Keeyask Generation Project

Aquatic Effects Monitoring Plan

Mercury in Fish Flesh from the Keeyask Reservoir, Stephens Lake, and Split Lake Report

AEMP-2022-11

KEEYASK

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KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2022-11

MERCURY IN FISH FLESH FROM THE KEEYASK RESERVOIR, STEPHENS LAKE, AND SPLIT LAKE, 2021

Prepared for

Manitoba Hydro

By

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SUMMARY

Background

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the Keeyask Generating Station (GS) on the environment. Besides measuring the accuracy of the predictions made and actual effects of the GS on the environment, monitoring results will provide information on how construction and operation of the GS will affect the environment and if more needs to be done to reduce harmful effects.

Construction of the Keeyask GS began in mid-July 2014 and instream work was completed in 2020. The reservoir was impounded with water levels being raised to full supply level between August 31 and September 5, 2020. Commissioning of the powerhouse turbines was initiated after impoundment and five of seven units were in-service by fall 2021. During commissioning and as units came into service, substantial flows continued through the spillway until the summer of 2021 when more flow was going through the powerhouse than spillway. By mid-September the spillway was closed and barely used in the fall.

Fish mercury is one of the key components for monitoring because it affects the suitability of fish for consumption by people. Flooding is predicted to increase mercury levels in fish in the Keeyask reservoir (formerly Gull Lake) and Stephens Lake, though the increase in Stephens Lake will be much less than when the lake was first created by construction of the Kettle GS in the early 1970s. There are no predicted effects of reservoir flooding on mercury in fish caught from Split Lake, but there is a potential for fish from the Keeyask reservoir to move in and out of it, so monitoring will be carried out to confirm there are no impacts.

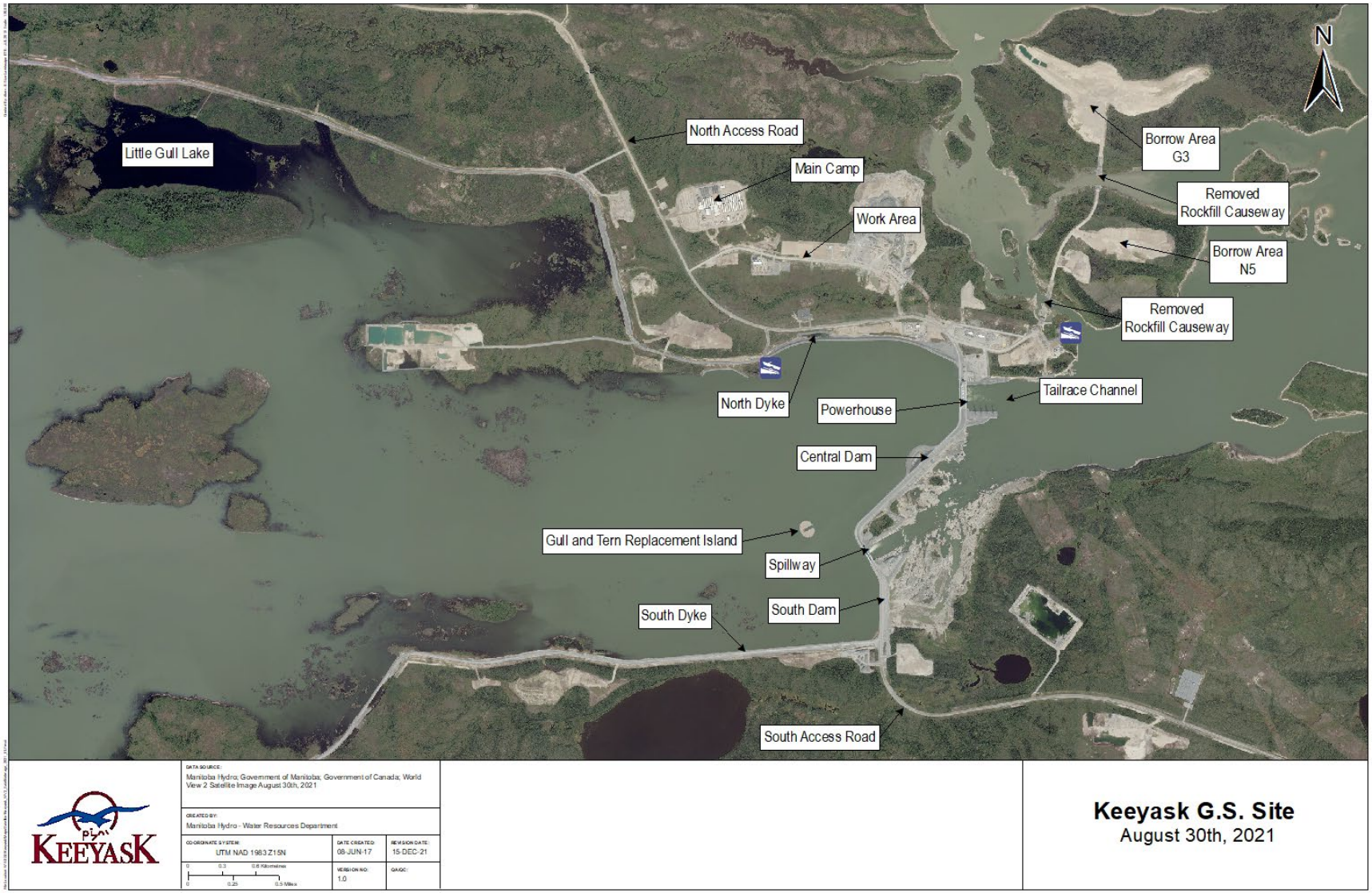
This report provides results of mercury concentrations measured in jackfish, pickerel, and whitefish, collected from the Keeyask reservoir, Stephens Lake, and Split Lake in 2021. These data are the first to be collected after final impoundment of the Keeyask reservoir in the fall of 2020. Monitoring will continue annually on all three waterbodies to measure the effect of impoundment on mercury in fish.

Though not targeted for mercury monitoring, Lake Sturgeon that die during Keeyask monitoring work are also analysed for mercury and the results are reported here.

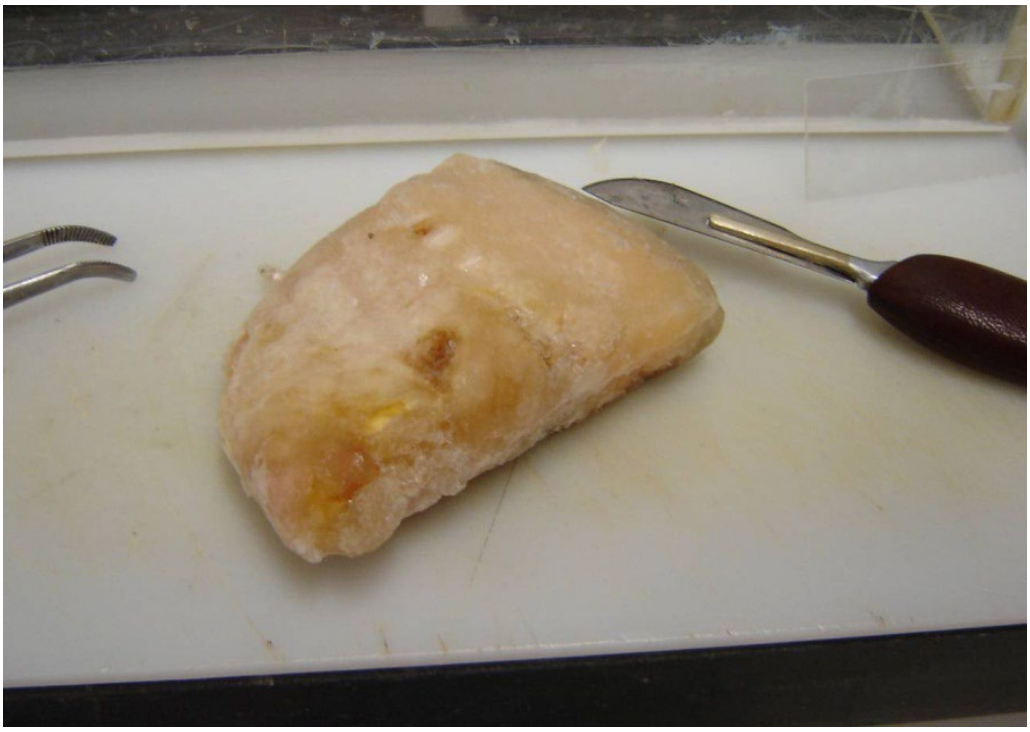
Why is the study being done?

Monitoring in 2021 was done to answer the following questions:

- What are mercury concentrations in jackfish, pickerel, and whitefish in Gull Lake, Stephens Lake, and Split Lake the first year after flooding the Keeyask reservoir?
- Have mercury concentrations in jackfish, pickerel, and whitefish changed in Gull, Stephens, and Split lakes in 2021 compared to previous study years?



Map illustrating instream structures at the Keeyask Generating Station site after reservoir flooding, August 2021.



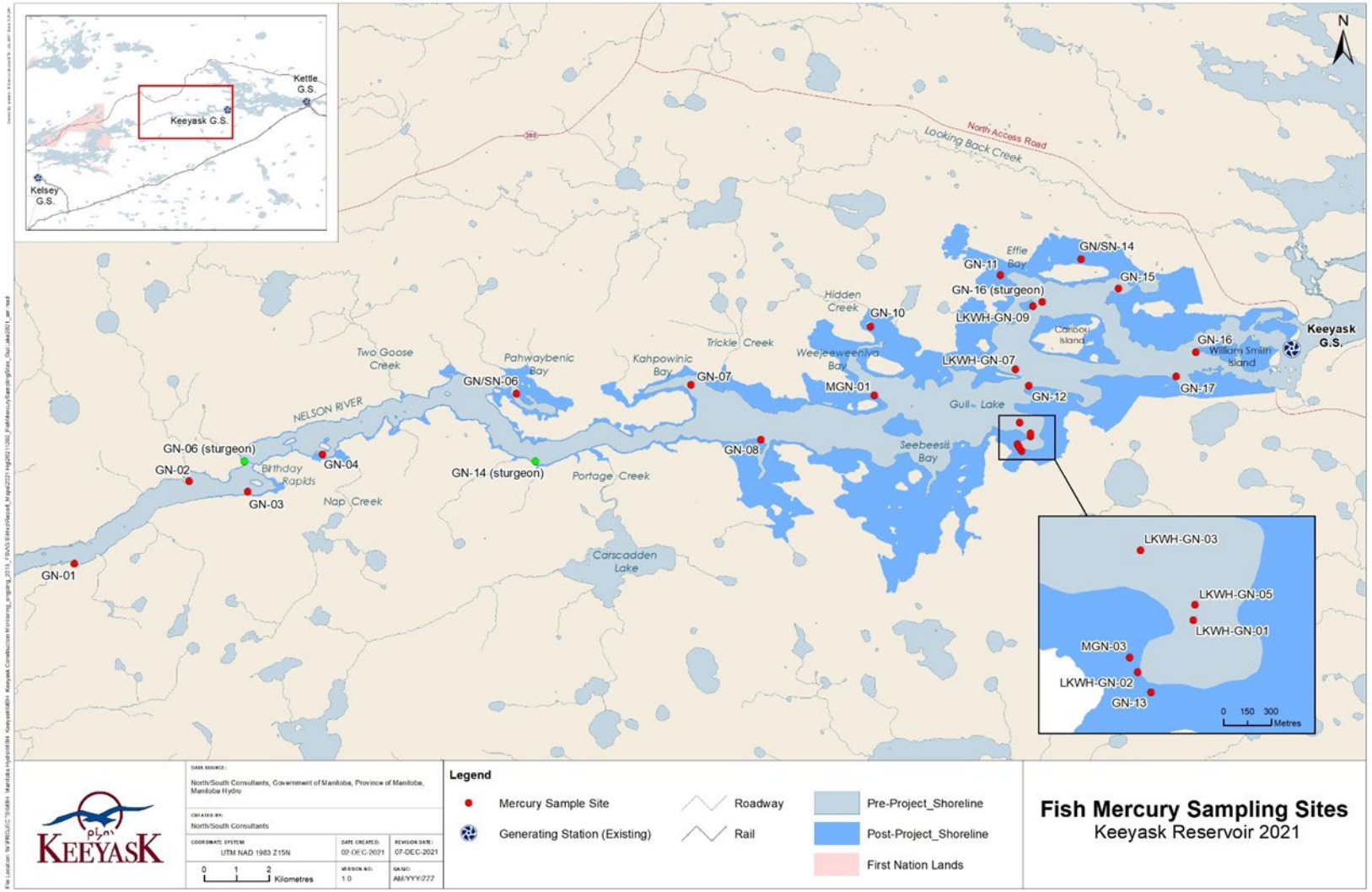
Frozen pickerel muscle sample being prepared for mercury analysis

What was done?

Mercury was analyzed in 36 jackfish, 36 pickerel, and 27 whitefish from the Keeyask reservoir (see map below), 27 jackfish, 36 pickerel, and six whitefish from Stephens Lake, and 37 jackfish, 35 pickerel, and 25 whitefish from Split Lake. Two Lake Sturgeon that died during AEMP monitoring work were analyzed for mercury. All fish were caught in August and September 2021.

Fish from all three waterbodies were measured for length and weight, and a structure to determine the fish's age was collected. A piece of muscle was taken from each fish for mercury analysis. Mercury was measured at a certified laboratory in Winnipeg.

Using the mercury concentration measured in each fish, the average mercury concentration of all fish from each species was calculated. This concentration is referred to as the **arithmetic mean**. Because the concentration of mercury in fish typically increases with the length of the fish, a second value was calculated that adjusts the concentration to a standard fish length of 550 mm for jackfish, 400 mm for pickerel, and 350 mm for whitefish (standard fish lengths are based on many years of studies done by scientists and will be used consistently during the Project). This second value is called the **standard mean**. Comparison of mercury concentrations between years and waterbodies based on the standard mean is more meaningful than the arithmetic mean since the standard mean accounts for differences in the size of fish sampled each year. Standard means can only be calculated if the fish that were sampled show an increase in mercury concentration with fish length. Therefore, a standard mean is not always available.



Map of the Keeyask study area showing sampling sites for fish mercury in 2021.

What was found?

Within the Keeyask reservoir:

- The standard mean mercury concentrations in fish in 2021 were 0.53 ppm in a 550 mm long jackfish and 0.52 ppm in a 400 mm long pickerel. Whitefish captured in the Keeyask reservoir in 2021 were either small or large; there were no middle-sized fish caught. Because of this, a standard mean for a 350 mm whitefish was calculated using the mercury concentrations found in the large fish (0.06 ppm) since only the large fish had been sampled in previous years.
- The standard mean mercury concentrations in jackfish, pickerel, and whitefish caught in the Keeyask reservoir in 2021 (and 2019) was higher than it has been since 1999, when monitoring began.

For fish from Stephens Lake:

- The standard mean mercury concentrations for fish caught in 2021 were 0.45 ppm in jackfish and 0.44 ppm in pickerel. The mercury concentration of pickerel measured in 2021 was within the range of values from 1999 to 2018 and the mercury concentration of jackfish was similar to the highest value recorded since 1999.
- A standard mean could not be calculated for whitefish because very few were caught in 2021, despite extra effort to catch whitefish in the reservoir. The mercury concentration of individual whitefish captured in 2021 was comparable to concentrations found in individual whitefish caught in previous years.

For fish from Split Lake:

- The standard mean mercury concentrations in fish collected from Split Lake in 2021 were 0.42 ppm in a 550 mm long jackfish, 0.45 ppm in a 400 mm long pickerel, and 0.08 ppm in a 350 mm long whitefish.
- The mercury concentration of whitefish in 2021 was within the range of values since 2001, and the mercury concentrations of jackfish and pickerel were similar to the highest values recorded since 2001.

Capturing a jackfish from the Keeyask reservoir in August 2021.

What does it mean?

Mercury concentrations in jackfish, pickerel, and whitefish caught from the Keeyask reservoir in 2021 are higher than values measured since 1999 (except for jackfish in 2019). The increase in mercury in fish in response to flooding the reservoir was a predicted effect of the Keeyask Project.

The concentrations found in fish from Split and Stephens lakes continue to fluctuate up and down from year to year with no obvious pattern or increase observed. This variability is typically what is observed when measuring mercury in fish on any given lake because of many interacting, environmental factors that affect the results.

The standard mean mercury concentrations in fish from the Keeyask reservoir and Stephens Lake are still well below the predicted peak values.

What will be done next?

Mercury in fish will be monitored again in the Keeyask reservoir, Stephens Lake, and Split Lake in 2022 to measure change. Because mercury concentrations in fish caught from Stephens Lake

in 2021 were still well below the predicted peak, it is unnecessary to do additional monitoring farther downstream in 2022.

ACKNOWLEDGEMENTS

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Grant Connell of Tataskweyak Cree Nation (TCN) is thanked for his local expertise and assistance in conducting the field work. We would also like to thank Keegan Neckoway and Terry Kitchekeesik of TCN arranging logistic support and personnel needed to conduct the fieldwork.

The collection of biological samples described in this report was authorized by Manitoba Agriculture and Resource Development, Fisheries Branch, under terms of the Scientific Collection Permit #08-2021.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station currently under construction in northern Manitoba. The Project is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam (Map 1). Construction of the Project began in July 2014.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the aquatic environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement: Aquatic Environment Supporting Volume* (AE SV). As part of the licensing process for the Project, an *Aquatic Effects Monitoring Plan* (AEMP) was developed detailing the monitoring activities of various components of the aquatic environment. This includes monitoring mercury concentrations in fish flesh of four species during the construction and operation phases of the Project.

The waterbodies included in the fish mercury component of the AEMP are the Keeyask Reservoir (formerly known as Gull Lake), Stephens Lake, Split Lake, and the Aiken/Landing River, which is a tributary of Split Lake. In the event that the mercury concentration in fish from Stephens Lake should exceed predicted maximum concentrations by more than 10%, the fish mercury monitoring program will be extended further downstream on the Nelson River by sampling within the Long Spruce Forebay.

Fish mercury is one of the key components of monitoring because it affects the suitability of fish for consumption by people. Flooding of the Keeyask reservoir is predicted to increase mercury levels in fish in the Keeyask reservoir and Stephens Lake, though the increase in Stephens Lake is predicted to be much less than when it was first created by construction of the Kettle GS in the early 1970s. The average concentration of mercury in fish in upstream waterbodies such as Split Lake and the Aiken/Landing River could be affected if a large proportion of the fish in these waterbodies also spend extended periods in the Keeyask reservoir. Given that fish moving out of the Keeyask reservoir are expected to form only a small proportion of the fish in Split Lake and the Aiken/Landing River, no measurable effects to average mercury concentrations of fish collected from these waterbodies are predicted. Sampling will be conducted to confirm these predictions.

The primary parameter of concern for the mercury monitoring program is the concentration of total mercury in fish skeletal muscle (*i.e.*, flesh) from the following species: Lake Whitefish (*Coregonus clupeaformis*), Northern Pike (*Esox lucius*), and Walleye (*Sander vitreus*). These species are sampled because they are important in domestic, commercial, and recreational fisheries and form the primary pathway by which humans ingest (methyl)mercury.

Impoundment of the Keeyask reservoir was completed on September 5, 2020 and sampling in 2021 represented the first year that the reservoir was at full supply level. Sampling was conducted in 2021 to determine whether concentrations have changed in the reservoir and Stephens Lake, post flooding, as well as to track the changes since monitoring began in 1999, prior to the Project. The sampling in Stephens Lake was conducted under the auspices of the Coordinated Aquatic Monitoring Program (CAMP). This report also includes results from Split Lake to provide a regional context for results observed in the reservoir and Stephens Lake and well as to monitor for potential increases caused by fish accumulating mercury in the Keeyask reservoir and moving upstream.

The monitoring in 2021 was done to answer the following questions:

- What are mercury concentrations in Lake Whitefish, Northern Pike, and Walleye in the Gull Lake, Stephens Lake, and Split Lake after final impoundment of the Keeyask reservoir?
- Have mercury concentrations measured in these three species changed from previous years?

Results reported herein add to the dataset of mercury concentrations in fish flesh from the Keeyask study area since 1999 (as reported in Jansen 2016a, 2018; Holm 2020).

2.0 STUDY SETTING

The study area encompasses the reach of the Nelson River from Split Lake to the end of Stephens Lake (Map 1). This section of river offers a diversity of physical habitat conditions, including a variety of substrate types, and variable water depths (range 0–30 m) and velocities.

Split Lake is located at the confluence of the Burntwood and Nelson rivers. Due to the large inflows from the Nelson and Burntwood rivers, the lake has detectable current in several locations. Split Lake has maximum and mean depths of 28.0 m and 3.9 m, respectively, at a water surface elevation of 167.0 m above sea level (ASL; Lawrence et al. 1999). The surface area of Split Lake was determined to be 26,100 ha (excluding islands), with a total shoreline length, including islands, of 940.0 km. The numerous islands in Split Lake represent 411.6 km of the total shoreline.

Clark Lake is located immediately downstream of Split Lake, and approximately 42 km upstream of the Keeyask GS (formerly Gull Rapids) (Map 1). Current is restricted to the main section of the lake, with off-current bays outside the main channel. The Assean River is the only major tributary to Clark Lake and flows into the north side. Downstream from the outlet of Clark Lake, the Nelson River narrows and water velocity increases for a 3 km stretch, known as Long Rapids. For the next 7 km, the river widens, and water velocity decreases. The area between Clark Lake and the Keeyask GS is considered the Keeyask reservoir.

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of Gull Rapids/the Keeyask GS (Map 1) and marks the upstream end of major water level changes as a result of impoundment by the Keeyask GS. The drop in elevation from the upstream to downstream side of Birthday Rapids was approximately 2 m prior to impoundment but is now a nearly level, albeit fast-flowing section of river. The 14 km reach of the Nelson River between Birthday Rapids and Gull Lake was characterized as a large and somewhat uniform channel with medium to high water velocities and a few large bays. This area is now within the Keeyask reservoir, though flooding was limited to mainly shoreline areas.

Prior to impoundment, Gull Lake was a widening of the Nelson River, with moderate to low water velocity beginning approximately 20 km upstream of Gull Rapids/the Keeyask GS. Water levels on Gull Lake increased by several metres following impoundment and flooding along the shoreline and small tributaries entering this reach was extensive. This area is now a portion of the Keeyask reservoir.

Just below the Keeyask GS, the Nelson River enters Stephens Lake. Stephens Lake was formed in 1971 by construction of the Kettle GS. Construction of the Keeyask GS has altered the flow distribution immediately downstream of the station.

Construction of the Kettle GS flooded Moose Nose Lake (north arm) and several other small lakes that previously drained into the Nelson River, as well as the old channels of the Nelson River that now lie within the southern portion of the lake (Map 1). Major tributaries of Stephens Lake include the North and South Moswakot rivers that enter the north arm of the lake. Looking Back Creek is

a second order stream that drains into the north arm of Stephens Lake (Map 1). Kettle GS is located approximately 40 km downstream of the Keeyask GS.

2.1 FLOWS AND WATER LEVELS

From October 2020 to mid-June 2021 the calculated Split Lake outflow varied about the median flow of about 3,300 m^3/s, ranging between about 3,000 m^3/s and 3,900 m^3/s. From mid-June to mid-August, the flows steadily decreased from about 3,700 m^3/s to about 2,000 m^3/s, which is approximately the 5th percentile low flow. Low flow conditions persisted from summer into winter, with flows dropping to a low of about 1,800 m^3/s at the end of November 2021. These are the lowest flows that have occurred during Keeyask construction. It is not since 2005 that flows this low have occurred on the Nelson River.

Water levels on Gull Lake have been held steady between about 158.8-159 m since reservoir impoundment in September 2020. Upstream of Gull Lake at gauges below and above Birthday Rapids the levels were about 0.5 m and 2 m higher than on Gull Lake, a smaller difference than would have occurred prior to the project. Upstream levels increased about 3-4 m at these sites in winter due to ice effects as in previous years. Due to low flows in summer 2021 the water surface was relatively flat from Gull Lake to the gauge just upstream of Birthday Rapids, with a difference of only about 0.8-0.9 m between the two.

Keeyask is transitioning from a construction project to an operating station (Map 2). In 2021, the work at site has been focused on bringing units into service. By the end of April 2021, prior to the start of aquatic monitoring, Unit 1 and Unit 2 were in service. Throughout the open water period more units were being tested and brought into service one at a time. As units came into service, the distribution of flow between the spillway and powerhouse has gradually shifted, as summarized below. By the end of October 2021 five units were fully in service.

Discharges from the spillway and powerhouse are not measured but have been estimated based on performance design curves. For reference it is noted that the design discharge capacity of the powerhouse is 4,000 m^3/s, giving each turbine unit a discharge capacity of approximately 570 m^3/s.

Table below outlines Keeyask GS operation, including powerhouse and spillway flows, in 2021.

Time 2021	Powerhouse Units	Spillway Gate Operation	Powerhouse (m3/s)	Spillway	Keeyask Total
			Discharge (m^3/s)		
end Apr - end June	Unit 2 online Unit 3 testing	Gates 1, 2, 3, 5, 7 in use until mid-June. Gates 1, 3, 5, 7 primarily mid to end June	Steady at about 1,100 varying down to 600 on a few intermittent days and up to 1,650 during 2 weeks of U3 testing	Generally 2,200-2,800 except during U3 testing it varied from about 1,400-2,400	Generally 3,400-3,900 except during Unit 3 testing it varied from 2,600-3,600
end June – mid Sep	Unit 3 online Unit 5 testing	Generally, Gates 1,3, 5, 7 until mid July. Gates 3, 5, 7 until end of July. Various gates used in Aug. Gates 1 and 7 used in September until closure of all gates on Sept.11.	About 1,650, but reduced to 1,100 for 2 weeks with a unit shut down and varying up to 2,100 during 2 weeks of U5 testing	From end Jun to mid Aug Nelson R inflow declined from about 3,600 to about 1,800-2,200 and has remained steady around 2,000-2,200 m^3/s since then – corresponding spillway discharge gradually declined from about 2,400 to 0 by mid-September when U5 came into service although daily variations of +/- 200-400 or more in a few instances occurred during this time	Total Keeyask discharge declined from about 3,600 to an average of about 2,000-2,200 corresponding to the decrease in Nelson R inflow, and daily variation of about +/- 200-400 depending on spillway and powerhouse operations
Mid Sep – end Oct	Unit 5 online Unit 4 testing Unit 4 online October 25	Various gates used very sporadically. First reopening on Sept. 28.	Average discharge about 2,000-2200 with typical daily variation from 1,600-2,200 and a maximum variation between 1,000-2,800 depending on unit operations an U4 testing	No spillway flow except for a few intermittent days of up to 1,000	Same as powerhouse

3.0 METHODS

3.1 FIELD COLLECTIONS

The 2021 sampling program at the Keeyask reservoir was conducted using similar methodologies as those used during previous sampling programs conducted in Gull Lake between 1999 and 2006 and during monitoring conducted in 2014, 2016, and 2019. Methodologies and sampling locations for previous years can be found in the reports listed in Table 1. Fish were captured from the Keeyask reservoir in 2021 during the experimental gillnetting program conducted under the AEMP (Loeppky and Hrenchuk 2022a) and additional gillnetting was conducted specifically to capture the target number of 36 fish of each species for mercury analysis. Sampling locations from the mercury-specific gillnetting are presented in Appendix 1. In addition, one Lake Whitefish mortality from the juvenile Lake Sturgeon program was sampled for mercury to increase the sample size (Burnett et al. 2022).

Lake Whitefish, Walleye, and Northern Pike were captured in 2021 using gill nets composed of six 22.9 m long and 2.5 m deep panels made of twisted nylon mesh. a panel each of 38, 51, 76, 95, 108, and 127 mm stretched mesh-size. At some sites, small mesh panels consisting of three 10 m long by 1.8 m deep gillnet panels of 16, 20, and 25 mm stretch mesh were attached to the 38 mm end of the gill net.

Lake Whitefish, Northern Pike, and Walleye were collected from 24 sites within the reservoir from 4–14 August and 17–22 September, 2021 (Map 3). One Northern Pike and three Walleye were captured in the Nelson River upstream of Birthday Rapids (Map 3).

The sampling programs in Split and Stephens lakes in 2021 used similar methodologies as those used for the reservoir (CAMP, unpubl. data). Fish analysed for mercury were captured at seven sites in the south basin and one site in the north basin of Stephens Lake from 1–4 September, 2021 (Map 4) and from 11 sites in Split Lake from 24–27 August, 2021 (Map 5). An additional three Lake Whitefish mortalities from the Floy-tagging program in Stephens Lake were analyzed for mercury to increase the sample size (Funk and Hrenchuk 2022).

To be consistent with the methodology described in earlier Manitoba fish mercury monitoring programs (Jansen and Strange 2007a), a broad size range of the large-bodied fish was collected. A tally of the fish captured within each consecutive 50 mm length interval (starting at 100 mm) was kept, aiming for an equal distribution of length classes within a target size of 36 fish per species. Upon capture, fish were measured for fork length (±1 mm) and round weight. Small fish that were less than approximately 100 g were weighed using a digital balance (±1 g), while heavier fish were weighed on a mechanical pan balance (±25 g). Bony structures were removed from fish for age analysis: cleithra were collected from Northern Pike, and otoliths were removed from Lake Whitefish and Walleye. A portion of axial muscle weighing between 10 and 40 g was removed from each fish, anterior to the caudal (tail) fin, for mercury analysis of the large-bodied species. The muscle, with the skin attached, was wrapped tightly in commercial “cling-wrap”, placed in

mercury-free, internally and externally labelled Whirl-Pac bags or Zip-lock bags, and stored on ice until they could be frozen. Frozen tissue samples were shipped to North/South Consultants Inc. in Winnipeg for further processing.

3.2 LABORATORY DETERMINATIONS

Muscle samples were weighed and shipped frozen to ALS Laboratories in Winnipeg for analysis of total mercury, ensuring the holding time requirement between catching the fish and its analysis was less than one year. Fish muscle samples from the Keeyask reservoir were analyzed for mercury between 27 October and 3 November, 2021, those from Stephens Lake were analyzed between 1-4 September, 2021, those from Split Lake were analyzed on 18 and 19 November, 2021, and the additional Lake Whitefish and the Lake Sturgeon samples were analyzed on 26 November, 2021. The skin and a thin surface layer of the exposed muscle tissue on the opposite side were sliced away before the remaining sample was homogenized (see below). This procedure helped to ensure that the percentage of water in the muscle sample was representative of the original sample taken from the fish.

Mercury analysis was conducted by cold-vapor atomic absorption spectrometry (CVAAS) applying a modification of EPA Method 200.3/1631E and using a Teledyne Leeman M-7600 mercury analyzer (Teledyne Leeman Labs, Hudson, NH). Quality control results are presented in Appendix 2. The results all fall within the control limits for the QC sample (ALS Data Quality Objective).

Dried ageing structures were prepared and analyzed using a variety of techniques. Northern Pike cleithra were boiled to remove any remaining tissue and typically examined without a microscope (i.e., free hand), although a dissecting microscope or magnified light ring was used when required. Lake Whitefish and Walleye otoliths were aged using the “crack and toast” method and then fixed on glass slides and examined under a microscope with reflected light. Annuli from all fish ageing structures were counted by a single reader without knowledge of length or weight of the fish. Quality assurance and quality control (QA/QC) procedures were conducted, which included re-ageing a random sample of at least 10% of all structures by an ageing technician not involved in the initial age determination.

3.3 DATA ANALYSIS

A condition factor (K) was calculated for each fish as:

$$K = W \times 10^5 / L^3$$

where: W = total weight (g); and
L = fork length (mm).

Fish obtained in different years from a group of lakes will invariably differ in mean size between years and lakes. Because fish accumulate mercury over their lifetime, older and, normally, larger individuals have higher levels than younger, smaller fish (Green 1986; Evans *et al.* 2005). In addition to calculating arithmetic mean mercury concentrations (also referred to as arithmetic means), mean mercury concentrations have been standardized to a common fish length under earlier Manitoba fish mercury monitoring programs (Jansen and Strange 2007a) and CAMP (CAMP 2017) to facilitate comparisons for the same species of fish over time or between waterbodies. The standard lengths used for Northern Pike, Walleye, and Lake Whitefish were 550, 400, and 350 mm, respectively.

Length standardized mean mercury concentrations (also referred to as standard means) were calculated from unique regression equations, by species and location, based on the analysis of logarithmic transformations of muscle mercury concentration and fork lengths using the following relationship:

$$\text{Log}_{10}\ \text{Hg} = a + b \times \text{Log}_{10}\ \text{L}$$

where: Hg = muscle mercury concentration (ppm);
L = fork length (mm);
a = Y-intercept (constant); and
b = slope of the regression line (coefficient).

Standard means were not calculated when the relationship between mercury concentration and fish length was not significant. Linear regression analysis was completed using XLSTAT (Version 2021.2.2; Addinsoft 2021). To present data in more familiar units, all standard means and their measures of variance presented in the tables and figures have been back-transformed to arithmetic values (*i.e.*, inverse log). All fish mercury concentrations were expressed as parts per million (ppm), which is the equivalent of mg/kg or µg/g wet weight muscle tissue.

A second statistical analysis was conducted to make statistical comparisons of mercury concentrations among years. To remove the effect of fish length on fish total mercury concentration, similar to Eagles-Smith et al. (2016), a linear mixed effects model was fit for each species which included log10 transformed total mercury concentration as the dependent variable, log10 transformed fork length as a fixed covariate and waterbody as a random effect. This analysis removed the typically positive relationship between length and mercury, but retained the variation in mercury concentration.

For each species, a model was fit to all of the data from all of the waterbodies, but included random (different) intercepts for each waterbody to account for differences between waterbodies, and fixed (the same) slopes for each waterbody to account for the similar positive slopes observed for each waterbody. To standardize mercury concentrations at standard lengths of 350 mm for Lake Whitefish, 400 mm for Walleye, and 550 mm for Northern Pike, the residuals from each fitted model were then added back to the values predicted by the model at each standard length to calculate standardized mercury values for each individual fish, and standardized means for each sampled waterbody and year. The significance of the effect of total length on total mercury was assessed by calculating p-values using the Satterthwaite approximation for degrees of freedom

(Satterthwaite 1941). To present data in more familiar units, all standardized means and their measures of variance presented in the tables and figures were back-transformed to arithmetic values. All mercury analyses were run using the lme4 and lmerTest packages (Kuznetsova et al. 2017; Bates et al. 2015) in R version 4.0.3 R Core Team (2020). Differences in the standardized mercury concentrations were then assessed between years using a nonparametric Kruskal-Wallis test with multiple pairwise comparisons using Dunn's. (XLSTAT).

3.4 BENCHMARKS

The benchmarks included in the Keeyask AEMP have been dropped as they are no longer relevant and not appropriate to apply to subsistence fishers (discussed in Jansen 2016a, b).

The key reason for measuring mercury in fish is to determine the risk of it to consumers. For this reason, the mercury data collected under the AEMP is shared with the *Keeyask Mercury and Human Health Implementation Group* for use in that process.

4.0 RESULTS

4.1 SAMPLE DESCRIPTION AND BIOLOGICAL DATA

4.1.1 KEEYASK RESERVOIR

The target number of 36 Northern Pike and Walleye, and 27 Lake Whitefish were captured for mercury analysis from the Keeyask reservoir in 2021 (Tables 2 to 5). Lake Whitefish are not abundant in the Keeyask reservoir (KHLP 2012) and it has been difficult to catch the target number for mercury monitoring in previous years, even with additional targeted sampling.

With a mean length of 368 mm, Lake Whitefish analyzed for mercury were within 5% of the standard length for the species (350 mm) (Table 2). In contrast., the average length of Northern Pike (377 mm) and Walleye (343 mm) analyzed for mercury were lower than the standard lengths for the species by 31% (550 mm) and 14% (400 mm), respectively (Tables 3 and 4).

The Walleye and Northern Pike analyzed for mercury varied in length (149–494 mm and 200–864 mm, respectively) and age (1–12 years and 1–9 years, respectively) (Figure 1). While the Lake Whitefish sampled showed a wide range of lengths (114–560 mm) and ages (1–18), the size and age distributions were bimodal, with no fish in the 325–400 mm size range or aged 6–12 years (Figure 1).

Biological data for individual fish of all species analyzed for mercury in 2021 are presented in Appendix 3 (Table A3-2). Box plots of lengths of Lake Whitefish, Northern Pike, and Walleye captured for mercury analysis from 1999–2021 are presented in Appendix 4. Lake Whitefish captured from 1999–2002 and in 2021 showed a greater range of length than those from 2014–2019. Lake Whitefish < 350 mm in length have not been sampled for mercury since 2002 and approximately half of the Lake Whitefish analyzed for mercury (44%) in 2021 were < 350 mm in length. Smaller Northern Pike have generally been analyzed since 2006. There has been some variation in the size of Walleye analyzed each year, but the mean and range has varied less than the other species.

4.1.2 STEPHENS LAKE

Thirty-six Walleye, 27 Northern Pike, and six Lake Whitefish were captured for mercury analysis from Stephens Lake in 2021 (Tables 2 to 5). Lake Whitefish have been difficult to catch in Stephens Lake in some previous sampling years. Differences in the ability to capture Lake Whitefish is likely related to the timing of sampling and locations fished (refer to the reports listed in Table 1 for information about sampling methodologies used in each year) as Lake Whitefish are known to make spawning migrations in Stephens Lake (KHLP 2012).

Lake Whitefish analysed for mercury in 2021 averaged 457 mm in length, which is 31% larger than the standard length for the species (350 mm) (Table 2). In contrast, the average lengths of Northern Pike (512 mm) and Walleye (344 mm) were slightly lower than the standard lengths for the species by 7% (550 mm) and 14% (400 mm), respectively (Tables 3 and 4).

Walleye analyzed for mercury varied in age (1–18) and length (160–501 mm) (Figure 2). Northern Pike measured between 226–849 mm FL and ranged in age from 2–10 years. No small Lake Whitefish were analyzed for mercury from Stephens Lake, with fish ranging from 300–534 mm. None of the Lake Whitefish were less than five years old and the oldest was 21 years.

Biological data for individual fish of all species analyzed in 2021 are presented in Appendix 3 (Table A3-3). The lengths of Lake Whitefish, Northern Pike, and Walleye captured for mercury analysis from 1999–2021 are presented as box plots in Appendix 4. There has been a considerable amount of variation in the length of Lake Whitefish analyzed for mercury in each year. With the exception of five young-of the-year (YOY) Lake Whitefish captured in 2015, no Lake Whitefish analysed since 2003 have been < 250 mm. There has been some variation in the size of Northern Pike and Walleye analyzed in each year, but the range of sizes analyzed has been consistent, with the exception of years when smaller numbers were collected (1999 for Northern Pike and 2007 for Walleye).

4.1.3 SPLIT LAKE

Thirty-seven Northern Pike, 35 Walleye, and 25 Lake Whitefish were collected for mercury analysis from Split Lake in 2021 (Tables 2 to 5). Lake Whitefish are not as common in Split Lake in the summer compared to the other two species (KHLP 2012).

Lake Whitefish analysed for mercury in 2021 averaged 446 mm in length, which is 27% larger than the standard length for the species (350 mm) (Table 2). In contrast, the average length of Walleye (322 mm) and Northern Pike (504 mm) were lower than the standard means for the species 20% (400 mm) and 8% (550 mm), respectively (Tables 3 and 4).

Walleye and Northern Pike analyzed for mercury ranged in length from 124–535 mm and 208–981 mm, respectively, and in age from 1–13 and 1–10 years, respectively (Figure 2). As in Stephens Lake, no small Lake Whitefish were analyzed for mercury, with fish ranging from 362–525 mm. None of the Lake Whitefish were less than six years old and the oldest was 18 years.

Biological data for individual fish of all species analyzed in 2021 are presented in Appendix 3 (Table A3-4). The lengths of Lake Whitefish, Northern Pike, and Walleye captured for mercury analysis from 1999–2021 are presented as box plots in Appendix 4. Since 2004, Lake Whitefish analyzed for mercury have had a narrower range of lengths and have generally been longer than in 2001 and 2002. While there has been some variation in the size of Northern Pike and Walleye collected over time, the means and ranges have been more similar than observed for Lake Whitefish and are likely related to a greater number of samples collected for these species.

4.2 MERCURY CONCENTRATIONS

4.2.1 KEEYASK RESERVOIR

4.2.1.1 RESULTS FOR 2021

Walleye and Northern Pike showed a significant, positive relationship between mercury concentration and fork length (Appendix 5), allowing for average concentrations to be standardized by fish length. The length standardized mean mercury concentrations collected from the Keeyask reservoir in 2021 were 0.52 and 0.53 ppm in the two piscivorous species, Walleye and Northern Pike, respectively (Tables 3 and 4).

As discussed in Section 4.1.1, Lake Whitefish analyzed for mercury in 2021 included considerably smaller fish than in previous years and had a bimodal length distribution. Linear regression is not appropriate to use to calculate a standard mean on a bimodal dataset as it violates model assumptions; particularly since the relationship between mercury and fork length does not appear consistent between the two size classes (see Figure A5-2). The standard mean mercury concentration of a 350 mm Lake Whitefish derived using only large fish (> 350 mm) was 0.06 ppm ($p = 0.001$).

4.2.1.2 COMPARISON TO PREVIOUS YEARS

Standard mean mercury concentrations measured for a 550 mm Northern Pike and a 400 mm Walleye in 2021 (0.53 ppm and 0.52 ppm, respectively) were higher in the reservoir in 2021 than concentrations measured in Gull Lake since environmental studies for the Keeyask GS began in 1999 (Figures 4 and 5). The only exception was in 2019, when the mean concentration in Northern Pike was 0.61 ppm.

The calculation of the standard mean mercury concentrations for Lake Whitefish from the Keeyask reservoir has likely been affected by changes in the length distribution of whitefish catches over time. The standard mean mercury concentration for a 350 mm Lake Whitefish appeared lower in 2016 and 2019 (0.03 ppm and 0.04 ppm, respectively) compared to those measured in 1999–2002 (0.06–0.08 ppm) (Figure 6, top panel). However, only large Lake Whitefish (>350 mm) were sampled in 2016 and 2019. The size of Lake Whitefish collected for mercury was reflective of the size of the catch during the index gillnetting program and was not an artifact of additional netting to obtain target numbers or sub-sampling for mercury analysis (Holm 2020). The calculation of a standard mean may not be accurate when only part of the length range is represented in the data; when the concentration of mercury in smaller fish is not known, this could contribute to a lower estimate of standard mean (Holm 2020). A comparison of the standard mean based only on large fish (> 350 mm) shows that the value in 2021 (0.06 ppm) is above the range observed in previous years (0.03-0.05 ppm), as was observed in the piscivores (Figure 6, bottom panel).

The mercury concentrations of the six yearling Lake Whitefish sampled in 2021 were higher compared to those sampled in 1999–2019, while the concentrations in the larger fish fell within the range measured in previous years. This suggests there may be a difference in the rate of mercury accumulation at different life stages.

Statistical analysis of the length corrected dataset indicated that there were significant differences (p <0.0001) among years in the mercury concentration of a 550 mm Northern Pike, 400 mm Walleye, and a 350 mm Lake Whitefish from the Keeyask reservoir (formerly Gull Lake). Pairwise comparison showed four groups for Walleye (Table 5) and three groups for Northern Pike (Table 6), with both species showing significantly higher mercury concentrations in 2021 than in all previous sampling years prior to 2019. Some additional significant differences were observed as outlined in Tables 5 and 6. For Lake Whitefish, the pairwise comparison showed three groups (Table 7), and mercury concentrations in 2021 were significantly higher than in 1999, 2001, 2002, and 2016, but did not differ significantly from 2014 or 2019.

4.2.2 STEPHENS LAKE

4.2.2.1 RESULTS FOR 2021

Walleye and Northern Pike showed a significant positive relationship between mercury concentration and fork length (Appendix 5), allowing for average concentrations to be standardized by fish length. Standard means were 0.44 ppm and 0.45 ppm, respectively (Tables 2 to 4). The relationship between mercury and length was not significant for Lake Whitefish from Stephens Lake, which had a very small sample size in 2021 (n = 6).

4.2.2.2 COMPARISONS TO PREVIOUS YEARS

Mercury concentrations in the three large-bodied species from Stephens Lake have fluctuated between 1999 and 2021 without showing a consistent increasing or decreasing trend (Figures 4 to 6). Length-standardized mean mercury concentrations measured in all three species since construction on the Project began in 2014 generally fell into the range of the standard means recorded during the pre-Project period (1999–2012). Since 1999, the standard mean of a 350 mm Lake Whitefish ranged from 0.03 ppm in 2005 to 0.11 ppm in 2002, a 550 mm Northern Pike ranged from 0.18 ppm in 2005 to 0.44 ppm in 2021, and a 400 mm Walleye ranged from 0.20 ppm in 2005 to 0.50 ppm in 2015. The standard means of Walleye and Lake Whitefish in 2021 fell within the range measured in previous years, while that of Northern Pike was similar to the maximum value from previous years (0.43 ppm in 1999).

While a standard mean mercury concentration could not be calculated for Lake Whitefish in 2021 (see Section 4.2.2.1), the mercury concentrations of individual fish fall within the range of fish analyzed in previous years (Figure 7). Likewise, the individual Northern Pike and Walleye sampled for mercury in 2021 have mercury concentrations that are on the higher end, but still within the range of mercury concentrations measured in previous years (Figure 8 and 9).

Statistical analysis of the length corrected dataset indicated that there were significant differences (p <0.0001) among years in the mercury concentration of a 550 mm Northern Pike, a 400 mm Walleye, and a 350 mm Lake Whitefish from Stephens Lake. For Walleye, pairwise comparison shows five groups (Table 5), with mercury concentrations in 2021 being significantly different from those measured in 2001, 2005, 2009, and 2012. For Northern Pike, pairwise comparison shows four groups (Table 6), with mercury concentrations measured in 2021 showing a significant difference from those in 2005, 2009, and 2012. For Lake Whitefish, pairwise comparison shows three groups, with mercury concentrations measured in 2021 being only significantly different from 1999, 2004, 2005, and 2018 (Table 7). For all three species, the overlapping groupings visible in Tables 5–7 indicates a general lack of temporal pattern over the 1999–2021 sampling period (*i.e.*, changes in the background are due to natural variability).

4.2.3 SPLIT LAKE

4.2.3.1 RESULTS FOR 2021

All three species showed a significant positive relationship between mercury concentration and fork length (Appendix 5), allowing for average concentrations to be standardized by fish length. Standard means were 0.08 ppm for Lake Whitefish, 0.42 ppm for Northern Pike, and 0.45 ppm for Walleye (Tables 2 to 4).

4.2.3.2 COMPARISONS TO PREVIOUS YEARS

Mercury concentrations in the three large-bodied species from Split Lake have fluctuated between 2001 and 2021 without showing a consistent increasing or decreasing trend (Figures 3 to 5). Length-standardized mean mercury concentrations measured in Northern Pike and Walleye in 2021 were similar to, but slightly higher than measured in previous years (0.42 and 0.45 ppm, respectively). Prior to impoundment, the standard mean of a 550 mm Northern Pike ranged from 0.18 ppm in 2005 to 0.38 ppm in 2019, and of a 400 mm Walleye ranged from 0.12 in 2005 to 0.41 in 2013. The standard mean of a 350 mm Lake Whitefish in 2021 fell within the range prior to impoundment from 0.03 ppm in 2016 to 0.10 ppm in 2013.

For all three species, mercury concentrations of individual fish in 2021 are on the higher end, but still within the range of mercury concentrations measured in previous years (Figures 7, 8 and 9).

Statistical analysis of the length corrected dataset indicated that there were significant differences (p <0.0001) among years in the mercury concentration of a 550 mm Northern Pike, a 400 mm Walleye, and a 350 mm Lake Whitefish from Split Lake.

For Northern Pike and Walleye, pairwise comparison shows four groups (Tables 5 and 6) and Lake Whitefish shows three groups (Table 7). For all three species, the mercury concentrations measured in 2021 were significantly higher than those measured from 2001 to 2005, as well as 2010 and 2016, but were not significantly different from those measured in 2007, 2013, or 2019.

The lack of a temporal gradient to the groupings of the Kruskal-Wallis tests suggests that annual differences in mercury concentrations in the piscivorous species are likely attributable to natural variability.

4.3 LAKE STURGEON MORTALITIES

Because Lake Sturgeon are a species of concern and have special cultural significance to the First Nation communities, efforts are taken to prevent Lake Sturgeon mortalities during Keeyask monitoring programs and are therefore not a target species for mercury monitoring.

Mercury samples were collected from two Lake Sturgeon that did not survive the gillnetting programs in the Keeyask reservoir in the 2021 (Loeppky and Hrenchuk 2022b). Biological information and mercury concentration of Lake Sturgeon analyzed for mercury in 2021 are summarized in Appendix 3 (Table A3-1). The capture locations of these fish are shown in Map 3.

The mercury concentrations of the two Lake Sturgeon were 0.69 and 0.70 ppm in 2021. In comparison, mercury concentrations similar sized Lake Sturgeon ranged from 0.04 to 0.67 ppm prior to impoundment. The individual mercury concentrations of the Lake Sturgeon incidental mortalities from the Keeyask Study Area from 2002–2021 are plotted in Figure 10 in relation to total length. Total length was used in lieu of fork length because several sturgeon samples in 2004 were submitted with only a total length (Jansen and Strange 2007b).

5.0 DISCUSSION

This report presents the results of the first year of monitoring mercury concentrations in fish flesh of Northern Pike, Walleye, and Lake Whitefish from Gull and Stephens lakes after final impoundment of the Keeyask reservoir in September 2020. The results presented in this report show:

- Standard mean concentrations in a 550 mm Northern Pike and a 400 mm Walleye from the Keeyask reservoir in 2019 and 2021 were higher than values recorded since data collection for the EIS began in 1999. Two consecutive years of standard means above the historical range is indicative of an increasing trend related to the Keeyask Project's construction. Mercury concentrations of the piscivores are predicted to reach 1.0 ppm in the reservoir (KHLP 2012). While there has been an increase in mercury concentrations, the standard means in 2021 (0.52 and 0.53 ppm) are still well below the predicted peak values for both piscivorous species.
- Lake Whitefish from the Keeyask reservoir in 2021 had a bimodal length distribution; no fish between 300 and 400 mm in length were collected for mercury analysis. As a result, it was not possible to calculate a standard mean mercury concentration for the full sample. The missing length class was not an artifact of subsampling for mercury analysis (Loeppky and Hrenchuk 2022a). The capture of the yearling Lake Whitefish in 2021 was the first time small fish <350 mm have been collected for mercury analysis in Gull Lake since 2002.
    - The standard mean mercury concentration calculated using only fish that were >350 mm for all years sampled since 1999 showed that the mercury concentration of a 350 mm Lake Whitefish in 2021 is slightly higher than the highest values recorded in previous years. The standard mean is considerably lower than the predicted peak of 0.19 ppm (KHLP 2012). As noted in Holm (2020), the calculation of a standard mean using only the upper part of the length range may underestimate mercury concentrations.
    - The arithmetic mean mercury concentration of the small Lake Whitefish (≤ 307 mm) that were excluded from the calculation of the standard mean in 2021 was 0.17 ppm, which is also below the length standardized predicted peak value. The small fish (≤ 220 mm) often had considerably higher individual mercury concentrations compared to similar sized fish collected in previous years. Fish in this size range that were aged were primarily yearlings (age 1 year), with only the 220 mm fish aged 2. In contrast, the larger Lake Whitefish (> 400 mm) had more similar individual mercury concentrations as similar sized fish collected in previous years. This suggests that there is a difference in the rate of mercury accumulation in small and large Lake Whitefish in the first year post-impoundment
- A comparison of mercury concentrations of fish from Stephens and Split lakes indicates that there were several differences among years that could be due to a combination of factors. For example, fish of similar sizes can show a large range in mercury

concentrations, since the amount of mercury accumulated by individuals is the result of several interacting environmental and physiological factors such as diet, growth, gender, metabolism, and use of habitat in the lake. In addition, some difference in the average mercury concentrations calculated each year will result from sampling variation.

  - Mercury concentrations in a 550 mm Northern Pike and a 400 mm Walleye collected from Stephens Lake in 2021 were similar to the highest values measured in previous years, both before and during construction. While there were significant differences in mercury concentrations among years, there was a general lack of a temporal pattern over the sampling period. The length standardized mercury concentrations for both species (0.44 and 0.45 ppm) are below the predicted peak value of 0.5 ppm (KHLP 2012).
  - Likewise, at Split Lake, the standard mean mercury concentrations in the piscivorous species in 2021 were similar to the highest values observed since data collected for the EIS commenced in 2001. There were differences in mercury concentrations among years, but there was no consistent temporal trend observed. No effects to mercury concentrations were predicted to occur at Split Lake as a result of construction of the Keeyask Project.
  - A standard mean could not be calculated for Lake Whitefish from Stephens Lake in 2021 because of the small number of fish collected. The concentrations of individual fish in 2021 fall within the range of mercury concentrations measured from 1999 to 2018. The length standardized mercury concentrations have remained consistently low in Split Lake since data collection for the EIS commenced in 2001.

- The two Lake Sturgeon moralities from the Keeyask reservoir in 2021 had mercury concentrations that were marginally higher than fish of similar size collected in the pre-impoundment period.

6.0 KEY QUESTIONS

The key questions to be answered about mercury in fish in relation to monitoring completed in 2021 are:

What are the concentrations of mercury in Northern Pike, Walleye, and Lake Whitefish caught in Gull Lake, Stephens Lake, and Split Lake following final impoundment of the Keeyask reservoir?

The standard means of fish caught in the Keeyask reservoir in 2021 were: 0.08 ppm for a 350 mm Lake Whitefish, 0.53 ppm for a 550 mm Northern Pike, and 0.52 ppm for a 400 mm Walleye. In Stephens Lake, the standard means were: 0.45 ppm in Northern Pike, and 0.44 ppm in Walleye. Too few Lake Whitefish were collected from Stephens Lake to calculate a standard mean. In Split Lake, the standard means were 0.42 ppm in Northern Pike, 0.45 ppm in Walleye, and 0.08 ppm Lake Whitefish

Have mercury concentrations measured in these three species changed from previous years?

The standard means of Northern Pike, Walleye, and Lake Whitefish from the Keeyask reservoir in 2021 and 2019 were higher than those measured since 1999. The standard means of Northern Pike and Walleye from Stephens Lake and Split Lake in 2021 were similar to the highest value measured since 1999 and 2001, respectively. The mercury concentrations of individual Lake Whitefish from Stephens Lake fall within the range of values measured since 1999. Standard means of Lake Whitefish from Split Lake have remained consistently low.

7.0 CONCLUSION AND NEXT STEPS

Standard mean mercury concentrations in Lake Whitefish, Walleye, and Northern Pike from the Keeyask reservoir measured in 2021 were higher than concentrations obtained since data collection for the EIS commenced in 1999. Those measured in piscivorous fish from Stephens Lake in 2021 were similar to the highest value recorded since 1999, with Walleye a bit lower and Northern Pike a bit higher. Too few Lake Whitefish were collected from Stephens Lake in 2021 to calculate a standard mean, but the mercury concentrations of individual fish were within the range observed since 1999. The standard mean mercury concentrations in fish from both waterbodies are still well under the predicted peak values. At Split Lake, the standard mean mercury concentrations in the piscivorous species in 2021 were similar to the highest values observed since data collected for the EIS commenced in 2001, while the standard mean of Lake Whitefish fell within the range over this period.

The AEMP requires mercury concentrations in fish in the Keeyask reservoir and Stephens Lake to be monitored annually for several years after final impoundment of the reservoir until maximum concentrations have been reached. Split Lake will also be sampled annually for the first three years following impoundment as there is a potential that fish may accumulate mercury in the Keeyask reservoir and move upstream. Monitoring will take place again in all three waterbodies in 2022.

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TABLES

Table 1: Summary of sampling conducted for fish mercury monitoring in Gull Lake/Keeyask reservoir and Stephens Lake from 1999–2021.

Waterbody	Year	Sampling Dates	# Sites	Sample Source
Gull Lake	1999	6–10 Oct	12	Remnant and Barth 2003
	2001	15–25 Aug	14	Remnant et al. 2004; Jansen and Strange 2007b
	2002	6–14 Aug	17	Johnson and Parks 2005; Jansen and Strange 2007b
	2004	6–9 Oct	2	Holm et al. 2007
	2006	31 May–30 Jun, 18–27 Aug	21	Jansen and Strange 2009
	2014	1–16 Sep	33	Jansen 2016a
	2016	14–24 Sep	16	Jansen 2018
	2019	8–15 Aug	21	Holm 2020; Burnett and Hrenchuk 2020
Keeyask reservoir	2021	4–14 Aug, 17-22 Sep	24	This report
Stephens Lake	1999	13–19 Aug	6	Bretecher and MacDonell 2000
	2001	31 Aug, 1–29 Sep	11	Pisiak et al. 2004; Jansen and Strange 2007b
	2002	24 Jul–8 Aug	16	Pisiak 2005a; Jansen and Strange 2007b
	2003	23 Jul–5 Aug	42	Pisiak 2005b; Jansen and Strange 2007b
	2004	12–13 Oct	1	Holm et al. 2007
	2005	25–27 Aug, 29 Sep, 4–11 Oct	12	Jansen and Strange 2007b
	2007	19 Sep–2 Oct	21	Jansen 2010
	2009	4–17 Sep	8	CAMP 2014
	2012	4–9 Sep	10	CAMP 2017
	2015	7–9 Sep	11	CAMP, unpubl. data
	2018	30 Aug–4 Sep	14	CAMP, unpubl. data
	2021	1-4 Sep, 12-13 Oct	10	This report

Table 1: Summary of sampling conducted for fish mercury monitoring in Gull Lake/Keeyask reservoir and Stephens Lake from 1999–2021 (continued).

Waterbody	Year	Sampling Dates	# Sites	Sample Source
Split Lake	2001	15-26 Aug	13	Dunmall et al. 2004; Jansen and Strange 2007b
	2002	13-21 Aug,10 Oct	13	Holm and Remnant 2004; Jansen and Strange 2007b
	2004	6–10 Oct	2	Holm et al. 2007
	2005	20-23 Aug, 6-9 Oct	15	Jansen and Strange 2007b
	2007	9 Oct	8	Jansen (2010)
	2010	21-25 Aug	8	CAMP 2014
	2013	14-19 Aug	12	CAMP 2017
	2016	14-18 Aug	13	CAMP, unpubl. data
	2019	23-28 Aug, 5-6 Sep	10	CAMP, unpubl. data
	2021	24-27 Aug	11	This report

Table 2: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish sampled for mercury analysis from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021.

Waterbody/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic [Hg] ppm)	Standardized [Hg] (ppm)	95% CI
Gull Lake/Keeyask reservoir										
1999	22	356 ± 22	21	1018 ± 152	22	5.8 ± 0.7	22	0.098 ± 0.016	0.075	0.055–0.103
2001	21	415 ± 23	21	1585 ± 256	21	7.7 ± 1.1	21	0.088 ± 0.010	0.062	0.053–0.073
2002	26	367 ±30	25	1406 ± 235	26	7.8 ± 1.2	26	0.102 ± 0.014	0.082	0.070–0.097
2014	4	498 ± 17	4	2300 ± 334	4	11.8 ± 1.9	4	0.225 ± 0.052	not significant	
2016	19	500 ± 9	19	2372 ± 129	19	10.6 ± 0.9	19	0.182 ± 0.020	0.034	0.014–0.085
2019	33	491 ± 9	33	2209 ± 118	33	11.1 ± 0.8	33	0.218 ± 0.020	0.038	0.024–0.058
2021	27	368 ± 30	27	1396 ± 235	16	9.5 ± 1.6	27	0.235 ± 0.020	bimodal length distribution	
Stephens Lake										
1999	6	365 ± 33	0	-	6	4.8 ± 0.9	6	0.091 ± 0.019	0.077	0.050–0.119
2001	15	489 ± 9	15	2180 ± 119	9	13.2 ± 1.3	15	0.153 ± 0.014	not significant	
2002	25	403 ± 23	25	1364 ± 185	25	8.1 ± 0.9	25	0.134 ± 0.013	0.112	0.096–0.131
2003	78	394 ± 15	65	1797 ± 132	75	9.6 ± 0.7	78	0.125 ± 0.008	0.104	0.096–0.113
2004	10	478 ± 10	10	1915 ± 129	10	10.6 ± 1.0	10	0.085 ± 0.006	not significant	
2005	25	488 ± 9	25	2234 ± 136	25	12.2 ± 0.7	25	0.108 ± 0.009	0.029	0.020–0.042
2007	33	463 ± 10	32	1931 ± 123	32	10.1 ± 0.7	33	0.138 ± 0.009	0.069	0.056–0.085
2009	7	483 ± 26	7	2410 ± 397	6	12.7 ± 1.9	7	0.159 ± 0.027	0.046	0.025–0.084
2012	5	526 ± 20	5	2718 ± 307	5	16.0 ± 2.3	5	0.168 ± 0.018	0.053	0.024–0.115
2015	11	302 ± 61	11	1138 ± 361	11	7.2 ± 2.6	11	0.110 ± 0.036	0.107	0.081–0.141
2018	13	441 ± 22	13	1626 ± 226	13	10.8 ± 1.6	13	0.116 ± 0.018	0.059	0.045–0.078
2021	6	457 ± 31	6	1632 ± 251	6	13.5 ± 2.1	6	0.142 ± 0.021	not significant	

Table 2: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Lake Whitefish sampled for mercury analysis from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021 (continued).

Waterbody/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic [Hg] ppm)	Standardized [Hg] (ppm)	95% CI
Split Lake								±		
2001	27	333 ± 22	26	799 ± 140	27	6.6 ± 1.0	27	0.069 ± 0.010	0.066	0.058–0.075
2002	21	391 ± 23	21	1272 ± 194	21	7.8 ± 0.8	21	0.079 ± 0.013	0.054	0.042–0.070
2004	3	449 ± 20	3	1833 ± 412	3	9.0 ± 0.5	3	0.057 ± 0.007	not significant	
2005	37	465 ± 6	37	1930 ± 80	37	11.3 ± 0.4	37	0.075 ± 0.004	0.030	0.021–0.042
2007	17	439 ± 8	17	1725 ± 130	17	9.8 ± 0.6	17	0.128 ± 0.013	0.059	0.035–0.101
2010	16	412 ± 19	16	1324 ± 154	15	17.5 ± 0.9	16	0.092 ± 0.012	0.062	0.049–0.078
2013	20	413 ± 11	20	1177 ± 109	19	8.5 ± 0.7	20	0.150 ± 0.013	0.102	0.082–0.128
2016	22	429 ± 8	22	1409 ± 95	22	8.6 ± 0.5	22	0.072 ± 0.005	0.037	0.030–0.047
2019	21	443 ± 11	21	1640 ± 147	21	10.4 ± 0.6	21	0.102 ± 0.009	0.065	0.048–0.090
2021	25	446 ± 10	25	1489 ± 108	25	12.1 ± 0.6	25	0.155 ± 0.010	0.082	0.066–0.101

Table 3: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Northern Pike sampled for mercury analysis from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021.

Waterbody/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic [Hg] ppm)	Standardized [Hg] (ppm)	95% CI
Gull Lake/Keeyask reservoir										
1999	40	694 ± 27	40	3440 ± 407	39	8.0 ± 0.5	40	0.572 ± 0.048	0.314	0.278–0.355
2001	33	688 ± 30	33	2967 ± 375	31	7.5 ± 0.5	33	0.447 ± 0.059	0.220	0.181–0.268
2002	35	700 ± 29	35	3299 ± 406	35	9.2 ± 0.6	35	0.466 ± 0.049	0.226	0.196–0.261
2004	20	637 ± 10	20	1821 ± 116	20	6.7 ± 0.6	20	0.211 ± 0.014	not significant	
2006	66	552 ± 22	66	1590 ± 164	44	5.3 ± 0.5	66	0.231 ± 0.018	0.208	0.187–0.230
2014	31	707 ± 17	31	2774 ± 227	29	7.1 ± 0.4	31	0.572 ± 0.039	0.338	0.274–0.417
2016	36	554 ± 33	36	1729 ± 294	36	5.5 ± 0.5	36	0.378 ± 0.041	0.342	0.313–0.373
2019	36	541 ± 26	36	1441 ± 196	35	6.4 ± 0.5	36	0.630 ± 0.050	0.611	0.557–0.670
2021	36	377 ± 26	36	650 ± 177	36	3.3 ± 0.3	36	0.403 ± 0.044	0.527	0.438–0.634
Stephens Lake										
1999	14	501 ± 17	14	1620 ± 120	14	4.6 ± 0.4	14	0.369 ± 0.067	0.432	0.316–0.591
2001	27	641 ± 35	27	2377 ± 399	26	6.5 ± 0.5	27	0.573 ± 0.097	0.316	0.276–0.361
2002	35	700 ± 30	35	2955 ± 352	33	9.3 ± 0.7	35	0.663 ± 0.082	0.332	0.280–0.395
2003	76	632 ± 18	76	2277 ± 202	73	9.4 ± 0.5	76	0.448 ± 0.038	0.272	0.246–0.301
2005	52	583 ± 20	52	1743 ± 205	52	6.7 ± 0.4	52	0.250 ± 0.030	0.180	0.165–0.196
2007	40	669 ± 29	20	1828 ± 364	40	8.2 ± 0.6	40	0.521 ± 0.052	0.339	0.302–0.381
2009	36	526 ± 32	36	1501 ± 224	28	6.8 ± 0.7	36	0.295 ± 0.042	0.261	0.230–0.297
2012	42	511 ± 22	42	1206 ± 143	42	6.0 ± 0.5	42	0.266 ± 0.022	0.275	0.249–0.304
2015	36	532 ± 27	36	1424 ± 220	34	5.9 ± 0.4	36	0.372 ± 0.051	0.333	0.284–0.390
2018	36	540 ± 23	36	1327 ± 180	36	5.0 ± 0.3	36	0.372 ± 0.049	0.329	0.289–0.375
2021	27	512 ± 35	27	1438 ± 294	27	4.9 ± 0.4	27	0.479 ± 0.082	0.448	0.385–0.520

Table 3: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Northern Pike sampled for mercury analysis from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021 (continued).

Waterbody/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic [Hg] ppm)	Standardized [Hg] (ppm)	95% CI
Split Lake										
2001	23	599 ± 23	23	1791 ± 204	23	6.0 ± 0.3	23	0.337 ± 0.041	0.239	0.200–0.285
2002	26	632 ± 31	26	2274 ± 353	22	7.0 ± 0.5	26	0.340 ± 0.054	0.204	0.174–0.239
2005	51	574 ± 17	51	1572 ± 141	51	6.8 ± 0.4	51	0.237 ± 0.023	0.182	0.164–0.202
2007	35	630 ± 13	35	2026 ± 194	35	7.5 ± 0.3	35	0.443 ± 0.024	not significant	
2010	24	584 ± 32	24	1936 ± 313	24	6.0 ± 0.6	24	0.363 ± 0.042	0.289	0.249–0.335
2013	37	506 ± 22	37	1070 ± 146	36	5.3 ± 0.3	37	0.354 ± 0.032	0.375	0.333–0.422
2016	34	504 ± 25	34	1120 ± 166	34	4.7 ± 0.4	34	0.262 ± 0.029	0.278	0.251–0.308
2019	36	446 ± 20	36	714 ± 121	36	4.0 ± 0.3	36	0.312 ± 0.064	0.383	0.381–0.461
2021	37	504 ± 27	35	1381 ± 289	37	4.7 ± 0.3	37	0.401 ± 0.044	0.415	0.376–0.458

Table 4: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Walleye sampled for mercury analysis from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021.

Waterbody/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic [Hg] ppm)	Standardized [Hg] (ppm)	95% CI
Gull Lake/Keeyask reservoir										
1999	22	445 ± 13	22	1350 ± 128	22	8.5 ± 0.8	22	0.414 ± 0.041	0.293	0.244–0.353
2001	26	422 ± 20	26	1181 ± 162	24	7.0 ± 1.0	26	0.273 ± 0.045	0.190	0.167–0.217
2002	32	423 ± 23	32	1340 ± 198	32	9.1 ± 1.1	32	0.371 ± 0.050	0.263	0.227–0.304
2006	44	478 ± 16	44	1521 ± 125	34	9.9 ± 0.9	44	0.432 ± 0.044	0.212	0.170–0.253
2014	38	391 ± 18	38	904 ± 128	38	8.6 ± 1.2	38	0.364 ± 0.045	0.325	0.294–0.358
2016	36	394 ± 17	35	862 ± 114	36	9.1 ± 1.5	36	0.369 ±0.057	0.302	0.254–0.358
2019	36	378 ± 15	36	761 ± 138	36	6.8 ± 0.5	36	0.437 ± 0.038	0.438	0.387–0.497
2021	36	343 ± 17	36	569 ± 66	36	6.4 ± 0.4	36	0.506 ± 0.042	0.515	0.424–0.625
Stephens Lake										
1999	24	380 ± 20	17	1504 ± 250	23	7.8 ± 0.8	24	0.444 ± 0.057	0.425	0.356–0.508
2001	29	419 ± 20	29	1217 ± 171	27	8.7 ± 1.0	29	0.373 ± 0.049	0.277	0.243–0.316
2002	34	438 ± 21	33	1342 ± 173	33	10.4 ± 0.9	34	0.469 ± 0.035	0.405	0.378–0.434
2003	70	433 ± 12	69	1240 ± 94	67	10.2 ± 0.6	70	0.418 ± 0.027	0.329	0.298–0.364
2004	1	421	1	900	1	7	1	0.150	too few samples	
2005	69	401 ± 13	69	1141 ± 95	69	10.1 ± 0.7	69	0.249 ± 0.022	0.204	0.183–0.227
2007	18	522 ± 17	15	2113 ± 171	18	14.4 ± 1.0	18	0.685 ± 0.058	0.394	0.282–0.551
2009	36	419 ± 18	36	1241 ± 141	33	11.5 ± 1.2	36	0.315 ± 0.030	0.262	0.236–0.291
2012	41	462 ± 15	41	1425 ± 120	41	9.2 ± 0.9	41	0.431 ± 0.045	0.283	0.248–0.322
2015	36	416 ± 18	36	961 ± 95	36	12.0 ± 1.2	36	0.592 ± 0.050	0.498	0.427–0.582
2018	36	403 ± 19	36	862 ± 106	35	8.7 ± 0.9	36	0.447 ± 0.051	0.380	0.336–0.431
2021	36	344 ± 18	36	571 ± 70	36	7.7 ± 0.7	36	0.372 ± 0.032	0.442	0.401–0.488

Table 4: Size and age (mean ± SE) and mercury concentration ([Hg], arithmetic mean ± SE and standardized mean ± 95% confidence interval, CI) of Walleye sampled for mercury analysis from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021 (continued).

Waterbody/ Year	n	Fork Length (mm)	n	Weight (g)	n	Age (y)	n	Arithmetic [Hg] ppm)	Standardized [Hg] (ppm)	95% CI
Split Lake										
2001	26	392 ± 21	26	981 ± 151	25	7.0 ± 0.7	26	0.209 ± 0.028	0.190	0.166–0.217
2002	28	401 ± 22	27	1098 ± 170	26	7.2 ± 0.8	28	0.212 ± 0.019	0.198	0.171–0.230
2004	15	427 ± 9	15	920 ± 84	15	7.7 ± 0.6	15	0.155 ± 0.010	not significant	
2005	53	330 ± 16	53	634 ± 83	53	6.1 ± 0.3	53	0.099 ± 0.007	0.118	0.108–0.128
2007	66	392 ± 6	66	805 ± 44	66	7.9 ± 0.3	66	0.359 ± 0.023	0.331	0.295–0.372
2010	33	376 ± 19	33	854 ± 120	33	5.2 ± 0.5	33	0.197 ± 0.023	0.196	0.173–0.222
2013	37	345 ± 21	37	689 ± 132	37	6.4 ± 0.8	37	0.368 ± 0.042	0.413	0.355–0.481
2016	36	343 ± 22	36	668 ± 151	35	5.7 ± 0.8	36	0.238 ± 0.032	0.262	0.230–0.298
2019	32	270 ± 12	32	257 ± 32	30	4.6 ± 0.4	32	0.231 ± 0.020	0.370	0.284–0.482
2021	35	322 ± 17	35	461 ± 59	35	6.5 ± 0.5	36	0.351 ± 0.032	0.452	0.397–0.516

Table 5: Summary of groupings from multiple pairwise comparisons (Dunn's procedure of standardized mercury concentrations in a 400 mm Walleye from Gull Lake/Keeyask reservoir (Bonferroni corrected significance level p = 0.0018), Stephens Lake (p = 0.0009), and Split Lake (p = 0.0011) from 1999–2021.

Gull Lake/Keeyask reservoir								
Sample	Frequency	Mean of ranks	Groups					
2001	26	64.962	A					
2006	44	107.659	A	B				
2002	32	109.203	A	B				
2016	36	118.361	A	B				
2014	38	131.145		B	C			
1999	22	133.864	A	B	C			
2019	36	186.222			C	D		
2021	36	215.861				D		
Stephens Lake								
Sample	Frequency	Mean of ranks	Groups					
2005	69	101.072	A					
2009	36	142.750	A	B				
2001	29	174.138	A	B	C			
2012	41	176.061	A	B	C			
2003	70	222.414		B	C	D		
2018	36	249.486			C	D	E	
1999	24	270.750			C	D	E	
2002	34	271.794			C	D	E	
2007	18	289.500			C	D	E	
2021	36	303.056				D	E	
2015	36	317.861					E	
Split Lake								
Sample	Frequency	Mean of ranks	Groups					
2005	53	55.849	A					
2004	15	59.033	A					
2001	26	117.019	A	B				
2010	33	119.606	A					
2002	28	131.357	A	B				
2016	36	202.444		B	C			
2007	66	226.909			C	D		
2013	37	264.351			C	D		
2019	32	267.188			C	D		
2021	35	292.371				D		

Table 6: Summary of groupings from multiple pairwise comparisons (Dunn's procedure of standardized mercury concentrations in a 550 mm Northern Pike from Gull Lake/Keeyask reservoir (Bonferroni corrected significance level p = 0.0014), Stephens Lake (p = 0.0009), and Split Lake (p = 0.0014) from 1999–2021.

Gull Lake/Keeyask reservoir						
Sample	Frequency	Mean of ranks	Groups			
2004	20	46.500	A			
2006	66	91.652	A			
2001	33	123.182	A	B		
2002	35	131.114	A	B		
2016	36	173.389		B		
1999	40	182.750		B		
2014	31	189.258		B		
2019	36	283.028			C	
2021	36	288.056			C	
Stephens Lake						
Sample	Frequency	Mean of ranks	Groups			
2005	52	87.269	A			
2009	36	161.056	A	B		
2012	42	183.619		B	C	
2003	76	209.500		B	C	D
2018	36	229.417		B	C	D
2015	36	237.431		B	C	D
1999	14	249.643		B	C	D
2001	27	251.000		B	C	D
2007	40	254.213			C	D
2002	35	276.257				D
2021	27	294.259				D
Split Lake						
Sample	Frequency	Mean of ranks	Groups			
2005	51	72.314	A			
2002	26	102.038	A	B		
2001	23	128.913	A	B	C	
2016	34	129.735	A	B	C	
2010	24	148.208		B	C	
2019	36	179.056			C	D
2007	35	188.714			C	D
2013	37	194.730			C	D
2021	37	230.432				D

Table 7: Summary of groupings from multiple pairwise comparisons (Dunn's procedure of standardized mercury concentrations in a 350 mm Lake Whitefish from Gull Lake/Keeyask reservoir (Bonferroni corrected significance level p = 0.0044), Stephens Lake (p = 0.0008), and Split Lake (p = 0.0011) from 1999–2021.

Gull Lake/Keeyask reservoir					
Sample	Frequency	Mean of ranks	Groups		
2001	21	40.571	A		
1999	22	52.682	A		
2002	26	56.846	A	B	
2016	19	78.053	A	B	
2019	33	90.576		B	C
2014	4	92.000	A	B	C
2021	27	122.185			C
Stephens Lake					
Sample	Frequency	Mean of ranks	Groups		
2004	10	31.700	A		
2005	25	65.000	A	B	
1999	6	87.167	A	B	
2018	13	87.769	A	B	
2007	33	119.152		B	C
2001	15	124.267	A	B	C
2015	11	129.636	A	B	C
2009	7	131.429	A	B	C
2021	6	131.667	A	B	C
2012	5	134.600	A	B	C
2003	78	136.192			C
2002	25	146.440			C
Split Lake					
Sample	Frequency	Mean of ranks	Groups		
2004	3	26.333	A	B	
2005	37	58.703	A		
2016	22	66.636	A		
2002	21	84.762	A	B	
2001	27	91.759	A	B	
2010	16	100.250	A	B	
2019	21	111.262	A	B	C
2007	17	139.294		B	C
2021	25	168.600			C
2013	20	172.350			C

FIGURES

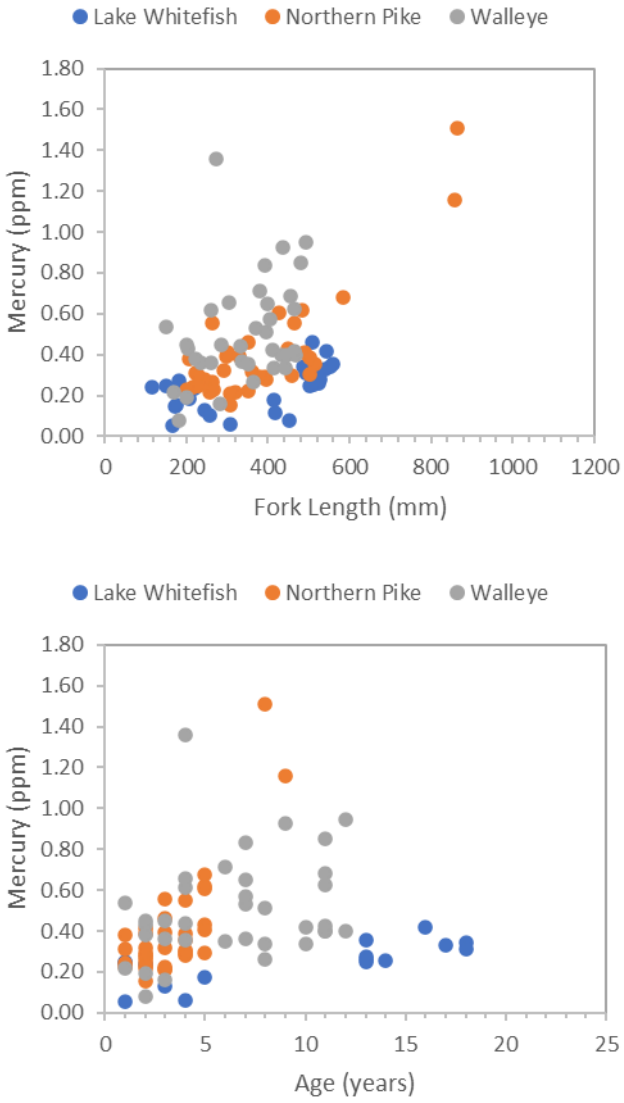


Figure 1: **Mercury concentration versus fork length (top) and age (bottom) for Northern Pike, Walleye, and Lake Whitefish captured from the Keeyask reservoir in 2021.**

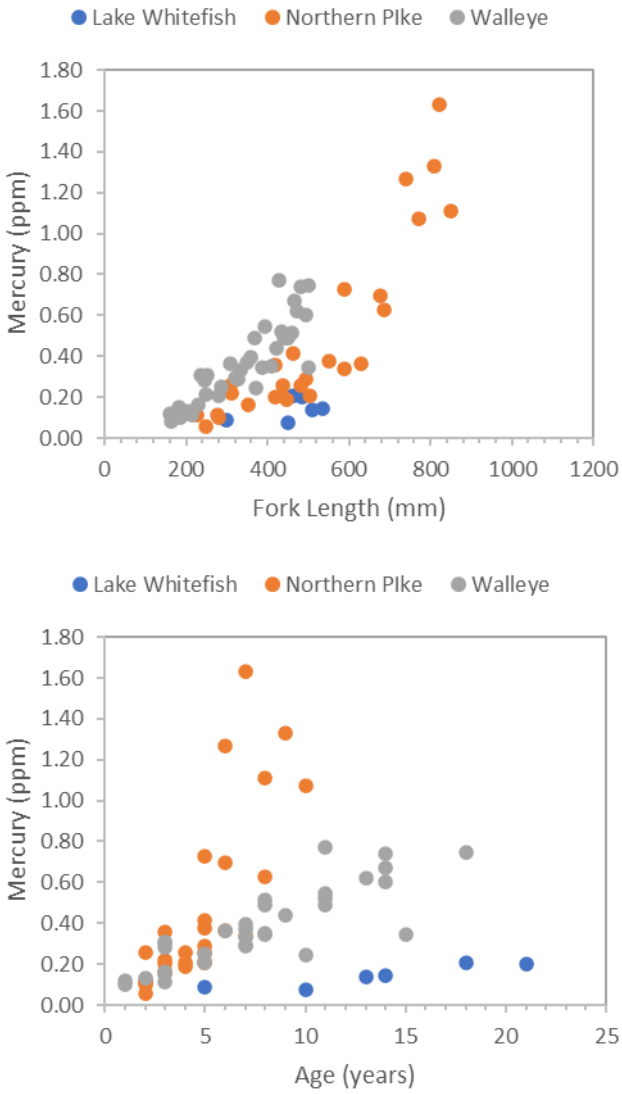


Figure 2: **Mercury concentration versus fork length (top) and age (bottom) for Northern Pike, Walleye, and Lake Whitefish captured from Stephens Lake in 2021.**

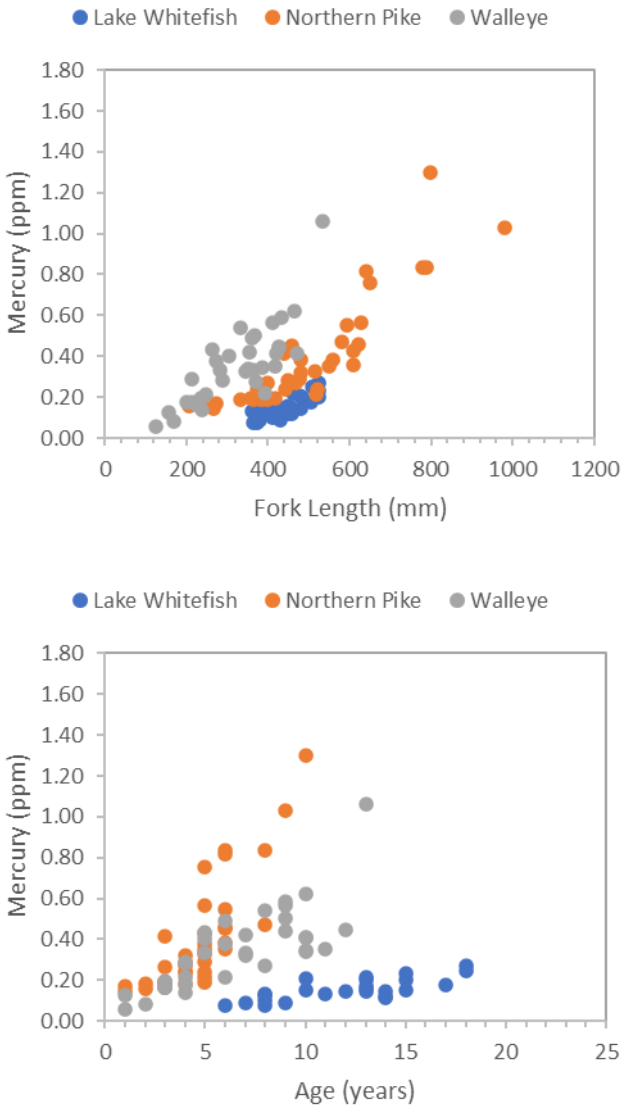


Figure 3: Mercury concentration versus fork length (top) and age (bottom) for Northern Pike, Walleye, and Lake Whitefish captured from Split Lake in 2021.

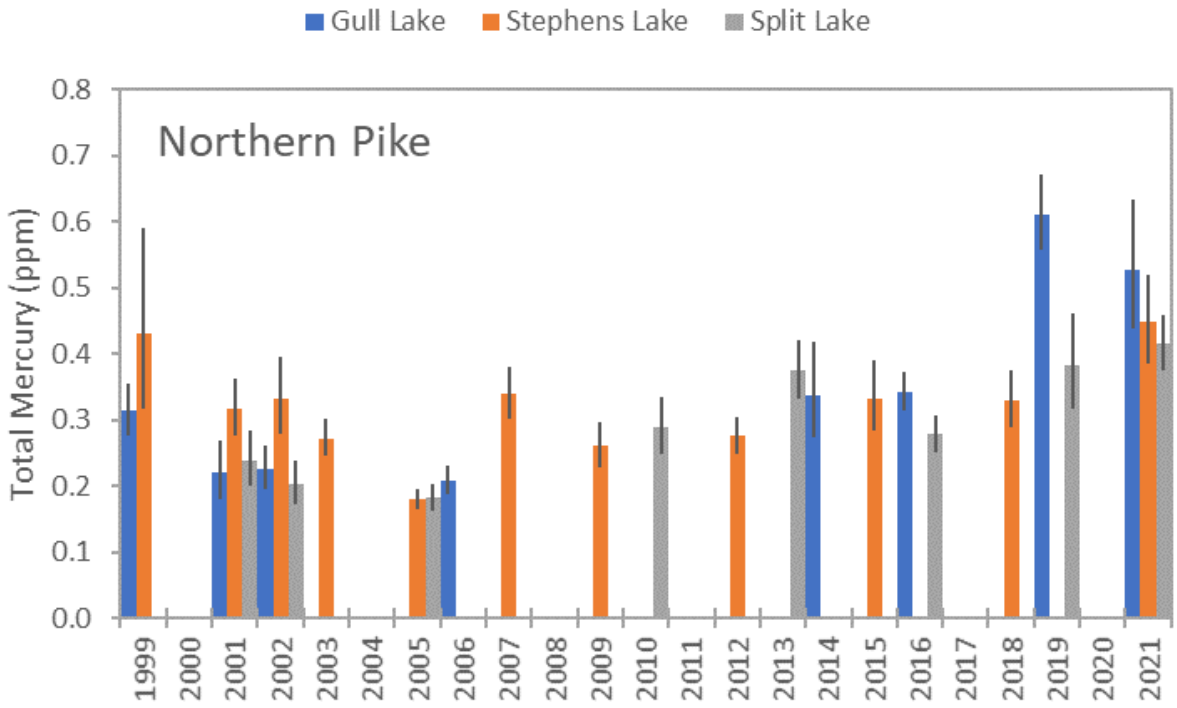


Figure 4: **Length standardized mean (±95% confidence limits, CL) muscle mercury concentrations of a 550 mm Northern Pike from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake for years 1999–2021.**

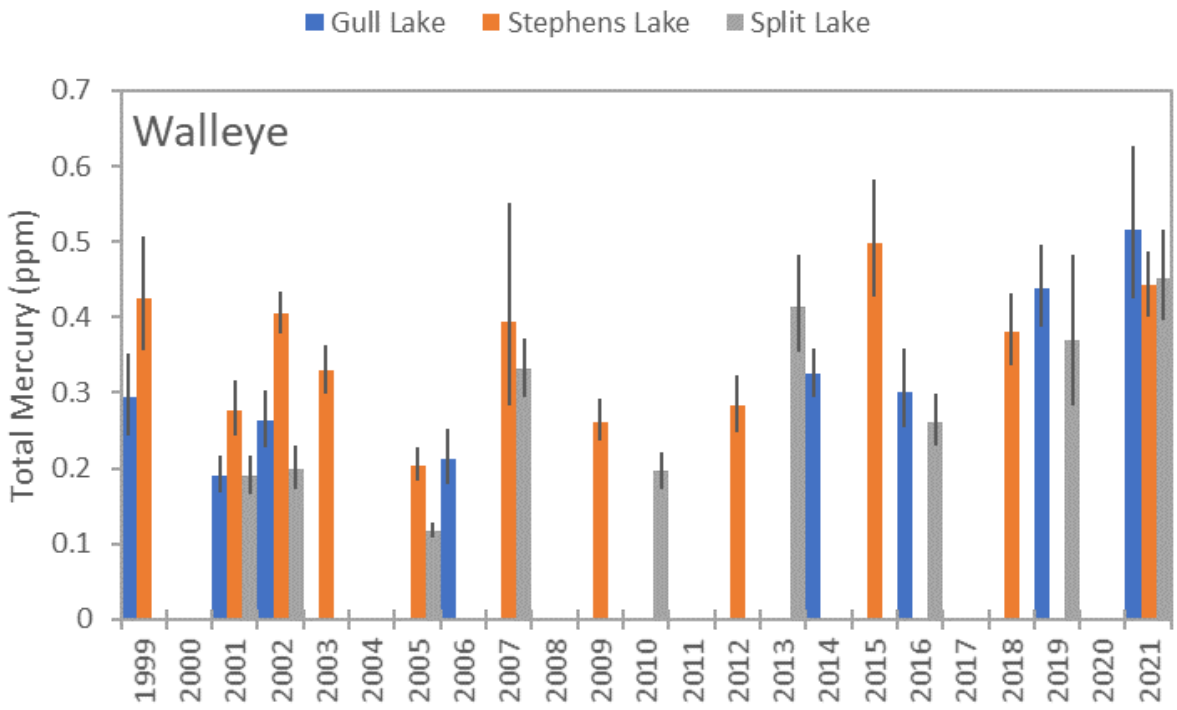


Figure 5: **Length standardized mean (±95% confidence limits, CL) muscle mercury concentrations of a 400 mm Walleye from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake for years 1999–2021.**

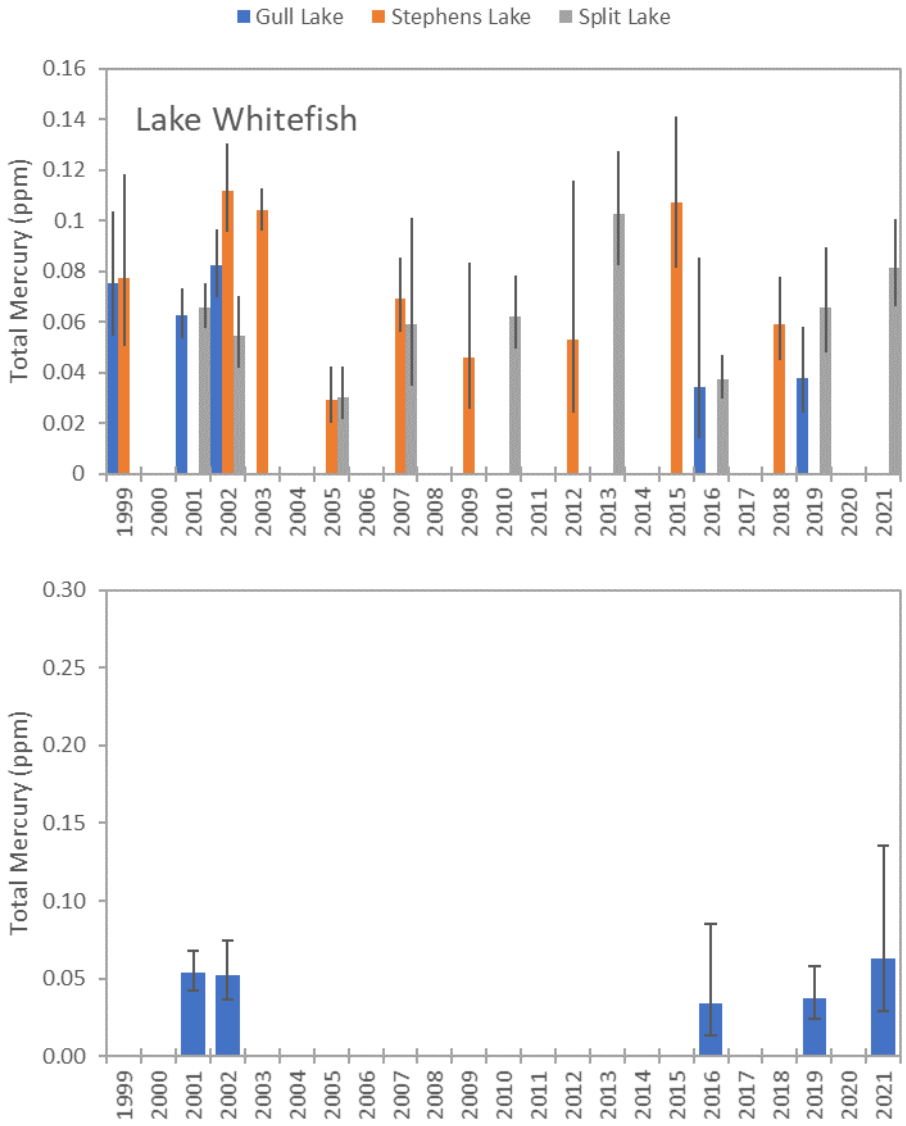


Figure 6: **Length standardized mean (±95% confidence limits, CL) muscle mercury concentrations of a 350 mm Lake Whitefish: from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake for years 1999–2021 (top) and for Lake Whitefish from Gull Lake/Keeyask reservoir using only large fish (> 350 mm) (bottom).**

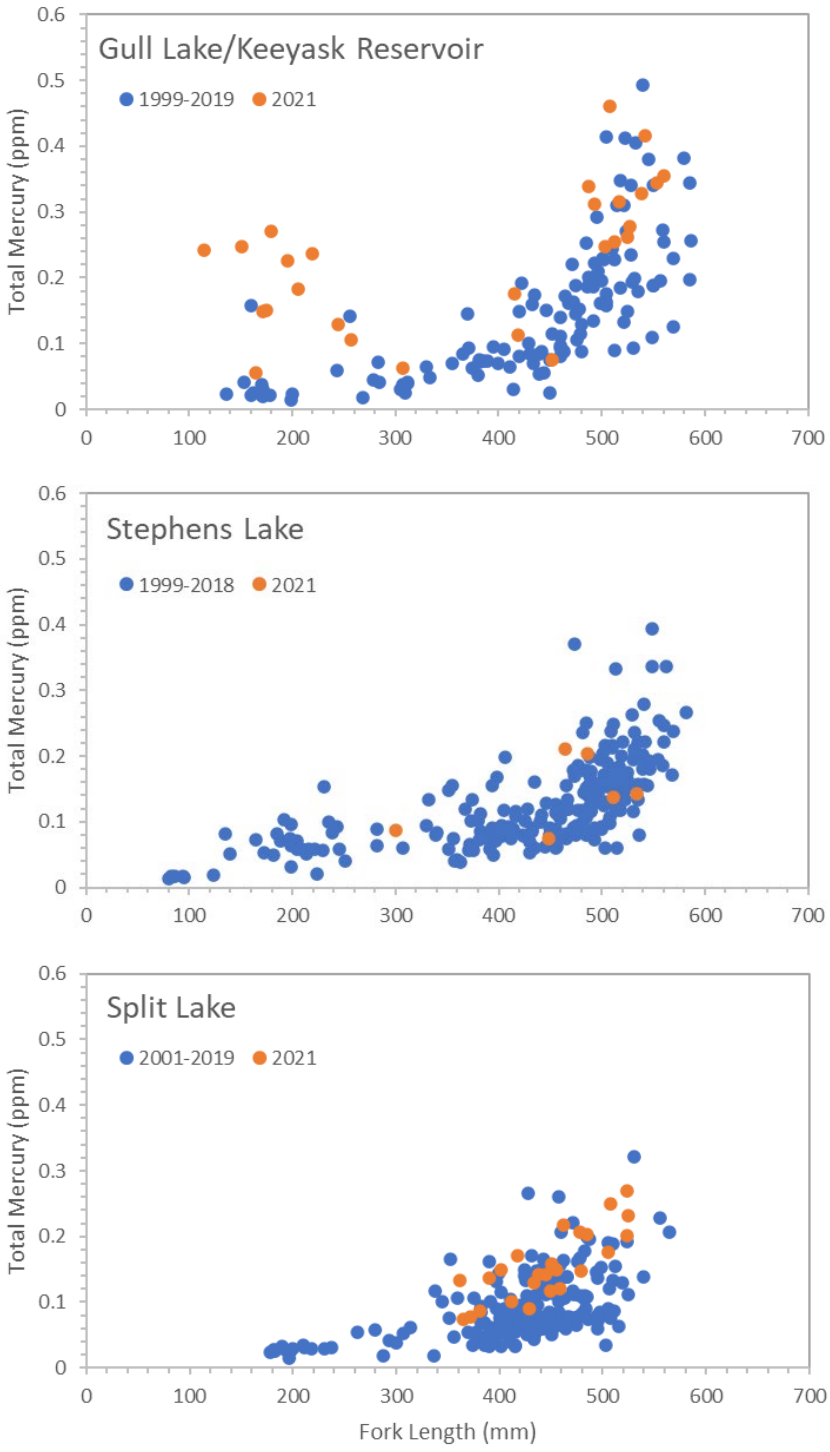


Figure 7: **Muscle mercury concentrations of Lake Whitefish as a function of fork length from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake in 2021 compared to 1999–2019.**

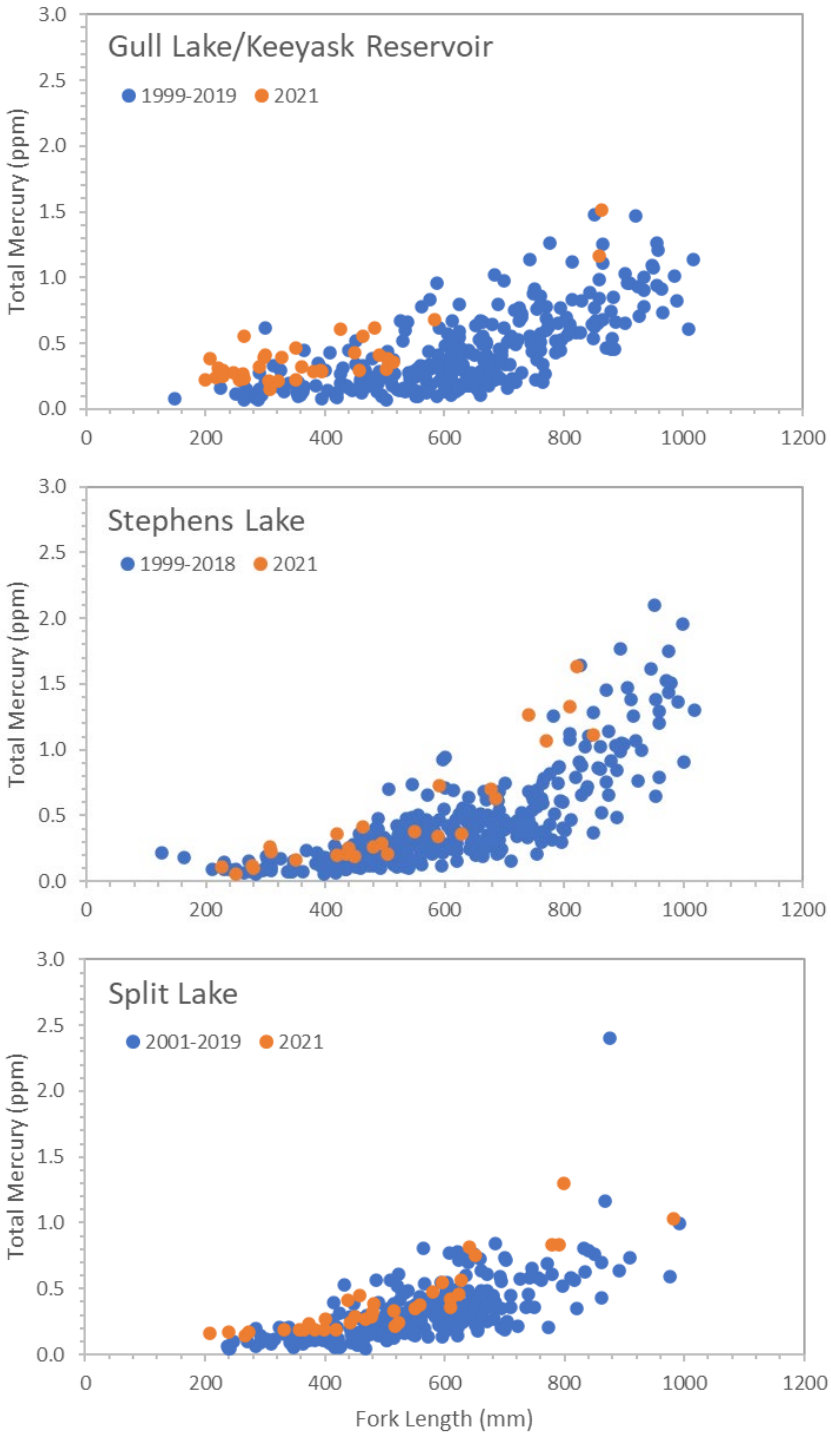


Figure 8: **Muscle mercury concentrations of Northern Pike as a function of fork length from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake in 2021 compared to 1999–2019.**

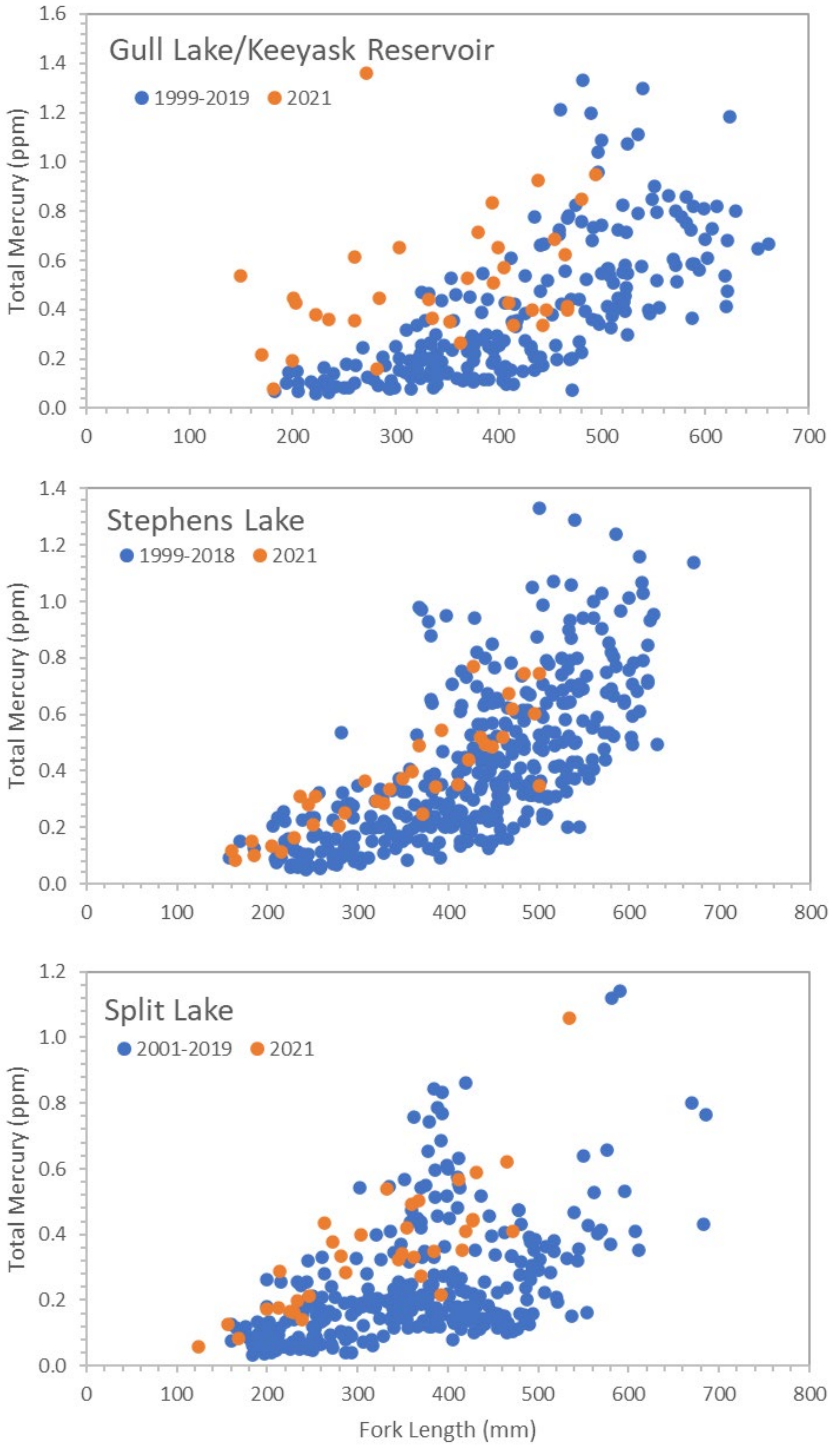


Figure 9: Muscle mercury concentrations of Walleye as a function of fork length from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake in 2021 compared to 1999–2019.

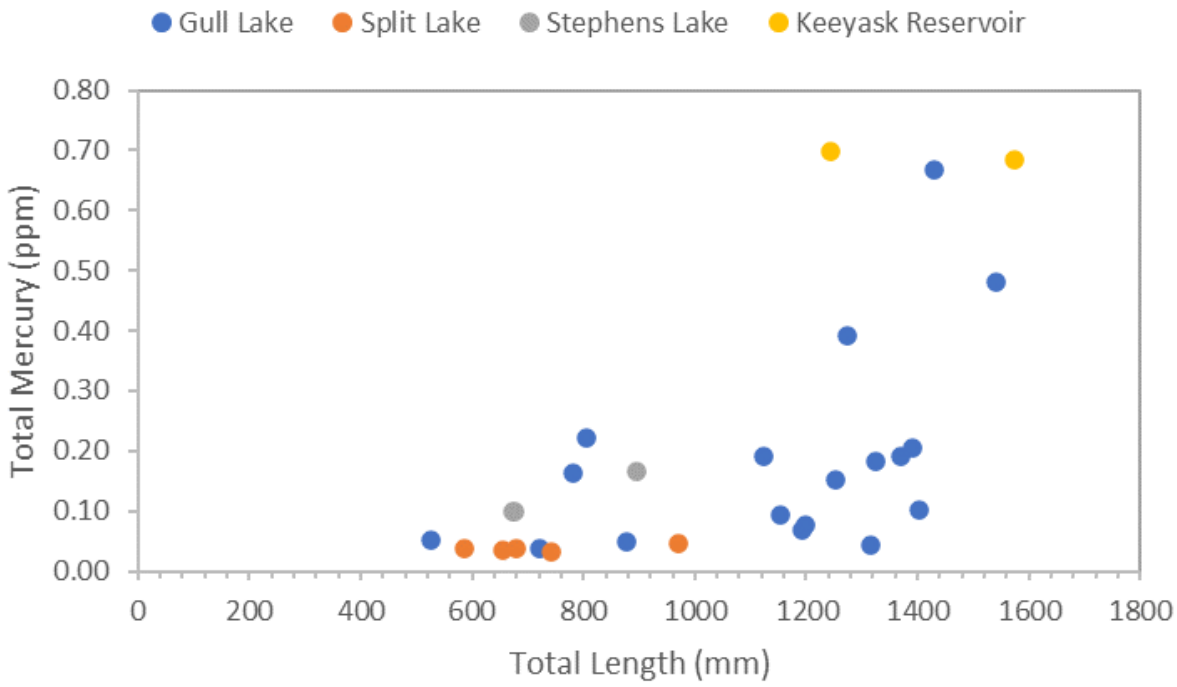
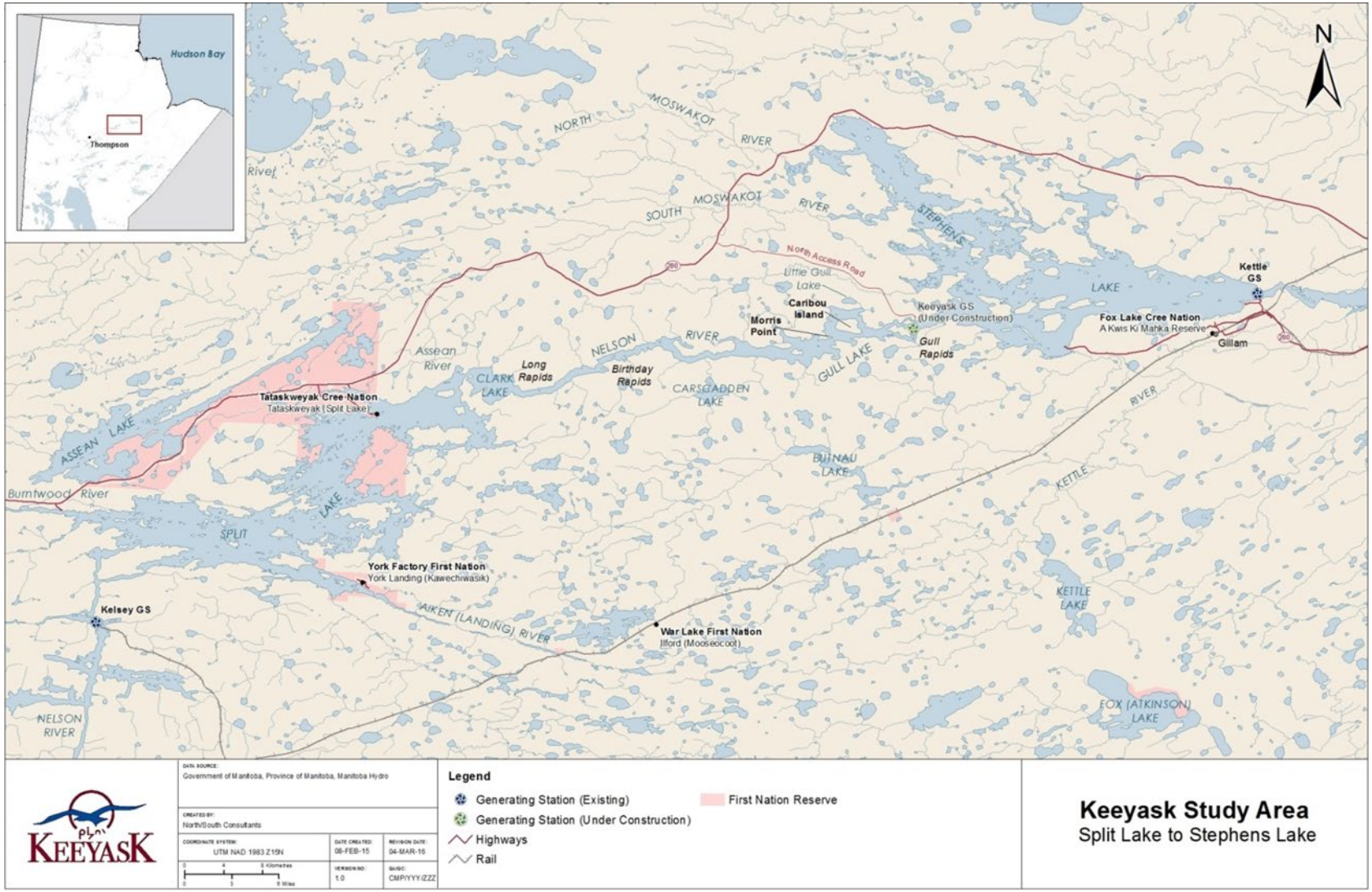
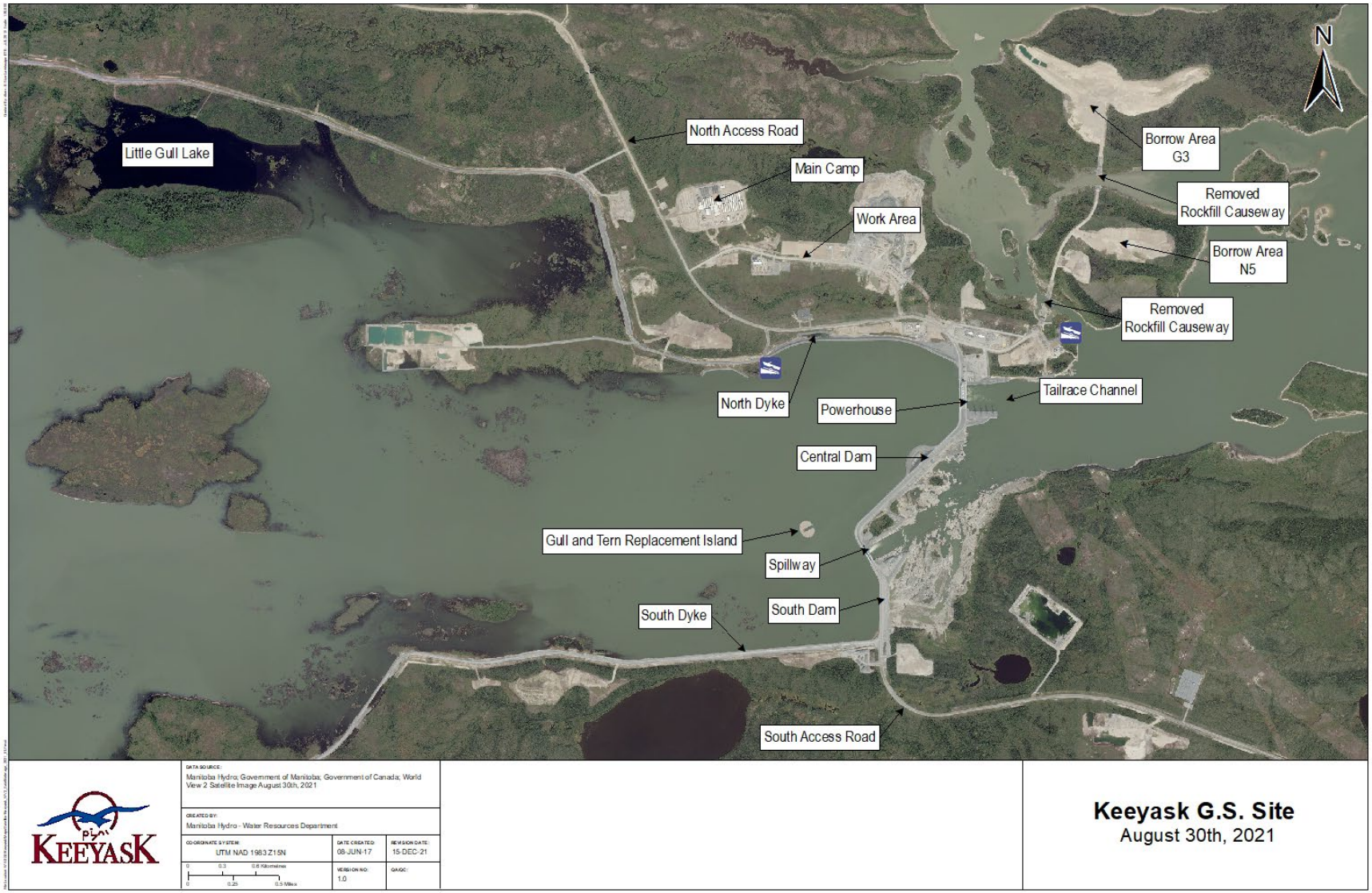


Figure 10: Mercury concentration versus total length for Lake Sturgeon collected from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 2002–2021.

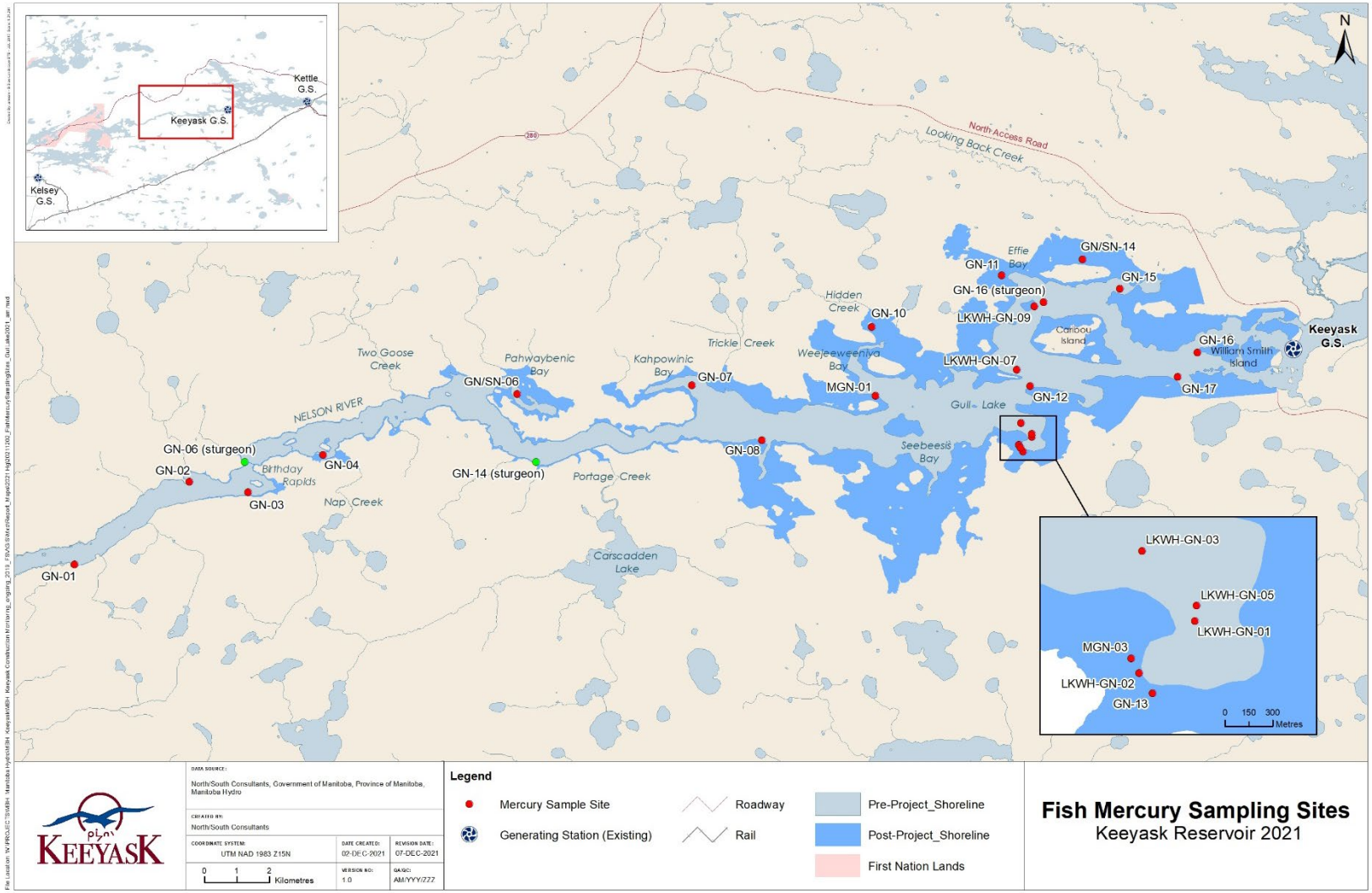
MAPS



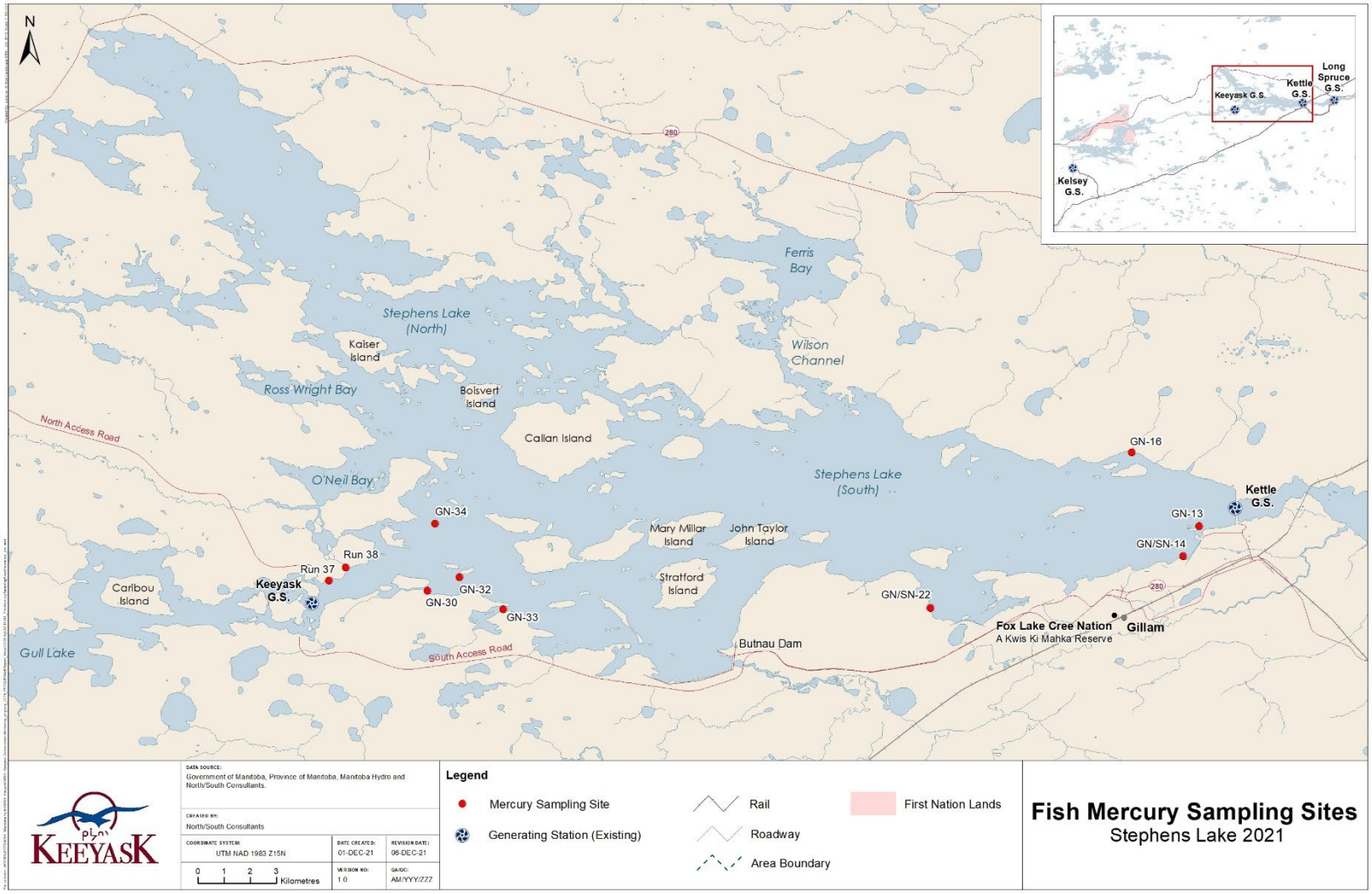
Map 1: Map of the Nelson River showing the site of Keeyask Generating Station and the fish mercury study setting.



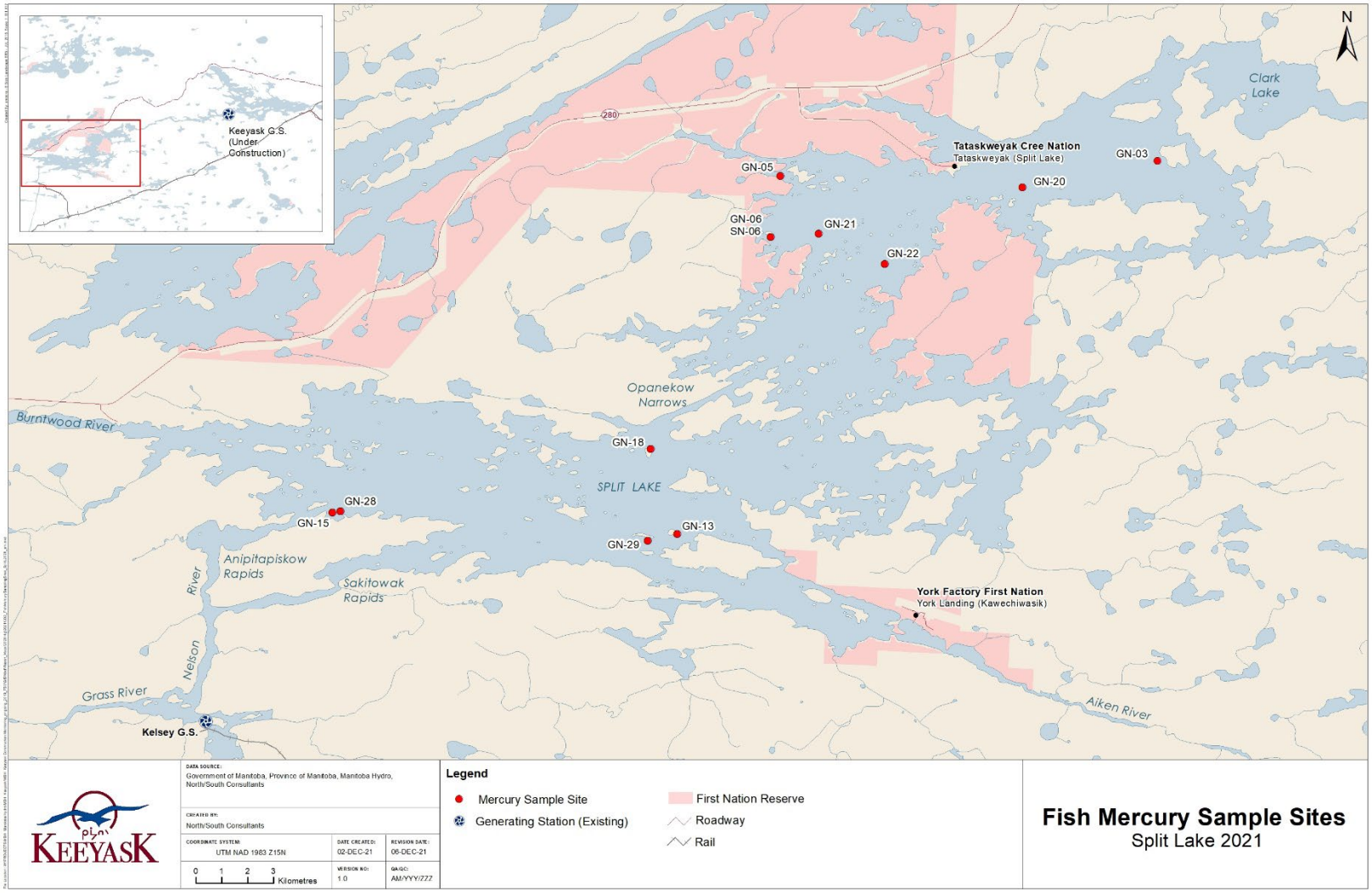
Map 2: Map of instream structures at the Keeyask Generating Station site after reservoir flooding, August 2021.



Map 3: **Map of the Keeyask reservoir showing sites where fish were captured for mercury analysis in 2021. Green sites are sites where Lake Sturgeon were collected.**



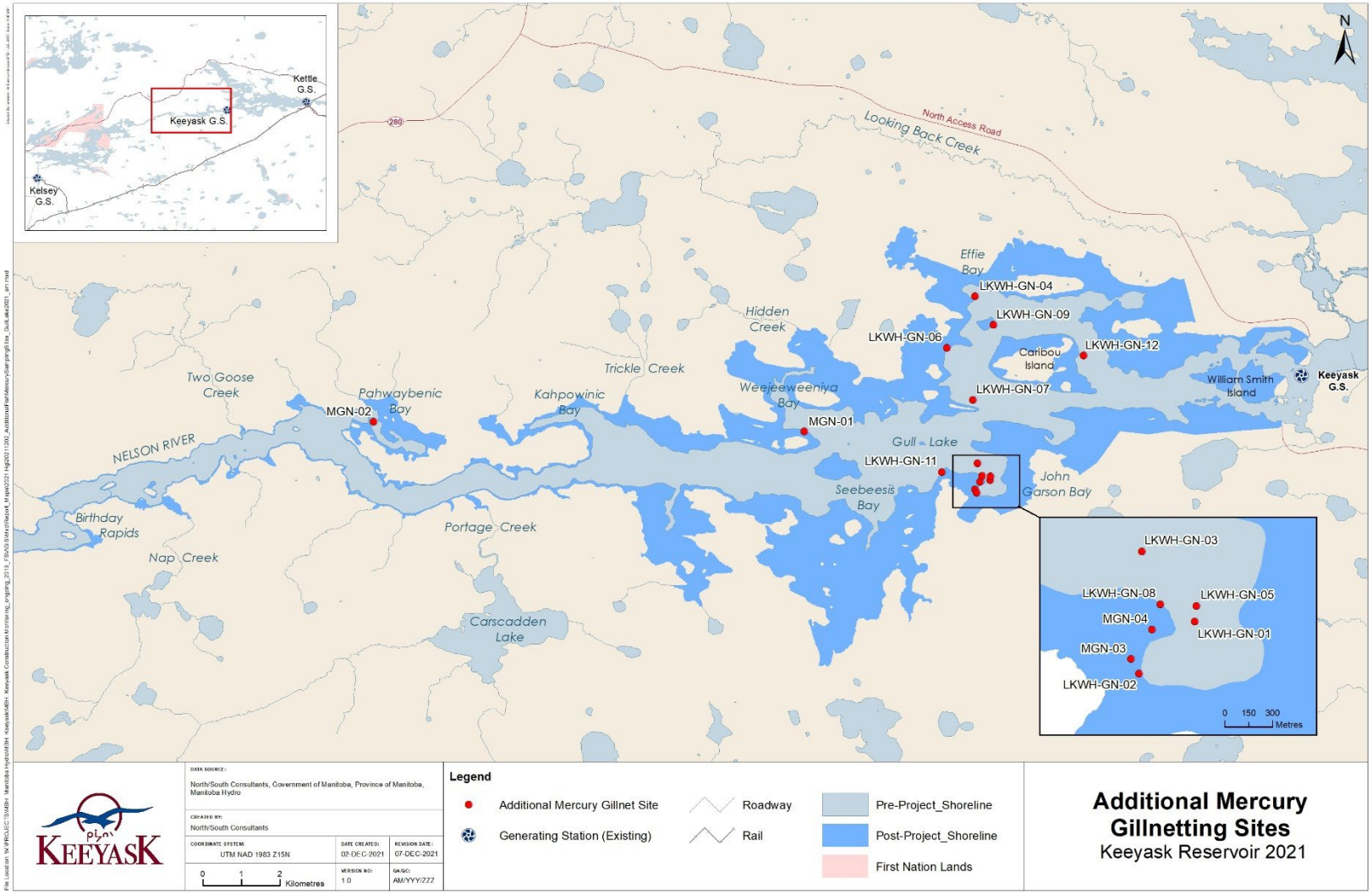
Map 4: Map of Stephens Lake showing sampling sites where fish were captured for mercury analysis in 2021.



Map 5: Map of Split Lake showing sampling sites where fish were captured for mercury analysis in 2021.

APPENDICES

APPENDIX 1:
SITE AND CATCH INFORMATION FOR GILLNETTING CONDUCTED IN THE KEEYASK RESERVOIR IN 2021 TO CAPTURE FISH FOR MERCURY ANALYSIS



Map A1-1. Gillnetting sites targeting fish for mercury analysis in the Keeyask reservoir, 2021.

Table A1-1. Mercury gillnetting survey information and Lake Whitefish (LKWH) catches in the Keeyask reservoir, 2021.

Site	UTM Coordinates			Pull Date	Duration (h)	Depth (m)		Catch (n)
	Zone	Easting	Northing			At Start	At End	LKWH
MGN-01	15	350779	6244966	14-Aug-21	23.50	3.5	6.6	2
MGN-02	15	339596	6245207	14-Aug-21	24.93	4.5	4.2	0
MGN-03	15	355204	6243464	14-Aug-21	25.05	5.6	6.2	5
MGN-04	15	355336	6243650	14-Aug-21	25.37	5.5	5.8	0
LKWH-GN-01	15	355604	6243698	19-Sep-21	23.67	6.7	7.1	1
LKWH-GN-02	15	355255	6243372	19-Sep-21	24.00	6.2	6.6	3
LKWH-GN-03	15	355273	6244137	20-Sep-21	23.17	7.9	8.2	1
LKWH-GN-04	15	355213	6248466	20-Sep-21	23.00	7.3	7.5	0
LKWH-GN-05	15	355615	6243796	21-Sep-21	25.00	7.4	7.5	2
LKWH-GN-06	15	354474	6247133	21-Sep-21	24.50	3.1	7.5	0
LKWH-GN-07	15	355149	6245777	21-Sep-21	25.25	8	7.5	1
LKWH-GN-08	15	355389	6243806	22-Sep-21	21.50	5.1	7.5	0
LKWH-GN-09	15	355687	6247728	22-Sep-21	21.83	6.9	9.9	2
LKWH-GN-11	15	354347	6243911	23-Sep-21	24.58	7.5	-	0
LKWH-GN-12	15	358029	6246930	23-Sep-21	24.85	9.5	-	0

APPENDIX 2:
ALS LABORATORY REPORT

North/South Consultants
ATTN: JODI HOLM
83 Scurfield Blvd
Winnipeg MB R3Y 1G4

Date Received: 30-AUG-21
Report Date: 08-NOV-21 07:33 (MT)
Version: FINAL

Client Phone: 204-487-5638

Certificate of Analysis

Lab Work Order #: L2633507

Project P.O. #: NOT SUBMITTED
Job Reference: KEEYASK FISH
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-1 59 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.344		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-2 65 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.0621		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-3 67 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.129		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-4 73 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.248		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-5 74 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.0550		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-6 86 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.176		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-7 99 Sampled By: CLIENT on 08-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.416		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-8 261 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.315		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-9 262 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.261		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-10 283 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.242		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-11 291 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.328		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-12 292 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.254		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-13 293 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.248		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-14 294 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.355		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-15 295 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.277		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-16 296 Sampled By: CLIENT on 14-AUG-21 Matrix: LKWH **Miscellaneous Parameters** Mercury (Hg)	0.237		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-17 1 Sampled By: CLIENT on 04-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.390		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-18 23 Sampled By: CLIENT on 04-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	1.51		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-19 37 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.558		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-20 63 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	1.16		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-21 64 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.552		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-22 68 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.679		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-23 72 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.313		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-24 90 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.318		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-25 91 Sampled By: CLIENT on 08-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.410		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-26 119 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.244		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-27 137 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.431		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-28 138 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.281		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-29 139 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.408		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-30 140 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters** Mercury (Hg)	0.291		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-31 142 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.461		0.0010	mg/kg wwt	06-OCT-21	27-OCT-21	R5631903
L2633507-32 143 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.297		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-33 144 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.604		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-34 145 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.620		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-35 147 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.391		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-36 148 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.266		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-37 149 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.280		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-38 151 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.250		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-39 152 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.381		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-40 153 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.296		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-41 155 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.225		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-42 156 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.218		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-43 157 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.154		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-44 158 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.321		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-45 159 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.305		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-46 160 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.289		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-47 163 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.214		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-48 165 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.212		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-49 166 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.229		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-50 176 Sampled By: CLIENT on 09-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.354		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-51 196 Sampled By: CLIENT on 10-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.386		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-52 235 Sampled By: CLIENT on 11-AUG-21 Matrix: NRPK **Miscellaneous Parameters**							
Mercury (Hg)	0.226		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-53 5 Sampled By: CLIENT on 04-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.162		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-54 6 Sampled By: CLIENT on 04-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.358		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-55 12 Sampled By: CLIENT on 04-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.338		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-56 21 Sampled By: CLIENT on 04-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.625		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-57 28 Sampled By: CLIENT on 04-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.400		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-58 33 Sampled By: CLIENT on 04-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.851		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-59 35 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.429		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-60 36 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.216		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-61 53 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.652		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-62 58 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.398		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-63 62 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.835		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-64 66 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.615		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-65 71 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.362		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-66 85 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.265		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-67 89 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.654		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-68 103 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.538		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-69 105 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.714		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-70 106 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters**							
Mercury (Hg)	0.948		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-71 108 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.925		0.0020	mg/kg wwt	07-OCT-21	02-NOV-21	R5635345
L2633507-72 113 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.382		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-73 114 Sampled By: CLIENT on 08-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	1.36		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-74 120 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.449		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-75 124 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.365		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-76 125 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.510		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-77 128 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.397		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-78 129 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.426		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-79 132 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.685		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-80 180 Sampled By: CLIENT on 09-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.529		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2633507-81 189 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.193		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-82 191 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.352		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-83 192 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.416		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-84 195 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.571		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-85 202 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.337		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-86 207 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.0809		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-87 219 Sampled By: CLIENT on 10-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.449		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768
L2633507-88 304 Sampled By: CLIENT on 14-AUG-21 Matrix: WALL **Miscellaneous Parameters** Mercury (Hg)	0.440		0.0010	mg/kg wwt	08-OCT-21	03-NOV-21	R5636768

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-WET-CVAA-WP	Tissue	Mercury in Tissue	EPA 200.3/1631E (mod)

Tissue samples undergo hotblock digestion with nitric and hydrochloric acids, in combination with repeated additons of hydrogen peroxide, followed by cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analysis by CVAAS.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: North/South Consultants
83 Scurfield Blvd
Winnipeg MB R3Y 1G4
Contact: JODI HOLM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAA-WP	**Tissue**							
Batch R5631903								
WG3632713-3 CRM		**DORM-4N**						
Mercury (Hg)			107.7		%		70-130	27-OCT-21
WG3632713-7 CRM		**DORM-4N**						
Mercury (Hg)			103.6		%		70-130	27-OCT-21
WG3632713-8 DUP		**L2633507-12**						
Mercury (Hg)		0.254	0.251		mg/kg wwt	1.1	40	27-OCT-21
WG3632713-2 LCS								
Mercury (Hg)			101.7		%		80-120	27-OCT-21
WG3632713-6 LCS								
Mercury (Hg)			111.6		%		80-120	27-OCT-21
WG3632713-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	27-OCT-21
WG3632713-5 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	27-OCT-21
Batch R5635345								
WG3635649-3 CRM		**DORM-4N**						
Mercury (Hg)			108.2		%		70-130	02-NOV-21
WG3635649-7 CRM		**DORM-4N**						
Mercury (Hg)			112.0		%		70-130	02-NOV-21
WG3635649-4 DUP		**L2633507-32**						
Mercury (Hg)		0.297	0.311		mg/kg wwt	4.8	40	02-NOV-21
WG3635649-8 DUP		**L2633507-52**						
Mercury (Hg)		0.226	0.256		mg/kg wwt	12	40	02-NOV-21
WG3635649-2 LCS								
Mercury (Hg)			103.3		%		80-120	02-NOV-21
WG3635649-6 LCS								
Mercury (Hg)			103.1		%		80-120	02-NOV-21
WG3635649-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	02-NOV-21
WG3635649-5 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	02-NOV-21
Batch R5636768								
WG3634632-3 CRM		**DORM-4N**						
Mercury (Hg)			105.2		%		70-130	03-NOV-21
WG3634632-4 DUP		**L2633507-78**						
Mercury (Hg)		0.426	0.425		mg/kg wwt	0.3	40	03-NOV-21
WG3634632-2 LCS								
Mercury (Hg)			111.0		%		80-120	03-NOV-21
WG3634632-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAA-WP	**Tissue**							
Batch R5636768								
WG3634632-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	03-NOV-21

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Fo
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

L2633507-COFC

OC # Keeyask GS

Page 1 of 1

Report to:		**Report Format / Distribution**		**Service Requested:** (rush - subject to availability)	
Company:	North South Consultants	☑ Standard ☐ Other		◉ Regular (Default)	
Contact:	Jodi Holm	☑ PDF ☑ Excel ☑ Digital		○ Priority (2-3 Business Days) - 50% Surcharge	
Address:	83 Scurfield Blvd, Winnipeg	Email 1: jholm@nscons.ca		○ Emergency (1 Business Day) - 100% Surcharge	
		Email 2:		○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS	
Phone:	284 3366 ext 227 Fax: 477 4173			**Analysis Request**	
Invoice To:	Same as Report ? ◉ Yes ○ No	**Client / Project Information:**		Please indicate below Filtered, Preserved or both (F, P, F/P)	
Company:		Job #: Keeyask Fish			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:	284 3366 Fax: 477 4173	Quote #: Q43475			
Lab Work Order # (lab use only)		**ALS Contact:**	**Sampler:**		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Gull Lake: See attached sheet			Tissue	X	X	88
	samples are organized by: fish species, and fish #						

Special Instructions / Regulations / Hazardous Details

* Weights to be taken from yellow perch only*

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
Kim Nowicky	Aug 27, 2021		8/30/21	15:48	6-8		AUG 31 2021	

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF 18.00 Front

Fish with Hg samples from Gull Lake in 2021				
Submitted 28 Aug 2021				
	Waterbody	**Date**	**Species**	**Fish #**	**Fork Length (mm)**
1	Gull Lake	8-Aug-2021	LKWH	59	553
2	Gull Lake	8-Aug-2021	LKWH	65	307
3	Gull Lake	8-Aug-2021	LKWH	67	245
4	Gull Lake	8-Aug-2021	LKWH	73	151
5	Gull Lake	8-Aug-2021	LKWH	74	165
6	Gull Lake	8-Aug-2021	LKWH	86	415
7	Gull Lake	8-Aug-2021	LKWH	99	542
8	Gull Lake	14-Aug-2021	LKWH	261	517
9	Gull Lake	14-Aug-2021	LKWH	262	525
10	Gull Lake	14-Aug-2021	LKWH	283	114
11	Gull Lake	14-Aug-2021	LKWH	291	539
12	Gull Lake	14-Aug-2021	LKWH	292	512
13	Gull Lake	14-Aug-2021	LKWH	293	503
14	Gull Lake	14-Aug-2021	LKWH	294	560
15	Gull Lake	14-Aug-2021	LKWH	295	527
16	Gull Lake	14-Aug-2021	LKWH	296	220
17	Gull Lake	4-Aug-2021	NRPK	1	298
18	Gull Lake	4-Aug-2021	NRPK	23	864
19	Gull Lake	8-Aug-2021	NRPK	37	264
20	Gull Lake	8-Aug-2021	NRPK	63	859
21	Gull Lake	8-Aug-2021	NRPK	64	464
22	Gull Lake	8-Aug-2021	NRPK	68	584
23	Gull Lake	8-Aug-2021	NRPK	72	221
24	Gull Lake	8-Aug-2021	NRPK	90	362
25	Gull Lake	8-Aug-2021	NRPK	91	301
26	Gull Lake	9-Aug-2021	NRPK	119	217
27	Gull Lake	9-Aug-2021	NRPK	137	450
28	Gull Lake	9-Aug-2021	NRPK	138	395
29	Gull Lake	9-Aug-2021	NRPK	139	491
30	Gull Lake	9-Aug-2021	NRPK	140	393
31	Gull Lake	9-Aug-2021	NRPK	142	351
32	Gull Lake	9-Aug-2021	NRPK	143	458
33	Gull Lake	9-Aug-2021	NRPK	144	426
34	Gull Lake	9-Aug-2021	NRPK	145	483
35	Gull Lake	9-Aug-2021	NRPK	147	328
36	Gull Lake	9-Aug-2021	NRPK	148	263
37	Gull Lake	9-Aug-2021	NRPK	149	246
38	Gull Lake	9-Aug-2021	NRPK	151	230
39	Gull Lake	9-Aug-2021	NRPK	152	207
40	Gull Lake	9-Aug-2021	NRPK	153	229
41	Gull Lake	9-Aug-2021	NRPK	155	352
42	Gull Lake	9-Aug-2021	NRPK	156	256
43	Gull Lake	9-Aug-2021	NRPK	157	307

Fish with Hg samples from Gull Lake in 2021				
Submitted 28 Aug 2021				
Waterbody	**Date**	**Species**	**Fish #**	**Fork Length (mm)**
Gull Lake	9-Aug-2021	NRPK	158	291
Gull Lake	9-Aug-2021	NRPK	159	502
Gull Lake	9-Aug-2021	NRPK	160	380
Gull Lake	9-Aug-2021	NRPK	163	321
Gull Lake	9-Aug-2021	NRPK	165	306
Gull Lake	9-Aug-2021	NRPK	166	265
Gull Lake	9-Aug-2021	NRPK	176	514
Gull Lake	10-Aug-2021	NRPK	196	504
Gull Lake	11-Aug-2021	NRPK	235	200
Gull Lake	4-Aug-2021	WALL	5	282
Gull Lake	4-Aug-2021	WALL	6	260
Gull Lake	4-Aug-2021	WALL	12	414
Gull Lake	4-Aug-2021	WALL	21	464
Gull Lake	4-Aug-2021	WALL	28	467
Gull Lake	4-Aug-2021	WALL	33	480
Gull Lake	8-Aug-2021	WALL	35	203
Gull Lake	8-Aug-2021	WALL	36	170
Gull Lake	8-Aug-2021	WALL	53	399
Gull Lake	8-Aug-2021	WALL	58	432
Gull Lake	8-Aug-2021	WALL	62	393
Gull Lake	8-Aug-2021	WALL	66	260
Gull Lake	8-Aug-2021	WALL	71	235
Gull Lake	8-Aug-2021	WALL	85	363
Gull Lake	8-Aug-2021	WALL	89	304
Gull Lake	8-Aug-2021	WALL	103	149
Gull Lake	8-Aug-2021	WALL	105	380
Gull Lake	8-Aug-2021	WALL	106	494
Gull Lake	8-Aug-2021	WALL	108	438
Gull Lake	8-Aug-2021	WALL	113	222
Gull Lake	8-Aug-2021	WALL	114	272
Gull Lake	9-Aug-2021	WALL	120	201
Gull Lake	9-Aug-2021	WALL	124	335
Gull Lake	9-Aug-2021	WALL	125	395
Gull Lake	9-Aug-2021	WALL	128	446
Gull Lake	9-Aug-2021	WALL	129	410
Gull Lake	9-Aug-2021	WALL	132	454
Gull Lake	9-Aug-2021	WALL	180	370
Gull Lake	10-Aug-2021	WALL	189	200
Gull Lake	10-Aug-2021	WALL	191	352
Gull Lake	10-Aug-2021	WALL	192	466
Gull Lake	10-Aug-2021	WALL	195	405
Gull Lake	10-Aug-2021	WALL	202	442
Gull Lake	10-Aug-2021	WALL	207	182

Fish with Hg samples from Gull Lake in 2021				
Submitted 28 Aug 2021				
Waterbody	**Date**	**Species**	**Fish #**	**Fork Length (mm)**
Gull Lake	10-Aug-2021	WALL	219	284
Gull Lake	14-Aug-2021	WALL	304	332

North/South Consultants
ATTN: JODI HOLM
83 Scurfield Blvd
Winnipeg MB R3Y 1G4

Date Received: 13-SEP-21
Report Date: 23-NOV-21 14:46 (MT)
Version: FINAL

Client Phone: 204-284-3366

Certificate of Analysis

Lab Work Order #: L2640918

Project P.O. #: NOT SUBMITTED
Job Reference: KEEYASK FISH
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-1 15 Sampled By: CLIENT on 24-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.134		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-2 20 Sampled By: CLIENT on 24-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.0776		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-3 21 Sampled By: CLIENT on 24-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.121		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-4 22 Sampled By: CLIENT on 24-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.136		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-5 23 Sampled By: CLIENT on 24-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.158		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-6 24 Sampled By: CLIENT on 24-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.150		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-7 132 Sampled By: CLIENT on 25-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.117		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-8 212 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.269		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-9 213 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.177		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-10 214 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.143		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-11 224 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.203		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-12 225 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.171		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-13 226 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.143		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-14 232 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.201		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-15 273 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.232		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-16 284 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.0863		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-17 342 Sampled By: CLIENT on 26-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.101		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-18 396 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.147		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-19 397 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.0899		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-20 398 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.129		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-21 408 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.0748		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-22 472 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.249		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-23 485 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.149		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-24 486 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.217		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-25 499 Sampled By: CLIENT on 27-AUG-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.207		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-26 69 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.834		0.020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-27 70 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.457		0.020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-28 80 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.350		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-29 81 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.471		0.020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-30 82 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.355		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-31 88 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.290		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-32 89 Sampled By: CLIENT on 24-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.380		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-33 126 Sampled By: CLIENT on 25-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.757		0.020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-34 227 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.168		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-35 234 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.451		0.020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-36 243 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.187		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-37 244 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.189		0.0020	mg/kg wwt	20-OCT-21	18-NOV-21	R5655642
L2640918-38 245 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.192		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-39 250 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.815		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-40 253 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.157		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-41 254 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.167		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-42 259 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.143		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-43 260 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.268		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-44 261 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.186		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-45 296 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.329		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-46 358 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.550		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-47 359 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.237		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-48 363 Sampled By: CLIENT on 26-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.186		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-49 405 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.425		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-50 406 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.213		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-51 407 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.566		0.0020	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-52 422 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.269		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-53 424 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.240		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-54 429 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.414		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-55 430 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.323		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-56 443 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.239		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-57 473 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	1.30		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-58 474 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.834		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-59 475 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	1.03		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-60 484 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.192		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-61 497 Sampled By: CLIENT on 27-AUG-21 Matrix: NORTHERN PIKE **Miscellaneous Parameters**							
Mercury (Hg)	0.284		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-62 27 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.214		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-63 28 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.127		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-64 43 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.163		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-65 77 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.347		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-66 78 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.504		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-67 83 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	1.06		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-68 84 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.324		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-69 887 Sampled By: CLIENT on 24-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.174		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-70 134 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.411		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-71 145 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.341		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-72 146 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.273		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-73 147 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.332		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-74 150 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.435		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-75 151 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.288		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-76 153 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.333		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-77 155 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.620		0.0010	mg/kg wwt	21-OCT-21	19-NOV-21	R5655409
L2640918-78 156 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.443		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-79 162 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.421		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-80 163 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.217		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-81 174 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.411		0.010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-82 195 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.383		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-83 197 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.351		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-84 198 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.492		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-85 200 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.165		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-86 202 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.197		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-87 206 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.139		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-88 207 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.177		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-89 208 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.0820		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-90 228 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.444		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2640918-91 237 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.567		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-92 264 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.588		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-93 266 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.540		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-94 268 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.379		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-95 269 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.0574		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-96 360 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.400		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409
L2640918-97 364 Sampled By: CLIENT on 25-AUG-21 Matrix: WALLEYE **Miscellaneous Parameters**							
Mercury (Hg)	0.285		0.0010	mg/kg wwt	22-OCT-21	19-NOV-21	R5655409

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-WET-CVAA-WP	Tissue	Mercury in Tissue	EPA 200.3/1631E (mod)

Tissue samples undergo hotblock digestion with nitric and hydrochloric acids, in combination with repeated additons of hydrogen peroxide, followed by cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analysis by CVAAS.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2640918 Report Date: 23-NOV-21

Client: North/South Consultants
83 Scurfield Blvd
Winnipeg MB R3Y 1G4
Contact: JODI HOLM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAA-WP	**Tissue**							
Batch R5655409								
WG3642901-3 CRM		**DORM-4N**						
Mercury (Hg)			106.0		%		70-130	19-NOV-21
WG3642901-7 CRM		**DORM-4N**						
Mercury (Hg)			115.5		%		70-130	19-NOV-21
WG3643861-3 CRM		**DORM-4N**						
Mercury (Hg)			111.4		%		70-130	19-NOV-21
WG3642901-4 DUP		**L2640918-38**						
Mercury (Hg)		0.192	0.196		mg/kg wwt	1.7	40	19-NOV-21
WG3642901-8 DUP		**L2640918-58**						
Mercury (Hg)		0.834	0.726		mg/kg wwt	14	40	19-NOV-21
WG3643861-4 DUP		**L2640918-78**						
Mercury (Hg)		0.443	0.329		mg/kg wwt	29	40	19-NOV-21
WG3642901-2 LCS								
Mercury (Hg)			109.2		%		80-120	19-NOV-21
WG3642901-6 LCS								
Mercury (Hg)			101.5		%		80-120	19-NOV-21
WG3643861-2 LCS								
Mercury (Hg)			110.1		%		80-120	19-NOV-21
WG3642901-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	19-NOV-21
WG3642901-5 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	19-NOV-21
WG3643861-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	19-NOV-21
Batch R5655642								
WG3641981-3 CRM		**DORM-4N**						
Mercury (Hg)			118.6		%		70-130	18-NOV-21
WG3641981-7 CRM		**DORM-4N**						
Mercury (Hg)			101.2		%		70-130	18-NOV-21
WG3641981-8 DUP		**L2640918-18**						
Mercury (Hg)		0.147	0.154		mg/kg wwt	4.5	40	18-NOV-21
WG3641981-2 LCS								
Mercury (Hg)			112.0		%		80-120	18-NOV-21
WG3641981-6 LCS								
Mercury (Hg)			108.4		%		80-120	18-NOV-21
WG3641981-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	18-NOV-21
WG3641981-5 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	18-NOV-21

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical
Canada Toll Free: 1 800
www.alsglobal.co

L2640918-COFC

COC # Keeyask GS

Page 1 of 1

Report to:		**Report Format / Distribution**		**Service Requested:** (rush - subject to availability)
Company:	North South Consultants	☑ Standard ☐ Other		◉ Regular (Default)
Contact:	Jodi Holm	☑ PDF ☑ Excel ☑ Digital		○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg	Email 1: jholm@nscons.ca		○ Emergency (1 Business Day) - 100% Surcharge
		Email 2:		○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227 Fax: 477 4173			**Analysis Request**
Invoice To:	Same as Report ? ◉ Yes ○ No	**Client / Project Information:**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		Job #: Keeyask Fish		
Contact:		PO / AFE:		
Address:		Legal Site Description:		
Phone:	284 3366 Fax: 477 4173	Quote #: Q43475		
Lab Work Order # (lab use only)		**ALS Contact:**	**Sampler:**	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP										Number of Containers
	Split Lake: See attached sheet			Tissue	X	X										97
	samples are organized by: fish species, and fish #															

Special Instructions / Regulations / Hazardous Details

* Weights to be taken from yellow perch only*

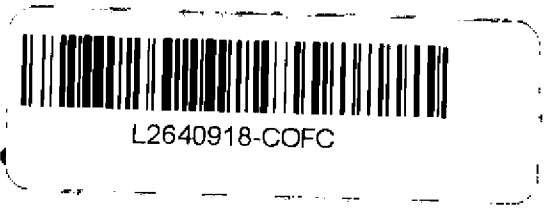
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	13-Sept-21	O.A.	13/9/21	2:05pm	5.3			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

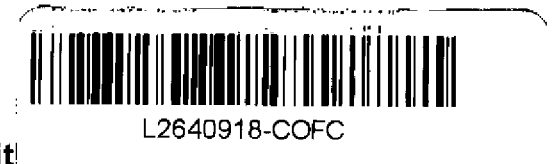
GENF 18.00 Front



Fish with Hg samples from Split Lak

Submitted 13 Sep 2021

	Waterbody	Date	Species	Fish #	Fork Length (mm)
1	Split Lake	24-Aug-2021	LKWH	15	362
2	Split Lake	24-Aug-2021	LKWH	20	372
3	Split Lake	24-Aug-2021	LKWH	21	459
4	Split Lake	24-Aug-2021	LKWH	22	390
5	Split Lake	24-Aug-2021	LKWH	23	450
6	Split Lake	24-Aug-2021	LKWH	24	455
7	Split Lake	25-Aug-2021	LKWH	132	449
8	Split Lake	26-Aug-2021	LKWH	212	524
9	Split Lake	26-Aug-2021	LKWH	213	505
10	Split Lake	26-Aug-2021	LKWH	214	445
11	Split Lake	26-Aug-2021	LKWH	224	485
12	Split Lake	26-Aug-2021	LKWH	225	438
13	Split Lake	26-Aug-2021	LKWH	226	438
14	Split Lake	26-Aug-2021	LKWH	232	524
15	Split Lake	26-Aug-2021	LKWH	273	525
16	Split Lake	26-Aug-2021	LKWH	284	381
17	Split Lake	26-Aug-2021	LKWH	342	412
18	Split Lake	27-Aug-2021	LKWH	396	479
19	Split Lake	27-Aug-2021	LKWH	397	429
20	Split Lake	27-Aug-2021	LKWH	398	433
21	Split Lake	27-Aug-2021	LKWH	408	365
22	Split Lake	27-Aug-2021	LKWH	472	508
23	Split Lake	27-Aug-2021	LKWH	485	401
24	Split Lake	27-Aug-2021	LKWH	486	462
25	Split Lake	27-Aug-2021	LKWH	499	478
26	Split Lake	24-Aug-2021	NRPK	69	779
27	Split Lake	24-Aug-2021	NRPK	70	623
28	Split Lake	24-Aug-2021	NRPK	80	550
29	Split Lake	24-Aug-2021	NRPK	81	580
30	Split Lake	24-Aug-2021	NRPK	82	610
31	Split Lake	24-Aug-2021	NRPK	88	477
32	Split Lake	24-Aug-2021	NRPK	89	559
33	Split Lake	25-Aug-2021	NRPK	126	651
34	Split Lake	26-Aug-2021	NRPK	227	239
35	Split Lake	26-Aug-2021	NRPK	234	458
36	Split Lake	26-Aug-2021	NRPK	243	383
37	Split Lake	26-Aug-2021	NRPK	244	332
38	Split Lake	26-Aug-2021	NRPK	245	357
39	Split Lake	26-Aug-2021	NRPK	250	642
40	Split Lake	26-Aug-2021	NRPK	253	208
41	Split Lake	26-Aug-2021	NRPK	254	272
42	Split Lake	26-Aug-2021	NRPK	259	266
43	Split Lake	26-Aug-2021	NRPK	260	400



Fish with Hg samples from Split

Submitted 13 Sep 2021

Waterbody	Date	Species	Fish #	Fork Length (mm)
44 Split Lake	26-Aug-2021	NRPK	261	365
45 Split Lake	26-Aug-2021	NRPK	296	515
46 Split Lake	26-Aug-2021	NRPK	358	595
47 Split Lake	26-Aug-2021	NRPK	359	373
48 Split Lake	26-Aug-2021	NRPK	363	398
49 Split Lake	27-Aug-2021	NRPK	405	609
50 Split Lake	27-Aug-2021	NRPK	406	518
51 Split Lake	27-Aug-2021	NRPK	407	628
52 Split Lake	27-Aug-2021	NRPK	422	468
53 Split Lake	27-Aug-2021	NRPK	424	523
54 Split Lake	27-Aug-2021	NRPK	429	439
55 Split Lake	27-Aug-2021	NRPK	430	480
56 Split Lake	27-Aug-2021	NRPK	443	443
57 Split Lake	27-Aug-2021	NRPK	473	798
58 Split Lake	27-Aug-2021	NRPK	474	790
59 Split Lake	27-Aug-2021	NRPK	475	981
60 Split Lake	27-Aug-2021	NRPK	484	418
61 Split Lake	27-Aug-2021	NRPK	497	450
62 Split Lake	24-Aug-2021	WALL	27	247
63 Split Lake	24-Aug-2021	WALL	28	156
64 Split Lake	24-Aug-2021	WALL	43	229
65 Split Lake	24-Aug-2021	WALL	77	385
66 Split Lake	24-Aug-2021	WALL	78	368
67 Split Lake	24-Aug-2021	WALL	83	535
68 Split Lake	24-Aug-2021	WALL	84	345
69 Split Lake	24-Aug-2021	WALL	87	200
70 Split Lake	25-Aug-2021	WALL	134	420
71 Split Lake	25-Aug-2021	WALL	145	350
72 Split Lake	25-Aug-2021	WALL	146	370
73 Split Lake	25-Aug-2021	WALL	147	363
74 Split Lake	25-Aug-2021	WALL	150	264
75 Split Lake	25-Aug-2021	WALL	151	214
76 Split Lake	25-Aug-2021	WALL	153	281
77 Split Lake	25-Aug-2021	WALL	155	465
78 Split Lake	25-Aug-2021	WALL	156	427
79 Split Lake	25-Aug-2021	WALL	162	354
80 Split Lake	25-Aug-2021	WALL	163	393
81 Split Lake	25-Aug-2021	WALL	174	472
82 Split Lake	25-Aug-2021	WALL	195	481
83 Split Lake	25-Aug-2021	WALL	197	416
84 Split Lake	25-Aug-2021	WALL	198	360
85 Split Lake	25-Aug-2021	WALL	200	225
86 Split Lake	25-Aug-2021	WALL	202	234

Fish with Hg samples from Split Lake in 2021

Submitted 13 Sep 2021

Waterbody	Date	Species	Fish #	Fork Length (mm)
87 Split Lake	25-Aug-2021	WALL	206	239
88 Split Lake	25-Aug-2021	WALL	207	213
89 Split Lake	25-Aug-2021	WALL	208	168
90 Split Lake	26-Aug-2021	WALL	228	428
91 Split Lake	26-Aug-2021	WALL	237	412
92 Split Lake	26-Aug-2021	WALL	264	432
93 Split Lake	26-Aug-2021	WALL	266	333
94 Split Lake	26-Aug-2021	WALL	268	272
95 Split Lake	26-Aug-2021	WALL	269	124
96 Split Lake	26-Aug-2021	WALL	360	304
97 Split Lake	26-Aug-2021	WALL	364	287

North/South Consultants
ATTN: JODI HOLM
83 Scurfield Blvd
Winnipeg MB R3Y 1G4

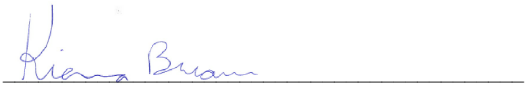
Date Received: 19-OCT-21
Report Date: 30-NOV-21 16:17 (MT)
Version: FINAL

Client Phone: 204-284-3366

Certificate of Analysis

Lab Work Order #: L2652793

Project P.O. #: NOT SUBMITTED
Job Reference: KEEYASK FISH
C of C Numbers:
Legal Site Desc:



Kianna Brown
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2652793-1 1A Sampled By: CLIENT on 17-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.183		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-2 7 Sampled By: CLIENT on 21-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.339		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-3 6 Sampled By: CLIENT on 21-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.271		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-4 8 Sampled By: CLIENT on 21-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.113		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-5 9 Sampled By: CLIENT on 22-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.149		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-6 10 Sampled By: CLIENT on 22-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.151		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-7 2 Sampled By: CLIENT on 22-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.312		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-8 3 Sampled By: CLIENT on 19-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.106		0.0010	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-9 4 Sampled By: CLIENT on 19-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.226		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-10 1B Sampled By: CLIENT on 19-SEP-21 Matrix: LAKE WHITEFISH **Miscellaneous Parameters**							
Mercury (Hg)	0.0760		0.0010	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2652793-11 5							
Sampled By: CLIENT on 20-SEP-21							
Matrix: LAKE WHITEFISH							
Miscellaneous Parameters							
Mercury (Hg)	0.460		0.010	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-12 1108							
Sampled By: CLIENT on 13-OCT-21							
Matrix: LAKE WHITEFISH							
Miscellaneous Parameters							
Mercury (Hg)	0.142		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-13 1112							
Sampled By: CLIENT on 13-OCT-21							
Matrix: LAKE WHITEFISH							
Miscellaneous Parameters							
Mercury (Hg)	0.203		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2652793-14 1113							
Sampled By: CLIENT on 13-OCT-21							
Matrix: LAKE WHITEFISH							
Miscellaneous Parameters							
Mercury (Hg)	0.138		0.0020	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-WET-CVAA-WP	Tissue	Mercury in Tissue	EPA 200.3/1631E (mod)

Tissue samples undergo hotblock digestion with nitric and hydrochloric acids, in combination with repeated additons of hydrogen peroxide, followed by cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analysis by CVAAS.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: North/South Consultants
83 Scurfield Blvd
Winnipeg MB R3Y 1G4
Contact: JODI HOLM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAA-WP	**Tissue**							
Batch R5659472								
WG3658652-3 CRM		**DORM-4N**						
Mercury (Hg)			105.6		%		70-130	26-NOV-21
WG3658652-7 CRM		**DORM-4N**						
Mercury (Hg)			111.9		%		70-130	26-NOV-21
WG3658652-8 DUP		**L2652793-11**						
Mercury (Hg)		0.460	0.594		mg/kg wwt	25	40	26-NOV-21
WG3658652-2 LCS								
Mercury (Hg)			95.5		%		80-120	26-NOV-21
WG3658652-6 LCS								
Mercury (Hg)			104.9		%		80-120	26-NOV-21
WG3658652-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	26-NOV-21
WG3658652-5 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	26-NOV-21

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

L2652793-COFC

COC # Keeyask GS

Page 1 of 1

Report to:				Report Format / Distribution			Service Requested: (rush - subject to availability)
Company:	North South Consultants			☑ Standard ☐ Other			◉ Regular (Default)
Contact:	Jodi Holm			☑ PDF ☑ Excel ☑ Digital			○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg			Email 1: jholm@nscons.ca			○ Emergency (1 Business Day) - 100% Surcharge
				Email 2:			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227	Fax:	477 4173				Analysis Request
Invoice To:	Same as Report ? ◉ Yes ○ No			Client / Project Information:			Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:				Job #: Keeyask Fish			
Contact:				PO / AFE:			
Address:				Legal Site Description:			
Phone:	284 3366	Fax:	477 4173	Quote #: Q43475			
Lab Work Order # (lab use only)				ALS Contact:	Sampler:		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Gull Lake and Stephens Lake: See attached sheet			Tissue	X	X	14
	samples are organized by: Waterbody						

Special Instructions / Regulations / Hazardous Details

Analyze muscle tissue with skin and scales removed

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	Oct 19 2021	TL	10/19/21	13:55	1.9°C			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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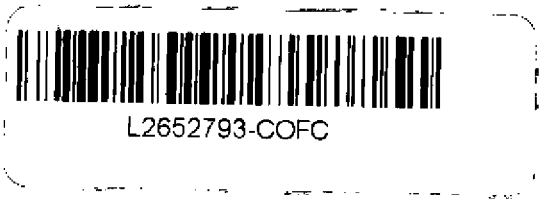
GENF 18.00 Front

Fish with Hg samples from Gull Lake and Stephens Lake in 2021

Submitted 19 October 2021

	Waterbody	Date	Species	Fish #	Fork Length (mm)
1	Gull Lake	17-Sep-2021	LKWH	1a	206
2	Gull Lake	21-Sep-2021	LKWH	7	487
3	Gull Lake	21-Sep-2021	LKWH	6	180
4	Gull Lake	21-Sep-2021	LKWH	8	419
5	Gull Lake	22-Sep-2021	LKWH	9	171
6	Gull Lake	22-Sep-2021	LKWH	10	175
7	Gull Lake	22-Sep-2021	LKWH	2	493
8	Gull Lake	19-Sep-2021	LKWH	3	257
9	Gull Lake	19-Sep-2021	LKWH	4	195
10	Gull Lake	19-Sep-2021	LKWH	1b	452
11	Gull Lake	20-Sep-2021	LKWH	5	508
12	Stephens Lake	13-Oct-2021	LKWH	1108	534
13	Stephens Lake	13-Oct-2021	LKWH	1112	486
14	Stephens Lake	13-Oct-2021	LKWH	1113	511



North/South Consultants
ATTN: JODI HOLM
83 Scurfield Blvd
Winnipeg MB R3Y 1G4

Date Received: 05-OCT-21
Report Date: 30-NOV-21 16:17 (MT)
Version: FINAL

Client Phone: 204-284-3366

Certificate of Analysis

Lab Work Order #: L2648219

Project P.O. #: NOT SUBMITTED
Job Reference: KEEYASK FISH
C of C Numbers:
Legal Site Desc:

Christine Mason
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2648219-1 102							
Sampled By: CLIENT on 10-JUN-21							
Matrix: LAKE STURGEON							
Miscellaneous Parameters							
Mercury (Hg)	0.685		0.010	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472
L2648219-2 80222							
Sampled By: CLIENT on 11-JUN-21							
Matrix: LAKE STURGEON							
Miscellaneous Parameters							
Mercury (Hg)	0.698		0.010	mg/kg wwt	16-NOV-21	26-NOV-21	R5659472

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

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mg/L - unit of concentration based on volume, parts per million.
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Quality Control Report

Client: North/South Consultants
83 Scurfield Blvd
Winnipeg MB R3Y 1G4
Contact: JODI HOLM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAA-WP	**Tissue**							
Batch R5659472								
WG3658652-3 CRM		**DORM-4N**						
Mercury (Hg)			105.6		%		70-130	26-NOV-21
WG3658652-4 DUP		**L2648219-1**						
Mercury (Hg)		0.685	0.622		mg/kg wwt	9.7	40	26-NOV-21
WG3658652-2 LCS								
Mercury (Hg)			95.5		%		80-120	26-NOV-21
WG3658652-1 MB								
Mercury (Hg)			<0.0010		mg/kg wwt		0.001	26-NOV-21

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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All test results reported with this submission were conducted within ALS recommended hold times.

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Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

L2648219-COFC

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COC # Keeyask GS

Page 1 of 1

Report to:				Report Format / Distribution			Service Requested: (rush - subject to availability)
Company:	North South Consultants			☑ Standard ☐ Other			◉ Regular (Default)
Contact:	Jodi Holm			☑ PDF ☑ Excel ☑ Digital			○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg			Email 1: jholm@nscons.ca			○ Emergency (1 Business Day) - 100% Surcharge
				Email 2:			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227	Fax:	477 4173				Analysis Request
Invoice To:	Same as Report ? ◉ Yes ○ No			Client / Project Information:			Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:				Job #: Keeyask Fish			
Contact:				PO / AFE:			
Address:				Legal Site Description:			
Phone:	284 3366	Fax:	477 4173	Quote #: Q43475			
Lab Work Order # (lab use only)				ALS Contact:	Sampler:		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Lake Sturgeon: See attached sheet			Tissue	X	X	2
	samples are organized by: fish species, and fish #						

Special Instructions / Regulations / Hazardous Details

Analyze the fillets with the skin removed.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	Oct 1 2021		10/5/21	11:14	-4.7C			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

L2648219-COFC

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COC # Keeyask GS

Page 1 of 1

Report to:				Report Format / Distribution			Service Requested: (rush - subject to availability)
Company:	North South Consultants			☑ Standard ☐ Other			◉ Regular (Default)
Contact:	Jodi Holm			☑ PDF ☑ Excel ☑ Digital			○ Priority (2-3 Business Days) - 50% Surcharge
Address:	83 Scurfield Blvd, Winnipeg			Email 1: jholm@nscons.ca			○ Emergency (1 Business Day) - 100% Surcharge
				Email 2:			○ For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone:	284 3366 ext 227	Fax:	477 4173				Analysis Request
Invoice To:	Same as Report ? ◉ Yes ○ No			Client / Project Information:			Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:				Job #: Keeyask Fish			
Contact:				PO / AFE:			
Address:				Legal Site Description:			
Phone:	284 3366	Fax:	477 4173	Quote #: Q43475			
Lab Work Order # (lab use only)				ALS Contact:	Sampler:		

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	SAMPLE DISPOSAL-WP	HG-WET-CVAA-WP	Number of Containers
	Lake Sturgeon: See attached sheet			Tissue	X	X	2
	samples are organized by: fish species, and fish #						

Special Instructions / Regulations / Hazardous Details

Analyze the fillets with the skin removed.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:	Observations: Yes / No ? If Yes attach SIF
	Oct 1 2021		10/5/21	11:14	-4.7°C			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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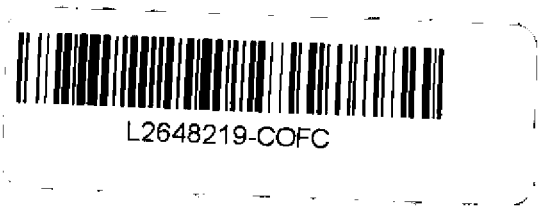

Lake Sturgeon with Hg samples from Gull Lake in 2021

Submitted 01 Oct 2021

Waterbody	Date	Species	Fish #	Fork Length (mm)
Gull Lake	10-Jun-2021	Lake Sturgeon	102	-
Gull Lake	11-Jun-2021	Lake Sturgeon	80222	-

APPENDIX 3:
MUSCLE MERCURY CONCENTRATIONS AND BIOLOGICAL DATA FOR INDIVIDUAL FISH FROM THE KEEYASK RESERVOIR, STEPHENS LAKE, AND SPLIT LAKE IN 2021

Table A3-1: Definitions of codes used in Appendix 3 tables.

Term	Code	Definition
Species	LKWH	Lake Whitefish
	NRPK	Northern Pike
	WALL	Walleye
Sex	F	Female
	M	Male
Maturity	IMM	Immature
	MAT	Mature
K		Condition factor

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Lake Sturgeon, Northern Pike, and Walleye from the Keeyask reservoir in 2021.

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
59	GN-13	08-Aug-21	LKWH	553	3050	1.80	M	MAT	18	0.344
65	GN-13	08-Aug-21	LKWH	307	400	1.38	M	IMM	4	0.0621
67	GN-13	08-Aug-21	LKWH	245	175	1.19	F	IMM	3	0.129
73	GN-13	08-Aug-21	LKWH	151	49	1.42	F	IMM	1	0.248
74	GN-13	08-Aug-21	LKWH	165	50	1.11	-	-	1	0.0550
86	GN-15	08-Aug-21	LKWH	415	1050	1.47	F	MAT	5	0.176
99	GN-08	09-Aug-21	LKWH	542	2850	1.79	F	MAT	16	0.416
261	MGN-01	14-Aug-21	LKWH	517	2625	1.90	M	MAT	18	0.315
262	MGN-01	14-Aug-21	LKWH	525	2875	1.99	F	MAT	13	0.261
283	SN-06	14-Aug-21	LKWH	114	15.1	1.02	-	-	1	0.242
291	MGN-03	14-Aug-21	LKWH	539	2575	1.64	M	MAT	17	0.328
292	MGN-03	14-Aug-21	LKWH	512	2175	1.62	M	MAT	14	0.254
293	MGN-03	14-Aug-21	LKWH	503	2500	1.96	F	MAT	13	0.248
294	MGN-03	14-Aug-21	LKWH	560	3150	1.79	F	MAT	13	0.355
295	MGN-03	14-Aug-21	LKWH	527	3100	2.12	M	MAT	13	0.277
296	GN-06	14-Aug-21	LKWH	220	148.3	1.39	-	-	2	0.237
1a	GN-16 (LKST)	17-Sep-21	LKWH	206	160	1.83	-	-	-	0.183
1b	LKWH-GN-01	19-Sep-21	LKWH	452	1650	1.79	-	-	-	0.0760
2	LKWH-GN-02	19-Sep-21	LKWH	493	2300	1.92	-	-	-	0.312
3	LKWH-GN-02	19-Sep-21	LKWH	257	225	1.33	-	-	-	0.106
4	LKWH-GN-02	19-Sep-21	LKWH	195	100	1.35	-	-	-	0.226
5	LKWH-GN-03	20-Sep-21	LKWH	508	2600	1.98	-	-	-	0.460
6	LKWH-GN-05	21-Sep-21	LKWH	180	80	1.37	-	-	-	0.271
7	LKWH-GN-05	21-Sep-21	LKWH	487	2175	1.88	-	-	-	0.339
8	LKWH-GN-07	21-Sep-21	LKWH	419	1475	2.01	-	-	-	0.113
9	LKWH-GN-09	22-Sep-21	LKWH	171	70	1.40	-	-	-	0.149

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Lake Sturgeon, Northern Pike, and Walleye from the Keeyask reservoir in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
10	LKWH-GN-09	22-Sep-21	LKWH	175	79	1.47	-	-	-	0.151
62B	GN-14 (LKST)	10-Jun-21	LKST	1435	24948	0.84	M	MAT	46	0.685
50	GN-06 (LKST)	08-Jun-21	LKST	1131	10400	0.72	-	-	38	0.698
1	GN-17	04-Aug-21	NRPK	298	175	0.66	M	IMM	2	0.390
23	GN-17	04-Aug-21	NRPK	864	4500	0.70	F	IMM	8	1.51
37	GN-12	08-Aug-21	NRPK	264	100	0.54	M	IMM	3	0.558
63	GN-13	08-Aug-21	NRPK	859	5075	0.80	F	MAT	9	1.16
64	GN-13	08-Aug-21	NRPK	464	600	0.60	M	MAT	4	0.552
68	GN-13	08-Aug-21	NRPK	584	1275	0.64	F	MAT	5	0.679
72	GN-13	08-Aug-21	NRPK	221	68.8	0.64	M	IMM	1	0.313
90	GN-15	08-Aug-21	NRPK	362	275	0.58	F	MAT	3	0.318
91	GN-15	08-Aug-21	NRPK	301	175	0.64	M	IMM	2	0.410
119	GN-07	09-Aug-21	NRPK	217	64.8	0.63	M	IMM	1	0.244
137	GN-10	09-Aug-21	NRPK	450	750	0.82	F	IMM	5	0.431
138	GN-10	09-Aug-21	NRPK	395	525	0.85	M	MAT	4	0.281
139	GN-10	09-Aug-21	NRPK	491	950	0.80	M	IMM	5	0.408
140	GN-10	09-Aug-21	NRPK	393	500	0.82	M	MAT	5	0.291
142	GN-10	09-Aug-21	NRPK	351	300	0.69	F	IMM	3	0.461
143	GN-10	09-Aug-21	NRPK	458	750	0.78	F	IMM	4	0.297
144	GN-10	09-Aug-21	NRPK	426	700	0.91	M	IMM	5	0.604
145	GN-10	09-Aug-21	NRPK	483	750	0.67	M	IMM	5	0.620
147	GN-10	09-Aug-21	NRPK	328	275	0.78	M	IMM	3	0.391
148	GN-10	09-Aug-21	NRPK	263	124.2	0.68	F	IMM	2	0.266
149	GN-10	09-Aug-21	NRPK	246	104.4	0.70	-	-	2	0.280
151	GN-10	09-Aug-21	NRPK	230	94.4	0.78	M	IMM	2	0.250
152	GN-10	09-Aug-21	NRPK	207	67.7	0.76	-	-	1	0.381

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Lake Sturgeon, Northern Pike, and Walleye from the Keeyask reservoir in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
153	GN-10	09-Aug-21	NRPK	229	80	0.67	-	-	2	0.296
155	GN-14	09-Aug-21	NRPK	352	400	0.92	F	IMM	3	0.225
156	GN-14	09-Aug-21	NRPK	256	116.5	0.69	M	IMM	2	0.218
157	GN-14	09-Aug-21	NRPK	307	211.1	0.73	F	IMM	2	0.154
158	GN-14	09-Aug-21	NRPK	291	163.8	0.66	F	IMM	2	0.321
159	GN-14	09-Aug-21	NRPK	502	1100	0.87	M	MAT	4	0.305
160	GN-14	09-Aug-21	NRPK	380	450	0.82	M	IMM	4	0.289
163	GN-14	09-Aug-21	NRPK	321	300	0.91	F	IMM	3	0.214
165	GN-14	09-Aug-21	NRPK	306	225	0.79	F	IMM	3	0.212
166	GN-14	09-Aug-21	NRPK	265	147.1	0.79	M	IMM	2	0.229
176	GN-14	09-Aug-21	NRPK	514	1100	0.81	M	IMM	4	0.354
196	GN-03	10-Aug-21	NRPK	504	850	0.66	F	IMM	4	0.386
235	GN-11	11-Aug-21	NRPK	200	53	0.66	M	IMM	1	0.226
5	GN-17	04-Aug-21	WALL	282	275	1.23	F	IMM	3	0.162
6	GN-17	04-Aug-21	WALL	260	200	1.14	M	IMM	4	0.358
12	GN-17	04-Aug-21	WALL	414	850	1.20	F	MAT	10	0.338
21	GN-17	04-Aug-21	WALL	464	1000	1.00	M	IMM	11	0.625
28	GN-16	04-Aug-21	WALL	467	1100	1.08	F	MAT	11	0.400
33	GN-16	04-Aug-21	WALL	480	1250	1.13	F	MAT	11	0.851
35	GN-12	08-Aug-21	WALL	203	75	0.90	F	IMM	2	0.429
36	GN-12	08-Aug-21	WALL	170	50	1.02	M	IMM	1	0.216
53	GN-12	08-Aug-21	WALL	399	850	1.34	M	IMM	7	0.652
58	GN-13	08-Aug-21	WALL	432	850	1.05	F	MAT	12	0.398
62	GN-13	08-Aug-21	WALL	393	650	1.07	F	IMM	7	0.835
66	GN-13	08-Aug-21	WALL	260	175	1.00	M	IMM	4	0.615
71	GN-13	08-Aug-21	WALL	235	150	1.16	F	IMM	3	0.362

Table A3-2: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Lake Sturgeon, Northern Pike, and Walleye from the Keeyask reservoir in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
85	GN-15	08-Aug-21	WALL	363	500	1.05	M	IMM	8	0.265
89	GN-15	08-Aug-21	WALL	304	300	1.07	M	IMM	4	0.654
103	GN-08	09-Aug-21	WALL	149	34.4	1.04	F	IMM	1	0.538
105	GN-08	09-Aug-21	WALL	380	700	1.28	F	IMM	6	0.714
106	GN-08	09-Aug-21	WALL	494	1400	1.16	F	MAT	12	0.948
108	GN-08	09-Aug-21	WALL	438	1025	1.22	F	IMM	9	0.925
113	GN-08	09-Aug-21	WALL	222	113.9	1.04	M	IMM	2	0.382
114	GN-08	09-Aug-21	WALL	272	189.5	0.94	M	IMM	4	1.36
120	GN-07	09-Aug-21	WALL	201	85.6	1.05	F	IMM	2	0.449
124	GN-07	09-Aug-21	WALL	335	450	1.20	M	IMM	7	0.365
125	GN-07	09-Aug-21	WALL	395	725	1.18	F	IMM	8	0.510
128	GN-07	09-Aug-21	WALL	446	850	0.96	M	IMM	11	0.397
129	GN-07	09-Aug-21	WALL	410	775	1.12	F	IMM	11	0.426
132	GN-07	09-Aug-21	WALL	454	950	1.02	F	MAT	11	0.685
180	SN-14	09-Aug-21	WALL	370	625	1.23	F	IMM	7	0.529
189	GN-04	10-Aug-21	WALL	200	92.4	1.16	M	IMM	2	0.193
191	GN-04	10-Aug-21	WALL	352	450	1.03	F	IMM	6	0.352
192	GN-04	10-Aug-21	WALL	466	1200	1.19	F	MAT	10	0.416
195	GN-04	10-Aug-21	WALL	405	800	1.20	M	IMM	7	0.571
202	GN-03	10-Aug-21	WALL	442	1050	1.22	F	MAT	8	0.337
207	GN-02	10-Aug-21	WALL	182	57.4	0.95	F	IMM	2	0.0809
219	GN-01	10-Aug-21	WALL	284	253.3	1.11	F	IMM	3	0.449
304	GN-06	14-Aug-21	WALL	332	400	1.09	F	IMM	4	0.440

Table A3-3: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake in 2021.

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
19	GN-32	01-Sep-21	LKWH	464	1410	1.41	F	IMM	18	0.210
182	GN-16	03-Sep-21	LKWH	449	1410	1.56	M	IMM	10	0.0748
271	GN-14	03-Sep-21	LKWH	300	670	2.48	F	IMM	5	0.0867
1108	Run 37	12-Oct-21	LKWH	534	2550	1.67	-	-	14	0.142
1112	Run 38	13-Oct-21	LKWH	486	1500	1.31	M	MAT	21	0.203
1113	Run 38	13-Oct-21	LKWH	511	2250	1.69	M	MAT	13	0.138
32	GN-34	04-Sep-21	NRPK	588	1600	0.79	F	IMM	7	0.341
38	GN-34	04-Sep-21	NRPK	678	2950	0.95	F	IMM	6	0.697
39	GN-33	01-Sep-21	NRPK	310	210	0.70	M	IMM	3	0.222
42	GN-33	01-Sep-21	NRPK	308	200	0.68	M	IMM	2	0.259
44	GN-33	01-Sep-21	NRPK	849	4330	0.71	M	MAT	8	1.11
45	GN-33	01-Sep-21	NRPK	740	3280	0.81	F	MAT	6	1.27
46	GN-33	01-Sep-21	NRPK	590	1210	0.59	F	MAT	5	0.725
59	GN-33	01-Sep-21	NRPK	770	3620	0.79	F	MAT	10	1.07
63	GN-33	01-Sep-21	NRPK	822	4300	0.77	F	MAT	7	1.63
71	GN-22	02-Sep-21	NRPK	439	560	0.66	M	IMM	4	0.255
72	GN-22	02-Sep-21	NRPK	419	400	0.54	M	IMM	3	0.360
73	GN-22	02-Sep-21	NRPK	420	410	0.55	F	IMM	3	0.200
74	GN-22	02-Sep-21	NRPK	351	290	0.67	M	IMM	3	0.161
82	GN-22	02-Sep-21	NRPK	810	5580	1.05	F	MAT	9	1.33
89	GN-13	02-Sep-21	NRPK	495	900	0.74	F	MAT	5	0.291
90	GN-13	02-Sep-21	NRPK	280	160	0.73	M	IMM	2	0.0980
95	GN-13	02-Sep-21	NRPK	550	950	0.57	F	MAT	5	0.378
96	GN-13	02-Sep-21	NRPK	504	850	0.66	F	MAT	5	0.208
174	GN-16	03-Sep-21	NRPK	448	580	0.65	F	MAT	4	0.190
175	GN-16	03-Sep-21	NRPK	249	100	0.65	M	IMM	2	0.0562

Table A3-3: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
176	GN-16	03-Sep-21	NRPK	226	70	0.61	F	IMM	2	0.112
178	GN-16	03-Sep-21	NRPK	435	550	0.67	F	MAT	4	0.208
181	GN-16	03-Sep-21	NRPK	462	620	0.63	F	MAT	5	0.413
198	GN-16	03-Sep-21	NRPK	685	2420	0.75	F	MAT	8	0.626
225	GN-14	03-Sep-21	NRPK	277	160	0.75	M	IMM	2	0.115
229	GN-14	03-Sep-21	NRPK	629	1790	0.72	M	MAT	6	0.361
230	GN-14	03-Sep-21	NRPK	481	740	0.66	M	MAT	5	0.259
31	GN-34	04-Sep-21	WALL	435	860	1.04	F	MAT	11	0.518
39	GN-34	04-Sep-21	WALL	392	800	1.33	F	IMM	11	0.545
9	GN-30	01-Sep-21	WALL	386	720	1.25	M	MAT	8	0.342
11	GN-30	01-Sep-21	WALL	371	490	0.96	M	IMM	10	0.246
13	GN-30	01-Sep-21	WALL	449	1140	1.26	M	MAT	11	0.487
38	GN-33	01-Sep-21	WALL	182	60	1.00	M	IMM	3	0.149
49	GN-33	01-Sep-21	WALL	440	850	1.00	M	MAT	-	0.492
51	GN-33	01-Sep-21	WALL	350	520	1.21	M	MAT	7	0.372
52	GN-33	01-Sep-21	WALL	308	360	1.23	M	MAT	6	0.362
55	GN-33	01-Sep-21	WALL	321	360	1.09	M	MAT	7	0.294
57	GN-33	01-Sep-21	WALL	360	610	1.31	M	MAT	7	0.398
60	GN-33	01-Sep-21	WALL	460	1000	1.03	M	MAT	8	0.517
62	GN-33	01-Sep-21	WALL	500	1480	1.18	M	MAT	18	0.745
66	SN-22	02-Sep-21	WALL	328	410	1.16	F	IMM	7	0.286
70	GN-22	02-Sep-21	WALL	236	160	1.22	M	IMM	3	0.310
77	GN-22	02-Sep-21	WALL	285	260	1.12	F	IMM	5	0.249
79	GN-22	02-Sep-21	WALL	245	150	1.02	M	IMM	3	0.280
83	GN-22	02-Sep-21	WALL	368	580	1.16	F	MAT	8	0.488
92	GN-13	02-Sep-21	WALL	253	220	1.36	M	IMM	3	0.310

Table A3-3: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
97	GN-13	02-Sep-21	WALL	423	790	1.04	F	MAT	9	0.440
177	GN-16	03-Sep-21	WALL	335	410	1.09	F	IMM	7	0.333
179	GN-16	03-Sep-21	WALL	428	770	0.98	M	IMM	11	0.769
184	GN-16	03-Sep-21	WALL	410	810	1.18	F	MAT	8	0.350
195	GN-16	03-Sep-21	WALL	501	1190	0.95	M	MAT	15	0.346
204	SN-14	03-Sep-21	WALL	185	50	0.79	-	IMM	1	0.101
217	GN-14	03-Sep-21	WALL	279	280	1.29	F	IMM	5	0.204
218	GN-14	03-Sep-21	WALL	229	120	1.00	M	IMM	3	0.165
219	GN-14	03-Sep-21	WALL	205	100	1.16	F	IMM	2	0.133
220	GN-14	03-Sep-21	WALL	215	120	1.21	M	IMM	3	0.111
221	GN-14	03-Sep-21	WALL	160	48	1.17	-	IMM	1	0.119
222	GN-14	03-Sep-21	WALL	165	45	1.00	-	IMM	-	0.0818
226	GN-14	03-Sep-21	WALL	250	160	1.02	F	IMM	5	0.211
228	GN-14	03-Sep-21	WALL	471	870	0.83	F	IMM	13	0.621
255	GN-14	03-Sep-21	WALL	467	1160	1.14	F	MAT	14	0.673
273	GN-14	03-Sep-21	WALL	483	1200	1.06	F	MAT	14	0.743
275	GN-14	03-Sep-21	WALL	495	1390	1.15	F	MAT	14	0.604

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2021.

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
15	GN-18	24-Aug-21	LKWH	362	820	1.73	M	IMM	11	0.134
20	GN-18	24-Aug-21	LKWH	372	790	1.53	F	IMM	6	0.0776
21	GN-18	24-Aug-21	LKWH	459	1910	1.98	F	MAT	14	0.121
22	GN-18	24-Aug-21	LKWH	390	930	1.57	M	IMM	8	0.136
23	GN-18	24-Aug-21	LKWH	450	1650	1.81	F	MAT	13	0.158
24	GN-18	24-Aug-21	LKWH	455	1460	1.55	M	MAT	15	0.150
132	GN-29	25-Aug-21	LKWH	449	1670	1.84	F	MAT	14	0.117
212	GN-06	26-Aug-21	LKWH	524	1900	1.32	M	MAT	18	0.269
213	GN-06	26-Aug-21	LKWH	505	2170	1.68	M	MAT	17	0.177
214	GN-06	26-Aug-21	LKWH	445	1400	1.59	M	MAT	12	0.143
224	GN-06	26-Aug-21	LKWH	485	1990	1.74	F	IMM	13	0.203
225	GN-06	26-Aug-21	LKWH	417	980	1.35	M	IMM	13	0.171
226	GN-06	26-Aug-21	LKWH	438	1130	1.34	M	MAT	13	0.143
232	GN-06	26-Aug-21	LKWH	524	2550	1.77	M	MAT	15	0.201
273	GN-21	26-Aug-21	LKWH	525	2510	1.73	M	MAT	15	0.232
284	GN-21	26-Aug-21	LKWH	381	810	1.46	M	IMM	9	0.0863
342	GN-22	26-Aug-21	LKWH	412	1100	1.57	F	MAT	8	0.101
396	GN-03	27-Aug-21	LKWH	479	1940	1.77	F	MAT	14	0.147
397	GN-03	27-Aug-21	LKWH	429	1280	1.62	F	IMM	7	0.0899
398	GN-03	27-Aug-21	LKWH	433	1140	1.40	M	MAT	8	0.129
408	GN-03	27-Aug-21	LKWH	365	750	1.54	F	IMM	8	0.0748
472	GN-05	27-Aug-21	LKWH	508	1980	1.51	F	MAT	18	0.249
485	GN-05	27-Aug-21	LKWH	401	870	1.35	M	IMM	10	0.149
486	GN-05	27-Aug-21	LKWH	462	1600	1.62	F	MAT	13	0.217
499	GN-05	27-Aug-21	LKWH	478	1890	1.73	M	MAT	10	0.207
69	GN-15	24-Aug-21	NRPK	779	3950	0.84	M	MAT	6	0.834

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
70	GN-15	24-Aug-21	NRPK	623	2210	0.91	M	IMM	6	0.457
80	GN-15	24-Aug-21	NRPK	550	1560	0.94	M	MAT	6	0.350
81	GN-15	24-Aug-21	NRPK	580	1550	0.79	M	IMM	8	0.471
82	GN-15	24-Aug-21	NRPK	610	2000	0.88	F	IMM	5	0.355
88	GN-15	24-Aug-21	NRPK	477	920	0.85	M	MAT	5	0.290
89	GN-15	24-Aug-21	NRPK	559	1220	0.70	F	MAT	5	0.380
126	GN-29	25-Aug-21	NRPK	651	1850	0.67	F	IMM	5	0.757
227	GN-06	26-Aug-21	NRPK	239	110	0.81	F	IMM	1	0.168
234	GN-06	26-Aug-21	NRPK	458	600	0.62	M	MAT	6	0.451
243	GN-06	26-Aug-21	NRPK	383	420	0.75	F	IMM	3	0.187
244	GN-06	26-Aug-21	NRPK	332	240	0.66	M	IMM	3	0.189
245	GN-06	26-Aug-21	NRPK	357	390	0.86	F	IMM	3	0.192
250	GN-06	26-Aug-21	NRPK	642	-	-	F	MAT	6	0.815
253	GN-06	26-Aug-21	NRPK	208	60	0.67	F	IMM	2	0.157
254	GN-06	26-Aug-21	NRPK	272	170	0.84	M	IMM	3	0.167
259	SN-06	26-Aug-21	NRPK	266	140	0.74	F	IMM	1	0.143
260	SN-06	26-Aug-21	NRPK	400	410	0.64	F	IMM	3	0.268
261	SN-06	26-Aug-21	NRPK	365	340	0.70	M	IMM	2	0.186
296	GN-21	26-Aug-21	NRPK	515	770	0.56	F	IMM	5	0.329
358	GN-22	26-Aug-21	NRPK	595	1300	0.62	F	IMM	6	0.550
359	GN-22	26-Aug-21	NRPK	373	690	1.33	M	MAT	4	0.237
363	GN-22	26-Aug-21	NRPK	398	740	1.17	F	IMM	4	0.186
405	GN-03	27-Aug-21	NRPK	609	1540	0.68	F	IMM	5	0.425
406	GN-03	27-Aug-21	NRPK	518	1170	0.84	F	IMM	5	0.213
407	GN-03	27-Aug-21	NRPK	628	1690	0.68	M	IMM	5	0.566
422	GN-03	27-Aug-21	NRPK	468	640	0.62	F	IMM	4	0.269

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
424	GN-03	27-Aug-21	NRPK	523	900	0.63	M	MAT	4	0.240
429	GN-03	27-Aug-21	NRPK	439	470	0.56	F	IMM	3	0.414
430	GN-03	27-Aug-21	NRPK	480	740	0.67	F	MAT	4	0.323
443	GN-20	27-Aug-21	NRPK	443	540	0.62	M	MAT	5	0.239
473	GN-05	27-Aug-21	NRPK	798	5690	1.12	F	MAT	10	1.30
474	GN-05	27-Aug-21	NRPK	790	4000	0.81	F	MAT	8	0.834
475	GN-05	27-Aug-21	NRPK	981	8910	0.94	F	MAT	9	1.03
484	GN-05	27-Aug-21	NRPK	418	440	0.60	F	IMM	5	0.192
497	GN-05	27-Aug-21	NRPK	450	600	0.66	M	MAT	4	0.284
195	GN-13	25-Aug-21	NRPK	481	740	0.66	F	IMM	6	0.383
27	GN-28	24-Aug-21	WALL	247	170	1.13	F	IMM	4	0.214
28	GN-28	24-Aug-21	WALL	156	60	1.58	M	IMM	1	0.127
43	GN-28	24-Aug-21	WALL	229	170	1.42	F	IMM	3	0.163
77	GN-15	24-Aug-21	WALL	385	700	1.23	F	IMM	10	0.347
78	GN-15	24-Aug-21	WALL	368	650	1.30	F	MAT	9	0.504
83	GN-15	24-Aug-21	WALL	535	1350	0.88	F	IMM	13	1.06
84	GN-15	24-Aug-21	WALL	345	510	1.24	F	IMM	7	0.324
87	GN-15	24-Aug-21	WALL	200	140	1.75	F	IMM	3	0.174
134	GN-29	25-Aug-21	WALL	420	860	1.16	F	IMM	10	0.411
145	GN-29	25-Aug-21	WALL	350	570	1.33	F	IMM	10	0.341
146	GN-29	25-Aug-21	WALL	370	550	1.09	F	IMM	8	0.273
147	GN-29	25-Aug-21	WALL	363	580	1.21	F	IMM	7	0.332
150	GN-29	25-Aug-21	WALL	264	250	1.36	M	IMM	5	0.435
151	GN-29	25-Aug-21	WALL	214	110	1.12	M	IMM	4	0.288
153	GN-29	25-Aug-21	WALL	281	260	1.17	M	IMM	5	0.333
155	GN-29	25-Aug-21	WALL	465	1100	1.09	F	MAT	10	0.620

Table A3-4: Muscle mercury concentrations (Hg) and biological data for Lake Whitefish, Northern Pike, and Walleye from Split Lake in 2021 (continued).

Fish #	Site	Sampling Date	Species	Fork Length (mm)	Weight (g)	K	Sex	Maturity	Age (y)	Hg ppm
156	GN-29	25-Aug-21	WALL	427	860	1.10	F	IMM	9	0.443
162	GN-29	25-Aug-21	WALL	354	470	1.06	F	IMM	7	0.421
163	GN-29	25-Aug-21	WALL	393	-	-	M	IMM	6	0.217
174	GN-13	25-Aug-21	WALL	472	1220	1.16	M	IMM	10	0.411
197	GN-13	25-Aug-21	WALL	416	670	0.93	M	IMM	11	0.351
198	GN-13	25-Aug-21	WALL	360	480	1.03	M	MAT	6	0.492
200	GN-13	25-Aug-21	WALL	225	100	0.88	M	IMM	3	0.165
202	GN-13	25-Aug-21	WALL	234	130	1.01	M	IMM	3	0.197
206	GN-13	25-Aug-21	WALL	239	130	0.95	M	IMM	4	0.139
207	GN-13	25-Aug-21	WALL	213	80	0.83	F	IMM	4	0.177
208	GN-13	25-Aug-21	WALL	168	50	1.05	F	IMM	2	0.0820
228	GN-06	26-Aug-21	WALL	428	760	0.97	F	IMM	12	0.444
237	GN-06	26-Aug-21	WALL	412	750	1.07	F	IMM	9	0.567
264	SN-06	26-Aug-21	WALL	432	890	1.10	F	MAT	9	0.588
266	SN-06	26-Aug-21	WALL	333	380	1.03	M	MAT	8	0.540
268	SN-06	26-Aug-21	WALL	272	250	1.24	M	IMM	6	0.379
269	SN-06	26-Aug-21	WALL	124	20	1.05	M	IMM	1	0.0574
360	GN-22	26-Aug-21	WALL	304	320	1.14	M	IMM	5	0.400
364	GN-22	26-Aug-21	WALL	287	270	1.14	F	IMM	4	0.285

APPENDIX 4:
LENGTH OF FISH SAMPLED FOR MERCURY 1999–2021

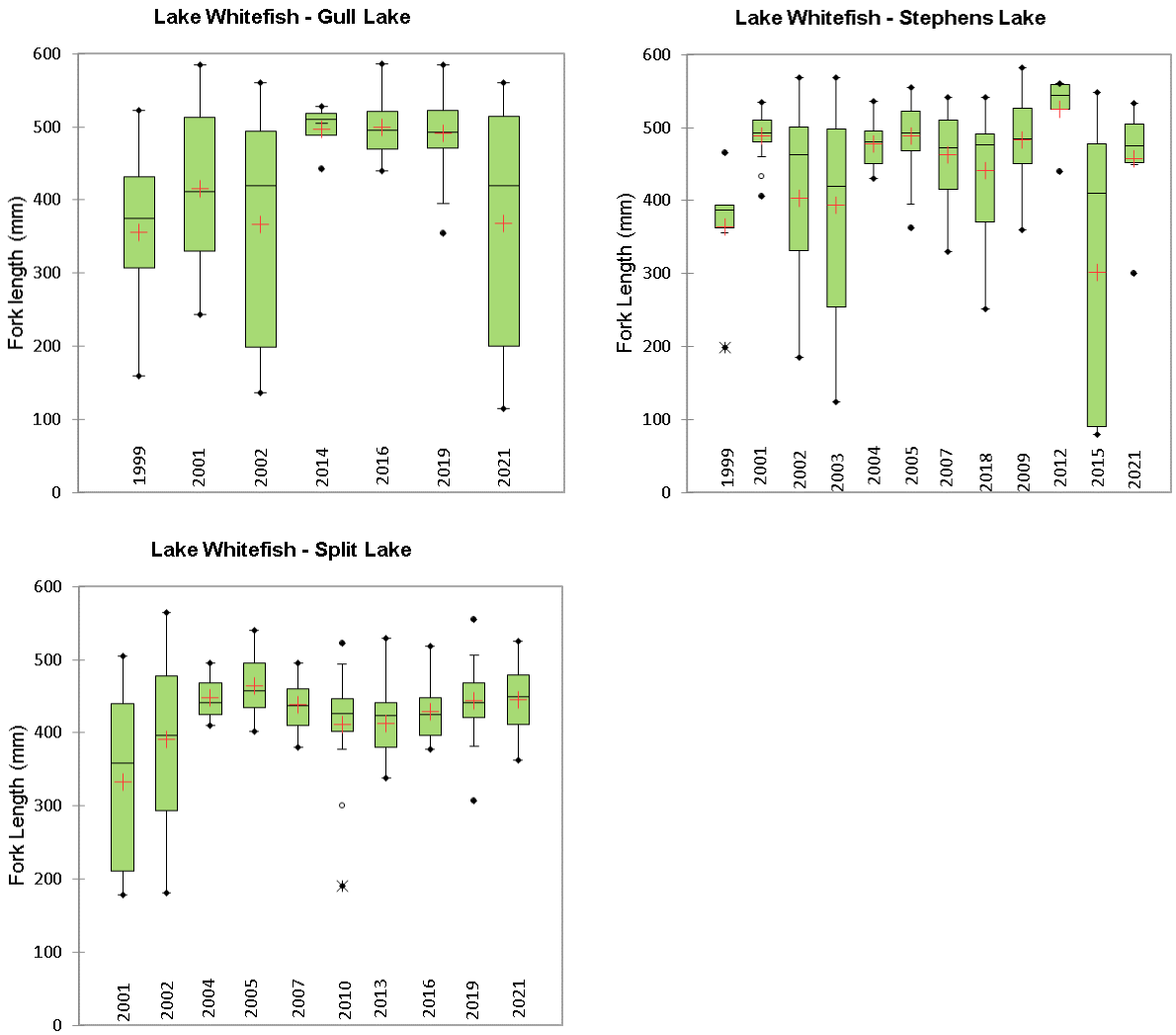

Figure A4-1: Box plots of fork length of Lake Whitefish collected from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021.

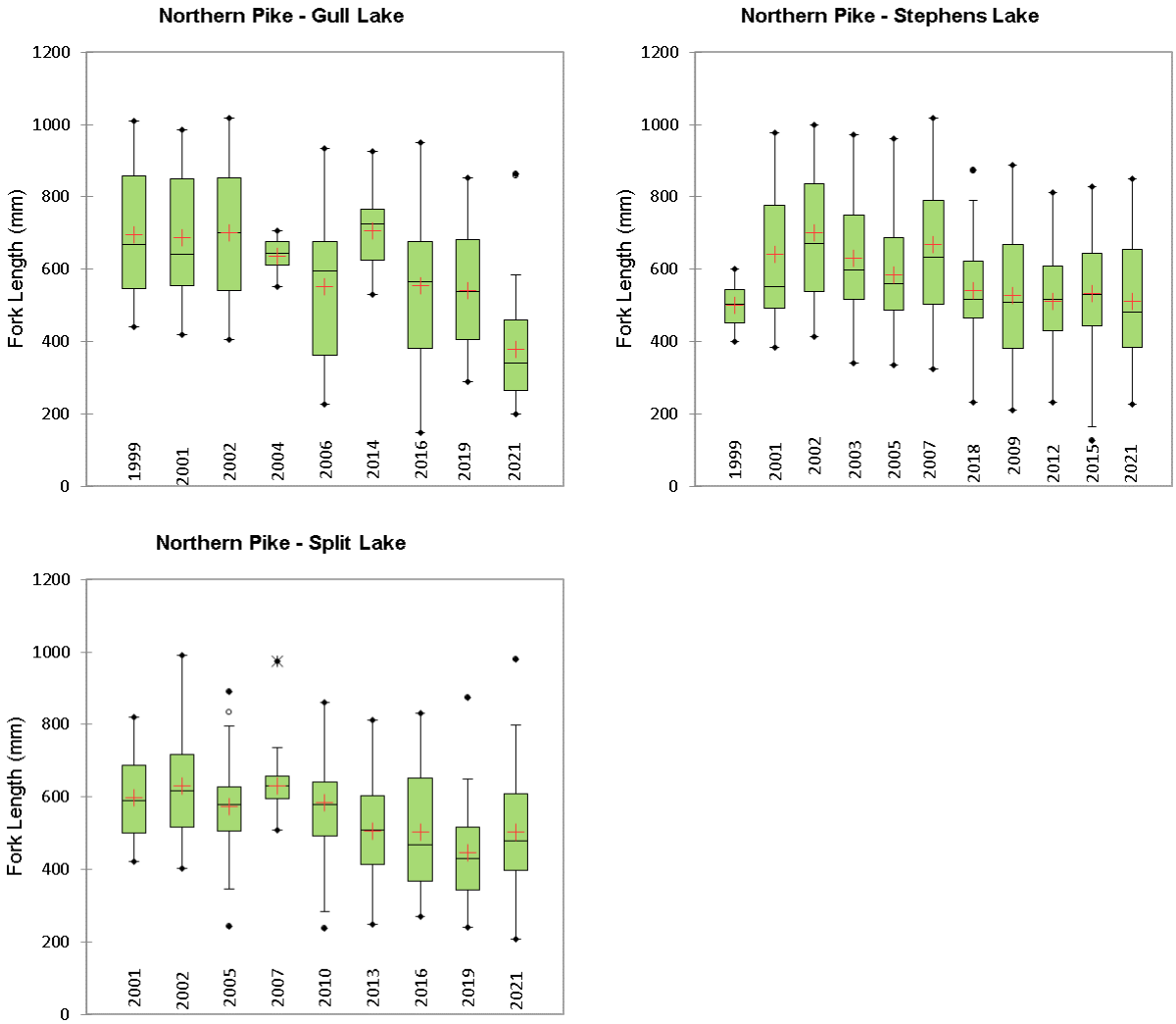

Figure A4-2: Box plots of fork length of Northern Pike collected from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021.

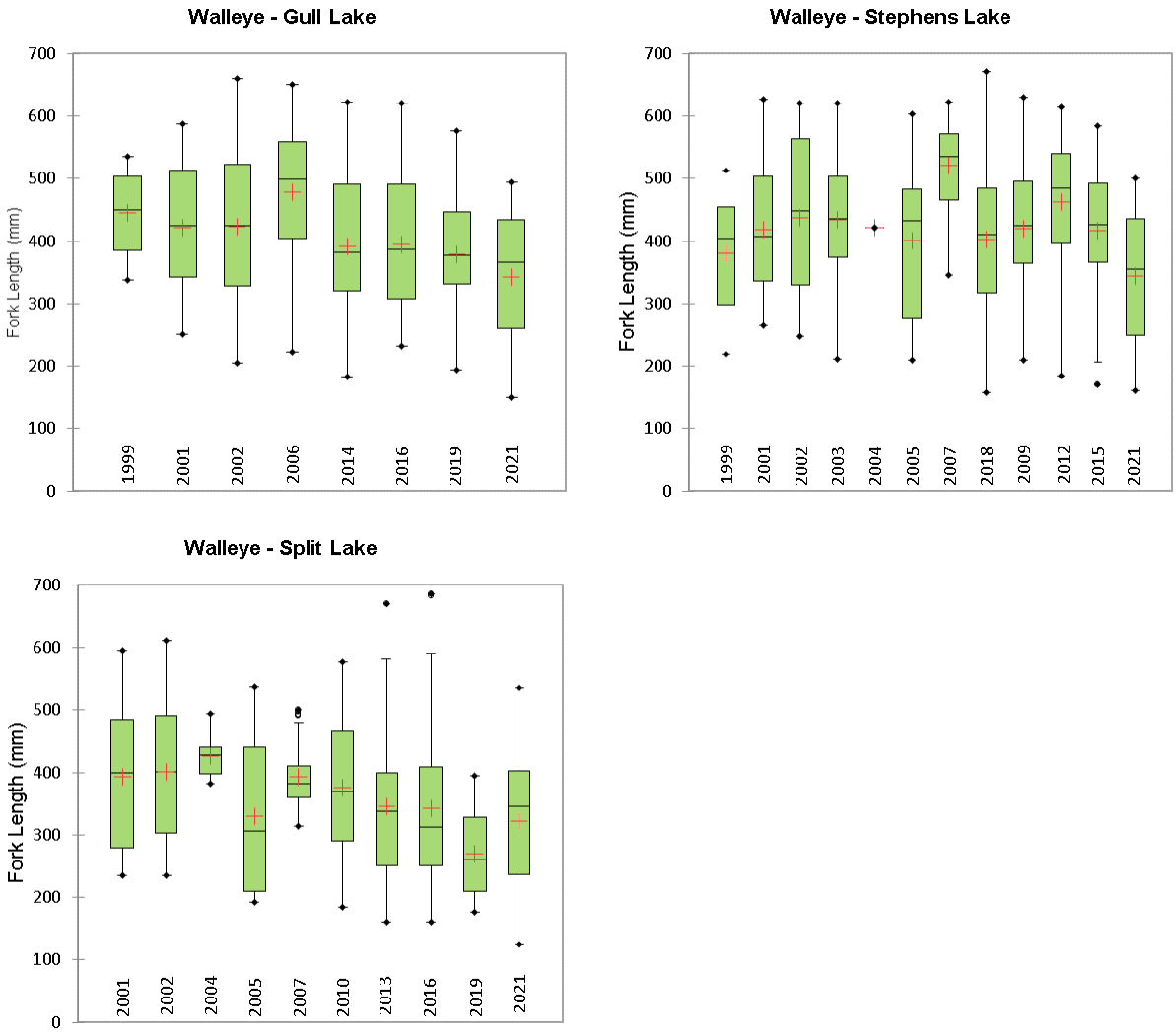

Figure A4-3: Box plots of fork length of Walleye collected from Gull Lake/Keeyask reservoir, Stephens Lake, and Split Lake from 1999–2021.

APPENDIX 5:
RESULTS OF LINEAR REGRESSION ANALYSIS

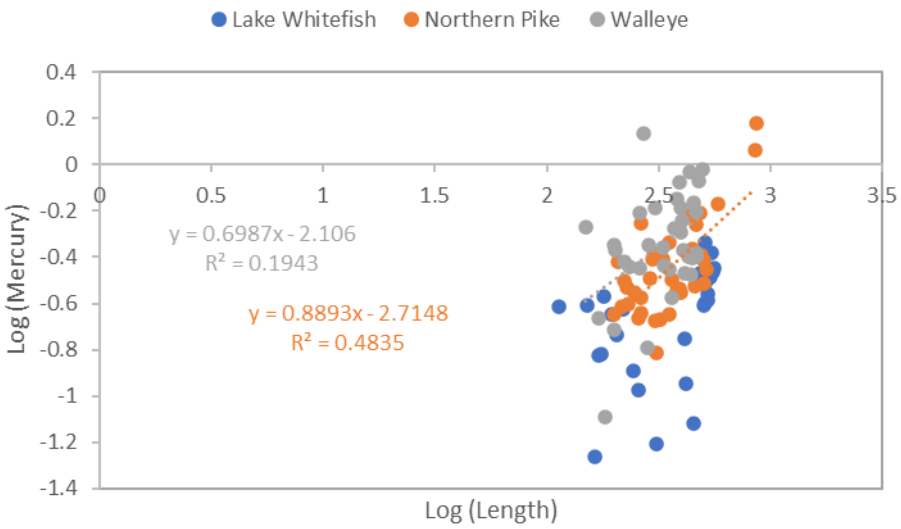

Figure A5-1: Plot of Log10 fork length (mm) and Log10 total mercury (ppm) in Northern Pike (p <0.0001) and Walleye (p =0.007) collected from the Keeyask reservoir in 2021.

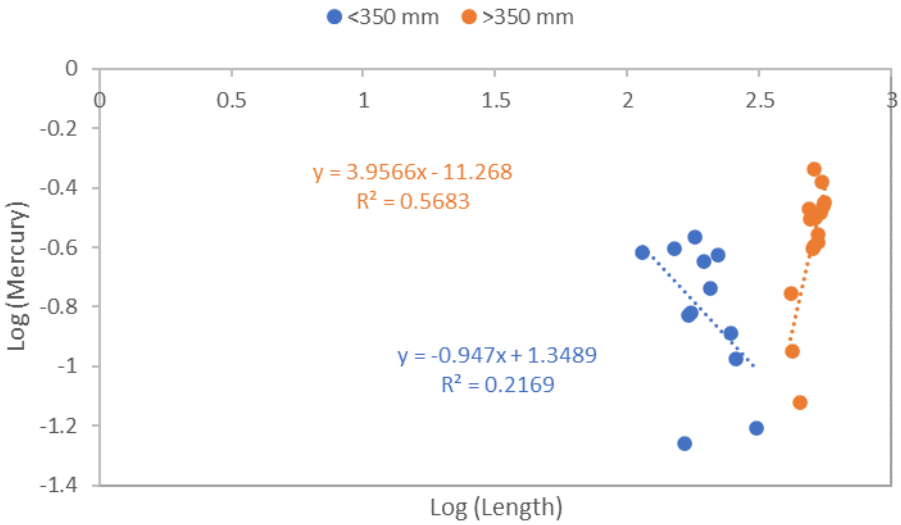

Figure A5-2: Plot of Log10 fork length (mm) and Log10 total mercury (ppm) in small (< 350 mm) and large (> 350 mm) Lake Whitefish collected from the Keeyask reservoir in 2021 (p = 0.127 and 0.001, respectively).

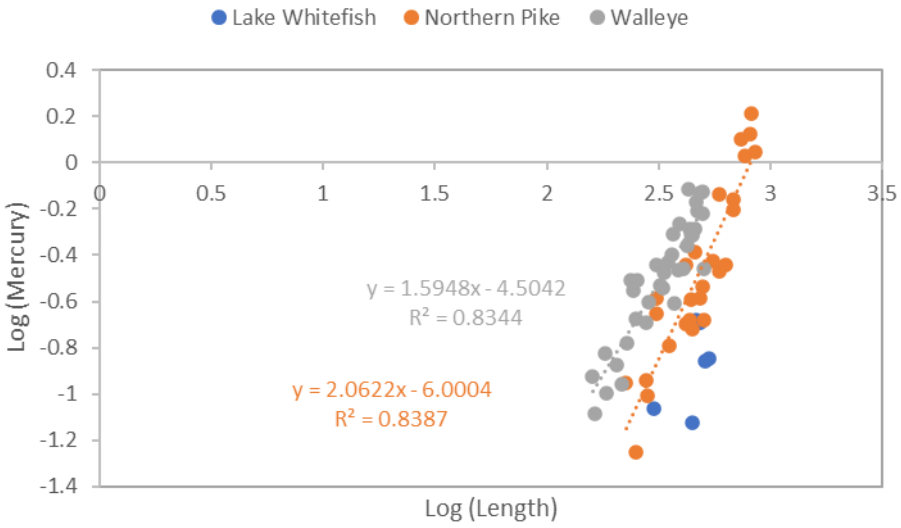

Figure A5-3: Plot of Log10 fork length (mm) and Log10 total mercury (ppm) in Northern Pike ($p < 0.0001$), Walleye ($p < 0.0001$), and Lake Whitefish ($p = 0.274$) collected from Stephens Lake in 2021.

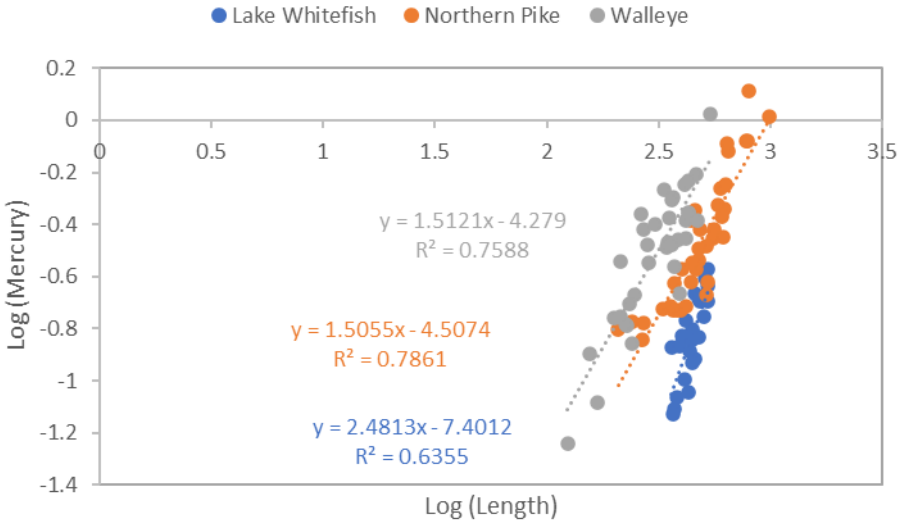

Figure A5-4: Plot of Log10 fork length (mm) and Log10 total mercury (ppm) in Northern Pike, Walleye, and Lake Whitefish collected from Split Lake in 2021 ($p < 0.0001$).