
Lake Memphremagog PFAS Sampling - Preliminary Results Update August 16, 2021

Introduction

On July 20, 2021, water quality monitoring experts from the Vermont Department of Environmental Conservation (DEC) and from COGESAF, the Saint-François watershed governance council, collected water samples from sites in Lake Memphremagog, its tributaries, and in adjacent wastewater effluent. These samples were then analyzed for 36 forms of Per- and Polyfluorinated Alkyl Substances (PFAS) at an accredited laboratory in the United States, including the five VT Regulated PFAS (PFHpA, PFHxS, PFOA, PFNA, PFOS), and 27 forms of PFAS at an accredited laboratory in Ontario, Canada¹.

PFAS Surface Water & Effluent Sample Collection Sites

VTDEC collected surface water samples from ten sites within the Lake Memphremagog watershed (Figure 1) including three sites on the Main Lake, including a US/Canada border location, a mid-lake site and southern site. South Bay and four major tributaries (Johns, Clyde, Black and Barton Rivers) and the Newport City Wastewater Treatment Facility (WWTF) effluent were also sampled. COGESAF collected samples from three sites in Lake Memphremagog on the Canadian side of the border, with duplicates taken at the northern end of the lake adjacent to the Sherbrooke and Magog Water Intake, for a total of four samples. To ensure complementarity between laboratory results, COGESAF also analyzed two samples taken by the VT DEC Team, one from the border and one effluent sample taken at the Newport WWTF. See Figures 1 and 2 below for maps of the respective sampling sites in USA and Canada.

PFAS Laboratory Analysis Information

Given the sensitivity of PFAS analyses, which are measured in parts per trillion, and potential for field contamination, duplicate samples from two sites in VT were also sent to the Canadian Laboratory to assess complementarity between the two laboratories. Based on US EPA Method 537.1, each PFAS analyte has a **laboratory reporting limit**, which is defined as the lowest analyte concentration that meets the Data Quality Objectives defined in the method. The laboratory reporting limit is 1.8 nanograms per liter (ng/L or parts per trillion) for most forms of PFAS in the USA and 2.0 ng/L for most forms of PFAS in Canada. PFAS analyte values below the laboratory reporting limit are defined as “ND” or non-detect in the tables below.

Laboratories typically obtain PFAS analyte results below the laboratory reporting limit but still above a detection limit, but these results, as defined in the US EPA Method 537.1, are intended

¹ USA Lab is Alpha Analytical in Massachusetts and the Canadian Lab is Bureau Veritas in Ontario.

Table 3. Surface Water PFAS detections (ng/L) for the 27 PFAS compounds at Quebec Lake Memphremagog sites, collected 7/20/2021

Site	Main Lake - Border	Main Lake - Central	Main Lake North #1	Main Lake - North #2
Analytes	Site 94	Site 91	Prise #1	Prise #2
EtFOSAA	ND	ND	ND	ND
Perfluorobutanoic Acid (PFBA)	ND	ND	ND	ND
Perfluoropentanoic Acid (PFPeA)	ND	ND	ND	ND
Perfluorohexanoic Acid (PFHxA)	ND	ND	ND	ND
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA)	ND	ND	ND	ND
Perfluorononanoic Acid (PFNA)	ND	ND	ND	ND
Perfluorodecanoic Acid (PFDA)	ND	ND	ND	ND
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA)	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTeDA)	ND	ND	ND	ND
Perfluorobutanesulfonic acid (PFBS)	ND	ND	ND	ND
Perfluoropentanesulfonic acid PFPes	ND	ND	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	ND	ND	ND	ND
Perfluoroheptanesulfonic acid (PFHp)	ND	ND	ND	ND
Perfluorooctanesulfonic acid (PFOS)	ND	ND	ND	ND
Perfluorononanesulfonic acid (PFNS)	ND	ND	ND	ND
Perfluorodecanesulfonic acid (PFDS)	ND	ND	ND	ND
Perfluorooctane Sulfonamide (PFOSA)	ND	ND	ND	ND
MeFOSAA	ND	ND	ND	ND
4:2 Fluorotelomer sulfonic acid	ND	ND	ND	ND
6:2 Fluorotelomer sulfonic acid	ND	ND	ND	ND
8:2 Fluorotelomer sulfonic acid	ND	ND	ND	ND
Hexafluoropropyleneoxide Dimer Acid	ND	ND	ND	ND
4,8-Dioxa-3H-Perfluorononanoic Acid	ND	ND	ND	ND
9Cl-PF3ONS (F-53B Major)	ND	ND	ND	ND
11Cl-PF3OUdS (F-53B Minor)	ND	ND	ND	ND

Table 4. US / Canada Lab results for (5) VT Regulated PFAS (ng/L) for duplicate lake samples

Site	Main Lake - Border - USA Lab	Main Lake - Border - Canadian Lab
Analytes	Duplicate 1	Duplicate 2
PFHpA	ND	ND
PFHxS	ND	ND
PFOA	ND	ND
PFNA	ND	ND
PFOS	ND	ND

WWTF Effluent Results

VT DEC collected wastewater effluent samples from the Newport WWTF, and duplicates samples were analyzed at both USA and Canadian labs to assess complementarity.

A total of ten PFAS analytes were detected in the Newport City WWTF effluent by the USA laboratory and a total of seven PFAS analytes were detected by the Canadian Laboratory. Effluent concentrations immediately become diluted when released into rivers, in this case the Clyde River, and when the total concentration of the USA laboratory PFAS values from the effluent are diluted based on values for low median monthly flow within the Clyde River, this effluent concentration **would be equivalent to a total of 2.5 ng/L (ppt) after mixing** for the sum of all PFAS detected. The result would be lower using the values from the Canadian laboratory as they detected fewer forms of PFAS.

Comparison of wastewater effluent results shows one result where inter-laboratory complementarity is below expectations; specifically, the PFOS results show a value of 5.35 ng/L from the USA laboratory and a ND result from the Canadian laboratory. Experts from both teams are reviewing this result in more detail, including recovery percentages from these analyses, and hope to better understand and describe this difference in our upcoming final report.

Table 5. Effluent PFAS detections (ng/L) for the 36 PFAS compounds at Newport WWTF, collected 7/20/2021, with results from both the USA and Canada laboratories

Site	Newport WWTF Effluent - US LAB	Newport WWTF Effluent- Canadian Lab
Analytes	Site 11	Site 11
PHFpA	3.66	3.4
PFHxS	ND	ND
PFOA	11.4	9.8
PFNA	2.12	ND
PFOS	5.35	ND
PFBA	19.2	9.1
PFPeA	41.1	35
PFBS	6.82	3.4
PFHxA	30.1	23
FOSA	ND	ND
PFDA	4.75	4
NMeFOSAA	4.22	ND
NEtFOSAA	ND	ND

Upcoming Sampling Activities

The second of three rounds of PFAS surface water sampling at Lake Memphremagog sites in the USA and Canada is scheduled for August 19, 2021. Fish tissue sampling will also be conducted during this period at four sites within the Lake Memphremagog watershed by the VT

Department of Fish & Wildlife. Fish tissue samples from the four sites, representing three species of fish will be analyzed for 36 PFAS compounds to provide baseline data for evaluation. A final round of water sampling will be conducted in September 2021. A final report will be disseminated shortly thereafter.

Figure 1. Eleven USA PFAS Sampling Sites

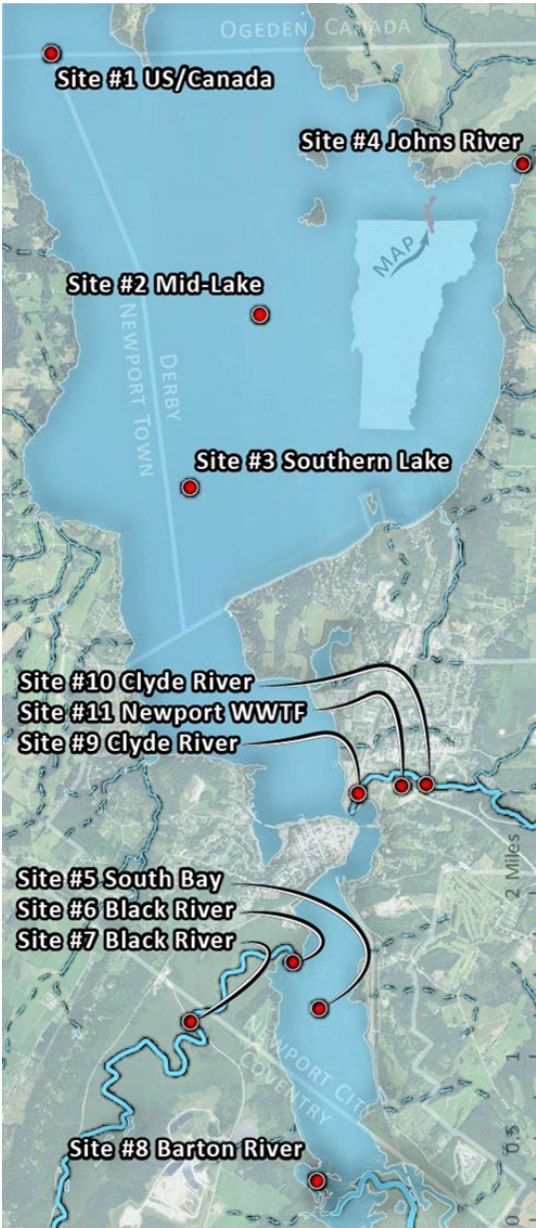


Figure 2. Three Canadian PFAS Sampling Sites.

