



SWAN HILLS TREATMENT CENTRE

2025 Environmental Monitoring Program

Annual Report

Executive Summary

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1 INTRODUCTION

The Swan Hills Treatment Centre (SHTC) (Figure 1-1) provides comprehensive treatment and disposal capabilities for hazardous wastes. The SHTC is owned by the Alberta Government and was operated in 2025 by Veolia Waste Services Alberta Inc. (Veolia) under an operating contract with Alberta Infrastructure.

The SHTC is located approximately 17 kilometers northeast of the Town of Swan Hills, as shown in Figure 1-2.



Figure 1-1: Swan Hills Treatment Centre

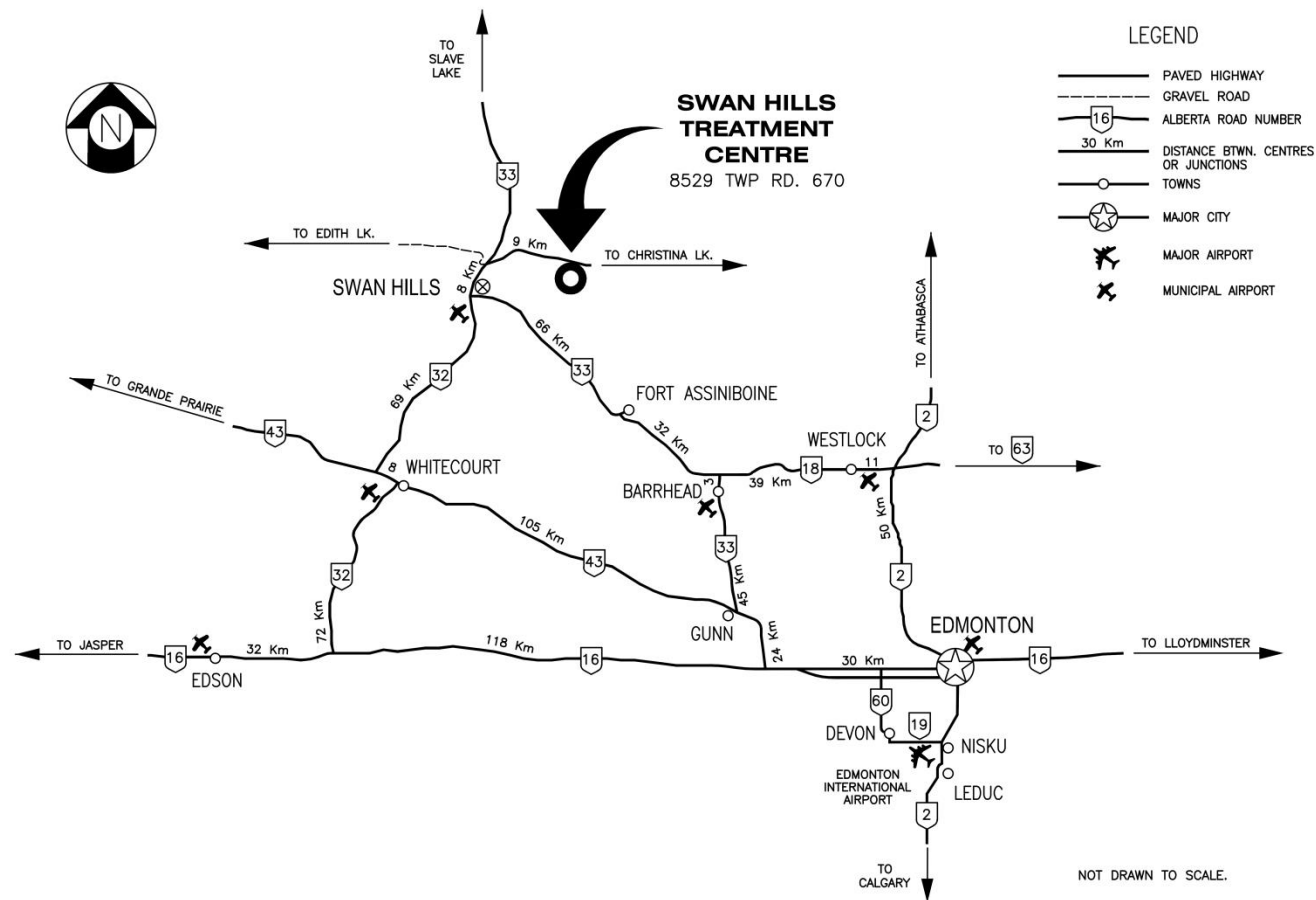


Figure 1-2: Site Location Map

A thorough environmental baseline data collection program was initiated around the SHTC in 1985, two years before it officially commenced operation in 1987. This program has evolved into an extensive environmental monitoring program that provides early detection of potential environmental impacts associated with SHTC operations. The program includes the monitoring of meteorological, air quality, soils, groundwater, vegetation, wildlife, surface water, sediment, and fish. A human health risk assessment, based on consumption of fish from local lakes, is also performed annually.

Key environmental monitoring program (EMP) items include:

Source and On-site Monitoring

Extensive source and on-site monitoring are conducted annually in accordance with Approval 1744-03-00, as amended. Specific requirements include the following:

- Continuous process monitoring and monthly reporting for the following parameters: Waste Feed Rate, Combustion Temperature, Flue Gas Flow Rate and other key incinerator operating parameters.
- Continuous (on-line) monitoring and reporting of stack emissions including Oxygen (O₂) Carbon Dioxide (CO₂) Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Sulphur Dioxide (SO₂) Total Hydrocarbon (THC), Hydrogen Chloride (HCl) and Mercury^a.
- Regular manual stack surveys are performed to ensure that the total particulate, dioxin and furan TEQ, metals and destruction and removal efficiency (DRE) criteria are being achieved.
- Monthly monitoring of Carbon Adsorption Unit (CAU) stack emissions for THC and PCBs
- Containment of all surface water runoff in retention ponds for use as process water. Excess water is released only if it is necessary and must meet the off-site discharge limits.
- Ambient air is monitored for PCBs, Volatile Organic Compounds (VOCs), Total Suspended Particulate (TSP), and Fine Particulate^b (PM_{2.5}) on the plant site and reported monthly (annually for VOCs).

^a Continuous monitoring for Mercury is required by Approval 1744-03-00, as amended. A continuous analyzer installed in 2020 and operational commencing January 01, 2021. The new emission limit for Mercury (20 µg/m³ maximum 24 hr rolling average) became effective January 01, 2023

^b PM_{2.5} monitoring commenced in July 2020

- All spills and releases are reported immediately and cleaned up in accordance with the facility's Emergency Response Plan.
- An on-site Soil Management Plan is conducted in accordance with Alberta Environment and Protected Areas (AEPA) Soil Monitoring Directive. The soil management program addresses on-site contamination in order to: protect workers at the facility; minimize off-site migration of contaminants; and decrease the cost of final site remediation.
- Groundwater Monitoring is conducted at 14 locations around the process area and landfills (upgradient and downgradient). Samples are obtained at three different depths (shallow till, intermediate till and the underlying sandstone) at most locations and results are reported annually.

Off-site Environmental Monitoring Program (EMP)

A comprehensive off-site environmental monitoring program is also conducted annually. This program was initiated two years prior to operation and includes a wide range of environmental receptors. Results are compared with pre-operational data and data collected at reference locations. In addition to reporting the results of the air monitoring and groundwater monitoring programs noted above, the program includes the following components:

- Soil – organic soils predominate in the Swan Hills area and the live moss layer is sampled and analyzed annually. The live moss layer provides information on contaminants accumulating in surface soils (2 – 3 years).
- Vegetation - Labrador tea is used as an indicator species based on its wide distribution in the Swan Hills region and its demonstrated ability to retain contaminants on its leaves. It provides annual data on contaminant deposition and distribution around the SHTC. Moss bags are used to monitor metals deposition and lichen health is assessed biannually.
- Wildlife – Red-backed Voles are considered an ideal indicator of potential impacts on wildlife receptors given their small home ranges, high reproduction potential, diet, and habitat. These characteristics provide the opportunity to assess both contaminant levels and population effects.
- Water Quality – local streams and surface water bodies are monitored annually to assess potential impacts on water quality.
- Sediment – many of the contaminants processed at the facility have low solubility in water and can be persistent in the environment. Sediment provides a sensitive media to monitor potential accumulation and impacts associated with these types of compounds.

- Fish – can accumulate contaminants in their tissue and represent a potential pathway for human risk through consumption. Fish tissue is monitored for contaminant levels annually.
- Toxicology and Risk Assessment – Monitoring data are reviewed annually and a human health risk assessment is completed based on fish consumption from monitored lakes.

The monitoring program results are compiled annually and reviewed with regulatory authorities and regional stakeholders. The program is dynamic, and changes are made to the scope and methodology, as required, to maintain its effectiveness.

The environmental monitoring program has been rationalized to focus on a subset of the historic monitoring plots along with a more comprehensive analytical scope. To ensure potential issues are not overlooked, the program is expanded on a 5-year cycle to include both additional monitoring locations and chemical parameters/contaminants. Expanded monitoring has been conducted in 2004, 2009, 2014; 2019, and 2024. The next expanded monitoring program will be performed in 2029. In addition, a series of receptor-specific “triggers” that require additional data collection, were established and are reviewed annually to provide early response to address emerging trends or to respond to specific incidents.

The overall analytical scope of the environmental monitoring program includes PCB, PCDD/F, TEQ, and metals. Additional groups of compounds are added to the program during “Expanded” monitoring years. In the past, these have included Polycyclic Aromatic Hydrocarbons (PAHs), Semi-Volatile Organic Compounds (SVOCs), as well as inclusion of PCDD/F, metals, and VOCs in receptors not included in the annual program scope. To date, these additional analyses have not identified any potential issues that warrant annual surveillance.

- The most significant contaminants identified in the monitoring program include polychlorinated biphenyls (PCBs) and dioxins and furans (PCDD/F). Both include a range of congeners that exhibit slightly different characteristics (e.g. volatility, solubility and toxicity) based on the number and position of chlorine atoms in their structure. There are 209 different PCBs, 75 dioxins and 135 furans. The analytical procedures have been continually upgraded in the monitoring program and these compounds are analyzed using the most sophisticated and sensitive methods available. As a result, the program interprets the data as follows: PCBs are analyzed by high-resolution mass spectrometry that can identify individual PCB congeners. The term PCB denotes the total of all 209 potential congeners identified within the sample.
- Dioxins/Furans – these compounds are reported together because they are very similar and exhibit toxicity through a similar mechanism. However, the toxicity of individual dioxin/furan congeners varies significantly based on the location and number of chlorine atoms in its structure. The most

toxic dioxin is 2,3,7,8 tetra-chloro dibenzodioxin (2,3,7,8 TCDD). The World Health Organization supports a methodology whereby the toxicity of this group of compounds can be interpreted by using Toxicity Equivalent Factors (TEFs) to calculate the overall toxicity relative to 2,3,7,8 TCDD. There are 7 dioxins and 10 furans that contribute to the toxicity associated with this group of chemicals. Each of the toxic congeners is multiplied by its respective TEF to establish the overall toxicity represented by the analytical result (i.e. PCDD/F TEQ).

- Toxic PCBs – twelve PCB congeners have been shown to exhibit similar toxicity as the toxic dioxins and furans. TEFs have been established for these congeners and the results are reported as PCB TEQ.
- Total TEQ – because toxic dioxins, furans and PCBs all exhibit their toxicity through the same mechanism, the combined toxicity of a sample is expressed as its Total TEQ. This simply represents the sum of the PCDD/F TEQ and the PCB TEQ results. Toxicity assessments conducted in this report are all conducted using Total TEQ.
- Polycyclic Aromatic Hydrocarbons (PAHs) – are organic compounds containing only carbon and hydrogen and are composed of multiple aromatic (benzene) rings. They include over 100 different chemicals that can occur naturally in coal, tar and crude oil or can be formed during the incomplete burning of organic substances. They are ubiquitous and are found in tobacco or on charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds. Some PAHs are manufactured for use in the manufacture of medicines, dyes, plastics, and pesticides. Several of the PAHs and some specific mixtures of PAHs are considered to be cancer-causing chemicals.
- Volatile Organic Compounds (VOCs) –include organic (carbon-based) chemical compounds that can evaporate into the atmosphere under normal indoor conditions of temperature and pressure. Some common examples include solvents, fuels and individual compounds such as toluene, xylenes, benzene, ethylbenzene, and formaldehyde. In addition, VOCs may also include chlorine and fluorine atoms which significantly change their chemical properties. Common examples include dry-cleaning solvents and chloro-fluorocarbons (freon). VOCs of interest from an environmental or human health risk perspective are commonly analyzed as a group. When monitoring for VOCs, they can be reported as a group (i.e. total VOC)) or speciated to provide a list of individual compounds.
- Semi-Volatile Organic Compounds (SVOCs) – are not as volatile as VOCs and generally include larger molecules with more carbon atoms. They include common materials such as pesticides,

plasticizers, and fire retardants. Like VOCs, SVOCs of interest from an environmental or human health risk perspective are commonly analyzed as a group. When monitoring for SVOCs, a list of the individual compounds included in the analysis is provided in the report.

The following provides an overview of SHTC operations and presents a summary of the results for both on-site and environmental monitoring programs conducted in 2025. The scope of individual monitoring components is presented along with any proposed changes for implementation in 2026. Detailed information including sampling and analytical methods, QA/QC procedures, statistical analysis and interpretation of results, supporting data and recommendations are all presented in the Annual Report.

Please note: The summary of the fish tissue monitoring results and human health risk assessment will not be included in this report due to fish tissue sample shipping issues. We have received an extension for the final report submissions, which are now due by September 30, 2026.

2 OPERATIONS

The Swan Hills Treatment Centre employs a variety of processes to treat hazardous waste. These include the following:

Incineration: The FBD Incinerator is the primary process unit with a capability of treating approximately 35,000 tonnes per year.

Physical/Chemical Treatment: Inorganic liquid wastes are treated through a variety of processes including neutralization, oxidation, reduction, phase separation and precipitation in the physical/chemical treatment plant.

Stabilization: The Stabilization plant treats heavy metal contaminated fly ash from the FBD Incinerator, by immobilizing the hazardous constituents in a cement-like matrix. The end product is an inert, non-hazardous solid.

The non-hazardous solid residues resulting from treatment are disposed in secure, onsite landfills and liquid residuals are sent to the onsite disposal well.

2.1 2025 Operations

The Swan Hills Treatment Centre has treated over 482,000 tonnes of commercial hazardous waste since commencing operations in 1987 (Figure 2-1). In 2025, approximately 1,154 tonnes of hazardous waste were treated including:

- 11 tonnes of PCBs
- 350 tonnes of Plant Generated, Decommissioning and Secondary Waste of which 48 tonnes were sent for off-site disposal/recycling
- 800 tonnes of Biomedical Waste (includes pharmaceuticals and expired medication)

The SHTC accepted all waste streams until May 31, 2021 when it moved to the base scope operation.

The base scope allowed for 1,500 tonnes of commercial waste (300 tonnes of high-level PCB waste and 1,200 tonnes of Alberta Biomedical & Pharmaceutical waste) to be processed each fiscal year (April – March).

Waste streams that had no alternate option for disposal or waste from special projects were approved by Alberta Infrastructure through a change order.

Effective January 1, 2026 waste is no longer to be accepted at the Swan Hills Treatment Centre. Operations can continue for processing inventoried waste.

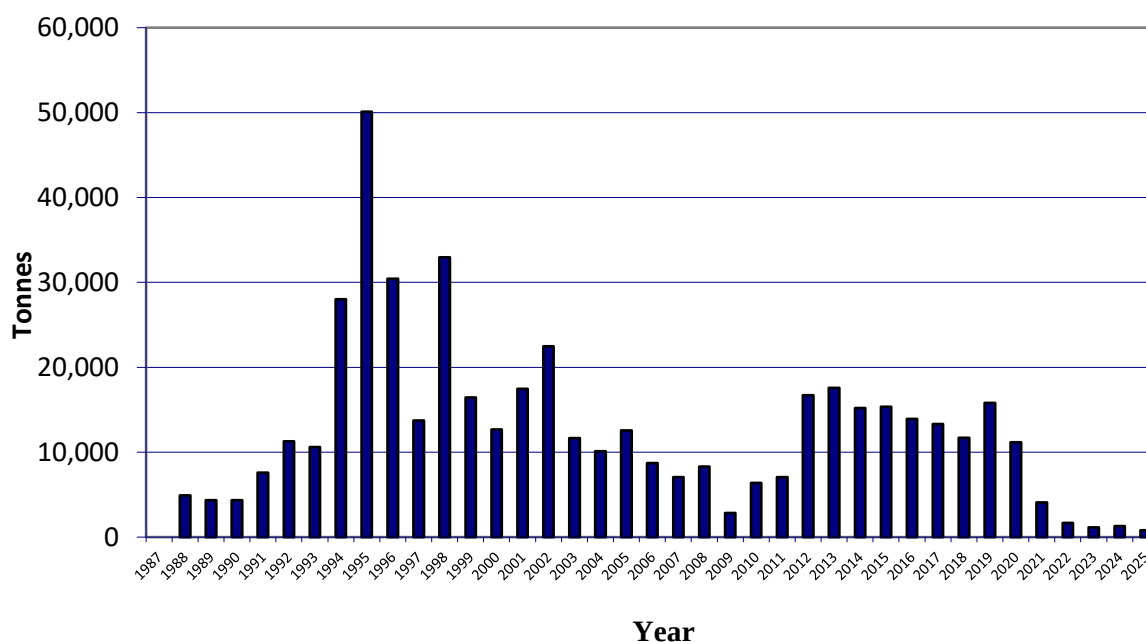


Figure 2-1: Commercial Waste Treatment Summary

Significant events and achievements in 2025 included the following:

- The FBD Incinerator was operational for approximately 6973 hours between January 1 and December 31, 2025.
- There were two scheduled maintenance shutdowns of the FBD Incinerator from May 5 to May 9 and July 14 to August 15.
 - The May 5 - May 9 maintenance included: baghouse metal and bag inspection; crack repairs completed on the spray dryer shell.
 - The July 14 - August 15 maintenance included: baghouse bag replacement and metal repair; deslagger chain and flight replacement. Projects included: DCS PCU 5 and 15 replacement, apron feeder inspection and repair plan, glycol cooling system valves and pump replacement, mercury analyzer and stack analyzer quarterly maintenance.
- A forest fire near the town of Swan Hills resulted in an evacuation of the facility. The incinerator was shutdown and the facility was unmanned for the majority of the time between May 26 and June 8, 2025.

- Site improvements included: completed underground firewater loop restoration; set up the HovaCAL for moisture calibration; demolition of disposal well surge tank at Water Treatment Plant; lab hot water tank replacement; biomed AC duct extension; removal of obsolete piping from WTP to the S/S plant including the removing glycol lines, caustic line, instrument air line, redundant piping, disconnected lines, and unused pipe rack structures; implemented the 5-minute rolling average and 24-hour rolling average alarms for mercury on the DCS.

2.2 2025 Manual Stack Surveys

The manual stack survey conducted April 22-24, assessed incinerator performance while processing hazardous waste. The scope of the survey is based on the waste-specific requirements as noted in Table 2-1.

Table 2-1: 2025 Manual Stack Survey Results

Parameter	Operating Approval Limit	Result
PCDD/F TEQ ^{1,2,3} (dry @ 11% O ₂)	80 pg/m ³	Average = 0.294 pg/m ³ Test 1 = 0.257 pg/m ³ Test 2 = 0.368 pg/m ³ Test 3 = 0.258 pg/m ³
Mercury (dry @ 11% O ₂)	20 µg/m ³	2.19 µg/m ³
HCl (dry @ 11% O ₂)	75 mg/m ³	0.024 mg/m ³
SO ₂ (dry @ 11% O ₂)	325 mg/m ³	0.355 mg/m ³
CO (dry @ 11% O ₂)	57 mg/m ³	<4.71 mg/m ³

¹ DRE – Primary Organic Hazardous Constituent

² PCDD/F TEQ – Dioxin/Furan Toxic Equivalent

³ When analytical results were < Method Detection Limit (MDL), the MDL was used to calculate concentrations and emission results.

⁴ The results of each test are listed to satisfy AEPA reporting requirements

2.3 2025 Process Monitoring Activities

- Successful relative accuracy test audits (RATA) were performed on the continuous stack emission monitoring systems (CEMS), for all parameters except for mercury, to verify the emission monitors are calibrated and reporting accurate data.
- The issues completing a successful RATA on the mercury analyzer continued throughout 2025. While the averages of the entire RATA match the stack testing company's values, the individual test results do not match. We are working with our consultants to request a CEMS code variance.
- Two cylinder gas audits (CGA) were performed in 2025.
- The CEMS Code (AEPA 2021^c) requires that the CEMS and Quality Assurance Manual be audited on an annual basis. In 2025, Global Analyzer Systems Ltd. completed this audit on August 26-27.
- The Air Monitoring Directive, Chapter 5, Quality System (AEPA 2016^d) requires that the Ambient Air Monitoring Quality Manual be audited every three years. In 2023, Global Analyzer Systems Ltd. completed this audit on August 16-17. The next audit will be done in 2026.
- The annual fugitive emission survey was conducted at the Organic Tank Farm. None of the components were found to be leaking.
- There was one vent cap release reported in 2025. The emergency vent cap is a safety device that prevents hot combustion gases from damaging the pollution control system in the event an emergency shutdown is required. An emergency shutdown is a controlled event that terminates waste feeds prior to implementing a sequence of steps (including vent cap openings) to ensure worker safety and equipment integrity is protected.
- Stack exhausts from buildings equipped with activated carbon air management systems are monitored, monthly, for PCBs and THC to evaluate the performance of the fugitive emission control systems. These include the Organic Tank Farm, Heated Storage Building and the FBD Incinerator Feed and Container Staging buildings. In 2025, there were no exceedances of the 6.0 µg/m³ PCB limit or 500 ppm THC limits.
- The SHTC did not receive any air-related complaints in 2025.

^c AEPA, 2021. "Continuous Emissions Monitoring System (CEMS) Code." Alberta Environmental and Protected Areas, Edmonton, AB, 111 pp.

^d AEPA, 2016, "Air Monitoring Directive (AMD), Chapter 5, Quality System." Alberta Environmental and Protected Areas, Edmonton, AB, 19 pp.

- The annual bottom hole survey and packer isolation test on the Deepwell were completed as per AER Approval 7742 confirming that the Class 1a injection well is in good mechanical condition. A successful Packer Isolation Test was performed August 5. The pressure survey was completed August 6-18. Since the well workover and acid stimulation in 2021, the injection flow rate was restored to over 30 m³/hr and has not deteriorated since. No mechanical repairs are required or anticipated in the upcoming operating year. The well and reservoir continue to operate under gravity injection, have surplus injection capability, and the well and reservoir should be able to handle the plant's disposal requirements for the near future and reservoir fill up is not a concern. At injection volumes of 25.5 10³m³/year (2021 - 2025 volume), it will take close to 100 years to reach a reservoir pressure of 14,900 kPag (i.e., 120% of initial reservoir pressure).

3 ON-SITE MONITORING

On-site monitoring conducted at the SHTC includes ambient air and groundwater monitoring in accordance with requirements specified in Approval 1744-03-00, as amended. In addition, regular soils monitoring, and management programs are conducted in accordance with Alberta's Soil Monitoring Directive (AENV 2009^e). Monitoring results and soil management program activities undertaken in 2025 are discussed in the following sections.

3.1 Ambient Air Monitoring

The ambient air monitoring program consists of monitoring PCB levels in ambient air at five locations, total suspended particulate (TSP) at two locations, fine particulate (PM_{2.5}) at three locations, and total hydrocarbons (THC) and volatile organic compounds (VOCs) at one location, as shown in Figure 3-1. One sampling site (E1) is located within the waste processing area, while the others are along the fenceline of the facility, or near the property boundary (Site 11). Ambient PCB, TSP, and PM_{2.5} levels are obtained monthly and THC and VOC monitoring at the Organic Tank Farm (OTF) is conducted annually.

Meteorological data is collected continuously at the Air Quality Monitoring (AQM) Station (Site 11) located southeast of the SHTC as shown in Figure 3-1. The meteorological parameters of interest for ambient air monitoring include hourly average values for ambient temperatures at a 2 m height, wind velocity and direction at a 30 m height. The predominant wind directions in 2025 were from the northwest and west-northwest at 30m which is typical for the Swan Hills region (Veolia 2026^f). Average wind speeds at the 30 m level were 18.0 km/hr, which are similar to observations from previous years. The average monthly temperature recorded at the AQM Station ranged between –15.8°C in December and 15.6°C in August.

Polychlorinated biphenyls (PCBs) sampling was conducted monthly with 100% data completeness in 2025. Ambient air PCB monitoring results at the SHTC for the period 2016-2025 are presented in Figure 3-2. results are summarized below. Alberta has an occupational health objective for PCBs to protect workers but does not have an ambient air quality objective. To help place these results into perspective, the Alberta Occupational Health and Safety 8-hour exposure limit is 500,000 ng/m³ (Aroclor 1254). In addition, some jurisdictions (e.g. Ontario), have established ambient air quality objectives. The Ontario 24-hour average and annual average ambient air quality objectives for PCBs are 150 ng/m³ and 35 ng/m³, respectively.

^e AENV, 2009. "Soil Monitoring Directive", Alberta Environment and Protected Areas, 32 pp

^f Veolia, 2026. "2025 SHTC Meteorological Report", Veolia Waste Services Alberta Ltd., Swan Hills, AB, 30 pp

The following observations were noted:

- Individual Site average PCB concentrations increased slightly at Site 5A and E1 and remained the same at Site 1, and 11, Site 2A decreased slightly compared to 2024 annual averages.
- The average PCB concentration at Site E1 increased slightly from 11.83 ng/m³ to 12.12 ng/m³ between 2024 and 2025. The highest PCB concentration at Site E1 was 29.52 ng/m³ detected on August 12th, 2025.
- The average fenceline PCB concentration (the average of sites 1, 2A, and 5A) was 1.25 ng/m³ which was slightly lower than in 2024 (1.26 ng/m³). The highest fenceline 24-hour Average PCB concentration in 2025 was 2.80 ng/m³ measured on June 12, 2025.
- Ambient PCB levels were lowest at Site 11 (New AQM). The average 24-hour concentration was 0.91 ng/m³ and the maximum 24-hour level reported was 0.91 ng/m³, which is the laboratory detection limit.
- Consistent with previous observations, PCB levels tended to be higher during the warm summer months.
- All 24-hour PCB measurements on plant site were well below the Occupational Health and Safety limit of 500,000 ng/m³ (Aroclor 1254). No exceedances of Veolia's fenceline trigger level of 150 ng/m³ were observed in 2025.

Total Suspended Particulate (TSP) sampling was conducted at two sites (Site 1 and Site 9, Figure 3-1) on the same monthly schedule as PCBs. There were no exceedances of the Alberta Ambient Air Quality Objective for TSP (100 µg/m³) for samples collected.

Fine Particulate (PM_{2.5}) sampling was conducted at three sites (Site 1, Site 5A, and Site 9, Figure 3-1) on the same monthly schedule as PCBs. No exceedances of the Alberta Environment Air Monitoring Directive 24-hour PM_{2.5} ambient air quality objective of 29 µg/m³ were measured at Site 1, Site 5A, or Site 9.

Volatile Organic Compounds (VOC) and Total Hydrocarbons (THC) sampling was conducted at the Organic Tank Farm (Site E1) once in 2025 as specified in the Approval. The total VOC and THC concentrations are presented in Table 3-1. There are no Approval limits for these parameters; however, both VOC and THC were below the monitoring program "trigger" values of 3 ppm and 5 ppm, respectively.

Table 3-1: VOC and THC Results at Site E1 (2025)

Date	Average Temperature (°C)	Total VOC Concentration (ppm)	Total THC Concentration (ppm)
Trigger Limit	n/a	3	5
04-Jul-25	18.9	0.014	1.74

The individual VOCs are summarized and compared to the Alberta Ambient Air Quality Objectives in Table 3-2.

Table 3-2: 2025 Site E1 VOC Canister Analysis Results Compared to the Alberta Ambient Air Quality Objective^g

Parameter	Reporting Units	Objective	Reported Result
Hydrocarbons, Total (as Methane)	ppmv		1.74
1-Butene	ppmv		<0.10
Acetylene	ppmv		<0.08
cis-2-Butene	ppmv		<0.04
Ethane	ppmv		<0.1
Ethylacetylene	ppmv		<0.06
Ethylene	ppmv		<0.07
Isobutane	ppmv		<0.1
Isobutylene	ppmv		<0.1
Methane	ppmv		1.7
n-Butane	ppmv		<0.2
n-Propane	ppmv		<0.07
Propylene	ppmv		<0.1
Propyne	ppmv		<0.1
trans-2-Butene	ppmv		<0.09
1,1,1-Trichloroethane	ppbv		<0.02
1,1,2,2-Tetrachloroethane	ppbv		<0.02

Parameter	Reporting Units	Objective	Reported Result
1,1,2-Trichloroethane	ppbv		<0.02
1,1-Dichloroethane	ppbv		<0.02
1,1-Dichloroethylene	ppbv		<0.02
1,2,3-Trimethylbenzene	ppbv		<0.05
1,2,4-Trichlorobenzene	ppbv		<0.3
1,2,4-Trimethylbenzene	ppbv		<0.03
1,2-Dibromoethane	ppbv		<0.02
1,2-Dichlorobenzene	ppbv		<0.03
1,2-Dichloroethane	ppbv		<0.03
1,2-Dichloropropane	ppbv		<0.03
1,3,5-Trimethylbenzene	ppbv		<0.03
1,3-Butadiene	ppbv		<0.03
1,3-Dichlorobenzene	ppbv		<0.4
1,4-Dichlorobenzene	ppbv		<0.4
1,4-Dioxane	ppbv		<0.5
1-Butene/Isobutylene	ppbv		1.48
1-Hexene/2-Methyl-1-pentene	ppbv		0.17
1-Pentene	ppbv		0.37
2,2,4-Trimethylpentane	ppbv		<0.02

Parameter	Reporting Units	Objective	Reported Result
2,2-Dimethylbutane	ppbv		<0.02
2,3,4-Trimethylpentane	ppbv		<0.02
2,3-Dimethylbutane	ppbv		<0.09
2,3-Dimethylpentane	ppbv		<0.02
2,4-Dimethylpentane	ppbv		<0.03
2-Methylheptane	ppbv		<0.02
2-Methylhexane	ppbv		<0.03
2-Methylpentane	ppbv		<0.02
3-Methylheptane	ppbv		<0.03
3-Methylhexane	ppbv		<0.02
3-Methylpentane	ppbv		<0.02
Acetone	ppbv	2,400 (1-hr)	5.1
Acrolein	ppbv	1.9 (1-hr) 0.17 (24-hr)	0.8
Benzene	ppbv	9.0 (1-hr)	0.19
Benzyl chloride	ppbv		<0.3
Bromodichloromethane	ppbv		<0.03
Bromoform	ppbv		<0.02
Bromomethane	ppbv		<0.02
Carbon disulfide	ppbv	10 (1-hr)	<0.02

^g AEPA, 2024. “Alberta Ambient Air Quality Objectives and Guidelines Summary”, Alberta Environment and Parks, 10pp

Parameter	Reporting Units	Objective	Reported Result
Carbon tetrachloride	ppbv		0.07
Chlorobenzene	ppbv		<0.02
Chloroethane	ppbv		<0.02
Chloroform	ppbv		<0.02
Chloromethane	ppbv		0.86
cis-1,2-Dichloroethene	ppbv		<0.02
cis-1,3-Dichloropropene	ppbv		<0.03
cis-2-Butene	ppbv		0.15
cis-2-Pentene	ppbv		<0.02
Cyclohexane	ppbv		<0.04
Cyclopentane	ppbv		<0.02
Dibromochloromethane	ppbv		<0.02
Ethanol	ppbv		2.4
Ethyl acetate	ppbv		<0.3
Ethylbenzene	ppbv	460 (1-hr)	<0.03
Freon-11	ppbv		0.30
Freon-113	ppbv		0.039
Freon-114	ppbv		<0.03
Freon-12	ppbv		0.65
Hexachloro-1,3-butadiene	ppbv		<0.3
Isobutane	ppbv		<0.03
Isopentane	ppbv		<0.04

Parameter	Reporting Units	Objective	Reported Result
Isoprene	ppbv		0.49
Isopropyl alcohol	ppbv		<0.3
Isopropylbenzene	ppbv		<0.04
m,p-Xylene	ppbv	530 (1-hr) 161 (24-hr)	<0.04
m-Diethylbenzene	ppbv		<0.02
m-Ethyltoluene	ppbv		<0.03
Methyl butyl ketone	ppbv		<0.4
Methyl ethyl ketone	ppbv		<0.3
Methyl isobutyl ketone	ppbv		<0.3
Methyl methacrylate	ppbv		<0.08
Methyl tert butyl ether	ppbv		<0.03
Methylcyclohexane	ppbv		<0.02
Methylcyclopentane	ppbv		<0.05
Methylene chloride	ppbv		<0.3
n-Butane	ppbv		0.23
n-Decane	ppbv		<0.06
n-Dodecane	ppbv		<0.3
n-Heptane	ppbv		<0.04
n-Hexane	ppbv	5,960 (1-hr) 1,990 (24-hr)	<0.03
n-Nonane	ppbv		<0.04

Parameter	Reporting Units	Objective	Reported Result
n-Octane	ppbv		<0.02
n-Pentane	ppbv		0.06
n-Propylbenzene	ppbv		<0.06
n-Undecane	ppbv		<0.5
Naphthalene	ppbv		<0.3
o-Ethyltoluene	ppbv		<0.02
o-Xylene	ppbv	530 (1-hr) 161 (24-hr)	0.14
p-Diethylbenzene	ppbv		<0.02
p-Ethyltoluene	ppbv		<0.04
Styrene	ppbv	52 (1-hr)	<0.04
Tetrachloroethylene	ppbv		<0.02
Tetrahydrofuran	ppbv		<0.3
Toluene	ppbv	499 (1-hr) 106 (24-hr)	0.06
trans-1,2-Dichloroethylene	ppbv		<0.06
trans-1,3-Dichloropropylene	ppbv		<0.02
trans-2-Butene	ppbv		0.17
trans-2-Pentene	ppbv		0.05
Trichloroethylene	ppbv		<0.02
Vinyl acetate	ppbv		<0.3
Vinyl chloride	ppbv	51 (1-hr)	<0.02

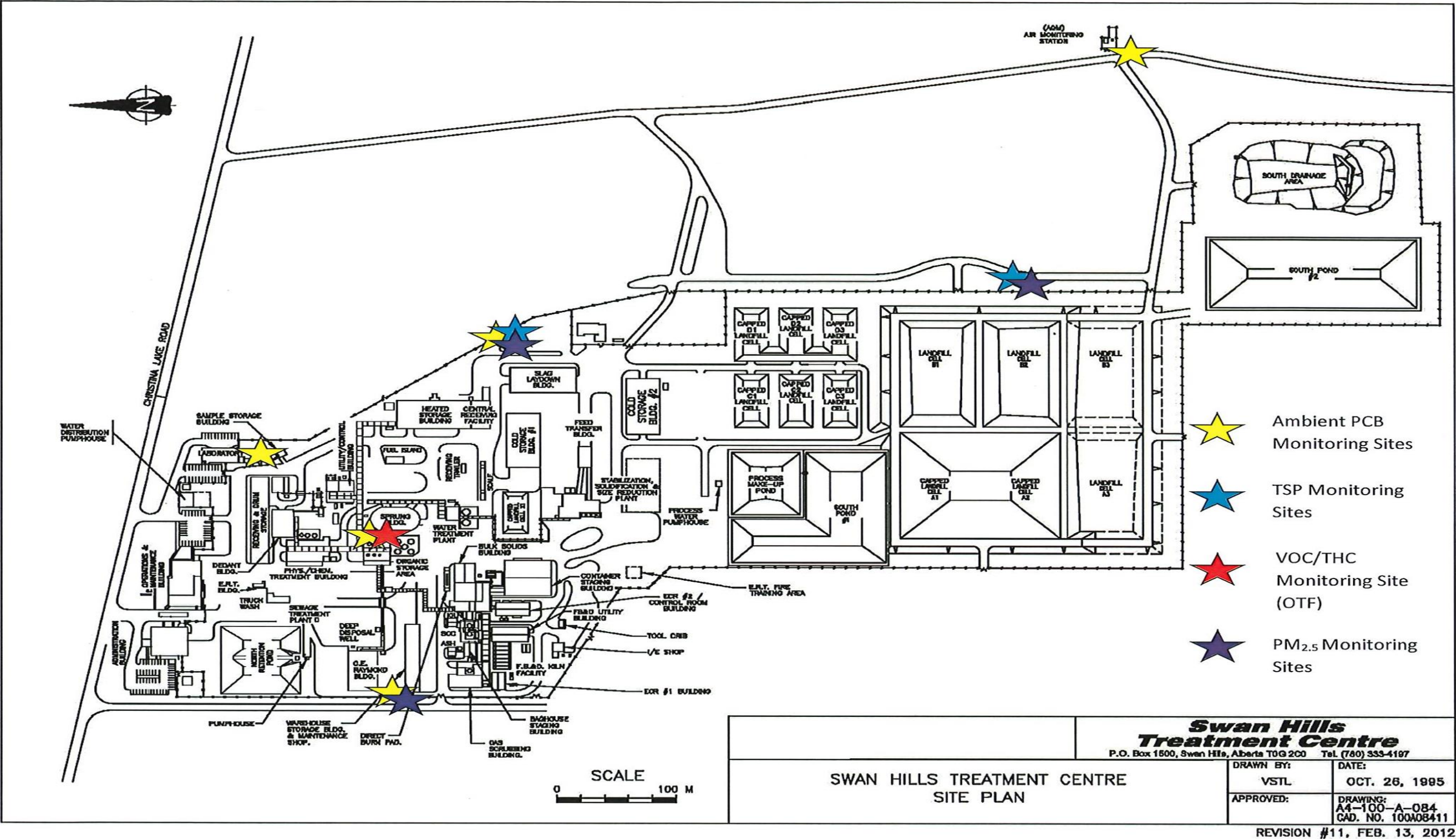


Figure 3-1: SHTC Site Plan Locations of Air Monitoring Stations

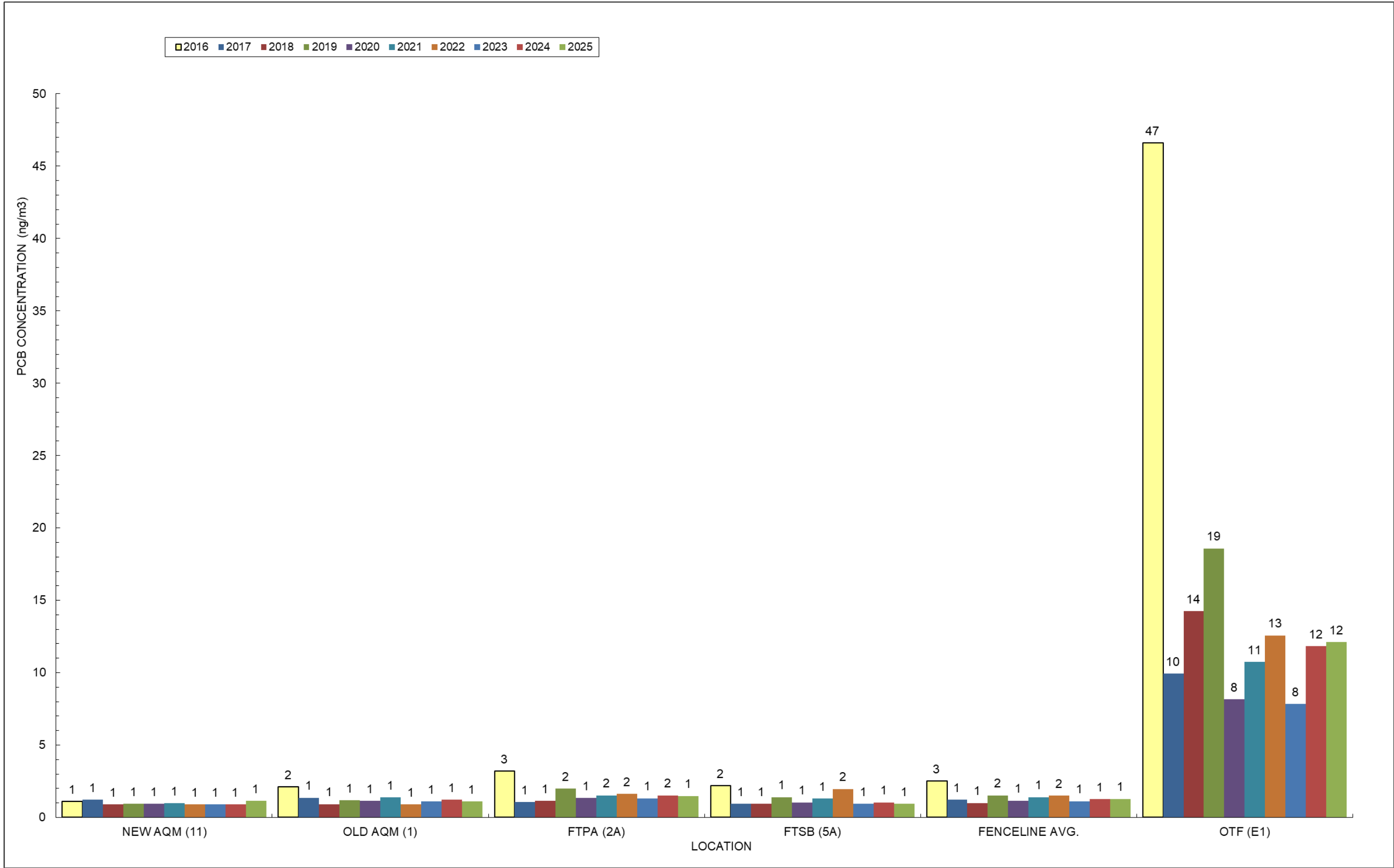


Figure 3-2: Ambient Air PCB Monitoring Results (2016-2025)

3.2 Soil Management Program

Alberta's Soil Monitoring Directive requires all industrial Approval holders to conduct on-site soil monitoring and management programs (if necessary) to address potential contamination resulting from operations. The first on-site Soil Monitoring Program (SMP) was completed in 1998 and subsequent SMPs have been completed every five years (2002, 2007, 2012, 2017, and 2019) in compliance with the Directive. Soil management programs (SMaPs) are undertaken to manage any identified on-site contamination to protect worker safety and minimize the potential for off-site migration.

The Soil Monitoring Program Proposal was submitted before May 30, 2025 and implemented after September 27, 2025. The sampling was performed November 17 21, 2025. The final report will be submitted before May 30, 2026. Preliminary reports show similar results to previous sampling events.

3.3 Groundwater Monitoring

Three depth intervals are monitored. The shallow and intermediate intervals monitor groundwater in the surficial till deposits. The sandstone interval monitors the groundwater in the Paskapoo Formation between 50 and 90 metres below ground surface (mBGS).

The groundwater flow in the shallow and intermediate intervals is generally to the east at an estimated velocity of 0.014 metres per year (m/yr) for the shallow till and 0.022 m/yr for the deeper till (intermediate interval wells). The groundwater flow in the sandstone interval is generally to the south. The flow velocity in 2025 is 16.26 m/yr.

The following presents the key findings of the 2025 groundwater monitoring program. The specific locations are referenced by the well location number and its depth interval with the following designations (SH=Shallow, IN=Intermediate, SS=Sandstone). Well locations and notable results are presented in Figures 3-3 – 3-5:

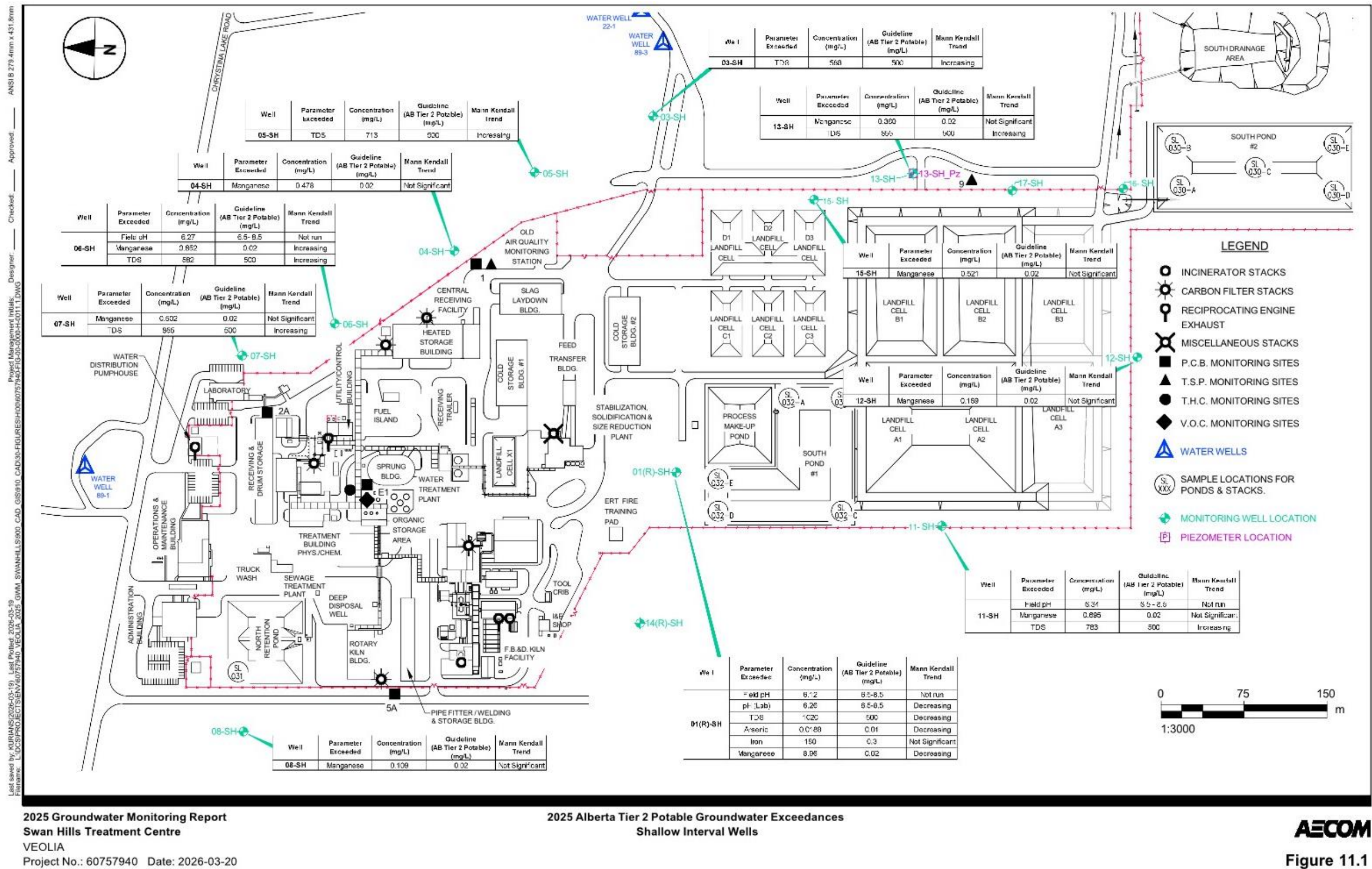
Based on the 2025 groundwater monitoring, the following conclusions can be made:

- Petroleum hydrocarbon (BTEX, PHC F1) concentrations were below the laboratory detection limit for all wells sampled in 2025, with the exception of 01(R)-SH, which had results at or above the detection limit but below applicable guidelines for benzene, toluene, ethylbenzene and F1 (C6-C10).
- Polychlorinated Biphenyl (PCB) Aroclor and total PCB concentrations were below the laboratory detection limit for all wells sampled in 2025.
- Adsorbable Organic Halogen (AOX) results were below the laboratory detection limit for all select wells tested .

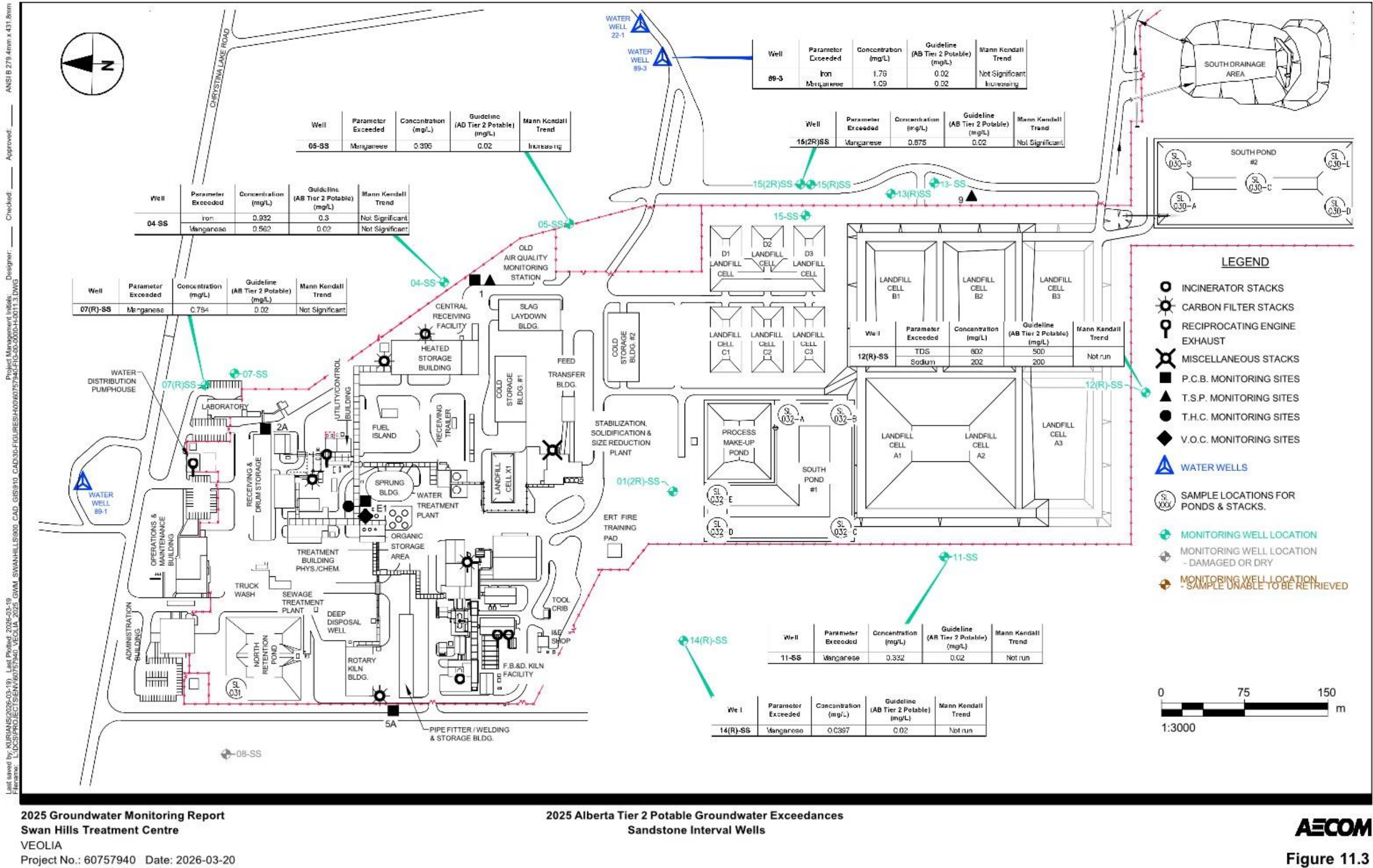
- Twelve of the wells completed in the till interval (shallow and intermediate wells) have Total Dissolved Solids (TDS) concentrations above the Alberta Tier II Potable Groundwater Guidelines. For all 12 wells these concentrations are consistent with baseline and/or historical observations, as well as expected TDS concentrations for a till lithology.
- Manganese concentrations exceeding the Alberta Tier II Potable Groundwater Guideline were observed in all monitoring wells except 01(2R)-SS, 03-SH, 03-IN, 05-SH, 12(R)-SS, 13(R)-SS, 16-SH, and 17-SH. Manganese concentrations have been measured since the 1990s and have typically exceeded the guideline in both up- gradient and down-gradient wells; therefore, it is likely naturally occurring. Manganese concentrations above the Alberta Tier II Potable Guideline for Commercial/Industrial Land Use (0.02 milligrams per litre; mg/L) in till are of little concern since this source is not capable of supporting a potable water supply.
- Elevated iron and manganese concentrations may be a result of biological activity. Orange and black residues and/or oxidation was noted on several bladder pumps and tubing during well maintenance in May 2014. Iron reducing bacteria (IRB) tests from 2015 confirmed the presence of anaerobic iron related and enteric bacteria in monitoring wells 01A-SH, 01A-IN, 04-IN, 04-SS, 07-SH, 07-IN, and 16-SH.
- The elevated chloride concentrations in 07-SH may be caused by infiltration of run-off containing road salt from the adjacent parking lot and road. Increasing chloride trends are observed in 07-SH in 2025, although the concentration is less than last year's result and is below the guideline in 2025 (205 mg/L). Monitoring well 07-SH is located in a low-lying area adjacent to a road. 01A-SH had elevated chloride concentrations and was decommissioned in January 2025. It's replacement 01(R)-SH had a chloride concentration an order of magnitude below the guideline in 2025. Monitoring well 17-SH had an increase in chloride concentration in 2015 compared to historical results, but the level is well below the guideline and has been falling in the following years. Monitoring wells 05-SH and 08-SH have increasing trends but both are an order of magnitude below the guideline.
- In connection to the 2022 Annual Groundwater Monitoring Report (AECOM, 2023a), a groundwater monitoring well network condition report and sandstone groundwater monitoring well replacement plan was developed by AECOM (AECOM, 2023b), which summarized well network maintenance recommendations based on 2022 field observations and outlines the sandstone wells needing replacement with locations and rationales provided. Veolia and AECOM carried out this program in 2025 by abandoning dry or damaged wells and installing new monitoring wells. Further details can be found in the *2025 Groundwater Monitoring Well Network - Well Replacement Program* report (AECOM, 2025). A summary of the activities are:

- In January and February 2025, wells 01A-SH and 01A-SS were decommissioned and replaced with 01(R)-SH and 01(2R)-SS. Wells 14-SH, 14-IN and 14-SS (and associated piezometers) were decommissioned and replaced with 14(R)-SH, 14(R)-IN and 14(R)-SS (and associated new piezometers). Well 12-SS was decommissioned and replaced with 12(R)-SS. These wells were included in the 2025 sampling program.
- In November 2025, the following wells were decommissioned: 07-SS (no replacement drilled), 08-SH, 08-IN and 08-SS plus associated piezometers (replaced with 08(R)-SH and 08(R)-IN and associated new piezometers), 13-SH (replaced with 13(R)-SH), 15-SS and 15(R)-SS (current sampling well is 15(2R)-SS). These new wells will be included in the 2026 sampling program.
- In December 2025, a survey of the wells and piezometers on site was conducted by AECOM personnel. Due to technical issues, the following wells and piezometers were unable to be surveyed: 13 series (except for 13-SH), 15-SH, 15-IN, 15-IN_Pz, 16 series and 17 series.
- Monitoring well 01A-IN:
 - The TDS and major ion groundwater chemistry of 01A-IN appears to be affected by rain and surface water infiltration.
 - High Dissolved Organic Carbon (DOC) concentrations may be a result of the composition of the engineered fill, as well as activity at the ERT Fire Training Pad. The high DOC probably results in anaerobic conditions in the monitoring well. It is noted that no Aroclor PCBs or petroleum hydrocarbons were detected in this well, thus the elevated DOC concentrations are from other compounds.
- The following recommendations are made based on the above conclusions and observations made during the fieldwork:
 - If dry piezometers are encountered, the water level in the corresponding well should be measured with clean equipment to verify if the well is dry or if the piezometer is compromised.
 - Review of road salt use at and around the Site and implement alternative measures to address chloride increases at selected locations. Sample surface water in the road ditches upgradient of the Site to investigate the source of the chloride concentration increase in well 07-SH.
 - Alberta Environment and Protected Areas have recommended that dioxins and furans should be sampled for in select shallow wells for three years (2022, 2023 and 2024) as part of the annual monitoring program. As three years of data have been collected and the results are two to three orders of magnitude below the applicable guideline, the monitoring frequency is adjusted to once every five years. The next dioxin and furan sampling event will occur in 2029.

- Conduct groundwater monitoring in the fall of 2026 with the sampling event performed a minimum of one week after the purging event to allow monitoring wells to sufficiently recover.
- Figures 3-3 to 3-5 show the groundwater sample locations and exceedances.







4 TERRESTRIAL ENVIRONMENT

The objective of the terrestrial environmental monitoring program is to assess changes in concentrations of chemicals of concern in the forested area surrounding the SHTC with emphasis on vegetation, soils and wildlife

Based on previous monitoring results, elevated PCB, dioxin (PCDD), and furan (PCDF) concentrations in the live moss, Labrador tea leaves and vole tissue near the SHTC are primarily related to fugitive emissions from the SHTC. Compounds measured in the live moss layer are representative of the cumulative accumulation of these compounds via atmospheric deposition over a period of several years. Labrador tea renews its leaves annually and therefore, results are representative of compounds deposited from the atmosphere over a one-year exposure period (June 2024 – June 2025). Compounds detected in vole tissue are a result of exposure to all potential pathways including inhalation, food consumption and dermal contact throughout their life span. Samples are collected in early June and focus on collection of mature, overwintering adults.

4.1 Soil and Vegetation

The 2025 program included:

- Assessing changes in chemical concentrations within nine annual monitoring plots by collecting vegetation samples and comparing the analytical results to those of previous sampling events:
 - Samples of moss and Labrador tea leaves were collected from each plot and analyzed for inorganic and organic parameters.
- Collecting moss bags from 15 moss bag plots and deploying unexposed moss bags at these plots for collection in the following year:
 - Assessing lichen health at the 15 moss bag plot locations to determine if emissions from the SHTC are having a deleterious effect on air quality as it relates to lichen health.
- Collecting moss bags from three additional sites situated around the SHTC's fenceline.

Changes to the scope for 2025 are outlined below and are consistent with the recommendations made in the February 2025 Technical Meeting and 2024 Soil and Vegetation Monitoring Program Report.

- Annual soil and vegetation plot 117 was shifted to the expanded program.

- Moss Bag plot MB22 was removed from the program, and the moss bag holder was shifted to Plot 114, creating a new moss bag plot titled MB114. A moss bag was deployed at MB114 for the first time in June 2025 to be collected in 2026.
- Overall, the monitoring program indicates that historical emissions from the facility have caused certain metals and polychlorinated compounds to accumulate in the surrounding terrestrial environment. However, current emissions from the SHTC do not appear to result in a continued accumulation of these parameters of concern in the surrounding environment. A nearby forest fire which occurred in the early summer of 2025 appears to have contributed to emissions and deposition of metals, as well as PCBs and PCDD/DF.



The following summarizes the results for 2025

Live Moss

- The median ten-year concentrations of metals (one or more of antimony, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, silver, tin, and zinc) have been elevated at plots near the SHTC (plots 4, 109, and 114). Metal concentrations are below the *Alberta Tier 1 Soil Guidelines* (Tier 1) protective of the eco soil contact pathway providing assurance that current metal levels are not affecting plant productivity and health.
 - At background plots the concentrations of cadmium, copper, and silver were elevated in the live moss. This may be a result of emissions from the nearby forest fire.
 - Aluminum, arsenic, cadmium, chromium, lead, nickel, and zinc were elevated relative to historical values at plot 402. This plot is the furthest downwind of all the monitoring plots with contaminant concentrations typically approaching background levels and it is unlikely that the SHTC is the source of this increase in metals.
 - There was no discernable increase in mercury in the live moss in 2025:
 - The live moss sample collected from plot 4 was extracted and analyzed twice for mercury in 2025. The original result was elevated relative to the historical range but not the concentration in the re-analyzed sample, indicating that the original result may be anomalous.
 - Zinc concentrations in the live moss have increased historically at plots 4, 114, 117, and 123 but have stabilized since 2020.
- Polychlorinated organic compounds (PCBs and PCDD/DF) are most elevated at the plots surrounding the SHTC.
 - PCB concentrations increased at most plots including the background locations in 2025. 2025 PCB concentrations were near or below historical median values at all plots except the background locations.
 - A similar yearly increase was observed in PCDD/DF TEQ and total TEQ values in 2025. There is a decreasing long-term trend in TEQ values at most plots.

Labrador Tea

- The median ten-year concentration of antimony, arsenic, cadmium, chromium, lead, molybdenum, nickel, and zinc are elevated at the plots near the SHTC.
 - Metal concentrations at the background plots were within historical ranges with the exception of zinc concentrations which were elevated relative to historical levels, which may reflect emissions from the nearby forest fire that was active in the early summer of 2025.
 - Aluminum, cadmium, copper, and nickel at plot 114 were elevated in the Labrador tea leaves although all the parameters except for nickel were within the historical range. Nickel concentrations have been elevated but constant between 2020 and 2025.
 - Mercury concentrations were within historical ranges.
 - Zinc concentrations at plots 4, 114, 123, and 402 were elevated in 2025 relative to historical values, but were still within the overall historical range for each plot.
- Polychlorinated organic compounds (PCBs) are elevated at the plots surrounding the SHTC. Whereas there is no current spatial trend observed for the PCDD/DF TEQ (expressed as a total TEQ value).
 - PCB concentrations increased at most plots, between 2024 and 2025, but only the background plots (plot 70 and 71) were elevated relative to the historical range. There is still a long-term decreasing trend in PCB concentrations at all plots.
 - PCB TEQ values also increased at most plots between 2024 and 2025 but only the values at plots 70 and 71 were elevated relative to the historical range.
- PCDD/DF TEQ values increased in 2025 relative to 2024 and historical median concentrations due to forest fire activity. A similar trend was observed in the total TEQ value.

Ambient Air Monitoring

- In the moss bags there was no statistically significant differences in metal concentrations between Zones 1 and 2 and there were no obvious differences in metal concentrations between moss bag plots.
- Between 2024 and 2025 moss bags were also deployed at fenceline air monitoring Sites 1 (downwind of the Solidification and Stabilization building), 5 (upwind of the SHTC), and 9 (downwind of the landfill). Metal concentrations were greatest at Site 1 and 9:
 - Site 1 (Stabilization and Solidification Building) - Metal concentrations at Site 1 were generally elevated relative to previous years (2023 to 2024), including the concentration of the metals that are characteristically elevated in fly ash (arsenic, copper, lead, tin, and zinc). This increase correlates with an increase in fly ash solidification between June 2024 and June 2025.

- Site 5 and Site 9 – Metal concentrations were comparable to previous years.
- A decrease in vigour was only observed at 3 of the 45-lichen sub-sites and overall, the vitality of lichen appeared to be unchanged relative to the previous monitoring period in 2024. Overall, there is no evidence that emissions from the SHTC are affecting lichen health.

Table 4-1: 2025 Live Moss Results - PCBB/PCDF, PCB, and TEQ

TABLE 4-1

Live Moss Quality Results - PCDD/PCDF, PCB, and TEQ¹

Veolia

W ½ 06-067-08 W5M

Sample Point	Sample Date	PCBs mg/kg	PCB TEQ ng TEQ/kg	PCDD/PCDF TEQ ng TEQ/kg	Total TEQ ng TEQ/kg
Live Moss					
Plot 4	17-Jun-25	0.373	50	8.66	58.66
Plot 11	18-Jun-25	0.0342	4.83	2.08	6.91
Plot 70	16-Jun-25	0.00057	0.201	0.557	0.758
Plot 71	18-Jun-25	0.000384	0.162	0.288	0.45
Plot 109	17-Jun-25	0.137	17.4	6.16	23.56
Plot 110	17-Jun-25	0.00571	0.233	0.68	0.913
Plot 114	17-Jun-25	0.0741	7.3	2.38	9.68
Plot 123	16-Jun-25	0.00575	0.438	0.498	0.936
Plot 402	16-Jun-25	0.00132	0.183	0.422	0.605

Notes:

¹ - a value equal to 1/2 the detection limit was used for all non-detected congeners to calculate sample TEQ.

Table 4-2 and Table 4-3: Historical Live Moss Results - PCB, and Total TEQ

TABLE 4-2

Historical Moss Quality Results - PCB Concentrations (Congeners) - mg/kg

Veolia

W ½ 06-067-08 W5M

Date	Plot 4	Plot 11	Plot 70	Plot 71	Plot 109	Plot 110	Plot 114	Plot 117	Plot 123	Plot 402
May-06	1.90	0.11	0.0021	0.0012	0.36	0.042	0.21	0.058	0.014	0.0053
Jun-07	0.77	0.17	0.0017	0.0012	0.27	0.027	0.69	0.045	0.011	0.0023
May-08	0.96	0.14	0.0013	0.0040	0.50	0.037	0.097	0.033	0.015	0.0064
Jun-08	0.96	0.14	0.0013	0.0040	0.50	0.037	0.097	0.033	0.015	0.0064
Jun-09	1.05	0.065	0.0013	0.00085	0.27	0.020	0.19	0.037	0.011	0.0020
Jul-09	0.86	0.093	0.024	0.0025	0.47	0.032	0.22	0.051	0.015	0.0057
May-10	1.95	0.19	0.0020	0.0023	0.60	0.066	0.35	0.070	0.010	0.0027
May-11	1.73	0.19	0.0036	0.0017	0.76	0.052	0.50	0.14	0.024	0.0039
Jun-12	1.62	0.17	0.00077	ND	0.61	0.034	0.24	0.035	0.0035	0.0011
Jun-13	1.98	0.14	0.0031	0.0022	0.72	0.038	0.38	0.10	0.020	0.0068
May-14	0.34	0.017	0.00096	0.00023	0.24	0.0063	0.087	0.013	0.00055	0.00068
Jun-15	0.98	0.12	0.00051	0.00095	0.54	0.015	0.17	0.066	0.011	0.0019
May-16	0.44	0.026	0.00013	0.00014	0.16	0.0046	0.13	0.016	0.0040	0.00068
Jun-17	0.88	0.074	0.00014	0.00029	0.51	0.017	0.064	0.036	0.0048	0.0013
May-18	1.09	0.056	0.00052	0.00012	0.75	0.013	0.20	0.026	0.011	0.0014
May-19	0.86	0.051	0.00046	0.00028	0.35	0.010	0.14	0.028	0.003	0.0014
Jun-20	0.43	0.029	0.00020	0.00014	0.21	0.004	0.04	0.006	0.013	0.0019
Jun-22	0.22	0.017	0.00014	0.00019	0.09	0.003	0.04	0.004	0.002	0.0017
Jun-23	0.16	0.024	0.00007	0.00007	0.07	0.002	0.04	0.005	0.001	0.0003
May-24	0.20	0.017	0.00009	0.00010	0.09	0.011	0.03	0.009	0.003	0.0004
Jun-25	0.37	0.034	0.00057	0.00038	0.14	0.006	0.07	---	0.006	0.0013

TABLE 4-3

Historical Moss Quality Results - Total TEQ - ng TEQ/kg¹

Veolia

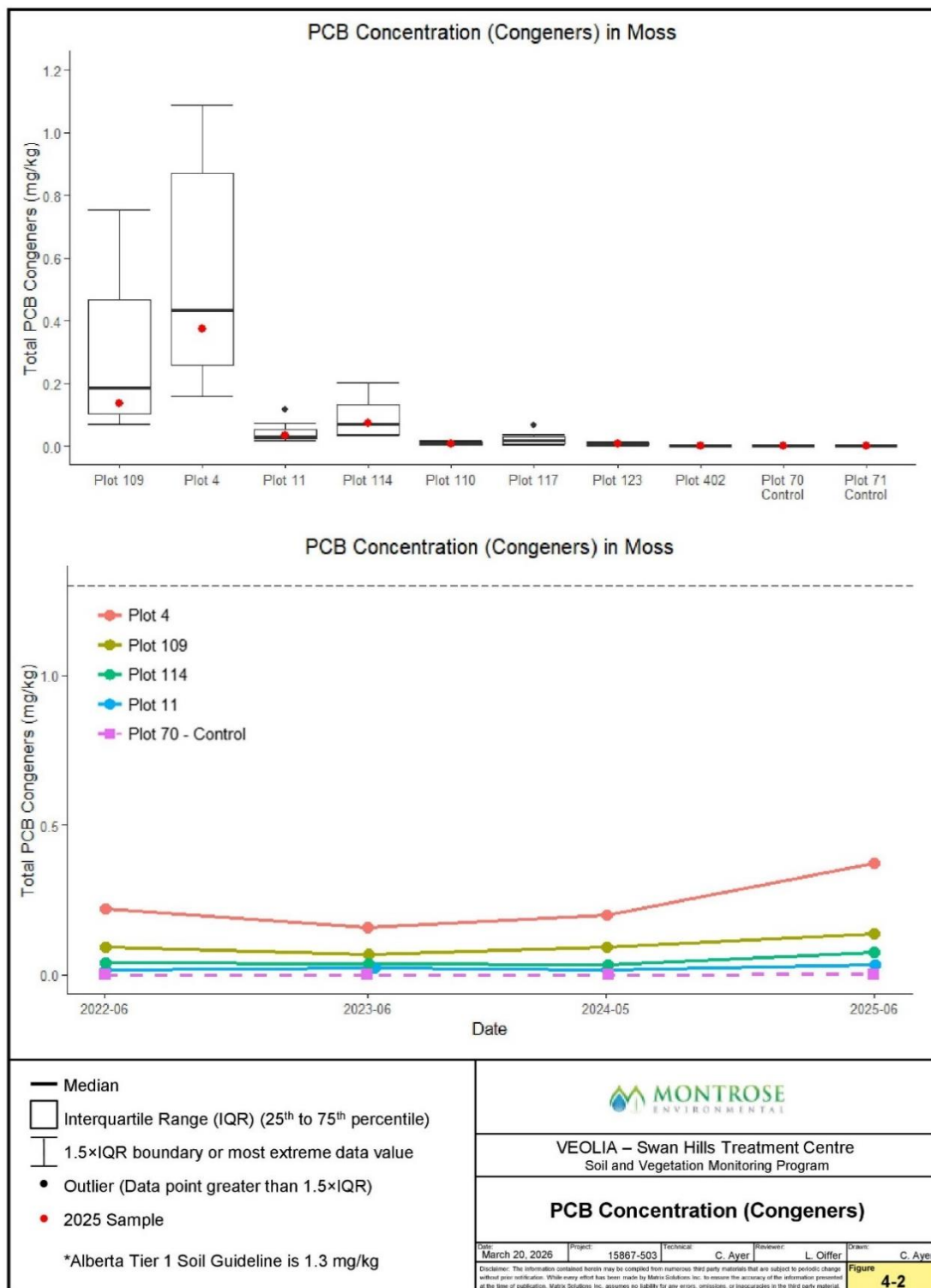
W ½ 06-067-08 W5M

Date	Plot 4	Plot 11	Plot 70	Plot 71	Plot 109	Plot 110	Plot 114	Plot 117	Plot 123	Plot 402
May-06	272.99	38.36	0.52	0.48	75.11	13.64	37.92	12.06	3.89	0.55
Jun-07	157.73	33.34	0.50	0.36	55.5	4.04	58.42	9.73	3.87	0.48
May-08	206.89	38.64	2.01	2.21	117.52	9.87	16.12	7.69	4.77	2.06
Jun-08	222.57	41.33	1.83	1.81	126.09	10.80	17.45	7.70	4.59	1.88
Jun-09	230.88	21.21	0.78	0.42	76.41	7.30	36.43	8.36	3.42	0.38
Jul-09	118.13	18.22	1.84	0.32	84.33	6.00	25.31	7.40	3.35	0.94
May-10	174.27	36.85	1.46	0.86	79.01	9.77	39.83	8	1.39	0.80
May-11	157.10	28.68	1.21	0.23	72.19	8.73	48.17	14.58	3.74	0.61
Jun-12	231.17	36.19	0.79	0.76	78.94	9.85	33.59	1.46	0.67	2.73
Jun-13	277.78	26.38	0.95	0.22	109.50	6.85	41.72	13.33	5.96	0.56
May-14	115.40	13.63	5.37	0.72	75.90	7.00	31.20	4.02	1.78	1.19
Jun-15	138.40	29.00	0.61	0.69	75.20	3.38	27.02	12.12	2.44	1.27
May-16	53.80	4.43	0.21	0.29	19.86	1.14	12.77	2.14	0.76	0.21
Jun-17	131.70	16.88	0.30	0.26	81.50	4.98	9.47	6.16	1.06	0.35
May-18	170.40	10.27	0.40	0.16	151.30	2.87	28.29	4.33	1.70	0.45
May-19	130.00	10.82	0.68	0.23	58.80	2.95	23.93	5.23	0.74	0.53
Jun-20	58.75	4.41	0.14	0.25	28.93	0.81	5.50	0.96	2.45	0.59
Jun-22	29.49	1.93	0.24	0.14	10.46	0.56	3.93	0.50	0.44	0.44
Jun-23	22.86	4.42	0.24	0.13	10.01	0.53	4.51	0.87	0.34	0.24
May-24	30.41	3.08	0.29	0.25	14.95	2.21	4.31	1.42	0.76	0.26
Jun-25	58.66	6.91	0.76	0.45	23.56	0.91	9.68	---	0.94	0.61

Notes:

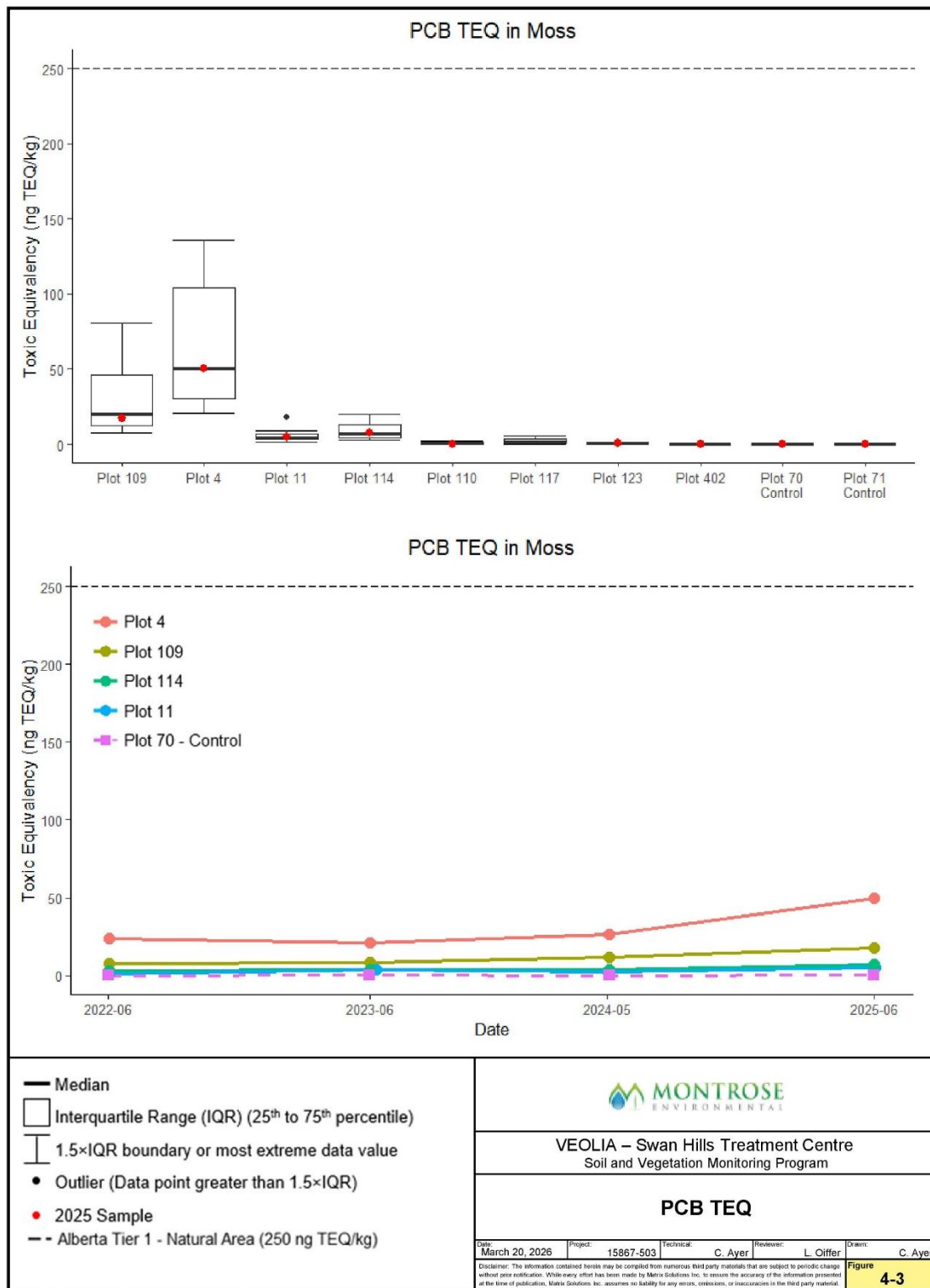
ND - results reported as zero in lab report

¹ - a value equal to 1/2 the detection limit was used for all non-detected congeners to calculate sample TEQ. Prior to 2014 a value of zero was used for all non-detected congeners.



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Figure 4-2: PCB Concentration (Congeners) in Live Moss Box Plots



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Figure 4-3: PCB TEQ in Live Moss Box Plots

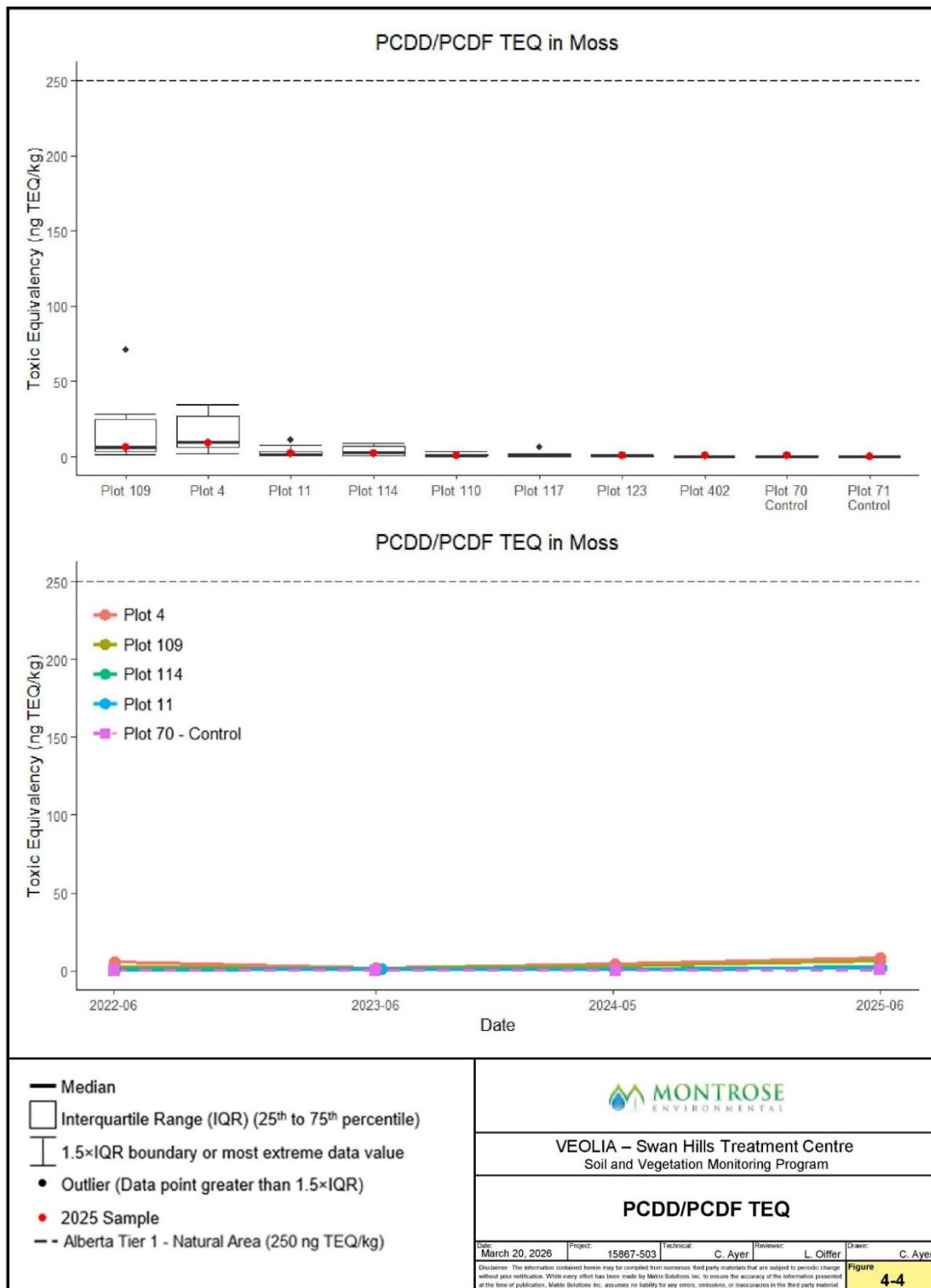


Figure 4-4: PCDD/PCDF TEQ in Live Moss Box Plots

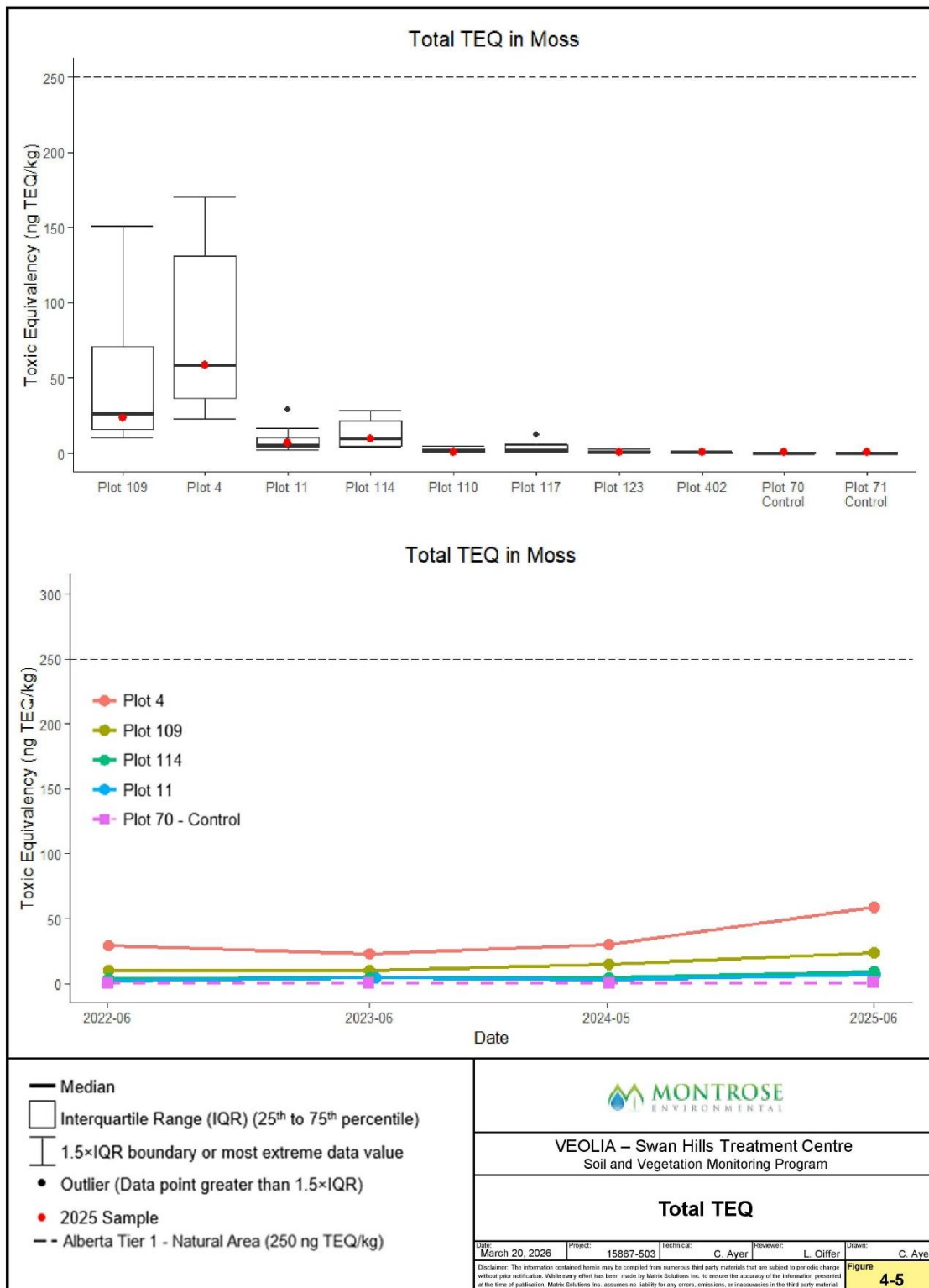


Figure 4-5: Total TEQ in Live Moss Box Plots

Table 4-4: 2025 Labrador Tea Results - PCBB/PCDF, PCB, and TEQ

TABLE 4-4

Labrador Tea Quality Results - PCDD/PCDF, PCD, and TEQ¹

Veolia

W ½ 06-067-08 W5M

Sample Point	Sample Date	PCBs mg/kg	PCB TEQ ng TEQ/kg	PCDD/PCDF TEQ ng TEQ/kg	Total TEQ ng TEQ/kg
Labrador Tea Leaves					
Plot 4	17-Jun-25	0.0501	8.1	3.53	11.63
Plot 11	18-Jun-25	0.00459	0.385	2.63	3.015
Plot 70	16-Jun-25	0.000577	0.2	3.42	3.62
Plot 71	18-Jun-25	0.000532	0.284	3.02	3.304
Plot 109	17-Jun-25	0.0216	2.92	2.67	5.59
Plot 110	17-Jun-25	0.00247	0.287	1.78	2.067
Plot 114	16-Jun-25	0.013	0.889	3.47	4.359
Plot 123	16-Jun-25	0.000698	0.229	2.33	2.559
Plot 402	16-Jun-25	0.000551	0.147	2.66	2.807

Notes:

¹ - a value equal to 1/2 the detection limit was used for all non-detected congeners to calculate sample TEQ.

Table 4-5 and Table 4-6: Historical Labrador Tea Results - PCB, and Total TEQ

TABLE 4-5

Historical Labrador Tea Quality Results - PCB Concentrations (Congeners) - mg/kg

Veolia

W ½ 06-067-08 W5M

Date	Plot 4	Plot 11	Plot 70	Plot 71	Plot 109	Plot 110	Plot 114	Plot 117	Plot 123	Plot 402
May-06	0.15	0.025	0.0034	0.0028	0.076	0.0080	0.060	0.013	0.0050	0.0029
Jun-07	0.23	0.093	0.014	0.026	0.13	0.036	0.10	0.039	0.021	0.020
May-08	0.30	0.025	0.0035	0.010	0.15	0.013	0.075	0.021	0.0089	0.010
Jun-08	0.30	0.025	0.0035	0.010	0.15	0.013	0.075	0.021	0.0089	0.010
Jun-09	0.24	0.020	0.0038	0.00093	0.052	0.0077	0.069	0.014	0.0050	0.0029
Jul-09	0.22	0.049	0.0028	0.027	0.42	0.015	0.075	0.012	0.0081	0.012
May-10	0.52	0.067	0.0057	0.0028	0.41	0.015	0.21	0.035	0.0084	0.0040
May-11	0.25	0.046	0.0026	0.00089	0.24	0.024	0.12	0.021	0.0039	0.0015
Jun-12	0.44	0.021	0.0057	0.00022	0.17	0.0023	0.052	0.0055	0.0012	ND
Jun-13	0.30	0.023	0.0020	0.0022	0.21	0.013	0.052	0.011	0.0026	0.0027
May-14	0.19	0.024	0.00024	0.00018	0.10	0.0072	0.037	0.0059	0.0020	0.00076
Jun-15	0.19	0.020	0.00028	0.00010	0.11	0.0062	0.041	0.0053	0.0013	0.00064
May-16	0.13	0.011	0.00015	0.000092	0.049	0.0027	0.021	0.0073	0.0017	0.00049
Jun-17	0.10	0.0076	0.00014	0.00016	0.073	0.0035	0.017	0.0052	0.0012	0.00041
May-18	0.065	0.0074	0.00031	0.00030	0.028	0.0032	0.013	0.0032	0.00080	0.00036
May-19	0.071	0.0051	0.00015	0.00019	0.026	0.0016	0.010	0.0022	0.00060	0.00030
Jun-20	0.062	0.0048	0.00018	0.00007	0.024	0.0016	0.010	0.0026	0.00079	0.00032
Jun-21	0.063	0.0048	0.00033	0.00144	0.018	0.0016	0.012	0.0025	0.00059	0.00064
Jun-22	0.035	0.0050	0.00045	0.00044	0.025	0.0017	0.008	0.0028	0.00089	0.00057
Jun-23	0.068	0.0113	0.00159	0.00131	0.038	0.0034	0.020	0.0078	0.00176	0.00073
May-24	0.043	0.0034	0.00034	0.00022	0.010	0.0014	0.009	0.0025	0.00082	0.00056
Jun-25	0.050	0.0046	0.00058	0.00053	0.022	0.0025	0.013	---	0.00070	0.00055

TABLE 4-6

Historical Labrador Tea Quality Results - Total TEQ - ng TEQ/kg¹

Veolia

W ½ 06-067-08 W5M

Date	Plot 4	Plot 11	Plot 70	Plot 71	Plot 109	Plot 110	Plot 114	Plot 117	Plot 123	Plot 402
May-06	40.50	0.76	0.62	0.50	10.75	0.26	8.92	0.67	0.74	0.29
Jun-07	36.60	5.24	0.57	0.33	10.72	0.71	12.24	0.64	0.37	0.35
May-08	31.20	4.14	0.29	1.16	13.59	1.33	8.34	1.82	1.33	0.20
Jun-08	34.90	4.12	0.31	1.63	15.45	1.45	9.41	2.03	1.89	0.20
Jun-09	33.17	3.35	0.49	0.16	5.39	0.57	6.84	1.40	0.38	0.18
Jul-09	8.51	1.19	0.86	0.67	13.29	0.65	4.90	0.81	0.88	0.67
May-10	46.13	8.44	0.72	0.64	31.99	0.51	23.06	3.42	0.98	0.20
May-11	28.70	4.35	0.14	0.16	20.05	4.04	10.59	2.52	0.13	0.13
Jun-12	66.53	1.14	2.86	0.94	1.50	0.32	0.87	0.88	0.93	1.11
Jun-13	43.16	3.64	0.22	0.20	27.63	0.46	7.18	0.47	0.29	0.50
May-14	29.90	4.10	0.46	0.64	12.59	1.59	5.80	0.58	0.71	0.55
Jun-15	23.00	2.79	0.21	0.19	14.93	1.01	5.62	0.85	0.31	0.31
May-16	18.26	2.20	0.14	0.55	6.76	1.19	2.74	0.89	0.90	0.80
Jun-17	15.11	1.53	0.38	0.40	8.39	1.28	3.98	1.45	0.73	1.58
May-18	10.88	1.28	0.28	0.40	4.46	1.26	1.97	2.09	2.46	0.55
May-19	12.56	1.48	0.17	1.22	3.93	1.00	2.34	1.33	1.36	1.24
Jun-20	8.76	1.05	0.54	0.12	2.86	0.31	1.34	0.52	0.29	0.41
Jun-21	8.35	0.88	0.58	0.96	3.21	1.93	3.45	1.08	1.41	2.16
Jun-22	4.24	1.19	0.68	0.89	2.26	0.77	1.01	0.78	0.60	0.75
Jun-23	18.92	6.71	6.68	9.07	8.32	2.64	5.76	10.32	6.78	4.62
May-24	6.75	1.39	0.92	0.91	1.88	0.65	2.03	0.80	1.12	1.11
Jun-25	11.63	3.02	3.62	3.30	5.59	2.07	4.36	---	2.56	2.81

Notes:

ND - results reported as zero in lab report

¹ - a value equal to 1/2 the detection limit was used for all non-detected congeners to calculate sample TEQ. Prior to 2014 a value of zero was used for all non-detected congeners.

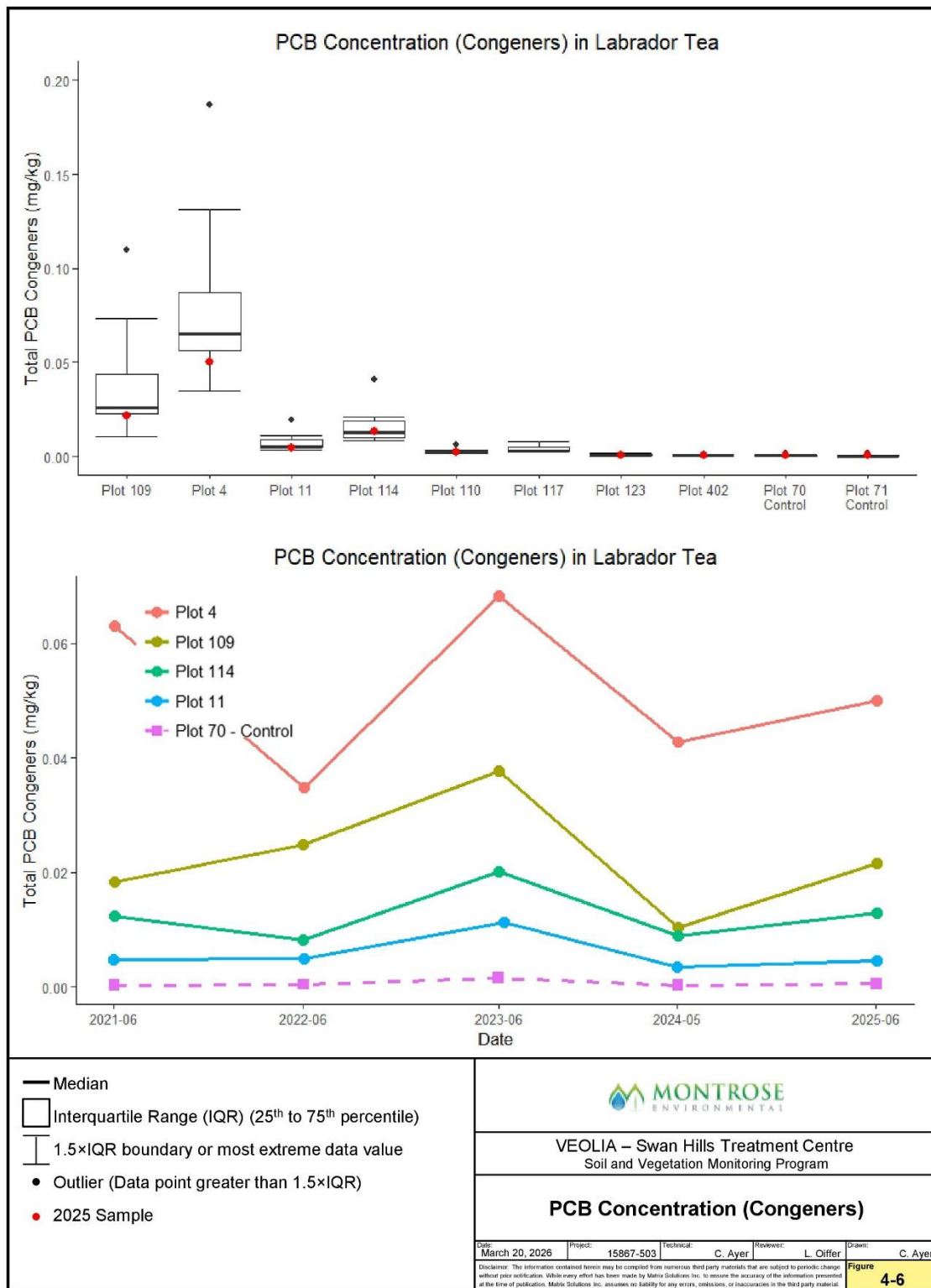
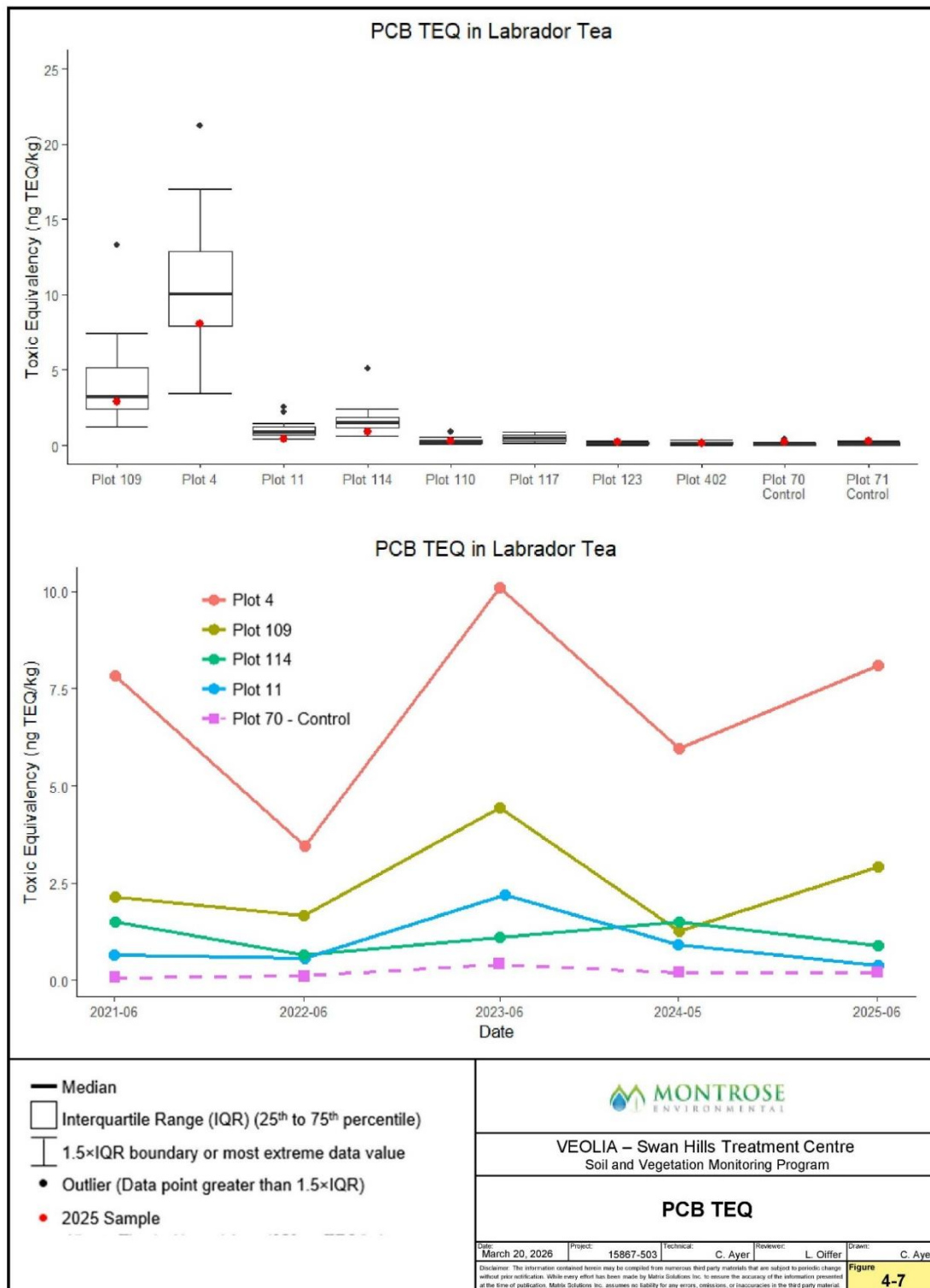


Figure 4-6: PCB Concentration (Congeners) in Labrador Tea Box Plots



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Figure 4-7: PCB TEQ in Labrador Tea Box Plots

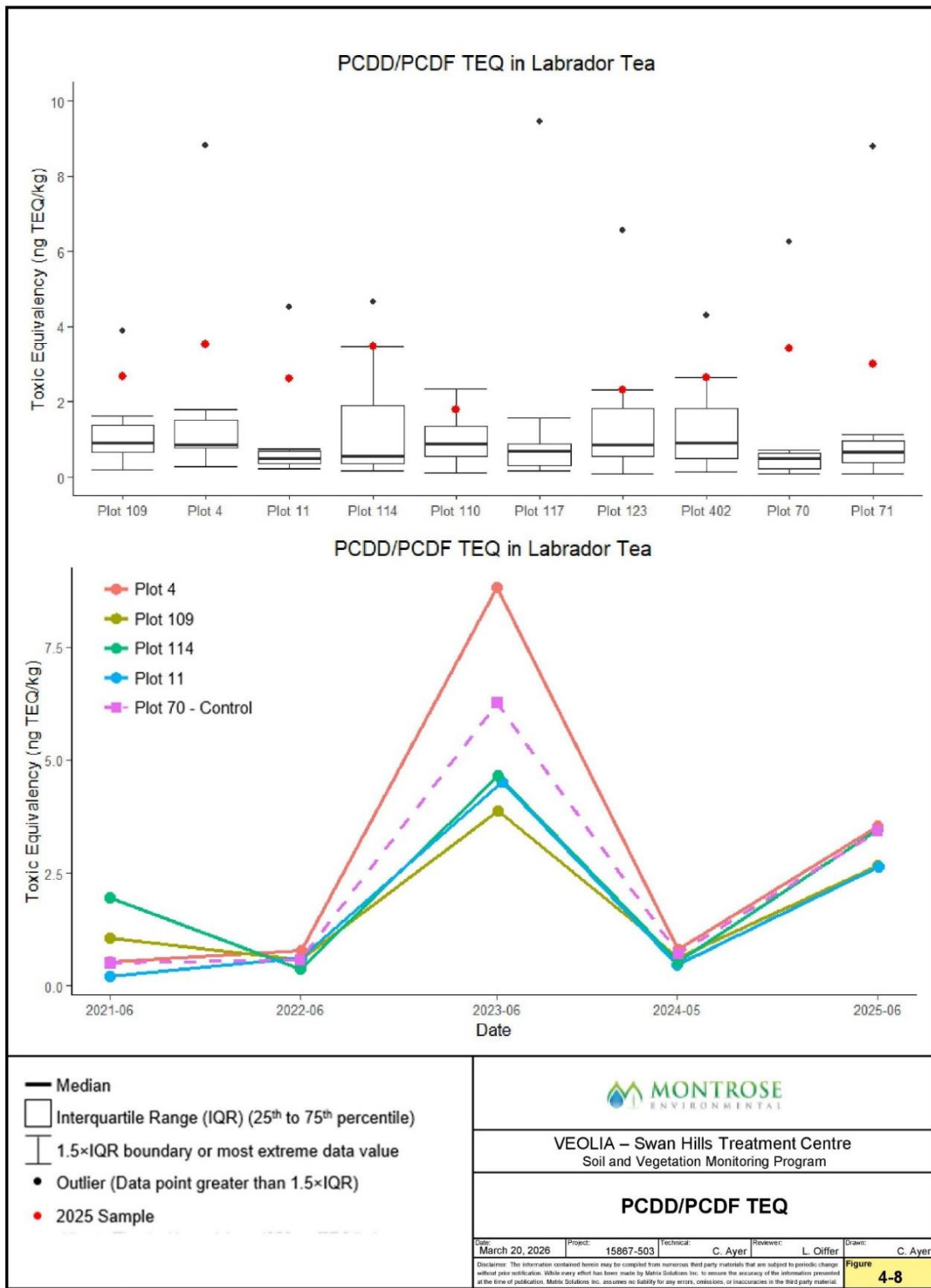
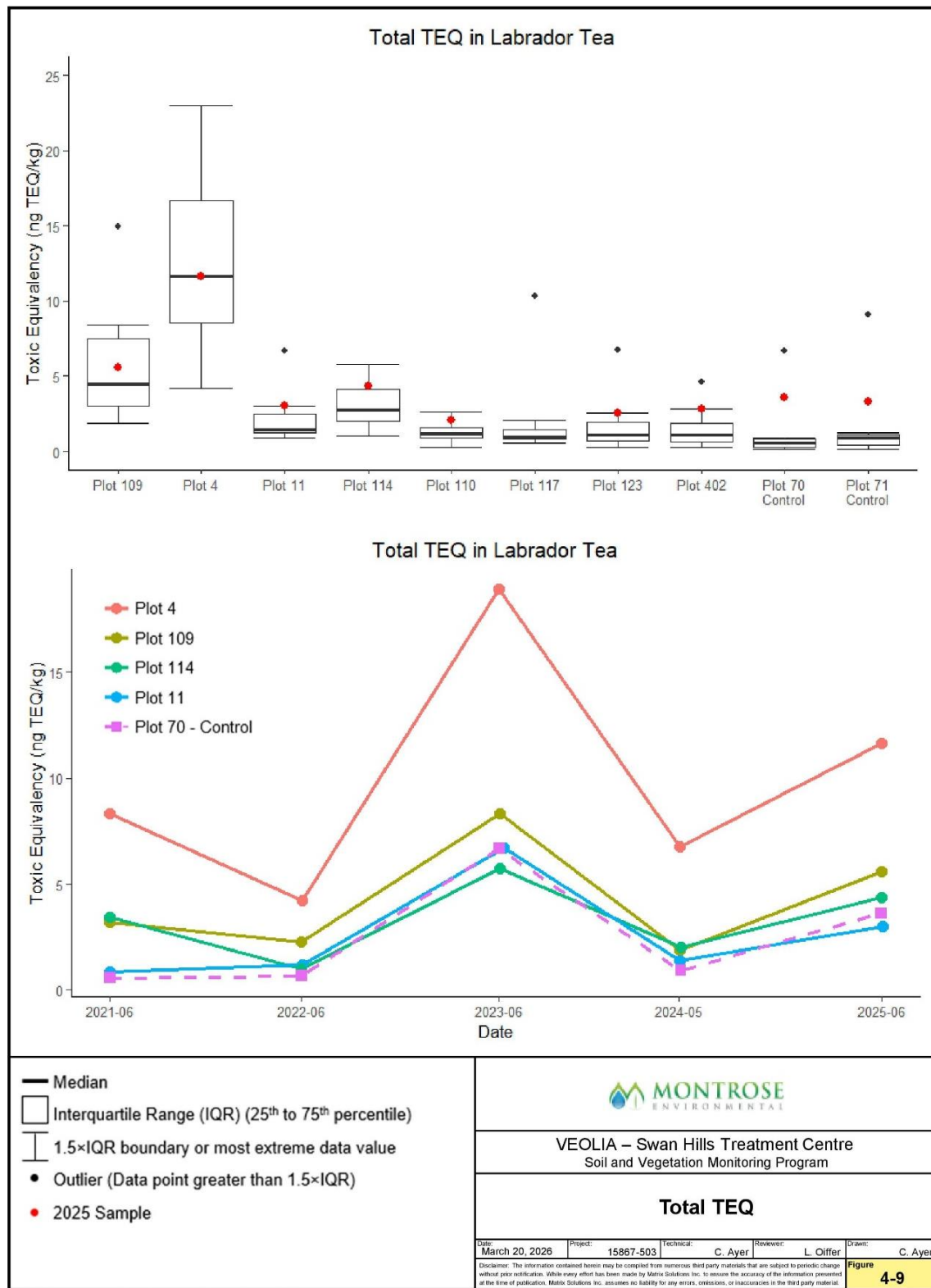


Figure 4-8: PCDD/PCDF TEQ in Labrador Tea Box Plots



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Figure 4-9: Total TEQ in Labrador Tea Box Plots

4.2 Vole Tissue Chemistry and Population Monitoring

As part of its integrated environmental monitoring program, the Swan Hills Treatment Centre (SHTC) has been conducting demographic studies and analyzing levels of various chemicals in the tissues of red-backed voles (*Myodes gapperi*) annually since 1986. Over this period, the scope of monitoring program was changed so that plots monitored prior to 2000 (10 population and 24 tissue collection plots (Figure 4-10)) would be included as part of an expanded monitoring program once every 5 years. However, in 2000, the wildlife monitoring program was modified so that annually monitored years (Years 1 – 4) was comprised of sampling 3 population and 10 tissue collection plots. However, based on recommendations made in the 2023 annual monitoring report (WMC 2024), sampling effort of the expanded monitoring program was reduced to focus on the 3 annually monitored population plots and 6 tissue collection plots. If warranted in the future, plots previously part of the expanded monitoring program (10 population and 24 tissue collection plots) would be sampled in the event of an upset at the SHTC based on the key trigger responses developed for red-backed voles. Therefore, the 2025 annual wildlife monitoring program was focused on demographic studies of voles on 3 live-trapping plots in June and September (Table 4-7) while concentrations of PCB congeners and TEQs, dioxin/furan congeners and TEQs, total TEQs, and PAHs were determined for animals collected from 6 plots in May (Table 4-7). Results were interpreted within the context of comparisons between the 2025 and 2024 monitoring years as well as the 39-year long-term monitoring dataset (1986 – 2025).

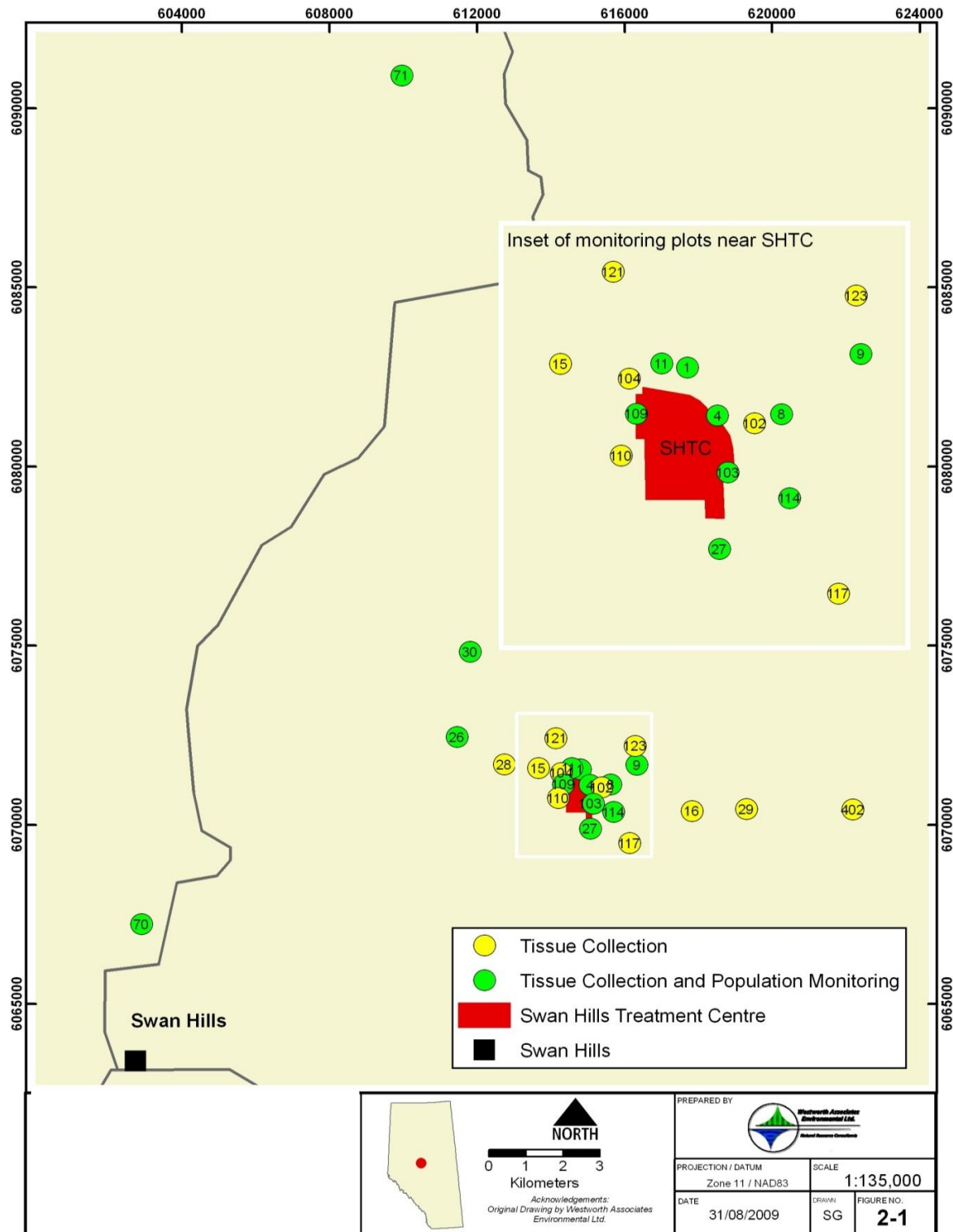


Figure 4-10: Location of the Wildlife Monitoring Plots in the Vicinity of the SHTC

Table 4-7: Summary of Previous and Current Annual/Expanded Red-backed Vole Monitoring Programs

Plot No.	Distance from SHTC the (km)	Direction from the SHTC	Tissue Collection/Snap-trapping ¹			Population Monitoring/ Live-trapping ¹
			Metals, PAHs ¹	Aroclor PCBs ²	PCB Congeners and TEQs, Dioxins/Furans and TEQs, Total TEQs ³	
Previous Annual and Expanded Monitoring Programs (Prior to 2024):						
11	0.1	N	✓	✓	☑	☑
109	0.2	W	✓	✓	☑	✓
103	0.2	SE	✓	✓	-	✓
4	0.3	E	✓	✓	☑	✓
110	0.3	W	✓	✓	☑	-
104	0.4	NW	✓	✓	-	-
102	0.4	E	✓	✓	-	-
1	0.4	NE	✓	✓	-	✓
27	0.5	S	✓	✓	-	✓
8	0.6	E	✓	✓	-	✓
15	0.6	NW	✓	✓	-	-
114	0.7	E	✓	✓	☑	☑
121	1.2	N	✓	✓	-	-
9	1.4	ENE	✓	✓	-	✓
28	1.4	WNW	✓	✓	-	-
123	1.6	NE	✓	✓	☑	-
16	2.4	E	✓	✓	-	-
117	2.4	SE	✓	✓	☑	-
26	2.6	WNW	✓	✓	-	✓
30	3.6	NW	✓	✓	-	✓
29	3.9	E	✓	✓	-	-
402	7.5	E	✓	✓	☑	-
70	11.5	SW	✓	✓	☑	☑
71	21.0	NNW	✓	✓	☑	✓
Current Annual and Expanded Monitoring Programs (2024 and Onward):						
11	0.1	N	✓	✓	☑	☑
109	0.2	W	✓	✓	☑	-
4	0.3	E	✓	✓	☑	-
110	0.3	W	✓	✓	✓	-
114	0.7	E	✓	✓	☑	☑
123	1.6	NE	✓	✓	✓	-
117	2.4	SE	✓	✓	✓	-
402	7.5	E	✓	✓	✓	-
70	11.5	SW	✓	✓	☑	☑
71	21.0	NNW	✓	✓	☑	-

¹ Bold boxed check marks ☑ indicate plots that are monitored annually for vole tissue collection and population studies. Plain check marks ✓ indicate plots that are part of the expanded monitoring program (i.e., once every 5 years). ² The low resolution GC-ECD method historically used for Aroclor PCBs was discontinued in Canada in 2019. ³ HRMS congener-specific methodology would be used for all expanded monitoring plots in response to a red-backed vole trigger

Red-backed Vole Demography

Red-backed vole populations increased substantially at all three annually monitored plots (plots 11, 114, and 70) between 2024 and 2025 in both June (Figure 4-11) and September (Figure 4-12). June population densities increased by 117% to 600% among plots, with an overall mean increase of approximately 198%. September densities also increased markedly but were within historical ranges for the SHTC study area. As in most previous years, the highest densities occurred at the reference plot (plot 70), followed by plots 11 and 114, reflecting long-standing differences in habitat structure rather than proximity to the facility.

Sex ratios followed typical seasonal patterns, with male-dominated populations in June (overall 2.4 males per female) and female-dominated populations in September (0.5 males per female). Weight class structure also reflected normal seasonal dynamics, with heavy (overwintered) adults dominating in June (83%) and moderate (young-of-the-year) individuals dominating in September. Reproductive activity was consistent with historical trends, with high breeding rates in June (63% of heavy males and 75% of heavy females) and reduced breeding in September, reflecting the end of the main breeding season. Overwinter survival between September 2024 and June 2025 could not be estimated because no previously tagged individuals were recaptured, which is consistent with the short lifespan of red-backed voles and long intervals between trapping sessions.

Trapping mortality remained elevated in 2025 and continues to be an important operational consideration. Exposure-based mortality for red-backed voles averaged 12.8% per capture event, while individual-based mortality was 31.4%. Non-target mortality, particularly for shrews, was also high and consistent with historical patterns. Despite mitigation measures (additional bedding, moisture sources, mealworms, natural cover, and twice-daily trap checks), mortality was highest during the September session when capture and recapture rates were greatest. Smaller-bodied individuals were more susceptible to mortality. Importantly, elevated trapping mortality did not appear to translate into detectable population-level effects, and vole populations increased substantially in 2025.

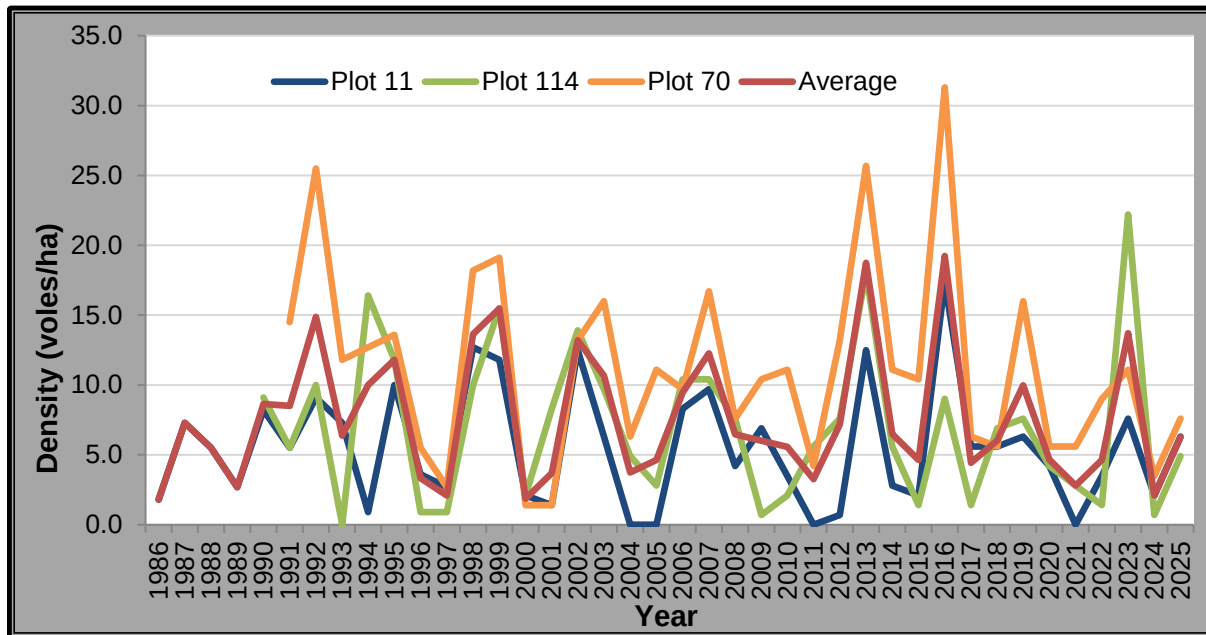


Figure 4-11: Densities of Red-Backed Voles in the SHTC Study Area, June 1986-2025

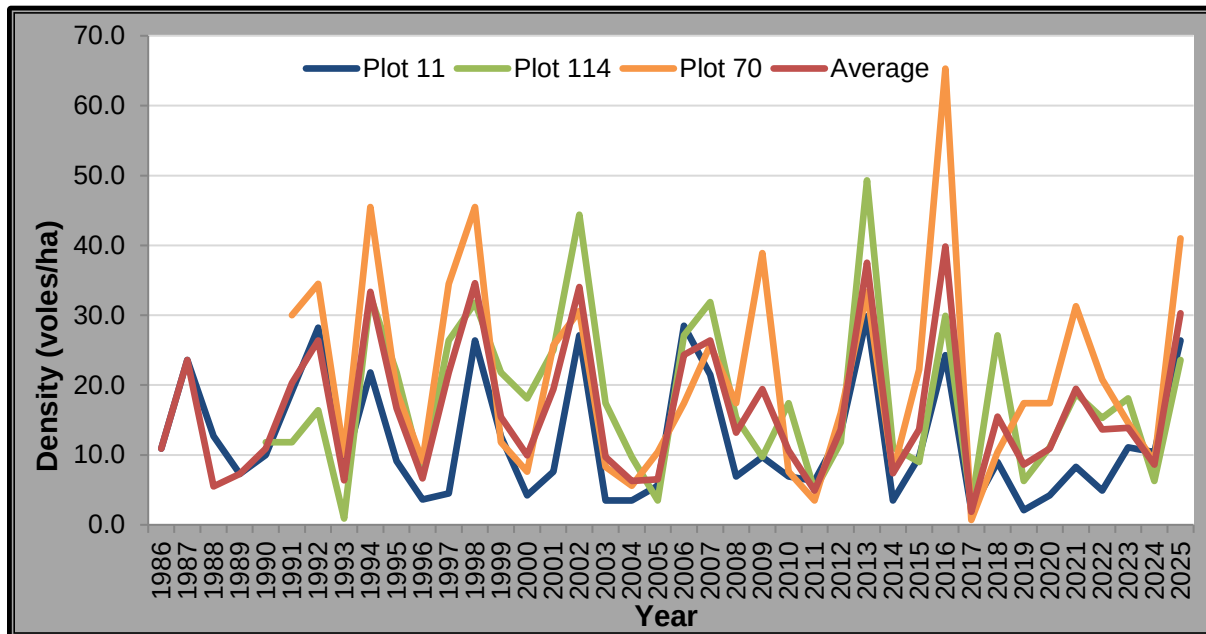


Figure 4-12: Densities of Red-Backed Voles in the SHTC Study Area, September 1986-2025

Tissue Chemistry of Red-baked Voles

PCB Congeners and TEQs

Congener PCB concentrations in vole tissues in 2025 were among the lowest recorded since 2000, despite a modest year-over-year increase from 2024 (Table 4-8). Average PCB concentrations were approximately 63% lower than the long-term mean (2000–2024). Spatial patterns remained consistent with historical results, with higher concentrations at near-field plots and very low concentrations at the more distant reference plots (Table 4-8).

While PCB TEQ concentrations exhibited modest increases at some plots, they remained low in a long-term context (Table 4-9). PCB 126 continued to be the dominant contributor to PCB TEQ because of its high toxicity equivalency factor, followed by PCB 169. Overall, PCB TEQs in 2025 were among the lowest recorded since 2000 at several near-field plots (Table 4-9).

Table 4-8: PCB congener concentrations¹ (pg/g) in red-backed voles in SHTC study area, 2000 – 2025.

Year	Plot ²										Averages
	11	109	4	110	114	123	117	402	70	71	
2000	480,000	-	300,000	-	170,000	-	24,000	5,500	8,800	3,600	141,700
2001	169,000	563,000	163	28,800	466,000	32,100	34,600	1,960	1,440	479	129,754
2002	627,382	819,944	642,093	16,715	495,810	53,724	108,457	5,557	1,799	393	277,187
2003	249,000	583,000	250,000	11,500	129,000	25,100	35,300	1,330	667	199	128,510
2004	70,359	1,034,201	687,233	133,077	136,802	14,997	17,438	734	1,084	406	209,633
2005	17,865	114,298	140,940	-	34,465	7,601	8,917	953	837	455	36,259
2006	203,545	254,766	867,215	17,820	143,851	9,468	34,099	2,944	2,363	1,273	153,734
2007	91,000	340,000	360,000	19,000	200,000	23,000	45,000	4,300	1,900	2,900	108,710
2008	100,000	99,000	410,000	17,000	85,000	23,000	69,000	47,000	7,200	3,800	86,100
2009	120,000	69,400	245,000	11,000	63,200	10,200	4,500	2,070	1,980	785	52,814
2010	192,000	98,800	351,000	43,500	294,000	19,300	74,900	3,530	1,680	795	107,951
2011	281,000	960,000	547,000	225,000	121,000	16,800	42,500	2,610	3,100	939	219,995
2012	181,000	815,000	357,000	136,000	250,000	27,400	45,900	6,150	1,860	1,280	182,159
2013	296,000	267,000	1,110,000	72,400	209,000	16,400	10,400	4,050	1,480	1,440	198,817
2014	114,000	115,000	399,000	105,000	263,000	19,900	42,500	4,570	935	716	106,462
2015	111,000	97,300	386,000	39,500	82,100	13,100	18,800	2,360	1,200	377	75,174
2016	90,400	87,700	429,000	21,600	86,900	11,300	33,300	2,330	770	356	76,366
2017	110,000	96,700	317,000	21,500	91,900	12,900	16,700	2,220	934	401	67,026
2018	84,200	187,000	368,000	26,400	102,000	14,300	34,500	2,470	779	888	82,054
2019	98,150	83,250	304,500	11,385	68,200	7,620	21,150	1,380	663	255	59,832
2020	63,700	60,400	161,000	7,380	45,900	12,900	17,000	1,410	533	190	37,041
2021	39,500	31,600	92,500	13,200	54,600	18,800	6,540	1,200	544	217	25,870
2022	65,200	66,100	171,000	28,000	121,000	4,650	51,600	663	471	191	50,888
2023	43,500	38,700	140,000	11,200	36,100	3,510	13,100	1,710	32,900 ³	143	32,086
2024	25,300	66,900	116,000	30,600	40,000	6,980	6,820	518	460	278	29,386
2025	9,630	112,000	77,300	- ⁴	37,600	-	-	-	420	316	39,544

¹ PCB congener concentrations are the sum of the homologues. ² Order of plots indicate increasing distance from SHTC (Plot 11 [100 m] to Plot 71 [21 km]). ³ Re-extraction result = 31,700 pg/g. ⁴ Plots 110, 123, 117, and 402 were dropped as part of the annual monitoring program in 2025 and instead will now be included as part of subsequent expanded monitoring programs.

Table 4-9: TEQ of PCB congeners in red-backed voles (pg/g) collected from the SHTC study area, 2000 - 2025.

Year	Plot ¹										Averages
	11	109	4	110	114	123	117	402	70	71	
2000	500	-	670	-	144	-	33	1.3	6.7	0.06	193.58
2001	108	253	352	18.7	252	15	23.4	0.03	0.01	0.01	102.22
2002	241	346	461	5.1	215	22	53	0.1	0.05	0.00	134.33
2003	400	385	568	6.1	164	20.4	21.2	0.5	0.0	0.00	156.52
2004	94.8	120	836	29.5	3.35	11.5	11.8	0.01	0.02	0.01	110.70
2005	40.6	106	267	-	42.2	4.1	6.4	0.03	0.02	0.01	51.82
2006	369.9	133.2	1039.8	12.3	96.2	9.5	16.7	1.36	0.04	0.02	167.90
2007	119.6	411.2	614.2	7	152.1	18.8	26.4	0.13	0.05	0.03	134.95
2008a ²	85.49	43.97	318.3	5.65	47.07	10.71	41.43	2.4	0.49	0.24	55.58
2008b ³	84.59	42.8	319.02	5.42	45.52	10.42	40.32	2.26	0.47	0.23	55.11
2009	139.16	51.54	279.87	5.11	36.24	6.96	1.71	0.55	0.52	0.26	52.19
2010	146.72	74.46	207.07	22.1	114.18	6.05	18.93	0.02	0.01	0.00	58.95
2011	88.3	259	438	115	34.9	3.9	7.48	0.01	0.99	0.35	94.79
2012	74.2	313	294	49.3	52.2	5.31	12.7	0.99	0.49	0.00	80.22
2013	203	224	603	22.5	84.4	5.95	3.12	0.84	0.01	0.01	114.68
2014	86.4	59.4	305	115	57.6	7.57	10.6	1.0	0.28	0.25	64.31
2015	57.2	38.3	335	15.2	38.1	5.85	9.32	0.83	0.56	0.15	50.05
2016	43.5	28.4	289	6	26.1	3.9	8.62	0.54	0.30	0.13	40.65
2017	52.2	41.8	170	10.6	30.6	4.73	5.24	0.87	0.39	0.20	40.57
2018	39.4	98.4	232	8	33.8	4.42	11.4	0.73	0.27	0.36	42.88
2019	45.1	45.5	198	3.84	25.5	3.06	7.19	0.20	0.26	0.15	32.88
2020	40.4	25.9	113	2.12	18.7	3.7	5.6	0.51	0.24	0.07	21.03
2021	21.5	15.8	61.1	6.15	23	7.1	2.66	0.43	0.22	0.09	13.81
2022	25.2	23.7	111	7.62	54.4/2.4 ⁴	1.67	28.1	0.16	0.11	0.05	25.20
2023	22.5	17.7	96.5	3.7	14.4	1.25	3.7	0.33	11.8 ⁵	0.09	17.20
2024	11.1	33.9	65.3	5.69	12.3	3.10	2.26	0.205	0.24	0.154	14.90
2025	3.9	42.0	46	- ⁶	16.3	-	-	-	0.15-	0.055	18.07

¹ Order of plots indicate increasing distance from SHTC (Plot 11 [100 m] to Plot 71 [21 km]). ² WHO-TEF: World Health Organization Toxic Equivalency Factor (1998). ³ WHO-TEF: World Health Organization Toxic Equivalency Factor (2005). ⁴ September 2022 result. ⁵ Re-extraction result = 11.9 pg/g. ⁶ Plots 110, 123, 117, and 402 were dropped as part of the annual monitoring program in 2025 and instead will now be included as part of subsequent expanded monitoring programs.

Dioxin/Furan Congeners and TEQs

Dioxin/furan concentrations and TEQs remained very low relative to early monitoring years and continued the long-term declining trend observed since the mid-2000s (Table 4-10). Unlike PCBs, dioxin/furan TEQs did not exhibit a consistent spatial gradient with distance or direction from the SHTC in 2025, suggesting that current body burdens are more influenced by regional background sources and analytical variability at low concentrations than by facility-related inputs (Table 4-10).

Table 4-10: Concentrations of dioxin/furan congeners (pg/g) in red-backed voles collected from the SHTC study area, 2000 - 2025.

Year	Plot ¹										Averages
	11	109	4	110	114	123	117	402	70	71	
2000	5,757	11,026	11,827	2,229	1,585	1,840	591	22	110	59	3,504.6
2001	655	2,902	9,203	460	960	931	1,225	8	7	7	1,635.8
2002	3,862	4,684	6,349	86	1,550	1,533	1,017	143	23	6	1,925.3
2003	2,994	3,938	9,432	112	1,874	865	273	5	25	4	1,952.2
2004	1,177	530	6,095	323	677	370	99	n.d. ³	1.6	0.2	927.3
2005	581	1,280	2,005	- ²	344	155	66	2.8	11	1.3	444.4
2006	8,043	648	7,633	158	488	345	78	15	22	8	1,743.8
2007	1,142	2,167	2,546	54	912	716	85	29	26	8	768.5
2008	862	373	2,316	76	223	266	506	20	36	18	469.6
2009	1,013	421	1,145	44	145	194	26	7	31	3	302.9
2010	1,720	503	434	168	314	43	48	7	3.4	<0.2	324.1
2011	131	312	1,010	438	55.8	22.9	10.2	1	1.9	<0.09	198.3
2012	171	973	1,156	168	139	23	43.1	4.4	15.5	1	269.4
2013	651	732	1,493	126	183	30.6	37	7.7	44.4	7.3	331.2
2014	329	162	781	386	91.8	82.3	27.8	13.7	32.8	7.5	191.4
2015	70	12	472	159	45.4	36.9	32.3	6.6	23.2	3.5	86.1
2016	123	53	488	31	53.8	20.5	15.6	3.7	17.0	9.2	81.5
2017	49.7	66.2	309.1	24.2	26.5	15.9	8.4	4.6	13.1	4.7	52.5
2018	77.6	173.7	257.6	21.8	31.1	19.6	11.2	3.4	7.1	1.2	60.4
2019	62.2	70.4	193.3	15.6	25.3	13.1	10.5	3.2	20.3	4.3	41.8
2020	66.6	26.3	111.9	8.5	14.0	8.2	4.3	3.8	6.7	1.9	25.2
2021	27.39	17.11	37.45	11.02	15.25	6.17	9.61	5.72	11.91	3.02	14.5
2022	19.66	18.27	135.15	14.17	41.74	5.81	27.17	1.34	11.85	8.44	28.4
2023	60.70	26.41	98.15	10.00	11.82	6.07	10.23	3.17	13.29 ⁴	1.55	24.1
2024	13.12	31.54	56.36	12.16	10.58	11.44	5.73	2.13	8.91	3.65	16.9
2025	7.42	66.46	48.39	- ⁵	12.94	-	-	-	10.83	3.34	24.9

¹ Order of plots indicate increasing distance from SHTC (Plot 11 [100 m] to Plot 71 [21 km]). ² No animals were collected for tissue samples. ³ n.d. - Not Detected. Average values calculated based on ½ the reported detection limit. ⁴ Re-extraction result = 14.7 pg/g. ⁵ Plots 110, 123, 117, and 402 were dropped as part of the annual monitoring program in 2025 and instead will now be included as part of subsequent expanded monitoring programs.

Table 4-11: TEQ of dioxin/furan congeners (pg/g) in red-backed voles collected from the SHTC study area, 2000 - 2025

Year	Plot ¹										Averages
	11	109	4	110	114	123	117	402	70	71	
2000	2,200	4,200	4,900	820	600	700	230	7.2	37	20	1,371.4
2001	230	1,100	3,800	160	340	350	440	0.76	2.9	1.2	642.5
2002	1,460	1,750	2,450	26.4	553	593	391	19.8	2.6	1.6	724.7
2003	1,200	1,490	3920	28.6	682	321	89.2	0.7	3.1	0.3	773.5
2004	416	187	2,190	99.5	262	126	31.7	0.79	1.5	0.27	331.5
2005	187	465	754	- ²	104	48.8	17.5	0.81	2	0.43	157.8
2006	3,071	219	2,851	32.5	154	109	19.2	2.2	0.5	1.1	646.0
2007	421	765	885	14	283	274	21	4	3	2	267.2
2008a ³	310	110	830	14	58	87	44	3.6	3.4	0.92	146.1
2008b ⁴	200	71	530	11	40	56	30	2.8	4.5	0.94	94.6
2009	217	81	241	7	24	36	3	1	2	0	61.2
2010	366	100	88	32	58	8	7	1	3	0	66.3
2011	19.3	53.4	234	104	8.6	4.5	2.2	1.3	2	0.4	43.0
2012	21.2	185.0	223.6	27.56	19.69	4.48	6.84	0.76	2.94	0.18	49.2
2013	121.2	129.5	197.7	17	20.3	4	3.8	0.5	4.8	1.4	50.0
2014	53.9	22.2	133	81.3	13.0	12.1	2.92	1.4	2.81	0.803	32.3
2015	7.26	1.62	75.9	19.2	4.66	5.01	4.04	0.565	2.59	0.378	12.1
2016	14.8	6.54	80.8	3.4	5.59	2.79	1.73	0.488	1.97	0.745	11.9
2017	5.38	8.71	46.8	4.27	3.03	1.99	0.70	0.53	1.94	0.55	7.4
2018	10.8	25.9	35.9	3.15	3.16	3.42	1.4	0.79	1.55	0.31	8.6
2019	9.86	10.9	33.7	2.54	3.7	2.19	1.39	0.435	3.05	0.65	6.8
2020	10.2	4.32	19.0	1.43	2.1	1.39	0.70	0.516	1.65	0.364	4.2
2021	4.44	2.43	5.79	1.5	1.65	0.77	1.33	0.461	1.69	0.45	2.1
2022	3.03	2.86	12.8	2.19	5.81/0.27 ⁵	1.04	3.97	0.201	2.04	0.284	3.4
2023	8.72	4.28	15.4	1.91	2.02	1.16	1.34	0.557	2.39 ⁶	0.274	3.8
2024	2.22	4.72	8.6	1.78	1.51	1.97	0.84	0.285	2.27	0.698	2.7
2025	1.00	8.75	6.23	- ⁷	1.78	-	-	-	1.78	1.72	3.3

¹ Order of plots indicate increasing distance from SHTC (plot 11 [100 m] to plot 71 [21 km]). ² No animals were collected for tissue samples. ³ Between 2000 and 2008a, dioxin and furan TEQs calculated based on NATO I-TEFs (1990). ⁴ From 2008b and onwards, dioxin and furan TEQs calculated based on WHO (2005). ⁵ September 2022 result. ⁶ Re-extraction result = 1.93 pg/g. ⁷ Plots 110, 123, 117, and 402 were dropped as part of the annual monitoring program in 2025 and instead will now be included as part of subsequent expanded monitoring programs.

Total TEQs

Total TEQs (PCB TEQ + dioxin/furan TEQ) increased slightly between 2024 and 2025 but remained low in a long-term context (Figure 4-13). PCB TEQs accounted for a greater proportion of total TEQ in 2025 than the historical average, confirming that PCBs remain the primary driver of spatial variability in total TEQs. Mean total TEQs were still substantially higher at near-field plots than at reference plots, consistent with long-term patterns (Figure 4-13).

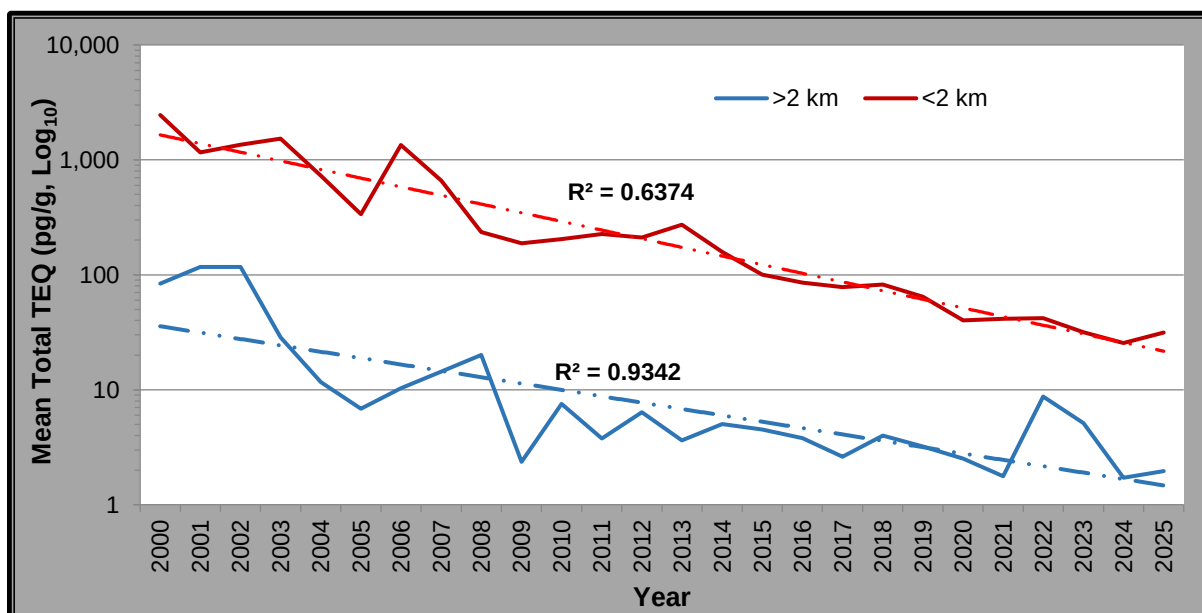


Figure 4-13: Mean total TEQ concentrations at plots ≤2 km and >2 km from SHTC, 2000 - 2025.

PAHs

All PAHs measured in vole tissues in 2025 were below analytical detection limits. Elevated calculated totals reflect summation of non-detect values ($\frac{1}{2}$ MDL) and variable detection limits rather than true increases in tissue concentrations (Table 4-12). Results from the 2024 expanded monitoring program demonstrated PAH fingerprints were consistent with regional wildfire sources that occurred in 2023, and 2025 results do not contradict this interpretation (Table 4-12). There was no evidence that the SHTC was a significant point source of PAHs to red-backed voles in 2025.

Table 4-12: Comparison of average PAH concentrations (mg/kg) between the 2019 and 2025 expanded monitoring years at plots in the SHTC study area

Plot ¹	Total PAH Concentrations (mg/kg)			% Change Between	
	2019 ²	2024 ²	2025 ³	2019-2024	2024-2025
11	0.01415	0.0998	0.992	605	894
109	0.01323	0.0972	1.598	635	1,544
4	0.01431	0.07357	1.893	414	2,473
110	0.01326	0.07246	- ⁴	447	-
114	0.01384	0.10515	1.043	660	892
123	0.01507	0.12491	-	729	-
117	0.0137	0.16145	-	1,079	-
402	0.01266	0.04876	-	285	-
70	0.01479	0.09956	1.143	573	1,048
71	0.01308	0.10174	0.698	678	586
Totals	0.13809	0.98460	7.364	613	648

¹ Order of plots indicate increasing distance from the SHTC (plot 11 [100 m] to plot 71 [21 km]). ² N=78 analytes analyzed. ³ N=52 analytes analyzed. ⁴ Plots 110, 123, 117, and 402 were dropped as part of the annual monitoring program in 2025 and instead will now be included as part of subsequent expanded monitoring programs.

Relationships Between Vole Tissue Chemistry and Vole Demography

Comparison of demographic and chemical data for the three annually monitored plots indicated that although PCB and total TEQ concentrations were higher at plots closer to the SHTC, there was no evidence of corresponding impairment in vole population density, reproductive activity, sex ratios, or weight class structure (Table 4-13). Long-term data collected over 39 years similarly show no sustained population-level effects despite historically elevated contaminant body burdens near the facility. Instead, vole demography continues to be driven primarily by habitat structure, weather, predation, wildfire disturbance, and natural population cycles.

Table 4-13: Comparison of population and chemical data collected at the 3 annual monitoring plots in the vicinity of the SHTC, 2025

Parameter		Plot 11	Plot 114	Plot 70
Distance to SHTC plant site (km)		0.1	0.7	11.5
Direction to SHTC plant site		Upwind (N)	Downwind (SE)	Upwind (SW)
Population Data	June population density (no./ha)	6.3	4.9	7.6
	September population density (no./ha)	26.4	23.6	41.0
	June sex ratio (M:F)	• 3. 5	2.5	1.8
	September sex ratio (M:F)	0.4	0.4	0.6
	% voles in heavy weight class in June	89	86	73
	% voles in heavy weight class in Sept.	18	21	22
	% heavy voles breeding in June	78	71	55
	% heavy voles breeding in Sept.	18	18	20
Chemical Data	PCB congeners (pg/g) in May	9,630	37,600	420
	Dioxins/furans (pg/g) in May	7	13	11
	PCB TEQ (pg/g) in May	4	16	0.15
	Dioxin/furan TEQ (pg/g) in May	1	2	2
	Total TEQ (pg/g) in May	5	18	2.15
	PAHs (mg/kg) in May	0.993	1.0343	1.143

¹ Not detected

Overall Conclusions

The 2025 monitoring results confirm that red-backed vole populations remain demographically stable and exhibit normal cyclic dynamics. PCB congener and total PCB TEQ concentrations continue to be higher near the SHTC than at reference sites but are historically low and show an overall declining trend. Dioxin/furan congeners and dioxin/furan TEQs are very low and spatially uniform. Elevated PAHs recorded in 2024 reflect regional wildfire influences that occurred in 2023 rather than facility emissions. There was no evidence that chemical exposures measured in 2025 have resulted in adverse population-level effects on voles.

The revised adaptive monitoring framework implemented in 2024 remains scientifically defensible and appropriate for continued long-term assessment of wildlife exposure near the SHTC. While trapping mortality remains an important ethical and operational issue, current evidence indicates that it has not compromised the scientific validity of population assessments or resulted in detectable population-level impacts. Continued refinement of trapping methods and consideration of reduced live-trapping frequency (e.g., once every five years) are recommended to balance scientific objectives with animal welfare considerations.

5 AQUATIC ENVIRONMENT

Aquatic ecosystem health monitoring includes indicators of water and sediment quality as well as indicators of fish health and contaminant load. Surface water quality (i.e., that of lakes and streams) near the SHTC is important for both human health and the integrity of aquatic ecosystems. Sediment quality in waterbodies near the SHTC is an important indicator of both current environmental conditions affecting aquatic biota and of cumulative pollutant deposition. Fish tissue provides a good indicator of aquatic system contaminant levels and is important to monitor given its direct potential linkage to human health risk through consumption of natural local foods.

The objective of the aquatic monitoring program is to assess changes in the concentration of chemicals of concern in lakes and streams near the SHTC (Figure 5-1) and their potential implications for human health risk.

5.1 Surface Water Monitoring

The Swan Hills Treatment Centre (SHTC) operates under *Environmental Protection and Enhancement Act* (EPEA) Approval No. 1744-03-00 and is subject to an ongoing, long-term environmental monitoring program designed to detect potential facility-related effects on the surrounding receiving environment. The 2025 surface water monitoring program included annual sampling at three (3) established locations: Chrystina Lake (S12) and the Coutts River (S5A)—both designated as downgradient exposure sites—and Edith Lake, the regional upgradient reference site.

Overall, surface water quality in 2025 was consistent with long-term historical conditions and comparable to results from the 2024 program. Most routine chemistry, nutrient, and metal parameters met the Alberta Surface Water Quality Guidelines for the Protection of Aquatic Life (PAL). As in previous years, pH and total alkalinity at Edith Lake fell below guideline minimums; however, these results continue to reflect the naturally acidic conditions of peatland-influenced waters rather than anthropogenic effects. At S5A, dissolved iron and total cobalt exceeded PAL guidelines, consistent with past monitoring years and are likely reflective of naturally elevated metal concentrations commonly observed during low-flow autumn conditions. No guideline exceedances were recorded at Chrystina Lake.

Several routine and metal parameters exceeded their respective 95th percentiles of historical values, particularly at Chrystina Lake, where elevated alkalinity, hardness, total dissolved solids (TDS), and multiple dissolved ions were again documented. These exceedances mirror patterns observed in 2024 and

are likely attributable to natural hydrologic variability, including the limited inflow, small watershed area, and susceptibility to evaporative concentration at S12. Similar exceedances in major ions at S5A (e.g., alkalinity, bicarbonate, dissolved magnesium) were also consistent with low autumn flow conditions. In contrast, Edith Lake remained stable, with only hardness exceeding the 95th percentile, reaffirming its role as an appropriate reference station.

Trend analysis using a 10-year moving window identified statistically significant trends for several parameters. At Chrystina Lake, upward trends in alkalinity, bicarbonate, TDS, sodium, and dissolved potassium, and a continued decreasing trend in pH, were consistent with results from 2024 and likely reflect natural geochemical and hydrological processes. At the reference site, Edith Lake, increasing trends in alkalinity, bicarbonate, and TKN, and decreasing trends in aluminum, silicon, and sulphur, were again observed and remain consistent with its natural watershed characteristics. At S5A, increasing trends in arsenic, iron, silicon, magnesium, and sodium were detected but remained within historical ranges and below PAL guideline thresholds, indicating no new or emerging concerns.

Taken together, the 2025 monitoring results demonstrate that surface water quality in the receiving environment surrounding the SHTC remains stable and within the bounds of natural regional variability. Observed exceedances, historical highs, and trends are consistent with site-specific hydrologic and geochemical conditions rather than changes in facility emissions or operations. The program continues to provide strong evidence that SHTC activities are not causing measurable adverse effects on regional surface water quality. The existing monitoring framework—including annual surface water sampling and biennial sediment sampling—remains appropriate for detecting environmental change and ensuring continued protection of aquatic life in the region.

5.2 Sediment Monitoring

Sediment monitoring was not conducted in 2025 in accordance with the biennial schedule.

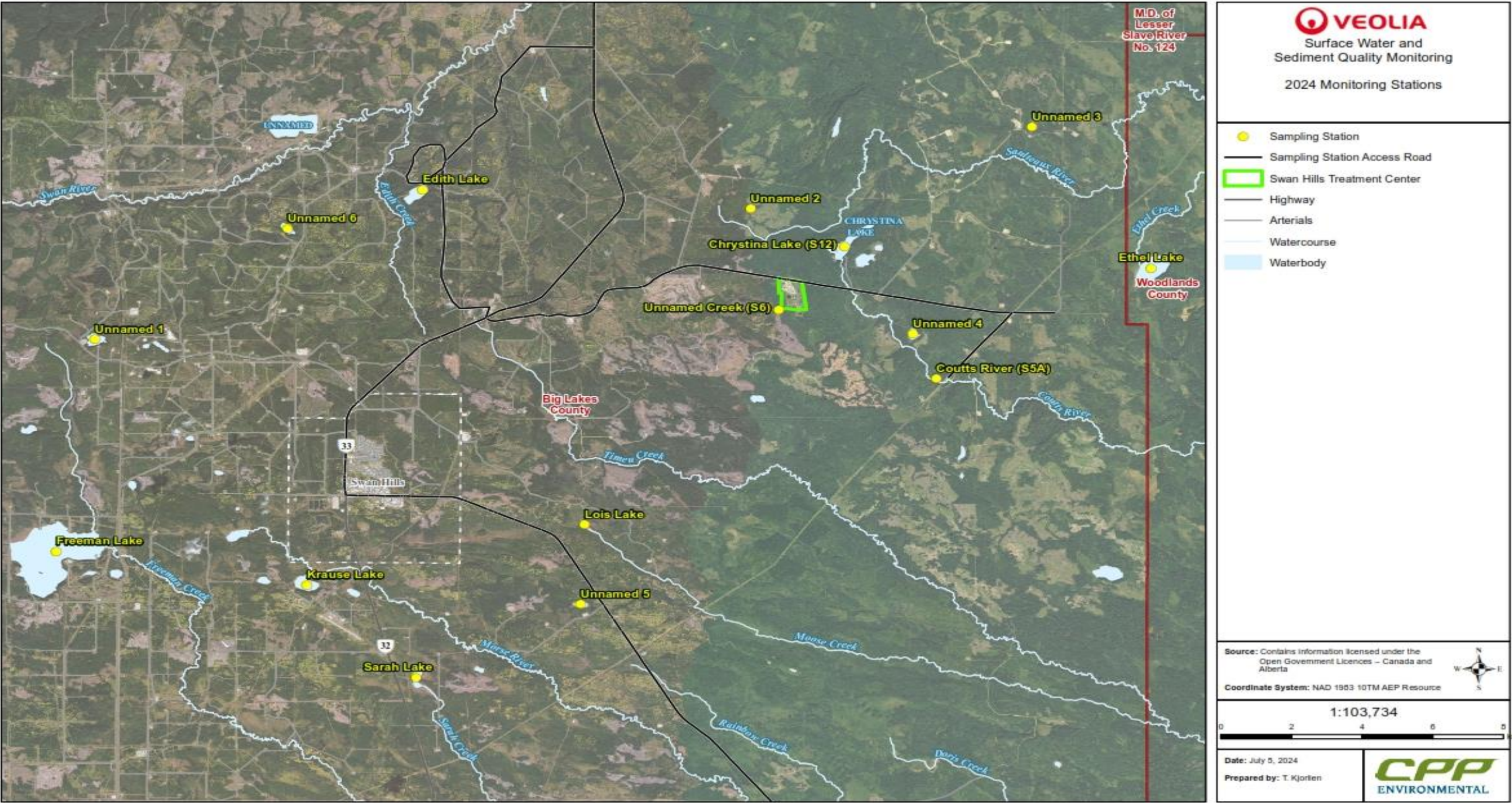


Figure 5-1: Surface Water, Sediment and Fish Tissue Monitoring Locations

Table 5-1: Summary of 2025 Surface Water Quality Monitoring Program

2025 surface water quality summary, including historically high values in 2025, regulatory guideline exceedances (Government of Alberta, 2018), and significant ($\alpha = 0.1$) water quality trends over 10 years for each of three (3) monitoring sites.

Parameter	Above Historical Range			Exceeding Regulatory Guidelines			Mann-Kendall Trends		
	Chrystina Lake	Edith Lake	Coufts River	Chrystina Lake	Edith Lake	Coufts River	Chrystina Lake	Edith Lake	Coufts River
Routine parameters and major ions									
Alkalinity (total as CaCO ₃)	Above	-	Above	-	Below minimum	-	Up	Up	Up
Electrical conductivity	Above	-	-	-	-	-	NT	NT	Up
Hardness	Above	Above	-	-	-	-	NT	NT	NT
Bicarbonate	Above	-	Above	-	-	-	Up	Up	Up
pH	-	-	-	-	Below minimum	-	Down	NT	NT
Sodium (total)	-	-	-	-	-	-	Up	NT	Up
Calcium (total)	Above	-	-	-	-	-	NT	NT	NT
Calcium (dissolved)	Above	-	-	-	-	-	NT	NT	NT
Total dissolved solids (TDS)	Above	-	-	-	-	-	Up	NT	NT
Nutrients									
Total Kjeldahl Nitrogen	Above	-	-	-	-	-	NT	Up	NT
Total Metals									
Barium (total)	Above	-	-	-	-	-	Up	NT	NT
Copper (total)	-	-	-	-	-	-	NT	Up	NT
Potassium (total)	Above	-	-	-	-	-	NT	NT	NT
Cobalt (total)	-	-	-	-	-	Above chronic	-	-	-
Silicon (total)	-	-	Above	-	-	-	NT	Down	Up
Strontium (total)	Above	-	-	-	-	-	Up	-	NT
Aluminum (total)	-	-	-	-	-	-	NT	Down	NT
Arsenic (total)	-	-	-	-	-	-	NT	NT	Up
Iron (total)	-	-	-	-	-	-	NT	NT	Up
Magnesium (total)	-	-	-	-	-	-	NT	NT	Up
Sulphur (total)	-	-	-	-	-	-	-	Down	NT
Dissolved Metals									
Iron (dissolved)	-	-	-	-	-	Above chronic	-	NT	NT
Potassium (dissolved)	Above	-	-	-	-	-	Up	NT	NT
Magnesium (dissolved)	Above	-	Above	-	-	-	NT	NT	NT
Manganese (dissolved)	-	-	Above	-	-	-	-	NT	NT

5.3 Fish Tissue Monitoring

The summary of the fish tissue monitoring will not be included in this report due to fish tissue sample shipping issues. We have received an extension for the final report submission, which is now due by September 30, 2026.

5.4 Toxicological Assessment of Fish Tissue Monitoring Results

The summary of the human health risk assessment will not be included in this report due to fish tissue shipping issues. We have received an extension for the final report submission, which is now due by September 30, 2026.

6 STATE OF THE ENVIRONMENT SURROUNDING THE SWAN HILLS TREATMENT CENTRE

6.1 On-Site Monitoring

The SHTC operated within its Approval requirements in 2025 and no excursions resulting in significant emissions occurred. Incinerator performance during the compliance tests met emission requirements for total PCDD/DF TEQ and mercury. Fugitive emissions remained well controlled and the activated carbon in the air management units was replaced as required. No leaks were identified in the annual tank farm survey. The success in fugitive emission control measures was demonstrated in the ambient air monitoring results. The annual average PCB levels in ambient air recorded at all fence line sites and the off-site monitoring location remain among the lowest reported to date. VOC and TOC levels measured at the OTF remained low and consistent with recent monitoring results. All Total Suspended Particulate (TSP) samples were well below the ambient air quality objective of $100 \mu\text{g}/\text{m}^3$, and the fine particulate ($\text{PM}_{2.5}$) samples were low at all monitoring locations and met the Alberta ambient air quality objective of $29 \mu\text{g}/\text{m}^3$.

The Soil Monitoring Program was executed. The samples were collected November 17-21, 2025 and the Soil Monitoring Report and Proposed Soil Management Program will be submitted before May 30, 2026.

Groundwater monitoring was completed in September and results in 2025 confirmed that water quality in the till (shallow and intermediate depths) and the sandstone aquifer remains good and consistent with previous results.

6.2 Terrestrial Environment

The 2025 soil, vegetation and wildlife monitoring results were consistent with previous monitoring program results. The primary contaminants of concern (PCBs, dioxins and furans) were detected in all three receptors and show a similar distribution. Although levels are declining, they remain elevated above background at sites nearest to the SHTC and decrease significantly with distance. The area of influence is relatively small as concentrations return to near background levels beyond approximately 2 km from the facility. A nearby forest fire which occurred in the early summer of 2025 appears to have contributed to emissions and deposition of metals, as well as PCBs and PCDD/DF.

Significant variation is often seen in the organic results year to year. This likely reflects the variability inherent in environmental monitoring programs and the highly sensitive analytical methods being employed. To summarize potential contaminant risk and show trends over the past 20 years, the mean total TEQ results for Labrador tea, live moss and red-backed vole tissue are presented in Figures 6-1 to 6-3. The results from 10 monitoring plots were segregated according to their proximity to the SHTC. Six of the 10

sites are situated near the SHTC and are all within 2 kilometers. The remaining four plots are located at distances of 2.4 to 21 kilometers and include the two reference sites. The magnitude of concentrations varies by receptor with the lowest levels observed in Labrador tea and the highest in red-backed vole tissue. This reflects the nature of the receptor and its exposure to the contaminants of concern. Despite these differences, consistency is seen in the results. Levels are highest at plots located closest to the facility (plots <2 km) and show a decreasing trend over time. Although the trends are not significant in all cases, a consistent decrease in average total TEQ is evident in Labrador tea, live moss and voles at plots near the facility. The Labrador tea mean total TEQ levels for plots >2 km has remained at a low level since 2000.

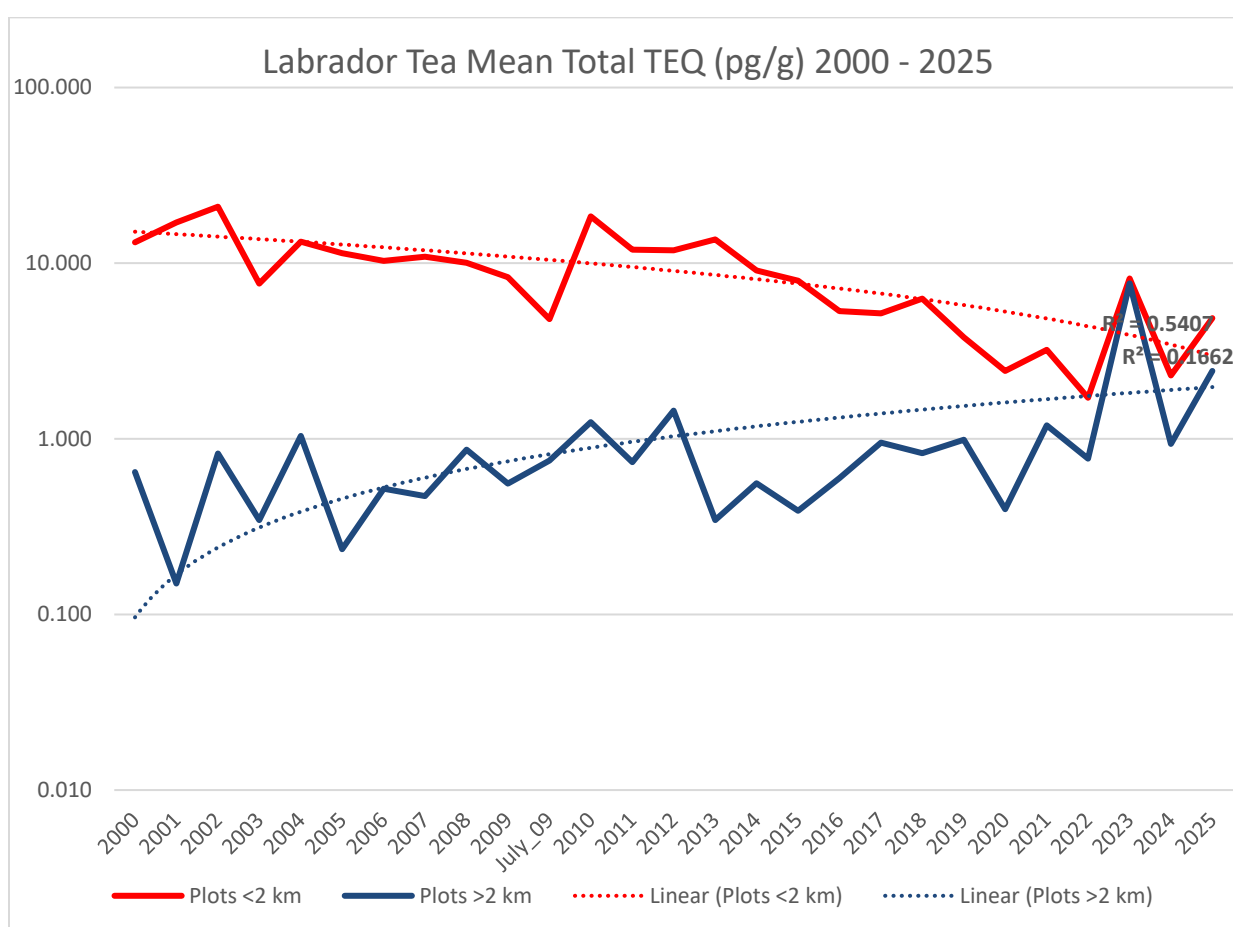


Figure 6-1: Labrador tea Mean Total TEQ at plots ≤2 km and >2 km from the SHTC (2000-2025)

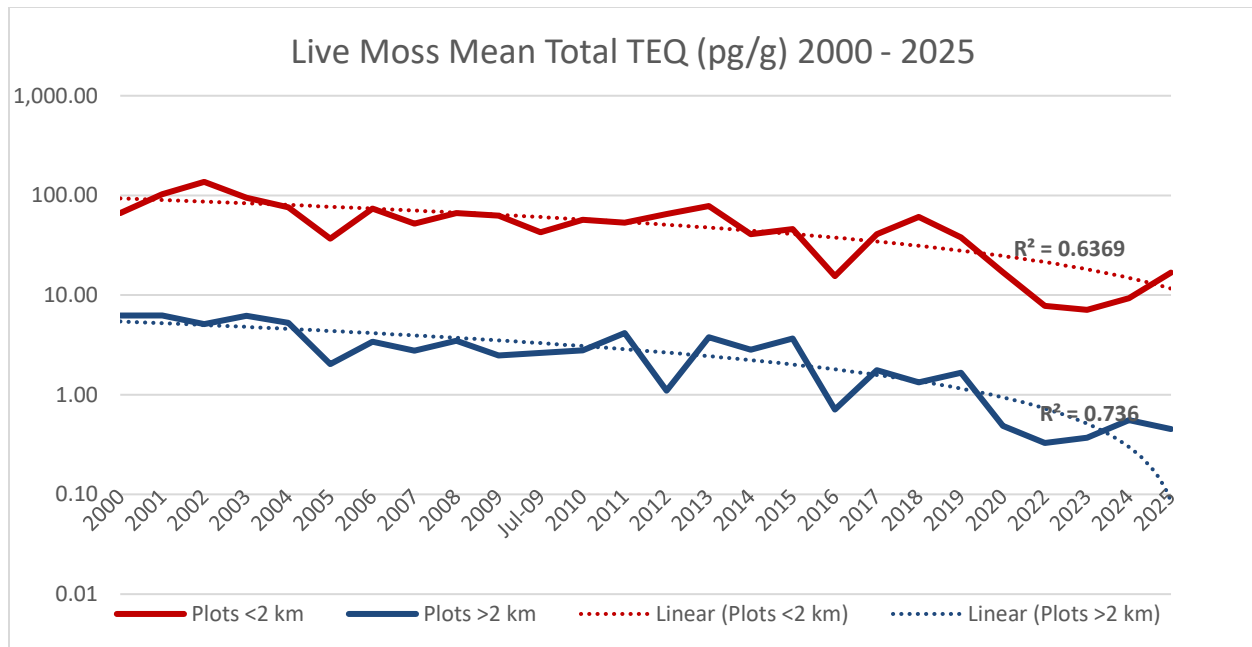


Figure 6-2: Live moss Mean Total TEQ at plots ≤ 2 km and >2 km from the SHTC (2000-2025)

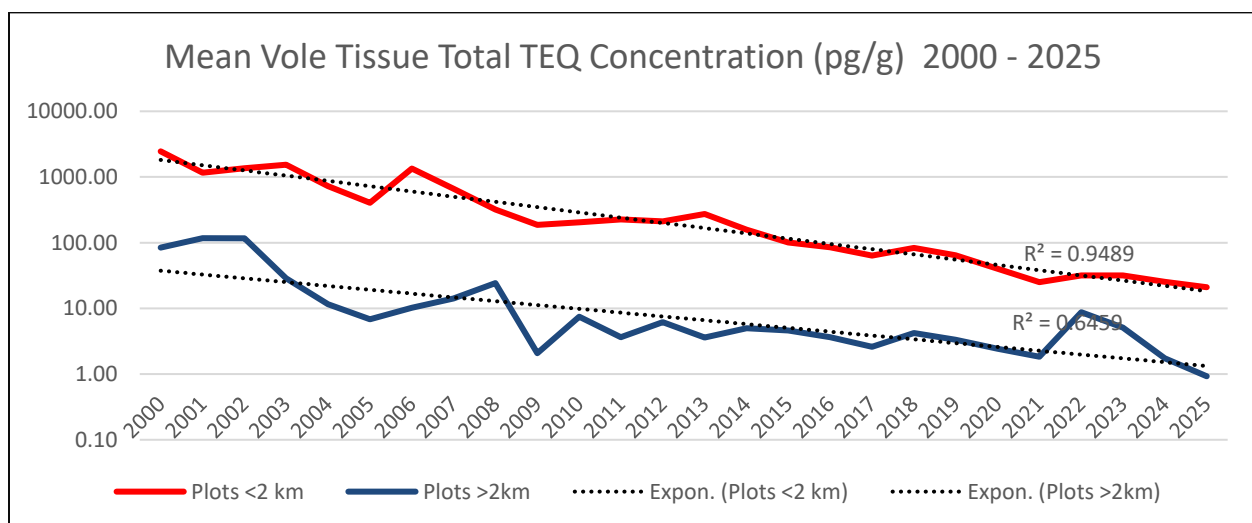


Figure 6-3: Wildlife Mean Total TEQ at plots ≤ 2 km and >2 km from the SHTC (2000-2025)

Collectively, these results suggest that the area influenced by trace organic contaminant emissions (total TEQ) from the SHTC is localized and that contaminant levels are either decreasing or stable. Furthermore, the Labrador tea results suggest that annual emissions of organic contaminants, reported as total TEQ, are very low and have not shown any significant change at sites beyond 2 km since 2000.

Organic contaminant results are lower than what has been observed historically in all media and appear to be stable and/or decreasing. Currently, results are below relevant guidelines and have not resulted in any observable impacts on the indicator receptors used in the monitoring program (lichen, live moss or Labrador tea). In addition, contaminant levels in small mammals (red-backed voles) are well below the lowest observed adverse effect level (LOAEL) and decreased from levels observed in 2024. The results for Total TEQ are among the lowest results at most sites. Demographic studies continue to show that vole populations are healthy, and no impacts have been observed.

Metals are also monitored in Labrador tea, live moss, moss bags and vole tissue (expanded years only). Metal results are generally low and consistent with background and historic levels at most sites. However, several metals including antimony, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, silver, tin and zinc have been observed at higher concentrations at monitoring plots closest to the SHTC from 2019-2025. This may be partially due to improved sample extraction methods, analytical procedures and lower detection limits implemented in recent years, or may reflect emissions from the nearby forest fire that was active in the early summer of 2025. However, recent results suggest that the SHTC may be a minor source of metals and additional monitoring effort is currently being implemented to better define and understand potential issues related to these findings.

6.3 Aquatic Environment

Overall, surface water quality in 2025 was consistent with long-term historical conditions and comparable to results from the 2024 program. Most routine chemistry, nutrient, and metal parameters met the Alberta Surface Water Quality Guidelines for the Protection of Aquatic Life (PAL). As in previous years, pH and total alkalinity at Edith Lake fell below guideline minimums; however, these results continue to reflect the naturally acidic conditions of peatland-influenced waters rather than anthropogenic effects. At S5A, dissolved iron and total cobalt exceeded PAL guidelines, consistent with past monitoring years and are likely reflective of naturally elevated metal concentrations commonly observed during low-flow autumn conditions. No guideline exceedances were recorded at Chrystina Lake.

Several routine and metal parameters exceeded their respective 95th percentiles of historical values, particularly at Chrystina Lake, where elevated alkalinity, hardness, total dissolved solids (TDS), and multiple dissolved ions were again documented. These exceedances mirror patterns observed in 2024 and are likely attributable to natural hydrologic variability, including the limited inflow, small watershed area, and susceptibility to evaporative concentration at S12. Similar exceedances in major ions at S5A (e.g., alkalinity, bicarbonate, dissolved magnesium) were also consistent with low autumn flow conditions. In contrast, Edith Lake remained stable, with only hardness exceeding the 95th percentile, reaffirming its role as an appropriate reference station.

Sediment quality will be assessed in 2026.

The fish tissue sample collected was performed in September 2025, however due to issues with shipping the samples the results were not available to include in this report. The samples have recently been shipped to the lab so that the Fish Tissue Monitoring Report and Human Health Risk Assessment can be completed and submitted by the September 30, 2025 due date.

Overall, environmental quality surrounding the SHTC is good and contaminant levels associated primarily with historic operations (PCBs, dioxins and furans) continue to decrease and/or have stabilized at low concentrations near background levels.

7 2026 MONITORING PROGRAM

7.1 Existing Program and Changes for 2026

The results of the 2025 monitoring program were reviewed at the technical meeting, which was held virtually on March 5, 2026. Participants include members of the Veolia staff, external consultants, representatives from Alberta Infrastructure, Alberta Health, and Alberta Environment and Protected Areas. Based on the findings of the 2025 monitoring year, several scope changes were recommended for future expanded monitoring years and the standard annual monitoring programs. These recommendations were presented and discussed during the meeting and have been incorporated into the proposed 2026 and future monitoring programs.

Overall objectives for the 2026 monitoring program include:

- Continue with the overall monitoring programs, reducing or expanding where necessary based on objectives and effectiveness.
- Continue to review and monitor triggers to optimize the effectiveness of the current scope for sampling and analysis.

Table 7-1: Overview of 2026 standard monitoring year and proposed changes.

Monitoring Program	Existing	Recommended Changes
Air	Program as specified in EPEA Approval No. 1744- 03-00	Mercury CEMS code variance request
Groundwater	- Routine water analysis, PCB's, metals and Dissolved Organic Carbons on all wells - BTEX, F1, AOX, analyzed on shallow wells - Well replacements and maintenance as needed	2026 results at 01(R)-SH will be closely monitored to confirm odd exceedances and detections. - Sampling frequency for Dioxins and Furans reduced to once every 5 years, next event is scheduled for 2029 - Investigate the potential source of elevated chloride concentrations in 07-SH
Soils and Vegetation	- Labrador Tea and Live Moss at 9 sites - Moss Bags at 15 sites 15 Lichen monitoring sites (coincides with moss bag sites)	Current Scope
Wildlife	3 Population monitoring plots 6 Snap trapping plots	Reduce the monitoring frequency to once every five years (or in the event of a major facility incident)
Surface Water and Sediments	- Annual surface water sampling at 3 locations - Biennial sediment sampling at 4 locations	Current Scope

7.2 Triggers

Triggers provide specific levels and actions that expand the Environmental Monitoring Program to address potential issues that may be identified through the initial review of monitoring results and/or to respond quickly to a potential off-site release. Recommended 2026 program triggers for all monitoring components have been reviewed and are presented in Table 7-1.

Table 7-2: Environmental Monitoring Triggers for 2026

Component	Trigger	Response - Additional Monitoring Work
Operations	A facility upset resulting in off-site emissions of significant magnitude to warrant immediate assessment	Implement Emergency Response Plan and compile relevant data regarding the incident to facilitate development of an effective Environmental Monitoring Program response
Ambient Air	PCB concentration exceeds 150 ng/m ³ at fenceline monitoring locations	Verify result and investigate potential sources of fugitive emissions. Increase frequency of PCB air monitoring to NAPS cycle – once every 6 days if warranted.
	VOC exceeds a level of 3 ppm or THC exceeds 5 ppm	Report individual VOC compounds and compare with appropriate air quality and occupational health and safety guidelines and review trends over the period of record. If deemed significant, the OTF fugitive emission survey would be triggered if not already conducted
	A facility upset resulting in an off-site release of significant magnitude to warrant immediate assessment	Review meteorological data and conduct dispersion modelling (if appropriate) to support initial assessment and guidance for environmental monitoring response. Conduct additional air monitoring as recommended
Groundwater	Statistically significant increase in key parameter (e.g. PCBs).	Implement Response Plan and conduct follow up sampling to verify and assess results
	A significant facility upset resulting in on-site spill of significant magnitude to warrant immediate assessment	Incorporate additional monitoring as recommended by the Response Plan
Soil & Vegetation	Total TEQ increases above 75th percentile (last 10 years data) in the Labrador tea at plots (4, 11, 109, 114)	Analyze archived live moss samples If levels are elevated in both Labrador tea and live moss, expand monitoring scope in following year to include both Labrador tea and live moss from 10 Plots
	A facility upset resulting in off-site emissions of significant magnitude to warrant immediate assessment	Soil and vegetation monitoring to proceed at selected sites immediately following incident. The number/location of sites and analytical scope would be based on meteorological conditions and the nature of the release.

Component	Trigger	Response - Additional Monitoring Work
Wildlife	Statistically significant change in June vole population levels correlated with the April/May tissue contaminant levels	Collect and analyze September vole tissue from population monitoring plots (11, 114 and 70) for PCBs, dioxins and furans
	Elevated Total TEQ in live moss and Labrador tea is observed	Expand vole tissue collection to 10 plots consistent with the Soil and Vegetation program
	A facility upset resulting in off-site emissions of significant magnitude to warrant immediate assessment	Additional sampling of vole tissue. Timing, sample locations and analytical scope would be determined based on meteorological conditions and the nature of the release.
Aquatic	Contaminant levels exceed the 95 th percentile value in Chrystina Lake sediments	Verify result and include sediment sampling in both Chrystina and Edith lakes during the next annual program if warranted
	Contaminant levels exceed 95 th percentile value and/or the Interim Sediment Quality Guidelines (ISQG) in stream sediment samples	Verify results and initiate additional downstream sampling in following sampling period if warranted
	Organic contaminant levels in Chrystina Lake brook trout exceed the recommended toxicity trigger	Analyze any archived samples to verify results Sample Edith Lake brook trout in the following year
	A facility upset resulting in off-site emissions of significant magnitude to warrant immediate assessment	Initiate immediate water quality, sediment and fish tissue sampling as recommended.
Toxicology	New toxicity information becomes available (i.e. significant change in end-point toxicity of the compounds of interest – PCBs, PCDD/F)	Conduct full HHRA on fish tissue results Re-evaluate vole toxicity assessment
	Chrystina Lake fish tissue level exceeds Toxicity Trigger	Conduct full HHRA and assess fish tissue levels in Edith Lake
	Any new compounds are identified at elevated levels (e.g. heavy metals) in animal or fish tissue.	Assess vole toxicity Expand HHRA to incorporate new compounds of interest

