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ENVIRONMENTAL RISK ASSESSMENT 2021 UPDATE

NUCLEAR SUSTAINABILITY SERVICES – WESTERN FACILITY

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ENVIRONMENTAL RISK ASSESSMENT 2021 UPDATE

NUCLEAR SUSTAINABILITY SERVICES – WESTERN FACILITY

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EXECUTIVE SUMMARY

The Nuclear Sustainability Services – Western Facility (NSS-W), formerly Western Waste Management Facility (WWMF) licensing process requires that Ontario Power Generation (OPG) make adequate provision for the protection of the environment and human health and safety (CSA, 2019). This requires identification, quantification, characterization, and prevention or mitigation of risks resulting from the operation of the NSS-W. To support these requirements, an Environmental Risk Assessment (ERA) has been completed for the current environment of the NSS-W.

This ERA update was carried out in accordance with the standard "Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills" (CSA N288.6- 12) (CSA, 2012). It builds on a previous ERA completed for the NSS-W and includes analysis of additional baseline data collected for the ERA as well as data collected as part of the current environmental monitoring programs.

The objectives of this ERA are as follows:

- Understand the potential risks to relevant human and ecological receptors resulting from the current operations of the NSS-W and RWOS1, and;
- Provide a suitable baseline for future NSS-W expansion activities.

The scope of this ERA consists of both the HHRA and the EcoRA for the NSS-W and looks at radiological and non-radiological contaminants, and physical stressors. The ERA focuses on the period from 2014 to 2020, but incorporates other years of data when necessary.

Human Health Risk Assessment (HHRA)

The human health risk assessment evaluated the impact on human health of radiological and non-radiological contaminants in different media, as well as a physical stressor (noise) resulting from the operations at the NSS-W.

For radiological emissions, individual dose to human receptors as the result of operation of all nuclear facilities at the Bruce nuclear site was less than 3 μSv/a for the period of 2014-2020. The maximum dose received by off-site members of the public, taking into account all potential pathways, is due to the total emissions from all nuclear facilities at the Bruce nuclear site and is approximately three orders of magnitude below the public dose limit of 1 mSv/a. The public dose arising from NSS-W operations is a portion of that from the Bruce nuclear site. Thus, the dose to members of the public from NSS-W operations is well below the regulatory limit. Therefore, it can be concluded that there is no radiological risk posed to off-site human receptors from NSS-W operations.

Based on the screening level risk assessment, non-radiological emissions from the NSS-W operations are compliant with environmental standards protective of human health (such as air quality and drinking water guidelines) and therefore there is no risk of human health effects.

From the results of the field noise level measurements and modelling results, the noise levels generated due to the operation of the NSS-W are compliant with the relevant standards. Therefore, it can be concluded that noise as a physical stressor causes no adverse effects to human health. Other than noise, no other physical stressor is considered for the HHRA, which is consistent with CSA N288.6-12.

Ecological Risk Assessment (EcoRA)

The ecological risk assessment evaluated radiological and non-radiological contaminants in different media, as well as physical stressors resulting from NSS-W operations.

Ecological receptors present at the NSS-W include terrestrial plants and invertebrates(including insects), aquatic plants and invertebrates, fish, herpetofauna, birds, and mammals. In addition, off-site aquatic receptors residing in Lake Huron could potentially come into contact with surface water Contaminants of Potential Concern (COPCs) originating from the site.

For radiological substances, all radionuclides were considered to be COPCs and a Tier 2 assessment was carried out.

For non-radiological substances, COPCs were identified by comparing the maximum concentration of each contaminant in each medium measured at the site to appropriate guidelines for the protection of ecological receptors. Where appropriate guidelines were not available, upper background concentrations were used as reference concentrations.

Those contaminants with maximum concentrations exceeding the guideline values were identified as COPCs and the list of COPCs carried forward for quantification of risk was as follows:

COPC	Medium	Location Group
Cadmium	Sediment	Group 2: WD
Chromium	Sediment	Group 1: SRD
Copper	Sediment	Group 1: SRD
		Group 2: WD
Dioxins and Furans	Surface Water	Group 1: SRD
	Sediment	Group 2: WD
Iron	Surface Water	Group 1: SRD

COPC	Medium	Location Group
		Group 2: WD
	Sediment	Group 2: WD
Lead	Sediment	Group 2: WD
Manganese	Sediment	Group 1: SRD
		Group 2: WD
Nickel	Surface Water	Group 1: SRD
	Sediment	Group 1: SRD
		Group 2: WD
Sodium	Surface Water	Group 1: SRD
		Group 2: WD
Strontium	Soil	Group 1: NSS-W
		Group 2: RWOS1
	Surface Water	Group 1: SRD
Zinc	Surface Water	Group 1: SRD
	Sediment	Group 2: WD

Note: SRD – South Railway Ditch samples, which includes Stream C and the wetlands as the SRD discharges into those water bodies
WD – West Ditch samples
NSS-W – Samples collected within the vicinity of the NSS-W facility
RWOS1 – Samples collected within the vicinity of the RWOS1

The risk evaluation for ecological receptors involved calculation of hazard quotients (HQ) for each COPC for each receptor, and concluded that:

- There are no adverse effects due to exposures to radiological contaminants.
- SRD and WD:
    - HQ values greater than 1 were calculated for iron, nickel and zinc for fish and herpetofauna in the SRD based on maximum water concentrations. In the WD, an HQ greater than 1 was calculated for zinc for fish and herpetofauna based on the

maximum water concentration. These species tend to move around through the environment, and are likely to see exposures similar to UCLM concentrations. The HQ was below 1 for all fish and herpetofauna based on UCLM concentrations for all COPCs in the SRD and WD.

    - The HQ values for cattails were greater than 1 in the SRD and WD based on exposure to maximum concentrations of one or more of iron, nickel and zinc. While it is possible that individual cattails may be exposed to elevated concentrations of these COPCs, the cattail population as a whole is not expected to be at risk in the SRD and WD.

    - The HQ values for benthic invertebrates were greater than 1 based on exposure to multiple COPCs in sediment in the SRD and WD. Since benthic invertebrates are not mobile, some individuals may experience prolonged exposure at the maximum concentration; however, the benthic invertebrate community as a whole is not expected to be at risk in the SRD.

    - COPCs in the SRD and WD are not likely to cause adverse effects on birds and mammals. Birds and mammals usually move around, and are likely to see exposures similar to UCLM concentrations as they move around the area. The HQ was below 1 for all riparian birds and mammals based on UCLM concentrations for all COPCs. Based on maximum concentrations, the little brown bat exceeded the target HQ of 1 in the SRD.

- Dioxins and Furans in the West Ditch

    - Adverse effects to benthic invertebrates at the community level are not expected within the SRD and the West Ditch, and as a result, remediation is not warranted. The HQ for benthic invertebrates exceeded 1 for dioxins and furans, suggesting a few individuals may be affected, however no community effects are anticipated. Remediation efforts within sediment would involve disturbing the benthic invertebrate habitats along with other aquatic receptors such as fish and herpetofauna, which would impact these aquatic species much more severely than allowing the dioxin and furan concentrations to remain in the sediment.

- NSS-W and RWOS1 Terrestrial Environments

    - For terrestrial ecological receptors there were no exceedances of the HQ target of 1 due to exposure to soil at the NSS-W or RWOS 1.

- Physical Stressors

    - Operation of the NSS-W is unlikely to represent a noise disturbance within the vicinity of the NSS-W since baseline bird survey observation numbers were considered to be normal at the survey locations and modelled noise level.

variations at these locations do not exceed existing noise level variations. A qualitative assessment was performed to address road kill and bird strikes at the NSS-W. Road mortality data suggests a decreasing trend for white-tailed deer. Additional data will improve the understanding of road mortalities for remaining mammals and insects. It is interpreted that amphibian road mortalities will remain consistent so long as the road network and vehicle traffic are expected to remain the same. No further evaluation is required for the NSS-W specifically, because the Bruce EMP is expected to continue road mortality surveys. It is recommended that these road mortality surveys will continue to be discussed within subsequent ERAs for the NSS-W.

Recommendations:

- It is recommended that the current quarterly monitoring of tritium within the SRD as part of the EMP program is appropriate and should be continued.

- HQs above 1 were observed in the surface water at the SRD for a number of metals, which is consistent with observations from past monitoring and may be attributed to the existence of a former rail line within the ditch for some metals, and to naturally elevated water concentrations for iron and manganese. Additional monitoring is recommended prior to the next ERA to confirm that conditions in the SRD remain unchanged.

- It was previously recommended that the supplementary precipitation study be repeated in 2020-21 to support the 2021 ERA update; however, based on discussion in Section 2.2.9.2.3 it is recommended that the updated precipitation monitoring supplementary study is not warranted and future precipitation monitoring can be discontinued. The precipitation monitoring program is not interpreted to provide additional insight into the NSS-W inputs to precipitation since the results indicated that tritium is most likely attributed to the operation of Bruce A and Bruce B, and the location and elevation of the precipitation samples are not expected to capture the tritium off-gassing processes occurring at the LLSBs.

- The source of inputs to the wetland is sufficiently understood; therefore, ongoing monitoring of the wetland is not necessary at this time. However, additional wetland monitoring is recommended to support the next ERA update to determine if conditions are stable or have changed.

- The soil and terrestrial conditions at the RWOS1 are appropriately characterized and are not expected to change based on its current use. There are no direct releases of radionuclides or non-radionuclides to air or water from RWOS1. Therefore, the RWOS1 facility does not need to be considered for subsequent ERAs so long as the operations at the site remain unchanged.

- The source of C-14 concentrations in vegetation near IC-18 is understood. Therefore, it is recommended that routine air monitoring should continue as part of the EMP design, but additional investigations into C-14 in air and vegetation are not required. Future consideration of C-14 in vegetation can be modelled using the specific activity model, as modelled concentrations in vegetation are expected to correlate well with measured air concentrations.

- Adverse effects to benthic invertebrates at the community level are not expected within the SRD and the West Ditch. Considering that dioxins and furans are not expected to cause adverse effects at the community level at both the West Ditch and SRD, remediation is not considered to be warranted. Remediation efforts that involve disturbing the sediment within the SRD and West Ditch are not recommended. Samples of benthic invertebrates can be collected and analyzed for dioxins and furans in a supplementary study to reduce uncertainty in risk characterization for the next ERA update.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

AAV	Annual Average Values
AECL	Atomic Energy of Canada Ltd.
AMEC	AMEC Foster Wheeler
APEC	Areas of Potential Environmental Concern
ATSDR	Agency for Toxic Substances and Disease Registry
BNGS	Bruce Nuclear Generating Station
BSAF	Biota-sediment Accumulation Factors
BTEX	Benzene, Toluene, Ethylbenzene and Total Xylenes
BV	Benchmark Value
CCME	Canadian Council of Ministers of the Environment
CDD	Polychlorinated Dibenzo-p-dioxins
CDF	Polychlorinated Dibenzofurans
CNSC	Canadian Nuclear Safety Commission
CO	Carbon Monoxide
COPC	Contaminant of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
CSM	Conceptual Site Model
CWQG	Canadian Water Quality Guidelines
DAV	Daily Assessment Values
DGR	Deep Geologic Repository
DQRA	Detailed Quantitative Risk Assessment
DRL	Derived Release Limits
DSC	Dry Storage container
ECCC	Environment and Climate Change Canada
EDTA	Ethylenediamine Tetra-acetic Acid
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Program
ERA	Environmental Risk Assessment
ESDM	Emission Summary and Dispersion Modelling
EV	Exposure Value
FCSAP	Federal Contaminated Sites Action Plan
FEQG	Federal Environmental Quality Guidelines
FUMP	Follow-Up Monitoring Plan
GMBP	GM Blue Plan
GS	Grassed Swale

GWMP	Groundwater Monitoring Plan
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
HTO	Tritiated Water
IAEA	International Atomic Energy Agency
IC	Inground Container
ICRP	International Commission on Radiological Protection
IJC	International Joint Commission
ISQG	Interim Sediment Quality Guidelines
L&ILW	Low and Intermediate Level Waste
LLSB	Low Level Storage Building
LOAEL	Lowest Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
MDL	Method Detection Limit
MECP	Ministry of Environment, Conservation and Parks
MNRF	Ministry of Natural Resources and Forestry
NCRP	National Commission on Radiological Protection
NGS	Nuclear Generating Station
NOAEL	No observed adverse effect level
NOx	Nitrogen Oxides
NSCA	Nuclear Safety and Control Act
NSS-W	Nuclear Sustainability Services – Western Facility
OPG	Ontario Power Generation
PEA	Predictive Effects Assessment
PEL	Permissible Exposure Limit
PHC	Petroleum Hydrocarbons
POI	Point of Impingement
POR	Point of Reception
PQRA	Preliminary Quantitative Risk Assessment
PRA	Probabilistic Risk Assessment
PROL	Nuclear Power Reactor Operating Licence's
PWQO	Provincial Water Quality Objective
RBE	Relative Biologic Effectiveness
RCSB	Retube Components Storage Building
REMP	Receiving Environment Monitoring Program
RSL	Regional Screening Level
RWS	Refurbishment Waste Storage
SAR	Species at Risk
SARA	Federal Species at Risk Act

SARO	Species at Risk in Ontario
SCS	Site Condition Standards
SGSB	Steam Generator Storage Buildings
SLRA	Screening Level Risk Assessment
SON	Saugeen Ojibway Nation
SRD	South Railway Ditch
SSTF	Spent Solvent Treatment Facility
SWHTG	Significant Wildlife Habitat Technical Guide
TEF	Toxic Equivalency Factor
TEQ	Toxic Equivalency Quotient
THQ	Target Hazard Quotient
TOC	Total Organic Carbon
TPMB	Transportation Package Maintenance Building
TRV	Toxicity Reference Value
UCLM	Upper Confidence Limit of the Mean
UFDS	Used Fuel Dry Storage
UFDS	Used Fuel Dry Storage Building
US EPA	United States Environmental Protection Agency
VEC	Valued Ecosystem Component
WD	West Ditch
WHO	World Health Organization
WSP	Water Supply Plant
WTL	Wetland
WVRB	Waste Volume Reduction Building
WWMF	Western Waste Management Facility

1.0 Introduction

The Nuclear Safety and Control Act (NSCA) mandates the Canadian Nuclear Safety Commission (CNSC) to regulate the nuclear industry in a manner that prevents unreasonable risk to the environment and makes adequate provision for environmental protection, in conformity with international obligations. This mandate is reflected in the General Nuclear Safety and Control Regulations under the NSCA.

In 2012, the Canadian Standards Association (CSA) published the N288.6 standard on environmental risk assessment (ERA) for Class I nuclear facilities (CSA, 2020). The standard calls for both ecological risk assessment (EcoRA) and human health risk assessment (HHRA), for both radiological and non-radiological contaminants and physical stressors. The CSA also published the N288.4 (CSA, 2019) and N288.5 standards on environmental monitoring programs (EMPs) and effluent monitoring programs. These standards recommend that effluent and environmental programs are designed, in part, to address risk issues identified by the ERA. These programs can also inform the ERA by providing information on effluent concentrations and loadings, and by providing environmental data to assist in model calibration and validation.

This ERA has been prepared to be compliant with CSA N288.6-12 (CSA, 2020) 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 (REGDOC-2.9.1, 2017). The ERA has been developed with current science and current regulatory attitudes in mind.

The text of this ERA is derived from a ERA that was conducted in 2016 including a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (EcoRA) by Amec Foster Wheeler (AMEC, 2016a). The text has been modified for sections that include updated data or information collected after 2016. These modified sections note the updated information accordingly.

1.1 Background

1.1.1 ERA Framework

An Environmental Risk Assessment (ERA) is a systematic process to assess the risk posed by contaminants and physical stressors in the environment on biological receptors. In June 2012, the Canadian Standards Association (CSA) published the first edition of Environmental risk assessments at Class I nuclear facilities and uranium mines and mills (CSA N288.6-12) (CSA, 2012). It addresses the design, implementation, and management of an environmental risk assessment program that incorporates best practices used in Canada and internationally.

In accordance with CSA N288.6-12 (CSA, 2012), the following tiers of assessment should be conducted for the nuclear facilities, as appropriate:

- Screening level risk assessment (SLRA) — Tier 1. The first tier of assessment is broad in scope and serves to identify potential issues (receptors and stressors) that require further quantitative evaluation at a higher tier. If no such issues are identified, no further assessment is needed.

- Preliminary quantitative risk assessment (PQRA) — Tier 2. The second tier addresses the identified potential issues quantitatively, generally using available site data. If an issue is resolved as being of no concern, it requires no further assessment.
- Detailed quantitative risk assessment (DQRA) — Tier 3. The third tier addresses any issues that are still of concern after the PQRA.

This progression is illustrated at a high level in Figure 1-1. Specifically, the following tasks, as appropriate, should be performed in each tier:

- Tier 1/SLRA: Characterization of the site; selection of contaminants and physical stressors for screening; comparison of the selected contaminants and physical stressors against the screening criteria; selection of receptors and exposure pathways; determination of assessment and measurement endpoints and development of conceptual model; and completion of problem formulation checklist if needed.
- Tier 2/PQRA: Estimation of exposure concentration or dose for receptors at relevant locations for each contaminant of potential concern (COPC) or physical stressors identified in Tier 1; selection of Toxicity Reference Values (TRV) or benchmark values for each receptor and COPC or physical stressors (if possible); calculations of Hazard Quotients (HQ) for each COPC or physical stressor; and calculation of cancer risk for non-radiological carcinogens for human receptors.
- Tier 3/DQRA: Refining exposure assessment and risk characterization to reduce uncertainty based on the additional site data; consideration of any other lines of evidence; and provision of recommendations for further uncertainty reduction, effect monitoring or risk management.

It should be noted that the biological receptors considered in an ERA include humans as well as non-human biota. The risks posed to human receptors can be addressed through a Human Health Risk Assessment (HHRA) and those posed to non-human biota can be addressed through an Ecological Risk Assessment (EcoRA).

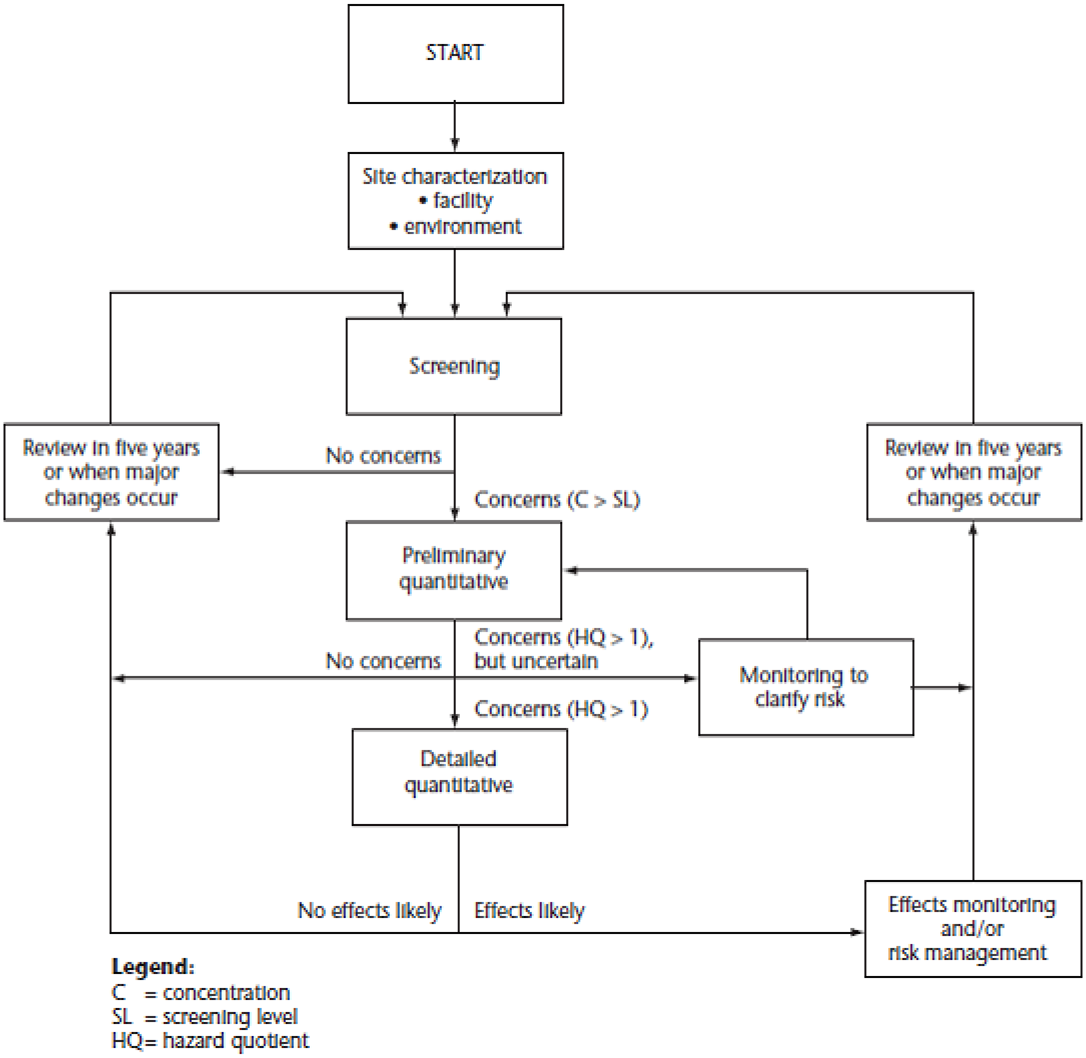


Figure 1-1: ERA Progression through Tiers of Assessment (CSA, 2012),

1.1.2 ERA for NSS-W

The Nuclear Sustainability Services – Western Facility (NSS-W), formerly known as the Western Waste Management Facility (WWMF) licensing process requires that Ontario Power Generation (OPG) makes adequate provision for the protection of the environment and human health and safety (CSA, 2010; Clause 0.1.2). This requires identification, quantification, characterization, and prevention or mitigation of effects resulting from the operation of the NSS-W.

An ERA for the NSS-W was prepared in 2016 (AMEC, 2016a). This 2021 ERA is an update to the 2016 ERA and focuses on available data during the 2014 to 2020 time period. Ecometrix completed a gap analysis to identify data requirements needed to complete the 2021 ERA update. As part of the gap analysis, Ecometrix conducted a review of the 2016 HHRA and EcoRA and additional relevant documents related to the ERA update (Ecometrix, 2020a).

Section 1.1.2.1 summarizes the 2016 ERA and Section 1.1.2.2 summarizes the additional soil, sediment, surface water and vegetation sampling program conducted by Ecometrix between fall of 2020 and summer of 2021.

1.1.2.1 Review of 2016 NSS-W ERA

In accordance with the standard "Environmental Risk Assessments at Class I Nuclear Facilities and Uranium mines and Mills" (CSA N288.6-12) (CSA, 2012) the ERA was conducted in 2016 by AMEC. The objectives of the 2016 ERA were to understand the potential risk resulting from then current operations of the NSS-W and to define baseline conditions to support future expansion activities. The ERA did not specifically evaluate the Radioactive Waste Operations Site 1 (RWOS1).

For the ERA, measurements from the following studies were evaluated:

- NSS-W EMP: Results of the annual Monitoring Program and Western Waste Management Facility Environmental Monitoring Report (OPG, 2014)
- Baseline Enhancement Monitoring for Future NSS-W Expansion Activities
- Bruce EMP (and formerly REMP) reports
- Supplementary Studies (OPG, 2016):
    - One-Year Supplementary Study for N288.4 Tritium Sampling in the Railway Ditch 2013
    - Radionuclides and Metals in Surface Water and Sediment (Grassed Swale/Wetland/South Railway Ditch)

The HHRA concluded that there were no adverse effects on the public due to radiological or non-radiological substances. For radiological emissions, individual dose to members of the critical group as a result of operation of all nuclear facilities at the Bruce nuclear site was less than 5 µSv/a, representing approximately 0.5 percent of the public dose limit. The dose to members of the critical group due to the operation of the NSS-W was estimated to be less than 0.2 µSv/a, four orders of magnitude less than the public dose limit of 1000 µSv/a. No physical stressors were identified.

The EcoRA concluded that radiological contaminants do not pose an adverse effect on biota at the NSS-W. The total radiological dose received by each indicator species is below the benchmark values given in CSA N288.6-12 (CSA, 2012).

No risks from non-radiological contaminants from the NSS-W to terrestrial plants and invertebrates were identified. There was no risk to aquatic receptors (plants, invertebrates, fish, and amphibians) from any non-radiological contaminants in surface water and sediment. It was determined that non-radiological contaminants identified in surface water and sediment from the NSS-W do not pose a risk to aquatic birds and mammals. Dioxins and furans in soil were found to present no risk to terrestrial birds and mammals.

No risks to benthic invertebrates were likely as a result of non-radiological contaminant exposure, with the exception of copper and zinc in the South Railway Ditch (SRD). The assessment of benthic invertebrates in the SRD resulted in a hazard quotient (HQ) greater than one for both copper and zinc. The source of copper and zinc in the SRD is not associated with NSS-W operations, but is attributed to historic release from the Spent Solvent Treatment Facility (SSTF) (AMEC, 2016a), which is no longer operational. In addition, upstream of SRD-1, drainage culverts may be contributing to elevated zinc concentrations in the SRD. In the Wetland, downstream of the SRD, sediment concentrations were below the toxicity reference values (TRVs) for benthic invertebrates, and adverse impacts to the benthic invertebrate community were not anticipated.

In the West Ditch, silver exceeded the sediment TRV; however, a low potential for effects was identified based on the benthic invertebrate field data. The ERA indicated that the West Ditch is not located within the NSS-W and the NSS-W is not known to be a source of silver contamination to the West Ditch.

No adverse effects were identified due to physical stressors.

There were no specific recommendations identified based on the results of the ERA.

1.1.2.2 Summary of 2020 to 2021 Sampling Program Conducted by Ecometrix

Following the 2016 ERA, Ecometrix completed a document review and gap analysis, and provided recommendations for additional data collection to support the 2021 ERA update (Ecometrix, 2020a). These recommendations were used to create the sampling program conducted for this ERA in 2020 and 2021.

Field investigations of the NSS-W were completed for the following four seasons: fall (November 2 to 5, 2020), winter (January 27 and 28, 2021), spring (May 2 to May 6, 2021) and summer (July 6 to July 7, 2021).

Samples were collected from surface water, sediment, aquatic vegetation, terrestrial vegetation and soil during the over-all field program from the locations outlined in Figure 1-2 and Figure 1-3. Individual field programs are summarized as follows:

- Surface Water:
  - Sampled in fall, winter, spring and summer
  - Collected from each of the stations identified in Figure 1-2, with the exception of WTL-2 in winter and summer due to low water levels
  - Analyzed for metals and inorganic parameters, dioxins and furans, C-14, tritium and Gamma Scan
- Sediment
  - Sampled in fall, spring and summer
  - Collected from each of the stations identified in Figure 1-2
  - Analyzed for metals, moisture, total organic carbon (TOC), dioxins and furans, C-14 and Gamma Scan
- Vegetation:
  - Sampled in fall only
  - Terrestrial Vegetation: Collected at each of the designated vegetation sampling areas identified in Figure 1-2. A total of five (5) grass and five (5) cedar samples were collected in each area.
    - Analyzed for C-14 and moisture
  - Aquatic Vegetation: Aquatic cattail rhizomes were collected at stations SRD-1, SRD-3, WTL-1 and WD-3 (Figure 1-2)
    - Analyzed for C-14, moisture and metals
- Soil:
  - Sampled in spring only
  - Collected at each of the designated soil sampling stations identified in Figure 1-3. Four (4) samples were collected in the vicinity of RWOS1, with samples being collected on each side of the RWOS1 area
  - Analyzed for moisture, TOC, metals, dioxins and furans, C-14, tritium and Gamma Scan

Analytical results from the sampling program are provided in Appendix F.

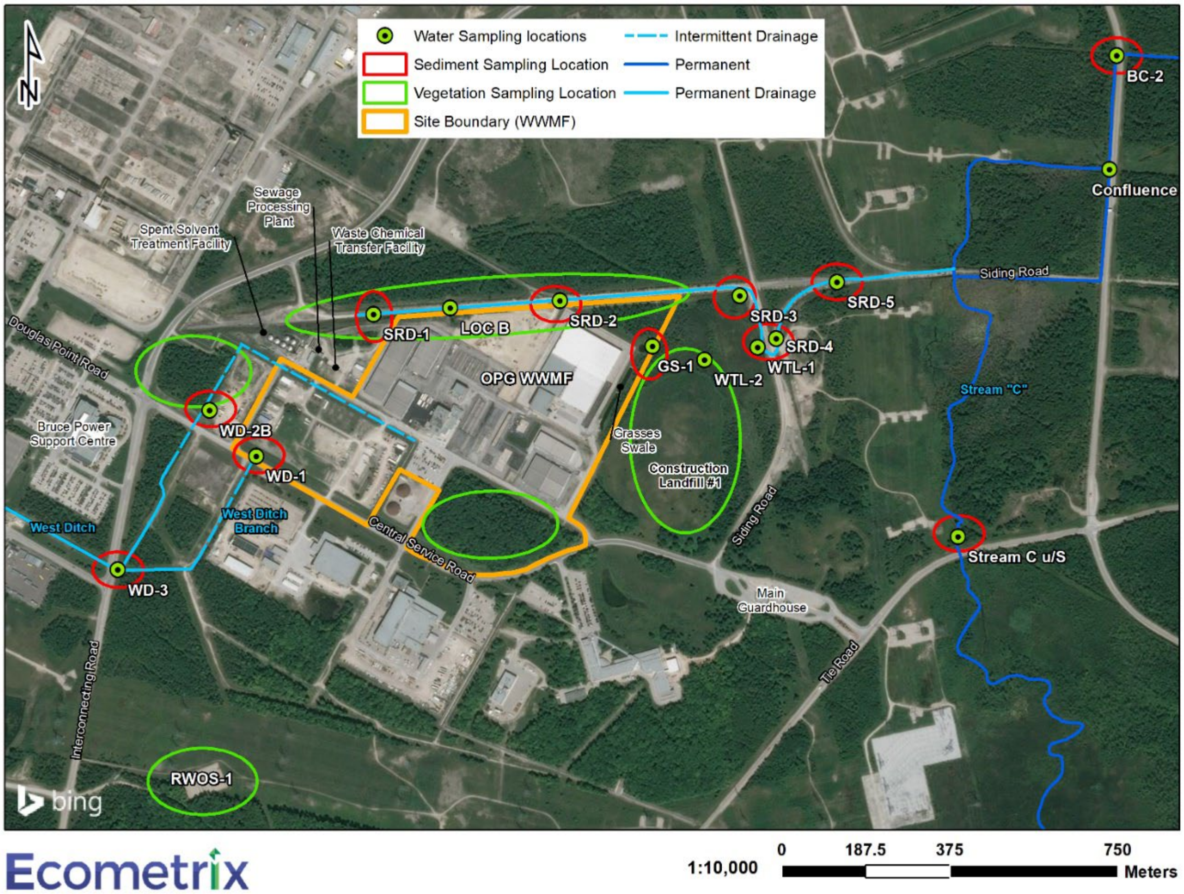


Figure 1-2: Water, vegetation and sediment sampling locations for the 2020-21 ERA Update Collections

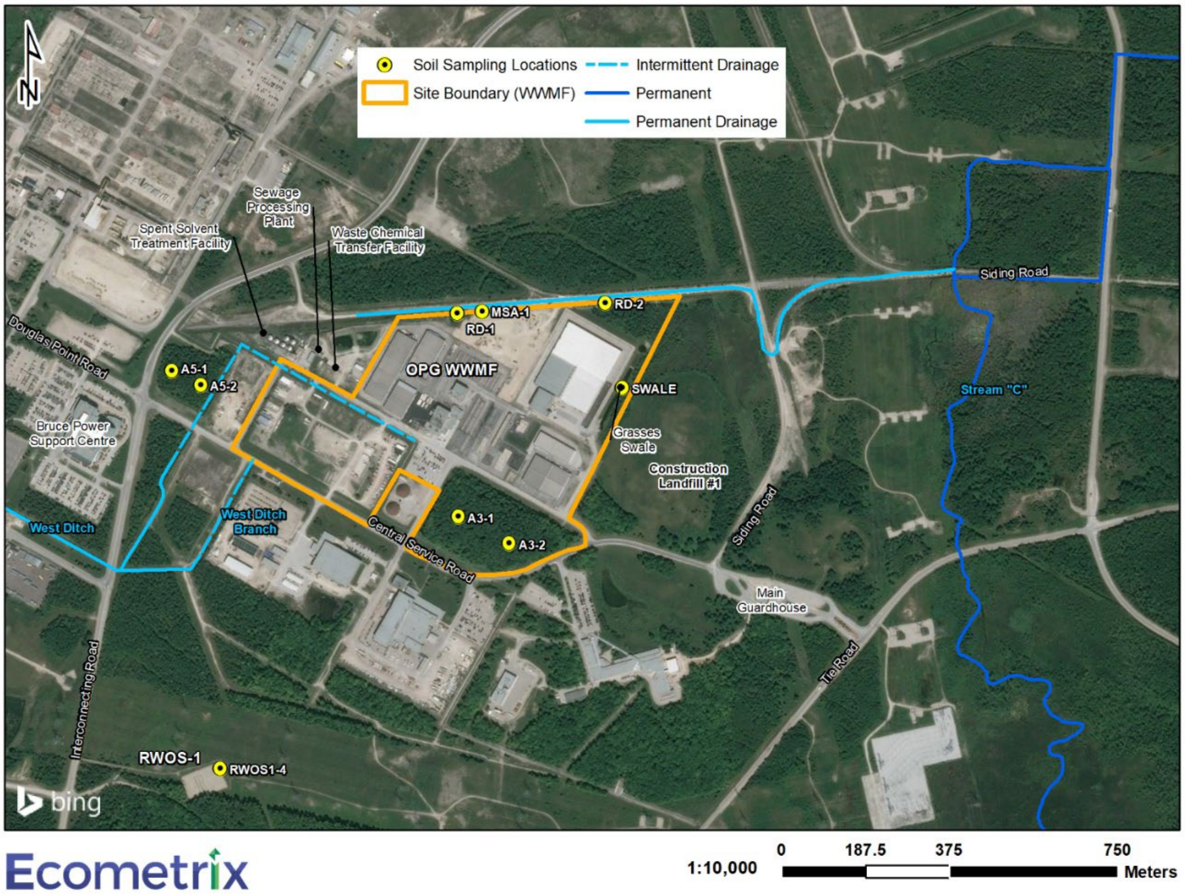


Figure 1-3: Soil sampling locations for the 2020-21 ERA Update Collections

1.1.3 Changes to Facility since 2016 ERA

The 2016 NSS-W ERA (AMEC, 2016a) was reviewed according to the recommendations in Clause 11 of CSA N288.6-12 for periodic review of the ERA. The purpose of the periodic review is to identify any new risks, changes to existing risks, or changes in risk assessment variables that need to be updated to reflect the new risk profile for the NSS-W and RWOS1, considering various review elements. The results of the periodic review are summarized at a high-level in Table 1-1, with additional details provided in the referenced sections.

Table 1-1: Periodic Review of 2016 NSS-W ERA

Periodic Review Element	Results from the 2016 to 2021 Period
Changes that have occurred in site ecology or	New information is available and should be considered in the ERA with potential to impact the Problem Formulation due to changes in site ecology and surrounding land use:

Periodic Review Element	Results from the 2016 to 2021 Period
Surrounding land use	• Additional species are classified as special concern, threatened or endangered as per the Species at Risk in Ontario (SARO) and/or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (MNRF, 2019) and are discussed in Section 4.1.1.2. • The NSS-W Groundwater Monitoring Plan (GWMP) developed end-use criteria based on domestic wells located on the Hydro 1 Property north of the Deep Geologic Repository (DGR) land, and inferred domestic wells beyond the northern boundary near Baie du Doré and beyond the southern boundary within Inverhuron Park. New information is available and should be updated in the ERA, but is not likely to modify risk implications: • The 2016 NSS-W ERA presented data from the 2011 Census of Population. The most recent Census of Population was conducted in 2016, and provides more updated information about the population distribution surrounding NSS-W. The new data is included in Appendix F.
Changes to the physical facility or facility processes that have the potential to change the nature of facility effluent(s) and the resulting risks to receptors	• The NSS-W ERA did not assess RWOS1 directly as it has been assessed in the NSS-W CSM, GWPP and GWMP. This investigation will assess the RWOS1 directly within this ERA. • DGR Lands were originally proposed to be "Future DGR lands" in the 2016 ERA. The NSS-W area currently comprises the expanded area and OPG has since retained ownership of the DGR lands. • The current status of the NSS-W expansion includes ongoing construction of UFDSBs 5 and 6, including setup of the stormwater system.

New environmental monitoring data collected since the last ERA update	• Precipitation sampling of tritium occurred at the NSS-W between 2015 to 2020 in order to meet the EMP objective to establish the source of HTO in on-site groundwater (from rainfall or from leaks/spills) and for trend analysis for tritium in precipitation.
	  ○ As outlined in the EMP (Ecometrix, 2020b), these sampling events involve approximately 30 sampling events a year based on precipitation frequency. Monitoring locations included the four corners of the NSS-W, one south of the Bruce A switchyard and one at RWOS1.
	  ○ No statistically significant trend was reported for tritium concentrations within precipitation from 2014 to 2019 (Ecometrix, 2020b).

Periodic Review Element	Results from the 2016 to 2021 Period

	• Surface water monitoring at WOD5 also began in 2016. Statistical analysis of the available data for this location showed a statically significant decreasing trend of tritium in samples from this location (Ecometrix, 2021c).
	
	• A review of the radiological and non-radiological contaminants that are not routinely analyzed within surface water samples of WOD4 and GS 1 at the NSS-W was completed in 2018 (COG, 2020). Detectable concentrations of di-benzo-p-dioxins and dibenzofurans were noted in the samples.
	
	• Ecometrix carried out additional sampling between Fall 2020 and Summer 2021. Locations of each vegetation, sediment and water sample locations are provided in Figure 1-2 and the locations of soil samples are provided in Figure 1-3. Details of each sampling program are provided as follows:
	  ○ Surface Water: sampled in Fall 2020, Winter 2021 and Spring 2021 at all locations identified in Figure 1-2, except for WTL-2 in Winter 2021;
	  ○ Sediment Sampling: sampled in Fall 2020 and Spring 2021 at all locations identified in Figure 1-2;
	  ○ Vegetation Sampling: sampled in 5 grass and 5 cedar samples in each sampling location outlined in Figure 1-2, with the exception of RWOS1 where 4 samples of each were collected. In addition, aquatic cattail rhizomes from stations SRD-1, SRD-3, WTL-1 and WD-3 in Fall 2020
	  ○ Soil Sampling: collected 12 soil samples in total from the locations identified in Figure 1-3 during the Spring 2021 program.
	
	• An environmental investigation was conducted by GM Blue Plan Engineering (GMBP, 2021) at the Spent Solvent Treatment Facility just west of the NSS-W which involved sampling soil through test holes, boreholes and onsite soil stockpiles, groundwater, surface water and sediments. Exceedances include:
	  ○ Groundwater samples from four monitoring wells (MW-2S, MW-6, MW-1, MW-3) exceeded the Table 3 SCS for one or more of the following parameters: cobalt, lead, nickel, and zinc
	  ○ Surface water sample SW-3 exceeded the Table 9 SCS for aluminum
	  ○ Sediment samples SED-SW-1E and SED-SW-2 exceeded the Table 9 SCS for copper
	
	• In 2017, Worley Parsons (Worley Parsons, 2017) completed a sediment and vegetation investigation within the SRD 270 m east of the SSTF and impacts were noted in sediment for metals and/or PHCs. Later in November 2017,

Periodic Review Element	Results from the 2016 to 2021 Period
	remedial excavations were conducted in the same area of the SRD 300 m east of SED-SW-2. According to GMBP (GMBP, 2021), there is the potential that more of the sediment extending east from the SSTF is impacted. • Additional sediment samples were collected within the SRD near the SSTF in June and December 2020 (GMBP, 2021). Six sediment locations exceeded the Table 9 SCS for copper and two locations exceeded the Table 9 SCS for PHC F2, PHC F3 and one location for PHC F3.
New or previously unrecognized environmental issues that have been reviewed	• Monitoring data indicated elevated C-14 concentrations in air, which were investigated further during a monitoring program identified in the EMP (Ecometrix, 2020b). Twenty passive air samplers were placed within the NSS-W to analyze C-14 concentrations within the air quarterly. o Results of this study showed that there were elevated concentrations of C-14 in air, which were interpreted to be due to the spent moderator ion exchange resin stored within the inground containers (IC) 12 and IC-18 (Ecometrix, 2020b). A statistically significant increasing trend was observed in the C-14 concentrations near IC-18 through the use of ProUCL (Ecometrix, 2020b). As a result, scrubbers (12 pucks with dimensions diameter 12" and media fill height of 1.25") are currently being installed. They are expected to meet the service life of 10 years with 125% capacity. To date three scrubbers are installed with further scrubbers planned for 2022 based on specific design requirements of individual IC-18s.
Scientific advances	• The CCME long-term water quality guidelines for the protection of aquatic life for manganese and zinc were updated in 2019 and 2018, respectively, as the result of new toxicology studies and new CCME assessments for these COPCs. The updated guidelines are lower (more stringent) than previously used guidelines; and therefore, have potential to change existing risk implications. The updated guidelines are used in the selection of COPCs (Section 4.1.3) for the EcoRA. • In 2020, CCME published an updated Ecological Risk Assessment Guidance Document (CCME, 2020). This document is used as additional guidance to this ERA update, in addition to the CSA N288.6 standard.
Changes in regulatory requirements	• REGDOC 2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures was published in April 2017. While REGDOC 2.9.1 is a CNSC regulatory document that outlines the CNSC's approach to conducting environmental assessments, it also provides

Periodic Review Element	Results from the 2016 to 2021 Period
	requirements and guidance for conducting ERAs. The requirement is for a facility to conduct the ERA in accordance with CSA N288.6-12.

1.1.4 Summary of Previous Environmental Assessments and Follow-Up Monitoring Programs

OPG prepared an Environmental Assessment (EA) Study Report for the construction of Low Level Storage Buildings (LLSBs) #9, #10 and #11 in March 2004. This report considered potential human health and ecological effects associated with construction and operation of LLSBs 9, 10 and 11. Monitoring data, existing information, relevant EA study results within the surrounding area for the NSS-W, predicted radionuclide dose calculations were used in the report to develop a conclusion that no risks to biota were expected due to chemical or radiological exposure (OPG, 2004). Since this EA, LLSBs #9 and #10 were constructed on the western portion of the NSS-W.

OPG conducted an Environmental Assessment (EA) in 2005 for the Refurbishment Waste Storage (RWS) Project. The EA examined site preparation, construction and operation activities for Retube Components Storage Buildings (RCSB), Steam Generator Storage Buildings (SGSB) and additional in-ground storage containers (ICs). Since this EA, the buildings that were constructed in the eastern portions of the RWS were the RCSB, the SGSB and LLSBs #11 #14. The Follow-Up Monitoring Program (FUMP) for this EA determined that there were no significant adverse environmental effects on hydrogeology, groundwater, sediment or surface water quality as a result of the construction of the RWS (OPG, 2007a). In addition, no soil samples were observed to exceed the applicable MECP criteria for both metals and radionuclides (OPG, 2007a). The CNSC has accepted the results of the FUMP and the follow-up requirements of the RWS have been met satisfactorily (CNSC, 2008).

Golder prepared an Environmental Impact Statement (EIS) for the site preparation, construction, operation and decommissioning of the DGR Project for Low and Intermediate Level Waste (L&ILW). This DGR would allow for the long-term storage of the L&ILW and was located north of the NSS-W. The regulatory process of the DGR began in 2003. The EIS assessed the likely effects to atmosphere, hydrology and water quality, aquatic environment, terrestrial environment, geology, indigenous interests, socio-economic factors, radiation and radioactivity, human and ecological health. The EIS predicted that the DGR project is not likely to result in any significant adverse effects on the environment with consideration of the mitigation measures that were proposed (Golder, 2011a). In 2013, OPG committed to only proceed with the DGR with the support of the Saugeen Ojibway Nation (SON) and in early 2020 the SON members had voted against the DGR project. OPG upheld the 2013 commitment and decided not to proceed with the DGR.

In 2016, a Predictive Effects Assessment (PEA) was conducted to estimate potential impacts from future expansion of the NSS-W (AMEC, 2016b). The results of the PEA human health and ecological risk assessment indicated that the highest dose to a member of the public could be up to 0.25 µSv/a (compared to a public dose limit of 1000 µSv/a) and the maximum dose to ecological VECs could be 3.57 µGy/h (the terrestrial dose benchmark of 100 µGy/h). For non-radionuclides, exceedances of assessment criteria for airborne particulates could occur at the Bruce nuclear site boundary during construction. Changes to surface water quality were also expected if drainage from all expansion areas were directed towards the SRD, but no adverse effects to aquatic organisms were predicted. A number of monitoring programs were recommended in the PEA and are summarized in an OPG commitments correspondence (OPG, 2017a) which included:

- Monitoring PM_{10} during construction: The results were low so no more monitoring was deemed necessary
- Soil monitoring: Impacted soil was discovered at the north site development and the used fuel storage area. The impacted soil was disposed of accordingly and clean excess soil was reused in other portions of the site prior to site preparation
- Monitoring total suspended solids during site preparation and construction: Addressed as part of the EMP for each phase.
- Stormwater monitoring during operations and maintenance: Not yet applicable
- Monitoring ambient noise at the expanded fence line during operations and maintenance: Not yet applicable.
- Monitoring radiation and radioactivity: monitor ambient dose at the expanded fence line

The PEA included mitigation measures listed in the PEA, OPG committed to additional mitigation measures that protected air, noise, surface water, soil, groundwater, terrestrial environment as well as additional considerations of species at risk (Little Brown Myotis and Butternut) (AMEC, 2016b; OPG, 2017a). Upon regulatory review, OPG has also committed to providing a list of assumptions for groundwater and surface water quantity and quality that were used in the PEA that were still valid during the design stage of the NSS-W Expansion Project (AMEC, 2016b; OPG, 2017a).

1.2 Objectives and Scope

The objectives of this ERA are as follows:

- Understand the potential risks to relevant human and ecological receptors resulting from the current operations of the NSS-W and RWOS1, and;

- Provide a suitable baseline for future NSS-W expansion activities.

The scope of this ERA consists of both the HHRA and the EcoRA for the NSS-W and looks at radiological and non-radiological contaminants, and physical stressors. The ERA focuses on the period from 2014 to 2020, but incorporates other years of data when necessary.

1.3 Organization of Report

The ERA is carried out consistent with CSA N288.6-12 (CSA, 2012). The report is structured as follows:

- Section 2.0: Site Description;
- Section 3.0: Human Health Risk Assessment;
- Section 4.0: Ecological Risk Assessment;
- Section 5.0: Conclusions and Recommendations;
- Section 6.0: Quality Assurance; and,
- Section 7.0: References.

2.0 Site Description

2.1 Site Facilities

The Bruce nuclear site is located on the east shore of Lake Huron, within the Municipality of Kincardine, approximately 18 km north of the Kincardine downtown, and 17 km southwest of Port Elgin, in the Province of Ontario, Canada (Figure 2-1). The site occupies an area of 932 hectares (2,300 acres) and hosts the NSS-W and other facilities. The description of these facilities is provided below.

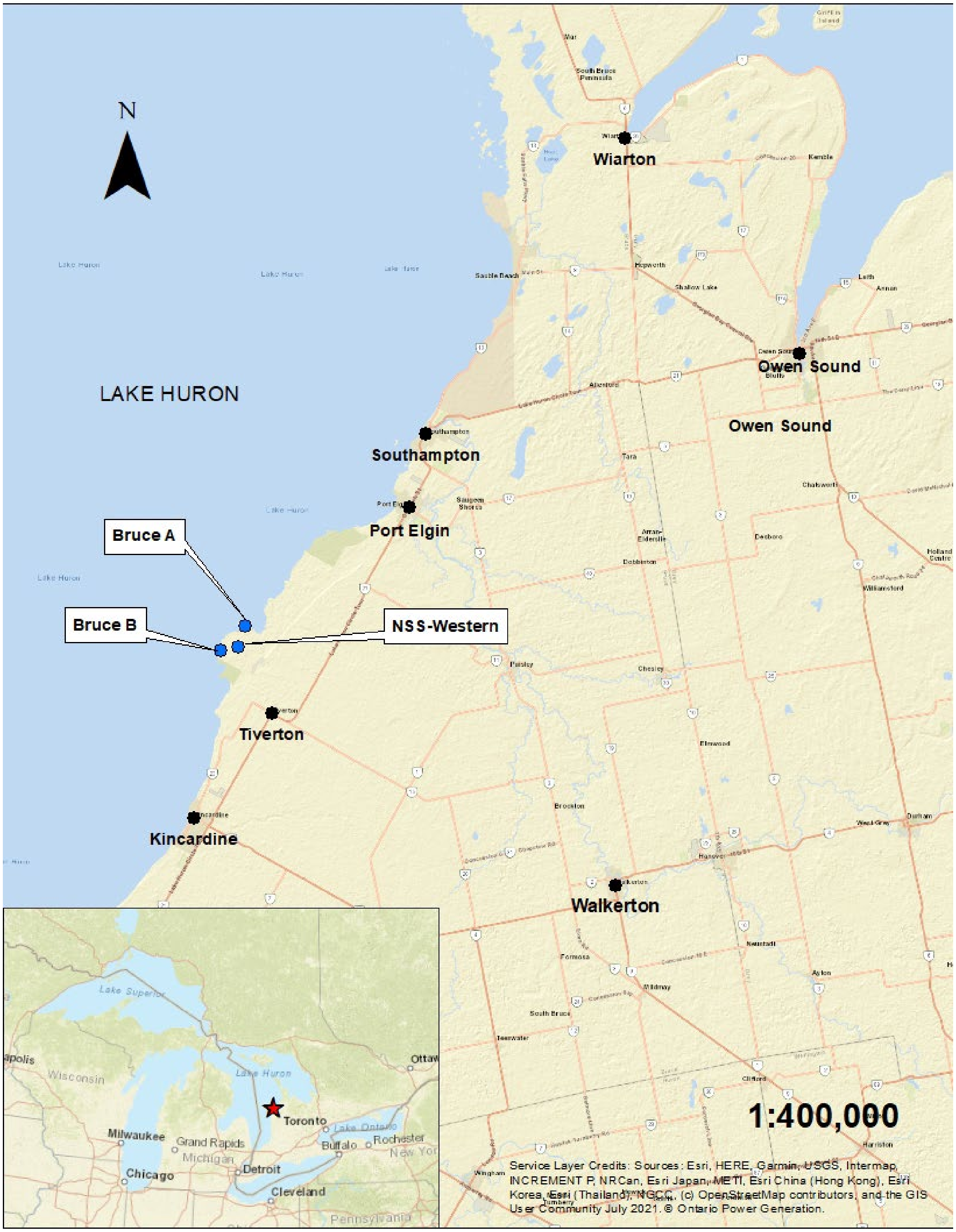


Figure 2 1: Regional Site Location of NSS-W

2.1.1 NSS-W and Other OPG Operated Facilities

The NSS-W covers an area of 19 ha within the OPG-retained lands. It is a Class 1B nuclear facility for the storage and management of Low- and Intermediate-Level Waste (L&ILW) and used fuel. Class IB is defined in the Class I Nuclear Facilities Regulations, SOR/2000-204, Nuclear Safety and Control Act (Minister of Justice Canada, 2015a). The NSS-W is classified as 1B as it is a facility that processes and stores nuclear substances generated at another nuclear facility.

The NSS-W facilities currently consist of the L&ILW Management Area, and the Used Fuel Management Area. There are seven additional L&ILW storage buildings and additional in-ground storage containers which have previously received Environmental Assessment approval (OPG, 2005) but have not been built. The layout of the existing waste management facilities at the NSS-W is shown in Figure 2-2.

The L&ILW Management Area is enclosed by a fence. The area consists of various structures primarily used for storage and processing of L&ILW from Pickering Nuclear Generating Station (NGS), Darlington NGS and Bruce Power's NGSs. These facilities are as follows:

- Low-Level Storage Buildings (LLSBs #1 to 14): The LLSBs are warehouse-like buildings. The LLSB structural design utilizes prefabricated, pre-stressed concrete. Shielding is provided as required to limit radiation fields. LLSBs provide storage for Type 1 and Type 2 Low Level Wastes (LLWs), which consist of items such as mop heads, rags, paper towels, floor sweepings and protective clothing that are minimally contaminated with radioactive material. Type 1 solid wastes are those with a contact dose rate less than or equal to 2 mSv/h. Type 2 solid wastes are those with a contact dose rate less than or equal to 0.15 Sv/h but greater than 2 mSv/h. The LLWs are placed in varying types of containers that are stacked in the LLSBs.

- Steam Generator Storage Building (SGSB #1): The SGSB structural design utilizes prefabricated, pre-stressed concrete. Shielding is provided as required to limit radiation fields. The SGSBs provides storage space for 24 steam generators.

- Retube Component Storage Building (RCSB #1): The RCSB structural design utilizes prefabricated, pre-stressed concrete. It provides storage capacity for retube component waste containers from the refurbishment of reactor units. Additional suitably packaged L&ILW from reactor refurbishment or operation may also be stored in the building.

- Waste Volume Reduction Building (WVRB): The WVRB provides for the management of LLWs, such as waste receiving and handling, compaction, and incineration prior to storage. The WVRB houses an incinerator unit and a compactor unit designed for processing LLWs. The WVRB also incorporates a truck unloading area, electrical and control rooms, and other service areas that support the waste processing function of the facility.

- Transportation Package Maintenance Building (TPMB): The TPMB houses a main shop area for the maintenance and decontamination of transportation packaging used for the transfer of radioactive materials between generating stations and waste management sites. The building also houses an active ventilation room, a smaller machine shop to service equipment for other portions of the NSS-W, a control maintenance shop with workstation areas for managing ongoing maintenance work, and a mechanical/electrical room, test room, vestibule, and washroom.

- Quadricells, In-ground Containers (ICs), trenches, and tile holes: These structures were built to store a variety of solid radioactive wastes. For example, above-ground quadricells provide storage capacity for bulk resin and reactor core components; in-ground trenches provide storage capacity for Type 1 and 2 radioactive wastes. Tile holes, which are vertical and cylindrical below- ground storage structures, are an early design for the storage of Type 3 wastes. They can be used for any wastes with dimensions compatible with tile holes. The ICs provide storage capacity for Type 2 and Type 3 radioactive wastes. Specifically, In-ground Containers for Heat Exchangers (IC-HXs) provide storage for waste heat exchangers.

Within the L&ILW Management Area, there is also an Amenities Building. This building provides entry space, office space, locker and shower facilities, and lunchroom facilities for the NSS-W staff.

The used fuel management area has additional security protection and is located northeast of the L&ILW storage area. It currently consists of the Dry Storage Containers (DSCs) processing building and four Used Fuel Dry Storage Buildings where used fuel is stored. The DSC processing building provides a facility for the receipt, inspection, preparation for use of empty DSCs, seal welding of loaded DSCs, and office space for personnel. Each DSC storage building is designed to house a maximum of 500 DSCs.

Figure 2-2: Layout of the Existing Waste Management Facilities at NSS-W (AMEC, 2016a)

1. LLSBs
2. In-ground Storage (trenches, tile holes, ICs, In-ground container for heat exchangers (ICHXs))
3. SGSB (3-1) and RCSB (3-2)
4. Used Fuel Processing Building (4-1) and Used Fuel Dry Storage Buildings (4-2)
5. Waste Volume Reduction Building and Amenities Buildings
6. Transportation Package Maintenance Building
7. Quadricells
8. SB 5&6

It is likely that the NSS-W will be expanded to accommodate additional buildings for the storage of used fuel, L&ILW and for waste processing. The proposed expansion areas are shown in Figure 2-3. The area outlined in blue was not considered as part of the Project Study Area by previous EAs, but was included in their Site or Local Study Areas, and was included as part of the 2016 ERA. The area outlined in red was previously considered as part of the Project Study Area in the NSS-W RWS EA (OPG, 2005) or the DGR EA (Golder, 2011b).

In the vicinity of the NSS-W, there is one conventional landfill, four legacy construction landfills, and some other facilities as described below, which are also owned by OPG:

- Bruce heavy water plant: The Bruce heavy water plant was in operation from 1973 to 1998 for the purpose of producing reactor-grade heavy water. The heavy water plant has been decommissioned, including the demolition of all above-ground structures, except for concrete floor slabs and foundations which remained in place. The Canadian Nuclear Safety Commission (CNSC) issued a Licence to Abandon the heavy water plant in 2014 (CNSC, 2014).

- Radioactive Waste Operation Site 1: The Radioactive Waste Operation Site 1 (RWOS1) is an approximately 0.5-hectare site constructed in the mid-1960s. After reaching capacity, in 1976, RWOS1 was shut down and entered into a state of care and maintenance. Historic L&ILW are stored there but no new wastes are received. In the 1990s and early 2000s, some wastes were relocated to NSS-W. Within a fenced perimeter, the site consists of in-ground structures only: trenches, a trench monolith (with 13 sections), tile holes in five of the trench monolith sections (8- to 9 holes each), and an assembly of lined holes. Figure 2-4 shows the layout of these structures at RWOS1.

- Spent Solvent Treatment Facility (SSTF): The STTF was established in the 1990s to store and process boiler-cleaning waste (spent solvent) consisting of ethylenediamine tetra-acetic acid (EDTA) and metals such as copper, iron, zinc and nickel. The SSTF had not accepted spent solvent since 2003 and was in caretaking mode until it was decommissioned in 2019. The CNSC nuclear substance licence was removed from the property. However, the MECP Environmental Compliance Approval (ECA) remains on the property due to residual groundwater impacts associated with the former operations.

A Deep Geologic Repository (DGR) was proposed to be built within the OPG-retained land for the permanent disposal of L&ILW currently managed in the NSS-W and other L&ILW to be generated from OPG-owned Nuclear Generating Stations. However, in 2020 the two communities of Saugeen Ojibway Nation voted to not support the DGR and consequently the project was cancelled.

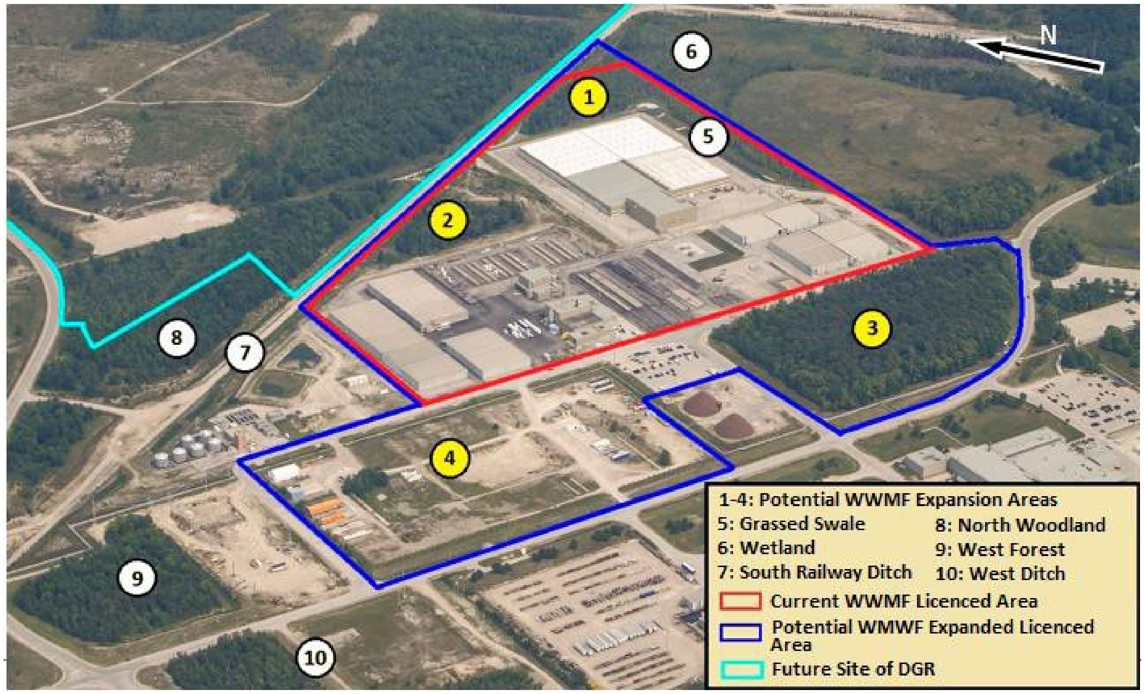


Figure 2-3: Potential NSS-W Expansion Areas

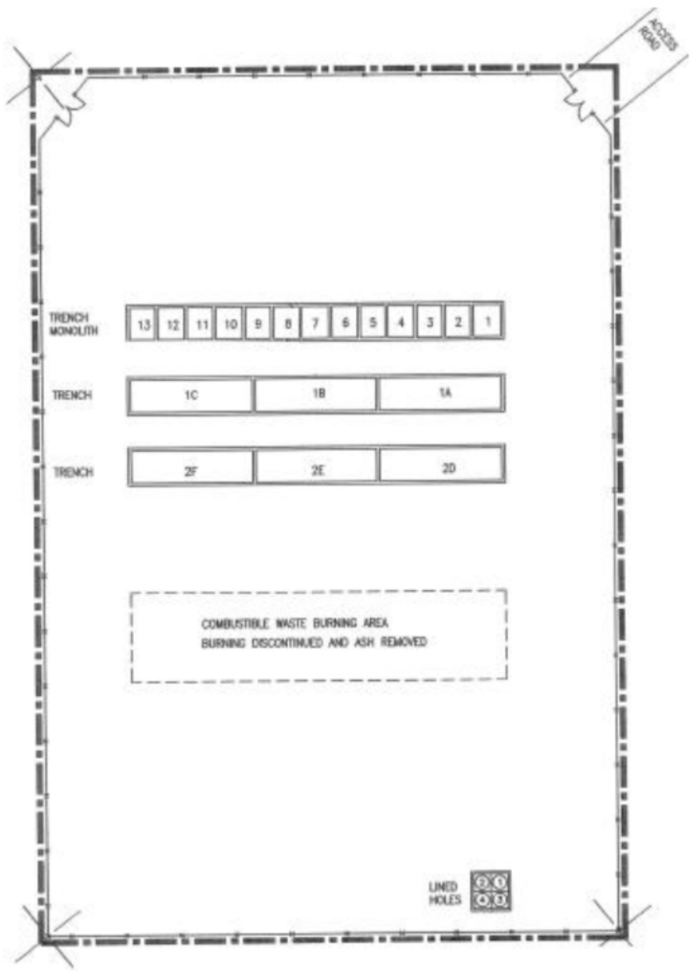


Figure 2-4: RWOS1 Inground Structures (Ecometrix, 2021a)

2.1.2 Other Facilities

As shown in Figure 2-5, there are other facilities within the Bruce nuclear site, including:

- Bruce Nuclear Generating Station A (BNGS-A) and Bruce Nuclear Generating Station B (BNGS-B) operated by Bruce Power;
- Douglas Point Waste Management Facility owned by Canadian Nuclear Laboratories, formerly known as Atomic Energy of Canada Ltd. (AECL); and,
- Hydro One Facilities (switchyard, switching stations and transformer stations).

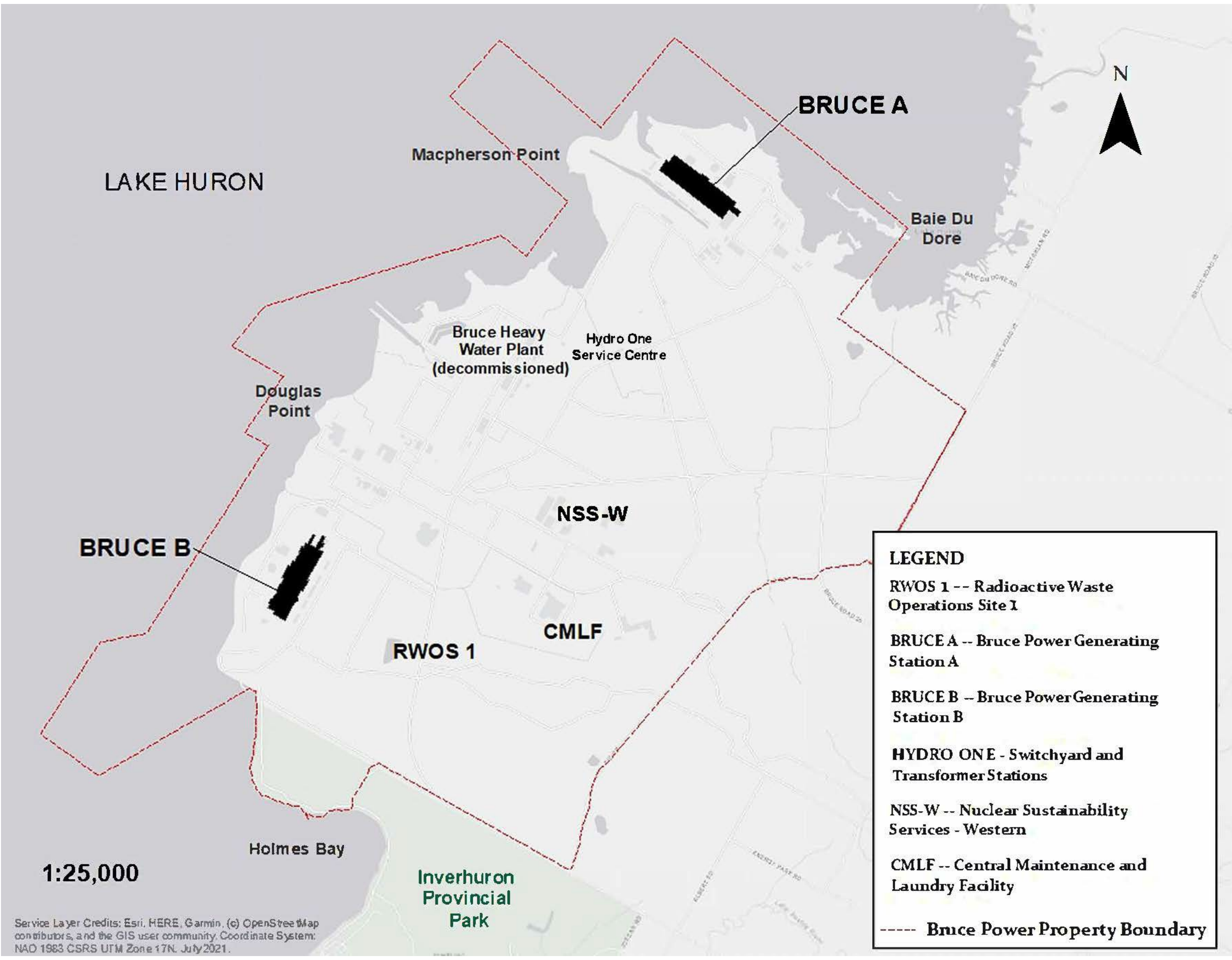


Figure 2-5 Facilities in Bruce Nuclear Site (Golder, 2011c)

A brief description of these facilities is provided below.

2.1.2.1 Bruce Nuclear Generating Station

Bruce Power operates BNGS-A and BNGS-B, which each house four CANDU® reactors. All of these units are currently operational and can produce a total of ~6,400 megawatts of electricity for the Ontario grid.

BNGS-A is located on the north-west corner of the Bruce nuclear site, about 2.5 km to the north-east of Douglas Point, while BNGS-B is located at the south-west corner, about 0.8 km to the south of Douglas Point.

The BNGS-A section includes part of a 914 m exclusion zone surrounding the BNGS-A powerhouse structure and the associated Lake Huron water lots. These portions are controlled by Bruce Power. Similarly, the BNGS-B section includes part of a 914 m exclusion zone extending from the BNGS-B powerhouse structure to the northern part of Inverhuron Park which is owned by OPG and leased to the Ministry of Natural Resources and Forestry. The four units of BNGS-A were originally put into service in 1977 and the four BNGS-B units were put into service between 1984 and 1987 (Golder, 2011b).

Currently all eight units are in operation.

There are several support facilities located on the site, including the Bruce Steam Plant, the Central Maintenance and Laundry Facility, garages, warehouses, workshops, a sewage processing plant and various administrative buildings.

The Bruce nuclear site is fenced and access to the Bruce nuclear site is restricted and is controlled by Bruce Power security personnel. Under the Bruce nuclear site services agreement, Bruce Power also provides security services for the protected area at the NSS-W.

An ERA was completed for Bruce Power in 2017 with the most recent update occurring in 2022 (Bruce Power, 2022a). Overall, the Bruce Power ERA concluded that Bruce Power is operating in a manner that is protective of human and non-human biota as a result of exposure to radiological and non-radiological releases. All radiation doses to human receptors are below the public dose limit and all radiation doses to non-human biota are below the radiation dose benchmarks. No non-radiological constituents were identified for human health. For assessment of non-radiological risk to non-human biota, potential risk was identified to terrestrial ecological receptors at various locations around the Bruce Power site, to aquatic and semi-aquatic receptors at various drainage ditches and ponds, and to aquatic receptors in Lake Huron. Follow-up monitoring was recommended for areas with elevated levels of non-radiological constituents.

2.1.2.2 Douglas Point Waste Management Facility

The Douglas Point Waste Management Facility is owned by Canadian Nuclear Laboratories. The facility consists of a permanently shut down, partially decommissioned prototype 200-megawatt CANDU® reactor and associated structures and ancillaries. This facility is presently in the long term "Storage with Surveillance" phase of a decommissioning program.

The most recent ERA for the Douglas Point Waste Management Facility was completed in 2019 (Arcadis, 2019). The ERA concluded that radiological releases from the Douglas Point Waste Management Facility are a small percentage of releases from the entire Bruce Power site, and that there is no radiological risk or non-radiological risk to human and on-human biota from current conditions at the Douglas Point Waste Management Facility.

2.1.2.3 Hydro One Facilities

Hydro One owns and operates a number of assets within the Bruce nuclear site. These include, but are not limited to, office and workshops for maintenance, switchyards at BNGS-A / BNGS-B, switching stations and transformer stations.

2.1.3 Cumulative Effects

The operation of the NSS-W can act cumulatively with the other non-OPG facilities within the Bruce nuclear site. Environmental monitoring data collected from the NSS-W site and surrounding area would include any combined effects from all facilities operating in the vicinity, as it is not possible to isolate the individual facility contributions when evaluating environmental monitoring data. Additionally, the Bruce Power annual environmental protection report assesses the combined radionuclide emissions from all facilities on the Bruce Power site including BNGS-A and BNGS-B, the Central Maintenance Facility, the Central Storage Facility, NSS-W, Douglas Point Waste Management Facility, and KI North; therefore, human public dose results provided represent the cumulative effects of the above facilities.

2.2 Description of Natural and Physical Environment

The natural and physical environment of the NSS-W and the surrounding area is described in this section. Where necessary, the information for the Bruce nuclear site and adjacent off-site area is also provided.

2.2.1 Meteorology

2.2.1.1 Wind

Wind data for the Bruce nuclear site, such as wind speed and direction, are measured at two meteorological towers, a 50 m on-site tower and a 10 m off-site tower. The 10 m tower is located along Concession 4 to the east of the Bruce Power Visitors' Centre. The 50 m on-site tower is located approximately 250 m north east of the NSS-W and measures wind speed and direction at two elevations: 50 m and 10 m.

The wind rose data for the period of 2011-2016 (excluding 2014), were obtained from the 2020 Bruce Power Environmental Protection Report (Bruce Power, 2021). This data is based on the monitoring results at the 10 m level from the 50 m on-site meteorological tower and was processed to produce the wind rose diagram in Figure 2-6.

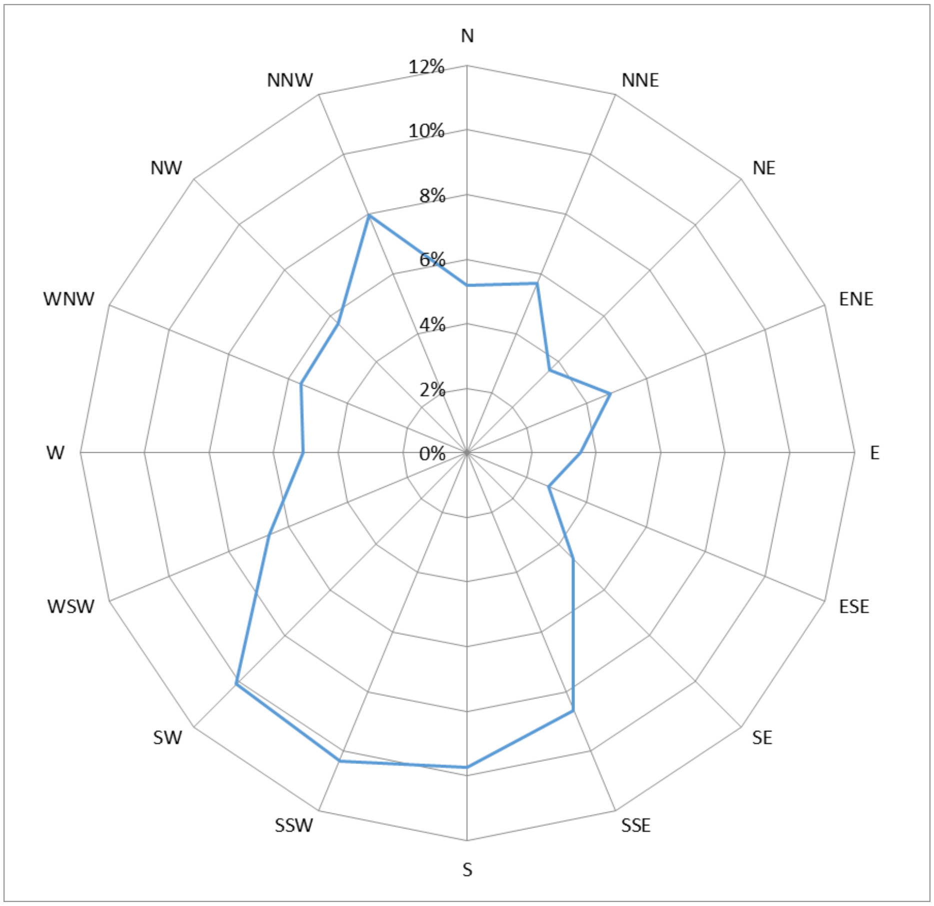


Figure 2-6: Average Windrose (Wind Blowing From) at the Bruce Power Site

The average wind speed and most frequent direction measured at the 10 m level from the 50 m on-site meteorological tower for 2014-2020 have been compared against the Canadian Climate Normals 1981-2010 Station Data from the Wiarton A monitoring station in Table 2-1 below.

Table 2-1: Summary of Hourly Winds for Bruce Site and Wiarton A Monitoring Station

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
50 m on-site meteorological tower at the 10 m elevation, 2014-2020													
Average Speed (km/h)	13.6	12.9	10.8	10.3	8.9	6.6	7.0	7.4	7.9	10.8	13.0	28.9	11.5
Most Prevalent Direction	SW	WNW	SSW	NW	SSW	SSW	SSW	SSW	S	SSW	NNW	WSW	SSW
Canadian Climate Normals, 1981-2010 (wind blowing from) (Government of Canada, 2021)													
Average Speed (km/h)	16.0	14.4	13.7	14.1	11.6	9.8	9.8	10.0	11.6	14.0	15.4	15.8	13.0
Most Prevalent Direction	S	S	W	W	W	W	W	W	S	S	S	S	W

The average wind speed for both the data sets follows a similar trend; the wind speed is higher at the beginning of the year in the winter, begins to decrease in May, hits a low in June and July, and increases back up to winter levels by October or November. The yearly average wind speeds for both data sets are also similar; the yearly average wind speed for 2014-2020 is only 1.5 km/h more than for 1981-2010. Therefore, the wind speeds observed at the on-site tower are aligned with the Canadian Climate Normals.

Both sets of data have their most prevalent monthly wind directions blowing from similar directions. The predominant wind direction for the 2014-2020 Bruce Tower dataset is from the south-southwest, and the predominant wind directions within the Canadian Climate Normals is generally from south and west directions. The Climate Normals report wind direction using the four cardinal directions, while the on-site meteorological data is recorded with the ordinal (SW, SE, etc.) and secondary-intercardinal directions (SSW, etc.). This may cause the wind directions in the climate normals to be approximated to the nearest cardinal direction while the on-site meteorological data is recorded with a higher degree of accuracy.

2.2.1.2 Temperature

The site has a humid continental climate and is characterized by warm summers and cold snowy winters. Air temperature data are collected from the on-site meteorological tower at the 10 m elevation. The temperature for each month over the period of 2014 to 2020, including maximum, minimum and mean values which are based on hourly measurement, is shown in Table 2-2.

Table 2-2: Atmospheric Temperature from On-Site Meteorological Tower (2014-2020)

Month	Hourly Maximum Temperature (°C)	Hourly Minimum Temperature (°C)	Monthly Mean Temperature (°C)
January	12.2	-23.4	-4.5
February	20.5	-26.7	-5.2
March	21.8	-17.5	-1.5
April	28.9	-7.0	5.7
May	31.2	-1.0	10.6
June	32.0	3.1	16.5
July	31.2	8.3	20.6
August	30.3	10.8	20.6
September	29.8	2.4	17.0
October	26.6	-0.3	10.1
November	22.8	-9.6	4.2
December	19.1	-16.1	0.5
Year	32.0	-26.7	7.9

Average historical extreme maximum, extreme minimum, and monthly mean temperatures at the Wiarton A monitoring station for 1981-2010 (AMEC, 2016a) can be found in Table 2-3 below.

Table 2-3: Average Temperature, Wiarton A Monitoring Station (1981-2010) (AMEC, 2016a) (Statistics Canada, 2019)

Month	Hourly Maximum Temperature (°C)	Hourly Minimum Temperature (°C)	Monthly Mean Temperature (°C)
January	7.6	-22.3	-6.3
February	7.1	-22.6	-6.1
March	15.8	-18.9	-1.8
April	23.1	-6.7	5.3
May	26.3	-0.7	11.0
June	29.5	3.5	15.9
July	30.1	7.1	18.9
August	30.0	6.3	18.3
September	27.9	1.4	14.6
October	22.8	-2.4	8.6
November	16.8	-8.8	3.1
December	9.9	-18.2	-2.8
Year	**30.1**	**-22.6**	**6.6**

Compared to the 1981-2010 data, the 2014-2020 data monthly mean temperatures are higher, and the maximum temperatures for 2014-2020 are consistently higher. Minimum temperatures were not consistently higher or lower in 2014-2020 but remained within similar ranges.

2.2.1.3 Precipitation

Precipitation data are collected by Environment and Climate Change Canada at weather stations in the vicinity of the Bruce nuclear site. The mean monthly and annual precipitation data (rainfall and snowfall) for the Kincardine weather station is shown in Table 2-4 for the period from 2014 to 2020 (MECP, 2021a).

Table 2-4: Mean Monthly and Annual Precipitation at Kincardine (2014-2020)

Month	Total Rain (mm)	Total Snow (cm)	Total Precipitation (mm)
January	23.9	66.0	89.9
February	20.8	37.2	4.5
March	27.2	22.2	49.4
April	66.5	12.1	78.6
May	36.1	0.1	36.2
June	56.9	0.0	56.9
July	27.6	0.0	27.6
August	38.3	0.0	38.3
September	39.9	0.0	39.9
October	59.0	1.3	60.3
November	36.6	15.8	52.4
December	32.4	34.9	67.2
Annual	**465.2**	**189.6**	**601.4**
Maximum	**66.5**	**66.0**	**89.9**
Minimum	**20.8**	**0.0**	**4.5**

Notes:

Precipitation is the summation of rainfall and snow water equivalent.
The total snowfall is the amount of frozen (solid) precipitation in centimetres (cm)

Historical precipitation data for 1981-2010 (AMEC, 2016a) (Statistics Canada, 2019) can be found in Table 2-5 below.

Table 2-5: Mean Monthly and Annual Precipitation at Wiarton A (1981-2010) (AMEC, 2016a) (Statistics Canada, 2019)

Month	Total Rain (mm)	Total Snow (cm)	Total Precipitation (mm)
January	22.6	111.7	99.5
February	21.3	77.7	74.0
March	36.5	39.7	67.4
April	57.9	17.3	73.0
May	83.0	0.5	83.5
June	76.4	0.0	76.4
July	65.8	0.0	65.8
August	77.7	0.0	77.7
September	103.1	0.0	103.1
October	97.2	4.1	101.0
November	79.1	44.7	115.7

Month	Total Rain (mm)	Total Snow (cm)	Total Precipitation (mm)
December	30.0	108.9	110.6
Annual	**750.6**	**404.8**	**1047.9**
Maximum	**103.1**	**111.7**	**115.7**
Minimum	**21.3**	**0.0**	**65.8**

Between 1981 and 2010, the annual rainfall averaged 750.6 mm. Monthly average rainfall ranged between 21.3 and 103.1 mm in Wiarton A. For 2014-2020 in Kincardine, the annual rainfall averaged 465.2 mm, and monthly average rainfall ranged between 66.5 and 20.8 mm. Therefore, average annual rainfall over 2014-2020 in Kincardine has been lower than that from 1981 and 2010 in Wiarton A.

Between 1981 and 2010 in Wiarton A, annual snowfall averaged 404.8 cm; monthly average snowfall ranged between 0 and 111.7 cm. For 2014-2020 in Kincardine, annual snowfall averaged 189.6 cm; monthly average snowfall ranged between 0 and 66.0 cm. Therefore, average annual snowfall over 2014-2020 in Kincardine has been lower than that from 1981-2010 in Wiarton A.

Between 1981 and 2010 in Wiarton A, annual total precipitation averaged 1047.9 mm; monthly average total precipitation ranged between 65.8 and 115.7 mm. For 2014-2020 in Kincardine, annual total precipitation averaged 601.4 mm; monthly average total precipitation ranged between 48.2 and 145.2 mm. Therefore, average annual total precipitation over 2014-2020 in Kincardine has been lower than that from 1981-2010 at Wiarton A.

2.2.2 Geology

The geologic setting of the Bruce nuclear site is characterized by a variable thickness of glacial sediment overlying carbonate bedrock of the horizontally bedded, relatively undeformed Paleozoic Amherstburg Formation. Glacial sediments thicken eastward from the Lake Huron shoreline where a thin veneer overlies the bedrock surface. The principal stratigraphic units are glacio-fluvial/lacustrine sands and gravel typically underlain by a dense fine-grained glacial till. Inter-till sand lenses and foreshore beach deposits occur locally. The bedrock surface beneath the Bruce nuclear site dips in an easterly direction. The upper few metres of the bedrock surface are fractured and highly weathered. The bedrock consists of near flat lying Paleozoic age dolostone, limestone and shale sedimentary rocks to a depth of around 800 m where the Precambrian granitic basement is encountered (OPG, 2005), (Jensen and Heystee, 1987) and (Jensen, 1996).

Beneath the NSS-W, the overburden stratigraphy is subdivided into five main units, which are listed below in descending order from ground surface (Jensen and Heystee, 1987) (Jensen, 1996):

- Surficial sand and gravel unit with topsoil and gravel present at some locations;

- Upper weathered silty glacial till unit;
- Upper unweathered silty glacial till unit;
- Middle sand/layered till unit; and,
- Lower unweathered silty glacial till unit.

This is illustrated in Figure 2-7.

Grain size distribution in the surficial sand gravel unit, based on the 2014 site survey, shows that the soils in the potential expansion areas are generally coarser grained, ranging from sandy silts to silty sandy gravel with an observed high percentage of organic matter. Qualitatively, site observations indicated that the soils have a high amount of organic matter. Given the grain size distribution and the estimated organic content, relatively low erodibility is expected. For the purpose of determining the dose to human and ecological receptors and concentrations in various media in Section 4.3, the surficial soil has been classified as loam, to reflect the high amount of organic matter and to be consistent with the default soil types recommended in clause 6.3.1.2 in CSA N288.1-20 (CSA, 2020).

The overburden stratigraphy is complex with drift thicknesses ranging between 14 and 19 m, attributed to the laterally discontinuous middle sand/layered till unit. This unit is comprised of well sorted fine to medium sand but coarsens at several locations and is interbedded with thin horizontal layers of silty till. The geometry of the middle sand/layered till unit is irregular with variations in the thickness and elevation.

With few exceptions, the glacial till units are laterally continuous with varied thicknesses. The upper till surface consists of a weathered horizon, with sub-vertical fractures varying in thickness from 0.6 to 2.9 m. Beneath the western sections of the NSS-W, the upper and lower unweathered till units are separated by the middle sand/layered till unit. In the central and eastern portions of the NSS-W, the two till units merge. In these areas, the two till units cannot be distinguished other than by a slight textural variation in clay content. Within the massive till deposits occasional seams of clay, sand, and sand and gravel occur.

The bedrock underling the surficial deposits consists of Middle Devonian age, buff, silty to sandy dolostone interbedded with dark grey bituminous limestone of the Amherstburg Formation. The bedding structure of the bedrock sequence beneath the NSS-W dips gently southeastward, while the bedrock surface dips northeastward.

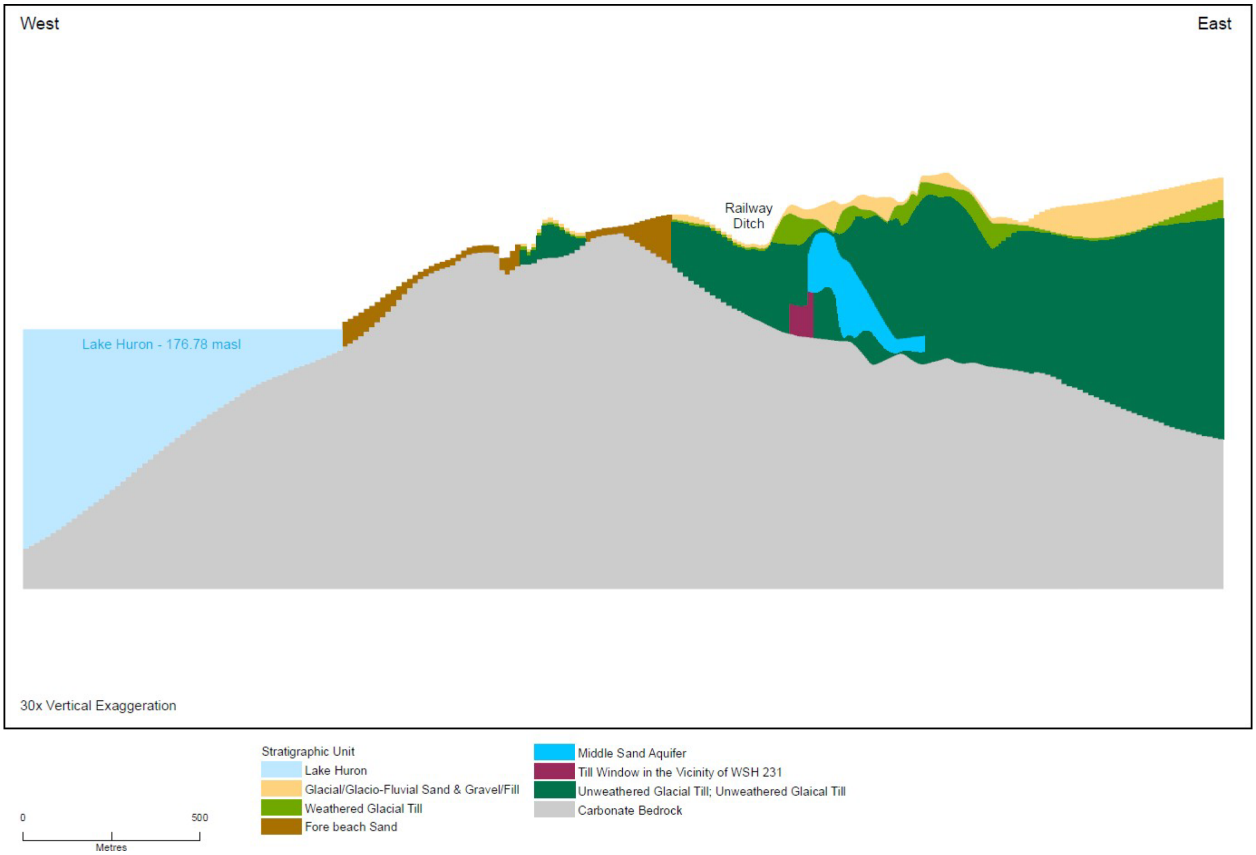


Figure 2-7: West-East Cross Section of Modelled Layers under the Bruce Nuclear Site (AMEC, 2016a)

2.2.3 Groundwater

Groundwater flow within the surficial deposits and bedrock of the Bruce nuclear site is directed northwestward toward Lake Huron. This is generally sub-parallel to the well- established surface drainage pattern.

Beneath the NSS-W, the main hydrostratigraphic units are as follows (Jensen and Heystee, 1987):

- Upper Fill and Sand Unit
- Middle sand unit;
- Upper and lower silty till units; and,
- Carbonate bedrock unit.

As summarized in the groundwater conceptual site model (Ecometrix, 2021a), the upper water table lies approximately 2 to 3 m below ground surface. Based on the water levels reported in October 2019 for wells screened in the upper fill (HSU1), sands (HSU2) and upper portions of the till (HSU3), groundwater flow is interpreted to flow to the north and south from a high of approximately 188.7 metres above sea level (masl) at WSH265 and WSH272, to a low of approximately 182.0 masl at WSH287 in the north, and 184.0 masl in the south portion of the NSS-W (Ecometrix, 2021a). Beneath the NSS-W, building foundation drains, tile holes, electrical manhole drains and a Stormceptor located on the northern reaches of the NSS-W near WSH231 are interpreted to influence the water levels in this upper (potentially perched) system (Ecometrix, 2021a). Groundwater flow in these units is also interpreted to discharge to nearby ditches including the SRD north of the NSS-W, and the Grassed Swale on the east side.

The middle sand unit forms a semi-confined aquifer beneath the NSS-W that discharges into the underlying carbonate bedrock. Groundwater levels collected from these wells in October 2019 indicate that groundwater flow in this unit is from west (186.65 masl at WSH255) to east (181.42 masl at WSH267) beneath the NSS-W (Ecometrix, 2021a). The groundwater flow in this area is sub-horizontal to the north central part of the NSS-W east with estimated average linear groundwater velocities between 1 and 50 m/year.

The silty till units form a local aquitard beneath the L&ILW storage area. The upper till unit is subdivided into an upper weathered unit and a lower unweathered unit. The weathered portion of the upper till is fractured, although the fracturing has not been found to significantly affect groundwater flux. The average linear groundwater velocities estimated within the silty till units are relatively low, in the order of 0.01 to 0.12 m/year, downward.

The carbonate bedrock beneath the NSS-W is part of a confined regional aquifer complex. The groundwater levels in the bedrock beneath the NSS-W are between elevations of approximately 181 and 183 masl. Groundwater flow within the aquifer is horizontal and oriented to the northwest. Groundwater discharge occurs at the Lake Huron shoreline approximately 1.4 km from the NSS-W. Groundwater flow rates range between approximately 10 and 140 m/year.

The groundwater levels beneath the NSS-W in upper fill, middle sand aquifer and bedrock aquifer, which could be used to assess groundwater flow, are illustrated in Figure 2-8, Figure 2-9 and Figure 2-10, respectively.

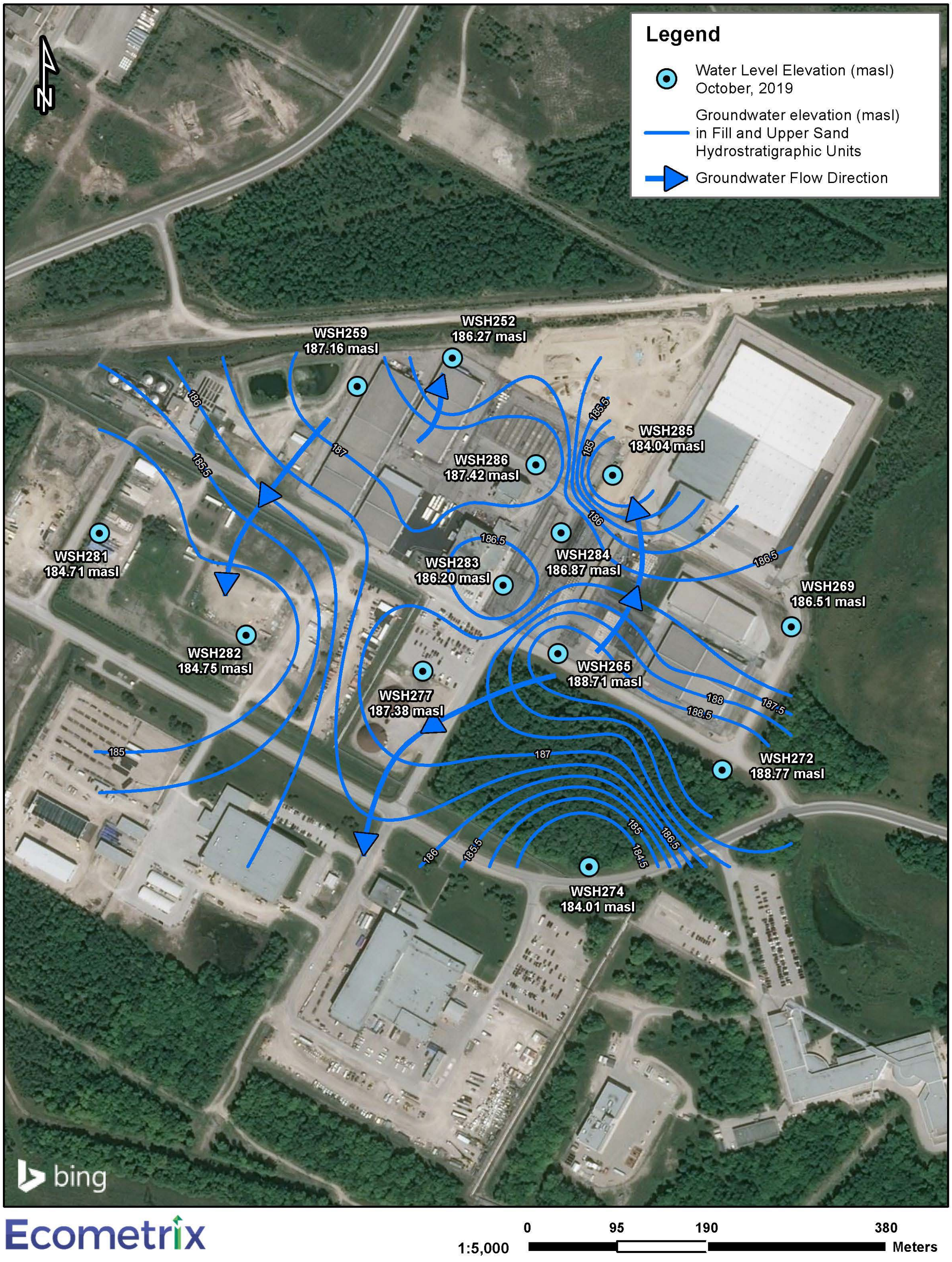


Figure 2-8: Groundwater Flow – Upper Aquifer (October 2019) (Ecometrix, 2021a)

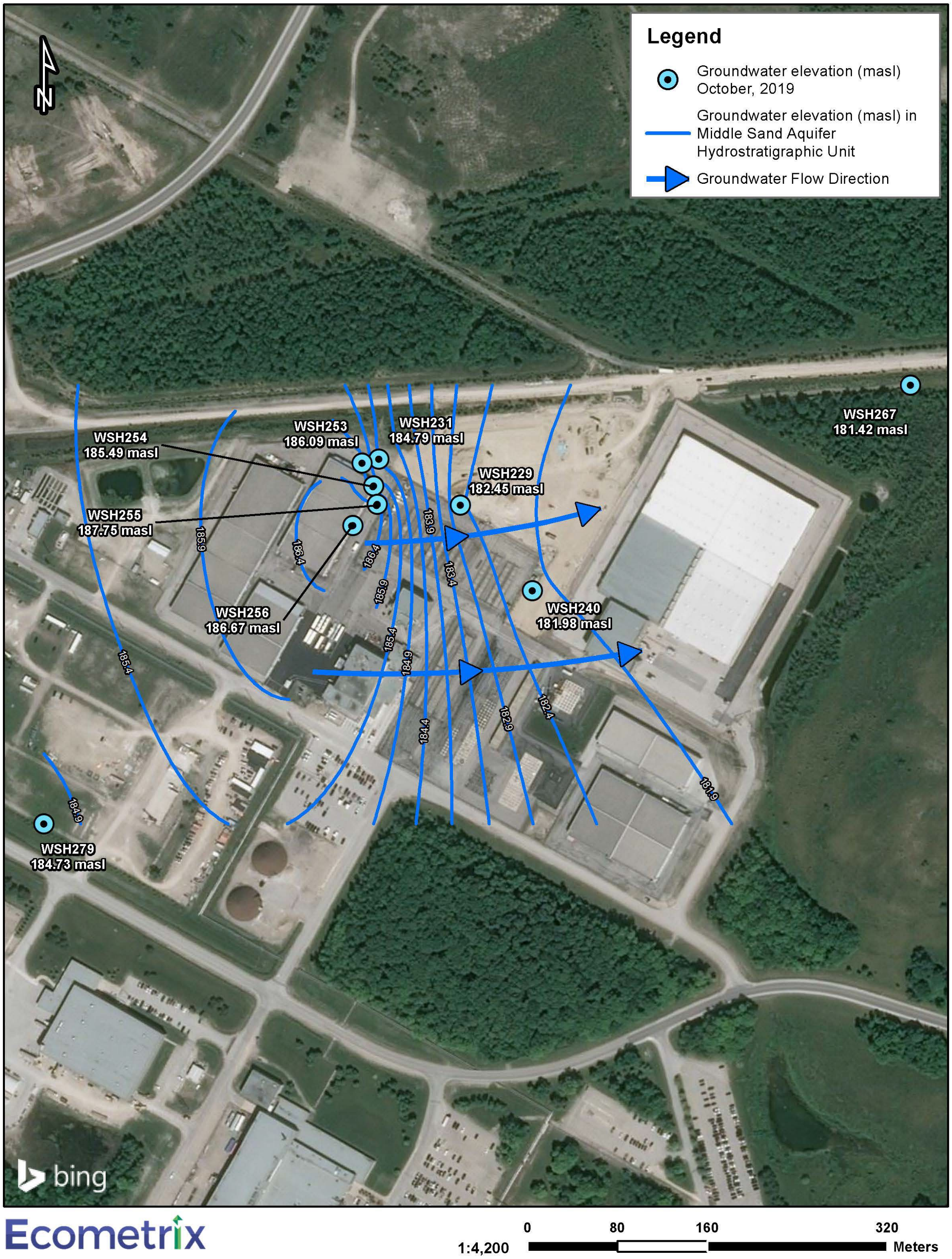


Figure 2-9: Groundwater Flow – Middle Sand Aquifer (October 2019) (Ecometrix, 2021a)

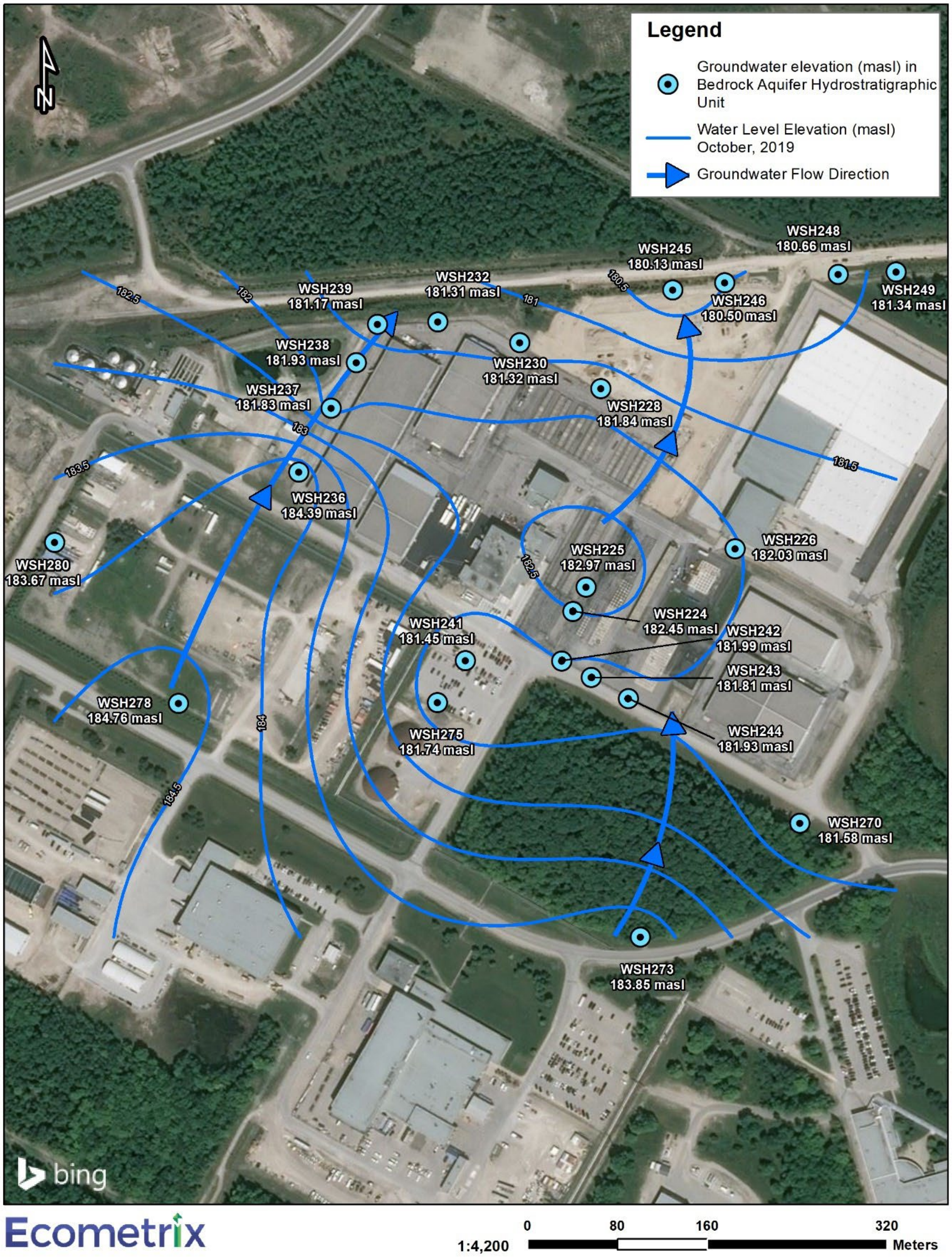


Figure 2-10: Groundwater Flow – Bedrock Aquifer (October 2019) (Ecometrix, 2021a)

2.2.4 Surface Water

2.2.4.1 Overview

The largest water body near the Bruce nuclear site is Lake Huron, which is used locally for sport and commercial fishing, as well as recreational swimming and boating. There are a number of small rivers and creeks in the vicinity of the Bruce nuclear site that flow into Lake Huron, such as Underwood Creek flowing to the Baie du Doré to the north and the Little Sauble River flowing to Inverhuron Bay to the south, as shown in Figure 2-11. Surface water drainage of the NSS-W is via the South Railway Ditch to Stream C to Baie du Doré, and the West Ditch to Lake Huron (Figure 1-2).

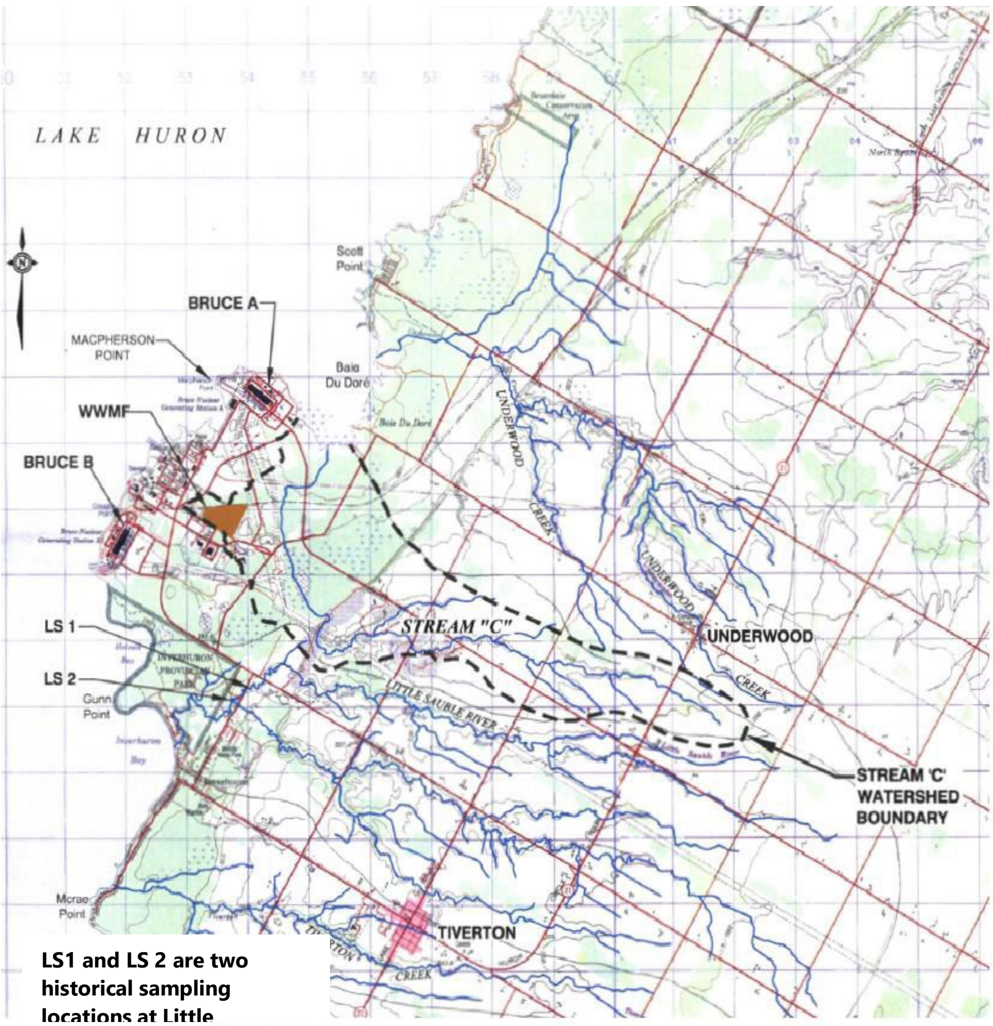


Figure 2-11: Drainage in the Vicinity of the Bruce Nuclear Site (OPG, 2005)

2.2.4.2 NSS-W Drainage

There are various surface and subsurface drainage systems within the NSS-W. Storm water runoff from the UFDS area and various L&ILW storage structures are directed through these drainage systems.

The runoff partially drains into the South Railway Ditch (SRD) that runs along the south side of an abandoned railway spur line north of the NSS-W. This abandoned railway spur line north of the NSS-W is also known as Siding Road. The SRD is approximately 5 m wide across the top of the ditch. The wetted width of the ditch is approximately 3 m and the mean water depth is 0.15 m. The SRD acts as an intermittent stream and receives drainage from a small catchment area.

In addition, the NSS-W drains into a wetland area (also known as the "Wetland") to the east of the site from an intermittent connection with the east storm water hybrid pond. The water in the SRD flows along the east edge of the Wetland. This Wetland has experienced large fluctuations in water level over the years. These fluctuations are dependent on the outflow culvert, which is the point of drainage discharge for the wetland. The outflow of the Wetland drains into the SRD at WTL-1. The SRD subsequently flows to Stream C, which is a man-made stream that was developed to divert water from a former tributary of the Little Sauble. Stream C flows through the Bruce nuclear site to drain into the southwest corner of Baie du Doré.

The average annual water temperature in SRD is 6.7 ºC based on the 2020 and 2021 sampling program. The flow rates measured in 2014 and 2015 are shown in Table 2-6.

There is a ditch called the "West Ditch" west of the NSS-W, shown in Figure 2-20, Figure 2-21, Figure 2-22 and Figure 2-23. Both east and west branches of the West Ditch convey water from the OPG laydown area and roadside ditching. The West Ditch runs in a westerly direction toward Lake Huron. The average annual water temperature in West Ditch is 7.1ºC based on the 2020 and 2021 sampling program. The measured flow rates at WD-3 are shown in Table 2-6.

Table 2-6: Measured Water Flow Rate in South Railway Ditch and West Ditch

Time	2014/04	2014/07	2014/09	2014/10	2015/05
South Railway Ditch (L/s)	17.7	0.2	0	29.8	2.7
West Ditch (L/s)	Not measured	Not measured	0.1	9.2	5.1

The drainage in the vicinity of the NSS-W is illustrated in Figure 2-24. Photographs of the aquatic environment, including the surface water sampling points at the NSS-W, are provided in Figure 2-11 to Figure 2-17.

Figure 2-12: South Railway Ditch (SRD-1) – Looking south at SRD-1

Figure 2-13: South Railway Ditch (SRD-2) – Looking east at SRD-2

Figure 2-14: South Railway Ditch (SRD-3) – Looking east at SRD-3

Figure 2-15: South Railway Ditch (SRD-4) – Looking south at SRD-4

Figure 2-16: South Railway Ditch (SRD-5) – Looking west at SRD-5

Figure 2-17: Wetland (WTL-1) – Looking west at WTL-1

Figure 2-18: Grassy Swale (GS-1) – Looking west at GS-1

Figure 2-19: Wetland (WTL-1) – Looking northwest at WTL-2

Figure 2-20: West Ditch (WD-1) – Looking north at WD-1

Figure 2-21: West Ditch (WD-2B) – Looking south at WD-2B

Figure 2-22: West Ditch (WD-3) – Looking west at WD-3

Figure 2-23: West Ditch (WD-4) – Looking south east at WD-4 (AMEC, 2016a)

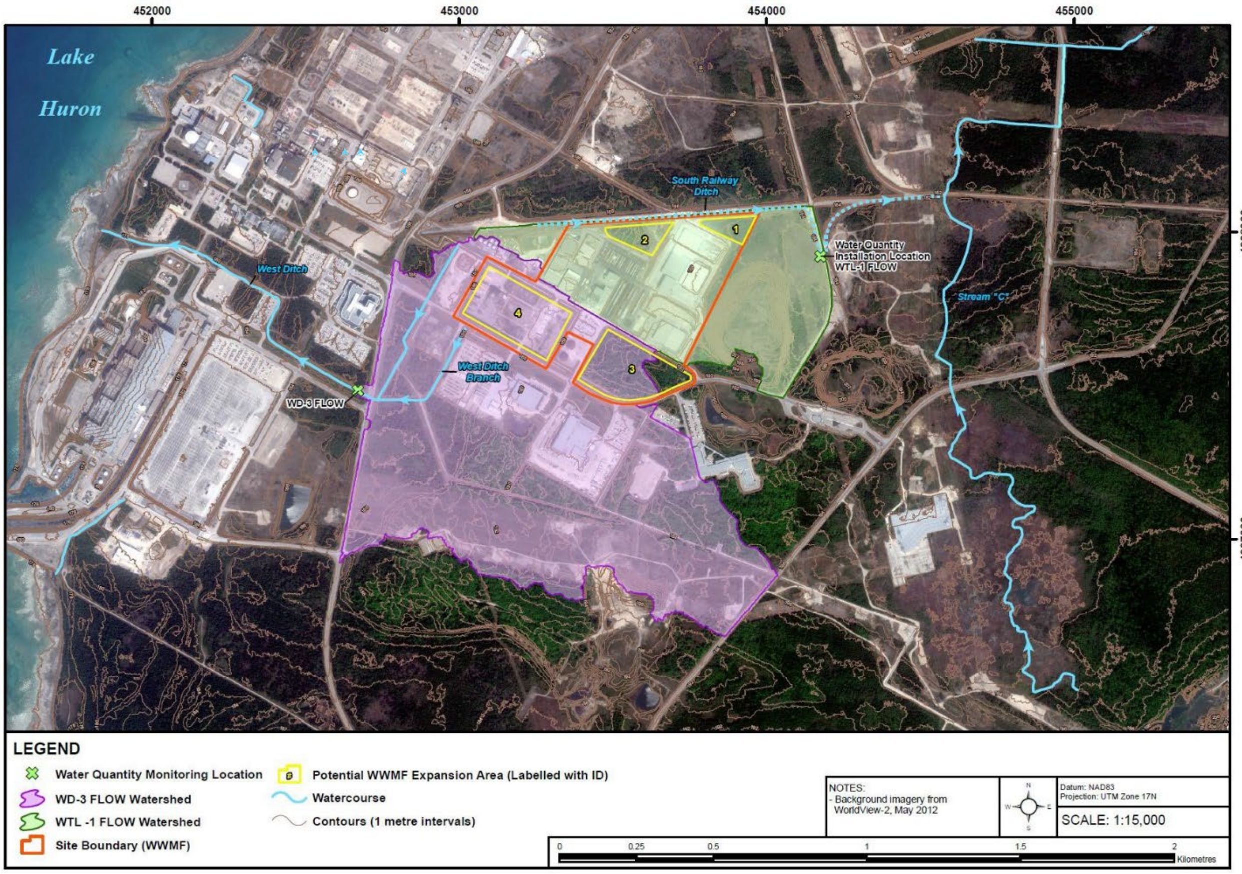


Figure 2-24: Drainage from the NSS-W to the Surrounding Environment (AMEC, 2016a)

2.2.5 Terrestrial Environment

A biophysical inventory survey of the Terrestrial Monitoring Area was undertaken and included in the 2016 ERA to update the terrestrial data from previous Environmental Assessments, with efforts focused around the NSS-W (see Figure 2-42). The Terrestrial Monitoring Area was selected based on ecological barriers around the proposed expansion areas including hard forest edges (roads), major ecosite changes from the previous surveys (corridors) and areas of potential environmental effect due to the NSS-W Expansion Project. The biophysical inventory survey comprised a number of specific field surveys which were conducted during the spring, summer and fall of 2014. The three main terrestrial-related components completed as part of the 2014 field surveys included:

- Terrestrial Habitat;
- Wildlife; and,
- Significant Species.

The survey locations are shown in Figure 2-43. The results of the surveys are summarized below.

Different ecosites were identified within the Terrestrial Monitoring Area. These ecosites are described using the Ecological Land Classification for Southern Ontario: First Approximation and its Applications, and their locations are illustrated in Figure 2-44. Images of the ecosites are shown in Figure 2-25 to Figure 2-41.

Figure 2-25: FOD8-1 (Fresh – Moist Poplar Deciduous Forest Type) (AMEC, 2016a)

Figure 2-26: FOD4-2 (Dry – Fresh White Ash Deciduous Forest Type) (AMEC, 2016a)

Figure 2-27: FOD5-8/FOD5-2 Complex (Dry – Fresh Sugar Maple – White Ash / Sugar Maple – Beech Deciduous Forest Type) (AMEC, 2016a)

Figure 2-28: FOC2-2 (Dry – Fresh White Cedar Coniferous Forest Type) (AMEC, 2016a)

Figure 2-29: SWC1-1/MAM2-10 Complex (White Cedar Mineral Coniferous Swamp Type / Forb Mineral Meadow Marsh) (AMEC, 2016a)

Figure 2-30: CUS1 (Mineral Cultural Savannah Ecosite) (AMEC, 2016a)

Figure 2-31: CUS1-2 (White Cedar- Green Ash Cultural Savannah Type) (AMEC, 2016a)

Figure 2-32: CUT1 (Mineral Cultural Thicket Ecosite) (AMEC, 2016a)

Figure 2-33: CUM1-1 (Dry – Moist Old Field Meadow Type) (AMEC, 2016a)

Figure 2-34: SWM1-1 (White Cedar – Hardwood Mineral Mixed Swamp Type) (AMEC, 2016a)

Figure 2-35: SWD2-1 (Type 1) (Black Ash Mineral Deciduous Swamp Type) (AMEC, 2016a)

Figure 2-36: SWD2-1 (Type 2) (Black Ash Mineral Deciduous Swamp Type) (AMEC, 2016a)

Figure 2-37: SWD2-2 (Green Ash Mineral Deciduous Swamp Type) (AMEC, 2016a)

**Figure 2-38: SWD4-3/MAM2-10/MAS2-1 Complex
(White Birch – Poplar Mineral Deciduous Swamp Type /
Forb Mineral Meadow Marsh Type / Cattail Mineral Shallow Marsh Type) (AMEC, 2016a)**

Figure 2-39: MAM2 (Mineral Meadow Marsh Ecosite) (AMEC, 2016a)

Figure 2-40: MAS2-1 (Cattail Mineral Shallow Marsh Type) (AMEC, 2016a)

Figure 2-41: MAM2-5/MAS2-1 (Narrow-leaved Sedge Mineral Meadow Marsh Type / Cattail Mineral Shallow Marsh Type) (AMEC, 2016a)

Significant wildlife habitats were confirmed within the Terrestrial Monitoring Area. As shown in Figure 2-45, these significant wildlife habitats include the following:

- Amphibian Woodland Breeding Habitats;
- Amphibian Wetland Breeding Habitats;
- Special Concern and Rare Wildlife Species Habitat;
- Turtle Wintering Areas;
- Deer Yard Areas; and,
- Terrestrial Crayfish Habitat.

Vegetation and wildlife communities located within the Terrestrial Monitoring Area for the proposed future NSS-W expansion activities were identified. These communities are typical of those found in the Lake Simcoe-Rideau Ecoregion. Upland communities and ecosites consist of deciduous, mixed wood, coniferous and cultural habitats.

Wetland communities and ecosites consist of swamps, marshes and open water wetlands.

The Bruce Power EMPs were also reviewed and the species observed in those reports were consistent with this survey (Bruce Power, 2019, 2020, 2021).

Four species listed as Endangered or Threatened under the provincial Endangered Species Act (ESA) were confirmed within the Terrestrial Monitoring Area, including:

- Barn Swallow;
- Eastern Meadowlark;
- Little brown myotis; and,
- Butternut.

In addition, two species listed as Endangered under the provincial ESA, northern myotis and eastern small-footed myotis, may occur within the Terrestrial Monitoring Area. These species were observed on OPG-retained lands and other areas within the Bruce nuclear site. The Species at Risk (SAR) wildlife and other significant species were observed during their respective breeding/maternity roost colony seasons.

Six species listed as Special Concern under the provincial ESA were confirmed within the Terrestrial Monitoring Area as shown in Figure 2-42, including:

- Golden-winged Warbler;
- Olive-sided Flycatcher;
- Eastern Wood-Pewee;
- Wood Thrush;
- Snapping turtle; and,
- Monarch butterfly.

Rusty Blackbird was also confirmed within the Terrestrial Monitoring Area. Rusty Blackbird is listed as Special Concern under Schedule 1 of the federal Species at Risk Act (SARA), but is not listed under the provincial ESA.

The status species mentioned above have been identified in Bruce Power Environmental Protection Reports (Bruce Power, 2015, 2020, 2021).

Since the 2016 ERA, a desktop review of the NHIC Make a Map feature (MNRF, 2019) was completed for the 2021 NSS-W ERA update. This review identified that the Bobolink, Queensnake, and Peregrine Falcon are potentially present within the vicinity of the NSS-W, and are classified as special concern, threatened or endangered as per the Species at Risk in Ontario (SARO) and the Federal Species at Risk Act (SARA) Schedule 1. Species at risk that were identified from the NHIC Make a Map feature were obtained from a review of the following 1 km grids: 17MK5206, 17MK5207, 17MK5208, 17MK5306, 17MK5307, 17MK5308, 17MK5406, 17MK5407 and 17MK5408.NSS-W. Additionally, a review of the species at risk identified in the Douglas Point ERA was also completed. The Spotted Turtle and Tri-Coloured Bat were identified as endangered species under SARO and SARA (Arcadis, 2019).

OPG completed a biological survey in 2020 which included survey locations across the entire Bruce Power Site (Jalava, 2020). The survey locations in this study that are within the NHIC grids mentioned above were reviewed and additional species at risk were also identified including: the Common Nighthawk, Eastern Whip-poor-will, Least Bittern, Red-headed Woodpecker and Eastern Ribbonsnake.

A summary of the significant species that were observed during the 2014 field surveys in the Terrestrial Monitoring Area within the Bruce nuclear site, and their status in the provincial ESA and in Schedule 1 of the federal SARA, can be found in Table 2-7. Table 2-7 also includes the Bobolink, Common Nighthawk, Eastern Whip-poor-will, Least Bittern, Queensnake, Peregrine Falcon, Red-headed Woodpecker, Spotted Turtle, Tri-Coloured Bat and the Eastern Ribbonsnake, which have been identified based on a desktop review, identified as a species at risk in the Douglas Point ERA (Arcadis, 2019), or observed in the 2020 Biological Survey (Jalava, 2020). The status noted in Table 2-7 is current as of July 6, 2022.

Table 2-7: Species at Risk in the Vicinity of the NSS-W and their Status

Species	Status	
	Provincial ESA	Federal SARA Schedule 1
Barn Swallow	Threatened	No status
Bobolink	Threatened	Threatened
Butternut	Endangered	Endangered
Common Nighthawk[d]	Special Concern	Threatened
Eastern Meadowlark	Threatened	Threatened
Eastern Small-footed Myotis*	Endangered	No status
Eastern Ribbonsnake	Special Concern	Threatened
Eastern Whip-poor-will[d]	Threatened	Threatened
Eastern Wood-Pewee	Special Concern	Special Concern
Golden-winged Warbler	Special Concern	Threatened
Least Bittern[d]	Threatened	Threatened
Little Brown Myotis	Endangered	Endangered
Monarch Butterfly	Special Concern	Special Concern
Northern Myotis[a]	Endangered	Endangered
Olive-sided Flycatcher	Special Concern	Threatened
Peregrine Falcon[b]	Special Concern	Special Concern
Queensnake [b]	Endangered	Endangered

Species	Status	
	Provincial ESA	Federal SARA Schedule 1
Red-headed Woodpecker[d]	Endangered	Endangered
Rusty Blackbird	Special Concern	Special Concern
Snapping Turtle	Special Concern	Special Concern
Spotted Turtle[c]	Endangered	Endangered
Tri-Coloured Bat[c]	Endangered	Endangered
Wood Thrush	Special Concern	Threatened

Notes:
[a] - Possibly present based on analysis of monitoring results
[b] - Possibly present based on a desktop review of the NHIC Make a Map feature (MNRF, 2019)
[c] - Possibly present as mentioned in the Douglas Point ERA (Arcadis, 2019)
[d] - Possibly present as mentioned in the 2020 Biological Survey (Jalava, 2020)

Based on field observations during the 2020 to 2021 sampling program, the following birds and mammals were noted on the site:

- Deer
- Turkey
- Canadian Geese
- Gulls
- Osprey
- Merlin
- Rabbit
- Bald Eagle
- Green (Night) Heron

Figure 2-42: NSS-W Terrestrial Monitoring AREA (AMEC, 2016a)

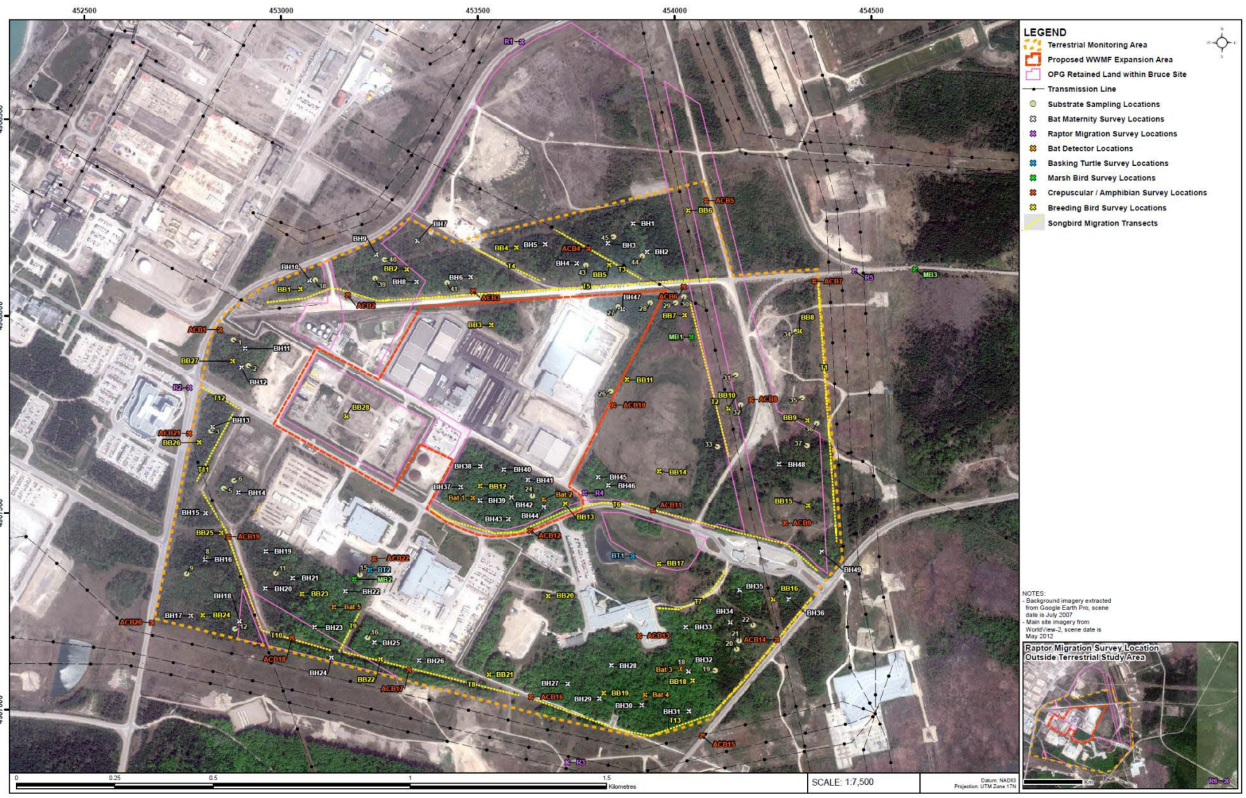


Figure 2-43: Wildlife and Substrate Sampling Survey Locations (AMEC, 2016a)

Figure 2-44: Ecological Land Classification - Terrestrial Monitoring Area (AMEC, 2016a)

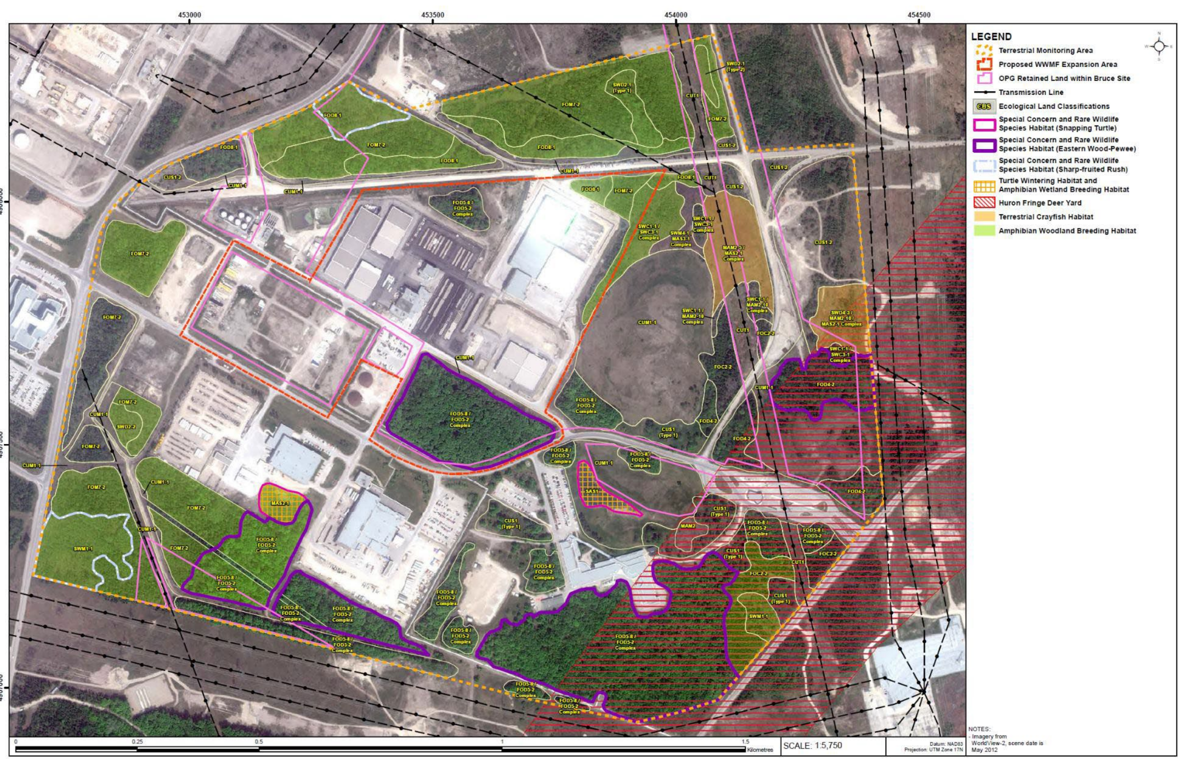


Figure 2-45: Significant Wildlife Habitat (AMEC, 2016a)

Between 2017 and 2021, pedestrian surveys, bioinventories, wildlife collision surveys, incidental observations and snake board studies have been conducted at the Bruce Power site (Bruce Power, 2022b). During this period, the following terrestrial snake species have been observed at the Bruce Power Site: Dekay's Brown Snake, Eastern Garter Snake, Red-bellied Snake, Smooth Green Snake, Eastern Ribbonsnake and Eastern Milk Snake.

2.2.6 Aquatic Environment

Aquatic Habitat and Fish Community surveys were conducted in each of three open water seasons, i.e., spring (April), summer (July) and fall (October) of 2014 for the 2016 ERA. Surveys were conducted in the vicinity of the NSS-W, including the SRD, the Grassed Swale, the Wetland, and the West Ditch. The surveyed areas are shown in Figure 2-46 to Figure 2-48. The results of the surveys are summarized below.

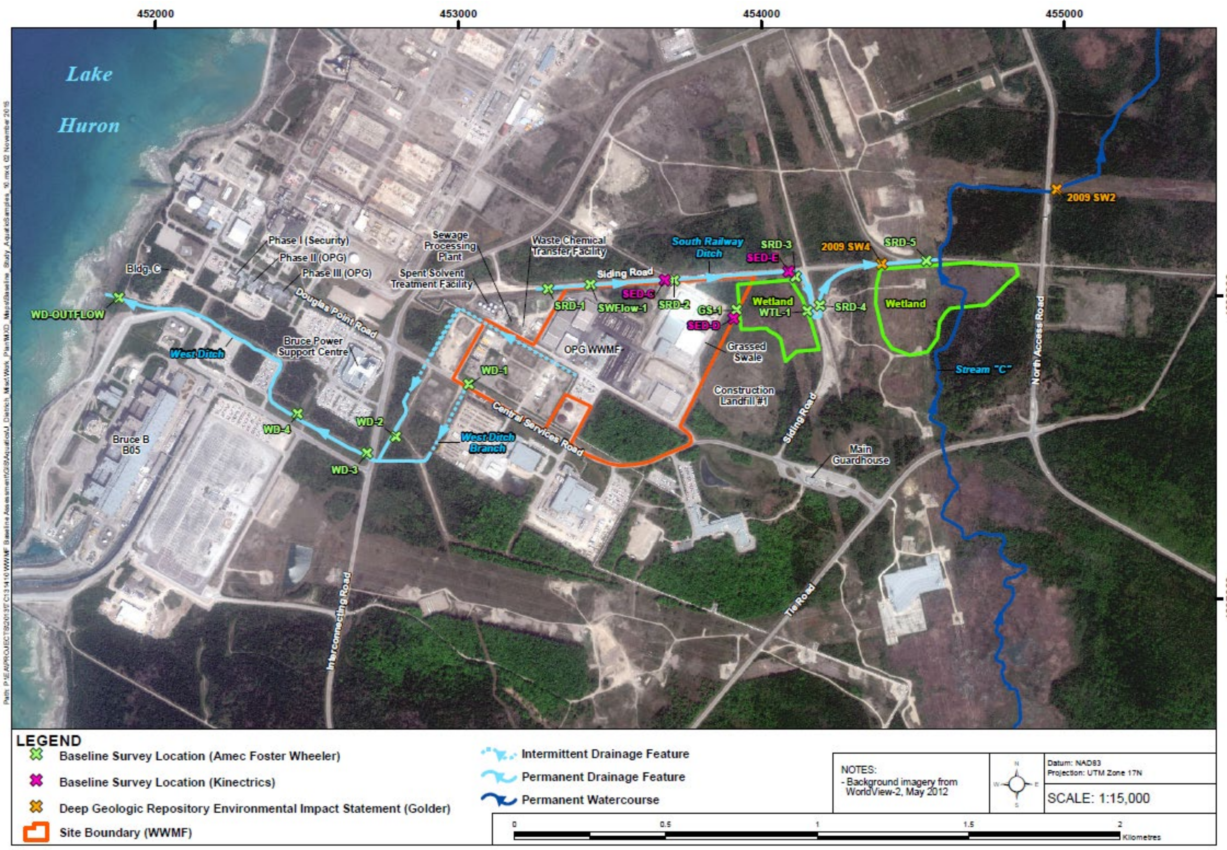


Figure 2-46: NSS-W Aquatic Habitat and Fish Community Baseline Monitoring Locations

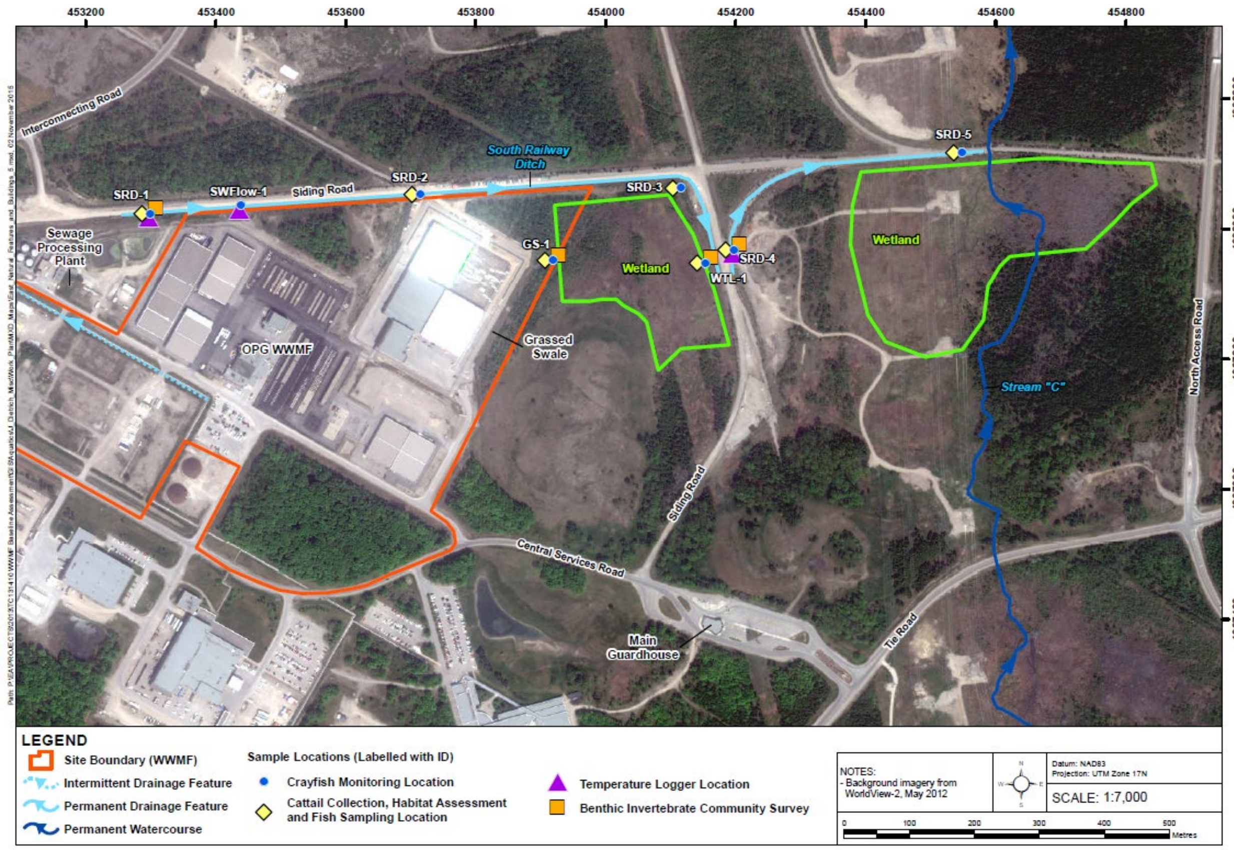


Figure 2-47: South Railway Ditch, Grassed Swale and Wetland Aquatic Habitat and Fish Community Monitoring Locations

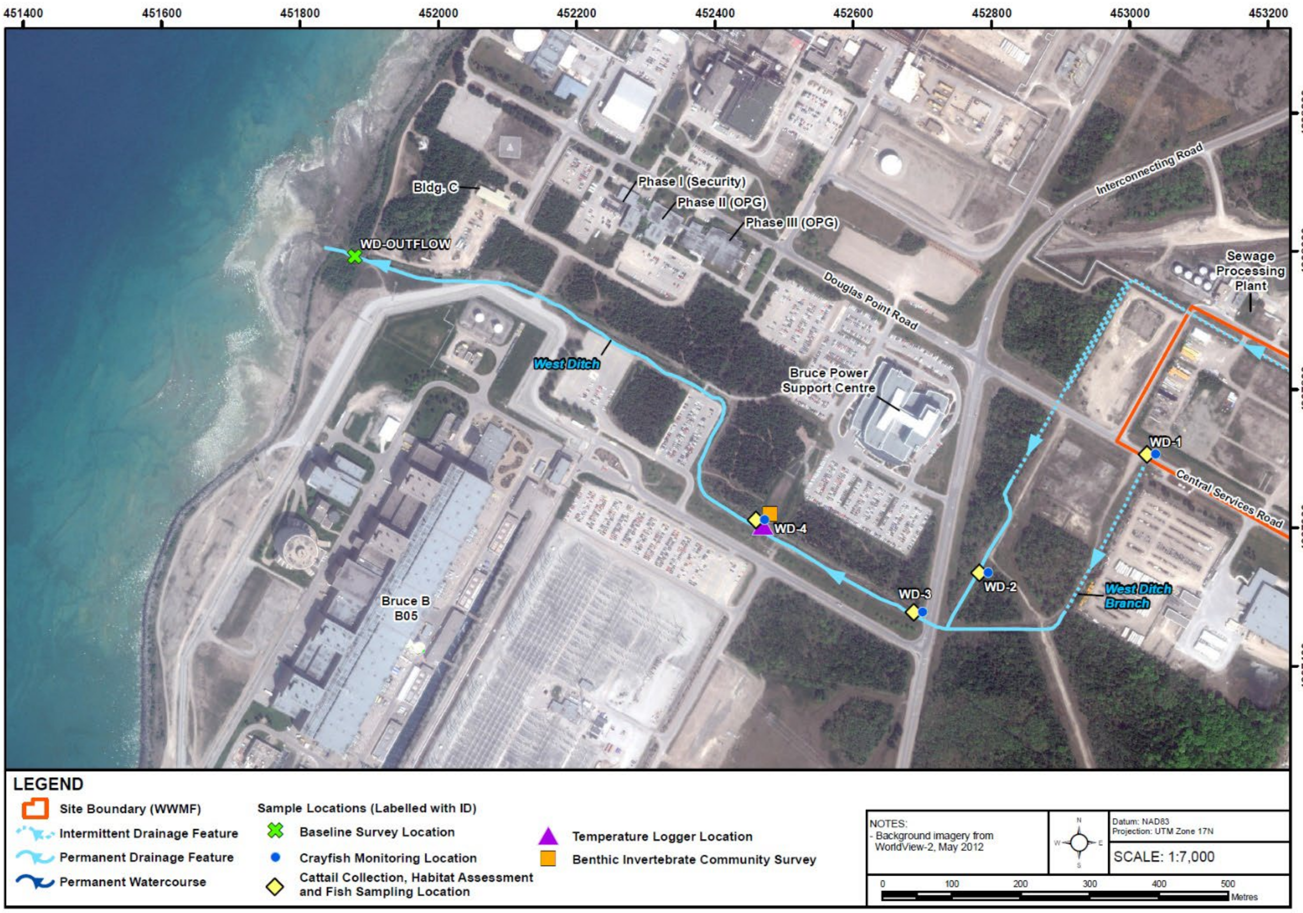


Figure 2-48: West Ditch Aquatic Habitat and Fish Community Monitoring Locations

2.2.6.1 Aquatic Habitats

Aquatic habitats of various types are found within the surveyed area (e.g. ditch, wetland, swale). Within the drainage ditches, differences in size, gradient, substrate, cover and riparian vegetation are observed from upstream to downstream areas, and within proximity to wetland features. The West Ditch exhibited habitat features consistent with an increased gradient and larger particle size substrates at one location (WD-4, Figure 2-23) compared to other locations.

Surveys conducted at different seasons rendered very similar results. However, seasonal variations were evident in vegetation growth/percent composition, as grasses in the riparian zone and aquatic cattail growth was found to be denser at all sampling sites in the summer sampling period. Similarly aquatic vegetation showed a summer increase in density, thereby providing some increased cover for small-bodied fish.

2.2.6.1.1 South Railway Ditch

The SRD originates near the Sewage Processing Plant and flows in a straight fashion eastwardly along the northern margin of the NSS-W and adjacent to an abandoned railway bed. The ditch continues northeast through a corrugated steel pipe culvert and turns to the southeast interfacing with the Wetland complex. At the Wetland the SRD flows through a corrugated steel culvert at Siding Road to then flow through another corrugated steel culvert, parallel to Siding Road on the east side of the road. The SRD then drains in a northeastwardly direction and ultimately flows into Stream C.

The SRD provides a high level of instream cover as 96 to 100% of the surface area within SRD locations provided cover for fish. Cover was typically provided in the form of aquatic macrophytes throughout the SRD, with woody debris, flat rock and round rock present in lesser quantities. Riparian vegetation was observed along the length of the SRD, including eastern white cedar (*Thuja occidentalis*), horsetail (*Equisetum sp.*), shrubs (red osier dogwood (*Cornus sericea*), alder (*Alnus sp.*), and juniper (*Juniperus sp.*), sedges (*Scirpus sp.*) and grasses (reed canary grass (*Phalaris arundinacea*) and common reed (*Phragmites australis*)). Substrates within the ditch were found to be dominated by fines (silt and clay) in upstream sections; however, an almost equal division of fines and gravel were present in the downstream reaches.

2.2.6.1.2 Wetland

Located on the east side of the NSS-W study area, the Wetland covers approximately 4 ha and is largely boarded by the Siding Road. The Wetland received drainage from three sources on site which includes the SRD, the Grassed Swale and the Construction Landfill 1 (bounded by the Central Service Road (to the south) and Siding Road (to the east)). Appreciable flows originate from the SRD which continues along the northeastern and eastern margins of the Wetland before passing under the Siding Road on its path to Stream C. Fluctuations in water levels in the Wetland are largely attributed to precipitation events, and overflow from the Grassed Swale once water levels exceeded holding capacity. While surveys have not found evidence to support the presence of groundwater inputs, the isolated nature of the Wetland suggests there is groundwater recharge potential within this water feature. The Wetland is dominated by dense cattail stands, sparsely intermixed with areas of standing water. Surveys in 2014 found that the Wetland is slowly taking on a meadow marsh hydrological regime as few areas of standing water were located. Substrate within the Wetland was made of organic matter (decaying vegetation) (95%) and fines (silts and clay) (5%).

2.2.6.1.3 Grassed Swale

During 2013 and 2014 the Grassed Swale was modified to provide an increase in capacity for storm water management and reduce suspended sediment loading and deposition in the downstream environment. The modifications included an overall increase in the size of the Swale and the introduction of permanent pools to provide water quality treatment. The modifications were designed so as to allow the Swale to accommodate a 10-year storm event. The settling basin at the outlet of the Swale to the Wetland is to provide final polishing. The Swale will ultimately discharge to the Wetland after the water level has reached the outfall crest.

The area directly downstream of the outfall structure is characterized by a cedar swamp with hummocks and pooled water with marginal to no flow. Intermittent flow areas were composed of approximately 30-55% grasses, 20-30% sedges, 20% trees, 5-15% shrubs and <5% ferns. The reduced frequency of discharge from the Grassed Swale to the Wetland during wet periods may, in time, influence the standing water conditions in the Swale. During 2014 sampling efforts, it was found that the wetted areas of the Grassed Swale were composed of water arum (55%), pondweed (20%), cattails (15%) and algae (10%). During the sampling event of 2020-2021 cattails, pondweed and algae were also noted within the Grassed Swale; water arum was not observed.

2.2.6.1.4 West Ditch

Both east and west branches of the West Ditch convey water from the OPG laydown area and roadside ditching and are generally characterized as cattail choked with some remaining tree stands in riparian areas. The upstream east branch of the West Ditch was found to travel along the perimeter of a laydown area possessing little overhead tree cover. The upstream west branch of the West Ditch flows alongside a truck access path (approximately 8 to 12 m of separation between path and ditch) and has a large amount of overhead tree cover. Flowing south-southwest, the east and west branches of West Ditch converge just upstream of the crossing of the Interconnecting Road. Flowing in a straight fashion (without significant meander) the West Ditch continues northwest receiving drainage from a Wetland/storm water feature adjacent to the Bruce Power Support Centre. The West Ditch continues flowing northwest, before ultimately discharging to Lake Huron. During the 2014 fall sampling period, a visual survey of the West Ditch outflow to Lake Huron was carried out. It was noted that both the instream and riparian zone were heavily vegetated. While the instream aquatic vegetation was dominated by rushes, grasses and cattails, the riparian zone was found to have trees (eastern white cedar), shrubs (red osier dogwood) and grasses. Substrate at this section of the West Ditch was found to be largely composed of fines and gravel.

2.2.6.2 Aquatic Communities

The majority of fish on the NSS-W site are found within the SRD with smaller numbers of fish in the West Ditch, the Grassy Swale and the Wetland. The most abundant fish species within the surveyed area included:

- Central Mudminnow (*Umbra limi*);
- Brook Stickleback (*Culaea inconstans*);
- Northern Redbelly Dace (*Chrosomus eos*); and,
- Creek Chub (*Semotilus atromaculatus*).

Other species captured within the surveyed area included:

- Fathead Minnow (*Pimephales promelas*);

- Finescale Dace (*Chrosomus neogaeus*);
- Blacknose Shiner (*Notropis heterolepis*);
- Longnose Dace (*Rhinichthys cataractae*);
- Blacknose Dace (*Rhinichthys atratulus*);
- Lake Chub (*Couesius plumbeus*); and,
- White Sucker (*Catostomus commersonii*).

The species mentioned above have been identified in Bruce Power Environmental Protection Reports (Bruce Power, 2015, 2020, 2021)

Of the less abundant species, Longnose Dace, Fathead Minnow, Blacknose Shiner and Blacknose Dace were found exclusively in the SRD. Lake Chub and Longnose Dace were captured in the SRD, but only at the most downstream sampling location. Lake Chub are known to inhabit lakes, rivers and creeks where there is an availability of gravel substrates. Longnose Dace prefer large particle size substrates (cobble and gravel). The presence of these species at this location likely indicates connectivity to Stream "C", yet their absence further upstream indicates a reduction in connectivity and habitat availability. White Sucker were captured in the West Ditch during June of 2014. A summary of species presence and absence by water body as assessed in 2014 is provided in Table 2-8. In summary, the aquatic habitats in the drainage ditches of the surveyed area support a warm/cool water small-bodied fish community. The habitats and fish communities identified are indicative of the man-made or influenced drainage features associated with the site which retain some connectivity to larger water bodies. It should be noted that no federal or provincial aquatic Species at Risk were identified inhabiting the drainage features within the survey area during the three seasons sampled in 2014.

Table 2-8: Fish Species Distribution across Surveyed Area in 2014 (AMEC, 2016a)

Common Name	Scientific Name	2014			
		South Railway Ditch	West Ditch	Grassed Swale	Wetland
Banded Killifish	*Fundulus diaphanus*		X		
Blacknose Shiner	*Notropis heterolepis*	X			
Bluntnose Minnow	*Pimephales notatus*		X		
Brassy Minnow	*Hybognathus hankinsoni*	X			
Brook Stickleback	*Culaea inconstans*	X	X	X	X
Central Mudminnow	*Umbra limi*	X		X	X
Creek Chub	*Semotilus atromaculatus*	X	X		
Common White Sucker	*Catostomus commersonii*		X		

Common Name	Scientific Name	2014			
		South Railway Ditch	West Ditch	Grassed Swale	Wetland
Fathead Minnow	*Pimephales promelas*	X	X		
Finescale Dace	*Phoxinus neogaeus*	X	X		
Lake Chub	*Couesius plumbeus*	X			
Longnose Dace	*Rhinichthys cataractae*	X			
Northern Redbelly Dace	*Chrosomus eos*	X	X	X	
Pearl Dace	*Margariscus margarita*		X		
Spotfin Shiner	*Cyprinella spiloptera*		X		
Western Blacknose Dace	*Rhinichthys obtusus*	X			

X – Represents captured species

Stream C is located to the east and receives drainage from the SRD. It is a former tributary of the Little Sauble River that was diverted to Baie du Doré during the initial development of the Bruce nuclear site in the 1960s. It is the largest stream entering Baie du Doré. Stream C is identified as cold-water fish habitat (AMEC, 2016a), as the fish community includes Brook Trout, Rainbow Trout (*Oncorhynchus mykiss*) and Brown Trout (*Salmo trutta*). Spawning activity of Brook Trout, Rainbow Trout, Brown Trout and Chinook Salmon (*Onchorynchus tshawytscha*) has been documented in this stream (Golder, 2011b). Sucker species (*Castostomus spp.*) and cyprinid species including Spottail Shiner (*Notropis hudsonius*) are also known to inhabit or have been observed in Stream C (Golder, 2011b).

Lake Huron and its embayments near the Bruce nuclear site provide nearshore and offshore fish habitats. Offshore habitats are deep and provide habitat for cool and cold-water fish species of recreational, commercial and Aboriginal importance. Fishes include Round Whitefish (*Prosopium cylindraceum*), Lake Whitefish (*Coregonus clupeaformis*), Lake Trout (*Salvelinus namaycush*), and Deepwater Sculpin (*Myoxocephalus thompsonii*) (Golder, 2011d).

The shallower nearshore areas of Baie du Doré, which are sheltered from coastal effects, support warm and cool water species. Available shallow shoal areas provide spawning, rearing and foraging habitats for species such as Northern Pike (*Esox lucius*), Smallmouth Bass (*Micropterus dolomieu*), and Bowfin (*Amia calva*) (Golder, 2011b).

MacPherson Bay is not sheltered from coastal effects and provides less cover than more sheltered embayments (Golder, 2011d). However, during previous studies nearshore species captured have included White Sucker, Longnose Gar (*Lepisosteus osseus*), Emerald Shiner (*Notropis atherinoides*), Spotfin Shiner and Bluntnose Minnow. Round Goby (*Neogobius melanostomus*) was also present in high abundance (Golder, 2011d).

Burrowing Crayfish (*Fallicambarus fodiens* and *Orconectes immunis*) inhabit marshy fields, drainage ditches, marshes, ponds, and shallow, slow moving streams with muddy substrates and rooted aquatic vegetation. They are known to inhabit the marsh, swamp and drainage ditches, including the SRD. Burrowing Crayfish are of ecological significance as they are at their northern limit with respect to distribution in Ontario. These crayfish construct burrows through clay or silty clay soils into the groundwater table to escape drying habitats associated with seasonal water level fluctuations. Burrowing Crayfish were assumed to be on site based on the active burrows and chimneys observed. These burrows and chimneys, indicating the continued use of habitat in the vicinity of the NSS-W, are most especially within close proximity to the SRD.

Benthic invertebrate communities showed some variability with substrate and perhaps vegetation at the different sampling locations. Diversity in the SRD and Wetland was relatively low and fairly consistent between the upstream and downstream sites.

Benthic communities were indicative of depositional habitat with chironomids, oligochaete worms, leeches and freshwater pea clams (family Sphaeriidae) being present in relatively high proportions. Each of these groups of organisms is generally tolerant of depositional and low levels of oxygen (Madaville, 2002) yet provide a forage base. These invertebrates provide a forage base for fish and insectivorous birds. Isopods dominated the invertebrate community of the West Ditch. Amphipods, bivalves and elmid beetles and flatworms were also present in lesser proportions. Overall, the families present within the ditch are considered moderately to highly tolerant of low oxygen conditions due to decomposition of organic matter such as decaying aquatic plants (cattails) (Madaville, 2002).

Based on field observations during the 2020 to 2021 sampling program, the following birds and mammals were noted on the site:

- Green Frogs
- Leopard Frogs
- Mink Frogs
- American Toad
- Snapping Turtle
- Painted turtle
- Muskrat
- Rainbow Trout (spawning in Stream C)
- Lake Chub (spawning in Stream C)
- Shiners (undetermined fish species)
- Sunfish
- Crayfish

2.2.7 Land Use

The Bruce nuclear site is located within the Municipality of Kincardine, in Bruce County, Ontario (population 68,147) (Statistics Canada, 2019). The site is approximately 18 km north of downtown Kincardine (population 8,315) (Statistics Canada, 2019) and 17 km southwest of Port Elgin (population 7,862) (Statistics Canada, 2019).

The land use adjacent to the Bruce nuclear site consists of agriculture, recreation and rural residential development. Bruce County includes the Bruce Peninsula and extends to Tobermory in the north, the shores of Lake Huron in the west, Highway 86 in the south, and the intersection of Highway 1 and Huron Bruce Road in the east.

The land adjacent to the Bruce nuclear site is owned by OPG, and consists of a non- resident buffer consisting of mainly unoccupied bush and/or swamp.

Recreational land use includes Inverhuron Park and cottages in the hamlet of Inverhuron (south of the Bruce nuclear site) and in the Baie du Doré/Scott Point area (north of the Bruce nuclear site). Common recreational activities on these lands include day visits, hiking, camping, hunting (game includes white tailed deer, wild turkey, waterfowl, and small game), and sport fishing (Bruce Power, 2017a).

The region surrounding the Bruce nuclear site has little manufacturing industry. A number of small to medium-sized private companies operate a small industrial park, known as the Bruce Eco-Industrial Park (also known as the Bruce Energy Centre), just outside of Bruce nuclear site. Other industries within 20 km of the Bruce nuclear site include food processing and animal feed. Within approximately 20 km of the Bruce nuclear site, there are 10 schools at the elementary and secondary school level.

Local municipalities receive their water supply largely from Lake Huron; Kincardine and Saugeen Shores have water treatment plants that receive water from the lake and distribute this water to Kincardine and Inverhuron Provincial Park (from the Kincardine Water Treatment Plant) and Port Elgin, MacGregor Point Provincial Park, Southampton, and Saugeen First Nation Reserve (from the Saugeen Shores Southampton treatment plant). The Municipality of Kincardine operates a series of groundwater wells which supply water to Tiverton, Scott Point, Underwood, and Armow (Bruce Power, 2017a).

The First Nations communities near to the Bruce nuclear site include the Saugeen Ojibway Nation, which is composed of the Chippewas of Saugeen First Nation and the Chippewas of Nawash Unceded First Nation. The Saugeen Ojibway Nation share the Saugeen and Cape Croker Fishing Island Reserve No. 1, located off the western shore of the Bruce Peninsula north of Chief's Point. The Chippewas of Saugeen First Nation Reserve No. 29 is located adjacent to the community of Southampton on the shoreline of Lake Huron between the mouths of the Saugeen and Sauble Rivers, approximately 25 km north of the Bruce nuclear site. The Chippewas of Saugeen First Nation Chief's Point Reserve No. 28 is located at Chief's Point to the north of Sauble Beach at the base of the Bruce Peninsula. The Chippewas of Nawash Unceded First Nation is centred at Cape Croker Reserve No, 27, located on the north side of Colpoy's Bay and the east shore of the Bruce Peninsula north of the town of Wiarton, approximately 70 km north of the Bruce nuclear site (AECOM, 2011).

The lands in and around the NSS-W are also the traditional territory of two Métis communities, which are Indigenous communities with a distinct identity and culture. Métis people were connected through the highly mobile fur trade network and distinct Métis settlements emerged along the rivers and watersheds of the province, surrounding the Great Lakes and throughout to the northwest of the province. These settlements formed regional Métis communities in Ontario.

The Georgian Bay Traditional Territory, which is part of the Métis Nation of Ontario, are represented by the rights-bearing Métis of the Georgian Bay Traditional Territory Consultation Committee. This committee is made of three Métis councils: Great Lakes Métis Council, Georgian Bay Métis Council and Moon River Métis Council. The Métis Nation of Ontario asserts it represents a regional Métis community that has aboriginal rights, including spiritual, cultural, socio-economic, harvesting and other traditional practices in the Georgian Bay harvesting area.

The second Métis community is represented by the Historic Saugeen Métis. The Historic Saugeen Métis, an independent, historic Métis community located at Southampton, Ontario, represents the descendants of Métis in the historic Saugeen community prior to settlement. The Historic Saugeen Métis asserts aboriginal communal rights in the Métis Saugeen territory. The community has been along the Lake Huron shoreline with continuity for almost two hundred years. The geographic scope of the contemporary community is described as covering over 275 km of shoreline from Tobermory and south of Goderich, and includes the counties of Bruce, Grey and Huron.

2.2.8 Population

The area within 100 km of the Bruce nuclear site is rural and consists of small towns and villages only. The 2016 Census indicates a slightly increasing population in Bruce county, with a population change of 3.1% over a period of 5 years (2011 to 2016) (Statistics Canada, 2019).

The population distribution around Bruce nuclear site, which was estimated based on population census information in 2016, is given in Table 2-9. The population in each geographic cell is shown in Figure 2-49.

Table 2-9: Population Distribution within 100 km Radius of the Bruce Nuclear Site [1]

Radial Distance (km)	2016 Census Population
0-4	32
4-8	1235
8-16	2472

[1] Statistics Canada. (2019). Census Profile, 2016 Census, Bruce County. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CD&Code1=3541&Geo2=PR&Code2=35&SearchText=Bruce&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=3541&TABID=1&type=0

Radial Distance (km)	2016 Census Population
16-24	19,008
24-32	9484
32-40	6256
40-60	70,517
60-80	61,282
80-100	68,182
Total	238,468

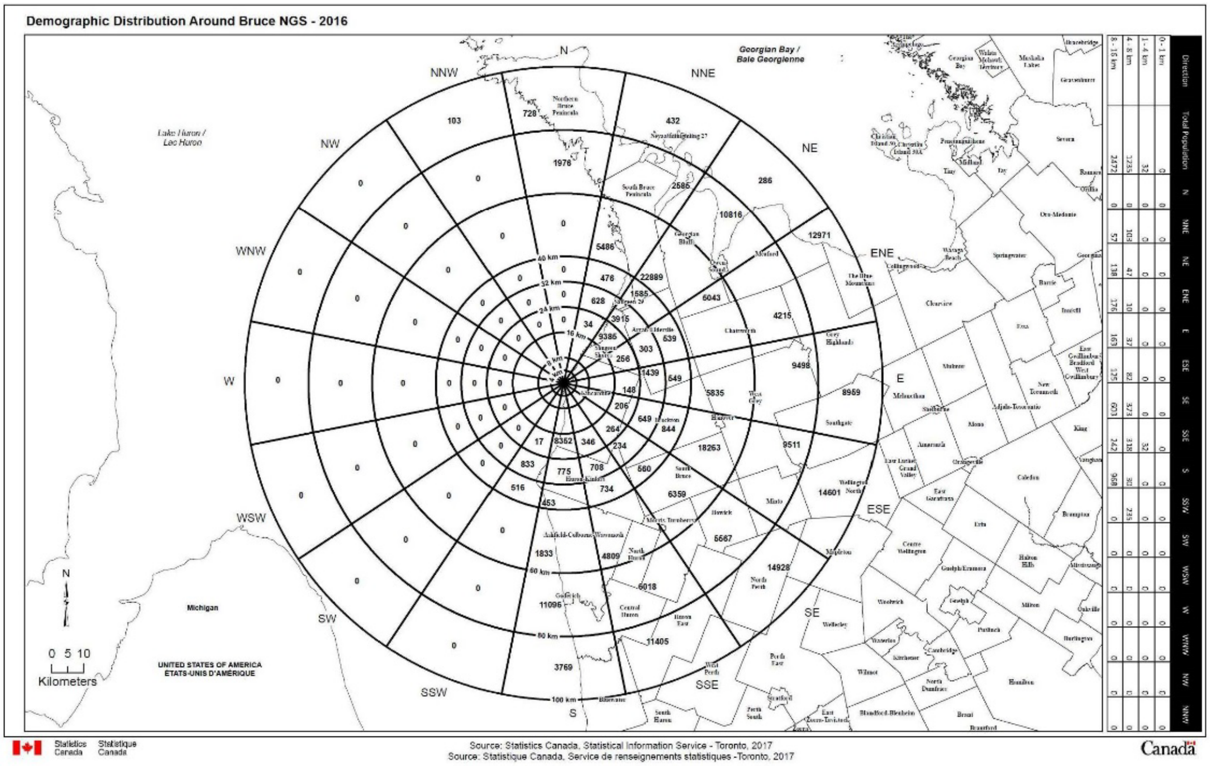


Figure 2-49: Population Distribution from 2016 Census (Bruce Power, 2017b)

2.2.9 Effluent and Environmental Monitoring Programs

Radiological and non-radiological substances are released to the environment as the result of the operation of the facilities at the NSS-W. To monitor releases and potential environmental effects, effluent monitoring programs and environmental monitoring programs have been established by OPG. These programs are described in Sections 2.2.9.1 – 2.2.9.3.

2.2.9.1 Effluent Monitoring at NSS-W

The airborne and waterborne radiological emissions, as well as non-radiological airborne emissions, to the environment from the NSS-W were monitored between 2014 and 2020 as part of the NSS-W effluent monitoring program. For airborne emissions, the WVRB radioactive waste incinerator stack and ventilation exhaust stack are monitored for tritium (HTO), particulate and iodine-131 (I-131) emissions. Carbon-14 (C-14) emissions are monitored on the incinerator stack; the TPMB ventilation stack is monitored for tritium and particulate emissions; the Used Fuel Processing Building ventilation stack is monitored for particulate emissions.

Waterborne effluent (stormwater runoff) leaving the NSS-W was previously collected weekly at the sampling stations shown on Figure 1-2 via the Surface and Sub-surface Drainage Systems as discussed previously, and analysed for tritium and gross beta activity.

However, as of January 2021, weekly sampling of stormwater via the surface drainage system has been discontinued as these samples are not defined as effluent as per N288.4-19. Since surface drainage discharges into the SRD, quarterly samples within the SRD and an additional sampling location at the stormwater management pond east of the Site will be collected instead to represent surface drainage at the site. The subsurface drainage system is also being sampled monthly as of January 2021 as part of the groundwater monitoring program.

This ERA update includes evaluation of the radiological emissions to air from NSS-W for recent years (2014-2020). The radiological emissions from 2014 to 2020 are shown in Table 2-10 and Table 2-11 are compared against the NSS-W Derived Release Limits (DRLs). The total emissions from the NSS-W are compared against emissions from the Bruce Power Site in (Bruce Power, 2015, 2016, 2017c, 2018, 2019, 2020, 2021). As shown in these tables, emissions from the NSS-W are generally four orders of magnitude lower than the DRLs for NSS-W. Additionally, emissions from NSS-W account for a small fraction of the total emissions from the Bruce nuclear site.

Table 2-10: Annual NSS-W Emissions and DRLs

Media		Air				Water	
Radionuclides		Tritium Oxide	I-131	Gross β/γ	C-14	Tritium Oxide	Gross β/γ
DRL for NSS-W		3.45E+17	1.99E+12	6.65E+11	2.41E+15	3.59E+15	4.01E+10
2014 NSS-W Emission	NSS-W Emissions (Bq)	7.17E+12	1.22E+05	5.12E+04	2.96E+08	2.44E+11	1.26E+08
	Emission/ DRL (%)	0.0021%	0.00001%	0.00001%	0.00001%	0.0068%	0.3142%
2015 NSS-W Emission	NSS-W Emissions (Bq)	4.14E+12	1.21E+05	4.89E+05	1.41E+09	4.21E+11	1.56E+08
	Emission/ DRL (%)	0.001%	0.00001%	0.0001%	0.0001%	0.012%	0.389%
2016 NSS-W Emission	NSS-W Emissions (Bq)	2.06E+13	1.71E+05	5.42E+03	3.94E+09	6.12E+11	4.62E+08
	Emission/ DRL (%)	0.006%	0.000009%	0.000001%	0.0002%	0.017%	1.152%
2017 NSS-W Emission	NSS-W Emissions (Bq)	1.72E+13	1.37E+05	4.52E+03	4.09E+09	2.59E+11	2.84E+08
	Emission/ DRL (%)	0.005%	0.000007%	0.000001%	0.0002%	0.007%	0.708%
2018 NSS-W Emission	NSS-W Emissions (Bq)	3.25E+12	7.23E+04	2.41E+04	1.57E+09	3.64E+11	1.69E+08
	Emission/ DRL (%)	0.001%	0.000004%	0.000004%	0.0001%	0.010%	0.421%
2019 NSS-W Emission	NSS-W Emissions (Bq)	1.03E+13	0.00E+00	6.52E+02	2.62E+09	1.60E+11	7.08E+07
	Emission/ DRL (%)	0.003%	0.0%	0.0000001%	0.0001%	0.004%	0.177%
2020 NSS-W Emission	NSS-W Emissions (Bq)	1.73E+13	0.00E+00	1.37E+04	2.63E+10	2.36E+11	9.54E+07
	Emission/ DRL (%)	0.005%	0.0%	0.000002%	0.0011%	0.007%	0.2%

Notes:

NSS-W Emissions are sourced from the Bruce Power EMPs from 2014 to 2020 (Bruce Power, 2015, 2016, 2017c, 2018, 2019, 2020, 2021)
The DRL for a given radionuclide is its annual release rate during normal operation that would cause an individual of the most highly exposed group to receive a dose equal to the regulatory annual dose limit due to exposure to the radionuclide from all potential pathways. In this report, the most recent DRLs for NSS-W are used for comparison purposes.
The DRL for iodine is the value for the mixed fission products of iodine.
The DRL for Particulate Gamma Scan is the value for Particulate Gross Beta/Gamma.
The DRL Gross Beta emissions is the value for Gross Beta/Gamma.

Table 2-11: NSS-W and Bruce Power Total Emissions

Media		Air				Water	
Radionuclides		Tritium Oxide	I-131	Gross β/γ	C-14	Tritium Oxide	Gross β/γ
2014	NSS-W Emission (Bq)	7.17E+12	1.22E+05	5.12E+04	2.96E+08	2.44E+11	1.26E+08
	Bruce nuclear site Total Emissions (Bq)	1.17E+15	4.34E+08	1.90E+07	2.90E+12	8.36E+14	3.14E+09
	NSS-W Emissions /Total Emissions (%)	0.61%	0.03%	0.27%	0.01%	0.03%	4.02%
2015	NSS-W Emission (Bq)	4.14E+12	1.21E+05	4.89E+05	1.41E+09	4.21E+11	1.56E+08
	Bruce nuclear site Total Emissions (Bq)	1.08E+15	< 9.20E+07	2.74E+07	< 4.31E+12	8.92E+14	2.68E+09
	NSS-W Emissions /Total Emissions (%)	0.38%	~ 0.13%	1.78%	~ 0.03%	0.05%	5.82%
2016	NSS-W Emission (Bq)	2.06E+13	1.71E+05	5.42E+03	3.94E+09	6.12E+11	4.62E+08
	Bruce nuclear site Total Emissions (Bq)	1.16E+15	4.57E+06	1.45E+06	2.83E+12	7.44E+14	2.89E+09
	NSS-W Emissions /Total Emissions (%)	1.78%	3.74%	0.37%	0.14%	0.08%	15.97%
2017	NSS-W Emission (Bq)	1.72E+13	1.37E+05	4.52E+03	4.09E+09	2.59E+11	2.84E+08
	Bruce nuclear site Total Emissions (Bq)	1.46E+15	2.21E+07	2.78E+06	3.12E+12	9.41E+14	3.40E+09
	NSS-W Emissions /Total Emissions (%)	1.18%	0.62%	0.16%	0.13%	0.03%	8.34%
2018	NSS-W Emission (Bq)	3.25E+12	7.23E+04	2.41E+04	1.57E+09	3.64E+11	1.69E+08
	Bruce nuclear site Total Emissions (Bq)	9.98E+14	1.01E+07	3.43E+06	2.27E+12	7.56E+14	2.37E+10
	NSS-W Emissions /Total Emissions (%)	0.33%	0.72%	0.70%	0.07%	0.05%	0.71%
2019	NSS-W Emission (Bq)	1.03E+13	0.00E+00	6.52E+02	2.62E+09	1.60E+11	7.08E+07
	Bruce nuclear site Total Emissions (Bq)	8.03E+14	4.21E+07	6.73E+06	2.43E+12	1.09E+15	4.51E+09
	NSS-W Emissions /Total Emissions (%)	1.28%	0.00%	0.01%	0.11%	0.01%	1.57%
2020	NSS-W Emission (Bq)	1.73E+13	0.00E+00	1.37E+04	2.63E+10	2.36E+11	9.54E+07
	Bruce nuclear site Total Emissions (Bq)	6.70E+14	2.50E+07	9300000	2.60E+12	8.20E+14	3.16E+09
	NSS-W Emissions /Total Emissions (%)	2.58%	0.00%	0.15%	1.01%	0.03%	3.02%

Notes:

Data is obtained from the Bruce EMPs between 2020 and 2014 (Bruce Power, 2015, 2016, 2017c, 2018, 2019, 2020, 2021)

%Gross Beta = NSS-W Gross Beta/(total Gross Beta/Gamma + NSS-W Gross Beta)

In addition, OPG also monitors non-radiological substances released to the environment, which is carried out through NSS-W's Environmental Compliance Approval (ECA) related programs. For example, each year OPG has an emission testing program conducted for the incinerator at the NSS-W (OPG, 2017b, 2018a, 2019, 2020, 2021). The program is required as part of the Ontario Ministry of the Environment, Conservation and Parks (MECP) Amended ECA No. 8047-8GLPAM. The program tests the emission rates of specific contaminants and demonstrates the facility's ability to meet the allowable emission levels for these contaminants according to the specified point of impingement (POI) concentration limits. The program is reviewed on a regular basis and the results, further discussed in Sections 3.3.2 are reported to MECP.

2.2.9.2 Environmental Monitoring at NSS-W

OPG has established an EMP to monitor the environment which could be potentially affected by the operation of the NSS-W. An environmental baseline monitoring program was also conducted in the vicinity of the NSS-W in 2016, with additional samples collected in Fall 2020 and winter, spring summer of 2021. A brief description of these programs is provided below. The results of these monitoring programs and the use of the monitoring data is further discussed in Sections 3 and 4.

2.2.9.2.1 NSS-W EMP

Environmental monitoring at the NSS-W has been conducted for many years. The environmental performance of the NSS-W is reported to the CNSC on a regular basis as part of the quarterly operations report. In 2012, a detailed design for the NSS-W EMP was developed and regular reporting of the EMP has been conducted since. Doses to off-site receptors from external exposure data were obtained from the 2020 EMP report and are discussed further in Section 3.2.2 of this report.

In 2020, a gap analysis was completed to confirm the data requirements of the current ERA in accordance with CSA N288.6-12 and REGDOC 2.9.1, which including reviewing recent EMP reports. Additional sampling was conducted in 2020 and 2021 to address the gaps noted and to use this new data within this ERA.

2.2.9.2.2 Baseline Enhancement Monitoring for Future NSS-W Expansion Activities

To support the 2016 ERA, a thorough review was completed to determine the additional studies required to adequately complete an ERA and predictive effects assessment for potential NSS-W site expansion activities. On this basis, the baseline monitoring program was developed and carried out. To characterize the environment in the vicinity of the NSS-W, field sampling and surveys were conducted for different environmental disciplines including terrestrial habitat, aquatic habitat and fish communities, water quantity, surface water and sediment quality, soil quality, groundwater quality, noise, and radiation and radioactivity. Specifically, the samples from different media including surface water, groundwater, vegetation, soil, and sediment were analyzed for both radiological and non-radiological contaminants. Soil, vegetation and groundwater samples were collected at various times of the year in 2014 (AMEC, 2016a). Water samples were collected in the spring, summer and fall of 2014, whereas sediment samples were collected in the spring and autumn. Aquatic vegetation (cattails) was collected during the summer.

Additionally, a field monitoring program was completed in 2020 and 2021 which involved sampling surface water, sediment, terrestrial vegetation (grass and cedar), aquatic vegetation (cattails) and soil. This 2020-2021 sampling program is summarized in 1.1.2.2. Relevant results of the monitoring program are provided within 3.3, 4.3, 4.4 and Appendix F of this report.

2.2.9.2.3 Precipitation and Surface Drainage Monitoring

In 2013 and 2014, OPG undertook an internal OPG investigation, supplementary to the EMP, to quantify tritium concentrations in precipitation (OPG, 2016). In that study, precipitation samples were collected between July 2013 and July 2014 from eight locations at the NSS-W and also from one location at the RWOS1. It was originally recommended that the supplementary study be repeated in 2020-21 to support the 2021 ERA update; however, based on discussion below it was determined that the updated precipitation monitoring supplementary study was not warranted. Review of the available data for the gap analysis preceding this ERA concluded that the precipitation monitoring supplementary study does not need to be repeated, but can be represented by an analysis of surface runoff measurements performed on the site of the NSS-W.

Water collected by the surface and subsurface drainage systems is directed to the sampling stations summarized in Table 2-12 and ultimately to either the south railway ditch (SRD), or to the stormwater management pond. Figure 2-50 illustrates the main surface and subsurface drainage catchment areas and discharge points. As of January 1st 2021, weekly sampling of the surface water drainage has been discontinued based on discussion with the CNSC.

Surface water drainage is directed through two outlet pathways that discharge to the SRD. The eastern portion of this surface drainage system is serviced by two double-chambered stormceptors that provide sediment removal and treatment of surface water prior to discharge to the SRD. Surface drainage water sampled at SS1, SS2 and SS3 flows into this line of the drainage system. The western portion of this drainage system includes subsurface discharge from SS2 and SS3 and connects to a system within the north site that discharges to the SRD.

Table 2-12: Sampling Stations at NSS-W – Surface Drainage Network

Unit/Structure	Sampling Station – Surface Drainage
LLSB#1	SS4A – LLSB#1 is included in the overall surface drainage network for LLSB's #1 through #10
LLSB#2 to #10	SS4A – LLSB#2 to #10 all discharge surface water is directed to SS4A and then through two stormceptors (in parallel) and out to the SRD

Unit/Structure	Sampling Station – Surface Drainage
LLSB# 11 to #14, RWCSB and SGSB	SS6 – Surface drainage is directed to SS6, which has separate sampling equipment for surface water and subsurface water
Stage 1 Tile Holes (TH101 to TH180) and Trenches (TRH3 to TRH6)	SS1 – Surface drainage from these areas is directed to SS1. Two sets of sampling equipment are present in SS1 – for surface sampling and subsurface sampling.
Remaining Tile Holes and Trenches (TRH7 to TRH10)	SS2 – Surface drainage from these areas is directed to SS2. From here, flow is directed east, then north and then through dual chamber stormceptors (in series) to the SRD.
Inground Containers and Quadricells	SS2 – Surface drainage is directed to SS2
Stage 3 and 3E Trenches	SS3 – Surface drainage consists of foundation drains at the footings of the trenches. The drains are connected through sumps SU-7, SU-8, and SU-9, discharging to SS3, then east and north through two dual -chamber stormceptors (in series) to the SRD
Used Fuel Dry Storage	SS5 – Surface drainage in this area is mixed with surface drainage at several points along the drainage system and directed to SS5, where the combined surface and subsurface drainage is sampled, analyzed and discharged to the stormwater management pond

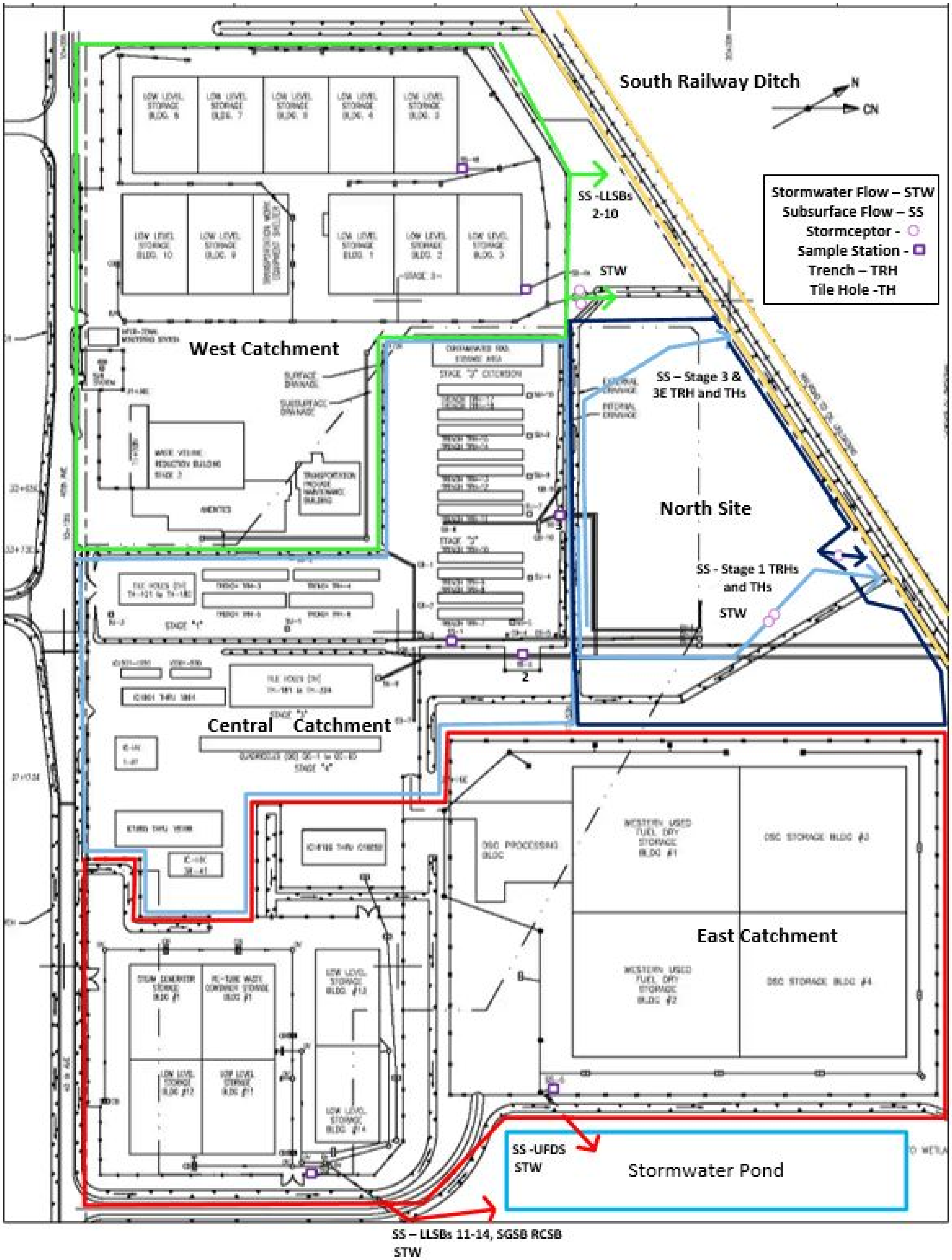


Figure 2-50: NSS-W Surface and Subsurface Drainage (Ecometrix, 2021a)

Tritium

Table 2-13 shows the average, maximum and median tritium concentrations measured in 2014-2020 at SS1, SS2, SS3, SS4 and SS6. Figure 2-51 shows average tritium concentrations at the sampling stations for each year. Comparison of the tritium values at locations SS4A and SS6 with the other surface drainage sampling locations demonstrates that the LLSBs are an important source of tritium to the atmosphere and to wet deposition of tritium on a localized scale since SS4A and SS6 direct surface drainage from the LLSBs. Median concentrations at SS1 and SS2 are similar to average tritium values measured in precipitation at the perimeter of the NSS-W. The data suggest that tritium concentrations in surface runoff resulting from atmospheric releases are generally less than 2,500 Bq/L, but can exceed these values proximal to sources of atmospheric releases (LLSBs).

Table 2-13: 2014-2020 Average, Maximum, and Median Tritium Concentrations in Surface Runoff

Tritium Concentration (Bq/L)	SS1	SS2	SS3	SS4A	SS6
Average	505	1054	1006	1844	3065
Maximum	5210	71400	4920	98400	1400
Median	382	507	760	1280	2635

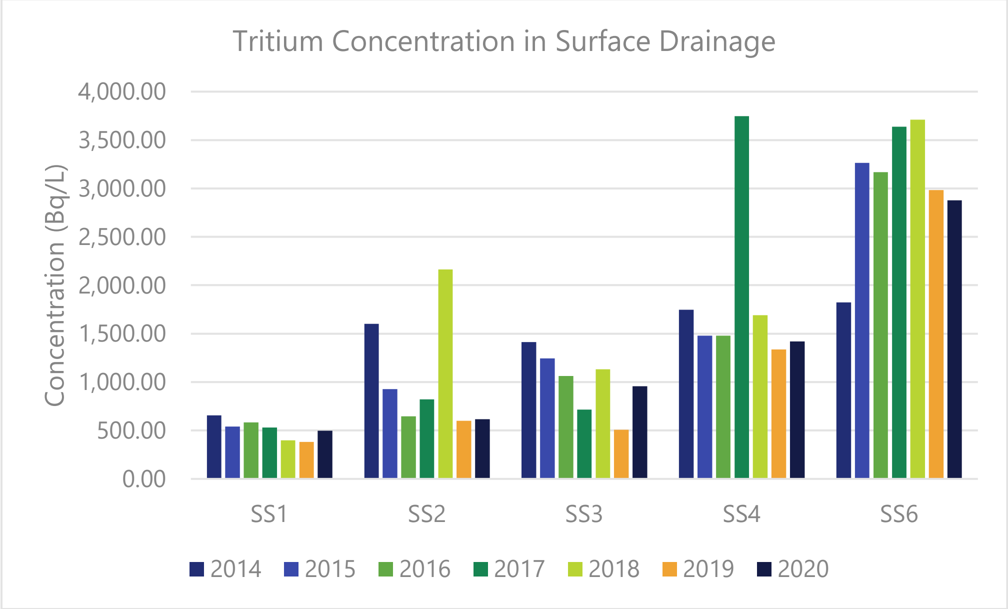


Figure 2-51: Yearly Averages of Tritium Concentration Measured at Surface Drainage Stations at the NSS-W

Stormwater and subsurface/foundation drainage collected from the NSS-W drainage systems discharge into the SRD. Tritium data are available within the SRD between 2014 and 2020, and are summarized in Figure 2-52.

Tritium concentrations at WOD-2 represent the highest concentrations in the SRD - the source of tritium is inferred to be LLSBs 1-10. Location WOD-5 represents the concentration of tritium downstream of the NSS-W and also collects stormwater and foundation drainage discharge from LLSBs 11 to 14. Also, concentrations in 2016 to 2020 are trending downwards at WOD-5. A comparison of tritium concentrations between The SRD and the surface runoff is shown in Table 2-15.

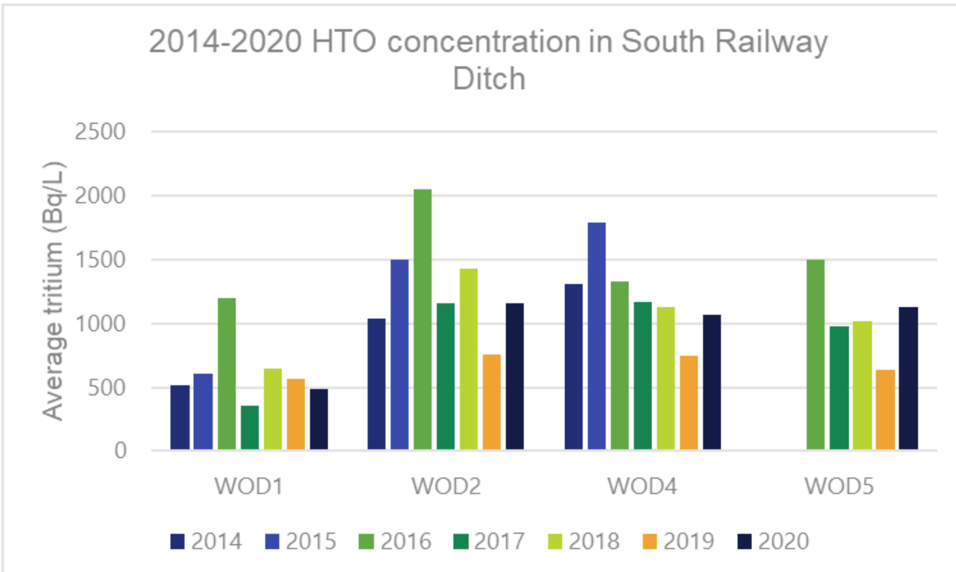


Figure 2-52: Yearly averages of Tritium in the SRD in 2014-2020

SRD and the east stormwater management pond (formerly grassy swale) receive all stormwater drainage from the NSS-W and primarily represent the quality of the stormwater leaving the NSS-W. The east stormwater management pond receives surface drainage from SS6 and was included in the monitoring program for the current ERA (GS-1). Tritium concentrations were measured in the pond four times between Fall 2020 and Summer 2021 and the results are presented in Table 2-14. Tritium concentrations are generally lower than in the SRD.

Table 2-14: Tritium Concentrations in the East Stormwater Management Pond in 2020 to 2021

	Fall 2020	Winter 2021	Spring 2021	Summer 2021	Average	2 x Standard deviation
Tritium (Bq/L)	371	673	389	339	**443**	**309**

Additionally to monitoring of surface runoff and concentrations in the SRD, OPG has historically also assessed tritium concentrations in precipitation at monitoring stations located at RWOS1 (monitoring stations WS A-B) and/or NSS-W (monitoring stations WS 1-4) (Ecometrix, 2020b, 2021c). Tritium concentrations in precipitation at the NSS-W perimeter are also monitored as part of the Environmental Monitoring Program (EMP). No statistically significant 5-year trend has been observed in the EMP reporting (Ecometrix, 2020b, 2021c) and tritium levels in precipitation were found to be comparable to background locations on the Bruce Power site. In 2020, OPG further evaluated the potential for air emissions from the WVRB incinerator to be a source of tritium in wet deposition at the NSS-W, through a preliminary internal OPG study. This preliminary investigation suggests that the WVRB incinerator is a potential contributing source to tritium concentrations observed in wet deposition across the NSS-W, and ultimately, to tritium concentrations in groundwater (Ecometrix, 2021a). The emissions sources that are considered to influence concentrations of tritium at RWOS1 are primarily from the Bruce Power operations and not from the NSS-W.

As shown in Table 2-15 median concentrations at SS1 and SS2 are similar to median tritium values measured in precipitation at the perimeter of the NSS-W and in water at upstream locations in the SRD (monitoring Station WOD1).

Table 2-15: Average, Maximum and Median Tritium Concentrations in the Surface Drainage, SRD, and Precipitation during the period 2014-2020

		Tritium Concentration (Bq/L)		
	Monitoring Station	**Average**	**Maximum**	**Median**
Surface Drainage	SS1	505	5210	382
	SS2	1054	71400	507
	SS3	1006	4920	760
	SS4	1844	98400	1280
	SS6	3065	10,800	2635
SRD	WOD1	629	3860	349
	WOD2	1304	3320	1190
	WOD4	1247	2360	1140
	WOD5	990	1600	878
Grassy Swale	GS-1	443	673	380
Precipitation	WS 1-4 (NSS-W)	629	6220	433
	WS A-B (RWOS1/Background)	590	6390	307

Concentrations in SS4 and SS6 are elevated in comparison to SS1 to SS3. Comparison of the tritium values at locations SS4A and SS6 with the other surface drainage sampling locations, demonstrates that the LLSBs are an important source of tritium to the atmosphere and to wet deposition of tritium on a localized scale. At these locations, tritium from off-gassing of the storage containers and radiolytic exchange with the moisture in the air can transport tritium outside the LLSBs through the ventilation system (Ecometrix, 2021a).

Figure 2-53 below summarizes precipitation monitoring results at two locations, WS1-4 which is located within the NSS-W and WSA-B, which is located in RWOS1 between 2016 and 2020. Despite the distance between the two sites, and the fact that RWOS1 is no longer an active site with active storage of radiological wastes, results from both monitors are very similar. This suggests that the source of tritium concentrations in precipitation is not representative of the NSS-W or RWOS1 site activities, but is likely from Bruce Power activities.

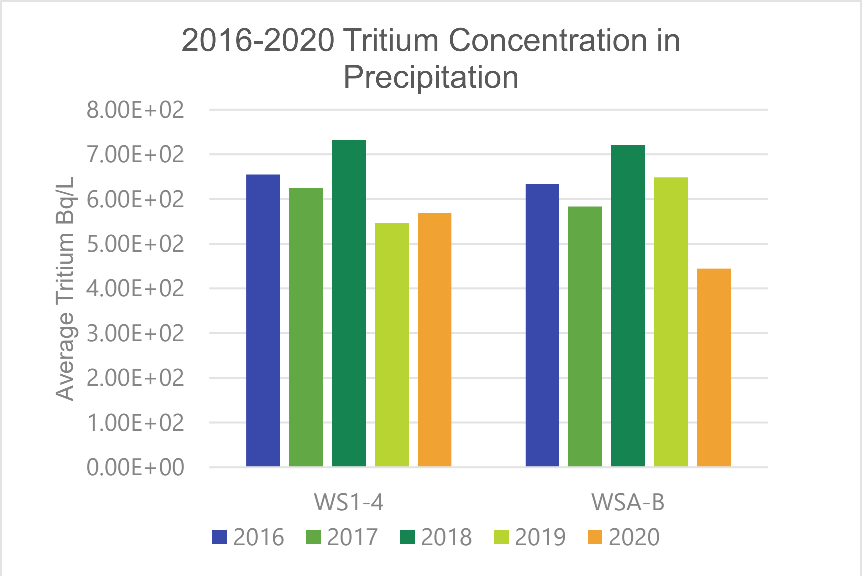


Figure 2-53: Tritium Concentrations in Precipitation (2016-2020)

<u>Gross Beta</u>

Table 2-16 shows the average, maximum and median gross beta concentrations measured in 2014 to 2020 at SS1, SS2, SS3, SS4 and SS6. Figure 2-54 shows average gross beta concentrations at the sampling stations for each year. Comparison of the gross beta values at all locations shows highest values at location SS6. In all locations except SS6 the gross beta concentration is significantly reduced in the years 2016-2020. The data suggest that gross beta concentrations in surface runoff resulting from atmospheric releases are generally less than 1 Bq/L, but can exceed these values in some instances.

Table 2-16: 2014-2020 Average, Maximum, and Median Gross Beta Concentrations in Surface Runoff

Gross Beta Concentration (Bq/L)	SS1	SS2	SS3	SS4A	SS6
Average	0.682	0.808	0.414	0.959	1.175
Maximum	7.440	7.710	4.660	5.610	12.030
Median	0.230	0.220	0.159	0.449	0.299

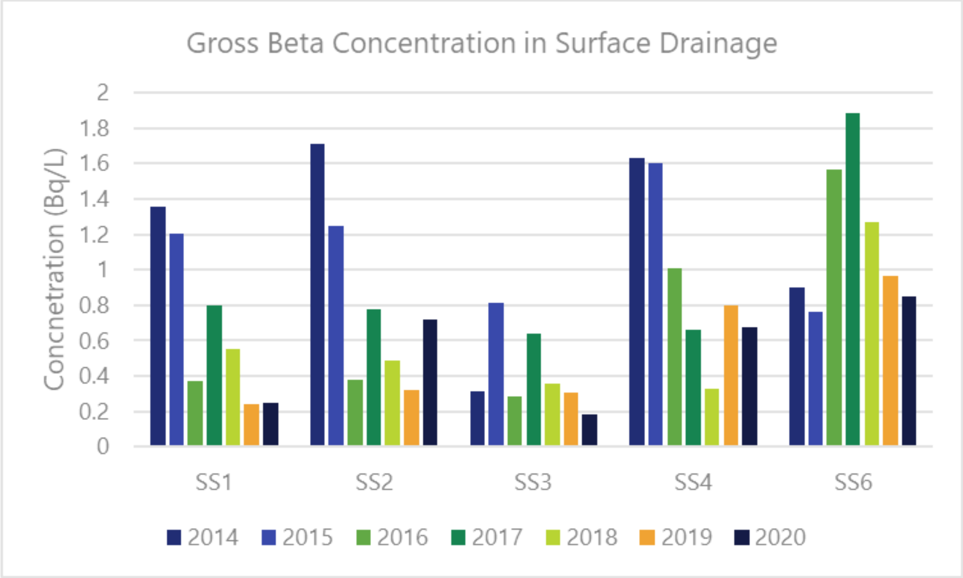


Figure 2-54: Yearly Averages of Gross Beta Concentration Measured at Surface Drainage Stations at the NSS-W

Stormwater and subsurface/foundation drainage collected from the NSS-W drainage systems discharge into the SRD. Gross beta data are available within the SRD between 2014 and 2020, and are generally comparable at all sample locations (Figure 2-55). A comparison of gross beta concentrations between the SRD and the surface runoff is shown in Table 2-18.

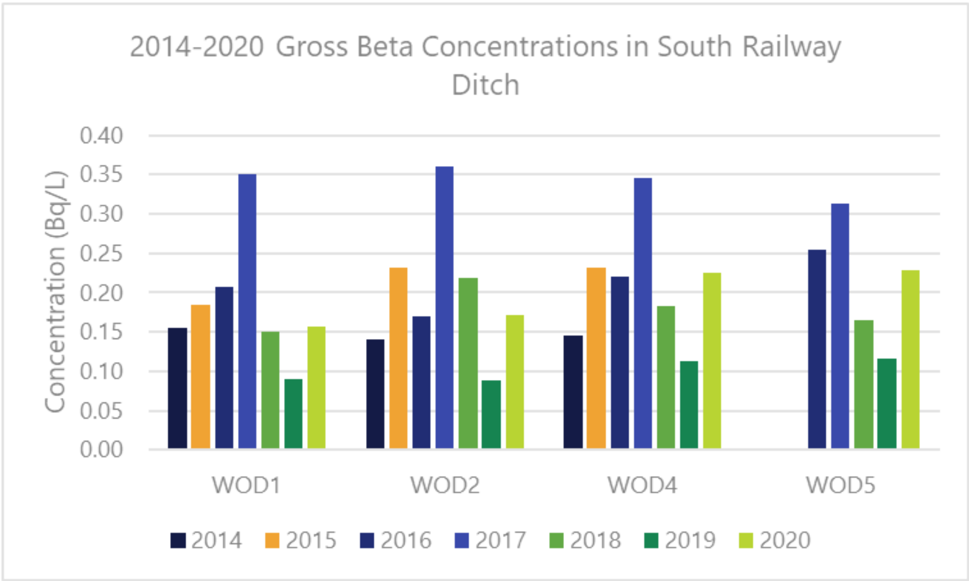


Figure 2-55: Yearly Averages of Gross Beta in the SRD in 2014-2020

The east stormwater management pond receives surface drainage from SS6 and was included in the monitoring program for the current ERA (GS-1). Concentrations of beta and gamma emitting radionuclides were measured at four instances between Fall 2020 and Summer 2021 and the results are presented in Table 2-17.

Table 2-17: Activity Concentrations of Beta and Gamma Emitting Radionuclides in the East Stormwater Management Pond

Activity Concentration (Bq/L)	Fall 2020	Winter 2021	Spring 2021	Summer 2021	Average	2 x Standard deviation
Carbon-14	-0.01	-0.02	-0.07	-0.03	-0.03	0.05
Cobalt-60	0.23	-0.05	0.2	-0.09	0.07	0.33
Cesium-134	-0.2	0.27	-0.15	0.38	0.07	0.58
Cesium-137	-0.52	-0.06	-0.42	-0.39	-0.35	0.4
Iodine-131	0.3	0.41	0.16	-0.09	0.19	0.43
Thorium Series	0.75	0.24	-1.22	-0.06	-0.07	1.67
Uranium Series	-1.04	0.22	-0.21	0.34	-0.17	1.25

All values are uncensored measurements under the detection limit and calculated values such as the average and standard deviation use the uncensored data.

As shown in Table 2-18 median gross beta concentrations in the SRD and surface drainage are comparable and mostly reflect the MDL of the measurements taken at these locations. The measurements from the east stormwater management pond are not directly comparable to the

SRD and surface runoff since uncensored values were reported in the 2020 program. Detection limits for the measured constituents vary based on radionuclide and method from 0.06 Bq/L for C-14 to greater than 2 Bq/L for thorium series radionuclides. The measurements were in all instances under their respective detection limit.

Table 2-18: Average, Maximum and Median Gross Beta Concentrations in the Surface Drainage and SRD during the period 2014-2020

		Gross Beta Concentration (Bq/L)		
	Monitoring Station	**Average[1]**	**Maximum[1]**	**Median[1]**
Surface Drainage	SS1	0.68	7.44	0.23
	SS2	0.81	7.71	0.22
	SS3	0.41	4.66	0.16
	SS4	0.96	5.61	0.45
	SS6	1.18	12.03	0.30
SRD	WOD1	0.19	0.54	0.16
	WOD2	0.20	0.55	0.16
	WOD4	0.21	0.53	0.20
	WOD5	0.21	0.52	0.18

[1] Calculated values using measurements <MDL at the MDL value.

2.2.9.3 Other Environmental Programs

Bruce Power has had an established EMP to monitor the environmental effects of the releases from their facilities for many years. The purpose of this EMP is to fulfill regulatory requirements under the Licence Condition of Bruce Power's Nuclear Power Reactor Operating Licence's (PROL) 15:00/2014 and PROL 16:00/2014. This licence condition requires Bruce Power to submit an annual environmental monitoring report. The monitoring programs include both radiological and non-radiological (hazardous) substances and quantify the effects on human and non-human biota. The program includes sampling conducted within a 20 km radius of the Bruce nuclear site.

NSS-W's radiological emissions are appropriately taken into account in the total dose to members of the public. As such, the Bruce Power EMP will be used to demonstrate the results of total dose to members of public compared to the regulatory limit, and it is expected that the over-all dose resulting from all nuclear facilities at the Bruce nuclear site will remain well below the regulatory limit.

3.0 Human Health Risk Assessment

The receptors considered for the HHRA consist of off-site members of the public. Health and safety of on-site workers will be protected by OPG's Radiation Protection Program and Conventional Safety Program, which are discussed below.

3.1 Problem Formulation

3.1.1 Health and Safety of On-site Workers

On-site workers, such as OPG employees, contractors, and visitors, are potentially exposed to radiological and non-radiological emissions resulting from the operation of the NSS-W. OPG has developed robust programs to protect their health and safety.

On-site workers receive radiation doses from works and activities relating to the NSS-W operations. These exposures are monitored and controlled through OPG's Radiation Protection Program. The Radiation Protection Program is designed to ensure that doses for employees, contractors and visiting members of the public are below the regulatory limits set by the CNSC as given in Table 3-1 (Minister of Justice Canada, 2015b), and as low as reasonably achievable, social and economic factors being taken into account (ALARA). For example, visitors to the NSS-W will always be escorted by qualified NSS-W staff.

On-site workers could also potentially be exposed to non-radiological substances. These exposures are considered and controlled through OPG's Conventional Safety Program. The Conventional Safety Program involves a systematic approach to manage risks associated with the activities, products and services of OPG's nuclear operations. The approach includes planning all work through pre-job briefings, and by using approved procedures and operating instructions. All work planned or conducted is subject to safe work planning requirements where safety hazards are identified and mitigating measures, such as the use of personal protection equipment, are identified and implemented.

As it is expected that the health and safety of on-site workers is protected with the implementation of OPG's Radiation Protection Program and Conventional Safety Program, no further risk assessment will be performed for on-site workers.

Table 3-1: Regulatory Exposure Limits

Receptor Group	Exposure Level	Dosimetry Period
Nuclear Energy Workers (NEWs), including pregnant NEWs (prior to declaring)	50 mSv	1 year
	100 mSv	5 year
Pregnant NEWs	4 mSv	balance of the pregnancy
A person who is not a NEW	1 mSv	1 year

3.1.2 Receptor Selection and Characterization

3.1.2.1 Receptor Selection

For off-site members of the public, the receptors are selected based on the results of the Bruce Power's site-specific survey carried out in 2016 (Bruce Power, 2017b). Bruce Power's EMP requires that a site-specific survey be conducted at least every five years. The latest survey was conducted in 2016 and gathered information regarding land usage, population distribution, meteorology, hydrology, water sources, water uses and food sources (Bruce Power, 2017b). The information accumulated during the survey consequently led to the identification of the different types of receptors and their characterization.

Based on the 2016 site-specific survey, the following five types of receptors have been identified:

- Non-farm residents (BR32, BR48);
- Farm residents (BF8, BF14, BF16;
- Subsistence farm residents (BSF2, BSF3);
- Dairy farm residents (BDF1, BDF9, BDF12, BDF13, BDF14, BDF15); and
- Industry workers (BEC).

In addition to the above receptors, Bruce Power, in the 2017 ERA, identified a new hunter/fisherman group (BHF1) located at Southampton, approximately 20 km north of the NSS-W, with dietary habits identical to the Subsistence farm group except for higher ingestion rates of fish and wild game (Bruce Power, 2017a). The dose to the hunter/fisherman group, as reported in the Bruce Power ERA (Bruce Power, 2017a), is mainly from terrestrial foods and is lower than the dose to either subsistence farm group (BSF2, BSF3).

While industry workers are all adults, the resident receptor groups and hunter/fisher group will include different age classes. The age class affects the resident's habits, intake rates and dose coefficients, which are used for dose calculations. In this ERA, residents were categorized into three age classes (Bruce Power, 2017b) as defined in CSA N288.1-20 (CSA, 2020), i.e., adult, child, and infant.

In 2019, Bruce Power commenced individualized diet surveys in collaboration with First Nations and Métis communities in the area (Bruce Power, 2021). The ultimate goal of the survey is to develop and refine receptor characteristics to better represent the behaviours and diet of Indigenous communities. The results of this study are not yet available for the current Environmental Risk Assessment, but are expected to be available for the next update.

The locations of the receptors are shown in Figure 3-1. The location of BHF1 is shown in Figure 3-2. The general characteristics of the receptors are provided in Table 3-2.

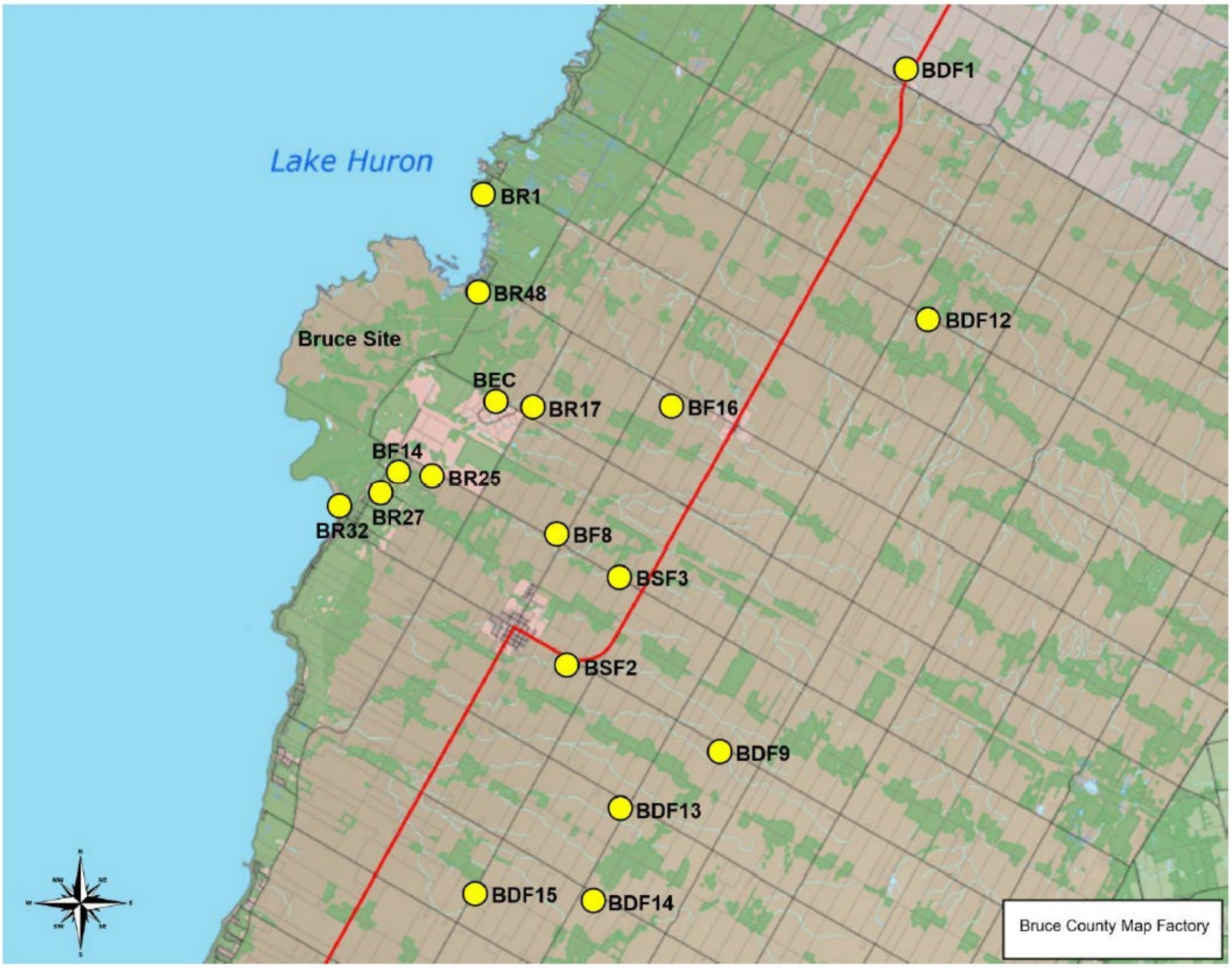


Figure 3-1: Potential Critical Receptor Groups (Excluding BHF1) (Bruce Power, 2017b)

Figure 3-2: Potential Critical Receptor Group for BHF1 (Bruce Power, 2017b)

Table 3-2: Identification of Human Receptors for the HHRA (Bruce Power, 2017b)

Receptor Group		General Characteristics of Receptors
Hunter/ Fisherman	BHF1	Generic hunter/fisherman resident Located to the north of the Bruce nuclear site in Southampton
Non-farm residents	BR1	Non-farm resident, Lakeshore Scott Point, Located north of the Bruce nuclear site
	BR17	Non-farm resident, Inland, Located to the east of the Bruce nuclear site
	BR25	Non-farm resident, Inland Located to the southeast of the Bruce nuclear site
	BR27	Non-farm resident, Inland, Trailer Park Located to the south of the Bruce nuclear site
	BR32	Non-farm resident, Lakeshore Located to the south of Bruce nuclear site in Inverhuron
	BR48	Non-farm resident, Inland Located to the east of the Bruce nuclear site near Baie du Doré
Farm residents	BF8	Agricultural, farm resident Located to the southeast of the Bruce nuclear site
	BF14	Agricultural, farm resident Located to the southeast of the Bruce nuclear site
	BF16	Agricultural, farm resident Located to the east of the Bruce nuclear site
Subsistence farm residents	BSF2	Agricultural, subsistence farm resident Located to the southeast of the Bruce nuclear site
	BSF3	Agricultural, subsistence farm resident Located to the southeast of the Bruce nuclear site
Dairy farm residents	BDF1	Agricultural, dairy farm resident Located to the northeast of the Bruce nuclear site
	BDF9	Agricultural, dairy farm resident Located to the southeast of the Bruce nuclear site
	BDF12	Agricultural, dairy farm resident Located to the northeast of the Bruce nuclear site
	BDF13	Agricultural, dairy farm resident Located to the southeast of the Bruce nuclear site
	BDF14	Agricultural, dairy farm resident Located to the southeast of the Bruce nuclear site

Receptor Group		General Characteristics of Receptors
	BDF15	Agricultural, dairy farm resident Located to the southeast of the Bruce nuclear site
Industry workers	BEC	Worker in BEC (now known as Bruce Eco-Industrial Park) Located to the east of the Bruce nuclear site

3.1.2.2 Receptor Characterization

3.1.2.2.1 Food and Water Consumption

The 2016 Bruce Power site-specific survey identified the characteristics of different receptors, specifically consumption of home grown produce and the use of local water supplies (Bruce Power, 2017b).

The receptors' average use of home grown or locally grown produce as a fraction of intake for each food category was determined based on the values reported by respondents. The sum of home grown and locally grown produce consumed is used to represent the food sources which were assumed to be affected by the emissions from the Bruce nuclear site.

Various sources of water used for drinking, bathing, livestock watering and irrigation are identified in the survey; these sources include private wells, community wells and lake water, as well as bottled water and municipal water. The receptors' average source use as a fraction of water use for each purpose was determined based on the values reported by respondents. It is assumed that all sources of water except bottled water were potentially affected by the emissions from Bruce nuclear site.

3.1.2.2.2 Exposure Duration and Frequency

For the purposes of the HHRA, it is assumed that all the receptors, except for the Bruce Eco-Industrial Park workers, spend 100% of their time in a single location as shown in Figure 3-1 and Figure 3-2. For the Bruce Eco-Industrial Park workers, they are assumed to have an occupancy factor of 0.23 at their work place (8 hours per day, 5 days per week and 50 weeks per year).

3.1.3 Human Health Exposure Pathways and Conceptual Model

Radiological and non-radiological contaminants are released to the environment as a result of operations at the NSS-W. Consequently, this could result in the emissions to various media, including air, surface water, soil, sediment, groundwater, and other media such as vegetation. Receptors could be exposed to contaminants through the following pathways:

- Air inhalation/skin absorption;
- Air immersion (external exposure);
- Water ingestion;

- Water immersion (via swimming or bathing);
- Soil external exposure;
- Soil ingestion (incidental);
- Terrestrial plant ingestion;
- Terrestrial animal ingestion;
- Aquatic animal ingestion;
- Sediment external exposure; and,
- Sediment ingestion (incidental).

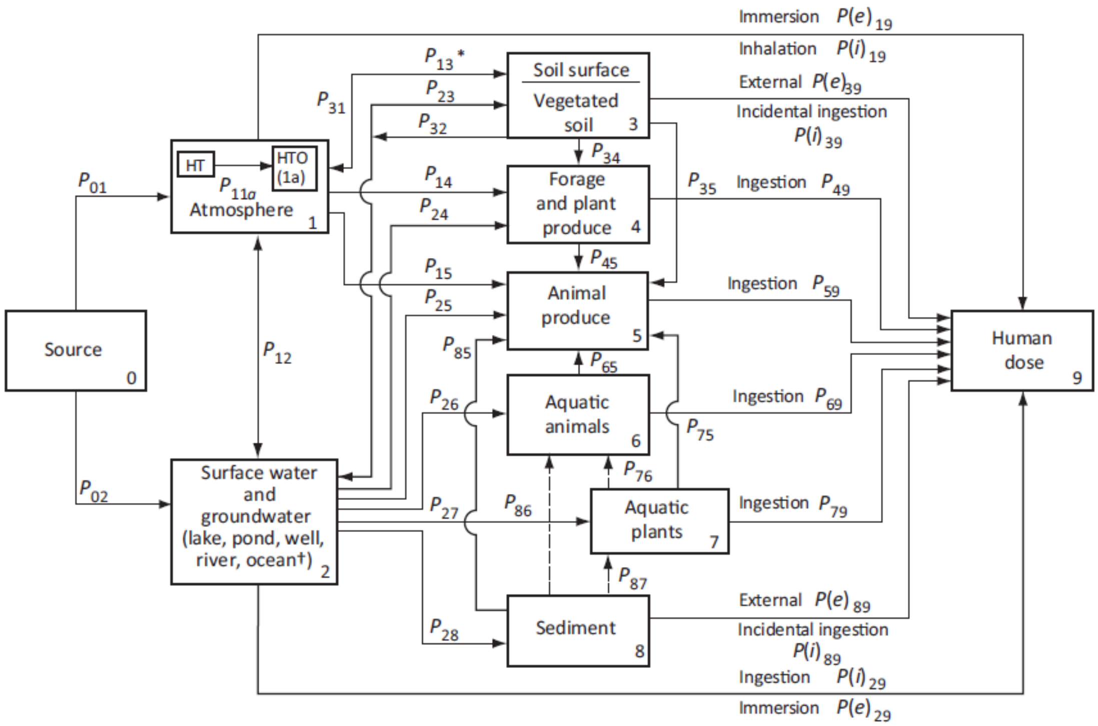
The conceptual model from CSA N288.1-20 of environmental radioactivity transport and human exposure pathways is shown in Figure 3-3, and is appropriate as the site-specific human health conceptual model for the NSS-W.

Using the concept of compartments, each environmental source/receptor is presented as a numbered compartment. The quantity in compartment i is denoted by X_i.

Transfer from compartment i to compartment j is characterized by a transfer parameter P_{ij}. The amount present in compartment j under steady-state conditions due to transfer from compartment i to compartment j is therefore $P_{ij}X_i$. The magnitude of the quantity (concentration or dose) represented by any compartment j is therefore

$$X_j = \sum_i P_{ij} X_i$$

where the summation is over all compartments i transferred into compartment j. Detailed information about the compartments and transfer parameters is provided in CSA N288.1-20 (CSA, 2020).



*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 3-3: Generic Conceptual Model for Human Receptors (CSA, 2020)

3.2 Assessment of Radiological Impact

Radiological materials could be released to the environment as a result of operations at the NSS-W. In this section, the impacts of radiological contaminants on human health are assessed.

3.2.1 Selection of Radiological Contaminants

As the result of NSS-W operations, airborne and waterborne radioactive materials are released to the environment, as shown in Table 3-3. Although no formal screening was performed; radionuclides are considered of public interest, therefore relevant radionuclides are carried forward quantitatively in the HHRA without a formal screening assessment.

Table 3-3: Radiological Emissions from the NSS-W (Bruce Power, 2015, 2016, 2017d, 2018, 2019, 2020, 2021)

Category of emissions	Radionuclides or radionuclide groups
Airborne emissions	• Tritium Oxide • Particulates • Carbon-14 • I-131
Waterborne emissions	• Tritium Oxide • Gross $\beta\gamma$

The assessment of the impact of radiological emissions on human health is presented below.

3.2.1.1 Human Exposure to Groundwater

As part of implementation of CSA N288.7-15 at the NSS-W, Ecometrix prepared a groundwater conceptual site model to understand what the potential sources of contamination to groundwater may be, the contaminants of potential concern, groundwater end use, and potential human and ecological receptors. Ecometrix reviewed available documentation to determine if there were any areas of potential environmental concern (APEC) or contaminants of potential concern (COPC) for groundwater (Ecometrix, 2021a). Ecometrix also reviewed available groundwater monitoring data between 1991 and 2020 at the NSS-W and RWOS1 and determined that tritium is the only groundwater COPC at the site.

The general public have no direct access to on-site groundwater at either NSS-W (AMEC, 2016a) or RWOS1. Shallow groundwater at the NSS-W, and in some instances groundwater within the Middle Sand Aquifer may discharge to surface water features, other than Lake Huron, including the SRD, the Grassed Swale and other surrounding ditches. It may also be collected within the subsurface drainage collection system at the site, and may be discharged to the SRD or Grassed Swale. The SRD and Grassed Swale subsequently drain to Stream C, and then to Baie du Doré in Lake Huron. Deeper groundwater is generally inferred to ultimately flow to the north and discharge to Lake Huron. At the RWOS1, the inferred direction of groundwater flow is to the south and ultimately to Lake Huron.

Off-site, domestic water well use and Lake Huron uses were identified in the groundwater CSM as the human end uses. Between the Site and Lake Huron in the direction of inferred groundwater flow in bedrock, water wells extending into bedrock and filed as being of domestic use were identified in the Ontario Well Records website (MECP, 2021a). Two groundwater wells are located adjacent to the DGR lands to the north, on the Hydro One property. One of the wells is listed as being of domestic use, and off-site human receptors are conservatively expected to use this well as a drinking water source. The pump intake depth within the domestic well is located within the limestone bedrock at 60 metres below ground surface (mbgs). Domestic water wells were also identified to the northwest of the NSS-W, beyond the Bruce Power property line. South of the RWSO1, a water well was identified in Inverhuron park.

The Provincial Water Quality Standards (PWQO) (MECP, 2011a) and (Health Canada, 2019) drinking water guideline for tritium is 7,000 Bq/L. The PWQO was set to the value of 7,000 Bq/L on the basis of the human health risk-based Health Canada guideline. Ecometrix (Ecometrix, 2021b) developed risk-based groundwater guidelines for the protection of human receptors for both the ingestion of domestic well water and the ingestion of water sourced from Lake Huron. The following sections summarize the screening of groundwater concentrations at on-Site wells to determine if tritium will be carried forward into the HHRA either through the ingestion of domestic well water or ingestion of water at Lake Huron.

3.2.1.1.1 Ingestion of Domestic Well Water

Ecometrix (Ecometrix, 2021b) developed a 2-D contaminant fate and transport model for groundwater to evaluate the attenuation of tritium between the NSS-W and the northern property boundary of the DGR lands. The results of this model indicated that a tritium concentration in groundwater of 148,000 Bq/L at the NSS-W (the source) is protective of the drinking water guideline at the property boundary. In addition, the model was used to determine a similar risk-based guideline for groundwater migrating from the RWOS1 to the southern property boundary. A concentration of tritium in groundwater of 97,800 Bq/L at RWOS1 is protective of the drinking water guideline at the property boundary to the south.

This ERA considered groundwater quality data between 2014 and 2020 and compared the risk-based guidelines to maximum concentrations of groundwater selected from the full monitoring well network developed for the NSS-W and RWSO1 (Ecometrix, 2021b). As shown in Table 3-4, the maximum tritium concentrations are below the risk-based guideline for ingestion of domestic well water and do not require further evaluation for this groundwater pathway in the HHRA.

Table 3-4: Groundwater – Ingestion of Domestic Well Water Tritium Screening

Applicable Location	Max Tritium Concentration (2014-2020) (Bq/L)	Max Tritium Concentration Well Location	Risk-Based Guideline (Bq/L)	Assessment Results
NSS-W	52,800	WSH231	148,000	No further assessment is required in the HHRA
RWOS1	1,736	WSH124	97,800	No further assessment is required in the HHRA

Note: Risk Based Guideline obtained from Groundwater Protection and Monitoring Program (Ecometrix, 2021b)

3.2.1.1.2 Ingestion of Water Sourced from Lake Huron

Human receptors living in the region may be exposed to tritium from the Site through consumption of water from Lake Huron. Water Supply Plants (WSPs) provide drinking water from Lake Huron to human receptors. The nearest WSP intake at Kincardine is approximately 15 km south-southwest of the site.

Ecometrix (Ecometrix, 2021b) developed a 2-D contaminant fate and transport model for tritium in the bedrock aquifer that demonstrates attenuation of tritium as it is transported away from the site and into Lake Huron. However, the same extent of attenuation of tritium concentrations may not occur in shallow surface water (e.g., SRD) draining to Lake Huron. Thus, it was conservatively assumed that no attenuation of tritium concentrations occurs in shallow surface water between the site and Lake Huron. However, the assumption remains that the tritium originating in groundwater is then mixed in the water of Lake Huron.

A dilution factor was derived and applied to the tritium drinking water objective (PWQO) in order to develop a groundwater concentration at the site that would be protective of drinking water from Lake Huron that is collected at the nearest WSP. Therefore, back-calculating from a tritium concentration from 7,000 Bq/L at the WSP to a concentration at the point of release of groundwater from the Bruce Nuclear Site to the lake, would result in a tritium concentration in the NSS-W and RWOS1 wells of 8.06×10^{8} Bq/L that would be protective of the PWQO at the point of consumption.

This ERA considered groundwater quality data between 2014 and 2020 and compared the risk-based guideline to the maximum concentrations of groundwater selected from the full monitoring well network for the NSS-W and RWSO1 (Ecometrix, 2021b). As shown in Table 3-5, the maximum tritium concentrations do not exceed the risk-based guideline for ingestion of water sourced from Lake Huron; therefore, the groundwater pathway does not require further evaluation in the HHRA.

Table 3-5: Groundwater – Ingestion of Water Sourced from Lake Huron Tritium Screening

Max Tritium Concentration for NSS-W and RWOS1 (2014-2020) (Bq/L)	Max Tritium Concentration Well Location	Risk-Based Guideline (Bq/L)	Assessment Results
52,800	WSH231	8.06×10^{8}	No further assessment is required in the HHRA

Note: Risk Based Guideline obtained from Ecometrix (Ecometrix, 2021b)

3.2.2 Dose to Off-Site Receptors due to External Exposure

Off-site receptors could receive radiation doses from external exposure to gamma radiation from the waste storage facilities at the NSS-W. The external dose rates at the boundary of the NSS-W are measured with Thermoluminescent Dosimeters (TLDs) installed around the NSS-W fence line. The external dose rates to members of the public were assessed using the TLDs installed around the NSS-W fenceline in combination with TLDs located at the Bruce Power indicator sites, which are located closest to the site boundary, as part of the Bruce Power EMP. TLDs provide a measurement of gamma radiation from all sources in the environment. This includes both background radiation and radiation from all anthropogenic sources on the Bruce nuclear site.

As shown in Table 3-6:, the average dose rate measured quarterly at the boundary of the NSS-W ranges from 0.028 µGy/h to 0.118 µGy/h from 2014-2020. As radioactivity falls off with distance, the external dose from the NSS-W is not a significant contributor to public dose and as such, did not carry through into the dose assessment for offsite receptors. This is confirmed with the external gamma measurement taken as part of the Bruce Power EMP (Bruce Power, 2015, 2016, 2017d, 2018, 2019, 2020, 2021).

Table 3-6: Gamma Dose Rate at the NSS-W Fence Line Measured with TLD

Period	Average Dose Rate (µGy/h)	Maximum Dose Rate (µGy/h)
2014 Q1	0.069	0.107
2014 Q2	0.060	0.103
2014 Q3	0.060	0.104
2014 Q4	0.068	0.118
2015 Q1	0.062	0.113
2015 Q2	0.060	0.108
2015 Q3	0.062	0.110
2015 Q4	0.070	0.114
2016 Q1	0.064	0.106
2016 Q2	0.073	0.110
2016 Q3	0.059	0.099
2016 Q4	0.073	0.110
2017 Q1	0.066	0.108
2017 Q2	0.067	0.104
2017 Q3	0.061	0.092
2017 Q4	0.074	0.108
2018 Q1	0.061	0.088
2018 Q2	0.068	0.098
2018 Q3	0.062	0.093

Period	Average Dose Rate (µGy/h)	Maximum Dose Rate (µGy/h)
2018 Q4	0.071	0.100
2019 Q1	0.071	0.098
2019 Q2	0.058	0.084
2019 Q3	0.070	0.097
2019 Q4	0.072	0.097
2020 Q1	0.070	0.096
2020 Q2	0.057	0.083
2020 Q3	0.075	0.099
2020 Q4	0.075	0.103

Note: Data is obtained from Bruce Power EMPs (Bruce Power, 2015, 2016, 2017d, 2018, 2019, 2020, 2021)

TLDs located throughout Ontario show the average of background radiation levels from 2014-2020 was 0.066 ± 0.027 µGy/h (average ± 2SD). In comparison, the Bruce Power indicator sites (three locations at the Bruce site boundary) show average external gamma dose in air of 0.052 ± 0.006 µGy/h. This demonstrates that the external doses at the closest off-site locations to the Bruce site are very similar to background values. As such, the external dose to members of the public from anthropogenic sources on the Bruce nuclear site (including the NSS-W) is considered negligible.

3.2.3 Radiological Criteria for HHRA

The CNSC has set regulatory limits for exposure to workers and members of the public to ensure that the probability of occurrence of effects is acceptably low (Minister of Justice Canada, 2015b). In this assessment, the regulatory limit established to protect members of the public, i.e. an effective dose of 1 mSv per year, is used as the criterion for the assessment of the impact of radiological contaminants on human health.

3.2.4 Doses to Potential Critical Groups Around the Bruce Nuclear Site

The EMP carried out by Bruce Power covers a 20 km radius from the Bruce nuclear site. The monitoring results from this program were used to assess the effect of the operations of all facilities at the Bruce nuclear site.

As part of Bruce Power's EMP, annual public dose resulting from the operation of nuclear facilities at the Bruce nuclear site is determined for each potential critical group located in the vicinity, and for three age classes within each potential critical group (adult, child and infant). The highest dose across all potential critical groups and age classes is designated as the official site dose. The public dose calculation is performed using IMPACT, an approved modeling software. IMPACT represents the method of dose calculation presented in CSA N288.1. The model uses both emissions data and environmental monitoring data, while taking into account the most recent site-specific survey results and site meteorological data. Table 3-7 provides the annual Bruce Power site public doses and associated critical groups from 2014-2020 (Bruce Power, 2015, 2016, 2017d, 2018, 2019, 2020, 2021).

Table 3-7: Dose to Critical Groups for the Bruce Nuclear Site, 2014-2020

Year	Critical Group	Committed Effective Dose (µSv/a)	Percentage of Regulatory Limit
2014	BSF3 Adult	2.0	0.20%
2015	BSF3 Infant	2.89	0.29%
2016	BSF3 Infant	1.6	0.16%
2017	BSF3 (10-year-old)	2.12	0.2%
2018	BSF3 Infant	1.67	0.17%
2019	BF14 Adult	1.5	0.15%
2020	BSF3 Adult	1.8	0.18%

Note: Data obtained from Bruce Power EMPs (Bruce Power, 2015, 2016, 2017d, 2018, 2019, 2020, 2021)

From Table 3-7, the doses received by the critical groups for 2014-2020 ranged from 1.5 µSv/a (BF14 adult) to 2.89 µSv/a (BSF3 infant). In 2019, the critical group was an adult from BF14; however, in other years the critical group was one of the age groups from BSF3. The locations of the BSF3 and BF14 relative to NSS-W are shown in Figure 3-4.

Figure 3-4: Relative Location of Critical Groups to the NSS-W, 2014-2020

The maximum dose received by the off-site members of the public presented above, taking into account all potential pathways, is due to the total emissions from all nuclear facilities at the Bruce nuclear site and is approximately three orders of magnitude below the public dose limit of 1 mSv/a. The public dose arising from NSS-W operations is a portion of the dose from the Bruce nuclear site. Thus, the dose to members of the public from NSS-W operations is well below the regulatory limit. Therefore, it can be concluded that there are no radiological effects to the public due to the operation of NSS-W, and there is no radiological risk posed to off-site human receptors.

3.2.5 Indigenous Peoples

Indigenous peoples inhabit communities within the vicinity of the NSS-W facility. The Bruce nuclear site resides within the traditional lands and treaty territory of Saugeen Ojibway Nation (Bruce Power, 2021). Saugeen Ojibway Nation comprises the Chippewas of Nawash Unceded First Nation and the Chippewas of Saugeen First Nation. Saugeen Ojibway Nation has two main on-reserve communities located approximately 30 km (Chippewas of Saugeen First Nation Reserve No. 29) and 80 km north of the Bruce nuclear site (Cape Croker Reserve No. 27) (Bruce

Power, 2021). Traditional hunting-ground reserves used by members of the First Nations communities are located approximately 115 km north of the Bruce nuclear site (Bruce Power, 2021).

Other Indigenous communities near the Site include the Georgian Bay Métis Nation of Ontario and the Historic Saugeen Métis. The Georgian Bay Métis Nation of Ontario acts as a representative organization that aims to protect and assert Indigenous culture and treaty rights across Ontario (Bruce Power, 2021). The Historic Saugeen Métis Community is located at the mouth of the Saugeen River in Southampton, approximately 25 km north on Lake Huron (Bruce Power, 2021).

In 2019, Bruce Power commenced individualized diet surveys in collaboration with First Nations and Métis communities in the area. The ultimate goal of the survey is to develop and refine receptor characteristics to better represent the behaviours and diet of Indigenous communities. The results of this study are not yet available for the current Environmental Risk Assessment, but are expected to be available for future updates.

For the purposes of the HHRA, the generic hunter/fisherman resident (BHF1) is considered to be representative of Indigenous peoples living a traditional subsistence lifestyle near the Bruce nuclear site. Comparisons between the highest total annual dose received by the BHF1 receptor and the highest total annual dose received by the critical receptor group in the same year, and the public dose limit, are presented in Table 3-8.

Table 3-8: Total Annual Dose to BHF1 Receptor and Comparison with Public Dose Limit and Critical Receptor Doses

Year	Total Dose to BHF1 (µSv/year)	BHF1 Age Group	Total Dose to Critical Receptor Group (µSv/year)	Critical Receptor Group	Public Dose Limit (µSv/year)	BHF1 Percent of Public Dose Limit	BHF1 Percent of Critical Group
2017	9.96E-01	Adult	2.12E+00	BSF3 (10-year-old)	1.00E+03	0.10%	47.0%
2018	6.08E-01	Adult	1.67E+00	BSF3 Infant	1.00E+03	0.06%	36.4%
2019	4.77E-01	Adult	1.50E+00	BF14 Adult	1.00E+03	0.05%	31.8%
2020	5.53E-01	Adult	1.76E+00	BSF3 Adult	1.00E+03	0.06%	31.4%

Note: Data is obtained from (Bruce Power, 2018, 2019, 2020, 2021)

Indigenous peoples practicing a traditional way of life near the Bruce nuclear site are expected to receive doses that are far lower than doses received by the potential critical groups. As shown in Table 3-8, the dose to the Generic Hunter/Fisherman resident (BHF1) is a fraction of the public dose limit and is well below the total dose to the identified critical receptor group over the assessment period (BSF3 and BF14). Therefore, there are no expected radiological effects to Indigenous communities in the vicinity of the Bruce nuclear site.

3.3 Assessment of Non-Radiological Impact

3.3.1 Screening Criteria

The non-radiological substances in different environmental media, including air, surface water, soil, sediment and groundwater, were screened to identify COPCs. The screening criteria are composed of applicable federal or provincial human health-based guidelines. In cases where guidelines were unavailable from government or other regulatory agencies, modified toxicity values from peer-reviewed academic literature were developed to be used as screening criteria. The guidelines used are specified in the following screening processes.

3.3.2 Air

Non-radiological substances, such as nitrogen oxides (NO_X), particulate matter (PM), carbon monoxide (CO), volatile organic compounds (VOCs), trace metals, and dioxins & furans, could be released to air as a result of operation of the facilities at the NSS-W. The airborne emission sources have been identified at the NSS-W, as listed below (OPG, 2017b, 2018a, 2019, 2020, 2021):

- Incinerator main stack;
- Lime silo filer vent;
- Incinerator building truck bay roof exhaust;
- Incinerator building HEPA filter exhaust;
- UFDSB active ventilation stack;
- UFDSB drain plug welding;
- UFDSB paint bay vent;
- Transportation package maintenance building;
- Incinerator emergency vent; and,
- Laboratory QA/QC fume hood.

To assess the airborne emissions of non-radiological COPCs from the NSS-W, modelling and calculations of airborne emissions have been conducted as documented in NSS-W Emissions Summary and Dispersion Modelling Reports (OPG, 2017b, 2018a, 2019, 2020, 2021). In these reports, the emissions from various sources were modelled using the programs AERMOD and AERMET. The impact of contaminant emissions was assessed within the ESDM reports by comparing point-of-impingement (POI) concentrations estimated from emission rates to POI exposure benchmarks listed in the MECP publication: Air Contaminants Benchmarks (ACB) List: Standards, guidelines, and screening levels for assessing point of impingement concentrations of air contaminants (the 'ACB list'). The ACB list encompasses the air standards set out in Ontario Regulation (O. Reg.) 419/05, as well as a broader list of additional benchmarks further intended to aid facilities in preparing ESDM reports. Modelled POI concentrations were compared to respective MECP POI benchmarks with corresponding averaging periods, typically ½-hour, 24-hour, or annual averages.

As shown in Table 3-9, all non-radiological substances are well below MOE's POI limits, which are all health-based limits, and are therefore negligible, and not assessed further. Therefore, no non-radiological airborne substances have been identified as COPCs for further assessment.

Table 3-9: Non-Radiological Airborne Emissions and Concentration Estimates (OPG, 2017b, 2018a, 2019, 2020, 2021)

Parameter	Maximum Total Emissions (g/s)	Max POI Concentration (µg/m^3)	Averaging Period	MECP POI Limit (µg/m^3)	Regulation Schedule Number	% of MECP POI Limit	Carry Forward to Tier 2?
NO_X	3.46E-01	213.90	1 hr	400	Schedule 3	53%	No
	3.13E-01	47.61	24 hr	200	Schedule 3	24%	No
HCl	3.45E-02	6.70	1/2 hour	600	Schedule 6	1.1%	No
	1.35E-02	0.86	24 hour	20 / 200	Schedule 3/6	4.3% / 0.4%	No
Cr (VI)	2.00E-06	4.87E-04	1/2 hour	2.10E-01	Schedule 6	0.2%	No
	2.00E-06	1.09E-04	24 hour	7.00E-02	Schedule 6	0.2%	No
	2.00E-06	2.26E-05	Annual	1.40E-04	Schedule 3	16%	No
Chromium compounds (hexavalent forms)	9.23E-07	1.20E-04	1/2 hour	2.10E-01	Schedule 6	0.1%	No
	9.23E-07	5.06E-05	24 hour	7.00E-02	Schedule 6 and DAV	0.1%	No
	9.23E-07	1.07E-05	Annual	1.40E-03	Schedule 3 and AAV	0.8%	No
Benzo(a)pyrene [as a surrogate of total PAHs]	4.96E-08	6.42E-06	1/2 hour	1.50E-02	Schedule 6	0.0%	No
	4.96E-08	2.72E-06	24 hour	5.00E-03	Schedule 6 and DAV	0.1%	No
	4.96E-08	5.38E-07	Annual	1.00E-04	Schedule 3 and AAV	0.5%	No

Note:

Data obtained from (OPG, 2017b, 2018a, 2019, 2020, 2021)

MECP POI Limits were obtained from O. Reg. 419/05, Air Pollution – Local Air Quality.

AAV – Annual Average Values

DAV – Daily Assessment Values

3.3.3 Surface Water

Screening of non-radiological contaminants in surface water was conducted by comparing environmental concentrations against relevant screening criteria. The environmental concentrations of non-radiological contaminants were determined during the monitoring programs described in Section 1.1.2.2. Specifically, surface water was collected for assessment of non-radiological contaminants from multiple locations at the NSS-W during the 2020 and 2021 field campaign.

The general public does not have direct access to any surface waters on the NSS-W site. However, they may be exposed to surface waters that run-off into the nearby receiving waterbody, Baie du Doré or directly within Lake Huron. The water concentrations of any contaminants reaching this waterbody are expected to be diluted by a factor of 20 (AMEC NSS, 2011b). For the purposes of this initial screening assessment, the measured on-Site concentrations were conservatively used with no dilution factor assumed.

Prior to screening, the NSS-W site was divided into two exposure areas. The first area ("SRD") was composed of a grouping of sampling locations which include GS-1, Location B, SRD-1, SRD-2, SRD-3, SRD-4, SRD-5, Stream C Confluence, Stream C DS, Stream C US, WTL-1, and WTL-2. The second area ("WD") was composed of a second grouping of sampling locations, namely WD-1, WD-2b, and WD-3. Sampling locations were grouped in this way to determine the concentrations of non-radiological contaminants along the two distinct flow pathways at the NSS-W, one towards the south railway ditch and the other towards the west ditch.

In addition, concentrations of unique dioxin and furan congeners were standardized and synthesized under one parameter (2,3,7,8-tetra CDD equivalent) in order to assess the environmental fate and toxicity of all dioxin and furan congeners under one collective variable. This method involves multiplying the concentration of each dioxin/furan congener by a unitless fraction called a toxic equivalency factor (TEF) to determine a toxic equivalent (TEQ) concentration. This expresses each congener concentration as an equivalent concentration of 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-tetra CDD). The TEQs of each dioxin/furan congener are summed together to determine a final concentration of 2,3,7,8-tetra CDD that represents the toxicity of the entire dioxin/furan mixture measured at the NSS-W. The following TEFs were used by CCME (CCME, 1999, 2001a, 2016) (adopted by WHO (2005) and sourced from van den Berg et al. (1998)):

Table 3-10: Toxic Equivalency Factors of Dioxin/Furan Congeners

Dioxin and Furan Congener	TEF
1,2,3,4,6,7,8-Hepta CDD	0.001
1,2,3,4,6,7,8-Hepta CDF	0.01
1,2,3,4,7,8,9-Hepta CDF	0.01

Dioxin and Furan Congener	TEF
1,2,3,4,7,8-Hexa CDD	0.5
1,2,3,4,7,8-Hexa CDF	0.1
1,2,3,6,7,8-Hexa CDD	0.01
1,2,3,6,7,8-Hexa CDF	0.1
1,2,3,7,8,9-Hexa CDD	0.01
1,2,3,7,8,9-Hexa CDF	0.1
1,2,3,7,8-Penta CDD	1
1,2,3,7,8-Penta CDF	0.05
2,3,4,6,7,8-Hexa CDF	0.1
2,3,4,7,8-Penta CDF	0.5
2,3,7,8-Tetra CDD	1
2,3,7,8-Tetra CDF	0.05
Octa CDD	0.0001
Octa CDF	0.0001

Selection of the applicable surface water screening criteria followed the hierarchical decision-tree presented in. The maximum measured environmental concentrations of non-radiological contaminants were compared to screening criteria from the following sources, in order of preference:

- The most conservative value between:
  - Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada, 2019); or,
  - Ontario Regulation 169/03: Ontario Drinking Water Quality Standards (MECP, 2003); or,
  - Groundwater Component Values (GW1) for a Potable Water Scenario in coarse textured soils derived from Ontario Regulation 153/04: Records of Site Condition (MECP, 2011b); or,
- Guidelines available from other reputable jurisdictions:

- British Columbia Ministry of Environment (BC MOE) Source Drinking Water Quality Guidelines (US EPA, 2020); or,
- United States Environmental Protection Agency (US EPA) 2018 Edition of the Drinking Water Standards and Health Advisories Tables (US EPA, 2020); or,
- US EPA Regional Screening Levels (RSLs) for tap water (target hazard quotients (THQ) of 0.1) (US EPA, 2020); or,
- World Health Organization (WHO) Guidelines for Drinking Water, Chapter 9 – Radiological Aspects (WHO, 2020); or,

- Modified toxicity values available from other sources:
  - WHO International Programme on Chemical Safety & WHO Task Group on Environmental Health Criteria for Titanium (WHO, 1982); or,
  - Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Cesium (ATSDR, 2004).

Selected human health screening criteria are shown in Figure 3-5.

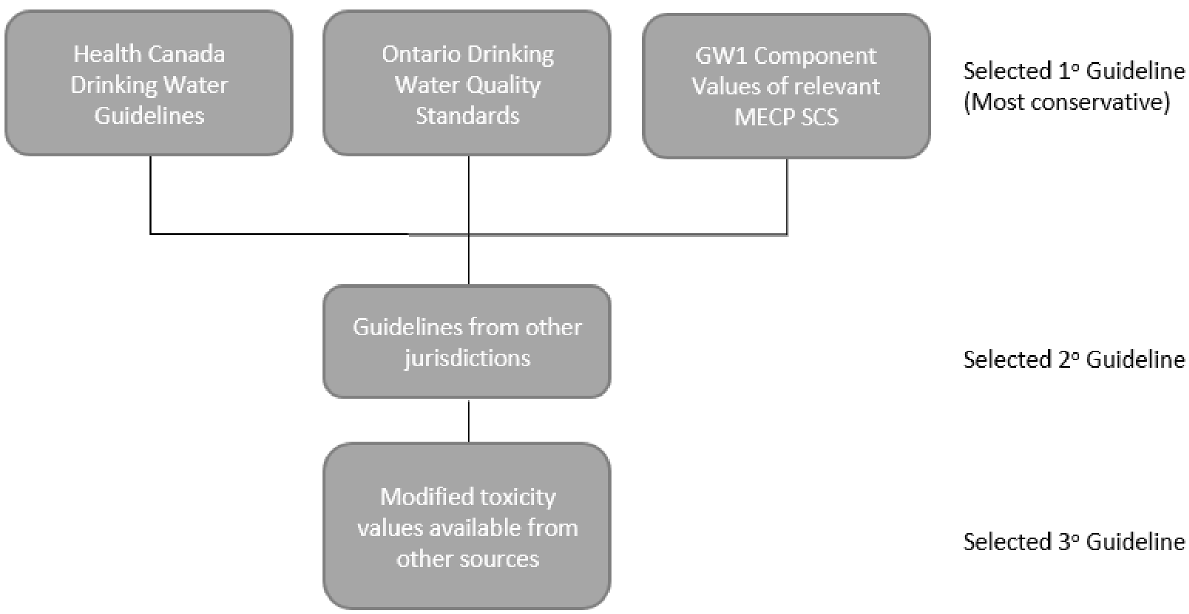


Figure 3-5: Hierarchy of Screening Criteria for Non-Radiological COPCs in Surface Water

Non-radiological contaminants with maximum concentrations exceeding the relevant human health screening criteria were carried forward as COPCs in the risk assessment. Based on initial screening results, iron, manganese, sodium, and zirconium were found to exceed the respective screening criteria in both sampling group locations.

The Health Canada guideline of 120 µg/L was derived from health-based effects for manganese. As no Health Canada guideline or Ontario drinking water standard exists for zirconium, the U.S. EPA Regional Screening Level (RSL) value of 0.16 µg/L in tap water (based on a non-carcinogen target hazard quotient (THQ) of 0.1 for a child) was used as the screening value.

The drinking water guidelines for sodium and iron are based on aesthetic objectives such as taste, odour and colour (BC MOE, 2020; Health Canada, 2012). These guidelines do not represent concentrations above which adverse health effects are expected to occur. As these metals are not considered to pose any risk to human health in drinking water, sodium and iron are not carried forward as COPCs in the risk assessment. Therefore, only manganese and zirconium were considered as human health COPCs in surface water and are considered further in the following section.

3.3.3.1 Secondary Screening of Surface Water

The concentrations of manganese and zirconium used in the primary screening represent the concentrations measured within the SRD and West Ditch. Humans are only exposed to surface water sourced from the SRD and WD once it has reached Lake Huron. The SRD discharges into Stream C and eventually Baie du Doré. OPG calculated a dilution factor of 20 (OPG, 2003) to represent the amount of dilution the surface water concentrations at the SRD experience before it reaches the outer bay. This is a conservative assumption as Scott Point receptors obtain their drinking water outside the outer bay and within the main body of Lake Huron. This dilution factor also considers the ingestion of fish which are also conservatively assumed to be within the outer bay of Baie du Doré.

OPG (2003) determined that the dilution of Stream C water travelling with the Lake Huron current beyond the outer bay is represented by a dilution factor of 43. This value is conservative for the West Ditch since its maximum flow is 9.2 m/s, as compared to 50 L/s assumed for Stream C.

Thus, a dilution factor of 20 was selected to be applied to the surface water concentrations from the SRD sample location group and a dilution factor of 43 was selected for the West Ditch sample location group.

A secondary screening of the surface water COPCS was then completed in this HHRA after applying the appropriate dilution factor to the concentrations (Table 3-11).

Table 3-11: Secondary Screening of COPCs in Surface Water

COPC	Concentration with Dilution Factor Applied (µg/L)		Screening Criteria (µg/L)	Carried Further in HHRA?
	SRD	West Ditch		
Manganese	19.9	4.8	120	No
Zirconium	0.01	0.009	0.16	No

Note: A dilution factor of 20 was applied to the concentrations from the SRD group
A dilution factor of 43 was applied to the concentrations from the West Ditch group

The concentrations of manganese and zirconium did not exceed their health-based criteria once the appropriate dilution factor is applied to represent the point of exposure. Therefore, manganese and zirconium are not carried forward for further quantitative assessment in this HHRA.

3.3.4 Soil

Workers, contractors and authorized visitors on-Site at the NSS-W may potentially be exposed to soil contaminants; however, these exposures are assumed to be mitigated through the Health and Safety Management System Program outlined in Section 3.1.1. The general public has no direct access to soils at the NSS-W. It is unlikely for off-Site human receptors to be exposed to non-radiological contaminants in soil. As the exposure pathway is considered incomplete, there is no expected risk to off-Site human receptors.

Standard operations at the NSS-W facility could potentially impact off-Site soils through the emission and subsequent deposition of airborne contaminants. Consistent with the 2016 NSS-W ERA, the results of the updated screening assessment for non-radiological airborne COPCs (Table 3-9) demonstrate that concentrations of airborne COPCs do not exceed MECP POI limits. Furthermore, there will be significant dilution due to air dispersion before the airborne contaminants deposit to the location where off-Site receptors reside. Any releases from NSS-W and subsequent off-site deposition of non-radiological particulates (metals) will be lost against the background soil levels. Therefore, it is expected that the contamination of off-Site soil resulting from airborne emissions is negligible.

Given that there is no complete exposure pathway between potentially contaminated soils and human receptors, and that air deposition to off-Site soil is considered negligible, no screening criteria were developed for non-radiological contaminants in soil.

Soil has been considered in the ecological risk assessment.

3.3.5 Sediment

Workers, contractors and authorized visitors on-Site at the NSS-W facility may potentially be exposed to sediment contaminants; however, these exposures are assumed to be mitigated through the Health and Safety Management System Program outlined in Section 3.1.1. The general public has no direct access to on-Site sediments at the NSS-W facility. Off-Site human receptors may be exposed to sediment during recreational activities such as swimming and fishing in Lake Huron. However, other than Baie du Doré, the majority of Lake Huron that would receive drainage from the NSS-W is considered non-depositional and exposure to sediment would be negligible. Additionally, as indicated in Section 3.3.3.1, concentrations of any constituents in water would be diluted by a factor of 20 as they enter Baie du Doré in Lake Huron. Based on this, and the occasional nature of human contact with sediment, sediment exposure would be minimal for any human receptor that may occasionally fish or swim in that area. As the exposure pathway is considered minimal, there is no risk to off-Site human receptors and no screening criteria were developed for sediment.

Sediment has been considered in the ecological risk assessment.

3.3.6 Groundwater

As part of implementation of CSA N288.7-15 at the NSS-W, Ecometrix prepared a groundwater conceptual site model to understand what the potential sources of contamination to groundwater may be, the contaminants of potential concern, groundwater end uses, and potential human and ecological receptors. Ecometrix (Ecometrix, 2021a) conducted a review of available documentation to determine if there were any areas of potential environmental concern (APEC) or contaminants of potential concern (COPC). In accordance with Clause 6.2.2.3 of CSA N288.7-15, this review of potential sources of contamination included:

a) *history of the site's surface and subsurface development*

b) *any COPCs used in operations, stored on site or transported on site with a potential to migrate in groundwater, as well as the volume and concentration or activity of liquids used;*

c) *the locations where these COPCs were used, stored, or transported on the site; and*

d) *records of past anomalous events that did or could have led to the subsurface release of COPCs*

In addition to this review, (Ecometrix, 2021a) also reviewed available groundwater monitoring data at the NSS-W and RWOS1 and did not identify any non-radiological COPCs that require further assessment within this HHRA.

3.3.7 Summary

A summary of COPCs identified from the screening of non-radiological parameters are presented in Table 3-12. None of the identified COPCs were retained for further analysis.

Table 3-12: Non-radiological COPC Screening Results – Human Health

Parameter	Max Concentration (µg/L)	Sample Group and Location	Screening Criteria (µg/L)	Include in HHRA?
Surface Water				
Iron	329	SRD: Stream C Confluence	300 [a]	No [e]
	362	WD: WD-2b		
Manganese	398	SRD: SRD-1	120 [b]	No [f]
	208	WD: WD-1		
Sodium	608,000	SRD: SRD-3	200,000 [c]	No [e]
	821,000	WD: WD-1		
Zirconium	0.2	SRD: Location B	0.16 [d]	No [f]
	0.37	WD: WD-2b		

Notes:
[a] B.C. Source Drinking Water Quality Guidelines (BC MOE, 2020).
[b] Guidelines for Canadian Drinking Water Quality—Summary Table (Health Canada, 2019)
[c] MECP GW1 Component Value for potable water scenario in coarse textured soils (MECP, 2011b).
[d] U.S. EPA Regional Screening Levels (RSLs) for tap water (target hazard quotients (THQ) of 0.1) (US EPA, 2020).
[e] Parameter is not considered a human health risk.
[f] Excluded as a COPC following secondary screening of surface waters.

3.4 Assessment of Impact of Noise

Noise is the only physical stressor to be considered for the HHRA, which is consistent with CSA N288.6-12 (CSA, 2012). The results of the assessment reported in the 2016 ERA (AMEC, 2016a) are presented below, along with results from a noise assessment conducted in 2017.

3.4.1 Assessment Criteria

The criteria specified in the following document are used for the noise assessments:

- Ontario Ministry of the Environment, "Environmental Noise Guideline Stationary and Transportation Source – Approval and Planning" Publication NPC-30016, August 2013 (MECP, 2013).

For the purposes of this assessment, the exclusionary noise limits in one-hour equivalent sound level (LEQ, 1 h) for a Class 3 (rural) area at an outdoor point of reception are identified in. Table 3-13. With respect to applying the NPC-300 noise criteria in Table 3-13, it is the independent impact of the facility under consideration that is compared to the noise criteria, and not the combined effect of multiple industrial facilities. Therefore, this is typically assessed using the modelled noise impact of a given facility to determine its independent noise impact at a given noise sensitive receptor location.

Table 3-13: Noise Limits for the Baseline HHRA

Time of Day	Class 3 Area (L_{EQ}, 1 h)
07:00 – 19:00 (daytime)	45 dBA
19:00 – 07:00 (nighttime)	40 dBA

The exclusionary limits defined in Table 3-13 are considered significant impacts when exceeded, due to community annoyance. They are sufficiently quieter than hearing loss criteria (e.g. 85 dBA), and exceedance of these Table 3-13 noise criteria are not considered an adverse effect on human health.

3.4.2 Assessment of Field Measurement

Noise baseline measurements were conducted for a 7-day period from November 24, 2016 to December 1, 2016. Three residential locations were selected for monitoring as the nearest points of reception (POR):

- R1 is a residential house located on Concession Road 2, east of Albert Road, approximately 2424 m southeast from the NSS-W facility
- R2 is located at the intersection of Cayley Street and Willington Street, 3218 m southwest from the NSS-W
- R3 is located on Tie Road towards the end of Baie du Doré Road, 2356 m northeast of the NSS-W

This investigation was the most recent noise assessment completed at the site.

The monitoring locations are illustrated in Figure 3-6. These are at the noise impact locations R1, R2 and R3 as discussed above.

Figure 3-6: Sampling Locations for Noise Assessment

The minimum measured noise values are summarized in Table 3-14 below.

Table 3-14: Minimum Measured Ambient Sound Level Summary

Location	Descriptor	Minimum Measured Sound Level dBA (1 hour)	Area Classification (based on minimum measured level)
POR1 Residence southeast of NSS-W (2.4 km)	L_{eq}	31	Class 3
	L_{90}	27	
POR2 Residence southwest of NSS-W (3.2 km)	L_{eq}	33	
	L_{90}	32	
POR3 Residence northeast of NSS-W (2.4 km)	L_{eq}	27	
	L_{90}	25	

Note: L_{eq} – Equivalent continuous sound level
L_{90} - Sound level exceeded 90% of the time
Data obtained from 2018 acoustic assessment (OPG, 2018b)

Based on the 1-hour minimum measured sound levels (L_{eq} and L_{90}) the NSS-W was classified as a Class 3 site, confirming that the exclusionary limits in Table 3-13 are applicable for this Site.

3.4.3 Modelling of Noise Level

3.4.3.1 Noise Modelling

Noise emissions from the Bruce nuclear site were initially documented in Bruce Nuclear Power Plant Project Environmental Assessment EIS Studies Air Quality and Noise Technical Support Document (Golder, 2008) and were updated in the 2016 ERA (AMEC, 2016a); however, noise measurements have been revised to provide a 2018 noise level reference (OPG, 2018b).

The following significant noise sources were identified within the 2018 noise assessment and were included in the noise prediction model:

- Main incinerator stack and incinerator emergency vent;
- HEPA Exhaust and HEPA inlet damper;
- DSF Ventilation Stack, exhausts and generator;
- Amenities exhaust;
- TPMB Ventilation exhaust;
- SGSB Exhaust;
- Exhausts from LLSB #11-#14;

- EQCB Exhaust; and,
- Compressor inlet damper and exhaust.

The noise sources were modelled based on the sources listed above. In the absence of NSS-W equipment sound power levels, they were estimated based on typical manufacturer's data sheets and/or the database for similarly sized units. The over-all sound power levels of the noise sources at the Bruce nuclear site were also considered in the assessment.

Noise impacts from the NSS-W, on the surrounding human receptor locations, were predicted using the CadnaA software package, published by Datakustik GmbH. The software is configured to implement the ISO 9613-2 environmental noise propagation algorithms (ISO, 1996). It has been widely accepted for evaluating noise and is an accepted model by the MECP. The model takes the following factors into account:

- source sound levels;
- source directivity;
- distance attenuation;
- source-receptor geometry including heights and elevations;
- barrier effects of the building and surrounding topography;
- ground and air (atmospheric) attenuation; and
- meteorological effects on noise propagation.

Noise sources are characterized by entering the sound power and/or sound pressure level associated with each source. Other parameters including building dimensions, frequency of use, hours of operation, and enclosure attenuation ratings also define the nature of sound emissions.

The ISO 9613-2 prediction method is conservative as it assumes that all receptors are downwind from the noise source or that a moderate ground-based temperature inversion exists. In addition, ground cover and physical barriers, either natural (terrain-based) or constructed and atmospheric absorption are included.

3.4.3.2 Noise Receptors

In addition to the three residential receptors monitored for ambient noise measurements, two additional locations were modelled using the CadnaA software package. The modelled receptor locations and predicted noise levels are shown in Figure 3-7. A closer view of the sound levels at the source locations is shown in Figure 3-8.

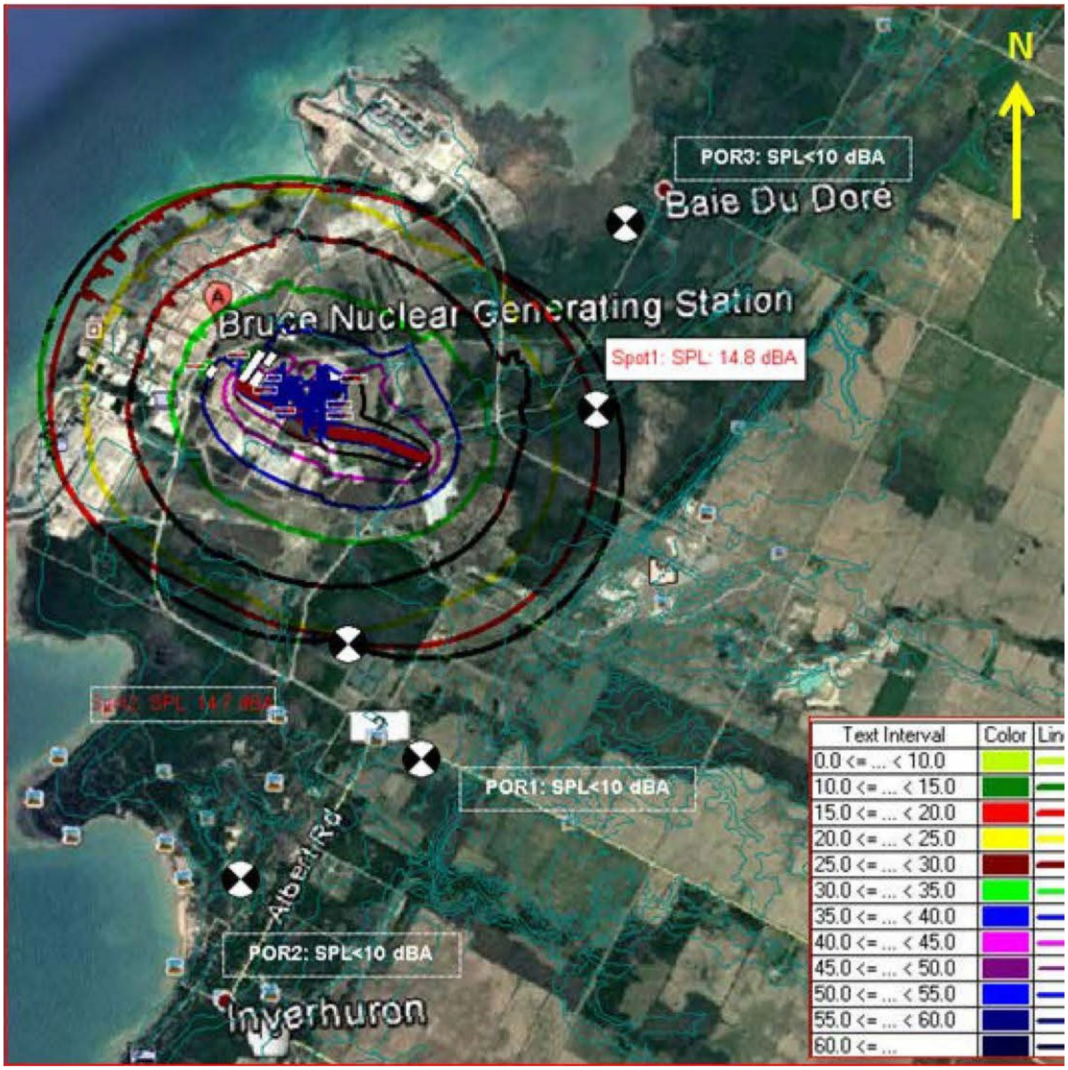


Figure 3-7: Predicted Sound Levels at Receptor Locations

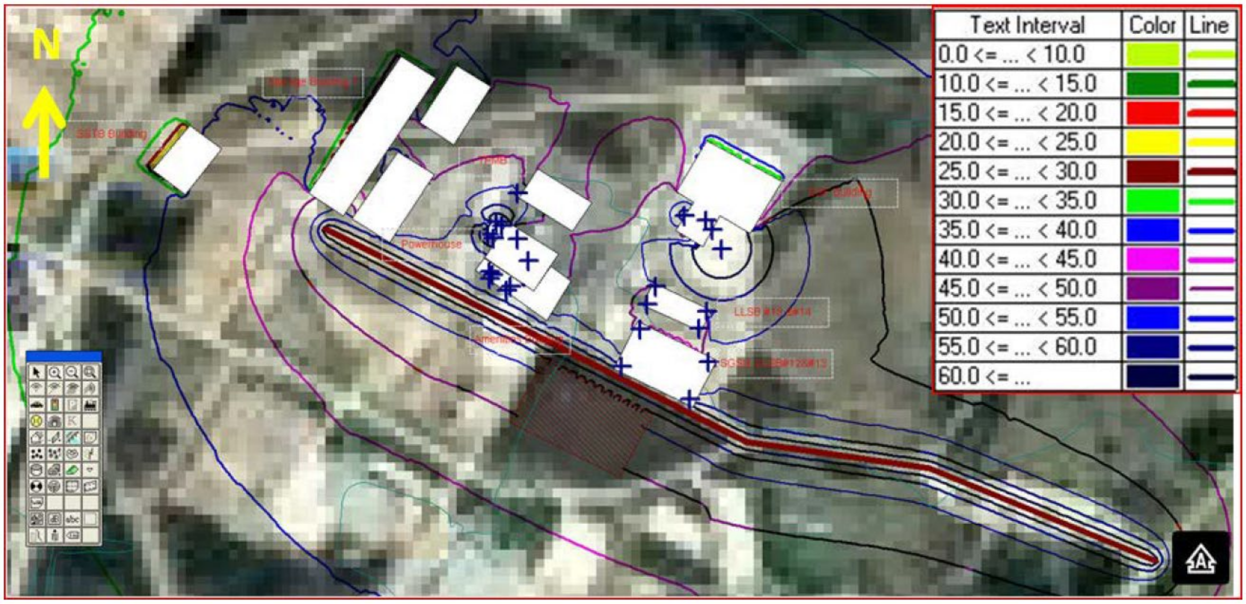


Figure 3-8: Expanded View of the NSS-W CadnaA Model Noise Source Locations

3.4.4 Noise Results and Discussion

The modelled noise levels as part of this HHRA represent the operational impact from the NSS-W and other sources on the Bruce nuclear site. The noise levels modelled from the existing facility noise sources are summarized in Table 3-15.

Table 3-15: Modelled Noise Levels at Receptor Locations Contributed by Existing Facilities

Receptor Description	Receptor ID	Modelled Day/Night Noise Levels L_{EQ}, 1hr dBA	MECP Day/NightNoise Level Limits L_{EQ}, 1hr dBA
		NSS-W	
POR1–	R1	<10/-88	45/40
POR2–	R2	<10/-88	45/40
POR3–	R3	<10/-88	45/40
PORSpot1	Spot 1	14.8/17.4	45/40
PORSpot2	Spot 2	14.7/17.3	45/40

The modelled noise levels at the receptor locations from the existing NSS-W operation are less than 20 dBA, which are well below the applicable MECP NPC-300 noise level limits and meet the acceptable noise criteria for human receptors.

When modelled noise levels are compared to the ambient measurements completed in November 24 to December 1, 2017 (see Table 3-14) the following can be noted: At receptor R1, R2 and R3, the predicted noise levels (<10/-88 dBA) are lower than the ambient measurements (31 dBA, 33 dBA and 27 dBA, respectively), which indicates that there are other noise sources in the area (e.g., traffic) that may influence the measurements.

Noise modelling completed for the existing conditions shows that the noise level from the operation of the NSS-W meets the MECP noise criteria. As such, it can be concluded from the noise modelling results that the current noise levels from NSS-W operation pose no adverse effects to human health.

3.5 Risk Characterization

Based on the screening level risk assessment, which takes into account the contamination of different media including air, surface water, soil, sediment, and groundwater, non-radiological contaminants resulting from the operation at the NSS-W pose no adverse effects to human health. No additional assessment is required.

For the radiological emissions, the dose to the critical group as the result of operation of all nuclear facilities at the Bruce nuclear site is less than 3 μSv/a, representing approximately 0.3% of the public dose limit. The public dose arising from NSS-W operations is a small fraction of this value since NSS-W radiological emissions are no more than 1.2% of the combined site emissions. Therefore, there are no adverse radiological effects to human health due to the operation of the NSS-W.

For noise, the analysis of the modelling results shows that noise levels from the operation of the NSS-W, are compliant with the NPC-300 for all locations and time periods. Therefore, it can be concluded that the operation of the NSS-W poses no adverse effects to human health.

3.6 Uncertainty Associated with Human Health Risk Assessment

Uncertainty could be introduced into the risk assessment during the process of screening, exposure assessment and risk characterization. The uncertainty can be minimized through the analysis of sources and historic trends, along with the use of conservative assumptions throughout the risk assessment, to ensure that human health is protected. A qualitative analysis of the uncertainty associated with the HHRA is presented below.

For the radiological risk assessment, the site monitoring data were used along with the use of modeling results where monitoring data are not available. The computer code used for the dose calculation, including the value of the parameters for the embedded models, is in line with CSA standard N288.1-20. Using conservative assumptions, the calculated doses are only a small percentage of the regulatory dose limit.

The screening of non-radiological contamination was carried out based on the comparison of up-to date site monitoring data to screening criteria. In this process, the maximum concentrations of non-radiological substances in different media based on field measurement or modelling are used. The main source of uncertainty in the calculation of POI air concentrations is associated with the use of dispersion factors as provided in Table B-1 of MECP's procedure for preparing an emission summary and dispersion modelling program (MECP, 2016). Dispersion of contaminants can be influenced by a number of factors including; terrain, land use, localized facility layout and localized wind patterns. Locations may not be fully indicative of an urban or a rural land use. As such the dispersion factors presented do not necessarily reflect the site-specific dispersion characteristics of the NSS-W area. However, the screening calculation of POI air concentrations is considered conservative and acceptable by the MECP in excluding contaminants from further modelling assessment at site-specific scale.

Furthermore, the most restrictive guidelines from reputable sources, if applicable, were adopted as the screening criteria for the assessment. This will ensure that the conclusion of the screening assessment is valid, with a high level of confidence.

Taken together, these approaches have ensured that the risk characterization has been undertaken in a manner that has not underestimated risk; the resulting hazard quotients are either overestimates or realistic estimates of risk, both of which are considered acceptable.

There is uncertainty in both the noise measurements and the noise modelling. Sound level monitoring units generally have a measurement error of within +/- 1 dB. For noise modelling, the assessment of source sound levels and the locations of these sources represent the greatest sources of uncertainty. For this assessment, the modelling relied on manufacturer and reference data for the NSS-W sources, and the simplified noise source modelling of the Bruce nuclear facilities as provided in previous EAs. An element of uncertainty in the noise modelling is in the sound propagation methodology and assumptions on wind direction, ground and air absorption, barrier buildings, reflections and topography. However, the measurements and modelling results are reasonably correlated, and there is conservatism in the modelling; therefore, it is expected that the uncertainty associated with the noise levels has no impact on the conclusions.

In summary, the assessment methods and the conservative assumptions used for the HHRA ensure that the actual risks are not underestimated. Therefore, the uncertainty associated with the assessment has no impact on the conclusions of the HHRA.

A probabilistic risk assessment to quantify uncertainty in the risk estimate has not been performed and is not considered necessary, since it is not likely to provide a better basis for risk management/decision making. According to CSA N288.6 (CSA, 2012), a qualitative or semi-quantitative evaluation of uncertainty is considered sufficient for evaluation of uncertainty.

4.0 Ecological Risk Assessment

4.1 Problem Formulation

4.1.1 Receptor Selection and Characterization

4.1.1.1 Selection of VECs and Indicator Species

It is not practical to assess the radiological or non-radiological dose to each species residing on the Bruce nuclear site at the NSS-W and vicinity. For the purpose of the EcoRA, the Valued Ecosystem Components (VECs) were chosen for the NSS-W and vicinity, which are elements of the environment that have scientific, economic, social or cultural significance and which may have potential exposure to contaminants due to the operation of the NSS-W. VECs were determined based on a review of the 2016 ERA (AMEC, 2016a), which considered previous EAs for the DGR and the NSS-W (AMEC NSS, 2011a; SENES, 2005), along with a desktop review of the NHIC Make a Map feature (MNRF, 2019). The previous ERA and EAs incorporated inputs from various technical disciplines and from regulators and members of the public. Photographs of the NSS-W site can be found in Section 2.2.

In order to determine the potential effect of radiological and non-radiological emissions on the environment, a smaller group of indicator species was chosen for risk assessment, in order to represent facility impact on the VECs. Indicator species were chosen based on at least one of the following criteria:

- They are reflective of the main exposure pathways, feeding habits, habitats, etc. on the site, and particularly those associated with the highest exposures;
- They are known to reside on the site, and therefore are potentially exposed to environmental effects from the NSS-W;
- They collectively represent the major plant or animal groups, and different trophic levels, and all important exposure pathways;
- They are particularly sensitive to stressors;
- They occupy a unique niche in the habitat or have a unique diet;
- They are ecologically significant, e.g., species at risk (SARs); or,
- They have a special socio-economic importance or value, e.g., due to their economic value or cultural importance.

Table 4-1 shows the comprehensive list of VECs selected for this EcoRA, as well as their indicator species and the rationale for their selection.

Table 4-2 shows a summary of the indicator species chosen to represent the various VECs, and to represent particular SARs.

The indicator species are the species for which risk is assessed in the EcoRA. The exposure pathways that have been considered for these species are addressed in Section 4.1.1.2. A detailed description of each indicator species has been provided in Appendix B.

Table 4-1: VECs and Indicator Species for the EcoRA

Class	VEC	Indicator Species	Rationale
Terrestrial Vegetation	Trees	Eastern White Cedar	An abundant tree species in the OPG retained lands. The eastern white cedar is slow growing, and plays an important role in providing conditions that support wildlife habitat and presence of plant species. The eastern white cedar is preferred by white-tailed deer for both shelter (OPG, 2018b)r and as an important food source in the winter, and is also used by such animals as snowshoe hare, porcupine and red squirrel. As a coniferous plant, the eastern white cedar may be more susceptible to foliar damage from changes in air quality. The Butternut is a tree species that is classified as Endangered under SARO and Threatened under Federal SARA Schedule 1 (Table 2-7). The Eastern White Cedar is selected as an indicator species.
	Graminoids (grasses,sedge, and rushes)	Grass	Graminoids are abundant within the Terrestrial Monitoring Study Area (the area that was surveyed in 2014 to characterize the Terrestrial baseline) and during the 2020-2021 field sampling program, and are representative of a ground cover species and are chosen to assess the effects associated with vegetation loss and radiological and non-radiological emissions on understory vegetation. Ground cover provides food and shelter for a variety of species and is relevant in the maintenance of a healthy ecosystem. Tissue samples were collected.

Class	VEC	Indicator Species	Rationale
Aquatic Vegetation	Aquatic Vegetation Community	Cattail	Aquatic vegetation provides a source of shelter and food for aquatic species. It assists in water quality and provides an indication of habitat quality. Common cattail is a native emergent wetland species which grows intermittently in drainage ditches and remnant pools on the OPG retained lands. Cattail is known for its ability to filter wastewater, which may lead to pollutant (including heavy metals) accumulation in the plant tissues. It is used by red-winged blackbird for nesting and by muskrat as a primary food source and as a shelter material. It can be used to assess the effects of both radiological and non-radiological emissions, in particular those to the surface water environment, on vegetation. Tissue samples have been collected.
Terrestrial Invertebrates	Terrestrial Invertebrates	Earthworm	Soil invertebrates such as earthworms, grubs, arthropods, etc. are present on the OPG retained lands. Invertebrates provide a food source to mammals and birds and the community can reflect the health of the environment. The caterpillar stage of the Monarch Butterfly is an invertebrate that is exposed to soil similarly to the earthworm. This species is classified as Threatened under Federal SARA Schedule 1 (Table 2-7).
	Insects	Bee	Insects are important to all ecological environments. As pollinators, bees are an ecologically important insect species. They live wherever there are flowers to feed on and are therefore likely present on site.

Class	VEC	Indicator Species	Rationale
			Bees are used as an indicator for flying insects.
Aquatic Invertebrates	Benthic Invertebrates	Benthic Invertebrate (Digger Crayfish)	Aquatic invertebrates living on or in sediment. Aquatic invertebrates are an important food item for many species of fish and waterfowl. Benthic invertebrates are used to provide an indication of habitat quality in the drainage features at the OPG retained lands. Digger Crayfish is a species of interest to the community based on its limited geographic distribution. Terrestrial crayfish habitats were evaluated as "significant" based on the criteria outlined in the Significant Wildlife Habitat Technical Guide (SWHTG) (MNRF, 2000) and the associated criteria schedules. Digger crayfish burrows have been seen on the NSS-W during the most recent baseline monitoring surveys. The indicator species that is representative of the crayfish are benthic invertebrates.
Fish	Bottom Feeding Fish	Northern Redbelly Dace	Northern Redbelly Dace are an indicator of the small-bodied fish community (productivity). They inhabit the West Ditch, are common in wetland conditions, cool/warm water tolerant, and have an affinity for organic substrates and aquatic vegetation.
		Smallmouth Bass	The Smallmouth Bass is a warm water near shore species in Lake Huron. The species is important to the recreational fishery and feeds on several trophic levels as an omnivore (benthic invertebrates, crayfish, and fish). The species is sensitive to changes in near shore habitat (physical, chemical and thermal).

Class	VEC	Indicator Species	Rationale
			The Spottail Shiner is common in Lake Huron near shore areas within the study area and is an important source of food for predatory fish and is used as a baitfish by anglers. The indicator species that is representative of inshore and forage fish is the smallmouth bass.
	Pelagic Fish	Lake Whitefish	Lake Whitefish is an important species to commercial, recreational and Aboriginal fisheries. The Lake Whitefish has been chosen as the indicator species, given its relevance to the commercial fisheries. Deepwater Sculpin is a threatened species in the Great Lakes. These indicator species have been included in order to assess the potential impact of surface water contaminants from the NSS-W on species in Lake Huron, as surface water can migrate offsite.
Herpetofauna	Snake	Northern Water Snake	The northern water snake was most recently documented within the SRD in September 2013. The Queensnake was observed in a desktop review of the NHIC Make A Map Feature (MNRF, 2019) within the vicinity of the NSS-W as well. Queensnakes and Northern water snakes can be found in and around almost any permanent body of fresh water,rarely occurring far from shore. The northern water snake and Queensnake are important components of the aquatic and adjacent terrestrial ecosystems as they prey on fish and amphibians. The eastern ribbonsnake also lives in these habitats and primarily feeds on amphibians. The northern water snake has been chosen as the indicator species.

Class	VEC	Indicator Species	Rationale
	Frogs	Northern Leopard Frog	Northern Leopard Frogs were common throughout lowland (moist soils) and treed wetland habitats and represent a large component of the biomass within the lower trophic levels. As an amphibian, Northern Leopard Frogs are more vulnerable than birds and mammals to direct contact with airborne contaminants, water discharges and changes in soil quality. Since this species spends the majority of its adult life stage in terrestrial environments, it is susceptible to road-related mortality. Spring Peepers are common on the NSS-W, throughout lowland (moist soils) and treed wetland habitats and represent a large component of the biomass within the lower trophic levels. As a terrestrial amphibian, Spring Peepers are more vulnerable than birds and mammals to direct contact with airborne contaminants and changes in soil quality. Since this species lives in terrestrial environments, it is susceptible to road-related mortality. The Northern Leopard Frog has been identified as the indicator VEC. This species is assumed to conservatively represent dose and risk for the spring peeper as the increased wetlands and surface water exposure relative to the spring peeper is assumed to result in a higher dosage. Amphibian Wetland Breeding Habitats were also evaluated as “significant” based on the criteria outlined in the SWHTG (MNRF, 2000) and the associated criteria schedules.
	Turtles	Painted turtle	Both snapping turtles and painted turtles are present and have wintering habitat in the OPG retained lands, and have been observed in ponds on the NSS-W during the most recent baseline monitoring survey. Painted turtles have been chosen as the indicator species for turtles as this species forms the majority of the turtle population on site, based on the most recent survey.

Class	VEC	Indicator Species	Rationale
			Turtle Wintering Habitats were evaluated as "significant" based on the criteria outlined in the SWHTG (MNRF, 2000) and the associated criteria schedules. The spotted turtle is listed as endangered under SARO and SARA. The spotted turtle was recorded only within the Baie du Doré (Arcadis, 2019). A fish model (Lake Whitefish and Northern Redbelly Dace) is 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.
Birds	Wild Turkey	Wild Turkey	Wild turkey is a territorial omnivorous ground dwelling bird using deciduous forest habitat near open communities. Wild turkey is an important subsistence, cultural and recreational feature of the study areas that was nearly extirpated from Canada because of unrestrained hunting and habitat loss, but has been successfully re-established in southern Ontario through Ministry of Natural Resources and Forestry reintroduction and conservation efforts. This species over-winters within the area of the site (deciduous forest and coniferous swamp). This species can be used to assess the effects of habitat loss on ground dwelling game birds with larger territorial areas as well as noise disturbance associated with traffic, construction equipment, and increased human activity.
	American Robin	American Robin	The American Robin is particularly sensitive to COPCs in soil due to their high ingestion of earthworms. The American Robin has been identified at OPG retained lands. The American Robin lives in a variety of habitats, including woodlands, wetlands, suburbs, and parks. They forage on the ground in open areas, such as meadows or parkland. The Wood

Class	VEC	Indicator Species	Rationale
			Thrush are classified as Threatened under Federal SARA Schedule 1 (Table 2-7). This species also primarily forages for insects on the ground but is also known to feed on berries and other small fruits The Common Nighthawk, Bobolink, Eastern Meadowlark, Eastern Whip-poor-will, Eastern Wood Peewee, Golden-winged Warbler and Red-headed Woodpecker are also foraging species that feed on insects primarily and also include seeds and berries. These species were classified as Threatened under SARO and the Federal SARA Schedule 1 (Table 2-7). The Olive-sided Flycatcher is a flying insectivore with minimal exposure to soil based on its feeding habits. This species was classified as Threatened under Federal SARA Schedule 1 (Table 2-7). The American Robin is selected as an indicator species.
	Mallard	Mallard	The mallard is an omnivorous waterfowl species that has been observed at the Bruce nuclear site, utilizing stable shallow areasfor foraging and nesting. This omnivorous species primarily feeds on aquatic vegetation, seeds, acorns and grains, and occasionally on fish and other aquatic organisms. The mallard can be used to assess the effects of airborne and waterborne emissions that may, in turn, influence forage opportunities as well as noise disturbance associated with traffic,construction equipment, and increased human activity. The Rusty Blackbird is an omnivorous bird that forages for invertebrates that are associated with aquatic environments. They are also known to consume smaller aquatic species such as small fish and salamanders. This species was classified as Threatened under Federal SARA Schedule 1 (Table 2-7).

Class	VEC	Indicator Species	Rationale
			The Mallard is selected as an indicator species.
	Bald Eagle	Bald Eagle	The bald eagle is a carnivorous bird that preferentially eats fish. It has been identified as having a winter population on the Brucenuclear site. It is considered a socially important species. The least bittern was observed in the vicinity of the Site in the 2020 Biological Survey (Jalava, 2020) and is classified as Threatened under SARO and Federal SARA Schedule 1. The least bittern is a carnivorous species that is known to primarily consume fish. The bald eagle is chosen as the surrogate species for the least bittern.
Riparian Mammals	Small Mammals	Northern short-tailed shrew	The northern short-tailed shrew may or may not be present at the OPG retained lands. It has been selected as a representative species for small mammals. The northern short-tailed shrew is omnivorous and eats almost their own weight daily. Their diet includes ground-dwelling species (e.g., earthworms) and plant matter. They are common in areas with abundant vegetative cover and can be found in a variety of habitats. They are an important food source for birds of prey, foxes and coyotes. In the context of physical impacts, affects are not commonly assessed. This species can be used to assess the effects of airborne and waterborne emissions that may, in turn, influence forage opportunities. Between 2017 and 2021, the following terrestrial snake species have been observed at the Bruce Power Site: Dekay's Brown

Class	VEC	Indicator Species	Rationale
			Snake, Eastern Garter Snake, Red-bellied Snake and Smooth Green Snake (Bruce Power, 2022b). Dekay's brown snake, Red-Bellied snakes and Smooth Green Snakes primarily ingest soil invertebrates similarly to the Northern Short-Tailed Shrew. The scales of the snakes also provide some protection from dermal contact of constituents in soil as fur would for the Northern Short-tailed shrew. As a result, the Northern Short-tailed shrew would be an appropriate surrogate to assess these species. In addition, young Eastern Garter Snakes also ingest soil invertebrates. The Northern Short-Tailed Shrew is an appropriate surrogate for the Eastern Garter Snake in this critical life stage.
	Muskrat	Muskrat	The presence of the muskrat has decreased on the OPG retained lands and muskrat is now absent from the Terrestrial Study Area, as previously documented in the DGR EA (Golder, 2011b); however, it is known to be present elsewhere at the Bruce nuclear site. This herbivorous aquatic mammal has a limited home range and can occur in high densities in areas with appropriate food and shelter (i.e., cattail marsh). Muskrats can be used to assess the effects of emissions on local vegetation and surface water resources.
Terrestrial Mammals	Bats	Little Brown Myotis (Little Brown Bat)	The Little Brown Bat, Northern Myotis, Eastern Small-footed Myotis and Tri-Coloured Bat are all SAR (See Table 2-7). Each of these species are insectivorous. The Little Brown Bat is chosen as the indicator species to represent the bat populations.
	Herbivores	White-tailed Deer	Sustainable population of white-tailed deer, that overwinters in the coniferous forest cover and grazes in the fields and woodlands from spring to fall, are present on the Bruce nuclear site. Evidence that the deer population has influenced the

Class	VEC	Indicator Species	Rationale
			development of forested communities at the Bruce nuclear site through selective browsing. The white-tailed deer can be used to assess the effects of emissions that may, in turn, influence forage opportunities, the potential effects of road-related wildlife mortality within the Bruce nuclear site and noise disturbance associated with traffic, construction equipment, and increased human activity.
	Carnivores	Red Fox	The red fox was observed on the NSS-W during the most recent wildlife surveys. An active fox den was also observed on the site. It has been chosen as a representative species for carnivorous mammals. The Eastern Milk Snake was observed at the Bruce Power Site in 2021 only (Bruce Power, 2022b). The Eastern Milk Snake is also a carnivore and consumes rodents, small birds, small reptiles and on occasion, soil invertebrates. Limited information is available on terrestrial snakes to accurately model exposure and risk to on-site COPCs. However, given the similarity in diet between the red fox and the Eastern Milk Snake, the red fox is an appropriate surrogate to estimate risk to the Eastern Milk Snake.

Table 4-2: Summary of Representative Indicator Species

Class	Indicator Species
Aquatic Vegetation	Cattail
Aquatic Invertebrates	Benthic Invertebrates
Fish	Northern Redbelly Dace
	Smallmouth Bass
	Lake Whitefish
Terrestrial Vegetation	Grass
	Eastern White Cedar
Terrestrial Invertebrates	Earthworm
	Bee
Herpetofauna	Northern Leopard Frog
	Painted Turtle
	Northern Water Snake
Terrestrial Birds	Wild Turkey
	American Robin
Riparian Birds	Mallard
	Bald Eagle
Riparian Mammals	Muskrat
Terrestrial Mammals	Northern Short-tailed Shrew
	Little Brown Myotis (Little Brown Bat)
	White-Tailed Deer
	Red Fox

4.1.1.2 Considerations of Species at Risk

A review of all sensitive flora and fauna identified in Table 2-7 was performed against the COSEWIC list in additional to the Species at Risk in Ontario (SARO) list and Schedule 1 of the federal Species at Risk Act. To be conservative, if a species is listed as threatened or endangered by either COSEWIC, SARA, or SARO, this species is 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, the status of "Special Concern" is not listed in Table 4-3.

Exposure models for specific assessment of these species are typically lacking. Most of these species can be assessed by reference to surrogate species already selected as VECs for the

EcoRA. Detailed justifications for selections of each of the surrogate species, based on habitat, diet, and ecological niche considerations, are presented below.

Table 4-3: Surrogate Species for Identified Species at Risk (Threatened or Endangered Status Only)

Species	Status			Surrogate Species
	Provincial ESA	COSEWIC (Federal)	Federal SARA Schedule 1	
Barn Swallow	Threatened	-	No status	American Robin
Bobolink	Threatened	Threatened	No Status	American Robin
Butternut	Endangered	Endangered	Endangered	Eastern White Cedar
Common Nighthawk	-	-	Threatened	American Robin
Eastern Meadowlark	Threatened	Threatened	Threatened	American Robin
Eastern Small-footed Myotis	Endangered	Not at Risk	No status	Little Brown Myotis
Eastern Ribbonsnake	-	-	Threatened	Northern Water Snake
Eastern Whip-poor-will	Threatened	Threatened	Threatened	American Robin
Golden-winged Warbler	-	Threatened	Threatened	American Robin
Least Bittern	Threatened	Threatened	Threatened	Bald Eagle
Little Brown Myotis	Endangered	Endangered	Endangered	No surrogate, chosen as Indicator Species
Monarch Butterfly	-	Endangered	-	Earthworm
Northern Myotis	Endangered	Endangered	Endangered	Little Brown Myotis
Olive-sided Flycatcher	-	-	Threatened	American Robin
Queensnake	Endangered	Endangered	Endangered	Northern Water Snake
Red-headed Woodpecker	Endangered	Endangered	Endangered	American Robin
Spotted Turtle	Endangered	Endangered	Endangered	Lake Whitefish and Northern Redbelly Dace
Tri-Coloured Bat	Endangered	Endangered	Endangered	Little Brown Myotis
Wood Thrush	-	Threatened	Threatened	American Robin

Note:
"Special Concern" classification is not considered in this table; represented as "-" symbol.

Monarch is a milkweed butterfly. It is a migrating butterfly 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 more diverse habitats. Potential risk to Monarch is expected to be adequately assessed by Earthworm, as they are both terrestrial invertebrates. Both Earthworm and Monarch caterpillar are exposed to airborne emissions via soil. Earthworms dwell underground and receive more soil exposure. Therefore, using Earthworm to represent monarch caterpillar is conservative.

Butternut 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. Potential risk to this species is expected to be adequately assessed by reference to other terrestrial plant species such as the Eastern White Cedar, as they receive similar exposure to airborne emissions via soil.

Barn Swallows are aerial insectivores and feed over open areas such as fields, meadows, watercourses and waterbodies. Barn Swallow, in Ontario, typically nests in small openings in man-made buildings, such as barns. Barn Swallows are typically observed foraging over lawns, open field areas, wetlands and along the lakeshore.

Olive-sided Flycatcher is also an aerial insectivore. They are most often found along natural forest edges and openings where they typically hunt from foraging perches such as trees. Olive-sided Flycatchers' breeding habitat usually consists of coniferous or mixed forest adjacent to rivers or wetlands. Both the Barn Swallow and Olive-Sided Flycatcher are conservatively assessed by the American Robin in the EcoRA as the American Robin is assumed to ingest larger quantities of soil as it forages on the ground.

Eastern Meadowlark are omnivores which typically forage on or near the ground for insects, seeds and berries. Eastern Meadowlark also breeds in grasslands and prairie, as well as pastures and hay fields. The Eastern Meadowlark builds its nest on the ground, covered with a roof woven from grasses. The Golden-winged Warbler breed in shrubby habitats and also tend to occur in wetland habitats. As adults the Golden-winged Warbler move into mature forests. The Golden-winged Warbler eats insects such as spiders that have been gleaned off of foliage. Potential risk to these species is expected to be adequately assessed by reference to other avian omnivores such as the American Robin, as they are all ground feeding birds and receive similar atmospheric exposure through food and soil.

Wood Thrush are omnivores which typically forage on invertebrates and fruits. They prefer woodlands. The American Robin is also considered a suitable surrogate for Wood Thrush, as they are both ground feeding insectivores, and are exposed to similar atmospheric exposure through food and soil.

Common Nighthawk are medium-sized, dark plumaged birds that prey almost exclusively on flying insects. They typically hunt at dawn and dusk, and tend to remain within 500 feet of the ground while hunting. The Eastern Whip-poor-will, like the Common Nighthawk, is a medium-sized, dark plumaged bird that feeds on flying insects. The Eastern Whip-poor-will is a nocturnal bird, and hunts only at dusk. The American Robin is considered a suitable surrogate for both the Common Nighthawk and the Eastern Whip-poor-will, as invertebrates are assumed to compose 90% of the American Robin's diet, which closely resembles the diet composition of most aerial insectivores.

The Least Bittern is the smallest bird in the heron family, with brown and beige plumage and a black crown. They primarily feed on fish, but are also known to prey upon small reptiles, amphibians, crustaceans, small mammals, and small birds and their eggs. Given the similarities in diet, the Bald Eagle is considered to be a suitable surrogate for the Least Bittern.

The Red-headed Woodpecker is a medium-sized bird, easily identified by its bright red head, neck and breast, with black colouring on its back and white on its underside. They are omnivorous birds, and will consume a diverse diet of insects, fruit, and seeds. The American Robin is considered to be a suitable surrogate for the Red-headed Woodpecker as they are expected to be exposed via the same food and soil ingestion pathways.

The Bobolink is an omnivore that is found in open areas and large fields and typically forages primarily on seeds and invertebrates. The American Robin is also considered a suitable surrogate for the Bobolink since they are both ground feeding species and are similarly exposed through terrestrial food and soil.

Little Brown Myotis, Eastern Small-footed Myotis, Northern Myotis and Tri-Coloured Bat are aerial insectivores. 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. Northern Myotis is typically associated with boreal forests, and often roosts under loose bark and in the cavities of trees. The Eastern Small-footed Myotis can roost in a variety of habitats, including in or under rocks, buildings, underneath bridges or hollow trees. The Tri-Coloured Bat can roost primarily in forests but also occasionally roost in barns and other structures. Potential risk to Eastern Small-footed Myotis, Northern Myotis and the Tri-Coloured Bat is expected to be adequately assessed by the Little Brown Myotis due to the similarity in species, habitats and eating habits.

The Queensnake is an aquatic species that is usually found within a few metres from water. The habitat of the Queensnake is primarily rivers, streams and lakes with clear water and is often found hiding in rocky or gravel covered sediment. The Eastern Ribbonsnake is also found near water, particularly marshes, where it feeds on frogs and small fish. Both snake species are expected to be adequately assessed by the Northern Water Snake in this EcoRA, which inhabits similar aquatic environments.

The Spotted Turtle is a semi-aquatic species that inhabits wetlands, marshes, bogs, and ditches, and primarily ingests aquatic invertebrates, but has been recorded in the Baie du Doré wetlands (Arcadis, 2019). A fish model (Lake Whitefish and Northern Redbelly Dace) is 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.

4.1.1.3 Receptor Characterization

Receptor profiles in Appendix B describe the habitat and the feeding habits of the selected indicator species. The indicator species were assigned to assessment locations on the site based on habitat features at each location and where the receptor is likely to be found. Receptor locations for assessment purposes are discussed in Section 4.1.1.5.

For mammals, birds, and fish, dietary assumptions were made based on the described feeding habits. Diets were simplified to represent the main food chain pathways without attempting to capture their full taxonomic complexity.

Species-specific exposure parameters, including bioaccumulation factors, food and water ingestion rates, transfer factors and body weights, are described in Section 4.2.

4.1.1.4 Assessment and Measurement of Endpoints

4.1.1.4.1 Assessment of Endpoints

Assessment endpoints are explicit expressions of the environmental value that is to be protected (FCSAP, 2012). The assessment endpoint for receptors in this EcoRA is either individual, population, or community success. While exposure and risk estimates always pertain to individuals, for most receptors, when effects on individuals are predicted from contaminant levels in a certain location, further discussion of population or community effects (or lack thereof) is appropriate. The population or community may tolerate effects on a few individuals. For species at risk, it is considered that effects on even a few individuals represent an effect on the population, so the focus is on protection of individuals.

The assessment endpoint for each indicator species is given in Table 4-4.

Table 4-4: Assessment Endpoints for Indicator Species

VEC/ Indicator Species	Assessment Endpoint		
	Individual success	Population success	Community success
Cattail		X	
Aquatic Vegetation			X
Grass		X	
Eastern White Cedar	X*	X	
Benthic Invertebrates			X
Earthworm	X*	X	
Northern Redbelly Dace	X*	X	
Smallmouth Bass		X	
Lake Whitefish	X*	X	
Bee		X	
Northern Leopard Frog		X	

VEC/ Indicator Species	Assessment Endpoint		
	Individual success	Population success	Community success
Painted turtle		X	
Northern Water Snake	X*	X	
Wild Turkey		X	
American Robin	X*	X	
Mallard		X	
Bald Eagle	X*		
Muskrat		X	
Little Brown Myotis	X*		
Northern Short-tailed Shrew		X	
White-Tailed Deer		X	
Red Fox		X	

*Surrogate species representing a SAR

The environmental protection goal for this ERA is to maintain population abundance for the majority of species, or abundance and diversity where a receptor community is considered, and thereby maintain biodiversity and ecosystem function. For SARs, the goal is to protect every individual. The purpose of the ecological risk assessment is to evaluate whether these goals are likely to be achieved.

4.1.1.4.2 Measurement Endpoints

Measurement endpoints are conceptually related to assessment endpoints but are quantifiable using standard toxicological methods such as laboratory exposures. They are typically utilized to evaluate whether environmental protection goals are likely to be achieved. These are endpoints such as reproduction, growth and survival that are logically related to maintenance of population abundance, but are more easily inferred from COPC concentration and dose. For wildlife, measurement endpoints are usually defined as some low-effect threshold concentration in a sensitive species, and are given on a species-specific basis for the indicator species in the assessment. For plants and invertebrates, benchmarks are not commonly established based on a sensitive species due to the diversity of plant and invertebrate species that may be present, soil types, chemical forms, and test procedures used in the generation of toxicological data. Instead, a threshold effect concentration that does not result in an effect greater than 25% on representative species is considered protective of plant and invertebrate communities. In this EcoRA, possible effects of COPCs on survival, reproduction, or growth were inferred or predicted by comparison of estimated doses to benchmark doses that have been associated with such effects in the literature.

In summary, the measurement endpoints are as follows:

- Survival and growth of plants – threshold effect concentration;

- Survival and growth of invertebrates – threshold effect concentration;
- Survival and growth of fish – threshold effect concentration
- Survival, growth and reproduction of mammals – LOAEL; and,
- Survival, growth and reproduction of birds – LOAEL.

The benchmark values used are presented in Section 4.4.2.

4.1.1.5 Locations Considered

The terrestrial and aquatic environments that are applicable to the NSS-W are summarized in Sections 4.1.1.5. The risk characterization in this EcoRA will focus on four main locations:

- The SRD, which includes Stream C and the wetlands as the SRD discharges into those water bodies;
- The West Ditch, a drainage feature that discharges into Lake Huron;
- The terrestrial environment within the vicinity of the NSS-W facility
- The terrestrial environment within the vicinity of the RWOS1

Baie du Doré is also considered for radiological modelling of dose based on NSS-W liquid emissions summarized in Section 2.2.9. Remaining exposure pathways and indicator species associated with the Baie du Doré or Lake Huron are conservatively assessed using the exposure pathways and indicator species modelled for the SRD and West Ditch.

4.1.2 Radiological COPCs

For radionuclides, no formal screening was performed. Since radionuclides are considered of public interest, relevant radionuclides are carried forward for quantitative assessment of radiological dose in the EcoRA, without a formal screening assessment.

4.1.2.1 Groundwater

As part of implementation of CSA N288.7-15 at the NSS-W, Ecometrix prepared a groundwater conceptual site model to understand what the potential sources of contamination to groundwater may be, the contaminants of potential concern, groundwater end use, and potential human and ecological receptors. Ecometrix (Ecometrix, 2021a) conducted a review of available documentation to determine if any areas of potential environmental concern (APEC) or contaminants of potential concern (COPCs) require assessment. (Ecometrix, 2021a) also reviewed available groundwater monitoring data at the NSS-W and at RWOS1, and determined that tritium is the only COPC at the Site.

The CSM for the Site (Ecometrix, 2021a) identifies that the ecological receptors that will be most exposed to tritium from site activities are in areas of aquatic habitat for aquatic plants, invertebrates, and aquatic animals, in the SRD and Grassed Swale. Beyond that, it is possible that there is a lower level of exposure for ecological receptors in the nearshore zone of Lake Huron. Ecological receptors in the nearshore zone of Lake Huron include aquatic vegetation, aquatic invertebrates, fish, herpetofauna, riparian birds and riparian mammals.

Because a number of groundwater monitoring wells that are screened within the overburden at the NSS-W are close to the SRD and groundwater is inferred to discharge into the SRD, it is conservative to assume that tritium concentrations are not attenuated in the shallow subsurface prior to discharge. It is also conservative to assume that the concentration of tritium at the point of exposure in the SRD is equivalent to the groundwater concentration. Thus, we assume that the water being discharged to the SRD is not diluted to an appreciable extent within the ditch. The wells within proximity to the SRD that are screened within the bedrock aquifer are assumed not to discharge groundwater into the SRD. As a result, Ecometrix (Ecometrix, 2021b) has selected the US Department of Energy (US DOE, 2019) surface water screening concentration for tritium of $1x10^7$ Bq/L for protection of aquatic and riparian biota for the purpose of screening groundwater concentrations from overburden wells located within the vicinity of the SRD. The wells selected to represent the maximum concentration of tritium in groundwater discharging into the SRD are WSH231, WSH251 WSH252, WSH253, WSH266, WSH267 and DGRB-14. After reviewing the available groundwater data, the maximum groundwater concentration was then determined for the 2014- 2020 period.

Groundwater within the bedrock aquifer is expected to discharge into Lake Huron. A factor of 10 was applied by MECP to conservatively account for dilution of groundwater in surface water (MECP, 2011a). As a result, a dilution factor of 10 is applied to the surface water screening concentration for tritium for riparian biota ($1x10^7$ Bq/L) resulting in a groundwater evaluation criterion of $1x10^8$ Bq/L for the overburden wells at the NSS-W. A dilution factor of 10 was not applied to the overburden wells discharging to the SRD due to their close proximity to the ditch. It is conservatively assumed that the groundwater discharging into the ditch is not diluted. The wells selected to represent the maximum concentration of tritium in groundwater discharging to Lake Huron are WSH224, WSH225, WSH226, WSH228, WSH230, WSH232, WSH236, WSH237, WSH238, WSH239, WSH241, WSH242, WSH243, WSH244, WSH245, WSH246, WSH247, WSH248, WSH249, WSH262, WSH270, WSH273, WSH275, WSH278, WSH280, WSH-302, WSH-307, WSH-301 and DGRB-12. After reviewing the available groundwater data, the maximum groundwater concentration was then determined for the 2014- 2020 period.

As shown in Table 4-5, the maximum tritium concentrations do not exceed the risk-based guideline for ingestion of domestic well water and do not require further evaluation for this pathway.

Table 4-5: Groundwater – Ecological Screening (Ecometrix, 2021b)

Screening Location	Max Concentration (2014-2020) (Bq/L)	Max Concentration Well Location	Risk-Based Guideline (Bq/L)	Assessment Results
Overburden Wells Near SRD	52,800	WSH231	$1x10^7$	No further assessment is required
All Bedrock Wells	1,570	WSH278	$1x10^8$	No further assessment is required

Note: The Risk-Based Guideline was obtained from the US DOE (US DOE, 2019)

4.1.3 Non-Radiological COPCs

4.1.3.1 Air

Sampling of environmental concentrations in air was not performed as part of this ERA. The Emissions Summary and Dispersion Modelling Reports between 2016 and 2020 (OPG, 2017b, 2018a, 2019, 2020, 2021) were used as the source of data.

Inhalation exposures to biota are usually minor compared to soil and food ingestion pathways, and can be ignored for most substances, with the exception of substances that do not partition to soil (CSA, 2012). These substances include gases such as nitrogen oxides (NOx) and sulphur dioxide (SO_2). For these substances, air concentrations dominate the exposure pathway for terrestrial biota. The main source of these compounds is combustion; at the NSS-W, the only significant source of emissions to air is the incinerator (OPG, 2017b, 2018a, 2019, 2020, 2021). The results of the air dispersion modelling for contaminants of interest to the EcoRA are summarized in Table 3-9.

Significant contaminants emitted from the incinerator include NOx and hydrogen chloride (HCl). The maximum POI concentrations modelled for these contaminants are well below the MECP POI limits, and are therefore not likely to have potential effects on ecological receptors located on site. Therefore, they have been screened out as not being of concern.

Dioxins and furans have been considered further for inhalation by ecological receptors. These contaminants were determined to be negligible in the Emissions Summary and Dispersion Modelling reports (OPG, 2017b, 2018a, 2019, 2020, 2021), however they have been considered as direct incinerator stack emissions. Dioxins and furans have been considered in surface water, sediment and soil as described in the following sections due to their high toxicity and because they have exhibited elevated levels in some soils on the NSS-W. Dioxins and furans bind strongly to soils, and are persistent and bioaccumulate in organic tissue (CCME, 1999; OPG, 2017c). The direct stack emissions for these contaminants were available for 2015, 2016, 2017 and 2020 and are summarized in Table 4-6 in terms of Toxic Equivalent (TEQ).

Table 4-6: Incinerator Stack Emission Concentrations

Parameter	Unit	Incinerator Concentration (2015, 2016, 2017, 2020)		Limit	Carry Forward to Tier 2?
		Minimum	Maximum		
Dioxins and Furans*	pg TEQ/Rm^3	<2.04	<14.2	80	No

Note: Rm^3 = Reference m^3, adjusted to 11% oxygen, dry at 25°C and 1 atmosphere
Data obtained from (OPG, 2017c) for 2015 and 2016, (Ortech, 2018) for 2017 and (Ortech, 2021) for 2020

The allowable emission concentration limit for dioxins and furans in the stack gases from the incinerator as per the MECP's Environmental Compliance Approval (ECA) (MECP, 2017) is a maximum of 80 pg TEQ/Rm^3. The maximum emission concentration available between 2014 and 2020 was <14.2 pg TEQ/Rm^3, measured in 2020. The level of quantification for the combined dioxin and furan congeners is 32 pg TEQ/Rm^3; concentrations below this level are not reliably quantifiable (Ortech, 2014). The CCME Canada-Wide Standard for dioxins and furans states that the goal for dioxins and furans is virtual elimination; concentrations less than the level of quantification have been obtained for all available years within the past five years, which indicates that steps toward virtual elimination have been taken (CCME, 2003). Since these measurements are below the allowable emission concentration given in the ECA and demonstrate steps toward virtual elimination, airborne concentrations of dioxins and furans at the incinerator outlet are not considered to be a concern and therefore inhalation of dioxins and furans has not been considered further.

In summary, airborne contaminants are not of concern to ecological receptors and they are not discussed further in this assessment.

4.1.3.2 Groundwater

Ecometrix (Ecometrix, 2021a) conducted a review of available documentation to determine if there were any areas of potential environmental concern (APEC) or contaminants of potential concern (COPC). In accordance with Clause 6.2.2.3 of CSA N288.7-15, this review of potential sources of contamination included:

a) *history of the site's surface and subsurface development*

b) *any COPCs used in operations, stored on site or transported on site with a potential to migrate in groundwater, as well as the volume and concentration or activity of liquids used;*

c) *the locations where these COPCs were used, stored, or transported on the site; and*

d) *records of past anomalous events that did or could have led to the subsurface release of COPCs*

In addition to this review, Ecometrix (Ecometrix, 2021a) also reviewed available groundwater monitoring data at the NSS-W and RWOS1 and determined that tritium is the only COPC at the Site for both human and ecological receptors.

As a result, non-radiological parameters within groundwater do not require further assessment within the EcoRA.

4.1.3.3 Soil

Sampling of environmental concentrations of non-radiological contaminants in soil was performed as part of the NSS-W baseline monitoring studies described in Section 1.1.2.2.

Before soil screening was conducted, the NSS-W site was divided into two distinct areas, to differentiate between the NSS-W area and RWOS-1. The first area ("NSS-W") was composed of one grouping of sampling locations, which include A3-1, A3-2, A5-1, A5-2, MSA-1, RD-1, RD-2 and SWALE. The second area ("RWOS1") was composed of a second grouping of sampling locations, and includes RWOS1-1, RWOS1-2, RWOS1-3 and RWOS1-4. The grouping of sampling locations was done in this way to determine the concentrations of non-radiological contaminants at the main NSS-W facility separately from RWOS1.

In addition, concentrations of unique dioxin and furan congeners were presented as 2,3,7,8-tetra CDD equivalents prior to screening using the same process outlined in Section 3.3.3.

Selection of soil screening criteria followed the hierarchical decision-tree presented in Figure 4-1. The maximum measured environmental concentrations of non-radiological contaminants were compared to screening criteria from the following sources, in order of preference:

- The most conservative value between:
    - MECP Soil Component Values (full depth, potable water scenario for agricultural land use (plants and soil organisms) or residential/parkland land use (birds and mammals) with coarse textured soils) (MECP, 2011a); or,
    - CCME Agricultural Soil Quality Guidelines (CCME, n.d.) ; or,
- Ontario soil background values:
    - MECP Table 1 (Full Depth Background Site Condition Standards) (MECP, 2011b, p. 2011); or,
    - MECP Rural/Parkland Ontario Typical Range (OTR_{98}) soil values (MECP, 1993, p. 1993); or,
    - Dragun & Chiasson, 1991. *Elements in North American* Soils (Dragun & Chiasson, 1991).

Non-radiological contaminants with maximum concentrations exceeding the relevant screening criteria were considered as COPCs in the risk assessment. Based on the results of this screening, calcium, magnesium, and strontium were identified as exceeding their respective ecological screening criteria for soil in both sampling group locations. Selected ecological screening criteria and the results of the full soil screening assessment are shown in Appendix A.

The maximum observed concentrations for calcium and magnesium exceeded the selected screening criteria, which is based on the Ontario soil background concentration. However, calcium and magnesium are essential nutrients for life, and do not pose ecological risk. Therefore, they were not carried forward as soil COPCs.

The maximum strontium concentration at both the NSS-W (154 µg/g) and RWOS-1 (83.8 µg/g) exceeded the soil screening criterion of 64 µg/g, which was derived from the MECP Rural/Parkland Ontario Typical Range (OTR_{98}) soil background value for strontium (MECP, 1993). Therefore, strontium was carried forward as a COPC for further analysis in the ecological risk assessment.

The COPCs identified from the screening of non-radiological parameters within soil are presented in Table 4-7.

Table 4-7: Summary of Non-radiological Soil COPC

Parameter	Max Concentration (µg/g)	Sample Group and Location	Screening Criteria (µg/g)	Include in Quantitative Assessment?
Calcium	147,000	RD-2	55,000	No, See Section 4.1.3.3.
	107,000	RWOS1-4		
Magnesium	52,300	A5-2	20,000	No, See Section 4.1.3.3.
	41,100	RWOS1-3		
Strontium	154	Group 1: RD-2	64	Yes
	83.8	Group 2: RWOS1-4		

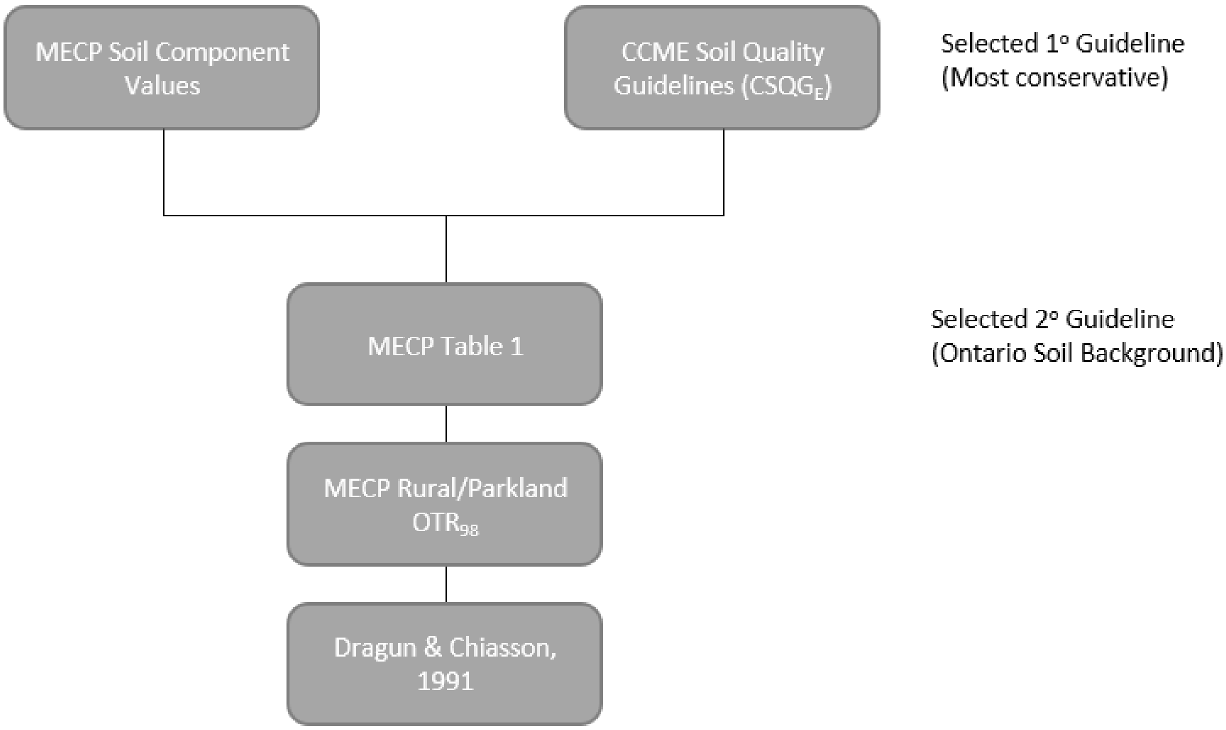


Figure 4-1: Hierarchy of Screening Criteria Selection for Non-Radiological COPCs in Soil

4.1.3.4 Surface Water

Sampling of surface water was completed in 2020 and 2021 as part of the NSS-W baseline monitoring studies outlined in Section 1.1.2.2. Before screening was conducted, the NSS-W site was divided into two distinct areas. The first area ("SRD") was composed of one grouping of sampling locations, which include GS-1, Location B, SRD-1, SRD-2, SRD-3, SRD-4, SRD-5, Stream C Confluence, Stream C DS, Stream C US, WTL-1, and WTL-2. The second area ("WD") was composed of a second grouping of sampling locations, namely WD-1, WD-2b, and WD-3. The grouping of sampling locations was done in this way to determine the concentrations of non-radiological contaminants along the two distinct flow pathways, one towards the south railway ditch and the other towards the west ditch.

In addition, concentrations of unique dioxin and furan congeners were presented as 2,3,7,8-tetra CDD equivalents prior to screening using the same process outlined in Section 3.3.3.

Selection of the applicable surface water screening criteria followed the hierarchical decision-tree presented in Figure 4-2. The maximum measured environmental concentrations of non-radiological contaminants were compared to screening criteria from the following sources, in order of preference:

- The most conservative value between:

- CCME Canadian Water Quality Guidelines for Protection of Aquatic Life (CCME, n.d.); or,
- Provincial Water Quality Objectives (MECP, 2003); or,
- Interim Provincial Water Quality Objectives; or,
- Federal Environmental Quality Objectives (ECCC, 2016, 2017, 2018, 2019, 2020b, 2021a, 2021b, 2021c, 2021d); or,

- Other jurisdictional guidelines:
  - MECP Aquatic Protection Values (MECP, 2011a); or,
- Guidelines from other sources and toxicological literature:
  - Suter and Tsao, (1996). *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision*.
  - Borgmann et al., (2005). *Toxicity of Sixty-Three Metals and Metalloids to Hyalella Azteca at Two Levels of Water Hardness*.

The toxicity benchmark values selected for screening are chronic low-effect threshold concentrations for sensitive test species, modified by a safety factor of 10 for conversion to a no effect level (Appendix A).

Based on the results of this screening procedure, the following parameters exceeded their respective screening criteria in surface water: aluminum, iron, magnesium, nickel, sodium, strontium, zinc, and 2,3,7,8-Tetra CDD TEQ. Selected ecological screening criteria and the results of the surface water screening assessment are shown in Appendix A.

While not considered a chemical contaminant, surface water pH was identified as a parameter requiring further qualitative assessment against the Ontario provincial water quality objective. The MECP PWQO for pH in freshwater is between 6.5 to 8.5 (MECP, 1979, p. 1979); within this range, the MECP considers freshwater bodies to be the most bio-productive. Surface waters with pH above the upper limit of the PWQO may be less productive. A maximum pH measurement of 8.55 was measured in the west ditch, exceeding the MECP PWQO guideline. The Canadian water quality objective for pH for freshwater biota is between 6.5 to 9.0 (CCME, 2010). This pH range has also been recommended by the International Joint Commission (IJC, 1977) and the U.S. EPA (US EPA, 1986). The range from 6.5 to 9.0 is considered to pose no risk to fish and benthic invertebrates, although the toxicity of other contaminants, such as ammonia, may be affected by pH changes within this range. As the pH was measured to be within the range of the CCME guideline, pH was not carried forward further in the risk assessment.

The maximum measured total aluminum concentrations in the south railway ditch (225 µg/L) and in the west ditch (207 µg/L) exceeded the CCME water quality guideline of 100 µg/L.

However, the maximum measured concentration for dissolved aluminum in a filtered sample in both groups, was below the screening criterion (PWQO) of 75 µg/L for dissolved aluminum. The relatively high concentration of aluminum in the unfiltered samples is therefore considered to be indicative of the presence of suspended solids in the samples. The dissolved phase of aluminum is expected to be more bioavailable and toxic than any aluminum in a suspended phase. The CCME CWQG for total aluminum is a value that was tentatively recommended by US EPA in 1973 (US EPA, 1973), while acknowledging that further data is required (CCREM, 1987). The PWQO value for dissolved aluminum, on the other hand, is more recent and is derived from a LOEC value. Therefore, whenever data for dissolved aluminum are available, screening of this parameter using the PWQO value is more defensible than the CWQG for total aluminum. As the dissolved aluminum did not exceed its screening criterion, aluminum was not carried forward as a COPC for the EcoRA.

The maximum measured concentrations of both total and dissolved calcium exceeded the toxicological-based screening guideline of 11.6 mg/L derived from Suter and Tsao (1996). In the south railway ditch, calcium concentrations were measured to be 120 mg/L (dissolved) and 116 mg/L (total); in the west ditch, calcium was measured at 120 mg/L (dissolved) and 117 mg/L (total). Calcium is a major chemical constituent of the natural environment and concentrations in surface water can vary substantially. In the Great Lakes, calcium concentrations range between 13 to 40 mg/L; across Canada, concentrations in surface water have been reported to range between <0.002 mg/L to 1370 mg/L (HC, 1987). Despite exceeding the screening guideline and being outside the range cited for the Great Lakes region, calcium is not considered a COPC for the NSS-W. Calcium is an essential element for plant and animal life and is generally not considered to be toxic. In living organisms, calcium metabolism is governed by a series of efficient homeostatic mechanisms, and any adverse toxic effects are only observed following exposure to extremely large quantities of calcium (HC, 1987). In toxicity tests for chloride, the CCME has used calcium as the cation (i.e. $CaCl_2$) to ensure that effect concentrations are associated with the chloride anion and not with the cation (CCME, 2011). In addition, as a component of water hardness, calcium has the effect of competing with and blocking heavy metal absorption and can decrease an organism's susceptibility to heavy metal toxicity (HC, 1987). Therefore, calcium is not considered to be a COPC and will not be assessed further.

Maximum measured concentrations of iron were found to exceed the CCME guideline of 300 µg/L in both the south railway ditch (1,500 µg/L) and west ditch (854 µg/L) sampling groups. Thus, iron was carried forward as a COPC in the risk assessment.

The maximum measured concentrations of magnesium exceeded the screening criteria of 8,200 µg/L in both the south railway ditch (25,400 µg/L) and west ditch (21,200 µg/L) sampling groups. However, magnesium is a naturally-occurring metal commonly found in surface water and is an essential element for all organisms. In areas rich in magnesium-containing rocks, surface water can contain magnesium in the concentration range of 10,000 to 50,000 µg/L (Health Canada, 1978). Maximum magnesium concentrations in surface waters for both sampling groups fell within this range. The measured concentration of magnesium in the upstream portion of Stream

C (a local reference area to the SRD and WD pathways) was 21,400 µg/L, suggesting that magnesium is naturally elevated in background at the NSS-W and is not a result of Site operations. Additionally, magnesium concentrations did not exceed the U.S. EPA's freshwater screening benchmark of 82,000 µg/L (US EPA, 1993a). For these reasons, magnesium was not carried forward as a COPC in surface water.

In the west ditch, the maximum measured nickel concentration (36 µg/L) was found to exceed the Ontario PWQO of 25 µg/L. As such, nickel was carried forward to be quantitatively assessed as a COPC in the risk assessment.

The maximum measured concentrations of sodium in both the south railway ditch (608,000 µg/L) and the west ditch (821,000 µg/L) sampling groups exceeded the selected screening criteria of 180,000 µg/L set by the MECP as the Aquatic Protection Value for sodium. The APV for sodium is based on a chronic (7-day) LOEL of 180,000 µg/L (IC_{50}) for chloride anions, and represents a concentration at which reproduction of the aquatic invertebrate *Ceriodaphnia dubia* becomes impaired (MECP, 2011b). There is evidence to suggest that the toxicity of sodium is more often attributable to its corresponding anion (CCME, 2011; McPherson et al., 2014) and thus the MECP uses the chloride APV to represent sodium. As it exceeded the screening guideline, sodium was carried forward as a COPC for further analysis in the risk assessment.

The maximum concentration of strontium in the south railway ditch sampling group was measured to be 4,450 µg/L, exceeding the selected screening criteria of 2,500 µg/L set by Environment and Climate Change Canada as the federal environmental quality guideline for strontium in freshwater. Thus, strontium was carried forward as a COPC.

Zinc was found to exceed the selected screening criterion of 7 µg/L in both the south railway ditch (105 µg/L) and the west ditch (42 µg/L) sampling groups. The Canadian water quality guideline of 7 µg/L is based on long-term exposure to dissolved zinc in freshwater and uses the default parameters of 50 mg $CaCO_3$/L hardness, pH 7.5, and 0.5 mg/L dissolved organic carbon to derive the guideline. As both dissolved and total zinc exceeded the CWQG, zinc was carried forward as a COPC in the risk assessment.

Before screening, measured concentrations of dioxins and furans in the south railway ditch and the west ditch were reported as 2,3,7,8-tetra CDD equivalent concentrations using a TEF which represents a relative toxicity of the individual congeners in comparison to 2,3,7,8-tetra CDD. This process is done in order to compare against guidelines expressed as TEQ (refer to Section 3.3.3 for further information regarding the assessment of dioxins and furans). The concentration of 2,3,7,8-tetra CDD equivalent exceeded the selected screening criteria of 0.6 pg/L in both the south railway ditch (1.36 pg/L) and the west ditch (6.81 pg/L) sampling groups. The screening criteria of 0.6 pg/L is protective of aquatic life assuming a particulate concentration of organic carbon of 0.2 mg/L in the water (US EPA, 1993a). As such, 2,3,7,8-tetra CDD equivalent was retained as a COPC for further assessment.

COPCs identified from the screening of non-radiological parameters within surface water are presented in Table 4-8.

Table 4-8: Summary of Non-radiological Surface Water COPC

Parameter	Surface Water Max Concentration (µg/L)	Sample Group and Location	Surface Water Screening Criteria (µg/L)	Include in Quantitative Assessment?
pH - Field	8.55	Group 2: WD-2b	Between 6.5 and 8.5	No, see Section 4.1.3.4
2,3,7,8-Tetra CDD Equivalent	1.36	Group 1: SRD-1	0.6	Yes
	6.81	Group 2: WD-2b		
Aluminum – Total	225	Group 1: Stream C Confluence	100	No, see Section 4.1.3.4
	207	Group 2: WD-2b		
Calcium – Dissolved	120,000	Group 1: SRD-1	11,600	No, see Section 4.1.3.4
	120,000	Group 2: WD-1		
Calcium – Total	116,000	Group 1: SRD-1	11,600	No, see Section 4.1.3.4
	117,000	Group 2: WD-1		
Iron – Total	1500	Group 1: Location B	300	Yes
	854	Group 2: WD-1		
Magnesium – Total	25,400	Group 1: WTL-2	8,200	No, see Section 4.1.3.4
	21,200	Group 2: WD-1		
Nickel – Total	36	Group 1: Location B	25	Yes
Sodium – Dissolved	188,000	Group 1: SRD-1	180,000	Yes
Sodium – Total	608,000	Group 1: SRD-3	180,000	Yes
	821,000	Group 2: WD-1		

Parameter	Surface Water Max Concentration (µg/L)	Sample Group and Location	Surface Water Screening Criteria (µg/L)	Include in Quantitative Assessment?
Strontium – Total	4,450	Group 1: WTL-2	2,500	Yes
Zinc – Dissolved	90	Group 1: SRD-3	7	Yes
	40	Group 2: WD-1		
Zinc – Total	105	Group 1: SRD-2	7	Yes
	42	Group 2: WD-1		

In addition to the non-radiological parameters listed in Table 4-8, additional COPCs are assessed quantitatively for surface water in this EcoRA. The sediment COPCs listed in Table 4-10 include some COPCs that are already assessed as COPCs in surface water, as they had exceeded the applicable surface water guideline. However, there are additional sediment COPCs such as cadmium, chromium, copper, lead and manganese, where the maximum surface water concentrations did not exceed the applicable surface water guideline. Given that the sediment and surface water media are both key components of aquatic habitats and that both may contribute to exposure, both media are considered for COPCs identified in water or sediment. Therefore, cadmium, chromium, copper, lead and manganese are also considered to be surface water COPCs and are carried forward for further quantification of exposure and risk.

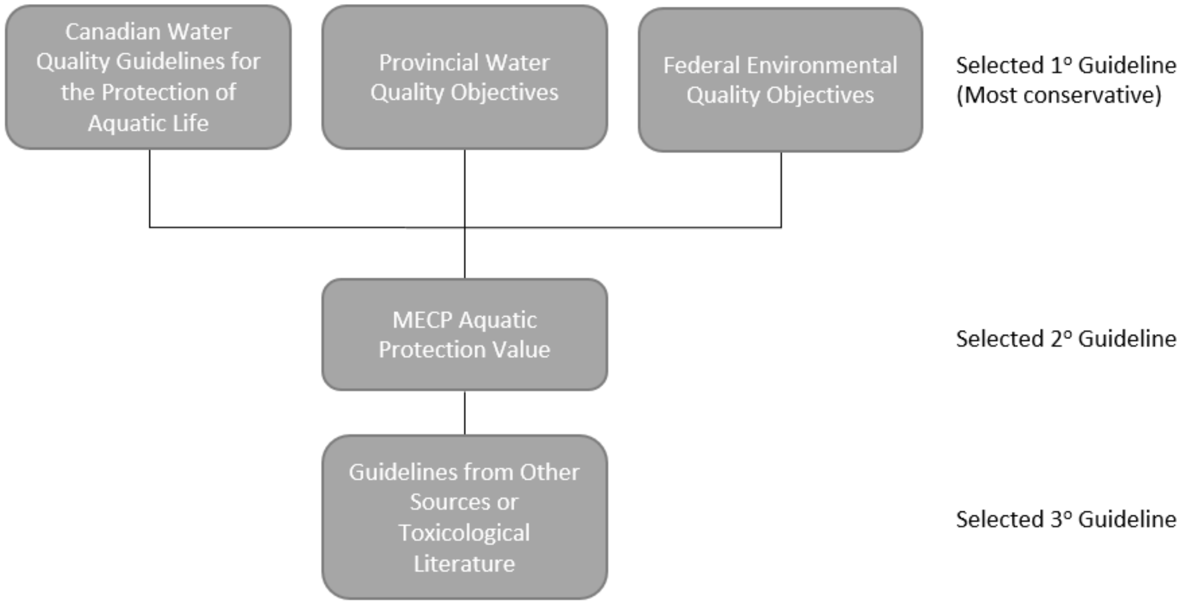


Figure 4-2: Hierarchy of Screening Criteria for Non-Radiological COPCs in Surface Water

4.1.3.4.1 Secondary Screening of Surface Water in Lake Huron

The concentrations of surface water COPCs identified above (iron, magnesium, nickel, sodium, strontium, zinc, and 2,3,7,8-tetra CDD equivalent) represent the concentrations in surface water within the SRD and West Ditch. However, when considering receptors inhabiting Baie du Doré or the larger Lake Huron water body, the concentrations that these aquatic receptors are exposed to are diluted concentrations. Therefore, a secondary screening was completed by applying a dilution factor to the COPCs to determine if the surface water COPCs need to be considered further for the lake receptors.

A dilution factor of 20 was selected to represent both the dilution experienced by the surface water sourced from the SRD and WD. The SRD discharges into Stream C and eventually Baie du Doré and a dilution factor of 20 was calculated by OPG (2003) to represent the amount of dilution the surface water concentrations at the SRD experience before reaching the outer bay. This is a conservative dilution factor as many fish are likely to spend time beyond the outer bay in Lake Huron. Smaller forage fish will be conservatively assessed using the Northern Redbelly Dace located at both the SRD and West Ditch.

A dilution factor of 43 was selected to represent surface water dilution sourced from the West Ditch discharging west directly into Lake Huron. Using the same dilution factor derivation document for the SRD, OPG (2003), multiple conservative assumptions were used in the development of a dilution factor for the Lake Huron current and are outlined in Section 3.1.2.2. The assumptions used in the derivation of this dilution factor are considered appropriate to be applied to the West Ditch scenario as described in Section 3.2.1.1.

A secondary screening of the surface water COPCs was then completed in this EcoRA after applying a dilution factor of 20 to the concentrations sourced from the SRD and a dilution factor of 43 applied to the concentrations originating from the West Ditch (Table 4-9:).

Table 4-9: Secondary Screening of COPCs in Lake Huron and Baie du Doré

COPC	Concentration with Dilution Factor Applied (µg/L)		Screening Criteria (µg/L)	Carried Further in EcoRA?
	SRD	West Ditch		
2,3,7,8-tetra CDD equivalent (pg/L)	0.068	0.158	0.6	No
Iron	75	19.9	300	No
Magnesium	1270	493	8,200	No
Nickel	1.8	-	25	No
Sodium	30,400	19,093	180,000	No
Strontium	222.5	-	2,500	No
Zinc	5.25	0.1	7	No

Note: "-", Parameter did not exceed applicable surface water criteria for the sample location group.
A dilution factor of 20 was applied to the SRD concentrations and a dilution factor of 43 was applied to the concentrations from the West Ditch

The concentrations of iron, magnesium, nickel, sodium, strontium, zinc, and 2,3,7,8-tetra CDD equivalent did not exceed their health-based criteria once the dilution factors are applied and are not carried further for the Lake Huron and Baie du Doré habitat and receptors (represented by the indicator species: Lake Whitefish and Smallmouth Bass).

4.1.3.5 Sediment

Sampling of sediment concentrations was performed in 2020 and 2021 as part of the NSS-W baseline monitoring studies described in Section 4.3.1. Before screening was conducted, the NSS-W site was divided into two distinct areas. The first area ("SRD") was composed of one grouping of sampling locations, which include GS-1, SRD-1, SRD-2, SRD-3, SRD-4, SRD-5, Stream C DS, Stream C US, and WTL-1. The second area ("WD") was composed of a second grouping of sampling locations, namely WD-1, WD-2b, and WD-3. The grouping of sampling locations was done in this way to determine the concentrations of non-radiological contaminants in sediments along the two distinct flow pathways, one towards the SRD and the other towards the west ditch.

In addition, concentrations of unique dioxin and furan congeners were presented as 2,3,7,8-tetra CDD equivalents prior to screening using the same process outlined in Section 3.3.3.

Selection of the applicable surface water screening criteria followed the hierarchical decision-tree presented in Figure 4-3. The maximum measured environmental concentrations of non-radiological contaminants were compared to screening criteria from the following sources, in order of preference:

- The most conservative value between:

    - Ontario Provincial Sediment Quality Guidelines; or,
    - CCME Sediment Quality Guidelines; or,
- Guidelines from other sources and toxicological literature; or,
- Sediment background concentrations derived from known crustal abundance values:
    - Dragun & Chiasson, 1991. *Elements in North American Soils* (James Dragun and Chiasson, 1991).

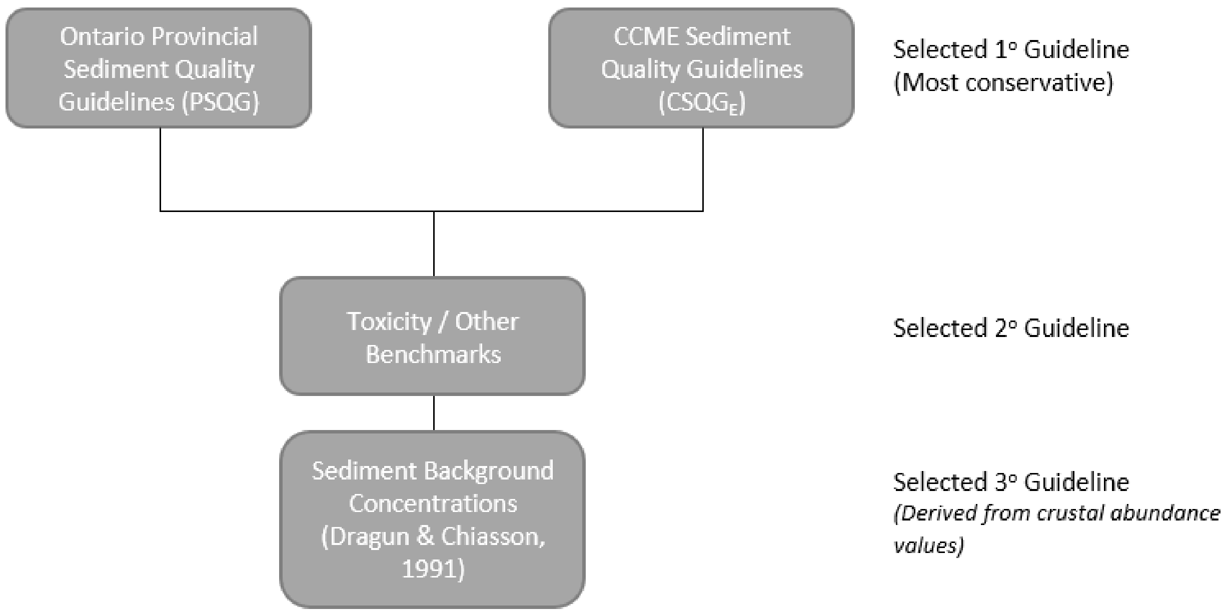


Figure 4-3: Hierarchy of Screening Criteria for Non-Radiological COPCs in Sediment

COPCs identified from the screening of non-radiological parameters within sediments are presented in Table 4-10.

Table 4-10: Summary of Non-radiological Sediment COPC

Parameter	Sediment Max Concentration (µg/g)	Sample Group and Location	Sediment Screening Criteria (µg/g)	Include in Quantitative Assessment?
Total Organic Carbon	77,000	Group 1: SRD-4	10,000	No, See Section 4.1.3.5
	55,000	Group 2: WD-1		
Total Phosphorus	670	Group 1: WTL-1	600	No, See Section 4.1.3.5
	610	Group 2: WD-1		
2,3,7,8-Tetra CDD Equivalent	20.14	Group 1: SRD-1	0.85	Yes
	21.79	Group 2: WD-2b		
Boron (hot water soluble)	0.61	Group 1: SRD-4	0.5	Yes
Cadmium	0.67	Group 2: WD-2b	0.6	Yes
Chromium	29.4	Group 1: WTL-1	26	Yes
Copper	140	Group 1: SRD-1	16	Yes
	35	Group 2: WD-1		
Iron	22,200	Group 2: WD-1	20,000	Yes
Lead	42.6	Group 2: WD-2b	31	Yes
Manganese	1,100	Group 1: Stream C US	460	Yes
	920	Group 2: WD-1		
Nickel	18.8	Group 1: WTL-1	16	Yes
	18.3	Group 2: WD-1		

Parameter	Sediment Max Concentration (µg/g)	Sample Group and Location	Sediment Screening Criteria (µg/g)	Include in Quantitative Assessment?
Zinc	450	Group 1: SRD-1	120	Yes
	550	Group 2: WD-1		
PHC F3 Aromatic C>16-C21	111	Group 1: SRD-1	1.7	No, See Section 4.1.3.5
	280	Group 2: WD-2b		
PHC F3 Aromatic C>21-C34	47	Group 1: SRD-1	5.4	No, See Section 4.1.3.5
	120	Group 2: WD-2b		
PHC F4 Aliphatic C>34	224	Group 1: SRD-1	98.8	No, See Section 4.1.3.5
	504	Group 2: WD-2b		
PHC F4 Aromatic C>34	56	Group 1: SRD-1	0.4	No, See Section 4.1.3.5
	126	Group 2: WD-2b		

A screening guideline was not determined for hexavalent chromium. Hexavalent chromium has a relatively high solubility in water and is normally found in water-soluble compounds within the water column (Ma et al., 2007). Trivalent chromium, however, has relatively low solubility tends to be found within the solid phase, making it more likely to remain within sediment (Lin, 2002). This relationship is observed within the analytical results for chromium and hexavalent; the maximum concentrations of total chromium within sediment are 29 µg/g and 19 µg/g for the SRD and West Ditch respectively. However, their associated maximum hexavalent chromium concentrations are 0.09 µg/g and 0.04 µg/g, which represent less than 0.01% of the total chromium maximum concentrations. This suggests that the chromium concentrations within sediment are predominantly within their 3+ valence state and a minimal amount is present as the 6+ valence state. Therefore, the concentration and screening criterion of total chromium is sufficiently protective of the hexavalent chromium and hexavalent chromium does not need to be considered further.

A separate set of guidelines were selected for petroleum hydrocarbons (PHCs) F1-F4, benzene, toluene, ethylbenzene and total xylenes (BTEX) results for sediment. These compounds were compared to sediment quality benchmarks developed by Atlantic PIRI (2012) based on chronic effects of H_5 (no adverse effects to more than 5% of the ecological receptor) or in the case of PHC a chronic value representative of sensitive species (Atlantic PIRI, 2012) It is important to note that benchmarks were developed for subfractions of each PHC fraction. Therefore, the PHC fractions that were obtained during the sampling program were converted into their aromatic and aliphatic subfractions using the ratios provided in CCME (2008) for soil and are summarized below in Table 4-11:.

Table 4-11: Maximum Concentrations of PHC Subfractions in Sediment

COC	Sub-fraction percentage (%)[a]	SRD Conc. (µg/g)	WD Conc. (µg/g)
Petroleum Hydrocarbons F1	100	0	0
Aliphatic C6-C8	55	0	0
Aliphatic C>8-C10	36	0	0
Aromatic C>8-C10	9	0	0
Petroleum Hydrocarbons F2	100	0	0
Aliphatic C>10-C12	36	0	0
Aliphatic C>12-C16	44	0	0
Aromatic C>10-C12	9	0	0
Aromatic C>12-C16	11	0	0
Petroleum Hydrocarbons F3	100	790	2000
Aliphatic C>16-C21	56	442	1120
Aliphatic C>21-C34	24	190	480
Aromatic C>16-C21	14	111	280
Aromatic C>21-C34	6	47	120
Petroleum Hydrocarbons F4	100	280	630
Aliphatic C>34	80	224	504
Aromatic C>34	20	56	126

Note: CCME (2008) – Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil: User Guidance. Canadian Council of Ministers of the Environment, January 2008.

Based on the results of this screening procedure, the following parameters exceeded their respective screening criteria in sediment: total organic carbon (TOC), total phosphorus (TP), 2,3,7,8-Tetra CDD equivalent, cadmium, boron (hot water soluble), chromium, copper, iron, lead, manganese, nickel, zinc, PHC F3 and PHC F4. Selected sediment COPCs are shown in Table 4-13. Selected ecological screening criteria and the results of the sediment screening assessment are shown in Appendix A.

While TOC exceeds the sediment quality guideline of 10,000 mg/kg (or 1%) and exceeds the sediment quality guideline of 600 µg/g for TP at both the SRD and West Ditch locations, these guidelines are not based on toxic effects to ecological receptors (MECP, 2008). These guidelines represent a nutrient effect on benthic community composition, and do not consider the nutrient enrichment typical of wetland communities (MECP, 2008). Given that these parameters do not directly affect the health of the indicator species assessed, TOC and TP will not be assessed further in this ERA.

The maximum 2,3,7,8-tetra CDD equivalent concentrations calculated for both the SRD (20 pg/g) and West Ditch (22 pg/g) exceeded the CCME sediment quality screening guideline of 0.85 pg/g (CCME, 1999). These maximum concentrations were obtained from samples SRD-1 and WD-2b. As a result, 2,3,7,8-Tetra CDD is carried forward for quantification of exposure and risk.

The available guideline for hot water soluble boron was 0.5 µg/g, which is based on background concentrations of hot water soluble boron within soil (MECP, 2011b). The maximum concentrations from the SRD and West Ditch are 0.61 µg/g (from SRD-4) and 0.59 µg/g (from WD-3) respectively. Despite exceeding the selected guideline, this guideline does not represent a health-based risk to ecological receptors and is therefore not carried forward in this ERA.

The maximum concentration of several parameters exceeded the applicable guideline from MECP (2008). The parameters, maximum concentrations and the location of the maximum is shown below:

- cadmium: 0.67 µg/g from WD-2b (guideline is 0.6 µg/g)
- chromium: 29 µg/g from WTL-1 (guideline is 26 µg/g)
- copper: 140 µg/g from SRD-1 and 35 µg/g from WD-1 (guideline is 16 µg/g)
- iron: 22,200 µg/g from WD-1 (guideline is 20,000 µg/g)
- lead: 43 µg/g from WD-2b (guideline is 31 µg/g)
- manganese: 1100 µg/g from Stream C U/S and 920 µg/g from WD-1 (guideline is 460 µg/g)
- nickel: 18.8 µg/g from WTL-1 and 18.3 µg/g from WD-1 (guideline is 16 µg/g)
- zinc: 450 µg/g from SRD-1 (guideline is 120 µg/g)

All parameters noted above are carried forward in the ERA as their corresponding guidelines are based on health-effects. They are the lowest levels that the majority of sediment-dwelling organisms can tolerate (MECP, 2008).

Detectable concentrations of benzene, ethylbenzene and total xylenes were not reported for this sampling event and the maximum toluene concentrations from the SRD and West Ditch did not exceed the Atlantic PIRI (2012) guideline, so these parameters are not carried forward in this assessment. Detectable concentrations of PHCs were only reported for PHC F3 and F4, so PHC F1 and PHC F2 are not carried further in this assessment. The following discussion focuses on the F3 and F4 parameters.

PHC F3 subfractions were screened against sediment benchmarks developed by Atlantic PIRI (2012). As shown in Table 4-11:, PHC F3 is further split into four subfractions and when compared to their equivalent guidelines from Atlantic PIRI (2012). Maximum concentrations of 111 µg/g and 280 µg/g were obtained from SRD-1 and WD-2b, respectively for aromatic C>16-C21. Maximum aromatic C>21-C34 concentrations of 47 µg/g and 120 µg/g were located in SRD-1 and WD-2b, respectively. The aromatic C>16-C21 and aromatic C>21-C34 maximum concentrations thus exceeded their respective guidelines of 1.7 µg/g and 5.4 µg/g for both the SRD and West Ditch locations. Despite exceeding the applicable guidelines, PHC F3 and PHC F4 are not considered further in the quantification of exposure, dose and risk. It is important to note that the selected guidelines obtained from Atlantic PIRI (2012) for both the PHC F3 and PHC F4 subfractions were calculated using chronic effect concentrations in water that are protective of aquatic receptors (Atlantic PIRI, 2012). However, the solubilities of PHC F3 and PHC F4 are very low, the half solubility of PHC F3 is 4.9E-08 µg/L and 3.9E-12 µg/L for PHC F4 (MECP, 2011b). These low solubilities suggest these compounds are not interpreted to partition into the water column. When reviewing the results reported for PHC F3 and PHC F4 the maximum location for the SRD is at SRD-1, which is at least one order of magnitude higher than the remaining downstream SRD samples, and many of these are less than detection. A similar trend is noted in the west ditch, where WD-1 and WD-2b both report similar concentrations and the downstream sample is at least an order of magnitude lower or less than detection. The difference in concentration between the upstream and downstream sampling locations indicate a lack of migration of the PHC F3 and PHC F4 concentrations in sediment due to the low solubility, and the water concentrations are assumed to be below chronic effect levels. Therefore, PHC concentrations in sediment are not expected to result in water concentrations that would exceed chronic effect levels for aquatic receptors (Atlantic PIRI, 2012).

Turtle habitats and populations have been observed by OPG along the SRD and according to the NHIC Make a Map Feature (MNRF, 2019) both the Snapping Turtle and Midland Painted Turtle were observed within the area of the NSS-W. It is inferred that these specific species of special concern can inhabit the SRD. Considering the lack of migration of the PHC compounds in sediment and the low solubility of the PHC compounds within surface water it is expected that any adverse ecological effects to these populations from PHCs will be minimal in comparison to remediating the PHC concentrations along the SRD. Remediation efforts within sediment would involve disturbing the turtle habitat, which would impact the turtle populations much more severely than allowing the PHC concentrations to remain in the sediment.

4.1.3.5.1 Spent Solvent Treatment Facility

The Spent Solvent Treatment Facility (SSTF) is located northwest of the WMMF site, adjacent to the SRD upstream of the discharge points of the NSS-W. The site was historically used for the storage of spent solvent concentrates. It is now decommissioned and these activities have not been occurring for over 10 years (GMBP, 2020). Sediment samples were collected by GMBP (2020) and concentrations had exceeded the MECP Table 9 sediment quality criterion for copper. Subsequent sampling was completed by GMBP (2021) and copper concentrations exceeded the applicable MECP criterion. In addition, concentrations of PHC F2 to F4 exceeded the MECP background concentrations in soil in two samples that are located within the SRD just west of sample location SRD-1. These concentrations are thus compared to the Atlantic PIRI guidelines selected for the screening (Table 4-12:).

Table 4-12: Screening of PHCs F2-F4 from SSTF and SRD-1

COC	Maximum Conc., at SSTF[a]	Concentration at SRD-1	Atlantic PIRI (2012) Benchmark
Petroleum Hydrocarbons F2	12	0	-
Aliphatic C>10-C12	4.3	0	8.7
Aliphatic C>12-C16	5.3	0	*>1000*[b]
Aromatic C>10-C12	1.1	0	5.7
Aromatic C>12-C16	1.3	0	2.5
Petroleum Hydrocarbons F3	350	790	-
Aliphatic C>16-C21	196	442	*>1000*[b]
Aliphatic C>21-C34	84	190	*>1000*[b]
Aromatic C>16-C21	**49**	111	1.7
Aromatic C>21-C34	**21**	47	5.4
Petroleum Hydrocarbons F4	290	280	-
Aliphatic C>34	**232**	224	98.8
Aromatic C>34	**58**	56	0.4

Notes: a = Concentrations were obtained from GMBP (2021)
b = *>1000* indicates that the sediment criteria could not be calculated based on a toxic endpoint to aquatic species due to the low solubility of the PHC fraction in water.
Bold = Concentration exceeds the applicable guideline

The maximum concentrations of the PHC F3 subfractions: aromatic C>16-C21 and aromatic C>21-C34, as well as the maximum concentrations of PHC F4 subfractions: aliphatic C>34 and aromatic C>34 exceed the selected guidelines. As noted above, PHC F3 and PHC F4 concentrations are not soluble in water, thus the chronic effect concentrations in water are not expected to be exceeded. In addition, the maximum concentration along the SRD at the NSS-W is SRD-1, which is located immediately downgradient from the exceedances at the SSTF site. The concentration at SRD-1 is at least one order of magnitude higher than the downstream samples. Therefore, it is inferred that PHC F3 and PHC F4 concentrations are not migrating due to the low solubility of these compounds, and therefore these concentrations are not expected to result in water concentrations that would exceed chronic effect levels for aquatic receptors (Atlantic PIRI, 2012).

4.1.3.6 Screening Summary

Table 4-13 below outlines all non-radiological COPCs carried forward for further quantitative assessment in the ecological risk assessment. Any COPC that screened in via one or more different types of environmental media were included for analysis in all other applicable exposure pathways (e.g., a COPC that screened in via surface water screening was also assessed as a sediment COPC, even if the parameter did not screen in via sediment screening).

Table 4-13: Summary of Non-Radiological COPCs for the Ecological Risk Assessment

Parameter	Screened-in via	Concentration	Screening Criteria
South Railway Ditch – Aquatic & Riparian VECs			
Chromium	Sediment	29.4 µg/g	26 µg/g
Copper	Sediment	140 µg/g	16 µg/g
Iron	Surface water	1,500 µg/L	300 µg/L
Manganese	Sediment	1,100 µg/g	460 µg/g
Nickel	Surface water	36 µg/L	25 µg/L
	Sediment	18.8 µg/g	16 µg/g
Sodium – Dissolved	Surface water	188 mg/L	180 mg/L
Sodium – Total	Surface water	608 mg/L	180 mg/L
Strontium	Surface water	4,450 µg/L	2,500 µg/L
Zinc – Dissolved	Surface Water	90 µg/L	7 µg/L
Zinc – Total	Surface water	105 µg/L	7 µg/L
	Sediment	450 µg/g	120 µg/g
2,3,7,8-tetra CDD TEQ	Surface water	1.36 pg/L	0.6 pg/L
	Sediment	20 pg/g	0.85 pg/g
West Ditch – Aquatic & Riparian VECs			
Cadmium	Sediment	0.67 µg/g	0.6 µg/g
Copper	Sediment	35 µg/g	16 µg/g
Iron	Surface water	854 µg/L	300 µg/L
	Sediment	22,200 µg/g	20,000 µg/g
Lead	Sediment	42.6 µg/g	31 µg/g
Manganese	Sediment	920 µg/g	460 µg/g

Parameter	Screened-in via	Concentration	Screening Criteria
Nickel	Sediment	18.3 µg/g	16 µg/g
Sodium – Total	Surface water	821 mg/L	180 mg/L
Zinc – Dissolved	Surface Water	40 µg/L	7 µg/L
Zinc – Total	Surface water	42 µg/L	7 µg/L
	Sediment	550 µg/g	120 µg/g
2,3,7,8-tetra CDD TEQ	Surface water	6.81 pg/L	0.6 pg/L
	Sediment	22 pg/g	0.85 pg/g
NSS-W – Terrestrial VECs *			
Strontium	Soil	154 µg/g	64 µg/g
RWOS1 – Terrestrial VECs **			
Strontium	Soil	83.8 µg/g	64 µg/g

Notes:
* Terrestrial VECs at the NSS-W were assumed to ingest 100% of their water from the SRD.
** Terrestrial VECs at RWOS1 were assumed to ingest no surface water from either the SRD or the WD in order to assess the RWOS1 area completely independently from the NSS-W facility.

4.1.4 Ecological Conceptual Model and Exposure Pathways

4.1.4.1 Conceptual Site Model

The conceptual model 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 COPCs enter the body of the receptor, or (for radionuclides) how they may exert effects from outside the body.

The potential exposure pathways considered in this assessment included exposure to air, water, soil, and sediment, and various dietary components for different species and receptor categories. Detailed potential exposure pathways for aquatic and terrestrial receptors for both radiological and non-radiological contaminants are given in Figure 4-4:

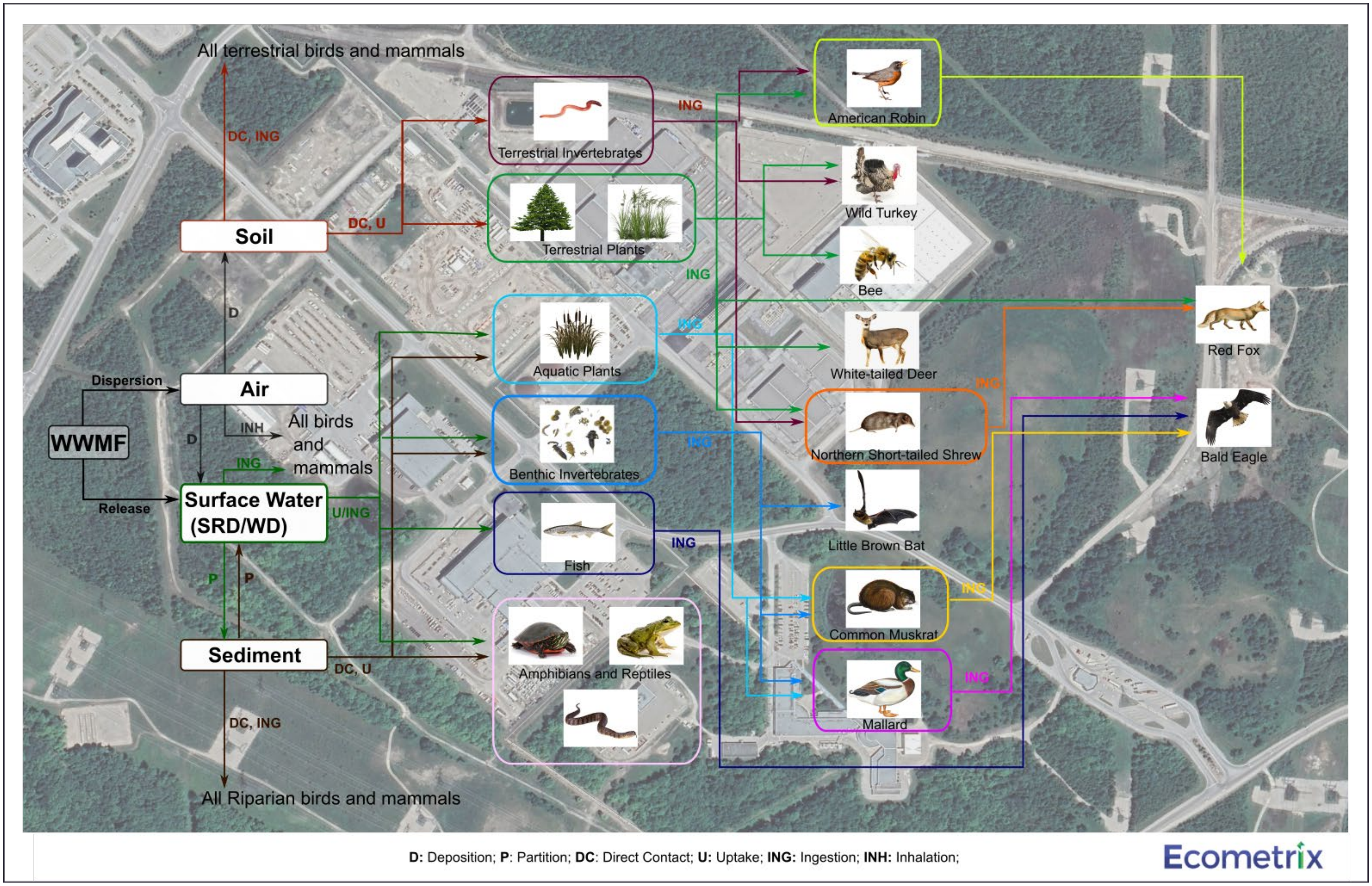


Figure 4-4: Potential Exposure Pathways for General Aquatic and Terrestrial Receptors

The pathways presented in Figure 4-4: are all potential pathways of exposure for the aquatic and terrestrial receptors. Exposure pathways considered in the assessment differ between the radiological and non-radiological COPCs, as discussed in the sections below

Radiological Contaminants

For radiological contaminants, exposures from air, surface water, soil, sediment, and vegetation are relevant. Exposures from each medium are considered for each receptor; no pathway is considered to result in minimal exposure and therefore no pathway is excluded from the assessment so long as there is a means of exposure. For this updated ERA, the only pathway not being assessed further is the exposure to groundwater. This is discussed in Section 4.1.2.1.

For radiological contaminants, the conceptual model for ecological receptors should also take into account external exposure in addition to exposure to environmental contamination through different pathways.

Non-Radiological Contaminants

The potential exposure pathways given in Figure 4-4: were assessed for non-radiological COPCs as part of the screening assessment. The result was that exposure to COPCs from air and groundwater were determined to not be a concern. Media with COPCs, as determined by the screening assessment in Section 4.1.3, are surface water, soil, and sediment. These media have been considered with their various routes of exposure in Figure 4-3 to form the site-specific conceptual model for non-radiological COPCs and to determine the relevant exposure pathways for ecological receptors to non-radiological COPCs.

Exposure pathways have been screened in Figure 4-3 as complete, minimal, incomplete, and not applicable. Complete pathways have been included in the assessment. Pathways by which a receptor may receive minimal exposure to a COPC have not been included in the assessment as they are not considered to be significant in comparison to the exposure from the complete pathways. Pathways that are “not applicable” are pathways by which it is not considered possible or probable for a receptor to be exposed by a COPC, either due to lack of exposure to the medium or the nature of the receptor. Alternatively, “not applicable” may indicate that the media is not applicable, as exposure is assessed through other media.

Pathways with minimal exposure are identified as follows:

- Dermal exposure to ecological receptors is generally prevented by fur or feathers, and has therefore not been included for terrestrial receptors for non-radiological modelling.
- Exposure through soil ingestion by aquatic receptors results in minimal exposure and has therefore not been included.
- Inhalation exposure was excluded from the table as exposures from the inhalation route are typically much less than from the ingestion pathway and as there were no non-radiological COPCs identified in air (CSA, 2012). The inhalation pathway is still considered

for radiological COPCs using the maximum gaseous emissions reported in Table 2-10 and Table 2-11.

- Exposure to sediment contaminants through ingestion of prey (i.e., benthic invertebrates) is considered and quantified.
- Air to aquatic plants is minor since aquatic plants take up contaminants mainly from the water. Generally, any deposition from air to aquatic plant leaves would be washed away rapidly. This exposure pathway has not been included.

The complete exposure pathways are shown in Table 4-14.

Most of the habitats considered in this assessment are within the bounds of the Bruce nuclear site, in areas on or immediately adjacent to the NSS-W and/or RWOS1, to ensure that the most exposed species are evaluated ("On-site" locations). A single exception is fish, which was considered in Lake Huron as well as in the ditches in the vicinity of NSS-W. This was included to ensure that deep-water fish species are considered.

Table 4-14: Complete Exposure Pathways for All Selected Indicator Species

VEC Category	VEC	Location	Exposure Pathways	Environmental Media
Bottom Feeding Fish	Northern Redbelly Dace	SRD, West Ditch	Direct Contact	In Water On Sediment
	Lake Whitefish	Baie du Doré	Direct Contact	In Water On Sediment
Pelagic Fish	Smallmouth Bass	Baie du Doré	Direct Contact	In Water
Reptiles and Amphibians	Painted Turtle	SRD, West Ditch	Direct Contact	In Water On Sediment
	Northern Leopard Frog	SRD, West Ditch	Direct Contact	In Water On Sediment
	Northern Water Snake	SRD, West Ditch	Direct Contact	In Water On Sediment
Aquatic Plants	Cattails	SRD, West Ditch	Direct Contact	In Water On sediment
Benthic Invertebrates	Benthic Invertebrates	SRD, West Ditch	Direct Contact	In Water In Sediment
Riparian Birds	Mallard	SRD, West Ditch	Ingestion	Aquatic Plant Benthic Invertebrates Water Sediment
			Direct Contact	On Sediment
	Bald Eagle	SRD, West Ditch	Ingestion	Northern Redbelly Dace Muskrat Mallard Water Sediment (conservatively assumed ingestion of sediment and not soil)
Riparian Mammals	Muskrat	SRD, West Ditch	Ingestion	Aquatic Plant Benthic Invertebrates Water Sediment

VEC Category	VEC	Location	Exposure Pathways	Environmental Media
			Direct Contact	On Sediment
	Little Brown Myotis	SRD, West Ditch	Ingestion	Water Benthic Invertebrates (Conservative assumption for insectivore)
Terrestrial Plants	Grasses	NSS-W, RWOS1	Direct Contact	On Soil (Direct Uptake) Air (Immersion)
	Eastern White Cedar	NSS-W, RWOS1	Direct Contact	On Soil (Direct Uptake) Air (Immersion)
Terrestrial Invertebrate /Insect	Earthworm	NSS-W, RWOS1	Direct Contact	In Soil (Direct Uptake) Air (Immersion)
	Bee	NSS-W, RWOS1	Ingestion (For Radiological COPCs)	Terrestrial Plant
Terrestrial Birds	American Robin	NSS-W, RWOS1	Direct Contact	On Soil Air (Immersion)
			Ingestion	Water Soil Earthworms Terrestrial Plant
	Wild Turkey	NSS-W, RWOS1	Direct Contact	On Soil Air (Immersion)
			Ingestion	Water Soil Earthworms Terrestrial Plant
Terrestrial Mammals	Northern Short-tailed Shrew	NSS-W, RWOS1	Direct Contact	On Soil Air (Immersion)
			Ingestion	Water Soil Earthworms Terrestrial Plant
	White-Tailed Deer	NSS-W, RWOS1	Direct Contact	On Soil Air (Immersion)

VEC Category	VEC	Location	Exposure Pathways	Environmental Media
			Ingestion	Water Soil Grasses Eastern White Cedar
	Red Fox	NSS-W, RWOS1	Direct Contact	On Soil Air (Immersion)
			Ingestion	Water Soil Grasses American Robin Northern Short-tailed Shrew

4.2 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, BAFs, TFs, and dose coefficients (DCs).

4.2.1 Body Weight and Intake Rates

The body weight and intake rates are required for the calculation of exposure to birds and mammals. The body weights, feed intake rates, water intakes and inhalation intakes were taken from the U.S. EPA (1993b) Sample and Suter (1994) and Federal Contaminated Sites Action Plan Module 3: Standardization of Wildlife Receptor Characteristics (FCSAP, 2012) where the assumptions and values were considered to be applicable. The incidental ingestion of soil and sediment was estimated based on the feed intake. Incidental ingestion varied from 2% to 9.85% of dry weight food intake depending on the biota (Beyer et al., 1994). The values are summarized in Table 4-15:.

Table 4-15: Feed Type Fractions and Intake Rates

Receptor	Body Weight	Ingestion Rate		Dietary Components	Feed Type Fraction	Feed Type Fraction	Feed Intake		Moisture	Feed Intake by Group		Intake of Soil & Sediment (Beyer et al., 1994)[f]	Basis of the Soil and Sediment Intake Value	Total Soil/ Sediment Intake	Water Intake	Inhalation Rate
	kg	kg dw/d	kg fw/d		fw	dw	kg dw/d	kg fw/d	%	kg dw/d	kg fw/d	%		kg dw/d	L/d	m^3/d
Muskrat	**1.17[a]**	0.075	**0.3[a]**	Freshwater Plants[d]	0.8	0.80	0.060	0.240	0.75	0.060	0.240	3.3	based on Mallard	0.0025	0.114[a]	0.59[a]
				Benthic Invertebrates[d]	0.2	0.20	0.015	0.060	0.75	0.015	0.060					
Northern Short-Tailed Shrew	**0.015[b]**	0.00153[b]	**0.009[b]**	Earthworms[e]	1	1.00	0.00153	0.0090	0.83	0.00153	0.0090	13.0	assuming a default rate of 2% in soil in the diet on a dry weight basis	0.0001989	0.0033[b]	0.019[a,b]
Little Brown Bat	**0.0075[b]**	0.00093	**0.0037[b]**	Benthic Invertebrates[d]	1	1.00	0.0009	0.0037	0.75	-	-	-	-	0.0000000	0.0012[a]	0.011[a]
White-tailed Deer	**75[c]**	2.25[a]	11.25	Grass[e]	0.5	0.50	1.13	5.63	0.80	2.25	11.25	-	White-tailed Deer	0.0450	4.5[c]	17.26[a]
				Eastern Cedar[e]	0.5	0.50	1.13	5.63	0.80							
Red Fox	**3.8[c]**	0.0975	**0.342[c]**	Grasse	0.15	0.105	0.010	0.051	0.80	0.010	0.051	2.8	Red Fox	0.0027	0.342[c]	1.59[a]
				Northern Short-Tailed Shrew[e]	0.65	0.765	0.067	0.222	0.70	0.087	0.29					
				American Robin[e]	0.2	0.235	0.021	0.068	0.70							
American Robin	**0.079[c]**	0.0165	**0.096[c]**	Grasse	0.1	0.12	0.0019	0.010	0.90	0.0165	0.096	9.9	Based on the average for the American Woodcock (10.4%) and Wild Turkey (9.3%)	0.00163	0.01106[c]	0.058[a]
				Earthwormse	0.9	0.88	0.0146	0.086	0.83							
Mallard	**1.2[c]**	0.06[c]	**0.240**	Cattail[e]	0.25	0.25	0.015	0.060	0.75	0.015	0.060	3.3	based on Mallard	0.00198	0.072[c]	0.47[a]
				Benthic Invertebrates[e]	0.75	0.75	0.045	0.180	0.75	0.045	0.180					
Wild Turkey	**5.8[b]**	0.0360	**0.174[b]**	Earthwormse	0.2	0.18	0.008	0.048	0.83	0.036	0.187	-	Wild Turkey, Sample and Suter, 1994 (derived from 9.3% of fw ingestion from Beyer et al., 1994)	0.3347	0.19[b]	1.6[a]
				Grasse	0.2	0.21	0.007	0.035	0.80							
				Cedar[e]	0.6	0.62	0.021	0.104	0.80							
Bald Eagle	**4.7[c]**	0.1466	**0.564[c]**	Fish[e]	0.8	0.77	0.113	0.451	0.75	0.113	0.451	2.0	Default from FCSAP, 2012	0.0029	0.188[c]	1.3[a]
				Muskrat	0.1	0.12	0.017	0.056	0.70	0.034	0.113					
				Mallard[e]	0.1	0.12	0.017	0.056	0.70							

Notes

a - USEPA (1993). Wildlife Exposure Factors Handbook, EPA/600/R-93/187.

b - Sample, B.E., and G.W. Suter II, Estimating Exposure of Terrestrial Wildlife to Contaminants, ES/ER/TM-125, 1994.

c - FCSAP (2012). Ecological Risk Assessment Guidance, Module 3: Standardization of Wildlife Receptor Characteristics. March

d - Ecometrix Assumption

e - 2016 NSS-W ERA (AMEC, 2016)

f - Beyer, W.N., E. Conner, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. J. Wildl. Manage. 58: 375-382.

4.2.2 Fraction of Time on Site and Occupancy Factors

The fraction of time a receptor resides in the assessed areas at the NSS-W is assumed to be one.

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 4-16.

Table 4-16: Occupancy Factors used in the Radiological Dose Calculation

Aquatic Biota	OFs	OFss	OFw	Terrestrial and Riparian Biota	OFs	OFss
Northern Redbelly Dace		0.5	0.5	Earthworm	1	
Lake Whitefish		0.5	0.5	American Robin		1
Smallmouth Bass		0	1	Terrestrial Plants (Grass and Eastern White Cedar)		1
Northern Water Snake		0.5	0.5	White-tailed Deer		1
Turtles		0.5	0.5	Northern Short-Tailed Shrew	0.5	0.5
Northern Leopard Frog		0.5	0.5	Red Fox		1
Aquatic Plants (excluding Cattails)		0.1	0.9	Wild Turkey		1
Cattails	0.25	0.25	0.25	Mallard		0.5
Benthic Invertebrates	1			Muskrat		0.5

Notes:
OF_s = occupancy factor in soil/sediment
OF_{ss} = occupancy factor on soil/sediment surface
OF_w = occupancy factor in water
Occupancy factor on water surface is 0 for all identified receptors, with the exception of cattails, which is 0.25.

4.2.3 Bioaccumulation Factors

Bioaccumulation factors relate the COPC concentration in the environmental media to the concentration in the receptor. In cases where tissue concentrations were not available for the receptors at the NSS-W site, BAFs were used to calculate COPC concentrations in invertebrate and fish tissues. These factors vary throughout the literature. For the exposure assessment, BAFs were taken from CSA, IAEA and literature sources, including those suggested in CSA N288.6 (CSA, 2012, 2020; IAEA, 2010).

The BAFs used in the assessment are presented in Table 4-17. Bioaccumulation factors for tritium and carbon-14 are calculated using the specific activity model in IMPACT. Soil-to-plant transfer factors are summarized in Table 4-18.

Table 4-17: BAFs for Aquatic Receptors

BAF (L/kg (fw)) Radiological COPCs								
COPC	Cattails[1]	Lake Whitefish[2]	Smallmouth Bass[2]	Redbelly Dace[2]	Leopard Frog[2]	Northern Watersnake[2]	Painted Turtle[2]	Benthic Invertebrates[3]
Co-60	790	54	54	54	54	54	54	110
Cs-134	220	3500	3500	3500	3500	3500	3500	99
Cs-137	220	3500	3500	3500	3500	3500	3500	99
I-131	71	6	6	6	6	6	6	10
Non-radiological COPCs								
Cadmium	19000	140	140	140	140	140	140	100
Chromium	10	55	55	55	55	55	55	390
Copper	3000	230	230	230	230	230	230	42
Iron	3100	240	240	240	240	240	240	2800
Lead	1900	25	25	25	25	25	25	22
Manganese	4400	240	240	240	240	240	240	690
Nickel	52	21	21	21	21	21	21	100
Sodium	18	84	84	84	84	84	84	7
Strontium	370	2	2	2	2	2	2	240
Zinc	1400	5000	5000	5000	5000	5000	5000	1800

All BAFs from CSA N288.1-20 (2020) except:

[1] BAFs for Cd from IAEA (2010), Cu from IAEA (2010), and Pb from IAEA (2010).

[2] BAFs for Cd from Sheppard et al., (2009), Cu from IAEA (2010), and Pb from IAEA (2010).

[3] BAFs for Cd from IAEA (2010), Cu from IAEA (2010), and Pb from IAEA (2010).

Table 4-18: Soil-to-Plant BAFs for Terrestrial Invertebrates and Terrestrial Plants

BAF kg(dw soil)/kg(dw plant)			
COPC	Terrestrial Invertebrate (Earthworm)[1]	Grass[2]	Cedar[2]
Radiological COPCs			
Co-60	0.0358	0.0470	0.0470
Cs-134	0.5259	0.0530	0.0530
Cs-137	0.5259	0.0530	0.0530
I-131	0.9176	0.0500	0.0500
Non-radiological COPCs			
Strontium	0.0528	0.8700	0.8700

All BAFs from CSA N288.1-20 (2020) unless otherwise stated

[1] BAF for Strontium from Sample et al. (1998), median value.

[2] BAFs for Grass and Cedar are for generic terrestrial plant

4.2.4 Biota-Sediment Accumulation Factors

To model the movement of dioxins and furans from sediment into aquatic receptors, biota-sediment accumulation factors (BSAF) were derived using data from Burkhard et al., (2004) for each dioxin/furan congener being assessed. BSAFs represent the relationship between the chemical concentration within an organism (standardized by the lipid fraction of the organism) with the chemical concentration in sediment over the fraction of sediment composed of organic carbon. BSAFs for each tetra-, hexa- and hepta-PCDD/F congener were derived using an exponential equation based on the log octanol-water partition coefficient (K_{ow}) of each congener and data from Burkhard et al., (2004). A BSAF for 2,3,4,7,8-Penta CDF was derived using additional data available through the U.S. EPA's BSAF dataset (US EPA, 2016) for lake trout in Southern Lake Michigan.

Transfer factors (TF) represent the fraction of daily COPC intake transferred to the tissue of birds and mammals. Ingestion transfer factors are COPC and biota-specific. Transfer factors from feed to tissue for agricultural livestock are available in CSA (2020). An allometric equation (transfer factor proportional to a -3/4 power of body weight), was applied to transfer factors available for beef and poultry, to estimate the transfer factors for mammal and bird receptors, respectively (CSA, 2012). The derived transfer factors are presented in Table 4-19 and Table 4-20. The TFs for tritium and carbon-14 were derived using specific activity methods in IMPACT.

4.2.4.1 Dioxins and Furans

Transfer factors from feed to animal tissues for specific dioxin/furan congeners are largely unavailable in the toxicological literature; however, BSAFs are available as discussed above. For the purposes of the dioxin/furan assessment, the bald eagle's diet was modified. Small mammals and birds, which previously represented a combined 20% of the eagle's diet, were substituted with fish, composing 100% of the eagle's diet.

Table 4-19: Ingestion Transfer Factors for Mammals and Birds.

Ingestion Transfer Factor (day/kg fw)										
COPC [1,2,3]	Bald Eagle	Mallard	Muskrat[1]	American Robin	Wild Turkey	Little Brown Bat	Northern Short-tailed Shrew[2]	Red Fox	White-tailed Deer	Bee
Radiological COPCs										
Co-60	5.11E-01	1.42E+00	4.63E-02	1.10E+01	4.36E-01	2.05E+00	1.22E+00	1.92E-02	2.05E-03	1.00E-01
Cs-134	1.42E+00	3.96E+00	2.37E+00	3.05E+01	1.22E+00	1.05E+02	6.22E+01	9.80E-01	1.05E-01	5.70E-02
Cs-137	1.42E+00	3.96E+00	2.37E+00	3.05E+01	1.22E+00	1.05E+02	6.22E+01	9.80E-01	1.05E-01	5.70E-02
I-131	4.58E-03	1.28E-02	7.22E-01	9.82E-02	3.92E-03	3.19E+01	1.90E+01	2.98E-01	3.19E-02	1.60E+00
Non-radiological COPCs										
Cadmium	9.69E+02	2.47E+02	8.23E-01	1.63E+01	1.20E+03	1.55E+00	1.05E-02	2.67E+00	5.27E+01	NA
Chromium	5.24E+02	1.34E+02	1.56E+00	8.81E+00	6.47E+02	8.36E-01	2.00E-02	5.07E+00	1.00E+02	NA
Copper	1.60E+02	4.07E+01	1.04E+00	2.68E+00	1.97E+02	2.55E-01	1.33E-02	3.36E+00	6.64E+01	NA
Iron	7.98E+02	2.04E+02	1.99E+00	1.34E+01	9.84E+02	1.27E+00	2.55E-02	6.45E+00	1.27E+02	NA
Lead	2.85E+01	7.27E+00	9.93E-02	4.79E-01	3.52E+01	4.55E-02	1.27E-03	3.22E-01	6.36E+00	NA
Manganese	1.08E+00	2.76E-01	8.51E-02	1.82E-02	1.34E+00	1.73E-03	1.09E-03	2.76E-01	5.46E+00	NA
Nickel	1.77E+02	4.51E+01	7.09E-01	2.97E+00	2.18E+02	2.82E-01	9.09E-03	2.30E+00	4.55E+01	NA
Sodium	3.99E+03	1.02E+03	2.13E+00	6.70E+01	4.92E+03	6.36E+00	2.73E-02	6.91E+00	1.36E+02	NA
Strontium	1.14E+01	2.91E+00	1.84E-01	1.92E-01	1.41E+01	1.82E-02	2.36E-03	5.99E-01	1.18E+01	1.00E-01
Zinc	2.68E+02	6.84E+01	2.27E+01	4.50E+00	3.30E+02	4.27E-01	2.91E-01	7.37E+01	1.45E+03	NA

All TFs calculated through allometric equations based on TF beef for mammals and poultry for birds from CSA N288.1-20 (2020) except:

[1] TF for Cadmium from IAEA (2010)

[2] TF for Copper from Sheppard (2009)

[3] TF for Lead from IAEA (2010)

Table 4-20: Inhalation Transfer Factors for Mammals and Birds.

Inhalation Transfer Factor										
COPC	**Bald Eagle**	**Mallard**	**Muskrat**	**American Robin**	**Wild Turkey**	**Little Brown Bat**	**Northern Short-tailed Shrew**	**Red Fox**	**White-tailed Deer**	**Bee**
Radiological COPCs										
Co-60	8.74E-01	2.43E+00	7.92E-02	1.87E+01	7.46E-01	3.50E+00	2.08E+00	3.28E-02	3.50E-03	0.00E+00
Cs-134	8.96E-01	2.50E+00	1.49E+00	1.92E+01	7.65E-01	2.59E+02	3.92E+01	6.17E-01	6.59E-02	0.00E+00
Cs-137	8.96E-01	2.50E+00	1.49E+00	1.92E+01	7.65E-01	6.59E+01	3.92E+01	6.17E-01	6.59E-02	0.00E+00
I-131	2.89E-03	8.04E-03	4.55E-01	6.19E-02	2.47E-03	2.01E+01	1.19E+01	1.88E-01	2.01E-02	0.00E+00

4.2.5 Radiation Dose Coefficients

Radiation dose coefficients (DCs) used for terrestrial and aquatic biota are shown in Table 4-21 to Table 4-23. These DCs were taken from ICRP (2008) and the ERICA Tool 1.2.1 (Brown et al., 2008). Surrogate organisms from these sources were selected to represent the receptors in this EcoRA, considering similarities in body size and likely external exposure media. The DC values for tritium in both sources ((ICRP, 2008a) and ERICA Tool 1.2.1 (Brown et al., 2008)) do not incorporate radiation quality factors for relative biological effectiveness (RBE). Therefore, the "low beta" components of the DCs were multiplied by 2 (as per CSA N288.6-12) in order to represent its greater relative effectiveness.

Table 4-21: External and Internal DCFs for Aquatic Organisms

COPC	Cattails[1]	Lake Whitefish[2]	Smallmouth Bass[2]	Redbelly Dace[2]	Leopard Frog[3]	Northern Watersnake[3]	Painted Turtle[3]	Benthic Invertebrates[4]
DCF external (µGy/hr)/(Bq/kg(ww sediment) or Bq/L(water))								
C-14	2.17E-07	1.79E-08	1.79E-08	1.79E-08	2.29E-07	2.29E-07	1.79E-08	8.20E-07
Co-60	1.42E-03	1.29E-03	1.29E-03	1.29E-03	1.42E-03	1.42E-03	1.29E-03	1.40E-03
Cs-134	8.75E-04	7.92E-04	7.92E-04	7.92E-04	9.17E-04	9.17E-04	7.92E-04	9.20E-04
Cs-137	3.29E-04	2.83E-04	2.83E-04	2.83E-04	3.38E-04	3.38E-04	2.83E-04	3.70E-04
HTO	2.33E-09	3.54E-13	3.54E-13	3.54E-13	1.33E-11	1.33E-11	3.54E-13	2.40E-13
I-131	2.21E-04	1.92E-04	1.92E-04	1.92E-04	2.25E-04	2.25E-04	1.92E-04	2.40E-04
DCF internal (µGy/hr)/(Bq/kg(fw))								
C-14	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.83E-05	2.80E-05
Co-60	8.75E-05	2.13E-04	2.13E-04	2.13E-04	6.25E-05	6.25E-05	6.25E-05	5.20E-05
Cs-134	1.13E-04	2.04E-04	2.04E-04	2.04E-04	9.58E-05	9.58E-05	9.58E-05	7.20E-05
Cs-137	1.38E-04	1.83E-04	1.83E-04	1.83E-04	1.33E-04	1.33E-04	1.33E-04	9.80E-05
HTO	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.76E-06	5.78E-06
I-131	1.13E-04	1.38E-04	1.38E-04	1.38E-04	1.04E-04	1.04E-04	1.04E-04	8.70E-05

[1] DCFs from ICRP 108 (2008), seaweed

[2] DCFs from ICRP 108 (2008), trout

[3] DCFs from ICRP 108 (2008), tadpole

[4] DCFs from ICRP 108 (2008), insect larvae

Table 4-22: Internal and External DCFs for Terrestrial Plants and Invertebrates

COPC	Terrestrial Invertebrate (Earthworm)[1]	Grass[2]	Cedar[2]
DCF internal (µGy/hr)/(Bq/kg(fw plant))			
C-14	2.83E-05	2.83E-05	2.83E-05
Co-60	7.50E-05	7.50E-05	7.50E-04
Cs-134	1.08E-04	1.04E-04	5.83E-04
Cs-137	1.42E-04	1.42E-04	3.25E-04
HTO	5.76E-06	5.76E-06	5.76E-06
I-131	1.13E-04	1.08E-04	2.46E-04
DCF external soil surface (µGy/hr)/(Bq/m^2)			
C-14	-	0.00E+00	0.00E+00
Co-60	-	1.79E-05	5.42E-06
Cs-134	-	1.21E-05	3.58E-06
Cs-137	-	4.58E-06	1.29E-06
HTO	-	0.00E+00	0.00E+00
I-131	-	3.08E-06	9.17E-07
DCF external soil (µGy/hr)/(Bq/kg(dw soil))			
C-14	0.00E+00	-	-
Co-60	1.29E-03	-	-
Cs-134	8.33E-04	-	-
Cs-137	3.04E-04	-	-
HTO	0.00E+00	-	-
I-131	1.92E-04	-	-

[1] DCFs from ICRP 108 (2008), earthworm

[2] DCFs from ICRP 108 (2008), pine tree

Table 4-23: Internal and External DCFs for Mammals and Birds

COPC	Bald Eagle[1]	Mallard[1]	Muskrat[2]	American Robin[1]	Wild Turkey[1]	Little Brown Bat[2]	Short-tailed Shrew[2]	Red Fox[2]	White-tailed Deer[3]	Bee[4]
DCF Internal (µGy/hr)/(Bq/kg(fw animal))										
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
Co-60	2.38E-04	2.38E-04	1.67E-04	2.38E-04	2.38E-04	1.67E-04	1.67E-04	1.67E-04	8.33E-04	6.67E-05
Cs-134	2.21E-04	2.21E-04	1.71E-04	2.21E-04	2.21E-04	1.71E-04	1.71E-04	1.71E-04	6.25E-04	9.58E-05
Cs-137	1.88E-04	1.88E-04	1.71E-04	1.88E-04	1.88E-04	1.71E-04	1.71E-04	1.71E-04	3.42E-04	1.33E-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
I-131	1.42E-04	1.42E-04	1.29E-04	1.42E-04	1.42E-04	1.29E-04	1.29E-04	1.29E-04	2.50E-04	1.08E-04
DCF external (soil surface) (µGy/hr)/(Bq/m^2)										
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-60	7.50E-06	7.50E-06	7.92E-06	7.50E-06	7.50E-06	7.92E-06	7.92E-06	7.92E-06	4.04E-06	7.92E-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	2.54E-06	5.42E-06
Cs-137	1.79E-06	1.79E-06	1.88E-06	1.79E-06	1.79E-06	1.88E-06	1.88E-06	1.88E-06	9.17E-07	1.92E-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
I-131	1.21E-06	1.21E-06	1.29E-06	1.21E-06	1.21E-06	1.29E-06	1.29E-06	1.29E-06	6.25E-07	1.33E-06

[1] DCFs from ICRP 108 (2008), duck

[2] DCFs from ICRP 108 (2008), rat

[3] DCFs from ICRP 108 (2008), deer

[4] DCFs from ICRP 108 (2008), bee

4.3 Assessment of Radiological Impact

In this EcoRA, the impact of radiological contaminants is assessed in a manner that considers the impact of multiple radionuclides and pathways on non-human biota.

4.3.1 Exposure Point Concentrations and Doses

In this assessment, the concentrations of radionuclides in air were estimated based on air dispersion modelling using IMPACT, with details presented in Appendix D. Radionuclide concentrations in soil and vegetation were obtained from baseline monitoring field studies performed at the NSS-W and RWOS1 site. Sampling was performed in accordance with CSA N288.4-19 (CSA, 2019). The general sampling locations for radiological monitoring of soil and vegetation are shown in Figure 1-2 in accordance with the work plan (Ecometrix, 2020c).

1. Along the SRD: Monitoring stations RD1, MSA-1, RD-2 for soil and A1 for terrestrial vegetation;
2. West of the west ditch: Monitoring stations A5-1 and A5-2;
3. In the forested area south of the NSS-W in-ground storage containers: Monitoring stations A3-1 and A3-2;
4. East of the Grasses Swale on the site of the Construction Landfill: Monitoring stations "SWALE" for soil and A2 for vegetation; and
5. Around RWOS 1

Concentrations of radionuclides in water were obtained from the sampling program conducted on the area of the NSS-W during the years 2020 and 2021 within the scope of this EcoRA. The general sampling locations for radiological monitoring in surface water and sediment are shown in Figure 1-2.

1. Along the SRD (SRD-1, LOPC B, SRD-2), north of the Western Used Fuel Dry Storage Facility;
2. GS-1: At the discharge following the last settling pond of the Grassed Swale;
3. SRD-3 (Location E): At the corner of Gantry Crane Road and the railway tracks, at the base of the stairs leading down to the ditch;
4. WTL-1 and WTL-2: in the wetland west of siding road;
5. SRD- 4 and SRD-5: downstream SRD before its confluence with Stream C;
6. Along Stream C before and after the Confluence with the SRD; and
7. WD 1, WD-3B, WD-3: along the West Ditch.

This radiological data set is used to represent the current conditions of the ecological environment. A summary of this data set is provided in Table 4-24 and details are available in Appendix F. A summary of the radiological contaminants, their maximum concentrations which were used for calculation, the media in which they were measured, and their sampling locations can be found below.

For modelling in IMPACT the site was divided in multiple polygons. The polygons used and the associated sampling locations are summarized in Table 4-24. The aquatic environment was divided into two groups, one representing the West Ditch (WD) and the second representing the remaining sampling locations (SRD). A third polygon was introduced in the IMPACT model representing Baie du Dore. No measurements were done in this location and concentrations were modelled based on liquid emissions from the NSS-W. The terrestrial environment was divided into the RWOS1, where concentrations were based on soil and vegetation concentrations measured at the RWOS 1 sampling stations, and NSS-W representing all other terrestrial sampling locations across the site.

Table 4-24: Polygons used for modelling and associated sampling stations.

IMPACT Polygon	Sampling stations
Aquatic	
SRD	"Stream C DS", "Stream C Confluence", "GS-1", "Location B", "SRD-1", "SRD-2", "SRD-3", "SRD-4", "SRD-5", "Stream C US", "WTL-1", "WTL-2".
WD	"WD-1", "WD-2b", "WD-3".
Baie du Dore	no measured concentrations
Terrestrial	
NSS-W	"A5-1", "A5-2", "RD-1", "MSA-1", "RD-2", "SWALE", "A3-1", "A3-2".
RWOS1	"RWOS1-4", "RWOS1-1", "RWOS1-2", "RWOS1-3".

4.3.1.1 Exposure Averaging

When multiple measurements and samples were available for a given COPC in a particular medium at an assessed exposure location, the upper confidence limit of the mean (UCLM) from all sampling points at this location was calculated, whenever possible, and used as an exposure value.

This approach is conservative. Birds and mammals are likely to experience something close to the mean concentrations as they move around the area. For less mobile organisms such as plants and invertebrates, both maximum and upper confidence limit (UCLM) concentrations represent exposures that would be experienced by some organisms on a long-term basis.

Concentration data were combined across seasons to determine the exposure point concentrations. While seasonal effects were not evident for the selected COPCs, no statistical analysis of seasonality was conducted.

All of the environmental data collected in 2020 and 2021 are uncensored, which means that data below detection were reported as the value generated by the analytical instrument, rather than the detection limit. These data were used to calculate the maximum and the upper confidence of the mean (UCLM) concentrations. In some cases, the UCLM values were greater than the maximum values because of small sample sizes (typically n<4). In these instances, the maximum values were used to represent the UCLM exposure point concentrations.

4.3.1.2 Concentration in Air

The air concentrations used in the IMPACT modelling were the maximum annual emissions for C-14, tritium and I-131 between 2014 and 2020 (Table 2-10) which were then converted to emissions in Bq/s. The air concentrations were then estimated with IMPACT at all receptor locations, presented in Table 4-25 and were used in the dose calculation.

Table 4-25: Modelled Air Concentrations at the Assessed Locations for Terrestrial Receptors

	Concentration (Bq/m^3)		
Location	**C-14**	**HTO**	**I-131**
RWOS1	8.79E-04	6.88E-01	5.71E-09
NSS-W	142.56/ 22.48	5.92E+00	4.91E-08
WD	1.83E-03	1.44E+00	1.19E-08

Note: Maximum and UCLM concentrations of C-14 from fugitive measurements are shown for NSS-W; both were used for pathways and dose modelling of C-14 at NSS-W

4.3.1.3 Soil and Vegetation Concentrations

Monitoring of soil was performed as part of the 2020-2021 sampling program monitoring program; soil monitoring locations are illustrated in Figure 1-3. Radionuclide concentrations in soil were measured as Bq/kg dry weight (dw). Table 4-26 and Table 4-27 give the maximum and UCLM concentration of each radionuclide in soil.

Monitoring of carbon-14 in terrestrial vegetation was performed as part of the baseline monitoring program; vegetation (cedar and grass) was measured at the sampling points illustrated in Figure 1-2. Radionuclide concentrations were measured as Bq/kg or Bq/kg-C for C-14, and were converted to Bq/kg fw using an average organic carbon content of 0.5 kgC/kg dw (CSA, 2020). Table 4-26 and Table 4-27 give the maximum concentrations of each radionuclide measured in cedar and grass.

Table 4-26: Soil, Cedar, and Grass for the NSS-W Polygon

	Soil[1]		Grass[2]		Cedar[3]	
	Maximum	UCLM	Maximum	UCLM	Maximum	UCLM
Radionuclides						
	Bq/kg(dw)	Bq/kg(dw)	Bq/kg(fw)	Bq/kg(fw)	Bq/kg(fw)	Bq/kg(fw)
Carbon-14	1.13E+01	9.63E+00	2.70E+02	1.35E+02	4.26E+02	2.05E+02
Cobalt-60	1.11E-01	1.11E-01	-	-	-	-
Cesium-134	1.00E+00	5.18E-01	-	-	-	-
Cesium-137	1.94E+01	1.49E+01	-	-	-	-
Tritium (Bq/L)	3.57E+02	3.35E+02				
Iodine-131	2.10E+00	1.12E+00	-	-	-	-

1) Calculated using mean measured organic carbon content of 56250 mg C/kg.
2) Calculated using mean measured moisture of 70% and organic carbon content of 0.5kgC/kg fw.
3) Calculated using mean measured moisture of 60% and organic carbon content of 0.5kgC/kg fw.

Table 4-27: Soil, Cedar, and Grass for the RWOS1 Polygon

	Soil[1]		Grass[2]		Cedar[3]	
	Maximum	UCLM	Maximum	UCLM	Maximum	UCLM
Radionuclides						
	Bq/kg(dw)	Bq/kg(dw)	Bq/kg(fw)	Bq/kg(fw)	Bq/kg(fw)	Bq/kg(fw)
Carbon-14	1.03E+01	5.39E+00	9.22E+01	9.22E+01	1.27E+02	1.27E+02
Tritium (Bq/L)	3.61E+02	1.70E+02	-	-	-	-

1) Calculated using mean measured organic carbon content of 51000 mg C/kg.
2) Calculated using mean measured moisture of 70% and organic carbon content of 0.5kgC/kg fw.
3) Calculated using mean measured moisture of 60% and organic carbon content of 0.5kgC/kg fw.

4.3.1.4 Concentrations in Surface Water, Sediment and Cattails

The maximum concentration of each radionuclide in surface water was obtained from on-site monitoring programs. Some concentrations were measured in Bq/kg; these were converted to Bq/L assuming a water density of 1.0 kg/L; tritium was directly measured in Bq/L. Sampling locations are outlined in Section 1.1.2.2 and Figure 1-2. The concentrations are given in Table 4-28 and Table 4-29.

The maximum concentration of each radionuclide in sediment was obtained from on- site monitoring programs. Radionuclide concentrations in sediment were measured as Bq/kg dw. Sampling locations are outlined in Section 1.1.2.2 and Figure 1-2. The concentrations are given in Table 4-28 and Table 4-29.

Monitoring of radionuclides in aquatic vegetation was performed as part of the 2020-2021 sampling program; cattails were measured at the sampling points illustrated in Section 1.1.2.2

and Figure 1-2. Radionuclide concentrations were measured as Bq/kg or Bq/kg-C for C-14. Table 4-28 and Table 4-29 give the maximum concentrations of each radionuclide in fresh weight measured in cattails for each sampling group respectively.

Table 4-28: Water, Sediment and Cattail Concentrations for the SRD Polygon

	Surface Water		Sediment[1]		Cattails[2]	
	Maximum	UCLM	Maximum	UCLM	Maximum	UCLM
Radionuclides						
	Bq/L	Bq/L	Bq/kg(dw)	Bq/kg(dw)	Bq/kg(fw)	Bq/kg(fw)
Carbon-14	1.39E+00	2.43E-01	9.67E+00	4.62E+00	8.30E+01	6.53E+01
Cobalt-60	8.16E-01	1.22E-01	9.97E-01	2.06E-01	-	-
Cesium-134	7.19E-01	8.95E-02	1.05E+00	4.34E-01	-	-
Cesium-137	5.32E-01	9.43E-02	1.62E+01	4.77E+00	-	-
Tritium	1.52E+03	5.67E+02	-	-	-	-
Iodine-131	1.01E+00	1.85E-01	4.11E+00	1.01E+00	-	-

1) Calculated using mean measured organic carbon content of 2.2%.

2) Calculated using mean measured moisture of 73% and organic carbon content of 0.5kgC/kg fw.

Table 4-29: Water, Sediment and Cattail Concentrations for the WD Polygon

	Surface Water		Sediment[1]		Cattails[2]	
	Maximum	UCLM	Maximum	UCLM	Maximum	UCLM
Radionuclides						
	Bq/L	Bq/L	Bq/kg(dw)	Bq/kg(dw)	Bq/kg(fw)	Bq/kg(fw)
Carbon-14	5.40E-02	4.10E-02	2.69E+00	2.69E+00	2.56E+01	2.56E+01
Cobalt-60	4.08E-01	1.62E-01	1.36E+00	1.03E+00	-	-
Cesium-134	5.37E-01	2.14E-01	1.80E+00	1.47E+00	-	-
Cesium-137	4.19E-01	1.82E-01	7.00E+00	5.18E+00	-	-
Tritium	2.58E+02	1.97E+02	-	-	-	-
Iodine-131	5.34E-01	2.62E-01	6.66E+00	5.45E+00	-	-

1) Calculated using mean measured organic carbon content of 2.6%.

2) Calculated using mean measured moisture of 85% and organic carbon content of 0.5kgC/kg fw.

4.3.1.5 Radiological Doses to Ecological Receptors

Exposure and dose calculations were performed for each radiological COPC for each ecological receptor for each receptor location. Doses to receptor species were calculated using the computer code IMPACT (Version 5.5.2). IMPACT is consistent with the equations outlined in CSA N288.1 and the methods outlined in CSA N288.6 (CSA, 2012, 2020) regarding ecological risk assessment for radiological exposures to non-human biota. IMPACT uses the specific activity model for tritium and C-14 as per CSA N288.1 and as recommended by CSA N288.6.

Doses to the indicator species were calculated using the measured environmental concentration data, and exposure factors presented in Section 4.3 above, as inputs to the code. Radiological doses to all receptors are summarized in Table 4-30 to Table 4-33. The only COPC considered within the Baie du Doré scenario is tritium as modelling in Baie du Doré is based on tritium migration via stormwater runoff and subsurface drainage from the NSS-W to the SRD, travelling along Stream C to Baie du Doré.

The theoretical basis and the default IMPACT parameter values used for dose calculation are presented in Appendix D.

Table 4-30: Radiological Dose to Receptors in Aquatic Polygon SRD and Terrestrial Polygon NSS-W

SRD and NSS-W																
	Dose by Radionuclide (mGy/d)														Total Dose (mGy/d)	
Indicator Species	HTO		OBT		C-14		Co-60		I-131		Cs-134		Cs-137			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Cattail	1.58E-04	5.88E-05	2.31E-05	8.62E-06	5.64E-05	4.44E-05	1.37E-03	2.05E-04	1.98E-04	3.64E-05	4.36E-04	5.48E-05	3.98E-04	7.17E-05	2.64E-03	4.80E-04
Grass	4.05E-05	4.05E-05	3.97E-10	3.97E-10	1.84E-04	9.18E-05	1.24E-05	1.24E-05	4.05E-05	2.16E-05	7.54E-05	3.91E-05	5.56E-04	4.27E-04	9.08E-04	6.32E-04
Eastern White Cedar	4.05E-05	4.05E-05	3.97E-06	3.97E-06	2.90E-04	1.39E-04	3.77E-06	3.77E-06	1.21E-05	6.47E-06	2.25E-05	1.17E-05	1.58E-04	1.21E-04	5.30E-04	3.27E-04
Earthworm	2.16E-04	1.07E-04	2.17E-05	1.07E-05	3.59E-02	4.84E-03	4.00E-06	3.53E-06	1.10E-05	5.70E-06	2.73E-05	1.14E-05	1.54E-04	1.15E-04	3.63E-02	5.09E-03
Benthic Invertebrates	1.58E-04	5.89E-05	2.95E-05	1.10E-05	4.86E-03	8.49E-04	1.19E-04	1.81E-05	2.50E-05	4.87E-06	1.28E-04	1.72E-05	1.53E-04	3.04E-05	5.47E-03	9.90E-04
Northern Redbelly Dace	1.58E-04	5.88E-05	2.94E-05	1.10E-05	5.39E-03	9.42E-04	2.45E-04	3.68E-05	2.44E-05	4.53E-06	1.23E-02	1.54E-03	8.20E-03	1.45E-03	2.64E-02	4.04E-03
Northern Leopard Frog	1.58E-04	5.88E-05	2.94E-05	1.10E-05	5.39E-03	9.42E-04	8.86E-05	1.33E-05	2.04E-05	3.80E-06	5.80E-03	7.22E-04	5.97E-03	1.06E-03	1.75E-02	2.81E-03
Northern Water Snake	1.58E-04	5.88E-05	2.94E-05	1.10E-05	5.38E-03	9.41E-04	8.86E-05	1.33E-05	2.03E-05	3.79E-06	5.80E-03	7.22E-04	5.95E-03	1.06E-03	1.74E-02	2.81E-03
Painted Turtle	1.58E-04	5.88E-05	2.94E-05	1.10E-05	5.39E-03	9.42E-04	8.66E-05	1.30E-05	1.96E-05	3.65E-06	5.80E-03	7.22E-04	5.97E-03	1.06E-03	1.74E-02	2.81E-03
Bald Eagle	2.66E-04	1.00E-04	4.34E-06	1.68E-06	5.09E-02	8.96E-03	7.24E-05	1.08E-05	5.72E-08	1.05E-08	8.64E-03	1.08E-03	5.43E-03	9.63E-04	6.53E-02	1.11E-02
American Robin	1.40E-04	6.69E-05	8.61E-06	3.93E-06	6.94E-02	9.39E-03	7.43E-06	5.54E-06	1.58E-05	8.45E-06	7.15E-05	2.18E-05	2.67E-04	1.90E-04	6.99E-02	9.68E-03
Mallard	2.23E-04	8.37E-05	3.65E-06	1.41E-06	4.01E-02	7.07E-03	4.47E-04	6.69E-05	1.46E-06	3.42E-07	4.70E-04	5.89E-05	3.02E-04	5.45E-05	4.15E-02	7.34E-03
Wild Turkey	7.50E-05	4.28E-05	5.60E-06	2.81E-06	1.63E-02	2.38E-03	5.71E-06	5.35E-06	1.58E-05	8.45E-06	3.50E-05	1.75E-05	2.54E-04	1.94E-04	1.67E-02	2.65E-03
Muskrat	2.05E-04	7.69E-05	7.36E-06	2.79E-06	3.30E-02	5.83E-03	3.16E-05	4.83E-06	4.14E-05	7.66E-06	4.13E-04	5.17E-05	3.12E-04	5.62E-05	3.40E-02	6.03E-03
Little Brown Bat	1.33E-04	5.01E-05	7.36E-06	2.79E-06	3.29E-02	5.76E-03	2.73E-06	4.08E-07	3.67E-06	6.71E-07	1.13E-04	1.41E-05	8.39E-05	1.49E-05	3.33E-02	5.84E-03
Northern Short-tailed Shrew	8.98E-05	4.47E-05	4.08E-06	2.06E-06	6.49E-02	8.76E-03	2.76E-06	2.74E-06	8.73E-06	4.63E-06	2.21E-05	8.99E-06	1.23E-04	9.18E-05	6.52E-02	8.92E-03
Red Fox	1.28E-04	6.50E-05	8.61E-06	3.80E-06	6.35E-02	8.70E-03	5.51E-06	5.49E-06	1.73E-05	9.10E-06	3.57E-05	1.68E-05	2.33E-04	1.77E-04	6.39E-02	8.98E-03
White-tailed Deer	6.89E-05	3.85E-05	6.79E-06	3.13E-06	4.76E-04	2.32E-04	2.95E-06	2.82E-06	9.12E-06	4.56E-06	2.12E-05	8.98E-06	1.16E-04	8.77E-05	7.00E-04	3.78E-04
Honey Bee	2.02E-04	2.02E-04	1.98E-05	1.98E-05	9.18E-04	4.59E-04	8.34E-10	8.34E-10	4.13E-07	2.26E-07	6.94E-09	3.60E-09	1.88E-07	1.44E-07	1.14E-03	6.82E-04

Table 4-31: Radiological Dose to Receptors in Polygon WD

WD																
	Dose by Radionuclide (mGy/d)														Total Dose (mGy/d)	
Indicator Species	HTO		OBT		C-14		Co-60		I-131		Cs-134		Cs-137			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Cattail	2.68E-05	2.04E-05	3.92E-06	3.00E-06	1.74E-05	1.74E-05	6.87E-04	2.74E-04	1.06E-04	5.31E-05	3.27E-04	1.32E-04	3.10E-04	1.36E-04	1.48E-03	6.36E-04
Benthic Invertebrates	2.68E-05	2.05E-05	5.01E-06	3.82E-06	1.89E-04	1.43E-04	6.51E-05	2.92E-05	1.84E-05	1.15E-05	9.98E-05	4.31E-05	1.10E-04	5.16E-05	5.14E-04	3.03E-04
Northern Redbelly Dace	2.68E-05	2.04E-05	4.99E-06	3.81E-06	2.09E-04	1.59E-04	1.24E-04	5.00E-05	1.39E-05	7.35E-06	9.22E-03	3.67E-03	6.46E-03	2.81E-03	1.61E-02	6.72E-03
Northern Leopard Frog	2.68E-05	2.04E-05	4.99E-06	3.81E-06	2.09E-04	1.59E-04	4.58E-05	1.90E-05	1.20E-05	6.46E-06	4.33E-03	1.73E-03	4.70E-03	2.04E-03	9.33E-03	3.98E-03
Northern Water Snake	2.67E-05	2.04E-05	4.99E-06	3.81E-06	2.09E-04	1.59E-04	4.58E-05	1.90E-05	1.20E-05	6.46E-06	4.33E-03	1.73E-03	4.69E-03	2.04E-03	9.32E-03	3.97E-03
Painted Turtle	2.68E-05	2.04E-05	4.99E-06	3.81E-06	2.09E-04	1.59E-04	4.46E-05	1.85E-05	1.14E-05	6.09E-06	4.33E-03	1.73E-03	4.70E-03	2.04E-03	9.33E-03	3.98E-03
Bald Eagle	4.01E-05	3.07E-05	7.43E-07	5.73E-07	1.99E-03	1.51E-03	3.17E-05	1.26E-05	3.04E-08	1.50E-08	6.44E-03	2.57E-03	4.27E-03	1.85E-03	1.28E-02	5.98E-03
Mallard	2.18E-05	1.67E-05	6.25E-07	4.82E-07	1.55E-03	1.18E-03	6.82E-05	2.80E-05	1.97E-06	1.60E-06	2.04E-04	8.22E-05	1.37E-04	6.04E-05	1.99E-03	1.37E-03
Muskrat	3.49E-05	2.66E-05	1.26E-06	9.62E-07	1.31E-03	9.99E-04	1.74E-05	7.85E-06	2.33E-05	1.21E-05	3.09E-04	1.24E-04	2.43E-04	1.07E-04	1.94E-03	1.28E-03
Little Brown Bat	2.27E-05	1.73E-05	1.26E-06	9.62E-07	1.28E-03	9.71E-04	1.36E-06	5.41E-07	1.94E-06	9.51E-07	8.47E-05	3.37E-05	6.61E-05	2.87E-05	1.46E-03	1.05E-03

Table 4-32: Radiological Dose to Receptors in Polygon RWOS1

RWOS1																
Indicator Species	Dose by Radionuclide (mGy/d)														Total Dose (mGy/d)	
	HTO		OBT		C-14		Co-60		I-131		Cs-134		Cs-137			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Grass	4.70E-06	4.70E-06	4.61E-11	4.61E-11	6.27E-05	6.27E-05	0.00E+00	0.00E+00	1.95E-10	1.95E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.74E-05	6.74E-05
Eastern White Cedar	4.70E-06	4.70E-06	4.61E-07	4.61E-07	8.63E-05	8.63E-05	0.00E+00	0.00E+00	4.45E-11	4.45E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-05	9.15E-05
Earthworm	4.88E-06	4.88E-06	4.90E-07	4.90E-07	2.21E-07	2.21E-07	0.00E+00	0.00E+00	2.08E-11	2.08E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.59E-06	5.59E-06
American Robin	2.75E-06	2.75E-06	1.34E-07	1.34E-07	1.88E-05	1.88E-05	0.00E+00	0.00E+00	1.76E-12	1.76E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.17E-05	2.17E-05
Wild Turkey	2.75E-06	2.75E-06	1.34E-07	1.34E-07	1.57E-04	1.57E-04	0.00E+00	0.00E+00	1.38E-12	1.38E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-04	1.60E-04
Northern Short-tailed Shrew	2.08E-06	2.08E-06	9.89E-08	9.89E-08	4.00E-07	4.00E-07	0.00E+00	0.00E+00	4.31E-12	4.31E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E-06	2.58E-06
Red Fox	3.18E-06	3.18E-06	1.09E-07	1.09E-07	1.30E-04	1.30E-04	0.00E+00	0.00E+00	4.81E-12	4.81E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-04	1.33E-04
White-tailed Deer	2.37E-06	2.37E-06	1.12E-07	1.12E-07	1.50E-04	1.50E-04	0.00E+00	0.00E+00	8.07E-11	8.07E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-04	1.52E-04
Honey Bee	2.35E-05	2.35E-05	2.31E-06	2.31E-06	3.13E-04	3.13E-04	0.00E+00	0.00E+00	1.41E-09	1.41E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.39E-04	3.39E-04

Table 4-33: Radiological Dose to Receptors in Polygon Baie du Dore

Baie du Dore																
Indicator Species	Dose by Radionuclide (mGy/d)														Total Dose (mGy/d)	
	HTO		OBT		C-14		Co-60		I-131		Cs-134		Cs-137			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Lake Whitefish	2.01E-06	2.01E-06	3.75E-07	3.75E-07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.39E-06	2.39E-06
Smallmouth Bass	2.01E-06	2.01E-06	3.75E-07	3.75E-07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.39E-06	2.39E-06

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, 1996) were selected for the DN assessment of effects on aquatic biota and terrestrial biota, respectively, as recommended in the CSA N288.6-12 standard (CSA, 2012). 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 (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 EcoRA 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, 2008b). 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 (CSA, 2012), and are appropriate for this assessment.

4.3.3 Risk Characterization

Ecological risk from radiological COPCs is assessed through comparison with the benchmarks of 2.4 mGy/d and 9.6 mGy/d for terrestrial and aquatic biota, respectively. The dose to considered indicator species from all pathways is presented in Table 4-34. All radiological doses are well below the benchmarks defined.

Table 4-34: Total Radiological Dose to all Receptors

Indicator Species	Location	Total Dose Max (mGy/d)	Total Dose UCLM (mGy/d)
Cattail	SRD & NSS-W	2.64E-03	4.80E-04
Grass	SRD & NSS-W	9.08E-04	6.32E-04
Eastern White Cedar	SRD & NSS-W	5.30E-04	3.27E-04
Earthworm	SRD & NSS-W	3.63E-02	5.09E-03
Benthic Invertebrates	SRD & NSS-W	5.47E-03	9.90E-04
Northern Redbelly Dace	SRD & NSS-W	2.64E-02	4.04E-03
Northern Leopard Frog	SRD & NSS-W	1.75E-02	2.81E-03
Northern Water Snake	SRD & NSS-W	1.74E-02	2.81E-03
Painted Turtle	SRD & NSS-W	1.74E-02	2.81E-03
Bald Eagle	SRD & NSS-W	6.53E-02	1.11E-02
American Robin	SRD & NSS-W	6.99E-02	9.68E-03
Mallard	SRD & NSS-W	4.15E-02	7.34E-03
Wild Turkey	SRD & NSS-W	1.67E-02	2.65E-03
Muskrat	SRD & NSS-W	3.40E-02	6.03E-03
Little Brown Bat	SRD & NSS-W	3.33E-02	5.84E-03
Northern Short-tailed Shrew	SRD & NSS-W	6.52E-02	8.92E-03
Red Fox	SRD & NSS-W	6.39E-02	8.98E-03
White-tailed Deer	SRD & NSS-W	7.00E-04	3.78E-04
Honey Bee	SRD & NSS-W	1.14E-03	6.82E-04
Cattail	WD	1.48E-03	6.36E-04
Benthic Invertebrates	WD	5.14E-04	3.03E-04
Northern Redbelly Dace	WD	1.61E-02	6.72E-03
Northern Leopard Frog	WD	9.33E-03	3.98E-03
Northern Water Snake	WD	9.32E-03	3.97E-03

Indicator Species	Location	Total Dose Max (mGy/d)	Total Dose UCLM (mGy/d)
Painted Turtle	WD	9.33E-03	3.98E-03
Bald Eagle	WD	1.28E-02	5.98E-03
Mallard	WD	1.99E-03	1.37E-03
Muskrat	WD	1.94E-03	1.28E-03
Little Brown Bat	WD	1.46E-03	1.05E-03
Grass	RWOS1	6.74E-05	6.74E-05
Eastern White Cedar	RWOS1	9.15E-05	9.15E-05
Earthworm	RWOS1	5.59E-06	5.59E-06
American Robin	RWOS1	2.17E-05	2.17E-05
Wild Turkey	RWOS1	1.60E-04	1.60E-04
Northern Short-tailed Shrew	RWOS1	2.58E-06	2.58E-06
Red Fox	RWOS1	1.33E-04	1.33E-04
White-tailed Deer	RWOS1	1.52E-04	1.52E-04
Honey Bee	RWOS1	3.39E-04	3.39E-04
Lake Whitefish	Baie du Dore	2.39E-06	2.39E-06
Smallmouth Bass	Baie du Dore	2.39E-06	2.39E-06

It should be noted that indicator species could receive radiation doses from direct external exposure to gamma radiation from the waste storage facilities at the NSS-W. This can be taken into account in the calculation of dose to non-human biota by conservatively assuming that all indicator species receive a gamma dose of 0.11 µGy/h (0.024 mGy/d), which is the maximum dose rate measured at the boundary of the NSS-W for the period of 2014 to 2020.

The acceptance criteria for dose at the walls of routinely accessible structure surfaces such as the SGSB or LLSB is 25 µSv/h (OPG, 2017d). However measured values at the wall have been reported to be significantly lower. For ecological receptors residing on the NSS-W site, in the immediate vicinity of the buildings, based on this value, the maximum expected dose rate could be up to 0.6 mGy/d. This assumes the wildlife whole body absorbed dose is comparable to the human effective dose. Assuming that this is a whole body effective dose, the tissue absorbed dose at body surface may be slightly higher, but the whole body tissue absorbed dose for wildlife may be lower. It is difficult to translate the human effective dose to a whole body absorbed dose for various wildlife species with different geometries.

4.4 Assessment of Non-Radiological Impact

4.4.1 Exposure Point Concentrations

Exposure estimates are provided below for receptors with complete exposure pathways. For most receptors, COPC concentrations in individual environmental media are used as the exposure value. The exception is for birds and mammals, for which the exposure point concentrations for all applicable media and pathways for a given COPC are used to calculate an exposure dose. Concentrations in soil, sediment, and vegetation were determined based on measured values in the same manner as for the radiological dose assessment.

4.4.1.1 Terrestrial Plants and Invertebrates

For plant and invertebrate species, the COPC concentrations in environmental media are used as the exposure point concentrations. As identified in Section 4.1.3.3, the COPC for soil exposure is strontium. These receptors are relatively immobile and will be directly exposed to the COPC concentrations at their locations. Exposure concentrations are given in Table 4-35.

Table 4-35: Measured Concentrations in Soil at NSS-W and RWOS1

	NSS-W Soil		RWOS1 Soil	
	Maximum	UCLM	Maximum	UCLM
	mg/kg (dw)	mg/kg (dw)	mg/kg (dw)	mg/kg (dw)
Strontium	1.54E+02	1.23E+02	8.38E+01	5.09E+01

4.4.1.2 Aquatic Receptors

A number of COPCs were identified in surface water and sediment. These COPCs require further evaluation in the context of potential risks to aquatic receptors. External exposure (via immersion or direct contact) to surface water is the predominant exposure pathway for aquatic plants, aquatic invertebrates, fish and herpetofauna (through the sensitive life stage of the tadpole, which are assumed to be protective of the northern leopard frog, painted turtle and northern water snake). The exposure concentrations to these receptor groups are considered to be the maximum concentrations measured. Exposure concentrations for both SRD and WD aquatic receptors are given in Table 4-36 and Table 4-37 respectively.

Table 4-36: Water, Sediment and Cattail Concentrations in SRD

SRD						
	Surface Water		Sediment		Cattails [1,2]	
	Maximum	UCLM	Maximum	UCLM	Maximum	UCLM
	mg/L	mg/L	mg/kg (dw)	mg/kg (dw)	mg/kg (fw)	mg/kg (fw)
2,3,7,8-Tetra CDD Equivalent	1.36E-09	8.17E-11	2.01E-05	4.17E-06	4.49E-06	2.70E-07
Chromium	8.80E-03	1.28E-03	2.94E+01	1.26E+01	4.28E-02	3.10E-02
Copper	1.68E-03	7.76E-04	1.40E+02	3.52E+01	5.78E-01	4.67E-01
Iron	1.50E+00	3.05E-01	1.72E+04	1.15E+04	1.14E+03	7.60E+02
Manganese	3.98E-01	6.53E-02	1.10E+03	5.30E+02	2.37E+01	1.47E+01
Nickel	3.60E-02	4.99E-03	1.88E+01	1.07E+01	3.01E-01	1.96E-01
Sodium	6.08E+02	2.18E+02	1.58E+03	5.60E+02	2.52E+03	1.10E+03
Strontium	4.45E+00	1.79E+00	7.90E+02	2.95E+02	3.66E+01	1.83E+01
Zinc	1.05E-01	2.62E-02	4.50E+02	1.69E+02	1.29E+01	7.20E+00

1) Calculated using mean measured moisture of 73%.
2) The dioxin/furan concentration in cattails (as 2,3,7,8-TCDD equivalent) was calculated by multiplying the concentration of 2,3,7,8-TCDD equivalent in water by a water-to-aquatic plant bioaccumulation factor of 3,302 $L/kg_{(fw)}$ (U.S. EPA, 1999)

Table 4-37: Water, Sediment, and Cattail Concentrations in WD

WD						
	Surface Water		Sediment		Cattails [1,2]	
	Maximum	UCLM	Maximum	UCLM	Maximum	UCLM
	mg/L	mg/L	mg/kg (dw)	mg/kg (dw)	mg/kg (fw)	mg/kg (fw)
2,3,7,8-Tetra CDD Equivalent	6.81E-09	1.10E-09	2.18E-05	9.83E-06	2.25E-05	3.64E-06
Cadmium	1.90E-05	1.17E-05	6.69E-01	4.81E-01	2.22E-03	2.22E-03
Copper	3.30E-03	2.22E-03	3.50E+01	2.99E+01	3.09E-01	2.81E-01
Iron	8.54E-01	4.35E-01	2.22E+04	1.75E+04	1.38E+02	1.24E+02
Lead	1.00E-03	3.79E-04	4.26E+01	3.10E+01	9.15E-02	7.92E-02
Manganese	2.08E-01	7.09E-02	9.20E+02	8.10E+02	8.34E+00	7.97E+00
Nickel	1.30E-03	9.36E-04	1.83E+01	1.67E+01	7.23E-02	6.81E-02
Sodium	8.21E+02	3.17E+02	1.86E+03	1.14E+03	3.98E+02	3.81E+02
Zinc	4.20E-02	2.20E-02	5.50E+02	3.86E+02	4.79E+00	4.35E+00

1) Calculated using mean measured moisture of 85%.
2) The dioxin/furan concentration in cattails (as 2,3,7,8-TCDD equivalent) was calculated by multiplying the concentration of 2,3,7,8-TCDD equivalent in water by a water-to-aquatic plant bioaccumulation factor of 3,302 $L/kg_{(fw)}$ (U.S. EPA, 1999)

4.4.1.3 Terrestrial and Riparian Birds and Mammals

The exposure concentrations in Appendix C, along with the exposure factors in Section 4.2, were applied in the equations in Appendix D to estimate the non-radiological dose to all aquatic biota and non-radiological dose to birds and mammals. The estimated non-radiological doses are presented in Table 4-38 to Table 4-42.

4.4.1.4 Dioxins and Furans

Aquatic biota are exposed to dioxins and furans through external contact (via immersion or direct contact) with contaminated sediments. The concentrations of dioxin and furan congeners measured in sediment were converted into toxic equivalency values (TEQs) by multiplying them with congener-specific toxicity equivalent factors (TEFs). The TEQ represents a concentration of 2,3,7,8-tetra CDD that is equivalent in its toxicity to the measured concentration of the original congener (refer to Section 3.3.3 for further discussion about the assessment of dioxins and furans). The TEFs used to characterize risk to aquatic biota are reported in Table 3-10, and the TEFs used to assess risk to bird and mammal receptors are presented in Table 4-41 and Table 4-42. The combined TEQ of 2,3,7,8-TCDD acts as the exposure point concentration for aquatic biota. Exposure concentrations of 2,3,7,8-TCDD (equivalent) for SRD and WD aquatic receptors are presented in Table 4-40 and Table 4-41, respectively.

Table 4-38: Doses to Terrestrial and Riparian Receptors with Exposure to the NSS-W and SRD

SRD and NSS-W																		
Indicator Species	Dose by Contaminant (mg/kg-d)																	
	2,3,7,8-Tetra CDD Equivalent		Chromium		Copper		Iron		Manganese		Nickel		Sodium		Strontium		Zinc	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Muskrat	1.07E-06	7.07E-08	2.48E-01	5.87E-02	4.19E-01	1.72E-01	4.86E+02	2.24E+02	2.13E+01	6.45E+00	2.90E-01	8.88E-02	8.07E+02	3.30E+02	6.44E+01	2.66E+01	1.33E+01	4.26E+00
Little Brown Bat	1.05E-06	6.29E-08	1.69E+00	2.46E-01	3.51E-02	1.62E-02	2.07E+03	4.22E+02	1.36E+02	2.22E+01	1.78E+00	2.47E-01	2.29E+03	8.19E+02	5.28E+02	2.12E+02	9.33E+01	2.33E+01
Mallard	5.76E-07	3.95E-08	5.66E-01	9.72E-02	2.71E-01	8.63E-02	7.16E+02	1.85E+02	4.42E+01	8.37E+00	5.88E-01	1.03E-01	8.31E+02	3.07E+02	1.64E+02	6.59E+01	2.97E+01	7.72E+00
Bald Eagle	1.15E-06	7.53E-08	7.61E-02	1.57E-02	1.11E-01	3.64E-02	7.43E+01	2.28E+01	9.73E+00	1.77E+00	8.91E-02	1.67E-02	5.07E+03	1.82E+03	1.63E+00	6.55E-01	5.41E+01	1.38E+01
Northern Short-tailed Shrew	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.85E+00	2.70E+00	N/A	N/A
White-tailed Deer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.38E+00	3.40E+00	N/A	N/A
Red Fox	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.88E-01	5.51E-01	N/A	N/A
American Robin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.54E+00	6.60E+00	N/A	N/A
Wild Turkey	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.68E+00	7.71E+00	N/A	N/A
Honey Bee	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.27E+05	1.82E+05	N/A	N/A

Note:
N/A indicates a contaminant is not relevant to a receptor as it is not considered a COPC in the polygon within which that receptor lives.

Table 4-39: Doses to Riparian Receptors with Exposure to the WD

WD																				
Indicator Species	Dose by Contaminant (mg/kg-d)																			
	2,3,7,8-Tetra CDD Equivalent		Cadmium		Copper		Iron		Lead		Manganese		Nickel		Sodium		Strontium		Zinc	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Muskrat	5.21E-06	8.57E-07	1.97E-03	1.53E-03	1.45E-01	1.26E-01	1.98E+02	1.25E+02	1.10E-01	8.23E-02	1.10E+01	5.86E+00	6.03E-02	5.41E-02	4.73E+02	2.30E+02	2.16E+02	1.60E+02	6.03E+00	3.69E+00
Little Brown Bat	5.24E-06	8.49E-07	9.40E-04	5.79E-04	6.89E-02	4.64E-02	1.18E+03	6.01E+02	1.10E-02	4.17E-03	7.08E+01	2.41E+01	6.43E-02	4.63E-02	3.09E+03	1.19E+03	2.89E+02	2.13E+02	3.73E+01	1.96E+01
Mallard	2.76E-06	4.57E-07	1.50E-03	1.08E-03	9.42E-02	7.76E-02	4.02E+02	2.18E+02	7.82E-02	5.64E-02	2.35E+01	9.08E+00	5.34E-02	4.50E-02	9.71E+02	3.87E+02	1.34E+02	9.88E+01	1.25E+01	6.79E+00
Bald Eagle	5.59E-06	9.19E-07	6.48E-04	4.41E-04	9.20E-02	6.54E-02	4.65E+01	2.75E+01	2.31E-02	1.60E-02	5.25E+00	2.03E+00	1.23E-02	1.06E-02	6.81E+03	2.63E+03	8.57E-01	6.56E-01	2.20E+01	1.17E+01

Table 4-40: Doses to Receptors with Exposures to RWOS1

RWOS1		
Indicator Species	Dose by Contaminant (mg/kg-d)	
	Strontium	
	Max	UCLM
Northern Short-tailed Shrew	1.56E+00	9.49E-01
White-tailed Deer	2.24E+00	1.36E+00
Red Fox	2.63E-01	1.60E-01
American Robin	4.31E+00	2.62E+00
Wild Turkey	5.19E+00	3.15E+00
Honey Bee	1.24E+05	7.52E+04

Table 4-41: Dioxin/Furan Doses to Receptors with Exposure to SRD

SRD and NSS-W										
Indicator Species	Dose (mg/kg-d)								TEF (U.S. EPA, 1999; Van den Berg, 1998)	
	Muskrat		Little Brown Bat		Mallard		Bald Eagle			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Mammals	Birds
1,2,3,4,6,7,8-Hepta CDD	2.77E-06	8.32E-07	3.26E-06	9.79E-07	2.16E-06	6.49E-07	1.10E-06	3.30E-07	1.00E-02	1.00E-03
1,2,3,4,6,7,8-Hepta CDF	2.82E-06	7.31E-07	4.42E-06	1.14E-06	2.20E-06	5.70E-07	1.22E-06	3.17E-07	1.00E-02	1.00E-02
1,2,3,4,7,8,9-Hepta CDF	1.82E-07	5.25E-08	2.85E-07	8.23E-08	1.42E-07	4.10E-08	7.90E-08	2.28E-08	1.00E-02	1.00E-02
1,2,3,4,7,8-Hexa CDD	8.86E-08	2.33E-08	1.31E-07	3.43E-08	6.91E-08	1.82E-08	3.76E-08	9.89E-09	1.00E-01	5.00E-02
1,2,3,4,7,8-Hexa CDF	3.66E-07	8.12E-08	6.40E-07	1.42E-07	2.86E-07	6.33E-08	1.65E-07	3.66E-08	1.00E-01	1.00E-01
1,2,3,6,7,8-Hexa CDD	1.77E-07	5.14E-08	2.61E-07	7.58E-08	1.38E-07	4.01E-08	7.51E-08	2.18E-08	1.00E-01	1.00E-02
1,2,3,6,7,8-Hexa CDF	5.27E-07	1.29E-07	9.20E-07	2.26E-07	4.11E-07	1.01E-07	2.38E-07	5.82E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDD	2.16E-07	6.05E-08	3.18E-07	8.92E-08	1.68E-07	4.72E-08	9.17E-08	2.57E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDF	0.00E+00	5.07E-09	0.00E+00	8.86E-09	0.00E+00	3.96E-09	0.00E+00	2.29E-09	1.00E-01	1.00E-01
1,2,3,7,8-Penta CDD	1.26E-07	3.70E-08	2.27E-07	6.65E-08	9.86E-08	2.89E-08	5.77E-08	1.69E-08	1.00E+00	1.00E+00
1,2,3,7,8-Penta CDF	1.80E-07	5.00E-08	3.33E-07	9.27E-08	1.40E-07	3.90E-08	8.29E-08	2.31E-08	5.00E-02	1.00E-01
2,3,4,6,7,8-Hexa CDF	3.60E-07	8.93E-08	6.28E-07	1.56E-07	2.81E-07	6.96E-08	1.62E-07	4.03E-08	1.00E-01	1.00E-01
2,3,4,7,8-Penta CDF	1.65E-07	4.99E-08	3.06E-07	9.25E-08	1.29E-07	3.89E-08	7.62E-08	2.30E-08	5.00E-01	1.00E+00
2,3,7,8-Tetra CDD	7.02E-08	2.05E-08	1.33E-07	3.90E-08	5.47E-08	1.60E-08	3.27E-08	9.54E-09	1.00E+00	1.00E+00
2,3,7,8-Tetra CDF	2.53E-07	1.03E-07	4.79E-07	1.95E-07	1.97E-07	8.04E-08	1.18E-07	4.79E-08	1.00E-01	1.00E+00
Octa CDD	8.70E-06	1.72E-06	7.22E-06	1.42E-06	6.79E-06	1.34E-06	3.16E-06	6.23E-07	1.00E-04	1.00E-04
Octa CDF	1.74E-06	1.69E-06	1.89E-06	1.84E-06	1.35E-06	1.32E-06	6.74E-07	6.57E-07	1.00E-04	1.00E-04
2,3,4,7,8-TCDD TEQ Dose	**5.46E-07**	**1.56E-07**	**9.49E-07**	**2.71E-07**	**6.39E-07**	**2.05E-07**	**3.75E-07**	**1.21E-07**	-	-

Table 4-42: Dioxin/Furan Doses to Receptors with Exposure to WD

WD										
Indicator Species	Dose (mg/kg-d)								TEF (U.S. EPA, 1999; Van den Berg, 1998)	
	Muskrat		Little Brown Bat		Mallard		Bald Eagle			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Mammals	Birds
1,2,3,4,6,7,8-Hepta CDD	6.10E-06	3.22E-06	7.17E-06	3.79E-06	4.76E-06	2.51E-06	2.42E-06	1.28E-06	1.00E-02	1.00E-03
1,2,3,4,6,7,8-Hepta CDF	2.79E-06	1.50E-06	4.36E-06	2.34E-06	2.17E-06	1.17E-06	1.21E-06	6.49E-07	1.00E-02	1.00E-02
1,2,3,4,7,8,9-Hepta CDF	2.10E-07	1.17E-07	3.28E-07	1.82E-07	1.63E-07	9.09E-08	9.09E-08	5.05E-08	1.00E-02	1.00E-02
1,2,3,4,7,8-Hexa CDD	1.06E-07	6.42E-08	1.57E-07	9.47E-08	8.29E-08	5.01E-08	4.52E-08	2.73E-08	1.00E-01	5.00E-02
1,2,3,4,7,8-Hexa CDF	3.07E-07	1.76E-07	5.36E-07	3.08E-07	2.40E-07	1.37E-07	1.39E-07	7.95E-08	1.00E-01	1.00E-01
1,2,3,6,7,8-Hexa CDD	2.94E-07	1.70E-07	4.33E-07	2.51E-07	2.29E-07	1.33E-07	1.25E-07	7.24E-08	1.00E-01	1.00E-02
1,2,3,6,7,8-Hexa CDF	2.16E-07	1.23E-07	3.78E-07	2.15E-07	1.69E-07	9.58E-08	9.76E-08	5.54E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDD	2.47E-07	1.45E-07	3.64E-07	2.14E-07	1.92E-07	1.13E-07	1.05E-07	6.15E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDF	1.17E-08	7.83E-09	2.03E-08	1.37E-08	9.06E-09	6.09E-09	5.25E-09	3.53E-09	1.00E-01	1.00E-01
1,2,3,7,8-Penta CDD	1.51E-07	9.32E-08	2.71E-07	1.68E-07	1.17E-07	7.27E-08	6.87E-08	4.25E-08	1.00E+00	1.00E+00
1,2,3,7,8-Penta CDF	1.05E-07	6.76E-08	1.95E-07	1.25E-07	8.20E-08	5.27E-08	4.85E-08	3.12E-08	5.00E-02	1.00E-01
2,3,4,6,7,8-Hexa CDF	1.88E-07	1.04E-07	3.29E-07	1.82E-07	1.47E-07	8.14E-08	8.49E-08	4.71E-08	1.00E-01	1.00E-01
2,3,4,7,8-Penta CDF	1.63E-07	9.23E-08	3.02E-07	1.71E-07	1.27E-07	7.20E-08	7.52E-08	4.26E-08	5.00E-01	1.00E+00
2,3,7,8-Tetra CDD	2.25E-07	1.28E-07	4.28E-07	2.44E-07	1.75E-07	9.99E-08	1.05E-07	5.97E-08	1.00E+00	1.00E+00
2,3,7,8-Tetra CDF	8.55E-07	4.71E-07	1.62E-06	8.92E-07	6.67E-07	3.68E-07	3.98E-07	2.19E-07	1.00E-01	1.00E+00
Octa CDD	2.76E-05	7.41E-06	2.28E-05	6.14E-06	2.15E-05	5.78E-06	1.00E-05	2.69E-06	1.00E-04	1.00E-04
Octa CDF	3.23E-06	9.68E-06	3.51E-06	1.05E-05	2.52E-06	7.55E-06	1.25E-06	3.75E-06	1.00E-04	1.00E-04
2,3,4,7,8-TCDD TEQ Dose	**7.79E-07**	**4.47E-07**	**1.36E-06**	**7.85E-07**	**1.21E-06**	**6.81E-07**	**7.14E-07**	**4.03E-07**	-	-

4.4.2 Toxicological Benchmarks

Toxicological benchmarks, also referred to as Toxicity Reference Values (TRVs), are provided for non-radiological COPCs identified through the screening process and carried into the risk assessment. TRVs are obtained by reviewing available publications from various regulatory agencies and peer-reviewed toxicological studies with measurement endpoints (e.g., survival, reproduction or growth) relevant to the endpoints assessed in the risk assessment. Wherever available TRVs were found to be more conservative than the initial screening criteria, the screening criteria was used as the toxicological benchmark, as the screening criteria is representative of the most protective peer-reviewed benchmark for the protection of ecological receptors.

Toxicological benchmarks for terrestrial plants and terrestrial soil organisms are presented in Table 4-43 and Table 4-44, respectively, and are based on soil concentrations. The strontium benchmark for plants was derived from a chronic LOEC of 25 mg/L in culture water that resulted in injury to the test species Nagaoka cabbage (*Brassica oleracea*) (Hara et al., 1977). To estimate a LOEC for strontium in soil, the LOEC of 25 mg/L was multiplied by a K_d of 69 L/kg dry-weight, consistent with loam soils as reported in (CSA, 2020). The estimated LOEC soil concentration of 1725 mg/kg dry-weight was used as the toxicological benchmark for terrestrial plants.

The strontium benchmark for soil organisms was derived from a study published by (Fisher et al., 1999) and cited in (WHO, 2010), and represents a test concentration at which the reproductive ability of earthworms (*Eisenia foetida*) was significantly reduced.

Table 4-43: Terrestrial Plants TRV

Terrestrial Plants (Grass / Eastern White Cedar)				
Parameter	TRV mg/kg dw	Endpoint	Test Species	Reference
Strontium	1.73E+03	Estimated from a 37-day LOEC of 25 mg/L in culture water resulting in injury to the plants	Nagaoka cabbage (*Brassica oleracea*)	(Hara et al., 1977)

Table 4-44: Soil Organisms TRV

Soil Organisms (Earthworm)				
Parameter	TRV mg/kg dw	Endpoint	Test Species	Reference
Strontium	1.06E+04	Significant reduction in reproduction after 10 weeks	Earthworm (*Eisenia foetida*)	(WHO, 2010)

All aquatic toxicity benchmarks for fish and herpetofauna, aquatic plants and benthic invertebrates are presented in Table 4-45, Table 4-46 and Table 4-47 respectively, and are based on water concentrations. The majority of the benchmarks for fish and herpetofauna were obtained from toxicological studies cited in (Suter and Tsao, 1996) with the exception of copper (Redick and LaPoint, 2004) sodium (Mount et al., 2009) and strontium (McPherson et al., 2014). Toxicological benchmarks for aquatic plants were also obtained from Suter and Tsao (1996), with the exception of iron (BC MOE, 2008), manganese (CCME, 2019), nickel (MECP, 1979), sodium (Mount et al., 2009), and strontium (McPherson et al., 2014). Toxicological benchmarks for benthic invertebrates were compiled from studies published in (Suter and Tsao, 1996), with exceptions including cadmium (MECP, 2011a) chromium (MECP, 2011b), iron (MECP, 1979), nickel (MECP, 1979), strontium (McPherson et al., 2014) and 2,3,7,8-TCDD (CCME, 2001a).

Table 4-45: Fish and Herpetofauna TRVs

Fish & Herpetofauna				
Parameter	TRV mg/L	Endpoint	Test Species	Reference
2,3,7,8-Tetra CDD Equivalent	1.00E-08	Chronic Screening Value	Marketability of fish	(Suter and Tsao, 1996)
Cadmium	1.70E-03	LCV	Early life stage test on brook trout (*Salvelinus fontinalis*)	(Suter and Tsao, 1996)
Chromium	6.86E-02	LCV	Rainbow trout early life stages	(Suter and Tsao, 1996)
Copper	1.90E-01	7-day NOAEC	Northern leopard frog (*Lithobates pipiens*) A LC_{50} of 670 µg/L was also identified	(Redick and LaPoint, 2004)
Iron	1.30E+00	LCV	Rainbow trout (Oncorhynchus mykiss)	(Suter and Tsao, 1996)

Fish & Herpetofauna				
Parameter	**TRV mg/L**	**Endpoint**	**Test Species**	**Reference**
Lead	1.89E-01	LCV	Rainbow trout early life stages	(Suter and Tsao, 1996)
Manganese	1.78E+00	LCV	28-day early life stage test on fathead minnow (*Pimephales promelas)*.	(Suter and Tsao, 1996)
Nickel	3.50E-02	LCV	Early life stage test on rainbow trout	(Suter and Tsao, 1996)
Sodium	3.43E+03	Chloride toxicity benchmark	-	(Mount et al., 2009)
Strontium	1.07E+01	Chronic effects benchmark	Chronic SSD that includes tests on aquatic invertebrates, aquatic plants and fish. The lowest chronic effects level for fish was an IC20 for fathead minnow (*Pimephales promelas*) of 17.4 mg/L.	(McPherson et al., 2014)
Zinc	3.64E-02	LCV	Life-cycle tests with flagfish (*Jordanella floridae*)	(Suter and Tsao, 1996)

Table 4-46: Aquatic Plant TRVs

Aquatic Plants				
Parameter	TRV mg/L	Endpoint	Test Species	Reference
2,3,7,8-Tetra CDD Equivalent	1.00E-08	Chronic Screening Value	Marketability of fish	(Suter and Tsao, 1996)
Cadmium	2.00E-03	LCV (LOEL)	Growth of *Asterionella formosa*	(Suter and Tsao, 1996)
Chromium	3.97E-01	LCV	*Selenastrum capricornutum* 4-day IC_{50} for growth	(Suter and Tsao, 1996)
Copper	4.00E-03	CWQG	Protection of all aquatic life	(CCME, n.d.)
Iron	1.49E+00	acute value converted to chronic	*Lemna minor* (common duckweed)	(BC MOE, 2008)
Lead	5.00E-01	LCV	IC_{35} to IC_{53} growth for *Chlorella vulgaris, Scenedesmus quadricauda*, and *Selenastrum capricornutum*	(Suter and Tsao, 1996)
Manganese	1.37E+01	7-day EC_{10}	*Lemna minor* (common duckweed) frond count normalized for pH 7.5 and for dissolved Mn. Green algae were found to be more sensitive than vascular plants to dissolved Mn with a 72-hour EC_{10} (cell yield) for *Pseudokirchneriella subcapitata* of 0.965 mg/L at pH 7.5.	(CCME, 2019)
Nickel	2.50E-02	Ontario PWQO	Protection of all aquatic life	(MECP, 2011a)
Sodium	1.17E+03	Chloride toxicity benchmark	-	(MECP, 2011b)
Strontium	3.60E+01	IC_{10}	Growth of green algae	(McPherson et al., 2014)

Aquatic Plants				
Parameter	TRV mg/L	Endpoint	Test Species	Reference
Zinc	3.00E-02	LCV	7-day growth tests with *Selenastrum capricornutum*	(Suter and Tsao, 1996)

Table 4-47: Benthic Invertebrates TRVs (Water)

Benthic Invertebrates				
Parameter	TRV mg/L	Endpoint	Test Species	Reference
2,3,7,8-Tetra CDD Equivalent	1.00E-08	Marketability of Fish	Fish	(Suter and Tsao, 1996)
Cadmium	2.00E-04	Ontario PWQO	Protection of all aquatic life	(MECP, 2011a)
Chromium	6.40E-02	Aquatic Protection Value (APV)	Protection of most aquatic life	(MECP, 2011b)
Copper	6.07E-03	LCV	*Gammarus pseudolimnaeus*	(Suter and Tsao, 1996)
Iron	3.00E+00	Safe concentration for reproduction and growth.	*Gammarus minus*	(MECP, 1979)
Lead	1.23E-02	LCV	*Daphnia magna*	(Suter and Tsao, 1996)
Manganese	1.10E+00	LCV	*Daphnia magna*	(Suter and Tsao, 1996)

Benthic Invertebrates				
Parameter	TRV mg/L	Endpoint	Test Species	Reference
Nickel	2.50E-02	Ontario PWQO	Protection of all aquatic life	(MECP, 2011a)
Sodium	6.80E+02	LCV	*Daphnia magna*	(Suter and Tsao, 1996)
Strontium	3.02E+01	IC_{50}	*Hyallella Azteca* (growth)	(McPherson et al., 2014)
Zinc	4.67E-02	LCV	*Daphnia magna*	(Suter and Tsao, 1996)

Considering that benthic invertebrates also reside in sediment, sediment toxicity benchmarks used in the assessment of benthic invertebrates are presented in Table 4-48. The majority of these benchmarks are Ontario MECP Lowest Effects Levels (LELs) for the assessment of benthic invertebrates (MECP, 1993, 2011b). Where MECP LELs were not available, sediment toxicity benchmarks were selected from other regulatory agencies (BC MOE, 2008; CCME, 2001b; ECHA, 2008) or from published studies in the toxicological literature (MacDonald, 1999).

Table 4-48: Benthic Invertebrates TRVs (Sediment)

Benthic Invertebrates				
Parameter	TRV mg/kg dw	Endpoint	Test Species	Reference
2,3,7,8-Tetra CDD Equivalent	8.50E-07	ISQG*	TEQ calculated using TEFs for fish	(CCME, 2001b)
Cadmium	6.00E-01	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)
Chromium	2.60E+01	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)
Copper	1.60E+01	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)

Benthic Invertebrates				
Parameter	TRV mg/kg dw	Endpoint	Test Species	Reference
Iron	2.12E+04	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)
Lead	3.10E+01	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)
Manganese	4.60E+02	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)
Nickel	1.60E+01	LEL	contamination that can be tolerated by the majority of sediment-dwelling organisms	(MECP, 2008)
Sodium	2.00E+02	NSS	toxicity to soil invertebrates and plants for agricultural, urban park and residential land uses	(BC MOE, 2019)
Strontium	1.78E+03	PNEC	whole-sediment toxicity tests on benthic organisms and application of an assessment factor of 1000	(ECHA, 2008)
Zinc	4.59E+02	Consensus-Based PEC	geometric mean of published SQGs from a variety of sources, including values used by the MOEE and CCME	(MacDonald, 1999)

Toxicity reference values used to assess risk to terrestrial and riparian mammals and birds are presented in Table 4-49 and Table 4-50 respectively. The TRVs selected to assess mammals and birds are based on doses. TRVs were generally the LOAEL values from Sample *et al.* (1996) for mammals and birds. All TRVs were compiled from (Sample et al., 1997).

Table 4-49: TRVs for Mammals

Mammals						
Parameter	TRV mg/kg BW/day	Type	Test Species	Endpoint	Test Duration	Reference
2,3,7,8-Tetra CDD Equivalent	0.00001	LOAEL	Rat	Reproduction	3-generations	(Sample et al., 1997)
Cadmium	10	LOAEL	Rat	Reproduction	6 weeks through mating and gestation (during a critical lifestage = chronic)	(Sample et al., 1997)
Chromium	2740	NOAEL	Rat	Reproduction and longevity	2-year	(Sample et al., 1997)
Copper	15.1	LOAEL	Mink	Reproduction	357-days during a critical lifestage	(Sample et al., 1997)
Iron	-	-	-	-	-	Assessed qualitatively.
Lead	80	LOAEL	Rat	Reproduction	3-generations	(Sample et al., 1997)
Manganese	284	LOAEL	Rat	Reproduction	224 days during a critical life stage	(Sample et al., 1997)
Nickel	80	LOAEL	Rat	Reproduction	>1-year during a critical life stage	(Sample et al., 1997)
Sodium	-	-	-	-	-	Assessed qualitatively.
Strontium	263	NOAEL	Rat	Body weight and bone changes	3-years	(Sample et al., 1997)
Zinc	320	LOAEL	Rat	Reproduction and longevity	Days 1 - 16 of gestation	(Sample et al., 1997)

Table 4-50: TRVs for Birds

Bird						
Parameter	TRV mg/kg BW/day	Type	Test Species	Endpoint	Test Duration	Reference
2,3,7,8-Tetra CDD Equivalent	0.00014	LOAEL	Ringneck pheasant	Reproduction	10-weeks and during a critical life stage	(Sample et al., 1997)
Chromium	5	LOAEL	Black duck	Reproduction	10-months and during a critical life stage	(Sample et al., 1997)
Cadmium	20	LOAEL	Mallard duck	Reproduction	90 d (> 10 wk and during a critical life stage =chronic)	(Sample et al., 1997)
Copper	15	LOAEL	Chicken chicks	Growth and mortality	10-weeks and during a critical life stage	(Sample et al., 1997)
Iron	-	-	-	-	-	Assessed qualitatively.
Lead	11	LOAEL	Japanese quail	Reproduction	12-weeks	(Sample et al., 1997)
Manganese	977	NOAEL	Japanese quail	Growth and behaviour	75-days	(Sample et al., 1997)
Nickel	107	LOAEL	Mallard duck	Growth, mortality, behaviour	90-days	(Sample et al., 1997)
Sodium	-	-	-	-	-	Assessed qualitatively.
Strontium	-	-	-	-	-	Assessed qualitatively.
Zinc	131	LOAEL	White leghorn hens	Reproduction	44-weeks	(Sample et al., 1997)

4.4.2.1 Sodium

A suitable TRV for the quantitative assessment of sodium toxicity to terrestrial mammals and birds was not available. Sodium is an essential nutrient for living organisms and is not usually considered to cause toxic effects.

4.4.2.2 Strontium

A quantitative assessment of strontium toxicity to birds could not be completed due to a lack of a suitable TRV. Concentrations of strontium in soil were found to exist within the range of reported background concentrations (5 – 3,000 mg/kg) for the continental United States (J. Dragun and Chiasson, 1991). The federal environmental quality guideline for strontium in freshwater is 2.5 mg/L (ECCC, 2020a).

4.4.2.3 Iron

Iron is an essential element for almost all living organisms as it participates in a wide variety of metabolic processes, including oxygen transport, deoxyribonucleic acid (DNA) synthesis, and electron transport. Exposures to iron in soil for birds and mammals is most often through incidental ingestion of soil and via exposure through the food chain. Absorption of iron in the body is regulated in both mammals and birds, and very little is metabolized (Vogt et al., 2021). For these reasons, iron was not assessed quantitatively for mammals and birds.

4.4.3 Risk Characterization

4.4.3.1 Risk Estimation

For non-radiological COPCs, the ecological risk is estimated by dividing the dose by the TRV for a given COPC and receptor species, yielding a hazard quotient (HQ). When the exposure value (EV) for an organism at a site exceeds the benchmark value (BV) then HQ > 1 and a potential for adverse ecological effects is inferred. A summary of non-radiological HQs for each receptor by COPC and polygon is presented in Table 4-51 through Table 4-54, with bolded/shaded values indicating benchmark exceedances.

Table 4-51: Hazard Quotients for Aquatic and Riparian Biota in SRD

Indicator Species	2,3,7,8-Tetra CDD Equivalent		Chromium		Copper		Iron		Manganese		Nickel		Sodium		Strontium		Zinc	
	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ
SRD																		
Muskrat	5.46E-02	1.56E-02	9.04E-05	2.14E-05	2.77E-02	1.14E-02	N/A	N/A	7.51E-02	2.27E-02	3.62E-03	1.11E-03	N/A	N/A	2.45E-01	1.01E-01	4.16E-02	1.33E-02
Little Brown Bat	9.49E-02	2.71E-02	6.18E-04	8.98E-05	2.32E-03	1.07E-03	N/A	N/A	4.77E-01	7.83E-02	2.23E-02	3.09E-03	N/A	N/A	**2.01E+00**	8.07E-01	2.91E-01	7.28E-02
Mallard	4.57E-03	1.46E-03	1.13E-01	1.94E-02	1.80E-02	5.75E-03	N/A	N/A	4.53E-02	8.56E-03	5.50E-03	9.59E-04	N/A	N/A	N/A	N/A	2.27E-01	5.90E-02
Bald Eagle	2.68E-03	8.61E-04	1.52E-02	3.14E-03	7.37E-03	2.43E-03	N/A	N/A	9.96E-03	1.81E-03	8.33E-04	1.56E-04	N/A	N/A	N/A	N/A	4.13E-01	1.05E-01
Northern Redbelly Dace, Northern Leopard Frog, Painted Turtle, Northern Water Snake (Surface Water)	1.36E-01	1.24E-02	1.28E-01	1.86E-02	8.84E-03	4.08E-03	**1.15E+00**	2.35E-01	2.24E-01	3.67E-02	**1.03E+00**	1.43E-01	1.77E-01	6.34E-02	4.16E-01	1.67E-01	**2.88E+00**	7.21E-01
Cattail (Surface Water)	1.36E-01	1.24E-02	2.22E-02	3.22E-03	4.20E-01	1.94E-01	**1.01E+00**	2.05E-01	2.91E-02	4.76E-03	**1.44E+00**	2.00E-01	5.19E-01	1.86E-01	1.24E-01	4.97E-02	**3.50E+00**	8.74E-01
Benthic Invertebrates (Surface Water)	1.36E-01	1.24E-02	1.38E-01	2.00E-02	2.77E-01	1.28E-01	5.00E-01	1.02E-01	3.62E-01	5.93E-02	**1.44E+00**	2.00E-01	8.94E-01	3.20E-01	1.47E-01	5.92E-02	**2.25E+00**	5.62E-01
Benthic Invertebrates (Sediment)	**2.37E+01**	**6.37E+00**	**1.13E+00**	4.84E-01	**8.75E+00**	**2.20E+00**	8.11E-01	5.43E-01	**2.39E+00**	**1.15E+00**	**1.18E+00**	6.67E-01	**7.90E+00**	**2.80E+00**	4.44E-01	1.66E-01	9.80E-01	3.68E-01

Bold values indicate a HQ > 1

Table 4-52: Hazard Quotients for Aquatic and Riparian Biota in WD

Indicator Species	2,3,7,8-Tetra CDD Equivalent		Cadmium		Copper		Iron		Lead		Manganese		Nickel		Sodium		Zinc	
	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ	Max HQ	UCLM HQ
WD																		
Muskrat	7.79E-02	4.47E-02	1.97E-04	1.53E-04	9.59E-03	8.35E-03	N/A	N/A	1.38E-03	1.03E-03	3.89E-02	2.06E-02	7.54E-04	6.76E-04	N/A	N/A	1.88E-02	1.15E-02
Little Brown Bat	1.36E-01	7.85E-02	9.40E-05	5.79E-05	4.56E-03	3.07E-03	N/A	N/A	1.38E-04	5.22E-05	2.49E-01	8.50E-02	8.04E-04	5.79E-04	N/A	N/A	1.17E-01	6.11E-02
Mallard	8.63E-03	4.87E-03	7.50E-05	5.40E-05	6.28E-03	5.17E-03	N/A	N/A	7.11E-03	5.13E-03	2.40E-02	9.29E-03	4.99E-04	4.20E-04	N/A	N/A	9.53E-02	5.18E-02
Bald Eagle	5.10E-03	2.88E-03	3.24E-05	2.20E-05	6.13E-03	4.36E-03	N/A	N/A	2.10E-03	1.45E-03	5.38E-03	2.08E-03	1.15E-04	9.93E-05	N/A	N/A	1.68E-01	8.94E-02
Northern Redbelly Dace, Northern Leopard Frog, Painted Turtle, Northern Water Snake (Surface Water)	6.81E-01	2.33E-01	1.12E-02	6.88E-03	1.74E-02	1.17E-02	6.57E-01	3.35E-01	5.29E-03	2.00E-03	1.17E-01	3.98E-02	3.71E-02	2.67E-02	2.39E-01	9.24E-02	**1.15E+00**	6.05E-01
Cattail (Surface Water)	6.81E-01	2.33E-01	9.50E-03	5.85E-03	8.25E-01	5.55E-01	5.73E-01	2.92E-01	2.00E-03	7.58E-04	1.52E-02	5.18E-03	5.20E-02	3.74E-02	7.01E-01	2.71E-01	**1.40E+00**	7.34E-01
Benthic Invertebrates (Surface Water)	6.81E-01	2.33E-01	9.50E-02	5.85E-02	5.44E-01	3.66E-01	2.85E-01	1.45E-01	8.16E-02	3.09E-02	1.89E-01	6.45E-02	5.20E-02	3.74E-02	**1.21E+00**	4.66E-01	8.99E-01	4.71E-01
Benthic Invertebrates (Sediment)	**2.56E+01**	**1.49E+01**	**1.12E+00**	8.02E-01	**2.19E+00**	**1.87E+00**	**1.05E+00**	8.25E-01	**1.37E+00**	**1.00E+00**	**2.00E+00**	**1.76E+00**	**1.14E+00**	**1.04E+00**	**9.30E+00**	**5.72E+00**	**1.20E+00**	8.41E-01

Bold values indicate a HQ > 1

Table 4-53: Hazard Quotients for Terrestrial Receptors at NSS-W

Indicator Species	Strontium	
	Max HQ	UCLM HQ
NSS-W		
Northern Short-tailed Shrew	1.46E-02	1.02E-02
White-tailed Deer	1.66E-02	1.29E-02
Red Fox	3.38E-03	2.09E-03
American Robin	N/A	N/A
Wild Turkey	N/A	N/A
Honey Bee	N/A	N/A
Terrestrial Plants (Grass / Eastern White Cedar)	8.90E-02	7.14E-02
Soil Organisms (Earthworm)	1.45E-02	1.16E-02

Notes: Bold values indicate a HQ > 1

Table 4-54: Hazard Quotients for Terrestrial Receptors at RWOS1

Indicator Species	Strontium	
	Max HQ	UCLM HQ
RWOS1		
Northern Short-tailed Shrew	5.94E-03	3.61E-03
White-tailed Deer	8.51E-03	5.17E-03
Red Fox	1.00E-03	6.08E-04
American Robin	N/A	N/A
Wild Turkey	N/A	N/A
Honey Bee	N/A	N/A
Terrestrial Plants (Grass / Eastern White Cedar)	4.84E-02	2.94E-02
Soil Organisms (Earthworm)	7.91E-03	4.80E-03

Bold values indicate a HQ > 1

4.4.3.2 Discussion of Chemical Effects

Data used for the problem formulation, screening and ecological risk assessment were taken from the most recent environmental studies at the site (2020-2021 sampling program), ERA (AMEC, 2016a) and annual EMP reports (from years 2014 to 2020). No additional data are available beyond what is presented at this time to clarify potential effects at the site.

4.4.3.2.1 SRD – Aquatic and Riparian

A summary of the results of the aquatic assessment in the SRD is provided below:

- Maximum water concentrations in the SRD exceeded the benchmarks for iron, nickel, and zinc in fish and herpetofauna (HQ>1); however, the UCLM water concentrations did not exceed the benchmark.

- Maximum water concentrations in the SRD exceeded the benchmarks for iron, nickel, and zinc in cattails (HQ>1); however, the UCLM water concentrations did not exceed the benchmarks.

- Maximum water concentrations in the SRD exceeded the benchmarks for nickel and zinc in benthic invertebrates (HQ>1). The UCLM water concentrations for nickel and zinc did not exceed the benchmarks.

- Maximum sediment concentrations in the SRD exceeded the benchmarks for chromium, copper, manganese, nickel, sodium and 2,3,7,8-tetra CDD equivalent in benthic invertebrates (HQ>1). The UCLM sediment concentrations also exceeded the benchmarks for 2,3,7,8-tetra CDD equivalent, copper, manganese, and sodium.

- For riparian mammals, the HQ was below the target of 1 based on UCLM concentrations in the SRD. However, based on maximum concentrations the HQ was greater than 1 for strontium for the little brown bat. The little brown bat is a species at risk and a surrogate for three other bat species that are also species at risk.

- For riparian birds, no risks were identified based on both the UCLM and maximum concentrations for the mallard and the bald eagle.

The HQ for exposure to maximum strontium exceeded the target value of 1 for the little brown bat. As this receptor moves around the area, it is likely exposed to COPC concentrations close to the UCLM. Therefore, it is not likely that the little brown bat is at risk because of strontium. Additionally, the little brown bat is identified as a surrogate species for other species at risk including the eastern small-footed myotis, tri-coloured bat and the northern myotis. Since no risk has been identified to the surrogate species, the identified species at risk are considered to be protected as well.

The HQ values for cattails were greater than 1 based on exposure to maximum iron, nickel and zinc. It is possible that individual cattails may be exposed to elevated concentrations of these COPCs, the cattail population as a whole is not expected to be at risk in the SRD.

The HQ values for redbelly dace, northern leopard frog, painted turtle and northern water snake were greater than 1 based on exposure to maximum iron, nickel, and zinc in the SRD. As fish are more mobile around a wider area, the HQs for UCLM water concentrations for iron, nickel and zinc are more representative of fish and herpetofauna (using the tadpole sensitive life stage) exposure than maximum concentrations. It is possible that iron, nickel and zinc pose a risk to some individuals of these receptors in the SRD that may experience higher concentrations. The spotted turtle and the eastern ribbonsnake, are species at risk that are assessed as fish. Both turtles and snakes are mobile and maximum concentrations of iron, nickel and zinc are not representative of the concentrations to which they are exposed. The UCLM concentration is more representative for these species and therefore it is not likely that the spotted turtle and eastern ribbonsnake are at risk from iron, nickel and zinc exposure.

The HQ values for benthic invertebrates were greater than 1 based on exposure to multiple COPCs in sediment and surface water. Since benthic invertebrates are not mobile, some individuals may experience prolonged exposure at the maximum concentration; however, the benthic invertebrate community as a whole is not expected to be at risk in the SRD.

Results of surface water sampling in the SRD are similar to quarterly sampling that was conducted at WOD-1 through WOD-6 in 2015 and 2016 (CH2M Hill, 2016). Exceedances of water quality guidelines were observed for a number of metals in many of the samples collected including: aluminum, cadmium, copper, iron, lead, and zinc. The elevated concentration of metals in the SRD was attributed to the existence of a former rail line within the ditch; therefore, metals could potentially be attributed to the rail ballasts or iron slag that was used to construct the railway bed (CH2M Hill, 2016). The 2016 ERA also indicated that the source of metals such as copper and zinc in the SRD is from historical releases from the SSTF upstream of SRD-1, as well as drainage culverts that may be contributing to elevated zinc concentrations in the SRD. This is consistent with patterns observed in water and sediment samples from the 2020 sampling program in the SRD. Copper concentrations in water did not exceed water quality guidelines; however, copper concentrations in sediment exceeded sediment quality guidelines only at SRD-1, downstream of the former SSTF. Zinc concentrations in water and sediment from the 2020 sampling program generally exceeded water and sediment quality guidelines along the majority of locations sampled in the SRD. Nickel concentrations in water from the 2020 sampling program exceeded water quality guidelines around SRD-2.

Additionally, some metals such as manganese and iron are naturally elevated in groundwater in the area.

4.4.3.2.2 Wetland

The wetland sampling locations were grouped with the SRD samples for the purpose of screening and risk characterization in this ERA. This is primarily due to the fact that the wetland receives drainage from multiple sources, including the SRD, Grassed Swale and Construction Landfill 1 (Section 2.2.6).

The majority of the maximum and mean concentrations were higher within the SRD in comparison to the wetland locations, suggesting that these concentrations are largely sourced from the SRD, particularly since appreciable flows from the SRD discharge into the wetland (Section 2.2.6.1.2). Also, a few of the mean concentrations in the wetland are slightly higher than mean concentration with the SRD, but the majority of these mean concentrations are comparable in both areas. The exception is the mean concentrations for iron, manganese and strontium which are reasonably higher in the wetland relative to the SRD. In the case of iron and manganese, the maximum concentrations across the sampling locations remain within the SRD and the concentrations within the wetland are assumed to be sourced from the SRD itself. The wetland concentration of strontium represents the maximum concentration for both the wetland and the SRD combined, and was from location WTL-2 at 4450 µg/L.

While the maximum strontium concentration in surface water in WTL-2 may be an outlier in comparison to the SRD and downstream sampling locations, it is possible that the maximum strontium location is representative of one of the other sources that discharge into the wetland, i.e. the Construction Landfill 1.

Surface water samples within the wetlands were collected by Intera Engineering during a three-year hydrogeological investigation. Sample SW-1 from this three-year program was located within the vicinity of WTL-2 from this 2020-2021 sampling program, and a maximum concentration of strontium from SW-1 was 5780 µg/L, exceeding the concentration of WTL-2 (OPG, 2008). The remaining surface water samples, collected within the vicinity of WTL-1 and within Landfill 2 east of Siding Road reported sample values exceeded the criteria of 2500 µg/L selected for screening of strontium in surface water in Section 4.1.3.4 (OPG, 2008). Intera inferred that the elevated metals in the surface water sample locations within the wetlands are considered to be "typical of surface water conditions in the immediate vicinity of a landfill" (OPG, 2008).

4.4.3.2.3 WD – Aquatic and Riparian

A summary of the results of the aquatic assessment in the SRD is provided below:

- Maximum water concentration in the WD exceeded the benchmark for zinc in fish and herpetofauna (HQ>1); however, the UCLM water concentration did not exceed the zinc benchmark.
- Maximum water concentrations in the WD exceeded the benchmark for zinc in cattails (HQ>1); however, the UCLM water concentration did not exceed the zinc benchmark.
- Maximum water concentrations in the WD exceeded the benchmark for sodium in benthic invertebrates (HQ>1); however, the UCLM water concentration did not exceed the sodium benchmark.
- Maximum sediment concentrations in the WD exceeded the benchmarks for cadmium, copper, iron, lead, manganese, nickel, sodium, zinc and 2,3,7,8-TCDD equivalent in benthic invertebrates (HQ>1). The UCLM water concentrations for copper, lead, manganese, nickel, sodium and 2,3,7,8-TCDD equivalent exceeded the benchmarks for benthic invertebrates; however, cadmium, iron and zinc did not exceed benchmarks.

The HQ values for cattails were greater than 1 based on exposure to maximum zinc. It is possible that individual cattails may be exposed to elevated concentrations of these COPCs, the cattail population as a whole is not expected to be at risk in the WD.

The HQ values for redbelly dace, northern leopard frog, painted turtle and northern water snake were greater than 1 based on exposure to maximum zinc concentrations in the west ditch; however, fish and herpetofauna are mobile around a wider area. The HQs for UCLM water concentrations for zinc are more representative of fish and herpetofauna (using the tadpole sensitive life stage) exposure than maximum concentrations. The spotted turtle and the eastern ribbonsnake are species at risk that are assessed as fish. Both turtles and snakes are mobile and maximum concentrations of iron, nickel and zinc are not representative of the concentrations to which they are exposed. The UCLM concentration is more representative for these species and therefore it is not likely that the spotted turtle and eastern ribbonsnake are at risk from iron, nickel and zinc exposure.

The HQ values for benthic invertebrates were greater than 1 based on exposure to multiple COPCs (cadmium, copper, iron, lead, manganese, nickel, sodium, zinc and 2,3,7,8-TCDD equivalent) in sediment. Since benthic invertebrates are not mobile, some individuals may experience prolonged exposure at the maximum concentration; however, the benthic invertebrate community as a whole is not expected to be at risk in the west ditch.

4.4.3.2.4 Dioxins and Furans in Sediment – SRD and WD

The only aquatic receptors where HQ exceedances were noted were benthic invertebrates based on the Interim Sediment Quality Guideline of 0.85 pg TEQ/g from the CCME (2001b). The ISQG represents the concentration below which adverse biological effects to aquatic life are expected to occur rarely (i.e., fewer than approximately 25% of adverse effects records occur below the ISQG). The probable effects level (PEL) for a chemical defines the level above which adverse effects are expected to occur frequently (i.e., more than approximately 50% of adverse effects records occur above the PEL). The PEL is 21.5 pg TEQ/g. Table 4-55 summarizes the maximum and UCLM HQ values using the CCME PEL as a TRV.

Table 4-55: Benthic Invertebrate HQs for 2,3,7,8-Tetra CDD with PEL

Location	2,3,7,8-Tetra CDD TEQ Concentration (pg/g)		CCME Probable Effect Level (PEL) (pg/g)	HQ	
	Maximum	UCLM		Maximum	UCLM
SRD	20.1	4.2	21.5	0.94	0.2
West Ditch	21.8	9.8		**1.01**	0.5

Note: Bold values indicate HQ exceedance (HQ >1)
PEL obtained from CCME (2001)

The HQs to benthic invertebrates based on the PEL remain at or below 1 for both the SRD and the West Ditch. Adverse effects at the community level are not expected. The maximum HQ values provide a conservative estimate of risk across the site by using the maximum value to represent risk for all ecological receptors across all aquatic habitats across the site.

Considering that the dioxin and furan compounds are not expected to provide adverse effects at the community level at both the West Ditch and SRD, remediation is not considered warranted. Remediation efforts within sediment would involve disturbing the benthic invertebrate habitats along with other aquatic receptors such as fish and herpetofauna, which would impact these aquatic species much more severely than allowing the dioxin and furan compounds concentrations to remain in the sediment.

4.4.3.2.5 NSS-W – Terrestrial

Ecological receptors on the NSS-W are not at toxicological risk from operations. A summary of the results of the terrestrial assessment in the NSS-W is provided below:

- There was no exceedance of the HQ target of 1 for any terrestrial receptors.

There were no data to determine strontium benchmarks for birds; however, when strontium benchmark values for birds are set to strontium benchmarks for mammals there are also no exceedances of the HQ target of 1 for any birds when using the UCLM concentrations to determine HQ.

The American Robin is used as a surrogate species for a number of species at risk including the bank swallow, eastern meadowlark, golden-winged warbler, olive-sided flycatcher, and wood thrush. Eastern white cedar is used a surrogate species for butternut, and earthworm is used as a surrogate species for the monarch butterfly. Since no risk has been identified to the surrogate species, the identified species at risk are considered to be protected as well.

4.4.3.2.6 RWOS1 – Terrestrial

Ecological receptors on the RWOS1 are not at toxicological risk from historical operations. A summary of the results of the terrestrial assessment in the RWOS1 is provided below:

- There was no exceedance of the HQ target of 1 for terrestrial receptors.

4.4.3.3 Qualitative Assessment of COPCs without Available TRVs for Mammals and Birds

4.4.3.3.1 Sodium

Riparian mammals, such as a muskrat, are known to inhabit estuarine habitats, where salinity can approach 35 g/L (NOAA, 2021). Additionally, a value of 30 g/L salinity is provided as a concentration that is protective of food sources for the muskrat (U.S. Fish and Wildlife Service, 1984). Cattails are abundant at the NSS-W site and the water chemistry is not known or expected to limit the growth of this food source. With respect to birds, sodium toxicity has been identified at concentrations above 4,000 mg/L in water and between 4,000 to 60,000 mg/kg in the diet (National Research Council, 1994).

Given that salinity concentrations were measured to be 0.608 g/L (in the SRD) and 0.821 g/L (in the WD), sodium concentrations are not expected to have any toxic effects on mammals. Sodium concentrations in water at the NSS-W are well below the reported toxic levels presented in Section 4.4.2. Estimated concentrations of sodium in some prey items exceed the reported bird dietary range associated with sodium toxicity based on the assumed bioaccumulation and transfer factors. However, as both birds and mammals physiologically regulate sodium to some extent, these modelled tissued concentrations are considered to be conservative estimates. For these reasons, adverse effects in mammals and birds as a result of sodium in surface water is not anticipated at the NSS-W.

4.4.3.3.2 Strontium

Birds are mobile receptors, and are likely to consume water and prey from different areas on and off of the NSS-W site. For this reason, their level of exposure is likely more accurately represented by the UCLM. Using a mammal TRV to assess risk from exposure to strontium in birds provides HQ values that are an order of magnitude below the target value 1 in the SRD and WD, and two orders of magnitude below the HQ target of 1 in the NSS-W and RWOS1. Strontium is not expected to pose a risk to any bird receptors at the NSS-W.

The federal environmental quality guideline for strontium in freshwater is 2.5 mg/L. To derive this value, long-term aquatic toxicity benchmarks for various test organisms (invertebrates, aquatic plants, and fish) were fit to multiple cumulative distribution functions (e.g., log-normal, log-logistic, log-gumbel, gamma, and weibull), and an average species sensitivity distribution (SSD) and hazardous concentration for 5% of species (HC_5) were estimated based on the relative goodness-of-fit of each model. The 2.5 mg/L benchmark represents the 5th percentile of the total averaged distribution. The cut-off concentration between moderate adverse effects and high adverse effects to aquatic life is 29 mg/L, which is the 50th percentile of the SSD model. The maximum concentration at the NSS-W in surface water was measured to be 4.45 mg/L in the south railway ditch. The maximum concentration only slightly exceeds the FEQG and is well below the cut-off (50th percentile) where the likelihood and severity of adverse effects to aquatic life becomes high. The UCLM for the south railway ditch was calculated to be 1.79 mg/L and falls below the FEQG. For these reasons, aquatic receptors may experience infrequent, moderately adverse effects in the SRD based on the maximum measured strontium concentrations.

4.4.3.3.3 Iron

Iron is generally present in surface water as salts in its trivalent form ($Fe3^{+}$) when the pH is above 7 (HC, 1978). Most of the iron salts are insoluble and settle to or become bound to the sediments. Therefore, most iron in surface water is associated with particulate matter and is not bioavailable. In the sediment, iron is mainly present in the form of particulates, and is not bioavailable.

Iron is an essential element for almost all living organisms as it participates in a wide variety of metabolic processes, including oxygen transport, deoxyribonucleic acid (DNA) synthesis, and electron transport. It is also a micro-nutrient for plants and is mainly involved in the manufacture of chlorophyll used for photosynthesis (Rout and Sahoo, 2015). Exposures to iron in soil for birds and mammals is most often through incidental ingestion of soil and via exposure through the food chain. Absorption of iron in the body is regulated in both mammals and birds, and very little is metabolized (Vogt et al., 2021). For these reasons, iron was not assessed quantitatively and is not expected to pose any risk to any mammalian and avian receptors present at the NSS-W facility.

4.5 Assessment of Physical Stressors

4.5.1 Screening Criteria

Physical stressors will be evaluated qualitatively. Therefore, no criteria have been identified.

4.5.2 Screening

For ecological receptors, the physical stressors considered include:

- Sensory disturbance (light, noise); and,
- Mortality (road kill and/or bird strikes).

Physical stressors such as loss of habitat, dust generation, entrainment/impingement of aquatic biota, and thermal releases to the aquatic environment are not applicable to the existing conditions at the NSS-W.

4.5.3 Effects Assessment

A qualitative assessment was performed to determine the impact of physical stressors. No benchmark data are available for mortality (road kill and/or bird strikes).

4.5.4 Risk Characterization

4.5.4.1 Mortality – Road Kill

Vehicle-collisions with wildlife have been monitored at the Bruce Power property (Bruce Power, 2019, 2020, 2021) since July 2017 to obtain a better understanding of this phenomenon. Weekly studies were completed in the fall and spring after 9 am on weekdays after peak traffic conditions. These surveys identified the species of any mortalities observed and a summary of the surveys is shown in Table 4-56 below.

Table 4-56: Results of Vehicle-Collision Surveys

Year	Surveys Completed (#)	Deceased Animals Observed During Formal Surveys (#)	Mortality Rate (# Animals / # Surveys)	Incidental Observations of Animal Mortality (#)
2017	19	43	2.3	9
2018	46	60	1.3	31
2019	46	78	1.7	15
2020	37	50	1.3	10

Note: Data is obtained from 2020 Bruce Power EMP (Bruce Power, 2021)

The majority of the species that were involved in vehicle collisions were mammals (approximately 55%). They involved: American Mink, Eastern Cottontail, Eastern Gray Squirrel, Muskrat, American Woodchuck, North American Porcupine, Raccoon, Striped Skunk, Coyote, and Opossum. Another significant portion (32%) of the collisions were involved with amphibians and reptiles. They involved: Northern Leopard Frog, Green Frog, Spotted Salamander, Eastern Gartersnake, Midland Painted Turtle, and Snapping Turtle. The remaining collisions represent approximately 13% and involve birds and insects such as Wild Turkey, Ring-billed Gull, Monarch Butterfly, and Dragonfly. One White-tailed deer was involved in a vehicle collision between 2020 and 2018.

The surveys also revealed that the highest frequencies of the collisions occur on Concession Road 2, which represent 29-42% of the total mortalities per year (Bruce Power, 2021) .

Previous monitoring of white-tailed deer collisions was conducted at the Bruce nuclear site between 1998 and 2012 (Bruce Power, 2013). The data ranged from 4 to 13 collisions per year and 0 to 6 mortalities per year, with the highest deer collision and mortality occurring in the first year of monitoring (1998).

In comparison to the previous monitoring, the surveys conducted indicate that the white-tailed deer mortalities have decreased significantly. This may be attributed to traffic control; posted speed limits are strictly adhered to by all site personnel. In addition, collisions and mortalities are likely limited by the 10 ft. fencing (with barbed wire) currently surrounding the entire Bruce nuclear site, which inherently has reduced the movement of deer onto the site from the Huron Fringe.

Deer sightings were uncommon and sporadic during the baseline surveys completed for the 2016 ERA (AMEC, 2016a); however, deer are routinely observed on site by Bruce Power and OPG staff.

For the remaining species noted in the 2017-2020 vehicle-collision surveys, continuous monitoring will be able to improve the understanding of road mortality trends. The Painted Turtle, Snapping Turtle and the Monarch Butterfly are species of special concern or are endangered.

Amphibian movements from breeding areas to summer habitats are typically associated with vegetated corridors; however, no significant amphibian corridors were identified within the vicinity of the NSS-W site. Roads through the Bruce site represent a physical barrier to movement of amphibians, although some amphibians will venture across roads with high risk of mortality and/or desiccation. As changes in the general road network and the movement of vehicles are assumed to remain consistent at the NSS-W site, changes in amphibian mortality due to vehicles are predicted to remain consistent.

4.5.4.2 Mortality – Bird Strikes

Window strikes are the largest known human-related cause of mortality to birds and are estimated to kill 97 to 976 million birds per year (Sibley, 2015). Birds perceive mirrored habitat in the window as 'natural' habitat (or simply do not see the glass) and fly directly into the window, causing injury and/or death. Bird-building collision monitoring has been carried out at the Bruce Power property since 2017. Since 2017, 8 bird mortalities were observed and recorded over 132 surveys.

Due to the low mortality observed at the Bruce Power property, the risks are not considered to be significant. In addition, the structures on the NSS-W are largely low-level buildings primarily constructed of cement, siding, or other non-glass material. Therefore, collisions with these buildings are expected to be negligible and would not represent a stressor to resident or migratory bird species. Bird collisions with NSS-W structures are not considered to represent an adverse effect. No further analysis is required.

4.5.4.3 Light

Artificial night lighting has the potential to interact with receptors (birds, mammals and amphibians) through habitat avoidance, changes in rates of predation and mortality, and/or changes in food resource availability (Gauthreaux Jr and Belser, 2006). Interior and exterior lighting on tall buildings and decorative lighting on all structures tends to confuse birds. Night migrants use the stars as navigational tools and may mistake building light sources as celestial lights. The situation is exacerbated during foggy or rainy weather when cloud cover is low and birds fly at lower altitudes. Birds can also become "entrapped" by light sources. Once inside a beam of light, they are reluctant to fly out into the darkness, and they will continue to fly around within the light beam. Fatigue sets in, collisions with other birds or the structure occurs, or the birds simply collapse from exhaustion. They frequently die from injuries or fall prey to predators. For small, nocturnal, herbivorous mammals, artificial night lighting may increase risk of being killed by a predator and may decrease food consumption. Circadian rhythms and melatonin production may also be disrupted by artificial night lighting, whereas for larger mammals, night lighting may increase vehicle collisions and can disrupt dispersal movements and corridor use. Amphibians (frogs) are affected through changes in calling rates, changes in frog prey or predation interactions, and tadpole survivorship.

As of the 2016 ERA, artificial night lighting at the existing NSS-W is not considered to represent a risk to receptors. Artificial night lighting at the existing NSS-W facility is limited and not far reaching, and the presence of birds, mammals and frogs within the immediate vicinity of the NSS-W facility would suggest that wildlife species currently using these areas are habituated or not detrimentally affected by artificial night lighting associated with the NSS-W facility. During the baseline surveys, high numbers of migrant species were observed during the migration periods (spring and fall) and no local deviations of expected migration routes or stressed birds were observed during migration. In addition, there was no observed or recorded correlation between light sources and bird collisions, and there were no tall continuous artificial light structures identified in frog breeding habitat. As such, no further analysis is required.

4.5.4.4 Noise

As reported in the 2016 ERA, based on the 2015 spot measurement noise sampling, birds and other wildlife in the vicinity of the NSS-W are currently experiencing LEQ noise levels ranging from 64 to 76 dB within and in the immediate vicinity of the NSS-W (Table 4-57 and Figure 4-5) during the morning hours (6 am to noon, peak bird activity). These noise levels are consistent with the 2018 modelled predictions where the highest noise level within the vicinity of the NSS-W is 55-60 dBA as shown in Figure 3-8 (OPG, 2018b). Locations designated as "ER#" are similar locations to the spot noise measurements stated in the DGR EA. Although these noise levels are based on a sample day, it is expected that these levels would be representative of typical operations and therefore the noise impact to birds and other wildlife would not vary significantly day to day.

It is assumed that all of the 2014 breeding bird baseline surveys were conducted within areas exposed to LEQ noise levels between approximately 64 and 76 dB, the species recorded (including SAR and species of conservation concern) have either acclimated to current noise levels and are able to successfully continue biological processes (e.g., mate selection, nesting, foraging), or are inherently tolerant to noise levels of this range. This is supported by the results of the survey conducted in 2014.

For example, on average, 12.5 bird species were observed per point count and 17.7 total birds were observed per point count. These are very normal numbers for bird survey results. In addition, 86 species of birds were recorded during migration for a total of 1,357 total birds over 4 days of surveys (approximately 32 hours of surveys). Acclimation and tolerance to noise levels of this range may be a result of the variable nature of the noise disturbance around the NSS-W since the 2015 modelling identified approximately a 12 dB variation in noise levels at these locations and the DGR EIS (Golder, 2011e) noted that existing noise levels vary by as much as 39 dB depending on the time of day. Based on these findings, the operation of the existing NSS-W is unlikely to represent a noise disturbance beyond the tolerance of species currently occurring within the vicinity of the NSS-W.

Table 4-57: 2015 Linear Noise Levels, Ecological Receptors

Location	2015 L_{EQ} Noise Levels (dB)
1	64
2 (ER7)	69
3 (ER4)	67
4	67
5	76
6 (ER3)	65
7	76
8 (ER5)	69
9 (ER6)	66
10	64

Figure 4-5: Noise monitoring Locations

4.6 Uncertainties in the Ecological Risk Assessment

4.6.1 Uncertainties in the Monitoring Data

The main sources of uncertainty in the measured physical parameters and non- radiological and radiological baseline data include:

- Inherent data variability, including temporal and spatial heterogeneity;
- Sampling uncertainty, including location, collection, transfer and handling of samples; and,

- Analytical uncertainty, including sample preparation, instrumentation and method uncertainties.

Overall monitoring strategies were built using the extensive data available for the NSS-W and were designed to address the remaining data gaps. The sampling program was designed to ensure that data variability is captured and to minimize systematic uncertainty.

The sampling program was implemented using current industry standards and procedures. The sampling procedures were designed to minimize sampling uncertainty. A quality program was also used to minimize potential systematic uncertainty in data collection and analysis.

4.6.2 Uncertainties in the Screening Assessment

Sources of uncertainty during the problem formulation and screening phase include the conceptual model and the screening criteria. Uncertainty in the conceptual model includes the assumption that certain pathways are not significant.

Maximum contaminant concentrations in each medium were determined from varying sampling programs (one sampling event for aquatic and terrestrial vegetation as well as soil, 3 sampling events for sediment, and 4 sampling events for surface water) for the screening assessment. QA/QC measures were in place to ensure that the sample results recorded at the laboratory were sufficiently accurate and precise to meet the quality objectives. The QA/QC measures include field duplicates (for precision) and recovery checks (for accuracy). Screening criteria selected were deemed to be appropriate for the media assessed and rationale was provided to justify the use of screening guidelines for a surrogate contaminant/medium. Therefore, the level of uncertainty in the screening assessment is considered to be acceptable and will not impact the conclusions of this step.

4.6.3 Uncertainties in the Exposure Assessment

Uncertainties in the exposure assessment include the representativeness of media concentrations used in the assessment at each location. The UCLM concentrations of COPCs were used for each location and media, where possible, and are considered to be representative for all mobile receptors. Maximum concentrations found in various sources were also used as an upper bound on exposure. These values are, by definition, not representative for mobile organisms that can move around the site, effectively averaging their exposure concentrations. Maximum values are representative for exposures of any sessile organisms that reside at the location of the maximum value.

Although the majority of data comes from measured values, BAFs were used to calculate uptake into tissues. In some cases, BAFs for a species of interest or a certain COPC were unavailable, and surrogate values were used, e.g., fish values used for frog. The BAFs used for the exposure assessment were not site-specific, and were taken from reputable sources 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 the factors are considered to be representative of the organisms assessed. Feed, water and inhalation intake rates were obtained or calculated based on the following primary sources: Federal Contaminated Sites Action Plan(FCSAP, 2012), US EPA (1993b) and Sample and Suter (1994). These documents have undergone several stages of review, therefore the uncertainty in referencing these documents is considered to be negligible.

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.

A radiation weighting factor (RBE) of 2 was applied to the low beta component of the tritium DCs, as recommended by CSA N288.6; however, a range of 1 to 3 is used in the literature. Therefore, the tritium internal dose coefficient for all ecological receptors presented in and Table 4-23 could be either higher or lower, modified by factors of 1.43 or 0.57, respectively.

Uncertainty in the HTO air and soil pore water predictions arises from inherent uncertainty in the air model in IMPACT. The model reports an average concentration, and typically over-predicts this concentration by a factor of 1.5(COG, 2013). Uncertainty in the predictions arises from the following assumptions made in the air 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 air concentration, where in reality measured concentrations can vary by a factor of 2 under identical conditions.

The main uncertainties associated with the exposure assessment are summarized in Table 4-58:.

Table 4-58: Uncertainties Associated with Exposure Assessment

Risk Assessment Assumption	Justification	Over/Under Estimate Risk?
BAFs, intake rates, etc. are from literature when measured information was not available	Reputable literature sources were used	Neither (value is best estimate)

Risk Assessment Assumption	Justification	Over/Under Estimate Risk?
Dose coefficients for each receptor were not adjusted for exact VEC body size and dimensions	Surrogates selected with attention to similar body size and exposure habits	Neither (value is best estimate)

4.6.4 Uncertainties in the Effects Assessment

Toxicological benchmark values (BVs) used in the risk assessment were selected from sources recommended in the CSA N288.6 standard (CSA, 2012), and other reputable sources. These BVs represent the low end of threshold effect levels in literature for each receptor category. BVs for the test species were not adjusted for body weight and were considered directly applicable to the wildlife species. The BVs are considered to be conservatively representative of the effect threshold for the COPC for the receptor of interest. There is uncertainty because most species of interest have not been tested to determine their effect thresholds. Nevertheless, it is expected that few species will be much more sensitive than indicated by the selected benchmark values.

Also, toxicological benchmarks are not available for certain COPCs (e.g., strontium for terrestrial birds and terrestrial plants), therefore no quantitative assessment could be carried out. Without the benchmark value, it is difficult to quantitatively determine potential for effects for these biota; however, in these cases a qualitative assessment was carried out.

While there is uncertainty related to some low values that have been suggested as radiation dose benchmarks based on field studies around Chernobyl, the radiation dose benchmarks chosen follow UNSCEAR and CSA N288.6-12 (CSA, 2012; UNSCEAR, 2008) in giving more credence to values based on controlled laboratory studies and demonstrated low levels of effect.

4.6.5 Uncertainties in the Risk Characterization

There are uncertainties associated with the components contributing to the overall risk assessment. This includes receptor exposure factors, such as transfer factors, intake rates and bioaccumulation factors, dose coefficients and averaging assumptions, as well as benchmark values used to determine risk of potential effects.

Overall, considering uncertainties in the exposure assessments and the benchmark values, it is reasonable to consider that HQs above 1 for a COPC, receptor and location are indicative of a potential for adverse effects. However, it does not necessarily imply adverse effects. In some cases, field studies may be appropriate to clarify whether effects are occurring.

A probabilistic risk assessment (PRA) to quantify uncertainty in the risk estimate has not been performed and is not considered necessary. Based on the quantity of data available for the current risk assessment, uncertainties in the current deterministic risk assessment could not be more accurately quantified using a PRA. According to CSA N288.6 (2012), a PRA should be conducted only if the results of the PRA are beneficial and provide a better basis for risk management/decision making, and a qualitative or semi-quantitative evaluation of uncertainty is considered sufficient for evaluation of uncertainty.

4.6.5.1 Non-Radiological Risk Characterization Uncertainty

Overall, considering uncertainties in the exposure assessments and the benchmark values, it is reasonable to consider that HQs above 1 for a COPC and receptor are indicative of a potential for adverse effects. However, it does not necessarily imply adverse effects; i.e. the potential for adverse effects does not necessarily mean toxicity is occurring at the site. No toxicity studies were performed at the site. In many cases, adverse effects at a site may be absent or much lower than that predicted from laboratory studies. For example, the high levels of water hardness and alkalinity characterizing NSS-W surface waters will have an ameliorating effect on metal toxicity.

4.6.5.2 Radiological Risk Characterization Uncertainty

The maximum values that were available in each medium were used as values that were representative for the entire NSS-W. The estimated doses resulting from these maximum concentrations are a small fraction of the benchmark values; therefore, any uncertainty in the calculations or the data does not impact the conclusions.

4.6.5.3 Physical Stressor Risk Characterization Uncertainty

Unpredictable events such as changes in predator-prey relations, disease, or stochastic weather events (e.g., heavy snowfall), could result in changes to deer movement through the Bruce site and thus result in changes (either positively or negatively) to vehicle collisions with deer. However, population levels are assumed to be stable at the NSS-W suggesting incidences of vehicle collisions would continue at the levels previously recorded at the site. Given the management measures in place to mitigate road mortality for deer, including reduced speed limits and fencing, there is a limited level of uncertainty with respect to the risk evaluation for deer mortality due to vehicle collisions.

Roads through the Bruce site represent a physical barrier to movement of amphibians, although some amphibians will venture across roads with high risk of mortality and/or desiccation. As changes in the general road network and the movement of vehicle are assumed to remain consistent at the NSS-W site, changes in amphibian mortality due to vehicles are predicted to remain consistent. As such, there is a low level of uncertainty with respect to the risk evaluation for amphibian road kill.

Given that collisions with the solid buildings (non-glass) are extremely rare events and that data from the Pickering NGS indicate that bird mortalities due to collisions with site structures are rare events (Golder, 2007), uncertainty with respect to the risk evaluation for bird strikes does not impact the conclusions.

5.0 Conclusions and Recommendations

5.1 Conclusions

5.1.1 Human Health Risk Assessment

5.1.1.1 Radiological Contaminants

For radiological emissions, individual dose to members of the critical group as the result of operation of all nuclear facilities at the Bruce nuclear site was less than 3 µSv/a and is approximately three orders of magnitude below the public dose limit of 1 mSv/a. The public dose arising from NSS-W operations is a portion of that from the Bruce nuclear site. Thus, the dose to members of the public from NSS-W operations is well below the regulatory limit.

5.1.1.2 Non-Radiological Contaminants

Based on the risk assessment, it is concluded that emissions of non-radiological substances resulting from the operations at the NSS-W pose no risk of adverse effects to human health. Further assessment of the impact of non-radiological contaminants on human health is not required.

5.1.1.3 Physical Stressors

Based on the results of field noise level measurements in 2017 from the Bruce nuclear site, and the modelling results, it can be concluded the noise generated due to the operation of NSS-W is acceptable and poses no risk of adverse effects to human health.

5.1.2 Ecological Risk Assessment

5.1.2.1 Radiological Contaminants

The risk from radiological contaminants emitted from the NSS-W was determined for indicator species across all trophic levels.

The total radiological dose received by each indicator species is below the benchmark values given in CSA N288.6-12. The calculated doses are based on the maximum radionuclide concentrations as well as UCLM radionuclide concentrations at the NSS-W for each medium. The total doses calculated using the maximum radionuclide concentrations therefore represent a conservative estimate of the dose the indicator species could receive from the existing environment at the NSS-W. Therefore, radiological contaminants do not pose an adverse effect to biota at the NSS-W. No change in the current monitoring of radiological dose to the environment is recommended.

5.1.2.2 Non-Radiological Contaminants

5.1.2.2.1 South Railway Ditch

Fish and herpetofauna in the SRD are not at toxicological risk from NSS-W operations. The UCLM concentrations of iron, nickel, and zinc in the SRD did not exceed the iron, nickel, and zinc benchmarks for fish or frogs, but the maximum concentrations of iron and zinc in the SRD did exceed the benchmark. However, as fish and herpetofauna are generally mobile, the UCLM concentration is a more representative estimate of the exposure.

The HQ values for cattails were greater than 1 based on exposure to maximum iron, nickel and zinc. It is possible that individual cattails may be exposed to elevated concentrations of these COPCs, however the cattail population as a whole is not expected to be at risk in the SRD.

The HQ values for benthic invertebrates were greater than 1 based on exposure to multiple COPCs in sediment and surface water. Since benthic invertebrates are not mobile, some individuals may experience prolonged exposure at the maximum concentration; however, the benthic invertebrate community as a whole is not expected to be at risk in the SRD.

COPCs in the SRD are not likely to cause adverse effects on birds and mammals. Birds and mammals are likely to see exposures similar to UCLM concentrations as they move around the area. The HQ for all riparian birds and mammals was below 1 based on UCLM concentrations in the SRD. The Little Brown Bat is a species at risk; while its target HQ of 1 was exceeded based on a maximum concentration of strontium, bats are known to be mobile and would be exposed to COPC concentrations close to the UCLM. Therefore, it is not likely that the Little Brown Bat is at risk because of strontium.

5.1.2.2.2 West Ditch

Fish and herpetofauna in the WD are not at toxicological risk from NSS-W operations. The UCLM concentration of zinc in the WD did not exceed the zinc benchmark for fish or frogs, but the maximum concentration of zinc in the WD did exceed. However, as fish and herpetofauna are generally mobile, the UCLM concentration is a more representative estimate of the exposure.

The HQ values for cattails were greater than 1 based on exposure to maximum zinc. It is possible that individual cattails may be exposed to elevated concentrations of these COPCs, however the cattail population as a whole is not expected to be at risk in the WD.

The HQ values for benthic invertebrates were greater than 1 based on exposure to multiple COPCs in sediment and surface water. Since benthic invertebrates are not mobile, some individuals may experience prolonged exposure at the maximum concentration; however, the benthic invertebrate community as a whole is not expected to be at risk in the west ditch.

COPCS in the WD are not likely to cause adverse effects on birds and mammals. Birds and mammals are likely to see exposures similar to UCLM concentrations as they move around the area. The HQ was below 1 for all riparian birds and mammals based on maximum and UCLM concentrations for all COPCs in the WD.

5.1.2.2.3 Dioxins and Furans in the SRD and West Ditch

As discussed in Section 4.4.3.2.4 adverse effects to benthic invertebrates at the community level are not expected within the SRD and the West Ditch because the HQ values remain at or below

1 when considering the PEL as the TRV, which is the level above which adverse effects are expected to occur frequently.

Considering that the dioxin and furan compounds are not expected to provide adverse effects at the community level at both the West Ditch and SRD, remediation is not warranted. Remediation efforts within sediment would involve disturbing the benthic invertebrate habitats along with other aquatic receptors such as fish and herpetofauna, which would impact these aquatic species much more severely than allowing the dioxin and furan compounds concentrations to remain in the sediment.

5.1.2.2.4 NSS-W and RWOS1 Terrestrial

For terrestrial ecological receptors there were no exceedances of the HQ target of 1 due to exposure to soil at the NSS-W or RWOS1.

5.1.2.3 Physical Stressors

Quantitative analysis shows that the operation of the existing NSS-W is unlikely to represent a noise disturbance beyond the tolerance of species currently occurring within the vicinity of the NSS-W. A qualitative assessment was performed to determine the risks that could result in road kill and bird strikes at the NSS-W. Road mortality data suggests a decreasing trend for white-tailed deer. Additional data will improve the understanding of road mortalities for remaining mammals and insects. It is interpreted that amphibian road mortalities will remain consistent so long as the road network and vehicle traffic are expected to remain the same. No further evaluation is required for the NSS-W specifically, because the Bruce EMP is expected to continue road mortality surveys. It is recommended that these road mortality surveys continue to be addressed within subsequent ERAs for the NSS-W.

5.2 Recommendations for Monitoring

The following sections summarize the recommendations proposed as a result of the findings discussed in the ERA. The recommendations include surface water sampling within the SRD, precipitation monitoring, wetland monitoring, monitoring at the RWOS1, C-14 monitoring within the vicinity of IC-18s, dioxins and furans within the SRD and West Ditch, as well as PHCs in sediment within the SRD and West Ditch.

5.2.1 Surface Water Sampling at SRD

Surface runoff at the NSS-W is collected by the surface drainage system, which discharges to either the SRD, or to the stormwater management pond. Tritium concentrations in 2016 to 2020 as reported in the EMP reports are trending downwards. In addition, radiological modelling of terrestrial and aquatic receptors that are exposed to the SRD resulted in total doses well below the terrestrial and aquatic dose benchmarks recommended in CSA N288.6-12. Therefore, it is recommended that the current quarterly monitoring of tritium within the SRD as part of the EMP program is considered to be appropriate.

For non-radiological COPCs, the ecological risk is estimated by dividing the concentration or dose by the TRV for a given COPC and receptor species, yielding a HQ. When the EV for an organism at a site exceeds the BV (HQ > 1), a potential for adverse ecological effects is inferred. HQs above 1 were observed in the SRD for a number of metals, including chromium, copper, iron, manganese, nickel, sodium, strontium and zinc for aquatic and/or riparian receptors. These exceedances are consistent with observations from past monitoring and are likely attributed to the existence of a former rail line within the ditch for some metals, historical releases from the SSTF, drainage culverts and naturally elevated water concentrations for iron and manganese. Monitoring is recommended to support the next ERA to confirm that conditions in the SRD remain unchanged.

5.2.2 Precipitation Monitoring

The precipitation sampling program to monitor tritium in precipitation and by extension runoff to the SRD was reviewed as part of this ERA. In 2013 to 2014, OPG undertook an internal investigation, supplementary to the EMP, to quantify tritium concentrations in precipitation (OPG, 2016). In that study, precipitation samples were collected between July 2013 and July 2014 from eight locations at the NSS-W and also from one location at the RWOS1. It was originally recommended that the supplementary study be repeated in 2020-21 to support the 2021 ERA update; however, based on discussion in Section 2.2.9.2.3 it is recommended that the updated precipitation monitoring supplementary study was not warranted and future precipitation monitoring can be discontinued.

As discussed in Section 2.2.9.2.3, the tritium concentrations measured in precipitation between the background and the monitoring locations at the NSS-W are very similar which is an indication that the tritium is most likely attributed to the operation of Bruce A and B and not capturing local sources. Based on the location and elevation of the samples collected during the precipitation monitoring program, the precipitation monitoring program is not expected to capture the tritium off-gassing processes occurring at the LLSBs or other NSS-W-specific processes. Seeing that the precipitation monitoring program is not interpreted to provide additional insight into the NSS-W inputs to precipitation, precipitation monitoring can be discontinued.

5.2.3 Surface Water Sampling at the Wetland

The wetland concentration of strontium represents the maximum concentration for both the wetland and the SRD combined, and was from location WTL-2 at 4450 µg/L. Surface water samples within the wetlands were collected by Intera Engineering during a three-year hydrogeological investigation at the Construction Landfill east and southeast of the NSS-W. Samples located near WTL-1 and WTL-2 within this landfill investigation also exceeded the criteria of 2500 µg/L selected for screening of strontium in surface water in Section 4.1.3.4 (OPG, 2008). Intera inferred that the elevated metals in the surface water sample locations within the wetlands are considered to be “typical of surface water conditions in the immediate vicinity of a landfill” (OPG, 2008).

Considering that the source of inputs to the wetland is generally understood, ongoing monitoring of the wetland is not considered necessary at this time. However, additional wetland monitoring is recommended to support the next ERA update to determine if conditions are stable or have changed.

5.2.4 RWOS1

As no surface water bodies are within the vicinity of the RWOS1, surface water and sediment are not considered at the RWOS1.

There are no direct releases of radionuclides or non-radionuclides to air or water from RWOS1. Radiological dose modelling of terrestrial receptors located at RWOS1 considered outdoor air inputs from the NSS-W Incinerator as well as soil, grass and cedar samples. Results of this modelling determined that the total doses to terrestrial receptors were well below the terrestrial dose benchmark recommended in CSA N288.6-12.

For non-radiological contaminants, strontium was the only COPC that exceeded the applicable screening criterion in soil at the RWOS1. When exposure to strontium in soil was then carried forward into the ERA for the terrestrial receptors, the resulting HQ remained below 1, and therefore adverse ecological effects are not expected as a result of soil exposure in terrestrial biota.

All relevant media were considered in this ERA, including soil, direct vegetation samples and exposure to outdoor air influenced by the NSS-W incinerator. Concentrations within these media were then used in modelling dose to biota within the RWOS1, and this indicated no adverse ecological effects are expected to occur. RWOS1 is no longer an active site and waste is no longer being sent to this site. As a result, the soil and terrestrial conditions at the RWOS1 are appropriately characterized and are not expected to change based on its current use. Therefore, the RWOS1 facility does not need to be considered for subsequent ERAs so long as the operations at the site remain unchanged.

5.2.5 C-14 Monitoring within the Vicinity of IC-18s

Monitoring data indicated elevated C-14 concentrations in air in close proximity to the inground storage containers (IC-18s and IC-12s), which were investigated further during a monitoring program described in the EMP (Ecometrix, 2020b). Twenty passive air samplers were placed within the NSS-W to analyze C-14 concentrations in air quarterly in Spring 2019.

Elevated concentrations of C-14 in air were observed, which were interpreted to be due to the spent moderator ion exchange resin stored within the inground containers (IC) IC-12s and IC-18s (Ecometrix, 2021c). A statistically significant increasing trend was observed in the C-14 concentrations near IC-18s (Ecometrix, 2020b).

The concentrations of C-14 in grasses growing next to the IC-18 within the fenceline of the NSS-W were assessed in the 2020 and 2019 EMPs (Ecometrix, 2020b, 2021c) and were determined to average 1160 Bq/kg (fw). The calculated dose rate to grasses was determined to be 7.91E-04 mGy/day, well below the terrestrial dose benchmark of 2.4 mGy/day (Ecometrix, 2020b, 2021c). The maximum C-14 concentrations in grass and cedar analyzed within the 2020-2021 sampling program were 27 Bq/kg (fw) and 43 Bq/kg (fw), respectively, for samples collected from location A3, the vegetated area just south of the inground containers at the NSS-W. The calculated dose rates to grasses and cedars were determined to be well below the terrestrial dose benchmark.

Based on the terrestrial sampling program carried out in both the 2019 and 2020 EMPs (Ecometrix, 2020b, 2021c) and the 2020-2021 sampling program for this ERA, the source of C-14 concentrations in vegetation near IC-18 is understood. Therefore, it is recommended that routine C-14 air monitoring around the inground storage containers should continue as part of the EMP design, but additional investigations into C-14 in air and vegetation are not required. Future consideration of C-14 in vegetation can be modelled using the specific activity model, as modelled concentrations in vegetation are expected to correlate well with measured air concentrations.

5.2.6 Dioxins and Furans and Metal COPCs in SRD and West Ditch

As discussed in Section 4.4.3.2.1, 4.4.3.2.3 and 4.4.3.2.4, adverse effects to benthic invertebrates at the community level are not expected within the SRD and the West Ditch.

Considering that dioxins and furans, chromium, cadmium, copper, iron, lead, manganese, nickel, sodium and zinc are not expected to cause adverse effects at the community level at both the West Ditch and SRD, remediation is not warranted. Remediation efforts within sediment would involve disturbing the benthic invertebrate habitats along with other aquatic receptors such as fish and herpetofauna, which would impact these aquatic species much more severely than allowing the dioxin and furans concentrations to remain in the sediment. As a result, Ecometrix does not recommend remediation efforts that involve disturbing the sediment within the SRD and West Ditch.

To assess the long-term effects of dioxin and furan accumulation from the incinerator, it is recommended that dioxins and furans continue to be analyzed in soil, sediment and surface water samples for the next ERA.

Additionally, samples of benthic invertebrates can be collected and analyzed for dioxins and furans as well as metals in a supplementary study to reduce uncertainty in risk characterization for the next ERA update to determine more realistic concentrations of these compounds in benthic invertebrates and a more realistic quantification of risk.

5.2.7 PHCs in Sediment within SRD and West Ditch

Despite PHC F3 and PHC F4 exceeding the applicable sediment guidelines, no further action is considered necessary. As discussed in Section 4.1.3.5, the selected guidelines for both the PHC F3 and PHC F4 subfractions were calculated using chronic effect concentrations in water that are protective of aquatic receptors (Atlantic PIRI, 2012). However, the low solubilities of PHC and PHC F4 suggest these compounds do not partition into the water column. Differences in PHC F3 and PHC F4 concentrations in sediment between the upstream and downstream sampling locations are noted for both the SRD and West Ditch sample results in the 2020-2021 sampling program. These differences between the upstream and downstream locations are likely due to the low solubility of these compounds, and the resulting water concentrations are assumed to be below chronic effect levels. Therefore, PHC concentrations in sediment are not expected to result in water concentrations that would exceed chronic effect levels for aquatic receptors (Atlantic PIRI, 2012).

Turtle populations are expected to inhabit the SRD. Considering the lack of migration of the PHC compounds in sediment and the low solubility of the PHC compounds within surface water it is expected that any adverse ecological effects to these populations from PHCs will be minimal in comparison to remediating the PHC concentrations along the SRD. Remediation efforts within sediment would involve disturbing the turtle habitat, which would impact the turtle populations much more severely than allowing the PHC concentrations to remain in the sediment. As a result, Ecometrix does not recommend remediation efforts that involve disturbing the sediment within the SRD.

6.0 Quality Assurance

The ERA makes extensive use of effluent and environmental monitoring data. These data are derived from chemical and radiochemical analyses of samples collected from effluent streams and environmental media around the NSS-W site.

Environmental samples collected to support the 2021 update of the NSS-W ERA (including surface water, sediment, soil, and vegetation) were collected by qualified Ecometrix staff and analyzed by Bureau Veritas Laboratories and Kinectrics, which both conform to the quality assurance requirements of ISO Standard 17025. Work plans to support the planning and collection of environmental samples were prepared according to CSA N288.4-10.

The environmental data provided by OPG were collected by qualified staff and analyzed by qualified performing laboratories, such as the Bruce Power Health Physics Lab. 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, 2007b). The station chemistry laboratory also has its own QA program and analyses sent externally utilize accredited laboratories.

Throughout the planning and preparation of the ERA, all 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.

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Appendix A Screening Tables

Table A-1 Human Health Screening Criteria for Screening Surface Water COPCs

Parameter	Units	Group 1 Max Conc. [d]	Group 2 Max Conc. [e]	Health Canada Drinking Water Guidelines (1)	Ontario Drinking Water Quality Standards (2)	MOE GW1 Component Value (3)	Guideline from Other Jurisdiction (4-9)		Selected Human Health Screening Criteria	Reference
							Value	Source		
Physical / Conventional Characteristics										
Alkalinity ($CaCO_3$)	mg/L	320	280	-	-	-	-	-	- [a]	-
Conductivity	µS/cm	4612	5200	-	-	-	-	-	- [a]	-
Dissolved Oxygen - Field	%	93.6	97.5	-	-	-	-	-	- [a]	-
Dissolved Oxygen - Field	mg/L	93.6	97.5	-	-	-	-	-	- [a]	-
pH - Field		**8.16**	**8.55**	-	-	-	6.5 - 8.5	(5)	- [a]	-
Specific Conductance - Field	µS/cm	8214	7077	-	-	-	-	-	- [a]	-
Total Dissolved Solids	mg/L	1990	2770	-	-	-	500	(5)	- [a]	-
Total Dissolved Solids - Field	g/L	6436	4521.8	-	-	-	-	-	- [a]	-
Total Hardness	mg/L	400	390	-	-	-	-	-	- [a]	-
Total Suspended Solids	mg/L	10	12	-	-	-	-	-	- [a]	-
Dioxins and Furans										
2,3,7,8-Tetra CDD Equivalent	pg/L	1.35914	6.813671	-	15	15	-	-	15	(2,3)
Metals										
Aluminum - Dissolved	µg/L	9.4	9.4	-	-	-	-	-	9500	(4)
Aluminum - Dissolved (0.2u)	µg/L	26	13	-	-	-	-	-		
Aluminum - Total	µg/L	225	207	-	-	-	9500	(4)		
Antimony - Dissolved	µg/L	0.39	0.24	-	-	-	-	-	6	(1,2,3)
Antimony - Total	µg/L	0.57	1.06	6	6	6	-	-		
Arsenic - Dissolved	µg/L	0.25	0.25	-	-	-	-	-	10	(1,2)
Arsenic - Total	µg/L	1.26	4.42	10	10	25	-	-		
Barium - Dissolved	µg/L	26.2	27.6	-	-	-	-	-	1000	(2,3)
Barium - Total	µg/L	77.5	59.70	2000	1000	1000	-	-		
Beryllium - Dissolved	µg/L	0	0	-	-	-	-	-	4	(3)
Beryllium - Total	µg/L	0.02	0.01	-	-	4	-	-		
Bismuth - Dissolved	µg/L	0	0	-	-	-	-	-	- [a]	-
Bismuth - Total	µg/L	0	0	-	-	-	-	-		
Boron - Dissolved	µg/L	21	22	-	-	-	-	-	5000	(1,2,3)
Boron - Total	µg/L	61	153	5000	5000	5000	-	-		
Cadmium - Dissolved	µg/L	0.008	0.005	-	-	-	-	-	5	(2,3)
Cadmium - Total	µg/L	0.067	0.02	7	5	5	-	-		
Calcium - Dissolved	mg/L	120	120	-	-	-	-	-	- [a]	-
Cesium - Total	µg/L	0.02	0.02	-	-	-	1	(7)	1	(7)
Chromium - Dissolved	µg/L	0.3	0.3	-	-	-	-	-	50	(1,2,3)
Chromium - Total	µg/L	8.8	0.5	50	50	50	-	-		
Chromium (III) - Total	µg/L	0	0	-	-	-	3000	(6)	3000	(6)
Chromium (VI) - Total	µg/L	0.76	0.79	-	-	25	-	-	25	(3)
Cobalt - Dissolved	µg/L	0.05	0.05	-	-	-	-	-	3	(3)
Cobalt - Total	µg/L	0.33	0.36	-	-	3	-	-		
Copper - Dissolved	µg/L	0.89	1.67	-	-	-	-	-	1000	(3)
Copper - Total	µg/L	1.68	3.3	2000	-	1000	-	-		
Iron - Dissolved	µg/L	63.2	41	-	-	-	-	-	300	(4)
Iron - Total	µg/L	**1500**	**854**	-	-	-	300	(4)		
Lead - Dissolved	µg/L	0.02	0.04	-	-	-	-	-	5	(1)
Lead - Total	µg/L	0.17	1.0	5	10	10	-	-		
Lithium - Dissolved	µg/L	1.3	1.3	-	-	-	-	-	4	(6)
Lithium - Total	µg/L	3.1	2.5	-	-	-	4	(6)		
Magnesium - Dissolved	mg/L	26	24	-	-	-	-	-	- [a]	-
Magnesium - Total	mg/L	25400	21200	-	-	-	-	-		
Manganese - Dissolved	µg/L	15.2	21	-	-	-	-	-	120	(1)
Manganese - Total	µg/L	**398**	**208**	120	-	-	-	-		
Mercury - Dissolved	µg/L	0	0	-	-	-	-	-	1	(1,2,3)
Mercury - Total	µg/L	0.003	0.003	1	1	1	-	-		
Molybdenum - Dissolved	µg/L	0.8	1.3	-	-	-	-	-	70	(3)
Molybdenum - Total	µg/L	10.4	2.30	-	-	70	-	-		
Nickel - Dissolved	µg/L	0.5	0.5	-	-	-	-	-	100	(3)
Nickel - Total	µg/L	36	1.30	-	-	100	-	-		
Potassium - Total	µg/L	4390	4760	-	-	-	-	-	- [a]	-
Selenium - Dissolved	µg/L	0.1	0.19	-	-	-	-	-	10	(3)
Selenium - Total	µg/L	0.21	0.37	50	50	10	-	-		
Silicon - Dissolved	µg/L	3890	2220	-	-	-	-	-	- [a]	-
Silicon - Total	µg/L	4170	3060	-	-	-	-	-		
Silver - Dissolved	µg/L	0.001	0	-	-	-	-	-	100	(3)
Silver - Total	µg/L	0.002	0.003	-	-	100	-	-		
Sodium - Dissolved	µg/L	188000	110000	-	-	-	-	-	200000	(3)
Sodium - Total	µg/L	**608000**	**821000**	-	-	200000	-	-		
Strontium - Dissolved	µg/L	1780	2130	-	-	-	-	-	7000	(1)
Strontium - Total	µg/L	4450	2440	7000	-	-	-	-		
Thallium - Dissolved	µg/L	0.003	0.005	-	-	-	-	-	2	(3)
Thallium - Total	µg/L	0.01	0.01	-	-	2	-	-		
Thorium - Dissolved	µg/L	0	0	-	-	-	-	-	250	(8)
Thorium - Total	µg/L	0	0	-	-	-	250 [b]	(8)		
Tin - Dissolved	µg/L	0.2	0.1	-	-	-	-	-	1200	(6)
Tin - Total	µg/L	0.1	0.1	-	-	-	1200	(6)		
Titanium - Dissolved	µg/L	0.4	-0.0029	-	-	-	-	-	15	(9)
Titanium - Total	µg/L	7.8	6.6	-	-	-	15 [c]	(9)		
Tungsten - Total	µg/L	0.1	0.1	-	-	-	1.6	(6)	1.6	(6)
Uranium - Dissolved	µg/L	0.77	1.18	-	-	-	-	-	20	(1,2,3)
Uranium - Total	µg/L	1.17	1.23	20	20	20	-	-		
Vanadium - Dissolved	µg/L	0.3	0.3	-	-	-	-	-	6.2	(3)
Vanadium - Total	µg/L	0.7	1.4	-	-	6.2	-	-		
Zinc - Dissolved	µg/L	90	40	-	-	-	-	-	5000	(3)
Zinc - Total	µg/L	105	42	-	-	5000	-	-		
Zirconium - Dissolved	µg/L	0.11	0.09	-	-	-	-	-	0.16	(6)
Zirconium - Total	µg/L	**0.2**	**0.37**	-	-	-	0.16	(6)		

Notes

The symbol '-' denotes no value was determined and/or required.

Highlighting and bold font denotes that the maximum concentration of a parameter exceeds the relavent screening criteria value.

a - The parameter is not considered a human health concern, and therefore no screening is necessary.

b - Converted thorium from Bq/L to µg/L.

c - Upper range limit (0.5 - 15 µg/L) of titanium concentrations found in an investigation of 42 municipal water supplies in the United States (Durfor & Becker, 1964).

d - Sampling locations: GS-1, Location B, SRD-1, SRD-2, SRD-3, SRD-4, SRD-5, Stream C Confluence, Stream C DS, Stream C US, WTL-1, WTL-2.

e - Sampling locations: WD-1, WD-2b, WD-3.

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Table A-2 Ecological Screening Criteria for Screening Surface Water COPCs

Parameter	Units	Group 1 Max Conc. [i]	Group 2 Max Conc. [j]	Canadian Water Quality Guidelines for the Protection of Aquatic Life (1)	Provincial Water Quality Objectives (2)	Interim Provincial Water Quality Objectives (2)	Federal Environmental Quality Objectives (3-11)	MECP Aquatic Protection Value (12)	Guideline from Other Source (13-15)		Selected Ecological Screening Criteria	Reference
									Value	Source		
Physical / Conventional Characteristics												
Alkalinity ($CaCO_3$)	mg/L	320	280	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	4612	5200	-	-	-	-	-	-	-	-	-
Dissolved Oxygen - Field	%	93.6	97.5	-	-	-	-	-	-	-	-	-
Dissolved Oxygen - Field	mg/L	93.6	97.5	-	-	-	-	-	-	-	-	-
pH - Field		8.16	**8.55**	6.5 - 9.0	6.5 - 8.5	-	-	-	-	-	6.5 - 8.5	(2)
Specific Conductance - Field	µS/cm	8214	7077	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	1990	2770	-	-	-	-	-	-	-	-	-
Total Dissolved Solids - Field	g/L	6436	4521.8	-	-	-	-	-	-	-	-	-
Total Hardness	mg/L	400	390	-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	10	12	5 mg/L above background	-	-	-	-	-	-	-	-
Dioxins and Furans												
2,3,7,8-Tetra CDD Equivalent	pg/L	**1.36**	**6.81**	-	-	-	-	10	0.6	(13)	0.6	(13)
Metals												
Aluminum - Dissolved	µg/L	9.4	9.4	-	-	-	-	-	-	-	100	(1)
Aluminum - Dissolved (0.2u)	µg/L	26	13	-	-	-	-	-	-	-		
Aluminum - Total	µg/L	**225**	**207**	100	-	75	232 [a]	-	-	-		
Antimony - Dissolved	µg/L	0.39	0.24	-	-	-	-	-	-	-	20	(2)
Antimony - Total	µg/L	0.57	1.06	-	-	20	-	1600	-	-		
Arsenic - Dissolved	µg/L	0.25	0.25	-	-	-	-	-	-	-	5	(1)
Arsenic - Total	µg/L	1.26	4.42	5	100	-	-	150	-	-		
Barium - Dissolved	µg/L	26.2	27.6	-	-	-	-	-	-	-	2300	(12)
Barium - Total	µg/L	77.5	59.7	-	-	-	-	2300	4	(14) [f]		
Beryllium - Dissolved	µg/L	0	0	-	-	-	-	-	-	-	1100	(2)
Beryllium - Total	µg/L	0.02	0.01	-	1100	-	-	5.3	-	-		
Bismuth - Dissolved	µg/L	0	0	-	-	-	-	-	-	-	2.5	(15)
Bismuth - Total	µg/L	0	0	-	-	-	-	-	2.5	(15) [g]		
Boron - Dissolved	µg/L	21	22	-	-	-	-	-	-	-	1500	(1)
Boron - Total	µg/L	61	153	1500	-	200	-	3550	-	-		
Cadmium - Dissolved	µg/L	0.008	0.005	-	-	-	-	-	-	-	0.2	(2)
Cadmium - Total	µg/L	0.067	0.019	0.37	0.2	-	-	0.21	-	-		
Calcium - Dissolved	mg/L	**120**	**120**	-	-	-	-	-	11.6	(14) [f]	11.6	(14)
Calcium - Total	mg/L	**116**	**117**	-	-	-	-	-	11.6	(14) [f]		
Cesium - Total	µg/L	0.02	0.02	-	-	-	-	-	315	(15) [g]	315	(15)
Chromium - Dissolved	µg/L	0.3	0.3	-	-	-	-	-	-	-	64	(12)
Chromium - Total	µg/L	8.8	0.5	-	-	-	-	64	-	-		
Chromium (III) - Total	µg/L	0	0	8.9	8.9	-	-	-	-	-	8.9	(1,2)
Chromium (VI) - Total	µg/L	0.76	0.79	1	1	-	5	11	-	-	1	(1,2)
Cobalt - Dissolved	µg/L	0.05	0.05	-	-	-	-	-	-	-	0.9	(2)
Cobalt - Total	µg/L	0.33	0.36	-	-	0.9	1.68 [b]	5.2	-	-		

Table A-2 Ecological Screening Criteria for Screening Surface Water COPCs

Parameter	Units	Group 1 Max Conc. [i]	Group 2 Max Conc. [j]	Canadian Water Quality Guidelines for the Protection of Aquatic Life (1)	Provincial Water Quality Objectives (2)	Interim Provincial Water Quality Objectives (2)	Federal Environmental Quality Objectives (3-11)	MECP Aquatic Protection Value (12)	Guideline from Other Source (13-15)		Selected Ecological Screening Criteria	Reference
									Value	Source		
Copper - Dissolved	µg/L	0.89	1.67	-	-	-	-	-	-	-	4	(1)
Copper - Total	µg/L	1.68	3.3	4	5	-	0.41 [c]	6.9	-	-		
Iron - Dissolved	µg/L	63.2	41	-	-	-	-	-	-	-	300	(1,2)
Iron - Total	µg/L	**1500**	**854**	300	300	-	635.7 [d]	-	-	-		
Lead - Dissolved	µg/L	0.02	0.04	-	-	-	-	-	-	-	3.68	(8)
Lead - Total	µg/L	0.17	1	7	25	-	3.68 [e]	2	-	-		
Lithium - Dissolved	µg/L	1.3	1.3	-	-	-	-	-	-	-	14	(14)
Lithium - Total	µg/L	3.1	2.5	-	-	-	-	-	14	(14) [f]		
Magnesium - Dissolved	mg/L	26	24	-	-	-	-	-	-	-	8200	(14)
Magnesium - Total	mg/L	**25400**	**21200**	-	-	-	-	-	8200	(14) [f]		
Manganese - Dissolved	µg/L	15.2	20.7	-	-	-	-	-	-	-	460	(1)
Manganese - Total	µg/L	398	208	460	-	-	-	-	-	-		
Mercury - Dissolved	µg/L	0	0	-	-	-	-	-	-	-	0.2	(2)
Mercury - Total	µg/L	0.003	0.003	0.026	0.2	-	-	0.77	-	-		
Molybdenum - Dissolved	µg/L	0.8	1.3	-	-	-	-	-	-	-	73	(1)
Molybdenum - Total	µg/L	10.4	2.3	73	-	40	-	730	-	-		
Nickel - Dissolved	µg/L	0.5	0.5	-	-	-	-	-	-	-	25	(2)
Nickel - Total	µg/L	**36**	1.3	150	25	-	-	39	-	-		
Potassium - Total	µg/L	4390	4760	-	-	-	-	-	5300	(14) [f]	5300	(14)
Selenium - Dissolved	µg/L	0.1	0.19	-	-	-	-	-	-	-	1	(1)
Selenium - Total	µg/L	0.21	0.37	1	100	-	-	5	-	-		
Silicon - Dissolved	µg/L	3890	2220	-	-	-	-	-	-	-	- [h]	-
Silicon - Total	µg/L	4170	3060	-	-	-	-	-	-	-		
Silver - Dissolved	µg/L	0.001	0	-	-	-	-	-	-	-	0.1	(2)
Silver - Total	µg/L	0.002	0.003	0.25	0.1	-	-	0.12	-	-		
Sodium - Dissolved	µg/L	**188000**	110000	-	-	-	-	-	-	-	180000	(12)
Sodium - Total	µg/L	**608000**	**821000**	-	-	-	-	180000	-	-		
Strontium - Dissolved	µg/L	1780	2130	-	-	-	-	-	-	-	2500	(10)
Strontium - Total	µg/L	**4450**	2440	-	-	-	2500	-	-	-		
Thallium - Dissolved	µg/L	0.003	0.005	-	-	-	-	-	-	-	0.8	(1)
Thallium - Total	µg/L	0.01	0.014	0.8	-	0.3	-	40	-	-		
Thorium - Dissolved	µg/L	0	0	-	-	-	-	-	-	-	0.52	(15)
Thorium - Total	µg/L	0	0	-	-	-	-	-	0.52	(15) [g]		
Tin - Dissolved	µg/L	0.2	0.1	-	-	-	-	-	-	-	73	(14)
Tin - Total	µg/L	0.1	0.1	-	-	-	-	-	73	(14) [f]		
Titanium - Dissolved	µg/L	0.4	-0.0029	-	-	-	-	-	-	-	27.2	(15)
Titanium - Total	µg/L	7.8	6.6	-	-	-	-	-	27.2	(15) [g]		
Tungsten - Total	µg/L	0.1	0.1	-	-	30	-	-	-	-	30	(2)
Uranium - Dissolved	µg/L	0.77	1.18	-	-	-	-	-	-	-	15	(1)
Uranium - Total	µg/L	1.17	1.23	15	-	5	-	33	-	-		
Vanadium - Dissolved	µg/L	0.3	0.3	-	-	-	-	-	-	-	6	(2)
Vanadium - Total	µg/L	0.7	1.4	-	-	6	120	20	-	-		
Zinc - Dissolved	µg/L	**90**	**40**	7	-	-	-	-	-	-	7	(1)
Zinc - Total	µg/L	**105**	**42**	-	30	-	-	89	-	-		
Zirconium - Dissolved	µg/L	0.11	0.09	-	-	4	-	-	-	-	4	(2)
Zirconium - Total	µg/L	0.2	0.37	-	-	-	-	-	-	-		

Table A-2 Ecological Screening Criteria for Screening Surface Water COPCs

Parameter	Units	Group 1 Max Conc. [i]	Group 2 Max Conc. [j]	Canadian Water Quality Guidelines for the Protection of Aquatic Life (1)	Provincial Water Quality Objectives (2)	Interim Provincial Water Quality Objectives (2)	Federal Environmental Quality Objectives (3-11)	MECP Aquatic Protection Value (12)	Guideline from Other Source (13-15)		Selected Ecological Screening Criteria	Reference
									Value	Source		

Notes
The symbol '-' denotes no value was determined and/or required.
Highlighting and bold font denotes that the maximum concentration of a parameter exceeds the selected screening criteria value.
A pH of 7.8 was assumed to determine CWQG value pH-dependent parameters.
A hardness of 333 mg/L $CaCO_3$ was used to calculate hardness-dependent CWQG values.
Alkalinity (as $CaCO_3$) of 225 mg/L was used to determine alkalinity-dependent parameters.
A DOC of 0.5 mg/L was assumed to calculate all DOC-dependent parameters. This is the default value used to derive default FWQG values.
a - FWQG Aluminum (μg/L) = exp([0.645 × ln(DOC)] + [2.255 × ln(hardness)] + [1.995 × pH] + [-0.284 × (ln(hardness) × pH)] -9.898)
b - FWQG Cobalt (μg/L) = exp{(0.414[ln(hardness)] – 1.887}
c - Default FWQG for copper.
d - FWQG Iron (μg/L) = exp(0.671[ln(DOC)] + 0.171[pH] + 5.586)
e - FWQG Lead (μg/L) = exp(0.514[ln(DOC)] + 0.214[ln(Hardness)] + 0.4152)
f - Secondary Chronic Values (SCV) were selected for COPCs. If the SCV was not available, the lowest LC_{50} value was modified by a safety factor of 10.
g - To be conservative, the measured LC_{50} values of *H. Azteca* (software or hardwater) was divided by a safety factor of 10. If there is no measured value, the tap water LC_{50} (nominal) values were adjusted by a safety factor of 10,
h - The parameter is not considered an ecological health concern, and therefore no screening is necessary.
i - Sampling locations: GS-1, Location B, SRD-1, SRD-2, SRD-3, SRD-4, SRD-5, Stream C Confluence, Stream C DS, Stream C US, WTL-1, WTL-2.
j - Sampling locations: WD-1, WD-2b, WD-3.

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Table A-3 Ecological Screening Criteria for Screening Sediment COPCs

Parameter	Units	Group 1 Max Conc. [f]	Group 2 Max Conc. [g]	Ontario Provincial Sediment Quality Guidelines (1)	CCME Sediment Quality Guidelines (2)	Guideline from Other Sources (3-6)		Background Concentration (Dragun & Chiasson, 1991) (7)	Selected Ecological Screening Criteria	Reference
						Value	Source			
Physical / Conventional Characteristics										
Moisture Content	%	79.8	68	-	-	-	-	-	- [c]	-
Total Organic Carbon	mg/kg	**77000**	**55000**	10000 [a]	-	-	-	-	10000	(1)
Total Phosphorous	µg/g	**670**	**610**	600	-	-	-	-	600	(1)
Dioxins and Furans										
2,3,7,8-Tetra CDD Equivalent	pg/g	**20**	**22**	-	0.85[d], 21.5[e]	-	-	-	0.85	(2)
Metals										
Aluminum	µg/g	11600	8500	-	-	58030	(3)	-	58030	(3)
Antimony	µg/g	0.48	0.9	-	-	2	(6)	-	2	(6)
Arsenic	µg/g	3.37	5.28	6	5.9	-	-	-	5.9	(2)
Barium	µg/g	58.4	49.6	-	-	-	-	10 - 5000	10 - 5000	(7)
Beryllium	µg/g	0.48	0.36	-	-	-	-	<1.0 - 15	<1.0 - 15	(7)
Bismuth	µg/g	0.14	0.14	-	-	-	-	<10 - 15	<10 - 15	(7)
Boron	µg/g	20.1	16.1	-	-	-	-	<20 - 300	<20 - 300	(7)
Boron (hot water)	µg/g	**0.61**	0.47	-	-	0.5	(8)	-	0.5	(8)
Cadmium	µg/g	0.48	**0.67**	0.6	0.6	-	-	-	0.6	(1,2)
Calcium	µg/g	181000	170000	-	-	-	-	100 - 320,000	100 - 320,000	(7)
Cesium	µg/g	0.8	0.6	-	-	-	-	0.25 - 25	0.25 - 25	(7)
Chromium	µg/g	**29.4**	19.4	26	37.3	-	-	-	26	(1)
Chromium (VI)	µg/g	0.09	0.04	-	-	-	-	-	-	-
Cobalt	µg/g	7.17	7.3	-	-	50	(4)	-	50	(4)
Copper	µg/g	**140**	**35**	16	35.7	-	-	-	16	(1)
Iron	µg/g	17200	**22200**	20000 [b]	-	-	-	-	20000	(1)
Lead	µg/g	20.3	**42.6**	31	35	-	-	-	31	(1)
Lithium	µg/g	14.8	12.6	-	-	-	-	<5.0 - 140	<5.0 - 140	(7)
Magnesium	µg/g	51100	57400	-	-	-	-	50 - >100,000	50 - >100,000	(7)
Manganese	µg/g	**1100**	**920**	460	-	-	-	-	460	(1)
Mercury	µg/g	0.098	0.105	0.2	0.17	-	-	-	0.17	(2)
Molybdenum	µg/g	1.6	1.18	-	-	13.8	(5)	-	13.8	(5)
Nickel	µg/g	**18.8**	**18.3**	16	-	-	-	-	16	(1)
Potassium	µg/g	1700	1300	-	-	-	-	50 - 63,000	50 - 63,000	(7)
Selenium	µg/g	0.6	0.74	-	-	1.9	(5)	-	1.9	(5)

Table A-3 Ecological Screening Criteria for Screening Sediment COPCs

Parameter	Units	Group 1 Max Conc. [f]	Group 2 Max Conc. [g]	Ontario Provincial Sediment Quality Guidelines (1)	CCME Sediment Quality Guidelines (2)	Guideline from Other Sources (3-6)		Background Concentration (Dragun & Chiasson, 1991) (7)	Selected Ecological Screening Criteria	Reference
						Value	Source			
Silver	µg/g	0.09	0.309	-	-	0.5	(4)	-	0.5	(4)
Sodium	µg/g	1580	1860	-	-	-	-	<500 - 100,000	<500 - 100,000	(7)
Strontium	µg/g	790	445	-	-	-	-	<5 - 3000	<5 - 3000	(7)
Thallium	µg/g	0.13	0.19	-	-	-	-	<0.25 - 10	<0.25 - 10	(7)
Thorium	µg/g	3.2	2.19	-	-	-	-	2.2 - 31	2.2 - 31	(7)
Tin	µg/g	0.77	1.2	-	-	-	-	<0.1 - 10	<0.1 - 10	(7)
Titanium	µg/g	265	290	-	-	-	-	70 - 20,000	70 - 20,000	(7)
Tungsten	µg/g	0.29	0.41	-	-	-	-	<100 - 1000	<100 - 1000	(7)
Uranium	µg/g	1.1	1	-	-	104.4	(5)	-	104.4	(5)
Vanadium	µg/g	29.7	31.4	-	-	35.2	(5)	-	35.2	(5)
Zinc	µg/g	**450**	**550**	120	123	-	-	-	120	(1)
Zirconium	µg/g	4.19	1.75	-	-	-	-	<20 - 2000	<20 - 2000	(7)
BTEX and Petroleum Hydrocarbons (PHCs)										
Benzene	µg/g	0	0	-	-	1.24	(9)	-	1.24	(9)
Toluene	µg/g	0.027	0.02	-	-	1.4	(9)	-	1.4	(9)
Ethylbenzene	µg/g	0	0	-	-	1.16	(9)	-	1.16	(9)
Total Xylenes	µg/g	0	0	-	-	1.28	(9)	-	1.28	(9)
Petroleum Hydrocarbons F1-BTEX	µg/g	0	0	-	-	-	-	-	-	-
Aliphatic C6-C8	µg/g	0	0	-	-	14	(9)	-	14	(9)
Aliphatic C>8-C10	µg/g	0	0	-	-	10.5	(9)	-	10.5	(9)
Aromatic C>8-C10	µg/g	0	0	-	-	11.6	(9)	-	11.6	(9)
Petroleum Hydrocarbons F2	µg/g	0	0	-	-	-	-	-	-	-
Aliphatic C>10-C12	µg/g	0	0	-	-	8.7	(9)	-	8.7	(9)
Aliphatic C>12-C16	µg/g	0	0	-	-	*>1000* [h]	(9)	-	>1000	(9)
Aromatic C>10-C12	µg/g	0	0	-	-	5.7	(9)	-	5.7	(9)
Aromatic C>12-C16	µg/g	0	0	-	-	2.5	(9)	-	2.5	(9)
Petroleum Hydrocarbons F3	µg/g	790	2000	-	-	-	-	-	-	-
Aliphatic C>16-C21	µg/g	442	1120	-	-	*>1000* [h]	(9)	-	>1000	(9)
Aliphatic C>21-C34	µg/g	190	480	-	-	*>1000* [h]	(9)	-	>1000	(9)
Aromatic C>16-C21	µg/g	**111**	**280**	-	-	1.7	(9)	-	1.7	(9)

Table A-3 Ecological Screening Criteria for Screening Sediment COPCs

Parameter	Units	Group 1 Max Conc. [f]	Group 2 Max Conc. [g]	Ontario Provincial Sediment Quality Guidelines (1)	CCME Sediment Quality Guidelines (2)	Guideline from Other Sources (3-6)		Background Concentration (Dragun & Chiasson, 1991) (7)	Selected Ecological Screening Criteria	Reference
						Value	Source			
Aromatic C>21-C34	µg/g	**47**	**120**	-	-	5.4	(9)	-	5.4	(9)
Petroleum Hydrocarbons F4	µg/g	280	630	-	-	-	-	-	-	-
Aliphatic C>34	µg/g	**224**	**504**	-	-	98.8[i]	(9)	-	98.8	(9)
Aromatic C>34	µg/g	**56**	**126**	-	-	0.4[i]	(9)	-	0.4	(9)

Notes

The symbol '-' denotes no value was determined and/or required.
Highlighting and bold font denotes that the maximum concentration of a parameter exceeds the relavent screening criteria value.
a - Converted from % to mg/kg.
b - Converted from % to µg/g.
c - The parameter is not considered an ecological health concern, and therefore no screening is necessary.
d - ISQG - Interim Sediment Quality Guidelines (pg/g dw) (CCME, 2001)
e - PEL - Probable Effect Levels (pg/g dw) (CCME, 2001)
f - Sampling locations: GS-1, SRD-1, SRD-2, SRD-3, SRD-4, SRD-5, Stream C DS, Stream C US, WTL-1.
g - Sampling locations: WD-1, WD-2b, WD-3.
h - ">1000" indicates that the sediment criteria could not be calculated based on a toxic endpoint to aquatic species due to the low solubility of the fraction in water.
i - based on the Chronic benchmarks for aliphatic C19-C36 and aromatic C16-C36 calculated by Atlantic PIRI (2012) using the model developed by DiToro and McGrath (2000) using the benchmarks from Batelle (2007)

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Table A-4 Ecological Screening Criteria for Screening Soil COPCs

Parameter	Units	Group 1 Max Conc. [f]	Group 2 Max Conc. [g]	MECP Soil Component Values - PSO (1) [a]	MECP Soil Component Values - BM (1) [b]	CCME Agricultural Soil Quality Guidelines (2)	Interim Canadian Soil Quality Criteria (3)	MECP Table 1 (1)	MECP Rural/Parkland OTR_{98} [c] (4)	Dragun & Chiasson, 1991 (5)	Selected Screening Criteria (Plants & Soil Organisms)	Reference	Selected Screening Criteria (Birds & Mammals)	Reference
Physical / Conventional Characteristics														
Available ($CaCl_2$) pH		7.63	7.38	-	-	6 - 8	-	-	7.4	-	6 - 8	(2)	6 - 8	(2)
Conductivity	µMHO/cm	419	291	700	-	2000	-	570	360	-	700	(1)	2000	(2)
Moisture Content	%	45	31	-	-	-	-	-	-	-	- [h]	-	- [h]	-
Sodium adsorption ratio		0.26	0.23	5	-	5	-	2.4	0.71	-	5	(1)	5	(2)
Total Organic Carbon	mg/kg	140000	62000	-	-	-	-	-	-	-	- [h]	-	- [h]	-
Total Phosphorus	µg/g	657	631	-	-	-	-	-	900	-	900	(4)	900	(4)
Dioxins and Furans														
2,3,7,8-Tetra CDD Equivalent	pg/g	2.44295	0.767083	-	13	4 [j]	10	7	-	-	4	(2)	13	(1)
Metals														
Aluminum	µg/g	12500	11700	-	-	-	-	-	30000	-	30000	(4)	30000	(4)
Antimony	µg/g	0.28	0.21	20	25	20	-	1.3	0.43	-	20	(1,2)	20	(2)
Arsenic	µg/g	5.7	4.3	20	51	12	20	18	11	-	12	(2)	12	(2)
Barium	µg/g	65.3	51.3	750	390	750	750	220	160	-	750	(1,2)	390	(1)
Beryllium	µg/g	0.52	0.43	4	13	4	4	2.5	1.1	-	4	(1,2)	4	(2)
Bismuth	µg/g	0.19	0.15	-	-	-	-	-	-	<10 - 15	<10 - 15	(5)	<10 - 15	(5)
Boron	µg/g	12.6	11	-	120	-	-	36	30	-	36	(1)	120	(1)
Boron (hot water)	µg/g	0.56	0.64	1.5	-	2	-	-	-	-	1.5	(1)	2	(2)
Cadmium	µg/g	1.28	0.851	12	1.9	1.4	3	1.2	0.71	-	1.4	(2)	1.4	(2)
Calcium	µg/g	**147000**	**107000**	-	-	-	-	-	55000	-	55000	(4)	55000	(4)
Cesium	µg/g	1.1	0.6	-	-	-	-	-	-	0.25 - 25	0.25 - 25	(5)	0.25 - 25	(5)
Chromium	µg/g	17.7	16.2	310	160	64	750	70	58	-	64	(2)	64	(2)
Chromium (VI)	µg/g	0	0	8	910	0.4	8	0.66	0.5 [d]	-	0.4	(2)	0.4	(2)
Cobalt	µg/g	6.76	5.57	40	180	40	-	21	16	-	40	(2)	40	(2)
Copper	µg/g	15.9	10.8	140	770	63	150	92	41	-	63	(2)	63	(2)
Iron	µg/g	18700	17400	-	-	-	-	-	35000	-	35000	(4)	35000	(4)
Lead	µg/g	28.8	16.2	250	32	70	375	120	45	-	70	(2)	32	(1)
Lithium	µg/g	11.7	10	-	-	-	-	-	-	<5.0 - 140	<5.0 - 140	(5)	<5.0 - 140	(5)
Magnesium	µg/g	**52300**	**41100**	-	-	-	-	-	20000	-	20000	(4)	20000	(4)
Manganese	µg/g	1500	1310	-	-	-	-	-	2200	-	2200	(4)	2200	(4)
Mercury	µg/g	0.162	0.119	10	20	6.6	0.8	0.27	0.13	-	6.6	(2)	6.6	(2)
Molybdenum	µg/g	0.67	0.54	40	6.9	5	-	2	1	-	5	(2)	5	(2)
Nickel	µg/g	13.8	12	100	5000	45	150	82	38	-	45	(2)	45	(2)

Table A-4 Ecological Screening Criteria for Screening Soil COPCs

Parameter	Units	Group 1 Max Conc. [f]	Group 2 Max Conc. [g]	MECP Soil Component Values - PSO (1) [a]	MECP Soil Component Values - BM (1) [b]	CCME Agricultural Soil Quality Guidelines (2)	Interim Canadian Soil Quality Criteria (3)	MECP Table 1 (1)	MECP Rural/Parkland OTR_{98} [c] (4)	Dragun & Chiasson, 1991 (5)	Selected Screening Criteria (Plants & Soil Organisms)	Reference	Selected Screening Criteria (Birds & Mammals)	Reference
Potassium	µg/g	1300	893	-	-	-	-	-	6500	-	6500	(4)	6500	(4)
Selenium	µg/g	0.84	0.55	10	2.4	1	2	1.5	0.93	-	1	(2)	1	(2)
Silver	µg/g	0.116	0.084	20	-	20	-	0.5	0.27	-	20	(1,2)	20	(2)
Sodium	µg/g	178	123	-	-	-	-	-	660	-	660	(4)	660	(4)
Strontium	µg/g	**154**	**83.8**	-	-	-	-	-	64	-	64	(4)	64	(4)
Thallium	µg/g	0.134	0.138	1.4	3.9	1	1	1	0.81	-	1	(2)	1	(2)
Thorium	µg/g	2.82	1.06	-	-	-	-	-	-	2.2 - 31	2.2 - 31	(5)	2.2 - 31	(5)
Tin	µg/g	0.81	0.64	-	-	5	-	-	-	-	5	(2)	5	(2)
Titanium	µg/g	294	208	-	-	-	-	-	5200	-	5200	(4)	5200	(4)
Tungsten	µg/g	0.14	0.19	-	-	-	-	-	-	<100 - 1000	<100 - 1000	(5)	<100 - 1000	(5)
Uranium	µg/g	0.771	0.764	500	33	23	-	2.5	2.1	-	23	(2)	23	(2)
Vanadium	µg/g	33	30.6	200	18	130	200	86	77	-	130	(2)	86	(1) [e]
Zinc	µg/g	166	93.9	400	340	250	600	290	120	-	250	(2)	250	(2)
Zirconium	µg/g	2.79	0.83	-	-	-	-	-	-	<20 - 2000	<20 - 2000	(5)	<20 - 2000	(5)

Notes

The symbol '-' denotes no value was determined and/or required.

Highlighting and bold font denotes that the maximum concentration of a parameter exceeds both the plant/soil organism and bird/mammal screening criteria values.

a - Full depth, potable water scenario for agricultural land use with coarse textured soils.

b - Full depth, potable water scenario for residential/parkland land use with coarse textured soils. This scenario was chosen as industrial/commercial component values only considers dermal soil contact and not soil ingestion for ecological receptors.

c - Where multiple OTR_{98} values were presented for different sampling regions, region 1 (southwest) was selected.

d - Provisional OTR_{98} vale; insufficient data.

e - The MECP Table 1 full depth background site condition standard for vanadium was chosen for the protection of birds and mammals. See discussion in Section 4.3.1 and 4.3.2.

f - Sampling locations: A3-1, A3-2, A5-1, A5-2, MSA-1, RD-1, RD-2, SWALE

g - Sampling locations: RWOS1-1, RWOS1-2, RWOS1-3, RWOS1-4

h - The parameter is not considered an ecological health concern, and therefore no screening is necessary.

j - Human Health and Ecological Criteria is based on human health only as insufficient information is available for ecological receptors.

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Appendix B Ecological Receptors

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 VECs are generally selected based on several criteria as discussed in Section 4.1.1 of the report.

This appendix details the aquatic and terrestrial ecological receptors (groups or species) selected for the assessment.

B.1 Fish

B.1.1 Northern Redbelly Dace

The Northern Redbelly Dace (*Chrosomus eos*) is a cool water forage fish that inhabits lakes, bogs, ponds, and creeks across Canada and the northern areas of the St. Lawrence (Eakins, 2021; 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 (Eakins, 2021; 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 & Crossman, 1973; Stasiak, 2006).

B.1.2 Smallmouth Bass

Smallmouth Bass (*Micropterus dolomieu*) is a species of freshwater fish native to eastern-central North America. Before its introduction into other water systems for recreational fishing, smallmouth bass were restricted to the Great Lakes and St Lawrence systems, with the exception of Lake Superior (DFO, 2021). Smallmouth bass favour cooler waters and are often found near shoals or submerged logs and in moderately shallow, rocky and sandy areas. In Ontario, smallmouth bass begin nest-building from May to early June; populations further north may delay spawning for up to one month. Spawning is highly temperature dependant, with nest-building and mating commencing at a water temperature of 12.5°C and 16°C, respectively (Brown et al., 2009).

B.1.3 Lake Whitefish

Lake Whitefish (*Coregonus clupeaformis*) are freshwater fish native to Canada and some northern areas of the United States. They are found in all provinces and territories across Canada and tend to live in larger lakes and river systems (DFO, 2016). The lake whitefish's diet is composed of mainly plankton and benthic organisms during their first summer of life; adult lake whitefish are benthivores and consume insect larvae, molluscs and amphipods (COSEWIC, 2005). Lake whitefish typically move to shallow waters during the fall to spawn, usually between November to December in the Great Lakes region and earlier for more northern populations. Lake whitefish eggs hatch in April or May and young fish leave the shallow inshore waters by early summer and move to deeper water (COSEWIC, 2005). Lake whitefish are an important commercial fish species in Canada; the Lake Huron population is specifically important for the local First Nation commercial fishery (AMEC, 2016a).

B.2 Aquatic Plants

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.

B.2.1 Common Cattail

The Common Cattail (*Typha latifolia*) is a native emergent wetland species of macrophyte which grows intermittently in the drainage ditches and marshlands/wetlands that exist around the NSS-W. Cattail is known for its ability to filter wastewater, which may lead to pollutant (including heavy metals) accumulation in the plant tissues. Cattails act as an important food source for the Muskrat.

Cattails are unisexual, wild pollinated weeds. The female flowers form the brown cylinder near the top of the stalk, while the male flowers are located above this cylinder. Cattails, though a native species, behave like aggressive introduced weeds. They are commonly considered a nuisance plant and can be difficult to control (Apfelbaum, n.d.).

B.3 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 Mallard duck and Little Brown Bat. 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.

B.3.1 Digger Crayfish

The Digger Crayfish (*Fallicambarus fodiens*) is a medium-sized benthic invertebrate species that is brown to olive in colour with darker mottling. It is an obligate burrowing, semi-terrestrial crayfish. It creates complex burrows adjacent to streams and seepage areas, or in low areas where the water table is near to the surface. In the spring, they can be found in open water, such as streams or ditches. Their diet consists of a variety of plant and animal materials (Missouri Department of Conservation, n.d.).

B.4 Herpetofauna

Amphibians 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 airbreathing form with lungs. With their complex reproductive needs and permeable skins, amphibians are often used as ecological indicators.

Reptiles are cold-blooded animals with scales or scutes; common animals within the class include turtles and snakes. Most reptiles are oviparous (egg-laying) but do not require water bodies in which to breed.

B.4.1 Northern Water Snake

The Northern Water Snake (*Nerodia sipedon*) is brown with faint horizontal banding (Ontario Nature, 2013a). Adults are typically 61-107 cm in length (US EPA, 1993b). The Northern Water Snake is largely aquatic, preferring streams to other water bodies, though it can be found in lakes and ponds, as well as riparian areas. They consume a carnivorous diet, eating primarily fish and amphibians, but also insects and small mammals on occasion (US EPA, 1993b).

Northern water snakes are active both during the day and at night, but mostly between 21°C and 27°C. During the day, they can be found near basking sites. Northern water snakes breed primarily in the early spring (US EPA, 1993b).

B.4.2 Northern Leopard Frog

The Northern Leopard Frog (*Rana pipiens*) is a true frog species. They are medium-sized, approximately 5-9 cm in length, and are strongly spotted. They generally weigh between 30 and 70 g (US EPA, 1993b). The frog's skin absorbs water and gas exchange occurs across the skin. Adult frogs frequently shed the outer layer of skin. Skin casts are eaten following molting (ICRP, 2008b).

Adult frogs are truly amphibious, living at the edge of water bodies and entering the water to catch prey, flee danger, and spawn. They are found near shallow freshwater, and live at the margins of permanent or semi-permanent shallow water, springs, swamps, streams, ponds and lakes. The frogs inhabit aquatic habitats approximately two thirds of the time, primarily for refuge and temperature regulation. The one third of the time spent in terrestrial habitats is primarily for feeding (US EPA, 1993b). Adult frogs are carnivorous, eating a wide variety of small invertebrates and even vertebrates (ICRP, 2008b). They will consume insects, worms, small fish, crayfish, other crustaceans, newts, spiders, small frogs, and molluscs.

Frogs breed from spring through summer, spawning primarily at night (US EPA, 1993b). Female frogs will lay their egg masses in water, and the male frog will immediately fertilize them (ICRP, 2008b). The eggs typically hatch within 3-6 days (US EPA, 1993b) into aquatic larvae (tadpoles) that will metamorphose into terrestrial adults (ICRP, 2008b).

B.4.3 Painted Turtle

The Painted Turtle (*Chrysemys picta marginata*) has an olive to black carapace (upper shell) with red or dark orange markings on the marginal scutes (enlarge scales), as well as red and yellow stripes on the head and neck. The lower shell (plastron) is yellow or dark tan, with an irregular dark butterfly-shaped marking along the midline (Ontario Nature, 2013b). Painted turtles are sexually dimorphic, with the female larger than the male. Painted turtles are a medium-sized turtle, averaging 11.5 – 14 cm in size, with the female weighing 260-330 g and the smaller male weighing 170-190 g (US EPA, 1993b).

Painted turtles are primarily aquatic turtles; their habitats require shallow water features with soft and muddy bottoms, basking sites, and floating aquatic vegetation for feeding and cover. They can commonly be found in ponds, marshes, and ditches (US EPA, 1993b). Painted turtles are omnivorous, and may consume either primarily vegetation or primarily animal matter. The composition of the diet between animal matter and vegetation varies with age. The animal component of the turtle's diet tends to be dominated by insect larvae, while algae is a dominating plant component (US EPA, 1993b).

The turtles are diurnal; they forage in the late morning and late afternoon, bask during the day, and spend their nights sleeping submerged. They are mostly dormant during the colder months, hibernating in the mud at the bottom of ponds; they become active during warms periods in the winter. Painted turtles mate in the spring and summer (US EPA, 1993b).

B.5 Riparian Birds

B.5.1 Mallard

The Mallard (*Anas platyrhnchos*) is a dabbling duck with a brightly coloured patch of feathers on the trailing edge of each wing. They are sexually dimorphic; the plumage of the male ducks is more colourful than the plumage of the females. They average 50 cm in length from the tips of their bills to the ends of their tails (US EPA, 1993b).

Mallards prefer wetlands and rivers as habitat; they prefer a water depth of 20 to 40 cm for foraging. Nesting habitat is dense grassy vegetation of at least half a meter in height; mallards prefer habitat with concealment from predators. Nests are usually located within a few kilometers of water. Mallards are migratory; they tend to arrive at their wintering grounds in the south between mid-September and early November and depart for their breeding grounds in the north in March (US EPA, 1993b).

The mallard is a surface-feeding duck that feeds in shallow water. They feed primarily on aquatic plants, seeds and aquatic invertebrates. In winter, they feed primarily on seeds, and also on invertebrates. Laying females consume a larger amount of animal matter than males or non-laying females, whose diet is primarily herbivorous. Ducklings have a diet made up almost exclusively of animal matter (US EPA, 1993b).

Mallards generally lay first clutches by late April or May. However, high rates of nest failure require female mallards to re-nest persistently to obtain a successful nest. Initial clutch size is larger than later clutches, so re-nesting females have smaller clutches. Older females produce larger clutches than yearlings. Males leave females at the onset of incubation, while females remain with the brood until fledging. Mallards are serially monogamous and will re-mate every year (US EPA, 1993b).

B.5.2 Bald Eagle

The Bald Eagle (*Haliaeetus leucocephalus*) is a large bird of prey with pale eyes; yellow bills; white heads, necks and tails; and dark brown bodies. Young eagles are a mixture of brown and white, with a black bill in young birds (MECP, 2021b). Bald eagles have long rounded wings, a large hooked bill, and sharp talons. Bald eagles are sexually dimorphic; females are significantly larger than males, but otherwise they look alike (US EPA, 1993b).

Bald Eagles are found throughout North America; they nest in a variety of habitats and forest types (MECP, 2021b). Their habitats are usually restricted to coastal areas, lakes, or rivers; they prefer mature trees with large, open crowns and stout limbs for perching or roosting. Bald eagles are migratory under certain conditions; they will migrate from areas where the water bodies become completely frozen over in winter, but will remain as far north as open water and a reliable food supply allow (US EPA, 1993b). The nests are nearly always near a major lake or river where most of their hunting is done (MECP, 2021b); they prefer to build their nests in large trees with sturdy branches, but they will also nest in rocky outcrops.

B.6 Riparian Mammals

B.6.1 Muskrat

The Muskrat (*Ondatra zibethicus*) is a primarily aquatic rodent. Muskrats are 25-36 cm long from the head to the end of the body, with a 20-25 cm long tail. Adult muskrats weight from 0.5 kg to over 2 kg (US EPA, 1993b).

Muskrats spend most of their lives in or near bogs, marshes, marshes, lakes, streams, ponds or creeks. Muskrats will either excavate dens in the banks of shores or will construct lodges from plant materials; however, dens are preferred. In the winter, muskrats will construct pushups to minimize their exposure to cold water. These pushups are cavities formed in piles of vegetation which have been pushed up through holes in the ice in a marsh. Muskrats will change their home range in response to water levels; however, only a portion of drought-evicted muskrats can usually find a new home (US EPA, 1993b).

Muskrats are primarily herbivorous, with a diet of mainly aquatic vegetation. Important foods for the muskrat are marsh grasses and sedges, as well as cattails (AMEC, 2016a); where cattail is plentiful, it can make up as much as 80% of the muskrat's diet (FCSAP, 2012). While the muskrat primarily eats the roots and basal portions of plants, it will also eat the shoots, bulbs, tubers, stems, and leaves.

Muskrats tend to forage near their lodges or dens; they rarely stray further than 5 or 10 m from them for foraging. They will sometimes dig for food on lake or pond bottoms. When muskrats eat animals, they will eat crayfish, fish, frogs, turtles, or young birds (US EPA, 1993b).

Muskrats are solitary or form breeding pairs; other pairs are excluded from their home range. Breeding occurs in spring and summer, with the first litters born in late April or early May (US EPA, 1993b).

B.7 Terrestrial Vegetation

B.7.1 Grass

A common grass found on the NSS-W and vicinity is Reed-canary Grass (*Phalaris arundinacea*). It is a rhizomatous perennial grass, which grows from 0.9 – 1.8 m in height. The stems are sturdy and often hollow with some red colouring near the top, and can be up to 1.3 cm in diameter. The leaf blades are flat and hairless, 0.64 to 1.9 inches wide. The flowers are borne in panicles on culms high above the leaves. The panicles are generally 7.6 to 15.25 cm in length (State of Washington Department of Ecology, n.d.).

Reed-canary grass typically occurs in soil which are saturated or nearly saturated for most of the growing season, but where standing water does not persist for extended periods. Reed-canary grass is a perennial species, and flowers in June and July (State of Washington Department of Ecology, n.d.).

Reed-canary grass forms dense, highly productive single species stands that pose a threat to wetland ecosystems. They are able to inhibit and eliminate competing species (State of Washington Department of Ecology, n.d.).

B.7.2 Eastern White Cedar

The Eastern White Cedar (*Thuja occidentalis*) is a member of the pine family of trees, which consists of over 200 species. These trees have a tapering trunk surrounded by a sheath of bark that supports branches that carry a crown of narrow leaves. They are approximately 10 m tall, and weigh approximately 471 kg. The trees have both male and female flowers. Reproduction results in woody female cones with spirally arranged scales (ICRP, 2008b).

The eastern white cedar is common in temperate regions. It requires nutrient-rich soils for growth. The main elements it requires are nitrogen and phosphorus; however, trees also require potassium, sulphur, magnesium and calcium, with small quantities of other elements such as iron and zinc (ICRP, 2008b).

The root system of the eastern white cedar consists of a taproot and branch roots which anchor the stem and obtain water and minerals from the soil through the root hairs. Chlorophyll in the leaves absorbs energy from daylight which is used to photosynthesize carbohydrates, starch, and cellulose from water and carbon dioxide. Energy is obtained from the oxidation of carbohydrates (ICRP, 2008b).

The eastern white cedar has separate male and female flowers borne in separate strobili. Pollination occurs from tree to tree by wind. After pollination, the male flowers are shed and the female flowers grow into large pine cones with fertilized seeds (ICRP, 2008b).

B.8 Terrestrial Invertebrate

B.8.1 Earthworm

The common earthworm (*Lumbricus terrestris*) is member of the class Oligochaeta. There are approximately 3,000 members of this class worldwide. This class is characterised as segmented worms with a visceral, fluid-filled cavity (the coelom) which acts as a hydrostatic skeleton and is surrounded by a muscular wall with an arrangement of circular and longitudinal muscles. This internal arrangement allows the worms to shorten or lengthen their bodies and coil themselves into shapes. An adult earthworm is approximately 5.24 x 10^{-3} kg in weight, with a length of 10 cm (ICRP, 2008b).

Earthworms use a variety of organic materials for food, including plant material, decaying organic animal matter, or, if necessary, soil itself (ICRP, 2008b).

Earthworms are hermaphroditic, but not self-fertilizing. They reproduce by cross-fertilization with another member of the species. They are generally continuous breeders. Breeding worms will produce capsules containing the fertilized eggs; the number of capsules produced and the time of hatching from the capsule is related to soil temperature (ICRP, 2008b).

B.8.2 Bee

Bees (family Apidae) are insects with membranous wings, a stinger, and long tongues to gather pollen. They weigh approximately 5.89 x10^{-4} kg, and are approximately 2 cm in length (ICRP, 2008b). Colouration is variable in the abdomen; it varies between brown and yellow on the T1 and T2 segments, while remaining segments are completely black (COSEWIC, 2010).

There are at least 25,000 bee species around the world, with 4,000 known in North America. The family Apidae are the most widely studied family, consisting of the bumblebee and the honeybee (ICRP, 2008b).

Bees from the family Apidae normally form their nests in dry caves or hollow trees, though "domesticated" colonies also live in beehives. A principal feature of the nest is the honeycomb, a thin sheet of wax covered with hexagonal cells. The nests typically contain a brood chamber housing the queen and the larvae, and a surrounding chamber used to store honey and pollen. Temperatures inside the nest are highly controlled; honey bee larvae are likely to die at temperatures below 32°C or above 36°C (ICRP, 2008b).

Worker bees collect pollen and nectar for feeding; larvae are fed pollen and nectar directly. Adult bees form honey from the nectar. Some of the honey formed is retained as food for the workers, while the rest is stored as food for the winter with the pollen (ICRP, 2008b).

Bees in the family Apidae are highly social and live in colonies that act as a single unit. These colonies consist of a single egg-laying female (the queen), plus sterile daughters (the workers), and male drones. The female workers are reared from fertilized eggs. Male drones are only occasionally reared as needed, and they are produced from unfertilized eggs through a process known as "parthenogenesis".

Workers behave cooperatively to gather food for the colony, build the nest and rear the young. There may be up to 80,000 worker bees at any one time per colony (ICRP, 2008b).

Bees are an important pollinator of many industrial crops and native flowering plants. They are important to many species of mammals, birds, and other organisms while rely on pollinated plants for food and shelter (COSEWIC, 2010).

B.9 Terrestrial Birds

B.9.1 American Robin

The American Robin (*Turdus migratorius*) is a common, medium-sized songbird that averages 25 cm from tail-to-tip. There is little variation between the sexes in terms of size (US EPA, 1993b). They have a distinctive rust-orange coloured breast and a dark gray-brown back, with a yellow beak (Seattle Audubon Society, n.d.).

The American robin can live in a variety of habitats, including woodlands, swamps, suburbs, and parkland. They require access to freshwater, protected nesting sites, and productive foraging areas for their habitats. Breeding habitat includes moist forests, swamps, open woodlands, orchards, parks and lawns. They will form their nests out of mud and vegetation near the edges of a forest or other opening in vegetation, on horizontal branches, within shrubs, or on man-made structures with horizontal surfaces. The American robin is migratory, breeding in northern latitudes and wintering in the south (US EPA, 1993b).

The diet of the American robin is made up of earthworms, insects, and fruit. The American robin forages on the ground in open areas, along habitat edges or streams by probing and gleaning; they also forage above ground in shrubs or in lower tree branches. The robin forages for ground-dwelling invertebrates on the ground, and in shrubs and lower tree branches for fruit and foliage-dwelling insects. During the breeding season the American robin eats primarily invertebrates with some fruit; the rest of the year the robin's diet is primarily made up of fruit (US EPA, 1993b).

Mating and egg laying for the American robin generally occurs in April or May. Females will pair with males that have established territories at the breeding site for the duration of the breeding season. First clutches generally contain three or four eggs; later clutches will contain fewer eggs. The female robin does all of the incubating, while both the male and the female feed the nestlings (US EPA, 1993b).

B.9.2 Wild Turkey

The wild turkey (*Meleagris gallopavo*) is a large bird that is brown to grey in colour, with iridescent black and green barring. It has a small, unfeathered head, the flesh of which is blue and red on the male turkey (Seattle Audubon Society, n.d.).

The natural habitat of the wild turkey is the deciduous forest; however, it has been shown that they can adapt to a range of landscape-level habitat conditions, including agricultural landscape and are now considered deciduous forest habitat generalists. The most specific habitat requirement for the wild turkey is brood cover; hens will nest in a variety of forest and open habitats with adequate cover at the nest site. This allows turkeys to use forest, savannah, and prairie habitats (MNRF, 2007).

Adult turkeys consume primarily mast, such as acorns and seeds. Their natural diet also includes fruits, green vegetation and insects. Turkeys may also feed on domestic grains, forages, and berries. Young turkeys feed almost exclusively on insects, while adults will consume insects in proportion with their availability (MNRF, 2007).

Wild turkeys are promiscuous breeders, with individual adult males mating with multiple females. A single mating is capable of fertilizing an entire egg clutch (MNRF, 2007).

B.10 Terrestrial Mammals

B.10.1 Northern Short-Tailed Shrew

The Northern short-tailed shrew (*Blarina brevicauda*) is a small mammal, generally 8-10 cm in length with a 1.9-3 cm long tail. Some Northern short-tailed shrews weigh over 22 g (US EPA, 1993b).

The Northern short-tailed shrew can inhabit a wide variety of habitats, and is common in areas with abundant vegetation cover. The shrew requires cool, moist habitats due to their high metabolic and water-loss rates. They inhabit round, underground nests and maintain underground runaways which are usually 10 cm below the soil surface, but can be as deep as 50 cm (US EPA, 1993b).

The Northern short-tailed shrew is carnivorous, eating primarily invertebrates such as insects, earthworms and snails; however, they may also eat plants, fungi, and small vertebrates such as mice, voles, and frogs when their primary food sources are in shorter supply. The Northern short-tailed shrew has a high metabolic rate and is able to eat its body weight in food each day. In autumn and winter, they are known to store food (US EPA, 1993b).

The Northern short-tailed shrew breeds year-round, although breeding is limited over winter. Peak breeding occurs in the spring and lasts until late summer or early fall (US EPA, 1993b).

B.10.2 White-Tailed Deer

The White-tailed Deer (*Odocoileus virginianus*) is a medium to large sized herbivorous mammal. They are sexually dimorphic; the males are typically larger than the females with average weights of 91 kg and 60 kg, respectively (FCSAP, 2012).

The colour and texture of the white-tailed deer’s coat changes seasonally. It is short and stiff in the summer, with a red colour similar to the red fox. In the fall, their coats change to grey and become longer and thicker to hold in warmth. The male deer grows and sheds antlers each year (AMEC, 2016a).

The general habitat of the white-tailed deer is forest. They prefer woodlands, meadows, valleys, stream courses and rolling country (FCSAP, 2012). The habitat of the white-tailed deer must offer a variety of vegetation, including a mixture of open and wooded areas. White-tailed deer thrive in disturbed forests (AMEC, 2016a).

In the winter, deer yards provide protection from the cold and deep snow. These areas include white cedar swamplands or dense stands of hemlock, jack pine or other upland conifers which block snow and reduce heat loss (AMEC, 2016a).

The white-tailed deer is an herbivore, and obtains food primarily by browsing. Its diet is seasonally variable; in the winter, they prefer the buds and twigs of shrubs. In the fall, they prefer fruit and mushrooms, and in the summer they prefer grasses and herbaceous plants. Eastern white cedar is a major component of the diet of the white-tailed deer (FCSAP, 2012).

White-tailed deer are autumn breeders, with the season peaking in early November (FCSAP, 2012). Deer live in large groups, or herds, the size of which varies based on the specific habitat of the herd. In northern forests, deer are often solitary or in small family groups (ICRP, 2008b).

B.10.3 Red Fox

The Red Fox (*Vulpes vulpes*) is a dog-sized canine, with a body that is 56 – 63 cm in length and a tail of 35 – 41 cm in length. Red foxes weigh between 3 and 7 kg, with the males slightly larger than the females (US EPA, 1993b).

The red fox is the most widely distributed carnivore in the world (US EPA, 1993b). They utilize many types of habitats, though their habitat can be generally categorized as open country (FCSAP, 2012). Specific habitat types that the red fox will use are cropland, rolling farmland, brush, pastures, hardwood stands, and coniferous forests. Red foxes prefer broken and diverse upland habitats. They are rare or absent from continuous stands of pine forests, moist conifer forests, and semiarid grasslands and deserts. Each fox or family usually has a main underground den and one or more other burrows in their home range. Red foxes are active primarily at night or twilight, and are active year-round and do not hibernate (US EPA, 1993b).

The red fox is primarily carnivorous; however, it will occasionally feed on both animals and plant material. The red fox preys mainly on small mammals such as voles, mice, and rabbits. The fox will also eat game birds, poultry, insects, fruits, berries, seeds and nuts. Red foxes are solitary hunters. They are also known to scavenge on carcasses or other refuse (US EPA, 1993b).

Red fox pups are grown and reared in an underground den. The male fox assists the female in rearing young by bringing food to the den for the pups. A fox family generally consists of a mated pair or one male and several related females (US EPA, 1993b).

B.10.4 Little Brown Bat

The little brown bat (or little brown myotis) (*Myotis lucifugus*) is a small, plain-nosed bat. Their average weight is 7.9 g, with a typical range of 5.5-11.0 g, and a wingspan of 22-27 cm. They are brown-pelaged, with a short and blunted tragus (COSEWIC, 2013).

The habitat required by the little brown bat includes hibernacula (e.g., caves, abandoned mines) for overwinter survival and summering areas with suitable foraging areas within commuting range to structures used for roosting or maternity colonies. In the summer, little brown bat will use a variety of structures as day-roosts, including buildings, bridges, rock crevices, and within tree cavities (COSEWIC, 2013).

Little brown bat are insectivorous, consuming 4-8 g of insects per night. Foraging occurs over water, along waterways, on forest edges and in gaps in the forest. Large open fields or clear-cuts are generally avoided (COSEWIC, 2013).

Mating occurs during the late summer and early autumn swarming periods. Bats will mate upon return to the hibernacula before preparing to overwinter. The female bat will ovulate in the spring, and upon leaving the hibernacula, will establish a summer maternity colony. Females typically produce one pup (COSEWIC, 2013).

Little brown bats are listed on the Species at Risk in Ontario list (MECP, 2021c) and SARA Schedule 1 (Government of Canada, 2015) with the status of Endangered. They are at risk of extirpation in Ontario. Little brown bats, in addition to other bat species, are threatened by a disease known as white-nose syndrome. This disease is caused by a contagious fungus that disrupts the bat's hibernation cycle, causing them to exhaust their body fat supplies before they are ready to emerge from hibernation in spring. Bats at more than 75% of Ontario's hibernation sites are at high-risk of disappearing (MECP, 2021c).

Appendix C Concentration and Dose Tables

C.1 Radiological Dose by Pathway – Ecological Receptors

C.1.1 Radiological Dose for Aquatic and Terrestrial Receptors in the SRD and NSS-W Polygon

Dose by Pathway (SRD) - Max Scenario

Receptor	Radionuclide	Unit	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 Dose
Cattail	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	5.64E-05	0	0	0	0	0	0	0	0	0	**5.64E-05**
	Co-60	mGy/d	0	0	1.35E-03	1.39E-05	0	0	0	2.54E-06	0	0	0	0	**1.37E-03**
	Cs-134	mGy/d	0	0	4.27E-04	7.55E-06	0	0	0	1.65E-06	0	0	0	0	**4.36E-04**
	Cs-137	mGy/d	0	0	3.86E-04	2.10E-06	0	0	0	9.60E-06	0	0	0	0	**3.98E-04**
	HTO	mGy/d	0	0	1.58E-04	4.26E-08	0	0	0	0	0	0	0	0	**1.58E-04**
	I-131	mGy/d	0	0	1.94E-04	2.68E-06	0	0	0	1.63E-06	0	0	0	0	**1.98E-04**
	OBT	mGy/d	0	0	2.31E-05	0	0	0	0	0	0	0	0	0	**2.31E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Benthic Invertebrates	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	4.86E-03	0	0	0	0	3.81E-08	0	0	0	0	**4.86E-03**
	Co-60	mGy/d	0	0	1.12E-04	0	0	0	0	6.70E-06	0	0	0	0	**1.19E-04**
	Cs-134	mGy/d	0	0	1.23E-04	0	0	0	0	4.64E-06	0	0	0	0	**1.28E-04**
	Cs-137	mGy/d	0	0	1.24E-04	0	0	0	0	2.88E-05	0	0	0	0	**1.53E-04**
	HTO	mGy/d	0	0	1.58E-04	0	0	0	0	0	0	0	0	0	**1.58E-04**
	I-131	mGy/d	0	0	2.02E-05	0	0	0	0	4.73E-06	0	0	0	0	**2.50E-05**
	OBT	mGy/d	0	0	2.95E-05	0	0	0	0	0	0	0	0	0	**2.95E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Redbelly Dace	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	5.39E-03	4.48E-10	0	0	0	2.08E-10	0	0	0	0	**5.39E-03**
	Co-60	mGy/d	0	0	2.25E-04	1.90E-05	0	0	0	1.55E-06	0	0	0	0	**2.45E-04**
	Cs-134	mGy/d	0	0	1.23E-02	1.02E-05	0	0	0	9.98E-07	0	0	0	0	**1.23E-02**
	Cs-137	mGy/d	0	0	8.19E-03	2.71E-06	0	0	0	5.51E-06	0	0	0	0	**8.20E-03**
	HTO	mGy/d	0	0	1.58E-04	9.69E-12	0	0	0	0	0	0	0	0	**1.58E-04**
	I-131	mGy/d	0	0	2.00E-05	3.48E-06	0	0	0	9.45E-07	0	0	0	0	**2.44E-05**
	OBT	mGy/d	0	0	2.94E-05	0	0	0	0	0	0	0	0	0	**2.94E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Leopard Frog	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	5.39E-03	5.73E-09	0	0	0	2.66E-09	0	0	0	0	**5.39E-03**
	Co-60	mGy/d	0	0	6.61E-05	2.08E-05	0	0	0	1.70E-06	0	0	0	0	**8.86E-05**
	Cs-134	mGy/d	0	0	5.79E-03	1.19E-05	0	0	0	1.16E-06	0	0	0	0	**5.80E-03**
	Cs-137	mGy/d	0	0	5.96E-03	3.23E-06	0	0	0	6.56E-06	0	0	0	0	**5.97E-03**
	HTO	mGy/d	0	0	1.58E-04	3.65E-10	0	0	0	0	0	0	0	0	**1.58E-04**
	I-131	mGy/d	0	0	1.52E-05	4.09E-06	0	0	0	1.11E-06	0	0	0	0	**2.04E-05**
	OBT	mGy/d	0	0	2.94E-05	0	0	0	0	0	0	0	0	0	**2.94E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Water Snake	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	5.38E-03	5.73E-09	0	0	0	2.66E-09	0	0	0	0	**5.38E-03**
	Co-60	mGy/d	0	0	6.61E-05	2.08E-05	0	0	0	1.70E-06	0	0	0	0	**8.86E-05**
	Cs-134	mGy/d	0	0	5.79E-03	1.19E-05	0	0	0	1.16E-06	0	0	0	0	**5.80E-03**
	Cs-137	mGy/d	0	0	5.94E-03	3.24E-06	0	0	0	6.57E-06	0	0	0	0	**5.95E-03**
	HTO	mGy/d	0	0	1.58E-04	3.64E-10	0	0	0	0	0	0	0	0	**1.58E-04**
	I-131	mGy/d	0	0	1.51E-05	4.09E-06	0	0	0	1.11E-06	0	0	0	0	**2.03E-05**
	OBT	mGy/d	0	0	2.94E-05	0	0	0	0	0	0	0	0	0	**2.94E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Painted Turtle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	5.39E-03	4.48E-10	0	0	0	2.08E-10	0	0	0	0	**5.39E-03**
	Co-60	mGy/d	0	0	6.61E-05	1.90E-05	0	0	0	1.55E-06	0	0	0	0	**8.66E-05**
	Cs-134	mGy/d	0	0	5.79E-03	1.02E-05	0	0	0	9.98E-07	0	0	0	0	**5.80E-03**
	Cs-137	mGy/d	0	0	5.96E-03	2.71E-06	0	0	0	5.51E-06	0	0	0	0	**5.97E-03**
	HTO	mGy/d	0	0	1.58E-04	9.69E-12	0	0	0	0	0	0	0	0	**1.58E-04**
	I-131	mGy/d	0	0	1.52E-05	3.48E-06	0	0	0	9.45E-07	0	0	0	0	**1.96E-05**
	OBT	mGy/d	0	0	2.94E-05	0	0	0	0	0	0	0	0	0	**2.94E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**

Dose by Pathway (NSS-W) - Max Scenario															
Receptor	Radionuclide	Unit	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 Dose
Grass	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	1.84E-04	0	0	0	0	0	0	0	**1.84E-04**
	Co-60	mGy/d	0	0	0	0	1.88E-09	1.24E-05	0	0	0	0	0	0	**1.24E-05**
	Cs-134	mGy/d	0	0	0	0	2.65E-08	7.54E-05	0	0	0	0	0	0	**7.54E-05**
	Cs-137	mGy/d	0	0	0	0	6.99E-07	5.55E-04	0	0	0	0	0	0	**5.56E-04**
	HTO	mGy/d	4.05E-05	0	0	0	0	0	0	0	0	0	0	0	**4.05E-05**
	I-131	mGy/d	1.68E-09	0	0	0	5.46E-08	4.04E-05	0	0	0	0	0	0	**4.05E-05**
	OBT	mGy/d	3.97E-10	0	0	0	0	0	0	0	0	0	0	0	**3.97E-10**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Eastern White Cedar	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	2.90E-04	0	0	0	0	0	0	0	**2.90E-04**
	Co-60	mGy/d	0	0	0	0	1.88E-08	3.75E-06	0	0	0	0	0	0	**3.77E-06**
	Cs-134	mGy/d	0	0	0	0	1.48E-07	2.24E-05	0	0	0	0	0	0	**2.25E-05**
	Cs-137	mGy/d	0	0	0	0	1.60E-06	1.56E-04	0	0	0	0	0	0	**1.58E-04**
	HTO	mGy/d	4.05E-05	0	0	0	0	0	0	0	0	0	0	0	**4.05E-05**
	I-131	mGy/d	3.82E-10	0	0	0	1.24E-07	1.20E-05	0	0	0	0	0	0	**1.21E-05**
	OBT	mGy/d	3.97E-06	0	0	0	0	0	0	0	0	0	0	0	**3.97E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Earthworm	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	3.59E-02	0	0	0	0	0	0	0	0	0	0	0	**3.59E-02**
	Co-60	mGy/d	0	0	5.58E-07	0	1.21E-09	3.44E-06	0	0	0	0	0	0	**4.00E-06**
	Cs-134	mGy/d	0	0	7.05E-06	0	2.32E-07	2.00E-05	0	0	0	0	0	0	**2.73E-05**
	Cs-137	mGy/d	0	0	6.90E-06	0	5.90E-06	1.42E-04	0	0	0	0	0	0	**1.54E-04**
	HTO	mGy/d	4.20E-05	0	1.74E-04	0	0	0	0	0	0	0	0	0	**2.16E-04**
	I-131	mGy/d	1.75E-10	0	4.27E-07	0	8.84E-07	9.66E-06	0	0	0	0	0	0	**1.10E-05**
	OBT	mGy/d	4.21E-06	0	1.75E-05	0	0	0	0	0	0	0	0	0	**2.17E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Bald Eagle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	1.08E-02	0	4.01E-02	**5.09E-02**
	Co-60	mGy/d	0	0	4.47E-07	0	2.19E-10	0	6.55E-09	0	0	5.79E-05	0	1.41E-05	**7.24E-05**
	Cs-134	mGy/d	0	0	1.02E-06	0	5.10E-09	0	1.79E-08	0	0	8.56E-03	0	8.03E-05	**8.64E-03**
	Cs-137	mGy/d	0	0	6.40E-07	0	8.41E-08	0	2.34E-07	0	0	5.38E-03	0	5.05E-05	**5.43E-03**
	HTO	mGy/d	7.81E-07	0	3.24E-05	0	0	0	0	0	0	9.49E-05	0	1.38E-04	**2.66E-04**
	I-131	mGy/d	6.32E-16	0	2.96E-09	0	2.22E-11	0	1.45E-10	0	0	4.26E-08	0	1.14E-08	**5.72E-08**
	OBT	mGy/d	8.59E-08	0	3.56E-06	0	0	0	0	0	0	0	0	6.91E-07	**4.34E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
American Robin	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	6.94E-02	0	**6.94E-02**
	Co-60	mGy/d	0	0	5.60E-07	0	1.13E-08	5.19E-06	0	0	0	0	1.66E-06	0	**7.43E-06**
	Cs-134	mGy/d	0	0	1.28E-06	0	2.63E-07	3.12E-05	0	0	0	0	3.87E-05	0	**7.15E-05**
	Cs-137	mGy/d	0	0	8.02E-07	0	4.33E-06	2.17E-04	0	0	0	0	4.45E-05	0	**2.67E-04**
	HTO	mGy/d	7.81E-07	0	3.24E-05	0	0	0	0	0	0	0	1.06E-04	0	**1.40E-04**
	I-131	mGy/d	5.98E-16	0	3.71E-09	0	1.14E-09	1.58E-05	0	0	0	0	1.28E-08	0	**1.58E-05**
	OBT	mGy/d	8.59E-08	0	3.56E-06	0	0	0	0	0	0	0	4.96E-06	0	**8.61E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Mallard	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	1.10E-04	4.00E-02	0	0	**4.01E-02**
	Co-60	mGy/d	0	0	4.76E-07	0	0	0	1.60E-08	1.79E-06	3.14E-04	1.31E-04	0	0	**4.47E-04**
	Cs-134	mGy/d	0	0	1.09E-06	0	0	0	4.36E-08	1.26E-06	1.99E-04	2.69E-04	0	0	**4.70E-04**
	Cs-137	mGy/d	0	0	6.83E-07	0	0	0	5.72E-07	6.97E-06	1.25E-04	1.69E-04	0	0	**3.02E-04**
	HTO	mGy/d	7.81E-07	0	3.24E-05	0	0	0	0	0	9.49E-05	9.49E-05	0	0	**2.23E-04**
	I-131	mGy/d	6.31E-16	0	3.16E-09	0	0	0	3.53E-10	1.19E-06	1.87E-07	7.57E-08	0	0	**1.46E-06**
	OBT	mGy/d	8.59E-08	0	3.56E-06	0	0	0	0	0	0	0	0	0	**3.65E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**

Dose by Pathway (NSS-W) - Max Scenario															
Receptor	Radionuclide	Unit	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 Dose
Wild Turkey	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.63E-02	0	**1.63E-02**
	Co-60	mGy/d	0	0	3.86E-07	0	9.24E-08	5.19E-06	0	0	0	0	3.31E-08	0	**5.71E-06**
	Cs-134	mGy/d	0	0	8.80E-07	0	2.16E-06	3.12E-05	0	0	0	0	7.73E-07	0	**3.50E-05**
	Cs-137	mGy/d	0	0	5.53E-07	0	3.55E-05	2.17E-04	0	0	0	0	1.03E-06	0	**2.54E-04**
	HTO	mGy/d	7.81E-07	0	3.24E-05	0	0	0	0	0	0	0	4.18E-05	0	**7.50E-05**
	I-131	mGy/d	6.52E-16	0	2.55E-09	0	9.36E-09	1.58E-05	0	0	0	0	2.88E-10	0	**1.58E-05**
	OBT	mGy/d	8.59E-08	0	3.56E-06	0	0	0	0	0	0	0	1.95E-06	0	**5.60E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Muskrat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	9.07E-05	3.29E-02	0	0	**3.30E-02**
	Co-60	mGy/d	0	0	1.72E-08	0	0	0	4.57E-10	1.89E-06	2.87E-05	9.98E-07	0	0	**3.16E-05**
	Cs-134	mGy/d	0	0	7.97E-07	0	0	0	2.53E-08	1.26E-06	3.69E-04	4.15E-05	0	0	**4.13E-04**
	Cs-137	mGy/d	0	0	5.89E-07	0	0	0	3.90E-07	7.29E-06	2.73E-04	3.07E-05	0	0	**3.12E-04**
	HTO	mGy/d	6.07E-07	0	6.07E-05	0	0	0	0	0	7.19E-05	7.19E-05	0	0	**2.05E-04**
	I-131	mGy/d	4.09E-14	0	2.58E-07	0	0	0	2.28E-08	1.27E-06	3.85E-05	1.30E-06	0	0	**4.14E-05**
	OBT	mGy/d	7.29E-08	0	7.29E-06	0	0	0	0	0	0	0	0	0	**7.36E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Little Brown Bat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	3.29E-02	0	0	**3.29E-02**
	Co-60	mGy/d	0	0	8.01E-09	0	0	0	0	0	0	2.72E-06	0	0	**2.73E-06**
	Cs-134	mGy/d	0	0	3.70E-07	0	0	0	0	0	0	1.13E-04	0	0	**1.13E-04**
	Cs-137	mGy/d	0	0	2.74E-07	0	0	0	0	0	0	8.36E-05	0	0	**8.39E-05**
	HTO	mGy/d	6.07E-07	0	6.07E-05	0	0	0	0	0	0	7.19E-05	0	0	**1.33E-04**
	I-131	mGy/d	3.36E-14	0	1.20E-07	0	0	0	0	0	0	3.55E-06	0	0	**3.67E-06**
	OBT	mGy/d	7.29E-08	0	7.29E-06	0	0	0	0	0	0	0	0	0	**7.36E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Northern Short-tailed Shrew	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	6.49E-02	0	**6.49E-02**
	Co-60	mGy/d	0	0	0	0	1.07E-10	2.74E-06	0	0	0	0	1.36E-08	0	**2.76E-06**
	Cs-134	mGy/d	0	0	0	0	5.07E-08	1.56E-05	0	0	0	0	6.43E-06	0	**2.21E-05**
	Cs-137	mGy/d	0	0	0	0	9.84E-07	1.13E-04	0	0	0	0	8.64E-06	0	**1.23E-04**
	HTO	mGy/d	6.07E-07	0	0	0	0	0	0	0	0	0	8.91E-05	0	**8.98E-05**
	I-131	mGy/d	3.45E-14	0	0	0	2.45E-08	8.47E-06	0	0	0	0	2.36E-07	0	**8.73E-06**
	OBT	mGy/d	7.29E-08	0	0	0	0	0	0	0	0	0	4.01E-06	0	**4.08E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Red Fox	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	3.69E-04	6.31E-02	**6.35E-02**
	Co-60	mGy/d	0	0	2.14E-08	0	2.30E-11	5.48E-06	0	0	0	0	4.00E-12	2.15E-09	**5.51E-06**
	Cs-134	mGy/d	0	0	9.88E-07	0	1.08E-08	3.12E-05	0	0	0	0	2.13E-09	3.52E-06	**3.57E-05**
	Cs-137	mGy/d	0	0	7.31E-07	0	2.10E-07	2.27E-04	0	0	0	0	4.13E-08	5.16E-06	**2.33E-04**
	HTO	mGy/d	6.07E-07	0	6.07E-05	0	0	0	0	0	0	0	1.73E-05	4.97E-05	**1.28E-04**
	I-131	mGy/d	4.55E-14	0	3.20E-07	0	5.25E-09	1.69E-05	0	0	0	0	9.19E-10	1.74E-08	**1.73E-05**
	OBT	mGy/d	7.29E-08	0	7.29E-06	0	0	0	0	0	0	0	7.77E-07	4.73E-07	**8.61E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
White-tailed Deer	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	4.76E-04	0	**4.76E-04**
	Co-60	mGy/d	0	0	1.50E-07	0	2.04E-10	2.80E-06	0	0	0	0	4.80E-10	0	**2.95E-06**
	Cs-134	mGy/d	0	0	5.08E-06	0	7.06E-08	1.59E-05	0	0	0	0	1.87E-07	0	**2.12E-05**
	Cs-137	mGy/d	0	0	2.05E-06	0	7.49E-07	1.11E-04	0	0	0	0	1.99E-06	0	**1.16E-04**
	HTO	mGy/d	6.07E-07	0	4.85E-05	0	0	0	0	0	0	0	1.98E-05	0	**6.89E-05**
	I-131	mGy/d	1.02E-13	0	8.69E-07	0	1.81E-08	8.19E-06	0	0	0	0	4.21E-08	0	**9.12E-06**
	OBT	mGy/d	7.29E-08	0	5.82E-06	0	0	0	0	0	0	0	8.88E-07	0	**6.79E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Honey Bee	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	9.18E-04	0	**9.18E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	8.34E-10	0	**8.34E-10**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	6.94E-09	0	**6.94E-09**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	1.88E-07	0	**1.88E-07**
	HTO	mGy/d	0	0	0	0	0	0	0	0	0	0	2.02E-04	0	**2.02E-04**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	4.13E-07	0	**4.13E-07**
	OBT	mGy/d	0	0	0	0	0	0	0	0	0	0	1.98E-05	0	**1.98E-05**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**

Dose by Pathway (SRD) - UCLM Scenario															
Receptor	Radionuclide	Unit	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 Dose
Cattail	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	4.44E-05	0	0	0	0	0.00E+00	0	0	0	0	**4.44E-05**
	Co-60	mGy/d	0	0	2.02E-04	2.07E-06	0	0	0	5.25E-07	0	0	0	0	**2.05E-04**
	Cs-134	mGy/d	0	0	5.32E-05	9.40E-07	0	0	0	6.84E-07	0	0	0	0	**5.48E-05**
	Cs-137	mGy/d	0	0	6.85E-05	3.72E-07	0	0	0	2.83E-06	0	0	0	0	**7.17E-05**
	HTO	mGy/d	0	0	5.88E-05	1.59E-08	0	0	0	0	0	0	0	0	**5.88E-05**
	I-131	mGy/d	0	0	3.55E-05	4.90E-07	0	0	0	4.01E-07	0	0	0	0	**3.64E-05**
	OBT	mGy/d	0	0	8.62E-06	0	0	0	0	0	0	0	0	0	**8.62E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Benthic Invertebrates	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	8.49E-04	0	0	0	0	1.82E-08	0	0	0	0	**8.49E-04**
	Co-60	mGy/d	0	0	1.67E-05	0	0	0	0	1.38E-06	0	0	0	0	**1.81E-05**
	Cs-134	mGy/d	0	0	1.53E-05	0	0	0	0	1.92E-06	0	0	0	0	**1.72E-05**
	Cs-137	mGy/d	0	0	2.20E-05	0	0	0	0	8.47E-06	0	0	0	0	**3.04E-05**
	HTO	mGy/d	0	0	5.89E-05	0	0	0	0	0	0	0	0	0	**5.89E-05**
	I-131	mGy/d	0	0	3.71E-06	0	0	0	0	1.16E-06	0	0	0	0	**4.87E-06**
	OBT	mGy/d	0	0	1.10E-05	0	0	0	0	0	0	0	0	0	**1.10E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Redbelly Dace	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	9.42E-04	7.84E-11	0	0	0	9.93E-11	0	0	0	0	**9.42E-04**
	Co-60	mGy/d	0	0	3.36E-05	2.84E-06	0	0	0	3.19E-07	0	0	0	0	**3.68E-05**
	Cs-134	mGy/d	0	0	1.53E-03	1.28E-06	0	0	0	4.12E-07	0	0	0	0	**1.54E-03**
	Cs-137	mGy/d	0	0	1.45E-03	4.81E-07	0	0	0	1.62E-06	0	0	0	0	**1.45E-03**
	HTO	mGy/d	0	0	5.88E-05	3.61E-12	0	0	0	0	0	0	0	0	**5.88E-05**
	I-131	mGy/d	0	0	3.66E-06	6.38E-07	0	0	0	2.32E-07	0	0	0	0	**4.53E-06**
	OBT	mGy/d	0	0	1.10E-05	0	0	0	0	0	0	0	0	0	**1.10E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Leopard Frog	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	9.42E-04	1.00E-09	0	0	0	1.27E-09	0	0	0	0	**9.42E-04**
	Co-60	mGy/d	0	0	9.88E-06	3.11E-06	0	0	0	3.50E-07	0	0	0	0	**1.33E-05**
	Cs-134	mGy/d	0	0	7.20E-04	1.48E-06	0	0	0	4.77E-07	0	0	0	0	**7.22E-04**
	Cs-137	mGy/d	0	0	1.06E-03	5.73E-07	0	0	0	1.93E-06	0	0	0	0	**1.06E-03**
	HTO	mGy/d	0	0	5.88E-05	1.36E-10	0	0	0	0	0	0	0	0	**5.88E-05**
	I-131	mGy/d	0	0	2.78E-06	7.49E-07	0	0	0	2.73E-07	0	0	0	0	**3.80E-06**
	OBT	mGy/d	0	0	1.10E-05	0	0	0	0	0	0	0	0	0	**1.10E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Water Snake	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	9.41E-04	1.00E-09	0	0	0	1.27E-09	0	0	0	0	**9.41E-04**
	Co-60	mGy/d	0	0	9.88E-06	3.11E-06	0	0	0	3.50E-07	0	0	0	0	**1.33E-05**
	Cs-134	mGy/d	0	0	7.20E-04	1.48E-06	0	0	0	4.78E-07	0	0	0	0	**7.22E-04**
	Cs-137	mGy/d	0	0	1.05E-03	5.74E-07	0	0	0	1.93E-06	0	0	0	0	**1.06E-03**
	HTO	mGy/d	0	0	5.88E-05	1.36E-10	0	0	0	0	0	0	0	0	**5.88E-05**
	I-131	mGy/d	0	0	2.77E-06	7.49E-07	0	0	0	2.73E-07	0	0	0	0	**3.79E-06**
	OBT	mGy/d	0	0	1.10E-05	0	0	0	0	0	0	0	0	0	**1.10E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Painted Turtle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	9.42E-04	7.84E-11	0	0	0	9.93E-11	0	0	0	0	**9.42E-04**
	Co-60	mGy/d	0	0	9.88E-06	2.84E-06	0	0	0	3.19E-07	0	0	0	0	**1.30E-05**
	Cs-134	mGy/d	0	0	7.20E-04	1.28E-06	0	0	0	4.12E-07	0	0	0	0	**7.22E-04**
	Cs-137	mGy/d	0	0	1.06E-03	4.81E-07	0	0	0	1.62E-06	0	0	0	0	**1.06E-03**
	HTO	mGy/d	0	0	5.88E-05	3.61E-12	0	0	0	0	0	0	0	0	**5.88E-05**
	I-131	mGy/d	0	0	2.78E-06	6.38E-07	0	0	0	2.32E-07	0	0	0	0	**3.65E-06**
	OBT	mGy/d	0	0	1.10E-05	0	0	0	0	0	0	0	0	0	**1.10E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**

Dose by Pathway (NSS-W) - UCLM Scenario

Receptor	Radionuclide	Unit	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 Dose
Grass	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	9.18E-05	0	0	0	0	0	0	0	**9.18E-05**
	Co-60	mGy/d	0	0	0	0	1.88E-09	1.24E-05	0	0	0	0	0	0	**1.24E-05**
	Cs-134	mGy/d	0	0	0	0	1.37E-08	3.91E-05	0	0	0	0	0	0	**3.91E-05**
	Cs-137	mGy/d	0	0	0	0	5.37E-07	0.0004261	0	0	0	0	0	0	**4.27E-04**
	HTO	mGy/d	4.05E-05	0	0	0	0	0	0	0	0	0	0	0	**4.05E-05**
	I-131	mGy/d	1.68E-09	0	0	0	2.91E-08	2.15E-05	0	0	0	0	0	0	**2.16E-05**
	OBT	mGy/d	3.97E-10	0	0	0	0	0	0	0	0	0	0	0	**3.97E-10**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Eastern White Cedar	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	1.39E-04	0	0	0	0	0	0	0	**1.39E-04**
	Co-60	mGy/d	0	0	0	0	1.88E-08	3.75E-06	0	0	0	0	0	0	**3.77E-06**
	Cs-134	mGy/d	0	0	0	0	7.69E-08	1.16E-05	0	0	0	0	0	0	**1.17E-05**
	Cs-137	mGy/d	0	0	0	0	1.23E-06	0.0001201	0	0	0	0	0	0	**1.21E-04**
	HTO	mGy/d	4.05E-05	0	0	0	0	0	0	0	0	0	0	0	**4.05E-05**
	I-131	mGy/d	3.82E-10	0	0	0	6.61E-08	6.41E-06	0	0	0	0	0	0	**6.47E-06**
	OBT	mGy/d	3.97E-06	0	0	0	0	0	0	0	0	0	0	0	**3.97E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Earthworm	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	4.84E-03	0	0	0	0	0	0	0	0	0	0	0	**4.84E-03**
	Co-60	mGy/d	0	0	8.35E-08	0	1.21E-09	3.44E-06	0	0	0	0	0	0	**3.53E-06**
	Cs-134	mGy/d	0	0	8.78E-07	0	1.20E-07	1.04E-05	0	0	0	0	0	0	**1.14E-05**
	Cs-137	mGy/d	0	0	1.22E-06	0	4.53E-06	0.0001088	0	0	0	0	0	0	**1.15E-04**
	HTO	mGy/d	4.20E-05	0	6.51E-05	0	0	0	0	0	0	0	0	0	**1.07E-04**
	I-131	mGy/d	1.75E-10	0	7.81E-08	0	4.72E-07	5.15E-06	0	0	0	0	0	0	**5.70E-06**
	OBT	mGy/d	4.21E-06	0	6.53E-06	0	0	0	0	0	0	0	0	0	**1.07E-05**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Bald Eagle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0.001887	0	0.00707439	**8.96E-03**
	Co-60	mGy/d	0	0	6.68E-08	0	2.19E-10	0	1.35E-09	0	0	8.66E-06	0	2.10E-06	**1.08E-05**
	Cs-134	mGy/d	0	0	1.27E-07	0	2.64E-09	0	7.38E-09	0	0	0.001065	0	1.00E-05	**1.08E-03**
	Cs-137	mGy/d	0	0	1.13E-07	0	6.46E-08	0	6.89E-08	0	0	0.000953	0	8.97E-06	**9.63E-04**
	HTO	mGy/d	7.81E-07	0	1.21E-05	0	0	0	0	0	0	3.54E-05	0	5.18E-05	**1.00E-04**
	I-131	mGy/d	6.32E-16	0	5.42E-10	0	1.18E-11	0	3.55E-11	0	0	7.81E-09	0	2.10E-09	**1.05E-08**
	OBT	mGy/d	8.59E-08	0	1.33E-06	0	0	0	0	0	0	0	0	2.64E-07	**1.68E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
American Robin	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0.00938713	0	**9.39E-03**
	Co-60	mGy/d	0	0	8.37E-08	0	1.13E-08	5.19E-06	0	0	0	0	2.52E-07	0	**5.54E-06**
	Cs-134	mGy/d	0	0	1.59E-07	0	1.36E-07	1.62E-05	0	0	0	0	5.31E-06	0	**2.18E-05**
	Cs-137	mGy/d	0	0	1.42E-07	0	3.33E-06	0.0001666	0	0	0	0	2.01E-05	0	**1.90E-04**
	HTO	mGy/d	7.81E-07	0	1.21E-05	0	0	0	0	0	0	0	5.40E-05	0	**6.69E-05**
	I-131	mGy/d	5.98E-16	0	6.80E-10	0	6.09E-10	8.44E-06	0	0	0	0	5.38E-09	0	**8.45E-06**
	OBT	mGy/d	8.59E-08	0	1.33E-06	0	0	0	0	0	0	0	2.52E-06	0	**3.93E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Mallard	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	8.67E-05	0.006988	0	0	**7.07E-03**
	Co-60	mGy/d	0	0	7.12E-08	0	0	0	3.31E-09	3.71E-07	4.69E-05	1.96E-05	0	0	**6.69E-05**
	Cs-134	mGy/d	0	0	1.35E-07	0	0	0	1.80E-08	5.21E-07	2.48E-05	3.35E-05	0	0	**5.89E-05**
	Cs-137	mGy/d	0	0	1.21E-07	0	0	0	1.68E-07	2.05E-06	2.22E-05	2.99E-05	0	0	**5.45E-05**
	HTO	mGy/d	7.81E-07	0	1.21E-05	0	0	0	0	0	3.54E-05	3.54E-05	0	0	**8.37E-05**
	I-131	mGy/d	6.31E-16	0	5.78E-10	0	0	0	8.68E-11	2.93E-07	3.42E-08	1.39E-08	0	0	**3.42E-07**
	OBT	mGy/d	8.59E-08	0	1.33E-06	0	0	0	0	0	0	0	0	0	**1.41E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**

Dose by Pathway (NSS-W) - UCLM Scenario															
Receptor	**Radionuclide**	**Unit**	**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 Dose**
Wild Turkey	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0.00237618	0	**2.38E-03**
	Co-60	mGy/d	0	0	5.77E-08	0	9.24E-08	5.19E-06	0	0	0	0	5.33E-09	0	**5.35E-06**
	Cs-134	mGy/d	0	0	1.09E-07	0	1.12E-06	1.62E-05	0	0	0	0	1.10E-07	0	**1.75E-05**
	Cs-137	mGy/d	0	0	9.80E-08	0	2.73E-05	0.0001666	0	0	0	0	5.16E-07	0	**1.94E-04**
	HTO	mGy/d	7.81E-07	0	1.21E-05	0	0	0	0	0	0	0	2.99E-05	0	**4.28E-05**
	I-131	mGy/d	6.52E-16	0	4.68E-10	0	4.99E-09	8.44E-06	0	0	0	0	1.25E-10	0	**8.45E-06**
	OBT	mGy/d	8.59E-08	0	1.33E-06	0	0	0	0	0	0	0	1.40E-06	0	**2.81E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Muskrat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	7.14E-05	0.005756	0	0	**5.83E-03**
	Co-60	mGy/d	0	0	2.58E-09	0	0	0	9.45E-11	3.91E-07	4.29E-06	1.49E-07	0	0	**4.83E-06**
	Cs-134	mGy/d	0	0	9.92E-08	0	0	0	1.04E-08	5.21E-07	4.59E-05	5.17E-06	0	0	**5.17E-05**
	Cs-137	mGy/d	0	0	1.04E-07	0	0	0	1.15E-07	2.15E-06	4.84E-05	5.44E-06	0	0	**5.62E-05**
	HTO	mGy/d	6.07E-07	0	2.27E-05	0	0	0	0	0	2.68E-05	2.68E-05	0	0	**7.69E-05**
	I-131	mGy/d	4.09E-14	0	4.72E-08	0	0	0	5.60E-09	3.13E-07	7.06E-06	2.39E-07	0	0	**7.66E-06**
	OBT	mGy/d	7.29E-08	0	2.72E-06	0	0	0	0	0	0	0	0	0	**2.79E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Little Brown Bat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0.005756	0	0	**5.76E-03**
	Co-60	mGy/d	0	0	1.20E-09	0	0	0	0	0	0	4.06E-07	0	0	**4.08E-07**
	Cs-134	mGy/d	0	0	4.61E-08	0	0	0	0	0	0	1.41E-05	0	0	**1.41E-05**
	Cs-137	mGy/d	0	0	4.85E-08	0	0	0	0	0	0	1.48E-05	0	0	**1.49E-05**
	HTO	mGy/d	6.07E-07	0	2.27E-05	0	0	0	0	0	0	2.68E-05	0	0	**5.01E-05**
	I-131	mGy/d	3.36E-14	0	2.19E-08	0	0	0	0	0	0	6.49E-07	0	0	**6.71E-07**
	OBT	mGy/d	7.29E-08	0	2.72E-06	0	0	0	0	0	0	0	0	0	**2.79E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Northern Short-tailed Shrew	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0.00876216	0	**8.76E-03**
	Co-60	mGy/d	0	0	0	0	1.07E-10	2.74E-06	0	0	0	0	2.06E-09	0	**2.74E-06**
	Cs-134	mGy/d	0	0	0	0	2.63E-08	8.08E-06	0	0	0	0	8.81E-07	0	**8.99E-06**
	Cs-137	mGy/d	0	0	0	0	7.56E-07	8.72E-05	0	0	0	0	3.88E-06	0	**9.18E-05**
	HTO	mGy/d	6.07E-07	0	0	0	0	0	0	0	0	0	4.41E-05	0	**4.47E-05**
	I-131	mGy/d	3.45E-14	0	0	0	1.31E-08	4.51E-06	0	0	0	0	9.88E-08	0	**4.63E-06**
	OBT	mGy/d	7.29E-08	0	0	0	0	0	0	0	0	0	1.98E-06	0	**2.06E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Red Fox	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.84E-04	0.00851513	**8.70E-03**
	Co-60	mGy/d	0	0	3.20E-09	0	2.30E-11	5.48E-06	0	0	0	0	4.00E-12	3.34E-10	**5.49E-06**
	Cs-134	mGy/d	0	0	1.23E-07	0	5.62E-09	1.62E-05	0	0	0	0	1.10E-09	4.92E-07	**1.68E-05**
	Cs-137	mGy/d	0	0	1.30E-07	0	1.62E-07	0.0001743	0	0	0	0	3.17E-08	2.46E-06	**1.77E-04**
	HTO	mGy/d	6.07E-07	0	2.27E-05	0	0	0	0	0	0	0	1.73E-05	2.44E-05	**6.50E-05**
	I-131	mGy/d	4.55E-14	0	5.85E-08	0	2.80E-09	9.03E-06	0	0	0	0	5.03E-10	7.49E-09	**9.10E-06**
	OBT	mGy/d	7.29E-08	0	2.72E-06	0	0	0	0	0	0	0	7.77E-07	2.29E-07	**3.80E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
White-tailed Deer	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	2.32E-04	0	**2.32E-04**
	Co-60	mGy/d	0	0	2.25E-08	0	2.04E-10	2.80E-06	0	0	0	0	4.80E-10	0	**2.82E-06**
	Cs-134	mGy/d	0	0	6.32E-07	0	3.66E-08	8.22E-06	0	0	0	0	9.69E-08	0	**8.98E-06**
	Cs-137	mGy/d	0	0	3.64E-07	0	5.75E-07	8.52E-05	0	0	0	0	1.52E-06	0	**8.77E-05**
	HTO	mGy/d	6.07E-07	0	1.81E-05	0	0	0	0	0	0	0	1.98E-05	0	**3.85E-05**
	I-131	mGy/d	1.02E-13	0	1.59E-07	0	9.64E-09	4.37E-06	0	0	0	0	2.28E-08	0	**4.56E-06**
	OBT	mGy/d	7.29E-08	0	2.17E-06	0	0	0	0	0	0	0	8.88E-07	0	**3.13E-06**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**
Honey Bee	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	4.59E-04	0	**4.59E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	8.34E-10	0	**8.34E-10**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	3.60E-09	0	**3.60E-09**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	1.44E-07	0	**1.44E-07**
	HTO	mGy/d	0	0	0	0	0	0	0	0	0	0	0.000202319	0	**2.02E-04**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	2.26E-07	0	**2.26E-07**
	OBT	mGy/d	0	0	0	0	0	0	0	0	0	0	1.98E-05	0	**1.98E-05**
	Xe-131md	mGy/d	0	1.10E-21	0	0	0	0	0	0	0	0	0	0	**1.10E-21**

C.1.2 Radiological Dose for Aquatic and Terrestrial Receptors in the WD Polygon

Dose by Pathway (WD Riparian) - Max Scenario

Receptor	Radionuclide	Unit	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 Dose
Bald Eagle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	4.19E-04	0	1.57E-03	**1.99E-03**
	Co-60	mGy/d	0	0	2.23E-07	0	2.19E-10	0	8.94E-09	0	0	2.90E-05	0	2.51E-06	**3.17E-05**
	Cs-134	mGy/d	0	0	7.61E-07	0	5.10E-09	0	3.06E-08	0	0	6.39E-03	0	4.80E-05	**6.44E-03**
	Cs-137	mGy/d	0	0	5.04E-07	0	8.41E-08	0	1.01E-07	0	0	4.24E-03	0	3.19E-05	**4.27E-03**
	HTO	mGy/d	1.90E-07	0	5.49E-06	0	0	0	0	0	0	1.61E-05	0	1.83E-05	**4.01E-05**
	I-131	mGy/d	1.53E-16	0	1.56E-09	0	2.22E-11	0	2.34E-10	0	0	2.25E-08	0	6.03E-09	**3.04E-08**
	OBT	mGy/d	2.09E-08	0	6.04E-07	0	0	0	0	0	0	0	0	1.18E-07	**7.43E-07**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**
Mallard	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	1.55E-03	0	0	**1.55E-03**
	Co-60	mGy/d	0	0	2.38E-07	0	0	0	2.18E-08	2.45E-06	0	6.55E-05	0	0	**6.82E-05**
	Cs-134	mGy/d	0	0	8.11E-07	0	0	0	7.48E-08	2.16E-06	0	2.01E-04	0	0	**2.04E-04**
	Cs-137	mGy/d	0	0	5.38E-07	0	0	0	2.47E-07	3.01E-06	0	1.33E-04	0	0	**1.37E-04**
	HTO	mGy/d	1.90E-07	0	5.49E-06	0	0	0	0	0	0	1.61E-05	0	0	**2.18E-05**
	I-131	mGy/d	1.53E-16	0	1.67E-09	0	0	0	5.72E-10	1.93E-06	0	4.00E-08	0	0	**1.97E-06**
	OBT	mGy/d	2.09E-08	0	6.04E-07	0	0	0	0	0	0	0	0	0	**6.25E-07**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**
Muskrat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	2.79E-05	1.28E-03	0	0	**1.31E-03**
	Co-60	mGy/d	0	0	8.62E-09	0	0	0	6.24E-10	2.58E-06	1.43E-05	4.99E-07	0	0	**1.74E-05**
	Cs-134	mGy/d	0	0	5.95E-07	0	0	0	4.33E-08	2.16E-06	2.76E-04	3.10E-05	0	0	**3.09E-04**
	Cs-137	mGy/d	0	0	4.64E-07	0	0	0	1.68E-07	3.15E-06	2.15E-04	2.42E-05	0	0	**2.43E-04**
	HTO	mGy/d	1.47E-07	0	1.03E-05	0	0	0	0	0	1.22E-05	1.22E-05	0	0	**3.49E-05**
	I-131	mGy/d	9.92E-15	0	1.36E-07	0	0	0	3.69E-08	2.07E-06	2.04E-05	6.89E-07	0	0	**2.33E-05**
	OBT	mGy/d	1.77E-08	0	1.24E-06	0	0	0	0	0	0	0	0	0	**1.26E-06**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**
Little Brown Bat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	1.28E-03	0	0	**1.28E-03**
	Co-60	mGy/d	0	0	4.01E-09	0	0	0	0	0	0	1.36E-06	0	0	**1.36E-06**
	Cs-134	mGy/d	0	0	2.76E-07	0	0	0	0	0	0	8.44E-05	0	0	**8.47E-05**
	Cs-137	mGy/d	0	0	2.16E-07	0	0	0	0	0	0	6.58E-05	0	0	**6.61E-05**
	HTO	mGy/d	1.47E-07	0	1.03E-05	0	0	0	0	0	0	1.22E-05	0	0	**2.27E-05**
	I-131	mGy/d	8.16E-15	0	6.33E-08	0	0	0	0	0	0	1.87E-06	0	0	**1.94E-06**
	OBT	mGy/d	1.77E-08	0	1.24E-06	0	0	0	0	0	0	0	0	0	**1.26E-06**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**

Dose by Pathway (WD) - Max Scenario															
Receptor	**Radionuclide**	**Unit**	**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 Dose**
Cattail	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.74E-05	0	0	0	0	0	0	0	0	0	**1.74E-05**
	Co-60	mGy/d	0	0	6.77E-04	6.94E-06	0	0	0	3.47E-06	0	0	0	0	**6.87E-04**
	Cs-134	mGy/d	0	0	3.19E-04	5.64E-06	0	0	0	2.84E-06	0	0	0	0	**3.27E-04**
	Cs-137	mGy/d	0	0	3.04E-04	1.66E-06	0	0	0	4.15E-06	0	0	0	0	**3.10E-04**
	HTO	mGy/d	0	0	2.68E-05	7.22E-09	0	0	0	0	0	0	0	0	**2.68E-05**
	I-131	mGy/d	0	0	1.02E-04	1.42E-06	0	0	0	2.65E-06	0	0	0	0	**1.06E-04**
	OBT	mGy/d	0	0	3.92E-06	0	0	0	0	0	0	0	0	0	**3.92E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Benthic Invertebrates	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.89E-04	0	0	0	0	1.06E-08	0	0	0	0	**1.89E-04**
	Co-60	mGy/d	0	0	5.60E-05	0	0	0	0	9.14E-06	0	0	0	0	**6.51E-05**
	Cs-134	mGy/d	0	0	9.19E-05	0	0	0	0	7.95E-06	0	0	0	0	**9.98E-05**
	Cs-137	mGy/d	0	0	9.76E-05	0	0	0	0	1.24E-05	0	0	0	0	**1.10E-04**
	HTO	mGy/d	0	0	2.68E-05	0	0	0	0	0	0	0	0	0	**2.68E-05**
	I-131	mGy/d	0	0	1.07E-05	0	0	0	0	7.67E-06	0	0	0	0	**1.84E-05**
	OBT	mGy/d	0	0	5.01E-06	0	0	0	0	0	0	0	0	0	**5.01E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Redbelly Dace	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	2.09E-04	1.74E-11	0	0	0	5.78E-11	0	0	0	0	**2.09E-04**
	Co-60	mGy/d	0	0	1.12E-04	9.49E-06	0	0	0	2.11E-06	0	0	0	0	**1.24E-04**
	Cs-134	mGy/d	0	0	9.21E-03	7.65E-06	0	0	0	1.71E-06	0	0	0	0	**9.22E-03**
	Cs-137	mGy/d	0	0	6.45E-03	2.14E-06	0	0	0	2.38E-06	0	0	0	0	**6.46E-03**
	HTO	mGy/d	0	0	2.68E-05	1.64E-12	0	0	0	0	0	0	0	0	**2.68E-05**
	I-131	mGy/d	0	0	1.06E-05	1.84E-06	0	0	0	1.53E-06	0	0	0	0	**1.39E-05**
	OBT	mGy/d	0	0	4.99E-06	0	0	0	0	0	0	0	0	0	**4.99E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Leopard Frog	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	2.09E-04	2.23E-10	0	0	0	7.40E-10	0	0	0	0	**2.09E-04**
	Co-60	mGy/d	0	0	3.30E-05	1.04E-05	0	0	0	2.31E-06	0	0	0	0	**4.58E-05**
	Cs-134	mGy/d	0	0	4.32E-03	8.86E-06	0	0	0	1.98E-06	0	0	0	0	**4.33E-03**
	Cs-137	mGy/d	0	0	4.69E-03	2.55E-06	0	0	0	2.84E-06	0	0	0	0	**4.70E-03**
	HTO	mGy/d	0	0	2.68E-05	6.19E-11	0	0	0	0	0	0	0	0	**2.68E-05**
	I-131	mGy/d	0	0	8.01E-06	2.16E-06	0	0	0	1.80E-06	0	0	0	0	**1.20E-05**
	OBT	mGy/d	0	0	4.99E-06	0	0	0	0	0	0	0	0	0	**4.99E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Water Snake	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	2.09E-04	2.23E-10	0	0	0	7.39E-10	0	0	0	0	**2.09E-04**
	Co-60	mGy/d	0	0	3.30E-05	1.04E-05	0	0	0	2.31E-06	0	0	0	0	**4.58E-05**
	Cs-134	mGy/d	0	0	4.32E-03	8.86E-06	0	0	0	1.98E-06	0	0	0	0	**4.33E-03**
	Cs-137	mGy/d	0	0	4.68E-03	2.55E-06	0	0	0	2.84E-06	0	0	0	0	**4.69E-03**
	HTO	mGy/d	0	0	2.67E-05	6.18E-11	0	0	0	0	0	0	0	0	**2.67E-05**
	I-131	mGy/d	0	0	8.00E-06	2.16E-06	0	0	0	1.80E-06	0	0	0	0	**1.20E-05**
	OBT	mGy/d	0	0	4.99E-06	0	0	0	0	0	0	0	0	0	**4.99E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Painted Turtle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	2.09E-04	1.74E-11	0	0	0	5.78E-11	0	0	0	0	**2.09E-04**
	Co-60	mGy/d	0	0	3.30E-05	9.49E-06	0	0	0	2.11E-06	0	0	0	0	**4.46E-05**
	Cs-134	mGy/d	0	0	4.32E-03	7.65E-06	0	0	0	1.71E-06	0	0	0	0	**4.33E-03**
	Cs-137	mGy/d	0	0	4.69E-03	2.14E-06	0	0	0	2.38E-06	0	0	0	0	**4.70E-03**
	HTO	mGy/d	0	0	2.68E-05	1.64E-12	0	0	0	0	0	0	0	0	**2.68E-05**
	I-131	mGy/d	0	0	8.01E-06	1.84E-06	0	0	0	1.53E-06	0	0	0	0	**1.14E-05**
	OBT	mGy/d	0	0	4.99E-06	0	0	0	0	0	0	0	0	0	**4.99E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**

Dose by Pathway (WD Riparian) - UCLM Scenario															
Receptor	Radionuclide	Unit	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 Dose
Bald Eagle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0.000318	0	0.00119596	**1.51E-03**
	Co-60	mGy/d	0	0	8.87E-08	0	2.19E-10	0	6.77E-09	0	0	1.15E-05	0	9.95E-07	**1.26E-05**
	Cs-134	mGy/d	0	0	3.03E-07	0	2.64E-09	0	2.50E-08	0	0	0.002548	0	1.92E-05	**2.57E-03**
	Cs-137	mGy/d	0	0	2.19E-07	0	6.46E-08	0	7.48E-08	0	0	0.00184	0	1.39E-05	**1.85E-03**
	HTO	mGy/d	1.90E-07	0	4.19E-06	0	0	0	0	0	0	1.23E-05	0	1.40E-05	**3.07E-05**
	I-131	mGy/d	1.53E-16	0	7.68E-10	0	1.18E-11	0	1.92E-10	0	0	1.11E-08	0	2.96E-09	**1.50E-08**
	OBT	mGy/d	2.09E-08	0	4.61E-07	0	0	0	0	0	0	0	0	9.07E-08	**5.73E-07**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**
Mallard	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0.001179	0	0	**1.18E-03**
	Co-60	mGy/d	0	0	9.46E-08	0	0	0	1.65E-08	1.85E-06	0	2.60E-05	0	0	**2.80E-05**
	Cs-134	mGy/d	0	0	3.23E-07	0	0	0	6.11E-08	1.76E-06	0	8.00E-05	0	0	**8.22E-05**
	Cs-137	mGy/d	0	0	2.34E-07	0	0	0	1.83E-07	2.23E-06	0	5.78E-05	0	0	**6.04E-05**
	HTO	mGy/d	1.90E-07	0	4.19E-06	0	0	0	0	0	0	1.23E-05	0	0	**1.67E-05**
	I-131	mGy/d	1.53E-16	0	8.19E-10	0	0	0	4.68E-10	1.58E-06	0	1.96E-08	0	0	**1.60E-06**
	OBT	mGy/d	2.09E-08	0	4.61E-07	0	0	0	0	0	0	0	0	0	**4.82E-07**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**
Muskrat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	2.79E-05	0.000971	0	0	**9.99E-04**
	Co-60	mGy/d	0	0	3.42E-09	0	0	0	4.73E-10	1.96E-06	5.69E-06	1.98E-07	0	0	**7.85E-06**
	Cs-134	mGy/d	0	0	2.37E-07	0	0	0	3.54E-08	1.76E-06	0.00011	1.24E-05	0	0	**1.24E-04**
	Cs-137	mGy/d	0	0	2.02E-07	0	0	0	1.25E-07	2.33E-06	9.34E-05	1.05E-05	0	0	**1.07E-04**
	HTO	mGy/d	1.47E-07	0	7.87E-06	0	0	0	0	0	9.31E-06	9.31E-06	0	0	**2.66E-05**
	I-131	mGy/d	9.92E-15	0	6.69E-08	0	0	0	3.02E-08	1.69E-06	1.00E-05	3.38E-07	0	0	**1.21E-05**
	OBT	mGy/d	1.77E-08	0	9.45E-07	0	0	0	0	0	0	0	0	0	**9.62E-07**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**
Little Brown Bat	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0.000971	0	0	**9.71E-04**
	Co-60	mGy/d	0	0	1.59E-09	0	0	0	0	0	0	5.40E-07	0	0	**5.41E-07**
	Cs-134	mGy/d	0	0	1.10E-07	0	0	0	0	0	0	3.36E-05	0	0	**3.37E-05**
	Cs-137	mGy/d	0	0	9.37E-08	0	0	0	0	0	0	2.86E-05	0	0	**2.87E-05**
	HTO	mGy/d	1.47E-07	0	7.87E-06	0	0	0	0	0	0	9.31E-06	0	0	**1.73E-05**
	I-131	mGy/d	8.16E-15	0	3.11E-08	0	0	0	0	0	0	9.20E-07	0	0	**9.51E-07**
	OBT	mGy/d	1.77E-08	0	9.45E-07	0	0	0	0	0	0	0	0	0	**9.62E-07**
	Xe-131md	mGy/d	0	1.03E-21	0	0	0	0	0	0	0	0	0	0	**1.03E-21**

Dose by Pathway (WD) - UCLM Scenario															
Receptor	**Radionuclide**	**Unit**	**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 Dose**
Cattail	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.74E-05	0	0	0	0	0.00E+00	0	0	0	0	**1.74E-05**
	Co-60	mGy/d	0	0	2.69E-04	2.75E-06	0	0	0	2.63E-06	0	0	0	0	**2.74E-04**
	Cs-134	mGy/d	0	0	1.27E-04	2.25E-06	0	0	0	2.32E-06	0	0	0	0	**1.32E-04**
	Cs-137	mGy/d	0	0	1.32E-04	7.19E-07	0	0	0	3.07E-06	0	0	0	0	**1.36E-04**
	HTO	mGy/d	0	0	2.04E-05	5.52E-09	0	0	0	0	0	0	0	0	**2.04E-05**
	I-131	mGy/d	0	0	5.02E-05	6.94E-07	0	0	0	2.17E-06	0	0	0	0	**5.31E-05**
	OBT	mGy/d	0	0	3.00E-06	0	0	0	0	0	0	0	0	0	**3.00E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Benthic Invertebrates	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.43E-04	0	0	0	0	1.06E-08	0	0	0	0	**1.43E-04**
	Co-60	mGy/d	0	0	2.22E-05	0	0	0	0	6.92E-06	0	0	0	0	**2.92E-05**
	Cs-134	mGy/d	0	0	3.66E-05	0	0	0	0	6.49E-06	0	0	0	0	**4.31E-05**
	Cs-137	mGy/d	0	0	4.24E-05	0	0	0	0	9.20E-06	0	0	0	0	**5.16E-05**
	HTO	mGy/d	0	0	2.05E-05	0	0	0	0	0	0	0	0	0	**2.05E-05**
	I-131	mGy/d	0	0	5.25E-06	0	0	0	0	6.28E-06	0	0	0	0	**1.15E-05**
	OBT	mGy/d	0	0	3.82E-06	0	0	0	0	0	0	0	0	0	**3.82E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Redbelly Dace	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.59E-04	1.32E-11	0	0	0	5.78E-11	0	0	0	0	**1.59E-04**
	Co-60	mGy/d	0	0	4.46E-05	3.77E-06	0	0	0	1.60E-06	0	0	0	0	**5.00E-05**
	Cs-134	mGy/d	0	0	3.67E-03	3.05E-06	0	0	0	1.40E-06	0	0	0	0	**3.67E-03**
	Cs-137	mGy/d	0	0	2.80E-03	9.28E-07	0	0	0	1.76E-06	0	0	0	0	**2.81E-03**
	HTO	mGy/d	0	0	2.04E-05	1.26E-12	0	0	0	0	0	0	0	0	**2.04E-05**
	I-131	mGy/d	0	0	5.19E-06	9.04E-07	0	0	0	1.25E-06	0	0	0	0	**7.35E-06**
	OBT	mGy/d	0	0	3.81E-06	0	0	0	0	0	0	0	0	0	**3.81E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Leopard Frog	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.59E-04	1.69E-10	0	0	0	7.40E-10	0	0	0	0	**1.59E-04**
	Co-60	mGy/d	0	0	1.31E-05	4.13E-06	0	0	0	1.75E-06	0	0	0	0	**1.90E-05**
	Cs-134	mGy/d	0	0	1.72E-03	3.53E-06	0	0	0	1.62E-06	0	0	0	0	**1.73E-03**
	Cs-137	mGy/d	0	0	2.04E-03	1.11E-06	0	0	0	2.10E-06	0	0	0	0	**2.04E-03**
	HTO	mGy/d	0	0	2.04E-05	4.73E-11	0	0	0	0	0	0	0	0	**2.04E-05**
	I-131	mGy/d	0	0	3.93E-06	1.06E-06	0	0	0	1.47E-06	0	0	0	0	**6.46E-06**
	OBT	mGy/d	0	0	3.81E-06	0	0	0	0	0	0	0	0	0	**3.81E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Northern Water Snake	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.59E-04	1.69E-10	0	0	0	7.39E-10	0	0	0	0	**1.59E-04**
	Co-60	mGy/d	0	0	1.31E-05	4.13E-06	0	0	0	1.75E-06	0	0	0	0	**1.90E-05**
	Cs-134	mGy/d	0	0	1.72E-03	3.53E-06	0	0	0	1.62E-06	0	0	0	0	**1.73E-03**
	Cs-137	mGy/d	0	0	2.03E-03	1.11E-06	0	0	0	2.10E-06	0	0	0	0	**2.04E-03**
	HTO	mGy/d	0	0	2.04E-05	4.72E-11	0	0	0	0	0	0	0	0	**2.04E-05**
	I-131	mGy/d	0	0	3.92E-06	1.06E-06	0	0	0	1.47E-06	0	0	0	0	**6.46E-06**
	OBT	mGy/d	0	0	3.81E-06	0	0	0	0	0	0	0	0	0	**3.81E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Painted Turtle	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	1.59E-04	1.32E-11	0	0	0	5.78E-11	0	0	0	0	**1.59E-04**
	Co-60	mGy/d	0	0	1.31E-05	3.77E-06	0	0	0	1.60E-06	0	0	0	0	**1.85E-05**
	Cs-134	mGy/d	0	0	1.72E-03	3.05E-06	0	0	0	1.40E-06	0	0	0	0	**1.73E-03**
	Cs-137	mGy/d	0	0	2.04E-03	9.28E-07	0	0	0	1.76E-06	0	0	0	0	**2.04E-03**
	HTO	mGy/d	0	0	2.04E-05	1.26E-12	0	0	0	0	0	0	0	0	**2.04E-05**
	I-131	mGy/d	0	0	3.93E-06	9.04E-07	0	0	0	1.25E-06	0	0	0	0	**6.09E-06**
	OBT	mGy/d	0	0	3.81E-06	0	0	0	0	0	0	0	0	0	**3.81E-06**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**

C.1.3 Radiological Dose for Aquatic and Terrestrial Receptors in the RWOS1 Polygon

Dose by Pathway (RWOS1) - Max Scenario															
Receptor	Radionuclide	Unit	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 Dose
Grass	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	6.27E-05	0	0	0	0	0	0	0	**6.27E-05**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	4.70E-06	0	0	0	0	0	0	0	0	0	0	0	**4.70E-06**
	I-131	mGy/d	1.92E-10	0	0	0	4.61E-15	3.41E-12	0	0	0	0	0	0	**1.95E-10**
	OBT	mGy/d	4.61E-11	0	0	0	0	0	0	0	0	0	0	0	**4.61E-11**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Eastern White Cedar	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	8.63E-05	0	0	0	0	0	0	0	**8.63E-05**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	4.70E-06	0	0	0	0	0	0	0	0	0	0	0	**4.70E-06**
	I-131	mGy/d	4.35E-11	0	0	0	1.05E-14	1.02E-12	0	0	0	0	0	0	**4.45E-11**
	OBT	mGy/d	4.61E-07	0	0	0	0	0	0	0	0	0	0	0	**4.61E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Earthworm	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	2.21E-07	0	0	0	0	0	0	0	0	0	0	0	**2.21E-07**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	4.88E-06	0	0	0	0	0	0	0	0	0	0	0	**4.88E-06**
	I-131	mGy/d	1.99E-11	0	0	0	7.47E-14	8.16E-13	0	0	0	0	0	0	**2.08E-11**
	OBT	mGy/d	4.90E-07	0	0	0	0	0	0	0	0	0	0	0	**4.90E-07**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
American Robin	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.88E-05	0	**1.88E-05**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	9.08E-08	0	0	0	0	0	0	0	0	0	2.66E-06	0	**2.75E-06**
	I-131	mGy/d	6.95E-17	0	0	0	9.65E-17	1.34E-12	0	0	0	0	4.18E-13	0	**1.76E-12**
	OBT	mGy/d	9.99E-09	0	0	0	0	0	0	0	0	0	1.24E-07	0	**1.34E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Wild Turkey	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.57E-04	0	**1.57E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	9.08E-08	0	0	0	0	0	0	0	0	0	2.66E-06	0	**2.75E-06**
	I-131	mGy/d	7.58E-17	0	0	0	7.91E-16	1.34E-12	0	0	0	0	4.59E-14	0	**1.38E-12**
	OBT	mGy/d	9.99E-09	0	0	0	0	0	0	0	0	0	1.24E-07	0	**1.34E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Northern Short-tailed Shrew	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	4.00E-07	0	**4.00E-07**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	7.06E-08	0	0	0	0	0	0	0	0	0	2.01E-06	0	**2.08E-06**
	I-131	mGy/d	4.01E-15	0	0	0	2.07E-15	7.15E-13	0	0	0	0	3.59E-12	0	**4.31E-12**
	OBT	mGy/d	8.47E-09	0	0	0	0	0	0	0	0	0	9.04E-08	0	**9.89E-08**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Red Fox	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.26E-04	4.02E-06	**1.30E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	7.06E-08	0	0	0	0	0	0	0	0	0	2.01E-06	1.09E-06	**3.18E-06**
	I-131	mGy/d	5.28E-15	0	0	0	4.43E-16	1.43E-12	0	0	0	0	3.13E-12	2.44E-13	**4.81E-12**
	OBT	mGy/d	8.47E-09	0	0	0	0	0	0	0	0	0	9.04E-08	9.81E-09	**1.09E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
White-tailed Deer	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.50E-04	0	**1.50E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	7.06E-08	0	0	0	0	0	0	0	0	0	2.30E-06	0	**2.37E-06**
	I-131	mGy/d	1.19E-14	0	0	0	1.53E-15	6.92E-13	0	0	0	0	7.99E-11	0	**8.07E-11**
	OBT	mGy/d	8.47E-09	0	0	0	0	0	0	0	0	0	1.03E-07	0	**1.12E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Honey Bee	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	3.13E-04	0	**3.13E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	0	0	0	0	0	0	0	0	0	0	2.35E-05	0	**2.35E-05**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	1.41E-09	0	**1.41E-09**
	OBT	mGy/d	0	0	0	0	0	0	0	0	0	0	2.31E-06	0	**2.31E-06**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**

Dose by Pathway (RWOS1) - UCLM Scenario															
Receptor	Radionuclide	Unit	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 Dose
Grass	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0.00E+00	0	0	0	6.27E-05	0	0	0	0	0	0	0	**6.27E-05**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	4.70E-06	0	0	0	0	0	0	0	0	0	0	0	**4.70E-06**
	I-131	mGy/d	1.92E-10	0	0	0	4.61E-15	3.41E-12	0	0	0	0	0	0	**1.95E-10**
	OBT	mGy/d	4.61E-11	0	0	0	0	0	0	0	0	0	0	0	**4.61E-11**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Eastern White Cedar	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0.00E+00	0	0	0	8.63E-05	0	0	0	0	0	0	0	**8.63E-05**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	4.70E-06	0	0	0	0	0	0	0	0	0	0	0	**4.70E-06**
	I-131	mGy/d	4.35E-11	0	0	0	1.05E-14	1.02E-12	0	0	0	0	0	0	**4.45E-11**
	OBT	mGy/d	4.61E-07	0	0	0	0	0	0	0	0	0	0	0	**4.61E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Earthworm	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	2.21E-07	0	0	0	0	0	0	0	0	0	0	0	**2.21E-07**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	4.88E-06	0	0	0	0	0	0	0	0	0	0	0	**4.88E-06**
	I-131	mGy/d	1.99E-11	0	0	0	7.47E-14	8.16E-13	0	0	0	0	0	0	**2.08E-11**
	OBT	mGy/d	4.90E-07	0	0	0	0	0	0	0	0	0	0	0	**4.90E-07**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
American Robin	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.88E-05	0	**1.88E-05**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	9.08E-08	0	0	0	0	0	0	0	0	0	2.66E-06	0	**2.75E-06**
	I-131	mGy/d	6.95E-17	0	0	0	9.65E-17	1.34E-12	0	0	0	0	4.18E-13	0	**1.76E-12**
	OBT	mGy/d	9.99E-09	0	0	0	0	0	0	0	0	0	1.24E-07	0	**1.34E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Wild Turkey	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.57E-04	0	**1.57E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	9.08E-08	0	0	0	0	0	0	0	0	0	2.66E-06	0	**2.75E-06**
	I-131	mGy/d	7.58E-17	0	0	0	7.91E-16	1.34E-12	0	0	0	0	4.59E-14	0	**1.38E-12**
	OBT	mGy/d	9.99E-09	0	0	0	0	0	0	0	0	0	1.24E-07	0	**1.34E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Northern Short-tailed Shrew	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	4.00E-07	0	**4.00E-07**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	7.06E-08	0	0	0	0	0	0	0	0	0	2.01E-06	0	**2.08E-06**
	I-131	mGy/d	4.01E-15	0	0	0	2.07E-15	7.15E-13	0	0	0	0	3.59E-12	0	**4.31E-12**
	OBT	mGy/d	8.47E-09	0	0	0	0	0	0	0	0	0	9.04E-08	0	**9.89E-08**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Red Fox	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.26E-04	4.02E-06	**1.30E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	7.06E-08	0	0	0	0	0	0	0	0	0	2.01E-06	1.09E-06	**3.18E-06**
	I-131	mGy/d	5.28E-15	0	0	0	4.43E-16	1.43E-12	0	0	0	0	3.13E-12	2.44E-13	**4.81E-12**
	OBT	mGy/d	8.47E-09	0	0	0	0	0	0	0	0	0	9.04E-08	9.81E-09	**1.09E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
White-tailed Deer	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	1.50E-04	0	**1.50E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	7.06E-08	0	0	0	0	0	0	0	0	0	2.30E-06	0	**2.37E-06**
	I-131	mGy/d	1.19E-14	0	0	0	1.53E-15	6.92E-13	0	0	0	0	7.99E-11	0	**8.07E-11**
	OBT	mGy/d	8.47E-09	0	0	0	0	0	0	0	0	0	1.03E-07	0	**1.12E-07**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**
Honey Bee	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	3.13E-04	0	**3.13E-04**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	0	0	0	0	0	0	0	0	0	0	2.35E-05	0	**2.35E-05**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	1.41E-09	0	**1.41E-09**
	OBT	mGy/d	0	0	0	0	0	0	0	0	0	0	2.31E-06	0	**2.31E-06**
	Xe-131md	mGy/d	0	8.63E-22	0	0	0	0	0	0	0	0	0	0	**8.63E-22**

C.1.4 Radiological Dose for Aquatic and Terrestrial Receptors in the Baie du Dore Polygon

Dose by Pathway (Baie du Dore) - Max Scenario

Receptor	Radionuclide	Unit	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 Dose
Lake Whitefish	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	0	0	2.01E-06	1.24E-13	0	0	0	0	0	0	0	0	**2.01E-06**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	OBT	mGy/d	0	0	3.75E-07	0	0	0	0	0	0	0	0	0	**3.75E-07**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Smallmouth Bass	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	0	0	2.01E-06	1.65E-13	0	0	0	0	0	0	0	0	**2.01E-06**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	OBT	mGy/d	0	0	3.75E-07	0	0	0	0	0	0	0	0	0	**3.75E-07**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**

Dose by Pathway (Baie du Dore) - UCLM Scenario

Receptor	Radionuclide	Unit	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 Dose
Lake Whitefish	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	0	0	2.01E-06	1.24E-13	0	0	0	0	0	0	0	0	**2.01E-06**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	OBT	mGy/d	0	0	3.75E-07	0	0	0	0	0	0	0	0	0	**3.75E-07**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
Smallmouth Bass	Ba-137md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	C-14	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Co-60	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-134	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	Cs-137	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	HTO	mGy/d	0	0	2.01E-06	1.65E-13	0	0	0	0	0	0	0	0	**2.01E-06**
	I-131	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**
	OBT	mGy/d	0	0	3.75E-07	0	0	0	0	0	0	0	0	0	**3.75E-07**
	Xe-131md	mGy/d	0	0	0	0	0	0	0	0	0	0	0	0	**0.00E+00**

C.2 Non-radiological Dose by Pathway – Ecological Receptors

C.2.1 Non-radiological Dose for Aquatic Receptors in the SRD and NSS-W Polygon

SRD and NSS-W										
Parameter	Muskrat - Dose By Pathway									
	Water		Sediment		Cattail		Benthic Invertebrates		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Chromium	8.60E-04	1.25E-04	6.22E-02	2.66E-02	8.78E-03	6.37E-03	1.76E-01	2.56E-02	2.48E-01	5.87E-02
Copper	1.64E-04	7.58E-05	2.96E-01	7.44E-02	1.19E-01	9.59E-02	3.62E-03	1.67E-03	4.19E-01	1.72E-01
Iron	1.47E-01	2.98E-02	3.64E+01	2.43E+01	2.34E+02	1.56E+02	2.15E+02	4.38E+01	4.86E+02	2.24E+02
Manganese	3.89E-02	6.38E-03	2.33E+00	1.12E+00	4.87E+00	3.01E+00	1.41E+01	2.31E+00	2.13E+01	6.45E+00
Nickel	3.52E-03	4.88E-04	3.98E-02	2.26E-02	6.18E-02	4.01E-02	1.85E-01	2.56E-02	2.90E-01	8.88E-02
Sodium	5.94E+01	2.13E+01	3.34E+00	1.19E+00	5.16E+02	2.26E+02	2.28E+02	8.15E+01	8.07E+02	3.30E+02
Strontium	4.35E-01	1.75E-01	1.67E+00	6.25E-01	7.50E+00	3.76E+00	5.48E+01	2.20E+01	6.44E+01	2.66E+01
Zinc	1.03E-02	2.56E-03	9.52E-01	3.57E-01	2.65E+00	1.48E+00	9.69E+00	2.42E+00	1.33E+01	4.26E+00

SRD and NSS-W						
Parameter	Little Brown Bat - Dose By Pathway					
	Water		Benthic Invertebrates		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM
Chromium	1.41E-03	2.04E-04	1.69E+00	2.46E-01	1.69E+00	2.46E-01
Copper	2.69E-04	1.24E-04	3.48E-02	1.61E-02	3.51E-02	1.62E-02
Iron	2.40E-01	4.88E-02	2.07E+03	4.22E+02	2.07E+03	4.22E+02
Manganese	6.37E-02	1.04E-02	1.35E+02	2.22E+01	1.36E+02	2.22E+01
Nickel	5.76E-03	7.99E-04	1.78E+00	2.46E-01	1.78E+00	2.47E-01
Sodium	9.73E+01	3.48E+01	2.19E+03	7.84E+02	2.29E+03	8.19E+02
Strontium	7.12E-01	2.86E-01	5.27E+02	2.12E+02	5.28E+02	2.12E+02
Zinc	1.68E-02	4.20E-03	9.32E+01	2.33E+01	9.33E+01	2.33E+01

SRD and NSS-W										
Parameter	Mallard - Dose By Pathway									
	Water		Sediment		Cattail		Benthic Invertebrates		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Chromium	5.28E-04	7.67E-05	4.85E-02	2.08E-02	2.14E-03	1.55E-03	5.15E-01	7.47E-02	5.66E-01	9.72E-02
Copper	1.01E-04	4.65E-05	2.31E-01	5.80E-02	2.89E-02	2.34E-02	1.06E-02	4.89E-03	2.71E-01	8.63E-02
Iron	9.00E-02	1.83E-02	2.84E+01	1.90E+01	5.72E+01	3.80E+01	6.30E+02	1.28E+02	7.16E+02	1.85E+02
Manganese	2.39E-02	3.92E-03	1.82E+00	8.74E-01	1.19E+00	7.34E-01	4.12E+01	6.75E+00	4.42E+01	8.37E+00
Nickel	2.16E-03	3.00E-04	3.10E-02	1.76E-02	1.51E-02	9.79E-03	5.40E-01	7.49E-02	5.88E-01	1.03E-01
Sodium	3.65E+01	1.31E+01	2.61E+00	9.24E-01	1.26E+02	5.50E+01	6.66E+02	2.38E+02	8.31E+02	3.07E+02
Strontium	2.67E-01	1.07E-01	1.30E+00	4.87E-01	1.83E+00	9.17E-01	1.60E+02	6.44E+01	1.64E+02	6.59E+01
Zinc	6.30E-03	1.57E-03	7.43E-01	2.79E-01	6.46E-01	3.60E-01	2.84E+01	7.08E+00	2.97E+01	7.72E+00

SRD and NSS-W															
Parameter	Bald Eagle - Dose By Pathway														
	Water		Sediment		Soil		Fish		Muskrat		Mallard		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Chromium	3.52E-04	5.11E-05	1.41E-02	6.04E-03	-	-	4.65E-02	6.75E-03	4.12E-03	9.77E-04	1.10E-02	1.89E-03	7.61E-02	1.57E-02
Copper	6.72E-05	3.10E-05	6.72E-02	1.69E-02	-	-	3.71E-02	1.71E-02	4.62E-03	1.90E-03	1.60E-03	5.11E-04	1.11E-01	3.64E-02
Iron	6.00E-02	1.22E-02	8.26E+00	5.52E+00	-	-	3.46E+01	7.03E+00	1.03E+01	4.74E+00	2.12E+01	5.48E+00	7.43E+01	2.28E+01
Manganese	1.59E-02	2.61E-03	5.28E-01	2.54E-01	-	-	9.17E+00	1.50E+00	1.94E-02	5.85E-03	1.77E-03	3.36E-04	9.73E+00	1.77E+00
Nickel	1.44E-03	2.00E-04	9.02E-03	5.12E-03	-	-	7.26E-02	1.01E-02	2.19E-03	6.72E-04	3.85E-03	6.72E-04	8.91E-02	1.67E-02
Sodium	2.43E+01	8.71E+00	7.58E-01	2.69E-01	-	-	4.90E+03	1.76E+03	1.83E+01	7.48E+00	1.23E+02	4.54E+01	5.07E+03	1.82E+03
Strontium	1.78E-01	7.16E-02	3.79E-01	1.42E-01	2.22E-02	1.78E-02	8.54E-01	3.44E-01	1.27E-01	5.23E-02	6.91E-02	2.79E-02	1.63E+00	6.55E-01
Zinc	4.20E-03	1.05E-03	2.16E-01	8.10E-02	-	-	5.04E+01	1.26E+01	3.22E+00	1.03E+00	2.95E-01	7.67E-02	5.41E+01	1.38E+01

SRD and NSS-W										
Indicator Species	Dose (mg/kg-d)								TEF (U.S. EPA, 1999; Van den Berg, 1998)	
	Muskrat		Little Brown Bat		Mallard		Bald Eagle			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Mammals	Birds
1,2,3,4,6,7,8-Hepta CDD	2.77E-06	8.32E-07	3.26E-06	9.79E-07	2.16E-06	6.49E-07	1.10E-06	3.30E-07	1.00E-02	1.00E-03
1,2,3,4,6,7,8-Hepta CDF	2.82E-06	7.31E-07	4.42E-06	1.14E-06	2.20E-06	5.70E-07	1.22E-06	3.17E-07	1.00E-02	1.00E-02
1,2,3,4,7,8,9-Hepta CDF	1.82E-07	5.25E-08	2.85E-07	8.23E-08	1.42E-07	4.10E-08	7.90E-08	2.28E-08	1.00E-02	1.00E-02
1,2,3,4,7,8-Hexa CDD	8.86E-08	2.33E-08	1.31E-07	3.43E-08	6.91E-08	1.82E-08	3.76E-08	9.89E-09	1.00E-01	5.00E-02
1,2,3,4,7,8-Hexa CDF	3.66E-07	8.12E-08	6.40E-07	1.42E-07	2.86E-07	6.33E-08	1.65E-07	3.66E-08	1.00E-01	1.00E-01
1,2,3,6,7,8-Hexa CDD	1.77E-07	5.14E-08	2.61E-07	7.58E-08	1.38E-07	4.01E-08	7.51E-08	2.18E-08	1.00E-01	1.00E-02
1,2,3,6,7,8-Hexa CDF	5.27E-07	1.29E-07	9.20E-07	2.26E-07	4.11E-07	1.01E-07	2.38E-07	5.82E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDD	2.16E-07	6.05E-08	3.18E-07	8.92E-08	1.68E-07	4.72E-08	9.17E-08	2.57E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDF	0.00E+00	5.07E-09	0.00E+00	8.86E-09	0.00E+00	3.96E-09	0.00E+00	2.29E-09	1.00E-01	1.00E-01
1,2,3,7,8-Penta CDD	1.26E-07	3.70E-08	2.27E-07	6.65E-08	9.86E-08	2.89E-08	5.77E-08	1.69E-08	1.00E+00	1.00E+00
1,2,3,7,8-Penta CDF	1.80E-07	5.00E-08	3.33E-07	9.27E-08	1.40E-07	3.90E-08	8.29E-08	2.31E-08	5.00E-02	1.00E-01
2,3,4,6,7,8-Hexa CDF	3.60E-07	8.93E-08	6.28E-07	1.56E-07	2.81E-07	6.96E-08	1.62E-07	4.03E-08	1.00E-01	1.00E-01
2,3,4,7,8-Penta CDF	1.65E-07	4.99E-08	3.06E-07	9.25E-08	1.29E-07	3.89E-08	7.62E-08	2.30E-08	5.00E-01	1.00E+00
2,3,7,8-Tetra CDD	7.02E-08	2.05E-08	1.33E-07	3.90E-08	5.47E-08	1.60E-08	3.27E-08	9.54E-09	1.00E+00	1.00E+00
2,3,7,8-Tetra CDF	2.53E-07	1.03E-07	4.79E-07	1.95E-07	1.97E-07	8.04E-08	1.18E-07	4.79E-08	1.00E-01	1.00E+00
Octa CDD	8.70E-06	1.72E-06	7.22E-06	1.42E-06	6.79E-06	1.34E-06	3.16E-06	6.23E-07	1.00E-04	1.00E-04
Octa CDF	1.74E-06	1.69E-06	1.89E-06	1.84E-06	1.35E-06	1.32E-06	6.74E-07	6.57E-07	1.00E-04	1.00E-04
2,3,4,7,8-TCDD TEQ Dose	**5.46E-07**	**1.56E-07**	**9.49E-07**	**2.71E-07**	**6.39E-07**	**2.05E-07**	**3.75E-07**	**1.21E-07**	-	-

C.2.2 Non-radiological Dose for Aquatic Receptors in the WD Polygon

WD										
Parameter	Muskrat - Dose By Pathway									
	Water		Sediment		Cattail		Benthic Invertebrates		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Cadmium	1.86E-06	1.14E-06	1.42E-03	1.02E-03	4.55E-04	4.55E-04	9.74E-05	6.00E-05	1.97E-03	1.53E-03
Copper	3.23E-04	2.17E-04	7.40E-02	6.33E-02	6.33E-02	5.77E-02	7.11E-03	4.78E-03	1.45E-01	1.26E-01
Iron	8.35E-02	4.25E-02	4.70E+01	3.70E+01	2.84E+01	2.55E+01	1.23E+02	6.25E+01	1.98E+02	1.25E+02
Lead	9.78E-05	3.70E-05	9.01E-02	6.56E-02	1.88E-02	1.63E-02	1.13E-03	4.28E-04	1.10E-01	8.23E-02
Manganese	2.03E-02	6.93E-03	1.95E+00	1.71E+00	1.71E+00	1.64E+00	7.36E+00	2.51E+00	1.10E+01	5.86E+00
Nickel	1.27E-04	9.15E-05	3.87E-02	3.52E-02	1.48E-02	1.40E-02	6.67E-03	4.80E-03	6.03E-02	5.41E-02
Sodium	8.03E+01	3.10E+01	3.93E+00	2.42E+00	8.16E+01	7.82E+01	3.07E+02	1.19E+02	4.73E+02	2.30E+02
Zinc	4.11E-03	2.15E-03	1.16E+00	8.17E-01	9.83E-01	8.35E-01	3.88E+00	2.03E+00	6.03E+00	3.69E+00

WD						
Parameter	Little Brown Bat - Dose By Pathway					
	Water		Benthic Invertebrates		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM
Cadmium	3.04E-06	1.87E-06	9.37E-04	5.77E-04	9.40E-04	5.79E-04
Copper	5.28E-04	3.55E-04	6.84E-02	4.60E-02	6.89E-02	4.64E-02
Iron	1.37E-01	6.96E-02	1.18E+03	6.01E+02	1.18E+03	6.01E+02
Lead	1.60E-04	6.06E-05	1.09E-02	4.11E-03	1.10E-02	4.17E-03
Manganese	3.33E-02	1.13E-02	7.08E+01	2.41E+01	7.08E+01	2.41E+01
Nickel	2.08E-04	1.50E-04	6.41E-02	4.62E-02	6.43E-02	4.63E-02
Sodium	1.31E+02	5.07E+01	2.96E+03	1.14E+03	3.09E+03	1.19E+03
Zinc	6.72E-03	3.52E-03	3.73E+01	1.95E+01	3.73E+01	1.96E+01

WD										
Parameter	Mallard - Dose By Pathway									
	Water		Sediment		Cattail		Benthic Invertebrates		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Cadmium	1.14E-06	7.02E-07	1.10E-03	7.94E-04	1.11E-04	1.11E-04	2.85E-04	1.75E-04	1.50E-03	1.08E-03
Copper	1.98E-04	1.33E-04	5.78E-02	4.94E-02	1.54E-02	1.41E-02	2.08E-02	1.40E-02	9.42E-02	7.76E-02
Iron	5.12E-02	2.61E-02	3.66E+01	2.89E+01	6.92E+00	6.22E+00	3.59E+02	1.83E+02	4.02E+02	2.18E+02
Lead	6.00E-05	2.27E-05	7.03E-02	5.12E-02	4.58E-03	3.96E-03	3.30E-03	1.25E-03	7.82E-02	5.64E-02
Manganese	1.25E-02	4.25E-03	1.52E+00	1.34E+00	4.17E-01	3.99E-01	2.15E+01	7.34E+00	2.35E+01	9.08E+00
Nickel	7.80E-05	5.62E-05	3.02E-02	2.75E-02	3.62E-03	3.40E-03	1.95E-02	1.40E-02	5.34E-02	4.50E-02
Sodium	4.93E+01	1.90E+01	3.07E+00	1.89E+00	1.99E+01	1.91E+01	8.99E+02	3.47E+02	9.71E+02	3.87E+02
Zinc	2.52E-03	1.32E-03	9.08E-01	6.37E-01	2.40E-01	2.04E-01	1.13E+01	5.94E+00	1.25E+01	6.79E+00

WD												
Parameter	Bald Eagle - Dose By Pathway											
	Water		Sediment		Fish		Muskrat		Mallard		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Cadmium	7.60E-07	4.68E-07	3.21E-04	2.31E-04	2.55E-04	1.57E-04	1.73E-05	1.35E-05	5.39E-05	3.88E-05	6.48E-04	4.41E-04
Copper	1.32E-04	8.88E-05	1.68E-02	1.44E-02	7.29E-02	4.90E-02	1.60E-03	1.39E-03	5.57E-04	4.59E-04	9.20E-02	6.54E-02
Iron	3.42E-02	1.74E-02	1.07E+01	8.39E+00	1.97E+01	1.00E+01	4.20E+00	2.65E+00	1.19E+01	6.44E+00	4.65E+01	2.75E+01
Lead	4.00E-05	1.52E-05	2.04E-02	1.49E-02	2.40E-03	9.09E-04	1.17E-04	8.72E-05	8.26E-05	5.96E-05	2.31E-02	1.60E-02
Manganese	8.32E-03	2.84E-03	4.42E-01	3.89E-01	4.79E+00	1.63E+00	1.00E-02	5.32E-03	9.42E-04	3.64E-04	5.25E+00	2.03E+00
Nickel	5.20E-05	3.74E-05	8.78E-03	7.99E-03	2.62E-03	1.89E-03	4.56E-04	4.09E-04	3.50E-04	2.95E-04	1.23E-02	1.06E-02
Sodium	3.28E+01	1.27E+01	8.93E-01	5.49E-01	6.62E+03	2.56E+03	1.07E+01	5.23E+00	1.44E+02	5.72E+01	6.81E+03	2.63E+03
Zinc	1.68E-03	8.81E-04	2.64E-01	1.85E-01	2.02E+01	1.06E+01	1.46E+00	8.92E-01	1.24E-01	6.74E-02	2.20E+01	1.17E+01

WD										
Indicator Species	Dose (mg/kg-d)								TEF (U.S. EPA, 1999; Van den Berg, 1998)	
	Muskrat		Little Brown Bat		Mallard		Bald Eagle			
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Mammals	Birds
1,2,3,4,6,7,8-Hepta CDD	6.10E-06	3.22E-06	7.17E-06	3.79E-06	4.76E-06	2.51E-06	2.42E-06	1.28E-06	1.00E-02	1.00E-03
1,2,3,4,6,7,8-Hepta CDF	2.79E-06	1.50E-06	4.36E-06	2.34E-06	2.17E-06	1.17E-06	1.21E-06	6.49E-07	1.00E-02	1.00E-02
1,2,3,4,7,8,9-Hepta CDF	2.10E-07	1.17E-07	3.28E-07	1.82E-07	1.63E-07	9.09E-08	9.09E-08	5.05E-08	1.00E-02	1.00E-02
1,2,3,4,7,8-Hexa CDD	1.06E-07	6.42E-08	1.57E-07	9.47E-08	8.29E-08	5.01E-08	4.52E-08	2.73E-08	1.00E-01	5.00E-02
1,2,3,4,7,8-Hexa CDF	3.07E-07	1.76E-07	5.36E-07	3.08E-07	2.40E-07	1.37E-07	1.39E-07	7.95E-08	1.00E-01	1.00E-01
1,2,3,6,7,8-Hexa CDD	2.94E-07	1.70E-07	4.33E-07	2.51E-07	2.29E-07	1.33E-07	1.25E-07	7.24E-08	1.00E-01	1.00E-02
1,2,3,6,7,8-Hexa CDF	2.16E-07	1.23E-07	3.78E-07	2.15E-07	1.69E-07	9.58E-08	9.76E-08	5.54E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDD	2.47E-07	1.45E-07	3.64E-07	2.14E-07	1.92E-07	1.13E-07	1.05E-07	6.15E-08	1.00E-01	1.00E-01
1,2,3,7,8,9-Hexa CDF	1.17E-08	7.83E-09	2.03E-08	1.37E-08	9.06E-09	6.09E-09	5.25E-09	3.53E-09	1.00E-01	1.00E-01
1,2,3,7,8-Penta CDD	1.51E-07	9.32E-08	2.71E-07	1.68E-07	1.17E-07	7.27E-08	6.87E-08	4.25E-08	1.00E+00	1.00E+00
1,2,3,7,8-Penta CDF	1.05E-07	6.76E-08	1.95E-07	1.25E-07	8.20E-08	5.27E-08	4.85E-08	3.12E-08	5.00E-02	1.00E-01
2,3,4,6,7,8-Hexa CDF	1.88E-07	1.04E-07	3.29E-07	1.82E-07	1.47E-07	8.14E-08	8.49E-08	4.71E-08	1.00E-01	1.00E-01
2,3,4,7,8-Penta CDF	1.63E-07	9.23E-08	3.02E-07	1.71E-07	1.27E-07	7.20E-08	7.52E-08	4.26E-08	5.00E-01	1.00E+00
2,3,7,8-Tetra CDD	2.25E-07	1.28E-07	4.28E-07	2.44E-07	1.75E-07	9.99E-08	1.05E-07	5.97E-08	1.00E+00	1.00E+00
2,3,7,8-Tetra CDF	8.55E-07	4.71E-07	1.62E-06	8.92E-07	6.67E-07	3.68E-07	3.98E-07	2.19E-07	1.00E-01	1.00E+00
Octa CDD	2.76E-05	7.41E-06	2.28E-05	6.14E-06	2.15E-05	5.78E-06	1.00E-05	2.69E-06	1.00E-04	1.00E-04
Octa CDF	3.23E-06	9.68E-06	3.51E-06	1.05E-05	2.52E-06	7.55E-06	1.25E-06	3.75E-06	1.00E-04	1.00E-04
2,3,4,7,8-TCDD TEQ Dose	**7.79E-07**	**4.47E-07**	**1.36E-06**	**7.85E-07**	**1.21E-06**	**6.81E-07**	**7.14E-07**	**4.03E-07**	-	-

C.2.3 Non-radiological Dose for Terrestrial Receptors in the NSS-W Polygon

NSS-W - Terrestrial																
Receptor	Dose of Strontium by Pathway															
	Water		Soil		Grass		Eastern Cedar		Earthworm		Shrew		Robin		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Northern Short-tailed Shrew	9.79E-01	3.94E-01	2.04E+00	1.64E+00	-	-	-	-	8.29E-01	6.65E-01	-	-	-	-	3.85E+00	2.70E+00
White-tailed Deer	2.67E-01	1.07E-01	9.24E-02	7.41E-02	2.01E+00	1.61E+00	2.01E+00	1.61E+00	-	-	-	-	-	-	4.38E+00	3.40E+00
Red Fox	4.01E-01	1.61E-01	1.11E-01	8.87E-02	3.62E-01	2.90E-01	-	-	-	-	1.24E-02	8.70E-03	2.74E-03	2.12E-03	8.88E-01	5.51E-01
American Robin	6.23E-01	2.51E-01	3.18E+00	2.55E+00	3.24E+00	2.60E+00	-	-	1.50E+00	1.21E+00	-	-	-	-	8.54E+00	6.60E+00
Wild Turkey	1.46E-01	5.86E-02	8.89E+00	7.13E+00	1.61E-01	1.29E-01	4.82E-01	3.87E-01	8.29E-03	6.64E-03	-	-	-	-	9.68E+00	7.71E+00
Bee	-	-	-	-	2.27E+05	1.82E+05	-	-	-	-	-	-	-	-	2.27E+05	1.82E+05

RWOS1 - Terrestrial														
Receptor	Dose of Strontium by Pathway													
	Soil		Grass		Eastern Cedar		Earthworm		Shrew		Robin		Total Dose	
	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM	Max	UCLM
Northern Short-tailed Shrew	1.11E+00	6.75E-01	-	-	-	-	4.51E-01	2.74E-01	-	-	-	-	1.56E+00	9.49E-01
White-tailed Deer	5.03E-02	3.05E-02	1.09E+00	6.64E-01	1.09E+00	6.64E-01	-	-	-	-	-	-	2.24E+00	1.36E+00
Red Fox	6.02E-02	3.66E-02	1.97E-01	1.20E-01	-	-	-	-	5.04E-03	3.06E-03	1.38E-03	8.40E-04	2.63E-01	1.60E-01
American Robin	1.73E+00	1.05E+00	1.76E+00	1.07E+00	-	-	8.19E-01	4.97E-01	-	-	-	-	4.31E+00	2.62E+00
Wild Turkey	4.84E+00	2.94E+00	8.75E-02	5.31E-02	2.62E-01	1.59E-01	4.51E-03	2.74E-03	-	-	-	-	5.19E+00	3.15E+00
Bee	-	-	1.24E+05	7.52E+04	-	-	-	-	-	-	-	-	1.24E+05	7.52E+04

Appendix D Theoretical Basis and Input Parameters used in the Calculations of Doses to Non-Human Biota

D.1 Introduction

Radiological dose calculations were estimated using the Ecometrix software IMPACT DRL Version 5.5.2 (IMPACT). IMPACT is consistent with the equations outlined in CSA N288.1 and the methods outlined in CSA N288.6 (CSA, 2012, 2020). IMPACT uses the specific activity model for tritium and C-14 as per CSA N288.1 and as recommended by CSA N288.6.

D.2 Theoretical Basis for Calculation of Radiation Dose to Non-Human Biota

The radiation doses for the aquatic biota were estimated using the methods outlined in CSA N288.6. 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 in the equation is for semi-infinite exposure to activity in water, for the time the organism spends at water surface, or at sediment surface, and for semi-infinite exposure to activity in sediment, for 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 the external dose component is driven by soil rather than water and sediment. The equations used to estimate radiation dose are:

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

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))
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)

For aquatic riparian biota, such as Muskrats and waterfowl, sediment was substituted for soil in calculating the external dose, since these animals are typically in shoreline situations.

The total radiation dose to biota is the sum of the internal and external dose components for each radionuclide (D_{int} + D_{ext}). Exposures through the air immersion and inhalation pathways are considered to be minor compared to the ingestion pathway, and were ignored, with the exception of noble gases, which were initially considered (CSA, 2020)

The dose coefficients and occupancy factors used in the radiological dose estimation are provided in Section 4.2.5 and 4.2.2 respectively.

D.3 Non-Radiological Dose Concentrations

The non-radiological dose (D_{ing}) for mammals and birds was estimated using the methods described in CSA (2012), as follows:

$$D_{ing} = \frac{C_x \cdot I_x}{W}$$

where,

C_x	=	concentration in the ingested item (x) (mg/kg)
I_x	=	ingestion rate of item x (kg/day)
W	=	body weight of consumer (kg fw)

For receptors that drink from contaminated water, the drinking water component was considered. The concentrations in the water and the ingestion rate were in units of volume. In addition, for receptors that have incidental contaminated soil or sediment ingestion, this pathway was considered on a dry weight basis. Other ingested items (foods) were considered on a fresh weight basis. As with the radiological dose calculations, inhalation exposure is considered minor compared to the ingestion exposure, and was ignored (CSA, 2012).

D.4 Tissue Concentration Calculations

In cases where tissue concentrations (C_t) were not measured in plants, fruits, invertebrates or fish, the tissue concentrations were derived using bioaccumulation factors (BAFs), as per CSA N288.6, 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 (TFs), or biomagnification factors (BMFs) and the concentrations in their food, as follows:

$$C_t = \sum C_x \cdot I_x \cdot TF = C_f \cdot BMF$$

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 times the transfer factor:

$$BMF = \sum I_x \cdot TF$$

The ingestion rates, BAFs and TFs used for the calculation of tissue concentrations in biota are further described in Section 4.2.1and 4.2.3.

D.5 Specific Activity Model for Tritium

IMPACT was used to estimate tritium and C-14 tissue concentrations using specific activity models as outlined in CSA (2014) and as recommended in Clause 7.3.4.3.7 of CSA (CSA, 2014).

Aquatic BAFs for tritium 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 concentrations in plant, invertebrate and fish tissues. Therefore, the BAF (L/kg-fw) is:

$$BAF_{aHTO} = 1 - DW_a$$

$$BAF_{pHTO} = 1 - DW_p$$

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 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:

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

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

where,

DW_{aa} = dry weight of aquatic animal food product 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 D-1.

Table D-1: Summary of BAFs for Tritium, OBT and Carbon-14

Receptor	Units	Tritium	OBT	Carbon-14	References
Fish	L/kg fw	7.50E-01	1.40E-01	5.70E+03	CSA, 2020
Turtles, Snakes and Frogs	L/kg fw	7.50E-01	1.40E-01	5.70E+03	CSA, 2020 using fish as a surrogate
Aquatic Plants	L/kg fw	7.50E-01	1.10E-01	5.90E+03	CSA, 2020
Benthic Invertebrates	L/kg fw	7.50E-01	1.40E-01	5.20E+03	CSA, 2020

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

For HTO and OBT, the majority of the tritium taken into the animal is from water ingestion and food consumption. The soil ingestion pathway is negligible for HTO and OBT. Consistent with the CSA equations, IMPACT was used to determine the transfer of HTO to animals ($P_{HTOwater\_animal}$, L/kg-fw) through water ingestion and is calculated as follows (CSA, 2020):

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

where,

k_{aw} = fraction of water from contaminated sources
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)

Similarly, IMPACT was used to determine the transfer of OBT to animals ($P_{OBTwater\_animal}$, L/kg-fw) through water ingestion, which is calculated as follows:

$$P_{OBTwater-animal} = P_{HTOwater-animal} \cdot f'_{OBT}(1 - DW_a)$$

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 , and is calculated as follows (CSA, 2020):

$$P_{HTOfood-animal} = k_{af}\left((1 - f_{OBT}) \cdot fw - dw\right) \cdot (1 - DW_a)/\left(1 - DW_p\right)$$

where,

k_{af} = fraction of food from contaminated sources
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
$1-DW_a$ = water content of the animal product (L water/kg-fw)
$1-DW_p$ = 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 using the specific activity model from CSA, and is calculated as follows (CSA, 2020):

$$P_{OBTfood-animal} = k_{af} \cdot \left((1 - f_{OBT} \cdot f_{w-pw} + 0.5 f_{w-dw})/DW_p \cdot WE_p\right)$$

where,

k_{af} = fraction of food from contaminated sources
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
WE_a = water equivalent of the animal product 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 products (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.

Input parameters for the specific activity models can be found in Table D-2.

Table D-2: Input Parameters for Specific Activity Calculations for Tritium and Carbon-14

Receptor	f_{w_fw}	f_{w_pw}	f_{w_dw}	f_{OBT}	S_a (gC/kg-fw)
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
White-tailed Deer	0.33	0.582	0.081	0.11	201
Common Shrew	0.413	0.509	0.071	0.11	201
Bald Eagle	0.22	0.65	0.121	0.10	244
Red fox	0.413	0.509	0.071	0.11	201
Little Brown Bat	0.413	0.509	0.071	0.11	201
Wild Turkey	0.22	0.65	0.121	0.10	244

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

D.6 Specific Activity Model for Carbon-14

Aquatic BAFs for C-14 assume that the C-14 to stable carbon ratio in aquatic animals 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, S_w is 0.0213 gC/L (2020). The stable carbon content for fish of 121.75 gC/kg-dw was used (2020). The fish stable carbon content was considered appropriate for frogs, water snakes and turtles. For freshwater invertebrates the stable carbon content for marine crustaceans of 111 gC/kg-fw was considered appropriate. For aquatic plants the stable carbon content for terrestrial plants of 500 gC/kg-dw or 125 gC/kg-fw was considered appropriate (2020).

The stable carbon concentrations for terrestrial plants, fruits and terrestrial invertebrates are presented in Table D-3.

Table D-3 Stable Carbon Content for Food Types

Food Type	Stable Carbon Content (S_a, S_p) (gC/kg-fw)	Reference
Aquatic Plants	125	CSA, 2020
Benthic Invertebrates	111	CSA, 2020
Fish	30.4	CSA, 2020
Earthworms	111	CSA, 2020
Grass/Eastern White Cedar	100	CSA, 2020
Mallard	244	CSA, 2020
Muskrat	201	CSA, 2020
American Robin	244	CSA, 2020

BAFs for terrestrial plants and soil invertebrates are not required for modelling tritium and C-14 but are handled through the transfer from air as outlined in Clause 6.4.9.2 of 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 (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,

S_a = stable carbon content in the animal (gC/kg-fw), X_{5_C} (2020)
S_p = stable carbon content in the food (gC/kg-fw), ($X_{4\_C} \cdot DW_p$ (2020)

The stable carbon content in the animal was obtained from CSA. 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 (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. N288.1 has noted this, and has used poultry values for wild waterfowl.

For each receptor, the transfer from each food item is calculated separately based on the carbon content of the food item (S_p). Input parameters for the specific activity models can be found in Table D- 3.

D.7 Dispersion Models

HTO concentrations were not measured in soil for Polygon C, D and E. IMPACT version 5.5.2 was used to estimate HTO concentrations in pore water based on atmospheric emissions of HTO and elemental tritium from 2016 to 2019, based on a maximum monthly emissions and average monthly emission. Emissions are modelled conservatively as a ground level release. Uncertainties in the model are discussed in Section 4.6.

IMPACT follows the CSA N288.1-20 model which uses a number of site-specific input parameters that are specified in N288.1 based on previous model calibrations. Additional model calibrations were not performed for this assessment.

D.8 Air Concentrations Used in Dose Calculation

In this report, Tritium (HTO), C-14, Cs-134, Cs-137, Co-60 and I-131 were selected for dose calculation. These radionuclides were selected because of their prevalence in the environment and their relevance to the emission of NSS-W and other nuclear facilities at the Bruce nuclear site, specifically BNGS-A and BNGS-B which are the major contributors to radiological emissions. The concentrations of these radionuclides in environmental media such as surface water, soil, and vegetation have been measured as discussed in Section 4.0. For air, the estimated concentrations, as presented below, were used for the dose calculation.

Radionuclide concentrations in air were estimated using the IMPACT code, based on the emission data for the period of 2016 to 2020 as presented in Section 2.2.9.1. The meteorological data for the Bruce nuclear site for the same period were used to derive Triple Joint Frequency (TJF) of wind speed, direction and stability class (Table D-13), which is the input data to the code IMPACT.

The air concentrations were estimated with IMPACT at all receptor locations as presented in Section 4.3.1.2.

Appendix E Sample Calculations

Table E.1: Sample Calculation for SRD Benthic Invertebrate Dose Calculations for Cobalt-60

Parameter	Calculation	Cobalt-60 (Radiological Dose)		
		Value	Unit	Source
Environmental Media Concentrations				
SRD Max Water Concentration	A	8.16E-01	Bq/L	Table 4-27
SRD Max Sediment Concentration (dry weight)	B	9.97E-01	Bq/kg dw	Table 4-27
Moisture content	C'	8.00E-01	unitless	Assumption
Dry Weight Fraction of Sediment (based on moisture conter	C	2.00E-01	kg dw/ kg fw	Calculated
SRD Sediment Concentration (fresh weight)	D=B*C	1.99E-01	Bq/kg fw	Calculated
Benthic Invertebrate Internal Dose (radiological)				
Bioaccumulation Factor - Benthic Invertebrate	E	1.10E+02	L/kg fw	Table 4-16
Modelled Benthic Invertebrate Tissue Concentration	F = A * E	8.98E+01	Bq/kg fw	Calculated
Dose Conversion Factor (Internal)	G	5.20E-05	(µGy/hr)/(Bq/kg fw)	Table 4-20
Internal Dose	H = F * G	4.67E-03	µGy/hr	Calculated
Internal Dose (converted units)	H' = H * 24 h/d / 1000 µGy/mGy	1.12E-04	mGy/d	Calculated
Benthic Invertebrate External Dose (radiological)				
Occupancy Factor, Water	I	0.00E+00	unitless	Table 4-15
Occupancy Factor, Water Surface	J	0.00E+00	unitless	Table 4-15
Occupancy Factor, Sediment	K	1.00E+00	unitless	Table 4-15
Occupancy Factor, Sediment Surface	L	0.00E+00	unitless	Table 4-15
Dose Conversion Factor (External)	M	1.40E-03	(µGy/hr)/(Bq/kg)	Table 4-20
Contribution of Water to External Dose	N = M * (I + 0.5*J + 0.5*L) * A	0.00E+00	µGy/hr	Calculated
Contribution of Sediment to External Dose	O = M * (K + 0.5*L) * D	2.79E-04	µGy/hr	Calculated
External Dose	P = N + O	2.79E-04	µGy/hr	Calculated
External Dose (converted units)	P' = P * 24 h/d / 1000 µGy/mGy	6.70E-06	mGy/d	Calculated
Benthic Invertebrate Total Dose (radiological)				
Total Dose	Q = H + P	4.95E-03	µGy/hr	Calculated
Total Dose (converted units)	Q' = H' + P'	1.19E-04	mGy/d	Calculated

Table E.2: Sample Calculation for SRD Mallard Dose Calculations for Cobalt-60

Parameter	Calculation	Cobalt-60 (Radiological Dose)		
		Value	Unit	Source
Environmental Media Concentrations				
SRD Water Concentration	A	8.16E-01	Bq/L	Table 4-27
SRD Sediment Concentration (dry weight)	B	9.97E-01	Bq/kg dw	Table 4-27
Sediment Dry Bulk Density	C	4.00E-01	kg dw/ L	CSA N288.1-14
Mixing Depth	D	5.00E-02	m	Assumption
SRD Sediment Surface Concentration (dry weight)	E = B * C * D * 1000 L/m^3	1.99E+01	Bq dw/ m^2	Calculated
Aquatic Plant (Cattail) Concentration				
Bioaccumulation Factor - Cattail	Y	7.90E+02	L/kg fw	Table 4-16
SRD Aquatic Plant Concentration (fresh weight)	F	6.45E+02	Bq/kg fw	Calculated
Benthic Invertebrate Concentration				
Bioaccumulation Factor - Benthic Invertebrates	G	1.10E+02	L/kg fw	Table 4-16
Benthic Invertebrate Tissue Concentration	H = A * G	8.98E+01	Bq/kg fw	Calculated
Mallard Exposure Factors				
Intake Rate, Water	I	7.20E-02	L/d	Table 4-14
Intake Rate, Sediment	J	1.98E-03	kg dw/d	Table 4-14
Intake Rate, Aquatic Plant	K	6.00E-02	kg/d fw	Table 4-14
Intake Rate, Aquatic Invertebrate	L	1.80E-01	kg/d fw	Table 4-14
Fraction of Time Spent on Site	M	1.00E+00	unitless	Section 4.2.2
Mallard Internal Dose (radiological)				
Ingestion Transfer Factor - Mallard	N	1.42E+00	d/kg fw	Table 4-19
Mallard Tissue Concentration	O = M*N*(A*I+B*J+F*K+H*L)	7.80E+01	Bq/kg fw	Calculated
Dose Conversion Factor (Internal)	P	2.38E-04	(µGy/hr)/(Bq/kg fw)	Table 4-22
Internal Dose	Q = O * P	1.85E-02	µGy/hr	Calculated
Internal Dose (converted units)	Q' = Q * 24 h/d / 1000 µGy/mGy	4.44E-04	mGy/d	Calculated
Mallard External Dose (radiological)				
Occupancy Factor, Sediment - Mallard	R	0.00E+00	unitless	Table 4.15
Occupancy Factor, Sediment Surface - Mallard	S	5.00E-01	unitless	Table 4.15
Dose Conversion Factor (External, in soil)	T	0.00E+00	(µGy/hr)/(Bq/kg)	-
Dose Conversion Factor (External, on soil)	U	7.50E-06	(µGy/hr)/(Bq/m^2)	Table 4-22
External Dose	V = M * (T * R * E + U * S * E)	7.48E-05	µGy/hr	Calculated
External Dose (converted units)	V' = V * 24 h/d / 1000 µGy/mGy	1.80E-06	mGy/d	Calculated
Mallard Total Dose (radiological)				
Total Dose	X = V + Q	1.86E-02	µGy/hr	Calculated
Total Dose (converted units)	X' = V' + Q'	4.46E-04	mGy/d	Calculated

Table E.3: Sample Calculation for WWMF-SRD White-tailed Deer Dose Calculations for Cobalt-60

Parameter	Calculation	Cobalt-60 (Radiological Dose)		
		Value	Unit	Source
Environmental Media Concentrations				
SRD Water Concentration	A	8.16E-01	Bq/L	Table 4-27
WWMF Loam Concentration (dry weight)	B	1.11E-01	Bq/kg dw	Table 4-25
Grass Concentration				
Soil to Plant Transfer Factor	C	4.70E-02	(Bq/kg dw plant)/(Bq/kg dw soil)	CSA N288.1-14
Dry/Fresh Weight Ratio	D	2.00E-01	kg(dw)/kg(fw)	CSA N288.1-14
WWMF Terrestrial Vegetation/Grass (dry weight)	E = B*C*D	1.04E-03	Bq/kg dw	Calculated
WWMF Terrestrial Vegetation/Cedar (dry weight)	F = B*C*D	1.04E-03	Bq/kg dw	Calculated
Deer Exposure Factors				
Intake Rate, Water	G	4.50E+00	L/d	Table 4-14
Intake Rate, Soil	H	4.50E-02	kg dw/d	Table 4-14
Intake Rate, Grass (dry weight)	I	1.13E+00	kg dw/d	Table 4-14
Intake Rate, Cedar (dry weight)	J	1.13E+00	kg dw/d	Table 4-14
Dry/Fresh Weight Ratio	K	2.00E-01	kg(dw)/kg(fw)	CSA N288.1-20
Fraction of Time Spent on Site	L	1.00E+00	unitless	Section 4.2.2
Deer Internal Dose (radiological)				
Transfer Factor Ingestion - Deer	M	2.05E-03	d/kg fw	Table 4-18
Deer Tissue Concentration	N = E*M (K*G+B*H+E*J/K+F*J/K)	7.56E-03	Bq/kg fw	Calculated
Dose Conversion Factor (Internal)	O	8.33E-04	(µGy/hr)/(Bq/kg fw)	Table 4-22
Internal Dose	P = N * O	6.30E-06	µGy/hr	Calculated
Internal Dose (converted units)	P' = P * 24 h/d / 1000 µGy/mGy	1.51E-07	mGy/d	Calculated
Deer External Dose (radiological)				
Occupancy Factor, Soil - Deer	Q	0.00E+00	unitless	Table 4-15
Occupancy Factor, Soil Surface - Deer	R	1.00E+00	unitless	Table 4-15
Dose Conversion Factor (External, in soil)	S	0.00E+00	(µGy/hr)/(Bq/kg)	-
Dose Conversion Factor (External, on soil)	T	4.04E-06	(µGy/hr)/(Bq/m^2)	Table 4-22
Dry Bulk Density of Soil (Loam)	U	1.30E+03	kg (dw)/m3	CSA N288.1-20
Soil Thickness	V	2.00E-01	m	CSA N288.1-20
External Dose	U = L * (Q * S * (B*U*V)+ R * T*(B*U*V))	1.17E-04	µGy/hr	Calculated
External Dose (converted units)	U' = U * 24 h/d / 1000 µGy/mGy	2.80E-06	mGy/d	Calculated
Deer Total Dose (radiological)				
Total Dose	V = P + U	1.23E-04	µGy/hr	Calculated
Total Dose (converted units)	V ' = P' + U"	2.95E-06	mGy/d	Calculated

Table E-4: Sample Calculation for SRD Mallard Tissue Concentration for Manganese

Parameter	Calculation	Manganese (Toxic Dose)		
		Value	Unit	Source
Environmental Media Concentrations				
South Railway Ditch Max Water Concentration	A	3.98E-01	mg/L	Table 3-12
South Railway Ditch Max Sediment Concentration (dry weight)	B	1.10E+03	mg/kg dw	Table 4-11
South Railway Ditch Max Cattail Concentration (wet weight)	C	2.37E+01	mg/kg fw	
Benthic Invertebrate Concentration				
Bioaccumulation Factor - Surface Water to Benthic Invertebrate	D	6.90E+02	L/kg fw	Table 4-16
Benthic Invertebrate Tissue Concentration	E = A * D	2.75E+02	mg/kg fw	Calculated
Mallard Exposure Factors				
Intake Rate, Water	F	7.20E-02	L/d	Table 4-14
Intake Rate, Sediment	G	1.98E-03	kg dw/d	Table 4-14
Intake Rate, Aquatic Plant	H	6.00E-02	kg/d fw	Table 4-14
Intake Rate, Benthic Invertebrate	I	1.80E-01	kg/d fw	Table 4-14
Fraction of Time Spent on Site	J	1.00E+00	unitless	Section 4.2.2
Body Weight	K	1.20E+00	kg	Table 4-14
Mallard Exposure Dose (toxic)				
Exposure Dose, Water	L = A * F * J / K	2.39E-02	mg/kg d	Calculated
Exposure Dose, Sediment	M = B * G * J / K	1.82E+00	mg/kg d	Calculated
Exposure Dose, Aquatic Plant	N = C * H * J / K	1.19E+00	mg/kg d	Calculated
Exposure Dose, Aquatic Invertebrate	O = E * I * J / K	4.12E+01	mg/kg d	Calculated
Total Exposure Dose	P = L + M + N + O	4.42E+01	mg/kg d	Calculated
Mallard HQ (toxic)				
Toxicity Reference Value - Birds	Q	9.77E+02	mg/kg d	Table 4-47
Hazard Quotient	R = P / Q	4.53E-02	unitless	Calculation

Table E-5: Sample Calculation for NSS-W White-tailed Deer Tissue Concentration for Strontium

Parameter	Calculation	Strontium (Toxic Dose)		
		Value	Unit	Source
Environmental Media Concentrations				
South Railway Ditch Max Water Concentration	A	4.45E+00	mg/L	Table 3-12
NSS-W Max Soil Concentration (dry weight)	B	1.54E+02	mg/kg dw	Table 4-12
Terrestrial Plant Concentration - Grass				
Bioaccumulation Factor - Soil to Plant	C	8.70E-01	unitless	Table 4-17
Grass Tissue Concentration	D = B * C	1.34E+02	mg/kg dw	Calculated
Terrestrial Plant Concentration - Eastern White Cedar				
Bioaccumulation Factor - Soil to Plant	C	8.70E-01	unitless	Table 4-17
Eastern White Cedar Tissue Concentration	E = B * C	1.34E+02	mg/kg dw	Calculated
Deer Exposure Factors				
Intake Rate, Water	F	4.50E+00	L/d	Table 4-14
Intake Rate, Soil	G	4.50E-02	kg dw/d	Table 4-14
Intake Rate, Terrestrial Plant (Grass)	H	1.13E+00	kg fw/d	Table 4-14
Intake Rate, Terrestrial Plant (Eastern White Cedar)	I	1.13E+00	kg fw/d	Table 4-14
Fraction of Time Spent on Site	J	1.00E+00	unitless	Section 4.2.2
Body Weight	K	7.50E+01	kg	Table 4-14
Deer Exposure Dose (toxic)				
Exposure Dose, Water	L = A * F * J / K	2.67E-01	mg/kg d	Calculated
Exposure Dose, Soil	M = B * G * J / K	9.24E-02	mg/kg d	Calculated
Exposure Dose, Terrestrial Plant (Grass)	N = D * H * J / K	2.01E+00	mg/kg d	Calculated
Exposure Dose, Terrestrial Plant (Eastern White Cedar)	O = E * H * J / K	2.01E+00	mg/kg d	Calculated
Total Exposure Dose	P = L + M + N + O	4.38E+00	mg/kg d	Calculated
Deer HQ (toxic)				
Toxicity Reference Value - Mammals	Q	2.63E+02	mg/kg d	Table 4-46
Hazard Quotient	R = P / Q	1.66E-02	unitless	Calculation

Table E-6: Sample Calculation for SRD Mallard Tissue Concentration for 2,3,7,8-TCDD TEQ

Parameter	Calculation	2,3,7,8-TCDD TEQ (Toxic Dose)		
		Value	Unit	Source
Environmental Media Concentrations				
South Railway Ditch Max Water Concentrations				
1,2,3,4,6,7,8-Hepta CDD	A1	4.67E-08	mg/L	Appendix F
1,2,3,4,6,7,8-Hepta CDF	A2	5.76E-08	mg/L	Appendix F
1,2,3,4,7,8,9-Hepta CDF	A3	3.50E-09	mg/L	Appendix F
1,2,3,4,7,8-Hexa CDD	A4	0.00E+00	mg/L	Appendix F
1,2,3,4,7,8-Hexa CDF	A5	1.64E-09	mg/L	Appendix F
1,2,3,6,7,8-Hexa CDD	A6	1.60E-09	mg/L	Appendix F
1,2,3,6,7,8-Hexa CDF	A7	4.00E-09	mg/L	Appendix F
1,2,3,7,8,9-Hexa CDD	A8	1.69E-09	mg/L	Appendix F
1,2,3,7,8,9-Hexa CDF	A9	0.00E+00	mg/L	Appendix F
1,2,3,7,8-Penta CDD	A10	0.00E+00	mg/L	Appendix F
1,2,3,7,8-Penta CDF	A11	0.00E+00	mg/L	Appendix F
2,3,4,6,7,8-Hexa CDF	A12	2.39E-09	mg/L	Appendix F
2,3,4,7,8-Penta CDF	A13	0.00E+00	mg/L	Appendix F
2,3,7,8-Tetra CDD	A14	0.00E+00	mg/L	Appendix F
2,3,7,8-Tetra CDF	A15	0.00E+00	mg/L	Appendix F
Octa CDD	A16	2.30E-07	mg/L	Appendix F
Octa CDF	A17	6.54E-08	mg/L	Appendix F
South Railway Ditch Max Sediment Concentrations				
1,2,3,4,6,7,8-Hepta CDD	B1	5.08E-04	mg/kg dw	Appendix F
1,2,3,4,6,7,8-Hepta CDF	B2	2.48E-04	mg/kg dw	Appendix F
1,2,3,4,7,8,9-Hepta CDF	B3	1.60E-05	mg/kg dw	Appendix F
1,2,3,4,7,8-Hexa CDD	B4	9.78E-06	mg/kg dw	Appendix F
1,2,3,4,7,8-Hexa CDF	B5	1.60E-05	mg/kg dw	Appendix F
1,2,3,6,7,8-Hexa CDD	B6	1.95E-05	mg/kg dw	Appendix F
1,2,3,6,7,8-Hexa CDF	B7	2.30E-05	mg/kg dw	Appendix F
1,2,3,7,8,9-Hexa CDD	B8	2.38E-05	mg/kg dw	Appendix F
1,2,3,7,8,9-Hexa CDF	B9	0.00E+00	mg/kg dw	Appendix F
1,2,3,7,8-Penta CDD	B10	3.91E-06	mg/kg dw	Appendix F
1,2,3,7,8-Penta CDF	B11	3.03E-06	mg/kg dw	Appendix F
2,3,4,6,7,8-Hexa CDF	B12	1.57E-05	mg/kg dw	Appendix F
2,3,4,7,8-Penta CDF	B13	2.81E-06	mg/kg dw	Appendix F
2,3,7,8-Tetra CDD	B14	3.65E-07	mg/kg dw	Appendix F
2,3,7,8-Tetra CDF	B15	1.94E-06	mg/kg dw	Appendix F
Octa CDD	B16	2.34E-03	mg/kg dw	Appendix F
Octa CDF	B17	3.56E-04	mg/kg dw	Appendix F

Biota-Sediment Accumulation Factors				
1,2,3,4,6,7,8-Hepta CDD	C1	1.30E-02	L/kg fw	Burkhard et al., 2004
1,2,3,4,6,7,8-Hepta CDF	C2	3.61E-02	L/kg fw	Burkhard et al., 2004
1,2,3,4,7,8,9-Hepta CDF	C3	3.61E-02	L/kg fw	Burkhard et al., 2004
1,2,3,4,7,8-Hexa CDD	C4	2.71E-02	L/kg fw	Burkhard et al., 2004
1,2,3,4,7,8-Hexa CDF	C5	8.11E-02	L/kg fw	Burkhard et al., 2004
1,2,3,6,7,8-Hexa CDD	C6	2.71E-02	L/kg fw	Burkhard et al., 2004
1,2,3,6,7,8-Hexa CDF	C7	8.11E-02	L/kg fw	Burkhard et al., 2004
1,2,3,7,8,9-Hexa CDD	C8	2.71E-02	L/kg fw	Burkhard et al., 2004
1,2,3,7,8,9-Hexa CDF	C9	8.11E-02	L/kg fw	Burkhard et al., 2004
1,2,3,7,8-Penta CDD	C10	1.18E-01	L/kg fw	Burkhard et al., 2004
1,2,3,7,8-Penta CDF	C11	2.23E-01	L/kg fw	Burkhard et al., 2004
2,3,4,6,7,8-Hexa CDF	C12	8.11E-02	L/kg fw	Burkhard et al., 2004
2,3,4,7,8-Penta CDF	C13	2.21E-01	L/kg fw	U.S. EPA (2016)
2,3,7,8-Tetra CDD	C14	7.41E-01	L/kg fw	Burkhard et al., 2004
2,3,7,8-Tetra CDF	C15	5.01E-01	L/kg fw	Burkhard et al., 2004
Octa CDD	C16	6.22E-03	L/kg fw	Burkhard et al., 2004
Octa CDF	C17	1.07E-02	L/kg fw	Burkhard et al., 2004
Aquatic Plant Tissue Concentration				
1,2,3,4,6,7,8-Hepta CDD	D1 = B1 * C1	6.59E-06	mg/kg fw	Calculated
1,2,3,4,6,7,8-Hepta CDF	D2 = B2 * C2	8.95E-06	mg/kg fw	Calculated
1,2,3,4,7,8,9-Hepta CDF	D3 = B3 * C3	5.77E-07	mg/kg fw	Calculated
1,2,3,4,7,8-Hexa CDD	D4 = B4 * C4	2.65E-07	mg/kg fw	Calculated
1,2,3,4,7,8-Hexa CDF	D5 = B5 * C5	1.30E-06	mg/kg fw	Calculated
1,2,3,6,7,8-Hexa CDD	D6 = B6 * C6	5.28E-07	mg/kg fw	Calculated
1,2,3,6,7,8-Hexa CDF	D7 = B7 * C7	1.86E-06	mg/kg fw	Calculated
1,2,3,7,8,9-Hexa CDD	D8 = B8 * C8	6.44E-07	mg/kg fw	Calculated
1,2,3,7,8,9-Hexa CDF	D9 = B9 * C9	0.00E+00	mg/kg fw	Calculated
1,2,3,7,8-Penta CDD	D10 = B10 * C10	4.61E-07	mg/kg fw	Calculated
1,2,3,7,8-Penta CDF	D11 = B11 * C11	6.75E-07	mg/kg fw	Calculated
2,3,4,6,7,8-Hexa CDF	D12 = B12 * C12	1.27E-06	mg/kg fw	Calculated
2,3,4,7,8-Penta CDF	D13 = B13 * C13	6.21E-07	mg/kg fw	Calculated
2,3,7,8-Tetra CDD	D14 = B14 * C14	2.71E-07	mg/kg fw	Calculated
2,3,7,8-Tetra CDF	D15 = B15 * C15	9.71E-07	mg/kg fw	Calculated
Octa CDD	D16 = B16 * C16	1.46E-05	mg/kg fw	Calculated
Octa CDF	D17 = B17 * C17	3.82E-06	mg/kg fw	Calculated

Benthic Invertebrate Tissue Concentration				
1,2,3,4,6,7,8-Hepta CDD	E1 = B1 * C1	6.59E-06	mg/kg fw	Calculated
1,2,3,4,6,7,8-Hepta CDF	E2 = B2 * C2	8.95E-06	mg/kg fw	Calculated
1,2,3,4,7,8,9-Hepta CDF	E3 = B3 * C3	5.77E-07	mg/kg fw	Calculated
1,2,3,4,7,8-Hexa CDD	E4 = B4 * C4	2.65E-07	mg/kg fw	Calculated
1,2,3,4,7,8-Hexa CDF	E5 = B5 * C5	1.30E-06	mg/kg fw	Calculated
1,2,3,6,7,8-Hexa CDD	E6 = B6 * C6	5.28E-07	mg/kg fw	Calculated
1,2,3,6,7,8-Hexa CDF	E7 = B7 * C7	1.86E-06	mg/kg fw	Calculated
1,2,3,7,8,9-Hexa CDD	E8 = B8 * C8	6.44E-07	mg/kg fw	Calculated
1,2,3,7,8,9-Hexa CDF	E9 = B9 * C9	0.00E+00	mg/kg fw	Calculated
1,2,3,7,8-Penta CDD	E10 = B10 * C10	4.61E-07	mg/kg fw	Calculated
1,2,3,7,8-Penta CDF	E11 = B11 * C11	6.75E-07	mg/kg fw	Calculated
2,3,4,6,7,8-Hexa CDF	E12 = B12 * C12	1.27E-06	mg/kg fw	Calculated
2,3,4,7,8-Penta CDF	E13 = B13 * C13	6.21E-07	mg/kg fw	Calculated
2,3,7,8-Tetra CDD	E14 = B14 * C14	2.71E-07	mg/kg fw	Calculated
2,3,7,8-Tetra CDF	E15 = B15 * C15	9.71E-07	mg/kg fw	Calculated
Octa CDD	E16 = B16 * C16	1.46E-05	mg/kg fw	Calculated
Octa CDF	E17 = B17 * C17	3.82E-06	mg/kg fw	Calculated
Mallard Exposure Factors				
Intake Rate, Water	F	7.20E-02	L/d	Table 4-14
Intake Rate, Sediment	G	1.98E-03	kg dw/d	Table 4-14
Intake Rate, Aquatic Plant	H	6.00E-02	kg/d fw	Table 4-14
Intake Rate, Benthic Invertebrate	I	1.80E-01	kg/d fw	Table 4-14
Fraction of Time Spent on Site	J	1.00E+00	unitless	Section 4.2.2
Body Weight	K	1.20E+00	kg	Table 4-14

Mallard Exposure Dose (toxic)				
Exposure Dose, Water				
1,2,3,4,6,7,8-Hepta CDD	L1 = A1 * F * J / K	2.80E-09	mg/kg d	Calculated
1,2,3,4,6,7,8-Hepta CDF	L2 = A2 * F * J / K	3.46E-09	mg/kg d	Calculated
1,2,3,4,7,8,9-Hepta CDF	L3 = A3 * F * J / K	2.10E-10	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDD	L4 = A4 * F * J / K	0.00E+00	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDF	L5 = A5 * F * J / K	9.84E-11	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDD	L6 = A6 * F * J / K	9.60E-11	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDF	L7 = A7 * F * J / K	2.40E-10	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDD	L8 = A8 * F * J / K	1.01E-10	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDF	L9 = A9 * F * J / K	0.00E+00	mg/kg d	Calculated
1,2,3,7,8-Penta CDD	L10 = A10 * F * J / K	0.00E+00	mg/kg d	Calculated
1,2,3,7,8-Penta CDF	L11 = A11 * F * J / K	0.00E+00	mg/kg d	Calculated
2,3,4,6,7,8-Hexa CDF	L12 = A12 * F * J / K	1.43E-10	mg/kg d	Calculated
2,3,4,7,8-Penta CDF	L13 = A13 * F * J / K	0.00E+00	mg/kg d	Calculated
2,3,7,8-Tetra CDD	L14 = A14 * F * J / K	0.00E+00	mg/kg d	Calculated
2,3,7,8-Tetra CDF	L15 = A15 * F * J / K	0.00E+00	mg/kg d	Calculated
Octa CDD	L16 = A16 * F * J / K	1.38E-08	mg/kg d	Calculated
Octa CDF	L17 = A17 * F * J / K	3.92E-09	mg/kg d	Calculated
Exposure Dose, Sediment				
1,2,3,4,6,7,8-Hepta CDD	M1 = B1 * G * J / K	8.38E-07	mg/kg d	Calculated
1,2,3,4,6,7,8-Hepta CDF	M2 = B2 * G * J / K	4.09E-07	mg/kg d	Calculated
1,2,3,4,7,8,9-Hepta CDF	M3 = B3 * G * J / K	2.64E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDD	M4 = B4 * G * J / K	1.61E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDF	M5 = B5 * G * J / K	2.64E-08	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDD	M6 = B6 * G * J / K	3.22E-08	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDF	M7 = B7 * G * J / K	3.80E-08	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDD	M8 = B8 * G * J / K	3.93E-08	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDF	M9 = B9 * G * J / K	0.00E+00	mg/kg d	Calculated
1,2,3,7,8-Penta CDD	M10 = B10 * G * J / K	6.45E-09	mg/kg d	Calculated
1,2,3,7,8-Penta CDF	M11 = B11 * G * J / K	5.00E-09	mg/kg d	Calculated
2,3,4,6,7,8-Hexa CDF	M12 = B12 * G * J / K	2.59E-08	mg/kg d	Calculated
2,3,4,7,8-Penta CDF	M13 = B13 * G * J / K	4.64E-09	mg/kg d	Calculated
2,3,7,8-Tetra CDD	M14 = B14 * G * J / K	6.02E-10	mg/kg d	Calculated
2,3,7,8-Tetra CDF	M15 = B15 * G * J / K	3.20E-09	mg/kg d	Calculated
Octa CDD	M16 = B16 * G * J / K	3.86E-06	mg/kg d	Calculated
Octa CDF	M17 = B17 * G * J / K	5.87E-07	mg/kg d	Calculated

Exposure Dose, Aquatic Plant				
1,2,3,4,6,7,8-Hepta CDD	N1 = D1 * H * J / K	3.30E-07	mg/kg d	Calculated
1,2,3,4,6,7,8-Hepta CDF	N2 = D2 * H * J / K	4.47E-07	mg/kg d	Calculated
1,2,3,4,7,8,9-Hepta CDF	N3 = D3 * H * J / K	2.89E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDD	N4 = D4 * H * J / K	1.32E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDF	N5 = D5 * H * J / K	6.48E-08	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDD	N6 = D6 * H * J / K	2.64E-08	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDF	N7 = D7 * H * J / K	9.32E-08	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDD	N8 = D8 * H * J / K	3.22E-08	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDF	N9 = D9 * H * J / K	0.00E+00	mg/kg d	Calculated
1,2,3,7,8-Penta CDD	N10 = D10 * H * J / K	2.30E-08	mg/kg d	Calculated
1,2,3,7,8-Penta CDF	N11 = D11 * H * J / K	3.38E-08	mg/kg d	Calculated
2,3,4,6,7,8-Hexa CDF	N12 = D12 * H * J / K	6.36E-08	mg/kg d	Calculated
2,3,4,7,8-Penta CDF	N13 = D13 * H * J / K	3.10E-08	mg/kg d	Calculated
2,3,7,8-Tetra CDD	N14 = D14 * H * J / K	1.35E-08	mg/kg d	Calculated
2,3,7,8-Tetra CDF	N15 = D15 * H * J / K	4.86E-08	mg/kg d	Calculated
Octa CDD	N16 = D16 * H * J / K	7.28E-07	mg/kg d	Calculated
Octa CDF	N17 = D17 * H * J / K	1.91E-07	mg/kg d	Calculated
Exposure Dose, Benthic Invertebrate				
1,2,3,4,6,7,8-Hepta CDD	O1 = E1 * I * J / K	9.89E-07	mg/kg d	Calculated
1,2,3,4,6,7,8-Hepta CDF	O2 = E2 * I * J / K	1.34E-06	mg/kg d	Calculated
1,2,3,4,7,8,9-Hepta CDF	O3 = E2 * I * J / K	8.66E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDD	O4 = E4 * I * J / K	3.97E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDF	O5 = E5 * I * J / K	1.95E-07	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDD	O6 = E6 * I * J / K	7.92E-08	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDF	O7 = E7 * I * J / K	2.80E-07	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDD	O8 = E8 * I * J / K	9.67E-08	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDF	O9 = E9 * I * J / K	0.00E+00	mg/kg d	Calculated
1,2,3,7,8-Penta CDD	O10 = E10 * I * J / K	6.91E-08	mg/kg d	Calculated
1,2,3,7,8-Penta CDF	O11 = E11 * I * J / K	1.01E-07	mg/kg d	Calculated
2,3,4,6,7,8-Hexa CDF	O12 = E12 * I * J / K	1.91E-07	mg/kg d	Calculated
2,3,4,7,8-Penta CDF	O13 = E13 * I * J / K	9.31E-08	mg/kg d	Calculated
2,3,7,8-Tetra CDD	O14 = E14 * I * J / K	4.06E-08	mg/kg d	Calculated
2,3,7,8-Tetra CDF	O15 = E15 * I * J / K	1.46E-07	mg/kg d	Calculated
Octa CDD	O16 = E16 * I * J / K	2.18E-06	mg/kg d	Calculated
Octa CDF	O17 = E17 * I * J / K	5.72E-07	mg/kg d	Calculated

Total Exposure Dose				
1,2,3,4,6,7,8-Hepta CDD	P1 = L1 + M1 + N1 + O1	2.16E-06	mg/kg d	Calculated
1,2,3,4,6,7,8-Hepta CDF	P2 = L2 + M2 + N2 + O2	2.20E-06	mg/kg d	Calculated
1,2,3,4,7,8,9-Hepta CDF	P3 = L3 + M3 + N3 + O3	1.42E-07	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDD	P4 = L4 + M4 + N4 + O4	6.91E-08	mg/kg d	Calculated
1,2,3,4,7,8-Hexa CDF	P5 = L5 + M5 + N5 + O5	2.86E-07	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDD	P6 = L6 + M6 + N6 + O6	1.38E-07	mg/kg d	Calculated
1,2,3,6,7,8-Hexa CDF	P7 = L7 + M7 + N7 + O7	4.11E-07	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDD	P8 = L8 + M8 + N8 + O8	1.68E-07	mg/kg d	Calculated
1,2,3,7,8,9-Hexa CDF	P9 = L9 + M9 + N9 + O9	0.00E+00	mg/kg d	Calculated
1,2,3,7,8-Penta CDD	P10 = L10 + M10 + N10 + O10	9.86E-08	mg/kg d	Calculated
1,2,3,7,8-Penta CDF	P11 = L11 + M11 + N11 + O11	1.40E-07	mg/kg d	Calculated
2,3,4,6,7,8-Hexa CDF	P12 = L12 + M12 + N12 + O12	2.81E-07	mg/kg d	Calculated
2,3,4,7,8-Penta CDF	P13 = L13 + M13 + N13 + O13	1.29E-07	mg/kg d	Calculated
2,3,7,8-Tetra CDD	P14 = L14 + M14 + N14 + O14	5.47E-08	mg/kg d	Calculated
2,3,7,8-Tetra CDF	P15 = L15 + M15 + N15 + O15	1.97E-07	mg/kg d	Calculated
Octa CDD	P16 = L16 + M16 + N16 + O16	6.79E-06	mg/kg d	Calculated
Octa CDF	P17 = L17 + M17 + N17 + O17	1.35E-06	mg/kg d	Calculated
2,3,7,8-TCDD TEQ Conversion (Birds)				
Toxic Equivalent Factor (TEF) - Birds				
1,2,3,4,6,7,8-Hepta CDD	Q1	1.00E-03	unitless	CCME, 2002
1,2,3,4,6,7,8-Hepta CDF	Q2	1.00E-02	unitless	CCME, 2002
1,2,3,4,7,8,9-Hepta CDF	Q3	1.00E-02	unitless	CCME, 2002
1,2,3,4,7,8-Hexa CDD	Q4	5.00E-02	unitless	CCME, 2002
1,2,3,4,7,8-Hexa CDF	Q5	1.00E-01	unitless	CCME, 2002
1,2,3,6,7,8-Hexa CDD	Q6	1.00E-02	unitless	CCME, 2002
1,2,3,6,7,8-Hexa CDF	Q7	1.00E-01	unitless	CCME, 2002
1,2,3,7,8,9-Hexa CDD	Q8	1.00E-01	unitless	CCME, 2002
1,2,3,7,8,9-Hexa CDF	Q9	1.00E-01	unitless	CCME, 2002
1,2,3,7,8-Penta CDD	Q10	1.00E+00	unitless	CCME, 2002
1,2,3,7,8-Penta CDF	Q11	1.00E-01	unitless	CCME, 2002
2,3,4,6,7,8-Hexa CDF	Q12	1.00E-01	unitless	CCME, 2002
2,3,4,7,8-Penta CDF	Q13	1.00E+00	unitless	CCME, 2002
2,3,7,8-Tetra CDD	Q14	1.00E+00	unitless	CCME, 2002
2,3,7,8-Tetra CDF	Q15	1.00E+00	unitless	CCME, 2002
Octa CDD	Q16	1.00E-04	unitless	CCME, 2002
Octa CDF	Q17	1.00E-04	unitless	CCME, 2002

2,3,7,8-TCDD TEQ Dose				
1,2,3,4,6,7,8-Hepta CDD	R1 = P1 * Q1	2.16E-09	mg/kg d TEQ	Calculated
1,2,3,4,6,7,8-Hepta CDF	R2 = P2 * Q2	2.20E-08	mg/kg d TEQ	Calculated
1,2,3,4,7,8,9-Hepta CDF	R3 = P3 * Q3	1.42E-09	mg/kg d TEQ	Calculated
1,2,3,4,7,8-Hexa CDD	R4 = P4 * Q4	3.46E-09	mg/kg d TEQ	Calculated
1,2,3,4,7,8-Hexa CDF	R5 = P5 * Q5	2.86E-08	mg/kg d TEQ	Calculated
1,2,3,6,7,8-Hexa CDD	R6 = P6 * Q6	1.38E-09	mg/kg d TEQ	Calculated
1,2,3,6,7,8-Hexa CDF	R7 = P7 * Q7	4.11E-08	mg/kg d TEQ	Calculated
1,2,3,7,8,9-Hexa CDD	R8 = P8 * Q8	1.68E-08	mg/kg d TEQ	Calculated
1,2,3,7,8,9-Hexa CDF	R9 = P9 * Q9	0.00E+00	mg/kg d TEQ	Calculated
1,2,3,7,8-Penta CDD	R10 = P10 * Q10	9.86E-08	mg/kg d TEQ	Calculated
1,2,3,7,8-Penta CDF	R11 = P11 * Q11	1.40E-08	mg/kg d TEQ	Calculated
2,3,4,6,7,8-Hexa CDF	R12 = P12 * Q12	2.81E-08	mg/kg d TEQ	Calculated
2,3,4,7,8-Penta CDF	R13 = P13 * Q13	1.29E-07	mg/kg d TEQ	Calculated
2,3,7,8-Tetra CDD	R14 = P14 * Q14	5.47E-08	mg/kg d TEQ	Calculated
2,3,7,8-Tetra CDF	R15 = P15 * Q15	1.97E-07	mg/kg d TEQ	Calculated
Octa CDD	R16 = P16 * Q16	6.79E-10	mg/kg d TEQ	Calculated
Octa CDF	R17 = P17 * Q17	1.35E-10	mg/kg d TEQ	Calculated
Total TCDD TEQ Dose	S = R1 + R2 + R3 ... + R17	6.39E-07	mg/kg d TEQ	Calculated
Mallard HQ (toxic)				
Toxicity Reference Value - Birds	T	1.40E-04	mg/kg d	Table 4-47
Hazard Quotient	U = S / T	4.57E-03	unitless	Calculation

Appendix F Environmental Datasets by Polygon

SRD Cattail Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Metals	Aluminum	ppm	01-Sep-2020	01-Sep-2021	11	0	0	80.2	634	242.51	174.5	52.613
	Antimony	ppm	01-Sep-2020	01-Sep-2021	11	10	10	0.008258*	0.054996	0.032474*	0.014551	0.0043872
	Arsenic	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.0094144*	0.17148*	0.069722*	0.05948	0.017934
	Barium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	1.52	38.2	7.4509	10.391	3.1329
	Beryllium	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.0032583*	0.02471*	0.0093921*	0.0072305	0.0021801
	Bismuth	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.0012451*	0.018765*	0.0052933*	0.0049076	0.0014797
	Boron	ppm	01-Sep-2020	01-Sep-2021	11	0	0	1.55	6.37	2.4509	1.3625	0.41081
	Cadmium	ppm	01-Sep-2020	01-Sep-2021	11	10	10	-0.017228*	0.052552	0.0087717*	0.019831	0.0059793
	Calcium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	1390	14600	3670	3788.76	1142.35
	Cesium	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.0049374*	0.036112*	0.013085*	0.0097311	0.002934
	Chromium	ppm	01-Sep-2020	01-Sep-2021	11	2	2	0.010168*	0.15914	0.081687*	0.050171	0.015127
	Cobalt	ppm	01-Sep-2020	01-Sep-2021	11	0	0	0.0642	0.345	0.18121	0.11134	0.033569
	Copper	ppm	01-Sep-2020	01-Sep-2021	11	0	0	0.706	2.15	1.4136	0.4827	0.14554
	Iron	ppm	01-Sep-2020	01-Sep-2021	11	0	0	568	4250	2016.73	1201.4	362.24
	Lead	ppm	01-Sep-2020	01-Sep-2021	11	0	0	0.12	0.574	0.29009	0.15525	0.04681
	Lithium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	0.12	0.609	0.344	0.18607	0.056101
	Magnesium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	520	3290	1113.27	750.02	226.14
	Manganese	ppm	01-Sep-2020	01-Sep-2021	11	0	0	7.69	88.3	38.999	23.18	6.9891
	Mercury	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.0026589*	0.04*	0.015167*	0.010086	0.003041
	Molybdenum	ppm	01-Sep-2020	01-Sep-2021	11	1	1	0.048*	0.275	0.17218*	0.07008	0.02113
	Nickel	ppm	01-Sep-2020	01-Sep-2021	11	0	0	0.206	1.12	0.52091	0.30773	0.092783
	Phosphorus	ppm	01-Sep-2020	01-Sep-2021	11	0	0	40.7	1090	276.31	325.64	98.183
	Potassium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	283	3540	1782.27	1007.06	303.64
	Selenium	ppm	01-Sep-2020	01-Sep-2021	11	11	11	-0.062878*	0.18956*	0.042904*	0.064735	0.019518
	Silicon	ppm	01-Sep-2020	01-Sep-2021	11	0	0	192	2180	771.91	629.62	189.84
	Silver	ppm	01-Sep-2020	01-Sep-2021	11	3	3	0.011763*	0.22304	0.077071*	0.063907	0.019269
	Sodium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	879	9360	2449.91	2440.3	735.78
	Strontium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	20.2	136	43.755	36.346	10.959
	Sulphur	ppm	01-Sep-2020	01-Sep-2021	11	0	0	263	1510	815.36	418.05	126.05
	Thallium	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.0022708*	0.037559*	0.01416*	0.011411	0.0034406
	Thorium	ppm	01-Sep-2020	01-Sep-2021	11	11	11	0.009776*	0.046707*	0.031541*	0.014019	0.0042269
	Tin	ppm	01-Sep-2020	01-Sep-2021	11	7	7	0.016053*	0.099278	0.050848*	0.030162	0.0090941
	Titanium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	6.16	48.1	17.524	13.483	4.0653
	Tungsten	ppm	01-Sep-2020	01-Sep-2021	11	6	6	0.021115*	0.10353	0.049812*	0.021219	0.0063976
	Uranium	ppm	01-Sep-2020	01-Sep-2021	11	8	8	0.018318*	0.11236	0.044024*	0.027022	0.0081475
	Vanadium	ppm	01-Sep-2020	01-Sep-2021	11	4	4	0.008815*	0.16683	0.066185*	0.042139	0.012705
	Zinc	ppm	01-Sep-2020	01-Sep-2021	11	0	0	3.2	48	17.327	14.039	4.233
	Zirconium	ppm	01-Sep-2020	01-Sep-2021	11	0	0	0.466	1.61	1.0747	0.42157	0.12711
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	11	0	0	0.27	87.32	73.104	24.476	7.3799
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	11	0	0	293	617	406.36	117.36	35.385

WD Cattail Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Metals	Aluminum	ppm	01-Sep-2020	01-Sep-2021	5	0	0	103	347	161	104.66	46.805
	Antimony	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.014345*	0.023417*	0.018191*	0.0032823	0.0014679
	Arsenic	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.016602*	0.057556*	0.033582*	0.01606	0.0071825
	Barium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	2.17	6.77	3.288	1.9595	0.87631
	Beryllium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.0025172*	0.0088937*	0.0052039*	0.0023255	0.00104
	Bismuth	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.0017421*	0.003577*	0.0024078*	0.0007074	0.00031636
	Boron	ppm	01-Sep-2020	01-Sep-2021	5	0	0	1.49	2.41	1.842	0.34738	0.15535
	Cadmium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	-0.0038119*	0.014452*	0.0065221*	0.0067856	0.0030346
	Calcium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	1910	3610	2372	705.71	315.6
	Cesium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.0061644*	0.01386*	0.0088302*	0.0030342	0.001357
	Chromium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.12706	0.20952	0.16755	0.031751	0.0142
	Cobalt	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.0743	0.235	0.1218	0.064467	0.028831
	Copper	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.99	2.01	1.328	0.40623	0.18167
	Iron	ppm	01-Sep-2020	01-Sep-2021	5	0	0	240	901	472.2	271.88	121.59
	Lead	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.151	0.596	0.2888	0.18306	0.081868
	Lithium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.129	0.204	0.1602	0.027959	0.012504
	Magnesium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	581	994	733.2	161.02	72.011
	Manganese	ppm	01-Sep-2020	01-Sep-2021	5	0	0	17.3	54.3	33.94	14.476	6.4738
	Mercury	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.0028208*	0.0066071*	0.0050599*	0.0015495	0.00069296
	Molybdenum	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.103	0.378	0.2678	0.10348	0.046277
	Nickel	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.238	0.471	0.3246	0.095594	0.042751
	Phosphorus	ppm	01-Sep-2020	01-Sep-2021	5	0	0	83.1	127	102.2	18.085	8.0881
	Potassium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	1200	2460	1802	486.85	217.72
	Selenium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.010762*	0.068495*	0.042247*	0.026309	0.011766
	Silicon	ppm	01-Sep-2020	01-Sep-2021	5	0	0	220	1250	459.2	446.12	199.51
	Silver	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.022217*	0.029779*	0.024987*	0.0035338	0.0015804
	Sodium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	913	2590	1738.6	599.23	267.99
	Strontium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	14.8	28	20.06	5.2008	2.3259
	Sulphur	ppm	01-Sep-2020	01-Sep-2021	5	0	0	504	1260	894.8	363.04	162.36
	Thallium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.0052216*	0.0092127*	0.0071399*	0.0017347	0.00077577
	Thorium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.012758*	0.031226*	0.021302*	0.006803	0.0030424
	Tin	ppm	01-Sep-2020	01-Sep-2021	5	4	4	0.029587*	0.050535	0.039732*	0.0078801	0.0035241
	Titanium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	6.79	26.6	12.3	8.1785	3.6575
	Tungsten	ppm	01-Sep-2020	01-Sep-2021	5	4	4	0.027685*	0.063771	0.037442*	0.014961	0.0066907
	Uranium	ppm	01-Sep-2020	01-Sep-2021	5	5	5	0.026418*	0.04471*	0.032309*	0.0071392	0.0031928
	Vanadium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.08304	0.10347	0.092416	0.0076493	0.0034209
	Zinc	ppm	01-Sep-2020	01-Sep-2021	5	0	0	8.7	31.2	17.5	8.7447	3.9108
	Zirconium	ppm	01-Sep-2020	01-Sep-2021	5	0	0	0.425	1.06	0.631	0.24775	0.1108
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	5	0	0	78.16	89.27	84.646	4.2655	1.9076
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	5	0	0	233	333	284.6	43.328	19.377

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "WD-3".
3. Values with '*' are stats results using un-detected uncensored data.

NSS-W Grass Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	20	0	0	61.77	72.61	65.599	2.6818	0.59968
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	20	0	0	192	1570	594	427.39	95.567

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "A1G", "A2G", "A3G", "A5G".

RWOS1 Grass Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	4	0	0	66.67	69.82	67.75	1.4402	0.7201
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	4	0	0	310	572	410	117.43	58.713

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "RWOS1G".

NSS-W Cedar Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	20	0	0	52.67	58.21	55.4	1.4882	0.33276
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	20	0	0	277	1910	686	499.54	111.7

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "A2C", "A3C", "A5C", "A1C".

RWOS1 Cedar Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	4	0	0	56.89	58.73	58.028	0.7967	0.39834
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	4	0	0	296	603	457	143.54	71.772

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "RWOS1C".

NSS-W Soil Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/ Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	16	0	0	12	45	25.853	10.696	2.6739
	Total Organic Carbon	mg/kg	01-Sep-2020	01-Sep-2021	8	0	0	19000	140000	56250	40390.06	14280.04
	Available (CaCl2) pH	pH	01-Sep-2020	01-Sep-2021	8	0	0	6.9	7.63	7.3088	0.26616	0.094102
	Conductivity	umho/cm	01-Sep-2020	01-Sep-2021	8	0	0	145	419	239.25	97.371	34.426
	Sodium Adsorption Ratio	N/A	01-Sep-2020	01-Sep-2021	8	0	0	0.14	0.26	0.20875	0.044541	0.015748
Nutrients	Total Phosphorous	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	385	657	542.88	112.16	39.655
Metals	Aluminum	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	4250	12500	7957.5	3100.23	1096.1
	Antimony	µg/g	01-Sep-2020	01-Sep-2021	8	2	2	0.09*	0.28	0.1575*	0.076485	0.027042
	Arsenic	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	2.13	5.7	3.295	1.2427	0.43936
	Barium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	19.8	65.3	39.05	13.999	4.9494
	Beryllium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.2	0.52	0.325	0.10351	0.036596
	Bismuth	µg/g	01-Sep-2020	01-Sep-2021	8	2	2	0.06*	0.19	0.12125*	0.043895	0.015519
	Boron	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	5.1	12.6	9.05	2.4437	0.86396
	Boron (hot water)	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.12	0.56	0.30125	0.16745	0.059204
	Cadmium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.083	1.28	0.50938	0.47296	0.16722
	Calcium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	5160	147000	73982.5	57058.13	20173.1
	Cesium	µg/g	01-Sep-2020	01-Sep-2021	8	7	7	0.2*	1.1	0.5*	0.30237	0.1069
	Chromium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	6.22	17.7	13.073	4.0056	1.4162
	Chromium (VI)	µg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0*	0*	0	0
	Cobalt	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	2.58	6.76	5.1213	1.4382	0.50849
	Copper	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	5.23	15.9	11.889	3.326	1.1759
	Iron	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	5860	18700	13331.25	3909.	1382.04
	Lead	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	5.21	28.8	14.735	8.4448	2.9857
	Lithium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	2.9	11.7	8.3438	2.8516	1.0082
	Magnesium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	3660	52300	27843.75	19329.14	6833.88
	Manganese	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	297	1500	643.63	397.15	140.42
	Mercury	µg/g	01-Sep-2020	01-Sep-2021	8	3	3	0.016*	0.162	0.081*	0.057681	0.020393
	Molybdenum	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.2	0.67	0.375	0.16053	0.056758
	Nickel	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	6.83	13.8	10.71	2.4095	0.8519

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Metals	Potassium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	402	1300	768.63	308.64	109.12
	Selenium	µg/g	01-Sep-2020	01-Sep-2021	8	5	5	0.07*	0.84	0.40375*	0.26554	0.093883
	Silver	µg/g	01-Sep-2020	01-Sep-2021	8	4	4	0.022*	0.116	0.059875*	0.036204	0.0128
	Sodium	µg/g	01-Sep-2020	01-Sep-2021	8	2	2	83*	178	126.5*	30.199	10.677
	Strontium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	13.2	154	76.825	55.798	19.728
	Thallium	µg/g	01-Sep-2020	01-Sep-2021	8	1	1	0.042*	0.134	0.081875*	0.030903	0.010926
	Thorium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.37	2.82	1.3563	0.96201	0.34012
	Tin	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.29	0.81	0.5225	0.1879	0.066433
	Titanium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	66.8	294	193.23	67.661	23.922
	Tungsten	µg/g	01-Sep-2020	01-Sep-2021	8	8	8	0.04*	0.14*	0.085*	0.033381	0.011802
	Uranium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	0.409	0.771	0.55263	0.12333	0.043603
	Vanadium	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	13.4	33	21.1	6.2002	2.1921
	Zinc	µg/g	01-Sep-2020	01-Sep-2021	8	0	0	28.3	166	75.8	56.117	19.84
	Zirconium	µg/g	01-Sep-2020	01-Sep-2021	8	1	1	0.32*	2.79	1.2938*	0.85575	0.30255
Radionuclides	Be-7	Bq/kg	01-Sep-2020	01-Sep-2021	8	8	8	-1.82*	7.14*	0.41924*	2.8596	1.011
	H-3	Bq/kg	01-Sep-2020	01-Sep-2021	8	0	0	21	92.2	63.35	27.849	9.846
	C-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	8	0	0	33	200	122.5	58.221	20.584
	Co-60	Bq/kg	01-Sep-2020	01-Sep-2021	8	8	8	-0.191*	0.0824*	-0.063388*	0.098094	0.034681
	Cs-134	Bq/kg	01-Sep-2020	01-Sep-2021	8	8	8	-0.306*	0.742*	0.08125*	0.36258	0.12819
	Cs-137	Bq/kg	01-Sep-2020	01-Sep-2021	8	0	0	0.502	14.4	6.5003	5.4302	1.9199
	I-131	Bq/kg	01-Sep-2020	01-Sep-2021	8	8	8	-2.06*	1.56*	-0.037025*	0.9959	0.3521
	K-40	Bq/kg	01-Sep-2020	01-Sep-2021	8	0	0	77.1	427	319.39	105.73	37.382
	Th-Series	Bq/kg	01-Sep-2020	01-Sep-2021	8	0	0	4.05	15.3	10.421	4.1022	1.4503
	U-Series	Bq/kg	01-Sep-2020	01-Sep-2021	8	0	0	10.4	25.7	16.025	5.7977	2.0498
Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0.758*	0.31575*	0.33182	0.11732
	1,2,3,4,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	4.26*	1.758*	1.4628	0.51718
	1,2,3,6,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	1.35*	0.79125*	0.47189	0.16684
	1,2,3,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	1.68*	0.74325*	0.66191	0.23402
	1,2,3,7,8,9-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	1.51*	0.6445*	0.55252	0.19535

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Dioxins and Furans	1,2,3,7,8,9-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0.367*	0.084*	0.13508	0.047756
	1,2,3,7,8-Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0.497*	0.19638*	0.22836	0.080737
	1,2,3,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0.67*	0.237*	0.27033	0.095576
	2,3,4,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	2.35*	1.0773*	0.86453	0.30566
	2,3,7,8-Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0.26*	0.062375*	0.11563	0.040882
	2,3,7,8-Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	8	6	6	0*	1.33	0.49088*	0.5093	0.18007
	2,3,4,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	8	8	8	0*	0.87*	0.40313*	0.32223	0.11393
	1,2,3,4,6,7,8-Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	8	1	1	2.31*	35.5	17.261*	10.513	3.7168
	1,2,3,4,6,7,8-Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	8	4	4	1.19*	13.7	7.1325*	5.0325	1.7793
	Total Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	8	3	3	0.811*	15.9	8.1201*	5.9319	2.0972
	Total Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	8	3	3	0.555*	15.9	8.4506*	5.5303	1.9552
	Total Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	8	1	1	4.38*	58.1	30.06*	17.131	6.0568
	Total Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	8	1	1	2.62*	26.7	14.508*	9.9433	3.5155
	Octa CDD	pg/g	01-Sep-2020	01-Sep-2021	8	0	0	11.3	212	93.3	59.567	21.06
	Octa CDF	pg/g	01-Sep-2020	01-Sep-2021	8	4	4	3.09*	37.7	16.663*	11.812	4.1763
	Total Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	8	5	5	0*	7.07	2.766*	2.9837	1.0549
	Total Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	8	4	4	0.289*	11.5	5.9168*	4.9355	1.745
	Total Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	8	5	5	0*	4.07	1.5678*	1.7507	0.61897
	Total Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	8	2	2	0*	9.88	4.663*	4.044	1.4298

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "A5-1", "A5-2", "RD-1", "MSA-1", "RD-2", "SWALE", "A3-1", "A3-2".
3. Values with '*' are stats results using un-detected uncensored data.

RWOS1 Soil Samples												
Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	8	0	0	13	31	20.239	7.5066	2.654
	Total Organic Carbon	mg/kg	01-Sep-2020	01-Sep-2021	4	0	0	40000	62000	51000	10645.81	5322.91
	Available (CaCl2) pH	pH	01-Sep-2020	01-Sep-2021	4	0	0	7.22	7.38	7.3	0.069762	0.034881
	Conductivity	umho/cm	01-Sep-2020	01-Sep-2021	4	0	0	172	291	218.5	55.585	27.792
	Sodium Adsorption Ratio	N/A	01-Sep-2020	01-Sep-2021	4	0	0	0.17	0.23	0.2075	0.028723	0.014361
Nutrients	Total Phosphorous	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	379	631	505.25	109.38	54.691
Metals	Aluminum	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	4390	11700	8315	3160.28	1580.14
	Antimony	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.1	0.21	0.135	0.050662	0.025331
	Arsenic	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	2.5	4.3	3.735	0.8372	0.4186
	Barium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	18.4	51.3	36.6	15.911	7.9556
	Beryllium	µg/g	01-Sep-2020	01-Sep-2021	4	1	1	0.18*	0.43	0.33*	0.11518	0.057591
	Bismuth	µg/g	01-Sep-2020	01-Sep-2021	4	2	2	0.07*	0.15	0.1125*	0.038622	0.019311
	Boron	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	7.5	11	9.6	1.6391	0.81955
	Boron (hot water)	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.28	0.64	0.4375	0.1584	0.079202
	Cadmium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.239	0.851	0.512	0.28049	0.14025
	Calcium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	41000	107000	79650	28994.31	14497.16
	Cesium	µg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.3*	0.6*	0.45*	0.1291	0.06455
	Chromium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	9.36	16.2	13.29	2.8956	1.4478
	Chromium (VI)	µg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0*	0*	0	0
	Cobalt	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	3.41	5.57	4.6825	0.92942	0.46471
	Copper	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	10.4	10.8	10.6	0.23094	0.11547
	Iron	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	9040	17400	13610	3520.1	1760.05
	Lead	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	7.94	16.2	12.063	4.5521	2.276
	Lithium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	5.42	10	8.0875	1.9455	0.97274
	Magnesium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	21600	41100	35275	9265.12	4632.56

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Metals	Manganese	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	482	1310	888.25	354.29	177.15
	Mercury	µg/g	01-Sep-2020	01-Sep-2021	4	1	1	0.04*	0.119	0.0835*	0.037403	0.018702
	Molybdenum	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.29	0.54	0.435	0.11733	0.058666
	Nickel	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	8.79	12	10.548	1.362	0.681
	Potassium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	634	893	783	118.86	59.429
	Selenium	µg/g	01-Sep-2020	01-Sep-2021	4	2	2	0.22*	0.55	0.4*	0.1699	0.084951
	Silver	µg/g	01-Sep-2020	01-Sep-2021	4	2	2	0.037*	0.084	0.061*	0.022993	0.011496
	Sodium	µg/g	01-Sep-2020	01-Sep-2021	4	1	1	96*	123	112.75*	12.971	6.4856
	Strontium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	26.5	83.8	50.9	25.817	12.908
	Thallium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.085	0.138	0.10675	0.022456	0.011228
	Thorium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.79	1.06	0.9325	0.14245	0.071224
	Tin	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.32	0.64	0.455	0.15674	0.078369
	Titanium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	189	208	199	8.6023	4.3012
	Tungsten	µg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.05*	0.19*	0.0925*	0.065511	0.032755
	Uranium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.484	0.764	0.59725	0.12052	0.06026
	Vanadium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	16.7	30.6	23.4	6.5335	3.2668
	Zinc	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	45.6	93.9	72.05	24.712	12.356
	Zirconium	µg/g	01-Sep-2020	01-Sep-2021	4	0	0	0.7	0.83	0.755	0.058023	0.029011
Radionuclides	H-3	Bq/kg	01-Sep-2020	01-Sep-2021	4	1	1	11.8*	73.1	34.45*	27.058	13.529
	C-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	4	0	0	56	202	105.75	65.83	32.915
Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0.318*	0.2045*	0.14262	0.07131
	1,2,3,4,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0.969*	0.56*	0.44329	0.22165
	1,2,3,6,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.217*	0.516*	0.417*	0.13631	0.068155
	1,2,3,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0.412*	0.23825*	0.18713	0.093565
	1,2,3,7,8,9-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.26*	0.652*	0.55025*	0.19354	0.096772
	1,2,3,7,8,9-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0*	0*	0	0
	1,2,3,7,8-Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0.242*	0.164*	0.11108	0.05554

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Dioxins and Furans	1,2,3,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0.27*	0.175*	0.12503	0.062517
	2,3,4,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.215*	0.54*	0.34725*	0.15761	0.078805
	2,3,7,8-Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0*	0*	0*	0	0
	2,3,7,8-Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.217*	0.452*	0.33025*	0.1304	0.0652
	2,3,4,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.149*	0.274*	0.20725*	0.066565	0.033283
	1,2,3,4,6,7,8-Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	4	1	1	3.87*	15.9	8.9775*	5.1149	2.5575
	1,2,3,4,6,7,8-Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	1.01*	3.12*	2.305*	0.91486	0.45743
	Total Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	4	2	2	1.71*	6.61	4.615*	2.1373	1.0687
	Total Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	1.26*	4.44*	3.1*	1.5039	0.75196
	Total Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	4	0	0	7.56	24.5	15.165	7.1404	3.5702
	Total Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	4	3	3	2.2*	6.47	4.1125*	1.9455	0.97274
	Octa CDD	pg/g	01-Sep-2020	01-Sep-2021	4	0	0	31	125	60.45	43.898	21.949
	Octa CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	2.67*	8.57*	5.04*	2.5246	1.2623
	Total Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	0.356*	2.18*	1.2065*	0.959	0.4795
	Total Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	4	4	4	1.38*	3.68*	2.54*	1.2606	0.63029
	Total Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	4	2	2	0.394*	1.29	0.86725*	0.44462	0.22231
	Total Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	4	0	0	1.45	3.43	2.2975	0.97869	0.48934

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "RWOS1-4", "RWOS1-1", "RWOS1-2", "RWOS1-3".
3. Values with '*' are stats results using un-detected uncensored data.

SRD Water Samples												
Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Physical/Conventional Characteristics	Alkalinity	mg/L CaCO	01-Sep-2020	01-Sep-2021	46	0	0	90	320	206.89	62.356	9.1939
	Conductivity	µS/cm	01-Sep-2020	01-Sep-2021	58	0	0	360	3700	1234.61	861.47	113.12
	pH - Field		01-Sep-2020	01-Sep-2021	24	0	0	7.26	8.16	7.7779	0.21561	0.044011
	Total Hardness	mg/L	01-Sep-2020	01-Sep-2021	34	0	0	100	400	263.53	84.527	14.496
	Specific Conductance - Field	µS/cm	01-Sep-2020	01-Sep-2021	24	0	0	27.2	1426	438.82	460.36	93.971
	Dissolved Oxygen - Field (%)	%	01-Sep-2020	01-Sep-2021	24	0	0	3.01	91.2	36.29	33.475	6.833
	Dissolved Oxygen - Field	mg/L	01-Sep-2020	01-Sep-2021	24	0	0	1.52	1430	381.29	444.62	90.758
	Total Dissolved Solids - Field	g/L	01-Sep-2020	01-Sep-2021	25	0	0	90	923	379.25	257.82	51.564
	Total Dissolved Solids	mg/L	01-Sep-2020	01-Sep-2021	46	0	0	170	1990	673.91	485.78	71.624
	Total Suspended Solids	mg/L	01-Sep-2020	01-Sep-2021	46	44	44	2*	10	4.7174*	2.2673	0.33429
Metals	Aluminum - Dissolved (0.2u)	µg/L	01-Sep-2020	01-Sep-2021	46	23	23	2*	26	5.8261*	4.239	0.62501
	Aluminum - Total	µg/L	01-Sep-2020	01-Sep-2021	46	2	2	2.7*	225	38.339*	54.165	7.9862
	Antimony - Total	µg/L	01-Sep-2020	01-Sep-2021	46	44	44	0.02*	0.57	0.13348*	0.11889	0.017529
	Arsenic - Total	µg/L	01-Sep-2020	01-Sep-2021	46	3	3	0.11	1.26	0.31022*	0.24815	0.036588
	Barium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	0	0	8.3	77.5	26.037	16.216	2.391
	Beryllium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.0028*	0.02*	0.0017717*	0.0046491	0.00068548
	Bismuth - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	Boron - Total	µg/L	01-Sep-2020	01-Sep-2021	46	45	45	8*	61	19.37*	9.3982	1.3857
	Cadmium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	30	30	0.001*	0.067	0.012043*	0.014536	0.0021432
	Cesium - Total	µg/L	01-Sep-2020	01-Sep-2021	34	34	34	0*	0.02*	0.0032353*	0.0058881	0.0010098
	Chromium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	41	41	0.1*	8.8	0.76087*	1.7526	0.25841
	Chromium (III) - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.76*	0*	-0.17087*	0.27787	0.04097
	Chromium (VI) - Total	µg/L	01-Sep-2020	01-Sep-2021	46	33	33	0.18*	0.76	0.42*	0.14652	0.021602
	Cobalt - Total	µg/L	01-Sep-2020	01-Sep-2021	46	44	44	0.02*	0.33	0.079783*	0.05901	0.0087005
	Copper - Total	µg/L	01-Sep-2020	01-Sep-2021	46	21	21	0.2*	1.68	0.6737*	0.3462	0.051045
	Iron - Total	µg/L	01-Sep-2020	01-Sep-2021	46	2	2	12*	1500	209.04*	326.1	48.08
	Lead - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	0.01*	0.17*	0.05087*	0.044663	0.0065852
	Lithium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	41	41	0.8*	3.1	1.5957*	0.54811	0.080814
	Calcium - Total	µg/L	01-Sep-2020	01-Sep-2021	11	0	0	28300	116000	65154.55	28433.34	8572.97
	Manganese - Total	µg/L	01-Sep-2020	01-Sep-2021	46	0	0	1.1	398	42.226	78.131	11.52
	Mercury - Total	µg/L	01-Sep-2020	01-Sep-2021	34	34	34	-0.0017*	0.003*	0.00077353*	0.001464	0.00025107
	Molybdenum - Total	µg/L	01-Sep-2020	01-Sep-2021	46	39	39	0.1*	10.4	1.1913*	2.0579	0.30342

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Metals	Magnesium - Total	µg/L	01-Sep-2020	01-Sep-2021	23	0	0	6960	25400	17025.22	6126.52	1277.47
	Potassium - Total	µg/L	01-Sep-2020	01-Sep-2021	34	0	0	658	4390	2034.35	779.1	133.61
	Nickel - Total	µg/L	01-Sep-2020	01-Sep-2021	46	36	36	0.2*	36	2.8543*	7.2507	1.0691
	Selenium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	23	23	0.05*	0.21	0.1137*	0.04348	0.0064107
	Silicon - Total	µg/L	01-Sep-2020	01-Sep-2021	46	0	0	172	4170	2036	1093.53	161.23
	Silver - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.0042*	0.002*	-0.00068043*	0.001395	0.00020568
	Sodium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	0	0	9010	608000	169335.4	163938.2	24171.37
	Strontium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	0	0	183	4450	1470	1082.86	159.66
	Thallium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.0014*	0.01*	0.0028*	0.0026085	0.00038461
	Thorium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.0067*	0*	-0.00047609*	0.0013967	0.00020593
	Tin - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.0017*	0.1*	0.0086587*	0.028501	0.0042023
	Titanium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	42	42	-1.14*	7.8	0.99042*	1.8887	0.27848
	Tungsten - Total	µg/L	01-Sep-2020	01-Sep-2021	34	34	34	0*	0.1*	0.011765*	0.032704	0.0056086
	Uranium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	1	1	0.08*	1.17	0.53891*	0.24622	0.036303
	Vanadium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	46	46	-0.188*	0.7*	0.18414*	0.2108	0.03108
	Zinc - Total	µg/L	01-Sep-2020	01-Sep-2021	46	17	17	0.6*	105	19.176*	23.931	3.5285
	Zirconium - Total	µg/L	01-Sep-2020	01-Sep-2021	46	31	31	0.01*	0.2	0.087391*	0.04008	0.0059094
Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	1,2,3,4,7,8-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	1.64*	0.07087*	0.33609	0.049553
	1,2,3,6,7,8-Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	1.6*	0.034783*	0.23591	0.034783
	1,2,3,6,7,8-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	4*	0.086957*	0.58977	0.086957
	1,2,3,7,8,9-Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	1.69*	0.036739*	0.24918	0.036739
	1,2,3,7,8,9-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	1,2,3,7,8-Penta CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	1,2,3,7,8-Penta CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	2,3,4,6,7,8-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	2.39*	0.051957*	0.35239	0.051957
	2,3,7,8-Tetra CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	2,3,7,8-Tetra CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	2,3,4,7,8-Penta CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	1,2,3,4,6,7,8-Hepta CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	46.7*	2.328*	7.8709	1.1605
	1,2,3,4,6,7,8-Hepta CDF	pg/L	01-Sep-2020	01-Sep-2021	46	45	45	0*	57.6	2.4909*	9.5786	1.4123
	1,2,3,4,7,8,9-Hepta CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	3.5*	0.10978*	0.55972	0.082527

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Dioxins and Furans	Total Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	11.6*	0.32478*	1.7693	0.26086
	Total Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	46	45	45	0*	55.5	1.9935*	9.1309	1.3463
	Total Hepta CDD	pg/L	01-Sep-2020	01-Sep-2021	46	45	45	0*	74.3	3.7565*	12.751	1.8801
	Total Hepta CDF	pg/L	01-Sep-2020	01-Sep-2021	46	45	45	0*	102	4.0972*	16.51	2.4343
	Octa CDD	pg/L	01-Sep-2020	01-Sep-2021	46	44	44	0*	230	12.798*	38.726	5.7099
	Octa CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	65.4*	2.5767*	10.398	1.5331
	Total Penta CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	1.22*	0.026522*	0.17988	0.026522
	Total Penta CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	5.84*	0.12696*	0.86106	0.12696
	Total Tetra CDD	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
	Total Tetra CDF	pg/L	01-Sep-2020	01-Sep-2021	46	46	46	0*	0*	0*	0	0
Radionuclides	Tritium	Bq/kg	01-Sep-2020	01-Sep-2021	70	0	0	11	1520	479.48	366.53	43.808
	Carbon-14	Bq/kg	01-Sep-2020	01-Sep-2021	46	28	28	-0.1*	1.39	0.15665*	0.29428	0.043389
	Cobalt-60	Bq/kg	01-Sep-2020	01-Sep-2021	46	46	46	-0.397*	0.816*	0.05642*	0.22195	0.032724
	Cesium-134	Bq/kg	01-Sep-2020	01-Sep-2021	46	46	46	-0.874*	0.719*	-0.0035759*	0.30364	0.04477
	Cesium-137	Bq/kg	01-Sep-2020	01-Sep-2021	46	46	46	-1*	0.532*	-0.07342*	0.31987	0.047163
	Iodine-131	Bq/kg	01-Sep-2020	01-Sep-2021	46	46	46	-1.1*	1.01*	0.064303*	0.40909	0.060316
	Potassium-40	Bq/kg	01-Sep-2020	01-Sep-2021	46	46	46	-46*	4.24*	-4.1821*	11.808	1.741
	Thorium Series	Bq/kg	01-Sep-2020	01-Sep-2021	46	44	44	-2.89*	1.8*	-0.10806*	0.9154	0.13497
	Uranium Series	Bq/kg	01-Sep-2020	01-Sep-2021	46	45	45	-2.36*	3.02*	0.16841*	0.88831	0.13097

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "Stream C DS", "Stream C Confluence", "GS-1", "Location B", "SRD-1", "SRD-2", "SRD-3", "SRD-4", "SRD-5", "Stream C US", "WTL-1", "WTL-2".
3. Values with '*' are stats results using un-detected uncensored data.

WD Water Samples											
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Alkalinity	ng/L CaCO	01-Sep-2020	01-Sep-2021	12	0	0	120	280	230.83	49.81	14.379
	Conductivity	µS/cm	01-Sep-2020	01-Sep-2021	15	0	0	300	5200	1306.12	1198.84	309.54
	pH - Field		01-Sep-2020	01-Sep-2021	6	0	0	7.49	8.55	8.025	0.34766	0.14193
	Total Hardness	mg/L	01-Sep-2020	01-Sep-2021	9	0	0	170	390	291.11	80.225	26.742
	Specific Conductance - Field	µS/cm	01-Sep-2020	01-Sep-2021	6	0	0	38.1	1045	429.35	477.28	194.85
	Dissolved Oxygen - Field (%)	%	01-Sep-2020	01-Sep-2021	6	0	0	4.23	97.5	43.522	40.837	16.671
	Dissolved Oxygen - Field	mg/L	01-Sep-2020	01-Sep-2021	6	0	0	7.86	1033	357.41	453.26	185.04
	Total Dissolved Solids - Field	g/L	01-Sep-2020	01-Sep-2021	6	0	0	136	682.5	332.09	264.57	108.01
	Total Dissolved Solids	mg/L	01-Sep-2020	01-Sep-2021	12	0	0	175	2770	749.58	697.69	201.4
	Total Suspended Solids	mg/L	01-Sep-2020	01-Sep-2021	12	11	11	3*	12	5.8333*	2.6227	0.75712
Metals	Aluminum - Dissolved (0.2u)	µg/L	01-Sep-2020	01-Sep-2021	12	6	6	3*	13	5.75*	2.9271	0.84499
	Aluminum - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	10	207	82.067	70.087	20.232
	Antimony - Total	µg/L	01-Sep-2020	01-Sep-2021	12	11	11	0.07*	1.06	0.215*	0.27181	0.078465
	Arsenic - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	0.15	4.42	0.6925	1.1921	0.34414
	Barium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	8.6	59.7	30.225	16.041	4.6306
	Beryllium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	-0.0004*	0.01*	0.0033*	0.0049496	0.0014288
	Bismuth - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	-0.0001*	0*	-8.33E-06*	0.000028868	8.33E-06
	Boron - Total	µg/L	01-Sep-2020	01-Sep-2021	12	9	9	6*	153	38.417*	43.866	12.663
	Cadmium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	10	10	0.003*	0.019*	0.0084167*	0.0051603	0.0014897
	Cesium - Total	µg/L	01-Sep-2020	01-Sep-2021	9	9	9	0*	0.02*	0.0077778*	0.0066667	0.0022222
	Chromium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	0.1*	0.5*	0.34167*	0.12401	0.035799
	Chromium (III) - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	-0.79*	0*	-0.20833*	0.31377	0.090578
	Chromium (VI) - Total	µg/L	01-Sep-2020	01-Sep-2021	12	8	8	0*	0.79	0.41083*	0.20322	0.058665
	Cobalt - Total	µg/L	01-Sep-2020	01-Sep-2021	12	11	11	0.05*	0.36	0.12417*	0.084473	0.024385
	Copper - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	0.7	3.3	1.71	0.80461	0.23227
	Iron - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	25	854	276.08	250.41	72.288
	Lead - Total	µg/L	01-Sep-2020	01-Sep-2021	12	9	9	0.04*	1	0.20333*	0.27638	0.079785
	Lithium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	11	11	0.4*	2.5*	1.4083*	0.69604	0.20093
Metals	Calcium - Total	µg/L	01-Sep-2020	01-Sep-2021	3	0	0	34400	117000	75966.66	41302.58	23846.06
	Manganese - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	4.9	208	35.583	55.587	16.047
	Mercury - Total	µg/L	01-Sep-2020	01-Sep-2021	9	9	9	-0.001*	0.003*	0.00065556*	0.0015661	0.00052204
	Molybdenum - Total	µg/L	01-Sep-2020	01-Sep-2021	12	7	7	0.5*	2.3	1.0417*	0.44407	0.12819
	Magnesium - Total	µg/L	01-Sep-2020	01-Sep-2021	6	0	0	14300	21200	18916.67	2401.18	980.28
	Potassium - Total	µg/L	01-Sep-2020	01-Sep-2021	9	0	0	550	4760	1871.67	1196.75	398.92
	Nickel - Total	µg/L	01-Sep-2020	01-Sep-2021	12	9	9	0.4*	1.3	0.74167*	0.30588	0.088299
	Selenium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	2	2	0.09*	0.37	0.17667*	0.076792	0.022168
	Silicon - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	745	3060	1971.5	753.89	217.63
	Silver - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	-0.0038*	0.003*	-0.000016667*	0.0018517	0.00053454
	Sodium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	9780	821000	177923.3	218892.3	63188.76
	Strontium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	248	2440	1316	761.49	219.82
	Thallium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	10	10	0.004*	0.014	0.0071667*	0.0028551	0.00082419
	Thorium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	-0.0075*	0*	-0.000625*	0.0021651	0.000625
	Tin - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	-0.0136*	0.1*	0.015533*	0.039646	0.011445
	Titanium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	8	8	-0.0521*	6.6	2.5873*	2.4801	0.71595
	Tungsten - Total	µg/L	01-Sep-2020	01-Sep-2021	9	9	9	0*	0.1*	0.011111*	0.033333	0.011111
	Uranium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	0	0	0.54	1.23	0.81833	0.17278	0.049876
	Vanadium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	1.4*	0.39167*	0.39418	0.11379
	Zinc - Total	µg/L	01-Sep-2020	01-Sep-2021	12	4	4	1.5*	42	13.983*	12.637	3.648
	Zirconium - Total	µg/L	01-Sep-2020	01-Sep-2021	12	3	3	0.07*	0.37	0.17833*	0.099985	0.028863

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	3.19*	0.44583*	1.0641	0.30719
	1,2,3,4,7,8-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	3.01*	0.4125*	0.99003	0.2858
	1,2,3,6,7,8-Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	3.13*	0.52333*	1.0312	0.29767
	1,2,3,6,7,8-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	2.62*	0.35833*	0.86055	0.24842
	1,2,3,7,8,9-Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	2.95*	0.48833*	0.96226	0.27778
	1,2,3,7,8,9-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	2.68*	0.395*	0.93194	0.26903
	1,2,3,7,8-Penta CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	2.46*	0.35083*	0.83324	0.24053
	1,2,3,7,8-Penta CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	2.49*	0.365*	0.862	0.24884
	2,3,4,6,7,8-Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	3.53*	0.505*	1.1985	0.34599
	2,3,7,8-Tetra CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	0*	0*	0	0
	2,3,7,8-Tetra CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	0*	0*	0	0
	2,3,4,7,8-Penta CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	2.59*	0.37417*	0.88616	0.25581
	1,2,3,4,6,7,8-Hepta CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	30.2*	4.4583*	8.8226	2.5469
	1,2,3,4,6,7,8-Hepta CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	9.09*	1.4683*	2.7893	0.80519
	1,2,3,4,7,8,9-Hepta CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	3.63*	0.53667*	1.2655	0.36532
	Total Hexa CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	11.6*	2.215*	4.1982	1.2119
	Total Hexa CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	11.8*	2.2058*	4.1559	1.1997
	Total Hepta CDD	pg/L	01-Sep-2020	01-Sep-2021	12	11	11	0*	54.3	8.0142*	15.777	4.5545
	Total Hepta CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	16.7*	2.895*	5.2807	1.5244
	Octa CDD	pg/L	01-Sep-2020	01-Sep-2021	12	11	11	0*	182	25.474*	51.771	14.945
	Octa CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	14.6*	2.7408*	4.5204	1.3049
	Total Penta CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	3.9*	0.58333*	1.373	0.39635
	Total Penta CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	6.36*	0.84583*	2.05	0.59179
	Total Tetra CDD	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	0*	0*	0	0
	Total Tetra CDF	pg/L	01-Sep-2020	01-Sep-2021	12	12	12	0*	0*	0*	0	0
Radionuclides	Tritium	Bq/kg	01-Sep-2020	01-Sep-2021	12	0	0	94.4	258	160.03	58.581	16.911
	Carbon-14	Bq/kg	01-Sep-2020	01-Sep-2021	12	12	12	-0.2*	0.054*	-0.033*	0.064532	0.018629
	Cobalt-60	Bq/kg	01-Sep-2020	01-Sep-2021	12	11	11	-0.422*	0.408*	0.018475*	0.22636	0.065346
	Cesium-134	Bq/kg	01-Sep-2020	01-Sep-2021	12	12	12	-0.76*	0.537*	-0.0875*	0.33634	0.097094
	Cesium-137	Bq/kg	01-Sep-2020	01-Sep-2021	12	12	12	-0.242*	0.419*	0.048309*	0.20991	0.060596
	Iodine-131	Bq/kg	01-Sep-2020	01-Sep-2021	12	12	12	-0.72*	0.534*	-0.049742*	0.413	0.11922
	Potassium-40	Bq/kg	01-Sep-2020	01-Sep-2021	12	12	12	-5.48*	2.54*	-1.2178*	2.6679	0.77015
	Thorium Series	Bq/kg	01-Sep-2020	01-Sep-2021	12	12	12	-1.66*	1.12*	-0.28167*	0.69086	0.19943
	Uranium Series	Bq/kg	01-Sep-2020	01-Sep-2021	12	11	11	-0.959*	1.63	0.0309*	0.69066	0.19938

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "WD-1", "WD-2b", "WD-3".
3. Values with '*' are stats results using un-detected uncensored data.

SRD Sediment Samples											
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	36	0	0	17	79.8	41.847	20.9	3.4834
	Total Organic Carbon	mg/kg	01-Sep-2020	01-Sep-2021	27	0	0	11000	77000	33259.26	17632.12	3393.3
	TOC	%	01-Sep-2020	01-Sep-2021	18	0	0	0.23	5.98	2.1828	1.7708	0.41738
Nutrients	Total Phosphorous	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	244	670	437.67	112.57	21.665
Metals	Aluminum	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	2100	11600	4836.3	2323.73	447.2
	Antimony	µg/g	01-Sep-2020	01-Sep-2021	27	15	8	0.02*	0.48	0.16259*	0.13825	0.026606
	Arsenic	µg/g	01-Sep-2020	01-Sep-2021	27	1	0	<0.8	3.37	<2.0459	0.58962	0.11347
	Barium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	10	58.4	27.259	12.967	2.4955
	Beryllium	µg/g	01-Sep-2020	01-Sep-2021	27	12	10	<0.09	0.48	0.22185*	0.094789	0.018242
	Bismuth	µg/g	01-Sep-2020	01-Sep-2021	27	24	16	<0	0.14	0.07*	0.036162	0.0069594
	Boron	µg/g	01-Sep-2020	01-Sep-2021	27	1	0	<3.5	20.1	<9.137	3.4356	0.66118
	Boron (hot water)	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	0.085	0.67	0.29019	0.14945	0.028762
	Cadmium	µg/g	01-Sep-2020	01-Sep-2021	27	4	1	0.04*	0.48	0.17274*	0.12687	0.024416
	Calcium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	84000	181000	121444.4	23560.27	4534.18
	Cesium	µg/g	01-Sep-2020	01-Sep-2021	18	18	18	0.1*	0.8*	0.33333*	0.1715	0.040423
	Chromium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	6.27	29.4	10.647	5.0535	0.97255
	Chromium (VI)	µg/g	01-Sep-2020	01-Sep-2021	27	27	19	0*	0.09*	0.015185*	0.020638	0.0039718
	Cobalt	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	1.8	7.17	3.7426	1.3459	0.25901
	Copper	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	3.1	140	22.214	33.642	6.4743
	Iron	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	5400	17200	10393.33	2887.59	555.72
	Lead	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	2.14	20.3	6.4881	4.9252	0.94785
	Lithium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	3.2	14.8	7.0659	2.8177	0.54226
	Magnesium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	26000	51100	35288.89	5431.27	1045.25
	Manganese	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	269	1100	465	168.06	32.343
	Mercury	µg/g	01-Sep-2020	01-Sep-2021	27	23	15	-<0.021	0.098	0.024674*	0.024951	0.0048018
	Molybdenum	µg/g	01-Sep-2020	01-Sep-2021	27	8	1	<0.11	1.6	0.38815*	0.40165	0.077298
	Nickel	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	4	18.8	9.1719	3.891	0.74882
	Potassium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	290	1700	792.33	357.16	68.735
	Selenium	µg/g	01-Sep-2020	01-Sep-2021	27	26	19	0.05*	0.6	0.24074*	0.15041	0.028946
	Silver	µg/g	01-Sep-2020	01-Sep-2021	27	23	15	<0.01	<0.09	0.029667*	0.02155	0.0041472
	Sodium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	120	1580	412.11	384.8	74.055
	Strontium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	65	790	223.3	187.26	36.038
	Thallium	µg/g	01-Sep-2020	01-Sep-2021	27	10	8	<0.025	0.13	0.064444*	0.030056	0.0057842
	Thorium	µg/g	01-Sep-2020	01-Sep-2021	18	0	0	0.65	3.2	1.7556	0.70119	0.16527
	Tin	µg/g	01-Sep-2020	01-Sep-2021	27	9	1	0.16	0.77	0.34519*	0.17205	0.033112
	Titanium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	84	265	173.69	55.232	10.629
	Tungsten	µg/g	01-Sep-2020	01-Sep-2021	18	18	18	0.02*	0.29*	0.083889*	0.073014	0.01721
	Uranium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	0.36	1.1	0.57404	0.19513	0.037553
	Vanadium	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	9.1	29.7	15.522	5.7159	1.1
	Zinc	µg/g	01-Sep-2020	01-Sep-2021	27	0	0	14.4	450	117.22	134.12	25.811
	Zirconium	µg/g	01-Sep-2020	01-Sep-2021	18	0	0	0.65	4.19	1.5044	0.98693	0.23262

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	F1-BTEX	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	Petroleum Hydrocarbons F2	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	Petroleum Hydrocarbons F3	µg/g	01-Sep-2020	01-Sep-2021	9	3	3	0*	790	142.11*	250.21	83.402
	Petroleum Hydrocarbons F4	µg/g	01-Sep-2020	01-Sep-2021	9	7	7	0*	280	37.667*	92.946	30.982
	Reached Baseline at C50	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	1	1	1	0	0
	o-Terphenyl	%	01-Sep-2020	01-Sep-2021	9	0	0	90	96	92.556	2.0069	0.66898
	4-Bromofluorobenzene	%	01-Sep-2020	01-Sep-2021	9	0	0	82	87	83.333	1.5811	0.52705
	D10-o-Xylene	%	01-Sep-2020	01-Sep-2021	9	0	0	74	96	85.222	6.0369	2.0123
	D4-1,2-Dichloroethane	%	01-Sep-2020	01-Sep-2021	9	0	0	103	106	104.56	0.88192	0.29397
	D8-Toluene	%	01-Sep-2020	01-Sep-2021	9	0	0	101	104	102.78	0.97183	0.32394
	p+m-Xylene	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	Benzene	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	Toluene	µg/g	01-Sep-2020	01-Sep-2021	9	8	8	0*	0.027	0.003*	0.009	0.003
	Ethylbenzene	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	Total Xylenes	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
	o-Xylene	µg/g	01-Sep-2020	01-Sep-2021	9	9	9	0*	0*	0*	0	0
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	18	0	0	26	443	147.56	128.66	30.326
	Beryllium-7	Bq/kg	01-Sep-2020	01-Sep-2021	18	16	16	-2.21*	10.2	2.8672*	3.063	0.72195
	Cobalt-60	Bq/kg	01-Sep-2020	01-Sep-2021	18	18	18	-0.56*	0.58*	0.0027389*	0.23518	0.055432
	Cesium-134	Bq/kg	01-Sep-2020	01-Sep-2021	18	18	18	-0.885*	0.612*	0.079756*	0.34657	0.081686
	Cesium-137	Bq/kg	01-Sep-2020	01-Sep-2021	18	7	7	-0.355*	9.41	1.6708*	2.2141	0.52188
	Iodine-131	Bq/kg	01-Sep-2020	01-Sep-2021	18	18	18	-3.26*	2.39*	-0.029639*	1.185	0.2793
	Potassium-40	Bq/kg	01-Sep-2020	01-Sep-2021	18	0	0	57.4	282	185.25	69.746	16.439
	Thorium Series	Bq/kg	01-Sep-2020	01-Sep-2021	18	4	4	1.29*	9.2	5.0344*	2.3803	0.56104
	Uranium Series	Bq/kg	01-Sep-2020	01-Sep-2021	18	0	0	4.94	13.3	9.07	2.0765	0.48943
Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	27	24	17	0*	9.78	1.4713*	2.8525	0.54896
	1,2,3,4,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	27	24	16	0*	16	1.9836*	4.0576	0.78088
	1,2,3,6,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	27	23	16	0*	23.1	3.2853*	6.1989	1.193
	1,2,3,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	27	24	17	0*	23	3.039*	6.753	1.2996
	1,2,3,7,8,9-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	27	22	16	0*	28	3.8261*	7.4027	1.4247
	1,2,3,7,8,9-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	27	27	19	0*	<0.948	0.12141*	0.25998	0.050033
	1,2,3,7,8-Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	27	27	19	0*	<4.42	0.66622*	1.2415	0.23893
	1,2,3,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	27	27	19	0*	3.03*	0.49178*	0.91309	0.17572
	2,3,4,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	27	24	17	0*	15.7	2.1832*	4.4542	0.85721
	2,3,7,8-Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	27	27	19	0*	0.417*	0.054778*	0.13444	0.025873
	2,3,7,8-Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	27	22	16	0*	2.99	0.45778*	0.86269	0.16602
	2,3,4,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	27	27	19	0*	2.81*	0.50905*	0.88219	0.16978

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	27	9	6	0.481*	573	90.968*	160.52	30.893
	1,2,3,4,6,7,8-Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	27	11	7	0*	248	35.904*	73.611	14.166
	1,2,3,4,7,8,9-Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	27	23	16	0*	18.1	2.6848*	5.0281	0.96765
	Total Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	27	14	10	0.21*	167	25.348*	47.522	9.1457
	Total Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	27	11	7	0*	343	37.976*	82.771	15.929
	Total Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	27	5	4	0.481*	969	150.01*	265.94	51.18
	Total Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	27	10	7	0*	489	66.97*	127.85	24.604
	Octa CDD	pg/g	01-Sep-2020	01-Sep-2021	27	4	3	1.83*	2530	462.12*	744.29	143.24
	Octa CDF	pg/g	01-Sep-2020	01-Sep-2021	27	12	8	0*	356	61.707*	106.2	20.438
	Total Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	27	21	15	0*	27.2	4.2718*	7.8062	1.5023
	Total Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	27	19	14	0*	137	16.631*	36.52	7.0282
	Total Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	27	22	15	0*	7.71	1.2011*	2.2459	0.43223
	Total Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	27	16	12	0*	32.9	5.9236*	11.035	2.1237
	2,3,7,8-Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	6	2	1	<0.41	1.59	1.035*	0.38635	0.15773

Notes:

1. The summary time is between 01-Sep-2020 and 01-Sep-2021.

2. The reporting locations are: "Stream C DS", "Stream C Confluence", "GS-1", "Location B", "SRD-1", "SRD-2", "SRD-3", "SRD-4", "SRD-5", "Stream C US", "WTL-1", "WTL-2".

3. Values with '*' are stats results using un-detected uncensored data.

WD Sediment Samples												
Category	**Parameter**	**Units**	**Start**	**End**	**Total Count**	**Count (<RDL)**	**Count (<RDL and uncensored)**	**Minimum**	**Maximum**	**Arithmetic_Mean**	**StdDev**	**Std_Error**
Physical/Conventional Characteristics	Moisture Content	%	01-Sep-2020	01-Sep-2021	12	0	0	41	68	56.008	8.7362	2.5219
	Total Organic Carbon	mg/kg	01-Sep-2020	01-Sep-2021	9	0	0	30000	55000	39111.11	9597.45	3199.15
	TOC	%	01-Sep-2020	01-Sep-2021	6	0	0	1.44	3.7	2.615	0.93616	0.38218
Nutrients	Total Phosphorous	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	388	610	477.44	83.202	27.734
Metals	Aluminum	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	4390	8500	6961.11	1637.66	545.89
	Antimony	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.12	0.9	0.39556	0.25803	0.086009
	Arsenic	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	2.33	5.28	3.3089	0.92402	0.30801
	Barium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	35.1	49.6	41.844	4.3741	1.458
	Beryllium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.21	0.36	0.30444	0.059605	0.019868
	Bismuth	µg/g	01-Sep-2020	01-Sep-2021	9	5	2	0.07*	0.14	0.10444*	0.022423	0.0074742
	Boron	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	8.3	16.1	11.322	2.7752	0.92508
	Boron (hot water)	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.12	0.59	0.29889	0.15988	0.053293
	Cadmium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.231	0.669	0.37756	0.13447	0.044823
	Calcium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	140000	170000	153333.3	11011.36	3670.45
	Cesium	µg/g	01-Sep-2020	01-Sep-2021	6	6	6	0.3*	0.6*	0.45*	0.10488	0.042817
	Chromium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	10.1	19.4	15.433	3.3782	1.1261
	Chromium (VI)	µg/g	01-Sep-2020	01-Sep-2021	9	9	6	0*	0.04*	0.015556*	0.016667	0.0055556
	Cobalt	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	4.19	7.3	5.5078	1.1246	0.37485
	Copper	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	19.1	35	25.478	5.7989	1.933
	Iron	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	11300	22200	14844.44	3438.43	1146.14
	Lead	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	7.38	42.6	19.549	14.902	4.9674
	Lithium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	6.88	12.6	9.9411	2.0558	0.68527
	Magnesium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	33400	57400	45266.67	9061.32	3020.44
	Manganese	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	450	920	666.22	186.66	62.221
	Mercury	µg/g	01-Sep-2020	01-Sep-2021	9	7	4	<0.015	0.105	0.043111*	0.028868	0.0096227
	Molybdenum	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.38	1.18	0.76222	0.27481	0.091603
	Nickel	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	9.79	18.3	14.132	3.2815	1.0938
	Potassium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	668	1300	1012.11	223.69	74.563
	Selenium	µg/g	01-Sep-2020	01-Sep-2021	9	6	5	0.23*	0.74	0.42889*	0.17737	0.059124
	Silver	µg/g	01-Sep-2020	01-Sep-2021	9	3	0	0.058	0.309	<0.12122	0.094561	0.03152
	Sodium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	250	1860	724	546.67	182.22
	Strontium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	160	445	298	103.89	34.63
	Thallium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.088	0.19	0.12478	0.036891	0.012297
	Thorium	µg/g	01-Sep-2020	01-Sep-2021	6	0	0	0.64	2.19	1.43	0.51842	0.21164
	Tin	µg/g	01-Sep-2020	01-Sep-2021	9	1	0	0.42	1.2	<0.82556	0.31524	0.10508
	Titanium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	123	290	205	48.539	16.18
	Tungsten	µg/g	01-Sep-2020	01-Sep-2021	6	6	6	0.12*	0.41*	0.21167*	0.12545	0.051213
	Uranium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	0.55	1	0.78533	0.16074	0.05358
	Vanadium	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	14.4	31.4	22.622	6.0346	2.0115
	Zinc	µg/g	01-Sep-2020	01-Sep-2021	9	0	0	97	550	268.67	152.88	50.96
	Zirconium	µg/g	01-Sep-2020	01-Sep-2021	6	0	0	0.84	1.75	1.3517	0.41849	0.17085

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	F1-BTEX	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	Petroleum Hydrocarbons F2	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	Petroleum Hydrocarbons F3	µg/g	01-Sep-2020	01-Sep-2021	3	0	0	130	2000	776.67	1060.02	612.
	Petroleum Hydrocarbons F4	µg/g	01-Sep-2020	01-Sep-2021	3	1	1	0*	630	270*	324.5	187.35
	Reached Baseline at C50	µg/g	01-Sep-2020	01-Sep-2021	3	0	0	1	1	1	0	0
	o-Terphenyl	%	01-Sep-2020	01-Sep-2021	3	0	0	82	95	89	6.5574	3.7859
	4-Bromofluorobenzene	%	01-Sep-2020	01-Sep-2021	3	0	0	82	83	82.667	0.57735	0.33333
	D10-o-Xylene	%	01-Sep-2020	01-Sep-2021	3	0	0	78	82	80	2	1.1547
	D4-1,2-Dichloroethane	%	01-Sep-2020	01-Sep-2021	3	0	0	104	105	104.33	0.57735	0.33333
	D8-Toluene	%	01-Sep-2020	01-Sep-2021	3	0	0	101	103	102.33	1.1547	0.66667
	p+m-Xylene	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	Benzene	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	Toluene	µg/g	01-Sep-2020	01-Sep-2021	3	2	2	0*	0.02	0.0066667*	0.011547	0.0066667
	Ethylbenzene	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	Total Xylenes	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
	o-Xylene	µg/g	01-Sep-2020	01-Sep-2021	3	3	3	0*	0*	0*	0	0
Radionuclides	Carbon-14	Bq/kg-C	01-Sep-2020	01-Sep-2021	6	0	0	22	103	70.167	33.772	13.787
	Beryllium-7	Bq/kg	01-Sep-2020	01-Sep-2021	6	2	2	5.35*	25.4	12.013*	7.9561	3.248
	Cobalt-60	Bq/kg	01-Sep-2020	01-Sep-2021	6	6	6	-0.164*	0.599*	0.11867*	0.31662	0.12926
	Cesium-134	Bq/kg	01-Sep-2020	01-Sep-2021	6	6	6	-0.127*	0.792*	0.30681*	0.32216	0.13152
	Cesium-137	Bq/kg	01-Sep-2020	01-Sep-2021	6	2	2	0.034*	3.08	1.1275*	1.0964	0.44761
	Iodine-131	Bq/kg	01-Sep-2020	01-Sep-2021	6	5	5	0.145*	2.93*	1.3208*	1.0267	0.41916
	Potassium-40	Bq/kg	01-Sep-2020	01-Sep-2021	6	0	0	64.9	221	157.32	55.882	22.814
	Thorium Series	Bq/kg	01-Sep-2020	01-Sep-2021	6	0	0	3.57	11.9	7.3933	3.0841	1.2591
	Uranium Series	Bq/kg	01-Sep-2020	01-Sep-2021	6	0	0	10.2	17.8	14.9	2.7291	1.1142
Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	0.721*	11.7	4.0461*	4.5457	1.5152
	1,2,3,4,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	0*	13.4	4.3739*	4.9804	1.6601
	1,2,3,6,7,8-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	1.2*	32.4	10.198*	12.893	4.2977
	1,2,3,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	0.581*	9.44	3.0917*	3.4044	1.1348
	1,2,3,7,8,9-Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	1.58*	27.2	9.2478*	10.089	3.363

Category	Parameter	Units	Start	End	Total Count	Count (<RDL)	Count (<RDL and uncensored)	Minimum	Maximum	Arithmetic_Mean	StdDev	Std_Error
Dioxins and Furans	1,2,3,7,8,9-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	9	9	6	0*	0.577*	0.17633*	0.24217	0.080722
	1,2,3,7,8-Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	9	9	6	0.345*	4.65*	1.7307*	1.7209	0.57363
	1,2,3,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	9	9	6	0*	1.77*	0.68*	0.68955	0.22985
	2,3,4,6,7,8-Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	9	7	4	0.635*	8.21	2.6928*	2.7924	0.93081
	2,3,7,8-Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	9	8	5	0*	1.17	0.34478*	0.48284	0.16095
	2,3,7,8-Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	0*	6.55	2.0406*	2.357	0.78568
	2,3,4,7,8-Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	9	9	6	0.232*	2.77*	0.946*	0.93551	0.31184
	1,2,3,4,6,7,8-Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	42.9	1120	319.57	408.64	136.21
	1,2,3,4,6,7,8-Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	9	1	0	<0	245	<69.177	93.524	31.175
	1,2,3,4,7,8,9-Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	9	6	4	<0	18.4	5.5354*	7.0563	2.3521
	Total Hexa CDD	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	13.2	199	68.756	69.458	23.153
	Total Hexa CDF	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	7.63	269	77.951	102.29	34.096
	Total Hepta CDD	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	85.2	1810	535.69	638.82	212.94
	Total Hepta CDF	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	14	816	187.91	294.12	98.041
	Octa CDD	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	236	7430	1995.67	2694.55	898.18
	Octa CDF	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	16	663	193.91	258.68	86.227
	Total Penta CDD	pg/g	01-Sep-2020	01-Sep-2021	9	4	3	2.55*	26.1	10.857*	9.3815	3.1272
	Total Penta CDF	pg/g	01-Sep-2020	01-Sep-2021	9	3	2	2.72*	87.3	25.79*	32.149	10.716
	Total Tetra CDD	pg/g	01-Sep-2020	01-Sep-2021	9	2	2	0.303*	7.38	2.9216*	2.823	0.94101
	Total Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	9	0	0	1.36	42.8	13.594	15.019	5.0062
	2,3,7,8-Tetra CDF	pg/g	01-Sep-2020	01-Sep-2021	3	0	0	1.44	4.07	2.6667	1.3239	0.76434

Notes:
1. The summary time is between 01-Sep-2020 and 01-Sep-2021.
2. The reporting locations are: "WD-1", "WD-2b", "WD-3".
3. Values with '*' are stats results using un-detected uncensored data.

Appendix G Environmental Datasets by Location

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
GS-1	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	95	1	0	180	1	0	110	1	0	100
		Conductivity	µS/cm	1	0	360	1	0	2300	2	0	1060.5	1	0	540
		Total Dissolved Solids	mg/L	1	0	170	1	0	1190	1	0	510	1	0	240
		Total Suspended Solids	mg/L	1	1	3*	1	1	3*	1	1	2*	1	1	4*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	1	4*	1	1	3*	1	1	4*	1	0	5
		Aluminum - Total	µg/L	1	0	7	1	0	5.7	1	0	11.7	1	0	5.7
		Antimony - Total	µg/L	1	1	0.4*	1	0	0.51	1	0	0.57	1	1	0.42*
		Arsenic - Total	µg/L	1	0	0.11	1	0	0.19	1	0	0.2	1	0	0.33
		Barium - Total	µg/L	1	0	8.3	1	0	29.5	1	0	17.1	1	0	11.2
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	-0.0028*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	12*	1	1	12*	1	1	23*	1	1	21*
		Cadmium - Total	µg/L	1	1	0.002*	1	1	0.005*	1	1	0.002*	1	1	0.002*
		Calcium - Total	µg/L										1	0	28300
		Cesium - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Chromium - Total	µg/L	1	1	0.1*	1	1	0.2*	1	1	0.5*	1	1	0.1*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.54*	1	1	-0.55*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.48*	1	0	0.54	1	0	0.55	1	1	0.41*
		Cobalt - Total	µg/L	1	1	0.02*	1	1	0.02*	1	1	0.03*	1	1	0.03*
		Copper - Total	µg/L	1	1	0.34*	1	1	0.42*	1	0	0.62	1	1	0.41*
		Iron - Total	µg/L	1	0	12	1	0	18	1	0	17	1	0	67
		Lead - Total	µg/L	1	1	0.02*	1	1	0.01*	1	1	0.03*	1	1	0.01*
		Lithium - Total	µg/L	1	1	0.9*	1	1	1.6*	1	1	1.1*	1	1	1*
		Manganese - Total	µg/L	1	0	1.1	1	0	8	1	0	2.5	1	0	8.1
		Mercury - Total	µg/L	1	1	0.002*	1	1	0*				1	1	0.001*
		Molybdenum - Total	µg/L	1	1	0.3*	1	1	0.5*	1	1	0.8*	1	1	0.2*
		Magnesium - Total	µg/L							1	0	10500	1	0	6960
		Potassium - Total	µg/L				1	0	1500	1	0	1180	1	0	658
		Nickel - Total	µg/L	1	1	0.2*	1	1	0.3*	1	0	1.7	1	1	0.3*
		Selenium - Total	µg/L	1	1	0.06*	1	0	0.15	1	0	0.12	1	1	0.09*
		Silicon - Total	µg/L	1	0	478	1	0	1520	1	0	172	1	0	395
		Silver - Total	µg/L	1	1	-0.0005*	1	1	-0.001*	1	1	-0.0011*	1	1	-0.0015*
		Sodium - Total	µg/L	1	0	30600	1	0	372000	1	0	153000	1	0	63400
		Strontium - Total	µg/L	1	0	337	1	0	1270	1	0	795	1	0	407
		Thallium - Total	µg/L	1	1	-0.0008*	1	1	0.003*	1	1	0.002*	1	1	0.001*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0011*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	-0.0873*	1	1	-0.332*	1	1	0.3*	1	1	-0.0869*
		Tungsten - Total	µg/L				1	1	0.1*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.36	1	0	0.78	1	0	0.33	1	0	0.11
		Vanadium - Total	µg/L	1	1	0*	1	1	0.1*	1	1	0.1*	1	1	0.1*
		Zinc - Total	µg/L	1	1	2.9*	1	0	10.9	1	0	5.3	1	1	2.8*
		Zirconium - Total	µg/L	1	1	0.05*	1	1	0.08*	1	1	0.04*	1	1	0.02*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	371	1	0	673	1	0	389	1	0	339
		Carbon-14	Bq/kg	1	1	-0.01*	1	1	-0.022*	1	1	-0.065*	1	1	-0.034*
		Cobalt-60	Bq/kg	1	1	0.225*	1	1	-0.045*	1	1	0.203*	1	1	-0.0917*
		Cesium-134	Bq/kg	1	1	-0.2*	1	1	0.267*	1	1	-0.146*	1	1	0.375*
		Cesium-137	Bq/kg	1	1	-0.516*	1	1	-0.062*	1	1	-0.423*	1	1	-0.389*
		Iodine-131	Bq/kg	1	1	0.297*	1	1	0.406*	1	1	0.164*	1	1	-0.0939*
		Potassium-40	Bq/kg	1	1	-6.21*	1	1	-2.36*	1	1	-1.15*	1	1	1.45*
		Thorium Series	Bq/kg	1	1	0.745*	1	1	0.241*	1	1	-1.22*	1	1	-0.0649*
		Uranium Series	Bq/kg	1	1	-1.04*	1	1	0.224*	1	1	-0.214*	1	1	0.339*
Location B	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	190	1	0	250	1	0	110	1	0	240
		Conductivity	µS/cm	1	0	1300	1	0	3200	2	0	1078.5	1	0	3100
		Total Dissolved Solids	mg/L	1	0	645	1	0	1700	1	0	560	1	0	1570
		Total Suspended Solids	mg/L	1	1	6*	1	1	2*	1	1	2*	1	0	10
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	1	4*	1	0	8	1	0	6	1	1	4*
		Aluminum - Total	µg/L	1	0	34.8	1	1	2.7*	1	0	34.3	1	0	13.1
		Antimony - Total	µg/L	1	1	0.12*	1	1	0.1*	1	1	0.22*	1	1	0.12*
		Arsenic - Total	µg/L	1	0	0.19	1	1	0.12*	1	0	0.24	1	0	0.55
		Barium - Total	µg/L	1	0	26.1	1	0	50.6	1	0	27.1	1	0	77.5
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	14*	1	1	9*	1	1	23*	1	1	27*
		Cadmium - Total	µg/L	1	0	0.012	1	0	0.043	1	0	0.067	1	0	0.03
		Calcium - Total	µg/L										1	0	97300
		Cesium - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Chromium - Total	µg/L	1	1	0.2*	1	1	0.2*	1	0	8.8	1	1	0.3*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.64*	1	1	-0.66*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.34*	1	0	0.64	1	0	0.66	1	1	0.22*
		Cobalt - Total	µg/L	1	1	0.06*	1	1	0.05*	1	1	0.1*	1	0	0.33
		Copper - Total	µg/L	1	0	0.88	1	1	0.6*	1	0	1.68	1	0	0.63
		Iron - Total	µg/L	1	0	90	1	0	24	1	0	110	1	0	1500
		Lead - Total	µg/L	1	1	0.06*	1	1	0.02*	1	1	0.16*	1	1	0.07*
		Lithium - Total	µg/L	1	1	1.3*	1	1	2*	1	1	1.2*	1	0	3.1
		Manganese - Total	µg/L	1	0	3.2	1	0	4.2	1	0	9.5	1	0	242
		Mercury - Total	µg/L	1	1	-0.0006*	1	1	-0.0017*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.8*	1	1	1.1*	1	0	10.4	1	0	1
		Magnesium - Total	µg/L							1	0	9640	1	0	25000
		Potassium - Total	µg/L				1	0	2440	1	0	1630	1	0	3420
		Nickel - Total	µg/L	1	1	0.5*	1	1	0.7*	1	0	36	1	1	0.9*
		Selenium - Total	µg/L	1	0	0.1	1	1	0.15*	1	0	0.15	1	0	0.18
		Silicon - Total	µg/L	1	0	2150	1	0	2780	1	0	516	1	0	2720
		Silver - Total	µg/L	1	1	-0.0002*	1	1	-0.0034*	1	1	0.001*	1	1	0*
		Sodium - Total	µg/L	1	0	155000	1	0	477000	1	0	182000	1	0	478000
		Strontium - Total	µg/L	1	0	1830	1	0	3320	1	0	1150	1	0	3270
		Thallium - Total	µg/L	1	1	0*	1	1	0.006*	1	1	0.004*	1	1	0.006*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0015*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0.1*	1	1	0*
		Titanium - Total	µg/L	1	1	0.8*	1	1	-1.14*	1	1	1.8*	1	1	0.3*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0.1*
		Uranium - Total	µg/L	1	0	0.63	1	0	0.96	1	0	0.35	1	0	0.78
		Vanadium - Total	µg/L	1	1	0.1*	1	1	-0.188*	1	1	0.5*	1	1	0.4*
		Zinc - Total	µg/L	1	0	17.4	1	0	45	1	0	34.7	1	0	17.1
		Zirconium - Total	µg/L	1	1	0.08*	1	0	0.2	1	1	0.07*	1	1	0.08*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	1.62*	1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	26.9*	1	1	1.73*	1	1	0*	1	1	2.6*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	31.5*	1	1	1.46*	1	1	1.27*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	3.34*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	28.9*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	45.8*	1	1	1.73*	1	1	1.75*	1	1	4.15*
		Total Hepta CDF	pg/L	1	1	49.3*	1	1	1.46*	1	1	1.27*	1	1	0*
		Octa CDD	pg/L	1	0	136	1	1	6.65*	1	1	7.46*	1	1	6.65*
		Octa CDF	pg/L	1	1	27.5*	1	1	2.09*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	3	0	523.67	3	0	863.33	3	0	891.33	3	0	1513.33
		Carbon-14	Bq/kg	1	1	-0.02*	1	0	0.094	1	1	0.023*	1	0	0.175
		Cobalt-60	Bq/kg	1	1	0.149*	1	1	0.229*	1	1	0.0669*	1	1	-0.114*
		Cesium-134	Bq/kg	1	1	0.425*	1	1	-0.198*	1	1	-0.578*	1	1	-0.0849*
		Cesium-137	Bq/kg	1	1	0.0918*	1	1	-0.156*	1	1	0.402*	1	1	-0.219*
		Iodine-131	Bq/kg	1	1	-0.193*	1	1	0.048*	1	1	-0.766*	1	1	-1.1*
		Potassium-40	Bq/kg	1	1	-0.614*	1	1	1.62*	1	1	1.42*	1	1	-3.89*
		Thorium Series	Bq/kg	1	1	-0.0757*	1	1	-0.609*	1	1	0.293*	1	0	0.479
		Uranium Series	Bq/kg	1	1	-0.0363*	1	1	0.177*	1	1	3.02*	1	1	-0.329*
SRD-1	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	200	1	0	250	1	0	230	1	0	280
		Conductivity	µS/cm	1	0	1400	1	0	2400	2	0	1882	1	0	3200
		Total Dissolved Solids	mg/L	1	0	725	1	0	1230	1	0	1100	1	0	1630
		Total Suspended Solids	mg/L	1	1	3*	1	1	6*	1	1	2*	1	0	10
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	14	1	0	7	1	1	3*	1	1	3*
		Aluminum - Total	µg/L	1	0	23.5	1	0	4.2	1	0	8.5	1	0	8.2
		Antimony - Total	µg/L	1	1	0.11*	1	1	0.12*	1	1	0.15*	1	1	0.08*
		Arsenic - Total	µg/L	1	0	0.2	1	0	0.15	1	0	0.22	1	0	0.59
		Barium - Total	µg/L	1	0	22.6	1	0	40	1	0	47.5	1	0	76.7
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	14*	1	1	8*	1	1	18*	1	1	21*
		Cadmium - Total	µg/L	1	1	0.003*	1	1	0.004*	1	1	0.004*	1	1	0.003*
		Calcium - Total	µg/L										1	0	116000
		Cesium - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Chromium - Total	µg/L	1	1	0.1*	1	1	0.2*	1	0	4.4	1	1	0.2*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.56*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.33*	1	0	0.56	1	1	0.26*	1	1	0.22*
		Cobalt - Total	µg/L	1	1	0.05*	1	1	0.05*	1	1	0.08*	1	0	0.21
		Copper - Total	µg/L	1	0	0.97	1	0	0.7	1	0	1.08	1	1	0.41*
		Iron - Total	µg/L	1	0	84	1	0	19	1	0	44	1	0	1200
		Lead - Total	µg/L	1	1	0.04*	1	1	0.02*	1	1	0.02*	1	1	0.02*
		Lithium - Total	µg/L	1	1	1.1*	1	1	1.4*	1	1	1.5*	1	0	2.5
		Manganese - Total	µg/L	1	0	2.1	1	0	1.5	1	0	8.5	1	0	398
		Mercury - Total	µg/L	1	1	0.001*	1	1	-0.0004*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.6*	1	1	0.9*	1	0	6.1	1	1	0.5*
		Magnesium - Total	µg/L							1	0	19700	1	0	24800
		Potassium - Total	µg/L				1	0	2230	1	0	3880	1	0	4390
		Nickel - Total	µg/L	1	1	0.5*	1	1	0.6*	1	0	17.6	1	1	0.9*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Selenium - Total	µg/L	1	1	0.08*	1	1	0.06*	1	1	0.07*	1	0	0.12
		Silicon - Total	µg/L	1	0	2010	1	0	2800	1	0	693	1	0	2980
		Silver - Total	µg/L	1	1	-0.0009*	1	1	0*	1	1	0.002*	1	1	0.001*
		Sodium - Total	µg/L	1	0	188000	1	0	349000	1	0	323000	1	0	483000
		Strontium - Total	µg/L	1	0	1580	1	0	2740	1	0	2660	1	0	3250
		Thallium - Total	µg/L	1	1	-0.0001*	1	1	0.008*	1	1	0.002*	1	1	0.005*
		Thorium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0.1*	1	1	0.1*	1	1	0.1*	1	1	0*
		Titanium - Total	µg/L	1	1	0.3*	1	1	-0.384*	1	1	0.2*	1	1	0.3*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.52	1	0	0.74	1	0	0.71	1	0	0.38
		Vanadium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0.2*
		Zinc - Total	µg/L	1	0	5.3	1	0	17.3	1	0	11.1	1	1	3.6*
		Zirconium - Total	µg/L	1	1	0.09*	1	0	0.12	1	0	0.1	1	1	0.05*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	1.6*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	4*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	1.69*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	2.39*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	46.7*	1	1	0*	1	1	6.08*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	0	57.6	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	3.5*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	11.6*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	0	55.5	1	1	0*	1	1	2.15*	1	1	0*
		Total Hepta CDD	pg/L	1	0	74.3	1	1	0*	1	1	9.92*	1	1	0*
		Total Hepta CDF	pg/L	1	0	102	1	1	1.18*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	0	230	1	1	15*	1	1	30.6*	1	1	4.31*
		Octa CDF	pg/L	1	1	65.4*	1	1	2.57*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	5.84*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	3	0	128.33	3	0	222.67	3	0	242.33	3	0	257.67
		Carbon-14	Bq/kg	1	1	-0.02*	1	1	-0.032*	1	1	-0.083*	1	1	-0.034*
		Cobalt-60	Bq/kg	1	1	-0.128*	1	1	-0.038*	1	1	-0.131*	1	1	0.115*
		Cesium-134	Bq/kg	1	1	-0.0548*	1	1	0.232*	1	1	0.16*	1	1	-0.217*
		Cesium-137	Bq/kg	1	1	-0.053*	1	1	-0.388*	1	1	0.0906*	1	1	-0.0878*
		Iodine-131	Bq/kg	1	1	-0.00106*	1	1	0.376*	1	1	0.0244*	1	1	-0.00491*
		Potassium-40	Bq/kg	1	1	-2.08*	1	1	-0.757*	1	1	-1.79*	1	1	-31.1*
		Thorium Series	Bq/kg	1	1	-0.718*	1	1	0.007*	1	1	-0.816*	1	1	-1.64*
		Uranium Series	Bq/kg	1	1	0.253*	1	1	0.421*	1	1	0.815*	1	1	-0.55*
SRD-2	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	200	1	0	240	1	0	96	1	0	210
		Conductivity	µS/cm	1	0	1300	1	0	3500	2	0	1092.5	1	0	2200
		Total Dissolved Solids	mg/L	1	0	665	1	0	1820	1	0	440	1	0	1140
		Total Suspended Solids	mg/L	1	1	4*	1	1	4*	1	1	3*	1	1	6*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	5	1	0	5	1	0	9	1	0	6
		Aluminum - Total	µg/L	1	0	17.4	1	1	5.9*	1	0	86.2	1	0	43.8
		Antimony - Total	µg/L	1	1	0.16*	1	1	0.1*	1	1	0.19*	1	1	0.12*
		Arsenic - Total	µg/L	1	0	0.19	1	1	0.18*	1	0	0.2	1	0	0.51
		Barium - Total	µg/L	1	0	28	1	0	51.6	1	0	16.5	1	0	55.5
		Beryllium - Total	µg/L	1	1	0*	1	1	0.01*	1	1	0*	1	1	0.01*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	14*	1	1	12*	1	1	18*	1	1	24*
		Cadmium - Total	µg/L	1	1	0.008*	1	0	0.056	1	0	0.026	1	0	0.016

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value	Winter 2021 Total Count	Winter 2021 Count (<RDL and uncensored)	Winter 2021 Value	Spring 2021 Total Count	Spring 2021 Count (<RDL and uncensored)	Spring 2021 Value	Summer 2021 Total Count	Summer 2021 Count (<RDL and uncensored)	Summer 2021 Value
		Calcium - Total	µg/L										1	0	85900
		Cesium - Total	µg/L				1	1	0*	1	1	0.01*	1	1	0.01*
		Chromium - Total	µg/L	1	1	0.2*	1	1	0.3*	1	0	7.1	1	1	0.3*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.62*	1	1	-0.59*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.34*	1	0	0.62	1	0	0.59	1	1	0.32*
		Cobalt - Total	µg/L	1	1	0.04*	1	1	0.05*	1	1	0.09*	1	1	0.18*
		Copper - Total	µg/L	1	0	0.81	1	1	0.8*	1	0	1.44	1	0	0.74
		Iron - Total	µg/L	1	0	34	1	1	12*	1	0	94	1	0	172
		Lead - Total	µg/L	1	1	0.03*	1	1	0.03*	1	1	0.1*	1	1	0.07*
		Lithium - Total	µg/L	1	1	1.7*	1	1	2.5*	1	1	1.3*	1	0	3
		Manganese - Total	µg/L	1	0	1.3	1	0	3.4	1	0	4.4	1	0	58.5
		Mercury - Total	µg/L	1	1	0.002*	1	1	-0.0012*				1	1	0*
		Molybdenum - Total	µg/L	1	1	0.9*	1	1	1.2*	1	0	8.3	1	1	0.9*
		Magnesium - Total	µg/L							1	0	8420	1	0	24000
		Potassium - Total	µg/L				1	0	2570	1	0	1470	1	0	3030
		Nickel - Total	µg/L	1	1	0.6*	1	1	0.9*	1	0	29.5	1	0	1
		Selenium - Total	µg/L	1	1	0.09*	1	0	0.21	1	0	0.14	1	0	0.14
		Silicon - Total	µg/L	1	0	1830	1	0	2610	1	0	594	1	0	1490
		Silver - Total	µg/L	1	1	-0.0001*	1	1	-0.0038*	1	1	0.001*	1	1	-0.0005*
		Sodium - Total	µg/L	1	0	158000	1	0	538000	1	0	145000	1	0	312000
		Strontium - Total	µg/L	1	0	1810	1	0	3050	1	0	850	1	0	2320
		Thallium - Total	µg/L	1	1	0.001*	1	1	0.01*	1	1	0.004*	1	1	0.007*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0067*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	0.2*	1	1	-1.05*	1	1	2.4*	1	1	1.2*
		Tungsten - Total	µg/L				1	1	0*	1	1	0.1*	1	1	0*
		Uranium - Total	µg/L	1	0	0.81	1	0	1.17	1	0	0.34	1	0	0.8
		Vanadium - Total	µg/L	1	1	0.3*	1	1	-0.0666*	1	1	0.6*	1	1	0.6*
		Zinc - Total	µg/L	1	0	46.1	1	0	84	1	0	35.6	1	0	105
		Zirconium - Total	µg/L	1	1	0.06*	1	1	0.18*	1	0	0.1	1	0	0.1
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	5.69*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	6.79*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	9.87*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDF	pg/L	1	1	6.79*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	28.2*	1	1	3.39*	1	1	5.64*	1	1	2.33*
		Octa CDF	pg/L	1	1	6.54*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	3	0	510	3	0	916.33	3	0	645	3	0	919
		Carbon-14	Bq/kg	1	1	0.09*	1	0	0.472	1	0	0.513	1	0	1.39
		Cobalt-60	Bq/kg	1	1	0.0833*	1	1	0.082*	1	1	0.306*	1	1	0.0733*
		Cesium-134	Bq/kg	1	1	-0.261*	1	1	0.01*	1	1	0.719*	1	1	0.0638*
		Cesium-137	Bq/kg	1	1	-0.196*	1	1	0.166*	1	1	0.461*	1	1	0.0221*
		Iodine-131	Bq/kg	1	1	-0.345*	1	1	0.065*	1	1	-0.52*	1	1	-0.306*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Potassium-40	Bq/kg	1	1	4.24*	1	1	-0.15*	1	1	1.33*	1	1	1.71*
		Thorium Series	Bq/kg	1	1	-0.553*	1	1	0.155*	1	1	1.13*	1	1	-0.268*
		Uranium Series	Bq/kg	1	1	0.489*	1	1	0.141*	1	1	1.41*	1	1	0.193*
SRD-3	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	190	1	0	230	1	0	120	1	0	140
		Conductivity	µS/cm	1	0	1200	1	0	3700	2	0	1220.5	1	0	2000
		Total Dissolved Solids	mg/L	1	0	595	1	0	1990	1	0	620	1	0	985
		Total Suspended Solids	mg/L	1	1	5*	1	1	5*	1	1	4*	1	1	8*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	7	1	0	7	1	0	5	1	0	5
		Aluminum - Total	µg/L	1	0	17	1	0	9.9	1	0	74.9	1	0	15.4
		Antimony - Total	µg/L	1	1	0.13*	1	1	0.1*	1	1	0.21*	1	1	0.1*
		Arsenic - Total	µg/L	1	0	0.2	1	1	0.19*	1	0	0.25	1	0	0.66
		Barium - Total	µg/L	1	0	24.9	1	0	51.2	1	0	23.3	1	0	28.7
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	13*	1	1	12*	1	1	15*	1	1	25*
		Cadmium - Total	µg/L	1	1	0.005*	1	0	0.028	1	0	0.023	1	1	0.008*
		Calcium - Total	µg/L										1	0	52800
		Cesium - Total	µg/L				1	1	0*	1	1	0.01*	1	1	0*
		Chromium - Total	µg/L	1	1	0.1*	1	1	0.3*	1	0	3.4	1	1	0.2*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.72*	1	1	-0.76*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.38*	1	0	0.72	1	0	0.76	1	1	0.32*
		Cobalt - Total	µg/L	1	1	0.04*	1	1	0.04*	1	1	0.08*	1	1	0.14*
		Copper - Total	µg/L	1	0	0.8	1	1	0.7*	1	0	1.44	1	0	0.7
		Iron - Total	µg/L	1	0	31	1	1	17*	1	0	95	1	0	403
		Lead - Total	µg/L	1	1	0.03*	1	1	0.02*	1	1	0.11*	1	1	0.03*
		Lithium - Total	µg/L	1	1	1.5*	1	1	2.7*	1	1	1.8*	1	0	2.8
		Manganese - Total	µg/L	1	0	2.4	1	0	6.2	1	0	8.2	1	0	85.6
		Mercury - Total	µg/L	1	1	0.001*	1	1	-0.0016*				1	1	0.001*
		Molybdenum - Total	µg/L	1	1	0.8*	1	1	1.2*	1	0	4.4	1	1	0.7*
		Magnesium - Total	µg/L							1	0	11500	1	0	21400
		Potassium - Total	µg/L				1	0	2470	1	0	1920	1	0	2930
		Nickel - Total	µg/L	1	1	0.6*	1	1	0.8*	1	0	13.8	1	1	0.9*
		Selenium - Total	µg/L	1	1	0.09*	1	1	0.19*	1	0	0.19	1	0	0.13
		Silicon - Total	µg/L	1	0	1660	1	0	2120	1	0	579	1	0	1200
		Silver - Total	µg/L	1	1	-0.0019*	1	1	-0.0042*	1	1	0.001*	1	1	0.001*
		Sodium - Total	µg/L	1	0	134000	1	0	608000	1	0	202000	1	0	294000
		Strontium - Total	µg/L	1	0	1610	1	0	2920	1	0	1110	1	0	1900
		Thallium - Total	µg/L	1	1	0*	1	1	0.007*	1	1	0.006*	1	1	0.003*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0048*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	0.2*	1	1	-0.875*	1	1	3.2*	1	1	0.3*
		Tungsten - Total	µg/L				1	1	0*	1	1	0.1*	1	1	0*
		Uranium - Total	µg/L	1	0	0.74	1	0	1.17	1	0	0.46	1	0	0.52
		Vanadium - Total	µg/L	1	1	0.2*	1	1	-0.0651*	1	1	0.6*	1	1	0.4*
		Zinc - Total	µg/L	1	0	30.3	1	0	85	1	0	53.6	1	0	11.9
		Zirconium - Total	µg/L	1	1	0.07*	1	1	0.16*	1	0	0.1	1	1	0.08*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	2.97*	1	1	0*	1	1	1.53*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDF	pg/L	1	1	2.97*	1	1	0*	1	1	1.53*	1	1	0*
		Octa CDD	pg/L	1	1	2.63*	1	1	5.25*	1	1	0*	1	1	3.3*
		Octa CDF	pg/L	1	1	0*	1	1	2.22*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	484	1	0	890	1	0	610	1	0	747
		Carbon-14	Bq/kg	1	0	0.09	1	0	0.542	1	0	0.778	1	0	0.673
		Cobalt-60	Bq/kg	1	1	-0.371*	1	1	-0.2*	1	1	-0.0963*	1	1	0.0845*
		Cesium-134	Bq/kg	1	1	0.476*	1	1	0.287*	1	1	-0.00221*	1	1	0.113*
		Cesium-137	Bq/kg	1	1	-1*	1	1	0.527*	1	1	0.0178*	1	1	-0.312*
		Iodine-131	Bq/kg	1	1	0.402*	1	1	0.584*	1	1	-0.0939*	1	1	0.357*
		Potassium-40	Bq/kg	1	1	0.435*	1	1	-4.99*	1	1	-1.75*	1	1	-41.5*
		Thorium Series	Bq/kg	1	1	1.43*	1	1	-0.036*	1	1	-0.375*	1	1	-0.904*
		Uranium Series	Bq/kg	1	0	1.91	1	1	-0.022*	1	1	0.118*	1	1	-1.55*
SRD-4	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	210	1	0	320	1	0	180	1	0	90
		Conductivity	µS/cm	1	0	800	1	0	830	2	0	1144.5	1	0	660
		Total Dissolved Solids	mg/L	1	0	410	1	0	445	1	0	620	1	0	295
		Total Suspended Solids	mg/L	1	1	2*	1	1	7*	1	1	3*	1	1	8*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	8	1	1	3*	1	1	3*	1	0	6
		Aluminum - Total	µg/L	1	0	9.7	1	0	6.4	1	0	25.2	1	0	176
		Antimony - Total	µg/L	1	1	0.11*	1	1	0.06*	1	1	0.15*	1	1	0.1*
		Arsenic - Total	µg/L	1	0	0.17	1	0	0.15	1	0	0.24	1	0	0.28
		Barium - Total	µg/L	1	0	17.9	1	0	22.2	1	0	24.9	1	0	14
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	-0.0024*	1	1	0.01*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	23*	1	1	43*	1	1	29*	1	1	21*
		Cadmium - Total	µg/L	1	1	0.002*	1	1	0.003*	1	0	0.017	1	0	0.023
		Calcium - Total	µg/L										1	0	29500
		Cesium - Total	µg/L				1	1	0*	1	1	0.01*	1	1	0.02*
		Chromium - Total	µg/L	1	1	0.1*	1	1	0.2*	1	0	1.7	1	1	0.4*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.51*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.36*	1	0	0.51	1	1	0.48*	1	1	0.44*
		Cobalt - Total	µg/L	1	1	0.04*	1	1	0.05*	1	1	0.06*	1	1	0.11*
		Copper - Total	µg/L	1	0	0.51	1	1	0.47*	1	0	1.01	1	0	1.13
		Iron - Total	µg/L	1	0	45	1	0	38	1	0	77	1	0	306
		Lead - Total	µg/L	1	1	0.02*	1	1	0.02*	1	1	0.04*	1	1	0.17*
		Lithium - Total	µg/L	1	1	1.3*	1	1	1.4*	1	1	1.6*	1	1	1.4*
		Manganese - Total	µg/L	1	0	7.4	1	0	7.3	1	0	13.1	1	0	23.6
		Mercury - Total	µg/L	1	1	0.002*	1	1	-0.0012*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.4*	1	1	0.6*	1	0	2.3	1	1	0.4*
		Magnesium - Total	µg/L							1	0	15600	1	0	7420
		Potassium - Total	µg/L				1	0	1380	1	0	2050	1	0	1470
		Nickel - Total	µg/L	1	1	0.4*	1	1	0.4*	1	0	6.6	1	1	0.6*
		Selenium - Total	µg/L	1	1	0.09*	1	1	0.07*	1	0	0.16	1	1	0.09*
		Silicon - Total	µg/L	1	0	2190	1	0	3080	1	0	631	1	0	1210
		Silver - Total	µg/L	1	1	-0.0001*	1	1	-0.0013*	1	1	0.001*	1	1	0*
		Sodium - Total	µg/L	1	0	73000	1	0	50400	1	0	183000	1	0	80500
		Strontium - Total	µg/L	1	0	1670	1	0	1440	1	0	1590	1	0	694
		Thallium - Total	µg/L	1	1	-0.0007*	1	1	0.002*	1	1	0.003*	1	1	0.004*
		Thorium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	0.2*	1	1	-0.215*	1	1	1.2*	1	0	6.6
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.48	1	0	0.52	1	0	0.47	1	0	0.16
		Vanadium - Total	µg/L	1	1	0.1*	1	1	-0.014*	1	1	0.1*	1	1	0.7*
		Zinc - Total	µg/L	1	0	16.6	1	0	9.4	1	0	23.6	1	0	14.4

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Zirconium - Total	µg/L	1	1	0.06*	1	0	0.11	1	1	0.08*	1	0	0.14
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	1.78*	1	1	1.72*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	2.4*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	1.82*	1	1	1.78*	1	1	1.72*	1	1	0*
		Total Hepta CDF	pg/L	1	1	2.4*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	12.9*	1	1	14.1*	1	1	4.63*	1	1	4.57*
		Octa CDF	pg/L	1	1	2.12*	1	1	1.63*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	349	1	0	88	1	0	450	1	0	289
		Carbon-14	Bq/kg	1	1	0.03*	1	0	0.103	1	0	0.438	1	0	0.482
		Cobalt-60	Bq/kg	1	1	0.308*	1	1	0.816*	1	1	-0.141*	1	1	-0.0211*
		Cesium-134	Bq/kg	1	1	0.105*	1	1	0.058*	1	1	-0.0946*	1	1	0.102*
		Cesium-137	Bq/kg	1	1	-0.122*	1	1	0.26*	1	1	-0.567*	1	1	-0.0759*
		Iodine-131	Bq/kg	1	1	-0.0636*	1	1	0.558*	1	1	0.0361*	1	1	0.255*
		Potassium-40	Bq/kg	1	1	-1.1*	1	1	3.59*	1	1	-4.62*	1	1	-1.3*
		Thorium Series	Bq/kg	1	1	-0.446*	1	1	-0.663*	1	1	-0.586*	1	1	0.066*
		Uranium Series	Bq/kg	1	1	0.591*	1	1	0.726*	1	1	0.302*	1	1	-0.121*
SRD-5	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	210	1	0	270	1	0	200	1	0	96
		Conductivity	µS/cm	1	0	770	1	0	2100	2	0	891.5	1	0	710
		Total Dissolved Solids	mg/L	1	0	380	1	0	1080	1	0	480	1	0	365
		Total Suspended Solids	mg/L	1	1	4*	1	1	5*	1	1	2*	1	1	9*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	12	1	1	3*	1	1	2*	1	0	5
		Aluminum - Total	µg/L	1	0	11.8	1	0	11.8	1	0	16.1	1	0	148
		Antimony - Total	µg/L	1	1	0.12*	1	1	0.11*	1	1	0.14*	1	1	0.13*
		Arsenic - Total	µg/L	1	0	0.18	1	0	0.2	1	0	0.21	1	0	0.27
		Barium - Total	µg/L	1	0	16.7	1	0	29.9	1	0	20.6	1	0	15.8
		Beryllium - Total	µg/L	1	1	-0.0002*	1	1	0*	1	1	-0.0008*	1	1	0.01*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	22*	1	1	25*	1	1	33*	1	1	25*
		Cadmium - Total	µg/L	1	1	0.002*	1	1	0.006*	1	1	0.009*	1	0	0.026
		Calcium - Total	µg/L										1	0	33600
		Cesium - Total	µg/L				1	1	0*	1	1	0*	1	1	0.02*
		Chromium - Total	µg/L	1	1	0.1*	1	1	0.2*	1	1	0.9*	1	1	0.5*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.56*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.4*	1	0	0.56	1	1	0.38*	1	1	0.47*
		Cobalt - Total	µg/L	1	1	0.04*	1	1	0.03*	1	1	0.05*	1	1	0.09*
		Copper - Total	µg/L	1	0	0.52	1	1	0.45*	1	0	0.81	1	0	1.3
		Iron - Total	µg/L	1	0	37	1	0	43	1	0	41	1	0	262
		Lead - Total	µg/L	1	1	0.02*	1	1	0.02*	1	1	0.02*	1	1	0.16*
		Lithium - Total	µg/L	1	1	1.3*	1	1	1.8*	1	1	1.3*	1	1	1.4*
		Manganese - Total	µg/L	1	0	4.6	1	0	9	1	0	6.8	1	0	24
		Mercury - Total	µg/L	1	1	0.001*	1	1	-0.0003*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.5*	1	1	0.6*	1	0	1.1	1	1	0.5*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Magnesium - Total	µg/L							1	0	17100	1	0	8440
		Potassium - Total	µg/L				1	0	1690	1	0	1900	1	0	1600
		Nickel - Total	µg/L	1	1	0.4*	1	1	0.4*	1	0	3.5	1	1	0.6*
		Selenium - Total	µg/L	1	1	0.08*	1	0	0.1	1	1	0.08*	1	0	0.1
		Silicon - Total	µg/L	1	0	2190	1	0	2760	1	0	1160	1	0	1470
		Silver - Total	µg/L	1	1	-0.0002*	1	1	-0.0012*	1	1	0*	1	1	-0.0003*
		Sodium - Total	µg/L	1	0	67700	1	0	279000	1	0	126000	1	0	90400
		Strontium - Total	µg/L	1	0	1590	1	0	2900	1	0	1730	1	0	849
		Thallium - Total	µg/L	1	1	-0.0005*	1	1	0.003*	1	1	0.002*	1	1	0.006*
		Thorium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	0.2*	1	1	0*	1	1	0.5*	1	0	7.8
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.5	1	0	0.73	1	0	0.34	1	0	0.16
		Vanadium - Total	µg/L	1	1	0*	1	1	0.1*	1	1	0.1*	1	1	0.5*
		Zinc - Total	µg/L	1	0	10.6	1	0	25	1	0	12.9	1	0	13.6
		Zirconium - Total	µg/L	1	1	0.03*	1	0	0.11	1	1	0.05*	1	0	0.16
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.36*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.36*
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	10.7*	1	1	4.18*	1	1	0*	1	1	4.6*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	394	1	0	517	1	0	414	1	0	301
		Carbon-14	Bq/kg	1	1	0.03*	1	0	0.133	1	0	0.233	1	0	0.472
		Cobalt-60	Bq/kg	1	1	-0.109*	1	1	0.026*	1	1	0.041*	1	1	0.0919*
		Cesium-134	Bq/kg	1	1	-0.0927*	1	1	0.31*	1	1	-0.0517*	1	1	-0.175*
		Cesium-137	Bq/kg	1	1	0.532*	1	1	0.05*	1	1	-0.384*	1	1	0.0377*
		Iodine-131	Bq/kg	1	1	-0.149*	1	1	-0.176*	1	1	-0.755*	1	1	-0.266*
		Potassium-40	Bq/kg	1	1	-3.99*	1	1	-0.669*	1	1	-2.69*	1	1	0.559*
		Thorium Series	Bq/kg	1	1	-0.0715*	1	1	0.077*	1	1	-0.751*	1	1	1.47*
		Uranium Series	Bq/kg	1	1	0.103*	1	1	0.292*	1	1	0.868*	1	1	0.327*
Stream C Confluence	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	240	1	0	250	1	0	250	1	0	280
		Conductivity	µS/cm	1	0	550	1	0	630	2	0	502.4	1	0	600
		Total Dissolved Solids	mg/L	1	0	300	1	0	310	1	0	295	1	0	350
		Total Suspended Solids	mg/L	1	1	7*	1	1	2*	1	1	9*	1	1	5*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	10	1	1	4*	1	1	2*	1	0	6
		Aluminum - Total	µg/L	1	0	225	1	0	17.3	1	0	56.8	1	0	34.4
		Antimony - Total	µg/L	1	1	0.03*	1	1	0.03*	1	1	0.04*	1	1	0.07*
		Arsenic - Total	µg/L	1	0	0.24	1	0	0.19	1	0	0.31	1	0	1.26
		Barium - Total	µg/L	1	0	14.7	1	0	14.4	1	0	16.3	1	0	17.8
		Beryllium - Total	µg/L	1	1	0.01*	1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	13*	1	1	10*	1	1	15*	1	1	23*
		Cadmium - Total	µg/L	1	1	0.005*	1	1	0.004*	1	1	0.004*	1	1	0.006*
		Calcium - Total	µg/L										1	0	74300
		Cesium - Total	µg/L				1	1	0*	1	1	0.01*	1	1	0*
		Chromium - Total	µg/L	1	1	0.4*	1	1	0.1*	1	1	0.2*	1	1	0.2*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.3*	1	1	0.45*	1	1	0.21*	1	1	0.47*
		Cobalt - Total	µg/L	1	1	0.13*	1	1	0.04*	1	1	0.12*	1	1	0.12*
		Copper - Total	µg/L	1	0	0.76	1	1	0.45*	1	0	0.5	1	1	0.48*
		Iron - Total	µg/L	1	0	295	1	0	79	1	0	329	1	0	228
		Lead - Total	µg/L	1	1	0.14*	1	1	0.03*	1	1	0.08*	1	1	0.09*
		Lithium - Total	µg/L	1	1	1.4*	1	1	1.4*	1	1	1.4*	1	1	1.4*
		Manganese - Total	µg/L	1	0	13.9	1	0	37.4	1	0	60.2	1	0	114
		Mercury - Total	µg/L	1	1	-0.001*	1	1	-0.0009*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.3*	1	1	0.3*	1	1	0.3*	1	1	0.6*
		Magnesium - Total	µg/L							1	0	19900	1	0	20000
		Potassium - Total	µg/L				1	0	1730	1	0	1800	1	0	1500
		Nickel - Total	µg/L	1	1	0.6*	1	1	0.4*	1	1	0.5*	1	1	0.6*
		Selenium - Total	µg/L	1	1	0.09*	1	0	0.1	1	0	0.11	1	0	0.21
		Silicon - Total	µg/L	1	0	3690	1	0	3230	1	0	2120	1	0	3200
		Silver - Total	µg/L	1	1	0.001*	1	1	-0.0017*	1	1	-0.0006*	1	1	-0.0021*
		Sodium - Total	µg/L	1	0	14700	1	0	26500	1	0	24900	1	0	19100
		Strontium - Total	µg/L	1	0	290	1	0	374	1	0	435	1	0	365
		Thallium - Total	µg/L	1	1	0.004*	1	1	0.002*	1	1	0.002*	1	1	0.006*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0037*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	-0.0017*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	0	5.4	1	1	0.3*	1	1	1.5*	1	1	0.8*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.61	1	0	0.67	1	0	0.59	1	0	0.7
		Vanadium - Total	µg/L	1	1	0.3*	1	1	0.1*	1	1	0.1*	1	1	0.3*
		Zinc - Total	µg/L	1	1	1.5*	1	1	1.2*	1	1	1.7*	1	1	2.4*
		Zirconium - Total	µg/L	1	0	0.14	1	1	0.07*	1	0	0.1	1	1	0.08*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.3*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	1.22*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	53	1	0	52	1	0	72.7	1	0	57.8
		Carbon-14	Bq/kg	1	1	-0.04*	1	1	-0.01*	1	1	0.004*	1	1	0.003*
		Cobalt-60	Bq/kg	1	1	0.234*	1	1	0.417*	1	1	0.168*	1	1	-0.0857*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Cesium-134	Bq/kg	1	1	0.454*	1	1	0.203*	1	1	-0.0299*	1	1	-0.401*
		Cesium-137	Bq/kg	1	1	0.247*	1	1	0.351*	1	1	0.104*	1	1	-0.121*
		Iodine-131	Bq/kg	1	1	0.418*	1	1	0.316*	1	1	0.339*	1	1	0.559*
		Potassium-40	Bq/kg	1	1	3.88*	1	1	-2.85*	1	1	-4.63*	1	1	-44.3*
		Thorium Series	Bq/kg	1	1	0.32*	1	1	1.29*	1	1	-0.8*	1	1	-2.89*
		Uranium Series	Bq/kg	1	1	1.07*	1	1	-0.02*	1	1	-0.244*	1	1	-0.0332*
Stream C DS	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	240	1	0	250	1	0	250	1	0	280
		Conductivity	µS/cm	1	0	550	1	0	620	2	0	506.2	1	0	590
		Total Dissolved Solids	mg/L	1	0	295	1	0	325	1	0	270	1	0	285
		Total Suspended Solids	mg/L	1	1	5*	1	1	2*	1	1	4*	1	1	4*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	11	1	0	5	1	1	3*	1	1	4*
		Aluminum - Total	µg/L	1	0	216	1	0	13.1	1	0	27.2	1	0	35.4
		Antimony - Total	µg/L	1	1	0.05*	1	1	0.04*	1	1	0.05*	1	1	0.05*
		Arsenic - Total	µg/L	1	0	0.27	1	0	0.19	1	0	0.27	1	0	1.09
		Barium - Total	µg/L	1	0	15	1	0	14	1	0	15.4	1	0	17.3
		Beryllium - Total	µg/L	1	1	0.01*	1	1	0*	1	1	0*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	14*	1	1	9*	1	1	15*	1	1	21*
		Cadmium - Total	µg/L	1	1	0.004*	1	1	0.003*	1	1	0.005*	1	1	0.004*
		Calcium - Total	µg/L										1	0	75200
		Cesium - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Chromium - Total	µg/L	1	1	0.4*	1	1	0.1*	1	1	0.1*	1	1	0.2*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.3*	1	1	0.47*	1	1	0.19*	1	1	0.4*
		Cobalt - Total	µg/L	1	1	0.12*	1	1	0.04*	1	1	0.08*	1	1	0.13*
		Copper - Total	µg/L	1	0	0.7	1	1	0.4*	1	1	0.42*	1	1	0.37*
		Iron - Total	µg/L	1	0	297	1	0	72	1	0	206	1	0	236
		Lead - Total	µg/L	1	1	0.13*	1	1	0.02*	1	1	0.04*	1	1	0.08*
		Lithium - Total	µg/L	1	1	1.6*	1	1	1.3*	1	1	1.3*	1	1	1.4*
		Manganese - Total	µg/L	1	0	15.5	1	0	25.2	1	0	32.3	1	0	101
		Mercury - Total	µg/L	1	1	0.001*	1	1	-0.0004*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.3*	1	1	0.3*	1	1	0.3*	1	1	0.5*
		Magnesium - Total	µg/L							1	0	19700	1	0	20800
		Potassium - Total	µg/L				1	0	1660	1	0	1800	1	0	1490
		Nickel - Total	µg/L	1	1	0.8*	1	1	0.4*	1	1	0.5*	1	1	0.6*
		Selenium - Total	µg/L	1	1	0.09*	1	1	0.08*	1	1	0.09*	1	0	0.19
		Silicon - Total	µg/L	1	0	3790	1	0	3190	1	0	2140	1	0	3550
		Silver - Total	µg/L	1	1	-0.0019*	1	1	-0.0025*	1	1	-0.001*	1	1	-0.0022*
		Sodium - Total	µg/L	1	0	14400	1	0	24100	1	0	24400	1	0	16800
		Strontium - Total	µg/L	1	0	327	1	0	388	1	0	424	1	0	367
		Thallium - Total	µg/L	1	1	0.002*	1	1	0.002*	1	1	0.001*	1	1	0.004*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0036*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	0	5.2	1	1	-0.0224*	1	1	0.8*	1	1	0.9*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.6	1	0	0.62	1	0	0.63	1	0	0.56
		Vanadium - Total	µg/L	1	1	0.3*	1	1	0.1*	1	1	0.1*	1	1	0.2*
		Zinc - Total	µg/L	1	1	1.6*	1	1	1.3*	1	1	1.2*	1	1	2.2*
		Zirconium - Total	µg/L	1	0	0.13	1	1	0.09*	1	1	0.06*	1	1	0.07*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	1.67*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	0*	1	1	1.67*	1	1	0*	1	1	0*
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	53	1	0	52	1	0	87.5	1	0	52.4
		Carbon-14	Bq/kg	1	1	-0.1*	1	1	-0.026*	1	1	-0.042*	1	1	0.027*
		Cobalt-60	Bq/kg	1	1	0.097*	1	1	0.165*	1	1	0.209*	1	1	-0.262*
		Cesium-134	Bq/kg	1	1	0.124*	1	1	0.069*	1	1	-0.144*	1	1	-0.477*
		Cesium-137	Bq/kg	1	1	-0.512*	1	1	0.004*	1	1	-0.124*	1	1	-0.179*
		Iodine-131	Bq/kg	1	1	-0.0723*	1	1	0.118*	1	1	1.01*	1	1	-0.22*
		Potassium-40	Bq/kg	1	1	2.95*	1	1	-1.65*	1	1	2.7*	1	1	-0.419*
		Thorium Series	Bq/kg	1	1	-0.0839*	1	1	0.369*	1	1	-0.353*	1	1	1.09*
		Uranium Series	Bq/kg	1	1	-0.000715*	1	1	0.119*	1	1	1.07*	1	1	0.241*
Stream C US	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	240	1	0	260	1	0	260	1	0	270
		Conductivity	µS/cm	1	0	510	1	0	570	2	0	453.7	1	0	530
		Total Dissolved Solids	mg/L	1	0	275	1	0	300	1	0	205	1	0	280
		Total Suspended Solids	mg/L	1	1	4*	1	1	3*	1	1	5*	1	1	7*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	14	1	1	3*	1	1	3*	1	1	4*
		Aluminum - Total	µg/L	1	0	131	1	0	25	1	0	25.4	1	0	26.5
		Antimony - Total	µg/L	1	1	0.03*	1	1	0.02*	1	1	0.03*	1	1	0.03*
		Arsenic - Total	µg/L	1	0	0.25	1	0	0.16	1	0	0.3	1	0	0.98
		Barium - Total	µg/L	1	0	14.4	1	0	13.7	1	0	14.7	1	0	14.7
		Beryllium - Total	µg/L	1	1	0.01*	1	1	0*	1	1	0*	1	1	0.02*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	13*	1	1	8*	1	1	13*	1	1	17*
		Cadmium - Total	µg/L	1	1	0.004*	1	1	0.003*	1	1	0.003*	1	0	0.024
		Calcium - Total	µg/L										1	0	67000
		Cesium - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Chromium - Total	µg/L	1	1	0.2*	1	1	0.1*	1	1	0.2*	1	1	0.2*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.24*	1	1	0.44*	1	1	0.18*	1	1	0.4*
		Cobalt - Total	µg/L	1	1	0.1*	1	1	0.04*	1	1	0.08*	1	1	0.16*
		Copper - Total	µg/L	1	0	0.54	1	1	0.25*	1	1	0.28*	1	1	0.26*
		Iron - Total	µg/L	1	0	282	1	0	106	1	0	222	1	0	873
		Lead - Total	µg/L	1	1	0.09*	1	1	0.02*	1	1	0.02*	1	1	0.06*
		Lithium - Total	µg/L	1	1	1.2*	1	1	1.3*	1	1	1.4*	1	1	1.3*
		Manganese - Total	µg/L	1	0	18.5	1	0	14.8	1	0	34.4	1	0	231
		Mercury - Total	µg/L	1	1	0.003*	1	1	-0.001*				1	1	0.003*
		Molybdenum - Total	µg/L	1	1	0.2*	1	1	0.2*	1	1	0.3*	1	1	0.2*
		Magnesium - Total	µg/L							1	0	21400	1	0	20500
		Potassium - Total	µg/L				1	0	1590	1	0	2000	1	0	1300
		Nickel - Total	µg/L	1	1	0.4*	1	1	0.3*	1	1	0.6*	1	1	0.4*
		Selenium - Total	µg/L	1	0	0.1	1	1	0.09*	1	1	0.07*	1	0	0.15
		Silicon - Total	µg/L	1	0	4170	1	0	3680	1	0	1380	1	0	3630
		Silver - Total	µg/L	1	1	-0.0011*	1	1	-0.0023*	1	1	-0.0014*	1	1	-0.0016*
		Sodium - Total	µg/L	1	0	9220	1	0	11000	1	0	11600	1	0	9010
		Strontium - Total	µg/L	1	0	183	1	0	210	1	0	212	1	0	206
		Thallium - Total	µg/L	1	1	0*	1	1	0.001*	1	1	0.001*	1	1	0.003*
		Thorium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	3.2*	1	1	0.4*	1	1	0.7*	1	1	0.5*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Uranium - Total	µg/L	1	0	0.46	1	0	0.53	1	0	0.45	1	0	0.22
		Vanadium - Total	µg/L	1	1	0.2*	1	1	0.1*	1	1	0.1*	1	1	0.2*
		Zinc - Total	µg/L	1	1	1.1*	1	1	0.8*	1	1	0.6*	1	1	2.1*
		Zirconium - Total	µg/L	1	0	0.1	1	1	0.08*	1	1	0.07*	1	1	0.06*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	32	1	0	11	1	0	29.5	1	0	41.8
		Carbon-14	Bq/kg	1	1	-0.06*	1	1	-0.064*	1	1	0.085*	1	1	0.07*
		Cobalt-60	Bq/kg	1	1	0.16*	1	1	-0.193*	1	1	-0.397*	1	1	0.0622*
		Cesium-134	Bq/kg	1	1	-0.874*	1	1	-0.359*	1	1	-0.185*	1	1	0.055*
		Cesium-137	Bq/kg	1	1	-0.826*	1	1	-0.176*	1	1	0.129*	1	1	-0.0584*
		Iodine-131	Bq/kg	1	1	0.549*	1	1	0.201*	1	1	0.324*	1	1	0.0671*
		Potassium-40	Bq/kg	1	1	-0.913*	1	1	-3.99*	1	1	-2.13*	1	1	-1.04*
		Thorium Series	Bq/kg	1	1	0.0573*	1	1	1.8*	1	1	0.317*	1	1	-1.69*
		Uranium Series	Bq/kg	1	1	-1.49*	1	1	0.445*	1	1	-0.573*	1	1	0.615*
WD-1	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	240	1	0	280	1	0	250	1	0	270
		Conductivity	µS/cm	1	0	740	1	0	5200	2	0	1048	1	0	1800
		Total Dissolved Solids	mg/L	1	0	390	1	0	2770	1	0	580	1	0	1020
		Total Suspended Solids	mg/L	1	1	5*	1	1	9*	1	1	3*	1	0	12
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	1	4*	1	0	5	1	1	3*	1	1	4*
		Aluminum - Total	µg/L	1	0	27.1	1	0	45.2	1	0	25.3	1	0	95.6
		Antimony - Total	µg/L	1	1	0.11*	1	1	0.1*	1	1	0.13*	1	1	0.12*
		Arsenic - Total	µg/L	1	0	0.15	1	0	0.24	1	0	0.24	1	0	0.57
		Barium - Total	µg/L	1	0	23.9	1	0	50.1	1	0	36	1	0	59.7
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	-0.0004*	1	1	0*
		Bismuth - Total	µg/L	1	1	-0.0001*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	9*	1	1	75*	1	1	12*	1	1	18*
		Cadmium - Total	µg/L	1	1	0.005*	1	1	0.019*	1	1	0.003*	1	1	0.006*
		Calcium - Total	µg/L										1	0	117000
		Cesium - Total	µg/L				1	1	0.01*	1	1	0*	1	1	0.01*
		Chromium - Total	µg/L	1	1	0.2*	1	1	0.4*	1	1	0.1*	1	1	0.4*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.62*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.37*	1	0	0.62	1	1	0*	1	1	0.41*
		Cobalt - Total	µg/L	1	1	0.05*	1	1	0.13*	1	1	0.1*	1	0	0.36
		Copper - Total	µg/L	1	0	0.7	1	0	3.3	1	0	0.86	1	0	0.87
		Iron - Total	µg/L	1	0	76	1	0	164	1	0	187	1	0	854
		Lead - Total	µg/L	1	1	0.06*	1	1	0.15*	1	1	0.04*	1	1	0.11*
		Lithium - Total	µg/L	1	1	0.7*	1	1	2.5*	1	1	0.9*	1	0	2.4

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Manganese - Total	µg/L	1	0	10.6	1	0	20.2	1	0	39.5	1	0	208
		Mercury - Total	µg/L	1	1	-0.001*	1	1	0*				1	1	-0.0003*
		Molybdenum - Total	µg/L	1	0	1	1	1	0.9*	1	1	0.9*	1	0	1.3
		Magnesium - Total	µg/L							1	0	14300	1	0	21200
		Potassium - Total	µg/L				1	0	2220	1	0	1340	1	0	4760
		Nickel - Total	µg/L	1	1	0.5*	1	1	0.5*	1	1	0.7*	1	0	1.2
		Selenium - Total	µg/L	1	0	0.1	1	1	0.19*	1	1	0.09*	1	0	0.16
		Silicon - Total	µg/L	1	0	1820	1	0	2880	1	0	745	1	0	3060
		Silver - Total	µg/L	1	1	-0.0005*	1	1	-0.0038*	1	1	0*	1	1	0*
		Sodium - Total	µg/L	1	0	62200	1	0	821000	1	0	130000	1	0	195000
		Strontium - Total	µg/L	1	0	2110	1	0	1590	1	0	2440	1	0	2120
		Thallium - Total	µg/L	1	1	0.006*	1	1	0.006*	1	1	0.008*	1	0	0.014
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0075*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	-0.0136*	1	1	0*	1	1	0*	1	1	0.1*
		Titanium - Total	µg/L	1	1	0.6*	1	1	1*	1	1	0.7*	1	0	5.4
		Tungsten - Total	µg/L				1	1	0.1*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.77	1	0	0.77	1	0	0.7	1	0	0.85
		Vanadium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0.5*
		Zinc - Total	µg/L	1	0	24.7	1	0	42	1	0	26.1	1	0	24.3
		Zirconium - Total	µg/L	1	1	0.07*	1	0	0.26	1	1	0.08*	1	0	0.27
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	1.3*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDD	pg/L	1	1	2.52*	1	1	0*	1	1	0*	1	1	0*
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/L	1	1	7.98*	1	1	3.66*	1	1	4.56*	1	1	3.28*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	130	1	0	146	1	0	174	1	0	148
		Carbon-14	Bq/kg	1	1	-0.02*	1	1	-0.2*	1	1	-0.013*	1	1	-0.037*
		Cobalt-60	Bq/kg	1	1	0.0837*	1	1	0.068*	1	1	-0.422*	1	1	0.312*
		Cesium-134	Bq/kg	1	1	0.537*	1	1	0.035*	1	1	-0.0678*	1	1	0.18*
		Cesium-137	Bq/kg	1	1	-0.152*	1	1	0.36*	1	1	-0.124*	1	1	0.113*
		Iodine-131	Bq/kg	1	1	-0.412*	1	1	0.057*	1	1	-0.501*	1	1	-0.478*
		Potassium-40	Bq/kg	1	1	-1.64*	1	1	2.54*	1	1	-0.308*	1	1	2.37*
		Thorium Series	Bq/kg	1	1	-0.9*	1	1	-0.615*	1	1	-0.353*	1	1	-1.66*
		Uranium Series	Bq/kg	1	0	1.63	1	1	-0.025*	1	1	0.376*	1	1	0.748*
WD-2b	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	120	1	0	250	1	0	170	1	0	170
		Conductivity	µS/cm	1	0	300	1	0	540	2	0	381.4	1	0	880
		Total Dissolved Solids	mg/L	1	0	175	1	0	315	1	0	195	1	0	455
		Total Suspended Solids	mg/L	1	1	7*	1	1	4*	1	1	5*	1	1	4*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	9	1	0	6	1	0	7	1	0	13
		Aluminum - Total	µg/L	1	0	207	1	0	10.1	1	0	202	1	0	127
		Antimony - Total	µg/L	1	1	0.24*	1	1	0.23*	1	1	0.2*	1	0	1.06

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Arsenic - Total	µg/L	1	0	0.28	1	0	0.32	1	0	0.93	1	0	4.42
		Barium - Total	µg/L	1	0	9.7	1	0	13.6	1	0	8.6	1	0	18.8
		Beryllium - Total	µg/L	1	1	0.01*	1	1	0*	1	1	0.01*	1	1	0.01*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	6*	1	1	6*	1	1	8*	1	1	24*
		Cadmium - Total	µg/L	1	0	0.011	1	1	0.005*	1	1	0.009*	1	0	0.018
		Calcium - Total	µg/L										1	0	34400
		Cesium - Total	µg/L				1	1	0*	1	1	0.02*	1	1	0.01*
		Chromium - Total	µg/L	1	1	0.5*	1	1	0.4*	1	1	0.5*	1	1	0.4*
		Chromium (III) - Total	µg/L	1	1	-0.57*	1	1	-0.79*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	0	0.57	1	0	0.79	1	1	0.29*	1	1	0.39*
		Cobalt - Total	µg/L	1	1	0.16*	1	1	0.05*	1	1	0.16*	1	1	0.12*
		Copper - Total	µg/L	1	0	2.15	1	0	1.31	1	0	2.66	1	0	1.96
		Iron - Total	µg/L	1	0	283	1	0	25	1	0	362	1	0	670
		Lead - Total	µg/L	1	0	0.4	1	1	0.04*	1	0	0.33	1	0	1
		Lithium - Total	µg/L	1	1	0.7*	1	1	0.4*	1	1	0.8*	1	1	1.5*
		Manganese - Total	µg/L	1	0	9.8	1	0	4.9	1	0	13.9	1	0	23.1
		Mercury - Total	µg/L	1	1	0.003*	1	1	-0.0002*				1	1	0.002*
		Molybdenum - Total	µg/L	1	1	0.5*	1	1	0.8*	1	1	0.8*	1	0	2.3
		Magnesium - Total	µg/L							1	0	19600	1	0	20000
		Potassium - Total	µg/L				1	0	965	1	0	550	1	0	1980
		Nickel - Total	µg/L	1	1	0.8*	1	1	0.4*	1	0	1.1	1	0	1.3
		Selenium - Total	µg/L	1	0	0.11	1	0	0.37	1	0	0.22	1	0	0.23
		Silicon - Total	µg/L	1	0	1460	1	0	2480	1	0	1480	1	0	793
		Silver - Total	µg/L	1	1	0.001*	1	1	-0.0017*	1	1	0.003*	1	1	0.002*
		Sodium - Total	µg/L	1	0	9780	1	0	18700	1	0	23400	1	0	102000
		Strontium - Total	µg/L	1	0	248	1	0	384	1	0	290	1	0	630
		Thallium - Total	µg/L	1	1	0.004*	1	1	0.004*	1	1	0.006*	1	1	0.008*
		Thorium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0.1*	1	1	0*
		Titanium - Total	µg/L	1	0	5.5	1	1	0*	1	0	6.6	1	1	3.2*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.54	1	0	0.9	1	0	0.78	1	0	0.74
		Vanadium - Total	µg/L	1	1	0.6*	1	1	0.4*	1	1	0.7*	1	1	1.4*
		Zinc - Total	µg/L	1	1	3.1*	1	1	2.8*	1	1	1.5*	1	1	2.5*
		Zirconium - Total	µg/L	1	0	0.15	1	0	0.12	1	0	0.37	1	0	0.3
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.19*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.01*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	1.24*	1	1	0*	1	1	0*	1	1	3.13*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.62*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	1.22*	1	1	0*	1	1	0*	1	1	2.95*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.68*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.46*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.49*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.53*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.59*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	30.2*	1	1	0*	1	1	8.81*	1	1	9.46*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	9.09*	1	1	0*	1	1	1.42*	1	1	4.43*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.63*
		Total Hexa CDD	pg/L	1	1	9.22*	1	1	0*	1	1	0*	1	1	11.6*
		Total Hexa CDF	pg/L	1	1	6.46*	1	1	0*	1	1	0*	1	1	11.8*
		Total Hepta CDD	pg/L	1	0	54.3	1	1	0*	1	1	17.2*	1	1	14.9*
		Total Hepta CDF	pg/L	1	1	16.7*	1	1	0*	1	1	3.15*	1	1	9.4*
		Octa CDD	pg/L	1	0	182	1	1	0*	1	1	51.3*	1	1	35.2*
		Octa CDF	pg/L	1	1	14.6*	1	1	2.06*	1	1	3.75*	1	1	7.91*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.9*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	6.36*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
	Radionuclides	Tritium	Bq/kg	1	0	115	1	0	258	1	0	240	1	0	254
		Carbon-14	Bq/kg	1	1	-0.07*	1	1	-0.013*	1	1	-0.038*	1	1	0.016*
		Cobalt-60	Bq/kg	1	1	0.408*	1	1	-0.196*	1	1	-0.0874*	1	1	0.0298*
		Cesium-134	Bq/kg	1	1	-0.76*	1	1	-0.127*	1	1	0.0652*	1	1	-0.22*
		Cesium-137	Bq/kg	1	1	0.0332*	1	1	0.419*	1	1	-0.125*	1	1	-0.024*
		Iodine-131	Bq/kg	1	1	0.49*	1	1	0.353*	1	1	0.534*	1	1	0.244*
		Potassium-40	Bq/kg	1	1	-5.48*	1	1	2.28*	1	1	-4.78*	1	1	-2.64*
		Thorium Series	Bq/kg	1	1	-0.283*	1	1	0.263*	1	1	1.12*	1	1	-0.435*
		Uranium Series	Bq/kg	1	1	-0.35*	1	1	-0.308*	1	1	-0.831*	1	1	-0.206*
WD-3	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	240	1	0	270	1	0	260	1	0	250
		Conductivity	µS/cm	1	0	1000	1	0	2000	2	0	1386.5	1	0	1500
		Total Dissolved Solids	mg/L	1	0	560	1	0	1050	1	0	770	1	0	715
		Total Suspended Solids	mg/L	1	1	5*	1	1	3*	1	1	6*	1	1	7*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	7	1	1	4*	1	1	3*	1	1	4*
		Aluminum - Total	µg/L	1	0	53	1	0	10	1	0	129	1	0	53.5
		Antimony - Total	µg/L	1	1	0.13*	1	1	0.07*	1	1	0.1*	1	1	0.09*
		Arsenic - Total	µg/L	1	0	0.27	1	0	0.24	1	0	0.3	1	0	0.35
		Barium - Total	µg/L	1	0	28.1	1	0	40.1	1	0	36	1	0	38.1
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	0.01*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	25*	1	0	54	1	0	71	1	0	153
		Cadmium - Total	µg/L	1	1	0.006*	1	1	0.008*	1	1	0.005*	1	1	0.006*
		Calcium - Total	µg/L										1	0	76500
		Cesium - Total	µg/L				1	1	0*	1	1	0.01*	1	1	0.01*
		Chromium - Total	µg/L	1	1	0.3*	1	1	0.2*	1	1	0.4*	1	1	0.3*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.52*	1	1	0*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.41*	1	0	0.52	1	1	0.21*	1	1	0.35*
		Cobalt - Total	µg/L	1	1	0.07*	1	1	0.05*	1	1	0.13*	1	1	0.11*
		Copper - Total	µg/L	1	0	1.27	1	0	1.19	1	0	2.22	1	0	2.03
		Iron - Total	µg/L	1	0	155	1	0	48	1	0	223	1	0	266
		Lead - Total	µg/L	1	1	0.09*	1	1	0.04*	1	1	0.08*	1	1	0.1*
		Lithium - Total	µg/L	1	1	1.6*	1	1	1.8*	1	1	1.8*	1	1	1.8*
		Manganese - Total	µg/L	1	0	23.8	1	0	9.7	1	0	19.2	1	0	44.3
		Mercury - Total	µg/L	1	1	0.003*	1	1	-0.0006*				1	1	0*
		Molybdenum - Total	µg/L	1	0	1.2	1	0	1	1	1	0.9*	1	1	0.9*
		Magnesium - Total	µg/L							1	0	19700	1	0	18700
		Potassium - Total	µg/L				1	0	1760	1	0	1690	1	0	1580
		Nickel - Total	µg/L	1	1	0.5*	1	1	0.5*	1	1	0.8*	1	1	0.6*
		Selenium - Total	µg/L	1	0	0.2	1	0	0.18	1	0	0.12	1	0	0.15
		Silicon - Total	µg/L	1	0	2410	1	0	2580	1	0	2000	1	0	1950
		Silver - Total	µg/L	1	1	-0.0003*	1	1	-0.0006*	1	1	0.002*	1	1	-0.0013*
		Sodium - Total	µg/L	1	0	111000	1	0	270000	1	0	214000	1	0	178000
		Strontium - Total	µg/L	1	0	1440	1	0	1760	1	0	1330	1	0	1450
		Thallium - Total	µg/L	1	1	0.005*	1	1	0.006*	1	0	0.01	1	1	0.009*
		Thorium - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	1.1*	1	1	-0.0521*	1	0	5.4	1	1	1.6*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	1.23	1	0	1	1	0	0.84	1	0	0.7
		Vanadium - Total	µg/L	1	1	0.2*	1	1	0.2*	1	1	0.3*	1	1	0.4*
		Zinc - Total	µg/L	1	0	7.5	1	0	13	1	0	10.3	1	0	10
		Zirconium - Total	µg/L	1	0	0.1	1	0	0.14	1	0	0.2	1	1	0.08*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.16*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.94*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.91*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.68*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.69*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.06*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.75*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.89*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.53*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.9*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.73*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.68*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	2.81*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	5.76*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	8.21*
		Total Hepta CDD	pg/L	1	1	1.4*	1	1	0*	1	1	0*	1	1	5.85*
		Total Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	5.49*
		Octa CDD	pg/L	1	1	6.61*	1	1	0*	1	1	0*	1	1	11.1*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	4.57*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.1*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.79*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	137	1	0	114	1	0	110	1	0	94.4
		Carbon-14	Bq/kg	1	1	-0.08*	1	1	-0.018*	1	1	0.023*	1	1	0.054*
		Cobalt-60	Bq/kg	1	1	-0.0354*	1	1	-0.186*	1	1	0.102*	1	0	0.145
		Cesium-134	Bq/kg	1	1	-0.595*	1	1	-0.033*	1	1	0.0231*	1	1	-0.0875*
		Cesium-137	Bq/kg	1	1	0.281*	1	1	-0.242*	1	1	0.00251*	1	1	0.038*
		Iodine-131	Bq/kg	1	1	-0.127*	1	1	-0.085*	1	1	-0.72*	1	1	0.0481*
		Potassium-40	Bq/kg	1	1	-2.18*	1	1	-1.88*	1	1	-2.81*	1	1	-0.0861*
		Thorium Series	Bq/kg	1	1	0.327*	1	1	-0.089*	1	1	-0.643*	1	1	-0.112*
		Uranium Series	Bq/kg	1	1	-0.959*	1	1	0.119*	1	1	0.102*	1	1	0.0748*
WTL-1	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	200	1	0	250	1	0	140	1	0	150
		Conductivity	µS/cm	1	0	800	1	0	2300	2	0	1261.5	1	0	1900
		Total Dissolved Solids	mg/L	1	0	390	1	0	1200	1	0	780	1	0	965
		Total Suspended Solids	mg/L	1	1	4*	1	1	4*	1	1	2*	1	1	7*
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	1	4*	1	1	3*	1	1	4*	1	1	4*
		Aluminum - Total	µg/L	1	0	9.7	1	0	4.8	1	0	33.7	1	0	37.6
		Antimony - Total	µg/L	1	1	0.11*	1	1	0.11*	1	1	0.19*	1	1	0.09*
		Arsenic - Total	µg/L	1	0	0.17	1	0	0.18	1	0	0.27	1	0	0.55
		Barium - Total	µg/L	1	0	17.2	1	0	31.3	1	0	27.9	1	0	35.9
		Beryllium - Total	µg/L	1	1	0*	1	1	0*	1	1	-0.0009*	1	1	0*
		Bismuth - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Boron - Total	µg/L	1	1	21*	1	1	20*	1	1	18*	1	1	25*
		Cadmium - Total	µg/L	1	1	0.002*	1	0	0.011	1	0	0.022	1	0	0.013
		Calcium - Total	µg/L										1	0	56800
		Cesium - Total	µg/L				1	1	0*	1	1	0.01*	1	1	0.01*
		Chromium - Total	µg/L	1	1	0.1*	1	1	0.2*	1	1	0.4*	1	1	0.3*
		Chromium (III) - Total	µg/L	1	1	0*	1	1	-0.6*	1	1	-0.55*	1	1	0*
		Chromium (VI) - Total	µg/L	1	1	0.38*	1	0	0.6	1	0	0.55	1	1	0.32*
		Cobalt - Total	µg/L	1	1	0.03*	1	1	0.03*	1	1	0.06*	1	1	0.14*
		Copper - Total	µg/L	1	1	0.48*	1	1	0.42*	1	0	1.15	1	0	0.75
		Iron - Total	µg/L	1	0	44	1	0	28	1	0	97	1	0	1140
		Lead - Total	µg/L	1	1	0.01*	1	1	0.01*	1	1	0.05*	1	1	0.07*
		Lithium - Total	µg/L	1	1	1.2*	1	1	1.8*	1	1	1.7*	1	0	2.6
		Manganese - Total	µg/L	1	0	7.2	1	0	7.4	1	0	14	1	0	198
		Mercury - Total	µg/L	1	1	0.003*	1	1	-0.0004*				1	1	0.001*
		Molybdenum - Total	µg/L	1	1	0.4*	1	1	0.6*	1	1	0.9*	1	1	0.7*
		Magnesium - Total	µg/L							1	0	13900	1	0	19500
		Potassium - Total	µg/L				1	0	1660	1	0	2140	1	0	2660
		Nickel - Total	µg/L	1	1	0.4*	1	1	0.4*	1	0	1.3	1	0	1
		Selenium - Total	µg/L	1	1	0.07*	1	0	0.11	1	0	0.17	1	0	0.13
		Silicon - Total	µg/L	1	0	2050	1	0	2570	1	0	258	1	0	1200
		Silver - Total	µg/L	1	1	-0.0003*	1	1	-0.0009*	1	1	-0.001*	1	1	0.001*
		Sodium - Total	µg/L	1	0	74000	1	0	323000	1	0	241000	1	0	278000
		Strontium - Total	µg/L	1	0	1570	1	0	2910	1	0	1470	1	0	1820
		Thallium - Total	µg/L	1	1	-0.0007*	1	1	0.003*	1	1	0.004*	1	1	0.003*
		Thorium - Total	µg/L	1	1	0*	1	1	-0.0004*	1	1	0*	1	1	0*

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Tin - Total	µg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Titanium - Total	µg/L	1	1	0.3*	1	1	-0.332*	1	1	0.8*	1	1	1.2*
		Tungsten - Total	µg/L				1	1	0*	1	1	0*	1	1	0*
		Uranium - Total	µg/L	1	0	0.42	1	0	0.68	1	0	0.5	1	0	0.29
		Vanadium - Total	µg/L	1	1	0.1*	1	1	0.1*	1	1	0.2*	1	1	0.6*
		Zinc - Total	µg/L	1	0	16.2	1	0	36.1	1	0	33.7	1	0	25.6
		Zirconium - Total	µg/L	1	1	0.08*	1	0	0.13	1	1	0.08*	1	1	0.06*
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.64*
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	2.13*	1	1	0*	1	1	0*	1	1	4.17*
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	2.46*	1	1	1.12*	1	1	0*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	1.55*
		Total Hexa CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Hexa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	3.36*
		Total Hepta CDD	pg/L	1	1	2.13*	1	1	0*	1	1	0*	1	1	6.78*
		Total Hepta CDF	pg/L	1	1	2.46*	1	1	1.12*	1	1	0*	1	1	8.78*
		Octa CDD	pg/L	1	1	0*	1	1	3.61*	1	1	0*	1	1	13.8*
		Octa CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	8.46*
		Total Penta CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Penta CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDD	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
		Total Tetra CDF	pg/L	1	1	0*	1	1	0*	1	1	0*	1	1	0*
	Radionuclides	Tritium	Bq/kg	1	0	345	1	0	613	1	0	554	1	0	695
		Carbon-14	Bq/kg	1	1	0.05*	1	0	0.103	1	0	0.51	1	0	0.371
		Cobalt-60	Bq/kg	1	1	-0.111*	1	1	0.456*	1	1	-0.149*	1	1	-0.073*
		Cesium-134	Bq/kg	1	1	0.353*	1	1	-0.001*	1	1	0.243*	1	1	-0.512*
		Cesium-137	Bq/kg	1	1	0.0988*	1	1	0.163*	1	1	-0.0527*	1	1	-0.205*
		Iodine-131	Bq/kg	1	1	-0.637*	1	1	0.071*	1	1	0.278*	1	1	-0.103*
		Potassium-40	Bq/kg	1	1	3.21*	1	1	-2.2*	1	1	-3.33*	1	1	-46*
		Thorium Series	Bq/kg	1	0	1.04	1	1	-1.09*	1	1	-0.0642*	1	1	-1.42*
		Uranium Series	Bq/kg	1	1	0.644*	1	1	-1.17*	1	1	0.027*	1	1	-2.36*
WTL-2	Physical and Conventional Characteristics	Alkalinity	mg/L CaCO3	1	0	170				1	0	300			
		Conductivity	µS/cm	1	0	470				2	0	614.75			
		Total Dissolved Solids	mg/L	1	0	245				1	0	330			
		Total Suspended Solids	mg/L	1	1	6*				1	1	5*			
	Metals	Aluminum - Dissolved (0.2u)	µg/L	1	0	26				1	1	2*			
		Aluminum - Total	µg/L	1	0	5.4				1	0	4.4			
		Antimony - Total	µg/L	1	1	0.12*				1	1	0.1*			
		Arsenic - Total	µg/L	1	0	0.19				1	0	0.23			
		Barium - Total	µg/L	1	0	8.8				1	0	18.3			
		Beryllium - Total	µg/L	1	1	0*				1	1	-0.0014*			
		Bismuth - Total	µg/L	1	1	0*				1	1	0*			
		Boron - Total	µg/L	1	1	19*				1	0	61			
		Cadmium - Total	µg/L	1	1	0.001*				1	1	0.001*			
		Calcium - Total	µg/L												
		Cesium - Total	µg/L							1	1	0*			
		Chromium - Total	µg/L	1	1	0.1*				1	1	0.2*			
		Chromium (III) - Total	µg/L	1	1	0*				1	1	0*			
		Chromium (VI) - Total	µg/L	1	1	0.38*				1	1	0.18*			
		Cobalt - Total	µg/L	1	1	0.03*				1	1	0.06*			
		Copper - Total	µg/L	1	1	0.2*				1	1	0.21*			

Monitoring Results by Location: Surface Water

Location	Category	Parameter	Units	Fall 2020			Winter 2021			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Iron - Total	µg/L	1	0	140				1	0	50			
		Lead - Total	µg/L	1	1	0.02*				1	1	0.01*			
		Lithium - Total	µg/L	1	1	0.8*				1	1	1.4*			
		Manganese - Total	µg/L	1	0	35.3				1	0	27.8			
		Mercury - Total	µg/L	1	1	0.003*									
		Molybdenum - Total	µg/L	1	1	0.1*				1	1	0.3*			
		Magnesium - Total	µg/L							1	0	25400			
		Potassium - Total	µg/L							1	0	2030			
		Nickel - Total	µg/L	1	1	0.2*				1	1	0.7*			
		Selenium - Total	µg/L	1	1	0.05*				1	1	0.05*			
		Silicon - Total	µg/L	1	0	1380				1	0	2440			
		Silver - Total	µg/L	1	1	-0.0005*				1	1	0.002*			
		Sodium - Total	µg/L	1	0	34200				1	0	38500			
		Strontium - Total	µg/L	1	0	977				1	0	4450			
		Thallium - Total	µg/L	1	1	-0.0014*				1	1	0*			
		Thorium - Total	µg/L	1	1	0*				1	1	-0.0001*			
		Tin - Total	µg/L	1	1	0*				1	1	0*			
		Titanium - Total	µg/L	1	1	-0.116*				1	1	0.2*			
		Tungsten - Total	µg/L							1	1	0*			
		Uranium - Total	µg/L	1	1	0.08*				1	0	0.16			
		Vanadium - Total	µg/L	1	1	-0.0654*				1	1	-0.0303*			
		Zinc - Total	µg/L	1	1	1*				1	1	0.8*			
		Zirconium - Total	µg/L	1	1	0.01*				1	1	0.04*			
	Dioxins and Furans	1,2,3,4,7,8-Hexa CDD	pg/L	1	1	0*				1	1	0*			
		1,2,3,4,7,8-Hexa CDF	pg/L	1	1	0*				1	1	0*			
		1,2,3,6,7,8-Hexa CDD	pg/L	1	1	0*				1	1	0*			
		1,2,3,6,7,8-Hexa CDF	pg/L	1	1	0*				1	1	0*			
		1,2,3,7,8,9-Hexa CDD	pg/L	1	1	0*				1	1	0*			
		1,2,3,7,8,9-Hexa CDF	pg/L	1	1	0*				1	1	0*			
		1,2,3,7,8-Penta CDD	pg/L	1	1	0*				1	1	0*			
		1,2,3,7,8-Penta CDF	pg/L	1	1	0*				1	1	0*			
		2,3,4,6,7,8-Hexa CDF	pg/L	1	1	0*				1	1	0*			
		2,3,7,8-Tetra CDD	pg/L	1	1	0*				1	1	0*			
		2,3,7,8-Tetra CDF	pg/L	1	1	0*				1	1	0*			
		2,3,4,7,8-Penta CDF	pg/L	1	1	0*				1	1	0*			
		1,2,3,4,6,7,8-Hepta CDD	pg/L	1	1	4.56*				1	1	0*			
		1,2,3,4,6,7,8-Hepta CDF	pg/L	1	1	5.48*				1	1	0*			
		1,2,3,4,7,8,9-Hepta CDF	pg/L	1	1	0*				1	1	0*			
		Total Hexa CDD	pg/L	1	1	0*				1	1	0*			
		Total Hexa CDF	pg/L	1	1	1.79*				1	1	0*			
		Total Hepta CDD	pg/L	1	1	8.02*				1	1	0*			
		Total Hepta CDF	pg/L	1	1	7.21*				1	1	0*			
		Octa CDD	pg/L	1	1	25.4*				1	1	1.53*			
		Octa CDF	pg/L	1	1	0*				1	1	0*			
		Total Penta CDD	pg/L	1	1	0*				1	1	0*			
		Total Penta CDF	pg/L	1	1	0*				1	1	0*			
		Total Tetra CDD	pg/L	1	1	0*				1	1	0*			
		Total Tetra CDF	pg/L	1	1	0*				1	1	0*			
	Radionuclides	Tritium	Bq/kg	1	0	320				1	0	238			
		Carbon-14	Bq/kg	1	1	-0.05*				1	1	-0.066*			
		Cobalt-60	Bq/kg	1	1	0.18*				1	1	0.304*			
		Cesium-134	Bq/kg	1	1	-0.00648*				1	1	-0.223*			
		Cesium-137	Bq/kg	1	1	0.0891*				1	1	-0.0164*			
		Iodine-131	Bq/kg	1	1	0.425*				1	1	0.576*			
		Potassium-40	Bq/kg	1	1	2.15*				1	1	2.54*			
		Thorium Series	Bq/kg	1	1	0.659*				1	1	0.182*			
		Uranium Series	Bq/kg	1	1	1.2*				1	1	-0.65*			

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
GS-1	Physical and Conventional Characteristics	Moisture Content	%	1	0	24	2	0	32.75	1	0	30
		Total Organic Carbon	mg/kg	1	0	11000	1	0	35000	1	0	24000
	Nutrients	Total Phosphorous	µg/g	1	0	440	1	0	381	1	0	415
	Metals	Aluminum	µg/g	1	0	4300	1	0	3760	1	0	5800
		Antimony	µg/g	1	0	0.26	1	0	0.29	1	0	0.39
		Arsenic	µg/g	1	0	1.5	1	0	1.76	1	0	2
		Barium	µg/g	1	0	20	1	0	18.1	1	0	23.9
		Beryllium	µg/g	1	0	0.21	1	1	0.18*	1	0	0.26
		Bismuth	µg/g	1	1	0.1*	1	1	0.06*	1	1	0.06*
		Boron	µg/g	1	0	8.3	1	0	7.8	1	0	12.3
		Boron (hot water)	µg/g	1	0	0.19	1	0	0.31	1	0	0.23
		Cadmium	µg/g	1	1	0.04*	1	0	0.069	1	0	0.061
		Calcium	µg/g	1	0	120000	1	0	111000	1	0	118000
		Cesium	µg/g				1	1	0.3*	1	1	0.5*
		Chromium	µg/g	1	0	9.4	1	0	8.77	1	0	11.5
		Chromium (VI)	µg/g	1	1	0*	1	1	0.02*	1	1	0*
		Cobalt	µg/g	1	0	3.6	1	0	3.28	1	0	4.1
		Copper	µg/g	1	0	11	1	0	10.7	1	0	11.8
		Iron	µg/g	1	0	9800	1	0	9340	1	0	11400
		Lead	µg/g	1	0	3	1	0	3.34	1	0	3.87
		Lithium	µg/g	1	0	6.9	1	0	6.69	1	0	8.93
		Magnesium	µg/g	1	0	34000	1	0	34000	1	0	37700
		Manganese	µg/g	1	0	350	1	0	349	1	0	394
		Mercury	µg/g	1	1	0.003*	1	1	0.019*	1	1	0.02*
		Molybdenum	µg/g	1	1	0.25*	1	0	0.24	1	0	0.31
		Nickel	µg/g	1	0	7.9	1	0	7.82	1	0	10.1
		Potassium	µg/g	1	0	950	1	0	768	1	0	1270
		Selenium	µg/g	1	1	0.09*	1	1	0.12*	1	1	0.14*
		Silver	µg/g	1	1	0.02*	1	1	0.02*	1	1	0.025*
		Sodium	µg/g	1	0	200	1	0	328	1	0	287
		Strontium	µg/g	1	0	120	1	0	125	1	0	145
		Thallium	µg/g	1	0	0.066	1	1	0.042*	1	0	0.07
		Thorium	µg/g				1	0	1.81	1	0	2.36
		Tin	µg/g	1	1	0.3*	1	0	0.22	1	0	0.28
		Titanium	µg/g	1	0	230	1	0	155	1	0	261
		Tungsten	µg/g				1	1	0.05*	1	1	0.04*
		Uranium	µg/g	1	0	0.47	1	0	0.518	1	0	0.616
		Vanadium	µg/g	1	0	14	1	0	11.3	1	0	15.6

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Zinc	µg/g	1	0	32	1	0	36.6	1	0	43.5
		Zirconium	µg/g				1	0	1.94	1	0	3.56
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	1	1.91*	1	1	4.43*	1	0	5.29
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	0.383*	1	1	0.665*	1	1	0.786*
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	1	0*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.107*	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0*	1	1	0.171*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0*	1	1	0.185*	1	1	0.177*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.187*	1	1	0.226*	1	1	0.278*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0*	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0*	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0*	1	1	0*	1	1	0.085622*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0*	1	1	0*	1	1	0*
		Octa CDD	pg/g	1	1	9.65*	1	0	26.2	1	0	34.6
		Octa CDF	pg/g	1	1	0.696*	1	1	1.5*	1	1	1.66*
		Total Hepta CDD	pg/g	1	1	3.72*	1	0	9.01	1	0	19.1
		Total Hepta CDF	pg/g	1	1	0.806*	1	1	1.53*	1	1	1.74*
		Total Hexa CDD	pg/g	1	1	1.2*	1	1	1.81*	1	1	2.33*
		Total Hexa CDF	pg/g	1	1	0*	1	1	0.548*	1	1	0.346*
		Total Penta CDD	pg/g	1	1	0*	1	1	0.404*	1	1	0*
		Total Penta CDF	pg/g	1	1	0.118*	1	1	0.453*	1	1	0*
		Total Tetra CDD	pg/g	1	1	0.179*	1	1	0.301*	1	1	0*
		Total Tetra CDF	pg/g	1	1	0*	1	1	0.182*	1	1	0*
	Radionuclides	Beryllium-7	Bq/kg	1	1	1.38*	1	1	2.72*			
		Carbon-14	Bq/kg-C	1	0	41	1	0	50			
		Cesium-134	Bq/kg	1	1	0.381*	1	1	-0.116*			
		Cesium-137	Bq/kg	1	1	0.383*	1	1	-0.0332*			
		Cobalt-60	Bq/kg	1	1	-0.0546*	1	1	0.0157*			
		Iodine-131	Bq/kg	1	1	-1.38*	1	1	0.352*			
		Potassium-40	Bq/kg	1	0	253	1	0	282			
		Thorium Series	Bq/kg	1	0	4.46	1	0	6.79			
		Uranium Series	Bq/kg	1	0	8.56	1	0	9.72			
SRD-1	Physical and Conventional Characteristics	Moisture Content	%	1	0	76	2	0	78.9	1	0	74
		Total Organic Carbon	mg/kg	1	0	45000	1	0	70000	1	0	52000

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
	Nutrients	Total Phosphorous	µg/g	1	0	520	1	0	488	1	0	573
	Metals	Aluminum	µg/g	1	0	4800	1	0	3530	1	0	5850
		Antimony	µg/g	1	0	0.48	1	0	0.34	1	0	0.44
		Arsenic	µg/g	1	0	2.9	1	0	2.72	1	0	3.37
		Barium	µg/g	1	0	52	1	0	35.5	1	0	43.7
		Beryllium	µg/g	1	0	0.22	1	1	0.17*	1	0	0.24
		Bismuth	µg/g	1	0	<0.1	1	1	0.09*	1	0	0.1
		Boron	µg/g	1	0	7.9	1	0	7.4	1	0	13.9
		Boron (hot water)	µg/g	1	0	0.25	1	0	0.23	1	0	0.39
		Cadmium	µg/g	1	0	0.48	1	0	0.391	1	0	0.377
		Calcium	µg/g	1	0	170000	1	0	137000	1	0	181000
		Cesium	µg/g				1	1	0.3*	1	1	0.4*
		Chromium	µg/g	1	0	11	1	0	8.53	1	0	12.9
		Chromium (VI)	µg/g	1	0	<0	1	1	0*	1	1	0*
		Cobalt	µg/g	1	0	5	1	0	4.1	1	0	5.23
		Copper	µg/g	1	0	140	1	0	89.7	1	0	107
		Iron	µg/g	1	0	12000	1	0	11000	1	0	13300
		Lead	µg/g	1	0	15	1	0	10.1	1	0	16.1
		Lithium	µg/g	1	0	7	1	0	5.22	1	0	8.28
		Magnesium	µg/g	1	0	31000	1	0	34700	1	0	42300
		Manganese	µg/g	1	0	420	1	0	393	1	0	450
		Mercury	µg/g	1	0	<0.019	1	0	0.057	1	0	0.051
		Molybdenum	µg/g	1	0	1.6	1	0	1.3	1	0	1.47
		Nickel	µg/g	1	0	15	1	0	11.3	1	0	15.2
		Potassium	µg/g	1	0	830	1	0	577	1	0	1070
		Selenium	µg/g	1	0	0.6	1	1	0.43*	1	1	0.46*
		Silver	µg/g	1	0	<0.09	1	0	0.063	1	0	0.069
		Sodium	µg/g	1	0	1000	1	0	1520	1	0	1580
		Strontium	µg/g	1	0	790	1	0	578	1	0	701
		Thallium	µg/g	1	0	0.13	1	0	0.076	1	0	0.126
		Thorium	µg/g				1	0	0.65	1	0	1.64
		Tin	µg/g	1	0	<0.6	1	0	0.49	1	0	0.61
		Titanium	µg/g	1	0	140	1	0	89.5	1	0	169
		Tungsten	µg/g				1	1	0.17*	1	1	0.21*
		Uranium	µg/g	1	0	1.1	1	0	0.897	1	0	1.08
		Vanadium	µg/g	1	0	24	1	0	19.2	1	0	24.7
		Zinc	µg/g	1	0	450	1	0	399	1	0	366
		Zirconium	µg/g				1	0	0.88	1	0	1.29

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	573	1	0	508	1	0	467
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	247	1	0	248	1	0	215
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	18.1	1	0	16	1	0	14.1
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	9.59	1	0	9.78	1	0	7.97
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<0	1	0	16	1	0	14.4
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	23.1	1	0	19.5	1	0	16.9
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	22.5	1	0	23	1	0	19
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	28	1	0	23.8	1	0	18.9
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0.948	1	1	0*	1	1	0.757*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<4.42	1	1	3.91*	1	1	3.57*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<2.76	1	1	3.03*	1	1	2.62*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	14.9	1	0	15.7	1	0	11.8
		2,3,4,7,8-Penta CDF	pg/g	1	0	<2.8	1	1	2.81*	1	1	2.67*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0.327	1	1	0.365*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	2.99	1	0	1.94	1	0	2.32
		2,3,7,8-Tetra CDF Confirmation	pg/g	1	0	1.07	1	1	0.91*	1	0	1.02
		Octa CDD	pg/g	1	0	2530	1	0	2340	1	0	2240
		Octa CDF	pg/g	1	0	355	1	0	356	1	0	301
		Total Hepta CDD	pg/g	1	0	969	1	0	822	1	0	775
		Total Hepta CDF	pg/g	1	0	277	1	0	489	1	0	439
		Total Hexa CDD	pg/g	1	0	167	1	0	160	1	0	132
		Total Hexa CDF	pg/g	1	0	132	1	0	343	1	0	272
		Total Penta CDD	pg/g	1	0	27.2	1	0	23.5	1	0	22.6
		Total Penta CDF	pg/g	1	0	103	1	0	137	1	0	106
		Total Tetra CDD	pg/g	1	0	6.9	1	0	4.55	1	0	4.37
		Total Tetra CDF	pg/g	1	0	32.9	1	0	30.9	1	0	30.5
	Radionuclides	Beryllium-7	Bq/kg	1	1	0.45*	1	1	0.774*			
		Carbon-14	Bq/kg-C	1	0	194	1	0	176			
		Cesium-134	Bq/kg	1	1	-0.261*	1	1	0.351*			
		Cesium-137	Bq/kg	1	0	2.22	1	0	2.04			
		Cobalt-60	Bq/kg	1	1	0.17*	1	1	0.161*			
		Iodine-131	Bq/kg	1	1	-0.796*	1	1	0.0975*			
		Potassium-40	Bq/kg	1	0	65.4	1	0	73.7			
		Thorium Series	Bq/kg	1	1	1.94*	1	1	1.98*			
		Uranium Series	Bq/kg	1	0	6.58	1	0	4.94			
SRD-2	Physical and Conventional Characteristics	Moisture Content	%	1	0	18	2	0	28.1	1	0	19
		Total Organic Carbon	mg/kg	1	0	11000	1	0	22000	1	0	18000
	Nutrients	Total Phosphorous	µg/g	1	0	450	1	0	341	1	0	368

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
	Metals	Aluminum	µg/g	1	0	5100	1	0	3340	1	0	5130
		Antimony	µg/g	1	0	<0.06	1	1	0.05*	1	1	0.06*
		Arsenic	µg/g	1	0	2.3	1	0	1.73	1	0	1.89
		Barium	µg/g	1	0	25	1	0	18.4	1	0	21.5
		Beryllium	µg/g	1	0	0.25	1	1	0.18*	1	0	0.23
		Bismuth	µg/g	1	0	<0.1	1	1	0.05*	1	1	0.05*
		Boron	µg/g	1	0	8.3	1	0	6.1	1	0	12.2
		Boron (hot water)	µg/g	1	0	0.1	1	0	0.13	1	0	0.085
		Cadmium	µg/g	1	0	<0.07	1	0	0.067	1	0	0.067
		Calcium	µg/g	1	0	120000	1	0	130000	1	0	129000
		Cesium	µg/g				1	1	0.3*	1	1	0.4*
		Chromium	µg/g	1	0	11	1	0	7.18	1	0	10.6
		Chromium (VI)	µg/g	1	0	<0.02	1	1	0.03*	1	1	0.02*
		Cobalt	µg/g	1	0	4.2	1	0	3.19	1	0	3.92
		Copper	µg/g	1	0	11	1	0	9.05	1	0	10.7
		Iron	µg/g	1	0	11000	1	0	7660	1	0	10700
		Lead	µg/g	1	0	3.7	1	0	3.2	1	0	3.26
		Lithium	µg/g	1	0	7.7	1	0	5.72	1	0	7.61
		Magnesium	µg/g	1	0	35000	1	0	36000	1	0	39100
		Manganese	µg/g	1	0	420	1	0	413	1	0	398
		Mercury	µg/g	1	0	-<0.0098	1	1	0.02*	1	1	0.025*
		Molybdenum	µg/g	1	0	<0.24	1	0	0.2	1	0	0.25
		Nickel	µg/g	1	0	9.5	1	0	7.11	1	0	8.85
		Potassium	µg/g	1	0	1100	1	0	660	1	0	1160
		Selenium	µg/g	1	0	<0.09	1	1	0.06*	1	1	0.05*
		Silver	µg/g	1	0	<0.01	1	1	0.015*	1	1	0.019*
		Sodium	µg/g	1	0	310	1	0	255	1	0	323
		Strontium	µg/g	1	0	140	1	0	160	1	0	154
		Thallium	µg/g	1	0	0.078	1	0	0.05	1	0	0.075
		Thorium	µg/g				1	0	1.66	1	0	2.16
		Tin	µg/g	1	0	<0.3	1	0	0.17	1	0	0.24
		Titanium	µg/g	1	0	250	1	0	116	1	0	265
		Tungsten	µg/g				1	1	0.03*	1	1	0.04*
		Uranium	µg/g	1	0	0.49	1	0	0.424	1	0	0.538
		Vanadium	µg/g	1	0	15	1	0	9.1	1	0	15.3
		Zinc	µg/g	1	0	37	1	0	42.5	1	0	31.7
		Zirconium	µg/g				1	0	1.19	1	0	4.19
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	<3.46	1	0	7.92	1	1	2.54*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	<2.39	1	0	5.83	1	1	1.84*
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<0.3	1	1	0.701*	1	1	0.27*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0	1	1	0.208*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<0.529	1	1	0.903*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<0.204	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<0.316	1	1	0.64*	1	1	0.191*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<0.255	1	1	0.482*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.201	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<0.417	1	1	0*	1	1	0.233*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.157	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		Octa CDD	pg/g	1	0	15.6	1	0	34.8	1	0	12.8
		Octa CDF	pg/g	1	0	<4.11	1	0	10.1	1	1	3.55*
		Total Hepta CDD	pg/g	1	0	5.94	1	0	14.3	1	1	4.54*
		Total Hepta CDF	pg/g	1	0	<4.33	1	0	10.6	1	1	3.51*
		Total Hexa CDD	pg/g	1	0	<1.87	1	1	3.45*	1	1	0.891*
		Total Hexa CDF	pg/g	1	0	<2.88	1	0	6.29	1	1	1.51*
		Total Penta CDD	pg/g	1	0	<0	1	1	0*	1	1	0.444*
		Total Penta CDF	pg/g	1	0	<1.46	1	1	2.2*	1	1	0.311*
		Total Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		Total Tetra CDF	pg/g	1	0	<0.0833	1	1	0*	1	1	0*
	Radionuclides	Beryllium-7	Bq/kg	1	1	2.19*	1	1	4.59*			
		Carbon-14	Bq/kg-C	1	0	80	1	0	437			
		Cesium-134	Bq/kg	1	1	-0.225*	1	1	-0.0888*			
		Cesium-137	Bq/kg	1	1	-0.355*	1	1	0.251*			
		Cobalt-60	Bq/kg	1	1	-0.29*	1	1	0.12*			
		Iodine-131	Bq/kg	1	1	-0.077*	1	1	-0.311*			
		Potassium-40	Bq/kg	1	0	242	1	0	230			
		Thorium Series	Bq/kg	1	0	6.98	1	0	7.21			
		Uranium Series	Bq/kg	1	0	10.3	1	0	11.8			
SRD-3	Physical and Conventional Characteristics	Moisture Content	%	1	0	51	2	0	45.45	1	0	37
		Total Organic Carbon	mg/kg	1	0	24000	1	0	40000	1	0	32000
	Nutrients	Total Phosphorous	µg/g	1	0	500	1	0	412	1	0	382
	Metals	Aluminum	µg/g	1	0	5000	1	0	4350	1	0	4700
		Antimony	µg/g	1	0	<0.18	1	0	0.11	1	1	0.09*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Arsenic	µg/g	1	0	2	1	0	1.76	1	0	2.03
		Barium	µg/g	1	0	25	1	0	20.5	1	0	20.8
		Beryllium	µg/g	1	0	0.24	1	0	0.25	1	1	0.19*
		Bismuth	µg/g	1	0	<0.1	1	1	0.08*	1	1	0.06*
		Boron	µg/g	1	0	8.4	1	0	8.7	1	0	9.6
		Boron (hot water)	µg/g	1	0	0.4	1	0	0.22	1	0	0.39
		Cadmium	µg/g	1	0	0.21	1	0	0.185	1	0	0.14
		Calcium	µg/g	1	0	95000	1	0	97700	1	0	97300
		Cesium	µg/g				1	1	0.3*	1	1	0.4*
		Chromium	µg/g	1	0	10	1	0	8.87	1	0	9.6
		Chromium (VI)	µg/g	1	0	<0	1	1	0.03*	1	1	0*
		Cobalt	µg/g	1	0	3.9	1	0	3.35	1	0	3.34
		Copper	µg/g	1	0	11	1	0	9.83	1	0	9.58
		Iron	µg/g	1	0	10000	1	0	8960	1	0	9730
		Lead	µg/g	1	0	5.5	1	0	5.3	1	0	5.31
		Lithium	µg/g	1	0	7.2	1	0	6.26	1	0	6.72
		Magnesium	µg/g	1	0	34000	1	0	33600	1	0	33600
		Manganese	µg/g	1	0	350	1	0	349	1	0	331
		Mercury	µg/g	1	0	-<0.018	1	0	0.098	1	1	0.029*
		Molybdenum	µg/g	1	0	<0.32	1	0	0.26	1	0	0.24
		Nickel	µg/g	1	0	9	1	0	7.72	1	0	7.76
		Potassium	µg/g	1	0	820	1	0	654	1	0	770
		Selenium	µg/g	1	0	<0.23	1	1	0.25*	1	1	0.17*
		Silver	µg/g	1	0	<0.03	1	1	0.026*	1	1	0.023*
		Sodium	µg/g	1	0	380	1	0	437	1	0	360
		Strontium	µg/g	1	0	110	1	0	117	1	0	123
		Thallium	µg/g	1	0	0.071	1	0	0.052	1	0	0.062
		Thorium	µg/g				1	0	1.64	1	0	1.7
		Tin	µg/g	1	0	<0.3	1	0	0.28	1	0	0.3
		Titanium	µg/g	1	0	200	1	0	170	1	0	211
		Tungsten	µg/g				1	1	0.08*	1	1	0.05*
		Uranium	µg/g	1	0	0.51	1	0	0.549	1	0	0.509
		Vanadium	µg/g	1	0	17	1	0	14.2	1	0	15.5
		Zinc	µg/g	1	0	180	1	0	143	1	0	89.5
		Zirconium	µg/g				1	0	1	1	0	0.77
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	31.7	1	0	17.2	1	0	12.7
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	15.3	1	0	7.9	1	0	5.62
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<1.26	1	1	0*	1	1	0.394*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0.869	1	1	0*	1	1	0.306*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<1.73	1	1	0.975*	1	1	0.607*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<1.36	1	1	0.643*	1	1	0.482*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<1.29	1	1	0.826*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<1.89	1	1	1.1*	1	1	0.722*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0.422	1	1	0.263*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.345	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<1.48	1	1	0.706*	1	1	0.429*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.405	1	1	0.233*	1	1	0.16*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0.57	1	1	0*	1	1	0.255*
		Octa CDD	pg/g	1	0	145	1	0	84.6	1	0	60.6
		Octa CDF	pg/g	1	0	21.9	1	0	11.7	1	1	7.34*
		Total Hepta CDD	pg/g	1	0	55	1	0	30.8	1	0	22.2
		Total Hepta CDF	pg/g	1	0	29.5	1	0	14	1	0	10.7
		Total Hexa CDD	pg/g	1	0	14	1	0	7.96	1	1	4.75*
		Total Hexa CDF	pg/g	1	0	19.2	1	0	10.4	1	0	5.34
		Total Penta CDD	pg/g	1	0	<2.14	1	1	1.23*	1	1	0.911*
		Total Penta CDF	pg/g	1	0	7.46	1	1	3.86*	1	1	2.62*
		Total Tetra CDD	pg/g	1	0	<0.764	1	1	0.228*	1	1	0*
		Total Tetra CDF	pg/g	1	0	3.63	1	0	1.1	1	1	0.44*
	Radionuclides	Beryllium-7	Bq/kg	1	0	10.2	1	1	5.91*			
		Carbon-14	Bq/kg-C	1	0	443	1	0	310			
		Cesium-134	Bq/kg	1	1	0.268*	1	1	-0.157*			
		Cesium-137	Bq/kg	1	0	1.61	1	0	2.64			
		Cobalt-60	Bq/kg	1	1	0.063*	1	1	0.0658*			
		Iodine-131	Bq/kg	1	1	0.181*	1	1	-3.26*			
		Potassium-40	Bq/kg	1	0	159	1	0	223			
		Thorium Series	Bq/kg	1	1	3.26*	1	0	6.22			
		Uranium Series	Bq/kg	1	0	7.47	1	0	10.3			
SRD-4	Physical and Conventional Characteristics	Moisture Content	%	1	0	73	2	0	69.5	1	0	21
		Total Organic Carbon	mg/kg	1	0	55000	1	0	77000	1	0	19000
	Nutrients	Total Phosphorous	µg/g	1	0	520	1	0	307	1	0	244
	Metals	Aluminum	µg/g	1	0	3500	1	0	2760	1	0	3330
		Antimony	µg/g	1	0	<0.15	1	0	0.13	1	1	0.07*
		Arsenic	µg/g	1	0	2	1	0	1.75	1	0	1.59
		Barium	µg/g	1	0	31	1	0	24.7	1	0	12.6

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Beryllium	µg/g	1	0	0.2	1	1	0.14*	1	1	0.14*
		Bismuth	µg/g	1	0	<0.1	1	1	0.06*	1	1	0.03*
		Boron	µg/g	1	0	7.5	1	0	9.2	1	0	8.1
		Boron (hot water)	µg/g	1	0	0.47	1	0	0.61	1	0	0.13
		Cadmium	µg/g	1	0	0.31	1	0	0.252	1	0	0.104
		Calcium	µg/g	1	0	110000	1	0	134000	1	0	134000
		Cesium	µg/g				1	1	0.2*	1	1	0.2*
		Chromium	µg/g	1	0	7.8	1	0	6.27	1	0	7.96
		Chromium (VI)	µg/g	1	0	<0.04	1	1	0*	1	1	0.02*
		Cobalt	µg/g	1	0	3.2	1	0	2.78	1	0	2.57
		Copper	µg/g	1	0	19	1	0	14.5	1	0	7.12
		Iron	µg/g	1	0	11000	1	0	7620	1	0	7060
		Lead	µg/g	1	0	6.7	1	0	6.09	1	0	3.58
		Lithium	µg/g	1	0	5.3	1	0	4.16	1	0	4.9
		Magnesium	µg/g	1	0	40000	1	0	38500	1	0	39500
		Manganese	µg/g	1	0	610	1	0	465	1	0	269
		Mercury	µg/g	1	0	<0.017	1	1	0.046*	1	1	0.022*
		Molybdenum	µg/g	1	0	<0.39	1	0	0.37	1	0	0.26
		Nickel	µg/g	1	0	8.3	1	0	6.17	1	0	6.55
		Potassium	µg/g	1	0	450	1	0	406	1	0	547
		Selenium	µg/g	1	0	<0.36	1	1	0.24*	1	1	0.08*
		Silver	µg/g	1	0	<0.02	1	1	0.028*	1	1	0.018*
		Sodium	µg/g	1	0	260	1	0	518	1	0	196
		Strontium	µg/g	1	0	250	1	0	389	1	0	367
		Thallium	µg/g	1	0	0.051	1	1	0.04*	1	1	0.049*
		Thorium	µg/g				1	0	0.7	1	0	1.45
		Tin	µg/g	1	0	<0.7	1	0	0.27	1	0	0.27
		Titanium	µg/g	1	0	84	1	0	105	1	0	183
		Tungsten	µg/g				1	1	0.29*	1	1	0.12*
		Uranium	µg/g	1	0	0.48	1	0	0.511	1	0	0.555
		Vanadium	µg/g	1	0	13	1	0	9.6	1	0	11.2
		Zinc	µg/g	1	0	420	1	0	223	1	0	88.8
		Zirconium	µg/g				1	0	0.65	1	0	1.3
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	116	1	0	141	1	0	49.9
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	35.8	1	0	20.5	1	0	13.1
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<3.42	1	1	3.15*	1	1	1.09*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<2.23	1	1	2.02*	1	1	0.585*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<3.39	1	1	1.47*	1	1	0*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value	Spring 2021 Total Count	Spring 2021 Count (<RDL and uncensored)	Spring 2021 Value	Summer 2021 Total Count	Summer 2021 Count (<RDL and uncensored)	Summer 2021 Value
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<4.14	1	1	3.42*	1	1	1.42*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<2.7	1	1	3.13*	1	1	0.64*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	5.11	1	1	4.19*	1	1	1.19*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0.354	1	1	0.48*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<1.07	1	1	0.783*	1	1	0.204*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.669	1	1	0.59*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<2.98	1	1	1.15*	1	1	0.325*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.723	1	1	0.359*	1	1	0.12935*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	1.03	1	1	0*	1	1	0.237*
		Octa CDD	pg/g	1	0	667	1	0	897	1	0	350
		Octa CDF	pg/g	1	0	70.6	1	0	73.9	1	0	35.8
		Total Hepta CDD	pg/g	1	0	190	1	0	225	1	0	78.7
		Total Hepta CDF	pg/g	1	0	81.5	1	0	60.6	1	0	46.9
		Total Hexa CDD	pg/g	1	0	35.6	1	0	28.7	1	0	9.05
		Total Hexa CDF	pg/g	1	0	39.7	1	0	26.5	1	0	11.6
		Total Penta CDD	pg/g	1	0	7.2	1	1	3.91*	1	1	0.898*
		Total Penta CDF	pg/g	1	0	15.8	1	0	5.36	1	1	2.09*
		Total Tetra CDD	pg/g	1	0	<0.477	1	1	0.573*	1	1	0*
		Total Tetra CDF	pg/g	1	0	6.41	1	0	3.08	1	1	0.731*
	Radionuclides	Beryllium-7	Bq/kg	1	1	4.72*	1	1	0.435*			
		Carbon-14	Bq/kg-C	1	0	198	1	0	133			
		Cesium-134	Bq/kg	1	1	0.612*	1	1	-0.0115*			
		Cesium-137	Bq/kg	1	0	3.1	1	0	1.52			
		Cobalt-60	Bq/kg	1	1	-0.56*	1	1	-0.114*			
		Iodine-131	Bq/kg	1	1	0.299*	1	1	1.19*			
		Potassium-40	Bq/kg	1	0	57.4	1	0	123			
		Thorium Series	Bq/kg	1	0	3.17	1	0	3.23			
		Uranium Series	Bq/kg	1	0	5.74	1	0	8.52			
SRD-5	Physical and Conventional Characteristics	Moisture Content	%	1	0	17	2	0	35.75	1	0	32
		Total Organic Carbon	mg/kg	1	0	12000	1	0	30000	1	0	24000
	Nutrients	Total Phosphorous	µg/g	1	0	480	1	0	380	1	0	403
	Metals	Aluminum	µg/g	1	0	5100	1	0	4940	1	0	6760
		Antimony	µg/g	1	0	<0.1	1	0	0.11	1	0	0.1
		Arsenic	µg/g	1	0	2.1	1	0	2.21	1	0	2.39
		Barium	µg/g	1	0	23	1	0	22.7	1	0	27.9
		Beryllium	µg/g	1	0	0.26	1	0	0.24	1	0	0.29
		Bismuth	µg/g	1	0	<0.1	1	1	0.07*	1	1	0.07*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Boron	µg/g	1	0	9.3	1	0	8.7	1	0	12.5
		Boron (hot water)	µg/g	1	0	0.17	1	0	0.27	1	0	0.28
		Cadmium	µg/g	1	0	<0.08	1	0	0.116	1	0	0.127
		Calcium	µg/g	1	0	100000	1	0	126000	1	0	114000
		Cesium	µg/g				1	1	0.3*	1	1	0.5*
		Chromium	µg/g	1	0	12	1	0	10.1	1	0	12.4
		Chromium (VI)	µg/g	1	0	<0.01	1	1	0.01*	1	1	0.01*
		Cobalt	µg/g	1	0	3.9	1	0	4.03	1	0	4.4
		Copper	µg/g	1	0	11	1	0	10.2	1	0	12.8
		Iron	µg/g	1	0	12000	1	0	10900	1	0	12300
		Lead	µg/g	1	0	4.4	1	0	4.93	1	0	5.06
		Lithium	µg/g	1	0	8	1	0	7.83	1	0	9.43
		Magnesium	µg/g	1	0	31000	1	0	34400	1	0	33000
		Manganese	µg/g	1	0	460	1	0	466	1	0	477
		Mercury	µg/g	1	0	-<0.021	1	1	0.034*	1	1	0.023*
		Molybdenum	µg/g	1	0	<0.21	1	0	0.24	1	0	0.24
		Nickel	µg/g	1	0	9.4	1	0	9.43	1	0	10.9
		Potassium	µg/g	1	0	1000	1	0	795	1	0	1240
		Selenium	µg/g	1	0	<0.17	1	1	0.16*	1	1	0.15*
		Silver	µg/g	1	0	<0.02	1	1	0.027*	1	1	0.027*
		Sodium	µg/g	1	0	220	1	0	275	1	0	282
		Strontium	µg/g	1	0	120	1	0	137	1	0	142
		Thallium	µg/g	1	0	0.058	1	1	0.045*	1	0	0.068
		Thorium	µg/g				1	0	2.04	1	0	3.2
		Tin	µg/g	1	0	<0.3	1	0	0.28	1	0	0.32
		Titanium	µg/g	1	0	240	1	0	160	1	0	234
		Tungsten	µg/g				1	1	0.07*	1	1	0.06*
		Uranium	µg/g	1	0	0.46	1	0	0.485	1	0	0.519
		Vanadium	µg/g	1	0	18	1	0	15	1	0	17.8
		Zinc	µg/g	1	0	69	1	0	88.5	1	0	77
		Zirconium	µg/g				1	0	1.29	1	0	1.52
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	32.8	1	0	135	1	0	61.9
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	9.03	1	0	29.9	1	0	14.2
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<0.829	1	1	2.1*	1	1	1.24*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0	1	1	1.22*	1	1	0.815*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<0.739	1	1	1.23*	1	1	0.855*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<1.24	1	1	3.58*	1	1	1.52*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<0.52	1	1	0.793*	1	1	0.61*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<1.13	1	1	2.64*	1	1	1.91*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0.256	1	1	0.407*	1	1	0.373*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0	1	1	0.188*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<0.477	1	1	0.714*	1	1	0.744*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.138	1	1	0.194*	1	1	0.178*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0.219	1	1	0*	1	1	0*
		Octa CDD	pg/g	1	0	190	1	0	927	1	0	433
		Octa CDF	pg/g	1	0	20.7	1	0	151	1	0	39.3
		Total Hepta CDD	pg/g	1	0	52.3	1	0	211	1	0	105
		Total Hepta CDF	pg/g	1	0	25.8	1	0	32	1	0	38.6
		Total Hexa CDD	pg/g	1	0	6.83	1	0	18.3	1	0	12.6
		Total Hexa CDF	pg/g	1	0	9.94	1	0	25.8	1	0	12.6
		Total Penta CDD	pg/g	1	0	<0.803	1	1	1.68*	1	1	2.4*
		Total Penta CDF	pg/g	1	0	<2.37	1	1	4.7*	1	1	3.36*
		Total Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0.713*
		Total Tetra CDF	pg/g	1	0	<0.476	1	0	1.43	1	1	0*
	Radionuclides	Beryllium-7	Bq/kg	1	0	6.76	1	1	6.2*			
		Carbon-14	Bq/kg-C	1	0	109	1	0	26			
		Cesium-134	Bq/kg	1	1	0.344*	1	1	-0.0155*			
		Cesium-137	Bq/kg	1	0	1.98	1	0	1.42			
		Cobalt-60	Bq/kg	1	1	0.58*	1	1	0.0912*			
		Iodine-131	Bq/kg	1	1	-0.361*	1	1	0.712*			
		Potassium-40	Bq/kg	1	0	193	1	0	269			
		Thorium Series	Bq/kg	1	0	3.11	1	0	8.19			
		Uranium Series	Bq/kg	1	0	8.45	1	0	10.4			
Stream C DS	Physical and Conventional Characteristics	Moisture Content	%	1	0	22	2	0	22.85	1	0	34
		Total Organic Carbon	mg/kg	1	0	17000	1	0	24000	1	0	22000
	Nutrients	Total Phosphorous	µg/g	1	0	370	1	0	314	1	0	246
	Metals	Aluminum	µg/g	1	0	2100	1	0	2370	1	0	2810
		Antimony	µg/g	1	0	<0.03	1	1	0.04*	1	1	0.04*
		Arsenic	µg/g	1	0	<0.8	1	0	1.03	1	0	1.22
		Barium	µg/g	1	0	10	1	0	10.8	1	0	11.6
		Beryllium	µg/g	1	0	<0.09	1	1	0.1*	1	1	0.11*
		Bismuth	µg/g	1	0	<0	1	1	0.03*	1	1	0.03*
		Boron	µg/g	1	0	<3.5	1	0	5.3	1	0	7.4
		Boron (hot water)	µg/g	1	0	0.31	1	0	0.16	1	0	0.29

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Cadmium	µg/g	1	0	<0.05	1	0	0.068	1	0	0.088
		Calcium	µg/g	1	0	85000	1	0	123000	1	0	133000
		Cesium	µg/g				1	1	0.1*	1	1	0.1*
		Chromium	µg/g	1	0	6.9	1	0	6.87	1	0	8.09
		Chromium (VI)	µg/g	1	0	<0	1	1	0.02*	1	1	0*
		Cobalt	µg/g	1	0	1.8	1	0	2.05	1	0	2.46
		Copper	µg/g	1	0	3.1	1	0	3.67	1	0	4.48
		Iron	µg/g	1	0	5400	1	0	6140	1	0	7060
		Lead	µg/g	1	0	2.9	1	0	3.78	1	0	3.82
		Lithium	µg/g	1	0	3.2	1	0	3.79	1	0	4.66
		Magnesium	µg/g	1	0	27000	1	0	38400	1	0	41900
		Manganese	µg/g	1	0	330	1	0	389	1	0	466
		Mercury	µg/g	1	0	<0.005	1	1	0.019*	1	1	0.009*
		Molybdenum	µg/g	1	0	<0.13	1	0	0.13	1	0	0.15
		Nickel	µg/g	1	0	4	1	0	4.56	1	0	5.88
		Potassium	µg/g	1	0	290	1	0	358	1	0	361
		Selenium	µg/g	1	0	<0.18	1	1	0.14*	1	1	0.15*
		Silver	µg/g	1	0	<0.01	1	1	0.011*	1	1	0.015*
		Sodium	µg/g	1	0	120	1	0	139	1	0	139
		Strontium	µg/g	1	0	65	1	0	107	1	0	120
		Thallium	µg/g	1	0	<0.025	1	1	0.028*	1	1	0.032*
		Thorium	µg/g				1	0	1.32	1	0	1.06
		Tin	µg/g	1	0	<0.2	1	0	0.16	1	0	0.18
		Titanium	µg/g	1	0	180	1	0	136	1	0	152
		Tungsten	µg/g				1	1	0.04*	1	1	0.03*
		Uranium	µg/g	1	0	0.36	1	0	0.444	1	0	0.535
		Vanadium	µg/g	1	0	10	1	0	9.3	1	0	10.1
		Zinc	µg/g	1	0	16	1	0	18	1	0	19.9
		Zirconium	µg/g				1	0	0.73	1	0	0.78
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	<3.38	1	0	31.7	1	1	4.69*
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	<1.16	1	0	7.81	1	1	1.1*
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<0	1	1	0.707*	1	1	0*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0	1	1	0.268*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<0	1	1	0.489*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<0.164	1	1	1.24*	1	1	0.216*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<0	1	1	0.216*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<0	1	1	0.631*	1	1	0.212*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<0	1	1	0.164*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		Octa CDD	pg/g	1	0	18	1	0	137	1	0	30.1
		Octa CDF	pg/g	1	0	<1.58	1	0	18.7	1	1	2.06*
		Total Hepta CDD	pg/g	1	0	5.76	1	0	45	1	0	7.44
		Total Hepta CDF	pg/g	1	0	<2.45	1	0	31.7	1	1	2.79*
		Total Hexa CDD	pg/g	1	0	<0.956	1	1	4.29*	1	1	1.41*
		Total Hexa CDF	pg/g	1	0	<1.24	1	0	12.2	1	1	1.14*
		Total Penta CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		Total Penta CDF	pg/g	1	0	<0.573	1	1	1.01*	1	1	0.787*
		Total Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		Total Tetra CDF	pg/g	1	0	<0.274	1	1	0*	1	1	0.454*
	Radionuclides	Beryllium-7	Bq/kg	1	1	2.92*	1	1	3.12*			
		Carbon-14	Bq/kg-C	1	0	75	1	0	36			
		Cesium-134	Bq/kg	1	1	0.225*	1	1	0.187*			
		Cesium-137	Bq/kg	1	0	0.708	1	1	-0.291*			
		Cobalt-60	Bq/kg	1	1	0.039*	1	1	-0.0344*			
		Iodine-131	Bq/kg	1	1	0.467*	1	1	2.39*			
		Potassium-40	Bq/kg	1	0	217	1	0	168			
		Thorium Series	Bq/kg	1	0	5.65	1	0	4.11			
		Uranium Series	Bq/kg	1	0	8.54	1	0	8.37			
Stream C US	Physical and Conventional Characteristics	Moisture Content	%	1	0	24	2	0	30.9	1	0	20
		Total Organic Carbon	mg/kg	1	0	29000	1	0	38000	1	0	30000
	Nutrients	Total Phosphorous	µg/g	1	0	620	1	0	485	1	0	323
	Metals	Aluminum	µg/g	1	0	3500	1	0	3710	1	0	2840
		Antimony	µg/g	1	0	<0.06	1	1	0.04*	1	1	0.02*
		Arsenic	µg/g	1	0	2.9	1	0	2.37	1	0	1.61
		Barium	µg/g	1	0	41	1	0	33.1	1	0	15.1
		Beryllium	µg/g	1	0	<0.17	1	1	0.17*	1	1	0.14*
		Bismuth	µg/g	1	0	<0	1	1	0.05*	1	1	0.03*
		Boron	µg/g	1	0	5	1	0	6.8	1	0	6.4
		Boron (hot water)	µg/g	1	0	0.35	1	0	0.22	1	0	0.12
		Cadmium	µg/g	1	0	0.2	1	0	0.153	1	0	0.065
		Calcium	µg/g	1	0	110000	1	0	146000	1	0	152000

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Cesium	µg/g				1	1	0.2*	1	1	0.2*
		Chromium	µg/g	1	0	7.5	1	0	7.32	1	0	7.41
		Chromium (VI)	µg/g	1	0	<0	1	1	0.01*	1	1	0.03*
		Cobalt	µg/g	1	0	2.6	1	0	2.54	1	0	2
		Copper	µg/g	1	0	6.8	1	0	7.07	1	0	3.67
		Iron	µg/g	1	0	11000	1	0	9270	1	0	7480
		Lead	µg/g	1	0	3.6	1	0	3.9	1	0	2.14
		Lithium	µg/g	1	0	5.2	1	0	5.22	1	0	4.76
		Magnesium	µg/g	1	0	26000	1	0	39500	1	0	51100
		Manganese	µg/g	1	0	1100	1	0	786	1	0	609
		Mercury	µg/g	1	0	<0.016	1	1	0.039*	1	1	0.022*
		Molybdenum	µg/g	1	0	<0.11	1	0	0.14	1	0	0.13
		Nickel	µg/g	1	0	5.5	1	0	5.59	1	0	4.6
		Potassium	µg/g	1	0	510	1	0	460	1	0	347
		Selenium	µg/g	1	0	<0.48	1	1	0.38*	1	1	0.16*
		Silver	µg/g	1	0	<0.01	1	1	0.019*	1	1	0.015*
		Sodium	µg/g	1	0	120	1	0	155	1	0	154
		Strontium	µg/g	1	0	190	1	0	173	1	0	132
		Thallium	µg/g	1	0	<0.045	1	1	0.036*	1	1	0.033*
		Thorium	µg/g				1	0	0.78	1	0	2.49
		Tin	µg/g	1	0	<0.3	1	0	0.22	1	0	0.17
		Titanium	µg/g	1	0	130	1	0	103	1	0	118
		Tungsten	µg/g				1	1	0.02*	1	1	0.02*
		Uranium	µg/g	1	0	0.4	1	0	0.441	1	0	0.426
		Vanadium	µg/g	1	0	12	1	0	10.3	1	0	9.5
		Zinc	µg/g	1	0	30	1	0	26.8	1	0	14.4
		Zirconium	µg/g				1	0	0.79	1	0	0.92
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	<1.08	1	1	0.789*	1	1	0.481*
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	<0.448	1	1	0.221*	1	1	0*
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0.134	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.192	1	1	0*	1	1	0*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.113	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0.129	1	1	0*	1	1	0*
		Octa CDD	pg/g	1	0	<4.88	1	1	3.28*	1	1	1.83*
		Octa CDF	pg/g	1	0	<0	1	1	0.37*	1	1	0*
		Total Hepta CDD	pg/g	1	0	<2.01	1	1	1.49*	1	1	0.481*
		Total Hepta CDF	pg/g	1	0	<0.698	1	1	0.221*	1	1	0*
		Total Hexa CDD	pg/g	1	0	<1.05	1	1	0.796*	1	1	0.21*
		Total Hexa CDF	pg/g	1	0	<0	1	1	0.176*	1	1	0*
		Total Penta CDD	pg/g	1	0	<0.134	1	1	0.384*	1	1	0*
		Total Penta CDF	pg/g	1	0	<0.305	1	1	0*	1	1	0*
		Total Tetra CDD	pg/g	1	0	<0.17	1	1	0.181*	1	1	0*
		Total Tetra CDF	pg/g	1	0	<0.129	1	1	0.307*	1	1	0*
	Radionuclides	Beryllium-7	Bq/kg	1	1	0.025*	1	1	-2.21*			
		Carbon-14	Bq/kg-C	1	0	62	1	0	58			
		Cesium-134	Bq/kg	1	1	-0.885*	1	1	0.0834*			
		Cesium-137	Bq/kg	1	1	0.157*	1	1	0.635*			
		Cobalt-60	Bq/kg	1	1	-0.24*	1	1	0.182*			
		Iodine-131	Bq/kg	1	1	-1.29*	1	1	0.582*			
		Potassium-40	Bq/kg	1	0	191	1	0	170			
		Thorium Series	Bq/kg	1	1	1.29*	1	0	6.26			
		Uranium Series	Bq/kg	1	0	10.9	1	0	9.75			
WD-1	Physical and Conventional Characteristics	Moisture Content	%	1	0	68	2	0	64.7	1	0	57
		Total Organic Carbon	mg/kg	1	0	50000	1	0	55000	1	0	31000
	Nutrients	Total Phosphorous	µg/g	1	0	610	1	0	605	1	0	388
	Metals	Aluminum	µg/g	1	0	7700	1	0	8380	1	0	7050
		Antimony	µg/g	1	0	0.45	1	0	0.31	1	0	0.31
		Arsenic	µg/g	1	0	4.2	1	0	5.28	1	0	3.01
		Barium	µg/g	1	0	46	1	0	49.6	1	0	35.1
		Beryllium	µg/g	1	0	0.36	1	0	0.36	1	0	0.3
		Bismuth	µg/g	1	0	<0.1	1	0	0.14	1	0	0.1
		Boron	µg/g	1	0	11	1	0	11.3	1	0	15.4
		Boron (hot water)	µg/g	1	0	0.35	1	0	0.28	1	0	0.35
		Cadmium	µg/g	1	0	0.39	1	0	0.326	1	0	0.29
		Calcium	µg/g	1	0	140000	1	0	156000	1	0	157000
		Cesium	µg/g				1	1	0.5*	1	1	0.4*
		Chromium	µg/g	1	0	18	1	0	19.4	1	0	16.6

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Chromium (VI)	µg/g	1	0	<0.03	1	1	0*	1	1	0.01*
		Cobalt	µg/g	1	0	6.7	1	0	7.3	1	0	4.59
		Copper	µg/g	1	0	35	1	0	34.9	1	0	21.2
		Iron	µg/g	1	0	18000	1	0	22200	1	0	16000
		Lead	µg/g	1	0	12	1	0	13.1	1	0	10.3
		Lithium	µg/g	1	0	12	1	0	12.6	1	0	10.3
		Magnesium	µg/g	1	0	38000	1	0	48100	1	0	50100
		Manganese	µg/g	1	0	730	1	0	920	1	0	482
		Mercury	µg/g	1	0	<0.015	1	1	0.045*	1	0	0.105
		Molybdenum	µg/g	1	0	0.86	1	0	0.8	1	0	0.86
		Nickel	µg/g	1	0	17	1	0	18.3	1	0	12.6
		Potassium	µg/g	1	0	1300	1	0	1250	1	0	977
		Selenium	µg/g	1	0	0.74	1	0	0.66	1	1	0.36*
		Silver	µg/g	1	0	<0.07	1	0	0.064	1	0	0.058
		Sodium	µg/g	1	0	660	1	0	1860	1	0	1410
		Strontium	µg/g	1	0	270	1	0	341	1	0	408
		Thallium	µg/g	1	0	0.19	1	0	0.174	1	0	0.128
		Thorium	µg/g				1	0	1.15	1	0	1.55
		Tin	µg/g	1	0	1.2	1	0	1.08	1	0	0.7
		Titanium	µg/g	1	0	200	1	0	207	1	0	202
		Tungsten	µg/g				1	1	0.41*	1	1	0.33*
		Uranium	µg/g	1	0	1	1	0	0.963	1	0	0.84
		Vanadium	µg/g	1	0	23	1	0	24.7	1	0	19.4
		Zinc	µg/g	1	0	550	1	0	372	1	0	387
		Zirconium	µg/g				1	0	1.66	1	0	0.92
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	105	1	0	79.4	1	0	42.9
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	16	1	0	12	1	0	6.95
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<0	1	1	1.3*	1	1	0.819*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<1.83	1	1	1.49*	1	1	0.878*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<1.83	1	1	1.32*	1	1	0.975*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<2.79	1	1	2.23*	1	1	1.22*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<1.15	1	1	0.829*	1	1	0.581*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<4.7	1	1	3.27*	1	1	2.06*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0.12	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<1.05	1	1	0.732*	1	1	0.527*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.4	1	1	0.289*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<1.29	1	1	0.99*	1	1	0.635*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.446	1	1	0.357*	1	1	0.232*

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value	Spring 2021 Total Count	Spring 2021 Count (<RDL and uncensored)	Spring 2021 Value	Summer 2021 Total Count	Summer 2021 Count (<RDL and uncensored)	Summer 2021 Value
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0.184*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0.877	1	1	0*	1	1	0.4*
		Octa CDD	pg/g	1	0	513	1	0	405	1	0	241
		Octa CDF	pg/g	1	0	36.8	1	0	31.6	1	0	16
		Total Hepta CDD	pg/g	1	0	258	1	0	185	1	0	104
		Total Hepta CDF	pg/g	1	0	40.8	1	0	34.3	1	0	17.1
		Total Hexa CDD	pg/g	1	0	48	1	0	32.8	1	0	18.6
		Total Hexa CDF	pg/g	1	0	18.2	1	0	14	1	0	7.63
		Total Penta CDD	pg/g	1	0	8.59	1	0	6.03	1	1	3.47*
		Total Penta CDF	pg/g	1	0	7.61	1	0	6.78	1	1	4.09*
		Total Tetra CDD	pg/g	1	0	1.59	1	0	1.46	1	1	0.303*
		Total Tetra CDF	pg/g	1	0	6.02	1	0	4.37	1	0	1.36
	Radionuclides	Beryllium-7	Bq/kg	1	0	25.4	1	0	10.2			
		Carbon-14	Bq/kg-C	1	0	102	1	0	65			
		Cesium-134	Bq/kg	1	1	0.792*	1	1	-0.127*			
		Cesium-137	Bq/kg	1	1	0.034*	1	0	0.644			
		Cobalt-60	Bq/kg	1	1	0.599*	1	1	-0.164*			
		Iodine-131	Bq/kg	1	1	0.145*	1	1	2.93*			
		Potassium-40	Bq/kg	1	0	64.9	1	0	153			
		Thorium Series	Bq/kg	1	0	3.57	1	0	6.57			
		Uranium Series	Bq/kg	1	0	10.2	1	0	17.1			
WD-2b	Physical and Conventional Characteristics	Moisture Content	%	1	0	41	2	0	45.05	1	0	51
		Total Organic Carbon	mg/kg	1	0	30000	1	0	35000	1	0	36000
	Nutrients	Total Phosphorous	µg/g	1	0	470	1	0	451	1	0	408
	Metals	Aluminum	µg/g	1	0	8500	1	0	7890	1	0	8480
		Antimony	µg/g	1	0	0.72	1	0	0.35	1	0	0.9
		Arsenic	µg/g	1	0	3.2	1	0	3.01	1	0	3.51
		Barium	µg/g	1	0	40	1	0	39.1	1	0	38.1
		Beryllium	µg/g	1	0	0.35	1	0	0.33	1	0	0.35
		Bismuth	µg/g	1	0	<0.1	1	0	0.13	1	0	0.12
		Boron	µg/g	1	0	11	1	0	8.6	1	0	16.1
		Boron (hot water)	µg/g	1	0	0.14	1	0	0.12	1	0	0.14
		Cadmium	µg/g	1	0	0.38	1	0	0.505	1	0	0.669
		Calcium	µg/g	1	0	160000	1	0	170000	1	0	163000
		Cesium	µg/g				1	1	0.5*	1	1	0.6*
		Chromium	µg/g	1	0	18	1	0	16.4	1	0	17.1
		Chromium (VI)	µg/g	1	0	<0	1	1	0.03*	1	1	0.03*
		Cobalt	µg/g	1	0	5.7	1	0	6.21	1	0	5.94

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Copper	µg/g	1	0	24	1	0	26.5	1	0	25
		Iron	µg/g	1	0	14000	1	0	13700	1	0	13700
		Lead	µg/g	1	0	32	1	0	42.6	1	0	42
		Lithium	µg/g	1	0	11	1	0	10.4	1	0	11
		Magnesium	µg/g	1	0	49000	1	0	57400	1	0	57000
		Manganese	µg/g	1	0	450	1	0	499	1	0	507
		Mercury	µg/g	1	0	<0.024	1	1	0.049*	1	0	0.069
		Molybdenum	µg/g	1	0	1	1	0	0.87	1	0	1.18
		Nickel	µg/g	1	0	16	1	0	16.3	1	0	16.2
		Potassium	µg/g	1	0	1200	1	0	757	1	0	1140
		Selenium	µg/g	1	0	<0.31	1	1	0.23*	1	1	0.25*
		Silver	µg/g	1	0	<0.19	1	0	0.309	1	0	0.222
		Sodium	µg/g	1	0	250	1	0	317	1	0	377
		Strontium	µg/g	1	0	160	1	0	177	1	0	191
		Thallium	µg/g	1	0	0.14	1	0	0.092	1	0	0.092
		Thorium	µg/g				1	0	1.4	1	0	2.19
		Tin	µg/g	1	0	1	1	0	1.14	1	0	0.96
		Titanium	µg/g	1	0	290	1	0	183	1	0	261
		Tungsten	µg/g				1	1	0.13*	1	1	0.12*
		Uranium	µg/g	1	0	0.76	1	0	0.748	1	0	0.934
		Vanadium	µg/g	1	0	29	1	0	27.8	1	0	31.4
		Zinc	µg/g	1	0	97	1	0	113	1	0	108
		Zirconium	µg/g				1	0	1.74	1	0	1.75
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	623	1	0	766	1	0	1120
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	145	1	0	177	1	0	245
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	11.5	1	0	14	1	0	18.4
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	7.26	1	0	10.7	1	0	11.7
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	7.83	1	0	10.9	1	0	13.4
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	22.2	1	0	26.5	1	0	32.4
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	5.64	1	0	7.25	1	0	9.44
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	18.2	1	0	21.5	1	0	27.2
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0.392	1	1	0.577*	1	1	0.498*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<3.18	1	1	4.04*	1	1	4.65*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<1.3	1	1	1.62*	1	1	1.77*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<4.18	1	0	6.08	1	0	8.21
		2,3,4,7,8-Penta CDF	pg/g	1	0	<1.45	1	1	2.11*	1	1	2.77*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0.911	1	1	0.838*	1	0	1.17
		2,3,7,8-Tetra CDF	pg/g	1	0	3.72	1	0	4.78	1	0	6.55

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		2,3,7,8-Tetra CDF Confirmation	pg/g	1	0	1.44	1	0	2.49	1	0	4.07
		Octa CDD	pg/g	1	0	3640	1	0	4980	1	0	7430
		Octa CDF	pg/g	1	0	453	1	0	474	1	0	663
		Total Hepta CDD	pg/g	1	0	998	1	0	1200	1	0	1810
		Total Hepta CDF	pg/g	1	0	157	1	0	561	1	0	816
		Total Hexa CDD	pg/g	1	0	124	1	0	147	1	0	199
		Total Hexa CDF	pg/g	1	0	162	1	0	197	1	0	269
		Total Penta CDD	pg/g	1	0	17.8	1	0	24.5	1	0	26.1
		Total Penta CDF	pg/g	1	0	47	1	0	65	1	0	87.3
		Total Tetra CDD	pg/g	1	0	5.13	1	0	7.17	1	0	7.38
		Total Tetra CDF	pg/g	1	0	22.4	1	0	31.8	1	0	42.8
	Radionuclides	Beryllium-7	Bq/kg	1	1	5.35*	1	1	5.48*			
		Carbon-14	Bq/kg-C	1	0	22	1	0	40			
		Cesium-134	Bq/kg	1	1	0.207*	1	1	0.364*			
		Cesium-137	Bq/kg	1	0	1.62	1	0	3.08			
		Cobalt-60	Bq/kg	1	1	0.19*	1	1	0.357*			
		Iodine-131	Bq/kg	1	1	0.751*	1	1	0.679*			
		Potassium-40	Bq/kg	1	0	207	1	0	221			
		Thorium Series	Bq/kg	1	0	6.57	1	0	11.9			
		Uranium Series	Bq/kg	1	0	14.6	1	0	15.8			
WD-3	Physical and Conventional Characteristics	Moisture Content	%	1	0	57	2	0	60.8	1	0	57
		Total Organic Carbon	mg/kg	1	0	36000	1	0	49000	1	0	30000
	Nutrients	Total Phosphorous	µg/g	1	0	520	1	0	415	1	0	430
	Metals	Aluminum	µg/g	1	0	5000	1	0	4390	1	0	5260
		Antimony	µg/g	1	0	0.22	1	0	0.12	1	0	0.18
		Arsenic	µg/g	1	0	2.7	1	0	2.54	1	0	2.33
		Barium	µg/g	1	0	44	1	0	42.2	1	0	42.5
		Beryllium	µg/g	1	0	0.25	1	0	0.21	1	0	0.23
		Bismuth	µg/g	1	0	<0.1	1	1	0.08*	1	1	0.07*
		Boron	µg/g	1	0	9	1	0	8.3	1	0	11.2
		Boron (hot water)	µg/g	1	0	0.47	1	0	0.25	1	0	0.59
		Cadmium	µg/g	1	0	0.32	1	0	0.287	1	0	0.231
		Calcium	µg/g	1	0	140000	1	0	140000	1	0	154000
		Cesium	µg/g				1	1	0.3*	1	1	0.4*
		Chromium	µg/g	1	0	12	1	0	10.1	1	0	11.3
		Chromium (VI)	µg/g	1	0	<0	1	1	0*	1	1	0.04*
		Cobalt	µg/g	1	0	4.6	1	0	4.34	1	0	4.19
		Copper	µg/g	1	0	22	1	0	21.6	1	0	19.1

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Iron	µg/g	1	0	13000	1	0	11300	1	0	11700
		Lead	µg/g	1	0	8.2	1	0	8.36	1	0	7.38
		Lithium	µg/g	1	0	7.7	1	0	6.88	1	0	7.59
		Magnesium	µg/g	1	0	36000	1	0	33400	1	0	38400
		Manganese	µg/g	1	0	890	1	0	826	1	0	692
		Mercury	µg/g	1	0	<0.019	1	1	0.038*	1	1	0.024*
		Molybdenum	µg/g	1	0	0.51	1	0	0.38	1	0	0.4
		Nickel	µg/g	1	0	11	1	0	10	1	0	9.79
		Potassium	µg/g	1	0	870	1	0	668	1	0	947
		Selenium	µg/g	1	0	0.52	1	1	0.41*	1	1	0.38*
		Silver	µg/g	1	0	<0.06	1	0	0.059	1	0	0.059
		Sodium	µg/g	1	0	430	1	0	623	1	0	589
		Strontium	µg/g	1	0	330	1	0	360	1	0	445
		Thallium	µg/g	1	0	0.11	1	0	0.088	1	0	0.109
		Thorium	µg/g				1	0	0.64	1	0	1.65
		Tin	µg/g	1	0	<0.5	1	0	0.42	1	0	0.43
		Titanium	µg/g	1	0	170	1	0	123	1	0	209
		Tungsten	µg/g				1	1	0.14*	1	1	0.14*
		Uranium	µg/g	1	0	0.67	1	0	0.55	1	0	0.603
		Vanadium	µg/g	1	0	17	1	0	14.4	1	0	16.9
		Zinc	µg/g	1	0	290	1	0	286	1	0	215
		Zirconium	µg/g				1	0	0.84	1	0	1.2
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	43.7	1	0	48.9	1	0	47.2
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	<0	1	0	11.2	1	0	9.44
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<1.13	1	1	1.54*	1	1	1.13*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0.826	1	1	1.01*	1	1	0.721*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<1.39	1	1	1.72*	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<1.52	1	1	1.72*	1	1	1.2*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<0.975	1	1	1.12*	1	1	0.84*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<2.3	1	1	2.42*	1	1	1.58*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0*	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0.483	1	1	0.569*	1	1	0.345*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.367	1	1	0.374*	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<0.979	1	1	1.08*	1	1	0.791*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.357	1	1	0.455*	1	1	0.337*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0*	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0.655	1	1	0.781*	1	1	0.602*
		Octa CDD	pg/g	1	0	236	1	0	266	1	0	250

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Octa CDF	pg/g	1	0	21.6	1	0	26.4	1	0	22.8
		Total Hepta CDD	pg/g	1	0	85.2	1	0	95.3	1	0	85.7
		Total Hepta CDF	pg/g	1	0	14	1	0	26.9	1	0	24.1
		Total Hexa CDD	pg/g	1	0	17.7	1	0	18.5	1	0	13.2
		Total Hexa CDF	pg/g	1	0	11	1	0	13.5	1	0	9.23
		Total Penta CDD	pg/g	1	0	<3.93	1	1	4.74*	1	1	2.55*
		Total Penta CDF	pg/g	1	0	<4.38	1	0	7.23	1	1	2.72*
		Total Tetra CDD	pg/g	1	0	1.15	1	0	1.26	1	1	0.851*
		Total Tetra CDF	pg/g	1	0	4.51	1	0	5.97	1	0	3.12
	Radionuclides	Beryllium-7	Bq/kg	1	0	17.6	1	0	8.05			
		Carbon-14	Bq/kg-C	1	0	103	1	0	89			
		Cesium-134	Bq/kg	1	1	0.505*	1	1	0.09984*			
		Cesium-137	Bq/kg	1	1	0.42*	1	0	0.967			
		Cobalt-60	Bq/kg	1	1	-0.13*	1	1	-0.14*			
		Iodine-131	Bq/kg	1	0	1.35	1	1	2.07*			
		Potassium-40	Bq/kg	1	0	135	1	0	163			
		Thorium Series	Bq/kg	1	0	5.55	1	0	10.2			
		Uranium Series	Bq/kg	1	0	13.9	1	0	17.8			
WTL-1	Physical and Conventional Characteristics	Moisture Content	%	1	0	48	2	0	72.05	1	0	54
		Total Organic Carbon	mg/kg	1	0	29000	1	0	62000	1	0	46000
	Nutrients	Total Phosphorous	µg/g	1	0	670	1	0	618	1	0	567
	Metals	Aluminum	µg/g	1	0	9200	1	0	10400	1	0	11600
		Antimony	µg/g	1	0	<0.13	1	0	0.38	1	0	0.24
		Arsenic	µg/g	1	0	2.3	1	0	2.17	1	0	2.84
		Barium	µg/g	1	0	42	1	0	58.4	1	0	47.7
		Beryllium	µg/g	1	0	0.43	1	0	0.41	1	0	0.48
		Bismuth	µg/g	1	0	<0.1	1	0	0.13	1	0	0.14
		Boron	µg/g	1	0	12	1	0	14	1	0	20.1
		Boron (hot water)	µg/g	1	0	0.49	1	0	0.37	1	0	0.67
		Cadmium	µg/g	1	0	0.19	1	0	0.397	1	0	0.307
		Calcium	µg/g	1	0	84000	1	0	126000	1	0	96000
		Cesium	µg/g				1	1	0.5*	1	1	0.8*
		Chromium	µg/g	1	0	15	1	0	29.4	1	0	23.1
		Chromium (VI)	µg/g	1	0	<0	1	1	0.05*	1	1	0.09*
		Cobalt	µg/g	1	0	5.4	1	0	7.17	1	0	6.94
		Copper	µg/g	1	0	15	1	0	27.6	1	0	22.4
		Iron	µg/g	1	0	15000	1	0	16300	1	0	17200
		Lead	µg/g	1	0	9.1	1	0	20.3	1	0	17.2

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Lithium	µg/g	1	0	11	1	0	14.3	1	0	14.8
		Magnesium	µg/g	1	0	29000	1	0	27800	1	0	30700
		Manganese	µg/g	1	0	380	1	0	606	1	0	525
		Mercury	µg/g	1	0	<0.015	1	0	0.059	1	1	0.048*
		Molybdenum	µg/g	1	0	<0.23	1	0	0.56	1	0	0.51
		Nickel	µg/g	1	0	13	1	0	18.8	1	0	17.7
		Potassium	µg/g	1	0	1100	1	0	1200	1	0	1700
		Selenium	µg/g	1	0	<0.36	1	1	0.42*	1	1	0.38*
		Silver	µg/g	1	0	<0.04	1	0	0.073	1	0	0.058
		Sodium	µg/g	1	0	260	1	0	814	1	0	495
		Strontium	µg/g	1	0	100	1	0	307	1	0	167
		Thallium	µg/g	1	0	0.11	1	0	0.106	1	0	0.116
		Thorium	µg/g				1	0	2.42	1	0	2.52
		Tin	µg/g	1	0	<0.5	1	0	0.77	1	0	0.59
		Titanium	µg/g	1	0	200	1	0	155	1	0	253
		Tungsten	µg/g				1	1	0.11*	1	1	0.08*
		Uranium	µg/g	1	0	0.54	1	0	0.86	1	0	0.782
		Vanadium	µg/g	1	0	22	1	0	26.7	1	0	29.7
		Zinc	µg/g	1	0	44	1	0	105	1	0	73.8
		Zirconium	µg/g				1	0	2.13	1	0	2.15
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	9.27	1	0	123	1	0	110
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	<2.83	1	0	46	1	0	36.6
		1,2,3,4,7,8,9-Hepta CDF	pg/g	1	0	<0.378	1	0	5.04	1	1	3.41*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	0	<0.256	1	1	2.02*	1	1	1.48*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	0	<0.598	1	0	6.08	1	1	3.39*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	0	<0.533	1	0	5.16	1	1	3.52*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	0	<0	1	1	3.53*	1	1	2.15*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	0	<0.621	1	0	5.43	1	1	4.4*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	0	<0	1	1	0.535*	1	1	0.204*
		1,2,3,7,8-Penta CDD	pg/g	1	0	<0.191	1	1	1.15*	1	1	0.835*
		1,2,3,7,8-Penta CDF	pg/g	1	0	<0.207	1	1	1.69*	1	1	0.786*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	0	<0.413	1	1	4.23*	1	1	2*
		2,3,4,7,8-Penta CDF	pg/g	1	0	<0.197	1	1	1.57*	1	1	0.908*
		2,3,7,8-Tetra CDD	pg/g	1	0	<0	1	1	0.417*	1	1	0.37*
		2,3,7,8-Tetra CDF	pg/g	1	0	<0.39	1	1	0*	1	0	2.28
		2,3,7,8-Tetra CDF Confirmation	pg/g				1	0	1.59	1	0	1.21
		Octa CDD	pg/g	1	0	50.4	1	0	598	1	0	636
		Octa CDF	pg/g	1	0	<4.83	1	0	92.7	1	0	80

Monitoring Results by Location: Sediment

Location	Category	Parameter	Units	Fall 2020			Spring 2021			Summer 2021		
				Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value	Total Count	Count (<RDL and uncensored)	Value
		Total Hepta CDD	pg/g	1	0	15.4	1	0	198	1	0	182
		Total Hepta CDF	pg/g	1	0	6.42	1	0	103	1	0	93.8
		Total Hexa CDD	pg/g	1	0	<3.24	1	0	36.7	1	0	27.4
		Total Hexa CDF	pg/g	1	0	<3.25	1	0	51.3	1	0	36.4
		Total Penta CDD	pg/g	1	0	<1.79	1	0	12.7	1	0	5.01
		Total Penta CDF	pg/g	1	0	<2.5	1	0	28.8	1	0	16.9
		Total Tetra CDD	pg/g	1	0	<0.754	1	0	7.71	1	0	4.56
		Total Tetra CDF	pg/g	1	0	1.81	1	0	27.9	1	0	17.2
	Radionuclides	Beryllium-7	Bq/kg	1	1	1.65*	1	1	-0.225*			
		Carbon-14	Bq/kg-C	1	0	89	1	0	139			
		Cesium-134	Bq/kg	1	1	0.425*	1	1	0.319*			
		Cesium-137	Bq/kg	1	0	2.68	1	0	9.41			
		Cobalt-60	Bq/kg	1	1	-0.062*	1	1	-0.0834*			
		Iodine-131	Bq/kg	1	1	0.06*	1	1	0.611*			
		Potassium-40	Bq/kg	1	0	257	1	0	161			
		Thorium Series	Bq/kg	1	0	9.2	1	0	7.57			
		Uranium Series	Bq/kg	1	0	13.3	1	0	9.62			

Monitoring Results by Location: Sediment (Petroleum Hydrocarbons & BTEX)

Location	Category	Parameter	Units	Total Count	Count (<RDL and uncensored)	Value
GS-1	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	89
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	93
		4-Bromofluorobenzene	%	1	0	83
		D10-o-Xylene	%	1	0	74
		D4-1,2-Dichloroethane	%	1	0	105
		D8-Toluene	%	1	0	103
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
SRD-1	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	790
		Petroleum Hydrocarbons F4	µg/g	1	0	280
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	90
		4-Bromofluorobenzene	%	1	0	84
		D10-o-Xylene	%	1	0	86
		D4-1,2-Dichloroethane	%	1	0	104
		D8-Toluene	%	1	0	102
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
SRD-2	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	1	0*
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	90

Location	Category	Parameter	Units	Total Count	Count (<RDL and uncensored)	Value
		4-Bromofluorobenzene	%	1	0	82
		D10-o-Xylene	%	1	0	83
		D4-1,2-Dichloroethane	%	1	0	105
		D8-Toluene	%	1	0	103
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
SRD-3	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	110
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	93
		4-Bromofluorobenzene	%	1	0	87
		D10-o-Xylene	%	1	0	89
		D4-1,2-Dichloroethane	%	1	0	104
		D8-Toluene	%	1	0	101
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	0	0.027
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
SRD-4	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	52
		Petroleum Hydrocarbons F4	µg/g	1	0	59
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	92
		4-Bromofluorobenzene	%	1	0	84
		D10-o-Xylene	%	1	0	85
		D4-1,2-Dichloroethane	%	1	0	105
		D8-Toluene	%	1	0	104
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*

Location	Category	Parameter	Units	Total Count	Count (<RDL and uncensored)	Value
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
SRD-5	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	58
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	94
		4-Bromofluorobenzene	%	1	0	82
		D10-o-Xylene	%	1	0	89
		D4-1,2-Dichloroethane	%	1	0	105
		D8-Toluene	%	1	0	103
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
Stream C DS	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	1	0*
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	94
		4-Bromofluorobenzene	%	1	0	83
		D10-o-Xylene	%	1	0	96
		D4-1,2-Dichloroethane	%	1	0	106
		D8-Toluene	%	1	0	102
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
Stream C US	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	1	0*
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1

Location	Category	Parameter	Units	Total Count	Count (<RDL and uncensored)	Value
		o-Terphenyl	%	1	0	96
		4-Bromofluorobenzene	%	1	0	82
		D10-o-Xylene	%	1	0	83
		D4-1,2-Dichloroethane	%	1	0	103
		D8-Toluene	%	1	0	104
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
WD-1	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	200
		Petroleum Hydrocarbons F4	µg/g	1	0	180
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	95
		4-Bromofluorobenzene	%	1	0	82
		D10-o-Xylene	%	1	0	78
		D4-1,2-Dichloroethane	%	1	0	105
		D8-Toluene	%	1	0	103
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
WD-2b	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	2000
		Petroleum Hydrocarbons F4	µg/g	1	0	630
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	82
		4-Bromofluorobenzene	%	1	0	83
		D10-o-Xylene	%	1	0	80
		D4-1,2-Dichloroethane	%	1	0	104
		D8-Toluene	%	1	0	103
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*

Location	Category	Parameter	Units	Total Count	Count (<RDL and uncensored)	Value
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
WD-3	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	130
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	90
		4-Bromofluorobenzene	%	1	0	83
		D10-o-Xylene	%	1	0	82
		D4-1,2-Dichloroethane	%	1	0	104
		D8-Toluene	%	1	0	101
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	0	0.02
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*
WTL-1	Hydrocarbons	Petroleum Hydrocarbons F1	µg/g	1	1	0*
		F1-BTEX	µg/g	1	1	0*
		Petroleum Hydrocarbons F2	µg/g	1	1	0*
		Petroleum Hydrocarbons F3	µg/g	1	0	180
		Petroleum Hydrocarbons F4	µg/g	1	1	0*
		Reached Baseline at C50	µg/g	1	0	1
		o-Terphenyl	%	1	0	91
		4-Bromofluorobenzene	%	1	0	83
		D10-o-Xylene	%	1	0	82
		D4-1,2-Dichloroethane	%	1	0	104
		D8-Toluene	%	1	0	103
		p+m-Xylene	µg/g	1	1	0*
		Benzene	µg/g	1	1	0*
		Toluene	µg/g	1	1	0*
		Ethylbenzene	µg/g	1	1	0*
		Total Xylenes	µg/g	1	1	0*
		o-Xylene	µg/g	1	1	0*

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
A3-1	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.06
		Conductivity	umho/cm	1	0	245
		Moisture Content	%	2	0	31.91
		Sodium Adsorption Ratio	N/A	1	0	0.19
		Total Organic Carbon	mg/kg	1	0	60000
	Nutrients	Total Phosphorous	µg/g	1	0	415
	Metals	Aluminum	µg/g	1	0	9100
		Antimony	µg/g	1	0	0.23
		Arsenic	µg/g	1	0	4.61
		Barium	µg/g	1	0	48.2
		Beryllium	µg/g	1	0	0.36
		Bismuth	µg/g	1	0	0.15
		Boron	µg/g	1	0	6.4
		Boron (hot water)	µg/g	1	0	0.51
		Cadmium	µg/g	1	0	1.28
		Calcium	µg/g	1	0	13900
		Cesium	µg/g	1	1	0.5*
		Chromium	µg/g	1	0	13.3
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	5.86
		Copper	µg/g	1	0	12.6
		Iron	µg/g	1	0	15000
		Lead	µg/g	1	0	18.8
		Lithium	µg/g	1	0	7.74
		Magnesium	µg/g	1	0	7150
		Manganese	µg/g	1	0	964
		Mercury	µg/g	1	0	0.101
		Molybdenum	µg/g	1	0	0.56
		Nickel	µg/g	1	0	11.3
		Potassium	µg/g	1	0	520
		Selenium	µg/g	1	0	0.59
		Silver	µg/g	1	0	0.116
		Sodium	µg/g	1	1	95*
		Strontium	µg/g	1	0	13.2
		Thallium	µg/g	1	0	0.098
		Thorium	µg/g	1	0	0.66
		Tin	µg/g	1	0	0.58
		Titanium	µg/g	1	0	198
		Tungsten	µg/g	1	1	0.08*
		Uranium	µg/g	1	0	0.465
		Vanadium	µg/g	1	0	24.2
		Zinc	µg/g	1	0	162
		Zirconium	µg/g	1	0	0.55

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
	Radionuclides	Be-7	Bq/kg	1	1	7.14*
		C-14	Bq/kg-C	1	0	200
		Co-60	Bq/kg	1	1	-0.0793*
		Cs-134	Bq/kg	1	1	-0.0007*
		Cs-137	Bq/kg	1	0	12.3
		H-3	Bq/kg	1	0	87.4
		I-131	Bq/kg	1	1	-2.06*
		K-40	Bq/kg	1	0	361
		Th-Series	Bq/kg	1	0	14.5
		U-Series	Bq/kg	1	0	24.2
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	23.1
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	13.7
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.758*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	4.26*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	1.22*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	1.68*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0.367*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.465*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.67*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	2.35*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.87*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	0	1.22
		Octa CDD	pg/g	1	0	97.5
		Octa CDF	pg/g	1	0	24
		Total Hepta CDD	pg/g	1	0	42.9
		Total Hepta CDF	pg/g	1	0	23.4
		Total Hexa CDD	pg/g	1	0	15.9
		Total Hexa CDF	pg/g	1	0	15.9
		Total Penta CDD	pg/g	1	0	7.07
		Total Penta CDF	pg/g	1	0	11.5
		Total Tetra CDD	pg/g	1	0	4.07
		Total Tetra CDF	pg/g	1	0	9.25
A3-2	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.1
		Conductivity	umho/cm	1	0	289
		Moisture Content	%	2	0	31.265
		Sodium Adsorption Ratio	N/A	1	0	0.18
		Total Organic Carbon	mg/kg	1	0	65000
	Nutrients	Total Phosphorous	µg/g	1	0	558
	Metals	Aluminum	µg/g	1	0	12500
		Antimony	µg/g	1	0	0.28
		Arsenic	µg/g	1	0	5.7

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Barium	µg/g	1	0	65.3
		Beryllium	µg/g	1	0	0.52
		Bismuth	µg/g	1	0	0.19
		Boron	µg/g	1	0	10.3
		Boron (hot water)	µg/g	1	0	0.56
		Cadmium	µg/g	1	0	1.04
		Calcium	µg/g	1	0	17300
		Cesium	µg/g	1	1	0.8*
		Chromium	µg/g	1	0	17.7
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	6.76
		Copper	µg/g	1	0	13.3
		Iron	µg/g	1	0	18700
		Lead	µg/g	1	0	23.2
		Lithium	µg/g	1	0	10.4
		Magnesium	µg/g	1	0	8240
		Manganese	µg/g	1	0	1500
		Mercury	µg/g	1	0	0.162
		Molybdenum	µg/g	1	0	0.67
		Nickel	µg/g	1	0	13.4
		Potassium	µg/g	1	0	753
		Selenium	µg/g	1	0	0.84
		Silver	µg/g	1	0	0.107
		Sodium	µg/g	1	1	83*
		Strontium	µg/g	1	0	16.5
		Thallium	µg/g	1	0	0.134
		Thorium	µg/g	1	0	0.92
		Tin	µg/g	1	0	0.81
		Titanium	µg/g	1	0	294
		Tungsten	µg/g	1	1	0.12*
		Uranium	µg/g	1	0	0.643
		Vanadium	µg/g	1	0	33
		Zinc	µg/g	1	0	166
		Zirconium	µg/g	1	0	0.73
	Radionuclides	Be-7	Bq/kg	1	1	-1.82*
		C-14	Bq/kg-C	1	0	186
		Co-60	Bq/kg	1	1	-0.191*
		Cs-134	Bq/kg	1	1	0.742*
		Cs-137	Bq/kg	1	0	11.7
		H-3	Bq/kg	1	0	83.5
		I-131	Bq/kg	1	1	1.56*
		K-40	Bq/kg	1	0	318
		Th-Series	Bq/kg	1	0	15.3

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		U-Series	Bq/kg	1	0	25.7
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	16.8
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	11.2
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.575*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	3.18*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	1.14*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	1.5*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	1.34*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.416*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	1.84*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.66*
		2,3,7,8-Tetra CDD	pg/g	1	1	0.239*
		2,3,7,8-Tetra CDF	pg/g	1	1	0*
		Octa CDD	pg/g	1	0	77.3
		Octa CDF	pg/g	1	0	18.4
		Total Hepta CDD	pg/g	1	0	31.9
		Total Hepta CDF	pg/g	1	0	19.3
		Total Hexa CDD	pg/g	1	0	15.2
		Total Hexa CDF	pg/g	1	0	14
		Total Penta CDD	pg/g	1	0	6.1
		Total Penta CDF	pg/g	1	0	9.31
		Total Tetra CDD	pg/g	1	0	3.48
		Total Tetra CDF	pg/g	1	0	8.46
A5-1	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	6.9
		Conductivity	umho/cm	1	0	145
		Moisture Content	%	2	0	29.47
		Sodium Adsorption Ratio	N/A	1	0	0.25
		Total Organic Carbon	mg/kg	1	0	39000
	Nutrients	Total Phosphorous	µg/g	1	0	385
	Metals	Aluminum	µg/g	1	0	11400
		Antimony	µg/g	1	1	0.09*
		Arsenic	µg/g	1	0	2.13
		Barium	µg/g	1	0	34.2
		Beryllium	µg/g	1	0	0.35
		Bismuth	µg/g	1	0	0.13
		Boron	µg/g	1	0	5.1
		Boron (hot water)	µg/g	1	0	0.21
		Cadmium	µg/g	1	0	0.258
		Calcium	µg/g	1	0	5160
		Cesium	µg/g	1	0	1.1
		Chromium	µg/g	1	0	15.9

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	6.26
		Copper	µg/g	1	0	5.23
		Iron	µg/g	1	0	15300
		Lead	µg/g	1	0	15.4
		Lithium	µg/g	1	0	10.4
		Magnesium	µg/g	1	0	3660
		Manganese	µg/g	1	0	297
		Mercury	µg/g	1	0	0.115
		Molybdenum	µg/g	1	0	0.28
		Nickel	µg/g	1	0	9.82
		Potassium	µg/g	1	0	479
		Selenium	µg/g	1	1	0.4*
		Silver	µg/g	1	1	0.038*
		Sodium	µg/g	1	0	143
		Strontium	µg/g	1	0	14.4
		Thallium	µg/g	1	0	0.114
		Thorium	µg/g	1	0	0.82
		Tin	µg/g	1	0	0.56
		Titanium	µg/g	1	0	249
		Tungsten	µg/g	1	1	0.09*
		Uranium	µg/g	1	0	0.409
		Vanadium	µg/g	1	0	24.4
		Zinc	µg/g	1	0	63.8
		Zirconium	µg/g	1	1	0.32*
	Radionuclides	Be-7	Bq/kg	1	1	-1.36*
		C-14	Bq/kg-C	1	0	155
		Co-60	Bq/kg	1	1	-0.0868*
		Cs-134	Bq/kg	1	1	-0.306*
		Cs-137	Bq/kg	1	0	4.26
		H-3	Bq/kg	1	0	62.5
		I-131	Bq/kg	1	1	-0.0624*
		K-40	Bq/kg	1	0	372
		Th-Series	Bq/kg	1	0	6.06
		U-Series	Bq/kg	1	0	13.6
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	12
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	2.68*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.248*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0.515*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.416*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0.267*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.446*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		1,2,3,7,8-Penta CDD	pg/g	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.154*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.263*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.132*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.29*
		Octa CDD	pg/g	1	0	75.5
		Octa CDF	pg/g	1	1	7.76*
		Total Hepta CDD	pg/g	1	0	20.5
		Total Hepta CDF	pg/g	1	0	6.12
		Total Hexa CDD	pg/g	1	1	4.18*
		Total Hexa CDF	pg/g	1	1	3*
		Total Penta CDD	pg/g	1	1	0.161*
		Total Penta CDF	pg/g	1	1	0.465*
		Total Tetra CDD	pg/g	1	1	0.222*
		Total Tetra CDF	pg/g	1	0	1.27
A5-2	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.43
		Conductivity	umho/cm	1	0	419
		Moisture Content	%	2	0	42.605
		Sodium Adsorption Ratio	N/A	1	0	0.14
		Total Organic Carbon	mg/kg	1	0	140000
	Nutrients	Total Phosphorous	µg/g	1	0	655
	Metals	Aluminum	µg/g	1	0	4440
		Antimony	µg/g	1	0	0.23
		Arsenic	µg/g	1	0	2.78
		Barium	µg/g	1	0	42.4
		Beryllium	µg/g	1	0	0.21
		Bismuth	µg/g	1	0	0.16
		Boron	µg/g	1	0	12.6
		Boron (hot water)	µg/g	1	0	0.24
		Cadmium	µg/g	1	0	0.852
		Calcium	µg/g	1	0	98100
		Cesium	µg/g	1	1	0.2*
		Chromium	µg/g	1	0	6.22
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	2.58
		Copper	µg/g	1	0	9.18
		Iron	µg/g	1	0	5860
		Lead	µg/g	1	0	28.8
		Lithium	µg/g	1	0	2.9
		Magnesium	µg/g	1	0	52300
		Manganese	µg/g	1	0	415
		Mercury	µg/g	1	0	0.146

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Molybdenum	µg/g	1	0	0.39
		Nickel	µg/g	1	0	6.83
		Potassium	µg/g	1	0	402
		Selenium	µg/g	1	0	0.61
		Silver	µg/g	1	0	0.076
		Sodium	µg/g	1	0	121
		Strontium	µg/g	1	0	84.6
		Thallium	µg/g	1	0	0.072
		Thorium	µg/g	1	0	0.37
		Tin	µg/g	1	0	0.73
		Titanium	µg/g	1	0	66.8
		Tungsten	µg/g	1	1	0.14*
		Uranium	µg/g	1	0	0.771
		Vanadium	µg/g	1	0	16.6
		Zinc	µg/g	1	0	65.7
		Zirconium	µg/g	1	0	0.94
	Radionuclides	Be-7	Bq/kg	1	1	0.0669*
		C-14	Bq/kg-C	1	0	79
		Co-60	Bq/kg	1	1	-0.146*
		Cs-134	Bq/kg	1	1	-0.0723*
		Cs-137	Bq/kg	1	0	14.4
		H-3	Bq/kg	1	0	92.2
		I-131	Bq/kg	1	1	0.0603*
		K-40	Bq/kg	1	0	77.1
		Th-Series	Bq/kg	1	0	4.05
		U-Series	Bq/kg	1	0	11.2
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	35.5
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	10.7
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.751*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	2.35*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	1.35*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	1.2*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	1.51*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0.114*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.497*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.612*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	1.81*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.777*
		2,3,7,8-Tetra CDD	pg/g	1	1	0.26*
		2,3,7,8-Tetra CDF	pg/g	1	0	1.33
		Octa CDD	pg/g	1	0	212
		Octa CDF	pg/g	1	0	25.5
		Total Hepta CDD	pg/g	1	0	58.1

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Total Hepta CDF	pg/g	1	0	24.7
		Total Hexa CDD	pg/g	1	0	14
		Total Hexa CDF	pg/g	1	0	12.7
		Total Penta CDD	pg/g	1	0	5.75
		Total Penta CDF	pg/g	1	0	11.1
		Total Tetra CDD	pg/g	1	0	3.42
		Total Tetra CDF	pg/g	1	0	9.88
MSA-1	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.47
		Conductivity	umho/cm	1	0	192
		Moisture Content	%	2	0	14.41
		Sodium Adsorption Ratio	N/A	1	0	0.23
		Total Organic Carbon	mg/kg	1	0	19000
	Nutrients	Total Phosphorous	µg/g	1	0	576
	Metals	Aluminum	µg/g	1	0	9180
		Antimony	µg/g	1	0	0.13
		Arsenic	µg/g	1	0	2.95
		Barium	µg/g	1	0	42.5
		Beryllium	µg/g	1	0	0.38
		Bismuth	µg/g	1	0	0.1
		Boron	µg/g	1	0	8.6
		Boron (hot water)	µg/g	1	0	0.23
		Cadmium	µg/g	1	0	0.155
		Calcium	µg/g	1	0	104000
		Cesium	µg/g	1	1	0.4*
		Chromium	µg/g	1	0	17.5
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	6.03
		Copper	µg/g	1	0	14.4
		Iron	µg/g	1	0	15300
		Lead	µg/g	1	0	10.1
		Lithium	µg/g	1	0	11.7
		Magnesium	µg/g	1	0	33900
		Manganese	µg/g	1	0	502
		Mercury	µg/g	1	1	0.036*
		Molybdenum	µg/g	1	0	0.34
		Nickel	µg/g	1	0	13.8
		Potassium	µg/g	1	0	1300
		Selenium	µg/g	1	1	0.18*
		Silver	µg/g	1	1	0.034*
		Sodium	µg/g	1	0	136
		Strontium	µg/g	1	0	111
		Thallium	µg/g	1	0	0.072
		Thorium	µg/g	1	0	2.53

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Tin	µg/g	1	0	0.5
		Titanium	µg/g	1	0	211
		Tungsten	µg/g	1	1	0.07*
		Uranium	µg/g	1	0	0.637
		Vanadium	µg/g	1	0	22.2
		Zinc	µg/g	1	0	39.8
		Zirconium	µg/g	1	0	1.98
	Radionuclides	Be-7	Bq/kg	1	1	-0.418*
		C-14	Bq/kg-C	1	0	75
		Co-60	Bq/kg	1	1	0.0824*
		Cs-134	Bq/kg	1	1	0.0206*
		Cs-137	Bq/kg	1	0	1.49
		H-3	Bq/kg	1	0	31.6
		I-131	Bq/kg	1	1	0.232*
		K-40	Bq/kg	1	0	427
		Th-Series	Bq/kg	1	0	13.3
		U-Series	Bq/kg	1	0	15.3
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	7.98
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	2.61*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.194*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0.769*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.665*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.521*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0.191*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.167*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.514*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.259*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.312*
		Octa CDD	pg/g	1	0	43.8
		Octa CDF	pg/g	1	1	8.32*
		Total Hepta CDD	pg/g	1	0	14.1
		Total Hepta CDF	pg/g	1	0	5.87
		Total Hexa CDD	pg/g	1	0	5.52
		Total Hexa CDF	pg/g	1	0	6.94
		Total Penta CDD	pg/g	1	1	0.707*
		Total Penta CDF	pg/g	1	0	9.76
		Total Tetra CDD	pg/g	1	1	0*
		Total Tetra CDF	pg/g	1	0	4.48
RD-1	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.59
		Conductivity	umho/cm	1	0	152

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Moisture Content	%	2	0	13.005
		Sodium Adsorption Ratio	N/A	1	0	0.26
		Total Organic Carbon	mg/kg	1	0	28000
	Nutrients	Total Phosphorous	µg/g	1	0	449
	Metals	Aluminum	µg/g	1	0	4250
		Antimony	µg/g	1	0	0.11
		Arsenic	µg/g	1	0	2.16
		Barium	µg/g	1	0	19.8
		Beryllium	µg/g	1	0	0.2
		Bismuth	µg/g	1	1	0.06*
		Boron	µg/g	1	0	8.4
		Boron (hot water)	µg/g	1	0	0.14
		Cadmium	µg/g	1	0	0.116
		Calcium	µg/g	1	0	140000
		Cesium	µg/g	1	1	0.3*
		Chromium	µg/g	1	0	9.16
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	3.5
		Copper	µg/g	1	0	11.7
		Iron	µg/g	1	0	9990
		Lead	µg/g	1	0	5.21
		Lithium	µg/g	1	0	5.82
		Magnesium	µg/g	1	0	44100
		Manganese	µg/g	1	0	432
		Mercury	µg/g	1	1	0.018*
		Molybdenum	µg/g	1	0	0.2
		Nickel	µg/g	1	0	8.23
		Potassium	µg/g	1	0	762
		Selenium	µg/g	1	1	0.07*
		Silver	µg/g	1	1	0.022*
		Sodium	µg/g	1	0	143
		Strontium	µg/g	1	0	130
		Thallium	µg/g	1	1	0.042*
		Thorium	µg/g	1	0	2.08
		Tin	µg/g	1	0	0.29
		Titanium	µg/g	1	0	172
		Tungsten	µg/g	1	1	0.04*
		Uranium	µg/g	1	0	0.461
		Vanadium	µg/g	1	0	13.4
		Zinc	µg/g	1	0	31.1
		Zirconium	µg/g	1	0	1.95
	Radionuclides	Be-7	Bq/kg	1	1	0.443*
		C-14	Bq/kg-C	1	0	111

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Co-60	Bq/kg	1	1	0.0124*
		Cs-134	Bq/kg	1	1	-0.0146*
		Cs-137	Bq/kg	1	0	2.88
		H-3	Bq/kg	1	0	44.2
		I-131	Bq/kg	1	1	0.254*
		K-40	Bq/kg	1	0	308
		Th-Series	Bq/kg	1	0	8.07
		U-Series	Bq/kg	1	0	10.4
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	25.3
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	0	11.3
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	2.04*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	1.05*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0.821*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.763*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	1.31*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.324*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.341*
		Octa CDD	pg/g	1	0	121
		Octa CDF	pg/g	1	0	37.7
		Total Hepta CDD	pg/g	1	0	39.7
		Total Hepta CDF	pg/g	1	0	26.7
		Total Hexa CDD	pg/g	1	0	5.58
		Total Hexa CDF	pg/g	1	0	9.76
		Total Penta CDD	pg/g	1	1	1.19*
		Total Penta CDF	pg/g	1	1	3.1*
		Total Tetra CDD	pg/g	1	1	0.236*
		Total Tetra CDF	pg/g	1	1	0.544*
RD-2	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.63
		Conductivity	umho/cm	1	0	156
		Moisture Content	%	2	0	13.02
		Sodium Adsorption Ratio	N/A	1	0	0.25
		Total Organic Carbon	mg/kg	1	0	20000
	Nutrients	Total Phosphorous	µg/g	1	0	648
	Metals	Aluminum	µg/g	1	0	5690
		Antimony	µg/g	1	1	0.09*
		Arsenic	µg/g	1	0	2.78
		Barium	µg/g	1	0	27
		Beryllium	µg/g	1	0	0.27

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Bismuth	µg/g	1	1	0.08*
		Boron	µg/g	1	0	10.2
		Boron (hot water)	µg/g	1	0	0.12
		Cadmium	µg/g	1	0	0.083
		Calcium	µg/g	1	0	147000
		Cesium	µg/g	1	1	0.4*
		Chromium	µg/g	1	0	12.6
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	5.04
		Copper	µg/g	1	0	15.9
		Iron	µg/g	1	0	13800
		Lead	µg/g	1	0	5.47
		Lithium	µg/g	1	0	9.23
		Magnesium	µg/g	1	0	45700
		Manganese	µg/g	1	0	523
		Mercury	µg/g	1	1	0.016*
		Molybdenum	µg/g	1	0	0.28
		Nickel	µg/g	1	0	11.9
		Potassium	µg/g	1	0	1080
		Selenium	µg/g	1	1	0.15*
		Silver	µg/g	1	1	0.029*
		Sodium	µg/g	1	0	178
		Strontium	µg/g	1	0	154
		Thallium	µg/g	1	0	0.056
		Thorium	µg/g	1	0	2.82
		Tin	µg/g	1	0	0.3
		Titanium	µg/g	1	0	205
		Tungsten	µg/g	1	1	0.05*
		Uranium	µg/g	1	0	0.564
		Vanadium	µg/g	1	0	17.1
		Zinc	µg/g	1	0	28.3
		Zirconium	µg/g	1	0	2.79
	Radionuclides	Be-7	Bq/kg	1	1	-1.32*
		C-14	Bq/kg-C	1	0	33
		Co-60	Bq/kg	1	1	0.0402*
		Cs-134	Bq/kg	1	1	-0.236*
		Cs-137	Bq/kg	1	0	0.502
		H-3	Bq/kg	1	0	21
		I-131	Bq/kg	1	1	0.0959*
		K-40	Bq/kg	1	0	377
		Th-Series	Bq/kg	1	0	12.3
		U-Series	Bq/kg	1	0	12.4
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	1	2.31*

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	1.19*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0*
		Octa CDD	pg/g	1	0	11.3
		Octa CDF	pg/g	1	1	3.09*
		Total Hepta CDD	pg/g	1	1	4.38*
		Total Hepta CDF	pg/g	1	1	2.62*
		Total Hexa CDD	pg/g	1	1	0.811*
		Total Hexa CDF	pg/g	1	1	0.555*
		Total Penta CDD	pg/g	1	1	0*
		Total Penta CDF	pg/g	1	1	0.289*
		Total Tetra CDD	pg/g	1	1	0.456*
		Total Tetra CDF	pg/g	1	1	0*
RWOS1-1	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.27
		Conductivity	umho/cm	1	0	291
		Moisture Content	%	2	0	30.41
		Sodium Adsorption Ratio	N/A	1	0	0.17
		Total Organic Carbon	mg/kg	1	0	58000
	Nutrients	Total Phosphorous	µg/g	1	0	551
	Metals	Aluminum	µg/g	1	0	11700
		Antimony	µg/g	1	0	0.12
		Arsenic	µg/g	1	0	4.3
		Barium	µg/g	1	0	48.5
		Beryllium	µg/g	1	0	0.43
		Bismuth	µg/g	1	0	0.15
		Boron	µg/g	1	0	10.8
		Boron (hot water)	µg/g	1	0	0.48
		Cadmium	µg/g	1	0	0.628
		Calcium	µg/g	1	0	41000
		Cesium	µg/g	1	1	0.6*
		Chromium	µg/g	1	0	16.2
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	5.57

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Copper	µg/g	1	0	10.8
		Iron	µg/g	1	0	17400
		Lead	µg/g	1	0	15.8
		Lithium	µg/g	1	0	10
		Magnesium	µg/g	1	0	21600
		Manganese	µg/g	1	0	1010
		Mercury	µg/g	1	0	0.11
		Molybdenum	µg/g	1	0	0.52
		Nickel	µg/g	1	0	12
		Potassium	µg/g	1	0	742
		Selenium	µg/g	1	0	0.55
		Silver	µg/g	1	0	0.084
		Sodium	µg/g	1	1	96*
		Strontium	µg/g	1	0	26.5
		Thallium	µg/g	1	0	0.099
		Thorium	µg/g	1	0	0.79
		Tin	µg/g	1	0	0.53
		Titanium	µg/g	1	0	208
		Tungsten	µg/g	1	1	0.19*
		Uranium	µg/g	1	0	0.598
		Vanadium	µg/g	1	0	30.6
		Zinc	µg/g	1	0	92.3
		Zirconium	µg/g	1	0	0.77
	Radionuclides	C-14	Bq/kg-C	1	0	202
		H-3	Bq/kg	1	0	73.1
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	6.88
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	2.71*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.217*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0.969*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.447*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0.412*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.642*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.242*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.27*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.54*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.274*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.434*
		Octa CDD	pg/g	1	0	34.8
		Octa CDF	pg/g	1	1	4.03*
		Total Hepta CDD	pg/g	1	0	12.5
		Total Hepta CDF	pg/g	1	1	4.9*

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Total Hexa CDD	pg/g	1	0	5.73
		Total Hexa CDF	pg/g	1	1	4.21*
		Total Penta CDD	pg/g	1	1	2.18*
		Total Penta CDF	pg/g	1	1	3.58*
		Total Tetra CDD	pg/g	1	0	1.29
		Total Tetra CDF	pg/g	1	0	3.43
RWOS1-2	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.33
		Conductivity	umho/cm	1	0	233
		Moisture Content	%	2	0	23.045
		Sodium Adsorption Ratio	N/A	1	0	0.2
		Total Organic Carbon	mg/kg	1	0	62000
	Nutrients	Total Phosphorous	µg/g	1	0	631
	Metals	Aluminum	µg/g	1	0	9800
		Antimony	µg/g	1	0	0.21
		Arsenic	µg/g	1	0	4.2
		Barium	µg/g	1	0	51.3
		Beryllium	µg/g	1	0	0.41
		Bismuth	µg/g	1	0	0.14
		Boron	µg/g	1	0	11
		Boron (hot water)	µg/g	1	0	0.64
		Cadmium	µg/g	1	0	0.851
		Calcium	µg/g	1	0	74900
		Cesium	µg/g	1	1	0.5*
		Chromium	µg/g	1	0	14.4
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	5.11
		Copper	µg/g	1	0	10.4
		Iron	µg/g	1	0	14900
		Lead	µg/g	1	0	16.2
		Lithium	µg/g	1	0	8.85
		Magnesium	µg/g	1	0	40900
		Manganese	µg/g	1	0	1310
		Mercury	µg/g	1	0	0.119
		Molybdenum	µg/g	1	0	0.54
		Nickel	µg/g	1	0	11.1
		Potassium	µg/g	1	0	893
		Selenium	µg/g	1	0	0.54
		Silver	µg/g	1	0	0.077
		Sodium	µg/g	1	0	109
		Strontium	µg/g	1	0	34.7
		Thallium	µg/g	1	0	0.138
		Thorium	µg/g	1	0	0.83
		Tin	µg/g	1	0	0.64

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Titanium	µg/g	1	0	195
		Tungsten	µg/g	1	1	0.07*
		Uranium	µg/g	1	0	0.764
		Vanadium	µg/g	1	0	27.1
		Zinc	µg/g	1	0	93.9
		Zirconium	µg/g	1	0	0.83
	Radionuclides	C-14	Bq/kg-C	1	0	92
		H-3	Bq/kg	1	0	32
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	9.26
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	3.12*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.283*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0.856*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.488*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0.36*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.652*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.22*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.26*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.412*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.255*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.452*
		Octa CDD	pg/g	1	0	51
		Octa CDF	pg/g	1	1	4.89*
		Total Hepta CDD	pg/g	1	0	16.1
		Total Hepta CDF	pg/g	1	0	6.47
		Total Hexa CDD	pg/g	1	0	6.61
		Total Hexa CDF	pg/g	1	1	4.44*
		Total Penta CDD	pg/g	1	1	1.88*
		Total Penta CDF	pg/g	1	1	3.68*
		Total Tetra CDD	pg/g	1	0	1.2
		Total Tetra CDF	pg/g	1	0	2.8
RWOS1-3	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.38
		Conductivity	umho/cm	1	0	172
		Moisture Content	%	2	0	14.11
		Sodium Adsorption Ratio	N/A	1	0	0.23
		Total Organic Carbon	mg/kg	1	0	44000
	Nutrients	Total Phosphorous	µg/g	1	0	460
	Metals	Aluminum	µg/g	1	0	7370
		Antimony	µg/g	1	0	0.1
		Arsenic	µg/g	1	0	3.94
		Barium	µg/g	1	0	28.2
		Beryllium	µg/g	1	0	0.3

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Bismuth	µg/g	1	1	0.09*
		Boron	µg/g	1	0	9.1
		Boron (hot water)	µg/g	1	0	0.28
		Cadmium	µg/g	1	0	0.33
		Calcium	µg/g	1	0	95700
		Cesium	µg/g	1	1	0.4*
		Chromium	µg/g	1	0	13.2
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	4.64
		Copper	µg/g	1	0	10.8
		Iron	µg/g	1	0	13100
		Lead	µg/g	1	0	7.94
		Lithium	µg/g	1	0	8.08
		Magnesium	µg/g	1	0	41100
		Manganese	µg/g	1	0	751
		Mercury	µg/g	1	0	0.065
		Molybdenum	µg/g	1	0	0.39
		Nickel	µg/g	1	0	10.3
		Potassium	µg/g	1	0	863
		Selenium	µg/g	1	1	0.29*
		Silver	µg/g	1	1	0.046*
		Sodium	µg/g	1	0	123
		Strontium	µg/g	1	0	58.6
		Thallium	µg/g	1	0	0.105
		Thorium	µg/g	1	0	1.06
		Tin	µg/g	1	0	0.32
		Titanium	µg/g	1	0	189
		Tungsten	µg/g	1	1	0.05*
		Uranium	µg/g	1	0	0.543
		Vanadium	µg/g	1	0	19.2
		Zinc	µg/g	1	0	45.6
		Zirconium	µg/g	1	0	0.7
	Radionuclides	C-14	Bq/kg-C	1	0	56
		H-3	Bq/kg	1	1	11.8*
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	15.9
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	2.38*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0.318*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0.415*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.516*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.647*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.194*

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		1,2,3,7,8-Penta CDF	pg/g	1	1	0*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.215*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.151*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.217*
		Octa CDD	pg/g	1	0	125
		Octa CDF	pg/g	1	1	8.57*
		Total Hepta CDD	pg/g	1	0	24.5
		Total Hepta CDF	pg/g	1	1	2.88*
		Total Hexa CDD	pg/g	1	1	4.41*
		Total Hexa CDF	pg/g	1	1	2.49*
		Total Penta CDD	pg/g	1	1	0.41*
		Total Penta CDF	pg/g	1	1	1.52*
		Total Tetra CDD	pg/g	1	1	0.394*
		Total Tetra CDF	pg/g	1	0	1.45
RWOS1-4	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.22
		Conductivity	umho/cm	1	0	178
		Moisture Content	%	2	0	13.39
		Sodium Adsorption Ratio	N/A	1	0	0.23
		Total Organic Carbon	mg/kg	1	0	40000
	Nutrients	Total Phosphorous	µg/g	1	0	379
	Metals	Aluminum	µg/g	1	0	4390
		Antimony	µg/g	1	0	0.11
		Arsenic	µg/g	1	0	2.5
		Barium	µg/g	1	0	18.4
		Beryllium	µg/g	1	1	0.18*
		Bismuth	µg/g	1	1	0.07*
		Boron	µg/g	1	0	7.5
		Boron (hot water)	µg/g	1	0	0.35
		Cadmium	µg/g	1	0	0.239
		Calcium	µg/g	1	0	107000
		Cesium	µg/g	1	1	0.3*
		Chromium	µg/g	1	0	9.36
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	3.41
		Copper	µg/g	1	0	10.4
		Iron	µg/g	1	0	9040
		Lead	µg/g	1	0	8.31
		Lithium	µg/g	1	0	5.42
		Magnesium	µg/g	1	0	37500
		Manganese	µg/g	1	0	482
		Mercury	µg/g	1	1	0.04*
		Molybdenum	µg/g	1	0	0.29

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021 Total Count	Spring 2021 Count (<RDL and uncensored)	Spring 2021 Value
		Nickel	µg/g	1	0	8.79
		Potassium	µg/g	1	0	634
		Selenium	µg/g	1	1	0.22*
		Silver	µg/g	1	1	0.037*
		Sodium	µg/g	1	0	123
		Strontium	µg/g	1	0	83.8
		Thallium	µg/g	1	0	0.085
		Thorium	µg/g	1	0	1.05
		Tin	µg/g	1	0	0.33
		Titanium	µg/g	1	0	204
		Tungsten	µg/g	1	1	0.06*
		Uranium	µg/g	1	0	0.484
		Vanadium	µg/g	1	0	16.7
		Zinc	µg/g	1	0	56.4
		Zirconium	µg/g	1	0	0.72
	Radionuclides	C-14	Bq/kg-C	1	0	73
		H-3	Bq/kg	1	0	20.9
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	1	3.87*
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	1.01*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.217*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0.181*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.26*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.17*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.222*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.149*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.218*
		Octa CDD	pg/g	1	0	31
		Octa CDF	pg/g	1	1	2.67*
		Total Hepta CDD	pg/g	1	0	7.56
		Total Hepta CDF	pg/g	1	1	2.2*
		Total Hexa CDD	pg/g	1	1	1.71*
		Total Hexa CDF	pg/g	1	1	1.26*
		Total Penta CDD	pg/g	1	1	0.356*
		Total Penta CDF	pg/g	1	1	1.38*
		Total Tetra CDD	pg/g	1	1	0.585*
		Total Tetra CDF	pg/g	1	0	1.51
SWALE	Physical and Conventional Characteristics	Available (CaCl2) pH	pH	1	0	7.29
		Conductivity	umho/cm	1	0	316

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Moisture Content	%	2	0	31.135
		Sodium Adsorption Ratio	N/A	1	0	0.17
		Total Organic Carbon	mg/kg	1	0	79000
	Nutrients	Total Phosphorous	µg/g	1	0	657
	Metals	Aluminum	µg/g	1	0	7100
		Antimony	µg/g	1	0	0.1
		Arsenic	µg/g	1	0	3.25
		Barium	µg/g	1	0	33
		Beryllium	µg/g	1	0	0.31
		Bismuth	µg/g	1	0	0.1
		Boron	µg/g	1	0	10.8
		Boron (hot water)	µg/g	1	0	0.4
		Cadmium	µg/g	1	0	0.291
		Calcium	µg/g	1	0	66400
		Cesium	µg/g	1	1	0.3*
		Chromium	µg/g	1	0	12.2
		Chromium (VI)	µg/g	1	1	0*
		Cobalt	µg/g	1	0	4.94
		Copper	µg/g	1	0	12.8
		Iron	µg/g	1	0	12700
		Lead	µg/g	1	0	10.9
		Lithium	µg/g	1	0	8.56
		Magnesium	µg/g	1	0	27700
		Manganese	µg/g	1	0	516
		Mercury	µg/g	1	0	0.054
		Molybdenum	µg/g	1	0	0.28
		Nickel	µg/g	1	0	10.4
		Potassium	µg/g	1	0	853
		Selenium	µg/g	1	1	0.39*
		Silver	µg/g	1	0	0.057
		Sodium	µg/g	1	0	113
		Strontium	µg/g	1	0	90.9
		Thallium	µg/g	1	0	0.067
		Thorium	µg/g	1	0	0.65
		Tin	µg/g	1	0	0.41
		Titanium	µg/g	1	0	150
		Tungsten	µg/g	1	1	0.09*
		Uranium	µg/g	1	0	0.471
		Vanadium	µg/g	1	0	17.9
		Zinc	µg/g	1	0	49.7
		Zirconium	µg/g	1	0	1.09
	Radionuclides	Be-7	Bq/kg	1	1	0.622*
		C-14	Bq/kg-C	1	0	141

Monitoring Results by Location: Soil

Location	Category	Parameter	Units	Spring 2021		
				Total Count	Count (<RDL and uncensored)	Value
		Co-60	Bq/kg	1	1	-0.139*
		Cs-134	Bq/kg	1	1	0.517*
		Cs-137	Bq/kg	1	0	4.47
		H-3	Bq/kg	1	0	84.4
		I-131	Bq/kg	1	1	-0.376*
		K-40	Bq/kg	1	0	315
		Th-Series	Bq/kg	1	0	9.79
		U-Series	Bq/kg	1	0	15.4
	Dioxins and Furans	1,2,3,4,6,7,8-Hepta CDD	pg/g	1	0	15.1
		1,2,3,4,6,7,8-Hepta CDF	pg/g	1	1	3.68*
		1,2,3,4,7,8-Hexa CDD	pg/g	1	1	0*
		1,2,3,4,7,8-Hexa CDF	pg/g	1	1	0.95*
		1,2,3,6,7,8-Hexa CDD	pg/g	1	1	0.489*
		1,2,3,6,7,8-Hexa CDF	pg/g	1	1	0.478*
		1,2,3,7,8,9-Hexa CDD	pg/g	1	1	0.576*
		1,2,3,7,8,9-Hexa CDF	pg/g	1	1	0*
		1,2,3,7,8-Penta CDD	pg/g	1	1	0.193*
		1,2,3,7,8-Penta CDF	pg/g	1	1	0.293*
		2,3,4,6,7,8-Hexa CDF	pg/g	1	1	0.531*
		2,3,4,7,8-Penta CDF	pg/g	1	1	0.203*
		2,3,7,8-Tetra CDD	pg/g	1	1	0*
		2,3,7,8-Tetra CDF	pg/g	1	1	0.434*
		Octa CDD	pg/g	1	0	108
		Octa CDF	pg/g	1	1	8.53*
		Total Hepta CDD	pg/g	1	0	28.9
		Total Hepta CDF	pg/g	1	0	7.35
		Total Hexa CDD	pg/g	1	1	3.77*
		Total Hexa CDF	pg/g	1	1	4.75*
		Total Penta CDD	pg/g	1	1	1.15*
		Total Penta CDF	pg/g	1	1	1.81*
		Total Tetra CDD	pg/g	1	1	0.658*
		Total Tetra CDF	pg/g	1	0	3.42

Monitoring Results by Location: Terrestrial Vegetation

Location	Category	Parameter	Units	Grass (Fall 2020)						Eastern White Cedar (Fall 2020)					
				Total Count	Count (<RDL and uncensored)	Min	Max	Mean	St. Dev.	Total Count	Count (<RDL and uncensored)	Min	Max	Mean	St. Dev.
A1G / A1C	Physical and Conventional Characteristics	Moisture Content	%	5	0	66.46	72.61	68.714	2.4685	5	0	52.67	55.2	53.782	0.95594
	Radionuclides	Carbon-14	Bq/kg-C	5	0	382	1440	951.2	412.9	5	0	556	1740	867.4	499.18
A2G / A2C	Physical and Conventional Characteristics	Moisture Content	%	5	0	61.77	64.96	64.004	1.2951	5	0	55.22	56.28	56.022	0.4534
	Radionuclides	Carbon-14	Bq/kg-C	5	0	267	384	321	53.446	5	0	316	461	380.6	57.535
A3G / A3C	Physical and Conventional Characteristics	Moisture Content	%	5	0	62.4	68.23	65.616	2.3315	5	0	54.57	57.59	56.332	1.1014
	Radionuclides	Carbon-14	Bq/kg-C	5	0	430	1570	847	466.87	5	0	618	1910	1192	520.05
A5G / A5C	Physical and Conventional Characteristics	Moisture Content	%	5	0	62.35	66.57	64.062	1.6414	5	0	53.09	58.21	55.462	1.8277
	Radionuclides	Carbon-14	Bq/kg-C	5	0	192	315	257.8	48.68	5	0	277	329	302.2	21.879
RWOS1G / RWOS1C	Physical and Conventional Characteristics	Moisture Content	%	4	0	66.67	69.82	67.75	1.4402	4	0	56.89	58.73	58.028	0.79668
	Radionuclides	Carbon-14	Bq/kg-C	4	0	310	572	410	117.43	4	0	296	603	457.25	143.54

Monitoring Results by Location: Terrestrial Vegetation

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
NSS-W: Cedar							
A1C	Physical/Conventional Characteristics	A1-1C_04-Nov-2020	Moisture Content	%	1	0	53.9
		A1-2C_04-Nov-2020			1	0	53.96
		A1-3C_04-Nov-2020			1	0	53.18
		A1-4C_04-Nov-2020			1	0	52.67
		A1-5C_04-Nov-2020			1	0	55.2
	Radionuclides	A1-1C_04-Nov-2020	Carbon-14	Bq/kg-C	1	0	589
		A1-2C_04-Nov-2020			1	0	624
		A1-3C_04-Nov-2020			1	0	1740
		A1-4C_04-Nov-2020			1	0	828
		A1-5C_04-Nov-2020			1	0	556
A2C	Physical/Conventional Characteristics	A2-1C_05-Nov-2020	Moisture Content	%	1	0	56.23
		A2-2C_05-Nov-2020			1	0	56.28
		A2-3C_05-Nov-2020			1	0	55.22
		A2-4C_05-Nov-2020			1	0	56.27
		A2-5C_05-Nov-2020			1	0	56.11
	Radionuclides	A2-1C_05-Nov-2020	Carbon-14	Bq/kg-C	1	0	340
		A2-2C_05-Nov-2020			1	0	316
		A2-3C_05-Nov-2020			1	0	411
		A2-4C_05-Nov-2020			1	0	375
		A2-5C_05-Nov-2020			1	0	461
A3C	Physical/Conventional Characteristics	A3-1C_05-Nov-2020	Moisture Content	%	1	0	57.59
		A3-2C_05-Nov-2020			1	0	56.41
		A3-3C_05-Nov-2020			1	0	56.73
		A3-4C_05-Nov-2020			1	0	54.57
		A3-5C_05-Nov-2020			1	0	56.36
	Radionuclides	A3-1C_05-Nov-2020	Carbon-14	Bq/kg-C	1	0	1150
		A3-2C_05-Nov-2020			1	0	1480
		A3-3C_05-Nov-2020			1	0	1910
		A3-4C_05-Nov-2020			1	0	618
		A3-5C_05-Nov-2020			1	0	802
A25C	Physical/Conventional Characteristics	A5-1C_04-Nov-2020	Moisture Content	%	1	0	55.37
		A5-2C_04-Nov-2020			1	0	55.06
		A5-3C_04-Nov-2020			1	0	53.09
		A5-4C_04-Nov-2020			1	0	55.58
		A5-5C_04-Nov-2020			1	0	58.21
	Radionuclides	A5-1C_04-Nov-2020	Carbon-14	Bq/kg-C	1	0	329
		A5-2C_04-Nov-2020			1	0	292
		A5-3C_04-Nov-2020			1	0	292
		A5-4C_04-Nov-2020			1	0	321
		A5-5C_04-Nov-2020			1	0	277

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
NSS-W: Grass							
A1G	Physical/Conventional Characteristics	A1-1G_04-Nov-2020	Moisture Content	%	1	0	66.85
		A1-2G_04-Nov-2020			1	0	69.38
		A1-3G_04-Nov-2020			1	0	68.27
		A1-4G_04-Nov-2020			1	0	72.61
		A1-5G_04-Nov-2020			1	0	66.46
	Radionuclides	A1-1G_04-Nov-2020	Carbon-14	Bq/kg-C	1	0	382
		A1-2G_04-Nov-2020			1	0	956
		A1-3G_04-Nov-2020			1	0	1230
		A1-4G_04-Nov-2020			1	0	1440
		A1-5G_04-Nov-2020			1	0	748
A2G	Physical/Conventional Characteristics	A2-1G_05-Nov-2020	Moisture Content	%	1	0	64.13
		A2-2G_05-Nov-2020			1	0	64.83
		A2-3G_05-Nov-2020			1	0	61.77
		A2-4G_05-Nov-2020			1	0	64.96
		A2-5G_05-Nov-2020			1	0	64.33
	Radionuclides	A2-1G_05-Nov-2020	Carbon-14	Bq/kg-C	1	0	271
		A2-2G_05-Nov-2020			1	0	267
		A2-3G_05-Nov-2020			1	0	317
		A2-4G_05-Nov-2020			1	0	366
		A2-5G_05-Nov-2020			1	0	384
A3G	Physical/Conventional Characteristics	A3-1G_05-Nov-2020	Moisture Content	%	1	0	64.7
		A3-2G_05-Nov-2020			1	0	62.4
		A3-3G_05-Nov-2020			1	0	65.24
		A3-4G_05-Nov-2020			1	0	67.51
		A3-5G_05-Nov-2020			1	0	68.23
	Radionuclides	A3-1G_05-Nov-2020	Carbon-14	Bq/kg-C	1	0	640
		A3-2G_05-Nov-2020			1	0	1570
		A3-3G_05-Nov-2020			1	0	1050
		A3-4G_05-Nov-2020			1	0	545
		A3-5G_05-Nov-2020			1	0	430
A5G	Physical/Conventional Characteristics	A5-1G_04-Nov-2020	Moisture Content	%	1	0	66.57
		A5-2G_04-Nov-2020			1	0	64.27
		A5-3G_04-Nov-2020			1	0	62.85
		A5-4G_04-Nov-2020			1	0	64.27
		A5-5G_04-Nov-2020			1	0	62.35
	Radionuclides	A5-1G_04-Nov-2020	Carbon-14	Bq/kg-C	1	0	283
		A5-2G_04-Nov-2020			1	0	315
		A5-3G_04-Nov-2020			1	0	273
		A5-4G_04-Nov-2020			1	0	226
		A5-5G_04-Nov-2020			1	0	192

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
RWOS1: Cedar							
RWOS1C	Physical/Conventional Characteristics	RWOS1-1C_05-Nov-202	Moisture Content	%	1	0	58.14
		RWOS1-2C_05-Nov-202			1	0	56.89
		RWOS1-3C_05-Nov-202			1	0	58.73
		RWOS1-4C_05-Nov-202			1	0	58.35
	Radionuclides	RWOS1-1C_05-Nov-202	Carbon-14	Bq/kg-C	1	0	603
		RWOS1-2C_05-Nov-202			1	0	380
		RWOS1-3C_05-Nov-202			1	0	550
		RWOS1-4C_05-Nov-202			1	0	296
RWOS1: Grass							
RWOS1G	Physical/Conventional Characteristics	RWOS1-1G_05-Nov-202	Moisture Content	%	1	0	67.63
		RWOS1-2G_05-Nov-202			1	0	66.88
		RWOS1-3G_05-Nov-202			1	0	66.67
		RWOS1-4G_05-Nov-202			1	0	69.82
	Radionuclides	RWOS1-1G_05-Nov-202	Carbon-14	Bq/kg-C	1	0	572
		RWOS1-2G_05-Nov-202			1	0	419
		RWOS1-3G_05-Nov-202			1	0	310
		RWOS1-4G_05-Nov-202			1	0	339

Monitoring Results by Location: Aquatic Vegetation

Location	Category	Parameter	Units	Cattail (Fall 2020)					
				Total Count	Count (<RDL and uncensored)	Min	Max	Mean	St. Dev.
SRD-1	Radionuclides	Carbon-14	Bq/kg-C	3	0	407	617	519	105.7
	Metals	Aluminum	ppm	3	0	80.2	351	183.07	146.66
		Antimony	ppm	3	3	0.008258*	0.016687*	0.01342*	0.0045226
		Arsenic	ppm	3	3	0.0094144*	0.036526*	0.019309*	0.014966
		Barium	ppm	3	0	5.77	7.07	6.6033	0.72342
		Beryllium	ppm	3	3	0.0037792*	0.013499*	0.0077597*	0.0050933
		Bismuth	ppm	3	3	0.0012451*	0.0019078*	0.0015694*	0.00033157
		Boron	ppm	3	0	1.64	6.37	3.2933	2.667
		Cadmium	ppm	3	3	-0.017228*	-0.0010946*	-0.0099931*	0.0081943
		Calcium	ppm	3	0	1500	5050	3080	1806.85
		Cesium	ppm	3	3	0.0049374*	0.011546*	0.0072432*	0.0037291
		Chromium	ppm	3	0	0.054837	0.15914	0.12387	0.059787
		Cobalt	ppm	3	0	0.0642	0.103	0.084367	0.019445
		Copper	ppm	3	0	0.974	1.99	1.3447	0.56093
		Iron	ppm	3	0	568	3670	2062.67	1554.07
		Lead	ppm	3	0	0.12	0.174	0.14167	0.028537
		Lithium	ppm	3	0	0.173	0.297	0.22867	0.062963
		Magnesium	ppm	3	0	773	3290	1649	1422.23
		Manganese	ppm	3	0	7.69	54.3	25.963	24.881
		Mercury	ppm	3	3	0.0026589*	0.014574*	0.0078095*	0.0061195
		Molybdenum	ppm	3	1	0.048*	0.138	0.098333*	0.045938
		Nickel	ppm	3	0	0.206	0.277	0.24333	0.035642
		Phosphorus	ppm	3	0	176	658	364	257.89
		Potassium	ppm	3	0	1180	3540	1983.33	1348.35
		Selenium	ppm	3	3	-0.022041*	0.035617*	0.013023*	0.030785
		Silicon	ppm	3	0	292	1520	857.33	619.76
		Silver	ppm	3	3	0.011763*	0.020799*	0.015152*	0.0049228
		Sodium	ppm	3	0	1890	9360	5076.67	3853.86
		Strontium	ppm	3	0	25	85.3	45.567	34.417
		Sulphur	ppm	3	0	263	1510	877	623.72
		Thallium	ppm	3	3	0.0022708*	0.0039268*	0.0032563*	0.00087178
		Thorium	ppm	3	3	0.009776*	0.032109*	0.01903*	0.011647
		Tin	ppm	3	3	0.016053*	0.027607*	0.020068*	0.0065335
		Titanium	ppm	3	0	6.32	29.7	14.84	12.915
		Tungsten	ppm	3	3	0.021115*	0.045404*	0.03536*	0.012677
		Uranium	ppm	3	3	0.018318*	0.032583*	0.023156*	0.0081645
		Vanadium	ppm	3	0	0.062705	0.076979	0.068999	0.0072852
		Zinc	ppm	3	0	3.2	10.3	6.56	3.5652
		Zirconium	ppm	3	0	0.466	1.61	1.102	0.58264
	Physical and Conventional Characteristics	Moisture Content	%	3	0	0.27	87.32	55.813	48.247
SRD-3	Radionuclides	Carbon-14	Bq/kg-C	3	0	341	580	444.67	122.61
	Metals	Aluminum	ppm	3	0	157	634	414.67	240.8
		Antimony	ppm	3	2	0.025343*	0.054996	0.041846*	0.015108
		Arsenic	ppm	3	3	0.02667*	0.11395*	0.067708*	0.043872
		Barium	ppm	3	0	2.83	38.2	15.917	19.396
		Beryllium	ppm	3	3	0.0065293*	0.02471*	0.017326*	0.009559
		Bismuth	ppm	3	3	0.0028179*	0.005822*	0.0043534*	0.0015032
		Boron	ppm	3	0	1.55	2.62	2.02	0.54672
		Cadmium	ppm	3	3	0.0020356*	0.0046201*	0.0031524*	0.0013275
		Calcium	ppm	3	0	1620	14600	6520	7050.14
		Cesium	ppm	3	3	0.0089346*	0.036112*	0.023364*	0.013667
		Chromium	ppm	3	1	0.010257*	0.11395	0.061642*	0.051853
		Cobalt	ppm	3	0	0.0911	0.29	0.2187	0.11076
		Copper	ppm	3	0	0.706	1.54	1.162	0.42244
		Iron	ppm	3	0	841	2480	1787	848.28
		Lead	ppm	3	0	0.281	0.574	0.40967	0.14972
		Lithium	ppm	3	0	0.369	0.599	0.51933	0.13027

Monitoring Results by Location: Aquatic Vegetation

Location	Category	Parameter	Units	Cattail (Fall 2020)					
				Total Count	Count (<RDL and uncensored)	Min	Max	Mean	St. Dev.
		Magnesium	ppm	3	0	859	1350	1073	251.49
		Manganese	ppm	3	0	18.1	46.5	30.233	14.644
		Mercury	ppm	3	3	0.0093862*	0.015185*	0.012183*	0.002905
		Molybdenum	ppm	3	0	0.135	0.275	0.189	0.075286
		Nickel	ppm	3	0	0.404	1.12	0.826	0.37477
		Phosphorus	ppm	3	0	51.2	1090	409.63	589.5
		Potassium	ppm	3	0	702	2410	1497.33	860.02
		Selenium	ppm	3	3	0.012801*	0.18956*	0.095544*	0.088917
		Silicon	ppm	3	0	430	2180	1260	878.46
		Silver	ppm	3	0	0.051071	0.062383	0.056715	0.0056561
		Sodium	ppm	3	0	1210	2310	1753.33	550.12
		Strontium	ppm	3	0	20.4	136	62.8	63.658
		Sulphur	ppm	3	0	802	1460	1150.67	330.76
		Thallium	ppm	3	3	0.0090572*	0.012598*	0.010691*	0.0017858
		Thorium	ppm	3	3	0.033357*	0.044*	0.038138*	0.0054031
		Tin	ppm	3	0	0.051881	0.092601	0.078243	0.022861
		Titanium	ppm	3	0	10.1	48.1	29.967	19.059
		Tungsten	ppm	3	2	0.036619*	0.060272	0.046773*	0.012176
		Uranium	ppm	3	1	0.038658*	0.11236	0.073759*	0.036978
		Vanadium	ppm	3	1	0.047984*	0.16683	0.10255*	0.060018
		Zinc	ppm	3	0	22.5	48	36.267	12.871
		Zirconium	ppm	3	0	1.33	1.57	1.47	0.1249
	Physical and Conventional Characteristics	Moisture Content	%	3	0	78.72	82.49	81.14	2.1005
WD-3	Radionuclides	Carbon-14	Bq/kg-C	5	0	233	333	284.6	43.328
	Metals	Aluminum	ppm	5	0	103	347	161	104.66
		Antimony	ppm	5	5	0.014345*	0.023417*	0.018191*	0.0032823
		Arsenic	ppm	5	5	0.016602*	0.057556*	0.033582*	0.01606
		Barium	ppm	5	0	2.17	6.77	3.288	1.9595
		Beryllium	ppm	5	5	0.0025172*	0.0088937*	0.0052039*	0.0023255
		Bismuth	ppm	5	5	0.0017421*	0.003577*	0.0024078*	0.0007074
		Boron	ppm	5	0	1.49	2.41	1.842	0.34738
		Cadmium	ppm	5	5	-0.0038119*	0.014452*	0.0065221*	0.0067856
		Calcium	ppm	5	0	1910	3610	2372	705.71
		Cesium	ppm	5	5	0.0061644*	0.01386*	0.0088302*	0.0030342
		Chromium	ppm	5	0	0.12706	0.20952	0.16755	0.031751
		Cobalt	ppm	5	0	0.0743	0.235	0.1218	0.064467
		Copper	ppm	5	0	0.99	2.01	1.328	0.40623
		Iron	ppm	5	0	240	901	472.2	271.88
		Lead	ppm	5	0	0.151	0.596	0.2888	0.18306
		Lithium	ppm	5	0	0.129	0.204	0.1602	0.027959
		Magnesium	ppm	5	0	581	994	733.2	161.02
		Manganese	ppm	5	0	17.3	54.3	33.94	14.476
		Mercury	ppm	5	5	0.0028208*	0.0066071*	0.0050599*	0.0015495
		Molybdenum	ppm	5	0	0.103	0.378	0.2678	0.10348
		Nickel	ppm	5	0	0.238	0.471	0.3246	0.095594
		Phosphorus	ppm	5	0	83.1	127	102.2	18.085
		Potassium	ppm	5	0	1200	2460	1802	486.85
		Selenium	ppm	5	5	0.010762*	0.068495*	0.042247*	0.026309
		Silicon	ppm	5	0	220	1250	459.2	446.12
		Silver	ppm	5	5	0.022217*	0.029779*	0.024987*	0.0035338
		Sodium	ppm	5	0	913	2590	1738.6	599.23
		Strontium	ppm	5	0	14.8	28	20.06	5.2008
		Sulphur	ppm	5	0	504	1260	894.8	363.04
		Thallium	ppm	5	5	0.0052216*	0.0092127*	0.0071399*	0.0017347
		Thorium	ppm	5	5	0.012758*	0.031226*	0.021302*	0.006803
		Tin	ppm	5	4	0.029587*	0.050535	0.039732*	0.0078801
		Titanium	ppm	5	0	6.79	26.6	12.3	8.1785

Monitoring Results by Location: Aquatic Vegetation

Location	Category	Parameter	Units	Cattail (Fall 2020)					
				Total Count	Count (<RDL and uncensored)	Min	Max	Mean	St. Dev.
		Tungsten	ppm	5	4	0.027685*	0.063771	0.037442*	0.014961
		Uranium	ppm	5	5	0.026418*	0.04471*	0.032309*	0.0071392
		Vanadium	ppm	5	0	0.08304	0.10347	0.092416	0.0076493
		Zinc	ppm	5	0	8.7	31.2	17.5	8.7447
		Zirconium	ppm	5	0	0.425	1.06	0.631	0.24775
	Physical and Conventional Characteristics	Moisture Content	%	5	0	78.16	89.27	84.646	4.2655
WTL-1	Radionuclides	Carbon-14	Bq/kg-C	5	0	293	342	315.8	21.522
	Metals	Aluminum	ppm	5	0	92.4	281	174.88	76.041
		Antimony	ppm	5	5	0.030981*	0.042259*	0.038284*	0.0049595
		Arsenic	ppm	5	5	0.017551*	0.17148*	0.10118*	0.068001
		Barium	ppm	5	0	1.52	4.38	2.88	1.0727
		Beryllium	ppm	5	5	0.0032583*	0.0086267*	0.0056109*	0.0022264
		Bismuth	ppm	5	5	0.0030832*	0.018765*	0.0080915*	0.0061786
		Boron	ppm	5	0	1.56	2.74	2.204	0.43293
		Cadmium	ppm	5	4	0.0009886*	0.052552	0.023402*	0.019834
		Calcium	ppm	5	0	1390	3370	2314	866.5
		Cesium	ppm	5	5	0.00554*	0.016517*	0.010422*	0.0047631
		Chromium	ppm	5	1	0.010168*	0.10303	0.068407*	0.036126
		Cobalt	ppm	5	0	0.0931	0.345	0.21682	0.12245
		Copper	ppm	5	0	1.06	2.15	1.606	0.4885
		Iron	ppm	5	0	755	4250	2127	1408.79
		Lead	ppm	5	0	0.131	0.488	0.3074	0.14498
		Lithium	ppm	5	0	0.12	0.609	0.308	0.20355
		Magnesium	ppm	5	0	520	1030	816	190.78
		Manganese	ppm	5	0	31	88.3	52.08	22.969
		Mercury	ppm	5	5	0.011042*	0.04*	0.021372*	0.011661
		Molybdenum	ppm	5	0	0.137	0.259	0.2064	0.051213
		Nickel	ppm	5	0	0.313	0.776	0.5044	0.19478
		Phosphorus	ppm	5	0	40.7	368	143.7	130.43
		Potassium	ppm	5	0	283	3320	1832.6	1078.05
		Selenium	ppm	5	5	-0.062878*	0.080065*	0.029248*	0.055395
		Silicon	ppm	5	0	192	919	427.8	284.59
		Silver	ppm	5	0	0.059777	0.22304	0.12644	0.062848
		Sodium	ppm	5	0	879	1680	1291.8	308.02
		Strontium	ppm	5	0	20.2	56.6	31.24	14.621
		Sulphur	ppm	5	0	339	794	577.2	172.15
		Thallium	ppm	5	5	0.010242*	0.037559*	0.022784*	0.011506
		Thorium	ppm	5	5	0.014915*	0.046707*	0.035089*	0.015593
		Tin	ppm	5	4	0.034353*	0.099278	0.052879*	0.026703
		Titanium	ppm	5	0	6.16	18.8	11.668	5.0077
		Tungsten	ppm	5	1	0.034943*	0.10353	0.060306*	0.025881
		Uranium	ppm	5	4	0.030039*	0.052894	0.038704*	0.0091321
		Vanadium	ppm	5	3	0.008815*	0.088428	0.042676*	0.030381
		Zinc	ppm	5	0	7.32	18.9	12.424	4.1864
		Zirconium	ppm	5	0	0.496	1.14	0.8212	0.26207
	Physical and Conventional Characteristics	Moisture Content	%	5	0	71.86	82.96	78.656	4.5237

Monitoring Results by Location: Aquatic Vegetation

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
SRD: Cattail							
SRD-1	Metals	SRD-1-1_02-Nov-2020	Aluminum	ppm	1		80.2
		SRD-1-2_02-Nov-2020		ppm	1		118
		SRD-1-3_02-Nov-2020		ppm	1		351
		SRD-1-1_02-Nov-2020	Antimony	ppm	1		0.01531
		SRD-1-2_02-Nov-2020		ppm	1		0.01669
		SRD-1-3_02-Nov-2020		ppm	1		0.00826
		SRD-1-1_02-Nov-2020	Arsenic	ppm	1		0.01199
		SRD-1-2_02-Nov-2020		ppm	1		0.00941
		SRD-1-3_02-Nov-2020		ppm	1		0.03653
		SRD-1-1_02-Nov-2020	Barium	ppm	1		6.97
		SRD-1-2_02-Nov-2020		ppm	1		7.07
		SRD-1-3_02-Nov-2020		ppm	1		5.77
		SRD-1-1_02-Nov-2020	Beryllium	ppm	1		0.0038
		SRD-1-2_02-Nov-2020		ppm	1		0.0060
		SRD-1-3_02-Nov-2020		ppm	1		0.0134994
		SRD-1-1_02-Nov-2020	Bismuth	ppm	1		0.0033
		SRD-1-2_02-Nov-2020		ppm	1		0.0012
		SRD-1-3_02-Nov-2020		ppm	1		0.0019
		SRD-1-1_02-Nov-2020	Boron	ppm	1		1.87
		SRD-1-2_02-Nov-2020		ppm	1		6.37
		SRD-1-3_02-Nov-2020		ppm	1		1.64
		SRD-1-1_02-Nov-2020	Cadmium	ppm	1		-0.0011
		SRD-1-2_02-Nov-2020		ppm	1		-0.0117
		SRD-1-3_02-Nov-2020		ppm	1		-0.0172
		SRD-1-1_02-Nov-2020	Calcium	ppm	1		1500
		SRD-1-2_02-Nov-2020		ppm	1		5050
		SRD-1-3_02-Nov-2020		ppm	1		2690
		SRD-1-1_02-Nov-2020	Cesium	ppm	1		0.0049
		SRD-1-2_02-Nov-2020		ppm	1		0.0052
		SRD-1-3_02-Nov-2020		ppm	1		0.0115
		SRD-1-1_02-Nov-2020	Chromium	ppm	1		0.1576
		SRD-1-2_02-Nov-2020		ppm	1		0.0548
		SRD-1-3_02-Nov-2020		ppm	1		0.1591
		SRD-1-1_02-Nov-2020	Cobalt	ppm	1		0.0642
		SRD-1-2_02-Nov-2020		ppm	1		0.1030
		SRD-1-3_02-Nov-2020		ppm	1		0.0859
		SRD-1-1_02-Nov-2020	Copper	ppm	1		1.07
		SRD-1-2_02-Nov-2020		ppm	1		1.99
		SRD-1-3_02-Nov-2020		ppm	1		0.9740
		SRD-1-1_02-Nov-2020	Iron	ppm	1		1950
		SRD-1-2_02-Nov-2020		ppm	1		3670
		SRD-1-3_02-Nov-2020		ppm	1		568
		SRD-1-1_02-Nov-2020	Lead	ppm	1		0.1200
		SRD-1-2_02-Nov-2020		ppm	1		0.1310
		SRD-1-3_02-Nov-2020		ppm	1		0.1740
		SRD-1-1_02-Nov-2020	Lithium	ppm	1		0.2160
		SRD-1-2_02-Nov-2020		ppm	1		0.1730
		SRD-1-3_02-Nov-2020		ppm	1		0.2970
		SRD-1-1_02-Nov-2020	Magnesium	ppm	1		884
		SRD-1-2_02-Nov-2020		ppm	1		3290
		SRD-1-3_02-Nov-2020		ppm	1		773
		SRD-1-1_02-Nov-2020	Manganese	ppm	1		7.69
		SRD-1-2_02-Nov-2020		ppm	1		54.3
		SRD-1-3_02-Nov-2020		ppm	1		15.9
		SRD-1-1_02-Nov-2020	Mercury	ppm	1		0.0146
		SRD-1-2_02-Nov-2020		ppm	1		0.0061952
		SRD-1-3_02-Nov-2020		ppm	1		0.0027
		SRD-1-1_02-Nov-2020	Molybdenum	ppm	1		0.0480
		SRD-1-2_02-Nov-2020		ppm	1		0.1090
		SRD-1-3_02-Nov-2020		ppm	1		0.1380

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
		SRD-1-1_02-Nov-2020	Nickel	ppm	1		0.2770
		SRD-1-2_02-Nov-2020		ppm	1		0.2060
		SRD-1-3_02-Nov-2020		ppm	1		0.2470
		SRD-1-1_02-Nov-2020	Phosphorous	ppm	1		258
		SRD-1-2_02-Nov-2020		ppm	1		658
		SRD-1-3_02-Nov-2020		ppm	1		176
		SRD-1-1_02-Nov-2020	Potassium	ppm	1		1180
		SRD-1-2_02-Nov-2020		ppm	1		3540
		SRD-1-3_02-Nov-2020		ppm	1		1230
		SRD-1-1_02-Nov-2020	Selenium	ppm	1		0.0356
		SRD-1-2_02-Nov-2020		ppm	1		0.0255
		SRD-1-3_02-Nov-2020		ppm	1		-0.0220
		SRD-1-1_02-Nov-2020	Silicon	ppm	1		292
		SRD-1-2_02-Nov-2020		ppm	1		760
		SRD-1-3_02-Nov-2020		ppm	1		1520
		SRD-1-1_02-Nov-2020	Silver	ppm	1		0.0207986
		SRD-1-2_02-Nov-2020		ppm	1		0.0129
		SRD-1-3_02-Nov-2020		ppm	1		0.0118
		SRD-1-1_02-Nov-2020	Sodium	ppm	1		3980
		SRD-1-2_02-Nov-2020		ppm	1		9360
		SRD-1-3_02-Nov-2020		ppm	1		1890
		SRD-1-1_02-Nov-2020	Strontium	ppm	1		26.4
		SRD-1-2_02-Nov-2020		ppm	1		85.3
		SRD-1-3_02-Nov-2020		ppm	1		25
		SRD-1-1_02-Nov-2020	Sulphur	ppm	1		858
		SRD-1-2_02-Nov-2020		ppm	1		1510
		SRD-1-3_02-Nov-2020		ppm	1		263
		SRD-1-1_02-Nov-2020	Thallium	ppm	1		0.0023
		SRD-1-2_02-Nov-2020		ppm	1		0.0039
		SRD-1-3_02-Nov-2020		ppm	1		0.0036
		SRD-1-1_02-Nov-2020	Thorium	ppm	1		0.0152
		SRD-1-2_02-Nov-2020		ppm	1		0.0098
		SRD-1-3_02-Nov-2020		ppm	1		0.0321
		SRD-1-1_02-Nov-2020	Tin	ppm	1		0.0276
		SRD-1-2_02-Nov-2020		ppm	1		0.0161
		SRD-1-3_02-Nov-2020		ppm	1		0.0165
		SRD-1-1_02-Nov-2020	Titanium	ppm	1		6.32
		SRD-1-2_02-Nov-2020		ppm	1		8.5
		SRD-1-3_02-Nov-2020		ppm	1		29.7
		SRD-1-1_02-Nov-2020	Tungsten	ppm	1		0.0454036
		SRD-1-2_02-Nov-2020		ppm	1		0.0396
		SRD-1-3_02-Nov-2020		ppm	1		0.0211
		SRD-1-1_02-Nov-2020	Uranium	ppm	1		0.0186
		SRD-1-2_02-Nov-2020		ppm	1		0.0183
		SRD-1-3_02-Nov-2020		ppm	1		0.0326
		SRD-1-1_02-Nov-2020	Vanadium	ppm	1		0.0673
		SRD-1-2_02-Nov-2020		ppm	1		0.0627
		SRD-1-3_02-Nov-2020		ppm	1		0.0770
		SRD-1-1_02-Nov-2020	Zinc	ppm	1		6.18
		SRD-1-2_02-Nov-2020		ppm	1		10.3
		SRD-1-3_02-Nov-2020		ppm	1		3.2
		SRD-1-1_02-Nov-2020	Zirconium	ppm	1		0.466
		SRD-1-2_02-Nov-2020		ppm	1		1.23
		SRD-1-3_02-Nov-2020		ppm	1		1.61
	Physical/Conventional Characteristics	SRD-1-1_02-Nov-2020	Moisture Content	%	1		87.32
		SRD-1-2_02-Nov-2020			1		0.27
		SRD-1-3_02-Nov-2020			1		79.85
	Radionuclides	SRD-1-1_02-Nov-2020	Carbon-14	Bq/kg-C	1		407
		SRD-1-2_02-Nov-2020			1		617
		SRD-1-3_02-Nov-2020			1		533

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
SRD-3	Metals	SRD-3-1_03-Nov-2020	Aluminum	ppm	1		453
		SRD-3-2_03-Nov-2020		ppm	1		157
		SRD-3-3_03-Nov-2020		ppm	1		634
		SRD-3-1_03-Nov-2020	Antimony	ppm	1		0.0550
		SRD-3-2_03-Nov-2020		ppm	1		0.0253
		SRD-3-3_03-Nov-2020		ppm	1		0.0452
		SRD-3-1_03-Nov-2020	Barium	ppm	1		6.72
		SRD-3-2_03-Nov-2020		ppm	1		2.83
		SRD-3-3_03-Nov-2020		ppm	1		38.2
		SRD-3-1_03-Nov-2020	Beryllium	ppm	1		0.0207
		SRD-3-2_03-Nov-2020		ppm	1		0.0065
		SRD-3-3_03-Nov-2020		ppm	1		0.0247
		SRD-3-1_03-Nov-2020	Bismuth	ppm	1		0.0058
		SRD-3-2_03-Nov-2020		ppm	1		0.0028
		SRD-3-3_03-Nov-2020		ppm	1		0.0044
		SRD-3-1_03-Nov-2020	Boron	ppm	1		1.89
		SRD-3-2_03-Nov-2020		ppm	1		1.55
		SRD-3-3_03-Nov-2020		ppm	1		2.62
		SRD-3-1_03-Nov-2020	Cadmium	ppm	1		0.0046
		SRD-3-2_03-Nov-2020		ppm	1		0.0020
		SRD-3-3_03-Nov-2020		ppm	1		0.0028
		SRD-3-1_03-Nov-2020	Calcium	ppm	1		3340
		SRD-3-2_03-Nov-2020		ppm	1		1620
		SRD-3-3_03-Nov-2020		ppm	1		14600
		SRD-3-1_03-Nov-2020	Cesium	ppm	1		0.0250
		SRD-3-2_03-Nov-2020		ppm	1		0.0089
		SRD-3-3_03-Nov-2020		ppm	1		0.0361
		SRD-3-1_03-Nov-2020	Chromium	ppm	1		0.0607
		SRD-3-2_03-Nov-2020		ppm	1		0.0103
		SRD-3-3_03-Nov-2020		ppm	1		0.1140
		SRD-3-1_03-Nov-2020	Cobalt	ppm	1		0.2750
		SRD-3-2_03-Nov-2020		ppm	1		0.0911
		SRD-3-3_03-Nov-2020		ppm	1		0.2900
		SRD-3-1_03-Nov-2020	Copper	ppm	1		1.54
		SRD-3-2_03-Nov-2020		ppm	1		0.7060
		SRD-3-3_03-Nov-2020		ppm	1		1.24
		SRD-3-1_03-Nov-2020	Iron	ppm	1		2480
		SRD-3-2_03-Nov-2020		ppm	1		841
		SRD-3-3_03-Nov-2020		ppm	1		2040
		SRD-3-1_03-Nov-2020	Lead	ppm	1		0.5740
		SRD-3-2_03-Nov-2020		ppm	1		0.2810
		SRD-3-3_03-Nov-2020		ppm	1		0.3740
		SRD-3-1_03-Nov-2020	Lithium	ppm	1		0.5990
		SRD-3-2_03-Nov-2020		ppm	1		0.3690
		SRD-3-3_03-Nov-2020		ppm	1		0.5900
		SRD-3-1_03-Nov-2020	Magnesium	ppm	1		1010
		SRD-3-2_03-Nov-2020		ppm	1		859
		SRD-3-3_03-Nov-2020		ppm	1		1350
		SRD-3-1_03-Nov-2020	Manganese	ppm	1		26.1
		SRD-3-2_03-Nov-2020		ppm	1		18.1
		SRD-3-3_03-Nov-2020		ppm	1		46.5
		SRD-3-1_03-Nov-2020	Mercury	ppm	1		0.0152
		SRD-3-2_03-Nov-2020		ppm	1		0.0120
		SRD-3-3_03-Nov-2020		ppm	1		0.0094
		SRD-3-1_03-Nov-2020	Molybdenum	ppm	1		0.2750
		SRD-3-2_03-Nov-2020		ppm	1		0.1350
		SRD-3-3_03-Nov-2020		ppm	1		0.1570
		SRD-3-1_03-Nov-2020	Nickel	ppm	1		1.12
		SRD-3-2_03-Nov-2020		ppm	1		0.4040
		SRD-3-3_03-Nov-2020		ppm	1		0.9540
		SRD-3-1_03-Nov-2020	Phosphorous	ppm	1		87.7
		SRD-3-2_03-Nov-2020		ppm	1		51.2
		SRD-3-3_03-Nov-2020		ppm	1		1090

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
		SRD-3-1_03-Nov-2020	Potassium	ppm	1		1380
		SRD-3-2_03-Nov-2020		ppm	1		702
		SRD-3-3_03-Nov-2020		ppm	1		2410
		SRD-3-1_03-Nov-2020	Selenium	ppm	1		0.0843
		SRD-3-2_03-Nov-2020		ppm	1		0.0128
		SRD-3-3_03-Nov-2020		ppm	1		0.1896
		SRD-3-1_03-Nov-2020	Silicon	ppm	1		1170
		SRD-3-2_03-Nov-2020		ppm	1		430
		SRD-3-3_03-Nov-2020		ppm	1		2180
		SRD-3-1_03-Nov-2020	Silver	ppm	1		0.0624
		SRD-3-2_03-Nov-2020		ppm	1		0.0567
		SRD-3-3_03-Nov-2020		ppm	1		0.0511
		SRD-3-1_03-Nov-2020	Sodium	ppm	1		1740
		SRD-3-2_03-Nov-2020		ppm	1		2310
		SRD-3-3_03-Nov-2020		ppm	1		1210
		SRD-3-1_03-Nov-2020	Strontium	ppm	1		32
		SRD-3-2_03-Nov-2020		ppm	1		20.4
		SRD-3-3_03-Nov-2020		ppm	1		136
		SRD-3-1_03-Nov-2020	Sulphur	ppm	1		1460
		SRD-3-2_03-Nov-2020		ppm	1		1190
		SRD-3-3_03-Nov-2020		ppm	1		802
		SRD-3-1_03-Nov-2020	Thallium	ppm	1		0.0126
		SRD-3-2_03-Nov-2020		ppm	1		0.0104
		SRD-3-3_03-Nov-2020		ppm	1		0.0091
		SRD-3-1_03-Nov-2020	Thorium	ppm	1		0.0440
		SRD-3-2_03-Nov-2020		ppm	1		0.0334
		SRD-3-3_03-Nov-2020		ppm	1		0.0371
		SRD-3-1_03-Nov-2020	Tin	ppm	1		0.0926
		SRD-3-2_03-Nov-2020		ppm	1		0.0519
		SRD-3-3_03-Nov-2020		ppm	1		0.0902
		SRD-3-1_03-Nov-2020	Titanium	ppm	1		31.7
		SRD-3-2_03-Nov-2020		ppm	1		10.1
		SRD-3-3_03-Nov-2020		ppm	1		48.1
		SRD-3-1_03-Nov-2020	Tungsten	ppm	1		0.0603
		SRD-3-2_03-Nov-2020		ppm	1		0.0366
		SRD-3-3_03-Nov-2020		ppm	1		0.0434
		SRD-3-1_03-Nov-2020	Uranium	ppm	1		0.0703
		SRD-3-2_03-Nov-2020		ppm	1		0.0387
		SRD-3-3_03-Nov-2020		ppm	1		0.1124
		SRD-3-1_03-Nov-2020	Vanadium	ppm	1		0.1668
		SRD-3-2_03-Nov-2020		ppm	1		0.0480
		SRD-3-3_03-Nov-2020		ppm	1		0.0928
		SRD-3-1_03-Nov-2020	Zinc	ppm	1		38.3
		SRD-3-2_03-Nov-2020		ppm	1		22.5
		SRD-3-3_03-Nov-2020		ppm	1		48
		SRD-3-1_03-Nov-2020	Zirconium	ppm	1		1.57
		SRD-3-2_03-Nov-2020		ppm	1		1.33
		SRD-3-3_03-Nov-2020		ppm	1		1.51
	Physical/Conventional Characteristics	SRD-3-1_03-Nov-2020	Moisture Content	%	1		78.72
		SRD-3-2_03-Nov-2020			1		82.49
		SRD-3-3_03-Nov-2020			1		82.21
	Radionuclides	SRD-3-1_03-Nov-2020	Carbon-14	Bq/kg-C	1		413
		SRD-3-2_03-Nov-2020			1		341
		SRD-3-3_03-Nov-2020			1		580
WTLS-1	Metals	WTL-1-1_03-Nov-2020	Aluminum	ppm	1		140
		WTL-1-2_03-Nov-2020		ppm	1		224
		WTL-1-3_03-Nov-2020		ppm	1		281
		WTL-1-4_03-Nov-2020		ppm	1		137
		WTL-1-5_03-Nov-2020		ppm	1		92.4
		WTL-1-1_03-Nov-2020	Antimony	ppm	1		0.0420
		WTL-1-2_03-Nov-2020		ppm	1		0.0423
		WTL-1-3_03-Nov-2020		ppm	1		0.0409
		WTL-1-4_03-Nov-2020		ppm	1		0.0353
		WTL-1-5_03-Nov-2020		ppm	1		0.0310
		WTL-1-1_03-Nov-2020	Arsenic	ppm	1		0.0176
		WTL-1-2_03-Nov-2020		ppm	1		0.1715
		WTL-1-3_03-Nov-2020		ppm	1		0.0631
		WTL-1-4_03-Nov-2020		ppm	1		0.1704

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
		WTL-1-5_03-Nov-2020		ppm	1		0.0833
		WTL-1-1_03-Nov-2020	Barium	ppm	1		2.26
		WTL-1-2_03-Nov-2020		ppm	1		3.16
		WTL-1-3_03-Nov-2020		ppm	1		4.38
		WTL-1-4_03-Nov-2020		ppm	1		3.08
		WTL-1-5_03-Nov-2020		ppm	1		1.52
		WTL-1-1_03-Nov-2020	Beryllium	ppm	1		0.0045
		WTL-1-2_03-Nov-2020		ppm	1		0.0072
		WTL-1-3_03-Nov-2020		ppm	1		0.0086
		WTL-1-4_03-Nov-2020		ppm	1		0.0044
		WTL-1-5_03-Nov-2020		ppm	1		0.0033
		WTL-1-1_03-Nov-2020	Bismuth	ppm	1		0.0188
		WTL-1-2_03-Nov-2020		ppm	1		0.0076
		WTL-1-3_03-Nov-2020		ppm	1		0.0054
		WTL-1-4_03-Nov-2020		ppm	1		0.0056
		WTL-1-5_03-Nov-2020		ppm	1		0.0031
		WTL-1-1_03-Nov-2020	Boron	ppm	1		2.41
		WTL-1-2_03-Nov-2020		ppm	1		2.14
		WTL-1-3_03-Nov-2020		ppm	1		2.17
		WTL-1-4_03-Nov-2020		ppm	1		2.74
		WTL-1-5_03-Nov-2020		ppm	1		1.56
		WTL-1-1_03-Nov-2020	Cadmium	ppm	1		0.0010
		WTL-1-2_03-Nov-2020		ppm	1		0.0288
		WTL-1-3_03-Nov-2020		ppm	1		0.0250
		WTL-1-4_03-Nov-2020		ppm	1		0.0526
		WTL-1-5_03-Nov-2020		ppm	1		0.0096
		WTL-1-1_03-Nov-2020	Calcium	ppm	1		3370
		WTL-1-2_03-Nov-2020		ppm	1		1960
		WTL-1-3_03-Nov-2020		ppm	1		1760
		WTL-1-4_03-Nov-2020		ppm	1		3090
		WTL-1-5_03-Nov-2020		ppm	1		1390
		WTL-1-1_03-Nov-2020	Cesium	ppm	1		0.0079
		WTL-1-2_03-Nov-2020		ppm	1		0.0144
		WTL-1-3_03-Nov-2020		ppm	1		0.0165
		WTL-1-4_03-Nov-2020		ppm	1		0.0077
		WTL-1-5_03-Nov-2020		ppm	1		0.0055
		WTL-1-1_03-Nov-2020	Chromium	ppm	1		0.0732
		WTL-1-2_03-Nov-2020		ppm	1		0.1030
		WTL-1-3_03-Nov-2020		ppm	1		0.0631
		WTL-1-4_03-Nov-2020		ppm	1		0.0925
		WTL-1-5_03-Nov-2020		ppm	1		0.0102
		WTL-1-1_03-Nov-2020	Cobalt	ppm	1		0.0931
		WTL-1-2_03-Nov-2020		ppm	1		0.1950
		WTL-1-3_03-Nov-2020		ppm	1		0.3430
		WTL-1-4_03-Nov-2020		ppm	1		0.3450
		WTL-1-5_03-Nov-2020		ppm	1		0.1080
		WTL-1-1_03-Nov-2020	Copper	ppm	1		1.97
		WTL-1-2_03-Nov-2020		ppm	1		1.14
		WTL-1-3_03-Nov-2020		ppm	1		1.71
		WTL-1-4_03-Nov-2020		ppm	1		2.15
		WTL-1-5_03-Nov-2020		ppm	1		1.06
		WTL-1-1_03-Nov-2020	Iron	ppm	1		755
		WTL-1-2_03-Nov-2020		ppm	1		2820
		WTL-1-3_03-Nov-2020		ppm	1		4250
		WTL-1-4_03-Nov-2020		ppm	1		1520
		WTL-1-5_03-Nov-2020		ppm	1		1290
		WTL-1-1_03-Nov-2020	Lead	ppm	1		0.1310
		WTL-1-2_03-Nov-2020		ppm	1		0.4880
		WTL-1-3_03-Nov-2020		ppm	1		0.3250
		WTL-1-4_03-Nov-2020		ppm	1		0.3960
		WTL-1-5_03-Nov-2020		ppm	1		0.1970
		WTL-1-1_03-Nov-2020	Lithium	ppm	1		0.1220
		WTL-1-2_03-Nov-2020		ppm	1		0.6090
		WTL-1-3_03-Nov-2020		ppm	1		0.3090
		WTL-1-4_03-Nov-2020		ppm	1		0.3800
		WTL-1-5_03-Nov-2020		ppm	1		0.1200
		WTL-1-1_03-Nov-2020		ppm	1		773
		WTL-1-2_03-Nov-2020		ppm	1		843

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
		WTL-1-3_03-Nov-2020	Magnesium	ppm	1		914
		WTL-1-4_03-Nov-2020		ppm	1		1030
		WTL-1-5_03-Nov-2020		ppm	1		520
		WTL-1-1_03-Nov-2020	Manganese	ppm	1		88.3
		WTL-1-2_03-Nov-2020		ppm	1		31
		WTL-1-3_03-Nov-2020		ppm	1		36.4
		WTL-1-4_03-Nov-2020		ppm	1		59.7
		WTL-1-5_03-Nov-2020		ppm	1		45
		WTL-1-1_03-Nov-2020	Mercury	ppm	1		0.0400
		WTL-1-2_03-Nov-2020		ppm	1		0.0237
		WTL-1-3_03-Nov-2020		ppm	1		0.0198
		WTL-1-4_03-Nov-2020		ppm	1		0.0123
		WTL-1-5_03-Nov-2020		ppm	1		0.0110
		WTL-1-1_03-Nov-2020	Molybdenum	ppm	1		0.1950
		WTL-1-2_03-Nov-2020		ppm	1		0.2590
		WTL-1-3_03-Nov-2020		ppm	1		0.1860
		WTL-1-4_03-Nov-2020		ppm	1		0.2550
		WTL-1-5_03-Nov-2020		ppm	1		0.1370
		WTL-1-1_03-Nov-2020	Nickel	ppm	1		0.3130
		WTL-1-2_03-Nov-2020		ppm	1		0.5050
		WTL-1-3_03-Nov-2020		ppm	1		0.7760
		WTL-1-4_03-Nov-2020		ppm	1		0.6020
		WTL-1-5_03-Nov-2020		ppm	1		0.3260
		WTL-1-1_03-Nov-2020	Phosphorus	ppm	1		368
		WTL-1-2_03-Nov-2020		ppm	1		122
		WTL-1-3_03-Nov-2020		ppm	1		40.7
		WTL-1-4_03-Nov-2020		ppm	1		64.8
		WTL-1-5_03-Nov-2020		ppm	1		123
		WTL-1-1_03-Nov-2020	Potassium	ppm	1		1720
		WTL-1-2_03-Nov-2020		ppm	1		1980
		WTL-1-3_03-Nov-2020		ppm	1		283
		WTL-1-4_03-Nov-2020		ppm	1		1860
		WTL-1-5_03-Nov-2020		ppm	1		3320
		WTL-1-1_03-Nov-2020	Selenium	ppm	1		0.0801
		WTL-1-2_03-Nov-2020		ppm	1		0.0365
		WTL-1-3_03-Nov-2020		ppm	1		0.0632
		WTL-1-4_03-Nov-2020		ppm	1		0.0294
		WTL-1-5_03-Nov-2020		ppm	1		-0.0629
		WTL-1-1_03-Nov-2020	Silicon	ppm	1		319
		WTL-1-2_03-Nov-2020		ppm	1		402
		WTL-1-3_03-Nov-2020		ppm	1		919
		WTL-1-4_03-Nov-2020		ppm	1		307
		WTL-1-5_03-Nov-2020		ppm	1		192
		WTL-1-1_03-Nov-2020	Silver	ppm	1		0.22304
		WTL-1-2_03-Nov-2020		ppm	1		0.14295
		WTL-1-3_03-Nov-2020		ppm	1		0.12153
		WTL-1-4_03-Nov-2020		ppm	1		0.08488
		WTL-1-5_03-Nov-2020		ppm	1		0.05978
		WTL-1-1_03-Nov-2020	Sodium	ppm	1		1110
		WTL-1-2_03-Nov-2020		ppm	1		1680
		WTL-1-3_03-Nov-2020		ppm	1		1440
		WTL-1-4_03-Nov-2020		ppm	1		1350
		WTL-1-5_03-Nov-2020		ppm	1		879
		WTL-1-1_03-Nov-2020	Strontium	ppm	1		20.2
		WTL-1-2_03-Nov-2020		ppm	1		26.4
		WTL-1-3_03-Nov-2020		ppm	1		29.8
		WTL-1-4_03-Nov-2020		ppm	1		56.6
		WTL-1-5_03-Nov-2020		ppm	1		23.2
		WTL-1-1_03-Nov-2020	Sulphur	ppm	1		339
		WTL-1-2_03-Nov-2020		ppm	1		486
		WTL-1-3_03-Nov-2020		ppm	1		794
		WTL-1-4_03-Nov-2020		ppm	1		642
		WTL-1-5_03-Nov-2020		ppm	1		625
		WTL-1-1_03-Nov-2020	Thallium	ppm	1		0.0376
		WTL-1-2_03-Nov-2020		ppm	1		0.0321
		WTL-1-3_03-Nov-2020		ppm	1		0.0165
		WTL-1-4_03-Nov-2020		ppm	1		0.0175
		WTL-1-5_03-Nov-2020		ppm	1		0.0102

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
		WTL-1-1_03-Nov-2020	Thorium	ppm	1		0.0460
		WTL-1-2_03-Nov-2020		ppm	1		0.0467
		WTL-1-3_03-Nov-2020		ppm	1		0.0463
		WTL-1-4_03-Nov-2020		ppm	1		0.0215
		WTL-1-5_03-Nov-2020		ppm	1		0.0149
		WTL-1-1_03-Nov-2020	Tin	ppm	1		0.0344
		WTL-1-2_03-Nov-2020		ppm	1		0.0357
		WTL-1-3_03-Nov-2020		ppm	1		0.0462
		WTL-1-4_03-Nov-2020		ppm	1		0.0489
		WTL-1-5_03-Nov-2020		ppm	1		0.0993
		WTL-1-1_03-Nov-2020	Titanium	ppm	1		10.2
		WTL-1-2_03-Nov-2020		ppm	1		14.5
		WTL-1-3_03-Nov-2020		ppm	1		18.8
		WTL-1-4_03-Nov-2020		ppm	1		8.68
		WTL-1-5_03-Nov-2020		ppm	1		6.16
		WTL-1-1_03-Nov-2020	Tungsten	ppm	1		0.10353
		WTL-1-2_03-Nov-2020		ppm	1		0.06073
		WTL-1-3_03-Nov-2020		ppm	1		0.05123
		WTL-1-4_03-Nov-2020		ppm	1		0.05109
		WTL-1-5_03-Nov-2020		ppm	1		0.03494
		WTL-1-1_03-Nov-2020	Uranium	ppm	1		0.03228
		WTL-1-2_03-Nov-2020		ppm	1		0.03004
		WTL-1-3_03-Nov-2020		ppm	1		0.04193
		WTL-1-4_03-Nov-2020		ppm	1		0.05289
		WTL-1-5_03-Nov-2020		ppm	1		0.03638
		WTL-1-1_03-Nov-2020	Vanadium	ppm	1		0.03348
		WTL-1-2_03-Nov-2020		ppm	1		0.05482
		WTL-1-3_03-Nov-2020		ppm	1		0.00882
		WTL-1-4_03-Nov-2020		ppm	1		0.08843
		WTL-1-5_03-Nov-2020		ppm	1		0.02784
		WTL-1-1_03-Nov-2020	Zinc	ppm	1		12.9
		WTL-1-2_03-Nov-2020		ppm	1		11.8
		WTL-1-3_03-Nov-2020		ppm	1		18.9
		WTL-1-4_03-Nov-2020		ppm	1		11.2
		WTL-1-5_03-Nov-2020		ppm	1		7.32
		WTL-1-1_03-Nov-2020	Zirconium	ppm	1		1.14
		WTL-1-2_03-Nov-2020		ppm	1		0.8580
		WTL-1-3_03-Nov-2020		ppm	1		0.9870
		WTL-1-4_03-Nov-2020		ppm	1		0.6250
		WTL-1-5_03-Nov-2020		ppm	1		0.4960
	Physical/Conventional Characteristics	WTL-1-1_03-Nov-2020	Moisture Content	%	1		76.71
		WTL-1-2_03-Nov-2020			1		71.86
		WTL-1-3_03-Nov-2020			1		82.2
		WTL-1-4_03-Nov-2020			1		82.96
		WTL-1-5_03-Nov-2020			1		79.55
	Radionuclides	WTL-1-1_03-Nov-2020	Carbon-14	Bq/kg-C	1		342
		WTL-1-2_03-Nov-2020			1		326
		WTL-1-3_03-Nov-2020			1		324
		WTL-1-4_03-Nov-2020			1		293
		WTL-1-5_03-Nov-2020			1		294

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
WD: Cattail							
WD-3	Metals	WD-3-1_02-Nov-2020	Aluminum	ppm	1		114
		WD-3-2_02-Nov-2020		ppm	1		107
		WD-3-3_02-Nov-2020		ppm	1		347
		WD-3-4_02-Nov-2020		ppm	1		103
		WD-3-5_02-Nov-2020		ppm	1		134
		WD-3-1_02-Nov-2020	Antimony	ppm	1		0.017371
		WD-3-2_02-Nov-2020		ppm	1		0.0176244
		WD-3-3_02-Nov-2020		ppm	1		0.0143454
		WD-3-4_02-Nov-2020		ppm	1		0.023417
		WD-3-5_02-Nov-2020		ppm	1		0.0181981
		WD-3-1_02-Nov-2020	Arsenic	ppm	1		0.0413301
		WD-3-2_02-Nov-2020		ppm	1		0.0261978
		WD-3-3_02-Nov-2020		ppm	1		0.0166021
		WD-3-4_02-Nov-2020		ppm	1		0.0575561
		WD-3-5_02-Nov-2020		ppm	1		0.0262251
		WD-3-1_02-Nov-2020	Barium	ppm	1		2.24
		WD-3-2_02-Nov-2020		ppm	1		2.53
		WD-3-3_02-Nov-2020		ppm	1		6.77
		WD-3-4_02-Nov-2020		ppm	1		2.17
		WD-3-5_02-Nov-2020		ppm	1		2.73
		WD-3-1_02-Nov-2020	Beryllium	ppm	1		0.0043832
		WD-3-2_02-Nov-2020		ppm	1		0.0025172
		WD-3-3_02-Nov-2020		ppm	1		0.0088937
		WD-3-4_02-Nov-2020		ppm	1		0.0048788
		WD-3-5_02-Nov-2020		ppm	1		0.0053467
		WD-3-1_02-Nov-2020	Bismuth	ppm	1		0.003577
		WD-3-2_02-Nov-2020		ppm	1		0.0017421
		WD-3-3_02-Nov-2020		ppm	1		0.002455
		WD-3-4_02-Nov-2020		ppm	1		0.0022699
		WD-3-5_02-Nov-2020		ppm	1		0.0019952
		WD-3-1_02-Nov-2020	Boron	ppm	1		1.49
		WD-3-2_02-Nov-2020		ppm	1		1.86
		WD-3-3_02-Nov-2020		ppm	1		2.41
		WD-3-4_02-Nov-2020		ppm	1		1.66
		WD-3-5_02-Nov-2020		ppm	1		1.79
		WD-3-1_02-Nov-2020	Cadmium	ppm	1		0.0070256
		WD-3-2_02-Nov-2020		ppm	1		0.0144522
		WD-3-3_02-Nov-2020		ppm	1		-0.003812
		WD-3-4_02-Nov-2020		ppm	1		0.0099663
		WD-3-5_02-Nov-2020		ppm	1		0.0049781
		WD-3-1_02-Nov-2020	Calcium	ppm	1		1910
		WD-3-2_02-Nov-2020		ppm	1		2100
		WD-3-3_02-Nov-2020		ppm	1		3610
		WD-3-4_02-Nov-2020		ppm	1		1970
		WD-3-5_02-Nov-2020		ppm	1		2270
		WD-3-1_02-Nov-2020	Cesium	ppm	1		0.0070398
		WD-3-2_02-Nov-2020		ppm	1		0.0061644
		WD-3-3_02-Nov-2020		ppm	1		0.0138603
		WD-3-4_02-Nov-2020		ppm	1		0.0078195
		WD-3-5_02-Nov-2020		ppm	1		0.0092671
		WD-3-1_02-Nov-2020	Chromium	ppm	1		0.1516185
		WD-3-2_02-Nov-2020		ppm	1		0.2095192
		WD-3-3_02-Nov-2020		ppm	1		0.1630694
		WD-3-4_02-Nov-2020		ppm	1		0.1270607
		WD-3-5_02-Nov-2020		ppm	1		0.1864688
		WD-3-1_02-Nov-2020	Cobalt	ppm	1		0.0743
		WD-3-2_02-Nov-2020		ppm	1		0.093
		WD-3-3_02-Nov-2020		ppm	1		0.108
		WD-3-4_02-Nov-2020		ppm	1		0.235
		WD-3-5_02-Nov-2020		ppm	1		0.0987
		WD-3-1_02-Nov-2020	Copper	ppm	1		2.01
		WD-3-2_02-Nov-2020		ppm	1		1.32
		WD-3-3_02-Nov-2020		ppm	1		1.05
		WD-3-4_02-Nov-2020		ppm	1		0.99
		WD-3-5_02-Nov-2020		ppm	1		1.27
		WD-3-1_02-Nov-2020	Iron	ppm	1		578
		WD-3-2_02-Nov-2020		ppm	1		299
		WD-3-3_02-Nov-2020		ppm	1		240

Location	Category	Sample ID	Parameter	Units	Fall 2020 Total Count	Fall 2020 Count (<RDL and uncensored)	Fall 2020 Value
		WD-3-4_02-Nov-2020		ppm	1		901
		WD-3-5_02-Nov-2020		ppm	1		343
		WD-3-1_02-Nov-2020	Lead	ppm	1		0.596
		WD-3-2_02-Nov-2020		ppm	1		0.151
		WD-3-3_02-Nov-2020		ppm	1		0.301
		WD-3-4_02-Nov-2020		ppm	1		0.243
		WD-3-5_02-Nov-2020		ppm	1		0.153
		WD-3-1_02-Nov-2020	Lithium	ppm	1		0.129
		WD-3-2_02-Nov-2020		ppm	1		0.155
		WD-3-3_02-Nov-2020		ppm	1		0.204
		WD-3-4_02-Nov-2020		ppm	1		0.147
		WD-3-5_02-Nov-2020		ppm	1		0.166
		WD-3-1_02-Nov-2020	Magnesium	ppm	1		581
		WD-3-2_02-Nov-2020		ppm	1		627
		WD-3-3_02-Nov-2020		ppm	1		994
		WD-3-4_02-Nov-2020		ppm	1		757
		WD-3-5_02-Nov-2020		ppm	1		707
		WD-3-1_02-Nov-2020	Manganese	ppm	1		17.3
		WD-3-2_02-Nov-2020		ppm	1		54.3
		WD-3-3_02-Nov-2020		ppm	1		42.3
		WD-3-4_02-Nov-2020		ppm	1		26.5
		WD-3-5_02-Nov-2020		ppm	1		29.3
		WD-3-1_02-Nov-2020	Mercury	ppm	1		0.0066071
		WD-3-2_02-Nov-2020		ppm	1		0.0051288
		WD-3-3_02-Nov-2020		ppm	1		0.0063708
		WD-3-4_02-Nov-2020		ppm	1		0.0043719
		WD-3-5_02-Nov-2020		ppm	1		0.0028208
		WD-3-1_02-Nov-2020	Molybdenum	ppm	1		0.378
		WD-3-2_02-Nov-2020		ppm	1		0.263
		WD-3-3_02-Nov-2020		ppm	1		0.268
		WD-3-4_02-Nov-2020		ppm	1		0.327
		WD-3-5_02-Nov-2020		ppm	1		0.103
		WD-3-1_02-Nov-2020	Nickel	ppm	1		0.238
		WD-3-2_02-Nov-2020		ppm	1		0.262
		WD-3-3_02-Nov-2020		ppm	1		0.283
		WD-3-4_02-Nov-2020		ppm	1		0.471
		WD-3-5_02-Nov-2020		ppm	1		0.369
		WD-3-1_02-Nov-2020	Phosphorus	ppm	1		89.2
		WD-3-2_02-Nov-2020		ppm	1		114
		WD-3-3_02-Nov-2020		ppm	1		83.1
		WD-3-4_02-Nov-2020		ppm	1		97.7
		WD-3-5_02-Nov-2020		ppm	1		127
		WD-3-1_02-Nov-2020	Potassium	ppm	1		1800
		WD-3-2_02-Nov-2020		ppm	1		1500
		WD-3-3_02-Nov-2020		ppm	1		1200
		WD-3-4_02-Nov-2020		ppm	1		2050
		WD-3-5_02-Nov-2020		ppm	1		2460

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
		WD-3-1_02-Nov-2020	Selenium	ppm	1		0.0543234
		WD-3-2_02-Nov-2020		ppm	1		0.0602655
		WD-3-3_02-Nov-2020		ppm	1		0.0107615
		WD-3-4_02-Nov-2020		ppm	1		0.0173895
		WD-3-5_02-Nov-2020		ppm	1		0.0684949
		WD-3-1_02-Nov-2020	Silicon	ppm	1		228
		WD-3-2_02-Nov-2020		ppm	1		233
		WD-3-3_02-Nov-2020		ppm	1		1250
		WD-3-4_02-Nov-2020		ppm	1		220
		WD-3-5_02-Nov-2020		ppm	1		365
		WD-3-1_02-Nov-2020	Silver	ppm	1		0.0297786
		WD-3-2_02-Nov-2020		ppm	1		0.027755
		WD-3-3_02-Nov-2020		ppm	1		0.0222845
		WD-3-4_02-Nov-2020		ppm	1		0.0222167
		WD-3-5_02-Nov-2020		ppm	1		0.0229009
		WD-3-1_02-Nov-2020	Sodium	ppm	1		1650
		WD-3-2_02-Nov-2020		ppm	1		913
		WD-3-3_02-Nov-2020		ppm	1		1670
		WD-3-4_02-Nov-2020		ppm	1		2590
		WD-3-5_02-Nov-2020		ppm	1		1870
		WD-3-1_02-Nov-2020	Strontium	ppm	1		20.6
		WD-3-2_02-Nov-2020		ppm	1		20.9
		WD-3-3_02-Nov-2020		ppm	1		28
		WD-3-4_02-Nov-2020		ppm	1		14.8
		WD-3-5_02-Nov-2020		ppm	1		16
		WD-3-1_02-Nov-2020	Sulphur	ppm	1		504
		WD-3-2_02-Nov-2020		ppm	1		539
		WD-3-3_02-Nov-2020		ppm	1		1260
		WD-3-4_02-Nov-2020		ppm	1		1230
		WD-3-5_02-Nov-2020		ppm	1		941
		WD-3-1_02-Nov-2020	Thallium	ppm	1		0.0075605
		WD-3-2_02-Nov-2020		ppm	1		0.0052216
		WD-3-3_02-Nov-2020		ppm	1		0.0054889
		WD-3-4_02-Nov-2020		ppm	1		0.0092127
		WD-3-5_02-Nov-2020		ppm	1		0.0082157
		WD-3-1_02-Nov-2020	Thorium	ppm	1		0.0178998
		WD-3-2_02-Nov-2020		ppm	1		0.0127582
		WD-3-3_02-Nov-2020		ppm	1		0.0312259
		WD-3-4_02-Nov-2020		ppm	1		0.0222042
		WD-3-5_02-Nov-2020		ppm	1		0.0224226
		WD-3-1_02-Nov-2020	Tin	ppm	1		0.050535
		WD-3-2_02-Nov-2020		ppm	1		0.0356123
		WD-3-3_02-Nov-2020		ppm	1		0.0431639
		WD-3-4_02-Nov-2020		ppm	1		0.0397623
		WD-3-5_02-Nov-2020		ppm	1		0.0295865
		WD-3-1_02-Nov-2020	Titanium	ppm	1		8.04
		WD-3-2_02-Nov-2020		ppm	1		6.79
		WD-3-3_02-Nov-2020		ppm	1		26.6
		WD-3-4_02-Nov-2020		ppm	1		8.57
		WD-3-5_02-Nov-2020		ppm	1		11.5
		WD-3-1_02-Nov-2020	Tungsten	ppm	1		0.0637706
		WD-3-2_02-Nov-2020		ppm	1		0.0276847
		WD-3-3_02-Nov-2020		ppm	1		0.0319319
		WD-3-4_02-Nov-2020		ppm	1		0.0346852
		WD-3-5_02-Nov-2020		ppm	1		0.0291382
		WD-3-1_02-Nov-2020	Uranium	ppm	1		0.026418
		WD-3-2_02-Nov-2020		ppm	1		0.0292175
		WD-3-3_02-Nov-2020		ppm	1		0.0447096
		WD-3-4_02-Nov-2020		ppm	1		0.0305688
		WD-3-5_02-Nov-2020		ppm	1		0.0306331

Location	Category	Sample ID	Parameter	Units	Fall 2020		
					Total Count	Count (<RDL and uncensored)	Value
		WD-3-1_02-Nov-2020	Vanadium	ppm	1		0.094309
		WD-3-2_02-Nov-2020		ppm	1		0.087989
		WD-3-3_02-Nov-2020		ppm	1		0.1034713
		WD-3-4_02-Nov-2020		ppm	1		0.0830397
		WD-3-5_02-Nov-2020		ppm	1		0.0932695
		WD-3-1_02-Nov-2020	Zinc	ppm	1		8.7
		WD-3-2_02-Nov-2020		ppm	1		18.4
		WD-3-3_02-Nov-2020		ppm	1		11.2
		WD-3-4_02-Nov-2020		ppm	1		31.2
		WD-3-5_02-Nov-2020		ppm	1		18
		WD-3-1_02-Nov-2020	Zirconium	ppm	1		0.59
		WD-3-2_02-Nov-2020		ppm	1		0.425
		WD-3-3_02-Nov-2020		ppm	1		1.06
		WD-3-4_02-Nov-2020		ppm	1		0.52
		WD-3-5_02-Nov-2020		ppm	1		0.56
	Physical/Conventional Characteristics	WD-3-1_02-Nov-2020	Moisture Content	%	1		89.27
		WD-3-2_02-Nov-2020			1		84.15
		WD-3-3_02-Nov-2020			1		84.05
		WD-3-4_02-Nov-2020			1		87.6
		WD-3-5_02-Nov-2020			1		78.16
	Radionuclides	WD-3-1_02-Nov-2020	Carbon-14	Bq/kg-C	1		260
		WD-3-2_02-Nov-2020			1		271
		WD-3-3_02-Nov-2020			1		333
		WD-3-4_02-Nov-2020			1		326
		WD-3-5_02-Nov-2020			1		233