



# Lake Manitoba & Lake St. Martin Outlet Channels Project

Aquatic Environment Monitoring, Fall 2021 - Water Quality

REPORT

Prepared for Manitoba Transportation and Infrastructure  
By North/South Consultants Inc. · 83 Scurfield Blvd. · Winnipeg, MB · R3Y 1G4

# Lake Manitoba & Lake St. Martin Outlet Channels Project

## Aquatic Environment Monitoring Fall 2021

### Water Quality

A Data Report Prepared for  
Manitoba Transportation and Infrastructure

By:

North/South Consultants Inc.

May 2022



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## EXECUTIVE SUMMARY

North/South Consultants Inc. (NSC) was retained by Manitoba Transportation and Infrastructure (MTI) to collect supplemental data with respect to the aquatic environment in support of the Lake Manitoba and Lake St. Martin Outlet Channel Project (the Project). A draft Aquatic Effects Monitoring Program (AEMP) was developed in 2020 to provide a plan for monitoring the effects of the Project on the aquatic environment, focusing on key issues identified in the Environmental Impact Statement (EIS). The AEMP also identified the need for the collection of data to supplement existing information that had been presented in the EIS.

A requirement for additional surface water quality data was identified in the AEMP and a monitoring program was developed. The monitoring program was designed to collect supplemental information to determine whether water quality conditions change due to channel operations and, more specifically, whether the proposed change in flow patterns would affect water quality. Subsequently, water quality sampling was conducted in early and late fall 2020 (NSC 2021; NSC 2022) and winter and spring 2021 (NSC 2022). Additional sampling was conducted during early and late fall 2021 (Fall 2021). This report provides results of the Fall 2021 sampling.

*In situ* water quality measurements and water samples were collected at 20 core sampling sites in the study area from Lake Manitoba to Lake Winnipeg during two sampling periods in Fall 2021. Sampling dates were as follows: August 29-September 3, and October 17-21, 2021. Additional sites were surveyed for the presence of water and *in situ* water quality, including: seven sites along the alignments of the proposed Lake Manitoba Outlet Channel (LMOC) and Lake St. Martin Outlet Channel (LSMOC) on September 3, 2021, and nine sites along the same routes on October 21, 2021.

Quality assurance/quality control (QA/QC) measures were incorporated into the monitoring program including standard sampling methods and QA/QC samples. All results were compared to the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) for the protection of aquatic life (PAL), as well as the Canadian Council of Ministers of the Environment (CCME) guidelines for PAL.

Based on the results of the monitoring that was conducted in late-August/September and October 2021, the water quality of the study area can be described as moderately nutrient-rich to nutrient-rich, low to moderately turbid, slightly alkaline, hard to very hard, and moderate- to well-oxygenated.

In general, water quality was similar at sites sampled along the main flow path from Lake Manitoba through the Fairford River to Lake St. Martin and into the Dauphin River. However, differences in water quality between the sites sampled along the main flow path and Birch Creek, Big Buffalo Lake, Buffalo Creek, and Sturgeon Bay, were observed, including:

- Watchorn Creek had higher concentrations of alkalinity, total phosphorus (TP), colour, carbon, total dissolved solids (TDS), calcium, fluoride and silicon and lower total nitrogen (TN), antimony, arsenic, chloride and sodium;

- Mercer Creek had higher alkalinity, TP, colour, carbon, TDS and calcium and lower TN;
- Birch Creek had higher alkalinity, hardness, carbon, colour, as well as higher sulfur at the site sampled near PR 239, and lower turbidity, total suspended solids (TSS), conductivity, TDS, arsenic, antimony, chloride, fluoride, copper, lithium, magnesium, rubidium, silicon, sodium and strontium;
- Big Buffalo Lake had higher alkalinity, TP, TN, carbon, colour and silicon, and lower conductivity, TDS, arsenic, antimony, boron, chloride, fluoride, lithium, molybdenum, nickel, potassium, sodium, strontium, sulfur and uranium;
- Buffalo Creek had higher alkalinity, carbon, colour, aluminum, chromium, copper, iron, silicon, titanium and zirconium and lower conductivity, TDS, antimony, arsenic, barium, boron, chloride, fluoride, lithium, magnesium, molybdenum, potassium, rubidium, sodium, strontium, sulfate, sulfur and uranium; and
- Sturgeon Bay had lower alkalinity, hardness, conductivity, TDS, TN, carbon, antimony, boron, chloride, fluoride, lithium, magnesium, molybdenum, potassium, rubidium, sodium, strontium, sulfate, sulfur, and uranium, and higher TP, dissolved inorganic nitrogen, aluminum, chromium, copper, cesium, iron, nickel, titanium and vanadium than sites sampled along the flow path from Lake Manitoba through the Dauphin River.

Sampling for additional parameters conducted at sites in the Fairford and Dauphin rivers and Birch Creek in late-August/September 2021 showed that *Escherichia coli* concentrations were higher in Birch Creek than in the Dauphin and Fairford rivers and that blue-green algae (i.e., cyanobacteria) were most abundant in the Dauphin River and least abundant in Birch Creek. Sampling was also conducted at these locations for microcystin, hydrocarbons, and pesticides; all results were below analytical detection limits.

TP exceeded the MWQSOG narrative guideline for phosphorus for lakes and river mouths (0.025 mg/L) at several locations, including: Watchorn Bay; Watchorn Creek at Watchorn Bay; Mercer Creek at Watchorn Bay; Fairford River at Lake St. Martin; Birch Creek at Lake St. Martin; Lake St. Martin; Big Buffalo Lake; the Dauphin River at Sturgeon Bay; and Sturgeon Bay. TP was below the MWQSOG narrative guideline for rivers and streams (0.050 mg/L) in the Fairford and Dauphin rivers and in Birch and Buffalo creeks.

Dissolved oxygen (DO) was below the MWQSOGs 30-day objective for the protection of cool-water aquatic life (6.5 mg/L) in Birch Creek at PR 239 on August 29, 2021. This lower DO concentration was likely due to the low water level and lack of flow observed at the time of sampling. DO was within MWQSOG objectives for PAL at all other sites and times sampled in Fall 2021.

Additionally, DO concentrations were below the CCME guidelines for the protection of early life stages of cold-water biota (9.5 mg/L) at several sites sampled in late-August/September, 2021, including sites in Birch Creek, the Fairford and Dauphin rivers, Lake St. Martin, Big Buffalo Lake and Buffalo Creek. DO was within CCME guidelines for PAL at all other sites and time sampled in Fall 2021.



*In situ* pH was above the upper limit of the MWQSOG/CCME PAL guideline (6.5-9.0 pH units) in the eastern bay of Lake St. Martin on August 31, 2021; however, laboratory-measured pH was within PAL guidelines. All other pH values measured at core sites in Fall 2021 were within PAL guidelines.

Aluminum exceeded the MWQSOG and CCME guideline for PAL (0.1 mg/L) in approximately one quarter of samples collected in Fall 2021 including samples from Lake St. Martin, Buffalo Creek, the Dauphin River, and Sturgeon Bay. Iron exceeded the MWQSOG and CCME guideline for PAL (0.3 mg/L) in samples collected from Buffalo Creek and at the off-shore site in Sturgeon Bay in late-August/September. Chloride exceeded the CCME long-term guideline for PAL (120 mg/L) in all samples collected along the main flow path from Lake Manitoba through the Fairford River to Lake St. Martin and into the Dauphin River, as well as in Watchorn and Mercer creeks (October only). Additionally, fluoride exceeded the CCME PAL (0.120 mg/L) at most sites and times sampled; the exception was Sturgeon Bay where only one sample collected exceeded the guideline. Exceedances of these parameters are common in the region.

All other water quality variables measured for which there are MWQSOG and CCME PAL objectives or guidelines were within PAL objectives and guidelines at all core sampling sites.

Surveys along the alignment of the proposed LMOC and LSMOC conducted on September 3 and October 21, 2021, found surface water to be present at all locations surveyed, although total depths did not exceed 0.5 m at most sites. Due to low water levels during the September survey, *in situ* water quality could not be measured at Goodison Lake and Woodale Drain. In general, sites along the alignment of the proposed LMOC were moderately- to well-oxygenated, alkaline, and low to moderately turbid and had moderate conductivity. Sites sampled along the alignment of the proposed LSMOC were circum-neutral to alkaline, had low turbidity, and lower specific conductance than sites along the alignment of the proposed LMOC. Additionally, sites along the alignment of the proposed LSMOC were generally well oxygenated; however, low oxygen conditions were found at the site located in Creek C on October 21, 2021.

At the time of the October survey, DO at a site sampled on Creek C was below the CCME guidelines for PAL (ranges from 5.5 mg/L to 9.5 mg/L depending on life-stage and biota), as well as applicable MWQSOG objectives, including: the MWQSOG 30-day averaging objective for cool-water aquatic life (5.5 mg/L); and the MWQSOG instantaneous objective for early life stages of cold-water aquatic life (8.0 mg/L). Furthermore, during the September survey, DO was below the CCME guideline for PAL for early life stages of cold-water (9.5 mg/L) at most sites sampled along the alignments of the proposed LMOC and LSMOC; however, it is unlikely that early life stages of cold-water species were present at the time the measurements were taken, as water temperatures were well above 5°C at the time. DO was within applicable MWQSOG and CCME PAL objectives/guidelines at all other sites and times sampled. Additionally, pH was within applicable MWQSOG and CCME for PAL objectives and guidelines at all sites along the proposed LSMOC and LMOC. There are no MWQSOG or CCME PAL guidelines for the other *in situ* parameters measured.

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## ACRONYMS

AEMP	Aquatic Effects Monitoring Program
BCMELP	British Columbia Ministry of Environment, Lands, and Parks
BOD	Biological Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
DIN	Dissolved Inorganic Nitrogen
DL	Analytical Detection Limit
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
EIS	Environmental Impact Statement
FRWCS	Fairford Water Control Structure
LMOC	Lake Manitoba Outlet Channel
LSMOC	Lake St. Martin Outlet Channel
MTI	Manitoba Transportation and Infrastructure
MWQSOG	Manitoba Water Quality Standards, Objectives, and Guidelines
MWS	Manitoba Water Stewardship
NSC	North/South Consultants Inc.
PAL	Protection of Freshwater Aquatic Life
PRSD	Percent Standard Relative Deviation
PTH	Provincial Trunk Highway
QA/QC	Quality Assurance/Quality Control
SD	Standard Deviation
TDS	Total Dissolved Solids
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids



## 1.0

## INTRODUCTION

North/South Consultants Inc. (NSC) was retained by Manitoba Transportation and Infrastructure (MTI) to collect supplemental data with respect to the aquatic environment in support of the Lake Manitoba and Lake St. Martin Outlet Channel Project (the Project). The proposed Project is designed to manage flood waters on Lake Manitoba and Lake St. Martin by providing a channel by which flood waters can be conveyed, in addition to the natural outflow via the Fairford and Dauphin rivers (Figure 1). The Project consists of two outlet channels that are intended to work together:

- The 24 km Lake Manitoba Outlet Channel (LMOC) will work in tandem with the existing water control structure on the Fairford River (the Fairford Water Control Structure or FRWCS) to help regulate water levels and mitigate flooding on Lake Manitoba; and
- The 24 km Lake St. Martin Outlet Channel (LSMOC) will restore a more natural water regime to Lake St. Martin and will also provide flood protection by mitigating increased inflows from operation of the FRWCS, as well as additional inflows from the planned outlet from Lake Manitoba.

A draft Aquatic Effects Monitoring Program (AEMP) was developed in 2020 to provide a plan for monitoring the effects of the Project on the aquatic environment, focusing on key issues identified in the Environmental Impact Statement (EIS). The specific objectives of the AEMP were to:

- Verify the predicted effects presented in the surface water quality and fish and fish habitat sections of the EIS;
- Determine the effectiveness of mitigation measures;
- Assess the need for additional mitigation measures if initial measures are not adequate;
- Determine the effectiveness of any additional/adapted measure(s); and
- Confirm compliance with regulatory requirements relevant to surface water quality and fish and fish habitat set out in the Project approvals (e.g., Manitoba Environment Act License; Fisheries Act Authorization).

Additionally, the AEMP identified the need for the collection of data to supplement existing information that had been presented in the EIS.

A requirement for additional surface water quality data was identified in the AEMP and a monitoring program was developed. The monitoring program was designed to collect supplemental information to determine whether water quality conditions change due to channel operations and, more specifically, whether the proposed change in flow patterns would affect water quality. Subsequently, water quality sampling was conducted in early and late fall 2020 (NSC 2021; NSC 2022) and winter and spring 2021 (NSC 2022). Additional sampling was conducted during early and late fall 2021 (Fall 2021). This report provides results of the Fall 2021 sampling.

## 2.0

## METHODS

### 2.1 SAMPLING PERIODS

Water quality sampling was conducted two times from August to October 2021. Sampling periods were as follows:

- August 29 to September 3; and
- October 17-21.

### 2.2 SAMPLING SITES

The study area for the monitoring program is comprised of Lake Manitoba, the Fairford and Dauphin rivers, Lake St. Martin, creeks and drains along the proposed LMOC alignment, the Buffalo Creek watershed, and Sturgeon Bay in Lake Winnipeg. Water quality sampling was conducted at 20 core sites in the study area. Information on sampling locations is listed in Table 1 and illustrated in Figure 1 . Sampling sites were as follows:

- Two sites in Lake Manitoba in Watchorn Bay,
  - offshore of the proposed LMOC (WHB1), and
  - nearshore at the proposed LMOC (WHB2);
- One site in Watchorn Creek at Watchorn Bay (WHC-WB);
- One site in Mercer Creek at Watchorn Bay (MC-WB);
- Two sites in Birch Creek,
  - at PR 239 (BCD-2018-9), and
  - the outlet at Lake St. Martin (BC-LSM);
- Two sites in the Fairford River,
  - at Provincial Trunk Highway (PTH) 6 (FR1), and
  - near the outlet at Lake St. Martin (FR2);
- Five sites in Lake St. Martin,
  - Birch Bay (BB-LSM),
  - middle of the south basin (LSM5),
  - at the narrows (LSM4),
  - middle of the north basin (LSM1), and
  - the eastern bay near the proposed LSMOC (LSM3);
- Three sites in the Dauphin River,
  - at Lake St. Martin (DR-A),
  - near the provincial monitoring station at the “Big Bend” (DR-B), and
  - at Sturgeon Bay (DR-E);
- One site in Big Buffalo Lake (BBL);
- One site in Buffalo Creek at the Dauphin River (BC3); and

- Two sites in Lake Winnipeg in Sturgeon Bay,
  - nearshore at the proposed LSMOC (SB1), and
  - offshore of the proposed LSMOC (SB2).

In addition to the core sampling sites described above, locations along the alignments of the proposed LMOC and LSMOC were surveyed by helicopter to ascertain the presence of water and where possible, *in situ* water quality parameters were measured. Seven sites were visited on September 3, 2021, and ten sites were visited October 21, 2021. Due to low water levels, *in situ* water quality parameters could not be collected at some sites (Woodale Drain, Goodison Lake) in October. Location information for these sites is presented in Table 2 and Figure 1.

### 2.3 WATER QUALITY PARAMETERS

*In situ* measurements of physical and chemical parameters were collected at each sampling site, including: total depth; dissolved oxygen (DO); water temperature; specific conductance; pH; and turbidity. Secchi disk depth was also measured at sites with low water velocity.

At core sampling sites, water samples were collected for laboratory analysis of routine parameters (e.g., pH, conductivity), nutrients (e.g., nitrogen, phosphorus), chlorophyll *a*, water clarity (e.g., total suspended solids, turbidity), and metals and major ions (e.g., aluminum, iron, calcium). A detailed list of parameters analysed at core sampling sites is provided in Table 3.

In late-August/September, selected sites were also sampled for additional parameters, including: *Escherichia coli*; blue-green algae (i.e., cyanobacteria); microcystin; hydrocarbons; and pesticides. These additional parameters were analysed from samples collected at BC-LSM, FR1 and DR-A. Detailed lists of hydrocarbons and pesticides measured by the laboratory are presented in Tables 4 and 5, respectively.

In addition, samples for the laboratory analysis of biological oxygen demand (BOD) were collected from seven sites in late-August/September, including: WHC-WB; MC-WB; BCD-2018-9; BC-LSM; FR1; BBL; and BC3.

### 2.4 FIELD METHODS

Sampling sites were accessed by truck, boat, or helicopter. Sampling date and time were noted for each site. Sample locations were recorded using a handheld Garmin GPS receiver. Total water depth was recorded using a hand-held depth sounder where possible; at sites sampled from shore, total water depth was estimated.

*In situ* measurements of water quality parameters including pH, specific conductance, DO, turbidity, and water temperature were collected using a YSI EXO™2 sonde. At river sites and those accessed from shore, *in situ* parameters were measured at approximately 0.3 m below the water's surface. At lake sites, *in situ* profiles were taken such that measurements were recorded near the surface (i.e., at 0.3 m) and at increments of either 0.5 m (if total water depth was less than 5 m) or 1.0 m. Secchi disk depth was measured at low velocity sites and was defined as the average of two depth readings: (1) the depth

at which a circular black and white disk can no longer be seen when lowered into the water column; and (2) the depth at which the disk becomes visible again, when raised.

Grab samples were collected from approximately 0.3 m below the water's surface into clean sample bottles supplied by ALS Laboratories. Where necessary, samples were preserved according to instructions provided by the analytical laboratory. After collection, samples were placed in a cooler and kept cool using ice packs until submission (within 48 hours) to ALS Laboratories in Winnipeg, MB (a Canadian Association for Laboratory Accreditations, Inc. accredited laboratory) for analysis.

## **2.5 QUALITY ASSURANCE AND QUALITY CONTROL**

Quality Assurance/Quality Control (QA/QC) measures were incorporated over the course of the monitoring program. Standard QA/QC measures were followed during sample collection (e.g., use of latex gloves, standard labelling practices, meter calibration, etc.). Additionally, QA/QC samples were collected for the list of parameters in Table 3 including field blanks, trip blanks, and replicate samples. Two field blanks, two trip blanks and two sets of triplicate samples were submitted to the analytical laboratory during each sampling period.

### **2.5.1 Field Blanks**

Field blanks are intended to provide information on sample contamination from atmospheric exposure and sample handling techniques, as well as potential laboratory contamination and/or error (British Columbia Ministry of Environment, Lands, and Parks [BCMELP] 1998). Field blanks were prepared by filling sample bottles with deionized water (both provided by the analytical laboratory) in the field and submitting the blanks along with the environmental samples.

### **2.5.2 Trip Blanks**

Trip blanks are used for evaluating the potential for sample contamination that may occur from the container or preservatives through transport and storage of the sample, as well as laboratory precision (BCMELP 1998). Trip blanks were prepared in the laboratory by filling sample bottles with deionized water. Trip blanks were transported to the field sampling sites, but remained sealed, and were then submitted to the analytical laboratory in conjunction with environmental samples for analysis.

### **2.5.3 Replicate Samples**

Triplicate samples were collected at two sites (one lake site and one river site) during each sampling period (late-August/September and October). Replicate samples provide a measure of variability of environmental conditions and the overall precision associated with field methods and laboratory analyses.

## 2.6 QA/QC ASSESSMENT

All water quality data were examined qualitatively for potential outliers and/or transcription or analytical errors. Where one replicate sample differed notably from the others, the measurement was flagged as “suspect” and the laboratory was asked to verify the result.

QA/QC samples were assessed according to standard criteria to evaluate precision and identify potential sample contamination issues (BCMELP 1998). Percent relative standard deviation (PRSD) was calculated for triplicate samples as follows:

$$\text{PRSD (\%)} = \text{standard deviation (SD) of the triplicate values} / \text{mean of the triplicate values} \times 100$$

Precision of replicate samples was evaluated using the “rule of thumb” criteria for precision of 18% for triplicate samples (BCMELP 1998). Where one or more of the replicate values were less than five times the analytical detection limit (DL), an analysis of precision was not undertaken, in accordance with guidance provided in BCMELP (1998).

Field and trip blank results were also evaluated for evidence of sample contamination. Values for any parameter that exceeded five times the DL were considered to be indicative of sample contamination and/or laboratory error.

## 2.7 DATA ANALYSIS

All data analyses treated censored values (i.e., values reported as below the DL) as equal to one half the DL. In cases where triplicate samples were collected, sample means are presented. Dissolved inorganic nitrogen (DIN) was calculated as the sum of ammonia-N and nitrate/nitrite-N. Nitrogen to phosphorus molar ratios were also calculated.

## 2.8 COMPARISON TO WATER QUALITY OBJECTIVES AND GUIDELINES

Results were compared to the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG; Manitoba Water Stewardship [MWS] 2011) for the protection of aquatic life (PAL) as well as the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life (CCME 1999; updated to 2022). In general, the MWQSOG for PAL are similar to the CCME guidelines for PAL for parameters measured; however, there are CCME guidelines for some parameters which lack a provincial guideline/objective and others for which the CCME and provincial guidelines are different. Typically, the CCME guideline is more stringent than the provincial guideline. A summary of relevant water quality objectives and guidelines is presented in Appendix 1.

### 3.0

## RESULTS

### 3.1 QA/QC RESULTS

QA/QC results are presented in Appendix 2.

#### 3.1.1 Field and Trip Blanks

Field and trip blank results generally indicated high precision and minimal sample contamination. Although some parameters were occasionally detected in blank samples, with one exception, all parameters were below the threshold of five times the DL. Total aluminum (0.0356 mg/L) was more than five times the DL (0.0030 mg/L) in one of the trip blanks submitted during the late-August/September sampling period; no other metals were detected in this sample.

#### 3.1.2 Replicate Samples

PRSD values were not derived for several parameters due to low concentrations (i.e., concentrations less than five times the DL). In general, the results indicate good agreement between samples and acceptable levels of precision. The PRSD exceeded threshold values (18%) for six parameters, including: turbidity; colour; phaeophytin; total aluminum; total iron; and total titanium.

### 3.2 ROUTINE VARIABLES AND LIMNOLOGY

This section discusses the results for routine and *in situ* water quality parameters measured at the core water quality sampling sites; results of the *in situ* surveys, are presented separately (see Section 3.5 *In Situ* Survey Results). Results for *in situ* and routine water quality parameters measured at core sampling sites are presented in Tables 6 and 7, respectively; the following is a summary of these results.

Based on the results of the sampling that was conducted in late-August/September and October 2021, the water quality of the study area can be generally described as moderately nutrient-rich to nutrient-rich, low to moderately turbid, slightly alkaline, hard to very hard, and moderate- to well-oxygenated. DO was relatively low at BCD-2018-9 on August 29, 2021 (6.23 mg/L), likely due to the low water level and lack of flow observed at the time of sampling. Additionally, BOD was low (<2.0 to 4.0 mg/L) at all seven sites where samples were collected in late-August/September, including: Watchorn (WHC-WB), Mercer (MC-WB), Birch (BCD-2018-9 and BC-LSM) and Buffalo (BC3) creeks; the Fairford River at PTH 6 (FR1), and Big Buffalo Lake (BBL).

*In situ* variables including, temperature, DO, turbidity, pH, and specific conductance were generally consistent across depth at sites where depth profiles could be collected. However, thermal stratification (i.e., >1 °C change within 1 m) was observed at the nearshore site in Sturgeon Bay (SB1) when sampled in August 2021. Slight increases in turbidity with depth were observed at some sites and times (i.e., BB-LSM, DR-E, and SB2, in late-August/September, and WHB2, FR1, and DR-E in October).

Total phosphorus (TP) concentrations in the study area were composed of a mix of dissolved and particulate forms. Phosphorus was predominately present in particulate form at most sites and times. However, the dissolved form was more prevalent at Watchorn Creek (WHC-WB), Birch Creek at PR 239 (BCD-2019-8) in late-August/September, and at both sites in Sturgeon Bay (SB1 and SB2) in late-August/September and at the nearshore site in Sturgeon Bay (SB1) in October. Most total nitrogen (TN) was present in organic form at all sites, with ammonia nitrogen generally comprising a greater amount of DIN than nitrate/nitrite nitrogen. Nitrate/nitrite-N comprised a greater proportion of the DIN than ammonia-N in Sturgeon Bay (SB1, SB2 [late-August/September only]) and at some sites and times in Lake St. Martin (LSM3 in late-August/September and BC-LSM in October). Based on TN:TP molar ratios, all waterbodies sampled were phosphorus limited (i.e., TN:TP ratio > 20; Kalff 2002).

Routine water quality was generally similar at sites sampled along the main flow path from Lake Manitoba through the Fairford River to Lake St. Martin and into the Dauphin River, including WHB1, WHB2, FR1, FR2, BB-LSM, LSM5, LSM4, LSM1, LSM3, DR-A, DR-B and DR-E. However, differences in water quality were observed between the sites sampled along the main flow path and Watchorn, Mercer and Birch creeks, Big Buffalo Lake, Buffalo Creek, and Sturgeon Bay. The following spatial differences in routine water quality were observed:

- Watchorn and Mercer creeks (WHC-WB and MC-WB, respectively), had higher alkalinity, TP, colour, carbon, TDS (total dissolved solids), and lower TN;
- Birch Creek (BCD-2018-9 and BC-LSM) had higher alkalinity, hardness, carbon and colour, and lower turbidity, TSS (total suspended solids), conductivity and TDS than sites along the main flow;
- Big Buffalo Lake (BBL) had higher alkalinity, TP, TN, carbon, and colour, and lower conductivity, and TDS;
- Buffalo Creek (BC3) had higher alkalinity, carbon and colour, and lower conductivity and TDS; and
- Sturgeon Bay (SB1 and SB2) had lower alkalinity, hardness, conductivity, TDS, TN, and carbon, and had higher TP and DIN, than upstream sites along the main flow path.

### 3.2.1 Comparison to Water Quality Guidelines and Objectives

TP exceeded the MWQSOG narrative guideline for phosphorus for lakes and river mouths (i.e., 0.025 mg/L) at several sites and times sampled, including the following:

- Watchorn Creek at Watchorn Bay (WHC-WB);
- Mercer Creek at Watchorn Bay (MC-WB)
- Fairford River at Lake St. Martin (FR2);
- Birch Creek at Lake St. Martin (BC-LSM);
- Lake St. Martin, at Birch Bay (BB-LSM), at the south basin (LSM5), and eastern bay (LSM3);
- Big Buffalo Lake (BBL);
- the Dauphin River at Sturgeon Bay (DR-E); and
- Sturgeon Bay (SB1 and SB2).



TP was below the MWQSOG narrative guideline for rivers and streams (0.05 mg/L) in all samples collected from sites where the guideline applies, including FR1, BCD-2018-9, DR-A, DR-B and BC3.

With one exception, DO was within MWQSOG objectives for PAL at all sites and times sampled in Fall 2021. The exception occurred at BCD-2018-9 on August 29, 2021 (6.23 mg/L) where the DO was below the MWQSOGs 30-day objective for the protection of cool-water aquatic life (6.5 mg/L). This lower DO concentration was likely due to the low water level and lack of flow observed at the time of sampling.

Additionally, DO was below the CCME guideline for PAL for early life stages of cold-water biota (9.5 mg/L) at several sites sampled in late-August/September (BCD-2018-9, FR1, FR2, LSM4, DR-A, BBL, BC3, and SB2). However, it is unlikely that early life stages of cold-water species were present at the time the measurements were taken, as water temperatures were above 5°C in these cases. DO was within CCME guidelines for PAL at all other sites and times sampled in Fall 2021.

*In situ* pH exceeded the MWQSOG/CCME PAL (6.5-9.0 pH units) in the eastern bay of Lake St. Martin (LSM3; 9.27 pH units) on August 31, 2021, and was at the upper limit of the PAL range in the Dauphin River at Big Bend (DR-B; 9.0 pH units) during the same sampling period. However, laboratory measured pH was within PAL guidelines in samples collected (8.95 at LSM3 and 8.75 at DR-B). All other pH values measured at core sites in Fall 2021 were within PAL guidelines.

All other routine water quality parameters for which there are MWQSOG and CCME PAL objectives/guidelines, including, ammonia (sample specific based on pH and temperature), nitrate (2.93 mg N/L and 3.0 mg/L for MWQSOG and CCME, respectively) and nitrite (0.60 mg N/L), were within PAL objectives and guidelines.

### 3.3 METALS AND MAJOR IONS

Metal and major ion concentrations measured in the study area are presented in Table 8.

Beryllium, bismuth, tellurium, tin, and tungsten were not detected at any site. Additionally, some metals were not detected in dissolved form at any site, including: cesium; lead; thallium; and thorium. Total aluminum, total antimony, arsenic, barium, boron, calcium, dissolved chloride, lithium, magnesium, total manganese, molybdenum, potassium, rubidium, silicon, sodium, strontium, dissolved sulphate, sulphur, uranium, and total vanadium were consistently detected. The remaining metals and major ions were detected in some samples.

Metals and major ions were similar at sites sampled along the main flow from Lake Manitoba through the Fairford River to Lake St. Martin and into the Dauphin River. However, in late-August/September, Birch Bay (BB-LSM) had higher concentrations of some metals than other sites sampled along the main flow path.

Similar to routine water quality, differences were observed between the sites along the main flow path and Watchorn, Mercer and Birch creeks, Big Buffalo Lake, Buffalo Creek, and Sturgeon Bay. Concentrations of chloride, antimony, lithium, rubidium, sodium, and strontium were greater along the

main flow path than in Birch Creek, Big Buffalo Lake, Buffalo Creek, and Sturgeon Bay. Additional spatial differences in metals and major ions were also observed, including:

- Watchorn Creek (WHC-WB) had lower antimony, arsenic, chloride and sodium, and higher calcium, fluoride and silicon;
- Mercer Creek (MC-WB) had higher calcium;
- Birch Creek (BCD-2018-9 and BC-LSM) had lower arsenic, and higher calcium, fluoride, copper, magnesium and silicon, as well as higher sulfur at the drain site (BCD-2018-9);
- Big Buffalo Lake (BBL) had lower arsenic, boron, fluoride, molybdenum, nickel, potassium, sulfur and uranium, and higher silicon;
- Buffalo Creek (BC3) had lower arsenic, barium, boron, fluoride, magnesium, molybdenum, potassium, sulfate, sulfur and uranium, and higher aluminum, chromium, copper, iron, silicon, titanium and zirconium; and
- Sturgeon Bay (SB1 and SB2) had lower boron, fluoride, magnesium, molybdenum, potassium, sulfate, sulfur and uranium, and higher aluminum, chromium, copper, cesium, iron, nickel, titanium and vanadium than sites sampled along the flow path from Lake Manitoba through the Dauphin River.

### 3.3.1 Comparison to Water Quality Guidelines and Objectives

Metals and major ions for which there are MWQSOG or CCME guidelines for PAL were, with few exceptions, within objectives and guidelines at sites sampled in late-August/September and October, 2021; PAL exceedances occurred for aluminum, iron, chloride, and fluoride, as described below. Exceedance of PAL guidelines for aluminum and iron are common in waterbodies throughout Manitoba (CAMP 2017) and exceedance of the CCME PAL guidelines for chloride and fluoride was regularly observed in the study area during the monitoring studies conducted for the Lake St. Martin Emergency Outlet Channel project (NSC and KGS Group 2016).

Aluminum exceeded the MWQSOG and CCME guideline for PAL (0.1 mg/L) in 10 of 40 samples collected, including samples from Lake St. Martin (BB-LSM and LSM1), Buffalo Creek (BC3), Dauphin River (DR-B and DR-E), and Sturgeon Bay (SB1 and SB2).

Iron exceeded the MWQSOG and CCME guideline for PAL (0.3 mg/L) in the samples collected from Buffalo Creek (BC3) and the off-shore site in Sturgeon Bay (SB2) in late-August/September. Iron was below PAL guidelines at all other sites and times sampled.

Chloride exceeded the CCME long-term guideline (120 mg/L) in all samples collected from Watchorn Bay (WHB1 and WHB2), Watchorn and Mercer creeks (WHC-WB and MC-WB; October only), Lake St. Martin (BB-LSM, LSM5, LSM4, LSM1 and LSM3), and the Fairford (FR1 and FR2) and Dauphin (DR-A, DR-B and DR-E) rivers. Chloride was consistently below the CCME long-term guideline in Birch Creek, Big Buffalo Lake, and Sturgeon Bay. All concentrations were below the CCME short-term guideline (640 mg/L). There are no MWQSOG for PAL for chloride.

Fluoride exceeded the CCME PAL (0.120 mg/L) in most samples collected. The exceptions were samples collected from the nearshore site in Sturgeon Bay (SB1) in late-August/September and samples collected from both sites in Sturgeon Bay (SB1 and SB2) in October.

### 3.4 ADDITIONAL PARAMETERS

This section presents the results for the additional parameters that were analyzed in samples collected from Birch Creek at Lake St. Martin (BC-LSM), the Fairford River at PTH 6 (FR1), and the Dauphin River at Lake St. Martin (DR-A) during the late-August/September sampling period, including: *E. coli*; blue-green algae; microcystin; hydrocarbons; and pesticides. Detailed results are available in Appendix 3, the following is a summary of these results:

- *E. coli* was detected at all three sites sampled and concentrations were higher in Birch Creek (152 MPN/100mL) than in the Dauphin River (49 MPN/100mL) and the Fairford River (14 MPN/100mL).
- blue-green algae were most abundant in the Dauphin River and least abundant in Birch Creek (Figure 2);
- microcystin was not detected (DL = 0.20 µg/L) at any of the three sites;
- hydrocarbons were not detected at any of the three sites; and
- pesticides were not detected at any of the three sites.

For a list of hydrocarbons and pesticides measured including DLs, see Tables 4 and 5, respectively.

#### 3.4.1 Comparison to Water Quality Guidelines and Objectives

As all results for hydrocarbons and pesticides were below detection and the DLs were lower than MWQSOG and CCME PAL guidelines, all measurements were also within the PAL guidelines.

There are no MWQSOG or CCME guidelines for PAL for *E. coli*, blue-green algae, or microcystin.

### 3.5 *IN SITU* SURVEY RESULTS

This section presents the results of the *in situ* measurements taken at locations along the proposed LMOC and LSMOC to support fish habitat assessments. Results from these surveys are presented in Table 9.

Of the four locations surveyed along the alignment of the proposed LMOC on September 3, 2021, all sites were less than 0.4 m in depth. Sites were moderately oxygenated (7.18 to 9.04 mg/L; 74.2 to 96.5 % saturation), alkaline (pH ranged from 8.04 to 8.78), with moderate conductivity (593–1284 µS/cm), and relatively low turbidity (0.80 to 11.17 NTU). On October 21, 2021, seven sites were surveyed and water levels were low at all sites; total depths ranged from <0.1 m to 0.5 m. Due to low water levels at Goodison Lake and Woodale Drain *in situ* parameters could not be accurately measured at these sites. At the sites where *in situ* measurements were collected, conditions were similar to those during the September survey; moderate- to well- oxygenated (9.77 to 14.70 mg/L; 78.1 to 116.3 % saturation),

alkaline (pH ranged from 8.24 to 8.91), with moderate conductivity (571–1252  $\mu\text{S}/\text{cm}$ ), and relatively low turbidity (3.36 to 15.42 NTU). Turbidity was higher at Clear Lake (38.19 NTU) than at the other sites sampled; likely due to low water levels and disturbance from the helicopter during sampling.

Three sites were sampled along the proposed LSMOC during each of the surveys in Fall 2021. Total depths ranged from 0.4 m to 1.2 m at the time of the surveys. All sites were circum-neutral to alkaline, with moderately low conductivity (220-346  $\mu\text{S}/\text{cm}$ ), and low turbidity (0.11 to 3.92 NTU). DO varied between sites and sampling periods and ranged from 4.19 mg/L (32.4 % saturation; Creek C on September 3, 2021) to 11.41 mg/L (91.6 % saturation; Unnamed Creek 2 on October 21, 2021).

### 3.5.1 Comparison to Water Quality Guidelines and Objectives

DO was below the CCME PAL guidelines for both warm water biota (5.5-6.0 mg/L) and cold water biota (6.5-9.5 mg/L), as well as the MWQSOG 30-day averaging objective for cool-water aquatic life (5.5 mg/L, when temperatures  $\leq 5^\circ\text{C}$ ), and the MWQSOG instantaneous objective for early life stages of cold-water aquatic life (8.0 mg/L, when temperatures  $\leq 5^\circ\text{C}$ ) at the site sampled on Creek C on October 21, 2021.

DO was below the CCME PAL for early life stages of cold-water biota (9.5 mg/L) at all but one site sampled on September 3, 2021; the exception was Unnamed Creek 1 where DO was 10.12 mg/L. However, it is unlikely that early life stages of cold-water species were present the time the measurements were taken (i.e., water temperatures were above  $5^\circ\text{C}$  in all instances where DO was less than 9.5 mg/L). DO was within all other applicable MWQSOG objectives and CCME guidelines for PAL at all other sites and times sampled.

*In situ* pH was within MWQSOG/CCME PAL guidelines (6.5-9.0 pH units) at all sites and sampling times.

There are no MWQSOG/CCME PAL guidelines for the other *in situ* parameters measured.

## 4.0

## SUMMARY

Based on the results of the monitoring that was conducted in Fall 2021, the water quality of the study area can be described as moderately nutrient-rich to nutrient-rich, low to moderately turbid, slightly alkaline, hard to very hard, and moderate- to well-oxygenated.

In general, water quality was similar at sites sampled along the main flow path from Lake Manitoba through the Fairford River to Lake St. Martin and into the Dauphin River. However, differences in water quality between the sites sampled along the main flow path and Watchorn, Mercer, Birch and Buffalo creeks, Big Buffalo Lake, and Sturgeon Bay, were observed, including:

- Watchorn Creek had higher concentrations of alkalinity, TP, colour, carbon, TDS, calcium, fluoride and silicon and lower TN, antimony, arsenic, chloride and sodium;
- Mercer Creek had higher alkalinity, TP, colour, carbon, TDS and calcium, and lower TN;
- Birch Creek had higher alkalinity, hardness, carbon, colour, as well as higher sulfur at the site near PR 239, and lower turbidity, TSS, conductivity, TDS, arsenic, antimony, chloride, fluoride, copper, lithium, magnesium, rubidium, silicon, sodium and strontium;
- Big Buffalo Lake had higher alkalinity, TP, TN, carbon, colour and silicon, and lower conductivity, TDS, arsenic, antimony, boron, chloride, fluoride, lithium, molybdenum, nickel, potassium, sodium, strontium, sulfur, and uranium;
- Buffalo Creek had higher alkalinity, carbon, colour, aluminum, chromium, copper, iron, silicon, titanium and zirconium and lower conductivity, TDS, antimony, arsenic, barium, boron, chloride, fluoride, lithium, magnesium, molybdenum, potassium, rubidium, sodium, strontium, sulfate, sulfur and uranium; and
- Sturgeon Bay had lower alkalinity, hardness, conductivity, TDS, TN, carbon, antimony, boron, chloride, fluoride, lithium, magnesium, molybdenum, potassium, rubidium, sodium, strontium, sulfate, sulfur, and uranium, and higher TP, DIN, aluminum, chromium, copper, cesium, iron, nickel, titanium and vanadium than sites sampled along the flow path from Lake Manitoba through the Dauphin River.

The results of the additional sampling that was conducted in the Fairford and Dauphin rivers, and Birch Creek in late-August/September showed that *E. coli* concentrations were higher in Birch Creek than in the Dauphin River and the Fairford River and that blue-green algae were most abundant in the Dauphin River and least abundant in Birch Creek. Microcystin, hydrocarbons, and pesticides were not detected.

TP exceeded the MWQSOG narrative guideline for phosphorus for lakes and river mouths at several locations, including: Watchorn Creek at Watchorn Bay; Mercer Creek at Watchorn Bay; Fairford River at Lake St. Martin; Birch Creek at Lake St. Martin; Lake St. Martin; Big Buffalo Lake; the Dauphin River at Sturgeon Bay; and Sturgeon Bay. TP was below the MWQSOG narrative guideline for rivers and streams in the Fairford and Dauphin rivers and in Birch and Buffalo creeks at the sites where this guideline applies.

DO was below the MWQSOGs 30-day objective for the protection of cool-water aquatic life in Birch Creek at PR 239 on August 29, 2021. This lower DO concentration was likely due to the low water level and lack of flow observed at the time of sampling. DO was also below the CCME guideline for PAL for early life stages of cold-water biota at several sites sampled in late-August/September; however, it is unlikely that early life stages of cold-water species were present at the time the measurements were taken, as water temperatures were above 5°C in these cases.

*In situ* pH exceeded the MWQSOG/CCME PAL guidelines in the eastern bay of Lake St. Martin during the August sampling period; however, laboratory-measured pH was within PAL guidelines. All other pH values measured at core sites in Fall 2021 were within PAL guidelines.

Aluminum exceeded the MWQSOG and CCME guideline for PAL in approximately one quarter of samples collected, including samples from Lake St. Martin, Buffalo Creek, the Dauphin River and Sturgeon Bay. Iron exceeded the MWQSOG and CCME guideline for PAL in samples collected from Buffalo Creek and the off-shore site in Sturgeon Bay in late-August/September. Chloride exceeded the CCME long-term guideline for PAL in all samples collected along the main flow path from Lake Manitoba through the Fairford River to Lake St. Martin and into the Dauphin River, as well as in Watchorn and Mercer creeks (October only). Additionally, fluoride exceeded the CCME PAL at most sites and times sampled; the exception was Sturgeon Bay where only one sample collected exceeded the guideline. Exceedances of these parameters are common in the region.

All other water quality variables measured for which there are MWQSOG and CCME objectives or guidelines were within PAL objectives and guidelines at all core sampling sites.

Surveys along the alignment of the proposed LMOC and LSMOC conducted on September 3 and October 21, 2021, found surface water to be present at all locations surveyed, although total depths did not exceed 0.5 m at most sites. Due to low water levels during the September survey, *in situ* water quality could not be measured at Goodison Lake and Woodale Drain. In general, sites along the alignment of the proposed LMOC were moderately- to well-oxygenated, alkaline, and low to moderately turbid and had moderate conductivity. Sites sampled along the alignment of the proposed LSMOC were circum-neutral to alkaline, had low turbidity, and lower specific conductance than sites along the alignment of the proposed LMOC. Additionally, sites along the alignment of the proposed LSMOC were generally well oxygenated; however, low oxygen conditions were observed at the site located in Creek C on October 21, 2021.

At the time of the October survey, DO at the site sampled on Creek C was below the CCME guidelines for PAL, as well as applicable MWQSOG objectives, including: the MWQSOG 30-day averaging objective for cool-water aquatic life; and the MWQSOG instantaneous objective for early life stages of cold-water aquatic life. Furthermore, during the September survey, DO was below the CCME guideline for PAL for early life stages of cold-water at most sites sampled along the alignments of the proposed LMOC and LSMOC; however, it is unlikely that early life stages of cold-water species were present at the time the measurements were taken, as water temperatures were well above 5°C at the time. DO was within applicable MWQSOG and CCME PAL objectives/guidelines at all other sites and times sampled.

Additionally, pH was within applicable MWQSOG and CCME for PAL objectives and guidelines at all sites along the proposed LSMOC and LMOC. There are no MWQSOG or CCME PAL guidelines for the other *in situ* parameters measured.



**5.0****REFERENCES**

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Table 1. Core water quality sampling sites, Fall 2021.

Waterbody	Location Description	Site ID	Sampling Date	UTM coordinates			AEMP
				Zone	Easting	Northing	Site <sup>1</sup>
Lake Manitoba	offshore at proposed LMOC	WHB1	29-Aug-21	14U	529003	5680779	-
	nearshore at proposed LMOC	WHB2	29-Aug-21	14U	529746	5681362	Yes
Watchorn Creek	at Watchorn Bay	WHC-WB	29-Aug-21	14U	530461	5681184	-
Mercer Creek	at Watchorn Bay	MC-WB	29-Aug-21	14U	528716	5682146	-
Birch Creek	at PR 239	BCD-2018-9	29-Aug-21	14U	531731	5697489	-
	at Lake St. Martin	BC-LSM	29-Aug-21	14U	533228	5702332	Yes
Fairford River	at Highway 6 bridge	FR1	30-Aug-21	14U	578787	5715310	Yes
	at Lake St. Martin	FR2	30-Aug-21	14U	526633	5718273	-
Lake St. Martin	Birch Bay	BB-LSM	29-Aug-21	14U	534215	5704378	Yes
	middle of south basin	LSM5	31-Aug-21	14U	536280	5724434	Yes
	at the narrows	LSM4	30-Aug-21	14U	541798	5733633	Yes
	middle of north basin	LSM1	31-Aug-21	14U	549959	5736743	-
	eastern bay near proposed LSMOC	LSM3	31-Aug-21	14U	555678	5737343	Yes
Dauphin River	at Lake St. Martin	DR-A	31-Aug-21	14U	546567	5744301	Yes
	at Big Bend	DR-B	30-Aug-21	14U	546031	5757487	-
	at Sturgeon Bay	DR-E	30-Aug-21	14U	565033	5756994	Yes
Buffalo Creek	at the Dauphin River	BC3	3-Sep-21	14U	562212	5754561	-
Big Buffalo Lake	Big Buffalo Lake	BBL	3-Sep-21	14U	558065	5745510	-
Lake Winnipeg	nearshore at LSMOC outlet	SB1	30-Aug-21	14U	574526	5757724	Yes
	offshore at LSMOC outlet	SB2	30-Aug-21	14U	576248	5753657	Yes

Table 1. Continued.

Waterbody	Location Description	Site ID	Sampling Date	UTM coordinates			AEMP
				Zone	Easting	Northing	Site <sup>1</sup>
Lake Manitoba	offshore at proposed LMOC	WHB1	18-Oct-21	14U	529062	5680743	-
	nearshore at proposed LMOC	WHB2	18-Oct-21	14U	529827	5681390	Yes
Watchorn Creek	at Watchorn Bay	WHC-WB	18-Oct-21	14U	530463	5681187	-
Mercer Creek	at Watchorn Bay	MC-WB	18-Oct-21	14U	528716	5682149	-
Birch Creek	at PR 239	BCD-2018-9	18-Oct-21	14U	531724	5697498	-
	at Lake St. Martin	BC-LSM	18-Oct-21	14U	533234	5702353	Yes
Fairford River	at Highway 6 bridge	FR1	19-Oct-21	14U	518788	5715304	Yes
	at Lake St. Martin	FR2	19-Oct-21	14U	527044	5717629	-
Lake St. Martin	Birch Bay	BB-LSM	18-Oct-21	14U	534243	5704273	Yes
	middle of south basin	LSM5	20-Oct-21	14U	536267	5724373	Yes
	at the narrows	LSM4	19-Oct-21	14U	541796	5733631	Yes
	middle of north basin	LSM1	20-Oct-21	14U	549803	5736449	-
	eastern bay near proposed LSMOC	LSM3	20-Oct-21	14U	555894	5737228	Yes
Dauphin River	at Lake St. Martin	DR-A	17-Oct-21	14U	546556	5744278	Yes
	at Big Bend	DR-B	17-Oct-21	14U	546033	5757490	-
	at Sturgeon Bay	DR-E	17-Oct-21	14U	564919	5757106	Yes
Buffalo Creek	at the Dauphin River	BC3	21-Oct-21	14U	562214	5754625	-
Big Buffalo Lake	Big Buffalo Lake	BBL	21-Oct-21	14U	558341	5745547	-
Lake Winnipeg	nearshore at LSMOC outlet	SB1	17-Oct-21	14U	574370	5751488	Yes
	offshore at LSMOC outlet	SB2	17-Oct-21	14U	576862	5753525	Yes

1 - Sampling sites that were identified for surface water quality monitoring in the AEMP.

Table 2. Locations surveyed for the presence of water and *in situ* parameters.

Waterbody	Sampling Date	UTM coordinates		
		Zone	Easting	Northing
Reed Lake	3-Sep-21	14U	531730	5697484
Clear Lake	3-Sep-21	14U	531172	5690006
Water Lake	3-Sep-21	14U	531082	5692398
Goodison Lake	3-Sep-21	14U	531841	5695504
Creek C upstream of LSMOC alignment	3-Sep-21	14U	567225	5748751
Unnamed Creek at LSMOC alignment	3-Sep-21	14U	561830	5742967
Unnamed Creek at Buffalo Creek	3-Sep-21	14U	559927	5740683
Reed Lake	21-Oct-21	14U	531960	5687216
Clear Lake	21-Oct-21	14U	531190	5690259
Water Lake	21-Oct-21	14U	531019	5692166
Goodison Lake	21-Oct-21	14U	531852	5695526
Clarks Drain	21-Oct-21	14U	532971	5699465
Woodale Drain	21-Oct-21	14U	532868	5699905
Creek C upstream of LSMOC alignment	21-Oct-21	14U	566688	5748944
Unnamed Creek at Buffalo Creek	21-Oct-21	14U	559949	5740653
Unnamed Creek at LSMOC alignment	21-Oct-21	14U	561572	5743057

Table 3. Laboratory parameters measured at core water quality sampling sites.

Routine Parameters	Metals (total and dissolved) and Major Ions	
<u>Routine Chemistry</u>	Aluminum	Nickel
Total alkalinity, as CaCO <sub>3</sub>	Antimony	Phosphorus
Bicarbonate alkalinity as HCO <sub>3</sub>	Arsenic	Potassium
Carbonate alkalinity, as CO <sub>3</sub>	Barium	Rubidium
Hydroxide alkalinity, as OH	Beryllium	Selenium
pH	Bismuth	Silicon
Conductivity	Boron	Silver
Total Dissolved Solids	Cadmium	Sodium
Hardness, as CaCO <sub>3</sub>	Calcium	Strontium
<u>Nutrients</u>	Cesium	Sulfate, dissolved
Total Ammonia (as N)	Chloride, dissolved	Sulfur
Nitrate (as N)	Chromium	Tellurium
Nitrite (as N)	Cobalt	Thallium
Nitrate and Nitrite (as N)	Copper	Thorium
Total Kjeldahl Nitrogen	Fluoride, dissolved	Tin
Total Nitrogen	Iron	Titanium
Dissolved Phosphorus	Lead	Tungsten
Total Particulate Phosphorus	Lithium	Uranium
Total Phosphorus	Magnesium	Vanadium
Total Inorganic Carbon	Manganese	Zinc
Total Organic Carbon	Mercury	Zirconium
Dissolved Organic Carbon	Molybdenum	
Total Carbon		
<u>Water Clarity</u>		
Total Suspended Solids		
Turbidity		
True Colour		
<u>Algal Pigments</u>		
Chlorophyll <i>a</i>		
Phaeophytin <i>a</i>		

Table 4. Hydrocarbon parameters measured at selected water quality sampling sites in Fall 2021.

Parameter	Unit	DL
Benzene	mg/L	0.00050
Ethyl benzene	mg/L	0.00050
Toluene	mg/L	0.0010
o-Xylene	mg/L	0.00050
m+p-Xylenes	mg/L	0.00040
Xylenes (Total)	mg/L	0.00064
F1 (C6-C10)	mg/L	0.10
F1-BTEX	mg/L	0.10
F2-Naphth	mg/L	0.10
F2 (C10-C16)	mg/L	0.10
F3-PAH	mg/L	0.25
F3 (C16-C34)	mg/L	0.25
F4 (C34-C50)	mg/L	0.25
Total Hydrocarbons (C6-C50)	mg/L	0.38
Acenaphthene	mg/L	0.000020
Acenaphthylene	mg/L	0.000020
Acridine	mg/L	0.000020
Anthracene	mg/L	0.000010
Benzo(a)anthracene	mg/L	0.000010
Benzo(a)pyrene	mg/L	0.000050
Benzo(b&j)fluoranthene	mg/L	0.000010
Benzo(g,h,i)perylene	mg/L	0.000020
Benzo(k)fluoranthene	mg/L	0.000010
Chrysene	mg/L	0.000020
Dibenzo(a,h)anthracene	mg/L	0.000050
Fluoranthene	mg/L	0.000020
Fluorene	mg/L	0.000020
Indeno(1,2,3-cd)pyrene	mg/L	0.000010
1-Methyl Naphthalene	mg/L	0.000020
2-Methyl Naphthalene	mg/L	0.000020
Naphthalene	mg/L	0.000050
Phenanthrene	mg/L	0.000050
Pyrene	mg/L	0.000010
Quinoline	mg/L	0.000020
B(a)P Total Potency Equivalent	mg/L	0.000030

Table 5. Pesticides measured at selected water quality sampling sites in Fall 2021.

Parameter	Unit	DL	Parameter	Unit	DL
Aldrin	µg/L	0.0080	Bromoxynil	mg/L	0.00010
alpha-BHC	µg/L	0.0080	Clopyralid	mg/L	0.00010
beta-BHC	µg/L	0.0080	2,4-D	mg/L	0.00010
gamma-hexachlorocyclohexane	µg/L	0.0080	Dicamba	mg/L	0.00010
delta-BHC	µg/L	0.0080	2,4-DB	mg/L	0.00010
a-chlordane	µg/L	0.0080	2,4-DP	mg/L	0.00010
g-chlordane	µg/L	0.0080	Dinoseb	mg/L	0.00010
o,p-DDD	µg/L	0.0040	MCPA	mg/L	0.00010
pp-DDD	µg/L	0.0040	MCPB	mg/L	0.00010
o,p-DDE	µg/L	0.0040	Mecoprop	mg/L	0.00010
pp-DDE	µg/L	0.0040	Picloram	mg/L	0.00010
op-DDT	µg/L	0.0040	2,4,5-T	mg/L	0.00010
pp-DDT	µg/L	0.0040	2,4,5-TP	mg/L	0.00010
Dieldrin	µg/L	0.0080	Triclopyr	mg/L	0.00010
Endosulfan I	µg/L	0.0070	Atrazine	µg/L	0.10
Endosulfan II	µg/L	0.0070	Atrazine+N-Dealkylated Metabolites	µg/L	0.20
Endosulfan Sulfate	µg/L	0.0070	Ethalfuralin	mg/L	0.00010
Endrin	µg/L	0.010	Atrazine Desethyl	µg/L	0.10
Endrin Aldehyde	µg/L	0.010	Fluazifop-p-butyl	mg/L	0.00010
Heptachlor	µg/L	0.0080	Glyphosate	µg/L	0.20
Heptachlor Epoxide	µg/L	0.0080	Diclofop-methyl	mg/L	0.00010
Hexachlorobenzene	µg/L	0.0080	Triallate	mg/L	0.00010
Hexachlorobutadiene	µg/L	0.0080	Trifluralin	mg/L	0.00010
Hexachloroethane	µg/L	0.0080			
Methoxychlor	µg/L	0.0080			
Mirex	µg/L	0.0080			
trans-Nonachlor	µg/L	0.010			
Oxychlordane	µg/L	0.0080			
Pentachloronitrobenzene	µg/L	0.010			
AMPA	µg/L	0.50			



Table 6. Results for *in situ* parameters measured at core sampling sites.

Waterbody	Site ID	Sampling Date	Sampling Time	Total Water Depth (m)	Sample Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	Turbidity (NTU)	pH	Secchi Disk Depth (m)
Watchorn Bay	WHB1	29-Aug-21	17:45	2.2	0.3	17.60	9.84	103.4	1119	4.17	8.37	0.80
					0.5	17.60	9.85	103.4	1120	4.17	8.36	
					1.0	17.60	9.88	103.8	1120	4.15	8.36	
					1.5	17.60	9.93	104.3	1120	4.10	8.36	
					2.0	17.50	10.07	105.1	1121	4.03	8.39	
	WHB2	29-Aug-21	17:30	1.3	0.3	18.00	9.98	105.9	1113	4.66	8.40	0.80
					0.5	18.00	9.98	105.8	1112	4.68	8.39	
					1.0	18.00	10.01	106.2	1112	4.82	8.39	
	WHC-WB	29-Aug-21	17:00	0.6	0.3	18.90	9.95	107.3	688	0.18	8.09	>0.6
					0.5	18.90	9.94	107.2	671	0.39	8.08	
Mercer Creek	MC-WB	29-Aug-21	18:15	0.4	0.3	18.10	10.15	107.7	1215	2.03	7.63	>0.4
Birch Creek	BCD-2018-9	29-Aug-21	11:45	0.3	0.3	15.90	6.23	63.2	820	0.16	7.34	>0.3
	BC-LSM	29-Aug-21	12:21	0.4	0.3	16.50	10.17	104.2	635	0.28	7.85	>0.20
Fairford River	FR1	30-Aug-21	7:45	1.8	0.3	16.20	9.02	92.2	1157	5.34	8.26	0.85
	FR2	30-Aug-21	8:45	0.4	0.3	16.30	9.28	95.0	1155	6.05	8.21	>0.4
Lake St. Martin	BB-LSM	29-Aug-21	13:30	2.3	0.3	16.50	9.83	100.9	1125	8.22	8.27	0.65
					0.5	16.50	9.86	101.2	1124	8.11	8.24	
					1.0	16.40	9.84	101.0	1126	12.98	8.28	
					1.5	16.40	9.84	101.0	1125	13.36	8.27	
					2.0	16.40	9.83	100.7	1125	14.72	8.27	
	LSM5	31-Aug-21	10:00	3.5	0.3	17.00	10.20	106.9	1120	2.85	8.73	1.05
					1.0	16.90	10.20	106.1	1120	2.86	8.73	
					1.5	16.90	10.22	106.1	1120	2.86	8.73	
					2.0	16.90	10.23	106.1	1120	2.87	8.73	
					2.5	16.90	10.22	106.0	1120	2.93	8.73	
3.0	16.90	10.22	106.0	1120	2.96	8.68						

Table 6. Continued.

Waterbody	Site ID	Sampling Date	Sampling Time	Total Water Depth (m)	Sample Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	Turbidity (NTU)	pH	Secchi Disk Depth (m)
Lake St. Martin	LSM4	30-Aug-21	10:30	0.4	0.3	17.42	8.28	86.9	1124	4.72	8.50	>0.4
	LSM1	31-Aug-21	12:45	0.9	0.3	18.60	10.46	117.5	1050	4.79	8.84	0.85
					0.6	18.60	11.02	118.2	1050	6.90	8.80	
	LSM3	31-Aug-21	13:15	0.9	0.3	18.80	11.59	124.6	1113	3.29	9.27	0.80
					0.7	18.70	11.94	128.5	1110	3.78	9.27	
Dauphin River	DR-A	31-Aug-21	8:12	1.2	0.3	16.90	8.12	84.3	1121	8.58	8.88	0.40
	DR-B	30-Aug-21	16:00	0.5	0.3	18.60	10.27	110.0	1080	9.36	9.00	>0.5
	DR-E	30-Aug-21	18:30	3.3	0.3	18.50	10.97	117.2	1064	6.90	8.84	0.65
					1.0	18.50	10.92	117.0	1066	6.89	8.83	
					1.5	18.50	10.69	114.4	1057	6.84	8.83	
					2.0	18.20	10.45	111.1	1063	6.91	8.84	
2.5	17.50	10.16	106.5	1062	9.20	8.81						
Big Buffalo Lake	BBL	3-Sep-21	12:01	1.0	0.3	18.42	9.30	96.5	559	3.07	8.70	>0.70
Buffalo Creek	BC3	3-Sep-21	12:30	0.6	0.3	18.70	8.81	94.6	393	11.37	7.97	>0.60
Sturgeon Bay	SB1	30-Aug-21	18:00	3.8	0.3	17.90	10.50	107.3	540	10.90	8.38	0.65
					1.0	17.90	10.20	107.9	539	10.86	8.36	
					1.5	17.90	10.16	107.4	540	10.64	8.35	
					2.0	17.90	10.11	106.7	543	9.52	8.34	
					2.5	16.10	10.13	103.0	552	7.52	8.20	
	SB2	30-Aug-21	17:30	6.2	0.3	17.50	9.86	103.3	438	11.39	8.34	0.65
					1.0	17.40	9.91	103.7	441	11.35	8.32	
					2.0	16.50	9.94	102.0	491	13.98	8.31	
					3.0	15.90	9.60	97.5	520	15.02	8.21	
					4.0	15.90	9.40	95.2	525	14.79	8.07	
5.0	15.90	9.40	95.2	524	14.94	8.07						
6.0	15.90	9.16	93.3	529	17.34	8.02						

Table 6. Continued.

Waterbody	Site ID	Sampling Date	Sampling Time	Total Water Depth (m)	Sample Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	Turbidity (NTU)	pH	Secchi Disk Depth (m)
Watchorn Bay	WHB1	18-Oct-21	15:30	2.3	0.3	9.83	10.96	97.1	1149	6.95	8.57	0.53
					1.0	9.83	10.98	97.2	1149	6.92	8.56	
					1.5	9.83	10.99	97.3	1149	7.28	8.56	
					2.0	9.83	10.99	97.3	1149	7.53	8.56	
					0.3	10.64	11.14	100.6	1149	5.85	8.58	
0.6	10.65	11.15	100.6	1150	5.83	8.57						
0.9	10.65	11.15	100.6	1149	5.86	8.57						
Mercer Creek	WHC-WB	18-Oct-21	14:09	0.8	0.3	9.84	12.77	112.3	1144	1.94	8.41	>0.8
	MC-WB	18-Oct-21	16:14	0.4	0.2	11.79	9.76	90.4	1288	4.04	7.93	>0.4
Birch Creek	BCD-2018-9	18-Oct-21	12:53	0.6	0.3	9.15	10.44	90.9	1035	1.94	8.40	-
	BC-LSM	18-Oct-21	12:27	0.4	0.2	8.49	10.04	86.0	723	2.00	8.50	-
Fairford River	FR1	19-Oct-21	15:22	1.3	0.3	8.35	11.03	94.2	1178	8.39	8.46	-
					0.6	8.34	11.02	94.2	1178	8.59	8.46	
					0.9	8.18	11.05	94.1	1177	8.86	8.46	
					0.3	8.24	11.49	97.9	1176	8.26	8.42	
FR2	19-Oct-21	14:51	0.7	0.3	8.24	11.49	97.9	1176	8.26	8.42		
Lake St. Martin	BB-LSM	18-Oct-21	11:03	2.1	0.3	9.01	10.76	93.5	1166	5.92	8.48	0.78
					1.0	8.99	10.76	93.4	1167	5.87	8.48	
					1.5	9.01	10.74	93.3	1166	5.84	8.48	
					1.8	9.01	10.74	93.3	1167	5.82	8.48	
	LSM5	20-Oct-21	14:11	3.4	0.3	8.67	11.60	95.4	1157	6.22	8.54	0.60
					1.0	8.68	11.03	95.0	1157	6.22	8.54	
					1.5	8.68	11.00	94.8	1157	6.27	8.54	
					2.0	8.68	10.99	94.7	1157	6.08	8.53	
					2.5	8.68	10.97	94.5	1157	6.09	8.46	
					3.0	8.68	10.97	94.5	1157	5.96	8.46	

Table 6. Continued.

Waterbody	Site ID	Sampling Date	Sampling Time	Total Water Depth (m)	Sample Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	Turbidity (NTU)	pH	Secchi Disk Depth (m)
Lake St. Martin	LSM4	19-Oct-21	9:15	0.6	0.3	7.91	10.85	91.8	1165	3.84	8.52	0.48
	LSM1	20-Oct-21	10:57	0.9	0.3	6.26	11.28	91.6	1175	12.64	8.46	0.31
					0.6	6.22	11.28	91.5	1176	12.74	8.47	
LSM3	20-Oct-21	10:26	10:26	0.9	0.3	6.53	11.13	90.9	1154	7.50	8.42	0.51
					0.6	6.54	11.41	91.0	1155	7.64	8.42	
Dauphin River	DR-A	17-Oct-21	16:03	0.9	0.3	9.45	11.45	100.6	1163	10.16	8.65	-
					0.6	9.47	11.46	100.6	1163	10.47	8.65	
	DR-B	17-Oct-21	15:21	0.6	0.3	8.08	11.41	96.8	1162	8.32	8.57	>0.6
	DR-E	17-Oct-21	14:00	2.1	0.3	7.29	10.97	91.4	1150	7.33	8.43	0.83
					1.0	7.25	10.94	91.7	1150	7.46	8.42	
1.5	7.19	10.87	90.3	1150	7.80	8.42						
Big Buffalo Lake	BBL	21-Oct-21	12:31	0.5	0.3	5.70	11.25	90.1	604	4.75	8.63	>0.5
Buffalo Creek	BC3	21-Oct-21	12:50	0.8	0.3	5.48	11.88	94.3	466	6.74	8.29	>0.8
Sturgeon Bay	SB1	17-Oct-21	13:17	3.5	0.3	10.26	10.38	92.7	438	6.37	8.34	0.88
					1.0	10.24	10.37	92.5	438	6.58	8.33	
					1.5	10.25	10.36	92.5	438	6.84	8.33	
					2.0	10.25	10.36	92.5	438	6.55	8.32	
					2.5	10.26	10.36	92.4	438	6.54	8.28	
	3.0	10.26	10.35	92.4	438	6.62	8.32					
	SB2	17-Oct-21	12:37	5.6	0.3	10.40	10.79	96.6	420	9.57	8.43	0.78
					1.0	10.41	10.80	96.7	409	9.82	8.44	
					2.0	10.40	10.79	96.6	419	9.96	8.44	
					3.0	10.40	10.78	96.5	419	9.91	8.44	
4.0					10.40	10.76	96.4	419	9.81	8.43		
5.0	10.39	10.75	96.2	419	9.96	8.28						
5.3	10.39	10.75	96.3	419	9.93	8.25						

Table 7. Laboratory results for routine parameters measured at core sampling sites.

Waterbody	Site ID	Sampling Date	ALS ID	Alkalinity				Nitrogen			
				Total Alkalinity as CaCO <sub>3</sub> (mg/L)	Bicarbonate, HCO <sub>3</sub> (mg/L)	Carbonate, CO <sub>3</sub> (mg/L)	Hydroxide, OH (mg/L)	Total Ammonia (mg N/L)	Nitrate (mg N/L)	Nitrite (mg N/L)	Nitrate/nitrite (mg N/L)
<i>Analytical DL</i>				<i>1.0</i>	<i>1.2</i>	<i>0.60</i>	<i>0.34</i>	<i>0.010</i>	<i>0.0050</i> <i>/0.010</i>	<i>0.0010</i> <i>/0.0020</i>	<i>0.0051</i> <i>/0.010</i>
Lake Manitoba	WHB1	29-Aug-21	L2633558-13	167	187	8.04	<0.34	0.012	<0.010	<0.0020	<0.010
	WHB2	29-Aug-21	L2633558-14	167	188	7.56	<0.34	0.013	<0.010	<0.0020	<0.010
Watchorn Creek	WHC-WB	29-Aug-21	L2633558-15	230	264	8.04	<0.34	0.020	<0.0050	<0.0010	<0.0051
Mercer Creek	MC-WB	29-Aug-21	L2633558-16	191	233	<0.60	<0.34	0.010	<0.010	<0.0020	<0.010
Birch Creek	BCD-2018-9	29-Aug-21	L2633060-3	214	261	<0.60	<0.34	0.024	<0.0050	<0.0010	<0.0051
	BC-LSM	29-Aug-21	L2633060-1	249	293	5.04	<0.34	0.025	<0.0050	<0.0010	<0.0051
Fairford River	FR1	30-Aug-21	L2633558-9	172	196	6.96	<0.34	<0.010	<0.010	<0.0020	<0.010
	FR2	30-Aug-21	Mean	172	197	6.36	<0.34	0.016	<0.010	<0.0020	<0.010
Lake St. Martin	BB-LSM	29-Aug-21	L2633060-2	172	193	8.28	<0.34	0.015	<0.010	<0.0020	<0.010
	LSM5	31-Aug-21	L2634301-5	163	181	8.88	<0.34	0.018	<0.010	<0.0020	<0.010
	LSM4	30-Aug-21	Mean	164	188	5.40	<0.34	0.025	<0.010	<0.0020	<0.010
	LSM1	31-Aug-21	L2634301-6	150	162	9.96	<0.34	0.033	<0.010	<0.0020	<0.010
	LSM3	31-Aug-21	L2634301-7	156	155	17.8	<0.34	0.012	0.031	<0.0020	0.031
Dauphin River	DR-A	31-Aug-21	L2634301-8	150	166	8.52	<0.34	0.024	<0.010	<0.0020	<0.010
	DR-B	30-Aug-21	L2634301-4	148	156	11.8	<0.34	0.016	<0.010	<0.0020	<0.010
	DR-E	30-Aug-21	L2634301-3	149	162	10.1	<0.34	0.016	<0.010	<0.0020	<0.010
Big Buffalo Lake	BBL	3-Sep-21	L2635892-1	237	263	13.2	<0.34	0.037	<0.0050	<0.0010	<0.0051
Buffalo Creek	BC3	3-Sep-21	L2635892-2	162	194	1.56	<0.34	0.020	0.0055	<0.0010	0.0055
Lake Winnipeg	SB1	30-Aug-21	L2634301-2	125	149	1.68	<0.34	0.021	0.0669	<0.0010	0.0669
	SB2	30-Aug-21	L2634301-1	115	139	<0.60	<0.34	0.011	0.0881	<0.0010	0.0881

Table 7. Continued.

Waterbody	Site ID	Sampling Date	ALS ID	Alkalinity				Nitrogen			
				Total Alkalinity as CaCO <sub>3</sub> (mg/L)	Bicarbonate, HCO <sub>3</sub> (mg/L)	Carbonate, CO <sub>3</sub> (mg/L)	Hydroxide, OH (mg/L)	Total Ammonia (mg N/L)	Nitrate (mg N/L)	Nitrite (mg N/L)	Nitrate/nitrite (mg N/L)
Lake Manitoba	WHB1	18-Oct-21	Mean	172	204	3.16	<0.34	<0.010	<0.010	<0.0020	<0.010
	WHB2	18-Oct-21	L2652497-6	172	203	3.24	<0.34	<0.010	<0.010	<0.0020	<0.010
Watchorn Creek	WHC-WB	18-Oct-21	L2652497-4	243	294	0.96	<0.34	0.010	<0.010	<0.0020	<0.010
Mercer Creek	MC-WB	18-Oct-21	L2652497-7	212	259	<0.60	<0.34	0.098	0.010	<0.0020	0.0100
Birch Creek	BCD-2018-9	18-Oct-21	L2652497-1	357	425	5.28	<0.34	0.017	<0.010	<0.0020	<0.010
	BC-LSM	18-Oct-21	L2652497-2	310	368	4.68	<0.34	0.042	0.152	0.0061	0.158
Fairford River	FR1	19-Oct-21	L2653142-1	178	208	4.44	<0.34	0.013	<0.010	<0.0020	<0.010
	FR2	19-Oct-21	Mean	178	208	4.44	<0.34	0.026	<0.010	<0.0020	<0.010
Lake St. Martin	BB-LSM	18-Oct-21	L2652497-3	180	215	2.40	<0.34	0.041	<0.010	<0.0020	<0.010
	LSM5	20-Oct-21	L2653742-3	180	207	6.12	<0.34	<0.010	<0.010	<0.0020	<0.010
	LSM4	19-Oct-21	L2653142-3	178	206	5.16	<0.34	0.024	<0.010	<0.0020	<0.010
	LSM1	20-Oct-21	L2653742-1	182	214	3.60	<0.34	0.037	<0.010	<0.0020	<0.010
	LSM3	20-Oct-21	L2653742-2	186	217	4.92	<0.34	0.017	<0.010	<0.0020	<0.010
Dauphin River	DR-A	17-Oct-21	L2652045-7	171	204	2.64	<0.34	0.034	<0.010	<0.0020	<0.010
	DR-B	17-Oct-21	L2652045-6	173	207	2.04	<0.34	0.038	<0.010	<0.0020	<0.010
	DR-E	17-Oct-21	L2652045-3	174	212	<0.60	<0.34	0.046	0.0130	<0.0020	0.0130
Big Buffalo Lake	BBL	21-Oct-21	L2654247-1	260	304	6.48	<0.34	0.033	0.0159	<0.0010	0.0159
Buffalo Creek	BC3	21-Oct-21	L2654247-2	212	254	2.52	<0.34	0.010	<0.0050	<0.0010	<0.0051
Lake Winnipeg	SB1	17-Oct-21	L2652045-2	119	146	<0.60	<0.34	0.013	0.0384	<0.0010	0.0384
	SB2	17-Oct-21	L2652045-1	116	141	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051

Table 7. Continued.

Waterbody	Site ID	Sampling Date	Nitrogen			Phosphorus				Molar N:P Ratios		
			Dissolved Inorganic Nitrogen (mg/L) <sup>1</sup>	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Phosphorus (mg/L)	Total Particulate Phosphorus (mg/L)	Total Phosphorus (mg/L)	Dissolved Fraction (%)	TN:TP	DIN:DP	DIN:TP
<i>Analytical DL</i>			<i>0.010</i>	<i>0.20</i>	<i>0.20</i>	<i>0.0010</i> <i>/0.0030</i>	<i>0.0028</i> <i>/0.0042</i>	<i>0.0010</i> <i>/0.0030</i>				
Lake Manitoba	WHB1	29-Aug-21	0.017	0.66	0.66	0.0068	0.0156	0.0224	30.4	65.2	5.53	1.68
	WHB2	29-Aug-21	0.018	1.25	1.25	0.0074	0.0130	0.0204	36.3	135	5.38	1.95
Watchorn Creek	WHC-WB	29-Aug-21	0.023	1.02	1.02	0.0171	0.0042	0.0213	80.3	106	2.92	2.34
Mercer Creek	MC-WB	29-Aug-21	0.015	1.37	1.37	0.0232	0.0259	0.0491	47.3	61.7	1.43	0.68
Birch Creek	BCD-2018-9	29-Aug-21	0.027	1.14	1.14	0.0110	0.0090	0.0200	55.0	126	5.34	2.94
	BC-LSM	29-Aug-21	0.028	1.09	1.09	0.0102	0.0104	0.0205	49.8	118	5.97	2.97
Fairford River	FR1	30-Aug-21	0.010	1.19	1.19	0.0067	0.0154	0.0221	30.3	119	3.30	1.00
	FR2	30-Aug-21	0.021	0.81	0.81	0.0072	0.0168	0.0240	30.2	74.4	6.42	1.94
Lake St. Martin	BB-LSM	29-Aug-21	0.020	1.06	1.06	0.0071	0.0329	0.0400	17.8	58.6	6.23	1.11
	LSM5	31-Aug-21	0.023	0.91	0.91	0.0076	0.0155	0.0231	32.9	87.1	6.69	2.20
	LSM4	30-Aug-21	0.030	1.38	1.38	0.0085	0.0148	0.0233	36.3	131	7.75	2.82
	LSM1	31-Aug-21	0.038	1.14	1.14	0.0081	0.0140	0.0221	36.7	114	10.4	3.80
	LSM3	31-Aug-21	0.043	1.55	1.58	0.0099	0.0171	0.0271	36.5	129	9.60	3.51
Dauphin River	DR-A	31-Aug-21	0.029	1.76	1.76	0.0095	0.0250	0.0345	27.5	113	6.75	1.86
	DR-B	30-Aug-21	0.021	1.41	1.41	0.0106	0.0240	0.0346	30.6	90.1	4.38	1.34
	DR-E	30-Aug-21	0.021	1.40	1.40	0.0107	0.0257	0.0364	29.4	85.1	4.34	1.28
Big Buffalo Lake	BBL	3-Sep-21	0.040	1.74	1.74	0.0099	0.0283	0.0382	25.9	101	8.83	2.29
Buffalo Creek	BC3	3-Sep-21	0.026	1.02	1.02	0.0093	0.0159	0.0252	36.9	89.5	6.06	2.24
Lake Winnipeg	SB1	30-Aug-21	0.088	0.55	0.62	0.0177	0.0144	0.0321	55.1	42.7	11.0	6.06
	SB2	30-Aug-21	0.099	0.40	0.49	0.0215	0.0162	0.0376	57.2	28.8	10.2	5.83

Table 7. Continued.

Waterbody	Site ID	Sampling Date	Nitrogen			Phosphorus				Molar N:P Ratios		
			Dissolved Inorganic Nitrogen (mg/L) <sup>1</sup>	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Phosphorus (mg/L)	Total Particulate Phosphorus (mg/L)	Total Phosphorus (mg/L)	Dissolved Fraction (%)	TN:TP	DIN:DP	DIN:TP
Lake Manitoba	WHB1	18-Oct-21	0.012	1.09	1.09	0.0060	0.0179	0.0239	25.2	101	4.28	1.08
	WHB2	18-Oct-21	0.010	1.16	1.16	0.0067	0.0152	0.0219	30.6	117	3.30	1.01
Watchorn Creek	WHC-WB	18-Oct-21	0.015	2.14	2.14	0.0224	0.0183	0.0407	55.0	116	1.48	0.81
Mercer Creek	MC-WB	18-Oct-21	0.108	1.53	1.54	0.0189	0.0241	0.0429	44.1	79.4	12.6	5.57
Birch Creek	BCD-2018-9	18-Oct-21	0.022	1.65	1.65	0.0095	0.0116	0.0211	45.0	173	5.12	2.31
	BC-LSM	18-Oct-21	0.200	1.24	1.39	0.0200	0.0222	0.0422	47.4	72.8	22.1	10.5
Fairford River	FR1	19-Oct-21	0.018	1.09	1.09	0.0081	0.0177	0.0258	31.4	93.4	4.91	1.54
	FR2	19-Oct-21	0.031	0.93	0.93	0.0073	0.0215	0.0288	25.5	71.2	9.45	2.41
Lake St. Martin	BB-LSM	18-Oct-21	0.046	0.95	0.95	0.0069	0.0170	0.0239	28.9	87.9	14.7	4.26
	LSM5	20-Oct-21	0.010	1.57	1.57	0.0075	0.0200	0.0276	27.2	126	2.95	0.80
	LSM4	19-Oct-21	0.029	1.05	1.05	0.0078	0.0164	0.0242	32.2	95.9	8.22	2.65
	LSM1	20-Oct-21	0.042	1.38	1.38	0.0096	0.0112	0.0207	46.4	147	9.67	4.49
	LSM3	20-Oct-21	0.022	1.57	1.57	0.0095	0.0180	0.0275	34.5	126	5.12	1.77
Dauphin River	DR-A	17-Oct-21	0.039	1.17	1.17	0.0094	0.0174	0.0268	35.1	96.5	9.17	3.22
	DR-B	17-Oct-21	0.043	1.45	1.45	0.0086	0.0163	0.0249	34.5	129	11.1	3.82
	DR-E	17-Oct-21	0.059	1.40	1.41	0.0096	0.0176	0.0272	35.3	115	13.6	4.80
Big Buffalo Lake	BBL	21-Oct-21	0.049	1.87	1.89	0.0114	0.0291	0.0405	28.1	103	9.49	2.67
Buffalo Creek	BC3	21-Oct-21	0.013	0.84	0.84	0.0074	0.0145	0.0218	33.9	85.2	3.75	1.27
Lake Winnipeg	SB1	17-Oct-21	0.051	0.45	0.49	0.0188	<0.0042	0.0228	82.5	47.5	6.05	4.99
	SB2	17-Oct-21	<0.010	0.52	0.52	0.0101	0.0213	0.0314	32.2	36.6	1.09	0.35



Table 7. Continued.

Waterbody	Site ID	Sampling Date	Carbon				Routine Chemistry				
			Total Inorganic Carbon (mg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)	Total Carbon (mg/L)	Laboratory pH (pH units)	Laboratory Conductivity (µmhos/cm)	Total Dissolved Solids (mg/L)	Hardness, as CaCO <sub>3</sub> (mg/L)	Biochemical Oxygen Demand (mg/L) <sup>2</sup>
<i>Analytical DL</i>			<i>0.50</i>	<i>0.50</i>	<i>0.50</i>	<i>1.0</i>	<i>0.10</i>	<i>1</i>	<i>20</i>	<i>0.2</i>	<i>2.0</i>
Lake Manitoba	WHB1	29-Aug-21	31.5	15.0	13.9	46.5	8.49	1130	652	247	-
	WHB2	29-Aug-21	32.0	15.2	14.8	47.1	8.48	1120	610	246	-
Watchorn Creek	WHC-WB	29-Aug-21	46.7	19.8	20.7	66.4	8.42	689	448	327	<2.0
Mercer Creek	MC-WB	29-Aug-21	37.9	18.3	17.7	56.3	8.21	1220	733	312	4.0
Birch Creek	BCD-2018-9	29-Aug-21	42.2	27.4	26.2	69.5	8.02	863	609	496	<2.0
	BC-LSM	29-Aug-21	48.4	26.5	27.0	74.9	8.33	672	458	358	<2.0
Fairford River	FR1	30-Aug-21	31.5	15.1	14.8	46.6	8.44	1170	620	252	<2.0
	FR2	30-Aug-21	33.4	15.8	15.0	49.2	8.44	1170	630	274	-
Lake St. Martin	BB-LSM	29-Aug-21	34.7	17.0	15.3	51.7	8.48	1190	619	266	-
	LSM5	31-Aug-21	33.5	14.1	13.6	47.6	8.56	1130	634	243	-
	LSM4	30-Aug-21	32.6	16.2	15.9	48.9	8.41	1137	615	266	-
	LSM1	31-Aug-21	29.1	13.9	13.0	43.0	8.66	1050	618	228	-
	LSM3	31-Aug-21	31.7	19.1	17.2	50.8	8.95	1130	654	248	-
Dauphin River	DR-A	31-Aug-21	28.4	16.4	15.7	44.8	8.65	1130	640	232	-
	DR-B	30-Aug-21	28.5	16.9	19.7	45.4	8.75	1080	620	227	-
	DR-E	30-Aug-21	29.2	15.0	14.6	44.1	8.66	1070	608	229	-
Big Buffalo Lake	BBL	3-Sep-21	50.7	21.6	22.9	72.2	8.58	568	378	251	<2.0
Buffalo Creek	BC3	3-Sep-21	32.7	22.8	26.1	55.5	8.30	390	285	201	<2.0
Lake Winnipeg	SB1	30-Aug-21	22.6	8.34	8.25	31.0	8.30	547	322	161	-
	SB2	30-Aug-21	23.7	7.32	8.02	31.0	8.30	458	273	147	-

Table 7. Continued.

Waterbody	Site ID	Sampling Date	Carbon				Routine Chemistry				
			Total Inorganic Carbon (mg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)	Total Carbon (mg/L)	Laboratory pH (pH units)	Laboratory Conductivity ( $\mu\text{mhos/cm}$ )	Total Dissolved Solids (mg/L)	Hardness, as $\text{CaCO}_3$ (mg/L)	Biochemical Oxygen Demand ( $\text{mg/L}^2$ )
Lake Manitoba	WHB1	18-Oct-21	35.6	14.5	14.2	50.1	8.35	1170	667	268	-
	WHB2	18-Oct-21	34.8	14.5	14.3	49.2	8.35	1160	664	264	-
Watchorn Creek	WHC-WB	18-Oct-21	50.4	18.4	17.7	68.8	8.29	1160	687	349	-
Mercer Creek	MC-WB	18-Oct-21	43.9	15.5	15.5	59.3	8.17	1280	745	330	-
Birch Creek	BCD-2018-9	18-Oct-21	74.6	30.7	30.1	105	8.34	1040	743	645	-
	BC-LSM	18-Oct-21	56.8	25.5	25.4	82.3	8.35	734	488	439	-
Fairford River	FR1	19-Oct-21	36.9	14.9	14.5	51.8	8.39	1220	511	266	-
	FR2	19-Oct-21	37.1	15.1	14.6	52.2	8.39	1217	660	273	-
Lake St. Martin	BB-LSM	18-Oct-21	38.7	16.3	15.3	55.0	8.31	1180	682	282	-
	LSM5	20-Oct-21	37.2	15.9	15.6	53.2	8.45	1190	663	267	-
	LSM4	19-Oct-21	34.6	16.1	15.6	50.7	8.43	1200	678	271	-
	LSM1	20-Oct-21	35.3	16.5	16.2	51.8	8.4	1200	687	276	-
	LSM3	20-Oct-21	38.8	18.0	18.6	56.8	8.42	1190	600	288	-
Dauphin River	DR-A	17-Oct-21	36.0	17.0	16.6	53.0	8.32	1200	684	261	-
	DR-B	17-Oct-21	37.9	17.3	16.6	55.2	8.31	1190	617	267	-
	DR-E	17-Oct-21	36.5	16.5	16.5	53.0	8.29	1170	693	262	-
Big Buffalo Lake	BBL	21-Oct-21	54.5	24.0	23.3	78.5	8.46	618	316	308	-
Buffalo Creek	BC3	21-Oct-21	45.1	23.8	24.1	68.8	8.35	472	272	252	-
Lake Winnipeg	SB1	17-Oct-21	24.9	8.36	8.34	33.3	8.17	449	256	160	-
	SB2	17-Oct-21	24.3	7.97	8.29	32.2	8.21	429	259	151	-

Table 7. Continued.

Waterbody	Site ID	Sampling Date	Water Clarity			Algal Pigments	
			Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (CU)	Chlorophyll a (µg/L)	Phaeophytin a (µg/L)
<i>Analytical DL</i>			<i>1.0</i>	<i>0.1</i>	<i>5.0</i>	<i>0.10</i>	<i>0.10</i>
Lake Manitoba	WHB1	29-Aug-21	10.9	6.18	<5.0	7.72	1.66
	WHB2	29-Aug-21	10.5	6.75	<5.0	7.06	1.57
Watchorn Creek	WHC-WB	29-Aug-21	<1.0	0.61	90	3.56	4.88
Mercer Creek	MC-WB	29-Aug-21	6.3	3.12	29.4	51.3	10.5
Birch Creek	BCD-2018-9	29-Aug-21	<1.0	0.51	121	1.89	2.12
	BC-LSM	29-Aug-21	<1.0	0.75	109	3.77	3.54
Fairford River	FR1	30-Aug-21	12.5	8.57	7.0	6.48	1.41
	FR2	30-Aug-21	12.8	9.10	<5.0	7.13	1.78
Lake St. Martin	BB-LSM	29-Aug-21	33.7	22.5	5.3	15.4	4.29
	LSM5	31-Aug-21	7.8	4.04	<5.0	7.83	1.66
	LSM4	30-Aug-21	7.7	5.15	8.7	6.45	2.10
	LSM1	31-Aug-21	8.0	6.05	<5.0	7.75	1.45
	LSM3	31-Aug-21	8.6	4.40	9.0	8.87	1.54
Dauphin River	DR-A	31-Aug-21	13.7	11.4	8.0	11.1	2.98
	DR-B	30-Aug-21	17.1	14.3	<5.0	10.7	2.19
	DR-E	30-Aug-21	11.9	9.01	7.0	11.7	2.22
Big Buffalo Lake	BBL	3-Sep-21	9.4	3.77	47.3	9.94	3.75
Buffalo Creek	BC3	3-Sep-21	8.5	11.4	78.4	2.93	2.54
Lake Winnipeg	SB1	30-Aug-21	6.0	11.1	5.6	6.93	1.49
	SB2	30-Aug-21	6.9	13.2	5.1	4.26	1.44

Table 7. Continued.

Waterbody	Site ID	Sampling Date	Water Clarity			Algal Pigments	
			Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (CU)	Chlorophyll a (µg/L)	Phaeophytin a (µg/L)
Lake Manitoba	WHB1	18-Oct-21	14.5	9.61	7.1	9.46	2.05
	WHB2	18-Oct-21	12.3	7.89	7.1	8.59	1.97
Watchorn Creek	WHC-WB	18-Oct-21	4.2	2.09	34.1	25.5	7.30
Mercer Creek	MC-WB	18-Oct-21	9.1	6.36	25.5	16.7	6.12
Birch Creek	BCD-2018-9	18-Oct-21	2.4	2.10	83.6	2.30	2.10
	BC-LSM	18-Oct-21	2.5	2.40	75.6	5.24	4.86
Fairford River	FR1	19-Oct-21	15.0	12.1	<5.0	5.91	1.30
	FR2	19-Oct-21	15.3	12.13	<5.0	6.01	2.25
Lake St. Martin	BB-LSM	18-Oct-21	10.7	7.74	9.0	10.3	2.59
	LSM5	20-Oct-21	13.4	8.32	<5.0	14.0	3.54
	LSM4	19-Oct-21	6.8	4.87	<5.0	5.87	1.62
	LSM1	20-Oct-21	19.4	17.4	39.1	8.33	2.79
	LSM3	20-Oct-21	12.3	10.1	64.6	7.27	2.20
Dauphin River	DR-A	17-Oct-21	16.1	12.8	9.0	7.12	2.28
	DR-B	17-Oct-21	13.1	11.3	8.4	7.72	2.69
	DR-E	17-Oct-21	10.8	8.24	6.4	6.91	2.66
Big Buffalo Lake	BBL	21-Oct-21	11.8	6.26	44.5	11.7	4.72
Buffalo Creek	BC3	21-Oct-21	4.3	7.49	59.8	2.88	1.72
Lake Winnipeg	SB1	17-Oct-21	2.5	6.66	7.1	5.33	1.21
	SB2	17-Oct-21	5.0	10.8	8.9	19.6	3.18

1 - Calculated as the sum of total ammonia and nitrate/nitrite

2 - Samples for BOD were only collected during the late-August/September sampling period and only from selected sites.

Table 8. Laboratory results for metals and major ions measured at core sampling sites. All units are mg/L.

Waterbody	Site ID	Sampling Date	ALS ID	Aluminum (Al)		Antimony (Sb)		Arsenic (As)		Barium (Ba)	
				Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>				<i>0.0010</i>	<i>0.0030</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>
Lake Manitoba	WHB1	29-Aug-21	L2633558-13	0.0024	0.0369	0.00019	0.00016	0.00215	0.00210	0.0406	0.0385
	WHB2	29-Aug-21	L2633558-14	0.0030	0.0381	0.00018	0.00017	0.00206	0.00209	0.0410	0.0384
Watchorn Creek	WHC-WB	29-Aug-21	L2633558-15	0.0021	0.0131	0.00015	0.00014	0.00146	0.00135	0.0397	0.0366
Mercer Creek	MC-WB	29-Aug-21	L2633558-16	0.0036	0.0204	0.00018	0.00020	0.00215	0.00204	0.0490	0.0459
Birch Creek	BCD-2018-9	29-Aug-21	L2633060-3	0.0010	0.0046	0.00023	0.00019	0.00165	0.00167	0.0347	0.0357
	BC-LSM	29-Aug-21	L2633060-1	0.0034	0.0187	0.00012	0.00013	0.00140	0.00130	0.0425	0.0411
Fairford River	FR1	30-Aug-21	L2633558-9	0.0039	0.0569	0.00021	0.00018	0.00212	0.00209	0.0419	0.0405
	FR2	30-Aug-21	Mean	0.00387	0.0469	0.00022	0.00023	0.00216	0.00205	0.0413	0.0399
Lake St. Martin	BB-LSM	29-Aug-21	L2633060-2	0.0075	0.232	0.00024	0.00020	0.00232	0.00249	0.0408	0.0453
	LSM5	31-Aug-21	L2634301-5	0.0025	0.0075 <sup>1</sup>	0.00027	0.00021	0.00220	0.00226	0.0397	0.0390
	LSM4	30-Aug-21	Mean	0.00637	0.0763	0.00021	0.00022	0.00233	0.00233	0.0391	0.0392
	LSM1	31-Aug-21	L2634301-6	0.0073	0.0643	0.00018	0.00029	0.00213	0.00231	0.0354	0.0348
	LSM3	31-Aug-21	L2634301-7	0.0075	0.0275	0.00020	0.00022	0.00251	0.00252	0.0276	0.0274
Dauphin River	DR-A	31-Aug-21	L2634301-8	0.0110	0.092	0.00022	0.00022	0.00261	0.00254	0.0316	0.0326
	DR-B	30-Aug-21	L2634301-4	0.0081	0.105	0.00019	0.00022	0.00231	0.00233	0.0296	0.0311
	DR-E	30-Aug-21	L2634301-3	0.0124	0.0621	0.00020	0.00021	0.00223	0.00237	0.0308	0.0307
Big Buffalo Lake	BBL	3-Sep-21	L2635892-1	0.0059	0.0512	0.00011	0.00011	0.00163	0.00162	0.0357	0.0360
Buffalo Creek	BC3	3-Sep-21	L2635892-2	0.0238	0.540	<0.00010	<0.00010	0.00117	0.00128	0.0223	0.0252
Lake Winnipeg	SB1	30-Aug-21	L2634301-2	0.0591	0.295	0.00015	0.00016	0.00191	0.00187	0.0386	0.0394
	SB2	30-Aug-21	L2634301-1	0.0716	0.606	0.00015	0.00017	0.00184	0.00185	0.0369	0.0397

Table 8. Continued.

Waterbody	Site ID	Sampling Date	ALS ID	Aluminum (Al)		Antimony (Sb)		Arsenic (As)		Barium (Ba)	
				Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	Mean	0.00310	0.0498	0.00017	0.00018	0.00215	0.00216	0.0428	0.0434
	WHB2	18-Oct-21	L2652497-6	0.0030	0.0322	0.00017	0.00018	0.00205	0.00225	0.0421	0.0430
Watchorn Creek	WHC-WB	18-Oct-21	L2652497-4	0.0026	0.0178	0.00013	0.00014	0.00182	0.00179	0.0428	0.0433
Mercer Creek	MC-WB	18-Oct-21	L2652497-7	0.0052	0.0370	0.00017	0.00018	0.00214	0.00206	0.0522	0.0520
Birch Creek	BCD-2018-9	18-Oct-21	L2652497-1	0.0041	0.0855	0.00013	0.00016	0.00203	0.00190	0.0436	0.0428
	BC-LSM	18-Oct-21	L2652497-2	0.0014	0.0436	0.00012	0.00012	0.00165	0.00165	0.0399	0.0399
Fairford River	FR1	19-Oct-21	L2653142-1	0.0040	0.0548	0.00018	0.00018	0.00205	0.00203	0.0437	0.0429
	FR2	19-Oct-21	Mean	0.00353	0.0493	0.00018	0.00018	0.00204	0.00202	0.0444	0.0431
Lake St. Martin	BB-LSM	18-Oct-21	L2652497-3	0.0055	0.0308	0.00020	0.00022	0.00230	0.00219	0.0471	0.0458
	LSM5	20-Oct-21	L2653742-3	0.0030	0.0476	0.00021	0.00021	0.00228	0.00227	0.0428	0.0446
	LSM4	19-Oct-21	L2653142-3	0.0024	0.0317	0.00019	0.00019	0.00214	0.00223	0.0427	0.0415
	LSM1	20-Oct-21	L2653742-1	0.0093	0.131	0.00020	0.00020	0.00202	0.00211	0.0437	0.0460
	LSM3	20-Oct-21	L2653742-2	0.0097	0.0479	0.00019	0.00019	0.00195	0.00192	0.0395	0.0393
Dauphin River	DR-A	17-Oct-21	L2652045-7	0.0063	0.0947	0.00019	0.00022	0.00204	0.00223	0.0346	0.0413
	DR-B	17-Oct-21	L2652045-6	0.0060	0.0490	0.00019	0.00021	0.00198	0.00214	0.0360	0.0418
	DR-E	17-Oct-21	L2652045-3	0.0066	0.103	0.00020	0.00028	0.00199	0.00210	0.0367	0.0420
Big Buffalo Lake	BBL	21-Oct-21	L2654247-1	0.0030	0.0750	<0.00010	0.00010	0.00152	0.00150	0.0350	0.0369
Buffalo Creek	BC3	21-Oct-21	L2654247-2	0.0135	0.295	<0.00010	<0.00010	0.00098	0.00100	0.0204	0.0243
Lake Winnipeg	SB1	17-Oct-21	L2652045-2	0.0457	0.272	0.00014	0.00014	0.00180	0.00194	0.0376	0.0419
	SB2	17-Oct-21	L2652045-1	0.0493	0.353	0.00011	0.00014	0.00164	0.00190	0.0346	0.0426

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Beryllium (Be)		Bismuth (Bi)		Boron (B)		Cadmium (Cd)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00010</i>	<i>0.00010</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.010</i>	<i>0.010</i>	<i>0.0000050</i>	<i>0.0000050</i>
Lake Manitoba	WHB1	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.106	0.102	<0.0000050	<0.0000050
	WHB2	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.105	0.099	<0.0000050	<0.0000050
Watchorn Creek	WHC-WB	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.133	0.128	<0.0000050	<0.0000050
Mercer Creek	MC-WB	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.110	0.106	<0.0000050	<0.0000050
Birch Creek	BCD-2018-9	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.177	0.163	<0.0000050	<0.0000050
	BC-LSM	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.114	0.110	<0.0000050	<0.0000050
Fairford River	FR1	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.106	0.108	<0.0000050	0.0000054
	FR2	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.119	0.105	<0.0000050	<0.0000050
Lake St. Martin	BB-LSM	29-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.112	0.108	<0.0000050	0.0000067
	LSM5	31-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.109	0.108	<0.0000050	<0.0000050
	LSM4	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.115	0.102	<0.0000050	<0.0000050
	LSM1	31-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.100	0.091	<0.0000050	<0.0000050
	LSM3	31-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.113	0.106	<0.0000050	<0.0000050
Dauphin River	DR-A	31-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.102	0.102	<0.0000050	0.0000060
	DR-B	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.102	0.102	<0.0000050	<0.0000050
	DR-E	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.099	0.100	<0.0000050	<0.0000050
Big Buffalo Lake	BBL	3-Sep-21	<0.00010	<0.00010	<0.000050	<0.000050	0.082	0.088	0.0000130	0.0000233
Buffalo Creek	BC3	3-Sep-21	<0.00010	<0.00010	<0.000050	<0.000050	0.056	0.047	<0.0000050	0.0000053
Lake Winnipeg	SB1	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.053	0.055	<0.0000050	<0.0000050
	SB2	30-Aug-21	<0.00010	<0.00010	<0.000050	<0.000050	0.044	0.059	<0.0000050	<0.0000050

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Beryllium (Be)		Bismuth (Bi)		Boron (B)		Cadmium (Cd)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00010</i>	<i>0.00010</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.010</i>	<i>0.010</i>	<i>0.0000050</i>	<i>0.0000050</i>
Lake Manitoba	WHB1	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.130	0.124	<0.0000050	<0.0000050
	WHB2	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.126	0.122	<0.0000050	<0.0000050
Watchorn Creek	WHC-WB	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.135	0.129	<0.0000050	<0.0000050
Mercer Creek	MC-WB	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.132	0.121	<0.0000050	<0.0000050
Birch Creek	BCD-2018-9	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.168	0.158	<0.0000050	<0.0000050
	BC-LSM	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.117	0.103	<0.0000050	<0.0000050
Fairford River	FR1	19-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.119	0.113	<0.0000050	<0.0000050
	FR2	19-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.121	0.103	<0.0000050	<0.0000050
Lake St. Martin	BB-LSM	18-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.138	0.133	<0.0000050	<0.0000050
	LSM5	20-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.105	0.123	<0.0000050	0.0000116
	LSM4	19-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.124	0.096	<0.0000050	<0.0000050
	LSM1	20-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.118	0.114	<0.0000050	<0.0000050
	LSM3	20-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.116	0.108	<0.0000050	0.0000072
Dauphin River	DR-A	17-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.124	0.125	<0.0000050	<0.0000050
	DR-B	17-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.124	0.121	<0.0000050	<0.0000050
	DR-E	17-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.119	0.117	<0.0000050	<0.0000050
Big Buffalo Lake	BBL	21-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.086	0.078	<0.0000050	<0.0000050
Buffalo Creek	BC3	21-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.056	0.049	<0.0000050	<0.0000050
Lake Winnipeg	SB1	17-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.050	0.044	<0.0000050	<0.0000050
	SB2	17-Oct-21	<0.00010	<0.00010	<0.000050	<0.000050	0.040	0.044	<0.0000050	<0.0000050



Table 8. Continued.

Waterbody	Site ID	Sampling Date	Calcium (Ca)		Cesium (Cs)		Chloride (Cl)	Chromium (Cr)		Cobalt (Co)	
			Dissolved	Total	Dissolved	Total	Dissolved	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.05</i>	<i>0.050</i>	<i>0.000010</i>	<i>0.000010</i>	<i>0.20</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>
Lake Manitoba	WHB1	29-Aug-21	33.7	33.5	<0.000010	<0.000010	216	<0.00010	<0.00010	<0.00010	<0.00010
	WHB2	29-Aug-21	32.8	32.5	<0.000010	<0.000010	217	<0.00010	<0.00010	<0.00010	<0.00010
Watchorn Creek	WHC-WB	29-Aug-21	48.2	46.3	<0.000010	<0.000010	49.6	0.00014	0.00026	0.00013	0.00013
Mercer Creek	MC-WB	29-Aug-21	47.8	47.5	<0.000010	<0.000010	207	<0.00010	<0.00010	<0.00010	<0.00010
Birch Creek	BCD-2018-9	29-Aug-21	65.7	58.2	<0.000010	<0.000010	11.0	<0.00010	0.00012	<0.00010	0.00011
	BC-LSM	29-Aug-21	54.1	52.6	<0.000010	<0.000010	7.27	0.00014	0.00020	0.00012	0.00012
Fairford River	FR1	30-Aug-21	35.4	35.6	<0.000010	<0.000010	226	<0.00010	0.00016	<0.00010	<0.00010
	FR2	30-Aug-21	38.1	34.9	<0.000010	<0.000010	228	<0.00010	0.00028	<0.00010	<0.00010
Lake St. Martin	BB-LSM	29-Aug-21	36.9	36.2	<0.000010	0.000036	203	<0.00010	0.00053	<0.00010	0.00022
	LSM5	31-Aug-21	31.5	33.7	<0.000010	<0.000010	212	<0.00010	<0.00010	<0.00010	<0.00010
	LSM4	30-Aug-21	35.8	31.2	<0.000010	0.000011	219	<0.00010	0.00021	<0.00010	<0.00010
	LSM1	31-Aug-21	28.7	29.3	<0.000010	<0.000010	201	<0.00010	0.00013	<0.00010	<0.00010
	LSM3	31-Aug-21	25.7	25.0	<0.000010	<0.000010	215	<0.00010	<0.00010	<0.00010	0.00011
Dauphin River	DR-A	31-Aug-21	27.6	28.7	<0.000010	0.000013	217	<0.00010	0.00017	<0.00010	0.00014
	DR-B	30-Aug-21	26.5	29.5	<0.000010	0.000016	210	<0.00010	0.00021	<0.00010	0.00013
	DR-E	30-Aug-21	27.3	28.1	<0.000010	<0.000010	204	<0.00010	0.00013	<0.00010	0.00012
Big Buffalo Lake	BBL	3-Sep-21	36.5	42.2	<0.000010	<0.000010	21.5	<0.00010	0.00015	<0.00010	<0.00010
Buffalo Creek	BC3	3-Sep-21	39.8	37.8	<0.000010	<0.000010	7.89	<0.00010	0.00092	<0.00010	0.00033
Lake Winnipeg	SB1	30-Aug-21	28.1	29.3	<0.000010	0.000025	65.6	<0.00010	0.00037	<0.00010	0.00013
	SB2	30-Aug-21	26.9	28.0	<0.000010	0.000059	44.4	<0.00010	0.00107	<0.00010	0.00024

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Calcium (Ca)		Cesium (Cs)		Chloride (Cl)	Chromium (Cr)		Cobalt (Co)	
			Dissolved	Total	Dissolved	Total	Dissolved	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	39.2	40.8	<0.000010	<0.000010	221	<0.00010	0.00010	<0.00010	<0.00010
	WHB2	18-Oct-21	38.1	39.9	<0.000010	<0.000010	221	<0.00010	0.00011	<0.00010	<0.00010
Watchorn Creek	WHC-WB	18-Oct-21	54.5	56.1	<0.000010	<0.000010	182	<0.00010	<0.00010	<0.00010	<0.00010
Mercer Creek	MC-WB	18-Oct-21	55.7	57.0	<0.000010	<0.000010	233	<0.00010	0.00011	<0.00010	0.00010
Birch Creek	BCD-2018-9	18-Oct-21	81.4	83.3	<0.000010	<0.000010	23.7	<0.00010	0.00031	0.00010	0.00014
	BC-LSM	18-Oct-21	55.8	56.8	<0.000010	<0.000010	9.25	0.00014	0.00026	0.00016	0.00021
Fairford River	FR1	19-Oct-21	38.6	40.5	<0.000010	0.000013	226	<0.00010	0.00023	<0.00010	0.00010
	FR2	19-Oct-21	40.1	40.9	<0.000010	<0.000010	225	<0.00010	0.00010	<0.00010	<0.00010
Lake St. Martin	BB-LSM	18-Oct-21	41.6	41.6	<0.000010	<0.000010	222	<0.00010	0.00011	<0.00010	<0.00010
	LSM5	20-Oct-21	36.7	38.8	<0.000010	<0.000010	210	<0.00010	0.00026	<0.00010	<0.00010
	LSM4	19-Oct-21	38.3	37.8	<0.000010	<0.000010	222	<0.00010	0.00018	<0.00010	<0.00010
	LSM1	20-Oct-21	37.5	40.9	<0.000010	0.000017	216	<0.00010	0.00031	<0.00010	0.00013
	LSM3	20-Oct-21	38.6	38.8	<0.000010	<0.000010	206	<0.00010	0.00012	<0.00010	0.00010
Dauphin River	DR-A	17-Oct-21	35.3	39.4	<0.000010	0.000014	226	<0.00010	0.00016	<0.00010	0.00012
	DR-B	17-Oct-21	37.0	39.8	<0.000010	<0.000010	223	<0.00010	<0.00010	<0.00010	<0.00010
	DR-E	17-Oct-21	36.0	38.0	<0.000010	0.000015	218	<0.00010	0.00017	<0.00010	0.00012
Big Buffalo Lake	BBL	21-Oct-21	46.0	43.7	<0.000010	0.000012	22.9	<0.00010	0.00016	<0.00010	<0.00010
Buffalo Creek	BC3	21-Oct-21	47.1	44.9	<0.000010	0.000029	8.41	<0.00010	0.00049	<0.00010	0.00016
Lake Winnipeg	SB1	17-Oct-21	31.1	31.7	<0.000010	0.000019	42.8	<0.00010	0.00027	<0.00010	<0.00010
	SB2	17-Oct-21	28.9	32.1	<0.000010	0.000033	38.3	<0.00010	0.00043	<0.00010	0.00015

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Copper (Cu)		Fluoride (F)	Iron (Fe)		Lead (Pb)		Lithium (Li)	
			Dissolved	Total		Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00020</i>	<i>0.00050</i>	<i>0.040</i>	<i>0.010</i>	<i>0.010</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.0010</i>	<i>0.0010</i>
Lake Manitoba	WHB1	29-Aug-21	0.00022	<0.00050	0.144	<0.010	0.028	<0.000050	0.000115	0.0349	0.0346
	WHB2	29-Aug-21	0.00023	<0.00050	0.145	<0.010	0.036	<0.000050	0.000118	0.0351	0.0343
Watchorn Creek	WHC-WB	29-Aug-21	0.00117	0.00125	0.231	0.026	0.034	<0.000050	<0.000050	0.0357	0.0371
Mercer Creek	MC-WB	29-Aug-21	0.00030	<0.00050	0.147	<0.010	0.028	<0.000050	0.000052	0.0363	0.0374
Birch Creek	BCD-2018-9	29-Aug-21	0.00062	0.00072	0.285	0.030	0.039	<0.000050	<0.000050	0.0251	0.0241
	BC-LSM	29-Aug-21	0.00135	0.00139	0.314	0.030	0.044	<0.000050	<0.000050	0.0163	0.0170
Fairford River	FR1	30-Aug-21	0.00026	<0.00050	0.153	<0.010	0.059	<0.000050	0.000155	0.0353	0.0363
	FR2	30-Aug-21	0.00026	<0.00050	0.153	<0.010	0.050	<0.000050	0.000169	0.0388	0.0354
Lake St. Martin	BB-LSM	29-Aug-21	0.00030	0.00065	0.160	<0.010	0.249	<0.000050	0.000413	0.0368	0.0367
	LSM5	31-Aug-21	0.00022	<0.00050	0.166	<0.010	0.011 <sup>1</sup>	<0.000050	0.000101	0.0347	0.0355
	LSM4	30-Aug-21	0.00026	<0.00050	0.153	<0.010	0.063	<0.000050	0.000162	0.0368	0.0352
	LSM1	31-Aug-21	0.00028	<0.00050	0.158	<0.010	0.034	<0.000050	0.000145	0.0325	0.0326
	LSM3	31-Aug-21	0.00038	<0.00050	0.178	<0.010	0.031	<0.000050	0.000156	0.0370	0.0369
Dauphin River	DR-A	31-Aug-21	0.00032	<0.00050	0.162	<0.010	0.080	<0.000050	0.000234	0.0352	0.0361
	DR-B	30-Aug-21	0.00029	<0.00050	0.163	<0.010	0.093	<0.000050	0.000221	0.0339	0.0347
	DR-E	30-Aug-21	0.00036	0.00052	0.157	<0.010	0.067	<0.000050	0.000196	0.0336	0.0334
Big Buffalo Lake	BBL	3-Sep-21	0.00031	0.00051	0.192	<0.010	0.056	<0.000050	0.000080	0.0171	0.0191
Buffalo Creek	BC3	3-Sep-21	0.00068	0.00108	0.140	0.048	0.543	<0.000050	0.000241	0.0165	0.0127
Lake Winnipeg	SB1	30-Aug-21	0.00107	0.00137	0.125	<0.010	0.176	<0.000050	0.000136	0.0170	0.0178
	SB2	30-Aug-21	0.00118	0.00190	0.115	<0.010	0.454	<0.000050	0.000291	0.0141	0.0160

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Copper (Cu)		Fluoride (F)	Iron (Fe)		Lead (Pb)		Lithium (Li)	
			Dissolved	Total		Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00020</i>	<i>0.00050</i>	<i>0.040</i>	<i>0.010</i>	<i>0.010</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.0010</i>	<i>0.0010</i>
Lake Manitoba	WHB1	18-Oct-21	0.00028	<0.00050	0.163	<0.010	0.044	<0.000050	0.000162	0.0402	0.0420
	WHB2	18-Oct-21	0.00028	0.00052	0.162	<0.010	0.039	<0.000050	0.000147	0.0394	0.0420
Watchorn Creek	WHC-WB	18-Oct-21	0.00024	<0.00050	0.193	<0.010	0.018	<0.000050	<0.000050	0.0414	0.0459
Mercer Creek	MC-WB	18-Oct-21	0.00034	<0.00050	0.168	<0.010	0.048	<0.000050	0.000087	0.0415	0.0441
Birch Creek	BCD-2018-9	18-Oct-21	0.00057	0.00072	0.343	0.020	0.096	<0.000050	0.000061	0.0321	0.0357
	BC-LSM	18-Oct-21	0.00150	0.00172	0.349	0.015	0.058	<0.000050	<0.000050	0.0207	0.0226
Fairford River	FR1	19-Oct-21	0.00029	0.00055	0.168	<0.010	0.070	<0.000050	0.000193	0.0399	0.0380
	FR2	19-Oct-21	0.00029	<0.00050	0.166	<0.010	0.061	<0.000050	0.000191	0.0398	0.0378
Lake St. Martin	BB-LSM	18-Oct-21	0.00045	<0.00050	0.176	<0.010	0.036	<0.000050	0.000236	0.0408	0.0433
	LSM5	20-Oct-21	0.00024	<0.00050	0.167	<0.010	0.049	<0.000050	0.000205	0.0367	0.0398
	LSM4	19-Oct-21	0.00025	<0.00050	0.169	<0.010	0.033	<0.000050	0.000133	0.0403	0.0381
	LSM1	20-Oct-21	0.00032	0.00051	0.171	<0.010	0.115	<0.000050	0.000270	0.0412	0.0409
	LSM3	20-Oct-21	0.00036	<0.00050	0.175	<0.010	0.049	<0.000050	0.000278	0.0408	0.0386
Dauphin River	DR-A	17-Oct-21	0.00027	0.00054	0.168	<0.010	0.087	<0.000050	0.000233	0.0392	0.0435
	DR-B	17-Oct-21	0.00034	<0.00050	0.170	<0.010	0.046	<0.000050	0.000201	0.0396	0.0429
	DR-E	17-Oct-21	0.00028	<0.00050	0.168	<0.010	0.091	<0.000050	0.000205	0.0380	0.0408
Big Buffalo Lake	BBL	21-Oct-21	0.00041	0.00061	0.194	<0.010	0.083	<0.000050	0.000075	0.0188	0.0177
Buffalo Creek	BC3	21-Oct-21	0.00053	0.00073	0.157	0.026	0.283	<0.000050	0.000121	0.0122	0.0124
Lake Winnipeg	SB1	17-Oct-21	0.00122	0.00150	0.119	<0.010	0.129	<0.000050	0.000108	0.0153	0.0166
	SB2	17-Oct-21	0.00116	0.00152	0.119	<0.010	0.226	<0.000050	0.000172	0.0120	0.0165

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Magnesium (Mg)		Manganese (Mn)		Mercury (Hg)		Molybdenum (Mo)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.0050</i>	<i>0.0050</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00000050</i>	<i>0.00000050</i>	<i>0.000050</i>	<i>0.000050</i>
Lake Manitoba	WHB1	29-Aug-21	39.5	37.9	<0.00010	0.00518	<0.00000050	0.00000054	0.00220	0.00225
	WHB2	29-Aug-21	40.0	38.8	<0.00010	0.00543	<0.00000050	0.00000062	0.00223	0.00231
Watchorn Creek	WHC-WB	29-Aug-21	50.3	48.8	0.00154	0.00612	<0.00000050	0.00000056	0.00194	0.00195
Mercer Creek	MC-WB	29-Aug-21	46.7	46.2	0.00051	0.00734	<0.00000050	0.00000062	0.00305	0.00296
Birch Creek	BCD-2018-9	29-Aug-21	80.5	75.2	0.00182	0.0143	0.00000109	<0.00000050	0.00484	0.00456
	BC-LSM	29-Aug-21	54.1	54.4	0.00389	0.00623	0.00000117	0.00000112	0.00233	0.00233
Fairford River	FR1	30-Aug-21	39.8	39.1	<0.00010	0.00651	<0.00000050	0.00000057	0.00233	0.00245
	FR2	30-Aug-21	43.3	39.0	<0.00010	0.00654	<0.00000050	0.00000059	0.00247	0.00236
Lake St. Martin	BB-LSM	29-Aug-21	42.3	41.1	<0.00010	0.0182	0.00000071	0.00000120	0.00252	0.00235
	LSM5	31-Aug-21	39.8	39.7	<0.00010	0.00505	<0.00000050	<0.00000050	0.00242	0.00241
	LSM4	30-Aug-21	43.0	38.7	0.00022	0.00779	<0.00000050	0.00000061	0.00274	0.00254
	LSM1	31-Aug-21	37.9	37.2	<0.00010	0.00664	<0.00000050	0.00000057	0.00247	0.00251
	LSM3	31-Aug-21	44.7	43.9	0.00013	0.00883	<0.00000050	0.00000087	0.00241	0.00240
Dauphin River	DR-A	31-Aug-21	39.5	40.4	0.00022	0.0115	<0.00000050	0.00000088	0.00269	0.00264
	DR-B	30-Aug-21	39.1	38.9	0.00015	0.0106	<0.00000050	0.00000083	0.00249	0.00251
	DR-E	30-Aug-21	39.1	37.6	0.00019	0.00952	<0.00000050	0.00000072	0.00243	0.00240
Big Buffalo Lake	BBL	3-Sep-21	38.7	42.3	0.00051	0.0110	0.00000064	0.00000106	0.000822	0.000817
Buffalo Creek	BC3	3-Sep-21	24.7	25.4	0.00246	0.0398	0.00000096	0.00000132	0.000402	0.000397
Lake Winnipeg	SB1	30-Aug-21	22.0	21.8	0.00020	0.00385	<0.00000050	<0.00000050	0.00122	0.00118
	SB2	30-Aug-21	19.4	19.2	0.00018	0.00709	<0.00000050	<0.00000050	0.00104	0.00108

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Magnesium (Mg)		Manganese (Mn)		Mercury (Hg)		Molybdenum (Mo)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	41.3	41.7	<0.00010	0.00694	<0.00000050	0.00000070	0.00234	0.00222
	WHB2	18-Oct-21	40.9	42.0	<0.00010	0.00574	<0.00000050	0.00000069	0.00228	0.00223
Watchorn Creek	WHC-WB	18-Oct-21	51.8	54.9	0.00050	0.0131	<0.00000050	0.00000061	0.00145	0.00130
Mercer Creek	MC-WB	18-Oct-21	46.5	47.1	0.00036	0.0165	<0.00000050	0.00000096	0.00223	0.00212
Birch Creek	BCD-2018-9	18-Oct-21	107	107	0.00454	0.0294	<0.00000050	0.00000123	0.00117	0.00110
	BC-LSM	18-Oct-21	72.7	73.8	0.00046	0.0229	0.00000076	0.00000195	0.00149	0.00146
Fairford River	FR1	19-Oct-21	41.2	40.7	<0.00010	0.00734	<0.00000050	0.00000081	0.00236	0.00231
	FR2	19-Oct-21	42.1	40.7	<0.00010	0.00719	<0.00000050	0.00000072	0.00251	0.00234
Lake St. Martin	BB-LSM	18-Oct-21	43.3	42.4	<0.00010	0.00970	<0.00000050	0.00000060	0.00275	0.00262
	LSM5	20-Oct-21	42.6	41.5	0.00010	0.00892	<0.00000050	0.00000079	0.00231	0.00249
	LSM4	19-Oct-21	42.5	42.2	0.00011	0.00583	<0.00000050	0.00000069	0.00250	0.00251
	LSM1	20-Oct-21	44.4	43.3	0.00010	0.0109	<0.00000050	0.00000079	0.00265	0.00270
Dauphin River	LSM3	20-Oct-21	46.4	46.5	0.00012	0.0118	<0.00000050	0.00000081	0.00274	0.00265
	DR-A	17-Oct-21	42.0	45.9	0.00011	0.00992	<0.00000050	0.00000085	0.00274	0.00289
	DR-B	17-Oct-21	42.5	45.5	0.00017	0.00905	<0.00000050	0.00000060	0.00266	0.00280
Big Buffalo Lake	DR-E	17-Oct-21	41.9	44.0	0.00012	0.00898	<0.00000050	0.00000075	0.00259	0.00274
	BBL	21-Oct-21	46.9	45.5	0.00026	0.0103	<0.00000050	0.00000055	0.000777	0.000836
	Buffalo Creek	BC3	21-Oct-21	32.6	32.3	0.00055	0.0157	0.00000052	0.00000084	0.000209
Lake Winnipeg	SB1	17-Oct-21	19.9	20.4	0.00011	0.00248	<0.00000050	<0.00000050	0.00109	0.00113
	SB2	17-Oct-21	19.2	19.8	0.00011	0.00535	<0.00000050	0.00000062	0.000951	0.00103

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Nickel (Ni)		Potassium (K)		Rubidium (Rb)		Selenium (Se)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00050</i>	<i>0.00050</i>	<i>0.050</i>	<i>0.050</i>	<i>0.00020</i>	<i>0.00020</i>	<i>0.000050</i>	<i>0.000050</i>
Lake Manitoba	WHB1	29-Aug-21	<0.00050	0.00054	11.4	9.67	0.00420	0.00392	0.000071	0.000074
	WHB2	29-Aug-21	<0.00050	0.00058	11.7	10.0	0.00429	0.00404	0.000087	<0.000050
Watchorn Creek	WHC-WB	29-Aug-21	0.00112	0.00114	9.87	8.62	0.00358	0.00335	0.000232	0.000192
Mercer Creek	MC-WB	29-Aug-21	0.00057	0.00062	11.5	10.0	0.00431	0.00399	0.000095	0.000073
Birch Creek	BCD-2018-9	29-Aug-21	0.00056	0.00063	8.52	8.41	0.00349	0.00344	0.000169	0.000126
	BC-LSM	29-Aug-21	0.00091	0.00097	5.32	5.07	0.00219	0.00205	0.000212	0.000185
Fairford River	FR1	30-Aug-21	<0.00050	0.00063	11.5	9.92	0.00429	0.00417	0.000099	0.000071
	FR2	30-Aug-21	<0.00050	0.00064	11.5	9.81	0.00425	0.00411	0.000080	0.000072
Lake St. Martin	BB-LSM	29-Aug-21	<0.00050	0.00100	10.5	10.4	0.00429	0.00473	0.000084	0.000106
	LSM5	31-Aug-21	<0.00050	0.00054	11.4	10.7	0.00419	0.00393	0.000068	0.000079
	LSM4	30-Aug-21	<0.00050	0.00073	11.0	10.0	0.00417	0.00417	0.000094	0.000082
	LSM1	31-Aug-21	<0.00050	0.00058	10.6	10.0	0.00395	0.00372	0.000096	0.000126
	LSM3	31-Aug-21	0.00050	0.00059	11.5	10.8	0.00470	0.00438	0.000099	0.000110
Dauphin River	DR-A	31-Aug-21	0.00053	0.00072	11.4	11.0	0.00428	0.00412	0.000103	0.000105
	DR-B	30-Aug-21	<0.00050	0.00072	11.0	10.3	0.00415	0.00411	0.000082	0.000100
	DR-E	30-Aug-21	0.00052	0.00068	10.7	10.0	0.00402	0.00393	0.000107	0.000110
Big Buffalo Lake	BBL	3-Sep-21	<0.00050	<0.00050	4.29	4.32	0.00324	0.00289	0.000148	0.000105
Buffalo Creek	BC3	3-Sep-21	0.00056	0.00124	2.04	2.26	0.00213	0.00343	0.000127	0.000126
Lake Winnipeg	SB1	30-Aug-21	0.00066	0.00104	5.47	5.32	0.00202	0.00238	0.000146	0.000116
	SB2	30-Aug-21	0.00071	0.00149	4.59	4.51	0.00173	0.00274	0.000144	0.000149

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Nickel (Ni)		Potassium (K)		Rubidium (Rb)		Selenium (Se)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	<0.00050	0.00064	11.8	10.9	0.00431	0.00408	0.000065	0.000121
	WHB2	18-Oct-21	<0.00050	0.00062	11.4	10.9	0.00429	0.00417	0.000106	0.000108
Watchorn Creek	WHC-WB	18-Oct-21	0.00053	0.00059	13.1	12.7	0.00424	0.00412	0.000083	0.000121
Mercer Creek	MC-WB	18-Oct-21	0.00062	0.00075	14.9	13.9	0.00473	0.00461	0.000091	0.000136
Birch Creek	BCD-2018-9	18-Oct-21	0.00089	0.00100	11.2	10.2	0.00386	0.00371	0.000206	0.000200
	BC-LSM	18-Oct-21	0.00101	0.00121	8.78	8.19	0.00240	0.00242	0.000194	0.000217
Fairford River	FR1	19-Oct-21	<0.00050	0.00077	11.1	10.9	0.00442	0.00417	0.000095	0.000085
	FR2	19-Oct-21	<0.00050	0.00067	11.2	10.6	0.00446	0.00415	0.000072	0.000075
Lake St. Martin	BB-LSM	18-Oct-21	0.00060	0.00068	11.9	11.2	0.00451	0.00413	0.000077	0.000095
	LSM5	20-Oct-21	<0.00050	0.00066	11.0	10.7	0.00426	0.00431	0.000106	0.000087
	LSM4	19-Oct-21	<0.00050	0.00069	11.3	10.8	0.00435	0.00416	<0.000050	0.000076
	LSM1	20-Oct-21	0.00058	0.00083	11.4	10.9	0.00435	0.00438	0.000086	0.000091
	LSM3	20-Oct-21	0.00067	0.00063	10.8	10.5	0.00432	0.00415	0.000077	0.000096
Dauphin River	DR-A	17-Oct-21	0.00052	0.00074	11.2	11.4	0.00386	0.00449	0.000102	0.000110
	DR-B	17-Oct-21	0.00057	0.00065	11.4	11.1	0.00406	0.00439	0.000094	0.000101
	DR-E	17-Oct-21	0.00051	0.00074	11.0	10.7	0.00389	0.00429	0.000092	0.000103
Big Buffalo Lake	BBL	21-Oct-21	<0.00050	<0.00050	4.63	4.57	0.00262	0.00276	0.000101	0.000088
Buffalo Creek	BC3	21-Oct-21	<0.00050	0.00079	2.50	2.57	0.00174	0.00236	0.000117	0.000081
Lake Winnipeg	SB1	17-Oct-21	0.00076	0.00094	4.23	4.39	0.00163	0.00228	0.000177	0.000131
	SB2	17-Oct-21	0.00067	0.00110	3.97	4.22	0.00165	0.00221	0.000138	0.000136



Table 8. Continued.

Waterbody	Site ID	Sampling Date	Silicon (Si)		Silver (Ag)		Sodium (Na)		Strontium (Sr)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.050</i>	<i>0.10</i>	<i>0.000010</i>	<i>0.000010</i>	<i>0.050</i>	<i>0.050</i>	<i>0.00010</i>	<i>0.00020</i>
Lake Manitoba	WHB1	29-Aug-21	3.16	3.16	<0.000010	<0.000010	152	139	0.302	0.259
	WHB2	29-Aug-21	3.02	3.18	<0.000010	<0.000010	151	139	0.290	0.258
Watchorn Creek	WHC-WB	29-Aug-21	6.89	7.00	<0.000010	<0.000010	29.6	27.7	0.187	0.160
Mercer Creek	MC-WB	29-Aug-21	3.32	3.29	<0.000010	<0.000010	142	134	0.320	0.278
Birch Creek	BCD-2018-9	29-Aug-21	6.28	6.87	<0.000010	<0.000010	15.5	15.5	0.209	0.190
	BC-LSM	29-Aug-21	8.39	8.74	<0.000010	<0.000010	11.2	11.2	0.141	0.138
Fairford River	FR1	30-Aug-21	3.40	3.64	<0.000010	<0.000010	153	145	0.306	0.270
	FR2	30-Aug-21	3.25	3.40	<0.000010	<0.000010	160	142	0.312	0.269
Lake St. Martin	BB-LSM	29-Aug-21	3.02	3.80	<0.000010	<0.000010	150	149	0.274	0.251
	LSM5	31-Aug-21	2.55	2.66	<0.000010	<0.000010	149	150	0.284	0.271
	LSM4	30-Aug-21	2.02	2.43	<0.000010	0.000025	156	143	0.275	0.242
	LSM1	31-Aug-21	2.38	2.63	<0.000010	<0.000010	141	141	0.254	0.229
	LSM3	31-Aug-21	2.36	2.47	<0.000010	<0.000010	158	152	0.213	0.196
Dauphin River	DR-A	31-Aug-21	1.98	2.28	<0.000010	<0.000010	151	153	0.233	0.218
	DR-B	30-Aug-21	2.13	2.54	<0.000010	<0.000010	149	148	0.230	0.217
	DR-E	30-Aug-21	2.10	2.23	<0.000010	<0.000010	142	141	0.229	0.209
Big Buffalo Lake	BBL	3-Sep-21	7.64	8.55	<0.000010	<0.000010	28.4	30.7	0.157	0.155
Buffalo Creek	BC3	3-Sep-21	5.27	6.70	<0.000010	<0.000010	14.9	14.8	0.105	0.0951
Lake Winnipeg	SB1	30-Aug-21	3.07	3.68	<0.000010	<0.000010	51.9	52.3	0.175	0.163
	SB2	30-Aug-21	3.42	4.52	<0.000010	<0.000010	37.3	38.1	0.162	0.149

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Silicon (Si)		Silver (Ag)		Sodium (Na)		Strontium (Sr)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	3.72	3.91	<0.000010	<0.000010	156	159	0.294	0.276
	WHB2	18-Oct-21	3.54	3.75	<0.000010	<0.000010	154	161	0.284	0.275
Watchorn Creek	WHC-WB	18-Oct-21	4.79	5.10	<0.000010	<0.000010	120	129	0.283	0.273
Mercer Creek	MC-WB	18-Oct-21	2.41	2.61	<0.000010	<0.000010	159	165	0.319	0.309
Birch Creek	BCD-2018-9	18-Oct-21	5.31	5.70	<0.000010	<0.000010	25.6	26.2	0.276	0.261
	BC-LSM	18-Oct-21	6.81	7.40	<0.000010	<0.000010	11.6	12.1	0.170	0.162
Fairford River	FR1	19-Oct-21	3.72	3.64	<0.000010	<0.000010	153	153	0.294	0.282
	FR2	19-Oct-21	3.65	3.55	<0.000010	<0.000010	156	154	0.305	0.285
Lake St. Martin	BB-LSM	18-Oct-21	3.32	3.36	<0.000010	<0.000010	156	160	0.295	0.284
	LSM5	20-Oct-21	2.77	3.05	<0.000010	<0.000010	161	151	0.263	0.281
	LSM4	19-Oct-21	2.15	2.17	<0.000010	<0.000010	151	158	0.284	0.279
	LSM1	20-Oct-21	2.42	2.71	<0.000010	<0.000010	154	153	0.285	0.285
	LSM3	20-Oct-21	2.08	2.15	<0.000010	<0.000010	147	147	0.249	0.243
Dauphin River	DR-A	17-Oct-21	2.26	2.81	<0.000010	<0.000010	149	161	0.248	0.279
	DR-B	17-Oct-21	2.33	2.73	<0.000010	<0.000010	154	159	0.257	0.276
	DR-E	17-Oct-21	2.18	2.72	<0.000010	<0.000010	145	152	0.249	0.268
Big Buffalo Lake	BBL	21-Oct-21	9.36	9.40	<0.000010	<0.000010	36.1	33.2	0.170	0.176
Buffalo Creek	BC3	21-Oct-21	4.53	5.07	<0.000010	<0.000010	19.6	19.1	0.112	0.114
Lake Winnipeg	SB1	17-Oct-21	3.04	3.75	<0.000010	<0.000010	36.0	36.1	0.150	0.162
	SB2	17-Oct-21	2.66	3.84	<0.000010	<0.000010	31.2	32.9	0.144	0.160

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Sulphate (SO <sub>4</sub> )	Sulphur (S)		Tellurium (Te)		Thallium (Tl)	
			Dissolved	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			0.60	0.50	0.50	0.00020	0.00020	0.000010	0.000010
Lake Manitoba	WHB1	29-Aug-21	92.0	32.5	33.4	<0.00020	<0.00020	<0.000010	<0.000010
	WHB2	29-Aug-21	94.5	32.4	36.1	<0.00020	<0.00020	<0.000010	<0.000010
Watchorn Creek	WHC-WB	29-Aug-21	80.8	28.7	30.8	<0.00020	<0.00020	<0.000010	<0.000010
Mercer Creek	MC-WB	29-Aug-21	141	49.9	53.5	<0.00020	<0.00020	<0.000010	<0.000010
Birch Creek	BCD-2018-9	29-Aug-21	225	80.6	92.0	<0.00020	<0.00020	<0.000010	<0.000010
	BC-LSM	29-Aug-21	104	38.7	41.2	<0.00020	<0.00020	<0.000010	<0.000010
Fairford River	FR1	30-Aug-21	94.5	32.9	35.6	<0.00020	<0.00020	<0.000010	<0.000010
	FR2	30-Aug-21	95.6	33.4	35.6	<0.00020	<0.00020	<0.000010	<0.000010
Lake St. Martin	BB-LSM	29-Aug-21	86.7	31.8	36.1	<0.00020	<0.00020	<0.000010	<0.000010
	LSM5	31-Aug-21	91.8	33.0	34.4	<0.00020	<0.00020	<0.000010	<0.000010
	LSM4	30-Aug-21	94.1	33.2	36.3	<0.00020	<0.00020	<0.000010	<0.000010
	LSM1	31-Aug-21	88.4	32.0	33.0	<0.00020	<0.00020	<0.000010	<0.000010
	LSM3	31-Aug-21	96.6	35.9	37.2	<0.00020	<0.00020	<0.000010	<0.000010
Dauphin River	DR-A	31-Aug-21	96.0	33.9	37.0	<0.00020	<0.00020	<0.000010	<0.000010
	DR-B	30-Aug-21	92.9	33.3	34.1	<0.00020	<0.00020	<0.000010	<0.000010
	DR-E	30-Aug-21	92.4	32.1	33.7	<0.00020	<0.00020	<0.000010	<0.000010
Big Buffalo Lake	BBL	3-Sep-21	51.7	18.1	21.2	<0.00020	<0.00020	<0.000010	<0.000010
Buffalo Creek	BC3	3-Sep-21	42.0	13.8	15.7	<0.00020	<0.00020	<0.000010	0.000010
Lake Winnipeg	SB1	30-Aug-21	54.2	18.7	19.6	<0.00020	<0.00020	<0.000010	<0.000010
	SB2	30-Aug-21	48.7	17.1	17.6	<0.00020	<0.00020	<0.000010	<0.000010

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Sulphate (SO <sub>4</sub> )	Sulphur (S)		Tellurium (Te)		Thallium (Tl)	
			Dissolved	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	93.8	33.9	36.0	<0.00020	<0.00020	<0.000010	<0.000010
	WHB2	18-Oct-21	94.2	33.2	35.8	<0.00020	<0.00020	<0.000010	<0.000010
Watchorn Creek	WHC-WB	18-Oct-21	99.5	36.7	38.7	<0.00020	<0.00020	<0.000010	<0.000010
Mercer Creek	MC-WB	18-Oct-21	99.9	36.2	38.3	<0.00020	<0.00020	<0.000010	<0.000010
Birch Creek	BCD-2018-9	18-Oct-21	242	87.0	88.7	<0.00020	<0.00020	<0.000010	<0.000010
	BC-LSM	18-Oct-21	114	38.5	42.6	<0.00020	<0.00020	<0.000010	<0.000010
Fairford River	FR1	19-Oct-21	93.8	34.0	33.7	<0.00020	<0.00020	<0.000010	<0.000010
	FR2	19-Oct-21	93.2	34.0	35.0	<0.00020	<0.00020	<0.000010	<0.000010
Lake St. Martin	BB-LSM	18-Oct-21	96.1	34.6	35.8	<0.00020	<0.00020	<0.000010	<0.000010
	LSM5	20-Oct-21	91.0	33.5	34.8	<0.00020	<0.00020	<0.000010	<0.000010
	LSM4	19-Oct-21	94.1	34.6	37.0	<0.00020	<0.00020	<0.000010	<0.000010
	LSM1	20-Oct-21	94.4	34.6	37.2	<0.00020	<0.00020	<0.000010	<0.000010
	LSM3	20-Oct-21	97.2	35.8	37.1	<0.00020	<0.00020	<0.000010	<0.000010
Dauphin River	DR-A	17-Oct-21	98.3	34.3	39.7	<0.00020	<0.00020	<0.000010	<0.000010
	DR-B	17-Oct-21	98.2	33.9	38.5	<0.00020	<0.00020	<0.000010	<0.000010
	DR-E	17-Oct-21	97.8	34.0	38.6	<0.00020	<0.00020	<0.000010	<0.000010
Big Buffalo Lake	BBL	21-Oct-21	54.5	20.9	20.7	<0.00020	<0.00020	<0.000010	<0.000010
Buffalo Creek	BC3	21-Oct-21	40.2	14.9	15.4	<0.00020	<0.00020	<0.000010	<0.000010
Lake Winnipeg	SB1	17-Oct-21	49.5	17.0	18.0	<0.00020	<0.00020	<0.000010	<0.000010
	SB2	17-Oct-21	48.4	14.8	18.1	<0.00020	<0.00020	<0.000010	<0.000010

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Thorium (Th)		Tin (Sn)		Titanium (Ti)		Tungsten (W)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00030</i>	<i>0.00030</i>	<i>0.00010</i>	<i>0.00010</i>
Lake Manitoba	WHB1	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00267	<0.00010	<0.00010
	WHB2	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00141	<0.00010	<0.00010
Watchorn Creek	WHC-WB	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00041	0.00081	<0.00010	<0.00010
Mercer Creek	MC-WB	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00074	<0.00010	<0.00010
Birch Creek	BCD-2018-9	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	<0.00030	<0.00010	<0.00010
	BC-LSM	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00043	0.00096	<0.00010	<0.00010
Fairford River	FR1	30-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00227	<0.00010	<0.00010
	FR2	30-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00198	<0.00010	<0.00010
Lake St. Martin	BB-LSM	29-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.01010	<0.00010	<0.00010
	LSM5	31-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	<0.00030	<0.00010	<0.00010
	LSM4	30-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00288	<0.00010	<0.00010
	LSM1	31-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00173	<0.00010	<0.00010
	LSM3	31-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00086	<0.00010	<0.00010
Dauphin River	DR-A	31-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00347	<0.00010	<0.00010
	DR-B	30-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00429	<0.00010	<0.00010
	DR-E	30-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00245	<0.00010	<0.00010
Big Buffalo Lake	BBL	3-Sep-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00141	<0.00010	<0.00010
Buffalo Creek	BC3	3-Sep-21	<0.00010	0.00013	<0.00010	<0.00010	0.00142	0.0219	<0.00010	<0.00010
Lake Winnipeg	SB1	30-Aug-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00100	0.00888	<0.00010	<0.00010
	SB2	30-Aug-21	<0.00010	0.00013	<0.00010	<0.00010	0.00122	0.0204	<0.00010	<0.00010

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Thorium (Th)		Tin (Sn)		Titanium (Ti)		Tungsten (W)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00145	<0.00010	<0.00010
	WHB2	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00131	<0.00010	<0.00010
Watchorn Creek	WHC-WB	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00069	<0.00010	<0.00010
Mercer Creek	MC-WB	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00162	<0.00010	<0.00010
Birch Creek	BCD-2018-9	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00039	0.00373	<0.00010	<0.00010
	BC-LSM	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00191	<0.00010	<0.00010
Fairford River	FR1	19-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00247	<0.00010	<0.00010
	FR2	19-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00205	<0.00010	<0.00010
Lake St. Martin	BB-LSM	18-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00129	<0.00010	<0.00010
	LSM5	20-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00186	<0.00010	<0.00010
	LSM4	19-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00120	<0.00010	<0.00010
	LSM1	20-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00515	<0.00010	<0.00010
Dauphin River	LSM3	20-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00165	<0.00010	<0.00010
	DR-A	17-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00326	<0.00010	<0.00010
	DR-B	17-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00162	<0.00010	<0.00010
Big Buffalo Lake	DR-E	17-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00350	<0.00010	<0.00010
	BBL	21-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	<0.00030	0.00275	<0.00010	<0.00010
	BC3	21-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00076	0.0116	<0.00010	<0.00010
Lake Winnipeg	SB1	17-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00067	0.00609	<0.00010	<0.00010
	SB2	17-Oct-21	<0.00010	<0.00010	<0.00010	<0.00010	0.00082	0.0100	<0.00010	<0.00010

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Uranium (U)		Vanadium (V)		Zinc (Zn)		Zirconium (Zr)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.000010</i>	<i>0.000010</i>	<i>0.00050</i>	<i>0.00050</i>	<i>0.0010</i>	<i>0.0030</i>	<i>0.00020</i>	<i>0.00020</i>
Lake Manitoba	WHB1	29-Aug-21	0.00148	0.00153	0.00124	0.00158	<0.0010	<0.0030	<0.00020	<0.00020
	WHB2	29-Aug-21	0.00151	0.00149	0.00126	0.00158	<0.0010	<0.0030	<0.00020	<0.00020
Watchorn Creek	WHC-WB	29-Aug-21	0.00232	0.00241	0.00122	0.00146	<0.0010	<0.0030	0.00025	<0.00020
Mercer Creek	MC-WB	29-Aug-21	0.00147	0.00156	0.00124	0.00147	<0.0010	<0.0030	<0.00020	<0.00020
Birch Creek	BCD-2018-9	29-Aug-21	0.00177	0.00191	0.00064	0.00098	<0.0010	<0.0030	<0.00020	<0.00020
	BC-LSM	29-Aug-21	0.00236	0.00234	0.00123	0.00144	0.0010	<0.0030	0.00022	0.00021
Fairford River	FR1	30-Aug-21	0.00157	0.00166	0.00129	0.00156	<0.0010	<0.0030	<0.00020	<0.00020
	FR2	30-Aug-21	0.00158	0.00156	0.00126	0.00152	<0.0010	<0.0030	<0.00020	<0.00020
Lake St. Martin	BB-LSM	29-Aug-21	0.00173	0.00181	0.00148	0.00234	<0.0010	<0.0030	<0.00020	0.00031
	LSM5	31-Aug-21	0.00157	0.00148	0.00141	0.00168	<0.0010	<0.0030	<0.00020	<0.00020
	LSM4	30-Aug-21	0.00175	0.00182	0.00149	0.00203	<0.0010	<0.0030	<0.00020	<0.00020
	LSM1	31-Aug-21	0.00159	0.00158	0.00138	0.00175	<0.0010	<0.0030	<0.00020	<0.00020
	LSM3	31-Aug-21	0.00143	0.00142	0.00149	0.00185	<0.0010	<0.0030	<0.00020	<0.00020
Dauphin River	DR-A	31-Aug-21	0.00170	0.00170	0.00167	0.00214	<0.0010	<0.0030	<0.00020	<0.00020
	DR-B	30-Aug-21	0.00154	0.00164	0.00154	0.00205	<0.0010	<0.0030	<0.00020	0.00020
	DR-E	30-Aug-21	0.00149	0.00150	0.00157	0.00189	<0.0010	<0.0030	<0.00020	<0.00020
Big Buffalo Lake	BBL	3-Sep-21	0.00100	0.000893	0.00074	0.00114	0.0022	0.0044	<0.00020	<0.00020
Buffalo Creek	BC3	3-Sep-21	0.000301	0.000305	0.00072	0.00187	<0.0010	<0.0030	0.00021	0.00044
Lake Winnipeg	SB1	30-Aug-21	0.000964	0.00101	0.00200	0.00250	<0.0010	<0.0030	<0.00020	0.00023
	SB2	30-Aug-21	0.000868	0.000967	0.00186	0.00282	<0.0010	0.0070	<0.00020	0.00033

Table 8. Continued.

Waterbody	Site ID	Sampling Date	Uranium (U)		Vanadium (V)		Zinc (Zn)		Zirconium (Zr)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Lake Manitoba	WHB1	18-Oct-21	0.00175	0.00156	0.00116	0.00166	<0.0010	<0.0030	<0.00020	<0.00020
	WHB2	18-Oct-21	0.00171	0.00157	0.00111	0.00167	<0.0010	<0.0030	<0.00020	<0.00020
Watchorn Creek	WHC-WB	18-Oct-21	0.00167	0.00135	0.00077	0.00121	<0.0010	<0.0030	<0.00020	<0.00020
Mercer Creek	MC-WB	18-Oct-21	0.00198	0.00182	0.00097	0.00148	<0.0010	<0.0030	<0.00020	<0.00020
Birch Creek	BCD-2018-9	18-Oct-21	0.00285	0.00273	<0.00050	0.00090	<0.0010	<0.0030	<0.00020	0.00020
	BC-LSM	18-Oct-21	0.00279	0.00281	0.00114	0.00172	<0.0010	<0.0030	0.00031	0.00029
Fairford River	FR1	19-Oct-21	0.00181	0.00166	0.00108	0.00140	<0.0010	<0.0030	<0.00020	<0.00020
	FR2	19-Oct-21	0.00188	0.00167	0.00116	0.00149	<0.0010	<0.0030	<0.00020	<0.00020
Lake St. Martin	BB-LSM	18-Oct-21	0.00203	0.00167	0.00133	0.00186	<0.0010	<0.0030	<0.00020	<0.00020
	LSM5	20-Oct-21	0.00160	0.00181	0.00132	0.00164	<0.0010	<0.0030	<0.00020	<0.00020
	LSM4	19-Oct-21	0.00182	0.00194	0.00119	0.00154	<0.0010	<0.0030	<0.00020	<0.00020
	LSM1	20-Oct-21	0.00198	0.00207	0.00104	0.00166	<0.0010	<0.0030	<0.00020	<0.00020
	LSM3	20-Oct-21	0.00190	0.00178	0.00079	0.00122	<0.0010	<0.0030	<0.00020	<0.00020
Dauphin River	DR-A	17-Oct-21	0.00188	0.00210	0.00113	0.00183	<0.0010	<0.0030	<0.00020	<0.00020
	DR-B	17-Oct-21	0.00189	0.00195	0.00102	0.00162	<0.0010	<0.0030	<0.00020	<0.00020
	DR-E	17-Oct-21	0.00185	0.00205	0.00097	0.00161	<0.0010	<0.0030	<0.00020	<0.00020
Big Buffalo Lake	BBL	21-Oct-21	0.000864	0.000899	0.00076	0.00120	<0.0010	<0.0030	<0.00020	<0.00020
Buffalo Creek	BC3	21-Oct-21	0.000260	0.000274	<0.00050	0.00128	<0.0010	<0.0030	<0.00020	0.00036
Lake Winnipeg	SB1	17-Oct-21	0.000967	0.00104	0.00177	0.00252	<0.0010	<0.0030	<0.00020	<0.00020
	SB2	17-Oct-21	0.000810	0.00104	0.00176	0.00270	<0.0010	<0.0030	<0.00020	0.00028

1 - Result verified by the analytical laboratory.



Table 9. *In situ* survey results. Values in blue italics are considered suspect.

Waterbody	Sampling Date	Sampling Time	Total Water Depth (m)	Sample Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	Turbidity (NTU)	pH
Reed Lake	3-Sep-21	10:33	0.4	0.3	17.17	8.14	85.0	966	6.37	8.78
Clear Lake	3-Sep-21	10:36	0.3	0.3	18.18	9.04	96.5	593	0.80	8.67
Water Lake	3-Sep-21	10:39	0.2	0.3	17.13	7.86	81.6	885	11.17	8.21
Goodison Lake	3-Sep-21	10:42	0.2	0.3	16.80	7.18	74.2	1284	4.30	8.04
Creek C upstream of LSMOC alignment	3-Sep-21	12:10	0.4	0.3	18.06	8.16	86.7	222	0.11	7.38
Unnamed Creek										
at LSMOC alignment	3-Sep-21	12:29	0.4	0.3	19.48	10.12	110.2	343	0.20	7.68
at Buffalo Creek	3-Sep-21	12:39	1.2	0.3	18.50	8.35	88.5	310	0.62	7.79
Reed Lake	21-Oct-21	13:56	0.5	0.3	5.61	12.24	97.6	1095	5.94	8.89
Clear Lake	21-Oct-21	13:52	0.5	0.3	5.63	9.77	78.1	739	38.19	8.24
Water Lake	21-Oct-21	13:48	0.3	0.3	5.21	13.08	103.9	1252	15.42	8.78
Goodison Lake	21-Oct-21	13:43	0.2	0.2	<i>5.40</i> <sup>1</sup>	<i>14.70</i> <sup>1</sup>	<i>116.3</i> <sup>1</sup>	<i>1572</i> <sup>1</sup>	- <sup>1</sup>	<i>8.91</i> <sup>1</sup>
Creek C upstream of LSMOC alignment	21-Oct-21	13:06	0.5	0.3	4.98	4.19	32.4	220	1.25	7.08
Unnamed Creek										
at LSMOC alignment	21-Oct-21	13:11	0.4	0.3	4.32	10.83	84.0	346	3.92	7.62
at Buffalo Creek	21-Oct-21	13:15	1.0	0.3	5.94	11.41	91.6	323	0.53	8.26
Woodale Drain	21-Oct-21	13:35	<0.10	0.3	- <sup>1</sup>	- <sup>1</sup>	- <sup>1</sup>	- <sup>1</sup>	- <sup>1</sup>	- <sup>1</sup>
Clarks Drain	21-Oct-21	13:39	0.2	0.2	3.84	13.07	98.9	571	3.36	8.52

1 - Insufficient water for accurate *in situ* measurements.

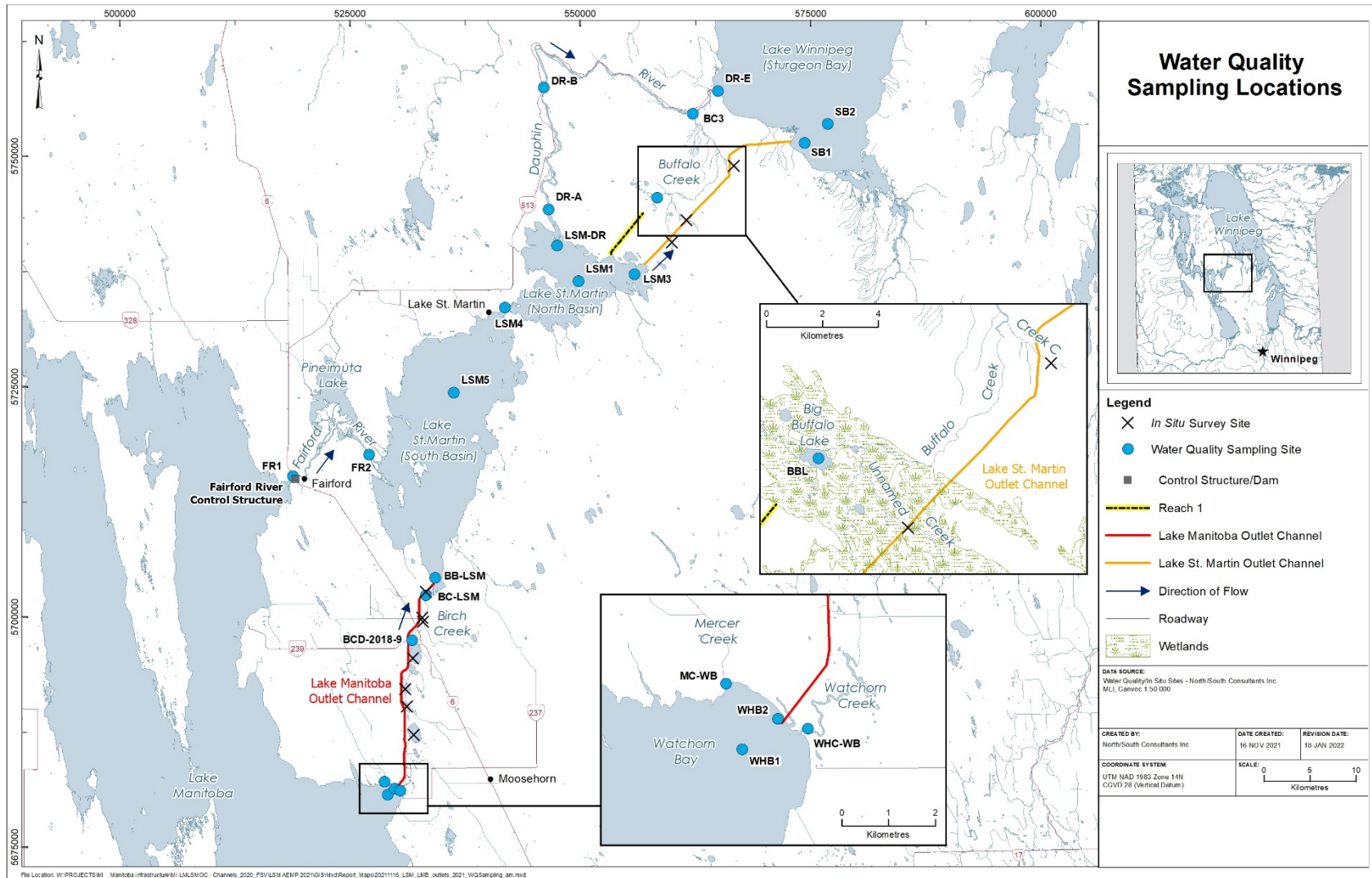


Figure 1. Water quality sampling locations.

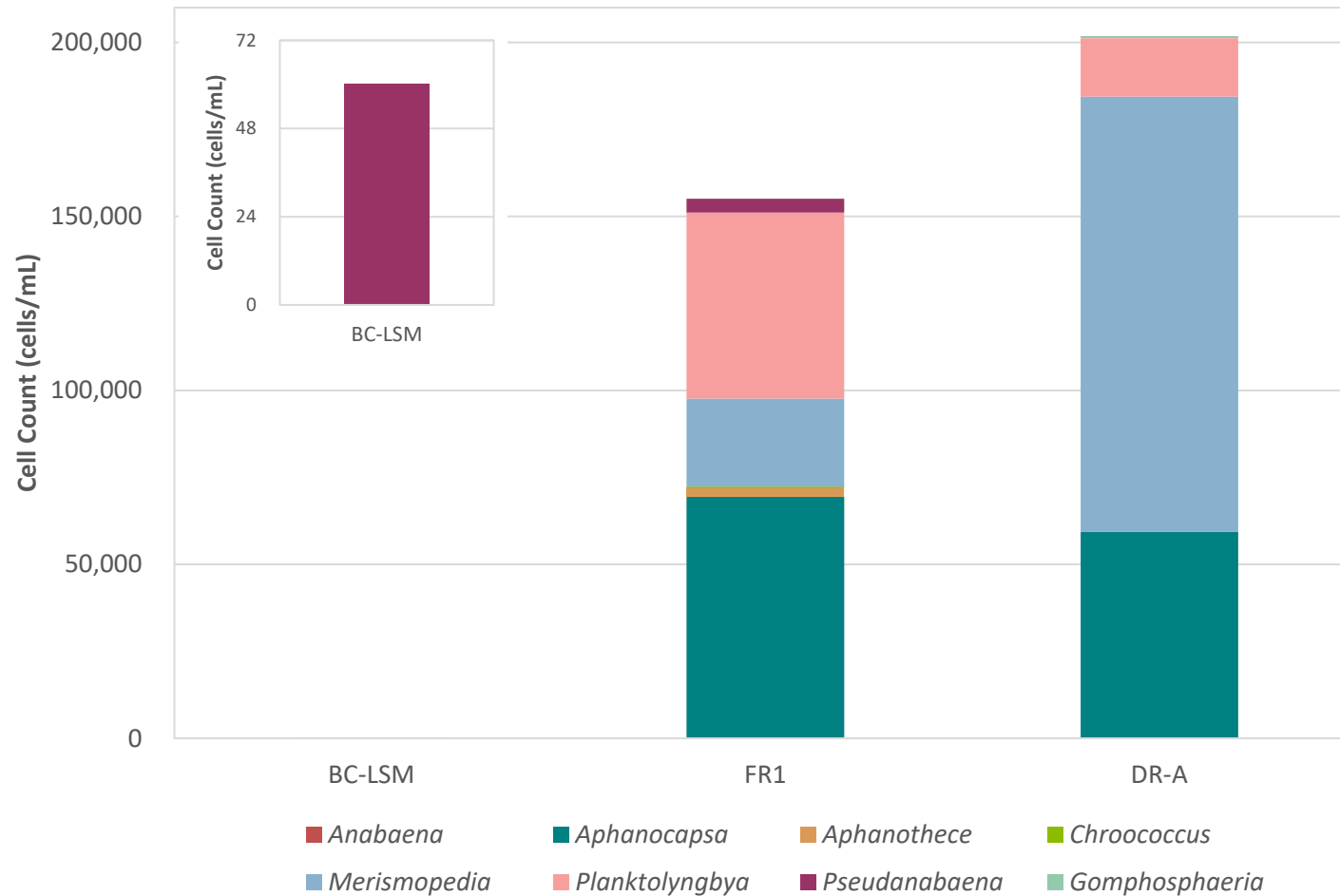


Figure 2. Abundance of blue-green algae at selected sampling sites in late-August 2021. Inset shows details for site BC-LSM where a lower abundance of blue-green algae was observed compared to the other sites.

## **APPENDIX 1. WATER QUALITY OBJECTIVES AND GUIDELINES**

## WATER QUALITY OBJECTIVES AND GUIDELINES

The following is a summary of applicable water quality objectives and guidelines for evaluation of water chemistry data collected in the study area, including: the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG) for the protection of aquatic life (PAL; MWS 2011); and the Canadian Council of Ministers for the Environment (CCME) guidelines for the protection of freshwater aquatic life (CCME 1999, updated to 2022).

### AMMONIA

Both MWQ objectives and CCME guidelines for PAL exist for ammonia; these criteria are dependent upon water temperature and pH. A representative range of Manitoba water quality objectives and CCME guidelines for ammonia appropriate for the range of pH and temperature measured in the study area (i.e., site-specific objectives) in Fall 2021 are presented in Tables A1-1 and A1-2, respectively.

Table A1-1. Range of applicable Manitoba Water Quality Objectives for ammonia, for the protection of cool-water and cold-water aquatic life and wildlife.

Water Use	pH	Temperature (°C)	Manitoba Water Quality Objective (mg N/L) <sup>1</sup>		
			30-day	4-day	1-hour
<u>Cool water aquatic life, early life stages present</u>					
	7.34	5.48	4.94	12.4	24.9
		18.9	3.73	9.32	24.9
	9.27	5.48	0.49	0.90	0.90
		18.9	0.37	0.90	0.90
<u>Cool water aquatic life, early life stages absent</u>					
	7.34	5.48	8.03	20.1	24.9
		18.9	3.73	9.32	24.9
	9.27	5.48	0.79	0.90	0.90
		18.9	0.37	0.90	0.90
<u>Cold water aquatic life, early life stages present</u>					
	7.34	5.48	4.94	12.4	16.6
		18.9	3.73	9.32	16.6
	9.27	5.48	0.49	0.60	0.60
		18.9	0.37	0.60	0.60
<u>Cold water aquatic life, early life stages absent</u>					
	7.34	5.48	8.03	16.6	16.6
		18.9	3.73	9.32	16.6
	9.27	5.48	0.79	0.60	0.60
		18.9	0.37	0.60	0.60

1 - Values calculated from algorithms provided in MWS (2011) and the range of pH and water temperature measured during the study. The most stringent objective is indicated in red.

Table A1-2. CCME water quality guidelines for total ammonia for the protection of freshwater aquatic life.

Temperature (°C)	CCME water quality guideline (mg N/L) <sup>1</sup>					
	pH					
	7.0	7.5	8.0	8.5	9.0	10
0	19.0 <sup>2</sup>	6.02 <sup>2</sup>	1.92 <sup>2</sup>	0.616 <sup>2</sup>	0.206 <sup>2</sup>	0.035 <sup>2</sup>
5	12.6	3.98	1.27	0.413	0.141	0.028 <sup>2</sup>
10	8.47	2.68	0.855	0.282	0.100	0.024 <sup>2</sup>
15	5.74	1.83	0.588	0.197	0.073	0.021 <sup>2</sup>
20	3.96	1.27	0.410	0.141	0.055	0.020 <sup>2</sup>

<sup>1</sup> - Guidelines presented are for the range of pH and water temperature measured in the study area in Fall 2021. The most stringent guideline is indicated in red.

<sup>2</sup> - Values should be used with caution

## DISSOLVED OXYGEN

Manitoba objectives for dissolved oxygen (DO) are dependent upon water temperature, the presence of early life stages, and the presence of sensitive fish species (e.g., cool-water fish such as Northern Pike and Walleye or cold-water fish species such as Lake Whitefish, MWS 2011). Objectives, which are specific for early life stages and mature life stages and vary according to the averaging duration, are presented in Table A1-3. Similarly, the CCME lowest acceptable level of DO varies by warm/cold water biota and life stage, as shown in Table A1-4.

Table A1-3. Manitoba Water Quality Objectives for dissolved oxygen.

Applicable Conditions	Dissolved Oxygen Objective (mg/L)			
	Averaging Duration			
	Instantaneous Minimum	7 Day Minimum	7 Days	30 Days
<u>Cold-Water Aquatic Life and Wildlife</u>				
Water Temperature ≤ 5°C and Early Life Stages Present	8.0	-	9.5	-
Water Temperature > 5°C and Mature Life Stages Present	4.0	5.0	-	6.5
<u>Cool-Water Aquatic Life and Wildlife</u>				
Water Temperature ≤ 5°C and Mature Life Stages Present	3.0	4.0	-	5.5
Water Temperature > 5°C and Early Life Stages Present	5.0	-	6.0	-

Table A1-4. CCME lowest acceptable concentration of dissolved oxygen for the protection of freshwater aquatic life.

	Dissolved Oxygen Value (mg/L)	
	Early life stages	Other life stages
Warm water biota	6.0	5.5
Cold water biota	9.5	6.5

## TOTAL SUSPENDED SOLIDS AND TURBIDITY

MWQSOG and CCME guidelines for PAL for total suspended solids (TSS) are similar and allow the following: a maximum increase of 25 mg/L from background for short term exposure (up to 24 hrs.); an average increase of 5 mg/L from background for long term exposure (i.e., 1 to 30 days); a maximum increase of 25 mg/L from background when background TSS is between 25 mg/L and 250 mg/L; and a maximum change of 10% from background when TSS greater than 250 mg/L.

There are different criteria for turbidity for the MWQSOG and CCME guidelines for PAL. The Manitoba objective for turbidity for PAL is for “equivalent induced levels of change as calculated from site-specific or regional-specific correlation between total suspended solids and turbidity” (MWS 2011). The CCME guideline is more definitive and allows for the following (CCME 1999, updated to 2022) a maximum increase of 8 NTU from background for short term exposure (up to 24 hrs.); an average increase of 2 NTU from background for long term exposure (i.e., 1 to 30 days); a maximum increase of 8 NTU from background when background TSS is between 8 NTU and 80 NTU; and a maximum change of 10 % from background when background is greater than 80 NTU.

There is also a MWQSOG maximum acceptable concentration of 1.0 NTU for drinking water. However, this guideline, as with all drinking water guidelines/objectives, is to be applied to finished drinking water; and, since the majority of natural surface waters will exceed this guideline, it has not been included in this assessment.

## PHOSPHORUS

MWQSOG include narrative guidelines for total phosphorus (TP) which state: “[TP] should not exceed 0.025 mg/L in any reservoir, lake, or pond, or in a tributary at the point where it enters such bodies of water. In other streams, [TP] should not exceed 0.05 mg/L” (MWS 2011).

CCME guidelines for the protection of freshwater aquatic life provide a guidance framework for the development of site-specific guidelines; this is a detailed process that requires sufficient baseline data for guideline development and is beyond the scope of this report.

## OTHER ROUTINE PARAMETERS

Table A1-5 presents water quality criteria for other routine parameters not discussed above.

## METALS AND MAJOR IONS

Table A1-6 presents water quality criteria for select metals and major ions.

## HYDROCARBONS

Table A1-7 presents water quality criteria for select hydrocarbons.

## PESTICIDES

Table A1-8 presents water quality criteria for select pesticides.

Table A1-5. Manitoba and CCME guidelines for the protection of aquatic life for other routine parameters measured.

Parameter	Guidelines/Objectives for PAL		
	MWQSOG <sup>1</sup>	CCME <sup>2</sup>	
		Short Term	Long Term
Nitrate	2.93 mg N/L <sup>3</sup>	124 mg N/L	3.0 mg N/L
Nitrite	0.060 mg N/L	-	0.060 mg N/L
pH	6.5 to 9.0	-	6.5 to 9.0

1 - Manitoba Water Quality Standards, Objectives, and Guidelines (MWS 2011).

2 - CCME guidelines for the protection of freshwater aquatic life (CCME 1999, updated to 2022).

3 - The Manitoba PAL guideline for nitrate indicated in MWS (2011) was incorrectly identified as 13 mg N/L. The PAL guideline should read 2.93 mg N/L (N. Armstrong, Pers. Comm.).



Table A1-6. Manitoba and CCME guidelines for the protection of aquatic life for metals and major ions.

Parameter	Manitoba Objectives and Guidelines (mg/L)					CCME Guidelines (mg/L)		
	Tier II Objectives		Tier III Guidelines			CWQG	Short-term	Long-term
	Acute <sup>1</sup>	Chronic <sup>2</sup>	MWQG	Short-term	Long-term			
Aluminum	-	-	0.1 <sup>3</sup>	-	-	0.1 <sup>3</sup>	-	-
Arsenic, dissolved	0.34	0.15	-	-	-	-	-	-
Arsenic, total	-	-	-	-	-	0.005	-	-
Boron	-	-	-	29	1.5	-	29	1.5
Cadmium, dissolved	0.00293 to 0.0123 <sup>4</sup>	0.000321 to 0.000895 <sup>4</sup>	-	-	-	-	0.00310 to 0.00770 <sup>4</sup>	0.000222 to 0.000370 <sup>4</sup>
Chloride	-	-	-	-	-	-	640	120
Chromium (III), dissolved	0.781 to 2.62 <sup>4</sup>	0.102 to 0.341 <sup>4</sup>	-	-	-	0.0089 <sup>5</sup>	-	-
Copper, dissolved	0.0193 to 0.0778 <sup>4</sup>	0.0124 to 0.0440 <sup>4</sup>	-	-	-	0.00329 to 0.004 <sup>4</sup>	-	-
Fluoride	-	-	-	-	-	0.12 <sup>5</sup>	-	-
Iron	-	-	≤0.3	-	-	0.3	-	-
Lead, dissolved	0.0980 to 0.455 <sup>4</sup>	0.00381 to 0.0177 <sup>4</sup>	-	-	-	0.00520 to 0.007 <sup>4</sup>	-	-
Manganese, dissolved	-	-	-	-	-	-	9.3 to 14.8 <sup>6</sup>	0.120 to 0.770 <sup>6</sup>
Mercury	-	-	0.000026	-	-	0.000026 <sup>5</sup>	-	-
Molybdenum	-	-	0.073	-	-	0.073 <sup>5</sup>	-	-
Nickel, dissolved	0.649 to 2.27 <sup>4</sup>	0.0720 to 0.252 <sup>4</sup>	-	-	-	0.128 to 0.150 <sup>4</sup>	-	-
Selenium, total	-	-	0.001	-	-	0.001	-	-
Silver, total	-	-	0.0001	-	-	-	-	0.00025
Thallium	-	-	0.0008	-	-	0.0008	-	-
Uranium	-	-	-	0.033	0.015	-	0.033	0.015
Zinc, dissolved	0.162 to 0.569 <sup>4</sup>	0.164 to 0.537 <sup>4</sup>	-	-	-	-	0.198 to 0.333 <sup>7</sup>	0.0156 to 0.261 <sup>8</sup>

1 - 1-hour averaging objective.

2 - 4-day averaging objective.

3 - Value represents the guideline where pH > 6.5.

4 - Calculated based on the range of hardness (147-645 mg/L) observed in all samples collected.

5 - Interim guideline.

6 - Calculated based on the range of hardness (167-645 mg/L) and pH (7.34-9.27) observed in all samples collected.

7 - Calculated based on the range of hardness (167-645 mg/L) and dissolved organic carbon (DOC; 8.02-30.1 mg/L) observed in all samples collected.

8 - Calculated based on the range of hardness (147-645 mg/L), DOC (8.02-30.1 mg/L) and pH (7.34-9.27) observed in all samples collected.

Table A1-7. Manitoba and CCME guidelines for the protection of aquatic life for hydrocarbons.

Parameter	Units	PAL Guideline <sup>1</sup>
Benzene	mg/L	0.370
Ethyl benzene	mg/L	0.090
Toluene	mg/L	0.002
Acenaphthene	mg/L	0.0058
Acridine	mg/L	0.0044
Anthracene	mg/L	0.00012
Benzo(a)anthracene	mg/L	0.00018
Benzo(a)pyrene	mg/L	0.00015
Fluoranthene	mg/L	0.00004
Fluorene	mg/L	0.003
Naphthalene	mg/L	0.0011
Phenanthrene	mg/L	0.0004
Pyrene	mg/L	0.000025
Quinoline	mg/L	0.0034

1 - MWQSOG and CCME guidelines are the same for these parameters.

Table A1-8. Manitoba and CCME guidelines for the protection of aquatic life for pesticides.

Parameter	Unit	MWQSOG			CCME Guidelines		
		MWQG	Short-term	Long-term	CWQG	Short-term	Long-term
Aldrin	µg/L	-	-	-	-	-	0.004
alpha-BHC	µg/L	0.01 <sup>1</sup>	-	-	-	-	0.01 <sup>1</sup>
beta-BHC	µg/L	0.01 <sup>1</sup>	-	-	-	-	0.01 <sup>1</sup>
gamma-hexachlorocyclohexane	µg/L	0.01 <sup>1</sup>	-	-	-	-	0.01 <sup>1</sup>
delta-BHC	µg/L	0.01 <sup>1</sup>	-	-	-	-	0.01 <sup>1</sup>
a-chlordane	µg/L	-	-	-	-	-	0.006 <sup>2</sup>
g-chlordane	µg/L	-	-	-	-	-	0.006 <sup>2</sup>
Endosulfan	µg/L	-	0.06	0.003	-	0.06	0.003
Hexachlorobutadiene	µg/L	1.3	-	-	1.3	-	-
Bromoxynil	mg/L	0.005	-	-	-	-	0.005
2,4-D	mg/L	-	-	-	-	-	0.004
Dicamba	mg/L	0.01	-	-	-	-	0.01
Dinoseb	mg/L	0.00005	-	-	-	-	0.00005
MCPA	mg/L	0.0026	-	-	-	-	0.0026
Picloram	mg/L	0.029	-	-	-	-	0.029
Atrazine	µg/L	1.8 <sup>3</sup>	-	-	-	-	1.8
Atrazine+N-Dealkylated Metabolites	µg/L	1.8 <sup>3</sup>	-	-	-	-	-
Glyphosate	µg/L	65	-	-	-	27000	800
Diclofop-methyl	mg/L	0.0061	-	-	-	-	0.0061
Triallate	mg/L	0.00024	-	-	-	-	0.00024
Trifluralin	mg/L	0.00020	-	-	-	-	0.0002

1 - Guideline for hexachlorocyclohexane (i.e., Lindane).

2 - Guideline for chlordane.

3 - Guideline for atrazine + metabolites.

**APPENDIX 2.           QUALITY ASSURANCE / QUALITY CONTROL RESULTS**

Table A2-1. QA/QC results for routine parameters. Percent relative standard deviation (PRSD) values greater than 18 are indicated in red bold. Results for all blanks are less than five times the analytical detection limit (DL).

Waterbody	Sampling Date	Sample ID	ALS ID	Alkalinity				Nitrogen			
				Total Alkalinity as CaCO <sub>3</sub> (mg/L)	Bicarbonate, HCO <sub>3</sub> (mg/L)	Carbonate, CO <sub>3</sub> (mg/L)	Hydroxide, OH (mg/L)	Total Ammonia (mg N/L)	Nitrate (mg N/L)	Nitrite (mg N/L)	Nitrate/nitrite (mg N/L)
<i>Analytical DL</i>				<i>1.0</i>	<i>1.2</i>	<i>0.60</i>	<i>0.34</i>	<i>0.010</i>	<i>0.0050 /0.010</i>	<i>0.0010 /0.0020</i>	<i>0.0051 /0.010</i>
<b>Replicates</b>											
Lake St. Martin	30-Aug-21	LSM4	L2633558-11	164	188	5.64	<0.34	0.029	<0.010	<0.0020	<0.010
		REP-1A	L2633558-1	164	189	5.04	<0.34	0.020	<0.010	<0.0020	<0.010
		REP-1B	L2633558-2	163	188	5.52	<0.34	0.025	<0.010	<0.0020	<0.010
		Mean		164	188	5.40	<0.34	0.025	<0.010	<0.0020	<0.010
		SD		0.6	0.6	0.317	-	-	-	-	-
		PRSD		0	0	6	-	-	-	-	-
Fairford River	30-Aug-21	FR2	L2633558-10	172	197	6.24	<0.34	0.020	<0.010	<0.0020	<0.010
		REP-2A	L2633558-3	171	196	6.48	<0.34	0.016	<0.010	<0.0020	<0.010
		REP-2B	L2633558-4	172	197	6.36	<0.34	0.012	<0.010	<0.0020	<0.010
		Mean		172	197	6.36	<0.34	0.016	<0.010	<0.0020	<0.010
		SD		0.6	0.6	0.120	-	-	-	-	-
		PRSD		0	0	2	-	-	-	-	-
Lake Manitoba	18-Oct-21	WHB1	L2652497-5	174	206	3.12	<0.34	0.010	<0.010	<0.0020	<0.010
		REP-1A	L2652497-8	173	205	3.00	<0.34	<0.010	<0.010	<0.0020	<0.010
		REP-1B	L2652497-9	170	200	3.36	<0.34	<0.010	<0.010	<0.0020	<0.010
		Mean		172	204	3.16	<0.34	<0.010	<0.010	<0.0020	<0.010
		SD		2.1	3.2	0.183	-	-	-	-	-
		PRSD		1	2	6	-	-	-	-	-
Fairford River	19-Oct-21	FR2	L2653142-2	179	209	4.20	<0.34	0.027	<0.010	<0.0020	<0.010
		REP-2A	L2653142-4	178	208	4.68	<0.34	0.025	<0.010	<0.0020	<0.010
		REP-2B	L2653142-5	177	207	4.44	<0.34	0.027	<0.010	<0.0020	<0.010
		Mean		178	208	4.44	<0.34	0.026	<0.010	<0.0020	<0.010
		SD		1.0	1.0	0.240	-	-	-	-	-
		PRSD		1	0	5	-	-	-	-	-

Table A2-1. Continued.

Waterbody	Sampling Date	Sample ID	ALS ID	Alkalinity				Nitrogen			
				Total Alkalinity as CaCO <sub>3</sub> (mg/L)	Bicarbonate, HCO <sub>3</sub> (mg/L)	Carbonate, CO <sub>3</sub> (mg/L)	Hydroxide, OH (mg/L)	Total Ammonia (mg N/L)	Nitrate (mg N/L)	Nitrite (mg N/L)	Nitrate/nitrite (mg N/L)
<i>Analytical DL</i>				<i>1.0</i>	<i>1.2</i>	<i>0.60</i>	<i>0.34</i>	<i>0.010</i>	<i>0.0050</i> <i>/0.010</i>	<i>0.0010</i> <i>/0.0020</i>	<i>0.0051</i> <i>/0.010</i>
<b>Blanks</b>											
Field Blank	30-Aug-21	WB-1A	L2633558-5	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
	30-Aug-21	WB-2A	L2633558-7	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
	17-Oct-21	WB-1B	L2652045-4	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
	20-Oct-21	WB-2A	L2653742-4	2.6	3.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
Trip Blank	30-Aug-21	WB-1B	L2633558-6	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
	30-Aug-21	WB-2B	L2633558-8	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
	17-Oct-21	WB-1A	L2652045-5	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051
	20-Oct-21	WB-2B	L2653742-5	<1.0	<1.2	<0.60	<0.34	<0.010	<0.0050	<0.0010	<0.0051

Table A2-1. Continued.

Waterbody	Sampling Date	Sample ID	Phosphorus					Carbon			
			Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Phosphorus (mg/L)	Total Particulate Phosphorus (mg/L)	Total Phosphorus (mg/L)	Total Inorganic Carbon (mg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)	Total Carbon (mg/L)
<i>Analytical DL</i>			0.20	0.20	0.0010 /0.0030	0.0028 /0.0042	0.0010 /0.0030	0.50	0.50	0.50	1.0
<b>Replicates</b>											
Lake St. Martin	30-Aug-21	LSM4	1.34 <sup>3</sup>	1.34	0.0088	0.0165	0.0254	30.9	16.5	15.9	47.4
		REP-1A	1.43	1.43	0.0088	0.0151	0.0239	32.7	16.3	16.0	49.1
		REP-1B	1.37	1.37	0.0078	0.0129	0.0206	34.2	15.9	15.9	50.1
		Mean	1.38	1.38	0.0085	0.0148	0.0233	32.6	16.2	15.9	48.9
		SD	0.046	0.046	-	-	0.00246	1.65	0.31	0.06	1.37
		PRSD	3	3	-	-	11	5	2	0	3
Fairford River	30-Aug-21	FR2	0.77	0.77	0.0066	0.0187	0.0252	35.0	15.5	15.1	50.5
		REP-2A	0.88	0.88	0.0079	0.0149	0.0228	31.7	15.6	15.0	47.3
		REP-2B	0.77	0.77	0.0072	0.0168	0.0239	33.6	16.2	14.8	49.9
		Mean	0.81	0.81	0.0072	0.0168	0.0240	33.4	15.8	15.0	49.2
		SD	0.064	-	-	-	0.00120	1.66	0.38	0.15	1.70
		PRSD	8	-	-	-	5	5	2	1	3
Lake Manitoba	18-Oct-21	WHB1	1.17	1.17	0.0058	0.0180	0.0237	36.7	15.1	14.4	51.8
		REP-1A	0.92	0.92	0.0057	0.0185	0.0242	35.5	15.0	14.0	50.5
		REP-1B	1.19	1.19	0.0066	0.0172	0.0238	34.5	13.5	14.2	48.0
		Mean	1.09	1.09	0.0060	0.0179	0.0239	35.6	14.5	14.2	50.1
		SD	0.150	0.150	-	-	0.00026	1.10	0.90	0.20	1.93
		PRSD	14	14	-	-	1	3	6	1	4
Fairford River	19-Oct-21	FR2	0.91	0.91	0.0075	0.0211	0.0286	37.3	15.2	14.5	52.5
		REP-2A	0.88	0.88	0.0077	0.0202	0.0279	37.2	15.3	14.7	52.5
		REP-2B	0.99	0.99	0.0068	0.0231	0.0299	36.7	14.8	14.5	51.6
		Mean	0.93	0.93	0.0073	0.0215	0.0288	37.1	15.1	14.6	52.2
		SD	0.057	-	-	0.00148	0.00101	0.32	0.26	0.12	0.52
		PRSD	6	-	-	7	4	1	2	1	1

Table A2-1. Continued.

Waterbody	Sampling Date	Sample ID	Phosphorus					Carbon			
			Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Phosphorus (mg/L)	Total Particulate Phosphorus (mg/L)	Total Phosphorus (mg/L)	Total Inorganic Carbon (mg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)	Total Carbon (mg/L)
<i>Analytical DL</i>			<i>0.20</i>	<i>0.20</i>	<i>0.0010</i> <i>/0.0030</i>	<i>0.0028</i> <i>/0.0042</i>	<i>0.0010</i> <i>/0.0030</i>	<i>0.50</i>	<i>0.50</i>	<i>0.50</i>	<i>1.0</i>
<b>Blanks</b>											
Field Blank	30-Aug-21	WB-1A	<0.20	<0.20	<0.0010	<0.0028	0.0010	<0.50	<0.50	<0.50	<1.0
	30-Aug-21	WB-2A	<0.20	<0.20	0.0012	<0.0028	<0.0010	<0.50	<0.50	<0.50	<1.0
	17-Oct-21	WB-1B	<0.20	<0.20	<0.0010	<0.0028	<0.0010	<0.50	<0.50	<0.50	<1.0
	20-Oct-21	WB-2A	<0.20	<0.20	<0.0010	<0.0028	0.0012	<0.50	0.73	<0.50	<1.0
Trip Blank	30-Aug-21	WB-1B	<0.20	<0.20	0.0010	<0.0028	<0.0010	<0.50	<0.50	<0.50	<1.0
	30-Aug-21	WB-2B	<0.20	<0.20	0.0011	<0.0028	<0.0010	<0.50	<0.50	<0.50	<1.0
	17-Oct-21	WB-1A	<0.20	<0.20	<0.0010	<0.0028	<0.0010	<0.50	<0.50	<0.50	<1.0
	20-Oct-21	WB-2B	<0.20	<0.20	<0.0010	<0.0028	0.0017	<0.50	<0.50	<0.50	<1.0



Table A2-1. Continued.

Waterbody	Sampling Date	Sample ID	Routine Chemistry				Water Clarity			Algal Pigments	
			Laboratory pH (pH units)	Laboratory Conductivity (µmhos/cm)	Total Dissolved Solids (mg/L)	Hardness, as CaCO <sub>3</sub> (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (CU)	Chlorophyll a (µg/L)	Phaeophytin a (µg/L)
<i>Analytical DL</i>			<i>0.10</i>	<i>1</i>	<i>4.0 / 20</i>	<i>0.2</i>	<i>1.0</i>	<i>0.1</i>	<i>5.0</i>	<i>0.10</i>	<i>0.10</i>
<b>Replicates</b>											
Lake St. Martin	30-Aug-21	LSM4	8.42	1130	557	240	7.9	6.13	7.8	6.67	2.17
		REP-1A	8.40	1140	638	283	7.6	5.39	8.4	5.94	1.96
		REP-1B	8.40	1140	649	276	7.5	3.92	10	6.73	2.17
		Mean	8.41	1137	615	266	7.7	5.15	8.7	6.45	2.10
		SD	0.012	5.8	50.2	23.1	0.21	1.12	1.14	0.440	0.121
		PRSD	0	1	8	9	3	<b>22</b>	13	7	6
Fairford River	30-Aug-21	FR2	8.44	1170	670	250	13.1	10.6	6.6	7.20	1.72
		REP-2A	8.44	1170	558	291	12.7	8.28	5.2	7.03	1.82
		REP-2B	8.43	1170	662	280	12.5	8.42	<5.0	7.17	1.79
		Mean	8.44	1170	630	274	12.8	9.10	<5.0	7.13	1.78
		SD	0.006	0.0	62.5	21.2	0.31	1.30	-	0.091	0.051
		PRSD	0	0	10	8	2	14	-	1	3
Lake Manitoba	18-Oct-21	WHB1	8.35	1170	663	259	14.7	9.38	7.1	9.79	1.83
		REP-1A	8.35	1170	670	270	14.5	9.16	8.7	9.55	2.11
		REP-1B	8.34	1170	668	275	14.4	10.3	5.6	9.05	2.21
		Mean	8.35	1170	667	268	14.5	9.61	7.1	9.46	2.05
		SD	0.006	0.0	3.6	8.2	0.15	0.605	1.55	0.378	0.197
		PRSD	0	0	1	3	1	6	<b>22</b>	4	10
Fairford River	19-Oct-21	FR2	8.39	1220	599	269	15.8	12.3	<5.0	5.71	1.79
		REP-2A	8.40	1210	695	274	14.8	11.4	<5.0	6.01	2.73
		REP-2B	8.39	1220	686	277	15.4	12.7	<5.0	6.31	2.23
		Mean	8.39	1217	660	273	15.3	12.13	<5.0	6.01	2.25
		SD	0.006	5.8	53.0	4.0	0.50	0.666	-	0.300	0.470
		PRSD	0	0	8	1	3	5	-	5	<b>21</b>

Table A2-1. Continued.

Waterbody	Sampling Date	Sample ID	Routine Chemistry				Water Clarity			Algal Pigments	
			Laboratory pH (pH units)	Laboratory Conductivity (µmhos/cm)	Total Dissolved Solids (mg/L)	Hardness, as CaCO <sub>3</sub> (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (CU)	Chlorophyll a (µg/L)	Phaeophytin a (µg/L)
<i>Analytical DL</i>			<i>0.10</i>	<i>1</i>	<i>4.0/ 20</i>	<i>0.2</i>	<i>1.0</i>	<i>0.1</i>	<i>5.0</i>	<i>0.10</i>	<i>0.10</i>
<b>Blanks</b>											
Field Blank	30-Aug-21	WB-1A	5.59	<1.0	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10
	30-Aug-21	WB-2A	5.49	<1.0	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10
	17-Oct-21	WB-1B	5.61	1.2	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10
	20-Oct-21	WB-2A	5.83	1.0	<4.0	<0.20	<1.0	0.27	<5.0	<0.10	<0.10
Trip Blank	30-Aug-21	WB-1B	5.51	<1.0	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10
	30-Aug-21	WB-2B	5.47	<1.0	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10
	17-Oct-21	WB-1A	5.44	<1.0	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10
	20-Oct-21	WB-2B	5.30	<1.0	<4.0	<0.20	<1.0	<0.10	<5.0	<0.10	<0.10

Table A2-2. QA/QC results for metals and major ions (mg/L). Percent relative standard deviation (PRSD) values greater than 18 and blank results greater than five times the analytical detection limit (DL) are indicated in red bold.

Waterbody	Sampling Date	Sample ID	ALS ID	Aluminum (Al)		Antimony (Sb)		Arsenic (As)	
				Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>				<i>0.0010</i>	<i>0.0030</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>
<b>Replicates</b>									
Lake St. Martin	30-Aug-21	LSM 4	L2633558-11	0.0058	0.0863	0.00022	0.00020	0.00230	0.00224
		REP - 1A	L2633558-1	0.0066	0.0739	0.00020	0.00021	0.00242	0.00237
		REP - 1B	L2633558-2	0.0067	0.0688	0.00020	0.00025	0.00227	0.00239
		Mean		0.00637	0.0763	0.00021	0.00022	0.00233	0.00233
		SD		0.000493	0.00900	0.000012	-	0.000079	0.000081
		PRSD		8	12	6	-	3	3
Fairford River	30-Aug-21	FR 2	L2633558-10	0.0039	0.0488	0.00021	0.00018	0.00211	0.00208
		REP - 2A	L2633558-3	0.0039	0.0406	0.00026	0.00033	0.00218	0.00206
		REP - 2B	L2633558-4	0.0038	0.0513	0.00019	0.00018	0.00218	0.00202
		Mean		0.00387	0.0469	0.00022	0.00023	0.00216	0.00205
		SD		0.000058	0.00560	0.000036	-	0.000040	0.000031
		PRSD		1	12	16	-	2	1
Lake Manitoba	18-Oct-21	WHB1	L2652497-5	0.0030	0.0963	0.00017	0.00018	0.00215	0.00222
		REP-1A	L2652497-8	0.0030	0.0281	0.00017	0.00017	0.00213	0.00216
		REP-1B	L2652497-9	0.0033	0.0250	0.00018	0.00018	0.00217	0.00209
		Mean		0.00310	0.0498	0.00017	0.00018	0.00215	0.00216
		SD		0.000173	0.0403	0.000006	-	0.000020	0.000065
		PRSD		6	<b>81</b>	3	-	1	3
Fairford River	19-Oct-21	FR2	L2653142-2	0.0034	0.0393	0.00018	0.00018	0.00203	0.00197
		REP-2A	L2653142-4	0.0033	0.0176	0.00019	0.00017	0.00204	0.00208
		REP-2B	L2653142-5	0.0039	0.0910	0.00018	0.00018	0.00206	0.00201
		Mean		0.00353	0.0493	0.00018	0.00018	0.00204	0.00202
		SD		0.000321	0.0377	0.000006	-	0.000015	0.000056
		PRSD		9	<b>76</b>	3	-	1	3
<b>Blanks</b>									
Field Blank	30-Aug-21	WB - 1A	L2633558-5	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010
Field Blank	30-Aug-21	WB - 2A	L2633558-7	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010
Field Blank	17-Oct-21	WB-1B	L2652045-4	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010
Field Blank	20-Oct-21	WB-2A	L2653742-4	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010
Trip Blank	30-Aug-21	WB - 1B	L2633558-6	<0.0010	<b>0.0356</b>	<0.00010	<0.00010	<0.00010	<0.00010
Trip Blank	30-Aug-21	WB - 2B	L2633558-8	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010
Trip Blank	17-Oct-21	WB-1A	L2652045-5	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010
Trip Blank	20-Oct-21	WB-2B	L2653742-5	<0.0010	<0.0030	<0.00010	<0.00010	<0.00010	<0.00010

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Barium (Ba)		Beryllium (Be)		Bismuth (Bi)		Boron (B)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.010</i>	<i>0.010</i>
<b>Replicates</b>										
Lake St. Martin	30-Aug-21	LSM 4	0.0395	0.0383	<0.00010	<0.00010	<0.000050	<0.000050	0.105	0.105
		REP - 1A	0.0387	0.0400	<0.00010	<0.00010	<0.000050	<0.000050	0.121	0.100
		REP - 1B	0.0390	0.0392	<0.00010	<0.00010	<0.000050	<0.000050	0.118	0.100
		Mean	0.0391	0.0392	<0.00010	<0.00010	<0.000050	<0.000050	0.115	0.102
		SD	0.00040	0.00085	-	-	-	-	0.0085	0.0029
		PRSD	1	2	-	-	-	-	7	3
Fairford River	30-Aug-21	FR 2	0.0408	0.0397	<0.00010	<0.00010	<0.000050	<0.000050	0.110	0.107
		REP - 2A	0.0420	0.0400	<0.00010	<0.00010	<0.000050	<0.000050	0.125	0.103
		REP - 2B	0.0412	0.0400	<0.00010	<0.00010	<0.000050	<0.000050	0.122	0.105
		Mean	0.0413	0.0399	<0.00010	<0.00010	<0.000050	<0.000050	0.119	0.105
		SD	0.00061	0.00017	-	-	-	-	0.0079	0.0020
		PRSD	1	0	-	-	-	-	7	2
Lake Manitoba	18-Oct-21	WHB1	0.0417	0.0440	<0.00010	<0.00010	<0.000050	<0.000050	0.124	0.123
		REP-1A	0.0431	0.0433	<0.00010	<0.00010	<0.000050	<0.000050	0.131	0.122
		REP-1B	0.0437	0.0429	<0.00010	<0.00010	<0.000050	<0.000050	0.135	0.126
		Mean	0.0428	0.0434	<0.00010	<0.00010	<0.000050	<0.000050	0.130	0.124
		SD	0.00103	0.00056	-	-	-	-	0.0056	0.0021
		PRSD	2	1	-	-	-	-	4	2
Fairford River	19-Oct-21	FR2	0.0442	0.0433	<0.00010	<0.00010	<0.000050	<0.000050	0.119	0.114
		REP-2A	0.0443	0.0430	<0.00010	<0.00010	<0.000050	<0.000050	0.120	0.093
		REP-2B	0.0447	0.0430	<0.00010	<0.00010	<0.000050	<0.000050	0.124	0.102
		Mean	0.0444	0.0431	<0.00010	<0.00010	<0.000050	<0.000050	0.121	0.103
		SD	0.00026	0.00017	-	-	-	-	0.0026	0.0105
		PRSD	1	0	-	-	-	-	2	10
<b>Blanks</b>										
Field Blank	30-Aug-21	WB - 1A	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010
	30-Aug-21	WB - 2A	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010
	17-Oct-21	WB-1B	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010
	20-Oct-21	WB-2A	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	0.000103	<0.010	<0.010
Trip Blank	30-Aug-21	WB - 1B	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010
	30-Aug-21	WB - 2B	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010
	17-Oct-21	WB-1A	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010
	20-Oct-21	WB-2B	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.010	<0.010

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Cadmium (Cd)		Calcium (Ca)		Cesium (Cs)		Chloride (Cl)
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
<i>Analytical DL</i>			<i>0.000050</i>	<i>0.000050</i>	<i>0.05</i>	<i>0.050</i>	<i>0.000010</i>	<i>0.000010</i>	<i>0.20/0.10</i>
<b>Replicates</b>									
Lake St. Martin	30-Aug-21	LSM4	<0.000050	<0.000050	31.3	31.7	<0.000010	0.000011	218
		REP-1A	<0.000050	0.000051	39.3	31.2	<0.000010	0.000012	219
		REP-1B	<0.000050	<0.000050	36.7	30.6	<0.000010	0.000010	219
		Mean	<0.000050	<0.000050	35.8	31.2	<0.000010	0.000011	219
		SD	-	-	4.08	0.55	-	-	0.6
		PRSD	-	-	11	2	-	-	0
Fairford River	30-Aug-21	FR2	<0.000050	<0.000050	34.2	35.1	<0.000010	<0.000010	228
		REP-2A	<0.000050	<0.000050	40.4	34.8	<0.000010	<0.000010	227
		REP-2B	<0.000050	<0.000050	39.7	34.9	<0.000010	<0.000010	228
		Mean	<0.000050	<0.000050	38.1	34.9	<0.000010	<0.000010	228
		SD	-	-	3.40	0.15	-	-	0.6
		PRSD	-	-	9	0	-	-	0
Lake Manitoba	18-Oct-21	WHB1	<0.000050	<0.000050	37.8	40.8	<0.000010	0.000011	219
		REP-1A	<0.000050	<0.000050	39.1	40.3	<0.000010	<0.000010	222
		REP-1B	<0.000050	<0.000050	40.7	41.4	<0.000010	<0.000010	221
		Mean	<0.000050	<0.000050	39.2	40.8	<0.000010	<0.000010	221
		SD	-	-	1.45	0.55	-	-	1.5
		PRSD	-	-	4	1	-	-	1
Fairford River	19-Oct-21	FR2	<0.000050	<0.000050	39.5	41.3	<0.000010	<0.000010	224
		REP-2A	<0.000050	<0.000050	39.3	40.7	<0.000010	<0.000010	225
		REP-2B	<0.000050	<0.000050	41.5	40.6	<0.000010	0.000010	225
		Mean	<0.000050	<0.000050	40.1	40.9	<0.000010	<0.000010	225
		SD	-	-	1.22	0.38	-	-	0.6
		PRSD	-	-	3	1	-	-	0
<b>Blanks</b>									
Field Blank	30-Aug-21	WB-1A	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
	30-Aug-21	WB-2A	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
	17-Oct-21	WB-1B	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
	20-Oct-21	WB-2A	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
Trip Blank	30-Aug-21	WB-1B	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
	30-Aug-21	WB-2B	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
	17-Oct-21	WB-1A	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10
	20-Oct-21	WB-2B	<0.000050	<0.000050	<0.050	<0.050	<0.000010	<0.000010	<0.10

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Chromium (Cr)		Cobalt (Co)		Copper (Cu)		Fluoride
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
<i>Analytical DL</i>			<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00020</i>	<i>0.00050</i>	<i>0.040/0.020</i>
<b>Replicates</b>									
Lake St. Martin	30-Aug-21	LSM4	<0.00010	0.00014	<0.00010	<0.00010	0.00025	<0.00050	0.147
		REP-1A	<0.00010	0.00033	<0.00010	0.00011	0.00027	0.00060	0.161
		REP-1B	<0.00010	0.00017	<0.00010	<0.00010	0.00026	<0.00050	0.152
		Mean	<0.00010	0.00021	<0.00010	<0.00010	0.00026	<0.00050	0.153
		SD	-	-	-	-	-	-	0.0071
		PRSD	-	-	-	-	-	-	5
Fairford River	30-Aug-21	FR2	<0.00010	0.00019	<0.00010	<0.00010	0.00025	<0.00050	0.153
		REP-2A	<0.00010	<0.00010	<0.00010	<0.00010	0.00027	<0.00050	0.155
		REP-2B	<0.00010	0.00037	<0.00010	<0.00010	0.00026	<0.00050	0.151
		Mean	<0.00010	0.00028	<0.00010	<0.00010	0.00026	<0.00050	0.153
		SD	-	-	-	-	-	-	0.0020
		PRSD	-	-	-	-	-	-	1
Lake Manitoba	18-Oct-21	WHB1	<0.00010	0.00015	<0.00010	<0.00010	0.00024	<0.00050	0.162
		REP-1A	<0.00010	<0.00010	<0.00010	<0.00010	0.00033	<0.00050	0.164
		REP-1B	<0.00010	0.00010	<0.00010	<0.00010	0.00028	<0.00050	0.162
		Mean	<0.00010	0.00010	<0.00010	<0.00010	0.00028	<0.00050	0.163
		SD	-	-	-	-	-	-	0.0012
		PRSD	-	-	-	-	-	-	1
Fairford River	19-Oct-21	FR2	<0.00010	0.00012	<0.00010	<0.00010	0.00030	<0.00050	0.166
		REP-2A	<0.00010	<0.00010	<0.00010	<0.00010	0.00028	<0.00050	0.166
		REP-2B	<0.00010	0.00014	<0.00010	<0.00010	0.00029	<0.00050	0.165
		Mean	<0.00010	0.00010	<0.00010	<0.00010	0.00029	<0.00050	0.166
		SD	-	-	-	-	-	-	0.0006
		PRSD	-	-	-	-	-	-	0
<b>Blanks</b>									
Field Blank	30-Aug-21	WB-1A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020
	30-Aug-21	WB-2A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020
	17-Oct-21	WB-1B	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020
	20-Oct-21	WB-2A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	0.00132	<0.020
Trip Blank	30-Aug-21	WB-1B	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020
	30-Aug-21	WB-2B	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020
	17-Oct-21	WB-1A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020
	20-Oct-21	WB-2B	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.020

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Iron (Fe)		Lead (Pb)		Lithium (Li)		Magnesium (Mg)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.010</i>	<i>0.010</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.0010</i>	<i>0.0010</i>	<i>0.0050</i>	<i>0.0050</i>
<b>Replicates</b>										
Lake St. Martin	30-Aug-21	LSM4	<0.010	0.053	<0.000050	0.000145	0.0344	0.0356	39.2	38.5
		REP-1A	<0.010	0.080	<0.000050	0.000204	0.0359	0.0348	45.0	38.8
		REP-1B	<0.010	0.055	<0.000050	0.000136	0.0400	0.0352	44.9	38.8
		Mean	<0.010	0.063	<0.000050	0.000162	0.0368	0.0352	43.0	38.7
		SD	-	0.0150	-	-	0.00290	0.00040	3.32	0.17
		PRSD	-	24	-	-	8	1	8	0
Fairford River	30-Aug-21	FR2	<0.010	0.056	<0.000050	0.000158	0.0348	0.0356	40.0	39.8
		REP-2A	<0.010	0.043	<0.000050	0.000160	0.0410	0.0351	46.1	38.9
		REP-2B	<0.010	0.052	<0.000050	0.000189	0.0407	0.0355	43.9	38.2
		Mean	<0.010	0.050	<0.000050	0.000169	0.0388	0.0354	43.3	39.0
		SD	-	0.0067	-	-	0.00350	0.00026	3.09	0.80
		PRSD	-	13	-	-	9	1	7	2
Lake Manitoba	18-Oct-21	WHB1	<0.010	0.061	<0.000050	0.000165	0.0381	0.0418	40.0	42.6
		REP-1A	<0.010	0.037	<0.000050	0.000162	0.0406	0.0416	42.0	41.6
		REP-1B	<0.010	0.035	<0.000050	0.000158	0.0418	0.0426	42.0	41.0
		Mean	<0.010	0.044	<0.000050	0.000162	0.0402	0.0420	41.3	41.7
		SD	-	-	-	-	0.00189	0.00053	1.15	0.81
		PRSD	-	-	-	-	5	1	3	2
Fairford River	19-Oct-21	FR2	<0.010	0.051	<0.000050	0.000189	0.0397	0.0386	41.4	40.6
		REP-2A	<0.010	0.031	<0.000050	0.000193	0.0394	0.0372	42.8	40.7
		REP-2B	<0.010	0.102	<0.000050	0.000192	0.0404	0.0377	42.0	40.8
		Mean	<0.010	0.061	<0.000050	0.000191	0.0398	0.0378	42.1	40.7
		SD	-	0.0366	-	-	0.00051	0.00071	0.70	0.10
		PRSD	-	-	-	-	1	2	2	0
<b>Blanks</b>										
Field Blank	30-Aug-21	WB-1A	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	0.0065	<0.0050
	30-Aug-21	WB-2A	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050
	17-Oct-21	WB-1B	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050
	20-Oct-21	WB-2A	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050
Trip Blank	30-Aug-21	WB-1B	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050
	30-Aug-21	WB-2B	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050
	17-Oct-21	WB-1A	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050
	20-Oct-21	WB-2B	<0.010	<0.010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0050	<0.0050

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Manganese (Mn)		Mercury (Hg)		Molybdenum (Mo)		Nickel (Ni)		
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	
<i>Analytical DL</i>			<i>0.00010</i>	<i>0.00010</i>	<i>0.00000050</i>	<i>0.00000050</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.00050</i>	<i>0.00050</i>	
<b>Replicates</b>											
Lake St. Martin	30-Aug-21	LSM4	0.00017	0.00725	<0.00000050	0.000000560	0.00262	0.00262	<0.00050	0.00064	
		REP-1A	0.00026	0.00884	<0.00000050	0.000000670	0.00285	0.00254	0.00051	0.00091	
		REP-1B	0.00024	0.00729	<0.00000050	0.000000590	0.00275	0.00247	0.00051	0.00063	
		Mean	0.00022	0.00779	<0.00000050	0.000000607	0.00274	0.00254	<0.00050	0.00073	
		SD	-	0.000907	-	0.000000057	0.000115	0.000075	-	-	
		PRSD	-	12	-	9	4	3	-	-	
Fairford River	30-Aug-21	FR2	<0.00010	0.00650	<0.00000050	0.000000600	0.00235	0.00245	<0.00050	0.00062	
		REP-2A	<0.00010	0.00657	<0.00000050	0.000000600	0.00251	0.00234	<0.00050	0.00059	
		REP-2B	<0.00010	0.00656	<0.00000050	0.000000580	0.00255	0.00230	<0.00050	0.00072	
		Mean	<0.00010	0.00654	<0.00000050	0.000000593	0.00247	0.00236	<0.00050	0.00064	
		SD	-	0.000038	-	0.000000012	0.000106	0.000078	-	-	
		PRSD	-	1	-	2	4	3	-	-	
Lake Manitoba	18-Oct-21	WHB1	<0.00010	0.00709	<0.00000050	0.000000710	0.00228	0.00226	<0.00050	0.00069	
		REP-1A	<0.00010	0.00687	<0.00000050	0.000000720	0.00236	0.00218	<0.00050	0.00061	
		REP-1B	<0.00010	0.00685	<0.00000050	0.000000670	0.00239	0.00221	<0.00050	0.00062	
		Mean	<0.00010	0.00694	<0.00000050	0.000000700	0.00234	0.00222	<0.00050	0.00064	
		SD	-	0.000133	-	0.000000026	0.000057	0.000040	-	-	
		PRSD	-	2	-	4	2	2	-	-	
Fairford River	19-Oct-21	FR2	<0.00010	0.00712	<0.00000050	0.000000770	0.00250	0.00239	<0.00050	0.00067	
		REP-2A	<0.00010	0.00703	<0.00000050	0.000000710	0.00255	0.00233	<0.00050	0.00064	
		REP-2B	0.00010	0.00742	<0.00000050	0.000000690	0.00249	0.00231	<0.00050	0.00069	
		Mean	<0.00010	0.00719	<0.00000050	0.000000723	0.00251	0.00234	<0.00050	0.00067	
		SD	-	0.000204	-	0.000000042	0.000032	0.000042	-	-	
		PRSD	-	3	-	6	1	2	-	-	
<b>Blanks</b>											
Field Blank	30-Aug-21	WB-1A	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050	
		30-Aug-21	WB-2A	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050
		17-Oct-21	WB-1B	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050
		20-Oct-21	WB-2A	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050
Trip Blank	30-Aug-21	WB-1B	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050	
		30-Aug-21	WB-2B	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050
		17-Oct-21	WB-1A	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050
		20-Oct-21	WB-2B	<0.00010	<0.00010	<0.00000050	<0.00000050	<0.000050	<0.000050	<0.00050	<0.00050



Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Potassium (K)		Rubidium (Rb)		Selenium (Se)		Silicon (Si)		Silver (Ag)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.050</i>	<i>0.050</i>	<i>0.00020</i>	<i>0.00020</i>	<i>0.000050</i>	<i>0.000050</i>	<i>0.050</i>	<i>0.10</i>	<i>0.000010</i>	<i>0.000010</i>
<b>Replicates</b>												
Lake St. Martin	30-Aug-21	LSM4	11.0	9.75	0.00418	0.00410	0.000081	0.000097	2.00	2.51	<0.000010	<0.000010
		REP-1A	11.0	10.0	0.00403	0.00413	0.000109	0.000084	2.02	2.29	<0.000010	<i>0.000066</i>
		REP-1B	10.9	10.3	0.00431	0.00427	0.000091	0.000064	2.04	2.48	<0.000010	<0.000010
		Mean	11.0	10.0	0.00417	0.00417	0.000094	0.000082	2.02	2.43	<0.000010	0.000025
		SD	0.06	0.28	0.000140	0.000091	-	-	0.020	0.119	-	-
		PRSD	1	3	3	2	-	-	1	5	-	-
Fairford River	30-Aug-21	FR2	11.6	9.99	0.00422	0.00419	0.000124	0.000073	3.28	3.48	<0.000010	<0.000010
		REP-2A	11.5	9.78	0.00444	0.00409	0.000058	0.000063	3.27	3.39	<0.000010	<0.000010
		REP-2B	11.3	9.66	0.00408	0.00405	0.000059	0.000080	3.21	3.32	<0.000010	<0.000010
		Mean	11.5	9.81	0.00425	0.00411	0.000080	0.000072	3.25	3.40	<0.000010	<0.000010
		SD	0.15	0.17	0.000181	0.000072	-	-	0.038	0.080	-	-
		PRSD	1	2	4	2	-	-	1	2	-	-
Lake Manitoba	18-Oct-21	WHB1	11.3	11.2	0.00404	0.00425	0.000078	0.000105	3.59	3.99	<0.000010	<0.000010
		REP-1A	12.1	10.8	0.00446	0.00387	0.000054	0.000146	3.75	3.85	<0.000010	<0.000010
		REP-1B	11.9	10.7	0.00442	0.00411	0.000063	0.000111	3.82	3.88	<0.000010	<0.000010
		Mean	11.8	10.9	0.00431	0.00408	0.000065	0.000121	3.72	3.91	<0.000010	<0.000010
		SD	0.42	0.26	0.000232	0.000192	-	-	0.118	0.074	-	-
		PRSD	4	2	5	5	-	-	3	2	-	-
Fairford River	19-Oct-21	FR2	11.0	10.8	0.00431	0.00416	0.000071	0.000088	3.64	3.47	<0.000010	<0.000010
		REP-2A	11.4	10.7	0.00448	0.00405	0.000066	0.000068	3.66	3.56	<0.000010	<0.000010
		REP-2B	11.3	10.4	0.00460	0.00424	0.000079	0.000070	3.66	3.62	<0.000010	<0.000010
		Mean	11.2	10.6	0.00446	0.00415	0.000072	0.000075	3.65	3.55	<0.000010	<0.000010
		SD	0.21	0.21	0.000146	0.000095	-	-	0.012	0.075	-	-
		PRSD	2	2	3	2	-	-	0	2	-	-
<b>Blanks</b>												
Field Blank	30-Aug-21	WB-1A	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
	30-Aug-21	WB-2A	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
	17-Oct-21	WB-1B	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
	20-Oct-21	WB-2A	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
Trip Blank	30-Aug-21	WB-1B	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
	30-Aug-21	WB-2B	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
	17-Oct-21	WB-1A	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010
	20-Oct-21	WB-2B	<0.050	<0.050	<0.00020	<0.00020	<0.000050	<0.000050	<0.050	<0.10	<0.000010	<0.000010

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Sodium (Na)		Strontium (Sr)		Sulphate (SO4)	Sulphur (S)	
			Dissolved	Total	Dissolved	Total	Dissolved	Dissolved	Total
<i>Analytical DL</i>			<i>0.050</i>	<i>0.050</i>	<i>0.00010</i>	<i>0.00020</i>	<i>0.30/0.60</i>	<i>0.50</i>	<i>0.50</i>
<b>Replicates</b>									
Lake St. Martin	30-Aug-21	LSM4	150	140	0.277	0.243	92.7	33.2	35.7
		REP-1A	160	144	0.282	0.244	94.8	33.6	36.8
		REP-1B	157	146	0.266	0.239	94.8	32.8	36.4
		Mean	156	143	0.275	0.242	94.1	33.2	36.3
		SD	5.1	3.1	0.0082	0.0026	1.21	0.40	0.56
		PRSD	3	2	3	1	1	1	2
Fairford River	30-Aug-21	FR2	155	145	0.309	0.280	95.6	33.7	36.1
		REP-2A	164	141	0.320	0.264	95.3	33.5	36.0
		REP-2B	160	141	0.306	0.263	95.8	33.1	34.7
		Mean	160	142	0.312	0.269	95.6	33.4	35.6
		SD	4.5	2.3	0.0074	0.0095	0.25	0.31	0.78
		PRSD	3	2	2	4	0	1	2
Lake Manitoba	18-Oct-21	WHB1	150	160	0.288	0.279	93.1	32.8	36.6
		REP-1A	160	158	0.292	0.275	94.3	33.8	35.5
		REP-1B	159	159	0.302	0.275	93.9	35.2	35.8
		Mean	156	159	0.294	0.276	93.8	33.9	36.0
		SD	5.5	1.0	0.0072	0.0023	0.61	1.21	0.57
		PRSD	4	1	2	1	1	4	2
Fairford River	19-Oct-21	FR2	155	151	0.304	0.282	93.1	33.9	33.3
		REP-2A	155	159	0.311	0.291	93.3	34.0	36.0
		REP-2B	157	153	0.300	0.281	93.2	34.0	35.8
		Mean	156	154	0.305	0.285	93.2	34.0	35.0
		SD	1.2	4.2	0.0056	0.0055	0.10	0.06	1.50
		PRSD	1	3	2	2	0	0	4
<b>Blanks</b>									
Field Blank	30-Aug-21	WB-1A	0.061	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50
	30-Aug-21	WB-2A	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50
	17-Oct-21	WB-1B	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	0.51
	20-Oct-21	WB-2A	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50
Trip Blank	30-Aug-21	WB-1B	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50
	30-Aug-21	WB-2B	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50
	17-Oct-21	WB-1A	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50
	20-Oct-21	WB-2B	<0.050	<0.050	<0.00010	<0.00020	<0.30	<0.50	<0.50

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Tellurium (Te)		Thallium (Tl)		Thorium (Th)		Tin (Sn)	
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
<i>Analytical DL</i>			<i>0.00020</i>	<i>0.00020</i>	<i>0.000010</i>	<i>0.000010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.00010</i>
<b>Replicates</b>										
Lake St. Martin	30-Aug-21	LSM4	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-1A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-1B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		Mean	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		SD	-	-	-	-	-	-	-	-
		PRSD	-	-	-	-	-	-	-	-
Fairford River	30-Aug-21	FR2	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-2A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-2B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		Mean	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		SD	-	-	-	-	-	-	-	-
		PRSD	-	-	-	-	-	-	-	-
Lake Manitoba	18-Oct-21	WHB1	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-1A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-1B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		Mean	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		SD	-	-	-	-	-	-	-	-
		PRSD	-	-	-	-	-	-	-	-
Fairford River	19-Oct-21	FR2	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-2A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		REP-2B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		Mean	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
		SD	-	-	-	-	-	-	-	-
		PRSD	-	-	-	-	-	-	-	-
<b>Blanks</b>										
Field Blank	30-Aug-21	WB-1A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
	30-Aug-21	WB-2A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
	17-Oct-21	WB-1B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
	20-Oct-21	WB-2A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
Trip Blank	30-Aug-21	WB-1B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
	30-Aug-21	WB-2B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
	17-Oct-21	WB-1A	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010
	20-Oct-21	WB-2B	<0.00020	<0.00020	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010

Table A2-2. Continued.

Waterbody	Sampling Date	Sample ID	Titanium (Ti)		Tungsten (W)		Uranium (U)		Zinc (Zn)		Zirconium (Zr)		
			Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	
<i>Analytical DL</i>			<i>0.00030</i>	<i>0.00030</i>	<i>0.00010</i>	<i>0.00010</i>	<i>0.000010</i>	<i>0.000010</i>	<i>0.0010</i>	<i>0.0030</i>	<i>0.00020</i>	<i>0.00020</i>	
<b>Replicates</b>													
Lake St. Martin	30-Aug-21	LSM4	<0.00030	0.00272	<0.00010	<0.00010	0.00168	0.00180	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-1A	<0.00030	0.00297	<0.00010	<0.00010	0.00181	0.00179	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-1B	<0.00030	0.00295	<0.00010	<0.00010	0.00176	0.00186	<0.0010	<0.0030	<0.00020	<0.00020	
		Mean	<0.00030	0.00288	<0.00010	<0.00010	0.00175	0.00182	<0.0010	<0.0030	<0.00020	<0.00020	
		SD	-	0.000139	-	-	0.000066	0.000038	-	-	-	-	
		PRSD	-	5	-	-	4	2	-	-	-	-	
Fairford River	30-Aug-21	FR2	<0.00030	0.00231	<0.00010	<0.00010	0.00150	0.00157	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-2A	<0.00030	0.00155	<0.00010	<0.00010	0.00161	0.00156	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-2B	<0.00030	0.00209	<0.00010	<0.00010	0.00162	0.00156	<0.0010	<0.0030	<0.00020	<0.00020	
		Mean	<0.00030	0.00198	<0.00010	<0.00010	0.00158	0.00156	<0.0010	<0.0030	<0.00020	<0.00020	
		SD	-	0.000391	-	-	0.000067	0.000006	-	-	-	-	
		PRSD	-	20	-	-	4	0	-	-	-	-	
Lake Manitoba	18-Oct-21	WHB1	<0.00030	0.00221	<0.00010	<0.00010	0.00170	0.00164	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-1A	<0.00030	0.00115	<0.00010	<0.00010	0.00173	0.00155	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-1B	<0.00030	0.00100	<0.00010	<0.00010	0.00183	0.00150	<0.0010	<0.0030	<0.00020	<0.00020	
		Mean	<0.00030	0.00145	<0.00010	<0.00010	0.00175	0.00156	<0.0010	<0.0030	<0.00020	<0.00020	
		SD	-	-	-	-	0.000068	0.000071	-	-	-	-	
		PRSD	-	-	-	-	4	5	-	-	-	-	
Fairford River	19-Oct-21	FR2	<0.00030	0.00168	<0.00010	<0.00010	0.00188	0.00170	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-2A	<0.00030	0.00058	<0.00010	<0.00010	0.00188	0.00158	<0.0010	<0.0030	<0.00020	<0.00020	
		REP-2B	<0.00030	0.00388	<0.00010	<0.00010	0.00189	0.00173	<0.0010	<0.0030	<0.00020	<0.00020	
		Mean	<0.00030	0.00205	<0.00010	<0.00010	0.00188	0.00167	<0.0010	<0.0030	<0.00020	<0.00020	
		SD	-	0.00168	-	-	0.000006	0.000079	-	-	-	-	
		PRSD	-	-	-	-	0	5	-	-	-	-	
<b>Blanks</b>													
Field Blank	30-Aug-21	WB-1A	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020	
		30-Aug-21	WB-2A	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020
		17-Oct-21	WB-1B	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020
		20-Oct-21	WB-2A	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020
Trip Blank	30-Aug-21	WB - 1B	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020	
		30-Aug-21	WB - 2B	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020
		17-Oct-21	WB-1A	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020
		20-Oct-21	WB-2B	<0.00030	<0.00030	<0.00010	<0.00010	<0.000010	<0.000010	<0.0010	<0.0030	<0.00020	<0.00020

## **APPENDIX 3.            RESULTS FOR ADDITIONAL PARAMETERS**

Table A3-1. Laboratory results for additional parameters measured at selected sites in late-August/September 2021.

Parameter	Units	DL	BC-LSM	FR1	DR-A
			L2633060-1 29-Aug-21	L2633558-9 30-Aug-21	L2634301-8 31-Aug-21
<i>Escherichia coli</i>	MPN/100mL	1	152	14	49
Microcystin	µg/L	0.20	<0.20	<0.20	<0.20
<u>Cyanobacteria cell count</u>					
Anabaena (Cyanophyceae)	cells/mL	1	-	130	10
Aphanocapsa (Cyanophyceae)	cells/mL	1	-	69300	59400
Aphanothece (Cyanophyceae)	cells/mL	1	-	2480	-
Chroococcus (Cyanophyceae)	cells/mL	1	-	396	12
Gomphosphaeria (Cyanophyceae)	cells/mL	1	-	-	500
Merismopedia (Cyanophyceae)	cells/mL	1	-	25300	125000
Microcystis (Cyanophyceae)	cells/mL	1	-	-	150
Planktolyngbya (Cyanophyceae)	cells/mL	1	-	53500	16800
Pseudanabaena (Cyanophyceae)	cells/mL	1	60	3960	-
Total cyanobacterial cell count	cells/mL	1	60	155000	202000
<u>Hydrocarbons</u>					
Benzene	mg/L	0.00050	<0.00050	<0.00050	<0.00050
Ethyl benzene	mg/L	0.00050	<0.00050	<0.00050	<0.00050
Toluene	mg/L	0.0010	<0.0010	<0.0010	<0.0010
o-Xylene	mg/L	0.00050	<0.00050	<0.00050	<0.00050
m+p-Xylenes	mg/L	0.00040	<0.00040	<0.00040	<0.00040
Xylenes (Total)	mg/L	0.00064	<0.00064	<0.00064	<0.00064
F1 (C6-C10)	mg/L	0.10	<0.10	<0.10	<0.10
F1-BTEX	mg/L	0.10	<0.10	<0.10	<0.10
F2-Naphth	mg/L	0.10	<0.10	<0.10	<0.10
F2 (C10-C16)	mg/L	0.100	<100	<100	<100
F3-PAH	mg/L	0.25	<0.25	<0.25	<0.25
F3 (C16-C34)	mg/L	0.250	<250	<250	<250
F4 (C34-C50)	mg/L	0.250	<250	<250	<250
Total Hydrocarbons (C6-C50)	mg/L	0.38	<0.38	<0.38	<0.38
Acenaphthene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Acenaphthylene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Acridine	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Anthracene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)anthracene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b&j)fluoranthene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Benzo(k)fluoranthene	mg/L	0.000010	<0.000010	<0.000010	<0.000010

Table A3-1. Continued.

Parameter	Units	DL	BC-LSM	FR1	DR-A
			L2633060-1 29-Aug-21	L2633558-9 30-Aug-21	L2634301-8 31-Aug-21
Benzo(b&j)fluoranthene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Benzo(k)fluoranthene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Dibenzo(a,h)anthracene	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Fluorene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Indeno(1,2,3-cd)pyrene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
1-Methyl Naphthalene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
2-Methyl Naphthalene	mg/L	0.000020	<0.000020	<0.000020	<0.000020
Naphthalene	mg/L	0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.000050	<0.000050	<0.000050	<0.000050
Pyrene	mg/L	0.000010	<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.000020	<0.000020	<0.000020	<0.000020
B(a)P Total Potency Equivalent	mg/L	0.000030	<0.000030	<0.000030	<0.000030
<u>Pesticides</u>					
Aldrin	µg/L	0.0080	<0.0080	<0.0080	<0.0080
alpha-BHC	µg/L	0.0080	<0.0080	<0.0080	<0.0080
beta-BHC	µg/L	0.0080	<0.0080	<0.0080	<0.0080
gamma-hexachlorocyclohexane	µg/L	0.0080	<0.0080	<0.0080	<0.0080
delta-BHC	µg/L	0.0080	<0.0080	<0.0080	<0.0080
a-chlordane	µg/L	0.0080	<0.0080	<0.0080	<0.0080
g-chlordane	µg/L	0.0080	<0.0080	<0.0080	<0.0080
o,p-DDD	µg/L	0.0040	<0.0040	<0.0040	<0.0040
pp-DDD	µg/L	0.0040	<0.0040	<0.0040	<0.0040
o,p-DDE	µg/L	0.0040	<0.0040	<0.0040	<0.0040
pp-DDE	µg/L	0.0040	<0.0040	<0.0040	<0.0040
op-DDT	µg/L	0.0040	<0.0040	<0.0040	<0.0040
pp-DDT	µg/L	0.0040	<0.0040	<0.0040	<0.0040
Dieldrin	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Endosulfan I	µg/L	0.0070	<0.0070	<0.0070	<0.0070
Endosulfan II	µg/L	0.0070	<0.0070	<0.0070	<0.0070
Endosulfan Sulfate	µg/L	0.0070	<0.0070	<0.0070	<0.0070
Endrin	µg/L	0.010	<0.010	<0.010	<0.010
Endrin Aldehyde	µg/L	0.010	<0.010	<0.010	<0.010

Table A3-1. Continued.

Parameter	Units	DL	BC-LSM	FR1	DR-A
			L2633060-1 29-Aug-21	L2633558-9 30-Aug-21	L2634301-8 31-Aug-21
Heptachlor	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Heptachlor Epoxide	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Hexachlorobenzene	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Hexachlorobutadiene	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Hexachloroethane	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Methoxychlor	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Mirex	µg/L	0.0080	<0.0080	<0.0080	<0.0080
trans-Nonachlor	µg/L	0.010	<0.010	<0.010	<0.010
Oxychlorane	µg/L	0.0080	<0.0080	<0.0080	<0.0080
Pentachloronitrobenzene	µg/L	0.010	<0.010	<0.010	<0.010
AMPA	µg/L	0.50	<0.50	<0.50	<0.50
Bromoxynil	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Clopyralid	mg/L	0.00010	<0.00010	<0.00010	<0.00010
2,4-D	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Dicamba	mg/L	0.00010	<0.00010	<0.00010	<0.00010
2,4-DB	mg/L	0.00010	<0.00010	<0.00010	<0.00010
2,4-DP	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Dinoseb	mg/L	0.00010	<0.00010	<0.00010	<0.00010
MCPA	mg/L	0.00010	<0.00010	<0.00010	<0.00010
MCPB	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Mecoprop	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Picloram	mg/L	0.00010	<0.00010	<0.00010	<0.00010
2,4,5-T	mg/L	0.00010	<0.00010	<0.00010	<0.00010
2,4,5-TP	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Triclopyr	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Atrazine	µg/L	0.10	<0.10	<0.10	<0.10
Atrazine+N-Dealkylated Metabolites	µg/L	0.20	<0.20	<0.20	<0.20
Ethalfuralin	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Atrazine Desethyl	µg/L	0.10	<0.10	<0.10	<0.10
Fluazifop-p-butyl	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Glyphosate	µg/L	0.20	<0.20	<0.20	<0.20
Diclofop-methyl	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Triallate	mg/L	0.00010	<0.00010	<0.00010	<0.00010
Trifluralin	mg/L	0.00010	<0.00010	<0.00010	<0.00010