KEEYASK AND CONAWAPA PROJECTS

July 2010

Keeyask
Report #09-04

Conawapa
Report #09-04

Water Quality Data for the Lower Nelson River System, Manitoba, 2009

Draft

ENVIRONMENTAL STUDIES PROGRAMS

KEEYASK

CONAWAPA

KEEYASK AND CONAWAPA PROJECTS

Environmental Studies Programs

Keeyask Report # 09-04
Conawapa Report # 09-04

WATER QUALITY DATA FOR THE LOWER NELSON RIVER SYSTEM, MANITOBA, 2009

Draft Report Prepared for Manitoba Hydro

by
T.G. Savard, S. Hnatiuk Stewart, and M. Cooley
July 2010

North/South Consultants Inc.
Aquatic Environment Specialists

83 Scurfield Blvd.
Winnipeg, Manitoba, R3Y 1G4
Website: www.nscons.ca

Tel.: (204) 284-3366
Fax: (204) 477-4173
E-mail: nscons@nscons.ca

OVERVIEW

Manitoba Hydro and its potential partners (Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation) are currently looking into building a hydroelectric generating station (GS) at Gull Rapids on the Nelson River. Studies are being done to support predictions of possible effects of this generating station on the environment. This information is required to prepare an Environmental Impact Statement, a document required by government for its consideration when deciding about licensing the generating station. The aquatic part of these studies is looking at the water, algae (microscopic plants in the water), weeds, bugs, and fish. The area being studied includes Split, Stephens, Clark, Gull, and Assean lakes and adjoining parts of the rivers (Burntwood, Nelson, Aiken, and Assean) and the streams that flow into them. In 2002, the reach of the lower Nelson River between the Kettle Generating Station and Gillam Island was added to the water quality Study Area. Since that time, Manitoba Hydro has been examining the feasibility of building a hydroelectric generating station at the Conawapa site on the lower Nelson River. Environmental studies for this potential GS were initiated on the lower Nelson River and tributaries in 2003.

This report presents the results of water quality sampling conducted on the Nelson River system during the ice-cover and open-water seasons of 2009. As the water quality sampling programs for the Keeyask and Conawapa projects were contiguous, the results of these programs are presented in this report collectively.

TECHNICAL SUMMARY

Manitoba Hydro and its potential partners (Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation) are currently investigating the feasibility of developing a hydroelectric generating station (GS) at Gull Rapids located at the upstream end of Stephens Lake on the Nelson River (Figure 1). Additionally, Manitoba Hydro has been investigating the feasibility of developing a hydroelectric generating station at the Conawapa site, located approximately 29 km downstream of the Limestone Generating Station on the lower Nelson River. Environmental Studies Programs for the two Projects have been developed to provide the data and information required for an environmental impact assessment of the above-mentioned hydroelectric Projects, should a decision be made to proceed with licensing submissions to regulatory authorities. Manitoba Hydro and the potential partners have established a cooperative approach to assessing the potential effects of future development on the environment and for producing the information required for regulatory review and impact monitoring.

The Keeyask and Conawapa aquatic monitoring and impact assessment programs were designed to investigate and document interrelated components of the Burntwood, Nelson, Aiken, and Assean rivers as well as the associated lake (Split, Stephens, Clark, Gull, and Assean) aquatic ecosystems. Investigations of physical habitat, water quality, detritus, algae, aquatic macrophytes, aquatic invertebrates, and fish were undertaken. Individual reports were prepared and issued on each topic and for specific waterbodies.

This report is one of a number that present results of environmental studies conducted to assess the potential effects of the proposed Keeyask and Conawapa GSs and associated facilities. The data presented in this report are from the fifth year of a multi-year water quality sampling program being conducted on the Nelson River system to support the Keeyask Environmental Studies Program and the third year of a multi-year study for the Conawapa Project. Baseline data from the previous five years of the study (2001-2004; 2006 [ice-cover only]) can be found in Badiou and Cooley (2004), Badiou and Cooley (2005), Badiou et al. (2005), Badiou et al. (2007), and Savard and Cooley (2007).

In 2009, water quality was sampled by Manitoba Hydro/Acres Manitoba Ltd. at 10 sites in the ice-cover season ranging from the Burntwood River inflow to Split Lake to the lower Nelson River upstream of the Weir River. Water quality was sampled by North/South Consultants Inc. at 28 sites in the open-water season from the inflows to

Split Lake to Gillam Island. Water samples were analyzed for numerous physical and chemical properties, which can affect the plants, algae (microscopic plant-like organisms that float in the water), and animals that live in the water. Additionally, parameters that are important in determining the acceptability of water for drinking and/or recreational purposes were also monitored across the Study Area. Water quality parameters measured in the Study Area were compared to Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life and for drinking water and recreation (Williamson 2002). Specific objectives of the water quality study were to:

- provide a description of existing water quality conditions, including sampling across seasons;
- provide data to indicate the magnitude of between year variations; and
- confirm that water quality conditions have not significantly changed in the Study Area since comprehensive studies were conducted in 2001-2004.

Discharge of the Nelson River was high in the open-water season of 2009 and higher than previous years of water quality baseline studies. However, the results of the 2009 water quality sampling program were generally similar to (i.e., within the range) results obtained in earlier years (2001-2004) and are summarized in the following:

- Overall, the mainstem of the Study Area is moderately nutrient-rich, well-oxygenated, moderately soft to hard, and has a slightly alkaline pH;
- Split Lake water quality varies according to the locations of tributary inflows as the quality of water varies between the three main tributaries (the Burntwood, Nelson, and Aiken rivers);
- Water quality in Stephens Lake also varies spatially. Conditions at the south end of Stephens Lake resemble those observed on the main flow of the Nelson River upstream and downstream of the lake. This area is generally more nutrient-rich, more turbid, does not stratify, and is more oxygenated over winter than the north arm of the lake;
- Changes in some water quality conditions are also evident from Stephens Lake to the estuary. Specifically, TSS and turbidity decrease along the flow of the Nelson River in Stephens Lake and downstream, increasing again at the lower end of the Nelson River. Other routine variables are generally similar along the length of the lower Nelson River;

- Larger downstream tributaries (Limestone, Angling, and Weir rivers) are generally less phosphorus-rich and contain higher concentrations of OC but lower concentrations of chlorophyll *a* than the mainstem of the Nelson River; and
- Analysis of trace elements in the main Study Area revealed that, similar to historical results and the results of recent studies, concentrations of aluminum and iron are relatively high in the Study Area.

Notable exceptions where results of the 2009 water quality program differed from studies conducted from 2001-2004 include:

- While most sites exhibited lower mean concentrations of TSS and turbidity levels in 2009 relative to 2001-2004, the opposite trend was observed at the Burntwood River, large tributaries to the lower Nelson River (Limestone, Angling, and Weir rivers) and sites on the lower Nelson River downstream of the Limestone GS. High levels of both parameters occurred at these sites in June and/or July, some of which exceeded the maximum levels recorded in previous years.
- Mean concentrations of most routine parameters (pH, hardness, specific conductance, nitrate/nitrite, ammonia, TP, and DP) were higher at some sites in the open-water season 2009 relative to the mean for the period of 2001-2004. However, the ranges for these parameters in 2009 were within the ranges observed in previous years; and
- Mean concentrations of chlorophyll *a* were lower in the open-water season of 2009 than for the period of 2001-2004 at all sites across the Study Area.

Comparison of 2009 water quality results to water quality objectives and guidelines indicated the following:

- All measurements of ammonia, nitrate/nitrite, and pH were below applicable water quality objectives or guidelines for the protection of aquatic life throughout the Study Area;
- All but three measurements (Aiken River in June) of DO were above the most stringent water quality objective for the protection of aquatic life;
- In general, TP concentrations at lake sites exceeded the MWQSOG of 0.025 mg/L for lakes, whereas levels measured at river sites were below the MWQSOG of 0.050 mg/L for rivers and streams;

- The majority of measurements of aluminum and iron exceeded the MWQSOG for the protection of aquatic life;
- Several other metals (copper, mercury, selenium, and silver) infrequently exceeded the MWQSOGs for the protection of aquatic life.

ACKNOWLEDGEMENTS

We would like to thank Manitoba Hydro for the opportunity and resources to conduct this study. Chief and Council of the Fox Lake Cree Nation (FLCN), York Factory First Nation (YFFN), Tataskweyak Cree Nation (TCN), and War Lake First Nation (WLFN) are gratefully acknowledged for their interest in, and support of, the work.

We would also like to thank Douglas Kitchekeesik (TCN) for arranging logistic support and personnel needed to conduct the fieldwork.

Finally, thanks are extended to: Keith Kitchekeesik (TCN), Kelvin Kitchekeesik (TCN), Jonathan Kitchekeesik (TCN), and Saul Mayham (TCN) of Split Lake for their assistance in the collection of water quality data.

NORTH/SOUTH CONSULTANTS INC. STUDY TEAM

Data Collection

Tobie Savard

Stacy Hnatiuk Stewart

Data Analysis, Report Preparation, and Report Review

Megan Cooley

Tobie Savard

Stacy Hnatiuk Stewart

MANITOBA HYDRO STUDY TEAM

Data Collection

Francis Michiels

John McCusker

Mike Nepton

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

Page

Page

LIST OF APPENDICES

Page

1.0 INTRODUCTION

Manitoba Hydro and its potential partners (Tataskweyak Cree Nation [TCN], War Lake First Nation [WLFN], Fox Lake Cree Nation [FLCN], and York Factory First Nation [YFFN]) are currently investigating the feasibility of developing a hydroelectric generating station (GS) at Gull Rapids located at the upstream end of Stephens Lake on the Nelson River (Figure 1). An Environmental Studies Program has been developed to provide the data and information required for an environmental impact assessment of the above-mentioned hydroelectric Project (hereafter referred to as the Keeyask Project), should a decision be made to proceed with a licensing submission to regulatory authorities. Manitoba Hydro and the potential partners have established a cooperative approach to assessing the potential effects of the Project on the environment and for producing the information required for regulatory review and impact monitoring.

In addition, Manitoba Hydro is currently investigating the feasibility of developing a hydroelectric generating station at the Conawapa site (hereafter referred to as the Conawapa Project), located approximately 29 km downstream of the Limestone Generating Station on the lower Nelson River (Figure 1). The Environmental Studies Program for the Conawapa Project, which includes terrestrial, wildlife, archaeology, and aquatic components, was developed and initiated in 2003 and is conducted with the participation of local First Nation members. The aquatic component for the Keeyask and Conawapa projects has been developed to provide information on the interrelated components of the lower Nelson River aquatic ecosystem, including physical habitat, water quality, detritus, algae, aquatic macrophytes, aquatic invertebrates, fish, and marine mammals.

The broad objectives of the Environmental Studies Programs for the Keeyask and Conawapa Projects are the following:

- to describe the existing environment of the Study Areas using an ecosystem-based approach;
- to provide data and information to assist in the planning of the Projects;
- to provide data and information to enable assessment of the potential adverse effects that may result from the Projects; and
- to provide the basis for monitoring environmental change resulting from development, should the Project(s) proceed.

The following report describing the results of a water quality sampling program conducted during the 2009 open-water and ice-cover seasons is one of numerous reports produced from the Keeyask and Conawapa Environmental Studies Programs. Results from previous water quality programs conducted from 2001 to 2004 can be found in Badiou and Cooley (2004), Badiou and Cooley (2005), Badiou et al. (2005), and Badiou et al. (2007).

Water quality sampling was undertaken in 2009 to provide more current information to describe the existing conditions of the lower Nelson River as well as to increase the robustness of the data set. As such, the following report provides a comparison of the 2009 water quality data to the results obtained in previous sampling years (2001-2004) to determine whether water quality conditions have remained relatively similar.

The 2009 water quality sampling program was similar to those conducted in previous years and included the collection of *in situ* water quality information and water samples for analysis at an accredited analytical laboratory for routine variables and metals. In addition, a targeted program was conducted in Stephens Lake to examine spatial variability in water clarity conditions in a representative back-bay in the north arm of the lake as well as in the southern, mainstem area of the lake in the vicinity of an actively eroding shoreline.

Lastly, additional sampling was conducted in a nearshore area of Split Lake in August 2009 in response to concerns that were raised from several members from TCN regarding the presence of a rusty-brown substance observed in nearshore areas of the lake. A Technical Memorandum (TM) presenting the results of the nearshore sampling was prepared and distributed to Manitoba Hydro and to TCN. Excerpts from this TM are included as a separate section in this report.

2.0 THE KEEYASK AND CONAWAPA STUDY SETTING

2.1 STUDY AREA

In 2001, the Keeyask Study Area included the reach of the Nelson River from the Kelsey GS to the Kettle GS, including Split, Clark, Gull, and Stephens lakes; the Burntwood River downstream of First Rapids; the Grass River downstream of Witchai Lake Falls; the Assean River watershed, including Assean Lake; and all other tributaries to the above stated reach of the Nelson River.

In 2002, the Keeyask Study Area, as it pertains to water quality assessments, was expanded to incorporate the section of the Nelson River between the Kettle GS and Gillam Island, which includes the forebays of the Long Spruce and Limestone GSs and the Limestone, Weir, and Angling rivers (Figure 1).

In 2003, Manitoba Hydro initiated environmental studies in relation to the proposed hydroelectric generating station at the Conawapa site (hereafter referred to as the Conawapa Project), located approximately 29 km downstream of the Limestone Generating Station on the lower Nelson River (Figure 1). The "Study Area" referred to hereafter encompasses both the Keeyask and Conawapa study areas.

The region of the Study Area upstream of the Kettle GS lies within the High Boreal Land Region characterized by a mean annual temperature of -3.4ºC and an annual precipitation range of 415 to 560 mm (Canada-Manitoba Soil Survey 1976). Topography is bedrock controlled overlain with fine-grained glacio-lacustrine deposits of clays and gravels. Depressional areas have peat plateaus and patterned fens with permafrost present. Black spruce/moss/sedge associations are the dominant vegetation (Canada-Manitoba Soil Survey 1976).

The portion of the Study Area downstream of the Kettle GS is located primarily in the Low Subarctic Land region characterized by a mean annual temperature of -4.4ºC (historical daily mean temperature reported at the Gillam Airport; Environment Canada 1993). Precipitation in the Low Subarctic Land Region is similar to that of the High Boreal Region. This region of the lower Nelson River is part of the Hudson Bay Lowlands, a vast plain of marine clays, silts, and sands blanketed in most years with poorly drained bogs and fens (Newbury 1968). White spruce/lichen/moss/sedge associations are the dominant vegetation (Canada-Manitoba Soil Survey 1976).

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

The reach of the Nelson River between Split Lake and Stephens Lake is characterized by: i) narrow sections with swiftly flowing water (including Birthday and Gull rapids); and ii) wider more lacustrine sections, including Clark and Gull lakes. Mean winter flow in the reach is 3,006 m^3/s (November 1977 – March 1994) and mean summer flow is 2,812 m^3/s (April 1978 – October 1994; Manitoba Hydro 1996a).

The Assean River system is north of Split Lake and drains into Clark Lake (Figure 1). Except for the mouth of the Assean River, the hydrology of the watershed has not been affected by hydroelectric development.

Stephens Lake, the largest lake in the Study Area, is located downstream of Gull Rapids and was created through the development of the Kettle GS. Stephens Lake has a surface area of 29,930 ha (excluding islands) and a total shoreline length, including islands, of 740.8 km. The numerous islands encompass an area of 3,340 ha and 336.2 km of shoreline. There is no detectable current throughout most of this large lake, except for the old Nelson River channel.

Similar to the section of the Nelson River between Split Lake and Stephens Lake, the reach of the Nelson River between the Kettle GS and Gillam Island is also characterized by narrow sections with swiftly flowing water and wider more lacustrine sections created by the forebays of the Long Spruce and Limestone GSs. The Nelson River below the Limestone GS is extensively affected by discharge regulation (Manitoba Hydro 1994). Mean winter flow in this reach of the Nelson River is 3,275 m^3/s and mean summer flow is 2,375 m^3/s (Manitoba Hydro 1994).

Communities in the Study Area include the First Nations communities at Split Lake (TCN) and York Landing (YFFN), both located on Split Lake (Figure 1). Members of War Lake First Nation (WLFN) reside in Ilford south of the Nelson River and members of FLCN reside in Gillam on the south shore of Stephens Lake and in Bird on the

Limestone River. Gillam, the largest community in the Study Area, is the regional headquarters for Manitoba Hydro's northern operations.

The names assigned to some of the features described in Section 2.3 and illustrated in Figure 1 may be inconsistent with local names, topographic maps, and/or the Gazetteer of Canada. When field programs were initiated in spring, 2001, names of several features within the Study Area were unknown to North/South Consultants Inc. (NSC) biologists and First Nation assistants. Therefore, some features for which no name was known were assigned names by field personnel. Chief and council of TCN, YFFN, WLFN, and FLCN or the Canadian Permanent Committee on Geographical Names have not approved names of features described within this document.

2.2 PREVIOUS HYDROELECTRIC DEVELOPMENT

The Study Area encompasses four Manitoba Hydro hydroelectric GSs on the Nelson River: the Kelsey GS just upstream of Split Lake, the Kettle GS downstream of Stephens Lake, the Long Spruce GS (approximately 16 km downstream of Kettle), and the Limestone GS (approximately 23 km downstream of Long Spruce).

The Kelsey GS came into service in 1961 and raised the water level upstream of the structure by approximately 9.5 m above the natural level (Manitoba Hydro 1996a). The Kelsey GS is operated as a run-of-river plant with very little storage or re-regulation of flows (Manitoba Hydro 1996a). Although impoundment is minimal, more than 16,500 ha of land were flooded through the creation of the Kelsey Forebay, extending as far upstream as Sipiwesk Lake (Manitoba Hydro 1996a).

The Kettle GS was completed in 1974, which raised the water level at the structure by 30.0 m and created a backwater effect upstream to Gull Rapids. Approximately 22,055 ha of land were flooded in creating Stephens Lake (Manitoba Hydro 1996a). Kettle GS is operated as a peaking-type plant, cycling its forebay on a daily, weekly, and seasonal basis. The forebay is operated within an annual water level range from 141.1 m to 139.5 m ASL (Manitoba Hydro 1996a).

The Long Spruce Forebay was formed in 1979 by the construction of the Long Spruce GS. It is a 16 km reach of the Nelson River extending from the Long Spruce GS upstream to the Kettle GS (Manitoba Hydro 1996a). The Long Spruce GS is the second largest producer of electricity on the Nelson River (Manitoba Hydro Public Affairs 1999). Approximately 1,376 ha of land were flooded as a result of the Long Spruce GS, equivalent to 6 percent of the area flooded by Kettle GS (Manitoba Hydro 1996a).

Limestone GS was completed in 1990 and resulted in the formation of the Limestone Forebay. The forebay extends 23 km upstream to the base of Long Spruce GS on the Nelson River (Manitoba Hydro Public Affairs 1998). The Limestone GS is the largest producer of electricity in the province (Manitoba Hydro Public Affairs 1998). The plant's operation and discharges are similar to those of the Kettle and Long Spruce GSs (Manitoba Hydro 1996a). Although water levels in the vicinity of the Limestone Forebay were raised by 33 m, flooding was minimal (209 ha) and the smallest of any hydroelectric GS in northern Manitoba (Manitoba Hydro 1996a). Reduced flooding is largely attributed to the high banks of the Nelson River in this region.

Since 1976, two water management projects, the Churchill River Diversion (CRD) and Lake Winnipeg Regulation (LWR), have influenced water levels and flows within the Study Area. These two projects augment and alter flows to GSs on the lower Nelson River by diverting additional water into the drainage from the CRD (Manitoba Hydro 1996b) and managing outflow from LWR. The CRD and LWR projects reversed the Nelson River pre-Project seasonal water level and flow patterns in the Keeyask Study Area by increasing water levels and flow during periods of ice cover and reducing flows during the open-water period. Overall, there has been a net increase of 246 m^3/s in average annual flow at Gull Rapids since CRD and LWR (Manitoba Hydro 1996a). The historic and current flow regimes are described in "History and First Order Effects, Split Lake Cree Post-Project Environmental Review", Volume Two (Manitoba Hydro 1996a).

2.3 REPORT SPECIFIC STUDY AREA

2.3.1 Split Lake

Split Lake is located along the Nelson River approximately 7 km downstream of the Kelsey GS (Figure 1). Immediately downstream of the Kelsey GS the Grass River flows into the Nelson River, and the Burntwood River flows into Split Lake in the western portion of the lake. The Aiken (Landing) River enters Split Lake in the southern-most portion of the lake adjacent to the community of York Landing. The Ripple and Mistuka rivers enter Split Lake along the southern shore west of Aiken River.

Split Lake is situated in a landscape with poor drainage, dominated by black spruce forest in upland areas and black spruce bogs, peatlands, and fens in lowland areas. The shoreline is stable and largely bedrock controlled interspersed with bog and marsh areas. Riparian vegetation includes willow and alder, black spruce and trembling aspen. Riparian vegetation extends to the water line along portions of the shoreline. Mineral and organic soils occur adjacent to Split Lake, with sporadically distributed permafrost

(Agriculture and Agri-Food Canada 2003). Lake substrates are primarily composed of fine mineral sediments (clay and silt) with small amounts of organic material. Ice typically forms on the lake during November and break-up occurs in April. Following break-up, the surface of the lake warms to 20°C by mid-July.

As discussed in Section 2.2, Split Lake hydrology has been affected by both LWR and by CRD, as well as the Kelsey GS. Split Lake receives its largest inflow from the Nelson River, with an annual average discharge at Kelsey GS of 2,150 m^3/s, about 68% of the total inflow for Split Lake. Inflow from the Burntwood River prior to CRD was estimated at 90.0 m^3/s at First Rapids, and following CRD increased nearly 10-fold to 849.0 m^3/s or about 29% of inflow to Split Lake (Manitoba Hydro 1996b). This large increase in river discharge resulted in extensive erosion of clay and silt sediments along the existing shoreline at First Rapids, as well as an increase in the surface area of Split Lake by approximately 100 ha (Environment Canada and Department of Fisheries and Oceans 1992, Manitoba Hydro 1996b). The Grass River watershed, not affected by hydroelectric development, has an average annual discharge of 66.5 m^3/s at Standing Stone Falls (approximately 40 km upstream of Witchai Lake Falls). The remainder of the inflow to Split Lake is from the Aiken (Landing) River and other small tributaries such as the Ripple and Mistuska rivers.

The Ripple River is approximately 35 km in length and enters Split Lake approximately 4 km west of the Aiken (Landing) River (Figure 1). A set of impassable falls, approximately 5 m in height, is located at the mouth of the Ripple River. Habitat within the river includes pool, run, and riffle sequences, and a substrate of boulder, cobble, and gravel. The shoreline is dominated by bedrock, and riparian forest occurs close to the waterline.

The Mistuska River is approximately 25 km in length and enters Split Lake approximately 5 km west of the Ripple River. The lower 6 km of the river features low velocity boggy lakes containing fine mineral and organic substrates. Higher water velocities occur further upstream, and substrates are dominated by boulder, cobble and gravel with bedrock shorelines. Habitat in the upper reaches includes pool, run, and riffle sequences.

2.3.2 Aiken (Landing) River

The land adjacent to the Aiken (Landing) River is generally poorly drained and composed of black spruce forest in upland areas and spruce bogs, peatlands, and fens in low lying areas with stands of trembling aspen sporadically distributed (Agriculture and

Agri-Food Canada 2003). Permafrost is distributed sporadically adjacent to the river, and in the lower reaches soils are both mineral and organic in nature, whereas mineral soils are more prevalent in the upper reaches of the river.

The Aiken (Landing) River is approximately 90 km in length with a drainage area of 58,000 ha (Fedoruk 1970). A small amount of flooding occurred at the mouth of the river following CRD. Downstream of First Rapids, approximately 20 km from the mouth, the river is characterized as slow moving with abundant pool habitat, submergent and emergent vegetation, and boggy shorelines. River bottom sediments in the lower reaches are predominantly fine silts and clays. Upstream of First Rapids, water velocities are considerably higher, with pool, run, and riffle habitat. The substrate includes boulder, cobble, and gravel, and the shoreline is dominated by bedrock, boulder, and cobble.

2.3.3 Nelson River: Clark Lake to Birthday Rapids

The land adjacent to Clark Lake and the Nelson River downstream to Birthday Rapids is well drained and dominated by black spruce forest, with stands of trembling aspen sporadically distributed. Mineral soils are predominant in the area with permafrost distributed sporadically and bedrock outcrops near Birthday Rapids (Agriculture and Agri-Food Canada 2003).

Clark Lake is located immediately downstream of Split Lake, and approximately 42 km upstream of Gull Rapids on the Nelson River (Figure 1). Current is restricted to the main section of the lake, with off-current bays located outside the main channel. Lake substrates are composed of fine mineral sediments and areas of bedrock. The shoreline is stable and largely bedrock with areas of mineral and organic sediments. Riparian vegetation includes willow, alder, and black spruce. Aquatic vegetation is restricted to and abundant in shallow off-current bays. The Assean River is the only major tributary to Clark Lake, flowing into the north side of the lake. Two small ephemeral creeks also flow into the north shore of Clark Lake.

Downstream from the outlet of Clark Lake, the Nelson River narrows and water velocity increases significantly for a 3 km stretch, with numerous rapids that are largely confined within bedrock shorelines. The substrate and shoreline features of this section of the river are largely bedrock and boulder/cobble. For the next 7 km the river widens, velocity decreases, and fine sediments become predominant. Five small ephemeral creeks drain into the Nelson River between Clark Lake and Birthday Rapids.

2.3.4 Nelson River: Birthday Rapids to Gull Lake

The majority of the reach of the Nelson River between Birthday Rapids and Gull Lake lies within a landscape of well-drained mineral soils, dominated by black spruce forest. Immediately upstream of Gull Lake, the land adjacent to the south shore of the Nelson River is generally poorly drained, and is dominated by organic soils, and black spruce bogs, peatlands, and fens. Trembling aspen occurs occasionally along the shores of the Nelson River in areas that are well-drained. Exposed bedrock occurs along the north shore and upstream portions of the south shore of the Nelson River, particularly within the first 2 km downstream of Birthday Rapids. Permafrost is discontinuous to sporadic adjacent this section of the river (Agriculture and Agri-Food Canada 2003).

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of Gull Rapids on the Nelson River (Figure 1). The drop in elevation from the upstream to downstream side of Birthday Rapids is approximately 5 m. The 14 km reach of the Nelson River between Birthday Rapids and Gull Lake is characterized as a large, somewhat uniform channel with medium to high water velocity. A series of exposed shoals and boulders are located within the first 7 km downstream of Birthday Rapids, after which run habitat dominates the river. There are a few large bays with reduced water velocity and a number of small tributaries that drain into the Nelson River between Birthday Rapids and Gull Lake. River substrates are typically bedrock, boulder, cobble, and sand, with some fine sediment in areas with reduced current. The shoreline in this section of the river contains large sections of bedrock and some areas of fine sediments. Riparian vegetation includes willow, alder, black spruce, tamarack, and trembling aspen. Aquatic vegetation is restricted to bays that are removed from the major river current.

2.3.5 Nelson River: Gull Lake

Gull Lake is situated within a landscape of well-drained mineral soils, dominated by black spruce forest. Trembling aspen occurs sporadically along the shores of Gull Lake and in areas that are well drained. Permafrost is sporadically distributed along this section of the river (Agriculture and Agri-Food Canada 2003).

Gull Lake is a section of the Nelson River where the river widens and is lacustrine in nature with moderate to low water velocity featuring numerous bays. Gull Lake is herein defined as the reach of the Nelson River beginning approximately 17 km upstream of Gull Rapids and 14 km downstream of Birthday Rapids, where the river widens to the north into a bay around a large point of land (Figure 1), and extending downstream to the downstream end of Caribou Island, approximately 3 km upstream of Gull Rapids. Gull

Lake has three distinct basins, the first extending from the upstream end of the lake downstream approximately 6 km to a large island; the second extending from the large island to Morris Point (a constriction in the river immediately upstream of Caribou Island); and the third extending from Morris Point to the downstream end of Caribou Island. Water velocity in the third basin is somewhat faster than in the first two, particularly under low flow scenarios, as the river channel flows around Caribou Island. Gull Lake has numerous small tributaries, with the majority being ephemeral. Lake substrates are predominantly silt and sand with some cobble and boulder in the first two basins where current is slow, and predominantly cobble, boulder, and bedrock in the third basin, with soft substrates in off-current areas. Riparian vegetation includes willow, alder, black spruce, tamarack, and trembling aspen. Aquatic vegetation is restricted to bays that are removed from the major river channel.

2.3.6 Nelson River: Gull Lake to Gull Rapids

The landscape between Gull Lake and Gull Rapids consists of well-drained mineral soils, with bedrock outcrops. Black spruce is the dominant forest cover, with trembling aspen occurring sporadically along the shore. Permafrost is sporadically distributed adjacent to this section of the river (Agriculture and Agri-Food Canada 2003).

This 3 km reach of the Nelson River is characterized by a steep gradient with high water velocity. The river channel is separated into two by a large island at the upstream end of Gull Rapids (Figure 1). The substrate is bedrock, boulder, and cobble with small amounts of clay and silt in off-current bays. Aquatic vegetation is restricted to a bay on the south shore.

2.3.7 Nelson River: Gull Rapids

Gull Rapids is located approximately 3 km downstream of Caribou Island on the Nelson River (Figure 1). Two large islands and several small islands occur within the rapids, prior to the river narrowing. The rapids are approximately 2 km in length, and the river elevation drops approximately 19 m from the downstream end of Gull Lake to the downstream end of Gull Rapids. The substrate and shoreline of Gull Rapids are composed of bedrock and boulders. One small tributary flows into the south side of Gull Rapids, approximately 1 km downstream from the upstream end of Gull Rapids. This tributary is approximately 2.5 km long, and is fed by bogs and fens. The first 300 m of this tributary feature a diversity of pool, run, and riffle habitats and are characterized by boulder, gravel, and sand substrate with small amounts of organic material. The upper

reach of this tributary is slower moving, dominated by marshy habitat and organic substrate.

2.3.8 Stephens Lake

The land bordering Stephens Lake includes areas of poor, moderate, and well-drained soils, dominated by black spruce forest in upland areas and black spruce bogs, peatlands, and fens in lowland areas. Trembling aspen occurs sporadically along the shoreline of Stephens Lake in areas that are well-drained. Soils are predominantly organic along the north shore, but include a section of mineral soil surrounding the north arm, and both mineral and organic soils along the south shore. Permafrost is discontinuous and sporadic, and exposed bedrock occurs at the west end of the lake (Agriculture and Agri-Food Canada 2003).

As discussed in Section 2.2, construction of the Kettle GS resulted in extensive flooding immediately upstream of the GS. Moose Nose Lake (north arm) and several other small lakes that previously drained into the Nelson River became continuous with the Nelson River to form Stephens Lake. Flooded terrestrial habitats compose a large portion of the existing lake substrates, and include organic sediments as well as areas of clay and silt. Woody debris is abundant due to the extensive flooding of treed areas. Outside the flooded terrestrial areas, substrates are dominated by fine clay and silt. Sand, gravel, and cobble, and areas of organic material dominate the shoreline, with much of the shoreline being prone to erosion. Riparian vegetation includes willow, alder, black spruce, tamarack, and scattered stands of trembling aspen.

Major tributaries of Stephens Lake include the North and South Moswakot rivers that enter the north arm of the lake. The only other major tributary of Stephens Lake was the Butnau River. However, during construction of the Kettle GS, an earth dyke was constructed at the inlet of the Butnau River at Stephens Lake, and a channel was developed to divert the Butnau River through Cache Lake into the Kettle River (Manitoba Hydro 1996a). Looking Back Creek is a second order ephemeral stream that drains into the north arm of Stephens Lake (Figure 1). This creek, located directly north of Gull Rapids and Gull Lake, is approximately 35 km in length and a number of small tributaries drain into it.

2.3.9 Long Spruce Forebay

Discharge from the Long Spruce GS is characterized by large and rapid daily fluctuations as a result of power demand. The forebay has limited storage capacity and, as a result,

water entering the reservoir from Kettle GS must be discharged relatively quickly. Water levels in the Long Spruce Forebay range from 109.0 m ASL in the summer to 110.4 m ASL in the winter, with normal water levels of 110.033 m and 110.330 m, respectively (Manitoba Hydro Public Affairs 1999). During the winter months a stable ice sheet forms over the forebay to within 1 km of Kettle GS. The forebay is completely mixed without vertical stratification of temperature (Baker and Schneider 1993). Long Spruce Forebay is located within the discontinuous permafrost zone.

Approximately 13 km of dykes border the downstream section of the Long Spruce GS (Manitoba Hydro Public Affairs 1999). Aquatic habitat within the upstream portion of the forebay is riverine while the downstream portion is more similar to a lake environment. Along approximately 3 km of the north shore of the forebay, there are extensive beds of emergent vegetation covering approximately 90% of this area. In this same location, approximately 10% to 20% of the littoral zone supports submergent aquatic macrophytes. In the remainder of the forebay, emergent vegetation covers only about 5% to 10% of the shoreline, while less than 1% of the littoral zone supports submergent vegetation. Kettle River and Boots Creek are the only major tributaries flowing into Long Spruce Forebay, with both tributaries entering the forebay on the south shore.

2.3.10 Limestone Forebay

Similar to Long Spruce GS, large and rapid daily fluctuations in discharge are characteristic of the Limestone GS and water discharged into the reservoir must exit relatively quickly, due to its limited storage capacity. The normal water level within the forebay is 83.5 m ASL (Manitoba Hydro Public Affairs 1998), and similar to Long Spruce Forebay the water within this forebay is completely mixed with no vertical stratification of temperature (Baker and Schneider 1993). During the winter months, ice forms to within 1 km of the Long Spruce GS. The geology in this area is Precambrian bedrock with a layer of limestone on the surface.

Unlike Long Spruce GS, the Limestone Forebay is contained within the existing riverbank with a minimal dyke system (Manitoba Hydro Public Affairs 1998). Aquatic habitat within Limestone Forebay ranges from a riverine environment in the upstream portion, to more of a lake-like environment just upstream of Limestone GS. In contrast to the Long Spruce Forebay, aquatic macrophytes were not found in 1992 along the shoreline of the Limestone Forebay or within the tributary mouths. However, several species of aquatic macrophytes were found further upstream within the tributaries themselves. There are four main tributaries that flow into Limestone Forebay: Wilson

Creek and Brooks Creek both enter from the south shoreline of the forebay, while Sky Pilot Creek and Leslie Creek enter from the north shore.

2.3.11 Nelson River: Limestone GS to Gillam Island

The Nelson River below the Limestone GS is extensively affected by discharge regulation (Manitoba Hydro 1994). The normal daily pattern of discharge from the Limestone GS is characterized by low night time and high daytime release, with flows in the daytime typically five to ten times higher than those at night time. Regulation in river discharge causes considerable differences in daily river stage (depth) downstream of the Limestone GS, with differences in stage of ranging from 1 m at Gillam Island to 4 m at upstream locations (Manitoba Hydro 1994). The large fluctuations in discharge cause portions of the river bottom to become alternately submerged and exposed, limiting the quantity of habitat consistently available to aquatic biota (Manitoba Hydro 1994).

The Low Subarctic region of the Hudson Bay Lowlands, which encompasses the reach of the Nelson River between the Limestone GS and Gillam Island, falls within the "open coniferous forest zone" an area of discontinuous permafrost dominated by stands of spruce, ground lichen (*Cladonia*), and mosses (Manitoba Hydro 1994). Organic soils are widespread and consist primarily of cryosols (i.e., frozen peats) in raised bogs and mesisols (i.e., non-frozen peats) in fens and bog veneers (Manitoba Hydro 1994). Mineral soils of clayey and loamy texture developed from marine, alluvial, and glacial till deposits are confined to river valleys, ancient beach ridges, drumlins, and meltwater channels (Manitoba Hydro 1994).

Stuckenia pectinata (formerly *Potamogeton pectinatus*), collected from near Gillam Island, was the only submerged macrophyte found in the lower Nelson River below the Limestone GS in 1992 (Manitoba Hydro 1994). Fluctuating water levels, high water velocity, ice scouring, and lack of suitable substrate combine to make the Nelson River mainstem in this region of the Study Area an unfavourable habitat for aquatic macrophytes (Manitoba Hydro 1994).

There are three main tributaries (and numerous smaller ones) that flow into the mainstem of the Nelson River between the Limestone GS and Gillam Island: the Limestone and Weir rivers enter from the north shore, while the Angling River enters from the south shore. All three rivers are perennial in nature.

2.3.11.1 Limestone River

The Limestone River enters the Nelson River directly below the Limestone GS. It is the largest unimpounded tributary of the lower Nelson River, with a length of approximately 150 km and a watershed of 3,160 km^2 (MacDonell 1991).

2.3.11.2 Angling River

The Angling River enters the Nelson River approximately 39 km downstream of the Limestone GS. It is the largest (110 km in length) south shore tributary of the lower Nelson River, and has the third largest (1,630 km^2) drainage area of all tributaries downstream of the Limestone GS (MacDonell 1992).

2.3.11.3 Weir River

The Weir River enters the lower Nelson River approximately 67 km downstream of the Limestone GS and 40 km upstream of the Nelson River estuary. It is the second largest tributary to the lower Nelson River after the Limestone River with a length of 227 km and a drainage area of 2,280 km^2 (Baker 1990, MacDonell 1993).

3.0 METHODS

The following provides a detailed description of the methods for field sample collection and data analysis for:

- The core water quality monitoring program: detailed water quality sampling across the Study Area (see Figure 1);
- Water clarity surveys: *in situ* water clarity surveys conducted in Stephens Lake (see Figure 2); and
- Nearshore sampling in Split Lake: sampling conducted in a nearshore area of Split Lake to investigate the nature of a rusty-brown plume.

3.1 CORE WATER QUALITY PROGRAM

Sampling sites visited during the Keeyask and Conawapa water quality sampling programs are presented in Table 1 and illustrated in Figure 1. Sampling in the ice-cover season was conducted by Manitoba Hydro whereas sampling in the open-water season was conducted by North/South Consultants Inc.

3.1.1 Sampling Sites

Most sites sampled previously along the lower Nelson River under the Keeyask and Conawapa studies were re-sampled in 2009, with the primary exception being that small tributaries were not sampled. However, two new sampling sites were added to the 2009 program in Stephens Lake.

3.1.1.1 Open-water Season

Water samples were collected from 28 locations in the Keeyask/Conawapa Study Area during the open-water season of 2009. The sites were as follows:

- one site at the mouth of the Burntwood River (SPL-1 [near the inlet to Split Lake]);
- six sites on Split Lake (SPL-3, -4, -5, -7, and 8; and YL-1 [at the community of York Landing]);
- one site on the Aiken River (AK-1);
- one site on Clark Lake (CL-1);
- two sites on Gull Lake (GL-1 and GL-2);

- nine sites along the Nelson River (SPL-2, located downstream of the Kelsey GS; NR-1, located downstream of Birthday Rapids; NR-2, located immediately upstream of Gull Rapids; NR-3, located at the Long Spruce GS; NR-4, located at the Limestone GS; and NR-5, -6, -7, and -8, located between the Limestone GS and Gillam Island);
- five sites on Stephens Lake (STL-1, -2, -3, -4, and RB-1 [in Ross Wright Bay in the north arm]);
- one site on the Limestone River (LR-1);
- one site on the Angling River (AR-1); and
- one site on the Weir River (WR-1).

3.1.1.2 Ice-cover Season

Manitoba Hydro/Acres Manitoba Ltd. (Acres) conducted the winter water quality sampling program in conjunction with a sediment and erosion monitoring program. This program was based on a sampling protocol developed by North/South Consultants Inc., and relative to the open-water season, was limited in the number of sites sampled. In March 2009, ten locations were sampled as follows (Figure 1):

- one site at the mouth of the Burntwood River (W-Tu-14 [inlet to Split Lake]);
- two sites on Split Lake (SPL-Tu-4 [at the community of York Landing] and SPL-Tu- 5 [near the community of Split Lake]);
- two sites on Stephens Lake (K-Tu-04 and K-Tu-12); and
- five sites on the Nelson River (K-Tu-10, K-Tu-11 [both upstream of Stephens Lake], Li-S-02b [Long Spruce Forebay]; Ls-S-04b [Limestone Forebay]; and C-Tu-8 [downstream of Jackfish Island]).

Sites were located at or near core water quality monitoring sites sampled in the open-water season of 2009 and in previous years (2001-2004).

3.1.2 Sampling Periods

The winter water quality sampling program was conducted from March 17-25, 2009. Samples were collected on four separate occasions during the 2009 open-water season to incorporate seasonal variability: (1) spring [June 25- July 1]; (2) early summer [July 26-31]; (3) late summer [August 27-31]; and (4) fall [September 29-October 5].

3.1.3 Sampling Methods

3.1.3.1 Open-water Season

In the open-water season, all sampling sites located upstream of the Long Spruce Forebay were accessed by, and sampled from a boat. Sample sites in the Long Spruce and Limestone forebays were accessed by road and sampled directly from the GS structures in June and July; *in situ* measurements were collected by lowering the probe to just below the water surface, and water samples were collected by lowering a Kemmerer water sampler to collect a surface water sample. During the last two sampling rounds, *in situ* profiles and water samples (surface [grab] and bottom [Kemmerer]) were collected from a boat in the middle of each forebay. The Limestone River (LR-1) and Conawapa boat launch (NR-5) sites were accessed by road and sampled from shore. The remainder of sites located downstream of the Conawapa boat launch to Gillam Island (including the Angling and Weir rivers) were accessed by helicopter and sampled from shore using a sampling pole.

In situ physical and chemical measurements were collected at each sampling site and included:

- total depth;
- dissolved oxygen (DO);
- temperature;
- specific conductance;
- pH; and
- turbidity.

Site depths were recorded using a handheld digital sonar. *In situ* surface measurements were collected using a Horiba® W-22XD Water Quality Meter throughout the open-water season. However, in August, problems occurred with the turbidity sensor during the first two sampling days and turbidity was subsequently measured using an Analite Turbidity Meter for the remainder of the August sampling period. Universal Transverse Mercator (UTM) coordinates were recorded at each site with a Garmin etrex® Global Positioning System (GPS) (Table 1). In addition to surface measurements, *in situ* depth profiles and Secchi disk depths were measured at sites where velocities permitted. Light extinction profiles were also measured, where possible (e.g., at sites with low velocities), using a quantum sensor as described in detail in Section 3.2.

Water samples were collected from just below the water surface into laboratory-supplied sample bottles at all sites. At selected sites, bottom samples were also collected from approximately 1 meter above the sediment, using a metals grade Kemmerer water sampler. Samples were preserved, as required, immediately after collection following instructions provided by the analytical laboratory. Following collection, samples were kept cool and in the dark until they were received by the analytical laboratory (ALS Laboratories, Winnipeg, MB), usually within 24 hours.

3.1.3.2 Ice-cover Season

Sampling sites in winter were accessed by either snowmobile or helicopter depending on site accessibility. At each site, a 10-inch gasoline powered ice-auger was used to drill a hole in the ice, through which *in situ* measurements were taken and water samples were collected. Field measurements were recorded using one or both of the following: an RBR Ltd. (Ottawa, ON) XR-420 Multi Channel Logger; or a YSI 600OMS V2 series Sonde. Measurements collected in the field included:

- total depth;
- ice depth;
- temperature;
- specific conductance;
- dissolved oxygen; and
- turbidity.

Prior to conducting the field work, the RBR logger was programmed and set to record every 10 seconds over a 2 second average. Once on site, the logger was lowered at approximately one meter intervals and generally held for one minute at each desired depth until the bottom was reached. Samples for laboratory analysis were collected from near the surface (approximately one metre below the ice) and bottom (approximately one metre above the sediment, where possible) using either a Kemmerer water sampler or a water pump (pre-rinsed with water from the site). Samples were then transferred to laboratory supplied sample bottles. Bottom samples were collected from Split Lake (SPL-Tu-4 and SPL-Tu-5), Stephens Lake (K-Tu-04 and K-Tu-12), and the Limestone Forebay (Ls-S-04b) where reduced velocities allowed the sampler to reach the bottom. Where necessary (i.e., metals), samples were preserved in the field according to instructions provided by the analytical laboratory. After collection, samples were kept cool (but not

allowed to freeze) and in the dark until they were received by ALS Laboratories in Winnipeg, MB (usually within 24 hours).

3.1.4 Water Quality Parameters

A brief description of selected key water quality variables that are discussed in this report can be found in Appendix 1. All laboratory analyses were conducted by ALS Laboratories (Winnipeg, MB) using standard methodologies. In addition, one water sample was collected during each sampling period in the open-water season for inter-laboratory comparison (see Section 3.4 [Quality Assurance/Quality Control] for more detail) and was submitted to CanTEST Laboratories (Winnipeg, MB) for analysis. A complete list of parameters and analytical detection limits is provided in Appendix 2. Detailed descriptions of analytical methodologies, method numbers, and method references for each analytical laboratory are provided in Appendix 3.

3.2 WATER CLARITY SURVEYS

In addition to the core water quality sampling program, water clarity surveys were conducted at a number of supplemental sites in Stephens Lake and light extinction profiles were collected at selected sampling sites during the water sampling program. The surveys involved: *in situ* profile measurements of water quality parameters; measurements of light irradiance within the water column; and Secchi disk depth measurements.

3.2.1 Sampling Sites

Water clarity surveys were conducted during the open-water season in two areas of Stephens Lake: (1) along a transect beginning in the north arm of the lake; and, (2) in the southern, mainstem portion of the lake, near an area of active shoreline erosion, with the intent to capture variability in turbidity and light attenuation in Stephens Lake (Figure 2). In the north arm, ten sites (RBCS-1, to -10) were sampled along a transect emanating from the nearshore in Ross Wright Bay out into Stephens Lake (near STL-4). For the southern survey, five sites (STLCS-1, to -5) were sampled along a transect radiating out from the shore of a small island with active shoreline erosion in the southwest section of Stephens Lake. For both transects, sampling sites were spaced approximately equidistantly away from the starting point until turbidity became relatively constant.

In addition to the detailed water clarity surveys in Stephens Lake, light extinction profiles and Secchi disk depths were measured in conjunction with the core water quality

sampling during the June and July sampling periods at a number of sites in the Keeyask Study Area (where velocities were conducive to sampling), as follows:

- five sites on Split Lake (SPL-3, -4, -5, and -7; and YL-1);
- one site on the Aiken River (AK-1); and
- five sites on Stephens Lake (STL-1 to -4; and RB-1).

3.2.2 Sampling Periods

Water clarity surveys were conducted during the spring and early summer sampling periods; light extinction profiles could not be measured during the last two sampling periods due to instrument failure.

3.2.3 Sampling Methods

The surveys involved *in situ* profile measurements of: turbidity; temperature; DO; specific conductance; and pH; as well as, the collection of light extinction profiles and Secchi disk depth. Total water depths were also recorded using a handheld digital sonar.

Attenuation of photosynthetically active radiation (PAR) in the range of 400-700 nm was measured in the water column using LI-COR radiation sensors (LI-192SA and LI-193SA: underwater quantum sensors) mounted on a lowering frame coincident with measurement of ambient down-welling light near the water surface. A spherical sensor was used to collect scattered light within the water column; while, a flat sensor was used to collect up-welling light. The three channels of light data ($\mu E\ M^{-2}\ s^{-1}$) were recorded to a LI-COR 1400 data logger at depth intervals of 0.1 m until 0.2 m past the point of extinction; or to a maximum depth of approximately 4 m.

In situ water quality profiles were measured with a Horiba® W-22XD Water Quality Meter. Secchi disk depths were determined by averaging two readings: the depth at which a black and white disk was no longer visible when lowered into the water column; and the depth at which the disc returns to view upon being raised from the water column. Secchi disk depths could not be obtained at all sites due to high velocities.

3.3 NEARSHORE SAMPLING IN SPLIT LAKE

On August 27, 2009, several TCN members indicated to the NSC field crew that they observed a “plume” on the water surface of Split Lake and near the Aiken River mouth, primarily in nearshore areas. The field sampling crew subsequently investigated the areas of Split Lake where the plume had been observed.

The plume substance was light brown/rust coloured and resembled flakes on the surface of the water (Figures 3 and 4). The plume seemed to be mostly localized along the shoreline and in bays as well as in off-current areas in Split Lake. In addition, the plume was also observed in the Burntwood River downstream of Thompson (by other NSC field sampling crews) to Split Lake, in the Aiken River, and as far downstream as Stephens Lake.

The late summer Keeyask water quality sampling program was conducted on Split Lake by NSC personnel on August 27th and 28th, during the presence of this plume substance. In response to the concerns expressed by several TCN members, and at the request of Randy Beardy, an additional water sample was collected from an area of the lake where the plume was observed. This sample was collected on the south side of the lake, across from the community of Split Lake (Site ID= UNK). Samples collected from the plume were collected by skimming across the surface to capture as much of the plume substance as possible (i.e., the substance was floating near the surface). The sample was submitted to ALS Laboratories (Winnipeg, MB) for analysis of the same parameters as other water samples collected for the Keeyask water quality sampling program. Additionally, a sample was collected from the plume for phytoplankton taxonomic identification (Note: Lugol's solution was not added in field for preservation as it was not available; preservation of the sample was conducted upon receipt at the laboratory).

3.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

All analyses were conducted at an analytical laboratory that is accredited under the Canadian Association for Laboratory Accreditations, Inc. (CALA). In addition, general Quality assurance/quality control (QA/QC) measures were incorporated in the field sampling program, data review and analysis, and reporting stages. Field sampling programs were conducted using predefined sampling protocols and standard measures to minimize sample contamination were taken at all times.

QA/QC samples incorporated in the 2009 sampling program included field blanks, trip blanks, sample replicates (i.e., triplicate samples), dissolved oxygen (DO) laboratory verification samples, and samples for inter-laboratory comparison. Each of these elements was included during all four sampling periods within the open-water season. During the ice-cover season, one field blank and one trip blank were collected in the Conawapa Study Area. All QA/QC data are presented in Appendix 4. The following is a detailed description of each of the QA/QC samples incorporated into the 2009 field program.

3.4.1 Field and Trip Blanks

Field blanks are intended to provide information on sample contamination from atmospheric exposure and sample handling techniques (i.e., cleanliness of sampling equipment, carry-over contamination from site to site), as well as potential laboratory contamination and/or error (BCMELP 1998). Field blanks were prepared by filling sample bottles with deionized water (both provided by the analytical laboratory) in the field and transporting them along with environmental samples. One field blank was collected per sampling round.

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). The trip blank was prepared in the analytical laboratory (ALS Laboratories, Winnipeg, MB) by filling one set of sample bottles with deionized water. The trip blank was then transported to the field sampling sites, but remained sealed, and was then submitted to the analytical laboratory in conjunction with environmental samples for analysis. One trip blank was collected per sampling round.

Field and trip blank results were evaluated for evidence of sample contamination. Values for any parameter that exceeded five times the analytical detection limit (DL) were considered to be indicative of sample contamination and/or laboratory error and are indicated in red in all tables and appendices presented herein.

3.4.2 Triplicate Samples

Triplicate samples are used to provide a measure of variability of environmental conditions and the overall precision associated with field methods and laboratory analysis. During the open-water season, the sampling program incorporated the collection of one triplicate sample in the Keeyask Study Area and one in the Conawapa Study Area during each sampling period. Triplicate samples were denoted with an ‘A’, ‘B’, and ‘C’ after the sample ID.

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

PRSD = Standard deviation of the triplicate values / Mean of the triplicate values x 100%.

Precision of triplicate samples was evaluated using the "rule of thumb" criteria for precision of 18% (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).

3.4.3 Dissolved Oxygen Laboratory Verification Samples

To evaluate the accuracy of *in situ* DO measurements, four surface water samples (two samples each for the Keeyask and Conawapa field programs) were collected per sampling trip during the open-water season and submitted to ALS Laboratories (Winnipeg, MB) for analysis of DO by the Winkler titration method.

Precision of DO field measurements was assessed by calculating the relative percent mean difference (RPMD) between the laboratory and *in situ* measurements using the formula:

RPMD = |(duplicate value 1 – duplicate value 2)| / ((duplicate value 1 + duplicate value 2) /2) x 100%.

Precision of these samples was evaluated using the "rule of thumb" criteria for precision of 25% for duplicate samples (BCMELP 1998).

3.4.4 Inter-Laboratory Comparison Samples

At one randomly selected sampling site, an additional sample of surface water was collected for inter-laboratory comparison during each sampling period in the open-water season. The inter-laboratory comparison sample was submitted to a CALA accredited analytical laboratory (CanTEST Ltd., Winnipeg, MB) for analysis. Samples for inter-laboratory comparison were collected at the same location and in as close in time as possible. As a measure of the level of precision, RPMD was calculated from results obtained from the two laboratories, and evaluated using the "rule of thumb" criteria for precision of 25% for duplicate samples (BCMELP 1998).

It should be noted that the sample bottle supplied from CanTEST for nutrient analysis required the sample to be field preserved with the addition of sulphuric acid in the field; however, the nutrients bottle collected for ALS was not preserved. As a result, total ammonia and nitrate/nitrite were measured by CanTEST, where as, the dissolved forms were measured by ALS Laboratories.

3.4.5 Data QA/QC

All water quality data were evaluated qualitatively for potential outliers and transcription or analytical errors. Where values were encountered that departed considerably from results obtained at the same site during other sampling periods and/or where one replicate sample differed notably from the others, the measurement was flagged as "suspect". In these instances, values were verified against analytical laboratory reports for transcription errors and/or requests were made to the analytical laboratory to verify the values through sample re-analysis and/or verification of reporting accuracy. Suspect measurements are indicated in blue italics in all tables and appendices presented herein and were omitted from any statistical calculations.

3.5 DATA ANALYSIS

3.5.1 Summary Statistics

To assist in data interpretation, summary statistics, including minimum, maximum, and mean ± standard error (SE), were calculated for water quality variables at each site sampled during the open-water season of 2009. For the purposes of calculating mean values, measurements reported below analytical detection limits (DL) were assigned a value of one half the DL. No summary statistics could be provided for samples obtained in March 2009 as only a single sample was collected at that time.

3.5.2 Comparison of 2009 data to 2001-2004 data

Water quality data collected during the open-water season in 2009 were compared to data collected in the Keeyask/Conawapa study areas from 2001-2004 to determine if there have been any substantive changes to water quality since the initial baseline studies were conducted. Figures 5-19 compare site means for select water quality parameters measured in 2009 against the overall means and ranges for the 2001-2004 open-water seasons.

3.5.3 Manitoba Water Quality Objectives and Guidelines

Provincial water quality objectives and guidelines have been generated for many water quality parameters, for the purpose of protecting aquatic biota and wildlife, and various human usages including recreation, drinking, irrigation, and livestock watering. A summary of relevant water quality objectives and guidelines is presented in Appendix 5. In Manitoba, existing provincial water quality objectives and guidelines were revised in 2002 (Williamson 2002) and are largely in accordance with national Canadian Council of Ministers of the Environment (CCME) guidelines (CCME 1999; updated to 2010).

Water quality data collected in the open-water and ice-cover seasons of 2009 were compared to the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs; Williamson 2002) where available, and CCME guidelines where criteria were not available for Manitoba.

3.5.3.1 Comparison to MWQSOGs for the Protection of Aquatic Life

In general, water quality objectives and guidelines are more stringent for the protection of aquatic life and wildlife, relative to those established to protect various human usages, including drinking water quality objectives. Water quality data were compared to MWQSOGs for the protection of aquatic life, where available (Williamson 2002), as summarized in Appendix 5. Objectives were calculated for ammonia based on the range of pH and water temperature observed in the Keeyask and Conawapa Study Area. Objectives were also calculated for cadmium, copper, chromium, lead, nickel, and zinc, based on water hardness measured in the Study Areas in 2009. With the exception of arsenic, all substances for which there are MWQSOGs for the protection of aquatic life, guidelines and objectives are more stringent for the protection of aquatic life than for protection of human health as drinking water (Williamson 2002).

3.5.3.2 Drinking Water Quality Objectives

Proposed Manitoba water quality objectives and guidelines for drinking water (Williamson 2002) are adopted directly from the federal Health Canada objectives, summarized in CCME (1999; updated to 2010); relevant objectives and guidelines for this study are presented in Appendix 5. Drinking water quality objectives and guidelines are intended to be applied to treated or finished water as it emerges from the tap and "*are not intended to be applied directly to source waters*" (CCME 1999; updated to 2010). However, comparison of water quality in the Study Area to drinking water quality objectives is included to provide context; it is indicated in the proposed MWQSOGs (Williamson 2002) that: "*All surface waters…are susceptible to uncontrolled microbiological contamination. It is therefore assumed that all raw surface water supplies will be disinfected as the minimum level of treatment prior to consumption.*" Furthermore, it is indicated that Manitoba Drinking Water Quality Guidelines "*apply to finished drinking water, but can be extrapolated to provide protection to raw drinking water sources.*"(Williamson 2002).

3.5.4 Calculations and Formulas

3.5.4.1 Calculation of Euphotic Depth

The measurements from the light extinction profiles were used to calculate euphotic depth. The euphotic depth (Z_1), defined as the depth at which 1% of the incident light is extinguished in the water column, was calculated as:

$Z_1 = (\ln I_0 - \ln I_Z) / K_e$

Where: the light attenuation coefficient (K_e) was calculated by regression analysis between depth and the natural logarithm of irradiance (I) such that, the negative slope of the regression equation is K; and, I_0 and I_Z denote irradiance at the surface and at depth.

3.5.4.2 Conductivity

Conductivity values were calculated from specific conductance and temperature measured in the field using the following formula:

Conductivity = specific conductance * [1+0.0191*(Temperature - 25^{o}C)].

4.0 RESULTS AND DISCUSSION

The following presents the results of the water quality sampling program conducted in the open-water and ice-cover seasons of 2009. Raw water quality data are presented in Appendix 6, including results of *in situ* depth profiles of temperature, DO, pH, turbidity, and specific conductance.

Split Lake outlet discharges from 1999-2009 are presented in Figures 20 and 21. Flows were high in the open-water season of 2009 and discharge exceeded the 95th percentile from the latter part of June through the latter part of October.

4.1 WATER QUALITY QA/QC RESULTS

The following describes the results for the QA/QC samples that were incorporated into the 2009 sampling program.

4.1.1 Field and Trip Blanks

Field and trip blank results for both the open-water and ice-cover seasons indicate good precision and minimal sample contamination issues. All measurements for total metals were below the threshold of five times the DL (Appendix 4). The majority of measurements for routine water quality variables were also below five times the DL; however, a small number of measurements were on occasion above this threshold (Appendix 4). Parameters that exceeded the threshold included single samples for ammonia, TP, DP, and turbidity. In each instance, the parameter was detected both in the field and trip blanks indicating that the likely source of sample contamination was related to the analytical laboratory (i.e., deionized water, sample bottles, analysis methods) and not due to contamination in the field.

4.1.2 Replicate Samples

Generally, there was good agreement between replicate samples, yielding acceptable levels of precision. Exceptions where the established threshold (18% PRSD) was exceeded were:

- the PRSD for ammonia replicates was 21% on one occasion (June 2009);
- three of the eight triplicate samples for aluminum exceeded the threshold;
- two of the eight triplicate samples for iron and rubidium exceeded the threshold;

- four of the eight triplicate samples for titanium exceeded the threshold.

All values flagged as suspect were verified against analytical laboratory reports for transcription errors, then submitted and verified by the laboratory through sample re-analysis. Measures of precision for sample replicates could not be derived for a number of metals due to low concentrations (i.e., concentrations less than five times the DL).

4.1.3 DO Samples

Samples collected for DO analysis in the laboratory were generally in agreement with DO measurements collected in the field, indicating a good level of field precision. RPMD between the laboratory and *in situ* measurements showed that 75% of the results were within the "rule of thumb" criteria for precision of 25% for duplicate samples (BCMELP 1998; Appendix 4). In October, DO concentrations were lower in the laboratory verification samples indicating that *in situ* measurements collected during this period may have over-represented actual DO concentrations at this time.

4.1.4 Inter-Laboratory Comparison

Results from routine analysis conducted on samples collected for the inter-laboratory comparison, where RPMD could be calculated (i.e., concentration for the sample was greater than five time the analytical detection limit) indicated that 13 measurements exceeded the level of precision of 25%. Parameters that exceeded the threshold included TP, DP, TOC, TSS, TDS, turbidity, true color and chlorophyll *a*. Only four measurements for metals exceeded the threshold (Appendix 4), which included the following parameters: aluminum; iron; manganese; and titanium. Inter-laboratory differences may be attributed to different laboratory methods used in the analysis of water samples as described in Appendix 3 (i.e., differences in filter sizes, analysis equipment, different detection limits, etc.).

4.2 ROUTINE WATER QUALITY

Routine water chemistry (e.g., nitrogen, phosphorus, carbon, TSS, turbidity, conductivity, pH, and chlorophyll *a*) and *in situ* variables (i.e., temperature, DO, pH, specific conductance, and turbidity) measured in the open-water and ice-cover seasons of 2009 are presented in raw form in Appendix 6; data for the open-water season are statistically summarized in Tables 2 and 3. Sections 4.2.1 – 4.2.8 provide a discussion of the routine water chemistry for the open-water season in 2009, with comparison to results of previous study years (2001-2004).

4.2.1 TSS and Turbidity

Consistent with previous studies, the Burntwood River contained higher average TSS concentrations and was more turbid than the Nelson River (Figures 5-6). Mean TSS and turbidity were higher along the Nelson River downstream of the Limestone GS (NR-5 to -8) in the open-water season of 2009 relative to the overall mean for 2001-2004 (Figures 5 and 6). TSS/turbidity was also higher at the Limestone, Angling and Weir rivers in June and July 2009 relative to other sampling periods and ranges measured in previous study years. However, with few exceptions, TSS was within the range observed for the Study Area from 2001-2004. Turbidity was consistently within the range measured from 2001-2004 (Figures 5 and 6, Appendix 6). Relatively high TSS concentrations were measured at the inlet of Split Lake (SPL-1) in June and July and at the two most downstream sites on the Nelson River (NR-7 and -8) in June.

In general, TSS and turbidity data collected in 2009 illustrated a similar overall spatial pattern as observed in 2001-2004, with higher mean concentrations at sites located on the lower Nelson River and generally lower concentrations in the north arm of Stephens Lake and large tributaries. The primary exception to this general trend was the elevated concentrations of TSS observed in large tributaries to the lower Nelson River in June and July.

The highest TSS and turbidity values occurred in June and/or July at sites located on the main flow of the Nelson and Burntwood rivers and in the large tributaries downstream of the Limestone GS. Notably higher levels occurred at the lower end of the Nelson River and in the large tributaries in June. These seasonal differences may reflect the high river discharge that was most pronounced in late June through July. There was no consistent difference between the open-water and ice-cover seasons for TSS and turbidity.

4.2.1.1 True Colour (TC)

True colour readings ranged from 5.0 TCU (multiple sites and times) to 100 TCU (WR-1, July) in the open-water season of 2009 (Appendix 6). As observed in previous years, the Burntwood River is more coloured than the Nelson River (Figure 7). In general, true colour in 2009 was similar to that measured in 2001-2004 and all values were within range of those measured during the earlier time period (Figure 7). However, true colour was notably lower in the Aiken River in 2009. There was no indication of variation in true colour between the open-water and ice-cover seasons.

The majority of true colour values (72%) exceeded the aesthetic drinking water quality guideline (15 TCU; Williamson 2002) across the Study Area in 2009, as observed in previous years.

4.2.2 Dissolved Oxygen and Stratification

Most sites were not thermally stratified during any of the sampling periods. The exceptions include Site SPL-3 near the western end of Split Lake in August and Site YL-1 near the mouth of the Aiken River in July (Appendix 6).

Surface waters were typically well-oxygenated from surface to bottom in the open-water and ice-cover seasons of 2009 and generally similar to DO concentrations measured from 2001-2004 (Figure 8). DO concentrations typically varied less than 1 mg/L from surface to bottom in all sampling periods. Spatially, DO was somewhat lower in the Aiken River and in the vicinity of York Landing than sites located on the mainstem (sites located along the main flow of the Nelson River) of the Nelson River.

All measurements of DO exceeded the most stringent applicable water quality objectives for the protection of cool-water and cold-water aquatic life with one exception. DO concentrations measured at the Aiken River in June (Site AK-1) were below the most stringent objective of 6.5 mg/L (30-day averaging duration for cold-water aquatic life).

4.2.3 pH and Hardness

4.2.3.1 pH

pH (measured in the laboratory) ranged from 7.64 in the Aiken R. (AK-1, August) to 8.62 in Split Lake (SPL-3, September) during the open-water season of 2009 (Table 2). Overall, pH in 2009 fell within the range observed from 2001-2004 (Figure 9); however, the mean pH at most sites in 2009 tended to be somewhat higher than that of the earlier time period. Spatially, the most notable difference was the lower pH observed in the Aiken River but this was also observed in previous years of study. There were no consistent differences in pH observed between the open-water and ice-cover seasons. All measurements of pH (laboratory and *in situ*) were within the MWQSOG for the protection of aquatic life (6.5-9.0). However, pH exceeded the upper range for the drinking water quality guideline (6.5-8.5) in September 2009 at three sites (SPL-2, SPL-3; and SPL-7).

4.2.3.2 Hardness

The Nelson River and lakes along the Nelson River in the Study Area are generally characterized as moderately soft (61 – 120 mg/L) to hard (121 – 180 mg/L) (CCREM 1987). The Burntwood River is characterized by softer water, with hardness ranging from soft to moderately soft in 2009. Across the Study Area as a whole, hardness, ranged from 61.2 mg/L (AR-1, July) to 146 mg/L (LR-1, August) in the open-water season of 2009 (Appendix 6), which is similar to the range observed from 2001-2004. At several sites, however, the average water hardness in 2009 was higher than during the earlier time period (Figure 10).

4.2.4 Specific Conductance and Total Dissolved Solids

4.2.4.1 Specific Conductance

Specific conductance (*in situ*) ranged from 97 µS/cm in the Angling River (AR-1, June) to 354 µS/cm on Split Lake (SPL-4, August) in the open-water season of 2009 (Table 3; Appendix 6). Overall, measurements of specific conductance were within the range recorded from 2001-2004 (Figure 11); however, mean specific conductance was higher at most mainstem sampling sites along the Nelson River in 2009. Higher specific conductance was not observed for the large tributaries or the off-current site in Stephens Lake (STL-3).

Specific conductance was lowest in July at all mainstem sampling sites but was higher in late summer and fall at large tributaries. Specific conductance was also higher in winter at most sampling sites, as observed in previous years of study.

4.2.4.2 Total Dissolved Solids

In the 2009 open-water season, TDS ranged from 80.0 mg/L on the Angling River (AR-1) in July to 224 mg/L in Stephens Lake (STL-1 and STL-2) in June (Appendix 6). Mean TDS concentrations were generally similar across all mainstem sampling sites along the Nelson River. As observed in previous studies, TDS concentrations were lower on the Burntwood River near the inlet to Split Lake (SPL-1) and in large tributaries (Figure 12). All site means recorded in 2009 were within the range observed for the Study Area in 2001-2004. All concentrations of TDS were well below the aesthetic drinking water quality objective of 500 mg/L.

4.2.5 Nitrogen

In general, mean concentrations of nitrogenous parameters measured in the Keeyask/Conawapa Study Area in 2009 were similar to, and within range of, those measured in 2001-2004 (Figures 13-15).

Inorganic forms of nitrogen were relatively low, such that: nitrate/nitrite-N ranged from <0.0050 mg/L (multiple sites and times) to 0.0520 mg/L (SPL-2 and SPL-7; August); and, ammonia-N ranged from <0.0030 mg/L (multiple sites and times) to 0.0423 mg/L (GL-2; October; Table 2). Similar to 2001-2004, mean nitrate/nitrite concentrations were comparable at most sites along the mainstem of the Nelson River, but were lower at large tributaries, the two sites near the Aiken River (YL-1 and SPL-5) and in the north arm of Stephens Lake (RB-1, STL-3, and STL-4; Figure 13). Consistent with the results of previous studies, nitrate/nitrite concentrations were notably higher in the ice-cover season (Appendix 6). All measurements of nitrate/nitrite were well below the CCME guideline for the protection of freshwater aquatic life (2.93 mg N/L; CCME 1999; updated to 2010) and the MWQSOG for drinking water (Williamson 2002).

Mean ammonia-N concentrations in 2009 were somewhat higher at sites along the Nelson River from Split Lake to Stephens Lake and in the Longspruce Forebay relative to the earlier time period; however, caution should be taken with this interpretation as ammonia concentrations in the Study Area can be quite variable (Figure 14). All ammonia concentrations were well below the most stringent site-specific objectives for the protection of aquatic life (Appendix 5).

TKN concentrations measured from surface water samples, were similar throughout the Study Area and ranged from <0.20 mg/L in Stephens Lake (RB-1, STL-4, July) to 1.00 mg/L in the Burntwood River (SPL-1, August). TKN concentrations were similar to those measured in 2001-2004 (Figure 15).

4.2.6 Phosphorus

Mean total phosphorus (TP) concentrations measured during the open-water season of 2009 were similar to, but generally slightly higher than, those measured from 2001-2004 (Figure 16). Along the mainstem of the Nelson River, TP was relatively similar between sites with mean values ranging from 0.0249 mg/L (SPL-5) to 0.0448 mg/L (SPL-8; Table 2). As observed in previous years, TP concentrations declined slightly in Stephens Lake. TP was lower in the large tributaries, the north basin of Stephens Lake, and at sites near the Aiken River mouth. Similar trends were observed for DP, but mean DP

concentrations were higher in 2009 at several mainstem sites relative to 2001-2004 (Figure 17).

During the open-water season, TP concentrations were generally highest at sites along the mainstem of the Nelson River in July and August and lowest in June. DP does not exhibit a clear seasonal pattern across the Study Area.

In Manitoba narrative guidelines for TP for lakes, ponds, reservoirs, and tributaries at the point of entry to these waterbodies is 0.025 mg/L (Williamson 2002). The guideline for rivers and streams is 0.050 mg/L, respectively. TP concentrations were within the narrative guideline at river sites but with a few exceptions (YL-1, June; SPL-5, June and July; RB-1, June; and STL-3, open-water season) TP concentrations measured at lake sites or stream sites near the point of entry to lakes, exceeded the 0.025 mg/L guideline.

4.2.7 Organic Carbon

Total and dissolved concentrations of organic carbon were often identical, with only a few samples differing by more than 1.0 mg/L (Appendix 6). In 2009, mean TOC concentrations in the Study Area were similar to those measured during the initial baseline studies and relatively consistent across the mainstem sites, with one exception (Site SPL-5), ranging from 8.4-10.4 mg/L (Table 2, Figure 18). As observed in previous years, TOC was higher in the large tributaries and Site SPL-5, located near the mouth of the Aiken River.

4.2.8 Chlorophyll *a*

All concentrations of chlorophyll *a* measured during the open-water season of 2009 were within the range measured from 2001-2004 (Figure 19). However, the mean chlorophyll *a* concentrations on the mainstem of the Burntwood/Nelson River system were somewhat lower than the means for the period of 2001-2004. Chlorophyll *a* was lower at the large tributary sites (AK-1, LR-1, AR-1, and WR-1) where mean chlorophyll *a* concentrations were ≤2.2 µg/L (Table 2). Chlorophyll *a* was not detected (<1.0 µg/L) in the ice-cover season.

4.3 MAJOR IONS AND METALS

Summary statistics for major ions and metals are presented in Table 4 and raw data are provided in Appendix 6. Frequencies of exceedences above MWQSOGs for the protection of aquatic life and drinking water quality guidelines are presented in Tables 5 and 6, respectively.

In general, the concentrations of major ions and metals measured in the open-water season of 2009, were similar to, and within the ranges of those measured in the Keeyask and Conawapa study areas from 2001-2004 (Table 4). Nine elements were found to exceed the 2001-2004 upper range observed for the Study Area (open-water season) including: aluminum (<1% of measurements); calcium (2.7% of measurements); chloride (1.8% of measurements); copper (<1% of measurements); iron (1.8% of measurements); magnesium (1.8% of measurements); manganese (3.6% of measurements); sodium (3.6% of measurements); strontium (14.4% of measurements); and titanium (3.6% of measurements). Maximum concentrations for aluminum, iron, magnesium, and manganese in the open-water season of 2009 were only marginally higher than the upper range of concentrations measured from 2001-2004.

The following major ions and metals were consistently above detection throughout the Study Area in the open-water and ice-cover seasons of 2009: aluminum; barium; calcium; iron; magnesium; manganese; potassium; rubidium; silica (dissolved); sodium; and, strontium. Additionally, several elements typically detected at sites along the Nelson River (including Split, Clarke, Gull and Stephens lakes), were frequently below the analytical DL in the Aiken, Limestone, Weir and Angling rivers, including: arsenic; copper; molybdenum; chloride; and vanadium. Metals that were rarely detected (i.e., <10% of measurements) in the Study Area in 2009 include: selenium; silver; thallium; tin; and zinc. Metals that were consistently below analytical detection limits include beryllium, bismuth, and tellurium.

Concentrations of some metals in surface water were elevated in the Study Area as a whole, most notably aluminum and iron; levels of both these metals are typically well above MWQSOGs for the protection of aquatic life in the Study Area (Badiou and Cooley 2004, 2005, and Badiou et al. 2005, 2007), and have been for at least several decades (Ramsey 1991). Several other metals were infrequently above MWQSOGs for the protection of aquatic life in the Study Area, including: copper (2% of measurements); mercury (<1% of measurements); selenium (5% of measurements); and silver (2% of measurements; Table 5). All other metals and major ions, for which there are MWQSOGs, were below water quality objectives and guidelines for the protection of aquatic life, including: antimony; arsenic; barium; cadmium; chromium; lead; molybdenum; nickel; thallium; and zinc (Table 5). In addition, all measurements of boron were well below the recently adopted CCME guideline for the protection of aquatic life (CCME 1999; updated to 2010). These results are consistent with the results of earlier studies in the Study Area.

With the exception of iron, which exceeded the aesthetic drinking water quality guideline (0.3 mg/L) in 87% of all measurements, all metals and major ions were within MWQSOGs for drinking water (Table 6).

There are no MWQSOGs or CCME guidelines for most substances for the protection of aquatic life and drinking water quality (beryllium, bismuth, calcium, cesium, cobalt, magnesium, potassium, rubidium, silica, strontium, tellurium, tin, titanium, tungsten, vanadium, and zirconium).

4.4 LIGHT PROFILES AND WATER CLARITY SURVEYS

Light extinction coefficients and euphotic zone depths calculated from light (PAR) profiles measured during the Keeyask water quality sampling program and Stephens Lake water clarity surveys are presented in Table 7. Raw *in situ* data collected during the light clarity surveys are presented in Appendix 7.

Data from light profiles collected in June and July of 2009 indicated that euphotic zone depths were lower along the mainstem of the Nelson River, relative to the north arm of Stephens Lake or sites in and near the Aiken River. Euphotic zone depths decreased along a transect in Ross Wright Bay in the north arm of Stephens Lake while the opposite trend was observed at a transect running from an island out into the main body of the southern portion of Stephens Lake.

Significant linear regressions were observed between euphotic zone depths (as calculated from light profiles) and *in situ* turbidity, laboratory turbidity, TSS, and Secchi disk depths (Figure 22). Conversely, linear regression analysis did not reveal a significant relationship between euphotic zone depth and TOC, DOC, or true colour (Figure 23). Overall, turbidity was the most closely correlated variable to euphotic zone depth.

4.5 SPLIT LAKE PLUME

Results from the plume sample collected in the nearshore area of Split Lake in August 2009 were compared to water quality measured at other sampling sites in the Split Lake area that were sampled as a regular component of the Keeyask water quality sampling program. Raw data collected during this survey are presented in Appendix 8.

With the following exceptions, the results obtained from the plume sample were found to be within the range found for the ten other sites sampled in August 2009 in the Split Lake area (Appendix 8):

- bicarbonate (HCO_3-);
- total phosphorus (TP);
- total suspended solids (TSS) were all moderately higher within the plume; and
- eight metals (antimony, barium, calcium, copper, nickel, rubidium, strontium, and zirconium) were found to be above the upper range measured in the Split Lake area in August 2009.

Of the above parameters, most only slightly exceeded the range of concentrations measured during the same period in the Split Lake area, including bicarbonate alkalinity, calcium, strontium, and TP. In addition, although the concentration of manganese measured in the plume sample was within the range measured in the area, it was higher than the concentration measured at the site located across the lake near the community of Split Lake (SPL-7).

Antimony, barium, rubidium, zirconium, and TSS were notably higher in the plume than other locations. There are no water quality objectives or guidelines for the protection of aquatic life or drinking water for rubidium or zirconium and the objectives for TSS apply to relative changes from background and are not applicable here. All measurements of TP collected in August in the Split Lake area exceeded the Manitoba narrative water quality guideline of 0.025 mg/L (Williamson 2002), which is typical for this area. While there are no water quality guidelines for the protection of aquatic life for antimony or barium, the concentrations measured in the plume were below the drinking water quality guidelines (0.006 mg/L and 1 mg/L, respectively). Both copper and nickel were found to below their respective calculated guideline for the protection of aquatic life (based on water hardness) and copper was also found to be well below the 1 mg/L drinking water guideline.

The results of the phytoplankton analysis from the plume are presented in Appendix 8. Total phytoplankton biomass was 7,747 mg/m^3. Three phytoplankton groups comprised 96% of the total biomass as follows: 36% Cyanophyceae (“blue-green algae”); 31% Chlorophyceae (“green algae”); and, 28 % Bacillariophyceae (“diatoms”). The dominant genera identified in this sample were *Aphanizomenon*, *Pandorina*, and *Fragilaria*. Each of these genera are bloom-forming taxa. Phytoplankton samples were not collected as part of the regular water quality studies conducted in 2009; therefore, there are no data from other sites or times for direct comparison. However, the phytoplankton biomass measured in the nearshore area of Split Lake in August 2009 was considerably higher than the average phytoplankton biomass measured in August for the Split Lake area

(SPL-3 to -8 and CL-1) during the Keeyask baseline studies (August 2001 and 2002), which ranged from 199 to 1,059 mg/m^3 (Badiou and Cooley 2004, 2005). Similarly, the chlorophyll *a* concentration (8.4 µg/L) of the plume sample was higher than concentrations measured on the main body of Split Lake in August 2009 (2.7 to 3.8 µg/L) but was within the range measured for Split Lake from 2001-2004.

A request was also made to the analytical laboratory to examine the nearshore "plume" sample microscopically; in particular, to determine the general nature of the brownish flakes suspended in the water column. The analytical laboratory reported that the flakes consisted mainly of organic debris with a very small amount of inorganic crystals. Therefore, while phytoplankton biomass was somewhat elevated in the plume sample, the flakes themselves were not algal in nature.

5.0 WATER QUALITY OVERVIEW

Discharge of the Nelson River was high in the open-water season of 2009 and higher than previous years of baseline studies. However, the results of the 2009 water quality sampling program were generally similar to (i.e., within the range) results obtained in earlier years (2001-2004) and are summarized in the following:

- Overall, the mainstem of the Study Area is moderately nutrient-rich, well-oxygenated, moderately soft to hard, and has a slightly alkaline pH;
- Split Lake water quality varies according to the locations of tributary inflows as the quality of water varies between the three main tributaries (the Burntwood, Nelson, and Aiken rivers);
- Water quality in Stephens Lake also varies spatially. Conditions at the south end of Stephens Lake resemble those observed on the main flow of the Nelson River upstream and downstream of the lake. This area is generally more nutrient-rich, more turbid, does not stratify, and is more oxygenated over winter than the north arm of the lake;
- Changes in some water quality conditions are also evident from Stephens Lake to the estuary. Specifically, TSS and turbidity decrease along the flow of the Nelson River in Stephens Lake and downstream, increasing again at the lower end of the Nelson River. Other routine variables are generally similar along the length of the lower Nelson River;
- Larger downstream tributaries (Limestone, Angling, and Weir rivers) are generally less phosphorus-rich and contain higher concentrations of OC but lower concentrations of chlorophyll *a* than the mainstem of the Nelson River;
- Analysis of metals in the main Study Area revealed that, similar to historical results and the results of recent studies, concentrations of aluminum and iron are relatively high in the Study Area.

Notable exceptions where results of the 2009 water quality program differed from studies conducted from 2001-2004 include:

- While most sites exhibited lower mean concentrations of TSS and turbidity levels in 2009 relative to 2001-2004, the opposite trend was observed at the Burntwood River, large tributaries to the lower Nelson River (Limestone, Angling, and Weir rivers) and sites on the lower Nelson River downstream of

the Limestone GS. High levels of both parameters occurred at these sites in June and/or July, some of which exceeded the maximum levels recorded in previous years;

- Mean concentrations of most routine parameters (pH, hardness, specific conductance, nitrate/nitrite, ammonia, TP, and DP) were higher at some sites in the open-water season 2009 relative to the mean for the period of 2001-2004. However, measurements for 2009 were within the ranges observed in previous years; and
- Mean concentrations of chlorophyll *a* were lower in the open-water season of 2009 than for the period of 2001-2004 at all sites across the Study Area.

Comparison of 2009 water quality results to water quality objectives and guidelines for the protection of aquatic life indicated the following:

- All measurements of ammonia, nitrate/nitrite, and pH were below applicable water quality objectives or guidelines for the protection of aquatic life throughout the Study Area;
- All but three measurements (Aiken River in June) of DO were above the most stringent water quality objective for the protection of aquatic life;
- In general, TP concentrations at lake sites exceeded the MWQSOG of 0.025 mg/L for lakes, whereas levels measured at river sites were below the MWQSOG of 0.050 mg/L for rivers and streams;
- The majority of measurements of aluminum and iron exceeded the MWQSOG for the protection of aquatic life; and
- Several other metals (copper, mercury, selenium, and silver) infrequently exceeded the MWQSOGs for the protection of aquatic life.

6.0 REFERENCES

AGRICULTURE and AGRI-FOOD CANADA. 2003. Biophysical Land Classification of the Kettle Rapids (54D) and Split Lake (54A – SE1/4) Map Areas. Information Bulletin 2003-3. Prepared by Land Resource Group – Manitoba Semiarid Prairie Agricultural Research Centre, Research Branch, Agriculture and Agri-Food Canada for Manitoba Hydro. 45 pp.

APHA, AWWA, and WPCF, 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition, Washington, DC.

BADIOU, P.H. and H.M. COOLEY. 2004. Water chemistry, phytoplankton, and sediment chemistry data for the Nelson and Assean River systems, Manitoba, 2001. A report prepared for Manitoba Hydro by North/South Consultants Inc. Report 01-15: xvi + 190 pp.

BADIOU, P.H. and H.M. COOLEY. 2005. Water chemistry, phytoplankton, and sediment chemistry data for the Nelson and Assean River systems, Manitoba, 2002. A report prepared for Manitoba Hydro by North/South Consultants Inc. Report 02-14: xvi + 234 pp.

BADIOU, P.H., H.M. COOLEY, and T. SAVARD. 2005. Water chemistry data for the lower Nelson River system, Manitoba, 2003. A report prepared for Manitoba Hydro by North/South Consultants Inc. Report 03-05: xiv + 201 pp.

BADIOU, P.H., H.M. COOLEY, and T. SAVARD. 2007. Water chemistry and phytoplankton data for the lower Nelson River system, Manitoba, 2004. A report prepared for Manitoba Hydro by North/South Consultants Inc. Report 04-04 and 04-08: xv + 227 pp.

BAKER, R.F. 1990. A fisheries survey and biological assessment of the Weir River. A report prepared for Manitoba Hydro by North/South Consultants Inc: 42 pp.

BAKER, R. and F. SCHNEIDER. 1993. Development of the insect fauna in the Limestone Forebay following impoundment and comparison with undisturbed sites at the Long Spruce Forebay and the Lower Nelson River Mainstem. A report prepared by North/South Consultants Inc. for Manitoba Hydro. 35 pp.

BRITISH COLUMBIA (B.C.) MINISTRY OF ENVIRONMENT, LANDS, AND PARKS. 1998. Guidelines for interpreting water quality data. Version 1, May 1998. Prepared for the Land Use Task Force Resource Inventory Committee.

CANADA-MANITOBA SOIL SURVEY: for the province of Manitoba Renewable Resources and Transportation Services. 1976. A Guide to Biophysical Land Classification 54D Manitoba, November 1976.

CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT. (CCME). 1999; updated to 2010. Canadian environmental quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB.

CANADIAN COUNCIL OF RESOURCE AND ENVIRONMENT MINISTERS (CCREM). 1987. Canadian water quality guidelines. Canadian Council of Resource and Environment Ministers, Winnipeg.

CAUX, P.-Y., D.R.J. MOORE, and D. MACDONALD. 1997. Ambient water quality guidelines (criteria) for turbidity, suspended and benthic sediments. Technical Appendix. Prepared for BC Ministry of Environment, Lands and Parks. 82 pp.

ENVIRONMENT CANADA and DEPARTMENT of FISHERIES and OCEANS. 1992. Federal Ecological Monitoring Program (FEMP). Final report Volume 1.

ENVIRONMENT CANADA. 1993. Canadian climate normals 1961-1990. Prairie Provinces, Atmos. Envir. Serv.

FAITHFULL, C.L., D.P. HAMILTON, D.F. BURGER, and I. DUGGAN. 2006. Waikato peat lakes sediment nutrient removal scoping exercise. Preapared for Environment Waikato, Environment Waikato Technical Report 2006/15. 116 pp.

FEDORUK, A.N. 1970. Proposed watershed divisions of Manitoba. Manitoba Department of Mines and Natural Resources, and Canada Land Inventory. Report No. 10. 89 pp.

GORNIAK, A., E. JEKATIERYNCZUK-TUDCZYK, and P. DOBRZYN. 1999. Hydrochemistry of three dystrophic lakes in northeastern Poland. Acta Hydrochim. Hydrobiol. 27: 12-18.

HAINES, T.A., V.T. KOMOV, V.E. MATEY, and C.H. JAGOE. 1995. Perch mercury content is related to acidity and color of 26 Russian lakes. Wat. Air Soil Pollut. 85: 823-828.

HORNE, A.J. and C.R. GOLDMAN. 1994. Limnology. Second Edition. McGraw-Hill, Inc. New York, USA. 576 pp.

JONES, R.I., K. SALONEN, and DE HAAN, H. 1988. Phosphorus transformations in the epilimnion of humic lakes: abiotic interactions between dissolved humic materials and phosphate. Freshwat. Biol. 19: 357-369.

LAWRENCE, M.J., C.R. FAZAKAS, L. ZRUM, C.L. BEZTE, and W.J. BERNHARDT. 1999. The Split Lake Aquatic Ecosystem: A synthesis of Split Lake biological and environmental data, January 1997 - October 1998. A report prepared for the Taskaskweyak Environmental Monitoring Agency by North/South Consultants Inc: xii + 87 pp.

MACDONELL, D.S. 1991. Enumeration and biological description of migrating fish in the Limestone River, Manitoba, 1990. A report prepared for Manitoba Hydro by North/South Consultants Inc: viii + 86 pp.

MACDONELL, D.S. 1992. Lower Nelson River tributary fish utilization studies. Angling and Kaiskwasotasine rivers, 1991. A report prepared for Manitoba Hydro by North/South Consultants Inc: viii + 90 pp.

MACDONELL, D.S. 1993. Lower Nelson River tributary fish utilization studies: Weir, Kaiskwasotasine, and Roblin rivers, and Broten Creek, 1992. A report prepared for Manitoba Hydro by North/South Consultants Inc: x + 123 pp.

MANITOBA HYDRO. 1994. Lower Nelson River – Generating Planning, Conawapa Generating Station: Biophysical Environmental Evaluation. A report prepared by North/South Consultants Inc.

MANITOBA HYDRO. 1996a. History and First Order Effects: Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area: Split Lake Cree Post Project Environmental Review Volume 2. Split Lake Cree – Manitoba Hydro Joint Study Group. 64 pp.

MANITOBA HYDRO. 1996b. First Rapids Generating Station, First Rapids Erosion Study. Geotechnical Department, Engineering Division, Manitoba Hydro. March 1996. 14 pp.

MANITOBA HYDRO PUBLIC AFFAIRS. November 1998. Limestone Generating Station. Brochure.

MANITOBA HYDRO PUBLIC AFFAIRS. December 1999. Long Spruce Generating Station. Brochure.

NEWBURY, R.W. 1968. The Nelson River: a study of subarctic river processes. Ph.D. dissertation, Johns Hopkins University, Baltimore, MD.

RAMSEY, D.J. 1991. Final water quality report. Federal Ecological Monitoring Program, Technical Appendices, Volume 1. 320 pp.

SAFFRAN K.A. and D.O. TREW. 1996. Sensitivity of Alberta lakes to acidifying deposition: an update of maps with emphasis on 109 northern lakes. Water Management Division. Alberta Environment, Edmonton, AB.

SAVARD, T. and M. COOLEY. 2007. Water Quality Data for the Lower Nelson River System: Winter 2006. A draft report prepared for Manitoba Hydro by North/South Consultants Inc. 48 pp

SPRY, D.J. and J.G. WIENER. 1991. Metal bioavailability and toxicity to fish in low-alkalinity lakes: A critical review. Environ. Pollut. 71: 243-304.

WETZEL, R.G. 1983. Limnology. Second Edition. New York. Saunders College Publishing. 767 pp.

WILLIAMSON, D.A. 2002. Manitoba Water Quality Standards, Objectives, and Guidelines. Manitoba Conservation Report 2002-11. Final Draft: November 22, 2002. 76 pp.

WILLIAMSON, D.A. and W.E. Ralley. 1993. A summary of water chemistry changes following hydroelectric development in northern Manitoba, Canada. Manitoba Environment, Water Quality Management Section Report #93-2.

TABLES AND FIGURES

Table 1. Summary of water quality sites visited during the Keeyask/Conawapa sampling programs, 2009.

Sample Location	Location ID	Easting	Northing	Zone	Location description/ Comments
Open-water season					
Burntwood River	SPL-1	277759	6227502	15V	Inlet to Split Lake.
Nelson River	SPL-2	279639	6218646	15V	Downstream of Kelsey GS.
Split Lake	SPL-3	286793	6226641	15V	West side of the lake.
Split Lake	SPL-4	297442	6224993	15V	Central, adjacent to the Aiken River.
Split Lake	SPL-5	306860	6219509	15V	The outlet of the Aiken River.
Aiken River	AK-1	316697	6215928	15V	-
York Landing	YL-1	304416	6219836	15V	Split Lake near the community of York Landing.
Split Lake	SPL-7	304503	6233345	15V	Northern basin adjacent to the community of Split Lake.
Split Lake	SPL-8	316358	6241072	15V	Near the outlet to Clark Lake.
Clark Lake	CL-1	322171	6240276	15V	-
Nelson River	NR-1	333324	6243703	15V	Downstream of Birthday Rapids.
Gull Lake	GL-1	352514	6244456	15V	-
Gull Lake	GL-2	356095	6247663	15V	-
Nelson River	NR-2	360765	6246209	15V	Upstream of Stephens Lake.
Stephens Lake	STL-1	375649	6247083	15V	Southwestern region.
Stephens Lake	STL-2	388255	6250474	15V	Southeastern region.
Stephens Lake	STL-3	362235	6262609	15V	North arm.
Stephens Lake	STL-4	370434	6255392	15V	North arm adjacent to Ross Wright Bay.
Stephens Lake	RB-1	362279	6254622	15V	Ross Wright Bay- north arm

Table 1. Continued.

Sample Location	Location ID	Easting	Northing	Zone	Location description/ Comments
Nelson River	NR-3	415415	6251278	15V	Long Spruce Forebay: sampled from the GS structure in June and July.
	NR-3	413804	6251136	15V	Sampled by boat in August and October.
Nelson River	NR-4	431684	6263092	15V	Limestone Forebay: sampled from the GS structure in June and July
	NR-4	431503	6262075	15V	Sampled by boat in August and October.
Limestone River	LR-1	430071	6264224	15V	-
Nelson River	NR-5	451043	6282812	15V	Upstream of Conawapa boat launch.
Nelson River	NR-6	460068	6288792	15V	Upstream of the Angling River.
Angling River	AR-1	462995	6289838	15V	-
Weir River	WR-1	478166	6308214	15V	-
Nelson River	NR-7	491015	6309699	15V	Deer Island, moved location, old location from 2003/2004 sampling period was underwater.
Nelson River	NR-8	512157	6309449	15V	Gillam Island, moved location, old location from 2003/2004 sampling period was underwater.
Ice-cover season					
Burntwood River	W-Tu-14	650555	6224174	14U	Inlet to Split Lake.
Split Lake	SPL-Tu-4	672385	6220439	14U	Near the Aiken River.
Split Lake	SPL-Tu-5	679039	6236309	14U	Near the community of Split Lake.
Nelson River	K-Tu-10	352965	6243731	15V	Upstream of Stephens Lake.
Nelson River	K-Tu-11	359360	6246337	15V	Upstream of Stephens Lake.
Stephens Lake	K-Tu-12	373958	6247090	15V	Southwestern region.
Stephens Lake	K-Tu-04	394218	6249778	15V	Southeastern region.
Nelson River	Li-S-02b	414435	6251452	15V	Long Spruce Forebay.
Nelson River	Ls-S-04b	431433	6262198	15V	Limestone Forebay.
Nelson River	C-Tu-8	470892	6301703	15V	Between the Angling and Weir rivers.

Table 2. Summary statistics for routine water quality parameters measured at ALS Laboratories from samples collected in the Keeyask/Conawapa study areas: open-water season 2009.

			Alkalinity				Nitrogen					
Sample Location	Location ID	Statistic	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Organic Nitrogen [1] (mg/L N)	Total Nitrogen [2] (mg/L)	Dissolved Inorganic Nitrogen [3] (mg/L N)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**-**	**-**	**-**
Burntwood River	SPL-1	Mean	78.2	64.7	0.62	<0.40	0.0075	0.0141	0.61	0.60	0.62	0.022
		SE	0.9	1.2	0.32	-	0.0028	0.0059	0.15	0.15	0.16	0.007
		Minimum	76.2	62.4	<0.60	<0.40	<0.0030	<0.0050	0.25	0.25	0.25	<0.0050
		Maximum	80.2	67.6	1.57	<0.40	0.0150	0.0300	1.00	0.99	1.03	0.036
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	SPL-2	Mean	129	107	1.49	<0.40	0.0123	0.0236	0.45	0.44	0.47	0.036
		SE	2.8	2.1	0.92	-	0.0039	0.0096	0.07	0.07	0.07	0.012
		Minimum	123	103	<0.60	<0.40	0.0030	0.0096	0.25	0.24	0.26	0.019
		Maximum	136	113	4.19	<0.40	0.0200	0.0520	0.56	0.54	0.61	0.069
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-3	Mean	96.3	81.0	1.52	<0.40	0.0102	0.0175	0.46	0.45	0.48	0.028
		SE	8.4	7.4	1.22	-	0.0041	0.0101	0.05	0.05	0.05	0.012
		Minimum	81.4	66.7	<0.60	<0.40	0.0031	<0.0050	0.37	0.37	0.37	0.006
		Maximum	119	97.2	5.17	<0.40	0.0220	0.0450	0.59	0.58	0.59	0.054
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-4	Mean	129	106	<0.60	<0.40	0.0151	0.0194	0.43	0.41	0.44	0.034
		SE	2.6	2.7	0.27	-	0.0043	0.0049	0.06	0.05	0.06	0.008
		Minimum	123	101	<0.60	<0.40	0.0040	0.0087	0.26	0.26	0.27	0.013
		Maximum	135	113	1.38	<0.40	0.0250	0.0300	0.52	0.50	0.53	0.050
		N	4	4	4	4	4	4	4	4	4	4
York Landing	YL-1	Mean	124	104	1.21	<0.40	0.0112	0.0063	0.45	0.44	0.45	0.017
		SE	1.4	1.2	0.32	-	0.0033	0.0025	0.07	0.07	0.07	0.005
		Minimum	121	102	<0.60	<0.40	<0.0030	<0.0050	0.24	0.24	0.24	<0.0050
		Maximum	128	107	1.64	<0.40	0.0162	0.0130	0.58	0.56	0.59	0.028
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-5	Mean	104	85.5	<0.60	<0.40	0.0107	<0.0050	0.51	0.50	0.51	0.014
		SE	5.5	4.5	-	-	0.0023	0.0006	0.05	0.05	0.05	0.003
		Minimum	93.2	76.4	<0.60	<0.40	0.0045	<0.0050	0.37	0.37	0.38	<0.0050

Table 2. Continued.

			Alkalinity				Nitrogen					
Sample Location	Location ID	Statistic	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Organic Nitrogen [1] (mg/L N)	Total Nitrogen [2] (mg/L)	Dissolved Inorganic Nitrogen [3] (mg/L N)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**-**	**-**	**-**
Split Lake	SPL-5	Maximum	118	96.6	<0.60	<0.40	0.0142	0.0050	0.60	0.59	0.60	0.019
		N	4	4	4	4	4	4	4	4	4	4
Aiken River	AK-1	Mean	78.1	64.0	<0.60	<0.40	0.0113	<0.0050	0.55	0.54	0.55	0.014
		SE	5.3	4.4	-	-	0.0009	0.0006	0.05	0.04	0.05	0.001
		Minimum	68.8	56.4	<0.60	<0.40	0.0090	<0.0050	0.42	0.41	0.42	0.012
		Maximum	91.1	74.7	<0.60	<0.40	0.0130	0.0050	0.63	0.62	0.63	0.016
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-7	Mean	123	103	1.33	<0.40	0.0218	0.0267	0.43	0.41	0.46	0.049
		SE	3.0	2.3	0.78	-	0.0056	0.0087	0.06	0.07	0.07	0.009
		Minimum	117	97	<0.60	<0.40	0.0100	0.0140	0.24	0.21	0.25	0.027
		Maximum	129	108	3.60	<0.40	0.0340	0.0520	0.51	0.50	0.56	0.067
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-8	Mean	119	97	<0.60	<0.40	0.0159	0.0226	0.42	0.47	0.51	0.039
		SE	1.3	1.0	-	-	0.0048	0.0081	0.06	0.09	0.09	0.006
		Minimum	116	95.3	<0.60	<0.40	0.0090	0.0054	0.27	0.24	0.28	0.031
		Maximum	122	100	<0.60	<0.40	0.0300	0.0443	0.54	0.67	0.72	0.056
		N	4	4	4	4	4	4	4	4	4	4
Clark Lake	CL-1	Mean	122	101	0.77	<0.40	0.0165	0.0230	0.43	0.41	0.45	0.040
		SE	1.8	2.2	0.32	-	0.0055	0.0082	0.06	0.06	0.06	0.006
		Minimum	118	97.0	<0.60	<0.40	0.0107	0.0058	0.27	0.24	0.28	0.029
		Maximum	125	106	1.64	<0.40	0.0330	0.0450	0.53	0.52	0.55	0.056
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-1	Mean	120	100	0.90	<0.40	0.0236	0.0195	0.47	0.44	0.48	0.043
		SE	1.7	2.1	0.36	-	0.0073	0.0056	0.06	0.06	0.06	0.004
		Minimum	117	95.7	<0.60	<0.40	0.0110	0.0091	0.30	0.26	0.31	0.031
		Maximum	124	104	1.70	<0.40	0.0380	0.0350	0.53	0.51	0.55	0.048
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-1	Mean	120	100	0.92	<0.40	0.0226	0.0178	0.45	0.43	0.47	0.040

Table 2. Continued.

Sample Location	Location ID	Statistic	Alkalinity as Bicarbonate (HCO_3^-) (mg/L)	Alkalinity as $CaCO_3$ (mg/L)	Alkalinity as Carbonate (CO_3^{2-}) (mg/L)	Alkalinity as Hydroxide (OH^-) (mg/L)	Nitrogen Dissolved Ammonia (mg/L N)	Nitrogen Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen TKN (mg/L N)	Nitrogen Organic Nitrogen [1] (mg/L N)	Nitrogen Total Nitrogen [2] (mg/L)	Nitrogen Dissolved Inorganic Nitrogen [3] (mg/L N)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**-**	**-**	**-**
Gull Lake	GL-1	SE	1.7	2.2	0.38	-	0.0050	0.0056	0.05	0.04	0.05	0.004
		Minimum	117	95.8	<0.60	<0.40	0.0110	0.0085	0.32	0.30	0.33	0.029
		Maximum	124	105	1.83	<0.40	0.0353	0.0330	0.53	0.49	0.54	0.045
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-2	Mean	120	100	0.97	<0.40	0.0182	0.0194	0.45	0.43	0.47	0.038
		SE	2	2	0.39	-	0.0083	0.0062	0.06	0.06	0.06	0.006
		Minimum	116	95.9	<0.60	<0.40	0.0050	0.0090	0.28	0.27	0.29	0.024
		Maximum	125	105	1.64	<0.40	0.0423	0.0370	0.55	0.53	0.57	0.051
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-2	Mean	120	100	0.95	<0.40	0.0196	0.0250	0.45	0.43	0.47	0.045
		SE	1.8	2.1	0.38	-	0.0072	0.0071	0.07	0.07	0.06	0.004
		Minimum	117	96.1	<0.60	<0.40	0.0070	0.0080	0.25	0.24	0.29	0.035
		Maximum	125	105	1.64	<0.40	0.0403	0.0390	0.55	0.53	0.57	0.054
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1S	Mean	118	98.8	1.37	<0.40	0.0178	<0.0050	0.35	0.33	0.36	0.022
(Open-water season: surface only)		SE	5.5	5.3	0.36	-	0.0038	0.0010	0.09	0.09	0.09	0.004
		Minimum	102	83.4	<0.60	<0.40	0.0121	<0.0050	<0.20	0.09	0.10	0.015
		Maximum	126	106	1.90	<0.40	0.0290	0.0060	0.53	0.52	0.54	0.032
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1B	Mean	118	98.7	1.32	<0.40	0.0125	<0.0050	0.35	0.34	0.36	0.015
(Open-water season: bottom only)		SE	5.9	5.4	0.34	-	0.0052	-	0.09	0.09	0.09	0.005
		Minimum	101	83.2	<0.60	<0.40	0.0050	<0.0050	<0.20	0.09	0.10	0.008
		Maximum	126	106	1.69	<0.40	0.0280	<0.0050	0.53	0.53	0.53	0.031
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	120	101	1.48	<0.40	0.0120	0.0248	0.42	0.41	0.45	0.037
		SE	2.1	1.9	0.11	-	0.0019	0.0050	0.03	0.03	0.03	0.004
		Minimum	116	97.6	1.18	<0.40	0.0081	0.0110	0.34	0.33	0.37	0.028
		Maximum	125	105	1.64	<0.40	0.0170	0.0350	0.49	0.47	0.50	0.045
		N	4	4	4	4	4	4	4	4	4	4

Table 2. Continued.

			Alkalinity				Nitrogen					
Sample Location	Location ID	Statistic	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Organic Nitrogen [1] (mg/L N)	Total Nitrogen [2] (mg/L)	Dissolved Inorganic Nitrogen [3] (mg/L N)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**-**	**-**	**-**
Stephens Lake	STL-2	Mean	120	101	1.56	<0.40	0.0147	0.0230	0.45	0.43	0.47	0.038
		SE	2.3	1.8	0.02	-	0.0026	0.0045	0.05	0.04	0.04	0.003
		Minimum	115	96.8	1.51	<0.40	0.0096	0.0100	0.34	0.33	0.37	0.030
		Maximum	124	104	1.58	<0.40	0.0200	0.0300	0.55	0.53	0.58	0.043
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3S	Mean	131	110	2.00	<0.40	0.0075	<0.0050	0.34	0.33	0.34	0.012
(Open-water season: surface only)		SE	1.8	1.5	0.26	-	0.0029	0.0014	0.02	0.02	0.02	0.002
		Minimum	127	107	1.25	<0.40	0.0032	<0.0050	0.27	0.26	0.27	0.009
		Maximum	135	114	2.42	<0.40	0.0160	0.0083	0.37	0.37	0.38	0.019
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3B	Mean	132	111	1.48	<0.40	0.0134	<0.0050	0.26	0.25	0.27	0.016
(Open-water season: bottom only)		SE	1.1	1.3	0.43	-	0.0056	-	0.06	0.06	0.06	0.006
		Minimum	130	108	<0.60	<0.40	<0.0030	<0.0050	<0.20	0.08	0.10	<0.0050
		Maximum	135	114	2.29	<0.40	0.0270	<0.0050	0.37	0.34	0.37	0.030
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4S	Mean	123	103	1.37	<0.40	0.0113	0.0083	0.34	0.33	0.35	0.020
(Open-water season: surface only)		SE	1.6	1.4	0.37	-	0.0033	0.0033	0.08	0.08	0.08	0.005
		Minimum	119	100	<0.60	<0.40	0.0040	<0.0050	<0.20	0.09	0.12	0.007
		Maximum	126	107	1.90	<0.40	0.0190	0.0150	0.47	0.45	0.47	0.029
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4B	Mean	122	103	1.73	<0.40	0.0122	0.0068	0.38	0.37	0.39	0.019
(Open-water season: bottom only)		SE	1.4	1.4	0.06	-	0.0043	0.0022	0.03	0.03	0.03	0.004
		Minimum	119	100	1.57	<0.40	0.0030	<0.0050	0.34	0.33	0.35	0.009
		Maximum	126	107	1.83	<0.40	0.0230	0.0130	0.47	0.45	0.47	0.026
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3	Mean	122	100	0.67	<0.40	0.0179	0.0207	0.43	0.41	0.45	0.038
(Open-water season: surface only)		SE	1.9	1.6	0.23	-	0.0041	0.0068	0.03	0.03	0.03	0.004
		Minimum	116	97	<0.60	<0.40	0.0095	<0.0050	0.35	0.34	0.37	0.032
		Maximum	124	104	1.22	<0.40	0.0290	0.0333	0.48	0.45	0.49	0.049
		N	4	4	4	4	4	4	4	4	4	4

Table 2. Continued.

			Alkalinity				Nitrogen					
Sample Location	Location ID	Statistic	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Organic Nitrogen [1] (mg/L N)	Total Nitrogen [2] (mg/L)	Dissolved Inorganic Nitrogen [3] (mg/L N)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**-**	**-**	**-**
Nelson River	NR-3D	Mean	123	102	0.61	<0.40	0.0125	0.0305	0.42	0.40	0.45	0.043
(August / October: bottom only)		SE	2.0	2.3	0.31	-	0.0055	0.0015	0.09	0.09	0.10	0.007
		Minimum	121	99.3	<0.60	<0.40	0.0070	0.0290	0.32	0.31	0.35	0.036
		Maximum	125	104	0.92	<0.40	0.0180	0.0320	0.51	0.49	0.54	0.050
		N	2	2	2	2	2	2	2	2	2	2
Nelson River	NR-4	Mean	122	102	1.04	<0.40	0.0083	0.0216	0.44	0.43	0.46	0.030
(Open-water season: surface only)		SE	2.4	2.0	0.39	-	0.0015	0.0070	0.03	0.03	0.03	0.006
		Minimum	117	97.4	<0.60	<0.40	0.0060	<0.0050	0.36	0.35	0.39	0.015
		Maximum	127	106	2.09	<0.40	0.0127	0.0330	0.52	0.51	0.55	0.039
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-4B	Mean	122	102	1.44	<0.40	0.0130	0.0325	0.45	0.44	0.48	0.046
(August / October: bottom only)		SE	3.0	3.0	0.52	-	0.0070	0.0005	0.15	0.16	0.15	0.007
		Minimum	119	98.9	0.92	<0.40	0.0060	0.0320	0.30	0.28	0.33	0.039
		Maximum	125	105	1.96	<0.40	0.0200	0.0330	0.60	0.59	0.63	0.052
		N	2	2	2	2	2	2	2	2	2	2
Limestone River	LR-1	Mean	137	114	1.54	<0.40	0.0086	<0.0050	0.47	0.46	0.47	0.012
		SE	12.3	11.2	0.75	-	0.0036	0.0009	0.06	0.06	0.06	0.003
		Minimum	110	90	<0.60	<0.40	<0.0030	<0.0050	0.30	0.28	0.30	0.008
		Maximum	163	137	3.34	<0.40	0.0180	0.0060	0.56	0.55	0.56	0.021
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-5	Mean	122	101	0.98	<0.40	0.0046	0.0224	0.46	0.45	0.48	0.027
		SE	2.1	2.0	0.29	-	0.0009	0.0071	0.03	0.03	0.03	0.007
		Minimum	117	97.6	<0.60	<0.40	0.0030	<0.0050	0.39	0.39	0.42	0.007
		Maximum	127	107	1.70	<0.40	0.0071	0.0340	0.51	0.51	0.54	0.037
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-6	Mean	122	102	1.16	<0.40	<0.0030	0.0221	0.45	0.44	0.47	0.025

Table 2. Continued.

Sample Location	Location ID	Statistic	Alkalinity as Bicarbonate (HCO_3^-) (mg/L)	Alkalinity as $CaCO_3$ (mg/L)	Alkalinity as Carbonate (CO_3^{2-}) (mg/L)	Alkalinity as Hydroxide (OH^-) (mg/L)	Nitrogen Dissolved Ammonia (mg/L N)	Nitrogen Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen TKN (mg/L N)	Nitrogen Organic Nitrogen [1] (mg/L N)	Nitrogen Total Nitrogen [2] (mg/L)	Nitrogen Dissolved Inorganic Nitrogen [3] (mg/L N)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**-**	**-**	**-**
Nelson River	NR-6	SE	2.0	1.9	0.41	-	0.0008	0.0071	0.02	0.02	0.02	0.007
		Minimum	118	98.2	<0.60	<0.40	<0.0030	<0.0050	0.39	0.39	0.42	<0.0050
		Maximum	126	106	2.29	<0.40	0.0047	0.0340	0.49	0.49	0.52	0.037
		N	4	4	4	4	4	4	4	4	4	4
Angling River	AR-1	Mean	74.6	61.1	<0.60	<0.40	0.0064	<0.0050	0.47	0.46	0.47	0.010
		SE	6.8	5.6	-	-	0.0017	0.0006	0.01	0.02	0.02	0.001
		Minimum	59.8	49.0	<0.60	<0.40	<0.0030	<0.0050	0.44	0.43	0.44	0.007
		Maximum	90.0	73.8	<0.60	<0.40	0.0093	0.0050	0.51	0.51	0.52	0.012
		N	4	4	4	4	4	4	4	4	4	4
Weir River	WR-1	Mean	110	91.4	1.10	<0.40	0.0061	<0.0050	0.54	0.53	0.54	0.010
		SE	17.5	15.6	0.80	-	0.0023	0.0015	0.07	0.06	0.06	0.001
		Minimum	86.4	70.8	<0.60	<0.4	<0.0030	<0.0050	0.47	0.46	0.47	0.009
		Maximum	144	122	2.69	<0.40	0.0087	0.0070	0.67	0.66	0.67	0.011
		N	3	3	3	3	3	3	3	3	3	3
Nelson River	NR-7	Mean	121	100	1.11	<0.40	0.0069	0.0224	0.45	0.44	0.47	0.029
		SE	2.9	2.4	0.34	-	0.0011	0.0075	0.03	0.03	0.03	0.008
		Minimum	113	94.3	<0.6	<0.40	0.0040	<0.0050	0.38	0.37	0.42	0.009
		Maximum	126	106	1.97	<0.40	0.0089	0.0350	0.52	0.52	0.55	0.044
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-8	Mean	123	102	1.00	<0.40	0.0052	0.0234	0.44	0.44	0.47	0.029
		SE	2.0	1.9	0.43	-	0.0027	0.0085	0.01	0.02	0.02	0.010
		Minimum	117	98.1	<0.60	<0.40	<0.0030	<0.0050	0.41	0.40	0.45	0.007
		Maximum	126	107	2.03	<0.40	0.0130	0.0420	0.48	0.48	0.51	0.055
		N	4	4	4	4	4	4	4	4	4	4

[1] Organic nitrogen estimated from: TKN - dissolved ammonia.
[2] Total nitrogen estimated from: TKN + dissolved nitrate/nitrite-nitrogen.
[3] Dissolved inorganic nitrogen is the sum of dissolved ammonia and nitrate/nitrite-nitrogen.
[4] Access to sampling site was not possible due to local moose hunters in the area. No water samples were collected during this sampling period.

Table 2. Continued.

Sample Location	Location ID	Statistic	Phosphorus			Organic Carbon				Water Clarity		
			Total (mg/L P)	Dissolved (mg/L P)	Dissolved Fraction (%)	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)
Analytical Detection Limits			**0.0010**	**0.0010**	**-**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**
Burntwood River	SPL-1	Mean	0.0413	0.0129	33	10.4	10.2	132	113	22.6	44.3	37.5
		SE	0.0034	0.0027	9	0.7	0.7	3.52	8.2	5.9	5.68	15.9
		Minimum	0.0334	0.0057	12	8.9	8.8	124	96.0	10.0	35.0	5.0
		Maximum	0.0479	0.0183	55	11.6	11.5	141	128	33.2	60.0	80.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	SPL-2	Mean	0.0391	0.0225	58	8.5	8.4	328	212	13.4	19.8	13.8
		SE	0.0019	0.0031	8	0.4	0.2	5.43	3.4	1.2	2.56	2.4
		Minimum	0.0363	0.0157	43	7.8	7.8	313	202	11.6	13.0	10.0
		Maximum	0.0443	0.0294	81	9.6	9.0	339	218	16.8	25.0	20.0
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-3	Mean	0.0425	0.0172	42	9.9	9.7	204	147	15.2	30.5	26.3
		SE	0.0026	0.0023	8	0.7	0.7	34.7	16.6	3.6	3.66	11.4
		Minimum	0.0369	0.0129	28	8.2	8.3	138	118	8.8	22.0	10.0
		Maximum	0.0476	0.0227	58	11.3	11.1	286	184	25.2	38.0	60.0
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-4	Mean	0.0386	0.0211	54	8.6	8.5	326	197	9.2	15.5	15.0
		SE	0.0022	0.0026	5	0.3	0.4	7.51	13.0	0.7	3.30	2.0
		Minimum	0.0332	0.0149	45	8.0	7.7	312	158	8.4	6.00	10.0
		Maximum	0.0437	0.0255	67	9.3	9.7	343	212	11.2	20.0	20.0
		N	4	4	4	4	4	4	4	4	4	4
York Landing	YL-1	Mean	0.0340	0.0180	51	9.4	9.3	306	197	4.6	12.2	18.8
		SE	0.0041	0.0043	6	0.3	0.4	3.88	4.4	1.4	3.35	5.5
		Minimum	0.0246	0.0106	43	8.6	8.4	298	188	<2.0	2.90	5.0
		Maximum	0.0442	0.0304	69	10.0	10.0	316	206	7.6	18.0	30.0
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-5	Mean	0.0249	0.0136	53	12.4	12.4	224	143	4.0	7.74	34.2
		SE	0.0037	0.0032	7	0.4	0.3	18.4	10.2	1.1	2.19	11.1
		Minimum	0.0178	0.0073	34	11.3	11.5	186	117	2.0	2.67	6.7
		Maximum	0.0349	0.0214	62	13.1	13.1	271	166	7.2	13.0	60.0
		N	4	4	4	4	4	4	4	4	4	4
Aiken River	AK-1	Mean	0.0159	0.0097	61	16.2	16.5	123	96.0	<2.0	3.93	37.5

Table 2. Continued.

Sample Location	Location ID	Statistic	Phosphorus			Organic Carbon				Water Clarity		
			Total (mg/L P)	Dissolved (mg/L P)	Dissolved Fraction (%)	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)
Analytical Detection Limits			**0.0010**	**0.0010**	**-**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**
Aiken River	AK-1	SE	0.0006	0.0019	13	0.7	0.6	8.79	3.7	0.6	2.36	15.9
		Minimum	0.0146	0.0065	38	14.9	15.3	108	88.0	<2.0	1.20	5.0
		Maximum	0.0173	0.0150	97	17.7	17.7	145	106	3.2	11.0	80.0
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-7	Mean	0.0407	0.0224	55	8.4	8.4	302	203	12.7	22.8	26.3
		SE	0.0017	0.0025	7	0.2	0.2	8.26	4.0	1.1	1.55	6.9
		Minimum	0.0377	0.0159	41	7.9	8.0	278	196	10.8	20.0	10.0
		Maximum	0.0453	0.0283	75	8.7	8.7	315	214	16.0	27.0	40.0
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-8	Mean	0.0448	0.0190	43	8.7	8.8	286	176	15.5	26.0	33.3
		SE	0.0015	0.0025	7	0.2	0.1	1.93	9.3	2.5	2.16	6.3
		Minimum	0.0410	0.0137	31	8.4	8.5	282	154	9.2	20.0	20.0
		Maximum	0.0480	0.0245	60	9.1	9.1	291	198	20.8	30.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Clark Lake	CL-1	Mean	0.0415	0.0196	47	8.6	8.6	300	186	13.5	23.0	32.5
		SE	0.0021	0.0026	7	0.2	0.2	6.98	5.2	2.0	1.35	9.5
		Minimum	0.0376	0.0149	35	8.1	8.2	280	173	9.3	19.0	20.0
		Maximum	0.0465	0.0248	65	9.0	9.1	311	194	18.8	25.0	60.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-1	Mean	0.0409	0.0163	41	8.8	8.8	294	191	13.8	23.0	28.8
		SE	0.0028	0.0005	3	0.3	0.4	7.01	8.1	1.2	1.58	7.7
		Minimum	0.0352	0.0149	31	8.2	8.2	276	168	11.6	20.0	15.0
		Maximum	0.0475	0.0173	47	9.8	9.9	307	204	17.2	27.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-1	Mean	0.0403	0.0171	43	8.8	8.8	294	191	13.2	22.8	28.8
		SE	0.0023	0.0012	3	0.3	0.5	5.87	6.4	1.1	1.70	7.7
		Minimum	0.0349	0.0154	36	8.3	8.2	278	172	11.2	20.0	15.0
		Maximum	0.0448	0.0208	48	9.7	10.2	304	202	16.4	27.0	50.0
		N	4	4	4	4	4	4	4	4	4	4

Table 2. Continued.

Sample Location	Location ID	Statistic	Phosphorus			Organic Carbon				Water Clarity		
			Total (mg/L P)	Dissolved (mg/L P)	Dissolved Fraction (%)	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)
Analytical Detection Limits			**0.0010**	**0.0010**	**-**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**
Gull Lake	GL-2	Mean	0.0414	0.0159	39	8.8	8.7	295	196	13.8	22.3	28.8
		SE	0.0034	0.0006	3	0.3	0.5	6.47	2.1	1.3	1.31	7.7
		Minimum	0.0322	0.0144	34	8.0	8.0	279	190	11.6	20.0	15.0
		Maximum	0.0470	0.0175	45	9.6	10.1	306	200	17.6	25.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-2	Mean	0.0426	0.0166	39	8.7	9.0	297	193	13.3	23.3	30.0
		SE	0.0022	0.0011	2	0.4	0.3	7.35	4.5	0.6	1.38	7.9
		Minimum	0.0377	0.0141	34	8.0	8.4	279	180	11.6	20.0	15.0
		Maximum	0.0479	0.0196	44	9.7	10.0	311	200	14.4	26.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1S	Mean	0.0290	0.0092	33	8.4	8.4	279	181	8.9	16.3	27.5
(Open-water season: surface only)		SE	0.0033	0.0015	6	0.6	0.5	18.7	9.1	3.4	6.26	7.8
		Minimum	0.0203	0.0067	21	7.1	7.3	227	160	4.8	5.00	15.0
		Maximum	0.0348	0.0131	48	9.8	9.6	311	204	19.2	34.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1B	Mean	0.0265	0.0093	35	8.6	8.5	280	180	8.8	16.5	27.5
(Open-water season: bottom only)		SE	0.0038	0.0015	4	0.6	0.5	19.3	9.9	3.6	6.18	7.8
		Minimum	0.0157	0.0054	29	7.4	7.3	227	160	4.0	6.00	15.0
		Maximum	0.0331	0.0121	45	9.9	9.7	310	206	19.6	34.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	0.0395	0.0192	48	8.7	8.4	300	195	14.3	22.0	25.0
		SE	0.0023	0.0024	4	0.3	0.3	4.48	15.2	1.3	1.08	3.5
		Minimum	0.0355	0.0149	42	8.2	7.8	288	152	10.8	20.0	15.0
		Maximum	0.0435	0.0259	60	9.6	9.2	308	224	16.8	25.0	30.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-2	Mean	0.0375	0.0209	55	8.6	8.5	296	199	12.5	22.3	28.8
		SE	0.0025	0.0046	10	0.3	0.3	5.79	12.4	1.1	1.03	8.5
		Minimum	0.0306	0.0116	38	8.2	8.0	279	166	10.0	20.0	15.0
		Maximum	0.0417	0.0333	82	9.5	9.2	305	224	15.2	25.0	50.0
		N	4	4	4	4	4	4	4	4	4	4

Table 2. Continued.

Sample Location	Location ID	Statistic	Phosphorus Total (mg/L P)	Phosphorus Dissolved (mg/L P)	Phosphorus Dissolved Fraction (%)	Organic Carbon Total (mg/L)	Organic Carbon Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	Water Clarity TSS (mg/L)	Water Clarity Turbidity (NTU)	Water Clarity True Color (TCU)
Analytical Detection Limits			**0.0010**	**0.0010**	**-**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**
Stephens Lake	STL-3S	Mean	0.0148	0.0058	44	8.4	8.4	263	167	6.4	10.0	18.8
(Open-water season: surface only)		SE	0.0020	0.0016	15	0.4	0.2	6.02	12.2	1.4	2.48	4.3
		Minimum	0.0090	0.0027	16	7.5	8.0	254	130	3.6	5.50	10.0
		Maximum	0.0182	0.0093	83	9.4	9.1	280	180	9.2	16.0	30.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3B	Mean	0.0162	0.0058	39	8.5	8.4	264	172	4.5	10.7	23.8
(Open-water season: bottom only)		SE	0.0020	0.0012	12	0.4	0.3	5.91	7.5	1.5	2.2	6.3
		Minimum	0.0104	0.0035	20	7.7	7.6	254	150	2.4	6.0	10.0
		Maximum	0.0198	0.0082	71	9.2	9.2	280	184	8.8	16.0	40.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4S	Mean	0.0315	0.0106	33	8.6	8.4	292	194	11.5	22.3	27.5
(Open-water season: surface only)		SE	0.0009	0.0013	3	0.3	0.3	7.49	9.4	2.0	2.56	7.8
		Minimum	0.0291	0.0078	27	7.9	7.7	276	166	7.2	17.0	15.0
		Maximum	0.0332	0.0133	40	9.4	9.1	306	208	15.6	28.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4B	Mean	0.0304	0.0116	38	8.6	8.3	290	183	11.2	21.8	28.8
(Open-water season: bottom only)		SE	0.0013	0.0007	1	0.3	0.3	7.13	12.3	2.8	2.02	7.7
		Minimum	0.0277	0.0101	36	8.2	7.8	274	150	4.0	16.0	15.0
		Maximum	0.0336	0.0129	40	9.2	9.2	305	208	16.8	25.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3	Mean	0.0370	0.0174	48	8.9	8.9	291	187	12.9	22.3	28.3
(Open-water season: surface only)		SE	0.0035	0.0017	5	0.1	0.3	6.72	9.2	1.3	1.35	7.8
		Minimum	0.0296	0.0127	40	8.6	8.2	273	163	10.4	20.0	11.7
		Maximum	0.0442	0.0200	62	9.2	9.6	304	202	16.0	25.0	46.7
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3D	Mean	0.0389	0.0182	47	9.2	9.2	301	186	12.0	20.5	15.0
(August / October: bottom only)		SE	0.0019	0.0000	2	0.3	0.5	2.50	14.0	0.0	0.50	5.0
		Minimum	0.0370	0.0181	45	8.9	8.7	298	172	12.0	20.0	10.0
		Maximum	0.0408	0.0182	49	9.5	9.7	303	200	12.0	21.0	20.0
		N	2	2	2	2	2	2	2	2	2	2

Table 2. Continued.

Sample Location	Location ID	Statistic	Phosphorus			Organic Carbon				Water Clarity		
			Total (mg/L P)	Dissolved (mg/L P)	Dissolved Fraction (%)	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)
Analytical Detection Limits			**0.0010**	**0.0010**	**-**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**
Nelson River	NR-4	Mean	0.0369	0.0167	46	8.8	8.6	298	193	11.5	21.3	35.0
(Open-water season: surface only)		SE	0.0034	0.0014	3	0.3	0.2	9.03	8.9	1.3	1.11	11.7
		Minimum	0.0272	0.0131	38	8.2	8.4	275	172	8.4	19.0	15.0
		Maximum	0.0419	0.0195	52	9.5	9.2	319	214	13.6	24.0	60.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-4B	Mean	0.0388	0.0193	50	9.0	9.0	310	189	10.4	22.0	15.0
(August / October: bottom only)		SE	0.0015	0.0006	0	0.2	0.2	9.00	23.0	0.4	2.00	0.0
		Minimum	0.0373	0.0187	49	8.8	8.8	301	166	10.0	20.0	15.0
		Maximum	0.0403	0.0199	50	9.2	9.1	319	212	10.8	24.0	15.0
		N	2	2	2	2	2	2	2	2	2	2
Limestone River	LR-1	Mean	0.0178	0.0099	55	13.5	13.7	219	151	14.4	11.3	37.5
		SE	0.0026	0.0036	18	1.0	1.2	24.5	8.6	6.9	5.08	14.9
		Minimum	0.0124	0.0026	18	11.6	11.6	171	136	2.0	2.60	10.0
		Maximum	0.0242	0.0199	100	15.4	15.9	268	172	30.4	25.0	80.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-5	Mean	0.0356	0.0151	45	9.1	9.1	290	191	19.6	25.5	31.3
		SE	0.0052	0.0013	5	0.1	0.1	9.77	8.3	2.4	2.22	8.3
		Minimum	0.0203	0.0116	36	8.8	8.9	268	172	13.2	20.0	15.0
		Maximum	0.0428	0.0178	57	9.3	9.3	311	212	24.8	30.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-6	Mean	0.0384	0.0172	44	8.8	8.7	298	189	17.4	24.5	31.3
		SE	0.0018	0.0022	4	0.3	0.3	7.79	11.4	3.5	2.02	8.3
		Minimum	0.0339	0.0107	32	7.9	8.2	276	156	13.2	21.0	15.0
		Maximum	0.0425	0.0198	51	9.3	9.5	313	208	28.0	30.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Angling River	AR-1	Mean	0.0167	0.0050	30	15.0	15.1	120	88.5	10.3	6.85	38.8
		SE	0.0046	0.0014	6	0.3	0.4	11.9	5.0	6.7	4.43	16.4

Table 2. Continued.

Sample Location	Location ID	Statistic	Phosphorus: Total (mg/L P)	Phosphorus: Dissolved (mg/L P)	Phosphorus: Dissolved Fraction (%)	Organic Carbon: Total (mg/L)	Organic Carbon: Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	Water Clarity: TSS (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Color (TCU)
Analytical Detection Limits			**0.0010**	**0.0010**	**-**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**
Angling River	AR-1	Minimum	0.0095	0.0018	19	14.4	14.3	96.1	80.0	<2.0	1.30	10.0
		Maximum	0.0296	0.0073	45	15.9	16.2	147	102	29.6	20.0	80.0
		N	4	4	4	4	4	4	4	4	4	4
Weir River	WR-1	Mean	0.0171	0.0059	35	15.1	15.1	178	124	15.1	9.60	73.3
		SE	0.0025	0.0010	7	1.1	1.1	34.1	21.6	5.2	3.03	17.6
		Minimum	0.0130	0.0041	24	13.0	12.9	137	94.0	5.6	4.50	40.0
		Maximum	0.0215	0.0075	47	16.5	16.7	246	166	23.6	15.0	100.0
		N	3	3	3	3	3	3	3	3	3	3
Nelson River	NR-7	Mean	0.0377	0.0153	40	9.4	9.0	295	186	26.9	30.3	32.5
		SE	0.0020	0.0018	3	0.3	0.1	12.8	14.0	8.9	4.99	10.1
		Minimum	0.0318	0.0107	34	8.5	8.7	260	148	15.6	23.0	15.0
		Maximum	0.0412	0.0182	47	9.9	9.3	321	208	53.6	45.0	50.0
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-8	Mean	0.0365	0.0153	42	8.8	8.7	298	187	26.0	30.8	31.3
		SE	0.0043	0.0016	2	0.3	0.2	10.0	7.1	10.0	6.50	7.2
		Minimum	0.0240	0.0107	37	8.2	8.2	273	174	12.4	22.0	20.0
		Maximum	0.0425	0.0184	48	9.4	9.1	321	206	55.6	50.0	50.0
		N	4	4	4	4	4	4	4	4	4	4

Table 2. Continued.

Sample Location	Location ID	Statistic	Lab pH	Hardness as $CaCO_3$ (mg/L)	Dissolved Oxygen (mg/L)	CBOD (mg/L)	Algal Pigments: Chlorophyll *a* (µg/L)	Algal Pigments: Pheophytin (µg/L)	Algal Pigments: ODb/ODa
Analytical Detection Limits			**0.01**	**0.30**	**0.10**	**1 / 6**	**1.0**	**1.0**	**1.0**
Burntwood River	SPL-1	Mean	8.21	72.4	-	-	2.5	1.7	1.4
		SE	0.07	3.38	-	-	0.5	0.1	0.0
		Minimum	8.09	66.9	-	-	1.1	1.6	1.3
		Maximum	8.42	82.0	-	-	3.4	1.8	1.5
		N	4	4	-	-	4	4	4
Nelson River	SPL-2	Mean	8.33	130	-	-	4.0	2.9	1.4
		SE	0.08	3.54	-	-	0.4	0.4	0.0
		Minimum	8.18	123	-	-	3.1	2.1	1.4
		Maximum	8.55	140	-	-	5.0	4.1	1.5
		N	4	4	-	-	4	4	4
Split Lake	SPL-3	Mean	8.30	90.9	10.0	-	3.8	1.8	1.5
		SE	0.11	8.91	-	-	0.3	0.3	0.0
		Minimum	8.11	78.2	10.0	-	3.1	1.2	1.4
		Maximum	8.62	117	10.0	-	4.2	2.7	1.5
		N	4	4	1	-	4	4	4
Split Lake	SPL-4	Mean	8.28	130	10.9	-	4.5	2.0	1.5
		SE	0.02	5.30	-	-	0.7	0.6	0.0
		Minimum	8.24	114	10.9	-	3.1	<1.0	1.4
		Maximum	8.33	137	10.9	-	6.5	3.1	1.5
		N	4	4	1	-	4	4	4
York Landing	YL-1	Mean	8.22	126	10.1	-	5.2	2.1	1.5
		SE	0.12	4.57	-	-	1.5	0.3	0.0
		Minimum	7.87	116	10.1	-	1.5	1.4	1.4
		Maximum	8.42	136	10.1	-	8.4	2.7	1.6
		N	4	4	1	-	4	4	4
Split Lake	SPL-5	Mean	8.10	100	-	-	4.1	1.8	1.5
		SE	0.08	5.08	-	-	1.0	0.3	0.0
		Minimum	7.88	85.5	-	-	2.7	1.3	1.4
		Maximum	8.22	109	-	-	6.9	2.5	1.5
		N	4	4	-	-	4	4	4
Aiken River	AK-1	Mean	7.80	68.6	-	-	1.3	3.9	1.2

Table 2. Continued.

Sample Location	Location ID	Statistic	Lab pH	Hardness as $CaCO_3$ (mg/L)	Dissolved Oxygen (mg/L)	CBOD (mg/L)	Algal Pigments		
							Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa
Analytical Detection Limits			**0.01**	**0.30**	**0.10**	**1 / 6**	**1.0**	**1.0**	**1.0**
Aiken River	AK-1	SE	0.09	3.14	-	-	0.5	2.0	0.1
		Minimum	7.64	62.0	-	-	<1.0	<1.0	1.0
		Maximum	8.02	77.1	-	-	2.7	9.5	1.4
		N	4	4	-	-	4	4	4
Split Lake	SPL-7	Mean	8.34	126	-	-	4.5	2.5	1.5
		SE	0.07	3.59	-	-	0.4	0.2	0.0
		Minimum	8.22	115	-	-	3.8	2.1	1.4
		Maximum	8.53	131	-	-	5.3	3.1	1.5
		N	4	4	-	-	4	4	4
Split Lake	SPL-8	Mean	8.19	115	9.00	-	5.0	1.9	1.5
		SE	0.06	3.33	-	-	1.0	0.2	0.1
		Minimum	8.03	107	9.00	-	3.1	1.5	1.3
		Maximum	8.29	122	9.00	-	7.3	2.3	1.6
		N	4	4	1	-	4	4	4
Clark Lake	CL-1	Mean	8.28	120	-	-	4.4	2.4	1.4
		SE	0.03	3.99	-	-	0.6	0.1	0.0
		Minimum	8.23	112	-	-	3.4	2.2	1.4
		Maximum	8.35	129	-	-	5.3	2.8	1.5
		N	4	4	-	-	4	4	4
Nelson River	NR-1	Mean	8.31	122	9.50	-	5.1	2.1	1.5
		SE	0.02	5.20	-	-	0.8	0.3	0.0
		Minimum	8.25	111	9.50	-	3.4	1.3	1.4
		Maximum	8.35	136	9.50	-	7.3	2.8	1.5
		N	4	4	1	-	4	4	4
Gull Lake	GL-1	Mean	8.30	123	-	-	5.0	1.6	1.5
		SE	0.02	5.19	-	-	0.6	0.2	0.0
		Minimum	8.24	108	-	-	3.8	1.1	1.5
		Maximum	8.35	132	-	-	6.5	2.1	1.6
		N	4	4	-	-	4	4	4

Table 2. Continued.

Sample Location	Location ID	Statistic	Lab pH	Hardness as $CaCO_3$ (mg/L)	Dissolved Oxygen (mg/L)	CBOD (mg/L)	Algal Pigments: Chlorophyll *a* (µg/L)	Algal Pigments: Pheophytin (µg/L)	Algal Pigments: ODb/ODa
Analytical Detection Limits			**0.01**	**0.30**	**0.10**	**1 / 6**	**1.0**	**1.0**	**1.0**
Gull Lake	GL-2	Mean	8.32	123	-	-	5.1	1.9	1.5
		SE	0.03	4.76	-	-	0.7	0.3	0.0
		Minimum	8.25	112	-	-	3.8	1.0	1.5
		Maximum	8.36	135	-	-	6.9	2.2	1.6
		N	4	4	-	-	4	4	4
Nelson River	NR-2	Mean	8.31	127	-	2	4.6	1.9	1.5
		SE	0.03	5.07	-	1	0.7	0.2	0.0
		Minimum	8.25	115	-	<1	3.4	1.4	1.5
		Maximum	8.36	136	-	<6	6.5	2.3	1.5
		N	4	4	-	4	4	4	4
Stephens Lake	RB-1S	Mean	8.21	117	-	2	4.2	1.8	1.5
(Open-water season: surface only)		SE	0.11	8.00	-	1	0.9	0.3	0.0
		Minimum	7.88	98.5	-	<1	1.9	1.0	1.5
		Maximum	8.38	137	-	<6	5.7	2.3	1.5
		N	4	4	-	4	4	4	4
Stephens Lake	RB-1B	Mean	8.20	118	-	-	3.3	2.0	1.4
(Open-water season: bottom only)		SE	0.11	6.66	-	-	0.7	0.6	0.1
		Minimum	7.88	100	-	-	1.5	<1.0	1.3
		Maximum	8.37	132	-	-	4.6	2.9	1.6
		N	4	4	-	-	4	4	4
Stephens Lake	STL-1	Mean	8.22	124	9.90	1	4.4	1.5	1.5
		SE	0.12	4.27	-	1	0.5	0.4	0.0
		Minimum	7.86	113	9.90	<1	3.4	<1.0	1.5
		Maximum	8.36	133	9.90	<6	5.7	2.3	1.6
		N	4	4	1	4	4	4	4
Stephens Lake	STL-2	Mean	8.23	124	9.90	1	4.3	1.8	1.5
		SE	0.12	5.10	-	1	0.5	0.3	0.0
		Minimum	7.88	110	9.90	<1	3.1	1.1	1.4
		Maximum	8.37	134	9.90	<6	5.3	2.6	1.6
		N	4	4	1	4	4	4	4

Table 2. Continued.

Sample Location	Location ID	Statistic	Lab pH	Hardness as $CaCO_3$ (mg/L)	Dissolved Oxygen (mg/L)	CBOD (mg/L)	Algal Pigments: Chlorophyll *a* (µg/L)	Algal Pigments: Pheophytin (µg/L)	Algal Pigments: ODb/ODa
Analytical Detection Limits			**0.01**	**0.30**	**0.10**	**1 / 6**	**1.0**	**1.0**	**1.0**
Stephens Lake	STL-3S	Mean	8.27	125	-	1	1.8	<1.0	1.5
(Open-water season: surface only)		SE	0.11	2.96	-	1	0.5	0.3	0.1
		Minimum	7.94	118	-	<1	1.1	<1	1.3
		Maximum	8.43	130	-	<6	3.1	1.5	1.7
		N	4	4	-	4	4	4	4
Stephens Lake	STL-3B	Mean	8.26	124	-	-	1.7	1.0	1.5
(Open-water season: bottom only)		SE	0.11	2.29	-	-	0.5	0.3	0.1
		Minimum	7.93	119	-	-	<1.0	0.5	1.3
		Maximum	8.40	129	-	-	2.7	1.9	1.7
		N	4	4	-	-	4	4	4
Stephens Lake	STL-4S	Mean	8.26	127	10.5	<6	3.8	1.8	1.5
(Open-water season: surface only)		SE	0.10	3.38	-	-	0.5	0.5	0.1
		Minimum	7.96	119	10.5	<6	2.7	<1.0	1.3
		Maximum	8.39	135	10.5	<6	5.0	2.9	1.7
		N	4	4	1	1	4	4	4
Stephens Lake	STL-4B	Mean	8.26	123	-	-	3.0	1.8	1.4
(Open-water season: bottom only)		SE	0.11	4.71	-	-	0.2	0.6	0.0
		Minimum	7.94	114	-	-	2.3	<1.0	1.3
		Maximum	8.38	136	-	-	3.4	3.5	1.5
		N	4	4	-	-	4	4	4
Nelson River	NR-3	Mean	8.30	124	10.7	-	3.8	1.8	1.5
(Open-water season: surface only)		SE	0.02	3.39	0.35	-	0.4	0.1	0.0
		Minimum	8.26	119	10.3	-	3.2	1.5	1.4
		Maximum	8.33	134	11.0	-	4.8	2.0	1.5
		N	4	4	2	-	4	4	4
Nelson River	NR-3D	Mean	8.29	126	-	-	2.9	2.4	1.4
(August / October: bottom only)		SE	0.03	6.50	-	-	0.2	0.3	0.0
		Minimum	8.26	119	-	-	2.7	2.0	1.4
		Maximum	8.31	132	-	-	3.1	2.7	1.4
		N	2	2	-	-	2	2	2

Table 2. Continued.

Sample Location	Location ID	Statistic	Lab pH	Hardness as $CaCO_3$ (mg/L)	Dissolved Oxygen (mg/L)	CBOD (mg/L)	Algal Pigments: Chlorophyll *a* (µg/L)	Algal Pigments: Pheophytin (µg/L)	Algal Pigments: ODb/ODa
Analytical Detection Limits			**0.01**	**0.30**	**0.10**	**1 / 6**	**1.0**	**1.0**	**1.0**
Nelson River	NR-4	Mean	8.34	127	11.4	<1	3.9	1.3	1.5
(Open-water season: surface only)		SE	0.03	4.06	0.15	0	0.3	0.3	0.0
		Minimum	8.28	122	11.2	<1	3.4	<1.0	1.5
		Maximum	8.42	139	11.5	2	4.6	1.8	1.6
		N	4	4	2	4	4	4	4
Nelson River	NR-4B	Mean	8.36	129	-	-	3.3	2.0	1.5
(August / October: bottom only)		SE	0.05	10.0	-	-	0.2	0.0	0.0
		Minimum	8.31	119	-	-	3.1	1.9	1.4
		Maximum	8.41	139	-	-	3.4	2.0	1.5
		N	2	2	-	-	2	2	2
Limestone River	LR-1	Mean	8.33	125	-	-	1.5	<1.0	1.4
		SE	0.07	11.7	-	-	0.8	0.3	0.1
		Minimum	8.15	104	-	-	<1.0	<1.0	1.2
		Maximum	8.49	146	-	-	3.8	1.6	1.6
		N	4	4	-	-	4	4	4
Nelson River	NR-5	Mean	8.32	126	10.9	-	3.2	1.8	1.4
		SE	0.02	4.01	-	-	0.6	0.5	0.0
		Minimum	8.25	120	10.9	-	1.5	<1.0	1.3
		Maximum	8.37	138	10.9	-	4.6	2.6	1.5
		N	4	4	1	-	4	4	4
Nelson River	NR-6	Mean	8.34	127	-	-	4.0	2.0	1.5
		SE	0.03	3.52	-	-	0.7	0.5	0.0
		Minimum	8.29	122	-	-	3.1	<1.0	1.4
		Maximum	8.41	137	-	-	6.1	2.7	1.5
		N	4	4	-	-	4	4	4
Angling River	AR-1	Mean	8.17	68.7	9.60	-	<1.0	<1.0	1.4
		SE	0.04	4.02	-	-	0.3	0.2	0.0

Table 2. Continued.

Sample Location	Location ID	Statistic	Lab pH	Hardness as $CaCO_3$ (mg/L)	Dissolved Oxygen (mg/L)	CBOD (mg/L)	Algal Pigments		
							Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa
Analytical Detection Limits			**0.01**	**0.30**	**0.10**	**1 / 6**	**1.0**	**1.0**	**1.0**
Angling River	AR-1	Minimum	8.08	61.2	9.60	-	<1.0	<1.0	1.3
		Maximum	8.27	76.4	9.60	-	1.5	1.1	1.5
		N	4	4	1	-	4	4	4
Weir River	WR-1	Mean	8.27	106	-	-	2.2	<1	1.4
		SE	0.10	18.6	-	-	0.9	0.2	0.2
		Minimum	8.12	81.0	-	-	<1.0	0.5	1.0
		Maximum	8.45	142	-	-	3.1	<1	1.6
		N	3	3	-	-	3	3	3
Nelson River	NR-7	Mean	8.33	127	10.4	-	3.5	1.9	1.5
		SE	0.03	4.96	-	-	0.4	0.3	0.0
		Minimum	8.26	118	10.4	-	2.7	1.3	1.4
		Maximum	8.42	140	10.4	-	4.6	2.4	1.5
		N	4	4	1	-	4	4	4
Nelson River	NR-8	Mean	8.34	129	9.60	<1	3.7	1.4	1.5
		SE	0.03	4.56	-	-	0.6	0.4	0.0
		Minimum	8.27	121	9.60	<1	2.7	<1.0	1.4
		Maximum	8.41	140	9.60	<1	5.3	2.2	1.6
		N	4	4	1	3	4	4	4

Table 3. Summary statistics for water quality parameters measured *in-situ* at the surface in the Keeyask/Conawapa study areas: open-water season 2009.

Sample Location	Location ID	Statistic	Water Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Burntwood River	SPL-1	Mean	11.0	14.4	11.24	111	137	110	145	7.74	-
		SE	0.3	1.1	1.30	14	3	5	34	0.12	-
		Minimum	10.6	12.3	7.36	71	131	101	84	7.40	-
		Maximum	11.9	17.5	12.81	131	143	123	200	7.93	-
		N	4	4	4	4	4	4	3	4	-
Nelson River	SPL-2	Mean	32.4	15.8	10.81	110	338	278	58	7.81	-
		SE	0.7	0.8	1.06	12	7	7	10	0.09	-
		Minimum	31.2	14.3	7.65	75	320	259	40	7.65	-
		Maximum	34.5	18.0	12.26	125	350	288	75	8.06	-
		N	4	4	4	4	4	4	3	4	-
Split Lake	SPL-3	Mean	4.8	15.3	10.99	111	213	174	112	7.78	0.36
		SE	0.1	1.2	1.24	14	36	30	23	0.12	0.08
		Minimum	4.6	13.1	7.33	71	157	124	66	7.48	0.22
		Maximum	5.0	18.3	12.82	130	312	258	140	8.05	0.50
		N	4	4	4	4	4	4	3	4	3
Split Lake	SPL-4	Mean	7.7	15.8	11.22	114	340	280	59	7.91	0.48
		SE	0.4	1.2	1.34	14	8	11	11	0.08	0.05
		Minimum	7.0	13.5	7.29	71	321	250	43	7.70	0.35
		Maximum	8.7	18.7	13.07	132	354	298	80	8.07	0.60
		N	4	4	4	4	4	4	3	4	4
York Landing	YL-1	Mean	7.4	15.0	9.92	98	318	257	42	8.03	0.71
		SE	0.1	1.8	1.27	11	2	12	6	0.07	0.07
		Minimum	7.0	10.8	7.45	73	315	230	32	7.89	0.55
		Maximum	7.6	19.4	13.42	123	324	289	54	8.19	0.90
		N	4	4	4	4	4	4	3	4	4
Split Lake	SPL-5	Mean	4.8	15.0	9.43	93	239	191	28	7.81	0.95
		SE	0.2	2.1	1.29	10	22	13	6	0.06	0.09
		Minimum	4.4	10.0	6.94	69	192	155	20	7.72	0.70
		Maximum	5.1	20.1	13.04	117	296	211	40	7.96	1.10
		N	4	4	4	4	4	4	3	4	4

Table 3. Continued.

Sample Location	Location ID	Statistic	Water Depth (m)	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Aiken River	AK-1	Mean	2.7	13.3	8.71	82	130	100	11	7.05	2.08
		SE	0.1	2.9	1.50	10	9	4	3	0.26	0.31
		Minimum	2.5	5.6	5.99	59	113	90	5	6.52	1.50
		Maximum	3.1	19.8	12.89	106	152	108	14	7.57	2.70
		N	4	4	4	4	4	4	3	4	4
Split Lake	SPL-7	Mean	5.1	15.5	11.29	113	316	258	72	7.90	0.51
		SE	0.0	1.0	0.78	7	10	9	14	0.07	0.07
		Minimum	5.0	13.8	9.17	98	296	233	52	7.76	0.35
		Maximum	5.1	18.3	12.96	131	335	275	100	8.09	0.65
		N	4	4	4	4	4	4	3	4	4
Split Lake	SPL-8	Mean	10.9	14.9	11.51	114	301	243	84	7.76	0.40
		SE	0.4	1.2	0.96	7	2	7	12	0.16	-
		Minimum	10.0	12.4	9.11	96	297	226	60	7.32	0.4
		Maximum	11.7	18.0	13.38	126	308	257	99	8.08	0.4
		N	4	4	4	4	4	4	3	4	1
Clark Lake	CL-1	Mean	6.3	15.0	11.61	115	317	256	95	7.86	-
		SE	0.2	1.2	0.92	7	7	9	21	0.10	-
		Minimum	5.7	12.3	9.23	98	305	231	56	7.63	-
		Maximum	6.7	18.0	13.39	126	335	272	130	8.11	-
		N	4	4	4	4	4	4	3	4	-
Nelson River	NR-1	Mean	7.5	14.7	10.86	107	309	248	77	7.82	-
		SE	0.3	1.5	1.05	7	6	10	22	0.10	-
		Minimum	6.7	10.7	9.16	95	296	218	20	7.62	-
		Maximum	8.0	18.0	13.67	125	321	264	120	8.01	-
		N	4	4	4	4	4	4	4	4	-
Gull Lake	GL-1	Mean	5.4	14.7	10.72	105	309	248	70	7.90	0.37
		SE	0.1	1.5	1.09	7	5	11	18	0.06	-
		Minimum	5.0	10.6	9.03	91	299	217	20	7.79	0.37
		Maximum	5.6	18.0	13.66	124	320	262	98	8.05	0.37
		N	4	4	4	4	4	4	4	4	1
Gull Lake	GL-2	Mean	3.6	14.6	10.75	105	311	250	65	7.93	0.37
		SE	0.1	1.5	1.12	8	6	11	16	0.06	-

Table 3. Continued.

Sample Location	Location ID	Statistic	Water Depth (m)	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Gull Lake	GL-2	Minimum	3.3	10.6	8.98	90	299	217	20	7.83	0.37
		Maximum	4.0	18.0	13.75	125	322	264	96	8.06	0.37
		N	4	4	4	4	4	4	4	4	1
Nelson River	NR-2	Mean	8.4	14.6	10.75	105	312	250	71	7.93	-
		SE	0.5	1.5	1.10	8	6	11	18	0.08	-
		Minimum	7.2	10.6	9.07	91	300	217	21	7.75	-
		Maximum	9.6	18.0	13.73	125	322	264	100	8.09	-
		N	4	4	4	4	4	4	4	4	-
Stephens Lake	RB-1	Mean	4.1	13.0	10.98	103	293	225	42	7.93	0.78
		SE	0.1	2.1	1.32	8	18	16	19	0.13	0.16
		Minimum	3.8	7.1	8.36	86	242	188	12	7.61	0.45
		Maximum	4.4	17.0	14.17	120	321	256	96	8.24	1.20
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	9.3	14.7	10.80	106	311	250	64	7.77	0.44
		SE	0.2	1.2	1.28	10	7	9	15	0.16	0.02
		Minimum	9.0	11.5	8.56	88	299	223	23	7.43	0.40
		Maximum	9.7	17.4	13.83	128	325	265	89	8.14	0.50
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-2	Mean	10.7	14.3	10.79	105	309	246	56	7.86	0.48
		SE	0.5	1.3	1.14	9	8	10	13	0.11	0.05
		Minimum	9.1	11.0	8.75	86	295	218	19	7.63	0.40
		Maximum	11.6	17.5	13.67	125	326	262	75	8.12	0.60
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3	Mean	7.4	12.7	11.08	104	275	210	29	7.98	1.02
		SE	0.9	1.6	1.32	9	3	8	10	0.15	0.17
		Minimum	6.2	9.7	8.66	88	269	195	4	7.56	0.67
		Maximum	10.0	15.9	13.64	122	282	225	49	8.25	1.40
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4	Mean	5.5	13.4	10.90	104	306	238	64	8.12	0.52
		SE	0.6	1.6	1.29	9	7	9	17	0.04	0.05
		Minimum	3.7	9.3	8.62	88	292	216	15	8.02	0.40
		Maximum	6.6	16.8	13.98	124	323	258	92	8.22	0.60
		N	4	4	4	4	4	4	4	4	4

Table 3. Continued.

Sample Location	Location ID	Statistic	Water Depth (m)	Temperature (ºC)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Nelson River	NR-3	Mean	26.0	14.6	11.34	110	309	247	67	7.85	0.53
		SE	1.0	1.1	1.43	12	7	8	18	0.15	0.07
		Minimum	25.0	12.3	7.98	83	295	232	18	7.51	0.45
		Maximum	27.0	17.4	14.66	137	327	266	100	8.16	0.60
		N	2	4	4	4	4	4	4	4	2
Nelson River	NR-4	Mean	27.1	14.4	11.60	112	312	248	60	7.82	0.53
		SE	0.1	1.3	1.34	10	8	7	14	0.13	0.07
		Minimum	27.0	11.5	8.51	89	291	231	21	7.52	0.45
		Maximum	27.2	17.7	13.90	132	330	266	85	8.14	0.60
		N	2	4	4	4	4	4	4	4	2
Limestone River	LR-1	Mean	-	12.8	11.55	107	229	173	41	7.76	-
		SE	-	2.5	1.49	8	24	17	16	0.17	-
		Minimum	-	5.4	9.04	91	177	137	2	7.45	-
		Maximum	-	16.3	15.56	126	276	219	77	8.15	-
		N	-	4	4	4	4	4	4	4	-
Nelson River	NR-5	Mean	-	14.2	11.58	111	303	241	75	7.78	-
		SE	-	1.4	1.18	9	9	10	18	0.07	-
		Minimum	-	11.1	9.24	96	289	224	23	7.62	-
		Maximum	-	17.7	13.98	127	329	265	100	7.94	-
		N	-	4	4	4	4	4	4	4	-
Nelson River	NR-6	Mean	-	14.5	11.77	114	312	249	73	7.90	-
		SE	-	1.3	1.06	8	7	8	15	0.07	-
		Minimum	-	11.3	9.84	97	296	230	28	7.76	-
		Maximum	-	17.7	13.83	128	329	267	96	8.09	-
		N	-	4	4	4	4	4	4	4	-
Angling River	AR-1	Mean	-	12.9	11.58	107	127	96	25	7.78	-
		SE	-	2.4	1.53	9	14	8	16	0.13	-
		Minimum	-	6.0	9.20	92	97	76	0	7.51	-
		Maximum	-	16.3	15.81	129	159	113	71	8.15	-
		N	-	4	4	4	4	4	4	4	-
Weir River [2]	WR-1	Mean	-	14.7	10.17	99	186	150	29	7.79	-
		SE	-	0.8	0.91	7	35	28	14	0.07	-

Table 3. Continued.

Sample Location	Location ID	Statistic	Water Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Weir River [2]	WR-1	Minimum	-	13.4	9.18	91	140	109	1	7.69	-
		Maximum	-	16.0	11.98	114	255	204	46	7.92	-
		N	-	3	3	3	3	3	3	3	-
Nelson River	NR-7	Mean	-	14.2	11.34	108	307	243	77	7.91	-
		SE	-	1.3	1.21	9	11	9	22	0.06	-
		Minimum	-	11.0	8.94	92	280	229	26	7.79	-
		Maximum	-	17.3	13.70	124	331	268	130	8.05	-
		N	-	4	4	4	4	4	4	4	-
Nelson River	NR-8	Mean	-	14.4	11.28	108	311	247	90	7.97	-
		SE	-	1.4	1.23	9	8	9	29	0.08	-
		Minimum	-	11.0	8.89	92	294	230	22	7.75	-
		Maximum	-	17.7	13.86	125	331	270	160	8.11	-
		N	-	4	4	4	4	4	4	4	-

[1] During the open-water season conductivity values were calculated on *in-situ* specific conductance measurements using the following formula: Conductivity = specific conductance * [1+0.0191*(temp. – 25°C)].

[2] Access to sampling site was not possible due to local moose hunters in the area. No water samples were collected during the fall sampling period.

Table 4. Summary statistics for major ions and metals measured at ALS Laboratories from water samples collected in the Keeyask/Conawapa study areas, open-water season 2009. Ranges observed in the Study Area during the 2001-2004 sampling period are indicated in red at the bottom of the table.

Sample Location	Location ID	Statistic (mg/L)	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total
Analytical Detection Limit	**ALS**		**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**
Burntwood River	SPL-1	Mean	1.64	<0.00050	<0.00050	0.0246	<0.0010	<0.00020	<0.030	<0.000010	19.2	0.00019
		SE	0.359	0.00010	0.00010	0.00217	-	-	-	0.000002	0.79	0.00004
		Minimum	0.964	<0.00050	<0.00050	0.0208	<0.0010	<0.00020	<0.030	<0.000010	18.0	0.00011
		Maximum	2.46	0.00064	0.00064	0.0291	<0.0010	<0.00020	<0.030	0.000011	21.4	0.00029
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	SPL-2	Mean	0.804	<0.0005	0.00137	0.0407	<0.0010	<0.00020	<0.030	<0.000010	30.6	<0.00010
		SE	0.136	0.00009	0.00009	0.00075	-	-	0.004	0.000002	0.53	-
		Minimum	0.578	<0.00050	0.00118	0.0394	<0.0010	<0.00020	<0.030	<0.000010	29.4	<0.00010
		Maximum	1.20	0.00061	0.00161	0.0422	<0.0010	<0.00020	0.030	0.000012	31.9	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-3	Mean	1.58	<0.00050	0.00085	0.0316	<0.0010	<0.00020	<0.030	<0.000010	22.8	0.00016
		SE	0.477	0.00007	0.00014	0.00171	-	-	-	-	1.71	0.00005
		Minimum	0.620	<0.00050	0.00052	0.0290	<0.0010	<0.00020	<0.030	<0.000010	20.5	<0.00010
		Maximum	2.75	0.00053	0.00118	0.0365	<0.0010	<0.00020	<0.030	<0.000010	27.8	0.00025
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-4	Mean	0.698	<0.00050	0.00134	0.0403	<0.0010	<0.00020	<0.030	<0.000010	30.4	<0.00010
		SE	0.108	-	0.00006	0.00205	-	-	0.006	-	1.05	-
		Minimum	0.513	<0.00050	0.00115	0.0358	<0.0010	<0.00020	<0.030	<0.000010	27.3	<0.00010
		Maximum	1.01	<0.00050	0.00143	0.0450	<0.0010	<0.00020	0.039	<0.000010	32.1	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
York Landing	YL-1	Mean	0.524	<0.00050	0.00101	0.0363	<0.0010	<0.00020	<0.030	<0.000010	30.3	<0.00010
		SE	0.060	0.00010	0.00026	0.00154	-	-	0.004	-	0.79	-
		Minimum	0.366	<0.00050	<0.00050	0.0342	<0.0010	<0.00020	<0.030	<0.000010	28.3	<0.00010
		Maximum	0.640	0.00059	0.00143	0.0408	<0.0010	<0.00020	0.030	<0.000010	31.6	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-5	Mean	0.375	<0.00050	0.00069	0.0234	<0.0010	<0.00020	<0.030	<0.000010	25.8	<0.00010
		SE	0.056	0.00008	0.00020	0.00291	-	-	0.004	-	1.01	-
		Minimum	0.245	<0.00050	<0.00050	0.0191	<0.0010	<0.00020	<0.030	<0.000010	23.0	<0.00010
		Maximum	0.511	0.00055	0.00122	0.0315	<0.0010	<0.00020	0.031	<0.000010	27.3	<0.00010
		N	4	4	4	4	4	4	4	4	4	4

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total
Analytical Detection Limit	**ALS**		**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**
Aiken River	AK-1	Mean	0.062	<0.00050	<0.00050	0.00660	<0.0010	<0.00020	<0.030	<0.000010	19.7	<0.00010
		SE	0.022	-	-	0.00093	-	-	-	0.000004	0.89	-
		Minimum	0.021	<0.00050	<0.00050	0.00395	<0.0010	<0.00020	<0.030	<0.000010	18.0	<0.00010
		Maximum	0.122	<0.00050	<0.00050	0.00795	<0.0010	<0.00020	<0.030	0.000020	22.2	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-7	Mean	0.996	<0.00050	0.00146	0.0396	<0.0010	<0.00020	<0.030	<0.000010	29.4	<0.00010
		SE	0.159	0.00007	0.00009	0.00173	-	-	-	-	0.60	0.00002
		Minimum	0.696	<0.00050	0.00133	0.0367	<0.0010	<0.00020	<0.030	<0.000010	27.6	<0.00010
		Maximum	1.29	0.00052	0.00170	0.0441	<0.0010	<0.00020	<0.030	<0.000010	30.1	0.00011
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-8	Mean	0.945	<0.00050	0.00120	0.0376	<0.0010	<0.00020	<0.030	<0.000010	27.6	<0.00010
		SE	0.251	-	0.00007	0.00242	-	-	-	0.000004	0.62	0.00002
		Minimum	0.543	<0.00050	0.00101	0.0336	<0.0010	<0.00020	<0.030	<0.000010	25.9	<0.00010
		Maximum	1.65	<0.00050	0.00134	0.0444	<0.0010	<0.00020	<0.030	0.000019	28.7	0.00014
		N	4	4	4	4	4	4	4	4	4	4
Clark Lake	CL-1	Mean	0.857	<0.00050	0.00126	0.0387	<0.0010	<0.00020	<0.030	<0.000010	28.5	<0.00010
		SE	0.227	0.00006	0.00008	0.00318	-	-	-	-	0.77	0.00002
		Minimum	0.378	<0.00050	0.00101	0.0312	<0.0010	<0.00020	<0.030	<0.000010	27.0	<0.00010
		Maximum	1.42	0.00050	0.00137	0.0446	<0.0010	<0.00020	<0.030	<0.000010	30.5	0.00011
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-1	Mean	0.991	<0.00050	0.00121	0.0378	<0.0010	<0.00020	<0.030	<0.000010	29.6	<0.00010
		SE	0.263	-	0.00008	0.00240	-	-	0.008	-	1.50	0.00002
		Minimum	0.558	<0.00050	0.00104	0.0328	<0.0010	<0.00020	<0.030	<0.000010	27.0	<0.00010
		Maximum	1.65	<0.00050	0.00139	0.0436	<0.0010	<0.00020	0.045	<0.000010	33.9	0.00014
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-1	Mean	0.931	<0.00050	0.00120	0.0385	<0.0010	<0.00020	<0.030	<0.000010	29.8	0.00010
		SE	0.191	0.00011	0.00004	0.00213	-	-	0.008	-	1.37	0.00003
		Minimum	0.526	<0.00050	0.00110	0.0338	<0.0010	<0.00020	<0.030	<0.000010	26.1	<0.00010
		Maximum	1.42	0.00067	0.00130	0.0441	<0.0010	<0.00020	0.048	<0.000010	32.4	0.00017
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-2	Mean	0.627	<0.00050	0.00122	0.0372	<0.0010	<0.00020	<0.030	<0.000010	29.9	<0.00010
		SE	0.109	0.00009	0.00007	0.00159	-	-	0.005	-	1.22	0.00002

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total
Analytical Detection Limit	**ALS**		**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**
Gull Lake	GL-2	Minimum	0.456	<0.00050	0.00104	0.0342	<0.0010	<0.00020	<0.030	<0.000010	27.2	<0.00010
		Maximum	0.945	0.00062	0.00140	0.0416	<0.0010	<0.00020	0.032	<0.000010	33.0	0.00014
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-2	Mean	0.842	<0.00050	0.00127	0.0391	<0.0010	<0.00020	<0.030	<0.000010	30.5	<0.00010
		SE	0.122	0.00012	0.00007	0.00286	-	-	0.008	-	1.31	0.00003
		Minimum	0.573	<0.00050	0.00105	0.0340	<0.0010	<0.00020	<0.030	<0.000010	27.8	<0.00010
		Maximum	1.16	0.00074	0.00138	0.0471	<0.0010	<0.00020	0.045	<0.000010	32.8	0.00018
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1S	Mean	0.558	<0.00050	0.00087	0.0301	<0.0010	<0.00020	<0.030	<0.000010	29.2	<0.00010
(Open-water season: surface only)		SE	0.118	-	0.00021	0.00358	-	-	-	-	2.21	-
		Minimum	0.213	<0.00050	<0.00050	0.0200	<0.0010	<0.00020	<0.030	<0.000010	24.1	<0.00010
		Maximum	0.744	<0.00050	0.00123	0.0365	<0.0010	<0.00020	<0.030	<0.000010	34.8	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1B	Mean	0.624	<0.00050	0.00092	0.0306	<0.0010	<0.00020	<0.030	0.000010	29.3	<0.00010
(Open-water season: bottom only)		SE	0.154	-	0.00014	0.00353	-	-	-	0.000005	1.73	0.00002
		Minimum	0.224	<0.00050	0.00051	0.0205	<0.0010	<0.00020	<0.030	<0.000010	24.5	<0.00010
		Maximum	0.878	<0.00050	0.00119	0.0369	<0.0010	<0.00020	<0.030	0.000025	32.8	0.00012
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	0.943	<0.00050	0.00120	0.0377	<0.0010	<0.00020	<0.030	<0.000010	29.7	<0.00010
		SE	0.342	-	0.00011	0.00230	-	-	0.008	0.000002	0.98	0.00004
		Minimum	0.448	<0.00050	0.00093	0.0332	<0.0010	<0.00020	<0.030	<0.000010	27.2	<0.00010
		Maximum	1.94	<0.00050	0.00146	0.0441	<0.0010	<0.00020	0.048	0.000014	31.4	0.00020
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-2	Mean	0.775	<0.00050	0.00113	0.0359	<0.0010	<0.00020	<0.030	<0.000010	29.9	<0.00010
		SE	0.327	-	0.00009	0.00247	-	-	0.014	0.000001	1.30	0.00003
		Minimum	0.214	<0.00050	0.00086	0.0316	<0.0010	<0.00020	<0.030	<0.000010	26.6	<0.00010
		Maximum	1.67	<0.00050	0.00126	0.0417	<0.0010	<0.00020	0.070	0.000010	32.9	0.00016
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3S	Mean	0.384	<0.00050	0.00063	0.0202	<0.0010	<0.00020	<0.030	<0.000010	33.9	<0.00010
(Open-water season: surface only)		SE	0.118	-	0.00005	0.00115	-	-	0.005	0.000002	0.84	-
		Minimum	0.155	<0.00050	0.00052	0.0174	<0.0010	<0.00020	<0.030	<0.000010	31.9	<0.00010
		Maximum	0.713	<0.00050	0.00075	0.0222	<0.0010	<0.00020	0.035	0.000012	35.8	<0.00010
		N	4	4	4	4	4	4	4	4	4	4

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total
Analytical Detection Limit	**ALS**		**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**
Stephens Lake	STL-3B	Mean	0.379	<0.00050	0.00062	0.0205	<0.0010	<0.00020	<0.030	<0.000010	33.6	<0.00010
(Open-water season: bottom only)		SE	0.101	-	0.00004	0.00106	-	-	-	-	0.68	-
		Minimum	0.182	<0.00050	0.00050	0.0176	<0.0010	<0.00020	<0.030	<0.000010	32.5	<0.00010
		Maximum	0.660	<0.00050	0.00067	0.0226	<0.0010	<0.00020	<0.030	<0.000010	35.5	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4S	Mean	0.751	<0.00050	0.00108	0.0346	<0.0010	<0.00020	<0.030	<0.000010	31.0	<0.00010
(Open-water season: surface only)		SE	0.207	-	0.00012	0.00169	-	-	0.004	0.000003	0.73	0.00002
		Minimum	0.395	<0.00050	0.00080	0.0299	<0.0010	<0.00020	<0.030	<0.000010	29.4	<0.00010
		Maximum	1.32	<0.00050	0.00131	0.0379	<0.0010	<0.00020	0.030	0.000016	32.9	0.00014
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4B	Mean	0.798	<0.00050	0.00104	0.0335	<0.0010	<0.00020	<0.030	<0.000010	30.4	<0.00010
(Open-water season: bottom only)		SE	0.245	-	0.00011	0.00175	-	-	-	0.000005	1.31	0.00003
		Minimum	0.432	<0.00050	0.00076	0.0285	<0.0010	<0.00020	<0.030	<0.000010	28.0	<0.00010
		Maximum	1.52	<0.00050	0.00126	0.0366	<0.0010	<0.00020	<0.030	0.000024	34.1	0.00016
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3	Mean	0.774	<0.00050	0.00116	0.0371	<0.0010	<0.00020	<0.030	<0.000010	30.0	<0.00010
(Open-water season: surface only)		SE	0.192	-	0.00006	0.00061	-	-	-	-	0.89	-
		Minimum	0.266	<0.00050	0.00101	0.0359	<0.0010	<0.00020	<0.030	<0.000010	28.8	<0.00010
		Maximum	1.19	<0.00050	0.00129	0.0384	<0.0010	<0.00020	<0.030	<0.000010	32.6	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3D	Mean	0.863	<0.00050	0.00124	0.0387	<0.0010	<0.00020	<0.030	<0.000010	30.5	<0.00010
(August / October: bottom only)		SE	0.004	-	0.00005	0.00075	-	-	-	-	1.90	-
		Minimum	0.859	<0.00050	0.00119	0.0379	<0.0010	<0.00020	<0.030	<0.000010	28.6	<0.00010
		Maximum	0.867	<0.00050	0.00128	0.0394	<0.0010	<0.00020	<0.030	<0.000010	32.4	<0.00010
		N	2	2	2	2	2	2	2	2	2	2
Nelson River	NR-4	Mean	0.700	<0.00050	0.00120	0.0378	<0.0010	<0.00020	<0.030	<0.000010	30.7	<0.00010
(Open-water season: surface only)		SE	0.162	0.00011	0.00006	0.00103	-	-	-	-	1.10	0.00001
		Minimum	0.251	<0.00050	0.00103	0.0349	<0.0010	<0.00020	<0.030	<0.000010	29.4	<0.00010
		Maximum	0.965	0.00069	0.00131	0.0398	<0.0010	<0.00020	<0.030	<0.000010	34.0	0.00010
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-4B	Mean	0.887	<0.00050	0.00127	0.0397	<0.0010	<0.00020	<0.030	<0.000010	31.3	<0.00010
(August / October: bottom only)		SE	0.014	-	0.00005	0.00070	-	-	-	-	2.70	-

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total
Analytical Detection Limit	**ALS**		**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**
Nelson River	NR-4B	Minimum	0.873	<0.00050	0.00122	0.0390	<0.0010	<0.00020	<0.030	<0.000010	28.6	<0.00010
(August / October: bottom only)		Maximum	0.901	<0.00050	0.00131	0.0404	<0.0010	<0.00020	<0.030	<0.000010	34.0	<0.00010
		N	2	2	2	2	2	2	2	0	2	2
Limestone River	LR-1	Mean	0.153	<0.00050	<0.00050	0.0120	<0.0010	<0.00020	<0.030	<0.000010	36.6	<0.00010
		SE	0.040	0.00007	-	0.00060	-	-	0.006	-	3.41	-
		Minimum	0.065	<0.00050	<0.00050	0.0102	<0.0010	<0.00020	<0.030	<0.000010	30.5	<0.00010
		Maximum	0.246	0.00051	<0.00050	0.0127	<0.0010	<0.00020	0.037	<0.000010	43.2	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-5	Mean	0.651	<0.00050	0.00113	0.0362	<0.0010	<0.00020	<0.030	<0.000010	31.1	<0.00010
		SE	0.132	0.00007	0.00007	0.00144	-	-	0.007	-	1.03	-
		Minimum	0.270	<0.00050	0.00095	0.0334	<0.0010	<0.00020	<0.030	<0.000010	29.9	<0.00010
		Maximum	0.876	0.00051	0.00126	0.0394	<0.0010	<0.00020	0.041	<0.000010	34.2	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-6	Mean	0.671	<0.00050	0.00118	0.0378	<0.0010	<0.00020	<0.030	<0.000010	30.9	<0.00010
		SE	0.137	-	0.00006	0.00047	-	-	-	0.000003	0.96	-
		Minimum	0.295	<0.00050	0.00102	0.0368	<0.0010	<0.00020	<0.030	<0.000010	29.7	<0.00010
		Maximum	0.950	<0.00050	0.00128	0.0386	<0.0010	<0.00020	<0.030	0.000015	33.7	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Angling River	AR-1	Mean	0.120	<0.00050	<0.00050	0.00640	<0.0010	<0.00020	<0.030	<0.000010	20.8	<0.00010
		SE	0.050	-	-	0.00066	-	-	0.010	-	1.24	-
		Minimum	0.029	<0.00050	<0.00050	0.00570	<0.0010	<0.00020	<0.030	<0.000010	18.5	<0.00010
		Maximum	0.254	<0.00050	<0.00050	0.00838	<0.0010	<0.00020	0.056	<0.000010	23.1	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Weir River [1]	WR-1	Mean	0.172	<0.00050	<0.00050	0.0102	<0.0010	<0.00020	0.044	<0.000010	31.8	<0.00010
		SE	0.038	-	-	0.00082	-	-	0.029	0.000002	5.62	-
		Minimum	0.100	<0.00050	<0.00050	0.0089	<0.0010	<0.00020	<0.030	<0.000010	24.4	<0.00010
		Maximum	0.231	<0.00050	<0.00050	0.0117	<0.0010	<0.00020	0.102	0.000010	42.8	<0.00010
		N	3	3	3	3	3	3	3	3	3	3
Nelson River	NR-7	Mean	0.604	<0.00050	0.00112	0.0361	<0.0010	<0.00020	<0.030	<0.000010	31.3	<0.00010
		SE	0.125	0.00006	0.00006	0.00192	-	-	-	0.000003	1.29	-
		Minimum	0.369	<0.00050	0.00099	0.0307	<0.0010	<0.00020	<0.030	<0.000010	29.1	<0.00010
		Maximum	0.848	0.00050	0.00123	0.0392	<0.0010	<0.00020	<0.030	0.000015	34.5	<0.00010
		N	4	4	4	4	4	4	4	4	4	4

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total
Analytical Detection Limit	**ALS**		**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**
Nelson River	NR-8	Mean	0.657	<0.00050	0.00115	0.0369	<0.0010	<0.00020	<0.030	<0.000010	31.6	<0.00010
		SE	0.102	-	0.00005	0.00106	-	-	-	-	1.24	-
		Minimum	0.371	<0.00050	0.00101	0.0345	<0.0010	<0.00020	<0.030	<0.000010	29.1	<0.00010
		Maximum	0.855	<0.00050	0.00125	0.0388	<0.0010	<0.00020	<0.030	<0.000010	34.3	<0.00010
		N	4	4	4	4	4	4	4	4	4	4
Study Area range (2001-2004)		Minimum	0.07	<0.001	<0.0005	0.0071	<0.001	<0.0001	<0.03	<0.00002	14.5	<0.0001
		Maximum	2.74	0.001	0.0025	0.0543	<0.001	0.0003	0.12	<0.00020	36.2	0.0003

[1] Access to sampling site in October was not possible due to local moose hunters in the area. No water samples were collected during this sampling period.

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Chloride Dissolved	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total
Analytical Detection Limit	**ALS**		**9.0**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**
Burntwood River	SPL-1	Mean	<9.0	0.0024	0.00081	0.0024	1.50	0.00084	5.92	0.0338	0.000028
		SE	2.9	0.0004	0.00016	0.0002	0.300	0.00014	0.357	0.00444	0.000018
		Minimum	<9.0	0.0014	0.00052	0.0020	0.970	0.00060	5.34	0.0251	<0.000020
		Maximum	16.0	0.0034	0.00117	0.0029	2.04	0.00118	6.96	0.0418	0.000080
		N	4	4	4	4	4	4	4	4	4
Nelson River	SPL-2	Mean	22.7	<0.0010	0.00048	0.0022	0.643	<0.00050	13.1	0.0181	<0.000020
		SE	1.8	0.0003	0.00008	0.0002	0.068	-	0.540	0.00154	0.000004
		Minimum	19.9	<0.0010	0.00037	0.0020	0.506	<0.00050	12.1	0.0147	<0.000020
		Maximum	28.0	0.0017	0.00072	0.0027	0.830	<0.00050	14.6	0.0219	0.000025
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-3	Mean	12.5	0.0020	0.00072	0.0024	1.32	0.00059	8.27	0.0272	<0.000020
		SE	4.6	0.0007	0.00019	0.0002	0.353	0.00019	1.12	0.00496	-
		Minimum	<9.0	<0.0010	0.00035	0.0020	0.544	<0.00050	6.56	0.0162	<0.000020
		Maximum	21.0	0.0037	0.00116	0.0029	2.06	0.00093	11.5	0.0366	<0.000020
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-4	Mean	21.3	<0.0010	0.00043	0.0020	0.537	<0.00050	13.0	0.0150	<0.000020
		SE	0.5	0.0002	0.00008	0.0000	0.059	-	0.694	0.00092	-
		Minimum	20.2	<0.0010	0.00032	0.0019	0.433	<0.00050	11.1	0.0130	<0.000020
		Maximum	22.5	0.0012	0.00066	0.0020	0.706	<0.00050	14.3	0.0174	<0.000020
		N	4	4	4	4	4	4	4	4	4
York Landing	YL-1	Mean	19.5	<0.0010	0.00031	0.0016	0.389	0.00052	12.1	0.0119	<0.000020
		SE	0.6	-	0.00008	0.0004	0.043	0.00027	0.702	0.00182	-
		Minimum	17.9	<0.0010	<0.00020	<0.0010	0.275	<0.00050	11.0	0.00858	<0.000020
		Maximum	20.5	<0.0010	0.00051	0.0025	0.484	0.00131	14.0	0.0160	<0.000020
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-5	Mean	12.7	<0.0010	0.00026	0.0013	0.303	<0.00050	8.61	0.0108	<0.000020
		SE	2.9	-	0.00006	0.0003	0.041	-	0.670	0.00156	-
		Minimum	<9.0	<0.0010	<0.00020	<0.0010	0.221	<0.00050	6.80	0.00810	<0.000020
		Maximum	17.9	<0.0010	0.00040	0.0019	0.409	<0.00050	9.83	0.0153	<0.000020
		N	4	4	4	4	4	4	4	4	4
Aiken River	AK-1	Mean	<9.0	<0.0010	0.00021	<0.0010	0.150	<0.00050	4.70	0.0130	<0.000020
		SE	-	-	0.00007	0.0004	0.032	-	0.252	0.00597	-

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Chloride Dissolved	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total
Analytical Detection Limit	**ALS**		**9.0**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**
Aiken River	AK-1	Minimum	<9.0	<0.0010	<0.00020	<0.0010	0.076	<0.00050	4.14	0.00240	<0.000020
		Maximum	<9.0	<0.0010	0.00037	0.0022	0.229	<0.00050	5.26	0.0286	<0.000020
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-7	Mean	21.2	0.0014	0.00049	0.0037	0.768	<0.00050	12.7	0.0186	<0.000020
		SE	2.4	0.0004	0.00009	0.0009	0.093	0.00011	0.527	0.00137	-
		Minimum	17.3	<0.0010	0.00035	0.0021	0.610	<0.00050	11.2	0.0166	<0.000020
		Maximum	27.9	0.0025	0.00074	0.0059	1.00	0.00070	13.7	0.0226	<0.000020
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-8	Mean	18.6	0.0015	0.00049	0.0028	0.778	<0.00050	11.3	0.0196	<0.000020
		SE	1.2	0.0006	0.00006	0.0004	0.148	0.00014	0.466	0.00152	-
		Minimum	15.1	<0.0010	0.00037	0.0022	0.531	<0.00050	10.3	0.0162	<0.000020
		Maximum	19.8	0.0032	0.00061	0.0039	1.17	0.00080	12.3	0.0235	<0.000020
		N	4	4	4	4	4	4	4	4	4
Clark Lake	CL-1	Mean	19.7	0.0012	0.00050	0.0022	0.672	<0.00050	11.9	0.0179	<0.000020
		SE	1.0	0.0004	0.00007	0.0001	0.124	0.00007	0.501	0.00106	-
		Minimum	16.6	<0.0010	0.00034	0.0019	0.379	<0.00050	10.9	0.0158	<0.000020
		Maximum	21.3	0.0022	0.00066	0.0024	0.923	0.00053	12.8	0.0197	<0.000020
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-1	Mean	18.8	0.0015	0.00047	0.0026	0.744	<0.00050	11.7	0.0180	<0.000020
		SE	0.9	0.0006	0.00015	0.0004	0.158	0.00008	0.371	0.00291	0.000005
		Minimum	16.3	<0.0010	<0.00020	0.0021	0.414	<0.00050	10.7	0.0100	<0.000020
		Maximum	20.2	0.0026	0.00081	0.0036	1.06	0.00055	12.5	0.0234	0.000029
		N	4	4	4	4	4	4	4	4	4
Gull Lake	GL-1	Mean	19.0	0.0016	0.00049	0.0025	0.755	<0.00050	11.8	0.0200	<0.000020
		SE	0.7	0.0005	0.00011	0.0002	0.120	0.00007	0.507	0.00144	-
		Minimum	16.9	<0.0010	0.00031	0.0020	0.491	<0.00050	10.3	0.0173	<0.000020
		Maximum	20.1	0.0026	0.00079	0.0030	1.01	0.00051	12.6	0.0235	<0.000020
		N	4	4	4	4	4	4	4	4	4
Gull Lake	GL-2	Mean	18.9	0.0015	0.00044	0.0021	0.576	<0.00050	11.8	0.0185	<0.000020
		SE	0.8	0.0005	0.00009	0.0000	0.080	-	0.408	0.00090	0.000006
		Minimum	16.6	<0.0010	0.00024	0.0020	0.437	<0.00050	10.8	0.0166	<0.000020
		Maximum	20.1	0.0027	0.00064	0.0022	0.807	<0.00050	12.8	0.0201	0.000033
		N	4	4	4	4	4	4	4	4	4

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Chloride Dissolved	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total
Analytical Detection Limit	**ALS**		**9.0**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**
Nelson River	NR-2	Mean	18.9	0.0015	0.00050	0.0022	0.712	<0.00050	12.2	0.0200	<0.000020
		SE	0.8	0.0005	0.00009	0.0001	0.098	-	0.456	0.00104	-
		Minimum	16.6	<0.0010	0.00033	0.0021	0.503	<0.00050	11.0	0.0180	<0.000020
		Maximum	20.0	0.0028	0.00065	0.0024	0.975	<0.00050	13.1	0.0227	<0.000020
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1S	Mean	18.3	<0.0010	0.00042	0.0021	0.455	<0.00050	10.8	0.0126	<0.000020
(Open-water season: surface only)		SE	0.9	0.0002	0.00009	0.0005	0.110	-	0.608	0.00219	-
		Minimum	15.6	<0.0010	0.00023	0.0011	0.162	<0.00050	9.33	0.00752	<0.000020
		Maximum	20.0	0.0011	0.00067	0.0032	0.694	<0.00050	12.2	0.0173	<0.000020
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1B	Mean	18.2	<0.0010	0.00044	0.0064	0.490	<0.00050	11.0	0.0131	<0.000020
(Open-water season: bottom only)		SE	0.9	-	0.00008	0.0032	0.130	-	0.541	0.00263	0.000006
		Minimum	15.5	<0.0010	0.00021	0.0017	0.172	<0.00050	9.50	0.00790	<0.000020
		Maximum	19.9	<0.0010	0.00061	0.0155	0.780	<0.00050	12.1	0.0182	0.000033
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	19.8	0.0013	0.00068	0.0040	0.792	<0.00050	12.0	0.0189	<0.000020
		SE	0.1	0.0005	0.00023	0.0012	0.239	0.00012	0.478	0.00244	0.000005
		Minimum	19.5	<0.0010	0.00029	0.0020	0.483	<0.00050	11.0	0.0159	<0.000020
		Maximum	20.1	0.0026	0.00127	0.0076	1.50	0.00074	13.3	0.0262	0.000031
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-2	Mean	19.6	0.0012	0.00057	0.0021	0.637	<0.00050	12.0	0.0162	<0.000020
		SE	0.2	0.0004	0.00018	0.0002	0.222	0.00008	0.509	0.00200	-
		Minimum	19.3	<0.0010	0.00022	0.0018	0.205	<0.00050	10.5	0.0117	<0.000020
		Maximum	20.2	0.0021	0.00099	0.0025	1.24	0.00058	12.7	0.0214	<0.000020
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3S	Mean	14.1	<0.0010	0.00040	0.0016	0.282	<0.00050	9.71	0.0119	<0.000020
(Open-water season: surface only)		SE	0.4	-	0.00016	0.0001	0.085	-	0.258	0.00505	-
		Minimum	13.6	<0.0010	<0.00020	0.0013	0.127	<0.00050	9.27	0.00428	<0.000020
		Maximum	15.3	<0.0010	0.00084	0.0020	0.516	<0.00050	10.4	0.0268	<0.000020
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3B	Mean	14.2	<0.0010	0.00036	0.0029	0.280	<0.00050	9.64	0.0119	<0.000020
(Open-water season: bottom only)		SE	0.3	-	0.00013	0.0007	0.078	-	0.225	0.00479	-

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Chloride Dissolved	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total
Analytical Detection Limit	**ALS**		**9.0**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**
Stephens Lake	STL-3B	Minimum	13.7	<0.0010	<0.00020	0.0017	0.137	<0.00050	9.07	0.00536	<0.000020
(Open-water season: bottom only)		Maximum	15.2	<0.0010	0.00069	0.0049	0.501	<0.00050	10.1	0.0261	<0.000020
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4S	Mean	18.9	0.0011	0.00054	0.0022	0.664	<0.00050	11.9	0.0158	<0.000020
(Open-water season: surface only)		SE	0.4	0.0004	0.00012	0.0001	0.141	-	0.469	0.00130	-
		Minimum	18.1	<0.0010	0.00034	0.0019	0.452	<0.00050	11.1	0.0133	<0.000020
		Maximum	19.9	0.0019	0.00082	0.0024	1.05	<0.00050	12.9	0.0191	<0.000020
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4B	Mean	18.6	<0.0010	0.00050	0.0049	0.677	<0.00050	11.4	0.0141	<0.000020
(Open-water season: bottom only)		SE	0.5	0.0004	0.00012	0.0017	0.173	0.00009	0.455	0.00154	0.000008
		Minimum	17.7	<0.0010	0.00023	0.0019	0.445	<0.00050	10.6	0.0106	<0.000020
		Maximum	19.9	0.0022	0.00075	0.0097	1.19	0.00061	12.4	0.0181	0.000043
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-3	Mean	19.7	<0.0010	0.00040	0.0071	0.646	<0.00050	11.9	0.0160	<0.000020
(Open-water season: surface only)		SE	0.4	0.0002	0.00007	0.0039	0.121	0.00007	0.287	0.00089	0.000009
		Minimum	18.5	<0.0010	0.00029	0.0019	0.352	<0.00050	11.5	0.0145	<0.000020
		Maximum	20.3	0.0014	0.00060	0.0183	0.943	0.00051	12.7	0.0186	0.000047
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-3D	Mean	20.2	0.0013	0.00034	0.0028	0.653	<0.00050	12.1	0.0163	0.000033
(August / October: bottom only)		SE	0.2	0.0002	0.00005	0.0000	0.016	-	0.450	0.00035	0.000023
		Minimum	20.0	0.0011	0.00029	0.0028	0.637	<0.00050	11.6	0.0159	<0.000020
		Maximum	20.4	0.0014	0.00038	0.0028	0.669	<0.00050	12.5	0.0166	0.000056
		N	2	2	2	2	2	2	2	2	2
Nelson River	NR-4	Mean	19.7	<0.0010	0.00042	0.0079	0.639	<0.00050	12.2	0.0166	<0.000020
(Open-water season: surface only)		SE	0.3	0.0003	0.00008	0.0058	0.121	0.00015	0.330	0.00142	-
		Minimum	19.0	<0.0010	0.00032	0.0020	0.328	<0.00050	11.7	0.0132	<0.000020
		Maximum	20.2	0.0016	0.00066	0.0253	0.900	0.00085	13.1	0.0200	<0.000020
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-4B	Mean	19.9	0.0011	0.00036	0.0027	0.706	<0.00050	12.4	0.0178	<0.000020
(August / October: bottom only)		SE	0.4	0.0006	0.00002	0.0004	0.028	-	0.800	0.00105	-
		Minimum	19.4	<0.0010	0.00034	0.0023	0.678	<0.00050	11.6	0.0167	<0.000020
		Maximum	20.3	0.0016	0.00038	0.0031	0.733	<0.00050	13.2	0.0188	<0.000020
		N	2	2	2	2	2	2	2	2	2

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Chloride Dissolved	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total
Analytical Detection Limit	**ALS**		**9.0**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**
Limestone River	LR-1	Mean	<9.0	<0.0010	0.00024	<0.0010	0.367	<0.00050	8.13	0.0369	<0.000020
		SE	-	0.0003	0.00008	0.0002	0.043	-	0.783	0.00580	-
		Minimum	<9.0	<0.0010	<0.00020	<0.0010	0.301	<0.00050	6.76	0.0214	<0.000020
		Maximum	<9.0	0.0015	0.00039	0.0012	0.489	<0.00050	9.61	0.0468	<0.000020
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-5	Mean	18.9	<0.0010	0.00042	0.0020	0.620	<0.00050	11.8	0.0196	<0.000020
		SE	0.7	0.0003	0.00005	0.0001	0.077	-	0.389	0.00078	-
		Minimum	16.8	<0.0010	0.00035	0.0017	0.404	<0.00050	10.9	0.0181	<0.000020
		Maximum	20.1	0.0018	0.00056	0.0021	0.733	<0.00050	12.8	0.0217	<0.000020
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-6	Mean	19.6	<0.0010	0.00041	0.0020	0.615	<0.00050	12.1	0.0175	<0.000020
		SE	0.4	0.0002	0.00007	0.0001	0.098	-	0.325	0.00089	-
		Minimum	18.5	<0.0010	0.00031	0.0018	0.398	<0.00050	11.5	0.0159	<0.000020
		Maximum	20.4	0.0013	0.00062	0.0022	0.873	<0.00050	13.0	0.0200	<0.000020
		N	4	4	4	4	4	4	4	4	4
Angling River	AR-1	Mean	<9.0	<0.0010	0.00022	<0.0010	0.266	<0.00050	4.09	0.0190	<0.000020
		SE	-	-	0.00007	-	0.068	-	0.233	0.00587	-
		Minimum	<9.0	<0.0010	<0.00020	<0.0010	0.144	<0.00050	3.63	0.00736	<0.000020
		Maximum	<9.0	<0.0010	0.00033	<0.0010	0.440	<0.00050	4.58	0.0296	<0.000020
		N	4	4	4	4	4	4	4	4	4
Weir River [1]	WR-1	Mean	<9.0	<0.0010	0.00028	<0.0010	0.424	<0.00050	6.37	0.0322	<0.000020
		SE	-	-	0.00009	0.0002	0.047	-	1.14	0.00328	-
		Minimum	<9.0	<0.0010	<0.00020	<0.0010	0.362	<0.00050	4.86	0.0283	<0.000020
		Maximum	<9.0	<0.0010	0.00041	0.0011	0.517	<0.00050	8.60	0.0387	<0.000020
		N	3	3	3	3	3	3	3	3	3
Nelson River	NR-7	Mean	19.3	<0.0010	0.00044	0.0021	0.604	<0.00050	11.9	0.0199	<0.000020
		SE	0.5	0.0002	0.00004	0.0000	0.050	0.00007	0.442	0.00105	-
		Minimum	18.1	<0.0010	0.00034	0.0020	0.491	<0.00050	11.0	0.0185	<0.000020
		Maximum	20.4	0.0015	0.00052	0.0021	0.690	0.00051	13.1	0.0230	<0.000020
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-8	Mean	19.5	<0.0010	0.00045	0.0020	0.631	<0.00050	12.2	0.0195	<0.000020
		SE	0.5	0.0002	0.00006	0.0000	0.031	-	0.357	0.00160	-

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Chloride Dissolved	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total
Analytical Detection Limit	**ALS**		**9.0**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**
Nelson River	NR-8	Minimum	18.1	<0.0010	0.00031	0.0020	0.552	<0.00050	11.6	0.0168	<0.000020
		Maximum	20.3	0.0014	0.00058	0.0021	0.689	<0.00050	13.2	0.0240	<0.000020
		N	4	4	4	4	4	4	4	4	4
Study Area range (2001-2004)		Minimum	<9	<0.001	<0.0002	<0.001	0.11	<0.0005	4.21	0.0054	<0.00005
		Maximum	23	0.012	0.0013	0.027 [2]	2.03	0.0024	14.10	0.0402	0.00032

[1] Access to sampling site in October was not possible due to local moose hunters in the area. No water samples were collected during this sampling period.
[2] Excluding two outliers.

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved
Analytical Detection Limit	**ALS**		**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**
Burntwood River	SPL-1	Mean	<0.00020	0.0030	1.58	0.00457	<0.0010	2.37	<0.00010	3.51	0.0418	9.2
		SE	0.00003	0.0005	0.09	0.00065	-	0.26	0.00005	0.226	0.00108	1.6
		Minimum	<0.00020	0.0020	1.41	0.00340	<0.0010	1.61	<0.00010	3.11	0.0388	<9.0
		Maximum	0.00023	0.0039	1.74	0.00584	<0.0010	2.71	0.00024	4.15	0.0440	11.1
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	SPL-2	Mean	0.00073	<0.0020	3.00	0.00289	<0.0010	1.73	<0.00010	20.0	0.119	25.7
		SE	0.00001	0.0003	0.10	0.00016	-	0.31	-	0.742	0.00468	2.2
		Minimum	0.00069	<0.0020	2.87	0.00253	<0.0010	1.15	<0.00010	18.7	0.110	22.1
		Maximum	0.00075	0.0021	3.31	0.00329	<0.0010	2.48	<0.00010	22.1	0.130	31.7
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-3	Mean	0.00035	0.0023	2.09	0.00436	<0.0010	2.24	<0.00010	8.85	0.0690	17.6
		SE	0.00011	0.0008	0.16	0.00078	-	0.23	-	2.34	0.0143	3.8
		Minimum	<0.00020	<0.0020	1.85	0.00262	<0.0010	1.59	<0.00010	4.79	0.0413	10.9
		Maximum	0.00061	0.0037	2.55	0.00590	<0.0010	2.60	<0.00010	15.0	0.108	24.3
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-4	Mean	0.00078	<0.0020	2.96	0.00272	<0.0010	1.82	<0.00010	19.3	0.120	25.8
		SE	0.00006	0.0003	0.12	0.00009	0.0002	0.39	-	1.18	0.0068	1.9
		Minimum	0.00068	<0.0020	2.63	0.00262	<0.0010	1.13	<0.00010	16.7	0.109	22.5
		Maximum	0.00094	0.0020	3.17	0.00300	0.0012	2.50	<0.00010	22.1	0.136	30.6
		N	4	4	4	4	4	4	4	4	4	4
York Landing	YL-1	Mean	0.00060	<0.0020	2.94	0.00227	<0.0010	1.82	<0.00010	18.2	0.117	23.1
		SE	0.00009	0.0004	0.17	0.00015	-	0.42	-	1.29	0.00624	1.1
		Minimum	0.00034	<0.0020	2.53	0.00195	<0.0010	0.96	<0.00010	16.0	0.104	19.9
		Maximum	0.00075	0.0026	3.35	0.00265	<0.0010	2.58	<0.00010	21.6	0.132	25.1
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-5	Mean	0.00034	<0.0020	1.89	0.00155	<0.0010	1.79	<0.00010	10.1	0.0772	10.5
		SE	0.00010	0.0006	0.24	0.00022	-	0.45	-	1.30	0.00821	2.0
		Minimum	<0.00020	<0.0020	1.44	0.00112	<0.0010	0.67	<0.00010	6.90	0.0625	<9.0
		Maximum	0.00061	0.0034	2.46	0.00215	<0.0010	2.54	<0.00010	13.0	0.0962	13.0
		N	4	4	4	4	4	4	4	4	4	4
Aiken River	AK-1	Mean	<0.00020	<0.0020	0.53	0.00050	<0.0010	1.81	<0.00010	1.33	0.0300	10.2
		SE	-	-	0.20	0.00012	-	0.27	-	0.160	0.00225	2.1

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved
Analytical Detection Limit	**ALS**		**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**
Aiken River	AK-1	Minimum	<0.00020	<0.0020	0.14	0.00029	<0.0010	1.12	<0.00010	1.01	0.0237	<9.0
		Maximum	<0.00020	<0.0020	1.07	0.00081	<0.0010	2.41	<0.00010	1.77	0.0344	14.6
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-7	Mean	0.00066	0.0028	2.82	0.00320	<0.0010	1.82	<0.00010	18.4	0.112	23.0
		SE	0.00003	0.0014	0.07	0.00020	-	0.30	-	0.916	0.00669	1.6
		Minimum	0.00058	<0.0020	2.62	0.00284	<0.0010	1.19	<0.00010	16.5	0.0974	18.8
		Maximum	0.00072	0.0069	2.97	0.00355	<0.0010	2.55	<0.00010	20.7	0.126	25.8
		N	4	4	4	4	4	4	4	4	4	4
Split Lake	SPL-8	Mean	0.00058	0.0037	2.59	0.00314	<0.0010	3.44	<0.00010	15.7	0.104	21.3
		SE	0.00002	0.0020	0.07	0.00038	0.0002	1.24	-	0.678	0.00446	0.9
		Minimum	0.00051	<0.0020	2.50	0.00245	<0.0010	1.57	<0.00010	15.0	0.0932	19.6
		Maximum	0.00062	0.0095	2.78	0.00422	0.0012	7.11	<0.00010	17.7	0.113	23.6
		N	4	4	4	4	4	4	4	4	4	4
Clark Lake	CL-1	Mean	0.00064	<0.0020	2.70	0.00298	<0.0010	3.19	<0.00010	16.7	0.110	24.0
		SE	0.00005	0.0005	0.09	0.00039	-	1.03	-	1.15	0.00690	1.8
		Minimum	0.00052	<0.0020	2.52	0.00197	<0.0010	1.53	<0.00010	13.9	0.0922	20.6
		Maximum	0.00074	0.0028	2.89	0.00375	<0.0010	6.19	<0.00010	19.1	0.122	28.9
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-1	Mean	0.00062	<0.0020	2.75	0.00323	<0.0010	3.19	<0.00010	15.9	0.110	21.4
		SE	0.00001	0.0005	0.07	0.00041	0.0002	0.99	-	0.765	0.00687	1.1
		Minimum	0.00059	<0.0020	2.56	0.00219	<0.0010	1.57	<0.00010	14.0	0.0954	18.7
		Maximum	0.00066	0.0027	2.90	0.00404	0.0011	6.08	<0.00010	17.4	0.126	24.0
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-1	Mean	0.00074	0.0020	2.86	0.00316	<0.0010	3.15	<0.00010	16.9	0.112	21.8
		SE	0.00007	0.0003	0.13	0.00022	-	0.96	-	0.675	0.00818	0.9
		Minimum	0.00061	<0.0020	2.48	0.00279	<0.0010	1.58	<0.00010	14.9	0.0962	19.8
		Maximum	0.00094	0.0024	3.02	0.00369	<0.0010	5.94	<0.00010	17.8	0.129	24.3
		N	4	4	4	4	4	4	4	4	4	4
Gull Lake	GL-2	Mean	0.00060	<0.0020	2.79	0.00263	<0.0010	3.10	<0.00010	16.9	0.112	21.5
		SE	0.00006	0.0004	0.09	0.00021	-	0.92	-	0.651	0.00832	1.1
		Minimum	0.00044	<0.0020	2.58	0.00225	<0.0010	1.57	<0.00010	15.5	0.0935	18.7
		Maximum	0.00072	0.0024	2.94	0.00301	<0.0010	5.77	<0.00010	18.4	0.131	24.1
		N	4	4	4	4	4	4	4	4	4	4

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved
Analytical Detection Limit	**ALS**		**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**
Nelson River	NR-2	Mean	0.00064	<0.0020	2.89	0.00308	<0.0010	3.17	<0.00010	16.8	0.115	21.6
		SE	0.00010	0.0004	0.12	0.00017	-	0.99	-	1.01	0.00922	1.2
		Minimum	0.00044	<0.0020	2.65	0.00281	<0.0010	1.60	<0.00010	14.4	0.0932	18.8
		Maximum	0.00092	0.0027	3.16	0.00356	<0.0010	6.06	<0.00010	18.8	0.131	24.7
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1S	Mean	0.00058	<0.0020	2.50	0.00237	<0.0010	1.56	<0.00010	15.3	0.106	19.5
(Open-water season: surface only)		SE	0.00002	-	0.18	0.00038	-	0.37	-	0.811	0.00802	2.4
		Minimum	0.00052	<0.0020	2.00	0.00145	<0.0010	0.55	<0.00010	13.1	0.0896	12.8
		Maximum	0.00063	<0.0020	2.83	0.00332	<0.0010	2.30	<0.00010	17.0	0.126	23.8
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1B	Mean	0.00064	<0.0020	2.59	0.00253	<0.0010	1.56	<0.00010	15.6	0.108	17.3
(Open-water season: bottom only)		SE	0.00005	-	0.18	0.00046	-	0.37	-	0.740	0.00644	1.7
		Minimum	0.00053	<0.0020	2.04	0.00150	<0.0010	0.56	<0.00010	13.5	0.0950	12.2
		Maximum	0.00074	<0.0020	2.82	0.00364	<0.0010	2.30	<0.00010	17.0	0.123	19.4
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	0.00074	0.0030	2.87	0.00348	<0.0010	1.96	<0.00010	17.4	0.117	21.0
		SE	0.00007	0.0011	0.11	0.00057	-	0.31	-	0.782	0.00914	0.6
		Minimum	0.00063	<0.0020	2.60	0.00279	<0.0010	1.21	<0.00010	15.9	0.0978	20.0
		Maximum	0.00095	0.0060	3.14	0.00520	<0.0010	2.54	<0.00010	19.6	0.139	22.6
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-2	Mean	0.00067	<0.0020	2.80	0.00298	<0.0010	1.9	<0.00010	17.4	0.117	20.8
		SE	0.00002	0.0004	0.16	0.00059	-	0.3	-	0.759	0.00970	0.3
		Minimum	0.00062	<0.0020	2.39	0.00178	<0.0010	1.1	<0.00010	15.3	0.0986	20.3
		Maximum	0.00070	0.0024	3.11	0.00460	<0.0010	2.5	<0.00010	18.9	0.137	21.5
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3S	Mean	0.00047	<0.0020	1.84	0.00150	<0.0010	1.97	<0.00010	10.4	0.0904	<9.0
(Open-water season: surface only)		SE	0.00003	-	0.03	0.00022	-	0.09	-	0.210	0.00522	1.3
		Minimum	0.00042	<0.0020	1.76	0.00113	<0.0010	1.83	<0.00010	10.0	0.0767	<9.0
		Maximum	0.00053	<0.0020	1.91	0.00201	<0.0010	2.20	<0.00010	11.0	0.102	10.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3B	Mean	0.00046	<0.0020	1.83	0.00141	<0.0010	2.00	<0.00010	10.4	0.0900	<9.0
(Open-water season: bottom only)		SE	0.00001	-	0.06	0.00017	-	0.07	-	0.247	0.00469	1.2

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved
Analytical Detection Limit	**ALS**		**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**
Stephens Lake	STL-3B	Minimum	0.00044	<0.0020	1.73	0.00117	<0.0010	1.84	<0.00010	9.83	0.0778	<9.0
(Open-water season: bottom only)		Maximum	0.00048	<0.0020	1.93	0.00191	<0.0010	2.19	<0.00010	11.0	0.100	9.7
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4S	Mean	0.00063	<0.0020	2.74	0.00292	<0.0010	1.82	<0.00010	16.8	0.116	18.9
(Open-water season: surface only)		SE	0.00002	0.0003	0.11	0.00029	-	0.31	-	0.804	0.00878	0.6
		Minimum	0.00057	<0.0020	2.56	0.00248	<0.0010	0.99	<0.00010	15.1	0.0937	17.3
		Maximum	0.00067	0.0021	3.06	0.00374	<0.0010	2.37	<0.00010	18.2	0.130	20.0
		N	4	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4B	Mean	0.00061	<0.0020	2.66	0.00299	<0.0010	1.81	<0.00010	16.0	0.113	21.1
(Open-water season: bottom only)		SE	0.00002	0.0003	0.09	0.00041	-	0.30	-	0.818	0.00856	2.3
		Minimum	0.00056	<0.0020	2.50	0.00230	<0.0010	0.99	<0.00010	14.0	0.0921	18.3
		Maximum	0.00065	0.0021	2.90	0.00415	<0.0010	2.37	<0.00010	17.4	0.128	27.9
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3	Mean	0.00055	<0.0020	2.78	0.00277	<0.0010	1.94	<0.00010	17.3	0.111	21.4
(Open-water season: surface only)		SE	0.00005	-	0.10	0.00036	-	0.36	-	0.400	0.00709	1.7
		Minimum	0.00042	<0.0020	2.53	0.00192	<0.0010	1.10	<0.00010	16.6	0.0947	18.7
		Maximum	0.00066	<0.0020	3.04	0.00368	<0.0010	2.56	<0.00010	18.3	0.129	26.4
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-3D	Mean	0.00055	<0.0020	2.92	0.00303	<0.0010	2.51	<0.00010	17.6	0.116	22.7
(August / October: bottom only)		SE	0.00013	-	0.13	0.00017	-	0.08	-	0.150	0.0110	2.3
		Minimum	0.00042	<0.0020	2.79	0.00286	<0.0010	2.43	<0.00010	17.4	0.105	20.4
		Maximum	0.00068	<0.0020	3.04	0.00320	<0.0010	2.59	<0.00010	17.7	0.127	25.0
		N	2	2	2	2	2	2	2	2	2	2
Nelson River	NR-4	Mean	0.00058	<0.0020	2.88	0.00277	<0.0010	1.91	<0.00010	17.8	0.111	20.5
(Open-water season: surface only)		SE	0.00005	0.0003	0.11	0.00034	-	0.36	-	0.366	0.00754	0.7
		Minimum	0.00046	<0.0020	2.63	0.00180	<0.0010	1.06	<0.00010	17.1	0.0978	19.6
		Maximum	0.00068	0.0022	3.17	0.00341	<0.0010	2.52	<0.00010	18.8	0.133	22.7
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-4B	Mean	0.00057	<0.0020	3.00	0.00312	<0.0010	2.52	<0.00010	18.1	0.120	21.6
(August / October: bottom only)		SE	0.00012	-	0.16	0.00009	-	0.03	-	0.700	0.0145	1.7
		Minimum	0.00045	<0.0020	2.84	0.00303	<0.0010	2.49	<0.00010	17.4	0.105	19.9
		Maximum	0.00068	<0.0020	3.16	0.00321	<0.0010	2.55	<0.00010	18.8	0.134	23.3
		N	2	2	2	2	2	2	2	2	2	2

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved
Analytical Detection Limit	**ALS**		**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**
Limestone River	LR-1	Mean	<0.00020	<0.0020	0.55	0.00094	<0.0010	3.44	<0.00010	2.96	0.0632	11.1
		SE	-	-	0.07	0.00009	-	0.31	-	0.444	0.0107	0.9
		Minimum	<0.00020	<0.0020	0.34	0.00081	<0.0010	2.64	<0.00010	2.21	0.0436	9.4
		Maximum	<0.00020	<0.0020	0.63	0.00121	<0.0010	4.14	<0.00010	3.96	0.0827	12.8
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-5	Mean	0.00056	<0.0020	2.66	0.00263	<0.0010	1.97	<0.00010	16.4	0.107	18.6
		SE	0.00005	-	0.16	0.00027	-	0.31	-	0.736	0.00888	1.5
		Minimum	0.00045	<0.0020	2.28	0.00184	<0.0010	1.23	<0.00010	14.5	0.0901	14.9
		Maximum	0.00066	<0.0020	3.05	0.00299	<0.0010	2.58	<0.00010	17.9	0.132	21.5
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-6	Mean	0.00056	<0.0020	2.79	0.00274	<0.0010	1.85	<0.00010	17.4	0.111	20.4
		SE	0.00005	0.0003	0.12	0.00029	-	0.34	-	0.434	0.00774	0.7
		Minimum	0.00044	<0.0020	2.46	0.00198	<0.0010	1.03	<0.00010	16.3	0.0965	18.7
		Maximum	0.00067	0.0022	3.00	0.00334	<0.0010	2.52	<0.00010	18.4	0.133	22.2
		N	4	4	4	4	4	4	4	4	4	4
Angling River	AR-1	Mean	<0.00020	<0.0020	0.25	0.00074	<0.0010	1.86	<0.00010	2.04	0.0261	12.1
		SE	-	-	0.06	0.00021	-	0.26	-	0.176	0.00232	0.3
		Minimum	<0.00020	<0.0020	0.18	0.00047	<0.0010	1.23	<0.00010	1.65	0.0218	11.3
		Maximum	<0.00020	<0.0020	0.43	0.00135	<0.0010	2.45	<0.00010	2.45	0.0309	13.0
		N	4	4	4	4	4	4	4	4	4	4
Weir River [1]	WR-1	Mean	<0.00020	<0.0020	0.48	0.00103	<0.0010	2.30	<0.00010	3.09	0.0378	12.6
		SE	-	-	0.07	0.00003	-	0.36	-	0.865	0.00805	0.9
		Minimum	<0.00020	<0.0020	0.37	0.00098	<0.0010	1.65	<0.00010	2.00	0.0281	10.8
		Maximum	<0.00020	<0.0020	0.60	0.00107	<0.0010	2.88	<0.00010	4.80	0.0538	13.8
		N	3	3	3	3	3	3	3	3	3	3
Nelson River	NR-7	Mean	0.00051	<0.0020	2.65	0.00257	<0.0010	1.90	<0.00010	16.6	0.108	19.3
		SE	0.00004	0.0004	0.15	0.00025	-	0.35	-	0.742	0.00953	1.2
		Minimum	0.00043	<0.0020	2.40	0.00204	<0.0010	1.06	<0.00010	15.3	0.0870	17.3
		Maximum	0.00063	0.0024	3.03	0.00312	<0.0010	2.55	<0.00010	18.4	0.133	22.2
		N	4	4	4	4	4	4	4	4	4	4
Nelson River	NR-8	Mean	0.00052	<0.0020	2.74	0.00266	<0.0010	1.88	<0.00010	17.0	0.108	19.6
		SE	0.00005	0.0003	0.12	0.00021	0.0002	0.34	-	0.665	0.00842	0.9

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved
Analytical Detection Limit	**ALS**		**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**
Nelson River	NR-8	Minimum	0.00043	<0.0020	2.46	0.00212	<0.0010	1.07	<0.00010	15.6	0.0922	17.4
		Maximum	0.00065	0.0022	3.03	0.00315	0.0012	2.51	<0.00010	18.7	0.132	21.9
		N	4	4	4	4	4	4	4	4	4	4
Study Area range (2001-2004)		Minimum	<0.0002	<0.002	0.2	0.0017	<0.001	-	<0.0001	1.30	0.0239	<9
		Maximum	0.0063	0.030	3.6	0.0060	0.008	-	0.0011	20.60	0.1290	36

[1] Access to sampling site in October was not possible due to local moose hunters in the area. No water samples were collected during this sampling period.

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit	**ALS**		**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Burntwood River	SPL-1	Mean	<0.0010	<0.00010	<0.00060	0.0703	<0.00020	0.00022	0.0029	<0.010	0.00195
		SE	-	-	-	0.0159	-	0.00001	0.0006	-	0.00029
		Minimum	<0.0010	<0.00010	<0.00060	0.0409	<0.00020	0.00019	0.0019	<0.010	0.00138
		Maximum	<0.0010	<0.00010	<0.00060	0.0996	<0.00020	0.00024	0.0042	<0.010	0.00259
		N	4	4	4	4	4	4	4	4	4
Nelson River	SPL-2	Mean	<0.0010	<0.00010	<0.00060	0.0319	<0.00020	0.00069	0.0021	<0.010	0.00075
		SE	-	-	-	0.0047	-	0.00002	0.0003	-	0.00013
		Minimum	<0.0010	<0.00010	<0.00060	0.0240	<0.00020	0.00063	0.0014	<0.010	0.00046
		Maximum	<0.0010	<0.00010	<0.00060	0.0457	<0.00020	0.00075	0.0026	<0.010	0.00109
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-3	Mean	<0.0010	<0.00010	<0.00060	0.0656	<0.00020	0.00040	0.0030	<0.010	0.00164
		SE	-	-	-	0.0193	-	0.00009	0.0005	-	0.00042
		Minimum	<0.0010	<0.00010	<0.00060	0.0248	<0.00020	0.00023	0.0020	<0.010	0.00084
		Maximum	<0.0010	<0.00010	<0.00060	0.1080	<0.00020	0.00065	0.0044	<0.010	0.00270
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-4	Mean	<0.0010	<0.00010	<0.00060	0.0277	<0.00020	0.00068	0.0020	<0.010	0.00073
		SE	-	-	-	0.00383	0.00004	0.00005	0.0002	0.002	0.00005
		Minimum	<0.0010	<0.00010	<0.00060	0.0217	<0.00020	0.00058	0.0015	<0.010	0.00063
		Maximum	<0.0010	<0.00010	<0.00060	0.0389	0.00025	0.00078	0.0023	0.012	0.00085
		N	4	4	4	4	4	4	4	4	4
York Landing	YL-1	Mean	<0.0010	<0.00010	<0.00060	0.0185	<0.00020	0.00055	0.0013	<0.010	0.00043
		SE	-	-	-	0.00313	0.00004	0.00007	0.0003	-	0.00013
		Minimum	<0.0010	<0.00010	<0.00060	0.0109	<0.00020	0.00037	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0258	0.00024	0.00068	0.0019	<0.010	0.00070
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-5	Mean	<0.0010	<0.00010	<0.00060	0.0118	<0.00020	0.00029	<0.0010	<0.010	<0.00040
		SE	-	-	-	0.00334	0.00006	0.00007	0.0003	-	0.00015
		Minimum	<0.0010	<0.00010	<0.00060	0.00674	<0.00020	0.00013	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0216	0.00034	0.00046	0.0016	<0.010	0.00079
		N	4	4	4	4	4	4	4	4	4
Aiken River	AK-1	Mean	<0.0010	<0.00010	<0.00060	0.00207	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		SE	-	-	-	0.00099	-	-	-	-	-

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit	**ALS**		**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Aiken River	AK-1	Minimum	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.00445	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-7	Mean	<0.0010	<0.00010	<0.00060	0.0378	<0.00020	0.00066	0.0023	0.012	0.00127
		SE	-	-	-	0.00525	-	0.00004	0.0002	0.007	0.00047
		Minimum	<0.0010	<0.00010	<0.00060	0.0282	<0.00020	0.00056	0.0017	<0.010	0.00071
		Maximum	<0.0010	<0.00010	<0.00060	0.0503	<0.00020	0.00074	0.0027	0.033	0.00268
		N	4	4	4	4	4	4	4	4	4
Split Lake	SPL-8	Mean	<0.0010	<0.00010	<0.00060	0.0443	<0.00020	0.00059	0.0024	0.012	0.00102
		SE	-	-	-	0.00363	-	0.00004	0.0003	0.007	0.00011
		Minimum	<0.0010	<0.00010	<0.00060	0.0383	<0.00020	0.00051	0.0020	<0.010	0.00089
		Maximum	<0.0010	<0.00010	<0.00060	0.0548	<0.00020	0.00066	0.0032	0.031	0.00136
		N	4	4	4	4	4	4	4	4	4
Clark Lake	CL-1	Mean	<0.0010	<0.00010	<0.00060	0.0361	<0.00020	0.00063	0.0016	<0.010	0.00095
		SE	-	-	-	0.00734	-	0.00006	0.0004	-	0.00013
		Minimum	<0.0010	<0.00010	<0.00060	0.0145	<0.00020	0.00051	<0.0010	<0.010	0.00074
		Maximum	<0.0010	<0.00010	<0.00060	0.0473	<0.00020	0.00076	0.0025	<0.010	0.00131
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-1	Mean	<0.0010	<0.00010	<0.00060	0.0415	<0.00020	0.00059	0.0023	<0.010	0.00106
		SE	-	0.00002	-	0.00940	-	0.00003	0.0003	-	0.00026
		Minimum	<0.0010	<0.00010	<0.00060	0.0218	<0.00020	0.00053	0.0017	<0.010	0.00060
		Maximum	<0.0010	0.00014	<0.00060	0.0667	<0.00020	0.00067	0.0032	<0.010	0.00177
		N	4	4	4	4	4	4	4	4	4
Gull Lake	GL-1	Mean	<0.0010	<0.00010	<0.00060	0.0398	0.00035	0.00061	0.0024	<0.010	0.00106
		SE	-	-	-	0.00645	0.00015	0.00005	0.0003	-	0.00012
		Minimum	<0.0010	<0.00010	<0.00060	0.0290	<0.00020	0.00052	0.0018	<0.010	0.00079
		Maximum	<0.0010	<0.00010	<0.00060	0.0584	0.00074	0.00075	0.0030	<0.010	0.00137
		N	4	4	4	4	4	4	4	4	4
Gull Lake	GL-2	Mean	<0.0010	<0.00010	<0.00060	0.0283	<0.00020	0.00061	0.0021	<0.010	0.00082
		SE	-	-	0.00008	0.00369	0.00006	0.00004	0.0001	-	0.00005
		Minimum	<0.0010	<0.00010	<0.00060	0.0189	<0.00020	0.00053	0.0019	<0.010	0.00070
		Maximum	<0.0010	<0.00010	0.00060	0.0353	0.00036	0.00072	0.0024	<0.010	0.00091
		N	4	4	4	4	4	4	4	4	4

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit	**ALS**		**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Nelson River	NR-2	Mean	<0.0010	<0.00010	<0.00060	0.0371	0.00031	0.00063	0.0023	<0.010	0.00123
		SE	-	-	-	0.00271	0.00017	0.00006	0.0001	-	0.00027
		Minimum	<0.0010	<0.00010	<0.00060	0.0322	<0.00020	0.00053	0.0020	<0.010	0.00077
		Maximum	<0.0010	<0.00010	<0.00060	0.0436	0.00080	0.00080	0.0027	<0.010	0.00198
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1S	Mean	<0.0010	<0.00010	<0.00060	0.0229	<0.00020	0.00049	0.0015	<0.010	0.00058
(Open-water season: surface only)		SE	-	-	-	0.00641	-	0.00006	0.0004	-	0.00014
		Minimum	<0.0010	<0.00010	<0.00060	0.00738	<0.00020	0.00032	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0387	<0.00020	0.00061	0.0022	<0.010	0.00083
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	RB-1B	Mean	<0.0010	<0.00010	<0.00060	0.0258	<0.00020	0.00049	0.0016	<0.010	0.00058
(Open-water season: bottom only)		SE	-	-	-	0.00881	-	0.00005	0.0004	-	0.00016
		Minimum	<0.0010	<0.00010	<0.00060	0.00790	<0.00020	0.00033	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0492	<0.00020	0.00056	0.0025	<0.010	0.00095
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-1	Mean	<0.0010	<0.00010	<0.00060	0.0427	0.00025	0.00062	0.0024	<0.010	0.00107
		SE	-	-	-	0.0127	0.00015	0.00002	0.0005	-	0.00016
		Minimum	<0.0010	<0.00010	<0.00060	0.0217	<0.00020	0.00057	0.0017	<0.010	0.00084
		Maximum	<0.0010	<0.00010	<0.00060	0.0797	0.00070	0.00066	0.0038	<0.010	0.00152
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-2	Mean	<0.0010	<0.00010	<0.00060	0.0324	<0.00020	0.00060	0.0021	<0.010	0.00119
		SE	-	-	-	0.0115	0.00007	0.00003	0.0005	-	0.00043
		Minimum	<0.0010	<0.00010	<0.00060	0.0122	<0.00020	0.00052	0.0012	<0.010	0.00059
		Maximum	<0.0010	<0.00010	<0.00060	0.0639	0.00037	0.00065	0.0034	<0.010	0.00248
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3S	Mean	<0.0010	<0.00010	<0.00060	0.0154	<0.00020	0.00043	0.0012	<0.010	0.00058
(Open-water season: surface only)		SE	-	-	-	0.00431	0.00003	0.00001	0.0002	-	0.00009
		Minimum	<0.0010	<0.00010	<0.00060	0.00653	<0.00020	0.00040	<0.0010	<0.010	0.00042
		Maximum	<0.0010	<0.00010	<0.00060	0.0244	0.00023	0.00045	0.0016	<0.010	0.00077
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-3B	Mean	<0.0010	<0.00010	<0.00060	0.0144	<0.00020	0.00043	0.0011	<0.010	0.00073
(Open-water season: bottom only)		SE	-	-	-	0.00363	-	0.00002	0.0002	-	0.00033

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit	**ALS**		**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Stephens Lake	STL-3B	Minimum	<0.0010	<0.00010	<0.00060	0.00722	<0.00020	0.00039	<0.0010	<0.010	<0.00040
(Open-water season: bottom only)		Maximum	<0.0010	<0.00010	<0.00060	0.0245	<0.00020	0.00046	0.0015	<0.010	0.00169
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4S	Mean	<0.0010	<0.00010	<0.00060	0.0327	<0.00020	0.00059	0.0021	<0.010	0.00083
(Open-water season: surface only)		SE	-	-	-	0.00700	-	0.00002	0.0003	-	0.00009
		Minimum	<0.0010	<0.00010	<0.00060	0.0198	<0.00020	0.00055	0.0015	<0.010	0.00069
		Maximum	<0.0010	<0.00010	<0.00060	0.0515	<0.00020	0.00065	0.0028	<0.010	0.00109
		N	4	4	4	4	4	4	4	4	4
Stephens Lake	STL-4B	Mean	<0.0010	<0.00010	<0.00060	0.0352	<0.00020	0.00056	0.0021	<0.010	0.00089
(Open-water season: bottom only)		SE	-	-	0.00008	0.00843	-	0.00002	0.0003	-	0.00010
		Minimum	<0.0010	<0.00010	<0.00060	0.0215	<0.00020	0.00053	0.0016	<0.010	0.00070
		Maximum	<0.0010	<0.00010	0.00061	0.0572	<0.00020	0.00061	0.0030	<0.010	0.00116
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-3	Mean	<0.0010	<0.00010	<0.00060	0.0314	<0.00020	0.00062	0.0020	<0.010	0.00078
(Open-water season: surface only)		SE	-	-	-	0.00681	-	0.00002	0.0002	-	0.00015
		Minimum	<0.0010	<0.00010	<0.00060	0.0139	<0.00020	0.00056	0.0014	<0.010	0.00048
		Maximum	<0.0010	<0.00010	<0.00060	0.0470	<0.00020	0.00066	0.0022	<0.010	0.00119
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-3D	Mean	<0.0010	<0.00010	<0.00060	0.0356	<0.00020	0.00061	0.0023	<0.010	0.00094
(August / October: bottom only)		SE	-	-	-	0.00160	-	0.00006	0.0001	-	0.00007
		Minimum	<0.0010	<0.00010	<0.00060	0.0340	<0.00020	0.00055	0.0022	<0.010	0.00087
		Maximum	<0.0010	<0.00010	<0.00060	0.0372	<0.00020	0.00066	0.0024	<0.010	0.00100
		N	2	2	2	2	2	2	2	2	2
Nelson River	NR-4	Mean	<0.0010	<0.00010	<0.00060	0.0301	<0.00020	0.00064	0.0021	<0.010	0.00087
(Open-water season: surface only)		SE	-	-	-	0.00643	-	0.00003	0.0003	-	0.00023
		Minimum	<0.0010	<0.00010	<0.00060	0.0131	<0.00020	0.00056	0.0013	<0.010	0.00041
		Maximum	<0.0010	<0.00010	<0.00060	0.0431	<0.00020	0.00068	0.0025	<0.010	0.00150
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-4B	Mean	<0.0010	<0.00010	<0.00060	0.0357	<0.00020	0.00061	0.0025	<0.010	0.00091
(August / October: bottom only)		SE	-	-	-	0.00080	-	0.00007	0.0001	-	0.00005
		Minimum	<0.0010	<0.00010	<0.00060	0.0349	<0.00020	0.00054	0.0024	<0.010	0.00086
		Maximum	<0.0010	<0.00010	<0.00060	0.0365	<0.00020	0.00068	0.0025	<0.010	0.00096
		N	2	2	2	2	2	2	2	2	2

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit	**ALS**		**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Limestone River	LR-1	Mean	<0.0010	<0.00010	<0.00060	0.0072	<0.00020	0.00014	<0.0010	<0.010	<0.00040
		SE	-	-	-	0.00237	-	0.00003	0.0002	-	0.00008
		Minimum	<0.0010	<0.00010	<0.00060	0.0023	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0129	<0.00020	0.00019	0.0011	<0.010	0.00053
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-5	Mean	<0.0010	<0.00010	<0.00060	0.0278	<0.00020	0.00060	0.0021	<0.010	0.00086
		SE	-	-	-	0.00477	0.00008	0.00002	0.0002	-	0.00001
		Minimum	<0.0010	<0.00010	<0.00060	0.0140	<0.00020	0.00055	0.0014	<0.010	0.00083
		Maximum	<0.0010	<0.00010	<0.00060	0.0356	0.00040	0.00065	0.0025	<0.010	0.00089
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-6	Mean	<0.0010	<0.00010	<0.00060	0.0294	<0.00020	0.00063	0.0020	<0.010	0.00076
		SE	-	-	-	0.00557	-	0.00003	0.0003	-	0.00010
		Minimum	<0.0010	<0.00010	<0.00060	0.0148	<0.00020	0.00055	0.0013	<0.010	0.00050
		Maximum	<0.0010	<0.00010	<0.00060	0.0418	<0.00020	0.00067	0.0025	<0.010	0.00095
		N	4	4	4	4	4	4	4	4	4
Angling River	AR-1	Mean	<0.0010	<0.00010	<0.00060	0.00609	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		SE	-	-	-	0.00322	-	-	0.0002	-	0.00011
		Minimum	<0.0010	<0.00010	<0.00060	0.00099	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0151	<0.00020	<0.00010	0.0011	<0.010	0.00063
		N	4	4	4	4	4	4	4	4	4
Weir River [1]	WR-1	Mean	<0.0010	<0.00010	<0.00060	0.00902	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		SE	-	-	-	0.00229	-	0.00002	0.0002	-	0.00017
		Minimum	<0.0010	<0.00010	<0.00060	0.00447	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
		Maximum	<0.0010	<0.00010	<0.00060	0.0117	<0.00020	0.00010	0.0010	<0.010	0.00070
		N	3	3	3	3	3	3	3	3	3
Nelson River	NR-7	Mean	<0.0010	<0.00010	<0.00060	0.0265	<0.00020	0.00060	0.0020	<0.010	0.00085
		SE	-	-	-	0.00464	-	0.00003	0.0002	-	0.00007
		Minimum	<0.0010	<0.00010	<0.00060	0.0183	<0.00020	0.00054	0.0016	<0.010	0.00071
		Maximum	<0.0010	<0.00010	<0.00060	0.0359	<0.00020	0.00067	0.0024	<0.010	0.00103
		N	4	4	4	4	4	4	4	4	4
Nelson River	NR-8	Mean	<0.0010	<0.00010	<0.00060	0.0291	<0.00020	0.00062	0.0021	<0.010	0.00084
		SE	-	-	-	0.00356	-	0.00003	0.0002	-	0.00007

Table 4. Continued.

Sample Location	Location ID	Statistic (mg/L)	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit	**ALS**		**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Nelson River	NR-8	Minimum	<0.0010	<0.00010	<0.00060	0.0192	<0.00020	0.00054	0.0016	<0.010	0.00072
		Maximum	<0.0010	<0.00010	<0.00060	0.0362	<0.00020	0.00067	0.0024	<0.010	0.00104
		N	4	4	4	4	4	4	4	4	4
Study Area range (2001-2004)		Minimum	<0.001	<0.0001	<0.0005	0.0112	<0.0002	<0.0001	<0.001	<0.01	<0.0004
		Maximum	0.001	0.0006	0.0228	0.0822	0.0039	0.0011	0.005	0.07	0.0043

[1] Access to sampling site in October was not possible due to local moose hunters in the area. No water samples were collected during this sampling period.

Table 5. Detection frequencies and frequencies of exceedences of Manitoba Water Quality Objectives or Guidelines for the Protection of Aquatic Life (PAL) for total metals measured in the Study Area: open-water and ice-cover seasons 2009.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Open-water season																	
Burntwood River	SPL-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	2	0	1	4	4	4	4	1	1	4	0	1	0	0
		% Detected	100	50	0	25	100	100	100	100	25	25	100	0	25	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	1	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	25	0	0
Nelson River	SPL-2	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	1	2	4	4	0	1	4	1	0	0	0	0
		% Detected	100	100	25	25	50	100	100	0	25	100	25	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Split Lake	SPL-3	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	0	3	4	4	2	0	3	2	0	0	0	0
		% Detected	100	100	0	0	75	100	100	50	0	75	50	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Split Lake	SPL-4	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	0	1	4	4	0	0	4	1	1	0	0	1
		% Detected	100	100	25	0	25	100	100	0	0	100	25	25	0	0	25
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	1	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	25	0	0	0
York Landing	YL-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	3	1	0	0	3	4	1	0	4	1	0	0	0	0
		% Detected	100	75	25	0	0	75	100	25	0	100	25	0	0	0	0
		# Above PAL	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	75	0	0	0	0	0	0	0	0

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Split Lake	SPL-5	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	3	1	0	0	3	4	0	0	3	1	0	0	0	0
		% Detected	100	75	25	0	0	75	100	0	0	75	25	0	0	0	0
		# Above PAL	4	0	0	0	0	0	2	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	50	0	0	0	0	0	0	0	0
Aiken River	AK-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	0	0	1	0	1	4	0	0	0	0	0	0	0	0
		% Detected	100	0	0	25	0	25	100	0	0	0	0	0	0	0	0
		# Above PAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		% Above PAL	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split Lake	SPL-7	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	0	3	4	4	1	0	4	2	0	0	0	1
		% Detected	100	100	0	0	75	100	100	25	0	100	50	0	0	0	25
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Split Lake	SPL-8	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	1	2	4	4	1	0	4	2	1	0	0	1
		% Detected	100	100	0	25	50	100	100	25	0	100	50	25	0	0	25
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	1	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	25	0	0	0
Clark Lake	CL-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	0	2	4	4	1	0	4	1	0	0	0	0
		% Detected	100	100	0	0	50	100	100	25	0	100	25	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	NR-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Nelson River	NR-1	# Detected	4	4	1	0	2	4	4	1	1	4	2	2	0	1	0
		% Detected	100	100	25	0	50	100	100	25	25	100	50	50	0	25	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	2	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	50	0	0	0
Gull Lake	GL-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	2	0	3	4	4	1	0	4	3	0	0	0	0
		% Detected	100	100	50	0	75	100	100	25	0	100	75	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Gull Lake	GL-2	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	2	0	3	4	4	0	1	4	1	0	0	0	0
		% Detected	100	100	50	0	75	100	100	0	25	100	25	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	NR-2	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	0	3	4	4	0	0	4	2	0	0	0	0
		% Detected	100	100	25	0	75	100	100	0	0	100	50	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Stephens Lake	RB-1S	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	3	0	0	1	4	4	0	0	4	0	0	0	0	0
		% Detected	100	75	0	0	25	100	100	0	0	100	0	0	0	0	0
		# Above PAL	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	75	0	0	0	0	0	0	0	0
Stephens Lake	STL-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	1	2	4	4	1	2	4	3	0	0	0	0

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Stephens Lake	STL-1	% Detected	100	100	25	25	50	100	100	25	50	100	75	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Stephens Lake	STL-2	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	1	2	4	4	1	0	4	2	0	0	0	0
		% Detected	100	100	25	25	50	100	100	25	0	100	50	0	0	0	0
		# Above PAL	4	0	0	0	0	0	3	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	75	0	0	0	0	0	0	0	0
Stephens Lake	STL-3S	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	1	0	4	4	0	0	4	0	0	0	0	0
		% Detected	100	100	25	25	0	100	100	0	0	100	0	0	0	0	0
		# Above PAL	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	25	0	0	0	0	0	0	0	0
Stephens Lake	STL-4S	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	1	2	4	4	0	0	4	2	0	0	0	0
		% Detected	100	100	25	25	50	100	100	0	0	100	50	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	NR-3	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	0	2	4	4	1	1	4	1	0	0	0	0
		% Detected	100	100	0	0	50	100	100	25	25	100	25	0	0	0	0
		# Above PAL	4	0	0	0	0	1	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	25	100	0	0	0	0	0	0	0	0
Nelson River	NR-4	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	0	2	4	4	1	0	4	2	0	0	0	0
		% Detected	100	100	0	0	50	100	100	25	0	100	50	0	0	0	0

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Nelson River	NR-4	# Above PAL	4	0	0	0	0	1	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	25	100	0	0	0	0	0	0	0	0
Limestone River	LR-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	0	1	0	1	1	4	0	0	0	0	0	0	0	0
		% Detected	100	0	25	0	25	25	100	0	0	0	0	0	0	0	0
		# Above PAL	3	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	75	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	NR-5	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	1	0	1	4	4	0	0	4	0	0	0	0	0
		% Detected	100	100	25	0	25	100	100	0	0	100	0	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	NR-6	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	1	2	4	4	0	0	4	2	0	0	0	0
		% Detected	100	100	0	25	50	100	100	0	0	100	50	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Angling River	AR-1	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	0	1	0	0	0	4	0	0	0	0	0	0	0	0
		% Detected	100	0	25	0	0	0	100	0	0	0	0	0	0	0	0
		# Above PAL	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0
		% Above PAL	50	0	0	0	0	0	50	0	0	0	0	0	0	0	0
Weir River	WR-1	# Samples	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		# Detected	3	0	1	1	0	1	3	0	0	0	0	0	0	0	0
		% Detected	100	0	33	33	0	33	100	0	0	0	0	0	0	0	0
		# Above PAL	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0
		% Above PAL	67	0	0	0	0	0	100	0	0	0	0	0	0	0	0

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Nelson River	NR-7	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	1	2	4	4	1	0	4	1	0	0	0	0
		% Detected	100	100	0	25	50	100	100	25	0	100	25	0	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	NR-8	# Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	0	2	4	4	0	0	4	1	1	0	0	0
		% Detected	100	100	0	0	50	100	100	0	0	100	25	25	0	0	0
		# Above PAL	4	0	0	0	0	0	4	0	0	0	0	1	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	25	0	0	0
Ice-cover season																	
Burntwood River	W-Tu-14	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	0	0	0	1	1	1	0	1	0	1	0	0	0	0
		% Detected	100	0	0	0	100	100	100	0	100	0	100	0	0	0	0
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Split Lake	SPL-Tu-4-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	0	1	0	1	1	0	0	1	0	0	0	0	0
		% Detected	100	100	0	100	0	100	100	0	0	100	0	0	0	0	0
		# Above PAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split Lake	SPL-Tu-5-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	0	1	1	1	0	0	0	0
		% Detected	100	100	100	0	100	100	100	0	100	100	100	0	0	0	0
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	K-Tu-10-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Nelson River	K-Tu-10-S	# Detected	1	1	1	0	0	1	1	0	1	1	0	1	0	0	0
		% Detected	100	100	100	0	0	100	100	0	100	100	0	100	0	0	0
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	K-Tu-11-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	0	0	0	1	1	0	1	1	0	0	0	0	0
		% Detected	100	100	0	0	0	100	100	0	100	100	0	0	0	0	0
		# Above PAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stephens Lake	K-Tu-12-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	1	1	1	0	0	1	0	0
		% Detected	100	100	100	0	100	100	100	100	100	100	0	0	100	0	0
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	100	0	0
Stephens Lake	K-Tu-04-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1
		% Detected	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	100	0	0	0
Nelson River	Li-S-02b-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	0	0	1	1	0	0	0	0
		% Detected	100	100	100	0	100	100	100	0	0	100	100	0	0	0	0
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	Ls-S-04b-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0

Table 5. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)														
			Aluminum	Arsenic	Boron [1]	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Zinc
Analytical Detection Limit			0.0050	0.00050	0.030	0.000010	0.0010	0.0010	0.020	0.00050	0.000020	0.00020	0.0020	0.0010	0.00010	0.00010	0.010
MWQSOGs for PAL			0.100	0.1500	1.5	0.00157-0.00333	0.054-0.118	0.006-0.013	0.30	0.0015-0.0052	0.00010	0.0730	0.032-0.072	0.0010	0.0001	0.0008	0.07-0.17
Nelson River	Ls-S-04b-S	% Detected	100	100	100	100	100	100	100	0	100	100	100	0	0	0	0
		# Above PAL	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Nelson River	C-Tu-8-S	# Samples	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0
		% Detected	100	100	0	0	100	100	100	100	100	100	100	0	0	0	0
		# Above PAL	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0
		% Above PAL	100	0	0	0	0	0	100	0	100	0	0	0	0	0	0
All sites	**Total**	# Samples	121	121	121	121	121	121	121	121	121	121	121	121	121	121	121
		# Detected	121	100	21	14	54	107	121	20	15	100	43	7	2	1	4
		% Detected	100	83	17	12	45	88	100	17	12	83	36	6	2	1	3
		# Above PAL	114	0	0	0	0	2	105	0	1	0	0	6	2	0	0
		% Above PAL	94	0	0	0	0	2	87	0	1	0	0	5	2	0	0

[1] CCME (1999; updated to 2010) guideline.

Table 6. Detection frequencies and frequencies of exceedences of Manitoba drinking water quality guidelines for metals measured in the Study Area: open-water and ice-cover seasons 2009. Guidelines include maximum acceptable concentrations (MAC), interim maximum acceptable concentrations (IMAC), and aesthetic objective (AO).

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Open-water season											
Burntwood River	SPL-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	2	4	0	1	1	4	4	4
		% Detected	25	50	100	0	25	25	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	SPL-2	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	1	1	4	2	4	4
		% Detected	25	100	100	25	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Split Lake	SPL-3	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	0	0	2	3	4	4
		% Detected	25	100	100	0	0	50	75	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Split Lake	SPL-3	# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Split Lake	SPL-4	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	1	0	4	1	4	4
		% Detected	0	100	100	25	0	100	25	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
York Landing	YL-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	2	3	4	1	0	4	0	3	4
		% Detected	50	75	100	25	0	100	0	75	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	3
		% Above AO	-	-	-	-	-	0	-	0	75
Split Lake	SPL-5	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	2	3	4	1	0	3	0	3	4
		% Detected	50	75	100	25	0	75	0	75	100

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Split Lake	SPL-5	# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	2
		% Above AO	-	-	-	-	-	0	-	0	50
Aiken River	AK-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	0	4	0	1	0	0	1	4
		% Detected	0	0	100	0	25	0	0	25	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	0
		% Above AO	-	-	-	-	-	0	-	0	0
Split Lake	SPL-7	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	0	0	4	3	4	4
		% Detected	25	100	100	0	0	100	75	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Split Lake	SPL-8	# Samples	4	4	4	4	4	4	4	4	4

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Split Lake	SPL-8	# Detected	0	4	4	0	1	4	2	4	4
		% Detected	0	100	100	0	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Clark Lake	CL-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	0	0	4	2	4	4
		% Detected	25	100	100	0	0	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	NR-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	1	0	4	2	4	4
		% Detected	0	100	100	25	0	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)								
			Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Gull Lake	GL-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	2	0	4	3	4	4
		% Detected	25	100	100	50	0	100	75	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Gull Lake	GL-2	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	2	0	4	3	4	4
		% Detected	25	100	100	50	0	100	75	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	NR-2	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	1	0	4	3	4	4
		% Detected	25	100	100	25	0	100	75	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Stephens Lake	RB-1S	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	3	4	0	0	4	1	4	4
		% Detected	0	75	100	0	0	100	25	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	3
		% Above AO	-	-	-	-	-	0	-	0	75
Stephens Lake	STL-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	1	1	4	2	4	4
		% Detected	0	100	100	25	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Stephens Lake	STL-2	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	1	1	4	2	4	4
		% Detected	0	100	100	25	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	3
		% Above AO	-	-	-	-	-	0	-	0	75

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Stephens Lake	STL-3S	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	1	1	4	0	4	4
		% Detected	0	100	100	25	25	100	0	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	25
Stephens Lake	STL-4S	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	1	1	4	2	4	4
		% Detected	0	100	100	25	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	NR-3	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	0	0	4	2	4	4
		% Detected	0	100	100	0	0	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Nelson River	NR-4	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	0	0	4	2	4	4
		% Detected	25	100	100	0	0	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Limestone River	LR-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	0	4	1	0	0	1	1	4
		% Detected	25	0	100	25	0	0	25	25	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	NR-5	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	1	0	4	1	4	4
		% Detected	25	100	100	25	0	100	25	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Nelson River	NR-6	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	0	1	4	2	4	4
		% Detected	0	100	100	0	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Angling River	AR-1	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	0	4	1	0	0	0	0	4
		% Detected	0	0	100	25	0	0	0	0	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	2
		% Above AO	-	-	-	-	-	0	-	0	50
Weir River	WR-1	# Samples	3	3	3	3	3	3	3	3	3
		# Detected	0	0	3	1	1	0	0	1	3
		% Detected	0	0	100	33	33	0	0	33	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	3
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)								
			Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Nelson River	NR-7	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	1	4	4	0	1	4	2	4	4
		% Detected	25	100	100	0	25	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	NR-8	# Samples	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	0	0	4	2	4	4
		% Detected	0	100	100	0	0	100	50	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	4
		% Above AO	-	-	-	-	-	0	-	0	100
Ice-cover season											
Burntwood River	W-Tu-14	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	0	0	1	0	0	0	1	1	1
		% Detected	0	0	100	0	0	0	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)								
			Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Split Lake	SPL-Tu-4-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	0	1	1	0	1	1	0	1	1
		% Detected	0	100	100	0	100	100	0	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	0
		% Above AO	-	-	-	-	-	0	-	0	0
Split Lake	SPL-Tu-5-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	0	1	1	1	0	1	1	1	1
		% Detected	0	100	100	100	0	100	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	K-Tu-10-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	1	0	1	0	1	1
		% Detected	100	100	100	100	0	100	0	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)								
			Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Nelson River	K-Tu-11-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	0	1	0	1	1
		% Detected	100	100	100	0	0	100	0	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	0
		% Above AO	-	-	-	-	-	0	-	0	0
Stephens Lake	K-Tu-12-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	0	1	1	1	0	1	1	1	1
		% Detected	0	100	100	100	0	100	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100
Stephens Lake	K-Tu-04-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	1	1
		% Detected	100	100	100	0	100	100	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)								
			Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
Nelson River	Li-S-02b-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	0	1	1	0	0	1	1	1	1
		% Detected	0	100	100	0	0	100	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	Ls-S-04b-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	1	1
		% Detected	100	100	100	0	100	100	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100
Nelson River	C-Tu-8-S	# Samples	1	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	0	1	1	1	1
		% Detected	100	100	100	0	0	100	100	100	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	1
		% Above AO	-	-	-	-	-	0	-	0	100

Table 6. Continued.

			Major Ions and metals (mg/L)								
Sample Location	Location ID	Statistic	Antimony	Arsenic	Barium	Boron	Cadmium	Chloride-Dissolved	Chromium	Copper	Iron
Analytical Detection Limit			0.00050	0.00050	0.00030	0.030	0.000010	9.0	0.0010	0.0010	0.020
Drinking water MAC			-	-	1	-	0.00500	-	0.050	-	-
Drinking water IMAC			0.0060	0.0250	-	5	-	-	-	-	-
Drinking water aesthetic			-	-	-	-	-	250	-	1	0.30
All sites	**Total**	# Samples	121	122	121	121	121	121	121	121	121
		# Detected	21	100	121	21	14	99	54	107	121
		% Detected	17	82	100	17	12	82	45	88	100
		# Above MAC	-	-	0	-	0	-	0	-	-
		% Above MAC	-	-	0	-	0	-	0	-	-
		# Above IMAC	0	0	-	0	-	-	-	-	-
		% Above IMAC	0	0	-	0	-	-	-	-	-
		# Above AO	-	-	-	-	-	0	-	0	105
		% Above AO	-	-	-	-	-	0	-	0	87

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Open-water season										
Burntwood River	SPL-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	4	4	1	0	4	3	4	0
		% Detected	100	100	25	0	100	75	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	SPL-2	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	1	0	4	4	4	0
		% Detected	0	100	25	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Split Lake	SPL-3	# Samples	4	4	4	4	4	4	4	4
		# Detected	2	4	0	0	4	4	4	0
		% Detected	50	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Split Lake	SPL-3	# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Split Lake	SPL-4	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	1	4	4	4	1
		% Detected	0	100	0	25	100	100	100	25
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
York Landing	YL-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	0	4	4	4	0
		% Detected	25	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Split Lake	SPL-5	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	3	4	0
		% Detected	0	100	0	0	100	75	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)							
			Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Split Lake	SPL-5	# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Aiken River	AK-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	3	0	0
		% Detected	0	100	0	0	100	75	0	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Split Lake	SPL-7	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	0	4	4	4	1
		% Detected	25	100	0	0	100	100	100	25
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Split Lake	SPL-8	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	1	4	4	4	1
		% Detected	25	100	0	25	100	100	100	25

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Split Lake	SPL-8	# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Clark Lake	CL-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	0	4	4	4	0
		% Detected	25	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	NR-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	1	2	4	4	4	0
		% Detected	25	100	25	50	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Gull Lake	GL-1	# Samples	4	4	4	4	4	4	4	4

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Gull Lake	GL-1	# Detected	1	4	0	0	4	4	4	0
		% Detected	25	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Gull Lake	GL-2	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	1	0	4	4	4	0
		% Detected	0	100	25	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	NR-2	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	4	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Stephens Lake	RB-1S	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	4	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Stephens Lake	STL-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	2	0	4	4	4	0
		% Detected	25	100	50	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Stephens Lake	STL-2	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	0	4	4	4	0
		% Detected	25	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)							
			Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Stephens Lake	STL-3S	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	3	4	0
		% Detected	0	100	0	0	100	75	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Stephens Lake	STL-4S	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	4	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	NR-3	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	1	0	4	4	4	0
		% Detected	25	100	25	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Nelson River	NR-4	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	0	4	4	4	0
		% Detected	25	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Limestone River	LR-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	3	0
		% Detected	0	100	0	0	100	100	75	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	NR-5	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	4	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Nelson River	NR-6	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	4	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Angling River	AR-1	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	0	4	4	0	0
		% Detected	0	100	0	0	100	100	0	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Weir River	WR-1	# Samples	3	3	3	3	3	3	3	3
		# Detected	0	3	0	0	3	3	1	0
		% Detected	0	100	0	0	100	100	33	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Nelson River	NR-7	# Samples	4	4	4	4	4	4	4	4
		# Detected	1	4	0	0	4	4	4	0
		% Detected	25	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	NR-8	# Samples	4	4	4	4	4	4	4	4
		# Detected	0	4	0	1	4	4	4	0
		% Detected	0	100	0	25	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Ice-cover season										
Burntwood River	W-Tu-14	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	1	0	1	0	1	0
		% Detected	0	100	100	0	100	0	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Split Lake	SPL-Tu-4-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	0	0	1	1	1	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Split Lake	SPL-Tu-5-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	1	0	1	1	1	0
		% Detected	0	100	100	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	K-Tu-10-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	1	1	1	1	1	0
		% Detected	0	100	100	100	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

Sample Location	Location ID	Statistic	Major Ions and metals (mg/L)							
			Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Nelson River	K-Tu-11-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	1	0	1	1	1	0
		% Detected	0	100	100	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Stephens Lake	K-Tu-12-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	0
		% Detected	100	100	100	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Stephens Lake	K-Tu-04-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	1	1	1	1	1	1	1	1
		% Detected	100	100	100	100	100	100	100	100
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
Nelson River	Li-S-02b-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	0	0	1	1	1	0
		% Detected	0	100	0	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	Ls-S-04b-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	0	1	1	0	1	1	1	0
		% Detected	0	100	100	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0
Nelson River	C-Tu-8-S	# Samples	1	1	1	1	1	1	1	1
		# Detected	1	1	1	0	1	1	1	0
		% Detected	100	100	100	0	100	100	100	0
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	-
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 6. Continued.

			Major Ions and metals (mg/L)							
Sample Location	Location ID	Statistic	Lead	Manganese	Mercury	Selenium	Sodium	Sulfate-Dissolved	Uranium	Zinc
Analytical Detection Limit			0.00050	0.00030	0.000020	0.0010	0.030	9.0	0.00010	0.010
Drinking water MAC			0.0100	-	0.00100	0.010	-	-	-	-
Drinking water IMAC			-	-	-	-	-	-	0.0200	-
Drinking water aesthetic			-	0.0500	-	-	200	500	-	500
All sites	**Total**	# Samples	121	121	121	121	121	121	121	121
		# Detected	20	121	15	7	121	116	110	4
		% Detected	17	100	12	6	100	96	91	3
		# Above MAC	0	-	0	0	-	-	-	-
		% Above MAC	0	-	0	0	-	-	-	-
		# Above IMAC	-	-	-	-	-	-	0	-
		% Above IMAC	-	-	-	-	-	-	0	
		# Above AO	-	0	-	-	0	0	-	0
		% Above AO	-	0	-	-	0	0	-	0

Table 7. Extinction coefficients and euphotic depths calculated from light (PAR) profiles measured during the Keeyask water quality sampling program, June and July 2009. Values in blue italics are considered suspect.

Sampling Location	Location ID	Sampling Date	Extinction Coefficient, K_e (m^{-1})	Euphotic Depth, z_1 (m)
Light profiles (Keeyask water quality sites)				
Split Lake	SPL-3	25-Jun-09	3.73	1.2
		26-Jul-09	4.04	1.1
Split Lake	SPL-4	25-Jun-09	1.71	2.7
		26-Jul-09	1.94	2.4
Aiken River	AK-1	25-Jun-09	1.49	3.1
		27-Jul-09	1.48	3.1
Split Lake	SPL-5	25-Jun-09	1.59	2.9
		27-Jul-09	1.43	3.2
York Landing	YL-1	25-Jun-09	1.43	3.2
		27-Jul-09	1.59	2.9
Split Lake	SPL-7	26-Jun-09	2.12	2.2
		27-Jul-09	2.59	1.8
Stephens Lake	STL-1	29-Jun-09	2.19	2.1
		31-Jul-09	2.41	1.9
Stephens Lake	STL-2	29-Jun-09	1.88	2.4
		31-Jul-09	2.24	2.1
Stephens Lake	STL-3	29-Jun-09	1.06	4.3
		31-Jul-09	1.42	3.2
Stephens Lake	STL-4	29-Jun-09	2.29	2.0
		31-Jul-09	2.03	2.3
Stephens Lake (Ross Wright Bay)	RB-1	29-Jun-09	1.06	4.3
		31-Jul-09	1.61	2.9
Water clarity surveys (Stephens Lake)				
Ross Wright Bay (north arm)	RBCS-1	29-Jun-09	1.02	4.5
		31-Jul-09	1.58	2.9
	RBCS-2 [1]	29-Jun-09	1.12	4.1
		31-Jul-09	*0.70*	*6.6*
	RBCS-3	29-Jun-09	1.19	3.9
		31-Jul-09	1.57	2.9
	RBCS-4	29-Jun-09	1.54	3.0
		31-Jul-09	1.91	2.4
	RBCS-5	29-Jun-09	1.84	2.5
		31-Jul-09	1.91	2.4
	RBCS-6	29-Jun-09	1.84	2.5
		31-Jul-09	1.95	2.4
	RBCS-7	29-Jun-09	2.54	1.8
		31-Jul-09	2.08	2.2

[1] Regression in July was poor, $R^2 = 0.71$.

Table 7. Continued.

Sampling Location	Location ID	Sampling Date	Extinction Coefficient, K_e (m^{-1})	Euphotic Depth, z_1 (m)
Ross Wright Bay (north arm)	RBCS-8	29-Jun-09	2.21	2.1
		31-Jul-09	1.95	2.4
	RBCS-9	29-Jun-09	2.24	2.1
		31-Jul-09	2.17	2.1
	RBCS-10	29-Jun-09	2.11	2.2
		31-Jul-09	2.19	2.1
Stephens Lake (southwest)	STLCS-1	1-Jul-09	4.69	1.0
		31-Jul-09	2.77	1.7
	STLCS-2	1-Jul-09	2.79	1.7
		31-Jul-09	2.82	1.6
	STLCS-3	1-Jul-09	2.75	1.7
		31-Jul-09	2.72	1.7
	STLCS-4	1-Jul-09	2.81	1.6
		31-Jul-09	2.38	1.9
	STLCS-5	1-Jul-09	2.72	1.7
		31-Jul-09	2.34	2.0

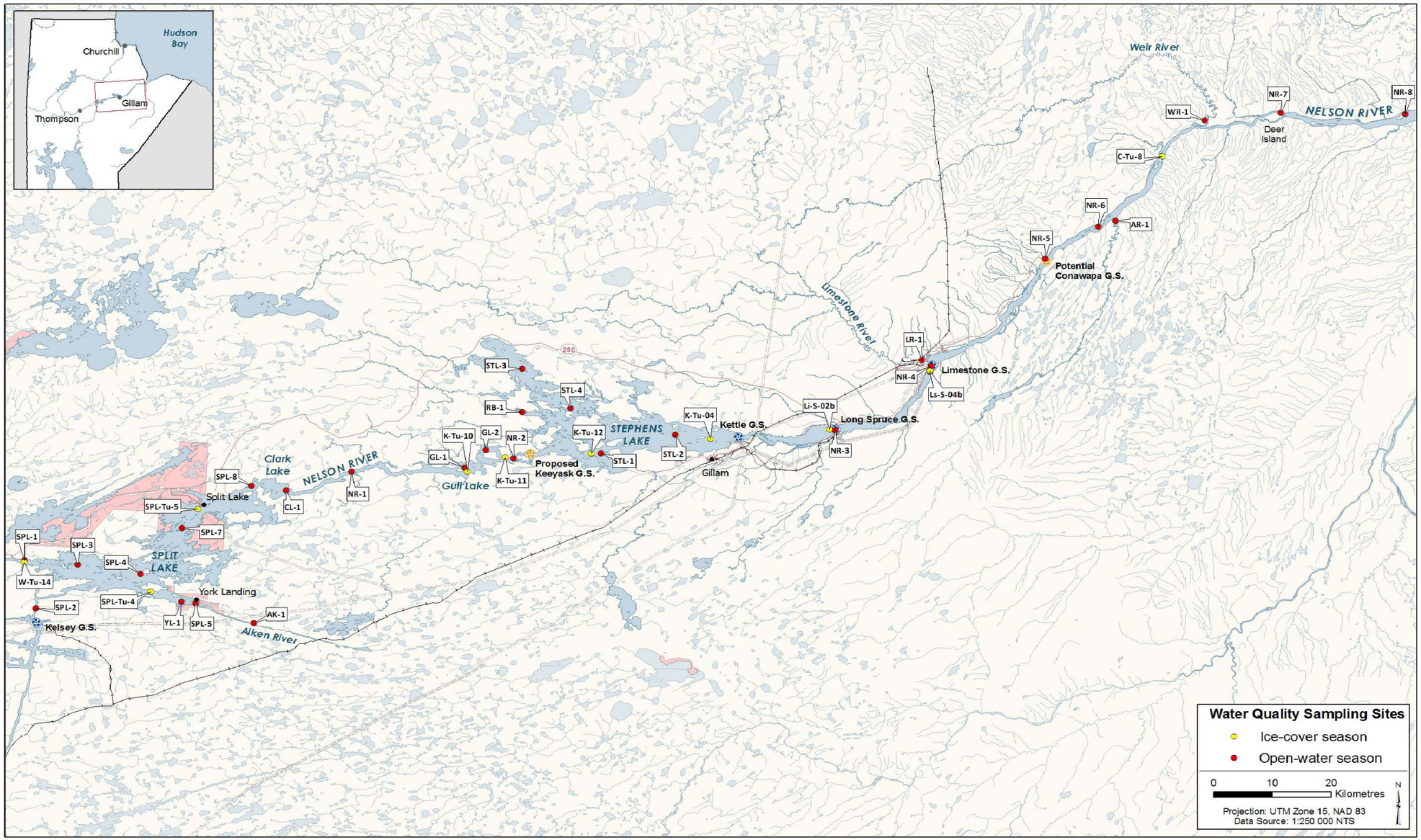

Figure 1. Keeyask and Conawapa water quality sampling sites: open-water and ice-cover seasons, 2009.

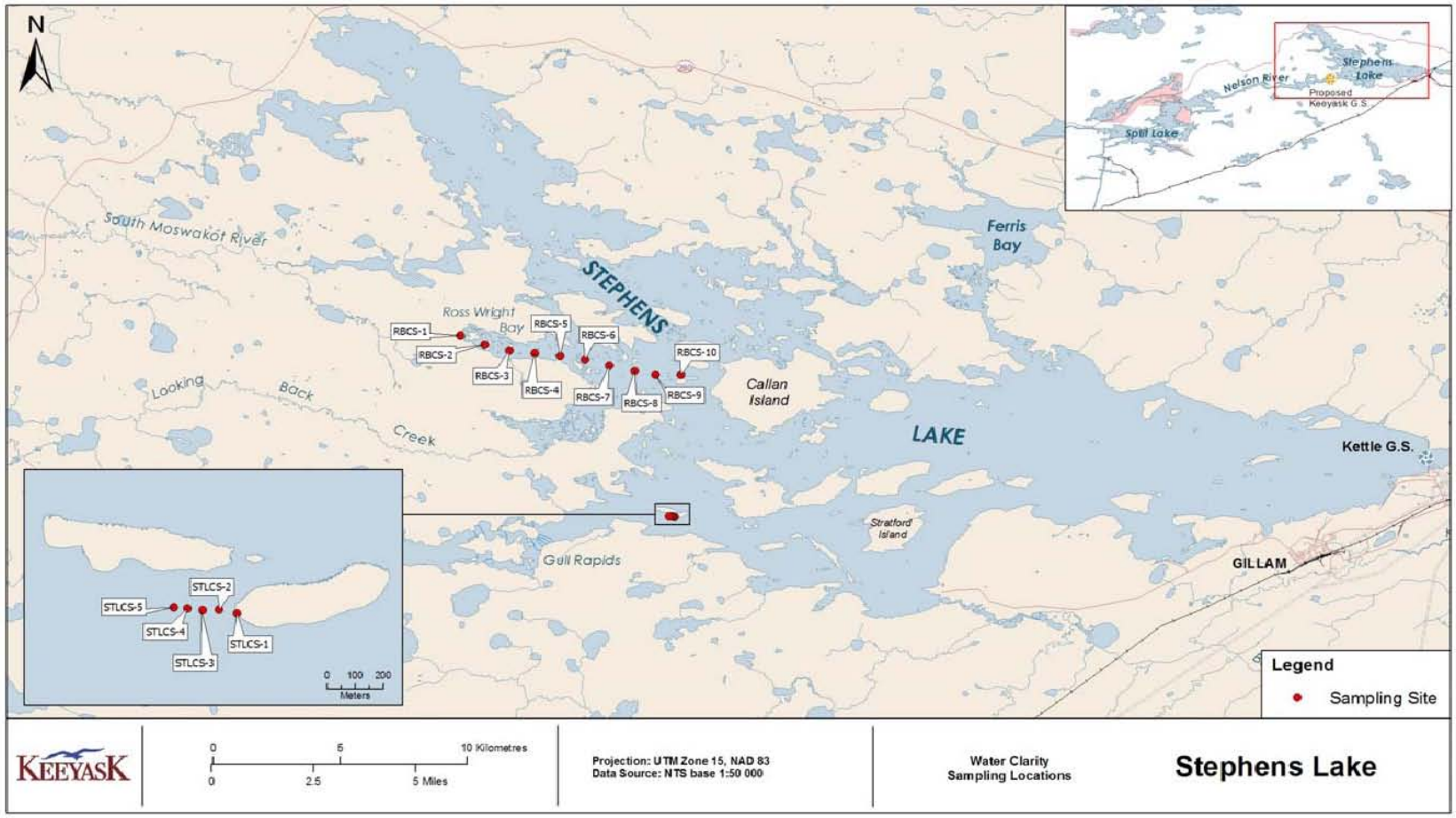

Figure 2. Sampling sites visited on Stephens Lake during the water clarity surveys conducted in June and July 2009.

Figure 3. Plume, seen as rusty brown area near the shoreline, observed on Split Lake, August 2009.

Figure 4. Sample collected from plume for laboratory analysis of routine variables, August 28th, 2009.

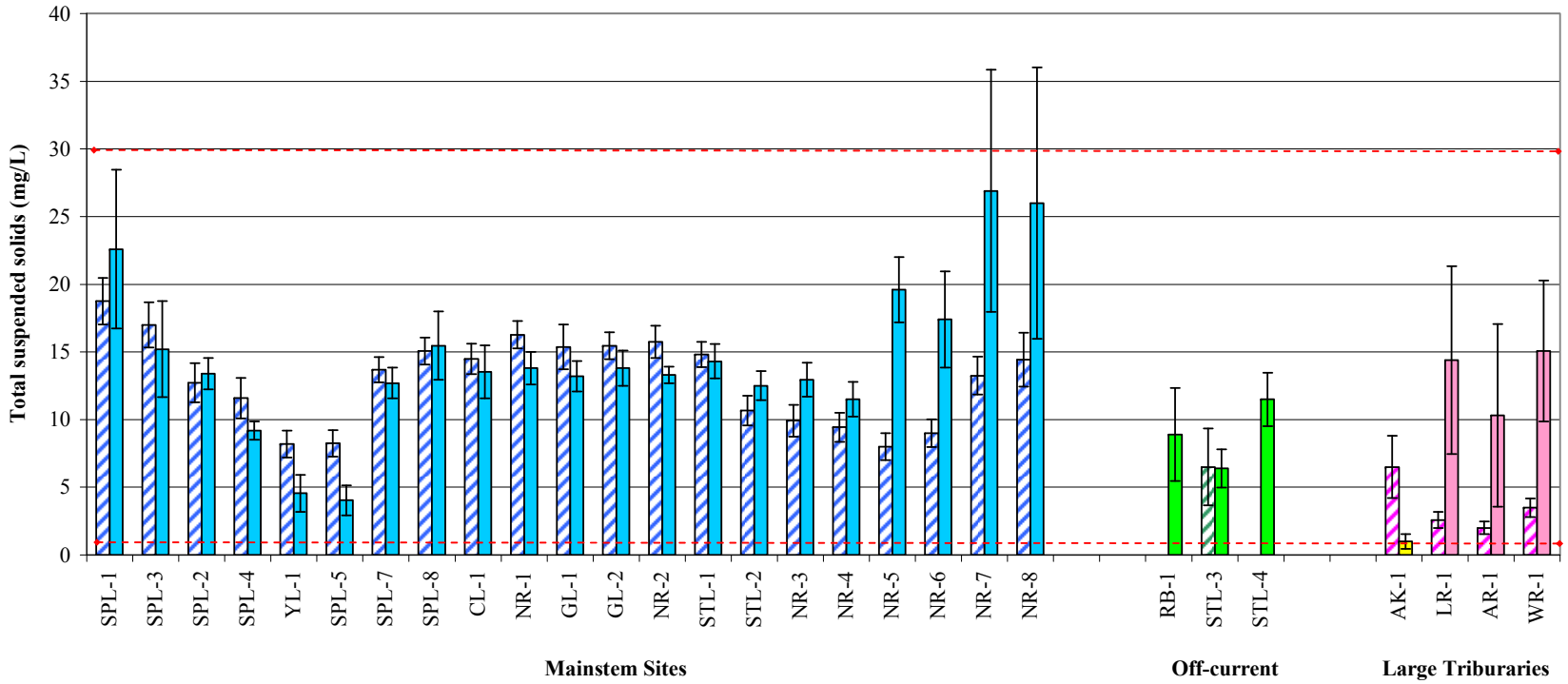

Figure 5. Open-water season mean (±SE) total suspended solids (TSS) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines. Values below the detection limit (DL; 2.0 mg/L) are indicated in yellow and were assigned a value equal to half the DL.

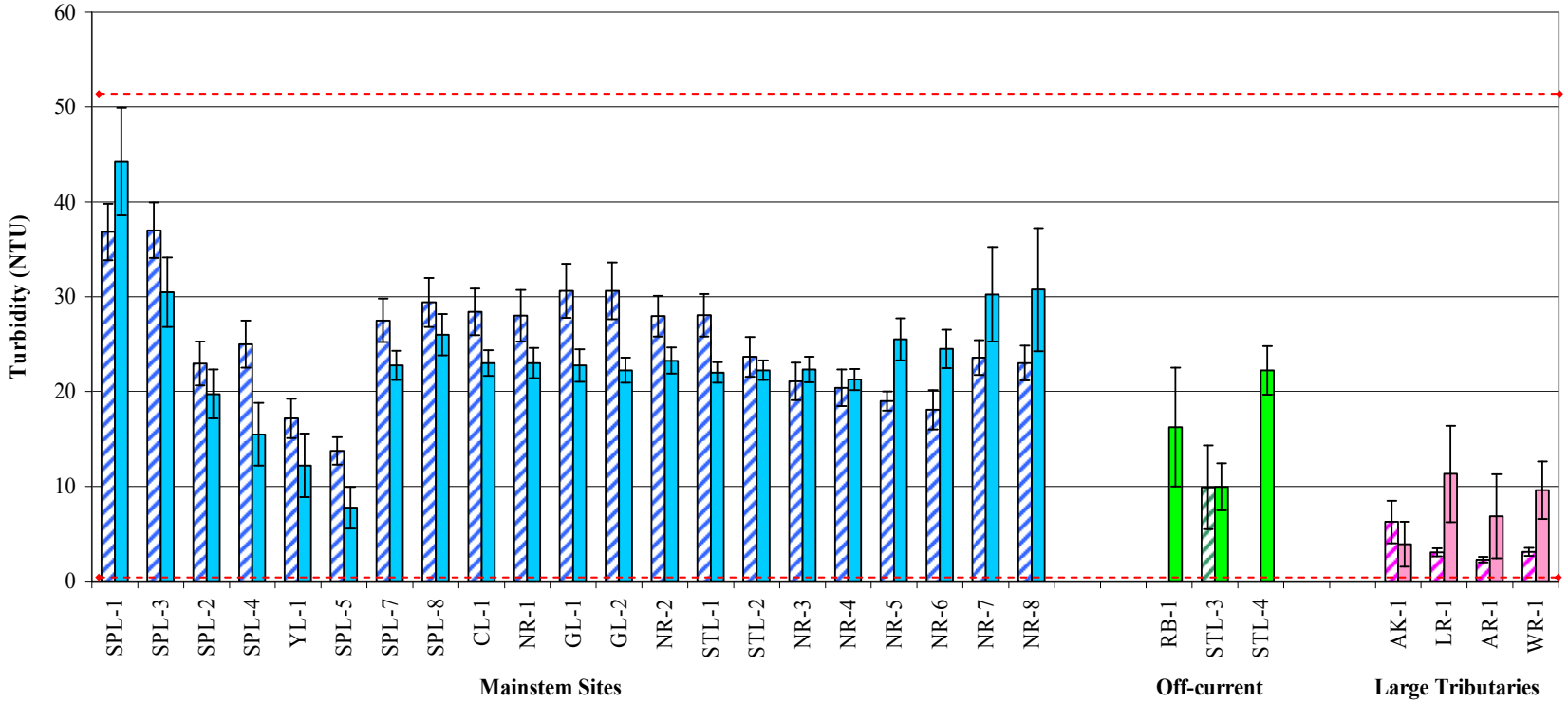

Figure 6. Open-water season mean (± SE) turbidity (laboratory) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solids bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

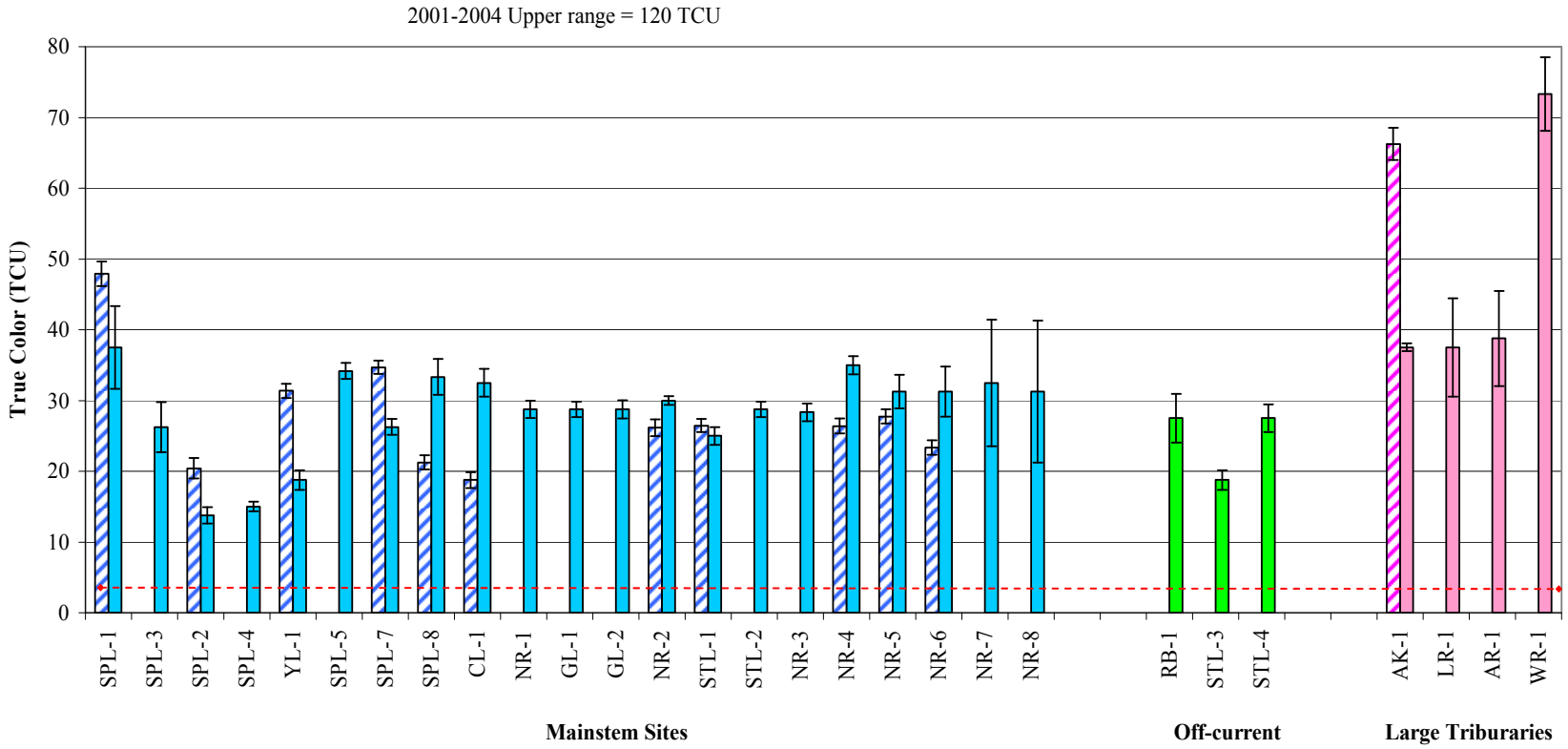

Figure 7. Open-water season mean (± SE) true color at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

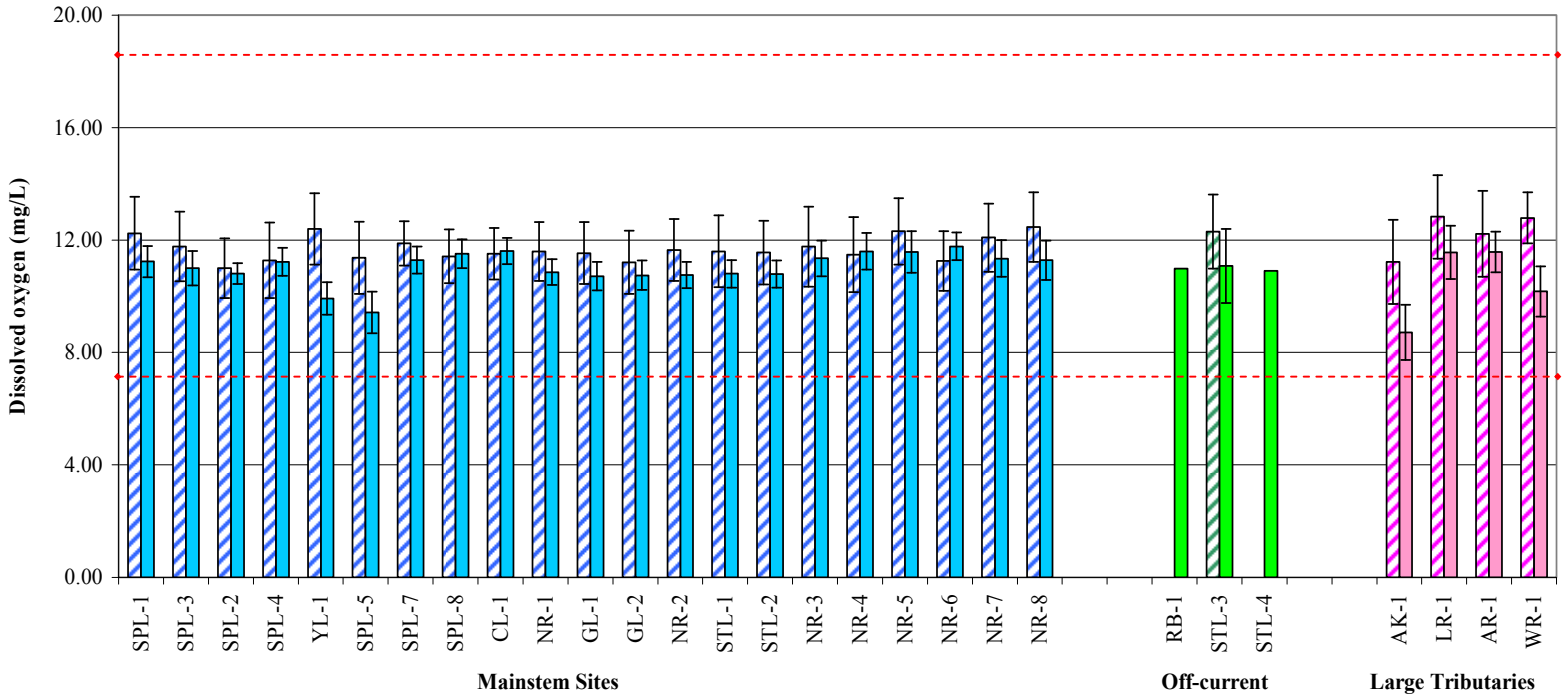

Figure 8. Open-water season mean (± SE) dissolved oxygen (*in situ*) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

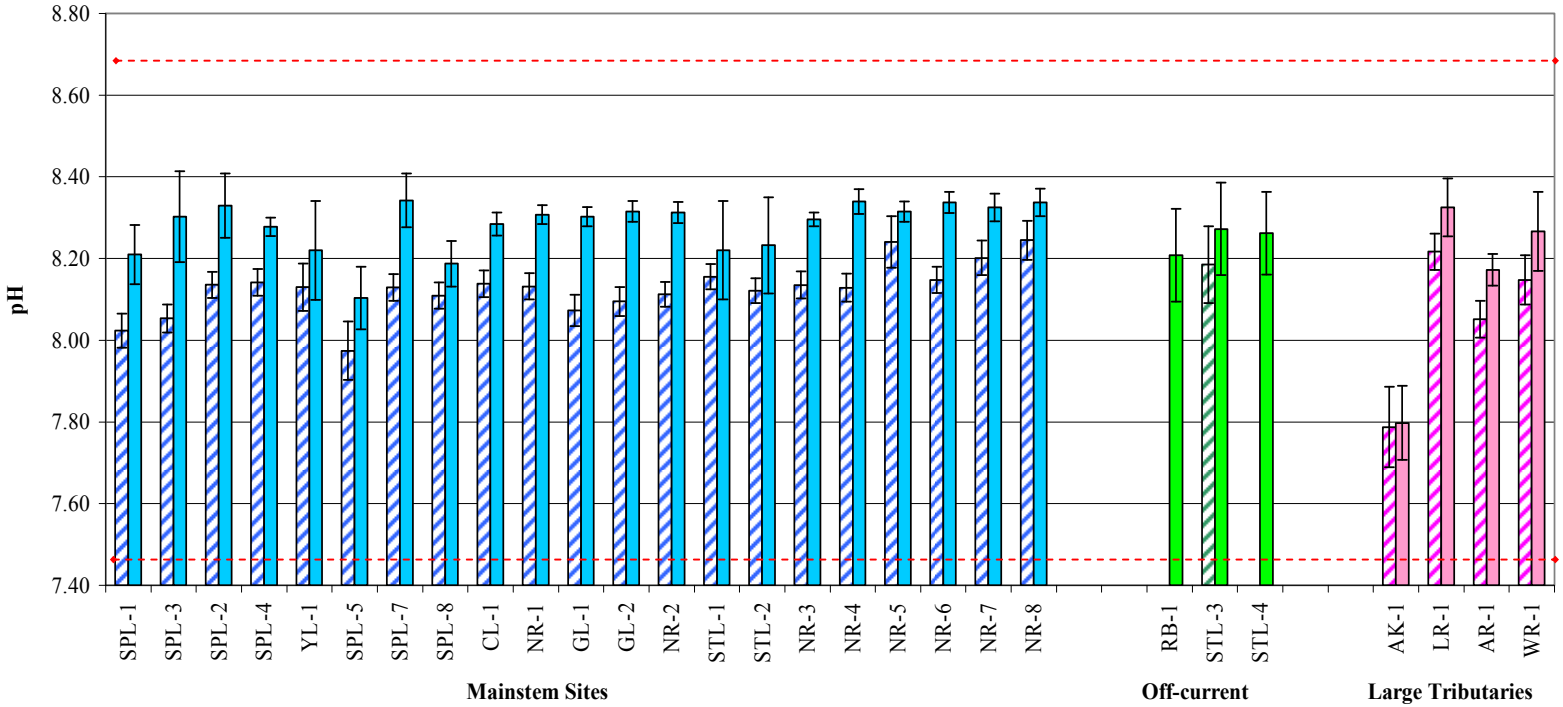

Figure 9. Open-water season mean (± SE) pH (laboratory) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

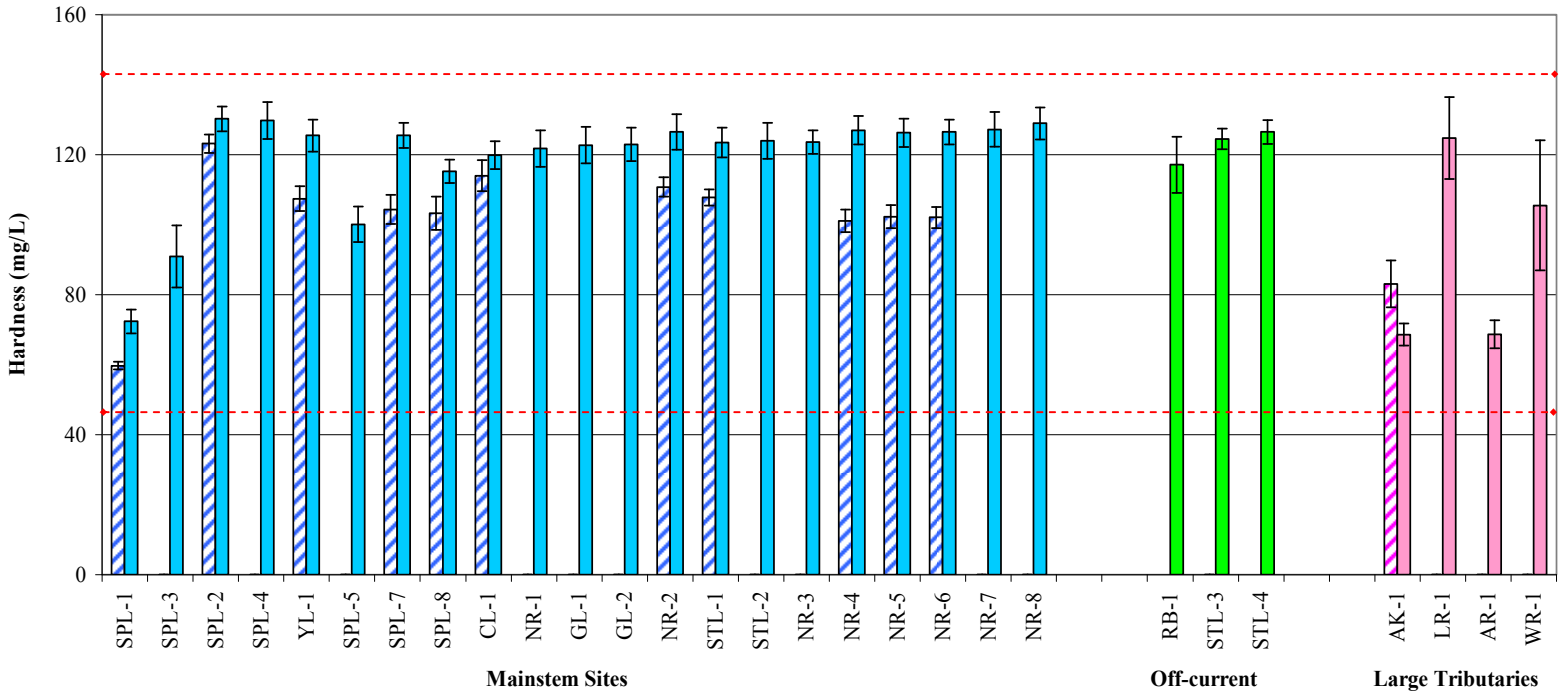

Figure 10. Open-water season mean (± SE) hardness at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

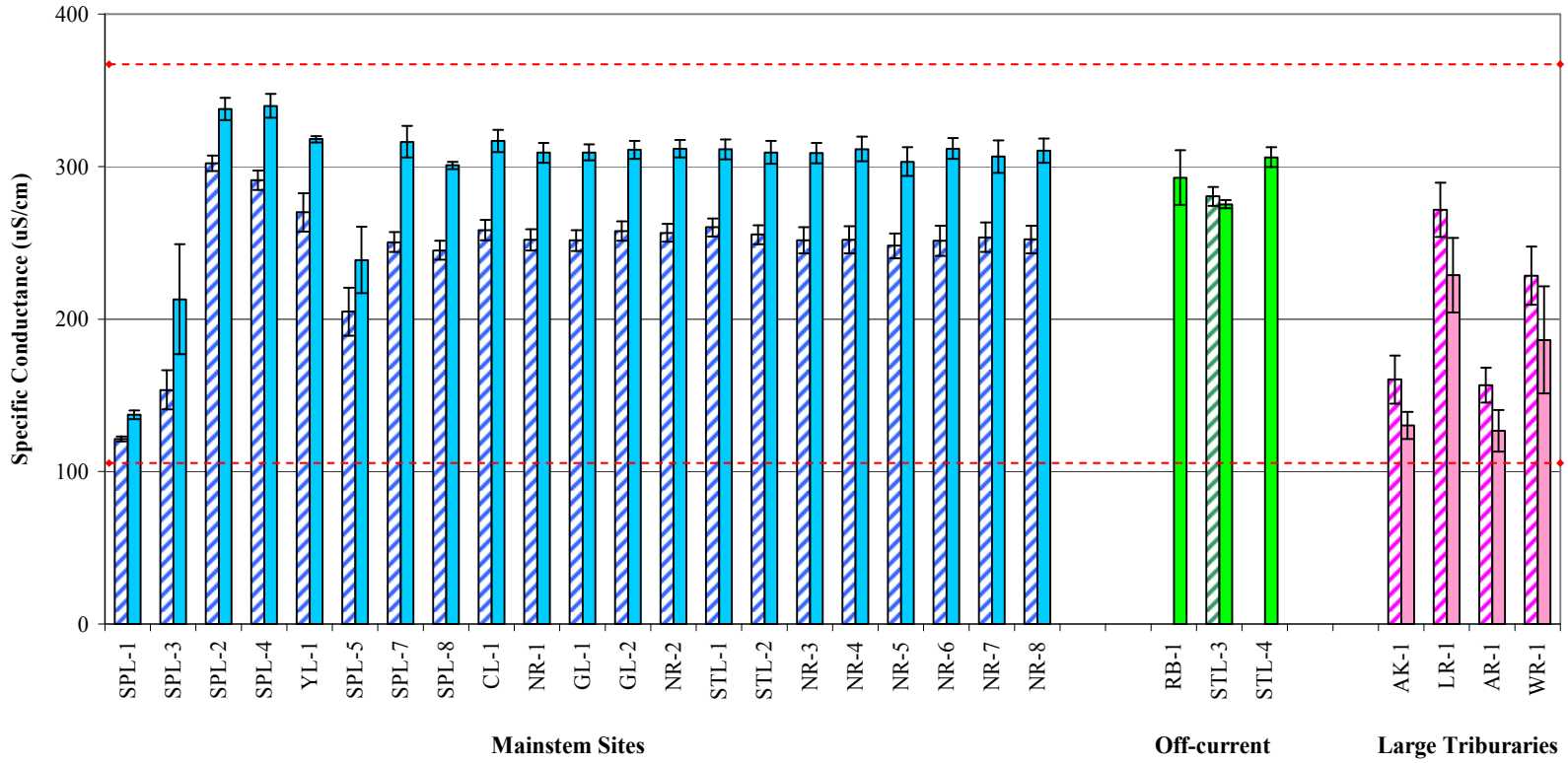

Figure 11. Open-water season mean (± SE) specific conductance (*in situ*) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

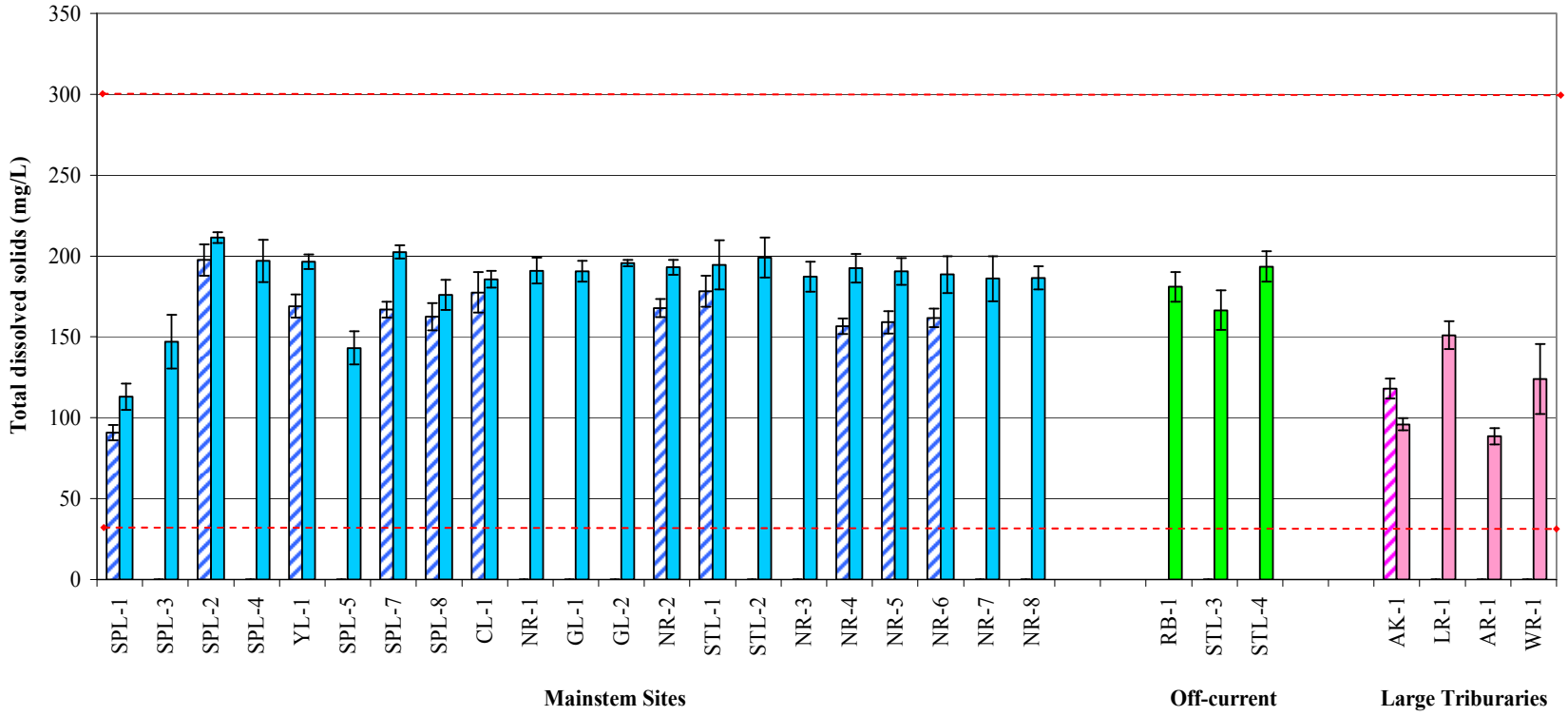

Figure 12. Open-water season mean (± SE) total dissolved solids (TDS) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

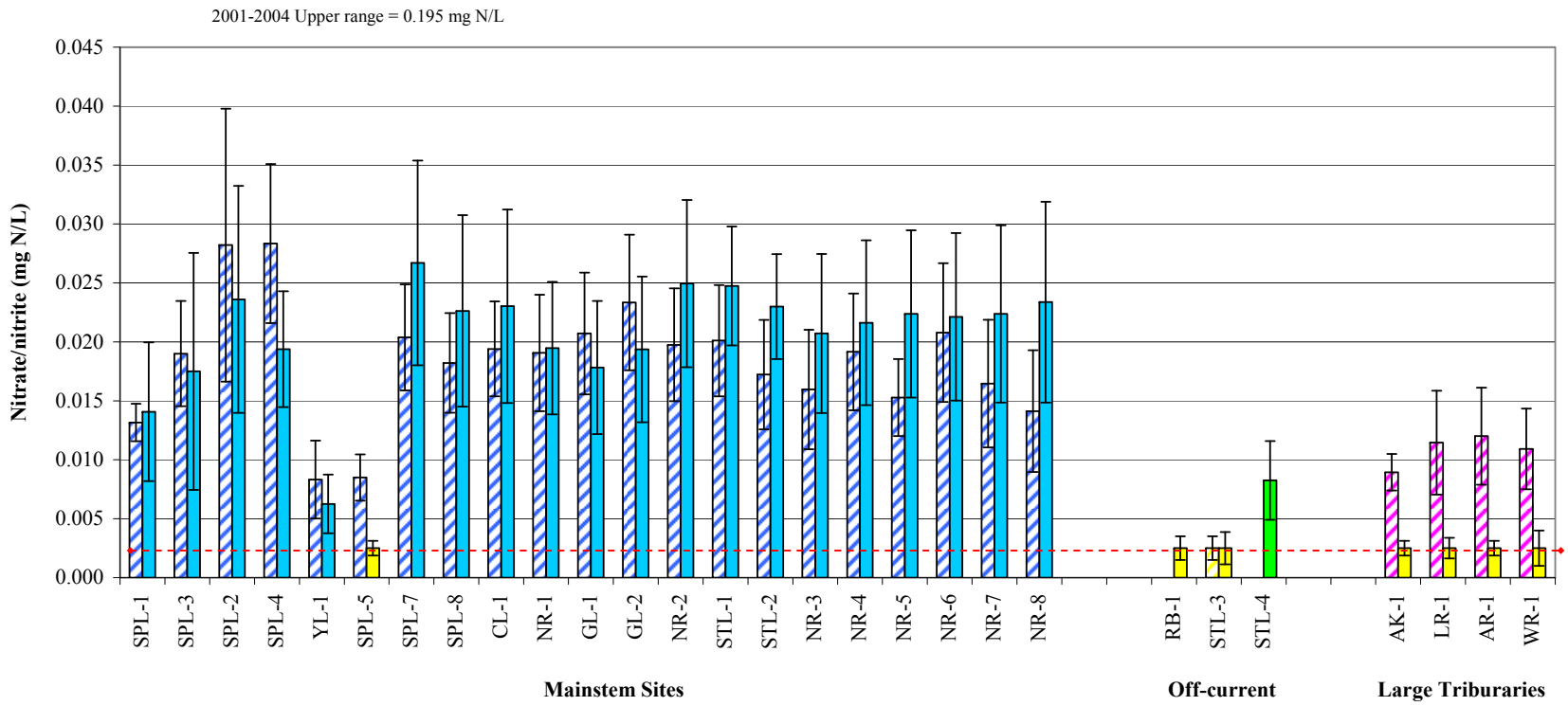

Figure 13. Open-water season mean (± SE) nitrate/nitrite at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines. Means that were below detection limits (0.0050 mg N/L) are indicated by yellow columns and were assigned a value equal to half the detection limit.

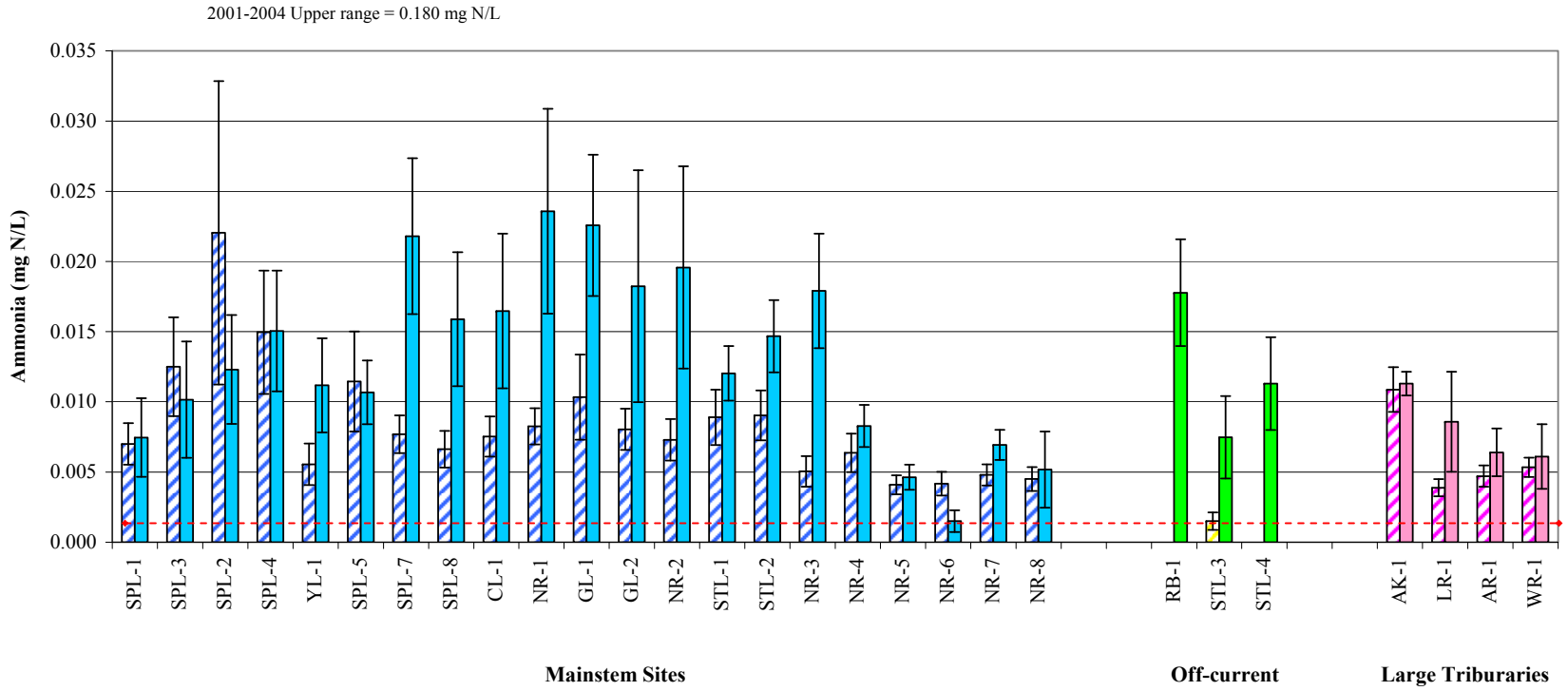

Figure 14. Open-water season mean (± SE) ammonia at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines. Means that were below detection limits (0.0030 mg N/L) are indicated by yellow columns and were assigned a value equal to half the detection limit.

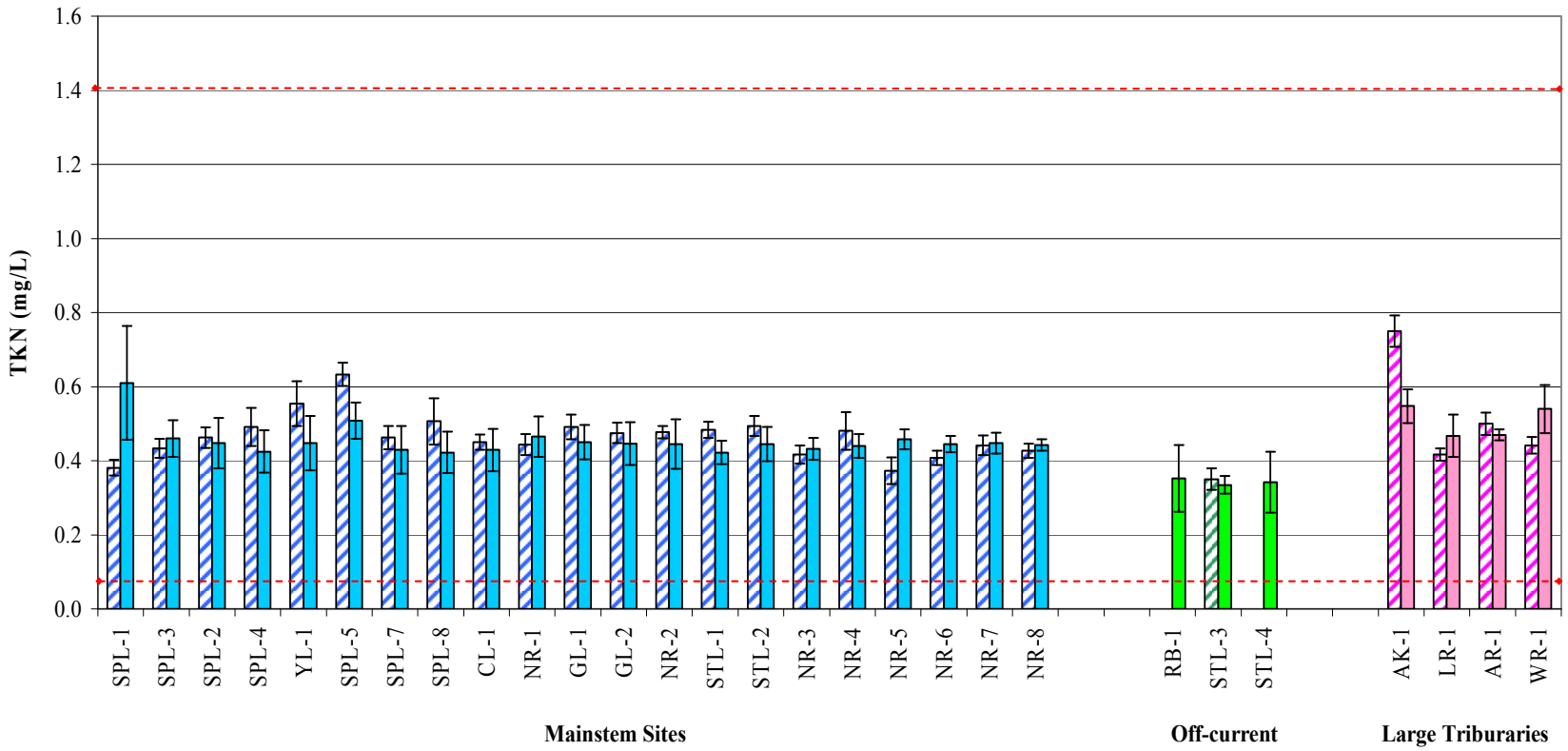

Figure 15. Open-water season mean (± SE) total Kjeldahl nitrogen (TKN) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

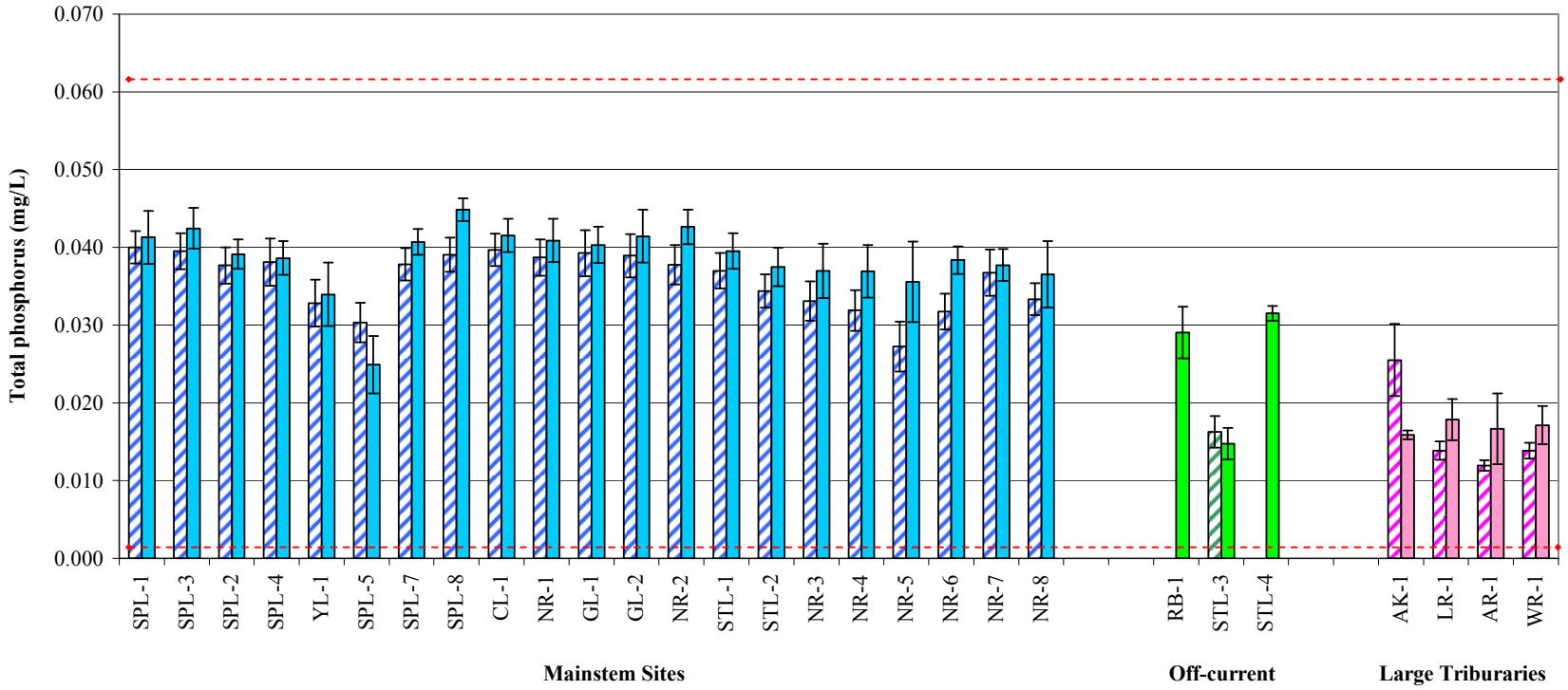

Figure 16. Open-water season mean (± SE) total phosphorus (TP) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

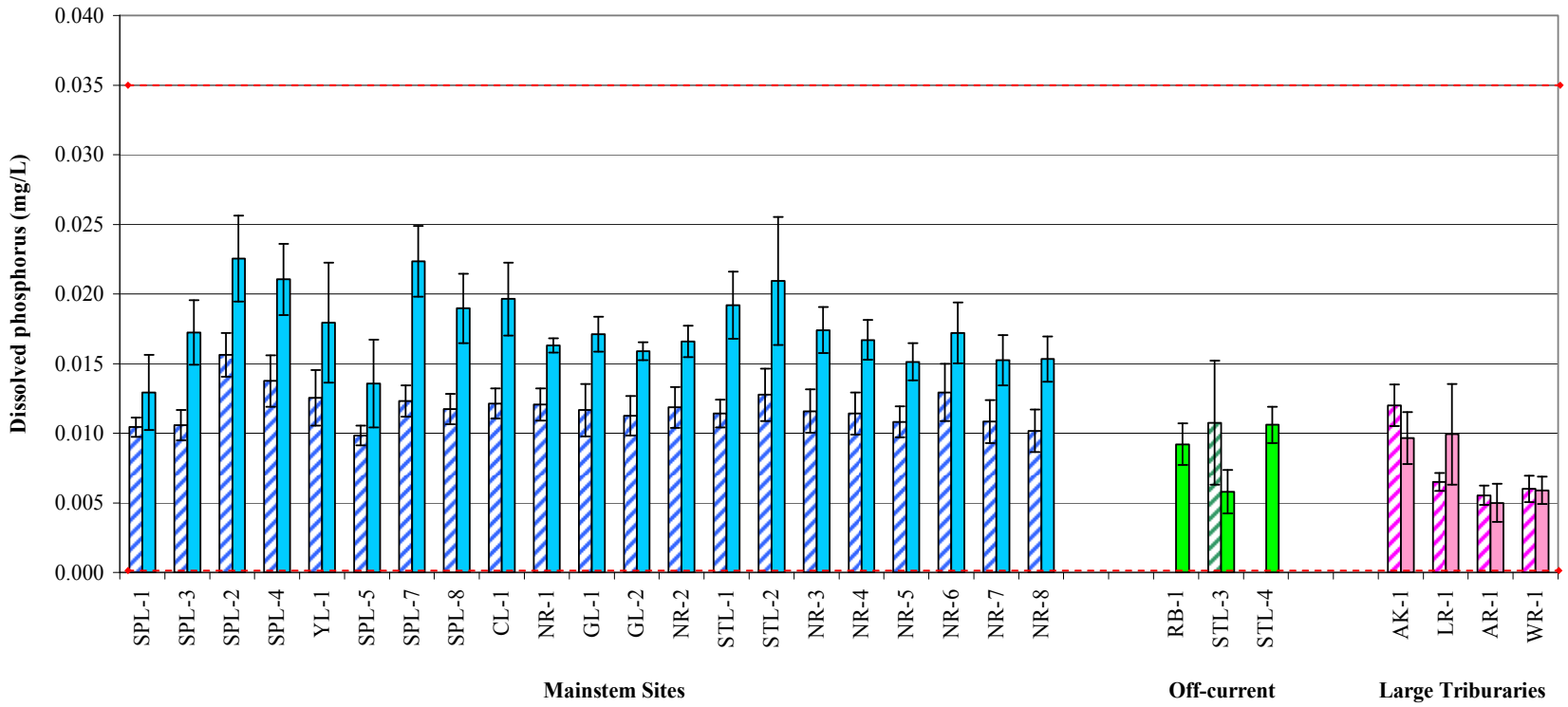

Figure 17. Open-water season mean (± SE) dissolved phosphorus (DP) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

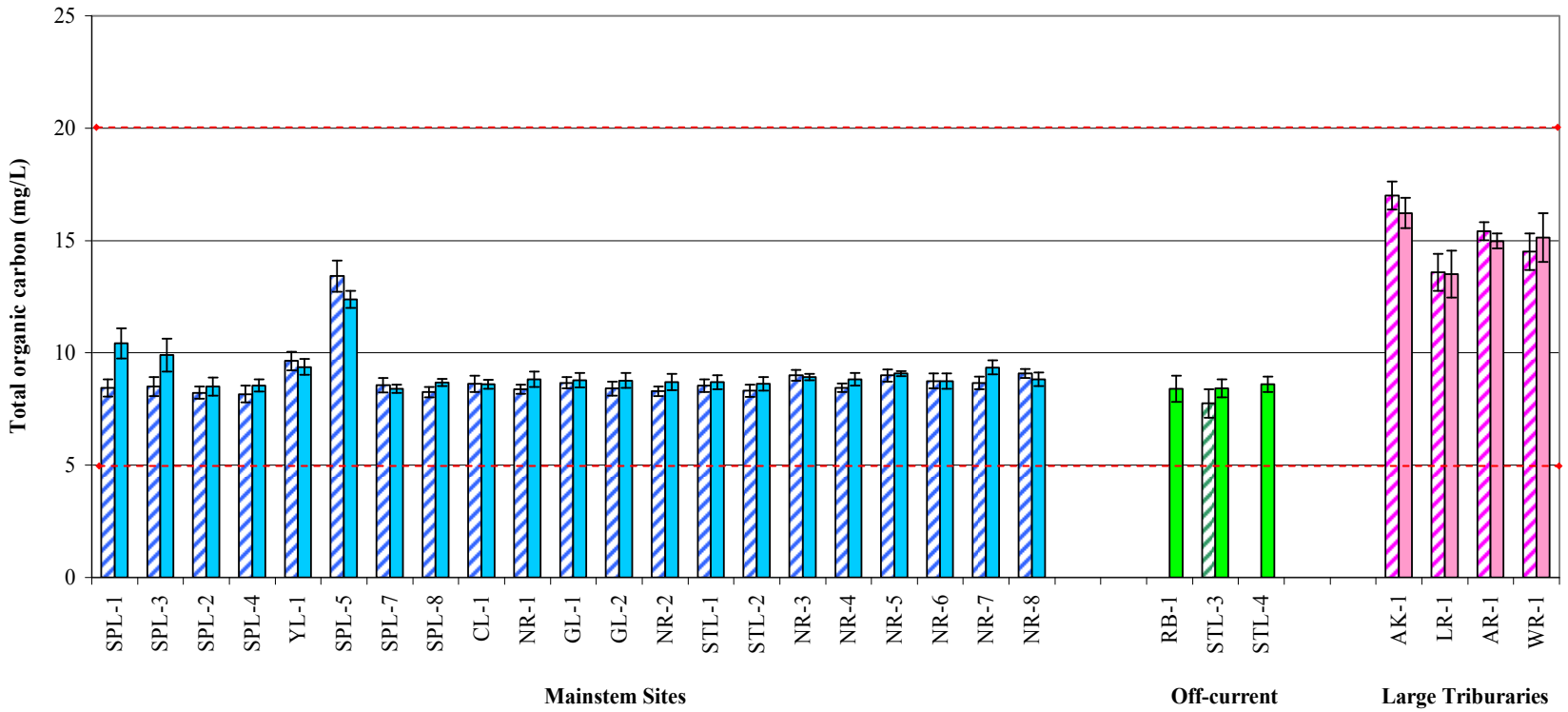

Figure 18. Open-water season mean (± SE) total organic carbon (TOC) at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines.

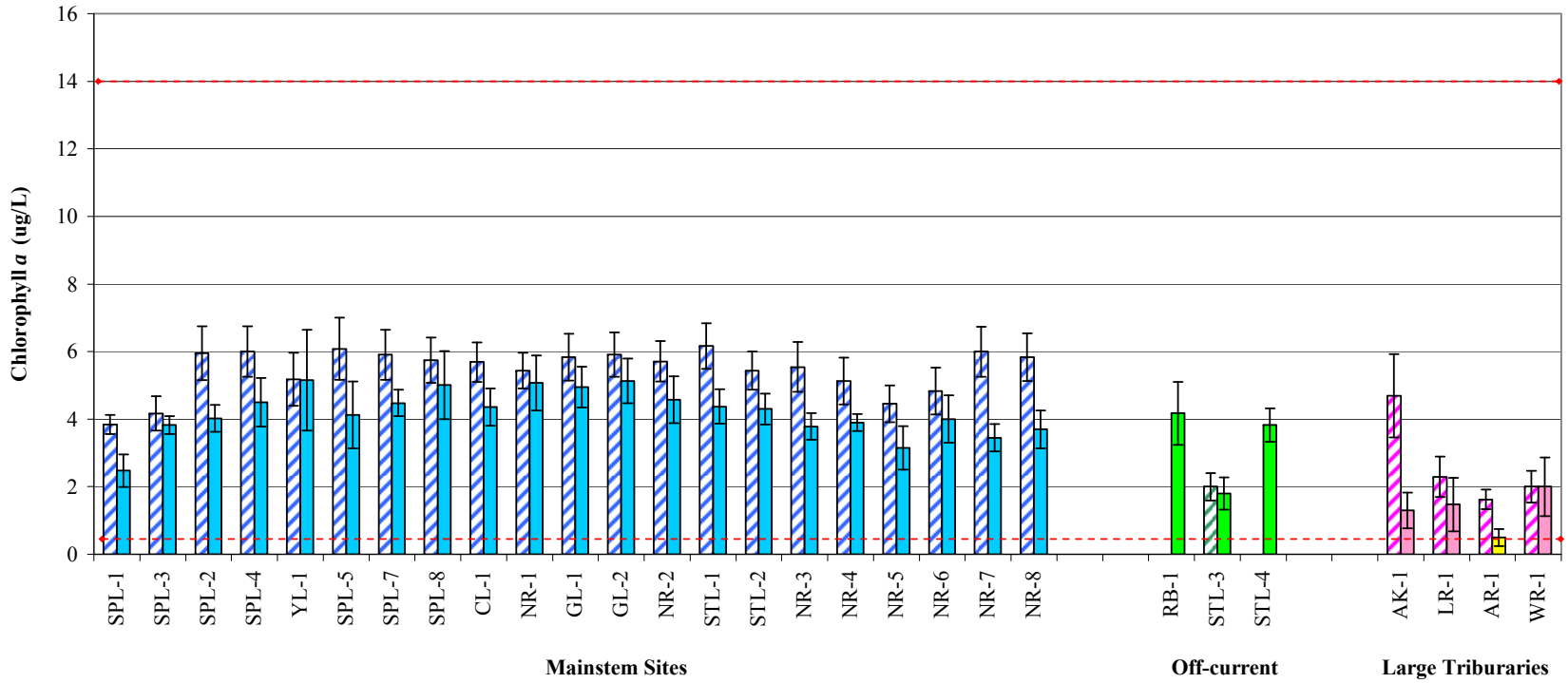

Figure 19. Open-water season mean (± SE) chlorophyll *a* at mainstem sites, off-current sites, and large tributaries in the Keeyask and Conawapa study areas in 2009 (solid bars) and 2001-2004 (striped bars). The overall range (minimum/maximum) for the Study Area from 2001-2004 is indicated by the dashed red lines. Means that were below detection limits (1.0 µg/L) are indicated by yellow columns and were assigned a value equal to half the detection limit.

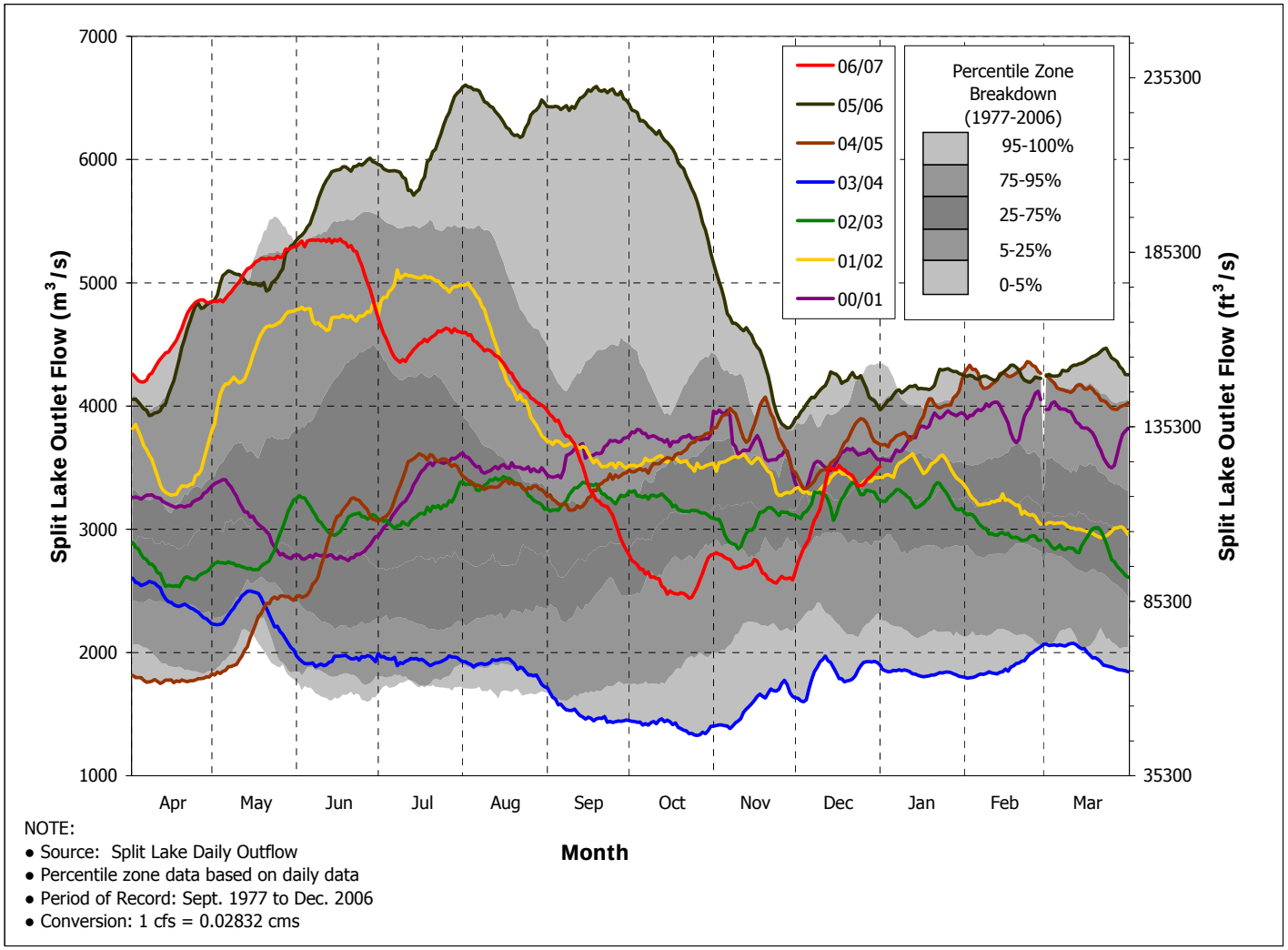

Figure 20. Split Lake outlet discharges: 2000/01-2006/07. Source: Manitoba Hydro, Jarrod Malenchak.

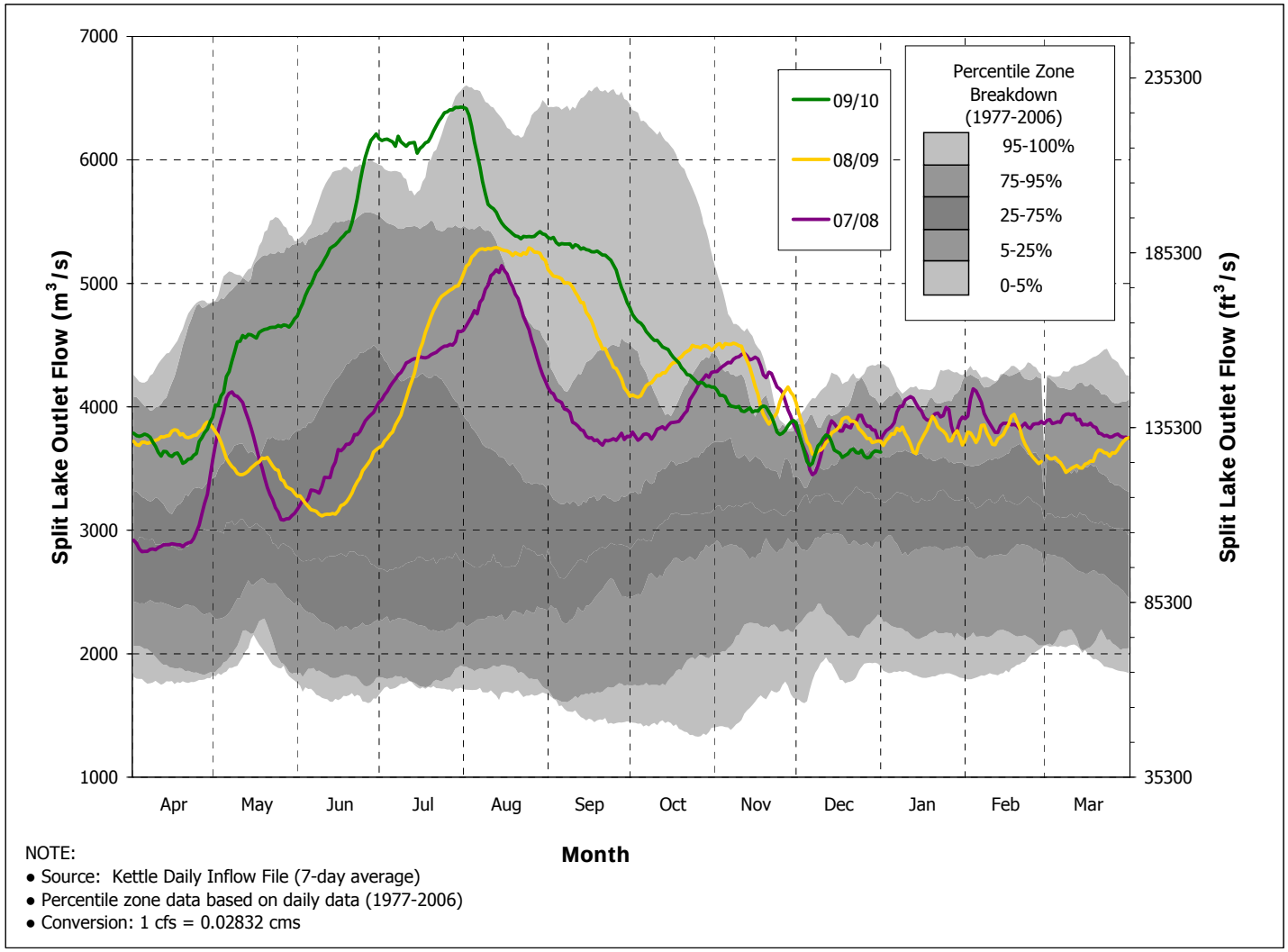

Figure 21. Split Lake outlet discharges: 2007/08-2009/10. Source: Manitoba Hydro, Jarrod Malenchak.

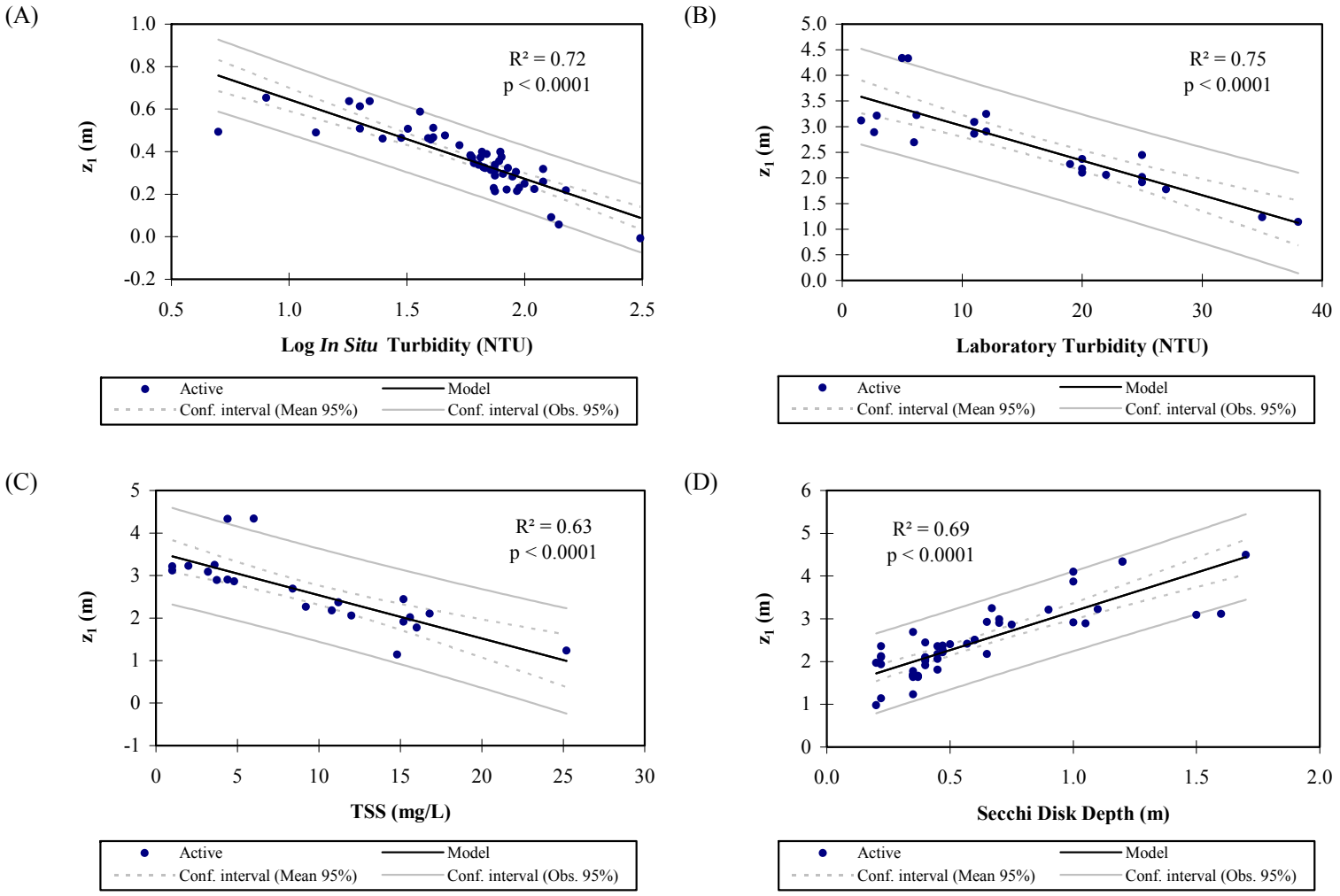

Figure 22. Linear regressions between euphotic zone depth (z_1) and (A) *in situ* turbidity, (B) laboratory turbidity, (C) total suspended solids (TSS), and (D) Secchi disk depth measured in the Keeyask Study Area 2009.

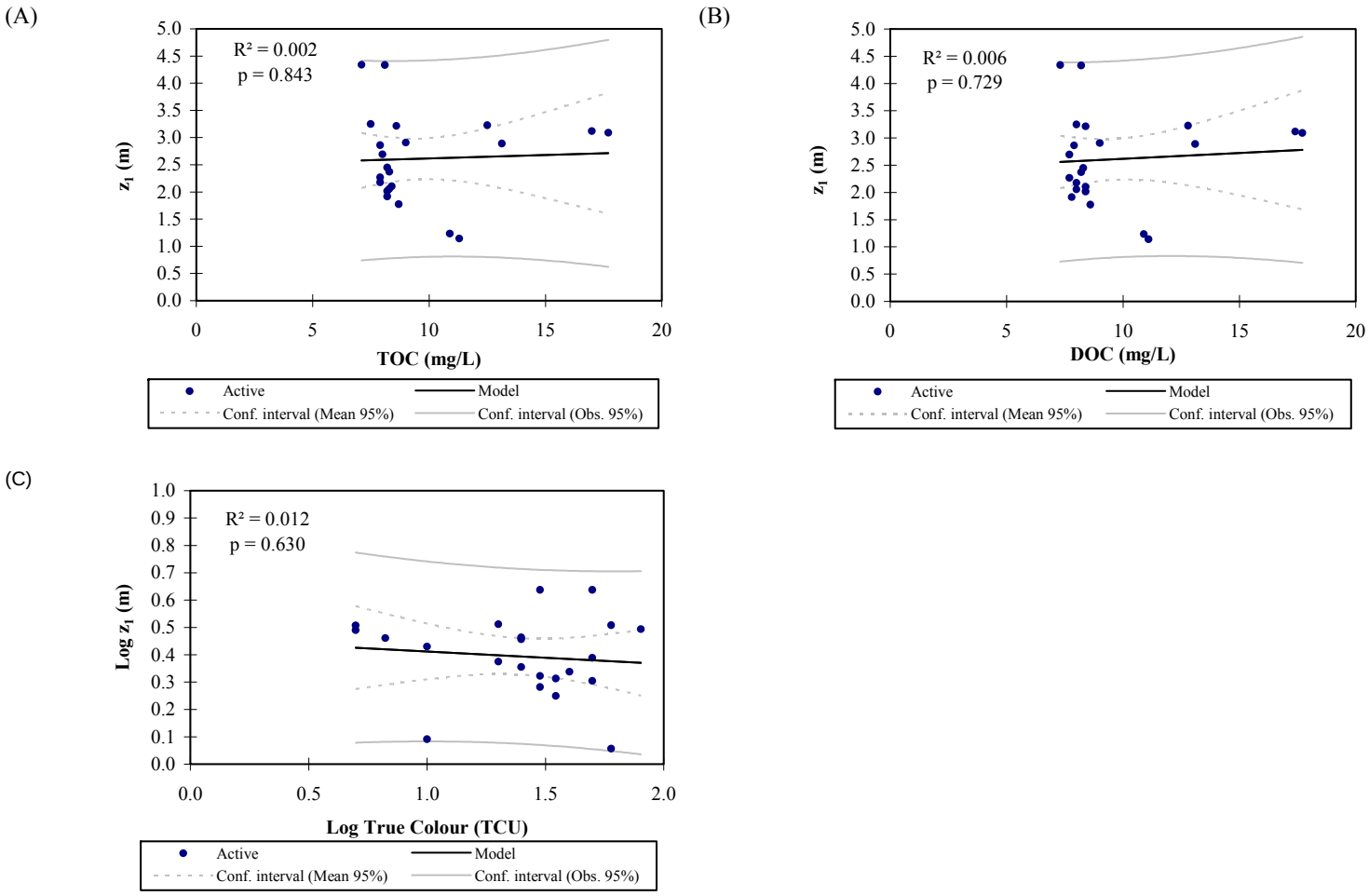

Figure 23. Linear regressions between euphotic zone depth (z_1) and (A) total organic carbon (TOC), (B) dissolved organic carbon (DOC), and (C) true colour measured in the Keeyask Study Area 2009.

APPENDIX 1.

BACKGROUND INFORMATION ON KEY WATER QUALITY VARIABLES

A1-1.0 BACKGROUND INFORMATION ON SELECTED WATER QUALITY PARAMETERS

The following provides a brief description of key water quality variables that are considered in the main document.

A1-1.1 Water Temperature and Stratification

Water temperature is an important variable in aquatic systems not only for its direct relevance to the growth, condition, and survival of biota, but also because it affects the rates and occurrence of biological processes and influences water chemistry (e.g., the amount of dissolved oxygen [DO] that water can hold is determined by its temperature). Changes to water temperature may affect water chemistry, growth and biological processes, toxicity of some substances, spawning times and locations, and productivity of aquatic organisms. Water temperature also affects important physical processes such as ice regimes.

Some waterbodies, notably lakes, may regularly or periodically stratify. Stratification is a function of changes in water's density with changes in temperature (e.g., through surface warming or cooling) and the ability of the lake to mix upper and lower layers of water. It is usually defined as a temperature change of 1 ^{o}C or more in one meter of water. Two distinct layers may form: an upper layer (epilimnion); and a lower layer (hypolimnion). Stratification may develop in summer when the epilimnion is warmed due to surface heating and the lake circulation is not strong enough to mix the less dense water at the surface with the cooler, denser hypolimnetic waters. In fall/winter, the epilimnion may cool and remain unmixed from the warmer and denser hypolimnion thus forming stratification. Numerous physical conditions affect the ability of stratification to develop in a lake including: lake morphometry (fetch); lake depth; lake volume; water residence time; air temperatures; wind speed; and solar radiation. Stratification is significant from a biological perspective as it affects temperature profiles in waterbodies and because it results in isolation of upper and lower layers of water, thus affecting exchange and flow of chemical constituents. In particular, stratified waterbodies may develop significant DO depletion.

A1-1.2 Dissolved Oxygen

Dissolved oxygen is essential for the survival of most aquatic biota. It is consumed by aquatic organisms including, animals, plants, algae, and bacteria in the water column and

sediments. Sources of dissolved oxygen to aquatic systems are aeration (i.e., input of oxygen from the atmosphere) and photosynthesis by plants and algae. The concentration of DO in surface waters is affected by water temperature; colder water can hold more DO than warmer water and saturation occurs at a higher concentration in winter. DO may decrease in north temperate ecosystems that experience long periods of ice cover due to the lack of an oxygen source from the atmosphere (i.e., no or minimal re-aeration due to ice). DO may also vary across depth in environments that stratify, typically being lowest at depth.

A1-1.3 Water Clarity: Total Suspended Solids (TSS), Turbidity, Secchi Disk Depth, and Colour

Water clarity is often described using measures of TSS or turbidity, which are generally interrelated (and typically correlated) but represent different measures. TSS is a measure of the amount (by weight) of suspended solids such as sediments in water whereas turbidity is a measure of scattering of light by suspended particles in water and it reflects the transparency of water caused by dissolved and suspended substances (Caux et al. 1997). At very high concentrations, TSS can reduce fish growth rates, modify fish movements, affect fish egg and larval development, impair foraging and predation behaviour of fish, reduce abundance of fish diet items, affect reproduction of aquatic biota, reduce immunocompetency of aquatic biota, and harm benthic habitats. At lower concentrations, suspended sediment can influence aquatic ecosystems by reducing light penetration into the water column, thereby limiting the growth of plants and algae, and may affect behaviour of aquatic life (e.g., predation success of fish). Turbidity and TSS are also relevant to the suitability of water used for drinking and recreation, and affect the aesthetic quality of aquatic ecosystems. Sources of TSS in surface waters include shoreline erosion, point sources (e.g., municipal or industrial wastewaters), surface water runoff/land use, and sediment re-suspension.

Secchi disk depth refers to the depth at which a black and white coloured disk lowered into the water is no longer visible. It is used as a general indicator of water clarity and can be used to estimate the depth of the euphotic zone (generally defined as the depth at which 1% surface radiation remains) in aquatic ecosystems. As Secchi disk depth is affected by all factors affecting visibility, including the presence of algae, it is often used as one of several indicators of trophic status in lakes.

Colour is the result of backscattering of light upward from a water body after it is selectively absorbed at various depths (Canadian Council of Ministers of the

Environment [CCME] 1999; updated to 2010). Both the colour of light and turbidity determine the depth to which light penetrates a water body. The colour of water can be measured as apparent colour or true colour. True colour, which was measured in this study, depends on the dissolved fraction of substances in water, and also on the physical and chemical properties that affect the solubility and stability of the dissolved and particulate fractions of water such as pH and temperature (CCME 1999; updated to 2010). It is important in terms of aesthetics, drinking water quality (aesthetics), the toxicity of certain contaminants (e.g., mercury toxicity increases with increasing water colour [Haines et al. 1995]), and is pertinent to the behaviour and presence of aquatic flora and fauna (e.g., algal species composition; reviewed in CCME 1999; updated to 2010).

A1-1.4 Nitrogen and Phosphorus

Nitrogen and phosphorus are the major nutrients in surface waters that support the growth of aquatic plants, benthic algae (i.e., periphyton), and algae in the water column (phytoplankton). Sources of nutrients in surface waters include the breakdown of organic matter, excretion by organisms, wastewater discharges, erosion and run-off from the watershed, sediment re-suspension, and atmospheric deposition. Nutrients are not toxic at the concentrations normally found in surface waters. However, nutrient enrichment can stimulate excessive growth of plants and algae (i.e., eutrophication), which can subsequently lead to the degradation of aquatic habitat through physical changes (e.g., excessive plant or algal growth over gravel substrate), and through changes to water quality (reduced dissolved oxygen at night, reduced water clarity due to phytoplankton, and possible production of toxins by some forms of phytoplankton). Stimulation of plant or algal growth by nutrient enrichment in individual water bodies also depends on several other factors that potentially limit plant or algal growth, such as water clarity, temperature, flushing rates, and turbulence.

Nitrogen is a major plant nutrient that may affect the productivity of fresh waters (Wetzel 1983). In water, nitrogen may be found in a number of forms: organic nitrogen (ON), ammonia-nitrogen, nitrate-nitrogen, and nitrite-nitrogen. Within surface waters, these various nitrogen pools may exist in particulate or dissolved forms. Organic nitrogen decays to produce ammonia via anaerobic bacterial decay processes. Ammonia in turn is converted to nitrite and ultimately to nitrate via the process of nitrification - an aerobic bacterial process. Algae (and other aquatic plants) readily take up dissolved inorganic nitrogen (DIN), which consists of ammonia and nitrate, with a typical preference for ammonia. Three forms of nitrogen were measured in this study: dissolved nitrate/nitrite-

nitrogen; total Kjeldahl nitrogen (TKN) (i.e., the sum of ON and ammonia); and dissolved ammonia-nitrogen.

Phosphorus is the most common nutrient limiting the growth of phytoplankton in lentic fresh water systems and concentrations are often related to the productivity of aquatic systems (Wetzel 1983). Two types of phosphorus, total (TP) and dissolved (DP), were quantified in this study. Dissolved forms of phosphorus are those most readily used by phytoplankton for growth. The amount of DP in the water column may fluctuate over the growing season, as phosphorus is bound up in algal cells and plants in the spring and summer, and is released in the fall and winter with the death and decomposition of plankton and plant matter. Total phosphorus includes DP as well as the phosphorus contained in suspended matter such as plankton (small plants and animals that exist in the water column) or bound to mineral sediments.

A1-1.5 Carbon

In the aquatic environment, carbon exists in two primary forms: organic carbon (OC; such as the carbon contained in humic acids, sugars, and carbohydrates); and inorganic carbon (IC; such as the carbon contained in carbon dioxide, carbonate, and bicarbonate). Carbon is found in many different substances, some of which may be dissolved in water and others that may be bound to (or contained within) particles suspended in the water column.

Algae and rooted plants can use IC, in the form of carbon dioxide, and convert it to OC through photosynthesis. Bacteria and other micro-organisms may consume dissolved and particulate OC, and in turn provide food for larger organisms such as invertebrates and fish. The amounts and types of carbon present in aquatic ecosystems are dependent on numerous variables, including the type of rock in the area (i.e., geological conditions), climate, topography, vegetative cover, and size of the watershed (Horne and Goldman 1994). Dissolved organic carbon (DOC) may also affect light attenuation in waterbodies; generally, as DOC, particularly the concentration of humic materials, increases, light attenuation also increases (Wetzel 1983). DOC may also form complexes with nutrients and metals, thus reducing their bioavailability (Faithfull et al. 2006; Gorniak et al. 1999; Jones et al. 1988).

A1-1.6 pH

The pH of water indicates the acidity of an aquatic system, and is influenced by nutrients, organic acids, metals, gases, algae (i.e., photosynthesis), solar radiation (i.e.,

temperature), and particulates (CCME 1999; updated to 2010). Changes in pH can influence the chemical state of important plant nutrients such as phosphate, ammonia, iron, and trace metals (Horne and Goldman 1994). pH may directly affect aquatic biota (i.e., highly acidic or alkaline conditions can threaten aquatic life) or may be indirectly harmful to aquatic life (e.g., increase bioavailability of metals). Reductions of pH may mobilize metals bound in sediments (i.e., release metals to water) and may alter the physico-chemical form of metals in aquatic systems. Additionally, accumulation of methylmercury in fish is greater in low pH lakes (Spry and Wiener 1991). pH may be altered by flooding of soils, decomposition of organic matter, and photosynthesis. A fairly wide range of pH in surface water is suitable for aquatic life and wildlife.

A1-1.7 Hardness

Hardness, a measure of the concentration of calcium carbonate in water, affects the accumulation and toxicity of numerous metals to aquatic biota (i.e., metals are less toxic to aquatic life in hard water). Hardness is a reflection of the type of soil minerals and bedrock in the local environment, as well as the hydrological characteristics of the area (e.g., length of time water is in contact with bedrock). In general, soft water occurs in watersheds characterized by igneous rock, whereas hard water occurs in systems draining through carbonate rock (Williamson and Ralley 1993). The hardness of surface waters is generally categorized according to the ranges presented in Table 2-2 (Canadian Council of Resource Ministers of the Environment [CCREM] 1987).

A1-1.8 Alkalinity

Alkalinity is a measure of the water's acid-neutralizing capability, which is largely dependent upon the concentration of calcium carbonate (water hardness) in the water. It is generally a reflection of the local geology and bicarbonates being leached from the soil. High alkalinity may indicate high levels of primary production and nutrient inputs. Production and bioaccumulation of methylmercury in aquatic food webs is greater in low alkalinity/low pH lakes (Spry and Wiener 1991). Furthermore, lakes with low-buffering capacity may be more susceptible to acidification due to flooding or acidic precipitation. The sensitivity of lakes to acidification is often categorized on the basis of total alkalinity. A commonly applied categorization scheme is presented in Table 2-3 (Saffran and Trew 1996).

A1-1.9 Total Dissolved Solids (TDS) and Conductivity

Total dissolved solids and conductivity are measures of the amount of minerals and organic matter dissolved in water, reflecting both natural conditions such as local geology, and anthropogenic activities that increase these substances in water (e.g., mining effluents). TDS may affect the quality of water for human use (i.e., taste, scaling, corrosion, and laxative effects).

Electrical conductivity is a measure of water's ability to conduct an electrical current and indicates the amount, but not the type, of dissolved solids present. As the amount of solute dissolved in water is temperature dependent, conductivity of a solution typically increases by approximately 2% with each 1ºC increase in temperature (Wetzel 1983). To provide comparable data between locations and sampling times, conductivity is frequently expressed as specific conductance, which is conductivity standardized to a water temperature of 25ºC.

A1-1.10 Metals and Metalloids

Metals and metalloids (i.e., mercury, selenium, and arsenic) are typically present in surface waters and sediments. At sufficient concentrations, certain metals/metalloids (such as arsenic, cadmium, and mercury) can be harmful to fish, wildlife, and humans. Conversely, many metals are biologically essential (e.g., iron, calcium). Metals are introduced to surface waters through erosion and weathering of soils and rock and atmospheric deposition. Whereas high concentrations of metals occur naturally in some waterbodies, they may become elevated due to various anthropogenic activities, including acidification (e.g., acid rain), agricultural activities, mining and smelting, combustion of fossil fuels, or the release of municipal and industrial effluents. In aquatic ecosystems, metals may bioaccumulate in aquatic biota through water and ingestion of food containing metals. Mercury also biomagnifies across the food web and is generally found at the highest concentrations in top predators. In freshwater aquatic ecosystems, the highest concentrations are generally observed in piscivorous fish. Flooding may increase the accumulation and magnification of mercury in aquatic ecosystems and is commonly observed in newly created hydroelectric reservoirs.

APPENDIX 2.

WATER QUALITY PARAMETERS MEASURED

Page

A2-1.0 ALS LABORATORIES

The following table lists the parameters measured in water samples collected during the Keeyask and Conawapa water quality sampling programs, open-water season and ice-cover seasons, 2009.

Table A2-1. Detailed parameters list and analytical detection limits for samples that were submitted to ALS Laboratories in Winnipeg, MB.

Parameter	Report D.L.	Units	Parameter	Report D.L.	Units
Routine Variables			**Metals and Major Ions**		
Conductivity	0.40	µmhos/cm	Chloride (Cl) - Dissolved	9.0	mg/L
Total Dissolved Solids	5.0	mg/L	Silica (SiO_2)- Dissolved Reactive	0.10	mg/L
Hardness (as $CaCO_3$)	0.30	mg/L	Sulphate (SO_4) - Dissolved	9.0	mg/L
pH	0.01	pH units	Aluminum (Al)-Total	0.0050	mg/L
Alkalinity - Total (as $CaCO_3$)	1.0	mg/L	Antimony (Sb)-Total	0.00050	mg/L
Alkalinity - Bicarbonate (HCO_3)	2.0	mg/L	Arsenic (As)-Total	0.00050	mg/L
Alkalinity - Carbonate (CO_3)	0.60	mg/L	Barium (Ba)-Total	0.00030	mg/L
Alkalinity - Hydroxide (OH)	0.40	mg/L	Beryllium (Be)-Total	0.0010	mg/L
Nitrate+Nitrite-N - Dissolved	0.0050	mg/L	Bismuth (Bi)-Total	0.00020	mg/L
Ammonia (NH3) - Dissolved	0.0030	mg/L	Boron (B)-Total	0.030	mg/L
Total Kjeldahl Nitrogen	0.20	mg/L	Cadmium (Cd)-Total	0.000010	mg/L
Total Phosphorus	0.0010	mg/L	Calcium (Ca)-Total	0.10	mg/L
Total Dissolved Phosphorus	0.0010	mg/L	Cesium (Cs)-Total	0.00010	mg/L
Dissolved Organic Carbon	1.0	mg/L	Chromium (Cr)-Total	0.0010	mg/L
Total Organic Carbon	1.0	mg/L	Cobalt (Co)-Total	0.00020	mg/L
Total Suspended Solids (LR)	2.0	mg/L	Copper (Cu)-Total	0.0010	mg/L
Turbidity	0.050	NTU	Iron (Fe)-Total	0.020	mg/L
True Colour	5.0	TCU	Lead (Pb)-Total	0.00050	mg/L
			Magnesium (Mg)-Total	0.010	mg/L
Biological			Manganese (Mn)-Total	0.00030	mg/L
Chlorophyll *a*	1.0	µg/L	Mercury (Hg)-Total	0.000020	mg/L
ODb/ODa	1.0	ABS Ratio	Molybdenum (Mo)-Total	0.00020	mg/L
Pheophytin *a*	1.0	µg/L	Nickel (Ni)-Total	0.0020	mg/L
			Potassium (K)-Total	0.10	mg/L
At Some Sites			Rubidium (Rb)-Total	0.00020	mg/L
Carbonaceous Biochemical			Selenium (Se)-Total	0.0010	mg/L
Oxygen Demand (CBOD)	1 / 6	mg/L	Silver (Ag)-Total	0.00010	mg/L
Dissolved Oxygen	0.10	mg/L	Sodium (Na)-Total	0.030	mg/L
			Strontium (Sr)-Total	0.00010	mg/L
			Tellurium (Te)-Total	0.0010	mg/L
			Thallium (Tl)-Total	0.00010	mg/L
			Tin (Sn)-Total	0.00060	mg/L
			Titanium (Ti)-Total	0.00090	mg/L
			Tungsten (W)-Total	0.00020	mg/L
			Uranium (U)-Total	0.00010	mg/L
			Vanadium (V)-Total	0.0010	mg/L
			Zinc (Zn)-Total	0.010	mg/L
			Zirconium (Zr)-Total	0.00040	mg/L

A2-2.0 CANTEST LTD.

The following table lists the parameters measured in water samples collected during the Keeyask and Conawapa water quality sampling programs, open-water season 2009.

Table A2-2. Detailed parameters list and analytical detection limits for samples that were submitted to CanTEST Ltd. in Winnipeg, MB.

Parameter	Report D.L.	Units	Parameter	Report D.L.	Units
Routine Variables			**Metals and Major Ions**		
Alkalinity - Total (as $CaCO_3$)	0.5/ 1	mg/L	Chloride - Dissolved	0.2	mg/L
Alkalinity - Bicarbonate (HCO_3)	0.5	mg/L	Silica (SiO_2) -Soluble Reactive	0.1	mg/L
Alkalinity - Carbonate (CO_3)	0.5	mg/L	Sulphate (SO_4)- Dissolved	0.5	mg/L
Alkalinity - Hydroxide (OH)	0.5	mg/L	Aluminum	0.001/ 0.005	mg/L
Ammonia Nitrogen	0.005	mg/L	Antimony	0.0002/ 0.0005/ 0.001	mg/L
Nitrate and Nitrite	0.005	mg/L	Arsenic	0.0002/ 0.001	mg/L
Total Kjeldahl Nitrogen	0.2	mg/L	Barium	0.0002/ 0.001	mg/L
Total Phosphorus	0.001	mg/L as P	Beryllium	0.0002/ 0.0005/ 0.001	mg/L
Total Soluble Phosphorus	0.001	mg/L as P	Bismuth	0.0002/ 0.0005/ 0.001	mg/L
Dissolved Organic Carbon	1	mg/L	Boron	0.01/ 0.025/ 0.05	mg/L
Total Organic Carbon	1	mg/L	Cadmium	0.00004/ 0.00005/ 0.0002	mg/L
pH, Laboratory	-	pH units	Calcium	0.01/ 0.05	mg/L
Conductivity	1	µS/cm	Chromium	0.0002/ 0.001	mg/L
True Color	5	CU	Cobalt	0.0002/ 0.0005/ 0.001	mg/L
Turbidity	0.1	NTU	Copper	0.0002/ 0.0005/ 0.001	mg/L
Hardness (Total) $CaCO_3$	0.2 / 1	mg/L	Iron	0.01/ 0.05	mg/L
Total Dissolved Solids	10	mg/L	Lead	0.0002/ 0.00025/ 0.001	mg/L
Total Suspended Solids	1	mg/L	Magnesium	0.01/ 0.025/ 0.05	mg/L
			Manganese	0.0002/ 0.0005/ 0.001	mg/L
			Mercury	0.02	µg/L
Biological			Molybdenum	0.0001/ 0.0005	mg/L
Chlorophyll *a*	0.5	µg/L	Nickel	0.0002/ 0.001	mg/L
Pheophytin *a*	0.5	µg/L	Potassium	0.01/ 0.02/ 0.05/ 0.1	mg/L
			Rubidium	0.0005	mg/L
			Selenium	0.0002/ 0.001	mg/L
			Silver	0.00005/ 0.0002/ 0.00025	mg/L
			Sodium	0.01/ 0.025/ 0.05	mg/L
			Strontium	0.0002/ 0.0005/ 0.001	mg/L
			Tellurium	0.0002/ 0.001	mg/L
			Thallium	0.00002/ 0.0001	mg/L
			Tin	0.0002/ 0.0005/ 0.001	mg/L
			Titanium	0.0002/ 0.001	mg/L
			Tungsten	0.0005	mg/L
			Uranium	0.0001/ 0.00025/ 0.0005	mg/L
			Vanadium	0.0002/ 0.0005/ 0.001	mg/L
			Zinc	0.001/ 0.005	mg/L
			Zirconium	0.0005/ 0.002/ 0.01	mg/L

APPENDIX 3.

DETAILED LABORATORY METHODOLOGIES FOR WATER QUALITY ANALYSES

A3-1.0 ALS LABORATORY TEST METHOD REFERENCES

A3-1.1 Alkalinity

Method Reference: APHA 2320B

Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate, and hydroxide components of water. It is determined by titration with a standard solution of strong mineral acid to the successive HCO_{3-} and H_2CO_3 endpoints indicated electrometrically.

A3-1.2 Ammonia Dissolved

Method Reference: LACHAT;2003

Ammonia- Colourimeric using Salicylate-nitroprusside and hypochlorite, in an alkaline phosphate buffer.

A3-1.3 Carbon (total and dissolved organic)

Method Reference: APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pre-treatment: Unfiltered sample = Total Carbon (TC); 0.45 µm filtered sample = Total Dissolved Carbon (TDC). Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon (IC) reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon (TIC) and dissolved inorganic carbon (DIC), the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The TOC content of the sample is calculated by subtracting TIC from the TC. TOC = TC - TIC; DOC = TDC - DIC; Particulate = Total – dissolved.

A3-1.4 Carbonaceous Biochemical Oxygen Demand (CBOD)

Method Reference: APHA 5210 B-5 day Incub.-O2 electrode

A sample of water is incubated for 5 days at 20 degrees Celsius. Comparison of dissolved oxygen content at beginning and end of incubation provides a measure of Biochemical oxygen demand. If carbonaceous BOD is requested, TCMP is added to the sample to chemically inhibit nitrogenous oxygen demand. If soluble BOD is requested, the sample is filtered prior to analysis.

A3-1.5 Chloride Dissolved

Method Reference: APHA 4500/LACHAT

Chloride- Colourimetric using Mercuric Thiocyanate.

A3-1.6 Chlorophyll *a* and Pheophytin *a*

Method References: APHA 10200H, 1998-664/750NM

Chlorophyll *a* is filtered from the sample, then extracted with 90% (v/v) acetone. Absorbance is measured spectrophotometrically at 664 nm and 750 nm. The extract is then acidified, converting chlorophyll *a* to pheophytin *a*. Absorbance is determined again after acidification. The chlorophyll *a* concentration is determined from the decrease in absorbance upon acidification. When a detection limit of 0.5 µg/L is required, the volume of sample filtered is doubled to 700 mL.

Samples with and OD664 before/OD665 after acidification ratio (664b/665a) of 1.70 are considered to contain no pheophytin *a* and to be in excellent physiological condition. Solutions of pure pheophytin show no reduction in OD665 upon acidification and have a 664b/665a ratio of 1.0. Thus, mixtures of chlorophyll *a* and pheophytin *a* have absorption peak ratios ranging between 1.0 and 1.7. These ratios are based on the used of 90% acetone as solvent.

A3-1.7 Conductivity

Method Reference: APHA 2510B

Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.

A3-1.8 Dissolved Oxygen

Method Reference: APHA 4500-O-C

Manganous sulphate reacts with potassium or sodium hydroxide to give a white precipitate of manganous hydroxide. In the presence of oxygen, brown manganic hydroxide is formed. Addition of sulphuric acid dissolves the manganic hydroxide, yielding manganic sulphate which reacts with iodide, releasing iodide in an amount equivalent to the original DO content. The iodide is then titrated with a standard solution of thiosulphate.

A3-1.9 Nitrate/nitrite-nitrogen

Method References: APHA4500;2005/LACHAT;1997,1999

Nitrate/nitrite nitrogen is measured by a colourimetric method employing a cadmium column with copper sulphate reduction.

A3-1.10 pH

Method References: APHA 4500H

pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.

A3-1.11 Phosphorus (dissolved and total)

Method References: APHA, 1998 P-TD or APHA, 1998 P-T

Samples are digested using a sulphuric acid-persulphate mixture to convert organic phosphorus to orthophosphate. The samples are analysed by either the Flow Injection Analysis (FIA) or the Segmented Flow Analysis (SFA) method. The absorbance measured by the instrument is proportional to the concentration of orthophosphate in the sample, and is reported as phosphorous. Samples are analysed for total or total dissolved phosphorous depending on the sample pre-treatment. Dissolved phosphorus is the fraction that passes through a 0.45 μm filter.

A3-1.12 Sulphate Dissolved

Method Reference: APHA 4500/LACHAT

Sulphate- Turbidimetric.

A3-1.13 Total Dissolved Solids (TDS)

Method Reference: APHA 2540

The residue remaining in a prepared casserole after passing the sample through a 1.2 µm Whatman GF/C glass microfibre filter and drying at 180 degrees Celsius. Samples may be dried at 105 degrees Celsius if the client specifically requests this drying temperature.

A3-1.14 Total Kjeldahl Nitrogen (TKN)

Method Reference: Quickchem Method 10-107-06-2-E Lachat

Samples are digested with a sulphuric acid solution, cooled, diluted with water, and analysed for ammonia. Total Kjeldahl nitrogen is the sum of free-ammonia and organic nitrogen compounds which are converted to ammonium sulphate through this digestion process. Analysis is performed by Flow Injection Analysis (FIA). The pH of the digested sample is raised to a known, basic pH by neutralization with a concentrated buffer solution. This neutralization converts the ammonium cation to ammonia. The ammonia produced is heated with saliclyate and hypochlorite to produce blue colour with is proportional to the ammonia concentration.

A3-1.15 Total Mercury (low level)

Method Reference: SW846 7470A

Mercury in the sample is oxidized with Bromine monoChloride then reduced with hydroxylamine hydrochloride. The samples are analyzed in an automated system where stannous chloride further reduces the mercury to volatile Hg (O). This gas is collected on a gold pre-concentrator then thermally desorbed from the gold trap into the cell of a cold-vapor atomic fluorescence spectrometer for detection.

A3-1.16 Total Metals (except total mercury) by ICP-MS

Method Reference: EPA 200.8 Rev 5.4 May 1994-T

This analysis is carried out using sample penetration procedures adapted from U.S. EPA-600/4-82-055 for hotblock digestion or U.S. EPA Test Methods for Evaluating Solid Waste SW846 3015 for microwave digestion, and procedures adapted from U.S. EPA Method 200.8 for analysis by inductively coupled-mass spectrometry.

A3-1.17 Total suspended solids (TSS)

Method Reference: APHA 2540 LR

The residue retained by a prepared 1.5 µm Whatman 934-AH glass microfibre filter dried at 105 degrees C. A method detection limit of 2 mg/L can be achieved when 500 mL of sample is used.

A3-1.18 True Colour

Method References: APHA, AWWA, WPCF

Colour is measured by visual comparison against a routinely calibrated colour disk. True colour is the colour of water from which turbidity has been removed by centrifugation.

A3-1.19 Turbidity

Method References: APHA , 1998, 2130B

A strong light beam is sent through a transparent tube containing the sample. Light that is reflected at 90 degrees to the axis by suspended particles is detected by the photocell. The electrical response is proportional to the sample turbidity.

A3-2.0 CanTEST LTD. TEST METHOD REFERENCES

A3-2.1 Ammonia (total)

Ammonia in water is performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream, which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically at 590nm.

A3-2.2 Carbon (total and dissolved organic)

Carbon in water is determined based on Method 5310 A and B in Standard Methods (21st Edition) and Method X314 in the BC Laboratory Manual (2005 Edition).

A3-2.3 Chlorophyll *a* and Pheophytin *a*

Analyses were performed using procedures based on those described in "Standards Methods for the Examination of Water and Wastewater" (21st Edition).

A3-2.4 Nitrate/nitrite-nitrogen (total)

Nitrate and nitrite in water is performed using Flow Injection Analysis where Nitrate is reduced to Nitrite by passing the sample through a cadmium reduction column. The nitrite produced is then determined by diazotizing sulphanilamide and N- (1-naphthyl)-ethylenediamine dihydrochloride to form a reddish azo dye which is then measured colorimetrically at 540 nm.

A3-2.5 Soluble Reactive Silica (SiO_2)

Samples are filtered in the laboratory and quantitatively determined using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP) and/or Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS). Results are then calculated by multiplying the Silicon (Si) result for the sample by 2.14.

A3-2.6 Total Dissolved Solids (TDS)

Total dissolved solids in water are determined based on Method 2540C in "Standard Methods for the Examination of Water and Wastewater" (21st Edition). Total dissolved solids is the fraction that passes through a 1.2 μm filter.

A3-2.7 Total Kjeldahl Nitrogen (TKN)

Total Kjeldahl nitrogen in water is determined based on Method 4500-N in "Standard Methods for the Examination of Water and Wastewater" (21st Edition) and Method X325 in the BC Laboratory Manual (2005).

A3-2.8 Mercury

Analysis is performed using procedures based on U.S. EPA Method 245.7, oxidative digestion using bromination, and analysis using Cold Vapour Atomic Fluorescence Spectroscopy.

A3-2.9 Metals (dissolved)

Samples were filtered in the laboratory and quantitatively determined using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP) and/or Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS). NOTE: If Sulphur is included in the analysis, only non-acid volatile sulphur is reported.

A3-2.10 Metals (total)

Analysis is performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS). NOTE: If Sulphur is included in the analysis, only non-acid volatile sulphur is reported.

A3-2.11 Total suspended solids (TSS)

Total suspended solids is determined based Method 2540 D in "Standard Methods for the Examination of Water and Wastewater" (21st Edition) and Method X314 in the BC Laboratory Manual (2005). Total suspended solids is the residue retained by a 1.5 µm filter.

A3-2.12 Conventional Parameters

Conventional parameters include: alkalinity, conductivity, phosphorus (total and dissolved), pH, true color, and turbidity.

Winnipeg Laboratory (Unit D-675 Berry Street, Winnipeg, MB): Analyses performed at CanTEST's Winnipeg facilities follow procedures based on those described in the "British Columbia Environmental Laboratory Manual for the Analysis of Water,

Wastewater, Sediment and Biological Materials" (2005 Edition) and "Standards Methods for the Examination of Water and Wastewater" (21st Edition).

APPENDIX 4.

QUALITY ASSURANCE/QUALITY CONTROL RESULTS FOR WATER QUALITY ANALYSES

Page

Table A4-1. Quality assurance/quality control results for routine water chemistry variables measured in the laboratory, open-water and ice-cover seasons, 2009. Percent relative standard deviations (PRSD) were calculated for triplicate samples and values above 18% are indicated in red. Field and trip blank measurements more than five times the analytical detection limits are also indicated in red. Measurements in blue italics are considered suspect.

			Alkalinity				Nitrogen			Phosphorus	
Sample Location	Location ID	Sample Date	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Total (mg/L P)	Dissolved (mg/L P)
Analytical Detection Limits	**ALS**		**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**0.0010**	**0.0010**
Open-water season											
Triplicate Samples											
Split Lake	SPL-5A	25-Jun-09	93.1	76.3	<0.60	<0.40	<0.0030	<0.0050	0.35	0.0226	0.0069
Split Lake	SPL-5B	25-Jun-09	93.3	76.5	<0.60	<0.40	0.0060	<0.0050	0.39	0.0200	0.0070
Split Lake	SPL-5C	25-Jun-09	93.1	76.3	<0.60	<0.40	0.0060	<0.0050	0.38	0.0217	0.0080
Mean			93.2	76.4	<0.60	<0.40	0.0045	<0.0050	0.37	0.0214	0.0073
SD			0.1	0.1	-	-	0.0026	-	0.02	0.0013	0.0006
PRSD			0	0	-	-	-	-	-	6	8
Split Lake	SPL-8A	27-Aug-09	119	97.9	<0.60	<0.40	0.0122	0.0440	0.42	0.0465	0.0216
Split Lake	SPL-8B	27-Aug-09	120	98.1	<0.60	<0.40	0.0112	0.0440	*1.16*	0.0442	0.0216
Split Lake	SPL-8C	27-Aug-09	118	98.1	0.85	<0.40	0.0112	0.0450	0.46	0.0462	0.0218
Mean			119	98.0	<0.60	<0.40	0.0115	0.0443	0.68	0.0456	0.0217
SD			1.0	0.1	0.32	-	0.0006	0.0006	0.42	0.0013	0.0001
PRSD			1	0	-	-	-	1	-	3	1
Clark Lake	CL-1A	1-Oct-09	120	98.1	<0.60	<0.40	0.0090	0.0240	0.40	0.0380	0.0243
Clark Lake	CL-1B	1-Oct-09	120	98.2	<0.60	<0.40	0.0110	0.0230	0.48	0.0379	0.0263
Clark Lake	CL-1C	1-Oct-09	120	98.2	<0.60	<0.40	0.0120	*0.0340*	0.40	0.0394	0.0239
Mean			120	98.2	<0.60	<0.40	0.0107	0.0270	0.43	0.0384	0.0248
SD			0.0	0.1	-	-	0	0.0061	0.05	0.0008	0.0013
PRSD			0	0	-	-	-	-	-	2	5
Gull Lake	GL-2A	28-Jul-09	118	96.7	<0.60	<0.40	0.0079	0.0198	0.53	0.0480	0.0149
Gull Lake	GL-2B	28-Jul-09	118	96.6	<0.60	<0.40	0.0220	0.0188	0.55	0.0445	0.0168
Gull Lake	GL-2C	28-Jul-09	118	96.6	<0.60	<0.40	0.0140	0.0168	0.56	0.0463	0.0155
Mean			118	96.6	<0.60	<0.40	0.0146	0.0185	0.55	0.0463	0.0157

Table A4-1. Continued.

			Alkalinity				Nitrogen			Phosphorus	
Sample Location	Location ID	Sample Date	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Total (mg/L P)	Dissolved (mg/L P)
Analytical Detection Limits	**ALS**		**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**0.0010**	**0.0010**
SD			0.0	0.1	-	-	0.0071	0.0015	0.02	0.0018	0.0010
PRSD			0	0	-	-	-	-	-	4	6
Nelson River	NR-3A	30-Jun-09	124	102	<0.60	<0.40	0.0290	<0.0050	0.48	0.0277	0.0130
Nelson River	NR-3B	30-Jun-09	125	102	<0.60	<0.40	0.0350	<0.0050	0.45	0.0264	0.0125
Nelson River	NR-3C	30-Jun-09	124	102	<0.60	<0.40	0.0230	<0.0050	0.52	0.0346	0.0127
Mean			124	102	<0.60	<0.40	0.0290	<0.0050	0.48	0.0296	0.0127
SD			0.6	0.0	-	-	0.0060	-	0.04	0.0044	0.0003
PRSD			0	0	-	-	**21**	-	-	15	2
Nelson River	NR-3A	30-Jul-09	117	96.7	0.72	<0.4	0.0191	0.0190	0.48	0.0502	0.0177
Nelson River	NR-3B	30-Jul-09	116	96.6	0.92	<0.4	0.0181	0.0170	0.41	0.0406	0.0168
Nelson River	NR-3C	30-Jul-09	116	96.7	0.98	<0.4	0.0161	0.0210	0.43	0.0419	0.0176
Mean			116	96.7	0.87	<0.4	0.0178	0.0190	0.44	0.0442	0.0174
SD			0.6	0.1	0.14	-	0.0015	0.0020	0.04	0.0052	0.0005
PRSD			0	0	-	-	9	-	-	12	3
Nelson River	NR-3A	31-Aug-09	124	104	1.37	<0.4	0.0160	0.0330	0.48	0.0418	0.0208
Nelson River	NR-3B	31-Aug-09	124	104	1.24	<0.4	0.0150	0.0320	0.52	0.0427	0.0202
Nelson River	NR-3C	31-Aug-09	125	104	1.05	<0.4	0.0150	0.0350	0.37	0.0399	0.0176
Mean			124	104	1.22	<0.4	0.0153	0.0333	0.46	0.0415	0.0195
SD			0.6	0.0	0.16	-	0.0006	0.0015	0.08	0.0014	0.0017
PRSD			0	0	-	-	4	5	-	3	9
Nelson River	NR-3A	2-Oct-09	121	99.1	<0.60	<0.40	0.0100	0.0290	0.37	0.0317	0.0200
Nelson River	NR-3B	2-Oct-09	121	99.1	<0.60	<0.40	0.0090	0.0270	0.31	0.0365	0.0201
Nelson River	NR-3C	2-Oct-09	121	99.2	<0.60	<0.40	<0.0030	0.0280	0.36	0.0295	0.0198
Mean			121	99.1	<0.60	<0.40	0.0068	0.0280	0.35	0.0326	0.0200
SD			0.0	0.1	-	-	0.0046	0.0010	0.03	0.0036	0.0002
PRSD			0	0	-	-	-	4	-	11	1

Table A4-1. Continued.

			Alkalinity				Nitrogen			Phosphorus	
Sample Location	Location ID	Sample Date	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Total (mg/L P)	Dissolved (mg/L P)
Analytical Detection Limits	**ALS**		**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**0.0010**	**0.0010**
Trip Blanks											
	Trip	27-Jun-09	2.8	2.3	<0.60	<0.40	0.0087	0.0050	<0.20	<0.0010	<0.0010
	Trip	30-Jul-09	2.7	2.2	<0.60	<0.40	0.0091	<0.0050	<0.20	**0.0058**	**0.0062**
	Trip	27-Aug-09	3.0	2.5	<0.60	<0.40	<0.0030	0.0190	<0.20	<0.0010	<0.0010
	Trip	4-Oct-09	2.5	2.0	<0.60	<0.40	**0.0190**	<0.0050	<0.20	<0.0010	<0.0010
Field Blanks											
Nelson River	NR-2A	27-Jun-09	3.1	2.5	<0.60	<0.40	0.0040	0.0060	<0.20	<0.0010	<0.0010
Clark Lake	CL-5	30-Jul-09	3.4	2.8	<0.60	<0.40	0.0043	0.0084	<0.20	**0.0053**	**0.0062**
Stephens Lake	STL-5	29-Aug-09	3.3	2.7	<0.60	<0.40	0.0040	<0.0050	<0.20	0.0021	0.0021
Nelson River	NR-9	4-Oct-09	2.7	2.2	<0.60	<0.40	**0.0190**	<0.0050	<0.20	<0.0010	<0.0010
Ice-cover season											
Trip Blank	WQ-08-LBR	19-Mar-09	2.0	2.0	<0.60	<0.40	0.0100	0.0050	<0.20	<0.0010	<0.0010
Field Blank	WQ-08-FLD	19-Mar-09	3.0	3.0	<0.60	<0.40	0.0110	0.0080	<0.20	<0.0010	<0.0010

Table A4-1. Continued.

			Organic Carbon				Water Clarity				
Sample Location	Location ID	Sample Date	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)	Lab pH	Hardness as $CaCO_3$ (mg/L)
Analytical Detection Limits	**ALS**		**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**	**0.01**	**0.30**
Open-water season											
Triplicate Samples											
Split Lake	SPL-5A	25-Jun-09	13.1	13.2	186	116	3.6	3.00	5.0	8.13	81.5
Split Lake	SPL-5B	25-Jun-09	13.1	13.2	186	118	3.2	2.50	10.0	8.14	88.8
Split Lake	SPL-5C	25-Jun-09	13.2	12.9	185	116	4.4	2.50	5.0	8.13	86.1
Mean			13.1	13.1	186	117	3.7	2.67	6.7	8.13	85.5
SD			0.1	0.2	0.58	1.2	0.6	0.289	2.9	0.01	3.69
PRSD			0	1	0	1	-	11	-	0	4
Split Lake	SPL-8A	27-Aug-09	8.9	8.5	285	166	13.6	26.0	25.0	8.28	120
Split Lake	SPL-8B	27-Aug-09	8.6	8.6	287	174	14.0	26.0	30.0	8.29	120
Split Lake	SPL-8C	27-Aug-09	8.7	8.5	286	170	14.0	26.0	30.0	8.30	117
Mean			8.7	8.5	286	170	13.9	26.0	28.3	8.29	119
SD			0.2	0.1	1.00	4.0	0.2	0	2.9	0.01	1.73
PRSD			2	1	0	2	2	0	10	0	1
Clark Lake	CL-1A	1-Oct-09	9.0	9.4	300	162	9.6	19.0	20.0	8.23	111
Clark Lake	CL-1B	1-Oct-09	9.1	8.9	300	180	9.6	19.0	20.0	8.22	113
Clark Lake	CL-1C	1-Oct-09	9.0	9.1	300	176	8.8	19.0	20.0	8.23	111
Mean			9.0	9.1	300	173	9.3	19.0	20.0	8.23	112
SD			0.1	0.3	0	9.5	0.5	0	0.0	0.01	1.15
PRSD			1	3	0	5	-	0	-	0	1
Gull Lake	GL-2A	28-Jul-09	8.5	8.5	278	194	17.2	26.0	30.0	8.25	120
Gull Lake	GL-2B	28-Jul-09	8.9	8.4	279	198	18.0	24.0	30.0	8.26	120
Gull Lake	GL-2C	28-Jul-09	8.6	8.3	280	198	17.6	25.0	30.0	8.24	122
Mean			8.7	8.4	279	197	17.6	25.0	30.0	8.25	121
SD			0.2	0.1	1.00	2.3	0.4	1.00	0.0	0.01	1.15
PRSD			2	1	0	1	2	4	0	0	1

Table A4-1. Continued.

			Organic Carbon				Water Clarity				
Sample Location	Location ID	Sample Date	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)	Lab pH	Hardness as $CaCO_3$ (mg/L)
Analytical Detection Limits	**ALS**		**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**	**0.01**	**0.30**
Nelson River	NR-3A	30-Jun-09	9.1	9.1	291	198	17.2	25.0	40.0	8.26	121
Nelson River	NR-3B	30-Jun-09	8.5	8.7	290	200	14.8	23.0	50.0	8.26	123
Nelson River	NR-3C	30-Jun-09	8.3	8.6	290	206	16.0	25.0	50.0	8.26	119
Mean			8.6	8.8	290	201	16.0	24.3	46.7	8.26	121
SD			0.4	0.3	0.58	4.2	1.2	1.15	5.8	0.00	2.00
PRSD			5	3	0	2	7	5	12	0	2
Nelson River	NR-3A	30-Jul-09	10.5	8.5	273	182	14.0	26.0	30.0	8.32	118
Nelson River	NR-3B	30-Jul-09	8.3	8.0	273	178	14.0	25.0	40.0	8.33	118
Nelson River	NR-3C	30-Jul-09	8.5	8.2	272	186	13.6	24.0	35.0	8.34	121
Mean			9.1	8.2	273	182	13.9	25.0	35.0	8.33	119
SD			1.2	0.3	0.58	4.0	0.2	1.00	5.0	0.01	1.7
PRSD			13	3	0	2	2	4	14	0	1
Nelson River	NR-3A	31-Aug-09	9.1	9.6	305	202	9.2	19.0	20.0	8.33	134
Nelson River	NR-3B	31-Aug-09	9.3	9.6	303	200	10.4	20.0	20.0	8.32	133
Nelson River	NR-3C	31-Aug-09	9.3	9.6	303	204	11.6	21.0	20.0	8.31	134
Mean			9.2	9.6	304	202	10.4	20.0	20.0	8.32	134
SD			0.1	0.0	1.15	2.0	1.2	1.00	0.0	0.01	0.58
PRSD			1	0	0	1	-	5	-	0	0
Nelson River	NR-3A	2-Oct-09	8.7	9.1	298	162	11.6	20.0	10.0	8.27	122
Nelson River	NR-3B	2-Oct-09	8.6	8.8	297	176	11.6	20.0	10.0	8.27	120
Nelson River	NR-3C	2-Oct-09	8.9	9.2	298	152	11.2	20.0	15.0	8.28	120
Mean			8.7	9.0	298	163	11.5	20.0	11.7	8.27	121
SD			0.2	0.2	0.58	12.1	0.2	0	2.9	0.01	1.15
PRSD			2	2	0	7	2	0	-	0	1
Trip Blanks	Trip	27-Jun-09	<1.0	<1.0	0.93	<5.0	<2.0	0.050	10.0	6.32	<0.30
	Trip	30-Jul-09	<1.0	<1.0	1.05	<5.0	<2.0	0.050	<5.0	6.27	<0.30
	Trip	27-Aug-09	<1.0	<1.0	1.02	<5.0	<2.0	0.050	<5.0	6.55	<0.30
	Trip	4-Oct-09	<1.0	<1.0	0.68	<5.0	<2.0	0.050	<5.0	5.87	<0.30

Table A4-1. Continued.

			Organic Carbon				Water Clarity				
Sample Location	Location ID	Sample Date	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)	Lab pH	Hardness as $CaCO_3$ (mg/L)
Analytical Detection Limits	**ALS**		**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**	**0.01**	**0.30**
Field Blanks											
Nelson River	NR-2A	27-Jun-09	<1.0	<1.0	1.25	<5.0	<2.0	0.100	10.0	6.38	0.33
Clark Lake	CL-5	30-Jul-09	<1.0	<1.0	1.94	<5.0	<2.0	<0.050	<5.0	6.60	0.66
Stephens Lake	STL-5	29-Aug-09	<1.0	<1.0	2.04	<5.0	<2.0	0.100	<5.0	6.59	0.65
Nelson River	NR-9	4-Oct-09	<1.0	<1.0	0.83	<5.0	<2.0	0.050	<5.0	6.09	<0.30
Ice-cover season											
Trip Blank	WQ-08-LBR	19-Mar-09	<1.0	<1.0	0.80	<5.0	<2.0	0.200	5.0	5.73	<0.30
Field Blank	WQ-08-FLD	19-Mar-09	<1.0	<1.0	1.80	<5.0	<2.0	**0.600**	5.0	6.33	0.50

Table A4-1. Continued.

			Algal Pigments		
Sample Location	Location ID	Sample Date	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa
Analytical Detection Limits	**ALS**		**1.0**	**1.0**	**1.0**
Open-water season					
Triplicate Samples					
Split Lake	SPL-5A	25-Jun-09	2.3	1.0	1.3
Split Lake	SPL-5B	25-Jun-09	2.7	2.1	1.4
Split Lake	SPL-5C	25-Jun-09	3.1	2.0	1.4
Mean			2.7	1.7	1.4
SD			0.4	0.6	0.1
PRSD			-	-	-
Split Lake	SPL-8A	27-Aug-09	3.8	1.5	1.5
Split Lake	SPL-8B	27-Aug-09	3.0	1.0	1.0
Split Lake	SPL-8C	27-Aug-09	3.8	2.1	1.5
Mean			3.5	1.5	1.3
SD			0.5	0.6	0.3
PRSD			-	-	-
Clark Lake	CL-1A	1-Oct-09	5.7	2.3	1.5
Clark Lake	CL-1B	1-Oct-09	5.0	3.1	1.4
Clark Lake	CL-1C	1-Oct-09	5.3	2.9	1.5
Mean			5.3	2.8	1.5
SD			0.4	0.4	0.1
PRSD			7	-	-
Gull Lake	GL-2A	28-Jul-09	5.0	2.3	1.5
Gull Lake	GL-2B	28-Jul-09	5.0	2.5	1.5
Gull Lake	GL-2C	28-Jul-09	5.7	1.8	1.5
Mean			5.2	2.2	1.5
SD			0.4	0.4	0.0
PRSD			8	-	-

Table A4-1. Continued.

			Algal Pigments		
Sample Location	Location ID	Sample Date	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa
Analytical Detection Limits	**ALS**		**1.0**	**1.0**	**1.0**
Nelson River	NR-3A	30-Jun-09	4.6	1.3	1.5
Nelson River	NR-3B	30-Jun-09	4.2	1.7	1.5
Nelson River	NR-3C	30-Jun-09	3.0	<1.0	1.5
Mean			3.9	1.2	1.5
SD			0.8	0.8	0.0
PRSD			-	-	-
Nelson River	NR-3A	30-Jul-09	4.6	1.8	1.5
Nelson River	NR-3B	30-Jul-09	5.3	1.9	1.5
Nelson River	NR-3C	30-Jul-09	4.6	2.1	1.5
Mean			4.8	1.9	1.5
SD			0.4	0.2	0.0
PRSD			8	-	-
Nelson River	NR-3A	31-Aug-09	3.4	1.6	1.5
Nelson River	NR-3B	31-Aug-09	3.4	1.6	1.5
Nelson River	NR-3C	31-Aug-09	2.7	1.6	1.4
Mean			3.2	1.6	1.5
SD			0.4	0.0	0.1
PRSD			-	-	-
Nelson River	NR-3A	2-Oct-09	3.4	1.6	1.5
Nelson River	NR-3B	2-Oct-09	3.1	2.3	1.4
Nelson River	NR-3C	2-Oct-09	3.1	2.0	1.4
Mean			3.2	2.0	1.4
SD			0.2	0.4	0.1
PRSD			-	-	-
Trip Blanks					
	Trip	27-Jun-09	<1.0	<1.0	1.0
	Trip	30-Jul-09	<1.0	<1.0	1.0

Table A4-1. Continued.

			Algal Pigments		
Sample Location	Location ID	Sample Date	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa
Analytical Detection Limits	**ALS**		**1.0**	**1.0**	**1.0**
	Trip	27-Aug-09	<1.0	<1.0	1.0
	Trip	4-Oct-09	<1.0	<1.0	1.0
Field Blanks					
Nelson River	NR-2A	27-Jun-09	<1.0	<1.0	1.0
Clark Lake	CL-5	30-Jul-09	<1.0	<1.0	1.0
Stephens Lake	STL-5	29-Aug-09	<1.0	<1.0	1.0
Nelson River	NR-9	4-Oct-09	<1.0	<1.0	1.0
Ice-cover season					
Trip Blank	WQ-08-LBR	19-Mar-09	<1.0	<1.0	1.0
Field Blank	WQ-08-FLD	19-Mar-09	<1.0	<1.0	1.0

Table A4-2. Quality assurance/quality control results for major ions and metals measured in the laboratory, open-water and ice-cover seasons, 2009. Percent relative standard deviations (PRSD) were calculated for triplicate samples and values in excess of 18% are indicated in red. Field and trip blank measurements more than five times the analytical detection limits are also indicated in red. Measurements in blue italics are considered suspect.

Sample Location	Location ID	Sampling Date	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total	Chloride Dissolved
Analytical Detection Limit			**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**	**9.0**
Open-water season													
Triplicate Samples													
Split Lake	SPL-5A	25-Jun-09	0.249	0.00060	0.00058	0.0177	<0.0010	<0.00020	<0.030	<0.000010	22.0	<0.00010	9.2
Split Lake	SPL-5B	25-Jun-09	0.265	0.00052	0.00060	0.0201	<0.0010	<0.00020	<0.030	<0.000010	24.0	<0.00010	<9.0
Split Lake	SPL-5C	25-Jun-09	0.222	0.00052	0.00062	0.0194	<0.0010	<0.00020	<0.030	<0.000010	23.1	<0.00010	<9.0
Mean			0.245	0.00055	0.00060	0.0191	<0.0010	<0.00020	<0.030	<0.000010	23.0	<0.00010	<9.0
SD			0.022	0.00005	0.00002	0.00123	-	-	-	-	1.00	-	2.7
PRSD			9	-	-	6	-	-	-	-	4	-	-
Split Lake	SPL-8A	27-Aug-09	1.15	<0.00050	0.00116	0.0366	<0.0010	<0.00020	<0.030	<0.000010	28.7	<0.00010	19.7
Split Lake	SPL-8B	27-Aug-09	0.824	<0.00050	0.00121	0.0383	<0.0010	<0.00020	<0.030	<0.000010	28.7	<0.00010	19.7
Split Lake	SPL-8C	27-Aug-09	0.889	<0.00050	0.00121	0.0380	<0.0010	<0.00020	<0.030	<0.000010	27.5	<0.00010	19.7
Mean			0.954	<0.00050	0.00119	0.0376	<0.0010	<0.00020	<0.030	<0.000010	28.3	<0.00010	19.7
SD			0.173	-	0.00003	0.00091	-	-	-	-	0.69	-	0.0
PRSD			18	-	-	2	-	-	-	-	2	-	-
Clark Lake	CL-1A	1-Oct-09	0.603	0.00055	0.00134	0.0359	<0.0010	<0.00020	<0.030	<0.000010	26.8	<0.00010	20.5
Clark Lake	CL-1B	1-Oct-09	0.657	<0.00050	0.00144	0.0367	<0.0010	<0.00020	<0.030	<0.000010	27.3	<0.00010	20.5
Clark Lake	CL-1C	1-Oct-09	*0.886*	<0.00050	0.00131	0.0344	<0.0010	<0.00020	<0.030	<0.000010	26.8	<0.00010	20.4
Mean			0.715	<0.00050	0.00136	0.0357	<0.0010	<0.00020	<0.030	<0.000010	27.0	<0.00010	20.5
SD			0.150	0.00017	0.00007	0.00117	-	-	-	-	0.29	-	0.1
PRSD			**21**	-	-	3	-	-	-	-	1	-	-
Gull Lake	GL-2A	28-Jul-09	*1.38*	<0.00050	0.00107	0.0374	<0.0010	<0.00020	<0.030	<0.000010	28.6	0.00011	20.1
Gull Lake	GL-2B	28-Jul-09	0.443	<0.00050	0.00101	0.0316	<0.0010	<0.00020	<0.030	<0.000010	28.9	<0.00010	20.0
Gull Lake	GL-2C	28-Jul-09	0.603	<0.00050	0.00105	0.0335	<0.0010	<0.00020	<0.030	<0.000010	29.5	<0.00010	20.1
Mean			0.809	<0.00050	0.00104	0.0342	<0.0010	<0.00020	<0.030	<0.000010	29.0	<0.00010	20.1
SD			0.501	-	0.00003	0.00296	-	-	-	-	0.46	0.00003	0.1
PRSD			**62**	-	-	9	-	-	-	-	2	-	-

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total	Chloride Dissolved
Analytical Detection Limit			**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**	**9.0**
Nelson River	NR-3A	30-Jun-09	0.251	<0.00050	0.00100	0.0366	<0.0010	<0.00020	<0.030	0.000010	29.3	<0.00010	18.8
Nelson River	NR-3B	30-Jun-09	0.275	0.00058	0.00103	0.0364	<0.0010	<0.00020	<0.030	0.000014	30.1	<0.00010	18.4
Nelson River	NR-3C	30-Jun-09	0.272	<0.00050	0.00099	0.0358	<0.0010	<0.00020	<0.030	<0.000010	29.0	<0.00010	18.4
Mean			0.266	<0.00050	0.00101	0.0363	<0.0010	<0.00020	<0.030	<0.000010	29.5	<0.00010	18.5
SD			0.013	-	0.00002	0.00042	-	-	-	-	0.57	-	0.2
PRSD			5	-	-	1	-	-	-	-	2	-	-
Nelson River	NR-3A	30-Jul-09	*0.248*	<0.00050	0.00109	0.0312	<0.0010	<0.00020	<0.030	<0.000010	28.7	<0.00010	19.8
Nelson River	NR-3B	30-Jul-09	1.16	<0.0005	0.00116	0.0379	<0.0010	<0.00020	<0.030	<0.000010	28.5	0.00012	19.7
Nelson River	NR-3C	30-Jul-09	1.22	0.00068	0.00116	0.0386	<0.0010	<0.00020	<0.030	<0.000010	29.2	0.00012	19.8
Mean			0.876	<0.00050	0.00114	0.0359	<0.0010	<0.00020	<0.030	<0.000010	28.8	<0.00010	19.8
SD			0.545	-	0.00004	0.00409	-	-	-	-	0.36	0.00004	0.1
PRSD			**62**	-	-	11	-	-	-	-	1	-	-
Nelson River	NR-3A	31-Aug-09	0.736	<0.00050	0.00121	0.0381	<0.0010	<0.00020	<0.030	<0.000010	32.5	<0.00010	20.3
Nelson River	NR-3B	31-Aug-09	0.723	<0.00050	0.00118	0.0373	<0.0010	<0.00020	<0.030	<0.000010	32.4	<0.00010	20.3
Nelson River	NR-3C	31-Aug-09	0.827	<0.00050	0.00121	0.0381	<0.0010	<0.00020	<0.030	<0.000010	33.0	<0.00010	20.2
Mean			0.762	<0.00050	0.00120	0.0378	<0.0010	<0.00020	<0.030	<0.000010	32.6	<0.00010	20.3
SD			0.057	-	0.00002	0.00046	-	-	-	-	0.32	-	0.1
PRSD			7	-	-	1	-	-	-	-	1	-	-
Nelson River	NR-3A	2-Oct-09	0.745	<0.00050	0.00132	0.0396	<0.0010	<0.00020	<0.030	<0.000010	29.4	<0.00010	20.4
Nelson River	NR-3B	2-Oct-09	1.03	<0.00050	0.00126	0.0365	<0.0010	<0.00020	<0.030	<0.000010	29.0	<0.00010	20.3
Nelson River	NR-3C	2-Oct-09	0.786	<0.00050	0.00129	0.0392	<0.0010	<0.00020	<0.030	<0.000010	28.9	<0.00010	20.3
Mean			0.854	<0.00050	0.00129	0.0384	<0.0010	<0.00020	<0.030	<0.000010	29.1	<0.00010	20.3
SD			0.154	-	0.00003	0.00169	-	-	-	-	0.26	-	0.1
PRSD			18	-	-	4	-	-	-	-	1	-	-
Trip Blanks													
	Trip	27-Jun-09	<0.0050	0.00059	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010	<9.0
	Trip	30-Jul-09	<0.0050	0.00057	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.10	<0.00010	<9.0
	Trip	27-Aug-09	<0.0050	<0.00050	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010	<9.0
	Trip	4-Oct-09	<0.0050	<0.00050	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010	<9.0

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total	Chloride Dissolved
Analytical Detection Limit			**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**	**9.0**
Field Blanks													
Nelson River	NR-2A	27-Jun-09	<0.0050	<0.00050	<0.00050	0.00065	<0.0010	<0.00020	<0.030	<0.000010	0.13	<0.00010	<9.0
Clark Lake	CL-5	30-Jul-09	<0.0050	<0.00050	<0.00050	0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.27	<0.00010	<9.0
Stephens Lake	STL-5	29-Aug-09	<0.0050	<0.00050	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.26	<0.00010	<9.0
Nelson River	NR-9	4-Oct-09	<0.0050	<0.00050	<0.00050	0.00073	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010	<9.0
Ice-cover season													
Trip Blank	WQ-08-LBR	19-Mar-09	<0.0050	0.00070	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010	<9.0
Field Blank	WQ-08-FLD	19-Mar-09	0.0070	<0.00050	<0.00050	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.20	<0.00010	<9.0

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total	Molybdenum Total	Nickel Total
Analytical Detection Limit			**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**	**0.00020**	**0.0020**
Open-water season												
Triplicate Samples												
Split Lake	SPL-5A	25-Jun-09	<0.0010	0.00028	0.0042	0.278	<0.00050	6.47	0.00948	<0.000020	0.00027	<0.0020
Split Lake	SPL-5B	25-Jun-09	<0.0010	0.00024	<0.0010	0.268	<0.00050	7.01	0.0103	<0.000020	0.00035	<0.0020
Split Lake	SPL-5C	25-Jun-09	<0.0010	0.00025	0.0009	0.237	<0.00050	6.91	0.0112	0.000021	0.00029	0.0081
Mean			<0.0010	0.00026	0.0019	0.261	<0.00050	6.80	0.0103	<0.000020	0.00030	0.0034
SD			-	0.00002	0.0020	0.021	-	0.287	0.00086	0.000006	0.00004	0.0041
PRSD			-	-	-	8	-	4	8	-	-	-
Split Lake	SPL-8A	27-Aug-09	<0.0010	0.00034	0.0019	0.960	<0.00050	11.8	0.0172	<0.000020	0.00061	<0.0020
Split Lake	SPL-8B	27-Aug-09	0.0013	0.00042	0.0025	0.731	<0.00050	11.9	0.0195	<0.000020	0.00062	<0.0020
Split Lake	SPL-8C	27-Aug-09	0.0014	0.00044	0.0021	0.842	<0.00050	11.7	0.0196	<0.000020	0.00063	<0.0020
Mean			<0.0010	0.00040	0.0022	0.844	<0.00050	11.8	0.0188	<0.000020	0.00062	<0.0020
SD			0.0005	0.00005	0.0003	0.115	-	0.100	0.00136	-	0.00001	-
PRSD			-	-	-	14	-	1	7	-	-	-
Clark Lake	CL-1A	1-Oct-09	<0.0010	0.00036	0.0021	0.506	<0.00050	10.8	0.0160	<0.000020	0.00069	<0.0020
Clark Lake	CL-1B	1-Oct-09	0.0011	0.00035	0.0027	0.541	<0.00050	11.0	0.0167	<0.000020	0.00069	<0.0020
Clark Lake	CL-1C	1-Oct-09	<0.0010	0.00031	0.0022	0.630	<0.00050	10.8	0.0146	<0.000020	0.00061	<0.0020
Mean			<0.0010	0.00034	0.0023	0.559	<0.00050	10.9	0.0158	<0.000020	0.00066	<0.0020
SD			0.0003	0.00003	0.0003	0.064	-	0.115	0.00107	-	0.00005	-
PRSD			-	-	-	11	-	1	7	-	-	-
Gull Lake	GL-2A	28-Jul-09	0.0018	0.00071	0.0022	*0.894*	<0.00050	11.9	0.0216	<0.000020	0.00059	0.0024
Gull Lake	GL-2B	28-Jul-09	<0.0010	0.00059	0.0020	0.485	<0.00050	11.6	0.0188	<0.000020	0.00053	<0.0020
Gull Lake	GL-2C	28-Jul-09	0.0025	0.00061	0.0021	0.567	<0.00050	11.9	0.0200	<0.000020	0.00054	<0.0020
Mean			0.0016	0.00064	0.0021	0.649	<0.00050	11.8	0.0201	<0.000020	0.00055	<0.0020
SD			0.0010	0.00006	0.0001	0.216	-	0.173	0.00140	-	0.00003	0.0008
PRSD			-	-	-	**33**	-	1	7	-	-	-
Nelson River	NR-3A	30-Jun-09	<0.0010	0.00032	0.0173	0.348	<0.00050	11.5	0.0142	<0.000020	0.00054	<0.0020
Nelson River	NR-3B	30-Jun-09	<0.0010	0.00035	0.0189	0.358	0.00064	11.7	0.0149	0.000023	0.00053	0.0021
Nelson River	NR-3C	30-Jun-09	<0.0010	0.00038	0.0187	0.351	<0.00050	11.3	0.0145	<0.000020	0.00051	0.0021
Mean			<0.0010	0.00035	0.0183	0.352	<0.00050	11.5	0.0145	<0.000020	0.00053	<0.0020

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total	Molybdenum Total	Nickel Total
Analytical Detection Limit			**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**	**0.00020**	**0.0020**
SD			-	0.00003	0.0009	0.005	-	0.200	0.00035	-	0.00002	0.0006
PRSD			-	-	5	1	-	2	2	-	-	-
Nelson River	NR-3A	30-Jul-09	<0.0010	0.00050	0.0074	*0.327*	<0.00050	11.3	0.0153	<0.000020	0.00053	<0.0020
Nelson River	NR-3B	30-Jul-09	0.0015	0.00066	0.0036	0.944	<0.00050	11.5	0.0202	<0.000020	0.00061	0.0020
Nelson River	NR-3C	30-Jul-09	0.0015	0.00065	0.0072	0.941	<0.00050	11.7	0.0203	<0.000020	0.00060	0.0020
Mean			0.0012	0.00060	0.0061	0.737	<0.00050	11.5	0.0186	<0.000020	0.00058	<0.0020
SD			0.0006	0.00009	0.0021	0.355	-	0.200	0.00286	-	0.00004	0.0006
PRSD			-	-	-	**48**	-	2	15	-	-	-
Nelson River	NR-3A	31-Aug-09	0.0014	0.00029	0.0018	0.603	<0.00050	12.8	0.0152	0.000056	0.00041	<0.0020
Nelson River	NR-3B	31-Aug-09	0.0013	0.00028	0.0020	0.608	<0.00050	12.7	0.0155	0.000039	0.00044	<0.0020
Nelson River	NR-3C	31-Aug-09	0.0014	0.00030	0.0020	0.642	<0.00050	12.6	0.0157	0.000047	0.00042	<0.0020
Mean			0.0014	0.00029	0.0019	0.618	<0.00050	12.7	0.0155	0.000047	0.00042	<0.0020
SD			0.0001	0.00001	0.0001	0.021	-	0.100	0.00025	0.000009	0.00002	-
PRSD			-	-	-	3	-	1	2	-	-	-
Nelson River	NR-3A	2-Oct-09	<0.0010	0.00038	0.0021	0.625	0.00057	11.8	0.0164	<0.000020	0.00068	<0.0020
Nelson River	NR-3B	2-Oct-09	<0.0010	0.00027	0.0020	0.750	<0.00050	11.6	0.0141	<0.000020	0.00064	<0.0020
Nelson River	NR-3C	2-Oct-09	<0.0010	0.00037	0.0020	0.642	0.00071	11.7	0.0161	<0.000020	0.00066	<0.0020
Mean			<0.0010	0.00034	0.0020	0.672	0.00051	11.7	0.0155	<0.000020	0.00066	<0.0020
SD			-	0.00006	0.0001	0.068	0.00024	0.100	0.00125	-	0.00002	-
PRSD			-	-	-	10	-	1	8	-	-	-
Trip Blanks												
	Trip	27-Jun-09	0.0014	<0.00020	<0.0010	0.047	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
	Trip	30-Jul-09	<0.0010	0.00031	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
	Trip	27-Aug-09	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
	Trip	4-Oct-09	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
Field Blanks												
Nelson River	NR-2A	27-Jun-09	0.0014	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
Clark Lake	CL-5	30-Jul-09	<0.0010	0.00024	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
Stephens Lake	STL-5	29-Aug-09	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	0.000021	<0.00020	<0.0020
Nelson River	NR-9	4-Oct-09	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total	Molybdenum Total	Nickel Total
Analytical Detection Limit			**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**	**0.00020**	**0.0020**
Ice-cover season												
Trip Blank	WQ-08-LBR	19-Mar-09	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020
Field Blank	WQ-08-FLD	19-Mar-09	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010	<0.00030	<0.000020	<0.00020	<0.0020

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved	Tellurium Total	Thallium Total	Tin Total
Analytical Detection Limit			**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**	**0.0010**	**0.00010**	**0.00060**
Open-water season													
Triplicate Samples													
Split Lake	SPL-5A	25-Jun-09	1.37	0.00125	<0.0010	0.70	<0.00010	6.52	0.0587	<9.0	<0.0010	<0.00010	<0.00060
Split Lake	SPL-5B	25-Jun-09	1.49	0.00139	<0.0010	0.65	<0.00010	7.30	0.0655	<9.0	<0.0010	<0.00010	<0.00060
Split Lake	SPL-5C	25-Jun-09	1.45	0.00133	<0.0010	0.67	<0.00010	6.87	0.0634	<9.0	<0.0010	<0.00010	<0.00060
Mean			1.44	0.00132	<0.0010	0.67	<0.00010	6.90	0.0625	<9.0	<0.0010	<0.00010	<0.00060
SD			0.06	0.00007	-	0.03	-	0.391	0.00348	-	-	-	-
PRSD			4	5	-	4	-	6	6	-	-	-	-
Split Lake	SPL-8A	27-Aug-09	2.48	0.00226	<0.0010	2.54	<0.00010	14.9	0.111	23.5	<0.0010	<0.00010	<0.00060
Split Lake	SPL-8B	27-Aug-09	2.59	0.00307	<0.0010	2.57	<0.00010	15.3	0.111	23.2	<0.0010	<0.00010	<0.00060
Split Lake	SPL-8C	27-Aug-09	2.58	0.00320	<0.0010	2.57	<0.00010	14.7	0.107	24.2	<0.0010	<0.00010	<0.00060
Mean			2.55	0.00284	<0.0010	2.56	<0.00010	15.0	0.110	23.6	<0.0010	<0.00010	<0.00060
SD			0.06	0.00051	-	0.02	-	0.306	0.00231	0.5	-	-	-
PRSD			2	18	-	1	-	2	2	-	-	-	-
Clark Lake	CL-1A	1-Oct-09	2.58	0.00288	<0.0010	2.53	<0.00010	15.7	0.106	20.5	<0.0010	<0.00010	<0.00060
Clark Lake	CL-1B	1-Oct-09	2.64	0.00310	<0.0010	2.49	<0.00010	16.0	0.108	20.1	<0.0010	<0.00010	<0.00060
Clark Lake	CL-1C	1-Oct-09	2.50	0.00239	<0.0010	2.54	<0.00010	15.9	0.106	21.3	<0.0010	<0.00010	<0.00060
Mean			2.57	0.00279	<0.0010	2.52	<0.00010	15.9	0.107	20.6	<0.0010	<0.00010	<0.00060
SD			0.07	0.00036	-	0.03	-	0.153	0.00115	0.6	-	-	-
PRSD			3	13	-	1	-	1	1	-	-	-	-
Gull Lake	GL-2A	28-Jul-09	2.92	*0.00351*	<0.0010	1.57	<0.00010	14.3	0.0957	21.4	<0.0010	<0.00010	<0.00060
Gull Lake	GL-2B	28-Jul-09	2.57	0.00218	<0.0010	1.59	<0.00010	16.8	0.0927	21.3	<0.0010	<0.00010	<0.00060
Gull Lake	GL-2C	28-Jul-09	2.67	0.00237	<0.0010	1.56	<0.00010	17.2	0.0921	21.3	<0.0010	<0.00010	<0.00060
Mean			2.72	0.00269	<0.0010	1.57	<0.00010	16.1	0.0935	21.3	<0.0010	<0.00010	<0.00060
SD			0.18	0.00072	-	0.02	-	1.57	0.00193	0.1	-	-	-
PRSD			7	**27**	-	1	-	10	2	-	-	-	-
Nelson River	NR-3A	30-Jun-09	2.52	0.00198	<0.0010	1.09	<0.00010	16.5	0.116	18.8	<0.0010	<0.00010	<0.00060
Nelson River	NR-3B	30-Jun-09	2.59	0.00186	<0.0010	1.10	<0.00010	16.9	0.109	18.4	<0.0010	<0.00010	<0.00060
Nelson River	NR-3C	30-Jun-09	2.49	0.00191	<0.0010	1.11	<0.00010	16.3	0.109	18.8	<0.0010	<0.00010	<0.00060

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved	Tellurium Total	Thallium Total	Tin Total
Analytical Detection Limit			**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**	**0.0010**	**0.00010**	**0.00060**
Mean			2.53	0.00192	<0.0010	1.10	<0.00010	16.6	0.111	18.7	<0.0010	<0.00010	<0.00060
SD			0.05	0.00006	-	0.01	-	0.306	0.00404	0.2	-	-	-
PRSD			2	3	-	1	-	2	4	-	-	-	-
Nelson River	NR-3A	30-Jul-09	2.55	*0.00180*	<0.0010	1.51	<0.00010	16.7	0.0921	19.6	<0.0010	<0.00010	<0.00060
Nelson River	NR-3B	30-Jul-09	2.85	0.00364	<0.0010	1.64	<0.00010	16.5	0.0958	19.6	<0.0010	<0.00010	<0.00060
Nelson River	NR-3C	30-Jul-09	2.91	0.00372	<0.0010	1.64	<0.00010	16.9	0.0962	19.6	<0.0010	<0.00010	0.00086
Mean			2.77	0.00305	<0.0010	1.60	<0.00010	16.7	0.0947	19.6	<0.0010	<0.00010	<0.00060
SD			0.19	0.00109	-	0.08	-	0.200	0.00226	0.0	-	-	0.00032
PRSD			7	**36**	-	5	-	1	2	-	-	-	-
Nelson River	NR-3A	31-Aug-09	3.02	0.00269	<0.0010	2.56	<0.00010	18.5	0.130	25.5	<0.0010	<0.00010	<0.00060
Nelson River	NR-3B	31-Aug-09	3.02	0.00268	<0.0010	2.55	<0.00010	18.1	0.128	26.1	<0.0010	<0.00010	<0.00060
Nelson River	NR-3C	31-Aug-09	3.07	0.00280	<0.0010	2.58	<0.00010	18.2	0.129	27.5	<0.0010	<0.00010	<0.00060
Mean			3.04	0.00272	<0.0010	2.56	<0.00010	18.3	0.129	26.4	<0.0010	<0.00010	<0.00060
SD			0.03	0.00007	-	0.02	-	0.208	0.00100	1.0	-	-	-
PRSD			1	2	-	1	-	1	1	-	-	-	-
Nelson River	NR-3A	2-Oct-09	2.83	0.00303	<0.0010	2.52	<0.00010	17.9	0.109	21.7	<0.0010	<0.00010	<0.00060
Nelson River	NR-3B	2-Oct-09	2.67	0.00222	<0.0010	2.49	<0.00010	17.4	0.106	20.3	<0.0010	<0.00010	<0.00060
Nelson River	NR-3C	2-Oct-09	2.80	0.00305	<0.0010	2.47	<0.00010	17.5	0.107	20.3	<0.0010	<0.00010	<0.00060
Mean			2.77	0.00277	<0.0010	2.49	<0.00010	17.6	0.107	20.8	<0.0010	<0.00010	<0.00060
SD			0.09	0.00047	-	0.03	-	0.265	0.00153	0.8	-	-	-
PRSD			3	17	-	1	-	2	1	-	-	-	-
Trip Blanks													
	Trip	27-Jun-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	0.035	<0.00010	<9.0	<0.0010	<0.00010	<0.00060
	Trip	30-Jul-09	0.19	<0.00020	<0.0010	<0.10	<0.00010	<0.030	<0.00010	<9.0	<0.0010	<0.00010	<0.00060
	Trip	27-Aug-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	<0.030	<0.00010	<9.0	<0.0010	<0.00010	<0.00060
	Trip	4-Oct-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	<0.030	<0.00010	<9.0	<0.0010	<0.00010	<0.00060
Field Blanks													
Nelson River	NR-2A	27-Jun-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	0.035	0.00011	<9.0	<0.0010	<0.00010	<0.00060
Clark Lake	CL-5	30-Jul-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	<0.030	0.00015	<9.0	<0.0010	<0.00010	<0.00060

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved	Tellurium Total	Thallium Total	Tin Total
Analytical Detection Limit			**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**	**0.0010**	**0.00010**	**0.00060**
Stephens Lake	STL-5	29-Aug-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	<0.030	0.00014	<9.0	<0.0010	<0.00010	<0.00060
Nelson River	NR-9	4-Oct-09	<0.10	<0.00020	<0.0010	<0.10	<0.00010	<0.030	<0.00010	<9.0	<0.0010	<0.00010	<0.00060
Ice-cover season													
Trip Blank	WQ-08-LBR	19-Mar-09	<0.10	<0.00020	<0.0010	-	<0.00010	<0.030	<0.00010	10.0	<0.0010	<0.00010	<0.00060
Field Blank	WQ-08-FLD	19-Mar-09	<0.10	<0.00020	<0.0010	-	<0.00010	<0.030	<0.00010	<9.0	<0.0010	<0.00010	<0.00060

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit			**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Open-water season								
Triplicate Samples								
Split Lake	SPL-5A	25-Jun-09	0.00717	<0.00020	0.00023	<0.0010	<0.010	<0.00040
Split Lake	SPL-5B	25-Jun-09	0.00698	<0.00020	0.00027	<0.0010	<0.010	<0.00040
Split Lake	SPL-5C	25-Jun-09	0.00606	<0.00020	0.00025	<0.0010	<0.010	<0.00040
Mean			0.00674	<0.00020	0.00025	<0.0010	<0.010	<0.00040
SD			0.00059	-	0.00002	-	-	-
PRSD			9	-	-	-	-	-
Split Lake	SPL-8A	27-Aug-09	*0.0512*	<0.00020	0.00066	0.0022	<0.010	0.00078
Split Lake	SPL-8B	27-Aug-09	0.0343	<0.00020	0.00067	0.0023	<0.010	0.00094
Split Lake	SPL-8C	27-Aug-09	0.0383	<0.00020	0.00066	0.0025	<0.010	0.00096
Mean			0.0413	<0.00020	0.00066	0.0023	<0.010	0.00089
SD			0.00883	-	0.00001	0.0002	-	0.00010
PRSD			**21**	-	1	-	-	-
Clark Lake	CL-1A	1-Oct-09	0.0307	<0.00020	0.00056	0.0020	<0.010	0.00078
Clark Lake	CL-1B	1-Oct-09	0.0421	<0.00020	0.00056	0.0024	<0.010	0.00082
Clark Lake	CL-1C	1-Oct-09	0.0505	<0.00020	0.00054	0.0015	<0.010	0.00069
Mean			0.0411	<0.00020	0.00055	0.0020	<0.010	0.00076
SD			0.00994	-	0.00001	0.0005	-	0.00007
PRSD			**24**	-	2	-	-	-
Gull Lake	GL-2A	28-Jul-09	*0.0711*	<0.00020	0.00055	0.0029	<0.010	0.00100
Gull Lake	GL-2B	28-Jul-09	0.0225	<0.00020	0.00051	0.0017	<0.010	0.00078
Gull Lake	GL-2C	28-Jul-09	0.0297	<0.00020	0.00054	0.0020	<0.010	0.00086
Mean			0.0411	<0.00020	0.00053	0.0022	<0.010	0.00088
SD			0.0262	-	0.00002	0.0006	-	0.00011
PRSD			**64**	-	4	-	-	-
Nelson River	NR-3A	30-Jun-09	0.0135	<0.00020	0.00066	0.0013	<0.010	0.00050
Nelson River	NR-3B	30-Jun-09	0.0139	<0.00020	0.00066	0.0015	0.016	0.00048
Nelson River	NR-3C	30-Jun-09	0.0143	<0.00020	0.00066	0.0014	<0.010	0.00046
Mean			0.0139	<0.00020	0.00066	0.0014	<0.010	0.00048

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit			**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
SD			0.00040	-	0.00000	0.0001	0.006	0.00002
PRSD			3	-	0	-	-	-
Nelson River	NR-3A	30-Jul-09	*0.0108*	<0.00020	0.00060	0.0014	<0.010	0.00130
Nelson River	NR-3B	30-Jul-09	0.0455	<0.00020	0.00063	0.0026	<0.010	0.00110
Nelson River	NR-3C	30-Jul-09	0.0484	<0.00020	0.00062	0.0027	<0.010	0.00118
Mean			0.0349	<0.00020	0.00062	0.0022	<0.010	0.00119
SD			0.0209	-	0.00002	0.0007	-	0.00010
PRSD			**60**	-	2	-	-	-
Nelson River	NR-3A	31-Aug-09	0.0293	<0.00020	0.00065	0.0022	<0.010	0.00068
Nelson River	NR-3B	31-Aug-09	0.0301	<0.00020	0.00066	0.0021	<0.010	0.00071
Nelson River	NR-3C	31-Aug-09	0.0324	<0.00020	0.00067	0.0022	<0.010	0.00073
Mean			0.0306	<0.00020	0.00066	0.0022	<0.010	0.00071
SD			0.00161	-	0.00001	0.0001	-	0.00003
PRSD			5	-	2	-	-	-
Nelson River	NR-3A	2-Oct-09	0.0306	<0.00020	0.00057	0.0022	<0.010	0.00080
Nelson River	NR-3B	2-Oct-09	0.0401	<0.00020	0.00055	0.0017	<0.010	0.00063
Nelson River	NR-3C	2-Oct-09	0.0316	<0.00020	0.00056	0.0022	<0.010	0.00083
Mean			0.0341	<0.00020	0.00056	0.0020	<0.010	0.00075
SD			0.00522	-	0.00001	0.0003	-	0.00011
PRSD			15	-	2	-	-	-
Trip Blanks								
	Trip	27-Jun-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	Trip	30-Jul-09	<0.00090	<0.00020	<0.00010	<0.0010	0.013	<0.00040
	Trip	27-Aug-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	Trip	4-Oct-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Field Blanks								
Nelson River	NR-2A	27-Jun-09	<0.00090	0.00027	<0.00010	<0.0010	<0.010	<0.00040
Clark Lake	CL-5	30-Jul-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Stephens Lake	STL-5	29-Aug-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Nelson River	NR-9	4-Oct-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040

Table A4-2. Continued.

Sample Location	Location ID	Sampling Date	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit			**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Ice-cover season								
Trip Blank	WQ-08-LBR	19-Mar-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Field Blank	WQ-08-FLD	19-Mar-09	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040

Table A4-3. Quality assurance/quality control results for dissolved oxygen measured in the laboratory and *in situ* during the Keeyask and Conawapa water quality sampling programs, open-water season 2009. Relative percent mean difference (RPMD) was calculated for duplicate samples and values in excess of 25% are indicated in red.

Sample Location	Location ID	Sample Date	Dissolved Oxygen (mg/L)		
			Laboratory	Field	RPMD
Analytical Detection Limit			**0.10**	-	-
June					
Split Lake	SPL-4	25-Jun-09	10.9	7.29	**40**
Stephens Lake	STL-2	29-Jun-09	9.90	11.55	15
Nelson River	NR-3	30-Jun-09	10.3	12.38	18
Nelson River	NR-4	30-Jun-09	11.5	13.78	18
July					
Split Lake	SPL-8	28-Jul-09	9.00	9.11	1
Stephens Lake	STL-1	31-Jul-09	9.90	8.56	15
Angling River	AR-1	30-Jul-09	9.60	9.47	1
Nelson River	NR-8	30-Jul-09	9.60	8.89	8
August					
Split Lake	SPL-3	27-Aug-09	10.0	12.82	25
York Landing	YL-1	28-Aug-09	10.1	8.98	12
Nelson River	NR-4	30-Aug-09	11.2	10.20	9
Nelson River	NR-3A	31-Aug-09	11.0	10.35	6
October					
Stephens Lake	STL-4	3-Oct-09	10.5	13.98	**28**
Nelson River	NR-1	5-Oct-09	9.50	13.67	**36**
Nelson River	NR-5	4-Oct-09	10.9	13.98	25
Nelson River	NR-7	4-Oct-09	10.4	13.70	**27**

Table A4-4. Results of inter-laboratory comparisons for routine water chemistry variables measured in surface water samples collected in the Keeyask/Conawapa study area: open-water season, 2009. Relative percent mean difference (RPMD) was calculated for duplicate samples and values in excess of 25% are indicated in red.

				Alkalinity				Nitrogen			Phosphorus	
Sample Location	Location ID	Sample Date	Laboratory	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia [1] (mg/L N)	Dissolved Nitrate/ nitrite [1] (mg/L N)	TKN (mg/L N)	Total (mg/L P)	Dissolved (mg/L P)
Analytical Detection Limits			**ALS**	**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**0.0010**	**0.0010**
			CanTEST	**0.5**	**0.5/ 1**	**0.5**	**0.5**	**0.005**	**0.005**	**0.2**	**0.001**	**0.001**
Stephens Lake	STL-3	29-Jun-09	ALS	132	111	1.3	<0.40	0.0160	<0.0050	0.37	0.0090	0.0075
Stephens Lake	STL-3	29-Jun-09	CanTEST [2]	136	111	<0.5	<0.5	0.023	<0.005	0.4	0.019	0.005
RPMD				3	0	-	-	-	-	-	**71**	**40**
Limestone River	LR-1	30-Jul-09	ALS	122	100	<0.6	<0.40	0.0051	<0.0050	0.51	0.0242	0.0089
Limestone River	LR-1	30-Jul-09	CanTEST	123	101	<0.5	<0.5	0.015	<0.005	0.3	0.013	0.005
RPMD				1	1	-	-	-	-	-	**60**	**56**
Nelson River	NR-1	29-Aug-09	ALS	122	102	1.3	<0.40	0.0380	0.0091	0.51	0.0434	0.0173
Nelson River	NR-1	29-Aug-09	CanTEST	126	103	<0.5	<0.5	0.030	0.015	0.4	0.046	0.023
RPMD				3	1	-	-	24	-	-	6	**28**
Nelson River	NR-6	4-Oct-09	ALS	119	99.4	1.0	<0.40	0.0032	0.0340	0.39	0.0384	0.0186
Nelson River	NR-6	4-Oct-09	CanTEST [2]	122	100	<0.5	<0.5	0.019	0.029	0.3	0.044	0.024
RPMD				2	1	-	-	-	16	-	14	25

Table A4-4. Continued.

				Organic Carbon				Water Clarity					Algal Pigments	
Sample Location	Location ID	Sample Date	Laboratory	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)	Lab pH	Hardness as $CaCO_3$ (mg/L)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Analytical Detection Limits			**ALS**	**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**	**0.01**	**0.30**	**1.0**	**1.0**
			CanTEST	**1**	**1**	**1**	**10**	**1**	**0.1**	**5**	**-**	**0.2/ 1**	**0.5**	**0.5**
Stephens Lake	STL-3	29-Jun-09	ALS	8.1	8.2	255	180	4.4	5.50	30.0	8.32	129	1.1	<1.0
Stephens Lake	STL-3	29-Jun-09	CanTEST [2]	8	7	276	136	4	5.2	18	7.84	119	<0.5	<0.5
RPMD				1	12	8	**28**	-	6	-	6	8	-	-
Limestone River	LR-1	30-Jul-09	ALS	15.2	15.9	182	138	21.6	13.0	80.0	8.29	104	<1.0	1.6
Limestone River	LR-1	30-Jul-09	CanTEST	20	18	193	135	18	11.3	59	8.10	99.0	<0.5	<0.5
RPMD				**27**	12	6	2	18	14	**30**	2	5	-	-
Nelson River	NR-1	29-Aug-09	ALS	8.6	8.2	307	204	11.6	24.0	20.0	8.34	136	4.6	1.3
Nelson River	NR-1	29-Aug-09	CanTEST	9	8	315	184	15	17.8	55	7.83	119	6	<0.5
RPMD				1	1	3	10	**26**	**30**	-	6	13	**26**	-
Nelson River	NR-6	4-Oct-09	ALS	9.3	8.7	302	156	13.2	21.0	15.0	8.31	123	3.4	2.2
Nelson River	NR-6	4-Oct-09	CanTEST [2]	9	8	304	183	9	16	31	7.67	116	6	<0.5
RPMD				3	6	1	16	**38**	**28**	-	8	6	-	-

[1] Water samples collected and sent to CanTEST Ltd were required to be field preserved and therefore total ammonia and nitrate.nitrate were measured in the laboratory.
[2] Samples collected in June and October were discarded by CanTEST Ltd. before rerun requests could be verified.

Table A4-5. Results of inter-laboratory comparisons for total metals and major ions measured in surface water samples collected in the Keeyask/Conawapa study areas: open-water season, 2009. Relative percent mean difference (RPMD) was calculated for duplicate samples and values in excess of 25% are indicated in red.

Sample Location	Location ID	Sampling Date	Laboratory	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Chloride Dissolved
Analytical Detection Limits			**ALS**	**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**9.0**
			CanTEST	**0.001/ 0.005**	**0.0002/ 0.0005/ 0.001**	**0.0002/ 0.001**	**0.0002/ 0.001**	**0.0002/ 0.0005/ 0.001**	**0.0002/ 0.0005/ 0.001**	**0.01/ 0.025/ 0.05**	**0.00004/ 0.00005/ 0.0002**	**0.01/ 0.05**	**0.2**
Stephens Lake	STL-3	29-Jun-09	ALS	0.155	<0.00050	0.00052	0.0174	<0.0010	<0.00020	<0.030	0.000012	34.5	13.6
Stephens Lake	STL-3	29-Jun-09	CanTEST [1]	0.12	<0.001	<0.001	0.0190	<0.001	<0.001	<0.05	<0.0002	32.7	9
RPMD				25	-	-	9	-	-	-	-	5	-
Limestone River	LR-1	30-Jul-09	ALS	0.187	<0.00050	<0.00050	0.0102	<0.0010	<0.00020	<0.030	<0.000010	30.5	<9.0
Limestone River	LR-1	30-Jul-09	CanTEST	0.23	<0.001	<0.001	0.0080	<0.001	<0.001	<0.05	<0.0002	28.8	1
RPMD				21	-	-	24	-	-	-	-	6	-
Nelson River	NR-1	29-Aug-09	ALS	0.558	<0.00050	0.00104	0.0328	<0.0010	<0.00020	<0.030	<0.000010	33.9	19.3
Nelson River	NR-1	29-Aug-09	CanTEST	0.6	<0.001	0.0010	0.0340	<0.001	<0.001	<0.05	<0.0002	28.7	19
RPMD				7	-	-	4	-	-	-	-	17	-
Nelson River	NR-6	4-Oct-09	ALS	0.739	<0.00050	0.00128	0.0386	<0.0010	<0.00020	<0.030	<0.000010	29.7	20.4
Nelson River	NR-6	4-Oct-09	CanTEST [1]	0.51	<0.0005	0.0020	0.0310	<0.0005	<0.0005	<0.025	<0.00005	28.2	20
RPMD				**37**	-	-	22	-	-	-	-	5	-

Table A4-5. Continued.

Sample Location	Location ID	Sampling Date	Laboratory	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total	Molybdenum Total	Nickel Total
Analytical Detection Limits			**ALS**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**	**0.00020**	**0.0020**
			CanTEST	**0.0002/ 0.001**	**0.0002/ 0.0005/ 0.001**	**0.0002/ 0.0005/ 0.001**	**0.01/ 0.05**	**0.0002/ 0.00025/ 0.001**	**0.01/ 0.025/ 0.05**	**0.0002/ 0.0005/ 0.001**	**0.00002**	**0.0001/ 0.0005**	**0.0002/ 0.001**
Stephens Lake	STL-3	29-Jun-09	ALS	<0.0010	0.00084	0.0013	0.127	<0.00050	10.4	0.0268	<0.000020	0.00049	<0.0020
Stephens Lake	STL-3	29-Jun-09	CanTEST [1]	<0.001	<0.001	0.001	0.16	<0.0010	9.00	0.0260	<0.00002	<0.0005	<0.001
RPMD				-	-	-	-	-	14	3	-	-	-
Limestone River	LR-1	30-Jul-09	ALS	<0.0010	0.00038	<0.0010	0.363	<0.00050	6.76	0.0348	<0.000020	<0.00020	<0.0020
Limestone River	LR-1	30-Jul-09	CanTEST	<0.001	<0.001	<0.001	0.49	<0.0010	6.53	0.0380	<0.00002	<0.0005	0.001
RPMD				-	-	-	**30**	-	3	9	-	-	-
Nelson River	NR-1	29-Aug-09	ALS	<0.0010	<0.00020	0.0022	0.414	<0.00050	12.5	0.0100	<0.000020	0.00062	<0.0020
Nelson River	NR-1	29-Aug-09	CanTEST	<0.001	<0.0010	0.002	0.48	<0.0010	11.50	0.0160	<0.00002	0.0005	0.001
RPMD				-	-	-	15	-	8	**46**	-	-	-
Nelson River	NR-6	4-Oct-09	ALS	<0.0010	0.00035	0.0021	0.601	<0.00050	12.0	0.0167	<0.000020	0.00067	<0.0020
Nelson River	NR-6	4-Oct-09	CanTEST [1]	0.002	<0.0005	0.003	0.52	0.0003	11.00	0.0140	<0.00002	0.0007	0.002
RPMD				-	-	-	14	-	9	18	-	-	-

Table A4-5. Continued.

Sample Location	Location ID	Sampling Date	Laboratory	Potassium Total	Rubidium Total	Selenium Total	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved	Tellurium Total	Thallium Total	Tin Total
Analytical Detection Limits			**ALS**	**0.10**	**0.00020**	**0.0010**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**	**0.0010**	**0.00010**	**0.00060**
			CanTEST	**0.01/ 0.02/ 0.05/ 0.1**	**0.0005**	**0.0002/ 0.001**	**0.1**	**0.00005/ 0.0002/ 0.00025**	**0.01/ 0.025/ 0.05**	**0.0002/ 0.0005/ 0.001**	**0.5**	**0.0002/ 0.001**	**0.00002/ 0.0001**	**0.0002/ 0.0005/ 0.001**
Stephens Lake	STL-3	29-Jun-09	ALS	1.76	0.00113	<0.0010	1.83	<0.00010	11.0	0.102	<9.0	<0.0010	<0.00010	<0.00060
Stephens Lake	STL-3	29-Jun-09	CanTEST [1]	1.7	-	<0.001	1.8	<0.00025	9.74	0.0850	13	<0.001	<0.0001	<0.0010
RPMD				3	-	-	2	-	12	18	-	-	-	-
Limestone River	LR-1	30-Jul-09	ALS	0.34	0.00086	<0.0010	3.50	<0.00010	2.21	0.0436	12.6	<0.0010	<0.00010	<0.00060
Limestone River	LR-1	30-Jul-09	CanTEST	<0.1	-	0.001	3.1	<0.00025	2.11	0.0420	1	<0.001	<0.0001	<0.0010
RPMD				-	-	-	12	-	5	4	-	-	-	-
Nelson River	NR-1	29-Aug-09	ALS	2.90	0.00219	<0.0010	2.57	<0.00010	17.4	0.126	21.5	<0.0010	<0.00010	<0.00060
Nelson River	NR-1	29-Aug-09	CanTEST	2.6	-	<0.001	2.3	<0.00025	16.50	0.1100	27	<0.001	<0.0001	<0.0010
RPMD				11	-	-	11	-	5	14	-	-	-	-
Nelson River	NR-6	4-Oct-09	ALS	2.84	0.00296	<0.0010	2.52	<0.00010	17.6	0.106	20.3	<0.0010	<0.00010	<0.00060
Nelson River	NR-6	4-Oct-09	CanTEST [1]	2.5	0.0023	<0.001	2.2	0.00030	15.30	0.1020	25	<0.001	<0.0001	<0.0005
RPMD				14	-	-	14	-	14	4	-	-	-	-

Table A4-5. Continued.

Sample Location	Location ID	Sampling Date	Laboratory	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limits			**ALS**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
			CanTEST	**0.0002/ 0.001**	**0.0005**	**0.0001/ 0.00025/ 0.0005**	**0.0002/ 0.0005/ 0.001**	**0.001/ 0.005**	**0.0005/ 0.002/ 0.01**
Stephens Lake	STL-3	29-Jun-09	ALS	0.00653	<0.00020	0.00040	<0.0010	<0.010	0.00042
Stephens Lake	STL-3	29-Jun-09	CanTEST [1]	0.0060	-	<0.0005	<0.001	<0.005	<0.0100
RPMD				8	-	-	-	-	-
Limestone River	LR-1	30-Jul-09	ALS	0.00921	<0.00020	<0.00010	<0.0010	<0.010	0.00040
Limestone River	LR-1	30-Jul-09	CanTEST	<0.001	-	<0.0005	<0.001	<0.005	<0.0100
RPMD				-	-	-	-	-	-
Nelson River	NR-1	29-Aug-09	ALS	0.0218	<0.00020	0.00058	0.0017	<0.010	0.00060
Nelson River	NR-1	29-Aug-09	CanTEST	0.0220	-	<0.0005	<0.001	<0.005	<0.0100
RPMD				1	-	-	-	-	-
Nelson River	NR-6	4-Oct-09	ALS	0.0317	<0.00020	0.00055	0.0022	<0.010	0.00085
Nelson River	NR-6	4-Oct-09	CanTEST [1]	0.0240	<0.0005	0.0005	0.002	<0.005	<0.0005
RPMD				**28**	-	-	-	-	-

[1] Samples collected in June and October were discarded by CanTEST Ltd. before rerun requests could be verified.

APPENDIX 5.

WATER QUALITY OBJECTIVES AND GUIDELINES

Page

WATER QUALITY OBJECTIVES AND GUIDELINES

The following is a summary of relevant water quality objectives for evaluation of water chemistry data collected in the Keeyask/Conawapa study area. Unless otherwise indicated, the water quality criteria discussed below refer to the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) presented in Williamson (2002).

A5-1 Ammonia

Table A5-1. Range of applicable MWQSOGs for ammonia, for the protection of cool-water or cold-water aquatic life. Values calculated from algorithms provided in Williamson (2002) and the range of pH and water temperature measured in the Study Area, open-water season 2009.

pH (laboratory)	Temperature (°C)	Water Quality Objective (mg/L)			MWQSOG Equation
		30-day	4-day	1-hour	
Cool water, early life stages present					
7.64	5.4	3.82	9.54	15.96	1-3
	20.1	2.66	6.66	15.96	1-3
8.62	5.4	0.89	2.22	2.55	1-3
	20.1	0.62	1.55	2.55	1-3
Cool water, early life stages absent					
7.64	5.4	6.20	15.50	15.96	4-6
	20.1	2.66	6.66	15.96	4-6
8.62	5.4	1.44	2.55	2.55	4-6
	20.1	0.62	1.55	2.55	4-6
Cold water, early life stages absent					
7.64	5.4	6.20	10.66	10.66	10-12
	20.1	2.66	6.66	10.66	10-12
8.62	5.4	1.44	1.71	1.71	10-12
	20.1	0.62	1.55	1.71	10-12

Table A5-2. Range of applicable MWQSOGs for ammonia, for the protection of cool-water or cold-water aquatic life. Values calculated from algorithms provided in Williamson (2002) and the range of pH and water temperature measured in the Study Area, ice-cover season 2009.

pH (laboratory)	Temperature (°C)	Water Quality Objective (mg/L)			MWQSOG Equation
		30-day	4-day	1-hour	
Cool water, early life stages present					
7.83	0.0	4.98	11.51	11.51	4-6
	0.4	4.98	11.51	11.51	4-6
8.36	0.0	2.24	4.20	4.20	4-6
	0.4	2.24	4.20	4.20	4-6
Cool water, early life stages absent					
7.83	0.0	3.07	7.66	7.68	7-9
	0.4	3.07	7.66	7.68	7-9
8.36	0.0	1.38	2.80	2.80	7-9
	0.4	1.38	2.80	2.80	7-9
Cold water, early life stages absent					
7.83	0.0	4.98	7.68	7.68	10-12
	0.4	4.98	7.68	7.68	10-12
8.36	0.0	2.24	2.80	2.80	10-12
	0.4	2.24	2.80	2.80	10-12

A5-2 Dissolved Oxygen

Proposed objectives for dissolved oxygen 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 pike and walleye or cold-water fish species such as whitefish and trout) (Williamson 2002). Objectives are generally more stringent in environments inhabited by cold-water fish species, as is true of the Study Area. Objectives are specific for early life stages and mature life stages and vary according to the averaging duration and are presented in Table A4-3.

Table A5-3. Manitoba Water Quality Objectives for dissolved oxygen (Williamson 2002).

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

Therefore, in winter when water temperature is less than or equal to 5 ^{o}C and early life stages of fall spawning cold-water fish species (e.g., lake whitefish and lake cisco) may be present in the Study Area, the first two objectives apply (9.5 mg/L chronic objective and 8.0 mg/L instantaneous minimum objective) to ensure the protection of these early life stages. Less stringent objectives apply in winter for cool-water fish species that are spring spawners (3.0, 4.0, and 5.5 mg/L).

In the open-water season, when water temperature is greater than 5 ^{o}C and early life stages of cold-water fish species are not present, objectives are less stringent (objectives range from 4.0 to 6.5 mg/L). However, early life stages of spring spawning fish species (e.g., walleye) may be present in the Study Area at this time, thus requiring application of appropriate guidelines to ensure their protection (i.e., early life stages are present for cool-water species). Of the two, objectives for the protection of mature life stages of cold-water fish species and early life stages of cool-water fish species (i.e., when water temperature is greater than 5 ^{o}C) are similar, with one major exception. The instantaneous minimum for the protection of early life stages of cool-water fish species in the ice-free season (5.0 mg/L) is more stringent than the instantaneous minimum objective for the protection of mature life stages of cold-water fish species (4.0 mg/L); chronic objectives are similar for both (5.0 to 6.5 mg/L).

A5-3 Total Suspended Solids (TSS) and Turbidity

MWQSOGs for TSS and turbidity vary according to the environment; the applicable objective for the Study Area is an allowable increase in TSS of 5 mg/L (applies to aquatic environments where 'background' TSS is ≤ 25 mg/L) (Williamson 2002).

A5-4 Nitrate

The Manitoba drinking water quality guideline for nitrate/nitrite is 10 mg N/L. There are no Manitoba water quality guidelines for nitrate for the protection of aquatic life. The CCME (1999; updated to 2010) guideline for nitrate is 2.93 mg N/L for the protection of aquatic life.

A5-5 Other Physico-Chemical Parameters

Guidelines for other relevant water chemistry parameters (e.g., colour) are presented in Table A5-4.

Table A5-4. Proposed MWQSOGs for chemical and physical parameters of surface waters and groundwaters.

Parameter	Water Use	Objectives / Guidelines	Comments
Nitrate/nitrite-nitrogen	Groundwater: Drinking water	10 mg/L	
TDS	Drinking Water:		
	Aesthetic	≤ 500 mg/L	
	Livestock	≤ 3,000 mg/L	
Total phosphorus	Narrative: To prevent nuisance growth and reproduction of aquatic rooted, attached and floating plants, fungi, or	0.025 mg/L	In reservoirs, lakes, ponds, or tributary at the point of entry to these bodies of water
	bacteria or to otherwise render the water unsuitable for other beneficial uses.	0.05 mg/L	All other streams
Colour	Drinking Water: Aesthetic	≤15 TCU	
pH	Drinking Water:		
	Aesthetic	6.5-8.5	
	Freshwater Aquatic Life	6.5-9.0	
	Recreation	5.0-9.0	
Turbidity	Drinking Water: Maximum Acceptable Concentration	1 NTU	
	Drinking Water: Aesthetic	≤ 5 NTU	At the point of consumption

A5-6 Inorganic substances

Table A5-5. Proposed MWQSOGs (chronic) for metals and major ions (Williamson 2002). Ranges are based on results obtained from water samples collected in the Keeyask/Conawapa study area and measured in the laboratory, open-water season 2009. The most stringent objectives/guidelines are indicated in red.

Element	Freshwater Aquatic Life		Drinking Water		
	Guidelines: Not dependent on water hardness	Total Objectives: Dependent on water hardness[1]	Maximum Acceptable Concentration	Interim Maximum Acceptable Concentration	Aesthetic Objective
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Ag	0.1	-	-	-	-
Al	100[2]	-	-	-	-
As	150[3]	-	-	25	-
B	1.5[4]	-	-	5,000	-
Ba	-	-	1,000	-	-
Cd	-	1.56 – 2.96[3]	5	-	-
Chloride	-	-	-	-	≤250,000
Cr (III)	-	49.57 – 101.04[3]	50[5]	-	-
Cu	-	5.89 – 12.37[3]	-	-	≤1,000
Fe	300	-	-	-	≤300
Hg	0.1	-	1	-	-
Mn	-	-	-	-	≤50
Mo	73	-	-	-	-
Na	-	-	-	-	≤200,000-
Ni	-	34.33 – 71.63[3]	-	-	-
Pb	-	1.47 – 3.79[3]	10	-	-

Table A5-5. Continued.

Element	Freshwater Aquatic Life		Drinking Water		
	Guidelines: Not dependent on water hardness	Total Objectives: Dependent on water hardness[1]	Maximum Acceptable Concentration	Interim Maximum Acceptable Concentration	Aesthetic Objective
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Sb	-	-	-	6	-
Se	1.0	-	10	-	-
Sulphate	-	-	-	-	≤500,000
Tl	0.8	-	-		-
U	-	-	-	20	-
Zn	-	77.93 – 162.80 [3]	-	-	≤5,000

[1] Ranges are based on water hardness measured in the Study Area

[2] Guideline based on pH (>6.5), calcium concentrations (>4.0 mg/L), and DOC concentrations (>2 mg/L) in the Study Area.

[3] Values represent the chronic (4-day averaging duration objective) objectives.

[4] CCME long-term guideline for the protection of aquatic life (CCME 1999; updated to 2010).

[5] Total chromium (i.e., Cr (III) + Cr (VI)).

Table A5-6. Proposed MWQSOGs (chronic) for metals and major ions (Williamson 2002). Ranges are based on results obtained from water samples collected in the Keeyask/Conawapa study area and measured in the laboratory, ice-cover season 2009. The most stringent objectives/guidelines are indicated in red.

Element	Freshwater Aquatic Life		Drinking Water		
	Guidelines: Not dependent on water hardness	Total Objectives: Dependent on water hardness[1]	Maximum Acceptable Concentration	Interim Maximum Acceptable Concentration	Aesthetic Objective
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Ag	0.1	-	-	-	-
Al	100[2]	-	-	-	-
As	150[3]	-	-	25	-
B	1.5 [4]	-	-	5,000	-
Ba	-	-	1,000	-	-
Cd	-	1.47 – 2.99 [3]	5	-	-
Chloride	-	-	-	-	≤250,000
Cr (III)	-	46.50 – 102.18 [3]	50 [5]	-	-
Cu	-	5.51 – 12.52 [3]	-	-	≤1,000
Fe	300	-	-	-	≤300
Hg	0.1	-	1	-	-
Mn	-	-	-	-	≤50
Mo	73	-	-	-	-
Na	-	-	-	-	≤200,000-
Ni	-	32.13 – 72.46 [3]	-	-	-
Pb	-	1.35 – 3.85 [3]	10	-	-
Sb	-	-	-	6	-
Se	1.0	-	10	-	-
Sulphate	-	-	-	-	≤500,000
Tl	0.8	-	-		-
U	-	-	-	20	-
Zn	-	72.94 – 164.69 [3]	-	-	≤5,000

[1] Ranges are based on water hardness measured in the Study Area

[2] Guideline based on pH (>6.5), calcium concentrations (>4.0 mg/L), and DOC concentrations (>2 mg/L) in the Study Area.

[3] Values represent the chronic (4-day averaging duration objective) objectives.

[4] CCME long-term guideline for the protection of aquatic life (CCME 1999; updated to 2010).

[5] Total chromium (i.e., Cr (III) + Cr (VI)).

APPENDIX 6.

DETAILED RESULTS OF WATER QUALITY ANALYSES IN THE KEEYASK/CONAWAPA STUDY AREA, 2009

Page

In the interest of reducing the use of paper, Appendix 6 is provided in the attached CD.

APPENDIX 7.

DATA FROM LIGHT CLARITY SURVEYS CONDUCTED ON STEPHENS LAKE

Page

Table A7-1. Surface and profile *in situ* measurements recorded on Stephens Lake during the water clarity surveys, June and July 2009. Values in blue italics are considered suspect.

Sample Location	Location ID	Sample Date	Sample Time	Water Depth (m)	Measurement Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Ross Wright Bay	RBCS-1	29-Jun-09	13:28	2.6	0.3	13.7	11.74	113	234	183	8	7.79	1.70
					1.0	13.7	11.63	112	234	183	8	7.79	-
					2.0	13.7	11.61	112	233	183	8	7.77	-
	RBCS-1	31-Jul-09	13:11	2.0	0.3	17.1	8.40	87	291	247	30	7.73	1.00
					1.0	17.0	8.09	84	290	246	27	7.71	-
	RBCS-2	29-Jun-09	13:50	2.6	0.3	13.4	11.51	111	243	189	20	7.79	1.00
					1.0	13.4	11.49	110	243	189	18	7.81	-
					2.0	13.4	11.48	110	243	189	18	7.82	-
	RBCS-2	31-Jul-09	13:20	2.7	0.3	17.2	7.99	83	291	248	32	7.86	0.77
					1.0	17.0	8.10	84	291	247	31	7.83	-
					2.0	16.9	8.02	83	291	246	30	7.83	-
					2.5	16.8	7.79	80	291	245	28	7.81	-
	RBCS-3	29-Jun-09	14:05	4.8	0.3	13.2	11.74	112	246	191	36	7.86	1.00
					1.0	13.2	11.61	111	246	191	30	7.85	-
					2.0	13.2	11.59	111	245	190	26	7.82	-
					3.0	13.1	11.58	111	245	189	25	7.81	-
					4.0	12.8	11.58	110	247	189	28	7.82	-
	RBCS-3	31-Jul-09	13:35	3.7	0.3	17.0	8.54	88	293	248	41	7.92	0.65
					1.0	17.0	8.26	85	295	250	43	7.90	-
					2.0	16.9	8.28	85	294	249	41	7.90	-
					3.0	16.7	8.09	83	295	248	45	7.88	-
					3.5	16.7	8.02	82	295	248	46	7.88	-
	RBCS-4	29-Jun-09	14:19	6.2	0.3	13.0	11.87	113	259	200	46	7.88	0.70
					1.0	13.0	11.80	112	259	200	41	7.85	-
					2.0	12.9	11.79	112	259	199	36	7.85	-
					3.0	12.8	11.79	112	259	199	36	7.87	-
					4.0	12.7	11.78	112	259	198	35	7.85	-
					5.0	12.6	11.80	112	261	199	39	7.85	-
					6.0	12.4	11.80	111	264	200	52	7.85	-

Table A7-1. Continued.

Sample Location	Location ID	Sample Date	Sample Time	Water Depth (m)	Measurement Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Ross Wright Bay	RBCS-4	31-Jul-09	13:50	5.9	0.3	17.0	8.46	87	297	252	59	7.88	0.50
					1.0	17.0	8.34	86	297	252	59	7.90	-
					2.0	16.9	8.26	85	297	251	56	7.94	-
					3.0	16.9	8.24	85	296	250	53	7.91	-
					4.0	16.9	8.27	85	296	250	52	7.91	-
					5.0	16.8	8.13	84	295	249	49	7.90	-
					5.5	16.7	8.10	83	295	248	50	7.92	-
	RBCS-5	29-Jun-09	14:40	7.3	0.3	12.8	12.02	114	273	209	66	7.95	0.60
					1.0	12.7	11.94	113	273	209	53	7.92	-
					2.0	12.7	11.92	113	273	209	48	7.92	-
					3.0	12.5	11.95	113	273	208	47	7.93	-
					4.0	12.5	11.91	112	274	209	49	7.92	-
					5.0	12.4	11.95	112	274	208	50	7.91	-
					6.0	12.2	11.94	112	275	208	53	7.92	-
					7.0	11.9	11.96	111	278	208	56	7.93	-
	RBCS-5	31-Jul-09	14:10	6.7	0.3	17.0	8.94	92	297	252	59	7.88	0.57
					1.0	16.9	8.73	90	296	250	58	7.89	-
					2.0	16.9	8.55	88	296	250	55	7.92	-
					3.0	16.8	8.50	87	296	250	59	7.91	-
					4.0	16.7	8.48	87	296	249	59	7.92	-
					5.0	16.7	8.37	86	296	249	57	7.92	-
					6.0	16.5	8.27	85	296	248	54	7.91	-
					6.5	16.5	8.09	83	296	248	63	7.91	-
	RBCS-6	29-Jun-09	15:00	4.2	0.3	12.5	12.21	115	276	210	79	7.92	0.60
					1.0	12.5	12.13	114	276	210	62	7.93	-
					2.0	12.5	12.09	114	276	210	54	7.92	-
					3.0	12.5	12.05	114	276	210	49	7.92	-
					4.0	12.4	12.05	113	275	209	45	7.92	-
	RBCS-6	31-Jul-09	14:25	4.1	0.3	17.2	8.89	92	297	253	60	7.88	0.45
					1.0	17.2	8.79	91	297	253	62	7.93	-
					2.0	17.2	8.77	91	297	253	60	7.98	-

Table A7-1. Continued.

Sample Location	Location ID	Sample Date	Sample Time	Water Depth (m)	Measurement Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Ross Wright Bay	RBCS-6	31-Jul-09	14:25		3.0	16.9	8.71	90	297	251	64	8.00	-
					3.8	16.7	8.53	88	297	250	*100*	7.94	-
	RBCS-7	29-Jun-09	15:16	11.3	0.3	12.2	12.22	115	285	215	120	8.02	0.45
					1.0	12.2	12.19	114	285	215	110	8.01	-
					2.0	12.2	12.14	114	284	215	100	7.99	-
					3.0	12.2	12.14	114	284	215	97	7.99	-
					4.0	12.1	12.16	114	284	214	92	7.97	-
					5.0	12.1	12.16	114	284	214	89	7.98	-
					6.0	11.9	12.23	114	285	214	78	7.99	-
					7.0	11.7	12.30	114	285	213	70	7.98	-
					8.0	11.7	12.31	114	285	213	70	7.97	-
					9.0	11.6	12.32	114	284	211	71	7.96	-
					10.0	11.5	12.36	114	284	211	71	7.96	-
					11.0	10.0	12.31	110	278	198	72	7.93	-
	RBCS-7	31-Jul-09	18:26	10.9	0.3	17.2	8.20	85	296	252	61	8.04	0.47
					1.0	17.2	8.10	84	296	252	64	8.04	-
					2.0	17.2	8.05	84	296	252	64	8.03	-
					3.0	17.1	8.14	84	296	251	62	8.03	-
					4.0	16.9	8.10	84	296	250	58	8.02	-
					5.0	16.8	8.13	84	297	250	59	8.03	-
					6.0	16.8	8.15	84	297	250	55	7.97	-
					7.0	16.8	8.04	83	298	251	58	7.97	-
					8.0	16.7	8.04	83	298	251	82	7.98	-
					9.0	15.3	7.00	70	306	249	84	7.94	-
					10.0	14.5	6.20	61	312	249	110	7.80	-
					10.5	13.9	5.50	53	318	251	120	7.71	-
	RBCS-8	29-Jun-09	15:45	8.7	0.3	11.9	12.51	117	289	217	120	7.98	0.40
					1.0	11.9	12.39	115	289	217	100	7.98	-
					2.0	11.9	12.35	115	288	216	94	7.98	-
					3.0	11.9	12.34	115	288	216	88	7.95	-
					4.0	11.9	12.35	115	288	216	86	7.96	-

Table A7-1. Continued.

Sample Location	Location ID	Sample Date	Sample Time	Water Depth (m)	Measurement Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity [1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Ross Wright Bay	RBCS-8	29-Jun-09	15:45		5.0	11.8	12.37	115	288	215	90	7.98	-
					6.0	11.7	12.35	115	287	214	93	7.97	-
					7.0	11.6	12.38	115	289	215	100	7.96	-
					8.0	11.6	12.32	114	290	216	100	7.95	-
	RBCS-8	31-Jul-09	18:50	8.6	0.3	17.4	8.09	84	298	255	65	8.01	0.22
					1.0	17.4	8.41	88	297	254	64	8.02	-
					2.0	17.2	8.37	87	296	252	62	8.06	-
					3.0	17.0	8.31	86	295	250	60	8.09	-
					4.0	16.8	8.20	84	295	249	56	8.08	-
					5.0	16.8	8.07	83	294	248	59	8.06	-
					6.0	16.8	8.18	84	295	249	61	8.02	-
					7.0	16.8	8.13	84	296	250	61	8.04	-
					8.0	16.6	8.01	82	298	250	78	8.05	-
	RBCS-9	29-Jun-09	16:05	7.1	0.3	12.9	12.26	117	300	231	72	8.03	0.45
					1.0	12.9	12.25	116	300	231	73	8.03	-
					2.0	12.9	12.26	117	300	231	71	8.03	-
					3.0	12.8	12.26	116	298	229	72	8.04	-
					4.0	12.5	12.31	116	296	225	75	8.02	-
					5.0	11.8	12.49	116	289	216	81	8.01	-
					6.0	11.6	12.45	115	287	214	80	8.00	-
					7.0	11.5	12.41	115	288	214	84	8.01	-
	RBCS-9	31-Jul-09	19:05	7.5	0.3	17.4	8.40	88	297	254	67	8.24	0.22
					1.0	17.4	8.43	88	296	253	71	8.13	-
					2.0	17.2	8.35	87	297	253	70	8.13	-
					3.0	17.1	8.34	86	296	251	66	8.10	-
					4.0	17.0	8.34	86	297	252	67	8.08	-
					5.0	17.0	8.18	85	298	252	74	8.10	-
					6.0	17.0	8.16	84	298	252	80	8.07	-
					7.0	16.9	8.24	85	298	252	84	8.07	-
	RBCS-10	29-Jun-09	16:26	3.7	0.3	13.7	12.17	118	306	240	75	8.10	0.45
					1.0	13.6	12.16	117	306	239	69	8.09	-

Table A7-1. Continued.

Sample Location	Location ID	Sample Date	Sample Time	Water Depth (m)	Measurement Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity[1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Ross Wright Bay	RBCS-10	29-Jun-09	16:26		2.0	13.6	12.16	117	305	239	71	8.10	-
					3.0	13.4	12.19	117	304	237	74	8.09	-
	RBCS-10	31-Jul-09	19:20	3.4	0.3	17.3	8.34	87	296	252	68	8.19	0.22
					1.0	17.3	8.40	87	296	252	71	8.15	-
					2.0	17.3	8.43	88	296	252	70	8.12	-
					3.0	17.3	8.33	87	296	252	*160*	8.07	-
Stephens Lake	STLCS-1	1-Jul-09	10:18	1.4	0.3	14.9	12.32	122	319	257	310	8.04	0.20
					1.0	14.9	12.43	123	319	257	280	8.04	-
	STLCS-1	31-Jul-09	17:10	1.5	0.3	17.7	8.51	89	299	257	84	8.02	0.37
					1.0	17.7	8.48	89	299	257	83	8.04	-
	STLCS-2	1-Jul-09	10:34	2.5	0.3	14.9	12.32	122	318	257	150	8.07	0.35
					1.0	14.9	12.29	122	318	257	130	8.06	-
					2.0	14.8	12.31	122	318	256	98	8.08	-
	STLCS-2	31-Jul-09	17:20	2.3	0.3	18.0	8.59	91	299	259	75	8.01	0.37
					1.0	17.7	8.65	91	299	257	75	8.00	-
					2.0	17.6	8.57	90	299	257	77	8.01	-
	STLCS-3	1-Jul-09	10:48	2.6	0.3	14.9	12.12	120	319	257	110	8.07	0.35
					1.0	14.9	12.16	120	318	257	90	8.07	-
					2.0	14.8	12.15	120	318	256	89	8.08	-
	STLCS-3	31-Jul-09	17:33	2.9	0.3	17.6	8.53	89	300	258	74	8.06	0.35
					1.0	17.5	8.64	90	300	257	74	8.01	-
					2.0	17.4	8.55	89	300	256	78	7.90	-
					2.5	17.3	8.49	88	301	257	80	7.97	-
	STLCS-4	1-Jul-09	11:02	3.1	0.3	14.9	12.19	121	319	257	93	8.08	0.35
					1.0	14.9	12.20	121	318	257	93	8.08	-
					2.0	14.8	12.24	121	318	256	83	8.07	-
					3.0	14.8	12.20	121	318	256	81	8.07	-
	STLCS-4	31-Jul-09	17:43	2.7	0.3	17.8	8.61	90	300	259	75	8.07	0.22
					1.0	17.5	8.63	90	301	258	76	8.03	-
					2.0	17.4	8.46	88	301	257	80	8.01	-

Table A7-1. Continued.

Sample Location	Location ID	Sample Date	Sample Time	Water Depth (m)	Measurement Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	Conductivity[1] (µS/cm)	Turbidity (NTU)	pH	Secchi Depth (m)
Stephens Lake	STLCS-5	1-Jul-09	11:14	8.0	0.3	14.9	12.13	120	317	256	95	8.09	0.35
					1.0	14.9	12.16	120	317	256	92	8.07	-
					2.0	14.9	12.17	121	317	256	87	8.06	-
					3.0	14.9	12.17	121	316	255	86	8.05	-
					4.0	14.9	12.16	120	316	255	83	8.06	-
					5.0	14.8	12.16	120	316	254	86	8.06	-
					6.0	14.8	12.15	120	316	254	84	8.06	-
					7.0	14.7	12.15	120	316	254	81	8.05	-
	STLCS-5	31-Jul-09	17:50	6.7	0.3	17.9	8.28	87	301	260	81	8.04	0.20
					1.0	17.5	8.37	87	302	259	79	7.99	-
					2.0	17.5	8.38	87	301	258	85	7.96	-
					3.0	17.4	8.31	87	301	257	80	7.95	-
					4.0	17.4	8.38	87	301	257	80	7.93	-
					5.0	17.4	8.41	88	301	257	82	7.95	-
					6.0	17.3	8.40	87	301	257	80	7.91	-

[1] During the open-water season conductivity values were calculated on *in-situ* specific conductance measurements using the following formula: Conductivity = specific conductance * [1+0.0191*(Temp. - 25°C)].

* Bottom was disturbed.

APPENDIX 8.

DETAILED RESULTS OF WATER CHEMISTRY AND PHYTOPLANKTON ANALYSES CONDUCTED DURING THE SPLIT LAKE PLUME EVENT, AUGUST 2009

Page

Table A8-1. Routine water quality results for water samples collected in the nearshore area of Split Lake and analysed in the laboratory, August 2009. Results which are in exceedance from the Split Lake area range are indicated in red.

			Alkalinity				Nitrogen			Phosphorus		
Sample Location	Location ID	Sample Date	as Bicarbonate (HCO_3^-) (mg/L)	as $CaCO_3$ (mg/L)	as Carbonate (CO_3^{2-}) (mg/L)	as Hydroxide (OH^-) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L N)	Total (mg/L P)	Dissolved (mg/L P)	Dissolved Fraction (%)
Analytical Detection Limits			**2.0**	**1.0**	**0.60**	**0.40**	**0.0030**	**0.0050**	**0.20**	**0.0010**	**0.0010**	**-**
Split Lake nearshore												
Split Lake (plume)	UNK	28-Aug-09	132	108	<0.60	<0.40	0.0092	0.0160	0.53	0.0502	0.0178	35
Keeyask water quality sites												
Burntwood River	SPL-1	27-Aug-09	76.2	62.4	<0.60	<0.40	0.0062	0.0300	1.00	0.0378	0.0153	40
Nelson River	SPL-2	27-Aug-09	129	106	<0.60	<0.40	0.0172	0.0520	0.56	0.0443	0.0257	58
Split Lake	SPL-3	27-Aug-09	119	97.2	<0.60	<0.40	0.0092	0.0450	0.48	0.0391	0.0227	58
Split Lake	SPL-4	27-Aug-09	130	108	<0.60	<0.40	0.0152	0.0300	0.44	0.0437	0.0250	57
York Landing	YL-1	28-Aug-09	124	104	1.64	<0.40	0.0162	0.0070	0.58	0.0353	0.0153	43
Split Lake	SPL-5	28-Aug-09	108	88.8	<0.60	<0.40	0.0142	0.0050	0.55	0.0255	0.0158	62
Aiken River	AK-1	28-Aug-09	82.6	67.7	<0.60	<0.40	0.0112	0.0050	0.59	0.0162	0.0092	57
Split Lake	SPL-7	27-Aug-09	126	104	<0.60	<0.40	0.0152	0.0520	0.51	0.0453	0.0231	51
Split Lake	SPL-8A	27-Aug-09	119	97.9	<0.60	<0.40	0.0122	0.0440	0.42	0.0465	0.0216	46
	SPL-8B	27-Aug-09	120	98.1	<0.60	<0.40	0.0112	0.0440	1.16	0.0442	0.0216	49
	SPL-8C	27-Aug-09	118	98.1	0.85	<0.40	0.0112	0.0450	0.46	0.0462	0.0218	47
		Mean	*119*	*98.0*	*<0.60*	*<0.40*	*0.0115*	*0.0443*	*0.68*	*0.0456*	*0.0217*	*48*
Clark Lake	CL-1	27-Aug-09	125	104	0.85	<0.40	0.0112	0.0450	0.49	0.0465	0.0235	51
Split Lake area range		**Minimum**	**76.2**	**62.4**	**<0.60**	**<0.40**	**0.0062**	**0.0050**	**0.42**	**0.0162**	**0.0092**	**40**
		Maximum	**130**	**108**	**1.64**	**<0.40**	**0.0172**	**0.0520**	**1.16**	**0.0465**	**0.0257**	**62**

Table A8-1. Continued.

			Organic Carbon				Water Clarity				Algal Pigments		
Sample Location	Location ID	Sample Date	Total (mg/L)	Dissolved (mg/L)	Conductivity (µmhos/cm)	TDS (mg/L)	TSS (mg/L)	Turbidity (NTU)	True Color (TCU)	Lab pH	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa
Analytical Detection Limits			**1.0**	**1.0**	**0.40**	**5.0**	**2.0**	**0.050**	**5.0**	**0.01**	**1.0**	**1.0**	**1.0**
Split Lake nearshore													
Split Lake (plume)	UNK	28-Aug-09	8.7	8.6	326	212	30.4	22.0	20.0	7.71	8.4	1.5	1.6
Keeyask water quality sites													
Burntwood River	SPL-1	27-Aug-09	9.7	9.3	130	102	10.0	35.0	40.0	8.15	2.7	1.6	1.4
Nelson River	SPL-2	27-Aug-09	8.5	8.4	330	202	12.8	22.0	15.0	8.27	3.1	2.6	1.4
Split Lake	SPL-3	27-Aug-09	9.2	8.6	286	184	8.8	22.0	20.0	8.28	3.8	1.5	1.5
Split Lake	SPL-4	27-Aug-09	8.6	8.3	333	208	8.4	20.0	15.0	8.30	3.1	<1.0	1.5
York Landing	YL-1	28-Aug-09	10.0	9.7	302	202	5.2	16.0	30.0	7.87	8.4	1.8	1.6
Split Lake	SPL-5	28-Aug-09	12.6	12.3	233	166	3.2	9.10	40.0	7.88	4.2	1.7	1.5
Aiken River	AK-1	28-Aug-09	15.3	15.3	130	106	<2.0	1.20	25.0	7.64	<1.0	9.5	1.0
Split Lake	SPL-7	27-Aug-09	8.5	8.4	310	196	12.0	23.0	20.0	8.30	3.8	2.1	1.5
Split Lake	SPL-8A	27-Aug-09	8.9	8.5	285	166	13.6	26.0	25.0	8.28	3.8	1.5	1.5
	SPL-8B	27-Aug-09	8.6	8.6	287	174	14.0	26.0	30.0	8.29	3.0	1.0	1.0
	SPL-8C	27-Aug-09	8.7	8.5	286	170	14.0	26.0	30.0	8.30	3.8	2.1	1.5
		Mean	*8.7*	*8.5*	*286*	*170*	*13.9*	*26.0*	*28.3*	*8.29*	*3.5*	*1.5*	*1.3*
Clark Lake	CL-1	27-Aug-09	8.5	8.2	311	182	13.2	24.0	20.0	8.31	3.4	2.4	1.4
Split Lake area range		**Minimum**	**8.5**	**8.2**	**130**	**102**	**<2.0**	**1.2**	**15.0**	**7.64**	**<1.0**	**<1.0**	**1.0**
		Maximum	**15.3**	**15.3**	**333**	**208**	**14.0**	**35.0**	**40.0**	**8.31**	**8.4**	**9.5**	**1.6**

Table A8-2. Concentrations of metals and major ions measured in the laboratory from the plume sample collected in the nearshore area of Split Lake area, August 2009. Results which are in exceedance from the Split Lake area range are indicated in red.

Sample Location	Location ID	Sampling Date	Hardness as $CaCO_3$	Aluminum Total	Antimony Total	Arsenic Total	Barium Total	Beryllium Total	Bismuth Total	Boron Total	Cadmium Total	Calcium Total	Cesium Total	Chloride Dissolved
Analytical Detection Limit		**(mg/L)**	**0.30**	**0.0050**	**0.00050**	**0.00050**	**0.00030**	**0.0010**	**0.00020**	**0.030**	**0.000010**	**0.10**	**0.00010**	**9.0**
Split Lake nearshore														
Split Lake (plume)	UNK	28-Aug-09	132	0.784	0.00263	0.00130	0.0442	<0.0010	<0.00020	<0.030	0.000012	31.8	0.00010	21.4
Keeyask water quality sites														
Burntwood River	SPL-1	27-Aug-09	68.6	1.11	<0.00050	<0.00050	0.0210	<0.0010	<0.00020	<0.030	<0.000010	18.1	0.00012	<9.0
Nelson River	SPL-2	27-Aug-09	129	0.719	<0.00050	0.00140	0.0418	<0.0010	<0.00020	<0.030	0.000012	30.2	<0.00010	22.3
Split Lake	SPL-3	27-Aug-09	117	0.620	<0.00050	0.00118	0.0365	<0.0010	<0.00020	<0.030	<0.000010	27.8	<0.00010	19.9
Split Lake	SPL-4	27-Aug-09	134	0.622	<0.00050	0.00143	0.0421	<0.0010	<0.00020	<0.030	<0.000010	30.8	<0.00010	22.5
York Landing	YL-1	28-Aug-09	120	0.502	<0.00050	<0.00050	0.0342	<0.0010	<0.00020	<0.030	<0.000010	29.7	<0.00010	20.0
Split Lake	SPL-5	28-Aug-09	103	0.404	<0.00050	<0.00050	0.0237	<0.0010	<0.00020	<0.030	<0.000010	27.3	<0.00010	14.8
Aiken River	AK-1	28-Aug-09	67.0	0.046	<0.00050	<0.00050	0.0040	<0.0010	<0.00020	<0.030	<0.000010	19.5	<0.00010	<9.0
Split Lake	SPL-7	27-Aug-09	127	0.748	<0.00050	0.00134	0.0405	<0.0010	<0.00020	<0.030	<0.000010	29.9	<0.00010	21.4
Split Lake	SPL-8A	27-Aug-09	120	1.15	<0.00050	0.00116	0.0366	<0.0010	<0.00020	<0.030	<0.000010	28.7	<0.00010	19.7
	SPL-8B	27-Aug-09	120	0.824	<0.00050	0.00121	0.0383	<0.0010	<0.00020	<0.030	<0.000010	28.7	<0.00010	19.7
	SPL-8C	27-Aug-09	117	0.889	<0.00050	0.00121	0.0380	<0.0010	<0.00020	<0.030	<0.000010	27.5	<0.00010	19.7
		Mean	*119*	*0.954*	*<0.00050*	*0.00119*	*0.0376*	*<0.0010*	*<0.00020*	*<0.030*	*<0.000010*	*28.3*	*<0.00010*	*19.7*
Clark Lake	CL-1	27-Aug-09	129	1.00	0.00050	0.00137	0.0433	<0.0010	<0.00020	<0.030	<0.000010	30.5	0.00011	21.3
Split Lake area range		**Minimum**	**67.0**	**0.046**	**<0.00050**	**<0.00050**	**0.00395**	**<0.0010**	**<0.00020**	**<0.030**	**<0.00001**	**18.1**	**<0.0001**	**<9.0**
		Maximum	**134**	**1.15**	**0.00050**	**0.00143**	**0.0433**	**<0.0010**	**<0.00020**	**<0.030**	**0.000012**	**30.8**	**0.00012**	**22.5**

Table A8-2. Continued.

Sample Location	Location ID	Sampling Date	Chromium Total	Cobalt Total	Copper Total	Iron Total	Lead Total	Magnesium Total	Manganese Total	Mercury Total	Molybdenum Total	Nickel Total	Potassium Total	Rubidium Total	Selenium Total
Analytical Detection Limit		**(mg/L)**	**0.0010**	**0.00020**	**0.0010**	**0.020**	**0.00050**	**0.010**	**0.00030**	**0.000020**	**0.00020**	**0.0020**	**0.10**	**0.00020**	**0.0010**
Split Lake nearshore															
Split Lake (plume)	UNK	28-Aug-09	<0.0010	0.00020	0.0029	0.734	<0.00050	12.9	0.0244	<0.000020	0.00060	0.0034	2.89	0.00482	<0.0010
Keeyask water quality sites															
Burntwood River	SPL-1	27-Aug-09	0.0021	0.00052	0.0021	0.991	0.00060	5.65	0.0251	0.000080	<0.00020	0.0023	1.45	0.00352	<0.0010
Nelson River	SPL-2	27-Aug-09	0.0011	0.00040	0.0020	0.626	<0.00050	13.1	0.0189	0.000025	0.00075	<0.0020	2.93	0.00283	<0.0010
Split Lake	SPL-3	27-Aug-09	<0.0010	0.00035	0.0020	0.544	<0.00050	11.5	0.0162	<0.000020	0.00061	<0.0020	2.55	0.00262	<0.0010
Split Lake	SPL-4	27-Aug-09	<0.0010	0.00032	0.0020	0.510	<0.00050	13.7	0.0143	<0.000020	0.00078	<0.0020	2.95	0.00262	<0.0010
York Landing	YL-1	28-Aug-09	<0.0010	<0.00020	<0.0010	0.407	0.00131	11.1	0.0140	<0.000020	0.00034	0.0026	3.35	0.00228	<0.0010
Split Lake	SPL-5	28-Aug-09	<0.0010	<0.00020	<0.0010	0.320	<0.00050	8.45	0.0096	<0.000020	<0.00020	<0.0020	2.46	0.00162	<0.0010
Aiken River	AK-1	28-Aug-09	<0.0010	<0.00020	<0.0010	0.135	<0.00050	4.43	0.0050	<0.000020	<0.00020	<0.0020	1.07	0.00029	<0.0010
Split Lake	SPL-7	27-Aug-09	0.0010	0.00037	0.0021	0.624	<0.00050	12.7	0.0175	<0.000020	0.00072	<0.0020	2.80	0.00284	<0.0010
Split Lake	SPL-8A	27-Aug-09	<0.0010	0.00034	0.0019	0.960	<0.00050	11.8	0.0172	<0.000020	0.00061	<0.0020	2.48	0.00226	<0.0010
	SPL-8B	27-Aug-09	0.0013	0.00042	0.0025	0.731	<0.00050	11.9	0.0195	<0.000020	0.00062	<0.0020	2.59	0.00307	<0.0010
	SPL-8C	27-Aug-09	0.0014	0.00044	0.0021	0.842	<0.00050	11.7	0.0196	<0.000020	0.00063	<0.0020	2.58	0.00320	<0.0010
		Mean	*<0.0010*	*0.00040*	*0.0022*	*0.844*	*<0.00050*	*11.8*	*0.0188*	*<0.000020*	*0.00062*	*<0.0020*	*2.55*	*0.00284*	*<0.0010*
Clark Lake	CL-1	27-Aug-09	0.0014	0.00045	0.0022	0.828	<0.00050	12.8	0.0197	<0.000020	0.00074	<0.0020	2.89	0.00341	<0.0010
Split Lake area range		**Minimum**	**<0.0010**	**<0.00020**	**<0.0010**	**0.135**	**<0.00050**	**4.43**	**0.00501**	**<0.000020**	**<0.00020**	**<0.0020**	**1.07**	**0.00029**	**<0.0010**
		Maximum	**0.0021**	**0.00052**	**0.0025**	**0.991**	**0.00131**	**13.7**	**0.0251**	**0.000080**	**0.00078**	**0.0026**	**3.35**	**0.00352**	**<0.0010**

Table A8-2. Continued.

Sample Location	Location ID	Sampling Date	Silica Dissolved	Silver Total	Sodium Total	Strontium Total	Sulfate Dissolved	Tellurium Total	Thallium Total	Tin Total	Titanium Total	Tungsten Total	Uranium Total	Vanadium Total	Zinc Total	Zirconium Total
Analytical Detection Limit		**(mg/L)**	**0.10**	**0.00010**	**0.030**	**0.00010**	**9.0**	**0.0010**	**0.00010**	**0.00060**	**0.00090**	**0.00020**	**0.00010**	**0.0010**	**0.010**	**0.00040**
Split Lake nearshore																
Split Lake (plume)	UNK	28-Aug-09	2.56	<0.00010	19.3	0.138	27.9	<0.0010	<0.00010	<0.00060	0.0333	<0.00020	0.00060	0.0015	<0.010	0.00298
Keeyask water quality sites																
Burntwood River	SPL-1	27-Aug-09	2.71	<0.00010	3.11	0.0419	10.7	<0.0010	<0.00010	<0.00060	0.0446	<0.00020	0.00022	0.0019	<0.010	0.00153
Nelson River	SPL-2	27-Aug-09	2.48	<0.00010	19.3	0.124	31.7	<0.0010	<0.00010	<0.00060	0.0288	<0.00020	0.00075	0.0023	<0.010	0.00075
Split Lake	SPL-3	27-Aug-09	2.55	<0.00010	15.0	0.108	24.3	<0.0010	<0.00010	<0.00060	0.0248	<0.00020	0.00065	0.0020	<0.010	0.00084
Split Lake	SPL-4	27-Aug-09	2.50	<0.00010	18.2	0.127	30.6	<0.0010	<0.00010	<0.00060	0.0244	<0.00020	0.00078	0.0021	<0.010	0.00063
York Landing	YL-1	28-Aug-09	2.52	<0.00010	16.4	0.122	25.1	<0.0010	<0.00010	<0.00060	0.0168	<0.00020	0.00037	<0.0010	<0.010	<0.00040
Split Lake	SPL-5	28-Aug-09	2.50	<0.00010	9.40	0.0855	11.8	<0.0010	<0.00010	<0.00060	0.00882	<0.00020	0.00013	<0.0010	<0.010	<0.00040
Aiken River	AK-1	28-Aug-09	2.01	<0.00010	1.01	0.0313	12.0	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Split Lake	SPL-7	27-Aug-09	2.55	<0.00010	17.5	0.120	25.8	<0.0010	<0.00010	<0.00060	0.0300	<0.00020	0.00073	0.0017	<0.010	0.00086
Split Lake	SPL-8A	27-Aug-09	2.54	<0.00010	14.9	0.111	23.5	<0.0010	<0.00010	<0.00060	0.0512	<0.00020	0.00066	0.0022	<0.010	0.00078
	SPL-8B	27-Aug-09	2.57	<0.00010	15.3	0.111	23.2	<0.0010	<0.00010	<0.00060	0.0343	<0.00020	0.00067	0.0023	<0.010	0.00094
	SPL-8C	27-Aug-09	2.57	<0.00010	14.7	0.107	24.2	<0.0010	<0.00010	<0.00060	0.0383	<0.00020	0.00066	0.0025	<0.010	0.00096
		Mean	*2.56*	*<0.00010*	*15.0*	*0.110*	*23.6*	*<0.0010*	*<0.00010*	*<0.00060*	*0.0413*	*<0.00020*	*0.00066*	*0.0023*	*<0.010*	*0.00089*
Clark Lake	CL-1	27-Aug-09	2.52	<0.00010	17.9	0.122	28.9	<0.0010	<0.00010	<0.00060	0.0416	<0.00020	0.00076	<0.0010	<0.010	0.00097
Split Lake area range		**Minimum**	**2.01**	**<0.00010**	**1.01**	**0.0313**	**10.7**	**<0.0010**	**<0.00010**	**<0.00060**	**<0.00090**	**<0.00020**	**<0.00010**	**<0.0010**	**<0.010**	**<0.00040**
		Maximum	**2.71**	**<0.00010**	**19.3**	**0.127**	**31.7**	**<0.0010**	**<0.00010**	**<0.00060**	**0.0512**	**<0.00020**	**0.00078**	**0.0025**	**<0.010**	**0.00153**

Table A8-3. Phytoplankton species biomass measured from a surface water sample collected in the Split Lake area during the plume event, August 2009.

Class	Genus	Species	Biomass (mg/m^3)
Cyanophyceae	*Anabaena*	*sp.*	972
Cyanophyceae	*Aphanizomenon*	*sp.*	1809
Cyanophyceae	*Pseudoanabena*	*sp.*	9
Chlorophyceae	*Closterium*	*sp.*	35
Chlorophyceae	*Coelastrum*	*sp.*	8
Chlorophyceae	*Dictyosphaerium*	*sp.*	27
Chlorophyceae	*Monoraphidium*	*sp.*	1
Chlorophyceae	*Pandorina*	*sp.*	2362
Chlorophyceae	*Scenedesmus*	*sp.*	1
Chrysophyceae	*small chrysophytes*		36
Cryptophyceae	*Cryptomonas*	*sp.*	295
Bacillariophyceae	*Cocconeis*	*sp.*	19
Bacillariophyceae	*Cyclotella*	*sp.*	20
Bacillariophyceae	*Cymbella*	*sp.*	18
Bacillariophyceae	*Fragilaria*	*sp.*	1929
Bacillariophyceae	*Nitzschia*	*sp.*	47
Bacillariophyceae	*Stephanodiscus*	*sp.*	128
Bacillariophyceae	*Synedra*	*sp.*	30

Table A8-4. Total phytoplankton biomass and relative abundance measured from a water sample collected in the Split Lake area during the plume event, August 2009.

Phytoplankton Class	Biomass (mg/m^3)	Relative Abundance (%)
Cyanophyceae	2790	36
Chlorophyceae	2434	31
Chrysophyceae	36	0
Cryptophyceae	295	4
Bacilliophyceae	2191	28
Total Phytoplankton	**7746**	**100**