Manitoba/Manitoba Hydro
Coordinated Aquatic Monitoring Pilot Program (CAMPP):
Three Year Summary Report (2008-2010) - Volume 10

Appendix 1 & 2: Detailed Methods; Quality Assurance/
Quality Control Results

<u>VOLUME 10</u>

APPENDIX 1: DETAILED RESULTS

APPENDIX 2: QUALITY ASSURANCE/QUALITY CONTROL RESULTS

Reference listing:

Coordinated Aquatic Monitoring Program (CAMP). 2014. Three Year Summary Report (2008-2010). Report prepared for the Manitoba/Manitoba Hydro MOU Working Group by North/South Consultants Inc., Winnipeg, MB.

APPENDIX 1
DETAILED RESULTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

1.0 INTRODUCTION

The following provides detailed descriptions of sampling and data analysis methods for aquatic habitat, water quality, phytoplankton, benthic macroinvertebrates, fish community, and fish mercury monitoring conducted under CAMPP.

2.0 AQUATIC HABITAT

The following appendix specifies the methods employed to collect, analyze, and map the habitat data collected at Apussigamasi Lake, Assean Lake, Northern Indian Lake and Billard Lake in 2010.

2.1 DATA COLLECTION

All boat-based acoustic depth and bottom-type data were collected with a Quester Tangent Corporation (QTC) Series 5 50 kHz scientific grade single-beam echosounder coupled to a Trimble Pro-XRS DGPS equipped with Omnistar real-time differential correction. The vessel used to conduct the surveys ranged from 16-18 ft aluminum outboard boat with 25-50 HP motor. All surveys were conducted at operating speeds of 5-10 km/h. The QTC transducer mount was affixed to the hull at the mid-point side of the vessel. The transducer depth below the water surface ranged from 0.3-0.5 metres. Acoustic boat-based surveys consisted of tracking and recording acoustic data at 1 second intervals along transects spaced approximately 50-200 metres apart. When required, intersecting ‘E-Lines’ were recorded on the longest axis of the waterbodies. Physical sampling using a Ponar grab sampler was conducted at well-spaced intervals along the acoustic sampling transects. Samples were assessed in the field based on texture, grain size, and composition, and classified according to the dominant substrate. A modified Wentworth (1922) grain size scale (Table 2-1) was used to type the substrates. The following sections detail the data collection surveys conducted on the four waterbodies selected for habitat surveys in 2010.

2.1.1 Apussigamasi Lake

Boat-based acoustic depth and bottom-type data were collected from June 3-7, 2010 (Figure 2-1). A total of 77,914 GPS-linked soundings were recorded. A total of 42 physical bottom-type samples were collected using a Ponar and typed according to texture, visual composition and particle size (Figure 2-2; Table 2-2).Examples of some of the bottom types encountered are shown in Photos 2-1 – 2-3. Water levels during the period of surveys ranged from 187.091 to 187.096 m above datum (Manitoba Hydro unpublished data), which were recorded at hydrometric gauging station 05TG702.

2.1.2 Assean Lake

Boat-based acoustic depth and bottom-type data were collected from June 8-16, 2010 (Figure 2-3). A total of 145,250 GPS-linked soundings were recorded. A total of 41 physical bottom-type samples were collected using a Ponar and typed according to texture, visual composition and particle size (Figure 2-4; Table 2-2). Examples of some of the bottom types encountered are shown in Photos 2-4 – 2-6.Water levels during the period of surveys ranged from 176.701 to 176.737 m above datum- (Manitoba Hydro unpublished data), which were recorded at the hydrometric gauging station (05UF605).

2.1.3 Northern Indian Lake

Boat-based acoustic depth and bottom-type data were collected from June 18-23, 2010 (Figure 2-5). A total of 138,217 GPS-linked soundings were recorded. A total of 16 physical bottom-type samples were collected using a Ponar grab sampler and typed according to texture, visual composition and particle size (Figure 2-6; Table 2-2). Examples of some of the bottom types encountered are shown in Photos 2-7 – 2-8. Water levels during surveys ranged from 24.31 to 24.38 m above datum (Manitoba Hydro unpublished data), which were recorded at the hydrometric gauging station (05FA701). It should be noted that water levels reached record lows on the lower Churchill River during the summer of 2010.

2.1.4 Billard Lake

Boat-based acoustic depth and bottom-type data were collected on June 24, 2010 (Figure 2-7). A total of 17,017 GPS-linked soundings were recorded. A total of 6 physical bottom-type samples were collected using a Ponar grab sampler and typed according to texture, visual composition and particle size (Figure 2-8; Table 2-2).Water levels during surveys ranged from 186.859 to 186.869 m above datum (Manitoba Hydro unpublished data) recorded at the hydrometric gauging station (06FB702). It should be noted that water levels reached record lows on the lower Churchill River during the summer of 2010.

2.2 DATA PROCESSING AND ANALYSIS

Acoustic data processing and analysis methods were duplicated for all four waterbodies surveyed in 2010. The following section details the methods employed and identifies any differences in methods used for each individual waterbody.

2.2.1 Bathymetry

2.2.1.1 Depth Correction

GPS-linked acoustic depth data recorded during the June 2010 surveys were imported into QTC Impact software. Data were analyzed and checked for signal error, invalid depths, and acoustic waveforms anomalies. Erroneous data were filtered out and the data were exported to an ASCII tabular format. Depth data were then imported into Microsoft Excel. Depths were corrected for transducer depth below the water surface, and water level variation encountered during the course of surveys.

2.2.1.2 Shoreline Data

Spatial modelling of waterbody depth requires contemporary and relatively accurate shoreline geometry data. CAMPP waterbody data is generally referenced to 1:50,000 federal topographic data (Natural Resources Canada National Topographic Database). When this data is not deemed to be sufficient, such as the topographic database being out of date, or the geometries no longer represent the current state of the waterbody, other sources are sought out. The following datasets were used as representative shorelines (zero depth) for each of the four lakes:

- Apussigamasi Lake uses a Manitoba Hydro aerial digital orthometric image (DOI) vector shoreline product representative of an open-water 1998 condition (Manitoba Hydro Surveys and Mapping unpublished data).
- Assean Lake uses a Manitoba Hydro aerial digital orthometric image (DOI) vector shoreline product representative of an open-water 2003 condition (Manitoba Hydro Surveys and Mapping unpublished data).
- Billard Lake uses a vector shoreline extracted from a June 24, 2010 orthometric Landsat 5 TM satellite image courtesy of the United States Geological Survey (USGS).
- Northern Indian Lake uses a vector shoreline extracted from a June 14, 2010 orthometric Landsat 5 TM satellite image courtesy of the United States Geological Survey (USGS).

2.2.1.3 Depth Interpolation Model

Spatial interpolation software is used to estimate a continuous surface of depths in the unnsurveyed areas of a given waterbody in order to develop a bathymetric map. Surfer 9 was used to run kriging spatial interpolation models for each of the four lakes individually. Data was first imported into Surfer 9 from Microsoft Excel. Shorelines were imported in as vector breaklines assigned depths of zero. A linear kriging model was selected for the depth model. An output grid or raster resolution of 5 metres was generated for each waterbody. All raster grids were exported in a Surfer 9 grid format then converted to an ESRI ASCII grid format for import into ArcGIS 10 software for final mapping and summary of depth statistics.

2.2.2 Acoustic Bottom-Typing

2.2.2.1 Acoustic Classification

QTC Impact software is used to classify the acoustic bottom-type data collected in the field into discrete acoustic classes related to substrate size, bottom hardness, and bottom roughness. Acoustic signals vary according to the bottom type and can therefore be classified based on these attributes recorded in the field. The software processes the 166 acoustic variables recorded by the

QTC View software in the field into 3 principal component variables that are used to cluster (K-means) the individual sonar records into a user-specified number of unsupervised acoustic classes. The classified acoustic records are then exported and labeled post-hoc in a GIS according to their spatial correspondence with the physical validation samples collected at intermittent intervals along the acoustic data tracks (Table 2-2). The following number of acoustic classes resulted from the acoustic classification for each of the lakes:

- Apussigamasi Lake had four acoustic classes corresponding to the following validated substrate classes: 1) Bedrock or rock outcrop; 2) Silt/Clay; 3) Clay; 4) Organic debris (variable in size) related to flooded terrestrial habitats.
- Assean Lake had three acoustic classes corresponding to the following validated substrate classes: 1) Bedrock or rock outcrop; 2) Silt/Clay; 3) Clay.
- Billard Lake had three acoustic classes corresponding to the following validated substrate classes: 1) Cobble/Boulder; 2) Sand; 3) Silt/Clay.
- Northern Indian Lake had five acoustic classes corresponding to the following validated substrate classes: 1) Bedrock; 2) Cobble/gravel; 3) Sand; 4) Silt/clay; 5) Clay.

2.2.2.2 Substrate Class Interpolation

Once the acoustically classified data are imported into ArcGIS software and labelled according to their corresponding substrate class, the discrete point data are interpolated to a continuous substrate surface. This is accomplished by using a Euclidean distance allocation procedure, which assigns the unsurveyed areas between the transects to the closest available substrate class based on the measured point data along the transects.

2.3 HABITAT MAPPING AND SUMMARY

Final mapping and data summaries are completed in a GIS (ArcGIS 10). The following section describes the steps taken to produce the final maps and summary tables presented in the Aquatic Habitat section.

2.3.1 Bathymetric Mapping and Summary Statistics

The interpolated depth models produced in Surfer 9 are imported into ArcGIS. ArcGIS software is used to colour the depth models into a user-specified number of depth interval classes. Vector contour lines are created at either: 1, 2, or 4 metre intervals (depending on map presentation scale) and overlayed on the continuous depth surface interval map. Background topographic data is used to provide additional context for the bathymetric depth data.

ArcGIS is used to summarize the raster depth statistic data. Mean and maximum depths are summarized for each waterbody using a Zonal Statistics procedure. Areas reported reflect the vector shoreline used to map each waterbody. Volumes are calculated by multiplying the depths by the raster grid resolution and then summing the total volume. All tabular results are exported to Microsoft Excel for formatting and insertion to the report.

2.3.2 Substrate Mapping and Summary Statistics

The interpolated Euclidian distance substrate grids for each waterbody are converted to a vector GIS polygon format in ArcGIS. A Polynomial Approximation with Exponential Kernel (PAEK) smoothing algorithm is used to smooth the lines between adjacent substrate class polygons. Substrate classes are assigned to symbology classes that best reflect the substrate class they represent. Total areas for each substrate class are calculated in ArcGIS and then exported to Microsoft Excel for formatting and insertion into the report.

2.4 REFERENCES

Centre for Topographic Information. 2010. National Topographic Database (NTDB) [computer file]. Government of Canada, Natural Resources Canada, Earth Sciences Sector (GeoGratis), Sherbrooke, QC. Available: http://geogratis.cgdi.gc.ca/geogratis/en/index.html. (November 2012).

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. The Journal of Geology 30: 377-392.

Table 2-1. Modified Wentworth (1922) scale of material size range, including aggregate class and hard or soft generalized category.

Size range (metric)	Wentworth Aggregate Class Name	Aggregate Class Name	Hard or Soft
> 256 mm	Boulder	Rock	Hard
64–256 mm	Cobble		
32–64 mm	Very coarse gravel	Large Gravel	
16–32 mm	Coarse gravel		
8–16 mm	Medium gravel		
4–8 mm	Fine gravel	Gravel/Sand	
2–4 mm	Very fine gravel		
1–2 mm	Very coarse sand		
0.25–0.5 mm	Medium sand		
125–250 µm	Fine sand	Fines	Soft
62.5–125 µm	Very fine sand		
3.90625–62.5 µm	Silt		
< 3.90625 µm	Clay		
< 1 µm	Colloid		

Table 2-2. Physical bottom-type validation samples collected in 2010 for Apussigamasi Lake, Assean Lake, Billard Lake, and Northern Indian Lake.

Waterbody	Site Id	Waypoint	Easting	Northing	UTM Zone	Datum	Method	Dominant Substrate	Compaction	Photo	Field Notes
Apussigamasi Lake	1	72	585512	6189808	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with soft compaction
Apussigamasi Lake	2	83	585406	6189621	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with soft compaction
Apussigamasi Lake	3	84	585101	6189111	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Apussigamasi Lake	4	85	584717	6189801	14U	NAD 83	Ponar	Debris	n/a	Yes	100% organic debris with silt
Apussigamasi Lake	5	86	584484	6189420	14U	NAD 83	Ponar	Clay	Soft	No	98% soft clay, 2% organic debris (fine, black, soft)
Apussigamasi Lake	6	87	584189	6189379	14U	NAD 83	Ponar	Debris	Coarse	Yes	silt with lots of organic debris (vegetation, detritus that is coarse and slightly woody)
Apussigamasi Lake	7	88	583917	6188430	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with soft compaction
Apussigamasi Lake	8	89	582586	6187548	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Apussigamasi Lake	9	90	582372	6187930	14U	NAD 83	Ponar	Clay	Soft	Yes	50% clay, 50% organic detritus with soft compaction
Apussigamasi Lake	10	91	580314	6185995	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Apussigamasi Lake	11	92	580154	6188797	14U	NAD 83	Ponar	Clay	Hard	Yes	1st grab=all woody debris. 2nd grab=compact clay (1 pic of each)
Apussigamasi Lake	12	95	579647	6185265	14U	NAD 83	Ponar	Clay	Soft	No	loose clay over compact clay
Apussigamasi Lake	13	96	580619	6185908	14U	NAD 83	Ponar	Clay	Hard	Yes	compact clay with a small proportion of sand. (pic of Craig's hand)
Apussigamasi Lake	14	97	582195	6186344	14U	NAD 83	Ponar	Clay	Soft	No	loose clay
Apussigamasi Lake	15	98	583578	6187255	14U	NAD 83	Ponar	Clay	Hard	No	packed clay with a small amount of sand
Apussigamasi Lake	16	100	583569	6183662	14U	NAD 83	Ponar	Organics	n/a	Yes	100% organics (silty, thin mud, leaves, aquatic moss). Smelled like eggs
Apussigamasi Lake	17	101	584012	6186230	14U	NAD 83	Ponar	Clay	Soft	Yes	1st grab=large branch. 2nd grab=100% clay with soft compaction
Apussigamasi Lake	18	107	592360	6194107	14U	NAD 83	Ponar	Clay	Soft	Yes	soft clay over hard clay with fine, soft vegetation debris
Apussigamasi Lake	19	108	593277	6194951	14U	NAD 83	Ponar	Sand	n/a	Yes	large granules/balls of clay (about the size of coarse sand)
Apussigamasi Lake	20	113	591652	6193846	14U	NAD 83	Ponar	Clay	Hard	Yes	hard compact clay with gravel/small cobble; also shell pieces and a clam. 2 pics: #1 - gravel and clam inside ponar. #2 - compact clay and small gravel on outside of ponar
Apussigamasi Lake	21	114	591439	6193661	14U	NAD 83	Ponar	Clay	Medium	Yes	medium compaction clay with some loose clay. Small gravel mixed in (shale-like) and clams
Apussigamasi Lake	22	115	590790	6193218	14U	NAD 83	Ponar	Clay	Soft	No	soft clay with small gravel (shale) and bits of clam shells
Apussigamasi Lake	23	117	589848	6192528	14U	NAD 83	Ponar	Clay	Hard	Yes	hard compaction clay with small shells (fingernail-sized)
Apussigamasi Lake	24	118	589469	6192289	14U	NAD 83	Ponar	Clay	Soft	Yes	loose clay over medium compaction clay
Apussigamasi Lake	25	120	588900	6191502	14U	NAD 83	Ponar	Clay	Soft	Yes	loose clay over a thin layer of medium compaction clay
Apussigamasi Lake	26	121	589726	6190259	14U	NAD 83	Ponar	Clay	Soft	Yes	loose clay and vegetation debris (leaves, sticks, aquatic moss). Smells like eggs
Apussigamasi Lake	27	123	587671	6190428	14U	NAD 83	Ponar	Clay	Soft	Yes	soft clay over a thin layer of medium compaction clay
Apussigamasi Lake	28	124	587439	6189983	14U	NAD 83	Ponar	Clay	Soft	Yes	soft clay (thin layer)
Apussigamasi Lake	29	127	586475	6189194	14U	NAD 83	Ponar	Clay	Soft	Yes	thin layer of very soft clay over bedrock. Dragged rebar, bottom was hard.
Apussigamasi Lake	30	129	585947	6189291	14U	NAD 83	Ponar	Clay	Medium	No	Clay with medium compaction
Apussigamasi Lake	31	130	587387	6188494	14U	NAD 83	Ponar	Clay	Soft	Yes	Thick clay with very soft compaction
Apussigamasi Lake	32	131	587293	6187746	14U	NAD 83	Ponar	Clay	Soft	Yes	small amount of clay mixed with flooded terrestrial vegetation (moss)
Apussigamasi Lake	33	132	588199	6188031	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with soft compaction
Apussigamasi Lake	34	134	587454	6188848	14U	NAD 83	Ponar	Clay	Soft	No	soft clay over medium compaction clay; smelled like eggs
Apussigamasi Lake	35	135	585859	6188828	14U	NAD 83	Ponar	Clay	Soft	No	soft clay over medium compaction clay and one piece of gravel
Apussigamasi Lake	36	140	589538	6185218	14U	NAD 83	Ponar	Mud	Soft	Yes	loose mud with woody debris and moss

Table 2-2. – continued –

Waterbody	Site Id	Waypoint	Easting	Northing	UTM_Zone	Datum	Method	Dominant Substrate	Compaction	Photo	Field Notes
Apussigamasi Lake	37	141	588864	6183742	14U	NAD 83	Ponar	Clay	Soft	Yes	Very soft clay, organics, with a small amount of woody debris
Apussigamasi Lake	38	142	589007	6184466	14U	NAD 83	Ponar	Clay	Soft	Yes	Very soft clay, organics, with a small amount of woody debris
Apussigamasi Lake	39	143	588386	6185655	14U	NAD 83	Ponar	Clay	Soft	Yes	Very soft clay with an extremely thin layer organics (fine, soft) on top
Apussigamasi Lake	40	143	583667	6187953	14U	NAD 83	Ponar	Clay	Hard	Yes	100% clay with hard compaction
Apussigamasi Lake	41	147	580430	6185770	14U	NAD 83	Ponar	Clay	Hard	No	compacted clay with thin surface layer of clam shell bits and fine sand
Apussigamasi Lake	42	148	579270	6185230	14U	NAD 83	Ponar	Clay	Hard	Yes	compacted clay-surface layer of clam shell bits and fine sand
Assean Lake	1	153	646792	6227577	14U	NAD 83	Ponar	Clay	Medium	Yes	soft to medium compaction clay with small amount of aquatic vegetation debris
Assean Lake	2	154	651346	6230078	14U	NAD 83	Ponar	Clay	Medium	Yes	soft to medium compaction clay, 1 fingernail clam shell
Assean Lake	3	155	652675	6231291	14U	NAD 83	Ponar	Clay	Medium	Yes	soft to medium clay
Assean Lake	4	157	651796	6232070	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with soft compaction
Assean Lake	5	158	651326	6230736	14U	NAD 83	Ponar	Clay	Soft	Yes	soft clay and aquatic vegetation debris. Shortly therafter we hit a bedrock reef and sheared the pin on the transducer
Assean Lake	6	160	660472	6232789	14U	NAD 83	Ponar	Rocks	Hard	Yes	forgot to pause the QTC during the grab, but a similar pattern was present on the echo sounder screen for a while before the grab
Assean Lake	7	161	659704	6233056	14U	NAD 83	Ponar	Clay	Medium	Yes	soft to medium compaction clay
Assean Lake	8	162	658881	6233208	14U	NAD 83	Ponar	Clay	Soft	Yes	soft clay with aquatic vegetation debris
Assean Lake	9	164	658798	6233448	14U	NAD 83	Ponar	Rocks	Hard	No	thin layer of sand over cobbles/boulders; dragged rebar
Assean Lake	10	165	660799	6235135	14U	NAD 83	Ponar	Rocks	Hard	No	cobbles/boulders with small amount of sand
Assean Lake	11	166	662459	6236839	14U	NAD 83	Ponar	Rocks	Hard	No	cobbles/boulders with small amount of sand
Assean Lake	12	168	657054	6232824	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	13	170	664750	6238290	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	14	171	661589	6236051	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with soft compaction
Assean Lake	15	172	658787	6234141	14U	NAD 83	Ponar	Clay	Soft	No	soft clay with occasional piece of small gravel
Assean Lake	16	175	658243	6235626	14U	NAD 83	Ponar	Boulders	Soft	No	Boulders interspersed with soft substrate; ponar grab had nothing
Assean Lake	17	176	661297	6237729	14U	NAD 83	Ponar	Clay	Soft	Yes	Very soft clay with live aquatic vegetation
Assean Lake	18	177	657770	6236342	14U	NAD 83	Ponar	Bedrock	Hard	No	
Assean Lake	19	179	654373	6232215	14U	NAD 83	Ponar	Clay	Soft	No	Soft clay with a tiny amount of dead vegetation
Assean Lake	20	180	656985	6233699	14U	NAD 83	Ponar	Clay	Soft	Yes	100% clay with very soft compaction
Assean Lake	21	181	658766	6236865	14U	NAD 83	Ponar	Clay	Medium	No	Soft to medium compaction clay
Assean Lake	22	182	660666	6237267	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	23	183	659297	6236734	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	24	184	653300	6232298	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	25	186	655615	6233169	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	26	187	653937	6233302	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	27	188	652664	6233014	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	28	189	649761	6229932	14U	NAD 83	Ponar	Clay	Soft	No	Soft clay over medium clay
Assean Lake	30	192	653704	6228617	14U	NAD 83	Ponar	Clay	Medium	Yes	Soft to medium compaction clay with fingernail clams
Assean Lake	31	193	666104	6239154	14U	NAD 83	Ponar	Rocks	Hard	No	Cobble/boulders with soft ? In between
Assean Lake	32	194	668172	6240885	14U	NAD 83	Ponar	Clay	Soft	No	Soft clay and silt

Table 2-2. – continued –

Waterbody	Site Id	Waypoint	Easting	Northing	UTM_Zone	Datum	Method	Dominant Substrate	Compaction	Photo	Field Notes
Assean Lake	33	195	669137	6241349	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	34	197	672338	6242962	14U	NAD 83	Ponar	Rocks	Hard	No	Boulder
Assean Lake	35	198	671073	6242756	14U	NAD 83	Ponar	Clay	Soft	No	Soft clay with sand and small gravel
Assean Lake	36	199	668837	6240979	14U	NAD 83	Ponar	Clay	Soft	Yes	Soft clay with silt and sand, organic flakes
Assean Lake	37	200	668307	6240701	14U	NAD 83	Ponar	Rocks	Hard	No	Boulders and cobbles
Assean Lake	38	201	667465	6240045	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	39	202	664913	6238257	14U	NAD 83	Ponar	Rocks	Hard	No	Boulders and cobbles
Assean Lake	40	203	671285	6242525	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	41	205	674058	6244603	14U	NAD 83	Ponar	Clay	Soft	No	100% clay with soft compaction
Assean Lake	42	207	651372	6228344	14U	NAD 83	Ponar	Clay	Soft	No	Soft clay and fingernail clams
Assean Lake	43	208	653250	6229036	14U	NAD 83	Ponar	Clay	Medium	No	Soft to medium compaction clay. Benchmark in reach 3 = 1.72m
Northern Indian Lake	1	209	603541	6357456	14U	NAD 83	Ponar	Clay	Soft	Yes	Brown silt/clay on top of soft grey clay
Northern Indian Lake	2	210	604923	6357929	14U	NAD 83	Ponar	Clay	Medium	Yes	Medium/soft clay and sand (50:50) and some woody debris
Northern Indian Lake	3	213	609572	6353622	14U	NAD 83	Ponar	Clay	Medium	No	70% clay, 30% sand
Northern Indian Lake	4	214	608731	6354109	14U	NAD 83	Ponar	Sand	Medium	Yes	Sand (60%) / Gravel (30%) / Silt (10%)
Northern Indian Lake	5	216	598886	6350798	14U	NAD 83	Ponar	Clay	Medium	Yes	Silt/Clay (50%) / Gravel (30%) / Sand (20%); medium-hard compaction
Northern Indian Lake	6	217	600188	6351455	14U	NAD 83	Ponar	Clay	Soft	Yes	Soft silt and clay
Northern Indian Lake	7	451	602156	6352053	14U	NAD 83	Ponar	Clay	Soft	Yes	Soft silt and clay (grey with thin brown surface layer)
Northern Indian Lake	8	453	603015	6351502	14U	NAD 83	Ponar	Silt	Soft	No	Soft silt and clay with a thicker brown silt surface layer
Northern Indian Lake	9	455	603224	6351446	14U	NAD 83	Ponar	Silt	Soft	Yes	Soft silt and clay with some organics; brown silt surface layer
Northern Indian Lake	10	456	601551	6351676	14U	NAD 83	Ponar	Silt	Soft		Soft silt and clay with brown silt surface layer
Northern Indian Lake	11	459	604146	6350060	14U	NAD 83	Ponar	Rocks	Hard		No grab; tried 5x; felt medium/hard
Northern Indian Lake	12	460	604623	6355440	14U	NAD 83	Ponar	Clay	Soft	No	Soft silt and clay; mostly brown
Northern Indian Lake	13	461	606501	6357979	14U	NAD 83	Ponar	Clay	Soft	No	Clay (70%) / Sand (25%) / Gravel (5%)
Northern Indian Lake	14	462	608486	6357180	14U	NAD 83	Ponar	Clay	Soft	No	Soft silt and clay; near rocky/steep shore
Northern Indian Lake	15	464	608652	6364061	14U	NAD 83	Ponar	Sand	Medium	Yes	Sand (50%) / Silt and Clay(50%)
Northern Indian Lake	16	465	608246	6363191	14U	NAD 83	Ponar	Sand	Medium	No	Sand (50%) / Gravel (30%) / Cobble and Boulders (10%)
Billard Lake	1	468	673473	6337913	14U	NAD 83	Ponar	Clay	Soft		Silt and clay (93%) / Sand (5%) / Gravel (2%)
Billard Lake	2	469	675251	6337140	14U	NAD 83	Ponar	Sand	Hard		Sand (50%) / Gravel (30%) / Cobble and Boulders (20%)
Billard Lake	3	218	676073	6337162	14U	NAD 83	Ponar	Clay	Hard		(GPS #02)Silt and clay (50%) / Sand (35%) / Gravel (15%)
Billard Lake	4	219	677441	6336508	14U	NAD 83	Ponar	Sand	Hard		Sand and gravel
Billard Lake	5	470	672971	6337603	14U	NAD 83	Ponar	Clay	Soft		Silt and clay
Billard Lake	6	471	670169	6337603	14U	NAD 83	Ponar	Rocks	Hard		Cobbles and boulders

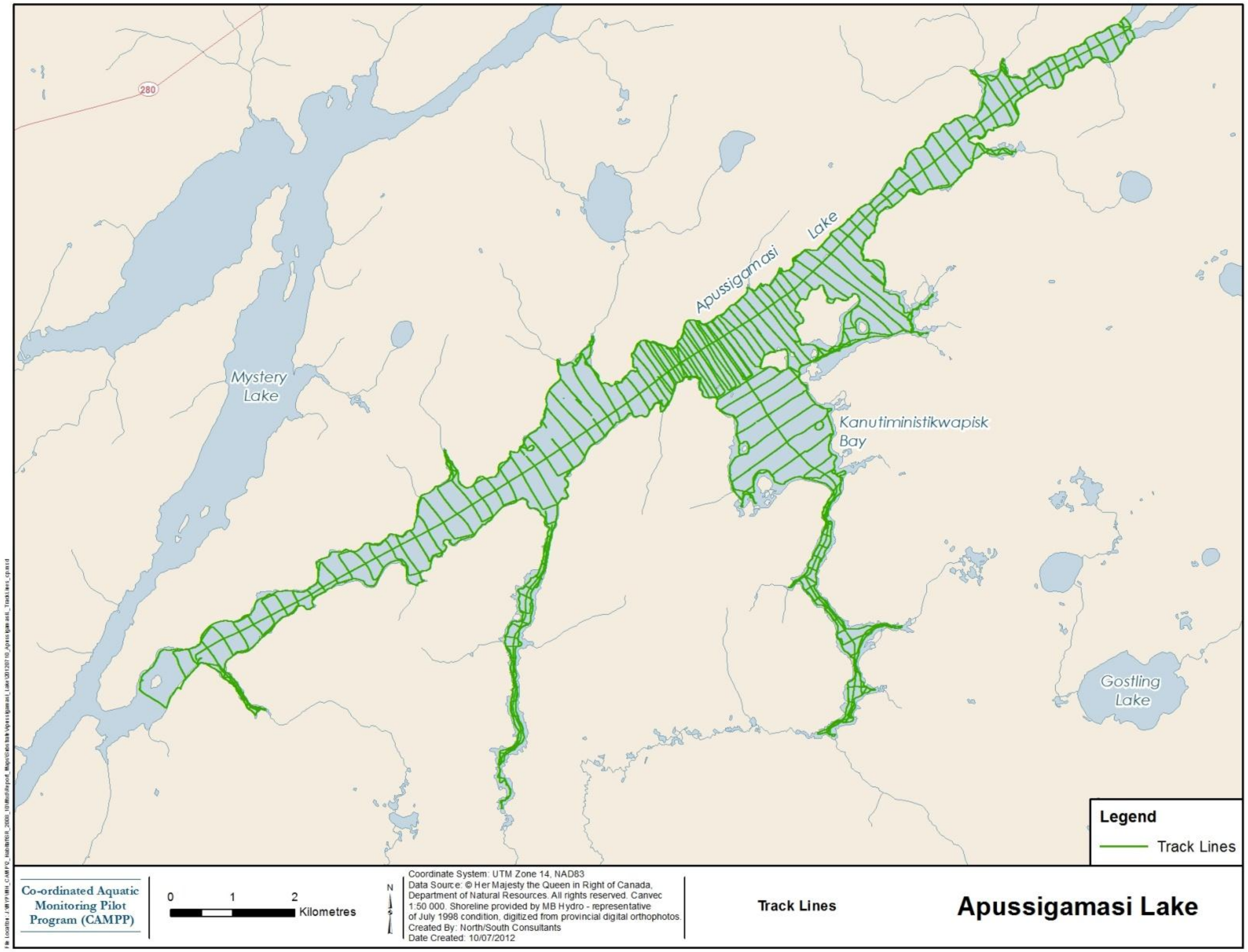

Figure 2-1. Distribution of acoustic track data collected on Apussigamasi Lake in 2010.

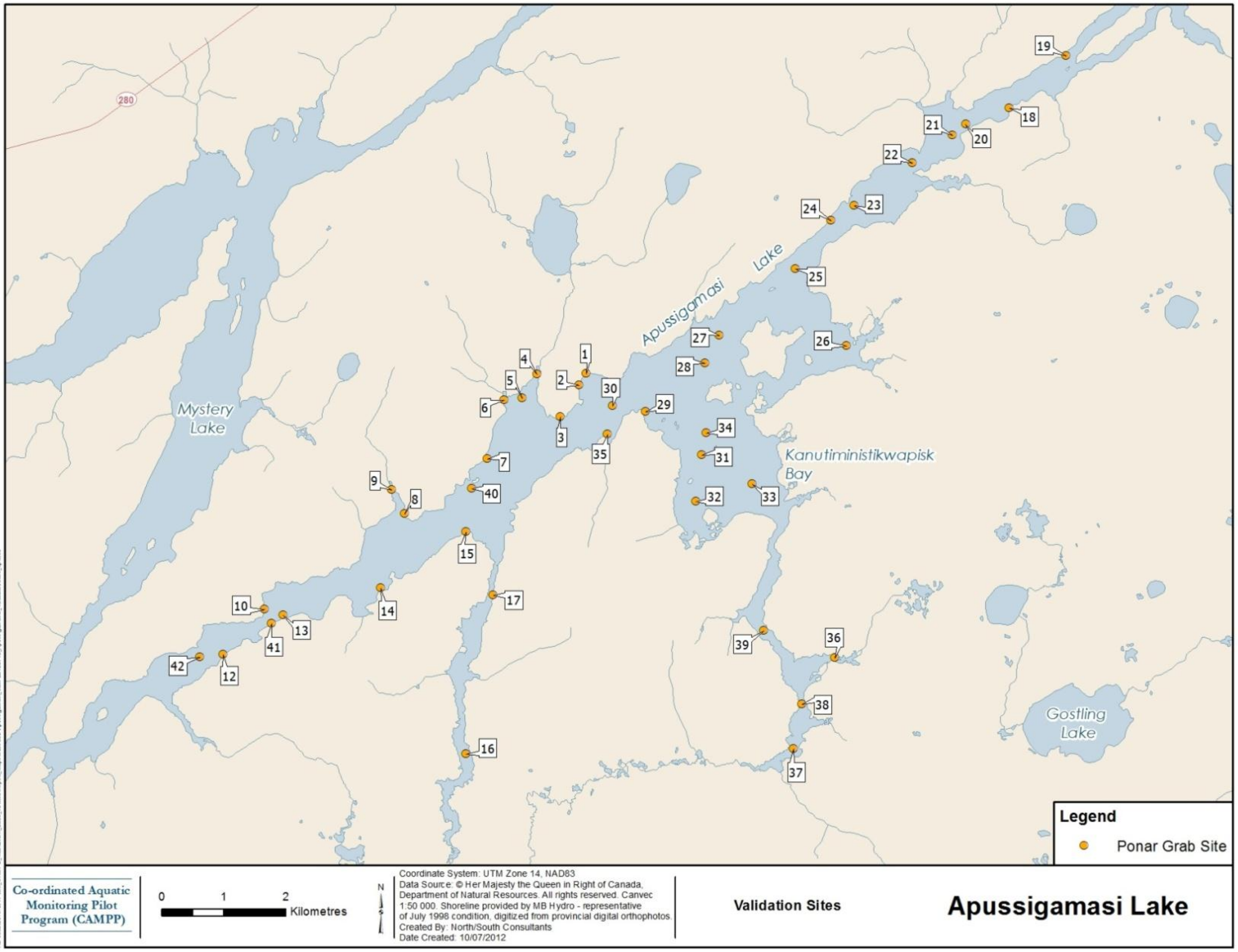

Figure 2-2. Distribution of physical bottom-type validation samples collected on Apussigamasi Lake in 2010.

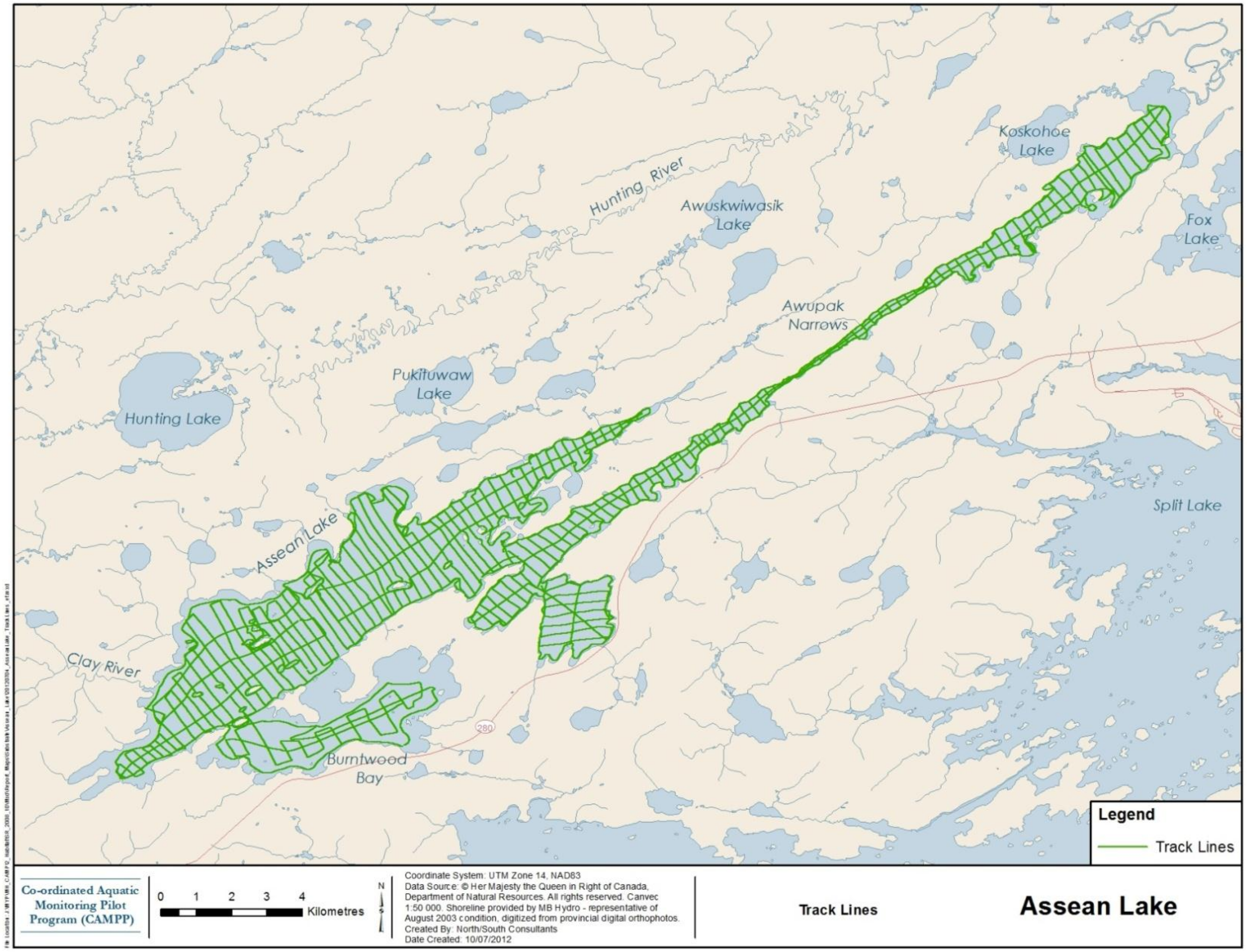

Figure 2-3. Distribution of acoustic track data collected on Assean Lake in 2010

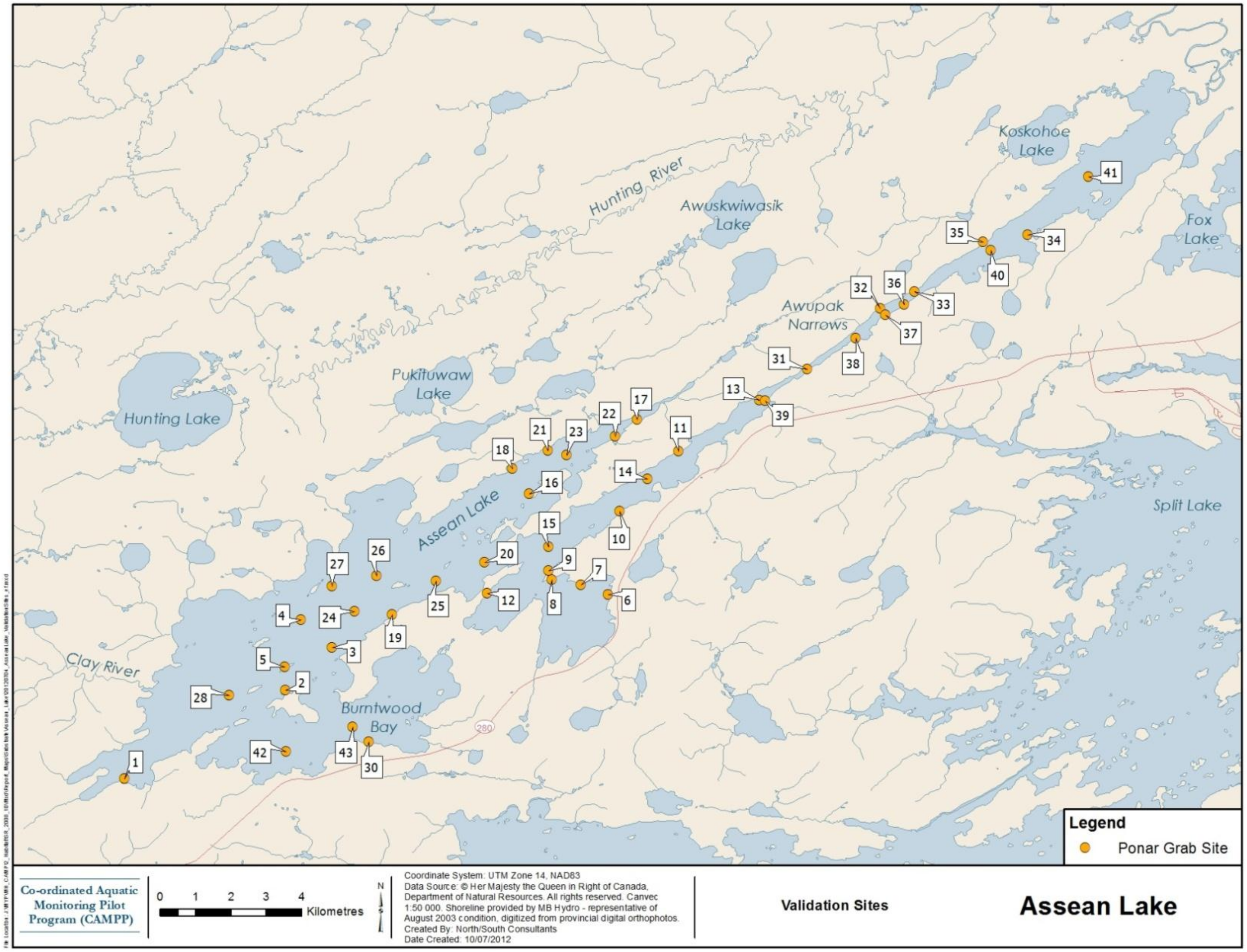

Figure 2-4. Distribution of physical bottom-type validation samples collected on Assean Lake in 2010.

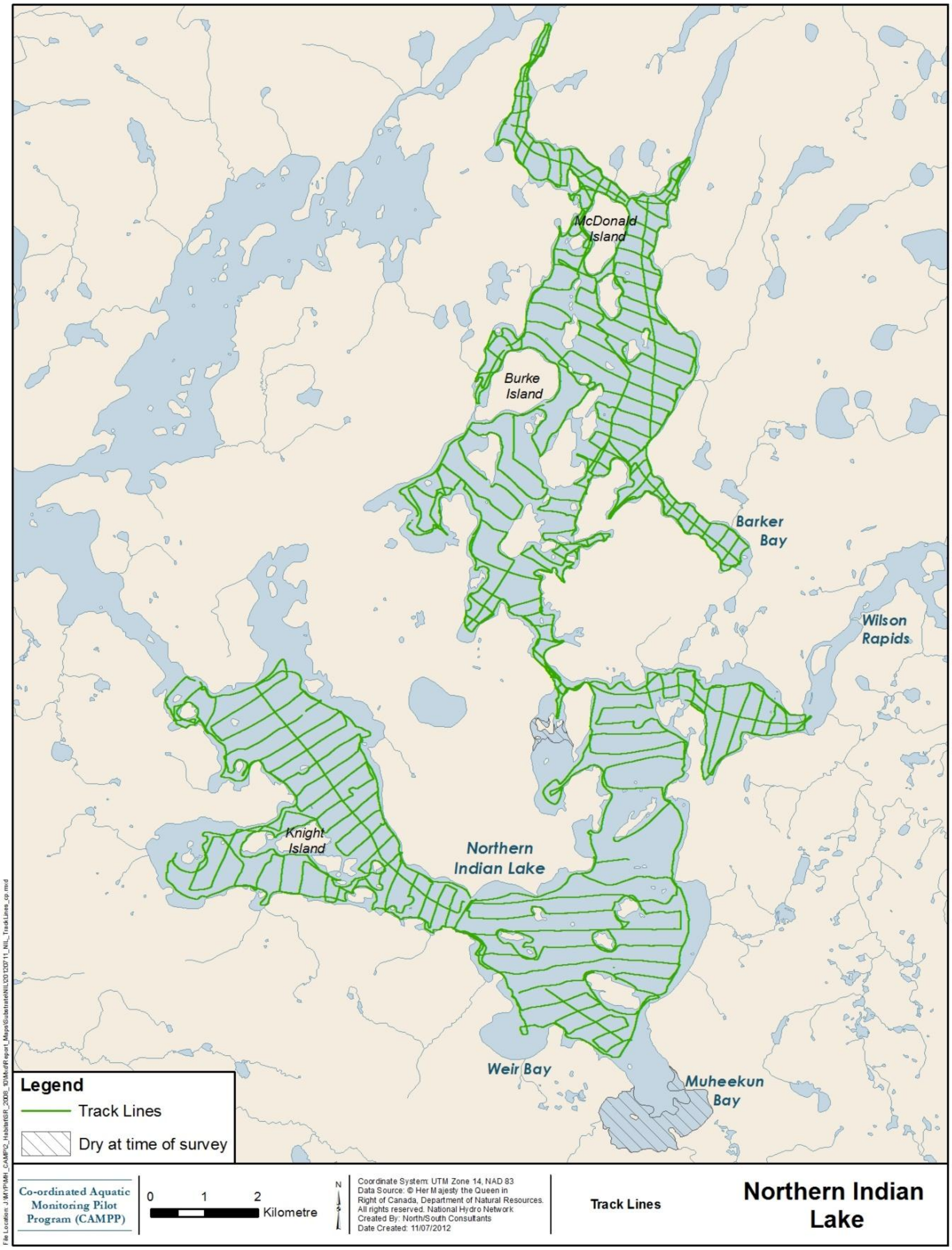

Figure 2-5. Distribution of acoustic track data collected on Northern Indian Lake in 2010.

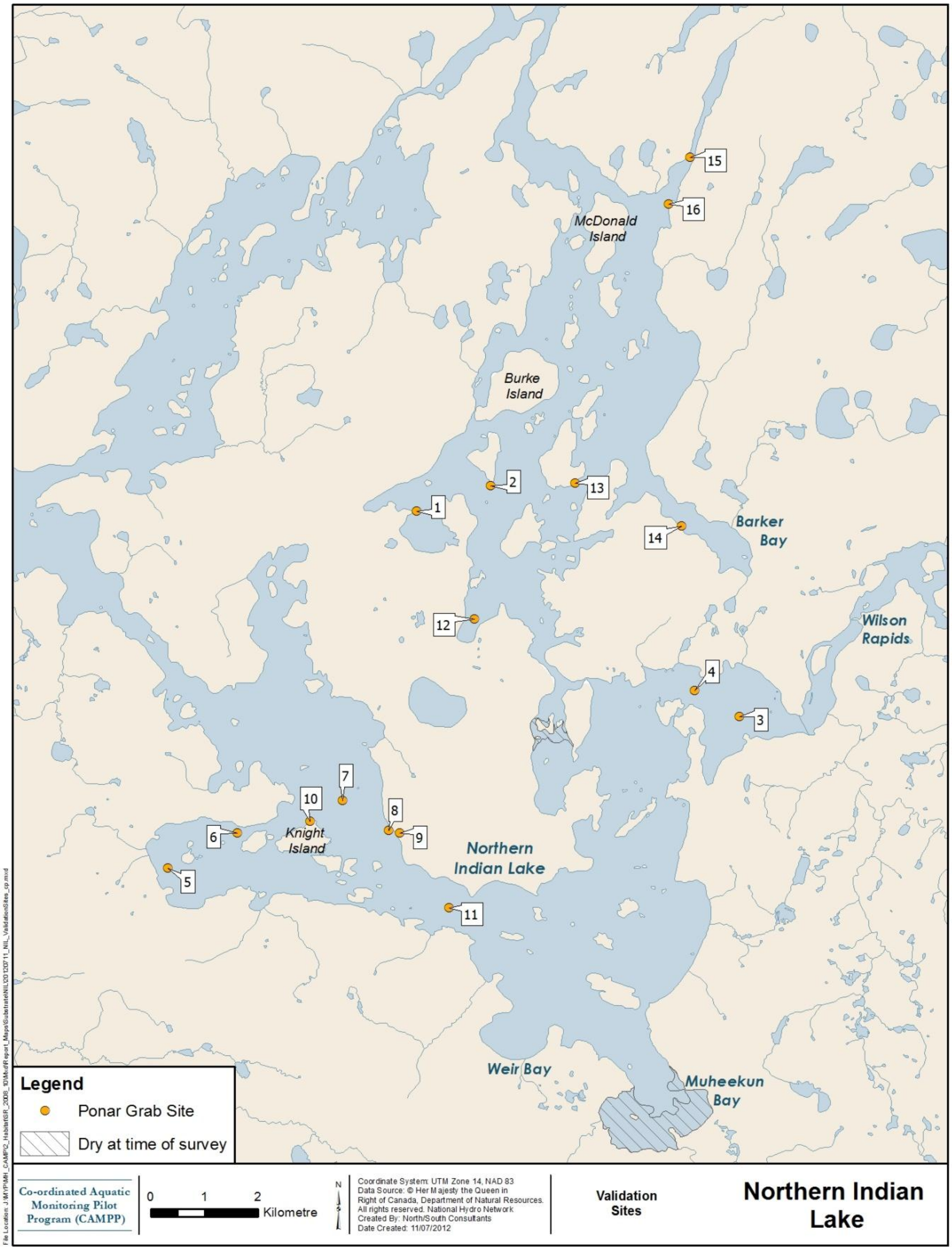

Figure 2-6. Distribution of physical bottom-type validation samples collected on Northern Indian Lake in 2010.

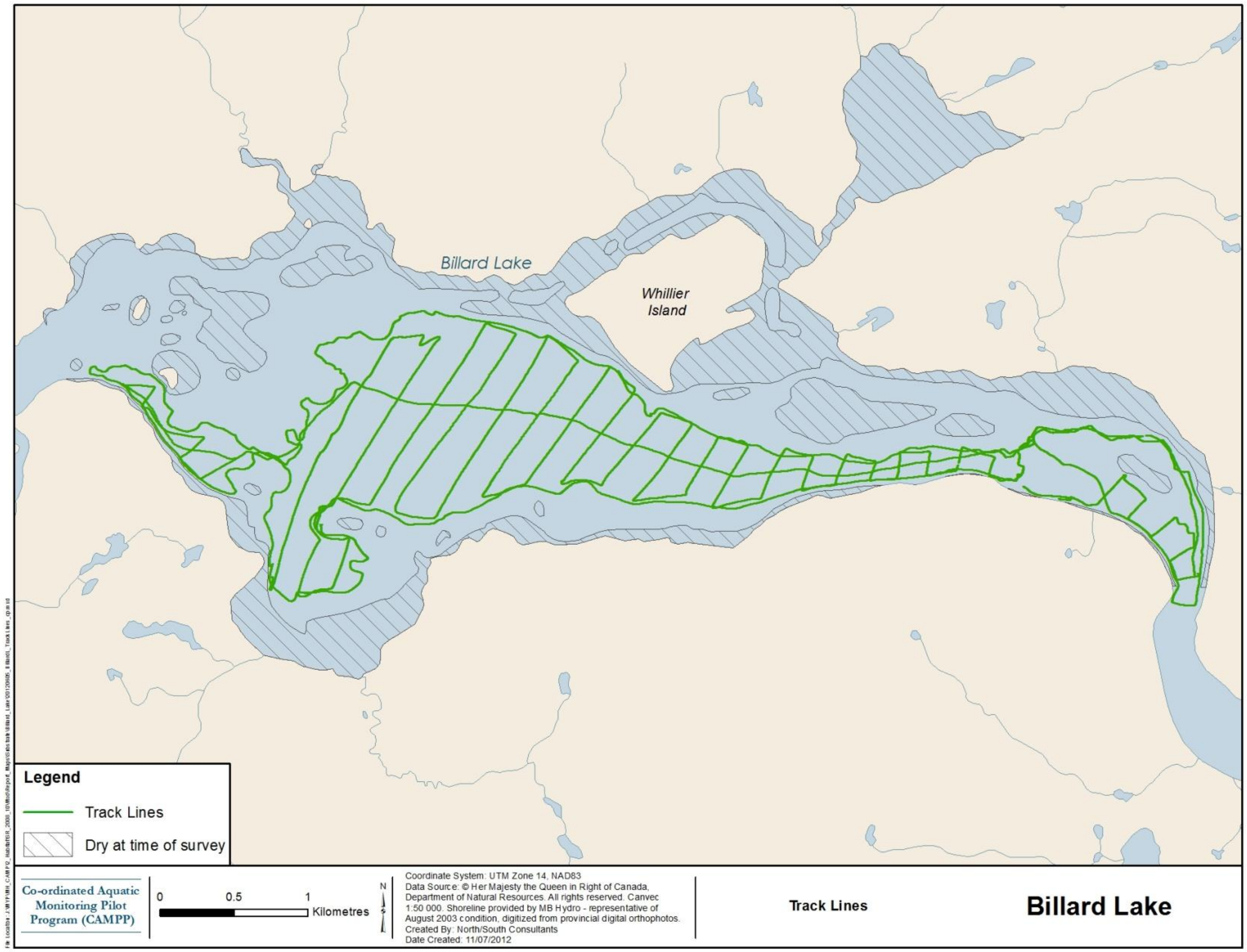

Figure 2-7. Distribution of acoustic track data collected on Billard Lake in 2010

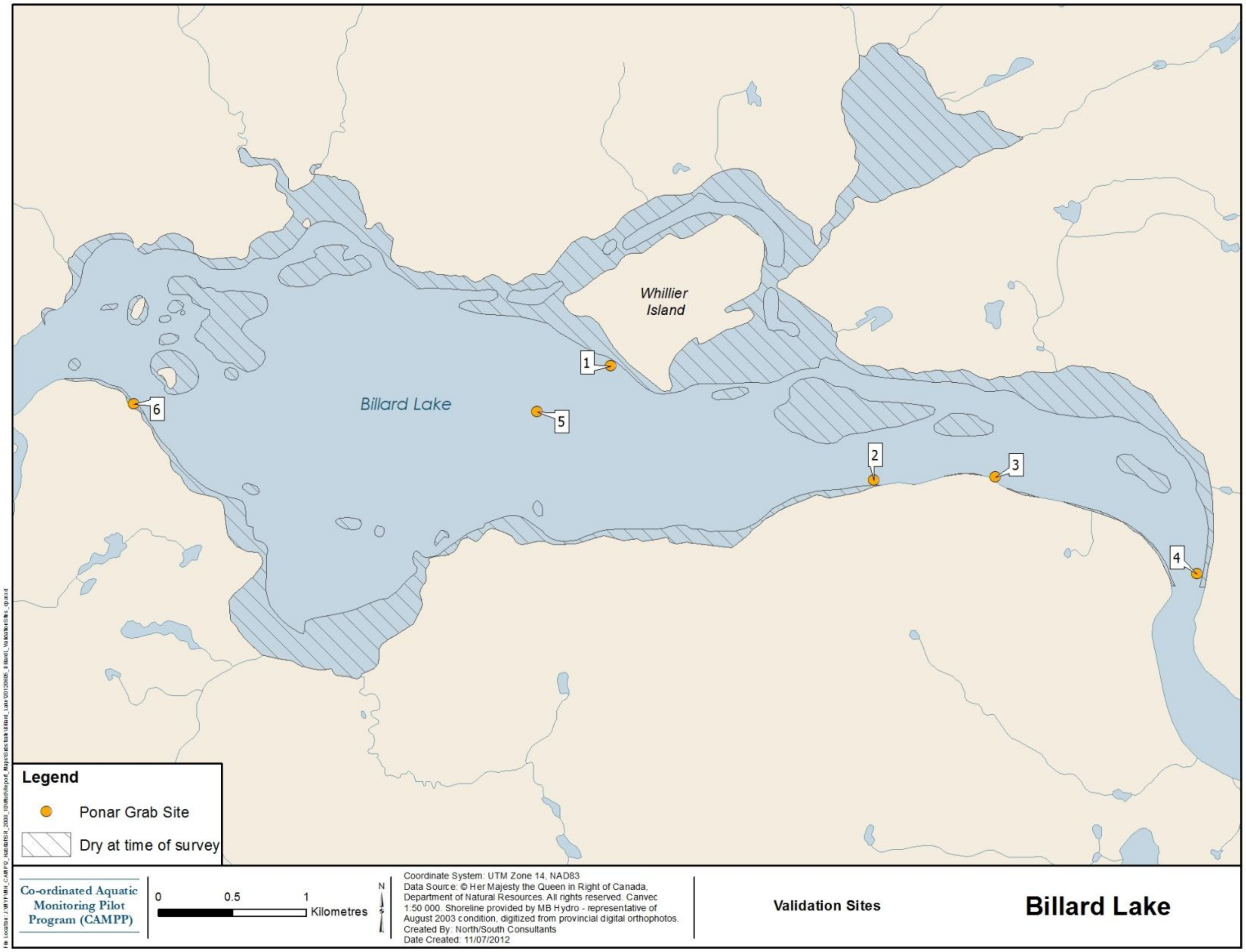

Figure 2-8. Distribution of physical bottom-type validation samples collected on Billard Lake in 2010.

Photo 2-1. Example of organic substrates found in flooded terrestrial areas of Apussigamasi Lake

Photo 2-2. Example of flooded tree stumps in flooded terrestrial areas of Apussigamasi Lake

Photo 2-3. Example of of rock substrates found along the shores of Apussigamasi Lake

Photo 2-4. Example of a clay substrate Ponar grab sample on Assean Lake.

Photo 2-5. Example of a silt clay Ponar grab sample containing aquatic plants taken on Assean Lake.

Photo 2-6. Example of some of the bedrock controlled shorelines on Assean Lake.

Photo 2-7. Example of a sandy shoreline on Northern Indian Lake.

Photo 2-8. Example of silt-clay substrates found in Northern Indian Lake.

Photo 2-9. Example of exposed shoal habitat on Billard Lake.

Photo 2-10. Example of sand beach habitat on south side of Whillier Island on Billard Lake.

3.0 WATER QUALITY

The following provides a detailed description of water quality sampling and data analysis methods employed under CAMPP.

3.1 SAMPLING SITES

Geographic coordinates (Universal Transverse Mercator [UTMs] units) and site identifications (IDs) for water quality sites sampled during Years 1 - 3 of CAMPP are provided in Table 3-1. The sampling protocol indicated that slight adjustment of location may be required depending on access (*i.e*., float plane) and/or site conditions encountered.

3.2 PARAMETERS

At each site, *in situ* parameters were measured and surface grab samples were collected (as described below). Euphotic zone samples were also collected at low-velocity sites and discrete depth samples (i.e., samples 1 m above the sediments) were collected at sites that were thermally stratified. Samples for Quality Assurance/Quality Control (QA/QC) included all parameters included in the surface grab samples as well as chlorophyll *a/*pheophytin. All samples were submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory (ALS Laboratories, Winnipeg, MB). Inter-laboratory comparison samples for water quality were submitted to a second CALA laboratory (Maxxam Analytics, Winnipeg, MB). Parameters measured under CAMPP were as follows:

In Situ Measurements:

- *In situ* measurements were collected using a Eureka Manta multi-meter and included sampling/measurement depth, dissolved oxygen (DO), temperature, turbidity, pH, specific conductance, and oxidative reductive potential (ORP; redox potential); and,
- Secchi disk depth was measured and recorded at each low-velocity site for calculation of euphotic zone depth.

Surface Grab Sampling:

- Near surface water samples were collected and submitted to ALS for water quality analysis of the parameters indicated in Table 3-2. Parameters included turbidity, total suspended solids (TSS), total dissolved solids (TDS), conductivity, alkalinity, pH, organic carbon, phosphorus (total, dissolved and particulate), nitrogen (ammonia, nitrate/nitrite and total Kjeldahl), true colour, hardness, *Escherichia coli*, and total metals. Chlorophyll *a* was also measured as a near surface sample in high-velocity waters.

Euphotic Zone Sampling:

- At each low-velocity site, a sample was collected from the euphotic zone and analysed for chlorophyll *a*.

Discrete Depth Sampling:

- Samples were collected from 1 m above the sediments (at sites that were thermally stratified) and analysed for all parameters indicated in Table 3-2, excepting chlorophyll *a* or *E. coli*.

Additional data collected/recorded at each site includes:

- Site coordinates (UTMs) were recorded with a hand-held Global Positioning System (GPS) unit[1];
- Sampling date and time;
- Names of crew members;
- Wind speed and direction using a Kestrel meter (wind speed was estimated in 2008 and 2009);
- Air temperature using a Kestrel;
- Cloud cover and precipitation conditions, including the occurrence of precipitation prior to sampling where possible;
- Digital photographs of the site/area;
- Photographs of phytoplankton blooms or unusual conditions when they occur;
- Total water depth (measured using a hand-held depth sounder);
- Maximum depth at which the euphotic zone sample was collected; and
- Depth at which the bottom sample was collected (if applicable).

3.3 SAMPLING PERIODS

Water quality sampling was conducted three times during the open-water season and once during the ice-cover season. The precise timing of sampling varies for the southern and northern sampling areas and from year to year. However, water quality sampling is generally scheduled as follows:

- Mid-May (Winnipeg River Region);

[1] In 2008 and 2009, coordinates for some sites were not recorded as a GPS unit was not available.

- Late June/early July (Central and northern regions);
- Early to mid-August (all regions);
- Mid-September (Central and northern regions);
- Late September (Winnipeg River Region); and,
- Late winter (late February to early March in all regions).

3.4 METHODS

The following refers only to sampling for the open-water season. During winter, all samples were collected from below the ice surface using a Kemmerer water sampler.

Sampling during each open-water period was conducted by one crew from NSC and one crew from Manitoba Conservation and Water Stewardship (MCWS). Winter sampling was conducted by NSC.

3.4.1 Sample and Site IDs

Site IDs are indicated in Table 3-1 and were used for all sample labeling. Identifiers for QA/QC samples were as follows:

- Triplicate samples:
  - MCWS - TFS 013, TFS 014
  - NSC - Winnipeg River System – PFS 095, PFS 096
  - NSC - Central and northern Manitoba – KLS 002, KLS 003
- Field blanks:
  - MCWS - TDS 005
  - NSC - Winnipeg River System – RAS 156
  - NSC - Central and northern Manitoba – LHS 004
- Trip blanks:
  - MCWS - TCS 007
  - NSC - Winnipeg River System – RAS 157
  - NSC - Central and northern Manitoba – LFS 006

3.4.2 *In Situ* Parameters

- Sites were approached moving in an upstream direction and measurements were collected facing upstream to avoid contamination from the plane and/or disturbance of sediments.
- Secchi disk depth was measured from the shady side of the plane by lowering the disk until it was no longer visible and recording the measurement. The disk was then lowered approximately 1 m more and raised until it became visible again and the depth was recorded. The Secchi disk depth for that site was calculated as the average of those two readings.
- DO, temperature, turbidity, pH, specific conductance, and ORP were measured at each site using the multi-meter. Each parameter was measured at 1 m intervals through the water column, beginning with a near surface measurement (i.e., 0.3 m) and ending approximately 0.5 m above the sediment. Where sites were greater than 20 m in depth, measurements were made at 2 m intervals at depths greater than 20 m. Where the sample site depth was less than 5 m, measurements were made at 0.5 m intervals.
- Where field conditions precluded measurements at depth (*i.e.*, where velocities were too high), a profile was not obtained and conditions preventing the collection of a profile were noted on the data sheet.

Hand-Held Meter QA/QC:

- The meter was inspected (i.e., membranes and probes) and meter readings were verified prior to departure and upon arrival to verify its condition.
- At the end of each day, the meter accuracy was verified by submersing the probe in room temperature distilled water and measuring temperature, turbidity, pH, and specific conductance. Verification readings were also conducted using standard solutions (turbidity standard of 40 NTU; specific conductance standard of 1413 µS/cm; and pH standard of 7).

3.4.3 Samples for Laboratory Analysis

Sampling was conducted primarily as surface grabs (a euphotic zone sample was collected from low-velocity sites to measure chlorophyll *a* and for archiving of phytoplankton and *microcystin-LR*; see Section 4 for details).

3.4.3.1 General Sample Collection

- To avoid contamination of samples, arm length gloves were worn during sample collection.
- All samples were placed on ice in the dark (i.e., kept at approximately 4 ^{o}C until receipt at ALS).

3.4.3.2 Surface Sampling

- While wearing gloves, the sampling bottle was submerged directly into the surface water to approximately elbow depth (about 30 cm).
- The bottle was filled and retrieved to the surface then the required preservatives were added, as appropriate, and the sample was mixed. The bacteria bottle contains pre-added preservative and was filled using a clean secondary vessel.

3.4.3.3 Euphotic Zone Sampling

- The chlorophyll *a* sampler was rinsed three times with site water to avoid contamination of the sample.
- After measurement of Secchi disk depth and approximation of the euphotic zone depth, the chlorophyll *a* sampler was lowered and raised through the euphotic zone at a constant rate; the sample bottle was then filled from this vessel.

3.4.3.4 Discrete Depth Sampling

- A sample was collected 1 m above the sediments if: a) the site was stratified; or b) an error with the multi-meter probe precluded measurement of *in situ* parameters at depth. Stratification was defined as a 1 ^{o}C (or more) change in temperature in 1 m of water.
- The Kemmerer water sampler was rinsed three times with water from the site prior to sampling, and then lowered to the desired depth (e.g., 1 m above the sediment-water interface), activated, and retrieved to the surface.
- A small volume of water was first released from the sampler (to ensure that the inside of the spigot was rinsed), and sample bottles were filled as indicated for surface samples.

3.4.4 Quality Assurance/Quality Control (QA/QC) Samples

QA/QC samples for water quality included collection of triplicate samples, field blanks, trip blanks, inter-laboratory comparison samples, and DO samples. During CAMPP, the samples for inter-laboratory comparison were collected and submitted by MCWS.

3.4.4.1 Triplicate Samples

The sampling program incorporated the collection of triplicate samples at randomly selected sampling sites during each sample collection period. MCWS collected one set of triplicates while NSC collected two (one in the southern region, the other in the central/northern region). The triplicates were collected at the same location and as close in time as practically feasible.

3.4.4.2 Field Blanks

Field blanks were submitted to the analytical laboratory (ALS) during each sampling period. One set was submitted by MCWS and two sets were submitted by NSC (one associated with the southern region and the other with the central/northern region). Field blanks were prepared by filling one set of sample bottles with deionized water (both provided by the analytical laboratory) in the field. The samples were then preserved in accordance with actual sample treatments, treated in exactly the same manner as actual samples (i.e., stored cool and in the dark), and submitted to ALS along with samples collected that day.

3.4.4.3 Trip Blanks

Trip blanks were submitted to the analytical laboratory during each sampling period. One set was submitted by MCWS and two sets were submitted by NSC (one associated with the southern region and the other with the central/northern region). Trip blanks were prepared by the analytical laboratory by filling one set of sample bottles with deionized water and adding preservatives where appropriate. The trip blank samples were then transported to the field site, using the same handling and transport protocols as for actual samples, and submitted along with samples to the analytical laboratory for analysis. Trip blanks thus were treated similarly to field blanks but the bottles were not opened at any point in the field and thus were not exposed to the environment.

3.4.4.4 Dissolved Oxygen QA/QC Samples

To evaluate the accuracy of *in situ* measurements, dissolved oxygen samples were collected during each sampling event and submitted for analysis using the Winkler method by ALS laboratories. MCWS and NSC each collected two DO samples from the central/northern region and NSC collected an additional sample in the southern region. The samples were taken from randomly selected sites and submitted to the analytical laboratory on different days. The sample bottles provided by the analytical laboratory for DO were filled with surface water and preserved as indicated by the laboratory.

3.5 DATA ANALYSIS METHODS

Water quality data were subject to QA/QC review in two stages: (1) an initial review of laboratory results and *in situ* measurements; and (2) a secondary review of data during the reporting and data analysis stage. The initial QA/QC review included review of *in situ* data tables for transcription errors and/or anomalies as well as review of analytical laboratory results, including review of QA/QC sample results.

Percent relative standard deviation (PRSD) was calculated for triplicate samples and compared to the criterion of 18% precision, in accordance with British Columbia Ministry of Environment, Lands, and Parks (BCMELP 1998) guidance. PRSD was calculated as:

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

Inter-laboratory comparison samples and laboratory vs. *in situ* measurements for pH, specific conductance, and DO were compared by calculating relative percent mean difference (RPMD) and compared to the criterion of 25%, in accordance with BCMELP (1998) guidance. RPMD was calculated as:

RPMD = (Value 1 – Value 2)/((Value 1 + Value 2)/2) x 100.

Any laboratory results identified as potentially suspect were verified with the analytical laboratory and, when possible, analyses were re-run for confirmation.

During the reporting stage, water quality data were reviewed in consideration of the three years of CAMPP data collectively to assist with identification of potential outliers or issues that required consideration for data analysis. Water quality variables measured both *in situ* and in the laboratory (turbidity, pH, and specific conductance) were subject to regression analysis to assist with identification of outliers or suspect data. Potential outliers were also identified through graphical methods, including box plots. In some instances, the field water quality meters were deemed to be improperly functioning and these *in situ* measurements were omitted from data analysis and reporting. However, in general, anomalous results identified through the reporting process were retained due to the relatively limited quantity of data available to date.

To assist with data interpretation and presentation, summary statistics including mean, median, minimum, maximum, standard deviation (SD), standard error (SE), and sample size (n) were calculated for water quality variables at each site. All data analyses treated censured values (i.e., values reported as below the analytical detection limit [DL]) as equal to one half the DL. In cases where triplicate samples were collected, sample means were used for the determination of summary statistics.

Statistical analyses were undertaken to evaluate seasonal, spatial, and temporal differences for the three years of CAMPP. Seasonality was evaluated in each waterbody/area sampled annually, as rotational waterbodies were only sampled during one year of CAMPP and data were inadequate for statistical analysis. Seasons were defined as spring, summer, fall, and winter. Spatial comparisons were made between annual waterbodies/areas in each of the regions and temporal comparisons were made between Years 1 through 3 for each annual waterbody/area.

All parameters detected in > 30% of samples for a given site were subjected to statistical analysis. Statistical methods varied in accordance with results of tests for normality of data and the number of comparisons. For parameters exhibiting a normal distribution, analyses were conducted using a t-test or analysis of variance (ANOVA) with a Tukey's test ($\alpha = 0.05$). For parameters not meeting the assumptions of a normal distribution (normality was tested on raw, untransformed data and log-transformed data), analyses were performed using the non-parametric Mann-Whitney test for two samples or with a Kruskal-Wallis test followed by the Dunn's multiple pairwise comparisons procedure (two-tailed; $\alpha = 0.05$).

3.5.1 Comparison to Manitoba Water Quality Objectives and Guidelines

Manitoba water quality objectives and guidelines have been developed for a number of water quality parameters for the purpose of protecting aquatic biota and wildlife as well as various human usages including recreation, drinking, irrigation, and livestock watering (Manitoba Water Stewardship [MWS] 2011). As a primary objective of CAMPP is to document and monitor aquatic ecosystem health, CAMPP water quality monitoring results were compared to Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL). Data were summarized in terms of the frequency of exceedances of MWQSOGs for PAL for each waterbody.

For many water quality variables there is a single water quality objective or guideline for PAL specified in the MWQSOGs (MWS 2011), but for some variables there are multiple objectives or guidelines, and for still others, objectives and guidelines are calculated based on site-specific conditions. A summary of MWQSOGs for PAL applied in this report is provided in Table 3-3; brief explanations for variables for which there are either multiple PAL objectives or guidelines or for which site-specific objectives or guidelines are derived is provided below.

Objectives for ammonia vary according to the presence of cool- (e.g., Walleye) or cold-water (e.g., Lake Whitefish) aquatic life, the presence of early (e.g., fish eggs) or mature (e.g., adult fish) life history stages of biota, averaging duration (i.e., 1 hour, 4-day, or 30-day average), pH, and water temperature. Site-specific water quality objectives were calculated for ammonia based on the range of pH and water temperature measured at each site for both cool- and cold-water aquatic biota. In the interest of being conservative, the presence of early life history stages was assumed based on water temperatures (above or below 5 ^{o}C).

Site-specific objectives were also calculated for cadmium, copper, chromium, lead, nickel, and zinc based on water hardness measured in the same water sample. To be conservative, monitoring results were compared to the long-term (4-day) objectives for PAL for these variables.

Like PAL objectives for ammonia, PAL objectives for DO vary according to the presence of cool- or cold-water aquatic life, the presence of mature or early life history stages of aquatic life, and duration of exposure. As the presence of various life history stages at a particular water quality site sampled under CAMPP cannot always be determined, to be conservative, DO data were compared to the most stringent objectives associated with water temperatures/time of year. In addition, CAMPP sampling frequency does not allow for determination of 7 day averages, minima, or 30-day averages of DO concentrations. To be conservative, the most stringent objectives in terms of exposure duration were applied.

In some instances, the laboratory analytical detection limits were higher than the MWQSOGs for PAL and comparisons to MWQSOGs could not be undertaken. The Manitoba PAL guideline for mercury was modified (changed from 0.0001 mg/L to 0.000026 mg/L) in 2011 and analytical detection limits employed for mercury under CAMPP were not always sufficiently low to facilitate comparison to the revised guideline. In addition, analytical detection limits for silver (0.0001 mg/L) and selenium (0.001 mg/) are equal to the Manitoba PAL guidelines. Therefore, where either variable was detected, the guidelines were exceeded. These exceedances should be viewed with caution due to the relatively high detection limits employed.

In addition to the MWQSOGs, CAMPP water quality data were compared to the Canadian Council of Ministers of the Environment (CCME) PAL guidelines for chloride (CCME 1999; updated to 2012) and the British Columbia Ministry of the Environment (Meays and Nordin 2013) PAL guidelines for sulphate as there are currently no PAL guidelines for Manitoba.

3.5.2 Categorization and Description of Waterbodies

Lakes, reservoirs and rivers sampled under CAMPP were compared to various published categorization schemes to describe trophic status, nutrient limitation, primary sources of organic carbon, and scales of water hardness, acid sensitivity, and water clarity.

Nitrogen to phosphorus (N:P) molar ratios were calculated to assist in estimating the limiting nutrient. Ratios less than 10 were considered indicative of nitrogen limitation and values greater than 20 were considered indicative of phosphorus limitation. Ratios between 10 and 20 were considered to indicate co-limitation, consistent with the approach applied by Environment Canada [EC] and MWS (2011) in the State of Lake Winnipeg Report.

Total organic carbon to organic nitrogen (TOC:ON) molar ratios were derived to provide an indication of the key source of carbon in each waterbody. Ratios greater than 50:1 were considered indicative of organic matter that is primarily allochthonous and ratios less than 12:1 were considered indicative of organic matter that is primarily autochthonous (Wetzel 1983).

Water hardness was compared to the Canadian Council of Resource and Environment Ministers (CCREM 1987) scale indicated in Table 3-4, acid sensitivity was compared to the scheme reported in Saffran and Trew (1996) as summarized in Table 3-5, and water clarity was compared to the Swedish Environmental Protection Agency (EPA) scheme for lakes based on mean Secchi disk depth (Swedish EPA 2000), as summarized in Table 3-6.

Trophic status of CAMPP waterbodies (rivers, lakes, and reservoirs) was classified utilizing the CCME Canadian phosphorus guidance framework for the management of freshwater systems (CCME 1999; updated to 2013) and the trophic state categorization scheme based on TP (Table 3-7). Lake and reservoir trophic states were also classified according to the Organization of Economic Cooperation and Development (OECD 1982) categorization scheme based on chlorophyll *a*, and the categorization scheme for total nitrogen (TN) presented by Nürnberg (1996). Comparison to the OECD trophic categorization scheme for lakes based on Secchi disk depth was also made in Section 6.2.

There are fewer trophic classification schemes for streams and rivers and no nationally or internationally accepted schemes for these waterbodies. As noted above, the CCME trophic classification scheme for TP is intended to be applied to all freshwater ecosystems including rivers and this scheme was applied for CAMPP river sites for this parameter. The trophic classification schemes based on TN and chlorophyll *a* for rivers presented in Dodds et al. (1998) was also applied to CAMPP sites (Table 3-8).

3.6 REFERENCES

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Table 3-1. Coordinates, site codes, and agencies responsible for sampling the CAMP water quality sites during the open-water season.

Sample Location	Site ID	Sampling Agency	UTM Zone	UTM Easting	UTM Northing
Annual Sites					
Lac du Bonnet	PFS 093	NSC	15 U	287321	5581856
Winnipeg River	PFS 094	NSC	15 U	325606	5580299
Manigotagan Lake	RAS 155	NSC	15 U	316279	5637844
Lake Winnipegosis-Site 1	LFS 003	NSC	14 U	378681	5865324
Lake Winnipegosis-Site 2	LFS 004	NSC	14 U	423343	5865324
Lake Winnipegosis-Site 3	LFS 005	NSC	14 U	440708	5837040
Lake Winnipegosis-Site 4					
Lake Winnipegosis-Site 5	LHS 003	NSC	14 U	443817	5726255
Cedar Lake	KLS 001	NSC	14 U	422933	5891911
Cormorant Lake	KKS 038	NSC	14 U	380168	6010105
Cross Lake	UDS 004	MCWS	14 U	578702	6050736
Setting Lake	TCS 006	MCWS	14 U	524475	6095095
Split Lake	UFS 011	MCWS	14 V	680875	6236433
Burntwood River	TGS 015	NSC	14 V	650586	6224395
Assean Lake	UFS 014	NSC	14 U	652273	6230749
Lower Nelson River (d/s of Limestone Forebay)	UHS002	NSC	15 V	458807	6288148
Hayes River	ABS 002	NSC	15 U	512647	6254409
Northern Indian Lake	FAS 008	MCWS	14 U	603625	6350003
Gauer Lake	FAS 007	MCWS	14 U	572884	6326121
Lower Churchill River	FDS 004	NSC	15 V	356443	6377201
Southern Indian Lake-Area 4 (near Missi Falls)	ECS 004	MCWS	14 U	541425	6353154
Granville Lake	EBS 043	MCWS	14 U	413537	6241429
Threepoint Lake	TFS 017	NSC	14 U	507165	6170021
Leftrook Lake	TFS 018	NSC	14 U	517773	6212359
Rotational Sites - Year 1					
South Moose Lake	KKS 039	NSC	14 U	417567	5960664
Playgreen Lake	UBS 015	MCWS	14 U	561680	5970773
Apussigamasi Lake	TGS 014	NSC	14U	587925	6190400
Notigi Lake-East	TFS 016	NSC	14U	483204	6197690
Notigi Lake-West	TFS 015	NSC	14U	476533	6196640
Partridge Breast Lake	FAS 009	NSC	14U	561764	6357872
Southern Indian Lake -Area 1 (near Lemay Island)	ECS 005	MCWS	14U	482343	6298204
Stephens Lake -North	UFS 015	NSC	15V	362235	6262609
Stephens Lake -South	UFS 016	NSC	15V	388255	6250474

Table 3-1. – continued –

Sample Location	Site ID	Sampling Agency	UTM Zone	UTM Easting	UTM Northing
Rotational Sites - Year 2					
Eaglenest Lake	PFS 097	NSC	15U	342896	5575717
Saskatchewan River	KJS 006	NSC	14U	385736	5941038
Little Playgreen Lake	UBS 018	MCWS	14U	578004	5986044
Walker Lake	UDS 020	NSC	14U	632296	6064019
Limestone Forebay	UHS 004	NSC	15V	431373	6261081
Billard Lake	FBS 003	NSC	14V	671953	6337700
Southern Indian Lake-Area 6 (South Bay)	ECS 001	MCWS	14V	501513	6285072
Footprint Lake	TFS 010	MCWS	14U	507440	6181167
Rat Lake	TFS 005	NSC	14U	466000	6227500

Table 3-2. Water quality parameters measured at an analytical laboratory.

Parameter	Units
CAMPP Group 1	
Conventional Parameters	
Hardness (Total as $CaCO_3$)	mg/L
Total Dissolved Solids	mg/L
Turbidity	NTU
Total Suspended Solids (LR)	mg/L
True Color	colour units
pH	ph units
Conductivity	µmhos/cm
Total Alkalinity ($CaCO_3$)	mg/L
Bicarbonate Alkalinity (HCO_3)	mg/L
Carbonate Alkalinity (CO_3)	mg/L
Hydroxide Alkalinity (OH)	mg/L
Nutrients	
Nitrate and Nitrite N	mg/L
Total Kjeldahl Nitrogen N	mg/L
Ammonia Nitrogen N	mg/L
Total Phosphorus P	mg/L
Total Particulate Phosphorus P	mg/L
Total Dissolved Phosphorus P	mg/L
Total Organic Carbon C	mg/L
Total Inorganic Carbon C	mg/L
Dissolved Organic Carbon	mg/L
Metals and Major Ions	
Total Aluminum (Al)	mg/L
Total Antimony (Sb)	mg/L
Total Arsenic (As)	mg/L
Total Barium (Ba)	mg/L
Total Beryllium (Be)	mg/L
Total Bismuth (Bi)	mg/L
Total Boron (B)	mg/L
Total Cadmium (Cd)	mg/L
Total Calcium (Ca)	mg/L
Total Chromium (Cr)	mg/L
Total Cobalt (Co)	mg/L
Total Copper (Cu)	mg/L
Total Iron (Fe)	mg/L
Total Lead (Pb)	mg/L
Total Magnesium (Mg)	mg/L
Total Manganese (Mn)	mg/L

Table 3-2. – continued –

Parameter	Units
Total Molybdenum (Mo)	mg/L
Total Nickel (Ni)	mg/L
Total Potassium (K)	mg/L
Total Selenium (Se)	mg/L
Total Silver (Ag)	mg/L
Total Sodium (Na)	mg/L
Total Thallium (Tl)	mg/L
Total Tin (Sn)	mg/L
Total Uranium (U)	mg/L
Total Vanadium (V)	mg/L
Total Zinc (Zn)	mg/L
Dissolved Chloride (Cl)	mg/L
Dissolved Sulphate (SO_4)	mg/L
Total Mercury (Hg)	mg/L
<u>*Line Items*</u>	
Dissolved oxygen	mg/L
Phytoplankton	N/A
Microcystin-LR	μg/L
Escherichia coli	CFU/100 mL
Chlorophyll *a*/pheophytin	μg/L

Table 3-3. Summary of Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL; MWS 2011).

Parameter	Unit	MWQSOG	Objective or Guideline	Comments
pH	-	6.5-9.0	Guideline	
Dissolved Oxygen	(mg/L)	Open-water: 6.0 and 6.5 Ice-cover: 5.5 and 9.5	Objective	Most stringent objectives for cool- and cold-water aquatic life
Ammonia	(mg N/L)	Site-specific	Objective	Values calculated based on pH and water temperature
Nitrate	(mg N/L)	2.93	Guideline	
Total Phosphorus	(mg/L)	Lakes, ponds, reservoirs: 0.025 Streams/rivers: 0.050	Narrative guideline	For protection of various water usages.
Metals				
Aluminum	(mg/L)	0.1	Guideline	
Arsenic	(mg/L)	0.15	Objective	
Boron	(mg/L)	1.5	Guideline	
Cadmium	(mg/L)	Site-specific	Objective	Values calculated based on water hardness
Chromium	(mg/L)	Site-specific	Objective	Values calculated based on water hardness
Copper	(mg/L)	Site-specific	Objective	Values calculated based on water hardness
Iron	(mg/L)	0.3	Guideline	
Lead	(mg/L)	Site-specific	Objective	Values calculated based on water hardness
Mercury	(mg/L)	0.000026	Guideline	Guideline for "inorganic mercury"

Table 3-3. – continued –

Parameter	Unit	MWQSOG	Objective or Guideline	Comments
Molybdenum	(mg/L)	0.073	Guideline	
Nickel	(mg/L)	Site-specific	Objective	Values calculated based on water hardness
Selenium	(mg/L)	0.001	Guideline	
Silver	(mg/L)	0.0001	Guideline	
Thallium	(mg/L)	0.0008	Guideline	
Uranium	(mg/L)	0.015	Guideline	
Zinc	(mg/L)	Site-specific	Objective	Values calculated based on water hardness

Table 3-4. Hardness scale for aquatic ecosystems (CCREM 1987).

Hardness as Calcium Carbonate (mg/L)	Degree of Hardness
0-30	Very soft
31-60	Soft
61-120	Moderately soft (hard)
121-180	Hard
180+	Very Hard

Table 3-5. Saffran and Trew (1996) categorization of acid sensitivity of aquatic ecosystems.

Parameter	Units	Acid Sensitivity			
		High	Moderate	Low	Least
pH	-	<6.5	6.6-7.0	7.1-7.5	>7.5
Total Alkalinity	(mg/L $CaCO_3$)	0-10	10-20	21-40	>40
Calcium	(mg/L)	0-4	5-8	9-25	>25
Total dissolved solids	(mg/L)	0-50	51-200	201-500	>500

Table 3-6. Rankings for lake water clarity (Swedish EPA 2000).

Water Clarity Ranking	Secchi Disk Depth (m)
Very High	≥ 8
High	5 – 8
Moderate	2.5 – 5
Low	1 – 2.5
Very Low	< 1

Table 3-7. Trophic categorization schemes applied for CAMPP lakes and reservoirs.

Parameter/Metric		Trophic categories						Reference
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic	
Total Phosphorus	(mg/L)	<0.004	0.004-0.010	0.010-0.020	0.020-0.035	0.035-0.100	> 0.100	CCME (1999; updated to 2013)
Chlorophyll *a*	(µg/L)	-	<2.5	2.5-8	-	8-25	>25	OECD (1982)
Total Nitrogen	(mg/L)	-	<0.350	0.350-0.650	-	0.651-1200	>1200	Nurnberg (1996)
Secchi Disk Depth	(m)	-	> 6	3-6	-	1.5-3	<1.5	OECD (1982)

Table 3-8. Trophic categorization schemes applied for CAMPP river sites.

Parameter/Metric		Trophic categories						Reference
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic	
Total Phosphorous	(mg/L)	<0.004	0.004-0.010	0.010-0.020	0.020-0.035	0.035-0.100	> 0.100	CCME (1999; updated to 2013)
Chlorophyll *a*	(µg/L)	-	<10	10-30	-	>30	-	Dodds et al. (1998)
Total Nitrogen	(mg/L)	-	<0.7	0.7-1.5	-	>1.5	-	Dodds et al. (1998)

4.0 PHYTOPLANKTON

4.1 PROGRAM DESCRIPTION

The phytoplankton monitoring component of CAMPP was conducted concurrent with the water quality sampling program and samples were collected at the same sites and times as water quality samples (see Sections 3.1 and 3.3). Phytoplankton monitoring included analysis of chlorophyll *a*, phytoplankton community composition and biomass, and microcystin-LR (an algal toxin). The phytoplankton sampling program consists of three sub-components, all of which are conducted as part of the water quality sampling program:

- Chlorophyll *a* Monitoring: Phytoplankton biomass was estimated by using the chlorophyll *a* concentration as an indicator. This component was conducted as part of the water quality sampling program and was measured during each sampling event (i.e., three times in the open-water season and once in the ice-cover season).
- Phytoplankton Bloom Monitoring: Where concentrations of chlorophyll *a* collected during the water quality sampling program were ≥ 10 µg/L, samples were submitted for analysis of microcystin-LR and phytoplankton community composition. This sampling was intended to collect information under phytoplankton "bloom" conditions (which have been operationally defined as chlorophyll *a* concentrations at or exceeding 10 µg/L). The 10 µg/L trigger was based on triggers (Alert Level 1) employed by the New Zealand government under its alert levels framework for the management of cyanobacteria in drinking water supplies (i.e., Ministry of Health 2005).
- Phytoplankton Community Composition Monitoring: As of 2009, phytoplankton community composition and biomass was measured on a three-year rotational basis at annual water quality sites (open-water season only) while rotational waterbodies were analysed during years in which sampling occurred. In addition, annual monitoring during the open-water season was initiated at four sites (Cross, Setting, Split and Assean lakes) in 2009/2010 to provide a more robust data set for analysis.

4.2 METHODS

The following section describes the field, laboratory, data analysis, and statistical methods for the chlorophyll *a* and phytoplankton composition and biomass components of the phytoplankton program.

4.2.1 Field Methods

In Years 1 (2008/2009) and 2 (2009/2010), two chlorophyll *a* samples from each site were submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory for analysis during each of the four sampling events: a surface grab from the site; and, an integrated sample of water taken from the euphotic zone (estimated as two times the Secchi disk depth). Data collected using both methods were compared for the open-water seasons of 2008 and 2009 to determine which sampling method was most appropriate; the results indicated that chlorophyll *a* concentrations were similar between the surface grab and euphotic zone samples. Thereafter (i.e., beginning in 2010/2011), chlorophyll *a* analysis was restricted to euphotic zone samples collected in the open-water season. Throughout the pilot program, however, surface grab samples were consistently analysed in winter and at sites with high velocities (i.e., river sites).

Samples were also collected at all water quality sites from the euphotic zone (open-water season) or near the surface (ice-cover season and high velocity sites), as described above, for phytoplankton bloom and community composition monitoring as well as microcystin-LR analysis. Euphotic zone samples were collected with a chlorophyll *a* sampler provided by MCWS. The chlorophyll *a* sampler was rinsed three times with site water prior to use, and was then lowered and raised evenly across the euphotic zone depth to obtain an integrated sample across this depth. The sample bottles for chlorophyll *a*, phytoplankton taxonomy, and microcystin-LR were filled from the chlorophyll *a* sampler and sufficient Lugol's solution was added to the phytoplankton taxonomy bottle until it appeared tea-coloured. Samples were stored cool and in the dark. Samples for potential analysis of microcystin-LR were stored at 4 ^{o}C and retained until the results of the chlorophyll *a* analyses were received (due to limited holding times, samples could not be archived).

As with the water quality program, quality assurance/quality control (QA/QC) measures were integrated into the phytoplankton component of CAMPP, including the preparation of detailed field sampling protocols, standard measures to avoid sample contamination during and following sample collection, inclusion of field QA/QC samples (triplicates, field and trip blanks, and inter-laboratory comparison samples) and QA/QC of data. Specifically, triplicate, blank, and inter-laboratory QA/QC samples were analysed for chlorophyll *a* since initiation of CAMPP. At least one set of field and trip blanks were collected by each sampling crew (North/South Consultants [NSC] and Manitoba Conservation and Water Stewardship [MCWS]) during each sampling event (spring, summer, fall, and winter). One or two sets of triplicate samples for chlorophyll *a* were also collected by each sampling crew from a randomly selected site. One inter-laboratory comparison sample was collected by the MCWS sampling crew during each open-water sampling period; no inter-laboratory sample was collected during the ice-cover season. As of 2010, triplicate sample collection included euphotic zone chlorophyll *a* samples (in 2008 and 2009, triplicate samples were only collected for surface samples, although this included a surface chlorophyll *a* sample). As of Year 3 (2010/2011), triplicate phytoplankton samples were also collected during each sampling season at both one annual and one rotational waterbody.

Additional details regarding the sampling methods for water quality and phytoplankton are provided in Section 3.

4.2.2 Chlorophyll *a*

4.2.2.1 Laboratory Analyses

Samples for analysis of chlorophyll *a* were submitted to a CALA accredited analytical laboratory (ALS Laboratories, Winnipeg, MB). As a CALA accredited laboratory, ALS Laboratories applies standard methods for chlorophyll *a* analysis and employs internal QA/QC procedures.

4.2.2.2 Data Analysis Methods

All chlorophyll *a* data were evaluated qualitatively for potential outliers and transcription or analytical errors. Where anomalous values were encountered, data 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.

QA/QC chlorophyll *a* samples were assessed according to standard criteria to evaluate precision and identify potential sample contamination issues (i.e., BCMELP 1998). Relative percent mean difference (RPMD) was calculated for occasional duplicate water quality results and for comparisons between results from the two analytical laboratories; percent relative standard deviation (PRSD) was calculated for the triplicate results:

RPMD = (Value 1 – Value 2)/((Value 1 + Value 2)/2) x 100; and

PRSD = SD of the triplicate values/Mean of the triplicate values x 100;

where SD is the standard deviation. Precision of replicate and interlaboratory chlorophyll *a* samples was evaluated using the "rule of thumb" criteria for precision of 25% for duplicate samples and 18% for triplicate samples (BCMELP 1998).

Where one or more of the replicate values were less than five times the analytical detection limit (DL), an analysis of precision was not undertaken, in accordance with guidance provided in BCMELP (1998).

Field and trip blank results were evaluated for evidence of sample contamination. Blank results that exceeded five times the analytical detection limit were considered to be indicative of sample contamination and/or laboratory error.

4.2.2.3 Statistical Analysis Methods

All data analyses treated censured values (i.e., values reported as below the analytical detection limit [DL]) as equal to one half the DL. In cases where replicate samples were collected, sample means were used for the determination of summary statistics and graphing.

As with the water quality data, statistical analyses were undertaken to evaluate seasonal, spatial, and temporal differences for the three years of CAMPP. Seasonality of chlorophyll *a* was evaluated in each annual waterbody/area, as rotational waterbodies and most phytoplankton data were only collected during one year of CAMPP and data were inadequate for statistical analysis. Seasons were defined as spring, summer, fall, and winter. Spatial and temporal comparisons of chlorophyll *a* were also made between annual waterbodies/areas within each of the region.

Statistical methods varied in accordance with results of the normality tests and with the number of comparisons. For parameters exhibiting a normal distribution, analyses were conducted using a t-test or analysis of variance (ANOVA) with a Tukey's test ($\alpha = 0.05$). For non-normal parameters (normality was tested on raw, untransformed data and log-transformed data), analyses were performed using the non-parametric Mann-Whitney test for two samples or with a Kruskal-Wallis test followed by the Dunn's multiple pairwise comparisons procedure (two-tailed; $\alpha = 0.05$).

4.2.3 Phytoplankton Taxonomic Composition and Biomass

4.2.3.1 Laboratory Analyses

All taxonomic and biomass analyses were conducted by ALS Laboratories, Winnipeg using an adaptation of Standard Methods for Examination of Plankton (APHA 1998). To conduct the analyses, the taxonomist removed a 1 to 10 mL aliquot (depending on the amount of material in the sample) from the sample bottle. Within this aliquot, algal cells were allowed to settle overnight in an Utermöhl chamber, following which all cells within each of ten random grid squares were identified and counted under magnification. Cell biovolume (per species) was determined from one typical specimen of each species in each aliquot by applying the geometric formula best fitted to the cell shape. Phytoplankton biomass, expressed in mg/m^3 wet weight, was then determined from total sample biovolume (μm^3), assuming a specific gravity of one for cellular mass.

Recent studies of phytoplankton assemblages in marine and freshwater environments have shown that laboratory analyses are highly variable (e.g., up to 42% difference between analyses of laboratory-derived samples containing only four species; Vuorio et al. 2007, Salas 2010). As ALS does not perform internal verification of laboratory analyses of phytoplankton samples (there are no industrial standards requiring inclusion of such analyses), laboratory QA/QC analyses were incorporated into the CAMPP sampling program as of 2009. Four methods were used to assess the precision of the laboratory analyses for phytoplankton taxonomic composition and biomass:

- Method 1 – two different taxonomists analysed a separate aliquot taken from one sample.
- Method 2 – a single taxonomist analysed the same aliquot three separate times.
- Method 3 – a single taxonomist analysed three separate aliquots from one sample.
- Method 4 – two different taxonomists analysed the same aliquot.

4.2.3.2 Data Analysis

To assist with data interpretation and presentation, the biomass of appropriate species were summed to determine the total, group, and relative biomass of the major groups of phytoplankton (e.g., blue-green algae, diatoms, etc.). A number of community metrics were also calculated to describe the richness and diversity of the communities sampled. Calculations followed those in Hill (1973), Magurran (1988), and Begon et al. (1996), and included:

- Species richness (S);
- Simpson's diversity index ($D = 1-G$);
- Simpson's evenness ($E_D = 1/G \times 1/S$);
- Shannon's heterogeneity ($H = -\sum P_i \times [\ln P_i]$);
- Shannon's evenness ($E_H = H/\ln[S]$);
- Hill's effective richness (e^H); and
- Hill's evenness (e^H/S);

where G is Simpson's diversity for sampling with no replacement ($[\sum n_i(n_i-1)]/[N(N-1)]$), P_i is the proportional contribution of species I to the total biomass, n_i is the number of individuals of the

i^{th} species, and N is the total number of individuals. Diversity and evenness metrics range for 0 to 1, with values close to 0 having low diversity/evenness and values close to 1 having high diversity/evenness. Heterogeneity is also higher as the value increases, although the maximum occurs at ln(S).

The similarity of the duplicate laboratory QA/QC results (i.e., Methods 1 and 4) was also calculated as:

$$\text{Similarity} = 1 - 0.5\sum \left| a\text{-}b \right|$$

where a and b are the proportions that a given species contributes to the total of samples A and B, respectively (Washington 1984 *in* USEPA 2009). As with diversity metrics, similarity varies from 0 to 1, with greater similarity between samples being represented by values approaching 1. Specifically, communities that are exactly the same will have a similarity of 1.

RPMDs were calculated for the duplicate results produced by Methods 1 and 4, and PRSDs were calculated for the triplicate results produced by Methods 2 and 3. A measurement quality objective (MQO) of 20% was applied for all QA/QC analyses of phytoplankton taxonomy and biomass (Findlay and Kling n.d.; Moncheva 2010).

In cases where multiple QA/QC analyses were conducted, sample means were used for the determination of summary statistics and graphing.

4.2.3.3 Statistical Analysis Methods

In contrast to the chlorophyll *a* and water quality data, the taxonomic data collected to date are insufficient to conduct seasonal, spatial, or temporal analyses at most sites (i.e., data for most sites were only analysed one year). The exception is that spatial and temporal comparisons of total phytoplankton biomass, community composition, and community metrics were undertaken at the sites where phytoplankton community composition monitoring was conducted in multiple years (i.e., Assean, Cross, and Setting lakes).

Statistical methods varied in accordance with results of the normality tests and with the number of comparisons. For parameters exhibiting a normal distribution, analyses were conducted using a t-test or analysis of variance (ANOVA) with a Tukey's test (α = 0.05). For non-normal parameters (normality was tested on raw, untransformed data and log-transformed data), analyses were performed using the non-parametric Mann-Whitney test for two samples or with a Kruskal-Wallis test followed by the Dunn's multiple pairwise comparisons procedure (two-tailed; α = 0.05).

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5.0 BENTHIC MACROINVERTEBRATES

Benthic macroinvertebrate monitoring was conducted annually at a minimum of one off-system waterbody and one on-system waterbody within each monitoring region. Like other CAMPP monitoring components, beginning in 2009/10, a larger group of waterbodies within each region were sampled for benthic macroinvertebrates and will be re-sampled on a three year rotational basis (i.e., rotational sites).

CAMPP benthic macroinvertebrate site selection considered the following:

- existing (i.e., current) or historical benthic macroinvertebrate sites monitored by Manitoba Hydro, or other agencies;
- bathymetry (where available);
- potential tributary influences and other features that may cause localized effects (e.g., proximity to cottages, heavy boat traffic);
- the locations/areas sampled for other CAMPP components (i.e., water quality and fish); and;
- site accessibility and safety.

Where no existing or historical sites were identified for a waterbody, or where existing or historical sites were deemed to be unsuitable for the purposes of the CAMPP program, sites were generally selected with consideration of site-specific conditions and accessibility.

Based on a preliminary power analysis of the Year 1 benthic macroinvertebrate data, modifications to the lake/reservoir and riverine study design were planned for the Year 3 field program in order to minimize the inherent variability within the benthic macroinvertebrate data. These changes were intended to increase the statistical power of the data without a major influence on sampling effort and analytical costs. Methods are described below for Years 1 and 2 and Year 3 of CAMPP.

Years 1 and 2

In lake and reservoir environments, benthic macroinvertebrate samples were randomly collected at pre-determined sampling sites within pre-determined polygons. Polygons were situated to represent the dominant habitat (e.g., substrate size) in each of the nearshore and offshore areas, and were defined as the area bounded by the lowest typical water elevation to depths defined by the lower extent of the littoral zone, and/or at a clear site-specific demarcation between nearshore and offshore areas. Polygons were positioned away from immediate influence of inflows and outflows and other features that may cause localized effects (e.g., proximity to cottages, heavy boat traffic). Polygons were at least 1 ha in size and large enough to allow 20-30 m between randomly located samples (Environment Canada 2012). In general, the water depth criterion for the nearshore habitat was between 3 and 5 m (predominantly-wetted); and greater than 5 m in the offshore habitat (permanently-wetted).

Sampling sites were generated within polygons by the Random Point Generator extension for ArcGIS®. The program creates a geospatial set of random sites within the bounds of predetermined sampling polygons. Sampling sites were mapped on 1: 60,000 scale digital ortho-imagery. Field crews used a handheld Garmin GPS unit to sample sites in consecutive order as provided by the Random Point Generator. If field crews are unable to sample a certain site (e.g., due to compaction of substrate), sampling was then attempted at the next site.

In northern riverine environments (Lower Nelson, Lower Churchill River at Little Churchill, and Hayes rivers), artificial substrate samplers (rockbaskets) were deployed to collect benthic macroinvertebrates. Rockbasket sites were determined by field crews and affected by limits imposed by site-specific characteristics (e.g., high river flows). Rockbaskets were randomly placed along a succession of water depths in order to capture both nearshore and offshore habitat types.

Year 3

In lake and riverine environments, nearshore and offshore polygons were established by field crews based on the dominant site-specific habitat attributes (e.g., substrate type, water velocity), spatially separated by at least 100 m x 100 m, and large enough to adequately accommodate five replicate stations (Environment Canada 2012). Replicate stations are a specific, fixed sampling location within each polygon that can be determined recognized, and defined quantitatively (e.g., UTM position and a written description), so to be re-sampled in subsequent years. The geographic extent of each replicate station was minimally 10 m x 10 m and separated from other replicate stations by at least 20 m (Environment Canada 2012).

In the nearshore habitat (intermittently-wetted), water depths were ≤ 1 m (i.e., wadeable depth), with consistent water movement/velocity (low or medium velocity habitat), and areas containing aquatic macrophyte beds were avoided. In the offshore habitat (permanently-wetted), water depths were 5 to 10 m with homogeneous substrate, and consistent water movement/velocity (low or medium velocity habitat).

5.1 FIELD COLLECTION METHODS

The following provides an overview of the field sampling methods employed in Years 1 through 3 of CAMPP. The benthic macroinvertebrate sampling program consisted of one sampling period in late summer/fall.

Years 1 and 2

In lake and reservoir environments, benthic macroinvertebrate sampling was conducted using a benthic grab sampler (ekman or petite Ponar opening = $0.023m^2$). Fifteen benthic macroinvertebrate samples were collected from each of nearshore (predominantly wetted) and offshore (permanently wetted) polygons, for a total of 30/lake. At each site, one benthic macroinvertebrate sample was retrieved to the surface and carefully sieved through a 500 µm mesh rinsing bag. All material, including macroinvertebrates, retained by the screen was transferred to labelled plastic jars and fixed with 10% formalin. Fixed samples were shipped to the laboratory (NSC, Winnipeg) for processing.

Additional Ekman or Ponar samples were taken at a subset of locations within each polygon and sub-sampled with a 5 cm diameter core tube (0.002 m^2 surface area) to provide a sample of approximately 100 mL of sediment. These sediment sub-samples were frozen and sent to the analytical laboratory (ALS, Winnipeg) for particle size and total organic carbon analyses. Where possible, three samples for sediment analysis were collected in each of the polygons, for a total of six per lake.

In large riverine environments (Lower Nelson, Lower Churchill River at Little Churchill, and Hayes rivers), artificial substrate samplers were deployed along a series of water depths to include both shallow and deeper environments. The locations and positioning of samplers will be affected by practical limits imposed by site-specific characteristics (e.g., samplers must be positioned so that they will not be lost in high river flows).

Artificial substrate samplers are typically placed in the river in spring/early summer and retrieved in late summer/fall. Locations were selected where samplers can be placed and retrieved readily. Site-specific conditions required a modified design, but the following describes rock baskets that were successfully deployed.

Rock baskets are comprised of two parts: a basket and a lid. The baskets are made of an outer ring of tent material approximately 10 cm deep, lined with 200 micron mesh on the inside and abrasion resistant plastic mesh on the outside. The outer ring has eight equally spaced grommets for attaching retrieval lines and lid. The lids are made of a 15” steel ring covered with fine wire mesh. A collection of ten approximately equal area river bed rocks are placed in the basket on top of the 200 micron mesh. The lid is then secured to the basket using four small zip ties. Four lines are secured through the remaining eyelets in the basket to a 1.5-2" steel ring. The steel ring serves two purposes; it serves as an attachment point between the sampler and the anchor block, and it serves as a 'pulley' through which a lowering rope is run for deployment. Anchor blocks are attached directly to the ring, while float line markers are attached to the anchor line approximately 24" from the block.

The anchor line is attached to the retrieval line and the float line to the anchor line. A deployment rope is then threaded through the retrieval line ring and held at each end. Once the boat is in position, the driver holds position while one person at the bow of the boat lowers the anchor block until it hits the river bottom. The boat power is let off as the boat drifts back with the flow, as the basket is lowered by letting one end of the deployment line out until the anchor line draws taught and the basket touches the river bottom. A last light pull on the deployment lines ensures the basket is on the bottom and the anchor line is taught. The end on the deployment line used to lower the basket is then let go and pulled out of the water by the other end.

To retrieve baskets, the boat driver approached the marker float from downstream while one person at the bow of the boat retrieves the float. The anchor line is then cut leaving the float attached to the anchor. With the loose end of the basket line in hand, a second person placed the loose end through a weighted and vented funnel which slides down the baskets' line until it covers the basket. The basket was then lifted from the bottom and into the boat. Once the basket is retrieved the marker float and anchor block are retrieved for reuse. Lids are removed and rocks and sediments are sampled for macroinvertebrates and periphyton. Rocks were washed to remove macroinvertebrates, which were retained in a jar, preserved, and processed in the laboratory as described for the grab samples.

Physical variables measured at each site included: water depth, water transparency (Secchi disc) and where feasible:

- Substrate composition (visual inspection – i.e. % cobble, gravel, silt)
- Riparian vegetation
- % Canopy Cover
- Water temperature
- Velocity (riverine sites)

Year 3

In lake and riverine environments, nearshore (intermittently wetted) and offshore (permanently wetted) polygons were established by field crews based on the dominant site-specific habitat attributes (e.g., substrate type, water velocity), spatially separated by at least 100 m x 100 m, and large enough to adequately accommodate five replicate stations (Environment Canada 2012). A replicate station is a specific, fixed sampling location within an area that can be determined recognized, re-sampled and defined quantitatively (e.g., UTM position and a written description). The geographic extent of each replicate station was minimally 10m x 10m and separated from other replicate stations by at least 20 m. Within the nearshore and offshore polygons, a replicate station consisted of three randomly collected benthic macroinvertebrate sub-samples; the three sub-samples were combined to provide a single composite sample for each station.

Five grab samples were collected in each polygon (one from each replicate station) for a total of ten benthic sediment samples per waterbody. Each benthic sediment grab was subsampled with a 5 cm diameter core tube (0.002 m^2 surface area) to provide approximately 100 mL of sediment. Sediment subsamples were kept cool in the field and then refrigerated. Sediment samples were not collected where the nearshore substrate was predominantly hard (i.e., bedrock and/or cobble), instead a photographic and visual description was recorded.

The following describes the benthic macroinvertebrate field collection protocol followed in Year 3.

Lake and Reservoir Environments

Nearshore polygon: Kicknet Travelling Kick/Sweep:

- Target water depths of ≤ 1 m (i.e., restrict water depth to a wadeable depth to accommodate kick-and-sweep net sampling method) and avoiding areas of water movement (i.e., sample in areas where water velocity < 0.2 m/s) and aquatic macrophyte beds. This aquatic habitat typically experiences frequent water level fluctuations and likely has heterogeneous substrate.
- Each replicate station will be comprised of a timed 3-minute composite kick/sweep sample, for a total of five composite nearshore samples per waterbody. Within each replicate station, three sub-samples will be collected along separate, randomly selected transects. Each transect will consist of a 1-minute zig-zag travelling kick/sweep sample in a perpendicular direction from the waters edge to about 1 m water depth(width of zig-zag will be approximately 1 m). Each transect will be sampled by vigorously kicking the substrate to disturb it to a depth of approximately 5 cm. The idea is to be as consistent as possible with respect to the amount of

sampling effort for all sub-samples. The three sub-samples collected within a replicate station will be pooled, providing a single descriptor value from each station.

- Where the nearshore habitat is considered non-wadeable as the result of shorelines dominated by woody debris and soft substrate, Ekman grabs will be collected from a boat to the extent possible (see sampling approach below).

Offshore polygon: Ekman/petite Ponar Grab:

- Target water depths of 5 to 10 m with homogeneous substrate and standing water aquatic habitat (sampling in areas where water velocity < 0.2 m/s).
- Each replicate station will be comprised of three benthic grab sub-samples, for a total of five composite offshore samples per waterbody. Three sub-samples will be collected using a random number table and sampled from designated sampling locations around an anchored boat within the 10 x 10m replicate station area. The three grab sub-samples collected from a replicate station will be pooled, providing a single descriptor value from each station.
- For each field sub-sample/grab, the Ekman/petite Ponar will be slowly lowered until it rests on the bottom to prevent shock waves that could physically move or disturb organisms and sediment from beneath the sampler. The Ekman/petite Ponar rope will be then pulled gently, closing the Ekman/petite Ponar jaws. The Ekman/petite Ponar will be slowly raised, to minimize turbulence, and the sample is immediately placed into a pail. An acceptable sample requires that the jaws be completely closed upon retrieval. If the jaws were not completely closed the sample is discarded into a bucket (and disposed of once sampling was completed) and the procedure is repeated. All sampling equipment will be rinsed before the sampling at the next site.

Riverine Environments

Nearshore polygon: Kicknet Travelling Kick and Sweep:

- Target water depths of ≤1 m (i.e., restrict water depth to accommodate kick-net sampling method) and areas with consistent water movement/velocity (i.e., standing water, low, or moderate). These water depths experience frequent water level fluctuations and likely have heterogeneous substrate.
- Sampling in nearshore polygons will be the same as described for lake sites, i.e., five replicate stations per polygon; three randomly selected transects perpendicular to shoreline to wadeable water depth (≤1 m) resulting in a timed 3-minute composite kicknet/sweep sample per replicate station.

Offshore polygon: Ekman/petite Ponar Grab:

- Target water depths of 5 to 10 m with homogeneous substrate and areas with consistent water movement/velocity (i.e., standing water, low or medium water velocity habitat).
- Sampling in offshore polygons will be the same as described for lake sites.

At waterbodies where nearshore and offshore polygons have been established, field crews will re-visit the same replicate stations; all coordinates (in UTM NAD 83).

Invertebrate and environmental data recorded from waterbodies will be relative to the water level at the time of sampling and will be recorded on a CAMPP benthic sampling field sheet. Supporting environmental variables will be measured in order to link aquatic habitat attributes with invertebrate community. Supporting environmental variables measured at each replicate station will include:

- UTM position (using a hand-held Garmin eTrex® GPS receiver);
- Water transparency (using a Secchi disk);
- Riparian vegetation (photographic record and visual description);
- Percent canopy cover (photographic record and visual description);
- Water temperature (using a hand-held thermometer for water surface measurement); and,
- Water velocity (using a Swoffer current velocity meter to characterize the flow regime at time of sampling at all CAMPP sampling areas).

Supporting environmental variables measured at each sub-sample site will include:

- Water depth (using a hand-held depth sounder for offshore + depth rod for nearshore [record maximum sampling depth of transect]), and
- Substrate composition (visual description e.g., % cobble, gravel, silt, etc).

Relative water levels will be measured at one location within the nearshore polygon for each waterbody using a simple line level and measuring tape method (BC Ministry of Fisheries 1999) in order to relate water surface elevation at the time of sampling. The procedure is as follows:

- Scan the shore for evidence of the high water mark (e.g., dead lichen on rocks parallel to water level, below currently thriving lichen);
- A benchmark can be any immovable structure above the high water mark of a water body. (e.g., find a mature healthy tree near the waters edge in the desired survey control area);

- Locate a point on the trunk that is above the current water level (bench mark should always be established above the visible high water mark; e.g., 1 to 2 metres above the current water level);
- Drive a large spike or nail horizontally into the tree and flag or blaze the tree with flagging tape or bright spray paint;
- Obtain coordinates and description of the benchmark location (describe whether the water level is abnormally low/high based on riparian vegetation, photograph etc.);
- Affix one end of fishing line or string to the spike or nail on the tree;
- Attach a small pocket sized line level to the fishing line or string;
- Extend the free end of the line out over the water line;
- Pull the line level (the level should be placed exactly in the middle of the line;
- Measure the vertical distance from the free end of the level line to the water line using a standard measuring tape;
- Record the vertical distance on the field sheet along with the coordinate and description (replicate station, time, UTM, description/photo);
- Also measure the vertical distance from this level line to the high water mark if apparent. The high water mark is usually considered the mean maximum over a two year period; record and photograph.

5.2 LABORATORY ANALYSIS METHODS

The following provides an overview of the laboratory methods employed in Years 1 through 3 of CAMPP.

In the NSC laboratory, each benthic invertebrate sample was thoroughly and gently rinsed with cold/cool water through a 500 µm brass test sieve. The entire sample was examined visually to determine whether splitting (sub-sampling) was required as the target was 300-organisms per field sample. Samples containing fewer than 300 invertebrates were sorted entirely. If splitting was required, the whole sample was scanned to remove any large and/or rare organisms, these organisms were placed into a separate and labelled vial. Once the large and/or rare scan was complete, a 1.0 or 4.0 L Folsom Plankton Splitter (specific to sample volume) was used to divide the whole sample into aliquots that were sorted until at least 300 invertebrates were counted. When the 300-organism count was achieved part way through an aliquot, the remainder of that fraction was processed so that a known portion was sorted. The following taxa were not included in the 300 organism count: Ostracoda, Cladocera/Rotifera, Copepoda, Harpacticoida, Porifera, Nemata, Platyhelminthes, and non-aquatic taxa.

All invertebrates were sorted from the sample matrix under a desktop magnifying lamp (3X magnification) and transferred to 70% ethanol prior to being identified to the appropriate taxonomic level. The approximate proportion of the organic and inorganic component (vegetation, detritus, and/or substrate) of each sample was recorded on the laboratory benchsheets. Samples were processed following the NSC Quality Assurance/Quality Control (QA/QC) sorting guidelines. All sorted samples were checked by a second laboratory technician; with the provision that a re-sort of the entire sample was required if sorting efficiency was less than 95%.

Invertebrates were enumerated and identified using a Leica MZ12.5 stereomicroscope with maximum 100x magnification. Taxonomic analyses of benthic macroinvertebrate communities in lake/reservoir and riverine environments were:

- family, or lowest practical level for non-Insecta,
- family for Insecta and sub-family for Chironomidae; and,
- genus for Ephemeroptera.

Taxonomic analysis was performed using reference texts: Clifford (1991), Merritt and Cummins (1996), Peckarsky et al. (1990), Smith (2001), Stewart and Stark (2002) and Wiggins (2004). Scientific names used followed the Integrated Taxonomic Information System classification (ITIS 2012). Taxonomic identifications were verified (i.e., QA/QC) by submitting 10% of randomly selected samples from each waterbody to an external taxonomic specialist. The target accuracy for in-house identifications is 90%, identifications and/or enumeration discrepancies were corrected on the taxonomic benchsheet.

All sorted samples were retained should further identification be required. A taxonomic reference collection of benthic macroinvertebrate was assembled to ensure taxonomic consistency throughout the Program duration. An external taxonomic specialist was used to verify all of the identifications in the collection.

Sediment samples were submitted to a CALA accredited analytical laboratory (ALS Laboratories, Winnipeg, MB) for PSA and TOC analyses.

5.3 DATA SUMMARIZATION AND ANALYSIS

The following provides an overview of the data analysis methods used in Years 1 through 3 of CAMPP.

Data from field sampling and laboratory benchsheets are entered into an MS Excel® data template. NSC data templates specify the project name, study area, site location/description, UTM coordinates, site label, sampling date, time of day, gear type, sieve mesh size in field and laboratory, presence or absence of vegetation/algae, water temperature, water depth, velocity, substrate type, number of splits, and an enumerated taxonomic list and life stage of invertebrates. A 2nd and 3rd technician verifies all entered data and formulae to original field book and laboratory benchsheets. A final verification is conducted by the component manager.

Benthic macroinvertebrate communities in lake/reservoir and riverine environments were described based on a variables related to composition, abundance, and richness measures. Measures were:

- Total macroinvertebrate abundance;
- Abundances and proportions of major groups (i.e., Non-Insecta, Oligochaeta, Amphipoda, Bivalvia, Gastropoda, Insecta, Chironomidae, Ephemeroptera, Plecoptera, and Trichoptera);
- Percent samples with only oligochaetes and/or chironmids;
- Percent of samples with no aquatic macroinvertebrates;
- EPT Index (Ephemeroptera, Plecoptera, and Trichoptera as total abundance, and proportion (%) of total macroinvertebrates);
- EPT: Chironomidae (ratio of EPT to chironomid abundance);
- Taxonomic Richness (family-level);
- Simpson's Diversity (D) and Evenness (E_D) indices;
- Shannon's Diversity (H) and Evenness (E_H); and,
- Hill's Effective Richness ($E^{H'}$) and Evenness ($E^{H'}$/S).

During the reporting stage, benthic macroinvertebrate data were reviewed in consideration of the three years of CAMPP data collectively to assist with identification of potential outliers or issues that required consideration for data analysis. Potential outliers were identified through graphical methods, including box plots. However, in general, potential outliers identified through the reporting process were retained due to the relatively limited quantity of data available to date.

To assist with data interpretation and presentation, summary statistics including mean, median, minimum, maximum, SD, and SE were calculated for macroinvertebrate community variables at each site on an annual basis. Any suspect results were omitted from the analyses.

Statistical analyses were undertaken to evaluate spatial and temporal differences for the three years of CAMPP collectively. Spatial comparisons were made between waterbodies/areas in each of the regions and temporal comparisons were made between Years 1 through 3 for each waterbody/area. Due to study design change, nearshore data in Year 3 were not included in the spatial and temporal analyses.

Statistical methods varied in accordance with results of tests for normality of data. Normality was tested using Shapiro-Wilk test ($\alpha = 0.05$) on raw, untransformed data, log-transformed (natural [ln] and base 10), and square-root-transformed data. For community variables exhibiting a normal distribution, analyses were conducted using ANOVA and a Tukey's test ($\alpha = 0.05$). For parameters not meeting the assumptions of a normal distribution, the non-parametric Kruskal-Wallis test followed by the Dunn's multiple pairwise comparisons procedure (two-tailed; $\alpha = 0.05$) was applied.

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6.0 FISH COMMUNITY

6.1 SITE SELECTION

Fish community sample sites were distributed between shallow and deep areas in lacustrine environments. Gillnetting sites were selected in such a way as to provide broad spatial representation and to avoid bias towards certain habitat types or fish species. In lakes in which previous sampling programs have been conducted, CAMPP sample sites were selected to maintain consistency with these programs to the degree practicable. Once set locations were established, they were generally used in subsequent years. Exceptions included instances in which previous set locations could not be sampled because of weather and/or lake conditions, or new criteria (i.e., those that necessitated a change in location of certain individual set locations) were established as part of the pilot phase of the program.

For riverine sites, set locations were generally selected based on the practicality of setting in a given location. Set locations were chosen to encompass, to the degree possible and as flow conditions allowed, the full extent of the sample area and habitat types. As was the case for lacustrine sites, once set locations were established, they were used in subsequent years when possible.

6.2 METHODS

6.2.1 Sampling Methods

6.2.1.1 Gillnetting

At each sampling site, standard gang index gill nets comprised of five mesh sizes (each constructed as a separate panel) were set. Each panel was 22.9 m (25 yds) long, approximately 1.8 m (2 yds) deep and seamed on to #30 leadline and 1.0 cm (3/8”) floatline. All mesh was constructed of light green coloured twisted nylon. Standard gangs were assembled by joining the nets from floatline to floatline and from leadline to leadline, and organized with the stretched meshes in sequence of size (51 mm [2”], 76 mm [3”], 95 mm [3.75”], 108 mm [4.25”], and 127 mm [5”]).

In addition, at approximately every third set location, the large mesh end of a small mesh index gillnet gang was attached to the small mesh end of the standard gang. If fewer than 9 standard gang index gill nets were set in a given waterbody, a minimum of three small mesh index gillnet gangs were usually set. Small mesh index gillnet gangs were comprised of three mesh sizes (16 mm, 20 mm and 25 mm bar measure), each constructed as a separate panel. Each panel was 10 m long, 1.8 m deep and constructed of clear monofilament. Small mesh gill net gangs were assembled by joining the nets floatline to floatline and leadline to leadline with meshes in sequence of size.

Gill nets were set for an approximate 24 hour period and the following information was collected:

- date and time set/retrieved;
- type of net set (standard gang index gill net only or both standard gang index gill net and small mesh index gill net);
- GPS coordinates;
- water temperature;
- weather conditions (e.g., air temperature, wind direction and wind velocity);
- water depth
- Secchi disc depth;
- proximity and orientation to shore;
- shoreline conditions;
- water velocity (low, medium, high);
- aquatic vegetation present (low, medium, high);
- substrate conditions; and,
- quantity and type of debris present.

6.2.1.2 Fish Sampling

Upon standard gang index gill net retrieval at each site, all fish captured were counted by mesh size and species. For certain species of management interest (i.e., Northern Pike, Lake Whitefish, Sauger and Walleye), individual metrics were collected from all fish captured in the standard index gill net gangs. Selected metrics were also collected from all Lake Sturgeon and some White Sucker. No individual metrics were collected from fish captured in the small mesh index gill net gangs. Metrics collected from fish captured in the standard gill nets included:

- fork length (to nearest 2 mm);
- total length (to nearest 2 mm - Lake Sturgeon only);

- individual weight (to nearest 10 g for fish <4 kg, to nearest 25 g for fish > 4 kg) for species of management interest (i.e., Northern Pike, Lake Whitefish, Sauger and Walleye)
- internal examination of sex and state of gonad maturity for species of management interest;
- occurrence of deformities, erosions, lesions and tumours (DELTs) for Northern Pike, Lake Whitefish, Sauger, Walleye, Lake Sturgeon and White Sucker; and,
- collection of ageing structures (cleithra from Northern Pike, otoliths from Lake Whitefish, Sauger and Walleye).

The remaining species from the standard gang index gill net catch were counted and bulk weighed to the nearest 25 g by species and mesh size. Fish from the small mesh index gill nets were not separated by mesh size, but were separated on the basis of species, counted and bulk weighed to the nearest 25 g (large bodied species) or 1 g (small bodied species).

Sex and state of Maturity

Select species were examined internally to determine sex and state of maturity. State of maturity classifications were as follows:

Female = F	1 – immature	Male = M	6 – immature
	2 – maturing to spawn		7 - maturing to spawn
	3 – ripe		8 – ripe
	4 – spent		9 – spent
	5 – resting		10 – resting
	12 – unknown		11 – unknown

Immature fish without distinguishable gender features were not classified.

DELTs

Occurrence and severity of deformities, erosion, lesions and tumours (DELTs) was documented for fish captured from standard gang index gill nets. A deformity was defined as a deformed fin or fin ray, head, spinal column, or other body part. Scale disorientation, such as scale whirling or reversal, was included in the deformity category. Erosion included erosion of fins, operculum, and tail, as well as fin rot. Lesions included open sores, exposed tissue, ulcerations, cysts, and eye abnormalities (e.g., cataracts, exopthalmia). Tumour-like growths were classified as tumours where the tissue was a solid mass using the USEPA "fingernail test". In this test, the growth was poked, and if it was not fluid-filled, it was classified as a tumour; fluid-filled nodules were considered lesions. Severity of DELTs was categorized as either mild or severe based on ranking criteria outlined below:

Type of DELT	Rank	Ranking Criteria
Deformity	Mild	• 1 deformed fin or branched barbel.
	Severe	• ≥2 deformed fins or barbells OR
		• any body (head, vertebrae, abdomen, or other body part) deformity**
Erosion	Mild	• 1 or 2 barbels eroded < half the barbel length OR
		• a fin ray not eroded past ray fork
	Severe	• ≥3 eroded barbels OR
		• 1 barbel eroded > half its length OR
		• ≥ 2 fins eroded OR
		• 1 fin eroded past a single ray fork OR
		• gill cover eroded showing exposed gill(s)
Lesion	Mild	• ≤ 2 lesions < the size of the largest scale
	Severe	• ≥ 3 lesions OR
		• 1 lesion size of the largest scale (for Ictalurids, use eye diameter) OR
		• raw tissue
Tumour	Mild	• ≥2 tumours < the diameter of the eye (count patches of Lymphocystis as one tumour)
	Severe	• ≥3 tumours OR
		• 1 tumour > diameter of the eye

** If scale disorientation (whorling, reversal, deformities, altered size, or pattern disruption) is encountered, an arbitrary distinction between ‘severe’ and ‘mild’ may be assigned.

Example:

Mild = < 30% of one side of the body affected
Severe = ≥30% of one side of the body affected *OR* both sides affected

6.2.2 Laboratory Methods

Ageing

Ageing of fish captured during CAMPP was conducted by two agencies: Manitoba Conservation and Water Stewardship – Fisheries Branch (MCWS); and North/South Consultants Inc. (NSC). Otoliths were used to age Lake Whitefish, Sauger, and Walleye, while cleithra were used to age Northern Pike. Although the general methodologies for ageing of otoliths and cleithra among the two agencies were similar, there were minor differences in methodology.

Most otoliths were cracked prior to toasting and viewing; however, otoliths that were particularly small and/or difficult to section or grind were toasted and viewed (read) whole. In the former case, the cracked plane of otoliths aged by MCWS were polished using a bench lathe. Cracked otoliths aged by either agency were placed cracked side up in plasticine with a drop of clearing medium (i.e., oil of wintergreen or water) placed on the cracked surface prior to reading. Whole otoliths, on the other hand, were placed in a shallow well (dish) and completely immersed in a clearing medium. In both cases, otoliths were then read under a dissecting microscope with reflected light against a dark background.

In preparation for reading, cleithra were boiled to remove any tissue or oil residue that was left on the structure after removal from the fish. Cleithra were then typically read ‘free hand’ (i.e., without a microscope) against a dark background; however, a dissecting microscope was utilized when required. MCWS used a magnifying light to read all cleithra.

Quality Assurance and Quality Control

NSC viewed all ageing structures two to three times before a final age was assigned while MCWS read the structure once and assigned an age and a confidence index score. In-house quality assurance and quality control (QA/QC) procedures conducted by both agencies included the re-ageing of a random sample of at least 10% of all structures by an ageing technician not involved in the initial age determination. After the in-house QA/QC was completed, each agency selected an additional 10% of the structures at random and they were sent to the other agency for ageing to assess accuracy and consistency among agencies. Please refer to Appendix 2 for additional detail on the fish ageing QA/QC procedures.

6.2.3 Data Analysis Methods

Relative Abundance and Biomass

For each waterbody, standard gang and small mesh index gillnet catches were tabulated by total number of fish per species and total biomass per species. Using the numbers of fish caught, frequency of occurrence for each species was expressed as percent relative abundance (RA), calculated as

$$C_x/C_t \times 100$$

Where C_x is the number of fish caught of species *x* and C_t is the total number of fish caught.

Similarly for biomass, percent of total biomass was calculated for each fish species as

$$B_x/B_t \times 100$$

Where B_x is the bulk weight or biomass (g) of species *x* and B_t is the total biomass of all fish caught in the waterbody during that sampling year.

Catch-Per-Unit-Effort (CPUE) and Biomass-Per-Unit-Effort (BPUE)

For each site sampled with a standard gang index gillnet, site CPUE and BPUE were calculated for each fish species and all fish species combined (total) as the number or bulk weight of fish captured in 100 m of net/24 h, or

$$C_x \ or \ B_x \div E \times 24$$

Where C_x and B_x are catch - the total number of fish caught of species *x* and biomass – the bulk weight of species x, respectively at a given gillnet site, and *E* is effort – the duration (h) the gill net was set in the water at a given site.

For small mesh index gill nets, site CPUE and BPUE were calculated for each fish species and all fish species combined (total) as the number or bulk weight of fish captured in 30 m of net/24 h, or

$$C_x \ or \ B_x \div 1.143 \div E \ \times 24$$

Using these site values, CPUE and BPUE were then calculated for each waterbody in two separate ways. First, yearly CPUE and BPUE were calculated as the mean (±SD) of all site values; and second, using these yearly CPUE and BPUE values, a simple moving (or running) average (±SE) was then calculated (from herein referred to as overall CPUE or BPUE) for each waterbody.

In some instances, captured fish were counted and measured to fork length, but were not weighed. In such cases, and in order to allow direct comparison of CPUE and BPUE values, individual fish with no recorded weight were provided with an inferred weight based on the calculated weight-length relationship for the species and region of origin. For each region, a weight-length relationship was established for each species with a sample size ≥20 fish using least squares linear regression and fitting a straight line between $\log_{10}$ transformed weight and $\log_{10}$ transformed fork length. Using the resultant regression equation, fork length was used to predict weight for individuals that were not originally weighed in the field. BPUE was then calculated using both field measured and weight-length relationship derived weights. Predicted weight values were not used for any analysis other than for calculation of BPUE.

Length, Weight and Condition Factor

Mean (±SD) length, weight and condition factor (K) were calculated for fish species of management interest (i.e., Northern Pike, Lake Whitefish, Sauger, and Walleye) by waterbody. Condition factor was calculated (after Fulton 1911 in Ricker 1975) per fish as

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

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

Mean fork length is also presented as a function of mesh size using the following groupings: small mesh (includes 16, 20 and 25 mm mesh collectively), 51 mm (2”), 76 mm (3”), 95 mm (3.75”), 108 mm (4.25”), and 127 mm (5”) mesh.

In many instances, fish were bulk weighed (rather than weighed individually). This action made quantifying a measure of variation (i.e., standard deviation) not possible, and as a result, in some cases only mean weight was calculable whereas SD was not.

Fork-length-frequency (%) distributions are presented at fork length intervals of 25 mm for Lake Whitefish, Sauger and Walleye, and at fork length intervals of 50 mm for Northern Pike.

Age and Growth

The results from ageing species of management interest were used to determine age- and year-class frequency distributions, and fork length- (mm), weight- (g), and condition factor-at-age. For each fish species, the number of fish aged were tabulated by age- and year-class, and used to calculate for each age- and year-class the percent of the total number of fish aged. For fork length, weight and condition factor, a mean (±SD) was calculated for each age- and year-class.

The Von Bertalanffy growth model (from herein referred to as VBGM) was chosen to analyze growth for species of management interest. The VBGM is calculated as follows (from von Bertalanffy 1934, 1938 *in* Ricker 1975)

$$l_t = L_\infty\left(1 - e^{-K(t-t_0}\right)$$

Where

l_t is the expected or average length at age t,

L_∞ is the asymptotic average length (the point where growth reaches an asymptote and slows), *K* is the Brody growth coefficient,

And t_0 is a modeling artefact that represents the age when the average length was zero.

In an attempt to produce meaningful results and to further simplify analyses, age and length data collected in each of 2008, 2009 and 2010 were pooled. Using the compiled data set, modeling was then completed in two steps: (1) generating starting values for model parameters, and (2) fitting the model. Starting values were estimated for each parameter (L_∞, K, and t_0) using Ford-Walford plots (Ford 1933; Walford 1946) and fitting second-degree polynomials to the length-at-age data. Once reasonable starting values were derived, models were then fit using non-linear least squares. Model assumptions were checked to and diagnostics assessed to determine how well the model fit the data. All analyses were completed using the FSA (Ogle 2012a), NCStats (Ogle 2012b) and nlstools (Baty and Delignette-Muller 2011) packages for R Version 2.15.0 (R Development Core Team 2012).

Index of Biotic Integrity

Biotic integrity is the capacity of a habitat to support and maintain a balanced, integrated and adapted assemblage where the assemblage has a composition, diversity and functional organization comparable with that of a natural habitat of the same region (Karr et al. 1986). An Index of Biotic Integrity (IBI) is a multimetric approach using a defined group of metrics or measures that, when combined, reflect the overall biological condition of a waterbody (Barbour et al. 1995). Metrics comprising an IBI should reflect some aspects of the biological structure, function, or other measurable characteristic changes in a predictable manner with increased ecosystem stress (Faucsh et al. 1990).

Various metrics have been proposed and used for IBI calculations; for CAMPP, eleven metrics from four categories were selected (Section 4, Table 4.7.2-1). Niemela et al. (1999) provides a thorough description of the selected metrics. The species present within all waterbodies were classified into various categories based on previous studies and existing knowledge (Section 4, Table 4.7.2-2). The species composition and richness category consisted of five metrics: total number of species; number of sensitive species; proportion of tolerant and invasive individuals; number of insectivore species; and, Hill's Effective Species Richness Index. Three metrics (percentage of insectivore biomass, omnivore biomass and piscivore biomass) were selected from the trophic composition category while one metric (the proportion of simple lithophilic spawners) was included from the reproductive composition category. Two metrics (standard index gillnet CPUE and the percentage of individuals with DELTs - the latter recorded only for certain species) were included from the abundance and condition category. Since DELTs were only recorded for certain species, the frequency of DELTs was only calculated using those species. This metric was also valued less than the other ten metrics due to concerns about possible sampling bias and inconsistency with regard to field DELT observations.

Metric Scoring

Continuous variable, rather than discrete, scoring was performed for the selected metrics. Continuous scores allow a greater range of scores, avoid sequence gaps, and minimize bias (Fore et al. 1994). Each metric was standardized such that values ranged from 0 to 10, with the exception of percentage of individuals with DELTs which was scored from 0 to 5, using methodology outlined in Minns et al. (1994) as follows:

$$Ms = A + B \times Mr$$

$$\text{If } Ms < Mmin\text{, then } Ms = 0$$

$$\text{If } Mr > Mmax\text{, then } Ms = 10.$$

A standardized metric (Ms) was defined as a linear function of a raw metric (Mr). The minimum and maximum thresholds (Mmin = 0 and Mmax = 10) defined the upper and lower limits for the standardized metric. For metrics positively related to biotic integrity, the lower limit (Mmin), was set to zero and the upper limit (Mmax) was set at or near the 95th percentile of the cumulative frequency distribution of the raw metric values. For metrics negatively related to lake integrity, the lower limit was set close to the 95th cumulative percentile and the upper limit was set close to the 5th cumulative percentile. The relationship between the raw and standardized metric was assumed to be linear between the upper and lower bound.

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7.0 FISH MERCURY

7.1 FIELD SAMPLING

Fish for mercury analysis were collected during fish community sampling. An effort was made to collect 36 fish each of Lake Whitefish (*Coregonus clupeaformis*), Northern Pike (*Esox lucius*), and Walleye (*Sander vitreus*). The individuals chosen for mercury analysis of these three species were to represent a broad size range and, as much as possible, an equal representation of size classes. In addition to the large-bodied species, up to 25 Yellow Perch (*Perca flavescens*) of age 1+ were collected. Fish of this age were retained for analysis based on their size; perch aged during previous sampling programs in Manitoba indicate that 1-year old perch nearing the end of their second summer measure from approximately 60-100 mm fork length.

Most fish were captured in standard gang index nets made up of six 25 yard (22.9 m) long by 6 foot (1.8 m) deep panels, consisting of 1.5, 2, 3, 3.75, 4.25, and 5 inch (38, 51, 76, 95, 108, and 127 mm) stretched mesh (see section 4.7.2.1 Fish Community). Additional fish were obtained from small mesh gill nets which consisted of three 10 m long by 1.8 m deep twisted nylon panels of 16, 20, or 25 mm stretched mesh. Nets were set for various durations ranging from approximately 17-30 hours. On a few occasions nets could not be retrieved for up to 48 hrs. Upon capture, large-bodied fish were measured for fork length (±1 mm) and total weight. Weight was recorded to ±1 g on a KPC 5000-05 (Kilo Tech) or a Scout Pro SP2001 (Ohaus Corp.) electronic balance. Some fish weighing more than 2 kg were weighted to ±10 g on an Accu weight SM 410 (Yamato Scale Co., Ltd.) electronic pan balance. Large-bodied fish were also examined internally to determine sex and maturity, and bony structures were removed for age analysis: otoliths were dissected from Lake Whitefish, dorsal spines were taken from Walleye, and cleithra were collected from Northern Pike. A portion of axial muscle weighing approximately 10-100 g was removed from each fish anterior to the caudal (tail) fin for mercury analysis. The muscle with skin attached was covered with cling-wrap, placed in a mercury-free Whirl-Pac bag with internal and external labeling, and stored on ice until it could be frozen. Whole Yellow Perch were placed individually or as a group into labeled, mercury-free plastic bags and stored on ice until they could be transferred into a freezer. Frozen tissue samples and whole Yellow Perch were shipped to the North/South office in Winnipeg for archiving and further processing.

7.2 LABORATORY ANALYSES

Yellow Perch were superficially thawed until fins became flexible and the axial musculature (fillet) could be easily cut with a scalpel. At that time, perch fork length (±1 mm) and weight (±0.1 g) were recorded, all internal organs removed, and the head (dorso-ventral oblique cut to anterior of the pelvic girdle) and the tail (at the caudal peduncle) severed from the remaining carcass. Otoliths and/or opercula bones were taken for age determination of selected individuals from length-stratified groups. The remaining carcass, including skin and bones was weighed (±0.01 g) on a PM 480 (Mettler-Toledo Inc., Columbus, OH) electronic balance, wrapped in cling wrap, placed in a Zip-Lock bag, and refrozen.

Frozen muscle samples and carcasses were shipped to a CALA accredited laboratory (ALS Laboratories, Winnipeg, MB) and analyzed for total mercury using an adaptation of US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues". Skin-off muscle samples of large-bodied fish and remaining bodies of Yellow Perch were homogenized in a blender and sub-sampled (if necessary) prior to hot-block digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Mercury quantification was by atomic fluorescence spectrophotometry, using a PS Analytical (Deerfield Beach, Florida) “Millenium Merlin” analyzer. The analytical detection limit (DL) of this method was 0.01 ppm for a sample weight of ≥ 2 g.

7.3 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

At ALS, samples of three different standard (certified) reference materials (SRMs) were analyzed with each sample run, including: apple leaves (National Institute of Standards & Technology, 1993); lobster hepatopancreas (TORT-2; National Research Council Canada [NRC] 1994); and, fish protein (DORM-3; NRC 2008). In addition, several duplicate analyses of the same sample homogenate were run for quality control purposes.

To provide an inter-laboratory comparison of mercury concentrations in fish from CAMPP waterbodies in 2010, five samples of Lake Sturgeon from the Lower Churchill River at the Little Churchill River and five samples each of Lake Whitefish, Northern Pike, Walleye, and Yellow Perch from Cormorant Lake were split in half (cut with a scalpel after slight thawing), and one half each was submitted to either ALS or Flett Research Ltd. (Winnipeg, MB) for analysis. At Flett Research, total Hg was measured according to EPA Method 7473 “Mercury in solids and solutions by thermal decomposition, amalgamation, and atomic absorption spectrophotometry” using a DMA-80 (Milestone, Burlington, Ont.) direct mercury analyzer. The method detection limit was 0.001 ppm. For analysis, a subsample of pure muscle (i.e., without bones or skin) weighing <0.1 g was dissected out of the submitted muscle samples or the Yellow Perch carcasses. Two duplicate analyses (separate subsamples from one muscle sample) and two runs of DORM-3 SRM were included in the analyses at Flett Research for quality control purposes.

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APPENDIX 2
QUALITY ASSURANCE/QUALITY CONTROL RESULTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The following provides a detailed description of the results of the quality assurance/quality control programs implemented under CAMPP for water quality, phytoplankton, fish community, and fish mercury monitoring components.

2.0 WATER QUALITY

2.1 INTRODUCTION

A variety of quality assurance and quality control (QA/QC) measures have been included in the water quality component throughout the implementation of CAMPP to ensure a high level of data quality. Field QA/QC measures employed in the program included use of standard operating procedures, routine calibration of *in situ* water quality meters, verifications of *in situ* water quality meters (i.e., routine checks of water quality meter performance), and inclusion of various QA/QC samples (trip and field blanks, triplicate samples, and inter-laboratory comparisons). Methods and results pertaining to the QA/QC component for the water quality monitoring program conducted from 2008/2009 through 2010/2011 are described below. The QA/QC program also includes rigorous measures in relation to data entry and management and evaluation of water quality data.

2.2 QA/QC METHODS

During the open-water period, the water quality monitoring component of CAMPP was conducted partly by North/South Consultants Inc. (NSC) and partly by Manitoba Conservation and Water Stewardship (MCWS). All sampling conducted during the ice-cover season was conducted by NSC; one crew sampled the Winnipeg River, Saskatchewan River, and Upper Nelson River regions while the second crew sampled all northern regions.

The QA/QC program was also shared between the two agencies. All the core water quality samples were submitted to a Canadian Association for Laboratory Accreditations, Inc (CALA) accredited analytical laboratory (ALS Laboratories, Winnipeg) for analysis; the inter-laboratory comparison samples were submitted to a second CALA accredited analytical laboratory (Maxxam Analytics, Winnipeg).

The QA/QC measures included in the CAMPP water quality sampling program included submission of field and trip blanks, analysis of replicate (i.e., triplicate) samples, and analysis of inter-laboratory comparison samples. In 2008, two sets of field and trip blanks were analysed during each sampling event (spring, summer, fall, and winter), with one set submitted by each crew. As of 2009, three sets of blanks were analysed each open-water sampling event (spring, summer, and fall), with one set analysed for the southern region (i.e., Winnipeg River), and two sets submitted for the central/northern regions (one set per sampling agency). Four sets of field and trip blanks were submitted during the ice-cover sampling periods of 2009/10 and 2010/11 (i.e., two sets per sampling crew).

Replicate samples were collected seasonally, generally at the same frequency as blanks; the exception occurred in winter 2009 when three sets of triplicates were collected by each crew. Replicate samples were collected from sites randomly selected throughout each region.

One sample was also collected randomly for inter-laboratory comparison during each open-water sampling event in 2008 and 2009 and during all sampling periods in 2010/2011. In addition, up to four samples of surface water were collected by each crew on each sampling trip (generally two for the MCWS crew and three for the NSC crew) for laboratory analysis of dissolved oxygen (DO); these samples provided a means of verifying *in situ* DO measurements.

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 in the field by filling sample bottles with deionized water (both provided by the analytical laboratory) and transporting the blanks along with the environmental samples. Field blanks were treated in a manner consistent with field samples (e.g., kept cool and in the dark) and submitted concurrently with field samples to the analytical laboratory.

Trip blanks are used to evaluate 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 (British Columbia Ministry of Environment, Land and Parks [BCMELP] 1998). Trip blanks were prepared in the laboratory by filling sample bottles with distilled water. Trip blanks were transported to the field sampling sites, but remained sealed, and were then submitted to the analytical laboratory in conjunction with environmental samples for analysis.

Replicate samples were collected at selected sites to provide a measure of variability of environmental conditions and the overall precision associated with field methods and laboratory analyses. Replicate (i.e., triplicates except on two occasions when duplicates were collected) samples were also treated in a manner consistent with field samples and submitted concurrently to the analytical laboratory. Note that as of 2010/2011, collection of samples for productivity parameters changed from analysis of both near-surface and euphotic zone samples to solely euphotic zone samples.

Inter-laboratory comparison samples were collected to assess the accuracy of the results through comparison to analyses performed at a different analytical laboratory (Maxxam Analytics). The two samples (one for ALS and one for Maxxam) were collected in as close proximity to each other as possible and as close in time as possible. As noted above, chlorophyll *a* samples were only collected from the euphotic zone, rather than from both the near-surface and euphotic zone, in 2010/2011.

All QA/QC samples were blindly labelled to ensure that the analytical laboratory was unaware of their identities. The sample identifiers were:

- NSC field blanks, all seasons – southern region: RAS 156;
- NSC field blank, all seasons – central and northern regions: LHS 004;
- MWS or NSC field blank, all seasons – northern region: TDS 005;
- NSC field blank, ice-cover season – northern region: ECS 007;

- NSC trip blanks, all seasons – southern region: RAS 157;
- NSC trip blanks, all seasons – central and northern regions: LFS 006;
- MWS or NSC trip blanks, all seasons – northern region: TCS 007;
- NSC trip blank, ice-cover season – northern region: ECS 006;

- NSC triplicates, all seasons – southern region: PFS 095, PFS 096;
- NSC triplicates, all seasons – central and northern regions: KLS 002, KLS 003;
- MWS or NSC triplicates, all seasons – northern region: TFS 013, TFS 014; and
- Triplicates, ice-cover season – northern region: FAS 010 and FAS 011.

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.

Relative percent mean difference (RPMD) was calculated for the DO, turbidity, pH, and conductivity data (i.e., comparing *in situ* to laboratory measurements), inter-laboratory comparisons, and duplicate samples using the formula (BCMELP 1998):

RPMD = (Value 1 – Value 2)/((Value 1 + Value 2)/2) x 100.

Precision of replicate samples was evaluated using the “rule of thumb” criteria for precision of 18% for triplicate samples and 25% for duplicate samples (BCMELP 1998).

Where one or more of the replicate values were less than five times the analytical detection limit (DL), an analysis of precision was not undertaken, in accordance with guidance provided in BCMELP (1998).

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

Comparisons between *in situ* and laboratory measurements of pH, turbidity, and conductivity were also undertaken through regression analysis. Linear regressions were conducted using all paired data collected over the three years of CAMPP where paired data represented a matched measurement of an *in situ* variable with a laboratory measurement collected at the same depth. This analysis facilitated a general QC review of the comparability of the measurement methods as well as to facilitate identification of outliers. Regressions were conducted based on all data collected across regions as well as on a regional basis during the data analysis phase for this report. Clear outliers identified through this process were excluded from statistical analyses presented in Section 5.

In addition to the aforementioned data QA/QC review, all water quality data were initially evaluated qualitatively for potential outliers and transcription or analytical errors upon receipt of analytical laboratory results. 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.

2.3 QA/QC RESULTS

The results of the QA/QC analyses suggest that the laboratory analyses generally had high precision and accuracy.

2.3.1 *In situ* versus Laboratory Results

2008/2009

Laboratory and *in situ* measurements of DO were generally in good agreement in 2008/2009. The largest discrepancy occurred for Cross Lake on March 5, 2009, where the *in situ* measurement was notably lower than the corresponding laboratory measurement (Table 2-1).

However, the other *in situ* and laboratory measurements samples collected on the same date are identical (Table 2-1). All other DO samples had RPMDs less than 25%.

In situ and laboratory measurements of pH and conductivity were also in good agreement, as most RPMDs were less than 25% (Tables 2-2 and 2-3); the majority of RPMDs for pH were less than 10%. The exceptions were six conductivity samples collected during March 2009, where *in situ* specific conductance was lower than laboratory measurements.

Regression analysis indicates relatively good agreement between laboratory and *in situ* turbidity (Figure 2-1). The largest discrepancies occur at the lower range of turbidity values.

2009/2010

In 2009/2010, laboratory and *in situ* measurements of DO differed early in the season but samples collected after August 11 were in good agreement (Table 2-4). Improper preservation of the laboratory samples, e.g., through the use of expired preservatives, may have contributed to discrepancies in spring and summer. The variability between the samples was lower after mid-summer and in 2010.

All comparisons of laboratory and *in situ* pH and conductivity were within 25% (Tables 2-5 and 2-6).

As in 2008/2009, regression analysis between laboratory and *in situ* turbidity measurements indicates relatively good agreement between the values, with greater variation in the low range of values (Figure 2-2).

2010/2011

The 2010/2011 laboratory and *in situ* measurements of DO were very similar and all had RPMD less than 25% (Table 2-7). Field measurements of pH and conductivity were also generally confirmed by the laboratory analyses (Tables 2-8 and 2-9). Only one pH comparison had RPMD in excess of the threshold, but the *in situ* pH (12.77) was marked as suspect as it was very basic and beyond the range of values recorded for any site in the program. One conductivity measurement from fall, and three from winter also had RPMDs exceeding 25%. As in previous years, there was relatively good agreement between the field and laboratory turbidity measurements, although more discrepancies were noted in the low range of values (Figure 2-3).

2.3.2 Trip and Field Blanks

2008/2009

Trip and field blanks analysed in 2008/2009 generally indicated a lack of contamination (i.e., measurements were less than five times the analytical DL; Tables 2-10 and 2-11). Concentrations of metals in blank samples were generally at or near the DL; concentrations of cobalt and aluminum exceeded five times the DL in three and one blank samples respectively, in either the trip or field blanks, and all exceedances occurred during summer or fall (Table 2-11). Four of the routine analyses may also be indicative of contamination or analytical error. The TKN concentration measured in the summer field blank was five times the DL (and the trip blank was three times the DL; Table 2-10), and ammonia concentrations in both fall blank samples also exceeded five times the DL.

2009/2010

As in 2008/2009, trip and field blanks generally indicated a lack of contamination (Tables 2-12 and 2-13). The samples analysed for metals all had results at or near the DL while 2.5 % of the routine analyses may be indicative of contamination or analytical error. Various trip or field blank samples had ammonia, dissolved phosphorus, total phosphorus, turbidity, or conductivity results greater than five times the DL; however, the exceedances never occurred in a trip and field blank processed on the same day. There was also no indication that elevated concentrations in one parameter were consistently associated with increases in another parameter.

2010/2011

All results of routine parameters measured in the 2010/2011 blanks were near to or below the detection limits; however, the trip blank had a high concentration of chlorophyll *a* on September 9, and both of blanks had elevated chlorophyll *a* concentrations on September 15 (Table 2-14), suggesting contamination during laboratory analyses. The field blank from July 21 had concentrations of aluminum, rubidium, and silicon exceeding five times the DL, and the field blank collected on September 15 also had elevated concentrations of potassium and sodium (Table 2-15). The trip blank did not have elevated concentrations of the aforementioned metals and major ions on the associated dates; however, zirconium was over 10 times the DL on June 17.

2.3.3 Triplicate Samples

2008/2009

Routine parameters and metals were generally very similar between replicate samples collected in 2008/2009 (i.e., PRSDs less than 18 % for samples where results were greater than five times the analytical DL; Tables 2-16 and 2-17). One exception was found for each of the following: ammonia (spring), dissolved phosphorus (spring and summer), total phosphorus (summer), aluminum (fall), cadmium (winter), and manganese (spring).

2009/2010

The results of the triplicate samples collected in 2009/2010 illustrate that the routine and metal analyses generally had a high level of precision (i.e., PRSD less than 18 % for samples where results were greater than five times the analytical DL; Tables 2-18 and 2-19). Exceptions were found for four nutrients (ammonia; and dissolved, particulate, and total phosphorus; spring, summer, and/or fall), turbidity (summer and winter), pigments (chlorophyll *a* and pheophytin *a*; summer and winter), hardness (summer), five metals (aluminum, iron, manganese, rubidium, and titanium; generally spring or summer), and two major ions (chloride and iron; spring, summer, and/or fall). In total, 28 exceptions were noted, which formed 2.8 % of all analyses completed for triplicates collected during the 2009/2010 sampling season.

2010/2011

As in previous sampling years, there was generally had a high level of precision between the results of the triplicate samples collected in 2010/2011 (Tables 2-20 to 2-22). Out of the almost 2700 analyses conducted for triplicate analyses, 13 sets had PRSDs exceeding 18%, including results for total dissolved solids (twice in summer, once in fall), turbidity (summer), total phosphorus (fall), chlorophyll *a* (twice in fall), pheopigments (spring, summer), titanium (spring), silicon (summer), iron (spring), and aluminum (spring).

2.3.4 Inter-laboratory Comparison Samples

2008/2009

Results of the inter-laboratory comparisons for routine parameters and chlorophyll *a* were more variable that the other QA/QC samples, but results were very similar for the metal analyses (Tables 2-23 and 2-24). During each sampling season, up to nine parameters had RPMD exceeding 25% as follows: ammonia (summer and fall); dissolved phosphorous (summer); total particulate phosphorous (spring and fall); total phosphorous (spring and summer); total organic carbon (spring, summer, and fall); total inorganic carbon (summer and fall); total suspended solids (spring); turbidity (spring); chlorophyll *a* (summer and fall); aluminum (spring, summer, and fall); iron (summer and fall); and titanium (summer).

2009/2010

Results of the samples analysed at ALS Laboratories and Maxxam Analytics in 2009/2010 were generally similar (i.e., RPMD less than 18; Tables 2-25 to 2-27). Only seven exceedances of the 25% RPMD were calculated for metals (i.e., aluminum, manganese, and uranium in spring; iron and titanium in spring and summer). Results of the inter-laboratory comparisons for routine and productivity parameters also showed low accuracy between the laboratories for eight parameters: dissolved phosphorus (summer and fall), particulate phosphorus (summer), total inorganic carbon (summer), turbidity (spring), and true colour (spring), and chlorophyll *a* (fall).

2010/2011

Inter-laboratory comparisons of routine, productivity, and metal concentrations showed general agreement in the results provided by each laboratory in 2010/2011. RPMD’s in excess of 25% were found for nitrate/nitrite (winter), total nitrogen (summer), total dissolved solids (spring), chlorophyll *a* (winter), pheopigments (spring, fall), aluminum (spring, winter), manganese (spring), and silicon (spring, summer, winter; Tables 2-28 to 2-30). As with the other types of QA/QC samples, the number of exceedances represents a relatively small proportion of the total number of samples analysed.

2.4 REFERENCES

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Table 2-1. Comparison of *in situ* and laboratory results of dissolved oxygen measured in surface waters during CAMPP sampling in 2008/2009. Relative percent mean differences (RPMD) were calculated and compared to the 25% rule of thumb.

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Dissolved Oxygen (mg/L)		
							Laboratory	*In situ*	RPMD
Method Detection Limit								*0.1*	
Spring									
Upper Nelson River	Setting Lake	TCS006-SURF	0806JHO928	L648805-11	26-Jun-08	11:15	11.3	10.07	12
Saskatchewan River	Cormorant Lake	KKS038-SURF	0806JHS800	L649710-1	30-Jun-08	12:40	10.5	10.07	4
Lower Nelson River	Lower Nelson River	UHS002-SURF	0806JHS857	L649852-5	1-Jul-08	11:30	10.4	10.47	1
Lower Churchill River	Gauer Lake	FAS007-SURF	0806JHS903	L648527-3	25-Jun-08	-	10.8	9.35	14
Summer									
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003 SURF	0808JHO654	L671937-7	18-Aug-08	12:00	7.2	9.04	23
Fall									
Upper Nelson River	Cross Lake (at surface)	UDS004-SURF	0809JHS460	L685102-7	18-Sep-08	-	11.1	11.28	2
Upper Nelson River	Cross Lake (at depth of 2m)	UDS004-2m	0809JHS461	L685102-8	18-Sep-08	-	10.7	11.33	6
Upper Churchill River	Granville Lake	EBS043-SURF	0808JHO968	L669933-18	13-Aug-08	16:05	8.2	10.21	22
Winter									
Winnipeg River	Lac Du Bonnet	PFS093-SURF	0903JH0190	L738178-9	1-Mar-09	13:20	15.0	15.62	4
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0903JH0191	L738653-15	2-Mar-09	11:05	13.7	14.75	7
Upper Nelson River	Cross Lake	UDS004-SURF	0903JH0237	L739152-10	5-Mar-09	11:40	9.1	7.09	25
Lower Nelson River	Limestone Forebay	UHS004-SURF	0903JH0238	L739943-6	5-Mar-09	13:35	16.8	16.81	0

Table 2-2. Comparison of *in situ* and laboratory results of pH measured in surface waters during CAMPP sampling in 2008/2009. Relative percent mean differences (RPMD) were calculated and compared to the 25% rule of thumb.

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit							*0.01*		
Spring									
Winnipeg River	Lac du Bonnet	PFS093-SURF	0806JHS810	L647387-1	25-Jun-08	9:30	7.97	7.54	6
Winnipeg River	Winnipeg River	PFS094-SURF	0806JHS811	L647387-2	25-Jun-08	10:35	7.87	7.62	3
Winnipeg River	Manigotagan Lake	RAS155-SURF	0806JHS812	L647387-3	25-Jun-08	11:32	8.09	8.52	5
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0806JHS802	L649360-1	29-Jun-08	15:25	8.54	8.50	0
Lake Winnipeg	Lake Winnipegosis, Site 2	LFS004-SURF	0806JHS803	L649360-2	29-Jun-08	13:33	8.52	8.47	1
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0806JHS804	L649360-3	29-Jun-08	13:00	8.51	8.46	1
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0806JHS805	L649360-4	29-Jun-08	12:18	8.53	8.46	1
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0806JHS806	L649360-5	29-Jun-08	11:10	8.52	8.45	1
Saskatchewan River	Cedar Lake	KLS001-SURF	0806JHS801	L649710-2	30-Jun-08	10:35	8.43	8.10	4
Saskatchewan River	Cormorant Lake (mean)	KLS003-SURF	0806JHS816	L649710-4	30-Jun-08	12:55	8.53	8.19	4
Upper Nelson River	Cross Lake (mean)	TFS014-SURF	0806JHS909	L648805-6	26-Jun-08	17:45	8.20	7.91	4
Upper Nelson River	Setting Lake	TCS006-SURF	0806JHS900	L648805-1	26-Jun-08	11:15	8.21	7.74	6
Lower Nelson River	Lower Nelson River	UHS002-SURF	0806JHS807	L649852-1	1-Jul-08	11:30	8.28	8.05	3
Lower Nelson River	Hayes River	ABS002-SURF	0806JHS808	L649852-2	1-Jul-08	10:42	8.27	8.09	2
Lower Churchill River	Northern Indian Lake	FAS008-SURF	0806JHS904	L648527-4	25-Jun-08	15:45	7.86	7.57	4
Lower Churchill River	Gauer Lake	FAS007-SURF	0806JHS903	L648527-3	25-Jun-08	17:15	7.89	7.66	3
Lower Churchill River	Lower Churchill River	FDS004-SURF	0806JHS809	L649852-3	1-Jul-08	13:21	8.12	7.94	2
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0806JHS902	L648527-2	25-Jun-08	13:45	7.95	7.44	7
Upper Churchill River	Granville Lake	EBS043-SURF	0806JHS901	L648527-1	25-Jun-08	19:50	7.68	7.64	1
Summer									
Winnipeg River	Lac du Bonnet	PFS093-SURF	0808JHS610	L668969-1	13-Aug-08	11:20	7.88	7.87	0
Winnipeg River	Winnipeg River	PFS094-SURF	0808JHS611	L668969-2	13-Aug-08	12:10	7.85	7.79	1
Winnipeg River	Manigotagan Lake (mean)	PFS096-SURF	0808JHS617	L668969-5	13-Aug-08	10:10	7.83	7.87	1
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0808JHS602	L671937-1	18-Aug-08	15:30	8.69	9.03	4
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0808JHS604	L671937-2	18-Aug-08	14:15	8.54	8.80	3
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0808JHS605	L671937-3	18-Aug-08	13:00	8.50	8.74	3

Table 2-2. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit							*0.01*		
Summer									
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0808JHS606	L671937-4	18-Aug-08	12:00	8.50	8.71	2
Saskatchewan River	Cormorant Lake	KKS038-SURF	0808JHS600	L672292-1	20-Aug-08	13:30	8.52	8.70	2
Upper Nelson River	Cross Lake	UDS004-SURF	0808JHS945	L670161-2	14-Aug-08	13:09	8.42	8.39	0
Upper Nelson River	Setting Lake	TCS006-SURF	0808JHS940	L670161-1	14-Aug-08	10:07	8.04	7.87	2
Lower Nelson River	Upper Nelson River	UHS003-SURF	0808JHS607	L671759-1	19-Aug-08	11:40	8.27	8.66	5
Lower Nelson River	Hayes River	ABS002-SURF	0808JHS608	L671759-2	19-Aug-08	10:30	8.26	8.45	2
Upper Churchill River	Northern Indian Lake	FAS008-SURF	0808JHS944	L669933-4	13-Aug-08	12:20	8.20	8.01	2
Lower Churchill River	Gauer Lake (mean)	TFS014-SURF	0808JHS949	L669933-6	13-Aug-08	18:25	8.51	8.46	1
Lower Churchill River	Lower Churchill River	FDS004-SURF-b	0808JHS609	L671759-3	19-Aug-08	12:40	8.15	8.43	3
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0808JHS942	L669933-2	13-Aug-08	10:15	8.24	7.93	4
Upper Churchill River	Granville Lake	EBS043-SURF	0808JHS941	L669933-1	13-Aug-08	4:05	7.96	7.72	3
Fall									
Winnipeg River	Lac du Bonnet	PFS093-SURF	0809JHS210	L683986-1	17-Sep-08	10:20	7.89	7.92	0
Winnipeg River	Winnipeg River	PFS094-SURF	0809JHS211	L683986-2	17-Sep-08	11:35	7.86	7.84	0
Winnipeg River	Manigotagan Lake	RAS155-SURF	0809JHS212	L683986-3	17-Sep-08	8:50	7.76	7.78	0
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0809JHS202	L687872-1	25-Sep-08	13:35	8.68	8.98	3
Lake Winnipeg	Lake Winnipegosis, Site 2	LFS004-SURF	0809JHS203	L687872-2	25-Sep-08	12:35	8.62	8.73	1
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0809JHS204	L687872-3	25-Sep-08	11:44	8.56	8.60	0
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0809JHS205	L687872-4	25-Sep-08	10:36	8.54	8.66	1
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0809JHS206	L686119-2	22-Sep-08	11:36	8.55	8.12	5
Saskatchewan River	Cormorant Lake	KKS038-SURF	0809JHS200	L686119-1	22-Sep-08	15:30	8.56	8.54	0
Upper Nelson River	Cross Lake	UDS004-SURF	0809JHS305	L685087-2	18-Sep-08	15:20	8.03	8.95	11
Upper Nelson River	Setting Lake (mean)	TFS014-SURF	0809JHS309	L685087-6	18-Sep-08	11:40	7.80	8.65	10
Lower Nelson River	Lower Nelson River	UHS002-SURF	0809JHS207	L685275-1	21-Sep-08	11:20	8.36	8.14	3
Lower Nelson River	Hayes River (mean)	KLS003-SURF	0809JHS215	L685275-5	21-Sep-08	10:20	8.16	7.64	7
Upper Churchill River	Northern Indian Lake	FAS008-SURF	0809JHS304	L684426-4	17-Sep-08	12:20	8.09	8.80	8
Lower Churchill River	Gauer Lake	FAS007-SURF	0809JHS303	L684426-3	17-Sep-08	10:50	8.20	8.63	5

Table 2-2. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH		
							Laboratory	*In situ*	RPMD
Method Detection Limit							*0.01*		
Fall									
Lower Churchill River	Lower Churchill River	FDS004-SURF	0809JHS209	L685275-3	21-Sep-08	12:35	8.16	7.79	5
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0809JHS302	L684426-2	17-Sep-08	9:15	8.05	n/r	-
Upper Churchill River	Granville Lake	EBS043-SURF	0809JHS301	L684426-1	17-Sep-08	12:45	7.83	8.11	4
Winter									
Winnipeg River	Lac du Bonnet (mean)	PFS096-SURF	0903JH0164	L738178-5	1-Mar-09	13:55	7.97	7.51	6
Winnipeg River	Winnipeg River	PFS094-SURF	0903JH0161	L738178-2	1-Mar-09	12:20	7.94	7.63	4
Winnipeg River	Manigotagan Lake	RAS155-SURF	0903JH0162	L738178-3	1-Mar-09	11:20	7.87	6.66	17
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0903JH0166	L738653-2	2-Mar-09	14:10	8.33	7.79	7
Lake Winnipeg	Lake Winnipegosis, Site 2	LFS004-SURF	0903JH0167	L738653-3	2-Mar-09	12:50	8.36	7.72	8
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0903JH0168	L738653-4	2-Mar-09	12:05	8.34	8.32	0
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0903JH0169	L738653-5	2-Mar-09	11:05	8.29	8.13	2
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0903JH0170	L738653-6	2-Mar-09	10:15	8.22	6.67	21
Saskatchewan River	Cormorant Lake	KKS038-SURF	0903JH0165	L738653-1	2-Mar-09	15:30	8.42	8.46	0
Upper Nelson River	Cross Lake	UDS004-SURF	0903JH0218	L739152-3	3-Mar-09	11:40	7.58	7.44	2
Upper Nelson River	Setting Lake (mean)	TFS014-SURF	0903JH0222	L739152-6	3-Mar-09	13:30	8.05	7.89	2
Lower Nelson River	Limestone Forebay	UHS004-SURF	0903JH0210	L739943-1	5-Mar-09	13:35	8.35	7.47	11
Upper Churchill River	Northern Indian Lake	FAS 008-SURF	0903JH214	L740174-2	7-Mar-09	12:55	7.83	7.88	1
Lower Churchill River	Gauer Lake	FAS 007-SURF	0903JH215	L740174-3	7-Mar-09	14:30	7.83	7.82	0
Lower Churchill River	Lower Churchill River	FDS004-SURF	0903JH0212	L739943-2	5-Mar-09	10:57	8.2	7.26	12
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0903JH213	L740174-1	7-Mar-09	11:45	7.99	7.85	2
Upper Churchill River	Granville Lake	EBS043-SURF	0903JH0216	L739152-1	3-Mar-09	15:35	7.66	7.42	3

Table 2-3. Comparison of *in situ* and laboratory conductivity measurements collected during CAMPP sampling in 2008/2009. Relative percent mean differences (RPMDs) exceeding 25 % are indicated in red.

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit							*0.4*		
Spring									
Winnipeg River	Lac du Bonnet	PFS093-SURF	0806JHS810	L647387-1	25-Jun-08	9:30	103	120	15
Winnipeg River	Winnipeg River	PFS094-SURF	0806JHS811	L647387-2	25-Jun-08	10:35	102	120	16
Winnipeg River	Manigotagan Lake	RAS155-SURF	0806JHS812	L647387-3	25-Jun-08	11:32	69.8	80	14
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0806JHS802	L649360-1	29-Jun-08	15:25	816	900	10
Lake Winnipeg	Lake Winnipegosis, Site 2	LFS004-SURF	0806JHS803	L649360-2	29-Jun-08	13:33	1080	1300	18
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0806JHS804	L649360-3	29-Jun-08	13:00	1180	1400	17
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0806JHS805	L649360-4	29-Jun-08	12:18	1390	1700	20
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0806JHS806	L649360-5	29-Jun-08	11:10	1310	1600	20
Saskatchewan River	Cedar Lake	KLS001-SURF	0806JHS801	L649710-2	30-Jun-08	10:35	362	390	7
Saskatchewan River	Cormorant Lake (mean)	KLS003-SURF	0806JHS816	L649710-4	30-Jun-08	12:55	291	320	9
Upper Nelson River	Cross Lake (mean)	TFS014-SURF	0806JHS909	L648805-6	26-Jun-08	17:45	335	376	12
Upper Nelson River	Setting Lake	TCS006-SURF	0806JHS900	L648805-1	26-Jun-08	11:15	151	170	12
Lower Nelson River	Lower Nelson River	UHS002-SURF	0806JHS807	L649852-1	1-Jul-08	11:30	253	290	14
Lower Nelson River	Hayes River	ABS002-SURF	0806JHS808	L649852-2	1-Jul-08	10:42	150	180	18
Lower Churchill River	Northern Indian Lake	FAS008-SURF	0806JHS904	L648527-4	25-Jun-08	15:45	109	124	13
Lower Churchill River	Gauer Lake	FAS007-SURF	0806JHS903	L648527-3	25-Jun-08	17:15	151	170	12
Lower Churchill River	Lower Churchill River	FDS004-SURF	0806JHS809	L649852-3	1-Jul-08	13:21	122	140	14
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0806JHS902	L648527-2	25-Jun-08	13:45	123	141	14
Upper Churchill River	Granville Lake	EBS043-SURF	0806JHS901	L648527-1	25-Jun-08	19:50	77	86	11
Summer									
Winnipeg River	Lac du Bonnet	PFS093-SURF	0808JHS610	L668969-1	13-Aug-08	11:20	98	92	7
Winnipeg River	Winnipeg River	PFS094-SURF	0808JHS611	L668969-2	13-Aug-08	12:10	97	89	8
Winnipeg River	Manigotagan Lake (mean)	PFS096-SURF	0808JHS617	L668969-5	13-Aug-08	10:10	72	66	8
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0808JHS602	L671937-1	18-Aug-08	15:30	820	796	3
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0808JHS604	L671937-2	18-Aug-08	14:15	1150	1127	2
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0808JHS605	L671937-3	18-Aug-08	13:00	1330	1307	2
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0808JHS606	L671937-4	18-Aug-08	12:00	1360	1271	7
Saskatchewan River	Cormorant Lake	KKS038-SURF	0808JHS600	L672292-1	20-Aug-08	13:30	285	275	4
Upper Nelson River	Cross Lake	UDS004-SURF	0808JHS945	L670161-2	14-Aug-08	13:09	279	285	2
Upper Nelson River	Setting Lake	TCS006-SURF	0808JHS940	L670161-1	14-Aug-08	10:07	144	145	1

Table 2-3. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit							*0.4*		
Summer									
Lower Nelson River	Upper Nelson River	UHS003-SURF	0808JHS607	L671759-1	19-Aug-08	11:40	316	296	7
Lower Nelson River	Hayes River	ABS002-SURF	0808JHS608	L671759-2	19-Aug-08	10:30	155	145	7
Upper Churchill River	Northern Indian Lake	FAS008-SURF	0808JHS944	L669933-4	13-Aug-08	12:20	132	131	1
Lower Churchill River	Gauer Lake (mean)	TFS014-SURF	0808JHS949	L669933-6	13-Aug-08	18:25	151	147	3
Lower Churchill River	Lower Churchill River	FDS004-SURF-b	0808JHS609	L671759-3	19-Aug-08	12:40	135	126	7
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0808JHS942	L669933-2	13-Aug-08	10:15	124	120	3
Upper Churchill River	Granville Lake	EBS043-SURF	0808JHS941	L669933-1	13-Aug-08	4:05	88	85	3
Fall									
Winnipeg River	Lac du Bonnet	PFS093-SURF	0809JHS210	L683986-1	17-Sep-08	10:20	95	87	8
Winnipeg River	Winnipeg River	PFS094-SURF	0809JHS211	L683986-2	17-Sep-08	11:35	93	87	6
Winnipeg River	Manigotagan Lake	RAS155-SURF	0809JHS212	L683986-3	17-Sep-08	8:50	72	66	8
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0809JHS202	L687872-1	25-Sep-08	13:35	885	827	7
Lake Winnipeg	Lake Winnipegosis, Site 2	LFS004-SURF	0809JHS203	L687872-2	25-Sep-08	12:35	1060	1021	4
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0809JHS204	L687872-3	25-Sep-08	11:44	1190	1134	5
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0809JHS205	L687872-4	25-Sep-08	10:36	1340	1290	4
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0809JHS206	L686119-2	22-Sep-08	11:36	1360	1299	5
Saskatchewan River	Cormorant Lake	KKS038-SURF	0809JHS200	L686119-1	22-Sep-08	15:30	293	274	7
Upper Nelson River	Cross Lake	UDS004-SURF	0809JHS305	L685087-2	18-Sep-08	15:20	282	283	0
Upper Nelson River	Setting Lake (mean)	TFS014-SURF	0809JHS309	L685087-6	18-Sep-08	11:40	154	152	1
Lower Nelson River	Lower Nelson River	UHS002-SURF	0809JHS207	L685275-1	21-Sep-08	11:20	301	277	8
Lower Nelson River	Hayes River (mean)	KLS003-SURF	0809JHS215	L685275-5	21-Sep-08	10:20	135	125	8
Upper Churchill River	Northern Indian Lake	FAS008-SURF	0809JHS304	L684426-4	17-Sep-08	12:20	132	129	2
Lower Churchill River	Gauer Lake	FAS007-SURF	0809JHS303	L684426-3	17-Sep-08	10:50	156	153	2
Lower Churchill River	Lower Churchill River	FDS004-SURF	0809JHS209	L685275-3	21-Sep-08	12:35	137	126	8
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0809JHS302	L684426-2	17-Sep-08	9:15	127	n/r	-
Upper Churchill River	Granville Lake	EBS043-SURF	0809JHS301	L684426-1	17-Sep-08	12:45	92	90	3
Winter									
Winnipeg River	Lac du Bonnet (mean)	PFS096-SURF	0903JH0164	L738178-5	1-Mar-09	13:55	110	71	**43**
Winnipeg River	Winnipeg River	PFS094-SURF	0903JH0161	L738178-2	1-Mar-09	12:20	107	70	**42**
Winnipeg River	Manigotagan Lake	RAS155-SURF	0903JH0162	L738178-3	1-Mar-09	11:20	88	76	15
Lake Winnipeg	Lake Winnipegosis, Site 1	LFS003-SURF	0903JH0166	L738653-2	2-Mar-09	14:10	1080	704	**42**
Lake Winnipeg	Lake Winnipegosis, Site 2	LFS004-SURF	0903JH0167	L738653-3	2-Mar-09	12:50	1280	1191	7

Table 2-3. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit							*0.4*		
Winter									
Lake Winnipeg	Lake Winnipegosis, Site 3	LFS005-SURF	0903JH0168	L738653-4	2-Mar-09	12:05	1410	444	**104**
Lake Winnipeg	Lake Winnipegosis, Site 4	LGS016-SURF	0903JH0169	L738653-5	2-Mar-09	11:05	1580	1264	22
Lake Winnipeg	Lake Winnipegosis, Site 5	LHS003-SURF	0903JH0170	L738653-6	2-Mar-09	10:15	1000	901	10
Saskatchewan River	Cormorant Lake	KKS038-SURF	0903JH0165	L738653-1	2-Mar-09	15:30	346	186	**60**
Upper Nelson River	Cross Lake	UDS004-SURF	0903JH0218	L739152-3	3-Mar-09	11:40	213	218	2
Upper Nelson River	Setting Lake (mean)	TFS014-SURF	0903JH0222	L739152-6	3-Mar-09	13:30	184	187	2
Lower Nelson River	Limestone Forebay	UHS004-SURF	0903JH0210	L739943-1	5-Mar-09	13:35	342	341	0
Upper Churchill River	Northern Indian Lake	FAS 008-SURF	0903JH214	L740174-2	7-Mar-09	12:55	188	184	2
Lower Churchill River	Gauer Lake	FAS 007-SURF	0903JH215	L740174-3	7-Mar-09	14:30	183	185	1
Lower Churchill River	Lower Churchill River	FDS004-SURF	0903JH0212	L739943-2	5-Mar-09	10:57	176	173	2
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	0903JH213	L740174-1	7-Mar-09	11:45	155	145	7
Upper Churchill River	Granville Lake	EBS043-SURF	0903JH0216	L739152-1	3-Mar-09	15:35	86	34	**87**

Table 2-4. Comparison of *in situ* and laboratory results of dissolved oxygen measured in surface waters during CAMPP sampling in 2009/2010. Relative percent mean differences (RPMD) exceeding 25 % are indicated in red.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Dissolved Oxygen (mg/L)		
						Laboratory	*In situ*	RPMD
Method Detection Limit						*0.10*		
Spring								
Leftrook Lake	TFS018-SURF	0906JH1070	L786966-12	2-Jul-09	8:00	8.80	14.7	**50**
Granville Lake	EBS043-SURF	0906JH1126	L783527-1	24-Jun-09	15:00	5.80	11.53	**66**
Southern Indian Lake – Area 4	ECS004-SURF	0906JH1127	L783983-1	25-Jun-09	11:20	5.30	14.95	**95**
Summer								
Lac Du Bonnet	PFS093-SURF	0907JH1294	L799503-1	30-Jul-09	n/r	9.30	13.47	**37**
Lake Winnipegosis (site 1)	LFS003-SURF	0908JH0801	L800201-11	2-Aug-09	11:20	10.8	15.30	**34**
Assean Lake	UFS014-SURF	0908JH1373	L801714-5	5-Aug-09	8:40	9.20	14.43	**44**
Southern Indian Lake – Area 4	ECS004-SURF	0908JH1482	L804981-1	12-Aug-09	11:30	7.70	10.12	**27**
Northern Indian Lake	FAS008-SURF	0908JH1483	L804981-2	12-Aug-09	12:18	8.80	9.75	10
Playgreen Lake	UBS015-SURF	0908JH1482	L804267-1	11-Aug-09	0:00	9.20	9.46	3
Fall								
Lac Du Bonnet	PFS093-SURF	0909JH1543	L819356-8	16-Sep-09	n/r	8.50	9.46	11
Lake Winnipegosis (site 1)	LFS003-SURF	0909JH1622	L815604-9	8-Sep-09	n/r	8.50	11.53	**30**
Apussigamasi Lake	TGS014-SURF	0909JH1623	L817517-9	11-Sep-09	n/r	11.1	9.15	19
Southern Indian Lake – Area 4	ECS004-SURF	0909JH1710	L819430-1	16-Sep-09	11:10	9.80	10.10	3
Southern Indian Lake - Area 1	ECS005-SURF	0909JH1711	L819430-2	16-Sep-09	12:45	9.00	9.32	3
Winter								
North Indian Lake	FAS008-SURF	1003JH0324	L867273-6	5-Mar-10	13:15	14.3	15.45	8
Lower Nelson River- L.Forebay	UHS004-SURF	1003JH0324	L866373-2	2-Mar-10	13:18	14.7	15.22	3
Assean Lake	UFS014-SURF	1003JH0301	L866769-6	3-Mar-10	14:21	14.7	15.22	3
Manigotagan Lake	RAS155-SURF	1003JH0191	L869032-7	12-Mar-10	14:10	12.9	14.24	10
Setting Lake	TCS006-SURF	1003JH0242	L867924-3	8-Mar-10	11:45	12.9	12.94	0

Table 2-5. Comparison of *in situ* and laboratory results of pH measured in surface waters during CAMPP sampling in 2009/2010. Relative percent mean differences (RPMD) were calculated and compared to the 25% rule of thumb.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit						*0.10*		
Spring								
Lac du Bonnet	PFS093-SURF	0905JH0815	L764834-4	19-May-09	8:00	7.98	7.15	11
Winnipeg River (mean)	PFS096-SURF	0905JH0819	L764834-12	19-May-09	10:00	7.91	7.54	5
Manigotagan Lake	RAS155-SURF	0905JH0817	L764834-1	19-May-09	10:30	7.72	7.36	5
Lake Winnipegosis (site 1)	LFS003-SURF	0906JH1001	L785132-1	29-Jun-09	10:15	8.54	8.77	3
Lake Winnipegosis (site 2)	LFS004-SURF	0906JH1002	L785132-2	29-Jun-09	12:15	8.54	8.85	4
Lake Winnipegosis (site 3)	-	-	-	-	-	-	-	-
Lake Winnipegosis (site 4)	LGS016-SURF	0906JH1004	L786622-1	30-Jun-09	9:00	8.54	8.66	1
Lake Winnipegosis (site 5)	LHS003-SURF	0906JH1005	L786622-2	30-Jun-09	9:55	8.52	8.57	1
Cedar Lake	KLS001-SURF	0906JH1007	L785132-4	29-Jun-09	13:00	8.46	8.72	3
Cormorant Lake	KKS038-SURF	0906JH1006	L785132-3	29-Jun-09	16:25	8.56	8.70	-
South Moose Lake	KKS039-SURF	0906JH1008	L785132-5	29-Jun-09	14:45	8.59	8.91	4
Cross Lake	UDS004-SURF	0906JH1107	L783169-2	23-Jun-09	10:40	8.26	7.14	15
Setting Lake	TCS006-SURF	0906JH1101	L783169-1	23-Jun-09	8:30	8.17	7.56	8
Playgreen Lake	UBS013-SURF	0906JH1011	L786622-3	30-Jun-09	12:00	8.38	8.16	3
Split Lake	n/a	n/a	n/a	23-Jun-09	13:25	8.34	n/a	-
Burntwood River	SPL-1	n/a	n/a	25-Jun-09	13:20	8.18	7.83	4
Assean Lake	UFS014-SURF	0906JH1013	L786186-2	1-Jul-09	15:15	8.43	8.19	3
Lower Nelson River	NR-6	n/a	n/a	30-Jun-09	14:08	8.29	7.92	5
Hayes River	ABS002-SURF	0906JH1012	L786186-1	1-Jul-09	13:30	8.29	8.06	3
Stephens Lake-North	STL-3S	n/a	n/a	29-Jun-09	11:33	8.32	7.56	10
Stephens Lake-South	STL-2	n/a	n/a	29-Jun-09	10:10	8.34	7.63	9
Northern Indian Lake	FAS008-SURF	0906JH1106	L783916-4	25-Jun-09	11:20	7.96	6.58	19
Gauer Lake	FAS007-SURF	0906JH1105	L783916-3	25-Jun-09	10:40	8.01	6.35	-
Lower Churchill River	FDS004-SURF	0906JH1016	L786186-3	1-Jul-09	11:40	8.22	8.16	1
Partridge Breast Lake (mean)	KLS003-SURF	0906JH1025	L786186-7	1-Jul-09	10:00	8.30	7.69	8
Southern Indian Lake - Area 4	ECS004-SURF	0906JH1103	L783916-1	25-Jun-09	12:10	8.25	7.75	6
Granville Lake (mean)	TFS014-SURF	0906JH1111	L783459-2	24-Jun-09	16:00	7.65	6.52	16
Southern Indian Lake - Area 1	ECS005-SURF	0906JH1104	L783916-2	25-Jun-09	13:10	7.78	7.29	7

Table 2-5. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit						*0.10*		
Spring								
Threepoint Lake	TFS017-SURF	0906JH1022	L786966-3	2-Jul-09	12:00	7.98	8.24	3
Leftrook Lake	TFS018-SURF	0906JH1023	L786966-4	2-Jul-09	8:15	8.21	8.03	2
Apussigamasi Lake	TGS014-SURF	0906JH1018	L786186-5	1-Jul-09	16:15	8.22	8.06	2
Notigi Lake - East	TFS016-SURF	0906JH1020	L786966-1	2-Jul-09	9:45	7.96	8.08	1
Notigi Lake - West	TFS015-SURF	0906JH1021	L786966-2	2-Jul-09	11:00	7.98	8.05	1
Summer								
Lac Du Bonnet (mean)	PFS096-SURF	0907JH1291	L799503-5	30-Jul-09	7:37	7.91	8.08	2
Winnipeg River	PFS094-SURF	0907JH1288	L799503-2	30-Jul-09	9:05	7.84	8.20	4
Manigotagan Lake	RAS155-SURF	0907JH1289	L799503-3	30-Jul-09	10:00	7.75	8.32	7
Lake Winnipegosis (site 1)	LFS003-SURF	0908JH1311	L800201-1	2-Aug-09	11:20	8.69	8.94	3
Lake Winnipegosis (site 2)	LFS004-SURF	0908JH1312	L800201-2	2-Aug-09	12:20	8.44	8.25	2
Lake Winnipegosis (site 3)	LFS005-SURF	0908JH1313	L800201-3	2-Aug-09	13:05	8.61	8.86	3
Lake Winnipegosis (site 4)	LGS016-SURF	0908JH1314	L800201-4	2-Aug-09	13:55	8.61	8.82	2
Lake Winnipegosis (site 5)	LHS003-SURF	0908JH1315	L800201-5	2-Aug-09	14:35	8.39	8.70	4
Cedar Lake	KLS001-SURF	0908JH1317	L802822-2	7-Aug-09	11:15	8.14	8.32	2
Cormorant Lake	KKS038-SURF	0908JH1316	L802822-1	7-Aug-09	9:40	8.17	8.31	2
South Moose Lake	KKS039-SURF	0908JH1318	L802822-3	7-Aug-09	12:50	8.24	8.46	3
Cross Lake	UDS004-SURF	0908JH1460	L804021-2	11-Aug-09	11:26	8.28	8.26	0
Setting Lake (mean)	TFS014-SURF	0908JH1464	L804029-2	11-Aug-09	10:30	8.09	7.61	6
Playgreen Lake (mean)	TFS013-SURF	0908JH1465	L804029-1	11-Aug-09	9:00	8.3	8.37	0
Split Lake	n/a	n/a	n/a	11-Aug-09	13:45	8.35	n/a	-
Burntwood River	SPL-1	n/a	n/a	26-Jul-09	13:43	8.09	7.40	9
Assean Lake (mean)	KLS003-SURF	0908JH1332	L801714-7	5-Aug-09	8:40	8.29	8.05	3
Lower Nelson River	NR-6	n/a	n/a	30-Jul-09	11:55	8.34	7.84	6
Hayes River	ABS002-SURF	0908JH0808	L802304-1	6-Aug-09	9:40	8.20	7.68	7
Stephens Lake-North	STL-3S	n/a	n/a	31-Jul-09	11:05	7.94	8.02	1
Stephens Lake-South	STL-2	n/a	n/a	31-Jul-09	9:40	7.88	7.75	2
Northern Indian Lake	FAS008-SURF	0908JH1459	L804978-5	12-Aug-09	12:18	8.08	7.15	12
Gauer Lake	FAS007-SURF	0908JH1458	L804978-4	12-Aug-09	13:00	8.18	7.69	6

Table 2-5. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit						*0.10*		
Summer								
Lower Churchill River	FDS004-SURF	0908JH1323	L802304-2	6-Aug-09	11:45	8.16	7.55	8
Partridge Breast Lake	FAS009-SURF	0908JH1324	L802304-3	6-Aug-09	13:15	8.13	7.46	9
Southern Indian Lake - Area 4	ECS004-SURF	0908JH1456	L804978-2	12-Aug-09	11:30	8.13	6.83	17
Granville Lake	EBS043-SURF	0908JH1455	L804978-1	12-Aug-09	9:10	7.90	7.72	2
Southern Indian Lake - Area 1	ECS005-SURF	0908JH1457	L804978-3	12-Aug-09	10:10	7.88	6.97	12
Threepoint Lake	TFS017-SURF	0908JH1329	L800197-3	3-Aug-09	12:05	8.16	8.03	2
Leftrook Lake	TFS018-SURF	0908JH1330	L800197-4	3-Aug-09	9:10	8.39	7.96	5
Apussigamasi Lake	TGS014-SURF	0908JH1325	L801714-2	5-Aug-09	10:10	8.08	7.88	3
Notigi Lake - East	TFS016-SURF	0908JH1327	L800197-1	3-Aug-09	10:00	8.13	8.11	0
Notigi Lake - West	TFS015-SURF	0908JH1328	L800197-2	3-Aug-09	10:32	7.87	7.56	4
Fall								
Lac Du Bonnet (mean)	PFS096-SURF	0909JH1540	L819356-5	16-Sep-09	8:30	7.97	7.09	12
Winnipeg River	PFS094-SURF	0909JH1537	L819356-2	16-Sep-09	10:00	7.90	6.97	13
Manigotagan Lake	RAS155-SURF	0909JH1538	L819356-3	16-Sep-09	10:55	7.86	6.93	13
Lake Winnipegosis (site 1)	LFS003-SURF	0909JH1560	L815604-1	8-Sep-09	10:20	8.50	8.68	2
Lake Winnipegosis (site 2)	LFS004-SURF	0909JH1561	L817489-1	12-Sep-09	10:15	8.57	8.47	1
Lake Winnipegosis (site 3)	LFS005-SURF	0909JH1562	L815604-2	8-Sep-09	13:55	8.54	9.11	6
Lake Winnipegosis (site 4)	LGS016-SURF	0909JH1563	L815604-3	8-Sep-09	11:47	8.53	8.84	4
Lake Winnipegosis (site 5)	LHS003-SURF	0909JH1564	L815604-4	8-Sep-09	12:35	8.52	9.11	7
Cedar Lake	KLS001-SURF	0909JH1566	L817489-3	12-Sep-09	9:25	8.57	8.47	1
Cormorant Lake	KKS038-SURF	0909JH1565	L817489-2	12-Sep-09	12:10	8.54	8.36	2
South Moose Lake	KKS039-SURF	0909JH1567	L817489-4	12-Sep-09	11:15	8.56	8.42	2
Cross Lake	UDS004-SURF	0909JH1685	L818740-2	15-Sep-09	12:05	8.30	-	-
Setting Lake	TCS006-SURF	0909JH1679	L818740-1	15-Sep-09	8:54	8.09	-	-
Playgreen Lake	UBS015-SURF	0909JH1686	L818740-3	15-Sep-09	10:30	8.39	-	-
Split Lake	n/a	n/a	n/a	9-Sep-09	14:15	8.35	n/a	-
Burntwood River	SPL-1	n/a	n/a	27-Aug-09	11:41	8.15	7.79	5
Assean Lake (mean)	KLS003-SURF	0909JH1581	L816365-6	9-Sep-09	8:25	8.47	8.42	1
Lower Nelson River	NR-6	n/a	n/a	30-Aug-09	10:50	8.41	7.76	8

Table 2-5. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit						*0.10*		
Fall								
Hayes River	ABS002-SURF	0909JH1569	L816365-1	9-Sep-09	10:10	8.37	8.20	2
Stephens Lake-North	STL-3S	n/a	n/a	29-Aug-09	12:12	8.43	8.25	2
Stephens Lake-South	STL-2	n/a	n/a	29-Aug-09	10:49	8.37	7.95	5
Northern Indian Lake	FAS008-SURF	0909JH1684	L819429-5	16-Sep-09	9:40	8.12	8.33	3
Gauer Lake	FAS007-SURF	0909JH1683	L819429-4	16-Sep-09	8:40	8.18	7.76	5
Lower Churchill River	FDS004-SURF	0909JH1572	L816365-3	9-Sep-09	11:50	8.27	8.11	2
Partridge Breast Lake	FAS009-SURF	0909JH1573	L816365-4	9-Sep-09	13:25	8.22	8.13	1
Southern Indian Lake - Area 4	ECS004-SURF	0909JH1681	L819429-2	16-Sep-09	11:10	8.10	9.2	13
Granville Lake (mean)	TFS014-SURF	0909JH1691	L819429-9	16-Sep-09	14:45	7.95	8.24	4
Southern Indian Lake - Area 1	ECS005-SURF	0909JH1682	L819429-3	16-Sep-09	12:45	7.90	8.3	5
Threepoint Lake	TFS017-SURF2	0909JH1578	L817517-2	11-Sep-09	12:35	8.00	7.75	3
Leftrook Lake	TFS018-SURF2	0909JH1579	L817517-3	11-Sep-09	11:35	8.09	8.25	2
Apussigamasi Lake	TGS014-SURF2	0909JH1574	L817517-4	11-Sep-09	10:30	8.11	7.77	4
Notigi Lake - East	TFS016-SURF	0909JH1576	L816911-2	10-Sep-09	8:35	8.04	7.23	11
Notigi Lake - West	TFS015-SURF2	0909JH1577	L817517-1	11-Sep-09	13:25	8.01	7.64	5
Winter								
Lac Du Bonnet (mean)	PFS096-SURF	1003JH0188	L869032-4	12-Mar-10	15:10	7.69	8.33	8
Manigotagan Lake	RAS155-SURF	1003JH0186	L869032-2	12-Mar-10	14:10	8.05	8.39	4
Lake Winnipegosis (site 1)	LFS003-SURF	1003JH0207	L867290-1	7-Mar-10	15:00	8.24	8.56	4
Lake Winnipegosis (site 2)	LFS004-SURF	1003JH0208	L867290-2	7-Mar-10	14:23	8.33	8.81	6
Lake Winnipegosis (site 3) (mean)	UDS019-SURF	1003JH0257	L867290-14	7-Mar-10	12:55	8.32	8.62	4
Lake Winnipegosis (site 4)	LGS016-SURF	1003JH0210	L867290-4	7-Mar-10	11:35	8.30	9.00	8
Lake Winnipegosis (site 5)	LHS003-SURF	1003JH0211	L867290-5	7-Mar-10	10:21	8.26	8.40	2
Cedar Lake	KLS001-SURF	1003JH0212	L867290-6	7-Mar-10	16:05	8.24	8.59	4
Cormorant Lake (mean)	KLS003-SURF	1003JH0241	L869032-10	12-Mar-10	10:00	8.24	8.12	1
South Moose Lake	KKS039-SURF	1003JH0213	L867290-7	7-Mar-10	17:00	8.28	8.65	4
Cross Lake	UDS004-SURF	1003JH0237	L867924-1	8-Mar-10	10:50	8.14	8.30	2

Table 2-5. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Laboratory	pH *In situ*	pH RPMD
Method Detection Limit						*0.10*		
Winter								
Burntwood River	TGS015-SURF	1003JH0297	L866769-2	3-Mar-10	13:40	7.91	7.92	0
Assean Lake (mean)	FAS011-SURF	1003JH0347	L866769-15	3-Mar-10	14:21	8.20	8.01	2
Limestone Forebay (mean)	TFS014-SURF	1003JH0345	L866373-6	2-Mar-10	13:18	8.1	8.11	1
Hayes River	ABS002-SURF	1003JH0319	L866373-1	2-Mar-10	11:48	7.77	8.02	3
Stephens Lake-North	UFS015-SURF	1003JH0299	L866769-4	3-Mar-10	9:20	8.09	8.05	0
Stephens Lake-South	UFS016-SURF	1003JH0300	L866769-5	3-Mar-10	10:18	8.10	8.00	1
Northern Indian Lake	FAS008-SURF	1003JH0320	L867273-2	5-Mar-10	13:15	7.92	7.28	8
Gauer Lake	FAS007-SURF	1003JH0323	L867273-5	5-Mar-10	14:07	8.01	7.21	11
Partridge Breast Lake	FAS009-SURF	1003JH0317	L867273-1	5-Mar-10	11:56	7.98	7.20	10
Southern Indian Lake- Area 4	ECS004-SURF	1003JH0321	L867273-3	5-Mar-10	10:57	7.99	6.83	16
Granville Lake	EBS043-SURF	1003JH0277	L867348-5	6-Mar-10	11:50	7.36	7.05	4
Southern Indian Lake- Area 1 (mean)	ABS004-SURF	1003JH0349	L867273-9	5-Mar-10	9:15	7.64	6.30	19
Threepoint Lake	TFS017-SURF	1003JH0276	L867348-4	6-Mar-10	8:55	7.51	6.33	17
Leftrook Lake	TFS018-SURF	1003JH0273	L867348-1	6-Mar-10	13:00	7.53	6.90	9
Apussigamasi Lake	TGS014-SURF	1003JH0272	L867077-1	4-Mar-10	8:50	7.90	7.59	4
Notigi Lake- East	TFS016-SURF	1003JH0274	L867348-2	6-Mar-10	9:54	7.45	6.57	13
Notigi Lake- West	TFS015-SURF	1003JH0275	L867348-3	6-Mar-10	10:44	7.45	7.01	6

Table 2-6. Comparison of *in situ* and laboratory of conductivity measured in surface waters during CAMPP sampling in 2009/2010. Relative percent mean differences (RPMD) were calculated and compared to the 25% rule of thumb.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Spring								
Lac du Bonnet	PFS093-SURF	0905JH0815	L764834-4	19-May-09	8:00	97.8	91	7
Winnipeg River (mean)	PFS096-SURF	0905JH0819	L764834-12	19-May-09	10:00	94.3	87	8
Manigotagan Lake	RAS155-SURF	0905JH0817	L764834-1	19-May-09	10:30	74.4	63	17
Lake Winnipegosis (site 1)	LFS003-SURF	0906JH1001	L785132-1	29-Jun-09	10:15	977	934	5
Lake Winnipegosis (site 2)	LFS004-SURF	0906JH1002	L785132-2	29-Jun-09	12:15	1120	1070	5
Lake Winnipegosis (site 3)	-	-	-	-	-	-	-	-
Lake Winnipegosis (site 4)	LGS016-SURF	0906JH1004	L786622-1	30-Jun-09	9:00	1330	1281	4
Lake Winnipegosis (site 5)	LHS003-SURF	0906JH1005	L786622-2	30-Jun-09	9:55	1140	1114	2
Cedar Lake	KLS001-SURF	0906JH1007	L785132-4	29-Jun-09	13:00	370	349	6
Cormorant Lake	KKS038-SURF	0906JH1006	L785132-3	29-Jun-09	16:25	289	271	-
South Moose Lake	KKS039-SURF	0906JH1008	L785132-5	29-Jun-09	14:45	335	317	6
Cross Lake	UDS004-SURF	0906JH1107	L783169-2	23-Jun-09	10:40	304	317	4
Setting Lake	TCS006-SURF	0906JH1101	L783169-1	23-Jun-09	8:30	151	154	2
Playgreen Lake	UBS013-SURF	0906JH1011	L786622-3	30-Jun-09	12:00	309	289	7
Split Lake	n/a	n/a	n/a	23-Jun-09	13:25	328		-
Burntwood River	SPL-1	n/a	n/a	25-Jun-09	13:20	124	131	5
Assean Lake	UFS014-SURF	0906JH1013	L786186-2	1-Jul-09	15:15	187	174	7
Lower Nelson River	NR-6	n/a	n/a	30-Jun-09	14:08	300	310	3
Hayes River	ABS002-SURF	0906JH1012	L786186-1	1-Jul-09	13:30	132	118	11
Stephens Lake-North	STL-3S	n/a	n/a	29-Jun-09	11:33	255	273	7
Stephens Lake-South	STL-2	n/a	n/a	29-Jun-09	10:10	300	318	6
Northern Indian Lake	FAS008-SURF	0906JH1106	L783916-4	25-Jun-09	11:20	120	125	4
Gauer Lake	FAS007-SURF	0906JH1105	L783916-3	25-Jun-09	10:40	127	129	-
Lower Churchill River	FDS004-SURF	0906JH1016	L786186-3	1-Jul-09	11:40	114	102	11
Partridge Breast Lake (mean)	KLS003-SURF	0906JH1025	L786186-7	1-Jul-09	10:00	132	120	9
Southern Indian Lake - Area 4	ECS004-SURF	0906JH1103	L783916-1	25-Jun-09	12:10	128	125	2

Table 2-6. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Spring								
Granville Lake (mean)	TFS014-SURF	0906JH1111	L783459-2	24-Jun-09	16:00	60.5	62	2
Southern Indian Lake - Area 1	ECS005-SURF	0906JH1104	L783916-2	25-Jun-09	13:10	66.0	67	2
Threepoint Lake	TFS017-SURF	0906JH1022	L786966-3	2-Jul-09	12:00	101	93	8
Leftrook Lake	TFS018-SURF	0906JH1023	L786966-4	2-Jul-09	8:15	179	167	7
Apussigamasi Lake	TGS014-SURF	0906JH1018	L786186-5	1-Jul-09	16:15	116	110	5
Notigi Lake - East	TFS016-SURF	0906JH1020	L786966-1	2-Jul-09	9:45	98.4	88	11
Notigi Lake - West	TFS015-SURF	0906JH1021	L786966-2	2-Jul-09	11:00	96.6	87	10
Summer							-	
Lac Du Bonnet (mean)	PFS096-SURF	0907JH1291	L799503-5	30-Jul-09	7:37	90.9	85	7
Winnipeg River	PFS094-SURF	0907JH1288	L799503-2	30-Jul-09	9:05	86.9	80	8
Manigotagan Lake	RAS155-SURF	0907JH1289	L799503-3	30-Jul-09	10:00	65.5	61	7
Lake Winnipegosis (site 1)	LFS003-SURF	0908JH1311	L800201-1	2-Aug-09	11:20	968	935	3
Lake Winnipegosis (site 2)	LFS004-SURF	0908JH1312	L800201-2	2-Aug-09	12:20	1110	1083	2
Lake Winnipegosis (site 3)	LFS005-SURF	0908JH1313	L800201-3	2-Aug-09	13:05	1140	1109	3
Lake Winnipegosis (site 4)	LGS016-SURF	0908JH1314	L800201-4	2-Aug-09	13:55	1310	1273	3
Lake Winnipegosis (site 5)	LHS003-SURF	0908JH1315	L800201-5	2-Aug-09	14:35	1170	1138	3
Cedar Lake	KLS001-SURF	0908JH1317	L802822-2	7-Aug-09	11:15	368	350	5
Cormorant Lake	KKS038-SURF	0908JH1316	L802822-1	7-Aug-09	9:40	285	272	5
South Moose Lake	KKS039-SURF	0908JH1318	L802822-3	7-Aug-09	12:50	336	321	5
Cross Lake	UDS004-SURF	0908JH1460	L804021-2	11-Aug-09	11:26	294	319	8
Setting Lake (mean)	TFS014-SURF	0908JH1464	L804029-2	11-Aug-09	10:30	134	141	5
Playgreen Lake (mean)	TFS013-SURF	0908JH1465	L804029-1	11-Aug-09	9:00	309	329	6
Split Lake	n/a	n/a	n/a	11-Aug-09	13:45	313		-
Burntwood River	SPL-1	n/a	n/a	26-Jul-09	13:43	132	143	8
Assean Lake (mean)	KLS003-SURF	0908JH1332	L801714-7	5-Aug-09	8:40	196	181	8
Lower Nelson River	NR-6	n/a	n/a	30-Jul-09	11:55	276	296	7
Hayes River	ABS002-SURF	0908JH0808	L802304-1	6-Aug-09	9:40	135	136	1
Stephens Lake-North	STL-3S	n/a	n/a	31-Jul-09	11:05	254	269	6

Table 2-6. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Summer							-	
Stephens Lake-South	STL-2	n/a	n/a	31-Jul-09	9:40	279	295	6
Northern Indian Lake	FAS008-SURF	0908JH1459	L804978-5	12-Aug-09	12:18	117	125	7
Gauer Lake	FAS007-SURF	0908JH1458	L804978-4	12-Aug-09	13:00	128	139	8
Lower Churchill River	FDS004-SURF	0908JH1323	L802304-2	6-Aug-09	11:45	128	114	12
Partridge Breast Lake	FAS009-SURF	0908JH1324	L802304-3	6-Aug-09	13:15	123	110	11
Southern Indian Lake - Area 4	ECS004-SURF	0908JH1456	L804978-2	12-Aug-09	11:30	108	114	5
Granville Lake	EBS043-SURF	0908JH1455	L804978-1	12-Aug-09	9:10	74.3	78	5
Southern Indian Lake - Area 1	ECS005-SURF	0908JH1457	L804978-3	12-Aug-09	10:10	67.2	69	3
Threepoint Lake	TFS017-SURF	0908JH1329	L800197-3	3-Aug-09	12:05	105	101	4
Leftrook Lake	TFS018-SURF	0908JH1330	L800197-4	3-Aug-09	9:10	168	162	4
Apussigamasi Lake	TGS014-SURF	0908JH1325	L801714-2	5-Aug-09	10:10	126	115	9
Notigi Lake - East	TFS016-SURF	0908JH1327	L800197-1	3-Aug-09	10:00	103	95	8
Notigi Lake - West	TFS015-SURF	0908JH1328	L800197-2	3-Aug-09	10:32	99.6	93	7
Fall								
Lac Du Bonnet (mean)	PFS096-SURF	0909JH1540	L819356-5	16-Sep-09	8:30	87.2	90	3
Winnipeg River	PFS094-SURF	0909JH1537	L819356-2	16-Sep-09	10:00	81.6	84	3
Manigotagan Lake	RAS155-SURF	0909JH1538	L819356-3	16-Sep-09	10:55	67.1	69	3
Lake Winnipegosis (site 1)	LFS003-SURF	0909JH1560	L815604-1	8-Sep-09	10:20	996	1020	2
Lake Winnipegosis (site 2)	LFS004-SURF	0909JH1561	L817489-1	12-Sep-09	10:15	1100	1200	9
Lake Winnipegosis (site 3)	LFS005-SURF	0909JH1562	L815604-2	8-Sep-09	13:55	1150	1194	4
Lake Winnipegosis (site 4)	LGS016-SURF	0909JH1563	L815604-3	8-Sep-09	11:47	1310	1352	3
Lake Winnipegosis (site 5)	LHS003-SURF	0909JH1564	L815604-4	8-Sep-09	12:35	1200	1242	3
Cedar Lake	KLS001-SURF	0909JH1566	L817489-3	12-Sep-09	9:25	372	389	4
Cormorant Lake	KKS038-SURF	0909JH1565	L817489-2	12-Sep-09	12:10	292	308	5
South Moose Lake	KKS039-SURF	0909JH1567	L817489-4	12-Sep-09	11:15	341	358	5
Cross Lake	UDS004-SURF	0909JH1685	L818740-2	15-Sep-09	12:05	313	-	-
Setting Lake	TCS006-SURF	0909JH1679	L818740-1	15-Sep-09	8:54	147	-	-
Playgreen Lake	UBS015-SURF	0909JH1686	L818740-3	15-Sep-09	10:30	315	-	-

Table 2-6. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	*In situ* Specific Conductance (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Fall								
Split Lake	n/a	n/a	n/a	9-Sep-09	14:15	314		-
Burntwood River	SPL-1	n/a	n/a	27-Aug-09	11:41	130	141	8
Assean Lake (mean)	KLS003-SURF	0909JH1581	L816365-6	9-Sep-09	8:25	218	220	1
Lower Nelson River	NR-6	n/a	n/a	30-Aug-09	10:50	313	329	5
Hayes River	ABS002-SURF	0909JH1569	L816365-1	9-Sep-09	10:10	149	141	6
Stephens Lake-North	STL-3S	n/a	n/a	29-Aug-09	12:12	262	277	6
Stephens Lake-South	STL-2	n/a	n/a	29-Aug-09	10:49	305	326	7
Northern Indian Lake	FAS008-SURF	0909JH1684	L819429-5	16-Sep-09	9:40	112	117	4
Gauer Lake	FAS007-SURF	0909JH1683	L819429-4	16-Sep-09	8:40	131	139	6
Lower Churchill River	FDS004-SURF	0909JH1572	L816365-3	9-Sep-09	11:50	124	118	5
Partridge Breast Lake	FAS009-SURF	0909JH1573	L816365-4	9-Sep-09	13:25	117	111	5
Southern Indian Lake - Area 4	ECS004-SURF	0909JH1681	L819429-2	16-Sep-09	11:10	108	114	5
Granville Lake (Rep 3)	TFS014-SURF	0909JH1691	L819429-9	16-Sep-09	14:45	84.0	87	3
Southern Indian Lake - Area 1	ECS005-SURF	0909JH1682	L819429-3	16-Sep-09	12:45	82.0	86	5
Threepoint Lake	TFS017-SURF2	0909JH1578	L817517-2	11-Sep-09	12:35	110	119	8
Leftrook Lake	TFS018-SURF2	0909JH1579	L817517-3	11-Sep-09	11:35	173	187	8
Apussigamasi Lake	TGS014-SURF2	0909JH1574	L817517-4	11-Sep-09	10:30	125	135	8
Notigi Lake - East	TFS016-SURF	0909JH1576	L816911-2	10-Sep-09	8:35	107	106	1
Notigi Lake - West	TFS015-SURF2	0909JH1577	L817517-1	11-Sep-09	13:25	106	115	8
Winter							-	
Lac Du Bonnet (mean)	PFS096-SURF	1003JH0188	L869032-4	12-Mar-10	15:10	100	93	7
Manigotagan Lake	RAS155-SURF	1003JH0186	L869032-2	12-Mar-10	14:10	76.5	70	9
Lake Winnipegosis (site 1)	LFS003-SURF	1003JH0207	L867290-1	7-Mar-10	15:00	1160	1194	3
Lake Winnipegosis (site 2)	LFS004-SURF	1003JH0208	L867290-2	7-Mar-10	14:23	1280	1296	1
Lake Winnipegosis (site 3) (mean)	UDS019-SURF	1003JH0257	L867290-14	7-Mar-10	12:55	1363	1381	1
Lake Winnipegosis (site 4)	LGS016-SURF	1003JH0210	L867290-4	7-Mar-10	11:35	1510	1545	2
Lake Winnipegosis (site 5)	LHS003-SURF	1003JH0211	L867290-5	7-Mar-10	10:21	1560	1600	3

Table 2-6. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Laboratory Conductivity (µmhos/cm)	In situ Specific Conductance (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Winter							-	
Cedar Lake	KLS001-SURF	1003JH0212	L867290-6	7-Mar-10	16:05	462	454	2
Cormorant Lake (mean)	KLS003-SURF	1003JH0241	L869032-10	12-Mar-10	10:00	320	316	1
South Moose Lake	KKS039-SURF	1003JH0213	L867290-7	7-Mar-10	17:00	426	418	2
Cross Lake	UDS004-SURF	1003JH0237	L867924-1	8-Mar-10	10:50	315	312	1
Setting Lake	TCS006-SURF	1003JH0238	L867924-2	8-Mar-10	11:45	175	168	4
Playgreen Lake	UBS015-SURF	1003JH0239	L869032-8	12-Mar-10	11:40	335	334	0
Split Lake	UFS011-SURF	1003JH0298	L866769-3	3-Mar-10	12:30	274	285.6	4
Burntwood River	TGS015-SURF	1003JH0297	L866769-2	3-Mar-10	13:40	107	104.0	3
Assean Lake (mean)	FAS011-SURF	1003JH0347	L866769-15	3-Mar-10	14:21	307	314.8	2
Limestone Forebay (mean)	TFS014-SURF	1003JH0345	L866373-6	2-Mar-10	13:18	270	226.5	17
Hayes River	ABS002-SURF	1003JH0319	L866373-1	2-Mar-10	11:48	184	148.2	22
Stephens Lake-North	UFS015-SURF	1003JH0299	L866769-4	3-Mar-10	9:20	292	291.5	0
Stephens Lake-South	UFS016-SURF	1003JH0300	L866769-5	3-Mar-10	10:18	269	267.2	1
Northern Indian Lake	FAS008-SURF	1003JH0320	L867273-2	5-Mar-10	13:15	129	151	16
Gauer Lake	FAS007-SURF	1003JH0323	L867273-5	5-Mar-10	14:07	172	206	18
Partridge Breast Lake	FAS009-SURF	1003JH0317	L867273-1	5-Mar-10	11:56	114	133	15
Southern Indian Lake- Area 4	ECS004-SURF	1003JH0321	L867273-3	5-Mar-10	10:57	111	127	13
Granville Lake	EBS043-SURF	1003JH0277	L867348-5	6-Mar-10	11:50	77.0	92	18
Southern Indian Lake- Area 1 (mean)	ABS004-SURF	1003JH0349	L867273-9	5-Mar-10	9:15	78.1	84	7
Threepoint Lake	TFS017-SURF	1003JH0276	L867348-4	6-Mar-10	8:55	92.2	114	21
Leftrook Lake	TFS018-SURF	1003JH0273	L867348-1	6-Mar-10	13:00	244	269	10
Apussigamasi Lake	TGS014-SURF	1003JH0272	L867077-1	4-Mar-10	8:50	103	98.3	5
Notigi Lake- East	TFS016-SURF	1003JH0274	L867348-2	6-Mar-10	9:54	90.8	106	15
Notigi Lake- West	TFS015-SURF	1003JH0275	L867348-3	6-Mar-10	10:44	89.5	105	16

Table 2-7. Comparison of *in situ* and laboratory results of dissolved oxygen concentrations measured in surface waters during CAMPP sampling in 2010/2011. Relative percent mean differences (RPMD) were calculated and compared to the 25% rule of thumb.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Depth (m)	Dissolved Oxygen (mg/L) Laboratory	Field	RPMD
Method Detection Limit							*0.10*	-	-
Spring									
Lac du Bonnet	PFS093-SURF	1005JH0646	L886933-18	14-May-10	9:30	0.3	11.4	11.16	2
Lake Winnipegosis (Site 3)	LFS005-SURF	1006JH0768	L898352-10	15-Jun-10	11:40	0.3	9.8	10.16	4
Cormorant Lake	KKS038-BOT	1006JH0769	L898352-11	15-Jun-10	16:45	10.0	10.2	10.19	0
Walker Lake	UDS020-SURF	1006JH0007	L899309-11	17-Jun-10	15:18	0.3	9.8	9.81	0
Footprint Lake	TFS010-SURF	-	from MWS*	23-Jun-10	8:10	0.3	8.10	9.13	12
Split Lake	UFS011	-	from MWS*	23-Jun-10	17:05	0.3	8.50	9.09	7
Cross Lake	UDS004	-	from MWS*	23-Jun-10	11:17	0.3	7.90	8.38	6
Summer									
Eaglenest Lake	PFS097-SURF	1007JS1357	L911400-18	21-Jul-10	9:25	0.3	8.1	8.23	2
Lake Winnipegosis (Site 3)	LFS005-SURF	1008JS1386	L918544-5	10-Aug-10	13:10	0.3	8.4	8.12	3
Southern Indian Lake (Area 4)	ECS004-SURF	1008JS1462	L922533-11	19-Aug-10	11:05	0.3	9.1	9.91	9
Southern Indian Lake (Area 6)	ECS001-SURF	1008JS1461	L921424-9	17-Aug-10	12:45	0.3	9.0	9.80	9
Threepoint Lake	TFS017-SURF	1008JS1387	L920004-9	12-Aug-10	10:35	0.3	8.5	8.66	2
Fall									
Lac du Bonnet	PFS093-SURF	1009JS1607	L935796-9	24-Sep-10	8:15	0.3	9.7	9.86	2
Saskatchewan River	KJS006-SURF	1009JS1591	L928851-13	7-Sep-10	12:50	0.3	8.5	8.65	2
Setting Lake	TCS006-SURF	1009JS1684	L932322-14	15-Sep-10	11:57	0.3	8.7	9.50	9
Walker Lake	UDS020-SURF	1009JS1590	L928361-9	6-Sep-10	13:00	0.3	10.1	9.96	1
Northern Indian Lake	FAS008-SURF	1009JS1683	L931485-11	14-Sep-10	9:30	0.3	10.1	10.67	5
Winter									
Lake Winnipegosis (Site 4)	LGS016-SURF	1102CL9001	L983897-5	6-Mar-11	13:40	0.3	12.9	15.97	21
Saskatchewan River	KJS006-SURF	1102CL0135	L984367-3	8-Mar-11	10:10	0.3	9.60	11.61	19
Setting Lake	TCS006-SURF	1102CL0148	L984359-6	7-Mar-11	11:00	0.3	12.1	14.51	18
Northern Indian Lake	FAS 008-SURF	1102CL0174	L981063-3	23-Feb-11	11:55	0.3	13.5	14.11	4
Granville Lake	EBS043-SURF	1102CL0182	L981694-1	25-Feb-11	12:33	0.3	14.5	15.72	8
Southern Indian Lake (Area 6)	ECS002-SURF	1102CL0183	L981693-3	25-Feb-11	10:38	0.3	13.4	14.68	9

Table 2-8. Comparison of *in situ* and laboratory results of pH measured in surface waters during CAMPP sampling in 2010/2011. Relative percent mean differences (RPMDs) exceeding 25 % are indicated in red. Measurements in blue italics are considered "suspect".

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH		
							Laboratory	*In situ*	RPMD
Method Detection Limit							*0.10*		
Spring									
Winnipeg River	Lac du Bonnet	PFS093-SURF	1005JH0619	L886933-1	14-May-10	9:30	7.93	8.13	2
Winnipeg River	Winnipeg River (mean)	PFS096-SURF	1005JH0624	L886933-6	14-May-10	11:20	7.92	8.30	5
Winnipeg River	Manigotagan Lake	RAS155-SURF	1005JH0621	L886933-3	14-May-10	13:20	7.70	7.79	1
Winnipeg River	Eaglenest Lake	PFS097-SURF	1005JH0622	L886933-4	14-May-10	12:30	7.93	8.25	4
Lake Winnipeg	Lake Winnipegosis (site 1)	LFS003-SURF	1006JH0704	L898352-1	15-Jun-10	12:40	8.46	8.50	0
Lake Winnipeg	Lake Winnipegosis (site 2)	LFS004-SURF	1006JH0705	L899653-1	20-Jun-10	13:45	8.51	8.59	1
Lake Winnipeg	Lake Winnipegosis (site 3)	LFS005-SURF	1006JH0706	L898352-2	15-Jun-10	11:40	8.49	8.58	1
Lake Winnipeg	Lake Winnipegosis (site 4)	LGS016-SURF	n/a	L899653-15	20-Jun-10	12:28	8.50	8.55	1
Lake Winnipeg	Lake Winnipegosis (site 5)	LHS003-SURF	1006JH0009	L899653-2	20-Jun-10	11:25	8.47	8.42	1
Saskatchewan River	Cedar Lake	KLS001-SURF	1006JH0710	L899653-5	20-Jun-10	14:45	8.44	8.45	0
Saskatchewan River	Cormorant Lake	KKS038-SURF	1006JH0010	L899653-4	20-Jun-10	16:05	8.53	8.59	1
Saskatchewan River	Saskatchewan River	KJS006-SURF	1006JH0711	L898352-4	15-Jun-10	14:15	8.19	8.11	1
Upper Nelson River	Cross Lake	UDS004-SURF	1006JH0828	L901288-2	23-Jun-10	11:17	8.39	8.09	4
Upper Nelson River	Setting Lake (mean)	TFS014-SURF	1006JH0835	L901288-9	23-Jun-10	9:47	8.30	8.19	1
Upper Nelson River	Little Playgreen Lake	UBS018-SURF	1006JH0830	L901288-4	23-Jun-10	13:02	8.40	8.38	0
Upper Nelson River	Walker Lake	UDS020-SURF	1006JH0722	L899309-3	17-Jun-10	15:18	8.22	8.24	0
Lower Nelson River	Split Lake	UFS011-SURF	1006JH0831	L901288-5	23-Jun-10	17:05	8.37	8.23	2
Lower Nelson River	Assean Lake	UFS014-SURF	1006JH0714	L897616-2	14-Jun-10	16:25	8.40	8.44	0
Lower Nelson River	Lower Nelson River	UHS002-SURF	1006JH0715	L897616-3	14-Jun-10	12:00	8.19	8.21	0
Lower Nelson River	Hayes River	ABS002-SURF	1006JH0713	L897616-1	14-Jun-10	10:40	8.31	8.40	1
Lower Nelson River	Limestone Forebay	UHS004-SURF	1006JH0719	L897616-5	14-Jun-10	13:15	8.19	8.20	0
Lower Nelson River	Burntwood River	TGS015-SURF	1006JH0718	L897616-4	14-Jun-10	17:15	8.17	8.35	2
Lower Churchill River	Northern Indian Lake	FAS008-SURF	n/a	L900971-5	22-Jun-10	15:35	8.13	8.25	1
Lower Churchill River	Gauer Lake	FAS007-SURF	n/a	L900971-4	22-Jun-10	14:33	8.23	8.30	1
Lower Churchill River	Churchill River	FDS004-SURF	1006JH0717	L899309-2	17-Jun-10	10:05	8.19	8.29	1
Lower Churchill River	Billard Lake	FBS003-SURF	1006JH0716	L899309-1	17-Jun-10	11:15	8.19	8.07	1
Upper Churchill River	Southern Indian Lake (Area 4)	ECS004-SURF	n/a	L900971-2	22-Jun-10	13:25	8.10	8.14	0

Table 2-8. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Lab	pH *In situ*	pH RPMD
Method Detection Limit							*0.10*		
Spring									
Upper Churchill River	Granville Lake	EBS043-SURF	n/a	L900971-1	22-Jun-10	9:40	7.83	7.75	1
Upper Churchill River	Southern Indian Lake (Area 6)	ECS001-SURF	n/a	L900971-3	22-Jun-10	11:40	7.95	7.96	0
Churchill River Diversion	Threepoint Lake	TFS017-SURF	1006JH0723	L899620-2	19-Jun-10	15:40	8.38	8.20	2
Churchill River Diversion	Leftrook Lake	TFS018-SURF	1006JH0724	L899620-3	19-Jun-10	12:35	8.78	8.20	7
Churchill River Diversion	Footprint Lake	TFS010-SURF	1006JH0829	L901288-3	23-Jun-10	8:10	8.37	7.85	6
Churchill River Diversion	Rat Lake (mean)	KLS003-SURF	1006JH0726	L899620-5	19-Jun-10	14:20	8.62	8.02	7
Summer									
Winnipeg River	Lac du Bonnet	PFS093-SURF	1007JS1236	L911400-1	21-Jul-10	7:25	7.84	7.74	1
Winnipeg River	Winnipeg River	PFS094-SURF	1007JS1237	L911400-2	21-Jul-10	8:40	7.75	7.68	1
Winnipeg River	Manigotagan Lake	RAS155-SURF	1007JS1238	L911400-3	21-Jul-10	10:55	7.91	8.19	3
Winnipeg River	Eaglenest Lake (mean)	PFS096-SURF	1007JS1241	L911400-6	21-Jul-10	10:05	7.79	7.75	0
Lake Winnipeg	Lake Winnipegosis (site 1)	LFS003-SURF	1008JS1322	L918544-1	10-Aug-10	14:25	8.62	8.76	2
Lake Winnipeg	Lake Winnipegosis (site 3)	LFS005-SURF	1008JS1324	L918544-2	10-Aug-10	13:10	8.54	8.64	1
Lake Winnipeg	Lake Winnipegosis (site 4)	LGS016-SURF	1008JS1325	L918544-3	10-Aug-10	12:15	8.54	8.66	1
Lake Winnipeg	Lake Winnipegosis (site 5)	LHS003-SURF	1008JS1326	L918544-4	10-Aug-10	11:20	8.62	8.64	0
Saskatchewan River	Cedar Lake	KLS001-SURF	1008JS1328	L920298-2	13-Aug-10	9:45	8.62	8.75	1
Saskatchewan River	Cormorant Lake	KKS038-SURF	1008JS1327	L920298-1	13-Aug-10	11:30	8.56	8.71	2
Saskatchewan River	Saskatchewan River	KJS006-SURF	1008JS1329	L920298-3	13-Aug-10	13:07	8.32	8.26	1
Upper Nelson River	Cross Lake	UDS004-SURF	1008JS1433	L922197-2	18-Aug-10	10:15	8.24	8.88	7
Upper Nelson River	Setting Lake	TCS006-SURF	1008JS1427	L922197-1	18-Aug-10	13:58	8.07	8.85	9
Upper Nelson River	Little Playgreen Lake	UBS018-SURF	1008JS1435	L922197-3	18-Aug-10	12:10	8.29	9.36	12
Upper Nelson River	Walker Lake (mean)	KLS003-SURF	1008JS1344	L920004-15	12-Aug-10	8:25	8.20	7.72	6
Lower Nelson River	Split Lake	UFS011-SURF	1008JS1436	L922533-3	19-Aug-10	8:49	8.30	9.06	9
Lower Nelson River	Assean Lake	UFS014-SURF	1008JS1332	L918401-2	9-Aug-10	15:55	8.40	8.49	1
Lower Nelson River	Lower Nelson River	UHS002-SURF	1008JS1333	L918401-3	9-Aug-10	13:35	8.24	8.23	0
Lower Nelson River	Hayes River	ABS002-SURF	1008JS1331	L918401-1	9-Aug-10	14:15	8.34	8.32	0
Lower Nelson River	Limestone Forebay	UHS004-SURF	1008JS1337	L918401-7	9-Aug-10	12:36	8.24	8.28	0
Lower Nelson River	Burntwood River	TGS015-SURF	1008JS1336	L918401-6	9-Aug-10	16:27	8.18	8.37	2
Lower Churchill River	Northern Indian Lake	FAS008-SURF	1008JS1432	L921424-3	17-Aug-10	10:10	8.14	8.72	7

Table 2-8. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Lab	pH *In situ*	pH RPMD
Method Detection Limit							*0.10*		
Summer									
Lower Churchill River	Gauer Lake	FAS007-SURF	1008JS1431	L921424-2	17-Aug-10	11:05	8.23	9.19	11
Lower Churchill River	Churchill River	FDS004-SURF	1008JS1335	L918401-5	9-Aug-10	11:10	8.34	8.54	2
Lower Churchill River	Billard Lake	FBS003-SURF	1008JS1334	L918401-4	9-Aug-10	10:10	8.73	8.81	1
Upper Churchill River	Southern Indian Lake (Area 4)	ECS004-SURF	1008JS1429	L922533-2	19-Aug-10	11:05	8.05	9.21	13
Upper Churchill River	Granville Lake (mean)	TFS014-SURF	1008JS1440	L922533-7	19-Aug-10	12:50	7.98	9.17	14
Upper Churchill River	South Indian Lake (Area 6)	ECS001-SURF	1008JS1430	L921424-1	17-Aug-10	12:45	7.94	8.52	7
Churchill River Diversion	Threepoint Lake	TFS017-SURF	1008JS1341	L920004-3	12-Aug-10	10:35	8.06	7.75	4
Churchill River Diversion	Leftrook Lake	TFS018-SURF	1008JS1342	L920004-4	12-Aug-10	13:00	8.57	8.97	5
Churchill River Diversion	Footprint Lake	TFS010-SURF	1008JS1434	L921424-4	17-Aug-10	14:15	8.30	8.98	8
Churchill River Diversion	Rat Lake	TFS005-SURF	1008JS1339	L920004-1	12-Aug-10	11:45	7.99	7.37	8
Fall									
Winnipeg River	Lac du Bonnet	PFS093-SURF	1009JS1599	L935796-1	24-Sep-10	8:15	7.92	7.33	8
Winnipeg River	Winnipeg River	PFS094-SURF	1009JS1600	L935796-2	24-Sep-10	9:52	7.90	7.50	5
Winnipeg River	Manigotagan Lake (mean)	PFS096-SURF	1009JS1604	L935796-6	24-Sep-10	11:25	7.78	7.66	2
Winnipeg River	Eaglenest Lake	PFS097-SURF	1009JS1602	L935796-4	24-Sep-10	10:30	7.90	7.87	0
Lake Winnipeg	Lake Winnipegosis (site 1)	LFS003-SURF	1009JS1526	L928851-1	7-Sep-10	11:35	8.67	8.73	1
Lake Winnipeg	Lake Winnipegosis (site 2) (mean)	KLS003-SURF	1009JS1548	L928851-10	7-Sep-10	10:05	8.55	8.40	2
Lake Winnipeg	Lake Winnipegosis (site 3)	LFS005-SURF	1009JS1528	L929387-1	8-Sep-10	10:40	8.53	8.53	0
Lake Winnipeg	Lake Winnipegosis (site 4)	LGS016-SURF	1009JS1529	L929387-2	8-Sep-10	11:40	8.52	8.54	0
Lake Winnipeg	Lake Winnipegosis (site 5)	LHS003-SURF	1009JS1530	L929387-3	8-Sep-10	12:40	8.51	8.54	0
Saskatchewan River	Cedar Lake	KLS001-SURF	1009JS1532	L929387-4	8-Sep-10	9:30	8.47	8.40	1
Saskatchewan River	Cormorant Lake	KKS038-SURF	1009JS1531	L928851-3	7-Sep-10	14:00	8.55	8.61	1
Saskatchewan River	Saskatchewan River	KJS006-SURF	1009JS1533	L928851-4	7-Sep-10	12:50	8.29	8.28	0
Upper Nelson River	Cross Lake (mean)	TFS014-SURF	1009JS1662	L932322-10	15-Sep-10	8:30	8.11	6.96	15
Upper Nelson River	Setting Lake	TCS006-SURF	1009JS1649	L932322-1	15-Sep-10	11:57	8.15	7.03	15
Upper Nelson River	Little Playgreen Lake	UBS018-SURF	1009JS1657	L932322-4	15-Sep-10	10:05	8.25	7.40	11
Upper Nelson River	Walker Lake	UDS020-SURF	1009JS1544	L928361-2	6-Sep-10	13:00	8.30	8.18	1
Lower Nelson River	Split Lake	UFS011-SURF	1009JS1682	L932770-2	16-Sep-10	9:55	8.27	7.39	11
Lower Nelson River	Assean Lake	UFS014-SURF	1009JS1536	L928361-10	6-Sep-10	15:35	8.32	7.80	6

Table 2-8. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH		
							Lab	*In situ*	RPMD
Method Detection Limit							*0.10*		
Fall									
Lower Nelson River	Lower Nelson River	UHS002-SURF	1009JS1537	L930015-2	9-Sep-10	12:50	8.23	8.10	2
Lower Nelson River	Hayes River	ABS002-SURF	1009JS1535	L930015-1	9-Sep-10	13:35	8.11	7.90	3
Lower Nelson River	Limestone Forebay	UHS004-SURF	1009JS1541	L930015-5	9-Sep-10	11:35	8.23	8.10	2
Lower Nelson River	Burntwood River	TGS015-SURF	1009JS1540	L928361-11	6-Sep-10	14:50	8.09	8.10	0
Lower Churchill River	Northern Indian Lake	FAS008-SURF	1009JS1654	L931485-5	14-Sep-10	9:30	8.10	6.99	15
Lower Churchill River	Gauer Lake	FAS007-SURF	1009JS1653	L931485-4	14-Sep-10	11:00	8.17	7.88	4
Lower Churchill River	Churchill River	FDS004-SURF	1009JS1539	L930015-4	9-Sep-10	10:00	8.08	6.77	18
Lower Churchill River	Billard Lake	FBS003-SURF	1009JS1538	L930015-3	9-Sep-10	8:55	8.07	6.89	16
Upper Churchill River	Southern Indian Lake (Area 4)	ECS004-SURF	1009JS1651	L931485-2	14-Sep-10	11:45	8.06	6.98	14
Upper Churchill River	Granville Lake	EBS043-SURF	1009JS1650	L931485-1	14-Sep-10	14:49	7.92	7.49	6
Upper Churchill River	South Indian Lake (Area 6)	ECS001-SURF	1009JS1652	L931485-3	14-Sep-10	13:30	7.98	6.89	15
Churchill River Diversion	Threepoint Lake	TFS017-SURF	1009JS1545	L928361-3	6-Sep-10	11:10	7.93	7.27	9
Churchill River Diversion	Leftrook Lake	TFS018-SURF	1009JS1546	L928361-4	6-Sep-10	8:30	8.39	8.30	1
Churchill River Diversion	Footprint Lake	TFS010-SURF	1009JS1656	L932322-3	15-Sep-10	13:26	8.35	7.72	8
Churchill River Diversion	Rat Lake	TFS005-SURF	1009JS1543	L928361-1	6-Sep-10	10:00	7.98	7.08	12
Winter									
Winnipeg River	Lac du Bonnet	PFS093-SURF	1102CL0116	L981697-1	25-Feb-11	14:35	7.76	-	-
Winnipeg River	Winnipeg River	PFS094-SURF	1102CL0117	L981697-2	25-Feb-11	13:45	7.78	*12.77*	**49**
Winnipeg River	Manigotagan Lake	RAS155-SURF	1102CL0118	L981697-3	25-Feb-11	10:35	7.73	-	-
Winnipeg River	Eaglenest Lake (mean)	PFS097-SURF	1102CL0120	L981697-5	25-Feb-11	13:20	7.81	9.90	24
Lake Winnipeg	Lake Winnipegosis (site 1)	LFS003-SURF	1102CL0129	L983897-1	6-Mar-11	16:00	8.22	9.07	10
Lake Winnipeg	Lake Winnipegosis (site 2)	LFS004-SURF	1102CL0130	L984367-1	8-Mar-11	12:20	8.31	7.87	5
Lake Winnipeg	Lake Winnipegosis (site 3)	LFS005-SURF	1102CL0131	L983897-2	6-Mar-11	15:00	8.24	8.13	1
Lake Winnipeg	Lake Winnipegosis (site 4)	LGS016-SURF	1102CL0132	L983897-3	6-Mar-11	13:20	8.27	8.37	1
Lake Winnipeg	Lake Winnipegosis (site 5)	LHS003-SURF	1102CL0133	L983897-4	6-Mar-11	12:10	8.17	8.20	0
Saskatchewan River	Cedar Lake	KLS001-SURF	1102CL0134	L984367-2	8-Mar-11	11:00	8.23	8.17	1
Saskatchewan River	Cormorant Lake (mean)	KLS003-SURF	1102CL0156	L984359-8	7-Mar-11	16:30	8.34	8.83	6
Saskatchewan River	Saskatchewan River	KJS006-SURF	1102CL0142	L984367-5	8-Mar-11	10:00	8.07	7.87	3
Upper Nelson River	Cross Lake	UDS004-SURF	1102CL0145	L984359-3	7-Mar-11	12:45	8.03	7.63	5

Table 2-8. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	pH Lab	pH *In situ*	pH RPMD
Method Detection Limit							*0.10*		
Winter									
Upper Nelson River	Setting Lake	TCS006-SURF	1102CL0144	L984359-2	7-Mar-11	10:40	7.82	6.61	17
Upper Nelson River	Little Playgreen Lake	UBS018-SURF	1102CL0147	L984359-5	7-Mar-11	13:45	8.09	8.13	0
Upper Nelson River	Walker Lake	UDS020-SURF	1102CL0146	L984359-4	7-Mar-11	11:50	7.81	7.74	1
Lower Nelson River	Split Lake	UFS011-SURF	1102CL0159	L981891-1	26-Feb-11	11:45	8.14	8.14	0
Lower Nelson River	Assean Lake	UFS014-SURF	1102CL0160	L981891-2	26-Feb-11	9:45	8.21	8.09	1
Lower Nelson River	Hayes River	ABS002-SURF	1102CL0170	L980166-1	21-Feb-11	13:02	7.88	8.17	4
Lower Nelson River	Limestone Forebay	UHS004-SURF	1102CL0162	L980166-3	21-Feb-11	14:35	8.09	8.48	5
Lower Nelson River	Burntwood River	TGS015-SURF	1102CL0163	L981891-3	26-Feb-11	10:28	8.03	7.94	1
Lower Churchill River	Northern Indian Lake	FAS008-SURF	1102CL0172	L981063-1	23-Feb-11	11:55	8.10	7.85	3
Lower Churchill River	Gauer Lake	FAS007-SURF	1102CL0179	L981063-8	23-Feb-11	13:15	8.18	8.08	1
Lower Churchill River	Churchill River	FDS004-SURF	1102CL0171	L980166-2	21-Feb-11	11:20	7.83	8.11	4
Lower Churchill River	Billard Lake (mean)	TFS014-SURF	1102CL0198	L981063-5	23-Feb-11	10:30	8.11	8.20	1
Upper Churchill River	Southern Indian Lake (Area 4)	ECS004-SURF	1102CL0180	L981063-9	23-Feb-11	11:55	8.15	8.13	0
Upper Churchill River	Granville Lake	EBS043-SURF	1102CL0182	L981693-2	25-Feb-11	12:33	7.61	7.99	5
Upper Churchill River	Southern Indian Lake (Area 6) (mean)	FAS011-SURF	1102CL0200	L981696-2	25-Feb-11	10:38	7.81	8.08	3
Churchill River Diversion	Threepoint Lake	TFS017-SURF	1102CL0188	L981891-4	26-Feb-11	14:35	7.90	7.75	2
Churchill River Diversion	Leftrook Lake	TFS018-SURF	1102CL0189	L981816-1	25-Feb-11	15:10	8.09	7.89	3
Churchill River Diversion	Footprint Lake	TFS010-SURF	1102CL0190	L981891-5	26-Feb-11	13:30	8.00	7.81	2
Churchill River Diversion	Rat Lake	TFS005-SURF	1102CL0191	L981816-2	25-Feb-11	13:55	7.89	7.79	1

Table 2-9. Comparison of *in situ* and laboratory conductivity measured in surface waters during CAMPP sampling in 2010/2011. Relative percent mean differences (RPMDs) exceeding 25 % are indicated in red. Measurements in blue italics are considered "suspect".

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Conductivity Laboratory (µmhos/cm)	Specific Conductance *In situ* (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Spring								
Lac du Bonnet	PFS093-SURF	1005JH0619	L886933-1	14-May-10	9:30	105	95.7	9
Winnipeg River (mean)	PFS096-SURF	1005JH0624	L886933-6	14-May-10	11:20	91.5	83.4	9
Manigotagan Lake	RAS155-SURF	1005JH0621	L886933-3	14-May-10	13:20	75.8	67.4	12
Eaglenest Lake	PFS097-SURF	1005JH0622	L886933-4	14-May-10	12:30	92.0	83.3	10
Lake Winnipegosis (site 1)	LFS003-SURF	1006JH0704	L898352-1	15-Jun-10	12:40	958	960.6	0
Lake Winnipegosis (site 2)	LFS004-SURF	1006JH0705	L899653-1	20-Jun-10	13:45	1160	1178	2
Lake Winnipegosis (site 3)	LFS005-SURF	1006JH0706	L898352-2	15-Jun-10	11:40	1180	*0*	-
Lake Winnipegosis (site 4)	LGS016-SURF	n/a	L899653-15	20-Jun-10	12:28	1270	1289	1
Lake Winnipegosis (site 5)	LHS003-SURF	1006JH0009	L899653-2	20-Jun-10	11:25	1180	1184	0
Cedar Lake	KLS001-SURF	1006JH0710	L899653-5	20-Jun-10	14:45	369	369	0
Cormorant Lake	KKS038-SURF	1006JH0010	L899653-4	20-Jun-10	16:05	294	297	1
Saskatchewan River	KJS006-SURF	1006JH0711	L898352-4	15-Jun-10	14:15	362	363	0
Cross Lake	UDS004-SURF	1006JH0828	L901288-2	23-Jun-10	11:17	322	317	2
Setting Lake (mean)	TFS014-SURF	1006JH0835	L901288-9	23-Jun-10	9:47	160	153	4
Little Playgreen Lake	UBS018-SURF	1006JH0830	L901288-4	23-Jun-10	13:02	329	323	2
Walker Lake	UDS020-SURF	1006JH0722	L899309-3	17-Jun-10	15:18	133	131	2
Split Lake	UFS011-SURF	1006JH0831	L901288-5	23-Jun-10	17:05	271	273	1
Assean Lake	UFS014-SURF	1006JH0714	L897616-2	14-Jun-10	16:25	225	225	0
Lower Nelson River	UHS002-SURF	1006JH0715	L897616-3	14-Jun-10	12:00	215	212	2
Hayes River	ABS002-SURF	1006JH0713	L897616-1	14-Jun-10	10:40	158	157	1
Limestone Forebay	UHS004-SURF	1006JH0719	L897616-5	14-Jun-10	13:15	216	215	1
Burntwood River	TGS015-SURF	1006JH0718	L897616-4	14-Jun-10	17:15	107	105	2
Northern Indian Lake	FAS008-SURF	n/a	L900971-5	22-Jun-10	15:35	129	126	2
Gauer Lake	FAS007-SURF	n/a	L900971-4	22-Jun-10	14:33	151	148	2
Churchill River	FDS004-SURF	1006JH0717	L899309-2	17-Jun-10	10:05	123	121	1
Billard Lake	FBS003-SURF	1006JH0716	L899309-1	17-Jun-10	11:15	120	118	2

Table 2-9. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Conductivity Laboratory (µmhos/cm)	Specific Conductance *In situ* (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Spring								
Southern Indian Lake (Area 4)	ECS004-SURF	n/a	L900971-2	22-Jun-10	13:25	105	101	4
Granville Lake	EBS043-SURF	n/a	L900971-1	22-Jun-10	9:40	70.4	68	3
Southern Indian Lake (Area 6)	ECS001-SURF	n/a	L900971-3	22-Jun-10	11:40	83.3	81	3
Threepoint Lake	TFS017-SURF	1006JH0723	L899620-2	19-Jun-10	15:40	104	93	11
Leftrook Lake	TFS018-SURF	1006JH0724	L899620-3	19-Jun-10	12:35	215	199	8
Footprint Lake	TFS010-SURF	1006JH0829	L901288-3	23-Jun-10	8:10	175	169	3
Rat Lake (mean)	KLS003-SURF	1006JH0726	L899620-5	19-Jun-10	14:20	101	84	18
Summer								
Lac du Bonnet	PFS093-SURF	1007JS1236	L911400-1	21-Jul-10	7:25	88.4	88	0
Winnipeg River	PFS094-SURF	1007JS1237	L911400-2	21-Jul-10	8:40	83.5	83	1
Manigotagan Lake	RAS155-SURF	1007JS1238	L911400-3	21-Jul-10	10:55	66.8	66	1
Eaglenest Lake (mean)	PFS096-SURF	1007JS1241	L911400-6	21-Jul-10	10:05	83.9	83	1
Lake Winnipegosis (site 1)	LFS003-SURF	1008JS1322	L918544-1	10-Aug-10	14:25	877	897	2
Lake Winnipegosis (site 3)	LFS005-SURF	1008JS1324	L918544-2	10-Aug-10	13:10	1160	1194	3
Lake Winnipegosis (site 4)	LGS016-SURF	1008JS1325	L918544-3	10-Aug-10	12:15	1250	1284	3
Lake Winnipegosis (site 5)	LHS003-SURF	1008JS1326	L918544-4	10-Aug-10	11:20	1080	1109	3
Cedar Lake	KLS001-SURF	1008JS1328	L920298-2	13-Aug-10	9:45	381	382	0
Cormorant Lake	KKS038-SURF	1008JS1327	L920298-1	13-Aug-10	11:30	298	301	1
Saskatchewan River	KJS006-SURF	1008JS1329	L920298-3	13-Aug-10	13:07	430	435	1
Cross Lake	UDS004-SURF	1008JS1433	L922197-2	18-Aug-10	10:15	286	290	1
Setting Lake	TCS006-SURF	1008JS1427	L922197-1	18-Aug-10	13:58	159	160	1
Little Playgreen Lake	UBS018-SURF	1008JS1435	L922197-3	18-Aug-10	12:10	309	312	1
Walker Lake (mean)	KLS003-SURF	1008JS1344	L920004-15	12-Aug-10	8:25	136	137	0
Split Lake	UFS011-SURF	1008JS1436	L922533-3	19-Aug-10	8:49	272	281	3
Assean Lake	UFS014-SURF	1008JS1332	L918401-2	9-Aug-10	15:55	240	244	2
Lower Nelson River	UHS002-SURF	1008JS1333	L918401-3	9-Aug-10	13:35	292	*57*	-
Hayes River	ABS002-SURF	1008JS1331	L918401-1	9-Aug-10	14:15	176	178	1
Limestone Forebay	UHS004-SURF	1008JS1337	L918401-7	9-Aug-10	12:36	292	298	2

Table 2-9. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Conductivity Laboratory (µmhos/cm)	Specific Conductance *In situ* (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Summer								
Burntwood River	TGS015-SURF	1008JS1336	L918401-6	9-Aug-10	16:27	121	121	0
Northern Indian Lake	FAS008-SURF	1008JS1432	L921424-3	17-Aug-10	10:10	136	134	1
Gauer Lake	FAS007-SURF	1008JS1431	L921424-2	17-Aug-10	11:05	155	154	1
Churchill River	FDS004-SURF	1008JS1335	L918401-5	9-Aug-10	11:10	143	144	1
Billard Lake	FBS003-SURF	1008JS1334	L918401-4	9-Aug-10	10:10	133	134	1
Southern Indian Lake (Area 4)	ECS004-SURF	1008JS1429	L922533-2	19-Aug-10	11:05	107	107	0
Granville Lake (mean)	TFS014-SURF	1008JS1440	L922533-7	19-Aug-10	12:50	85.2	85	0
Southern Indian Lake (Area 6)	ECS001-SURF	1008JS1430	L921424-1	17-Aug-10	12:45	84.8	85	0
Threepoint Lake	TFS017-SURF	1008JS1341	L920004-3	12-Aug-10	10:35	99.1	98	1
Leftrook Lake	TFS018-SURF	1008JS1342	L920004-4	12-Aug-10	13:00	194	193	1
Footprint Lake	TFS010-SURF	1008JS1434	L921424-4	17-Aug-10	14:15	192	192	0
Rat Lake	TFS005-SURF	1008JS1339	L920004-1	12-Aug-10	11:45	90.7	90	1
Fall								
Lac du Bonnet	PFS093-SURF	1009JS1599	L935796-1	24-Sep-10	8:15	92.4	90	3
Winnipeg River	PFS094-SURF	1009JS1600	L935796-2	24-Sep-10	9:52	88.3	86	3
Manigotagan Lake (mean)	PFS096-SURF	1009JS1604	L935796-6	24-Sep-10	11:25	70.2	68	3
Eaglenest Lake	PFS097-SURF	1009JS1602	L935796-4	24-Sep-10	10:30	88.0	86	2
Lake Winnipegosis (site 1)	LFS003-SURF	1009JS1526	L928851-1	7-Sep-10	11:35	853	864	1
Lake Winnipegosis (site 2) (mean)	KLS003-SURF	1009JS1548	L928851-10	7-Sep-10	10:05	1087	1099	1
Lake Winnipegosis (site 3)	LFS005-SURF	1009JS1528	L929387-1	8-Sep-10	10:40	1160	1179	2
Lake Winnipegosis (site 4)	LGS016-SURF	1009JS1529	L929387-2	8-Sep-10	11:40	1240	1263	2
Lake Winnipegosis (site 5)	LHS003-SURF	1009JS1530	L929387-3	8-Sep-10	12:40	1200	1220	2
Cedar Lake	KLS001-SURF	1009JS1532	L929387-4	8-Sep-10	9:30	388	389	0
Cormorant Lake	KKS038-SURF	1009JS1531	L928851-3	7-Sep-10	14:00	296	299	1
Saskatchewan River	KJS006-SURF	1009JS1533	L928851-4	7-Sep-10	12:50	415	416	0
Cross Lake (mean)	TFS014-SURF	1009JS1662	L932322-10	15-Sep-10	8:30	238	239	0
Setting Lake	TCS006-SURF	1009JS1649	L932322-1	15-Sep-10	11:57	159	158	1
Little Playgreen Lake	UBS018-SURF	1009JS1657	L932322-4	15-Sep-10	10:05	284	285	0

Table 2-9. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Conductivity Laboratory (μmhos/cm)	Specific Conductance *In situ* (μS/cm)	RPMD
Method Detection Limit						*0.40*		
Fall								
Walker Lake	UDS020-SURF	1009JS1544	L928361-2	6-Sep-10	13:00	137	136	1
Split Lake	UFS011-SURF	1009JS1682	L932770-2	16-Sep-10	9:55	291	214	**30**
Assean Lake	UFS014-SURF	1009JS1536	L928361-10	6-Sep-10	15:35	224	224	0
Lower Nelson River	UHS002-SURF	1009JS1537	L930015-2	9-Sep-10	12:50	269	247	9
Hayes River	ABS002-SURF	1009JS1535	L930015-1	9-Sep-10	13:35	134	134	0
Limestone Forebay	UHS004-SURF	1009JS1541	L930015-5	9-Sep-10	11:35	269	275	2
Burntwood River	TGS015-SURF	1009JS1540	L928361-11	6-Sep-10	14:50	133	132	1
Northern Indian Lake	FAS008-SURF	1009JS1654	L931485-5	14-Sep-10	9:30	137	135	1
Gauer Lake	FAS007-SURF	1009JS1653	L931485-4	14-Sep-10	11:00	144	142	1
Churchill River	FDS004-SURF	1009JS1539	L930015-4	9-Sep-10	10:00	124	122	2
Billard Lake	FBS003-SURF	1009JS1538	L930015-3	9-Sep-10	8:55	120	120	0
Southern Indian Lake (Area 4)	ECS004-SURF	1009JS1651	L931485-2	14-Sep-10	11:45	110	107	3
Granville Lake	EBS043-SURF	1009JS1650	L931485-1	14-Sep-10	14:49	88.5	87	2
Southern Indian Lake (Area 6)	ECS001-SURF	1009JS1652	L931485-3	14-Sep-10	13:30	90.5	88	3
Threepoint Lake	TFS017-SURF	1009JS1545	L928361-3	6-Sep-10	11:10	106	104	2
Leftrook Lake	TFS018-SURF	1009JS1546	L928361-4	6-Sep-10	8:30	186	185	1
Footprint Lake	TFS010-SURF	1009JS1656	L932322-3	15-Sep-10	13:26	169	170	1
Rat Lake	TFS005-SURF	1009JS1543	L928361-1	6-Sep-10	10:00	99.9	98	2
Winter								
Lac du Bonnet	PFS093-SURF	1102CL0116	L981697-1	25-Feb-11	14:35	99.3	176	**56**
Winnipeg River	PFS094-SURF	1102CL0117	L981697-2	25-Feb-11	13:45	98.2	99	0
Manigotagan Lake	RAS155-SURF	1102CL0118	L981697-3	25-Feb-11	10:35	73.8	72	2
Eaglenest Lake (mean)	PFS097-SURF	1102CL0120	L981697-5	25-Feb-11	13:20	98.4	57	**53**
Lake Winnipegosis (site 1)	LFS003-SURF	1102CL0129	L983897-1	6-Mar-11	16:00	809	843	4
Lake Winnipegosis (site 2)	LFS004-SURF	1102CL0130	L984367-1	8-Mar-11	12:20	1140	1216	6
Lake Winnipegosis (site 3)	LFS005-SURF	1102CL0131	L983897-2	6-Mar-11	15:00	1250	1313	5
Lake Winnipegosis (site 4)	LGS016-SURF	1102CL0132	L983897-3	6-Mar-11	13:20	1380	1450	5
Lake Winnipegosis (site 5)	LHS003-SURF	1102CL0133	L983897-4	6-Mar-11	12:10	926	815	13

Table 2-9. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Conductivity Laboratory (µmhos/cm)	Specific Conductance *In situ* (µS/cm)	RPMD
Method Detection Limit						*0.40*		
Winter								
Cedar Lake	KLS001-SURF	1102CL0134	L984367-2	8-Mar-11	11:00	505	520	3
Cormorant Lake (mean)	KLS003-SURF	1102CL0156	L984359-8	7-Mar-11	16:30	309	330	6
Saskatchewan River	KJS006-SURF	1102CL0142	L984367-5	8-Mar-11	10:00	534	555	4
Cross Lake	UDS004-SURF	1102CL0145	L984359-3	7-Mar-11	12:45	320	344	7
Setting Lake	TCS006-SURF	1102CL0144	L984359-2	7-Mar-11	10:40	167	173	4
Little Playgreen Lake	UBS018-SURF	1102CL0147	L984359-5	7-Mar-11	13:45	327	344	5
Walker Lake	UDS020-SURF	1102CL0146	L984359-4	7-Mar-11	11:50	149	158	6
Split Lake	UFS011-SURF	1102CL0159	L981891-1	26-Feb-11	11:45	294	319	8
Assean Lake	UFS014-SURF	1102CL0160	L981891-2	26-Feb-11	9:45	301	325	8
Hayes River	ABS002-SURF	1102CL0170	L980166-1	21-Feb-11	13:02	162	170	5
Limestone Forebay	UHS004-SURF	1102CL0162	L980166-3	21-Feb-11	14:35	294	240	20
Burntwood River	TGS015-SURF	1102CL0163	L981891-3	26-Feb-11	10:28	123	128	4
Northern Indian Lake	FAS008-SURF	1102CL0172	L981063-1	23-Feb-11	11:55	146	145	1
Gauer Lake	FAS007-SURF	1102CL0179	L981063-8	23-Feb-11	13:15	181	182	1
Churchill River	FDS004-SURF	1102CL0171	L980166-2	21-Feb-11	11:20	151	158	5
Billard Lake (mean)	TFS014-SURF	1102CL0198	L981063-5	23-Feb-11	10:30	152	152	0
Southern Indian Lake (Area 4)	ECS004-SURF	1102CL0180	L981063-9	23-Feb-11	11:55	128	98	**27**
Granville Lake	EBS043-SURF	1102CL0182	L981693-2	25-Feb-11	12:33	103	105	2
Southern Indian Lake (Area 6) (mean)	FAS011-SURF	1102CL0200	L981696-2	25-Feb-11	10:38	114	117	2
Threepoint Lake	TFS017-SURF	1102CL0188	L981891-4	26-Feb-11	14:35	112	116	4
Leftrook Lake	TFS018-SURF	1102CL0189	L981816-1	25-Feb-11	15:10	225	246	9
Footprint Lake	TFS010-SURF	1102CL0190	L981891-5	26-Feb-11	13:30	134	129	4
Rat Lake	TFS005-SURF	1102CL0191	L981816-2	25-Feb-11	13:55	111	115	4

Table 2-10. Results of routine, bacterial, and productivity parameters measured in field and trip blanks included in the 2008/2009 CAMPP water quality program. Values more than five times the analytical detection limits are indicated in bold red.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Alkalinity Bicarbonate (HCO_3) (mg/L)	Alkalinity Carbonate (CO_3) (mg/L)	Alkalinity Hydroxide (OH) (mg/L)
Method Detection Limit						*1*	*2*	*0.6*	*0.4*
FIELD BLANKS									
MWS Field Blank	TCS007 (FieldBlk)	0806JHS907	L648805-4	26-Jun-08	8:00	2	2	<0.6	<0.4
NSC Field Blank	LHS004	0806JHS819	L649710-5	30-Jun-08	12:55	2	2	<0.6	<0.4
MWS Field Blank	TDS005	0808JHS946	L670161-3	14-Aug-08	11:25	2	2	<0.6	<0.4
NSC Field Blank	LHS004	0808JHS618	L671937-5	18-Aug-08	15:40	2	2	<0.6	<0.4
MWS Field Blank	TDS005-SURF	0809JHS306	L685087-3	18-Sep-08	9:30	2	2	<0.6	<0.4
MWS Field Blank	TDS005-EUPH	0809JHS331	L685087-11	18-Sep-08	9:30	-	-	-	-
NSC Field Blank	LHS004	0809JHS218	L683986-4	17-Sep-08	10:00	2	2	<0.6	<0.4
NSC Field Blank	LHS004	0903JH0173	L738653-7	2-Mar-09	13:20	2	3	<0.6	<0.4
NSC Field Blank	TDS005	0903JH0219	L739943-3	5-Mar-09	13:35	<1	<2	<0.6	<0.4
TRIP BLANKS									
MWS Trip Blank	TDS005 (TripBlk)	0806JHS906	L648805-3	26-Jun-08	-	2	2	<0.6	<0.4
NSC Trip Blank	LFS006	0806JFS820	L649710-6	30-Jun-08	-	2	2	<0.6	<0.4
MWS Trip Blank	TCS007	0808JHS947	L670161-4	14-Aug-08	-	2	2	<0.6	<0.4
NSC Trip Blank	LFS006	0808JHS619	L671937-6	18-Aug-08	-	2	2	<0.6	<0.4
MWS Trip Blank	TCS007	0809JHS307	L685087-4	18-Sep-08	-	2	2	<0.6	<0.4
NSC Trip Blank	LFS006	0809JHS219	L683986-5	17-Sep-08	-	2	2	<0.6	<0.4
NSC Trip Blank	LFS006	0903JH0174	L738653-8	2-Mar-09	-	2	2	<0.6	<0.4
NSC Trip Blank	TCS007	0903JH0220	L739152-4	5-Mar-09	-	2	<2	<0.6	<0.4

Table 2-10. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)
Method Detection Limit			*0.003*	*0.005*	*0.15/0.2*	*0.001/0.005*	*0.001*	*0.001*
FIELD BLANKS								
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	0.003	0.006	<0.2	0.005	<0.001	<0.001
NSC Field Blank	LHS004	30-Jun-08	0.007	0.010	<0.2	<0.001	<0.001	<0.001
MWS Field Blank	TDS005	14-Aug-08	<0.003	0.006	<0.2	<0.001	0.005	0.005
NSC Field Blank	LHS004	18-Aug-08	<0.003	0.013	**0.76**	<0.001	<0.001	<0.001
MWS Field Blank	TDS005-SURF	18-Sep-08	**0.023**	0.009	<0.2	-	<0.001	<0.001
MWS Field Blank	TDS005-EUPH	18-Sep-08	-	-	-	-	-	-
NSC Field Blank	LHS004	17-Sep-08	0.007	0.014	<0.2	-	<0.001	0.001
NSC Field Blank	LHS004	2-Mar-09	0.005	<0.005	<0.2	<0.001	<0.001	<0.001
NSC Field Blank	TDS005	5-Mar-09	0.003	0.008	<0.2	<0.001	<0.001	<0.001
TRIP BLANKS								
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	0.004	0.005	<0.2	<0.005	<0.001	<0.001
NSC Trip Blank	LFS006	30-Jun-08	0.012	0.017	<0.2	<0.001	<0.001	<0.001
MWS Trip Blank	TCS007	14-Aug-08	<0.003	0.005	<0.2	<0.001	0.003	0.003
NSC Trip Blank	LFS006	18-Aug-08	0.004	0.008	**0.54**	<0.001	<0.001	<0.001
MWS Trip Blank	TCS007	18-Sep-08	**0.017**	0.008	<0.2	0.003	0.003	0.005
NSC Trip Blank	LFS006	17-Sep-08	<0.003	0.010	<0.2	0.005	<0.001	0.005
NSC Trip Blank	LFS006	2-Mar-09	0.007	<0.005	<0.2	0.001	<0.001	<0.001
NSC Trip Blank	TCS007	5-Mar-09	0.007	<0.005	0.5	<0.001	0.001	0.001

Table 2-10. – continued –

			Carbon			Water Clarity			
Sample Location	Sample ID	Sample Date	Dissolved Organic (mg/L)	Total Organic (mg/L)	Total Inorganic (mg/L)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (TCU)
Method Detection Limit			*1*	*1*	*1*	*5*	*2*	*0.05*	*5*
FIELD BLANKS									
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	<1	<1	<1	8	2	0.05	<5
NSC Field Blank	LHS004	30-Jun-08	<1	<1	<1	<5	<2	0.05	<5
MWS Field Blank	TDS005	14-Aug-08	<1	<1	<1	<5	<2	0.05	<5
NSC Field Blank	LHS004	18-Aug-08	<1	<1	<1	<5	<2	0.25	<5
MWS Field Blank	TDS005-SURF	18-Sep-08	<1	<1	<1	<5	<2	<0.05	<5
MWS Field Blank	TDS005-EUPH	18-Sep-08	-	-	-	-	-	-	-
NSC Field Blank	LHS004	17-Sep-08	<1	<1	<1	<5	<2	<0.05	<5
NSC Field Blank	LHS004	2-Mar-09	<1	<1	<1	<5	<2	<0.05	5
NSC Field Blank	TDS005	5-Mar-09	<1	<1	<1	<5	<2	0.15	10
TRIP BLANKS									
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	<1	<1	<1	<5	2	0.05	<5
NSC Trip Blank	LFS006	30-Jun-08	<1	<1	<1	<5	<2	0.05	<5
MWS Trip Blank	TCS007	14-Aug-08	<1	<1	<1	<5	<2	0.05	<5
NSC Trip Blank	LFS006	18-Aug-08	<1	<1	<1	<5	<2	0.05	<5
MWS Trip Blank	TCS007	18-Sep-08	<1	<1	<1	<5	<2	<0.05	5
NSC Trip Blank	LFS006	17-Sep-08	<1	<1	<1	<5	<2	0.05	<5
NSC Trip Blank	LFS006	2-Mar-09	<1	<1	<1	<5	<2	0.05	5
NSC Trip Blank	TCS007	5-Mar-09	<1	<1	<1	<5	<2	0.05	5

Table 2-10. – continued –

					Bacteria	Productivity	
Sample Location	Sample ID	Sample Date	pH	Conductivity (µmhos/cm)	*E. coli* (CFU/100 mL)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Method Detection Limit			*0.01*	*0.4*	*1*	*1*	*1*
FIELD BLANKS							
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	5.68	0.6	<1	-	-
NSC Field Blank	LHS004	30-Jun-08	5.67	0.7	<1	<1	<1
MWS Field Blank	TDS005	14-Aug-08	5.58	0.8	-	<1	<1
NSC Field Blank	LHS004	18-Aug-08	5.63	0.7	<1	<1	<1
MWS Field Blank	TDS005-SURF	18-Sep-08	7.04	0.5	<1	<1	3
MWS Field Blank	TDS005-EUPH	18-Sep-08	-	-	-	<1	<1
NSC Field Blank	LHS004	17-Sep-08	5.64	0.8	<1	<1	<1
NSC Field Blank	LHS004	2-Mar-09	6.31	1.1	-	<1	<1
NSC Field Blank	TDS005	5-Mar-09	6.55	1.1	<1	<1	<1
TRIP BLANKS							
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	5.64	0.6	<1	-	-
NSC Trip Blank	LFS006	30-Jun-08	5.68	0.7	<1	3	<1
MWS Trip Blank	TCS007	14-Aug-08	5.59	0.8	-	<1	<1
NSC Trip Blank	LFS006	18-Aug-08	5.64	0.7	<1	<1	<1
MWS Trip Blank	TCS007	18-Sep-08	6.75	0.6	-	5	<1
NSC Trip Blank	LFS006	17-Sep-08	5.66	0.7	<1	<1	<1
NSC Trip Blank	LFS006	2-Mar-09	5.69	0.8	-	<1	<1
NSC Trip Blank	TCS007	5-Mar-09	5.61	0.8	<1	<1	<1

Table 2-11. Results of metals, hardness, and major ions (chloride and sulphate) measured in field and trip blanks included in the 2008/2009 CAMPP water quality program. Values more than five times the analytical detection limit are indicated in bold red.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)
Method Detection Limit						*0.3*	*0.005*	*0.001/0.0005*	*0.0005*
FIELD BLANKS									
MWS Field Blank	TCS007 (FieldBlk)	0806JHS907	L648805-4	26-Jun-08	8:00	<0.3	0.013	<0.001	<0.0005
NSC Field Blank	LHS004	0806JHS819	L649710-5	30-Jun-08	12:55	<0.3	0.015	<0.001	<0.0005
MWS Field Blank	TDS005	0808JHS946	L670161-3	14-Aug-08	11:25	1.0	<0.005	<0.001	<0.0005
NSC Field Blank	LHS004	0808JHS618	L671937-5	18-Aug-08	15:40	0.8	<0.005	<0.001	<0.0005
MWS Field Blank	TDS005	0809JHS306	L685087-3	18-Sep-08	9:30	0.5	0.011	<0.001	<0.0005
NSC Field Blank	LHS004	0809JHS218	L683986-4	17-Sep-08	10:00	0.4	<0.005	<0.001	<0.0005
NSC Field Blank	LHS004	0903JH0173	L738653-7	2-Mar-09	13:20	0.4	<0.005	<0.0005	<0.0005
NSC Field Blank	TDS005	0903JH0219	L739943-3	5-Mar-09	13:35	<0.3	<0.005	<0.0005	<0.0005
TRIP BLANKS									
MWS Trip Blank	TDS005 (TripBlk)	0806JHS906	L648805-3	26-Jun-08	-	<0.3	0.012	<0.001	<0.0005
NSC Trip Blank	LFS006	0806JFS820	L649710-6	30-Jun-08	-	<0.3	0.015	<0.001	<0.0005
MWS Trip Blank	TCS007	0808JHS947	L670161-4	14-Aug-08	-	0.6	<0.005	<0.001	<0.0005
NSC Trip Blank	LFS006	0808JHS619	L671937-6	18-Aug-08	-	0.9	<0.005	<0.001	<0.0005
MWS Trip Blank	TCS007	0809JHS307	L685087-4	18-Sep-08	-	0.5	**0.030**	<0.001	<0.0005
NSC Trip Blank	LFS006	0809JHS219	L683986-5	17-Sep-08	-	0.4	<0.005	<0.001	<0.0005
NSC Trip Blank	LFS006	0903JH0174	L738653-8	2-Mar-09	-	<0.3	<0.005	<0.0005	<0.0005
NSC Trip Blank	TCS007	0903JH0220	L739152-4	5-Mar-09	-	<0.3	<0.005	0.0006	<0.0005

Table 2-11. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)
Method Detection Limit			*0.0003*	*0.001*	*0.0002*	*0.03*	*0.00001*	*0.1*	*0.0001*	*0.2/9*
FIELD BLANKS										
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	<0.0003	<0.001	<0.0002	0.03	<0.00001	<0.1	<0.0001	<0.2
NSC Field Blank	LHS004	30-Jun-08	<0.0003	<0.001	<0.0002	<0.03	0.00002	0.1	<0.0001	<0.2
MWS Field Blank	TDS005	14-Aug-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	0.4	<0.0001	0.3
NSC Field Blank	LHS004	18-Aug-08	0.0004	<0.001	<0.0002	<0.03	<0.00001	0.3	<0.0001	<9
MWS Field Blank	TDS005	18-Sep-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	0.2	<0.0001	<0.2
NSC Field Blank	LHS004	17-Sep-08	<0.0003	<0.001	<0.0002	<0.03	0.00001	0.2	<0.0001	<0.2
NSC Field Blank	LHS004	2-Mar-09	0.0004	<0.001	<0.0002	<0.03	<0.00001	0.2	<0.0001	<0.2
NSC Field Blank	TDS005	5-Mar-09	<0.0003	<0.001	<0.0002	<0.03	<0.00001	<0.1	<0.0001	<0.2
TRIP BLANKS										
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	<0.1	<0.0001	<0.2
NSC Trip Blank	LFS006	30-Jun-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	<0.1	<0.0001	<0.2
MWS Trip Blank	TCS007	14-Aug-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	0.3	<0.0001	<0.2
NSC Trip Blank	LFS006	18-Aug-08	0.0005	<0.001	<0.0002	<0.03	<0.00001	0.3	<0.0001	<9
MWS Trip Blank	TCS007	18-Sep-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	0.2	<0.0001	<0.2
NSC Trip Blank	LFS006	17-Sep-08	<0.0003	<0.001	<0.0002	<0.03	<0.00001	0.2	<0.0001	<0.2
NSC Trip Blank	LFS006	2-Mar-09	<0.0003	<0.001	<0.0002	<0.03	<0.00001	<0.1	<0.0001	<0.2
NSC Trip Blank	TCS007	5-Mar-09	<0.0003	<0.001	<0.0002	<0.03	<0.00001	<0.1	<0.0001	<0.2

Table 2-11. – continued –

Sample Location	Sample ID	Sample Date	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)
Method Detection Limit			*0.001*	*0.0002*	*0.001*	*0.02*	*0.0005*	*0.01*	*0.0003*	*0.00005*
FIELD BLANKS										
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	<0.001	<0.0002	<0.001	0.03	<0.0005	<0.01	<0.0003	<0.00005
NSC Field Blank	LHS004	30-Jun-08	0.002	<0.0002	<0.001	0.04	<0.0005	<0.01	<0.0003	<0.00005
MWS Field Blank	TDS005	14-Aug-08	<0.001	**0.0011**	<0.001	<0.02	<0.0005	<0.01	0.0004	<0.00005
NSC Field Blank	LHS004	18-Aug-08	0.003	**0.0014**	<0.001	<0.02	<0.0005	0.01	<0.0003	-
MWS Field Blank	TDS005	18-Sep-08	0.001	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	-
NSC Field Blank	LHS004	17-Sep-08	0.001	<0.0002	<0.001	<0.02	<0.0005	0.01	<0.0003	<0.00005
NSC Field Blank	LHS004	2-Mar-09	0.002	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	<0.00005
NSC Field Blank	TDS005	5-Mar-09	<0.001	<0.0002	0.002	<0.02	<0.0005	<0.01	<0.0003	<0.00005
TRIP BLANKS										
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	<0.001	<0.0002	<0.001	0.04	<0.0005	<0.01	<0.0003	<0.00005
NSC Trip Blank	LFS006	30-Jun-08	<0.001	0.0002	<0.001	0.03	<0.0005	<0.01	<0.0003	<0.00005
MWS Trip Blank	TCS007	14-Aug-08	<0.001	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	<0.00005
NSC Trip Blank	LFS006	18-Aug-08	<0.001	**0.0013**	<0.001	<0.02	<0.0005	0.01	<0.0003	<0.00005
MWS Trip Blank	TCS007	18-Sep-08	<0.001	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	<0.00005
NSC Trip Blank	LFS006	17-Sep-08	0.001	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	<0.00005
NSC Trip Blank	LFS006	2-Mar-09	0.001	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	<0.00005
NSC Trip Blank	TCS007	5-Mar-09	<0.001	<0.0002	<0.001	<0.02	<0.0005	<0.01	<0.0003	<0.00005

Table 2-11. – continued –

Sample Location	Sample ID	Sample Date	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)
Method Detection Limit			*0.0002*	*0.002*	*0.05*	*0.1*	*0.0002*	*0.001*	*0.0001*
FIELD BLANKS									
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	0.0002
NSC Field Blank	LHS004	30-Jun-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
MWS Field Blank	TDS005	14-Aug-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Field Blank	LHS004	18-Aug-08	<0.0002	0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
MWS Field Blank	TDS005	18-Sep-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Field Blank	LHS004	17-Sep-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Field Blank	LHS004	2-Mar-09	<0.0002	<0.002	0.06	<0.1	<0.0002	<0.001	<0.0001
NSC Field Blank	TDS005	5-Mar-09	<0.0002	0.003	<0.05	<0.1	<0.0002	<0.001	<0.0001
TRIP BLANKS									
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Trip Blank	LFS006	30-Jun-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
MWS Trip Blank	TCS007	14-Aug-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Trip Blank	LFS006	18-Aug-08	<0.0002	0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
MWS Trip Blank	TCS007	18-Sep-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Trip Blank	LFS006	17-Sep-08	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Trip Blank	LFS006	2-Mar-09	<0.0002	<0.002	<0.05	<0.1	<0.0002	<0.001	<0.0001
NSC Trip Blank	TCS007	5-Mar-09	<0.0002	<0.002	0.05	<0.1	<0.0002	<0.001	<0.0001

Table 2-11. – continued –

Sample Location	Sample ID	Sample Date	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)
Method Detection Limit			*0.03*	*0.0001*	*2*	*0.001*	*0.0001*	*0.0006*	*0.0009*	*0.0002*
FIELD BLANKS										
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Field Blank	LHS004	30-Jun-08	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
MWS Field Blank	TDS005	14-Aug-08	<0.03	0.0002	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Field Blank	LHS004	18-Aug-08	0.06	0.0002	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
MWS Field Blank	TDS005	18-Sep-08	<0.03	0.0001	<2	<0.001	<0.0001	0.0011	<0.0009	<0.0002
NSC Field Blank	LHS004	17-Sep-08	0.04	0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Field Blank	LHS004	2-Mar-09	<0.03	0.0002	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Field Blank	TDS005	5-Mar-09	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
TRIP BLANKS										
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Trip Blank	LFS006	30-Jun-08	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	0.0010	<0.0002
MWS Trip Blank	TCS007	14-Aug-08	<0.03	0.0001	<2	<0.001	<0.0001	<0.0006	0.0010	<0.0002
NSC Trip Blank	LFS006	18-Aug-08	0.05	0.0002	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
MWS Trip Blank	TCS007	18-Sep-08	<0.03	0.0001	<2	<0.001	0.0001	<0.0006	<0.0009	0.0004
NSC Trip Blank	LFS006	17-Sep-08	0.04	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Trip Blank	LFS006	2-Mar-09	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002
NSC Trip Blank	TCS007	5-Mar-09	<0.03	<0.0001	<2	<0.001	<0.0001	<0.0006	<0.0009	<0.0002

Table 2-11. – continued –

Sample Location	Sample ID	Sample Date	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc- Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit			*0.0001*	*0.001*	*0.01*	*0.0004*
FIELD BLANKS						
MWS Field Blank	TCS007 (FieldBlk)	26-Jun-08	<0.0001	<0.001	<0.01	<0.0004
NSC Field Blank	LHS004	30-Jun-08	<0.0001	<0.001	<0.01	<0.0004
MWS Field Blank	TDS005	14-Aug-08	<0.0001	<0.001	<0.01	<0.0004
NSC Field Blank	LHS004	18-Aug-08	<0.0001	<0.001	<0.01	<0.0004
MWS Field Blank	TDS005	18-Sep-08	<0.0001	<0.001	<0.01	<0.0004
NSC Field Blank	LHS004	17-Sep-08	<0.0001	<0.001	<0.01	<0.0004
NSC Field Blank	LHS004	2-Mar-09	<0.0001	<0.001	<0.01	<0.0004
NSC Field Blank	TDS005	5-Mar-09	<0.0001	<0.001	<0.01	<0.0004
TRIP BLANKS						
MWS Trip Blank	TDS005 (TripBlk)	26-Jun-08	<0.0001	<0.001	<0.01	<0.0004
NSC Trip Blank	LFS006	30-Jun-08	<0.0001	<0.001	<0.01	<0.0004
MWS Trip Blank	TCS007	14-Aug-08	<0.0001	<0.001	<0.01	<0.0004
NSC Trip Blank	LFS006	18-Aug-08	<0.0001	<0.001	<0.01	<0.0004
MWS Trip Blank	TCS007	18-Sep-08	<0.0001	<0.001	<0.01	<0.0004
NSC Trip Blank	LFS006	17-Sep-08	<0.0001	<0.001	<0.01	<0.0004
NSC Trip Blank	LFS006	2-Mar-09	<0.0001	<0.001	<0.01	<0.0004
NSC Trip Blank	TCS007	5-Mar-09	<0.0001	<0.001	<0.01	<0.0004

Table 2-12. Results of routine, bacterial, and productivity parameters measured in field and trip blanks included in the 2009/2010 CAMPP water quality program. Values more than five times the analytical detection limit are indicated in bold red.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)
Method Detection Limit					*OW*[1]	*1.0*	*2.0*	*0.60*	*0.40*
					IC[2]	*1.0*	*2.0*	*0.60*	*0.40*
FIELD BLANKS									
NSC Field blank-South	LHS004-SURF	0905JH0820	L764834-14	19-May-09	11:00	3.0	3.7	<0.60	<0.40
MWS Field Blank	TDS005-SURF	0906JH1108	L783470-2	24-Jun-09	16:00	2.7	3.3	<0.60	<0.40
NSC Field blank	LHS004-SURF	0906JH1026	L786966-5	2-Jul-09	8:45	2.5	3.1	<0.60	<0.40
NSC Field blank-South	RAS156-SURF	0907JH1292	L799503-6	30-Jul-09	10:00	2.8	3.4	<0.60	<0.40
NSC Field blank	LHS004-SURF	0908JH1333	L802304-8	6-Aug-09	13:35	2.8	3.4	<0.60	<0.40
MWS Field Blank	TDS005-SURF	0908JH1462	L804978-6	12-Aug-09	8:50	3.0	3.7	<0.60	<0.40
NSC Field blank	LHS004-SURF	0909JH1582	L816911-6	10-Sep-09	-	2.0	2.4	<0.60	<0.40
NSC Field blank-South	RAS156-SURF	0909JH1541	L819356-6	16-Sep-09	-	2.3	2.8	<0.60	<0.40
MWS Field Blank	TDS005-SURF	0909JH1688	L819429-6	16-Sep-09	10:00	3.1	3.8	<0.60	<0.40
Field blank- North	TDS005-SURF	1003JH0359	L866373-8	2-Mar-10	13:18	1.9	2.3	<0.60	<0.40
Field blank- North	ECS007-SURF	1003JH0325	L867273-7	5-Mar-10	9:15	1.8	2.2	<0.60	<0.40
Field blank- South	LHS004-SURF	1003JH0259	L867924-5	8-Mar-10	11:45	2.0	2.4	<0.60	<0.40
Field blank- South	RAS156-SURF	1003JH0189	L869032-5	12-Mar-10	15:10	1.8	2.2	<0.60	<0.40
TRIP BLANKS									
NSC Trip blank-South	LFS006-SURF	0905JH0821	L764834-16	19-May-09	-	2.4	3.0	<0.60	<0.40
MWS Trip Blank	TCS007-SURF	0906JH1109	L783470-3	24-Jun-09	-	2	2.5	<0.60	<0.40
NSC Trip blank	LFS006-SURF	0906JH1027	L786966-6	2-Jul-09	-	2.1	2.6	<0.60	<0.40
NSC Trip blank-South	RAS157-SURF	0907JH1293	L799503-7	30-Jul-09	-	2.2	2.7	<0.60	<0.40
NSC Trip blank	LFS006-SURF	0908JH1334	L802304-9	6-Aug-09	-	2.3	2.8	<0.60	<0.40
MWS Trip Blank	TCS007-SURF	0908JH1463	L804978-7	12-Aug-09	-	2.4	2.9	<0.60	<0.40
NSC Trip blank-South	RAS157-SURF	0909JH1542	L819356-7	16-Sep-09	-	2.2	2.7	<0.60	<0.40
NSC Trip blank	LFS006-SURF	0909JH1583	L816911-7	10-Sep-09	-	2.3	2.8	<0.60	<0.40
MWS Trip Blank	TCS007-SURF	0909JH1689	L819429-7	16-Sep-09	-	2.5	3.0	<0.60	<0.40
Trip blank- North	TCS007-SURF	1003JH0358	L866769-12	3-Mar-10	-	1.7	2.1	<0.60	<0.40
Trip blank- North	ECS006-SURF	1003JH0360	L867077-3	4-Mar-10	-	1.7	2.0	<0.60	<0.40
Trip blank- South	RAS157-SURF	1003JH0190	L869032-6	12-Mar-10	-	1.8	2.2	<0.60	<0.40
Trip blank- South	LFS006-SURF	1003JH0258	L867924-4	8-Mar-10	-	1.8	2.2	<0.60	<0.40

Table 2-12. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW*[1]	*0.0030*	*0.0050*	*0.20*	*0.0010*	*0.0010*	*0.0010*	*1.0*	*1.0*	*1.0*
		IC[2]	*0.050*	*0.050*	*0.20*	*0.0030*	*0.0030*	*0.0030*	*1.0*	*1.0*	*1.0*
FIELD BLANKS											
NSC Field blank-South	LHS004-SURF	19-May-09	<0.0030	0.0060	<0.20	0.0020	<0.0010	0.0020	<1.0	<1.0	<1.0
MWS Field Blank	TDS005-SURF	24-Jun-09	0.0075	0.0063	<0.20	**0.0073**	<0.0010	**0.0053**	<1.0	<1.0	<1.0
NSC Field blank	LHS004-SURF	2-Jul-09	0.0071	0.0078	<0.20	**0.0070**	<0.0010	0.0030	<1.0	<1.0	<1.0
NSC Field blank-South	RAS156-SURF	30-Jul-09	0.0068	0.0087	<0.20	<0.0010	<0.0010	<0.0010	<1.0	<1.0	<1.0
NSC Field blank	LHS004-SURF	6-Aug-09	0.0054	0.0170	<0.20	0.0013	<0.0010	<0.0010	<1.0	<1.0	<1.0
MWS Field Blank	TDS005-SURF	12-Aug-09	0.0150	0.0110	<0.20	0.0032	<0.001	0.0028	<1.0	<1.0	<1.0
NSC Field blank	LHS004-SURF	10-Sep-09	<0.0030	0.0060	<0.20	<0.0010	<0.0010	<0.0010	<1.0	1.3	<1.0
NSC Field blank-South	RAS156-SURF	16-Sep-09	0.0031	<0.0050	<0.20	<0.0010	<0.0010	<0.0010	<1.0	<1.0	<1.0
MWS Field Blank	TDS005-SURF	16-Sep-09	<0.0030	0.008	<0.20	0.0031	<0.0010	0.0035	<1.0	<1.0	<1.0
Field blank- North	TDS005-SURF	2-Mar-10	<0.050	<0.050	0.32	<0.0030	<0.0030	<0.0030	<1.0	1.1	<1.0
Field blank- North	ECS007-SURF	5-Mar-10	<0.050	<0.050	<0.20	<0.0030	<0.0030	<0.0030	<1.0	<1.0	<1.0
Field blank- South	LHS004-SURF	8-Mar-10	<0.050	<0.050	<0.20	<0.0030	<0.0030	<0.0030	<1.0	<1.0	<1.0
Field blank- South	RAS156-SURF	12-Mar-10	<0.050	<0.050	<0.20	<0.0030	<0.0030	<0.0030	<1.0	<1.0	<1.0
TRIP BLANKS											
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.0030	0.0050	<0.20	0.0029	<0.0010	0.0027	<1.0	<1.0	<1.0
MWS Trip Blank	TCS007-SURF	24-Jun-09	0.0100	0.0072	<0.20	0.0050	<0.0010	0.0048	<1.0	<1.0	<1.0
NSC Trip blank	LFS006-SURF	2-Jul-09	0.0071	0.0061	<0.20	0.0015	<0.0010	0.0011	<1.0	<1.0	<1.0
NSC Trip blank-South	RAS157-SURF	30-Jul-09	0.0128	0.0093	<0.20	<0.0010	<0.0010	<0.0010	<1.0	<1.0	<1.0
NSC Trip blank	LFS006-SURF	6-Aug-09	0.0084	0.0130	<0.20	<0.0010	<0.0010	<0.0010	<1.0	<1.0	<1.0
MWS Trip Blank	TCS007-SURF	12-Aug-09	**0.0340**	0.0077	<0.20	0.0020	<0.0010	0.0020	<1.0	<1.0	<1.0
NSC Trip blank-South	RAS157-SURF	16-Sep-09	0.0037	<0.0050	<0.20	<0.0010	<0.0010	<0.0010	<1.0	<1.0	<1.0
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.0030	<0.0050	<0.20	<0.0010	<0.0010	<0.0010	1.0	<1.0	<1.0
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.0030	<0.0050	<0.20	0.0018	0.0046	**0.0064**	<1.0	<1.0	<1.0
Trip blank- North	TCS007-SURF	3-Mar-10	<0.050	<0.050	<0.20	<0.0030	<0.0030	<0.0030	<1.0	<1.0	<1.0
Trip blank- North	ECS006-SURF	4-Mar-10	<0.050	<0.050	<0.20	<0.0030	<0.0030	<0.0030	<1.0	<1.0	<1.0
Trip blank- South	RAS157-SURF	12-Mar-10	<0.050	<0.050	<0.20	<0.0030	<0.0030	<0.0030	<1.0	<1.0	<1.0
Trip blank- South	LFS006-SURF	8-Mar-10	<0.050	<0.050	<0.20	<0.0030	0.0030	<0.0030	<1.0	<1.0	<1.0

Table 2-12. – continued –

			Water Clarity						Bacteria
Sample Location	Sample ID	Sample Date	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (TCU)	pH	Conductivity (µmhos/cm)	*E. coli* (CFU/100 mL)
Method Detection Limit		*OW*[1]	*5.0*	*2.0*	*0.050*	*5.0*	*0.10*	*0.40*	*1/10*
		IC[2]	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
FIELD BLANKS						-			
NSC Field blank-South	LHS004-SURF	19-May-09	<5.0	<2.0	0.150	<5.0	6.65	0.98	<10
MWS Field Blank	TDS005-SURF	24-Jun-09	<5.0	<2.0	0.100	5.0	6.54	1.59	<10
NSC Field blank	LHS004-SURF	2-Jul-09	<5.0	<2.0	**0.350**	<5.0	6.36	1.36	<1
NSC Field blank-South	RAS156-SURF	30-Jul-09	<5.0	<2.0	0.050	<5.0	6.52	**2.07**	<1
NSC Field blank	LHS004-SURF	6-Aug-09	<5.0	<2.0	0.200	<5.0	6.60	**2.23**	-
MWS Field Blank	TDS005-SURF	12-Aug-09	<5.0	<2.0	0.100	5.0	6.77	**2.30**	<1
NSC Field blank	LHS004-SURF	10-Sep-09	<5.0	<2.0	0.150	<5.0	5.91	0.83	<1
NSC Field blank-South	RAS156-SURF	16-Sep-09	<5.0	<2.0	0.050	<5.0	6.30	1.25	<1
MWS Field Blank	TDS005-SURF	16-Sep-09	<5.0	<2.0	0.100	<5.0	6.69	**2.54**	<1
Field blank- North	TDS005-SURF	2-Mar-10	<5.0	<2.0	<0.10	5.0	6.00	0.83	<1
Field blank- North	ECS007-SURF	5-Mar-10	6.0	<2.0	<0.10	<5.0	5.85	0.61	<1
Field blank- South	LHS004-SURF	8-Mar-10	<5.0	<2.0	<0.10	5.0	6.11	0.77	<1
Field blank- South	RAS156-SURF	12-Mar-10	<5.0	<2.0	<0.10	<5.0	6.45	0.80	-
TRIP BLANKS									
NSC Trip blank-South	LFS006-SURF	19-May-09	<5.0	<2.0	0.150	<5.0	6.40	0.91	-
MWS Trip Blank	TCS007-SURF	24-Jun-09	<5.0	<2.0	0.150	5.0	6.06	0.67	<10
NSC Trip blank	LFS006-SURF	2-Jul-09	<5.0	<2.0	0.100	<5.0	6.15	1.07	<1
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<5.0	<2.0	0.050	<5.0	6.19	0.92	<1
NSC Trip blank	LFS006-SURF	6-Aug-09	<5.0	<2.0	0.100	<5.0	6.33	1.37	<1
MWS Trip Blank	TCS007-SURF	12-Aug-09	<5.0	<2.0	**0.300**	<5.0	6.49	1.34	-
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<5.0	<2.0	0.050	<5.0	6.29	0.97	<1
NSC Trip blank	LFS006-SURF	10-Sep-09	<5.0	<2.0	**0.300**	<5.0	6.25	1.17	<1
MWS Trip Blank	TCS007-SURF	16-Sep-09	<5.0	<2.0	**0.300**	<5.0	6.40	1.36	<1
Trip blank- North	TCS007-SURF	3-Mar-10	<5.0	<2.0	<0.10	5.0	5.52	0.55	<1
Trip blank- North	ECS006-SURF	4-Mar-10	<5.0	<2.0	0.18	5.0	5.67	0.55	<1
Trip blank- South	RAS157-SURF	12-Mar-10	<5.0	<2.0	<0.10	<5.0	6.32	0.67	<1
Trip blank- South	LFS006-SURF	8-Mar-10	<5.0	<2.0	<0.10	5.0	5.86	0.56	<1

Table 2-12. – continued –

Sample Location	Sample ID	Sample Date	Productivity Chlorophyll *a* (µg/L)	Productivity Pheophytin (µg/L)	Productivity ODb/ODa ABS Ratio
Method Detection Limit		*OW*[1]	*0.60/1.0*	*0.60/1.0*	*1.0*
		IC[2]	*0.010 / 0.020*	*0.010 / 0.020*	-
FIELD BLANKS					
NSC Field blank-South	LHS004-SURF	19-May-09	<0.60	<0.60	1.0
MWS Field Blank	TDS005-SURF	24-Jun-09	<1.0	<1.0	1.0
NSC Field blank	LHS004-SURF	2-Jul-09	<1.0	<1.0	1.0
NSC Field blank-South	RAS156-SURF	30-Jul-09	<1.0	<1.0	1.0
NSC Field blank	LHS004-SURF	6-Aug-09	<1.0	<1.0	1.0
MWS Field Blank	TDS005-SURF	12-Aug-09	1.9	<1.0	1.5
NSC Field blank	LHS004-SURF	10-Sep-09	<1.0	<1.0	1.0
NSC Field blank-South	RAS156-SURF	16-Sep-09	<1.0	<1.0	1.0
MWS Field Blank	TDS005-SURF	16-Sep-09	<1.0	<1.0	1.0
Field blank- North	TDS005-SURF	2-Mar-10	<0.010	<0.010	-
Field blank- North	ECS007-SURF	5-Mar-10	<0.010	<0.010	-
Field blank- South	LHS004-SURF	8-Mar-10	<0.010	<0.010	-
Field blank- South	RAS156-SURF	12-Mar-10	-	-	-
TRIP BLANKS					
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.60	<0.60	1.0
MWS Trip Blank	TCS007-SURF	24-Jun-09	-	-	-
NSC Trip blank	LFS006-SURF	2-Jul-09	<1.0	<1.0	1.0
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<1.0	<1.0	1.0
NSC Trip blank	LFS006-SURF	6-Aug-09	<1.0	<1.0	1.0
MWS Trip Blank	TCS007-SURF	12-Aug-09	<1.0	<1.0	1.0
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<1.0	<1.0	1.0
NSC Trip blank	LFS006-SURF	10-Sep-09	<1.0	<1.0	1.0
MWS Trip Blank	TCS007-SURF	16-Sep-09	-	-	-
Trip blank- North	TCS007-SURF	3-Mar-10	<0.010	<0.010	-
Trip blank- North	ECS006-SURF	4-Mar-10	<0.010	<0.010	-
Trip blank- South	RAS157-SURF	12-Mar-10	0.03	0.02	-
Trip blank- South	LFS006-SURF	8-Mar-10	<0.010	<0.010	-

[1] Open-water season.

[2] Ice-cover season.

Table 2-13. Results of metals and major ions measured in field and trip blanks included in the 2009/2010 CAMPP water quality program.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)
Method Detection Limit						*0.30*	*0.0050*	*0.00050*	*0.00050*
FIELD BLANKS									
NSC Field blank-South	LHS004-SURF	0905JH0820	L764834-14	19-May-09	11:00	0.57	<0.0050	0.00058	<0.00050
MWS Field Blank	TDS005-SURF	0906JH1108	L783470-2	24-Jun-09	16:00	0.52	<0.0050	<0.00050	<0.00050
NSC Field blank	LHS004-SURF	0906JH1026	L786966-5	2-Jul-09	8:45	0.50	<0.0050	<0.00050	<0.00050
NSC Field blank-South	RAS156-SURF	0907JH1292	L799503-6	30-Jul-09	10:00	0.62	<0.0050	<0.00050	<0.00050
NSC Field blank	LHS004-SURF	0908JH1333	L802304-8	6-Aug-09	13:35	0.74	<0.0050	<0.00050	<0.00050
MWS Field Blank	TDS005-SURF	0908JH1462	L804978-6	12-Aug-09	8:50	0.68	<0.0050	<0.00050	<0.00050
NSC Field blank	LHS004-SURF	0909JH1582	L816911-6	10-Sep-09	-	<0.30	0.0074	0.00062	<0.00050
NSC Field blank-South	RAS156-SURF	0909JH1541	L819356-6	16-Sep-09	-	<0.30	<0.0050	<0.00050	<0.00050
MWS Field Blank	TDS005-SURF	0909JH1688	L819429-6	16-Sep-09	10:00	0.75	<0.0050	<0.00050	<0.00050
Field blank- North	TDS005-SURF	1003JH0359	L866373-8	2-Mar-10	13:18	<0.30	<0.0050	<0.00050	<0.00050
Field blank- North	ECS007-SURF	1003JH0325	L867273-7	5-Mar-10	9:15	<0.30	<0.0050	<0.00050	<0.00050
Field blank- South	LHS004-SURF	1003JH0259	L867924-5	8-Mar-10	11:45	<0.30	<0.0050	<0.00050	<0.00050
Field blank- South	RAS156-SURF	1003JH0189	L869032-5	12-Mar-10	15:10	0.370	<0.0050	<0.00050	<0.00050
TRIP BLANKS									
NSC Trip blank-South	LFS006-SURF	0905JH0821	L764834-16	19-May-09	-	<0.30	<0.0050	0.00059	<0.00050
MWS Trip Blank	TCS007-SURF	0906JH1109	L783470-3	24-Jun-09	-	<0.30	<0.0050	<0.00050	<0.00050
NSC Trip blank	LFS006-SURF	0906JH1027	L786966-6	2-Jul-09	-	<0.30	<0.0050	<0.00050	<0.00050
NSC Trip blank-South	RAS157-SURF	0907JH1293	L799503-7	30-Jul-09	-	<0.30	<0.0050	<0.00050	<0.00050
NSC Trip blank	LFS006-SURF	0908JH1334	L802304-9	6-Aug-09	-	<0.30	<0.0050	<0.00050	<0.00050
MWS Trip Blank	TCS007-SURF	0908JH1463	L804978-7	12-Aug-09	-	<0.30	<0.0050	<0.00050	<0.00050
NSC Trip blank	LFS006-SURF	0909JH1583	L816911-7	10-Sep-09	-	<0.30	<0.0050	0.00052	<0.00050
NSC Trip blank-South	RAS157-SURF	0909JH1542	L819356-7	16-Sep-09	-	<0.30	<0.0050	<0.00050	<0.00050
MWS Trip Blank	TCS007-SURF	0909JH1689	L819429-7	16-Sep-09	-	<0.30	<0.0050	<0.00050	<0.00050
Trip blank- North	TCS007-SURF	1003JH0358	L866769-12	3-Mar-10	-	<0.30	<0.0050	<0.00050	<0.00050
Trip blank- North	ECS006-SURF	1003JH0360	L867077-3	4-Mar-10	-	<0.30	<0.0050	<0.00050	<0.00050
Trip blank- South	RAS157-SURF	1003JH0190	L869032-6	12-Mar-10	-	<0.30	<0.0050	<0.00050	<0.00050
Trip blank- South	LFS006-SURF	1003JH0258	L867924-4	8-Mar-10	-	<0.30	<0.0050	<0.00050	<0.00050

Table 2-13. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)
Method Detection Limit			*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*
FIELD BLANKS									
NSC Field blank-South	LHS004-SURF	19-May-09	0.00099	<0.0010	<0.00020	<0.030	<0.000010	0.23	<0.00010
MWS Field Blank	TDS005-SURF	24-Jun-09	0.00085	<0.0010	<0.00020	<0.030	<0.000010	0.21	<0.00010
NSC Field blank	LHS004-SURF	2-Jul-09	0.00085	<0.0010	<0.00020	<0.030	<0.000010	0.20	<0.00010
NSC Field blank-South	RAS156-SURF	30-Jul-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.25	<0.00010
NSC Field blank	LHS004-SURF	6-Aug-09	0.00038	<0.0010	<0.00020	<0.030	<0.000010	0.30	<0.00010
MWS Field Blank	TDS005-SURF	12-Aug-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.27	<0.00010
NSC Field blank	LHS004-SURF	10-Sep-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
NSC Field blank-South	RAS156-SURF	16-Sep-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
MWS Field Blank	TDS005-SURF	16-Sep-09	0.00049	<0.0010	<0.00020	<0.030	<0.000010	0.30	<0.00010
Field blank- North	TDS005-SURF	2-Mar-10	0.00037	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
Field blank- North	ECS007-SURF	5-Mar-10	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
Field blank- South	LHS004-SURF	8-Mar-10	0.00060	<0.0010	<0.00020	0.035	<0.000010	<0.10	<0.00010
Field blank- South	RAS156-SURF	12-Mar-10	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	0.15	<0.00010
TRIP BLANKS									
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
MWS Trip Blank	TCS007-SURF	24-Jun-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
NSC Trip blank	LFS006-SURF	2-Jul-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
NSC Trip blank	LFS006-SURF	6-Aug-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
MWS Trip Blank	TCS007-SURF	12-Aug-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
Trip blank- North	TCS007-SURF	3-Mar-10	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
Trip blank- North	ECS006-SURF	4-Mar-10	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
Trip blank- South	RAS157-SURF	12-Mar-10	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010
Trip blank- South	LFS006-SURF	8-Mar-10	<0.00030	<0.0010	<0.00020	<0.030	<0.000010	<0.10	<0.00010

Table 2-13. – continued –

Sample Location	Sample ID	Sample Date	Chloride-Dissolved (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Iron- Total (mg/L)	Lead-Total (mg/L)	Magnesium-Total (mg/L)
Method Detection Limit			*0.20*	*0.40*	*0.0010*	*0.00020*	*0.0010*	*0.020*	*0.00050*	*0.010*
FIELD BLANKS										
NSC Field blank-South	LHS004-SURF	19-May-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
MWS Field Blank	TDS005-SURF	24-Jun-09	<0.20	-	<0.0010	0.00066	<0.0010	<0.020	<0.00050	<0.010
NSC Field blank	LHS004-SURF	2-Jul-09	0.25	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
NSC Field blank-South	RAS156-SURF	30-Jul-09	<0.20	-	<0.0010	0.00024	<0.0010	<0.020	<0.00050	<0.010
NSC Field blank	LHS004-SURF	6-Aug-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
MWS Field Blank	TDS005-SURF	12-Aug-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
NSC Field blank	LHS004-SURF	10-Sep-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
NSC Field blank-South	RAS156-SURF	16-Sep-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
MWS Field Blank	TDS005-SURF	16-Sep-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Field blank- North	TDS005-SURF	2-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Field blank- North	ECS007-SURF	5-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Field blank- South	LHS004-SURF	8-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Field blank- South	RAS156-SURF	12-Mar-10	-	0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
TRIP BLANKS										
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
MWS Trip Blank	TCS007-SURF	24-Jun-09	<0.20	-	<0.0010	0.00062	<0.0010	<0.020	<0.00050	<0.010
NSC Trip blank	LFS006-SURF	2-Jul-09	0.24	-	0.0024	<0.00020	<0.0010	<0.020	<0.00050	<0.010
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<0.20	-	<0.0010	0.00025	<0.0010	<0.020	<0.00050	<0.010
NSC Trip blank	LFS006-SURF	6-Aug-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
MWS Trip Blank	TCS007-SURF	12-Aug-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.20	-	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Trip blank- North	TCS007-SURF	3-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	0.017
Trip blank- North	ECS006-SURF	4-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Trip blank- South	RAS157-SURF	12-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010
Trip blank- South	LFS006-SURF	8-Mar-10	-	<0.40	<0.0010	<0.00020	<0.0010	<0.020	<0.00050	<0.010

Table 2-13. – continued –

Sample Location	Sample ID	Sample Date	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Mercury-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)
Method Detection Limit			*0.00030*	*0.00002*	*0.000050*	*0.00010*	*0.00020*	*0.0020*	*0.050/0.20* [1]
FIELD BLANKS									
NSC Field blank-South	LHS004-SURF	19-May-09	<0.00030	-	<0.000050	-	<0.00020	<0.0020	<0.050
MWS Field Blank	TDS005-SURF	24-Jun-09	0.00031	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Field blank	LHS004-SURF	2-Jul-09	<0.00030	0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Field blank-South	RAS156-SURF	30-Jul-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Field blank	LHS004-SURF	6-Aug-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
MWS Field Blank	TDS005-SURF	12-Aug-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Field blank	LHS004-SURF	10-Sep-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Field blank-South	RAS156-SURF	16-Sep-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
MWS Field Blank	TDS005-SURF	16-Sep-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
Field blank- North	TDS005-SURF	2-Mar-10	<0.00030	-	-	<0.00010	<0.00020	<0.0020	<0.20
Field blank- North	ECS007-SURF	5-Mar-10	<0.00030	-	-	<0.00010	<0.00020	<0.0020	<0.20
Field blank- South	LHS004-SURF	8-Mar-10	<0.00030	-	-	<0.00010	<0.00020	<0.0020	<0.20
Field blank- South	RAS156-SURF	12-Mar-10	<0.00030	-	-	<0.00010	<0.00020	<0.0020	<0.20
TRIP BLANKS									
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.00030	-	0.000050	-	<0.00020	<0.0020	<0.050
MWS Trip Blank	TCS007-SURF	24-Jun-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Trip blank	LFS006-SURF	2-Jul-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Trip blank	LFS006-SURF	6-Aug-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
MWS Trip Blank	TCS007-SURF	12-Aug-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.00030	<0.000020	-	-	<0.00020	<0.0020	<0.050
Trip blank- North	TCS007-SURF	3-Mar-10	<0.00030	-	-	<0.00010	<0.00020	<0.0020	<0.20
Trip blank- North	ECS006-SURF	4-Mar-10	0.00085	-	-	<0.00010	<0.00020	<0.0020	<0.20
Trip blank- South	RAS157-SURF	12-Mar-10	<0.00030	-	-	-	<0.00020	<0.0020	<0.20
Trip blank- South	LFS006-SURF	8-Mar-10	<0.00030	-	-	<0.00010	0.00032	<0.0020	<0.20

Table 2-13. – continued –

Sample Location	Sample ID	Sample Date	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver- Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)
Method Detection Limit			*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*
FIELD BLANKS									
NSC Field blank-South	LHS004-SURF	19-May-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00021	<2.0
MWS Field Blank	TDS005-SURF	24-Jun-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00015	<2.0
NSC Field blank	LHS004-SURF	2-Jul-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00013	<2.0
NSC Field blank-South	RAS156-SURF	30-Jul-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00015	<2.0
NSC Field blank	LHS004-SURF	6-Aug-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00017	<2.0
MWS Field Blank	TDS005-SURF	12-Aug-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00016	<2.0
NSC Field blank	LHS004-SURF	10-Sep-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
NSC Field blank-South	RAS156-SURF	16-Sep-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
MWS Field Blank	TDS005-SURF	16-Sep-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	0.00017	<2.0
Field blank- North	TDS005-SURF	2-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0
Field blank- North	ECS007-SURF	5-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0
Field blank- South	LHS004-SURF	8-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0
Field blank- South	RAS156-SURF	12-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0
TRIP BLANKS									
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
MWS Trip Blank	TCS007-SURF	24-Jun-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
NSC Trip blank	LFS006-SURF	2-Jul-09	<0.10	<0.00020	<0.0010	<0.0010	0.042	<0.00010	<2.0
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	2.1
NSC Trip blank	LFS006-SURF	6-Aug-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
MWS Trip Blank	TCS007-SURF	12-Aug-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.10	<0.00020	<0.0010	<0.0010	<0.030	<0.00010	<2.0
Trip blank- North	TCS007-SURF	3-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0
Trip blank- North	ECS006-SURF	4-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	0.070	<0.00010	<2.0
Trip blank- South	RAS157-SURF	12-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0
Trip blank- South	LFS006-SURF	8-Mar-10	<0.10	<0.00020	<0.0010	<0.00010	<0.030	<0.00010	<2.0

Table 2-13. – continued –

Sample Location	Sample ID	Sample Date	Tellurium-Total (mg/L)	Thallium-Total (mg/L)	Tin- Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)
Method Detection Limit			*0.0010*	*0.00010*	*0.00060/0.0010* [1]	*0.00090*	*0.00020/0.00050* [1]	*0.00010*
FIELD BLANKS								
NSC Field blank-South	LHS004-SURF	19-May-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
MWS Field Blank	TDS005-SURF	24-Jun-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Field blank	LHS004-SURF	2-Jul-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Field blank-South	RAS156-SURF	30-Jul-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Field blank	LHS004-SURF	6-Aug-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
MWS Field Blank	TDS005-SURF	12-Aug-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Field blank	LHS004-SURF	10-Sep-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Field blank-South	RAS156-SURF	16-Sep-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
MWS Field Blank	TDS005-SURF	16-Sep-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
Field blank- North	TDS005-SURF	2-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	<0.00050	<0.00010
Field blank- North	ECS007-SURF	5-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	<0.00050	<0.00010
Field blank- South	LHS004-SURF	8-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	0.00060	<0.00010
Field blank- South	RAS156-SURF	12-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	<0.00050	<0.00010
TRIP BLANKS								
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
MWS Trip Blank	TCS007-SURF	24-Jun-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Trip blank	LFS006-SURF	2-Jul-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Trip blank	LFS006-SURF	6-Aug-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
MWS Trip Blank	TCS007-SURF	12-Aug-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.0010	<0.00010	<0.00060	<0.00090	<0.00020	<0.00010
Trip blank- North	TCS007-SURF	3-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	<0.00050	<0.00010
Trip blank- North	ECS006-SURF	4-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	<0.00050	<0.00010
Trip blank- South	RAS157-SURF	12-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	<0.00050	<0.00010
Trip blank- South	LFS006-SURF	8-Mar-10	<0.0010	<0.00010	<0.0010	<0.00090	0.00111	<0.00010

Table 2-13. – continued –

Sample Location	Sample ID	Sample Date	Vanadium-Total (mg/L)	Zinc- Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit			*0.0010*	*0.010*	*0.00040*
FIELD BLANKS					
NSC Field blank-South	LHS004-SURF	19-May-09	<0.0010	<0.010	<0.00040
MWS Field Blank	TDS005-SURF	24-Jun-09	<0.0010	<0.010	<0.00040
NSC Field blank	LHS004-SURF	2-Jul-09	<0.0010	<0.010	<0.00040
NSC Field blank-South	RAS156-SURF	30-Jul-09	<0.0010	<0.010	<0.00040
NSC Field blank	LHS004-SURF	6-Aug-09	<0.0010	<0.010	<0.00040
MWS Field Blank	TDS005-SURF	12-Aug-09	<0.0010	<0.010	<0.00040
NSC Field blank	LHS004-SURF	10-Sep-09	<0.0010	<0.010	<0.00040
NSC Field blank-South	RAS156-SURF	16-Sep-09	<0.0010	<0.010	<0.00040
MWS Field Blank	TDS005-SURF	16-Sep-09	<0.0010	<0.010	<0.00040
Field blank- North	TDS005-SURF	2-Mar-10	<0.0010	<0.010	<0.00040
Field blank- North	ECS007-SURF	5-Mar-10	<0.0010	0.016	<0.00040
Field blank- South	LHS004-SURF	8-Mar-10	<0.0010	<0.010	<0.00040
Field blank- South	RAS156-SURF	12-Mar-10	<0.0010	<0.010	<0.00040
TRIP BLANKS					
NSC Trip blank-South	LFS006-SURF	19-May-09	<0.0010	<0.010	<0.00040
MWS Trip Blank	TCS007-SURF	24-Jun-09	<0.0010	<0.010	<0.00040
NSC Trip blank	LFS006-SURF	2-Jul-09	<0.0010	<0.010	<0.00040
NSC Trip blank-South	RAS157-SURF	30-Jul-09	<0.0010	<0.010	<0.00040
NSC Trip blank	LFS006-SURF	6-Aug-09	<0.0010	<0.010	<0.00040
MWS Trip Blank	TCS007-SURF	12-Aug-09	<0.0010	<0.010	<0.00040
NSC Trip blank	LFS006-SURF	10-Sep-09	<0.0010	<0.010	<0.00040
NSC Trip blank-South	RAS157-SURF	16-Sep-09	<0.0010	<0.010	<0.00040
MWS Trip Blank	TCS007-SURF	16-Sep-09	<0.0010	<0.010	<0.00040
Trip blank- North	TCS007-SURF	3-Mar-10	<0.0010	<0.010	<0.00040
Trip blank- North	ECS006-SURF	4-Mar-10	<0.0010	<0.010	<0.00040
Trip blank- South	RAS157-SURF	12-Mar-10	<0.0010	<0.010	<0.00040
Trip blank- South	LFS006-SURF	8-Mar-10	<0.0010	<0.010	<0.00040

[1] First value represents the detection limit for the open-water season; second value represents DL for the ice-cover season.

Table 2-14. Results of routine, bacterial, and productivity parameters measured in field and trip blanks included in the 2010/2011 CAMPP water quality program. Values more than five times the analytical detection limit are indicated in bold red.

					Alkalinity				Nitrogen	
Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate (mg/L N)
Method Detection Limit				*OW*	*1.0*	*2.0*	*0.60*	*0.40*	*0.010/0.050*	*0.0010/0.0050*
				IC	*1.0*	*2.0*	*0.60*	*0.40*	*0.010*	*0.0050*
FIELD BLANKS										
Field blank (NSC South)	RAS156-SURF	1005JH0625	L886933-7	14-May-10	2.3	2.8	<0.60	<0.40	<0.050	-
Field Blank (NSC North/Central)	LHS004-SURF	1006JH0727	L899309-4	17-Jun-10	2.3	2.8	<0.60	<0.40	0.091	-
Field Blank (MWS North/Central)	TDS005-SURF	1006JH0832	L901288-6	23-Jun-10	2.3	2.8	<0.60	<0.40	<0.050	-
Field blank (NSC South)	RAS156-SURF	1007JS1242	L911400-7	21-Jul-10	2.2	2.7	<0.60	<0.40	0.023	0.0017
Field Blank (NSC North/Central)	LHS004-SURF	1008JS1345	L920004-12	12-Aug-10	2.3	2.8	<0.60	<0.40	0.019	<0.0010
Field Blank (MWS North/Central)	TDS005-SURF	1008JS1437	L922533-4	19-Aug-10	2.1	2.6	<0.60	<0.40	0.023	<0.0010
Field Blank (NSC North/Central)	LHS004-SURF	1009JS1549	L930015-11	9-Sep-10	2.3	2.9	<0.60	<0.40	<0.010	<0.0010
Field Blank (MWS North/Central)	TDS005-SURF	1009JS1659	L932322-7	15-Sep-10	2.1	2.6	<0.60	<0.40	0.042	<0.0010
Field blank (NSC South)	RAS156-SURF	1009JS1605	L935796-7	24-Sep-10	2.2	2.6	<0.60	<0.40	<0.010	<0.0010
Field blank (South)	RAS156-SURF	1102CL0123	L981698-1	25-Feb-11	2.0	2.4	<0.60	<0.40	<0.010	<0.0050
Field blank (North)	TDS005-SURF	1102CL0202	L981063-6	23-Feb-11	2.1	2.6	<0.60	<0.40	<0.010	<0.0050
Field blank (North)	ECS007-SURF	1102CL0204	L981891-6	26-Feb-11	2.2	2.7	<0.60	<0.40	<0.010	<0.0050
Field blank (Central)	LHS004-SURF	1102CL0158	L983897-10	6-Mar-11	2.1	2.5	<0.60	<0.40	0.024	<0.0050
TRIP BLANKS										
Trip Blank (NSC South)	RAS157-SURF	1005JH0626	L886933-8	14-May-10	2.4	2.9	<0.60	<0.40	<0.050	-
Trip blank (NSC North/Central)	LFS006-SURF	1006JH0728	L899309-5	17-Jun-10	2.0	2.4	<0.60	<0.40	<0.050	-
Trip Blank (MWS North/Central)	TCS007-SURF	1006JH0833	L901288-7	23-Jun-10	2.0	2.4	<0.60	<0.40	<0.050	-
Trip Blank (NSC South)	RAS157-SURF	1007JS1243	L911400-8	21-Jul-10	2.1	2.5	<0.60	<0.40	<0.010	<0.0010
Trip blank (NSC North/Central)	LFS006-SURF	100JS1346	L920004-13	12-Aug-10	2.0	2.4	<0.60	<0.40	0.018	<0.0010
Trip Blank (MWS North/Central)	TCS007-SURF	1008JS1438	L922533-5	19-Aug-10	2.1	2.6	<0.60	<0.40	0.027	<0.0010
Trip blank (NSC North/Central)	LFS006-SURF	1009JS1550	L930015-12	9-Sep-10	2.0	2.4	<0.60	<0.40	<0.010	<0.0010
Trip Blank (MWS North/Central)	TCS007-SURF	1009JS1660	L932322-8	15-Sep-10	1.9	2.4	<0.60	<0.40	<0.010	<0.0010
Trip Blank (NSC South)	RAS157-SURF	1009JS1606	L935796-8	24-Sep-10	1.9	2.3	<0.60	<0.40	<0.010	0.0043
Trip Blank (South)	RAS157-SURF	1102CL0122	L981697-7	25-Feb-11	1.9	2.3	<0.60	<0.40	<0.010	<0.0050
Trip Blank (North)	ECS006-SURF	1102CL0203	L981063-7	23-Feb-11	1.9	2.3	<0.60	<0.40	0.021	<0.0050
Trip Blank (North)	TCS007-SURF	1102CL0201	L980166-4	21-Feb-11	1.7	2.1	<0.60	<0.40	<0.010	<0.0050
Trip Blank (Central)	LFS006-SURF	1102CL0157	L983897-9	6-Mar-11	1.8	2.2	<0.60	<0.40	<0.010	<0.0050

Table 2-14. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Nitrite – Dissolved (mg/L N)	Nitrogen: Nitrate/ Nitrite - Dissolved (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate (mg/L)	Phosphorus: Total (mg/L)
ALS Method Detection Limit		*OW*	*0.0010*	*0.0050/0.050*	*0.20*	*0.0010/0.0020/0.0030*	*0.0030*	*0.0010/0.0020/0.0030*
		IC	*0.0010*	*0.0051*	*0.20*	*0.0020*	*0.0028*	*0.0020*
FIELD BLANKS								
Field blank (NSC South)	RAS156-SURF	14-May-10	-	<0.050	<0.20	0.0012	0.0104	0.0104
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	-	<0.050	<0.20	<0.0010	<0.0030	<0.0010
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	-	<0.050	0.55	<0.0010	<0.0030	<0.0010
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.0010	<0.0050	<0.20	0.0020	<0.0030	0.0025
Field blank (South)	RAS156-SURF	25-Feb-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
Field blank (North)	TDS005-SURF	23-Feb-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
Field blank (North)	ECS007-SURF	26-Feb-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
TRIP BLANKS								
Trip Blank (NSC South)	RAS157-SURF	14-May-10	-	<0.050	<0.20	<0.0010	0.0101	0.0101
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	-	<0.050	<0.20	<0.0010	<0.0030	<0.0010
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	-	<0.050	<0.20	<0.0010	<0.0030	<0.0010
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	<0.0010	<0.0050	<0.20	<0.0020	<0.0030	<0.0020
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.0010	<0.0050	<0.20	<0.0020	0.0034	0.0034
Trip Blank (South)	RAS157-SURF	25-Feb-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.0010	<0.0051	<0.20	<0.0020	<0.0028	<0.0020

Table 2-14. – continued –

Sample Location	Sample ID	Sample Date	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)
ALS Method Detection Limit		*OW*	*1.0*	*1.0*	*1.0*	*5.0*	*2.0*	*0.10*	*5.0*
		IC	*1.0*	*1.0*	*1.0*	*5.0*	*2.0*	*0.10*	*5.0*
FIELD BLANKS									
Field blank (NSC South)	RAS156-SURF	14-May-10	1.0	1.0	<1.0	10.0	<2.0	<0.10	<5.0
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<1.0	<1.0	<1.0	<5.0	<2.0	0.41	<5.0
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	1.4	1.3	<1.0	<5.0	<2.0	0.12	5.0
Field blank (NSC South)	RAS156-SURF	21-Jul-10	1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<1.0	<1.0	<1.0	10.0	<2.0	<0.10	<5.0
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<1.0	1.1	<1.0	<5.0	<2.0	<0.10	<5.0
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	1.2	1.2	1.5	<5.0	<2.0	0.31	<5.0
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	1.5	1.3	1.2	<5.0	<2.0	0.20	<5.0
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<1.0	1.4	1.6	<5.0	<2.0	<0.10	<5.0
Field blank (South)	RAS156-SURF	25-Feb-11	<1.0	<1.0	<1.0	<5.0	<2.0	0.16	<5.0
Field blank (North)	TDS005-SURF	23-Feb-11	<1.0	<1.0	<1.0	<5.0	<2.0	0.25	<5.0
Field blank (North)	ECS007-SURF	26-Feb-11	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Field blank (Central)	LHS004-SURF	6-Mar-11	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
TRIP BLANKS									
Trip Blank (NSC South)	RAS157-SURF	14-May-10	<1.0	<1.0	<1.0	10.0	<2.0	<0.10	<5.0
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<1.0	<1.0	<1.0	18.0	3.0	<0.10	<5.0
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<1.0	<1.0	<1.0	16.0	4.0	0.13	<5.0
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	1.0	<1.0	1.0	6.0	<2.0	0.27	<5.0
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	1.1	<1.0	<1.0	<5.0	<2.0	0.30	<5.0
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<1.0	1.1	1.4	<5.0	<2.0	0.26	<5.0
Trip Blank (South)	RAS157-SURF	25-Feb-11	<1.0	<1.0	<1.0	<5.0	2.0	0.19	<5.0
Trip Blank (North)	ECS006-SURF	23-Feb-11	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Trip Blank (North)	TCS007-SURF	21-Feb-11	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<1.0	<1.0	<1.0	<5.0	<2.0	<0.10	<5.0

Table 2-14. – continued –

Sample Location	Sample ID	Sample Date	pH	Conductivity (µmhos/cm)	Bacteria E. coli (CFU/100 mL)	Productivity Chlorophyll *a* (µg/L)			
ALS Method Detection Limit		*OW*	*0.10*	*0.40*	*1*	*0.010*	*0.020*	*0.030*	*-*
		IC	*0.10*	*0.40*	*1*	*-*	*-*	*-*	*0.60*
FIELD BLANKS									
Field blank (NSC South)	RAS156-SURF	14-May-10	6.11	-	<1	-	-	<0.030	-
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	6.35	-		<0.010	-	-	-
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	6.25	-	<1	-	-	-	-
Field blank (NSC South)	RAS156-SURF	21-Jul-10	6.24	-	<1	<0.010	-	-	-
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	6.31	-	<1	-	-	<0.030	-
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	6.30	-	<1	<0.010	-	-	-
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	6.24	-	<1	0.017	-	-	-
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	6.22	-	<1	**0.113**	-	-	-
Field blank (NSC South)	RAS156-SURF	24-Sep-10	6.21	-	<1	<0.010	-	-	-
Field blank (South)	RAS156-SURF	25-Feb-11	6.10	0.99	<1	-	-	-	<0.60
Field blank (North)	TDS005-SURF	23-Feb-11	6.11	0.76	<1	-	-	-	<0.60
Field blank (North)	ECS007-SURF	26-Feb-11	6.26	1.11	<1	-	-	-	<0.60
Field blank (Central)	LHS004-SURF	6-Mar-11	5.97	0.86	<1	-	-	-	<0.60
TRIP BLANKS									
Trip Blank (NSC South)	RAS157-SURF	14-May-10	6.17	-	<1	-	-	<0.030	-
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	6.12	-	<1	<0.010	-	-	-
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	6.04	-	<1	0.016	-	-	-
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	6.06	-	<1	<0.010	-	-	-
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	6.05	-	<1	-	-	<0.030	-
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	6.34	-	<1	<0.010	-	-	-
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	6.00	-	<1	**0.133**	-	-	-
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	6.05	-	<1	**0.144**	-	-	-
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	5.94	-	<1	<0.010	-	-	-
Trip Blank (South)	RAS157-SURF	25-Feb-11	5.84	0.88	<1	-	-	-	<0.60
Trip Blank (North)	ECS006-SURF	23-Feb-11	5.87	0.73	<1	-	-	-	<0.60
Trip Blank (North)	TCS007-SURF	21-Feb-11	5.70	0.62	<1	-	-	-	<0.60
Trip Blank (Central)	LFS006-SURF	6-Mar-11	5.80	0.73	<1	-	-	-	<0.60

Table 2-15. Results of metals and major ions measured in field and trip blanks included in the 2010/2011 CAMPP water quality program. Values more than five times the analytical detection limit are indicated in bold red.

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)
Method Detection Limit					*0.30*	*0.0050*	*0.00020*	*0.00020*
FIELD BLANKS								
Field blank (NSC South)	RAS156-SURF	1005JH0625	L886933-7	14-May-10	<0.30	<0.0050	<0.00020	<0.00020
Field Blank (NSC North/Central)	LHS004-SURF	1006JH0727	L899309-4	17-Jun-10	0.32	<0.0050	<0.00020	<0.00020
Field Blank (MWS North/Central)	TDS005-SURF	1006JH0832	L901288-6	23-Jun-10	0.32	<0.0050	<0.00020	<0.00020
Field blank (NSC South)	RAS156-SURF	1007JS1242	L911400-7	21-Jul-10	<0.30	**0.388**	<0.00020	<0.00020
Field Blank (NSC North/Central)	LHS004-SURF	1008JS1345	L920004-12	12-Aug-10	0.35	<0.0050	<0.00020	<0.00020
Field Blank (MWS North/Central)	TDS005-SURF	1008JS1437	L922533-4	19-Aug-10	0.30	<0.0050	<0.00020	<0.00020
Field Blank (NSC North/Central)	LHS004-SURF	1009JS1549	L930015-11	9-Sep-10	<0.30	<0.0050	<0.00020	<0.00020
Field Blank (MWS North/Central)	TDS005-SURF	1009JS1659	L932322-7	15-Sep-10	<0.30	<0.0050	<0.00020	<0.00020
Field blank (NSC South)	RAS156-SURF	1009JS1605	L935796-7	24-Sep-10	<0.30	<0.0050	<0.00020	<0.00020
Field blank (NSC South)	RAS156-SURF	1102CL0123	L981698-1	25-Feb-11	<0.30	<0.0050	<0.00020	<0.00020
Field blank (North)	TDS005-SURF	1102CL0202	L981063-6	23-Feb-11	<0.30	<0.0050	<0.00020	<0.00020
Field blank (North)	ECS007-SURF	1102CL0204	L981891-6	26-Feb-11	<0.30	<0.0050	<0.00020	<0.00020
Field blank (Central)	LHS004-SURF	1102CL0158	L983897-10	6-Mar-11	<0.30	<0.0050	<0.00020	<0.00020
TRIP BLANKS								
Trip Blank (NSC South)	RAS157-SURF	1005JH0626	L886933-8	14-May-10	<0.30	<0.0050	<0.00020	<0.00020
Trip blank (NSC North/Central)	LFS006-SURF	1006JH0728	L899309-5	17-Jun-10	<0.30	0.0106	<0.00020	<0.00020
Trip Blank (MWS North/Central)	TCS007-SURF	1006JH0833	L901288-7	23-Jun-10	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (NSC South)	RAS157-SURF	1007JS1243	L911400-8	21-Jul-10	<0.30	<0.0050	<0.00020	<0.00020
Trip blank (NSC North/Central)	LFS006-SURF	100JS1346	L920004-13	12-Aug-10	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (MWS North/Central)	TCS007-SURF	1008JS1438	L922533-5	19-Aug-10	0.34	<0.0050	<0.00020	<0.00020
Trip blank (NSC North/Central)	LFS006-SURF	1009JS1550	L930015-12	9-Sep-10	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (MWS North/Central)	TCS007-SURF	1009JS1660	L932322-8	15-Sep-10	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (NSC South)	RAS157-SURF	1009JS1606	L935796-8	24-Sep-10	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (NSC South)	RAS157-SURF	1102CL0122	L981697-7	25-Feb-11	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (North)	ECS006-SURF	1102CL0203	L981063-7	23-Feb-11	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (North)	TCS007-SURF	1102CL0201	L980166-4	21-Feb-11	<0.30	<0.0050	<0.00020	<0.00020
Trip Blank (Central)	LFS006-SURF	1102CL0157	L983897-9	6-Mar-11	<0.30	<0.0050	<0.00020	<0.00020

Table 2-15. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)
ALS Method Detection Limit			*0.00020*	*0.00020*	*0.00020*	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20/0.40*
FIELD BLANKS										
Field blank (NSC South)	RAS156-SURF	14-May-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.40
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.13	<0.00010	<0.40
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.13	<0.00010	<0.40
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.11	0.00010	<0.20
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.12	<0.00010	<0.20
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.12	<0.00010	<0.20
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.11	<0.00010	<0.20
Field blank (NSC South)	RAS156-SURF	25-Feb-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Field blank (North)	TDS005-SURF	23-Feb-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Field blank (North)	ECS007-SURF	26-Feb-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.11	<0.00010	<0.20
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
TRIP BLANKS										
Trip Blank (NSC South)	RAS157-SURF	14-May-10	0.00048	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.40
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.40
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.40
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	0.14	<0.00010	<0.20
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (NSC South)	RAS157-SURF	25-Feb-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.00020	<0.00020	<0.00020	<0.010	<0.000010	<0.10	<0.00010	<0.20

Table 2-15. – continued –

Sample Location	Sample ID	Sample Date	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Fluoride (mg/L)	Iron- Total (mg/L)	Lead-Total (mg/L)	Lithium-Total (mg/L)
ALS Method Detection Limit			*0.0010*	*0.00020*	*0.00020*	*0.020*	*0.020/0.010* [1]	*0.000090*	*0.0020*
FIELD BLANKS									
Field blank (NSC South)	RAS156-SURF	14-May-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<0.0010	<0.00020	0.00026		<0.020	<0.000090	<0.0020
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.0010	<0.00020	0.00024		<0.020	0.000164	<0.0020
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	<0.0010	<0.00020	0.00025		<0.020	<0.000090	<0.0020
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.0010	<0.00020	0.00021		<0.020	<0.000090	<0.0020
Field blank (NSC South)	RAS156-SURF	25-Feb-11	<0.0010	<0.00020	<0.00020		<0.010	<0.000090	<0.0020
Field blank (North)	TDS005-SURF	23-Feb-11	<0.0010	<0.00020	<0.00020		<0.010	<0.000090	<0.0020
Field blank (North)	ECS007-SURF	26-Feb-11	<0.0010	<0.00020	<0.00020		<0.010	<0.000090	<0.0020
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.0010	<0.00020	<0.00020	<0.020	<0.010	<0.000090	<0.0020
TRIP BLANKS									
Trip Blank (NSC South)	RAS157-SURF	14-May-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<0.0010	<0.00020	0.00021		<0.020	<0.000090	<0.0020
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.0010	<0.00020	0.00035		<0.020	<0.000090	<0.0020
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.0010	<0.00020	<0.00020		<0.020	<0.000090	<0.0020
Trip Blank (NSC South)	RAS157-SURF	25-Feb-11	<0.0010	<0.00020	<0.00020		<0.010	<0.000090	<0.0020
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.0010	<0.00020	<0.00020		<0.010	<0.000090	<0.0020
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.0010	<0.00020	0.00056		<0.010	<0.000090	<0.0020
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.0010	<0.00020	<0.00020	<0.020	<0.010	<0.000090	<0.0020

[1] First value represents the open-water DL; second value is the ice-season DL.

Table 2-15. – continued –

Sample Location	Sample ID	Sample Date	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)
ALS Method Detection Limit			*0.010*	*0.00030*	*0.000050/0.00010*	*0.00020*	*0.0020*	*0.20*
FIELD BLANKS								
Field blank (NSC South)	RAS156-SURF	14-May-10	<0.010	<0.00030	<0.00010	<0.00020	<0.0020	<0.20
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	0.011	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field blank (NSC South)	RAS156-SURF	25-Feb-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field blank (North)	TDS005-SURF	23-Feb-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field blank (North)	ECS007-SURF	26-Feb-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
TRIP BLANKS								
Trip Blank (NSC South)	RAS157-SURF	14-May-10	<0.010	<0.00030	<0.00010	<0.00020	<0.0020	<0.20
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.010	0.00057	<0.000050	<0.00020	<0.0020	<0.20
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (NSC South)	RAS157-SURF	25-Feb-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.010	<0.00030	<0.000050	<0.00020	<0.0020	<0.20

Table 2-15. – continued –

Sample Location	Sample ID	Sample Date	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silicon-Total (mg/L)	Silver- Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)
ALS Method Detection Limit			*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*
FIELD BLANKS									
Field blank (NSC South)	RAS156-SURF	14-May-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.020	**0.00126**	<0.0010	**0.255**	<0.00010	<0.030	<0.00010
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	0.00011
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	**0.195**	<0.00020	<0.0010	<0.050	<0.00010	**0.565**	<0.00010
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	0.00010
Field blank (NSC South)	RAS156-SURF	25-Feb-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field blank (North)	TDS005-SURF	23-Feb-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field blank (North)	ECS007-SURF	26-Feb-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
TRIP BLANKS									
Trip Blank (NSC South)	RAS157-SURF	14-May-10	<0.020	<0.00020	<0.0010	0.074	<0.00010	<0.030	<0.00010
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.020	<0.00020	<0.0010	0.226	<0.00010	<0.030	<0.00010
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	0.031	0.00011
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	0.048	<0.00020	<0.0010	<0.050	<0.00010	0.107	<0.00010
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (NSC South)	RAS157-SURF	25-Feb-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.020	<0.00020	<0.0010	<0.050	<0.00010	<0.030	<0.00010

Table 2-15. – continued –

Sample Location	Sample ID	Sample Date	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)	Thorium-Total (mg/L)	Tin- Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)
ALS Method Detection Limit			*0.50/2.0*	*0.00020*	*0.00010*	*0.00010*	*0.00020*	*0.00020*	*0.0010*
FIELD BLANKS									
Field blank (NSC South)	RAS156-SURF	14-May-10	<2.0	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<2.0	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	<2.0	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<0.50	<0.00020	<0.00010	<0.00010	0.00024	<0.00020	<0.0010
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field blank (NSC South)	RAS156-SURF	25-Feb-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field blank (North)	TDS005-SURF	23-Feb-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field blank (North)	ECS007-SURF	26-Feb-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
TRIP BLANKS									
Trip Blank (NSC South)	RAS157-SURF	14-May-10	<2.0	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<2.0	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<2.0	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (NSC South)	RAS157-SURF	25-Feb-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.50	<0.00020	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010

Table 2-15. – continued –

Sample Location	Sample ID	Sample Date	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc- Total (mg/L)	Zirconium-Total (mg/L)
ALS Method Detection Limit			*0.00010*	*0.00020*	*0.0050*	*0.00040*
FIELD BLANKS						
Field blank (NSC South)	RAS156-SURF	14-May-10	<0.00010	<0.00020	<0.0050	<0.00040
Field Blank (NSC North/Central)	LHS004-SURF	17-Jun-10	<0.00010	<0.00020	<0.0050	<0.00040
Field Blank (MWS North/Central)	TDS005-SURF	23-Jun-10	<0.00010	<0.00020	<0.0050	<0.00040
Field blank (NSC South)	RAS156-SURF	21-Jul-10	<0.00010	<0.00020	<0.0050	<0.00040
Field Blank (NSC North/Central)	LHS004-SURF	12-Aug-10	<0.00010	<0.00020	<0.0050	<0.00040
Field Blank (MWS North/Central)	TDS005-SURF	19-Aug-10	<0.00010	<0.00020	<0.0050	<0.00040
Field Blank (NSC North/Central)	LHS004-SURF	9-Sep-10	<0.00010	<0.00020	<0.0050	<0.00040
Field Blank (MWS North/Central)	TDS005-SURF	15-Sep-10	<0.00010	<0.00020	<0.0050	<0.00040
Field blank (NSC South)	RAS156-SURF	24-Sep-10	<0.00010	<0.00020	<0.0050	<0.00040
Field blank (NSC South)	RAS156-SURF	25-Feb-11	<0.00010	<0.00020	<0.0050	<0.00040
Field blank (North)	TDS005-SURF	23-Feb-11	<0.00010	<0.00020	<0.0050	<0.00040
Field blank (North)	ECS007-SURF	26-Feb-11	<0.00010	<0.00020	<0.0050	<0.00040
Field blank (Central)	LHS004-SURF	6-Mar-11	<0.00010	<0.00020	<0.0050	<0.00040
TRIP BLANKS						
Trip Blank (NSC South)	RAS157-SURF	14-May-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip blank (NSC North/Central)	LFS006-SURF	17-Jun-10	<0.00010	<0.00020	<0.0050	**0.00523**
Trip Blank (MWS North/Central)	TCS007-SURF	23-Jun-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (NSC South)	RAS157-SURF	21-Jul-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip blank (NSC North/Central)	LFS006-SURF	12-Aug-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (MWS North/Central)	TCS007-SURF	19-Aug-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip blank (NSC North/Central)	LFS006-SURF	9-Sep-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (MWS North/Central)	TCS007-SURF	15-Sep-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (NSC South)	RAS157-SURF	24-Sep-10	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (NSC South)	RAS157-SURF	25-Feb-11	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (North)	ECS006-SURF	23-Feb-11	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (North)	TCS007-SURF	21-Feb-11	<0.00010	<0.00020	<0.0050	<0.00040
Trip Blank (Central)	LFS006-SURF	6-Mar-11	<0.00010	<0.00020	<0.0050	<0.00040

Table 2-16. Concentrations of routine, bacterial, and productivity parameters measured in triplicate samples collected from surface waters during the 2008/2009 CAMPP water quality program. Percent relative standard deviations (PRSDs) greater than 18% are indicated in red. Measurements in blue italics are considered "suspect”.

Region	Sample Location	Sample ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)
Method Detection Limit						
Spring						
Saskatchewan River	Cormorant Lake- Rep 1	KKS038-SURF	30-Jun-08	12:43	Surface	0.3
	Cormorant Lake- Rep 2	KLS002-SURF	30-Jun-08	12:50	Surface	0.3
	Cormorant Lake- Rep 3	KLS003-SURF	30-Jun-08	12:55	Surface	0.3
		Mean				
		SD				
		PRSD				
Upper Nelson River	Cross Lake- Rep 1	UDS004-SURF	26-Jun-08	13:35	Surface	0.3
	Cross Lake- Rep 2	TFS013-SURF	26-Jun-08	18:12	Surface	0.3
	Cross Lake- Rep 3	TFS014-SURF	26-Jun-08	17:45	Surface	0.3
		Mean				
		SD				
		PRSD				
Upper Nelson River	Cross Lake- Rep 1	UDS004-EUPH	26-Jun-08	13:35	Euphotic	0.9
	Cross Lake- Rep 2	TFS013-EUPH	26-Jun-08	18:12	Euphotic	1.7
	Cross Lake- Rep 3	TFS014-EUPH	26-Jun-08	17:45	Euphotic	1.4
		Mean				
		SD				
		PRSD				

Table 2-16. – continued –

Sample Location	Sample ID	Sample Date	Alkalinity: Total ($CaCO_3$) (mg/L)	Alkalinity: Bicarbonate (HCO_3) (mg/L)	Alkalinity: Carbonate (CO_3) (mg/L)	Alkalinity: Hydroxide (OH) (mg/L)	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)
Method Detection Limit			*1*	*2*	*0.6*	*0.4*	*0.003*	*0.005*	*0.2*
Spring									
Cormorant Lake- Rep 1	KKS038-SURF	30-Jun-08	161	182	7.2	<0.4	*0.031*	0.033	0.3
Cormorant Lake- Rep 2	KLS002-SURF	30-Jun-08	161	181	7.3	<0.4	0.021	0.033	0.3
Cormorant Lake- Rep 3	KLS003-SURF	30-Jun-08	161	181	7.5	<0.4	0.024	0.023	0.3
	Mean		161	181	7.3	<0.4	0.025	0.030	0.3
	SD		0	1	0.2	-	0.005	0.006	0.0
	PRSD		0	0	2	-	**20**	-	-
Cross Lake- Rep 1	UDS004-SURF	26-Jun-08	113	138	<0.6	<0.4	0.007	0.017	0.5
Cross Lake- Rep 2	TFS013-SURF	26-Jun-08	112	136	<0.6	<0.4	0.006	0.013	0.4
Cross Lake- Rep 3	TFS014-SURF	26-Jun-08	112	137	<0.6	<0.4	0.009	0.013	0.4
	Mean		112	137	<0.6	<0.4	0.007	0.014	0.4
	SD		1	1	-	-	0.002	0.002	0.1
	PRSD		1	1	-	-	-	-	-
Cross Lake- Rep 1	UDS004-EUPH	26-Jun-08	-	-	-	-	-	-	-
Cross Lake- Rep 2	TFS013-EUPH	26-Jun-08	-	-	-	-	-	-	-
Cross Lake- Rep 3	TFS014-EUPH	26-Jun-08	-	-	-	-	-	-	-
	Mean		-	-	-	-	-	-	-
	SD		-	-	-	-	-	-	-
	PRSD		-	-	-	-	-	-	-

Table 2-16. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus Dissolved (mg/L)	Phosphorus Total Particulate Phosphorus (mg/L)	Phosphorus Total (mg/L)	Carbon Dissolved Organic (mg/L)	Carbon Total Organic (mg/L)	Carbon Total Inorganic (mg/L)
Method Detection Limit			*0.001*	*0.001*	*0.001*	*1*	*1*	*1*
Spring								
Cormorant Lake- Rep 1	KKS038-SURF	30-Jun-08	0.007	0.005	0.012	6	6	37
Cormorant Lake- Rep 2	KLS002-SURF	30-Jun-08	0.008	0.003	0.011	6	6	38
Cormorant Lake- Rep 3	KLS003-SURF	30-Jun-08	*0.013*	<0.001	0.009	6	6	37
	Mean		0.009	0.003	0.011	6	6	37
	SD		0.003	-	0.002	0	0	1
	PRSD		**34**	-	14	0	0	2
Cross Lake- Rep 1	UDS004-SURF	26-Jun-08	0.012	0.026	0.038	8	9	27
Cross Lake- Rep 2	TFS013-SURF	26-Jun-08	0.013	0.024	0.037	8	8	26
Cross Lake- Rep 3	TFS014-SURF	26-Jun-08	0.012	0.026	0.039	8	8	26
	Mean		0.012	0.025	0.038	8	8	26
	SD		0.001	0.001	0.001	0	1	1
	PRSD		5	5	3	0	7	2
Cross Lake- Rep 1	UDS004-EUPH	26-Jun-08	-	-	-	-	-	-
Cross Lake- Rep 2	TFS013-EUPH	26-Jun-08	-	-	-	-	-	-
Cross Lake- Rep 3	TFS014-EUPH	26-Jun-08	-	-	-	-	-	-
	Mean		-	-	-	-	-	-
	SD		-	-	-	-	-	-
	PRSD		-	-	-	-	-	-

Table 2-16. – continued –

Sample Location	Sample ID	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Total Dissolved Solids (mg/L)	Conductivity (µmhos/cm)
Method Detection Limit		*2*	*0.05*	*5*	*0.01*	*5*	*0.4*
Cormorant Lake- Rep 1	KKS038-SURF	<2	0.85	5	8.53	170	293
Cormorant Lake- Rep 2	KLS002-SURF	<2	0.75	5	8.53	160	293
Cormorant Lake- Rep 3	KLS003-SURF	<2	0.80	5	8.54	170	287
	Mean	<2	0.80	5	8.53	167	291
	SD	-	0.05	0	0.01	6	3
	PRSD	-	6	-	0	3	1
Cross Lake- Rep 1	UDS004-SURF	18	20	15	8.19	210	334
Cross Lake- Rep 2	TFS013-SURF	18	20	20	8.20	210	335
Cross Lake- Rep 3	TFS014-SURF	18	20	15	8.20	200	336
	Mean	18	20	17	8.20	207	335
	SD	0	0	3	0.01	6	1
	PRSD	0	0	-	0	3	0
Cross Lake- Rep 1	UDS004-EUPH	-	-	-	-	-	-
Cross Lake- Rep 2	TFS013-EUPH	-	-	-	-	-	-
Cross Lake- Rep 3	TFS014-EUPH	-	-	-	-	-	-
	Mean	-	-	-	-	-	-
	SD	-	-	-	-	-	-
	PRSD	-	-	-	-	-	-

Table 2-16. – continued –

			Bacteria	Productivity	
Sample Location	Sample ID	Sample Date	*E. coli* (CFU/100 mL)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Method Detection Limit			*1*	*1*	*1*
Spring					
Cormorant Lake- Rep 1	KKS038-SURF	30-Jun-08	<1	<1	13
Cormorant Lake- Rep 2	KLS002-SURF	30-Jun-08	<1	<1	6
Cormorant Lake- Rep 3	KLS003-SURF	30-Jun-08	<1	<1	4
	Mean		<1	<1	8
	SD		-	-	5
	PRSD		-	-	-
Cross Lake- Rep 1	UDS004-SURF	26-Jun-08	<1	7	3
Cross Lake- Rep 2	TFS013-SURF	26-Jun-08	1	7	3
Cross Lake- Rep 3	TFS014-SURF	26-Jun-08	1	7	3
	Mean		<1	7	3
	SD		0	0	0
	PRSD		-	0	-
Cross Lake- Rep 1	UDS004-EUPH	26-Jun-08	-	6	3
Cross Lake- Rep 2	TFS013-EUPH	26-Jun-08	-	7	3
Cross Lake- Rep 3	TFS014-EUPH	26-Jun-08	-	5	5
	Mean		-	6	4
	SD		-	1	1
	PRSD		-		-

Table 2-16. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)
Method Detection Limit								
Summer								
Winnipeg River	Manigotagan Lake- Rep 1	RAS155-SURF	0808JHS612	L668969-3	13-Aug-08	9:50	Surface	0.3
	Manigotagan Lake- Rep 2	PFS095-SURF	0808JHS616	L668969-4	13-Aug-08	10:00	Surface	0.3
	Manigotagan Lake- Rep 3	PFS096-SURF	0808JHS617	L668969-5	13-Aug-08	10:10	Surface	0.3
		Mean						
		SD						
		PRSD						
Lower Churchill River	Gauer Lake- Rep 1	FAS007-SURF	0808JHS943	L669933-3	13-Aug-08	14:00	Surface	0.3
	Gauer Lake- Rep 2	TFS013-SURF	0808JHS948	L669933-5	13-Aug-08	8:20	Surface	0.3
	Gauer Lake- Rep 3	TFS014-SURF	0808JHS949	L669933-6	13-Aug-08	18:25	Surface	0.3
		Mean						
		SD						
		PRSD						
Fall								
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	0809JHS300	L685087-1	18-Sep-08	12:35	Surface	0.3
	Setting Lake- Rep 2	TFS013-SURF	0809JHS308	L685087-5	18-Sep-08	8:00	Surface	0.3
	Setting Lake- Rep 3	TFS014-SURF	0809JHS309	L685087-6	18-Sep-08	11:40	Surface	0.3
		Mean						
		SD						
		PRSD						
Upper Nelson River	Setting Lake- Rep 1	TCS006-EUPH	0809JHE319	L685087-7	18-Sep-08	12:40	Euphotic	4.0
	Setting Lake- Rep 2	TFS013-EUPH	0809JHE325	L685087-9	18-Sep-08	8:15	Euphotic	3.8
	Setting Lake- Rep 3	TFS014-EUPH	0809JHE326	L685087-10	18-Sep-08	11:50	Euphotic	4.2
		Mean						
		SD						
		PRSD						

Table 2-16. – continued –

Sample Location	Sample ID	Sample Date	Alkalinity: Total ($CaCO_3$) (mg/L)	Alkalinity: Bicarbonate (HCO_3) (mg/L)	Alkalinity: Carbonate (CO_3) (mg/L)	Alkalinity: Hydroxide (OH) (mg/L)	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)
Method Detection Limit			*1*	*2*	*0.6*	*0.4*	*0.003*	*0.005*	*0.2*
Summer									
Manigotagan Lake- Rep 1	RAS155-SURF	13-Aug-08	34	42	<0.6	<0.4	0.011	0.020	0.6
Manigotagan Lake- Rep 2	PFS095-SURF	13-Aug-08	34	42	<0.6	<0.4	0.014	0.013	0.5
Manigotagan Lake- Rep 3	PFS096-SURF	13-Aug-08	34	42	<0.6	<0.4	0.012	0.010	0.6
	Mean		34	42	<0.6	<0.4	0.012	0.014	0.6
	SD		0	0	-	-	0.002	0.005	0.06
	PRSD		0	0	-	-	-	-	10
Gauer Lake- Rep 1	FAS007-SURF	13-Aug-08	80	89	4.1	<0.4	0.009	0.006	0.5
Gauer Lake- Rep 2	TFS013-SURF	13-Aug-08	80	90	3.9	<0.4	0.011	*0.076*	0.5
Gauer Lake- Rep 3	TFS014-SURF	13-Aug-08	80	90	3.5	<0.4	0.012	0.006	0.6
	Mean		80	90	3.8	<0.4	0.011	0.029	0.5
	SD		0	1	0.3	-	0.002	0.040	0.1
	PRSD		0	1	8	-	-	-	-
Fall									
Setting Lake- Rep 1	TCS006-SURF	18-Sep-08	76	93	<0.6	<0.4	*0.009*	0.053	0.5
Setting Lake- Rep 2	TFS013-SURF	18-Sep-08	77	94	<0.6	<0.4	0.024	0.051	0.5
Setting Lake- Rep 3	TFS014-SURF	18-Sep-08	76	93	<0.6	<0.4	0.019	0.056	0.5
	Mean		76	93	<0.6	<0.4	0.017	0.053	0.5
	SD		1	1	-	-	0.008	0.003	0.0
	PRSD		1	1	-	-	-	5	-
Setting Lake- Rep 1	TCS006-EUPH	18-Sep-08	-	-	-	-	-	-	-
Setting Lake- Rep 2	TFS013-EUPH	18-Sep-08	-	-	-	-	-	-	-
Setting Lake- Rep 3	TFS014-EUPH	18-Sep-08	-	-	-	-	-	-	-
	Mean								
	SD								
	PRSD								

Table 2-16. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus Dissolved (mg/L)	Phosphorus Total Particulate Phosphorus (mg/L)	Phosphorus Total (mg/L)	Carbon Dissolved Organic (mg/L)	Carbon Total Organic (mg/L)	Carbon Total Inorganic (mg/L)
Method Detection Limit			*0.001*	*0.001*	*0.001*	*1*	*1*	*1*
Summer								
Manigotagan Lake- Rep 1	RAS155-SURF	13-Aug-08	0.013	<0.001	0.012	15	16	7
Manigotagan Lake- Rep 2	PFS095-SURF	13-Aug-08	0.012	0.007	*0.018*	14	14	7
Manigotagan Lake- Rep 3	PFS096-SURF	13-Aug-08	*0.007*	0.005	0.012	14	15	7
	Mean		0.011	0.004	0.014	14	15	7
	SD		0.003	-	0.003	1	1	0
	PRSD		**30**	-	**25**	4	7	0
Gauer Lake- Rep 1	FAS007-SURF	13-Aug-08	0.005	0.010	0.015	7	9	18
Gauer Lake- Rep 2	TFS013-SURF	13-Aug-08	0.006	0.011	0.017	7	9	18
Gauer Lake- Rep 3	TFS014-SURF	13-Aug-08	0.005	0.011	0.016	7	9	18
	Mean		0.005	0.011	0.016	7	9	18
	SD		0.001	0.001	0.001	0	0	0
	PRSD		-	5	6	0	0	0
Fall								
Setting Lake- Rep 1	TCS006-SURF	18-Sep-08	0.009	0.013	0.023	12	13	18
Setting Lake- Rep 2	TFS013-SURF	18-Sep-08	0.007	0.013	0.020	12	13	18
Setting Lake- Rep 3	TFS014-SURF	18-Sep-08	0.009	0.011	0.021	12	13	18
	Mean		0.008	0.012	0.021	12	13	18
	SD		0.001	0.001	0.002	0	0	0
	PRSD		14	9	7	0	0	0
Setting Lake- Rep 1	TCS006-EUPH	18-Sep-08	-	-	-	-	-	-
Setting Lake- Rep 2	TFS013-EUPH	18-Sep-08	-	-	-	-	-	-
Setting Lake- Rep 3	TFS014-EUPH	18-Sep-08	-	-	-	-	-	-
	Mean							
	SD							
	PRSD							

Table 2-16. – continued –

Sample Location	Sample ID	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Total Dissolved Solids (mg/L)	Conductivity (µmhos/cm)
Method Detection Limit		*2*	*0.05*	*5*	*0.01*	*5*	*0.4*
Summer							
Manigotagan Lake- Rep 1	RAS155-SURF	6	1.7	80	7.81	48	71.8
Manigotagan Lake- Rep 2	PFS095-SURF	3	1.6	100	7.83	44	71.4
Manigotagan Lake- Rep 3	PFS096-SURF	<2	1.5	100	7.85	44	71.5
	Mean	3	1.6	93	7.83	45	71.6
	SD	-	0.1	12	0.02	2	0.2
	PRSD	-	6	12	0	5	0
Gauer Lake- Rep 1	FAS007-SURF	4	3.1	20	8.51	110	151
Gauer Lake- Rep 2	TFS013-SURF	4	3.8	20	8.51	92	151
Gauer Lake- Rep 3	TFS014-SURF	4	3.6	20	8.51	94	151
	Mean	4	3.5	20	8.51	99	151
	SD	0	0.4	0	0.00	10	0
	PRSD	-	10	-	0	10	0
Fall							
Setting Lake- Rep 1	TCS006-SURF	2	3.6	35	7.84	100	155
Setting Lake- Rep 2	TFS013-SURF	2	3.6	35	7.77	110	154
Setting Lake- Rep 3	TFS014-SURF	<2	4.3	35	7.79	110	153
	Mean	2	3.8	35	7.80	107	154
	SD	-	0.4	0	0.04	6	1
	PRSD	-	11	0	0	5	1
Setting Lake- Rep 1	TCS006-EUPH	-	-	-	-	-	-
Setting Lake- Rep 2	TFS013-EUPH	-	-	-	-	-	-
Setting Lake- Rep 3	TFS014-EUPH	-	-	-	-	-	-
	Mean						
	SD						
	PRSD						

Table 2-16. – continued –

			Bacteria	Productivity	
Sample Location	Sample ID	Sample Date	*E. coli* (CFU/100 mL)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Method Detection Limit			*1*	*1*	*1*
Summer					
Manigotagan Lake- Rep 1	RAS155-SURF	13-Aug-08	<1	7	<1
Manigotagan Lake- Rep 2	PFS095-SURF	13-Aug-08	<1	6	1
Manigotagan Lake- Rep 3	PFS096-SURF	13-Aug-08	<1	6	<1
	Mean		<1	6	1
	SD		-	1	-
	PRSD		-	9	-
Gauer Lake- Rep 1	FAS007-SURF	13-Aug-08	<1	25	<1
Gauer Lake- Rep 2	TFS013-SURF	13-Aug-08	<1	25	<1
Gauer Lake- Rep 3	TFS014-SURF	13-Aug-08	<1	21	1
	Mean		<1	24	1
	SD		-	2	-
	PRSD		-	10	-
Fall					
Setting Lake- Rep 1	TCS006-SURF	18-Sep-08	<1	-	-
Setting Lake- Rep 2	TFS013-SURF	18-Sep-08	<1	5	1
Setting Lake- Rep 3	TFS014-SURF	18-Sep-08	1	5	<1
	Mean		<1	5	1
	SD		-	0	-
	PRSD		-	-	-
Setting Lake- Rep 1	TCS006-EUPH	18-Sep-08	-	5	<1
Setting Lake- Rep 2	TFS013-EUPH	18-Sep-08	-	5	<1
Setting Lake- Rep 3	TFS014-EUPH	18-Sep-08	-	5	<1
	Mean		-	5	<1
	SD		-	0	-
	PRSD		-	-	-

Table 2-16. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)
Method Detection Limit								
Fall								
Lower Nelson River	Hayes River- Rep 1	ABS002-SURF	0809JHS208	L685275-2	21-Sep-08	9:55	Surface	0.3
	Hayes River- Rep 2	KLS002-SURF	0809JHS214	L685275-4	21-Sep-08	10:10	Surface	0.3
	Hayes River- Rep 3	KLS003-SURF	0809JHS215	L685275-5	21-Sep-08	10:20	Surface	0.3
		Mean						
		SD						
		PRSD						
Winter								
Winnipeg River	Lac du Bonnet- Rep 1	PFS093-SURF	0903JH0160	L738178-1	1-Mar-09	13:20	Surface	0.3
	Lac du Bonnet- Rep 2	PFS095-SURF	0903JH0163	L738178-4	1-Mar-09	13:40	Surface	0.3
	Lac du Bonnet- Rep 3	PFS096-SURF	0903JH0164	L738178-5	1-Mar-09	13:55	Surface	0.3
		Mean						
		SD						
		PRSD						
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	0903JH0217	L739152-2	3-Mar-09	13:30	Surface	0.3
	Setting Lake- Rep 2	TFS013-SURF	0903JH0221	L739152-5	3-Mar-09	13:30	Surface	0.3
	Setting Lake- Rep 3	TFS014-SURF	0903JH0222	L739152-6	3-Mar-09	13:30	Surface	0.3
		Mean						
		SD						
		PRSD						

Table 2-16. – continued –

			Alkalinity				Nitrogen		
Sample Location	Sample ID	Sample Date	Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)	Dissolved Ammonia (mg/L N)	Dissolved Nitrate/ nitrite (mg/L N)	TKN (mg/L)
Method Detection Limit			*1*	*2*	*0.6*	*0.4*	*0.003*	*0.005*	*0.2*
Fall									
Hayes River- Rep 1	ABS002-SURF	21-Sep-08	71	87	<0.6	<0.4	*0.044*	0.012	0.5
Hayes River- Rep 2	KLS002-SURF	21-Sep-08	71	87	<0.6	<0.4	0.020	0.012	0.5
Hayes River- Rep 3	KLS003-SURF	21-Sep-08	71	87	<0.6	<0.4	0.012	0.009	0.5
	Mean		71	87	<0.6	<0.5	0.025	0.011	0.5
	SD		0	0	-	-	0.017	0.002	0
	PRSD		0	0	-	-	-	-	-
Winter									
Lac du Bonnet- Rep 1	PFS093-SURF	1-Mar-09	46	56	<0.6	<0.4	0.012	0.113	0.3
Lac du Bonnet- Rep 2	PFS095-SURF	1-Mar-09	46	56	<0.6	<0.4	0.013	0.118	0.4
Lac du Bonnet- Rep 3	PFS096-SURF	1-Mar-09	46	57	<0.6	<0.4	0.006	0.112	0.5
	Mean		46	56	<0.6	<0.4	0.010	0.114	0.4
	SD		0	0.6	-	-	0.004	0.003	0.1
	PRSD		0	1	-	-	-	3	-
Setting Lake- Rep 1	TCS006-SURF	3-Mar-09	91	111	<0.6	<0.4	0.014	0.091	0.6
Setting Lake- Rep 2	TFS013-SURF	3-Mar-09	91	111	<0.6	<0.4	0.012	0.109	0.5
Setting Lake- Rep 3	TFS014-SURF	3-Mar-09	91	111	<0.6	<0.4	0.015	0.090	0.5
	Mean		91	111	<0.6	<0.4	0.014	0.097	0.5
	SD		0	0	-	-	0.002	0.011	0.1
	PRSD		0	0	-	-	-	11	-

Table 2-16. – continued –

			Phosphorus			Carbon		
Sample Location	Sample ID	Sample Date	Dissolved (mg/L)	Total Particulate Phosphorus (mg/L)	Total (mg/L)	Dissolved Organic (mg/L)	Total Organic (mg/L)	Total Inorganic (mg/L)
Method Detection Limit			*0.001*	*0.001*	*0.001*	*1*	*1*	*1*
Fall								
Hayes River- Rep 1	ABS002-SURF	21-Sep-08	0.007	0.014	0.021	11	11	17
Hayes River- Rep 2	KLS002-SURF	21-Sep-08	0.011	0.010	0.021	10	11	17
Hayes River- Rep 3	KLS003-SURF	21-Sep-08	0.005	0.014	0.019	10	11	17
	Mean		0.008	0.013	0.020	10	11	17
	SD		0.003	0.002	0.001	1	0	0
	PRSD		-	18	6	6	0	0
Winter								
Lac du Bonnet- Rep 1	PFS093-SURF	1-Mar-09	0.024	0.003	0.026	10	10	10
Lac du Bonnet- Rep 2	PFS095-SURF	1-Mar-09	0.021	0.008	0.030	10	10	10
Lac du Bonnet- Rep 3	PFS096-SURF	1-Mar-09	0.020	0.006	0.026	10	10	10
	Mean		0.022	0.006	0.027	10	10	10
	SD		0.002	0.003	0.002	0	0	0
	PRSD		10	-	8	0	0	0
Setting Lake- Rep 1	TCS006-SURF	3-Mar-09	0.014	0.007	0.021	14	15	21
Setting Lake- Rep 2	TFS013-SURF	3-Mar-09	0.012	0.007	0.019	14	14	21
Setting Lake- Rep 3	TFS014-SURF	3-Mar-09	0.014	0.008	0.021	14	14	21
	Mean		0.013	0.007	0.020	14	14	21
	SD		0.001	0.001	0.001	0	1	0
	PRSD		9	8	6	0	4	0

Table 2-16. – continued –

		Water Clarity					
Sample Location	Sample ID	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (TCU)	pH	Total Dissolved Solids (mg/L)	Conductivity (µmhos/cm)
Method Detection Limit		*2*	*0.05*	*5*	*0.01*	*5*	*0.4*
Fall							
Hayes River- Rep 1	ABS002-SURF	21	12	40	8.15	92	135
Hayes River- Rep 2	KLS002-SURF	18	10	40	8.16	100	134
Hayes River- Rep 3	KLS003-SURF	20	12	40	8.17	110	137
	Mean	20	11	40	8.16	101	135
	SD	2	1	0	0.01	9	2
	PRSD	8	10	0	0	9	1
Winter							
Lac du Bonnet- Rep 1	PFS093-SURF	<2	4	40	7.97	76	109
Lac du Bonnet- Rep 2	PFS095-SURF	<2	4	40	7.97	74	110
Lac du Bonnet- Rep 3	PFS096-SURF	<2	4	40	7.98	72	110
	Mean	<2	4	40	7.97	74	110
	SD	-	0	0	0.01	2.0	1
	PRSD	-	1	0	0	3	1
Setting Lake- Rep 1	TCS006-SURF	<2	2	35	8.05	150	184
Setting Lake- Rep 2	TFS013-SURF	<2	2	35	8.06	150	184
Setting Lake- Rep 3	TFS014-SURF	<2	2	35	8.05	150	184
	Mean	<2	2	35	8.05	150	184
	SD	-	0	0	0.01	0	0
	PRSD	-	4	0	0	0	0

Table 2-16. – continued –

			Bacteria	Productivity	
Sample Location	Sample ID	Sample Date	*E. coli* (CFU/100 mL)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Method Detection Limit			*1*	*1*	*1*
Fall					
Hayes River- Rep 1	ABS002-SURF	21-Sep-08	4	2	<1
Hayes River- Rep 2	KLS002-SURF	21-Sep-08	3	2	<1
Hayes River- Rep 3	KLS003-SURF	21-Sep-08	4	2	<1
	Mean		4	2	<1
	SD		0.6	0	-
	PRSD		-	-	-
Winter					
Lac du Bonnet- Rep 1	PFS093-SURF	1-Mar-09	<1	<1	<1
Lac du Bonnet- Rep 2	PFS095-SURF	1-Mar-09	1	<1	<1
Lac du Bonnet- Rep 3	PFS096-SURF	1-Mar-09	<1	<1	<1
	Mean		<1	<1	<1
	SD		-	-	-
	PRSD		-	-	-
Setting Lake- Rep 1	TCS006-SURF	3-Mar-09	<1	1	<1
Setting Lake- Rep 2	TFS013-SURF	3-Mar-09	<1	1	<1
Setting Lake- Rep 3	TFS014-SURF	3-Mar-09	<1	1	<1
	Mean		<1	1	<1
	SD		-	0	-
	PRSD		-	-	-

Table 2-17. Concentrations of metals and major ions measured in triplicate samples collected from surface waters during the 2008/2009 CAMPP water quality program. Percent relative standard deviations (PRSDs) greater than 18% are indicated in red. Measurements in blue italics are considered "suspect".

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Hardness as $CaCO_3$ (mg/L)
Method Detection Limit									*0.3*
Spring									
Saskatchewan River	Cormorant Lake (Rep 1)	KKS038-SURF	0806JHS800	L649710-1	30-Jun-08	12:43	Surface	0.3	142
	Cormorant Lake (Rep 2)	KLS002-SURF	0806JHS815	L649710-3	30-Jun-08	12:50	Surface	0.3	158
	Cormorant Lake (Rep 3)	KLS003-SURF	0806JHS816	L649710-4	30-Jun-08	12:55	Surface	0.3	154
		Mean							151
		SD							8.3
		PRSD							6
Upper Nelson River	Cross Lake (Rep 1)	UDS004-SURF	0806JHS905	L648805-2	26-Jun-08	13:35	Surface	0.3	127
	Cross Lake (Rep 2)	TFS013-SURF	0806JHS908	L648805-5	26-Jun-08	18:12	Surface	0.3	121
	Cross Lake (Rep 3)	TFS014-SURF	0806JHS909	L648805-6	26-Jun-08	17:45	Surface	0.3	121
		Mean							123
		SD							3
		PRSD							3
Summer									
Winnipeg River	Manigotagan Lake (Rep 1)	RAS155-SURF	0808JHS612	L668969-3	13-Aug-08	9:50	Surface	0.3	36.2
	Manigotagan Lake (Rep 2)	PFS095-SURF	0808JHS616	L668969-4	13-Aug-08	10:00	Surface	0.3	37.2
	Manigotagan Lake (Rep 3)	PFS096-SURF	0808JHS617	L668969-5	13-Aug-08	10:10	Surface	0.3	34.0
		Mean							35.8
		SD							1.6
		PRSD							5
Lower Churchill River	Gauer Lake (Rep 1)	FAS007-SURF	0808JHS943	L669933-3	13-Aug-08	14:00	Surface	0.3	80.2
	Gauer Lake (Rep 2)	TFS013-SURF	0808JHS948	L669933-5	13-Aug-08	8:20	Surface	0.3	69.1
	Gauer Lake (Rep 3)	TFS013-SURF	0808JHS949	L669933-6	13-Aug-08	18:25	Surface	0.3	70.1
		Mean							73.1
		SD							6.1
		PRSD							8

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)
Method Detection Limit			*0.005*	*0.0005/0.001*	*0.0005*	*0.0003*	*0.001*	*0.0002*	*0.03*	*0.00001*
Spring										
Cormorant Lake (Rep 1)	KKS038-SURF	30-Jun-08	0.045	<0.001	0.0010	0.0297	<0.001	<0.0002	<0.03	0.00003
Cormorant Lake (Rep 2)	KLS002-SURF	30-Jun-08	0.037	<0.001	0.0011	0.0325	<0.001	<0.0002	<0.03	0.00006
Cormorant Lake (Rep 3)	KLS003-SURF	30-Jun-08	0.033	<0.001	0.0010	0.0327	<0.001	<0.0002	<0.03	<0.00001
	Mean		0.038	<0.001	0.0010	0.0316	<0.001	<0.0002	<0.04	0.00003
	SD		0.006		0.0001	0.0017	-	-	-	-
	PRSD		16	-	-	5	-	-	-	-
Cross Lake (Rep 1)	UDS004-SURF	26-Jun-08	0.636	<0.001	0.0014	0.0464	<0.001	<0.0002	0.03	<0.00001
Cross Lake (Rep 2)	TFS013-SURF	26-Jun-08	0.697	<0.001	0.0015	0.0458	<0.001	<0.0002	0.04	0.00002
Cross Lake (Rep 3)	TFS014-SURF	26-Jun-08	0.612	<0.001	0.0014	0.0449	<0.001	<0.0002	0.04	0.00002
	Mean		0.648	<0.001	0.0014	0.0457	<0.001	<0.0002	0.04	0.00002
	SD		0.044	-	0.0001	0.0008	-	-	0.01	-
	PRSD		7	-	-	2	-	-	-	-
Summer										
Manigotagan Lake (Rep 1)	RAS155-SURF	13-Aug-08	0.070	<0.001	0.0007	0.0083	<0.001	<0.0002	<0.03	<0.00001
Manigotagan Lake (Rep 2)	PFS095-SURF	13-Aug-08	0.062	<0.001	0.0006	0.0080	<0.001	<0.0002	<0.03	0.00001
Manigotagan Lake (Rep 3)	PFS096-SURF	13-Aug-08	0.056	<0.001	0.0006	0.0075	<0.001	<0.0002	<0.03	0.00001
	Mean		0.063	<0.001	0.0006	0.0079	<0.001	<0.0002	<0.03	0.00001
	SD		0.007		0.0001	0.0004	-	-	-	-
	PRSD		11	-	-	5	-	-	-	-
Gauer Lake (Rep 1)	FAS007-SURF	13-Aug-08	0.019	<0.001	<0.0005	0.0106	<0.001	<0.0002	<0.03	0.00001
Gauer Lake (Rep 2)	TFS013-SURF	13-Aug-08	0.024	<0.001	<0.0005	0.0096	<0.001	<0.0002	<0.03	0.00003
Gauer Lake (Rep 3)	TFS013-SURF	13-Aug-08	0.024	<0.001	<0.0005	0.0095	<0.001	<0.0002	<0.03	<0.00001
	Mean		0.022	<0.001	<0.0005	0.0099	<0.001	<0.0002	<0.03	0.00002
	SD		0.003	-	-	0.0006	-	-	-	0.00001
	PRSD		-	-	-	6	-	-	-	-

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)
Method Detection Limit			*0.1*	*0.0001*	*0.2*	*0.001*	*0.0002*	*0.001*	*0.02*	*0.0005*
Spring										
Cormorant Lake (Rep 1)	KKS038-SURF	30-Jun-08	30.0	<0.0001	1.4	<0.001	<0.0002	0.001	0.03	<0.0005
Cormorant Lake (Rep 2)	KLS002-SURF	30-Jun-08	33.4	<0.0001	1.4	0.001	<0.0002	0.001	0.03	<0.0005
Cormorant Lake (Rep 3)	KLS003-SURF	30-Jun-08	32.4	<0.0001	1.3	0.002	<0.0002	0.001	0.04	<0.0005
	Mean		31.9	<0.0001	1.4	0.001	<0.0002	0.001	0.03	<0.0005
	SD		1.7	-	0.1	-	-	0	0.01	-
	PRSD		5	-	4	-	-	-	-	-
Cross Lake (Rep 1)	UDS004-SURF	26-Jun-08	30.4	0.0001	21.4	0.002	0.0005	0.002	0.63	<0.0005
Cross Lake (Rep 2)	TFS013-SURF	26-Jun-08	28.8	0.0001	21.6	0.002	0.0004	0.002	0.62	<0.0005
Cross Lake (Rep 3)	TFS014-SURF	26-Jun-08	28.9	0.0001	21.3	0.002	0.0004	0.003	0.59	0.0006
	Mean		29.4	0.0001	21.4	0.002	0.0004	0.002	0.61	<0.0005
	SD		0.9	0.0000	0.15	0.000	0.0001	0.001	0.02	-
	PRSD		3	-	1	-	-	-	3	-
Summer										
Manigotagan Lake (Rep 1)	RAS155-SURF	13-Aug-08	9.2	<0.0001	0.9	0.002	0.0015	<0.001	0.16	<0.0005
Manigotagan Lake (Rep 2)	PFS095-SURF	13-Aug-08	9.6	<0.0001	0.9	0.002	0.0016	<0.001	0.15	<0.0005
Manigotagan Lake (Rep 3)	PFS096-SURF	13-Aug-08	8.7	<0.0001	0.9	0.001	0.0013	<0.001	0.16	<0.0005
	Mean		9.2	<0.0001	0.9	0.002	0.0015	<0.001	0.16	<0.0005
	SD		0.5	-	0	0.001	0.0002	-	0.01	-
	PRSD		5	-	0	-	10	-	4	-
Gauer Lake (Rep 1)	FAS007-SURF	13-Aug-08	23.3	<0.0001	0.9	<0.001	0.0010	0.001	0.04	<0.0005
Gauer Lake (Rep 2)	TFS013-SURF	13-Aug-08	19.9	<0.0001	0.8	<0.001	0.0012	<0.001	0.03	<0.0005
Gauer Lake (Rep 3)	TFS013-SURF	13-Aug-08	20.2	<0.0001	0.8	<0.001	0.0014	<0.001	0.03	<0.0005
	Mean		21.1	<0.0001	0.8	<0.001	0.0012	<0.001	0.03	<0.0005
	SD		1.9	-	0.1	-	0.0002	-	0.01	-
	PRSD		9	-	-	-	-	-	-	-

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)
Method Detection Limit			*0.01*	*0.0003*	*0.00005*	*0.0002*	*0.002*	*0.05*	*0.1*
Spring									
Cormorant Lake (Rep 1)	KKS038-SURF	30-Jun-08	16.2	*0.0062*	<0.00005	<0.0002	<0.002	<0.05	1.0
Cormorant Lake (Rep 2)	KLS002-SURF	30-Jun-08	18.2	0.0028	<0.00005	0.0002	<0.002	<0.05	1.2
Cormorant Lake (Rep 3)	KLS003-SURF	30-Jun-08	17.6	0.0019	<0.00005	<0.0002	<0.002	<0.05	1.2
	Mean		17.3	0.0036	<0.00005	<0.0002	<0.002	<0.05	1.1
	SD		1.03	0.0023	-	-	-	-	0.1
	PRSD		6	**62**	-	-	-	-	10
Cross Lake (Rep 1)	UDS004-SURF	26-Jun-08	12.5	0.0150	<0.00005	0.0008	0.002	0.08	3.1
Cross Lake (Rep 2)	TFS013-SURF	26-Jun-08	11.9	0.0138	<0.00005	0.0008	0.002	0.05	2.9
Cross Lake (Rep 3)	TFS014-SURF	26-Jun-08	11.9	0.0137	<0.00005	0.0008	0.002	0.06	2.9
	Mean		12.1	0.0142	<0.00005	0.0008	0.002	0.06	3.0
	SD		0.3	0.0007	-	0.0000	0.000	0.02	0.1
	PRSD		3	5	-	-	-	-	4
Summer									
Manigotagan Lake (Rep 1)	RAS155-SURF	13-Aug-08	3.19	0.0035	<0.00005	<0.0002	<0.002	0.27	0.8
Manigotagan Lake (Rep 2)	PFS095-SURF	13-Aug-08	3.25	0.0038	<0.00005	<0.0002	<0.002	0.23	0.8
Manigotagan Lake (Rep 3)	PFS096-SURF	13-Aug-08	2.96	0.0035	<0.00005	<0.0002	<0.002	0.15	0.8
	Mean		3.13	0.0036	<0.00005	<0.0002	<0.002	0.22	0.8
	SD		0.15	0.0002	-	-	-	0.06	0.0
	PRSD		5	5	-	-	-	-	0
Gauer Lake (Rep 1)	FAS007-SURF	13-Aug-08	5.35	0.0171	<0.00005	0.0002	<0.002	<0.05	0.9
Gauer Lake (Rep 2)	TFS013-SURF	13-Aug-08	4.70	0.0149	<0.00005	<0.0002	<0.002	<0.05	0.7
Gauer Lake (Rep 3)	TFS013-SURF	13-Aug-08	4.80	0.0151	<0.00005	<0.0002	<0.002	<0.05	0.7
	Mean		4.95	0.0157	<0.00005	<0.0002	<0.002	<0.05	0.8
	SD		0.35	0.0012	-	-	-	-	0.1
	PRSD		7	8	-	-	-	-	15

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit			*0.0002*	*0.001*	*0.0001*	*0.03*	*0.0001*	*2/9*	*0.001*
Spring									
Cormorant Lake (Rep 1)	KKS038-SURF	30-Jun-08	0.0009	<0.001	<0.0001	2.24	0.0526	4	<0.001
Cormorant Lake (Rep 2)	KLS002-SURF	30-Jun-08	0.0010	<0.001	<0.0001	2.53	0.0583	4	<0.001
Cormorant Lake (Rep 3)	KLS003-SURF	30-Jun-08	0.0009	<0.001	<0.0001	2.46	0.0565	4	<0.001
	Mean		0.0009	<0.001	<0.0001	2.41	0.0558	4	<0.001
	SD		0.0001	-	-	0.15	0.0029	0	-
	PRSD		-	-	-	6	5	-	-
Cross Lake (Rep 1)	UDS004-SURF	26-Jun-08	0.003	<0.001	0.0001	18.4	0.129	28	<0.001
Cross Lake (Rep 2)	TFS013-SURF	26-Jun-08	0.003	<0.001	<0.0001	17.5	0.124	29	<0.001
Cross Lake (Rep 3)	TFS014-SURF	26-Jun-08	0.003	<0.001	<0.0001	17.4	0.123	29	<0.001
	Mean		0.003	<0.001	<0.0001	17.8	0.125	29	<0.001
	SD		0.000	-	-	0.6	0.003	1	-
	PRSD		-	-	-	3	3	2	-
Summer									
Manigotagan Lake (Rep 1)	RAS155-SURF	13-Aug-08	0.0015	<0.001	<0.0001	0.97	0.0188	<2	<0.001
Manigotagan Lake (Rep 2)	PFS095-SURF	13-Aug-08	0.0016	<0.001	<0.0001	1.05	0.0191	<2	<0.001
Manigotagan Lake (Rep 3)	PFS096-SURF	13-Aug-08	0.0014	<0.001	<0.0001	0.91	0.0175	<2	<0.001
	Mean		0.0015	<0.001	<0.0001	0.98	0.0185	<2	<0.001
	SD		0.0001	-	-	0.07	0.0009	-	-
	PRSD		7	-	-	7	5	-	-
Gauer Lake (Rep 1)	FAS007-SURF	13-Aug-08	0.0009	<0.001	<0.0001	1.27	0.0332	<2	<0.001
Gauer Lake (Rep 2)	TFS013-SURF	13-Aug-08	0.0008	<0.001	<0.0001	1.12	0.0284	<2	<0.001
Gauer Lake (Rep 3)	TFS013-SURF	13-Aug-08	0.0008	<0.001	<0.0001	1.13	0.0294	<2	<0.001
	Mean		0.0008	<0.001	<0.0001	1.17	0.0303	<2	<0.001
	SD		0.0001	-	-	0.08	0.0025	-	-
	PRSD		-	-	-	7	8	-	-

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit			*0.0001*	*0.0006*	*0.0009*	*0.0002*	*0.0001*	*0.001*	*0.01*	*0.0004*
Spring										
Cormorant Lake (Rep 1)	KKS038-SURF	30-Jun-08	<0.0001	<0.0006	0.0010	<0.0002	0.0002	0.001	<0.01	<0.0004
Cormorant Lake (Rep 2)	KLS002-SURF	30-Jun-08	<0.0001	<0.0006	<0.0009	<0.0002	0.0002	0.001	0.01	<0.0004
Cormorant Lake (Rep 3)	KLS003-SURF	30-Jun-08	<0.0001	<0.0006	<0.0009	<0.0002	0.0002	0.001	0.01	<0.0004
	Mean		<0.0001	<0.0006	<0.0009	<0.0002	0.0002	0.001	0.01	<0.0005
	SD		-	-	-	-	0	0	-	-
	PRSD		-	-	-	-	-	-	-	-
Cross Lake (Rep 1)	UDS004-SURF	26-Jun-08	<0.0001	<0.0006	0.0280	<0.0002	0.0007	0.002	<0.01	0.0005
Cross Lake (Rep 2)	TFS013-SURF	26-Jun-08	<0.0001	<0.0006	0.0303	<0.0002	0.0007	0.002	<0.01	0.0006
Cross Lake (Rep 3)	TFS014-SURF	26-Jun-08	<0.0001	<0.0006	0.0265	<0.0002	0.0007	0.002	0.01	0.0005
	Mean		<0.0001	<0.0006	0.0283	<0.0002	0.0007	0.002	<0.01	0.0005
	SD		-	-	0.0019	-	0.0000	0.000	-	0.0001
	PRSD		-	-	7	-	0	-	-	-
Summer										
Manigotagan Lake (Rep 1)	RAS155-SURF	13-Aug-08	<0.0001	<0.0006	0.0020	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Manigotagan Lake (Rep 2)	PFS095-SURF	13-Aug-08	<0.0001	<0.0006	0.0015	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Manigotagan Lake (Rep 3)	PFS096-SURF	13-Aug-08	<0.0001	<0.0006	0.0014	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	Mean		<0.0001	<0.0006	0.0016	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	SD		-	-	0.0003	-	-	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Gauer Lake (Rep 1)	FAS007-SURF	13-Aug-08	<0.0001	<0.0006	<0.0009	<0.0002	0.0002	<0.001	0.02	<0.0004
Gauer Lake (Rep 2)	TFS013-SURF	13-Aug-08	<0.0001	<0.0006	0.0009	<0.0002	0.0001	<0.001	<0.01	<0.0004
Gauer Lake (Rep 3)	TFS013-SURF	13-Aug-08	<0.0001	<0.0006	0.0011	<0.0002	0.0001	<0.001	<0.01	<0.0004
	Mean		<0.0001	<0.0006	0.0008	<0.0002	0.0001	<0.001	<0.01	<0.0004
	SD		-	-	-	-	0.0001	-	-	-
	PRSD		-	-	-	-	-	-	-	-

Table 2-17. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Hardness as $CaCO_3$ (mg/L)
Method Detection Limit									*0.3*
Fall									
Upper Nelson River	Setting Lake (Rep 1)	TCS006-SURF	0809JHS300	L685087-1	18-Sep-08	12:35	Surface	0.3	74.5
	Setting Lake (Rep 2)	TFS013-SURF	0809JHS308	L685087-5	18-Sep-08	8:00	Surface	0.3	71.9
	Setting Lake (Rep 3)	TFS014-SURF	0809JHS309	L685087-6	18-Sep-08	11:40	Surface	0.3	73.7
		Mean							73.4
		SD							1.3
		PRSD							2
Lower Nelson River	Hayes River (Rep 1)	ABS002-SURF	0809JHS208	L685275-2	21-Sep-08	9:55	Surface	0.3	69.8
	Hayes River (Rep 2)	KLS002-SURF	0809JHS214	L685275-4	21-Sep-08	10:10	Surface	0.3	71.0
	Hayes River (Rep 3)	KLS003-SURF	0809JHS215	L685275-5	21-Sep-08	10:20	Surface	0.3	71.2
		Mean							70.7
		SD							0.8
		PRSD							1
Winter									
Winnipeg River	Lac Du Bonnet (Rep 1)	PFS093-SURF	0903JH0160	L738178-1	1-Mar-09	13:20	Surface	0.3	47.8
	Lac Du Bonnet (Rep 2)	PFS095-SURF	0903JH0163	L738178-4	1-Mar-09	13:40	Surface	0.3	45.7
	Lac Du Bonnet (Rep 3)	PFS096-SURF	0903JH0164	L738178-5	1-Mar-09	13:55	Surface	0.3	47.2
		Mean							46.9
		SD							1.1
		PRSD							2
Upper Nelson River	Setting Lake (Rep 1)	TCS006-SURF	0903JH0217	L739152-2	3-Mar-09	13:30	Surface	0.3	114
	Setting Lake (Rep 2)	TFS013-SURF	0903JH0221	L739152-5	3-Mar-09	13:30	Surface	0.3	101
	Setting Lake (Rep 3)	TFS014-SURF	0903JH0222	L739152-6	3-Mar-09	13:30	Surface	0.3	98.1
		Mean							104
		SD							8.5
		PRSD							8

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)
Method Detection Limit			*0.005*	*0.0005/0.001*	*0.0005*	*0.0003*	*0.001*	*0.0002*	*0.03*	*0.00001*
Fall										
Setting Lake (Rep 1)	TCS006-SURF	18-Sep-08	0.109	<0.001	0.0010	0.0090	<0.001	<0.0002	<0.03	<0.00001
Setting Lake (Rep 2)	TFS013-SURF	18-Sep-08	*0.165*	<0.001	0.0009	0.0091	<0.001	<0.0002	<0.03	0.00002
Setting Lake (Rep 3)	TFS014-SURF	18-Sep-08	0.104	<0.001	0.0010	0.0088	<0.001	<0.0002	<0.03	0.00002
	Mean		0.126	<0.001	0.0010	0.009	<0.001	<0.0002	<0.03	0.00002
	SD		0.034	-	0.0001	0.000	-	-	-	0.00000
	PRSD		**27**	-	-	2	-	-	-	-
Hayes River (Rep 1)	ABS002-SURF	21-Sep-08	0.070	<0.001	<0.0005	0.0069	<0.001	<0.0002	<0.03	<0.00001
Hayes River (Rep 2)	KLS002-SURF	21-Sep-08	0.079	<0.001	<0.0005	0.0071	<0.001	<0.0002	<0.03	<0.00001
Hayes River (Rep 3)	KLS003-SURF	21-Sep-08	0.063	<0.001	<0.0005	0.0067	<0.001	<0.0002	<0.03	<0.00001
	Mean		0.071	<0.001	<0.0005	0.0069	<0.001	<0.0002	<0.03	<0.00001
	SD		0.008		-	0.0002	-	-	-	-
	PRSD		11	-	-	3	-	-	-	-
Winter										
Lac Du Bonnet (Rep 1)	PFS093-SURF	1-Mar-09	0.310	<0.0005	0.0009	0.0121	<0.001	<0.0002	<0.03	0.00010
Lac Du Bonnet (Rep 2)	PFS095-SURF	1-Mar-09	0.299	<0.0005	0.0008	0.0126	<0.001	<0.0002	<0.03	0.00013
Lac Du Bonnet (Rep 3)	PFS096-SURF	1-Mar-09	0.286	<0.0005	0.0008	0.0130	<0.001	<0.0002	<0.03	*0.00005*
	Mean		0.298	<0.0005	0.0008	0.0126	<0.001	<0.0002	<0.03	0.00009
	SD		0.012	-	0.0001	0.0005	-	-	-	0.00004
	PRSD		4	-	-	4	-	-	-	**43**
Setting Lake (Rep 1)	TCS006-SURF	3-Mar-09	0.113	0.0006	0.0014	0.0122	<0.001	<0.0002	<0.03	0.00002
Setting Lake (Rep 2)	TFS013-SURF	3-Mar-09	0.117	<0.0005	0.0012	0.0105	<0.001	<0.0002	<0.03	0.00002
Setting Lake (Rep 3)	TFS014-SURF	3-Mar-09	0.121	<0.0005	0.0011	0.0106	<0.001	<0.0002	<0.03	0.00001
	Mean		0.117	<0.0005	0.0012	0.0111	<0.001	<0.0002	<0.03	0.00002
	SD		0.004	-	0.0002	0.0010	-	-	-	0.00001
	PRSD		3	-	-	9	-	-	-	-

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)
Method Detection Limit			*0.1*	*0.0001*	*0.2*	*0.001*	*0.0002*	*0.001*	*0.02*	*0.0005*
Fall										
Setting Lake (Rep 1)	TCS006-SURF	18-Sep-08	18.4	<0.0001	2.5	0.001	<0.0002	0.001	*0.17*	<0.0005
Setting Lake (Rep 2)	TFS013-SURF	18-Sep-08	17.9	<0.0001	2.6	0.001	<0.0002	0.001	0.08	<0.0005
Setting Lake (Rep 3)	TFS014-SURF	18-Sep-08	18.2	<0.0001	2.7	0.002	<0.0002	0.002	0.09	<0.0005
	Mean		18.2	<0.0001	2.6	0.001	<0.0002	0.001	0.11	<0.0005
	SD		0.3	-	0.1	0.001	-	0.001	0.05	-
	PRSD		1	-	4	-	-	-	-	-
Hayes River (Rep 1)	ABS002-SURF	21-Sep-08	21.1	<0.0001	1.0	0.002	<0.0002	<0.001	0.17	<0.0005
Hayes River (Rep 2)	KLS002-SURF	21-Sep-08	21.9	<0.0001	1.0	0.002	<0.0002	<0.001	0.20	<0.0005
Hayes River (Rep 3)	KLS003-SURF	21-Sep-08	21.4	<0.0001	1.1	0.001	<0.0002	<0.001	0.18	<0.0005
	Mean		21.5	<0.0001	1.0	0.002	<0.0002	<0.001	0.18	<0.0005
	SD		0.4	-	0.1	0.001	-	-	0.02	-
	PRSD		2	-	-	-	-	-	8	-
Winter										
Lac Du Bonnet (Rep 1)	PFS093-SURF	1-Mar-09	12.9	<0.0001	1.7	<0.001	<0.0002	0.002	0.28	0.0005
Lac Du Bonnet (Rep 2)	PFS095-SURF	1-Mar-09	12.4	<0.0001	1.6	<0.001	<0.0002	0.002	0.28	<0.0005
Lac Du Bonnet (Rep 3)	PFS096-SURF	1-Mar-09	13.0	<0.0001	1.7	<0.001	<0.0002	0.002	0.26	<0.0005
	Mean		12.8	<0.0001	1.7	<0.001	<0.0002	0.002	0.27	<0.0005
	SD		0.3	-	0.1	-	-	0	0.01	-
	PRSD		3	-	3	-	-	-	4	-
Setting Lake (Rep 1)	TCS006-SURF	3-Mar-09	27.7	<0.0001	2.9	<0.001	<0.0002	0.002	0.06	<0.0005
Setting Lake (Rep 2)	TFS013-SURF	3-Mar-09	24.6	<0.0001	2.9	0.001	<0.0002	0.002	0.06	<0.0005
Setting Lake (Rep 3)	TFS014-SURF	3-Mar-09	23.6	<0.0001	3.0	0.002	<0.0002	0.002	0.06	<0.0005
	Mean		25.3	<0.0001	2.9	0.001	<0.0002	0.002	0.06	<0.0005
	SD		2.1	-	0.1	-	-	0	0	-
	PRSD		8	-	2	-	-	-	-	-

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)
Method Detection Limit			*0.01*	*0.0003*	*0.00005*	*0.0002*	*0.002*	*0.05*	*0.1*
Fall									
Setting Lake (Rep 1)	TCS006-SURF	18-Sep-08	6.92	0.0088	<0.00005	<0.0002	<0.002	<0.05	0.9
Setting Lake (Rep 2)	TFS013-SURF	18-Sep-08	6.59	0.0094	<0.00005	<0.0002	<0.002	<0.05	0.9
Setting Lake (Rep 3)	TFS014-SURF	18-Sep-08	6.86	0.0090	<0.00005	<0.0002	<0.002	<0.05	0.9
	Mean		6.79	0.0091	<0.00005	<0.0002	<0.002	<0.05	0.9
	SD		0.18	0.0003	-	-	-	-	0.0
	PRSD		3	3	-	-	-	-	0
Hayes River (Rep 1)	ABS002-SURF	21-Sep-08	4.18	0.0186	<0.00005	<0.0002	<0.002	<0.05	0.5
Hayes River (Rep 2)	KLS002-SURF	21-Sep-08	3.99	0.0188	<0.00005	<0.0002	<0.002	<0.05	0.4
Hayes River (Rep 3)	KLS003-SURF	21-Sep-08	4.29	0.0172	<0.00005	<0.0002	<0.002	<0.05	0.5
	Mean		4.15	0.0182	<0.00005	<0.0002	<0.002	<0.05	0.5
	SD		0.15	0.0009	-	-	-	-	0.1
	PRSD		4	5	-	-	-	-	12
Winter									
Lac Du Bonnet (Rep 1)	PFS093-SURF	1-Mar-09	3.78	0.0088	<0.00005	<0.0002	<0.002	<0.05	1.0
Lac Du Bonnet (Rep 2)	PFS095-SURF	1-Mar-09	3.57	0.0085	<0.00005	<0.0002	<0.002	<0.05	0.9
Lac Du Bonnet (Rep 3)	PFS096-SURF	1-Mar-09	3.56	0.0099	<0.00005	<0.0002	<0.002	0.07	1.0
	Mean		3.64	0.0091	<0.00005	<0.0002	<0.002	<0.05	1.0
	SD		0.12	0.0007	-	-	-	-	0.1
	PRSD		3	8	-	-	-	-	6
Setting Lake (Rep 1)	TCS006-SURF	3-Mar-09	11.00	0.0039	<0.00005	<0.0002	<0.002	<0.05	1.4
Setting Lake (Rep 2)	TFS013-SURF	3-Mar-09	9.76	0.0033	<0.00005	<0.0002	<0.002	<0.05	1.3
Setting Lake (Rep 3)	TFS014-SURF	3-Mar-09	9.51	0.0027	<0.00005	<0.0002	<0.002	<0.05	1.3
	Mean		10.09	0.0033	<0.00005	<0.0002	<0.002	<0.05	1.3
	SD		0.80	0.0006	-	-	-	-	0.1
	PRSD		8	18	-	-	-	-	4

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit			*0.0002*	*0.001*	*0.0001*	*0.03*	*0.0001*	*2/9*	*0.001*
Fall									
Setting Lake (Rep 1)	TCS006-SURF	18-Sep-08	0.0012	<0.001	0.0002	2.95	0.0376	3	<0.001
Setting Lake (Rep 2)	TFS013-SURF	18-Sep-08	0.0011	<0.001	<0.0001	2.86	0.0360	2	<0.001
Setting Lake (Rep 3)	TFS014-SURF	18-Sep-08	0.0012	<0.001	<0.0001	2.91	0.0365	3	<0.001
	Mean		0.0012	<0.001	<0.0001	2.91	0.0367	3	<0.001
	SD		0.0001	-	-	0.05	0.0008	1	-
	PRSD		5	-	-	2	2	-	-
Hayes River (Rep 1)	ABS002-SURF	21-Sep-08	0.0009	<0.001	<0.0001	1.29	0.0284	<2	<0.001
Hayes River (Rep 2)	KLS002-SURF	21-Sep-08	0.0008	<0.001	<0.0001	1.41	0.0291	<2	<0.001
Hayes River (Rep 3)	KLS003-SURF	21-Sep-08	0.0008	<0.001	<0.0001	1.25	0.0284	<2	<0.001
	Mean		0.0008	<0.001	<0.0001	1.32	0.0286	<2	<0.001
	SD		0.0001	-	-	0.08	0.0004	-	-
	PRSD		-	-	-	6	1	-	-
Winter									
Lac Du Bonnet (Rep 1)	PFS093-SURF	1-Mar-09	0.0017	<0.001	<0.0001	2.730	0.0242	7	<0.001
Lac Du Bonnet (Rep 2)	PFS095-SURF	1-Mar-09	0.0017	<0.001	<0.0001	2.600	0.0230	7	<0.001
Lac Du Bonnet (Rep 3)	PFS096-SURF	1-Mar-09	0.0017	<0.001	<0.0001	2.900	0.0223	5	<0.001
	Mean		0.0017	<0.001	<0.0001	2.743	0.0232	6	<0.001
	SD		0.0000	-	-	0.150	0.0010	1	-
	PRSD		0	-	-	5	4	-	-
Setting Lake (Rep 1)	TCS006-SURF	3-Mar-09	0.0015	0.001	<0.0001	4.62	0.0557	5	<0.001
Setting Lake (Rep 2)	TFS013-SURF	3-Mar-09	0.0012	0.001	<0.0001	4.11	0.0480	4	<0.001
Setting Lake (Rep 3)	TFS014-SURF	3-Mar-09	0.0013	<0.001	<0.0001	4.01	0.0483	7	<0.001
	Mean		0.0013	0.001	<0.0001	4.25	0.0507	5	<0.001
	SD		0.0002	0	-	0.33	0.0044	2	-
	PRSD		11	-	-	8	9	-	-

Table 2-17. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit			*0.0001*	*0.0006*	*0.0009*	*0.0002*	*0.0001*	*0.001*	*0.01*	*0.0004*
Fall										
Setting Lake (Rep 1)	TCS006-SURF	18-Sep-08	0.0002	0.0011	0.0019	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Setting Lake (Rep 2)	TFS013-SURF	18-Sep-08	0.0001	0.0010	0.0017	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Setting Lake (Rep 3)	TFS014-SURF	18-Sep-08	<0.0001	0.0010	0.0023	<0.0002	<0.0001	0.001	<0.01	<0.0004
	Mean		0.0001	0.0010	0.0020	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	SD		-	0.0001	0.0003	-	-	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Hayes River (Rep 1)	ABS002-SURF	21-Sep-08	<0.0001	0.0010	0.0026	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Hayes River (Rep 2)	KLS002-SURF	21-Sep-08	<0.0001	<0.0006	0.0031	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Hayes River (Rep 3)	KLS003-SURF	21-Sep-08	<0.0001	*0.0027*	0.0026	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	Mean		<0.0001	0.0013	0.0028	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	SD		-	-	0.0003	-	-	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Winter										
Lac Du Bonnet (Rep 1)	PFS093-SURF	1-Mar-09	<0.0001	*0.0057*	0.0105	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Lac Du Bonnet (Rep 2)	PFS095-SURF	1-Mar-09	<0.0001	<0.0006	0.0093	<0.0002	<0.0001	<0.001	<0.01	<0.0004
Lac Du Bonnet (Rep 3)	PFS096-SURF	1-Mar-09	<0.0001	<0.0006	0.0106	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	Mean		<0.0001	<0.0006	0.0101	<0.0002	<0.0001	<0.001	<0.01	<0.0004
	SD		-	-	0.0007	-	-	-	-	-
	PRSD		-	-	7	-	-	-	-	-
Setting Lake (Rep 1)	TCS006-SURF	3-Mar-09	<0.0001	0.0018	0.0018	<0.0002	0.0002	<0.001	<0.01	<0.0004
Setting Lake (Rep 2)	TFS013-SURF	3-Mar-09	<0.0001	0.0010	0.0018	<0.0002	0.0001	<0.001	<0.01	<0.0004
Setting Lake (Rep 3)	TFS014-SURF	3-Mar-09	<0.0001	0.0016	0.0014	<0.0002	0.0001	<0.001	<0.01	0.0005
	Mean		<0.0001	0.0015	0.0017	<0.0002	0.0001	<0.001	<0.01	<0.0004
	SD		-	0.0004	0.0002	-	0.0001	-	-	-
	PRSD		-	-	-	-	-	-	-	-

Table 2-18. Concentrations of routine, bacterial, and productivity parameters measured in triplicate samples collected from surface waters during the 2009/2010 CAMPP water quality program. Percent relative standard deviations (PRSD) were calculated for triplicate samples; values greater than 18% are indicated in red. Relative percent mean differences (RPMD) were calculated for duplicate samples; values greater than 25% are indicated in red. Measurements in blue italics are considered "suspect".

							Alkalinity			
Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)
Method Detection Limit						*OW*[1]	*1.0*	*2.0*	*0.60*	*0.40*
						IC[2]	*1.0*	*2.0*	*0.60*	*0.40*
Spring										
Winnipeg River	Winnipeg River-Rep 1	PFS094-SURF	0905JH0816	L764834-7	19-May-09	9:05	45.2	55.1	<0.60	<0.40
	Winnipeg River-Rep 2	PFS095-SURF	0905JH0818	L764834-10	19-May-09	9:30	43.0	52.5	<0.60	<0.40
	Winnipeg River-Rep 3	PFS096-SURF	0905JH0819	L764834-12	19-May-09	10:00	43.1	52.6	<0.60	<0.40
		Mean					43.8	53.4	<0.60	<0.40
		SD					1.24	1.47	-	-
		PRSD					3	3	-	-
Upper Churchill River	Granville Lake- Rep 1	EBS043-SURF	0906JH1102	L783470-1	24-Jun-09	16:00	28.4	34.6	<0.60	<0.40
	Granville Lake- Rep 2	TFS013-SURF	0906JH1110	L783459-1	24-Jun-09	16:00	28.5	34.8	<0.60	<0.40
	Granville Lake- Rep 3	TFS014-SURF	0906JH1111	L783459-2	24-Jun-09	16:00	28.5	34.8	<0.60	<0.40
		Mean					28.5	34.7	<0.60	<0.40
		SD					0.06	0.12	-	-
		PRSD					0	0	-	-
Lower Churchill River	Partridge Breast Lake- Rep 1	FAS009-SURF	0906JH1017	L786186-4	1-Jul-09	9:15	66.5	81.1	<0.60	<0.40
	Partridge Breast Lake- Rep 2	KLS002-SURF	0906JH1024	L786186-6	1-Jul-09	9:40	66.3	80.9	<0.60	<0.40
	Partridge Breast Lake- Rep 3	KLS003-SURF	0906JH1025	L786186-7	1-Jul-09	10:00	66.5	79.1	0.98	<0.40
		Mean					66.4	80.4	<0.60	<0.40
		SD					0.1	1.1	-	-
		PRSD					0	1	-	-
Summer										
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	0907JH1287	L799503-1	30-Jul-09	7:37	41.3	50.4	<0.60	<0.40
	Lac Du Bonnet- Rep 2	PFS095-SURF	0907JH1290	L799503-4	30-Jul-09	7:37	41.3	50.4	<0.60	<0.40
	Lac Du Bonnet- Rep 3	PFS096-SURF	0907JH1291	L799503-5	30-Jul-09	7:37	41.3	50.4	<0.60	<0.40
		Mean					41.3	50.4	<0.60	<0.40
		SD					0.0	0.0	-	-
		PRSD					0	0	-	-

Table 2-18. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Alkalinity Bicarbonate (HCO_3) (mg/L)	Alkalinity Carbonate (CO_3) (mg/L)	Alkalinity Hydroxide (OH) (mg/L)
Method Detection Limit						*OW*[1]	*1.0*	*2.0*	*0.60*	*0.40*
						IC [2]	*1.0*	*2.0*	*0.60*	*0.40*
Summer										
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	JH1320	L801714-1	5-Aug-09	8:40	106	129	<0.60	<0.40
	Assean Lake- Rep 2	KLS002-SURF	JH1331	L801714-6	5-Aug-09	8:40	106	130	<0.60	<0.40
	Assean Lake- Rep 3	KLS003-SURF	JH1332	L801714-7	5-Aug-09	8:40	111	134	0.72	<0.40
		Mean					108	131	<0.60	<0.40
		SD					3	3	-	-
		PRSD					3	2	-	-
Upper Nelson River	Playgreen Lake- Rep 1	UBS015-SURF	0908JH1461	L804021-3	11-Aug-09	10:06	99.0	118	1.37	<0.40
	Playgreen Lake- Rep 2	TFS013-SURF	0908JH1465	L804029-1	11-Aug-09	9:00	99.0	118	1.18	<0.40
		Mean					99.0	118	1.28	<0.40
		RPMD					0	0	-	-
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	0908JH1454	L804021-1	11-Aug-09	8:20	67.6	82.5	<0.60	<0.40
	Setting Lake- Rep 2	TFS014-SURF	0908JH1464	L804029-2	11-Aug-09	10:30	67.5	82.4	<0.60	<0.40
		Mean					67.6	82.5	<0.60	<0.40
		RPMD					0	0	-	-
Fall										
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	JH1536	L819356-1	16-Sep-09	8:30	39.1	47.7	<0.60	<0.40
	Lac Du Bonnet- Rep 2	PFS095-SURF	JH1539	L819356-4	16-Sep-09	8:30	38.8	47.4	<0.60	<0.40
	Lac Du Bonnet- Rep 3	PFS096-SURF	JH1540	L819356-5	16-Sep-09	8:30	39.2	47.8	<0.60	<0.40
		Mean					39.0	47.6	<0.60	<0.40
		SD					0.2	0.2	-	-
		PRSD					1	0	-	-
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	JH1570	L816365-2	9-Sep-09	8:25	119	138	3.86	<0.40
	Assean Lake- Rep 2	KLS002-SURF	JH1580	L816365-5	9-Sep-09	8:25	114	137	***1.18***	<0.40
	Assean Lake- Rep 3	KLS003-SURF	JH1581	L816365-6	9-Sep-09	8:25	115	133	3.86	<0.40
		Mean					116	136	2.97	<0.40
		SD					3	3	-	-
		PRSD					2	2	-	-

Table 2-18. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Alkalinity Bicarbonate (HCO_3) (mg/L)	Alkalinity Carbonate (CO_3) (mg/L)	Alkalinity Hydroxide (OH) (mg/L)
Method Detection Limit						*OW*[1]	*1.0*	*2.0*	*0.60*	*0.40*
						IC[2]	*1.0*	*2.0*	*0.60*	*0.40*
Fall										
Upper Churchill River	Granville Lake- Rep 1	EBS043-SURF	0909JH1680	L819429-1	16-Sep-09	13:50	41.5	50.6	<0.60	<0.40
	Granville Lake- Rep 2	TFS013-SURF	0909JH1690	L819429-8	16-Sep-09	14:25	41.1	50.2	<0.60	<0.40
	Granville Lake- Rep 3	TFS014-SURF	0909JH1691	L819429-9	16-Sep-09	14:45	41.1	50.2	<0.60	<0.40
		Mean					41.2	50.3	<0.60	<0.40
		SD					0.2	0.2	-	-
		PRSD					1	0	-	-
Winter										
Upper Churchill River	South Indian Lake- Area 1- Rep 1	ECS005-SURF	1003JH0322	L867273-4	5-Mar-10	9:15	35.4	43.2	<0.60	<0.40
	South Indian Lake- Area 1- Rep 2	ABS003-SURF	1003JH0348	L867273-8	5-Mar-10	9:15	35.4	43.2	<0.60	<0.40
	South Indian Lake- Area 1- Rep 3	ABS004-SURF	1003JH0349	L867273-9	5-Mar-10	9:15	35.4	43.2	<0.60	<0.40
		Mean					35.4	43.2	<0.60	<0.40
		SD					0.0	0.0	-	-
		PRSD					0	0	-	-
Lower Nelson River	Limestone Forebay- Rep 1	UHS004-SURF	1003JH0350	L866373-7	2-Mar-10	13:18	88.2	108	<0.60	<0.40
	Limestone Forebay- Rep 2	TFS013-SURF	1003JH0344	L866373-5	2-Mar-10	13:18	88.2	108	<0.60	<0.40
	Limestone Forebay- Rep 3	TFS014-SURF	1003JH0345	L866373-6	2-Mar-10	13:18	88.2	108	<0.60	<0.40
		Mean					88.2	108	<0.60	<0.40
		SD					0.0	0.0	-	-
		PRSD					0	0	-	-
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	1003JH0296	L866769-1	3-Mar-10	14:21	165	202	<0.60	<0.40
	Assean Lake- Rep 2	FAS010-SURF	1003JH0346	L866769-14	3-Mar-10	14:21	167	203	<0.60	<0.40
	Assean Lake- Rep 3	FAS011-SURF	1003JH0347	L866769-15	3-Mar-10	14:21	166	202	<0.60	<0.40
		Mean					166	202	<0.60	<0.40
		SD					1.0	0.6	-	-
		PRSD					1	0	-	-

Table 2-18. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Alkalinity Bicarbonate (HCO_3) (mg/L)	Alkalinity Carbonate (CO_3) (mg/L)	Alkalinity Hydroxide (OH) (mg/L)
Method Detection Limit						*OW*[1]	*1.0*	*2.0*	*0.60*	*0.40*
						IC [2]	*1.0*	*2.0*	*0.60*	*0.40*
Winter										
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	1003JH0184	L869032-1	12-Mar-10	15:10	43.1	52.6	<0.60	<0.40
	Lac Du Bonnet- Rep 2	PFS095-SURF	1003JH0187	L869032-3	12-Mar-10	15:10	44.1	53.8	<0.60	<0.40
	Lac Du Bonnet- Rep 3	PFS096-SURF	1003JH0188	L869032-4	12-Mar-10	15:10	42.0	51.2	<0.60	<0.40
		Mean					43.1	52.5	<0.60	<0.40
		SD					1.1	1.3	-	-
		PRSD					2	2	-	-
Saskatchewan River	Cormorant Lake- Rep 1	KKS038-SURF	1003JH0214	L869032-11	12-Mar-10	10:00	175	206	4.06	<0.40
	Cormorant Lake- Rep 2	KLS002-SURF	1003JH0240	L869032-9	12-Mar-10	10:00	175	206	3.99	<0.40
	Cormorant Lake- Rep 3	KLS003-SURF	1003JH0241	L869032-10	12-Mar-10	10:00	175	206	3.93	<0.40
		Mean					175	206	3.99	<0.40
		SD					0.0	0.0	0.07	-
		PRSD					0	0	2	-
Lake Winnipeg	Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	1003JH0209	L867290-3	7-Mar-10	12:55	193	228	3.99	<0.40
	Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	1003JH0256	L867290-13	7-Mar-10	12:55	193	226	4.65	<0.40
	Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	1003JH0257	L867290-14	7-Mar-10	12:55	193	226	4.71	<0.40
		Mean					193	227	4.45	<0.40
		SD					0.0	1.2	0.40	-
		PRSD					0	1	9	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW*[1]	*0.0030*	*0.0050*	*0.20*	*0.0010*	*0.0010*	*0.0010*	*1.0*	*1.0*	*1.0*
		IC [2]	*0.050*	*0.050*	*0.20*	*0.0030*	*0.0030*	*0.0030*	*1.0*	*1.0*	*1.0*
Spring											
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	0.0060	0.0470	0.31	0.0152	0.0100	0.0253	10.9	10.9	9.1
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	<0.0030	0.0500	0.37	0.0139	0.0082	0.0221	10.9	10.8	9.2
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	<0.0030	0.0600	0.31	0.0145	0.0121	0.0266	11.0	11.0	9.1
	Mean		0.0060	0.0523	0.33	0.0145	0.0101	0.0247	10.9	10.9	9.1
	SD		-	0.0068	-	0.0007	0.0020	0.0023	0.1	0.1	0.1
	PRSD		-	13	-	4	**19**	9	1	1	1
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	0.0059	<0.0050	<0.20	0.0056	0.0062	0.0118	8.2	8.3	5.8
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	0.0099	0.0120	<0.20	0.0056	0.0068	0.0124	7.7	8.2	5.8
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	0.0074	<0.0050	<0.20	0.0060	0.0055	0.0115	8.2	8.5	5.8
	Mean		0.0077	<0.0050	<0.20	0.0057	0.0062	0.0119	8.0	8.3	5.8
	SD		-	-	-	0.0002	0.0007	0.0005	0.3	0.2	0.0
	PRSD		-	-	-	4	11	4	4	2	0
Partridge Breast L- Rep 1	FAS009-SURF	1-Jul-09	***0.0900***	0.0062	0.31	0.0054	0.0042	0.0096	6.4	6.3	15.5
Partridge Breast L- Rep 2	KLS002-SURF	1-Jul-09	0.0470	<0.0050	0.26	0.0060	0.0056	0.0116	6.0	5.5	15.7
Partridge Breast L- Rep 3	KLS003-SURF	1-Jul-09	0.0530	<0.0050	0.29	0.0062	0.0075	0.0137	5.6	5.7	15.5
	Mean		0.0633	<0.0050	0.29	0.0059	0.0058	0.0116	6.0	5.8	15.6
	SD		0.0511	-	-	0.0004	-	0.0021	0.4	0.4	0.1
	PRSD		**81**	-	-	7	-	18	7	7	1
Summer											
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	0.0088	0.0180	0.48	0.0153	0.0076	0.0229	10.7	10.5	8.9
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	0.0118	0.0150	0.47	0.0135	0.0092	0.0227	10.9	10.1	8.8
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	0.0138	0.0150	0.47	0.0107	0.0117	0.0224	10.8	10.1	8.7
	Mean		0.0115	0.0160	0.47	0.0132	0.0095	0.0227	10.8	10.2	8.8
	SD		-	-	-	0.0023	0.0021	0.0003	0.1	0.2	0.1
	PRSD		-	-	-	18	**22**	1	1	2	1

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW*[1]	*0.0030*	*0.0050*	*0.20*	*0.0010*	*0.0010*	*0.0010*	*1.0*	*1.0*	*1.0*
		IC[2]	*0.050*	*0.050*	*0.20*	*0.0030*	*0.0030*	*0.0030*	*1.0*	*1.0*	*1.0*
Summer											
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	0.0780	<0.0050	0.53	0.0131	0.0119	0.0250	12.4	11.8	24.3
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	0.0400	<0.0050	0.47	0.0122	0.0102	0.0224	11.7	11.8	24.5
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	0.0170	<0.0050	0.44	*0.0084*	0.0144	0.0228	10.9	10.8	25.3
	Mean		0.0450	<0.0050	0.48	0.0112	0.0122	0.0234	11.7	11.5	24.7
	SD		0.0308	-	-	0.0025	0.0021	0.0014	0.8	0.6	0.5
	PRSD		**68**	-	-	**22**	17	6	6	5	2
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	0.0059	0.0069	0.61	0.0182	0.0262	0.0444	8.3	7.8	23.8
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	0.0059	0.0067	0.61	0.0164	0.0299	0.0463	8.2	8.3	23.7
	Mean		0.0059	0.0068	0.61	0.0173	0.0281	0.0454	8.3	8.1	23.8
	RPMD		-	-	-	10	13	4	1	6	0
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	0.0089	<0.0050	0.64	0.0089	0.0117	0.0206	16.1	15.4	15.8
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	0.0069	<0.0050	0.64	0.0092	0.0112	0.0204	16.5	15.5	15.5
	Mean		0.0079	<0.0050	0.64	0.0091	0.0115	0.0205	16.3	15.5	15.7
	RPMD		-	-	-	3	4	1	2	1	2
Fall											
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	0.0048	0.0423	0.37	0.0164	0.0115	0.0279	11.4	11.1	8.6
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	0.0055	0.0390	0.22	0.0217	0.0054	0.0271	11.4	11.1	8.6
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	0.0045	0.0370	<0.20	0.0186	0.0085	0.0271	11.4	11.2	8.6
	Mean		0.0049	0.0394	0.23	0.0189	0.0085	0.0274	11.4	11.1	8.6
	SD		0.0005	0.0027	-	0.0027	0.0031	0.0005	0.0	0.1	0.0
	PRSD		10	7	-	14	**36**	2	0	1	0
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	0.0128	0.0050	0.43	0.0064	0.0085	0.0149	10.9	10.8	27.1
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	0.0108	<0.0050	0.44	0.0073	0.0083	0.0156	10.7	10.9	26.2
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	0.0098	<0.0050	0.39	0.0062	0.0104	0.0166	11.0	11.1	26.2
	Mean		0.0111	<0.0050	0.42	0.0066	0.0091	0.0157	10.9	10.9	26.5
	SD		-	-	-	0.0006	0.0012	0.0009	0.2	0.2	0.5
	PRSD		-	-	-	9	13	5	1	1	2

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW [1]*	*0.0030*	*0.0050*	*0.20*	*0.0010*	*0.0010*	*0.0010*	*1.0*	*1.0*	*1.0*
		IC [2]	*0.050*	*0.050*	*0.20*	*0.0030*	*0.0030*	*0.0030*	*1.0*	*1.0*	*1.0*
Fall											
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	0.0037	<0.0050	0.20	0.0084	0.0094	0.0178	7.0	8.3	10.1
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	0.0052	<0.0050	<0.20	0.0099	0.0087	0.0186	8.0	7.9	9.5
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	0.0039	<0.0050	<0.20	0.0100	0.0087	0.0187	7.9	8.2	9.5
	Mean		0.0043	<0.0050	<0.20	0.0094	0.0089	0.0184	7.6	8.1	9.7
	SD		-	-	-	0.001	0.000	0.0005	0.6	0.2	0.3
	PRSD		-	-	-	10	5	3	7	3	4
Winter											
SIL- Area 1- Rep 1	ECS005-SURF	5-Mar-10	<0.050	0.063	0.42	0.0124	<0.0030	0.0140	7.0	7.7	8.5
SIL - Area 1- Rep 2	ABS003-SURF	5-Mar-10	<0.050	0.064	0.41	0.0148	<0.0030	0.0139	6.9	7.5	8.1
SIL - Area 1- Rep 3	ABS004-SURF	5-Mar-10	<0.050	0.062	0.43	0.0140	<0.0030	0.0154	6.6	7.5	8.3
	Mean		<0.050	0.063	0.42	0.0137	<0.0030	0.0144	6.8	7.6	8.3
	SD		-	0.001	0.01	0.0012	-	0.0008	0.2	0.1	0.2
	PRSD		-	-	-	-	-	-	3	2	2
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	<0.050	0.137	0.50	0.0380	0.0099	0.0479	8.5	8.9	19.9
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	<0.050	0.144	0.58	0.0380	0.0131	0.0511	8.5	9.1	20.1
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	<0.050	0.138	0.48	0.0392	0.0139	0.0531	9.0	9.2	20.5
	Mean		<0.050	0.140	0.52	0.0384	0.0123	0.0507	8.7	9.1	20.2
	SD		-	0.004	0.05	0.0007	0.0021	0.0026	0.3	0.2	0.3
	PRSD		-	-	-	2	-	5	3	2	2
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	<0.050	<0.050	0.52	0.0189	<0.0030	0.0198	11.8	12.5	39.7
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	<0.050	0.054	0.51	0.0156	<0.0030	0.0182	12.0	12.7	38.6
Assean Lake- Rep 3	FAS011-SURF	3-Mar-10	<0.050	0.115	0.47	0.0178	0.0091	0.0180	12.6	12.8	39.9
	Mean		<0.050	0.065	0.50	0.0174	0.0040	0.0187	12.1	12.7	39.4
	SD		-	0.046	0.03	0.0017	0.0044	0.0010	0.4	0.2	0.7
	PRSD		-	-	-	10	-	5	3	1	2

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW* [1]	*0.0030*	*0.0050*	*0.20*	*0.0010*	*0.0010*	*0.0010*	*1.0*	*1.0*	*1.0*
		IC [2]	*0.050*	*0.050*	*0.20*	*0.0030*	*0.0030*	*0.0030*	*1.0*	*1.0*	*1.0*
Winter											
Lac Du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	<0.050	0.164	0.46	0.0229	0.0076	0.0305	10.4	10.8	8.7
Lac Du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	<0.050	0.171	0.48	0.0234	0.0059	0.0293	9.9	11.8	9.3
Lac Du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	<0.050	0.144	0.47	0.0238	0.0043	0.0281	10.0	10.0	9.7
	Mean		<0.050	0.160	0.47	0.0234	0.0059	0.0293	10.1	10.9	9.2
	SD		-	0.014	0.01	0.0005	0.0017	0.0012	0.3	0.9	0.5
	PRSD		-	-	-	2	-	4	3	8	5
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	<0.050	<0.050	0.37	*0.0045*	<0.0030	0.0114	6.3	6.9	42.1
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	<0.050	<0.050	0.43	0.0126	<0.0030	0.0121	6.4	6.5	42.2
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	<0.050	<0.050	0.38	0.0105	<0.0030	0.0114	6.6	6.9	42.4
	Mean		<0.050	<0.050	0.39	0.0092	<0.0030	0.0116	6.4	6.8	42.2
	SD		-	-	0.03	0.0042	-	0.0004	0.2	0.2	0.2
	PRSD		-	-	-	-	-	-	2	3	0
Winnipegosis-3- Rep 1	LFS005-SURF	7-Mar-10	<0.050	<0.050	0.72	0.0111	0.0040	0.0151	11.6	13.3	46.7
Winnipegosis-3- Rep 2	UDS018-SURF	7-Mar-10	<0.050	<0.050	0.78	0.0137	<0.0030	0.0143	11.3	12.8	47.0
Winnipegosis-3- Rep 3	UDS019-SURF	7-Mar-10	<0.050	<0.050	0.74	0.0133	0.0032	0.0165	11.7	13.5	46.3
	Mean		<0.050	<0.050	0.75	0.0127	<0.0030	0.0153	11.5	13.2	46.7
	SD		-	-	0.03	0.0014	0.0013	0.0011	0.2	0.4	0.4
	PRSD		-	-	-	-	-	-	2	3	1

Table 2-18. – continued –

			Water Clarity						Bacteria
Sample Location	Sample ID	Sample Date	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (TCU)	pH	Conductivity (µmhos/cm)	*E. coli* (CFU/100 mL)
Method Detection Limit		*OW* [1]	*5.0*	*2.0*	*0.050*	*5.0*	*0.10*	*0.40*	*1/10*
		IC [2]	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Spring									
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	78.0	2.8	4.20	40.0	7.92	94.1	<10
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	66.0	3.2	4.40	35.0	7.90	94.4	<10
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	66.0	4.4	4.40	30.0	7.90	94.3	<10
	Mean		70.0	3.5	4.33	35.0	7.91	94.3	<10
	SD		6.9	0.8	0.115	5.0	0.01	0.15	-
	PRSD		10	-	3	14	0	0	-
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	46.0	<2.0	3.50	50.0	7.64	60.2	<10
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	42.0	4.4	3.50	30.0	7.66	61.3	<10
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	42.0	4.8	3.00	40.0	7.66	60.0	<10
	Mean		43.3	3.4	3.33	40.0	7.65	60.5	<10
	SD		2.3	0.3	0.289	10.0	0.01	0.70	-
	PRSD		5	-	9	-	0	1	-
Partridge Breast Lake- Rep 1	FAS009-SURF	1-Jul-09	90.0	<2.0	4.00	20.0	8.28	132	<1
Partridge Breast Lake- Rep 2	KLS002-SURF	1-Jul-09	86.0	<2.0	3.50	30.0	8.30	132	<1
Partridge Breast Lake- Rep 3	KLS003-SURF	1-Jul-09	92.0	<2.0	4.00	20.0	8.31	131	<1
	Mean		89.3	<2.0	3.83	23.3	8.30	132	<1
	SD		3.1	-	0.289	-	0.02	0.58	-
	PRSD		3	-	8	-	0	0	-
Summer									
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	66.0	4.8	4.60	50.0	7.88	91.7	6
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	66.0	4.8	4.30	50.0	7.92	90.6	3
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	64.0	4.8	4.50	50.0	7.94	90.5	2
	Mean		65.3	4.8	4.47	50.0	7.91	90.9	4
	SD		1.2	0.0	0.153	0.0	0.03	0.67	-
	PRSD		2	-	3	0	0	1	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Water Clarity: Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (TCU)	pH	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
Method Detection Limit		*OW* [1]	*5.0*	*2.0*	*0.050*	*5.0*	*0.10*	*0.40*	*1/10*
		IC [2]	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Summer									
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	138	2.8	11.0	40.0	8.29	196	<1
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	144	2.0	8.50	40.0	8.27	196	2
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	150	17.2	*31.0*	40.0	8.30	195	1
	Mean		144	7.3	16.8	40.0	8.29	196	1
	SD		6.0	8.6	12.3	0.0	0.02	0.58	-
	PRSD		4	-	**73**	0	0	0	-
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	196	19.6	16.0	15.0	8.35	308	3
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	212	16.8	14.0	15.0	8.34	309	<1
	Mean		204	18.2	15.0	15.0	8.35	309	2
	RPMD		8	15	13	-	0	0	-
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	108	3.6	5.50	40.0	8.09	134	<1
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	114	4.4	5.50	50.0	8.08	134	2
	Mean		111	4.0	5.50	45.0	8.09	134	1
	RPMD		5	-	0	22	0	0	-
Fall									
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	72.0	5.2	7.50	40.0	7.97	87.4	44
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	76.0	4.4	7.40	40.0	7.97	87.0	59
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	78.0	8.4	7.30	40.0	7.97	87.2	46
	Mean		75.3	6.0	7.40	40.0	7.97	87.2	50
	SD		3.1	2.1	0.100	0.0	0.00	0.20	8
	PRSD		4	-	1	0	0	0	16
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	142	6.8	6.90	20.0	8.54	226	<1
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	134	4.0	5.60	20.0	8.32	210	<1
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	136	4.4	5.60	15.0	8.54	219	<1
	Mean		137	5.1	6.03	18.3	8.47	218	<1
	SD		4.2	1.5	0.751	-	0.13	8.02	-
	PRSD		3	-	12	-	2	4	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Conductivity (μmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
Method Detection Limit		*OW* [1]	*5.0*	*2.0*	*0.050*	*5.0*	*0.10*	*0.40*	*1/10*
		IC [2]	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Fall									
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	78.0	5.2	7.80	15.0	7.92	84.1	<1
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	78.0	4.8	7.60	15.0	7.98	83.9	<1
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	82.0	6.0	8.10	15.0	7.95	84.1	<1
	Mean		79.3	5.3	7.83	15.0	7.95	84.0	<1
	SD		2.3	0.6	0.252	-	0.03	0.12	-
	PRSD		3	-	3	-	0	0	-
Winter									
South Indian Lake- Area 1- Rep 1	ECS005-SURF	5-Mar-10	58.0	2.4	2.66	15.0	7.62	78.0	<1
South Indian Lake- Area 1- Rep 2	ABS003-SURF	5-Mar-10	58.0	<2.0	1.80	15.0	7.66	78.1	<1
South Indian Lake- Area 1- Rep 3	ABS004-SURF	5-Mar-10	54.0	<2.0	1.76	15.0	7.64	78.1	<1
	Mean		56.7	<2.0	2.07	15.0	7.64	78.1	<1
	SD		2.3	0.8	0.51	0.0	0.02	0.06	-
	PRSD		4	-	**25**	-	0	0	-
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	186	13.2	22.3	20.0	8.08	270	6
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	188	13.2	22.0	20.0	8.05	269	5
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	186	14.0	22.1	20.0	8.05	270	5
	Mean		187	13.5	22.1	20.0	8.06	270	5
	SD		1.2	0.5	0.15	0.0	0.02	0.58	1
	PRSD		1	3	1	-	0	0	11
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	194	<2.0	0.43	15.0	8.18	306	<1
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	196	<2.0	0.44	15.0	8.21	309	<1
Assean Lake- Rep 3	FAS011-SURF	3-Mar-10	192	<2.0	0.43	15.0	8.21	307	<1
	Mean		194	<2.0	0.43	15.0	8.20	307	<1
	SD		2.0	-	0.01	0.0	0.02	1.53	-
	PRSD		1	-	-	-	0	0	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
Method Detection Limit		*OW* [1]	*5.0*	*2.0*	*0.050*	*5.0*	*0.10*	*0.40*	*1/10*
		IC [2]	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Winter									
Lac Du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	76.0	2.0	4.10	40.0	7.69	100	<1
Lac Du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	78.0	<2.0	3.58	40.0	7.69	103	<1
Lac Du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	78.0	<2.0	3.59	40.0	7.69	97	<1
	Mean		77.3	<2.0	3.76	40.0	7.69	100	<1
	SD		1.2	0.6	0.30	0.0	0.00	2.80	-
	PRSD		1	-	8	0	0	3	-
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	192	<2.0	0.30	5.0	8.27	320	<1
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	176	<2.0	1.16	15.0	8.18	320	<1
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	194	<2.0	0.78	5.0	8.26	319	<1
	Mean		187	<2.0	0.75	8.3	8.24	320	<1
	SD		9.9	-	0.43	5.8	0.05	0.58	-
	PRSD		5	-	-	-	1	0	-
Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	7-Mar-10	796	<2.0	0.51	5.0	8.33	1360	<1
Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	7-Mar-10	786	<2.0	0.56	5.0	8.32	1360	<1
Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	7-Mar-10	792	<2.0	0.67	5.0	8.31	1370	<1
	Mean		791	<2.0	0.58	5.0	8.32	1363	<1
	SD		5.0	-	0.08	0.0	0.01	5.77	-
	PRSD		1	-	14	-	0	0	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Productivity: Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa ABS Ratio
Method Detection Limit		*OW* [1]	*0.60/1.0*	*0.60/1.0*	*1.0*
		IC [2]	*0.010 / 0.020 / 0.050*	*0.010 / 0.020 / 0.050*	-
Spring					
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	7.64	1.18	1.6
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	6.87	0.88	1.6
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	6.49	1.79	1.5
	Mean		7.00	1.28	1.6
	SD		0.59	-	-
	PRSD		8	-	-
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	3.4	1.1	1.5
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	3.1	1.8	1.4
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	3.4	1.4	1.5
	Mean		3.3	1.4	1.5
	SD		-	-	-
	PRSD		-	-	-
Partridge Breast Lake- Rep 1	FAS009-SURF	1-Jul-09	2.3	<1.0	1.5
Partridge Breast Lake- Rep 2	KLS002-SURF	1-Jul-09	2.3	<1.0	1.7
Partridge Breast Lake- Rep 3	KLS003-SURF	1-Jul-09	2.3	<1.0	1.7
	Mean		2.3	<1.0	1.6
	SD		-	-	-
	PRSD		-	-	-
Summer					
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	8.0	4.0	1.5
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	8.0	2.9	1.5
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	8.0	3.2	1.5
	Mean		8.0	3.4	1.5
	SD		0.0	-	-
	PRSD		0	-	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Productivity: Chlorophyll *a* (µg/L)	Productivity: Pheophytin (µg/L)	Productivity: ODb/ODa ABS Ratio
Method Detection Limit		*OW* [1]	*0.60/1.0*	*0.60/1.0*	*1.0*
		IC [2]	*0.010 / 0.020 / 0.050*	*0.010 / 0.020 / 0.050*	-
Summer					
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	2.7	1.1	1.5
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	2.3	<1.0	1.5
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	2.3	1.2	1.5
	Mean		2.4	<1.0	1.5
	SD		-	-	-
	PRSD		-	-	-
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	9.2	2.6	1.5
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	5.0	<1.0	1.6
	Mean		7.1	1.6	1.6
	RPMD		**59**	-	-
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	4.6	2.4	1.5
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	7.6	3.1	1.5
	Mean		6.1	2.8	1.5
	RPMD		**49**	-	-
Fall					
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	3.4	3.5	1.3
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	4.6	1.8	1.5
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	4.2	2.7	1.4
	Mean		4.1	2.7	1.4
	SD		-	-	-
	PRSD		-	-	-
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	2.7	1.1	1.5
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	3.8	<1.0	1.7
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	3.8	<1.0	1.7
	Mean		3.4	<1.0	1.6
	SD		-	-	-
	PRSD		-	-	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Productivity: Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa ABS Ratio
Method Detection Limit		*OW* [1]	*0.60/1.0*	*0.60/1.0*	*1.0*
		IC [2]	*0.010 / 0.020 / 0.050*	*0.010 / 0.020 / 0.050*	-
Fall					
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	3.8	2.1	1.5
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	3.4	2.4	1.4
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	3.8	2.3	1.4
	Mean		3.7	2.3	1.4
	SD		-	-	-
	PRSD		-	-	-
Winter					
South Indian Lake- Area 1- Rep 1	ECS005-SURF	5-Mar-10	0.479	0.245	-
South Indian Lake- Area 1- Rep 2	ABS003-SURF	5-Mar-10	0.534	0.225	-
South Indian Lake- Area 1- Rep 3	ABS004-SURF	5-Mar-10	0.486	0.188	-
	Mean		0.500	0.219	-
	SD		0.030	0.029	-
	PRSD		6	13	-
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	0.682	0.731	-
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	0.720	0.857	-
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	0.772	0.869	-
	Mean		0.725	0.819	-
	SD		0.045	0.076	-
	PRSD		6	9	-
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	1.13	0.278	-
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	1.23	0.228	-
Assean Lake- Rep 3	FAS011-SURF	3-Mar-10	1.11	0.200	-
	Mean		1.16	0.235	-
	SD		0.064	0.040	-
	PRSD		6	17	-

Table 2-18. – continued –

Sample Location	Sample ID	Sample Date	Productivity Chlorophyll *a* (µg/L)	Pheophytin (µg/L)	ODb/ODa ABS Ratio
Method Detection Limit		*OW*[1]	*0.60/1.0*	*0.60/1.0*	*1.0*
		IC[2]	*0.010 / 0.020 / 0.050*	*0.010 / 0.020 / 0.050*	-
Winter					
Lac Du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	1.83	0.675	-
Lac Du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	*0.868*	0.723	-
Lac Du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	1.88	0.702	-
	Mean		1.53	0.700	-
	SD		0.570	0.024	-
	PRSD		**37**	3	-
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	0.643	0.181	-
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	0.615	0.153	-
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	0.477	0.142	-
	Mean		0.578	0.159	-
	SD		0.089	0.020	-
	PRSD		15	13	-
Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	7-Mar-10	1.26	0.342	-
Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	7-Mar-10	1.42	*0.625*	-
Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	7-Mar-10	1.39	0.321	-
	Mean		1.36	0.429	-
	SD		0.085	0.170	-
	PRSD		6	**40**	-

[1] Open-water season.

[2] Ice-cover season.

Table 2-19. Concentrations of metals and major ions measured in triplicate samples collected from surface waters during the 2009/2010 CAMPP water quality program. Percent relative standard deviations (PRSD) were calculated for triplicate samples; values greater than 18% are indicated in red. Relative percent mean differences (RPMD) were calculated for duplicate samples; values greater than 25% are indicated in red. Measurements in blue italics are considered "suspect".

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)
Method Detection Limit						*OW*[1]	*0.30*	*0.0050*	*0.00050*
						IC [2]	*0.30*	*0.0050*	*0.00050*
Spring									
Winnipeg River	Winnipeg River-Rep 1	PFS094-SURF	0905JH0816	L764834-7	19-May-09	9:05	47.0	0.363	0.00056
	Winnipeg River-Rep 2	PFS095-SURF	0905JH0818	L764834-10	19-May-09	9:30	47.3	0.400	0.00064
	Winnipeg River-Rep 3	PFS096-SURF	0905JH0819	L764834-12	19-May-09	10:00	46.5	0.392	0.00060
		Mean					46.9	0.385	0.00060
		SD					0.40	0.0195	-
		PRSD					1	5	-
Upper Churchill River	Granville Lake- Rep 1	EBS043-SURF	0906JH1102	L783470-1	24-Jun-09	16:00	27.3	0.137	<0.00050
	Granville Lake- Rep 2	TFS013-SURF	0906JH1110	L783459-1	24-Jun-09	16:00	26.9	0.131	0.00051
	Granville Lake- Rep 3	TFS014-SURF	0906JH1111	L783459-2	24-Jun-09	16:00	27.4	*0.197*	0.00068
		Mean					27.2	0.155	<0.00050
		SD					0.26	0.0365	-
		PRSD					1	**24**	-
Lower Churchill River	Partridge Breast Lake- Rep 1	FAS009-SURF	0906JH1017	L786186	1-Jul-09	9:15	63.7	0.0799	0.00057
	Partridge Breast Lake- Rep 2	KLS002-SURF	0906JH1024	L786186-6	1-Jul-09	9:40	63.5	0.0794	0.00051
	Partridge Breast Lake- Rep 3	KLS003-SURF	0906JH1025	L786186-7	1-Jul-09	9:50	62.2	0.102	<0.00050
		Mean					63.1	0.0871	0.00044
		SD					0.81	0.0129	-
		PRSD					1	15	-
Summer									
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	0907JH1287	L799503-1	30-Jul-09	7:37	45.8	0.242	<0.00050
	Lac Du Bonnet- Rep 2	PFS095-SURF	0907JH1290	L799503-4	30-Jul-09	7:37	45.9	0.224	<0.00050
	Lac Du Bonnet- Rep 3	PFS096-SURF	0907JH1291	L799503-5	30-Jul-09	7:37	46.3	0.236	<0.00050
		Mean					46.0	0.234	<0.00050
		SD					0.26	0.0092	-
		PRSD					1	4	-

Table 2-19. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)
Method Detection Limit						*OW*[1]	*0.30*	*0.0050*	*0.00050*	*0.00050*
						IC [2]	*0.30*	*0.0050*	*0.00050*	*0.00050*
Summer										
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	0907JH1321	L801714-1	5-Aug-09	8:40	125	0.588	0.00064	0.00068
	Assean Lake- Rep 2	KLS002-SURF	0907JH1331	L801714-6	5-Aug-09	8:40	129	0.583	0.00058	0.00064
	Assean Lake- Rep 3	KLS003-SURF	0907JH1332	L801714-7	5-Aug-09	8:40	125	0.520	0.00064	0.00059
		Mean					126	0.564	0.00062	0.00064
		SD					2.31	0.0379	-	-
		PRSD					2	7	-	-
Upper Nelson River	Playgreen Lake- Rep 1	UBS015-SURF	0908JH1461	L804021-3	11-Aug-09	10:06	128	0.545	<0.00050	0.00145
	Playgreen Lake- Rep 2	TFS013-SURF	0908JH1465	L804029-1	11-Aug-09	9:00	82.3	0.375	<0.00050	0.00151
		Mean					105	0.460	<0.00050	0.00148
		RPMD					**43**	**37**	-	-
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	0908JH1454	L804021-1	11-Aug-09	8:20	74.2	0.294	<0.00050	0.00071
	Setting Lake- Rep 2	TFS014-SURF	0908JH1464	L804029-2	11-Aug-09	10:30	143	0.292	<0.00050	0.00083
		Mean					109	0.293	<0.00050	0.00077
		RPMD					**63**	1	-	-
Fall										
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	0909JH1536	L819356-1	16-Sep-09	8:30	44.5	0.427	<0.00050	0.00099
	Lac Du Bonnet- Rep 2	PFS095-SURF	0909JH1539	L819356-4	16-Sep-09	8:30	45.0	0.459	<0.00050	0.00099
	Lac Du Bonnet- Rep 3	PFS096-SURF	0909JH1540	L819356-5	16-Sep-09	8:30	44.1	0.434	<0.00050	0.00097
		Mean					44.5	0.440	<0.00050	0.00098
		SD					0.45	0.0168	-	-
		PRSD					1	4	-	-
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	0909JH1570	L816365-2	9-Sep-09	8:25	129	0.239	<0.00050	0.00063
	Assean Lake- Rep 2	KLS002-SURF	0909JH1580	L816365-5	9-Sep-09	8:25	122	0.246	<0.00050	0.00058
	Assean Lake- Rep 3	KLS003-SURF	0909JH1581	L816365-6	9-Sep-09	8:25	124	0.240	<0.00050	0.00059
		Mean					125	0.242	<0.00050	0.00060
		SD					3.61	0.0038	-	-
		PRSD					3	2	-	-

Table 2-19. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)
Method Detection Limit						*OW[1]*	*0.30*	*0.0050*	*0.00050*	*0.00050*
						IC [2]	*0.30*	*0.0050*	*0.00050*	*0.00050*
Fall										
Upper Churchill River	Granville Lake- Rep 1	EBS043-SURF	0909JH1680	L819429-1	16-Sep-09	13:50	41.1	0.397	<0.00050	<0.00050
	Granville Lake- Rep 2	TFS013-SURF	0909JH1690	L819429-8	16-Sep-09	14:25	41.0	*0.207*	<0.00050	<0.00050
	Granville Lake- Rep 3	TFS014-SURF	0909JH1691	L819429-9	16-Sep-09	14:45	40.0	0.360	<0.00050	<0.00050
		Mean					40.7	0.321	<0.00050	<0.00050
		SD					0.61	0.101	-	-
		PRSD					1	**31**	-	-
Winter										
Upper Churchill River	South Indian Lake- Area 1- Rep 1	ECS005-SURF	1003JH0322	L867273-4	5-Mar-10	9:15	34.4	0.136	<0.00050	<0.00050
	South Indian Lake- Area 1- Rep 2	ABS003-SURF	1003JH0348	L867273-8	5-Mar-10	9:15	36.9	0.137	<0.00050	<0.00050
	South Indian Lake- Area 1- Rep 3	ABS004-SURF	1003JH0349	L867273-9	5-Mar-10	9:15	33.6	0.127	<0.00050	<0.00050
		Mean					35.0	0.133	<0.00050	<0.00050
		SD					1.72	0.0055	-	-
		PRSD					5	4	-	-
Lower Nelson River	Limestone Forebay- Rep 1	UHS004-SURF	1003JH0350	L866373-7	2-Mar-10	13:18	115	0.288	<0.00050	0.0012
	Limestone Forebay- Rep 2	TFS013-SURF	1003JH0344	L866373-5	2-Mar-10	13:18	111	0.294	<0.00050	0.0011
	Limestone Forebay- Rep 3	TFS014-SURF	1003JH0345	L866373-6	2-Mar-10	13:18	112	0.275	<0.00050	0.0011
		Mean					113	0.286	<0.00050	0.0011
		SD					2.08	0.0097	-	0.00002
		PRSD					2	3	-	-
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	1003JH0296	L866769-1	3-Mar-10	14:21	167	0.0201	<0.00050	0.00099
	Assean Lake- Rep 2	FAS010-SURF	1003JH0346	L866769-14	3-Mar-10	14:21	173	0.0188	<0.00050	0.00085
	Assean Lake- Rep 3	FSS011-SURF	1003JH0347	L866769-15	3-Mar-10	14:21	189	0.0190	<0.00050	0.00087
		Mean					176	0.0193	<0.00050	0.00090
		SD					11.4	0.0007	-	0.00008
		PRSD					6	-	-	-

Table 2-19. – continued –

Region	Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)
Method Detection Limit						*OW*[1]	*0.30*	*0.0050*	*0.00050*	*0.00050*
						IC[2]	*0.30*	*0.0050*	*0.00050*	*0.00050*
Winter										
Winnipeg River	Winnipeg River-Rep 1	PFS093-SURF	1003JH0184	L869032-1	12-Mar-10	15:10	46.9	*0.121*	<0.00050	0.00088
	Winnipeg River-Rep 2	PFS095-SURF	1003JH0187	L869032-3	12-Mar-10	15:10	47.9	0.0844	<0.00050	0.00093
	Winnipeg River-Rep 3	PFS096-SURF	1003JH0188	L869032-4	12-Mar-10	15:10	44.7	0.0821	<0.00050	0.00087
		Mean					46.5	0.0958	<0.00050	0.00089
		SD					1.64	0.0218	-	0.00003
		PRSD					4	**23**	-	-
Saskatchewan River	Cormorant Lake- Rep 1	KKS038-SURF	1003JH0214	L869032-11	12-Mar-10	10:00	178	0.0139	<0.00050	0.0012
	Cormorant Lake- Rep 2	KLS002-SURF	1003JH0240	L869032-9	12-Mar-10	10:00	179	0.0149	<0.00050	0.0013
	Cormorant Lake- Rep 3	KLS003-SURF	1003JH0241	L869032-10	12-Mar-10	10:00	184	0.0117	<0.00050	0.0013
		Mean					180	0.0135	<0.00050	0.0012
		SD					3.21	0.0016	-	0.00008
		PRSD					2	-	-	-
Lake Winnipeg	Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	1003JH0209	L867290-3	7-Mar-10	12:55	291	<0.0050	<0.00050	0.0023
	Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	1003JH0256	L867290-13	7-Mar-10	12:55	257	0.0051	<0.00050	0.0022
	Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	1003JH0257	L867290-14	7-Mar-10	12:55	248	<0.0050	<0.00050	0.0020
		Mean					265	<0.0050	<0.00050	0.0022
		SD					22.7	0.0015	-	0.00013
		PRSD					9	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)
Method Detection Limit		*OW[1]*	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*
		IC[2]	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.40*	*0.0010*	*0.00020*
Spring												
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	0.0130	<0.0010	<0.00020	<0.030	<0.000010	12.5	<0.00010	1.85	0.0012	0.00021
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	0.0125	<0.0010	<0.00020	<0.030	<0.000010	12.4	<0.00010	1.89	<0.0010	0.00023
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	0.0123	<0.0010	<0.00020	<0.030	<0.000010	12.2	<0.00010	1.81	0.0016	<0.00020
	Mean		0.0126	<0.0010	<0.00020	<0.030	<0.000010	12.4	<0.00010	1.85	0.0011	<0.00020
	SD		0.0004	-	-	-	-	0.15	-	0.04	0.0006	0.00007
	PRSD		3	-	-	-	-	1	-	2	-	-
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	0.00920	<0.0010	<0.00020	<0.030	<0.000010	6.66	<0.00010	0.86	<0.0010	0.00074
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	0.00890	<0.0010	<0.00020	<0.030	<0.000010	6.57	<0.00010	0.96	<0.0010	0.00115
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	0.00961	<0.0010	<0.00020	<0.030	<0.000010	6.65	<0.00010	1.01	<0.0010	0.00083
	Mean		0.00924	<0.0010	<0.00020	<0.030	<0.000010	6.63	<0.00010	0.94	<0.0010	0.00091
	SD		0.00036	-	-	-	-	0.05	-	-	-	0.00046
	PRSD		4	-	-	-	-	1	-	-	-	-
Partridge Breast Lake- Rep 1	FAS009-SURF	1-Jul-09	0.00965	<0.0010	<0.00020	<0.030	<0.000010	17.3	<0.00010	***1.89***	<0.0010	<0.00020
Partridge Breast Lake- Rep 2	KLS002-SURF	1-Jul-09	0.00972	<0.0010	<0.00020	<0.030	<0.000010	17.2	<0.00010	1.05	<0.0010	<0.00020
Partridge Breast Lake- Rep 3	KLS003-SURF	1-Jul-09	0.00964	<0.0010	<0.00020	<0.030	0.000012	16.9	<0.00010	1.09	<0.0010	<0.00020
	Mean		0.00967	<0.0010	<0.00020	<0.030	<0.000010	17.1	<0.00010	1.34	<0.0010	<0.00020
	SD		0.00004	-	-	-	-	0.21	-	0.47	-	-
	PRSD		0	-	-	-	-	1	-	**35**	-	-
Summer												
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	0.0123	<0.0010	<0.00020	<0.030	0.000016	12.0	<0.00010	1.73	<0.0010	0.00044
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	0.0114	<0.0010	<0.00020	<0.030	<0.000010	12.0	<0.00010	1.73	<0.0010	0.00037
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	0.0114	<0.0010	<0.00020	<0.030	0.000016	12.2	<0.00010	1.70	<0.0010	0.00037
	Mean		0.0117	<0.0010	<0.00020	<0.030	0.000012	12.1	<0.00010	1.72	<0.0010	0.00039
	SD		0.00052	-	-	-	-	0.12	-	0.02	-	-
	PRSD		4	-	-	-	-	1	-	1	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)
Method Detection Limit		*OW[1]*	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*
		IC[2]	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.40*	*0.0010*	*0.00020*
Summer												
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	0.0168	<0.0010	<0.00020	<0.030	<0.000010	38.3	<0.00010	*1.85*	<0.0010	0.00043
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	0.0173	<0.0010	<0.00020	<0.030	<0.000010	39.4	<0.00010	1.01	<0.0010	0.00035
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	0.0163	<0.0010	<0.00020	<0.030	<0.000010	38.6	<0.00010	1.04	<0.0010	0.00038
	Mean		0.0168	<0.0010	<0.00020	<0.030	<0.000010	38.8	<0.00010	1.30	<0.0010	0.00039
	SD		0.0005	-	-	-	-	0.57	-	0.48	-	-
	PRSD		3	-	-	-	-	1	-	**37**	-	-
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	0.0363	<0.0010	<0.00020	<0.030	<0.000010	29.7	<0.00010	21.2	0.0011	0.00036
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	0.0368	<0.0010	<0.00020	<0.030	<0.000010	28.1	<0.00010	20.4	<0.0010	0.00021
	Mean		0.0366	<0.0010	<0.00020	<0.030	<0.000010	28.9	<0.00010	20.8	<0.0010	0.00029
	RPMD		1	-	-	-	-	6	-	4	-	-
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	0.0102	<0.0010	<0.00020	<0.030	<0.000010	18.2	<0.00010	1.99	<0.0010	0.00027
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	0.0105	<0.0010	<0.00020	<0.030	<0.000010	16.7	<0.00010	2.08	<0.0010	<0.0010
	Mean		0.0104	<0.0010	<0.00020	<0.030	<0.000010	17.5	<0.00010	2.04	<0.0010	<0.0010
	RPMD		3	-	-	-	-	9	-	4	-	-
Fall												
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	0.0138	<0.0010	<0.00020	<0.030	0.000017	11.8	<0.00010	1.08	<0.0010	0.00021
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	0.0137	<0.0010	<0.00020	<0.030	<0.000010	11.9	<0.00010	1.09	<0.0010	0.00021
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	0.0138	<0.0010	<0.00020	<0.030	0.000011	11.7	<0.00010	1.12	<0.0010	<0.00020
	Mean		0.0138	<0.0010	<0.00020	<0.030	<0.000010	11.8	<0.00010	1.10	<0.0010	<0.00020
	SD		0.0001	-	-	-	-	0.10	-	0.02	-	0.00006
	PRSD		0	-	-	-	-	1	-	2	-	-
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	0.0145	<0.0010	<0.00020	<0.030	<0.000010	40.5	<0.00010	1.06	<0.0010	0.00021
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	0.0135	<0.0010	<0.00020	<0.030	<0.000010	37.8	<0.00010	1.07	<0.0010	<0.00020
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	0.0137	<0.0010	<0.00020	<0.030	<0.000010	38.0	<0.00010	1.07	<0.0010	<0.00020
	Mean		0.0139	<0.0010	<0.00020	<0.030	<0.000010	38.8	<0.00010	1.07	<0.0010	<0.00020
	SD		0.0005	-	-	-	-	1.50	-	0.01	-	0.00006
	PRSD		4	-	-	-	-	4	-	1	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*
		IC[2]	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.40*	*0.0010*	*0.00020*
Fall												
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	0.0182	<0.0010	<0.00020	<0.030	<0.000010	9.72	<0.00010	0.69	<0.0010	<0.00020
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	0.0167	<0.0010	<0.00020	<0.030	<0.000010	9.68	<0.00010	0.86	<0.0010	<0.00020
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	0.0172	<0.0010	<0.00020	<0.030	<0.000010	9.42	<0.00010	0.84	<0.0010	<0.00020
	Mean		0.0174	<0.0010	<0.00020	<0.030	<0.000010	9.61	<0.00010	0.80	<0.0010	<0.00020
	SD		0.0008	-	-	-	-	0.16	-	-	-	-
	PRSD		4	-	-	-	-	2	-	-	-	-
Winter												
SIL- Area 1- Rep 1	ECS005-SURF	5-Mar-10	0.0116	<0.0010	<0.00020	<0.030	<0.000010	8.23	<0.00010	1.37	<0.0010	<0.00020
SIL- Area 1- Rep 2	ABS003-SURF	5-Mar-10	0.0120	<0.0010	<0.00020	<0.030	<0.000010	8.85	<0.00010	1.23	<0.0010	<0.00020
SIL- Area 1- Rep 3	ABS004-SURF	5-Mar-10	0.0113	<0.0010	<0.00020	<0.030	<0.000010	7.93	<0.00010	1.10	<0.0010	<0.00020
	Mean		0.0116	<0.0010	<0.00020	<0.030	<0.000010	8.34	<0.00010	1.23	<0.0010	<0.00020
	SD		0.00035	-	-	-	-	0.47	-	0.14	-	-
	PRSD		3	-	-	-	-	6	-	-	-	-
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	0.0268	<0.0010	<0.00020	<0.030	<0.000010	27.8	<0.00010	20.6	<0.0010	<0.00020
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	0.0258	<0.0010	<0.00020	<0.030	<0.000010	26.6	<0.00010	20.8	<0.0010	<0.00020
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	0.0259	<0.0010	<0.00020	<0.030	<0.000010	26.9	<0.00010	20.3	<0.0010	<0.00020
	Mean		0.0262	<0.0010	<0.00020	<0.030	<0.000010	27.1	<0.00010	20.6	<0.0010	<0.00020
	SD		0.00055	-	-	-	-	0.62	-	0.25	-	-
	PRSD		2	-	-	-	-	2	-	1	-	-
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	0.0164	<0.0010	<0.00020	<0.030	<0.000010	52.8	<0.00010	1.69	0.0010	<0.00020
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	0.0137	<0.0010	<0.00020	<0.030	<0.000010	54.7	<0.00010	1.75	<0.0010	<0.00020
Assean Lake- Rep 3	FSS011-SURF	3-Mar-10	0.0156	<0.0010	<0.00020	<0.030	<0.000010	59.8	<0.00010	1.94	<0.0010	<0.00020
	Mean		0.0152	<0.0010	<0.00020	<0.030	<0.000010	55.8	<0.00010	1.79	<0.0010	<0.00020
	SD		0.0014	-	-	-	-	3.62	-	0.131	0.0003	-
	PRSD		9	-	-	-	-	6	-	-	-	

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*
		IC[2]	*0.00030*	*0.0010*	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.40*	*0.0010*	*0.00020*
Winter												
Lac du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	0.0103	<0.0010	<0.00020	<0.030	*0.000049*	12.4	<0.00010	1.96	<0.0010	<0.00020
Lac du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	0.00963	<0.0010	<0.00020	<0.030	0.000180	12.8	<0.00010	1.96	<0.0010	<0.00020
Lac du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	0.00892	<0.0010	<0.00020	<0.030	0.000143	12.0	<0.00010	1.78	<0.0010	<0.00020
	Mean		0.00962	<0.0010	<0.00020	<0.030	0.000124	12.4	<0.00010	1.90	<0.0010	<0.00020
	SD		0.00069	-	-	-	0.000068	0.40	-	0.104	-	-
	PRSD		7	-	-	-	-	3	-	-	-	-
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	0.0348	<0.0010	<0.00020	<0.030	0.000088	36.7	<0.00010	1.47	<0.0010	<0.00020
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	0.0367	<0.0010	<0.00020	<0.030	0.000046	36.9	<0.00010	1.35	<0.0010	<0.00020
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	0.0357	<0.0010	<0.00020	<0.030	0.000031	37.6	<0.00010	1.37	<0.0010	<0.00020
	Mean		0.0357	<0.0010	<0.00020	<0.030	0.000055	37.1	<0.00010	1.40	<0.0010	<0.00020
	SD		0.00095	-	-	-	0.000030	0.47	-	0.06	-	-
	PRSD		3	-	-	-	-	1	-	-	-	-
Winnipegosis-3- Rep 1	LFS005-SURF	7-Mar-10	0.0463	<0.0010	<0.00020	0.094	0.000012	60.5	<0.00010	295	<0.0010	<0.00020
Winnipegosis-3- Rep 2	UDS018-SURF	7-Mar-10	0.0425	<0.0010	<0.00020	0.088	<0.000010	55.2	<0.00010	291	<0.0010	<0.00020
Winnipegosis-3- Rep 3	UDS019-SURF	7-Mar-10	0.0410	<0.0010	<0.00020	0.084	0.000018	52.3	<0.00010	291	<0.0010	<0.00020
	Mean		0.0433	<0.0010	<0.00020	0.089	0.000012	56.0	<0.00010	292	<0.0010	<0.00020
	SD		0.0027	-	-	0.005	0.000007	4.16	-	2.31	-	-
	PRSD		6	-	-	-	-	7	-	1	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.000020/0.000050*	*0.00020*	*0.0020*
		IC[2]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.00010*	*0.00020*	*0.0020*
Spring										
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	0.0016	0.341	<0.00050	3.85	0.0137	<0.000050	<0.00020	<0.0020
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	0.0019	0.369	0.00060	3.97	0.0130	<0.000050	<0.00020	<0.0020
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	0.0015	0.360	<0.00050	3.92	0.0124	0.000050	<0.00020	<0.0020
	Mean		0.0017	0.357	<0.00050	3.91	0.0130	<0.000050	<0.00020	<0.0020
	SD		0.0001	0.014	-	0.060	0.00065	-	-	-
	PRSD		-	4	-	2	5	-	-	-
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	0.0011	0.193	<0.00050	2.58	0.0100	<0.000020	<0.00020	<0.0020
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	<0.0010	0.182	<0.00050	2.55	0.00911	<0.000020	<0.00020	<0.0020
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	0.0014	***0.294***	<0.00050	2.62	0.0109	<0.000020	<0.00020	<0.0020
	Mean		0.0010	0.223	<0.00050	2.58	0.0100	<0.000020	<0.00020	<0.0020
	SD		0.0005	0.062	-	0.035	0.00090	-	-	-
	PRSD		-	**28**	-	1	9	-	-	-
Partridge Breast Lake- Rep 1	FAS009-SURF	1-Jul-09	0.0010	0.073	<0.00050	4.99	0.00493	<0.000020	0.00024	<0.0020
Partridge Breast Lake- Rep 2	KLS002-SURF	1-Jul-09	0.0022	0.073	<0.00050	4.95	0.00510	<0.000020	<0.00020	<0.0020
Partridge Breast Lake- Rep 3	KLS003-SURF	1-Jul-09	0.0013	0.084	<0.00050	4.84	0.00500	<0.000020	<0.00020	<0.0020
	Mean		0.0015	0.077	<0.00050	4.93	0.00501	<0.000020	<0.00020	<0.0020
	SD		-	0.006	-	0.078	0.00009	-	-	-
	PRSD		-	-	-	2	2	-	-	-
Summer										
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	0.0014	0.270	<0.00050	3.82	0.0125	<0.000020	<0.00020	<0.0020
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	0.0013	0.249	<0.00050	3.83	0.0122	<0.000020	<0.00020	<0.0020
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	0.0014	0.254	<0.00050	3.83	0.0121	<0.000020	<0.00020	<0.0020
	Mean		0.0014	0.258	<0.00050	3.83	0.0123	<0.000020	<0.00020	<0.0020
	SD		-	0.011	-	0.006	0.00021	-	-	-
	PRSD		-	4	-	0	2	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.000020/0.000050*	*0.00020*	*0.0020*
		IC[2]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.00010*	*0.00020*	*0.0020*
Summer										
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	0.0020	0.504	<0.00050	7.23	*0.0323*	<0.000020	<0.00020	<0.0020
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	0.0019	0.484	<0.00050	7.35	0.0141	<0.000020	<0.00020	<0.0020
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	0.0019	0.441	<0.00050	7.08	0.0127	<0.000020	<0.00020	<0.0020
	Mean		0.0019	0.476	<0.00050	7.22	0.0197	<0.000020	<0.00020	<0.0020
	SD		-	0.032	-	0.135	0.0109	-	-	-
	PRSD		-	7	-	2	**56**	-	-	-
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	0.0018	0.392	<0.00050	13.1	0.0304	<0.000020	0.00079	0.0021
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	0.0013	0.261	<0.00050	12.1	0.0267	<0.000020	0.00056	<0.0020
	Mean		0.0016	0.327	<0.00050	12.6	0.0286	<0.000020	0.00068	<0.0020
	RPMD		-	**40**	-	8	13	-	-	-
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	0.0011	0.246	<0.00050	7.01	0.00791	<0.000020	<0.00020	<0.0020
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	<0.0010	0.229	<0.00050	6.50	0.00694	<0.000020	<0.00020	<0.0020
	Mean		<0.0011	0.238	<0.00050	6.76	0.00743	<0.000020	<0.00020	<0.0020
	RPMD		-	7	-	8	13	-	-	-
Fall										
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	0.0015	0.362	<0.00050	3.63	0.0157	<0.000020	0.00025	<0.0020
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	0.0015	0.379	<0.00050	3.68	0.0160	<0.000020	<0.00020	<0.0020
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	0.0015	0.368	<0.00050	3.59	0.0162	<0.000020	<0.00020	<0.0020
	Mean		0.0015	0.370	<0.00050	3.63	0.0160	<0.000020	<0.00020	<0.0020
	SD		0.0000	0.009	-	0.045	0.00025	-	-	-
	PRSD		-	2	-	1	2	-	-	-
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	0.0018	0.219	<0.00050	6.87	0.0115	<0.000020	<0.00020	<0.0020
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	0.0017	0.174	<0.00050	6.83	0.0097	<0.000020	<0.00020	<0.0020
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	0.0017	0.180	<0.00050	7.00	0.0102	<0.000020	<0.00020	<0.0020
	Mean		0.0017	0.191	<0.00050	6.90	0.0105	<0.000020	<0.00020	<0.0020
	SD		0.0001	0.024	-	0.089	0.00093	-	-	-
	PRSD		-	13	-	1	9	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)
Method Detection Limit		*OW[1]*	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.000020/0.000050*	*0.00020*	*0.0020*
		IC[2]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.00010*	*0.00020*	*0.0020*
Fall										
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	<0.0010	0.365	0.00057	4.09	0.0192	<0.000020	<0.00020	<0.0020
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	0.0010	***0.179***	<0.00050	4.09	0.0173	<0.000020	<0.00020	<0.0020
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	<0.0010	0.310	<0.00050	4.00	0.0183	<0.000020	<0.00020	<0.0020
	Mean		<0.0010	0.285	<0.00050	4.06	0.0183	<0.000020	<0.00020	<0.0020
	SD		0.0003	0.096	-	0.052	0.00095	-	-	-
	PRSD		-	**34**	-	1	5	-		-
Winter										
South Indian Lake- Area 1- Rep 1	ECS005-SURF	5-Mar-10	<0.0010	0.116	<0.00050	3.37	0.00419	<0.00010	0.00022	<0.0020
South Indian Lake- Area 1- Rep 2	ABS003-SURF	5-Mar-10	<0.0010	0.118	<0.00050	3.60	0.00421	<0.00010	0.00062	<0.0020
South Indian Lake- Area 1- Rep 3	ABS004-SURF	5-Mar-10	<0.0010	0.122	<0.00050	3.36	0.00397	<0.00010	0.00043	<0.0020
	Mean		<0.0010	0.119	<0.00050	3.44	0.00412	<0.00010	0.00042	<0.0020
	SD		-	0.003	-	0.136	0.00013	-	0.00020	-
	PRSD		-	3	-	4	3	-	-	-
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	0.0019	0.247	<0.00050	11.1	0.0161	<0.00010	0.00053	<0.0020
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	0.0019	0.258	<0.00050	10.9	0.0157	<0.00010	0.00053	<0.0020
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	0.0020	0.234	<0.00050	10.9	0.0156	<0.00010	0.00055	<0.0020
	Mean		0.0019	0.246	<0.00050	11.0	0.0158	<0.00010	0.00054	<0.0020
	SD		0.0001	0.012	-	0.115	0.00026	-	0.00001	-
	PRSD		-	5	-	1	2	-	-	-
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	0.0027	<0.020	<0.00050	8.62	0.00492	<0.00010	0.00030	<0.0020
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	0.0020	<0.020	<0.00050	8.81	0.00423	<0.00010	<0.00020	<0.0020
Assean Lake- Rep 3	FSS011-SURF	3-Mar-10	0.0024	<0.020	<0.00050	9.53	0.00458	<0.00010	<0.00020	<0.0020
	Mean		0.0024	<0.020	<0.00050	8.99	0.00458	<0.00010	<0.00020	<0.0020
	SD		0.0004	-	-	0.480	0.00035	-	0.00012	-
	PRSD		-	-	-	5	8	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Copper-Total (mg/L)	Iron-Total (mg/L)	Lead-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.000020/0.000050*	*0.00020*	*0.0020*
		IC[2]	*0.0010*	*0.020*	*0.00050*	*0.010*	*0.00030*	*0.00010*	*0.00020*	*0.0020*
Winter										
Lac du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	0.0032	0.131	<0.00050	3.84	0.00662	<0.00010	<0.00020	<0.0020
Lac du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	0.0023	0.108	<0.00050	3.90	0.00658	<0.00010	0.00022	<0.0020
Lac du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	0.0014	0.106	<0.00050	3.55	0.00599	<0.00010	0.00022	<0.0020
	Mean		0.0023	0.115	<0.00050	3.76	0.00640	<0.00010	<0.00020	<0.0020
	SD		0.0009	0.014	-	0.187	0.00035	-	0.00007	-
	PRSD		-	12	-	5	6	-	-	-
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	0.0031	<0.020	<0.00050	20.9	0.00111	<0.00010	0.00021	<0.0020
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	0.0013	<0.020	<0.00050	21.2	0.00086	<0.00010	<0.00020	<0.0020
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	0.0018	<0.020	<0.00050	21.8	0.00088	<0.00010	<0.00020	<0.0020
	Mean		0.0021	<0.020	<0.00050	21.3	0.00095	<0.00010	<0.00020	<0.0020
	SD		0.0009	-	-	0.458	0.00014	-	0.00006	-
	PRSD		-	-	-	2	-	-	-	-
Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	7-Mar-10	<0.0010	<0.020	<0.00050	33.9	0.00169	<0.00010	0.00251	<0.0020
Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	7-Mar-10	<0.0010	<0.020	<0.00050	28.9	0.00153	<0.00010	0.00209	<0.0020
Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	7-Mar-10	<0.0010	<0.020	<0.00050	28.5	0.00148	<0.00010	0.00210	<0.0020
	Mean		<0.0010	<0.020	<0.00050	30.4	0.00157	<0.00010	0.00223	<0.0020
	SD		-	-	-	3.01	0.00011	-	0.00024	-
	PRSD		-	-	-	10	-	-	11	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.050*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
		IC[2]	*0.20*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
Spring											
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	<0.050	1.10	0.00185	0.0011	<0.00010	2.72	0.0245	4.1	<0.0010
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	<0.050	1.13	0.00192	<0.0010	<0.00010	2.60	0.0250	4.3	<0.0010
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	<0.050	1.11	0.00188	<0.0010	<0.00010	2.57	0.0244	5.1	<0.0010
	Mean		<0.050	1.11	0.00188	<0.0010	<0.00010	2.63	0.0246	4.5	<0.0010
	SD		-	0.02	0.00004	-	-	0.079	0.00032	0.5	-
	PRSD		-	1	2	-	-	3	1	-	-
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	<0.050	0.98	0.00155	<0.0010	<0.00010	2.18	0.0251	4.1	<0.0010
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	<0.050	0.97	0.00148	<0.0010	<0.00010	2.15	0.0245	4.2	<0.0010
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	<0.050	1.01	0.00166	<0.0010	<0.00010	2.24	0.0253	4.0	<0.0010
	Mean		<0.050	0.99	0.00156	<0.0010	<0.00010	2.19	0.0250	4.1	<0.0010
	SD		-	0.02	0.00009	-	-	0.046	0.00042	0.1	-
	PRSD		-	2	6	-	-	2	2	-	-
Partridge Breast Lake- Rep 1	FAS009-SURF	1-Jul-09	<0.050	0.98	0.00088	<0.0010	<0.00010	2.52	0.0339	2.7	<0.0010
Partridge Breast Lake- Rep 2	KLS002-SURF	1-Jul-09	<0.050	0.99	0.00088	<0.0010	<0.00010	2.50	0.0349	3.2	<0.0010
Partridge Breast Lake- Rep 3	KLS003-SURF	1-Jul-09	<0.050	0.98	0.00089	<0.0010	<0.00010	2.46	0.0334	2.7	<0.0010
	Mean		-	0.98	0.00088	<0.0010	<0.00010	2.49	0.0341	2.9	<0.0010
	SD		-	0.01	-	-	-	0.031	0.00076	0.3	-
	PRSD		-	1	-	-	-	1	2	-	-
Summer											
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	0.063	0.97	0.00176	<0.0010	<0.00010	2.72	0.0246	8.3	<0.0010
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	0.066	0.96	0.00169	<0.0010	<0.00010	2.74	0.0241	8.9	<0.0010
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	0.067	0.97	0.00171	<0.0010	<0.00010	2.73	0.0240	8.7	<0.0010
	Mean		0.065	0.97	0.00172	<0.0010	<0.00010	2.73	0.0242	8.6	<0.0010
	SD		-	0.01	0.00004	-	-	0.010	0.00032	0.3	-
	PRSD		-	1	2	-	-	0	1	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.050*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
		IC[2]	*0.20*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
Summer											
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	<0.050	0.88	0.00167	<0.0010	<0.00010	2.46	0.0461	8.2	<0.0010
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	<0.050	0.92	0.00165	<0.0010	<0.00010	2.55	0.0467	7.8	<0.0010
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	<0.050	0.87	0.00153	<0.0010	<0.00010	2.44	0.0458	7.1	<0.0010
	Mean		<0.050	0.89	0.00162	<0.0010	<0.00010	2.48	0.0462	7.7	<0.0010
	SD		-	0.03	0.00008	-	-	0.059	0.00046	0.6	-
	PRSD		-	3	5	-	-	2	1	-	-
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	0.109	2.97	0.00233	<0.0010	<0.00010	20.0	0.114	29.4	<0.0010
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	0.050	2.71	0.00168	0.0010	<0.00010	18.9	0.110	29.6	<0.0010
	Mean		0.080	2.84	0.00201	<0.0010	<0.00010	19.5	0.112	29.5	<0.0010
	RPMD		-	9	**32**	-	-	6	4	1	-
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	0.073	0.87	0.00148	<0.0010	<0.00010	3.08	0.0332	12.2	<0.0010
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	<0.05	0.73	0.00130	<0.0010	<0.00010	2.69	0.0329	12.3	<0.0010
	Mean		0.049	0.80	0.00139	<0.0010	<0.00010	2.89	0.0331	12.3	<0.0010
	RPMD		-	18	13	-	-	14	1	1	-
Fall											
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	<0.050	1.03	0.00215	<0.0010	0.00022	2.20	0.0237	7.3	<0.0010
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	<0.050	1.04	0.00221	<0.0010	<0.00010	2.23	0.0242	6.9	<0.0010
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	<0.050	0.96	0.00215	<0.0010	<0.00010	2.17	0.0240	7.4	<0.0010
	Mean		<0.050	1.01	0.00217	<0.0010	<0.00010	2.20	0.0240	7.2	<0.0010
	SD		-	0.04	0.00003	-	-	0.030	0.00025	0.3	-
	PRSD		-	4	2	-	-	1	1	-	-
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	0.076	0.84	0.00109	<0.0010	<0.00010	2.25	0.0513	6.9	<0.0010
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	0.081	0.80	0.00106	<0.0010	<0.00010	2.29	0.0482	6.4	<0.0010
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	0.082	0.81	0.00103	<0.0010	<0.00010	2.31	0.0486	6.2	<0.0010
	Mean		0.080	0.82	0.00106	<0.0010	<0.00010	2.28	0.0494	6.5	<0.0010
	SD		-	0.02	0.00003	-	-	0.031	0.00169	0.4	-
	PRSD		-	3	3	-	-	1	3	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.050*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
		IC[2]	*0.20*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
Fall											
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	<0.050	1.40	0.00264	<0.0010	<0.00010	3.59	0.0379	4.6	<0.0010
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	<0.050	1.34	0.00212	<0.0010	<0.00010	3.63	0.0376	4.4	<0.0010
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	<0.050	1.36	0.00249	<0.0010	<0.00010	3.52	0.0367	4.9	<0.0010
	Mean		<0.050	1.37	0.00242	<0.0010	<0.00010	3.58	0.0374	4.6	<0.0010
	SD		-	0.03	0.00027	-	-	0.056	0.00062	0.3	-
	PRSD		-	2	11	-	-	2	2	-	-
Winter											
South Indian Lake- Area 1- Rep 1	ECS005-SURF	5-Mar-10	<0.20	1.11	0.00163	<0.0010	<0.00010	2.97	0.0297	3.7	<0.0010
South Indian Lake- Area 1- Rep 2	ABS003-SURF	5-Mar-10	<0.20	1.19	0.00171	<0.0010	<0.00010	3.11	0.0314	4.6	<0.0010
South Indian Lake- Area 1- Rep 3	ABS004-SURF	5-Mar-10	<0.20	1.09	0.00153	<0.0010	<0.00010	2.87	0.0295	3.9	<0.0010
	Mean		<0.20	1.13	0.00162	<0.0010	<0.00010	2.98	0.0302	4.1	<0.0010
	SD		-	0.05	0.00009	-	-	0.121	0.00104	0.5	-
	PRSD		-	5	6	-	-	4	3	-	-
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	<0.20	2.76	0.00155	<0.0010	<0.00010	16.0	0.0804	23.5	<0.0010
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	<0.20	2.69	0.00152	<0.0010	<0.00010	14.6	0.0791	21.6	<0.0010
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	<0.20	2.70	0.00149	<0.0010	<0.00010	15.5	0.0795	22.3	<0.0010
	Mean		<0.20	2.72	0.00152	<0.0010	<0.00010	15.4	0.0797	22.5	<0.0010
	SD		-	0.04	0.00003	-	-	0.709	0.00067	1.0	-
	PRSD		-	1	2	-	-	5	1	4	-
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	<0.20	1.01	0.00082	<0.0010	<0.00010	2.91	0.0767	5.4	<0.0010
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	<0.20	0.97	0.00072	<0.0010	<0.00010	3.06	0.0625	6.1	<0.0010
Assean Lake- Rep 3	FSS011-SURF	3-Mar-10	<0.20	1.05	0.00075	<0.0010	<0.00010	3.32	0.0683	7.8	<0.0010
	Mean		<0.20	1.01	0.00076	<0.0010	<0.00010	3.10	0.0692	6.4	<0.0010
	SD		-	0.04	0.00005	-	-	0.207	0.00714	1.2	-
	PRSD		-	4	-	-	-	7	10	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit		*OW[1]*	*0.050*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
		IC[2]	*0.20*	*0.10*	*0.00020*	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*
Winter											
Lac du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	<0.20	1.00	0.00132	0.0011	<0.00010	2.36	0.0242	10.1	<0.0010
Lac du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	<0.20	1.00	0.00145	0.0011	<0.00010	2.44	0.0251	9.9	<0.0010
Lac du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	<0.20	1.01	0.00121	<0.0010	<0.00010	2.23	0.0227	9.5	<0.0010
	Mean		<0.20	1.00	0.00133	<0.0010	<0.00010	2.34	0.0240	9.8	<0.0010
	SD		-	0.01	0.00012	0.0003	-	0.106	0.00121	0.3	-
	PRSD		-	1	9	-	-	5	5	-	-
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	<0.20	1.32	0.00092	<0.0010	<0.00010	2.97	0.0654	3.6	<0.0010
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	<0.20	1.33	0.00099	0.0010	<0.00010	2.98	0.0648	3.9	<0.0010
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	<0.20	1.32	0.00094	<0.0010	<0.00010	2.92	0.0649	4.0	<0.0010
	Mean		<0.20	1.32	0.00095	<0.0010	<0.00010	2.96	0.0650	3.8	<0.0010
	SD		-	0.01	0.00004	0.0003	-	0.032	0.00032	0.2	-
	PRSD		-	0	-	-	-	1	0	-	-
Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	7-Mar-10	<0.20	10.7	0.00470	<0.0010	<0.00010	175	0.331	57.7	<0.0010
Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	7-Mar-10	<0.20	9.31	0.00449	<0.0010	<0.00010	169	0.307	62.3	<0.0010
Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	7-Mar-10	<0.20	9.05	0.00435	<0.0010	<0.00010	171	0.294	61.4	<0.0010
	Mean		<0.20	9.69	0.00451	<0.0010	<0.00010	172	0.311	60.5	<0.0010
	SD		-	0.89	0.00018	-	-	3.06	0.0188	2.4	-
	PRSD		-	9	4	-	-	2	6	4	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.00010*	*0.00060*	*0.00090*	*0.00020*	*0.00010*	*0.0010*	*0.010*	*0.00040*
		IC[2]	*0.00010*	*0.0010*	*0.00090*	*0.00050*	*0.00010*	*0.0010*	*0.010*	*0.00040*
Spring										
Winnipeg River-Rep 1	PFS094-SURF	19-May-09	<0.00010	<0.00060	*0.0103*	<0.00020	0.00011	0.0013	<0.010	0.00043
Winnipeg River-Rep 2	PFS095-SURF	19-May-09	<0.00010	<0.00060	0.0172	<0.00020	0.00012	0.0015	<0.010	0.00052
Winnipeg River-Rep 3	PFS096-SURF	19-May-09	<0.00010	<0.00060	0.0148	<0.00020	0.00012	0.0016	<0.010	0.00042
	Mean		<0.00010	<0.00060	0.0141	<0.00020	0.00012	0.0015	<0.010	0.00046
	SD		-	-	0.00350	-	0.00001	0.0002	-	0.00006
	PRSD		-	-	**25**	-	-	-	-	-
Granville Lake- Rep 1	EBS043-SURF	24-Jun-09	<0.00010	<0.00060	0.00690	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Granville Lake- Rep 2	TFS013-SURF	24-Jun-09	<0.00010	<0.00060	0.00653	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Granville Lake- Rep 3	TFS014-SURF	24-Jun-09	<0.00010	<0.00060	0.00859	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.00060	0.00734	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	SD		-	-	0.00110	-	-	-	-	-
	PRSD		-	-	15	-	-	-	-	-
Partridge Breast Lake- Rep 1	FAS009-SURF	1-Jul-09	<0.00010	<0.00060	0.00325	0.00037	0.00015	<0.0010	<0.010	<0.00040
Partridge Breast Lake- Rep 2	KLS002-SURF	1-Jul-09	<0.00010	<0.00060	0.00343	<0.00020	0.00014	<0.0010	<0.010	<0.00040
Partridge Breast Lake- Rep 3	KLS003-SURF	1-Jul-09	<0.00010	<0.00060	0.00369	<0.00020	0.00014	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.00060	0.00346	<0.00020	0.00014	<0.0010	<0.010	<0.00040
	SD		-	-	-	-	0.00001	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Summer										
Lac Du Bonnet- Rep 1	PFS093-SURF	30-Jul-09	<0.00010	<0.00060	0.00794	<0.00020	0.00013	<0.0010	<0.010	<0.00040
Lac Du Bonnet- Rep 2	PFS095-SURF	30-Jul-09	<0.00010	<0.00060	0.00705	<0.00020	0.00013	<0.0010	<0.010	<0.00040
Lac Du Bonnet- Rep 3	PFS096-SURF	30-Jul-09	<0.00010	<0.00060	0.00744	<0.00020	0.00013	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.00060	0.00748	<0.00020	0.00013	<0.0010	<0.010	<0.00040
	SD		-	-	0.00045	-	0.00000	-	-	-
	PRSD		-	-	6	-	-	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.00010*	*0.00060*	*0.00090*	*0.00020*	*0.00010*	*0.0010*	*0.010*	*0.00040*
		IC[2]	*0.00010*	*0.0010*	*0.00090*	*0.00050*	*0.00010*	*0.0010*	*0.010*	*0.00040*
Summer										
Assean Lake- Rep 1	UFS014-SURF	5-Aug-09	<0.00010	<0.00060	0.0214	<0.00020	0.00024	0.0015	<0.010	0.00110
Assean Lake- Rep 2	KLS002-SURF	5-Aug-09	<0.00010	<0.00060	0.0204	<0.00020	0.00025	0.0014	<0.010	0.00102
Assean Lake- Rep 3	KLS003-SURF	5-Aug-09	<0.00010	<0.00060	0.0191	<0.00020	0.00025	0.0014	<0.010	0.00087
	Mean		<0.00010	<0.00060	0.0203	<0.00020	0.00025	0.0014	<0.010	0.00100
	SD		-	-	0.00115	-	0.00001	0.0001	-	0.00012
	PRSD		-	-	6	-	-	-	-	-
Playgreen Lake- Rep 1	UBS015-SURF	11-Aug-09	<0.00010	<0.00060	0.02030	<0.00020	0.00055	0.0018	<0.010	0.00046
Playgreen Lake- Rep 2	TFS013-SURF	11-Aug-09	<0.00010	<0.00060	0.00979	<0.00020	0.00058	0.0014	<0.010	<0.00040
	Mean		<0.00010	<0.00060	0.01505	<0.00020	0.00057	0.0016	<0.010	<0.00040
	RPMD		-	-	**70**	-	5	-	-	-
Setting Lake- Rep 1	TCS006-SURF	11-Aug-09	<0.00010	<0.00060	0.00915	<0.00020	<0.00010	<0.0010	<0.010	0.00051
Setting Lake- Rep 2	TFS014-SURF	11-Aug-09	<0.00010	<0.00060	0.00862	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.00060	0.00889	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	RPMD		-	-	6	-	-	-	-	-
Fall										
Lac Du Bonnet- Rep 1	PFS093-SURF	16-Sep-09	<0.00010	<0.00060	0.0176	<0.00020	0.00014	0.0014	<0.010	0.00065
Lac Du Bonnet- Rep 2	PFS095-SURF	16-Sep-09	<0.00010	<0.00060	0.0160	<0.00020	0.00014	0.0015	<0.010	0.00064
Lac Du Bonnet- Rep 3	PFS096-SURF	16-Sep-09	<0.00010	<0.00060	0.0158	<0.00020	0.00013	0.0015	<0.010	0.00042
	Mean		<0.00010	<0.00060	0.0165	<0.00020	0.00014	0.0015	<0.010	0.00057
	SD		-	-	0.00099	-	0.00001	0.0001	-	0.00013
	PRSD		-	-	6	-	-	-	-	-
Assean Lake- Rep 1	UFS014-SURF	9-Sep-09	<0.00010	<0.00060	0.00835	0.00030	0.00026	0.0010	<0.010	0.00056
Assean Lake- Rep 2	KLS002-SURF	9-Sep-09	<0.00010	<0.00060	0.00771	<0.00020	0.00025	<0.0010	<0.010	0.00050
Assean Lake- Rep 3	KLS003-SURF	9-Sep-09	<0.00010	<0.00060	0.00774	<0.00020	0.00025	<0.0010	<0.010	0.00051
	Mean		<0.00010	<0.00060	0.00793	<0.00020	0.00025	<0.0010	<0.010	0.00052
	SD		-	-	0.00036	-	0.00001	0.0003	-	0.00003
	PRSD		-	-	5	-	-	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.00010*	*0.00060*	*0.00090*	*0.00020*	*0.00010*	*0.0010*	*0.010*	*0.00040*
		IC[2]	*0.00010*	*0.0010*	*0.00090*	*0.00050*	*0.00010*	*0.0010*	*0.010*	*0.00040*
Fall										
Granville Lake- Rep 1	EBS043-SURF	16-Sep-09	<0.00010	<0.00060	0.0204	<0.00020	0.00011	<0.0010	<0.010	0.00052
Granville Lake- Rep 2	TFS013-SURF	16-Sep-09	<0.00010	<0.00060	***0.00896***	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
Granville Lake- Rep 3	TFS014-SURF	16-Sep-09	<0.00010	<0.00060	0.0181	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.00060	0.0158	<0.00020	<0.00010	<0.0010	<0.010	<0.00040
	SD		-	-	0.00605	-	-	-	-	0.00018
	PRSD		-	-	**38**	-	-	-	-	-
Winter										
South Indian Lake- Area 1- Rep 1	ECS005-SURF	5-Mar-10	<0.00010	<0.0010	0.00504	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
South Indian Lake- Area 1- Rep 2	ABS003-SURF	5-Mar-10	<0.00010	<0.0010	0.00425	0.00053	<0.00010	<0.0010	<0.010	<0.00040
South Indian Lake- Area 1- Rep 3	ABS004-SURF	5-Mar-10	<0.00010	0.0011	0.00436	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.0010	0.00455	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
	SD		-	0.0003	0.00043	0.00016	-	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Limestone Forebay- Rep 1	UHS004-SURF	2-Mar-10	<0.00010	<0.0010	0.0107	<0.00050	0.00054	0.0012	<0.010	0.00066
Limestone Forebay- Rep 2	TFS013-SURF	2-Mar-10	<0.00010	<0.0010	0.0111	<0.00050	0.00052	0.0012	<0.010	0.00063
Limestone Forebay- Rep 3	TFS014-SURF	2-Mar-10	<0.00010	<0.0010	0.0102	<0.00050	0.00055	0.0012	<0.010	0.00064
	Mean		<0.00010	<0.0010	0.0107	<0.00050	0.00054	0.0012	<0.010	0.00064
	SD		-	-	0.00045	-	0.00002	0.0000	-	0.00002
	PRSD		-	-	4	-	3	-	-	-
Assean Lake- Rep 1	UFS014-SURF	3-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00038	<0.0010	<0.010	0.00048
Assean Lake- Rep 2	FAS010-SURF	3-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00029	<0.0010	<0.010	<0.00040
Assean Lake- Rep 3	FSS011-SURF	3-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00033	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.0010	<0.00090	<0.00050	0.00033	<0.0010	<0.010	<0.00040
	SD		-	-	-	-	0.00005	-	-	0.00016
	PRSD		-	-	-	-	-	-	-	-

Table 2-19. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*[1]	*0.00010*	*0.00060*	*0.00090*	*0.00020*	*0.00010*	*0.0010*	*0.010*	*0.00040*
		IC[2]	*0.00010*	*0.0010*	*0.00090*	*0.00050*	*0.00010*	*0.0010*	*0.010*	*0.00040*
Winter										
Lac du Bonnet- Rep 1	PFS093-SURF	12-Mar-10	<0.00010	<0.0010	0.00397	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
Lac du Bonnet- Rep 2	PFS095-SURF	12-Mar-10	<0.00010	0.0019	0.00210	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
Lac du Bonnet- Rep 3	PFS096-SURF	12-Mar-10	<0.00010	<0.0010	0.00213	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.0010	0.00273	<0.00050	<0.00010	<0.0010	<0.010	<0.00040
	SD		-	0.0008	0.00107	-	-	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Cormorant Lake- Rep 1	KKS038-SURF	12-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00020	<0.0010	<0.010	<0.00040
Cormorant Lake- Rep 2	KLS002-SURF	12-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00020	<0.0010	<0.010	<0.00040
Cormorant Lake- Rep 3	KLS003-SURF	12-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00020	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.0010	<0.00090	<0.00050	0.00020	<0.0010	<0.010	<0.00040
	SD		-	-	-	-	0.00000	-	-	-
	PRSD		-	-	-	-	-	-	-	-
Lake Winnipegosis (site 3)- Rep 1	LFS005-SURF	7-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00148	0.0013	<0.010	<0.00040
Lake Winnipegosis (site 3)- Rep 2	UDS018-SURF	7-Mar-10	<0.00010	<0.0010	<0.00090	<0.00050	0.00129	<0.0010	<0.010	<0.00040
Lake Winnipegosis (site 3)- Rep 3	UDS019-SURF	7-Mar-10	<0.00010	<0.0010	0.00108	<0.00050	0.00126	<0.0010	<0.010	<0.00040
	Mean		<0.00010	<0.0010	<0.00090	<0.00050	0.00134	<0.0010	<0.010	<0.00040
	SD		-	-	0.00036	-	0.00012	0.0005	-	-
	PRSD		-	-	-	-	9	-	-	-

[1] Open-water season.
[2] Ice-cover season.

Table 2-20. Concentrations of routine and bacterial parameters measured in triplicate samples collected from surface waters during the 2010/2011 CAMPP water quality program. Percent relative standard deviations (PRSD) greater than 18% are indicated in red. Measurements in blue italics are considered "suspect".

						Alkalinity				Nitrogen
Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)	Dissolved Ammonia (mg/L N)
Method Detection Limit					*OW*	*1.0*	*2.0*	*0.60*	*0.40*	*0.010/0.050*
					IC	*1.0*	*2.0*	*0.60*	*0.40*	*0.010*
Spring										
Winnipeg River (Rep 1)	PFS094-SURF	1005JH0620	L886933-2	14-May-10	11:20	37.9	46.2	<0.60	<0.40	<0.050
Winnipeg River (Rep 2)	PFS095-SURF	1005JH0623	L886933-5	14-May-10	11:20	37.7	46.0	<0.60	<0.40	<0.050
Winnipeg River (Rep 3)	PFS096-SURF	1005JH0624	L886933-6	14-May-10	11:20	37.8	46.2	<0.60	<0.40	<0.050
	Mean					37.8	46.1	<0.60	<0.40	<0.050
	SD					0.10	0.12	-	-	-
	PRSD					0	0	-	-	-
Setting Lake (Rep 1)	TCS006-SURF	1006JH0822	L901288-1	23-Jun-10	9:47	75.0	90.6	<0.60	<0.40	<0.050
Setting Lake (Rep 2)	TFS013-SURF	1006JH0834	L901288-8	23-Jun-10	9:47	74.8	91.3	<0.60	<0.40	0.051
Setting Lake (Rep 3)	TFS014-SURF	1006JH0835	L901288-9	23-Jun-10	9:47	74.9	90.3	<0.60	<0.40	<0.050
	Mean					74.9	90.7	<0.60	<0.40	<0.050
	SD					0.10	0.51	-	-	-
	PRSD					0	1	-	-	-
Rat Lake (Rep 1)	TFS005-SURF	1006JH0721	L899620-1	19-Jun-10	14:20	48.3	49.0	4.84	<0.40	0.089
Rat Lake (Rep 2)	KLS002-SURF	1006JH0725	L899620-4	19-Jun-10	14:20	49.2	48.0	5.89	<0.40	<0.050
Rat Lake (Rep 3)	KLS003-SURF	1006JH0726	L899620-5	19-Jun-10	14:20	45.6	51.8	*1.90*	<0.40	<0.050
	Mean					47.7	49.6	4.21	<0.40	<0.050
	SD					1.87	1.97	2.068	-	-
	PRSD					4	4	-	-	-
Summer										
Eaglenest Lake (Rep 1)	PFS097-SURF	1007JS1239	L911400-4	21-Jul-10	9:25	36.8	44.9	<0.60	<0.40	0.012
Eaglenest Lake (Rep 2)	PFS095-SURF	1007JS1240	L911400-5	21-Jul-10	9:45	36.9	45.0	<0.60	<0.40	<0.010
Eaglenest Lake (Rep 3)	PFS096-SURF	1007JS1241	L911400-6	21-Jul-10	10:05	36.9	45.0	<0.60	<0.40	0.036
	Mean					36.9	45.0	<0.60	<0.40	0.018
	SD					0.06	0.06	-	-	0.0163
	PRSD					0	0	-	-	-

Table 2-20. – continued –

			Nitrogen						Phosphorus	
Sample Location	Sample ID	Sample Date	Nitrate – Dissolved (mg/L N)	Nitrate - Dissolved (mg/L N)	Nitrite – Dissolved (mg/L N)	Nitrate/ Nitrite - Dissolved (mg/L N)	Nitrate/ Nitrite - Dissolved (mg/L N)	TKN (mg/L)	Dissolved (mg/L)	Dissolved (mg/L)
Method Detection Limit		*OW*	*0.0010*	*0.0050*	*0.0010/0.0050*	*0.0050/0.0071*	*0.050*	*0.20*	*0.0010*	*0.0020/0.0030*
		IC		*0.0050*	*0.0010*	*0.0051*		*0.20*	*0.010*	*0.0020*
Spring										
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	-	-	-	-	<0.050	0.29	-	0.0164
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	-	-	-	-	<0.050	0.29	-	0.0107
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	-	-	-	-	<0.050	0.32	-	0.0139
	Mean		-	-	-	-	<0.050	0.30	-	0.0137
	SD		-	-	-	-	-	0.017	-	0.00286
	PRSD		-	-	-	-	-	-	-	-
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	-	-	-	-	<0.050	1.11	0.0044	-
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	-	-	-	-	<0.050	<0.20	0.0045	-
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	-	-	-	-	<0.050	0.58	0.0063	-
	Mean		-	-	-	-	<0.050	0.60	0.0051	-
	SD		-	-	-	-	-	0.505	0.00107	-
	PRSD		-	-	-	-	-	-	21	-
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	-	-	-	-	<0.050	0.21	0.0035	-
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	-	-	-	-	<0.050	0.25	<0.0010	-
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	-	-	-	-	<0.050	0.26	0.0041	-
	Mean		-	-	-	-	<0.050	0.24	0.0027	-
	SD		-	-	-	-	-	0.026	0.00193	-
	PRSD		-	-	-	-	-	-		-
Summer										
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	0.0132	-	<0.0010	0.0132	-	0.46	-	0.0125
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	0.0115	-	<0.0010	0.0115	-	0.54	-	0.0116
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	0.0132	-	<0.0010	0.0132	-	0.51	-	0.0118
	Mean		0.0126	-	<0.0010	0.0126	-	0.50	-	0.0120
	SD		0.00098	-	-	0.00098	-	0.040	-	0.00047
	PRSD		8	-	-	-	-	-	-	-

Table 2-20. – continued –

			Phosphorus				Carbon		
Sample Location	Sample ID	Sample Date	Total Particulate Phosphorus (mg/L)	Total Particulate Phosphorus (mg/L)	Total (mg/L)	Total (mg/L)	Dissolved Organic (mg/L)	Total Organic (mg/L)	Total Inorganic (mg/L)
Method Detection Limit		*OW*	*0.0030*		*0.0010*	*0.0020/0.0030*	*1.0*	*1.0*	*1.0*
		IC	*0.014*	*0.0028*	*0.010*	*0.0020*	*1.0*	*1.0*	*1.0*
Spring									
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	0.0062	-	-	0.0226	11.0	11.2	8.3
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	0.0122	-	-	0.0229	11.1	11.4	8.5
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	0.0097	-	-	0.0236	11.1	11.3	8.5
	Mean		0.0094	-	-	0.0230	11.1	11.3	8.4
	SD		0.00301	-	-	0.00051	0.06	0.10	0.12
	PRSD		-	-	-	2	1	1	1
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	0.0098	-	0.0142	-	12.6	12.6	15.3
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	<0.0030	-	0.0120	-	12.9	12.5	15.3
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	<0.0030	-	0.0156	-	12.4	12.4	15.2
	Mean		<0.0030	-	0.0139	-	12.6	12.5	15.3
	SD		-	-	0.00181	-	0.25	0.10	0.06
	PRSD		-	-	13	-	2	1	0
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	0.0093	-	0.0128	-	7.0	7.1	9.6
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	0.0105	-	0.0105	-	7.0	7.1	10.0
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	0.0043	-	0.0084	-	6.9	7.2	9.7
	Mean		0.0080	-	0.0106	-	7.0	7.1	9.8
	SD		0.00329	-	0.00220	-	0.06	0.06	0.21
	PRSD		-	-	21	-	1	1	2
Summer									
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	0.0131	-	-	0.0256	10.4	10.2	7.4
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	0.0102	-	-	0.0218	10.7	10.6	7.8
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	0.0129	-	-	0.0247	11.6	10.8	7.5
	Mean		0.0121	-	-	0.0240	10.9	10.5	7.6
	SD		0.00162	-	-	0.00199	0.62	0.31	0.21
	PRSD		-	-	-	8	6	3	3

Table 2-20. – continued –

			Water Clarity						Bacteria
Sample Location	Sample ID	Sample Date	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	True Colour (TCU)	pH	Conductivity (µmhos/cm)	*E. coli* (CFU/100 mL)
Method Detection Limit		*OW*	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
		IC	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Spring									
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	62.0	4.4	2.26	35.0	7.92	-	4
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	70.0	4.4	2.44	40.0	7.92	-	3
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	68.0	5.2	2.50	40.0	7.91	-	1
	Mean		66.7	4.7	2.40	38.3	7.92		3
	SD		4.16	0.46	0.125	2.89	0.006		1.5
	PRSD		6	-	5	8	0		-
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	110	2.4	1.98	30.0	8.30	-	<1
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	104	4.4	1.90	20.0	8.30	-	<1
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	106	4.0	2.16	30.0	8.30	-	<1
	Mean		107	3.6	2.01	26.7	8.30		<1
	SD		3.1	1.06	0.133	5.77	0.00		-
	PRSD		3	-	7	-	0		-
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	52.0	4.0	6.60	15.0	8.68	-	<1
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	52.0	2.8	6.05	15.0	8.75	-	<1
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	54.0	3.6	6.28	15.0	8.42	-	<1
	Mean		52.7	3.5	6.31	15.0	8.62		<1
	SD		1.15	0.61	0.276	0.00	0.174		-
	PRSD		2	-	4	-	2		-
Summer									
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	88.0	<2.0	3.21	42.7	7.79	-	<1
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	54.0	<2.0	3.04	37.9	7.78	-	<1
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	78.0	<2.0	2.99	36.9	7.79	-	<1
	Mean		73.3	<2.0	3.08	39.2	7.79		<1
	SD		17.47	-	0.115	3.10	0.006		-
	PRSD		**24**	-	4	8	0		-

Table 2-20. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Alkalinity Bicarbonate (HCO_3) (mg/L)	Alkalinity Carbonate (CO_3) (mg/L)	Alkalinity Hydroxide (OH) (mg/L)	Nitrogen Dissolved Ammonia (mg/L N)
Method Detection Limit					*OW*	*1.0*	*2.0*	*0.60*	*0.40*	*0.010/0.050*
					IC	*1.0*	*2.0*	*0.60*	*0.40*	*0.010*
Summer										
Walker Lake (Rep 1)	UDS020-SURF	1008JS1340	L920004-2	12-Aug-10	8:25	68.3	83.4	<0.60	<0.40	0.044
Walker Lake (Rep 2)	KLS002-SURF	1008JS1343	L920004-14	12-Aug-10	8:25	68.4	83.4	<0.60	<0.40	0.034
Walker Lake (Rep 3)	KLS003-SURF	1008JS1344	L920004-15	12-Aug-10	8:25	68.4	83.5	<0.60	<0.40	0.030
	Mean					68.4	83.4	<0.60	<0.40	0.036
	SD					0.06	0.06	-	-	0.0072
	PRSD					0	0	-	-	-
Granville Lake (Rep 1)	EBS043-SURF	1008JS1428	L922533-1	19-Aug-10	12:50	38.9	47.5	<0.60	<0.40	0.021
Granville Lake (Rep 2)	TFS013-SURF	1008JS1439	L922533-6	19-Aug-10	12:50	38.8	47.4	<0.60	<0.40	0.021
Granville Lake (Rep 3)	TFS014-SURF	1008JS1440	L922533-7	19-Aug-10	12:50	38.8	47.3	<0.60	<0.40	0.020
	Mean					38.8	47.4	<0.60	<0.40	0.021
	SD					0.06	0.10	-	-	0.0006
	PRSD					0	0	-	-	-
Fall										
Manigotagan Lake (Rep 1)	RAS155-SURF	1009JS1601	L935796-3	24-Sep-10	11:25	32.4	39.5	<0.60	<0.40	<0.010
Manigotagan Lake (Rep 2)	PFS095-SURF	1009JS1603	L935796-5	24-Sep-10	11:25	32.2	39.3	<0.60	<0.40	<0.010
Manigotagan Lake (Rep 3)	PFS096-SURF	1009JS1604	L935796-6	24-Sep-10	11:25	32.2	39.3	<0.60	<0.40	<0.010
	Mean					32.3	39.4	<0.60	<0.40	<0.010
	SD					0.12	0.12	-	-	-
	PRSD					0	0	-	-	-
Lake Winnipegosis (site 2) (Rep 1)	LFS004-SURF	1009JS1527	L928851-2	7-Sep-10	10:05	168	191	7.14	<0.40	<0.010
Lake Winnipegosis (site 2) (Rep 2)	KLS002-SURF	1009JS1547	L928851-9	7-Sep-10	10:05	168	192	6.87	<0.40	0.010
Lake Winnipegosis (site 2) (Rep 3)	KLS003-SURF	1009JS1548	L928851-10	7-Sep-10	10:05	168	191	7.07	<0.40	<0.010
	Mean					168	191	7.03	<0.40	<0.010
	SD					0.0	0.6	0.140	-	-
	PRSD					0	0	2	-	-

Table 2-20. – continued –

			Nitrogen						Phosphorus	
Sample Location	Sample ID	Sample Date	Nitrate – Dissolved (mg/L N)	Nitrate - Dissolved (mg/L N)	Nitrite – Dissolved (mg/L N)	Nitrate/ Nitrite - Dissolved (mg/L N)	Nitrate/ Nitrite - Dissolved (mg/L N)	TKN (mg/L)	Dissolved (mg/L)	Dissolved (mg/L)
Method Detection Limit		*OW*	*0.0010*	*0.0050*	*0.0010/0.0050*	*0.0050/0.0071*	*0.050*	*0.20*	*0.0010*	*0.0020/0.0030*
		IC		*0.0050*	*0.0010*	*0.0051*		*0.20*	*0.010*	*0.0020*
Summer										
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	<0.0010	-	<0.0010	<0.0050	-	0.65	-	0.0106
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	<0.0010	-	<0.0010	<0.0050	-	0.65	-	0.0073
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	<0.0010	-	<0.0010	<0.0050	-	0.59	-	0.0077
	Mean		<0.0010	-	<0.0010	<0.0050	-	0.63	-	0.0085
	SD		-	-	-	-	-	0.035	-	0.00180
	PRSD		-	-	-	-	-	-	-	-
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	<0.0010	-	<0.0010	<0.0050	-	0.38	-	0.0143
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	<0.0010	-	<0.0010	<0.0050	-	0.39	-	0.0124
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	<0.0010	-	<0.0010	<0.0050	-	0.41	-	0.0155
	Mean		<0.0010	-	<0.0010	<0.0050	-	0.39	-	0.0141
	SD		-	-	-	-	-	0.015	-	0.00156
	PRSD		-	-	-	-	-	-	-	11
Fall										
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	0.0584	-	<0.0010	0.0584	-	0.24	-	0.0114
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	0.0478	-	<0.0010	0.0478	-	0.25	-	0.0129
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	0.0490	-	<0.0010	0.0490	-	0.21	-	0.0105
	Mean		0.0517	-	<0.0010	0.0517	-	0.23	-	0.0116
	SD		0.00580	-	-	0.00580	-	0.021	-	0.00121
	PRSD		11	-	-	11	-	-	-	10
Winnipegosis-2 (Rep 1)	LFS004-SURF	7-Sep-10	-	<0.0050	<0.0050	<0.0071	-	0.55	-	0.0111
Winnipegosis-2 (Rep 2)	KLS002-SURF	7-Sep-10	-	<0.0050	<0.0010	<0.0050	-	0.58	-	0.0124
Winnipegosis-2 (Rep 3)	KLS003-SURF	7-Sep-10	-	<0.0010	<0.0010	<0.0050	-	0.72	-	0.0112
	Mean		-	<0.0050	<0.0050	<0.0071	-	0.62	-	0.0116
	SD		-	-	-	-	-	0.091	-	0.00072
	PRSD		-	-	-	-	-	-	-	6

Table 2-20. – continued –

			Phosphorus				Carbon		
Sample Location	Sample ID	Sample Date	Total Particulate Phosphorus (mg/L)	Total Particulate Phosphorus (mg/L)	Total (mg/L)	Total (mg/L)	Dissolved Organic (mg/L)	Total Organic (mg/L)	Total Inorganic (mg/L)
Method Detection Limit		*OW*	*0.0030*		*0.0010*	*0.0020/0.0030*	*1.0*	*1.0*	*1.0*
		IC	*0.014*	*0.0028*	*0.010*	*0.0020*	*1.0*	*1.0*	*1.0*
Summer									
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	<0.0030	-	-	0.0311	10.3	10.6	14.6
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	<0.0030	-	-	0.0294	10.3	10.4	13.9
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	<0.0030	-	-	0.0311	10.3	10.5	14.3
	Mean		<0.0030	-	-	0.0305	10.3	10.5	14.3
	SD		-	-	-	0.00098	0.00	0.10	0.35
	PRSD		-	-	-	3	0	1	2
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	0.0118	-	-	0.0261	7.4	7.6	7.9
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	0.0113	-	-	0.0237	7.5	7.6	7.9
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	0.0104	-	-	0.0259	7.5	7.7	8.1
	Mean		0.0112	-	-	0.0252	7.5	7.6	8.0
	SD		0.00071	-	-	0.00133	0.06	0.06	0.12
	PRSD		-	-	-	5	1	1	1
Fall									
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	0.0092	-		0.0206	14.4	15.5	7.6
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	0.0106	-	-	0.0235	16.0	15.8	7.7
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	0.0109	-	-	0.0214	15.7	15.6	7.7
	Mean		0.0102	-	-	0.0218	15.4	15.6	7.7
	SD		0.00091	-	-	0.00150	0.85	0.15	0.06
	PRSD		-	-	-	7	6	1	1
					-				
Lake Winnipegosis (site 2) (Rep 1)	LFS004-SURF	7-Sep-10	0.0107	-	-	0.0218	12.3	12.7	37.7
Lake Winnipegosis (site 2) (Rep 2)	KLS002-SURF	7-Sep-10	0.0197	-	-	*0.0321*	12.3	12.7	37.5
Lake Winnipegosis (site 2) (Rep 3)	KLS003-SURF	7-Sep-10	0.0097	-	-	0.0209	12.2	12.5	37.8
	Mean		0.0134	-	-	0.0249	12.3	12.6	37.7
	SD		0.00551	-	-	0.00622	0.06	0.12	0.15
	PRSD		-	-	-	**25**	0	1	0

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
Method Detection Limit		*OW*	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
		IC	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Summer									
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	*263*	<2.0	1.60	8.4	8.19	-	1
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	113	<2.0	*2.13*	10.4	8.21	-	<1
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	103	<2.0	1.39	10.2	8.20	-	<1
	Mean		160	<2.0	1.71	9.7	8.20		<1
	SD		89.6	-	0.381	1.10	0.010		-
	PRSD		**56**	-	**22**	-	0		-
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	52.0	5.2	3.62	10.8	7.96	-	<1
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	50.0	5.2	3.87	14.5	7.99	-	<1
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	48.0	5.2	3.49	16.9	8.00	-	<1
	Mean		50.0	5.2	3.66	14.1	7.98		<1
	SD		2.00	0.00	0.193	3.07	0.021		-
	PRSD		4	0	5	-	0		-
Fall									
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	*18.0*	<2.0	2.36	64.9	7.80	-	<1
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	32.0	<2.0	2.37	66.6	7.77	-	<1
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	34.0	<2.0	2.54	66.6	7.78	-	<1
	Mean		28.0	<2.0	2.42	66.0	7.78		<1
	SD		8.72	-	0.101	0.98	0.015		-
	PRSD		**31**	-	4	1	0		-
Lake Winnipegosis (site 2) (Rep 1)	LFS004-SURF	7-Sep-10	592	5.6	3.70	8.4	8.55	-	<1
Lake Winnipegosis (site 2) (Rep 2)	KLS002-SURF	7-Sep-10	572	6.8	3.83	8.2	8.55	-	<1
Lake Winnipegosis (site 2) (Rep 3)	KLS003-SURF	7-Sep-10	578	6.4	3.42	8.4	8.55	-	<1
	Mean		581	6.3	3.65	8.3	8.55		<1
	SD		10.3	0.61	0.210	0.12	0.000		-
	PRSD		2	-	6	-	0		-

Table 2-20. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Alkalinity Total ($CaCO_3$) (mg/L)	Alkalinity Bicarbonate (HCO_3) (mg/L)	Alkalinity Carbonate (CO_3) (mg/L)	Alkalinity Hydroxide (OH) (mg/L)	Nitrogen Dissolved Ammonia (mg/L N)
Method Detection Limit					*OW*	*1.0*	*2.0*	*0.60*	*0.40*	*0.010/0.050*
					IC	*1.0*	*2.0*	*0.60*	*0.40*	*0.010*
Fall										
Cross Lake (Rep 1)	UDS004-SURF	1009JS1655	L932322-2	15-Sep-10	8:30	77.9	95.0	<0.60	<0.40	<0.010
Cross Lake (Rep 2)	TFS013-SURF	1009JS1661	L932322-9	15-Sep-10	8:30	78.1	95.3	<0.60	<0.40	0.016
Cross Lake (Rep 3)	TFS014-SURF	1009JS1662	L932322-10	15-Sep-10	8:30	78.5	95.8	<0.60	<0.40	0.024
	Mean					78.2	95.4	<0.60	<0.40	0.015
	SD					0.31	0.40	-	-	0.0095
	PRSD					0	0	-	-	-
Winter										
Eaglenest Lake (Rep 1)	PFS095-SURF	1102CL0119	L981697-4	25-Feb-11	12:35	41.7	50.8	<0.60	<0.40	<0.010
Eaglenest Lake (Rep 2)	PFS096-SURF	1102CL0121	L981697-6	25-Feb-11	13:00	41.7	50.9	<0.60	<0.40	<0.010
Eaglenest Lake (Rep 3)	PFS097-SURF	1102CL0120	L981697-5	25-Feb-11	13:20	41.6	50.8	<0.60	<0.40	<0.010
	Mean					41.7	50.8	<0.60	<0.40	<0.010
	SD					0.06	0.06	-	-	-
	PRSD					0	0	-	-	-
Cormorant Lake (Rep 1)	KKS038-SURF	1102CL0143	L984359-1	7-Mar-11	15:30	175	208	2.16	<0.40	0.012
Cormorant Lake (Rep 2)	KLS002-SURF	1102CL0155	L984359-7	7-Mar-11	16:00	175	207	2.42	<0.40	0.014
Cormorant Lake (Rep 3)	KLS003-SURF	1102CL0156	L984359-8	7-Mar-11	16:30	176	208	2.68	<0.40	0.014
	Mean					175	208	2.42	<0.40	0.013
	SD					0.6	0.6	0.260	-	0.0012
	PRSD					0	0	-	-	-
Billard Lake (Rep 1)	FBS003-SURF	1102CL0173	L981063-2	23-Feb-11	10:30	74.9	91.4	<0.60	<0.40	<0.010
Billard Lake (Rep 2)	TFS013-SURF	1102CL0197	L981063-4	23-Feb-11	10:30	75.1	91.6	<0.60	<0.40	0.011
Billard Lake (Rep 3)	TFS014-SURF	1102CL0198	L981063-5	23-Feb-11	10:30	75.2	91.8	<0.60	<0.40	<0.010
	Mean					75.1	91.6	<0.60	<0.40	<0.010
	SD					0.15	0.20	-	-	-
	PRSD					0	0	-	-	-

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Nitrate – Dissolved (mg/L N)	Nitrogen: Nitrate - Dissolved (mg/L N)	Nitrogen: Nitrite – Dissolved (mg/L N)	Nitrogen: Nitrate/ Nitrite – Dissolved (mg/L N)	Nitrogen: Nitrate/ Nitrite – Dissolved (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Dissolved (mg/L)
Method Detection Limit		*OW*	*0.0010*	*0.0050*	*0.0010/0.0050*	*0.0050/0.0071*	*0.050*	*0.20*	*0.0010*	*0.0020/0.0030*
		IC		*0.0050*	*0.0010*	*0.0051*		*0.20*	*0.010*	*0.0020*
Fall										
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	0.0246	-	<0.0010	0.0246	-	0.53	-	0.0288
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	0.0261	-	<0.0010	0.0261	-	0.57	-	0.0236
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	0.0246	-	<0.0010	0.0246	-	0.55	-	0.0218
	Mean		0.0251	-	<0.0010	0.0251	-	0.55	-	0.0247
	SD		0.00087	-	-	0.00087	-	0.020	-	0.00364
	PRSD		3	-	-	-	-	-	-	15
Winter										
Eaglenest Lake (Rep 1)	PFS095-SURF	25-Feb-11	-	0.131	<0.0010	0.131	-	0.42	0.023	-
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	-	0.132	<0.0010	0.132	-	0.37	0.022	-
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	-	0.129	<0.0010	0.129	-	0.46	0.022	-
	Mean		-	0.131	<0.0010	0.131	-	0.42	0.022	-
	SD		-	0.002	-	0.0015	-	0.045	0.0006	-
	PRSD		-	1	-	1	-	-	-	-
Cormorant Lake (Rep 1)	KKS038-SURF	7-Mar-11	-	0.0084	<0.0010	0.0084	-	0.20	0.011	0.0025
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	-	0.0075	<0.0010	0.0075	-	0.33	<0.010	0.0056
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	-	0.0086	<0.0010	0.0086	-	0.30	<0.010	0.0051
	Mean		-	0.0082	<0.0010	0.0082	-	0.28	<0.010	0.0044
	SD		-	0.00059	-	0.00059	-	0.068	-	0.00166
	PRSD		-	-	-	-	-	-	-	-
Billard Lake (Rep 1)	FBS003-SURF	23-Feb-11	-	0.0702	<0.0010	0.0702	-	0.36	0.014	-
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	-	0.0700	<0.0010	0.0700	-	0.33	0.014	-
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	-	0.0689	<0.0010	0.0689	-	0.38	0.014	-
	Mean		-	0.0697	<0.0010	0.0697	-	0.36	0.014	-
	SD		-	0.00070	-	0.00070	-	0.025	0.0000	-
	PRSD		-	1	-	1	-	-	-	-

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW*	*0.0030*		*0.0010*	*0.0020/0.0030*	*1.0*	*1.0*	*1.0*
		IC	*0.014*	*0.0028*	*0.010*	*0.0020*	*1.0*	*1.0*	*1.0*
Fall									
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	0.0127	-	-	0.0415	14.9	14.8	18.8
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	0.0154	-	-	0.0390	14.3	14.5	18.0
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	0.0182	-	-	0.0400	14.5	14.5	18.3
	Mean		0.0154	-	-	0.0402	14.6	14.6	18.4
	SD		0.00275	-	-	0.00126	0.31	0.17	0.40
	PRSD		-	-	-	3	2	1	2
Winter									
Eaglenest Lake (Rep 1)	PFS095-SURF	25-Feb-11	<0.014	-	0.027	-	10.3	11.0	10.1
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	<0.014	-	0.029	-	11.0	11.0	10.0
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	<0.014	-	0.028	-	10.2	10.8	10.0
	Mean		<0.014	-	0.028	-	10.5	10.9	10.0
	SD		-	-	0.0010	-	0.44	0.12	0.06
	PRSD		-	-	-	-	4	1	1
Cormorant Lake (Rep 1)	KKS038-SURF	7-Mar-11	<0.014	0.0073	<0.010	0.0098	6.8	7.1	41.6
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	<0.014	0.0046	<0.010	0.0102	6.8	7.1	41.5
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	<0.014	0.0036	<0.010	0.0087	7.0	7.3	41.3
	Mean		<0.014	0.0052	<0.010	0.0096	6.9	7.2	41.5
	SD		-	0.00191	-	0.00078	0.12	0.12	0.15
	PRSD		-	-	-	-	2	2	0
Billard Lake (Rep 1)	FBS003-SURF	23-Feb-11	<0.014	-	0.018	-	8.4	8.7	17.2
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	<0.014	-	0.018	-	8.3	8.7	17.2
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	<0.014	-	0.017	-	8.4	8.7	17.3
	Mean		<0.014	-	0.018	-	8.4	8.7	17.2
	SD		-	-	0.0006	-	0.06	0.00	0.06
	PRSD		-	-	-	-	1	0	0

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
Method Detection Limit		*OW*	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
		IC	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Fall									
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	142	5.6	7.26	60.6	8.09	-	2
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	148	6.8	7.34	64.9	8.12	-	<1
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	156	6.4	7.32	65.0	8.12	-	<1
	Mean		149	6.3	7.31	63.5	8.11		<1
	SD		7.0	0.61	0.042	2.51	0.017		-
	PRSD		5	-	1	4	0		-
Winter									
Eaglenest Lake (Rep 1)	PFS095-SURF	25-Feb-11	72.0	2.0	5.25	31.2	7.80	98.6	2
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	76.0	2.0	3.75	34.6	7.81	98.3	2
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	78.0	<2.0	4.64	30.6	7.83	98.3	2
	Mean		75.3	<2.0	4.55	32.1	7.81	98.4	2
	SD		3.06	0.58	0.754	2.16	0.015	0.17	0.0
	PRSD		4	-	17	7	0	0	-
Cormorant Lake (Rep 1)	KKS038-SURF	7-Mar-11	204	<2.0	0.37	<5.0	8.32	308	<1
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	202	<2.0	0.41	<5.0	8.34	309	<1
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	212	<2.0	0.33	<5.0	8.35	311	<1
	Mean		206	<2.0	0.37	<5.0	8.34	309	<1
	SD		5.3	-	0.040	-	0.015	1.5	-
	PRSD		3	-	-	-	0	0	-
Billard Lake (Rep 1)	FBS003-SURF	23-Feb-11	90.0	2.0	4.94	15.0	8.13	152	<1
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	90.0	<2.0	4.80	16.8	8.08	152	<1
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	92.0	2.0	4.92	17.8	8.12	153	<1
	Mean		90.7	<2.0	4.89	16.5	8.11	152	<1
	SD		1.15	0.58	0.076	1.42	0.026	0.6	-
	PRSD		1	-	2	-	0	0	-

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Alkalinity: Total ($CaCO_3$) (mg/L)	Alkalinity: Bicarbonate (HCO_3) (mg/L)	Alkalinity: Carbonate (CO_3) (mg/L)	Alkalinity: Hydroxide (OH) (mg/L)	Nitrogen: Dissolved Ammonia (mg/L N)
Method Detection Limit		*OW*	*1.0*	*2.0*	*0.60*	*0.40*	*0.010/0.050*
		IC	*1.0*	*2.0*	*0.60*	*0.40*	*0.010*
Winter							
Southern Indian Lake (Area 6) (Rep 1)	ECS002-SURF	25-Feb-11	53.0	64.7	<0.60	<0.40	<0.010
Southern Indian Lake (Area 6) (Rep 2)	FAS010-SURF	25-Feb-11	53.1	64.7	<0.60	<0.40	<0.010
Southern Indian Lake (Area 6) (Rep 3)	FAS011-SURF	25-Feb-11	53.1	64.8	<0.60	<0.40	<0.010
	Mean		53.1	64.7	<0.60	<0.40	<0.010
	SD		0.06	0.06	-	-	-
	PRSD		0	0	-	-	-

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Nitrogen: Nitrate – Dissolved (mg/L N)	Nitrogen: Nitrate - Dissolved (mg/L N)	Nitrogen: Nitrite – Dissolved (mg/L N)	Nitrogen: Nitrate/ Nitrite – Dissolved (mg/L N)	Nitrogen: Nitrate/ Nitrite – Dissolved (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Dissolved (mg/L)
Method Detection Limit		*OW*	*0.0010*	*0.0050*	*0.0010/0.0050*	*0.0050/0.0071*	*0.050*	*0.20*	*0.0010*	*0.0020/0.0030*
		IC		*0.0050*	*0.0010*	*0.0051*		*0.20*	*0.010*	*0.0020*
Winter										
SIL - Area 6 (Rep 1)	ECS002-SURF	25-Feb-11	-	0.0316	<0.0010	0.0316	-	0.33	0.012	-
SIL - Area 6 (Rep 2)	FAS010-SURF	25-Feb-11	-	0.0326	<0.0010	0.0326	-	0.36	0.013	-
SIL -(Area 6 (Rep 3)	FAS011-SURF	25-Feb-11	-	0.0336	<0.0010	0.0336	-	0.39	0.012	-
	Mean		-	0.0326	<0.0010	0.0326	-	0.36	0.012	-
	SD		-	0.00100	-	0.00100	-	0.030	0.0006	-
	PRSD		-	3	-	3	-	-	-	-

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)	Phosphorus: Total (mg/L)	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)
Method Detection Limit		*OW*	*0.0030*		*0.0010*	*0.0020/0.0030*	*1.0*	*1.0*	*1.0*
		IC	*0.014*	*0.0028*	*0.010*	*0.0020*	*1.0*	*1.0*	*1.0*
Winter									
Southern Indian Lake (Area 6) (Rep 1)	ECS002-SURF	25-Feb-11	<0.014	-	0.017	-	8.1	8.7	12.6
Southern Indian Lake (Area 6) (Rep 2)	FAS010-SURF	25-Feb-11	<0.014	-	0.017	-	8.1	8.8	12.7
Southern Indian Lake (Area 6) (Rep 3)	FAS011-SURF	25-Feb-11	<0.014	-	0.019	-	8.3	8.7	12.7
	Mean		<0.014	-	0.018	-	8.2	8.7	12.7
	SD		-	-	0.0012	-	0.12	0.06	0.06
	PRSD		-	-	-	-	1	1	0

Table 2-20. – continued –

Sample Location	Sample ID	Sample Date	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
Method Detection Limit		*OW*	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
		IC	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*	*0.40*	*1*
Winter									
Southern Indian Lake (Area 6) (Rep 1)	ECS002-SURF	25-Feb-11	64.0	2.0	4.77	14.0	7.77	114	<1
Southern Indian Lake (Area 6) (Rep 2)	FAS010-SURF	25-Feb-11	58.0	<2.0	5.34	13.1	7.81	114	<1
Southern Indian Lake (Area 6) (Rep 3)	FAS011-SURF	25-Feb-11	64.0	2.0	4.87	13.7	7.85	115	<1
	Mean		62.0	<2.0	4.99	13.6	7.81	114	<1
	SD		3.46	0.58	0.304	0.46	0.040	0.6	-
	PRSD		6	-	6	-	1	1	-

Table 2-21. Concentrations of productivity parameters measured in triplicate samples collected from euphotic waters during the 2010/2011 CAMPP water quality program. Percent relative standard deviations (PRSD) greater than 18% are indicated in red. Measurements in blue italics are considered "suspect".

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Depth (m)	Productivity (μg/L) Chlorophyll *a*			
Analytical Detection Limit							*0.010*	*0.030/0.040*	*0.30*	*0.60*
Spring										
Winnipeg River (Rep 1)	PFS094-EUPH	0905JH0634	L886933-15	14-May-10	11:20	3.6	-	5.25	-	
Winnipeg River (Rep 2)	PFS095-EUPH	1005JH0627	L886933-9	14-May-10	11:20	3.6	-	*2.24*	-	
Winnipeg River (Rep 3)	PFS096-EUPH	0905JH0637	L886933-17	14-May-10	11:20	3.6	-	4.30	-	
	Mean							3.93		
	SD							1.54		
	PRSD							**39**		
Rat Lake (Rep 1)	TFS005-EUPH	1006JH0764	L899620-8	19-Jun-10	14:20	2.0	0.566	-	-	
Rat Lake (Rep 2)	KLS002-EUPH	1006JH0751	L899620-7	19-Jun-10	14:20	2.0	0.546	-	-	
Rat Lake (Rep 3)	KLS003-EUPH	1006JH0008	L899620-11	19-Jun-10	14:20	2.0	0.699	-	-	
	Mean						0.604			
	SD						0.083			
	PRSD						14			
Summer										
Eaglenest Lake (Rep 1)	PFS097-EUPH	100JS1350	L911400-14	21-Jul-10	9:25	3.5	-	7.00	-	
Eaglenest Lake (Rep 2)	PFS095-EUPH	100JS1245	L911400-9	21-Jul-10	9:25	3.5	-	6.04	-	
Eaglenest Lake (Rep 3)	PFS096-EUPH	100JS1246	L911400-10	21-Jul-10	9:25	3.5	-	4.97	-	
	Mean							6.00		
	SD							1.02		
	PRSD							17		
Walker Lake (Rep 1)	UDS020-EUPH	1008JS1383	L920004-6	12-Aug-10	8:25	4.2	-	7.06	-	
Walker Lake (Rep 2)	KLS002-EUPH	1008JS1369	L920004-16	12-Aug-10	8:25	4.2	-	-	7.36	
Walker Lake (Rep 3)	KLS003-EUPH	1008JS1377	L920004-17	12-Aug-10	8:25	4.2	-	6.50	-	
	Mean							6.97		
	SD							0.44		
	PRSD							6		

Table 2-21. – continued –

Sample Location	Sample ID	Sample Date	Sample Depth (m)	Productivity (µg/L)						
				Pheophytin						ODb/ODa Ratio
Analytical Detection Limit				*0.010*	*0.029/0.030*	*0.070*	*0.10*	*0.30*	*0.60*	*1.0*
Spring										
Winnipeg River (Rep 1)	PFS094-EUPH	14-May-10	3.6	-	3.62	-	-	-	-	-
Winnipeg River (Rep 2)	PFS095-EUPH	14-May-10	3.6	-	*2.43*	-	-	-	-	-
Winnipeg River (Rep 3)	PFS096-EUPH	14-May-10	3.6	-	3.66	-	-	-	-	-
	Mean				3.24					
	SD				0.70					
	PRSD				**22**					
Rat Lake (Rep 1)	TFS005-EUPH	19-Jun-10	2.0	0.655	-	-	-	-	-	-
Rat Lake (Rep 2)	KLS002-EUPH	19-Jun-10	2.0	0.644	-	-	-	-	-	-
Rat Lake (Rep 3)	KLS003-EUPH	19-Jun-10	2.0	0.573	-	-	-	-	-	-
	Mean			0.624						
	SD			0.045						
	PRSD			7						
Summer										
Eaglenest Lake (Rep 1)	PFS097-EUPH	21-Jul-10	3.5	2.54	-	-	-	-	-	-
Eaglenest Lake (Rep 2)	PFS095-EUPH	21-Jul-10	3.5	-	-	-	1.67	-	-	-
Eaglenest Lake (Rep 3)	PFS096-EUPH	21-Jul-10	3.5	1.65	-	-	-	-	-	-
	Mean			1.95						
	SD			0.51						
	PRSD			**26**						
Walker Lake (Rep 1)	UDS020-EUPH	12-Aug-10	4.2	-	2.53	-	-	-	-	-
Walker Lake (Rep 2)	KLS002-EUPH	12-Aug-10	4.2	-	-	-	-	1.86	-	-
Walker Lake (Rep 3)	KLS003-EUPH	12-Aug-10	4.2	-	-	2.52	-	-	-	-
	Mean				2.30					
	SD				0.38					
	PRSD				17					

Table 2-21. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Depth (m)	Productivity (µg/L)			
							Chlorophyll *a*			
Analytical Detection Limit							*0.010*	*0.030/0.040*	*0.30*	*0.60*
Fall										
Manigotagan Lake (Rep 1)	RAS155-EUPH	1009JS1610	L935796-12	24-Sep-10	11:25	3.0	2.01	-	-	
Manigotagan Lake (Rep 2)	PFS095-EUPH	1009JS1614	L935796-16	24-Sep-10	11:25	3.0	4.09	-	-	
Manigotagan Lake (Rep 3)	PFS096-EUPH	1009JS1619	L935796-17	24-Sep-10	11:25	3.0	2.49	-	-	
	Mean						2.86			
	SD						1.09			
	PRSD						**38**			
Lake Winnipegosis (site 2) (Rep 1)	LFS004-EUPH	1009JS1575	L928851-6	7-Sep-10	10:05	2.8	5.22	-	-	
Lake Winnipegosis (site 2) (Rep 2)	KLS002-EUPH	1009JS1573	L928851-11	7-Sep-10	10:05	2.8	4.42	-	-	
Lake Winnipegosis (site 2) (Rep 3)	KLS003-EUPH	1009JS1581	L928851-12	7-Sep-10	10:05	2.8	4.27	-	-	
	Mean						4.64			
	SD						0.51			
	PRSD						11			
Cross Lake (Rep 1)	UDS004-EUPH	1009JS1679	L932322-6	15-Sep-10	8:30	1.5	2.34	-	-	
Cross Lake (Rep 2)	TFS013-EUPH	1009JS1725	L932322-17	15-Sep-10	8:30	1.5	1.05	-	-	
Cross Lake (Rep 3)	TFS014-EUPH	1009JS1726	L932322-18	15-Sep-10	8:30	1.5	1.39	-	-	
	Mean						1.59			
	SD						0.67			
	PRSD						**42**			
Winter										
Eaglenest Lake (Rep 1)	PFS095-SURF	1102CL0119	L981697-4	25-Feb-11	12:35	0.3				<0.60
Eaglenest Lake (Rep 2)	PFS096-SURF	1102CL0121	L981697-6	25-Feb-11	13:00	0.3				<0.60
Eaglenest Lake (Rep 3)	PFS097-SURF	1102CL0120	L981697-5	25-Feb-11	13:20	0.3				<0.60
	Mean									<0.60
	SD									-
	PRSD									-

Table 2-21. – continued –

Sample Location	Sample ID	Sample Date	Sample Depth (m)	Productivity (µg/L)						
				Pheophytin						ODb/ODa Ratio
Analytical Detection Limit				*0.010*	*0.029/0.030*	*0.070*	*0.10*	*0.30*	*0.60*	*1.0*
Fall										
Manigotagan Lake (Rep 1)	RAS155-EUPH	24-Sep-10	3.0	0.597	-	-	-	-	-	-
Manigotagan Lake (Rep 2)	PFS095-EUPH	24-Sep-10	3.0	0.641	-	-	-	-	-	-
Manigotagan Lake (Rep 3)	PFS096-EUPH	24-Sep-10	3.0	0.860	-	-	-	-	-	-
	Mean			0.699						
	SD			0.141						
	PRSD			**20**						
Lake Winnipegosis (site 2) (Rep 1)	LFS004-EUPH	7-Sep-10	2.8	-	-	-	-	-	-	-
Lake Winnipegosis (site 2) (Rep 2)	KLS002-EUPH	7-Sep-10	2.8	-	-	-	-	-	-	-
Lake Winnipegosis (site 2) (Rep 3)	KLS003-EUPH	7-Sep-10	2.8	-	-	-	-	-	-	-
	Mean									
	SD									
	PRSD									
Cross Lake (Rep 1)	UDS004-EUPH	15-Sep-10	1.5	1.20	-	-	-	-	-	-
Cross Lake (Rep 2)	TFS013-EUPH	15-Sep-10	1.5	0.605	-	-	-	-	-	-
Cross Lake (Rep 3)	TFS014-EUPH	15-Sep-10	1.5	0.752	-	-	-	-	-	-
	Mean			0.852						
	SD			0.310						
	PRSD			**36**						
Winter										
Eaglenest Lake (Rep 1)	PFS095-SURF	25-Feb-11	0.3	-	-	-	-	-	0.69	1.3
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	0.3	-	-	-	-	-	<0.60	1.4
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	0.3	-	-	-	-	-	<0.60	1.4
	Mean			-	-	-	-	-	<0.60	1.4
	SD			-	-	-	-	-	-	0.06
	PRSD			-	-	-	-	-	-	-

Table 2-21. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Sample Depth (m)	Productivity (µg/L)			
							Chlorophyll *a*			
Analytical Detection Limit							*0.010*	*0.030/0.040*	*0.30*	*0.60*
Winter										
Cormorant Lake (Rep 1)	KKS038-SURF	1102CL0143	L984359-1	7-Mar-11	15:30	0.3	-	-	-	1.15
Cormorant Lake (Rep 2)	KLS002-SURF	1102CL0155	L984359-7	7-Mar-11	16:00	0.3	-	-	-	0.76
Cormorant Lake (Rep 3)	KLS003-SURF	1102CL0156	L984359-8	7-Mar-11	16:30	0.3	-	-	-	1.53
	Mean									1.15
	SD									0.385
	PRSD									-
Billard Lake (Rep 1)	FBS003-SURF	1102CL0173	L981063-2	23-Feb-11	10:30	0.3	-	-	-	<0.60
Billard Lake (Rep 2)	TFS013-SURF	1102CL0197	L981063-4	23-Feb-11	10:30	0.3	-	-	-	<0.60
Billard Lake (Rep 3)	TFS014-SURF	1102CL0198	L981063-5	23-Feb-11	10:30	0.3	-	-	-	<0.60
	Mean									<0.60
	SD									-
	PRSD									-
South Indian Lake (Area 6) (Rep 1)	ECS002-SURF	1102CL0181	L981693-1	25-Feb-11	10:38	0.3	-	-	-	<0.60
South Indian Lake (Area 6) (Rep 2)	FAS010-SURF	1102CL0199	L981696-1	25-Feb-11	10:38	0.3	-	-	-	<0.60
South Indian Lake (Area 6) (Rep 3)	FAS011-SURF	1102CL0200	L981696-2	25-Feb-11	10:38	0.3	-	-	-	0.76
	Mean									<0.60
	SD									-
	PRSD									-

Table 2-21. – continued –

Sample Location	Sample ID	Sample Date	Sample Depth (m)	Productivity (µg/L)						
				Pheophytin						ODb/ODa Ratio
Analytical Detection Limit				*0.010*	*0.029/0.030*	*0.070*	*0.10*	*0.30*	*0.60*	*1.0*
Winter										
Cormorant Lake (Rep 1)	KKS038-SURF	7-Mar-11	0.3	-	-	-	-	-	<0.60	1.7
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	0.3	-	-	-	-	-	<0.60	1.6
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	0.3	-	-	-	-	-	<0.60	1.7
	Mean								<0.60	1.7
	SD								-	0.06
	PRSD								-	-
Billard Lake (Rep 1)	FBS003-SURF	23-Feb-11	0.3	-	-	-	-	-	0.61	1.2
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	0.3	-	-	-	-	-	<0.60	1.7
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	0.3	-	-	-	-	-	<0.60	1.4
	Mean								<0.60	1.4
	SD								-	0.25
	PRSD								-	-
South Indian Lake (Area 6) (Rep 1)	ECS002-SURF	25-Feb-11	0.3	-	-	-	-	-	<0.60	1.7
South Indian Lake (Area 6) (Rep 2)	FAS010-SURF	25-Feb-11	0.3	-	-	-	-	-	<0.60	1.4
South Indian Lake (Area 6) (Rep 3)	FAS011-SURF	25-Feb-11	0.3	-	-	-	-	-	<0.60	1.7
	Mean								<0.60	1.6
	SD								-	0.17
	PRSD								-	-

Table 2-22. Concentrations of metals and major ions measured in triplicate samples collected from surface waters during the 2010/2011 CAMPP water quality program. Percent relative standard deviations (PRSD) greater than 18% are indicated in red. Measurements in blue italics are considered "suspect".

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)
Method Detection Limit					*OW*	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
					IC	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
Spring												
Winnipeg River (Rep 1)	PFS094-SURF	1005JH0620	L886933-2	14-May-10	11:20	40.3	0.146	<0.00020	0.00075	0.00893	<0.00020	<0.00020
Winnipeg River (Rep 2)	PFS095-SURF	1005JH0623	L886933-5	14-May-10	11:20	38.9	0.170	<0.00020	0.00073	0.00909	<0.00020	<0.00020
Winnipeg River (Rep 3)	PFS096-SURF	1005JH0624	L886933-6	14-May-10	11:20	39.7	0.155	<0.00020	0.00073	0.00867	<0.00020	<0.00020
	Mean					39.6	0.157	<0.00020	0.00074	0.00890	<0.00020	<0.00020
	SD					0.70	0.0121	-	0.000012	0.000212	-	-
	PRSD					2	8	-	-	2	-	-
Setting Lake (Rep 1)	TCS006-SURF	1006JH0822	L901288-1	23-Jun-10	9:47	77.0	0.113	<0.00020	0.00068	0.00810	<0.00020	<0.00020
Setting Lake (Rep 2)	TFS013-SURF	1006JH0834	L901288-8	23-Jun-10	9:47	80.5	0.0814	<0.00020	0.00068	0.00782	<0.00020	<0.00020
Setting Lake (Rep 3)	TFS014-SURF	1006JH0835	L901288-9	23-Jun-10	9:47	83.2	0.0965	<0.00020	0.00072	0.00798	<0.00020	<0.00020
	Mean					80.2	0.0970	<0.00020	0.00069	0.00797	<0.00020	<0.00020
	SD					3.11	0.01581	-	0.000023	0.000140	-	-
	PRSD					4	16	-	-	2	-	-
Rat Lake (Rep 1)	TFS005-SURF	1006JH0721	L899620-1	19-Jun-10	14:20	38.7	0.203	<0.00020	0.00027	0.0109	<0.00020	<0.00020
Rat Lake (Rep 2)	KLS002-SURF	1006JH0725	L899620-4	19-Jun-10	14:20	37.8	*0.351*	<0.00020	0.00025	0.0116	<0.00020	<0.00020
Rat Lake (Rep 3)	KLS003-SURF	1006JH0726	L899620-5	19-Jun-10	14:20	38.7	0.244	<0.00020	0.00024	0.0107	<0.00020	<0.00020
	Mean					38.4	0.266	<0.00020	0.00025	0.0111	<0.00020	<0.00020
	SD					0.52	0.0764	-	0.000015	0.00047	-	-
	PRSD					1	**29**	-	-	4	-	-
Summer												
Eaglenest Lake (Rep 1)	PFS097-SURF	1007JS1239	L911400-4	21-Jul-10	9:25	36.9	0.217	0.00023	0.00080	0.0108	<0.00020	<0.00020
Eaglenest Lake (Rep 2)	PFS095-SURF	1007JS1240	L911400-5	21-Jul-10	9:45	36.4	0.225	0.00027	0.00077	0.0107	<0.00020	<0.00020
Eaglenest Lake (Rep 3)	PFS096-SURF	1007JS1241	L911400-6	21-Jul-10	10:05	37.8	0.213	<0.00020	0.00079	0.0105	<0.00020	<0.00020
	Mean					37.0	0.218	0.00020	0.00079	0.0107	<0.00020	<0.00020
	SD					0.71	0.0061	0.000089	0.000015	0.00015	-	-
	PRSD					2	3	-	-	1	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Fluoride (mg/L)	Iron-Total (mg/L)
Method Detection Limit		*OW*	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20/0.40/1.0*	*0.0010*	*0.00020*	*0.00020*		*0.020*
		IC	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*	*0.00020*	*0.020*	*0.010/0.10*
Spring												
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	<0.010	0.000028	11.0	<0.00010	1.60	<0.0010	<0.00020	0.00123	-	0.165
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	<0.010	0.000030	10.9	<0.00010	1.65	<0.0010	<0.00020	0.00126	-	0.161
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	<0.010	0.000035	11.1	<0.00010	1.59	<0.0010	<0.00020	0.00119	-	0.156
	Mean		<0.010	0.000031	11.0	<0.00010	1.61	<0.0010	<0.00020	0.00123	-	0.161
	SD		-	0.0000036	0.10	-	0.032	-	-	0.000035	-	0.0045
	PRSD		-	-	1	-	-	-	-	3	-	3
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	<0.010	<0.000010	19.4	<0.00010	2.45	<0.0010	<0.00020	0.00094	-	0.050
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	<0.010	<0.000010	20.1	<0.00010	2.25	<0.0010	<0.00020	0.00127	-	0.037
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	<0.010	<0.000010	20.7	<0.00010	2.56	<0.0010	<0.00020	0.00110	-	0.037
	Mean		<0.010	<0.000010	20.1	<0.00010	2.42	<0.0010	<0.00020	0.00110	-	0.041
	SD		-	-	0.65	-	0.157	-	-	0.000165	-	0.0075
	PRSD		-	-	3	-	6	-	-	15	-	-
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	<0.010	<0.000010	10.6	<0.00010	0.87	<0.0010	<0.00020	0.00090	-	0.147
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	<0.010	<0.000010	10.0	<0.00010	0.86	<0.0010	<0.00020	0.00091	-	*0.244*
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	<0.010	<0.000010	10.5	<0.00010	0.90	<0.0010	<0.00020	0.00083	-	0.184
	Mean		<0.010	<0.000010	10.4	<0.00010	0.88	<0.0010	<0.00020	0.00088	-	0.192
	SD		-	-	0.32	-	0.021	-	-	0.000044	-	0.0490
	PRSD		-	-	3	-	-	-	-	-	-	**26**
Summer												
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	0.011	0.000023	10.1	<0.00010	1.45	<0.0010	<0.00020	0.00134	-	0.235
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	<0.010	0.000014	9.89	<0.00010	1.44	<0.0010	<0.00020	0.00128	-	0.230
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	<0.010	0.000011	10.3	<0.00010	1.44	<0.0010	<0.00020	0.00134	-	0.225
	Mean		<0.010	0.000016	10.1	<0.00010	1.44	<0.0010	<0.00020	0.00132	-	0.230
	SD		-	0.0000062	0.21	-	0.006	-	-	0.000035	-	0.0050
	PRSD		-	-	2	-	0	-	-	3	-	2

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Lead-Total (mg/L)	Lithium-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)
Method Detection Limit		*OW*	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050/0.00010*	*0.00020*	*0.0020*	*0.20*	*0.020*
		IC	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050*	*0.00020*	*0.0020*	*0.20*	*0.020*
Spring											
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	0.000214	0.0021	3.12	0.00823	<0.00010	<0.00020	<0.0020	<0.20	0.807
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	0.000188	<0.0020	2.87	0.00756	<0.00010	<0.00020	<0.0020	<0.20	0.794
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	0.000230	<0.0020	2.94	0.00785	<0.00010	<0.00020	<0.0020	<0.20	0.802
	Mean		0.000211	<0.0020	2.98	0.00788	<0.00010	<0.00020	<0.0020	<0.20	0.801
	SD		0.0000212	-	0.129	0.000336	-	-	-	-	0.0066
	PRSD		-	-	4	4	-	-	-	-	1
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	<0.000090	0.0022	6.97	0.00351	<0.000050	<0.00020	<0.0020	<0.20	0.949
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	0.000104	0.0021	7.39	0.00351	<0.000050	<0.00020	<0.0020	<0.20	0.946
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	<0.000090	0.0026	7.69	0.00355	<0.000050	<0.00020	<0.0020	<0.20	0.972
	Mean		<0.000090	0.0023	7.35	0.00352	<0.000050	<0.00020	<0.0020	<0.20	0.956
	SD		-	0.00026	0.362	0.000023	-	-	-	-	0.0142
	PRSD		-	-	5	1	-	-	-	-	1
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	<0.000090	0.0036	2.99	0.00471	<0.000050	<0.00020	<0.0020	<0.20	0.993
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	0.000232	0.0034	3.10	0.00540	<0.000050	<0.00020	<0.0020	<0.20	1.05
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	0.000192	0.0040	3.05	0.00503	<0.000050	<0.00020	<0.0020	<0.20	1.04
	Mean		0.000212	0.0037	3.05	0.00505	<0.000050	<0.00020	<0.0020	<0.20	1.03
	SD		0.0000283	0.00031	0.055	0.000345	-	-	-	-	0.030
	PRSD		-	-	2	7	-	-	-	-	3
Summer											
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	0.000289	<0.0020	2.86	0.00982	<0.000050	<0.00020	<0.0020	<0.20	0.863
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	0.000143	<0.0020	2.84	0.00863	<0.000050	<0.00020	<0.0020	<0.20	0.849
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	0.000141	<0.0020	2.95	0.00888	<0.000050	<0.00020	<0.0020	<0.20	0.865
	Mean		0.000191	<0.0020	2.88	0.00911	<0.000050	<0.00020	<0.0020	<0.20	0.859
	SD		0.0000849	-	0.059	0.000627	-	-	-	-	0.0087
	PRSD		-	-	2	7	-	-	-	-	1

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silicon-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)	Thorium-Total (mg/L)
Method Detection Limit		*OW*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50/2.0/2.5*	*0.00020*	*0.00010*	*0.00010*
		IC	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50*	*0.00020*	*0.00010*	*0.00010*
Spring												
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	0.00140	<0.0010	2.88	<0.00010	2.03	0.0215	7.2	<0.00020	<0.00010	<0.00010
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	0.00140	<0.0010	3.05	<0.00010	2.02	0.0219	6.9	<0.00020	<0.00010	<0.00010
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	0.00138	<0.0010	2.86	<0.00010	1.98	0.0216	7.0	<0.00020	<0.00010	<0.00010
	Mean		0.00139	<0.0010	2.93	<0.00010	2.01	0.0217	7.0	<0.00020	<0.00010	<0.00010
	SD		0.000012	-	0.104	-	0.026	0.00021	0.15	-	-	-
	PRSD		1	-	4	-	1	1	-	-	-	-
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	0.00093	<0.0010	1.79	<0.00010	3.04	0.0349	5.3	<0.00020	<0.00010	<0.00010
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	0.00091	<0.0010	1.82	<0.00010	3.15	0.0362	5.9	<0.00020	<0.00010	<0.00010
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	0.00093	<0.0010	2.05	<0.00010	3.25	0.0357	5.4	<0.00020	<0.00010	<0.00010
	Mean		0.00092	<0.0010	1.89	<0.00010	3.15	0.0356	5.5	<0.00020	<0.00010	<0.00010
	SD		0.000012	-	0.142	-	0.105	0.00066	0.34	-	-	-
	PRSD		-	-	8	-	3	2	-	-	-	-
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	0.00155	<0.0010	1.70	<0.00010	2.38	0.0310	5.5	<0.00020	<0.00010	<0.00010
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	0.00189	<0.0010	2.11	<0.00010	2.52	0.0306	5.5	<0.00020	<0.00010	0.00010
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	0.00154	<0.0010	2.11	<0.00010	2.47	0.0299	5.7	<0.00020	<0.00010	<0.00010
	Mean		0.00166	<0.0010	1.97	<0.00010	2.46	0.0305	5.6	<0.00020	<0.00010	<0.00010
	SD		0.000199	-	0.237	-	0.071	0.00056	0.12	-	-	-
	PRSD		12	-	12	-	3	2	-	-	-	-
Summer												
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	0.00167	<0.0010	1.50	<0.00010	2.26	0.0229	3.15	<0.00020	<0.00010	<0.00010
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	0.00168	<0.0010	1.70	<0.00010	2.24	0.0226	3.13	<0.00020	<0.00010	<0.00010
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	0.00162	<0.0010	1.49	<0.00010	2.31	0.0225	3.14	<0.00020	<0.00010	<0.00010
	Mean		0.00166	<0.0010	1.56	<0.00010	2.27	0.0227	3.14	<0.00020	<0.00010	<0.00010
	SD		0.000032	-	0.118	-	0.036	0.00021	0.010	-	-	-
	PRSD		2	-	8	-	2	1	0	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
		IC	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
Spring									
Winnipeg River (Rep 1)	PFS094-SURF	14-May-10	<0.00020	0.00496	<0.0010	<0.00010	0.00066	<0.0050	<0.00040
Winnipeg River (Rep 2)	PFS095-SURF	14-May-10	<0.00020	0.00614	<0.0010	0.00010	0.00059	<0.0050	<0.00040
Winnipeg River (Rep 3)	PFS096-SURF	14-May-10	<0.00020	0.00541	<0.0010	<0.00010	0.00063	<0.0050	<0.00040
	Mean		<0.00020	0.00550	<0.0010	<0.00010	0.00063	<0.0050	<0.00040
	SD		-	0.000596	-	-	0.000035	-	-
	PRSD		-	11	-	-	-	-	-
Setting Lake (Rep 1)	TCS006-SURF	23-Jun-10	<0.00020	0.00216	<0.0010	<0.00010	0.00033	<0.0050	<0.00040
Setting Lake (Rep 2)	TFS013-SURF	23-Jun-10	<0.00020	0.00221	<0.0010	<0.00010	0.00031	<0.0050	<0.00040
Setting Lake (Rep 3)	TFS014-SURF	23-Jun-10	<0.00020	0.00172	<0.0010	<0.00010	0.00032	<0.0050	<0.00040
	Mean		<0.00020	0.00203	<0.0010	<0.00010	0.00032	<0.0050	<0.00040
	SD		-	0.000270	-	-	0.000010	-	-
	PRSD		-	13	-	-	-	-	-
Rat Lake (Rep 1)	TFS005-SURF	19-Jun-10	<0.00020	0.00792	<0.0010	<0.00010	0.00047	<0.0050	0.00141
Rat Lake (Rep 2)	KLS002-SURF	19-Jun-10	<0.00020	*0.0137*	<0.0010	<0.00010	0.00068	<0.0050	0.00053
Rat Lake (Rep 3)	KLS003-SURF	19-Jun-10	<0.00020	0.00915	<0.0010	<0.00010	0.00052	<0.0050	0.00043
	Mean		<0.00020	0.0103	<0.0010	<0.00010	0.00056	<0.0050	0.00079
	SD		-	0.00304	-	-	0.000110	-	0.000539
	PRSD		-	**30**	-	-	-	-	-
Summer									
Eaglenest Lake (Rep 1)	PFS097-SURF	21-Jul-10	<0.00020	0.00701	<0.0010	0.00012	0.00086	<0.0050	<0.00040
Eaglenest Lake (Rep 2)	PFS095-SURF	21-Jul-10	<0.00020	0.00990	<0.0010	0.00012	0.00081	<0.0050	<0.00040
Eaglenest Lake (Rep 3)	PFS096-SURF	21-Jul-10	<0.00020	0.00971	<0.0010	0.00013	0.00078	<0.0050	<0.00040
	Mean		<0.00020	0.00887	<0.0010	0.00012	0.00082	<0.0050	<0.00040
	SD		-	0.001616	-	0.000006	0.000040	-	-
	PRSD		-	18	-	-	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)
Method Detection Limit					*OW*	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
					IC	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
Summer												
Walker Lake (Rep 1)	UDS020-SURF	1008JS1340	L920004-2	12-Aug-10	8:25	69.7	<0.0050	<0.00020	0.00048	0.00841	<0.00020	<0.00020
Walker Lake (Rep 2)	KLS002-SURF	1008JS1343	L920004-14	12-Aug-10	8:25	70.1	<0.0050	0.00026	0.00046	0.00856	<0.00020	<0.00020
Walker Lake (Rep 3)	KLS003-SURF	1008JS1344	L920004-15	12-Aug-10	8:25	70.3	<0.0050	0.00024	0.00042	0.00857	<0.00020	<0.00020
	Mean					70.0	<0.0050	0.00020	0.00045	0.00851	<0.00020	<0.00020
	SD					0.31	-	0.000087	0.000031	0.000090	-	-
	PRSD					0	-	-	-	1	-	-
Granville Lake (Rep 1)	EBS043-SURF	1008JS1428	L922533-1	19-Aug-10	12:50	38.0	0.236	<0.00020	0.00039	0.0138	<0.00020	<0.00020
Granville Lake (Rep 2)	TFS013-SURF	1008JS1439	L922533-6	19-Aug-10	12:50	36.4	0.225	<0.00020	0.00039	0.0137	<0.00020	<0.00020
Granville Lake (Rep 3)	TFS014-SURF	1008JS1440	L922533-7	19-Aug-10	12:50	37.6	0.193	<0.00020	0.00039	0.0136	<0.00020	<0.00020
	Mean					37.3	0.218	<0.00020	0.00039	0.0137	<0.00020	<0.00020
	SD					0.83	0.0223	-	0.000000	0.00010	-	-
	PRSD					2	10	-	-	1	-	-
Fall												
Manigotagan L (Rep 1)	RAS155-SURF	1009JS1601	L935796-3	24-Sep-10	11:25	40.6	0.153	<0.00020	0.00073	0.00824	<0.00020	<0.00020
Manigotagan L (Rep 2)	PFS095-SURF	1009JS1603	L935796-5	24-Sep-10	11:25	38.8	0.161	<0.00020	0.00072	0.00809	<0.00020	<0.00020
Manigotagan L (Rep 3)	PFS096-SURF	1009JS1604	L935796-6	24-Sep-10	11:25	38.8	0.157	<0.00020	0.00072	0.00847	<0.00020	<0.00020
	Mean					39.4	0.157	<0.00020	0.00072	0.00827	<0.00020	<0.00020
	SD					1.04	0.0040	-	0.000006	0.000191	-	-
	PRSD					3	3	-	-	2	-	-
Winnipegosis-2 (Rep 1)	LFS004-SURF	1009JS1527	L928851-2	7-Sep-10	10:05	222	0.0228	0.00027	0.00212	0.0356	<0.00020	<0.00020
Winnipegosis-2 (Rep 2)	KLS002-SURF	1009JS1547	L928851-9	7-Sep-10	10:05	224	0.0201	0.00025	0.00194	0.0359	<0.00020	<0.00020
Winnipegosis-2 (Rep 3)	KLS003-SURF	1009JS1548	L928851-10	7-Sep-10	10:05	248	0.0250	0.00020	0.00192	0.0360	<0.00020	<0.00020
	Mean					231	0.0226	0.00024	0.00199	0.0358	<0.00020	<0.00020
	SD					14.5	0.00245	0.000036	0.000110	0.00021	-	-
	PRSD					6	-	-	6	1	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Fluoride (mg/L)	Iron-Total (mg/L)
Method Detection Limit		*OW*	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20/0.40/1.0*	*0.0010*	*0.00020*	*0.00020*		*0.020*
		IC	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*	*0.00020*	*0.020*	*0.010/0.10*
Summer												
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	<0.010	0.000020	19.5	<0.00010	0.96	<0.0010	<0.00020	<0.00020	-	0.121
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	<0.010	0.000013	19.8	<0.00010	0.94	<0.0010	<0.00020	<0.00020	-	0.123
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	<0.010	<0.000010	19.9	<0.00010	0.95	<0.0010	<0.00020	<0.00020	-	0.125
	Mean		<0.010	0.000013	19.7	<0.00010	0.95	<0.0010	<0.00020	<0.00020	-	0.123
	SD		-	0.0000075	0.21	-	0.010	-	-	-	-	0.0020
	PRSD		-	-	1	-	-	-	-	-	-	2
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	0.011	<0.000010	9.40	<0.00010	1.01	<0.0010	<0.00020	0.00087	-	0.164
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	0.011	<0.000010	9.02	<0.00010	1.00	<0.0010	<0.00020	0.00088	-	0.152
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	0.010	<0.000010	9.34	<0.00010	0.99	<0.0010	<0.00020	0.00082	-	0.130
	Mean		0.011	<0.000010	9.25	<0.00010	1.00	<0.0010	<0.00020	0.00086	-	0.149
	SD		0.0006	-	0.204	-	0.010	-	-	0.000032	-	0.0172
	PRSD		-	-	2	-	1	-	-	-	-	12
Fall												
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	<0.010	<0.000010	10.6	<0.00010	0.31	<0.0010	<0.00020	0.00113	-	0.222
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	<0.010	<0.000010	10.1	<0.00010	0.32	<0.0010	<0.00020	0.00112	-	0.232
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	<0.010	0.000014	10.1	<0.00010	0.31	<0.0010	<0.00020	0.00109	-	0.229
	Mean		<0.010	<0.000010	10.3	<0.00010	0.31	<0.0010	<0.00020	0.00111	-	0.228
	SD		-	-	0.29	-	0.006	-	-	0.000021	-	0.0051
	PRSD		-	-	3	-	-	-	-	2	-	2
Winnipegosis-2 (Rep 1)	LFS004-SURF	7-Sep-10	0.068	*0.000129*	49.9	<0.00010	203	<0.0010	<0.00020	0.00054	-	<0.020
Winnipegosis-2 (Rep 2)	KLS002-SURF	7-Sep-10	0.068	0.000014	51.8	<0.00010	220	<0.0010	<0.00020	0.00057	-	<0.020
Winnipegosis-2 (Rep 3)	KLS003-SURF	7-Sep-10	0.070	0.000031	50.3	<0.00010	211	<0.0010	<0.00020	0.00056	-	<0.020
	Mean		0.069	0.000058	50.7	<0.00010	211	<0.0010	<0.00020	0.00056	-	<0.020
	SD		0.0012	0.0000621	1.00	-	8.5	-	-	0.000015	-	-
	PRSD		2	-	2	-	4	-	-	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Lead-Total (mg/L)	Lithium-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)
Method Detection Limit		*OW*	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050/0.00010*	*0.00020*	*0.0020*	*0.20*
		IC	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050*	*0.00020*	*0.0020*	*0.20*
Summer										
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	0.000213	<0.0020	5.10	0.0525	<0.000050	<0.00020	<0.0020	<0.20
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	0.000131	<0.0020	5.03	0.0548	<0.000050	<0.00020	<0.0020	<0.20
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	<0.000090	<0.0020	5.01	0.0564	<0.000050	<0.00020	<0.0020	<0.20
	Mean		0.000130	<0.0020	5.05	0.0546	<0.000050	<0.00020	<0.0020	<0.20
	SD		0.0000840	-	0.047	0.00196	-	-	-	-
	PRSD		-	-	1	4	-	-	-	-
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	0.000141	0.0040	3.52	0.0159	<0.000050	<0.00020	<0.0020	<0.20
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	0.000106	0.0032	3.37	0.0155	<0.000050	<0.00020	<0.0020	<0.20
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	0.000096	0.0031	3.48	0.0157	<0.000050	<0.00020	<0.0020	<0.20
	Mean		0.000114	0.0034	3.46	0.0157	<0.000050	<0.00020	<0.0020	<0.20
	SD		0.0000236	0.00049	0.078	0.00020	-	-	-	-
	PRSD		-	-	2	1	-	-	-	-
Fall										
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	0.000115	0.0026	3.46	0.00699	<0.000050	<0.00020	<0.0020	<0.20
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	0.000115	0.0035	3.33	0.00671	<0.000050	<0.00020	<0.0020	<0.20
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	0.000138	0.0027	3.28	0.00689	<0.000050	<0.00020	<0.0020	<0.20
	Mean		0.000123	0.0029	3.36	0.00686	<0.000050	<0.00020	<0.0020	<0.20
	SD		0.0000133	0.00049	0.093	0.000142	-	-	-	-
	PRSD		-	-	3	2	-	-	-	-
Winnipegosis-2 (Rep 1)	LFS004-SURF	7-Sep-10	0.000104	0.0248	23.6	0.0134	<0.000050	0.00171	<0.0020	<0.20
Winnipegosis-2 (Rep 2)	KLS002-SURF	7-Sep-10	<0.000090	0.0255	23.0	0.0142	<0.000050	0.00168	<0.0020	<0.20
Winnipegosis-2 (Rep 3)	KLS003-SURF	7-Sep-10	<0.000090	0.0237	29.7	0.0150	<0.000050	0.00170	<0.0020	<0.20
	Mean		<0.000090	0.0247	25.4	0.0142	<0.000050	0.00170	<0.0020	<0.20
	SD		-	0.00091	3.71	0.00080	-	0.000015	-	-
	PRSD		-	4	15	6	-	1	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silicon-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit		*OW*	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50/2.0/2.5*	*0.00020*
		IC	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50*	*0.00020*
Summer											
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	0.744	0.00152	<0.0010	1.36	<0.00010	2.05	0.0295	1.03	<0.00020
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	0.763	0.00144	<0.0010	1.02	<0.00010	1.99	0.0289	1.03	<0.00020
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	0.761	0.00145	<0.0010	0.959	<0.00010	1.99	0.0296	1.03	<0.00020
	Mean		0.756	0.00147	<0.0010	1.11	<0.00010	2.01	0.0293	1.03	<0.00020
	SD		0.0104	0.000044	-	0.216	-	0.035	0.00038	0.000	-
	PRSD		1	3	-	**19**	-	2	1	-	-
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	1.25	0.00227	<0.0010	2.81	<0.00010	3.04	0.0364	2.40	<0.00020
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	1.19	0.00217	<0.0010	2.58	<0.00010	2.99	0.0358	2.41	<0.00020
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	1.21	0.00207	<0.0010	2.43	<0.00010	3.03	0.0351	2.40	<0.00020
	Mean		1.22	0.00217	<0.0010	2.61	<0.00010	3.02	0.0358	2.40	<0.00020
	SD		0.031	0.000100	-	0.191	-	0.026	0.00065	0.006	-
	PRSD		3	5	-	7	-	1	2	-	-
Fall											
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	0.827	0.00174	<0.0010	2.98	<0.00010	1.12	0.0211	1.02	<0.00020
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	0.798	0.00171	<0.0010	3.05	<0.00010	1.06	0.0207	1.00	<0.00020
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	0.817	0.00174	<0.0010	3.12	<0.00010	1.05	0.0210	1.00	<0.00020
	Mean		0.814	0.00173	<0.0010	3.05	<0.00010	1.08	0.0209	1.01	<0.00020
	SD		0.0147	0.000017	-	0.070	-	0.038	0.00021	0.012	-
	PRSD		2	1	-	2	-	4	1	-	-
Winnipegosis-2 (Rep 1)	LFS004-SURF	7-Sep-10	7.48	0.00356	<0.0010	4.07	<0.00010	136	0.254	48.6	<0.00020
Winnipegosis-2 (Rep 2)	KLS002-SURF	7-Sep-10	7.87	0.00365	<0.0010	4.33	<0.00010	143	0.252	54.1	<0.00020
Winnipegosis-2 (Rep 3)	KLS003-SURF	7-Sep-10	7.97	0.00366	<0.0010	4.30	<0.00010	145	0.249	52.6	<0.00020
	Mean		7.77	0.00362	<0.0010	4.23	<0.00010	141	0.252	51.8	<0.00020
	SD		0.259	0.000055	-	0.142	-	4.7	0.0025	2.84	-
	PRSD		3	2	-	3	-	3	1	5	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Thorium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*	*0.00010*	*0.00010*	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
		IC	*0.00010*	*0.00010*	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
Summer											
Walker Lake (Rep 1)	UDS020-SURF	12-Aug-10	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010	0.00013	0.00038	<0.0050	<0.00040
Walker Lake (Rep 2)	KLS002-SURF	12-Aug-10	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010	<0.00010	0.00033	<0.0050	<0.00040
Walker Lake (Rep 3)	KLS003-SURF	12-Aug-10	<0.00010	<0.00010	<0.00020	<0.00020	<0.0010	<0.00010	0.00039	<0.0050	<0.00040
	Mean		<0.00010	<0.00010	<0.00020	<0.00020	<0.0010	<0.00010	0.00037	<0.0050	<0.00040
	SD		-	-	-	-	-	-	0.000032	-	-
	PRSD		-	-	-	-	-	-	-	-	-
Granville Lake (Rep 1)	EBS043-SURF	19-Aug-10	<0.00010	<0.00010	<0.00020	0.00874	<0.0010	0.00010	0.00060	<0.0050	<0.00040
Granville Lake (Rep 2)	TFS013-SURF	19-Aug-10	<0.00010	<0.00010	<0.00020	0.00884	<0.0010	0.00011	0.00053	<0.0050	<0.00040
Granville Lake (Rep 3)	TFS014-SURF	19-Aug-10	<0.00010	<0.00010	<0.00020	0.00667	<0.0010	0.00010	0.00053	<0.0050	<0.00040
	Mean		<0.00010	<0.00010	<0.00020	0.00808	<0.0010	0.00010	0.00055	<0.0050	<0.00040
	SD		-	-	-	0.001225	-	0.000006	0.000040	-	-
	PRSD		-	-	-	15	-	-	-	-	-
Fall											
Manigotagan Lake (Rep 1)	RAS155-SURF	24-Sep-10	<0.00010	<0.00010	0.00102	0.00464	<0.0010	0.00011	0.00066	<0.0050	<0.00040
Manigotagan Lake (Rep 2)	PFS095-SURF	24-Sep-10	<0.00010	<0.00010	0.00096	0.00484	<0.0010	0.00011	0.00066	<0.0050	<0.00040
Manigotagan Lake (Rep 3)	PFS096-SURF	24-Sep-10	<0.00010	<0.00010	0.00099	0.00466	<0.0010	0.00011	0.00069	<0.0050	<0.00040
	Mean		<0.00010	<0.00010	0.00099	0.00471	<0.0010	0.00011	0.00067	<0.0050	<0.00040
	SD		-	-	0.000030	0.000110	-	0.000000	0.000017	-	-
	PRSD		-	-	3	2	-	-	-	-	-
Winnipegosis-2 (Rep 1)	LFS004-SURF	7-Sep-10	<0.00010	<0.00010	<0.00020	0.00124	<0.0010	0.00110	0.00085	<0.0050	<0.00040
Winnipegosis-2 (Rep 2)	KLS002-SURF	7-Sep-10	<0.00010	<0.00010	<0.00020	0.00114	<0.0010	0.00108	0.00096	<0.0050	<0.00040
Winnipegosis-2 (Rep 3)	KLS003-SURF	7-Sep-10	<0.00010	<0.00010	<0.00020	0.00121	<0.0010	0.00107	0.00104	<0.0050	<0.00040
	Mean		<0.00010	<0.00010	<0.00020	0.00120	<0.0010	0.00108	0.00095	<0.0050	<0.00040
	SD		-	-	-	0.000051	-	0.000015	0.000095	-	-
	PRSD		-	-	-	4	-	1	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)
Method Detection Limit					*OW*	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
					IC	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
Fall												
Cross Lake (Rep 1)	UDS004-SURF	1009JS1655	L932322-2	15-Sep-10	8:30	91.4	0.347	<0.00020	0.00154	0.0269	<0.00020	<0.00020
Cross Lake (Rep 2)	TFS013-SURF	1009JS1661	L932322-9	15-Sep-10	8:30	92.6	0.430	<0.00020	0.00147	0.0275	<0.00020	<0.00020
Cross Lake (Rep 3)	TFS014-SURF	1009JS1662	L932322-10	15-Sep-10	8:30	94.1	0.437	<0.00020	0.00151	0.0276	<0.00020	<0.00020
	Mean					92.7	0.405	<0.00020	0.00151	0.0273	<0.00020	<0.00020
	SD					1.35	0.0501	-	0.000035	0.00038	-	-
	PRSD					1	12	-	2	1	-	-
Winter												
Eaglenest Lake	PFS095-SURF	1102CL0119	L981697-4	25-Feb-11	12:35	48.2	0.304	<0.00020	0.00108	0.0117	<0.00020	<0.00020
Eaglenest Lake (Rep 2)	PFS096-SURF	1102CL0121	L981697-6	25-Feb-11	13:00	47.8	0.323	<0.00020	0.00109	0.0115	<0.00020	<0.00020
Eaglenest Lake (Rep 3)	PFS097-SURF	1102CL0120	L981697-5	25-Feb-11	13:20	47.5	0.324	<0.00020	0.00108	0.0118	<0.00020	<0.00020
	Mean					47.8	0.317	<0.00020	0.00108	0.0117	<0.00020	<0.00020
	SD					0.35	0.0113	-	0.000006	0.00015	-	-
	PRSD					1	4	-	1	1	-	-
Cormorant Lake	KKS038-SURF	1102CL0143	L984359-1	7-Mar-11	15:30	178	0.0177	<0.00020	0.00131	0.0399	<0.00020	<0.00020
Cormorant Lake (Rep 2)	KLS002-SURF	1102CL0155	L984359-7	7-Mar-11	16:00	181	0.0178	<0.00020	0.00137	0.0404	<0.00020	<0.00020
Cormorant Lake (Rep 3)	KLS003-SURF	1102CL0156	L984359-8	7-Mar-11	16:30	173	0.0157	<0.00020	0.00131	0.0389	<0.00020	<0.00020
	Mean					177	0.0171	<0.00020	0.00133	0.0397	<0.00020	<0.00020
	SD					4.0	0.00118	-	0.000035	0.00076	-	-
	PRSD					2	-	-	3	2	-	-
Billard Lake	FBS003-SURF	1102CL0173	L981063-2	23-Feb-11	10:30	69.7	0.381	<0.00020	0.00036	0.0124	<0.00020	<0.00020
Billard Lake (Rep 2)	TFS013-SURF	1102CL0197	L981063-4	23-Feb-11	10:30	70.4	0.398	<0.00020	0.00035	0.0130	<0.00020	<0.00020
Billard Lake (Rep 3)	TFS014-SURF	1102CL0198	L981063-5	23-Feb-11	10:30	69.7	0.394	<0.00020	0.00034	0.0131	<0.00020	<0.00020
	Mean					69.9	0.391	<0.00020	0.00035	0.0128	<0.00020	<0.00020
	SD					0.40	0.0089	-	0.000010	0.00038	-	-
	PRSD					1	2	-	-	3	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Fluoride (mg/L)	Iron-Total (mg/L)
Method Detection Limit		*OW*	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20/0.40/1.0*	*0.0010*	*0.00020*	*0.00020*		*0.020*
		IC	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*	*0.00020*	*0.020*	*0.010/0.10*
Fall												
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	0.016	<0.000010	22.2	<0.00010	14.1	<0.0010	<0.00020	0.00174	-	0.360
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	0.016	<0.000010	22.6	<0.00010	14.2	<0.0010	0.00020	0.00152	-	0.399
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	0.017	<0.000010	22.9	<0.00010	14.3	<0.0010	0.00023	0.00169	-	0.429
	Mean		0.016	<0.000010	22.6	<0.00010	14.2	<0.0010	0.00022	0.00165	-	0.396
	SD		0.0006	-	0.35	-	0.10	-	0.000021	0.000115	-	0.0346
	PRSD		-	-	2	-	1	-	-	7	-	9
Winter												
Eaglenest Lake (Rep 1)	PFS095-SURF	25-Feb-11	<0.010	<0.000010	13.3	<0.00010	1.39	<0.0010	<0.00020	0.00152	-	0.30
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	<0.010	<0.000010	13.3	<0.00010	1.38	<0.0010	<0.00020	0.00133	-	0.30
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	<0.010	<0.000010	13.2	<0.00010	1.37	<0.0010	<0.00020	0.00139	-	0.30
	Mean		<0.010	<0.000010	13.3	<0.00010	1.38	<0.0010	<0.00020	0.00141	-	0.30
	SD		-	-	0.06	-	0.010	-	-	0.000097	-	0.000
	PRSD		-	-	0	-	1	-	-	7	-	-
Cormorant Lake (Rep 1)	KKS038-SURF	7-Mar-11	0.015	<0.000010	37.6	<0.00010	1.03	<0.0010	<0.00020	0.00104	0.059	0.021
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	0.015	<0.000010	37.8	<0.00010	1.02	<0.0010	<0.00020	0.00113	0.060	0.012
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	0.014	<0.000010	36.7	<0.00010	1.02	<0.0010	<0.00020	0.00101	0.064	<0.010
	Mean		0.015	<0.000010	37.4	<0.00010	1.02	<0.0010	<0.00020	0.00106	0.061	0.013
	SD		0.0006	-	0.59	-	0.006	-	-	0.000062	0.0026	0.0080
	PRSD		-	-	2	-	1	-	-	6	-	-
Billard Lake (Rep 1)	FBS003-SURF	23-Feb-11	<0.010	<0.000010	20.7	<0.00010	0.80	<0.0010	<0.00020	0.00146	-	0.17
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	<0.010	0.000011	20.9	<0.00010	0.80	<0.0010	<0.00020	0.00151	-	0.20
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	<0.010	<0.000010	20.7	<0.00010	0.82	<0.0010	<0.00020	0.00148	-	0.19
	Mean		<0.010	<0.000010	20.8	<0.00010	0.81	<0.0010	<0.00020	0.00148	-	0.19
	SD		-	-	0.12	-	0.012	-	-	0.000025	-	0.015
	PRSD		-	-	1	-	-	-	-	2	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Lead-Total (mg/L)	Lithium-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)
Method Detection Limit		*OW*	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050/0.00010*	*0.00020*	*0.0020*	*0.20*
		IC	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050*	*0.00020*	*0.0020*	*0.20*
Fall										
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	0.000236	0.0069	8.71	0.0136	<0.000050	0.00051	<0.0020	<0.20
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	0.000270	0.0067	8.81	0.0135	<0.000050	0.00051	<0.0020	<0.20
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	*0.000470*	0.0072	8.97	0.0133	<0.000050	0.00051	<0.0020	<0.20
	Mean		0.000325	0.0069	8.83	0.01347	<0.000050	0.00051	<0.0020	<0.20
	SD		0.0001264	0.00025	0.131	0.00015	-	0.000000	-	-
	PRSD		-	-	1	1	-	-	-	-
Winter										
Eaglenest Lake	PFS095-SURF	25-Feb-11	0.000184	<0.0020	3.65	0.00918	<0.000050	<0.00020	<0.0020	<0.20
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	0.000158	<0.0020	3.57	0.00851	<0.000050	<0.00020	<0.0020	<0.20
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	0.000192	<0.0020	3.55	0.00842	<0.000050	<0.00020	<0.0020	<0.20
	Mean		0.000178	<0.0020	3.59	0.00870	<0.000050	<0.00020	<0.0020	<0.20
	SD		0.0000178	-	0.053	0.000415	-	-	-	-
	PRSD		-	-	1	5	-	-	-	-
Cormorant Lake	KKS038-SURF	7-Mar-11	<0.000090	0.0046	20.4	0.00149	<0.000050	0.00023	<0.0020	<0.20
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	<0.000090	0.0048	20.9	0.00162	<0.000050	0.00024	<0.0020	<0.20
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	<0.000090	0.0042	19.9	0.00143	<0.000050	0.00022	<0.0020	<0.20
	Mean		<0.000090	0.0045	20.4	0.00151	<0.000050	0.00023	<0.0020	<0.20
	SD		-	0.00031	0.50	0.000097	-	0.000010	-	-
	PRSD		-	-	2	-	-	-	-	-
Billard Lake	FBS003-SURF	23-Feb-11	0.000177	0.0026	4.37	0.00568	<0.000050	<0.00020	<0.0020	<0.20
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	0.000190	0.0022	4.46	0.00597	<0.000050	<0.00020	<0.0020	<0.20
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	0.000202	0.0026	4.39	0.00576	<0.000050	<0.00020	<0.0020	<0.20
	Mean		0.000190	0.0025	4.41	0.00580	<0.000050	<0.00020	<0.0020	<0.20
	SD		0.0000125	0.00023	0.047	0.000150	-	-	-	-
	PRSD		-	-	1	3	-	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silicon-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)
Method Detection Limit		*OW*	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50/2.0/2.5*	*0.00020*	*0.00010*
		IC	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50*	*0.00020*	*0.00010*
Fall												
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	2.22	0.00210	<0.0010	3.07	<0.00010	11.4	0.0761	17.7	<0.00020	<0.00010
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	2.26	0.00230	<0.0010	3.41	<0.00010	11.4	0.0771	18.1	<0.00020	<0.00010
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	2.30	0.00221	<0.0010	3.68	<0.00010	11.6	0.0770	18.0	<0.00020	<0.00010
	Mean		2.26	0.00220	<0.0010	3.39	<0.00010	11.5	0.0767	17.9	<0.00020	<0.00010
	SD		0.040	0.000100	-	0.306	-	0.12	0.00055	0.21	-	-
	PRSD		2	5	-	9	-	1	1	1	-	-
Winter												
Eaglenest Lake	PFS095-SURF	25-Feb-11	0.964	0.00175	<0.0010	3.16	<0.00010	2.47	0.0270	3.26	<0.00020	<0.00010
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	0.966	0.00174	<0.0010	3.00	<0.00010	2.38	0.0261	3.27	<0.00020	<0.00010
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	0.949	0.00174	<0.0010	3.02	<0.00010	2.42	0.0265	3.24	<0.00020	<0.00010
	Mean		0.960	0.00174	<0.0010	3.06	<0.00010	2.42	0.0265	3.26	<0.00020	<0.00010
	SD		0.0093	0.000006	-	0.087	-	0.045	0.00045	0.015	-	-
	PRSD		1	0	-	3	-	2	2	0	-	-
Cormorant Lake	KKS038-SURF	7-Mar-11	1.37	0.00114	<0.0010	3.15	<0.00010	2.85	0.0678	3.35	<0.00020	<0.00010
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	1.40	0.00112	<0.0010	3.23	<0.00010	2.90	0.0695	3.28	<0.00020	<0.00010
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	1.31	0.00110	<0.0010	3.20	<0.00010	2.79	0.0654	3.33	<0.00020	<0.00010
	Mean		1.36	0.00112	<0.0010	3.19	<0.00010	2.85	0.0676	3.32	<0.00020	<0.00010
	SD		0.046	0.000020	-	0.040	-	0.055	0.00206	0.036	-	-
	PRSD		3	2	-	1	-	2	3	1	-	-
Billard Lake	FBS003-SURF	23-Feb-11	1.12	0.00133	<0.0010	2.50	<0.00010	2.64	0.0383	1.76	<0.00020	<0.00010
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	1.16	0.00141	<0.0010	2.43	<0.00010	2.74	0.0390	1.77	<0.00020	<0.00010
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	1.15	0.00146	<0.0010	2.52	<0.00010	2.71	0.0395	1.76	<0.00020	<0.00010
	Mean		1.14	0.00140	<0.0010	2.48	<0.00010	2.70	0.0389	1.76	<0.00020	<0.00010
	SD		0.021	0.000066	-	0.047	-	0.051	0.00060	0.006	-	-
	PRSD		2	5	-	2	-	2	2	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
		IC	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
Fall									
Cross Lake (Rep 1)	UDS004-SURF	15-Sep-10	<0.00020	0.0130	<0.0010	0.00046	0.00145	<0.0050	<0.00040
Cross Lake (Rep 2)	TFS013-SURF	15-Sep-10	<0.00020	0.0159	<0.0010	0.00046	0.00154	<0.0050	<0.00040
Cross Lake (Rep 3)	TFS014-SURF	15-Sep-10	<0.00020	0.0159	<0.0010	0.00047	0.00153	<0.0050	0.00042
	Mean		<0.00020	0.0149	<0.0010	0.00046	0.00151	<0.0050	<0.00040
	SD		-	0.00167	-	0.000006	0.000049	-	-
	PRSD		-	11	-	-	3	-	-
Winter									
Eaglenest Lake	PFS095-SURF	25-Feb-11	<0.00020	0.0101	<0.0010	0.00012	0.00106	<0.0050	<0.00040
Eaglenest Lake (Rep 2)	PFS096-SURF	25-Feb-11	<0.00020	0.0104	<0.0010	0.00011	0.00104	<0.0050	<0.00040
Eaglenest Lake (Rep 3)	PFS097-SURF	25-Feb-11	<0.00020	0.0107	<0.0010	0.00012	0.00101	<0.0050	<0.00040
	Mean		<0.00020	0.0104	<0.0010	0.00012	0.00104	<0.0050	<0.00040
	SD		-	0.00030	-	0.000006	0.000025	-	-
	PRSD		-	3	-	-	2	-	-
Cormorant Lake	KKS038-SURF	7-Mar-11	<0.00020	0.00020	<0.0010	0.00021	0.00076	<0.0050	<0.00040
Cormorant Lake (Rep 2)	KLS002-SURF	7-Mar-11	<0.00020	0.00027	<0.0010	0.00022	0.00076	<0.0050	<0.00040
Cormorant Lake (Rep 3)	KLS003-SURF	7-Mar-11	<0.00020	0.00022	<0.0010	0.00020	0.00073	<0.0050	<0.00040
	Mean		<0.00020	0.00023	<0.0010	0.00021	0.00075	<0.0050	<0.00040
	SD		-	0.000036	-	0.000010	0.000017	-	-
	PRSD		-	-	-	-	-	-	-
Billard Lake	FBS003-SURF	23-Feb-11	0.00089	0.00821	<0.0010	0.00021	0.00059	<0.0050	<0.00040
Billard Lake (Rep 2)	TFS013-SURF	23-Feb-11	0.00078	0.00801	<0.0010	0.00022	0.00063	<0.0050	<0.00040
Billard Lake (Rep 3)	TFS014-SURF	23-Feb-11	0.00093	0.00791	<0.0010	0.00021	0.00065	<0.0050	<0.00040
	Mean		0.00087	0.00804	<0.0010	0.00021	0.00062	<0.0050	<0.00040
	SD		0.000078	0.000153	-	0.000006	0.000031	-	-
	PRSD		-	2	-	-	-	-	-

Table 2-22 – continued –

Sample Location	Sample ID	MWS ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)
Method Detection Limit					*OW*	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
					IC	*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
Winter												
SIL-Area 6- Rep 1	ECS002-SURF	1102CL0181	L981693-1	25-Feb-11	10:38	52.2	0.368	<0.00020	0.00038	0.0177	<0.00020	<0.00020
SIL-Area 6- Rep 2	FAS010-SURF	1102CL0199	L981696-1	25-Feb-11	10:38	52.9	0.385	<0.00020	0.00037	0.0175	<0.00020	<0.00020
SIL-Area 6- Rep 3	FAS011-SURF	1102CL0200	L981696-2	25-Feb-11	10:38	55.1	0.406	<0.00020	0.00038	0.0177	<0.00020	<0.00020
	Mean					53.4	0.386	<0.00020	0.00038	0.0176	<0.00020	<0.00020
	SD					1.51	0.0190	-	0.000006	0.00012	-	-
	PRSD					3	5	-	-	1	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Fluoride (mg/L)	Iron-Total (mg/L)
Method Detection Limit		*OW*	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20/0.40/1.0*	*0.0010*	*0.00020*	*0.00020*		*0.020*
		IC	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20*	*0.0010*	*0.00020*	*0.00020*	*0.020*	*0.010/0.10*
Winter												
SIL-Area 6- Rep 1	ECS002-SURF	25-Feb-11	0.013	<0.000010	12.9	<0.00010	1.20	<0.0010	<0.00020	0.00117	-	0.30
SIL-Area 6- Rep 2	FAS010-SURF	25-Feb-11	0.012	<0.000010	13.2	<0.00010	1.24	<0.0010	<0.00020	0.00117	-	0.30
SIL-Area 6- Rep 3	FAS011-SURF	25-Feb-11	0.012	<0.000010	13.8	<0.00010	1.22	<0.0010	<0.00020	0.00102	-	0.33
	Mean		0.012	<0.000010	13.3	<0.00010	1.22	<0.0010	<0.00020	0.00112	-	0.31
	SD		0.0006	-	0.46	-	0.020	-	-	0.000087	-	0.017
	PRSD		-	-	3	-	2	-	-	8	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Lead-Total (mg/L)	Lithium-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)
Method Detection Limit		*OW*	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050/0.00010*	*0.00020*	*0.0020*	*0.20*
		IC	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050*	*0.00020*	*0.0020*	*0.20*
Winter										
SIL-Area 6- Rep 1	ECS002-SURF	25-Feb-11	0.000137	0.0039	4.82	0.00706	<0.000050	<0.00020	<0.0020	<0.20
SIL-Area 6- Rep 2	FAS010-SURF	25-Feb-11	0.000155	0.0046	4.83	0.00716	<0.000050	<0.00020	<0.0020	<0.20
SIL-Area 6- Rep 3	FAS011-SURF	25-Feb-11	0.000144	0.0035	5.01	0.00745	<0.000050	0.00021	<0.0020	<0.20
	Mean		0.000145	0.0040	4.89	0.00722	<0.000050	<0.00020	<0.0020	<0.20
	SD		0.0000091	0.00056	0.107	0.000203	-	-	-	-
	PRSD		6	-	2	3	-	-	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silicon-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)
Method Detection Limit		*OW*	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50/2.0/2.5*	*0.00020*
		IC	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*	*0.50*	*0.00020*
Winter											
SIL-Area 6- Rep 1	ECS002-SURF	25-Feb-11	1.44	0.00225	<0.0010	2.35	<0.00010	3.87	0.0455	2.28	<0.00020
SIL-Area 6- Rep 2	FAS010-SURF	25-Feb-11	1.46	0.00225	<0.0010	2.43	<0.00010	3.88	0.0465	2.31	<0.00020
SIL-Area 6- Rep 3	FAS011-SURF	25-Feb-11	1.55	0.00234	<0.0010	2.33	<0.00010	3.98	0.0469	2.32	<0.00020
	Mean		1.48	0.00228	<0.0010	2.37	<0.00010	3.91	0.0463	2.30	<0.00020
	SD		0.059	0.000052	-	0.053	-	0.061	0.00072	0.021	-
	PRSD		4	2	-	2	-	2	2	-	-

Table 2-22. – continued –

Sample Location	Sample ID	Sample Date	Thallium-Total (mg/L)	Thorium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
Method Detection Limit		*OW*	*0.00010*	*0.00010*	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
		IC	*0.00010*	*0.00010*	*0.00020*	*0.00020*	*0.0010*	*0.00010*	*0.00020*	*0.0050*	*0.00040*
Winter											
SIL-Area 6- Rep 1	ECS002-SURF	25-Feb-11	<0.00010	0.00014	0.00064	0.0130	<0.0010	0.00019	0.00075	<0.0050	0.00063
SIL-Area 6- Rep 2	FAS010-SURF	25-Feb-11	<0.00010	0.00014	0.00089	0.0128	<0.0010	0.00019	0.00077	<0.0050	0.00046
SIL-Area 6- Rep 3	FAS011-SURF	25-Feb-11	<0.00010	0.00015	0.00034	0.0134	<0.0010	0.00019	0.00076	<0.0050	0.00048
	Mean		<0.00010	0.00014	0.00062	0.0131	<0.0010	0.00019	0.00076	<0.0050	0.00052
	SD		-	0.000006	0.000275	0.00031	-	0.000000	0.000010	-	0.000093
	PRSD		-	-	-	2	-	-	-	-	-

Table 2-23. Results of analyses conducted in 2008/2009 for routine, bacterial, and productivity parameters at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface water samples. Relative percent mean differences (RPMDs) greater than 25% are indicated in red.

Region	Sample Location	Sample ID	Laboratory	Sample Date	Sample Time	Sample Depth	Alkalinity Total ($CaCO_3$)	Alkalinity Bicarbonate (HCO_3)	Alkalinity Carbonate (CO_3)	Alkalinity Hydroxide (OH)
						(m)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
ALS Method Detection Limit							*1*	*2*	*0.6*	*0.4*
Maxxam Detection Limit							*1*	*2*	*0.5*	*0.5*
Spring										
Upper Nelson	Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	13:35	0.3	112	137	<0.6	<0.4
River	Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	13:35	0.3	114	139	<0.5	<0.5
		RPMD					1	1	-	-
Summer										
Upper Nelson	Cross Lake	UDS004-SURF	ALS	14-Aug-08	13:09	0.3	98	113	3.2	<0.4
River	Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08		0.3	98.9	121	<0.5	<0.5
		RPMD					1	7	-	-
Fall										
Upper Nelson	Cross Lake	UDS004-SURF	ALS	18-Sep-08	15:20	0.3	95	116	<0.6	<0.4
River	Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08		0.3	94.1	115	<0.5	<0.5
		RPMD					1	1	-	-

*Maxxam sample IDs are not known as the data were retrieved from the MWS water quality database.

Table 2-23. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)
ALS Method Detection Limit				*0.003*	*0.005*	*0.2*	*0.001*	*0.001*	*0.001*
Maxxam Detection Limit				*0.01*	*0.01*	*0.2*	*0.001*	*0.001*	*0.001*
Spring									
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	0.007	0.014	0.4	0.012	0.025	0.038
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	<0.01	0.01	0.8	0.013	0.044	0.057
	RPMD			-	-	-	5	**54**	**40**
Summer									
Cross Lake	UDS004-SURF	ALS	14-Aug-08	0.024	0.008	0.8	0.011	0.019	0.031
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	0.04	<0.01	1.1	0.008	0.001	0.009
	RPMD			**50**	-	-	**32**	-	**110**
Fall									
Cross Lake	UDS004-SURF	ALS	18-Sep-08	0.015	0.064	0.7	0.013	0.028	0.041
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	0.06	0.05	0.7	0.014	0.038	0.052
	RPMD			**120**	25	-	7	**30**	24

Table 2-23. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)
ALS Method Detection Limit				*1*	*1*	*1*	*2*	*0.05*	*5*
Maxxam Detection Limit				-	*1*	*1*	*2*	*0.05*	*5*
Spring									
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	8	8	26	18	20	17
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	-	3.3	28	11	13.1	19
	RPMD			-	**87**	6	**48**	**42**	-
Summer									
Cross Lake	UDS004-SURF	ALS	14-Aug-08	11	13	21	6	6	35
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	-	8.7	29	2	4.8	31
	RPMD			-	**40**	**32**	-	22	12
Fall									
Cross Lake	UDS004-SURF	ALS	18-Sep-08	10	11	22	10	9	40
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	-	5.4	30	10	6.9	33
	RPMD			-	**68**	**31**	0	23	19

Table 2-23. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	pH	Total Dissolved Solids (mg/L)	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)	Productivity: Chlorophyll *a* (µg/L)	Productivity: Pheophytin (µg/L)
ALS Method Detection Limit				*0.01*	*5*	*0.4*	*1*	*1*	*1*
Maxxam Detection Limit				*0.01*	*5*	*0.4*	*-*	*1*	*0.5*
Spring									
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	8.20	207	335	<1	7	3
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	8.05	204	349	-	5.98	<0.5
	RPMD			2	1	4	-	16	-
Summer									
Cross Lake	UDS004-SURF	ALS	14-Aug-08	8.42	180	279	<1	15**	<1**
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	8.41	189	297	-	5.98**	<0.5**
	RPMD			0	5	6	-	**86**	-
Fall									
Cross Lake	UDS004-SURF	ALS	18-Sep-08	8.03	180	282	<1	31**	4**
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	8.08	178	294	-	15**	<0.5**
	RPMD			1	1	4	-	**70**	-

**Measured on samples collected across the euphotic zone (i.e., sample ID was UDS004-EUPH).

Table 2-24. Results of metal and major ion analyses conducted in 2008/2009 at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface samples. Relative percent mean differences (RPMDs) greater than 25% are indicated in red. Measurements in blue italics are considered "suspect".

Region	Sample Location	Sample ID	Laboratory	Sample Date	Sample Time	Sample Depth (m)	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)
ALS Method Detection Limit							*0.3*	*0.005*	*0.001*
Maxxam Detection Limit							*1*	*0.001*	*0.0002*
Spring									
Upper Nelson River	Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	13:35	0.3	123	0.648	<0.001
	Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	13:35	0.3	135	0.5	0.0004
		RPMD					9	**26**	-
Summer									
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	14-Aug-08	13:09	0.3	118	0.208	<0.001
	Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	13:09	0.3	119	0.088	0.0004
		RPMD					1	**81**	-
Fall									
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	18-Sep-08	15:20	0.3	104	0.105	<0.001
	Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	15:20	0.3	113	0.18	0.0004
		RPMD					8	**53**	-

*Maxxam sample IDs are not known as the data were retrieved from the MWS water quality database.

Table 2-24. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)
ALS Method Detection Limit				*0.0005*	*0.0003*	*0.001*	*0.0002*	*0.03*	*0.00001*	*0.1*
Maxxam Detection Limit				*0.0002*	*0.0002*	*0.0002*	-	*0.01*	*0.00004*	-
Spring										
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	0.0014	0.0457	<0.001	<0.0002	0.04	0.00002	29.4
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	0.0011	0.0420	<0.0002	-	0.03	<0.00004	
	RPMD			-	8	-	-	-	-	-
Summer										
Cross Lake	UDS004-SURF	ALS	14-Aug-08	0.0018	0.0308	<0.001	<0.0002	<0.03	<0.00001	28.2
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	0.0015	0.0280	<0.0002	-	0.02	<0.00004	
	RPMD			18	10	-	-	-	-	-
Fall										
Cross Lake	UDS004-SURF	ALS	18-Sep-08	0.0015	0.0315	<0.001	<0.0002	<0.03	<0.00001	25.1
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	0.0015	0.0300	<0.0002	-	0.02	<0.00004	
	RPMD			-	5	-	-	-	-	-

Table 2-24. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Iron- Total (mg/L)	Lead-Total (mg/L)
ALS Method Detection Limit				*0.0001*	*0.2*	*0.001/0.002*	*0.0002*	*0.001*	*0.02*	*0.0005*
Maxxam Detection Limit				*0.0001*	*0.1*	*0.0002*	*0.0002*	*0.0002*	*0.01*	*0.0002*
Spring										
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	0.0001	21.4	0.002	0.0004	0.002	0.61	<0.0005
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	<0.0001	20.5	0.0011	0.0003	0.0023	0.52	0.0002
	RPMD			-	4	-	-	-	16	-
Summer										
Cross Lake	UDS004-SURF	ALS	14-Aug-08	<0.0001	18.3	0.002	0.0015	0.002	0.2	<0.0005
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	<0.0001	17.6	0.0003	<0.0002	0.0014	0.16	<0.0002
	RPMD			-	4	-	-	-	**22**	-
Fall										
Cross Lake	UDS004-SURF	ALS	18-Sep-08	<0.0001	21.0	0.002	<0.0002	0.001	0.10	<0.0005
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	<0.0001	17.9	0.0004	<0.0002	0.0015	0.23	<0.0002
	RPMD			-	16	-	-	-	**79**	-

Table 2-24. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)
ALS Method Detection Limit				*0.01*	*0.0003*	*0.00005*	*0.0002*	*0.002*	*0.1*	*0.0002*
Maxxam Detection Limit				*0.05*	*0.0002*	-	*0.0002*	*0.0002*	*0.002/0.03*	*0.02*
Spring										
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	12.1	0.01417	<0.00005	0.0008	0.002	3.0	0.003
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	13.8	0.0120	-	0.0008	0.0018	2.96	0.0025
	RPMD			13	17	-	-	-	0	16
Summer										
Cross Lake	UDS004-SURF	ALS	14-Aug-08	11.6	0.0134	<0.00005	0.0006	0.003	2.6	0.0018
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	11.8	0.0120	-	0.0006	0.001	2.24	0.0016
	RPMD			2	11	-	-	-	15	12
Fall										
Cross Lake	UDS004-SURF	ALS	18-Sep-08	10.1	0.0124	<0.00005	0.0005	<0.002	2.3	0.0014
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	11.2	0.0130	-	0.0006	0.001	2.39	0.0017
	RPMD			10	5	-	-	-	4	19

Table 2-24. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)
ALS Method Detection Limit				*0.001*	*0.0001*	*0.03*	*0.0001*	*2/9*	*0.001*	*0.0001*
Maxxam Detection Limit				*0.0004*	*0.00002*	*0.02*	*0.001*	*0.5*	*0.0002*	*0.00002*
Spring										
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	<0.001	<0.0001	17.8	0.125	29	<0.001	<0.0001
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	<0.0004	<0.00002	19.4	0.130	29.9	<0.0002	<0.00002
	RPMD			-	-	9	4	4	-	-
Summer										
Cross Lake	UDS004-SURF	ALS	14-Aug-08	<0.001	<0.0001	16.3	0.102	25	<0.001	<0.0001
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	<0.0004	<0.00002	15.5	0.110	24.3	<0.0002	<0.00002
	RPMD			-	-	5	8	3	-	-
Fall										
Cross Lake	UDS004-SURF	ALS	18-Sep-08	<0.001	<0.0001	14.8	0.0917	24	<0.001	0.0004
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	<0.0004	<0.00002	15.7	0.097	23.6	<0.0002	<0.00002
	RPMD			-	-	6	6	2	-	-

Table 2-24. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
ALS Method Detection Limit				*0.0006*	*0.0009*	*0.0002*	*0.0001*	*0.001*	*0.01*	*0.0004*
Maxxam Detection Limit				*0.0002*	*0.0002*	-	*0.0001*	*0.0002*	*0.001*	*0.002*
Spring										
Cross Lake (mean)	UDS004-SURF	ALS	26-Jun-08	<0.0006	0.0283	<0.0002	0.0007	0.002	<0.01	0.0005
Cross Lake	UDS004-SURF*	Maxxam	26-Jun-08	<0.0002	0.022	-	0.0006	0.0014	0.003	<0.002
	RPMD			-	25	-	15	-	-	-
Summer										
Cross Lake	UDS004-SURF	ALS	14-Aug-08	<0.0006	0.0081	<0.0002	0.0005	0.002	<0.01	<0.0004
Cross Lake	UDS004-SURF*	Maxxam	14-Aug-08	<0.0002	0.0059	-	0.0005	0.0011	0.002	<0.002
	RPMD			-	**31**	-	0	-	-	-
Fall										
Cross Lake	UDS004-SURF	ALS	18-Sep-08	0.0007	0.0022	<0.0002	0.0005	0.002	<0.01	<0.0004
Cross Lake	UDS004-SURF*	Maxxam	18-Sep-08	<0.0002	0.0083	-	0.0005	0.0011	0.002	<0.002
	RPMD			-	-	-	0	-	-	-

Table 2-25. Results of analyses conducted in 2009/2010 for routine, bacterial, and productivity parameters at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface water samples. Relative percent mean differences (RPMD) were calculated for duplicate samples; values exceeding 25 % are indicated in red. Measurements in blue italics are considered "suspect".

						Alkalinity			
Region	Sample Location	Sample ID	Laboratory	Sample Date	Sample Time	Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)
ALS Method Detection Limit					*OW*[1]	*1.0*	*2.0*	*0.60*	*0.40*
					IC[2]	*1.0*	*2.0*	*0.60*	*0.40*
Maxxam Detection Limit					*IC*	*1*	*2*	*0.5/0.6*	*0.4/.05*
Spring									
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	23-Jun-09	10:40	98.2	120	<0.60	<0.40
Upper Nelson River	Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	10:40	97.8	119	<0.5	<0.5
		RPMD				0	1	-	-
Summer									
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	11-Aug-09	11:26	99.1	121	<0.60	<0.40
Upper Nelson River	Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	11:26	99.1	121	<0.6	<0.4
		RPMD				0	0	-	-
Fall									
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	15-Sep-09	12:05	101	123	<0.60	<0.40
Upper Nelson River	Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	12:05	97.6	117	1.25	<0.4
		RPMD				3	5	-	-

[1] Open-water season.

[2] Ice-cover season.

*Maxxam sample IDs are not known as the data were retrieved from the MWS water quality database.

Table 2-25. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Nitrogen: Dissolved Ammonia (mg/L N)	Nitrogen: Dissolved Nitrate/ nitrite (mg/L N)	Nitrogen: TKN (mg/L)	Nitrogen: TN (mg/L)	Phosphorus: Dissolved (mg/L)	Phosphorus: Total Particulate Phosphorus (mg/L)	Phosphorus: Total (mg/L)
ALS Method Detection Limit			*OW*[1]	*0.0030*	*0.0050*	*0.20*	-	*0.0010*	*0.0010*	*0.0010*
			IC[2]	*0.010*	*0.010*	*0.20*	-	*0.0030*	*0.0030*	*0.0030*
Maxxam Detection Limit			*IC*	*0.003/0.01*	*0.01/0.02*	*0.2*	-	*0.001*	*0.001*	*0.001*
Spring										
Cross Lake	UDS004-SURF	ALS	23-Jun-09	0.0082	<0.0050	0.30	-	0.015	0.018	0.033
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	0.03	<0.01	0.40	-	0.015	0.027	0.042
	RPMD			-	-	-	-	1	-	23
Summer										
Cross Lake	UDS004-SURF	ALS	11-Aug-09	0.012	<0.0050	0.58	-	0.025	0.0059	0.031
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	0.0079	0.011	0.59	-	0.0148	0.0176	0.0324
	RPMD			-	-	-	-	**52**	**100**	4
Fall										
Cross Lake	UDS004-SURF	ALS	15-Sep-09	<0.0030	<0.0050	0.38	-	0.0052	<0.0010	0.028
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	<0.003	0.045	0.40	-	0.0093	0.0227	0.032
	RPMD			-	-	-	-	**57**	-	15

Table 2-25. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Carbon: Dissolved Organic (mg/L)	Carbon: Total Organic (mg/L)	Carbon: Total Inorganic (mg/L)	Water Clarity: Total Dissolved Solids (mg/L)	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH
ALS Method Detection Limit			*OW[1]*	*1.0*	*1.0*	*1.0*	*5.0*	*2.0*	*0.050*	*5.0*	*0.10*
			IC[2]	*1.0*	*1.0*	*1.0*	*5.0*	*2.0*	*0.10*	*5.0*	*0.10*
Maxxam Detection Limit			*IC*	*-*	*1*	*1*	*5*	*1/5*	*0.1*	*5*	*0.01*
Spring											
Cross Lake	UDS004-SURF	ALS	23-Jun-09	8.7	8.9	22.8	186	8.8	12.0	50.0	8.26
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	-	11	*15*	173	8	8.2	35	7.88
	RPMD			-	21	**41**	7	-	**38**	**35**	5
Summer											
Cross Lake	UDS004-SURF	ALS	11-Aug-09	9.4	9.1	23.8	190	5.2	6.10	20.0	8.28
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	-	9.6	23.7	202	9	6.5	15	8.29
	RPMD			-	5	0	6	-	6	-	0
Fall											
Cross Lake	UDS004-SURF	ALS	15-Sep-09	9.9	9.8	22.9	178	6.0	5.00	15.0	8.30
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	-	8.6	23.1	166	<5	6	15	8.33
	RPMD			-	13	1	7	-	18	-	0

Table 2-25. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Conductivity (µmhos/cm)	Bacteria *E. coli* (CFU/100 mL)
ALS Method Detection Limit			*OW*[1]	*0.40*	*1*
			IC[2]	*0.40*	*1*
Maxxam Detection Limit			*IC*	*1*	*10*
Spring					
Cross Lake	UDS004-SURF	ALS	23-Jun-09	304	<1
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	317	-
	RPMD			4	-
Summer					
Cross Lake	UDS004-SURF	ALS	11-Aug-09	294	<1
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	299	<10
	RPMD			2	-
Fall					
Cross Lake	UDS004-SURF	ALS	15-Sep-09	313	<1
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	306	<10
	RPMD			2	-

Table 2-26. Results of analyses conducted in 2009/2010 for productivity parameters at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface samples. Relative percent mean differences (RPMD) were calculated for duplicate samples; values exceeding 25 % are indicated in red.

Region	Sample Location	Sample ID	Laboratory ID	Sample Date	Sample Time	Productivity Chlorophyll *a* (µg/L)	Productivity Pheophytin (µg/L)
ALS Method Detection Limit					*OW*[1]	*0.60/1.0*	*0.60/1.0*
					IC[2]	*0.05*	*0.010 / 0.020 / 0.050*
Maxxam Detection Limit						*0.5*	*0.5*
Summer							
Upper Nelson River	Cross Lake	UDS004-EUPH	ALS	11-Aug-09	11:26	5.0	2.8
Upper Nelson River	Cross Lake	UDS004-EUPH*	Maxxam	11-Aug-09	11:26	4.6	1.8
		RPMD				8	-
Fall							
Upper Nelson River	Cross Lake	UDS004-EUPH	ALS	15-Sep-09	12:05	7.6	<1.0
Upper Nelson River	Cross Lake	UDS004-EUPH*	Maxxam	15-Sep-09	12:05	5.73	-
		RPMD				**28**	-

*Maxxam sample IDs are not known as the data were retrieved from the MWS water quality database.

Table 2-27. Results of metal and major ion analyses conducted in 2009/2010 at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface samples. Relative percent mean differences (RPMD) were calculated for duplicate samples; values exceeding 25 % are indicated in red.

Region	Sample Location	Sample ID	Laboratory	Sample Date	Sample Time	Hardness as CaCO3 (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)
ALS Method Detection Limit					*OW*[1]	*0.30*	*0.0050*	*0.00050*	*0.00050*	*0.00030*	*0.0010*
					IC[2]	*0.30*	*0.0050*	*0.00050*	*0.00050*	*0.00030*	*0.0010*
Maxxam Detection Limit						*1*	*0.001*	*0.0002*	*0.0002*	*0.0002*	*0.0002*
Spring											
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	23-Jun-09	10:40	126	0.530	0.00095	0.00127	0.0404	<0.0010
Upper Nelson River	Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	10:40	121	0.21	0.0003	0.0012	0.0330	<0.0002
		RPMD				4	**86**	-	6	20	-
Summer											
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	11-Aug-09	11:26	117	0.289	<0.00050	0.00131	0.0344	<0.0010
Upper Nelson River	Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	11:26	128	0.323	<0.0002	0.00141	0.0386	<0.0002
		RPMD				9	11	-	7	-	-
Fall											
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	15-Sep-09	12:05	125	0.205	<0.00050	0.00143	0.0376	<0.0010
Upper Nelson River	Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	12:05	120	0.162	<0.0002	0.00142	0.0366	<0.0002
		RPMD				4	23	-	-	3	-

*Maxxam sample IDs are not known as the data were retrieved from the MWS water quality database.

Table 2-27. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)	Copper-Total (mg/L)	Iron-Total (mg/L)
ALS Method Detection Limit			*OW*[1]	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.0001*	*0.20*	*0.0010*	*0.00020*	*0.0010*	*0.020*
			IC[2]	*0.00020*	*0.030*	*0.000010*	*0.10*	*0.00010*	*0.40*	*0.0010*	*0.00020*	*0.0010*	*0.020*
Maxxam Detection Limit				-	*0.01*	*0.00001/0.00004*	*0.05*	*0.0001*	*0.5*	*0.0002/0.001*	*0.0002*	*0.0002*	*0.01*
Spring													
Cross Lake	UDS004-SURF	ALS	23-Jun-09	<0.00020	<0.030	0.000102	29.1	<0.00010	20.4	0.0012	0.00040	0.0021	0.374
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	-	0.02	<0.00004	-	<0.0001	19.8	0.0006	<0.0002	0.0017	0.28
	RPMD			-	-	-	-	-	3	-	-	-	**29**
Summer													
Cross Lake	UDS004-SURF	ALS	11-Aug-09	<0.00020	<0.030	0.000012	27.4	<0.00010	18.2	<0.0010	0.00024	0.0015	0.167
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	-	0.027	0.00001	-	<0.0001	20.1	<0.001	0.00023	0.0015	0.216
	RPMD			-	-	-	-	-	10	-	-	-	**26**
Fall													
Cross Lake	UDS004-SURF	ALS	15-Sep-09	<0.00020	<0.030	<0.000010	29.0	<0.00010	18.1	<0.0010	<0.00020	0.0016	0.104
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	-	0.026	<0.00001	-	<0.0001	21.4	<0.001	<0.0002	0.0015	0.124
	RPMD			-	-	-	-	-	17	-	-	-	18

Table 2-27. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Lead-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)
ALS Method Detection Limit			*OW*[1]	*0.00050*	*0.010*	*0.00030*	*0.00002*	*0.00020*	*0.0020*	*0.050*	*0.10*	*0.00020*
			IC[2]	*0.00050*	*0.010*	*0.00030*	*0.00010*	*0.00020*	*0.0020*	*0.20*	*0.10*	*0.00020*
Maxxam Detection Limit				*0.0002*	*0.05*	*0.001*	*-*	*0.0002*	*0.0002/0.002*	*0.03/0.2*	*0.02*	*0.0002*
Spring												
Cross Lake	UDS004-SURF	ALS	23-Jun-09	0.00288	13.0	0.0196	<0.000020	0.00074	0.0022	<0.050	2.97	0.00253
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	0.0003	12.2	0.014	-	0.0007	0.0014	0.03	2.58	0.0020
	RPMD			-	6	**33**	-	-	-	-	14	23
Summer												
Cross Lake	UDS004-SURF	ALS	11-Aug-09	<0.00050	11.9	0.00976	<0.000020	0.00075	<0.0020	0.089	2.54	0.00188
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	0.00017	13.2	0.0103	-	0.00076	<0.002	<0.2	2.81	0.00198
	RPMD			-	10	5	-	-	-	-	10	5
Fall												
Cross Lake	UDS004-SURF	ALS	15-Sep-09	<0.00050	12.8	0.00789	<0.000020	0.00073	<0.0020	<0.050	2.86	0.00185
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	0.00011	12.2	0.00915	-	0.00072	<0.002	<0.2	2.80	0.00181
	RPMD			-	5	15	-	-	-	-	2	2

Table 2-27. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Selenium-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)	Sulphate-Dissolved (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)	Tin-Total (mg/L)
ALS Method Detection Limit			*OW*[1]	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*	*0.00010*	*0.00060*
			IC[2]	*0.0010*	*0.00010*	*0.030*	*0.00010*	*2.0*	*0.0010*	*0.00010*	*0.0010*
Maxxam Detection Limit				*0.0004/0.001*	*0.00002/0.0001*	*0.1*	*0.001*	*0.5*	*0.0002*	*0.00002/0.0001*	*0.0002/0.0006*
Spring											
Cross Lake	UDS004-SURF	ALS	23-Jun-09	<0.0010	<0.00010	16.7	0.111	28.3	<0.0010	<0.00010	0.00176
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	<0.0004	<0.00002	17.9	0.110	27.3	<0.0002	<0.00002	<0.0002
	RPMD			-	-	7	1	4	-	-	-
Summer											
Cross Lake	UDS004-SURF	ALS	11-Aug-09	<0.0010	<0.00010	17.9	0.109	28.3	<0.0010	<0.00010	<0.00060
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	<0.001	<0.0001	17.5	0.117	28.3	<0.0002	<0.0001	<0.0006
	RPMD			-	-	2	7	0	-	-	-
Fall											
Cross Lake	UDS004-SURF	ALS	15-Sep-09	<0.0010	<0.00010	16.7	0.112	29.7	<0.0010	<0.00010	<0.00060
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	<0.001	<0.0001	18.4	0.112	28.6	<0.0002	<0.0001	<0.0006
	RPMD			-	-	10	0	4	-	-	-

Table 2-27. – continued –

Sample Location	Sample ID	Laboratory	Sample Date	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
ALS Method Detection Limit			*OW*[1]	*0.00090*	*0.00020*	*0.00010*	*0.0010*	*0.010*	*0.00040*
			IC[2]	*0.00090*	*0.00050*	*0.00010*	*0.0010*	*0.010*	*0.00040*
Maxxam Detection Limit				*0.0002*	*0.0002*	*0.0001*	*0.0002*	*0.001/0.005*	*0.0004/0.002*
Spring									
Cross Lake	UDS004-SURF	ALS	23-Jun-09	0.0204	<0.00020	0.00078	0.0018	0.014	0.00062
Cross Lake	UDS004-SURF*	Maxxam	23-Jun-09	0.0120	-	0.0006	0.0012	0.002	<0.002
	RPMD			**52**	-	**26**	-	-	-
Summer									
Cross Lake	UDS004-SURF	ALS	11-Aug-09	0.0101	<0.00020	0.00051	0.0014	<0.010	<0.00040
Cross Lake	UDS004-SURF*	Maxxam	11-Aug-09	0.0284	<0.0002	0.00063	0.00162	<0.005	<0.0004
	RPMD			**95**	-	21	-	-	-
Fall									
Cross Lake	UDS004-SURF	ALS	15-Sep-09	0.00634	<0.00020	0.00070	0.0012	<0.010	<0.00040
Cross Lake	UDS004-SURF*	Maxxam	15-Sep-09	0.00507	<0.0002	0.00063	0.00127	<0.005	<0.0004
	RPMD			22	-	11	-	-	-

Table 2-28. Results of analyses conducted in 2010/2011 for routine and bacterial parameters at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface water samples. Relative percent mean deviations (RPMD) exceeding 18 % are indicated in red. Measurements in blue italics are considered "suspect".

					Alkalinity			
Sample Location	Sample ID	Laboratory ID	Sample Date	Sample Time	Total ($CaCO_3$) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Carbonate (CO_3) (mg/L)	Hydroxide (OH) (mg/L)
ALS Method Detection Limit				*OW*	*1.0*	*2.0*	*0.60*	*0.40*
				IC	*1.0*	*2.0*	*0.60*	*0.40*
Maxxam Detection Limit					*1*	*0.5*	*0.5*	*0.5*
Spring								
Northern Indian Lake	FAS008-SURF	L900971-5	22-Jun-10	15:35	63.3	77.3	<0.60	<0.40
Northern Indian Lake	FAS008-EUPH	B048856	22-Jun-10	15:35	64	78	<0.5	<0.5
	RPMD				1	1	-	-
Summer								
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	19-Aug-10	11:05	51.9	63.3	<0.60	<0.40
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	19-Aug-10	11:05	n/a	n/a	n/a	n/a
	RPMD				-	-	-	-
Fall								
Cross Lake (mean)	UDS004-SURF	ALS	15-Sep-10	8:30	78.2	95.4	<0.60	<0.40
Cross Lake	UDS004-SURF	B086530	15-Sep-10	8:30	80	97	<0.5	<0.5
	RPMD				2	2	-	-
Winter								
Cedar Lake	KLS001-SURF	L984367-2	8-Mar-11	11:00	182	222	<0.60	<0.40
Cedar Lake	KLS001-SURF	B118463	8-Mar-11	11:00	190	230	<0.5	<0.5
	RPMD				4	4	-	-

Table 2-28. – continued –

Sample Location	Sample ID	Laboratory ID	Nitrogen: Dissolved Ammonia (mg/L N)	Dissolved Ammonia (mg/L N)	Nitrate – Dissolved (mg/L N)	Nitrate - Dissolved (mg/L N)	Nitrite – Dissolved (mg/L N)	Nitrate/ Nitrite - Dissolved (mg/L N)	Total Nitrogen (mg/L N)	TKN (mg/L)
ALS Method Detection Limit		*OW*	*0.010*	*0.050*	*0.0010*	*0.0050*	*0.0010*	*0.0050/0.050*		*0.20*
		IC	*0.010*			*0.0050*	*0.0010*	*0.0051*		*0.20*
Maxxam Detection Limit			*0.005*	*0.05*			*0.002*	*0.02*	*0.02/0.2*	*0.02/0.2*
Spring										
Northern Indian Lake	FAS008-SURF	L900971-5	-	<0.050	-	-	-	<0.050	0.35 [1]	0.32
Northern Indian Lake	FAS008-EUPH	B048856	-	<0.05	-	-	-	<0.02	0.33	0.33
	RPMD		-	-	-	-	-	-	4	3
Summer										
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	0.080	-	0.0141	-	<0.0010	0.0141	0.29[1]	0.28
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	<0.005	-	-	-	0.006	<0.02	0.17	0.17
	RPMD		-	-	-	-	-	-	**53**	-
Fall										
Cross Lake (mean)	UDS004-SURF	ALS	0.015		0.0251	-	<0.0010	0.0251	0.58[1]	0.55
Cross Lake	UDS004-SURF	B086530	0.006	-	-	-	0.002	0.03	0.8	0.8
	RPMD		-	-	-	-	-	-	33	-
Winter										
Cedar Lake	KLS001-SURF	L984367-2	0.026	-	-	0.0846	<0.0010	0.0846	0.54[1]	0.46
Cedar Lake	KLS001-SURF	B118463	0.061	-	-	-	-	0.12	0.58	
	RPMD		-	-	-	-	-	**35**	6	-

[1] Total nitrogen was estimated as (TKN + dissolved nitrate/nitrite)

Table 2-28. – continued –

						Carbon		
Sample Location	Sample ID	Laboratory ID	Dissolved (mg/L)	Total Particulate Phosphorus (mg/L)	Total (mg/L)	Dissolved Organic (mg/L)	Total Organic (mg/L)	Total Inorganic (mg/L)
ALS Method Detection Limit		*OW*	*0.0010/0.0020*	*0.0030*	*0.0010/0.0020*	*1.0*	*1.0*	*1.0*
		IC	*0.0020/0.010*	*0.014*	*0.0020/0.010*	*1.0*	*1.0*	*1.0*
Maxxam Detection Limit			*0.002*	*0.002/0.01*	*0.002*	*0.5*	*0.5*	*0.5*
Spring								
Northern Indian Lake	FAS008-SURF	L900971-5	0.0055	0.0047	0.0102	7.9	8.0	12.9
Northern Indian Lake	FAS008-EUPH	B048856	0.006	<0.002	0.008	6.7	7.4	13.7
	RPMD		9	-	24	16	8	6
Summer								
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	0.0154	0.0093	0.0247	7.0	7.0	10.7
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	*0.003*	0.02	0.023	2.3	6.8	*2.9*
	RPMD		-	-	7	-	3	-
Fall								
Cross Lake (mean)	UDS004-SURF	ALS	0.0247	0.0154	0.0402	14.6	14.6	18.4
Cross Lake	UDS004-SURF	B086530	0.024	*0.008*	0.032	14.5	15.1	17.5
	RPMD		3	-	23	0	3	5
Winter								
Cedar Lake	KLS001-SURF	L984367-2	0.016	<0.014	0.016	9.6	10.4	43.3
Cedar Lake	KLS001-SURF	B118463	0.008	-	0.010	10.3	10.8	41.5
	RPMD		-	-	-	7	4	4

Table 2-28. – continued –

Sample Location	Sample ID	Laboratory ID	Water Clarity: Total Suspended Solids (mg/L)	Water Clarity: Turbidity (NTU)	Water Clarity: True Colour (TCU)	pH	Total Dissolved Solids (mg/L)	Conductivity (µmhos/cm)	Bacteria: *E. coli* (CFU/100 mL)
ALS Method Detection Limit		*OW*	*2.0*	*0.10*	*5.0*	*0.10*	*5.0*	*0.40*	*1*
		IC	*2.0*	*0.10*	*5.0*	*0.10*	*5.0*	*0.40*	*1*
Maxxam Detection Limit			*4*	*0.1*	*5*	*0.1*	*10*	*1*	*10*
Spring									
Northern Indian Lake	FAS008-SURF	L900971-5	6.8	2.85	10.0	8.13	96.0	-	<1
Northern Indian Lake	FAS008-EUPH	B048856	9	2.7	13	7.7	68	134	<10
	RPMD		-	5	-	5	**34**	-	-
Summer									
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	5.2	8.21	12.6	8.05	64.0	-	<1
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	<4	8.9	22	7.7	62	111	<10
	RPMD		-	8	-	4	3	-	-
Fall									
Cross Lake (mean)	UDS004-SURF	ALS	6.3	7.31	63.5	8.11	149		<1
Cross Lake	UDS004-SURF	B086530	5	7.4	46	7.8	150	250	<10
	RPMD		-	1	32	4	1	-	-
Winter									
Cedar Lake	KLS001-SURF	L984367-2	<2.0	1.93	21.1	8.23	318	505	<1
Cedar Lake	KLS001-SURF	B118463	< 4	1.9	18	7.9	300	522	<10
	RPMD		-	2	16	4	6	3	-

Table 2-29. Results of analyses conducted in 2010/2011 for productivity parameters at ALS Laboratory and Maxxam Analytics for interlaboratory comparison of water samples. Relative percent mean deviations (RPMD) exceeding 18 % are indicated in red.

Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Depth (m)	Productivity (µg/L)								
						Chlorophyll *a*				Pheophytin				
ALS Method Detection Limit						*0.010/ 0.020*	*0.040*	*0.50*	*0.60*	*0.010*	*0.022*	*0.040*	*0.50*	*0.60*
Maxxam Detection Limit								*0.5*					*0.5*	
Spring														
Northern Indian Lake	FAS008-EUPH	L900971-10	22-Jun-10	15:35	3.6	1.63	-	-	-	-	0.392	-	-	-
Northern Indian Lake	FAS008-EUPH	B048856	22-Jun-10	15:35	3.6	-	-	1.4	-	-	-	-	3.9	-
	RPMD							15					**163**	
Summer														
Southern Indian Lake (Area 4)	ECS004-EUPH	L922533-9	19-Aug-10	11:05	1.7	-	0.991	-	-	-	-	0.199	-	-
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	19-Aug-10	11:05	1.7	-	-	<0.5	-	-	-	-	<0.5	-
	RPMD							-					-	
Fall														
Cross Lake (mean)	UDS004-EUPH	ALS	15-Sep-10	8:30	1.5	1.59				0.852				
Cross Lake	UDS004-SURF	B086530	15-Sep-10	8:30	1.5	-	-	1.6	-	-	-	-	3.5	-
	RPMD					0		-		**122**			-	
Winter														
Cedar Lake	KLS001-SURF	L984367-2	8-Mar-11	11:00	0.3	-	-	-	0.95	-	-	-	-	<0.60
Cedar Lake	KLS001-SURF	B118463	8-Mar-11	11:00	0.3	-	-	1.3	-	-	-	-	<0.5	-
	RPMD							**31**					-	

Table 2-30. Results of metal and major ion analyses conducted in 2010/2011 at ALS Laboratory and Maxxam Analytics for inter-laboratory comparison of surface samples. Relative percent mean deviations (RPMD) were calculated for duplicate samples; values exceeding 25 % are indicated in red.

Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Hardness as $CaCO_3$ (mg/L)	Aluminum-Total (mg/L)	Antimony-Total (mg/L)	Arsenic-Total (mg/L)	Barium-Total (mg/L)	Beryllium-Total (mg/L)
ALS Method Detection Limit					*0.30*	*0.0050*	*0.00020*	*0.00020*	*0.00020*	*0.00020*
Maxxam Detection Limit					*0.5*	*0.003*	*0.0005*	*0.0001*	*0.001*	*0.0001*
Spring										
Northern Indian Lake	FAS008-SURF	L900971-5	22-Jun-10	15:35	67.4	0.0627	<0.00020	<0.00020	0.0111	<0.00020
Northern Indian Lake	FAS008-SURF	B048856	22-Jun-10	15:35	58.3	0.137	<0.0005	0.0003	0.010	<0.0001
	RPMD				14	**74**	-	-	10	-
Summer										
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	19-Aug-10	11:05	52.7	0.505	<0.00020	0.00038	0.0138	<0.00020
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	19-Aug-10	11:05	49.8	0.418	<0.0005	0.0004	0.012	<0.0001
	RPMD				6	19	-	-	14	-
Fall										
Cross Lake (mean)	UDS004-SURF	ALS	15-Sep-10	8:30	92.7	0.405	<0.00020	0.00151	0.0273	<0.00020
Cross Lake	UDS004-SURF	B086530	15-Sep-10	8:30	90.9	0.385	<0.0005	0.0013	0.026	<0.0001
	RPMD				2	5	-	15	5	-
Winter										
Cedar Lake	KLS001-SURF	L984367-2	8-Mar-11	11:00	213	0.0805	<0.00020	0.00121	0.0976	<0.00020
Cedar Lake	KLS001-SURF	B118463	8-Mar-11	11:00	198	0.043	<0.0005	0.0011	0.082	<0.0001
	RPMD				7	**61**	-	10	17	-

Table 2-30. – continued –

Sample Location	Sample ID	ALS ID	Bismuth-Total (mg/L)	Boron-Total (mg/L)	Cadmium-Total (mg/L)	Calcium-Total (mg/L)	Cesium-Total (mg/L)	Chloride-Dissolved (mg/L)	Chromium-Total (mg/L)	Cobalt-Total (mg/L)
ALS Method Detection Limit			*0.00020*	*0.010*	*0.000010*	*0.10*	*0.00010*	*0.20/0.40*	*0.0010*	*0.00020*
Maxxam Detection Limit			*0.001*	*0.0500*	*0.00001*	*0.05*	*-*	*0.5*	*0.001*	*0.0005*
Spring										
Northern Indian Lake	FAS008-SURF	L900971-5	<0.00020	<0.010	<0.000010	19.3	<0.00010	1.04	<0.0010	<0.00020
Northern Indian Lake	FAS008-SURF	B048856	<0.001	<0.050	0.00009	-	-	0.5	<0.001	<0.0005
	RPMD		-	-	-	-	-	-	-	-
Summer										
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	<0.00020	<0.010	<0.000010	14.3	<0.00010	0.76	<0.0010	<0.00020
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	<0.001	<0.050	0.00002	-	-	0.8	<0.001	<0.0005
	RPMD		-	-	-	-	-	-	-	-
Fall										
Cross Lake (mean)	UDS004-SURF	ALS	<0.00020	0.016	<0.000010	22.6	<0.00010	14.2	<0.0010	0.00022
Cross Lake	UDS004-SURF	B086530	<0.001	<0.050	0.00005	-	-	14	<0.001	<0.0005
	RPMD		-	-	-	-	-	1	-	-
Winter										
Cedar Lake	KLS001-SURF	L984367-2	<0.00020	0.033	0.000022	52.5	<0.00010	16.0	<0.0010	<0.00020
Cedar Lake	KLS001-SURF	B118463	<0.001	<0.050	0.00003	49.3	-	17	<0.001	<0.0005
	RPMD		-	-	-	6	n/a	6	-	-

Table 2-30. – continued –

Sample Location	Sample ID	ALS ID	Copper-Total (mg/L)	Fluoride mg/L	Iron-Total (mg/L)	Lead-Total (mg/L)	Lithium-Total (mg/L)	Magnesium-Total (mg/L)	Manganese-Total (mg/L)	Mercury-Total (mg/L)	Molybdenum-Total (mg/L)
ALS Method Detection Limit			*0.00020*	*0.020*	*0.020/0.10**	*0.000090*	*0.0020*	*0.010*	*0.00030*	*0.000050*	*0.00020*
Maxxam Detection Limit			*0.0002*	*-*	*0.005*	*0.0002*	*0.005*	*0.05*	*0.001*	*0.00002*	*0.001*
Spring											
Northern Indian Lake	FAS008-SURF	L900971-5	0.00078	-	0.058	<0.000090	<0.0020	4.67	0.00536	<0.000050	<0.00020
Northern Indian Lake	FAS008-SURF	B048856	0.0007	-	0.129	<0.0002	-	-	0.007	<0.00002	<0.001
	RPMD		-	-	-	-	-	-	**27**	-	-
Summer											
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	0.00122		0.320	0.000191	0.0026	4.12	0.00578	<0.000050	<0.00020
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	0.0013		0.329	0.0003	-	-	0.006	<0.00002	<0.001
	RPMD		6		3	-	-	-	4	-	-
Fall											
Cross Lake (mean)	UDS004-SURF	ALS	0.00165	-	0.396	0.000325	0.0069	8.83	0.01347	<0.000050	0.00051
Cross Lake	UDS004-SURF	B086530	0.0018		0.345	0.0008	-	-	0.012	0.00002	<0.001
	RPMD		9		14	-	-	-	12	-	-
Winter											
Cedar Lake	KLS001-SURF	L984367-2	0.00175	0.111	0.15	0.000102	0.0152	20.0	0.00575	<0.000050	0.00150
Cedar Lake	KLS001-SURF	B118463	0.0022	-	0.073	<0.0002	0.015	18.1	0.005	<0.00005	0.001
	RPMD		23	-	-	-	-	10	14	-	-

*first value represents the open-water DL; second value is the ice-season DL.

Table 2-30. – continued –

Sample Location	Sample ID	ALS ID	Nickel-Total (mg/L)	Phosphorus-Total (mg/L)	Potassium-Total (mg/L)	Rubidium-Total (mg/L)	Selenium-Total (mg/L)	Silicon-Total (mg/L)	Silver-Total (mg/L)	Sodium-Total (mg/L)	Strontium-Total (mg/L)
ALS Method Detection Limit			*0.0020*	*0.20*	*0.020*	*0.00020*	*0.0010*	*0.050*	*0.00010*	*0.030*	*0.00010*
Maxxam Detection Limit			*0.001*	*-*	*0.05*	*-*	*0.0001*	*0.100*	*0.00002*	*0.05*	*0.001*
Spring											
Northern Indian Lake	FAS008-SURF	L900971-5	<0.0020	<0.20	0.970	0.00090	<0.0010	0.873	<0.00010	2.19	0.0255
Northern Indian Lake	FAS008-SURF	B048856	<0.001	-	-	-	<0.0001	1.680	<0.00002	-	0.030
	RPMD		-	-	-	-	-	**63**	-	-	16
Summer											
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	<0.0020	<0.20	1.18	0.00198	<0.0010	3.17	<0.00010	2.51	0.0328
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	<0.001	-	-	-	<0.0001	1.870	<0.00002	-	0.031
	RPMD		-	-	-	-	-	**52**	-	-	6
Fall											
Cross Lake (mean)	UDS004-SURF	ALS	<0.0020	<0.20	2.26	0.00220	<0.0010	3.39	<0.00010	11.5	0.0767
Cross Lake	UDS004-SURF	B086530	0.001	-	-	-	0.0001	2.870	<0.00002	-	0.078
	RPMD		-	-	-	-	-	17	-	-	2
Winter											
Cedar Lake	KLS001-SURF	L984367-2	<0.0020	<0.20	3.60	0.00141	<0.0010	2.59	<0.00010	23.5	0.311
Cedar Lake	KLS001-SURF	B118463	0.001	-	3.11	-	0.0002	1.930	<0.00002	19.6	0.306
	RPMD		-	-	15	-	-	**29**	-	18	2

Table 2-30. – continued –

Sample Location	Sample ID	ALS ID	Sulphate-Dissolved (mg/L)	Sulphur-Total (mg/L)	Tellurium-Total (mg/L)	Thallium-Total (mg/L)	Thorium-Total (mg/L)	Tin-Total (mg/L)	Titanium-Total (mg/L)	Tungsten-Total (mg/L)	Uranium-Total (mg/L)
ALS Method Detection Limit			*0.50/2.0*		*0.00020*	*0.00010*	*0.00010*	*0.00020*	*0.00020*	*0.0010*	*0.00010*
Maxxam Detection Limit			*0.5*	*3.0*	*-*	*0.00005*	*-*	*0.005*	*0.005*	*-*	*0.0001*
Spring											
Northern Indian Lake	FAS008-SURF	L900971-5	4.0		<0.00020	<0.00010	<0.00010	<0.00020	0.00264	<0.0010	0.00017
Northern Indian Lake	FAS008-SURF	B048856	1.3		-	<0.00005	-	<0.005	0.005	-	0.0002
	RPMD		-		-	-	-	-	-	-	-
Summer											
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	2.00		<0.00020	<0.00010	0.00017	<0.00020	0.0149	<0.0010	0.00010
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	3.6		-	<0.00005	-	<0.005	0.012	-	0.0001
	RPMD		-		-	-	-	-	-	-	-
Fall											
Cross Lake (mean)	UDS004-SURF	ALS	17.9		<0.00020	<0.00010	<0.00010	<0.00020	0.0149	<0.0010	0.00046
Cross Lake	UDS004-SURF	B086530	20		-	<0.00005	-	<0.005	0.010	-	0.0004
	RPMD		11		-	-	-	-	-	-	-
Winter											
Cedar Lake	KLS001-SURF	L984367-2	64.3		<0.00020	<0.00010	<0.00010	<0.00020	0.00277	<0.0010	0.00124
Cedar Lake	KLS001-SURF	B118463	64	0.020	-	<0.00005	-	<0.005	<0.005	-	0.0011
	RPMD		0		-	-	-	-	-	-	12

Table 2-30. – continued –

Sample Location	Sample ID	ALS ID	Vanadium-Total (mg/L)	Zinc-Total (mg/L)	Zirconium-Total (mg/L)
ALS Method Detection Limit			*0.00020*	*0.0050*	*0.00040*
Maxxam Detection Limit			*0.005*	*0.005*	*0.0005*
Spring					
Northern Indian Lake	FAS008-SURF	L900971-5	0.00020	<0.0050	<0.00040
Northern Indian Lake	FAS008-SURF	B048856	<0.005	<0.005	<0.0005
	RPMD		-	-	-
Summer					
Southern Indian Lake (Area 4)	ECS004-SURF	L922533-2	0.00086	<0.0050	0.00044
Southern Indian Lake (Area 4)	ECS004-SURF	B074174	<0.005	<0.005	<0.0005
	RPMD		-	-	-
Fall					
Cross Lake (mean)	UDS004-SURF	ALS	0.00151	<0.0050	<0.00040
Cross Lake	UDS004-SURF	B086530	<0.005	<0.005	<0.0005
	RPMD		-	-	-
Winter					
Cedar Lake	KLS001-SURF	L984367-2	0.00066	<0.0050	<0.00040
Cedar Lake	KLS001-SURF	B118463	<0.005	<0.005	<0.0005
	RPMD		-	-	-

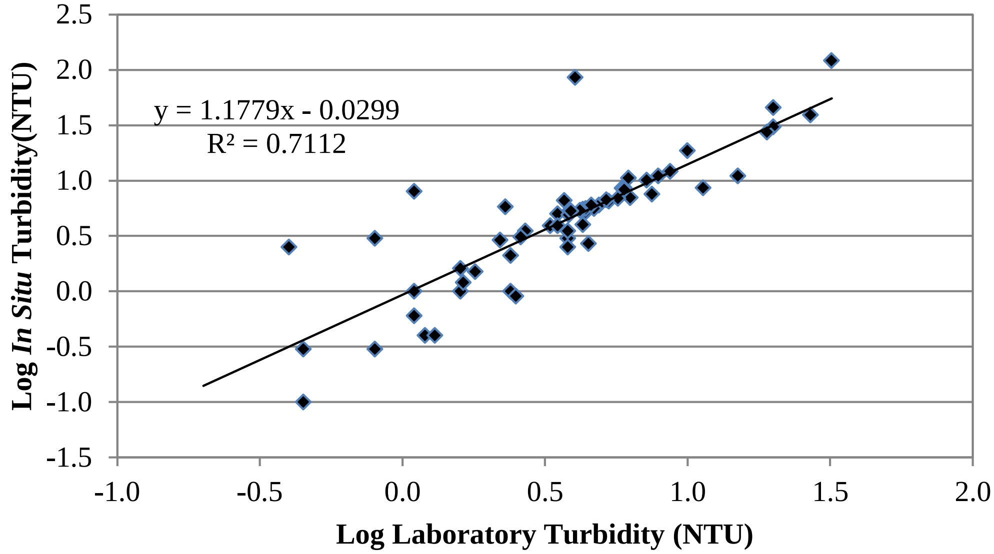

Figure 2-1. Linear regression between laboratory and *in situ* turbidity: 2008/2009.

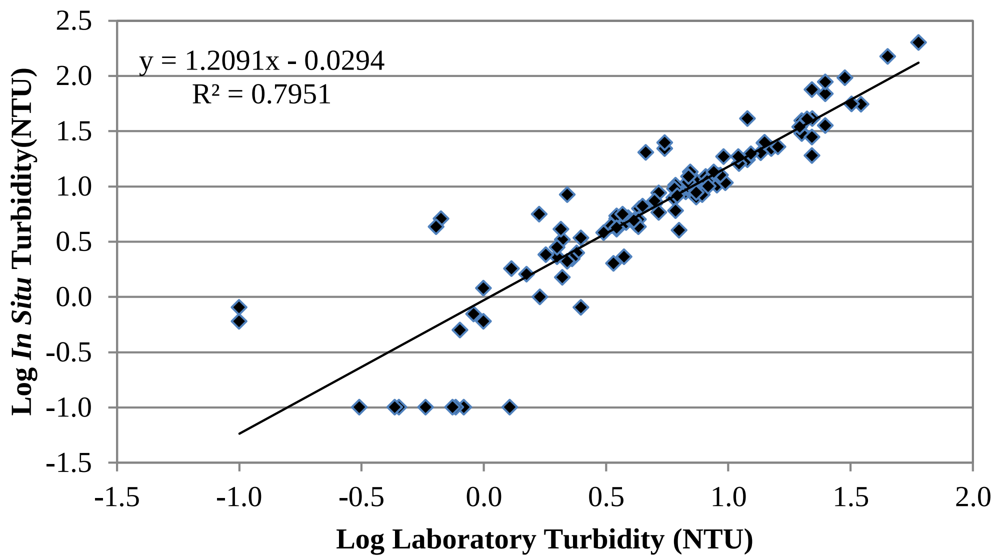

Figure 2-2. Linear regression between laboratory and *in situ* turbidity: 2009/2010.

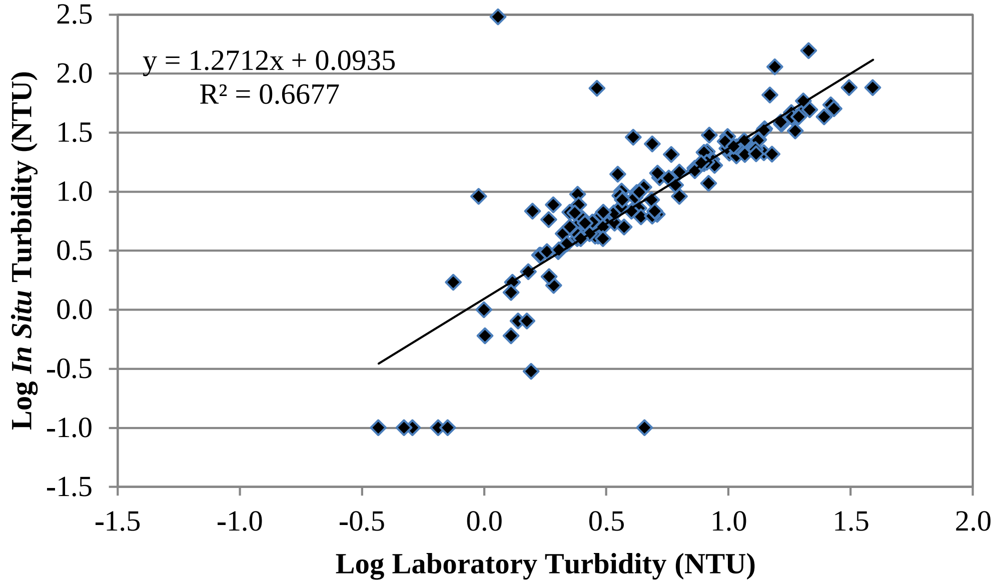

Figure 2-3. Linear regression between laboratory and *in situ* turbidity: 2010/2011.

3.0 PHYTOPLANKTON

Phytoplankton metrics measured under CAMPP include chlorophyll *a* and phytoplankton taxonomic composition and biomass. All analyses to date have been conducted by a Canadian Association for Laboratory Accreditations, Inc (CALA) laboratory (ALS Laboratories, Winnipeg, MB) using an adaptation of Standard Methods (APHA 1998). A variety of quality assurance/quality control (QA/QC) methods were incorporated into the phytoplankton monitoring component of the pilot phase (2008/2009 through 2010/2011) of CAMPP. Methods and results pertaining to the phytoplankton QA/QC program are described below.

3.1 METHODS

The following section describes the field sampling and data analysis methods for the phytoplankton QA/QC program.

3.1.1 Chlorophyll *a* QA/QC Samples

3.1.1.1 Description

QA/QC measures incorporated in the 2008/2009-2010/2011 CAMPP water quality sampling program, which included analysis of chlorophyll *a*, included submission of field and trip blanks, analysis of replicate (generally triplicate) samples, and analysis of inter-laboratory comparison samples, as described in the water quality QA/QC section (Section 2). Briefly, at least one set of field and trip blanks were collected by each sampling crew (NSC and MCWS) during each sampling event (spring, summer, fall, and winter). One or two sets of triplicate samples were also collected by each sampling crew from a randomly selected site each season. One inter-laboratory comparison sample was collected by the MCWS sampling crew during each open-water sampling period; an inter-laboratory sample was only collected during the ice-cover season of 2010/2011.

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 in the field by filling sample bottles with deionized water (both provided by the analytical laboratory) and transporting the blanks along with the environmental samples. Field blanks were treated in a manner consistent with field samples (e.g., kept cool and in the dark) and submitted concurrently with field samples to the analytical laboratory.

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

Replicate samples were collected at selected sites to provide a measure of variability of environmental conditions and the overall precision associated with field methods and laboratory analyses. Replicate samples were also treated in a manner consistent with field samples and submitted concurrently to the analytical laboratory.

Inter-laboratory samples were collected to assess the accuracy of the results through comparison to analyses performed at a different analytical laboratory (Maxxam Analytics, Winnipeg, MB). The two samples (one for ALS and one for Maxxam laboratories) were collected in as close proximity to each other as possible.

3.1.1.2 Data Analysis

QA/QC samples were assessed according to standard criteria to evaluate precision and identify potential sample contamination issues (i.e., BCMELP 1998). Relative percent mean difference (RPMD) was calculated for occasional duplicate water quality (i.e., chlorophyll *a*) results and for comparisons of results from the two analytical laboratories; percent relative standard deviation (PRSD) was calculated for the triplicate results:

RPMD = (Value 1 – Value 2)/((Value 1 + Value 2)/2) x 100; and

PRSD = SD of the triplicate values/Mean of the triplicate values x 100;

where SD is the standard deviation. Precision of replicate chlorophyll *a* samples was evaluated using the "rule of thumb" criteria for precision of 25% for duplicate samples and 18% for triplicate samples (BCMELP 1998).

Where one or more of the replicate values were less than five times the analytical detection limit (DL), an analysis of precision was not undertaken, in accordance with guidance provided in BCMELP (1998).

Field and trip blank results were evaluated for evidence of sample contamination. Blank results that exceeded five times the analytical detection limit were considered to be indicative of sample contamination and/or laboratory error.

3.1.2 Phytoplankton Taxonomic Composition and Biomass

Phytoplankton samples were analysed for biomass and composition by ALS Laboratories, Winnipeg (a CALA accredited laboratory) using an adaptation of Standard Methods (APHA 1998). To conduct the analysis, the taxonomist removed a 1 to 10 mL aliquot (depending on the amount of material in the sample) from the sample bottle submitted to the laboratory. Within this aliquot, algal cells were allowed to settle overnight in an Utermöhl chamber, following which all cells within each of ten random grid squares were identified and counted under magnification. Cell biovolume (per species) was determined from one typical specimen of each species in each aliquot by applying the geometric formula best fitted to the cell shape. Phytoplankton biomass, expressed in mg/m^3 wet weight, was then determined from total sample biovolume (μm^3), assuming a specific gravity of one for cellular mass.

Recent studies of phytoplankton assemblages in marine and freshwater environments have shown that laboratory analyses are highly variable (e.g., up to 42% difference between analyses of laboratory-derived samples containing only four species; Vuorio et al. 2007, Salas 2010). As ALS does not perform internal verification of laboratory analyses of phytoplankton samples (there are no industry standards requiring inclusion of such analyses), both laboratory QA/QC and environmental QA/QC analyses were included in the CAMPP sampling program.

3.1.2.1 Laboratory QA/QC Analyses

Four methods were used to assess the precision of the laboratory analyses for phytoplankton taxonomic composition and biomass. The first three were used to assess samples collected during the 2009/2010 sampling year, whereas Method 4 was employed in the 2010/2011 sampling year. The four methods were:

- Method 1 – two different taxonomists each analysed a separate aliquot taken from the same sample. This method provided information on the overall reproducibility of the analytical methods. This method would be expected to show the greatest amount of variation as it included potential variability associated with the analyst and different aliquots from the same sample.
- Method 2 – a single taxonomist analysed the same aliquot three separate times. This method provided information regarding the accuracy of the estimation methods used for counting and cell measurements and was expected to show the least amount of variation in the results.
- Method 3 – a single taxonomist analysed three separate aliquots from the same sample. This method provided information on the potential variability introduced by subsampling (i.e., aliquots) from a larger sample.

- Method 4 – two different taxonomists each analysed the same aliquot. This method was intended to evaluate variability associated with different analysts.

3.1.2.2 Environmental QA/QC Samples

Starting in 2010/2011, the MCWS field crew collected two triplicate samples for analysis of phytoplankton taxonomic composition and biomass during each of the three open-water sampling periods. The triplicate samples were collected from each of one randomly selected annual and rotational sampling site, although only samples from the annual sites were analysed. The samples were collected from the euphotic zone in as close a time as possible. It is worth noting that although every effort was made to collect samples from the same parcel of water, the sites were sampled from a float plane that was not anchored (i.e., drift occurred between collection of triplicates).

3.1.2.3 Data Analysis

For evaluation of the phytoplankton QA/QC data, the biomass of each species was summed to determine the total, group, and relative biomass of the major groups of phytoplankton (e.g., blue-green algae, diatoms, etc.). A number of community metrics were also calculated to describe the richness and diversity of the communities sampled. Calculations followed those in Hill (1973), Magurran (1988), and Begon et al. (1996), and included:

- Species richness (S);
- Simpson's diversity index ($D = 1\text{-}G$);
- Simpson's evenness ($E_D = 1/G \times 1/S$);
- Shannon's heterogeneity ($H = -\sum P_i \times [\ln P_i]$);
- Shannon's evenness ($E_H = H/\ln[S]$);
- Hill's effective richness (e^H); and
- Hill's evenness (e^H/S),

where G is Simpson's diversity for sampling with no replacement ($[\sum n_i(n_i\text{-}1)]/[N(N\text{-}1)]$), P_i is the proportional contribution of species I to the total biomass, n_i is the number of individuals of the i^{th} species, and N is the total number of individuals. Diversity and evenness metrics range for 0 to 1, with values close to 0 having low diversity/evenness and values close to 1 having high diversity/evenness. Heterogeneity is also higher as the value increases, although the maximum occurs at ln(S).

The similarity of the duplicate laboratory QA/QC results (i.e., Methods 1 and 4) was also calculated as:

$$\text{Similarity} = 1 - 0.5\sum \left| a\text{-}b \right|$$

where a and b are the proportions that a given species contributes to the total of samples A and B, respectively (Washington 1984 *in* USEPA 2009). As with diversity metrics, similarity varies from 0 to 1, with greater similarity between samples being represented by values approaching 1. Specifically, communities that are exactly the same will have a similarity of 1.

RPMDs were calculated for the duplicate results produced by Methods 1 and 4, and PRSDs were calculated for the triplicate results produced by Methods 2 and 3. Precision of phytoplankton results was evaluated using the measurement quality objective (MQO) of 20% for any samples or aliquots that were reanalysed (Findlay and Kling n.d.; Moncheva 2010).

3.2 RESULTS

3.2.1 Chlorophyll *a*

With three exceptions, field and trip blanks always had low (i.e., less than five times the DL) or undetected concentrations of chlorophyll *a* and pheophytin *a* (Table 3-1). Exceptions were reported for one field blank and two trip blanks, all collected in fall 2010. Analytical DLs for chlorophyll *a* and pheophytin *a* decreased substantively in 2010 and concentrations reported for blank samples when detections occurred were very low (i.e., < 0.15 µg/L).

A total of 37 replicate samples were collected at a range of sites, across seasons, and spanning a range of chlorophyll *a* concentrations. Variability between replicate samples was low, with nearly all PRSDs and RPMDs being below the 18% and 25% criteria for triplicate and duplicate samples, respectively (Table 3-2; BCMELP 1998). For samples where the results were more than five times the analytical detection limit, higher variability was noted for: one sample collected in each of spring and summer 2010; and, two samples collected in each of summer 2009, winter 2009/10, and fall 2010. Higher frequencies occurred, at least in part, in 2010 due to a reduction in the detection limit. Though the number of replicates collected under CAMPP from the euphotic zone is relatively limited, available information suggests higher variability of replicates collected using this method relative to samples collected as surface grabs. This may reflect high natural variability (i.e., patchiness) of phytoplankton in the euphotic zone, inconsistent depth-integration of the water column during sample collection, and/or greater drift and therefore distance between replicate samples associated with collection of euphotic zone samples (due to increased time for collection of these samples relative to grab samples).

Analysis of samples collected for inter-laboratory comparison generally showed good agreement between the laboratories (Table 3-3). Of the 10 sets of samples analysed under CAMPP, discrepancy between the results reported by the two laboratories was found in summer 2008, fall 2008, and fall 2009 for chlorophyll *a*, and in spring and fall 2010/11 for pheophytin *a*. It should be noted that the results of samples sent to Maxxam Laboratories in 2008/09 and 2009/10 were measured at a DL half that of ALS Laboratories whereas detection limits were much lower at ALS than Maxxam in 2010/11.

3.2.2 Phytoplankton Taxonomy: Laboratory QA/QC Analyses

The laboratory QA/QC analyses generally showed a high degree of variability in the biomass of individual species measured in each sample by the analytical laboratory, regardless of the QA/QC test method (Tables 3-4 to 3-7). Across the QA/QC methods, the range of RPMD/PRSDs was 0 to 200% difference between counts, with 43-97% of the species in each sample having an RPMD or PRSD in excess of the 20% measurement quality objective identified in (Findlay and Kling n.d.).

The frequent occurrence of high RPMD/PRSDs values relating to species was partly caused by the high frequency of a species being identified in one of the QA/QC analyses but not the other. Specifically, for samples where two counts were performed (i.e., Methods 1 and 4), an RPMD value of 200% was returned in all instances where a species was found by one analyst but not the other (suggesting that it was a rare/uncommon taxa; e.g., Method 1 - *Amphiprora* sp., Cedar Lake, June 29, 2009; Table 3-4). For samples where three counts were performed (i.e., Methods 2 and 3), a PRSD of 173% was always returned when one of the three analyses identified the presence of a particular species but the other two analyses did not (i.e., the other two sample counts were zero; e.g., Method 3 – *Amphiprora* sp or *Amphora* sp., Cedar Lake, June 29, 2009; Table 3-6). These RPMD/PRSDs values exceed the 20% MQO and skewed the comparison of the precision of each method. Ultimately, inclusion of rare or uncommon taxa skewed the evaluation of overall precision of the program. Therefore, the analysis of the precision of each method was instead based on similarity indices, biomass metrics (total biomass, group biomass, and relative biomass of the major taxa), and richness, diversity, and evenness metrics to determine whether there is less variability at a broader community scale. These analyses are also considered to be of greater interest than species variability from the broader perspective of monitoring ecosystem health.

The similarity index is only appropriate for comparisons of two samples and therefore can only be used to assess Methods 1 and 4. As expected, the results obtained using Method 4 (i.e., recount of a single aliquot by a different taxonomist) were more similar to each other than those obtained via Method 1 (i.e., recount of a different aliquot by a different analyst), as revealed by higher mean, minimum, maximum, and median similarity values (Table 3-8 and Figure 3-1). This suggests that sub-sampling introduces more error than that associated with taxonomic identification.

Comparison of the RPMDs and PRSDs of total biomass, group biomass, and relative biomass of each major taxonomic group generally resulted in lower variability than when results for individual species were evaluated. Although RPMD/PRSDs across the four methods still ranged from 0 to 200%, the extreme values were generally only calculated for rare taxa, particularly Peridineae and Euglenophyceae.

In terms of total biomass, the mean and median RPMD/PRSDs were lowest for Method 2 (i.e., recount of one aliquot by one analyst; 25 and 26%, respectively), and second lowest for Method 1 (recount of a different aliquot by a different analyst; 47 and 26%, respectively; Figure 3-2 and Table 3-9). RPMD/PRSDs of all samples analysed using Methods 3 and 4 exceeded the MQO of 20% recommended by Findlay and Kling (n.d.); whereas only 56% and 67% of samples from Methods 1 and 2, respectively, exceeded this MQO.

As expected, samples analysed using Method 2 also had lower mean and median RPMD/PRSDs (42 and 43%, respectively) for group biomass when compared to the other methods (Figure 3-3 and Table 3-9). Methods 1 and 4 had equivalent mean and median (66 and 48%, respectively) precision of the analyses and proved to have better replicability than Method 3 (i.e., count of three separate aliquots by one taxonomist). As with total biomass, Method 1 had the lowest proportion of samples that exceeded the recommended MWO of 20%.

Method 2 yielded the highest precision in terms of relative biomass, with mean and median PRSDs of 40 and 36%, respectively (Figure 3-4 and Table 3-9). Precision was slightly better for Method 4 (mean and median RPMD: 69 and 45%) than for Method 1 (70 and 53%, respectively), but was worst for Method 3 (79 and 74%, respectively). Methods 2 and 4 also had lower proportions (60 and 67%, respectively) of samples exceeding the recommended MQO compared to Methods 1 and 3 (80 and 83% exceedance, respectively).

In terms of community metrics, the greatest precision was observed for Method 2, as only one of the PRSDs exceeded the recommended MQO of 20% (Table 3-10). As expected, the mean, median, and maximum PRSDs were also lower for this method than any other (Figures 3-6 to 3-11); variability between analyses was higher for all other methods. When the metrics were considered individually, Methods 3 and 4 each had up to 67% of samples with RPMD/PRSDs exceeding the recommended MQO, which was slightly higher than the frequency of exceedance under Method 1 (up to 56%). However, when the metrics were considered collectively, Methods 1 and 3 had a similar number of analyses exceeding the recommended MQO (40 and 38%, respectively), which was lower than that found for Method 4 (55%; Table 3-10). Further, the overall means were similar between methods, but the median RPMD/PRSD was highest for Method 4 whereas the maximum RPMD/PRSD was highest for Method 1.

3.2.3 Phytoplankton Taxonomy: Triplicate Environmental Samples

Analysis of phytoplankton triplicate samples collected in the field showed high variability between species-level identification of the samples; however, variability between the triplicate samples analysed at the biomass and community level was similar to that observed in samples analysed more than once by the analytical laboratory (i.e., laboratory replication; Figures 3-2 to 3-11). The mean and median PRSD results of the total biomass, group biomass, and relative biomass were relatively high and nearly all PRSDs were elevated beyond the 20% MQO, but individual values spanned a wide range (4 to 173%; Table 3-11). Although all the community metrics had at least one sample with an elevated PRSD, the range of PRSDs (6-45%) was lower than for the biomass measures (4-173%) and there were fewer exceedances of the recommended MQO (Table 3-12).

3.3 DISCUSSION

Collectively, the results of the phytoplankton QA/QC program indicate low variability (i.e., high precision and replicability) for chlorophyll *a* measurements, but relatively high variability associated with both field replicates and laboratory QA/QC methods for phytoplankton taxonomy and biomass. The mean PRSD for triplicate samples of chlorophyll *a* was 19% whereas the laboratory QA/QC analyses for phytoplankton yielded mean and median RPMD/PRSDs of 25-79% and 26-74%, respectively, for the biomass metrics (Table 3-9) and 7-21% and 6-22%, respectively, for the overall community metrics (Table 3-10). Variability of field replicate sample results was generally similar to that observed for laboratory QA/QC replications; the mean and median PRSDs for biomass metrics were 45-88 and 47-79% (Table 3-11), whereas both were 21% for the community metrics (Table 3-12).

For taxonomy and biomass, CAMPP QA/QC analyses indicate that the community metrics generally yielded lower RPMD/PRSDs and fewer exceedances of the recommended MQO (Findlay and Kling n.d.) than the biomass metrics (Tables 3-9 and 3-10). Community metrics may therefore be useful in determining changes in community structure through time or space; however, these metrics do not inherently provide information regarding the total biomass of alga present, nor the dominant taxa.

Review of the variabilities observed for the laboratory QA/QC analyses indicates:

- the lowest variability between QA/QC tests occurred for Method 2 (i.e., one analyst recounting one aliquot), although a minimum of 25% (i.e., lowest mean PRSD for this method in terms of biomass) of variability was introduced;
- the highest variability of the various QA/QC analyses undertaken occurred for: Method 3 for total and relative biomass; for replicates for group biomass; and, for Method 4 and the replicates for the overall community metrics;
- the difference between the results for Method 3 (i.e., one analyst counting three different aliquots) and Method 2 (i.e., one analyst recounting one aliquot) provides a measure of the error associated with sub-sampling. The difference in mean PRSDs for biomass metrics calculated using these two methods (i.e., an indicator of sub-sampling error) is 31-38%;
- Method 4 (i.e., two analysts counting one aliquot) provides a measure of the error associated with different analysts; mean PRSDs for the biomass metrics were 56-69% whereas community metrics were 21%; and,
- although variability of the field replicates was slightly higher than that of the laboratory QA/QC analyses, removal of error associated with the laboratory analyses (i.e., Method 2) reduces the mean error in sample collection to 20 and 22% for total and relative biomass, 45% for group biomass, and 14% for the overall community metrics.

Tables 3-13 and 3-14 present the percentage of analyses where measures of variability exceed MQOs of 20, 40, 50, and 60% for the laboratory QA/QC analyses, while Tables 3-15 and 3-16 present the percentage of analyses of the triplicate field samples that exceed MQOs set at 20, 30, 40, 50, and 60%. This evaluation indicates the following:

- in terms of the biomass metrics, all laboratory and field QA/QC methods examined yielded more than 50% of samples with RPMDs or PRSDs exceeding the 20% MQO recommended by Findlay and Kling (n.d.);
- Method 2 generally yielded the lowest exceedance of any MQO whereas Method 3 tended to have the highest percent exceedance for the biomass metrics; and,
- Method 2 also yielded the lowest exceedance of all MQO levels (i.e., 5% exceedance at MQO of 20%) for the overall community metrics while Method 4 was highest when the MQO was set to 20 or 30%.

To determine how the observed level of variability for CAMPP samples compares to other studies, results for two common taxa (*Cyclotella* sp. and *Cryptomonas* sp.) were examined and compared to a recent study that evaluated variability in laboratory methods in a manner similar to CAMPP (Vuorio et al. 2007).

RPMDs and PRSDs associated with measurements of biomass of these two common taxa (*Cyclotella* sp. and *Cryptomonas* sp.) in CAMPP samples ranged from 0 to 141%, depending on the samples (i.e., from different CAMPP waterbodies) as well as the laboratory QA/QC method tests employed (Figures 3-12 to 3-16). Vuorio et al. (2007) assessed the variability in counts of a limited number of species present in natural and laboratory-derived samples that were analysed by 12 to 22 separate taxonomists (using different aliquots) and found variability between 10 and 42% (for professionals), depending on the species. While this level of precision is generally higher than observed for CAMPP samples, the results of this study indicate that relatively high variability is not unusual for phytoplankton taxonomic analysis. Further, PRSDs would be expected to be higher for CAMPP samples as the number of taxonomists was far fewer (i.e., two) relative to the study undertaken by Vuorio et al. (2007). Lastly, precision was examined on species cell counts in Vuorio et al. (2007), where precision for CAMPP samples was examined based on biomass measurements. The latter would be expected to be associated with lower levels of precision as biomass is derived from an additional analytical measurement (i.e., cell biovolume). Thus, the results of CAMPP QA/QC analyses are not directly comparable to results reported by Vuorio et al. (2007) and would, on a relative basis, be expected to yield higher variability. Considering these caveats, estimates of variability associated with laboratory method applied for CAMPP may in fact be in a similar range observed in other analytical laboratories.

3.4 REFERENCES

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Table 3-1. Chlorophyll *a* and pheophytin results for field and trip blanks included in the 2008-2010 CAMP water quality programs. Values more than five times the analytical detection limits are indicated in bold red.

Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Method Detection Limit				*2008*	*1*	*1*
				2009 OW	*0.60/1.0*	*0.60/1.0*
				2009 IC	*0.010 / 0.020*	*0.010 / 0.020*
				2010 OW	*0.010/0.020/0.030*	*0.010/0.022/0.029/0.030*
				2010 IC	*0.60*	*0.60*
Field Blanks						
2008/2009						
MWS Field Blank	TCS007 (Field Blk)	L648805-4	26-Jun-08	8:00	-	-
NSC Field blank	LHS004	L649710-5	30-Jun-08	12:55	<1	<1
MWS Field Blank	TDS005	L670161-3	14-Aug-08	11:25	<1	<1
NSC Field blank	LHS004	L671937-5	18-Aug-08	15:40	<1	<1
NSC Field blank	LHS004	L683986-4	17-Sep-08	10:00	<1	<1
MWS Field Blank	TDS005-SURF	L685087-3	18-Sep-08	9:30	<1	3
MWS Field Blank	TDS005-EUPH	L685087-11	18-Sep-08	9:30	<1	<1
Field blank-Central	LHS004	L738653-7	2-Mar-09	13:20	<1	<1
Field Blank-North	TDS005	L739943-3	5-Mar-09	13:35	<1	<1
2009/2010						
NSC Field blank-South	LHS004-SURF	L764834-14	19-May-09	11:00	<0.60	<0.60
MWS Field Blank	TDS005-SURF	L783470-2	24-Jun-09	16:00	<1.0	<1.0
NSC Field blank	LHS004-SURF	L786966-5	2-Jul-09	8:45	<1.0	<1.0
NSC Field blank-South	RAS156-SURF	L799503-6	30-Jul-09	10:00	<1.0	<1.0
NSC Field blank	LHS004-SURF	L802304-8	6-Aug-09	13:35	<1.0	<1.0
MWS Field Blank	TDS005-SURF	L804978-6	12-Aug-09	8:50	1.9	<1.0
NSC Field blank	LHS004-SURF	L816911-6	10-Sep-09	-	<1.0	<1.0
NSC Field blank-South	RAS156-SURF	L819356-6	16-Sep-09	-	<1.0	<1.0
MWS Field Blank	TDS005-SURF	L819429-6	16-Sep-09	10:00	<1.0	<1.0

Table 3-1. – continued –

Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Field blank- North	TDS005-SURF	L866373-8	2-Mar-10	13:18	<0.010	<0.010
Field blank- North	ECS007-SURF	L867273-7	5-Mar-10	9:15	<0.010	<0.010
Field blank- Central	LHS004-SURF	L867924-5	8-Mar-10	11:45	<0.010	<0.010
Field blank- South	RAS156-SURF	L869032-5	12-Mar-10	15:10	-	-
2010/11						
Field blank (NSC South)	RAS156-EUPH	L886933-13	14-May-10	-	<0.030	<0.029
Field Blank (NSC North/Central)	LHS004-EUPH	L899309-6	17-Jun-10	-	<0.010	<0.010
Field blank (NSC South)	RAS156-EUPH	L911400-15	21-Jul-10	-	<0.010	<0.010
Field Blank (NSC North/Central)	LHS004-SURF	L920004-10	12-Aug-10	-	<0.030	0.055
Field Blank (MWS North/Central)	TDS005-EUPH	L922533-13	19-Aug-10	-	<0.010	<0.010
Field Blank (NSC North/Central)	LHS004-EUPH	L930015-13	9-Sep-10	-	0.017	<0.010
Field Blank (MWS North/Central)	TDS005-EUPH	L932322-16	15-Sep-10	-	**0.113**	<0.010
Field blank (NSC South)	RAS156-EUPH	L935796-14	24-Sep-10	-	<0.010	0.038
Field blank (NSC South)	RAS156-SURF	L981698-1	25-Feb-11	15:30	<0.60	<0.60
Field blank (North)	TDS005-SURF	L981063-6	23-Feb-11	14:10	<0.60	0.78
Field blank (North)	ECS007-SURF	L981891-6	26-Feb-11	14:35	<0.60	<0.60
Field blank (Central)	LHS004-SURF	L983897-10	6-Mar-11	18:40	<0.60	<0.60
TRIP BLANKS						
2008/2009						
MWS Trip Blank	TDS005 (TripBlk)	L648805-3	26-Jun-08	-	-	-
NSC Trip blank	LFS006	L649710-6	30-Jun-08	-	3	<1
MWS Trip Blank	TCS007	L670161-4	14-Aug-08	-	<1	<1
NSC Trip blank	LFS006	L671937-6	18-Aug-08	-	<1	<1
NSC Trip blank	LFS006	L683986-5	17-Sep-08	-	<1	<1
MWS Trip Blank	TCS007	L685087-4	18-Sep-08	-	5	<1
Trip blank-Central	LFS006	L738653-8	2-Mar-09	-	<1	<1
Trip Blank-North	TCS007	L739152-4	5-Mar-09	-	<1	<1

Table 3-1. – continued –

Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
2009/2010						
NSC Trip blank-South	LFS006-SURF	L764834-16	19-May-09	11:30	<0.60	<0.60
MWS Trip Blank	TCS007-SURF	L783470-3	24-Jun-09	16:00	-	-
NSC Trip blank	LFS006-SURF	L786966-6	2-Jul-09	9:15	<1.0	<1.0
NSC Trip blank-South	RAS157-SURF	L799503-7	30-Jul-09	9:30	<1.0	<1.0
NSC Trip blank	LFS006-SURF	L802304-9	6-Aug-09	-	<1.0	<1.0
MWS Trip Blank	TCS007-SURF	L804978-7	12-Aug-09	12:30	<1.0	<1.0
NSC Trip blank-South	RAS157-SURF	L819356-7	16-Sep-09	-	<1.0	<1.0
NSC Trip blank	LFS006-SURF	L816911-7	10-Sep-09	-	<1.0	<1.0
MWS Trip Blank	TCS007-SURF	L819429-7	16-Sep-09	7:20	-	-
Trip blank- North	TCS007-SURF	L866769-12	3-Mar-10	-	<0.010	<0.010
Trip blank- North	ECS006-SURF	L867077-3	4-Mar-10	-	<0.010	<0.010
Trip blank- South	RAS157-SURF	L869032-6	12-Mar-10	-	0.03	0.02
Trip blank- South	LFS006-SURF	L867924-4	8-Mar-10	-	<0.010	<0.010
2010/2011						
Trip Blank (NSC South)	RAS157-EUPH	L886933-14	14-May-10	-	<0.030	0.031
Trip blank (NSC North/Central)	LFS006-EUPH	L899309-7	17-Jun-10	-	<0.010	<0.010
Trip Blank (MWS North/Central)	TCS007-EUPH	L901288-16	23-Jun-10	-	0.016	<0.010
Trip Blank (NSC South)	RAS157-EUPH	L911400-16	21-Jul-10	-	<0.010	<0.010
Trip blank (NSC North/Central)	LFS006-EUPH	L920004-11	12-Aug-10	-	<0.030	<0.030
Trip Blank (MWS North/Central)	TCS007-EUPH	L922533-12	19-Aug-10	-	<0.010	<0.010
Trip blank (NSC North/Central)	LFS006-EUPH	L930015-14	9-Sep-10	-	**0.133**	0.027
Trip Blank (MWS North/Central)	TCS007-EUPH	L932322-15	15-Sep-10	-	**0.144**	<0.010
Trip Blank (NSC South)	RAS157-EUPH	L935796-15	24-Sep-10	-	<0.010	<0.010
Trip Blank (NSC South)	RAS157-SURF	L981697-7	25-Feb-11	-	<0.60	<0.60
Trip Blank (North)	ECS006-SURF	L981063-7	23-Feb-11	-	<0.60	<0.60
Trip Blank (North)	TCS007-SURF	L980166-4	21-Feb-11	-	<0.60	<0.60
Trip Blank (Central)	LFS006-SURF	L983897-9	6-Mar-11	-	<0.60	<0.60

Table 3-2. Chlorophyll a and pheophytin results for replicate samples collected during the 2008-2010 CAMPP water quality program. Percent relative standard deviations (PRSD) were calculated for triplicate samples and relative percent mean deviations (RPMDs) were calculated for duplicate values. Precision results greater than 18% and 25%, respectively are indicated in bold red.

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (μg/L)	Pheophytin (μg/L)
Method Detection Limit							*2008*	*1*	*1*
							2009 OW1	*0.60/1.0*	*0.60/1.0*
							2009 IC [2]	*0.010 / 0.020 / 0.050*	*0.010 / 0.020 / 0.050*
							2010 OW1	*0.010/0.030/ 0.040/0.30*	*0.010/0.029/0.030/ 0.070/0.10/0.30*
							2010 IC [2]	*0.60*	*0.60*
2008/2009									
Spring									
Saskatchewan River	Cormorant Lake- Rep 1	KKS038-SURF	L649710-1	30-Jun-08	12:43	Surface	0.3	<1	13
	Cormorant Lake- Rep 2	KLS002-SURF	L649710-3	30-Jun-08	12:50	Surface	0.3	<1	6
	Cormorant Lake- Rep 3	KLS003-SURF	L649710-4	30-Jun-08	12:55	Surface	0.3	<1	4
		Mean						<1	8
		SD						-	5
		PRSD						-	-
Upper Nelson River	Cross Lake- Rep 1	UDS004-SURF	L648805-2	26-Jun-08	13:35	Surface	0.3	7	3
	Cross Lake- Rep 2	TFS013-SURF	L648805-5	26-Jun-08	18:12	Surface	0.3	7	3
	Cross Lake- Rep 3	TFS014-SURF	L648805-6	26-Jun-08	17:45	Surface	0.3	7	3
		Mean						7	3
		SD						0	0
		PRSD						0	-
Upper Nelson River	Cross Lake- Rep 1	UDS004-EUPH	L648805-8	26-Jun-08	13:35	Euphotic	0.9	6	3
	Cross Lake- Rep 2	TFS013-EUPH	L648805-9	26-Jun-08	18:12	Euphotic	1.7	7	3
	Cross Lake- Rep 3	TFS014-EUPH	L648805-10	26-Jun-08	17:45	Euphotic	1.4	5	5
		Mean						6	4
		SD						1	1
		PRSD							-

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Summer									
Winnipeg River	Manigotagan Lake- Rep 1	RAS155-SURF	L668969-3	13-Aug-08	9:50	Surface	0.3	7	<1
	Manigotagan Lake- Rep 2	PFS095-SURF	L668969-4	13-Aug-08	10:00	Surface	0.3	6	1
	Manigotagan Lake- Rep 3	PFS096-SURF	L668969-5	13-Aug-08	10:10	Surface	0.3	6	<1
		Mean						6	1
		SD						1	-
		PRSD						9	-
Lower Churchill River	Gauer Lake- Rep 1	FAS007-SURF	L669933-3	13-Aug-08	14:00	Surface	0.3	25	<1
	Gauer Lake- Rep 2	TFS013-SURF	L669933-5	13-Aug-08	8:20	Surface	0.3	25	<1
	Gauer Lake- Rep 3	TFS014-SURF	L669933-6	13-Aug-08	18:25	Surface	0.3	21	1
		Mean						24	1
		SD						2	-
		PRSD						10	-
Fall									
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	L685087-1	18-Sep-08	12:35	Surface	0.3	-	-
	Setting Lake- Rep 2	TFS013-SURF	L685087-5	18-Sep-08	8:00	Surface	0.3	5	1
	Setting Lake- Rep 3	TFS014-SURF	L685087-6	18-Sep-08	11:40	Surface	0.3	5	<1
		Mean						5	1
		SD						0	-
		PRSD						-	-
Upper Nelson River	Setting Lake- Rep 1	TCS006-EUPH	L685087-7	18-Sep-08	12:40	Euphotic	4.0	5	<1
	Setting Lake- Rep 2	TFS013-EUPH	L685087-9	18-Sep-08	8:15	Euphotic	3.8	5	<1
	Setting Lake- Rep 3	TFS014-EUPH	L685087-10	18-Sep-08	11:50	Euphotic	4.2	5	<1
		Mean						5	<1
		SD						0	-
		PRSD						-	-
Lower Nelson River	Hayes River- Rep 1	ABS002-SURF	L685275-2	21-Sep-08	9:55	Surface	0.3	2	<1
	Hayes River- Rep 2	KLS002-SURF	L685275-4	21-Sep-08	10:10	Surface	0.3	2	<1
	Hayes River- Rep 3	KLS003-SURF	L685275-5	21-Sep-08	10:20	Surface	0.3	2	<1
		Mean						2	<1
		SD						0	-
		PRSD						-	-

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Winter									
Winnipeg River	Lac du Bonnet- Rep 1	PFS093-SURF	L738178-1	1-Mar-09	13:20	Surface	0.3	<1	<1
	Lac du Bonnet- Rep 2	PFS095-SURF	L738178-4	1-Mar-09	13:40	Surface	0.3	<1	<1
	Lac du Bonnet- Rep 3	PFS096-SURF	L738178-5	1-Mar-09	13:55	Surface	0.3	<1	<1
		Mean						<1	<1
		SD						-	-
		PRSD						-	-
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	L739152-2	3-Mar-09	13:30	Surface	0.3	1	<1
	Setting Lake- Rep 2	TFS013-SURF	L739152-5	3-Mar-09	13:30	Surface	0.3	1	<1
	Setting Lake- Rep 3	TFS014-SURF	L739152-6	3-Mar-09	13:30	Surface	0.3	1	<1
		Mean						1	<1
		SD						0	-
		PRSD						-	-
2009/2010									
Spring									
Winnipeg River	Lac Du Bonnet- Rep 1	PFS094-SURF	L764834-7	19-May-09	9:05	Surface	0.3	7.64	1.18
	Lac Du Bonnet- Rep 2	PFS095-SURF	L764834-10	19-May-09	9:30	Surface	0.3	6.87	0.88
	Lac Du Bonnet- Rep 3	PFS096-SURF	L764834-12	19-May-09	10:00	Surface	0.3	6.49	1.79
		Mean						7.00	1.28
		SD						0.59	-
		PRSD						8	-
Upper Churchill River	Granville Lake- Rep 1	EBS043-SURF	L783470-1	24-Jun-09	16:00	Surface	0.3	3.4	1.1
	Granville Lake- Rep 2	TFS013-SURF	L783459-1	24-Jun-09	16:00	Surface	0.3	3.1	1.8
	Granville Lake- Rep 3	TFS014-SURF	L783459-2	24-Jun-09	16:00	Surface	0.3	3.4	1.4
		Mean						3.3	1.4
		SD						-	-
		PRSD						-	-
Lower Churchill River	Partridge Breast Lake- Rep 1	FAS009-SURF	L786186-4	1-Jul-09	9:15	Surface	0.3	2.3	<1.0
	Partridge Breast Lake- Rep 2	KLS002-SURF	L786186-6	1-Jul-09	9:40	Surface	0.3	2.3	<1.0
	Partridge Breast Lake- Rep 3	KLS003-SURF	L786186-7	1-Jul-09	10:00	Surface	0.3	2.3	<1.0
		Mean						2.3	<1.0
		SD						-	-
		PRSD						-	-

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Summer									
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	L799503-1	30-Jul-09	7:37	Surface	0.3	8.0	4.0
	Lac Du Bonnet- Rep 2	PFS095-SURF	L799503-4	30-Jul-09	7:37	Surface	0.3	8.0	2.9
	Lac Du Bonnet- Rep 3	PFS096-SURF	L799503-5	30-Jul-09	7:37	Surface	0.3	8.0	3.2
		Mean						8.0	3.4
		SD						0.0	-
		PRSD						0	-
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	L801714-1	5-Aug-09	8:40	Surface	0.3	2.7	1.1
	Assean Lake- Rep 2	KLS002-SURF	L801714-6	5-Aug-09	8:40	Surface	0.3	2.3	<1.0
	Assean Lake- Rep 3	KLS003-SURF	L801714-7	5-Aug-09	8:40	Surface	0.3	2.3	1.2
		Mean						2.4	<1.0
		SD						-	-
		PRSD						-	-
Upper Nelson River	Playgreen Lake- Rep 1	UBS015-SURF	L804021-3	11-Aug-09	10:06	Surface	0.3	9.2	2.6
	Playgreen Lake- Rep 2	TFS013-SURF	L804029-1	11-Aug-09	9:00	Surface	0.3	5.0	<1.0
		Mean						7.1	1.6
		RPMD						**59**	-
Upper Nelson River	Setting Lake- Rep 1	TCS006-SURF	L804021-1	11-Aug-09	8:20	Surface	0.3	4.6	2.4
	Setting Lake- Rep 2	TFS014-SURF	L804029-2	11-Aug-09	10:30	Surface	0.3	7.6	3.1
		Mean						6.1	2.8
		RPMD						**49**	-
Fall									
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	L819356-1	16-Sep-09	8:30	Surface	0.3	3.4	3.5
	Lac Du Bonnet- Rep 2	PFS095-SURF	L819356-4	16-Sep-09	8:30	Surface	0.3	4.6	1.8
	Lac Du Bonnet- Rep 3	PFS096-SURF	L819356-5	16-Sep-09	8:30	Surface	0.3	4.2	2.7
		Mean						4.1	2.7
		SD						-	-
		PRSD						-	-
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	L816365-2	9-Sep-09	8:25	Surface	0.3	2.7	1.1
	Assean Lake- Rep 2	KLS002-SURF	L816365-5	9-Sep-09	8:25	Surface	0.3	3.8	<1.0
	Assean Lake- Rep 3	KLS003-SURF	L816365-6	9-Sep-09	8:25	Surface	0.3	3.8	<1.0
		Mean						3.4	<1.0
		SD						-	-
		PRSD						-	-

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Upper Churchill River	Granville Lake- Rep 1	EBS043-SURF	L819429-1	16-Sep-09	13:50	Surface	0.3	3.8	2.1
	Granville Lake- Rep 2	TFS013-SURF	L819429-8	16-Sep-09	14:25	Surface	0.3	3.4	2.4
	Granville Lake- Rep 3	TFS014-SURF	L819429-9	16-Sep-09	14:45	Surface	0.3	3.8	2.3
		Mean						3.7	2.3
		SD						-	-
		PRSD						-	-
Winter									
Upper Churchill River	South Indian Lake-Area 1- Rep 1	ECS005-SURF	L867273-4	5-Mar-10	9:15	Surface	0.3	0.479	0.245
	South Indian Lake- Area 1- Rep 2	ABS003-SURF	L867273-8	5-Mar-10	9:15	Surface	0.3	0.534	0.225
	South Indian Lake- Area 1- Rep 3	ABS004-SURF	L867273-9	5-Mar-10	9:15	Surface	0.3	0.486	0.188
		Mean						0.500	0.219
		SD						0.030	0.029
		PRSD						6	13
Lower Nelson River	Limestone Forebay- Rep 1	UHS004-SURF	L866373-7	2-Mar-10	13:18	Surface	0.3	0.682	0.731
	Limestone Forebay- Rep 2	TFS013-SURF	L866373-5	2-Mar-10	13:18	Surface	0.3	0.720	0.857
	Limestone Forebay- Rep 3	TFS014-SURF	L866373-6	2-Mar-10	13:18	Surface	0.3	0.772	0.869
		Mean						0.725	0.819
		SD						0.045	0.076
		PRSD						6	9
Lower Nelson River	Assean Lake- Rep 1	UFS014-SURF	L866769-1	3-Mar-10	14:21	Surface	0.3	1.13	0.278
	Assean Lake- Rep 2	FAS010-SURF	L866769-14	3-Mar-10	14:21	Surface	0.3	1.23	0.228
	Assean Lake- Rep 3	FAS011-SURF	L866769-15	3-Mar-10	14:21	Surface	0.3	1.11	0.200
		Mean						1.16	0.235
		SD						0.064	0.040
		PRSD						6	17
Winnipeg River	Lac Du Bonnet- Rep 1	PFS093-SURF	L869032-1	12-Mar-10	15:10	Surface	0.3	1.83	0.675
	Lac Du Bonnet- Rep 2	PFS095-SURF	L869032-3	12-Mar-10	15:10	Surface	0.3	0.868	0.723
	Lac Du Bonnet- Rep 3	PFS096-SURF	L869032-4	12-Mar-10	15:10	Surface	0.3	1.88	0.702
		Mean						1.53	0.700
		SD						0.570	0.024
		PRSD						**37**	3

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Saskatchewan River	Cormorant Lake- Rep 1	KKS038-SURF	L869032-11	12-Mar-10	10:00	Surface	0.3	0.643	0.181
	Cormorant Lake- Rep 2	KLS002-SURF	L869032-9	12-Mar-10	10:00	Surface	0.3	0.615	0.153
	Cormorant Lake- Rep 3	KLS003-SURF	L869032-10	12-Mar-10	10:00	Surface	0.3	0.477	0.142
		Mean						0.578	0.159
		SD						0.089	0.020
		PRSD						15	13
Lake Winnipeg	Lake Winnipegosis-Site 3- Rep 1	LFS005-SURF	L867290-3	7-Mar-10	12:55	Surface	0.3	1.26	0.342
	Lake Winnipegosis-Site 3- Rep 2	UDS018-SURF	L867290-13	7-Mar-10	12:55	Surface	0.3	1.42	0.625
	Lake Winnipegosis-Site 3- Rep 3	UDS019-SURF	L867290-14	7-Mar-10	12:55	Surface	0.3	1.39	0.321
		Mean						1.36	0.429
		SD						0.085	0.170
		PRSD						6	**40**
2010/2011									
Spring									
Winnipeg River	Winnipeg River - Rep 1	PFS094-EUPH	L886933-15	14-May-10	11:20	Euphotic	3.6	5.25	3.62
	Winnipeg River - Rep 2	PFS095-EUPH	L886933-9	14-May-10	11:20	Euphotic	3.6	2.24	2.43
	Winnipeg River - Rep 3	PFS096-EUPH	L886933-17	14-May-10	11:20	Euphotic	3.6	4.30	3.66
		Mean						3.93	3.24
		SD						1.54	0.70
		PRSD						**39**	**22**
Churchill River Diversion	Rat Lake - Rep 1	TFS005-EUPH	L899620-8	19-Jun-10	14:20	Euphotic	2.0	0.566	0.655
	Rat Lake - Rep 2	KLS002-EUPH	L899620-7	19-Jun-10	14:20	Euphotic	2.0	0.546	0.644
	Rat Lake - Rep 3	KLS003-EUPH	L899620-11	19-Jun-10	14:20	Euphotic	2.0	0.699	0.573
		Mean						0.604	0.624
		SD						0.083	0.045
		PRSD						14	7
Summer									
Winnipeg River	Eaglenest Lake - Rep 1	PFS097-EUPH	L911400-14	21-Jul-10	9:25	Euphotic	3.5	7.00	2.54
	Eaglenest Lake - Rep 2	PFS095-EUPH	L911400-9	21-Jul-10	9:25	Euphotic	3.5	6.04	1.67
	Eaglenest Lake - Rep 3	PFS096-EUPH	L911400-10	21-Jul-10	9:25	Euphotic	3.5	4.97	1.65
		Mean						6.00	1.95
		SD						1.02	0.51
		PRSD						17	**26**

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Upper Nelson River	Walker Lake - Rep 1	UDS020-EUPH	L920004-6	12-Aug-10	8:25	Euphotic	4.2	7.06	2.53
	Walker Lake - Rep 2	KLS002-EUPH	L920004-16	12-Aug-10	8:25	Euphotic	4.2	7.36	1.86
	Walker Lake - Rep 3	KLS003-EUPH	L920004-17	12-Aug-10	8:25	Euphotic	4.2	6.50	2.52
		Mean						6.97	2.30
		SD						0.44	0.38
		PRSD						6	17
Fall									
Winnipeg River	Manigotagan Lake - Rep 1	RAS155-EUPH	L935796-12	24-Sep-10	11:25	Euphotic	3.0	2.01	0.597
	Manigotagan Lake - Rep 2	PFS095-EUPH	L935796-16	24-Sep-10	11:25	Euphotic	3.0	4.09	0.641
	Manigotagan Lake - Rep 3	PFS096-EUPH	L935796-17	24-Sep-10	11:25	Euphotic	3.0	2.49	0.860
		Mean						2.86	0.699
		SD						1.09	0.141
		PRSD						**38**	**20**
Lake Winnipeg	Lake Winnipegosis-Site 2 -Rep 1	LFS004-EUPH	L928851-6	7-Sep-10	10:05	Euphotic	2.8	5.22	-
	Lake Winnipegosis-Site 2 -Rep 2	KLS002-EUPH	L928851-11	7-Sep-10	10:05	Euphotic	2.8	4.42	-
	Lake Winnipegosis-Site 2 -Rep 3	KLS003-EUPH	L928851-12	7-Sep-10	10:05	Euphotic	2.8	4.27	-
		Mean						4.64	
		SD						0.51	
		PRSD						11	
Upper Nelson River	Cross Lake - Rep 1	UDS004-EUPH	L932322-6	15-Sep-10	8:30	Euphotic	1.5	2.34	1.20
	Cross Lake - Rep 2	TFS013-EUPH	L932322-17	15-Sep-10	8:30	Euphotic	1.5	1.05	0.605
	Cross Lake - Rep 3	TFS014-EUPH	L932322-18	15-Sep-10	8:30	Euphotic	1.5	1.39	0.752
		Mean						1.59	0.852
		SD						0.67	0.310
		PRSD						**42**	**36**
Winter									
Winnipeg River	Eaglenest Lake - Rep 1	PFS095-SURF	L981697-4	25-Feb-11	12:35	Surface	0.3	<0.60	0.69
	Eaglenest Lake - Rep 2	PFS096-SURF	L981697-6	25-Feb-11	13:00	Surface	0.3	<0.60	<0.60
	Eaglenest Lake - Rep 3	PFS097-SURF	L981697-5	25-Feb-11	13:20	Surface	0.3	<0.60	<0.60
		Mean						<0.60	<0.60
		SD						-	-
		PRSD						-	-

Table 3-2. – continued –

Region	Sample Location	Sample ID	ALS ID	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Saskatchewan River	Cormorant Lake - Rep 1	KKS038-SURF	L984359-1	7-Mar-11	15:30	Surface	0.3	1.15	<0.60
	Cormorant Lake - Rep 2	KLS002-SURF	L984359-7	7-Mar-11	16:00	Surface	0.3	0.76	<0.60
	Cormorant Lake - Rep 3	KLS003-SURF	L984359-8	7-Mar-11	16:30	Surface	0.3	1.53	<0.60
		Mean						1.15	<0.60
		SD						0.385	-
		PRSD						-	-
Lower Churchill River	Billard Lake - Rep 1	FBS003-SURF	L981063-2	23-Feb-11	10:30	Surface	0.3	<0.60	0.61
	Billard Lake - Rep 2	TFS013-SURF	L981063-4	23-Feb-11	10:30	Surface	0.3	<0.60	<0.60
	Billard Lake - Rep 3	TFS014-SURF	L981063-5	23-Feb-11	10:30	Surface	0.3	<0.60	<0.60
		Mean						<0.60	<0.60
		SD						-	-
		PRSD						-	-
Upper Churchill River	South Indian Lake-Area 6 - Rep 1	ECS002-SURF	L981693-1	25-Feb-11	10:38	Surface	0.3	<0.60	<0.60
	South Indian Lake-Area 6 - Rep 2	FAS010-SURF	L981696-1	25-Feb-11	10:38	Surface	0.3	<0.60	<0.60
	South Indian Lake-Area 6 - Rep 3	FAS011-SURF	L981696-2	25-Feb-11	10:38	Surface	0.3	0.76	<0.60
		Mean						<0.60	<0.60
		SD						-	-
		PRSD						-	-

Table 3-3. Chlorophyll *a* and pheophytin results measured at ALS Laboratory and Maxxam Analytics for interlaboratory comparison. Relative percent mean deviation (RPMD) was calculated and values greater than 25% are indicated in red.

Region	Sample Location	Sample ID	Laboratory	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
ALS Method Detection Limit							*2008*	*1*	*1*
Maxxam Method Detection Limit							*2008*	*-**	*0.5*
Spring									
Upper Nelson River	Cross Lake (Mean)	UDS004-SURF	ALS	26-Jun-08	13:35	Surface	0.3	7	3
	Cross Lake	UDS004-SURF	Maxxam*	26-Jun-08		Surface	0.3	5.98	<0.5
		RPMD						16	-
Upper Nelson River	Cross Lake (Mean)	UDS004-EUPH	ALS	26-Jun-08	13:35	Euphotic	1.31	6	4
	Cross Lake	UDS004-EUPH	Maxxam*	26-Jun-08		Euphotic	0.86	-	-
		RPMD						-	-
Summer									
Upper Nelson River	Cross Lake	UDS004-EUPH	ALS	14-Aug-08	13:09	Euphotic	3.8	15	<1
	Cross Lake	UDS004-EUPH	Maxxam*	14-Aug-08		Euphotic	3.80	5.98	<0.5
		RPMD						86	-
Fall									
Upper Nelson River	Cross Lake	UDS004-EUPH	ALS	18-Sep-08	15:20	Euphotic	1.8	31	4
	Cross Lake	UDS004-EUPH	Maxxam*	18-Sep-08		Euphotic	1.80	15	<0.5
		RPMD						70	-
ALS Method Detection Limit							*2009*	*0.60/1.0*	*0.60/1.0*
Maxxam Method Detection Limit							*2009*	*-**	*1.0*
Spring									
Upper Nelson River	Cross Lake	UDS004-SURF	ALS	23-Jun-09	10:40	Surface	0.3	3.8	2.3
	Cross Lake	UDS004-SURF	Maxxam*	23-Jun-09	10:40	Surface	0.3	3.82	-
		RPMD						1	-
Summer									
Upper Nelson River	Cross Lake	UDS004-EUPH	ALS	11-Aug-09	11:26	Euphotic	1.9	5.0	2.8
	Cross Lake	UDS004-EUPH	Maxxam*	11-Aug-09	11:26	Euphotic	1.9	4.60	1.80
		RPMD						8	-

Table 3-3. – continued –

Region	Sample Location	Sample ID	Laboratory	Sample Date	Sample Time	Sample Type	Sample Depth (m)	Chlorophyll *a* (µg/L)	Pheophytin (µg/L)
Fall									
Upper Nelson River	Cross Lake	UDS004-EUPH	ALS	15-Sep-09	12:05	Euphotic	3.0	7.6	<1.0
	Cross Lake	UDS004-EUPH	Maxxam*	15-Sep-09	12:05	Euphotic	3.0	5.73	-
		RPMD						**28**	-
ALS Method Detection Limit							*2010 OW*	*0.010/0.020/ 0.040/0.50*	*0.010/0.022/ 0.040/0.50*
							2010 IC	*0.60*	*0.60*
Maxxam Detection Limit							*2010*	*0.5*	*0.5*
Spring									
Lower Churchill River	Northern Indian Lake	FAS008-EUPH	ALS	22-Jun-10	15:35	Euphotic	3.6	1.63	0.392
Lower Churchill River	Northern Indian Lake	FAS008-EUPH	Maxxam	22-Jun-10	15:35	Euphotic	3.6	1.4	3.9
		RPMD						-	**163**
Summer									
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-EUPH	ALS	19-Aug-10	11:05	Euphotic	1.7	0.991	0.199
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-SURF	Maxxam	19-Aug-10	11:05	Euphotic	1.7	<0.5	<0.5
		RPMD						-	-
Fall									
Upper Nelson River	Cross Lake (Mean)	UDS004-EUPH	ALS	15-Sep-10	8:30	Euphotic	1.5	1.59	0.85
Upper Nelson River	Cross Lake	UDS004-SURF	Maxxam	15-Sep-10	8:30	Euphotic	1.5	1.6	3.5
		RPMD						-	**122**
Winter									
Saskatchewan River	Cedar Lake	KLS001-SURF	ALS	8-Mar-11	11:00	Surface	0.3	0.95	<0.60
Saskatchewan River	Cedar Lake	KLS001-SURF	Maxxam	8-Mar-11	11:00	Surface	0.3	1.3	<0.5
		RPMD						-	-

*Maxxam laboratory IDs and detection limits are not known as the data were retrieved from the MWS water quality database.

Table 3-4. A selection of phytoplankton biomass (mg/m3) results (Bacillariophyceae for spring 2009) for QA/QC Method 1 – count of a separate aliquot by a different taxonomist. Relative percent mean difference (RPMD) values greater than 20% are indicated in red bold.

Region	Sample Location	Sample ID	ALS Sample Description	ALS ID	ALS Analyst	Sample Date	Sample Depth	Class Genus Species	Bacillariophyceae *Amphiprora* sp.
Spring									
Saskatchewan River	Cedar Lake	KLS001-EUPH	Aliquot 1	L820211-6	1	29-Jun-09	6.0		32.0
	Cedar Lake	KLS001-EUPH	Aliquot 4	L871280-3	2	29-Jun-09	6.0		0.0
		Mean							16.0
		RPMD							**200**
Upper Nelson River	Setting Lake	TCS006-EUPH	Aliquot 1	L824958-6	1	23-Jun-09	3.0		
	Setting Lake	TCS006-EUPH	Aliquot 2	L871280-9	2	23-Jun-09	3.0		
		Mean							
		RPMD							
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-EUPH	Aliquot 1	L824958-3	1	25-Jun-09	4.5		
	Southern Indian Lake-Area 4	ECS004-EUPH	Aliquot 2	L871280-7	2	25-Jun-09	4.5		
		Mean							
		RPMD							

Table 3-4. – continued –

Sample Location	Sample ID	ALS Sample Description	Bacillariophyceae *Asterionella formosa*	*Asterionella* sp.	*Cyclotella* sp.	*Diatoma tenue var. elongatum*	*Diatoma* sp.	*Melosira* sp.	*Navicula* sp.
Cedar Lake	KLS001-EUPH	Aliquot 1	7.7	0.0	384.4	1.6		207.4	2.2
Cedar Lake	KLS001-EUPH	Aliquot 4	0.0	4.4	425.1		0.8	141.7	0.6
	Mean		3.9	2.2	404.7	0.8	0.4	174.5	1.4
	RPMD		**200**	**200**	10	**200**	**200**	**38**	**109**
Setting Lake	TCS006-EUPH	Aliquot 1			83.7	89.3			
Setting Lake	TCS006-EUPH	Aliquot 2	1.3		332.1		94.5	0.3	
	Mean		0.6		207.9	44.6	47.2	0.2	
	RPMD		**200**		**119**	**200**	**200**	**200**	
Southern Indian Lake-Area 4	ECS004-EUPH	Aliquot 1			83.7			142.8	
Southern Indian Lake-Area 4	ECS004-EUPH	Aliquot 2			108.0			134.4	
	Mean				95.9			138.6	
	RPMD				25			6	

Table 3-4. – continued –

Sample Location	Sample ID	ALS Sample Description	Bacillariophyceae *Nitzschia* sp.	*Rhizosolenia* sp.	*Stephanodiscus* sp.	*Synedra acus*	*Synedra* sp.	*Tabellaria* sp.
Cedar Lake	KLS001-EUPH	Aliquot 1	22.1		216.0		53.1	147.6
Cedar Lake	KLS001-EUPH	Aliquot 4	41.3		1771.2	0.1		62.4
	Mean		31.7		993.6	0.0	26.6	105.0
	RPMD		**60**		**157**	**200**	**200**	**81**
Setting Lake	TCS006-EUPH	Aliquot 1		26.8			35.2	
Setting Lake	TCS006-EUPH	Aliquot 2		17.3		1.6	29.5	
	Mean			22.0		0.8	32.3	
	RPMD			**43**		**200**	17	
Southern Indian Lake-Area 4	ECS004-EUPH	Aliquot 1					0.5	
Southern Indian Lake-Area 4	ECS004-EUPH	Aliquot 2	1.1					
	Mean		0.5				0.2	
	RPMD		**200**				**200**	

Table 3-5. A selection of phytoplankton biomass (mg/m^3) results (Bacillariophyceae) for QA/QC Method 2 – re-count of the same aliquot by the same taxonomist. Percent relative standard deviation (PRSD) values greater than 20% are indicated in red bold.

Region	Sample Location	Sample ID	ALS Sample Desciption	ALS ID	ALS Analyst	Sample Date	Sample Depth	Class / Genus / Species	Bacillariophyceae *Asterionella formosa*
Saskatchewan River	Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 1	L871778-2	1	29-Jun-09	6.0		26.784
	Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 2	L871778-3	1	29-Jun-09	6.0		23.436
	Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 3	L871778-4	1	29-Jun-09	6.0		35.154
		Mean							28.5
		SD							6.0
		PSRD							**21**
Churchill River Diversion	Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 1	L871778-6	1	2-Jul-09	1.3		50.22
	Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 2	L871778-7	1	2-Jul-09	1.3		80.352
	Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 3	L871778-8	1	2-Jul-09	1.3		55.242
		Mean							61.9
		SD							16.1
		PSRD							**26**
Upper Nelson River	Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 1	L871778-10	1	23-Jun-09	1.0		77.76
	Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 2	L871778-11	1	23-Jun-09	1.0		50.22
	Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 3	L871778-12	1	23-Jun-09	1.0		50.22
		Mean							59.4
		SD							15.9
		PSRD							**27**

Table 3-5. – continued –

Sample Location	Sample ID	ALS Sample Desciption	Bacillariophyceae *Chaetoceros* sp.	*Cyclotella* sp.	*Cymbella* sp.	*Diatoma tenue var. elongatum*	*Diatoma* sp.	*Fragilaria crotonensis*	*Fragilaria* sp.
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 1		2.48	18	0		19.04	12
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 2		49.6	25	0.96		17.92	9.6
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 3		49.6	0	0.96		41.664	24
	Mean		-	33.9	14.3	0.6	-	26.2	15.2
	SD		-	27.2	12.9	0.6	-	13.4	7.7
	PSRD		-	**80**	**90**	**87**	-	**51**	**51**
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 1	1.536	66.96		7.812			
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 2	0	18.6		5.6			
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 3	1.536	6.2		0			
	Mean		1.0	30.6	-	4.5	-	-	-
	SD		0.9	32.1	-	4.0	-	-	-
	PSRD		**87**	**105**	-	**90**	-	-	-
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 1		99.2			13.888		
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 2		44.64			1.25		
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 3		49.6			6.944		
	Mean		-	64.5	-	-	7.4	-	-
	SD		-	30.2	-	-	6.3	-	-
	PSRD		-	**47**	-	-	**86**	-	-

Table 3-5 – continued –

Sample Location	Sample ID	ALS Sample Desciption	Bacillariophyceae *Melosira* sp.	*Navicula* sp.	*Nitzschia* sp.	*Synedra* sp.	*Tabellaria* sp.
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 1	28.8		31.744	6.696	54
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 2	69.12		186	10.044	13.44
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Count 3	23.04		7.936	10.044	15.36
	Mean		40.3	-	75.2	8.9	27.6
	SD		25.1	-	96.7	1.9	22.9
	PSRD		**62**	-	**129**	**22**	**83**
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 1	92.16		11.904	6.696	
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 2	53.568		2.976	6.696	
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Count 3	26.784		2.52	5.4	
	Mean		57.5	-	5.8	6.3	-
	SD		32.9	-	5.3	0.7	-
	PSRD		**57**	-	**91**	12	-
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 1		28	6.72	3.348	
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 2		18	11.904	3.78	
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Count 3		18	17.856	3.24	
	Mean		-	21.3	12.2	3.5	-
	SD		-	5.8	5.6	0.3	-
	PSRD		-	**27**	**46**	8	-

Table 3-6. A selection of phytoplankton biomass (mg/m^3) results (Bacillariophyceae) for QA/QC Method 3 – count of separate aliquots by the same taxonomist. Percent relative standard deviation (PRSD) values greater than 20% are indicated in red bold.

								Class	Bacillariophyceae
Region	Sample Location	Sample ID	ALS Sample Desciption	ALS ID	ALS Analyst	Sample Date	Sample Depth	Genus Species	*Amphiprora* sp.
Saskatchewan River	Cedar Lake	KLS001-EUPH		L820211-6	1	29-Jun-09	6.0		32.0
	Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 2	L871778-1	1	29-Jun-09	6.0		0
	Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Mean of 3 counts	L871778-10 to 12	1	29-Jun-09	6.0		0
		Mean							10.7
		SD							18.5
		PSRD							**173**
Churchill River Diversion	Threepoint Lake	TFS017-EUPH		L820212-3	1	2-Jul-09	1.3		
	Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 2	L871778-5	1	2-Jul-09	1.3		
	Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Mean of 3 counts	L871778-6 to 8	1	2-Jul-09	1.3		
		Mean							-
		SD							-
		PSRD							-
Upper Nelson River	Cross Lake	UDS004-EUPH		L824958-5	1	23-Jun-09	1.0		
	Cross Lake	UDS004-EUPH	L824958-5 Aliquot 2	L871778-9	1	23-Jun-09	1.0		
	Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Mean of 3 counts	L871778-10 to 12	1	23-Jun-09	1.0		
		Mean							-
		SD							-
		PSRD							-

Table 3-6. – continued –

Sample Location	Sample ID	ALS Sample Desciption	Bacillariophyceae *Amphora* sp.	*Asterionella formosa*	*Chaetoceros* sp.	*Cyclotella* sp.	*Cymatopleura* sp.	*Cymbella* sp.
Cedar Lake	KLS001-EUPH		0	7.7		384.4		0
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 2	232.5	11.718		20		0
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3 - Mean	0	28.5		33.9		21.5
	Mean		77.5	16.0	-	146.1	-	7.2
	SD		134.2	11.0	-	206.5	-	12.4
	PSRD		**173**	**69**	-	**141**	-	**173**
Threepoint Lake	TFS017-EUPH			113.27	0	12.40		
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 2		50.22	0	9.3		
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3 - Mean		61.9	1.5	30.6		
	Mean		-	75.1	0.5	17.4	-	-
	SD		-	33.5	0.9	11.5	-	-
	PSRD		-	**45**	**173**	**66**	-	-
Cross Lake	UDS004-EUPH			125.55		74.40	0	
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 2		53.568		198.4	126	
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3 - Mean		59.4		64.48	0	
	Mean		-	79.5	-	112.4	42.0	-
	SD		-	40.0	-	74.6	72.7	-
	PSRD		-	**50**	-	**66**	**173**	-

Table 3-6. – continued –

Sample Location	Sample ID	ALS Sample Desciption	Bacillariophyceae *Diatoma tenue var. elongatum*	*Diatoma* sp.	*Fragilaria crotonensis*	*Fragilaria* sp.	*Melosira* sp.	*Navicula* sp.
Cedar Lake	KLS001-EUPH		1.6		0	0	207.4	2.2
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 2	0		48	10.5	46.08	0
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3-Mean	1.0		26.2	15.2	40.3	0
	Mean		0.9	-	24.7	8.6	97.9	0.7
	SD		0.8	-	24.0	7.8	94.8	1.2
	PSRD		**94**	-	**97**	**91**	**97**	**173**
Threepoint Lake	TFS017-EUPH		0	23.81			200.88	0
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 2	13.39	0			449.28	0
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3-Mean	6.7	0			57.5	11.9
	Mean		6.7	7.9	-	-	235.9	4.0
	SD		6.7	13.7	-	-	198.2	6.9
	PSRD		**100**	**173**	-	-	**84**	**173**
Cross Lake	UDS004-EUPH		17.86	0		0	0	10.04
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 2	5.6	5		163.84	95.232	0
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3-Mean	0	7.36		0	0	21.3
	Mean		7.8	4.1	-	54.6	31.7	10.5
	SD		9.1	3.8	-	94.6	55.0	10.7
	PSRD		**117**	**91**	-	**173**	**173**	**102**

Table 3-6. – continued –

			Bacillariophyceae			
Sample Location	Sample ID	ALS Sample Desciption	*Nitzschia* sp.	*Stephanodiscus* sp.	*Synedra* sp.	*Tabellaria* sp.
Cedar Lake	KLS001-EUPH		22.1	216.0	53.1	147.6
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 2	17.856	0	10.044	27
Cedar Lake	KLS001-EUPH	L820211-6 Aliquot 3-Mean	75.2	0	8.9	27.6
	Mean		38.4	72.0	24.0	67.4
	SD		32.0	124.7	25.2	69.5
	PSRD		**83**	**173**	**105**	**103**
Threepoint Lake	TFS017-EUPH		1.12		20.09	
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 2	0		30.132	
Threepoint Lake	TFS017-EUPH	L820212-3 Aliquot 3-Mean	2.7		6.3	
	Mean		1.3	-	18.8	-
	SD		1.4	-	12.0	-
	PSRD		**107**	-	**64**	-
Cross Lake	UDS004-EUPH		14.88	225.00	22.32	
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 2	14.88	0	6.696	
Cross Lake	UDS004-EUPH	L824958-5 Aliquot 3-Mean	12.16	0	3.456	
	Mean		14.0	75.0	10.8	-
	SD		1.6	129.9	10.1	-
	PSRD		11	**173**	**93**	-

Table 3-7. A selection of phytoplankton biomass (mg/m^3) results (Bacillariophyceae for spring and fall 2010) for QA/QC Method 4 – count of the same aliquot by a different taxonomist. Relative percent mean difference (RPMD) values greater than 20% are indicated in red bold.

								Class	*Bacillariophyceae*	
Region	Sample Location	Sample ID	ALS Sample Description	ALS ID	ALS Analyst	Sample Date	Sample Depth	Genus Species	*Achnanthes minutissima*	*Asterionella formosa*
Spring										
Saskatchewan River	Saskatchewan River	KJS006-EUPH	Aliquot 1	L938977-1	1	15-Jun-10	0.75			
	Saskatchewan River	KJS006-EUPH	Aliquot 1	L979412-1	2	15-Jun-10	0.75			
	Mean									
	RPMD									
Lower Nelson River	Limestone Forebay	UHS004-EUPH	Aliquot 1	L938977-5	1	14-Jun-10	1.0			8.928
	Limestone Forebay	UHS004-EUPH	Aliquot 1	L979412-2	2	14-Jun-10	1.0			3.3604
	Mean									6.14
	RPMD									**91**
Summer										
Saskatchewan River	Saskatchewan River	KJS006-EUPH	Aliquot 1	L941899-1	1	13-Aug-10	0.7		0.0	0.819
	Saskatchewan River	KJS006-EUPH	Aliquot 1	L979412-6	2	13-Aug-10	0.7		0.15	2.8665
	Mean								0.08	1.84
	RPMD								**200**	**111**
Lower Churchill River	South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1	L939141-4	1	17-Aug-10	1.4			
	South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1	L979412-5	2	17-Aug-10	1.4			
	Mean									
	RPMD									

Table 3-7. – continued –

Sample Location	Sample ID	ALS Sample Description	*Bacillariophyceae* *Asterionella* sp.	*Cocconeis* sp.	*Cyclotella* sp.	*Cymatopleura* sp.	*Diatoma* sp.	*Fragilaria crotonensis*
Spring								
Saskatchewan River	KJS006-EUPH	Aliquot 1	11.52	2.0	198.4	0.0	10.53	407.5
Saskatchewan River	KJS006-EUPH	Aliquot 1	11.52	24.6	147.6	20.0	14.76	335.0
Mean			11.52	13.30	173.00	10.00	12.65	371.25
RPMD			0	**170**	**29**	**200**	**33**	20
Limestone Forebay	UHS004-EUPH	Aliquot 1			29.6			12.96
Limestone Forebay	UHS004-EUPH	Aliquot 1			32.0			42.48
Mean					30.80			27.72
RPMD					8			**106**
Fall								
Saskatchewan River	KJS006-EUPH	Aliquot 1		0.0	10.0	14.0		0.0
Saskatchewan River	KJS006-EUPH	Aliquot 1		0.3	10.0	14.4		11.808
Mean				0.15	10.00	14.20		5.90
RPMD				**200**	0	3		**200**
South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1			10.0			
South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1			4.0			
Mean					7.00			
RPMD					**86**			

Table 3-7. – continued –

Sample Location	Sample ID	ALS Sample Description	*Bacillariophyceae* *Fragilaria* sp.	*Melosira* sp.	*Navicula* sp.	*Nitzschia sigmoidea*	*Nitzschia* sp.	*Stephanodiscus* sp.
Spring								
Saskatchewan River	KJS006-EUPH	Aliquot 1	124.8	1228.8	38.88	0.0	22.599	
Saskatchewan River	KJS006-EUPH	Aliquot 1	50.88	2267.136	0.00	55.104	5.904	
Mean			87.84	1747.97	19.44	27.55	14.25	
RPMD			**84**	**59**	**200**	**200**	**117**	
Limestone Forebay	UHS004-EUPH	Aliquot 1	18.0	369.6	0.8		11.648	21.6
Limestone Forebay	UHS004-EUPH	Aliquot 1	15.0	41.16	0.0		2.08	40.0
Mean			16.50	205.38	0.40		6.86	30.80
RPMD			18	**160**	**200**		**139**	**60**
Fall								
Saskatchewan River	KJS006-EUPH	Aliquot 1	3.168	56.832	1.5		13.824	
Saskatchewan River	KJS006-EUPH	Aliquot 1	2.112	75.264	0.5		9.408	
Mean			2.64	66.05	1.00		11.62	
RPMD			**40**	**28**	**100**		**38**	
South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1		9.216			0.112	
South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1		19.2			0.112	
Mean				14.21			0.11	
RPMD				**70**			0	

Table 3-7. – continued –

Sample Location	Sample ID	ALS Sample Description	*Bacillariophyceae* *Surirella* sp.	*Synedra acus*	*Synedra* sp.	*Tabellaria* sp.
Spring						
Saskatchewan River	KJS006-EUPH	Aliquot 1		0.0	27.776	55.2
Saskatchewan River	KJS006-EUPH	Aliquot 1		17.22	0	0.0
Mean				8.61	13.89	27.60
RPMD				**200**	**200**	**200**
Limestone Forebay	UHS004-EUPH	Aliquot 1	12.6	0.0	10.692	
Limestone Forebay	UHS004-EUPH	Aliquot 1	12.6	2.46	0.98	
Mean			12.6	1.23	5.84	
RPMD			0	**200**	**166**	
Fall						
Saskatchewan River	KJS006-EUPH	Aliquot 1	2.4	0.0	0.384	
Saskatchewan River	KJS006-EUPH	Aliquot 1	0.4	28.416	0.000	
Mean			1.40	14.21	0.19	
RPMD			**143**	**200**	**200**	
South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1		0.0		
South Indian Lake-Area 6	ECS001-EUPH	Aliquot 1		0.18		
Mean				0.09		
RPMD				**200**		

Table 3-8. Summary statistics of the Similarity Index calculated between analyses conducted using Methods 1 and 4.

Region	Sample Location	Sample ID	Sample Date	Similarity Index
QA/QC Method 1	*Method Description - count of a separate aliquot by a different taxonomist*			
Saskatchewan River	Cedar Lake	KLS001-EUPH	29-Jun-09	0.40
Upper Nelson River	Setting Lake	TCS006-EUPH	23-Jun-09	0.63
Upper Churchill River	Southern Indian Lake-Area 4	ECS004-EUPH	25-Jun-09	0.85
Lake Winnipeg	Lake Winnipegosis-Site 4	LGS016-EUPH	2-Aug-09	0.42
Upper Churchill River	Southern Indian Lake-Area 1	ECS005-EUPH	12-Aug-09	0.97
Churchill River Diversion	Notigi Lake-West	TFS015-EUPH	3-Aug-09	0.34
Lake Winnipeg	Lake Winnipegosis-Site 1	LFS003-EUPH	8-Sep-09	0.67
Upper Nelson River	Cross Lake	UDS004-EUPH	15-Sep-09	0.56
Churchill River Diversion	Leftrook Lake	TFS018-EUPH2	11-Sep-09	0.89
	Mean			0.64
	Median			0.63
	Minimum			0.34
	Maximum			0.97
	SE			0.08
	n			9
QA/QC Method 4	*Method Description - Count of the same aliquots by different taxonomists*			
Saskatchewan River	Saskatchewan River	KJS006-EUPH	15-Jun-10	0.77
Lower Nelson River	Limestone Forebay	UHS004-EUPH	14-Jun-10	0.44
Saskatchewan River	Saskatchewan River	KJS006-EUPH	13-Aug-10	0.62
Lower Churchill River	Southern Indian Lake-Area 6	ECS001-EUPH	17-Aug-10	0.83
Lake Winnipeg	Lake Winnipegosis-Site 1	LFS003-EUPH	7-Sep-10	0.77
Saskatchewan River	Saskatchewan River	KJS006-EUPH	7-Sep-10	0.90
	Mean			0.72
	Median			0.77
	Minimum			0.44
	Maximum			0.90
	SE			0.07
	n			6

Table 3-9. Summary statistics for relative percent mean differences (RPMDs; %; Methods 1 and 4) and percent relative standard deviations (PRSDs; %; Methods 2 and 3) calculated from the differences in total biomass, group biomass, and relative biomass between samples analysed using each of the four laboratory QA/QC methods.

	Total Biomass (%)				Group Biomass (%)				Relative Biomass (%)			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
Mean	47	25	56	56	66	42	79	66	70	40	79	69
Median	26	26	59	53	48	43	66	48	53	36	74	45
Minimum	3	11	42	26	0	6	28	0	1	10	5	2
Maximum	121	39	66	90	200	80	173	200	200	95	173	200
SE	14.5	8.3	7.2	9.1	8	5	11	10	8	7	13	12
n	9	3	3	6	51	15	18	30	51	15	18	33
n > MQO[1]	5	2	3	6	36	14	18	25	41	9	15	22
% Exceedence	56	67	100	100	71	93	100	83	80	60	83	67

[1] Measurement quality objective

Table 3-10. Summary statistics for relative percent mean differences (RPMDs; %; Methods 1 and 4) and percent relative standard deviations (PRSDs; %; Methods 2 and 3) calculated from the differences in community metrics between samples analysed using each of the four laboratory QA/QC methods.

	Species Richness (S)				Simpson's Diversity Index (D)				Simpson's Evenness (E_D)			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
Mean	9	5	11	7	14	4	11	20	14	4	23	27
Median	6	4	16	6	17	3	8	22	11	4	17	32
Min	0	4	3	0	0	2	4	1	0	2	8	1
Max	22	7	16	18	28	6	23	42	45	7	43	48
SE	3	1	4	3	4	1	6	6	5	1	11	8
n	9	3	3	6	9	3	3	6	9	3	3	6
n > MQO[1]	2	0	0	0	3	0	1	4	2	0	1	4
% Exceedence	22	0	0	0	33	0	33	67	22	0	33	67

Table 3-10. – continued –

	Shannon's Diversity (H)				Shannon's Evenness (E_H)				Hill's Effective Richness (e^H)			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
Mean	16	6	16	21	18	6	14	18	25	12	32	30
Median	20	5	15	26	21	4	15	22	16	10	35	28
Min	0	4	6	0	0	3	6	0	0	8	12	1
Max	47	8	26	34	40	10	20	34	73	18	47	61
SE	5	1	6	6	5	2	4	5	9	3	10	9
n	9	3	3	6	9	3	3	6	9	3	3	6
n > MQO[1]	4	0	1	4	5	0	1	4	4	0	2	4
% Exceedence	44	0	33	67	56	0	33	67	44	0	67	67

Table 3-10. – continued –

	Hill's Evenness (e^H/S)				Overall			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
Mean	29	12	28	23	18	7	19	21
Median	24	7	33	18	14	6	16	22
Min	0	7	14	1	0	2	3	0
Max	63	23	37	61	73	23	47	61
SE	8	5	7	9	2.3	1.1	2.9	2.6
n	9	3	3	6	63	21	21	42
n > MQO[1]	5	1	2	3	25	1	8	23
% Exceedence	56	33	67	50	40	5	38	55

[1] Measurement quality objective

Table 3-11. Summary statistics for percent relative standard deviations (PRSDs; %) calculated from the differences in total biomass, group biomass, and relative biomass between triplicate samples.

	Total Biomass	Group Biomass	Relative Biomass
Mean	45	88	62
Median	56	79	47
Minimum	21	24	4
Maximum	58	173	173
SE	12.0	11.5	11.7
n	3	19	17
n > MQO[1]	3	19	15
% Exceedance	100	100	88

[1] Measurement quality objective

Table 3-12. Summary statistics for percent relative standard deviations (PRSDs; %) calculated from the differences in community metrics between triplicate samples.

	Species Richness (S)	Simpson's Diversity Index (D)	Simpson's Evenness (E_D)	Shannon's Diversity (H)	Shannon's Evenness (E_H)	Hill's Effective Richness (e^H)	Hill's Evenness (e^H/S)	Overall
Mean	16	19	27	19	17	26	20	21
Median	14	24	20	23	15	22	9	21
Min	9	6	17	9	6	21	9	6
Max	24	28	45	26	29	34	42	45
SE	4.5	6.8	8.7	5.2	6.8	4.1	10.9	2.4
n	3	3	3	3	3	3	3	21
n > MQO[1]	1	2	1	2	1	3	1	11
% Exceedence	33	67	33	67	33	100	33	52

[1] Measurement quality objective

Table 3-13. The frequency that biomass metrics calculated from separate analyses of individual samples exceed measurement quality objectives (MQO) of 20, 40, 50, and 60%. See text for a description of each method. Values in bold have less than 50% exceedance.

	Total Biomass				Group Biomass				Relative Biomass			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
n	9	3	3	6	51	15	18	30	51	15	18	33
n > 20% MQO	5	2	3	6	36	14	18	25	41	9	15	22
% Exceedence	56	67	100	100	71	93	100	83	80	60	83	67
n > 40% MQO	**4**	**0**	3	5	28	10	17	19	33	**7**	13	18
% Exceedence	**44**	**0**	100	83	55	67	94	61	65	**47**	72	55
n > 50% MQO	**3**	**0**	2	**3**	**25**	**3**	14	16	28	**6**	12	**14**
% Exceedence	**33**	**0**	67	**50**	**49**	**20**	78	52	55	**40**	67	**42**
n > 60% MQO	**3**	**0**	**1**	**2**	**24**	**2**	10	**15**	**22**	**4**	11	**14**
% Exceedence	**33**	**0**	**33**	**33**	**47**	**13**	56	**48**	**43**	**27**	61	**42**

Table 3-14. The frequency that community metrics calculated from separate analyses of individual samples exceed measurement quality objectives (MWO) of 20, 30, and 40%. See text for a description of each method. Values in bold have less than 50% exceedance.

	Species Richness (S)				Simpson's Diversity Index (D)				Simpson's Evenness (E_D)			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
n	**9**	**3**	**3**	**6**	**9**	**3**	**3**	6	**9**	**3**	**3**	6
n > 20% MQO	**2**	**0**	**0**	**0**	**3**	**0**	**1**	4	**2**	**0**	**1**	4
% Exceedence	**22**	**0**	**0**	**0**	**33**	**0**	**33**	67	**22**	**0**	**33**	67
n > 30% MQO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**1**	3
% Exceedence	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**33**	**11**	**0**	**33**	50
n > 40% MQO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**2**
% Exceedence	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17**	**11**	**0**	**33**	**33**

Table 3-14. – continued –

	Shannon's Diversity (H)				Shannon's Evenness (E_H)				Hill's Effective Richness (e^H)			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
n	**9**	**3**	**3**	6	9	**3**	**3**	6	**9**	**3**	3	6
n > 20% MQO	**4**	**0**	**1**	4	5	**0**	**1**	4	**4**	**0**	2	4
% Exceedence	**44**	**0**	**33**	67	56	**0**	**33**	67	**44**	**0**	67	67
n > 30% MQO	**1**	**0**	**0**	**2**	**2**	**0**	**0**	**1**	**4**	**0**	2	3
% Exceedence	**11**	**0**	**0**	**33**	**22**	**0**	**0**	**17**	**44**	**0**	67	50
n > 40% MQO	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**0**	**1**	**2**
% Exceedence	**11**	**0**	**0**	**0**	**11**	**0**	**0**	**0**	**33**	**0**	**33**	**33**

Table 3-14. – continued –

	Hill's Evenness (e^H/S)				Overall			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
n	9	**3**	3	**6**	**63**	**21**	**21**	42
n > 20% MQO	5	**1**	2	**3**	**25**	**1**	**8**	23
% Exceedence	56	**33**	67	**50**	**40**	**5**	**38**	55
n > 30% MQO	**4**	**0**	2	**1**	**12**	**0**	**5**	**12**
% Exceedence	**44**	**0**	67	**17**	**19**	**0**	**24**	**29**
n > 40% MQO	**4**	**0**	**0**	**1**	**10**	**0**	**2**	**6**
% Exceedence	**44**	**0**	**0**	**17**	**16**	**0**	**10**	**14**

Table 3-15. The frequency that biomass metrics calculated from triplicate field samples exceed measurement quality objectives (MWO) of 20, 30, 40, 50, and 60%. See text for a description of each method. Values in bold have less than 50% exceedance.

	Total Biomass	Group Biomass	Relative Biomass
n	3	19	17
n > 20% MQO	3	19	15
% Exceedence	100	100	88
n > 30% MQO	2	17	12
% Exceedence	67	89	71
n > 40% MQO	2	15	9
% Exceedence	67	79	53
n > 50% MQO	2	14	**8**
% Exceedence	67	74	**47**
n > 60% MQO	**0**	12	**8**
% Exceedence	**0**	63	**47**

Table 3-16. The frequency that community metrics calculated from triplicate field samples exceed measurement quality objectives (MWO) of 20 and 30%. See text for a description of each method. Values in bold have less than 50% exceedance

	Species Richness (S)	Simpson's Diversity Index (D)	Simpson's Evenness (E_D)	Shannon's Diversity (H)	Shannon's Evenness (E_H)	Hill's Effective Richness (e^H)	Hill's Evenness (e^H/S)	Overall
n	**3**	3	**3**	3	**3**	3	**3**	21
n > 20% MQO	**1**	2	**1**	2	**1**	3	**1**	11
% Exceedence	**33**	67	**33**	67	**33**	100	**33**	52
n > 30% MQO	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**3**
% Exceedence	**0**	**0**	**33**	**0**	**0**	**33**	**33**	**14**

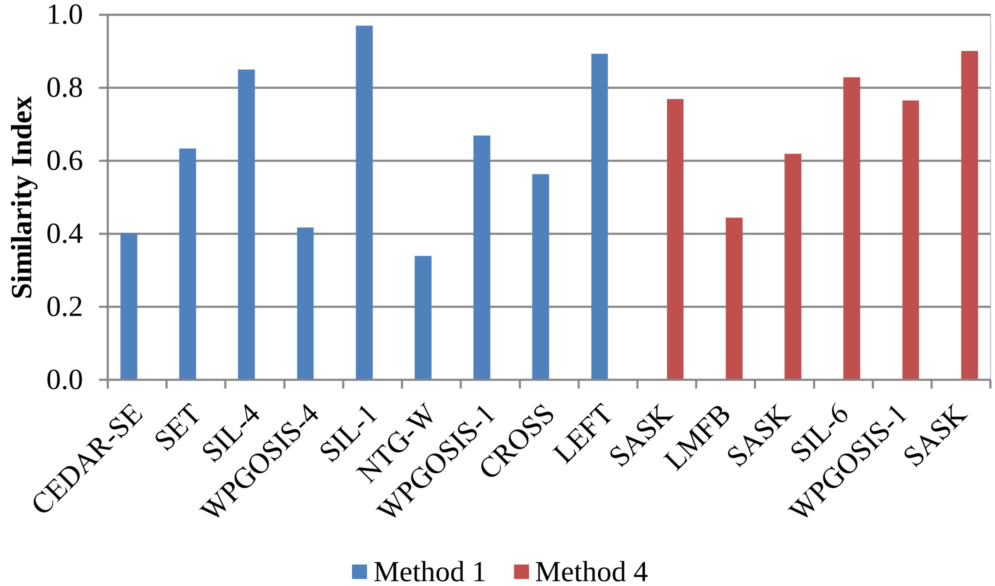


Figure 3-1. The similarity between separate counts of phytoplankton in individual samples collected for CAMPP; samples analysed using Method 1 were evaluated as separate aliquots counted by separate taxonomists whereas Method 4 involved counts of the same aliquot by different taxonomists.

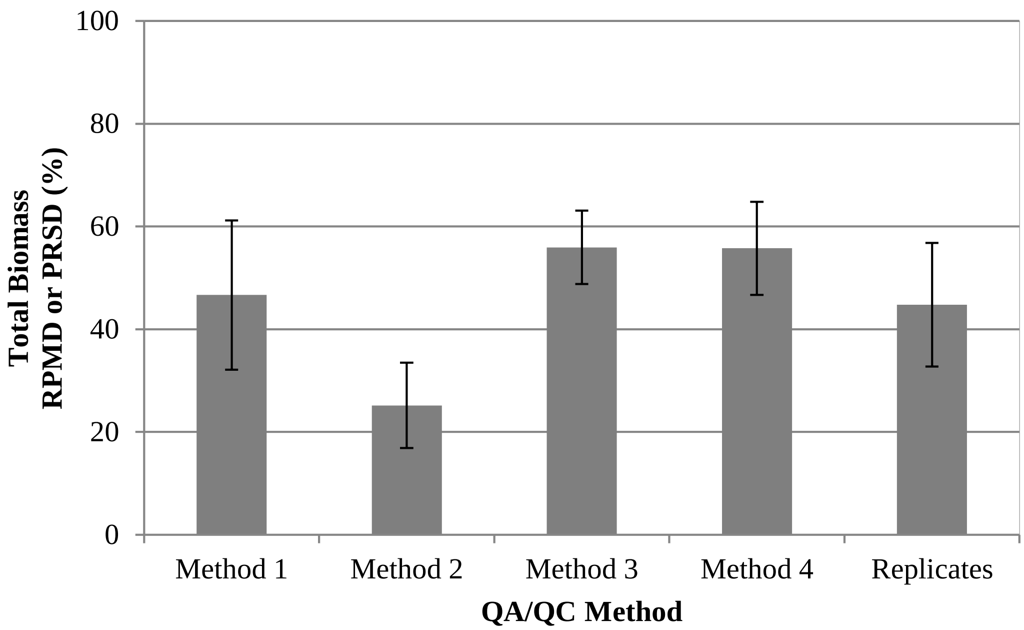


Figure 3-2. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for total phytoplankton biomass.

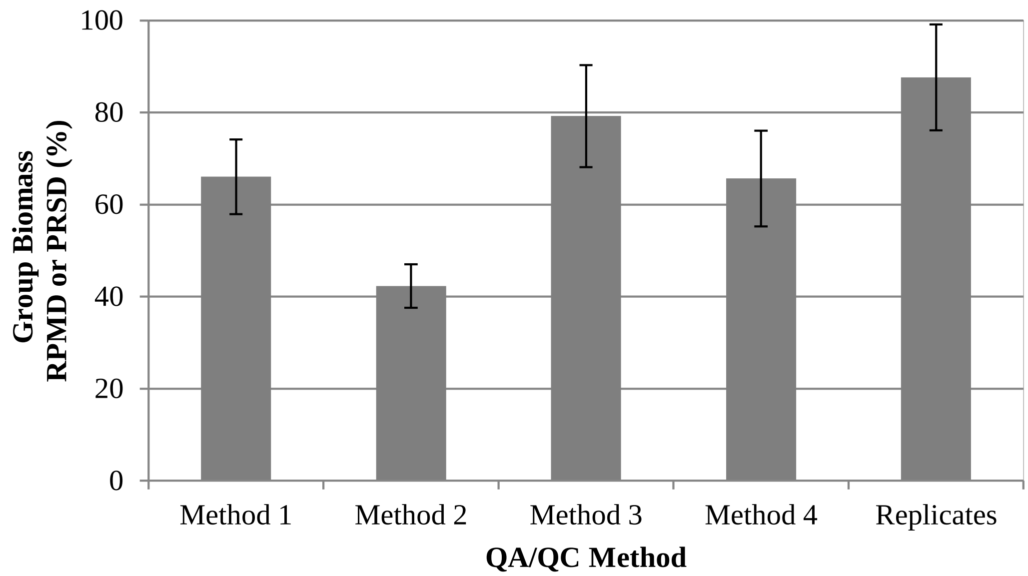


Figure 3-3. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for phytoplankton group biomass.

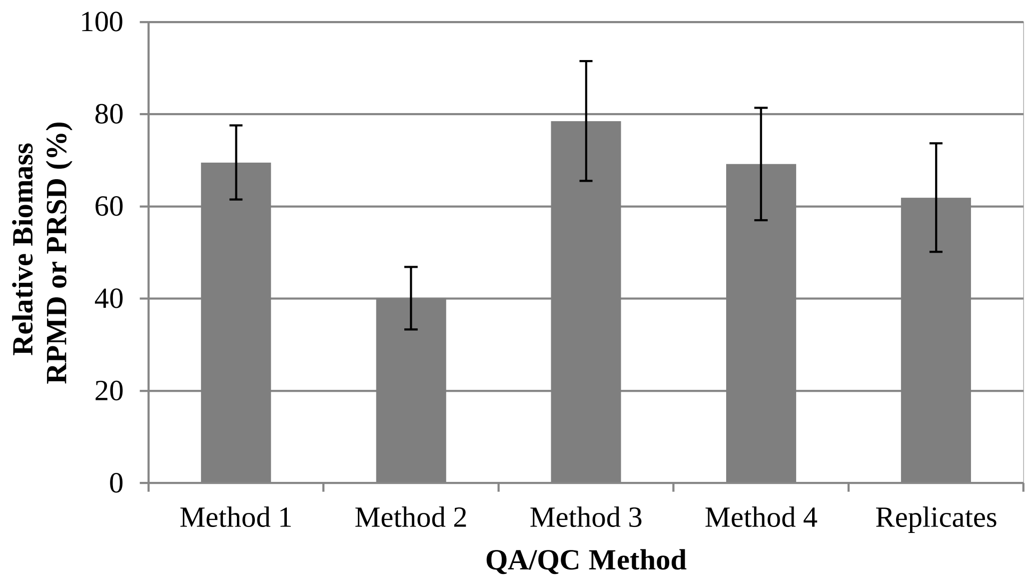


Figure 3-4. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for phytoplankton relative biomass.

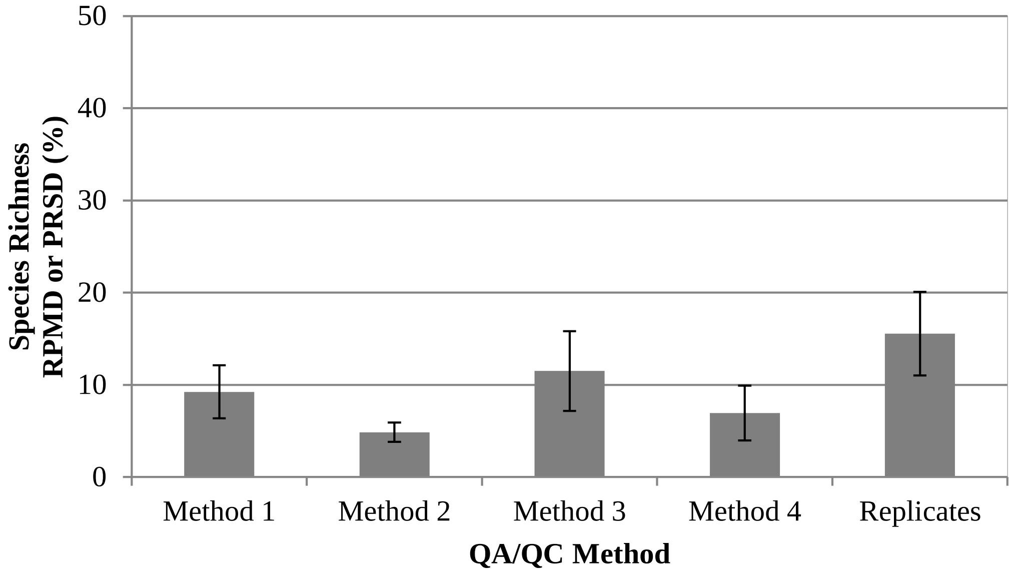


Figure 3-5. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for phytoplankton species richness.

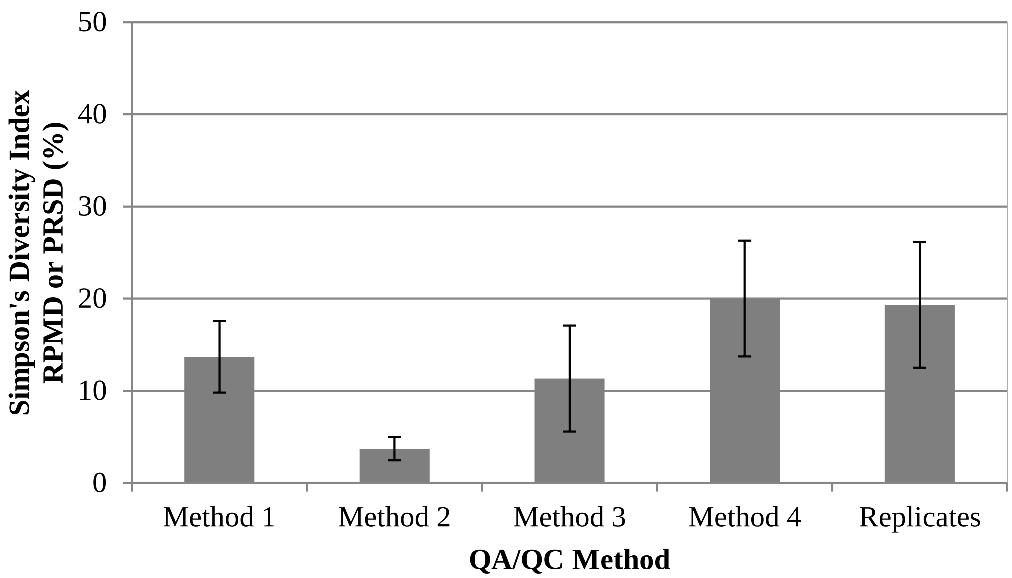


Figure 3-6. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for Simpson's Diversity Index.

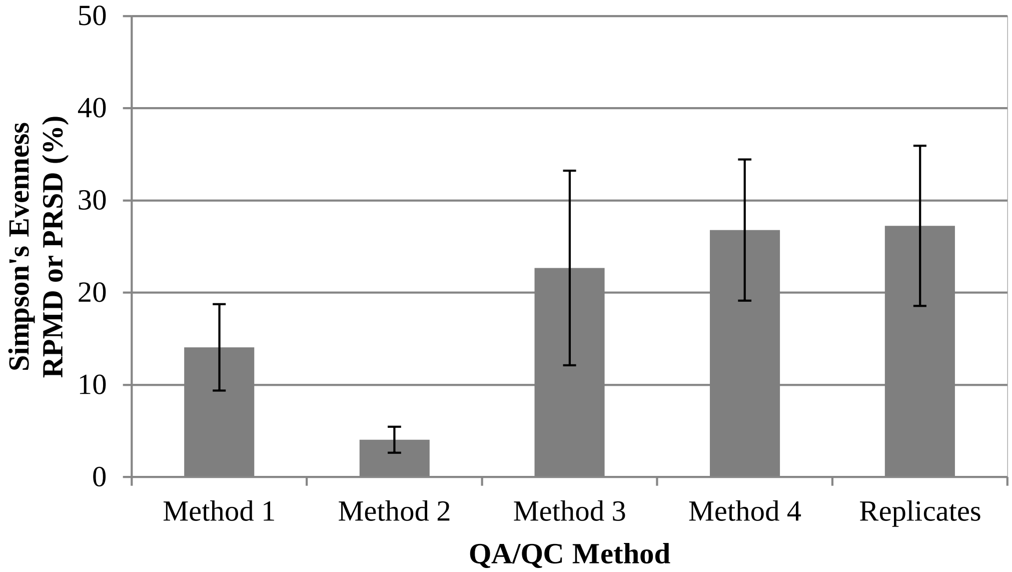


Figure 3-7. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for Simpson's Evenness.

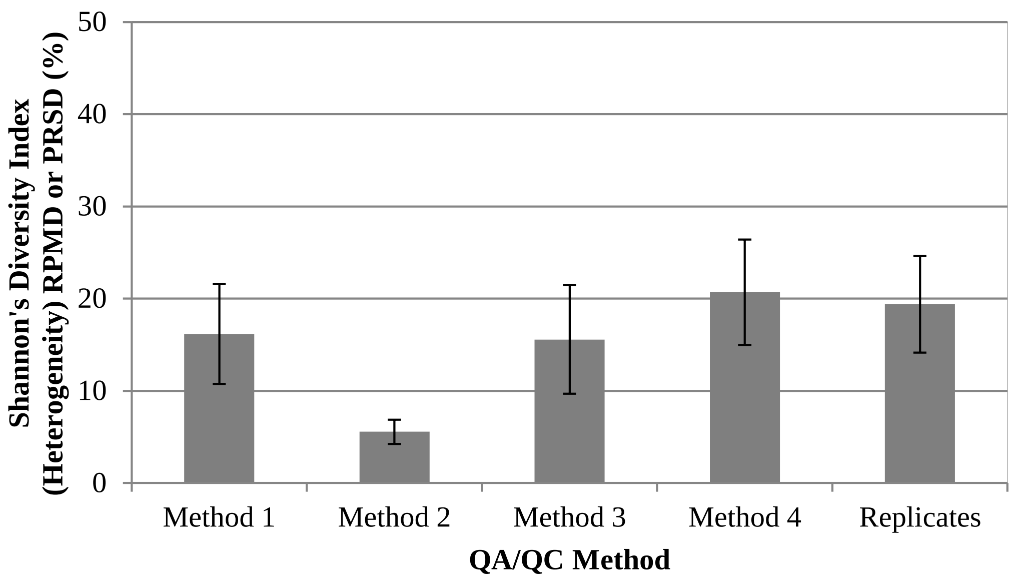


Figure 3-8. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for Shannon's Diversity Index.

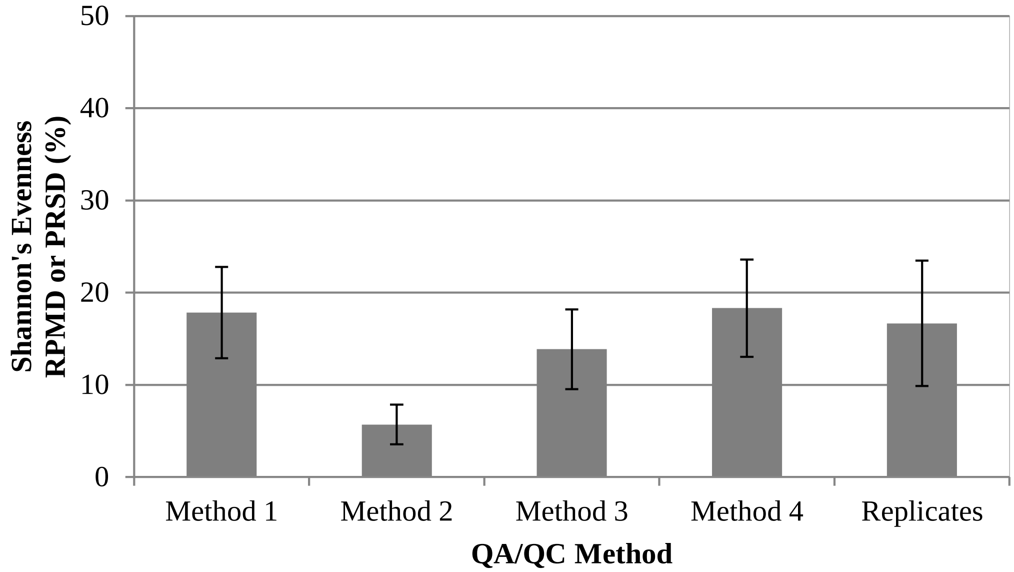


Figure 3-9. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for Shannon's Evenness.

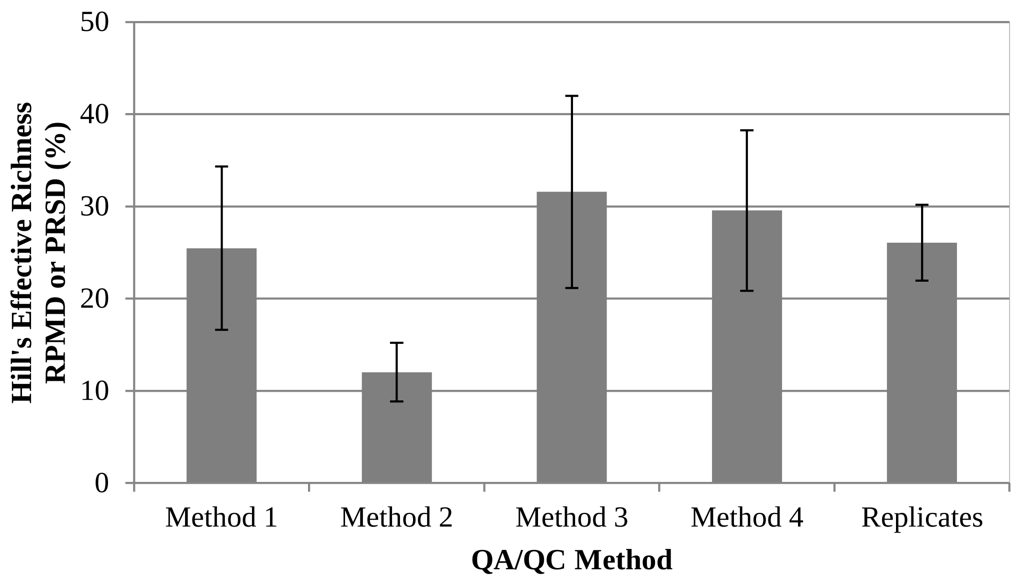


Figure 3-10. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for Hill's Effective Richness.

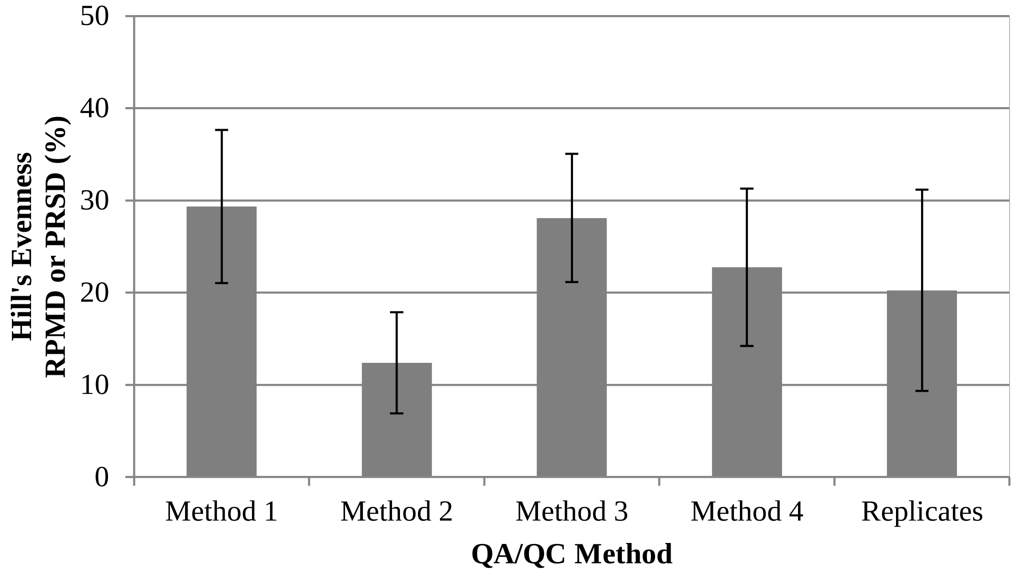
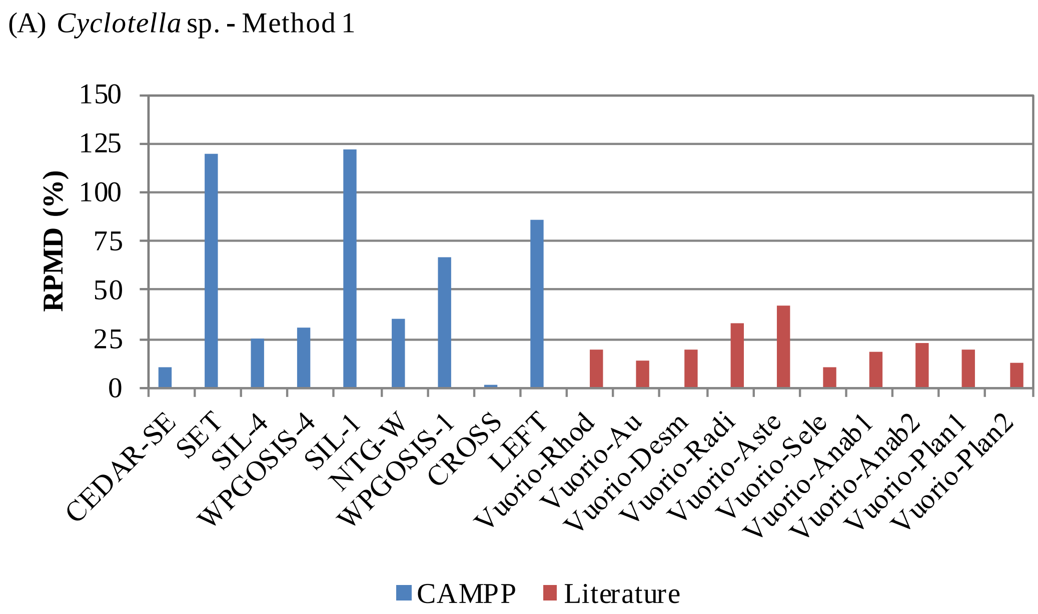


Figure 3-11. Mean (±SE) relative percent mean difference (RPMD; Methods 1 and 4) or percent relative standard deviation (PRSD; Methods 2, 3, and replicates) for Hill's Evenness.



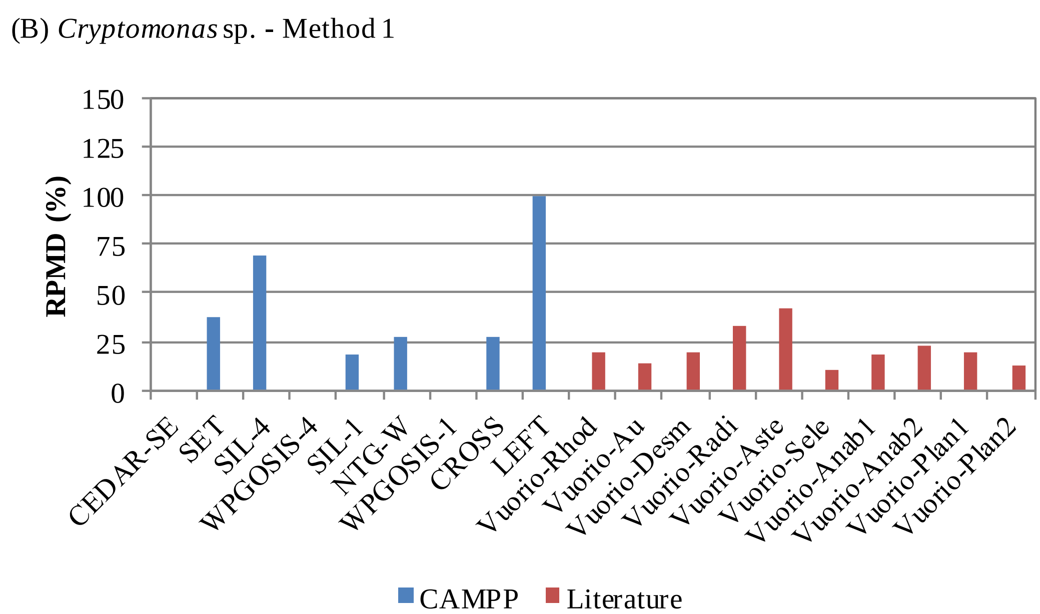
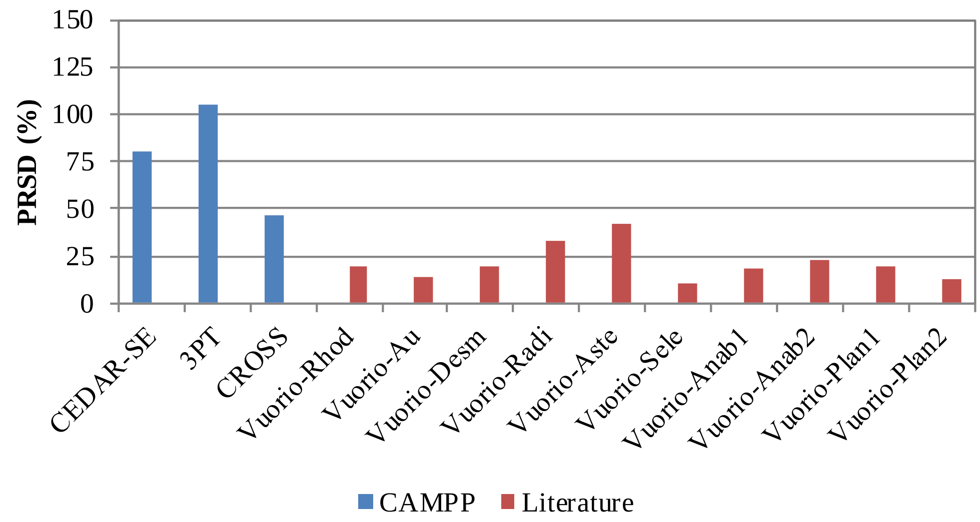


Figure 3-12. Relative percent mean difference (RPMD) of the biomass of (A) *Cyclotella* sp. and (B) *Cryptomonas* sp. determined by two taxonomists analysing different aliquots (i.e., Method 1 of QA/QC analyses) of each of the CAMPP phytoplankton samples; results are compared to PRSD values associated with cell counts made by 12-22 taxonomists analysing a select number of species or genera in a given sample (species as follows: Rhod=*Rhodomonus lacustris*; Au=*Aulacoseira subarctica* var. *subborealis*; Desm=*Desmodesnus bicellularis*; Radi=*Radiocystis geminata*; Aste=*Asterionella formosa*; Sele=*Selenastrum*; Anab1=*Anabena* cells; Anab2=*Anabena* trichomes Plan1=*Planktothrix* units of 25 µm; Plan2=*Planktothrix* trichomes).

(A) *Cyclotella* sp. - Method 2



(B) *Cryptomonas* sp. - Method 2

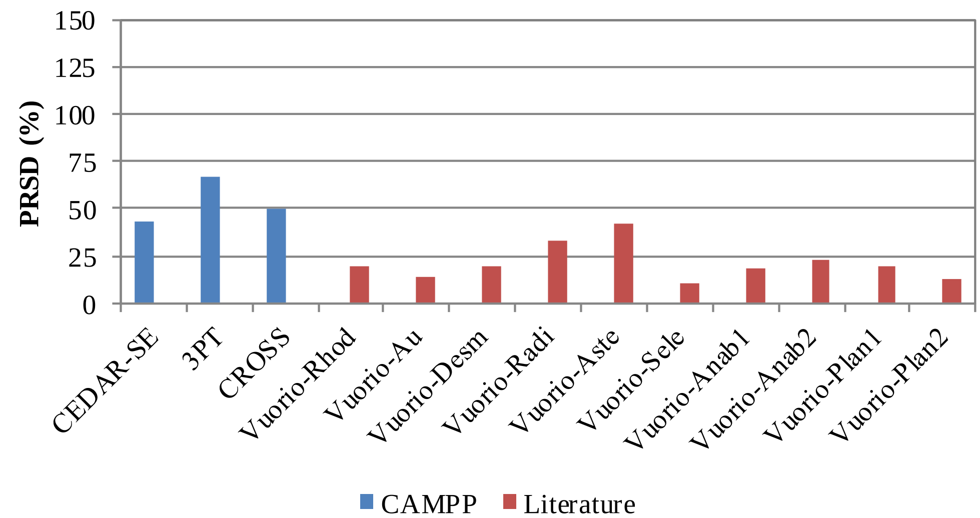
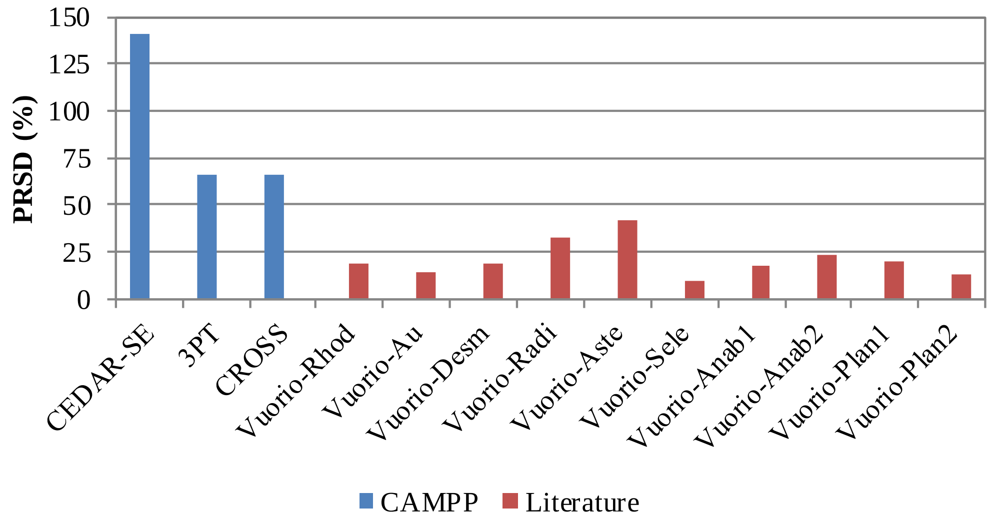


Figure 3-13. Percent relative standard deviation (PRSD) of the biomass of (A) *Cyclotella* sp. and (B) *Cryptomonas* sp. determined by one taxonomist in one aliquot (i.e., Method 2 of QA/QC analyses) analysing each of the CAMPP phytoplankton samples; results are compared to PRSD values associated with cell counts made by 12-22 taxonomists analysing a select number of species or genera in a given sample (species as follows: Rhod=*Rhodomonus lacustris*; Au=*Aulacoseira subarctica* var. *subborealis*; Desm=*Desmodesnus bicellularis*; Radi=*Radiocystis geminata*; Aste=*Asterionella formosa*; Sele=*Selenastrum*; Anab1=*Anabena* cells; Anab2=*Anabena* trichomes Plan1=*Planktothrix* units of 25 µm; Plan2=*Planktothrix* trichomes).

(A) *Cyclotella* sp. - Method 3



(B) *Cryptomonas* sp. - Method 3

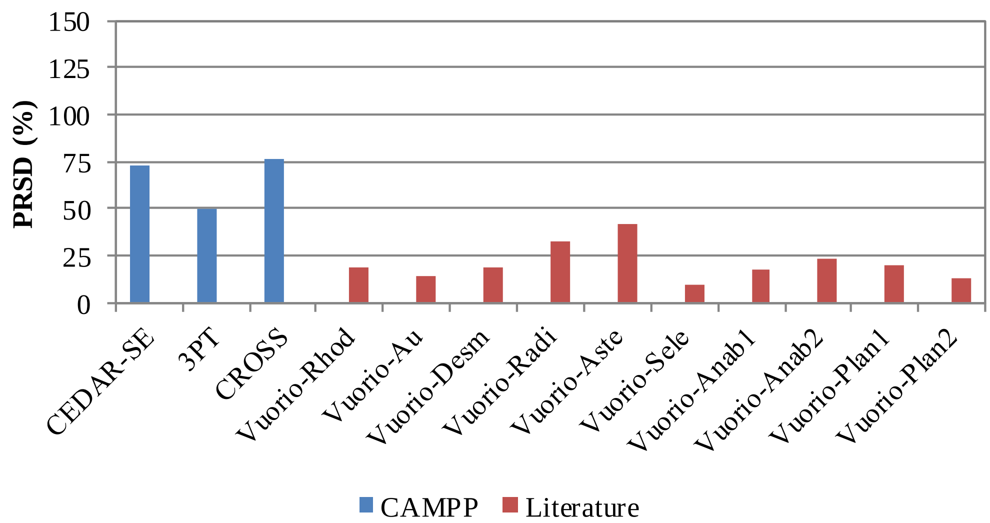
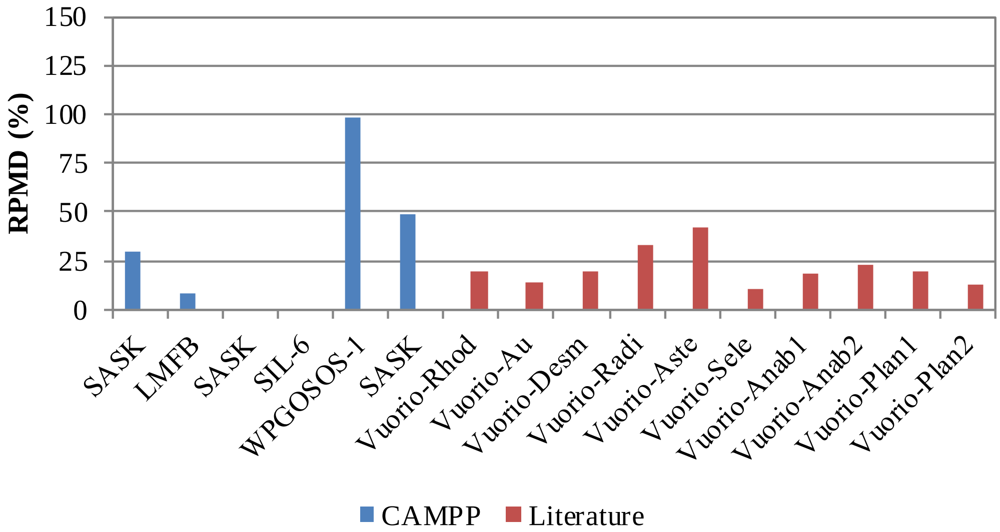


Figure 3-14. Percent relative standard deviation (PRSD) of the biomass of (A) *Cyclotella* sp. and (B) *Cryptomonas* sp. determined by one taxonomist analysing different aliquots (i.e., Method 3 of QA/QC analyses) of each of the CAMPP phytoplankton samples; results are compared to PRSD values associated with cell counts made by 12-22 taxonomists analysing a select number of species or genera in a given sample (species as follows: Rhod=*Rhodomonus lacustris*; Au=*Aulacoseira subarctica* var. *subborealis*; Desm=*Desmodesnus bicellularis*; Radi=*Radiocystis geminata*; Aste=*Asterionella formosa*; Sele=*Selenastrum*; Anab1=*Anabena* cells; Anab2=*Anabena* trichomes Plan1=*Planktothrix* units of 25 µm; Plan2=*Planktothrix* trichomes).

(A) *Cyclotella* sp. - Method 4



(B) *Cryptomonas* sp. - Method 4

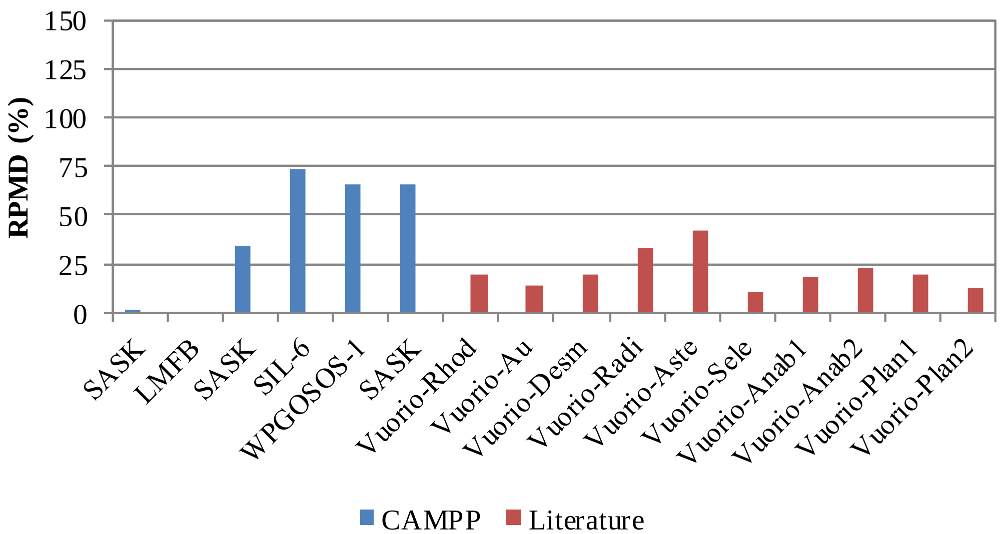
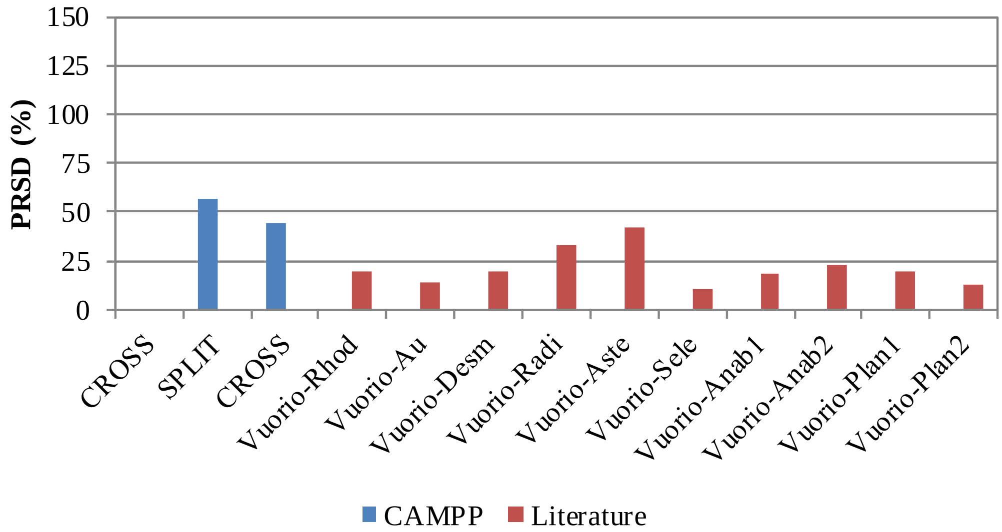


Figure 3-15. Relative percent mean difference (RPMD) of the biomass of (A) *Cyclotella* sp. and (B) *Cryptomonas* sp. determined by two taxonomists analysing one aliquot (i.e., Method 1 of QA/QC analyses) of each of the CAMPP phytoplankton samples; results are compared to PRSD values associated with cell counts made by 12-22 taxonomists analysing a select number of species or genera in a given sample (species as follows: Rhod=*Rhodomonus lacustris*; Au=*Aulacoseira subarctica* var. *subborealis*; Desm=*Desmodesnus bicellularis*; Radi=*Radiocystis geminata*; Aste=*Asterionella formosa*; Sele=*Selenastrum*; Anab1=*Anabena* cells; Anab2=*Anabena* trichomes Plan1=*Planktothrix* units of 25 µm; Plan2=*Planktothrix* trichomes).

(A) *Cyclotella* sp. - Replicates



(B) *Cryptomonas* sp. - Replicates

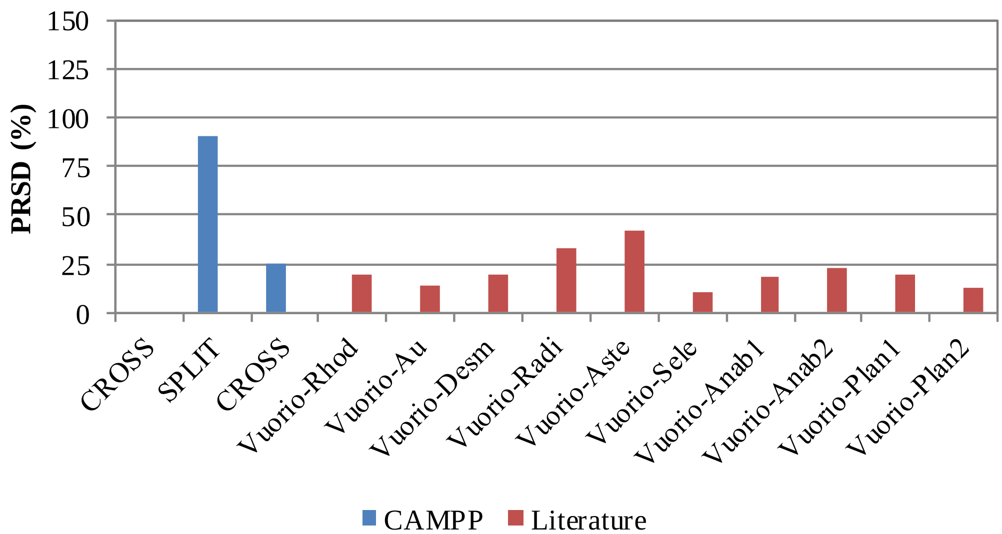


Figure 3-16. Percent relative standard deviation (PRSD) of the biomass of (A) *Cyclotella* sp. and (B) *Cryptomonas* sp. determined by one taxonomist from triplicate phytoplankton samples collected at three different CAMPP sites; results are compared to PRSD values associated with cell counts made by 12-22 taxonomists analysing a select number of species or genera in a given sample (species as follows: Rhod=*Rhodomonus lacustris*; Au=*Aulacoseira subarctica* var. *subborealis*; Desm=*Desmodesnus bicellularis*; Radi=*Radiocystis geminata*; Aste=*Asterionella formosa*; Sele=*Selenastrum*; Anab1=*Anabena* cells; Anab2=*Anabena* trichomes Plan1=*Planktothrix* units of 25 µm; Plan2=*Planktothrix* trichomes).

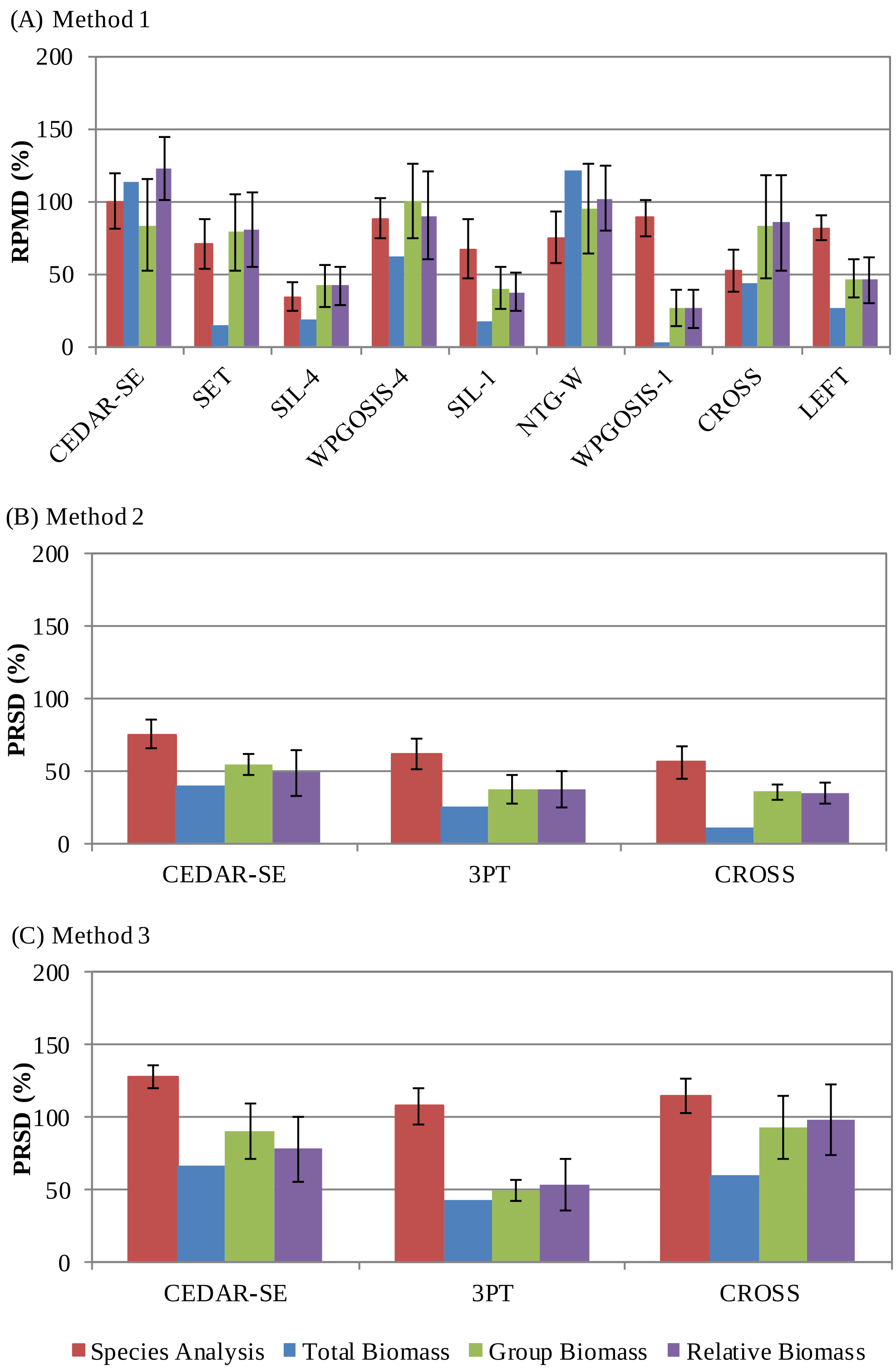
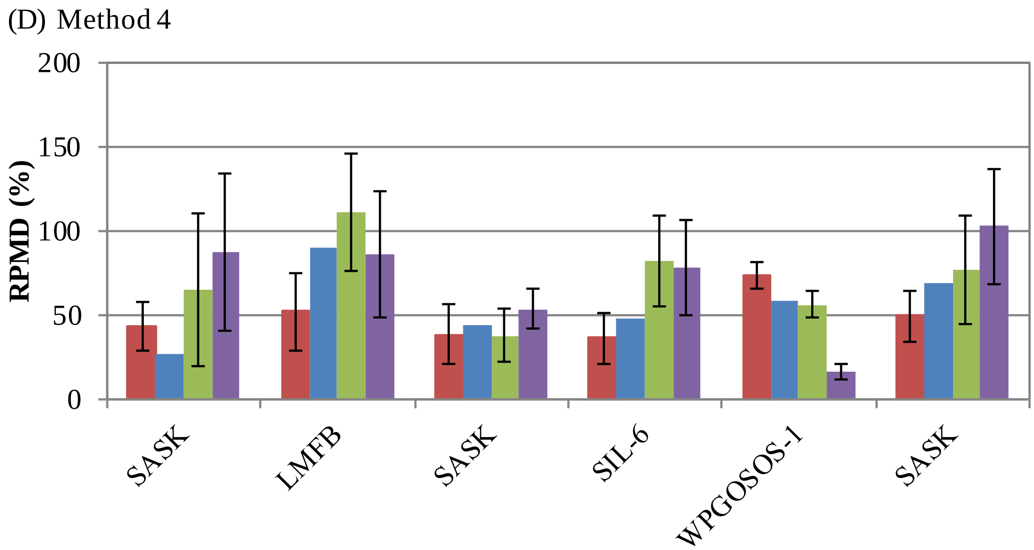


Figure 3-17. Relative percent mean difference (RPMD) and percent relative standard deviation (PRSD) of species, total, group, and relative biomass calculated for individual CAMPP phytoplankton samples analysed by five different QA/QC methods.



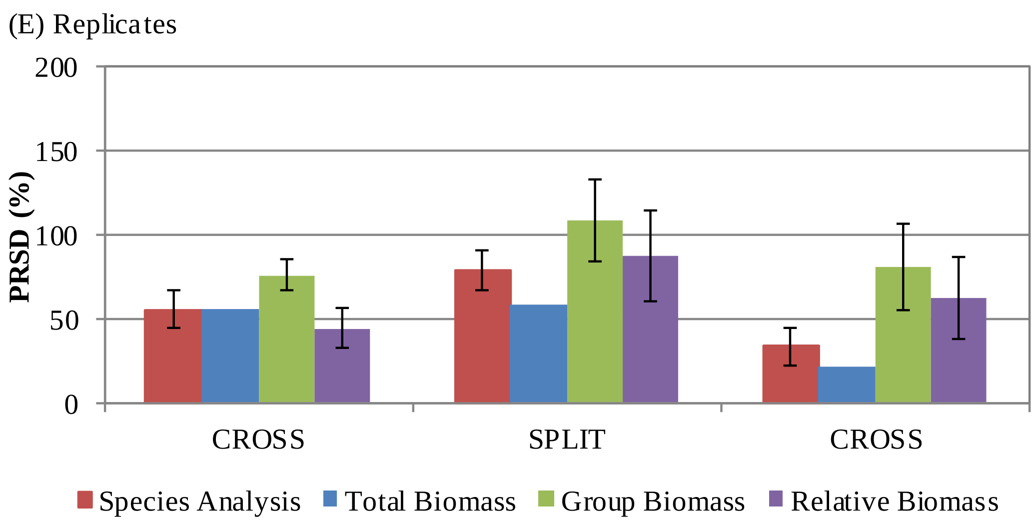


Figure 3-17. – continued –

4.0 FISH COMMUNITY

The following section describes the methods for the fish community ageing quality assurance/quality control (QA/QC) program.

4.1 FISH AGEING QA/QC METHODS

4.1.1 Standard Procedures

Ageing of fish captured during CAMPP was conducted by two agencies: Manitoba Conservation and Water Stewardship – Fisheries Branch (MCWS); and North/South Consultants Inc. (NSC). Otoliths were used to age Lake Whitefish, Sauger, and Walleye, while cleithra were used to age Northern Pike.

Although the general methodologies for ageing of otoliths and cleithra among the two agencies were similar, there were minor differences in methodology. NSC viewed all ageing structures two to three times before a final age was assigned while MCWS read the structure once and assigned an age and a confidence index score (Table 4-1). This index was intended to rank ageing structures based on their readability. An ageing structure ranked poor indicates a structure that is difficult to age accurately, while one ranked as very good is relatively easy to age accurately.

In-house QA/QC procedures conducted by both agencies included the re-ageing of a random sample of at least 10% of all structures by an ageing technician not involved in the initial age determination. After the in-house QA/QC was completed, each agency randomly selected an additional 10% of the structures for interagency comparison of ageing. All QA/QC readings were conducted “blind” (i.e., with no knowledge of the previously assigned age).

4.1.2 Comparison of MCWS and NSC Age Determinations

There are a number of advantages and challenges associated with two agencies (MCWS and NSC) sharing fish ageing responsibilities. Although both agencies have established similar ageing protocols and QA/QC procedures based on standard references, including: *Fish Ageing Methods for Alberta* (MacKay et al. 1990) and *Materials and Methods Used to Age Fish in Saskatchewan* (Musker 1985), slight differences in methodologies may have facilitated slight differences in final fish age determinations. For example, MWS polishes the cracked plane of all otoliths with a bench lathe, and uses a magnifying light when viewing all cleithra, whereas NSC does neither.

Such differences have the potential to introduce systematic biases into the data. Biased data creates a number of difficulties for monitoring fish population parameters such as: stock size, year-class strength, recruitment, mortality, and growth. Though potentially negligible in the short term, biased data can compound over time creating misleading results, and management decisions based on these results (Paragamian and Beanesderfer 2003 and references therein). Given that CAMPP has been running for three years, and is expected to continue into the future as a long term monitoring program, it is important that fish ageing techniques utilized by MCWS and NSC be consistent and standardized so that errors do not compound into the future.

A benefit of two agencies conducting age determinations on the same set of fish is that an assessment of ageing error and potential biases can be undertaken. Assessing ageing error boils down to analyzing two things: ageing accuracy and precision. Errors related to accuracy occur when a fish is aged incorrectly due to either: (a) an invalid method; or (b) an ager systematically ageing a fish differently than another ager, or differently from what is known to be true. Precision is the reproducibility of estimated ages either between- or within-agers regardless of whether the estimated ages are accurate or not (Campana 2001 *In* Ogle 2011).

Here, ageing QA/QC involved comparing ages determined by NSC and MCWS on a common set of fish. To do this, NSC aged a subset of fish originally aged by MCWS and vice-versa. The purpose of this exercise was to identify ageing differences, determine why such differences have occurred (if possible), and finally, create a common set of guidelines that can be employed by both agencies for all future ageing and ageing quality assurance/quality control under the CAMP program.

4.2 DATA ANALYSIS

To compare MCWS and NSC fish ageing, a subset of approximately 10% of all ageing structures aged by each respective agency was randomly selected. These subsets included ageing structures from the three most commonly aged fish species: Northern Pike, Lake Whitefish, and Walleye, and from a multitude of lakes fished under CAMPP. Each subset was then exchanged, with NSC ageing structures previously aged by MCWS and vice versa. NSC and MCWS agers independently aged each subset “blind”, with no prior knowledge of what ages were previously assigned. The product of this exercise was a spreadsheet containing two ages for each fish: (1) an initial age determined by either an NSC or MCWS ager, and (2) a second age determined by the agency which did not initially age the fish. Using these sets of age pairs, a number of statistical analyses were undertaken to assess the accuracy and precision of CAMPP ageing for each of 2008, 2009, and 2010.

The first set of analyses was intended to estimate the consistency of ageing between MCWS and NSC. The age determined by one agency was compared against that of the other agency to assess whether there were differences between NSC and MCWS ages and, if so, what caused these differences, and how can the magnitude of the differences be reduced or eliminated. To begin to address these questions an age agreement table was constructed with NSC ages running down the first column and MCWS ages across the top row (see Table 4-2 for an example). The main diagonal (shaded in gray) represents the frequency of NSC and MCWS fish aged the same (i.e., perfect agreement), whereas tabulations outside of the main diagonal represent disagreement between NSC and MCWS assigned ages.

A modified Chi-square test proposed by Hoenig et al. (1995) was used to test for symmetry between NSC and MCWS ages, with the significance level set at p=0.05. In addition, a number of graphical techniques were used to assess differences. First, age differences were calculated by subtracting the MCWS age from the NSC age. Using these age differences, a histogram for each fish species (Northern Pike, Lake Whitefish, or Walleye) and sampling year (2008, 2009, or 2010) combination was created illustrating the distribution (percent frequency) of these age differences. Additionally, age bias plots were created for each fish species and year combination with NSC assigned ages along the x-axis and both age differences and MCWS assigned ages along the y-axis.

In addition to assessing consistency, two measures of precision were computed for comparing NSC and MCWS's age determinations: the percent of all paired age assessments that are in agreement (calculated percentage agreement [Agree%]), and the coefficient of variation (CV). As a general rule of thumb, a CV of less than 5% is considered to be acceptably precise, whereas values greater than 5% suggest that the ages are relatively imprecise (Campana 2001 *In* Ogle 2011).

All age comparison analyses were completed using the FSA (Ogle 2012a) and NCStats (Ogle 2012b) packages for R Version 2.15.0 (R Development Core Team 2012).

4.3 RESULTS AND DISCUSSION

4.3.1 Northern Pike

Boeker's test of symmetry (Hoenig et al. 1995) indicated no systematic differences in Northern Pike ageing between NSC and MCWS (p_{2008} =0.12; p_{2009} = 0.07; p_{2010} = 0.06), suggesting that ages were randomly distributed on both sides of the main diagonal in the age agreement table (i.e., no biases) (Table 4-3, Figure 4-1) (Ogle 2011). Although the 2008 histogram in Figure 4-1 suggests that NSC consistently aged Northern Pike younger than MCWS, Bowker's Test of

Symmetry did not indicate systematic differences. A possible explanation for the lack of systematic difference is small sample size (n=40) and the associated lack of statistical power to detect a difference that results when sample sizes are small. The age bias plots provide further evidence that NSC aged pike consistently higher than MCWS up until about age 10, with statistically significant differences (between MCWS and NSC assigned ages) demonstrated for NSC aged 6 fish in 2008, and NSC aged 8 fish in 2010 (Figure 4-2).

No systematic differences were detected between NSC and MCWS Northern Pike age determinations, but a lack of agreement was evident. In general, NSC aged Northern Pike younger than MCWS. A possible explanation for this may be MCWS' use of a magnifying ring light on all Northern Pike cleithra, whereas NSC used a magnifying ring light only in certain circumstances. The use of a magnifying ring light may lead to counting potential annuli that do not stand out when viewed by the naked eye.

4.3.2 Lake Whitefish

Out of the three aged species, accuracy and precision were highest for Lake Whitefish. Tests of symmetry indicated no systematic differences between NSC and MCWS ages (Table 4-3). Similarly, precision was quite good, with percent agreement reaching a maximum of 57% in 2008, but declining to 41.5% in 2009, and 40.7% in 2010. CV ranged from 6.7% in 2008, to 8.5% in 2009, and 7.5% in 2010 (Table 4-3).

Age difference histograms suggested a normal distribution around the zero age difference (Figure 4-1), while again, no evidence of systematic differences were evident in the age bias plots (Figure 4-3).

NSC and MCWS appeared to age Lake Whitefish similarly and consistently, and precision was the highest among the three species aged. However, since precision (as measured by both percent agreement and CV) appeared to decline from 2008 to 2010, measures to improve consistency need to be revisited.

4.3.3 Walleye

Systematic differences between NSC and MCWS Walleye ages were evident for all three years of sampling (Table 4-4). The distribution of age differences was consistently skewed to the left, demonstrating that NSC aged Walleye older than MCWS, typically by one year (Figure 4-1). The age bias plots once again confirm this, with statistically significant differences between NSC and MCWS age assignments for 8, 9, 11, and 12 year-old fish aged by NSC (Figure 3). Precision was again poor, with percent agreement and CV equaling 21.7% and 10.4 in 2008, 19.6% and 9.3 in 2009, and increasing to 43.9% and 8.2 in 2010.

A potential explanation for the poor consistency is that NSC appears to be counting one annulus (possibly a first annulus) that MCWS is not counting. However, consistency did improve between 2008 and 2010, with perfect agreement among the two agencies increasing to approximately 45% of all structures in 2010.

4.4 SUMMARY AND CONCLUSIONS

Ageing of fish captured during CAMPP was conducted by MCWS and NSC. Otoliths were used to age Lake Whitefish and Walleye, while cleithra were used to age Northern Pike. Although the general methodologies for ageing otoliths and cleithra among the two agencies were similar, there were minor differences. Each year, a subset of ageing structures representing all three species was aged by each agency and the results were compared statistically to assess the consistency in ageing among agencies. A modified Chi-square test was used to test for symmetry between NSC and MCWS ages, with the significance level set at p=0.05. In addition to assessing consistency, precision among NSC and MCWS's age determinations was assessed using the calculated percentage agreement and the coefficient of variation.

For Northern Pike, no systematic differences were detected between NSC and MCWS age determinations, but a lack of agreement was evident. In general, NSC aged Northern Pike younger than MCWS, possibly due to the use of a magnifying ring light on all Northern Pike cleithra aged by MCWS. Consistency in age determination of Northern Pike between the two agencies appeared to increase from 2008 to 2010.

NSC and MCWS aged Lake Whitefish similarly and consistently, and precision was the highest among the three species aged. However, since precision appeared to decline from 2008 to 2010, measures to improve consistency need to be explored.

For Walleye, there were systematic and consistent differences between ages produced by NSC and MCWS. The distribution of age differences was consistently skewed to the left, demonstrating that NSC aged Walleye older (often by one year) than MCWS. However, consistency did improve between 2008 and 2010.

4.5 REFERENCES

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Table 4-1. Summary of confidence index utilized by MCWS for rating the quality of ageing structures.

Confidence Indices and Abbreviations	Qualitative characteristics (pattern clarity)	Quantitative characteristics (repeatability)
Very Good (VG)	Annuli are clear with no interpretation problems	Reader always gets the same age
Good (G)	Annuli are clear with a few easy interpretation problems	Reader would get the same age most of the time for fish <10 years, within one year for fish 11-20 years
Fair (F)	Annuli are fairly clear with some areas presenting easy and moderate interpretation problems	Reader would be within 1 year most of the time for fish<10 years and 2-3 years for fish >10 years
Poor (P)	Annuli are fairly unclear presenting a number of difficult interpretation problems	Reader would be within 2-3 years most of the time for fish <15 years and 4-5 years for fish >15 years
Very Poor (VP)	Annuli are very unclear presenting significant interpretation problems	Reader has little confidence in repeatability of age within 4-5 years

Table 4-2. Example of an age agreement table used to compare NSC ages (listed down the first column) against MCWS ages (listed across the top row). The main diagonal (shaded gray) indicates the frequency with which NSC and MCWS ages were in exact agreement, whereas frequencies not on the main diagonal indicate disagreement.

NSC Age / MCWS Age	1	2	3
1	5	1	2
2	3	9	1
3	0	2	15

Table 4-3. Summary of comparisons between NSC and MCWS Northern Pike, Lake Whitefish, and Walleye age estimates, 2008-2010.

Year	n [1]	*p* [2]	Agree [3] (%)	CV [4]
Northern Pike				
2008	40	0.12	27.5	17.3
2009	218	0.07	30.7	12.5
2010	105	0.06	37.1	10.2
Lake Whitefish				
2008	129	0.28	51.2	6.7
2009	53	0.40	41.5	8.5
2010	86	0.36	40.7	7.5
Walleye				
2008	207	0*	21.7	10.4
2009	214	0*	19.6	9.3
2010	205	0.02*	43.9	8.2

[1] Sample size;
[2] p-value calculated for Bowker's (Hoenig's) chi-square test of symmetry;
[3] Percentage of NSC and MWS age estimates that were in exact agreement;
[4] Coefficient of variation (Chang 1982).
* = $p \leq 0.05$ (indicates systematic differences between NSC and MWS age estimates).

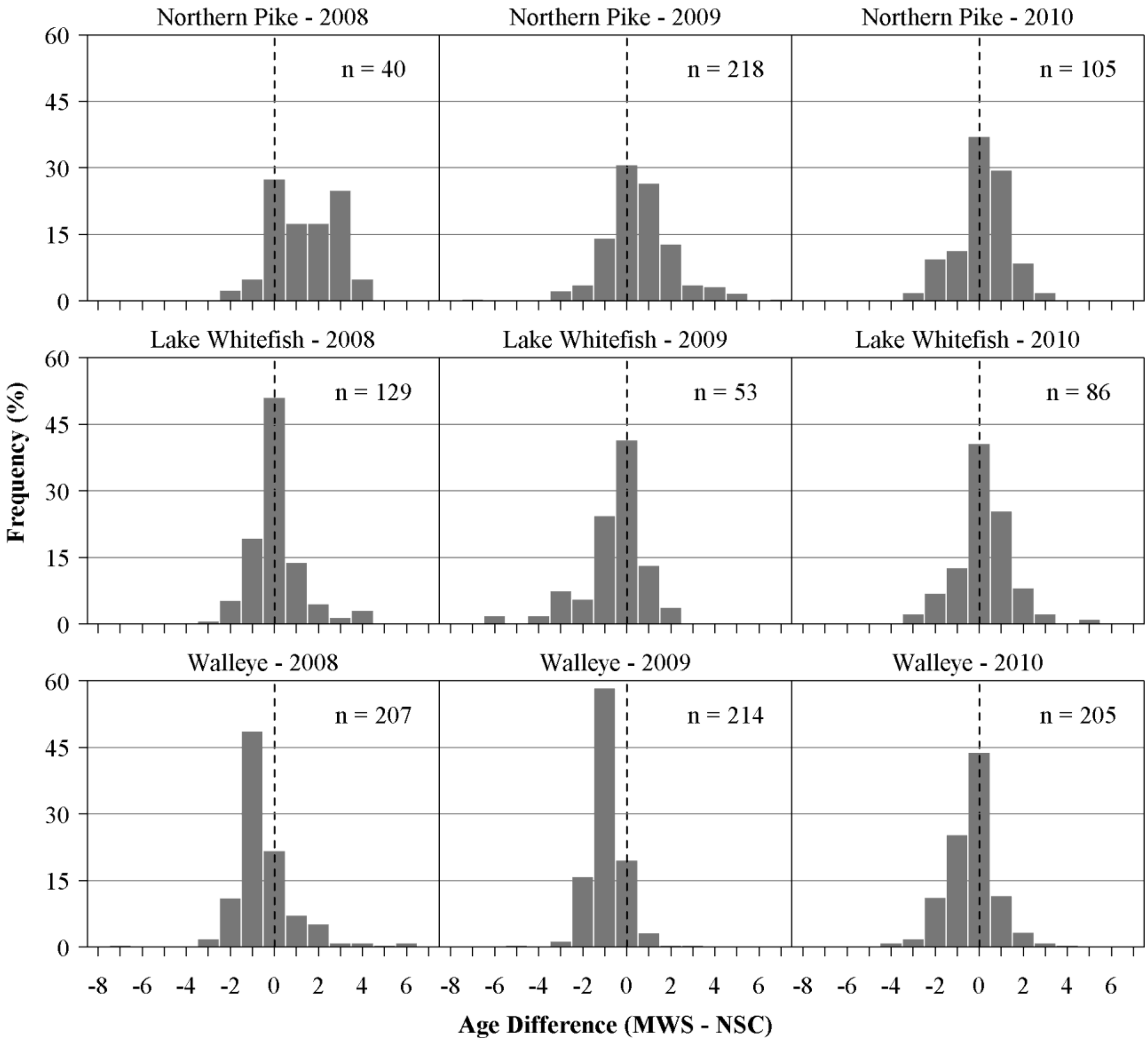

Figure 4-1. Distributions of differences between MWS and NSC Northern Pike, Lake Whitefish and Walleye age estimates.

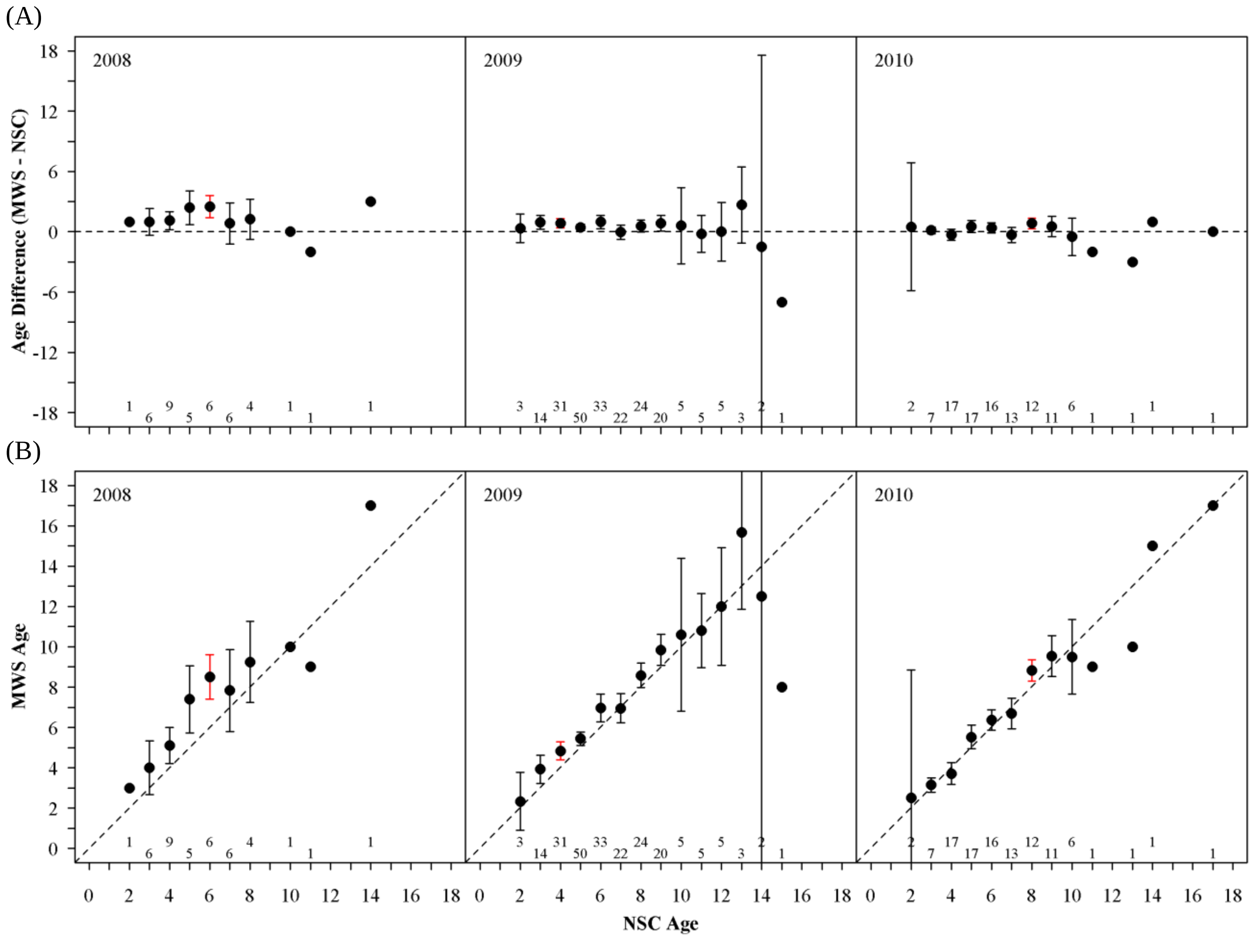

Figure 4-2. Northern Pike age bias plots depicting (A) the difference between NSC and MWS age estimates versus NSC age estimates, and (B) MWS versus NSC age estimates. Error bars represent 95% confidence intervals of the mean ages assigned by MWS to all structures assigned a given age by NSC. A red error bar indicates a statistically significant difference between NSC and MWS age assignments ($p < 0.05$). The 1:1 line represents perfect agreement between NSC and MWS. Sample sizes are denoted below each error bar.

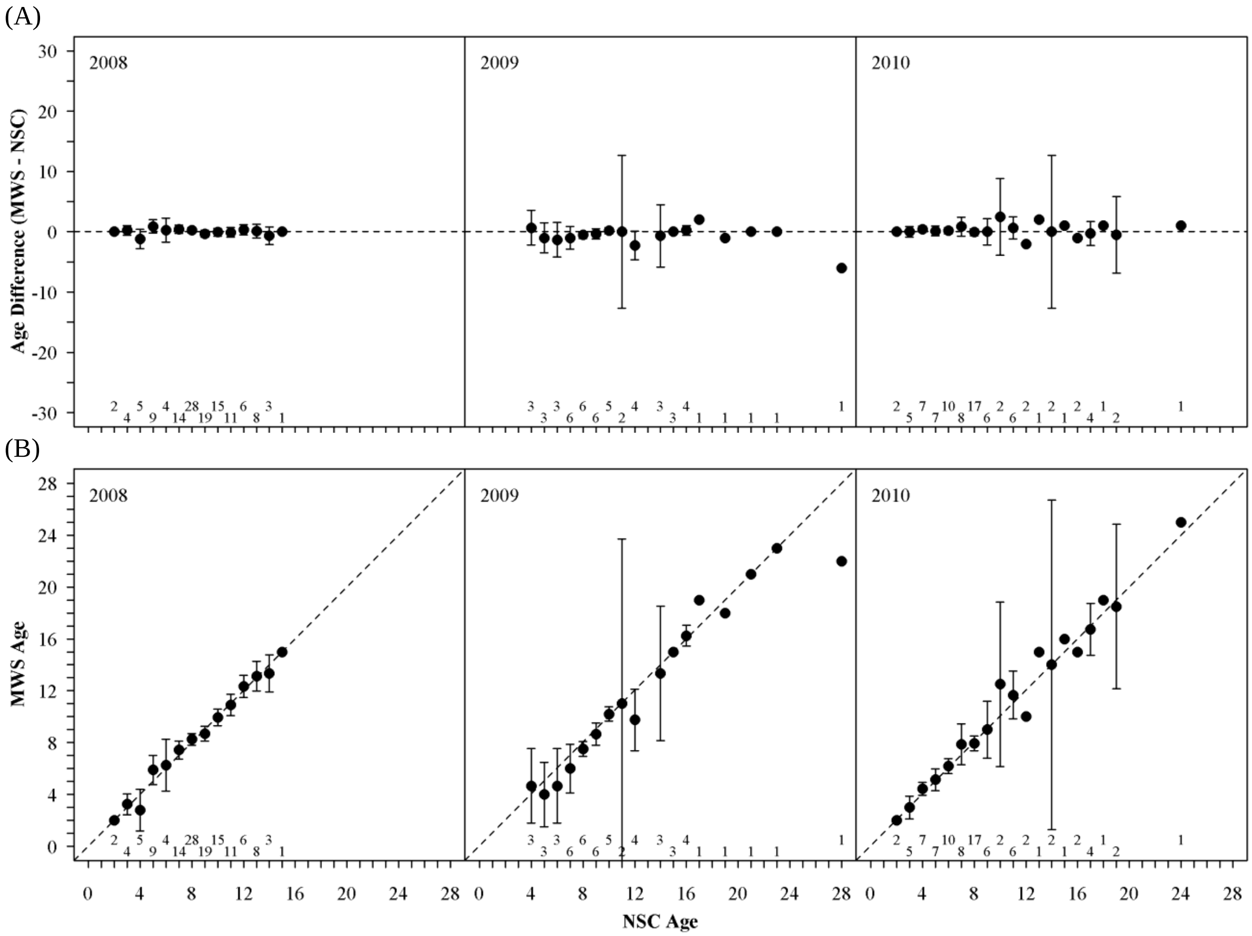

Figure 4-3. Lake Whitefish age bias plots depicting (A) the difference between NSC and MWS age estimates versus NSC age estimates, and (B) MWS versus NSC age estimates. Error bars represent 95% confidence intervals of the mean ages assigned by MWS to all structures assigned a given age by NSC. A red error bar indicates a statistically significant difference between NSC and MWS age assignments (p < 0.05). The 1:1 line represents perfect agreement between NSC and MWS. Sample size is denoted below each error bar.

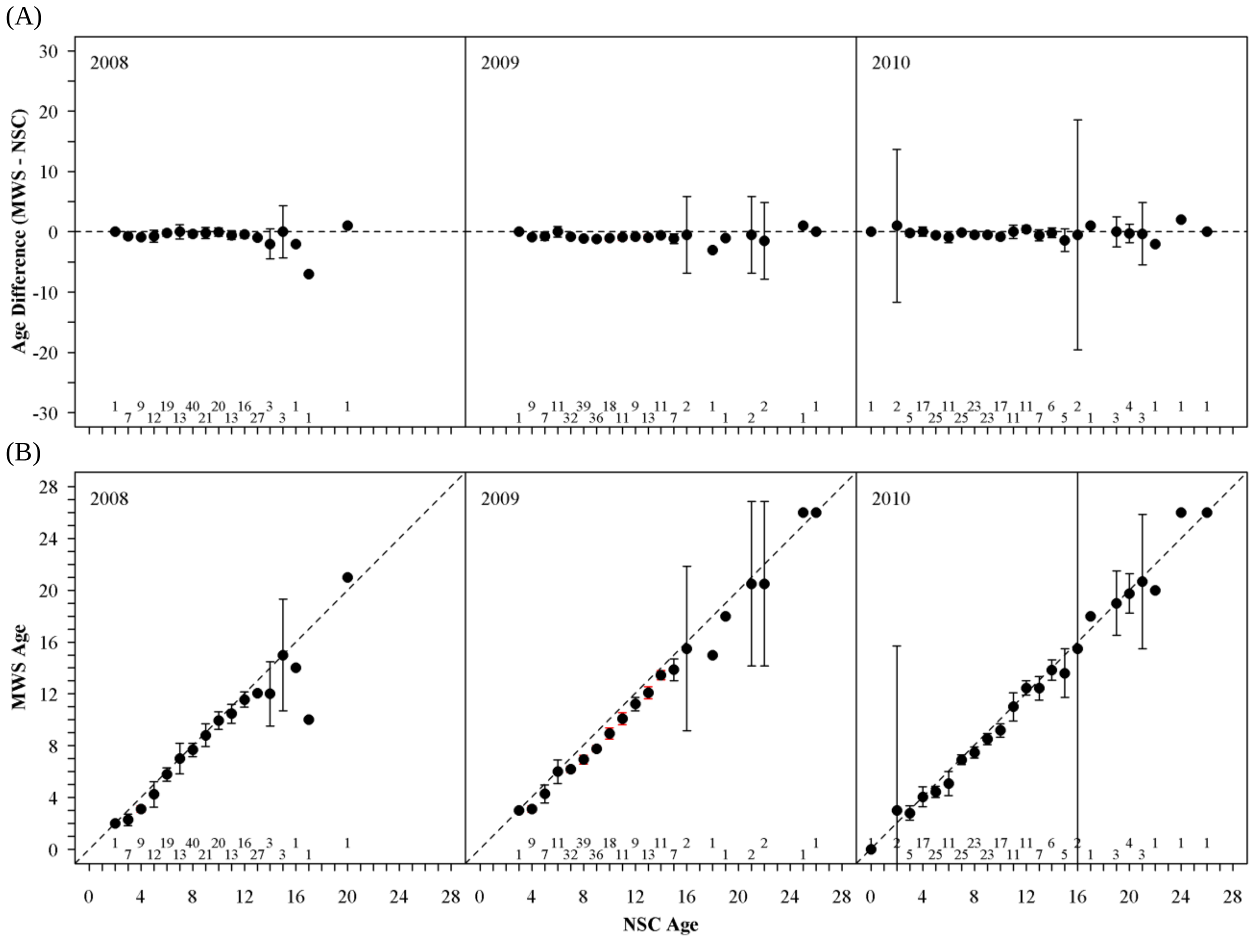

Figure 4-4. Walleye age bias plots depicting (A) the difference between NSC and MWS age estimates versus NSC age estimates, and (B) MWS versus NSC age estimates. Error bars represent 95% confidence intervals of the mean ages assigned by MWS to all structures assigned a given age by NSC. A red error bar indicates a statistically significant difference between NSC and MWS age assignments (p < 0.05). The 1:1 line represents perfect agreement between NSC and MWS. Sample size is denoted below each error bar.

5.0 FISH MERCURY

Standard/certified reference materials (SRM) analyzed by ALS in 2009 and 2010 during each fish muscle sample run had mean mercury concentrations that differed from the mean certified value by 10.7-21.7 percent (Table 5-1). Mean concentrations measured by ALS were always lower than the certified values and the largest difference existed for DORM-3, the SRM with the highest mercury concentration. The mean (from 3 analyses) mercury concentration of DORM-3, the only SRM analysed at Flett Research, was within 4% of the certified value.

The mean difference in mercury concentrations between duplicate analyses of the same sample homogenate at ALS was 7.5% with a range of 0.1 to 33.0% (Table 5-2). The difference in concentrations between the three duplicates analysed by Flett Research was 1.6, 2.0 and 4.6%.

Mercury concentrations from the split muscle samples submitted for inter-laboratory comparison differed depending on the fish species, with mean differences ranging from 7.4 to 32.3% (Table 5-3). For Walleye and Lake Sturgeon, the differences between paired samples were generally small and there was no tendency for concentrations obtained from one laboratory to be consistently higher or lower than the concentrations measured at the other laboratory (Table 5-3). In contrast, such a trend was obvious for Lake Whitefish, Northern Pike, and Yellow Perch. For Whitefish, concentrations recorded by ALS were equal to (one fish) or lower, than the concentrations obtained by Flett Research, but the difference between laboratories was relatively small (Table 5-3). For Pike, concentrations measured by ALS were consistently and substantially higher than those obtained by Flett Research, resulting in a mean difference of 23% (Table 5-3). With 32% mean difference, Perch had the largest inter-laboratory discrepancy in mercury concentrations, values reported by ALS being consistently the lower of the two labs (Table 5-2).

Table 5-1. Comparison of total mercury concentrations (ppm) of standard (National Institute of Standards & Technology, NIST) or certified (National Research Council Canada, NRC) reference materials: Apple leaves (NIST 1515), lobster hepatopancreas (TORT-2, NRC), and fish protein (DORM-3, NRC). Analyses were completed at ALS Laboratories and Flett Research in conjunction with fish muscle sample analysis in 2009 and 2010.

Statistic	Apple leaves (0.044 ± 0.004)[1]	TORT-2 (0.27 ± 0.06)[2]	DORM-3 (ALS)	DORM-3 (Flett)
			(0.382 ± 0.060)[3]	
Mean	0.039	0.256	0.326	0.397
Range	0.033 - 0.051	0.210 - 0.295	0.278 - 0.359	0.392 - 0.404
n[4]	89	92	85	3
Difference[5] (%)	12.8	5.2	14.7	3.9

[1] mean ± 95% CL or expanded uncertainty; see http://www-s.nist.gov/srmors/view_cert.cfm?srm=1515; last accessed 6 January, 2012

[2] mean ± 95% CL or expanded uncertainty; see http://www.nrc-cnrc.gc.ca/obj/inms-ienm/doc/crm-mrc/eng/TORT-2_e.pdf; last accessed 6 January, 2012

[3] mean ± 95% CL or expanded uncertainty; see http://www.nrc-cnrc.gc.ca/obj/inms-ienm/doc/crm-mrc/eng/DORM-3_e.pdf, last accessed 6 January, 2012

[4] Number of analyses

[5] Difference between sample mean and SRM mean

Table 5-2. Comparison (percentage difference) of total mercury concentrations for duplicate analyses of the same muscle sample homogenate at ALS Laboratories in 2009 and 2010 and of two separate pieces taken from a single muscle sample at Flett Research in 2010.

Statistic	ALS (%)[1]	Flett (%)[1]
Mean	7.5	2.7
Range	0.1 - 33.0	1.6 - 4.6
n[2]	122	3

[1] Percentage difference between first and second sample of duplicate analyses of a sample

[2] Number of analyses

Table 5-3. Comparison of total mercury concentrations (ppm) analysed from split tissue samples for inter-laboratory comparison at ALS Laboratory Group (1st value) and Flett Research Ltd. (2nd value). Analyses were done on fish samples from Cormorant Lake and the Churchill River (Lake Sturgeon only) in 2010.

Statistic	Northern Pike	Walleye	Lake Whitefish	Yellow Perch	Lake Sturgeon
Fish 1	0.582 ; 0.401	0.084 ; 0.097	0.057 ; 0.057	0.034 ; 0.050	0.556 ; 0.541
Fish 2	0.406 ; 0.365	0.209 ; 0.201	0.032 ; 0.043	0.025 ; 0.035	0.646 ; 0.650
Fish 3	0.547 ; 0.354	0.157 ; 0.149	0.130 ; 0.139	0.032 ; 0.046	0.214 ; 0.214
Fish 4	0.364 ; 0.316	0.298 ; 0.316	0.055 ; 0.062	0.035 ; 0.040	0.291 ; 0.269
Fish 5	0.497 ; 0.377	0.311 ; 0.289	0.045 ; 0.049	0.027 ; 0.031	0.107 ; 0.138
Mean	0.479 ; 0.363	0.212 ; 0.210	0.064 ; 0.070	0.031 ; 0.040	0.363 ; 0.362
Difference (%) [1]	22.8	7.4	12.4	32.3	8.0

[1] Mean percentage difference between concentrations of individual fish analyzed by ALS and Flett.