



MEMO

TO: Jackie Wells
COMPANY: Newfoundland and Labrador Hydro
FROM: Matthew Gosse
DATE: December 14, 2022
CC: James McCarthy
PROJECT NO.: TE22104007.3000
SUBJECT: Muskrat Falls Reservoir Methylmercury Monitoring – June 2022 Update

Dear Ms. Wells,

To provide additional monitoring coverage of possible changes in methylmercury concentrations in water during headpond and reservoir formation, the provincial government requested an additional sampling program be implemented by Nalcor. Nalcor provided a program description to government and engaged WSP E&I Canada (WSP; formerly Wood Environment & Infrastructure Solutions) to implement the sampling program. This memo provides a summary of total and dissolved methylmercury data collected in June 2022. While not considered analysis, the results will be continually added to the annual dataset.

1 METHYLMERCURY

Methylmercury is the organic form of mercury, which is bioavailable and biomagnifies within the food chain (Mergler et al. 2007, Chen et al. 2014). The Muskrat Falls Methylmercury Monitoring Program is specifically designed to monitor methylmercury (total and dissolved) as well as total mercury and various parameters which could affect methylation (i.e., total phosphorus, DOC, and temperature) and transport (i.e., TSS).

2 HEADPOND FORMATION AND RESERVOIR CREATION

Headpond formation was completed in early February 2017, with the first set of impoundment samples being collected February 6, 2017. The inundation to full supply water level (38.5-39 m elevation) began on August 7, 2019 and was completed on September 5, 2019. The first complete year of water quality data with full reservoir formation was collected between September 9, 2019 through August 25, 2020. Year two of full reservoir formation began in September 2020 and was completed at the end of August 2021. September 2021 marks the beginning of Year 3 of full impoundment.

3 SAMPLING PROGRAM OVERVIEW

Water sampling began in October 2016, with initial samples being collected before any headpond/reservoir formation began to capture natural methylmercury concentrations. Headpond formation in February 2017 initiated weekly water sample collection from 11 of the 13 sample locations (Figure 1). Throughout headpond formation, inundation had not affected sample locations N2 and N3, therefore they were omitted from the weekly sampling regime until full reservoir inundation, as per WRMD request.

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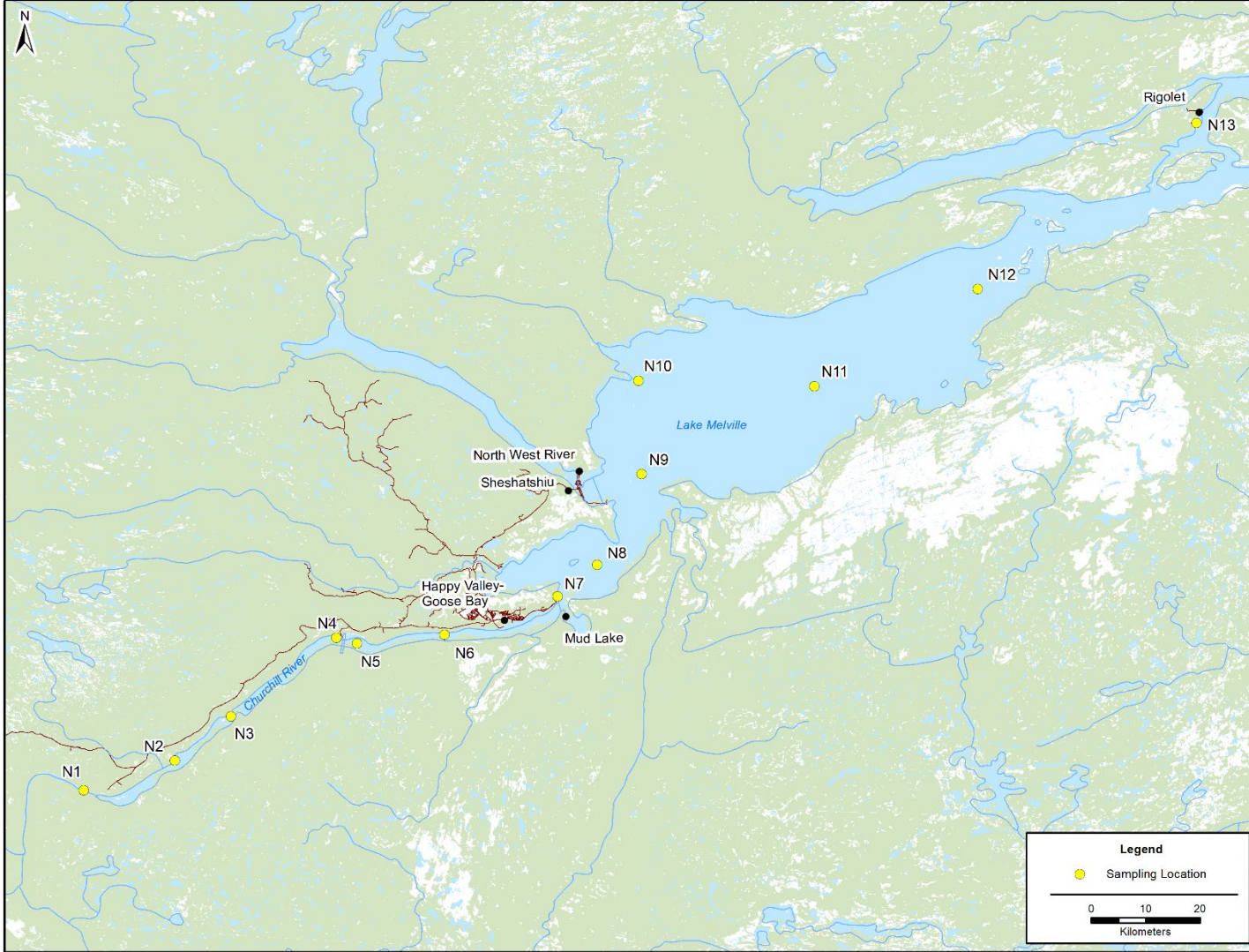


Figure 1: Map of sampling locations for the Muskrat Falls Methylmercury Monitoring Program

With the completion of reservoir formation in September 2019, samples are currently being collected from all 13 sampling locations, including N2 and N3. As per Independent Expert Advisory Committee (IEAC) recommendation, each location is now sampled weekly when water temperatures exceed 6°C. When water temperatures are below 6°C, sampling occurs on a bi-weekly basis unless there is a change in water elevation of the reservoir by Nalcor which would re-trigger weekly sampling.

Since this program began in October 2016, over 2,700 samples have been collected and analysed.

4 MEASURED METHYLMERCURY - JUNE 2022

All ongoing laboratory analysis is currently being completed by AGAT Laboratories (AGAT), with a subset of methylmercury also being analysed by Flett Research (Flett) as a means of QA/QC. The results of this annual QA/QC analysis will be presented at a future date.

During June 2022, the highest mean concentrations of total methylmercury were measured in eastern Lake Melville (N12; Table 1). Three samples were collected from N12 during June 2022, one with a concentration of 0.198ng/L, which is approximately 7x the mean concentration from N12 since Reservoir formation was completed. The other two samples collected from N12 had concentrations of 0.029 and 0.039ng/L.

The highest mean dissolved methylmercury concentration measured in June 2022 was in western Lake Melville, at site N10.

Table 1: Summary of methylmercury concentrations measured during June 2022

SAMPLE SITE	TOTAL METHYLMERCURY			DISSOLVED METHYLMERCURY		
	SAMPLE SIZE	MEAN	MAXIMUM	SAMPLE SIZE	MEAN	MAXIMUM
N1	3	0.040	0.043	3	0.030	0.032
N2	3	0.058	0.069	3	0.035	0.038
N3	3	0.050	0.059	3	0.033	0.036
N4	7	0.054	0.077	7	0.034	0.050
N5	3	0.051	0.060	3	0.034	0.044
N6	3	0.044	0.046	3	0.033	0.037
N7	3	0.049	0.062	3	0.032	0.035
N8	3	0.049	0.053	3	0.033	0.038
N9	2	0.031	0.035	2	0.017	0.023
N10	3	0.072	0.094	3	0.045	0.076
N11	2	0.031	0.032	2	0.015	0.019
N12	3	0.089	0.198	3	0.032	0.067
N13	3	0.024	0.042	3	0.010	- ²

Note All values below detection limits have been included in calculations at the detection limit (0.010 ng/L)
All values are presented in ng/L

¹ All sample depths, where applicable, have been included in summary values

² All samples were below laboratory detection limits

All water quality data related to this program is available from Nalcor's website ([muskatfalls.nalcorenergy.com](https://www.gov.nl.ca/ecc/methylmercury-mrf/)) and the province (<https://www.gov.nl.ca/ecc/methylmercury-mrf/>).

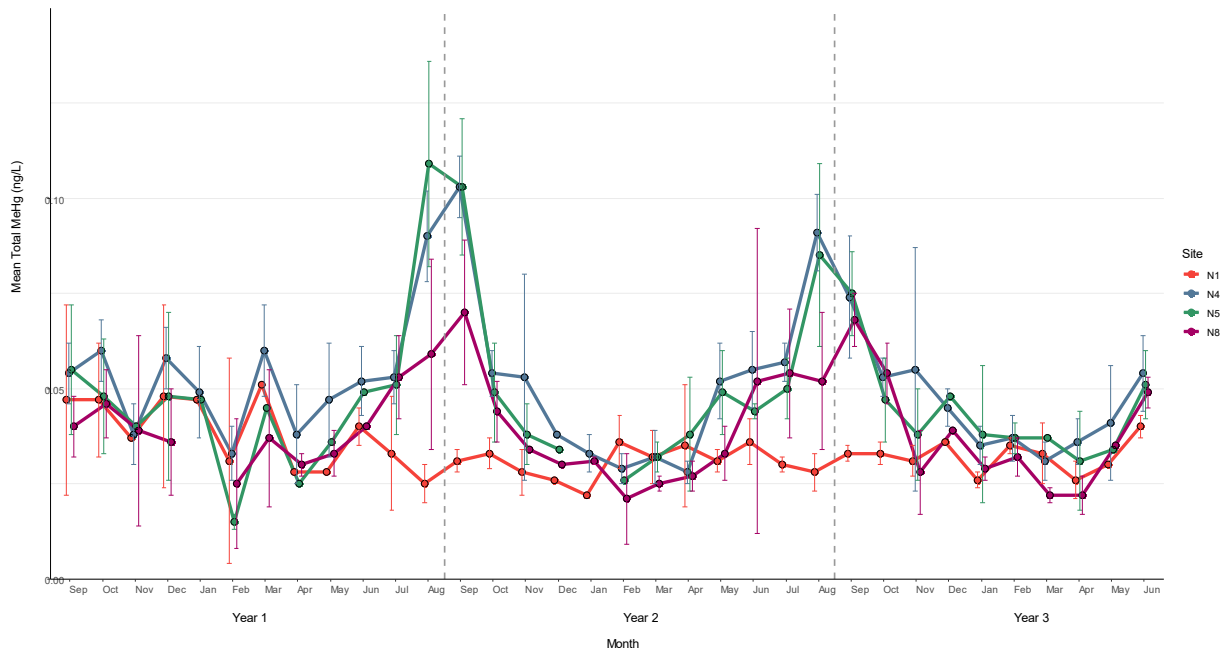


Figure 2: Summary of mean monthly Total methylmercury concentrations since the completion of Reservoir inundation (September 2019). Error bars represent the 95% Confidence interval of the mean monthly concentration.

5 CLOSURE

We trust that you will find the information presented within this memo satisfactory. However, should you have any questions, concerns or require clarification, please do not hesitate to contact us at your convenience.

Sincerely,

WSP Environment & Infrastructure

Prepared by

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Biologist

Reviewed by

James McCarthy, M.Sc.
Atlantic Sciences Discipline Lead

6 REFERENCES

- Chen, C. Y., M. E. Borsuk, D. M. Bugge, T. Hollweg, P. H. Balcom, D. M. Ward, J. Williams, and R. P. Mason. 2014. Benthic and Pelagic Pathways of Methylmercury Bioaccumulation in Estuarine Food Webs of the Northeast United States. *PLoS ONE* 9:e89305.
- Mergler, D., H. A. Anderson, L. H. M. Chan, K. R. Mahaffey, M. Murray, M. Sakamoto, and A. H. Stern. 2007. Methylmercury Exposure and Health Effects in Humans: A Worldwide Concern. *AMBIO: A Journal of the Human Environment* 36:3–11.