Appendix G1

2017 Core Receiving Environment Monitoring Program

FINAL

Core Receiving Environment Monitoring Program 2017

Meadowbank Mine

Prepared for:

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March 2018

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Project No. AEM-17-02

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ACKNOWLEDGEMENTS

Azimuth would like to thank Agnico Eagle for their continued support of this program and for facilitating our work by providing logistical assistance and help whenever needed. Key personnel conducting this project were as follows:

- Gary Mann (Azimuth) – Gary was responsible for overall management, technical oversight and review of the CREMP.
- Eric Franz (Azimuth) – Eric was responsible for overall coordination and implementation (sampling, analysis/interpretation and reporting) of the CREMP.
- Meara Crawford (Azimuth) – Meara assisted with analysis/interpretation and reporting.
- Brian Pyper (Azimuth Associate) – Brian conducted the statistical analyses and plotting for the trends assessment.

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ACRONYMS

Agnico	Agnico Eagle Mines Ltd.
AEMP	Aquatic Effects Monitoring Program
ANOVA	Analysis of variance
AWAR	All weather access road
BACI	Before/after control/impact
BACIP	Before/after control/impact Paired
BAP	Baker Lake – Akilahaarjuk Point
BBD	Baker Lake – barge dock
BES	Baker Lake – east shore
BPJ	Baker Lake – proposed jetty
CCME	Canadian Council of Ministers of the Environment
COC	Chain of custody
CREMP	Core Receiving Environment Monitoring Program
CRM	Certified reference material
DFO	Department of Fisheries and Oceans
DI	Deionized blank
DOC	Dissolved organic carbon
DQO	Data quality objective
EAS	Effects assessment strategy
EEM	Environmental effects monitoring
EB	Equipment blank
EIA	Environmental impact assessment
FEIS	Final Environmental Impact Statement
FF	Far-field
GPS	Global positioning system
HEPH	Heavy extractable petroleum hydrocarbons
ICP-MS	Inductively coupled plasma mass spectrometry
INUG	Inuggugayualik Lake
ISQG	Interim sediment Quality Guidelines
LCS	Laboratory control sample
LEPH	Light Extractable Petroleum Hydrocarbons
MDL	Method detection limit
MF	Mid-field
MMER	Metal Mining Effluent Regulations
NF	Near-field
NWB	Nunavut Water Board
PAG	Potentially acid Generating
PAHs	Polycyclic aromatic hydrocarbons

PDL	Pipedream Lake
PEL	Probable effect level
QA/QC	Quality assurance / quality control
REF	Reference
RPD	Relative percent difference
SEP	Sequential extraction procedure
SOP	Standard operating procedure
SQG	Sediment quality guidelines
SP	Second Portage Lake
TDS	Total dissolved solids
TE	Tehek Lake
TEFF	Tehek Lake Far-field
TIA	Tailings impoundment area
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TSF	Tailings Storage Facility (North and South Cells)
TSS	Total suspended solids
TPE, TPN, TPS	Third Portage Lake
UTM	Universal Transverse Mercator
WAL	Wally Lake

EXECUTIVE SUMMARY

The CREMP focuses on identifying changes in limnological parameters, water and sediment chemistry, or changes to primary (phytoplankton) and secondary (benthic invertebrate community) aquatic producers that may be associated with mine development activities. This is accomplished through the application of a temporal/spatial trend assessment that includes application of quantitative decision criteria (i.e., early warning "triggers" and action "thresholds") to facilitate immediate and objective decision-making regarding appropriate management actions. This information is integrated annually into the Aquatic Ecosystem Monitoring Program (AEMP) for holistic environmental management and decision making.

Meadowbank Study Lakes

CREMP monitoring started in 2006 and in-water mine development started in 2008. Key mine development activities that could result in changes to the aquatic receiving environment include: East Dike construction (2008), Bay-Goose Dike construction (2009-10), dewatering of lakes and impoundments (2009-11 [Second Portage, Third Portage], 2013 [Vault], 2016 [Phaser]), effluent discharge (2012 to 2014 [TPN]; 2014 to present [WAL and SP]), and general site-related mining activities that mostly generate dust (e.g., rock crushing, blasting, ore and waste hauling; 2008 to present). Key findings for 2017 are summarized in **Table ES–1**:

- *Water Chemistry* – Statistically significant mine-related changes were detected relative to baseline/reference conditions at one or more near-field (NF) areas for alkalinity (SP); conductivity (TPN, TPE, SP, WAL); hardness (TPN, TPE, SP, WAL); major cations (i.e., calcium, potassium, magnesium, and sodium [TPN, TPE, SP, WAL]); TDS (TPN, TPE, SP, WAL), and TKN (WAL). In the absence of effects-based thresholds (e.g., CCME water quality criteria) for these parameters, their triggers were set at the 95th percentile of baseline data. While these results represent mine-related changes, the observed concentrations are still relatively low and unlikely to adversely affect aquatic life. There were no trigger exceedances in 2017 for any water quality parameters with CCME water quality guidelines, including metals. **The trends in water chemistry will be monitored in 2018**.

- *Sediment Chemistry* – Quantitative trigger analysis was completed on metals data from the sediment core samples (1.5 cm horizon). Grab samples were also submitted for analysis in 2017 for analysis of habitat variables (particle size and TOC), metals, and organics analysis on the top 3-5 cm of sediment. As new data were available, trigger values were updated in 2017 for use in deciding which metals to carry forward in formal BA statistical analysis of changes compared to baseline conditions.

  The core sample results showed that chromium concentrations continue to exceed the trigger value at TPE, and statistically significant changes compared to the baseline period were identified in the BA statistical analysis. While grab sample results showed a reduction in 2016, they also increased in 2017. The increasing trend in chromium concentrations at this location was investigated in detail in 2015, when a targeted bioavailability study was conducted to assess sediment geochemistry and toxicity at TPE; those results indicated that the changes in chromium, likely related to dike construction material, did not pose risks to the benthic community. However, current chromium concentrations are no longer comparable to the results from 2015 upon which the conclusion of no toxicity was based. **Recommended management actions for 2018 are to repeat the coring program to verify if the continued increase observed in 2017 was real or if conditions had stabilized and repeat the bioavailability study that was undertaken in 2015 (i.e., to see if the changes are ecologically relevant).**

Wally Lake was the only other NF station with trigger exceedances in the sediment sample collected in 2017. Lead and chromium were only marginally above their respective trigger values, but arsenic was approximately 2.5-times higher in 2017 relative to the baseline and trending higher relative to the last coring cycle in 2014. However, there is some uncertainty regarding whether this trend to real or due to natural spatial heterogeneity. Notwithstanding, no effects to benthic invertebrate community richness or abundance were identified in the 2017 BACI analysis. **Recommended management actions for 2018 are to repeat the coring program to verify the nature of the observed trend (i.e., real or due to spatial heterogeneity) and conduct a targeted bioavailability study (i.e., to see if the changes are ecologically relevant).**

- *Phytoplankton Community* – Phytoplankton biomass was statistically significantly higher at TPE, SP, and WAL in 2017 relative to reference/baseline conditions. The observed increase in the BACI assessment was not linked back to any observable Site-related activities. Higher biomass would be expect to occur if nutrient loading to the areas was identified in the BACI analysis of water chemistry, but nutrient concentrations remain well below levels associated with increased primary productivity. Changes in biomass identified in the BACI assessment appear to be due largely to lower biomass at INUG (the reference area) in 2017 compared to the baseline period, whereas the opposite was true at the NF areas. The divergent patterns of phytoplankton biomass between INUG and the NF areas resulted in a large "perceived" increase in biomass for the NF areas. The absolute biomass values at the NF are in line with their historical values. Taking into consideration all the lines of evidence (BACI and absolute values plotted over time), there is no evidence to suggest mining operations are increasing primary productivity in the NF areas. Phytoplankton richness was similar to previous monitoring cycles. **The trends in phytoplankton biomass and richness will be reviewed again in 2018**.
- *Benthic Invertebrate Community* – Benthic invertebrate abundance at TPE in 2017 was lower relative to INUG, consistent with observations from 2015 and 2016. The only statistically significant reduction in abundance was for the expanded 2015-2017 temporal assessment relative to INUG. However, the absolute total abundance at TPE in 2017 is consistent with recent years and well within the range of natural variability. The "apparent" decrease in abundance at TPE relative to the baseline period is indicative of slightly divergent trends between INUG and TPE. Mean total abundance at INUG has increased slightly in the "after" period relative to the baseline 2006-2008 years, whereas TPE has remained relatively consistent throughout the "after" period, with 2009-2011 being the exception. Richness at TPE has remained consistent throughout the monitoring period, indicating that mining activities are not adversely affecting the structure of the benthic invertebrate community. Taking into consideration all available benthic invertebrate data at TPE, there is little to suggest mining activities are negatively impacting the community. No adverse effects were noted at the other NF areas in 2017. **The trends in benthic invertebrate abundance and richness will be reviewed again in 2018**.

Baker Lake

CREMP monitoring at Baker Lake started in 2008. Key mine-related activities include barge/shipping traffic and general land-based activities associated with the tank farm area. No spills of fuels, hydrocarbons or any other materials were reported in the vicinity of the barge dock or jetty in 2017.

- *Chemistry* – There were no cases where water quality parameters exceeded the triggers in 2017. Sediment arsenic concentrations exceeded the trigger value at BPJ as has been the case dating back to when monitoring started in 2008. Importantly, there is no increasing trend in arsenic concentrations at this location. **The trends in water and sediment chemistry (grab) will be monitored in 2018**.

- *Biological Communities* – no changes in the biological communities were attributable to Agnico Eagle's activities in Baker Lake, and as such, no follow-up management actions are required for 2018 beyond routine monitoring.

Table ES–1. Summary of key findings from the 2017 CREMP.

Variable Type & Variable	Magnitude[1]	Spatial Scale[2]	Causation[3]	Permanence[4]	Uncertainty[5]	Comments	Management Action[6]
Exposure - Limnology							
Oxygen	**0**	n/a	n/a	n/a	?	All stations - consistent with previous years	**0**
Temperature	**0**	n/a	n/a	n/a	?	All stations - consistent with previous years	**0**
Conductivity	**0**	Moderate	High	Low	?	Specific conductivity readings at WAL in 2017 were at the upper end of the range reported for previous monitoring cycles for most months, particularly for sample collected near the diffuser. Plume investigations in 2016 and 2017 by C. Portt and Associates confirm effluent concentrations to 1% are confined to within approximately 700 m of the diffuser. No action beyond routine monitoring is recommended for 2018.	**1**
Exposure - Water Chemistry							
Conventionals	**1**	Large	High	Low	?	The following parameters were elevated relative to reference/baseline conditions. However, concentrations suggest low potential for adverse effects: **Alkalinity** (SP); **Conductivity** (TPN, TPE, SP, WAL); **Hardness** (TPN, TPE, SP, WAL); **Ca/K/Mg/Na** (TPN, TPE, SP, WAL); **TDS** (TPN, TPE, SP, WAL)	**1**
Nutrients	**1**	Small	Low	Low	??	The following parameters were elevated relative to reference/baseline conditions: **TKN** (WAL) Exceedance were sporadic (not all months) and the absolute concentrations were low. Low likelihood of adverse effects.	**1**
Total Metals	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**
Dissolved Metals	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**
Total Suspended Solids	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**

Notes:

[1] **Magnitude Ratings (narrative in brackets used in the absence of specific triggers/thresholds):**
- 0 – 'no exceedances of triggers or thresholds (or no apparent changes from baseline of concern)
- 1 – 'early warning trigger exceeded (or change from baseline warranting concern)
- 2 – threshold exceeded (or change from baseline exceeding magnitude of concern)

[2] **Spatial Scale Ratings:**
- n/a – no magnitude of effect, therefore not evaluated
- Small – localized
- Moderate – sub-basin to basin
- Large – basin to whole lake

[3] **Causation Ratings:**
- n/a – no magnitude of effect, therefore not evaluated
- Low – no evidence for a mine-related source
- Moderate – some likelihood of a mine-related source
- High – the source of the problem is very likely to be mine-related

[4] **Permanence Ratings:**
- n/a –no magnitude of effect, therefore not evaluated
- Low – rapidly reversible (e.g., months to years)
- Moderate – slowly reversible (e.g., years to decades)
- High – largely irreversible (e.g., decades +)

[5] **Uncertainty Ratings:**
- ? – low uncertainty
- ?? – moderate uncertainty
- ??? – high uncertainty

[6] **Management Actions:**
- 0 – 'no action beyond routine CREMP monitoring
- 1 – continued trend monitoring in 2017
- 2 – active follow-up with more detailed quantitative assessment in 2018

Table ES–1. Summary of key findings from the 2017 CREMP.

Variable Type & Variable	Magnitude[1]	Spatial Scale[2]	Causation[3]	Permanence[4]	Uncertainty[5]	Comments	Management Action[6]
Exposure - Sediment Chemistry							
Physical	**0**	n/a	n/a	n/a	?		**0**
Total Metals	**2**	Moderate (TPE Cr) Unknown (WAL As, Cr, Pb)	High (TPE Cr) Unknown (WAL As, Cr, Pb)	Moderate (TPE Cr) Unknown (WAL As, Cr, Pb)	? (TPE) ??? (WAL As, Cr, Pb)	The following parameters were elevated relative to reference/baseline conditions: _Meadowbank_ - **Arsenic** (WAL); **Chromium** (TPE, WAL); **Lead** (WAL) _Baker Lake_ - **Arsenic** (BPJ) **TPE** - Chromium concentrations continue to exceed the trigger at TPE. 2017 results indicate concentrations are increasing. Targeted study in 2015 showed lack of bioavailability and toxicity to benthic invertebrates. **WAL** - Arsenic concentrations in core samples collected in 2017 were elevated relative to baseline and compared to the 2014 coring cycle results. Chromium and lead exceedances were marginal. Coring is recommended in 2018 to verify the nature of the trend observed (i.e., related to mining or natural spatial heterogeneity). **BPJ** - Arsenic continues to exceed the trigger. No evidence of increasing concentrations over time.	**0** = SP, TPN, and BL **2 =** WAL (As) and TPE (Cr)
Organics	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**

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Effects - Phytoplankton							
Chlorophyll-a	**0**	n/a	n/a	n/a	?	No evidence of increased phytoplankton productivity based on chlorophyll-a data.	**0**
Total Biomass	**2**	Large	Low	Low	???	Statistically significant increases in phytoplankton biomass were detected for the NF stations in the BACI analysis of 2017 data relative to reference/baseline conditions. Effect sizes of biomass increases ranged between 46% (SP) to 87% (WAL). There was no plausible linkage between increased biomass in 2017 and site-related activities (see **Section 3.2.4.2** for details).	**0**
Taxa Richness	**0**	n/a	n/a	n/a	?	Taxa richness increased 12% (p=0.09) at WAL relative to reference/baseline conditions. The slight increase in diversity is not above the trigger value of 20%.	**0**
Effects - Benthic Invertebrates							
Total Abundance	**0**	n/a	n/a	n/a	?	Decreased abundance at TPE relative to INUG in the past four years relative to reference/baseline conditions. The only statistically significant difference was for 3 after years (2015-2017). The differences are primarily driven by increased abundance at INUG while abundance at TPE has been relatively stable and consistent with baseline sampling results (**Figure 3.2-67** and **Figure 3.2-68**).	**0**
Total Richness	**0**	n/a	n/a	n/a	?	Richness continues to track higher for most stations. The benthic communities are dominated by chironomids, and the relative proportion of major taxa remains stable at all stations.	**0**

Notes:

[1] **Magnitude Ratings (narrative in brackets used in the absence of specific triggers/thresholds):**
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1. INTRODUCTION

1.1. Background

Agnico Eagle Mines Ltd.'s (Agnico Eagle) Meadowbank Mine is situated approximately 75 km north of the hamlet of Baker Lake, Nunavut. The Aquatic Effects Management Program (AEMP; Azimuth, 2005a [updated 2015a]) was developed to address issues identified during the Environmental Impact Assessment (EIA) process that could potentially impact the aquatic receiving environments surrounding the development. Building from earlier baseline monitoring (Azimuth, 2005b), the 2005 AEMP described the general monitoring strategy designed to detect impacts to the aquatic environment. This strategy relied on two primary components (discussed further in **Section 1.3**): the core monitoring program and targeted studies. Monitoring following the 2005 AEMP strategy has been implemented as follows:

- 2006 and 2007 – The core monitoring program was implemented over two complete cycles (Azimuth, 2008a, 2008b) prior to construction of the mine (i.e., baseline conditions).
- 2008 to 2017 – Mine construction started in 2008, with dike construction activities occurring directly in the receiving environment. Core receiving environment monitoring (Azimuth, 2009c, 2010a, 2011b, 2012a, 2013, 2014, 2015c, 2016, 2017a, and this report) was complemented by targeted studies on dike construction monitoring (Azimuth, 2009a, 2010b; Agnico, 2011), the potential effects of total suspended solids (Azimuth, 2009a, 2010c, 2011a, 2012b) on water quality and benthic invertebrate communities in affected waterbodies, and most recently a sediment chromium bioavailability and toxicity study (Azimuth, 2016).

Agnico Eagle, in consultation with regulators, completed two ongoing initiatives in 2012, the first, being the restructured AEMP (Azimuth, 2012c). That document serves as an overarching 'umbrella' strategy that conceptually provides an

"AEMP" Terminology

The term "AEMP" was first used in the 2005 report *Aquatic Effects Management Program* (Azimuth, 2005a), which described the rationale, framework, strategy, methods, and scope of receiving environment monitoring for the Meadowbank Mine. Receiving environment monitoring conducted in 2006 and 2007 use this term in the annual report titles.

The Nunavut Water Board A License, issued in 2008 and renewed in 2015, defines "AEMP" as the "Aquatic Effects Monitoring Program"; annual receiving environment monitoring reports since 2008 reflect this subtle change.

Agnico Eagle has a number of monitoring programs (e.g., effluent monitoring, ground water monitoring, air quality monitoring) relevant to tracking potential changes to the aquatic receiving environment surrounding the Meadowbank Mine. One of the requirements of the original Nunavut Water Board (NWB) A License was to revise the AEMP to consider the results of all these programs; a restructured AEMP was submitted in December 2012 (Azimuth, 2012c). Previously, the term "AEMP" was essentially synonymous with receiving environment monitoring. However, given the AEMP's broadened scope, more specific terminology is needed to minimize confusion. To that end, we use the following terms in this report:

CREMP – refers to the "core receiving environment monitoring program"; this is synonymous with "core monitoring program". While this term was first used for the 2009 annual report, it is meant to encompass the entire core receiving environment monitoring program since 2006. Program details were recently documented in the *CREMP: 2015 Plan Update* (Azimuth, 2015b).

2005 AEMP – refers to the original AEMP, which served as the plan for the CREMP until the *CREMP Design Document 2012* (Azimuth, 2012d).

AEMP – is used generically when not referring to either of the first two definitions.

opportunity to integrate results of individual, but related, monitoring programs in accordance with the original NWB Type A water license requirements. In 2012, Agnico Eagle completed the AEMP synthesis document which systematically evaluated the results of individual monitoring programs, developed a site specific conceptual model to evaluate stressors, transport medias and receptors of concern (see **Section 2.4** for more details), and integrated the results of numerous monitoring programs into a management response framework.

The second initiative completed in 2012 was the *Core Receiving Environment Monitoring Program (CREMP): Design Document 2012* (Azimuth, 2012d). This document reviewed all historic monitoring CREMP data, presented the trigger/threshold derivation process (see **Section 1.5** for description of triggers/thresholds), determined trigger/threshold values for individual parameters, and established the experimental design to optimize the program. The resulting triggers/thresholds and experimental design changes have been integrated into the CREMP since 2012.

As per the recommendations of the 2012 CREMP (Azimuth, 2013), water quality triggers/thresholds were updated in 2013, with minor updates in 2014 and 2017 to include more recent monitoring data (i.e., in the case of triggers based on the 95th percentile of reference/baseline conditions), to reflect new thresholds (e.g., adopted from other jurisdictions where not covered by CCME), and to add field pH triggers. Program details were documented in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). Updates in this report were limited to sediment chemistry triggers. The triggers were updated to reflect lower DLs for some parameters (e.g., lead) and to develop triggers specific to Wally Lake.

This CREMP monitoring report documents the methods and results of aquatic receiving environment monitoring activities completed at the Meadowbank project lakes and Baker Lake in 2017. As in previous years, this report integrates accumulated results since 2006 to facilitate the identification of changes in limnology or water chemistry parameters, sediment chemistry, phytoplankton biomass and benthic community structure associated with mine-related activities at Meadowbank Mine or in Baker Lake.

1.2. Environmental Setting

Understanding the environmental setting of the project lakes is integral to understanding the design of the CREMP. The Meadowbank project lakes are situated in the barren-ground central Arctic region of Nunavut within an area of continuous permafrost. These are headwater ultra-oligotrophic/oligotrophic (nutrient poor and unproductive) lakes, situated on the watershed boundary that separates two main drainages – the Arctic and Hudson Bay drainages. Only a few hundred meters to the north of Second and Third Portage lakes is the divide between water that flows north to the Arctic Ocean (via the Meadowbank and Back River system) or to Chesterfield Inlet and Hudson Bay (via the Quoich River system).

The landscape consists of rolling hills and relief with low-growing vegetative cover and poor soil development. Numerous lakes are interspersed among boulder fields, eskers and bedrock outcrops, with indistinct and complex drainages. The main lakes in the Meadowbank project area include: Third Portage Lake (TP), Second Portage Lake (SP), Tehek Lake (TE), and the Vault Lake system – Vault, Wally (WAL) and Drilltrail lakes. As is common of headwater lakes, all of the project lakes have small drainage areas relative to the surface area of the lakes themselves. Local inflow from surrounding terrain is the predominant influence on water movement within the system. Small channels connect the project area lakes, although there is little flow between lakes except during freshet and possibly none during winter months. Movement by fish between lakes is also rare, as populations remain quite isolated from one another. The ice-free season on these lakes is short, with ice break-up in late-June to mid-July and ice-up beginning in late September or early October. Maximum ice thickness is at least 2 m by March/April.

Overall, the Meadowbank project lakes support healthy communities of plankton, benthos and fish that are typical of oligotrophic Arctic lakes (Azimuth, 2005b). Biological productivity of the lakes is limited by nutrient availability, cold water and a short growing season.

1.3. Core Monitoring Program (CREMP) Objectives

The 2005 AEMP framework (Azimuth, 2005a) presented a receiving environment monitoring strategy consisting of two components:

- *Core Monitoring Program (CREMP)* - was tailored based on our understanding of mine construction, operation and infrastructure (e.g., dikes, effluents, stream crossings, roads, etc.) and has been developed to detect mine-related effects at temporal and spatial scales that are ecologically relevant. The program was expanded to include Baker Lake in 2008. The program was updated based on the recommendations of the *CREMP: Design Document 2012* (Azimuth, 2012d) and more recently, described in detail in the *CREMP: 2015 Plan Update* (Azimuth, 2015b).
- *Targeted Monitoring Program* – targeted studies are specific studies that typically have narrower temporal or spatial bounds or are designed to address specific questions related to particular components of mine development during construction or operation (i.e., they are not routinely conducted). These are integrated with and are complementary to the core monitoring design. Examples include dike construction monitoring (e.g., Azimuth, 2009a) and the total suspended solids (TSS) effects assessment studies (EAS) (e.g., Azimuth, 2009b). Following a recommendation from the 2014 CREMP report (Azimuth, 2015c), a targeted study was conducted in 2015 to investigate the toxicity and bioavailability of chromium in sediments from TPE (Azimuth, 2016). No targeted studies were completed in 2016 or 2017.

<u>CREMP Sampling Area Categorization</u>

Tracking spatial and temporal differences related to mining activities relied on categorizing areas using two factors:

• *Area Type* – this concept relates to an area's spatial proximity to the planned mine development, whether built or not; categories include near-field, mid-field, far-field, and reference (see text for more details).

• *Area Status* – this concept is temporal and has two levels: control (not exposed to mine-related activity) or impact (exposed to mine-related activity. The term "impact" is taken from the BACI statistical study design approach and does not mean that an actual impact has taken place; rather, it designates a time period when potential mine-related impacts may occur for an area.

For example, the status of baseline (i.e., pre-construction) monitoring conducted at all areas, regardless of category, would be "control". This status would change to "impact" once construction activities started that had the potential to affect an area (e.g., SP changed from control to impact status in August 2008 with the onset of construction for the East Dike; TE followed suit based on actual exposure to TSS from that event). WAL (a near-field lake) was still "control" status in early 2013, but changed to "impact" in July when construction activities were initiated for the Vault deposit.

Together, area categorization by type and status provide a logical framework to facilitate the identification of real mining-related changes (as opposed to natural regional changes due to climate or other factors) to the aquatic receiving environment (described in **Section 1.5**).

The study design is based on a before-after-control-impact (BACI) approach (see text box), but has also incorporated the concept of gradients in exposure. To this end, the 2017 program consisted of 13 sampling areas (see **Figure 1.3-1** to **Figure 1.3-3**), each categorized into one of the four[1] main types of areas described below:

- *Near-field (NF) areas* – Areas are situated in close proximity to the development (planned or constructed), in particular, near dikes, dewatering discharge, and proposed effluent sources (**Figure 1.3-1** to **Figure 1.3-3**). These areas provide the first line of early-warning for introductions of stressors into the receiving environment. In the Meadowbank study lakes, these areas include: Third Portage Lake North (TPN), Third Portage Lake East (TPE), Second Portage (SP), and Wally Lake (WAL; note that planned mining activity started there in July 2013).

  For Baker Lake, there are two NF areas, one targeting the hamlet's barge landing area (Baker Barge Dock [BBD]) and the other targeting Agnico Eagle's fuel storage facility (Baker Proposed Jetty [BPJ]).

- *Mid-field (MF) areas* – This area designation was added in 2011 to be consistent with the area categorizations used in the *CREMP: Design Document 2012* (Azimuth, 2012d) and includes Tehek Lake (TE) and Third Portage Lake South (TPS). TE is adjacent to the inlet from Second Portage Lake (**Figure 1.3-1**) and was exposed to elevated TSS during construction of the East Dike in 2008, prompting the addition of a new far-field area (Tehek far-field) in 2009. Consequently, MF designation is more accurate for TE. TPS was initially envisioned as an internal reference area in the 2005 AEMP. However, given the connectivity to TPN and the slight changes in hardness-related parameters, it is more appropriately considered a MF area. That said, given the degree (i.e., relatively minor) and nature (i.e., limited to certain non-metal parameters only) of the observed changes and the termination of discharges to TPN, TPS should still be appropriate as a reference area for EEM water quality monitoring.

  Beginning in 2016, sampling frequency and monitoring components are determined based on the results from the previous monitoring cycle at the NF areas. This new sampling approach is discussed in full in **Section 2.2.3**.

- *Far-field (FF) area* – The intent of this area is to monitor water and sediment quality downstream of project infrastructure to provide insights into the spatial extent of any effects observed at the near-field areas. The Tehek far-field (TEFF) area is a key location that will ultimately determine whether or not contaminants are detectable downstream of the entire mine development. Lake waters from Second and Third Portage Lakes and the Vault Lakes (Vault, Wally, Drilltrail) meet at the southern end of Second Portage Lake and discharge via a single channel into Tehek Lake (**Figure 1.3-1**). Monitoring the water and sediment quality and the health of the benthic invertebrate community in the basin adjoining the discharge point from Second Portage Lake will help determine if any effects identified at SP are extending into TE and beyond into TEFF.

  Similar to the MF areas, the sampling frequency and monitoring components at TEFF are determined based on conclusions from the previous monitoring cycle at the MF areas, specifically TE. This new sampling approach for the TEFF is discussed in full in **Section 2.2.3**.

- *Reference (Ref) areas* – By definition, reference areas are sufficiently removed from the mine that they are presumed to be unaffected by any infrastructure (roads, dikes, runways) and point

[1] Note that three main area types were initially envisioned in the 2005 AEMP: NF, FF and Ref. However, area designations were modified during the CREMP design review (Azimuth, 2012d) to more accurately reflect the realities of potential exposure to mine-related activities following dike construction; a mid-field (MF) category was added that includes Tehek Lake (TE) and Third Portage Lake South (TPS).

sources (aerial and aquatic) associated with mine development. Monitoring of reference areas is important in order to distinguish between possible mine-related changes in water quality or ecological parameters and natural changes, unrelated to the mine. Inuggugayualik Lake (INUG) and Pipedream Lake (PDL) are external reference areas chosen for the purposes of making comparisons with the project lakes (EVS, 1999; Azimuth, 2005b). INUG has served as a control station since 2006. Pipedream Lake was added to the CREMP in 2009. PDL was originally investigated as a candidate reference area in 1998 (EVS, 1999) from a fisheries perspective. Relative to the mine site, the reference areas are situated about 16 km west at INUG and 12 km northwest at PDL (**Figure 1.3-1** and **Figure 1.3-2**). They are both headwater lakes and flow north into the Arctic Ocean. Despite the different drainage basin, both these lakes satisfy the requirements of an external reference lake from a physical/chemical perspective because they are at similar in latitude, have similar geology, relief and climate, do not have any significant inflows and has generally similar limnological features, water chemistry and aquatic biological community structure to the project lakes (Azimuth, 2005b).

A thorough review of INUG and PDL as reference areas was completed in 2017 in response to comments from Fisheries and Oceans Canada (DFO) regarding the suitability of INUG and PDL as reference areas for the Whale Tail Pit project (Azimuth, 2017b). The focus of the review was on the likelihood of changes at INUG and PDL related to dust from haul road between Meadowbank and the Whale Tail Pit project. The review concluded that the Whale Tail Pit Haul Road is not expected to jeopardize or affect conditions at INUG or PDL given the isolated location of each basin relative to the road (i.e., 2 km for PDL and 10 km for INUG) and the prevailing NW winds.

- For Baker Lake, an internal reference area is located several kilometers to the east of the hamlet along the north shore of the lake (Baker Akilahaarjuk Point [BAP]) and a second reference area was added in 2011 based on a recommendation from additional analysis and interpretation of the historical Baker Lake data, which is located on the same shoreline, east of BPJ and west of BAP (Baker East Shore [BES]; see **Figure 1.3-3**).

The core monitoring program is intended to detect changes and help define the extent (both spatially and temporally) of any adverse effects. Information on the status of each site (i.e., control or impact designation as per the text box) is provided in **Section 1.4**.

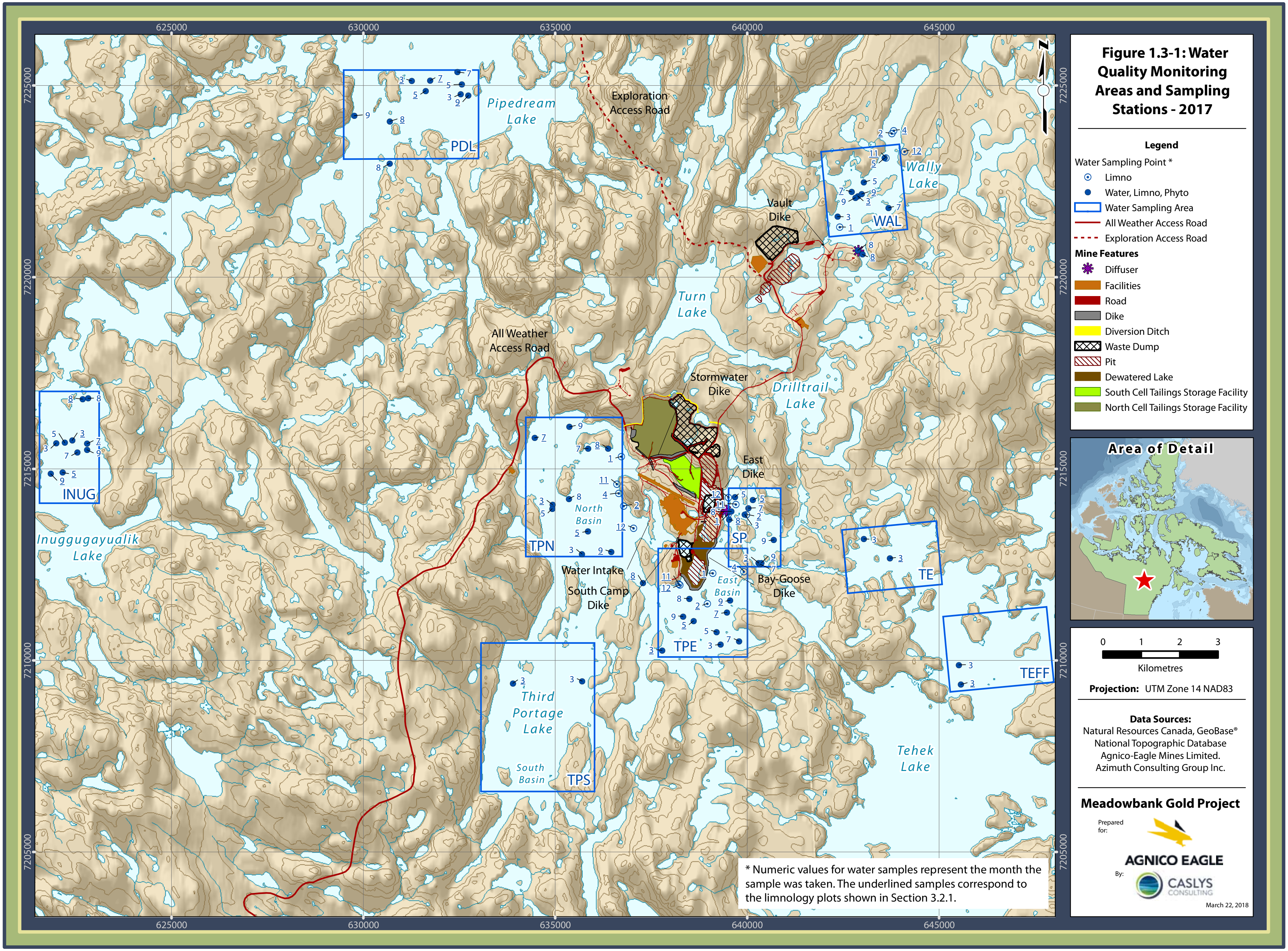


Figure 1.3-1: Water Quality Monitoring Areas and Sampling Stations - 2017

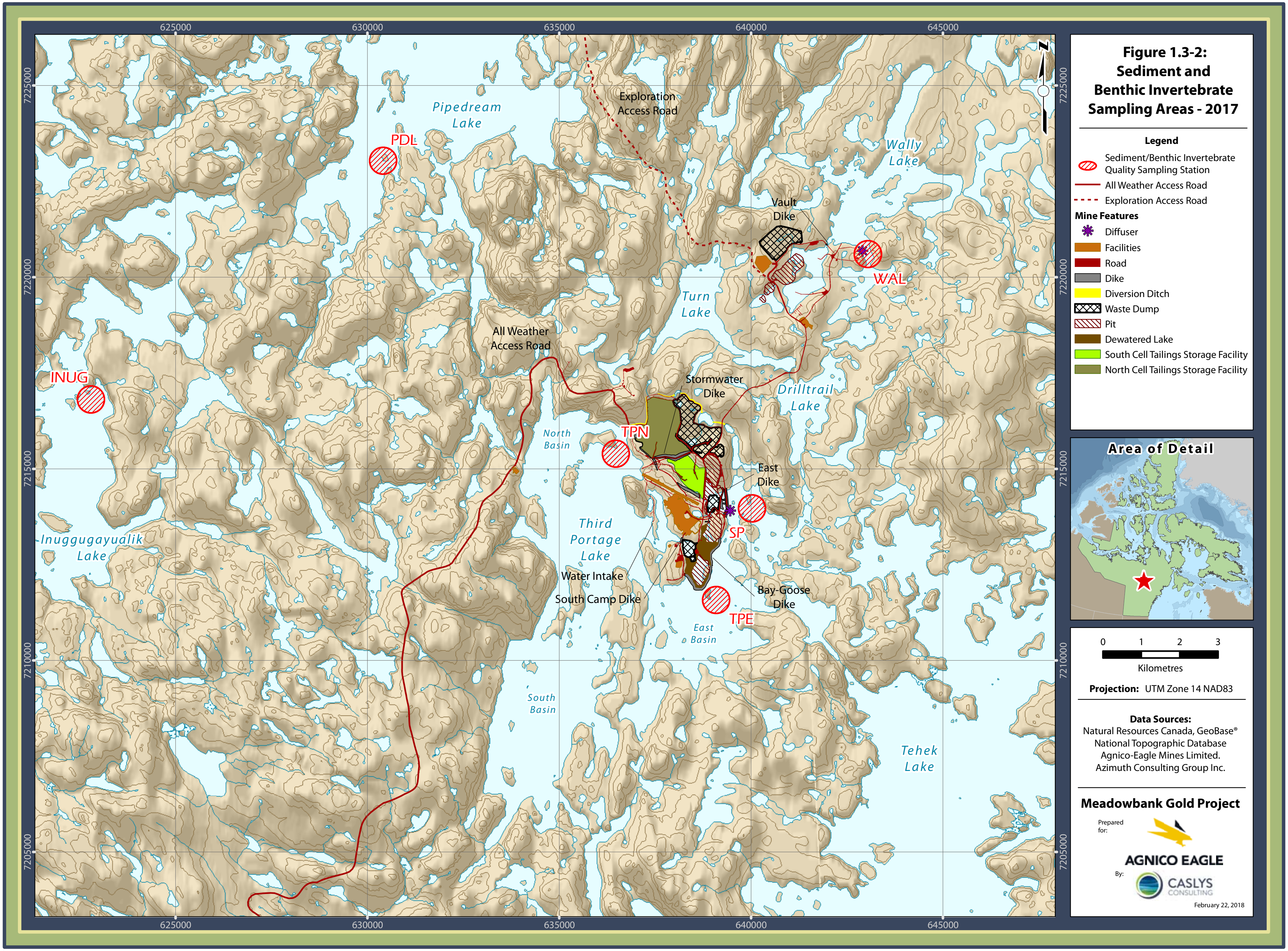
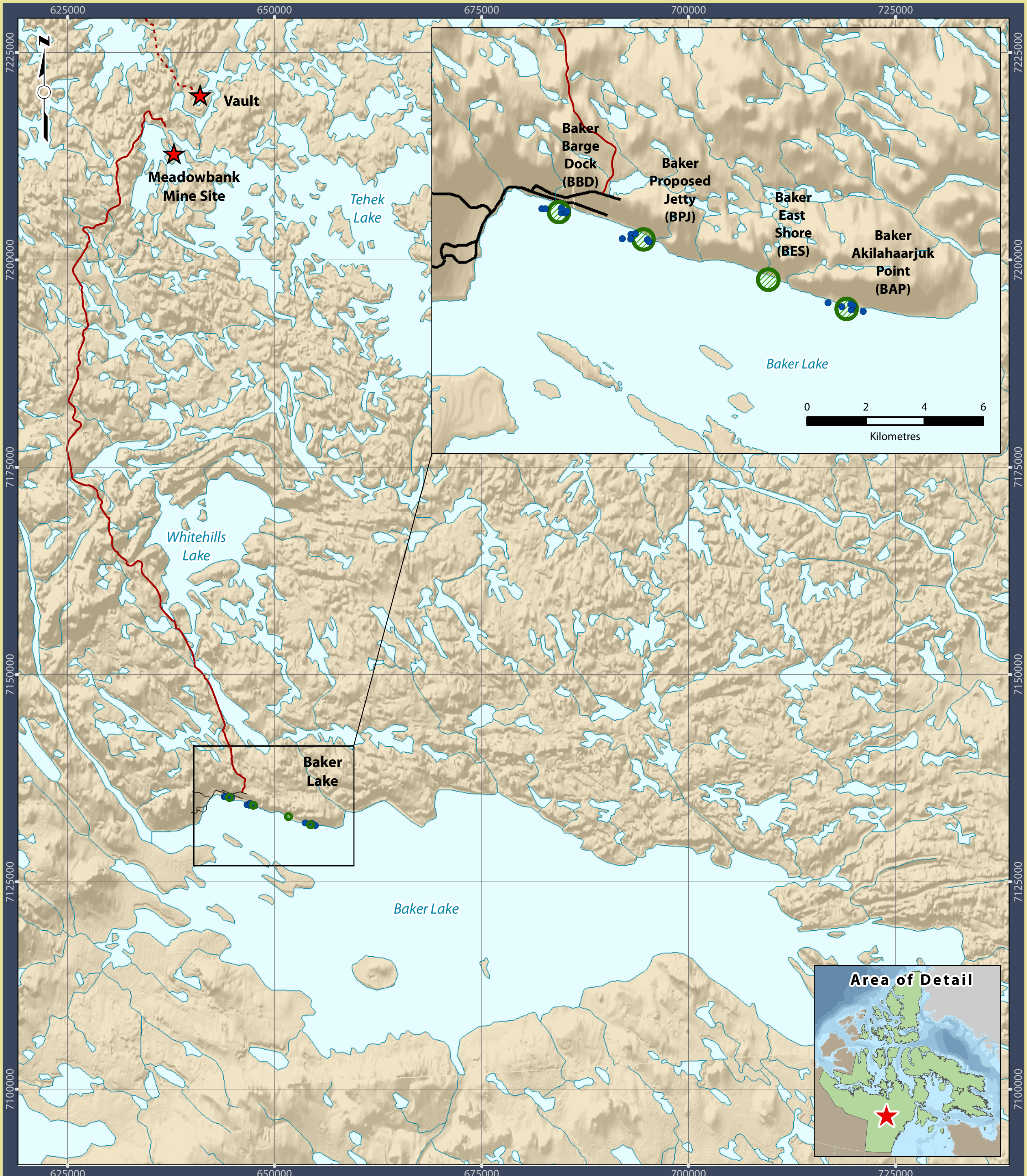


Figure 1.3-2:
Sediment and
Benthic Invertebrate
Sampling Areas - 2017
Legend
Sediment/Benthic Invertebrate Quality Sampling Station
All Weather Access Road
Exploration Access Road
Mine Features
Diffuser
Facilities
Road
Dike
Diversion Ditch
Waste Dump
Pit
Dewatered Lake
South Cell Tailings Storage Facility
North Cell Tailings Storage Facility
Area of Detail
0 1 2 3
Kilometres
Projection: UTM Zone 14 NAD83
Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.
Meadowbank Gold Project
Prepared for:
AGNICO EAGLE
By:
CASLYS CONSULTING
February 22, 2018
625000
630000
635000
640000
645000
7225000
7220000
7215000
7210000
7205000
N
Pipedream Lake
PDL
Exploration Access Road
Wally Lake
Vault Dike
WAL
Turn Lake
All Weather Access Road
INUG
Stormwater Dike
Drilltrail Lake
North Basin
TPN
East Dike
SP
Inuggugayualik Lake
Third Portage Lake
Water Intake
South Camp Dike
Bay-Goose Dike
TPE
East Basin
South Basin
Tehek Lake



Legend

- Water Sampling Point
- Sediment/Benthic Invertebrate Quality Sampling Station
- All Weather Access Road
- Exploration Access Road

0 5 10 15

Kilometres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

Figure 1.3-3: Baker Lake Water and Sediment Benthic Invertebrate Sampling Area - 2017

Meadowbank Gold Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

February 22, 2018

1.4. Meadowbank Mine Development and Operation

The construction phase of the Meadowbank Mine officially started in June 2008, upon receipt of the NWB A Water License (2AM-MEA0815; renewed to 2AM-MEA1525 in 2015) for the project. The Fisheries and Oceans Canada (DFO) *Fisheries Act* Authorization (NU-03-0191) for the project was issued on July 30, 2008, thus allowing the start of in-water construction activities. Key mine-related activities (e.g., site construction, dike construction, dewatering, effluent discharge, general site-related activity, barge traffic in Baker Lake (**Figure 1.4-1**; information provided by Agnico Eagle), and related changes observed in the receiving environment are described by year in **Table 1.4-1**.

The onset of construction activities in proximity to a CREMP monitoring area formally ends the baseline phase and changes the status of that area from "control" to "impact" (not necessarily meaning that there is an impact or effect [i.e., either positive or negative]; only that there is the potential for mining-related changes that may occur at that area after that time). Status changes are also important for any statistical analyses, as they dictate how data are grouped when assessing potential trends (see **Section 1.5**). Note that the end of the baseline phase is specific to each area. For example, TPE would have still be in the baseline phase in August 2008 (it is up gradient of Second Portage Lake), but not in August 2009 due to dike construction activities. The lack of baseline monitoring at the Baker Lake areas means that the status of areas does not change over time (i.e., near-field areas are "impact" and reference areas are "control"). The status of all CREMP areas since monitoring started is provided in **Table 1.4-2**.

Table 1.4 1. Chronology of mine development and operational activities and associated receiving environment overview.

Year	Major Mine-Related Activities	Receiving Environment Overview
2008	● Major in-water construction activities included the East Dike (located in Second Portage Lake) and the Western Channel Dike (located between Third Portage Lake and Second Portage Lake); the closest CREMP sampling area to these activities was the Second Portage Lake area (SP). ● Other site-related activities included rock crushing, road building, pit blasting, ground preparation, and infrastructure construction. ● Barge traffic increases in Baker Lake to support construction.	● As described in detail elsewhere (Azimuth, 2009a; 2009b), East Dike construction led to a sedimentation event that extended through Second Portage Lake (SP) to Tehek Lake (TE). The potential impact of construction-related sediment releases to the aquatic environment was the focus of the four-year EAS study (Azimuth, 2009b, 2010d, 2011a, 2012c).
2009	● Dewatering discharges (i.e., impounded Second Portage Lake water with TSS) were directed primarily into the north basin of Third Portage Lake (TPN), but also into Second Portage Lake (March to July and Oct to Dec, 2009). ● Bay-Goose Dike construction started in late July 2009. ● Most of the site preparation and road infrastructure was completed in 2009. ● North Portage Pit was the primary focus of blasting and mine operations. ● Barge traffic increases in Baker Lake.	● Despite a number of precautions, storm winds broke the Bay-Goose Dike turbidity barrier containment system, leading to another sedimentation event in late August. ● Elevated TSS (and other parameters) was primarily restricted to east basin of Third Portage Lake (TPE) and to a minor extent into SP and TE. The implications of the release were assessed in the EAS study (see above).
2010	● Bay-Goose Dike construction completed using additional mitigation measures. ● Mine officially opened on 27 Feb 2010, marking the start of the operations period. ● Pit development focused on North Portage and South Portage pits. ● Waste rock to rock storage facility (RSF). Tailings to impoundment area (TIA). Contact water from operations not discharged to receiving environment. ● Dewatering of SP impoundment to TPN continued, with discharge now subject to MMER. ● Barge traffic increases in Baker Lake.	● Bay-Goose Dike construction leads to less-pronounced sedimentation event in TPE and extends through SP to TE; EAS studies continue. ● TPN (dewatering) TSS concentrations generally consistent with baseline conditions.
2011	● Mining operations focus on North Portage and South Portage pits. ● Waste rock to rock storage facility (RSF). Tailings to impoundment area (TIA). ● Construction activities limited to mine footprint. ● Dewatering of SP and TPE to TPN continued, with treatment added to reduce fine sediment and turbidity. ● Barge traffic stabilizes in Baker Lake.	● TPN focus of routine EEM study - no mine-related effects detected (Azimuth, 2012e). ● TPN TSS concentrations consistent with baseline. ● The TSS EAS targeting dike construction sedimentation events completed.
2012	● SP and TPE dewatering discharges to TPN finished by spring. Diffuser installed and effluent (mix of residual Bay-Goose water, contact water, East Dike seepage and run-off) discharge to TPN commences; treatment (for fine sediment, turbidity) continues. ● North cell non-contact water diversion ditches completed in August (intercepting run-off prior to the tailings and waste rock areas and diverting to NP2 and Dogleg ponds). ● Vault access road constructed and site preparation activities for the Vault Pit and Vault Dike commence. ● Barge traffic remains stable in Baker Lake; 200-L diesel spill occurs, but cleaned up successfully.	● TPN TSS concentrations generally consistent with baseline. ● Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, sulphate and total dissolved solids. ● Spill-related monitoring show no traces of hydrocarbons in Baker Lake.
2013	● Effluent discharge to TPN continued. ● Fishout activity in Vault lake was completed. ● Vault lake was dewatered into Wally Lake (ongoing) and did not require TSS treatment. ● Minor construction modifications to north cell diversion ditches completed. ● Completion of the Airstrip extension (18m) into Third Portage Lake in March. ● Seepage from Rock Storage Facility (ST-16) through the road into NP2 identified (additional monitoring in NP2 to evaluate near-shore water quality).	● TPN TSS concentrations consistent with baseline. ● Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: alkalinity, conductivity, calcium and total dissolved solids. ● TPE sediment chromium concentrations were elevated above trigger value; better spatial coverage needed to reduce uncertainty in 2014.

Table 1.4 1. Chronology of mine development and operational activities and associated receiving environment overview.

Year	Major Mine-Related Activities	Receiving Environment Overview
2014	● Effluent discharge to TPN from the Portage Attenuation Pond occurred only from June 10 to July 5. Discharge to TPN is now complete. The former Portage Attenuation Pond has now become the South Cell for tailings deposition. ● EEM Cycle 2 Study Design was conducted at the end of August through the beginning of September (no TPN discharge at this time). ● Vault Dewatering into Wally Lake from June 20 to 29 (now complete); discharge from Vault Attenuation Pond into Wally Lake from July 24 to August 14. No TSS treatment for Vault Discharge. ● New discharge into Second Portage Lake during all of 2014 (except from May 3 to July 28): two seepage collection points (North and South) are situated on west side of the East Dike to collect seepage through dike from SP. Water is pumped from both collection points, which are connected together before discharging back into Second Portage Lake through a diffuser. No TSS treatment for East Dike Discharge. ● No seepage water from Rock Storage Facility (ST-16) reaching the NP2 Lake in 2014. ● Commercial mining in Vault Pit started at the beginning of 2014. No major construction or modifications in 2014.	● Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. ● Temporal trend in TPE sediment chromium confirmed in coring study; targeted study recommended for 2015.
2015	● No discharge to TPN in 2015 ● Vault discharge to Wally from July 7th to September 10th. No TSS treatement needed. ● East dike (North-South) discharge to SP all year except from June 16th to August 10th. Discharge was stopped for increasing TSS levels as no treatment is available for this location. The discharge from East Dike that was not directed to 2PL was discharged in the Portage Pit and then pumped to the South Cell TSF (Tailings Storage Facility). ● No seepage water from Rock Storage Facility to NP-2. Monitoring ongoing. ● HCMP work completed for TP, SP and Dogleg lakes and at water crossing R02 along the AWAR. ● One incident of elevated TSS from Vault road culverts to NP-1, early june, during freshet. Barriers installed. No impacts observed to Dogleg Lake.	● Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. Parameters with effects-based thresholds (e.g., CCME water quality criteria) were below their respective trigger values in 2016. ● Targeted sediment bioavailability and toxicity testing was completed at TPE. Toxicity test results on *Chironomus dilutus* and *Hyalella azteca,* combined with sequential extraction tests on the sediment, indicated current chromium concentrations at TPE are unlike to adversely affect the benthic invertebrate community. Continued monitoring was recommended for 2016, but addition target studies were not recommended for 2016. ● Phytoplankton and benthic invertebrate community results for the impact stations were within the range of reference/baseline conditions.
2016	● Vault discharge to Wally from June to September. No TSS treatement needed. ● East dike (North-South) discharge to SP all year. ● No seepage water from Rock Storage Facility to NP-2. Monitoring ongoing. ● Phaser lake dewatering - August 26th to September 10th and September 15th to October 4th ● Phaser Lake fishout from August 13th to 31st and September 10th to 25th ● No Goose Pit reflooding activities ● Pit E and pushback assessment ● Mining focused on Vault Pit and Pit A ● Amaruq exploration road construction (km 25 at end of 2016)	● Minor mine-related trends identified for a number of water chemistry parameters at near-field areas: conductivity, hardness, Ca/Mg/K/Na and total dissolved solids. ● Similar trend of elevated chromium in sediment grab samples from TPE, but the concentrations appear stable relative to those measured in 2015. ● Phytoplankton and benthic invertebrate community results for the impact stations were within the range of reference/baseline conditions.
2017	● Vault discharge to Wally from June to October. No TSS treatment needed ● East dike (North-South) discharge to SP all year except from May 12th to October 29th. Discharge was stopped for increasing TSS levels as no treatment is available for this location. The discharge from East Dike that was not directed to SP was discharged in the Portage Pit and then pumped to the South Cell TSF (Tailings Storage Facility). ● No seepage water from Rock Storage Facility to NP-2. Monitoring ongoing ● No Goose Pit reflooding activities ● Mining focused on Vault Pit and Pit A, Pit E and Phaser Pit ● Amaruq exploration road completed ● Phaser Pit started in November ● HCMP work completed for TP, SP and Dogleg lakes and at water crossing R02 along the AWAR ● One incident of elevated TSS from Vault road to NP-1, early june, during freshet. Barriers installed. No impacts observed to Dogleg Lake.	● CREMP monitoring results reported herein (See Summary in **Table 4.1-1**). ● EEM cycle 3 study completed.

Table 1.4-2. Status of all CREMP sampling areas since the beginning of monitoring.

	Meadowbank Areas									Baker Lake Areas			
	REF	**REF**	**NF**	**NF**	**NF**	**NF**	**MF**	**MF**	**FF**	**REF**	**REF**	**NF**	**NF**
Year	**INUG**	**PDL**	**TPN**	**SP**	**TPE**	**WAL**	**TPS**	**TE**	**TEFF**	BAP	BES	BBD	BPJ
2006	C		C	C	C	C	C	C					
2007	C		C	C	C	C	C	C					
2008	C		C	I (Aug)	C	C	C	I (Aug)		C		I	I
2009	C	C	I (Mar)	I	I (Aug)	C	C	I	C	C		I	I
2010	C	C	I	I	I	C	C	I	C	C		I	I
2011	C	C	I	I	I	C	C	I	C	C	C	I	I
2012	C	C	I	I	I	C	C	I	C	C	C	I	I
2013	C	C	I	I	I	I (Jul)	C	I	C	C	C	I	I
2014	C	C	I	I	I	I	C	I	C	C	C	I	I
2015	C	C	I	I	I	I	C	I	C	C	C	I	I
2016	C	C	I	I	I	I	C	I	C	C	C	I	I
2017	C	C	I	I	I	I	C	I	C	C	C	I	I

Notes:

Area designations:

C=Control; I=Impact; REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading); Blank denotes that the area was not part of the monitoring program that year.

Area IDs:

INUG=Inuggugayualik Lake;

PDL=Pipedream Lake

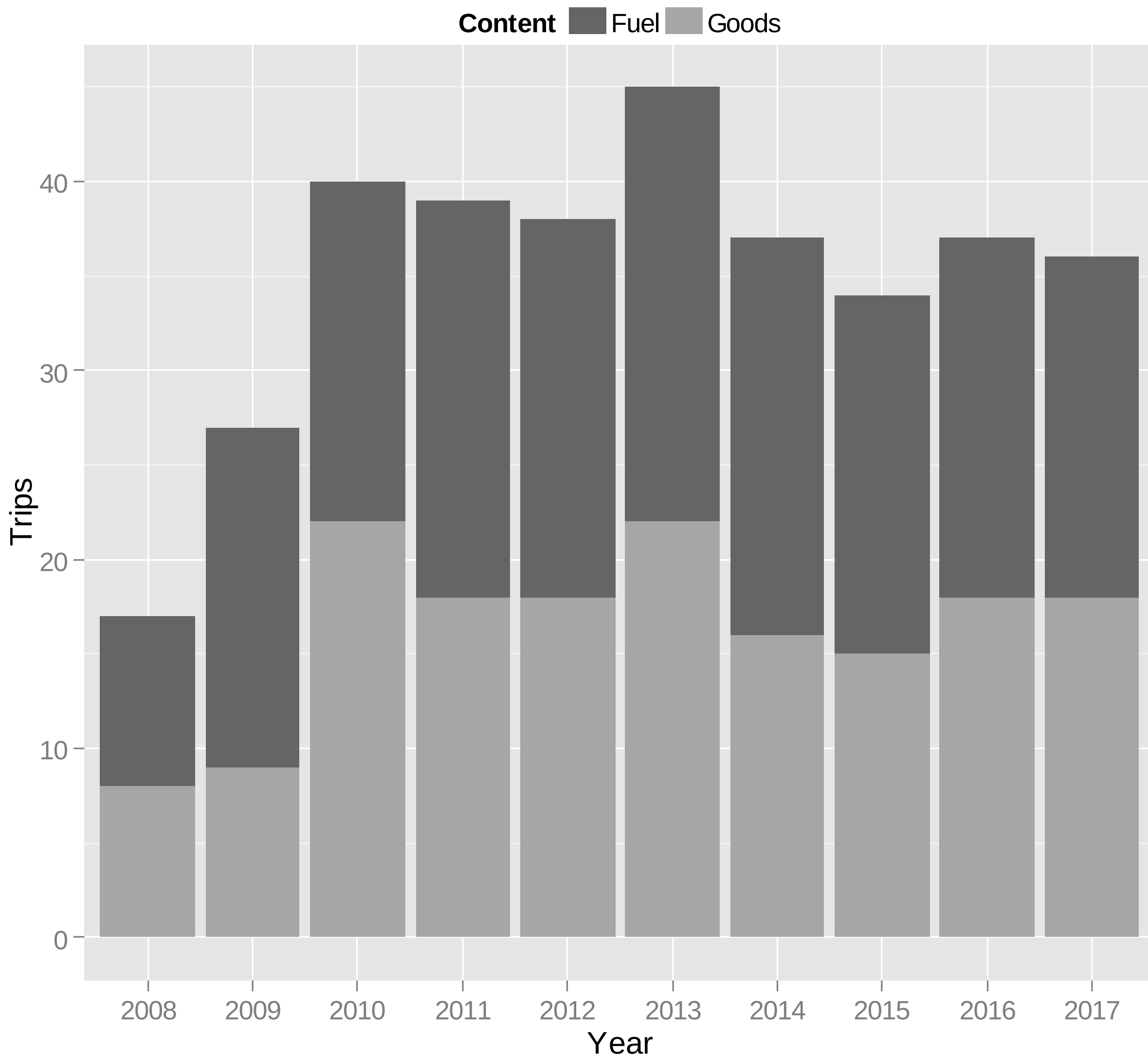
TPN, TPE, TPS=Third Portage Lake - North, East, South basins

SP=Second Portage Lake; WAL=Wally Lake;

TE, TEFF=Tehek Lake – Mid-field and Far-field;

BAP, BES, BBD, BPJ=Baker Lake - Akilahaarjuk Point, East Shore, Barge Dock, Proposed Jetty.

Figure 1.4-1. Barge traffic (number of trips/year) arriving in Baker Lake from Chesterfield Inlet since 2008.



1.5. Approach

CREMP reporting changed substantially starting in 2011 with a stronger focus on assessing potential temporal and spatial trends in the data related to mining activity. Greater emphasis is now placed on identifying changes to support the AEMP and ultimately the environmental management process, rather than on providing a detailed description of the annual results in isolation. To that end, this CREMP report applies numerical decision criteria (i.e., triggers and thresholds) to assess the magnitude of change in CREMP monitoring variables.

The 2012 AEMP (Azimuth, 2012c) described a two-tiered approach for decision criteria at Meadowbank based on 'trigger' and 'threshold' level concentrations (**Figure 1.5-1**). Trigger values are typically lower or more conservative than threshold values. These are defined as:

- *Triggers* are early warning criteria that may lead to action. Exceedance of a trigger value does not necessarily imply that an adverse effect may be expected. The triggers may be based on absolute numbers (e.g., an increases half-way from baseline to an identified effects threshold) or statistical criteria (e.g., statistically significant trend that predicts exceedances of a threshold within 3 years).
- *Thresholds* are legal requirements, regulatory guidelines (e.g., CCME), or other discrete benchmarks, below which unacceptable adverse effects are not expected and above which adverse effects may occur. If effects-based thresholds do not exist or are not warranted for a particular variable, then early warning triggers will be developed *without* thresholds. In such cases, if triggers are exceeded then the implications of such exceedances can only be understood through the integration of results from other AEMP monitoring programs, or, if important information gaps still exist, through focused studies (e.g., risk assessment).

Comparison of the data to trigger values is the initial analytical focus. If trigger values are exceeded, the data are then compared to the applicable thresholds.

Details regarding the derivation of trigger and threshold values for the CREMP are presented in the *CREMP: Design Document 2012* (Azimuth, 2012d). The application of trigger/threshold values complements the spatial-temporal trends assessment initiated in the 2011 CREMP (Azimuth, 2012a), which used trend plots (each showing monitoring results since 2006) to identify patterns of change consistent with one or more of the mining activities described in **Section 1.4**.

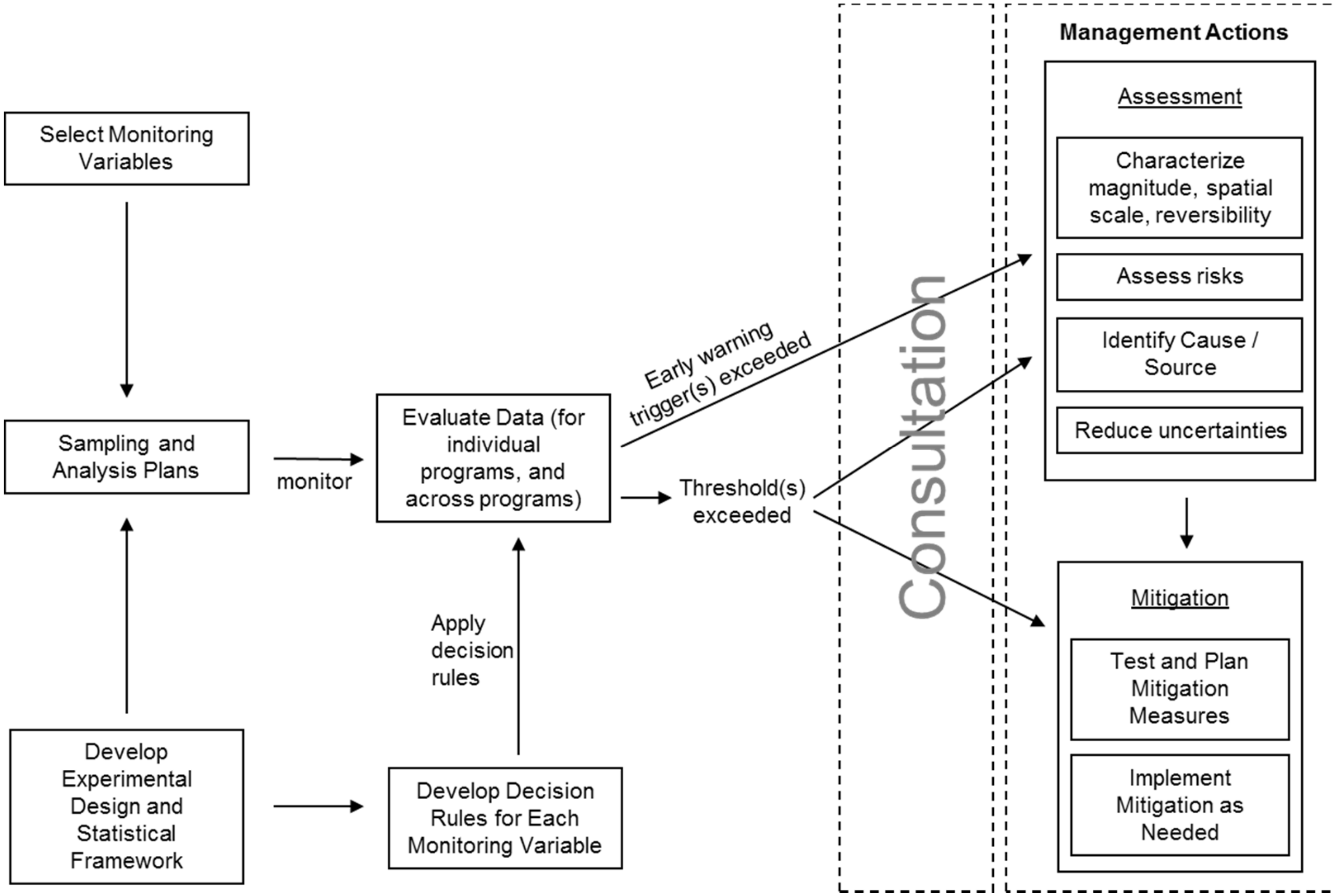
The general rationale for conducting the trend assessment followed these principles:

1. *Establish Expected Conditions* – Control data (i.e., combination of baseline (i.e., pre-mining) data from impact areas and data from remote reference or control areas; see **Table 1.4-2**) were examined to set expectations for a parameter (e.g., water or sediment metal concentration, etc.) in the absence of mining activity. Baseline data were used to infer relative spatial differences (e.g., between a NF and Ref area) and reference data were used to infer regional temporal changes (e.g., the regional decrease in benthic community abundance between 2009 and 2010).
2. *Compare Patterns of Change* – With expected conditions in mind, impact data (i.e., data collected at NF and MF areas after the onset of mining-related activity in proximity to an area; see **Table 1.4-2**) were assessed visually for spatial-temporal patterns (e.g., short-term [in any year] spikes [rapid rises that return to baseline] or longer-term trends [gradual or rapid increases that persist]) matching mining activity (e.g., rise in TSS concentrations at SP in August 2008). Where observed, the spatial and temporal extent and magnitude of the changes were characterized (i.e., do they extend to MF or FF areas, and if so, at what magnitude/duration?).

3. *Provide Context for Magnitude of Change* – As discussed above, site-specific triggers and thresholds were used to provide some context for observed changes to CREMP monitoring parameters. In addition, where applicable and available, results of target studies (e.g., TSS EAS studies) were used to help interpret changes in biological parameters and endpoints.

4. *Identify Parameters for Management* – Identify parameters requiring management action on one of two levels: continued trend monitoring (i.e., to follow low magnitude or weak trends), or active follow-up with more detailed quantitative assessment (i.e., a targeted study to address a potential concern). This process will emphasize issues or concerns present in this year's CREMP results.

Figure 1.5-1. Management response plan for the Meadowbank Mine AEMP.



2. METHODS

2.1. Overview

The *CREMP: 2015 Plan Update* (Azimuth, 2015b) provides detailed documentation of the Meadowbank CREMP. The document describes the CREMP study design and methods, and integrates a number of changes from the previous CREMP plan (Azimuth, 2010d), including those stemming from the NWB Type A Water License renewal process. In an effort to streamline the annual report and reduce redundancy, aspects of the CREMP study design presented in the *CREMP: 2015 Plan Update* are not repeated herein. Readers looking for detailed information on the aspects of the study design such as sampling methods, QA/QC protocols and procedures, and data evaluation criteria are referred to Azimuth (2015b). An overview of the routine CREMP study is provided below.

2.2. Routine CREMP

2.2.1. Sampling Areas

A summary of monitoring events for 2017 CREMP is presented in **Table 2.2-1**. Sampling locations for water, limnology, and phytoplankton were selected randomly[2] from within their respective lake basins (**Figure 1.3-1**) with the exception of WAL in August. The August CREMP water sampling program was adapted to accommodate the sampling and analysis plan for Cycle 3 of the Environmental Effects Monitoring (EEM) program completed at the same time as the CREMP. The two water samples collected in August 2017 were located synoptically with two benthic invertebrate replicate samples to comply with the EEM program requirements. Benthic invertebrate and sediment sampling in WAL is located in an area where the diffuser was placed for dewatering Vault and Phaser Lakes, as well as the ongoing discharge of water from the Vault Attenuation Pond. This area of WAL is estimated to have between 4% and 6% effluent based on the conductivity survey completed in 2017 (C. Portt and Associates, Kilgour & Associates, 2018). Typically the random locations would not be situated in the immediate vicinity of the diffuser for a given monthly sampling event. The location of both August 2017 water samples within the effluent plume in WAL is highlighted in the interpretation of the 2017 CREMP water quality data for certain parameters.

Sediment for chemistry and benthic invertebrate community analyses were collected from the established areas (i.e., depositional zones between 6.5 m and 9 m) in each basin/lake (**Figure 1.3-2**). Global Positioning System (GPS) Universal Transverse Mercator (UTM) coordinates (in NAD 83) for all monitoring components are shown in **Table 2.2-2** for each sampling area.

2.2.2. Sampling Components and Methods

Water quality, sediment quality, phytoplankton community, and benthic invertebrate community were monitored in the 2017 program. Sampling was undertaken according to established SOPs included in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). 2017 was a coring year, and 10 replicate samples were collected from the reference and NF. The coring program is typically completed using a gravity corer at locations where the substrate is amenable to this collection method. The corer was accidentally lost prior to the field program, so the ponar method of collecting sediment cores was used in 2017. Details of how

[2] Target locations for sampling were randomly pre-determined by bounding the sample areas and using a random number generator to select coordinates within those bounds. Coordinates were then recorded in MapSource and in the hand-held GPS units (NAD 83) before going out into the field.

core horizons are collected using the ponar method are outlined in Appendix B of the *CREMP: 2015 Plan Update* (Azimuth, 2015b).

Samples from the 2017 CREMP were sent to the laboratories listed below for analysis.

- Water and sediment chemistry – ALS Laboratories (Burnaby, British Columbia)
- Phytoplankton taxonomy – Plankton R Us Inc. (Winnipeg, Manitoba)
- Benthic invertebrate taxonomy – ZEAS Inc. (Nobleton, Ontario)

2.2.3. Sampling Effort and Frequency Assessment

The new results-driven sampling strategy that was developed as part of the *CREMP: 2015 Plan Update* (Azimuth, 2015b) was implemented for the first time in 2016. The objective of this new strategy is to increase the overall efficiency of the CREMP by maintaining monitoring intensity in the areas most likely to be affected by mining-related activities (i.e., NF areas), while potentially reducing monitoring intensity at MF and FF areas depending on the water quality results observed at up-gradient areas. The annual decision framework presented in the *CREMP: 2015 Plan Update* (Azimuth, 2015b; **Figure 2.2-1** [below]) applies to MF and FF areas at Meadowbank[3] (i.e., MF area TE (which is paired with upstream NF areas TPE, SP, and WAL), MF area TPS (which is paired with NF area TPN), and to FF area TEFF (paired with upstream MF area TE). As per the normal CREMP data analysis process, NF results are evaluated on an annual basis (i.e., with CREMP reporting due at the end of March following each monitoring year), with the NF results (i.e., for "Year") dictating the monitoring requirements for the MF area in the subsequent year (i.e., "Year +1"). The Year +1 NF and MF results are used as the basis to determine the MF and FF monitoring requirements for Year +2, and so on. While the full CREMP program will be conducted at each NF area each year, the specific monitoring requirements for the MF and FF areas vary based on the NF and MF results, respectively. Below are the various outcomes of the CREMP data analysis and associated program requirements for MF and FF areas in the following year (see Azimuth, 2015b for more details, including a worked example of the strategy):

- *No changes identified* – no statistical changes above any trigger values. No further sampling required.
- *Minor changes identified* – statistically significant changes exceeding the early warning trigger values for parameters without effects-based threshold values (i.e., trigger values are based on the 95th percentile of the baseline distribution). Spot sampling through-ice is required to determine if changes extend to MF area (or to FF if such changes are seen at an MF area), but no further sampling is needed that year at the MF or FF areas unless moderate changes (see below) are identified at those areas.
- *Moderate changes identified* – statistically significant changes exceeding the early warning trigger values for parameters with effects-based thresholds (e.g., CCME water quality guidelines for water chemistry parameters). Full CREMP water sampling (all events) is required to determine if changes extend to MF area (or to FF if such changes are seen at an MF area).
- *Major changes identified* – statistically significant changes exceeding the effects-based threshold values. Full CREMP program (i.e., including sediment and biological components) is required to determine if changes extend to MF area (or to FF if such changes are seen at an MF area).

[3] This framework does not apply to the Baker Lake areas as there are no MF or FF areas in Baker Lake.

Minor changes to water quality parameters without toxicologically-derived effects-based thresholds were identified in the 2016 CREMP (Azimuth, 2017a). Following the strategy outlined above, these results warranted a pared-down monitoring program at MF (TPS and TE) and FF (TEFF) areas in 2017. Water sampling through-ice was completed (at NF, MF and FF areas) in March 2017, but further water sampling at MF or FF areas during the open-water season was not completed.

Figure 2.2-1. Annual results-based sampling strategy rules for mid-field and far-field sampling areas.

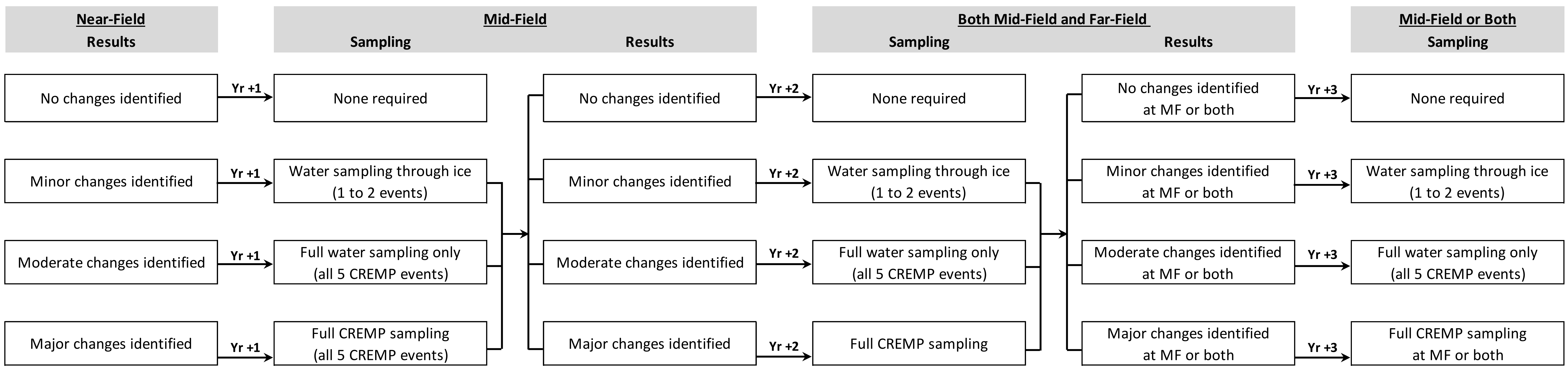


Table 2.2–1. CREMP sampling summary, Meadowbank study lakes and Baker Lake, 2017.

Sampling Month	Sampling Crew	Monitoring Conditions	Monitoring Components	Meadowbank Areas									Baker Areas			
				INUG	PDL	TPN	SP	TPE	WAL	TPS	TE	TEFF	BAP	BES	BBD	BPJ
				REF	REF	NF	NF	NF	NF	MF	MF	FF	REF	REF	NF	NF
January	AEM	Ice	L			✓	✓	✓	✓							
February	AEM	Ice	L			✓	✓	✓	✓							
March	AEM	Ice	L,W,P	✓	✓	✓	✓	✓	✓	✓	✓	✓				
April	AEM	Ice	L			✓	✓	✓	✓							
May	AEM	Ice	L,W,P	✓	✓	✓	✓	✓	✓							
June	***Ice not safe***															
July	AEM	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓
August	Azimuth	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓
			B,S,C*	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓
September	AEM	Open-water	L,W,P	✓	✓	✓	✓	✓	✓				✓		✓	✓
October	***Ice not safe***															
November	AEM	Ice	L,W,P			✓	✓	✓	✓							
December	AEM	Ice	L			✓	✓	✓	✓							

Notes:

Components:

L=Limnology; W=Water chemistry; P=Phytoplankton; B=Benthic invertebrates; S=Sediment grab chemistry; C=Sediment coring chemistry. *Sediment coring is conducted to match the timing of EEM field studies program (i.e., in 2014, 2017, 2020…).

✓ = monitoring components were collected.

x = monitoring components were scheduled but not collected due to equipment issues. Refer to **Section 3.1.6** for more details.

Area designations:

C=Control; I=Impact; REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading); Blank denotes that the area was not part of the monitoring program that year.

Area IDs:

INUG=Inuggugayualik Lake;
PDL=Pipedream Lake
TPN, TPE, TPS=Third Portage Lake - North, East, South basins
SP=Second Portage Lake; WAL=Wally Lake;
TE, TEFF=Tehek Lake – Mid-field and Far-field;
BAP, BES, BBD, BPJ=Baker Lake - Akilahaarjuk Point, East Shore, Barge Dock, Proposed Jetty.

Table 2.2–2. CREMP sampling location coordinates (GPS, UTM, NAD83), Meadowbank study lakes and Baker Lake, 2017

Lake	Area Type[2]	Area-Replicate ID[1]	Water & Phytoplankton (monthly)				Benthos & Sediment Grabs (August)					Sediment Cores (August)			
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing	Area-Replicate	Depth (m)	Zone & Easting	Northing
Third Portage	NF	TPE-limno	January	16	14W 639105	7212277	TPE-1	B & C	8.1	14W 639142	7211731	TPE-SC-1	8.1	14W 639142	7211731
		TPE-limno	February	8	14W 638965	7211485	TPE-2	B & C	7.9	14W 639150	7211695	TPE-SC-2	9.2	14W 639150	7211700
		TPE-100	March	20	14W 637784	7210265	TPE-3	B & C	8.4	14W 639123	7211563	TPE-SC-3	9.3	14W 639122	7211553
		TPE-101	March	5.2	14W 639309	7210415	TPE-4	B & C	8.1	14W 639103	7211541	TPE-SC-4	8.4	14W 639123	7211563
		TPE-limno	April	5.5	14W 639019	7212324	TPE-5	B & C	7.8	14W 639074	7211514	TPE-SC-5	8.1	14W 639103	7211541
		TPE-102	May	5	14W 639203	7210740	TPE-COMP	C				TPE-SC-6	7.8	14W 639074	7211514
		TPE-103	May	5	14W 638605	7211031						TPE-SC-7	8.8	14W 639094	7211528
		TPE-104	July	7.3	14W 639471	7211253						TPE-SC-8	7.8	14W 639057	7211505
		TPE-105	July	6.3	14W 639787	7210501						TPE-SC-9	8.3	14W 639155	7211665
		TPE-106	August	6.9	14W 638493	7211609						TPE-SC-10	8.3	14W 639154	7211683
		TPE-107	August	8.3	14W 637282	7212026									
		TPE-108	September	5	14W 639555	7211567									
		TPE-109	September	5.22	14W 638330	7211147									
		TPE-limno	November	11.2	14W 638216	7212002									
		TPE-limno	December	11	14W 638250	7211971									
	NF	TPN-limno	January	20	14W 636728	7215329	TPN-1	B & C	8.4	14W 636387	7215536	TPN-SC-1	8.4	14W 636384	7215536
		TPN-limno	February	11	14W 636784	7214034	TPN-2	B & C	8.3	14W 636407	7215527	TPN-SC-2	8.3	14W 636378	7215538
		TPN-100	March	5.5	14W 635693	7212774	TPN-3	B & C	8.4	14W 636421	7215515	TPN-SC-3	8.8	14W 636400	7215530
		TPN-101	March	20	14W 634929	7214061	TPN-4	B & C	8.3	14W 636510	7215448	TPN-SC-4	8.5	14W 636338	7215520
		TPN-limno	April	11	14W 636658	7214370	TPN-5	B & C	8.8	14W 636608	7215410	TPN-SC-5	8.3	14W 636407	7215527
		TPN-102	May	20	14W 635855	7213366	TPN-COMP	C				TPN-SC-6	8.4	14W 636421	7215515
		TPN-103	May	13	14W 634919	7213954						TPN-SC-7	7.7	14W 636374	7215546
		TPN-104	July	14	14W 634461	7215808						TPN-SC-8	8.3	14W 636352	7215530
		TPN-105	July	9.3	14W 635857	7215527						TPN-SC-9	8.7	14W 636567	7215416
		TPN-106	August	8.8	14W 635356	7214214						TPN-SC-10	9.5	14W 636575	7215407
		TPN-107	August	10.6	14W 636375	7215520									
		TPN-108	September	5.02	14W 635367	7216092									
		TPN-109	September	15	14W 636462	7212831									
		TPN-limno	November	13.5	14W 636609	7214603									
		TPN-limno	December	15.3	14W 637043	7213454									
	MF	TPS-57	March	9	14W 635700	7209458									
		TPS-58	March	20	14W 633897	7209398									
Second Portage	NF	SP-limno	January	5.5	14W 639509	7213818	SP-1	B & C	7.9	14W 639988	7214064	SP-SC-1	9.8	14W 640012	7214072
		SP-limno	February	13	14W 639987	7213809	SP-2	B & C	8.1	14W 640039	7214114	SP-SC-2	7.9	14W 639988	7214064
		SP-100	March	10	14W 639936	7213808	SP-3	B & C	8.7	14W 640060	7214140	SP-SC-3	8.1	14W 640039	7214114
		SP-101	March	12	14W 640295	7212545	SP-4	B & C	7.8	14W 640061	7214173	SP-SC-4	8.7	14W 640060	7214140
		SP-limno	April	7.3	14W 640705	7213263	SP-5	B & C	8.1	14W 640076	7214219	SP-SC-5	7.8	14W 640061	7214173
		SP-102	May	10.3	14W 640147	7214182	SP-COMP	C				SP-SC-6	8.9	14W 640071	7214171
		SP-103	May	5	14W 639682	7214256						SP-SC-7	8.1	14W 640076	7214219
		SP-104	July	14.8	14W 640034	7213970						SP-SC-8	8.4	14W 640067	7214231
		SP-105	July	7.4	14W 640336	7212513						SP-SC-9	8.2	14W 640067	7214156
		SP-106	August	8.9	14W 639531	7213670						SP-SC-10	8.3	14W 640048	7214130
		SP-107	August	5.4	14W 639589	7213886									
		SP-108	September	9.83	14W 640370	7212541									
		SP-109	September	7.04	14W 640694	7213142									
		SP-limno	November	12.4	14W 639711	7214076									
		SP-limno	December	5.5	14W 639516	7214256									
Tehek	MF	TE-92	March	5.2	15W 360304	7213011									
		TE-93	March	13.7	15W 360937	7212444									
	FF	TEFF-45	March	10.5	15W 362460	7208990									
		TEFF-46	March	8.7	15W 362459	7209503									
Wally	NF	WAL-limno	January	5.2	15W 360456	7221176	WAL-1	B & C	8.0	15W 360951	7220401	WAL-SC-1	8	15W 360951	7220401
		WAL-limno	February	5	15W 362040	7223476	WAL-2	B & C	8.3	15W 360930	7220427	WAL-SC-2	7.7	15W 360938	7220412
		WAL-69	March	9	15W 360997	7221932	WAL-3	B & C	7.9	15W 360889	7220485	WAL-SC-3	8.3	15W 360930	7220427
		WAL-70	March	5.2	15W 360422	7221447	WAL-4	B & C	7.9	15W 360900	7220458	WAL-SC-4	7.1	15W 360917	7220441
		WAL-limno	April	7	15W 362095	7223548	WAL-5	B & C	7.5	15W 360863	7220504	WAL-SC-5	7.9	15W 360889	7220485
		WAL-71	May	7	15W 361786	7222858	WAL-COMP	C				WAL-SC-6	7.5	15W 360877	7220486
		WAL-72	May	5	15W 361183	7222274						WAL-SC-7	7.9	15W 360900	7220458
		WAL-73	July	11.3	15W 360844	7222060						WAL-SC-8	7.3	15W 360891	7220471
		WAL-74	July	5.4	15W 361765	7221549						WAL-SC-9	7.5	15W 360863	7220504
		WAL-75	August	9.2	15W 360975	7220405						WAL-SC-10	7.2	15W 360826	7220520
		WAL-76	August	7.5	15W 360862	7220520									
		WAL-77	September	5.03	15W 360931	7221897									
		WAL-78	September	6.7	15W 361106	7221976									
		WAL-limno	November	8	15W 361825	7222855									
		WAL-limno	December	15	15W 362319	7222978									
Innugugayualik	Ref	INUG-86	March	N/R	14W 621994	7215673	INUG-1	B & C	7.0	14W 622826	7216839	INUG-SC-1	6.5	14W 622818	7216852
		INUG-87	March	15.1	14W 622413	7215739	INUG-2	B & C	7.3	14W 622810	7216795	INUG-SC-2	7	14W 622826	7216839
		INUG-88	May	16	14W 622158	7214901	INUG-3	B & C	7.5	14W 622770	7216799	INUG-SC-3	7.3	14W 622810	7216795
		INUG-89	May	14	14W 622215	7215683	INUG-4	B & C	7.9	14W 622733	7216822	INUG-SC-4	7.5	14W 622770	7216799
		INUG-90	July	9.7	14W 622799	7215656	INUG-5	B & C	8.1	14W 622682	7216817	INUG-SC-5	7.9	14W 622733	7216822
		INUG-91	July	5.32	14W 622545	7215429	INUG-COMP	C				INUG-SC-6	8.1	14W 622682	7216817
		INUG-92	August	7	14W 622826	7216839						INUG-SC-7	8.9	14W 622661	7216779
		INUG-93	August	8	14W 622682	7216817						INUG-SC-8	8.3	14W 622662	7216804
		INUG-94	September	6.4	14W 621851	7214873						INUG-SC-9	8.3	14W 622717	7216784
		INUG-95	September	7	14W 622797	7215497						INUG-SC-10	8.2	14W 622722	7216811
Pipedream	Ref	PDL-51	March	22.4	14W 631261	7225119	PDL-1	B & C	8	14W 630687	7223063	PDL-SC-1	8	14W 630687	7223063
		PDL-52	March	17.8	14W 632532	7224780	PDL-2	B & C	6.9	14W 630600	7223019	PDL-SC-2	6.9	14W 630600	7223019
		PDL-53	May	32	14W 631625	7224861	PDL-3	B & C	6.9	14W 630584	7223009	PDL-SC-3	6.9	14W 630584	7223009
		PDL-54	May	26	14W 632568	7225031	PDL-4	B & C	8	14W 630692	7223007	PDL-SC-4	8	14W 630692	7223007
		PDL-55	July	29.4	14W 631739	7225132	PDL-5	B & C	7.5	14W 630682	7222961	PDL-SC-5	7.5	14W 630682	7222961
		PDL-56	July	15	14W 632451	7225354	PDL-COMP	C				PDL-SC-6	8.5	14W 630692	7222898
		PDL-57	August	9.5	14W 630687	7224063						PDL-SC-7	8.7	14W 630681	7222841
		PDL-58	August	7	14W 630682	7222961						PDL-SC-8	6.8	14W 630578	7222995
		PDL-59	September	12.3	14W 632733	7224742						PDL-SC-9	7	14W 630670	7223025
		PDL-60	September	11.6	14W 629760	7224213						PDL-SC-10	9	14W 630669	7223111

Table 2.2–2. CREMP sampling location coordinates (GPS, UTM, NAD83), Meadowbank study lakes and Baker Lake, 2017

Lake	Area Type[2]	Area-Replicate ID[1]	**Water & Phytoplankton** (monthly)				**Benthos & Sediment Grabs** (August)					**Sediment Cores** (August)			
			Month	Depth (m)	Zone & Easting	Northing	Area-Replicate	Sample Type[3]	Depth (m)[4]	Zone & Easting	Northing	Area-Replicate	Depth (m)	Zone & Easting	Northing
Baker	NF	BBD-49	July	13.4	14W 644617	7135175	BBD-1	B & C	8.6	14W 644444	7135329	BBD-SC-1	8.6	14W 644444	7135329
		BBD-50	July	10.8	14W 643951	7135298	BBD-2	B & C	8.4	14W 644429	7135344	BBD-SC-2	8.4	14W 644429	7135344
		BBD-51	August	12.9	14W 644755	7135147	BBD-3	B & C	8.1	14W 644522	7135318	BBD-SC-3	8.5	14W 644529	7135311
		BBD-52	August	6.7	14W 644613	7135317	BBD-4	B & C	8.2	14W 644604	7135289	BBD-SC-4	8.6	14W 644511	7135309
		BBD-53	September	9.6	14W 644069	7135303	BBD-5	B & C	9.2	14W 644539	7135290	BBD-SC-5	8.2	14W 644604	7135289
		BBD-54	September	10.5	14W 644811	7135208	BBD-COMP	C				BBD-SC-6	8.7	14W 644605	7135278
												BBD-SC-7	9.2	14W 644539	7135290
												BBD-SC-8	9.1	14W 644556	7135278
												BBD-SC-9	8.6	14W 644477	7135322
												BBD-SC-10	8.7	14W 644491	7135317
	NF	BPJ-49	July	16.4	15W 356793	7134246	BPJ-1	B & C	8.4	15W 356267	7134097	BPJ-SC-1	8.4	15W 357267	7134097
		BPJ-50	July	11.8	15W 357329	7134017	BPJ-2	B & C	7.9	15W 357249	7134132	BPJ-SC-2	8.4	15W 357253	7134106
		BPJ-51	August	28.3	15W 356482	7134126	BPJ-3	B & C	8.6	15W 357196	7134138	BPJ-SC-3	7.9	15W 357249	7134132
		BPJ-52	August	24.2	15W 356768	7134084	BPJ-4	B & C	7.6	15W 357071	7134220	BPJ-SC-4	8.3	15W 357230	7134129
		BPJ-53	September	7.3	15W 357390	7133937	BPJ-5	B & C	8.3	15W 357030	7134217	BPJ-SC-5	8.6	15W 357196	7134138
		BPJ-54	September	9.2	15W 356938	7134260	BPJ-COMP	C				BPJ-SC-6	8.4	15W 357169	7134152
												BPJ-SC-7	7.6	15W 357071	7134220
												BPJ-SC-8	7.2	15W 357063	7134227
												BPJ-SC-9	8.3	15W 357030	7134217
												BPJ-SC-10	8.2	15W 357022	7134224
	Ref						BES-1	B & C	7.8	15W 361239	7132401	BES-SC-1	7.8	15W 361239	7132401
							BES-2	B & C	8.2	15W 361256	7132389	BES-SC-2	8.2	15W 361235	7132394
							BES-3	B & C	8	15W 361314	7132359	BES-SC-3	8.2	15W 361256	7132389
							BES-4	B & C	8.3	15W 361367	7132338	BES-SC-4	8.4	15W 361262	7132378
							BES-5	B & C	7.9	15W 361434	7132307	BES-SC-5	8.0	15W 361314	7132359
							BES-COMP	C				BES-SC-6	8.0	15W 361302	7132358
												BES-SC-7	8.3	15W 361367	7132338
												BES-SC-8	9.1	15W 361368	7132321
												BES-SC-9	7.9	15W 361434	7132307
												BES-SC-10	7.4	15W 361427	7132316
	Ref	BAP-49	July	10.4	15W 364108	7131109	BAP-1	B & C	8.3	15W 363965	7131220	BAP-SC-1	8.3	15W 363965	7131220
		BAP-50	July	17	15W 363719	7131122	BAP-2	B & C	7.8	15W 364027	7131190	BAP-SC-2	8.4	15W 363954	7131221
		BAP-51	August	13.9	15W 364032	7130984	BAP-3	B & C	7.8	15W 364074	7131165	BAP-SC-3	7.8	15W 364013	7131198
		BAP-52	August	10.9	15W 364432	7130900	BAP-4	B & C	7.7	15W 364135	7131134	BAP-SC-4	7.8	15W 364027	7131190
		BAP-53	September	12.2	15W 363269	7131294	BAP-5	B & C	8.6	15W 364140	7131059	BAP-SC-5	7.8	15W 364074	7131165
		BAP-54	September	8.4	15W 364032	7131179	BAP-COMP	C				BAP-SC-6	8.4	15W 364075	7131156
												BAP-SC-7	7.7	15W 364135	7131134
												BAP-SC-8	7.8	15W 364140	7131136
												BAP-SC-9	8.6	15W 364140	7131059
												BAP-SC-10	8.3	15W 364140	7131067

Notes:

1. Area IDs are as follows: TPE,TPN,TPS=Third Portage Lake - East, North, South basins; SP=Second Portage Lake; TE,TEFF=Tehek Lake - Farfield; INUG=Inuggugayualik Lake; WAL=Wally Lake; PDL=Pipedream Lake; BBD,BPJ,BES,BAP=Baker Lake - Barge Dock, Proposed Jetty, East Shore, Akilahaarjuk Point.
2. Area types: NF=near-field; MF=mid-field; FF=far-field; Ref=reference.
3. Sample types: B=Benthos; C=chemistry.
4. Comp = composite sample of all 5 replicate samples from each area (no coordinates)

Note that water sampling at BES and sediment/benthic invertebrate sampling at TPS, TE, or TEFF was not completed as per the study design (Azimuth, 2015b).

N/R = depth not recorded (no limno data for this sample

2.3. Quality Assurance / Quality Control

The objective of quality assurance and quality control (QA/QC) is to assure that the chemical and biological data collected are representative of the material or populations being sampled, are of known quality, have sufficient laboratory precision to be highly repeatable, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

An overview of the QA/QC program for each component is provided below; refer to the 2015 CREMP plan (Azimuth, 2015b) update for a complete description.

2.3.1. Surface Water

Laboratory QC

The first step in the QC program involves documenting any issues with the sample submission. ALS reports these as "Sample Integrity" issues in the Sample Receipt Confirmation (SRC) email after the samples are received. Results are typically recorded in the Sample Integrity assessment for one of three reasons: (1) samples were damaged during transport, (2) the temperature inside the cooler was above 10°C when received by the laboratory, or (3) the recommend hold-time was exceeded prior to analysis. Sample integrity issues don't necessarily mean the data are unusable; rather, this information is meant to help the client make an informed decision on how to proceed with analysis and using the results.

There are four main components of the water chemistry laboratory QC program to assess analytical precision, bias, and completeness:

- *Laboratory Duplicate* – a new aliquot from the same sample is analyzed from the start in the same manner as the original aliquot taken from the bottle/jar. The difference between the two analyses is a measure of the variability associated with duplicate analyses of the same sample in the laboratory.
- *Method Blank (MB)* – an analyte-free matrix (e.g., water) subjected to the entire analytical process to demonstrate that the analytical system itself does not introduce contamination.
- *Matrix Spike (MS) / Matrix Duplicate (MD)* – a known amount of a compound similar chemically to the target analyte is added to samples to ascertain any matrix effects on recoveries and to determine the accuracy and precision of the method in this matrix.
- *Laboratory Control Sample (LCS)*[4] – a well-characterized sample of known analytes and concentration. A reference material (i.e., certified reference material) containing certified amounts of target analytes, may be used as an LCS. Percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit.

Laboratory QC results are included in each laboratory report for CREMP water quality samples. The ALS analytical reports are presented in **Appendix F**.

[4] Descriptions of the various QC sample types are found on the ALS Environmental website (Link)

Field QA/QC

The standard QA procedures included thoroughly flushing the flexible tubing and pump to prevent cross-contamination between areas and thoroughly rinsing the sample containers with site water prior to sample collection. Field QC procedures include collection and/or analysis of field duplicates, travel blanks, and equipment blanks. Data quality objectives (DQOs) for each QA/QC sample type are discussed below.

Data Quality Objectives

Duplicate Samples – Quality control results of the laboratory and field duplicates are assessed by measuring the relative percent difference (RPD) between original and duplicate measurements as measure of precision by the laboratory and the magnitude of variability between original and field duplicate samples, respectively. The equation used to calculate a RPD is:

$$RPD = \frac{(A - B)}{(\frac{A + B}{2})} x\ 100$$

where: A = analytical result; B = duplicate result[5].

Laboratory duplicate DQOs are parameter-specific and depend on the concentration in the sample[6]. For most parameters including metals, anions, and nutrients, the DQO is an RPD of less than 20% when the concentration is greater than 10-times the MDL. For parameters with concentrations less than 10-times the MDL, the DQO is a difference in concentration between the original and duplicate samples of less than 2-times the MDL. The DQOs for field duplicates is RPDs less than 50% when concentrations exceed 10-times the MDL. RPD values may be either positive or negative, and ideally should provide a mix of the two, clustered around zero. RPDs are not calculated for cases where one of the samples (i.e., either A or B above) is below detection and the other is not.

Blanks (Travel, Field, Equipment) – Results from both the equipment and travel blanks are examined for detectable concentrations of any of the parameters measured; no parameter in either blank should exceed laboratory method detection limits (MDLs). If an analyte is detected in a blank, the results for the batch of samples submitted with the blank are compared with the measured concentration in the blank; results that are less than 5-times the detected analyte concentration in the equipment blank are flagged to examine the potential for cross-contamination to affect the results[7]. Results carried forward in the QA/QC assessment are given either a cautionary flag or an unreliable flag. Cautionary flags are applied to sample results if the analyte was detected in the blank, but the effect of potential cross-contamination is considered minor (e.g., the concentration in the equipment blank is a small percentage of the concentration in the samples). Unreliable data flags are applied to water quality results that are anomalous or unrepresentative of the water quality (e.g., elevated metals concentrations in a sample that are not observed in other replicate sample(s) collected during the same event). The "cautionary" and "unreliable" data flags are provided for clarity on which results should be excluded from decision making.

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[5] RPD values are not calculated when one of the analytical results is below the MDL.

[6] The list of DQOs for each water quality parameter is provided in Azimuth (2015b; Appendix A, Table 2).

[7] This approach is consistent with how ALS flags unreliable results for the laboratory method blanks.

2.3.2. Sediment

Laboratory QC

Laboratory duplicates were analyzed for sediment chemistry parameters similar to water chemistry parameters. The full list of laboratory DQOs for each parameter are presented in the SOP appended to the *CREMP: 2015 Plan Update* (Azimuth, 2015b).

Field QA/QC

Field QA consisted of taking care between sampling areas, by rinsing and cleaning the sampling gear for sediment grabs (Petite Ponar grab, stainless steel compositing bowls and spoons) and sediment cores (corer and spatula) using site water and phosphate-free cleaning detergent, avoids the possibility of cross-contamination. Field QC measures included collection and analysis of the following:

- *Filter Swipe* – Metals analysis of an ashless filter (QA/QC Filter) that was swiped over the pre-cleaned bowl at four sampling areas to assess the cleaning procedures. The significance of any metal detected on this filter was evaluated by comparing this amount to the measured concentrations in the sediment samples. Where comparisons were required, the concentration of metals originating from any equipment was estimated by dividing the amount detected on the filter (weight) by: the surface area of 2 Petite Ponar grabs (assuming a thickness of 3 cm was collected from each), that was multiplied by the density of sediment (assumed to be 2 g/cm^3).
- *Field Duplicate* – Five duplicate sediment grab samples were collected for the 2016 program. The DQO for field duplicate samples is based on an RPD of 50% for concentrations that are greater than 10-times the MDL.

2.3.3. Biota

Standard procedures were used to collect phytoplankton and benthic invertebrate samples (Azimuth, 2015b). Sampling gear was thoroughly rinsed between sampling areas to ensure that there was no inadvertent introduction (i.e., cross-contamination) of biota from one area to another.

Laboratory QC

Phytoplankton – As a measure of laboratory QA/QC on the enumeration method replicate counts were performed on 10% of the samples. Replicate samples were chosen at random and processed at different times from the original analysis to reduce biases. The laboratory replicate is a new aliquot (10 mL) from the sample jar and is counted from the start in the same manner as the original aliquot (10 mL) taken from the jar. A RPD of 25% for total density and biomass concentrations is considered acceptable for laboratory replicates.

Benthic Invertebrates – ZEAS re-sorts and re-counts approximately 10% of the samples, targeting greater than 90% recovery between the original and re-sorted sample.

Field QA/QC

Phytoplankton – Field duplicates were collected for phytoplankton during each sampling event (i.e., monthly) in coordination with water sample duplicates and were taken in order to assess sampling variability and sample homogeneity. A RPD of 50% for total density and biomass concentrations is considered acceptable.

Benthic Invertebrates – Field replicates (5 per area) were collected for benthos to determine natural variability and heterogeneity. Replicates were collected at least 20 m apart from one another, within the defined sampling areas.

2.4. Data Evaluation Criteria

The specific methods used to apply triggers/thresholds in the evaluation of CREMP monitoring parameters varied by study component; details are presented in the following sections. As discussed in **Section 1.5**, the evaluation process focused on comparisons to early warning triggers; only when triggers were exceeded were monitoring results compared to thresholds. Consequently, methods for applying numerical decision criteria focus on triggers only, but apply equally to threshold values.

A comprehensive review of the data evaluation methods/approach was completed in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). The data evaluation process is summarized by component in the following sections.

2.4.1. Water Chemistry

Water quality data collected in 2017 were evaluated against triggers and thresholds consistent with the existing framework outlined in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). Formal comparison of the water quality data for decision-making purposes was done by comparing the yearly mean[8] parameter concentrations to the trigger values developed separately for the Meadowbank projects lakes, Wally Lake, and Baker Lake areas[9]. Those parameters where the yearly mean was equal to or exceeded the trigger value were formally tested using a one-tailed test of the null hypothesis[10] (significance level of p=0.05) according to the framework outlined below for Meadowbank and Baker Lake areas.

- *Meadowbank Project Lakes and Wally Lake* – A Before-After-Control-Impact (BACI) statistical framework was applied. The BACI model is "paired" (i.e., BACIP) when multiple "before" and "after" events are available. In the BACI model, INUG is used as the reference ("control") area, and the other areas are tested as exposure ("impact") areas. Both PDL and TEFF are excluded as control areas in the BACI analysis because neither area was sampled in the "before" period between 2006 and 2008. True "pre-impact" data (i.e., when both INUG and the test area had "control" ("C") status; see **Table 1.4-2**) were used for the "before" data. Only events when both INUG and the test area were sampled in 2017 were used as the "after" data.
- *Baker Lake* – Baker Lake areas were designated as "control" (BAP) or "impact" (BPJ and BBD) when sampling started in 2008 (i.e., there was no detailed baseline sampling was conducted for Baker Lake; see **Table 1.4-2**), so there are no true "pre-impact" "before" data. While a spatial "CI" design could be used to test for differences between reference "control" and exposure "impact" areas, the design does not allow for distinguishing natural differences between areas from development-related changes. Given that no development-related changes had been

[8] Yearly means were calculated by first calculating the monthly mean for each parameter per area, then calculating the yearly mean on an area-specific basis. Values that were less than the MDL were conservatively set to the MDL.

[9] Separate water quality triggers were developed for Wally Lake from the other Meadowbank areas when mining activities transitioned from the North and South Portage Pits (discharge to TPN) to the Vault Lake area (discharge to WAL) in 2013 (**Table 1.4-1**).

[10] The null hypothesis is "test" area concentrations either did not change or decreased. The alternative hypothesis is that they increased.

identified to date, all years of data up to and including 2015 were considered in the "before" period while the 2016 results were considered "after" period data (i.e., allowing the more robust BACI analysis). Thus, the BACI analyses specifically looked at changes in 2016 at the two "impact" areas relative to previous years.

In addition to the trigger/threshold evaluation, annual CREMP water chemistry data were also compared to the maximum whole-lake average water quality modelling predictions for Third Portage, Second Portage, and Wally Lakes made during the environmental assessment process (Cumberland, 2005). While direct comparisons were made, the difference in spatial focus (i.e., the CREMP at the basin scale and the water quality model at the whole-lake scale) warrants caution interpreting any differences. To that end, the assessment criteria outlined in the Final Environmental Impact Statement (FEIS; Cumberland, 2005) for defining the predicted magnitude of impacts to water quality will be used to provide the appropriate context for interpreting the screening results as follows:

- *Negligible*: water quality concentrations are similar to baseline
- *Low*: concentrations are < 1x the CCME WQG
- *Medium*: concentrations are between 1 and 10-times the CCME guidelines
- *High*: concentrations are less than MMER but greater than 10-times the CCME guidelines
- *Very High*: concentrations exceed MMER standards

2.4.2. Sediment Chemistry

Sediment chemistry core sampling for the CREMP is completed every three years and is intended to detect long term trends in metals concentrations in the top layer of sediment (0 to 1.5 cm)[11]. Statistical comparison of sediment core chemistry data against new trigger values was completed in 2017 in accordance with the *CREMP: 2015 Plan Update* (Azimuth, 2015b). Prior to the 2017 CREMP (this report), separate sediment core chemistry trigger values were developed for the Meadowbank and Baker Lake areas based on control ("baseline") chemistry data from 2008 and 2009 (see table below). For the 2017 CREMP report, control sediment core chemistry data collected in 2012, 2014, and 2017 were used to update the trigger values for the Meadowbank and Baker Lake areas. New sediment chemistry trigger values were also derived specifically for Wally Lake using baseline core chemistry data from 2008 and 2012, before the area designation changed from "before" to "after" in July 2013. The number of baseline samples collected for each system was 180 for Meadowbank areas, 20 for Wally Lake, and 55 for Baker Lake areas:

Area	2008	2009	2012	2014	2017	N
Meadowbank Areas						**180**
• INUG	15	15	5	5	10	
• PDL	0	0	5	5	10	
• TPN	15	0	0	0	0	
• TPE	15	15	0	0	0	
• SP	15	0	0	0	0	

[11] Sediment grabs samples are collected annually synoptically with the benthic invertebrate samples. In addition to characterizing physical conditions (e.g., grain size and organic carbon content), they provide additional information on temporal changes in sediment metals concentrations. The sediment grab chemistry results are evaluated against the sediment triggers, but BACI statistical analysis is limited to core samples collected every three years.

Area	2008	2009	2012	2014	2017	N
• TPS	15	0	5	5	0	
• TE	15	0	0	0	0	
• TEFF	0	0	5	5	0	
Wally Lake (WAL)	15	0	5	0	0	**20**
Baker Lake Areas						**55**
• BAP	15	0	5	5	10	
• BES	0	0	5	5	10	

Notes:

N = the number of baseline samples used to derive the sediment trigger values in each area.

Sediment triggers for the seven metals (i.e., arsenic, cadmium, copper, chromium, lead, mercury, and zinc) were updated, or in the case of Wally Lake, newly-derived, using methods outlined in Appendix D of the *CREMP: 2015 Plan Update* (Azimuth, 2015b). One of two methods (A or B) were applied depending on the data for each area:

Method A. the value halfway between the baseline median core chemistry results and the CCME interim sediment quality guideline (i.e., the threshold)

Method B. the 95th percentile of the baseline sediment core chemistry results

The new and old sediment triggers for Meadowbank, Wally, and Baker Lake areas are shown in **Table 2.4-1**, along with information on the derivation method for each parameter. Refer to Appendix D (Azimuth, 2015b) for a more detailed discussion of the rationale and approach to development of sediment chemistry triggers for the CREMP.

Formal comparison of the sediment chemistry data for decision-making purposes was done by comparing the yearly mean parameter (metal) concentrations to the updated trigger values developed separately for the Meadowbank projects lakes, Wally Lake, and Baker Lake areas. Those parameters where the yearly mean was equal to or exceeded triggers were formally tested using a before-after (BA) statistical model[12]. Sediment chemistry can be quite variable over a small spatial scale within a given basin, but natural seasonal variability in sediment chemistry is assumed to be low given the low rates of natural sediment deposition in Arctic lakes (Azimuth, 2012d). The BA statistical model assumes that, in absence of mining-related inputs, annual variability in sediment chemistry is negligible.

[12] One-tailed test of the null hypothesis that concentrations are not different (or lower) in the after period relative to the before period (significance level of p=0.05)); the alternate hypothesis is that concentrations have increased in relation to mining.

Table 2.4-1. Summary of trigger values for sediment core samples for Meadowbank, Wally, and Baker Lake areas.

Variable	Threshold[1]	DL	N	>DL	Median	95th %ile	Method[2]	Trigger Values		
								New[3]	Old[4]	Change[5]
Meadowbank Study Areas										
Arsenic	5.9	0.1	180	178	26.7	120.9	B	120.9	120.0	Increase
Cadmium	0.6	0.02	180	115	0.27	1.1	B	1.10	1.10	No Change
Chromium	37.3	0.5	180	180	90	135	B	135	114	Increase
Copper	35.7	0.5	180	180	55.7	83.4	B	83.4	126	Decrease
Lead	35	0.5	180	62	15.5	21.7	A	25.3	32.5	Decrease
Mercury	0.17	0.005	180	180	0.034	0.059	A	0.102	0.104	Decrease
Zinc	123	2	180	180	89.9	114.2	B	114.2	121.3	Decrease
Wally Lake										
Arsenic	5.9	0.1	20	20	29.1	44.5	B	44.5	-	n/a
Cadmium	0.6	0.02	20	14	0.51	0.7	B	0.66	-	n/a
Chromium	37.3	0.5	20	20	51.8	61.2	B	61.2	-	n/a
Copper	35.7	0.5	20	20	148	257.1	B	257.1	-	n/a
Lead	35	0.5	20	14	32	36.5	B	36.5	-	n/a
Mercury	0.17	0.005	20	20	0.071	0.087	A	0.12	-	n/a
Zinc	123	2	20	20	105	142.1	B	142.1	-	n/a
Baker Lake Areas										
Arsenic	5.9	0.1	55	43	3.5	7.6	B	7.6	8.3	Decrease
Cadmium	0.6	0.02	55	18	0.04	0.05	A	0.32	0.55	Decrease
Chromium	37.3	0.5	55	55	16.3	22.4	A	26.8	27	Decrease
Copper	35.7	0.5	55	55	4.8	8.3	A	20.3	20.5	Decrease
Lead	35	0.5	55	40	3.9	5.6	A	19.5	32.5	Decrease
Mercury	0.17	0.005	55	30	0.005	0.009	A	0.088	0.088	No Change
Zinc	123	2	55	55	23.2	31.1	A	73.1	73.6	Decrease

Notes:

1. Threshold values set equal to the CCME iterim sediment quality guideline except in cases (*) where the trigger value is greater than the threshold.
2. Method used to determine the new trigger value:
   A = midpoint value between the median concentration and the threshold value.
   B = 95^{th} percentile of the baseline data.
3. New = trigger values developed for the 2017 CREMP.
4. Old = trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d).

"-" no Wally Lake specific trigger values were previously in place. The same sediment trigger values (i.e., "Old") shown for the Meadowbank project lakes were previously applied to Wally Lake.

5. Comparison of "New" vs "Old" sediment chemistry triggers.

n/a = not applicable given there were no Wally Lake specific trigger values prior to the 2017 CREMP.

2.4.3. Phytoplankton

Trigger and threshold value development was discussed in detail in the original CREMP Design Document (Azimuth, 2012d). Phytoplankton triggers and thresholds are set to relative changes (increases or decreases of 20% and 50%, respectively) in total biomass and species richness at test areas using the BACI framework[13]. The evaluation procedure was analogous to that used for water chemistry, except that area means for 2017 were not directly comparable to triggers (i.e., since the triggers/thresholds are based on the relative change over time in a parameter rather than on a finite value), so the process started with the BACI testing. Two-tailed tests of the null hypothesis (i.e., that test areas experienced no relative change up or down) were conducted with a significance level of p=0.1.

2.4.4. Benthic Invertebrates

Similar to phytoplankton, triggers and thresholds were set to relative changes (decreases of 20% and 50%, respectively) in total biomass and species richness at test areas using the BACI framework. The CREMP uses percent change rather than standard deviations which are used in EEM, to maintain a transparent (fixed) effect size that is more likely to be ecologically relevant. Statistical power increases with consideration of more "after" period years (Note: benthic invertebrates are sampled yearly in August); consequently, BACI analyses were conducted on four "after" data period lengths: one year (2017 only), two years (2016-2017), three years (2015-2017), and four years (2014-2017). One-tailed tests of the null hypothesis were conducted with a significance level of p=0.1[14].

Similar to water chemistry (**Section 2.4.1**), there is no baseline benthic community data for Baker Lake, so there are no true "pre-impact" "before" data. While a spatial "CI" design could be used to test for differences between reference "control" and exposure "impact" areas, the design does not allow for distinguishing natural differences between areas from development-related changes. Rather, since no development-related changes had been identified to date, the temporal scenarios for Baker Lake used all the data (i.e., 2017 was compared to 2008-2016; 2016/2017 was compared to 2008-2015…and so on). Thus, the series of comparisons provides a more robust means to identify temporal changes due to mining-related activities in Baker Lake.

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[13] BACI framework involves paired monthly sampling events at "control" [INUG or BAP] and "impact" [i.e., NF or MF areas] areas over two periods ["before" and "after"], with "months" as the unit for temporal replication).

[14] The null hypothesis is "test" area measures (total biomass and species richness) either did not change or increased. The alternative hypothesis is that they decreased. Despite this BACI being conducted as a one-tailed test, the p value was left at 0.1 to help improve statistical power for the benthic invertebrate endpoints.

3. RESULTS AND DISCUSSION

The QA/QC results for the 2017 CREMP program are presented and discussed in **Section 3.1**. Results of the 2017 CREMP program are presented and discussed separately for the Meadowbank project lakes (**Section 3.2**) and Baker Lake (**Section 3.3**). The Meadowbank and Baker Lake sections are subdivided by study component (e.g., limnology, water chemistry, etc.) with the discussion organized into the following sub-headings:

- *General Observations* – This provides a synopsis of expected conditions in the absence of mining-related activities (i.e., based on baseline and reference data [i.e., "control" status data; see textbox in **Section 1.3** and text in **Section 1.4**]).
- *Temporal and Spatial Trend Interpretation* – This (1) describes the types of changes that could be expected in relation to mining activity, specific to the parameters in question; (2) identifies trends in parameters that are associated with mining-related activities; (3) provides context for the magnitude of observed changes relative to trigger and threshold value; and (4) identifies parameters requiring management action on two levels: a) continued trend monitoring in 2018 (i.e., to follow low magnitude or weak trends), or b) active follow-up with more detailed quantitative assessment in 2018 (i.e., a targeted study to address a potential concern).

3.1. QA/QC

QA/QC procedures consisted of a combination of careful field collection and sample handling, the collection of field duplicate samples and the analysis of laboratory replicates and standard reference materials. A discussion of sample shipping and handling procedures is provided upfront, followed by a discussion of the results pertaining to the various CREMP components.

3.1.1. Sample Shipping and Handling

Sample shipping and handling concerns document in previous CREMP reports have largely been rectified in recent years. The Meadowbank Environment Department plans water sampling events to minimize the amount of time that samples are in transit between Site, Val d'Or, and ALS in Burnaby. The remote location of the mine will always challenges with some analytes meeting recommended hold-times, but the effect of slightly exceeding hold-times on the quality of the results is considered negligible. Correspondence with the lab regarding hold time exceedance hasn't led to establishing definitive benchmarks for data quality. ALS recommends "professional judgement" when interpreting chemistry data for parameters that exceeded hold-times for analysis.

The ALS analytical reports for the 2017 CREMP are listed in **Table 3.1-1**. The table provides a summary of the ALS QA assessment for each certificate of analysis (COA) such as sample integrity observations (e.g., broken sample containers, mislabelled containers), cooler temperature upon delivery to the lab, and parameters that exceeded the recommended hold-time for analysis. In these cases where sample bottles were broken (i.e., Hg in May), the lab took an aliquot from either the conventional or TSS/TDS bottle, preserved the sample, and analyzed accordingly.

3.1.2. Water Chemistry

Field duplicates, laboratory duplicates, and blank samples were analyzed as part of the QA/QC program in each of the five sampling events in 2017. Results of the QA/QC analysis are discussed below, along with a discussion on the implications of the QA/QC assessment on the sample results from 2017.

- **Travel Blanks** – Two travel blanks sent to Site at the beginning of the program were analyzed in the March and May sampling events. The full suite of parameters (excluding dissolved metals) were analyzed. With the exception of ammonia in the May travel blank, all parameters were below the MDL (**Table 3.1-2**). Ammonia was detected in the May travel blank at 0.006 mg/L, slightly about the MDL of 0.005 mg/L. The results is likely an artifact of analytical variability and is inconsequential to the data quality for the samples collected in May. Travel blanks were not submitted with the other sampling events; however, de-ionized (DI) water blanks were analyzed for each event and provide a measure of DI water quality and laboratory analytical variability.
- **Deionized Blanks** – The goal of these blanks is to test the quality of the DI water batch and/or variability in laboratory analytical methods. One DI blank with the full suite of analyses was submitted for each event with the exception of September (**Table 3.1-2**). The March DI blank had detectable concentrations of dissolved orthophosphate and phosphorus (total dissolved) at concentrations equal to the detection limit. Total molybdenum was detected in the July DI blank slightly at 0.00013 mg/L, three-fold higher than the MDL (0.00005 mg/L). In both events, the EB collected concurrently had concentrations of the parameters in question measured at concentrations below the MDL, indicating the quality of the DI water is high. The plausible explanation(s) for detected concentrations of phosphate in the March DI blank and molybdenum in the July DI blank are 1) variability in the analytical method, or 2) particulate debris falling into the sample container during collection. The holistic review of the DI blanks did not identify any parameters with low confidence in the analytical results.
- **Equipment Blanks** – Several parameters were detected in at least one of the equipment blanks submitted in 2017 (**Table 3.1-2**). Results for the EB analysis were detected at concentrations less than 10-times the MDL with the exception of lead in the September EB. Detected concentrations of certain parameters, particularly lead, barium, and strontium have been recorded since the more expansive QA of the water quality data was implemented in 2015. The pump and tubing method for collecting samples has certain advantages, particularly when collecting water samples for the winter through-ice sampling events. In the vast majority of cases where a metal is detect in the EB, the implication of possible cross-contamination on interpreting the water quality data from the same event is considered inconsequential. A more detailed discussion of the EB results in the context of the 2017 water quality data is discussed at the end of this section.

Fraction	Parameter	Months				
		Mar	May	Jul	Aug	Sept
Unfiltered	Turbidity	○		○		
	TKN	○				
	Aluminum	○				○
	Antimony					○
	Barium	○		○	○	○
	Calcium			○		○
	Chromium					○
	Copper					○
	Iron					○
	Lead	○			○	●
	Manganese	○				○
	Nickel					○

Fraction	Parameter	Months				
		Mar	May	Jul	Aug	Sept
Unfiltered	Silicon	○				
	Strontium			○		○
	Zinc			○		○
Filtered	Aluminum					
	Arsenic					○
	Barium	○		○		●
	Calcium			○		○
	Copper		○			
	Manganese					
	Sodium					
	Strontium			○		○
	Zinc	○		○		○
	DOC		○	○		

Notes:
○ < 10-times the MDL
● >10-times the MDL

- **Field Duplicates** – The target frequency of duplicate sample collection is approximately 10% of the total number of samples. There were a total of 9 duplicates collected in 2017, corresponding to 10.7% of the total number of water samples (84) collected at the Meadowbank and Baker Lake areas. Two field duplicates were collected in each event with the exception of September where only one was collected (**Table 3.1-3**). The field duplicate samples showed a high level of consistency with the original samples. Of the over 900 paired RPD comparisons in 2017, there were only 5 instances where the RPD exceeded 50%, and none of these samples had original and duplicate concentrations greater than 10-times the MDL.
- **Laboratory QC Samples** – ALS provides a thorough account of their QA assessment in each COA that is issued. The various components of the QA assessment are provided to help make informed decisions when interpreting the data. The QA program is comprised of four main elements:
    1. *Laboratory Duplicates* – The laboratory DQO for most parameters is an RPD of less than 20%. There were no instances where the laboratory DQOs was exceeded in 2017 (**Table 3.1-1**).
    2. *Method blanks (MB)* – The MB is a blank matrix sample that is taken through the entire analytical procedure to test variability in the analytical method and report any bias in the analysis. MB results are equal to the limit of reporting (or MDL as termed here). MDLs were adjusted for water samples with detected concentrations below 5x blank level (termed MB-LOR in **Table 3.1-3**). In total, only 5 parameters were flagged in the 2017 data set for not meeting the MB DQO. The limited number of cases with DQO flags for MB samples were reviewed; the results do not affect the interpretation of the 2017 water quality data.

3. *Matrix Spike (MS)* – MS recovery is periodically flagged in the QC assessment due to high concentrations of the analyte in the sample. These instances are rare, and are typically associated with parameters such as major cations (e.g., magnesium) or certain metals with detected results above the MDL (i.e., strontium). The limited number of cases with DQO flags for MS samples were reviewed; the results do not affect the interpretation of the 2017 water quality data.
4. *Laboratory Control Samples (LCS) / Certified Reference Material (CRM) / Internal Reference Material (IRM)* – reference material analysis met the ALS DQOs for all samples analyzed as part of the 2017 CREMP.

- **Anomalous Results** – Part of the QA assessment involves comparing the paired sampling events collected at each station within a given event to confirm the data are representative of current conditions. If the paired samples vary drastically in their concentrations, and no plausible reason for different concentrations is identified, the anomalous result is flagged as unreliable. Three instances were noted in the 2017 CREMP report when comparing the paired monthly samples: total chromium at PDL-58 in August, total mercury at BBD-51 in August, and DOC at TPN-102 in May. The chromium result from PDL was clearly an outlier when compared to the other sample from August, as well as compared to historical data. Similarly, mercury at BBD was an order of magnitude above the MDL. The other sample collected at BBD was less than MDL. The DOC result from TPN in May was higher than the TOC value in the same sample, indicating a potential labelling issue or an issue with how the sample was collected. These three results are not considered representative of water quality in each area, and as such, were excluded from formal data analysis.

Summary

The field and laboratory duplicate analyses showed a high degree of similarity in 2017. The few exceedances of the established DQOs represent much less than 1% of the total for QA samples and parameters measured. When comparing results for a large number of parameters, many of which are near detection limits, simple odds dictate that a few parameters will exceed DQOs due to laboratory variability (i.e., a false positive). Overall, there was no pattern in the nature of the exceedances that indicates a bias of specific parameters one way or another.

Three results were flagged as unreliable and excluded from formal analysis: (total chromium in PDL-58 [August], DOC in TPN [May], and total mercury at BBD [Aug]). The results were flagged as outliers during initial analysis of the data. For transparency the results are shown in **Table 3.2-1** (PDL and TPN) and **Table 3.3-1** (BBD) but they are excluded from the formal BACI analysis and plots.

The implication of possible cross-contamination on interpretation of the 2017 water quality data was evaluated by comparing the sample concentrations with the equipment blank results from the same event[15]. Sample results in **Table 3.2-1** (Meadowbank) and **Table 3.3-1** (Baker) were given a cautionary flag using underlining (e.g., <u>0.001</u>) to indicate that the measured concentration was less than 5-times the concentration detected in the equipment blank. Of the analytes detected in the equipment blanks, lead, barium, calcium, and strontium (among others) were routinely given a "cautionary" flag because the concentrations were consistently within 5-times the MDL, meaning there is potential for cross-

[15] If more than one equipment blank was submitted for a given event, the maximum detected concentration was compared against the samples results.

contamination to bias the sample results higher. Analysis of the water quality data relative to the triggers and thresholds was done on the entire data set, including the cautionary flagged data. Dissolved lead at TPN in September was the only instance where the flagged result (0.0006 mg/L) exceeded the trigger value (0.00052 mg/L). The other sample collected at TPN was less than the MDL, as has been the majority of the results dating back to 2006 at TPN (**Figure A1–26**). The total lead concentration in the same sample was less than the MDL, indicating little confidence in the accuracy of the detected dissolved lead concentration. This result should be interpreted with caution in light of the available evidence suggesting lead (total and dissolved) is largely below the MDL at TPN. Overall, potential cross-contamination is considered unlikely to bias interpretation of the 2017 water quality analysis.

3.1.3. Sediment Chemistry

The QA/QC assessment of the 2017 sediment chemistry includes a review of the field and laboratory duplicate results, filter swipes for cross-contamination, and the QC report from ALS for sediment grab and core samples submitted in 2017 (**Table 3.1-1**). The 2017 sediment chemistry QA data is presented in the following three tables:

- Sediment core chemistry (metals): **Table 3.1-4**
- Sediment grab chemistry (metals) **Table 3.1-5**
- Sediment grab chemistry (hydrocarbons and PAHs): **Table 3.1-6**

The tables document the results of the field and laboratory duplicate samples analyses and the QA swipe data for assessing cross-contamination of the field equipment (metals only). Below are the main points from the 2017 QA review of the sediment chemistry results.

- **ALS QC Reports –** A summary of the various QC reports issued in 2017 is presented in **Table 3.1-1** along with the results from the water chemistry analysis. Four analytical reports were issued for the 2017 sediment sampling program, one each for the grab and core chemistry results from Meadowbank and Baker Lake sampling programs.
    - *Sample Integrity* **–** There were no sample integrity issues with any of the sample submissions in 2017. Hold-times for analysis were met for all analytes except for BES-2 which analyzed six days past the recommended hold-time. This delay was related to ALS and not reflective of the timely shipping and handling of samples from Site.
    - *Detection Limits* – Detection limits were met for all metals analyzed in 2017. There were a few instances where DLs were raised for TOC in each of the four certificates of analysis (COA). The target DL for TOC is 0.05%, but in a few cases the DL was raised to 0.075%. These instances of elevated DLs occurred in samples with low TOC content in the 0.5 to 2 % range. The elevated DLs lower the confidence of the results, but do not affect the overall interpretation of the results.

      ALS documented that some Meadowbank grab samples submitted for particle size analysis had less than the recommended mass of 100 g of sediment. The lab noted higher uncertainty for these results.

      Hydrocarbon and PAH analysis for some samples from the Meadowbank project lakes had elevated DLs. For acenaphthene, acenaphthylene, and dibenz(a,h)anthracene, the elevated DLs exceeded the CCME interim sediment quality guidelines (ISQGs) used for screening (see **Table 3.2-11**). The lab noted that high moisture content in the sediment was responsible for the elevated DLs for these parameters. Historically, hydrocarbons and PAHs are almost always below the DL. The handful of cases with elevated DLs in

2017 relative to the CCME ISQGs do not change the overall conclusion that hydrocarbons and PAHs in the sediment occur at concentrations at or below the analytical detection limit and well below concentrations shown to cause adverse effects to aquatic life. Issues with moisture content and elevated DLs will be discussed with the lab prior to the 2018 field season.

- **Field Duplicates** – Ten core sample field duplicates and five grab sample duplicates were collected in 2017. Of the 760 analytical measurements on the core samples and field duplicates in 2017, only nine instances were recorded where the RPD was greater than 50%. Of these nine cases, only four occurred for samples where the result was greater than 10-times the MDL (**Table 3.1-4**). Similar consistency was noted in among the 5 duplicate grab samples. INUG-2 and the duplicate sample exceeded the RPD DQO of 50% TOC. Slight exceedances of the 50% RPD DQO between field duplicates are not uncommon in sediment, but overall the consistency in field replicate data demonstrates low variability associated with subsampling error and analytical error. There were no field duplicate DQO exceedances for the hydrocarbon and PAH analyses in 2017.
- **Laboratory Duplicates** – There were no cases where the RPD value exceeded the parameter-specific DQOs listed in **Table 3.1-4** (cores, metals), **Table 3.1-5** (grabs; metals) and **Table 3.1-6** (grabs; hydrocarbons and PAHs). These results confirm that sediments were well homogenized in the field and that the laboratory processing and analytical methods were consistent between sub-samples.
- **Filter Swipes** – Filter swipes were taken on various pieces of the sampling gear to quantify potential metals cross-contamination for grab and core samples. Ashless filters were swiped on the various sampling gear including the stainless steel spoons and bowls, the core ring, plastic spatulas used for core slicing, and the Petite Ponar[16] and analyzed for metals (µg/filter). There were a number of metal parameters that were detected on the blank filter swipe that confounded the interpretation of the swipe results. Whatman™ glass microfiber filters (47 mm) were used as swipe material in 2017. The filters are made entirely of borosilicate glass and are touted as "the industry standard for high purity filtration". Aluminum, barium, calcium, iron, potassium, sodium, strontium, and zinc on the filter paper were detected on the blank filter paper as well as the equipment swipes of the core sampling equipment (**Table 3.1-4**) and grab sampling equipment (**Table 3.1-5**). A nominal threshold of 20% greater concentration in the equipment swipe vs the blank was used as an indicator of the potential for cross-contamination. For the core swipes, iron and manganese were the only two metals detected 20% above the amount measured in the blank. When comparing the amount of each metal on the filters to the concentration in the sediment core samples, the potential percent contribution from the swipe was less than 0.01% for both metals. Iron and manganese, as well as chromium, were also detected on the filter swipes of the grab sampling equipment. In all three cases the concentrations corresponded to well below 0.01% of the concentrations present in the sediment grabs. Despite the confounding effects of metals in the blank swipes, the QA results from 2017 show the potential for cross-

[16] Equipment swipes were taken on equipment that comes in contact with sediment collected for chemistry. Sediment for core sampling was in contact with the 1.5 cm core ring, spatulas for removing the core from the ponar, the removable ponar screens, and stainless steel bowls and spoons. Sediment for grab sampling was in contact with the ponar and stainless steel bowls and spoons.

contamination to effect the sediment chemistry results is negligible. A new filter swipe product will be used for the 2018 CREMP.

3.1.4. Phytoplankton

Two field duplicate samples were collected for each sampling event with the exception of September, when only one was collected. The field duplicates and laboratory QC duplicates were analyzed for the RPD in total density and total biomass between the original sample and the duplicate. RPD values were also calculated for the major taxa groups, but these results are not relied on for QC purposes because of the tendency for small differences in abundance/biomass between the original and the duplicate to cause large differences in the RPD. Thus, we evaluate the quality of these data based on total density and total biomass both for field and laboratory duplicates.

Results of the RPD analysis for all these parameters are presented in **Table 3.1-7** (field) and **Table 3.1-8** (laboratory) and are discussed below:

- **Field Duplicates** – There were two DQO exceedances for total biomass (RPD = 95% in March field duplicate at TPE; RPD = -54% in May INUG field duplicate); both of these occurred under ice cover when total phytoplankton biomass was low. The effects of natural spatial heterogeneity are exacerbated when biomass is low. Total density slightly exceeded the RPD DQO, by between 3% and 10%, in four of nine 2017 field duplicates (DQO exceedances in field duplicates in March at TPE and WAL, in May at INUG, and in July at TPN; absolute value of RPD exceedances were between 53% and 60%); similar to total biomass, three of these four total density DQO exceedances occurred under ice cover. While there were occasional excursions from the DQOs, overall data quality is considered good and meets the needs of this study. Although not specified as required components in this program's DQOs (**Section 2.3.3**), total richness, and Simpson's diversity endpoints were all below the 50% RPD DQO for all field duplicate samples in 2017.
- **Laboratory Duplicates** – Duplicate re-counts were conducted on over 10% of the 2017 samples. No DQO exceedances were observed for the total density and total biomass endpoints in laboratory duplicates.
- **Overall** – While there were some DQO excursions in the field duplicate samples, the majority of those occurred during ice cover when phytoplankton communities have low biomass and densities. Phytoplankton metrics are known to be variable and interpretation of trends should not focus too much on individual values. Overall, the 2017 results met the data quality needs of the project.

3.1.5. Benthic Invertebrates

Laboratory replicate counts were performed on 10% of all benthic samples. Replicate samples were chosen at random and processed at different times from the original analysis to reduce bias. Percent recovery was above 91% in all re-sorted samples, with an average percent recovery of approximately 98% (**Table 3.1-9**). These results suggest that the majority of individual organisms are recovered by the taxonomist during enumeration. As in previous years, the reference collection of benthic taxa for this project has been maintained.

3.1.6. QA/QC Summary

Below is a summary of field and sample QA/QC results for the 2017 CREMP program:

- Deviations from the proposed sampling plan:

  - Benthic invertebrate samples at INUG, PDL, and WAL were collected as individual subsamples (2) per replicate (5) in each area to comply with the EEM program. However, as described above, data from the individual subsamples were combined prior to analysis to match the rest of the CREMP.
- Chemistry Data from 2017:
  - Field duplicate water and sediment samples were collected at a frequency of approximately 10% for each program. There were a limited number of measurements that did not meet the DQOs.
  - Laboratory QA/QC analyses (blanks, duplicates, certified reference material) were performed in accordance with ALS's DQO's.
  - Three results were considered anomalous and removed from the data set: total chromium at PDL-58 in August, DOC at TPN-102 in May, and total mercury at BBD-51 in August. These results were clearly not representative of conditions in the lakes (**3.1.2**).
- Blanks:
  - Travel blanks were submitted for the March and May sampling events to confirm the quality of the DI water for interpreting the potential for cross-contamination.
  - Blanks (DI and EB) were submitted in each sampling event except for the September where the DI blank was missing. EB results suggest the SOP needs to be refined to reduce the potential for cross-contamination when collecting the samples. The main recommendation for 2018 is increasing the amount of time that the pump circulates water at each station prior to collecting the samples. Overall, the potential cross-contamination effect (bias) on interpretation of the 2017 data was considered negligible.
- Lost, damaged, and or compromised data:
  - Shipping – temperatures inside the coolers continue exceed 20°C upon arrival at ALS for the summer sampling events (July and August). The effect on preserved samples is considered negligible, but for chlorophyll-a samples the increase in temperature means samples may arrive thawed. Keeping the chlorophyll-a samples frozen is a recurring challenge for this program given the logistics of shipping samples from Nunavut to Vancouver in a timely fashion. There were a couple minor discrepancies between the COCs and sample labels that were easily addressed in correspondence with Agnico Eagle and ALS.

Table 3.1–1. Laboratory QA/QC summary for the 2017 CREMP water and sediment quality program.

								Laboratory QC Summary									
					Sample Integrity			Detection Limits		Laboratory Duplicates		Method Blanks		Matrix Spike		LCS / CRM	
Event	**Lab ID**	**Parameters Measured**	**Date sampled**	**Date received**	**Observations**	**Temperature (°C)**	**Hold-time Exceedances**	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier
March	L1908589	All parameters	March 24 - 27	4-Apr-17	None	8, 9	TDS, TSS, Turbidity, pH, Alkalinity, Diss O-PO4, Nitrate, Nitrite, TDP	TDS	DL (10 mg/L) for some samples	None		None		Total - Mg Diss - Ca & Mg	MS-B	None	
	L1908598	All parameters	March 27 & 29	4-Apr-17	None	17, 17.8	TDS, TSS, Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	None		None		None		None		None	
May	L1925440	All parameters	May 4 - 9	12-May-17	Broken Hg vials for TPE-102 (diss) and SP-103 (total) TPE-102 nutrients, DOC, and metals may not have been preserved	15, 16	TDS, TSS, Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP, Cyanides	TDS	DL (10 mg/L) for some samples	None		None		DOC	MS-B	None	
	L1926208	All parameters	11-May-17	15-May-17	None	13	TDS, TSS, Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	None		None		None		None		None	
July	L1955650	All parameters	July 1 - 4	10-Jul-17	Unknown sample container submitted for TPE-105 metals analysis	21.5	TDS, TSS, Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	Total - P		None		Total - Al, As, Ba, Mn	MB-LOR	None		None	
	L1957992	Preserved parameters	4-Jul-17	13-Jul-17	None	21, 20	None	None		None		None		None		None	
	L1958001	All parameters	6-Jul-17	13-Jul-17	Mislabelled bottles for D. Metals (BPJ-50) and D. Mercury (BAP-49)	21, 20	pH, Diss O-PO4, Nitrate, Nitrite, TDP	Total - P & Ti		None		None		None		None	
	L1965475	Chlorophyll-a	July 1 - 4	27-Jul-17	None	17	None	None		n/a		None		n/a		None	
	L1965480	All parameters + Chl-a for some samples	July 6, 8, and 22	27-Jul-17	BAP-49 Chl-a listed on COC but not included in the shipment	17	Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	None		None		None		None		None	
August	L1976502	All parameters - Baker Lake	August 9 - 10	17-Aug-17	AEM inadvertently submitted soil from KM23 on this COC	16.8	TDS, TSS, Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	Total - P		None		Zn - Diss	MB-LOR	Total - Mg, Na, & Sr	MS-B	None	
	L1985253	All parameters - MBK Lakes	August 25 - 28	1-Sep-17	None	14.7, 14.2	pH, Turbidity, Nitrate, Nitrite, Diss-O, Diss-P, TSS, TDS	None		None		Cr-Total	MB-LOR	None		None	
	L1976494	Sediment grabs - Baker Lake	August 9 - 12	17-Aug-17	None	18.1	Hg	TOC		Cu	DUP-H	None		n/a		None	
	L1976488	Sediment cores - Baker Lake	August 9 - 12	17-Aug-17	None	18.1	None	TOC		None		None		n/a		None	
	L1984228	Sediment grabs - MBK Lakes	August 22 - 27	31-Aug-17	None	17, 18	None	TOC Hydrocarbons PAHs	DLHM for some samples	None		None		n/a		None	
	L1984230	Sediment cores - MBK Lakes	August 22 - 27	31-Aug-17	None	17, 18	None	TOC		None		None		n/a		None	

Table 3.1–1. Laboratory QA/QC summary for the 2017 CREMP water and sediment quality program.

								Laboratory QC Summary									
								Detection Limits		Laboratory Duplicates		Method Blanks		Matrix Spike		LCS / CRM	
Event	**Lab ID**	**Parameters Measured**	**Date sampled**	**Date received**	**Sample Integrity Observations**	**Temperature (°C)**	**Hold-time Exceedances**	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier	Parameters	Qualifier
September	L1992770	All parameters (BPJ-53)	9-Sep-17	15-Sep-17	None	18.3	Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	None		None		Ba - Diss	MB-LOR	Total - Mg, Na, & Sr	MS-B	None	
	L1994955	All parameters	Sept 9 - Sept 17	21-Sep-17	None	Not recorded	Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	None		None		None		Total - Mg	MS-B	None	
	L1995845	All parameters + chl-a for BAP-49	Sept 18 Jul 6 (BAP-49 chl-a)	22-Sep-17	Discrepancy between COC and label	19	Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP, Chl-a (BAP-49)	None		None		None		None		None	
	L1999750	All parameters	23-Sep-17	29-Sep-17	Extra sample received for SEPT DUP-1 Chl-a	15	Turbidity, pH, Diss O-PO4, Nitrate, Nitrite, TDP	None		None		None		None		None	
	L2003561	All parameters	Sept 30 - Oct 1	6-Oct-17	Extra sample received for SEPT DUP-1 but not listed on COC	16, 16	Alkalinity, NH4, Br, Cl, Cond, Diss Hg, Diss O-PO4, DOC, F, Cyanides, Nitrate, Nitrite, Si, Sulfate, TDP, Total Hg, Total P, TSS, TOC, Turbidity, pH	Total - Mo & Ti		None		Mo - Total	MB-LOR	Diss - Mg	MS-B	None	
	L2003562	Chlorophyll-a	Sept 30 - Oct 1	6-Oct-17	Samples listed on the COC by not received	16, 16	None	None		n/a		None		None		None	

Notes:
Conventionals = analytes that are not preserved
Diss O-PO4 = dissolved orthophosphate
LCS / CRM = laboratory control sample / certified reference material
TDS = total dissolved solids
TDP = total dissolved phosphorus
TSS = total suspended solids

Laboratory QC qualifiers:
n/a = laboratory QC program not included as part of the analyses.
MB-LOR = Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
B = Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLDS = Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHM = Detection Limit Adjusted: Sample has high moisture content.
MS-B = Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
DUP-H = Duplicate results outside ALS DQO, due to sample heterogeneity.

Table 3.1–2. Laboratory detection limits, equipment blanks, and travel blanks for the 2017 CREMP water quality program.

Month	Detection Limits										
	March		May		July		August		September		MAR DI-1
Analyte	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	24-Mar-17
Physical Tests											
Conductivity (µS/cm)	2	2	2	2	2	2	2	2	2	2	*<2.0*
Hardness (mg/L)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	*<0.50*
pH (Laboratory)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	5.24
Total Suspended Solids (mg/L)	1	1	1	1	1	1	1	1	1	1	*<1.0*
Total Dissolved Solids (mg/L)	3	10	3	10	3	3	3	10	3	10	*<3.0*
Turbidity (NTU)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*<0.10*
Anions and Nutrients (mg/L)											
Alkalinity, Bicarbonate	1	1	1	1	1	1	1	1	1	1	*<1.0*
Alkalinity, Carbonate	1	1	1	1	1	1	1	1	1	1	*<1.0*
Alkalinity, Hydroxide	1	1	1	1	1	1	1	1	1	1	*<1.0*
Alkalinity, Total	1	1	1	1	1	1	1	1	1	1	*<1.0*
Ammonia, Total (as N)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	*<0.0050*
Bromide (Br)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Chloride (Cl)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*<0.10*
Fluoride (F)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	*<0.020*
Nitrate (as N)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	*<0.0050*
Nitrite (as N)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Total Kjeldahl Nitrogen	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Orthophosphate-Dissolved (as P)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	**0.001**
Phosphorus (P)-Total Dissolved	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	**0.002**
Phosphorus (P)-Total	0.002	0.002	0.002	0.002	0.002	0.01	0.002	0.02	0.002	0.02	*<0.0020*
Silicate (as SiO_2)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	*<0.50*
Sulfate (SO_4)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	*<0.30*
Cyanides (mg/L)											
Total Cyanide	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Free Cyanide	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	*<0.50*
Total Organic Carbon	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	*<0.50*
Plant Pigments (µg/L)											
Chlorophyll-a	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-
Total Metals (mg/L)											
Aluminum	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	*<0.0030*
Antimony	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Arsenic	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Barium	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Beryllium	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	*<0.000020*
Bismuth	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Boron	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	*<0.010*
Cadmium	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	*<0.0000050*
Calcium	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Chromium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00015	0.0001	0.00015	*<0.00010*
Cobalt	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Copper	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	*<0.00050*
Iron	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	*<0.010*
Lead	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Lithium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Magnesium	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*<0.10*
Manganese	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Mercury	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	*<0.0000050*
Molybdenum	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Nickel	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	*<0.00050*
Phosphorus	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Potassium	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*<0.10*
Selenium	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Silicon	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	*<0.050*
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.000010*
Sodium	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Strontium	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*<0.00020*
Sulfur	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	*<0.50*
Thallium	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.000010*
Tin	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Titanium	0.0003	0.0003	0.0003	0.0003	0.0003	0.0009	0.0003	0.0003	0.0003	0.0003	*<0.00030*
Uranium	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.000010*
Vanadium	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	*<0.00050*
Zinc	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	*<0.0030*
Zirconium	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*<0.00030*
Dissolved Metals (mg/L)											
Aluminum	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Antimony	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Arsenic	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Barium	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Beryllium	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	*<0.000020*
Bismuth	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Boron	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	*<0.010*
Cadmium	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	*<0.0000050*
Calcium	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Chromium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Cobalt	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Copper	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*<0.00020*
Iron	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	*<0.010*
Lead	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Lithium	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Magnesium	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*<0.10*
Manganese	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Mercury	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	*<0.0000050*
Molybdenum	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Nickel	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	*<0.00050*
Phosphorus	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Potassium	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	*<0.10*
Selenium	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	*<0.000050*
Silicon	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.000010*
Sodium	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	*<0.050*
Strontium	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*<0.00020*
Sulfur	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	*<0.50*
Thallium	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.000010*
Tin	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*<0.00010*
Titanium	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*<0.00030*
Uranium	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	*<0.000010*
Vanadium	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	*<0.00050*
Zinc	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	*<0.0010*
Zirconium	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*<0.00030*

Notes:

Bolded Equipment or Travel Blank values concentration exceeds laboratory MDLs but < 10 x MDL. concentration ex

Shaded Equipment or Travel Blank values concentration is > 10 x MDL. concentration is :

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–2. Laboratory detection limits, equipment blanks, and travel blanks for the 2017 CREMP water quality program.

Analyte	Equipment & Deionized Water Blanks								Travel Blanks	
Month	MAR EB-1	MAY DI-1	MAY EB-1	JULY DI-1	JULY EB-1	AUG DI-1	AUG EB-1	SEPT EB-1	MAR TB-1	MAY TB-1
	24-Mar-17	05-May-17	05-May-17	04-Jul-17	04-Jul-17	28-Aug-17	28-Aug-17	23-Sep-17		
Physical Tests										
Conductivity (µS/cm)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-
pH (Laboratory)	5.2	5.37	5.34	5.4	5.58	5.19	5.27	5.55	5.3	5.34
Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Turbidity (NTU)	**0.13**	<0.10	<0.10	<0.10	**0.11**	<0.10	<0.10	**0.24**	<0.10	<0.10
Anions and Nutrients (mg/L)										
Alkalinity, Bicarbonate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Carbonate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ammonia, Total (as N)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.006**
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Fluoride (F)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nitrate (as N)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	**0.061**	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Orthophosphate-Dissolved (as P)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Dissolved	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulfate (SO_4)	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Cyanides (mg/L)										
Total Cyanide	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)										
Dissolved Organic Carbon	<0.50	<0.50	**1.13**	<0.50	**2.78**	<0.50	<0.50	<0.50	-	-
Total Organic Carbon	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Plant Pigments (µg/L)										
Chlorophyll-a	-	-	-	-	-	-	-	-	-	-
Total Metals (mg/L)										
Aluminum	**0.0044**	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	**0.0142**	<0.0030	<0.0030
Antimony	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	**0.00014**	<0.00010	<0.00010
Arsenic	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Barium	**0.00022**	<0.000050	<0.000050	<0.000050	**0.000102**	<0.000050	**0.000095**	**0.000323**	<0.000050	<0.000050
Beryllium	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	<0.050	<0.050	<0.050	<0.050	**0.073**	<0.050	<0.050	**0.05**	<0.050	<0.050
Chromium	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	**0.00021**	<0.00010	<0.00010
Cobalt	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	**0.00069**	<0.00050	<0.00050
Iron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.028**	<0.010	<0.010
Lead	**0.000098**	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	**0.000231**	0.00302	<0.000050	<0.000050
Lithium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Manganese	**0.00012**	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	**0.00064**	<0.00010	<0.00010
Mercury	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	<0.000050	<0.000050	<0.000050	**0.000132**	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	**0.00134**	<0.00050	<0.00050
Phosphorus	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon	**0.096**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
Silver	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Strontium	<0.00020	<0.00020	<0.00020	<0.00020	**0.00038**	<0.00020	<0.00020	**0.00031**	<0.00020	<0.00020
Sulfur	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Thallium	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	<0.0030	<0.0030	<0.0030	<0.0030	**0.0033**	<0.0030	<0.0030	**0.0038**	<0.0030	<0.0030
Zirconium	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)										
Aluminum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-
Antimony	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Arsenic	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Barium	**0.000076**	<0.000050	<0.000050	<0.000050	**0.000065**	<0.000050	<0.000050	**0.000148**	-	-
Beryllium	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-	-
Bismuth	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-
Boron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Cadmium	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-
Calcium	<0.050	<0.050	<0.050	<0.050	**0.057**	<0.050	<0.050	<0.050	-	-
Chromium	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Cobalt	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Copper	<0.00020	<0.00020	**0.00021**	<0.00020	<0.00020	<0.00020	<0.00020	**0.00071**	-	-
Iron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Lead	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00157	-	-
Lithium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-
Magnesium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
Manganese	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	**0.00033**	-	-
Mercury	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-
Molybdenum	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-
Nickel	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	**0.00111**	-	-
Phosphorus	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-
Potassium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
Selenium	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-
Silicon	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-
Silver	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-
Sodium	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-
Strontium	<0.00020	<0.00020	<0.00020	<0.00020	**0.00032**	<0.00020	<0.00020	**0.00031**	-	-
Sulfur	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-
Thallium	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-
Tin	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Titanium	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	-	-
Uranium	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-
Vanadium	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Zinc	**0.003**	<0.0010	<0.0010	<0.0010	**0.0028**	<0.0010	<0.0010	**0.0036**	-	-
Zirconium	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	-	-

Notes:

Bolded Equipment or Travel Blank values ceeds laboratory MDLs but < 10 x MDL.

Shaded Equipment or Travel Blank values > 10 x MDL.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–3. Field QA/QC summary for the 2017 CREMP water quality program.

Month	March							May			
	March MDLs	Third Portage Lake - East Basin			Wally Lake			May MDLs	Inuggugayualik Lake		
Analyte		**TPE-100-S**	**MAR DUP-1**	**RPD**	**WAL-70-S**	**MAR DUP-2**	**RPD**		**INUG-88-S**	**MAY DUP-1**	**RPD**
Physical Tests											
Conductivity (µS/cm)	2	35.5	36.0	-1.4	65.7	61.4	6.8	2	17.6	17.0	3.5
Hardness (mg/L)	0.5	12.60	12.60	0.0	25.00	24.90	0.4	0.5	6.48	6.32	2.5
pH (Laboratory)	0.1	7.03	7.07	-0.6	7.07	7.30	-3.2	0.1	6.81	6.81	0.0
Total Suspended Solids (mg/L)	1	*<1.0*	*<1.0*		*<1.0*	*<1.0*		1	*<1.0*	*<1.0*	
Total Dissolved Solids (mg/L)	3	24.4	23.8	2.5	34.0	44.0	-25.6	3	12.6	12.9	-2.4
Turbidity (NTU)	0.1	0.16	0.19	-17	0.15	0.20	-28.6	0.1	0.15	0.15	0
Anions and Nutrients (mg/L)											
Alkalinity, Bicarbonate	1	9	9	0.0	20	21	-4.4	1	5	5	0.0
Alkalinity, Carbonate	1	*<1.0*	*<1.0*		*<1.0*	*<1.0*		1	*<1.0*	*<1.0*	
Alkalinity, Hydroxide	1	*<1.0*	*<1.0*		*<1.0*	*<1.0*		1	*<1.0*	*<1.0*	
Alkalinity, Total	1	9	9	0.0	20	21	-4.4	1	5	5	0.0
Ammonia, Total (as N)	0.005	0.0180	0.0180	0.0	0.0310	0.0310	0.0	0.005	0.0155	0.0160	-3.2
Bromide (Br)	0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*	
Chloride (Cl)	0.1	0.94	0.94	0.0	1.13	1.12	0.9	0.1	0.83	0.83	0
Fluoride (F)	0.02	0.083	0.084	-1.2	0.058	0.058	0.0	0.02	0.063	0.063	0
Nitrate (as N)	0.005	0.0263	0.0263	0.0	0.0912	0.0914	-0.2	0.005	*<0.0050*	*<0.0050*	
Nitrite (as N)	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Total Kjeldahl Nitrogen	0.05	0.124	0.182	-37.9	0.198	0.206	-4.0	0.05	0.1	0.13	0.8
Orthophosphate-Dissolved (as P)	0.001	0.0011	0.0011	0.0	0.0012	0.0015	-22.2	0.001	*<0.0010*	*<0.0010*	
Phosphorus (P)-Total Dissolved	0.002	*<0.0020*	0.0025		0.003	0.0028	6.9	0.002	*<0.0020*	*<0.0020*	
Phosphorus (P)-Total	0.002	*<0.0020*	0.002		0.0026	0.0021	21.3	0.002	*<0.0020*	*<0.0020*	
Silicate (as SiO_2)	0.5	*<0.50*	*<0.50*		0.91	0.94	-3.2	0.5	*<0.50*	*<0.50*	
Sulfate (SO_4)	0.3	6.08	6.07	0.2	6.87	6.83	0.6	0.3	1.00	1.00	0.0
Cyanides (mg/L)											
Total Cyanide	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Free Cyanide	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon	0.5	1.62	1.80	-10.5	2.31	2.34	-1.3	0.5	1.58	1.65	-4.3
Total Organic Carbon	0.5	1.58	1.54	3	2.66	2.32	13.7	0.5	1.61	1.60	0.6
Plant Pigments (µg/L)											
Chlorophyll-a	0.01	0.086	0.084	2	0.15	0.148	1.3	0.01	0.088	0.095	-8
Total Metals (mg/L)											
Aluminum	0.003	0.0032	0.006	**-60.9**	*<0.0030*	0.0056		0.003	0.0043	0.0033	26
Antimony	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Arsenic	0.0001	0.00033	0.00032	3.1	0.00029	0.00031	-6.7	0.0001	*<0.00010*	*<0.00010*	
Barium	0.00005	0.00363	0.00366	-0.8	0.00379	0.00378	0.3	0.00005	0.00204	0.00194	5.0
Beryllium	0.00002	*<0.000020*	*<0.000020*		*<0.000020*	*<0.000020*		0.00002	*<0.000020*	*<0.000020*	
Bismuth	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Boron	0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Cadmium	0.000005	0.0000136	0.000005	**92.5**	*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Calcium	0.05	2.96	2.97	-0.3	6.90	6.78	1.8	0.05	1.27	1.26	0.8
Chromium	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	0.0001	*<0.00010*	
Cobalt	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Copper	0.0005	0.00062	0.00053	15.7	0.00106	0.00108	-1.9	0.0005	*<0.00050*	*<0.00050*	
Iron	0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Lead	0.00005	0.000222	0.000214	3.7	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Lithium	0.001	0.00110	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Magnesium	0.1	1.16	1.18	-1.7	2.07	2.08	-0.5	0.1	0.76	0.76	0.0
Manganese	0.0001	0.00054	0.00057	-5	0.00124	0.00130	-4.7	0.0001	0.00078	0.00077	1
Mercury	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Molybdenum	0.00005	0.000178	0.000177	0.6	0.000428	0.000423	1.2	0.00005	*<0.000050*	0.000522	
Nickel	0.0005	0.00056	0.00056	0.0	*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Phosphorus	0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*	
Potassium	0.1	0.63	0.64	-1.6	0.73	0.73	0.0	0.1	0.39	0.39	0.0
Selenium	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Silicon	0.05	0.091	0.094	-3.2	0.471	0.463	1.7	0.05	0.190	0.190	0.0
Silver	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Sodium	0.05	1.32	1.33	-0.8	0.89	0.90	-1.1	0.05	0.59	0.58	1.7
Strontium	0.0002	0.0134	0.0132	1.5	0.0342	0.0344	-0.6	0.0002	0.0070	0.0070	-0.9
Sulfur	0.5	1.96	1.84	6.3	2.32	2.28	1.7	0.5	*<0.50*	*<0.50*	
Thallium	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Tin	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Titanium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	
Uranium	0.00001	0.000040	0.000041	-2	0.000069	0.000069	0.0	0.00001	0.000039	0.000039	0
Vanadium	0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Zinc	0.003	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		0.003	*<0.0030*	*<0.0030*	
Zirconium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	
Dissolved Metals (mg/L)											
Aluminum	0.001	0.0017	0.0041	**-82.8**	0.0015	*<0.0010*		0.001	0.0036	0.0020	**57.1**
Antimony	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Arsenic	0.0001	0.00031	0.00030	3.3	0.00032	0.00029	9.8	0.0001	*<0.00010*	*<0.00010*	
Barium	0.00005	0.00411	0.00414	-0.7	0.00406	0.00417	-2.7	0.00005	0.00207	0.00199	3.9
Beryllium	0.00002	*<0.000020*	*<0.000020*		*<0.000020*	*<0.000020*		0.00002	*<0.000020*	*<0.000020*	
Bismuth	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Boron	0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Cadmium	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Calcium	0.05	3.09	3.07	0.6	6.77	6.72	0.7	0.05	1.35	1.30	3.8
Chromium	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Cobalt	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Copper	0.0002	0.00044	0.00044	0.0	0.00099	0.00108	-8.7	0.0002	0.00045	0.00027	50.0
Iron	0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Lead	0.00005	0.000066	0.00006	9.5	*<0.000050*	0.000057		0.00005	*<0.000050*	*<0.000050*	
Lithium	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Magnesium	0.1	1.20	1.21	-0.8	1.97	1.98	-0.5	0.1	0.76	0.75	1.3
Manganese	0.0001	0.00017	0.00018	-5.7	0.00058	0.00053	9.0	0.0001	0.00063	0.00056	12
Mercury	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Molybdenum	0.00005	0.000163	0.000165	-1.2	0.000403	0.000399	1.0	0.00005	*<0.000050*	*<0.000050*	
Nickel	0.0005	0.00051	0.00051	0.0	*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Phosphorus	0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*	
Potassium	0.1	0.64	0.64	0	0.69	0.69	0.0	0.1	0.43	0.42	2.4
Selenium	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Silicon	0.05	0.052	0.052	0.0	0.425	0.430	-1.2	0.05	0.177	0.166	6.4
Silver	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Sodium	0.05	1.37	1.37	0.0	0.86	0.86	-0.6	0.05	0.61	0.60	1.3
Strontium	0.0002	0.0137	0.01390	-1.4	0.0337	0.03310	1.8	0.0002	0.0074	0.00724	2.6
Sulfur	0.5	1.83	1.85	-1.1	2.14	2.21	-3.2	0.5	0.72	0.71	1
Thallium	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Tin	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Titanium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	
Uranium	0.00001	0.000037	0.000037	0.0	0.000065	0.000063	3.1	0.00001	0.000040	0.000038	5
Vanadium	0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Zinc	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Zirconium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are calculated when both samples are above detection.

The data quality objective (DQO) for field duplicates is an RPD < 50%.

Bolded RPDs RPD values exceed 50% but < 10 x MDL.

Shaded RPD RPD values exceed 50% and > 10 x MDL.

\- = no measurement

Italicized numbers are below detection limits.

Table 3.1–3. Field QA/QC summary for the 2017 CREMP water quality program.

Month	May			July						
	Third Portage Lake - North Basin			July MDLs	Third Portage Lake - North Basin			Baker Lake - Barge Dock		
Analyte	**TPN-103-S**	**MAY DUP-2**	**RPD**		**TPN-105**	**JULY DUP-1**	**RPD**	**BBD-49**	**JULY DUP-2**	**RPD**
Physical Tests										
Conductivity (µS/cm)	29.3	29.7	-1.4	2	27.5	26.6	3.3	24.1	23.8	1.3
Hardness (mg/L)	9.61	9.60	0.1	0.5	8.25	8.64	-4.6	9.9	9.9	-0.7
pH (Laboratory)	7.00	6.99	0.1	0.1	6.97	6.97	0.0	7.09	7.11	-0.3
Total Suspended Solids (mg/L)	*<1.0*	*<1.0*		1	*<1.0*	*<1.0*		*<1.0*	1.8	
Total Dissolved Solids (mg/L)	18.8	17.5	7.2	3	17.0	19.7	-14.7	18.1	16.2	11
Turbidity (NTU)	0.15	0.15	0	0.1	0.18	0.18	0	0.76	0.72	5
Anions and Nutrients (mg/L)										
Alkalinity, Bicarbonate	6	6	-3.2	1	6	6	3.3	8.4	8.7	-3.5
Alkalinity, Carbonate	*<1.0*	*<1.0*		1	*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Hydroxide	*<1.0*	*<1.0*		1	*<1.0*	*<1.0*		*<1.0*	*<1.0*	
Alkalinity, Total	6	6	-3.2	1	6	6	3	8.4	8.7	-3.5
Ammonia, Total (as N)	0.0177	0.0186	-5.0	0.005	*<0.0050*	0.0068		*<0.0050*	*<0.0050*	
Bromide (Br)	*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Chloride (Cl)	0.80	0.80	0.0	0.1	0.75	0.70	6.9	1.21	1.21	0
Fluoride (F)	0.069	0.069	0.0	0.02	0.064	0.063	2	0.060	0.060	0.0
Nitrate (as N)	0.0409	0.0412	-0.7	0.005	0.0372	0.0357	4.1	0.0281	0.0275	2
Nitrite (as N)	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Total Kjeldahl Nitrogen	0.10	0.12	-11.0	0.05	0.10	0.09	6.5	0.17	0.17	4.7
Orthophosphate-Dissolved (as P)	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Phosphorus (P)-Total Dissolved	*<0.0020*	*<0.0020*		0.002	*<0.0020*	*<0.0020*		*<0.0020*	*<0.0020*	
Phosphorus (P)-Total	*<0.0020*	*<0.0020*		0.002	*<0.0020*	*<0.0020*		0.0	0.0	0.0
Silicate (as SiO_2)	*<0.50*	*<0.50*		0.5	*<0.50*	*<0.50*		*<0.50*	*<0.50*	
Sulfate (SO_4)	5.26	5.27	-0.2	0.3	4.38	4.33	1.1	0.62	0.61	1.6
Cyanides (mg/L)										
Total Cyanide	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Free Cyanide	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Organic / Inorganic Carbon (mg/L)										
Dissolved Organic Carbon	1.24	1.34	-7.8	0.5	1.46	1.71	-15.8	3.44	3.44	0
Total Organic Carbon	1.43	1.34	6.5	0.5	1.51	1.72	-13	3.64	3.58	1.7
Plant Pigments (µg/L)										
Chlorophyll-a	0.115	0.101	13	0.01	0.135	0.096	34	0.609	0.615	-1.0
Total Metals (mg/L)										
Aluminum	*<0.0030*	*<0.0030*		0.003	0.0064	0.0056	13	0.0259	0.0352	-30.4
Antimony	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	0.00016	0.00018	-11.8	0.0001	0.00021	0.00019	10.0	0.00010	0.00011	-9.5
Barium	0.00319	0.00306	4.2	0.00005	0.00288	0.00270	6.5	0.01650	0.01650	0.0
Beryllium	*<0.000020*	*<0.000020*		0.00002	*<0.000020*	*<0.000020*		*<0.000020*	*<0.000020*	
Bismuth	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	2.38	2.46	-3.3	0.05	2.08	2.09	-0.5	2.21	2.40	-8.2
Chromium	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	0.0	
Cobalt	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*		*<0.00050*	0.0	
Iron	*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*		0.0	0.0	0.0
Lead	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Magnesium	0.92	0.94	-2.2	0.1	0.89	0.85	4.6	1.00	1.00	0.0
Manganese	0.00052	0.00052	0.0	0.0001	0.00247	0.00235	5.0	0.00501	0.00491	2.0
Mercury	*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	0.000151	0.000154	-2.0	0.00005	0.000148	0.000135	9	0.00006	0.00005	14.3
Nickel	*<0.00050*	*<0.00050*		0.0005	0.00054	0.00054	0.0	*<0.00050*	*<0.00050*	
Phosphorus	*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	0.50	0.51	-2.0	0.1	0.45	0.43	4.5	0.37	0.36	2.7
Selenium	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Silicon	*<0.10*	*<0.10*		0.1	*<0.10*	*<0.10*		0.280	0.280	0.0
Silver	*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	1.19	1.27	-6.5	0.05	1.10	1.03	6.6	0.62	0.61	1.8
Strontium	0.0112	0.0115	-2.6	0.0002	0.0108	0.0097	10.4	0.0169	0.0184	-8.5
Sulfur	1.78	1.85	-3.9	0.5	1.54	1.48	4.0	*<0.50*	*<0.50*	
Thallium	*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*		0.0	*<0.00090*	
Uranium	0.000034	0.000035	-2.9	0.00001	0.000042	0.000042	0.0	0.000046	0.000052	-12.2
Vanadium	*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	*<0.0030*	*<0.0030*		0.003	*<0.0030*	*<0.0030*		*<0.0030*	0.0	
Zirconium	*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Dissolved Metals (mg/L)										
Aluminum	*<0.0010*	0.0011		0.001	0.0018	0.0022	-20	0.0073	0.0079	-7.9
Antimony	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Arsenic	0.00017	0.00018	-5.7	0.0001	0.00016	0.00018	-12	0.00011	0.00010	9.5
Barium	0.00320	0.00325	-1.6	0.00005	0.00261	0.00261	0.0	0.01750	0.01740	0.6
Beryllium	*<0.000020*	*<0.000020*		0.00002	*<0.000020*	*<0.000020*		*<0.000020*	*<0.000020*	
Bismuth	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Boron	*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Cadmium	*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Calcium	2.29	2.33	-1.7	0.05	1.95	2.08	-6.5	2.31	2.34	-1.3
Chromium	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Cobalt	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Copper	0.00028	0.00029	-3.5	0.0002	0.00030	0.00032	-6.5	0.00025	0.00024	4
Iron	*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*		0.0	0.0	-8.7
Lead	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*	
Lithium	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*	
Magnesium	0.94	0.92	2.2	0.1	0.82	0.84	-2.4	0.99	0.99	0.0
Manganese	*<0.00010*	*<0.00010*		0.0001	0.00182	0.00195	-6.9	0.00343	0.00344	-0.3
Mercury	*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*	
Molybdenum	0.000154	0.000167	-8.1	0.00005	0.000136	0.000135	0.7	*<0.000050*	0.000054	
Nickel	*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Phosphorus	*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*	
Potassium	0.55	0.54	2	0.1	0.42	0.43	-2.4	0.38	0.38	0.0
Selenium	*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*		0.0	0.0	32.9
Silicon	*<0.050*	*<0.050*		0.05	0.067	0.069	-2.9	0.2	0.214	0.9
Silver	*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Sodium	1.22	1.23	-0.8	0.05	1.00	1.01	-1.0	0.63	0.63	0.0
Strontium	0.0114	0.01150	-1	0.0002	0.0098	0.01030	-5.5	0.01700	0.01710	-0.6
Sulfur	1.92	1.98	-3	0.5	1.48	1.48	0.0	*<0.50*	*<0.50*	
Thallium	*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*	
Tin	*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*	
Titanium	*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	
Uranium	0.000030	0.000031	-3	0.00001	0.000037	0.000036	3	0.000036	0.000036	0
Vanadium	*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*	
Zinc	*<0.0010*	*<0.0010*		0.001	0.0019	0.0014	30.3	*<0.0010*	0.0	
Zirconium	*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*	

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are calculated when both samples are above detection.

The data quality objective (DQO) for field duplicates is an RPD < 50%.

Bolded RPDs	RPD values exceed 50% but < 10 x MDL.
Shaded RPD	RPD values exceed 50% and > 10 x MDL.

- = no measurement

Italicized numbers are below detection limits.

Table 3.1–3. Field QA/QC summary for the 2017 CREMP water quality program.

Month	August							September			
	Aug MDLs	Baker Lake - Akilahaarjuk Point			Second Portage Lake			Sept MDLs	Inuggugayualik Lake		
Analyte		**BAP-51**	**AUG DUP-1**	**RPD**	**SP-107**	**AUG DUP-2**	**RPD**		**INUG-94**	**SEPT DUP-1**	**RPD**
Physical Tests											
Conductivity (µS/cm)	2	153.0	165.0	-7.5	35.1	33.1	5.9	2	15.1	15.2	-0.7
Hardness (mg/L)	0.5	22.40	21.00	6.5	14.30	14.3	0.0	0.5	5.69	5.96	-4.6
pH (Laboratory)	0.1	6.94	7.03	-1.3	7.23	7.17	0.8	0.1	6.89	6.89	0.0
Total Suspended Solids (mg/L)	1	*<1.0*	*<1.0*		*<1.0*	*<1.0*		1	*<1.0*	*<1.0*	
Total Dissolved Solids (mg/L)	3	93.0	92.0	1.1	25.7	25.0	2.8	3	10.0	06.9	36.7
Turbidity (NTU)	0.1	0.69	1.05	-41.4	0.34	0.26	27	0.1	0.33	0.30	9.5
Anions and Nutrients (mg/L)											
Alkalinity, Bicarbonate	1	9	9	2	10	10	0.0	1	5	5	-5.7
Alkalinity, Carbonate	1	*<1.0*	*<1.0*		*<1.0*	*<1.0*		1	*<1.0*	*<1.0*	
Alkalinity, Hydroxide	1	*<1.0*	*<1.0*		*<1.0*	*<1.0*		1	*<1.0*	*<1.0*	
Alkalinity, Total	1	9	9	2	10	10	0.0	1	5	5	-5.7
Ammonia, Total (as N)	0.005	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		0.005	*<0.0050*	*<0.0050*	
Bromide (Br)	0.05	0.127	0.136	-6.8	*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*	
Chloride (Cl)	0.1	38.00	38.00	0	0.84	0.84	0	0.1	0.75	0.75	0.0
Fluoride (F)	0.02	0.061	0.060	2	0.065	0.064	1.6	0.02	0.059	0.060	-1.7
Nitrate (as N)	0.005	0.0371	0.0395	-6.3	*<0.0050*	*<0.0050*		0.005	*<0.0050*	*<0.0050*	
Nitrite (as N)	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Total Kjeldahl Nitrogen	0.05	0.15	0.16	-1.3	0.11	0.08	31	0.05	0.11	0.12	-4.4
Orthophosphate-Dissolved (as P)	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Phosphorus (P)-Total Dissolved	0.002	*<0.0020*	*<0.0020*		*<0.0020*	*<0.0020*		0.002	*<0.0020*	*<0.0020*	
Phosphorus (P)-Total	0.002	0.0025	*<0.0020*		*<0.020*	*<0.0020*		0.002	*<0.0020*	*<0.0020*	
Silicate (as SiO_2)	0.5	*<0.50*	*<0.50*		*<0.50*	*<0.50*		0.5	*<0.50*	*<0.50*	
Sulfate (SO_4)	0.3	5.86	5.87	-0.2	4.90	4.91	-0.2	0.3	0.85	0.88	-3.5
Cyanides (mg/L)											
Total Cyanide	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Free Cyanide	0.001	*<0.0010*	*<0.0010*		*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Organic / Inorganic Carbon (mg/L)											
Dissolved Organic Carbon	1	3.22	3.21	0.3	1.76	1.93	-9.2	0.5	1.66	1.70	-2.4
Total Organic Carbon	1	3.22	3.20	0.6	1.89	1.97	-4.1	0.5	2.13	1.76	19.0
Plant Pigments (µg/L)											
Chlorophyll-a	0.01	0.715	0.574	21.9	0.535	0.426	22.7	0.01	0.555	0.526	5.4
Total Metals (mg/L)											
Aluminum	0.003	0.0118	0.0125	-6	0.0065	0.0064	2	0.003	0.0057	0.0059	-3.4
Antimony	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Arsenic	0.0001	0.00012	0.00012	0.0	0.00034	0.00032	6	0.0001	*<0.00010*	*<0.00010*	
Barium	0.00005	0.01700	0.01740	-2.3	0.00271	0.00265	2.2	0.00005	0.00159	0.00156	1.9
Beryllium	0.00002	*<0.000020*	*<0.000020*		*<0.000020*	*<0.000020*		0.00002	*<0.000020*	*<0.000020*	
Bismuth	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Boron	0.01	0.011	0.011	0.0	*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Cadmium	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Calcium	0.05	3.13	3.12	0.3	3.78	3.82	-1.1	0.05	1.13	1.11	1.8
Chromium	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Cobalt	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Copper	0.0005	*<0.00050*	*<0.00050*		0.00061	0.00071	-15.2	0.0005	*<0.00050*	*<0.00050*	
Iron	0.01	0.016	0.017	-6	0.021	0.02	4.9	0.01	0.011	0.012	-8.7
Lead	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Lithium	0.001	0.00130	0.00120	8.0	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Magnesium	0.1	3.15	3.27	-3.7	1.22	1.20	1.7	0.1	0.75	0.74	1.3
Manganese	0.0001	0.00295	0.00318	-7.5	0.00206	0.00208	-1.0	0.0001	0.00193	0.00195	-1.0
Mercury	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Molybdenum	0.00005	0.000067	0.000065	3.0	0.000201	0.000187	7.2	0.00005	*<0.000050*	0.000099	
Nickel	0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Phosphorus	0.05	*<0.050*	*<0.050*		*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*	
Potassium	0.1	1.05	1.09	-3.7	0.55	0.56	-2	0.1	0.37	0.37	0.0
Selenium	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Silicon	0.1	0.210	0.220	-4.7	0.170	0.170	0.0	0.1	0.150	0.150	0.0
Silver	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Sodium	0.05	19.50	20.10	-3.0	0.93	0.92	1.3	0.05	0.59	0.60	-0.8
Strontium	0.0002	0.0300	0.0299	0.3	0.0173	0.0173	0.0	0.0002	0.0067	0.0066	1.7
Sulfur	0.5	2.00	1.91	4.6	1.79	1.93	-7.5	0.5	*<0.50*	*<0.50*	
Thallium	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Tin	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Titanium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	
Uranium	0.00001	0.000053	0.000049	7.8	0.000047	0.000043	9	0.00001	0.000045	0.000045	0.0
Vanadium	0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Zinc	0.003	*<0.0030*	*<0.0030*		*<0.0030*	*<0.0030*		0.003	*<0.0030*	*<0.0030*	
Zirconium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	
Dissolved Metals (mg/L)											
Aluminum	0.001	0.0057	0.0055	4	0.0028	0.0026	7	0.001	0.0018	0.0015	18.2
Antimony	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Arsenic	0.0001	0.00010	0.00013	-26	0.00023	0.00023	0.0	0.0001	*<0.00010*	*<0.00010*	
Barium	0.00005	0.01770	0.01780	-0.6	0.00243	0.00258	-6.0	0.00005	0.00164	0.00169	-3.0
Beryllium	0.00002	*<0.000020*	*<0.000020*		*<0.000020*	*<0.000020*		0.00002	*<0.000020*	*<0.000020*	
Bismuth	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Boron	0.01	0.01	*<0.010*		*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Cadmium	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Calcium	0.05	3.43	3.06	11.4	3.69	3.71	-0.5	0.05	1.05	1.13	-7.3
Chromium	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Cobalt	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Copper	0.0002	0.00040	0.00035	13	0.00065	0.00058	11	0.0002	0.00037	0.00035	5.6
Iron	0.01	*<0.010*	*<0.010*		*<0.010*	*<0.010*		0.01	*<0.010*	*<0.010*	
Lead	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Lithium	0.001	0.00120	0.00110	8.7	*<0.0010*	*<0.0010*		0.001	*<0.0010*	*<0.0010*	
Magnesium	0.1	3.37	3.25	3.6	1.23	1.22	0.8	0.1	0.75	0.76	-1.3
Manganese	0.0001	0.00205	0.00139	38	0.00071	0.00068	4	0.0001	0.00037	0.00036	2.7
Mercury	0.000005	*<0.0000050*	*<0.0000050*		*<0.0000050*	*<0.0000050*		0.000005	*<0.0000050*	*<0.0000050*	
Molybdenum	0.00005	0.000064	0.000087	-30.5	0.000269	0.000245	9.3	0.00005	*<0.000050*	*<0.000050*	
Nickel	0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Phosphorus	0.05	0.092	*<0.050*		*<0.050*	*<0.050*		0.05	*<0.050*	*<0.050*	
Potassium	0.1	1.24	1.15	8	0.52	0.50	3.9	0.1	0.40	0.42	-4.9
Selenium	0.00005	*<0.000050*	*<0.000050*		*<0.000050*	*<0.000050*		0.00005	*<0.000050*	*<0.000050*	
Silicon	0.05	0.174	0.170	2.3	0.135	0.137	-1.5	0.05	0.118	0.113	4.3
Silver	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Sodium	0.05	19.90	20.60	-3.5	0.90	0.89	1.1	0.05	0.63	0.60	5.0
Strontium	0.0002	0.0319	0.02920	8.8	0.0180	0.01790	0.6	0.0002	0.0059	0.00621	-5.3
Sulfur	0.5	2.07	1.90	8.6	1.70	1.67	1.8	0.5	*<0.50*	*<0.50*	
Thallium	0.00001	*<0.000010*	*<0.000010*		*<0.000010*	*<0.000010*		0.00001	*<0.000010*	*<0.000010*	
Tin	0.0001	*<0.00010*	*<0.00010*		*<0.00010*	*<0.00010*		0.0001	*<0.00010*	*<0.00010*	
Titanium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	
Uranium	0.00001	0.000047	0.000044	6.6	0.000042	0.000042	0	0.00001	0.000028	0.000031	-10.2
Vanadium	0.0005	*<0.00050*	*<0.00050*		*<0.00050*	*<0.00050*		0.0005	*<0.00050*	*<0.00050*	
Zinc	0.001	0.0045	*<0.0010*		0.0073	0.0017	**124.4**	0.001	*<0.0010*	*<0.0010*	
Zirconium	0.0003	*<0.00030*	*<0.00030*		*<0.00030*	*<0.00030*		0.0003	*<0.00030*	*<0.00030*	

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are calculated when both samples are above detection.

The data quality objective (DQO) for field duplicates is an RPD < 50%.

Bolded RPDs	RPD values exceed 50% but < 10 x MDL.
Shaded RPD	RPD values exceed 50% and > 10 x MDL.

- = no measurement

Italicized numbers are below detection limits.

Table 3.1–4. QA/QC data for analysis of sediment core samples, Meadowbank study lakes and Baker Lake, 2017.

Analyte	DQOs[1,2]	MDLs (mg/kg)	Field Duplicates[3]																							
			SP			TPE			TPN			WAL			PDL			INUG			BAP			BES		
			SC-7	DUP-SC-1	RPD	SC-4	DUP-SC-2	RPD	SC-2	DUP-SC-3	RPD	SC-4	DUP-SC-4	RPD	SC-2	DUP-SC-5	RPD	SC-2	DUP-SC-6	RPD	SC-7	DUP-SC-7	RPD	SC-5	DUP-SC-8	RPD
			22-Aug-17		(%)	23-Aug-17		(%)	27-Aug-17		(%)	26-Aug-17		(%)	24-Aug-17		(%)	25-Aug-17		(%)	9-Aug-17		(%)	10-Aug-17		(%)
Physical & Organic Parameters																										
Moisture (%)	20	*0.25*	85.6	86.0	0	88.0	88.3	0	81.2	82.9	-2	89.6	89.7	0	83.7	84.8	-1	82.9	84.4	-2	33.8	46.3	-31	37.6	40.5	-7
pH	0.30	*0.10*	6.26	6.27	0	6.31	6.21	2	6.15	5.84	5	6.66	6.51	2	5.92	5.74	3	5.60	5.65	-1	6.36	6.02	5	6.99	6.90	1
TOC (% dw)	30	*0.10*	4.76	4.35	9	4.87	4.69	4	3.91	3.40	14	8.74	8.34	5	3.55	4.52	-24	4.20	4.68	-11	0.35	0.76	**-74**	0.34	0.45	-26
Total Metals (mg/kg dw)																										
Aluminum	40	*50*	22400	27000	-19	26000	25100	4	15900	15700	1	21300	20800	2	20100	17100	16	24800	21100	16	4100	6270	-42	5210	6390	-20
Antimony	30	*0.10*	0.29	0.32	-10	0.39	0.39	0	0.25	0.22	13	0.48	0.47	2	0.25	0.27	-8	0.23	0.22	4	0.13	0.17	-27	0.11	0.13	-17
Arsenic	30	*0.100*	29.9	34.9	-15	28.3	27.1	4	18.9	15.6	19	55.5	47.0	17	11.4	10.3	10	18.1	18.7	-3	2.8	5.1	-58	3.6	3.7	-2
Barium	40	*0.50*	115	131	-13	147	145	1	64	63	2	119	120	-1	102	92	11	134	117	14	243	287	-17	176	211	-18
Beryllium	30	*0.10*	1.73	2.00	-14	1.71	1.71	0	0.95	1.03	-8	1.67	1.64	2	0.96	0.86	11	1.54	1.34	14	0.27	0.42	-43	0.30	0.35	-15
Bismuth	30	*0.20*	1.97	2.47	-23	2.35	2.29	3	0.99	1.14	-14	2.17	2.28	-5	0.83	0.77	7	1.45	1.22	17	*<0.20*	*<0.20*		*<0.20*	*<0.20*	
Boron	30	*5.0*	8.30	9.20	-10	7.90	8.20	-4	6.30	5.50	14	9.00	8.90	1	7.20	6.80	6	8.60	7.70	11	5.20	7.60	-38	*<5.0*	6.60	
Cadmium	30	*0.020*	0.219	0.210	4	0.746	0.814	-9	0.142	0.105	30	0.441	0.424	4	0.248	0.261	-5	0.235	0.256	-9	0.023	0.057	**-85**	0.032	0.040	-22
Calcium	30	*50*	2580	2930	-13	3210	3010	6	1740	1690	3	4230	4160	2	2510	2360	6	2270	1960	15	1670	2190	-27	2240	2270	-1
Chromium	30	*0.50*	108.0	109.0	-1	224	201	11	119.0	109.0	9	61.7	60.1	3	134.0	115	15	124.0	104.0	18	13.4	18.6	-33	16.5	19.2	-15
Cobalt	30	*0.10*	15.6	18.0	-14	22.2	21.9	1	11.1	9.5	15	10.9	10.2	7	11.5	10.0	14	15.9	14.3	11	3.6	5.3	-38	4.4	5.0	-14
Copper	30	*0.50*	61.8	74.0	-18	55.8	55.1	1	45.5	48.4	-6	152.0	149.0	2	46.9	41.9	11	55.2	47.8	14	4.5	8.7	-63	4.5	5.1	-11
Iron	30	*50*	51900	60100	-15	51900	49200	5	36700	31000	17	47800	43100	10	28700	24700	15	55700	51800	7	11400	14900	-27	13600	13800	-1
Lead	40	*0.50*	20.2	23.6	-16	26.5	26.4	0	15.6	15.8	-1	36.5	36.9	-1	14.8	14.6	1	18.0	15.6	14	4.1	6.2	-41	4.6	5.1	-11
Lithium	30	*2.0*	37.5	41.4	-10	42.1	41.0	3	23.4	23.8	-2	34.7	32.7	6	27.7	23.9	15	29.6	23.7	22	6.9	10.2	-39	8.4	9.8	-15
Magnesium	30	*20*	9420	10500	-11	13200	12500	5	8100	7550	7	8100	7810	4	11100	9220	19	10900	9020	19	2750	3990	-37	3560	4220	-17
Manganese	30	*1.0*	3090	3530	-13	4130	4440	-7	507	305	50	703	598	16	314	270	15	1380	1430	-4	98	158	-47	417	526	-23
Mercury	40	*0.0050*	0.0356	0.0337	5	0.0276	0.0289	-5	0.0191	0.0172	10	0.0597	0.0575	4	0.0184	0.0202	-9	0.0332	0.0314	6	*<0.0050*	0.0062		*<0.0050*	0.0051	
Molybdenum	40	*0.10*	5.01	6.45	-25	4.71	4.72	0	3.40	3.39	0	11.60	11.20	4	1.60	1.78	-11	3.12	3.09	1	0.32	0.68	**-72**	0.41	0.47	-14
Nickel	30	*0.50*	73.4	75.4	-3	191.0	193.0	-1	58.3	53.3	9	59.0	56.80	4	88.1	76	15	97.6	84.9	14	8.4	12.1	-36	10.0	12.0	-18
Phosphorus	30	*50*	562	646	-14	600	547	9	599	606	-1	758	724	5	572	503	13	1360	1200	13	551	623	-12	761	672	12
Potassium	40	*100*	3850	4820	-22	4380	4240	3	2250	2360	-5	3610	3540	2	2800	2470	13	3950	3410	15	1040	1620	-44	1050	1370	-26
Selenium	30	*0.20*	0.61	0.61	0	0.91	0.90	1	0.56	0.58	-4	0.87	0.84	4	0.43	0.38	12	0.68	0.62	9	*<0.20*	*<0.20*		*<0.20*	*<0.20*	
Silver	40	*0.10*	0.18	0.15	18	0.22	0.22	0	0.15	0.12	22	0.55	0.57	-4	0.24	0.24	0	0.20	0.17	16	*<0.10*	*<0.10*		*<0.10*	*<0.10*	
Sodium	40	*50*	183	197	-7	197	199	-1	129	111	15	178	174	2	112	100	11	187	157	17	78	117	-40	84	105	-22
Strontium	40	*0.50*	21.5	23.8	-10	23.7	22.8	4	14.4	14.6	-1	28.9	28.1	3	21.9	20.9	5	27.2	23.7	14	36.4	44.3	-20	33.8	40.8	-19
Thallium	30	*0.050*	0.324	0.393	-19	0.552	0.573	-4	0.175	0.195	-11	0.323	0.339	-5	0.186	0.174	7	0.256	0.219	16	0.051	0.086	**-51**	0.051	0.063	-21
Tin	40	*2.0*	2.9	3.1	-7	4.5	2.6	**54**	*<2.0*	*<2.0*		4.0	2.4	50	2.5	*<2.0*		2.1	*<2.0*		*<2.0*	*<2.0*		*<2.0*	*<2.0*	
Titanium	40	*1.0*	637	820	-25	815	824	-1	418	443	-6	521	542	-4	570	473	19	612	565	8	242	343	-35	307	375	-20
Uranium	30	*0.050*	16.5	19.8	-18	15.7	15.4	2	11.7	13.2	-12	17.0	17.0	0	7.7	7.2	7	18.7	15.7	17	1.2	2.1	-54	1.1	1.3	-17
Vanadium	30	*0.20*	37.6	43.1	-14	47.8	45.2	6	30.3	29.6	2	33.4	32.0	4	35.8	30.8	15	42.0	34.7	19	17.7	25.0	-34	19.7	20.8	-5
Zinc	30	*2.0*	102.0	117.0	-14	125.0	125.0	0	70.5	69.3	2	128.0	124.0	3	84.8	72.4	16	102.0	89.1	14	18.5	29.8	-47	22.4	27.0	-19
Zirconium	30	*1.0*	1.4	2.0	-35	3.0	2.4	22	1.2	1.5	-22	3.1	3.4	-9	2.0	2.0	0	2.5	2.0	22	4.5	5.1	-13	2.2	2.5	-13

Notes:

1. Laboratory data quality objectives (DQOs) for moisture, TOC, and metals are expressed as the relative percent difference (RPD) .
2. The laboratory DQOs for pH and particle size are the absolute difference between the original sample and laboratory duplicate.
3. The DQO for field duplicates is an RPD of < 50%.

RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs are > DQOs, but concentrations are < 10 x MDL.

Shaded RPDs values are > DQOs, and concentrations are > 10 x MDL.

Bold Filter Swipe values are > MDL, but < 10 x MDL.

Shaded Filter Swipe values are > 10x MDL and > 20% of the Blank QA Swipe.

Field Dup' samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–4. QA/QC data for analysis of sediment core samples, Meadowbank study lakes and Baker Lake, 2017.

			Field Duplicates (Con't)						Laboratory Duplicates									Equipment Swipes				
			BPJ			BBD			WAL-SC-7			WAL-SC-4 & PDL-SC-1			BES-SC-10				SWIPE-QA FILTER	SWIPE-SC-1 FILTER	SWIPE-SC-2 FILTER	SWIPE-SC-3 FILTER
Analyte	**DQOs**[1,2]	**MDLs (mg/kg)**	**SC-5** 11-Aug-17	**DUP-SC-9** 11-Aug-17	**RPD** (%)	**SC-5** 12-Aug-17	**DUP-SC-10** 12-Aug-17	**RPD** (%)	**Original**	**Laboratory Duplicate**	**RPD** (%)	**Original**	**Laboratory Duplicate**	**RPD** (%)	**Original**	**Laboratory Duplicate**	**RPD** (%)		20-Aug-17	11-Aug-17	9-Aug-17	24-Aug-17
Physical & Organic Parameters																			Blank swipe	INUG - 1.5 cm ring and 2 spatulas	PDL - ponar screens, bowls, spoons	WAL - ponar and screens
Moisture (%)	20	*0.25*	40.5	48.5	-18	47.8	44.9	6	-	-		89.6	90.1	-0.6	32.9	32.7	0.6					
pH	0.30	*0.10*	6.68	6.29	6	6.69	6.18	8	6.76	6.81	0.0	6.36	6.32	0.0	-	-						
TOC (% dw)	30	*0.10*	0.40	0.55	-33	0.73	0.70	5	-	-		-	-		-	-						
Total Metals (mg/kg dw)																		**Swipe MDLs (mg)**	**Total Metals (mg/filter)**			
Aluminum	40	*50*	6650	10400	-44	8720	7410	16	23500	23300	0.9	-	-		-	-		0.020	0.860	0.929	0.845	0.648
Antimony	30	*0.10*	0.11	0.14	-24	0.15	0.11	31	0.52	0.52	0.0	-	-		-	-		0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Arsenic	30	*0.100*	8.5	9.1	-7	8.5	6.1	32	70.7	70.2	1	-	-		-	-		0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Barium	40	*0.50*	76	89	-16	111	103	7	125	129	-3.1	-	-		-	-		0.00100	1.64000	1.77000	1.58000	1.28000
Beryllium	30	*0.10*	0.29	0.48	-49	0.35	0.30	15	1.9	1.81	4.9	-	-		-	-		0.00050	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Bismuth	30	*0.20*	*<0.20*	0.24		0.23	*<0.20*		2.35	2.3	2.2	-	-		-	-		0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Boron	30	*5.0*	5.50	8.70	-45	6.10	6.10	0	12.5	12.7	-1.6	-	-		-	-		-	-	-	-	-
Cadmium	30	*0.020*	0.050	0.068	-31	0.065	0.053	20	0.463	0.451	2.6	-	-		-	-		0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Calcium	30	*50*	1910	3040	-46	3170	2780	13	5240	5210	0.6	-	-		-	-		0.200	0.460	0.500	0.440	0.370
Chromium	30	*0.50*	15	23	-44	20.0	17	17	65.3	65.5	-0.3	-	-		-	-		0.0020	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Cobalt	30	*0.10*	5.8	7.6	-27	7.3	5.6	25	11.2	11	1.8	-	-		-	-		0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Copper	30	*0.50*	7.1	10.7	-40	11.7	8.8	29	165	161	2.5	-	-		-	-		0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Iron	30	*50*	14600	19200	-27	18900	15600	19	56500	55500	1.8	-	-		-	-		0.0100	0.0150	**0.0280**	**0.0230**	**0.0240**
Lead	40	*0.50*	6.4	10.5	-48	9.6	7.6	23	41.2	40.4	2.0	-	-		-	-		0.0040	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*
Lithium	30	*2.0*	8.9	13.4	-40	11.8	10.0	17	36.5	35.6	2	-	-		-	-		0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium	30	*20*	3800	5770	-41	5060	4330	16	8570	8430	1.6	-	-		-	-		0.1000	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Manganese	30	*1.0*	864	849	2	444	295	40	633	590	7.0	-	-		-	-		0.00050	*<0.00050*	**0.00091**	**0.00072**	**0.00066**
Mercury	40	*0.0050*	0.0054	0.0082	-41	0.0072	0.0073	-1	0.0743	0.0735	1.1	-	-		-	-		-	-	-	-	-
Molybdenum	40	*0.10*	1.12	0.97	14	0.85	1.53	-57	14.2	13.8	2.9	-	-		-	-		0.0030	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Nickel	30	*0.50*	10.1	15	-38	13.5	11.1	20	62.3	61.7	1.0	-	-		-	-		0.0050	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Phosphorus	30	*50*	700	811	-15	1040	840	21	945	950	-0.5	-	-		-	-		0.030	*<0.030*	*<0.030*	*<0.030*	*<0.030*
Potassium	40	*100*	1290	1910	-39	1500	1330	12	4020	4020	0.0	-	-		-	-		0.20	0.91	1.00	0.88	0.77
Selenium	30	*0.20*	*<0.20*	*<0.20*		*<0.20*	*<0.20*		0.98	0.99	-1.0	-	-		-	-		0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Silver	40	*0.10*	*<0.10*	*<0.10*		*<0.10*	*<0.10*		0.61	0.59	3.3	-	-		-	-		0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Sodium	40	*50*	135	171	-24	125	103	19	206	209	-1	-	-		-	-		0.40	2.41	2.79	2.34	2.14
Strontium	40	*0.50*	41.2	55.7	-30	44.4	42.1	5	34.3	34.3	0.0	-	-		-	-		0.00050	0.01090	0.01190	0.01060	0.00848
Thallium	30	*0.050*	0.056	0.083	-39	0.072	0.062	15	0.351	0.356	-1.4	-	-		-	-		0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Tin	40	*2.0*	*<2.0*	*<2.0*		*<2.0*	*<2.0*		2.3	3.2	-32.7	-	-		-	-		0.0030	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Titanium	40	*1.0*	330	515	-44	439	453	-3	610	613	-0.5	-	-		-	-		0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Uranium	30	*0.050*	1.5	2.1	-37	1.9	1.6	20	18.5	18.3	1.1	-	-		-	-		-	-	-	-	-
Vanadium	30	*0.20*	18.7	27.4	-38	23.6	21.0	12	36.3	36.4	0	-	-		-	-		0.0030	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zinc	30	*2.0*	30.1	44.6	-39	38.4	33.0	15	140	140	0.0	-	-		-	-		0.00050	1.16000	1.31000	1.18000	0.93500
Zirconium	30	*1.0*	4.0	6.9	**-53**	4.4	4.1	7	3	2.8	6.9	-	-		-	-		-	-	-	-	-

Notes:

1. Laboratory data quality objectives (DQOs) for moisture, TOC, and metals are expressed as the relative percent difference (RPD) .
2. The laboratory DQOs for pH and particle size are the absolute difference between the original sample and laboratory duplicate.
3. The DQO for field duplicates is an RPD of < 50%.

RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs are > DQOs, but concentrations are < 10 x MDL.

Shaded RPDs values are > DQOs, and concentrations are > 10 x MDL.

Bold Filter Swipe values are > MDL, but < 10 x MDL.

Shaded Filter Swipe values are > 10x MDL and > 20% of the Blank QA Swipe.

Field Dup' samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–5. QA/QC data for analysis of sediment grab samples, Meadowbank study lakes and Baker Lake, 2017.

			Field Duplicates[3]															Laboratory Duplicates		
			BPJ			BES			SP			INUG			TPE			BES-4, BBD-4, BES-2		
Analyte	DQOs[1,2]	MDLs (mg/kg)	BPJ-2 11-Aug-17	DUP-1	RPD (%)	BES-2 10-Aug-17	DUP-2	RPD (%)	SP-5 22-Aug-17	DUP-3	RPD (%)	INUG-2 25-Aug-17	DUP-4	RPD (%)	TPE-4 23-Aug-17	DUP-5	RPD (%)	Original	Laboratory Duplicate	RPD (%)
Physical & Organic Parameters																				
Moisture (%)	20	0.25	50.5	51.5	-2.0	40.1	39.8	0.8	85.5	85.7	-0.2	83.3	84.2	-1	86.4	86.6	-0.2	30	28.6	4.8
pH	0.30	0.10	6.81	6.65	2	7.21	7.02	2.7	6.22	6.17	0.8	6.34	6.17	2.7	6.35	6.14	3.4	7.54	7.64	0.1
TOC (% dw)	30	0.05	0.70	0.77	-9.1	0.35	0.45	-24.9	3.90	3.93	-1	6.34	3.75	51.3	3.96	4.10	-3.5	-	-	
Particle Size																				
% Gravel (>2mm)	5	0.10	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
% Sand (2.00mm -	5	0.10	30.40	30.90	-2	66.7	66.4	0	*<1.0*	*<1.0*		6.9	5.3	26.2	*<1.0*	*<1.0*		66.7	67.90	1.2
% Silt (0.063mm -	5	0.10	58.7	58.3	0.7	29.8	29.9	0	70.4	68.9	2.2	68.6	71.2	-4	71.1	68.7	3.4	29.8	28.6	1
% Clay (<4µm)	5	0.10	11.0	10.7	2.8	3.5	3.7	-6	28.9	30.8	-6.4	24.5	23.5	4	28.2	30.6	-8.2	3.5	3.4	0.1
Total Metals (mg/kg dw)																				
Aluminum	40	50	8700	8220	5.7	6380	5890	8.0	24600	22200	10.3	19300	19300	0	23900	21400	11.0	5150	4650	10.2
Antimony	30	0.10	0.14	0.14	0	0.15	0.14	7	0.26	0.25	4	0.19	0.17	11.1	0.27	0.23	16.0	0.11	0.11	0.0
Arsenic	30	0.100	16.3	15.5	5.0	4.1	4.1	0.7	27.5	26.0	5.6	22.0	21.7	1.4	20.1	18.9	6.2	3.11	2.94	6
Barium	40	0.50	117	109	7	199	191	4	121	111	8.6	96	98	-2.6	113	107	5.5	148	136	8.5
Beryllium	30	0.10	0.41	0.40	2.5	0.35	0.33	5.9	2.00	1.80	11	1.24	1.23	0.8	1.70	1.46	15.2	0.32	0.28	13.3
Bismuth	30	0.20	0.20	0.31	-43.1	*<0.20*	*<0.20*		2.30	2.07	10.53	1.12	1.10	1.80	2.25	2.00	11.8	*<0.20*	*<0.20*	
Boron	30	5.0	7.80	7.20		6.20	5.70		8.80	7.70		7.00	7.00		7.80	7.30		5	*<5.0*	
Cadmium	30	0.020	0.074	0.058	24	0.044	0.040	9.5	0.238	0.201	17	0.203	0.204	0	0.289	0.282	2.5	0.03	0.028	6.9
Calcium	30	50	2670	2460	8.2	2270	2120	6.8	2200	2050	7.1	1620	1640	-1.2	2460	2100	16	2030	1850	9.3
Chromium	30	0.50	21.5	20.3	5.7	21	20	5	80.9	74.1	8.8	101.0	96.4	4.7	152.0	134	12.6	17.5	17.2	1.7
Cobalt	30	0.10	8.2	8.0	1.5	5.2	5.1	1.7	16.4	15.0	8.9	17.6	17.0	3.5	16.6	15.6	6.2	4.23	4.12	2.6
Copper	30	0.50	9.1	8.8	3.6	6.5	4.9	27.8	71.8	65.1	9.8	44.6	42.8	4.1	50.5	45.5	10.4	4.19	4.15	1.0
Iron	30	50	22800	21800	4.5	13800	13900	-0.7	63300	57500	9.6	48900	48900	0	44800	38900	14.1	12600	11800	6.6
Lead	40	0.50	9.1	8.5	6.4	5.3	4.8	11.1	21.7	18.9	13.8	12.2	12.1	0.8	21.1	18.3	14.2	4.38	4.12	6.1
Lithium	30	2.0	11.9	11.1	7	9.4	9.2	2	41.0	39.2	4	24.6	24.5	0	42.5	39.1	8	8.8	7.9	11
Magnesium	30	20	4760	4540	4.7	4120	3810	7.8	8970	8110	10.1	8430	8050	4.6	10600	9400	12.0	3390	3240	4.5
Manganese	30	1.0	1940	1820	6.4	877	807	8.3	1690	1530	9.9	2180	2150	1	1950	1940	0.5	520	501	3.7
Mercury	40	0.0050	0.0088	0.0084	5	0.0055	0.0059	-7.0	0.0261	0.0254	3	0.0244	0.0233	5	0.0204	0.0182	11.4	*<0.0050*	*<0.0050*	
Molybdenum	40	0.10	1.75	1.88	-7.2	0.58	0.54	7.1	6.01	5.55	8.0	4.15	4.04	2.7	3.81	3.33	13.4	0.51	0.44	14.7
Nickel	30	0.50	13.5	13.1	3.0	12.4	12.2	1.6	62.1	57.3	8.0	73.5	71.20	3.2	99.7	91	9.7	10.6	10.3	2.9
Phosphorus	30	50	1060	994	6.4	644	651	-1.1	530	522	1.5	635	610	4.0	459	427	7	627	650	-3.6
Potassium	40	100	1810	1670	8.0	1380	1320	4.4	4420	4070	8.2	3220	3150	2	4200	3850	9	1160	1020	12.8
Selenium	30	0.20	*<0.20*	*<0.20*		*<0.20*	*<0.20*		0.61	0.53	14.04	0.51	0.53	-3.85	0.76	0.72	5.4	*<0.20*	*<0.20*	
Silver	40	0.10	*<0.10*	*<0.10*		*<0.10*	*<0.10*		0.12	0.11	8.70	*<0.10*	0.11		0.11	*<0.10*		*<0.10*	*<0.10*	
Sodium	40	50	151	147	2.7	104	98	5.9	199	156	24.2	135	132	2	183	153	18	83	76	9
Strontium	40	0.50	53.1	48.5	9.1	40.5	37.6	7.4	20.0	17.9	11.1	21.1	21.0	0.5	19.2	16.8	13	35.4	30.1	16.2
Thallium	30	0.050	0.077	0.075	3	0.072	0.062	14.9	0.368	0.329	11	0.243	0.234	4	0.411	0.379	8.1	0.058	0.051	12.8
Tin	40	2.0	*<2.0*	*<2.0*		*<2.0*	*<2.0*		*<2.0*	*<2.0*		*<2.0*	*<2.0*		*<2.0*	*<2.0*		*<2.0*	*<2.0*	
Titanium	40	1.0	431	405	6	383	334	13.7	755	680	10.5	520	522	0	818	723	12	303	245	21.2
Uranium	30	0.050	2.0	1.9	5.7	1.3	1.2	9.6	20.1	17.6	13.3	15.4	14.6	5.3	15.0	13.0	14.3	1.11	1.05	5.6
Vanadium	30	0.20	26.0	24.6	5.5	20.5	20.2	1.5	39.5	35.9	9.5	33.7	32.9	2	42.1	38.1	10.0	18.9	17.3	9
Zinc	30	2.0	39.9	38.9	2.5	26.7	25.5	4.6	113.0	106.0	6.4	82.0	81.3	1	105.0	98.2	6.7	22.7	21.7	4.5

Notes:

1. Laboratory data quality objectives (DQOs) for moisture, TOC, and metals are expressed as the relative percent difference (RPD) .
2. The laboratory DQOs for pH and particle size are the absolute difference between the original sample and laboratory duplicate.
3. The DQO for field duplicates is an RPD of < 50%.

RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs are > DQOs, but concentrations are < 10 x MDL.

Shaded RPDs values are > DQOs, and concentrations are > 10 x MDL.

Bold Filter Swipe values are > MDL, but < 10 x MDL.

Shaded Filter Swipe values are > 10x MDL and > 20% of the Blank QA Swipe.

Field Dup' samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–5. QA/QC data for analysis of sediment grab samples, Meadowbank study lakes and Baker Lake, 2017.

Analyte	DQOs[1,2]	MDLs (mg/kg)	Laboratory Duplicates (Con't) BAP-1 Original	BAP-1 Laboratory Duplicate	BAP-1 RPD (%)	WAL-4, WAL-5, TPN-3 Original	WAL-4, WAL-5, TPN-3 Laboratory Duplicate	WAL-4, WAL-5, TPN-3 RPD (%)	PDL-1 Original	PDL-1 Laboratory Duplicate	PDL-1 RPD (%)
Physical & Organic Parameters											
Moisture (%)	20	*0.25*	30	28.6	4.8	89.9	89.7	0.2	-	-	
pH	0.30	*0.10*	-	-		6.59	6.55	0.04	-	-	
TOC (% dw)	30	*0.05*	-	-		-	-		-	-	
Particle Size											
% Gravel (>2mm)	5	*0.10*	*<1.0*	*<1.0*		*<1.0*	*<1.0*		*<1.0*	*<1.0*	
% Sand (2.00mm -	5	*0.10*	71.9	73.2	1.3	42.5	42.4	0.1	2.8	5.5	2.7
% Silt (0.063mm -	5	*0.10*	24.9	23.8	1.1	42.8	40.8	2.0	77.2	72.9	4.3
% Clay (<4µm)	5	*0.10*	3.2	3	0.2	14.7	16.9	2.2	20	21.6	1.6
Total Metals (mg/kg dw)											
Aluminum	40	*50*	-	-		18000	18900	-4.9	-	-	
Antimony	30	*0.10*	-	-		0.38	0.4	-5.1	-	-	
Arsenic	30	*0.100*	-	-		40.4	44	-8.5	-	-	
Barium	40	*0.50*	-	-		91.4	98.6	-7.6	-	-	
Beryllium	30	*0.10*	-	-		1.43	1.49	-4.1	-	-	
Bismuth	30	*0.20*	-	-		1.79	1.92	-7.0	-	-	
Boron	30	*5.0*	-	-		10.4	10		-	-	
Cadmium	30	*0.020*	-	-		0.368	0.406	-9.8	-	-	
Calcium	30	*50*	-	-		3900	3950	-1.3	-	-	
Chromium	30	*0.50*	-	-		53.7	57.3	-6.5	-	-	
Cobalt	30	*0.10*	-	-		9.18	9.86	-7.1	-	-	
Copper	30	*0.50*	-	-		117	122	-4.2	-	-	
Iron	30	*50*	-	-		32400	34700	-6.9	-	-	
Lead	40	*0.50*	-	-		29.2	31.6	-7.9	-	-	
Lithium	30	*2.0*	-	-		32.1	34.3	-6.6	-	-	
Magnesium	30	*20*	-	-		7150	7470	-4.4	-	-	
Manganese	30	*1.0*	-	-		319	342	-7.0	-	-	
Mercury	40	*0.0050*	-	-		0.0558	0.0583	-4	-	-	
Molybdenum	40	*0.10*	-	-		7.82	8.37	-7	-	-	
Nickel	30	*0.50*	-	-		48.2	50.8	-5.3	-	-	
Phosphorus	30	*50*	-	-		730	775	-6.0	-	-	
Potassium	40	*100*	-	-		3190	3300	-3.4	-	-	
Selenium	30	*0.20*	-	-		0.7	0.66	5.9	-	-	
Silver	40	*0.10*	-	-		0.48	0.53	-9.9	-	-	
Sodium	40	*50*	-	-		166	166	0	-	-	
Strontium	40	*0.50*	-	-		25.7	27.6	-7.1	-	-	
Thallium	30	*0.050*	-	-		0.292	0.311	-6.3	-	-	
Tin	40	*2.0*	-	-		*<2.0*	*<2.0*		-	-	
Titanium	40	*1.0*	-	-		578	583	-0.9	-	-	
Uranium	30	*0.050*	-	-		14.2	15.4	-8.1	-	-	
Vanadium	30	*0.20*	-	-		29.1	30.5	-4.7	-	-	
Zinc	30	*2.0*	-	-		114	121	-6.0	-	-	

Analyte	Swipe MDLs (mg)	Equipment Swipes SWIPE-QA FILTER 20-Aug-17	SWIPE-1 FILTER 11-Aug-17	SWIPE-2 FILTER 9-Aug-17	SWIPE-3 FILTER 24-Aug-17	SWIPE-4 FILTER 27-Aug-17	SWIPE-5 FILTER 26-Aug-17
		Blank swipe	BPJ - 2 stainless steel bowls, 2 spoons, and inside of the ponar	BAP - 2 stainless steel bowls and 2 spoons	PDL - ponar screens	TPN - inside of the ponar but not the screens	WAL - 2 stainless steel bowls and 1 spoon
Total Metals (mg/filter)							
Aluminum	0.020	0.860	0.922	0.818	0.864	0.807	0.794
Antimony	0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Arsenic	0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Barium	0.00100	1.64000	1.61000	1.43000	1.56000	1.54000	1.55000
Beryllium	0.00050	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Bismuth	0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Boron	-	-	-	-	-	-	-
Cadmium	0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Calcium	0.200	0.460	0.470	0.420	0.430	0.430	0.430
Chromium	0.0020	*<0.0020*	**0.0054**	**0.0106**	**0.0023**	**0.0046**	**0.0065**
Cobalt	0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Copper	0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Iron	0.0100	0.0150	**0.0380**	**0.0720**	**0.0350**	**0.0450**	**0.0500**
Lead	0.0040	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*
Lithium	0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium	0.1000	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Manganese	0.00050	*<0.00050*	**0.00130**	**0.00124**	**0.00073**	**0.00106**	**0.00174**
Mercury	-	-	-	-	-	-	-
Molybdenum	0.0030	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Nickel	0.0050	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Phosphorus	0.030	*<0.030*	*<0.030*	*<0.030*	*<0.030*	*<0.030*	*<0.030*
Potassium	0.20	0.91	0.95	0.85	0.85	0.90	0.90
Selenium	0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Silver	0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Sodium	0.40	2.41	2.53	2.31	2.43	2.44	2.50
Strontium	0.00050	0.01090	0.01070	0.00961	0.01050	0.01040	0.01040
Thallium	0.020	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*
Tin	0.0030	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Titanium	0.00100	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Uranium	-	-	-	-	-	-	-
Vanadium	0.0030	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zinc	0.00050	1.16000	1.23000	1.07000	1.13000	1.11000	1.12000

Notes:

1. Laboratory data quality objectives (DQOs) for moisture, TOC, and metals are expressed as the relative percent difference (RPD) .
2. The laboratory DQOs for pH and particle size are the absolute difference between the original sample and laboratory duplicate.
3. The DQO for field duplicates is an RPD of < 50%.

RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs are > DQOs, but concentrations are < 10 x MDL.

Shaded RPDs values are > DQOs, and concentrations are > 10 x MDL.

Bold <u>Filter Swipe</u> values are > MDL, but < 10 x MDL.

Shaded <u>Filter Swipe</u> values are > 10x MDL and > 20% of the Blank QA Swipe.

Field Dup' samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–5. QA/QC data for hydrocarbon and PAH analysis of sediment grab samples, Meadowbank study lakes and Baker Lake, 2017.

Analyte	DQOs[1,2]	MDLs (mg/kg)	Field Duplicates[3] Baker Lake BBD-COMP 12-Aug-17	COMP DUP-1	RPD (%)	TPN-COMP 27-Aug-17	COMP DUP-2	RPD (%)	Laboratory Duplicates BPJ-COMP Original	Laboratory Duplicate	RPD (%)
Physical Parameters											
Moisture (%)		*0.25*	28.4	28.4	0.0	64.3	66.9	-4.0	-	-	
Aggregate Organics (mg/kg)											
Mineral Oil and Grease		*500*	*<500*	*<500*		*<500*	710.0		-	-	
Hydrocarbons (mg/kg)											
EPH10-19	40	*200*	*<200*	*<200*		*<240*	*<300*		*<200*	*<200*	
EPH19-32	40	*200*	*<200*	*<200*		*<240*	*<300*		*<200*	*<200*	
LEPH		*200*	*<200*	*<200*		*<240*	*<300*		-	-	
HEPH		*200*	*<200*	*<200*		*<240*	*<300*		-	-	
Polycyclic Aromatic Hydrocarbons (mg/kg)											
Acenaphthene	50	*0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*	
Acenaphthylene	50	*0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*	
Anthracene	50	*0.0040*	*<0.0040*	*<0.0040*		*<0.0040*	*<0.0040*		*<0.0040*	*<0.0040*	
Benzo(a)anthracene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(a)pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(b)fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		-	-	
Benzo(b+j+k)fluoranthene	50	*0.015*	*<0.015*	*<0.015*		*<0.015*	*<0.015*		*<0.010*	*<0.010*	
Benzo(g,h,i)perylene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(k)fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Chrysene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Dibenz(a,h)anthracene	50	*0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*	
Fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Fluorene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Indeno(1,2,3-c,d)pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
2-Methylnaphthalene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Naphthalene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Phenanthrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
d10-Acenaphthene (%)	50		74.5	78.1	-4.7	85.7	92.7	-7.8	-	-	
d12-Chrysene (%)	50		85.4	87.5	-2.4	93.0	105.5	-12.6	-	-	
d8-Naphthalene (%)	50		74.5	78.5	-5.2	85.8	91.7	-6.6	-	-	
d10-Phenanthrene (%)	50		82.2	85.1	-3.5	91.5	100.4	-9.3	-	-	
B(a)P Total Potency Equivalent	50	*0.020*	*<0.020*	*<0.020*		*<0.020*	*<0.020*		-	-	
IACR (CCME)	50	*0.15*	*<0.15*	*<0.15*		*<0.15*	*<0.15*		-	-	

Notes:

1. Laboratory data quality objectives (DQOs) for moisture, TOC, and metals are expressed as the relative percent difference (RPD) .

2. The laboratory DQOs for pH and particle size are the absolute difference between the original sample and laboratory duplicate.

3. The DQO for field duplicates is an RPD of < 50%.

RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs are > DQOs, but concentrations are < 10 x MDL.

Shaded RPDs are > DQOs, and concentrations are > 10 x MDL.

Bold Filter Swipe values are > MDL, but < 10 x MDL.

Shaded Filter Swipe values > 10x MDL.

Field Dup' samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–5. QA/QC data for hydrocarbon and PAH analysis of sediment grab samples, Meadowbank study lakes and Baker Lake, 2017.

			Laboratory Duplicates								
			BES-COMP			BAP-COMP			WAL-COMP		
Analyte	**DQOs**[1,2]	**MDLs (mg/kg)**	**Original**	**Laboratory Duplicate**	**RPD (%)**	**Original**	**Laboratory Duplicate**	**RPD (%)**	**Original**	**Laboratory Duplicate**	**RPD (%)**
Physical Parameters											
Moisture (%)		*0.25*	-	-		-	-		-	-	
Aggregate Organics (mg/kg)											
Mineral Oil and Grease		*500*	-	-		-	-		-	-	
Hydrocarbons (mg/kg)											
EPH10-19	40	*200*	*<200*	*<200*		*<200*	*<200*		*<840*	*<840*	
EPH19-32	40	*200*	*<200*	*<200*		*<200*	*<200*		*<840*	*<840*	
LEPH		*200*	-	-		-	-		-	-	
HEPH		*200*	-	-		-	-		-	-	
Polycyclic Aromatic Hydrocarbons (mg/kg)											
Acenaphthene	50	*0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		*<0.010*	*<0.010*	
Acenaphthylene	50	*0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		*<0.010*	*<0.010*	
Anthracene	50	*0.0040*	*<0.0040*	*<0.0040*		*<0.0040*	*<0.0040*		*<0.010*	*<0.010*	
Benzo(a)anthracene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(a)pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(b)fluoranthene	50	*0.010*	-	-		-	-		-	-	
Benzo(b+j+k)fluoranthene	50	*0.015*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(g,h,i)perylene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Benzo(k)fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Chrysene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Dibenz(a,h)anthracene	50	*0.0050*	*<0.0050*	*<0.0050*		*<0.0050*	*<0.0050*		*<0.010*	*<0.010*	
Fluoranthene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Fluorene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Indeno(1,2,3-c,d)pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
2-Methylnaphthalene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.020*	*<0.020*	
Naphthalene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.030*	*<0.030*	
Phenanthrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
Pyrene	50	*0.010*	*<0.010*	*<0.010*		*<0.010*	*<0.010*		*<0.010*	*<0.010*	
d10-Acenaphthene (%)	50		-	-		-	-		-	-	
d12-Chrysene (%)	50		-	-		-	-		-	-	
d8-Naphthalene (%)	50		-	-		-	-		-	-	
d10-Phenanthrene (%)	50		-	-		-	-		-	-	
B(a)P Total Potency Equivalent	50	*0.020*	-	-		-	-		-	-	
IACR (CCME)	50	*0.15*	-	-		-	-		-	-	

Notes:

1. Laboratory data quality objectives (DQOs) for moisture, TOC, and metals are expressed as the relative percent difference (RPD) .

2. The laboratory DQOs for pH and particle size are the absolute difference between the original sample and laboratory duplicate.

3. The DQO for field duplicates is an RPD of < 50%.
RPD (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are not calculated for cases where one of the samples is below detection and the other is not and in cases where both are below detection. RPD has been left blank.

Bold RPDs are > DQOs, but concentrations are < 10 x MDL.

Shaded RPDs are > DQOs, and concentrations are > 10 x MDL.

Bold Filter Swipe values are > MDL, but < 10 x MDL.

Shaded Filter Swipe values > 10x MDL.

Field Dup' samples are homogenization duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

Italicized numbers are below detection limits.

"-" analyte not measured

Table 3.1–7. Field QA/QC data for phytoplankton, Meadowbank study lakes and Baker Lake, 2017.

Area-Replicate	Field QA	Phytoplankton Biomass (mg/m^3)							Taxa Richness
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**	
March	TPE-100	0	6.8	13	2.7	9.6	0	32	17
	DUP - 1	0	0.3	8.7	0.2	2.0	0	11	11
	RPD (%)		181	36	174	131		**95**	43
	WAL-70	0	0.6	8.4	1.7	3.7	3.3	18	19
	DUP - 2	0	2.8	16	1	6.4	2.2	28	17
	RPD (%)		-132	-61.9	55	-53	40	-46.2	11
May	INUG-88	0	1.9	9.2	0	1	0	13	14
	DUP - 1	0	1.7	13	0	5.5	1.0	22	18
	RPD (%)		14	-37	68	-143	NA	**-54**	-25
	TPN-103	0	4.4	9.3	0	4.2	11	29	16
	DUP - 2	0	2.2	12	2.9	2.5	10	30	20
	RPD (%)		69	-28	-143	50	4	-3.0	-22
July	TPN-105	0.04	15	135	3.9	7.6	4.6	165	28
	DUP - 1	0	6.3	81	2.7	1	38	128	22
	RPD (%)	NA	79	50	38	158	-156	25	24
	BBD-49	0.04	2.3	75	26	56	18	177	31
	DUP - 2	0	1.4	50	52	29	35	167	31
	RPD (%)	NA	45	41	-68	63	-65	6.0	0.0
August	BAP-51	0.3	6.1	75	25	8.9	7.3	122	37
	DUP - 1	0	7.4	41	25	9.6	7.1	90	30
	RPD (%)	NA	-20	59	-3.0	-8	2	30	21
	SP-107	0.6	34	113	23	10	8.7	190	41
	DUP - 2	0.2	29	121	16	24	20	209	36
	RPD (%)	93	16	-6	37	-78	-78	-9.5	13
September	INUG-94	1.3	9.2	107	23	2.1	16	158	33
	DUP - 1	1.9	6.9	99	22	3.5	14	148	35
	RPD (%)	-34	28	7	3	-51	10	6.6	-5.9

Notes:
RPD = Relative Percent Difference (%) = ((original - duplicate) / ((original + duplicate)/2)) x 100.
Bolded RPD values exceed 50%.
RPDs have not been calculated for cases where one or both of the samples is "0".

Table 3.1–7. Field QA/QC data for phytoplankton, Meadowbank study lakes and Baker Lake, 2017.

Area-Replicate	Field QA	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
March	TPE-100	100	128,160	276,596	131,706	49,099	0	585,660
	DUP - 1	0	24,823	301,419	3,646	11,238	0	341,126
	RPD (%)	NA	135	-8.6	189	125		**53**
	WAL-70	0	46,199	283,688	5,346	15,984	300	351,518
	DUP - 2	0	99,391	475,177	22,177	51,045	3,646	651,436
	RPD (%)	-	-73	-50	-122	-104.6	-169.6	**-59.8**
May	INUG-88	0	36,061	198,582	21,477	3,946	0	260,065
	DUP - 1	0	63,930	340,426	3,746	39,807	100	448,009
	RPD (%)		-56	-53	141	-164	NA	**-53.1**
	TPN-103	0	63,930	187,943	14,284	22,477	11,338	299,972
	DUP - 2	0	88,953	251,773	131,306	14,784	1,200	488,016
	RPD (%)		-33	-29	-161	41	162	-47.7
July	TPN-105	200	251,640	1,784,432	115,344	46,704	1,000	2,199,320
	DUP - 1	0	136,896	949,288	129,912	400	5,800	1,222,296
	RPD (%)	NA	59	61.1	-12	197	-141	**57.1**
	BBD-49	200	35,920	1,107,536	78,240	349,232	2,800	1,573,928
	DUP - 2	0	35,920	1,207,712	201,784	189,784	4,200	1,639,400
	RPD (%)	NA	0	-9	-88.2	59	-40	-4.1
August	BAP-51	28,736	510,264	627,808	260,672	65,056	1,400	1,493,936
	DUP - 1	0	790,240	503,880	165,696	72,040	1,200	1,533,056
	RPD (%)	NA	-43	22	45	-10	15	-2.6
	SP-107	2,200	1,230,664	1,343,808	519,864	60,272	1,400	3,158,208
	DUP - 2	1,200	711,816	1,516,424	418,488	141,496	2,800	2,792,224
	RPD (%)	59	53	-12	22	-81	-67	12.3
September	INUG-94	11,600	382,752	1,024,328	413,088	14,568	1,000	1,847,336
	DUP - 1	16,400	461,576	803,224	420,872	22,152	800	1,725,024
	RPD (%)	-34.3	-19	24	-2	-41	22	6.8

Notes:
RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.
Bolded RPD values exceed 50%.
RPDs have not been calculated for cases where one or both of the samples is "0".

Table 3.1–8. Laboratory QA/QC data for phytoplankton, Meadowbank study lakes and Baker Lake, 2017.

Area-Replicate	**Field QA**	**Phytoplankton Biomass (mg/m^3)**							**Taxa Richness**
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**	
March	TPE-100	0	6.8	12.60	2.7	9.6	0	31.66	17
	Lab Dup	0	7.2	14.19	2.7	11.76	0.18	36.06	16
	RPD (%)		-6	-12	-1	-20	NA	-13	6.1
	INUG-87	0.16	0.73	13.12	0.79	12.30	0.72	27.83	16
	Lab Dup	0	0.50	12.99	0.52	13.37	1.6	28.98	14
	RPD (%)	NA	37	1	41	-8	-76	-4.0	13
May	SP-102	0	0.99	13.16	0.82	1.4	0.21	16.60	13
	Lab Dup	0	0.65	13.41	0.92	0.81	0.00	15.78	15
	RPD (%)		41	-2	-11	55	NA	5.1	-14
	PDL-53	0.77	0.66	18.06	5.3	8.6	12.87	46.28	21
	Lab Dup	0.97	0.93	20.47	5.4	11.11	10.31	49.17	23
	RPD (%)	-23	-34	-13	-1	-25	22	-6.1	-9.1
July	TPE-104	0	8.6	116.21	2.5	7.1	2.8	137.22	25
	Lab Dup	0	10.42	112.84	0.95	5.7	2.1	132.02	25
	RPD (%)		-19	3	90	22	29	3.9	0
	BBD-49	0.04	2.3	75.32	25.55	55.96	17.83	176.96	31
	Lab Dup	0	2.7	65.71	21.14	53.03	22.22	164.77	30
	RPD (%)	NA	-17	14	19	5	-22	7.1	3.3
August	BAP-51	0.29	6.1	74.66	24.66	8.9	7.3	121.89	37
	Lab Dup	0	8.9	62.32	33.16	4.9	5.6	114.99	35
	RPD (%)	NA	-38	18	-29	58	26	5.8	5.6
	PDL-57	2.2	9.8	58.22	17.14	0.60	2.5	90.43	38
	Lab Dup	1.6	5.9	62.53	12.96	1.7	6.0	90.64	38
	RPD (%)	31	50	-7	28	-94	-82	0	0
September	WAL-77	0.12	16.45	176.65	27.75	7.6	14.31	242.93	35
	Lab Dup	0.40	55.32	171.76	20.79	9.3	9.3	266.80	33
	RPD (%)	-108	-108	3	29	-19	43	-9.4	5.9
	INUG-95	1.4	7.8	106.06	12.77	2.7	5.7	136.42	33
	Lab Dup	1.7	5.9	117.06	12.59	9.0	4.5	150.67	31
	RPD (%)	-18	28	-10	1	-107	23	-9.9	6.3

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / ((original + duplicate))/2) x 100.

Bolded RPD values exceed 25%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table 3.1–8. Laboratory QA/QC data for phytoplankton, Meadowbank study lakes and Baker Lake, 2017.

Area-Replicate	Field QA	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
March	TPE-100	100	128,160	276,596	131,706	49,099	0	585,660
	Lab Dup	0	131,706	244,681	117,421	63,684	100	557,592
	RPD (%)	NA	-3	12.2	11	-26	NA	4.9
	INUG-87	3,546	700	358,156	14,584	99,891	100	476,977
	Lab Dup	0	500	326,241	14,384	103,237	300	444,663
	RPD (%)	NA	33	9.3	1	-3	-100	7.0
May	SP-102	0	53,192	234,043	21,677	4,346	100	313,357
	Lab Dup	0	46,099	265,958	25,423	600	0	338,080
	RPD (%)		14	-12.8	-16	151	NA	-7.6
	PDL-53	5,000	50,045	276,596	62,184	70,922	4,246	468,993
	Lab Dup	6,300	50,045	262,411	57,838	92,299	600	469,493
	RPD (%)	-23	0	5.3	7	-26	150	0
July	TPE-104	0	208,536	1,476,320	101,176	59,272	800	1,846,104
	Lab Dup	0	237,272	1,439,800	36,720	58,672	600	1,773,064
	RPD (%)		-13	2.5	93	1	29	4.0
	BBD-49	200	35,920	1,107,536	78,240	349,232	2,800	1,573,928
	Lab Dup	0	50,288	1,129,488	49,904	341,048	2,400	1,573,128
	RPD (%)	NA	-33	-2.0	44	2	15	0
August	BAP-51	28,736	510,264	627,808	260,672	65,056	1,400	1,493,936
	Lab Dup	0	675,896	590,888	291,008	36,120	1,400	1,595,312
	RPD (%)	NA	-28	6.1	-11	57	0	-6.6
	PDL-57	9,800	489,712	582,304	154,464	7,184	600	1,244,064
	Lab Dup	7,200	403,104	697,648	125,728	21,752	600	1,256,032
	RPD (%)	31	19	-18.0	21	-101	0	-1
September	WAL-77	400	546,184	1,548,960	723,200	19,368	800	2,838,912
	Lab Dup	1,400	560,552	1,612,416	594,488	13,784	1,000	2,783,640
	RPD (%)	-111	-3	-4.0	20	34	-22	2.0
	INUG-95	12,600	555,568	1,219,696	297,344	15,568	400	2,101,176
	Lab Dup	15,200	533,216	1,169,208	268,408	20,168	800	2,007,000
	RPD (%)	-19	4	4.2	10	-26	-67	4.6

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 25%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table 3.1–9. Percent recovery of benthic invertebrate samples, Meadowbank study lakes and Baker Lake, August 2017.

Area-Replicate	Number of Organisms Recovered	Number of Organisms in Re-sort	Percent Recovery
BAP-1	280	305	91.8%
INUG-4.2	23	23	100%
PDL-2.1	32	33	97.0%
SP-2	109	109	100%
TPE-3	218	222	98.2%
TPN-1	132	132	100%
WAL-1.2	71	74	95.9%
		Average % Recovery	97.6%

Notes:

All samples were sorted in their entirety.

Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.

Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.

3.2. Meadowbank Study Lakes

3.2.1. Limnology

3.2.1.1. General Observations

The ice-free season on the Meadowbank study lakes is very short. Ice break-up usually occurs during mid- to late-June; ice begins to form again on the lakes beginning in late September or early October, with complete ice cover by late October. Maximum ice thickness is about 2 m and occurs in March/April, increasing the concentration of some ions, such as chloride, in the water near the ice-water interface. This phenomenon is due to cryo-concentration where ice formation excludes certain ions and increases their concentration in the water column (Wetzel, 1983). Because the lakes are ice covered for most of the year, gas exchange with the atmosphere is limited, although oxygen concentrations usually remain high under the ice because of the low rates of biological activity and decomposition of organic material (processes that consume oxygen from the water). Historically, during winter there is typically a slight negative thermal stratification with near 0°C water near the ice-water interface, increasing to 3°C to 5 $^{\circ}$C at depth.

During open water conditions, maximum water temperatures may reach 15°C in summer (e.g. July at SP) with little evidence of thermal stratification, except for brief periods of time (days) and typically only a 4°C to 5°C temperature difference. Winds blow near constantly and at high speeds, maintaining uniform temperature and high oxygen profiles in the water column in all lakes due to vertical mixing. This also ensures that the distribution of phytoplankton and to a lesser extent, zooplankton is vertically more uniform.

Limnology data, when compared to previous monitoring data, provides an initial assessment of whether conditions are changing within a sampling area that may require additional follow-up investigation. One depth profile for temperature, dissolved oxygen, and conductivity was conducted monthly from NF stations except when ice conditions were unsafe in June and October. Two limnology profiles were collected synoptically with water chemistry and phytoplankton sampling in March, May, July, August, and September. Qualitative evaluation of the limnology data is done using plots of the deepest sample within each lake for a given event. The table below indicates which samples were used in the limnology plots and data interpretation for 2017. Raw limnology data for 2017 is included for all of the locations in **Appendix G**.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
INUG			INUG-87		INUG-88	Not sampled	INUG-90	INUG-93	INUG-94	Not sampled		
PDL			PDL-51		PDL-53		PDL-55	PDL-57	PDL-59			
TPN	✓	✓	TPN-101	✓	TPN-102		TPN-104	TPN-107	TPN-109		✓	✓
TPE	✓	✓	TPE-100	✓	TPE-103		TPE-104	TPE-107	TPE-108		✓	✓
SP	✓	✓	SP-101	✓	SP-102		SP-104	SP-106	SP-108		✓	✓
WAL	✓	✓	WAL-69	✓	WAL-71		WAL-73	WAL-75	WAL-78		✓	✓
TPS			TPS-58									
TE			TE-93									
TEFF			TEFF-45									

Notes:
Empty cells indicate no limnology profiles were collected, consistent with the study design.
✓ = One profile is collected in months where water sampling is not completed (i.e., January, February, April, November, and December).

3.2.1.2. Temporal and Spatial Trend Interpretation

Temperature and Oxygen

Water temperatures at a depth of 3 m are shown in **Figure 3.2-1** for the Meadowbank project lakes since 2006. Water temperatures in 2017 followed similar patterns of seasonal change compared to previous monitoring cycles.

The 2017 vertical temperature profiles are characteristic of the typical thermal regime of these lakes (**Figure 3.2-2** through **Figure 3.2-11**). Winter temperature profiles for the through-ice events show a slight negative thermal stratification with water temperatures near 0˚C at the ice-water interface, increasing to typically between 2˚C and 3.5˚C at depth. Oxygen concentrations in winter generally decrease slightly with increasing depth, with occasional values measured above theoretical limits of air saturation[17] (14.6 mg/L at 0˚C). Oxygen concentrations in all basins are greater than 5 mg/L, and usually greater than 10 mg/L even at the lowest depths, despite nearly nine months of ice cover.

The project lakes typically turn over by mid-July, leading to a well-mixed water column with uniform temperature and high oxygen concentrations. Water temperatures warm rapidly to reach maximum temperatures of around 15˚C by late July and into August. Deeper lakes and basins, such as TPN and INUG, are typically 2˚C to 3˚C colder than the shallower locations WAL and SP. Temperatures in 2017 were moderate and typical of historical temperature patterns (**Figure 3.2-1**). Vertical stratification in water temperature, which occasionally establishes after extended periods of calm, windless conditions, was noted at all areas in 2017 with the exception of INUG and PDL in July (**Figure 3.2-7**). The profile at INUG shows the lake likely had turned over and was warming at the surface, whereas PDL had turned over after ice-off, but temperatures remained cold at the surface (~ 6°C). By August, temperature profiles were thermally unstratified and warmer at all areas (**Figure 3.2-8**). In September, water temperatures cooled to below 5˚C but remained un-stratified. With vertical mixing, oxygen concentrations are high and fully saturated (**Figure 3.2-9**). While the values jumped around slightly, no vertical stratification was observed. The November and December sampling events at the NF areas indicate the water column was generally well mixed and un-stratified for DO and conductivity despite ice-cover on all the lakes (**Figure 3.2-10** and **Figure 3.2-11**, respectively).

The seasonal patterns in water temperature and oxygen concentrations observed in 2017 were typical of this area of the Arctic and similar to what has been observed in previous years. There were no differences in these patterns between the control lakes INUG and PDL and the NF and MF monitoring areas.

Conductivity

Field conductivity[18] is discussed here as an indicator of stratification in the water column. From a monitoring perspective, uniform conductivity provides confidence that the water column is well-mixed and that a water chemistry sample will be representative. In contrast, variable conductivity may indicate the presence of water with different chemical properties (e.g., mining effluent), so profiling is useful to identify these situations and adjust sample collection if necessary to ensure that the different water masses are properly characterized. Oligotrophic systems with low dissolved solids and ions (Ca, Na, Cl,

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[17] Photosynthesis occurring under ice can lead to DO results exceeding theoretical air saturation limits. This is due to photosynthesis producing pure oxygen, as opposed to the approximate oxygen content of 21% in air.

[18] Throughout this report, any discussion of “conductivity” refers to specific conductance, which is conductivity normalized to 25°C.

Mg, etc.) typically register conductivity measurements of less than 50 µS/cm. Conductivity is usually uniform in concentration from top to bottom at impact and reference lakes in any given month, with minor seasonal fluctuations between months. While the overall range in conductivity is similar between ice-on (10 – 50 µS/cm) and ice-off (10 – 40 µS/cm) months, the conductivities in ice-off months are generally lower, consistent with cryo-concentration during progressive ice formation during winter months.

Field conductivity was generally uniform in concentration through the water column among the various areas sampled in 2017. Minor vertical differences due to cryo-concentration were observed during winter sampling events (e.g., February 2017 [**Figure 3.2-3**]), with no apparent differences between reference and near-field areas and fairly uniform profiles during the open water period (**Figure 3.2-7** to **Figure 3.2-9**).

The two locations with the greatest potential for fluctuations in conductivity in 2017 were SP and WAL as both locations received periodic water discharges from the Site. In the case of SP, seep water from the East Dike was collected and diverted back to SP via the diffuser except between May 12th and October 29th. The release of seep water to SP was stopped because of elevated TSS and there being no treatment available at this location. A review of the conductivity values dating back to 2009 showed 2017 conductivity results at SP were generally within the range reported in previous monitoring cycles. Historically, conductivity at SP was typically between 20 µS/cm and 30 µS/cm. More recent results from 2015-2017 have trended more towards 30 µS/cm to 40 µS/cm in most months. The change in conductivity at SP has been continually identified in the water chemistry BACI analysis without any corresponding adverse effects to the biological community.

Conductivity at WAL tended to be higher compared to the reference and NF areas in 2017. Water was released from the Vault Attenuation Pond to Wally Lake between June 19th and October 9th. Conductivity increased monthly from January (10 to 25 µS/cm) to April (50 to 65 µS/cm). For the remainder of the year (May through December) conductivity concentrations ranged between 40 µS/cm and 60 µS/cm. Among the highest concentrations were those measured in April near the ice-water interface (60 µS/cm), which is consistent with cryo-concentration discussed above. At 5 m, the conductivity reading in April was 50 µS/cm, closer to typical “background” conductivity for WAL. July readings were all below 40 µS/cm, and close to previously-reported concentrations for July (**Figure 3.2-12**). In August the limnology profiles were taken synoptically at two benthic invertebrate sampling areas to align with requirements of the EEM program. The benthic and sediment sampling areas are located within approximately 300 m of the diffuser, and unsurprisingly, conductivity was higher for the August event. A field investigation of the effluent plume in WAL was completed in 2016 (July) and 2017 (August) using conductivity as a tracer as part of the Cycle 3 EEM program. Effluent concentrations in the vicinity of the diffuser (<250 m) were estimated at between 4% and 6% in 2017 (see C. Portt and Associates, and Kilgour & Associates Ltd., 2018). Background conductivity in the north part of the lake measured 38 µS/cm in August 2017, similar to values reported in WAL during the before period (2009-2012) for the same month (**Figure 3.2-12**). The release of effluent from the Vault Attenuation Pond is detectable as an effluent plume (i.e., 1%) in WAL to a distance of approximately 700 m (C. Portt and Associates, and Kilgour & Associates Ltd., 2018). Results of the 2017 limnology survey for the CREMP agree with the plume investigation completed for the EEM, namely, that elevated conductivity relative to previous years is reflective of sampling near the diffuser and not indicative of widespread increases throughout WAL.

Figure 3.2-1. Mean monthly field-measured temperature (°C) at 3 m depth from 2006 – 2017, Meadowbank project lakes.

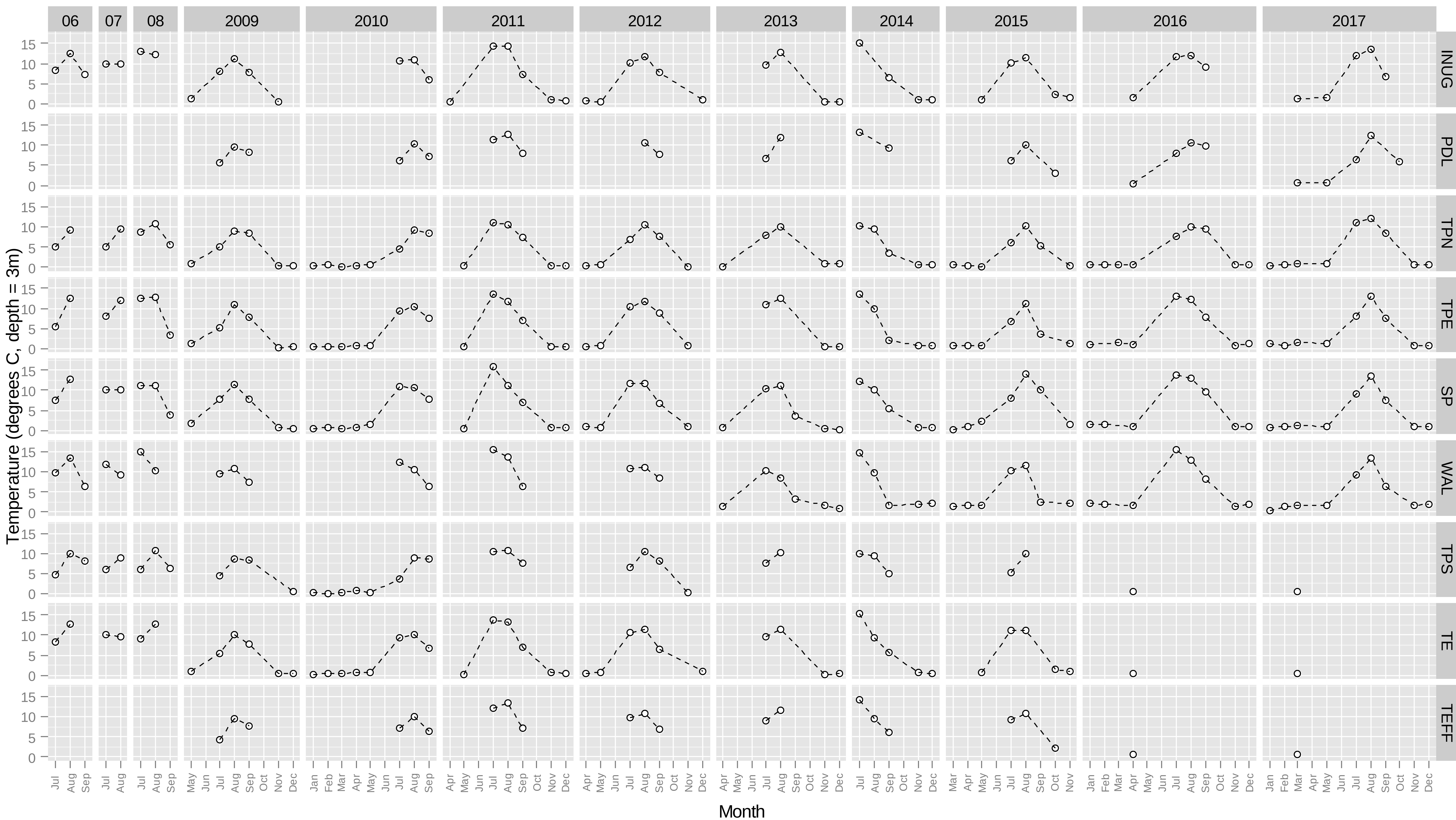


Figure 3.2-2. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for January, 2017.

Note: The specific conductivity measurements for SP were considered unreliable. The recorded values are labelled but not shown in the figure.

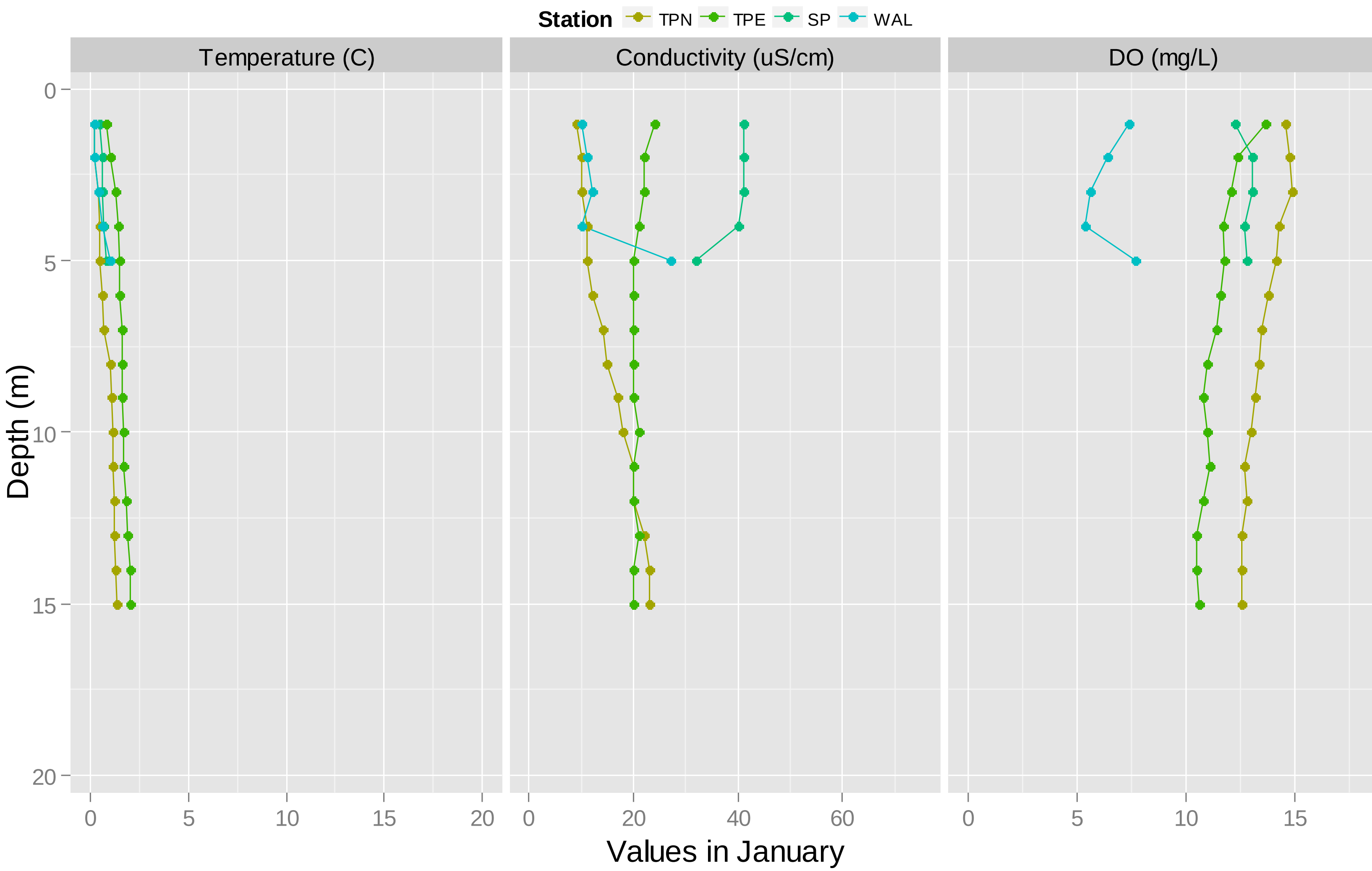


Figure 3.2-3. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for February, 2017.

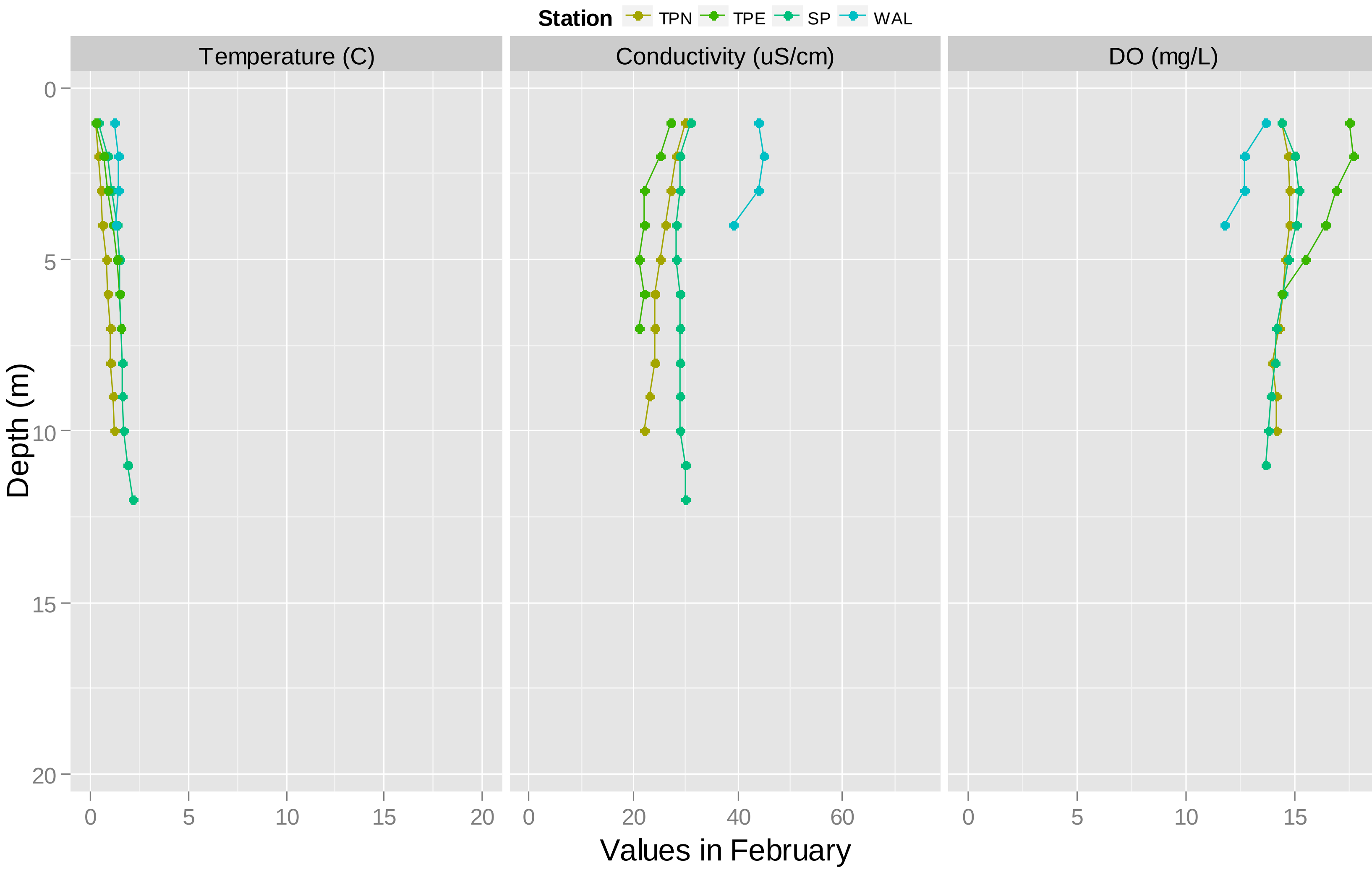


Figure 3.2-4. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for March, 2017.

Note: The specific conductivity measurements for WAL were considered unreliable. The recorded values are labelled but not shown in the figure.

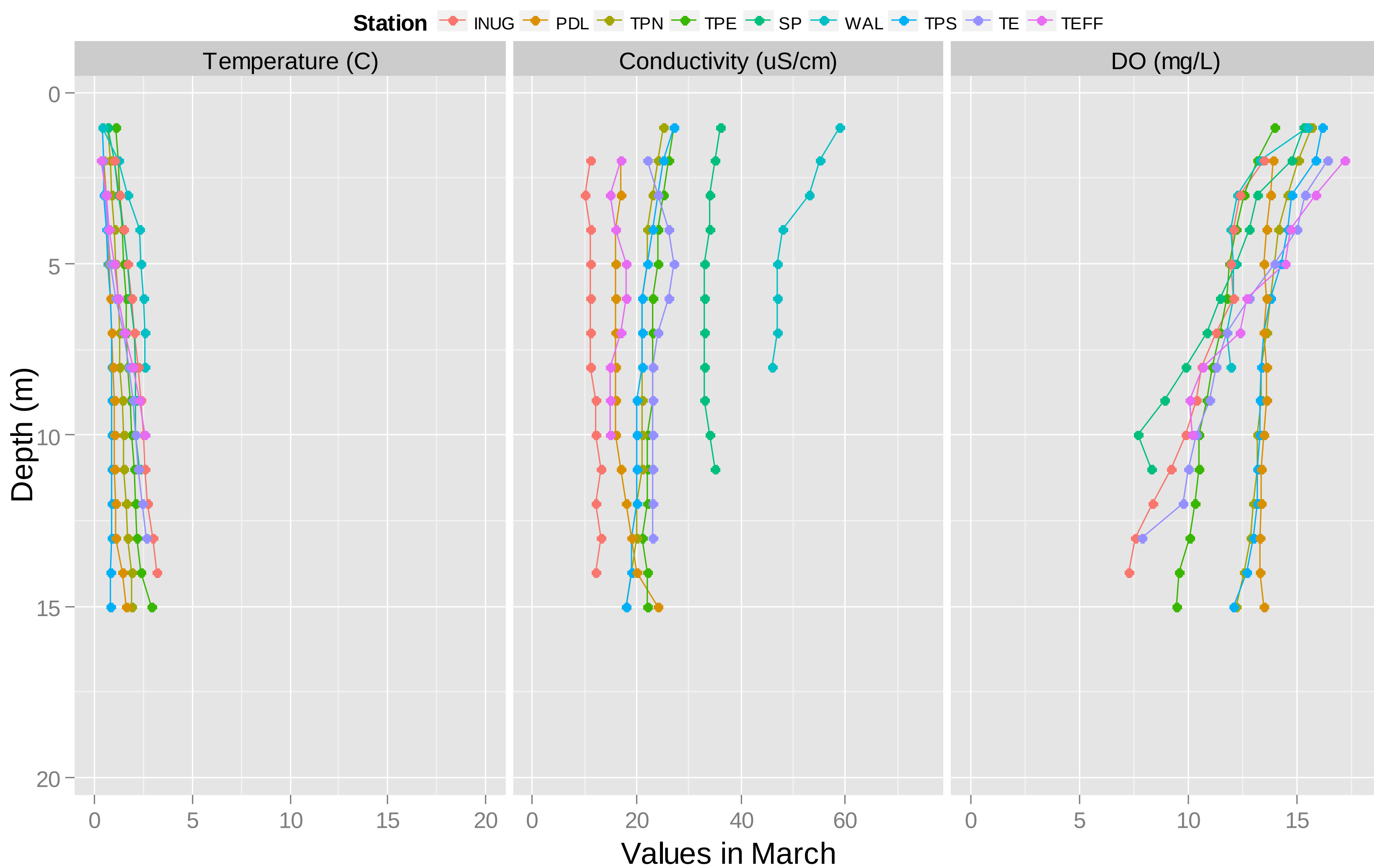


Figure 3.2-5. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for April, 2017.

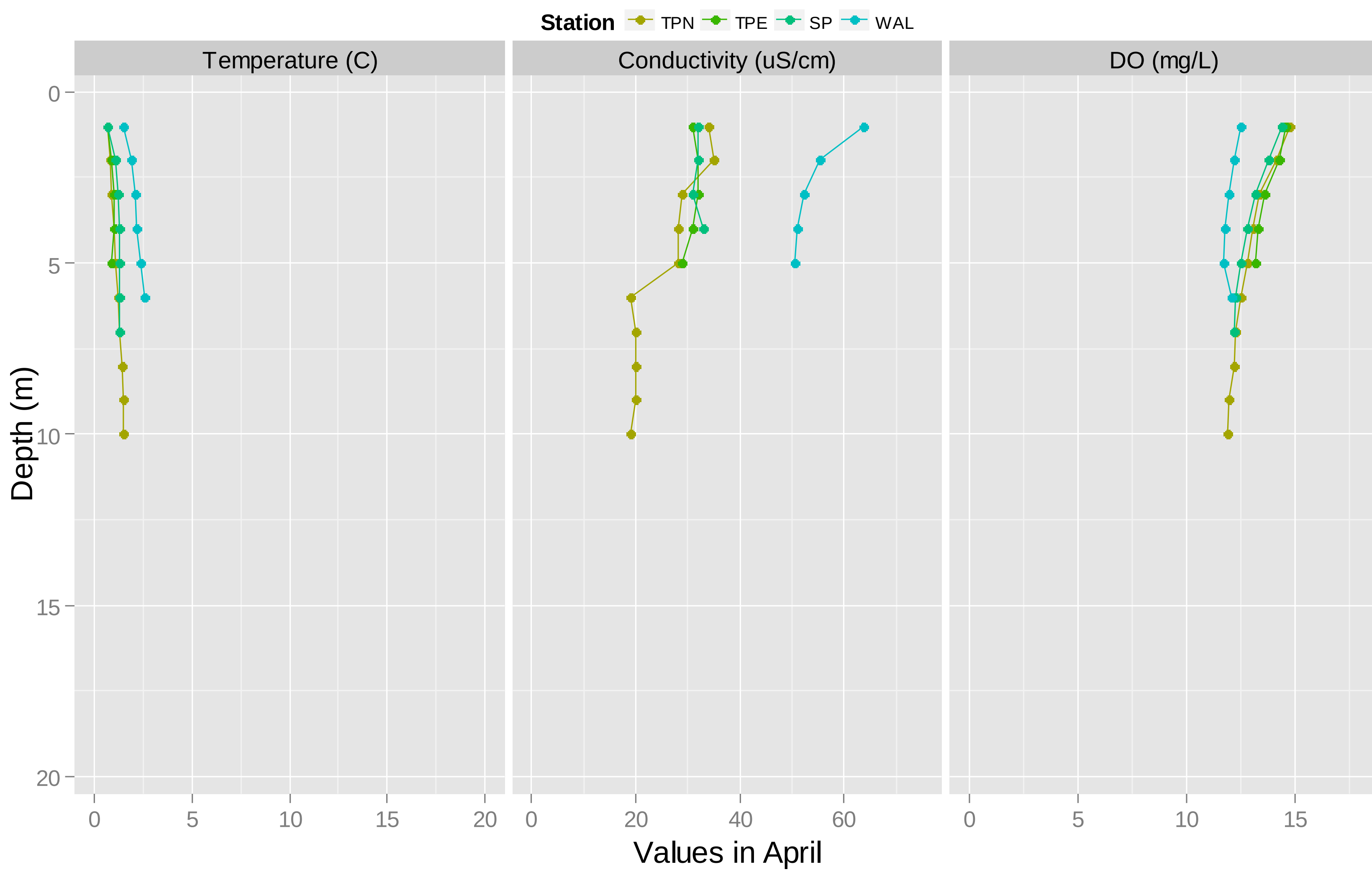


Figure 3.2-6. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for May, 2017.

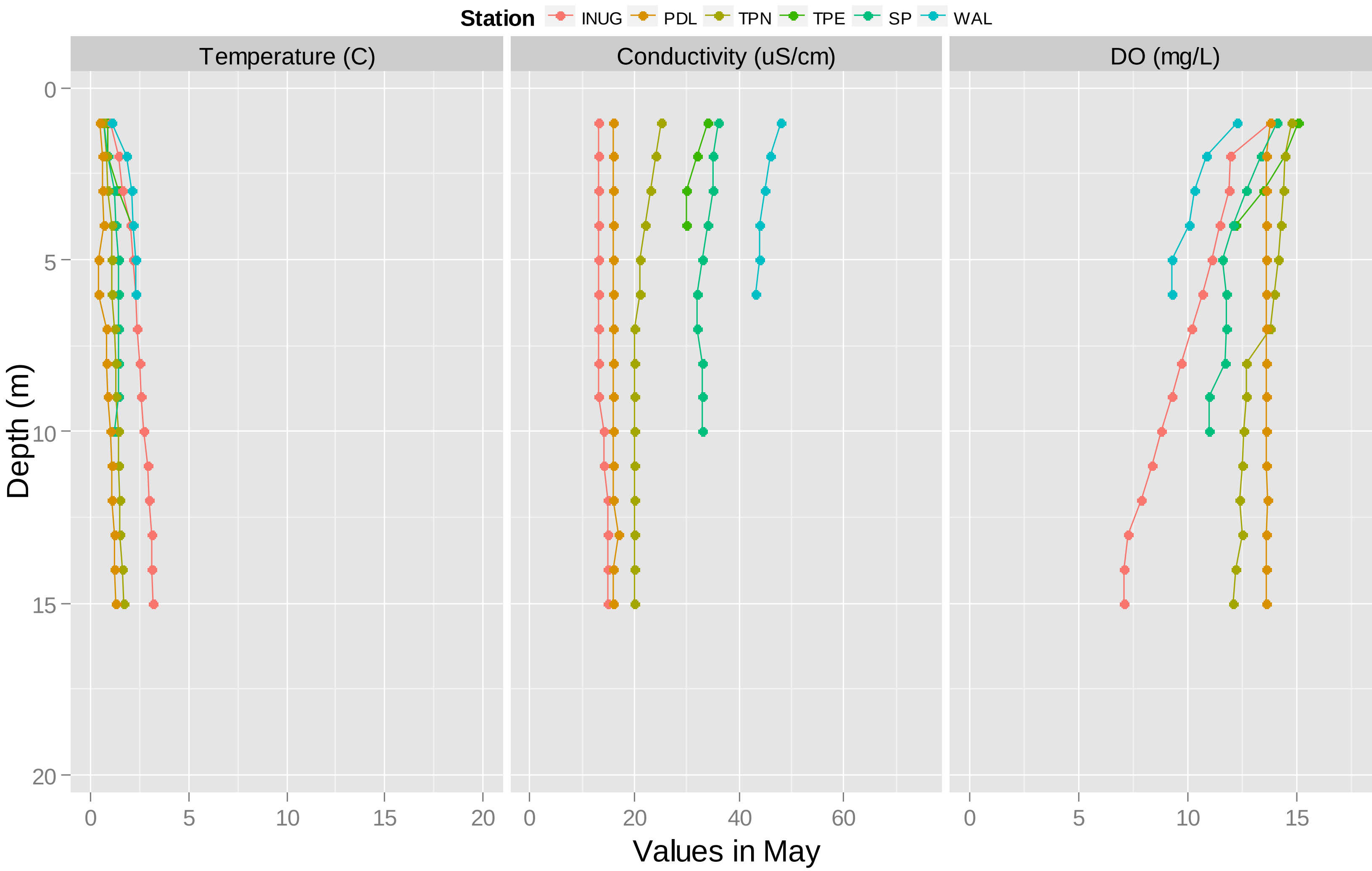


Figure 3.2-7. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for July, 2017.

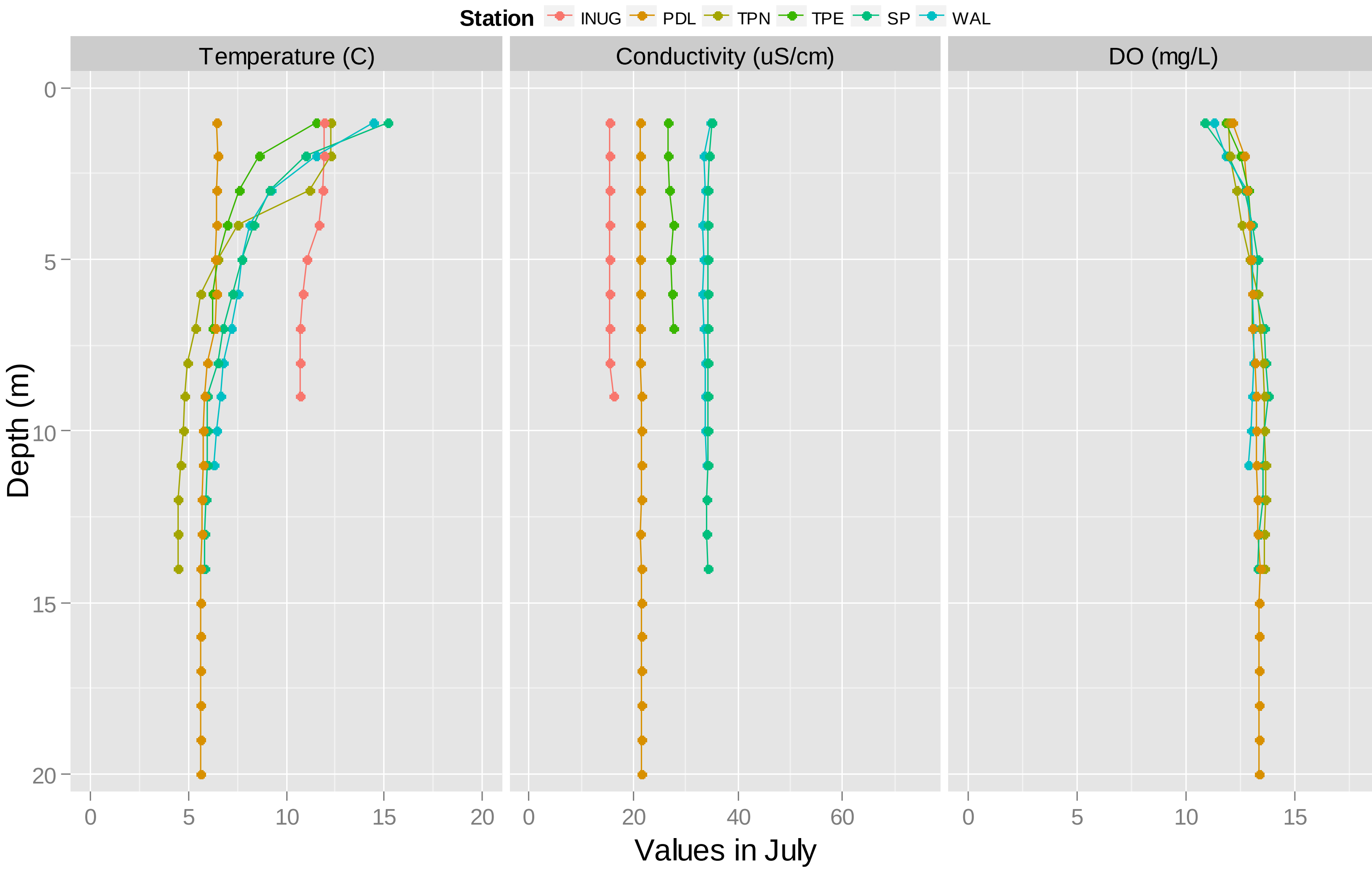


Figure 3.2-8. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for August, 2017.

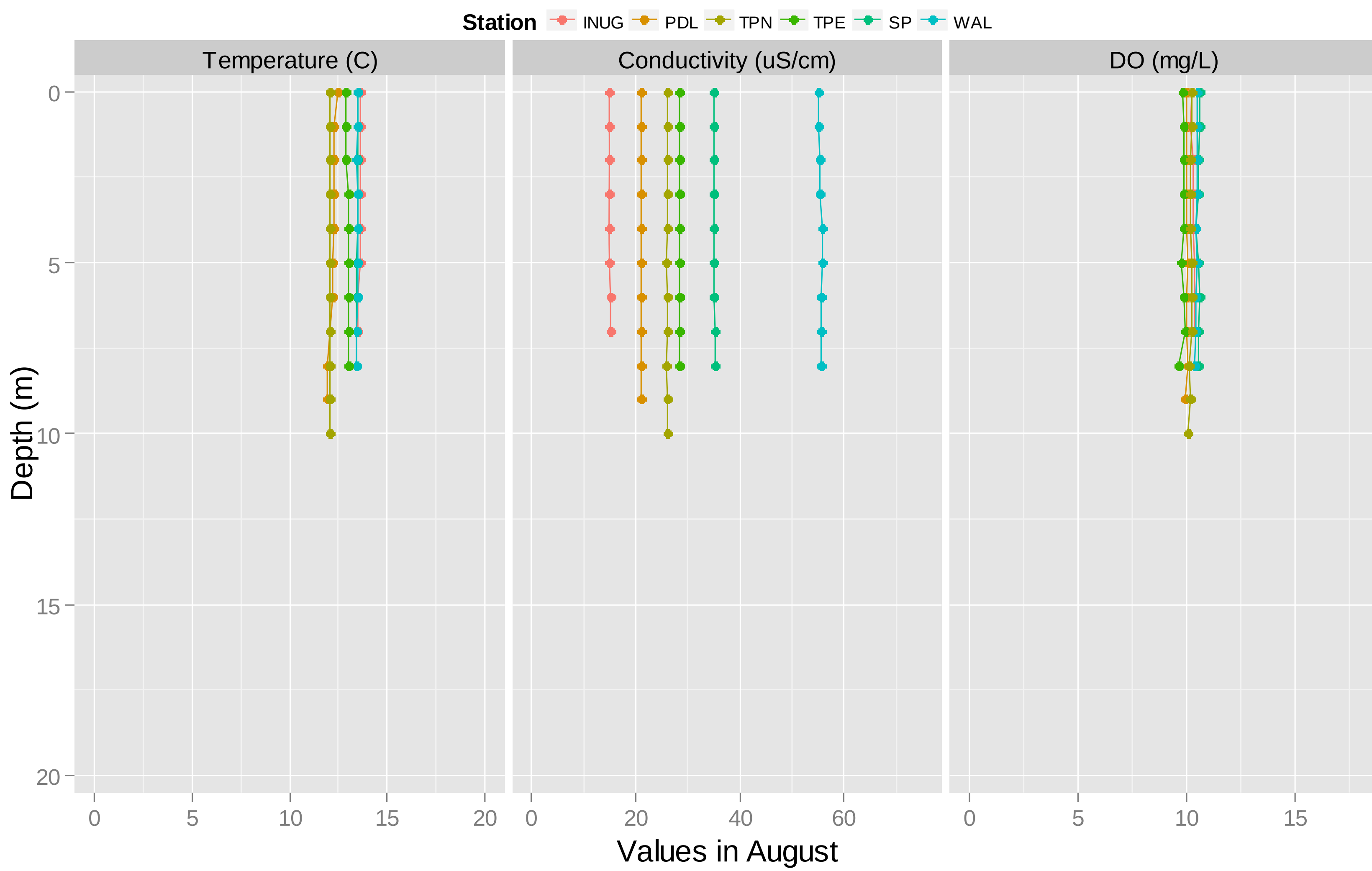


Figure 3.2-9. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for September, 2017.

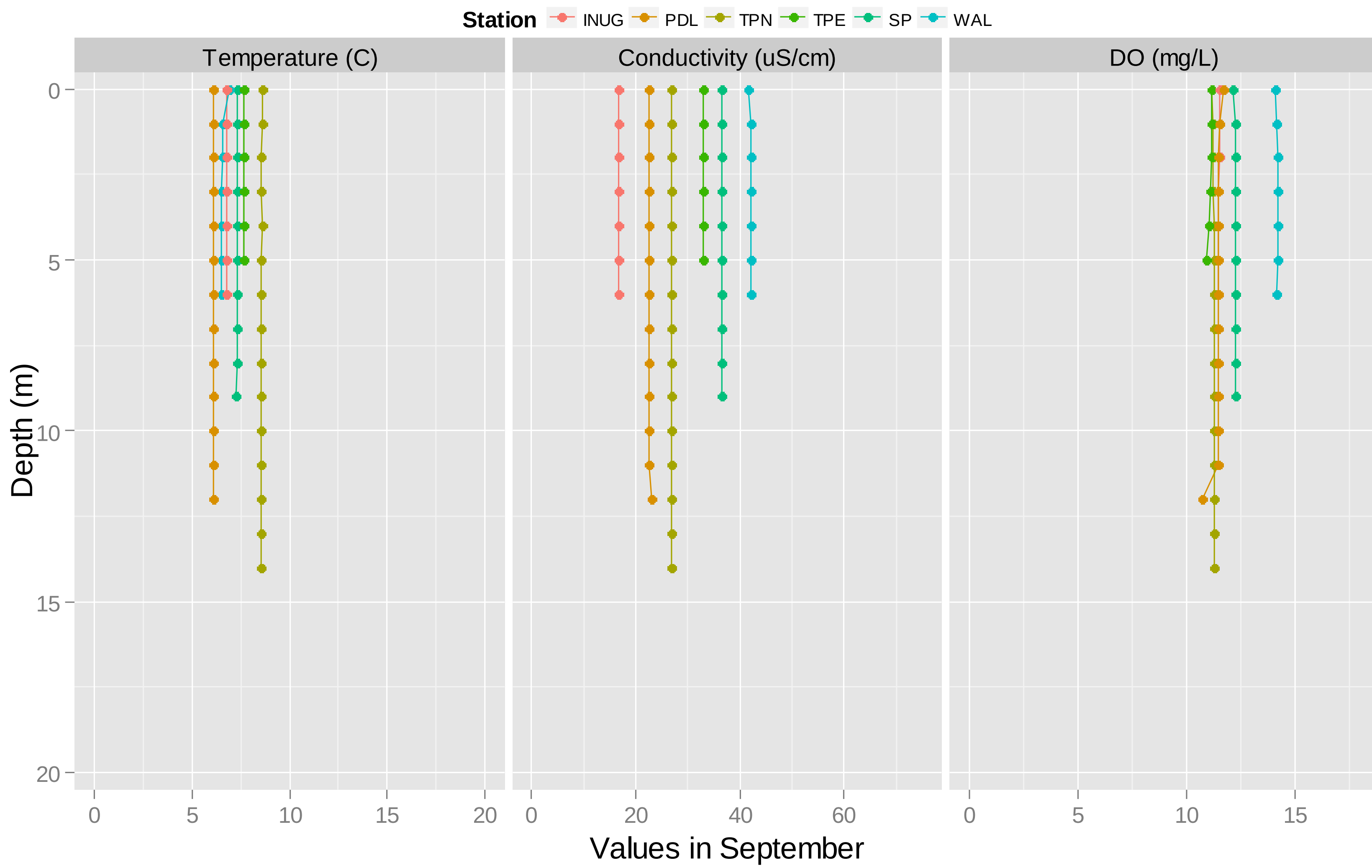


Figure 3.2-10. Field-measured temperature (°C), conductivity (μS/cm) and dissolved oxygen (mg/L) profiles for November, 2017.

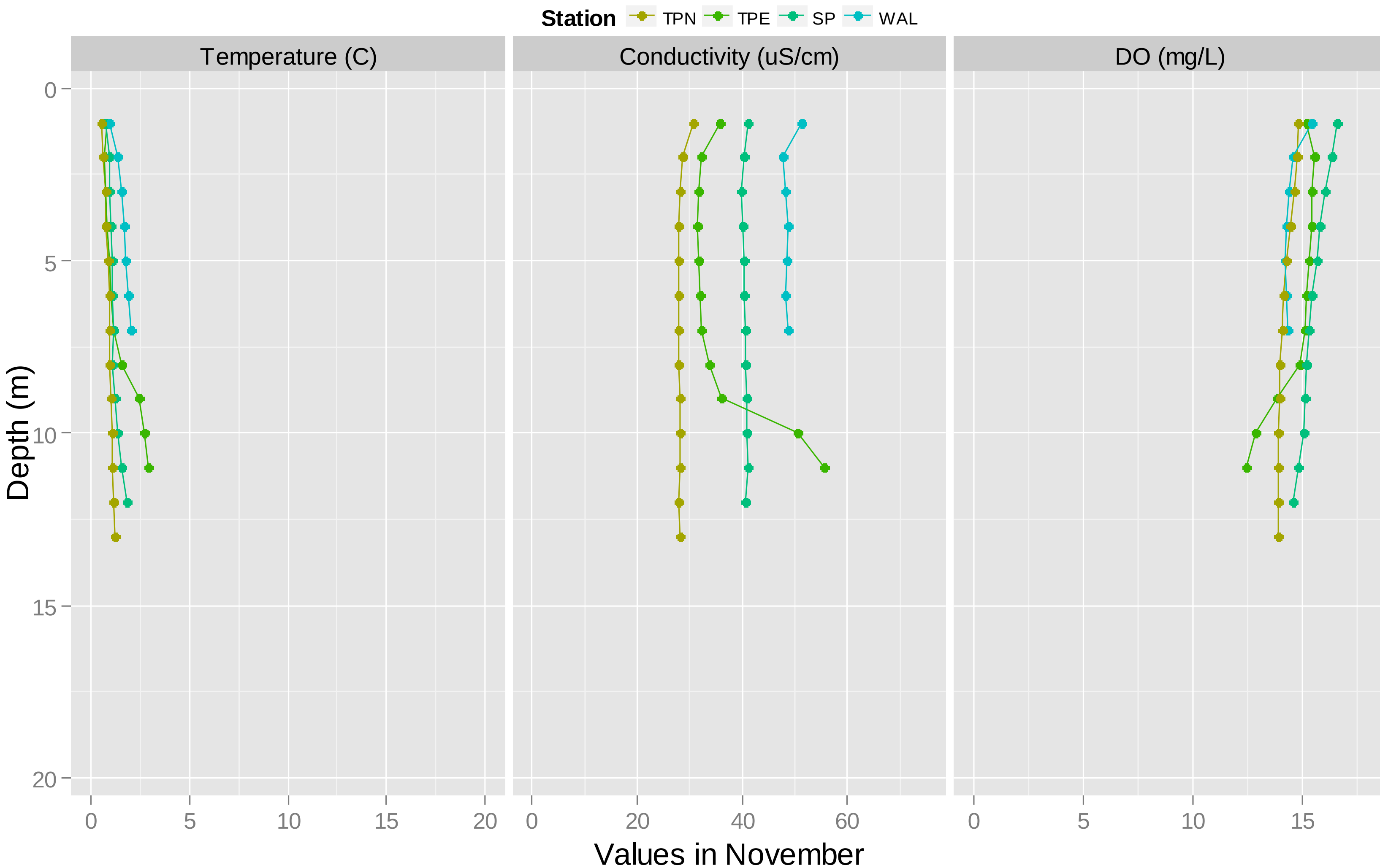


Figure 3.2-11. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles for December, 2017.

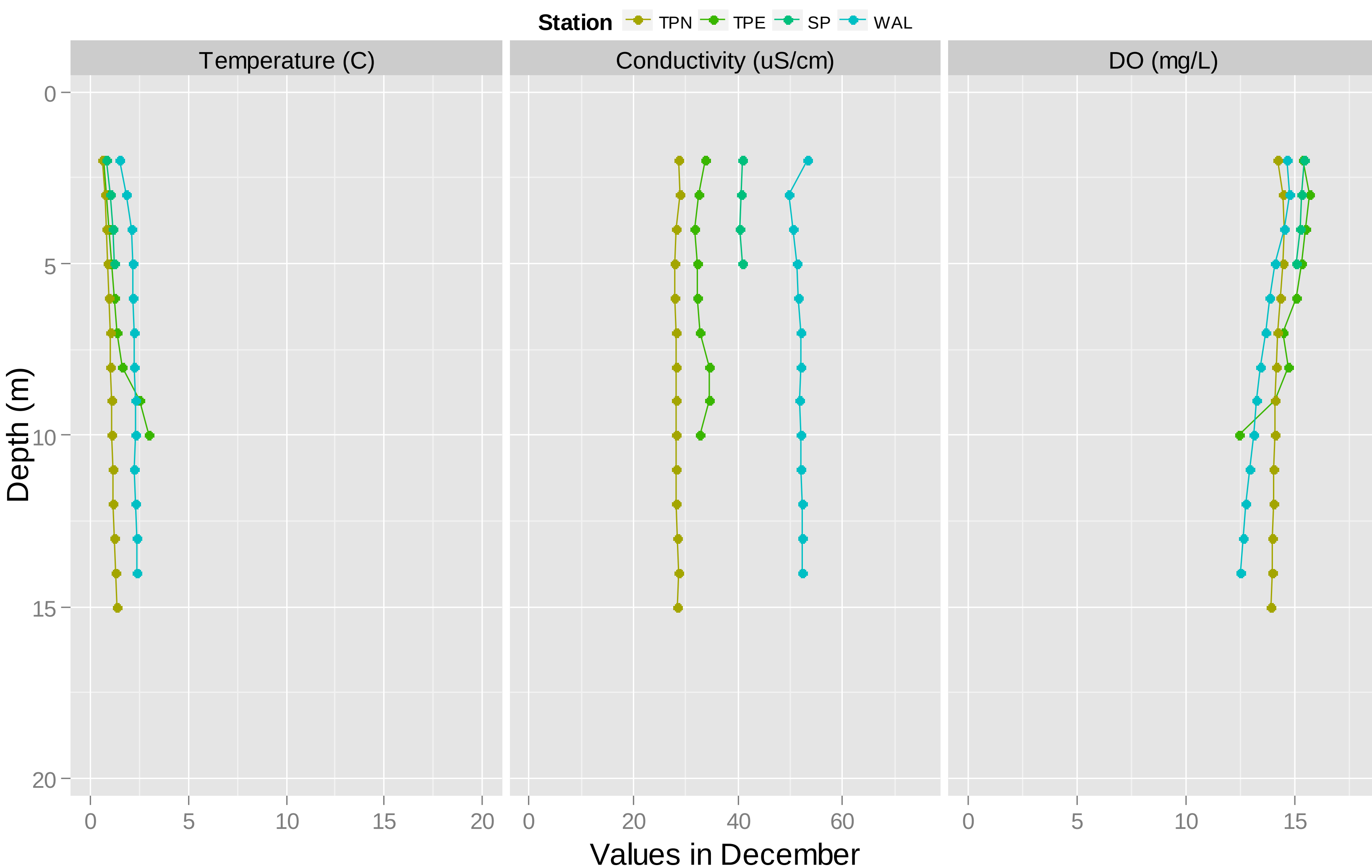
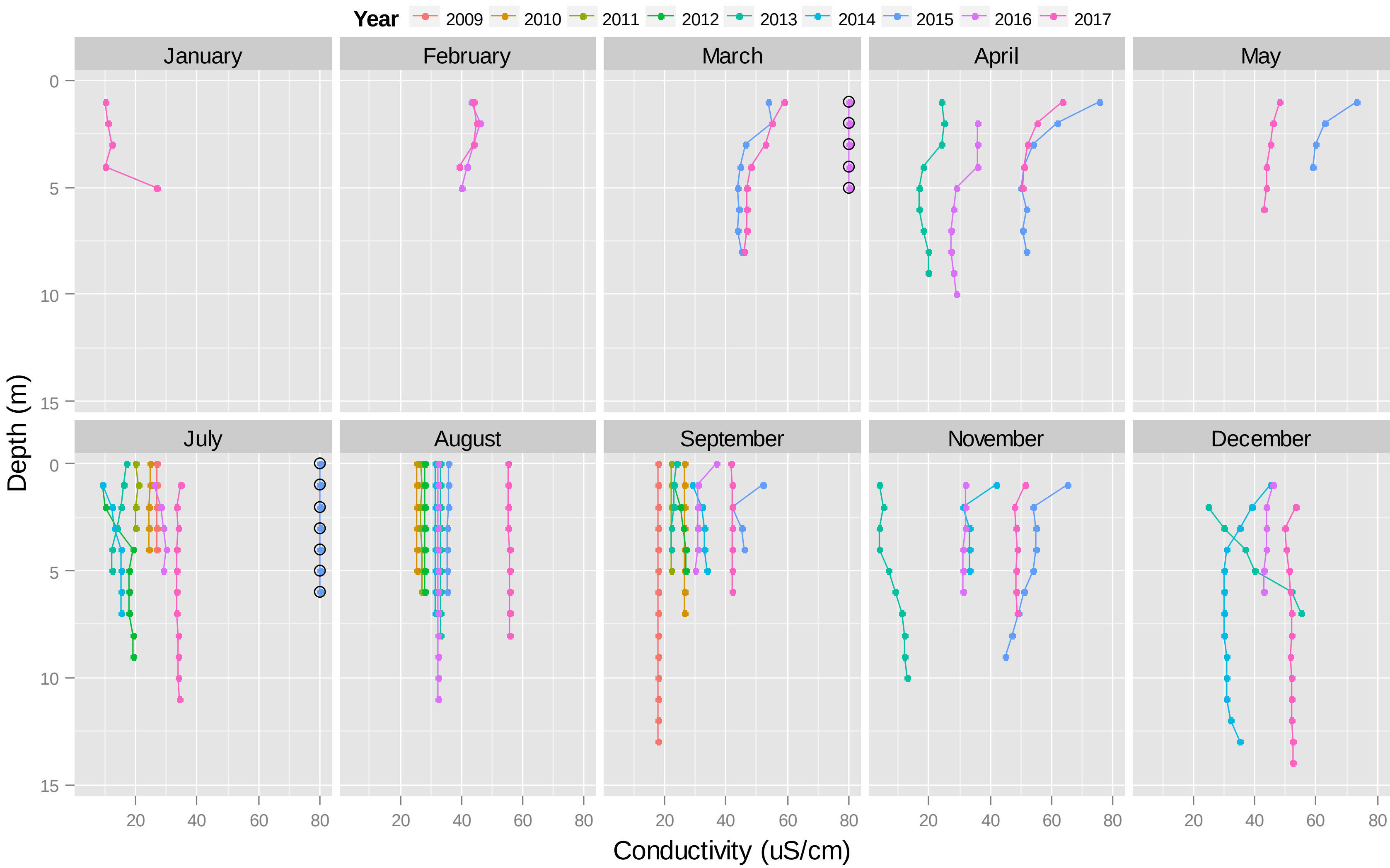


Figure 3.2-12. Conductivity profile data for Wally Lake, 2009-2017.

Notes: Data points with black circles were flagged as unreliable in the QA assessment and set at 80 µS/cm for illustrative purposes. Mine-related discharges to Wally Lake began in 2013 with the dewatering of Vault Lake into Wally Lake. Discharge of effluent from the Vault Attenuation Pond started in July 2015.



3.2.2. Water Chemistry

3.2.2.1. General Observations

The general conditions affecting water quality in this region were described in **Section 3.2**. Key points to recall are:

- The Meadowbank study lakes are generally nutrient-poor, thermally un-stratified and well-mixed with uniform temperature and oxygen profiles with no winter anoxia beneath an ice cover.
- The Meadowbank study lakes are headwater lakes, so there are no significant natural sources of nutrients or sediment introduced to these lakes, save only local runoff that contributes little nutrient enrichment, but sustains these aquatic ecosystems. Many chemical parameters in water have been typically below laboratory detection limits (MDLs) since formal baseline monitoring started in 2006[19].

3.2.2.2. Temporal and Spatial Trend Interpretation

2017 water quality data shown in **Table 3.2-1** from the Meadowbank project lakes (NF locations only) were screened against site-specific trigger and threshold values developed for the Meadowbank project lakes and Wally Lake. Many water quality parameters had concentrations that were routinely below laboratory MDLs, thus providing little insight into the assessment of mine-related changes to water quality. To streamline the interpretation process, a conservative three-step screening process was used to identify parameters for inclusion into the formal trend assessment (the results are summarized in **Table 3.2-2**):

1. *Overall Detection Frequency* – Only those water quality parameters that exceeded MDLs in at least 10% of the samples were included in this discussion. Because the project lakes are ultra-oligotrophic, it is normal for many parameters to routinely be below MDLs. In 2016, just over half (53%) of parameters measured exceeded MDLs at least 10% of the time. These parameters are included in this discussion.
2. Control*-Impact Detection Frequency Comparison* – To avoid screening out infrequently detected parameters that were detected more often in association with mining activities, the proportion of samples exceeding MDLs between "control" and "impact" samples were compared. The intent of this screen was to identify parameters with <10% detection frequency (i.e., those screened out above) for which there were detection frequency changes potentially associated with mining activity (i.e., where the proportion of detected values increased by 0.1 or more). No parameters were added back into the trend assessment based on this second screening level.
3. *Apparent Detection Pattern Matching Mining Activity* – To avoid screening out infrequently detected parameters that may be associated with mining activities (see **Section 1.4**), trend plots were used to identify parameters with measured values associated with periods/locations of known mining activities. Where such patterns were observed or where parameters were measured at greater than 5-times the MDL at near-field sampling areas in at least one event, these parameters were added back into the trend assessment process. Given that no such patterns have been observed since 2008 East Dike construction and no major activities have

[19] While formal baseline water quality monitoring started in 2006, reconnaissance baseline monitoring started in the mid-1990s and served as the foundation for designing the formal monitoring program.

taken place on site in 2017, no parameters were added back into the trend assessment process based on this screen.

Water chemistry parameters that were retained in the analysis are shown in **Figure 3.2-14** to **Figure 3.2-52**. Samples shown in these figures were collected from a depth of 3 meters. The red dashed line in each of these water chemistry figures is the trigger value specific to the parameter and area. All parameters not retained for the trend assessment were assumed to have no spatial or temporal trends related to mining activities or natural variability and were excluded from further consideration. For completeness, plots for these parameters are included in **Appendix A1**.

Water chemistry parameters for which the 2017 means for Meadowbank study lakes exceeded their respective trigger values are presented in **Table 3.2-3**. For each parameter/area that exceeded the trigger, formal statistical testing of the result was conducted using the BACI statistical model (one-tailed; looking for uni-directional changes [i.e., increases]). In this analysis, the model interaction term (or BACI effect term) represents the change at the test area in 2017 ("After" period) relative to baseline ("Before" period[20]) after accounting for natural temporal changes (i.e., temporal changes at the reference area). For simplicity, changes are noted "relative to baseline/reference" conditions.

Results of the BACI analysis for parameter/area combinations where the 2017 results were statistically different ($p<0.05$[21]) are provided in **Table 3.2-4**. Conclusions from the 2017 BACI analysis were largely the same as the 2016 CREMP, namely, there were increases in conductivity, major ions, and other non-threshold parameters in the NF lakes relative to baseline/reference conditions.

- *Laboratory Conductivity/Hardness* – TPN, TPE, SP, and WAL showed an increase relative to baseline/reference conditions. This list of analytes and areas is identical to 2016 and consistent with previous reporting cycles. Conductivity is a composite variable that responds positively to increasing concentrations of ionic compounds (e.g., chlorides, sulphates, carbonates, sodium, magnesium, calcium, potassium and metallic ions). The observed change, therefore, is indicative of changes in its underlying compounds (e.g., see ionic compounds below for additional context).
- *Ionic* Compounds *(Calcium, Magnesium, Potassium, Sodium)* – TPN, TPE, SP, and WAL all showed an increase (relative to baseline/reference) for these major ions. Concentrations at these NF areas have typically been <6 mg/L (calcium), <2 mg/L (magnesium), < 1.5 mg/L (sodium), and <1 mg/L (potassium). The highest concentrations reported in 2017 were at WAL, consistent with effluent discharge from the Vault Attenuation Pond. Slight increases of these ionic compounds in the Meadowbank study lakes are unlikely to adversely affect biota.
- *TDS* – TPN, TPE, SP, and WAL showed an increase in TDS relative to baseline/reference conditions. The implications of elevated TDS from a toxicological standpoint were reviewed in last year's CREMP report (Azimuth, 2017a). The maximum reported concentration in 2017 was 46 mg/L at WAL in August, consistent with the magnitude of concentration reported in 2016. Weber-Scannell and Duffy (2007) reviewed TDS toxicity to aquatic life. While they recommend deriving ion-specific limits for aquatic life (i.e., rather than for TDS), none of the literature studies they compiled showed effects at TDS concentrations less than 250 mg/L and they report mean TDS in the world's rivers of approximately 120 mg/L. There are no federal water quality guidelines for

[20] The "Before" data for a particular comparison is limited to those months where both INUG and the Impact station were sampled during the "Control" period before mining-related activities.

[21] Results have the same targeted statistical power (0.9) as a two-tailed test using $p<0.1$.

TDS in Canada or the US. In Alaska, TDS may not exceed 500 mg/L without a special permit and 1000 mg/L at any time (ADEC, 2012). A TDS receiving environment benchmark 500 mg/L was adopted at Diavik (WLWB, 2013). Thus, these changes leading to TDS concentrations on the order of 15 to 50 mg/L are very low and do not pose risks to aquatic receptors.

- *Alkalinity* – SP showed an increase in bicarbonate and total alkalinity in 2017 relative to baseline/reference conditions. Bicarbonate (HCO_3^-) comprised 100% of the total alkalinity faction, typical of surface water with pH in the range of 6.5 to 9. Bicarbonate alkalinity at SP has consistently exceeded the trigger dating back to 2011, and in 2017 the mean concentration was 11.0 mg/L, almost identical to the concentration reported in 2015 of 11.5 mg/L and 2016 of 11.1 mg/L. The trigger value for both bicarbonate and total alkalinity is 8.5 mg/L. The temporal trend of slightly increasing alkalinity relative to baseline/reference conditions is unlikely to adversely affect biota at SP.
- *Total Kjeldahl Nitrogen (TKN)* – a marginal increase of TKN was reported for WAL in 2017 relative to the trigger. TKN is a measure of the total concentration of organic nitrogen and ammonia. The mean TKN concentration in WAL in 2017 was 0.17 mg/L compared to the trigger value of 0.163 mg/L (**Table 3.2-3**). The trigger exceedance was primarily due to samples collected in March and August (**Figure 3.2-25**). Slight exceedances of the trigger value have been reported previously during early season through-ice sampling events in 2015 and 2016. The March 2017 concentrations, while higher (0.20 mg/L and 0.32 mg/L), are not anomalous when compared to past events. Similarly, the August concentrations were higher than those reported in 2016, but within the range of previously-reported concentrations. The elevated concentrations of TKN in the August sampling event are consistent with the samples being collected within an area of WAL estimated to have between 4% and 6% effluent (**Section 2.2.1**). The potential impacts of slightly elevated TKN are related to the ammonia which, in excess, can cause eutrophication. The organic nitrogen fraction consisting of proteins, peptides, amino acids, and urea, is not immediately bioavailable for primary producers until decomposition of the organic molecules into inorganic nitrogen (Smith, 2013; Link]). Ammonia concentrations, rather than TKN, are a more accurate direct measure of the potential for increased primary productivity due to nitrogen in the water column. Importantly, none of the water samples from WAL exceeded the trigger value in 2017 suggesting there is no potential for increased primary productivity in WAL related to nitrogen.

In the absence of available effects-based thresholds, CREMP trigger values for these substances were set at the 95th percentile of baseline data. While occasional threshold exceedances are expected (i.e., in the absence of any mine-related inputs, 5% of the samples would be expected to exceed the trigger), the trends described above are clearly mine-related. However, the BACI model results reported above only indicate that statistically significant changes have been detected relative to baseline/reference conditions. Furthermore, while these conditions have been observed for a number of years, it is important to note that they have been fairly stable over the last few years. As discussed above, available information suggests that the observed concentrations of these parameters are well below levels of concern.

Metals concentrations (total and dissolved) were consistently low or below their respective MDLs at the NF, MF, and FF locations in 2017 (**Table 3.2-1**). None of these parameters have ever exceeded trigger or threshold values in the formal BACI analysis. In 2017, the same metals were measured above laboratory detection limits (MDLs) as in previous years. This is important to note in relation to ongoing discharges to the receiving environment (e.g., discharge from Vault attenuation pond to Wally Lake [June – October] and discharge of East Dike seepage to Second Portage Lake).

The CREMP continues to detect changes in some general water quality parameters that appear to be related to mining activity. These changes are also reflected in higher concentrations of some parameters when compared to the model predictions in FEIS (Cumberland, 2005). The FEIS water quality predictions are estimates of change water quality in Third Portage Lake, Second Portage Lake, and Wally Lake assuming different mixing scenarios and loading estimates from water releases and dike leaching:

- *Third Portage Lake*: the model for Third Portage Lake includes treated water release from the project in year's 1 to 4 and long-term loading of metals from the Bay-Goose dike material. Two mixing scenarios (upper range [169 Mm^3] and mid-range [92 Mm^3] mixing) are evaluated for Third Portage Lake depending with and without dike leaching.
- *Second Portage Lake*: The Second Portage Lake water quality model includes loading of parameters from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. Changes in water quality in Second Portage Lake were modelled for the two different mixing scenarios of water releases into Third Portage Lake listed above.
- *Wally Lake*: The water quality model for Wally incorporates long-term loadings from the Vault dike and effluent releases from the Vault Attenuation Pond.

The 2017 CREMP water quality data were screened against the model predictions for Third Portage Lake (**Table 3.2-5**), Second Portage Lake (**Table 3.2-6**), and Wally Lake (**Table 3.2-7**). The same list of parameters that exceed the Meadowbank trigger values typically exceed the concentrations predicted in the FEIS, namely ionic compounds (calcium and magnesium), hardness, and total alkalinity. Chloride, fluoride, nitrate, and sulphate also exceed the FEIS predictions for Third Portage Lake, Second Portage Lake, and Wally Lake in at least one sample. Most metals are below the predicted concentrations for Third Portage Lake (**Table 3.2-5**), Second Portage Lake (**Table 3.2-6**), and Wally Lake (**Table 3.2-7**) with the exception of silicon (all three lakes), strontium (Third Portage Lake) and isolated instances of aluminum, copper, iron, manganese, and silver. Strontium consistently exceeded the model predictions for Third Portage Lake, but importantly did not exceed the trigger (95th percentile of baseline) indicating current strontium concentrations are representative of pre-development conditions.

At the time the FEIS was issued in 2005, the CWQG for cadmium was lower than the MDL for the baseline data. A thorough review of the ecological significance of the predicted cadmium concentrations was presented in the FEIS, and the probability of cadmium causing toxicity was considered "extremely low" (Cumberland, 2005). Arsenic was also predicted to exceed the CWQGs in Wally Lake. Similar to cadmium, the MDL was equal to the guideline (i.e., 0.005 mg/L). The models were considered conservative because the MDLs were used as the baseline concentrations. The MDLs for arsenic and cadmium in the 2017 data are 0.0001 mg/L and 0.000005 mg/L, respectively. All of the samples collected in 2017 from Third Portage, Second Portage, and Wally Lakes were below the MDL for cadmium, as was the case in 2016 (**Figure A1-9**). In the case of arsenic, the concentrations are below the trigger values applicable to Meadowbank project lakes and WAL, and over an order of magnitude lower than the CCME water quality guideline of 0.005 mg/L in all samples. Overall, the FEIS predicted the magnitude of potential effect on water quality in each of the lakes as "low[22]" (see **Section 2.4.1** for more details on the decision criteria for effect magnitude). It is important to point out that none of the above parameters

[22] Low magnitude effect on water quality was applied in the FEIS if predicted parameter concentrations remain below CWQGs for the protection of aquatic life (and project specific guidelines), but remain above baseline values (Cumberland, 2005). Even though cadmium was predicted to exceed the CWQG, the magnitude was considered low based on several considerations including over-estimation of the actual concentrations (i.e., using the MDL as the baseline concentration) and a thorough examination of chronic toxicity data available at the time the FEIS was issued (Cumberland, 2005).

that exceeded the trigger values or FEIS model predictions in 2017 have trigger values that were set in the context of effects-based threshold values (e.g., CCME water quality guidelines). Thus, CREMP water quality results are consistent with the "low" significance (i.e., <1x CCME WQG) rating applied to model predictions in the FEIS (Cumberland, 2005).

Pursuant to the new assessment strategy for MF and FF areas outlined in the *CREMP: 2015 Plan Update* (Azimuth, 2015b), formal analysis of the trigger/threshold exceedances in 2017 was applied to the decision criteria outlined in **Section 2.2.3** to determine the level of effort and frequency of sampling required at the MF and FF areas in 2018. The assessment strategy uses the water quality assessment results from current year (in this case 2017) to inform sampling at MF and FF areas the following year (i.e., 2018). The data were analyzed starting from the "Year +1" step of the flow chart where results from the NF areas are used to inform sampling at both MF and FF locations in 2017 (**Figure 3.2-13**).

Trigger/threshold screening results are presented in **Table 3.2-8** according to their corresponding degree of change (i.e., no trigger exceedance, minor changes, moderate changes, and major changes). The outcome of the assessment for sampling at NF, MF and FF areas in 2017 is summarized below:

- *Near-field (TPE, TPN, SP, and WAL)*: Trigger exceedances were documented for parameters without effects-based thresholds (e.g., conductivity, hardness, and cations). The full program will be completed at the NF locations in 2018 as well as at both reference areas (INUG and PDL).
- *Mid-field and Far-field (TE, TPS, and TEFF)*: One through-ice sampling event was completed at the MF and FF areas in 2017. Some parameters without effects-based thresholds exceeded trigger values at TPS, TE, and TEFF in the March 2017 samples, but all of the metals were below their respective trigger values in 2017. Additional sampling during the open water period in 2017 was deemed unnecessary. Formal BACI analysis of the results was not completed given the new sampling and analysis framework. Given there were no trigger exceedances for parameters with effects-based thresholds at the NF stations in 2017, a minimum of one (but ideally two) through-ice sampling events at the MF and FF areas are recommended in 2018 to verify there are no exceedances of effects-based thresholds. No other sampling (e.g., sediment chemistry or benthic invertebrate community) is required at MF and FF areas in 2018.

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					Third Portage Lake East Basin (TPE)									
Area-Replicate ID		Trigger[2]			TPE-100	TPE-101	TPE-102	TPE-103	TPE-104	TPE-105	TPE-106	TPE-107	TPE-108	TPE-109
Depth (m)	**CCME (2012)**				3	3	3	3	3	3	3	3	3	3
Date	**Guideline[1]**	**Meadowbank**	**Wally Lake**	**Threshold[2]**	24-Mar-17	24-Mar-17	4-May-17	5-May-17	1-Jul-17	1-Jul-17	27-Aug-17	27-Aug-17	18-Sep-17	18-Sep-17
Field Measurements (Surface)														
Temperature (°C)					1.1	1.0	0.6	0.9	11.5	11.0	12.9	12.9	7.7	7.5
Specific Conductivity (µS/cm)					27	28	57.2	34	27	26	28.5	28.4	33	32.1
Dissolved Oxygen (mg/L)					14.0	16.9	15.3	15.10	11.83	12.15	9.92	9.86	11.20	11.18
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.13	7.16	7.00	7.53	6.99	7.06	7.04	7.09	7.25	7.00
Physical Tests (mg/L)														
Conductivity (µS/cm)		23.5	36.6		**35.5**	**38.5**	**39.2**	**36.6**	**29.1**	**27.2**	**27.7**	**27.7**	**29.8**	**29.1**
Hardness		8.5	16.7		**12.6**	**13.1**	**13.4**	**13.0**	**9.6**	**9.6**	**10.4**	**10.1**	**10.1**	**10.0**
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	7.03	7.11	7.13	7.10	7.12	7.12	7.00	6.99	7.10	7.16
Total Suspended Solids		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids		18.0	25.3		**24**	**24**	**26**	**29**	**19**	**21**	**21**	**21**	**20**	16
Turbidity (NTU)					0.16	0.23	0.26	0.15	0.23	0.24	0.36	0.38	0.29	0.29
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.6	17.8		**8.8**	**9.7**	**9.8**	**8.7**	7.5	6.9	7.2	6.8	7.8	7.8
Alkalinity - Carbonate		4	4		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Hydroxide					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Total		8.5	17.8		**8.8**	**9.7**	**9.8**	**8.7**	7.5	6.9	7.2	6.8	7.8	7.8
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.018	0.021	0.018	0.019	0.007	0.007	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60.28	60.2	120	0.94	0.95	0.98	0.94	0.67	0.66	0.71	0.73	0.75	0.76
Fluoride	0.120				0.08	0.09	0.09	0.09	0.07	0.07	0.07	0.07	0.08	0.08
Nitrate (as N)	3.0	1.50	1.50	3	0.0263	0.0180	0.0262	0.0368	0.0240	0.0229	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Nitrite (as N)	0.060	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Kjeldahl Nitrogen		0.170	0.163		0.12	0.14	0.14	0.14	0.09	0.10	0.08	0.09	0.11	0.10
Ortho Phosphate (as P)		0.002	0.002		0.0011	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total Diss.					*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0040*	*<0.0040*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Silicate (as SiO_2)		1.0	1.08		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		64.7	65.2	128	6.08	6.17	6.51	6.25	4.34	4.25	4.71	4.71	4.78	4.80
Cyanides (mg/L)														
Total Cyanide					*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Free Cyanide	0.005				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.60	3.21		1.62	1.51	1.45	1.40	1.19	1.50	1.62	1.58	1.50	1.38
Total Organic Carbon		2.79	4.11		1.58	1.73	1.49	1.56	1.38	1.53	1.61	1.79	1.51	1.56
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.09	0.04	0.10	0.08	0.17	0.16	0.64	0.82	0.51	0.49
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0032	0.0039	0.0040	*<0.0030*	0.0082	0.0092	0.0056	0.0053	0.0058	0.0052
Antimony		0.0101	0.0100	0.020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.00255	0.0026	0.005	0.0003	0.0004	0.0004	0.0003	0.0004	0.0004	0.0005	0.0005	0.0004	0.0004
Barium		0.50	0.50	1	0.0036	0.0039	0.0044	0.0040	0.0031	0.0029	0.0029	0.0028	0.0029	0.0027
Beryllium		0.0027	0.0027	0.0053	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.76	0.76	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	0.00	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.15	4.88		**2.96**	**3.23**	**3.54**	**3.11**	**2.47**	**2.37**	**2.57**	**2.58**	**2.56**	**2.52**
Chromium[4]	0.001	0.00056	0.00055	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.0001	*<0.00015*	*<0.00010*	*<0.00010*	0.0001
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.00124	0.00149	0.002	0.0006	0.0005	0.0005	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.155	0.157	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.016	0.017	0.012	*<0.010*	0.010	*<0.010*
Lead[3]	***equation***	0.000525	0.000525	0.001	0.00022	0.00009	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	0.00007	*<0.000050*
Lithium		0.048	0.048	0.096	0.00	0.00	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.83	1.36		**1.16**	**1.31**	**1.34**	**1.20**	**0.90**	**0.86**	**0.98**	**0.95**	**0.95**	**0.94**
Manganese[3]		0.3157	0.3300	***equation***	0.0005	0.0004	0.0004	0.0004	0.0034	0.0033	0.0012	0.0012	0.0013	0.0013
Mercury	0.000026	0.000018	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.0365	0.0370	0.073	0.00018	0.00019	0.00019	0.00017	0.00013	0.00012	0.00016	0.00016	0.00019	0.00015
Nickel[3]	***equation***	0.0127	0.0130	0.025	0.0006	0.0006	0.0006	0.0006	0.0008	0.0007	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.50	0.59		**0.63**	**0.72**	**0.70**	**0.62**	0.43	0.41	**0.54**	**0.55**	**0.52**	**0.51**
Selenium	0.001	0.00055	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.09	0.09	0.11	*<0.10*	0.14	0.14	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Silver	0.0001				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		0.975	0.72		**1.32**	**1.45**	**1.53**	**1.42**	**1.02**	**0.98**	**1.15**	**1.13**	**1.05**	**1.06**
Strontium		0.0279	0.0330	0.049	0.0134	0.0145	0.0161	0.0142	0.0113	0.0110	0.0111	0.0111	0.0111	0.0111
Sulfur					1.96	2.12	2.25	2.07	1.35	1.45	1.82	1.82	1.67	1.64
Thallium	0.0008	0.00041	0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.0002	0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		1.00	1.00	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium	0.015	0.0075	0.0075	0.015	0.000040	0.000046	0.000048	0.000042	0.000053	0.000051	0.000042	0.000044	0.000039	0.000036
Vanadium		0.0035	0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	0.030	0.0063	0.0106	***equation***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	0.0035	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Dissolved Metals (mg/L)														
Aluminum[3]		0.0263	0.0260	0.05	0.0017	0.0013	0.0016	0.0017	0.0024	0.0027	0.0029	0.0028	0.0018	0.0022
Antimony		0.0101	0.0100	0.020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.0026	0.005	0.0003	0.0004	0.0003	0.0004	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004
Barium		0.5010	0.5000	1	0.0041	0.0041	0.0037	0.0041	0.0030	0.0029	0.0026	0.0027	0.0026	0.0027
Beryllium		0.0027	0.0027	0.0053	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron		0.76	0.76	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium		0.000025	0.000025	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium					3.09	3.22	3.33	3.31	2.41	2.31	2.54	2.47	2.54	2.49
Chromium		0.00055	0.00055	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.00119	0.00148	0.002	0.00044	0.00047	0.00043	0.00043	0.00034	0.0003	0.00038	0.00034	0.00035	0.00037
Iron		0.155	0.155	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead		0.000525	0.000525	0.001	0.00007	0.00024	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.048	0.048	0.096	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium					1.20	1.22	1.23	1.15	0.87	0.92	0.97	0.96	0.91	0.92
Manganese[3]		0.315	0.330	***equation***	0.0002	0.0002	0.0002	0.0002	0.0028	0.0028	0.0004	0.0005	0.0003	0.0005
Mercury		0.000018	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.037	0.073	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
Nickel		0.013	0.013	0.025	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium					0.64	0.64	0.64	0.67	0.44	0.47	0.50	0.48	0.51	0.50
Selenium		0.00055	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.05	*<0.050*	0.07	0.06	0.10	0.10	0.06	0.05	*<0.050*	*<0.050*
Silver					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium					1.37	1.36	1.42	1.42	1.01	1.00	1.09	1.09	1.02	1.04
Strontium		0.028	0.033	0.049	0.0137	0.0143	0.0150	0.0148	0.0107	0.0104	0.0117	0.0117	0.0109	0.0109
Sulfur					1.83	1.88	2.23	2.39	1.28	1.35	1.63	1.59	1.48	1.53
Thallium		0.00041	0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.0002	0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		1.01	1.00	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium		0.0075	0.0075	0.015	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00003	0.00004	0.00003	0.00003
Vanadium		0.0035	0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]		0.0053	0.0096	***equation***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	0.002	0.005	*<0.0010*	*<0.0010*
Zirconium					*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.
2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d). A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.
3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					**Third Portage Lake North Basin (TPN)**									
Area-Replicate ID					TPN-100	TPN-101	TPN-102	TPN-103	TPN-104	TPN-105	TPN-106	TPN-107	TPN-108	TPN-109
Depth (m)	**CCME (2012)**	**Trigger[2]**			3	3	3	3	3	3	3	3	3	3
Date	**Guideline[1]**	**Meadowbank**	**Wally Lake**	**Threshold[2]**	25-Mar-17	25-Mar-17	7-May-17	7-May-17	4-Jul-17	4-Jul-17	27-Aug-17	27-Aug-17	17-Sep-17	17-Sep-17
Field Measurements (Surface)														
Temperature (°C)					0.6	0.7	0.7	0.6	12.3	10.9	12.1	12.2	8.4	8.6
Specific Conductivity (µS/cm)					29	25	25	27	n/a	n/a	25.9	26	27	26.9
Dissolved Oxygen (mg/L)					16.5	15.7	14.8	14.6	11.98	12.18	10.27	10.24	10.4	11.2
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.37	7.34	7.08	7.17	6.61	6.54	7.00	7.02	7.40	7.07
Physical Tests (mg/L)														
Conductivity (µS/cm)		23.5	36.6		**34.9**	**33.4**	**29.3**	**29.3**	**26.4**	**27.5**	**25.6**	**25.5**	**26.7**	**26.5**
Hardness		8.5	16.7		**11.2**	**10.7**	**9.9**	**9.6**	8.4	8.3	**8.9**	**8.9**	**8.6**	**8.6**
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	7.07	7.01	7.00	7.00	7.00	6.97	6.90	6.89	7.06	7.06
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		18.0	25.3		**22**	**19**	**18**	**19**	**19**	17	**19**	**19**	18	17
Turbidity (NTU)					0.16	0.18	0.14	0.15	0.19	0.18	0.25	0.31	0.26	0.23
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.6	17.8		7.9	7.2	6.5	6.2	5.8	6.2	5.9	6.1	6.3	6.3
Alkalinity - Carbonate		4	4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.5	17.8		7.9	7.2	6.5	6.2	5.8	6.2	5.9	6.1	6.3	6.3
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.020	0.019	0.017	0.018	0.008	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60.28	60.2	120	0.92	0.87	0.81	0.80	0.71	0.75	0.73	0.73	0.76	0.76
Fluoride	0.120				0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.07
Nitrate (as N)	3.0	1.50	1.50	3	0.0439	0.0401	0.0399	0.0409	0.0406	0.0372	0.0240	0.0220	0.0185	0.0204
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.170	0.163		0.133	0.132	0.13	0.10	0.09	0.10	0.08	0.08	0.07	0.10
Ortho Phosphate (as P)		0.002	0.002		0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.					0.0022	0.0029	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.08		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		64.7	65.2	128	5.92	5.57	5.31	5.26	4.42	4.38	4.64	4.64	4.67	4.66
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.60	3.21		1.48	1.56	~~6.42~~	1.24	1.52	1.46	1.33	1.24	1.33	1.36
Total Organic Carbon		2.79	4.11		1.46	1.66	1.69	1.43	1.48	1.51	1.56	1.54	1.46	1.45
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.17	0.09	0.13	0.12	0.10	0.14	0.29	0.46	0.57	0.62
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0040	0.0050	<0.0030	<0.0030	0.0059	0.0064	0.0049	0.0044	0.0065	0.0052
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00255	0.0026	0.005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Barium		0.50	0.50	1	0.0045	0.0035	0.0033	0.0032	0.0028	0.0029	0.0030	0.0029	0.0027	0.0029
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	0.00001	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.15	4.88		**2.74**	**2.55**	**2.40**	**2.38**	2.05	2.08	**2.19**	**2.17**	2.11	2.09
Chromium[4]	0.001	0.00056	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.00124	0.00149	0.002	0.0006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.155	0.157	0.3	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead[3]	***equation***	0.000525	0.000525	0.001	0.00011	0.00027	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.83	1.36		**1.14**	**1.10**	**0.94**	**0.92**	**0.84**	**0.89**	**0.87**	**0.89**	**0.86**	**0.90**
Manganese[3]		0.3157	0.3300	***equation***	0.0006	0.0006	0.0005	0.0005	0.0023	0.0025	0.0015	0.0015	0.0016	0.0015
Mercury	0.000026	0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0365	0.0370	0.073	0.00018	0.00018	0.00016	0.00015	0.00014	0.00015	0.00014	0.00015	0.00014	0.00014
Nickel[3]	***equation***	0.0127	0.0130	0.025	0.0006	0.0005	<0.00050	<0.00050	<0.00050	0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.50	0.59		**0.64**	**0.61**	**0.51**	0.50	0.43	0.45	0.50	**0.52**	0.47	0.49
Selenium	0.001	0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.06	0.06	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Silver	0.0001				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000	0.0000
Sodium		0.975	0.72		**1.44**	**1.36**	**1.21**	**1.19**	**1.05**	**1.10**	**1.16**	**1.18**	**1.06**	**1.12**
Strontium		0.0279	0.0330	0.049	0.0128	0.0119	0.0113	0.0112	0.0099	0.0108	0.0099	0.0099	0.0100	0.0100
Sulfur					1.90	1.83	1.75	1.78	1.52	1.54	1.83	1.72	1.78	1.75
Thallium	0.0008	0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.00	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.000040	0.000038	0.000035	0.000034	0.000038	0.000042	0.000032	0.000033	0.000034	0.000035
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.0063	0.0106	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)														
Aluminum[3]		0.0263	0.0260	0.05	0.0012	0.0016	0.0016	<0.0010	0.0016	0.0018	0.0020	0.0019	0.0031	0.0031
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.005	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002
Barium		0.5010	0.5000	1	0.0038	0.0036	0.0034	0.0032	0.0027	0.0026	0.0027	0.0027	0.0028	0.0028
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.000025	0.000025	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium					2.69	2.54	2.41	2.29	2.00	1.95	2.10	2.12	2.03	2.02
Chromium		0.00055	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.00119	0.00148	0.002	0.00037	0.00040	0.00032	0.00028	0.00030	0.00030	0.00033	0.00033	0.00033	0.00035
Iron		0.155	0.155	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.000525	0.000525	0.001	<0.000050	0.00009	0.00011	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	**0.00060**
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium					1.08	1.05	0.95	0.94	0.82	0.82	0.88	0.87	0.86	0.86
Manganese[3]		0.315	0.330	***equation***	0.0001	0.0001	0.0001	<0.00010	0.0019	0.0018	0.0008	0.0006	0.0007	0.0008
Mercury		0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium					0.59	0.57	0.57	0.55	0.43	0.42	0.46	0.47	0.49	0.49
Selenium		0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					<0.050	<0.050	<0.050	<0.050	0.06	0.07	<0.050	<0.050	<0.050	<0.050
Silver					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium					1.39	1.31	1.28	1.22	1.01	1.00	1.11	1.11	1.09	1.09
Strontium		0.028	0.033	0.049	0.0125	0.0120	0.0117	0.0114	0.0098	0.0098	0.0105	0.0107	0.0097	0.0098
Sulfur					1.83	1.70	2.03	1.92	1.47	1.48	1.71	1.63	1.56	1.54
Thallium		0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.01	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00003	0.00003	0.00003	0.00003	0.00003	0.00004	0.00003	0.00003	0.00003	0.00003
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0053	0.0096	***equation***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).
A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					Second Portage Lake (SP)									
Area-Replicate ID					SP-100	SP-101	SP-102	SP-103	SP-104	SP-105	SP-106	SP-107	SP-108	SP-109
Depth (m)	**CCME (2012)**	**Trigger[2]**			3	3	3	3	3	3	3	3	3	3
Date	**Guideline[1]**	**Meadowbank**	**Wally Lake**	**Threshold[2]**	26-Mar-17	26-Mar-17	5-May-17	5-May-17	2-Jul-17	2-Jul-17	26-Aug-17	26-Aug-17	14-Sep-17	14-Sep-17
Field Measurements (Surface)														
Temperature (°C)					0.7	0.7	0.7	0.6	15.2	14.6	13.5	13.5	7.4	7.6
Specific Conductivity (µS/cm)					35	36	36	34	35	34	35	35.4	36.5	36.6
Dissolved Oxygen (mg/L)					15.0	15.3	14.1	14.40	10.9	10.80	10.82	10.46	12.17	12.12
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.01	7.15	7.20	7.17	7.39	7.31	7.37	7.41	7.19	7.27
Physical Tests (mg/L)														
Conductivity (µS/cm)		23.5	36.6		**43.5**	**42.6**	**43.2**	**42.0**	**35.2**	**35.2**	**34.8**	**35.1**	**38.5**	**36.8**
Hardness		8.5	16.7		**16.0**	**15.8**	**16.8**	**16.1**	**13.9**	**13.7**	**14.2**	**14.3**	**13.7**	**14.0**
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	7.22	7.21	7.25	7.16	7.21	7.21	7.21	7.23	7.28	7.31
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	1
Total Dissolved Solids		18.0	25.3		**27**	**26**	**27**	**28**	**24**	**24**	**24**	**26**	**23**	**24**
Turbidity (NTU)					0.15	0.22	0.14	0.18	0.41	0.34	0.47	0.34	0.30	0.32
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.6	17.8		**11.8**	**11.7**	**12.1**	**11.4**	**10.1**	**10.3**	**10.3**	**10.4**	**10.9**	**11.0**
Alkalinity - Carbonate		4	4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.5	17.8		**11.8**	**11.7**	**12.1**	**11.4**	**10.1**	**10.3**	**10.3**	**10.4**	**10.9**	**11.0**
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.016	0.016	0.015	0.015	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60.28	60.2	120	1.00	0.96	1.04	1.01	0.86	0.84	0.84	0.84	0.88	0.88
Fluoride	0.120				0.08	0.08	0.08	0.09	0.06	0.06	0.07	0.07	0.07	0.07
Nitrate (as N)	3.0	1.50	1.50	3	0.0158	0.0126	0.0173	0.0261	0.0167	0.0149	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.170	0.163		0.15	**0.32**	0.15	0.13	0.11	0.11	0.09	0.11	0.12	0.11
Ortho Phosphate (as P)		0.002	0.002		0.0013	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.					0.0022	0.0027	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	0.0023	<0.0020	<0.0020	<0.0020	0.0050	0.0047	<0.0020	<0.020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.08		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		64.7	65.2	128	5.91	5.61	6.06	6.21	4.68	4.67	4.90	4.90	4.94	4.94
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.60	3.21		1.91	1.90	1.61	1.53	2.02	1.94	1.82	1.76	1.57	1.56
Total Organic Carbon		2.79	4.11		1.95	1.84	1.64	1.67	2.10	1.98	2.12	1.89	1.86	1.65
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.18	0.17	0.16	0.11	0.46	0.51	0.46	0.54	0.60	0.72
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0056	0.0039	0.0032	0.0043	0.0128	0.0133	0.0066	0.0065	0.0064	0.0068
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00255	0.0026	0.005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002
Barium		0.50	0.50	1	0.0037	0.0033	0.0034	0.0037	0.0030	0.0029	0.0027	0.0027	0.0025	0.0025
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.15	4.88		**4.19**	**4.08**	**4.39**	**4.17**	**3.78**	**3.66**	**3.76**	**3.78**	**3.67**	**3.71**
Chromium[4]	0.001	0.00056	0.00055	0.001	<0.00010	<0.00010	<0.00010	0.0001	0.0001	<0.00010	<0.00015	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.00124	0.00149	0.002	0.0006	0.0006	0.0006	**0.0015**	0.0007	0.0007	0.0006	0.0006	0.0007	0.0006
Iron	0.3	0.155	0.157	0.3	<0.010	<0.010	<0.010	<0.010	0.027	0.027	0.021	0.021	0.020	0.021
Lead[3]	***equation***	0.000525	0.000525	0.001	<0.000050	0.00011	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.83	1.36		**1.48**	**1.39**	**1.43**	**1.37**	**1.20**	**1.13**	**1.19**	**1.22**	**1.23**	**1.27**
Manganese[3]		0.3157	0.3300	***equation***	0.0005	0.0005	0.0004	0.0004	0.0035	0.0031	0.0022	0.0021	0.0023	0.0023
Mercury	0.000026	0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0365	0.0370	0.073	0.00020	0.00019	0.00018	0.00018	0.00019	0.00020	0.00018	0.00020	0.00020	0.00020
Nickel[3]	***equation***	0.0127	0.0130	0.025	<0.00050	<0.00050	<0.00050	0.0005	0.0006	0.0006	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.50	0.59		**0.69**	**0.63**	**0.62**	**0.64**	0.46	0.44	**0.57**	**0.55**	**0.53**	**0.53**
Selenium	0.001	0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.18	0.18	0.21	0.18	0.28	0.26	0.17	0.17	0.16	0.16
Silver	0.0001				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000	0.0000
Sodium		0.975	0.72		**1.27**	**1.13**	**1.17**	**1.30**	0.84	0.81	0.95	0.93	0.86	0.88
Strontium		0.0279	0.0330	0.049	0.0191	0.0187	0.0199	0.0193	0.0186	0.0179	0.0171	0.0173	0.0177	0.0179
Sulfur					2.00	1.92	1.99	2.06	1.68	1.65	2.02	1.79	1.85	1.73
Thallium	0.0008	0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.00	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.000047	0.000044	0.000045	0.000051	0.000061	0.000065	0.000046	0.000047	0.000045	0.000045
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.0063	0.0106	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0034	<0.0030
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)														
Aluminum[3]		0.0263	0.0260	0.05	0.0020	0.0016	0.0021	0.0020	0.0033	0.0030	0.0032	0.0028	0.0022	0.0028
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.005	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Barium		0.5010	0.5000	1	0.0039	0.0036	0.0036	0.0039	0.0027	0.0028	0.0025	0.0024	0.0024	0.0026
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.000025	0.000025	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium					4.06	4.04	4.43	4.26	3.70	3.63	3.73	3.69	3.58	3.55
Chromium		0.00055	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.00119	0.00148	0.002	0.00055	0.00055	0.00065	0.00058	0.00057	0.00053	0.00059	0.00065	0.00050	0.00055
Iron		0.155	0.155	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.000525	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium					1.41	1.38	1.39	1.34	1.13	1.12	1.20	1.23	1.17	1.26
Manganese[3]		0.315	0.330	***equation***	0.0003	0.0002	0.0003	0.0003	0.0022	0.0022	0.0009	0.0007	0.0008	0.0008
Mercury		0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium					0.65	0.63	0.68	0.69	0.47	0.47	0.50	0.52	0.50	0.53
Selenium		0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.13	0.15	0.19	0.16	0.22	0.22	0.13	0.14	0.13	0.13
Silver					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium					1.23	1.14	1.18	1.27	0.80	0.81	0.88	0.90	0.81	0.87
Strontium		0.028	0.033	0.049	0.0182	0.0190	0.0211	0.0203	0.0177	0.0171	0.0177	0.0180	0.0170	0.0172
Sulfur					1.91	1.86	2.26	2.41	1.54	1.64	1.80	1.70	1.68	1.63
Thallium		0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.01	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00005	0.00004	0.00005	0.00005	0.00006	0.00005	0.00004	0.00004	0.00004	0.00004
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0053	0.0096	***equation***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.007**	<0.0010	<0.0010
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).
A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					Wally Lake (WAL)									
Area-Replicate ID					WAL-69	WAL-70	WAL-71	WAL-72	WAL-73	WAL-74	WAL-75	WAL-76	WAL-77	WAL-78
Depth (m)	**CCME (2012)**	**Trigger[2]**			3	3	3	3	3	3	3	3	3	3
Date	**Guideline[1]**	**Meadowbank**	**Wally Lake**	**Threshold[2]**	26-Mar-17	26-Mar-17	7-May-17	7-May-17	1-Jul-17	1-Jul-17	26-Aug-17	26-Aug-17	16-Sep-17	16-Sep-17
Field Measurements (Surface)														
Temperature (°C)					0.4	0.4	1.1	0.6	14.4	13.2	13.5	13.4	6.8	6.9
Specific Conductivity (µS/cm)					59	59	48	57	34.7	34	55.1	54.9	41.9	41.7
Dissolved Oxygen (mg/L)					15.5	14.5	12.3	12.50	11.33	11.86	10.5	9.97	14.03	14.11
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.28	7.21	7.26	7.07	7.55	7.60	7.32	7.30	7.41	7.37
Physical Tests (mg/L)														
Conductivity (µS/cm)		23.5	36.6		**67.4**	**65.7**	**54.1**	**61.3**	34.6	33.0	**55.7**	**54.7**	**42.1**	**42.3**
Hardness		8.5	16.7		**25.5**	**25.0**	**23.1**	**26.2**	14.3	14.3	**22.9**	**22.4**	**17.3**	**16.8**
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	6.96	7.07	7.27	7.28	7.35	7.34	7.37	7.38	7.41	7.39
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2	1	1	<1.0
Total Dissolved Solids		18.0	25.3		**44**	**34**	**31**	**38**	23	25	**46**	**39**	**27**	**27**
Turbidity (NTU)					0.20	0.15	0.14	0.13	0.33	0.39	0.44	0.52	0.36	0.35
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.6	17.8		**20.2**	**20.2**	17.2	**21.2**	12.1	11.5	14.8	15.0	13.7	14.2
Alkalinity - Carbonate		4	4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.5	17.8		**20.2**	**20.2**	17.2	**21.2**	12.1	11.5	14.8	15.0	13.7	14.2
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.030	0.031	0.019	0.020	<0.0050	<0.0050	0.048	0.047	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60.28	60.2	120	1.15	1.13	1.05	1.24	0.66	0.65	1.27	1.25	0.89	0.90
Fluoride	0.120				0.06	0.06	0.06	0.06	0.04	0.04	0.05	0.05	0.06	0.06
Nitrate (as N)	3.0	1.50	1.50	3	0.0992	0.0912	0.0765	0.1070	0.0075	<0.0050	0.2680	0.2530	0.0204	0.0219
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.005	0.003	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.170	0.163		**0.319**	**0.198**	0.16	**0.17**	0.12	0.13	**0.19**	**0.23**	0.12	0.12
Ortho Phosphate (as P)		0.002	0.002		0.0011	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.					0.0028	0.0030	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	0.0028	0.0026	<0.0020	**0.0042**	**0.0059**	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.08		0.92	0.91	0.89	0.91	0.52	0.51	0.51	0.51	<0.50	<0.50
Sulphate (SO_4)		64.7	65.2	128	6.99	6.87	6.26	7.20	3.68	3.54	8.29	8.09	5.12	5.18
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.60	3.21		2.48	2.31	2.08	2.45	2.25	2.56	2.30	2.31	2.13	2.18
Total Organic Carbon		2.79	4.11		2.64	2.66	2.16	2.36	2.44	2.45	2.73	2.33	2.27	2.14
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.14	0.15	0.13	0.17	1.23	0.71	0.89	0.88	1.08	0.94
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0043	<0.0030	<0.0030	<0.0030	0.0128	0.0112	0.0101	0.0117	0.0044	0.0047
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00	0.00	<0.00010	<0.00010
Arsenic	0.0050	0.00255	0.0026	0.005	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002	0.0004	0.0004	0.0003	0.0003
Barium		0.50	0.50	1	0.0039	0.0038	0.0035	0.0043	0.0024	0.0023	0.0038	0.0038	0.0023	0.0023
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.15	4.88		**7.03**	**6.90**	**6.40**	**7.29**	4.11	3.85	**6.52**	**6.40**	4.74	4.70
Chromium[4]	0.001	0.00056	0.00055	0.001	<0.00010	<0.00010	0.0002	<0.00010	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.00124	0.00149	0.002	0.0011	0.0011	0.0010	0.0011	0.0009	0.0009	0.0013	0.0013	0.0009	0.0009
Iron	0.3	0.155	0.157	0.3	<0.010	<0.010	<0.010	<0.010	0.030	0.028	0.028	0.030	0.018	0.018
Lead[3]	***equation***	0.000525	0.000525	0.001	0.00008	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.83	1.36		**2.10**	**2.07**	**1.80**	**2.05**	1.15	1.09	**1.77**	**1.77**	**1.40**	**1.41**
Manganese[3]		0.3157	0.3300	***equation***	0.0015	0.0012	0.0010	0.0012	0.0034	0.0035	0.0045	0.0044	0.0027	0.0028
Mercury	0.000026	0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0365	0.0370	0.073	0.00045	0.00043	0.00032	0.00035	0.00027	0.00018	0.00134	0.00130	0.00044	0.00047
Nickel[3]	***equation***	0.0127	0.0130	0.025	0.0014	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0006	0.0006	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.50	0.59		**0.75**	**0.73**	**0.63**	**0.71**	0.39	0.37	**0.81**	**0.81**	0.54	0.55
Selenium	0.001	0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.49	0.47	0.45	0.52	0.33	0.33	0.26	0.25	0.24	0.24
Silver	0.0001				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.0000	0.0000
Sodium		0.975	0.72		**0.96**	**0.89**	**0.81**	**0.91**	0.56	0.56	**0.97**	**0.94**	0.67	0.68
Strontium		0.0279	0.0330	0.049	**0.0350**	**0.0342**	0.0315	**0.0353**	0.0213	0.0200	**0.0354**	**0.0353**	0.0245	0.0250
Sulfur					2.51	2.32	2.14	2.52	1.38	1.23	3.12	3.12	1.96	1.82
Thallium	0.0008	0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.00	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.000073	0.000069	0.000053	0.000060	0.000068	0.000064	0.000292	0.000275	0.000075	0.000073
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.0063	0.0106	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)														
Aluminum[3]		0.0263	0.0260	0.05	0.0013	0.0015	<0.0010	<0.0010	0.0046	0.0045	0.0033	0.0033	0.0019	0.0019
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0002	0.0002	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.005	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002	0.0003	0.0004	0.0003	0.0003
Barium		0.5010	0.5000	1	0.0041	0.0041	0.0035	0.0042	0.0021	0.0024	0.0036	0.0035	0.0022	0.0021
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.000025	0.000025	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium					6.91	6.77	6.32	7.10	3.92	3.84	6.28	6.12	4.64	4.55
Chromium		0.00055	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.00119	0.00148	0.002	0.00100	0.00099	0.00083	0.00096	0.00069	0.00080	0.00106	0.00111	0.00086	0.00082
Iron		0.155	0.155	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.000525	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	0.00012	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium					2.01	1.97	1.78	2.05	1.10	1.14	1.75	1.73	1.38	1.32
Manganese[3]		0.315	0.330	***equation***	0.0005	0.0006	0.0003	0.0003	0.0021	0.0022	0.0012	0.0011	0.0010	0.0009
Mercury		0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	0.0004	0.0004	0.0003	0.0004	0.0002	0.0002	0.0013	0.0013	0.0004	0.0004
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium					0.71	0.69	0.66	0.75	0.39	0.40	0.74	0.72	0.54	0.52
Selenium		0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.42	0.43	0.45	0.53	0.26	0.29	0.21	0.19	0.21	0.20
Silver					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium					0.89	0.86	0.82	0.94	0.50	0.59	0.91	0.89	0.66	0.63
Strontium		0.028	0.033	0.049	**0.0339**	**0.0337**	0.0326	**0.0375**	0.0196	0.0195	**0.0358**	**0.0346**	0.0241	0.0241
Sulfur					2.17	2.14	2.34	3.08	1.12	1.06	2.81	2.76	1.66	1.81
Thallium		0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.01	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00007	0.00007	0.00005	0.00006	0.00006	0.00005	0.00027	0.00023	0.00007	0.00006
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0053	0.0096	***equation***	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	<0.0010	<0.0010
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).
A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					Tehek Lake (TE)		Tehek Lake Far-field (TEFF)		Third Portage Lake South Basin (TPS)	
Area-Replicate ID					TE-92	TE-93	TEFF-45	TEFF-46	TPS-57	TPS-58
Depth (m)	CCME (2012)	Trigger[2]			3	3	3	3	3	3
Date	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	29-Mar-17	29-Mar-17	29-Mar-17	29-Mar-17	25-Mar-17	25-Mar-17
Field Measurements (Surface)										
Temperature (°C)					0.3	0.4	0.3	0.5	0.6	0.4
Specific Conductivity (µS/cm)					28	22	17	13	28	27
Dissolved Oxygen (mg/L)					17.5	16.4	17.20	15.80	16.9	16.2
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.01	7.00	6.86	6.99	7.24	7.19
Physical Tests (mg/L)										
Conductivity (µS/cm)		23.5	36.6		**38.4**	**31.8**	**24.6**	18.1	**34.3**	**34.4**
Hardness		8.5	16.7		**14.9**	**12.3**	**8.6**	6.4	**11.3**	**11.5**
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	7.33	7.24	6.98	6.95	7.04	7.04
Total Suspended Solids		3.0	3.0	5.0	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids		18.0	25.3		**26**	**22**	14	14	**21**	**18**
Turbidity (NTU)					0.17	0.16	0.16	0.15	0.17	0.16
Anions and Nutrients (mg/L)										
Alkalinity - Bicarbonate		8.6	17.8		**11.0**	**9.1**	6.3	4.7	7.4	7.7
Alkalinity - Carbonate		4	4		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Hydroxide					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Total		8.5	17.8		**11.0**	**9.1**	6.3	4.7	7.4	7.7
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.010	0.013	0.007	0.006	0.022	0.028
Bromide					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Chloride	120	60.28	60.2	120	1.05	0.96	0.77	0.73	0.93	0.92
Fluoride	0.120				0.08	0.08	0.07	0.06	0.08	0.08
Nitrate (as N)	3.0	1.50	1.50	3	0.0137	0.0075	*<0.0050*	*<0.0050*	0.0417	0.0427
Nitrite (as N)	0.060	0.031	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Kjeldahl Nitrogen		0.170	0.163		0.13	0.13	0.11	0.10	0.14	0.15
Ortho Phosphate (as P)		0.002	0.002		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	0.0011
Phosphorus (P)-Total Diss.					*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	0.0025
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Silicate (as SiO_2)		1.0	1.08		0.61	0.56	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		64.7	65.2	128	5.08	4.09	2.94	2.35	5.89	5.90
Cyanides (mg/L)										
Total Cyanide					*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Free Cyanide	0.005				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)										
Dissolved Organic Carbon		2.60	3.21		1.95	1.88	1.52	1.41	1.77	1.79
Total Organic Carbon		2.79	4.11		1.95	1.73	1.91	1.38	1.79	1.67
Plant Pigments (µg/L)										
Chlorophyll-*a*					0.23	0.19	0.15	0.24	0.16	0.10
Total Metals (mg/L)										
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0039	0.0041	0.0055	0.0032	*<0.0030*	0.0032
Antimony		0.0101	0.0100	0.020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.00255	0.0026	0.005	0.0002	0.0002	0.0001	*<0.00010*	0.0002	0.0002
Barium		0.50	0.50	1	0.0035	0.0032	0.0027	0.0025	0.0036	0.0036
Beryllium		0.0027	0.0027	0.0053	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.76	0.76	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	0.00001
Calcium		2.15	4.88		**3.83**	**2.99**	2.07	1.45	**2.67**	**2.71**
Chromium[4]	0.001	0.00056	0.00055	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.00124	0.00149	0.002	0.0006	*<0.00050*	*<0.00050*	*<0.00050*	0.0005	*<0.00050*
Iron	0.3	0.155	0.157	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead[3]	***equation***	0.000525	0.000525	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.048	0.048	0.096	0.0011	0.0010	0.0010	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.83	1.36		**1.38**	**1.17**	**0.88**	0.69	**1.16**	**1.15**
Manganese[3]		0.3157	0.3300	***equation***	0.0006	0.0005	0.0008	0.0007	0.0005	0.0006
Mercury	0.000026	0.000018	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.0365	0.0370	0.073	0.00015	0.00010	0.00006	*<0.000050*	0.0002	0.0002
Nickel[3]	***equation***	0.0127	0.0130	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.0005	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		0.50	0.59		**0.67**	**0.63**	**0.51**	0.47	**0.65**	**0.66**
Selenium	0.001	0.00055	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.25	0.23	0.19	0.15	0.06	0.07
Silver	0.0001				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		0.975	0.72		**1.07**	**0.98**	0.80	0.74	**1.44**	**1.46**
Strontium		0.0279	0.0330	0.049	0.0185	0.0150	0.0107	0.0087	0.0125	0.0126
Sulfur					1.64	1.38	0.99	1.04	1.99	1.98
Thallium	0.0008	0.00041	0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.0002	0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		1.00	1.00	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium	0.015	0.0075	0.0075	0.015	0.000054	0.000051	0.000041	0.000036	0.000040	0.000040
Vanadium		0.0035	0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	0.030	0.0063	0.0106	***equation***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium					*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Dissolved Metals (mg/L)										
Aluminum[3]		0.0263	0.0260	0.05	0.0011	0.0014	0.0014	0.0013	0.0013	0.0016
Antimony		0.0101	0.0100	0.020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.0026	0.005	0.0002	0.0002	0.0001	*<0.00010*	0.0002	0.0002
Barium		0.5010	0.5000	1	0.0036	0.0033	0.0028	0.0026	0.0038	0.0039
Beryllium		0.0027	0.0027	0.0053	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth					*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron		0.76	0.76	1.5	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium		0.000025	0.000025	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium					3.78	3.05	2.08	1.48	2.72	2.82
Chromium		0.00055	0.00055	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt					*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.00119	0.00148	0.002	0.00052	0.00043	0.00035	0.00031	0.00039	0.00038
Iron		0.155	0.155	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Lead		0.000525	0.000525	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.048	0.048	0.096	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium					1.33	1.14	0.83	0.66	1.11	1.09
Manganese[3]		0.315	0.330	***equation***	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003
Mercury		0.000018	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.037	0.073	0.0001	0.0001	0.0001	*<0.000050*	0.0002	0.0002
Nickel		0.013	0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus					*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium					0.64	0.60	0.49	0.45	0.62	0.61
Selenium		0.00055	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon					0.22	0.18	0.15	0.10	*<0.050*	*<0.050*
Silver					*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium					1.03	0.94	0.74	0.69	1.44	1.39
Strontium		0.028	0.033	0.049	0.0178	0.0149	0.0107	0.0086	0.0127	0.0133
Sulfur					1.55	1.21	0.86	0.70	1.89	1.82
Thallium		0.00041	0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.0002	0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		1.01	1.00	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium		0.0075	0.0075	0.015	0.00005	0.00005	0.00004	0.00003	0.00004	0.00004
Vanadium		0.0035	0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]		0.0053	0.0096	***equation***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Zirconium					*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d). A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					Inuggugayualik Lake (INUG)									
Area-Replicate ID					INUG-86	INUG-87	INUG-88	INUG-89	INUG-90	INUG-91	INUG-92	INUG-93	INUG-94	INUG-95
Depth (m)	CCME (2012)	Trigger[2]			3	3	3	3	3	3	3	3	3	3
Date	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	29-Mar-17	29-Mar-17	7-May-17	7-May-17	22-Jul-17	22-Jul-17	25-Aug-17	25-Aug-17	23-Sep-17	23-Sep-17
Field Measurements (Surface)														
Temperature (°C)					-	1.0	1.0	1.0	12.0	11.9	13.4	13.6	6.8	6.8
Specific Conductivity (µS/cm)					-	11	13	12	15	15	15	15	16.6	16.5
Dissolved Oxygen (mg/L)					-	13.5	13.8	13.8	11.05	11.05	9.86	10.24	11.52	11.5
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.01	7.01	7.13	7.16	7.24	6.94	7.17	6.76	6.54	6.71
Physical Tests (mg/L)														
Conductivity (µS/cm)		23.5	36.6		21.0	18.1	17.6	17.4	14.4	14.5	15.4	15.1	15.1	15.2
Hardness		8.5	16.7		6.7	6.5	6.5	6.5	5.7	5.6	5.7	5.8	5.7	6.0
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	7.00	7.00	6.81	6.87	6.59	6.65	6.84	6.86	6.89	6.89
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		18.0	25.3		14	13	13	13	11	12	15	15	10	11
Turbidity (NTU)					0.19	0.17	0.15	0.16	0.34	0.32	0.36	0.41	0.33	0.29
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.6	17.8		5.9	5.7	5.3	5.6	5.3	4.9	4.9	4.5	5.1	5.3
Alkalinity - Carbonate		4	4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.5	17.8		5.9	5.7	5.3	5.6	5.3	4.9	4.9	4.5	5.1	5.3
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.015	0.016	0.016	0.014	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60.28	60.2	120	0.86	0.84	0.83	0.84	0.71	0.71	0.74	0.75	0.75	0.75
Fluoride	0.120				0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Nitrate (as N)	3.0	1.50	1.50	3	<0.0050	<0.0050	<0.0050	0.0060	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.170	0.163		0.14	0.15	0.13	0.12	0.11	0.11	0.15	0.11	0.11	0.11
Ortho Phosphate (as P)		0.002	0.002		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.					<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	0.0021	0.0032	<0.0020	<0.0020	0.0022	0.0034	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.08		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		64.7	65.2	128	1.01	0.99	1.00	1.03	0.79	0.79	0.86	0.87	0.85	0.86
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.60	3.21		2.07	1.92	1.58	1.67	1.87	1.82	1.75	1.88	1.66	1.70
Total Organic Carbon		2.79	4.11		2.08	2.01	1.61	1.75	1.92	1.97	2.11	1.96	2.13	1.59
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.09	0.12	0.09	0.08	0.26	0.28	0.26	0.31	0.56	0.50
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0041	0.0039	0.0043	0.0030	0.0095	0.0101	0.0075	0.0072	0.0057	0.0053
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00255	0.0026	0.005	0.0001	<0.00010	<0.00010	<0.00010	0.0001	0.0001	0.0002	0.0002	<0.00010	<0.00010
Barium		0.50	0.50	1	0.0019	0.0018	0.0020	0.0020	0.0018	0.0018	0.0017	0.0018	0.0016	0.0016
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	0.00	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.15	4.88		1.31	1.28	1.27	1.33	1.12	1.11	1.13	1.13	1.13	1.12
Chromium[4]	0.001	0.00056	0.00055	0.001	<0.00010	<0.00010	0.0001	<0.00010	0.0002	<0.00010	<0.00015	<0.00015	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.00124	0.00149	0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.155	0.157	0.3	<0.010	<0.010	<0.010	<0.010	0.016	0.016	0.014	0.017	0.011	0.011
Lead[3]	***equation***	0.000525	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.83	1.36		**0.86**	0.82	0.76	0.78	0.72	0.72	0.70	0.71	0.75	0.74
Manganese[3]		0.3157	0.3300	***equation***	0.0007	0.0007	0.0008	0.0008	0.0029	0.0030	0.0020	0.0020	0.0019	0.0019
Mercury	0.000026	0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0365	0.0370	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel[3]	***equation***	0.0127	0.0130	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0005	<0.00050	0.0006	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.50	0.59		0.44	0.42	0.39	0.41	0.38	0.38	0.40	0.40	0.37	0.37
Selenium	0.001	0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.18	0.18	0.19	0.20	0.19	0.19	0.18	0.18	0.15	0.18
Silver	0.0001				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		0.975	0.72		0.66	0.62	0.59	0.60	0.61	0.60	0.60	0.60	0.59	0.60
Strontium		0.0279	0.0330	0.049	0.0075	0.0072	0.0070	0.0072	0.0066	0.0066	0.0061	0.0062	0.0067	0.0065
Sulfur					<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Thallium	0.0008	0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.00	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00039	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.000042	0.000041	0.000039	0.000043	0.000055	0.000056	0.000040	0.000039	0.000045	0.000042
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.0063	0.0106	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0038	<0.0030	<0.0030
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)														
Aluminum[3]		0.0263	0.0260	0.05	0.0022	0.0025	0.0036	0.0033	0.0030	0.0033	0.0037	0.0034	0.0018	0.0016
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Barium		0.5010	0.5000	1	0.0022	0.0020	0.0021	0.0020	0.0018	0.0018	0.0016	0.0016	0.0016	0.0016
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.000025	0.000025	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium					1.33	1.28	1.35	1.33	1.10	1.10	1.11	1.14	1.05	1.16
Chromium		0.00055	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.00119	0.00148	0.002	0.00034	0.00033	0.00045	0.00029	0.00040	0.00027	0.00034	0.00033	0.00037	0.00037
Iron		0.155	0.155	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.000525	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium					0.82	0.80	0.76	0.78	0.71	0.69	0.71	0.71	0.75	0.76
Manganese[3]		0.315	0.330	***equation***	0.0003	0.0003	0.0006	0.0006	0.0006	0.0006	0.0009	0.0009	0.0004	0.0004
Mercury		0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel		0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium					0.43	0.42	0.43	0.45	0.37	0.35	0.36	0.37	0.40	0.41
Selenium		0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.15	0.14	0.18	0.18	0.15	0.16	0.13	0.14	0.12	0.12
Silver					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium					0.62	0.59	0.61	0.62	0.58	0.56	0.57	0.57	0.63	0.73
Strontium		0.028	0.033	0.049	0.0074	0.0070	0.0074	0.0076	0.0064	0.0064	0.0067	0.0068	0.0059	0.0066
Sulfur					<0.50	<0.50	0.72	0.69	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Thallium		0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.01	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00004	0.00004	0.00004	0.00004	0.00004	0.00005	0.00004	0.00004	0.00003	0.00003
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0053	0.0096	***equation***	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	0.004	0.004	<0.0010	<0.0010
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).
A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123	Bolded concentrations exceed the trigger value.
123	Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–1. Water quality results from the 2017 CREMP, Meadowbank study lakes.

Lake and Station					Pipedream Lake (PDL)									
Area-Replicate ID	CCME (2012)	Trigger[2]			PDL-51	PDL-52	PDL-53	PDL-54	PDL-55	PDL-56	PDL-57	PDL-58	PDL-59	PDL-60
Depth (m)					3	3	3	3	3	3	3	3	3	3
Date	Guideline[1]	Meadowbank	Wally Lake	Threshold[2]	27-Mar-17	27-Mar-17	11-May-17	11-May-17	8-Jul-17	8-Jul-17	24-Aug-17	24-Aug-17	1-Oct-17	1-Oct-17
Field Measurements (Surface)														
Temperature (°C)					0.5	0.5	0.5	0.6	6.5	6.3	12.5	12.4	6.1	5.6
Specific Conductivity (µS/cm)					17	20	16	17	21	21	21	21	23	22.6
Dissolved Oxygen (mg/L)					13.90	14.90	13.8	14.1	12.13	13.01	10.04	10.03	11.71	11.69
pH	6.5 - 9.0	6.30 - 8.25	6.54 - 8.34	6.5 - 9.0	7.43	7.47	7.27	7.45	6.51	6.75	6.57	6.75	6.94	6.93
Physical Tests (mg/L)														
Conductivity (µS/cm)		23.5	36.6		22.4	22.0	23.4	22.9	20.9	20.9	19.9	22.1	22.4	21.5
Hardness		8.5	16.7		**9.3**	**9.2**	**9.0**	**8.9**	8.5	**8.5**	**8.8**	**8.8**	8.4	**8.6**
pH (Laboratory)	6.5 - 9.0	6.50 - 7.94	6.92 - 8.17	6.5 - 9.0	7.18	7.18	7.06	7.09	7.05	7.07	7.06	7.02	7.13	7.15
Total Suspended Solids		3.0	3.0	5.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	1	<1.0	<1.0	<1.0
Total Dissolved Solids		18.0	25.3		13	16	9	13	12	13	18	16	14	14
Turbidity (NTU)					0.16	0.15	0.13	0.14	0.19	0.33	0.23	0.28	0.21	0.25
Anions and Nutrients (mg/L)														
Alkalinity - Bicarbonate		8.6	17.8		8.1	7.6	7.7	7.5	7.2	7.0	7.4	7.3	7.7	7.6
Alkalinity - Carbonate		4	4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		8.5	17.8		8.1	7.6	7.7	7.5	7.2	7.0	7.4	7.3	7.7	7.6
Ammonia (as N)[3]	***equation***	0.065	0.067	0.126	0.011	0.011	0.009	0.009	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60.28	60.2	120	0.64	0.63	0.63	0.62	0.58	0.61	0.61	0.60	0.62	0.62
Fluoride	0.120				0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04
Nitrate (as N)	3.0	1.50	1.50	3	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.060	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.170	0.163		0.114	0.106	0.12	0.11	0.09	0.09	0.09	0.10	0.08	0.08
Ortho Phosphate (as P)		0.002	0.002		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.					<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total	0.0040	0.0060	0.0067	0.004	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.010	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)		1.0	1.08		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		64.7	65.2	128	1.74	1.70	1.71	1.69	1.59	1.69	1.65	1.65	1.67	1.68
Cyanides (mg/L)														
Total Cyanide					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)														
Dissolved Organic Carbon		2.60	3.21		1.72	1.58	1.77	1.58	1.78	1.62	1.67	1.62	1.48	1.43
Total Organic Carbon		2.79	4.11		1.81	1.70	1.77	1.72	1.89	1.99	1.74	1.80	1.50	1.58
Plant Pigments (µg/L)														
Chlorophyll-*a*					0.35	0.26	0.34	0.21	0.42	0.38	0.22	0.26	0.65	0.57
Total Metals (mg/L)														
Aluminum[3]	***equation***	0.054	0.053	0.100	0.0033	<0.0030	<0.0030	<0.0030	0.0034	0.0043	0.0047	0.0044	0.0044	0.0053
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00255	0.0026	0.005	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Barium		0.50	0.50	1	0.0020	0.0019	0.0020	0.0019	0.0018	0.0021	0.0019	0.0019	0.0019	0.0019
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.000025	0.000025	0.000040	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		2.15	4.88		**2.39**	**2.28**	**2.38**	**2.33**	2.08	2.11	**2.25**	**2.22**	**2.21**	**2.22**
Chromium[4]	0.001	0.00056	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0003	<0.00010	~~0.0046~~	<0.00010	0.0001
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.00124	0.00149	0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0006	<0.00050	<0.00050
Iron	0.3	0.155	0.157	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.037	<0.010	<0.010
Lead[3]	***equation***	0.000525	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.83	1.36		**0.88**	**0.83**	**0.83**	0.79	0.76	0.82	0.80	0.78	0.77	0.79
Manganese[3]		0.3157	0.3300	***equation***	0.0006	0.0007	0.0006	0.0006	0.0017	0.0019	0.0014	0.0017	0.0012	0.0012
Mercury	0.000026	0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0365	0.0370	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0001	<0.00015	<0.00015
Nickel[3]	***equation***	0.0127	0.0130	0.025	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0006	0.0006
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.50	0.59		0.39	0.37	0.36	0.35	0.31	0.36	0.37	0.37	0.35	0.36
Selenium	0.001	0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.15	0.15	0.15	0.15	0.17	0.18	0.17	0.15	0.15	0.15
Silver	0.0001				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		0.975	0.72		0.54	0.51	0.54	0.51	0.47	0.52	0.53	0.53	0.50	0.52
Strontium		0.0279	0.0330	0.049	0.0096	0.0092	0.0097	0.0095	0.0090	0.0088	0.0090	0.0089	0.0090	0.0090
Sulfur					0.54	0.58	0.69	0.59	0.56	0.55	0.57	0.68	0.68	0.58
Thallium	0.0008	0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.00	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium	0.015	0.0075	0.0075	0.015	0.000021	0.000022	0.000022	0.000020	0.000026	0.000023	0.000022	0.000021	0.000022	0.000022
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.0063	0.0106	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)														
Aluminum[3]		0.0263	0.0260	0.05	0.0041	<0.0010	<0.0010	<0.0010	0.0022	0.0023	0.0011	0.0012	0.0016	0.0016
Antimony		0.0101	0.0100	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.0026	0.005	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001
Barium		0.5010	0.5000	1	0.0022	0.0021	0.0020	0.0020	0.0019	0.0019	0.0018	0.0018	0.0018	0.0018
Beryllium		0.0027	0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.000025	0.000025	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium					2.34	2.34	2.31	2.29	2.15	2.16	2.21	2.20	2.16	2.19
Chromium		0.00055	0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.00119	0.00148	0.002	0.00061	0.00087	0.00039	0.00038	0.00039	0.00041	0.00038	0.00040	0.00042	0.00041
Iron		0.155	0.155	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead		0.000525	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.048	0.096	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium					0.85	0.83	0.79	0.77	0.75	0.75	0.80	0.79	0.74	0.75
Manganese[3]		0.315	0.330	***equation***	0.0006	0.0005	0.0002	0.0002	0.0013	0.0013	0.0003	0.0003	0.0003	0.0004
Mercury		0.000018	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.037	0.073	<0.000050	<0.000050	0.0001	<0.000050	<0.000050	<0.000050	0.0001	0.0001	<0.000050	<0.000050
Nickel		0.013	0.013	0.025	0.0006	0.0005	0.0005	0.0005	0.0006	0.0006	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium					0.37	0.36	0.35	0.35	0.33	0.34	0.33	0.33	0.34	0.36
Selenium		0.00055	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon					0.12	0.13	0.11	0.13	0.14	0.14	0.12	0.12	0.11	0.11
Silver					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium					0.53	0.50	0.51	0.50	0.47	0.47	0.50	0.50	0.48	0.49
Strontium		0.028	0.033	0.049	0.0095	0.0093	0.0097	0.0094	0.0089	0.0089	0.0097	0.0097	0.0086	0.0087
Sulfur					0.52	0.55	0.62	0.66	0.54	0.52	0.60	0.57	0.54	0.62
Thallium		0.00041	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002	0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.01	1.00	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.0075	0.015	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Vanadium		0.0035	0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0053	0.0096	***equation***	<0.0010	<0.0010	0.002	<0.0010	<0.0010	<0.0010	<0.0010	0.002	<0.0010	<0.0010
Zirconium					<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).
A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.2–2. Screening process for water quality parameters, Meadowbank study lakes, 2017.

CONVENTIONALS

Screening Level	1	2	3
Screening Rule[1]	>DL ≥ 10% frequency	C-I > 0.1 frequency	Pattern = Activity
Conductivity	Figure 3.2-14		
Hardness	Figure 3.2-15		
pH -Field	Figure 3.2-16		
pH -Lab	Figure 3.2-17		
TSS	Figure 3.2-18		
TDS	Figure 3.2-19		
B-Alkalinity	Figure 3.2-20		
C-Alkalinity*	No	No	No
T-Alkalinity	Figure 3.2-21		
Ammonia-N	Figure 3.2-22		
Chloride	Figure 3.2-23		
Nitrate-N	Figure 3.2-24		
Nitrite-N*	No	No	No
TKN	Figure 3.2-25		
T-phosphorous	Figure 3.2-26		
Ortho-phosphate*	No	No	No
Reactive silica	Figure 3.2-27		
Sulphate	Figure 3.2-28		
DOC	Figure 3.2-29		
TOC	Figure 3.2-30		
T-Cyanide*	No	No	No
Free Cyanide*	No	No	No

TOTAL METALS

Screening Level	1	2	3
Screening Rule[1]	>DL ≥ 10% frequency	C-I > 0.1 frequency	Pattern = Activity
Aluminum	Figure 3.2-31		
Antimony*	No	No	No
Arsenic	Figure 3.2-32		
Barium	Figure 3.2-33		
Beryllium*	No	No	No
Boron*	No	No	No
Cadmium*	No	No	No
Calcium	Figure 3.2-34		
Chromium	Figure 3.2-35		
Copper	Figure 3.2-36		
Iron	Figure 3.2-37		
Lead*	No	No	No
Lithium*	No	No	No
Magnesium	Figure 3.2-38		
Manganese	Figure 3.2-39		
Mercury*	No	No	No
Molybdenum	Figure 3.2-40		
Nickel*	No	No	No
Potassium	Figure 3.2-41		
Selenium*	No	No	No
Sodium	Figure 3.2-42		
Strontium	Figure 3.2-43		
Thallium*	No	No	No
Tin*	No	No	No
Titanium*	No	No	No
Uranium	Figure 3.2-44		
Vanadium*	No	No	No
Zinc*	No	No	No

DISSOLVED METALS

Screening Level	1	2	3
Screening Rule[1]	>DL ≥ 10% frequency	C-I > 0.1 frequency	Pattern = Activity
Aluminum	Figure 3.2-45		
Antimony*	No	No	No
Arsenic	Figure 3.2-46		
Barium	Figure 3.2-47		
Beryllium*	No	No	No
Boron*	No	No	No
Cadmium*	No	No	No
Chromium*	No	No	No
Copper	Figure 3.2-48		
Iron*	No	No	No
Lead*	No	No	No
Lithium*	No	No	No
Manganese	Figure 3.2-49		
Mercury*	No	No	No
Molybdenum	Figure 3.2-50		
Nickel*	No	No	No
Selenium*	No	No	No
Strontium	Figure 3.2-51		
Thallium*	No	No	No
Tin*	No	No	No
Titanium*	No	No	No
Uranium	Figure 3.2-52		
Vanadium*	No	No	No
Zinc*	No	No	No

Notes:

"*" indicates plots for these parameters are presented in **Appendix A1**.

1. See **Section 3.2.2.2** for information on the screening process for deciding which parameters are carried forward in the temporal and spatial trend assessment.

Table 3.2-3. Water quality variables at the Meadowbank areas for which 2017 mean concentration exceeded the trigger.

Meadowbank Areas

		2017 Mean			
Parameter	**Trigger**	**PDL**	**TPN**	**TPE**	**SP**
Bicarb. alkalinity	8.56				11
Conductivity	23.51		28.51	32.04	38.69
Hardness	8.49	8.8	9.3	11.19	14.85
Calcium	2.15	2.25	2.28	2.79	3.92
Potassium	0.5		0.51	0.56	0.57
Magnesium	0.83		0.94	1.06	1.29
Sodium	0.98		1.19	1.21	1.01
Total alkalinity	8.55				11
TDS	18		18.76	22.1	25.26

Wally Lake

Parameter	Trigger	2017 Mean
Conductivity	36.6	51.1
Hardness	16.7	20.8
Calcium	4.9	5.8
Potassium	0.59	0.63
Magnesium	1.36	1.66
Sodium	0.72	0.78
TDS	25.3	33.5
TKN	0.16	0.17

Notes:
No cases of trigger exceedances at INUG in 2017.
Reported mean values are all in units of mg/L with the exception of conductivity (µS/cm).

Table 3.2-4. Results of BACI tests for selected water variables at Meadowbank areas in 2017.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	Proportional change		
							exp(Est)	LCI	UCI
Bicarb. alkalinity	SP	5	5	0.351	0.035	**0.000**	1.42	1.31	1.54
Total alkalinity	SP	5	5	0.351	0.035	**0.000**	1.42	1.31	1.54
TKN	WAL	18	5	0.219	0.093	**0.014**	1.24	1.03	1.51
Conductivity	TPN	6	5	0.56	0.025	**0.000**	1.75	1.65	1.85
	TPE	8	5	0.652	0.045	**0.000**	1.92	1.74	2.12
	SP	5	5	0.438	0.031	**0.000**	1.55	1.44	1.67
	WAL	18	5	0.365	0.077	**0.000**	1.44	1.23	1.69
Hardness	TPN	6	5	0.447	0.023	**0.000**	1.56	1.48	1.65
	TPE	8	5	0.611	0.044	**0.000**	1.84	1.67	2.03
	SP	5	5	0.383	0.02	**0.000**	1.47	1.4	1.54
	WAL	18	5	0.368	0.071	**0.000**	1.45	1.25	1.68
Calcium	TPN	6	5	0.526	0.021	**0.000**	1.69	1.61	1.78
	TPE	8	5	0.687	0.046	**0.000**	1.99	1.79	2.2
	SP	5	5	0.431	0.018	**0.000**	1.54	1.48	1.6
	WAL	18	5	0.391	0.055	**0.000**	1.48	1.32	1.66
Potassium	TPN	6	5	0.251	0.036	**0.000**	1.29	1.19	1.39
	TPE	8	5	0.338	0.055	**0.000**	1.4	1.24	1.58
	SP	5	5	0.349	0.053	**0.000**	1.42	1.25	1.6
	WAL	18	5	0.406	0.067	**0.000**	1.5	1.31	1.73
Magnesium	TPN	6	5	0.393	0.024	**0.000**	1.48	1.4	1.56
	TPE	8	5	0.505	0.048	**0.000**	1.66	1.49	1.84
	SP	5	5	0.352	0.025	**0.000**	1.42	1.34	1.51
	WAL	18	5	0.342	0.056	**0.000**	1.41	1.25	1.58
Sodium	TPN	6	5	0.669	0.036	**0.000**	1.95	1.8	2.12
	TPE	8	5	0.682	0.056	**0.000**	1.98	1.75	2.24
	SP	5	5	0.502	0.081	**0.000**	1.65	1.37	1.99
	WAL	18	5	0.258	0.058	**0.000**	1.29	1.15	1.46
TDS	TPN	6	5	0.331	0.075	**0.001**	1.39	1.18	1.65
	TPE	8	5	0.53	0.066	**0.000**	1.7	1.47	1.97
	SP	5	5	0.595	0.09	**0.000**	1.81	1.47	2.23
	WAL	18	5	0.381	0.143	**0.007**	1.46	1.09	1.97

Notes:

1. **Bolded** values are p-values < 0.05

Test area = area compared to control (INUG)

n(B) = number of paired months in the "before" period

n(A) = number of paired months in the "after" period (i.e., in 2017)

Estimate = BACI model estimate of the 2017 change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or a decrease in mean (opposite for a pH lower trigger)

Exp(Est.) = estimated proportional change

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 3.2–5. Water quality results from Third Portage Lake in 2017 compared against predicted concentrations in the FEIS.

Lake and Station		Simulated Maximum Whole Lake Concentration (mg/L) Third Portage Lake[2]				Third Portage Lake East Basin (TPE)									
		Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)											
Area-Replicate ID	CCME (2012) Guideline[1]					TPE-100	TPE-101	TPE-102	TPE-103	TPE-104	TPE-105	TPE-106	TPE-107	TPE-108	TPE-109
Depth (m)		Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3	3
Date						24-Mar-17	24-Mar-17	4-May-17	5-May-17	1-Jul-17	1-Jul-17	27-Aug-17	27-Aug-17	18-Sep-17	18-Sep-17
Physical Tests (mg/L)															
Hardness		5.7	6.0	6.0	6.4	***12.6***	***13.1***	***13.4***	***13***	***9.6***	***9.56***	***10.4***	***10.1***	***10.1***	***9.99***
Anions and Nutrients (mg/L)															
Alkalinity - Total		4.13	4.14	4.23	4.24	***8.8***	***9.7***	***9.8***	***8.7***	***7.5***	***6.9***	***7.2***	***6.8***	***7.8***	***7.8***
Ammonia (as N)[3]	***equation***	0.0333	0.0333	0.0497	0.0497	0.018	0.0209	0.0179	0.019	0.0071	0.0068	<0.0050	<0.0050	<0.0050	<0.0050
Chloride	120	0.8	0.8	1.0	1.1	0.94	0.95	0.98	0.94	0.67	0.66	0.71	0.73	0.75	0.76
Fluoride	0.120	0.07	0.08	0.07	0.09	**0.083**	**0.087**	***0.091***	**0.086**	**0.071**	**0.071**	**0.071**	0.07	**0.08**	**0.081**
Nitrate (as N)	3.0	0.0351	0.0363	0.0569	0.0588	0.026	0.018	0.026	0.037	0.024	0.023	<0.0050	<0.0050	<0.0050	<0.0050
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	0.0040	0.0027	0.0029	0.0032	0.0035	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Sulphate (SO_4)		1.7	1.7	2.0	2.0	***6.08***	***6.17***	***6.51***	***6.25***	***4.34***	***4.25***	***4.71***	***4.71***	***4.78***	***4.8***
Cyanides (mg/L)															
Total Cyanide		0	0	0	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Metals (mg/L)															
Aluminum[3]	***equation***	0.007	0.009	0.007	0.01	0.0032	0.0039	0.004	<0.0030	**0.0082**	**0.0092**	0.0056	0.0053	0.0058	0.0052
Antimony		0.00056	0.00057	0.0006	0.00062	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00062	0.00062	0.00072	0.00072	0.00033	0.00043	0.00041	0.00033	0.00036	0.00035	0.00048	0.00048	0.00044	0.00041
Barium		0.02	0.022	0.02	0.023	0.00363	0.00391	0.00435	0.00399	0.00312	0.00294	0.00285	0.00277	0.0029	0.00272
Beryllium		0.001	0.001	0.001	0.001	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth		0.102	0.102	0.104	0.104	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.00001	0.00001	0.00001	0.00001	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	<0.000051	<0.000051	<0.000052	<0.000052	0.0000136	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		1.3	1.4	1.5	1.5	***2.96***	***3.23***	***3.54***	***3.11***	***2.47***	***2.37***	***2.57***	***2.58***	***2.56***	***2.52***
Chromium[4]	0.001	0.001	0.001	0.001	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00015	<0.00010	<0.00010	0.00011
Cobalt		0.004	0.0013	0.0004	0.0017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0012	0.0013	0.0013	0.00062	0.00052	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.03	0.03	0.03	0.03	<0.010	<0.010	<0.010	<0.010	0.016	0.017	0.012	<0.010	0.01	<0.010
Lead[3]	***equation***	0.0006	0.0006	0.0006	0.0007	0.000222	0.000092	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000065	<0.000050
Lithium		0.005	0.005	0.005	0.005	0.0011	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.6	0.6	0.6	0.7	***1.16***	***1.31***	***1.34***	***1.2***	***0.9***	***0.86***	***0.98***	***0.95***	***0.95***	***0.94***
Manganese[3]		0.009	0.052	0.015	0.072	0.00054	0.00044	0.00043	0.0004	0.0034	0.00329	0.00118	0.00117	0.00127	0.00125
Mercury	0.000026	0.00005	0.00005	0.00005	0.00005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.001	0.001	0.001	0.001	0.000178	0.000191	0.000185	0.000171	0.000126	0.000123	0.000157	0.000163	0.000189	0.000148
Nickel[3]	***equation***	0.0016	0.0016	0.002	0.0021	0.00056	0.0006	0.00064	0.00059	0.00076	0.00068	<0.00050	<0.00050	<0.00050	<0.00050
Potassium		2	2.1	2	2.1	0.63	0.72	0.7	0.62	0.43	0.41	0.54	0.55	0.52	0.51
Selenium	0.001	0.001	0.001	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.01	0.08	0.02	0.12	**0.091**	**0.089**	**0.11**	<0.10	***0.14***	***0.14***	<0.10	<0.10	<0.10	<0.10
Silver	0.0001	0.00002	0.00002	0.00002	0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		2	2	2	2.1	1.32	1.45	1.53	1.42	1.02	0.976	1.15	1.13	1.05	1.06
Strontium		0.002	0.005	0.004	0.007	***0.0134***	***0.0145***	***0.0161***	***0.0142***	***0.0113***	***0.011***	***0.0111***	***0.0111***	***0.0111***	***0.0111***
Thallium	0.0008	0.0002	0.0002	0.0002	0.0002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium	0.015	0.0002	0.0002	0.0002	0.0003	0.00004	0.000046	0.000048	0.000042	0.000053	0.000051	0.000042	0.000044	0.000039	0.000036
Vanadium		0.03	0.03	0.03	0.03	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.011	0.011	0.015	0.015	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0035	<0.0030	<0.0030	<0.0030

Notes:

1 . CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.

2. Whole lake data are given for a range of mixing conditions, representing mid-range and upper mixing estimate for the north basin discharge location. The model includes treated water releases from the project (Years 1 to 4), and long-term substance loading due to leaching from the Bay-Goose dike (Cumberland, 2005).

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Mid-range Mixing Estimate (92 Mm^3):

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Upper-range Mixing Estimate (169 Mm^3):

- Bordered cells = concentrations exceed the prediction "With Dike Leaching."
- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table 3.2–5. Water quality results from Third Portage Lake in 2017 compared against predicted concentrations in the FEIS.

Lake and Station		Simulated Maximum Whole Lake Concentration (mg/L) Third Portage Lake[2]				Third Portage Lake East Basin (TPE)										Third Portage Lake South Basin (TPS)	
		Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)													
Area-Replicate ID	**CCME (2012)**					TPN-100	TPN-101	TPN-102	TPN-103	TPN-104	TPN-105	TPN-106	TPN-107	TPN-108	TPN-109	TPS-57	TPS-58
Depth (m)	**Guideline[1]**	Without Dike Leaching	With Dike Leaching	Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3	3	3	3
Date						25-Mar-17	25-Mar-17	7-May-17	7-May-17	4-Jul-17	4-Jul-17	27-Aug-17	27-Aug-17	17-Sep-17	17-Sep-17	25-Mar-17	25-Mar-17
Physical Tests (mg/L)																	
Hardness		5.7	6.0	6.0	6.4	***11.2***	***10.7***	***9.94***	***9.61***	***8.39***	***8.25***	***8.85***	***8.87***	***8.6***	***8.6***	***11.3***	***11.5***
Anions and Nutrients (mg/L)																	
Alkalinity - Total		4.13	4.14	4.23	4.24	***7.9***	***7.2***	***6.5***	***6.2***	***5.8***	***6.2***	***5.9***	***6.1***	***6.3***	***6.3***	***7.4***	***7.7***
Ammonia (as N)[3]	***equation***	0.0333	0.0333	0.0497	0.0497	0.0202	0.0192	0.0169	0.0177	0.0076	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0221	0.0276
Chloride	120	0.8	0.8	1.0	1.1	0.92	0.87	0.81	0.8	0.71	0.75	0.73	0.73	0.76	0.76	0.93	0.92
Fluoride	0.120	0.07	0.08	0.07	0.09	**0.076**	**0.072**	**0.071**	0.069	0.063	0.064	0.062	0.061	0.069	**0.071**	**0.076**	**0.076**
Nitrate (as N)	3.0	0.0351	0.0363	0.0569	0.0588	0.044	0.040	0.040	0.041	0.041	0.037	0.024	0.022	0.0185	0.0204	0.0417	0.0427
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024	0.001	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Phosphorus (P)-Total	0.0040	0.0027	0.0029	0.0032	0.0035	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulphate (SO_4)		1.7	1.7	2.0	2.0	***5.92***	***5.57***	***5.31***	***5.26***	***4.42***	***4.38***	***4.64***	***4.64***	***4.67***	***4.66***	***5.89***	***5.9***
Cyanides (mg/L)																	
Total Cyanide		0	0	0	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010 0	<0.0010 0
Total Metals (mg/L)																	
Aluminum[3]	***equation***	0.007	0.009	0.007	0.01	0.004	0.005	<0.0030	<0.0030	0.0059	0.0064	0.0049	0.0044	0.0065	0.0052	<0.0030	0.0032
Antimony		0.00056	0.00057	0.0006	0.00062	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00062	0.00062	0.00072	0.00072	0.00024	0.00021	0.00017	0.00016	0.00019	0.00021	0.0002	0.0002	0.00018	0.00016	0.00021	0.0002
Barium		0.02	0.022	0.02	0.023	0.00452	0.00351	0.00326	0.00319	0.00276	0.00288	0.00297	0.00287	0.0027	0.00285	0.00364	0.00358
Beryllium		0.001	0.001	0.001	0.001	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth		0.102	0.102	0.104	0.104	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.00001	0.00001	0.00001	0.00001	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	<0.000051	<0.000051	<0.000052	<0.000052	0.0000076	0.0000061	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000117
Calcium		1.3	1.4	1.5	1.5	***2.74***	***2.55***	***2.4***	***2.38***	***2.05***	***2.08***	***2.19***	***2.17***	***2.11***	***2.09***	***2.67***	***2.71***
Chromium[4]	0.001	0.001	0.001	0.001	0.001	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt		0.004	0.0013	0.0004	0.0017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.0012	0.0012	0.0013	0.0013	0.00061	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	<0.00050
Iron	0.3	0.03	0.03	0.03	0.03	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead[3]	***equation***	0.0006	0.0006	0.0006	0.0007	0.000111	0.000273	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.005	0.005	0.005	0.005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.6	0.6	0.6	0.7	***1.14***	***1.1***	***0.94***	***0.92***	***0.84***	***0.89***	***0.87***	***0.89***	***0.86***	***0.9***	***1.16***	***1.15***
Manganese[3]		0.009	0.052	0.015	0.072	0.00057	0.00056	0.00053	0.00052	0.00228	0.00247	0.00147	0.0015	0.00156	0.00145	0.00052	0.00059
Mercury	0.000026	0.00005	0.00005	0.00005	0.00005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.001	0.001	0.001	0.001	0.000181	0.000181	0.000156	0.000151	0.00014	0.000148	0.000135	0.000151	0.000135	0.000142	0.000185	0.000189
Nickel[3]	***equation***	0.0016	0.0016	0.002	0.0021	0.00056	0.0005	<0.00050	<0.00050	<0.00050	0.00054	<0.00050	<0.00050	<0.00050	<0.00050	0.00053	<0.00050
Potassium		2	2.1	2	2.1	0.64	0.61	0.51	0.5	0.43	0.45	0.5	0.52	0.47	0.49	0.65	0.66
Selenium	0.001	0.001	0.001	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.01	0.08	0.02	0.12	**0.062**	**0.062**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.058**	**0.065**
Silver	0.0001	0.00002	0.00002	0.00002	0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00002	0.000014	<0.000010	<0.000010
Sodium		2	2	2	2.1	1.44	1.36	1.21	1.19	1.05	1.1	1.16	1.18	1.06	1.12	1.44	1.46
Strontium		0.002	0.005	0.004	0.007	***0.0128***	***0.0119***	***0.0113***	***0.0112***	***0.00993***	***0.0108***	***0.00987***	***0.00987***	***0.01***	***0.01***	***0.0125***	***0.0126***
Thallium	0.0008	0.0002	0.0002	0.0002	0.0002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium	0.015	0.0002	0.0002	0.0002	0.0003	0.00004	0.000038	0.000035	0.000034	0.000038	0.000042	0.000032	0.000033	0.000034	0.000035	0.00004	0.00004
Vanadium		0.03	0.03	0.03	0.03	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.011	0.011	0.015	0.015	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Notes:

1 . CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.

2. Whole lake data are given for a range of mixing conditions, representing mid-range and upper mixing estimate for the north basin discharge location. The model includes treated water releases from the project (Years 1 to 4), and long-term substance loading due to leaching from the Bay-Goose dike (Cumberland, 2005).

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Mid-range Mixing Estimate (92 Mm^3):

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Upper-range Mixing Estimate (169 Mm^3):

- Bordered cells = concentrations exceed the prediction "With Dike Leaching."
- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table 3.2–6. Water quality results from Second Portage Lake in 2017 compared against predicted concentrations in the FEIS.

Lake and Station		**Simulated Maximum Whole Lake Concentration (mg/L) Second Portage Lake[2]**				**Second Portage Lake (SP)**									
		Upper Mixing Estimate (169 Mm^3)		Mid-range Mixing Estimate (92 Mm^3)											
Area-Replicate ID	**CCME (2012)**					SP-100	SP-101	SP-102	SP-103	SP-104	SP-105	SP-106	SP-107	SP-108	SP-109
Depth (m)	**Guideline[1]**	Without Dike	With Dike	Without Dike	With Dike	3	3	3	3	3	3	3	3	3	3
Date		Leaching	Leaching	Leaching	Leaching	26-Mar-17	26-Mar-17	5-May-17	5-May-17	2-Jul-17	2-Jul-17	26-Aug-17	26-Aug-17	14-Sep-17	14-Sep-17
Physical Tests (mg/L)															
Hardness		8.9	8.9	8.9	8.9	***16***	***15.8***	***16.8***	***16.1***	***13.9***	***13.7***	***14.2***	***14.3***	***13.7***	***14***
Anions and Nutrients (mg/L)															
Alkalinity - Total		7.0	7.0	7.0	7.0	***11.8***	***11.7***	***12.1***	***11.4***	***10.1***	***10.3***	***10.3***	***10.4***	***10.9***	***11***
Ammonia (as N)[3]	***equation***	0.025	0.025	0.031	0.031	0.0158	0.0156	0.0152	0.0146	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Chloride	120	0.7	0.7	0.8	0.8	***1***	***0.96***	***1.04***	***1.01***	***0.86***	***0.84***	***0.84***	***0.84***	***0.88***	***0.88***
Fluoride	0.120	0.07	0.071	0.07	0.071	***0.08***	***0.075***	***0.078***	***0.085***	0.06	0.062	0.067	0.065	0.07	***0.072***
Nitrate (as N)	3.0	0.017	0.017	0.025	0.025	0.0158	0.0126	0.0173	***0.0261***	0.0167	0.0149	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Ortho Phosphate (as P)		0.003	0.003	0.003	0.003	0.0013	0.0011	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.0040	0.003	0.003	0.0031	0.0031	0.0023	*<0.0020*	*<0.0020*	*<0.0020*	***0.005***	***0.0047***	*<0.0020*	*<0.020*	*<0.0020*	*<0.0020*
Sulphate (SO_4)		2.8	2.8	2.8	2.8	***5.91***	***5.61***	***6.06***	***6.21***	***4.68***	***4.67***	***4.9***	***4.9***	***4.94***	***4.94***
Cyanides (mg/L)															
Total Cyanide		0	0	0	0	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Metals (mg/L)															
Aluminum[3]	***equation***	0.007	0.007	0.007	0.007	0.0056	0.0039	0.0032	0.0043	***0.0128***	***0.0133***	0.0066	0.0065	0.0064	0.0068
Antimony		0.0005	0.0005	0.0005	0.0005	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.0005	0.0005	0.0006	0.0006	0.00033	0.00028	0.00027	0.00033	0.00026	0.00023	0.00034	0.00034	0.00025	0.00024
Barium		0.02	0.02	0.02	0.02	0.00365	0.00333	0.00335	0.00373	0.00295	0.00287	0.00273	0.00271	0.00254	0.00252
Beryllium		0.001	0.001	0.001	0.001	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth		0.1	0.1	0.1	0.1	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.00001	0.00001	0.00001	0.00001	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[3]	***equation***	<0.000050	<0.000050	<0.000051	<0.000051	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		2.3	2.3	2.3	2.3	***4.19***	***4.08***	***4.39***	***4.17***	***3.78***	***3.66***	***3.76***	***3.78***	***3.67***	***3.71***
Chromium[4]	0.001	0.001	0.001	0.001	0.001	*<0.00010*	*<0.00010*	*<0.00010*	0.00013	0.00012	*<0.00010*	*<0.00015*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt		0.0003	0.0004	0.0003	0.0004	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.0011	0.0011	0.0011	0.0011	0.00062	0.00059	0.00062	***0.00152***	0.0007	0.00066	0.00062	0.00061	0.00065	0.00064
Iron	0.3	0.03	0.03	0.03	0.03	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.027	0.027	0.021	0.021	0.02	0.021
Lead[3]	***equation***	0.0009	0.0009	0.0009	0.0009	*<0.000050*	0.00011	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.005	0.005	0.005	0.005	0.001	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		0.8	0.8	0.8	0.8	***1.48***	***1.39***	***1.43***	***1.37***	***1.2***	***1.13***	***1.19***	***1.22***	***1.23***	***1.27***
Manganese[3]		0.0044	0.0067	0.0066	0.0089	0.00045	0.00052	0.00037	0.00041	0.00351	0.00306	0.0022	0.00206	0.00225	0.00227
Mercury	0.000026	0.00005	0.00005	0.00005	0.00005	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.001	0.001	0.001	0.001	0.000198	0.000186	0.000179	0.000179	0.000187	0.000203	0.000178	0.000201	0.000196	0.000196
Nickel[3]	***equation***	0.001	0.001	0.001	0.001	*<0.00050*	*<0.00050*	*<0.00050*	0.00053	0.0006	0.00059	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Potassium		2	2	2	2	0.69	0.63	0.62	0.64	0.46	0.44	0.57	0.55	0.53	0.53
Selenium	0.001	0.001	0.001	0.001	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.01	0.01	0.01	0.01	***0.177***	***0.182***	***0.21***	***0.18***	***0.28***	***0.26***	***0.17***	***0.17***	***0.16***	***0.16***
Silver	0.0001	0.00001	0.00001	0.00001	0.00001	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	***0.000032***	***0.000031***
Sodium		2	2	2	2	1.27	1.13	1.17	1.3	0.838	0.809	0.946	0.933	0.864	0.879
Strontium		0.8	0.8	0.8	0.8	0.0191	0.0187	0.0199	0.0193	0.0186	0.0179	0.0171	0.0173	0.0177	0.0179
Thallium	0.0008	0.0002	0.0002	0.0002	0.0002	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Uranium	0.015	0.0002	0.0002	0.0002	0.0002	0.000047	0.000044	0.000045	0.000051	0.000061	0.000065	0.000046	0.000047	0.000045	0.000045
Vanadium		0.03	0.03	0.03	0.03	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	0.030	0.007	0.007	0.009	0.009	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	0.0034	*<0.0030*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.

2. The Second Portage Lake water quality model includes substance loading from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. Changes in water quality in Second Portage Lake were modelled for two different mixing scenarios of water releases into Third Portage Lake (Cumberland, 2005).

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Mid-range Mixing Estimate (92 Mm^3):

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Upper-range Mixing Estimate (169 Mm^3):

- Bordered cells = concentrations exceed the prediction "With Dike Leaching."
- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table 3.2–7. Water quality results from Wally Lake in 2017 compared against predicted concentrations in the FEIS.

Lake and Station		**Simulated Maximum Whole Lake Concentration (mg/L)**		**Wally Lake (WAL)**									
Area-Replicate ID	**CCME (2012) Guideline**[1]	**Wally Lake**[2]		WAL-69	WAL-70	WAL-71	WAL-72	WAL-73	WAL-74	WAL-75	WAL-76	WAL-77	WAL-78
Depth (m)		Without Dike Leaching	With Dike Leaching	3	3	3	3	3	3	3	3	3	3
Date				26-Mar-17	26-Mar-17	7-May-17	7-May-17	1-Jul-17	1-Jul-17	26-Aug-17	26-Aug-17	16-Sep-17	16-Sep-17
Physical Tests (mg/L)													
Hardness		17.2	17.2	***25.5***	***25***	***23.1***	***26.2***	14.3	14.3	***22.9***	***22.4***	***17.3***	16.8
Anions and Nutrients (mg/L)													
Alkalinity - Total		13.24	13.34	***20.2***	***20.2***	***17.2***	***21.2***	12.1	11.5	***14.8***	***15***	***13.7***	***14.2***
Ammonia (as N)[3]	***equation***	0.089	0.089	0.0302	0.031	0.0191	0.0195	*<0.0050*	*<0.0050*	0.0482	0.0471	*<0.0050*	*<0.0050*
Chloride	120	0.7	0.7	***1.15***	***1.13***	***1.05***	***1.24***	0.66	0.65	***1.27***	***1.25***	***0.89***	***0.9***
Fluoride	0.120	0.05	0.05	***0.059***	***0.058***	***0.057***	***0.061***	0.042	0.043	***0.053***	***0.054***	***0.057***	***0.056***
Nitrate (as N)	3.0	0.102	0.102	0.0992	0.0912	0.0765	***0.107***	0.0075	*<0.0050*	***0.268***	***0.253***	0.0204	0.0219
Ortho Phosphate (as P)		0.003	0.003	0.0011	0.0012	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total	0.0040	0.0039	0.004	0.0028	0.0026	*<0.0020*	***0.0042***	***0.0059***	*<0.0040*	*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*
Sulphate (SO_4)		5.3	5.3	***6.99***	***6.87***	***6.26***	***7.2***	3.68	3.54	***8.29***	***8.09***	5.12	5.18
Cyanides (mg/L)													
Total Cyanide		0	0	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Metals (mg/L)													
Aluminum[3]	***equation***	0.012	0.013	0.0043	*<0.0030*	*<0.0030*	*<0.0030*	**0.0128**	0.0112	0.0101	0.0117	0.0044	0.0047
Antimony		0.0009	0.0009	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.00019	0.00018	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.005	0.006	0.00031	0.00029	0.00027	0.00029	0.00023	0.00024	0.00043	0.00044	0.00032	0.00033
Barium		0.02	0.02	0.00387	0.00379	0.00353	0.0043	0.0024	0.00228	0.00382	0.00384	0.00225	0.00228
Beryllium		0.001	0.001	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth		0.1	0.1	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.00001	0.00001	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Cadmium[3]	***equation***	0.00018	0.00019	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.7	4.7	***7.03***	***6.9***	***6.4***	***7.29***	4.11	3.85	***6.52***	***6.4***	***4.74***	4.7
Chromium[4]	0.001	0.001	0.001	*<0.00010*	*<0.00010*	0.00015	*<0.00010*	*<0.00010*	0.00013	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt		0.0003	0.0003	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.002	0.002	0.00113	0.00106	0.00098	0.00109	0.00091	0.0009	0.00134	0.00128	0.00091	0.00089
Iron	0.3	0.03	0.03	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.03	0.028	0.028	0.03	0.018	0.018
Lead[3]	***equation***	0.0007	0.0007	0.000082	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.005	0.005	0.001	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Magnesium		1.3	1.3	***2.1***	***2.07***	***1.8***	***2.05***	1.15	1.09	***1.77***	***1.77***	***1.4***	***1.41***
Manganese[3]		0.002	0.002	0.00145	0.00124	0.00096	0.00119	***0.00339***	***0.00349***	***0.00452***	***0.00444***	***0.00268***	***0.00279***
Mercury	0.000026	0.0001	0.0001	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.002	0.002	0.000445	0.000428	0.00032	0.000354	0.000269	0.000183	0.00134	0.0013	0.000438	0.000466
Nickel[3]	***equation***	0.001	0.001	***0.00143***	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	0.00055	0.00055	*<0.00050*	*<0.00050*
Potassium		2	2	0.75	0.73	0.63	0.71	0.39	0.37	0.81	0.81	0.54	0.55
Selenium	0.001	0.001	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon		0.04	0.04	***0.486***	***0.471***	***0.45***	***0.52***	***0.33***	***0.33***	***0.26***	***0.25***	***0.24***	***0.24***
Silver	0.0001	0.00002	0.00002	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	0.00002	0.000018
Sodium		2	2	0.96	0.894	0.81	0.913	0.558	0.559	0.968	0.939	0.669	0.68
Thallium	0.0008	0.0002	0.0002	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Uranium	0.015	0.0007	0.0007	0.000073	0.000069	0.000053	0.00006	0.000068	0.000064	0.000292	0.000275	0.000075	0.000073
Vanadium		0.03	0.03	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	0.030	0.013	0.013	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.
2. Preliminary modelling of whole lake water quality in the receiving environment water bodies incorporates long-term loadings from the Vault dike and effluent releases from the Vault Attenuation pond (Cumberland, 2005).
3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. Ammonia and aluminum (t & d) guidelines vary with pH; cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

- ***Bold italicized*** = concentrations exceed the prediction "With Dike Leaching."
- **Bold** = concentrations exceed the prediction "Without Dike Leaching."

Italicized numbers are below detection limits.

Table 3.2–8. Sampling effort and frequency assessment results for the 2018 CREMP.

Areas	Designation	Triggers Exceeded?	Minor Changes		Moderate Changes		Major Changes		Plan for 2018
		Yes/No	Yes/No	Parameters	Yes/No	Parameters	Yes/No	Parameters	
Sampling Strategy for Reference Areas									
INUG	Ref	No	No	-	No	-	No	-	Full CREMP (reference area)
PDL	Ref	Yes	Yes	Hard., Ca	No	-	No	-	Full CREMP (reference area)
Sampling Strategy for TE and TEFF									
TPE	NF	Yes	Yes	Cond., Hard., Ca, K, Mg, Na, TDS	No	-	No	-	Full CREMP (near-field area)
SP	NF	Yes	Yes	Cond., Hard., Ca, K, Mg, Alkalinity (HCO_3 & Total), TDS	No	-	No	-	Full CREMP (near-field area)
WAL	NF	Yes	Yes	Cond., Hard., Ca, K, Mg, Na, TDS, TKN	No	-	No	-	Full CREMP (near-field area)
TE	MF	NA	NA	-	No	-	No	-	Limnology and water sampling see **Table 4.2-1** for schedule
TEFF	FF	NA	NA	-	No	-	No	-	Limnology and water sampling see **Table 4.2-1** for schedule
Sampling Strategy for TPS									
TPN	NF	Yes	Yes	Cond., Hard., Ca, K, Mg, Na, TDS	No	-	No	-	Full CREMP (near-field area)
TPS	MF	NA	NA	-	No	-	No	-	Limnology and water sampling see **Table 4.2-1** for schedule

Notes:
Minor — exceedance of the early warning trigger values for parameters without effects-based threshold values.
Moderate — exceedance of the early warning trigger values for parameters with effects-based thresholds.
Major — exceedance of the effects-based threshold values.
NA — MF and/or FF stations were not assessed using the formal BACI analysis in the current CREMP year.

Figure 3.2-13. Flow chart showing sampling effort and frequency assessment results for mid-field and far-field sampling in 2018.

Notes:
Blue-shaded cells show the linkage between 2017 CREMP results and the sampling effort and frequency for mid-field and far-field areas for 2017.
"Minor changes" refer to statistically significant increased concentrations for parameters without effects-based threshold values that exceed the early warning trigger values Refer to **Section 2.2.3** for more information.

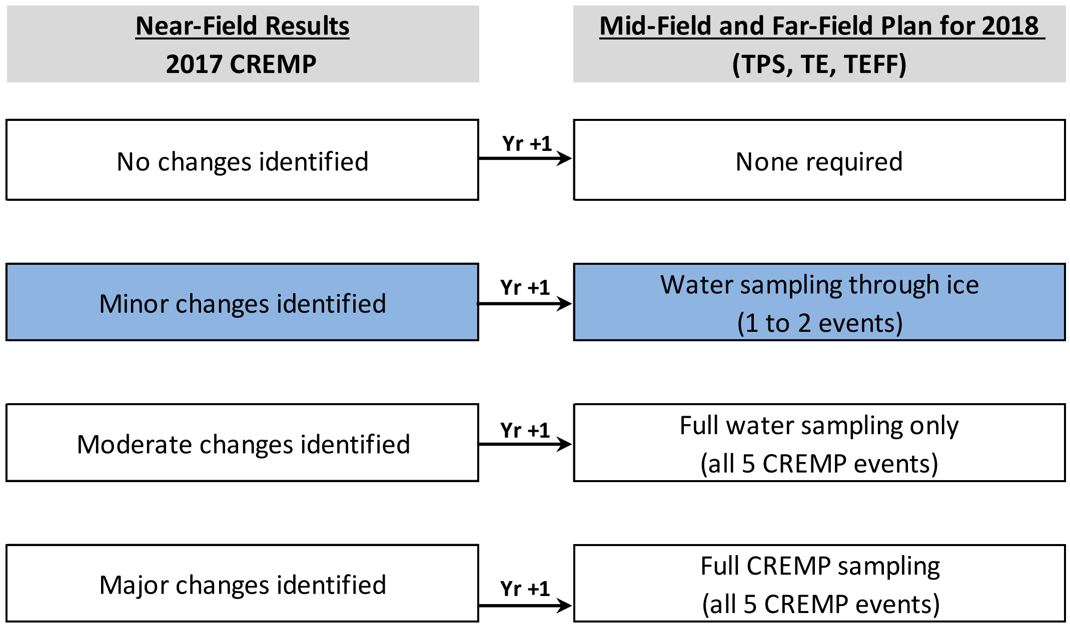


Figure 3.2-14. Laboratory-measured conductivity (µS/cm) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL). Laboratory-measured conductivity data from 2014 should be interpreted with caution, particularly at low concentrations (See Azimuth [2015c] for more detail).

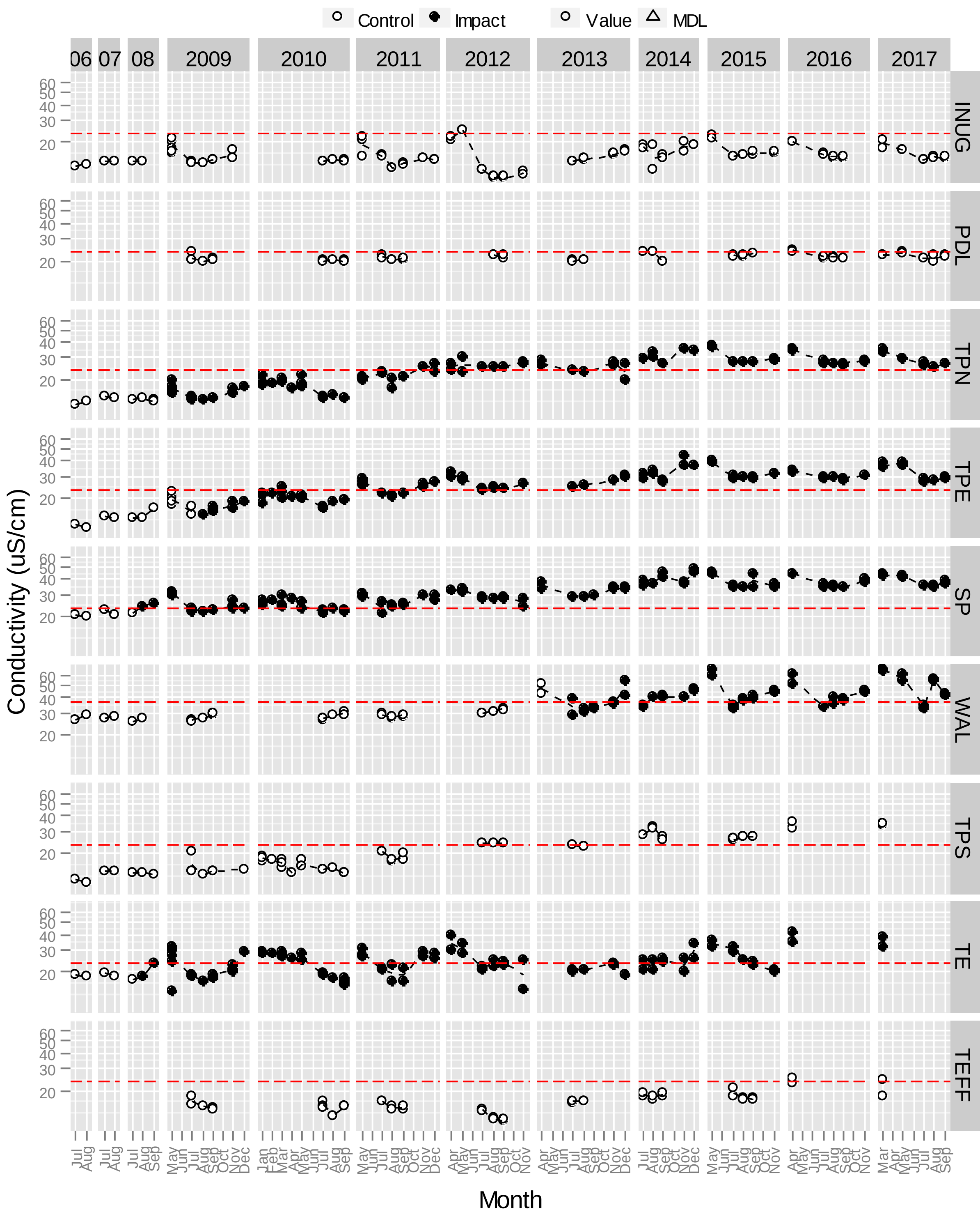


Figure 3.2-15. Hardness (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

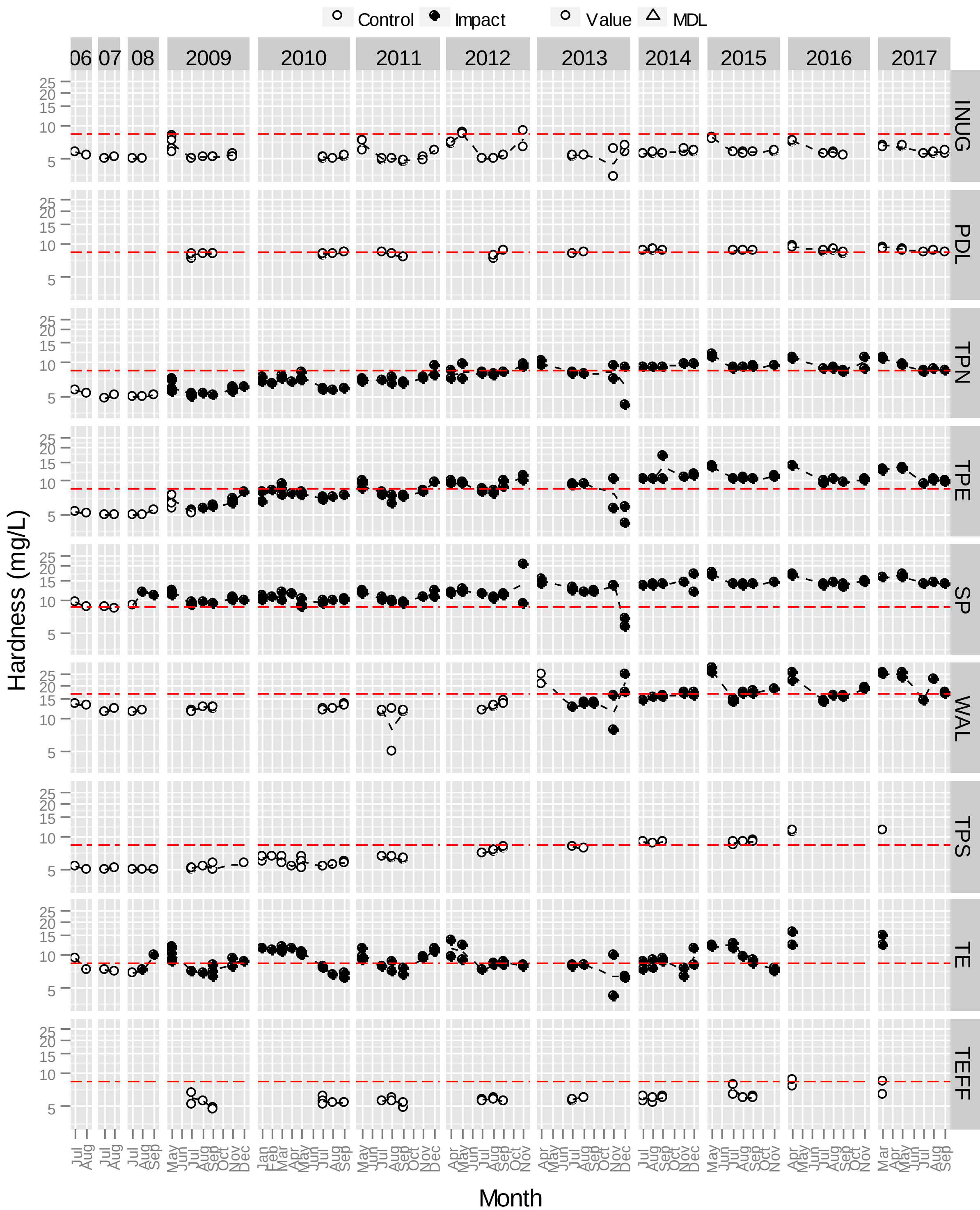


Figure 3.2-16. Field-measured pH in water samples from Meadowbank study lakes since 2006.

Note: The red dashed lines are the upper and lower field pH trigger values (separate trigger for WAL).

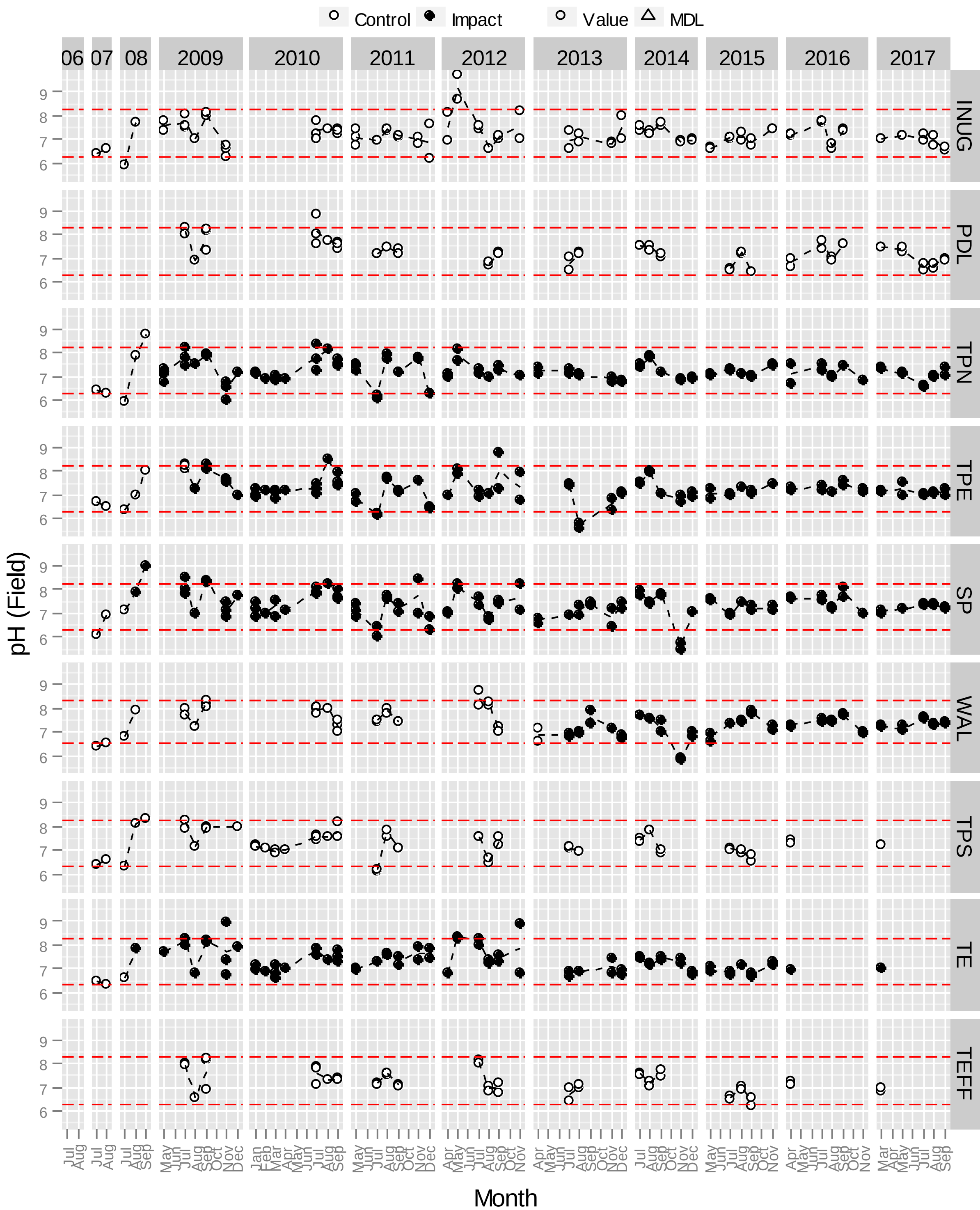


Figure 3.2-17. Laboratory-measured pH in water samples from Meadowbank study lakes since 2006.

Note: The red dashed lines are the upper and lower laboratory pH trigger values (separate trigger for WAL).

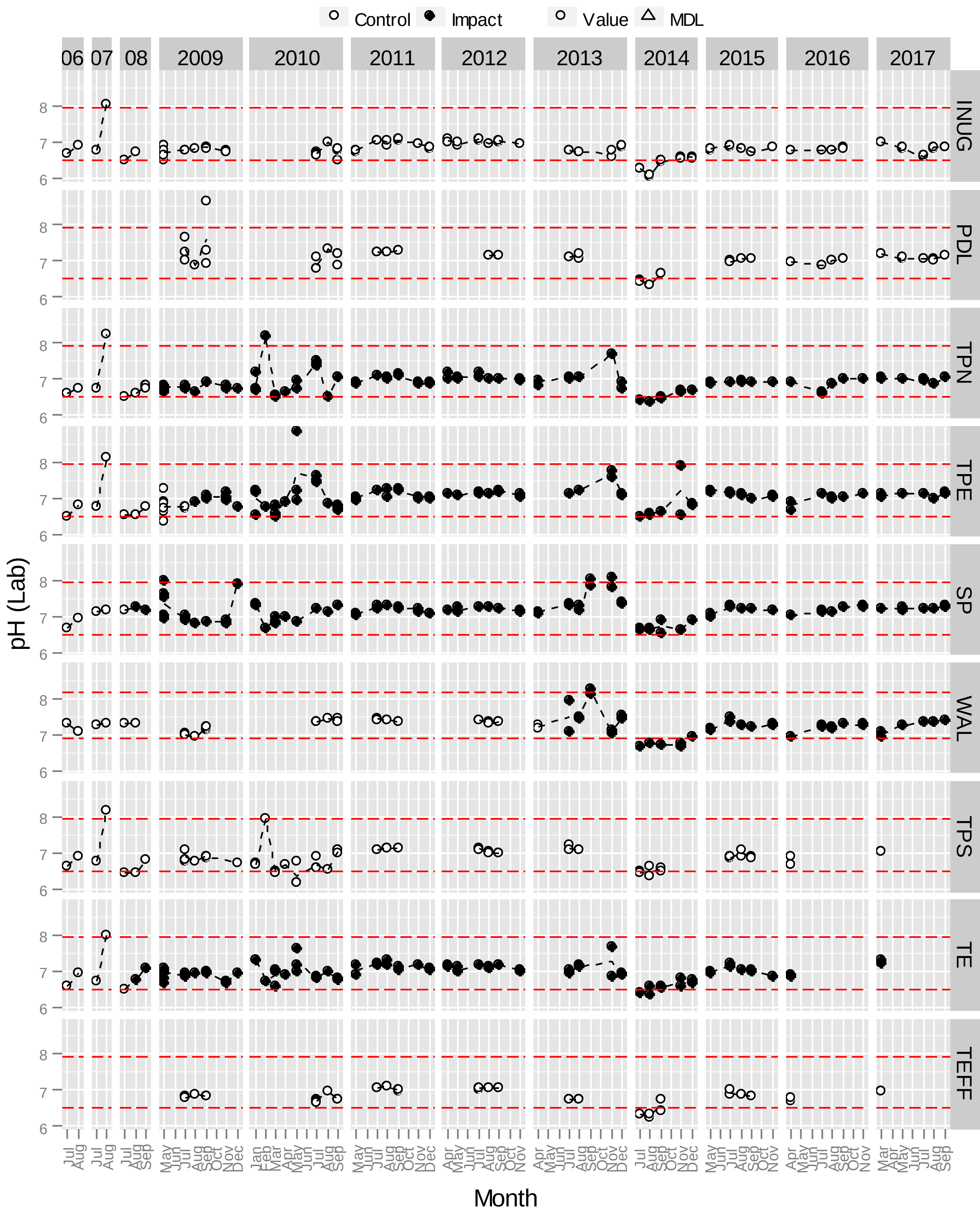


Figure 3.2-18. Total Suspended Solids (TSS; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL). TSS data from 2014 were excluded due to data quality issues (See Azimuth [2015c] for more detail).

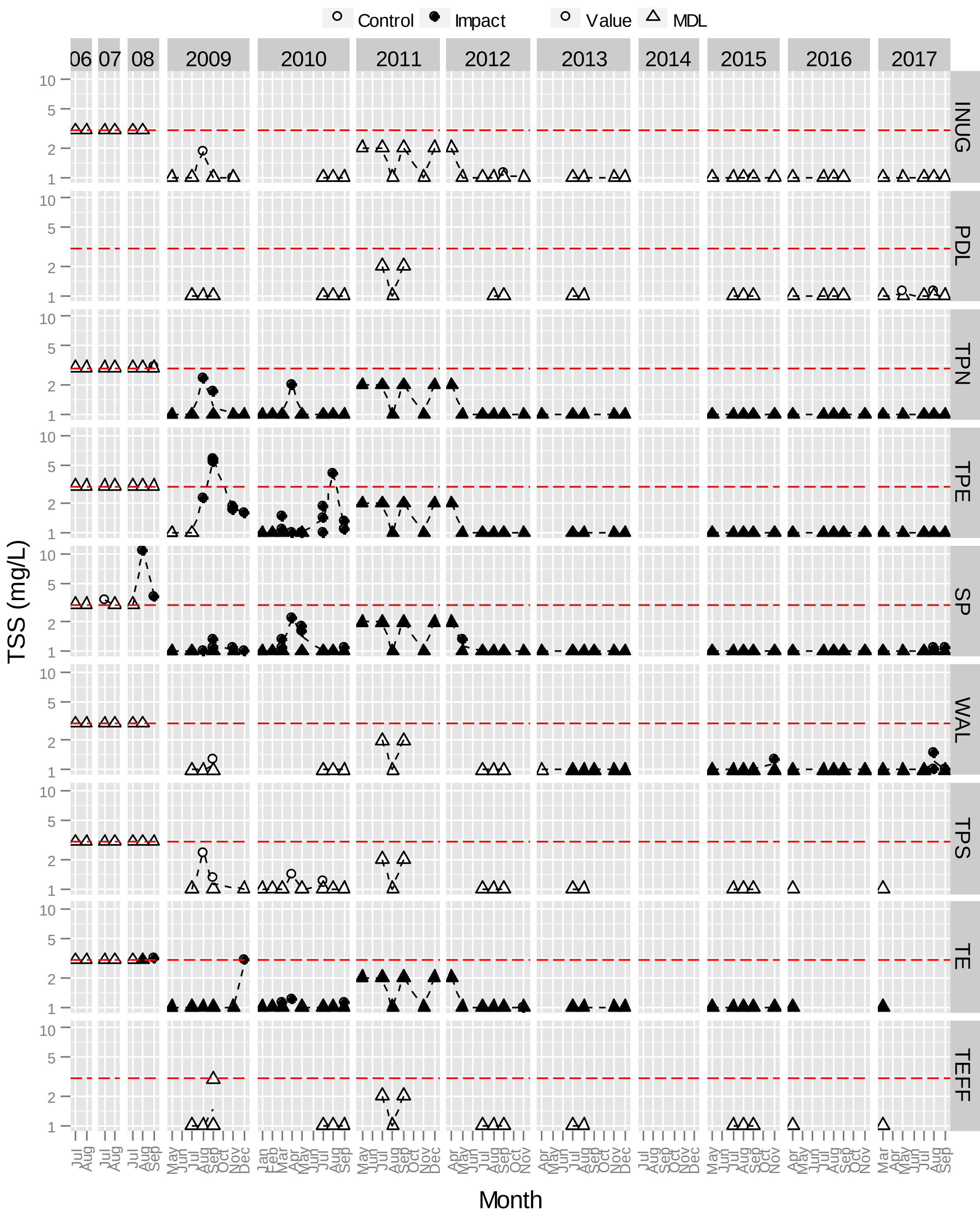


Figure 3.2-19. Total Dissolved Solids (TDS; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL). TDS data from 2014 were excluded due to data quality issues (See Azimuth [2015c] for more detail).

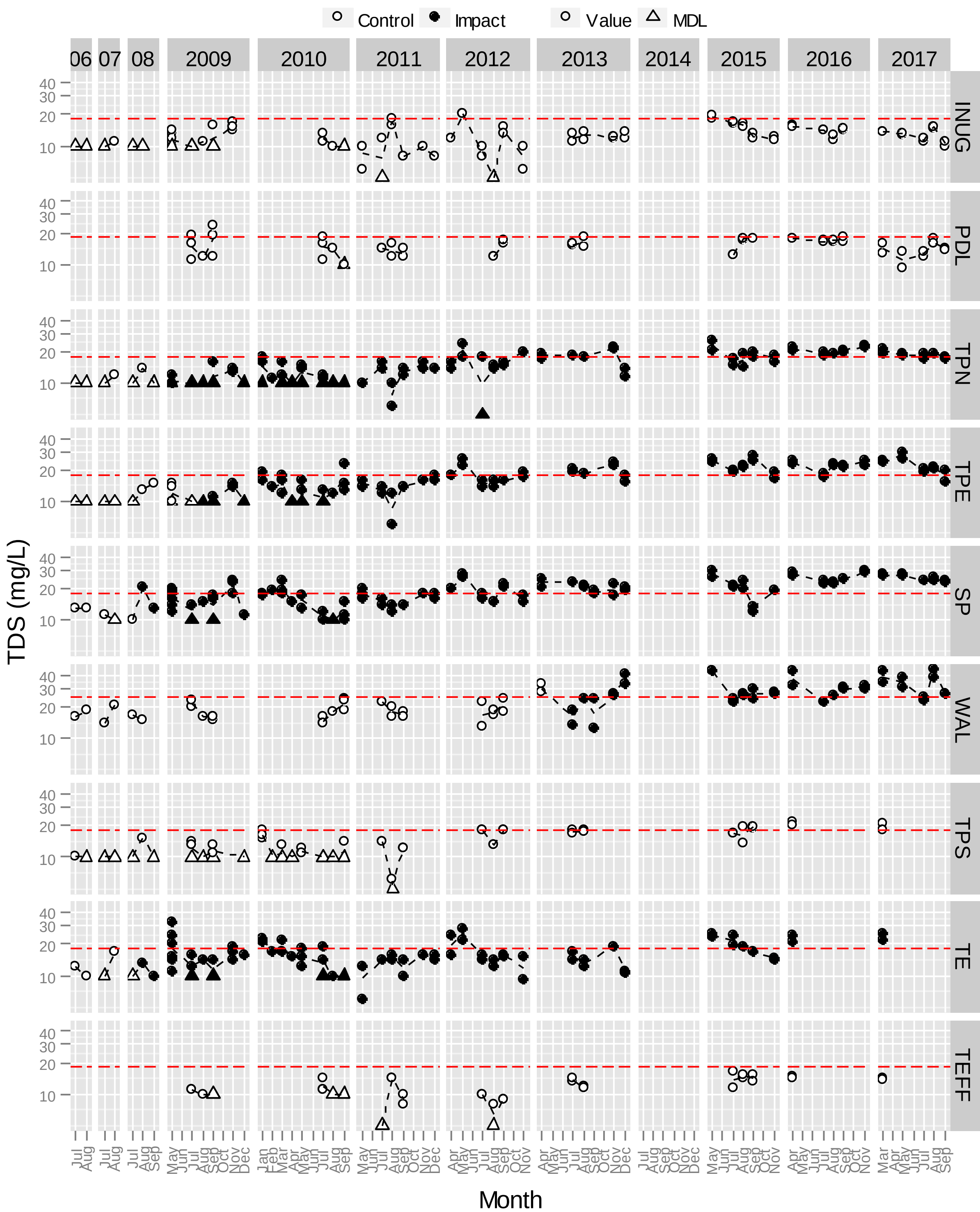


Figure 3.2-20. Bicarbonate alkalinity (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL). Bicarbonate alkalinity data from 2014 were excluded due to data quality issues (see Azimuth [2015c] for more detail).

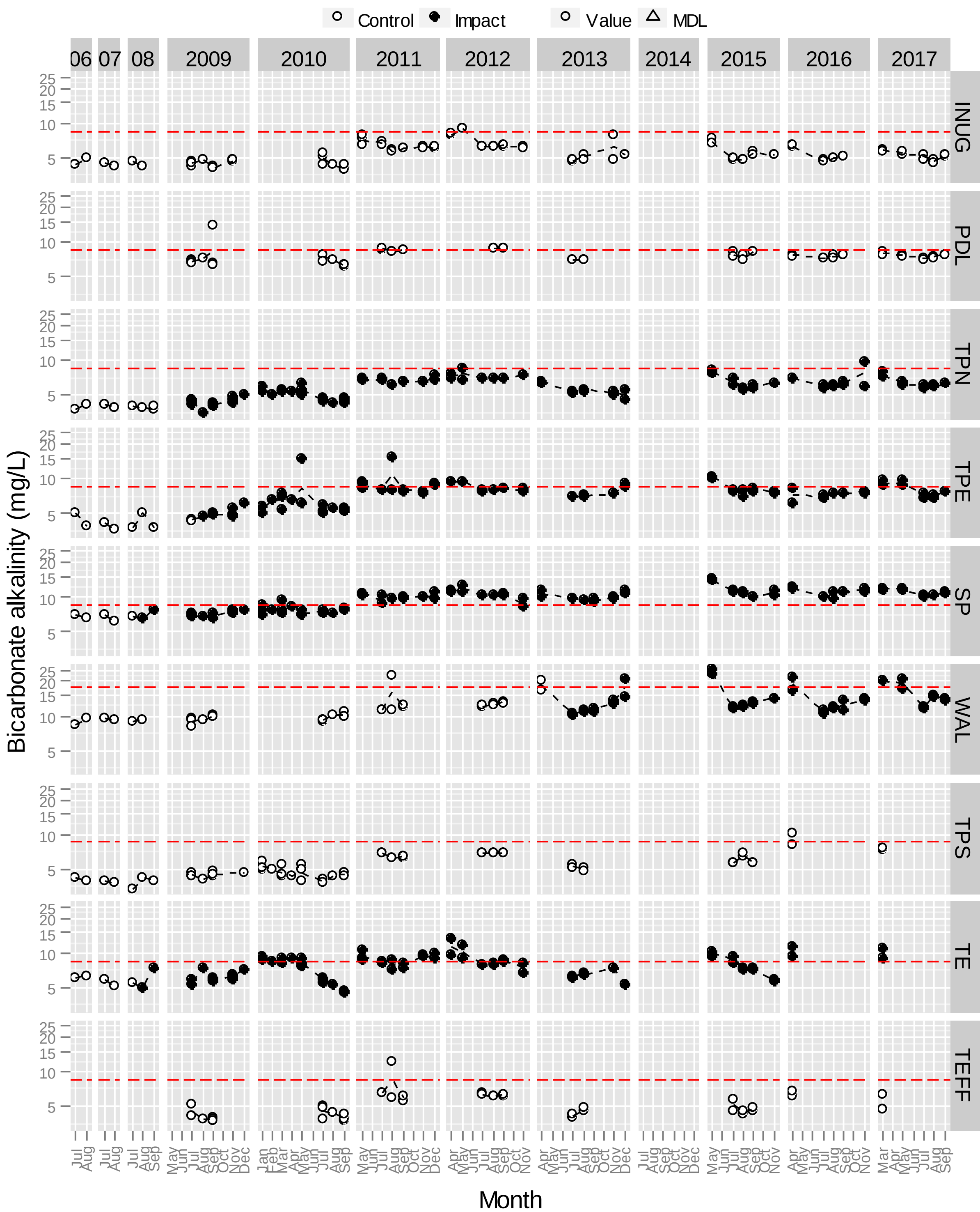


Figure 3.2-21. Total alkalinity (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL). Total alkalinity data from 2014 were excluded due to data quality issues (See Azimuth [2015c] for more detail).

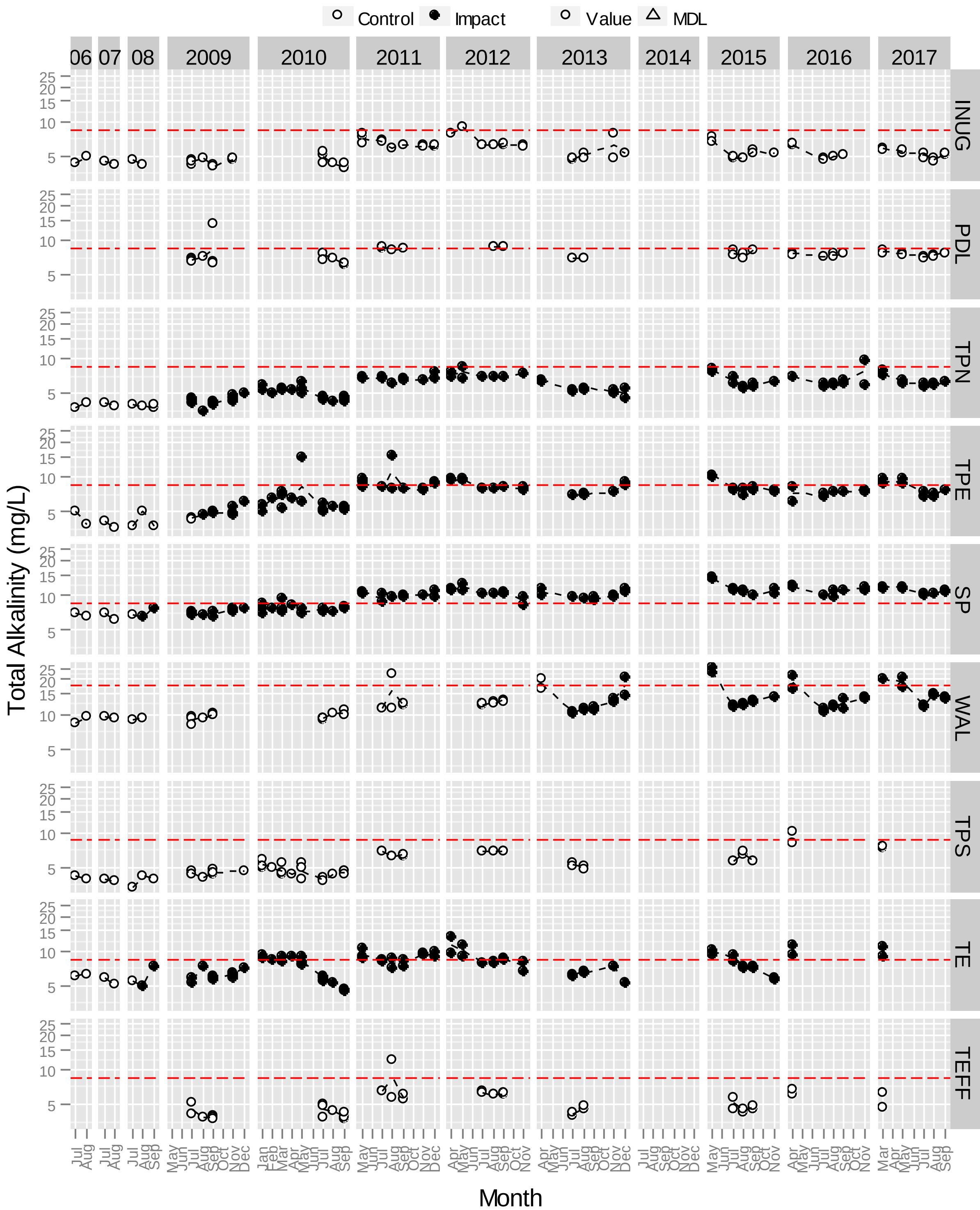


Figure 3.2-22. Ammonia-N (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

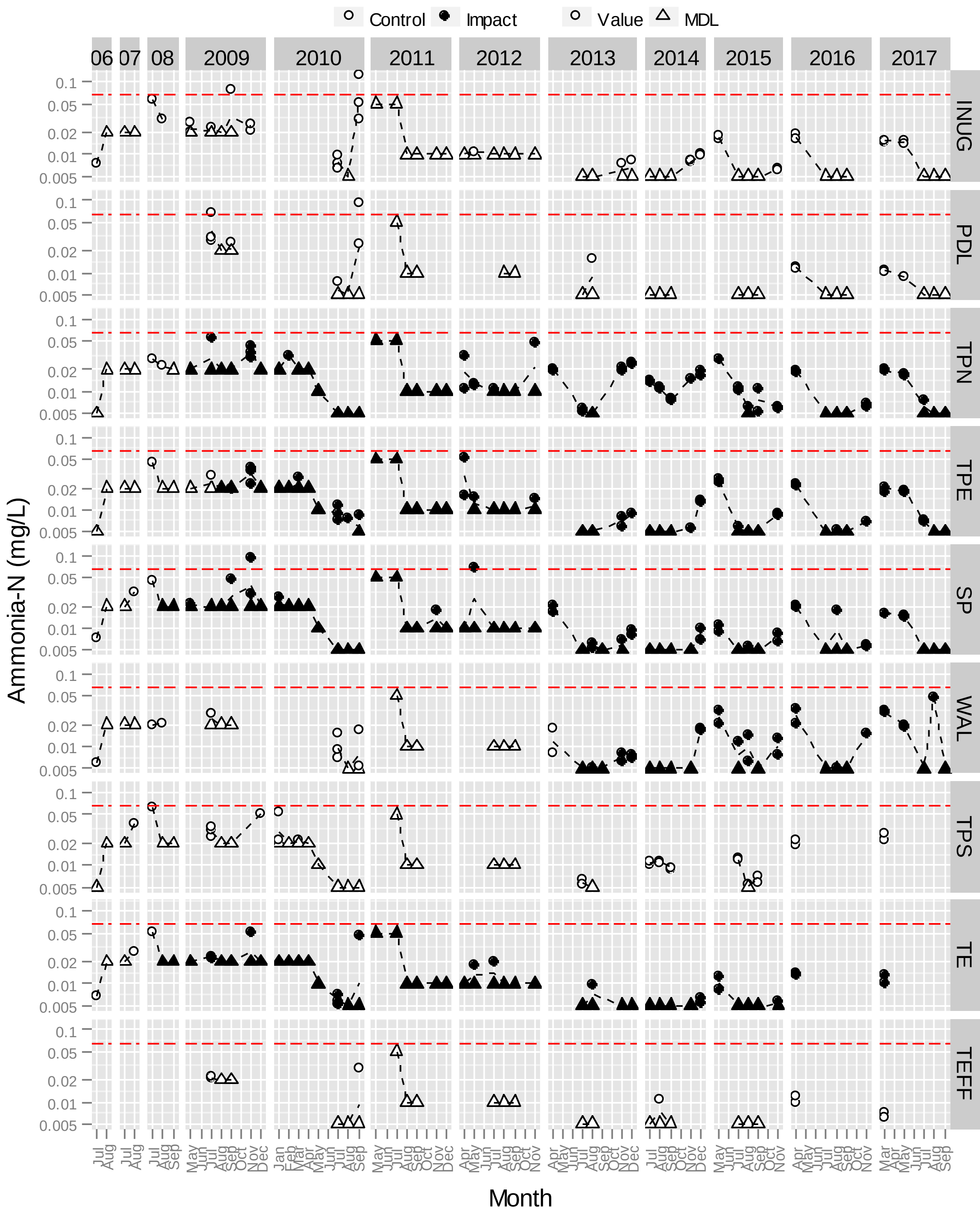


Figure 3.2-23. Chloride (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

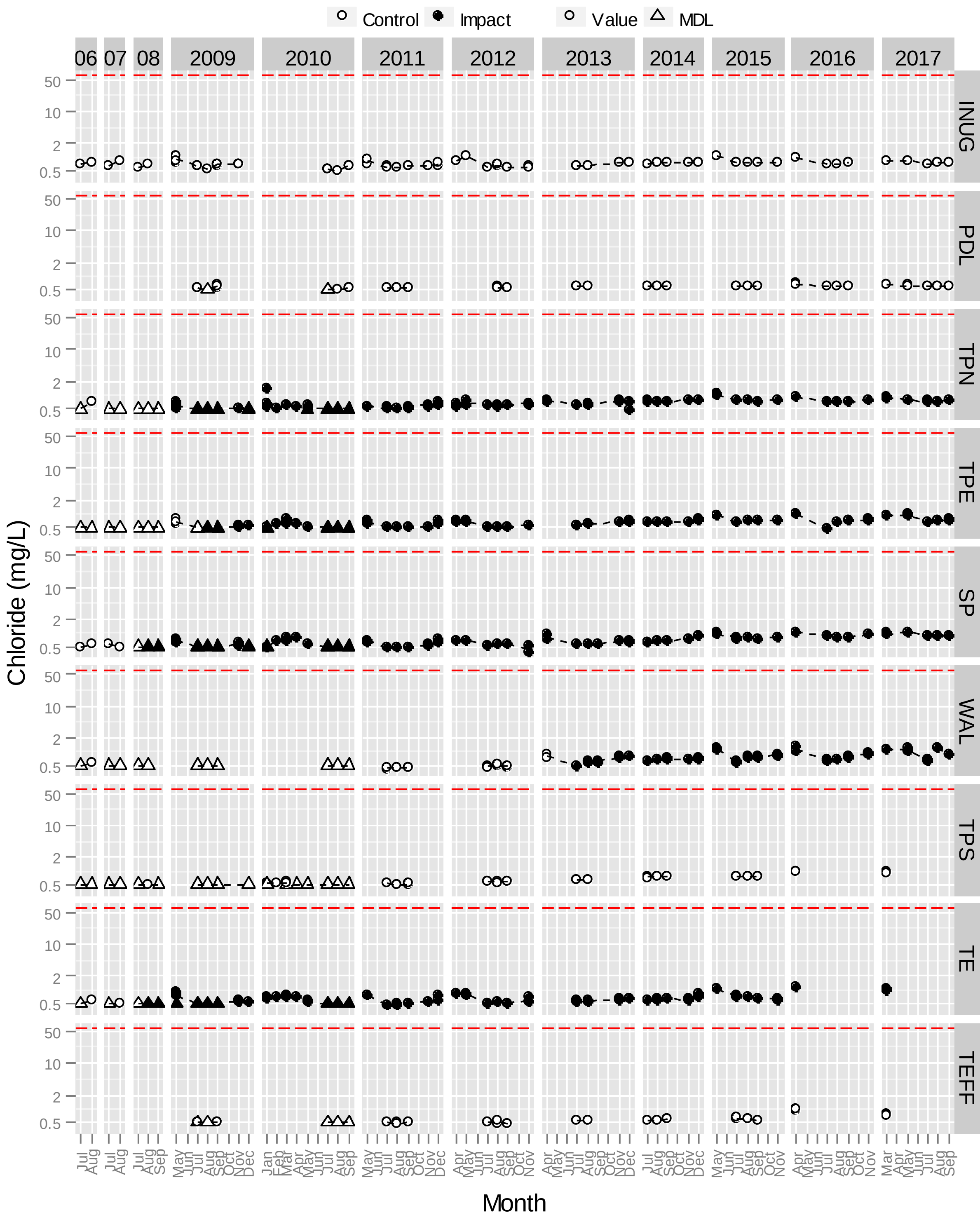


Figure 3.2-24. Nitrate-N (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

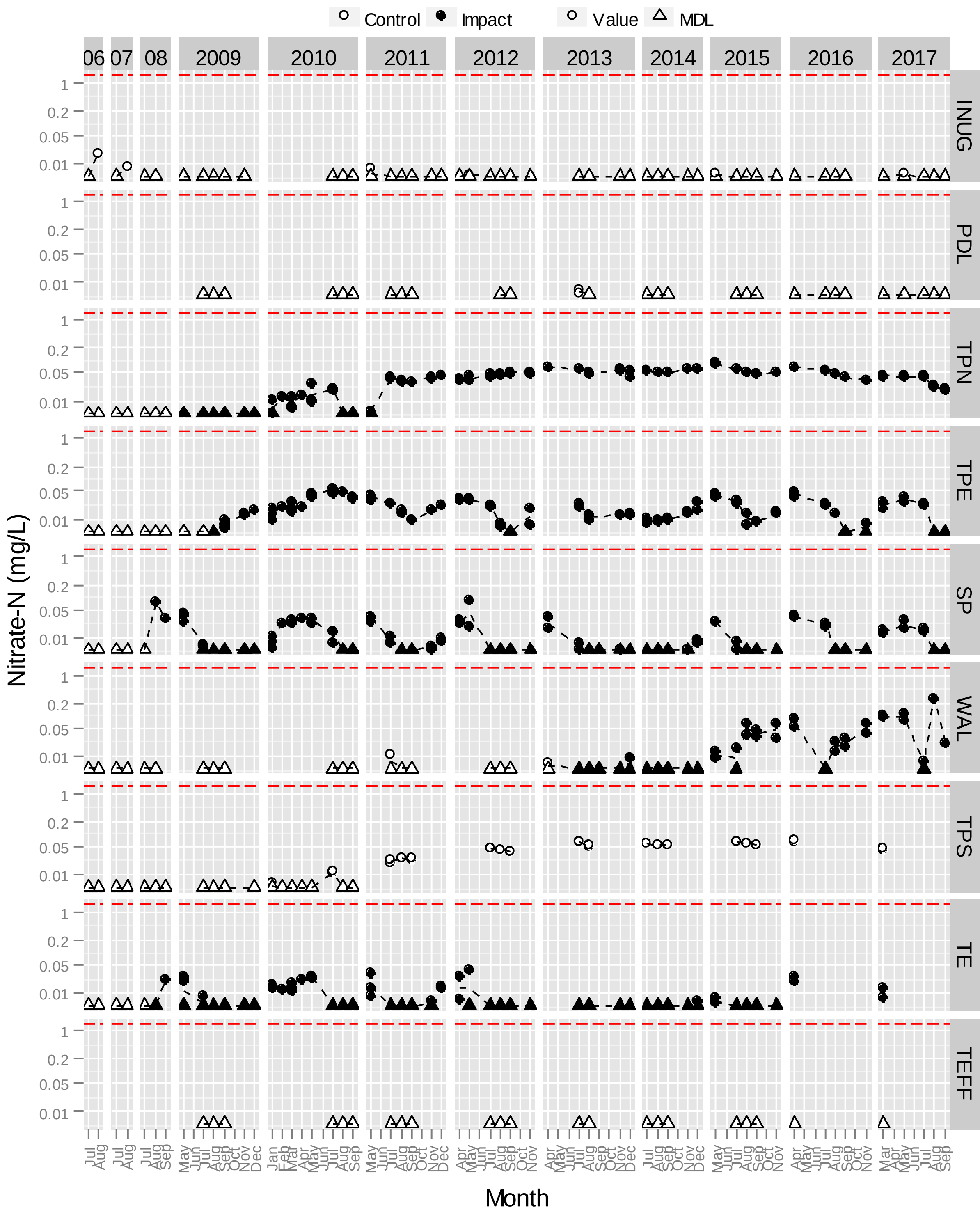


Figure 3.2-25. Total Kjeldahl Nitrogen (TKN; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL). TKN data from 2014 were excluded due to data quality issues (See Azimuth [2015c] for more detail).

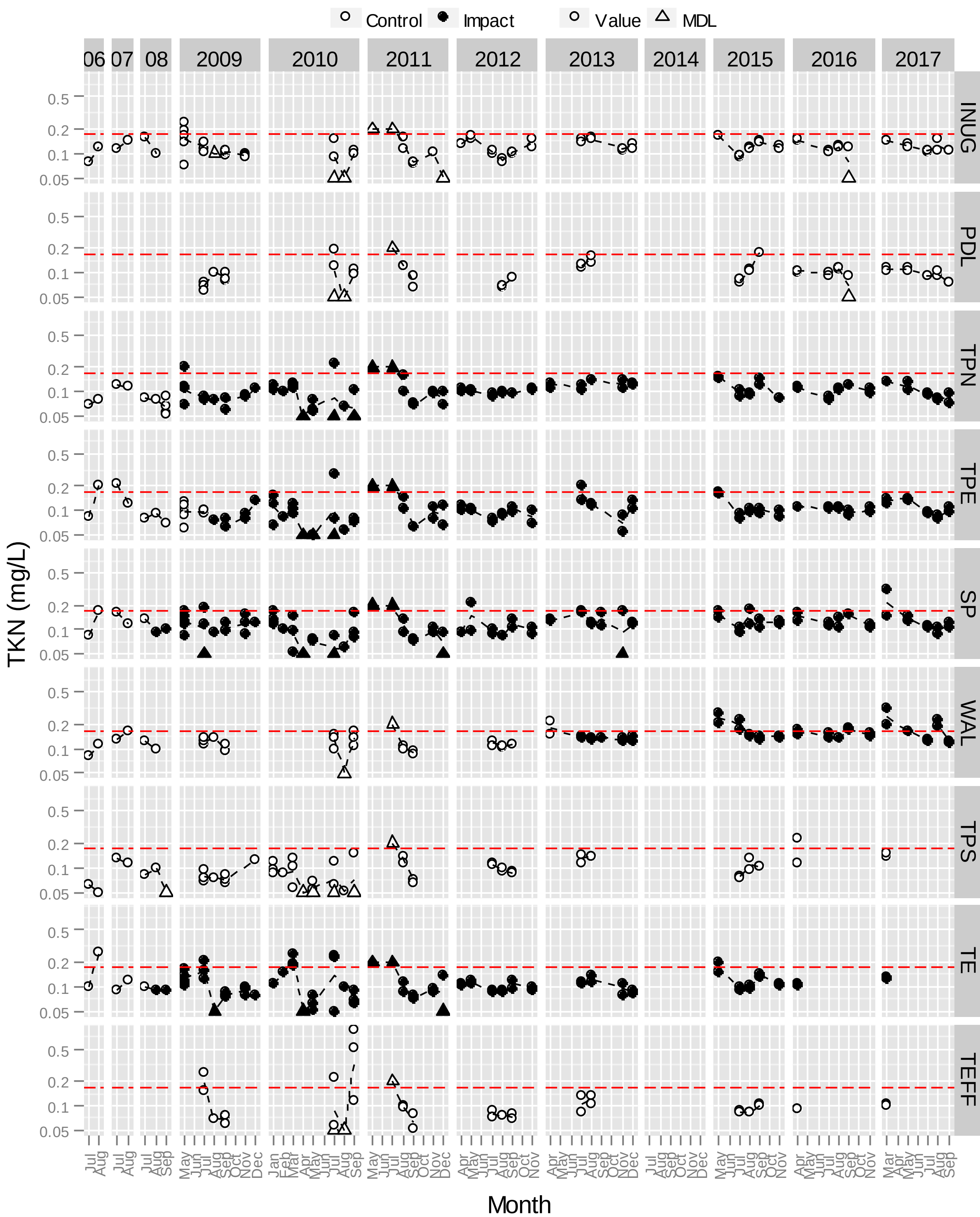


Figure 3.2-26. Total phosphorus (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

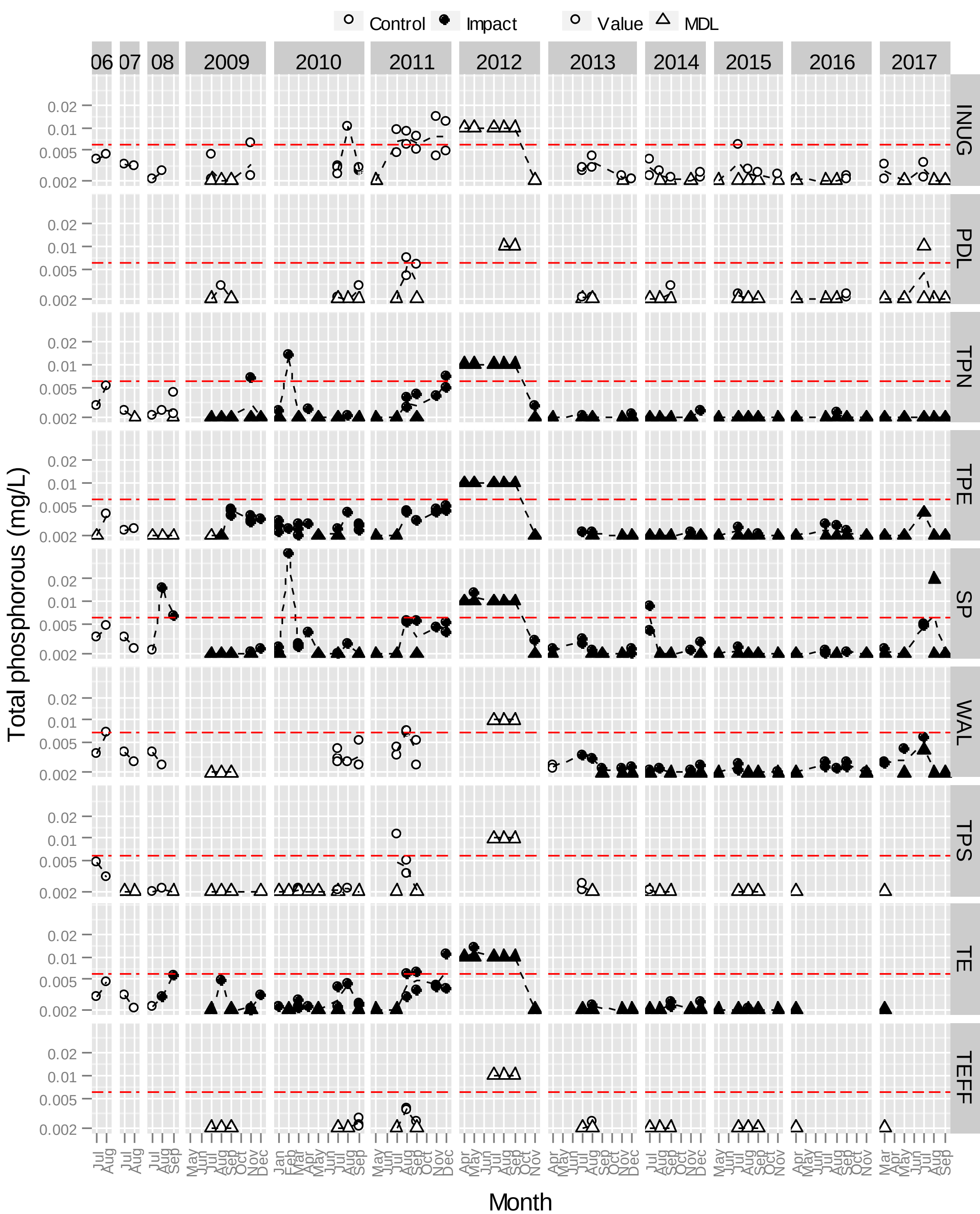


Figure 3.2-27. Reactive Silica (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

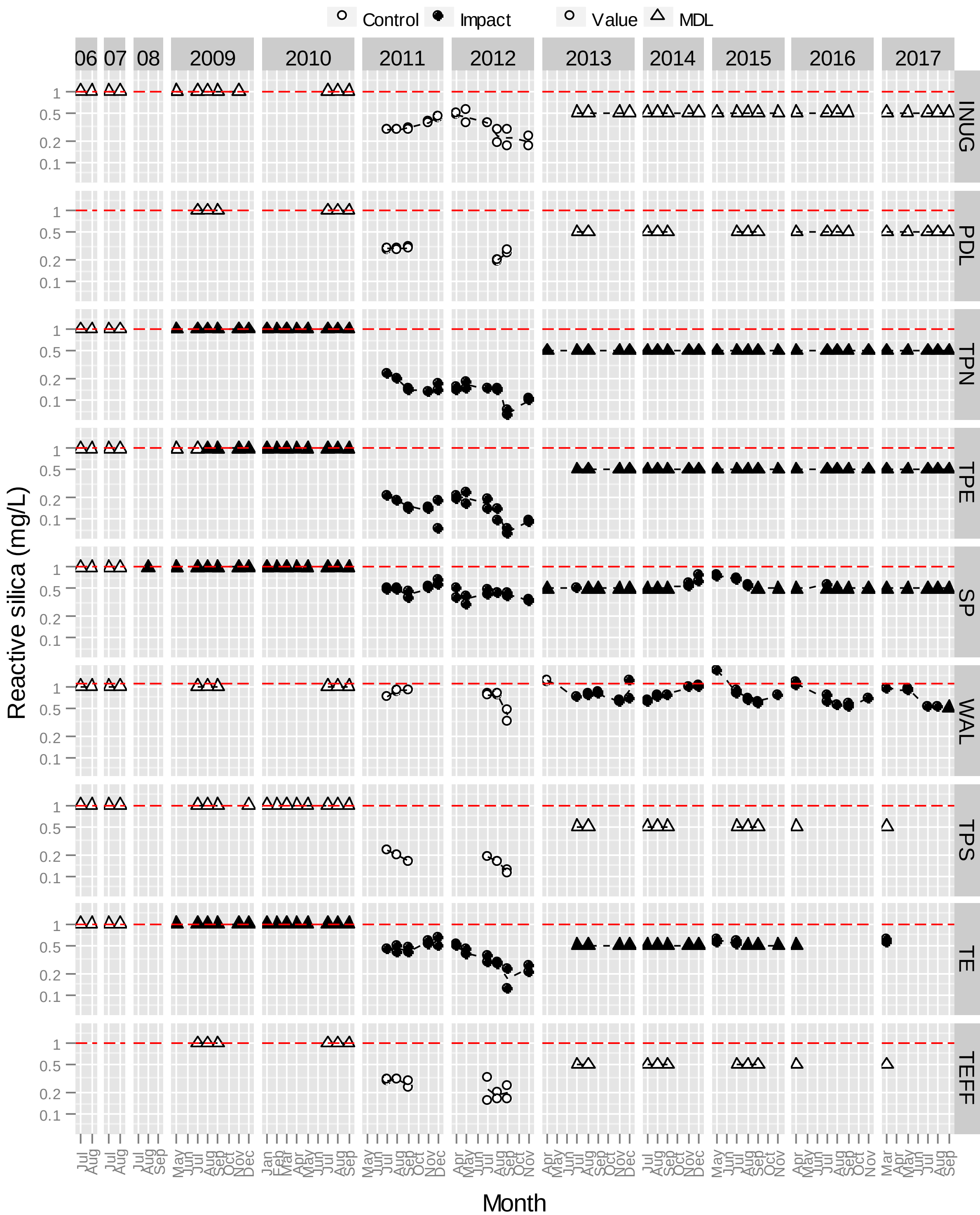


Figure 3.2-28. Sulphate (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

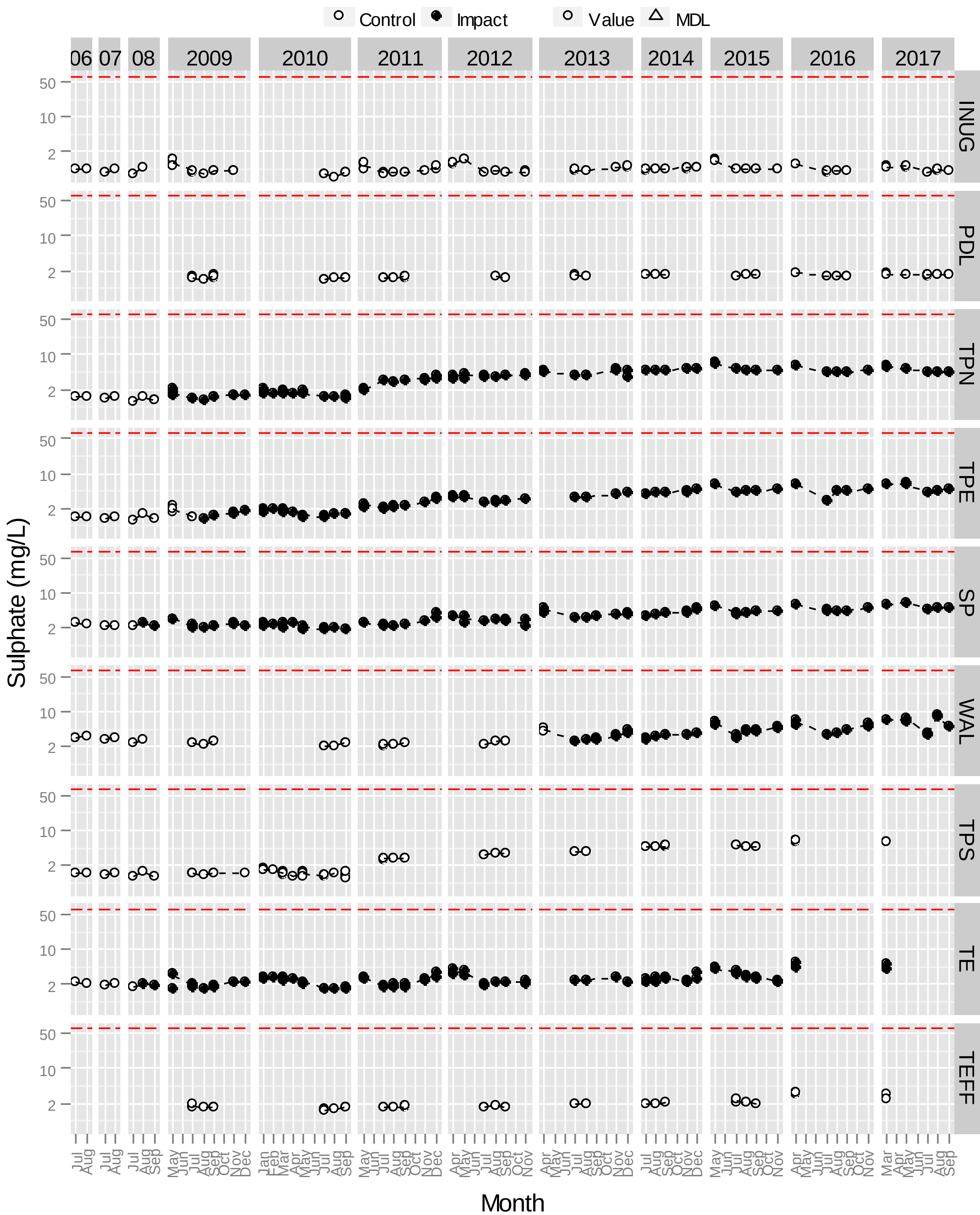


Figure 3.2-29. Dissolved Organic Carbon (DOC; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

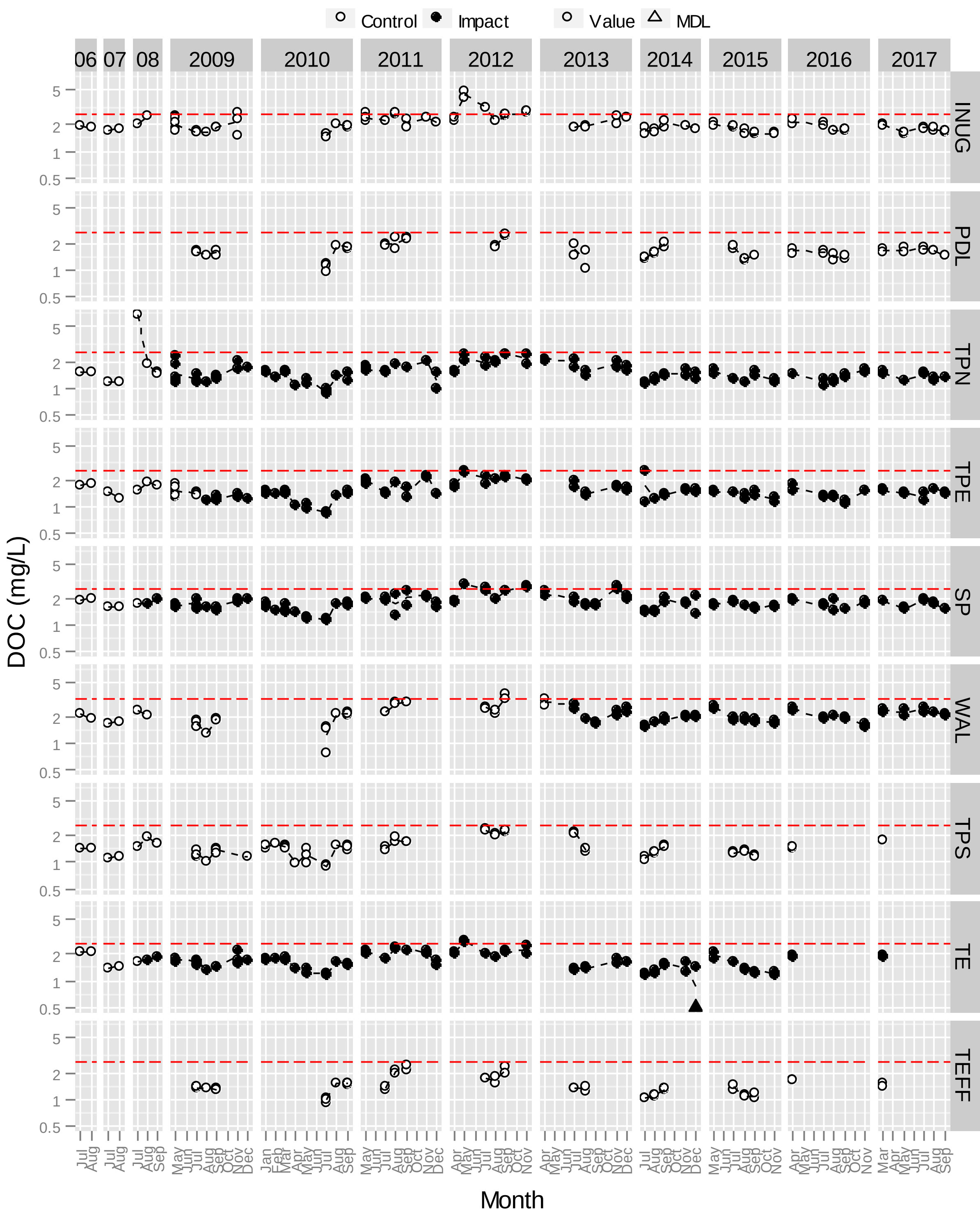


Figure 3.2-30. Total Organic Carbon (TOC; mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

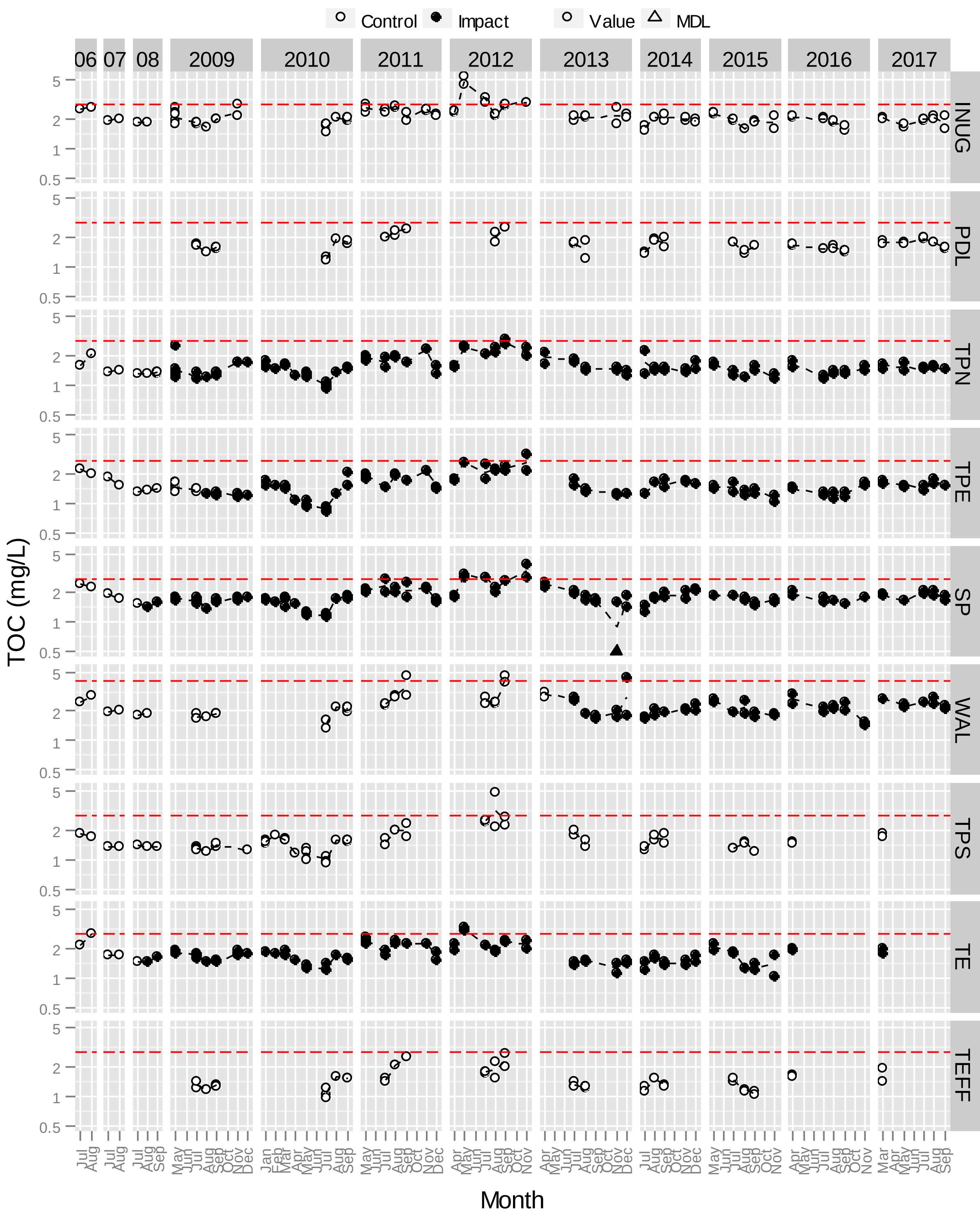


Figure 3.2-31. Total aluminum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

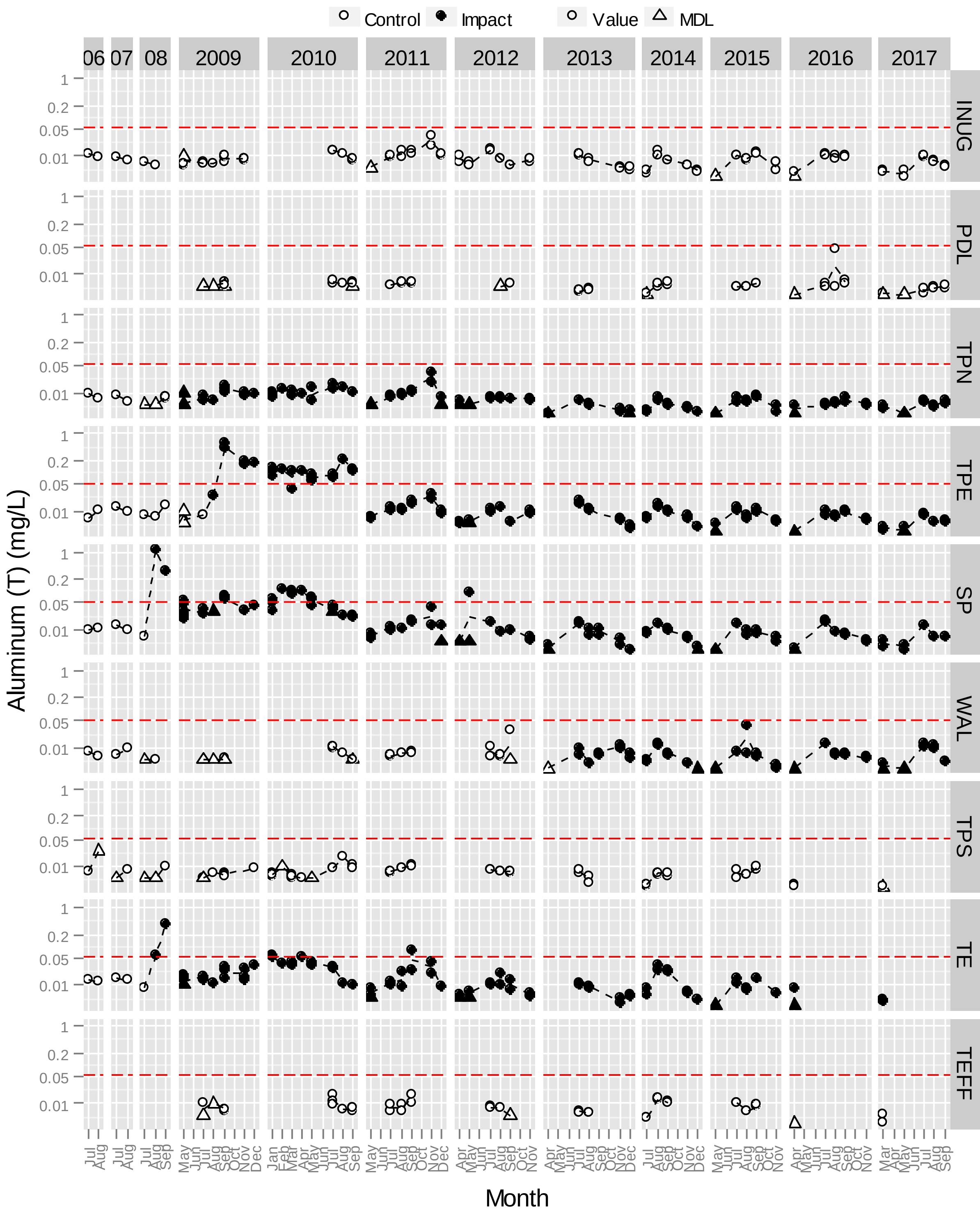


Figure 3.2-32. Total arsenic (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

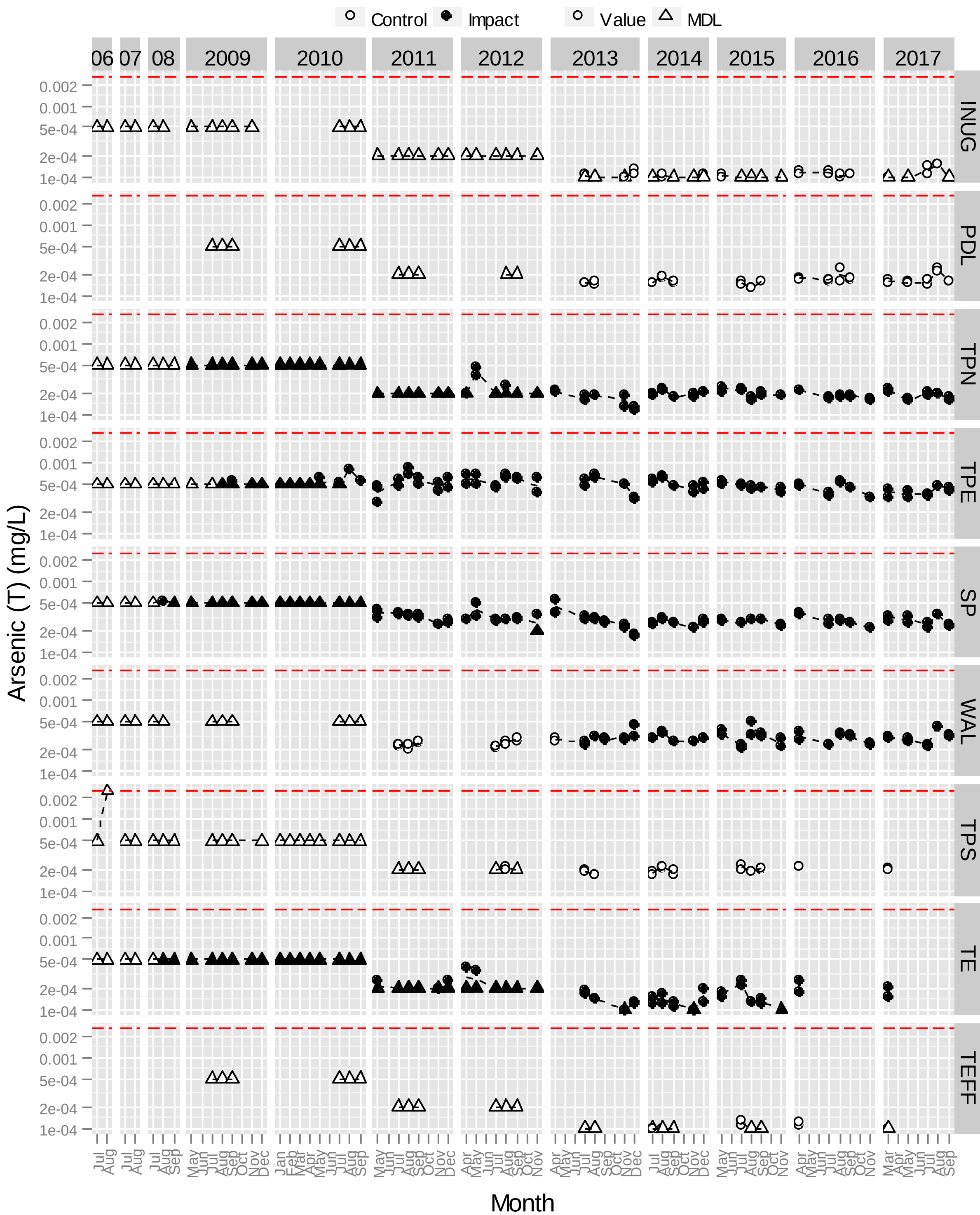


Figure 3.2-33. Total barium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

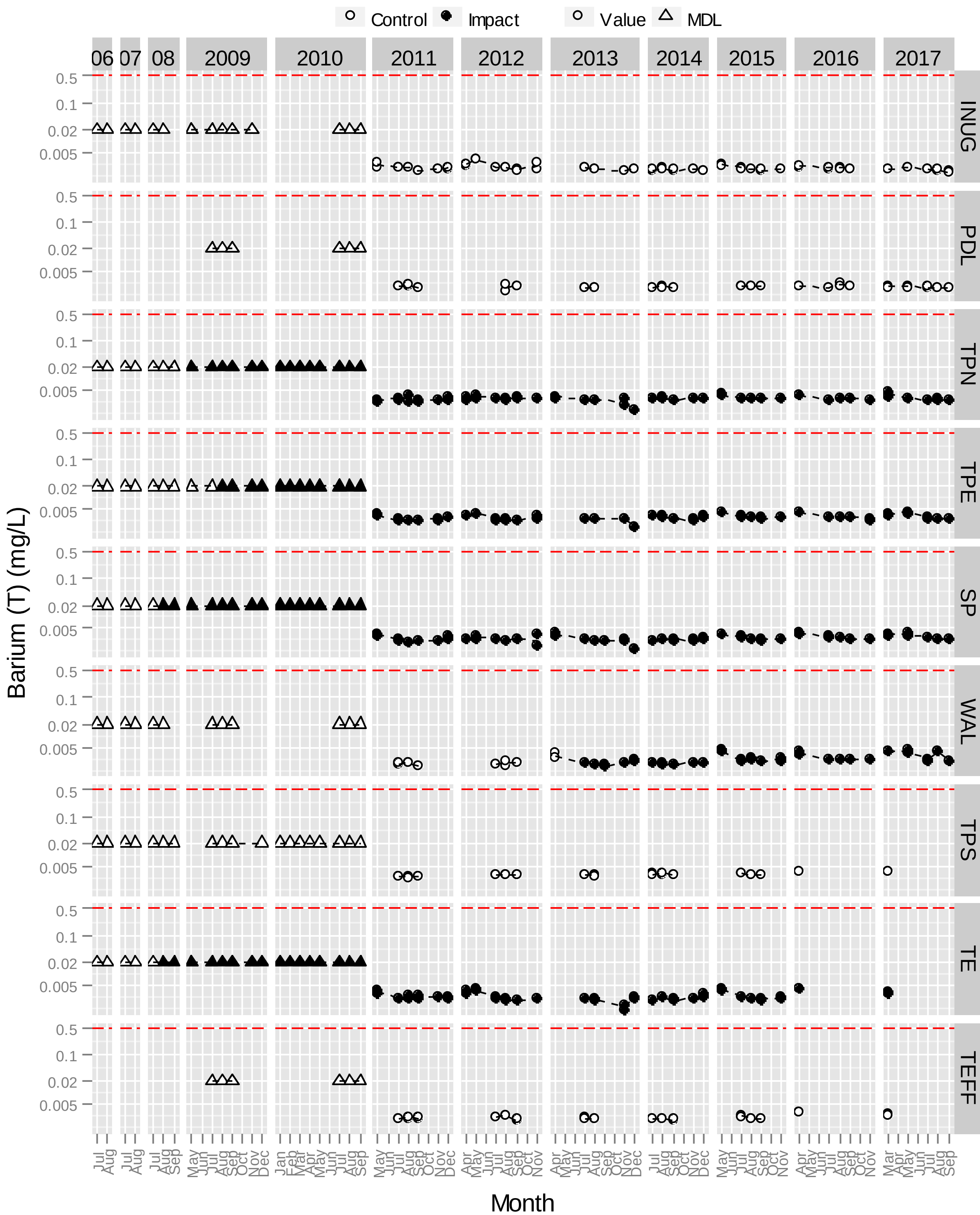


Figure 3.2-34. Total calcium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

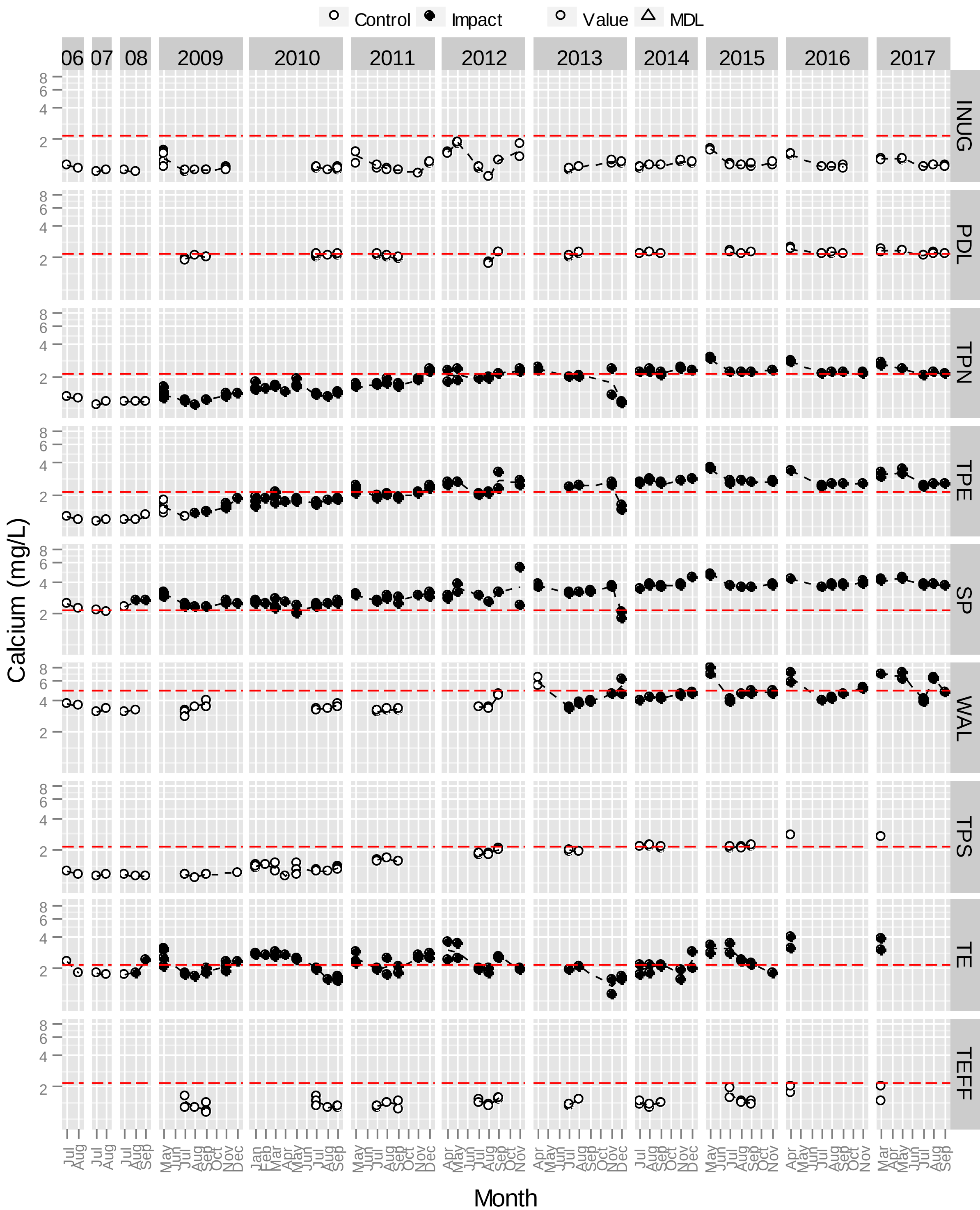


Figure 3.2-35. Total chromium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

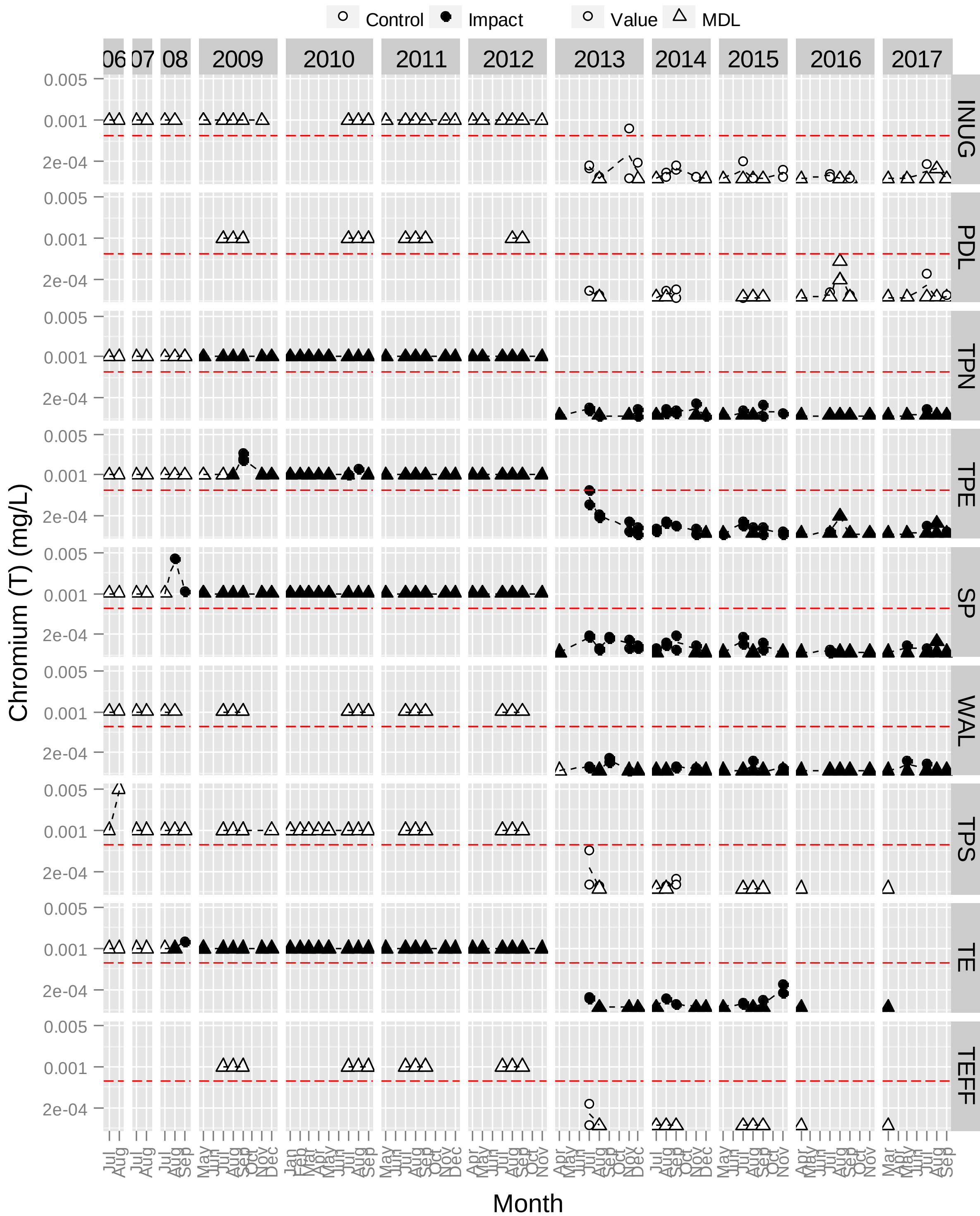


Figure 3.2-36. Total copper (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

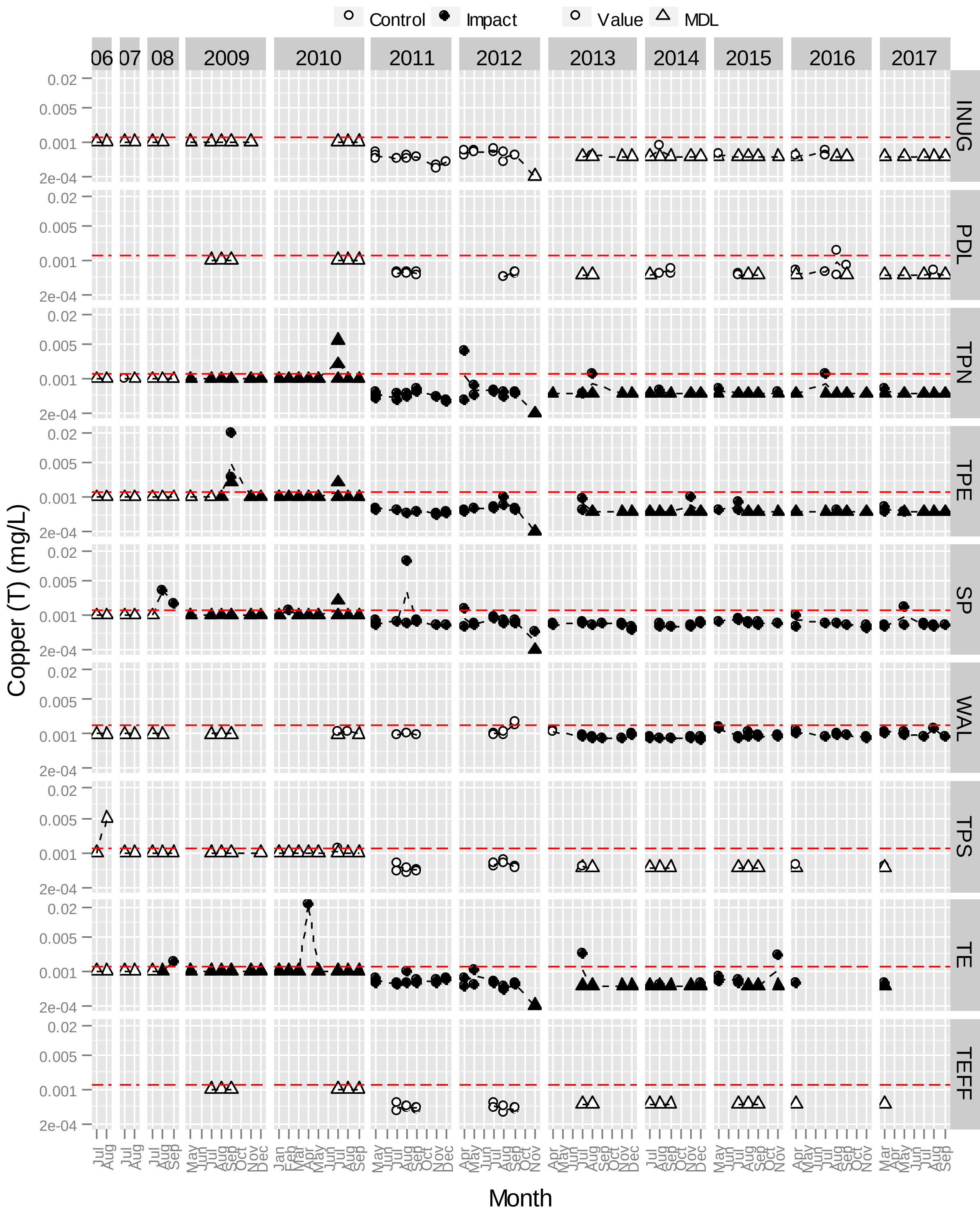


Figure 3.2-37. Total iron (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

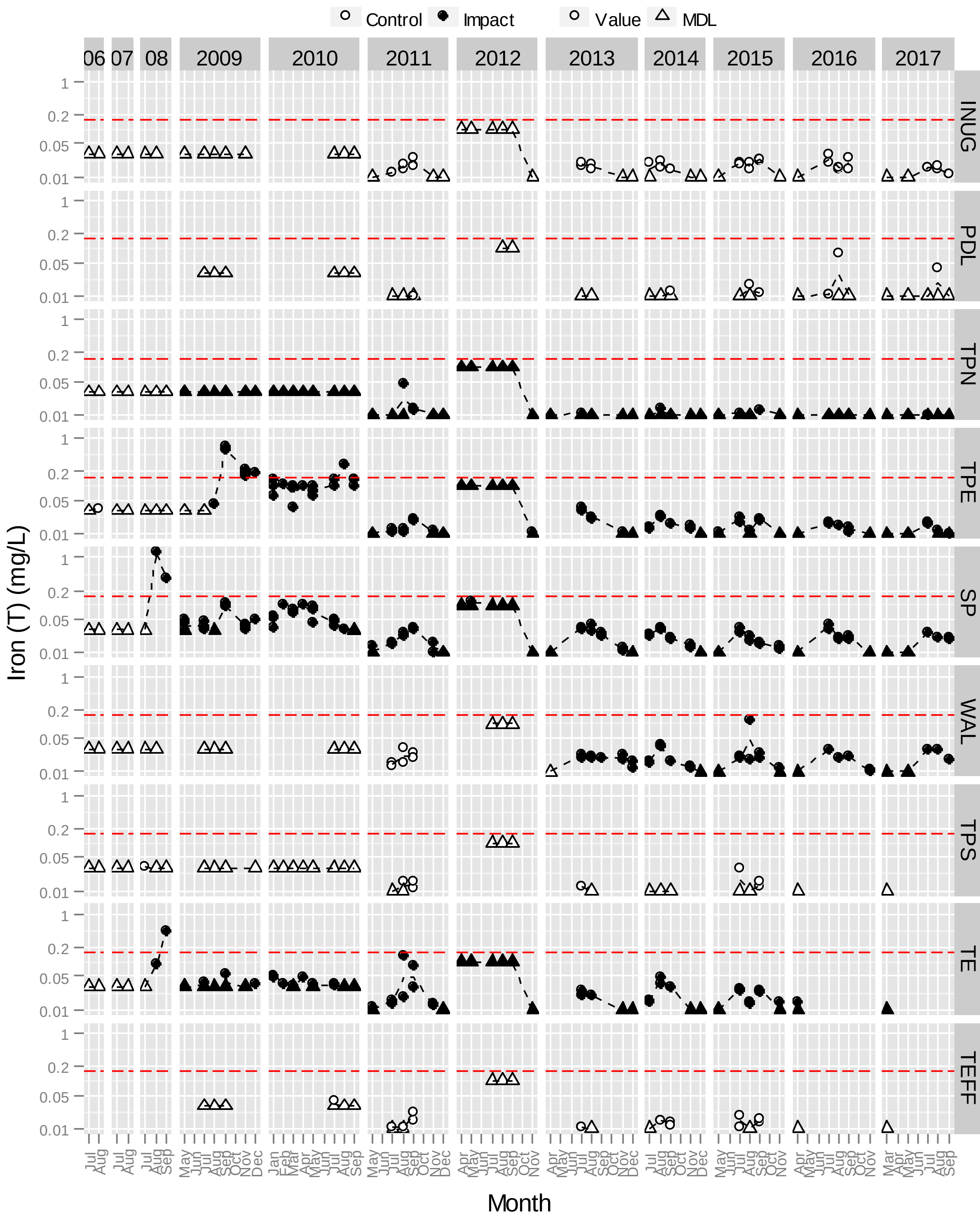


Figure 3.2-38. Total magnesium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

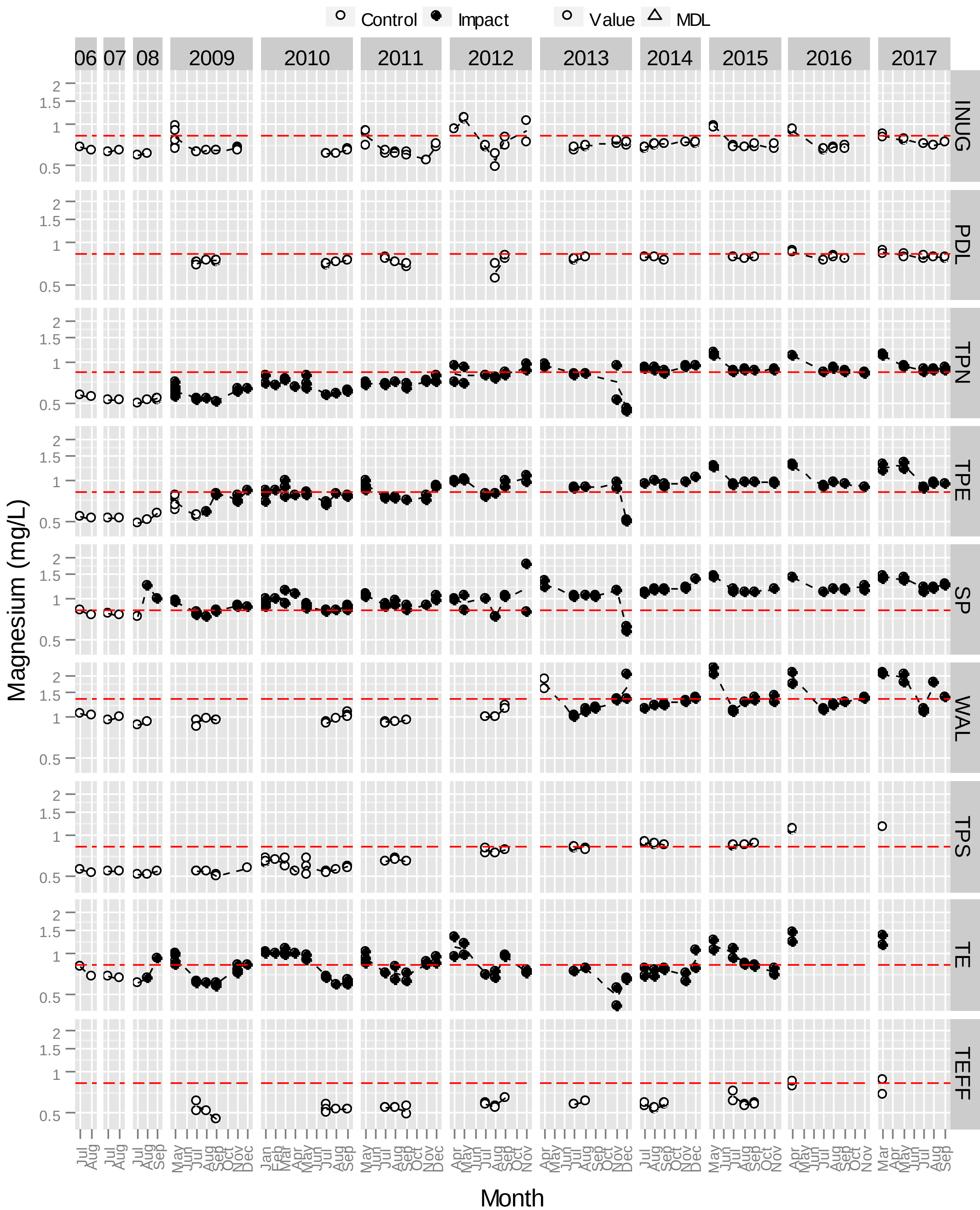


Figure 3.2-39. Total manganese (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

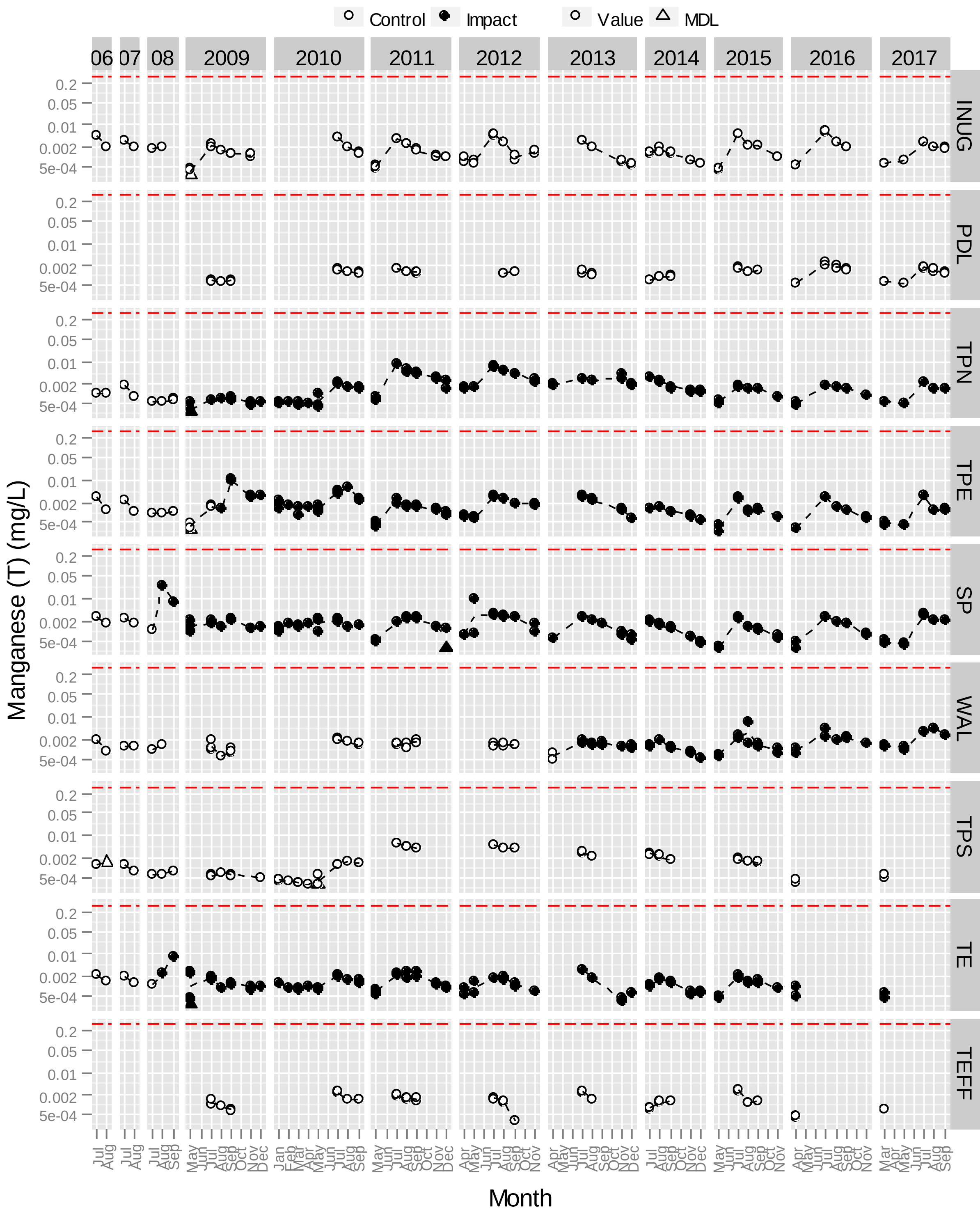


Figure 3.2-40. Total molybdenum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

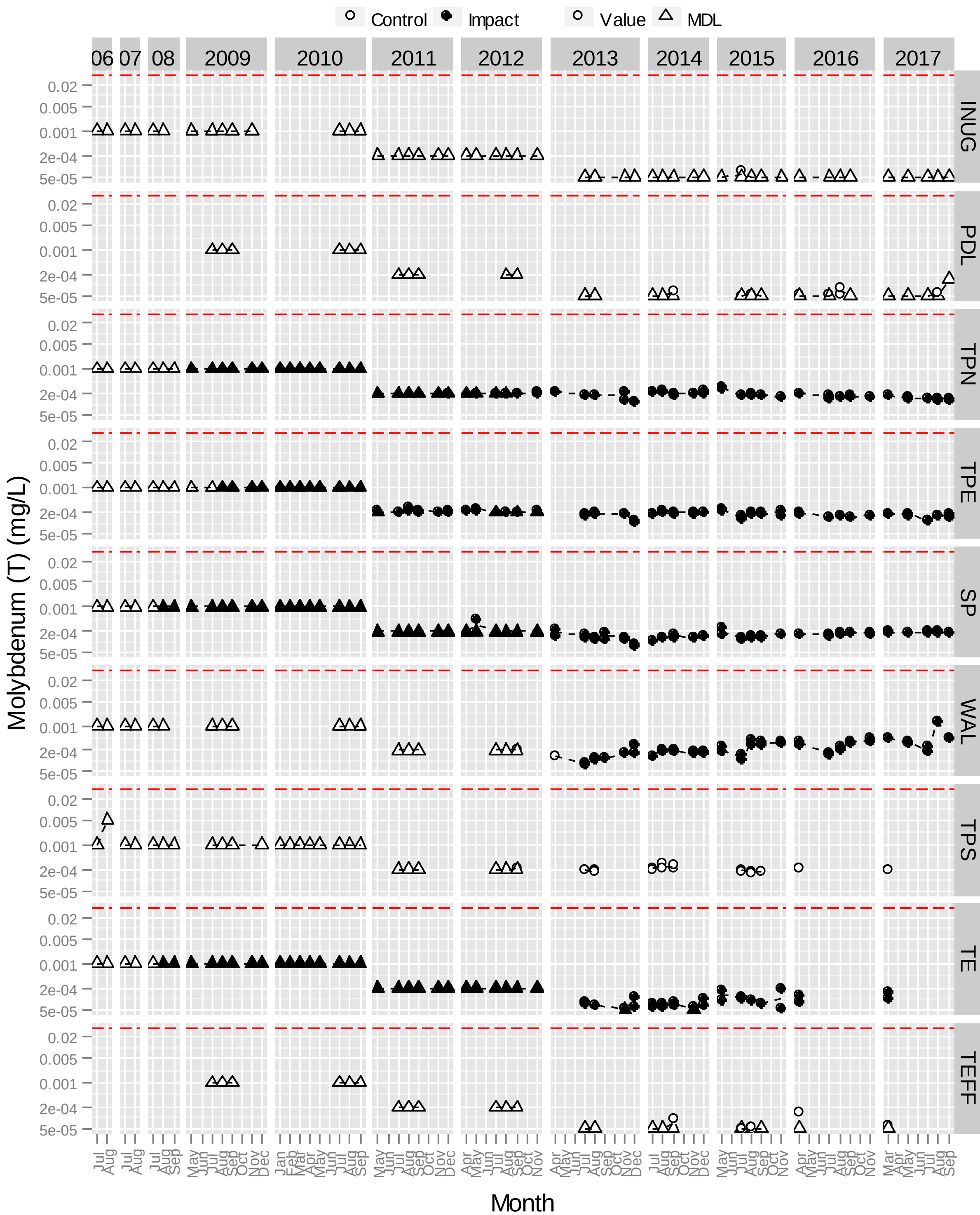


Figure 3.2-41. Total potassium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

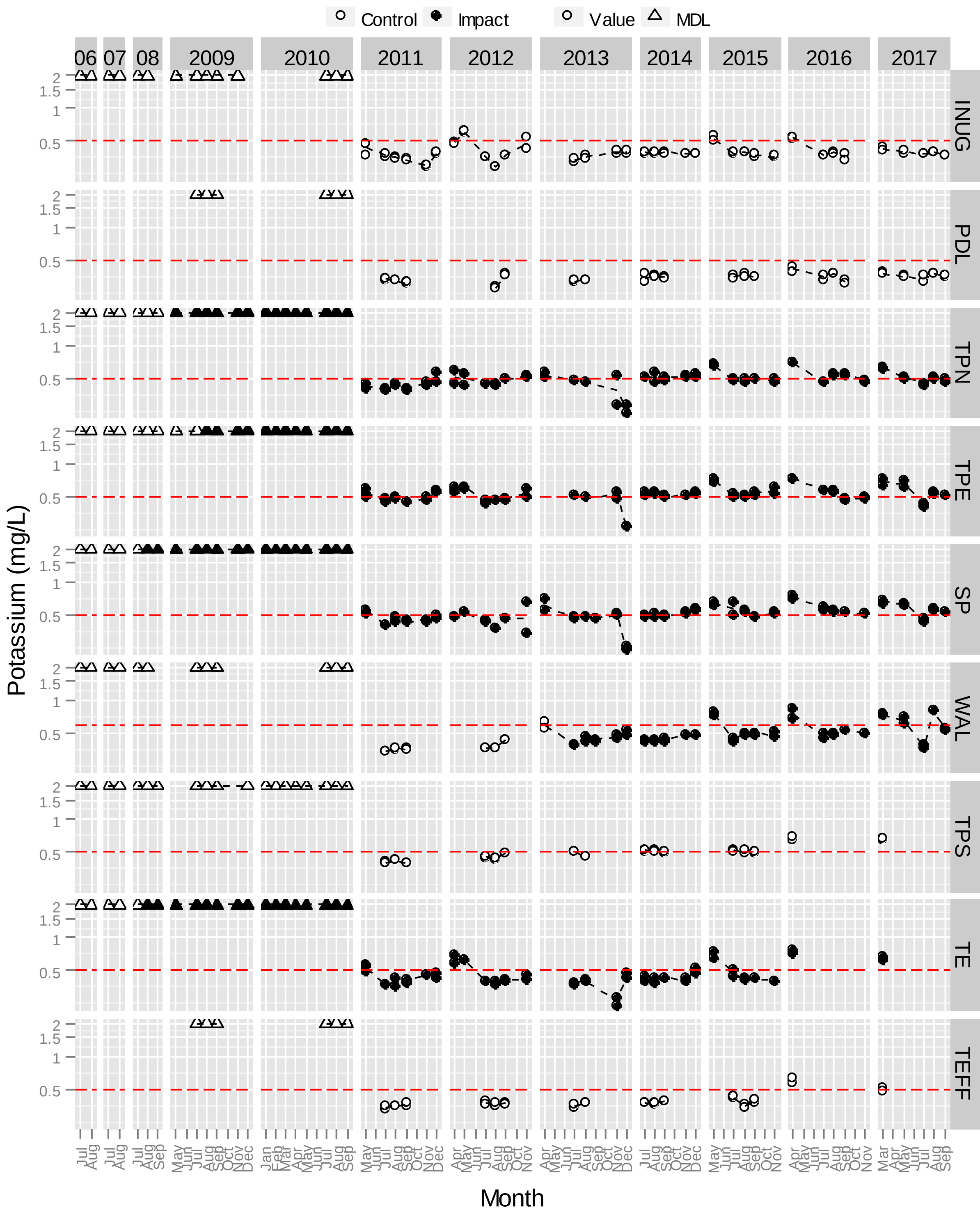


Figure 3.2-42. Total sodium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

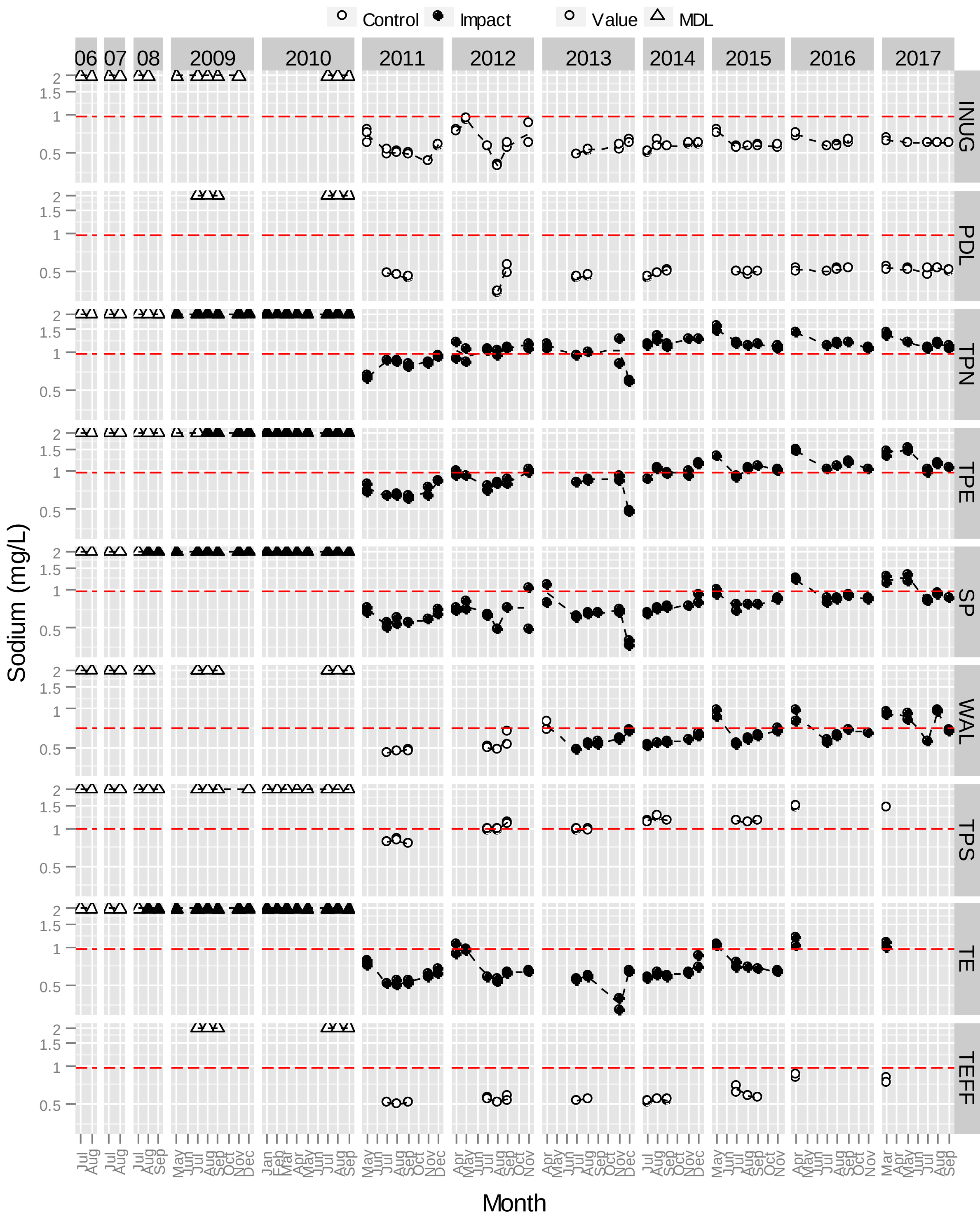


Figure 3.2-43. Total strontium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

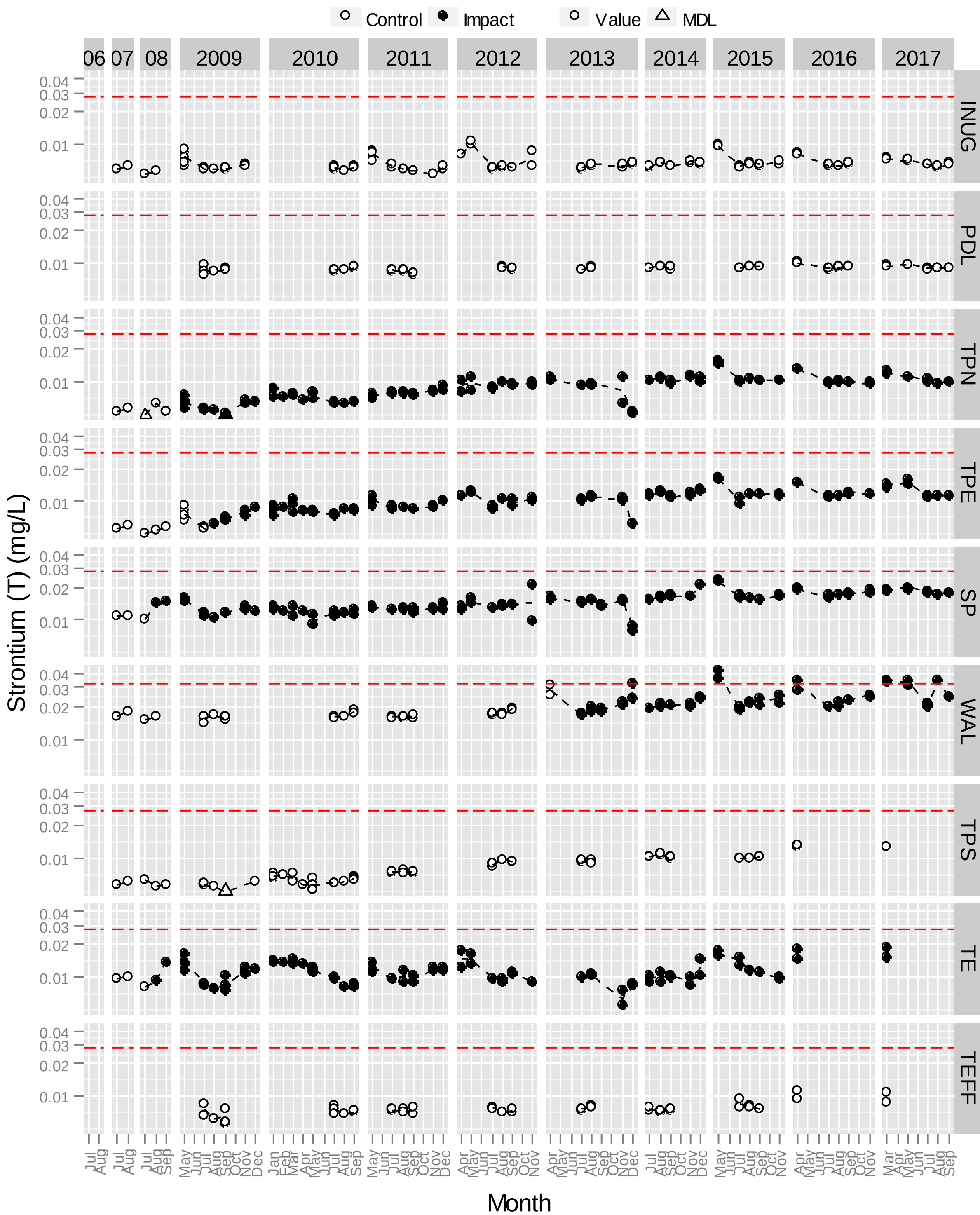


Figure 3.2-44. Total uranium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

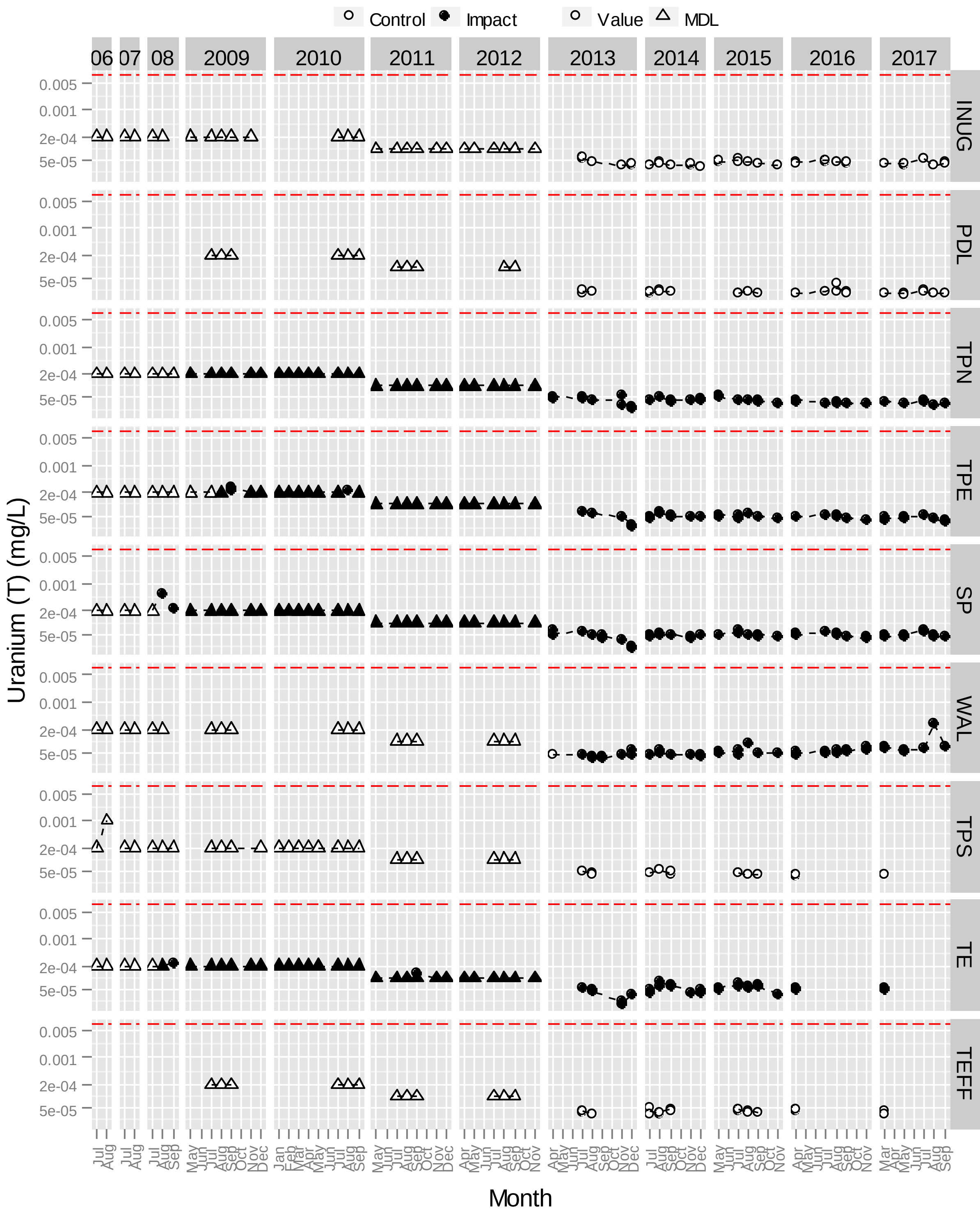


Figure 3.2-45. Dissolved aluminum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

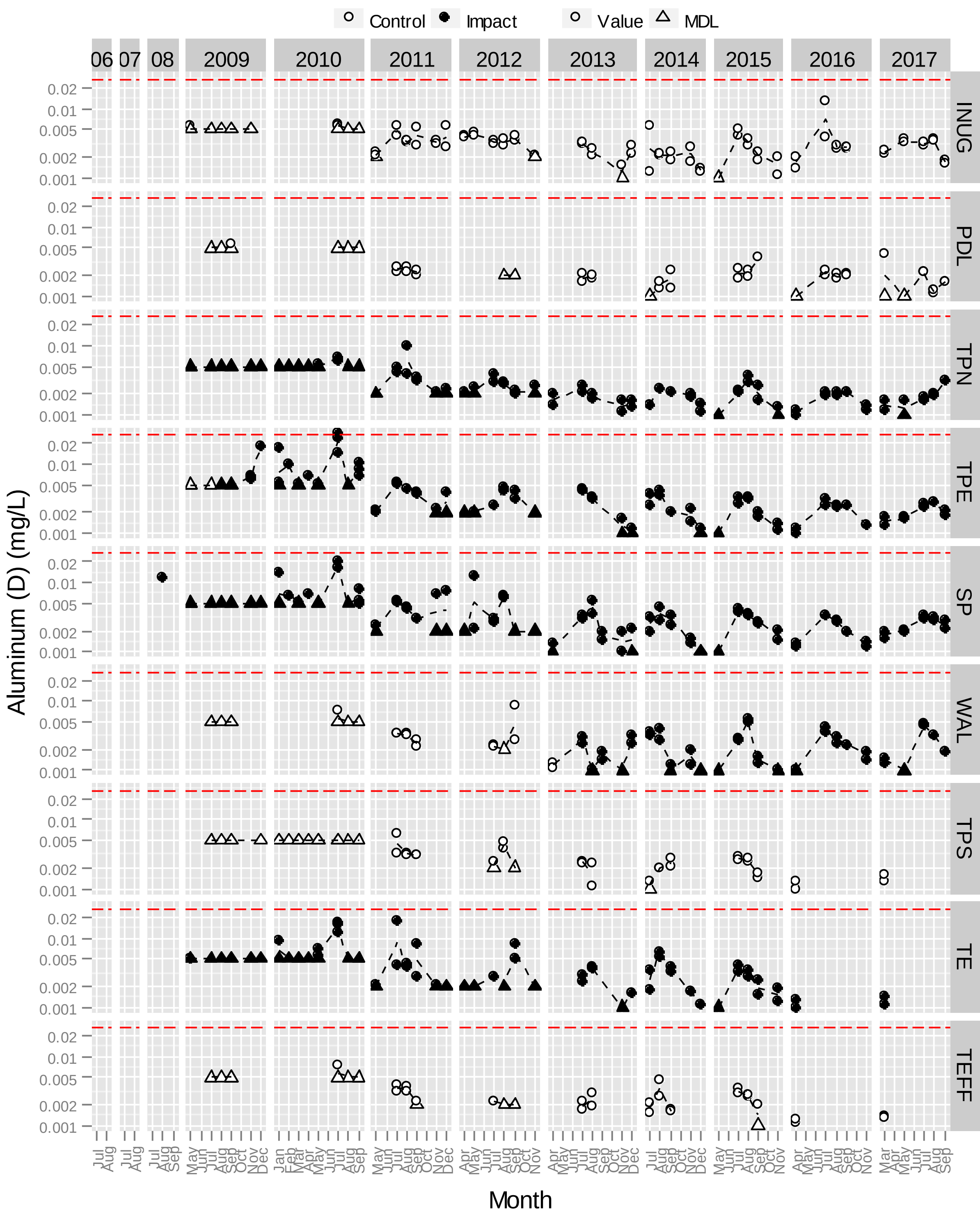


Figure 3.2-46. Dissolved arsenic (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

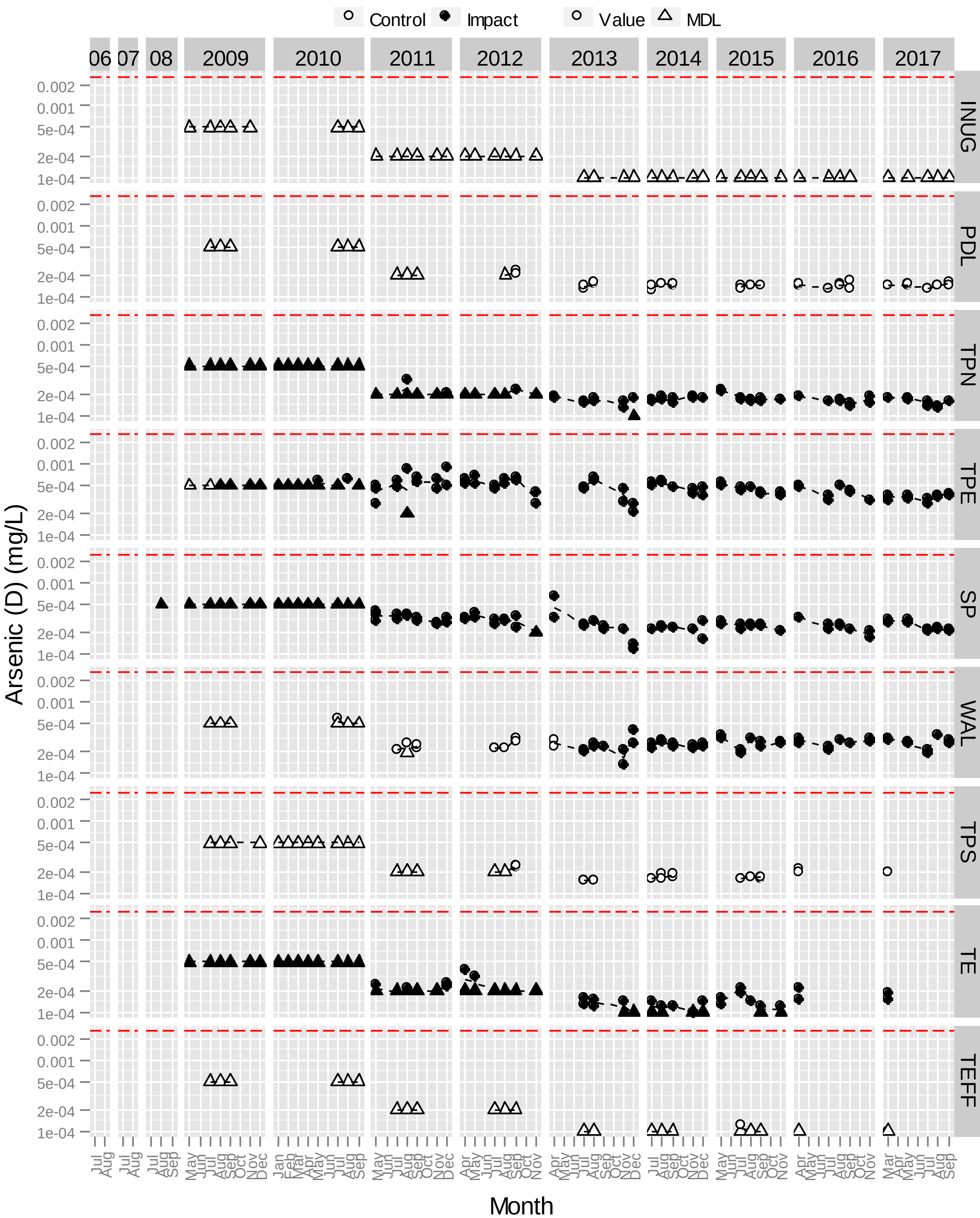


Figure 3.2-47. Dissolved barium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

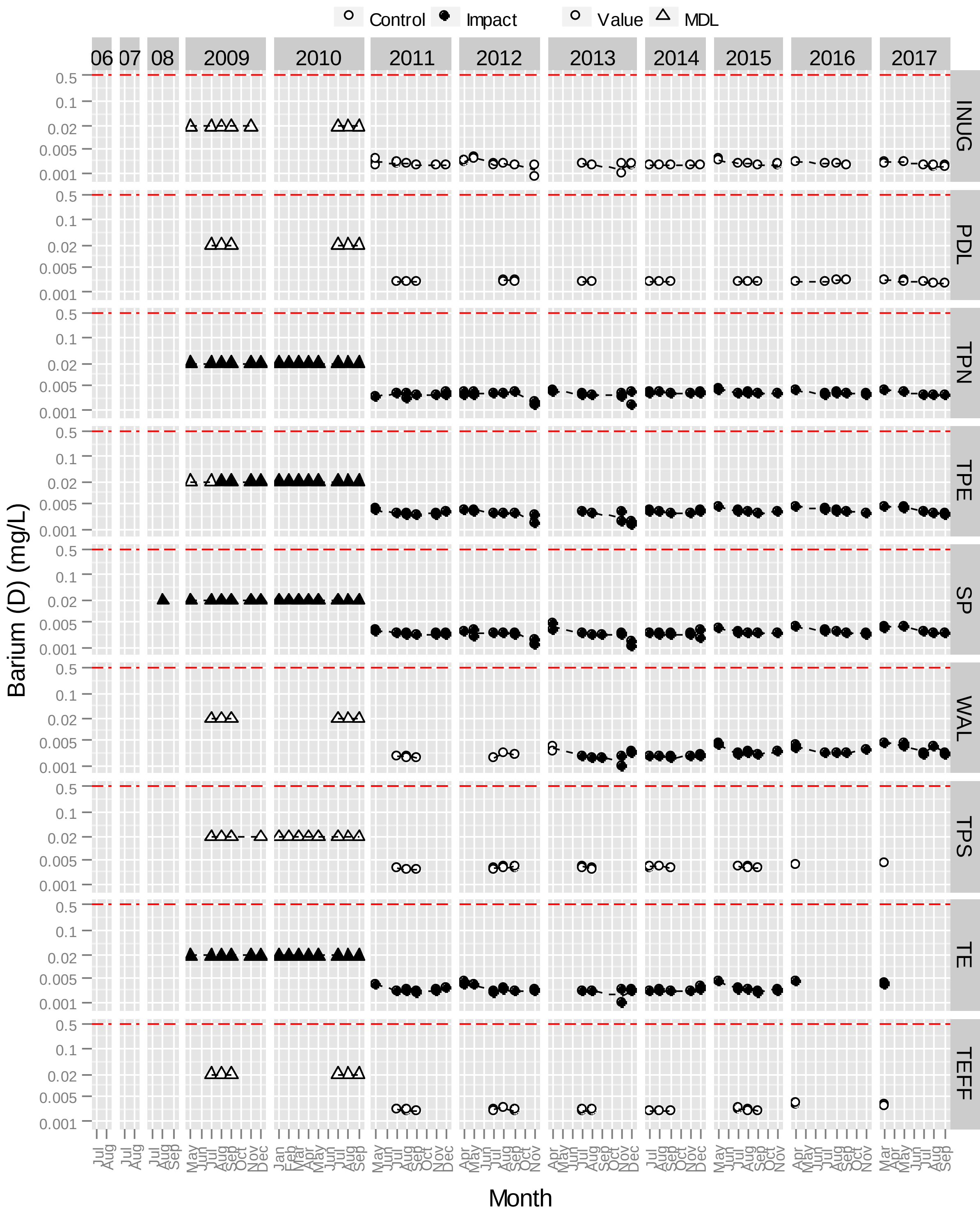


Figure 3.2-48. Dissolved copper (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

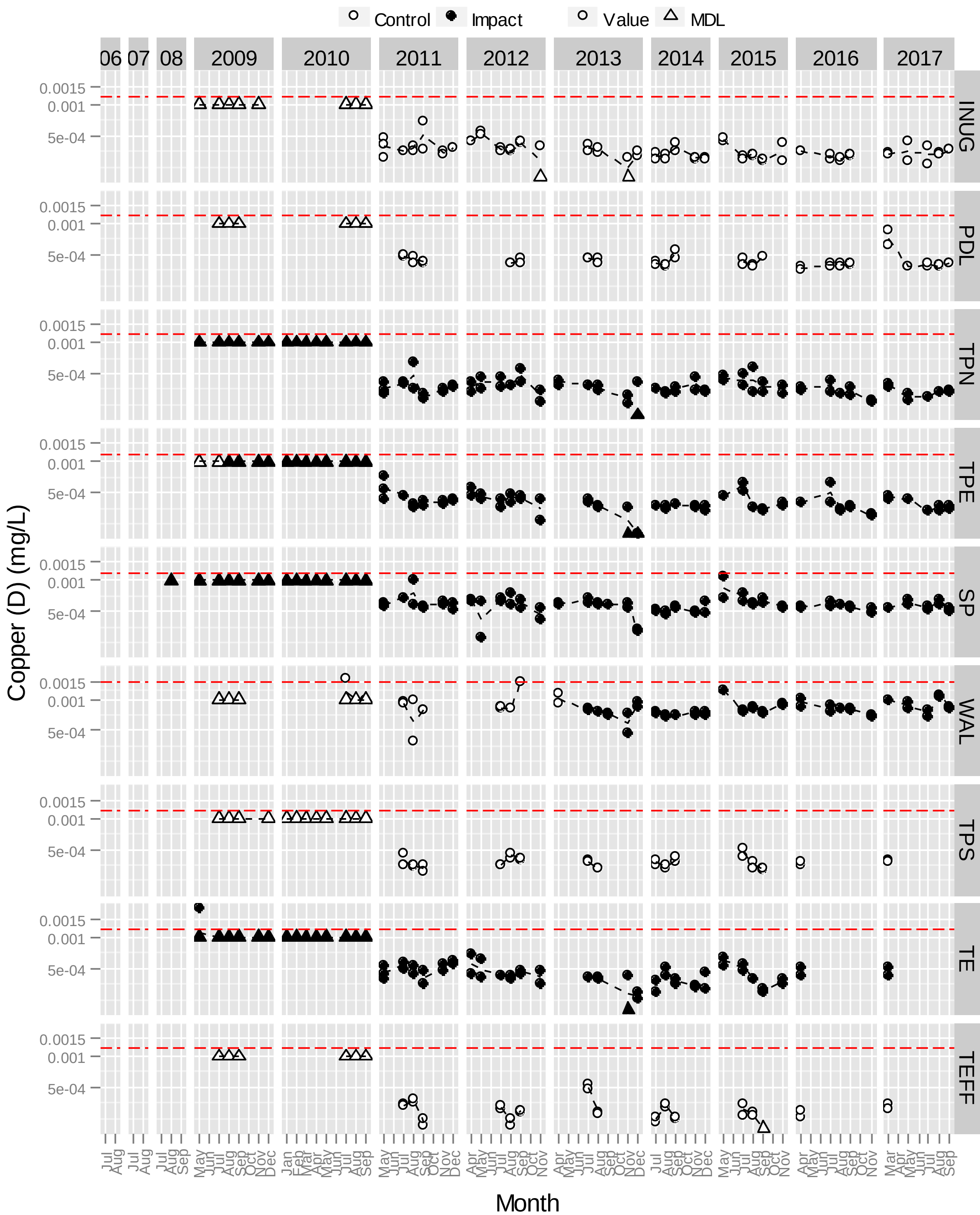


Figure 3.2-49. Dissolved manganese (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

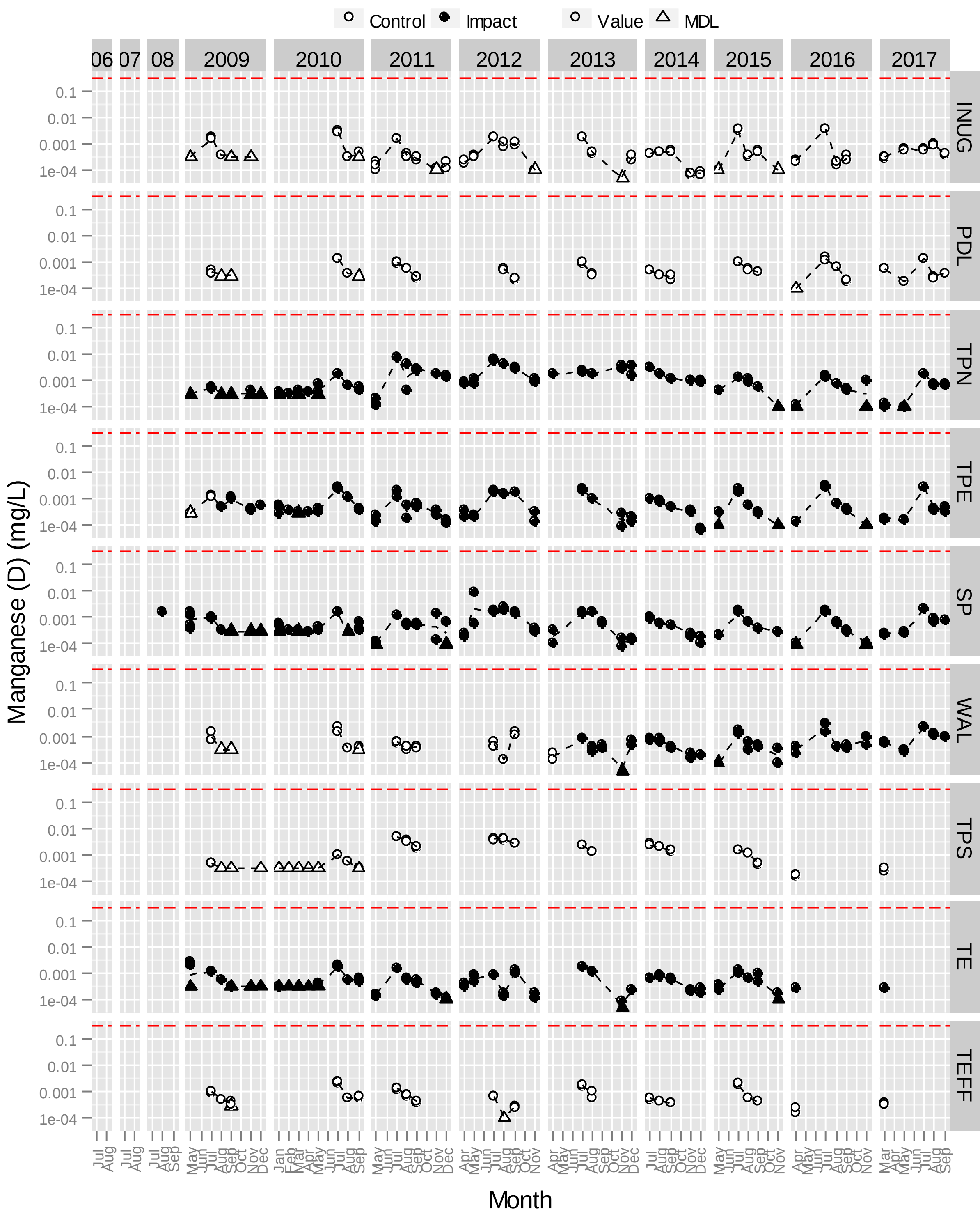


Figure 3.2-50. Dissolved molybdenum (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

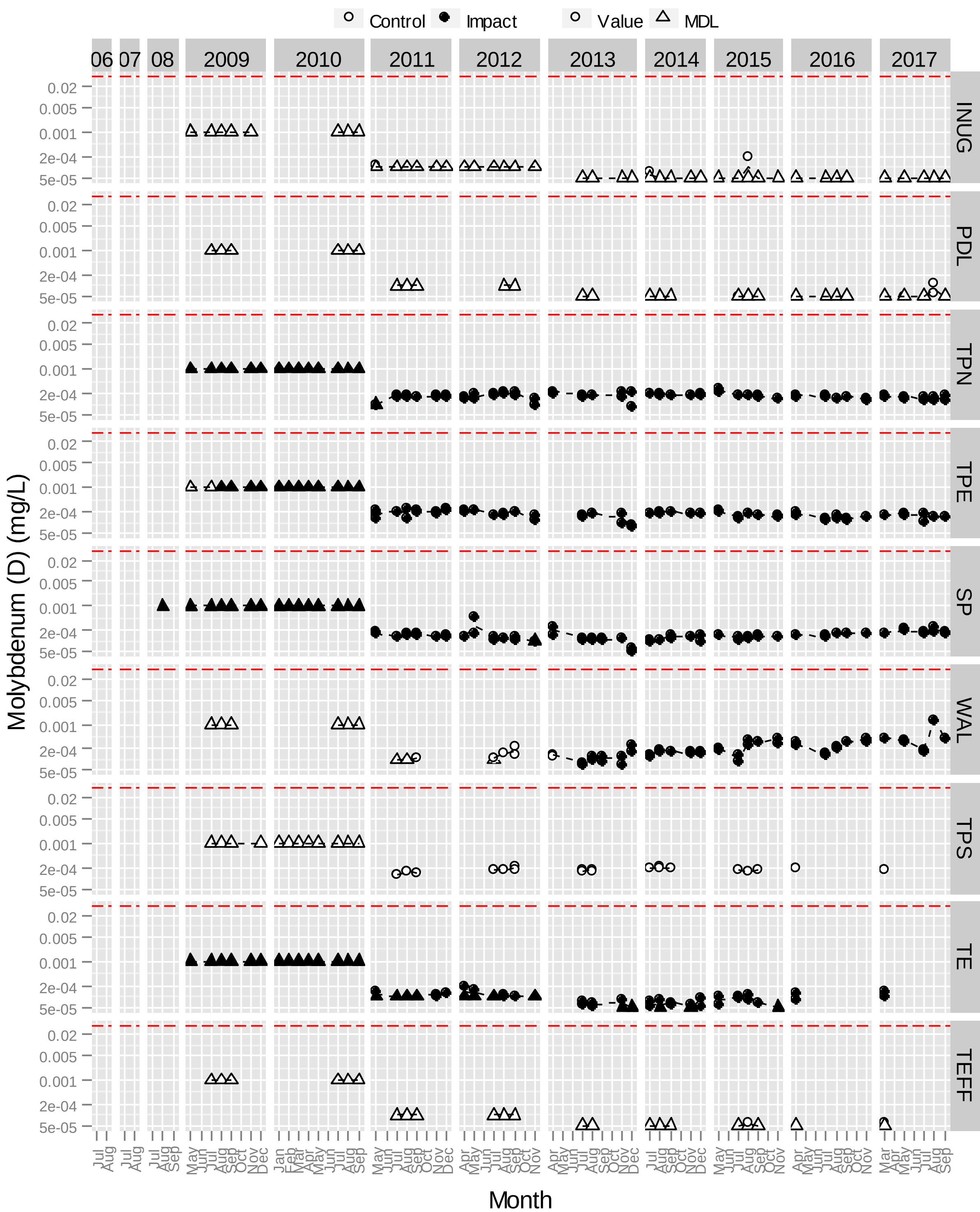


Figure 3.2-51. Dissolved strontium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

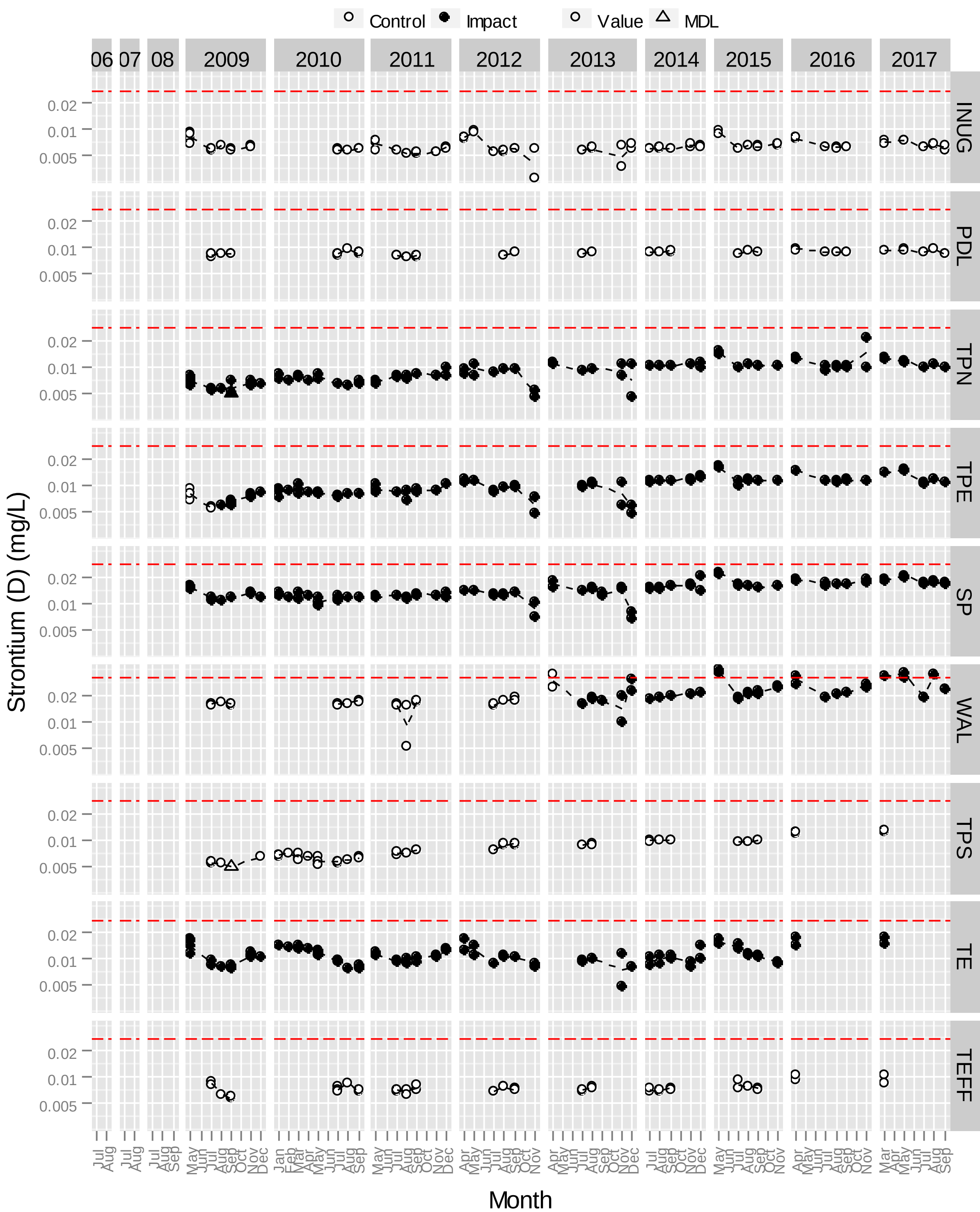
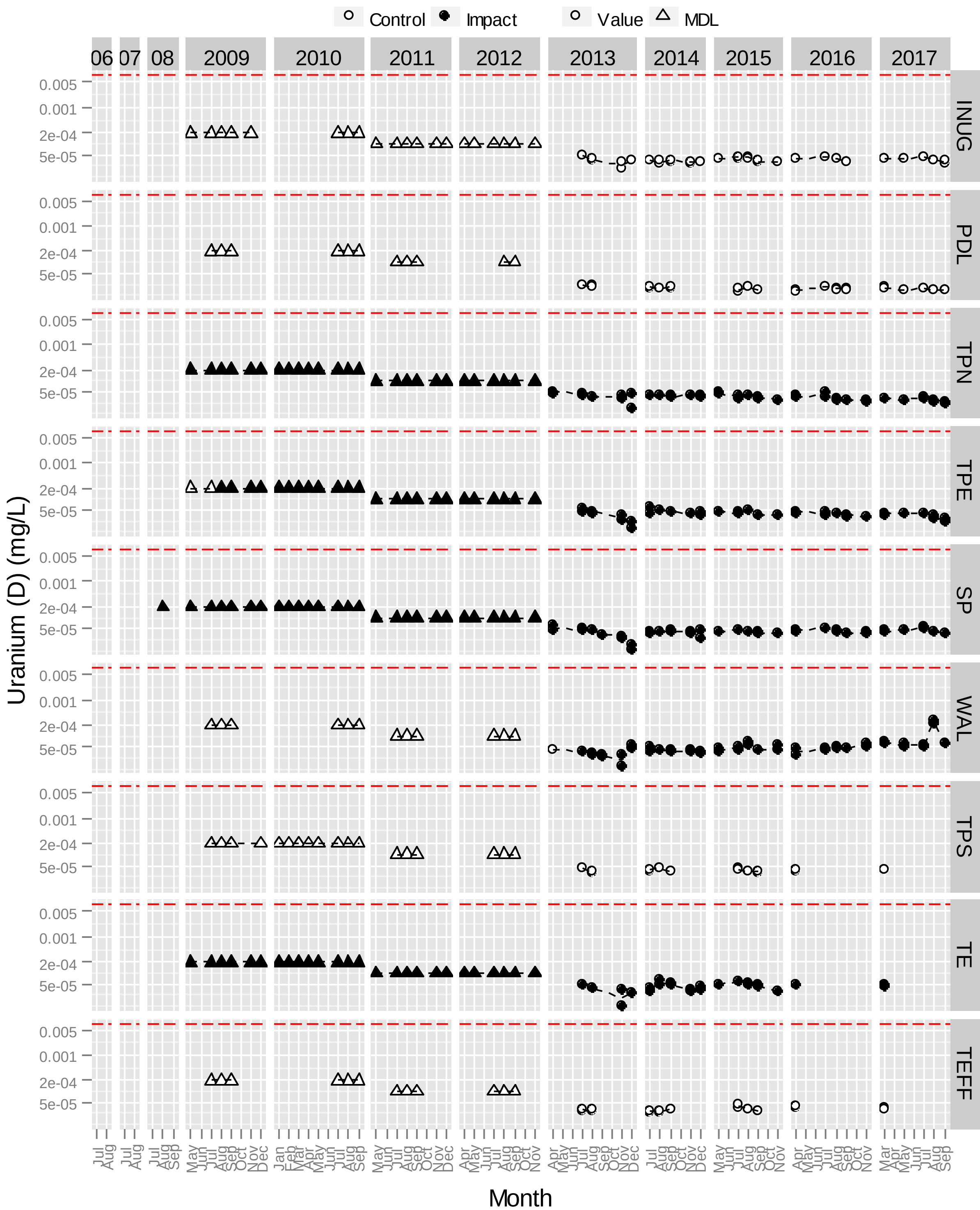


Figure 3.2-52. Dissolved uranium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).



3.2.3. Sediment Chemistry

3.2.3.1. General Observations

Natural sedimentation rates are considered low, due to the headwater nature of the watersheds and the lack of any substantial riverine or tributary inflow. Thus, very little sediment is carried into the lakes besides what may drain off of the nearby tundra during spring run-off or heavy rain events, or from dust deposition. There are, however, a number of mine-site activities that can generate dust and potentially increase the net deposition into project lakes.

Based on historical bulk sampling of sediment using grab samples, we have observed reasonably large, within-basin or within-lake differences in surface sediment (i.e., top 3 – 5 cm) concentrations for a variety of metals, indicative of natural spatial heterogeneity driven by localized mineralization. There are a number of processes that can affect the pattern of metals distribution to sediments, including differential deposition of different grain size materials according to wind direction and speed, water depth, water currents, basin morphometry, bioturbation (i.e., vertical mixing of sediment by burrowing insect larvae) and patchy, heterogeneous distribution of metals in mineralized areas. Grain size has a very large influence on metals concentrations – all else equal, the more coarse the grain size (i.e., sandier), the lower the metals concentrations. As such, our sediment programs target low energy, depositional areas that are dominated by silt/clay sediment in areas of similar depth (6 – 10 m), where grain size tends to be finer and more consistent.

Sediment chemistry samples have been collected using grab samplers (targeting top 3 - 5 cm) or coring devices (targeting top 1.5 cm). Grab samples are used every year to characterize the chemical and physical conditions of sediments paired with the benthic invertebrate community samples. While grab samples can provide insights into temporal changes in sediment chemistry, core samples are a more sensitive tool and are used in the CREMP to formally test for changes in sediment chemistry related to mining. Core samples are collected every three years, and now match the timing of EEM studies required under the *Metal Mining Effluent Regulations*. Below is an overview of the various sediment coring programs at Meadowbank dating back to baseline sampling in 2008:

- 2008 – Baseline coring was conducted in July 2008 prior to onset of East Dike construction to characterize baseline surface metals concentrations at all monitoring areas.
- 2009 – The 2009 coring program was implemented to monitor potential changes to surface sediment chemistry that may have occurred as a result of the East Dike sedimentation event in August 2008. The 2009 study was conducted only at SP, TE, TPE, and INUG. TPE and INUG were used as the reference areas for SP and TE.
- 2010 to 2013 – The 2010 to 2013 sediment grab sampling programs covered all NF, MF, and FF Meadowbank study lakes as well as the reference areas INUG and PDL. Sediment coring was completed as part of the 2012 program.
- 2014 – The 2014 program covered all Meadowbank study lakes sampling areas and reference areas. Note that the 2014 program was advanced a year ahead to align with EEM program. Additional sampling was completed at TPE in 2014 to help assess whether the apparent changes in sediment chromium concentrations were related to spatially biased sampling or were a real temporal trend. Two zones in TPE were targeted for coring: the zone sampled initially in 2008 and 2009 (prior to dike construction; TPE-B) and the zone sampled in 2010 (TPE). Results from this analysis helped inform the design of the targeted chromium bioavailability study conducted at TPE in 2015.

- 2015 – The routine 2015 sediment sampling program was limited to the NF study lakes in accordance with the new approach outlined in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). In addition to routine sampling, a targeted bioavailability and toxicity testing program was completed on sediments from TPE to provide more information on whether the apparent increase in chromium concentrations is adversely affecting the benthic invertebrate community. Sediment grab samples were collected from two zones in TPE and from the reference areas. Samples were analyzed for total metals and other conventional parameters as per the routine CREMP program, as well as sequential extraction testing to determine the bioavailability of sediment chromium. Bulk sediment was sent to a toxicity testing laboratory where two tests were run using *Chironomus dilutus* and *Hyalella azteca*.
- 2016 – Sediment sampling in 2016 was limited to grab sampling at the Meadowbank study lakes, synoptic with the benthic invertebrate community sampling locations.
- 2017 – Sediment grab (n=5) and core (n=10) sampling was completed at all of the Meadowbank project lakes. Core and grab samples were spaced throughout each basin. Grab for chemistry and benthic invertebrates were collected at the same location. Core samples were opportunistically collected from some of the grab sampling locations. The remaining replicates were spaced throughout the basin in areas with the targeted depth and substrate composition.

3.2.3.2. Temporal and Spatial Trend Interpretation

The 2017 sediment chemistry results are presented in the following tables along with the updated trigger values specific to Meadowbank project lakes and Wally Lake:

- Core chemistry (metals, TOC): **Table 3.2-9**
- Grab chemistry (metals, particle size, TOC): **Table 3.2-10**
- Grab chemistry (hydrocarbons and PAHs): **Table 3.2-11**
- Results of the BACI analysis for the 2017 core chemistry: **Table 3.2-12**

To help with interpretation of long-term temporal and spatial trends, concentrations of individual metals have been plotted in **Figure 3.2-54** to **Figure 3.2-61**. Metals concentrations are shown by area/basin for the different sampling methods (grab [data points] vs core samples [box and whisker plots]). The red dashed line in each of sediment metals figures is the trigger value specific to the parameter and area (i.e., Meadowbank lakes and Wally Lake each have their own trigger values as of 2017). The box and whisker plots illustrate the statistical distribution of core samples within each area. Data interpretation for the box and whisker plots is as follows:

- The horizontal line inside the box represents the median concentration
- The upper and lower margins of the box represent the upper (75^{th}) and lower (25^{th}) percentile concentrations, respectively (the "interquartile" range)
- The vertical lines represent maximum and/or minimum concentrations (provided at least one value falls outside the box but within 1.5 times the interquartile range)
- 'x's that occur beyond the maximum or minimum lines represent concentrations that are greater than 1.5 times the interquartile distance and indicate 'outlier' concentrations that are real, but don't fit within the distribution of the rest of the data, for whatever reason.

Formal statistical analysis of the sediment core chemistry data was completed in 2017 using updated trigger values (**Table 2.4-1**).

Below is a summary of the 2017 chemistry data with emphasis on the statistical BA comparisons for metals that exceeded their respective trigger values.

Third Portage Lake – Chromium was the only metal where the mean 2017 concentration (204.5 mg/kg) exceeded the Meadowbank project lakes trigger value of 135 mg/kg. Chromium concentrations at TPE have been trending higher since the onset of the mine development in TPE in 2009 (i.e., change in status from "before" to "after"). While the 2016 grab results for TPE suggested a reduction in chromium concentrations last year, both the grab and core results for 2017 show concentrations slightly higher than in 2015 (**Figure 3.2-57**). Nine of the 10 core samples collected in 2017 exceeded the trigger (range = 126 – 264 mg/kg; **Table 3.2-9**). Chromium concentrations in the grab samples tended to be lower compared to the cores, but all five replicate grabs still exceeded the chromium trigger value in 2017. By comparison, chromium concentrations in cores collected from PDL in 2017 averaged 128 mg/kg (range = 110 – 148 mg/kg) and were consistent with historical data for that area. Relative to the before data, chromium concentration in 2017 are nearly 2.5 times the concentration measured in the 30 samples from the baseline period (see the exp[Est] for proportional change in BA analysis[23]; **Table 3.2-12**).

Wally Lake – New triggers for Wally were developed based on 20 samples collected in the "before" period. Arsenic, chromium, and lead all exceeded their respective trigger values (i.e., the 95th percentile of baseline [n=20]). In the case of chromium and lead, the mean concentration reported in 2017 is just marginally greater than the 95th percentile of baseline (**Table 3.2-9**) and there is no evidence of increasing concentrations (**Figure 3.2-57** and **Figure 3.2-59**). Results for arsenic were not so clear. The BA analysis shows a 2.1-times increase relative to the "before" period), which is clear in the plot of the 2017 coring results relative to previous years (**Figure 3.2-55**). Unlike the chromium data at TPE, the core and grab chemistry data for arsenic at WAL do not tell the same story. Arsenic concentrations in the core samples averaged 62 mg/kg (range = 48 – 91 mg/kg; **Table 3.2-9**), considerably higher than the mean arsenic concentration in the grabs of 35 mg/kg (range = 27 – 45 mg/kg; **Table 3.2-10**). Core chemistry results from 2017 show arsenic concentrations are trending higher relative to the "before" period and compared to more recent "after" data collected in 2014. Meanwhile, the grab chemistry data from 2017 are largely within the range of previously reported concentrations in both the "before" and "after" periods (**Figure 3.2-55**). While the 2017 core results indicate a temporal change has occurred, the pattern does not appear consistent when both the core and grab data are considered (**Figure 3.2-55**). There are two plausible explanations for this difference:

1. Sampling methods – The coring method targets a narrower sediment horizon for analysis (1.5 cm) compared to bulk grab sampling with the ponar (3-5 cm). Mining-related inputs to the lake from effluent discharge and deposition of particulate material would be expected to accumulate on the surface of the sediment. Bulk grab samples of the top 3-5 cm used for habitat characterization (i.e., grain size and TOC) would effectively dilute the signal from any newly deposited metals in the more surficial top few mm of sediment.
2. Spatial heterogeneity – There are three lines of evidence that suggest that the 2017 results were due to spatial heterogeneity. First, the 2008 and 2012 WAL coring results, both of which were in the "before" period, also showed an increase in arsenic concentrations across the two events, which suggests that spatial heterogeneity in sediment arsenic concentrations was present prior to mining activities. This was also seen in INUG (2012 vs 2017), so not the only time this result has

[23] The estimate (Est) is before-after model estimate of the 2017 change in mean concentration for log-transformed data. The exponent of the estimate (exp[Est]) converts estimated change in mean from log space to normal space. The exp(Est) is the estimated proportional change in concentration in the after period (i.e., 2017) compared to the before period.

occurred in the absence of mining activity. Secondly, unlike chromium in TPE, the 2017 coring results only fall marginally outside the range of historical results for grabs and cores in WAL. Third, there has been no apparent change in water-borne arsenic concentrations in WAL (**Figure 3.2-46**), suggesting limited inputs from the ongoing discharges since 2013.

Of the trigger exceedances discussed above, both chromium (TPE) and arsenic (WAL) warrant active follow-up in 2018 to verify existing trends. Details as follows:

- Chromium (TPE) – Chromium has now been tracked for a number of years and concentrations continue to exceed the trigger value at TPE. The "apparent" decrease in concentration noted in the 2016 CREMP (Azimuth, 2017a) may have been an artifact of spatial variability within the sediment area, rather than an actual reduction in sediment chromium concentrations. The 2017 chromium concentrations are at the upper limit of the concentrations reported in 2015 when sediment toxicity testing and sequential extraction analysis were conducted to determine the ecological significance of the results (**Figure 3.2-57**). At that time, the results showed that while chromium concentrations had increased, both the bioavailability and toxicity lines of evidence pointed to the sediments being non-toxic to benthic species (*C. dilutus* and *H. azteca*). Coring should be repeated to confirm the 2017 results represent an ongoing trend or if conditions have stabilized.
- Arsenic (WAL) – The apparent increase in arsenic concentrations at WAL merit repeating core sampling in 2018 to determine whether or not the observed increase in arsenic in 2017 is a temporal trend or indicative of spatial heterogeneity in the basin. Formal statistical testing of the sediment core chemistry results at WAL would be completed against triggers/thresholds in 2018.

In addition to repeat sediment coring at TPE and WAL in 2018, sequential extraction analysis and sediment toxicity tests are proposed in 2018 to provide information on the bioavailability of chromium in sediments at TPE and arsenic at WAL. The decision to proceed with confirmatory sediment coring and bioavailability testing at TPE and WAL in 2018 is unique. Typically, follow-up confirmatory sediment coring and bioavailability testing would be conducted in a phased approach where the results of the sediment coring program help inform whether to proceed with sequential extraction and sediment toxicity testing. However, a baseline sediment bioavailability study is planned for the Whale Tail Pit program in 2018 and INUG and PDL serve as control stations for the exposure lakes. Harmonizing the bioavailability studies at TPE and WAL in 2018 with the Whale Tail Pit study provides the opportunity to share sequential extraction test data and sediment toxicity results collected at the control stations INUG and PDL.

Table 3.2–9. Sediment core chemistry, Meadowbank study lakes, 2017.

Lake & Basin	**Screening Criteria**				**Third Portage Lake - East Basin**									
					TPE									
Area-Replicate ID	**CCME[1]**	**Trigger Values[2]**		**Threshold**	**SC-1**	**SC-2**	**SC-3**	**SC-4**	**SC-5**	**SC-6**	**SC-7**	**SC-8**	**SC-9**	**SC-10**
Date	**ISQG**	MBK	WAL	**Values**	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17
Physical & Organic Parameters														
Moisture (%)					85.8	86.4	87.3	88	87.1	88.2	86.0	88.5	82.8	81.8
pH					6.28	6.32	6.34	6.31	6.39	6.64	6.61	6.32	6.24	6.22
TOC (% dw)					3.67	4.25	4.58	4.87	4.54	4.25	4.34	4.34	3.55	3.53
Total Metals (mg/kg dw)														
Aluminum					25700	23500	23100	26000	25700	25100	24000	24500	25800	26400
Antimony					0.33	0.34	0.36	0.39	0.36	0.35	0.36	0.3	0.28	0.27
Arsenic*	5.9	120.9	44.5		24.1	29.2	26.9	28.3	31.1	29.3	29.2	23.2	25.9	19.1
Barium					119	103	121	147	127	116	152	109	111	128
Beryllium					1.9	1.65	1.55	1.71	1.65	1.49	1.54	1.59	1.6	1.79
Bismuth					2.61	2.31	2.13	2.35	2.2	2.09	2.1	2.08	2.16	2.46
Boron					9	7.5	7	7.9	7.8	7.9	7.8	8	7.9	8.1
Cadmium*	0.6	1.10	0.66		0.222	0.228	0.569	0.746	0.511	0.388	1.09	0.233	0.292	0.24
Calcium					2620	2500	3130	3210	3020	2770	2880	3200	2350	2310
Chromium*	37.3	135.0	61.2		**178**	**186**	**219**	**224**	**264**	**257**	**212**	**195**	**184**	126
Cobalt					17	19.6	20.1	22.2	22.5	21.70	21.8	17.6	19	18.7
Copper*	35.7	83.4	257.1		56.3	51.8	48.8	55.8	52.5	49.9	53.9	46.4	54.6	57.9
Iron					49200	55900	47500	51900	52600	53600	51700	46000	49800	44700
Lead[†]	35	25.3	36.5	35	24.7	22.9	23.5	**26.5**	24.4	23	**25.5**	21.4	22.7	23.6
Lithium					50	41.4	38.3	42.1	39.3	38.3	37.1	40.1	47.1	51.3
Magnesium					12000	11600	12600	13200	14300	13900	12200	12100	12500	10900
Manganese					1440	2800	3210	4130	3180	3560	9920	1770	2480	2290
Mercury	0.17	0.102	0.120	0.17	0.0217	0.0229	0.0269	0.0276	0.0259	0.0247	0.026	0.0256	0.0218	0.0204
Molybdenum					4.55	4.62	4.33	4.71	4.64	4.85	5.38	3.7	4.38	3.7
Nickel					92.9	90.6	159	191	163	135	235	94.6	101	83.7
Phosphorus					537	517	530	600	578	551	532	499	504	442
Potassium					4540	4020	3780	4380	4200	4100	4010	4160	4450	4840
Selenium					0.67	0.71	0.77	0.91	0.79	0.77	0.78	0.79	0.81	0.67
Silver					0.15	0.23	0.25	0.22	0.23	0.29	0.18	0.19	0.14	0.14
Sodium					179	164	169	197	189	182	176	195	170	180
Strontium					21.3	19.4	21	23.7	22.5	21.1	22	21.4	19.5	19.6
Thallium					0.425	0.368	0.479	0.552	0.477	0.432	0.645	0.374	0.403	0.445
Tin					4	4.8	4.2	4.5	4.6	3	4.1	4.7	2.6	3.3
Titanium					895	803	704	815	770	800	785	781	933	968
Uranium					17.7	15.5	13.8	15.7	14	13.2	14	13.6	15.9	18.2
Vanadium					46.1	43.2	43	47.8	47.7	46.9	44.2	43.9	47.8	45.3
Zinc*	123	114.2	142.1		113	100	107	**125**	113	106	**127**	99.5	111	**118**

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–9. Sediment core chemistry, Meadowbank study lakes, 2017.

Lake & Basin	**Screening Criteria**				**Third Portage Lake - North Basin**									
					TPN									
Area-Replicate ID	**CCME[1]**	**Trigger Values[2]**		**Threshold**	**SC-1**	**SC-2**	**SC-3**	**SC-4**	**SC-5**	**SC-6**	**SC-7**	**SC-8**	**SC-9**	**SC-10**
Date	**ISQG**	MBK	WAL	**Values**	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17
Physical & Organic Parameters														
Moisture (%)					83.7	81.2	81.2	56.2	80.6	86.0	80.6	76.0	80.5	77
pH					6.34	6.15	6.19	5.98	5.9	6.33	6.06	6.14	5.98	6.23
TOC (% dw)					4.58	3.91	4.27	1.08	3.08	4.74	3.71	2.25	3.17	2.79
Total Metals (mg/kg dw)														
Aluminum					18400	15900	16600	10800	16300	16900	16800	13800	17900	14700
Antimony					0.28	0.25	0.22	*<0.10*	0.18	0.24	0.23	0.16	0.21	0.18
Arsenic*	5.9	120.9	44.5		19.5	18.9	19	13.8	10.9	24.7	15.8	11.6	17.2	13.5
Barium					78	64	66.5	36.1	62	65.4	64.1	47.6	67.6	57.6
Beryllium					1.12	0.95	1.02	0.54	1.01	0.98	0.98	0.75	1.02	0.79
Bismuth					1.17	0.99	0.94	0.44	0.99	0.94	0.9	0.78	1.06	0.76
Boron					7.5	6.3	7.2	*<5.0*	5.6	6.6	6.4	5.2	7.6	6.3
Cadmium*	0.6	1.10	0.66		0.171	0.142	0.204	0.061	0.114	0.243	0.203	0.071	0.096	0.12
Calcium					2220	1740	2100	838	1610	2100	2030	1310	1780	1650
Chromium*	37.3	135.0	61.2		135	119	129	71.5	112	**153**	**138**	99.9	125	116
Cobalt					12.3	11.1	11.8	6.86	9.3	16.70	11.4	9.01	11.5	10.8
Copper*	35.7	83.4	257.1		55.7	45.5	47.6	21.6	45.5	41.7	44.8	35.4	42.6	32.8
Iron					35500	36700	35300	21300	26700	38100	30800	23100	32000	27600
Lead†	35	25.3	36.5	35	17.5	15.6	15	6.61	13.6	15.7	14.2	11.7	15.3	12
Lithium					27.5	23.4	25.6	21.6	26.8	25.5	25.9	22.8	30.4	25.6
Magnesium					9020	8100	8300	5840	7740	9100	8750	6800	8690	7930
Manganese					529	507	576	281	335	1300	388	356	568	579
Mercury	0.17	0.102	0.120	0.17	0.0241	0.0191	0.0219	*<0.0050*	0.0139	0.0219	0.0184	0.0143	0.0199	0.0139
Molybdenum					4.02	3.4	3.29	2.61	2.06	3.52	2.83	1.75	2.4	1.97
Nickel					69.1	58.3	66.9	38.2	56.2	79.6	65.8	45.3	60.5	55.9
Phosphorus					628	599	643	230	582	535	583	342	456	373
Potassium					2650	2250	2380	1520	2330	2290	2300	1970	2690	2180
Selenium					0.66	0.56	0.58	*<0.20*	0.51	0.51	0.47	0.32	0.39	0.28
Silver					0.21	0.15	0.2	*<0.10*	0.15	0.2	0.16	*<0.10*	0.13	0.11
Sodium					141	129	125	65	113	145	118	103	127	107
Strontium					18.1	14.4	17.3	8.49	14.4	16.1	16.1	12.6	16.3	15.2
Thallium					0.208	0.175	0.174	0.105	0.177	0.185	0.185	0.135	0.197	0.162
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					472	418	463	417	444	422	443	404	538	468
Uranium					14.5	11.7	11.8	6.03	12.2	11.3	10.9	9.54	12.5	9.16
Vanadium					34.9	30.3	31.5	19.9	30.6	31.7	32.3	25	32.2	27.4
Zinc*	123	114.2	142.1		84.4	70.5	73.5	47.7	69.6	73.5	73.4	55.7	74.3	62.6

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–9. Sediment core chemistry, Meadowbank study lakes, 2017.

Lake & Basin	Screening Criteria				Second Portage Lake									
					SP									
Area-Replicate ID	**CCME[1]**	**Trigger Values[2]**		**Threshold**	**SC-1**	**SC-2**	**SC-3**	**SC-4**	**SC-5**	**SC-6**	**SC-7**	**SC-8**	**SC-9**	**SC-10**
Date	**ISQG**	MBK	WAL	**Values**	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17
Physical & Organic Parameters														
Moisture (%)					85.8	84	87.1	86.6	84.3	85.2	85.6	85.7	83.8	84.2
pH					6.24	6.24	6.2	6.06	6.2	6.32	6.26	6.23	6.25	6.44
TOC (% dw)					4.94	4.09	4.87	4.36	4.05	4.38	4.76	4.33	4.28	4.23
Total Metals (mg/kg dw)														
Aluminum					20800	20800	21200	21300	21900	20600	22400	22500	26600	28100
Antimony					0.32	0.26	0.29	0.27	0.26	0.31	0.29	0.27	0.30	0.31
Arsenic*	5.9	120.9	44.5		33	31.4	27	33.4	27.1	47.6	29.9	31.8	37.6	32.1
Barium					113	114	105	110	113	105	115	118	124	141
Beryllium					1.6	1.72	1.68	1.68	1.82	1.68	1.73	1.75	1.89	1.95
Bismuth					1.84	1.96	1.93	1.93	2.04	1.88	1.97	2.01	2.15	2.26
Boron					7.8	6.5	7.7	8	7.9	7.8	8.3	8.2	9.1	9.6
Cadmium*	0.6	1.10	0.66		0.34	0.25	0.244	0.16	0.228	0.205	0.219	0.239	0.193	0.292
Calcium					2430	2300	2480	2150	2290	2360	2580	2370	2580	2620
Chromium*	37.3	135.0	61.2		96.2	81	90.6	78.4	81.4	81.5	108	95.5	96.6	107
Cobalt					16.1	14.3	14.3	14.8	14	13.70	15.6	14.1	15.9	18.9
Copper*	35.7	83.4	257.1		62.4	63.2	60.4	61.9	64	61	61.8	63.3	71	75.7
Iron					57600	60800	48800	67100	62300	75200	51900	66700	72700	67400
Lead†	35	25.3	36.5	35	20	19.6	20.3	19.2	20.0	19.1	20.2	19.9	21.8	22.4
Lithium					34.8	36.8	36.7	36.4	37.6	34.3	37.5	37.6	42.6	44.2
Magnesium					8780	8360	8710	8350	8400	8100	9420	8970	10400	10900
Manganese					5350	4040	2320	3030	2220	3750	3090	3080	3040	3950
Mercury	0.17	0.102	0.120	0.17	0.0462	0.0292	0.0347	0.0326	0.0285	0.035	0.0356	0.0325	0.0358	0.0376
Molybdenum					6.44	6.15	4.97	5.89	5.56	7.95	5.01	5.95	6.21	5.8
Nickel					77.9	65.1	67.2	55.7	60.4	56.9	73.4	64.8	66.2	81
Phosphorus					615	471	562	511	491	547	562	500	562	610
Potassium					3670	3560	3660	3810	3850	3580	3850	3900	4710	4950
Selenium					0.7	0.65	0.52	0.65	0.55	0.77	0.61	0.63	0.62	0.63
Silver					0.27	0.15	0.17	0.16	0.14	0.19	0.18	0.19	0.17	0.16
Sodium					175	158	176	194	173	161	183	183	204	208
Strontium					20.8	19.4	20.4	18.8	19.4	20	21.5	20.8	21.7	22.8
Thallium					0.318	0.32	0.315	0.303	0.33	0.293	0.324	0.334	0.347	0.384
Tin					2.2	*<2.0*	2.7	*<2.0*	2.2	*<2.0*	2.9	2.9	3.2	2.1
Titanium					625	592	642	667	666	610	637	637	753	780
Uranium					15.1	16.9	16.5	16.1	18	15.8	16.5	17.1	17.8	18.3
Vanadium					35.5	35.2	36	35.4	36.2	34.1	37.6	36.9	42.4	44.6
Zinc*	123	114.2	142.1		102	102	102	97.5	105	95.3	102	104	**120**	**129**

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–9. Sediment core chemistry, Meadowbank study lakes, 2017.

Lake & Basin	Screening Criteria				Wally Lake WAL									
Area-Replicate ID	CCME[1]	Trigger Values[2]		Threshold	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date	ISQG	MBK	WAL	Values	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17
Physical & Organic Parameters														
Moisture (%)					89.3	89.7	89.1	89.6	90.7	91.1	91.2	90.0	90.2	89.1
pH					6.66	6.39	6.84	6.66	6.5	6.53	6.76	6.7	6.27	6.43
TOC (% dw)					8.91	8.69	9.37	8.74	9.01	9.34	9.4	8.93	9.43	9.82
Total Metals (mg/kg dw)														
Aluminum					21100	21700	19600	21300	22600	21600	23500	24100	20400	19700
Antimony					0.5	0.53	0.5	0.48	0.47	0.49	0.52	0.51	0.48	0.52
Arsenic*	5.9	120.9	44.5		**48.1**	**51.5**	**54.8**	**55.5**	**91.4**	**67.2**	**70.7**	**67.9**	**57.7**	**53**
Barium					110	112	107	119	131	125	125	137	103	113
Beryllium					1.72	1.75	1.63	1.67	1.69	1.77	1.9	1.92	1.55	1.44
Bismuth					1.97	2.08	1.99	2.17	2.19	2.28	2.35	2.38	1.98	1.92
Boron					12.6	12	10.5	9	10.6	11.4	12.5	12.1	11.5	11.9
Cadmium*	0.6	1.10	0.66		0.443	0.442	0.452	0.441	0.553	0.49	0.463	0.513	0.442	0.464
Calcium					4810	4290	4550	4230	4300	4640	5240	4800	4910	5020
Chromium*	37.3	135.0	61.2		**61.4**	**63.9**	58.3	**61.7**	**63.9**	**61.5**	**65.3**	**66.9**	58.3	57
Cobalt					10.5	10.7	10.1	10.9	12.4	10.50	11.2	11.5	10.7	10.7
Copper*	35.7	83.4	257.1		140	147	144	152	172	161	165	169	134	131
Iron					43700	45000	45700	47800	59000	52000	56500	53200	43100	43700
Lead†	35	25.3	36.5	35	33.6	34.2	33.8	36.5	**36.7**	**39.3**	**41.2**	**40.3**	35.2	34.4
Lithium					36.4	37.8	34.8	34.7	33.8	34.2	36.5	36.8	33.4	32
Magnesium					7920	8030	7330	8100	8210	7750	8570	8710	8000	7790
Manganese					532	623	596	703	824	483	633	566	412	466
Mercury	0.17	0.102	0.120	0.17	0.0695	0.0656	0.0734	0.0597	0.0695	0.0757	0.0743	0.0682	0.0744	0.0752
Molybdenum					10.4	10.6	11.8	11.6	13.10	14.4	14.2	12.9	11.1	9.44
Nickel					57.8	59.2	55.4	59	64.5	59	62.3	63.2	57.4	56.8
Phosphorus					871	869	793	758	887	823	945	951	993	934
Potassium					3580	3780	3250	3610	3810	3640	4020	4170	3580	3520
Selenium					0.83	0.92	0.83	0.87	1.06	1.03	0.98	0.98	0.85	0.84
Silver					0.53	0.55	0.58	0.55	0.69	0.65	0.61	0.66	0.53	0.52
Sodium					207	238	176	178	199	188	206	215	192	190
Strontium					32.7	30.2	30.2	28.9	29.4	30.8	34.3	32.4	32.3	32.6
Thallium					0.308	0.323	0.295	0.323	0.341	0.354	0.351	0.378	0.323	0.308
Tin					3.1	3.5	2.1	4	2.4	2.2	2.3	2.1	2.3	2.4
Titanium					618	754	471	521	585	564	610	643	593	588
Uranium					15.9	16.4	16.0	17	18.4	19.1	18.5	19.1	15.8	14.8
Vanadium					33	34.2	31	33.4	34.7	33.8	36.3	37.2	31.4	31.5
Zinc*	123	114.2	142.1		125	126	122	128	136	130	140	**144**	129	121

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–9. Sediment core chemistry, Meadowbank study lakes, 2017.

Lake & Basin	**Screening Criteria**				**Inuggugayualik Lake INUG**									
Area-Replicate ID	**CCME[1]**	**Trigger Values[2]**		**Threshold**	**SC-1**	**SC-2**	**SC-3**	**SC-4**	**SC-5**	**SC-6**	**SC-7**	**SC-8**	**SC-9**	**SC-10**
Date	**ISQG**	MBK	WAL	**Values**	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17
Physical & Organic Parameters														
Moisture (%)					83.7	82.9	84.2	84.4	84.3	85.9	86.7	85.9	84.7	84.3
pH					5.61	5.6	5.83	5.7	5.66	5.23	5.35	5.41	5.62	5.68
TOC (% dw)					4.52	4.2	4.76	5.27	4.99	6	5.89	5.82	4.49	5.01
Total Metals (mg/kg dw)														
Aluminum					19200	24800	22000	17600	22300	17600	17900	20500	19100	19900
Antimony					0.19	0.23	0.25	0.25	0.26	0.25	0.25	0.24	0.22	0.23
Arsenic*	5.9	120.9	44.5		117	18.1	39.2	39.4	50.3	88.6	115	35.5	**186**	117
Barium					109	134	144	122	138	123	119	126	118	117
Beryllium					1.19	1.54	1.38	1.13	1.4	1.21	1.17	1.32	1.24	1.29
Bismuth					1.12	1.45	1.28	1.08	1.26	1.07	1.11	1.25	1.16	1.2
Boron					6.6	8.6	8.2	6.9	8.3	7.8	7.7	8	6.1	8
Cadmium*	0.6	1.10	0.66		0.163	0.235	0.359	0.268	0.364	0.326	0.273	0.308	0.23	0.252
Calcium					1820	2270	1910	1830	2530	1940	2170	2310	1900	2130
Chromium*	37.3	135.0	61.2		95.8	124	108	89.5	112	88.6	90.7	104	97.9	99.5
Cobalt					16.6	15.9	26.6	20.3	17.6	16.60	18.6	14.8	17	13
Copper*	35.7	83.4	257.1		42.8	55.2	49.7	41.8	51.1	44.8	42.8	48.9	45.1	47.3
Iron					104000	55700	83100	87700	82100	130000	107000	73000	141000	125000
Lead[†]	35	25.3	36.5	35	13.9	18	16.7	15.1	16.1	15.7	15.3	17.6	14.3	15.2
Lithium					22.2	29.6	25	20.2	24.9	19.4	20.4	24	22.2	22.4
Magnesium					8510	10900	9420	7510	9700	7620	7790	8940	8510	8560
Manganese					2800	1380	4190	3860	2160	2080	2640	990	2650	1400
Mercury	0.17	0.102	0.120	0.17	0.0291	0.0332	0.0345	0.0382	0.0385	0.05	0.0448	0.0475	0.034	0.0353
Molybdenum					9.6	3.12	6.09	5.1	4.97	6.81	6.36	4.52	9.96	8.62
Nickel					77.1	97.6	117	93	102	86.1	94	90.3	83.4	75.6
Phosphorus					1700	1360	878	1300	1820	2990	3240	1510	3950	2680
Potassium					2990	3950	3540	2860	3650	2890	3000	3250	3010	3170
Selenium					0.65	0.68	0.77	0.68	0.83	0.84	0.8	0.78	0.73	0.77
Silver					0.13	0.2	0.16	0.16	0.22	0.2	0.18	0.22	0.18	0.2
Sodium					167	187	163	136	188	148	171	163	166	163
Strontium					22	27.2	24	21.6	26.8	22	24.3	24.3	21.8	24.3
Thallium					0.2	0.256	0.278	0.207	0.258	0.195	0.207	0.213	0.205	0.198
Tin					2.5	2.1	*<2.0*	2.1	*<2.0*	2.5	2	2.4	2.9	*<2.0*
Titanium					462	612	544	429	586	426	435	472	402	539
Uranium					13.9	18.7	16.6	13.6	17	14.9	14.5	16.9	14.8	15.4
Vanadium					32.1	42	36.6	29.9	37.1	29.9	30.5	34.9	32.5	33.5
Zinc*	123	114.2	142.1		84	102	98.2	81.9	103	87.1	84.9	94.1	88.6	92.7

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–9. Sediment core chemistry, Meadowbank study lakes, 2017.

Lake & Basin	**Screening Criteria**				**Pipedream Lake**									
					PDL									
Area-Replicate ID	**CCME[1]**	**Trigger Values[2]**		**Threshold**	**SC-1**	**SC-2**	**SC-3**	**SC-4**	**SC-5**	**SC-6**	**SC-7**	**SC-8**	**SC-9**	**SC-10**
Date	**ISQG**	MBK	WAL	**Values**	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17
Physical & Organic Parameters														
Moisture (%)					81.3	83.7	87.7	80.3	79.5	81.4	79.6	86.8	72.5	81.3
pH					6.36	5.92	5.23	6.18	6.5	6.22	6.13	5.37	6.25	6.31
TOC (% dw)					3.05	3.55	6.09	3.16	2.7	2.88	2.48	5.19	1.86	3.01
Total Metals (mg/kg dw)														
Aluminum					21300	20100	17400	22100	19400	17500	16500	16200	19900	20500
Antimony					0.32	0.25	0.3	0.33	0.3	0.3	0.28	0.29	0.26	0.32
Arsenic*	5.9	120.9	44.5		39.4	11.4	29.4	39.2	32.1	36.9	30.4	18.6	41.6	36.8
Barium					86.4	102	81.6	91	78.8	83	77.8	72.1	79.3	83.6
Beryllium					1.11	0.96	0.92	1.18	1	0.91	0.83	0.92	1.03	1.1
Bismuth					1.06	0.83	0.79	1.12	0.93	0.82	0.77	0.74	1.01	1.04
Boron					7.6	7.2	9.4	7.7	7	6.5	5.7	7.2	5.4	7
Cadmium*	0.6	1.10	0.66		0.146	0.248	0.286	0.136	0.105	0.175	0.141	0.254	0.239	0.157
Calcium					2200	2510	2250	2490	2310	2320	2170	2430	1800	2320
Chromium*	37.3	135.0	61.2		**143**	134	117	**148**	135	118	111	110	128	**139**
Cobalt					18.2	11.5	12.2	17.3	14.5	16.40	14.6	11	21.9	17.9
Copper*	35.7	83.4	257.1		57	46.9	47	54.9	47.4	42	37.6	43.1	52.5	54.9
Iron					43200	28700	33600	44600	38100	39600	36500	28100	41000	41800
Lead[†]	35	25.3	36.5	35	16.7	14.8	15.4	18.1	15.1	14.4	13.4	14.7	15.3	16.4
Lithium					28.3	27.7	24.1	29.5	25.4	23.0	21.7	22.7	27.2	27.2
Magnesium					11100	11100	9670	11800	10100	9410	9160	8820	10200	10700
Manganese					1250	314	306	1050	777	3200	2650	273	2480	1540
Mercury	0.17	0.102	0.120	0.17	0.0159	0.0184	0.0247	0.0178	0.0168	0.0213	0.0182	0.025	0.0139	0.0167
Molybdenum					3.09	1.6	3.11	3.24	3.23	3	2.64	2.9	3.81	3
Nickel					93.7	88.1	93.8	91.9	80.4	92.4	75.8	86.2	104	95
Phosphorus					569	572	649	601	548	584	551	556	427	561
Potassium					2900	2800	2480	3040	2810	2590	2420	2400	2660	2950
Selenium					0.39	0.43	0.45	0.48	0.32	0.5	0.4	0.44	0.24	0.36
Silver					*<0.10*	0.24	0.24	0.11	*<0.10*	0.15	0.14	0.23	*<0.10*	*<0.10*
Sodium					118	112	108	121	113	111	98	101	84	111
Strontium					21.8	21.9	20.1	24.2	22.4	22.5	20.6	20.2	18.4	22.4
Thallium					0.211	0.186	0.184	0.22	0.179	0.174	0.167	0.175	0.201	0.202
Tin					*<2.0*	2.5	2.4	2.9	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					482	570	451	512	501	487	491	471	532	473
Uranium					10.5	7.69	7.9	10.3	8.47	7.36	6.75	7.2	10.5	10.3
Vanadium					38.3	35.8	32	40.1	35.4	32.8	31.5	30.6	37.8	37.3
Zinc*	123	114.2	142.1		86.3	84.8	84	90.2	75	71.6	67.3	75.3	83.3	82.8

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–10. Sediment grab chemistry, Meadowbank study lakes, 2017.

Lake & Basin	Screening Criteria				Third Portage Lake										Second Portage Lake				
					East Basin					North Basin									
Area-Replicate ID	**CCME**[1]	**Trigger Values**[2]		**Threshold**	**TPE-1**	**TPE-2**	**TPE-3**	**TPE-4**	**TPE-5**	**TPN-1**	**TPN-2**	**TPN-3**	**TPN-4**	**TPN-5**	**SP-1**	**SP-2**	**SP-3**	**SP-4**	**SP-5**
Date	ISQG	MBK	WAL	**Values**[3]	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17
Physical & Organic Parameters																			
Moisture (%)					84.7	84.7	87.5	86.4	87.4	86.6	83.4	72.9	42.2	62.3	85.3	85.0	85.5	85.9	85.5
pH					6.19	6.19	6.34	6.35	6.62	6.06	6	6.25	6.33	6.2	6.15	5.99	6.20	6.38	6.22
TOC (% dw)					3.57	3.4	4.29	3.96	4.21	4.59	3.35	1.72	0.529	1.05	3.96	3.69	4.04	4.01	3.9
Particle Size																			
% Gravel (>2mm)					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	14	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)					4.8	5.6	*<1.0*	*<1.0*	*<1.0*	11.5	18.3	42.5	53.1	40.7	1.9	1.8	1.7	1.4	*<1.0*
% Silt (0.063mm - 4µm)					66.6	64.4	72.5	71.1	71.8	68.9	63.9	42.8	21.6	37.8	74.4	70.6	69.2	69.1	70.4
% Clay (<4µm)					28.5	30.1	26.6	28.2	27.4	19.7	17.9	14.7	11.4	21.5	23.7	27.6	29.2	29.5	28.9
Total Metals (mg/kg dw)																			
Aluminum					25300	26200	24500	23900	23400	18100	16700	9020	13800	18700	23100	23300	25400	24300	24600
Antimony					0.26	0.27	0.29	0.27	0.28	0.26	0.25	*<0.10*	*<0.10*	0.15	0.26	0.23	0.26	0.27	0.26
Arsenic*	5.9	120.9	44.5		21.3	21.7	22.2	20.1	23.9	17.1	14.5	7.04	7.87	20.1	26.6	25.0	27.2	30.7	27.5
Barium					112	117	113	113	103	79.9	71.4	36.7	54.9	79	122	107	123	124	121
Beryllium					1.83	1.94	1.72	1.7	1.55	1.22	1.15	0.5	0.75	1.15	1.89	1.85	2.08	1.96	2
Bismuth					2.4	2.6	2.3	2.25	2.1	1.23	1.14	0.54	0.69	1.11	2.12	2.16	2.33	2.2	2.3
Boron					8.9	9.4	8.5	7.8	7.1	7.7	6.7	*<5.0*	*<5.0*	5.8	8.6	8.60	9.7	8.9	8.8
Cadmium*	0.6	1.10	0.66		0.136	0.176	0.319	0.289	0.23	0.197	0.246	0.045	0.039	0.079	0.28	0.171	0.307	0.277	0.238
Calcium					2210	2240	2560	2460	2530	2130	1710	792	1120	1340	2400	1980	2270	2230	2200
Chromium*	37.3	135.0	61.2		**155**	**141**	**179**	**152**	**215**	127	109	54.8	76.4	106	80.2	73.1	78.8	82.9	80.9
Cobalt					16.3	17.1	17.8	16.6	18.7	11.60	11.1	6.54	7.35	12.8	13.5	12.5	16.6	16.6	16.4
Copper*	35.7	83.4	257.1		52.3	57.3	52.1	50.5	47.7	58.2	51.8	22	26.5	45.6	66.5	65.8	78.1	72.9	71.8
Iron					46500	50400	46400	44800	48100	32600	30100	15500	22600	38000	60200	54600	53800	62400	63300
Lead	35	25.3	36.5	35	21.2	22.9	22.1	21.1	20.6	17.9	16	7.42	9.03	14.4	20.7	19.7	22	20.8	21.7
Lithium					46.6	48.1	42.8	42.5	40.4	28.3	26.4	16.7	26.9	33.1	37.5	39	42.9	39.2	41
Magnesium					11100	10800	11500	10600	12400	8610	7820	4300	6850	8690	8770	8390	8970	8930	8970
Manganese					1350	1610	2060	1950	1840	465	305	298	306	619	1590	990	2700	2200	1690
Mercury	0.17	0.102	0.120	0.17	0.0176	0.0169	0.0226	0.0204	0.0219	0.0225	0.0175	0.0058	*<0.0050*	0.0061	0.0292	0.0229	0.0293	0.0274	0.0261
Molybdenum					3.95	4.92	4.11	3.81	3.78	3.42	2.41	1.44	1.03	2.22	6.24	5.5	6.07	6.17	6.01
Nickel					74.9	75.2	105	99.7	102	67.5	63.2	29.7	41.7	56.2	62.9	51.1	68.9	70.9	62.1
Phosphorus					451	442	506	459	474	652	721	205	220	517	490	458	540	547	530
Potassium					4520	4810	4200	4200	3810	2730	2560	1470	2160	2990	4230	4230	4640	4400	4420
Selenium					0.54	0.47	0.84	0.76	0.67	0.72	0.5	*<0.20*	*<0.20*	*<0.20*	0.63	0.44	0.48	0.61	0.61
Silver					*<0.10*	*<0.10*	0.13	0.11	0.18	0.22	0.14	*<0.10*	*<0.10*	*<0.10*	0.17	*<0.10*	*<0.10*	0.12	0.12
Sodium					179	186	191	183	181	135	126	65	82	114	193	173	178	184	199
Strontium					19.1	19.7	20.2	19.2	19.1	17.7	15.5	8.1	12	14.1	20.3	18.4	20.4	19.8	20
Thallium					0.376	0.407	0.41	0.411	0.342	0.217	0.216	0.101	0.151	0.221	0.361	0.339	0.404	0.37	0.368
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					897	999	814	818	732	498	529	346	547	673	795	761	801	721	755
Uranium					17.1	19.7	15.6	15	13.5	15.5	14.8	6.9	8.61	15.4	18	19.1	21.5	19.7	20.1
Vanadium					45.2	46.7	44.3	42.1	44.3	34.8	31.3	16.9	24.4	34	38.2	37.4	40.2	38.6	39.5
Zinc*	123	114.2	142.1		106	112	107	105	101	84.2	81.5	38.9	59.5	76	113	103	**118**	114	113

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–10. Sediment grab chemistry, Meadowbank study lakes, 2017.

Lake & Basin	**Screening Criteria**				**Wally Lake**					**Inuggugayualik Lake**					**Pipedream Lake**				
Area-Replicate ID	**CCME[1]**	**Trigger Values[2]**		**Threshold**	**WAL-1**	**WAL-2**	**WAL-3**	**WAL-4**	**WAL-5**	**INUG-1**	**INUG-2**	**INUG-3**	**INUG-4**	**INUG-5**	**PDL-1**	**PDL-2**	**PDL-3**	**PDL-4**	**PDL-5**
Date	ISQG	MBK	WAL	**Values[3]**	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17
Physical & Organic Parameters																			
Moisture (%)					89.9	89.5	90.3	89.9	89.1	85.3	83.3	84.1	85.3	85.8	81.8	84.1	85.7	80.8	79.2
pH					6.66	6.8	6.83	6.78	6.59	6.02	6.34	6.08	5.93	5.7	6.21	5.94	5.62	6.21	6.29
TOC (% dw)					7.48	7.52	8.1	7.15	7.86	6.02	6.34	6.08	5.93	5.7	6.21	5.94	5.62	6.21	6.29
Particle Size																			
% Gravel (>2mm)					*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)					4.7	*<1.0*	1.1	2.1	3.2	4	6.9	4.3	3.5	2.8	2.8	9	7.7	6.6	7.1
% Silt (0.063mm - 4µm)					78.5	79.3	76.6	76.1	80.8	74.1	68.6	69.8	67.8	68.5	77.2	72.3	74	73.4	75.1
% Clay (<4µm)					16.8	19.80	22.3	21.8	16.1	22	24.5	25.9	28.8	28.7	20.0	18.8	18.3	20	17.7
Total Metals (mg/kg dw)																			
Aluminum					19900	20800	21100	21400	18000	17600	19300	20500	19500	19800	20600	17900	15900	17300	18200
Antimony					0.42	0.42	0.43	0.38	0.38	0.21	0.19	0.18	0.19	0.21	0.29	0.23	0.24	0.25	0.26
Arsenic*	5.9	120.9	44.5		31.2	31.3	44.7	26.8	40.4	25	22	14.6	41.7	23.3	38.1	8.74	12.6	32.9	34.3
Barium					116	120	122	114	91.4	96.6	95.8	126	117	126	85.5	94.6	79	72.2	77
Beryllium					1.59	1.68	1.69	1.67	1.43	1.19	1.24	1.33	1.28	1.29	1.05	0.87	0.81	0.94	0.93
Bismuth					1.99	2.14	2.15	2.17	1.79	1.1	1.12	1.17	1.13	1.14	1.02	0.72	0.69	0.90	0.9
Boron					10	8.8	11	9.5	10.4	6.4	7	8.2	8.2	9	7.9	6.7	7	5.30	6
Cadmium*	0.6	1.10	0.66		0.472	0.453	0.467	0.401	0.368	0.169	0.203	0.285	0.255	0.329	0.135	0.269	0.255	0.115	0.164
Calcium					4120	3950	4050	3770	3900	1640	1620	2110	2020	2000	2130	2270	2040	1770	1860
Chromium*	37.3	135.0	61.2		57.6	60.8	58.4	57.9	53.7	93.2	101	102	96.2	99.3	**139**	118	106	121	125
Cobalt					9.09	8.91	9.44	8.83	9.18	14.6	17.6	13.3	12.5	14	17.5	10.3	9.81	16	16.7
Copper*	35.7	83.4	257.1		**133**	**147**	**155**	**146**	**117**	43.2	44.6	45.2	45.1	45.8	53.1	42.5	39.8	44.9	45.5
Iron					33400	33700	39600	31500	32400	59000	48900	39700	59900	50800	39900	23000	22700	35600	37200
Lead	35	25.3	36.5	35	**32.3**	**33.5**	**34.8**	**33**	**29.2**	13.6	12.2	14.1	13.5	14	15.3	12.6	12.5	13.7	13.9
Lithium					34.7	35.2	35.4	37.6	32.1	22.6	24.6	25.6	23.4	24.3	27.7	26.0	23	25.2	26
Magnesium					7570	7750	7500	7770	7150	7910	8430	8880	8390	8520	10500	9650	8590	9140	9730
Manganese					368	365	382	318	319	1620	2180	1090	1110	954	1080	270	253	1090	1210
Mercury	0.17	0.102	0.120	0.17	0.0539	0.0449	0.0611	0.0453	0.0558	0.0315	0.0244	0.036	0.0315	0.0347	0.0142	0.0112	0.0195	0.0124	0.0129
Molybdenum					7.66	8.54	11.5	8.63	7.82	3.81	4.15	2.72	4.02	3.8	2.87	1.36	1.91	2.62	2.82
Nickel					52.6	54.6	55.4	54.8	48.2	72.2	73.5	88.4	78.5	91.3	89.4	78	75	75.9	86.6
Phosphorus					694	649	746	616	730	1250	635	1030	1620	1370	558	467	472	445	482
Potassium					3460	3560	3670	3740	3190	2830	3220	3420	3380	3440	3050	2600	2330	2410	2590
Selenium					0.73	0.77	0.86	0.67	0.7	0.57	0.51	0.55	0.61	0.59	0.31	0.31	0.42	0.23	0.26
Silver					0.51	0.54	0.61	0.49	0.48	0.15	*<0.10*	0.18	0.2	0.22	*<0.10*	0.21	0.23	*<0.10*	*<0.10*
Sodium					196	191	182	172	166	131	135	163	162	170	113	99	107	79	85
Strontium					28.1	26.6	28	27.1	25.7	19.6	21.1	24.9	23.8	24.6	22.2	21.1	18.6	17	19.3
Thallium					0.305	0.318	0.324	0.311	0.292	0.178	0.243	0.229	0.208	0.232	0.195	0.166	0.159	0.17	0.178
Tin					*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium					625	599	572	622	578	431	520	577	558	586	503	537	471	373	462
Uranium					15	16.0	16.9	16.6	14.2	14	15.4	15.1	14.4	15.3	9.5	6.95	6.51	8.23	8.24
Vanadium					31	32.7	33.6	33.7	29.1	31.8	33.7	35.3	33.8	34.5	38.7	32.7	29.7	33.1	34.8
Zinc*	123	114.2	142.1		**115**	**116**	**125**	**122**	114	80.5	82	90.1	92.6	97.2	85.8	79.8	75.1	74	77.5

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.2–11. Hydrocarbon and PAH results for composite sediment grabs at Meadowbank study lakes, 2017.

Lake	**CCME (2002) Guidelines[1]**	**Third Portage Lake**		**Second Portage**	**Wally**	**Inuggugayualik**	**Pipedream**
Area ID		**TPE**	**TPN**	**SP**	**WAL**	**INUG**	**PDL**
Date	**ISQG**	23-Aug-17	27-Aug-17	22-Aug-17	26-Aug-17	25-Aug-17	24-Aug-17
Physical Parameters							
Moisture (%)		86.9	64.3	85.5	89.2	84.9	81.2
Aggregate Organics (mg/kg)							
Mineral Oil and Grease		2730	*<500*	*<500*	550	1380	1280
Hydrocarbons (mg/kg)							
EPH10-19		*<700*	*<240*	*<700*	*<840*	*<600*	*<480*
EPH19-32		*<700*	*<240*	*<700*	*<840*	*<600*	*<480*
LEPH		*<700*	*<240*	*<700*	*<840*	*<600*	*<480*
HEPH		*<700*	*<240*	*<700*	*<840*	*<600*	*<480*
Polycyclic Aromatic Hydrocarbons (mg/kg)							
Acenaphthene	0.00671	*<0.010*	*<0.0050*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Acenaphthylene	0.00587	*<0.010*	*<0.0050*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Anthracene	0.0469	*<0.010*	*<0.0040*	*<0.0080*	*<0.010*	*<0.010*	*<0.010*
Benzo(a)anthracene	0.0317	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Benzo(a)pyrene	0.0319	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Benzo(b)fluoranthene		*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Benzo(b+j+k)fluoranthene		*<0.015*	*<0.015*	*<0.028*	*<0.015*	*<0.015*	*<0.015*
Benzo(g,h,i)perylene		*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Benzo(k)fluoranthene		*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Chrysene	0.0571	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Dibenz(a,h)anthracene	0.00622	*<0.010*	*<0.0050*	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Fluoranthene	0.111	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Fluorene	0.0212	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Indeno(1,2,3-c,d)pyrene		*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
2-Methylnaphthalene	0.0202	*<0.020*	*<0.010*	*<0.020*	*<0.020*	*<0.020*	*<0.010*
Naphthalene	0.0346	*<0.030*	*<0.010*	*<0.020*	*<0.030*	*<0.020*	*<0.020*
Phenanthrene	0.0419	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
Pyrene	0.053	*<0.010*	*<0.010*	*<0.020*	*<0.010*	*<0.010*	*<0.010*
d10-Acenaphthene (%)		79.5	85.7	103.1	81.9	83.3	89.5
d12-Chrysene (%)		087.6	093.0	92.9	094.1	97.0	099.8
d8-Naphthalene (%)		78.5	85.8	98.2	81.5	82.3	87.6
d10-Phenanthrene (%)		87.1	91.5	98.3	089.7	93.0	097.0
B(a)P Total Potency Equivalent		*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*
IACR (CCME)		*<0.15*	*<0.15*	*<0.21*	*<0.15*	*<0.15*	*<0.15*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Table 3.2-12. Results of the before-after statistical analysis of sediment core chemistry data at Meadowbank study lakes, 2017.

Third Portage - East Basin			Wally Lake		
Parameter	**Trigger**	**Mean**	**Parameter**	**Trigger**	**Mean**
Arsenic	120.9		Arsenic	44.5	61.78
Cadmium	1.10		Cadmium	0.66	
Chromium	135.0	204.5	Chromium	61.2	61.82
Copper	83.4		Copper	257.1	
Lead	25.3		Lead	36.5	36.52
Mercury	0.102		Mercury	0.12	
Zinc	114.2		Zinc	142.1	

Notes:
Mean concentration (mg/kg dw) of 10 replicate samples.
Blank cells indicate the trigger value was not exceeded in 2017.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value[1]	Proportional change		
							exp(Est)	**LCI**	**UCI**
Chromium	TPE	30	10	0.899	0.055	**0.000**	2.46	2.20	2.74
Arsenic	WAL	20	10	0.746	0.106	**0.000**	2.11	1.70	2.62
Chromium	WAL	20	10	0.210	0.060	**0.001**	1.23	1.09	1.39
Lead	WAL	20	10	0.113	0.033	**0.001**	1.12	1.05	1.20

Notes:
1. **Bolded** values are p-values < 0.05
Test area in 2017 compared to the before period
n(B) = number of paired months in the "before" period
n(A) = number of paired months in the "after" period (i.e., in 2017)
Estimate = BA model estimate of the 2017 change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis of no change or a decrease in mean concentration
Exp(Est.) = estimated proportional change
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 3.2-53. Sediment grain size composition in sediment samples from Meadowbank study lakes since 2008.

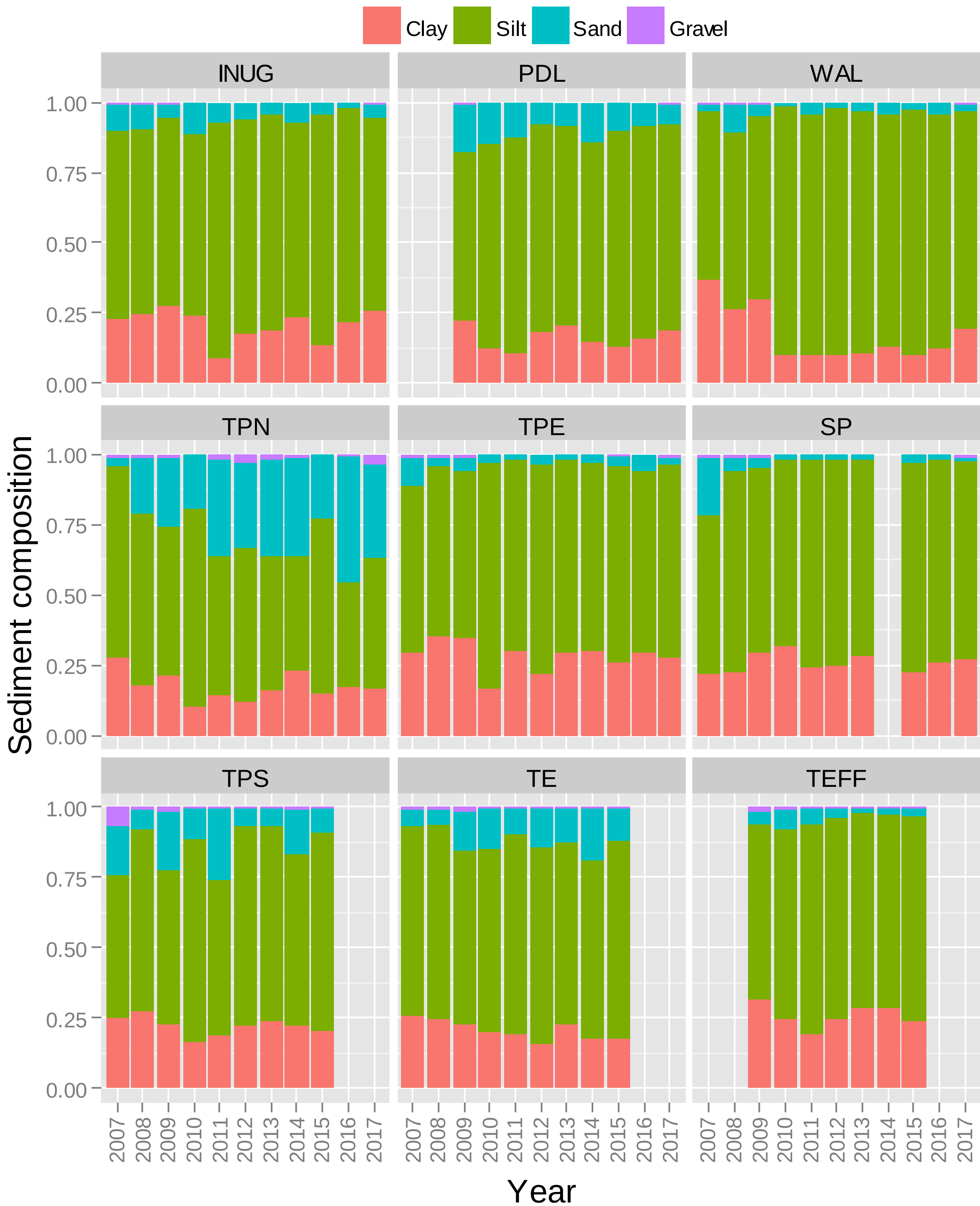


Figure 3.2-54. Total Aluminum (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: Grab samples = dots; Core samples = box and whisker

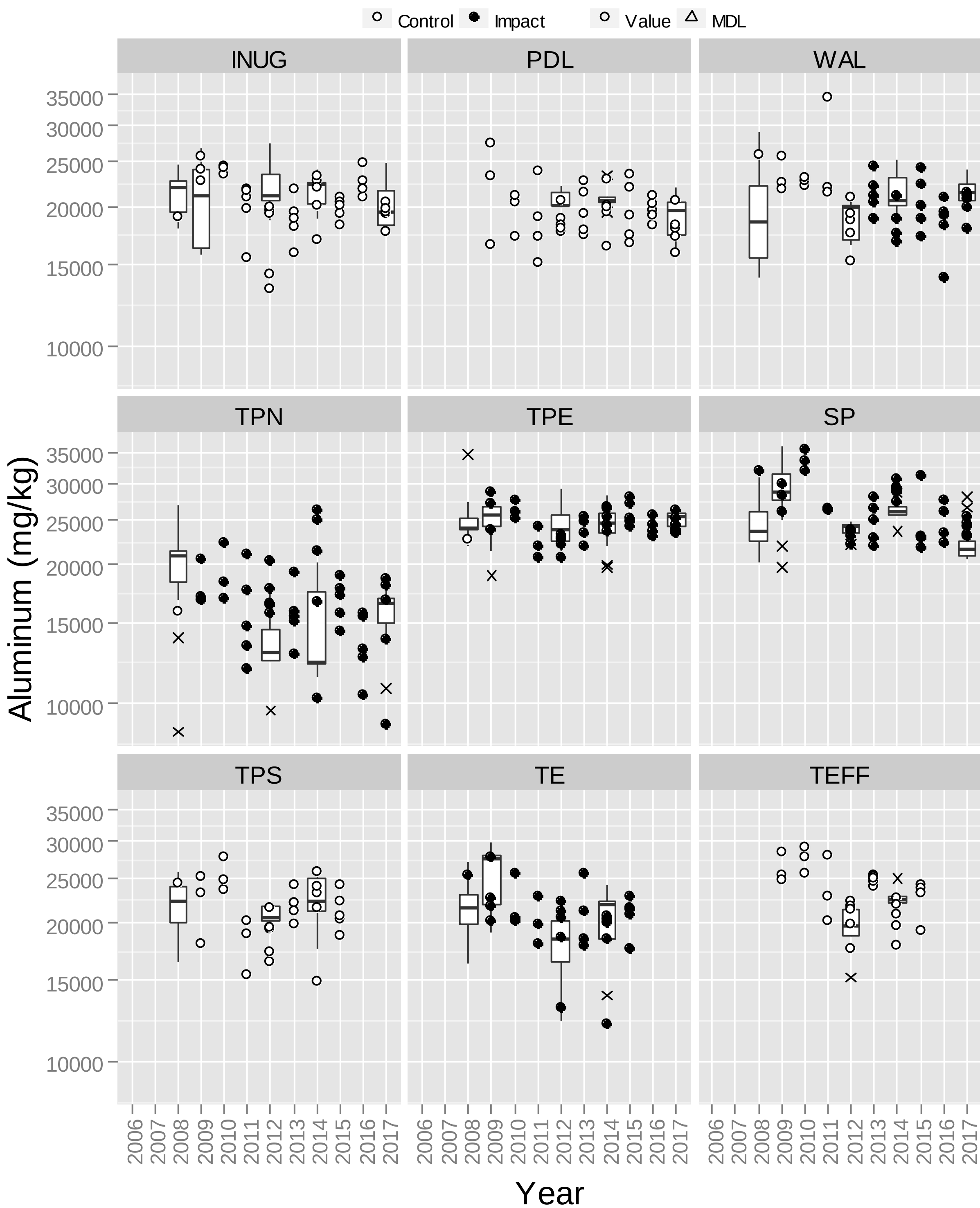


Figure 3.2-55. Total Arsenic (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.

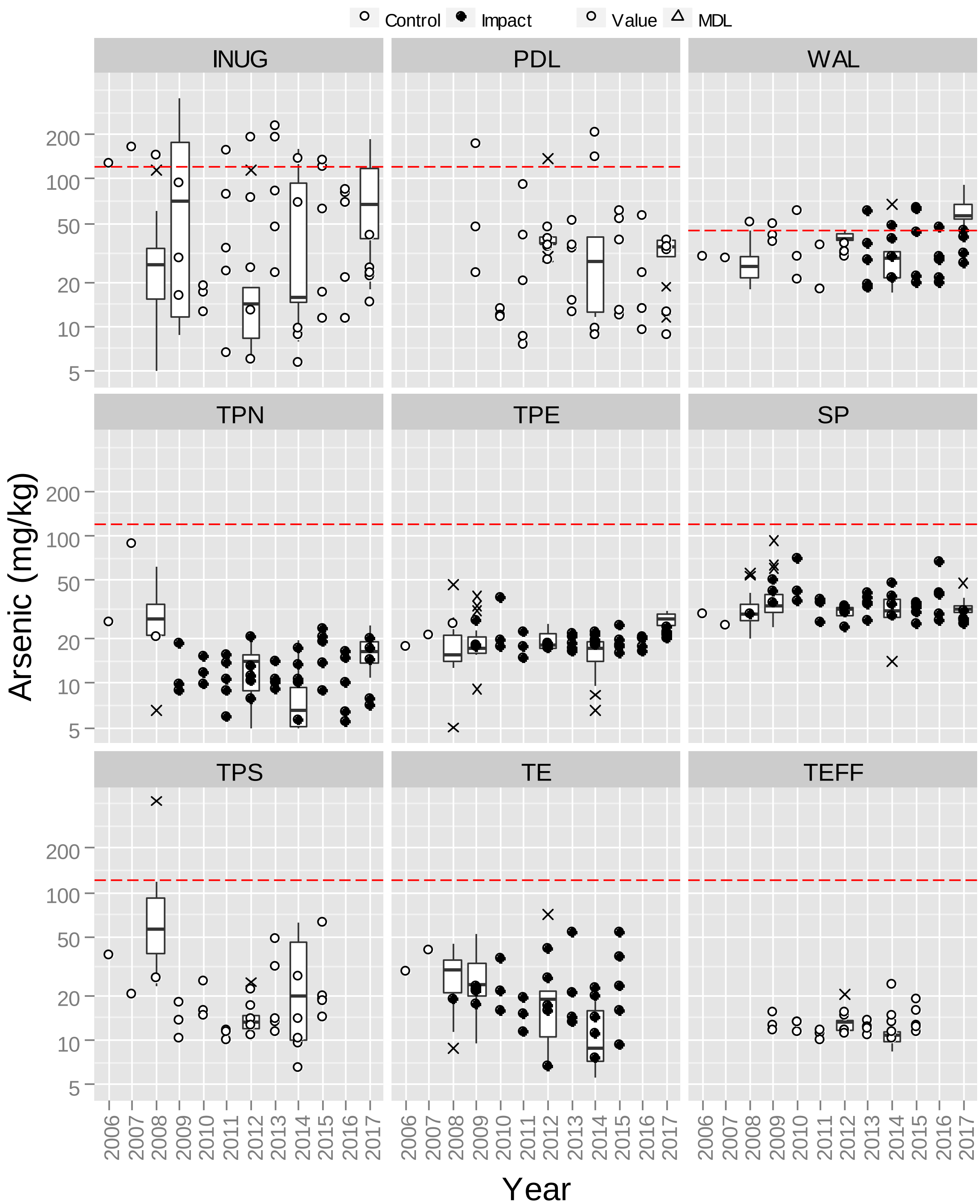


Figure 3.2-56. Total Cadmium (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.

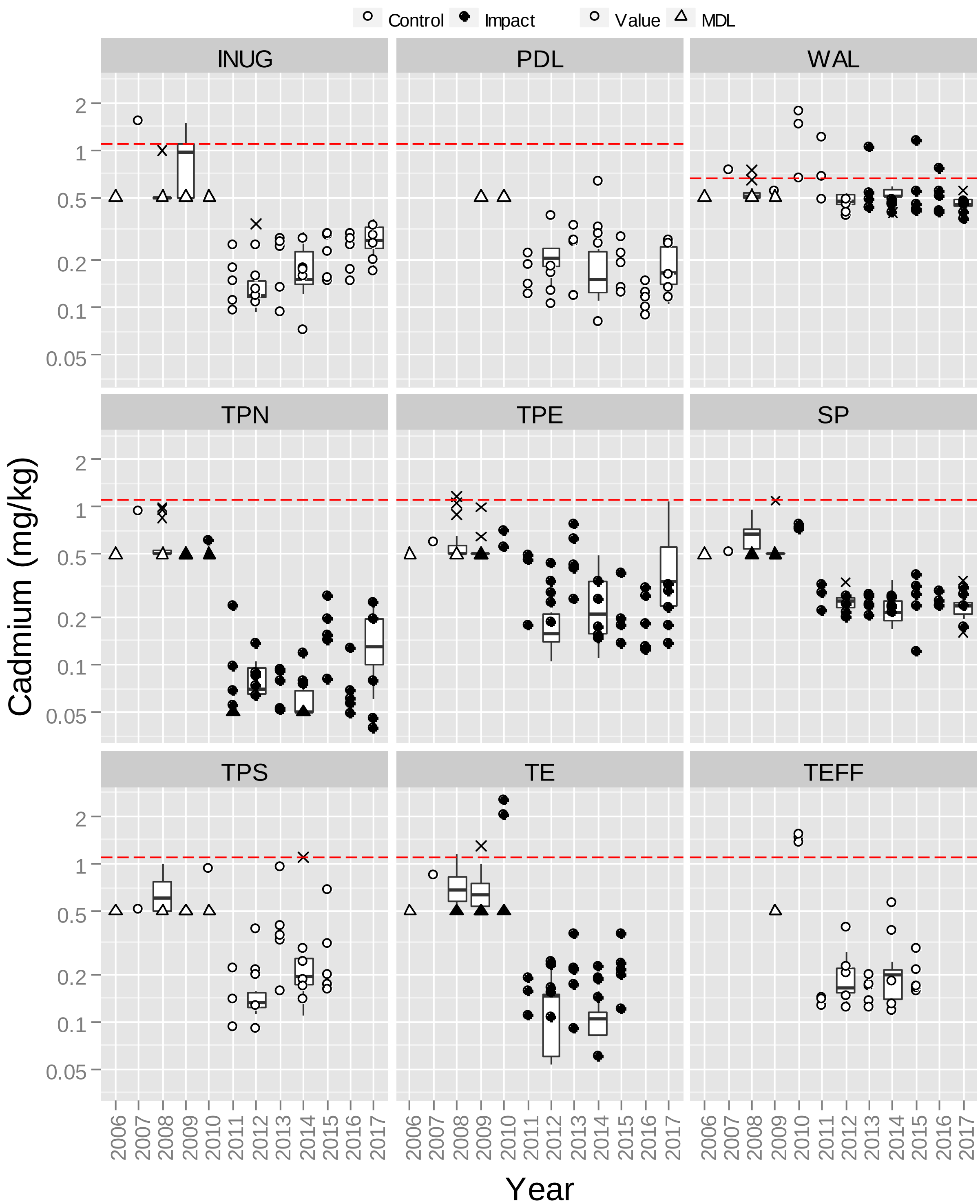


Figure 3.2-57. Total Chromium (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.

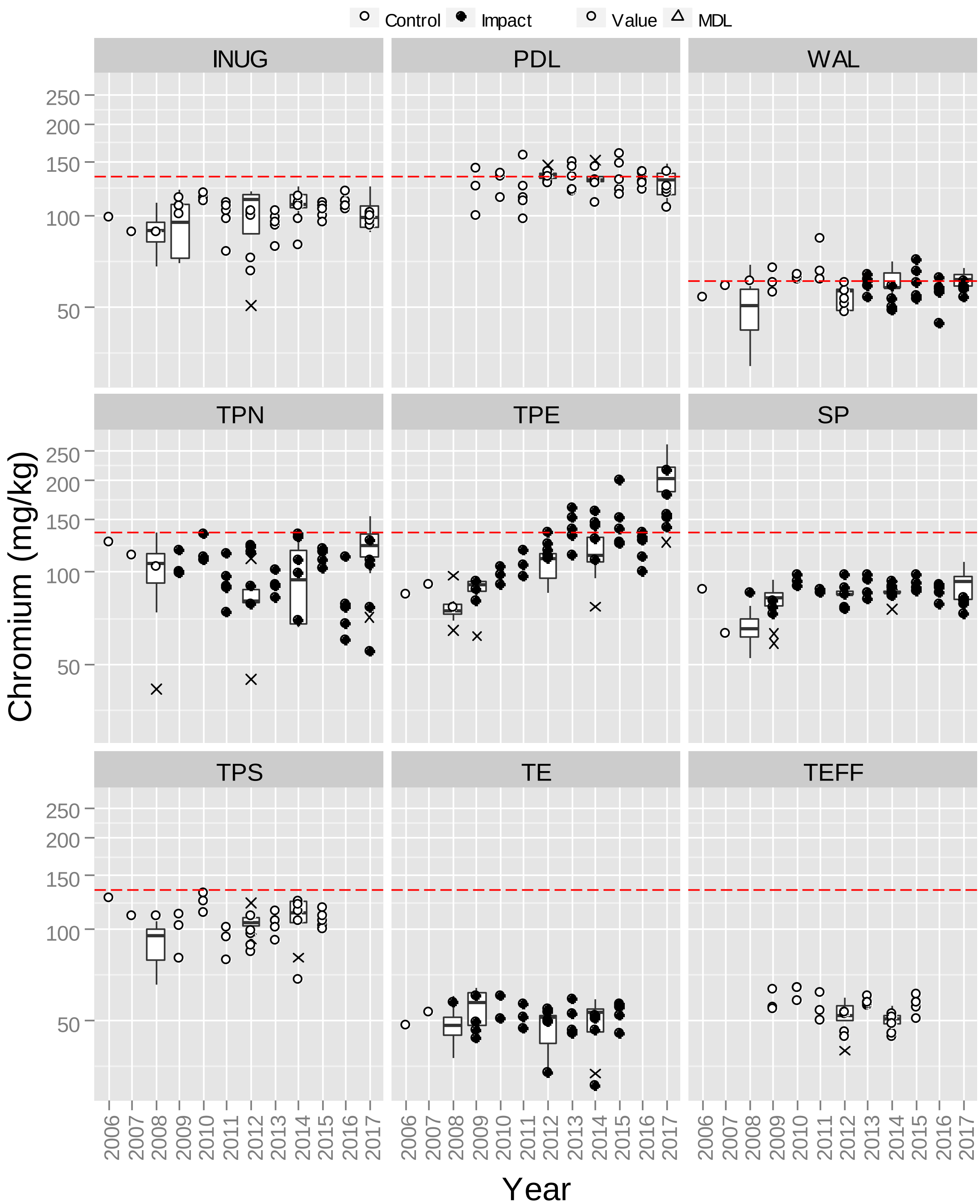


Figure 3.2-58. Total Copper (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.

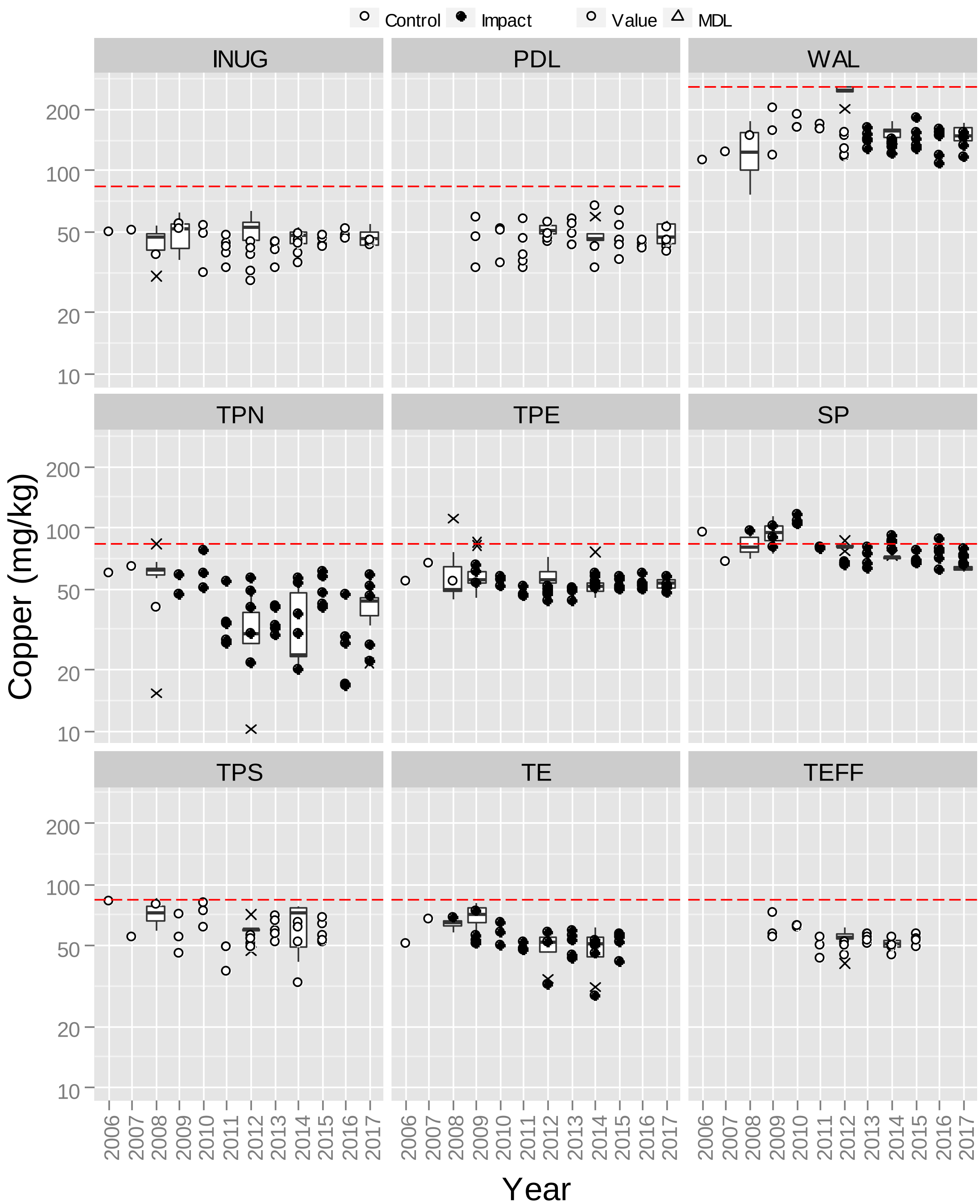


Figure 3.2-59. Total Lead (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.

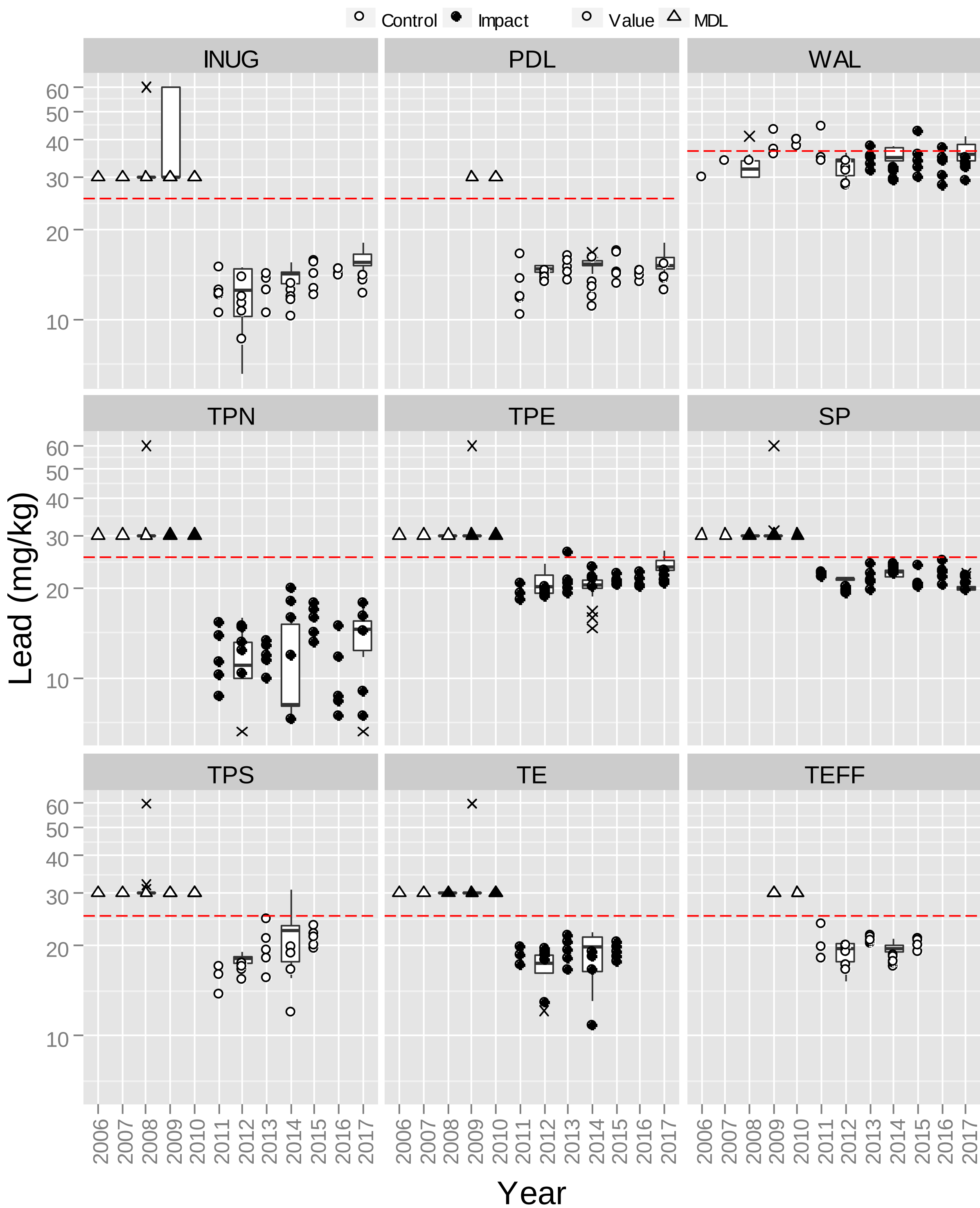


Figure 3.2-60. Total Mercury (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.

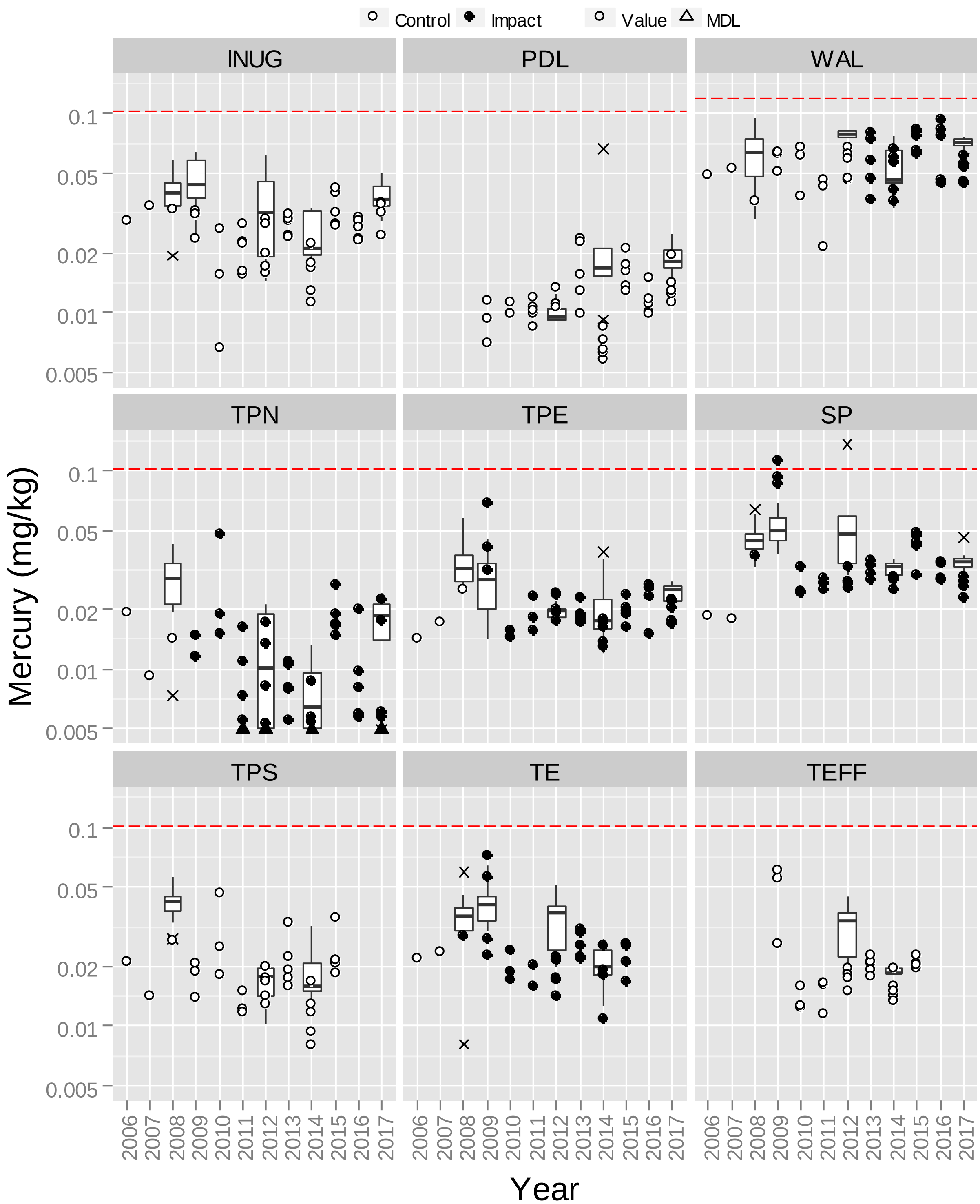
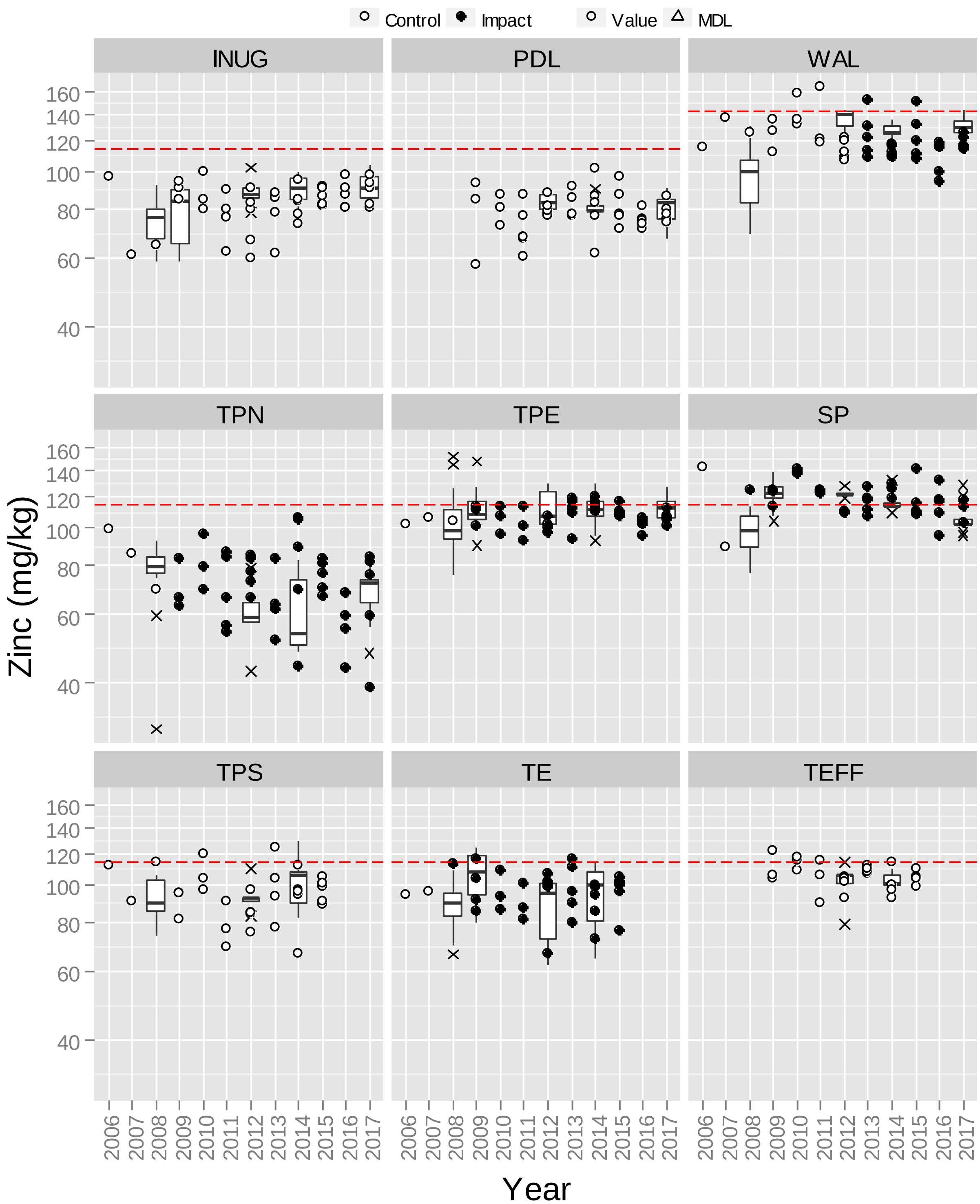


Figure 3.2-61. Total Zinc (mg/kg) in sediment samples (grabs & cores) from Meadowbank project lakes since 2006.

Note: The red dashed line represents the trigger values. New triggers were established in 2017 for Wally Lake that are different from the other Meadowbank project lakes. Grab samples = dots; Core samples = box and whisker.



3.2.4. Phytoplankton

3.2.4.1. General Observations

The diversity in types and sizes of phytoplankton is large and their abundance is great, typically exceeding 1 million individuals per litre with a total biomass of approximately 200 mg/m^3 in summer. Six major taxonomic groups of phytoplankton are present in the study lakes, namely blue-green algae (Cyanophyta), green algae (Chlorophyta), golden-brown algae (Chrysophyta), Diatoms, Cryptophytes and Dinoflagellates. Chrysophytes (golden-brown algae) are small, usually unicellular phytoplankton that are consistently the most abundant taxonomic group in the Meadowbank area lakes. Chrysophytes also dominate phytoplankton biomass in all project lakes, typically representing 65% or more of total phytoplankton biomass in summer samples, with smaller proportions (usually <10% each) from the other five major groups. The dominant chrysophyte genera for the Meadowbank lakes are *Chrysococcus*, *Kephyrion*, *Chrysochromulina, Dinobryon* and *Chrysolkos*. Dominant genera for the other groups were *Oocystis* for chlorophytes, *Planktolyngbya* for cyanophytes, *Cyclotella* for diatoms, *Rhodomonas* and *Cryptomonas* for cryptophytes, and *Gymnodinium* and *Peridinium* for dinoflagellates (Azimuth, 2012a, 2011b, 2010a, 2009c, 2008a, and 2008b).

Mean phytoplankton biomass in the Meadowbank area lakes typically ranges from 100 to 250 mg/m^3 during summer with diminishing biomass in fall through winter. This range in biomass is typical for oligotrophic, central Arctic Canadian lakes. Biomass estimates from lakes sampled in the 1980's in the Kiggavik area generally ranged between 100 and 300 mg/m^3 (McKee et al., 1989). Other studies on arctic lake phytoplankton communities have reported similar ranges of phytoplankton biomass at Snap Lake (266 mg/m^3; De Beers, 2002), Char Lake (166 mg/m^3, Kalff et al., 1975), and Spring Lake (120 mg/m^3, Welch et al., 1989).

3.2.4.2. Temporal and Spatial Trend Interpretation

The approach to identify potential mine-related impacts involves visually searching for general temporal-spatial patterns that might be associated with mine-related activities (see **Section 1.5** for details), augmented by statistical analyses of 2017 data to test for changes relative to baseline/reference conditions using the BACI model (see **Section 2.4.3** for details).

The primary metrics used in the assessment were chlorophyll-a concentration (a surrogate for overall primary productivity), total biomass (mg/m^3), relative biomass of major taxonomic groups, and species richness (total # species). Biomass, and not abundance, was examined because the two tend to be reasonably well correlated and ultimately, biomass is a much better approximation of actual lake productivity or food available to zooplankton. The BACI statistical testing focused on total biomass and species richness as these reflect ecologically relevant aspects of the phytoplankton community (i.e., total mass of community and community composition, respectively); trigger and threshold effect sizes are 20% and 50%, respectively.

The expected response patterns in phytoplankton biomass and species richness is dictated by the nature of the physical and/or chemical changes caused by mine-related activities. For example, dike construction or dewatering may introduce turbidity, leading to a reduction in phytoplankton biomass/diversity. In contrast, introduction of other substances such as nitrogen nutrients associated with blasting by-products could increase primary production, so we are looking for both reductions and increases (i.e., two-tailed statistical tests) in phytoplankton-related metrics coinciding with mining activities (i.e., focusing primarily on data for SP, TPE, TPN, and WAL).

One consideration with phytoplankton data is the high natural variability of control data. This potentially confounding "noise" effect can make it difficult to identify mining-related influences or "signals" at impact areas, unless the latter are quite large.

Density and biomass results for phytoplankton samples collected from the Meadowbank study lakes are provided in **Table 3.2-13** (a presence/absence species matrix is provided in **Appendix B**). The 2012 CREMP (Azimuth, 2013) provides a detailed description of historical trends in phytoplankton-related metrics; this report emphasizes results for 2017. Trend data for chlorophyll-a, total biomass, major taxa composition, and species richness are presented in **Figure 3.2-62** to **Figure 3.2-66**. Plots for all other phytoplankton metrics are presented in **Appendix C1**. The results for the BACI model statistical tests of the 2017 results against baseline/reference conditions for total biomass and species richness are provided in **Table 3.2-14**; Key results are described below:

- *Chlorophyll-a* – Concentrations in the reference area samples typically ranged between 0.2 and 0.7 µg/L in summer months, reflecting the oligotrophic, nutrient poor condition of these lakes; a trend that has not changed over time. The seasonal pattern of chlorophyll-a concentrations among reference and exposure areas was similar in 2017, with higher concentrations observed at all locations during the late-summer event in September relative to earlier July and August open-water events, and to March and May through-ice events. The highest chlorophyll-a concentrations of all exposure areas in 2017 were at WAL, up to 1.08 µg/L in the September event. This trend of higher chlorophyll-a levels at WAL, and also to a lesser extent at TPN, relative to other sampling areas, has been consistent from 2015 to 2017. With the exception of an August peak in 2011 at TPN, seasonal peaks in chlorophyll-a were not as high at TPN and WAL prior to 2015. But overall, despite some variability in timing and magnitude of peak concentrations, chlorophyll-a concentrations have typically remained less than 1 µg/L since 2006 (**Figure 3.2-62**), which is consistent with oligotrophic conditions (Kasprzak et al. 2008).
- *Total Biomass* – Biomass results followed the same seasonal trends as previous years with highest biomass reported in the summer months (July to September), compared to early spring. Winter under-ice biomass is naturally very low at all locations in all years it has been measured, and the same pattern was noted in 2017; biomass typically less than approximately 50 mg/m^3 in March through May (**Figure 3.2-63**). Peak summer phytoplankton biomass at the INUG reference areas was sustained from July to September between 130 and 160 mg/m^3, which was lower than 2016 peaks between 220 to 330 mg/m^3. Phytoplankton biomass PDL peaked around 250 to 320 mg/m^3 in July, and then dropped to around 90 to 110 mg/m^3 for remainder of off-ice sampling events. These results are consistent with the range observed in previous years for the reference areas (**Figure 3.2-64**). Elevated biomass at exposure areas in 2017 persisted at levels generally between 120 and 350 mg/m^3 from July through the latest phytoplankton sampling event in 2017, which was mid-September for NF exposure areas (i.e., sampling periods didn't capture expected fall/winter drop-offs in phytoplankton biomass). Peak biomass in 2017 at NF exposure areas (150 to 500 mg/m^3) spanned a wider range compared to 2016 (150 to 250 mg/m^3). WAL in particular had higher biomass in 2017, peaking at up to 500 mg/m^3 in July, and staying above 170 mg/m^3 through September. This peak biomass was the highest biomass measured to date at WAL, but was not completely anomalous - similarly high peaks were also measured in before years 2006 and 2009 for example (**Figure 3.2-64**). The BACI analysis shows apparent increases ranging from 46% to 87% at the NF areas in 2017 relative to baseline/reference (INUG) conditions (**Table 3.2-13**); the apparent increases were statistically significant ($p<0.1$) at TPE (84% increase), SP (46% increase), and WAL (87% increase) (**Table 3.2-13**). The apparent increases in 2017 biomass are primarily due to lower biomass at INUG in

2017 and to a lesser extent from slightly elevated biomass at TPE, SP, and WAL in 2017. For example, mean biomass during the open water season at INUG and TPE prior to mining were 218 and 167 mg/m^3, respectively. In the 2017 open water season, INUG was down by 34% and TPE up by 23%. The BACI model assumes that trends occurring at the reference area also occur at the exposure area (e.g., responses due to regional climatic conditions), so the opposite responses seen in 2017 combine to a large apparent effect. While changes in phytoplankton biomass in 2017 exceeded trigger (>20% effect; SP) and threshold (>50% effect; TPE, WAL, TPN) values, it is hard to determine in a single year whether these changes are related to mining. For example, while the responses at SP and WAL are coincident with mining-related discharges, TPN's 62% increase in biomass in 2017 occurred despite no effluent discharging. This suggests that natural variability may be an important driver of the observed trends.

- *Major Taxa Composition* – Chrysophytes tend to dominate in all open-water months, a pattern that has been consistent since monitoring began in 2006 (**Figure 3.2-65**).
- *Species Richness* – Seasonal profiles in species richness were similar in shape to total biomass, with an increase from low diversity in under-ice months (INUG; 14 to 18 taxa) to peak diversity of between approximately 30 and 40 taxa during the open water season (**Table 3.2-13**). The seasonal pattern of species richness at the exposure areas was similar to the reference areas and consistent with previous years (**Figure 3.2-66**). A statistically significant increase (12%; p=0.087) in taxa richness was noted at WAL in 2017 relative to INUG, but the effect size was below the 20% trigger level (**Table 3.2-14**). Differences in richness between INUG and WAL was greatest in August, when WAL had 42 taxa present, compared to 35 taxa at INUG. Taxa richness differences between WAL and INUG were less in July and September (INUG between 31 and 33 taxa; WAL between 33 and 36 taxa). Peak taxa richness at WAL (42 taxa) occurred in August, the month following peak biomass (500 mg/m^3 in July); Chrysophytes contributed up to 80% of the July peak biomass at WAL, then decreased to less than 65% of biomass in August, with up to 35% of biomass from a broader range of taxa..

The phytoplankton community taxa biomass and taxa richness data from 2017 are generally similar to previous years and largely appear within the range of historical baseline/reference conditions. However, higher phytoplankton biomass in 2017 was significantly (P<0.1) higher than the trigger value (>20% effect) at SP and the threshold value (>50% effect) at TPE, WAL (and marginally at TPN). Taxa richness was also enhanced at WAL, but did not exceed the trigger value. However, ascribing causality for these statistically significant effects from the BACI model is more difficult. As discussed above for total biomass, there is evidence that natural variability might be driving these effects. This is further corroborated by the lack of major changes in water quality in 2017 relative to 2016 (i.e., as changes in phytoplankton of this magnitude were not observed until now). While the gradual changes in water quality observed over the years could have resulted in stimulated phytoplankton productivity, they do not explain the large increases in biomass, and to a lesser extent taxa richness, seen in 2017. Consequently, natural variation is likely the most plausible explanation for apparent increased biomass at the NF areas in 2017. Notwithstanding, this trend should be watched closely in 2018 to verify whether future patterns are consistent with that conclusion or whether they provide stronger evidence of mine-related causality.

Table 3.2–13. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Inuggugayualik Lake										
INUG-86	29-Mar-17	0.2	0.7	20	0.5	4.8	5.7	32	18	0.65
INUG-87	29-Mar-17	0.2	0.7	13	0.8	12	0.7	28	16	0.76
INUG-88	7-May-17	0	1.9	9.2	0.5	0.9	0.00	13	14	0.77
INUG-89	7-May-17	0	9.1	7.0	0.6	2.2	0.00	19	16	0.50
INUG-90	22-Jul-17	0.5	3.4	127	6.2	0.3	22	159	32	0.82
INUG-91	22-Jul-17	1.4	3.1	126	5.2	0.8	4.6	141	31	0.78
INUG-92	25-Aug-17	1.6	16	111	10	2.3	3.8	145	35	0.86
INUG-93	25-Aug-17	2.4	8.1	98	8.5	1.3	8.0	126	35	0.88
INUG-94	23-Sep-17	1.3	9.2	107	23	2.1	16	158	33	0.89
INUG-95	23-Sep-17	1.4	7.8	106	13	2.7	5.7	136	33	0.86
Percent Density or Biomass		***0.94***	***6.2***	***76***	***7.1***	***3.1***	***6.9***			
Pipedream Lake										
PDL-51	27-Mar-17	1.5	1.6	19	3.2	2.7	1.4	29	21	0.85
PDL-52	27-Mar-17	1.3	3.3	19	4.7	9.7	3.2	41	22	0.84
PDL-53	10-May-17	0.8	0.7	18	5.3	8.6	13	46	21	0.84
PDL-54	10-May-17	0.8	0.9	30	10	8.5	1.3	52	23	0.81
PDL-55	8-Jul-17	0.3	2.4	238	15	10	53	320	32	0.87
PDL-56	8-Jul-17	0.3	2.5	164	19	11	45	242	32	0.86
PDL-57	24-Aug-17	2.2	9.8	58	17	0.6	2.5	90	38	0.90
PDL-58	24-Aug-17	3.1	7.5	60	10	1.3	5.0	88	37	0.85
PDL-59	1-Oct-17	3.8	3.5	86	8.3	1.0	7.5	110	35	0.88
PDL-60	1-Oct-17	4.4	3.9	82	13	1.0	5.6	110	34	0.89
Percent Density or Biomass		***1.6***	***3.2***	***69***	***9.5***	***4.8***	***12***			
Third Portage Lake - East Basin										
TPE-100	24-Mar-17	0	6.8	13	2.7	9.6	0	32	17	0.82
TPE-101	24-Mar-17	0	3.8	12	5.3	4.5	2.5	28	18	0.77
TPE-102	4-May-17	0	4.2	18	0.2	7.2	2.4	32	15	0.75
TPE-103	5-May-17	0	4.4	9.3	0.5	4.2	11	29	16	0.82
TPE-104	1-Jul-17	0	8.6	116	2.5	7.1	2.8	137	25	0.71
TPE-105	1-Jul-17	0.0	15	135	3.9	7.6	4.6	165	28	0.67
TPE-106	27-Aug-17	0.4	50	150	24	1.8	4.7	231	34	0.84
TPE-107	27-Aug-17	0.2	44	134	26	5.0	5.2	214	34	0.84
TPE-108	18-Sep-17	0	44	211	9.4	4.8	2.4	271	31	0.88
TPE-109	18-Sep-17	0	38	232	11	6.3	3.3	290	30	0.88
Percent Density or Biomass		***<0.1***	***17***	***72***	***6.9***	***1.8***	***1.5***			

Table 3.2–13. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Inuggugayualik Lake								
INUG-86	29-Mar-17	3,546	4,146	528,369	21,377	32,915	500	590,853
INUG-87	29-Mar-17	3,546	700	358,156	14,584	99,891	100	476,977
INUG-88	7-May-17	0	36,061	198,582	21,477	3,946	0	260,065
INUG-89	7-May-17	0	557,238	166,667	25,023	22,177	0	771,104
INUG-90	22-Jul-17	2,600	136,896	1,304,104	124,128	400	2,200	1,570,328
INUG-91	22-Jul-17	30,136	151,464	1,453,168	94,392	14,568	400	1,744,128
INUG-92	25-Aug-17	8,800	649,160	916,768	217,320	28,936	800	1,821,784
INUG-93	25-Aug-17	13,200	498,096	997,992	181,400	14,768	8,184	1,713,640
INUG-94	23-Sep-17	11,600	382,752	1,024,328	413,088	14,568	1,000	1,847,336
INUG-95	23-Sep-17	12,600	555,568	1,219,696	297,344	15,568	400	2,101,176
Percent Density or Biomass		***0.67***	***23***	***63***	***11***	***1.9***	***0.11***	
Pipedream Lake								
PDL-51	27-Mar-17	11,000	22,577	241,135	57,738	18,131	3,646	354,226
PDL-52	27-Mar-17	10,100	63,984	336,880	47,199	65,030	200	523,392
PDL-53	10-May-17	5,000	50,045	276,596	62,184	70,922	4,246	468,993
PDL-54	10-May-17	5,100	53,992	539,007	107,583	64,230	3,546	773,458
PDL-55	8-Jul-17	2,000	87,808	2,175,568	217,536	75,040	8,000	2,565,952
PDL-56	8-Jul-17	1,600	86,808	1,836,520	300,944	73,840	7,400	2,307,112
PDL-57	24-Aug-17	9,800	489,712	582,304	154,464	7,184	600	1,244,064
PDL-58	24-Aug-17	13,600	685,080	539,800	117,544	7,784	1,200	1,365,008
PDL-59	1-Oct-17	27,984	167,232	811,208	111,760	7,184	1,200	1,126,568
PDL-60	1-Oct-17	37,768	238,672	789,456	106,576	7,184	1,000	1,180,656
Percent Density or Biomass		***1.0***	***16***	***68***	***11***	***4.0***	***0.30***	
Third Portage Lake - East Basin								
TPE-100	24-Mar-17	100	128,160	276,596	131,706	49,099	0	585,660
TPE-101	24-Mar-17	0	46,699	226,950	212,966	16,384	100	503,100
TPE-102	4-May-17	0	56,738	322,695	10,638	50,445	3,946	444,463
TPE-103	5-May-17	0	63,930	187,943	14,284	22,477	11,338	299,972
TPE-104	1-Jul-17	0	208,536	1,476,320	101,176	59,272	800	1,846,104
TPE-105	1-Jul-17	200	251,640	1,784,432	115,344	46,704	1,000	2,199,320
TPE-106	27-Aug-17	2,000	1,424,432	1,187,776	1,096,384	7,984	1,600	3,720,176
TPE-107	27-Aug-17	1,200	1,596,248	1,028,328	1,152,056	37,520	1,400	3,816,752
TPE-108	18-Sep-17	0	926,936	1,561,576	326,680	16,768	800	2,832,760
TPE-109	18-Sep-17	0	826,760	1,501,536	383,552	38,320	1,200	2,751,368
Percent Density or Biomass		***<0.1***	***29***	***50***	***19***	***1.8***	***0.12***	

Table 3.2–13. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Third Portage Lake - North Basin										
TPN-90	25-Mar-17	0	2.3	19	6.4	3.2	7.3	38	17	0.72
TPN-91	25-Mar-17	0	0.6	5.7	1.8	3.6	3.7	15	15	0.78
TPN-92	7-May-17	0	6.8	16	5.7	0.7	1.1	30	16	0.78
TPN-93	7-May-17	0	68	6.7	0.5	2.1	0	77	10	0.13
TPN-94	4-Jul-17	0	1.0	54	2.7	0.9	62	120	20	0.67
TPN-95	4-Jul-17	0	3.9	73	3.2	0.9	48	128	22	0.71
TPN-96	27-Aug-17	0.1	17	101	22	1.5	5.8	147	32	0.87
TPN-97	27-Aug-17	0	20	89	21	2.4	7.7	140	35	0.83
TPN-98	16-Sep-17	0	12	100	11	3.6	0.5	127	26	0.87
TPN-99	16-Sep-17	0	16	83	12	4.6	0	116	27	0.88
Percent Density or Biomass		***<0.1***	***12***	***70***	***12***	***2.3***	***2.6***			
Third Portage Lake - South Basin										
TPS-55	25-Mar-17	0	2.7	7.1	7.1	5.1	0.9	23	17	0.82
TPS-56	25-Mar-17	0	2.9	12	5.6	4.3	1.2	26	18	0.82
Percent Density or Biomass		***<0.1***	***11***	***39***	***26***	***19***	***4.2***			
Second Portage Lake										
SP-100	26-Mar-17	0	0.6	16	0.5	7.9	2.8	28	17	0.69
SP-101	26-Mar-17	0	0.9	10	1.2	3.7	0.00	16	15	0.76
SP-102	5-May-17	0	1.0	13	0.8	1.4	0.2	17	13	0.71
SP-103	5-May-17	0.02	1.6	13	1.1	3.7	3.5	23	17	0.76
SP-104	2-Jul-17	0	2.9	209	3.3	10	11	236	24	0.83
SP-105	2-Jul-17	0	4.4	289	3.4	22	9.7	329	26	0.78
SP-106	26-Aug-17	0.2	19	101	26	3.2	15	163	42	0.84
SP-107	26-Aug-17	0.6	34	113	23	10	8.7	190	41	0.89
SP-108	14-Sep-17	0.1	19	96	11	4.5	7.9	139	31	0.87
SP-109	14-Sep-17	0.2	19	105	11	14	4.8	153	29	0.86
Percent Density or Biomass		***<0.1***	***14***	***64***	***11***	***4.9***	***5.6***			
Tehek Lake										
TE-92	29-Mar-17	0.01	3.9	16	0.9	10	15	46	18	0.75
TE-93	29-Mar-17	0.1	0.3	17	0.8	10.0	4.4	33	22	0.67
Percent Density or Biomass		***0.14***	***5.3***	***42***	***2.1***	***26***	***25***			

Table 3.2–13. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Third Portage Lake - North Basin								
TPN-90	25-Mar-17	0	49,645	358,156	276,696	18,531	600	703,628
TPN-91	25-Mar-17	0	46,199	187,943	75,068	6,146	400	315,757
TPN-92	7-May-17	0	149,736	304,965	184,397	7,192	200	646,490
TPN-93	7-May-17	0	2,993,208	138,298	21,677	4,846	0	3,158,029
TPN-94	4-Jul-17	0	100,576	712,416	144,280	600	7,000	964,872
TPN-95	4-Jul-17	0	122,128	898,800	122,728	400	7,000	1,151,056
TPN-96	27-Aug-17	400	619,024	721,400	620,024	800	800	1,962,448
TPN-97	27-Aug-17	200	512,464	720,400	683,480	1,600	1,200	1,919,344
TPN-98	16-Sep-17	0	431,440	763,120	345,832	15,568	200	1,556,160
TPN-99	16-Sep-17	0	438,824	573,136	339,048	9,784	0	1,360,792
Percent Density or Biomass		***<0.1***	***40***	***39***	***20***	***0.48***	***0.13***	
Third Portage Lake - South Basin								
TPS-55	25-Mar-17	0	67,676	117,021	79,314	20,031	200	284,242
TPS-56	25-Mar-17	0	89,753	184,397	114,475	16,184	3,546	408,355
Percent Density or Biomass		***<0.1***	***23***	***44***	***28***	***5.2***	***0.54***	
Second Portage Lake								
SP-100	26-Mar-17	0	21,277	375,887	11,238	41,507	700	450,609
SP-101	26-Mar-17	0	24,823	216,312	46,599	5,846	0	293,580
SP-102	5-May-17	0	53,192	234,043	21,677	4,346	100	313,357
SP-103	5-May-17	100	35,461	248,327	32,615	18,931	700	336,133
SP-104	2-Jul-17	0	50,288	1,777,080	66,472	60,072	1,000	1,954,912
SP-105	2-Jul-17	0	107,960	2,407,072	84,240	152,264	3,400	2,754,936
SP-106	26-Aug-17	600	879,048	927,936	797,640	8,984	2,200	2,616,408
SP-107	26-Aug-17	2,200	1,230,664	1,343,808	519,864	60,272	1,400	3,158,208
SP-108	14-Sep-17	400	489,312	944,104	334,864	16,368	1,200	1,786,248
SP-109	14-Sep-17	1,200	539,600	1,222,680	208,752	74,840	400	2,047,472
Percent Density or Biomass		***<0.1***	***22***	***62***	***14***	***2.8***	***<0.1***	
Tehek Lake								
TE-92	29-Mar-17	100	49,645	329,787	32,015	62,784	4,946	479,277
TE-93	29-Mar-17	600	28,369	322,895	7,392	68,876	11,038	439,170
Percent Density or Biomass		***<0.1***	***8.5***	***71***	***4.3***	***14***	***1.7***	

Table 3.2–13. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Tehek Lake - Far-field										
TEFF-45	29-Mar-17	0.4	2.4	25	1.0	1.9	6.1	37	18	0.51
TEFF-46	29-Mar-17	0.2	2.5	25	0.4	4.3	1.2	33	17	0.75
Percent Density or Biomass		***0.75***	***7.1***	***71***	***2.1***	***8.8***	***10***			
Wally Lake										
WAL-69	26-Mar-17	0	4.0	9.6	4.7	2.1	2.2	23	14	0.77
WAL-70	26-Mar-17	0	0.6	8.4	1.7	3.7	3.3	18	19	0.72
WAL-71	7-May-17	0	2.3	15	0.9	9.1	0.7	28	20	0.76
WAL-72	7-May-17	0	4.2	34	1.9	20	2.1	62	25	0.69
WAL-73	1-Jul-17	0	7.2	357	16	12	39	432	36	0.77
WAL-74	1-Jul-17	0	11	401	10	26	51	498	33	0.76
WAL-75	26-Aug-17	0	20	136	18	9.1	24	207	42	0.88
WAL-76	26-Aug-17	0	23	111	21	9.2	8.2	171	42	0.86
WAL-77	16-Sep-17	0.1	16	177	28	7.6	14	243	35	0.88
WAL-78	16-Sep-17	0	63	203	28	13	15	323	38	0.83
Percent Density or Biomass		***<0.1***	***13***	***66***	***10***	***4.2***	***6.5***			
All 2017 Locations Relative Density or Biomass (%)		***0.24***	***8.9***	***66***	***6.5***	***4.9***	***7.5***			

Table 3.2–13. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Tehek Lake - Far-field								
TEFF-45	29-Mar-17	3,400	35,461	386,525	28,569	4,746	10,938	469,639
TEFF-46	29-Mar-17	1,400	92,199	351,064	17,831	22,477	400	485,370
Percent Density or Biomass		***0.50***	***13***	***77***	***4.9***	***2.9***	***1.2***	
Wally Lake								
WAL-69	26-Mar-17	0	164,621	336,880	30,923	1,700	100	534,223
WAL-70	26-Mar-17	0	46,199	283,688	5,346	15,984	300	351,518
WAL-71	7-May-17	0	42,653	287,234	4,446	51,745	200	386,279
WAL-72	7-May-17	0	117,121	567,476	12,538	140,698	300	838,134
WAL-73	1-Jul-17	0	179,800	3,146,024	212,016	89,808	12,184	3,639,832
WAL-74	1-Jul-17	0	107,960	3,105,320	190,448	233,488	27,752	3,664,968
WAL-75	26-Aug-17	0	778,272	1,158,240	541,200	40,920	3,600	2,522,232
WAL-76	26-Aug-17	0	655,344	1,162,024	627,808	60,872	2,200	2,508,248
WAL-77	16-Sep-17	400	546,184	1,548,960	723,200	19,368	800	2,838,912
WAL-78	16-Sep-17	0	288,760	1,752,112	963,672	23,768	1,600	3,029,912
Percent Density or Biomass		***<0.1***	***14***	***66***	***16***	***3.3***	***0.24***	
All 2017 Locations Relative Density or Biomass (%)		***0.14***	***22***	***54***	***14***	***2.4***	***0.18***	

Table 3.2–14. Results of the BACI test for phytoplankton variables at Meadowbank areas.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total biomass	TPN	7	5	0.48	0.28	0.11	62	-13	199
	TPE	8	5	0.61	0.16	**0.003**	84	29	161
	SP	6	5	0.38	0.2	**0.087**	46	-6	126
	WAL	19	5	0.63	0.22	**0.010**	87	18	196
Species	TPN	7	5	0.03	0.08	0.70	3	-14	25
	TPE	8	5	0.02	0.05	0.64	2	-8	14
	SP	6	5	0.05	0.07	0.47	6	-10	24
	WAL	19	5	0.12	0.06	**0.087**	12	-2	29

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate positive (increases) or negative (reduced) effect sizes of 20% or more

Test area = area compared to control (INUG)

n(B) = number of months in the "before" period

n(A) = number of months in the "after" period (i.e., in 2017)

Estimate = BACI model estimate of the 2017 change in mean for log-transformed data

SE = standard error of the estimate

P-value = two-tailed test of the null hypothesis of no change

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 3.2-62. Chlorophyll-a (µg/L) in water samples from Meadowbank study lakes since 2006.

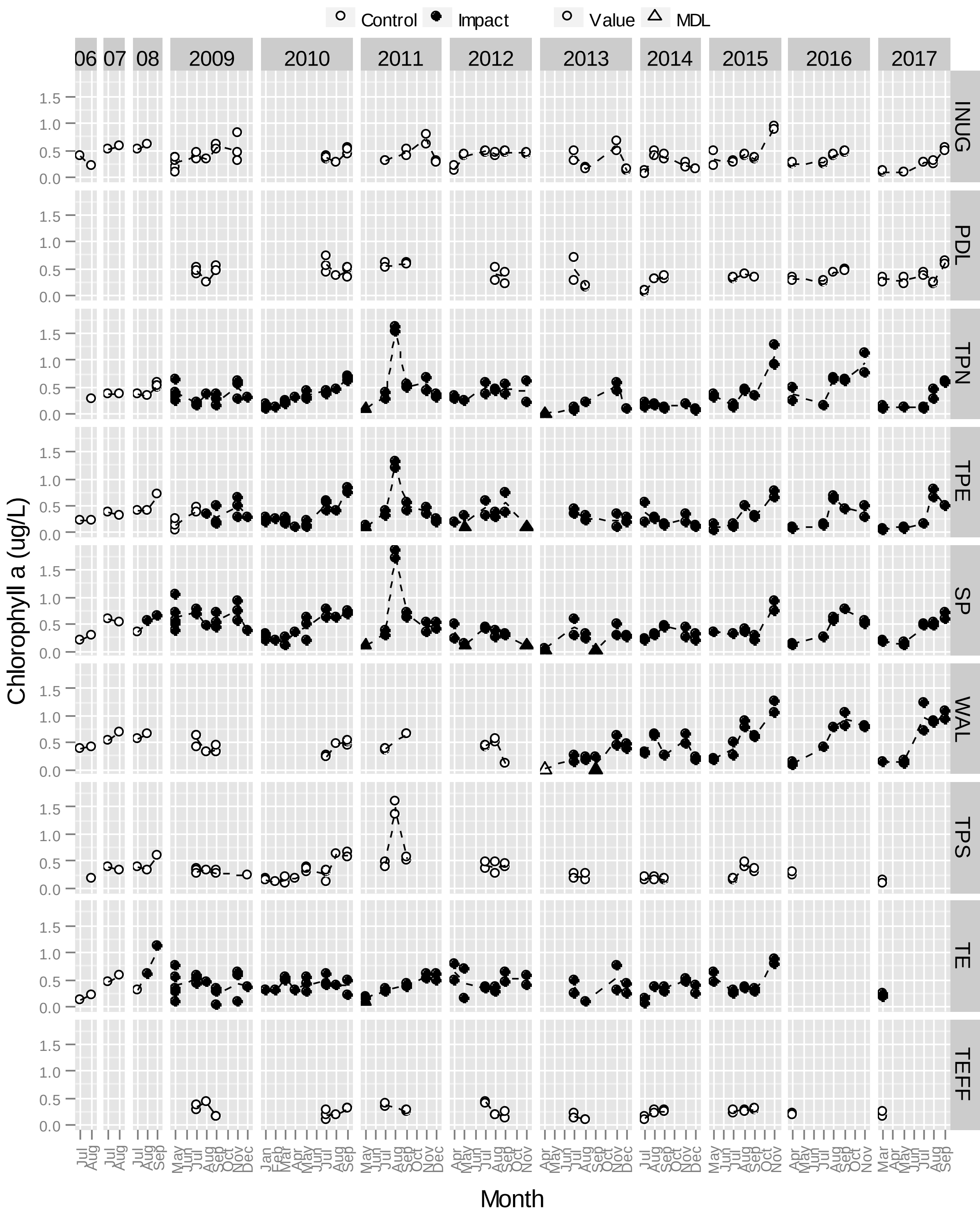


Figure 3.2-63. Total phytoplankton biomass (mg/m^3) from Meadowbank study lakes since 2006.

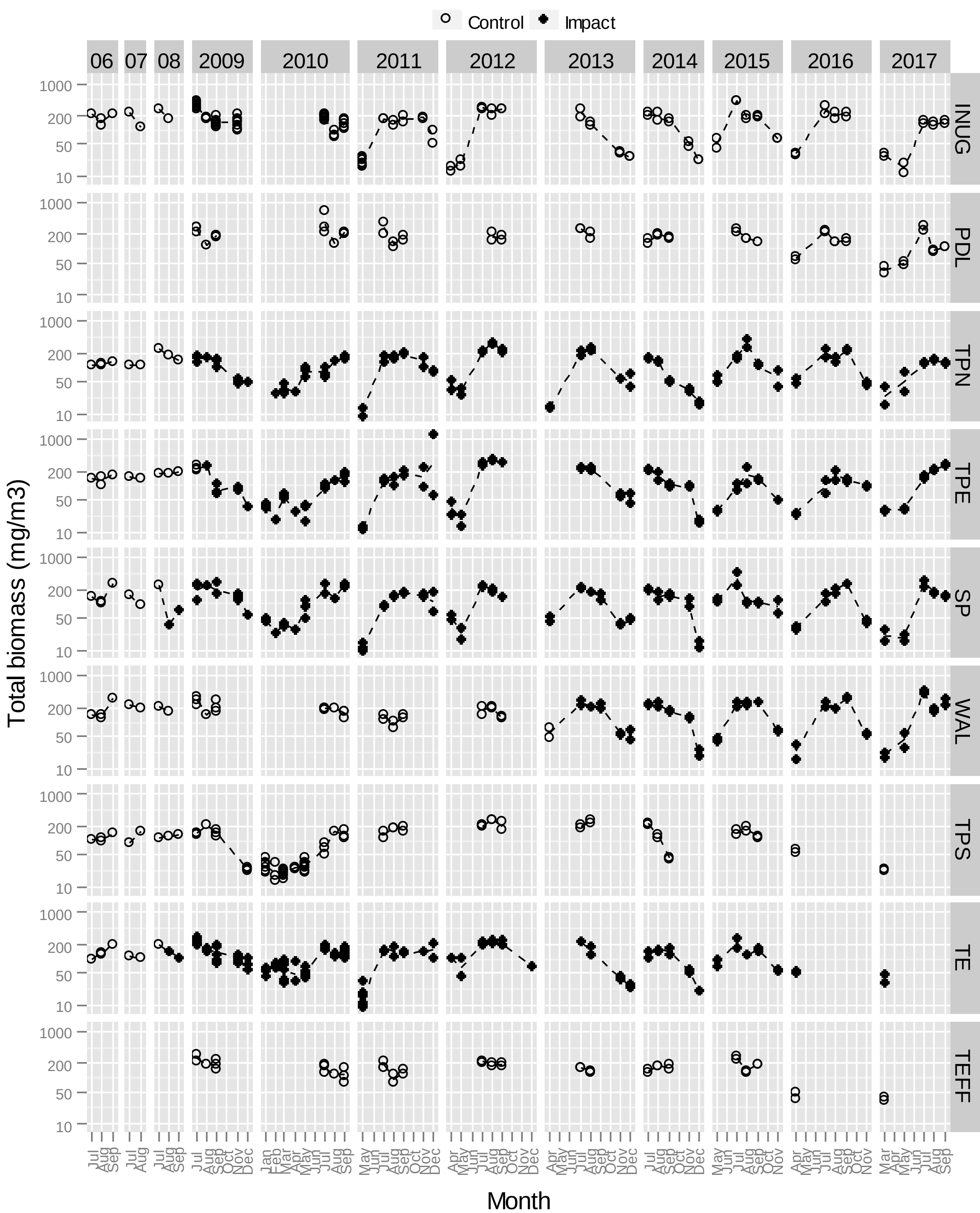


Figure 3.2-64. Phytoplankton biomass (mg/m^3) by major taxa group from Meadowbank study lakes since 2006.

Figure 3.2-65. Relative phytoplankton biomass by major taxa group from Meadowbank study lakes since 2006.

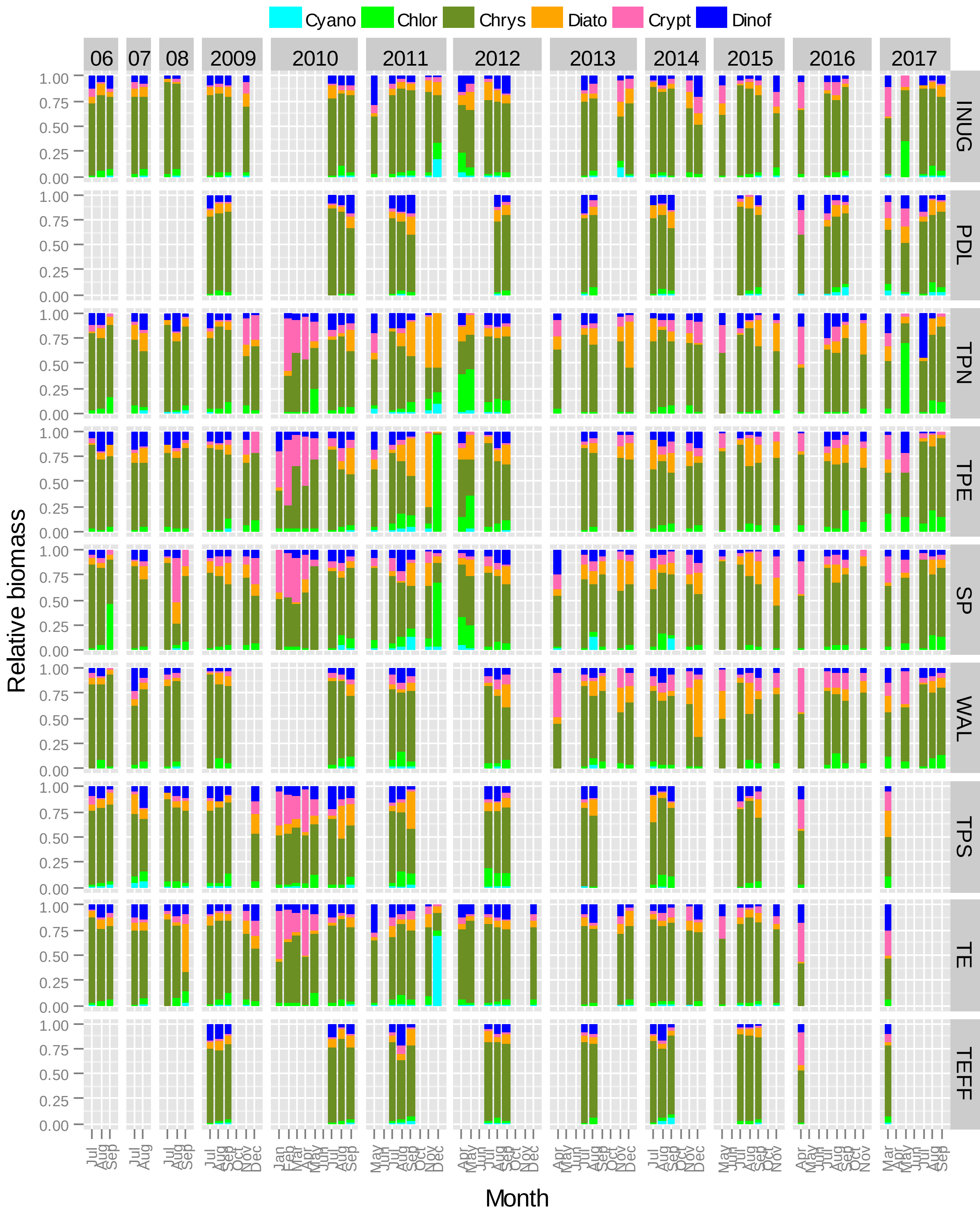
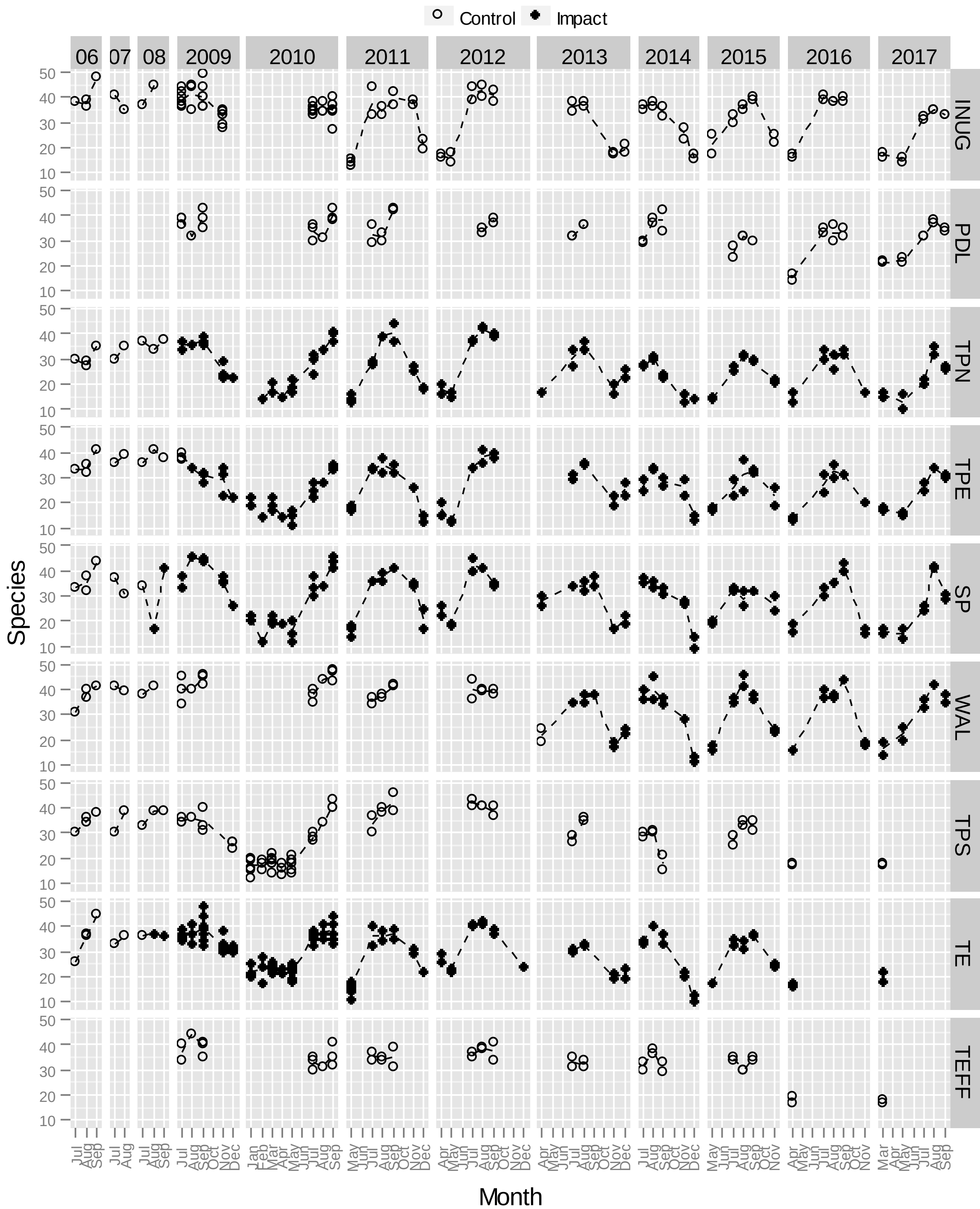


Figure 3.2-66. Phytoplankton species richness from Meadowbank study lakes since 2006.



3.2.5. Benthic Invertebrates

3.2.5.1. General Observations

The abundance and species composition of benthic invertebrates are strongly affected by water depth, substrate size and organic carbon. Other physical factors, such as water temperature, can influence larval development rates and ultimately timing of hatching for insect larvae. Consequently, even if sampling can be conducted simultaneously in all lakes (which is not practical), this would still not overcome differential timing of hatching of particular species between lakes. This is partly overcome in the CREMP by sampling during late fall, after the emergence of most groups, but is still a source of some variability.

Benthic invertebrate communities in the Meadowbank study lakes are typically characterized by relatively few taxa and low abundance. Abundance is generally less than 2,000 organisms/m^2 and is often less than 1,000 organisms/m^2 among both reference and exposure areas (e.g., **Figure 3.2-67**). Despite abundance generally being low at the study lakes, values above 5,000 organisms/m^2 are not uncommon and they have even exceeded 10,000 organisms/m^2 on occasion. Relatively large total benthic invertebrate abundance values were periodically observed in replicate samples collected prior to mine development (e.g., one replicate had 26,000 organism/m^2 at WAL in 2006) and in more recent sampling events (e.g., one replicate had 31,000 organism/m^2 at WAL in 2016; **Figure 3.2-67**). The high variability in total abundance within a station has also recently been observed at lakes sampled for the Whale Tail Pit project during the baseline period (i.e., the "before" period). Lake A76, a MF station in the study design, had total abundance in 2017 ranging between 3,000 and >24,000 organisms/m^2 (Azimuth, 2018). Whale Tail Lake – South Basin also showed comparatively large variance in abundance in 2017 ranging from 1,800 to over 10,000 organisms/m^2. Abundance data for the Meadowbank study lakes between 2006 and 2017, as well as more recent baseline data from the Whale Tail Pit program, show there can be substantial natural spatial and temporal variability in abundance both among and within sampling areas.

Taxa richness typically ranged from 8 to 12 for most area/year combinations (**Figure 3.2-71**). Typical of most Arctic lakes, the benthic invertebrate community has been dominated by the aquatic larval stages of insects, especially chironomids (Family Chironomidae), both in terms of abundance and taxa richness (e.g., **Figure 3.2-69** and **Figure 3.2-72**). The next most abundant group was Mollusca (clams) especially, *Cyclocalyx / Neopisidium*, genera of the family Sphaeriidae (fingernail clams). Oligochaete worms were also relatively common in the lake sediments; generally, at least one oligochaete taxon was present at most area/year combinations.

3.2.5.2. Temporal and Spatial Trend Interpretation

Benthic invertebrate abundance and richness results from the reference (INUG and PDL) and NF (TPE, TPN, SP, and WAL) Meadowbank study lakes in 2017 are summarized in **Table 3.2-15** by major taxa group (i.e., Insecta, Mollusca, Oligochaeta, and other taxa[24]). Geometric means of total abundance and total richness for the entire data set dating back to 2006 are provided in **Table 3.2-16.** Raw data are provided in **Appendix D** showing the organism counts by taxa for each of the replicate samples collected in 2017.

Time-series plots showing abundance and richness endpoints are presented in **Figure 3.2-67** to **Figure 3.2-72.** Below are descriptions of the endpoints based on Environment Canada guidance (EEM, 2011):

[24] "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, and O. Notostraca).

- *Total abundance* – the number of individual organisms per m^2, this metric is a measure of community density.
- *Total richness* – the number of different taxa (identified to the lowest practical taxonomic level, usually species) per grab.
- *Major taxa group abundance* – similar to total abundance, but broken down by major taxa group.
- *Major taxa group relative abundance* – proportional abundance of each major taxa group.
- *Major taxa group richness* – similar to total richness, but broken down by major taxa group.
- *Major taxa group relative richness* – proportional richness of each major taxa group.

Other benthic invertebrate community results presented in **Appendix E**, but not discussed in detail include time-series plots of abundance and richness within each major taxa group, Simpson's Diversity[25] and Bray-Curtis Index values[26].

The identification of potential mine-related impacts generally involved visually examining the data for spatial/temporal patterns that matched mine-related events. Visual examination of the data was further supported with statistical analyses of the 2017 data to test for changes relative to baseline/reference conditions using the BACI model (see **Section 2.4.4** for details). The BACI comparisons involved looking at longer-term trends (i.e., up to four-year trends) and focused only on benthic invertebrate abundance and taxa richness. Details regarding historical trends (e.g., related to sedimentation events) are discussed in the 2011 CREMP (Azimuth, 2012a) and the 2011 EAS (Azimuth, 2012b). This report focuses on the 2017 results and trends over the last four years (i.e., dating back to 2014), similar to the approach taken in recent CREMP reports (Azimuth 2014; Azimuth 2015c). As discussed in **Section 2.2.3**, MF (TPS and TE) and FF (TEFF) areas were not sampled in 2017. BACI model results for benthic invertebrate abundance and richness are presented in **Table 3.2-17** and **Table 3.2-18**, respectively. Key results are described below:

- *Total abundance* – INUG had similar abundance in 2017 compared to 2016, while PDL had slightly lower abundance in 2017 compared to 2016. Overall, abundance at INUG and PDL was within the range of previously-reported results across all sampled years. Abundance at WAL in 2017 (averaging around 5,300 organisms/m^2; **Table 3.2-15**), was lower than the record highs measured in 2016 (record average of nearly 16,000 organisms/m^2), but was still in the upper range of abundances measured at WAL prior to mine development, and still higher than the three years, 2013 to 2015, preceding the record high (**Figure 3.2-67**). These spikes in abundance at WAL are likely due to natural causes; as discussed in **Section 3.2.5.1**, similar events have been observed periodically under natural conditions (i.e., either during the baseline period or at reference areas) at both Meadowbank and Whale Tail Pit. Similar to other years, total abundance at WAL in 2017 remained dominated by insects from the Chironomidae family; within that family, Corynocera genus was most abundant, but up to six other different Chironomid genera were also represented.

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[25] Simpson's Diversity takes into account both the abundance patterns and taxa richness of the community based on the proportion of individuals that each taxa contributes to total abundance.

[26] Bray-Curtis Index is a distance coefficient (based on comparison of a site to one or more [pooled] reference sites) that ranges between 0 (both identical) to 1 (completely different). The index measures the percentage of difference between sites.

As more years of "after" data were included, estimates of effect size on abundance fluctuated. The strongest reductions were estimated at TPE; up to 49% reduced abundance in 2016-2017 after period relative to baseline years in the BACI analysis (**Table 3.2-17**). The only marginally significant result across variables and years was a 47% reduction at TPE for 3 "after" years (2015-2017). These results for TPE were similar to those found last year as well; INUG has generally increased across these years, whereas TPE has remained flat (but with the highest total abundance across years in 2008 during the "before" period, which strongly influences the comparisons with INUG).

Abundance at TPN in 2017 was slightly reduced in 2017 compared to baseline years (by 20.5%; not statistically significant ($P>0.1$) and the confidence interval quite large (**Table 3.2-17**). However, the range of abundance value at TPN in 2017 was much larger (between 500 to 2400 organisms/m^2 in the 5 replicates; **Table 3.2-15**) relative to 2016 and many other sampling years, suggesting that this difference detected in the BACI analysis was due to spatial heterogeneity. Abundance at SP and WAL relative to previous years was higher than the baseline period.

It's important to note while these "differences" are being identified in the BACI analysis, absolute abundance at TPE has been consistent over the past 4 years. Overall, none of the NF areas show a consistent decreasing trend in invertebrate abundance that could be attributable to mining activity.

- *Major taxa group abundance and relative abundance* – Insects were the dominant taxa group (generally over 60% relative abundance) followed by molluscs (roughly between 10-20% relative abundance) (**Figure 3.2-68** and **Figure 3.2-69**). While there were no apparent trends in composition changes related to mining, it is notable that most peaks (or valleys) in total abundance over the years appear to be driven by changes in abundance of insects (predominantly chironomids). Notable examples of this are WAL in 2006 and 2016, TPE in 2008, or TPS in 2015.
- *Taxa richness* – Taxa richness was either higher in 2017 relative to previous years, or within the range of taxa reported in more recent monitoring cycles (i.e., since 2014; **Figure 3.2-70**). Taxa numbers averaged between 10 (PDL) and 14 taxa (INUG) in 2017 (**Table 3.2-15**). Number of taxa at WAL and SP was slightly reduced in 2017 compared to 2016; average richness was 11 (SP) and 13 (WAL) in 2017 relative to 14 to 18 (SP) and 13 to 16 (WAL) in 2016. But, at both NF areas, the 2017 taxa richness was within range of richness observed over the duration of sampling years. Furthermore, the BACI analysis showed generally weak or positive effect sizes at all areas for 2017 and onwards; there were no statistically significant decreases in richness at NF areas in 2017 or the longer term 2, 3 and 4-yr after periods (**Table 3.2-18**). Despite some within-year variability in taxa richness, the NF areas show either stable or slightly increasing taxa richness.
- *Major taxa group richness and relative richness* – Similar to abundance, insects were dominant in terms of absolute and proportional richness (generally between five to ten taxa), followed by molluscs (~one to three taxa) (**Figure 3.2-71** and **Figure 3.2-72**). There were no apparent trends in composition related to mining.

The benthic invertebrate metrics (total abundance and taxa richness) for the NF and reference areas were generally within the range reported for previous years. The BACI analysis detected decreased abundance at TPE relative to INUG in the past three years, but the differences are primarily driven by increased abundance at INUG, while abundance at TPE has been relatively stable. Importantly, the diversity of the benthic invertebrate community at TPE is consistent with previous CREMP years, indicating the benthic community at TPE remains functionally diverse. In summary, no mine-related effects to the benthic invertebrate communities in the Meadowbank project lakes were observed in 2017.

Table 3.2–15. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Meadowbank study lakes, 2017.

Area-Replicate	Date	Depth (m)	Abundance (#/m^2)				Total Abundance	Richness (# taxa)				Total Richness	Simpson's Diversity	Bray-Curtis Index
			Oligochaetes	Insects	Molluscs	Other Taxa[1]		Oligochaetes	Insects	Molluscs	Other Taxa[1]			
Inuggugayualik Lake														
INUG-1	25-Aug-17	7.0	0	674	500	65	1239	0	11	2	2	15	0.852	0.186
INUG-2	25-Aug-17	7.3	22	478	500	87	1087	1	6	2	1	10	0.771	0.206
INUG-3	25-Aug-17	7.5	22	1370	391	22	1804	1	8	3	1	13	0.773	0.334
INUG-4	25-Aug-17	7.9	22	1543	391	43	2000	1	11	3	1	16	0.818	0.254
INUG-5	25-Aug-17	8.1	109	2217	674	22	3022	2	9	3	1	15	0.878	0.383
Area Mean			***35***	***1257***	***491***	***48***	***1830***	***1***	***9***	***3***	***1***	***14***	***0.818***	***0.273***
Pipedream Lake														
PDL-1	24-Aug-17	8	43	674	500	43	1261	1	6	2	2	11	0.773	0.260
PDL-2	24-Aug-17	6.9	87	783	217	0	1087	2	8	2	0	12	0.896	0.271
PDL-3	24-Aug-17	6.9	65	326	22	0	413	1	6	1	0	8	0.901	0.439
PDL-4	24-Aug-17	8	22	457	239	43	761	1	5	2	2	10	0.810	0.172
PDL-5	24-Aug-17	7.5	22	348	174	0	543	1	6	1	0	8	0.820	0.206
Area Mean			***48***	***517***	***230***	***17***	***813***	***1***	***6***	***2***	***1***	***10***	***0.840***	***0.270***
Second Portage Lake														
SP-1	22-Aug-17	7.9	0	1000	935	152	2087	0	7	1	3	11	0.744	0.380
SP-2	22-Aug-17	8.1	22	1717	370	130	2239	1	6	1	3	11	0.586	0.477
SP-3	22-Aug-17	8.7	43	1543	761	109	2457	1	6	2	2	11	0.708	0.464
SP-4	22-Aug-17	7.8	43	1174	522	65	1804	1	7	1	3	12	0.769	0.271
SP-5	22-Aug-17	8.1	0	783	913	87	1783	0	7	1	3	11	0.690	0.331
Area Mean			***22***	***1243***	***700***	***109***	***2074***	***1***	***7***	***1***	***3***	***11***	***0.699***	***0.385***
Third Portage Lake - East Basin														
TPE-1	23-Aug-17	8.1	65	2022	1022	43	3152	1	8	1	1	11	0.812	0.531
TPE-2	23-Aug-17	7.9	43	2043	543	22	2652	2	9	1	1	13	0.836	0.404
TPE-3	23-Aug-17	8.4	109	1717	1000	0	2826	2	10	1	0	13	0.810	0.450
TPE-4	23-Aug-17	8.1	196	2239	696	0	3130	1	9	1	0	11	0.846	0.499
TPE-5	23-Aug-17	7.8	109	2652	1370	43	4174	1	11	1	2	15	0.761	0.620
Area Mean			***104***	***2135***	***926***	***22***	***3187***	***1***	***9***	***1***	***1***	***13***	***0.813***	***0.501***
Third Portage Lake - North Basin														
TPN-1	27-Aug-17	8.4	43	1891	457	43	2435	2	9	1	1	13	0.830	0.377
TPN-2	27-Aug-17	8.3	43	935	674	22	1674	2	11	1	1	15	0.796	0.294
TPN-3	27-Aug-17	8.4	0	935	87	22	1043	0	9	1	1	11	0.865	0.437
TPN-4	27-Aug-17	8.3	43	1435	391	22	1891	1	11	1	1	14	0.857	0.341
TPN-5	27-Aug-17	8.8	0	283	130	65	478	0	6	1	2	9	0.887	0.410
Area Mean			***26***	***1096***	***348***	***35***	***1504***	***1***	***9***	***1***	***1***	***12***	***0.847***	***0.372***
Wally Lake														
WAL-1	26-Aug-17	8	0	2457	543	65	3065	0	8	2	3	13	0.842	0.595
WAL-2	26-Aug-17	8.3	0	2826	565	22	3413	0	8	2	1	11	0.847	0.624
WAL-3	26-Aug-17	7.9	0	5348	935	87	6370	0	10	2	2	14	0.854	0.689
WAL-4	26-Aug-17	7.9	0	5239	543	65	5848	0	10	2	2	14	0.798	0.698
WAL-5	26-Aug-17	7.5	*0*	*6152*	*1261*	*152*	*7565*	*0*	*9*	*2*	*3*	*14*	*0.846*	*0.704*
Area Mean			***0***	***4404***	***770***	***78***	***5252***	***0***	***9***	***2***	***2***	***13***	***0.837***	***0.662***

Notes:

1. “Other taxa” includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, and O. Notostraca).

Table 3.2–16. Geometric means for total abundance and total richness, Meadowbank study lakes.

Geometric means for Total abundance[1]												
Station	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
INUG	731 (10)	975 (8)	1300 (5)	1129 (6)	628 (11)	882 (9)	1043 (7)	1975 (2)	621 (12)	1648 (4)	2100 (1)	1712 (3)
PDL	NA	NA	NA	1522 (1)	776 (7)	928 (6)	943 (5)	1279 (3)	474 (9)	1127 (4)	1373 (2)	748 (8)
WAL	12895 (2)	4357 (4)	1058 (11)	1835 (7)	1728 (8)	800 (12)	1874 (6)	1445 (10)	2223 (5)	1568 (9)	14253 (1)	4943 (3)
TPN	NA	1360 (4)	864 (9)	1214 (6)	1030 (8)	499 (10)	1141 (7)	1407 (3)	374 (11)	3025 (1)	1696 (2)	1310 (5)
TPE	3221 (3)	1563 (11)	5556 (1)	1663 (9)	1127 (12)	1584 (10)	3916 (2)	2244 (8)	2827 (5)	2765 (7)	2787 (6)	3148 (4)
SP	619 (9)	843 (7)	396 (11)	772 (8)	242 (12)	563 (10)	1170 (6)	2279 (2)	2796 (1)	1928 (4)	1420 (5)	2059 (3)
TPS	936 (9)	1597 (4)	1501 (6)	1715 (3)	1130 (8)	932 (10)	1933 (2)	1582 (5)	1218 (7)	5940 (1)	NA	NA
TE	914 (4)	930 (3)	743 (8)	757 (6)	518 (10)	725 (9)	748 (7)	819 (5)	1158 (2)	1548 (1)	NA	NA
TEFF	NA	NA	NA	1215 (1)	887 (5)	615 (7)	921 (3)	956 (2)	892 (4)	817 (6)	NA	NA

Geometric means for Total richness												
Station	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
INUG	10.2 (10)	12 (7)	13.5 (4)	13.3 (5)	8.2 (12)	10.6 (9)	10.8 (8)	15.5 (2)	9.3 (11)	12.5 (6)	15.8 (1)	13.7 (3)
PDL	NA	NA	NA	11 (1)	9 (6)	9.3 (5)	8 (8)	10.4 (2)	5.6 (9)	8.8 (7)	10.2 (3)	9.7 (4)
WAL	11.7 (4)	13.2 (2)	7.9 (11)	10.6 (7)	10.5 (9)	7 (12)	11.5 (5)	10.5 (8)	10.9 (6)	10.2 (10)	14.6 (1)	13.2 (3)
TPN	NA	9.4 (7)	7.6 (10)	9.1 (8)	10.4 (5)	7.8 (9)	10.1 (6)	12.4 (1)	5.8 (11)	10.8 (4)	12.4 (2)	12.2 (3)
TPE	8.3 (12)	10.8 (9)	14.2 (1)	11.4 (7)	9.8 (10)	9.3 (11)	12.5 (6)	14 (3)	10.9 (8)	14.1 (2)	13.8 (4)	12.6 (5)
SP	6.1 (11)	9.4 (8)	7.2 (10)	7.3 (9)	4.2 (12)	10.2 (7)	12.8 (4)	11.6 (5)	13.4 (2)	13 (3)	15.2 (1)	11.2 (6)
TPS	10.6 (5)	9.5 (8)	10.8 (3)	10.7 (4)	8.2 (9)	7.9 (10)	10.3 (6)	10.2 (7)	10.9 (2)	16.5 (1)	NA	NA
TE	5 (10)	8.7 (5)	9.9 (2)	7.1 (7)	5.9 (9)	6 (8)	8.8 (4)	7.8 (6)	9 (3)	12.9 (1)	NA	NA
TEFF	NA	NA	NA	10.3 (4)	10.6 (2)	8.5 (6)	8.3 (7)	9.6 (5)	10.3 (3)	11.4 (1)	NA	NA

Notes:

1. Total abundance in organisms/m^2.

Rank order of abundance and richness shown in parentheses.

Red vertical lines marks the year that station designations switched from "control" to "impact".

NA = Benthic invertebrate sampling was not completed for the given station/year.

Table 3.2–17. Results of the BACI tests for benthic invertebrate abundance at Meadowbank study lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2017	TPN	2	1	-0.23	0.47	0.36	-20.5	-100	32227
	TPE	3	1	-0.51	0.67	0.26	-40	-97	959
	SP	2	1	0.34	0.27	0.79	40.2	-95	4041
	WAL	7	1	0.21	0.99	0.58	23.7	-89	1278
2016-17	TPN	2	2	-0.20	0.35	0.31	-18	-82	269
	TPE	3	2	-0.67	0.45	0.12	-49	-88	112
	SP	2	2	0.05	0.30	0.56	5	-71	282
	WAL	7	2	0.64	0.72	0.80	90	-66	947
2015-17	TPN	2	3	0.08	0.39	0.57	8.00	-69	274
	TPE	3	3	-0.64	0.35	**0.07**	-47	-80	38
	SP	2	3	0.14	0.24	0.70	15	-46	144
	WAL	7	3	0.12	0.68	0.57	13	-76	437
2014-17	TPN	2	4	-0.06	0.43	0.45	-6	-71	211
	TPE	3	4	-0.39	0.43	0.20	-32	-77	104
	SP	2	4	0.52	0.49	0.83	68	-56	549
	WAL	7	4	0.20	0.60	0.63	22	-68	370

Notes:

Bolded values are P-values < 0.1

Shaded cells indicate negative effect sizes (reductions) of 20% or more

Test area = area compared to control (INUG)

n(B) = number of years in the "before" period

n(A) = number of years in the "after" period

Estimate = BACI model estimate of the after-period change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or an increase in mean

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 3.2–18. Results of the BACI tests for benthic invertebrate taxa richness at Meadowbank study lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2017	TPN	2	1	0.31	0.24	0.79	36	-94	2770
	TPE	3	1	-0.01	0.15	0.47	-1	-47	85
	SP	2	1	0.16	0.21	0.71	18	-92	1689
	WAL	7	1	0.06	0.31	0.57	6	-50	126
2016-17	TPN	2	2	0.24	0.18	0.85	27	-40	172
	TPE	3	2	-0.04	0.11	0.37	-4	-32	35
	SP	2	2	0.24	0.15	0.88	27	-32	138
	WAL	7	2	0.04	0.22	0.57	4	-38	74
2015-17	TPN	2	3	0.25	0.16	0.90	29	-22	111
	TPE	3	3	0.04	0.11	0.64	4	-23	41
	SP	2	3	0.29	0.13	0.94	33	-12	101
	WAL	7	3	-0.01	0.18	0.48	-1	-35	51
2014-17	TPN	2	4	0.17	0.17	0.81	19	-26	91
	TPE	3	4	0.09	0.11	0.78	9	-17	45
	SP	2	4	0.41	0.20	0.95	51	-13	162
	WAL	7	4	0.06	0.16	0.63	6	-27	53

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate negative effect sizes (reductions) of 20% or more

Test area = area compared to control (INUG)

n(B) = number of years in the "before" period

n(A) = number of years in the "after" period

Estimate = BACI model estimate of the after-period change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or an increase in mean

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 3.2-67. Benthic invertebrate total abundance (#/m^2) from Meadowbank study lakes since 2006.

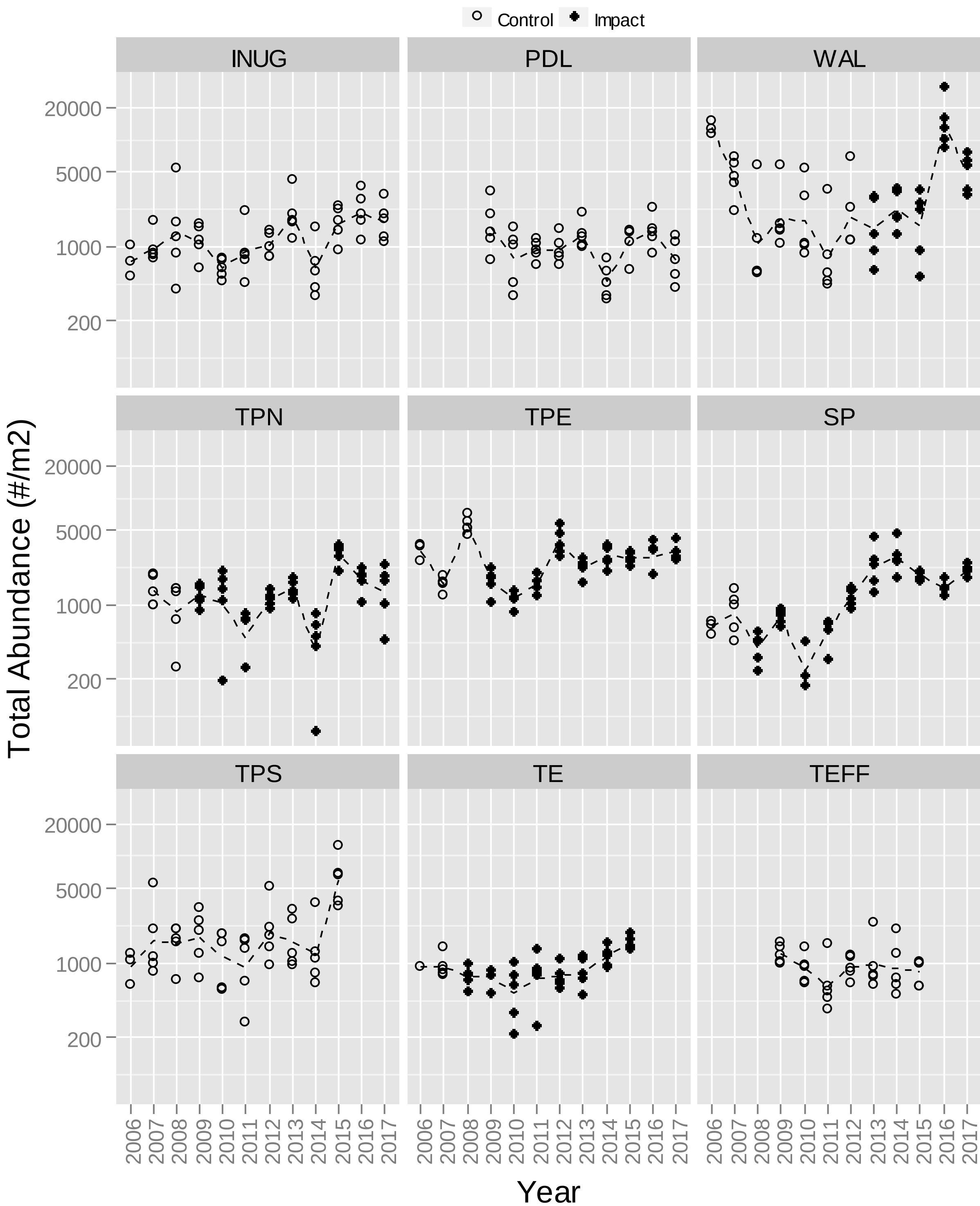


Figure 3.2-68. Benthic invertebrate abundance (#/m^2) by major taxa group from Meadowbank study lakes since 2006.

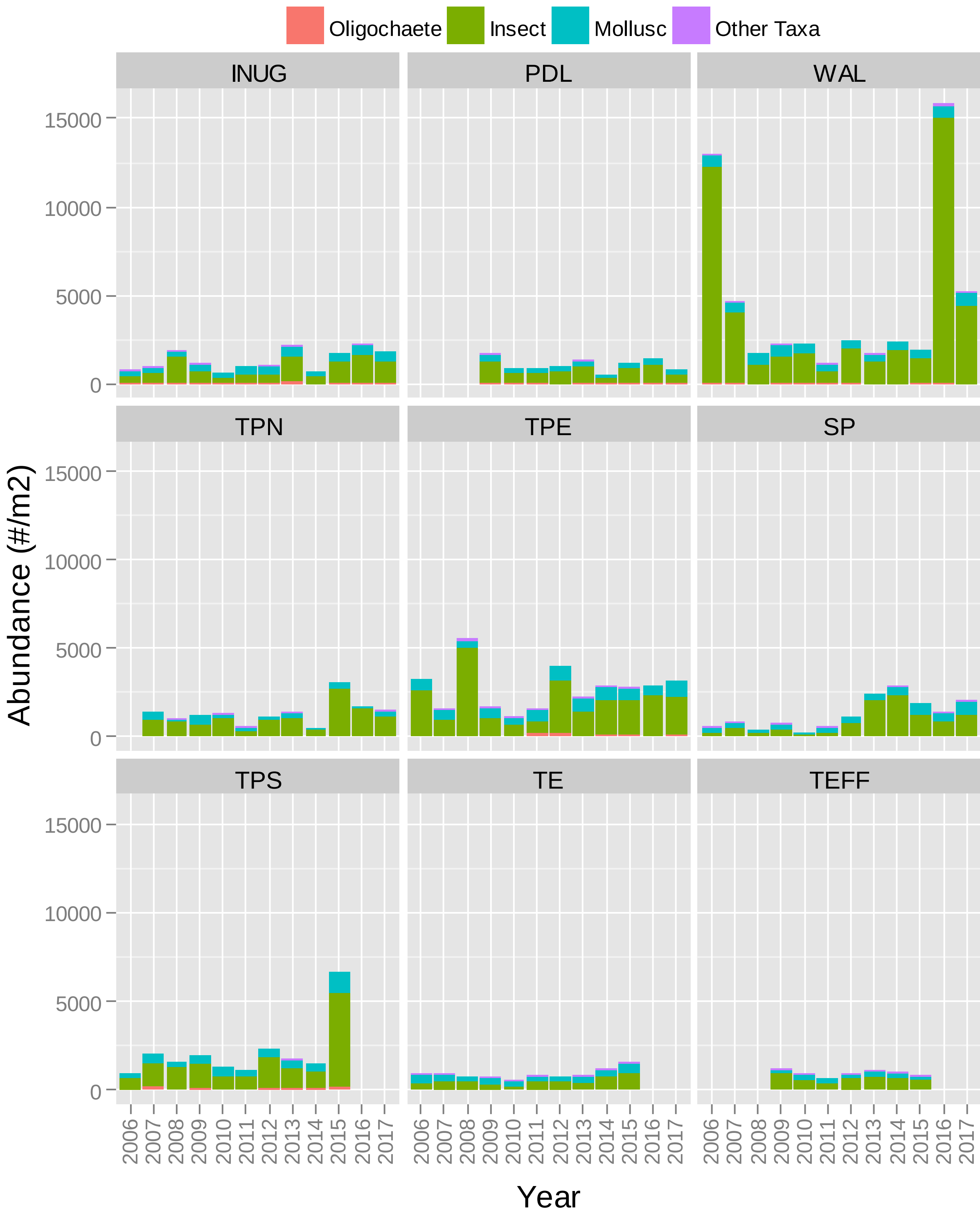


Figure 3.2-69. Benthic invertebrate relative abundance by major taxa group from Meadowbank study lakes since 2006.

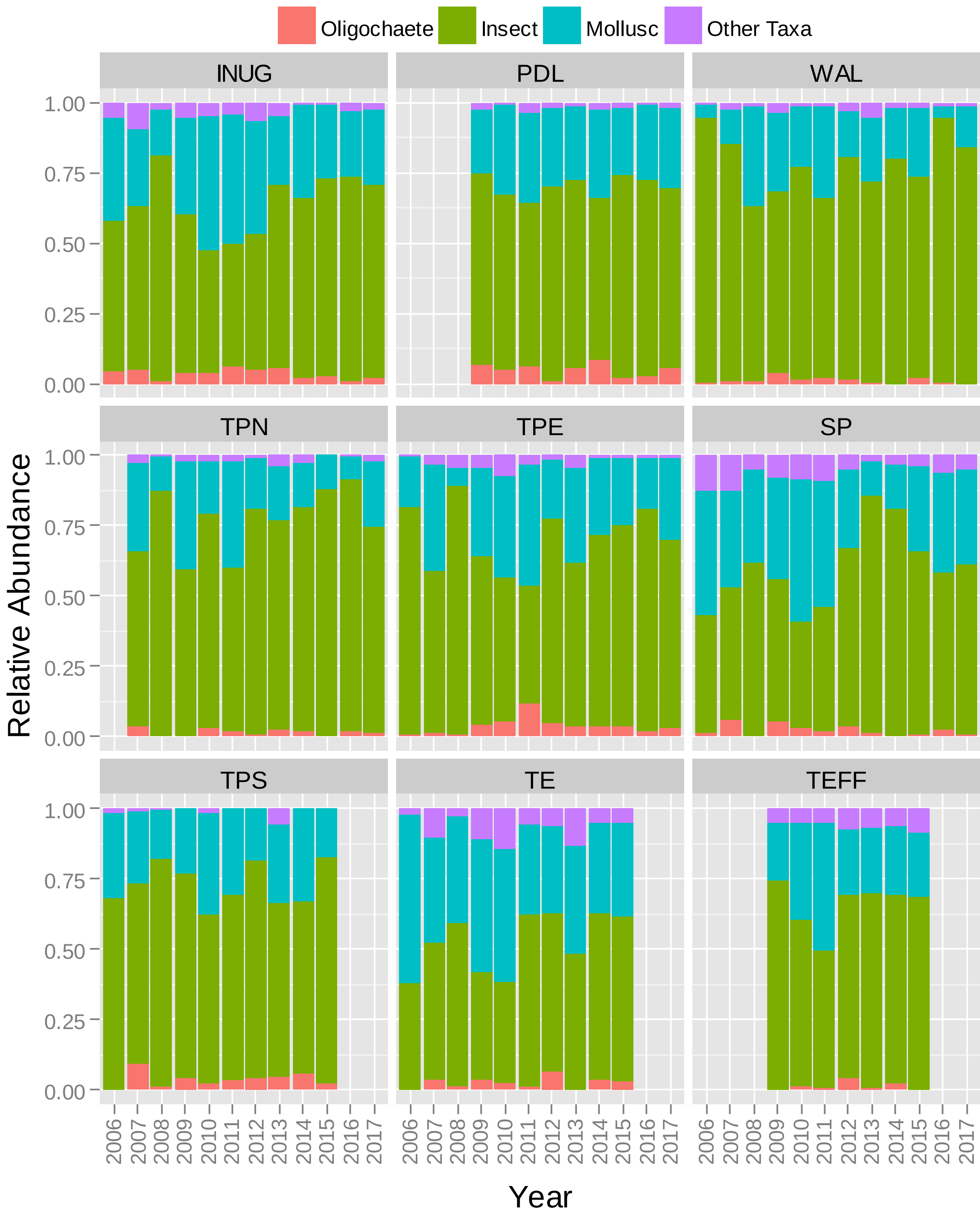


Figure 3.2-70. Benthic invertebrate total richness (# taxa) from Meadowbank study lakes since 2006.

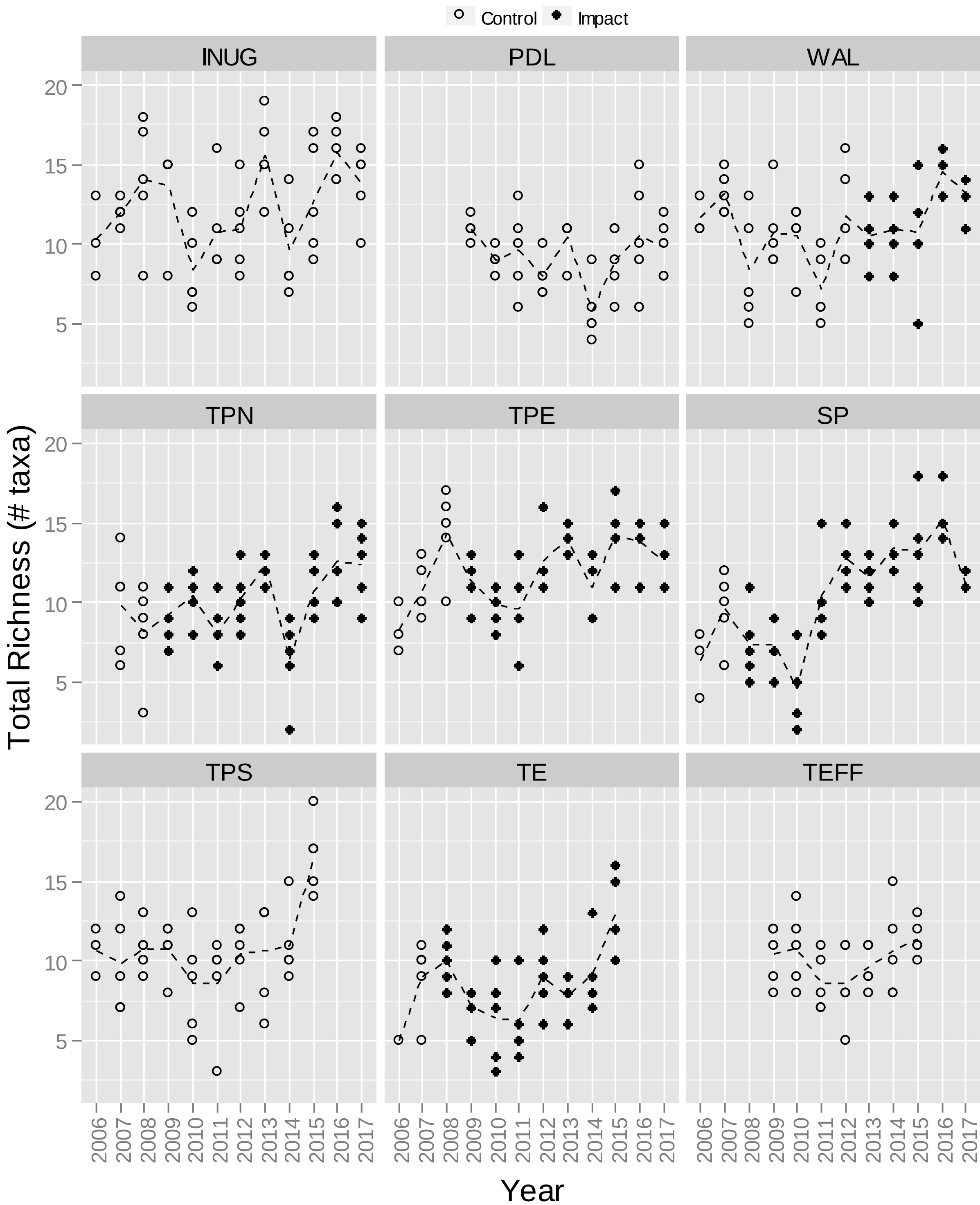


Figure 3.2-71. Benthic invertebrate richness (# taxa) by major taxa group from Meadowbank study lakes since 2006.

Notes:

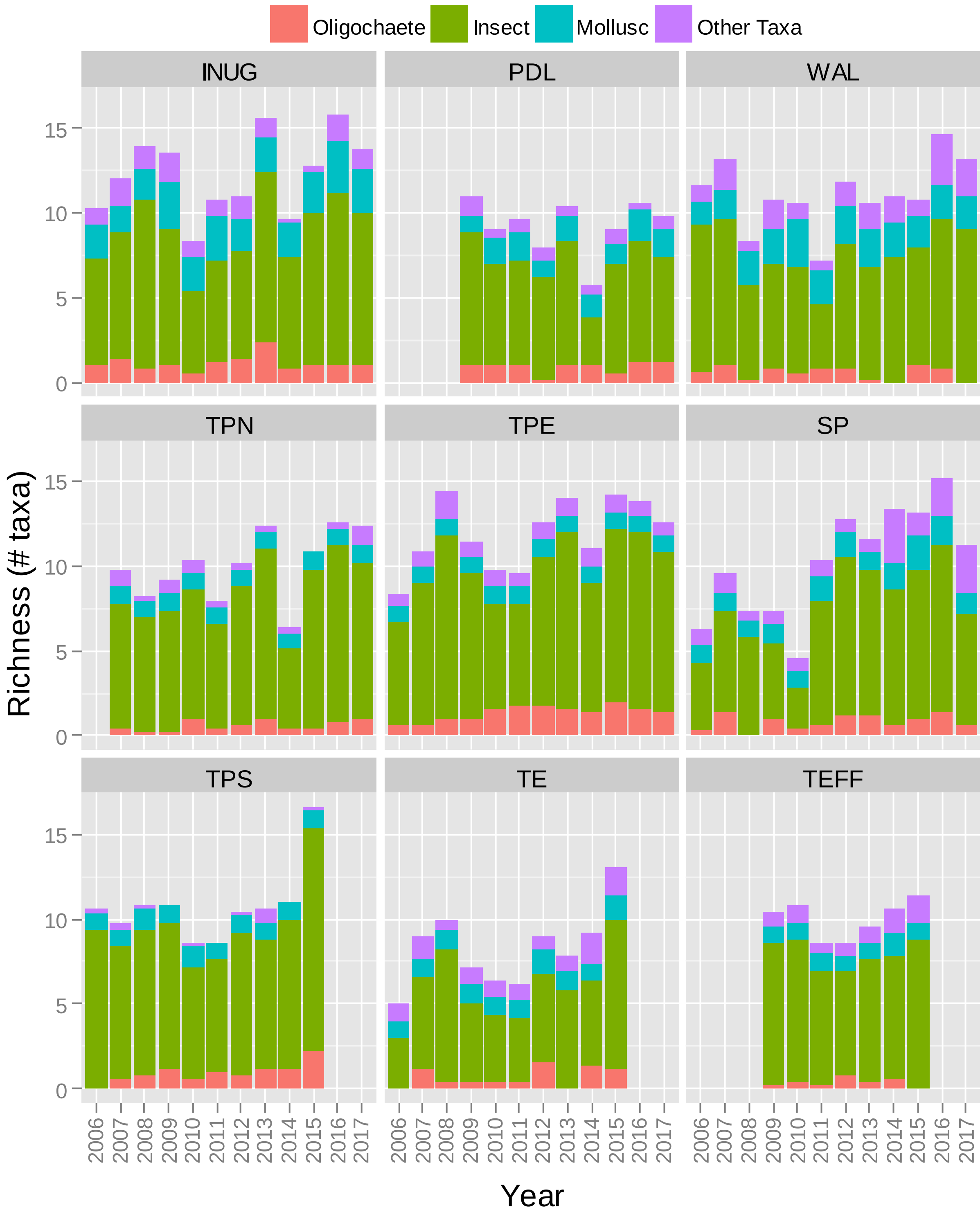
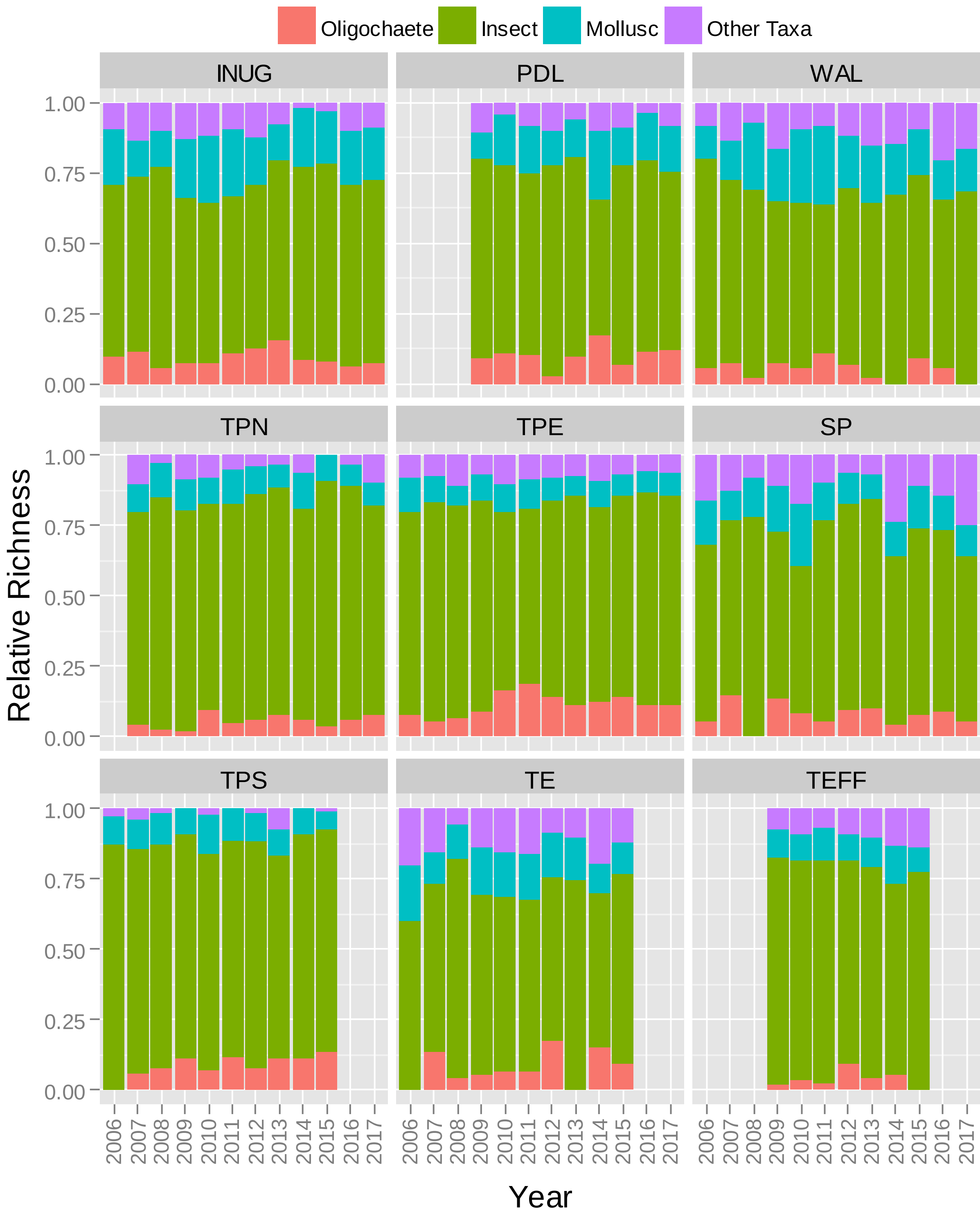


Figure 3.2-72. Benthic invertebrate relative richness by major taxa group from Meadowbank study lakes since 2006.



3.3. Baker Lake

Throughout this discussion, the following abbreviations will be used for each lake area/basin:

- BBD – Baker Lake Barge Dock,
- BPJ – Baker Lake Proposed Jetty (no longer a proposed jetty, but located adjacent to Agnico's fuel storage area and the Meadowbank Spud Barge),
- BES – Bake Lake East Shore (sediment chemistry/benthic invertebrates only),
- BAP – Bake Lake Akilahaarjuk Point

The full CREMP program was completed at all Baker Lake areas in 2017. Limnology, water chemistry, and phytoplankton sampling was completed in July, August, and September. Sediment sampling (grabs and cores) and benthic invertebrate sampling was completed in August.

3.3.1. Limnology

3.3.1.1. General Observations

Baker Lake is a large lake with much greater wind fetch than the Meadowbank lakes and a unique limnology, due partly to its proximity to tidally influenced Chesterfield Inlet, influence of the Thelon River and deep water that is naturally elevated in dissolved solids. These natural complexities interact, leading to the "competing" influences of less-saline Thelon River water and more-saline Baker Lake water. Timing of sampling relative to freshet on the Thelon River, coupled with shifts in north/south wind speed and direction lead to variable degrees of horizontal and vertical mixing of the water column. When sampling near to the north shore, these factors may combine to confound the detection of potential changes in water quality related to barge activity, with the "signal" getting lost in the "noise" of natural variability in this dynamic location.

The following parameters are associated with more-saline or higher conductivity water that appears to be present in deep water (>10-15 m) and demonstrates considerable fluctuations within and between years. These include conductivity, hardness, calcium, chloride, magnesium, sodium and TDS. Other parameters also have a high level of natural variability and appear to be correlated with the above parameters in Baker Lake and include ammonia, nitrate, TKN, total phosphorus, sulphate and TOC/DOC.

As described below (and in **Section 3.3.2**), sampling results to date show marked differences in certain parameters (e.g., total dissolved solids and ancillary parameters such as water hardness, alkalinity and some nutrients) associated with hard (e.g., slightly brackish) water. Variability related to these factors potentially confounds the identification of development-related effects on local limnology and water quality. A deep limnology survey was conducted in August 2012 to better characterize Baker Lake limnology at depth. All parameters measured (temperature, conductivity, dissolved oxygen, pH, total dissolved solids and salinity) showed a strong and abrupt stratification from 8 m to 12 m depth at areas BBD 1 and 2, and BPJ. For example, conductivity increased from <20 µS/cm in shallow, near-shore water, to >200 µS/cm between 8 and 12 m depth, depending on location. Conductivity remained uniformly high to the maximum depth sampled (40 m).

3.3.1.2. Temporal and Spatial Trend Interpretation

The major mine-related activity that occurs in this area is seasonal barge traffic during the summer months when Baker Lake is ice-free. It should also be noted that the Hamlet of Baker Lake's sewage lagoons and landfill are situated in a watershed that discharges seasonally into Baker Lake between BBD and BPJ. Locally, propeller wash may cause vertical mixing in very discrete areas when there is active traffic. Otherwise (with the exception of spills and occasional discharge from commercial vessels etc.), there are no other activities with the potential to alter limnological parameters.

At Baker Lake, limnological conditions are similar to the Meadowbank study lakes except that water temperatures are cooler, typically reaching no more than 10°C in mid-summer (**Figure 3.3-1**). Some thermal stratification is evident in Baker Lake, particularly in July and August. Thermal stratification was detected at BBD during the August sampling event with surface water temperatures at 12°C, dropping to 6°C at 5 m depth, and staying relatively constant to the bottom of the profile (**Figure 3.3-3**). Stations BPJ and BAP took longer to warm in 2017, and the timing of the sampling events in August (9th to 10th), and September (30th) missed capturing the typical seasonal warming that occurs in mid to late August / early September. By the end of September, limnology profiles at all Baker stations resembled conditions in early July just after ice came off the lake (i.e., un-stratified colder water, well-mixed in terms of conductivity [<40 µS/cm] , and saturated DO).

Conductivity can show a strong and abrupt stratification in Baker Lake. The August profile (**Figure 3.3-3**) at BBD is characteristic of the pattern of seasonal (late summer) mixing in Baker Lake. Both BAP and BPJ had uniform conductivity measuring over 150 µS/cm in August, indicating these stations had likely already turned over with a breakdown of the thermocline and mixing of deeper, more saline water with the entire water column. Overall, the general pattern of temperature and conductivity in Baker Lake was similar in 2017 as described above. Occasional elevations in conductivity and related parameters are due to the heterogeneity of surface waters related to the natural phenomena of wind driven currents, vertical mixing of deeper, higher conductivity water and influence of the Thelon River.

Figure 3.3-1. Mean monthly field-measured temperature (°C) at 3 m depth from 2008 – 2016, Baker Lake.

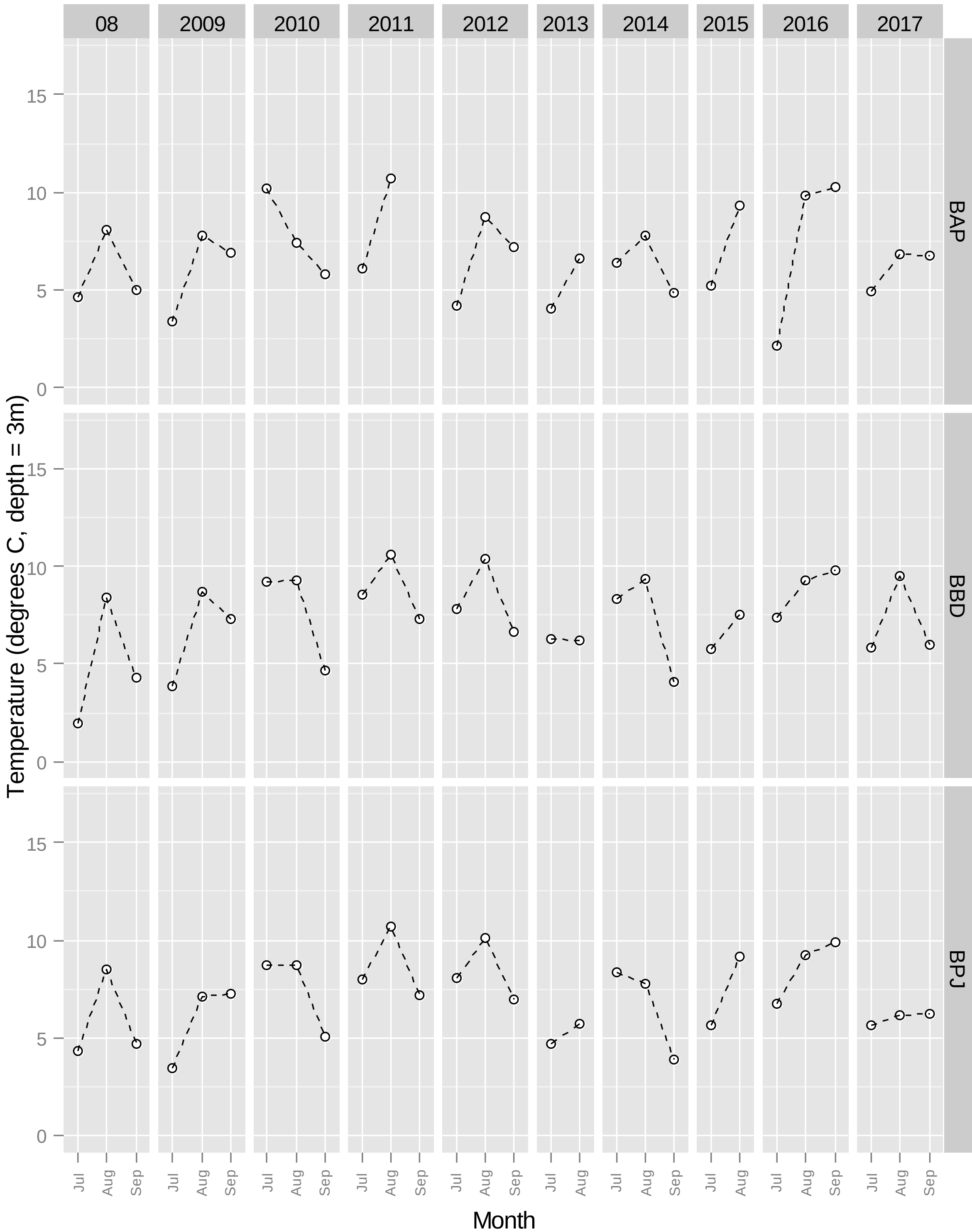


Figure 3.3-2. Field-measured temperature (°C) and conductivity (µS/cm) profiles in Baker Lake, July 2017.

Notes: Conductivity for BBD is masked behind BPJ. Measurements were 24.4 ± 1 µS/cm for each depth horizon at BBD and BPJ.

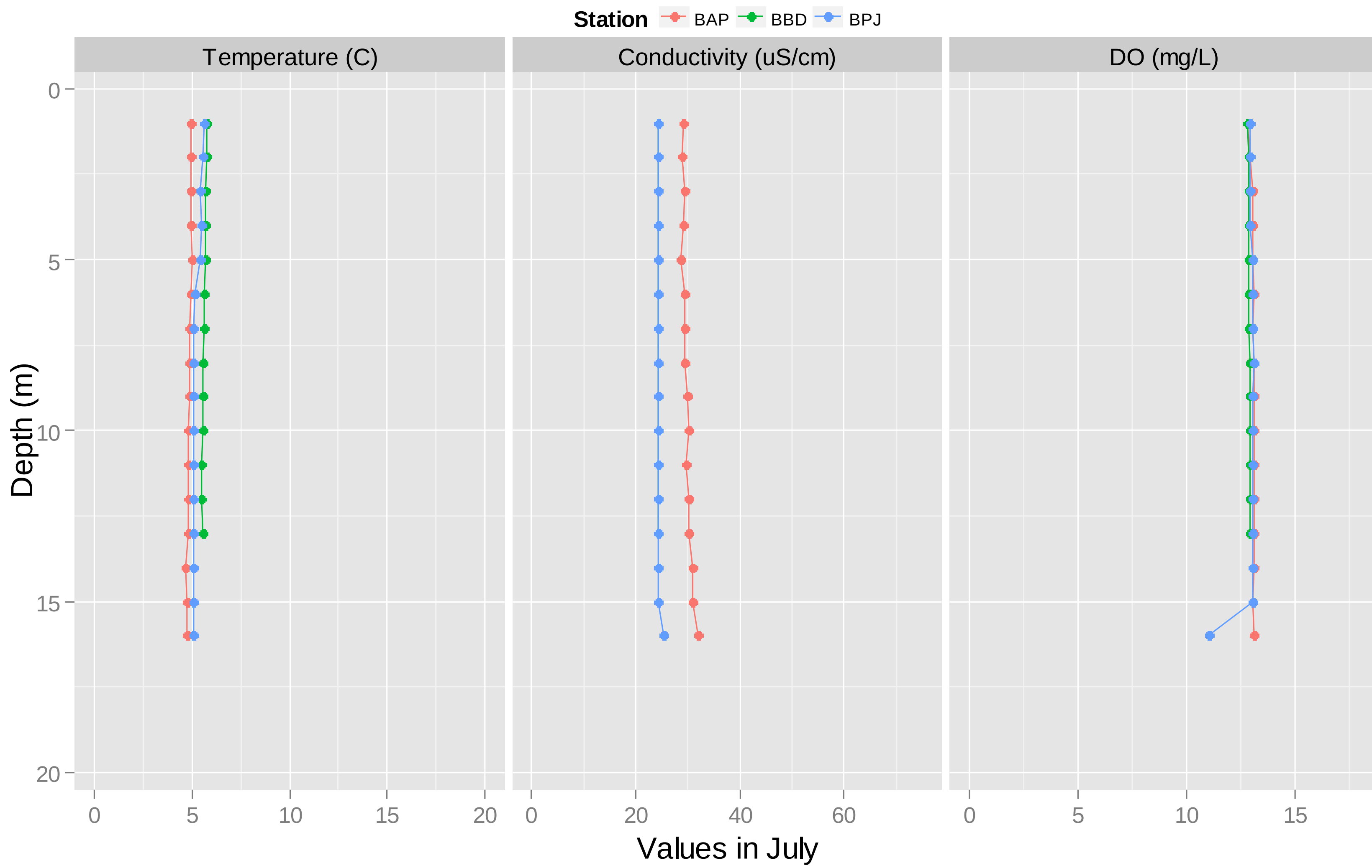


Figure 3.3-3. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles in Baker Lake, August 2017.

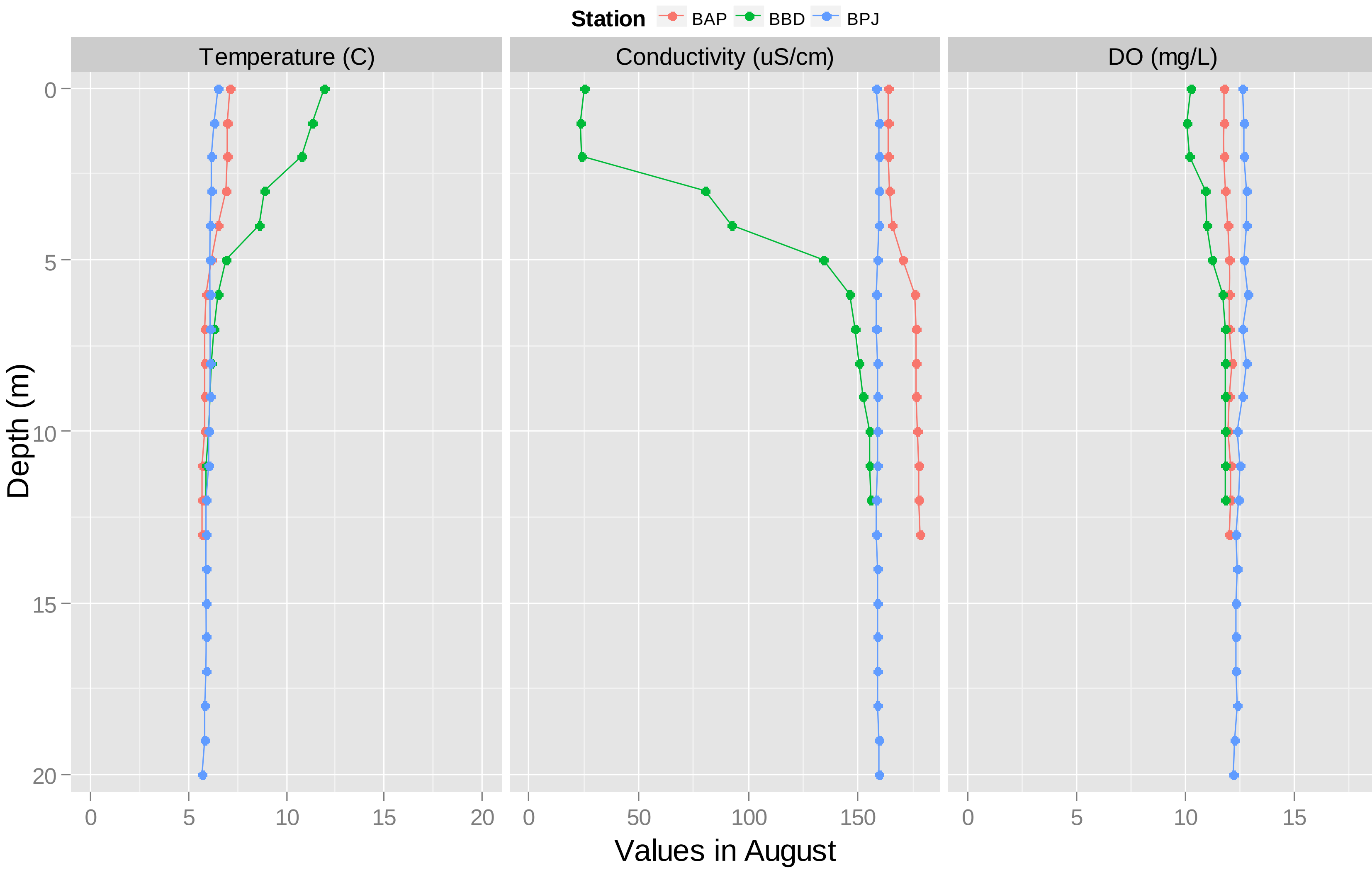
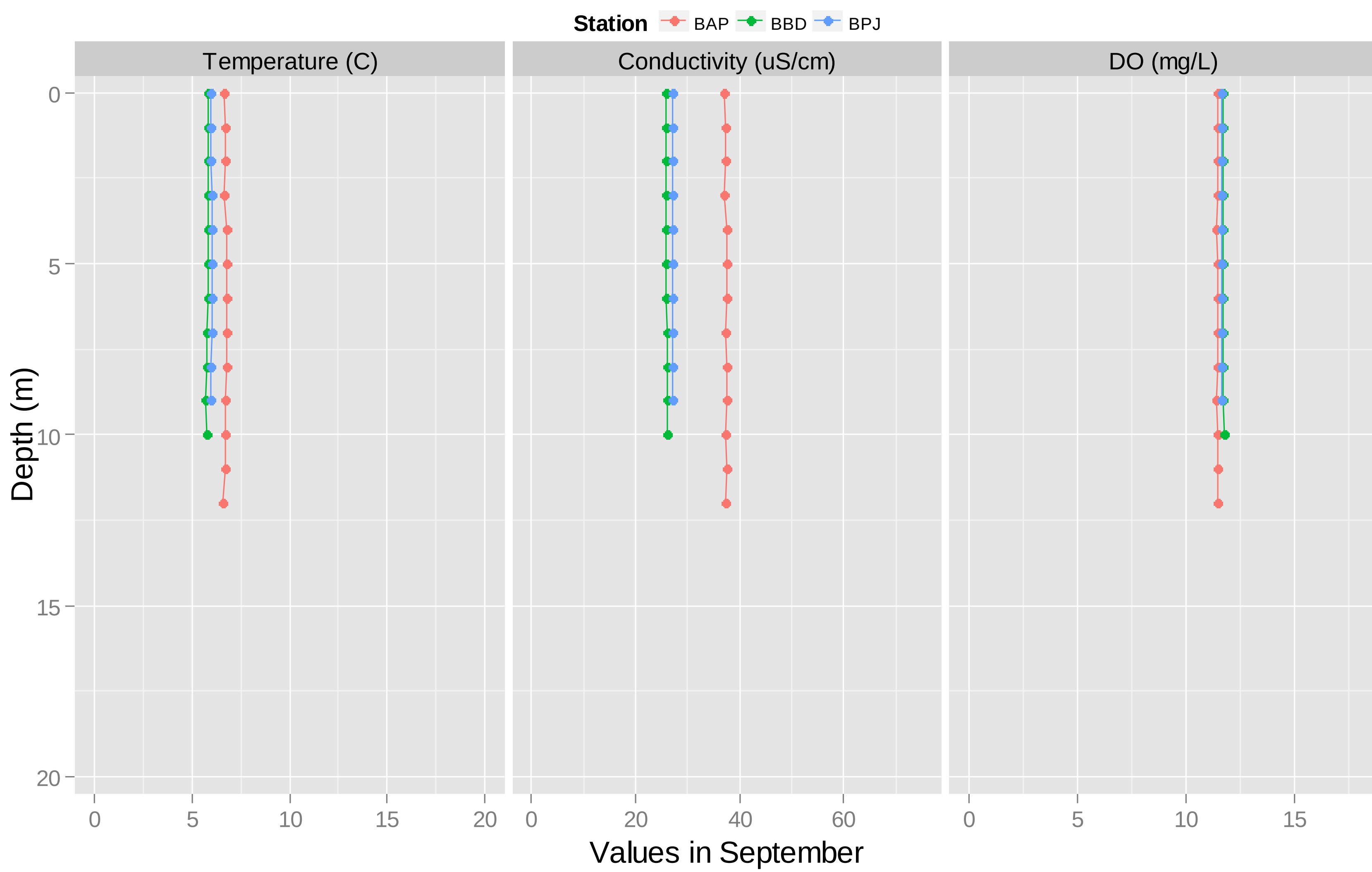


Figure 3.3-4. Field-measured temperature (°C), conductivity (µS/cm) and dissolved oxygen (mg/L) profiles in Baker Lake, September 2017.

Note: Specific conductivity readings were only taken at the surface because of technical issues with water quality instrument.



3.3.2. Water Chemistry

3.3.2.1. General Observations

Baker Lake is very large and exposed along the north-south axis to high wind and wind-generated currents. Monitoring areas along the north shore also have the added complexity of a large river (Thelon River) that discharges into Baker Lake at its western end, and possibly a residual deep-water brackish layer. Depending on wind speed and direction, water from this deeper layer can influence water chemistry parameters (conductivity, salts, and dissolved solids) in surface waters. Consequently, there can be pronounced spatial (horizontal and vertical) and temporal variability in certain parameters. Despite this variability, many parameters in the Baker Lake samples were also typically below laboratory MDLs.

3.3.2.2. Temporal and Spatial Trend Interpretation

Results for conventional water quality parameters, nutrients and metals for 2017 are presented in **Table 3.3-1**; they are discussed, where relevant from a spatial and temporal trend perspective.

CREMP monitoring results since 2008 were used to assess temporal and spatial trends related to mining activities. The general rationale for assessing these trends was discussed in **Section 1.5**; the process was tailored slightly for water chemistry, as described below.

Most water quality parameters in Baker Lake were routinely below laboratory MDLs, similar to the results for the Meadowbank study lakes. Detection of changes to water quality related to barge activity (or related to potential non-mining inputs from the Hamlet of Baker Lake) would be relatively easy to detect, notwithstanding the confounding influence of naturally elevated conductivity, dissolved salts and TDS depending on limnological conditions at the time of sampling. Starting with the parameters listed in **Table 3.3-1**, a conservative two-step screening process was used to refine the list parameters for inclusion into the formal trend assessment. The results are summarized in **Table 3.3-2** with figure number references for all parameters that were screened in.

1. *Overall Detection Frequency* - Only those water quality parameters that exceeded MDLs in at least 10% of the samples were included in this discussion. Because this lake is ultra-oligotrophic, it is normal for many parameters to routinely be below MDLs.
2. *Control-Impact Detection Frequency Comparison* – In order to avoid screening out infrequently detected parameters that were detected more often in association with barge activities, the proportion of samples exceeding MDLs between "control" and "impact" samples were compared; the intent of this screen was to identify parameters with <5% detection frequency (i.e., those screened out above) for which there were detection frequency changes potentially associated with mining activity (i.e., where the proportion of detected values increased by 0.05 or more).

All routine parameters, anions and nutrients, and metal (total and dissolved) retained based on the two-step screening process are shown in **Figure 3.3-5** to **Figure 3.3-49**. The samples were collected from a depth of 3 meters for all areas and events, consistent with the SOP. The red dashed line in each of these water chemistry figures is the trigger value specific to Baker Lake. All parameters not retained for the trend assessment were assumed to have no spatial or temporal trends related to barge activities or to natural variability and were excluded from further consideration (plots for these parameters are included for reference in **Appendix A2**).

The mean parameter concentrations for the 2017 water samples were below their respective trigger values in 2017. Other than one isolated trigger exceedance for total aluminum at the reference area BAP in September, all water quality parameters were below the trigger values in 2017 (**Table 3.3-1**). Barge traffic over the past few years is not adversely affecting water quality at the exposure areas (**Figure 1.4-1**). This is not surprising given that there were no reported spills in 2017 and that any effects to the water column from prop wash would be ephemeral and would clear quickly with no lingering effects to the water column. There are no follow-up measures for management in 2018 beyond routine CREMP water quality sampling during the open water season.

Table 3.3–1. Water quality results from the 2017 CREMP, Baker Lake.

Lake and Station				Baker Lake											
				Akilahaarjuk Point (BAP)						Barge Dock (BBD)					
Area-Replicate ID				BAP-49	BAP-50	BAP-51	BAP-52	BAP-53	BAP-54	BBD-49	BBD-50	BBD-51	BBD-52	BBD-53	BBD-54
Depth (m)		Trigger[2]		3	3	3	3	3	3	3	3	3	3	3	3
Date	CCME Guideline[1]	Baker Lake	Threshold[2]	6-Jul-17	6-Jul-17	9-Aug-17	9-Aug-17	30-Sep-17	30-Sep-17	6-Jul-17	6-Jul-17	10-Aug-17	10-Aug-17	30-Sep-17	30-Sep-17
Field Measurements (Surface)															
Temperature (°C)				5.0	4.9	7.1	6.9	6.7	6.8	5.7	6.0	11.9	11.9	6.0	5.8
Specific Conductivity (µS/cm)				30.3	29.2	163.9	166.7	37.1	37.7	24.3	24.4	24.9	29.1	26.1	25.9
Dissolved Oxygen (mg/L)				12.91	12.85	11.77	11.89	11.49	11.46	12.84	12.73	10.24	10.28	11.71	11.73
pH	6.5 - 9.0	6.50 - 8.32	6.5 - 9.0	6.77	6.75	7.29	7.07	6.99	6.97	6.82	6.81	7.17	7.09	6.78	6.94
Physical Tests (mg/L)															
Conductivity (µS/cm)		494.5		31	28	153	158	34.8	36.9	24.1	24	86	59	24.1	24.3
Hardness		41.2		10.3	10.0	22.4	22.7	10.7	10.6	9.9	9.7	15.7	13.8	10.3	10.2
pH (Laboratory)	6.5 - 9.0	6.86 - 8.11	6.5 - 9.0	7.06	7.09	6.94	7.00	7.17	7.14	7.09	7.11	7.01	7.01	7.13	7.16
Total Suspended Solids		3.0	5.0	1.3	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids		208		19	19	93	94	26	25	18	17	57	45	20	21
Turbidity (NTU)				0.71	0.81	0.69	0.42	0.72	0.53	0.76	0.95	0.60	0.82	0.46	0.58
Anions and Nutrients (mg/L)															
Alkalinity - Bicarbonate		10.6		8.4	8.1	9.4	9.1	8.7	8.7	8.4	8.6	8.8	8.7	8.3	8.5
Alkalinity - Carbonate		4		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Total		10.6		8.4	8.1	9.4	9.1	8.7	8.7	8.4	8.6	8.8	8.7	8.3	8.5
Ammonia (as N)[3]	***equation***	0.067	0.126	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide				<0.050	<0.050	0.13	0.14	<0.050	<0.050	<0.050	<0.050	0.07	0.05	<0.050	<0.050
Chloride	120	95.7	120	3	2	38	39	4	4	1	1	19	12	2	1
Fluoride	0.120			0.06	0.06	0.06	0.06	0.05	0.05	0.06	0.06	0.06	0.05	0.05	0.05
Nitrate (as N)	3.0	1.51	3	0.0277	0.0286	0.0371	0.0367	0.0218	0.0216	0.0281	0.0274	0.0241	0.0197	0.0274	0.0270
Nitrite (as N)	0.060	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.214		0.17	0.17	0.15	0.16	0.16	0.15	0.17	0.17	0.17	0.16	0.14	0.13
Ortho Phosphate (as P)		0.002		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total Diss.				<0.0020	<0.0020	<0.0020	<0.0020	0.0021	0.0022	<0.0020	<0.0020	<0.0020	<0.0020	0.0025	0.0027
Phosphorus (P)-Total	0.0040	0.0096	0.004	0.0024	<0.0020	0.0025	<0.020	0.0043	0.0046	0.0028	0.0026	<0.0020	<0.0020	0.0035	0.0038
Silicate (as SiO_2)		1.0		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO_4)		65.92	128	0.85	0.76	5.86	5.98	0.96	1.00	0.62	0.61	3.04	2.09	0.56	0.56
Cyanides (mg/L)															
Total Cyanide				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Free Cyanide	0.005			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon (mg/L)															
Dissolved Organic Carbon		4.05		3.47	3.49	3.22	3.21	3.42	3.31	3.44	3.46	3.35	3.23	3.42	3.43
Total Organic Carbon		4.25		3.45	3.70	3.22	3.40	3.41	3.56	3.64	3.54	3.43	3.36	3.55	3.38
Plant Pigments (µg/L)															
Chlorophyll-*a*				0.42	0.63	0.72	0.64	0.77	1.06	0.61	0.48	0.93	0.98	1.16	1.06
Total Metals (mg/L)															
Aluminum[3]	***equation***	0.056	0.100	0.0256	0.0245	0.0118	0.0136	**0.0637**	0.0169	0.0259	0.0281	0.0169	0.0168	0.0234	0.0288
Antimony		0.0101	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.00257	0.005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium		0.51	1	0.0162	0.0162	0.0170	0.0173	0.0195	0.0195	0.0165	0.0166	0.0175	0.0187	0.0193	0.0196
Beryllium		0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	1.5	<0.010	<0.010	0.01	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium[3]	***equation***	0.000025	0.000040	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.50		2.25	2.24	3.13	3.10	2.36	2.37	2.21	2.29	2.65	2.51	2.34	2.29
Chromium[4]	0.001	0.00056	0.001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	0.0001	<0.00010	0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper[3]	***equation***	0.00125	0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron	0.3	0.160	0.3	0.04	0.04	0.02	0.02	0.04	0.02	0.04	0.04	0.03	0.03	0.03	0.03
Lead[3]	***equation***	0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	0.00008	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.096	<0.0010	<0.0010	0.0013	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0011	<0.0010	<0.0010
Magnesium		7.44		1.07	1.07	3.15	3.31	1.24	1.26	1.00	1.02	1.99	1.69	1.15	1.15
Manganese[3]		0.3400	***equation***	0.0053	0.0056	0.0030	0.0030	0.0027	0.0024	0.0050	0.0049	0.0046	0.0042	0.0022	0.0023
Mercury	0.000026	0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	~~0.00002~~	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0365	0.073	0.0001	0.0001	0.0001	0.0001	<0.00015	<0.00015	0.0001	0.0001	<0.000050	<0.000050	<0.000050	<0.000050
Nickel[3]	***equation***	0.0128	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		2.43		0.39	0.38	1.05	1.09	0.48	0.48	0.37	0.37	0.67	0.55	0.40	0.40
Selenium	0.001	0.00055	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.28	0.28	0.21	0.22	0.15	0.13	0.28	0.27	0.21	0.21	0.16	0.18
Silver	0.0001			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		54.0		1	1.2	19.5	20.8	2.1	2.2	0.6	0.6	9.3	6.2	0.7	0.6
Strontium		0.0564	0.049	0.017	0.017	0.030	0.030	0.017	0.017	0.017	0.017	0.023	0.020	0.016	0.016
Sulfur				<0.50	<0.50	2.00	2.02	<0.50	0.50	<0.50	<0.50	1.06	0.72	<0.50	<0.50
Thallium	0.0008	0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.00	2	<0.00060	<0.00060	<0.00030	<0.00030	<0.00060	0.00031	0.00040	<0.00090	<0.00030	<0.00030	<0.00060	0.00039
Uranium	0.015	0.0075	0.015	0.00005	0.00005	0.00005	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Vanadium		0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]	0.030	0.0132	***equation***	<0.0030	<0.0030	<0.0030	<0.0030	0.0036	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals (mg/L)															
Aluminum[3]		0.0274	0.05	0.0060	0.0069	0.0057	0.0056	0.0062	0.0052	0.0073	0.0055	0.0062	0.0061	0.0069	0.0065
Antimony		0.0101	0.020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.0026	0.005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium		0.5089	1	0.0171	0.0170	0.0177	0.0180	0.0187	0.0186	0.0175	0.0174	0.0184	0.0191	0.0187	0.0192
Beryllium		0.0027	0.0053	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		0.76	1.5	<0.010	<0.010	0.01	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium		0.000025	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium				2.32	2.28	3.43	3.15	2.31	2.29	2.31	2.33	2.71	2.56	2.31	2.27
Chromium		0.00055	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper		0.00116	0.002	0.00027	0.00023	0.00040	0.00036	0.00029	0.00035	0.00025	0.00023	0.00031	0.00037	0.00021	0.00022
Iron		0.155	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	<0.010	0.01	<0.010	<0.010
Lead		0.000525	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.048	0.096	<0.0010	<0.0010	0.0012	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0012	<0.0010	<0.0010
Magnesium				1.09	1.03	3.37	3.60	1.20	1.19	0.99	0.96	2.17	1.80	1.12	1.11
Manganese[3]		0.339	***equation***	0.0036	0.0038	0.0021	0.0012	0.0006	0.0005	0.0034	0.0032	0.0019	0.0015	0.0006	0.0007
Mercury		0.000018	0.000026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.037	0.073	0.0001	0.0001	0.0001	0.0001	0.0001	<0.000050	<0.000050	<0.000050	0.0001	0.0001	0.0002	<0.000050
Nickel		0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				<0.050	<0.050	0.09	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium				0.42	0.40	1.24	1.28	0.45	0.46	0.38	0.37	0.80	0.67	0.38	0.38
Selenium		0.00055	0.001	<0.000050	0.00	<0.000050	<0.000050	<0.000050	<0.000050	0.00	0.00	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.22	0.22	0.17	0.17	0.08	0.08	0.22	0.21	0.17	0.16	0.09	0.08
Silver				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium				1.62	1.15	19.90	21.80	2.04	2.12	0.63	0.60	9.72	6.40	0.66	0.63
Strontium		0.049	0.049	0.0178	0.0168	0.0319	0.0295	0.0167	0.0167	0.0170	0.0168	0.0217	0.0193	0.0159	0.0158
Sulfur				0.82	<0.50	2.07	1.98	<0.50	<0.50	<0.50	<0.50	1.21	0.83	<0.50	<0.50
Thallium		0.00041	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin		0.0002		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium		1.01	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium		0.0075	0.015	0.00004	0.00004	0.00005	0.00004	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004
Vanadium		0.0035	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc[3]		0.0122	***equation***	<0.0010	<0.0010	0.005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).

A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for details)

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.3–1. Water quality results from the 2017 CREMP, Baker Lake.

Lake and Station				Baker Lake					
				Proposed Jetty (BPJ)					
Area-Replicate ID				BPJ-49	BPJ-50	BPJ-51	BPJ-52	BPJ-53	BPJ-54
Depth (m)		**Trigger[2]**		3	3	3	3	3	3
Date	**CCME Guideline[1]**	**Baker Lake**	**Threshold[2]**	6-Jul-17	6-Jul-17	10-Aug-17	10-Aug-17	30-Sep-17	30-Sep-17
Field Measurements (Surface)									
Temperature (°C)				5.7	6.0	6.5	6.6	6.5	6.0
Specific Conductivity (µS/cm)				24.3	24.5	158.4	156.1	29.4	27.1
Dissolved Oxygen (mg/L)				12.93	12.81	12.66	12.18	11.67	11.67
pH	6.5 - 9.0	6.50 - 8.32	6.5 - 9.0	6.82	6.78	7.60	7.26	6.96	6.98
Physical Tests (mg/L)									
Conductivity (µS/cm)		494.5		24	24	165.0	159.0	27.9	25.5
Hardness		41.2		9.9	9.8	22.8	21.9	10.2	10.4
pH (Laboratory)	6.5 - 9.0	6.86 - 8.11	6.5 - 9.0	7.12	7.11	6.99	7.00	7.17	7.16
Total Suspended Solids		3.0	5.0	1.2	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Total Dissolved Solids		208		17	19	95	96	22	21
Turbidity (NTU)				0.74	0.81	0.56	0.72	0.65	0.88
Anions and Nutrients (mg/L)									
Alkalinity - Bicarbonate		10.6		8.2	8.5	8.4	9.0	8.7	8.6
Alkalinity - Carbonate		4		*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Hydroxide				*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*
Alkalinity - Total		10.6		8.2	8.5	8.4	9.0	8.7	8.6
Ammonia (as N)[3]	***equation***	0.067	0.126	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Bromide				*<0.050*	*<0.050*	0.13	0.13	*<0.050*	*<0.050*
Chloride	120	95.7	120	1	1	39	39	2	2
Fluoride	0.120			0.06	0.06	0.06	0.06	0.05	0.05
Nitrate (as N)	3.0	1.51	3	0.0284	0.0279	0.0389	0.0390	0.0244	0.0260
Nitrite (as N)	0.060	0.031	0.060	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Total Kjeldahl Nitrogen		0.214		0.17	0.17	0.14	0.15	0.15	0.12
Ortho Phosphate (as P)		0.002		*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Phosphorus (P)-Total Diss.				*<0.0020*	*<0.0020*	*<0.0020*	*<0.0020*	0.0024	0.0024
Phosphorus (P)-Total	0.0040	0.0096	0.004	0.0040	0.0027	*<0.0020*	0.0025	0.0039	0.0052
Silicate (as SiO_2)		1.0		*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*	*<0.50*
Sulphate (SO_4)		65.92	128	0.61	0.62	6.05	6.04	0.71	0.61
Cyanides (mg/L)									
Total Cyanide				*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Free Cyanide	0.005			*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*
Organic / Inorganic Carbon (mg/L)									
Dissolved Organic Carbon		4.05		3.58	3.54	3.19	3.11	3.95	3.46
Total Organic Carbon		4.25		3.54	3.54	3.31	3.13	3.41	3.70
Plant Pigments (µg/L)									
Chlorophyll-*a*				0.65	0.68	0.65	0.70	1.13	1.23
Total Metals (mg/L)									
Aluminum[3]	***equation***	0.056	0.100	0.0288	0.0319	0.0134	0.0125	0.0427	0.0169
Antimony		0.0101	0.020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic	0.0050	0.00257	0.005	0.0001	*<0.00010*	0.0001	0.0001	0.0002	0.0001
Barium		0.51	1	0.0164	0.0166	0.0175	0.0174	0.0195	0.0195
Beryllium		0.0027	0.0053	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth				*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron	1.5	0.76	1.5	*<0.010*	*<0.010*	0.01	0.01	*<0.010*	*<0.010*
Cadmium[3]	***equation***	0.000025	0.000040	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium		4.50		2.26	2.26	3.12	3.15	2.40	2.37
Chromium[4]	0.001	0.00056	0.001	0.0001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	0.0001
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper[3]	***equation***	0.00125	0.002	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Iron	0.3	0.160	0.3	0.04	0.04	0.02	0.02	0.04	0.02
Lead[3]	***equation***	0.000525	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.048	0.096	*<0.0010*	*<0.0010*	0.0014	0.0012	*<0.0010*	*<0.0010*
Magnesium		7.44		1.01	1.00	3.36	3.31	1.19	1.26
Manganese[3]		0.3400	***equation***	0.0052	0.0053	0.0033	0.0033	0.0027	0.0024
Mercury	0.000026	0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum	0.073	0.0365	0.073	*<0.000050*	0.0001	0.0001	0.0001	*<0.000050*	*<0.00015*
Nickel[3]	***equation***	0.0128	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium		2.43		0.36	0.36	1.11	1.10	0.43	0.48
Selenium	0.001	0.00055	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon				0.29	0.28	0.22	0.23	0.18	0.13
Silver	0.0001			*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium		54.0		0.6	0.6	21.1	20.6	1.2	2.2
Strontium		0.0564	0.049	0.017	0.017	0.031	0.030	0.017	0.017
Sulfur				*<0.50*	*<0.50*	2.02	1.91	*<0.50*	0.50
Thallium	0.0008	0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		1.00	2	*<0.00060*	0.00065	*<0.00030*	*<0.00030*	*<0.00060*	0.00031
Uranium	0.015	0.0075	0.015	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Vanadium		0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]	0.030	0.0132	***equation***	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*	*<0.0030*
Zirconium				0.00	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Dissolved Metals (mg/L)									
Aluminum[3]		0.0274	0.05	0.0056	0.0062	0.0046	0.0051	0.0068	0.0052
Antimony		0.0101	0.020	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Arsenic		0.0026	0.005	*<0.00010*	*<0.00010*	0.0001	0.0001	0.0001	0.0001
Barium		0.5089	1	0.0172	0.0170	0.0175	0.0180	0.0190	0.0186
Beryllium		0.0027	0.0053	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*	*<0.000020*
Bismuth				*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Boron		0.76	1.5	*<0.010*	*<0.010*	0.01	0.01	*<0.010*	*<0.010*
Cadmium		0.000025	0.00004	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Calcium				2.32	2.33	3.68	3.12	2.27	2.29
Chromium		0.00055	0.001	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Cobalt				*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Copper		0.00116	0.002	0.00022	0.00023	0.00040	0.00035	0.00026	0.00035
Iron		0.155	0.3	*<0.010*	*<0.010*	*<0.010*	*<0.010*	0.01	*<0.010*
Lead		0.000525	0.001	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Lithium		0.048	0.096	*<0.0010*	*<0.0010*	0.0013	0.0011	*<0.0010*	*<0.0010*
Magnesium				1.00	0.97	3.32	3.42	1.10	1.19
Manganese[3]		0.339	***equation***	0.0032	0.0035	0.0017	0.0018	0.0007	0.0005
Mercury		0.000018	0.000026	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*	*<0.0000050*
Molybdenum		0.037	0.073	*<0.000050*	*<0.000050*	0.0003	0.0001	0.0001	*<0.000050*
Nickel		0.013	0.025	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Phosphorus				*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium				0.38	0.38	1.17	1.16	0.42	0.46
Selenium		0.00055	0.001	0.00	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*	*<0.000050*
Silicon				0.22	0.20	0.18	0.18	0.08	0.08
Silver				*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Sodium				0.61	0.62	21.30	21.60	1.10	2.12
Strontium		0.049	0.049	0.0169	0.0166	0.0359	0.0302	0.0160	0.0167
Sulfur				*<0.50*	*<0.50*	2.08	2.15	*<0.50*	*<0.50*
Thallium		0.00041	0.0008	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*	*<0.000010*
Tin		0.0002		*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*	*<0.00010*
Titanium		1.01	2	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*
Uranium		0.0075	0.015	0.00004	0.00004	0.00005	0.00005	0.00005	0.00005
Vanadium		0.0035	0.006	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*	*<0.00050*
Zinc[3]		0.0122	***equation***	*<0.0010*	*<0.0010*	*<0.0010*	*<0.0010*	0.002	*<0.0010*
Zirconium				*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*	*<0.00030*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2015.

2. Trigger and threshold values were developed in *CREMP Design Document 2012* (Azimuth, 2012d).

A number of thresholds were derived from methods (or sources) other than CCME guidelines. Refer to the *CREMP: 2015 Plan Update* (Azimuth, 2015a) for more details.

3. "***equation***" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum (t & d) guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.

4. Chromium CCME guideline is for Cr VI.

123	Bolded concentrations exceed the trigger value.
123	Bolded and shaded concentrations also exceed the threshold v

Italicized numbers are below detection limits.

underline = results were given a cautionary flag in the QC assessment (refer to **Section 3.1.2** for detail

~~strikethrough~~ = results flagged as unreliable in the QC assessment

Table 3.3–2. Screening process for water quality parameters, Baker Lake, 2017.

CONVENTIONALS			TOTAL METALS			DISSOLVED METALS		
Screening Level	**1**	**2**	**Screening Level**	**1**	**2**	**Screening Level**	**1**	**2**
Screening Rule[1]	**>DL ≥ 10% frequency**	**C-I > 0.05 frequency**	**Screening Rule[1]**	**>DL ≥ 10% frequency**	**C-I > 0.05 frequency**	**Screening Rule[1]**	**>DL ≥ 10% frequency**	**C-I > 0.05 frequency**
Conductivity	Figure 3.3-5		Aluminum	Figure 3.3-23		Aluminum	Figure 3.3-40	
Hardness	Figure 3.3-6		Antimony*	No	No	Antimony*	No	No
pH -Field	Figure 3.3-7		Arsenic	Figure 3.3-24		Arsenic	Figure 3.3-41	
pH -Lab	Figure 3.3-8		Barium	Figure 3.3-25		Barium	Figure 3.3-42	
TSS	Figure 3.3-9		Beryllium*	No	No	Beryllium*	No	No
TDS	Figure 3.3-10		Boron	Figure 3.3-26		Boron	Figure 3.3-43	
B-Alkalinity	Figure 3.3-11		Cadmium*	No	No	Cadmium*	No	No
C-Alkalinity*	No	No	Calcium	Figure 3.3-27		Chromium*	No	No
T-Alkalinity	Figure 3.3-12		Chromium	Figure 3.3-28		Copper	Figure 3.3-44	
Ammonia-N	Figure 3.3-13		Copper	Figure 3.3-29		Iron*	No	No
Chloride	Figure 3.3-14		Iron	Figure 3.3-30		Lead*	No	No
Nitrate-N	Figure 3.3-15		Lead	No	No	Lithium	Figure 3.3-45	
Nitrite-N*	No	No	Lithium	Figure 3.3-31		Manganese	Figure 3.3-46	
TKN	Figure 3.3-16		Magnesium	Figure 3.3-32		Mercury*	No	No
T-phosphorous	Figure 3.3-17		Manganese	Figure 3.3-33		Molybdenum	Figure 3.3-47	
Ortho-phosphate	Figure 3.3-18		Mercury*	No	No	Nickel*	No	No
Reactive silica	Figure 3.3-19		Molybdenum	Figure 3.3-34		Selenium*	No	No
Sulphate	Figure 3.3-20		Nickel*	No	No	Strontium	Figure 3.3-48	
DOC	Figure 3.3-21		Potassium	Figure 3.3-35		Thallium*	No	No
TOC	Figure 3.3-22		Selenium*	No	No	Tin*	No	No
T-Cyanide*	No	No	Sodium	Figure 3.3-36		Titanium*	No	No
Free Cyanide*	No	No	Strontium	Figure 3.3-37		Uranium	Figure 3.3-49	
			Thallium*	No	No	Vanadium*	No	No
			Tin*	No	No	Zinc*	No	No
			Titanium	Figure 3.3-38				
			Uranium	Figure 3.3-39				
			Vanadium*	No	No			
			Zinc*	No	No			

Notes:

"*" Plots for these parameters are presented in **Appendix A2**.

1. See text for further detail.

Figure 3.3-5. Laboratory-measured conductivity (µS/cm) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. Laboratory-measured conductivity data from 2014 should be interpreted with caution, particularly at low concentrations (see Azimuth, 2015c for details).

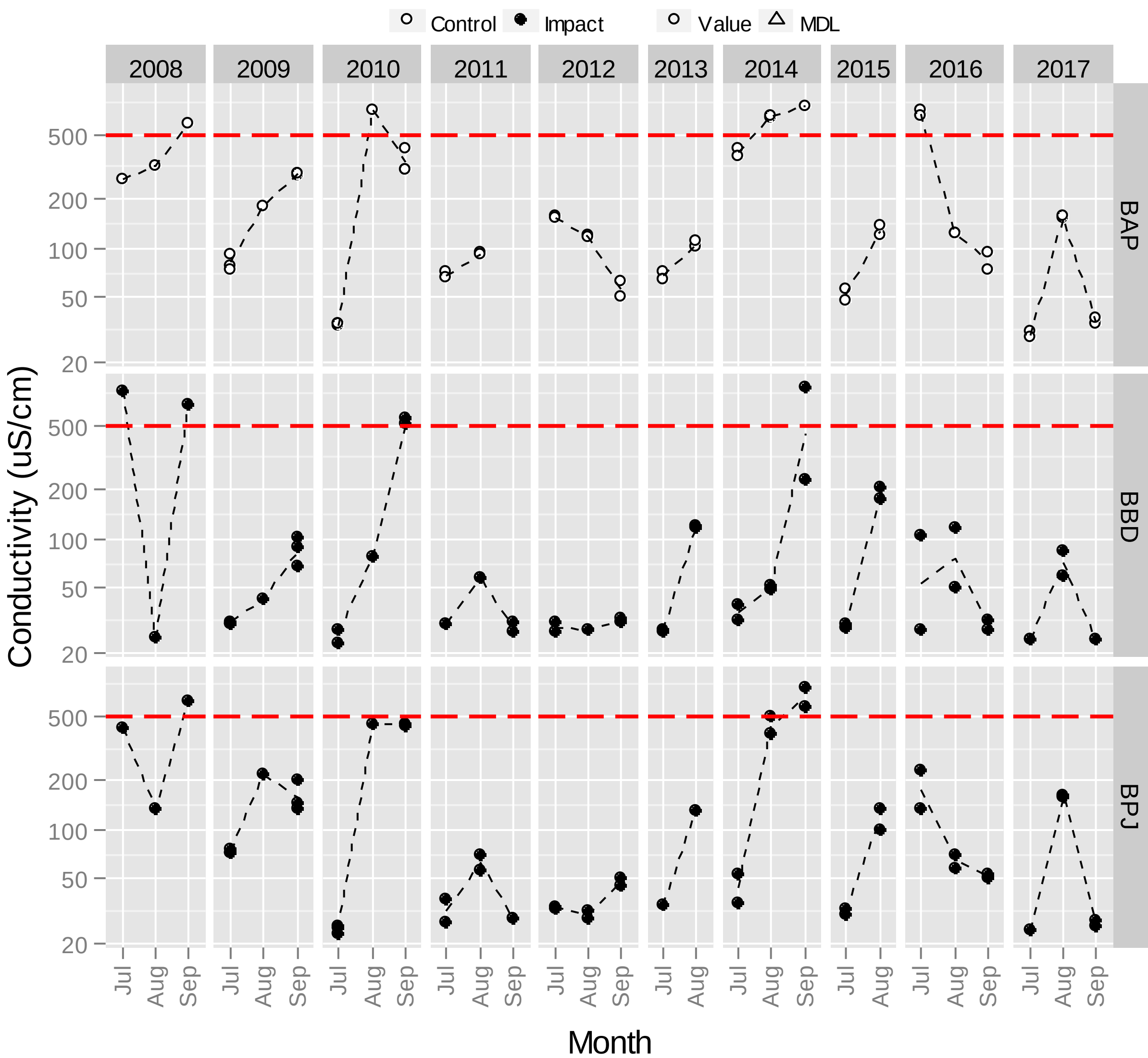


Figure 3.3-6. Hardness (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

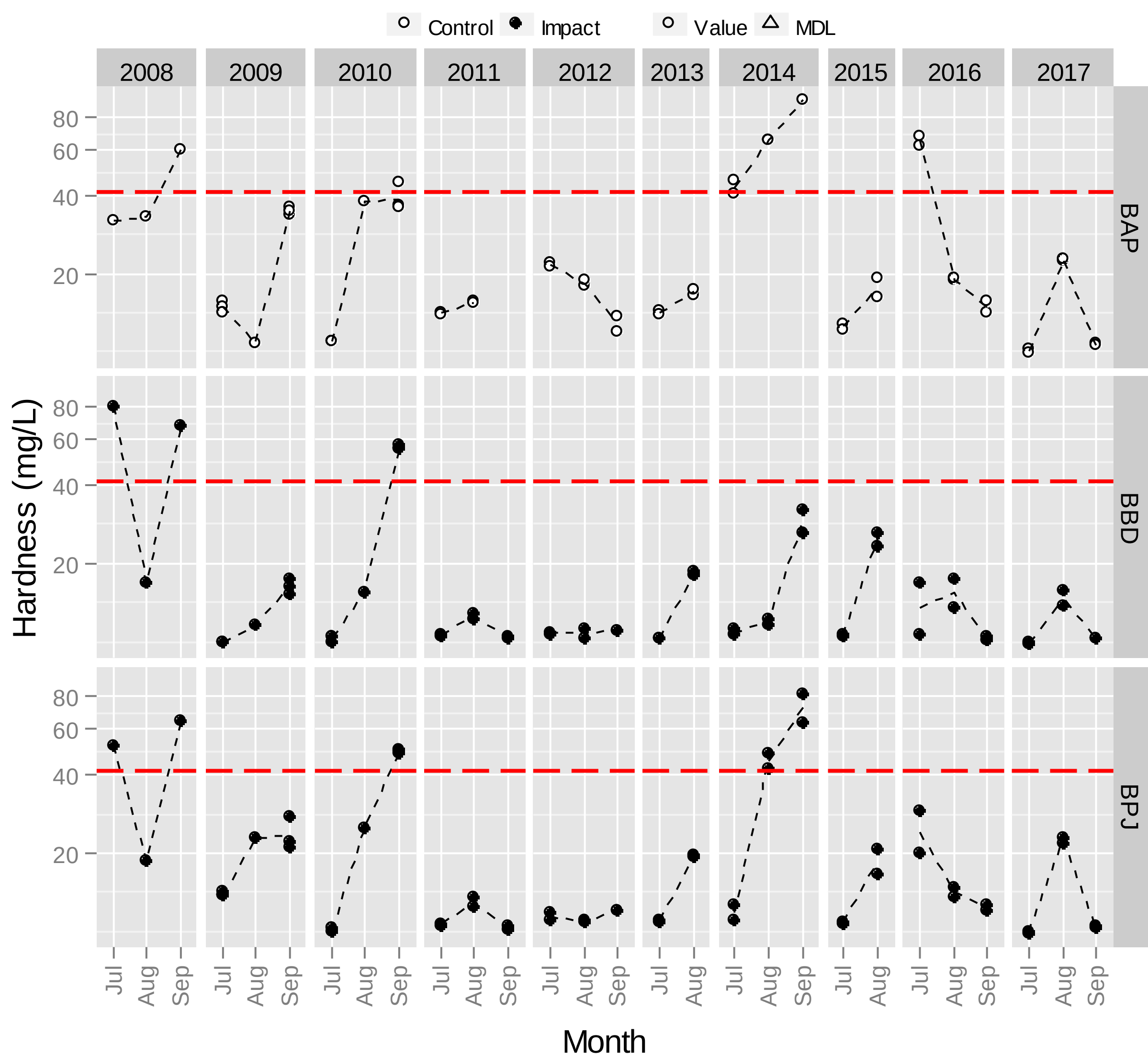


Figure 3.3-7. Field-measured pH in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

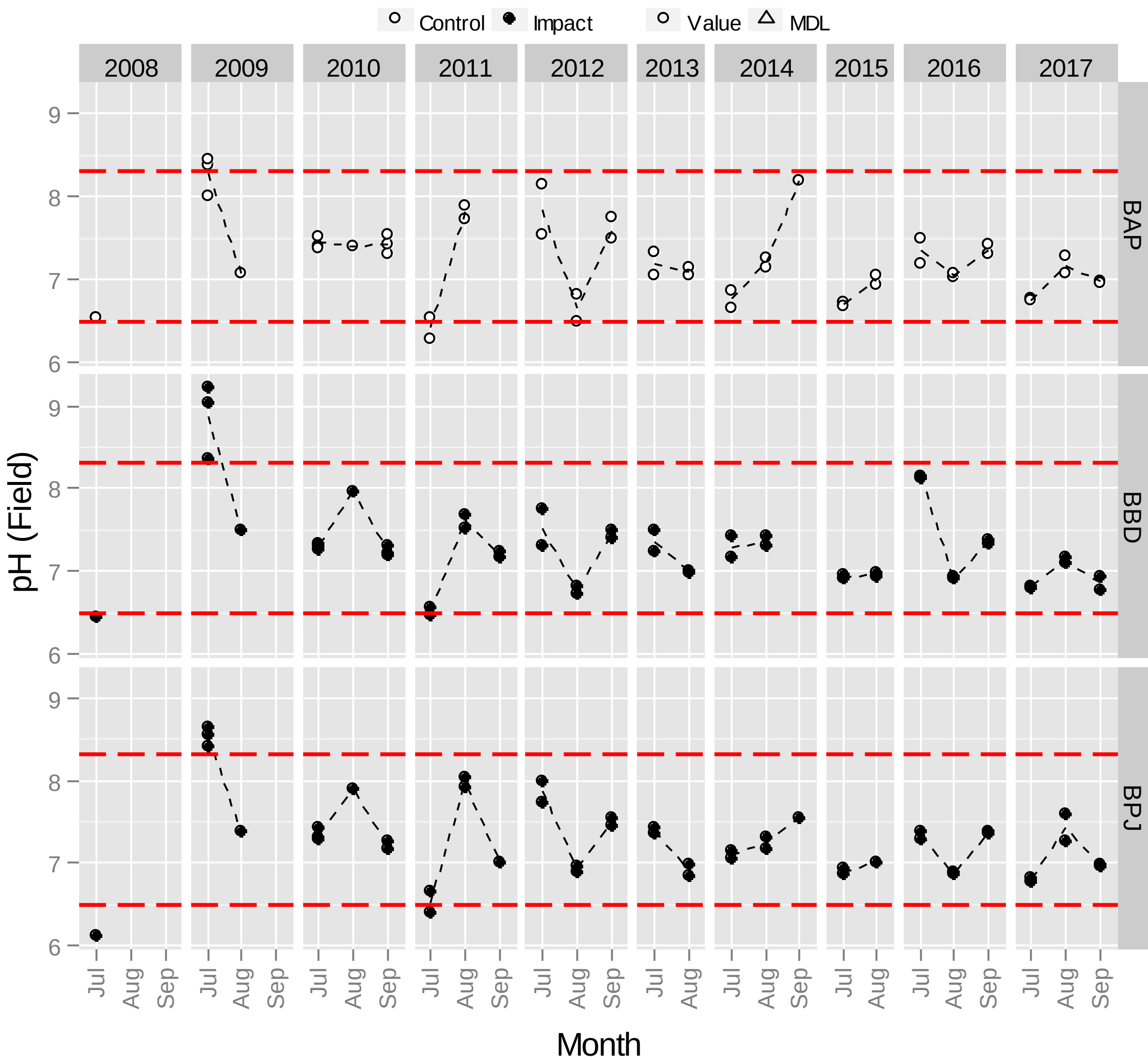


Figure 3.3-8. Laboratory-measured pH in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

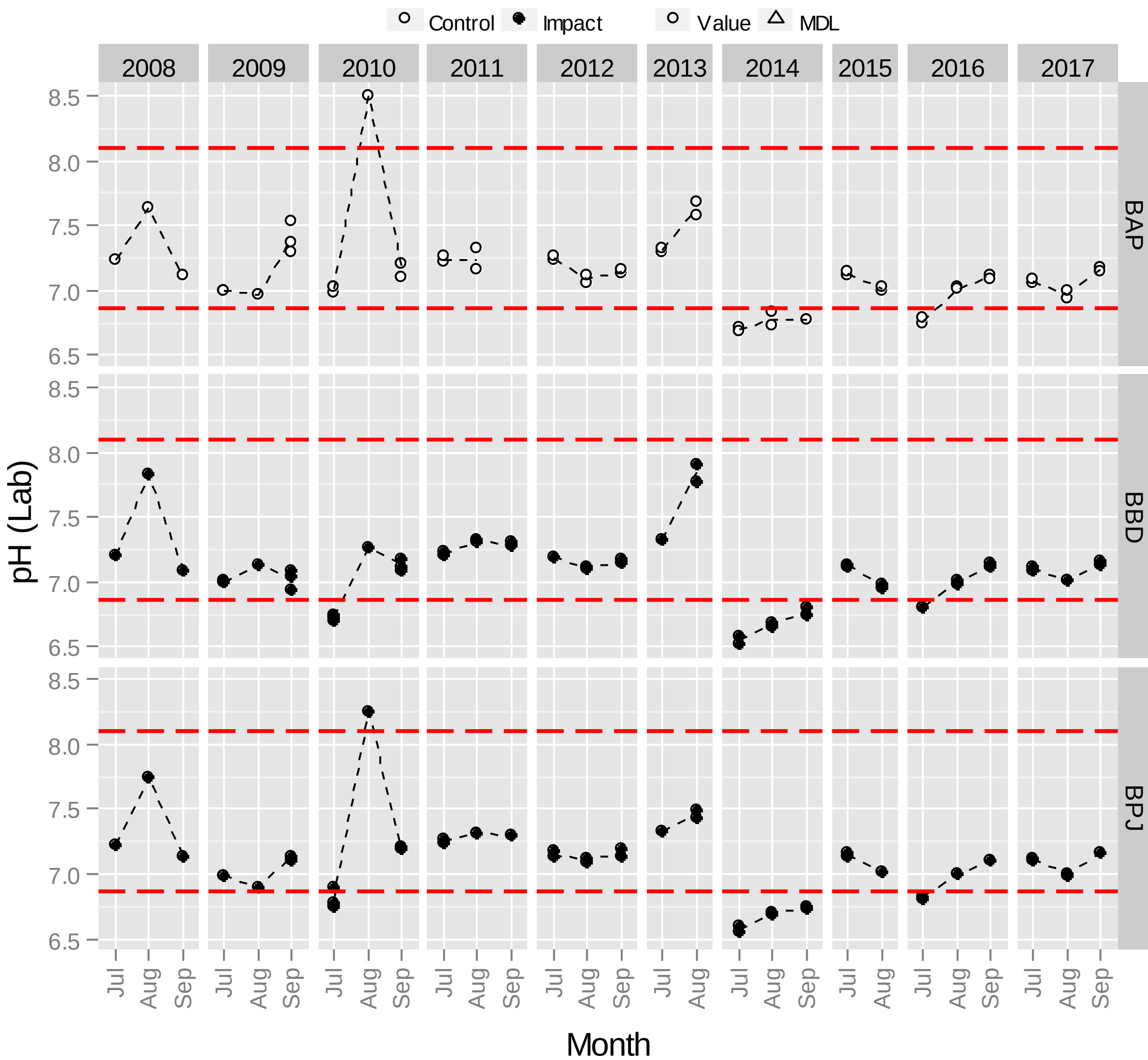


Figure 3.3-9. Total Suspended Solids (TSS; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. TSS data from 2014 were excluded due to data quality issues (see Azimuth, 2015c for more detail).

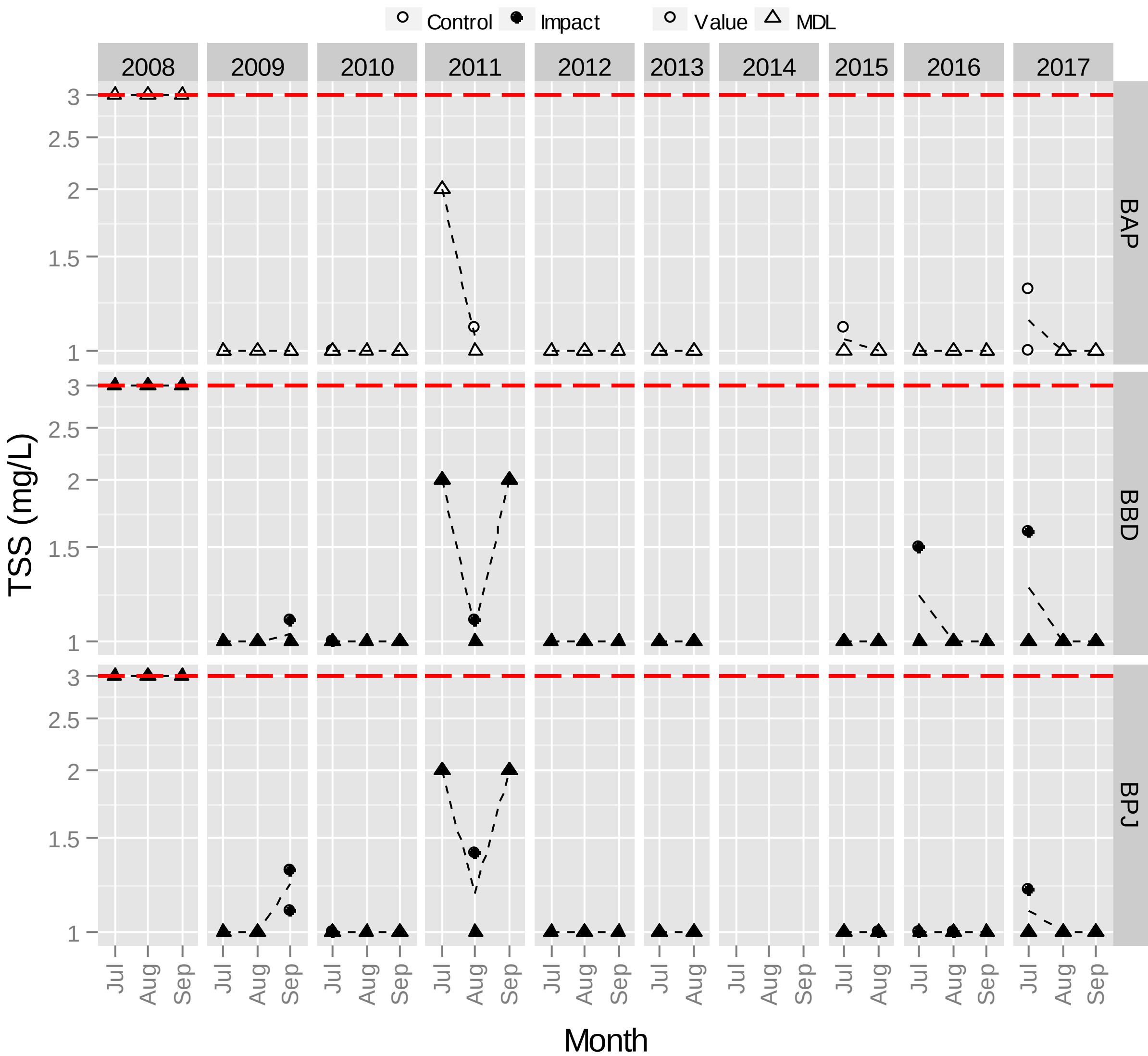


Figure 3.3-10. Total Dissolved Solids (TDS; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. TDS data from 2014 were excluded due to data quality issues (see Azimuth, 2015c for more detail).

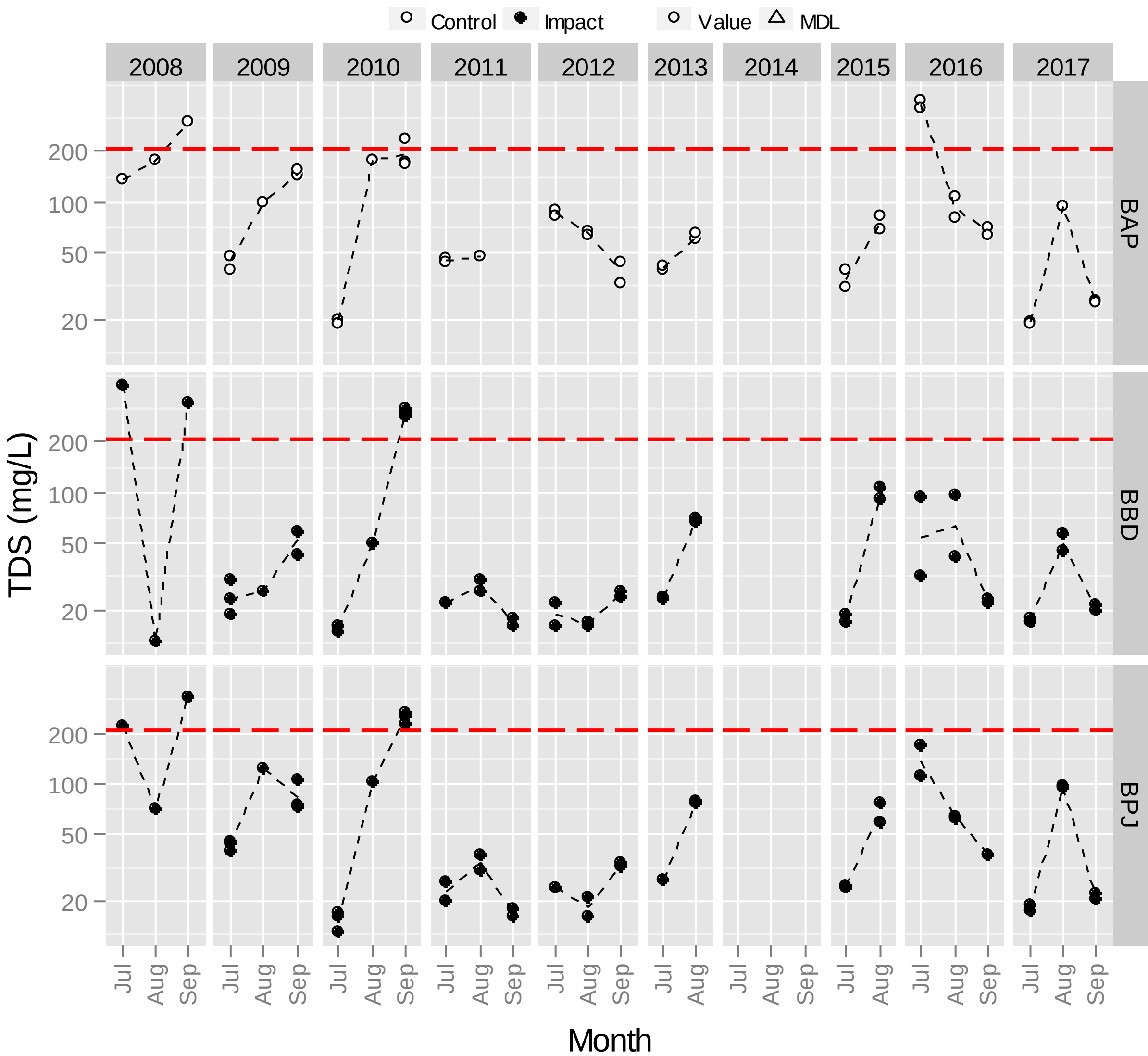


Figure 3.3-11. Bicarbonate Alkalinity (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. Bicarbonate alkalinity data from 2014 were excluded due to data quality issues (see Azimuth, 2015c for more detail).

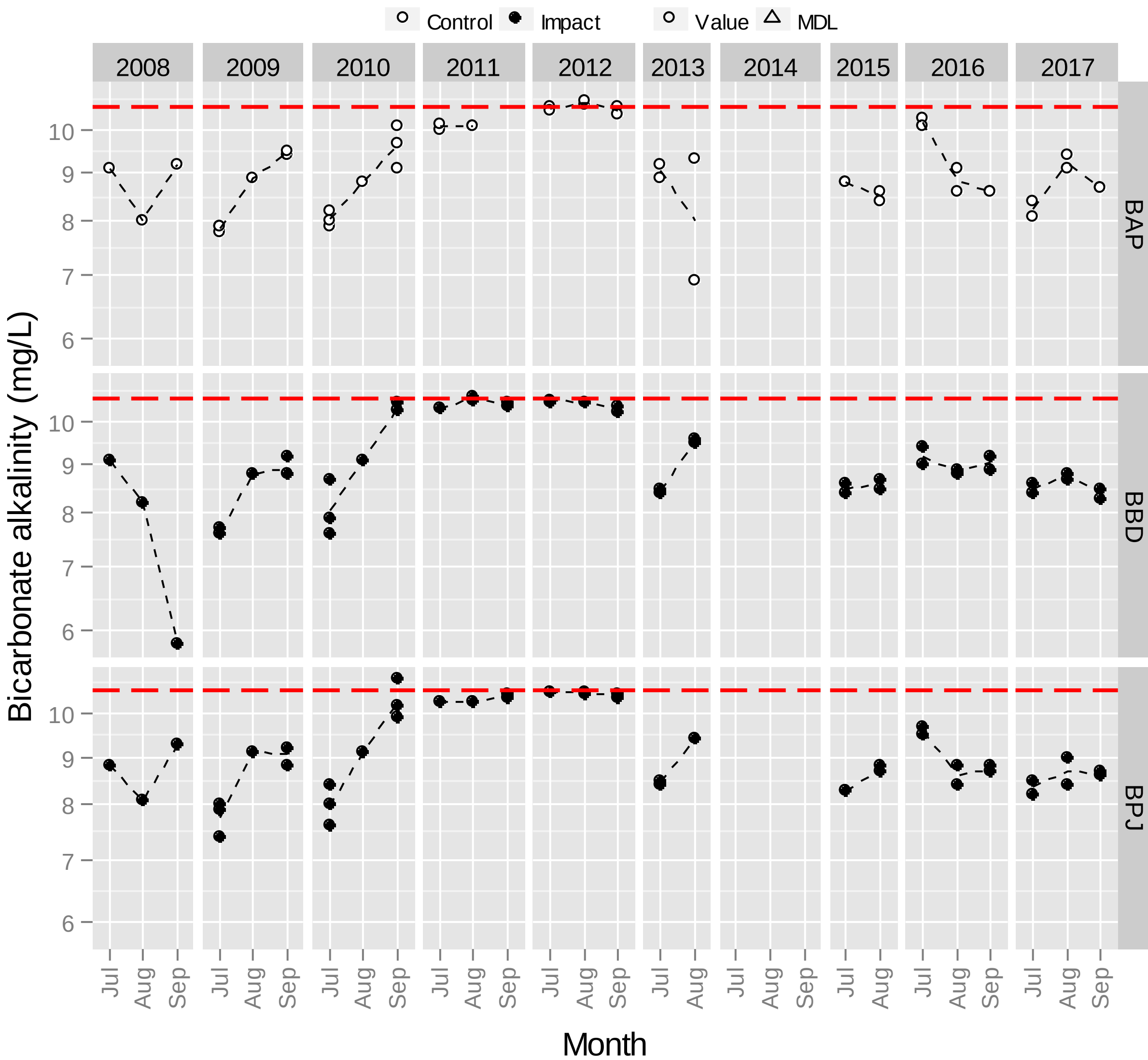


Figure 3.3-12. Total Alkalinity (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. Total alkalinity data from 2014 were excluded due to data quality issues (see Azimuth, 2015c for more detail).

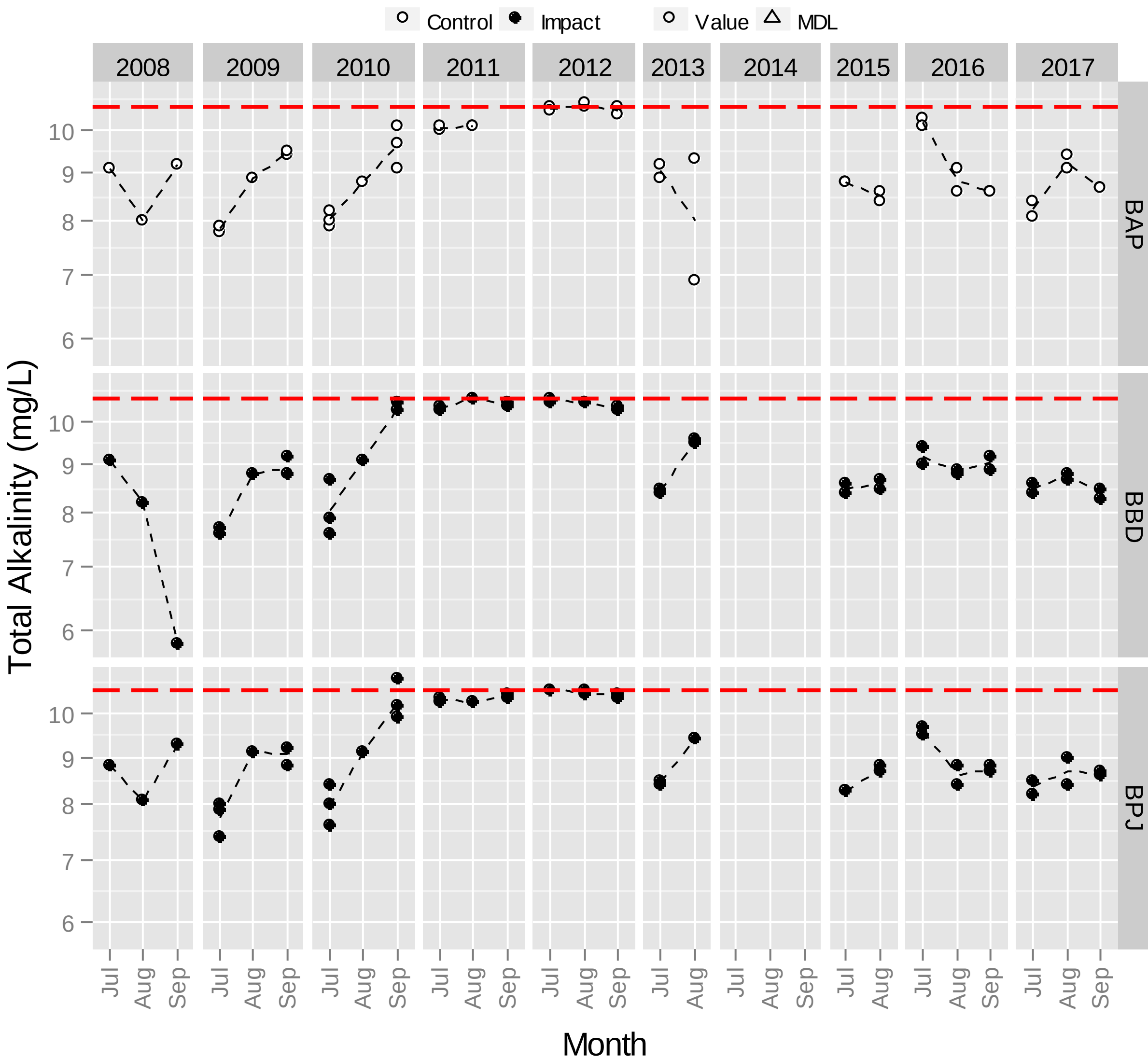


Figure 3.3-13. Ammonia-N (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

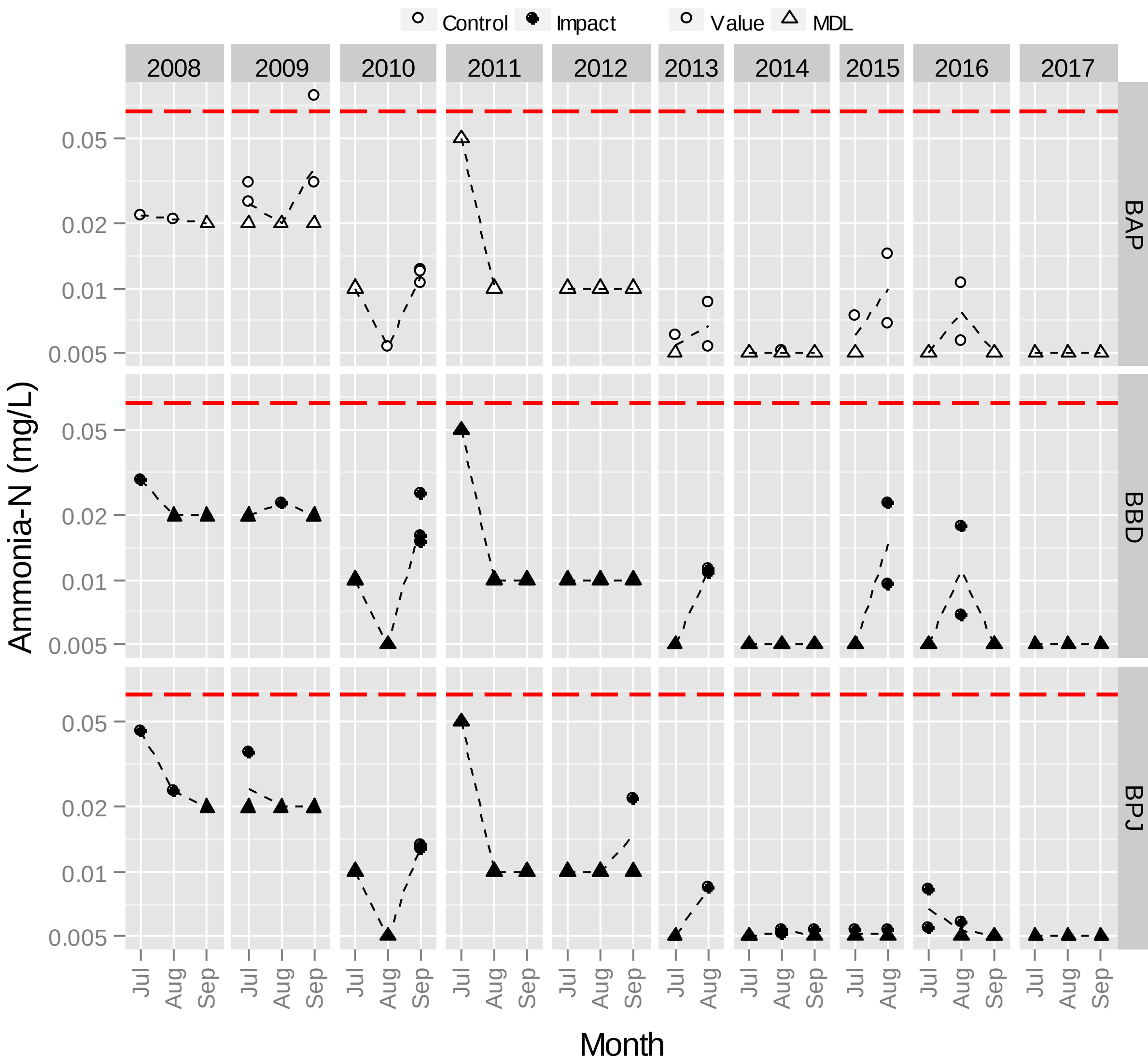


Figure 3.3-14. Chloride (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

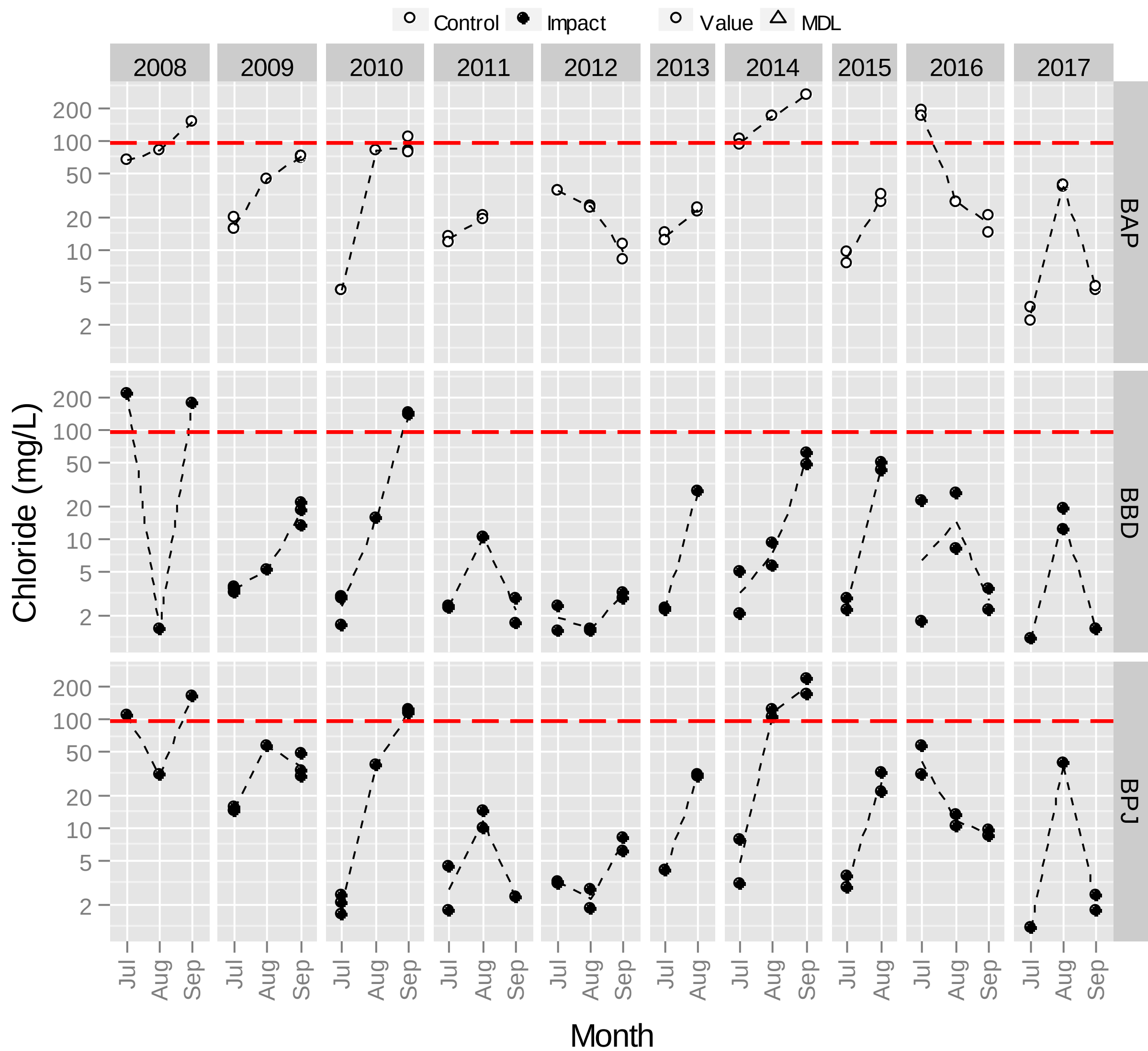


Figure 3.3-15. Nitrate-N (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

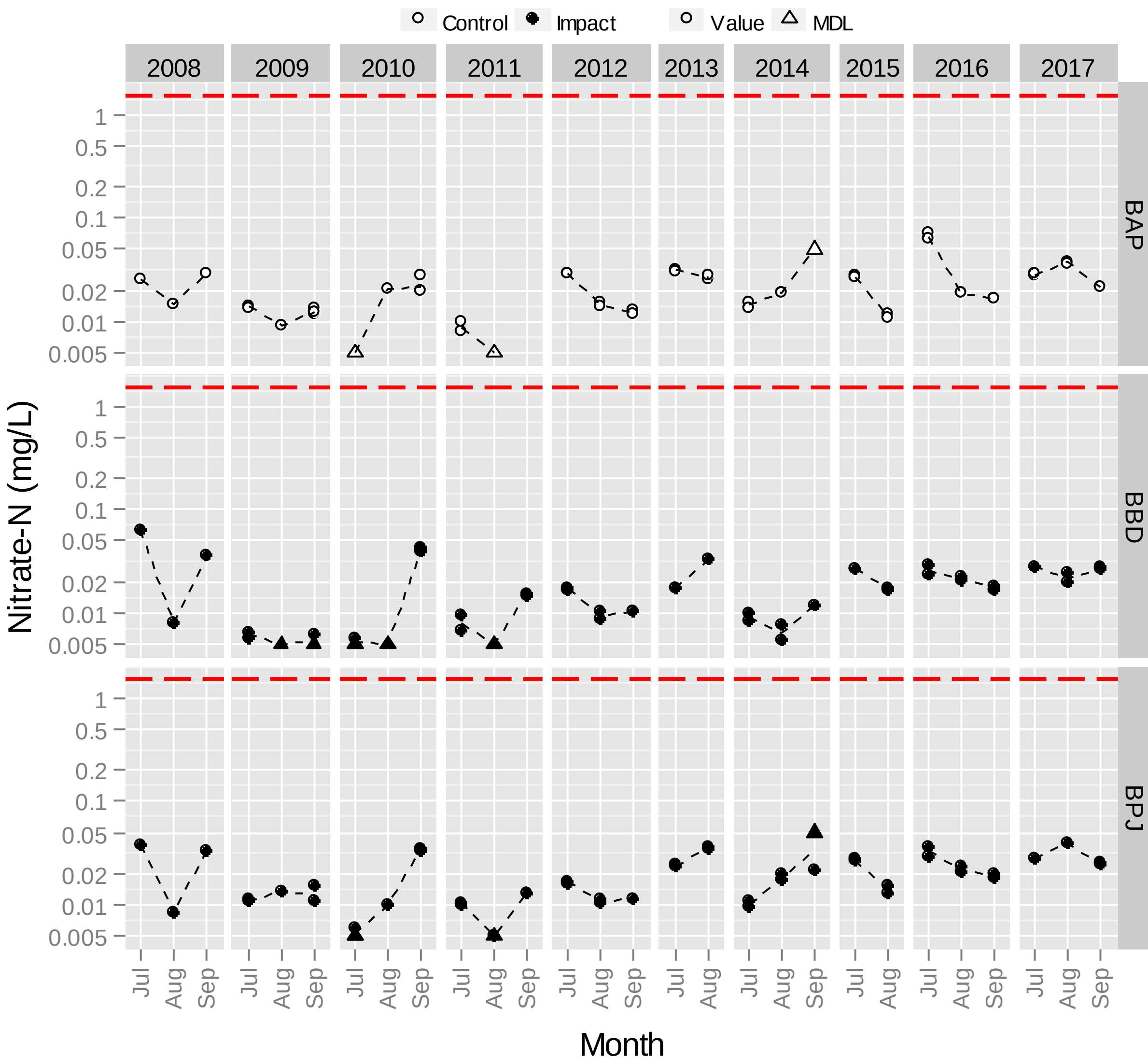


Figure 3.3-16. Total Kjeldahl Nitrogen (TKN; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. TKN alkalinity data from 2014 were excluded due to data quality issues (see Azimuth, 2015c for more detail).

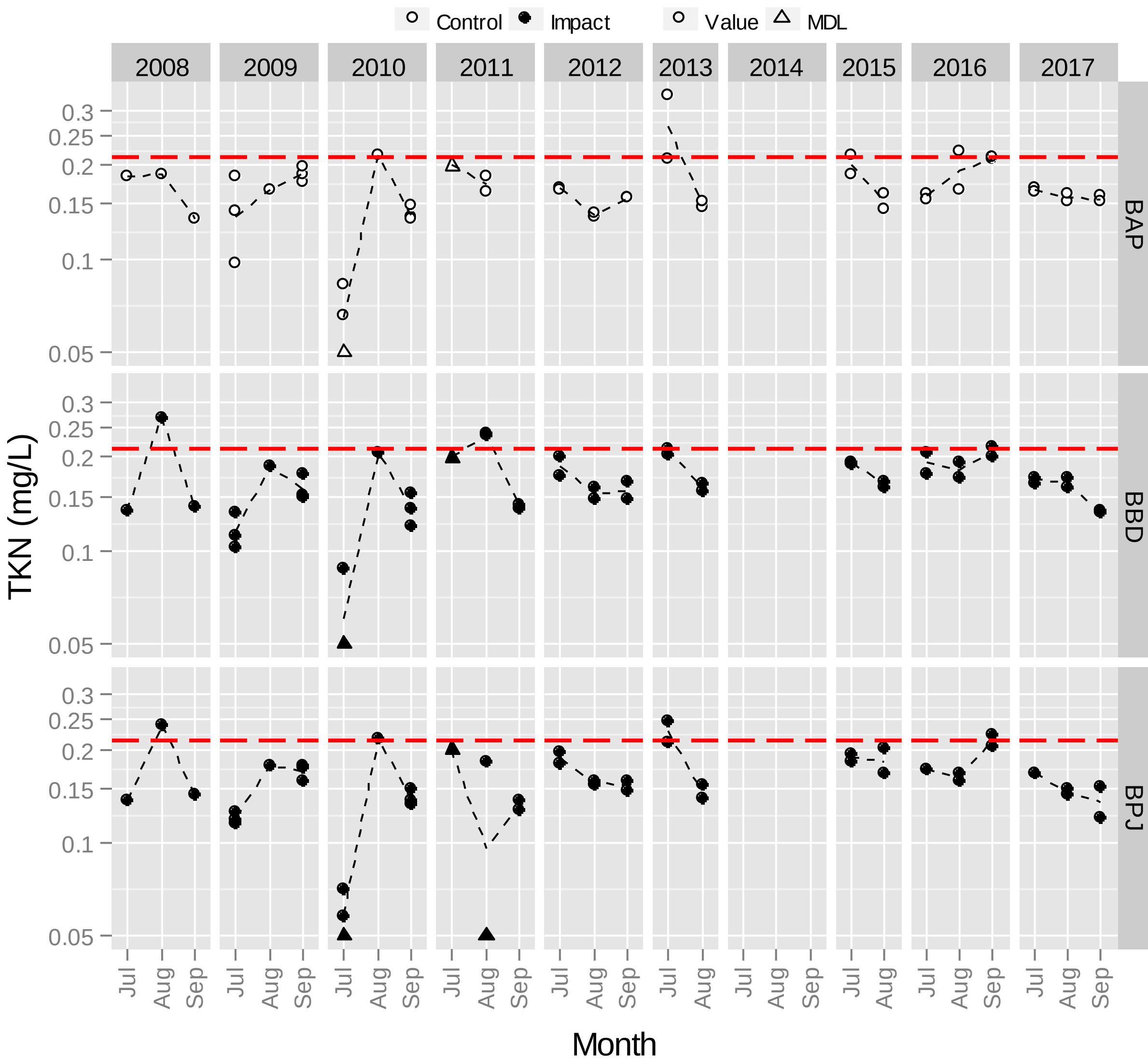


Figure 3.3-17. Total Phosphorus (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake. Sample BAP-52 in August 2017 had an elevated MDL = 0.02 mg/L. This result was excluded from the plot.

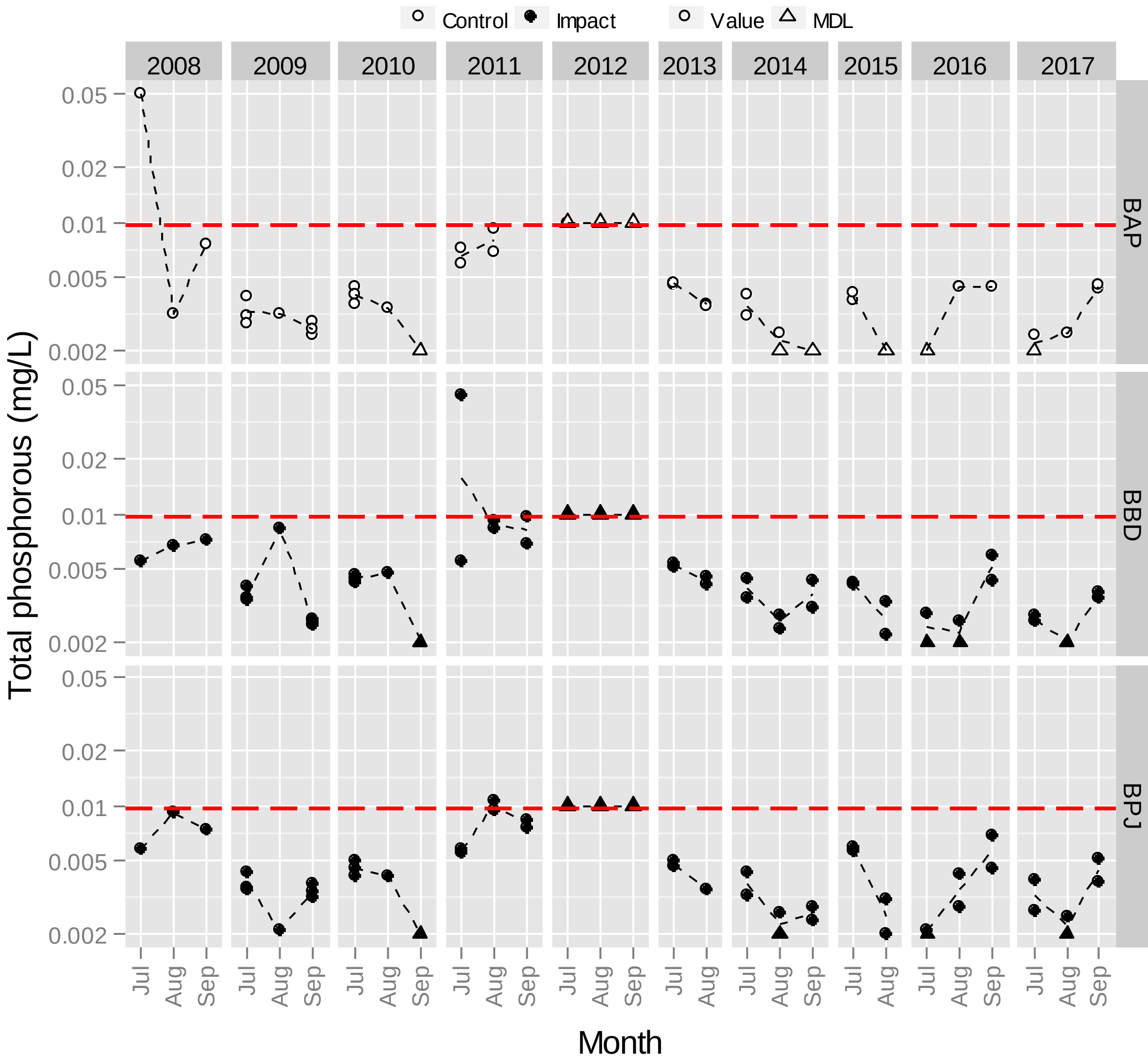


Figure 3.3-18. Total Ortho-phosphate (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

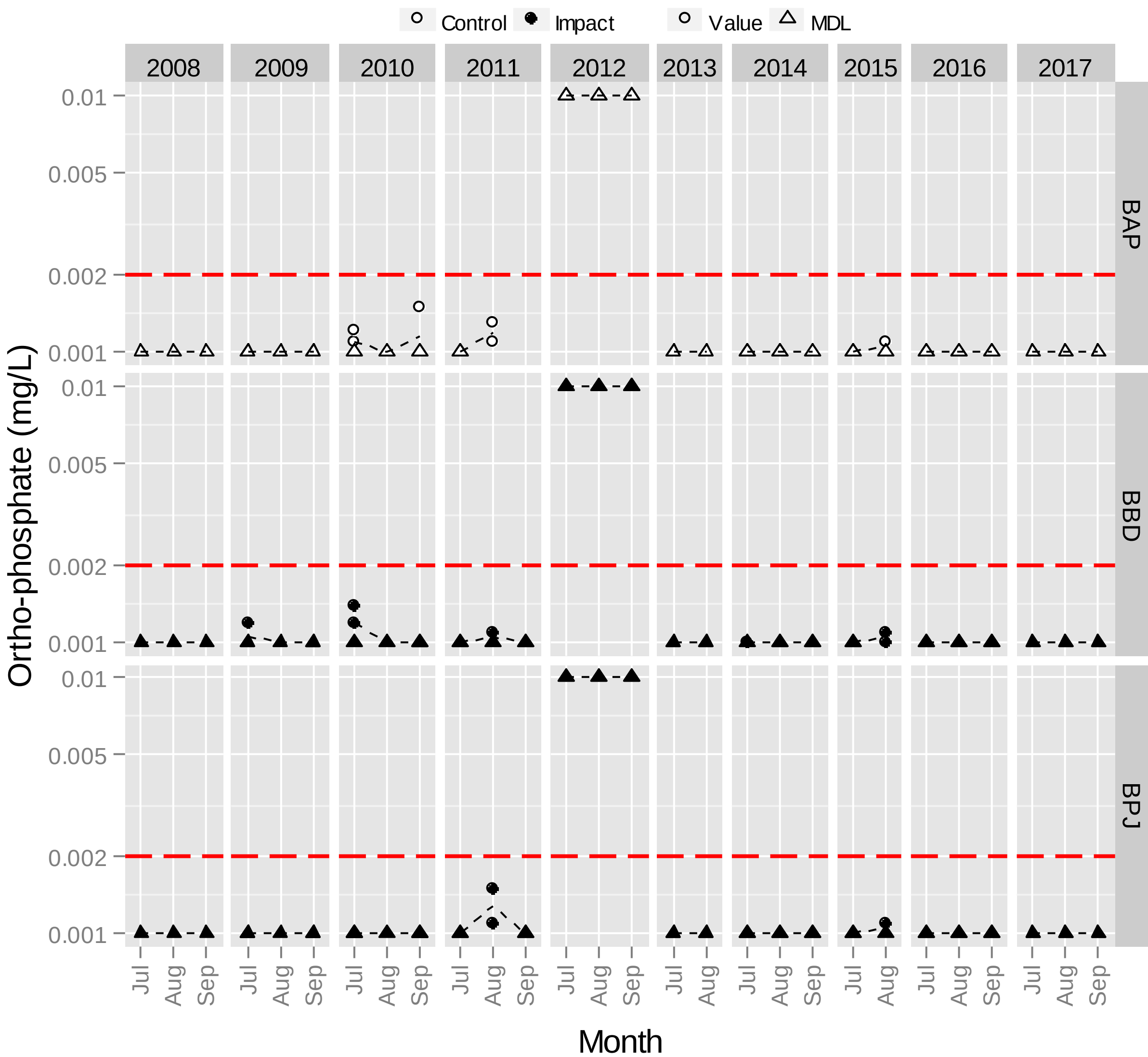


Figure 3.3-19. Reactive Silica (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

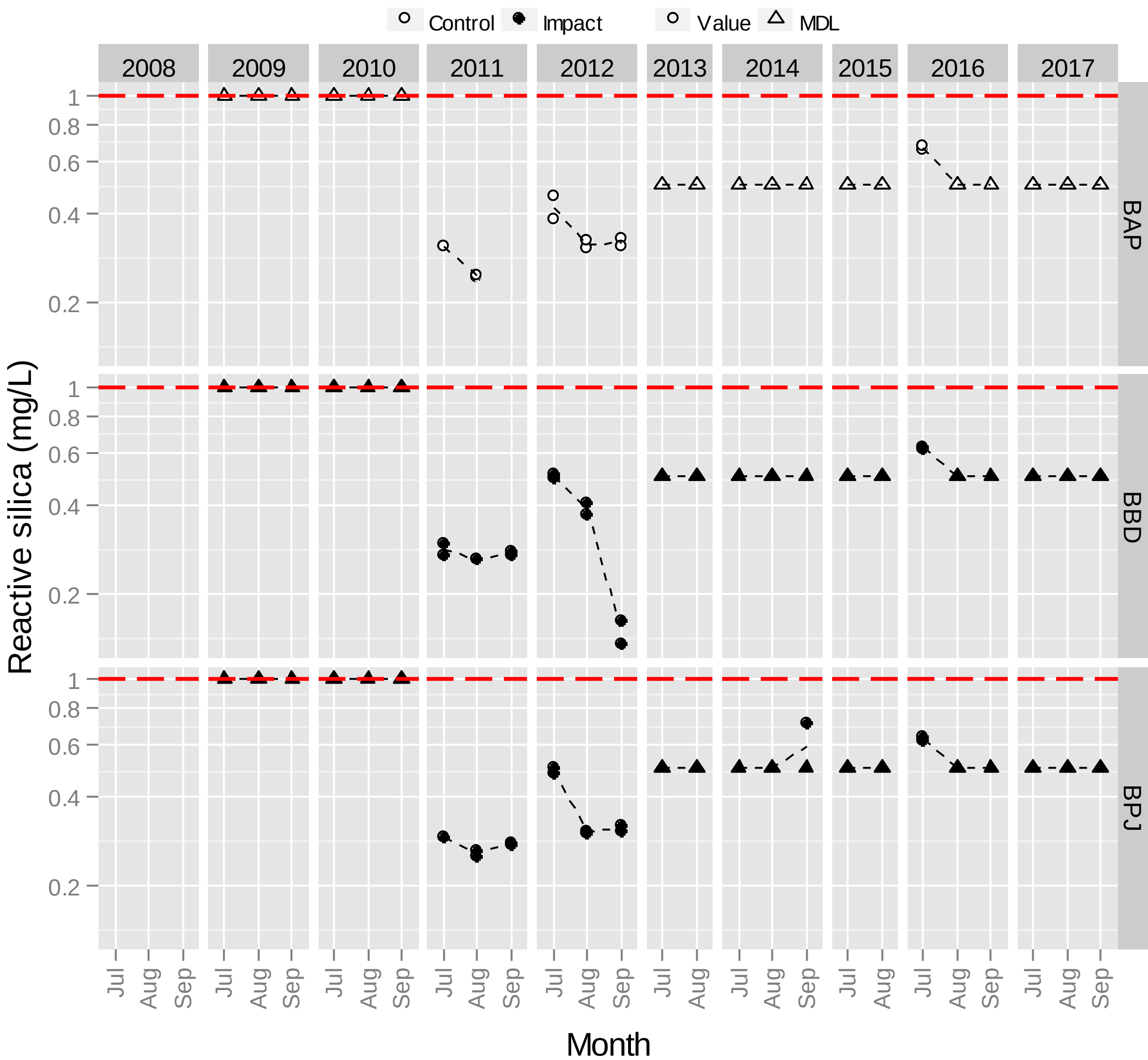


Figure 3.3-20. Sulphate (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

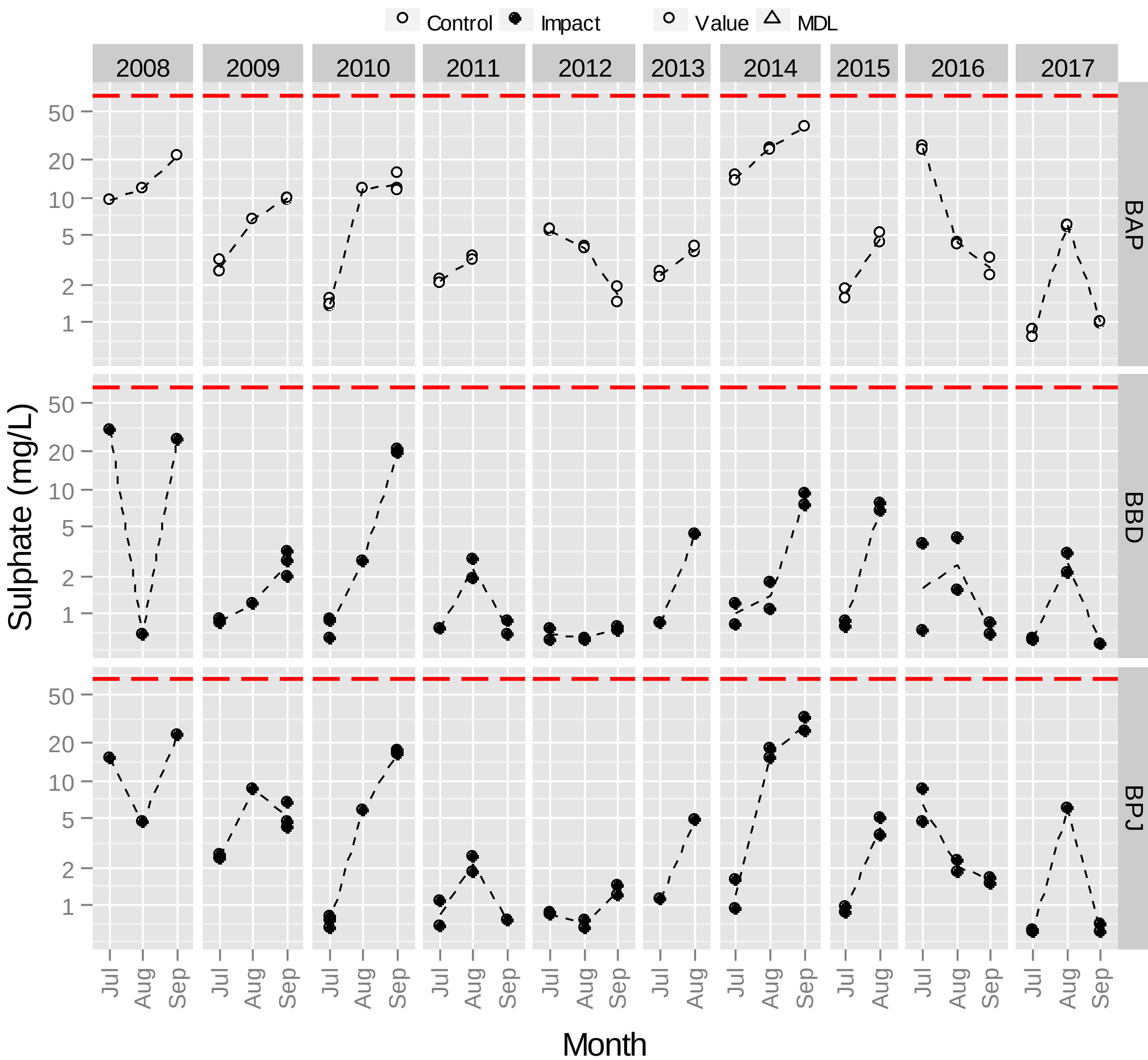


Figure 3.3-21. Dissolved Organic Carbon (DOC; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

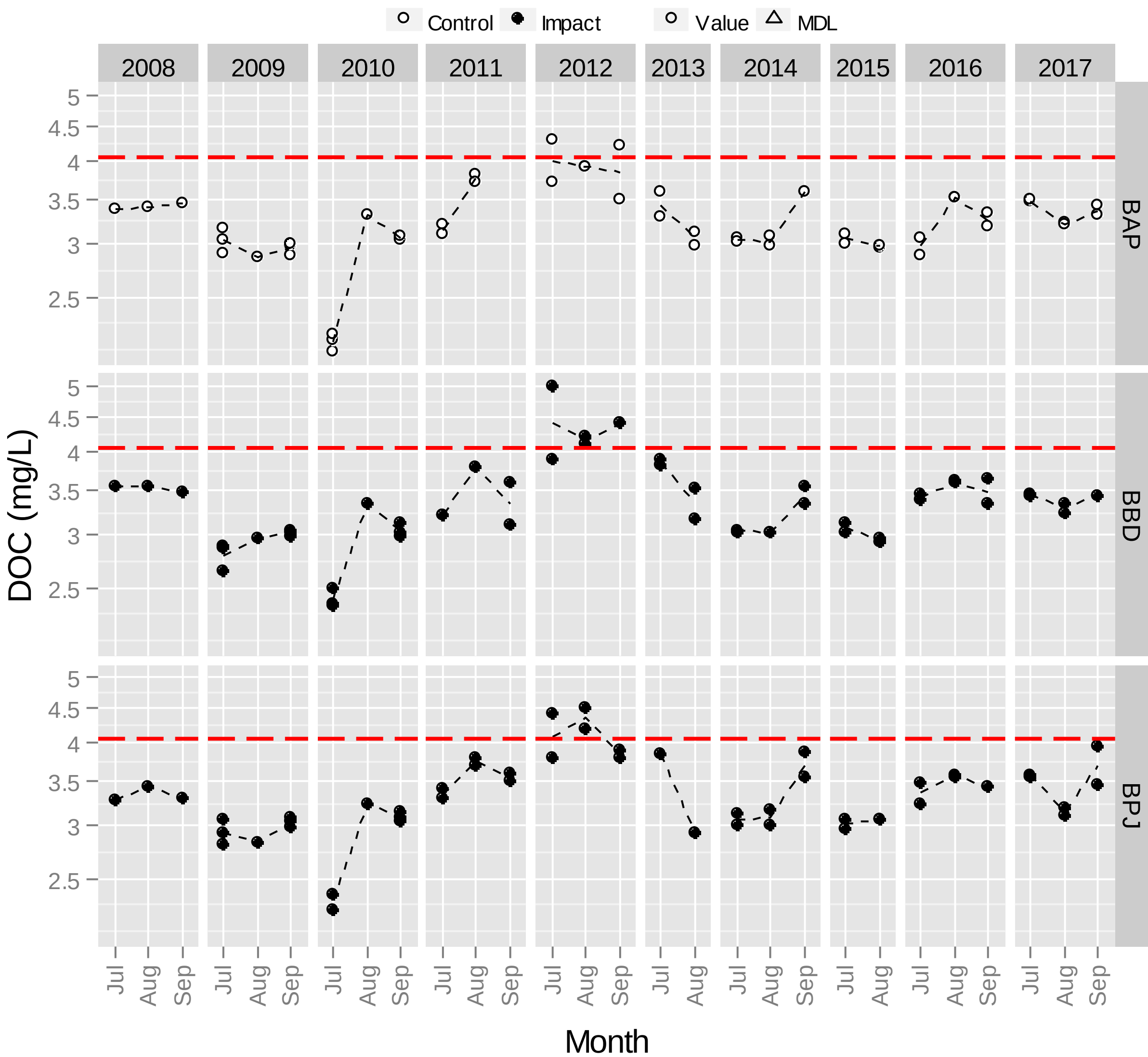


Figure 3.3-22. Total Organic Carbon (TOC; mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

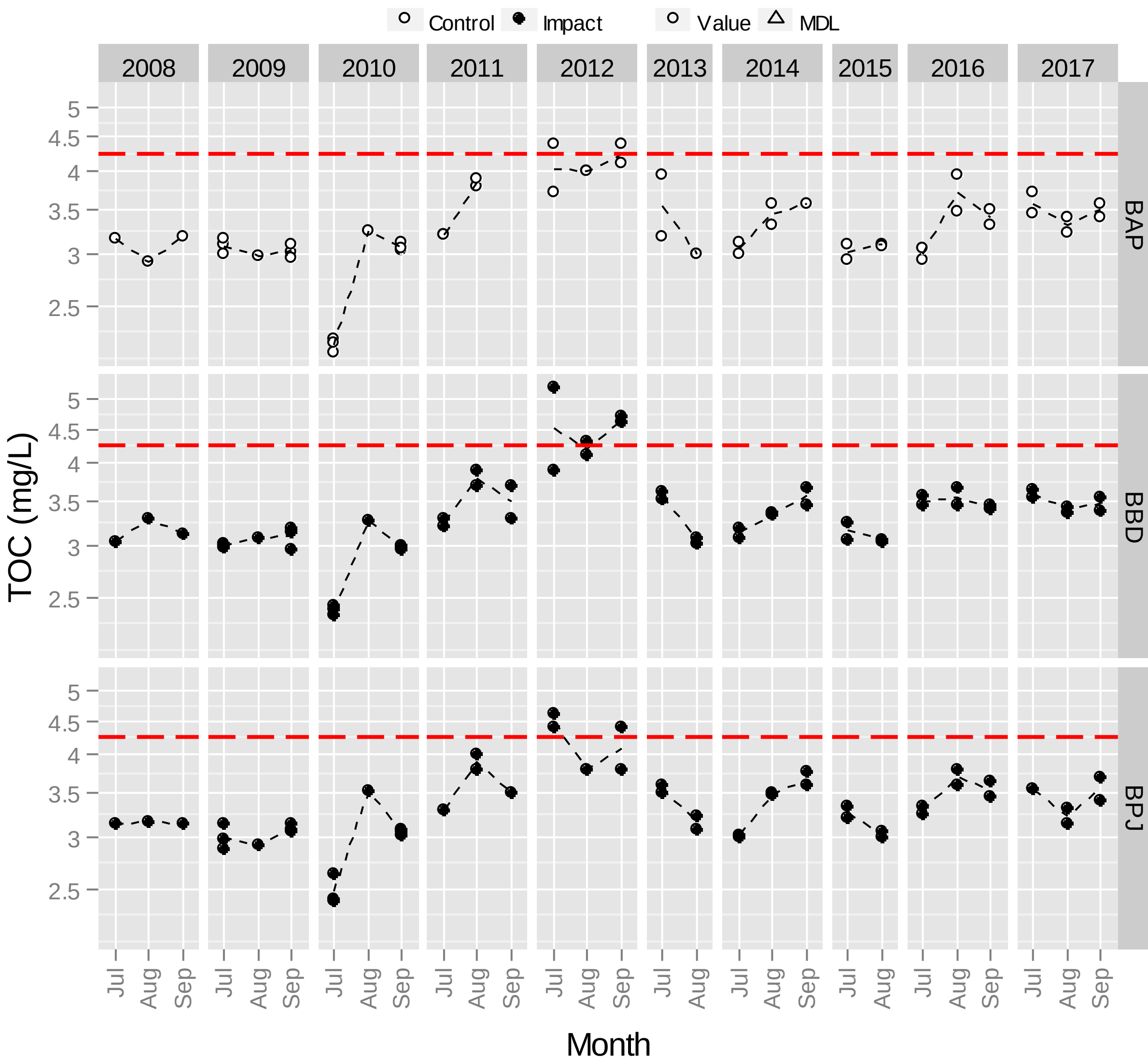


Figure 3.3-23. Total aluminum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

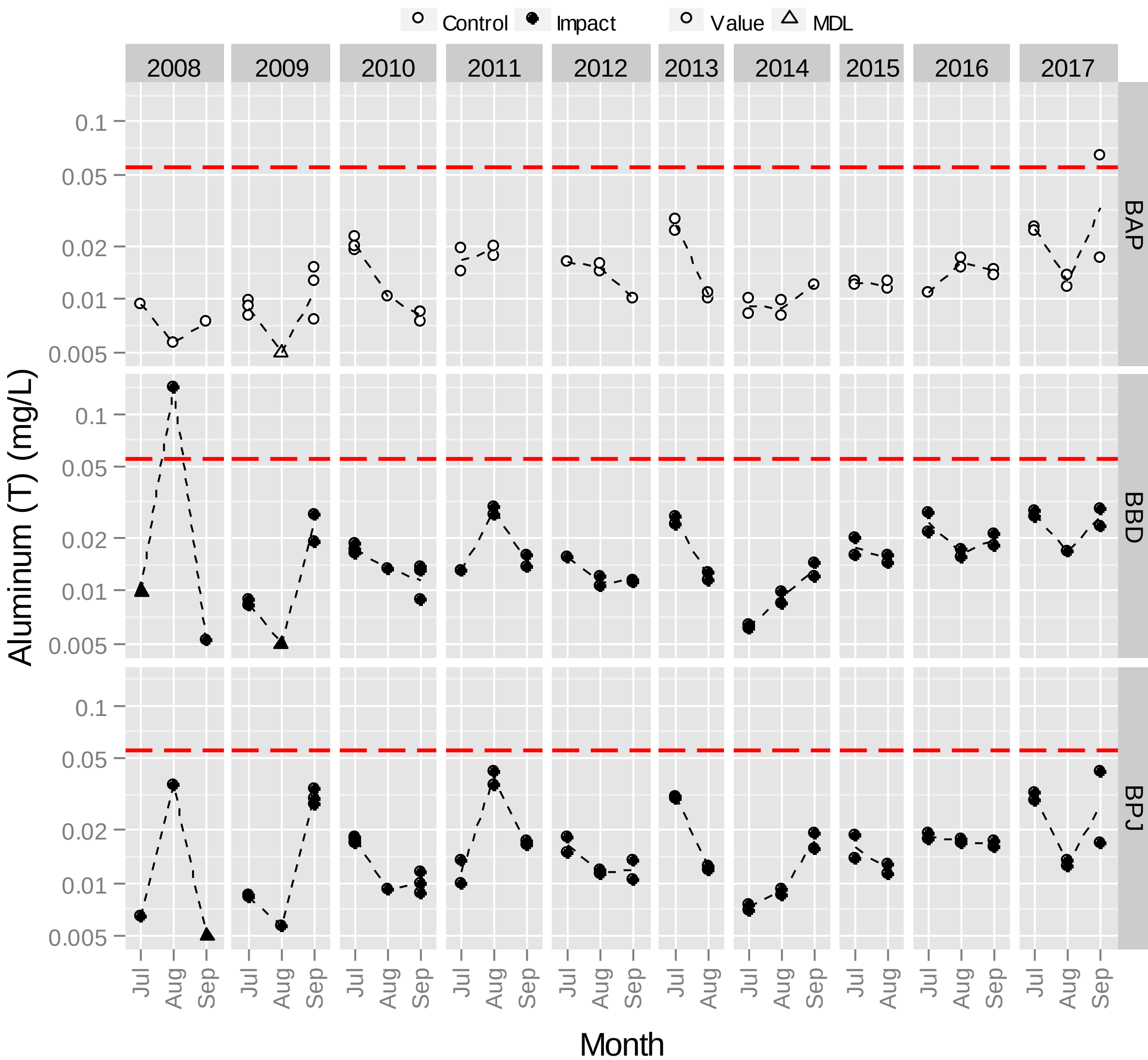


Figure 3.3-24. Total arsenic (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

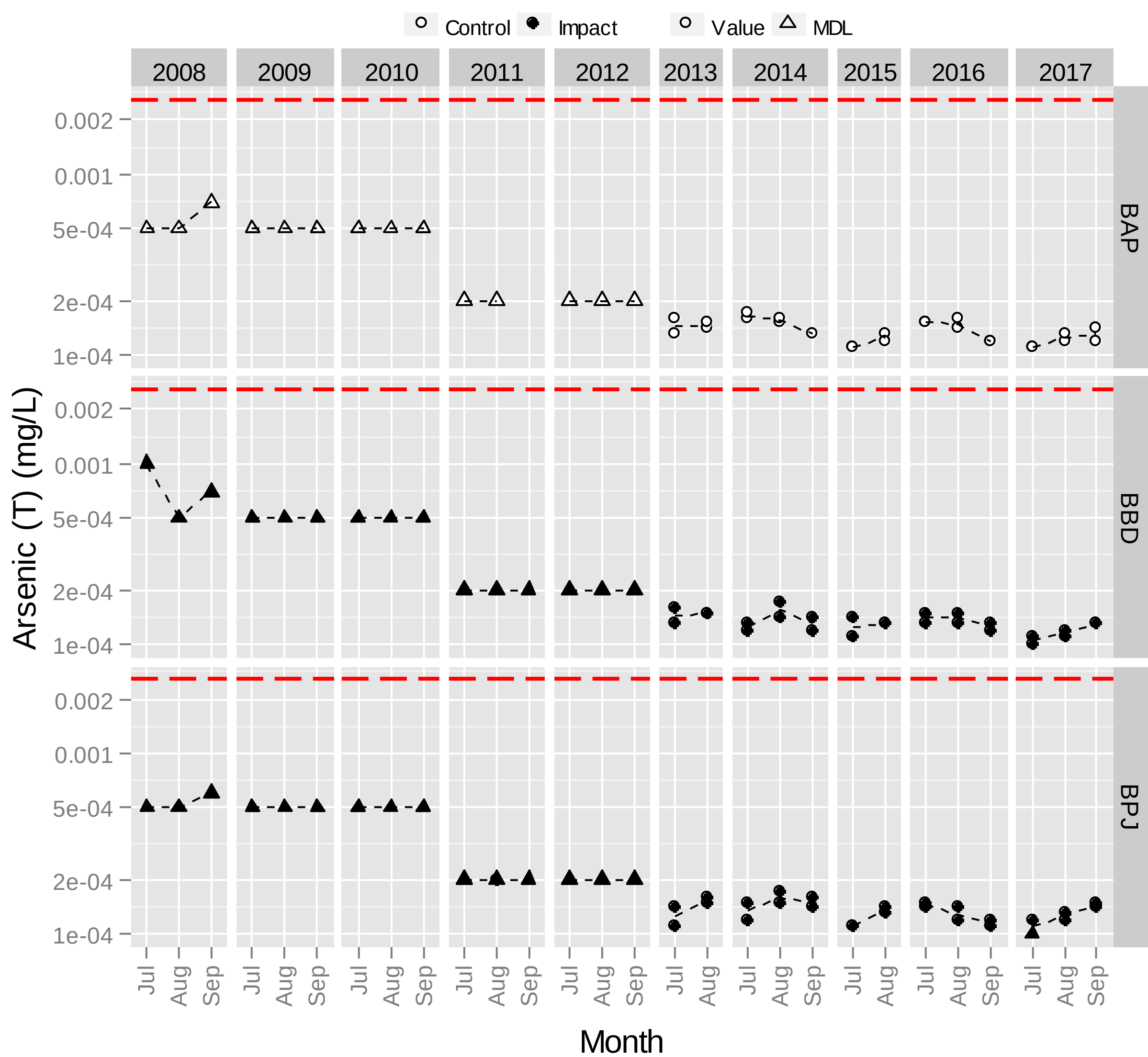


Figure 3.3-25. Total barium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

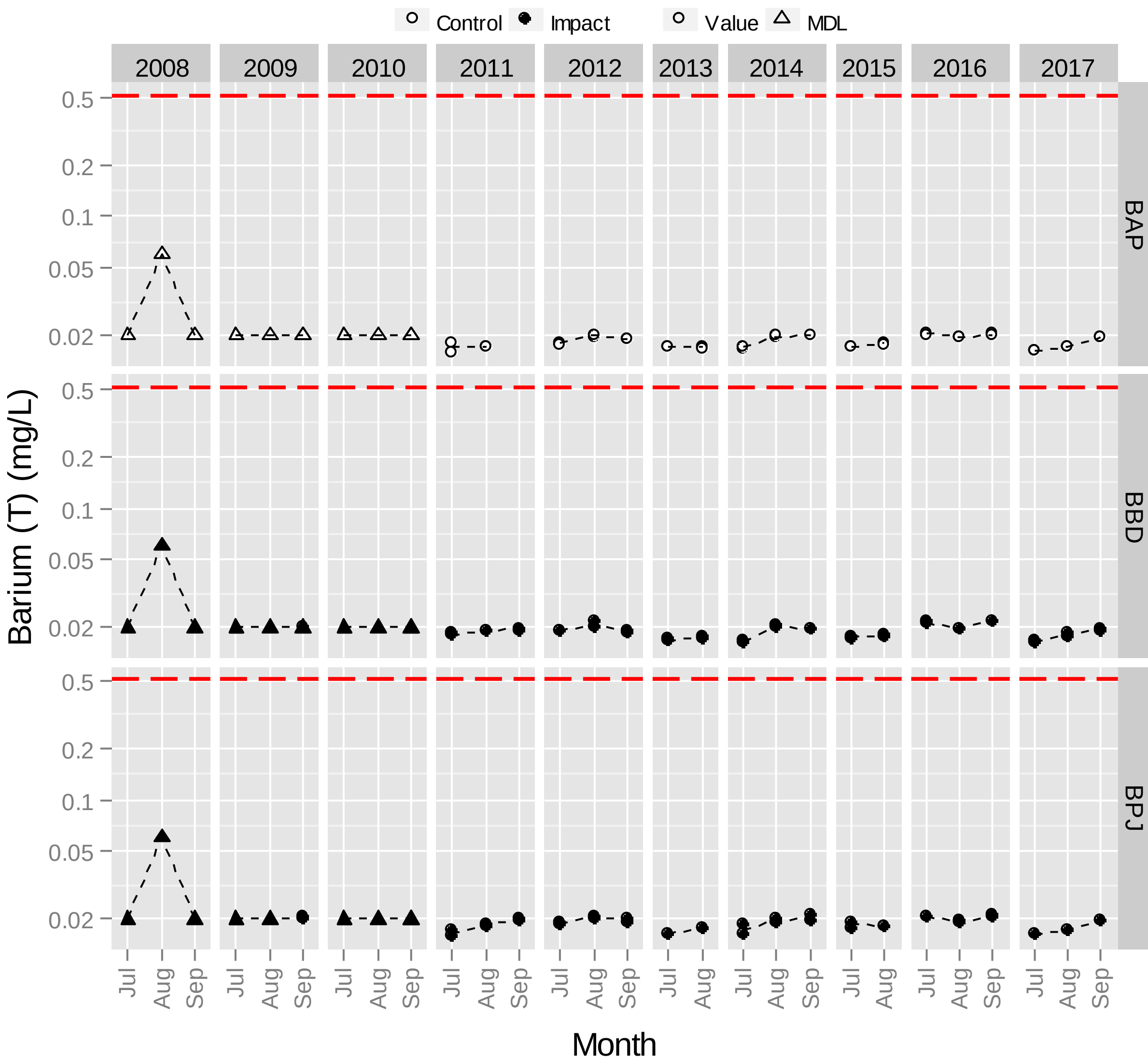


Figure 3.3-26. Total boron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

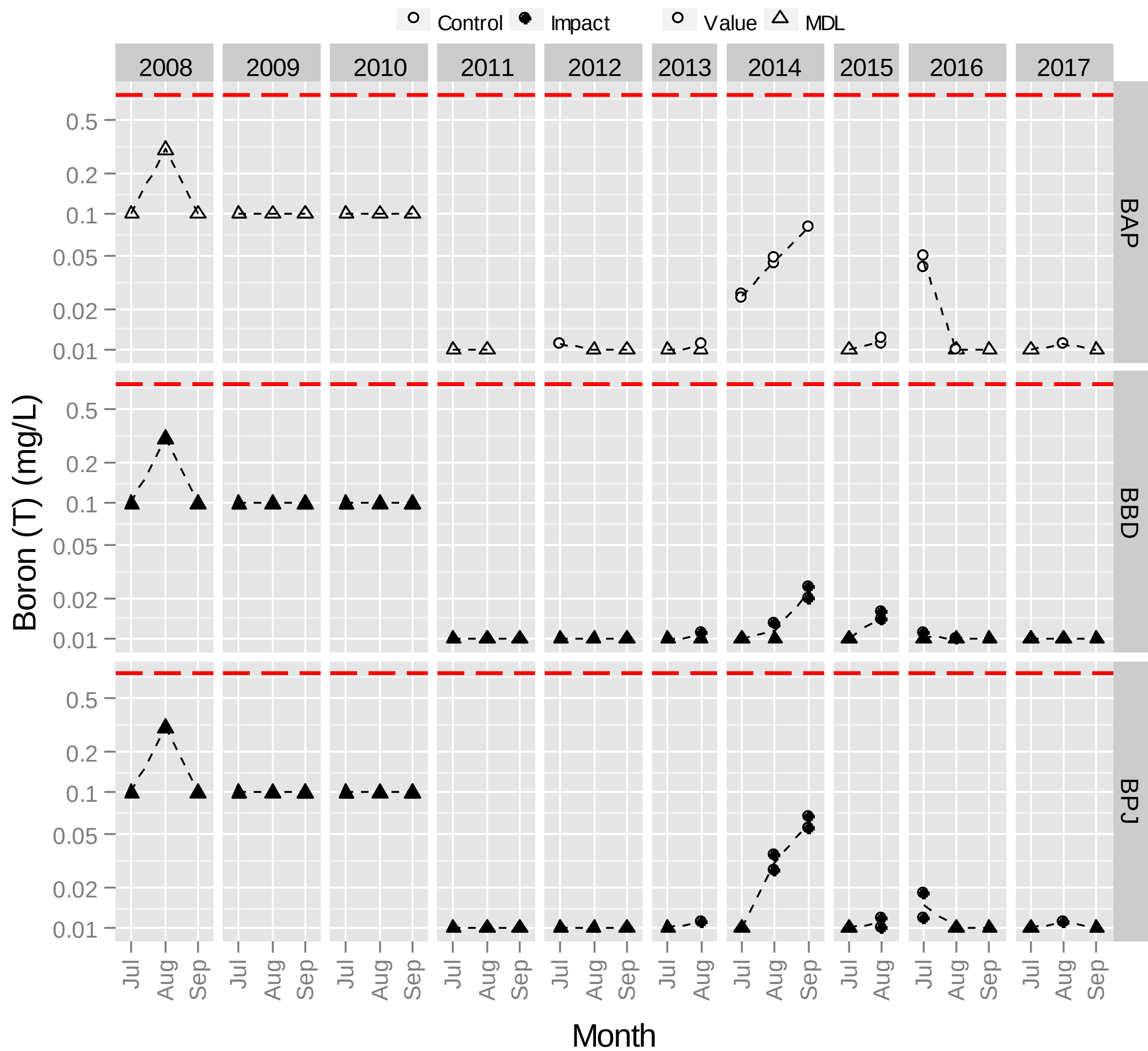


Figure 3.3-27. Total calcium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

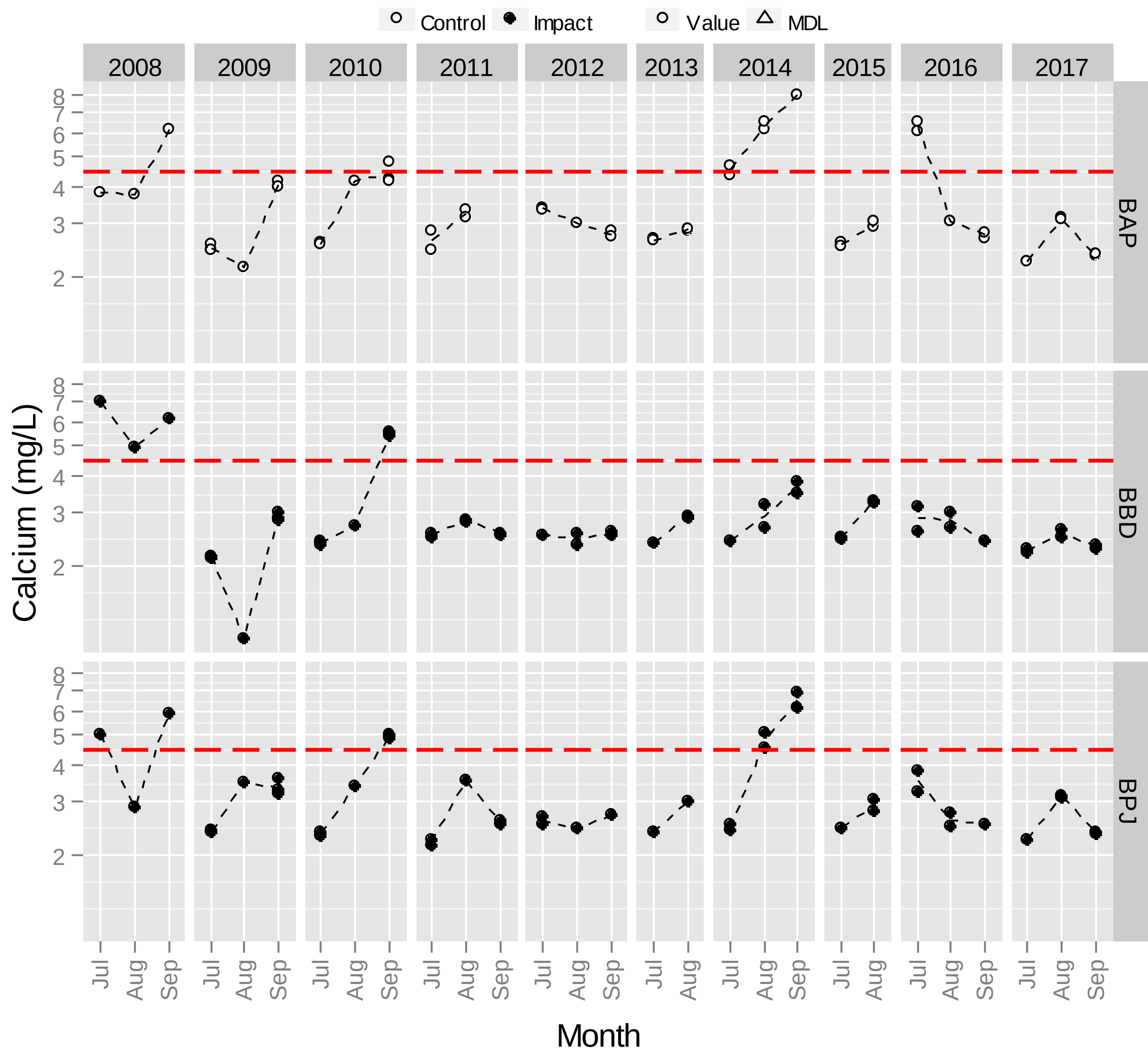


Figure 3.3-28. Total chromium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

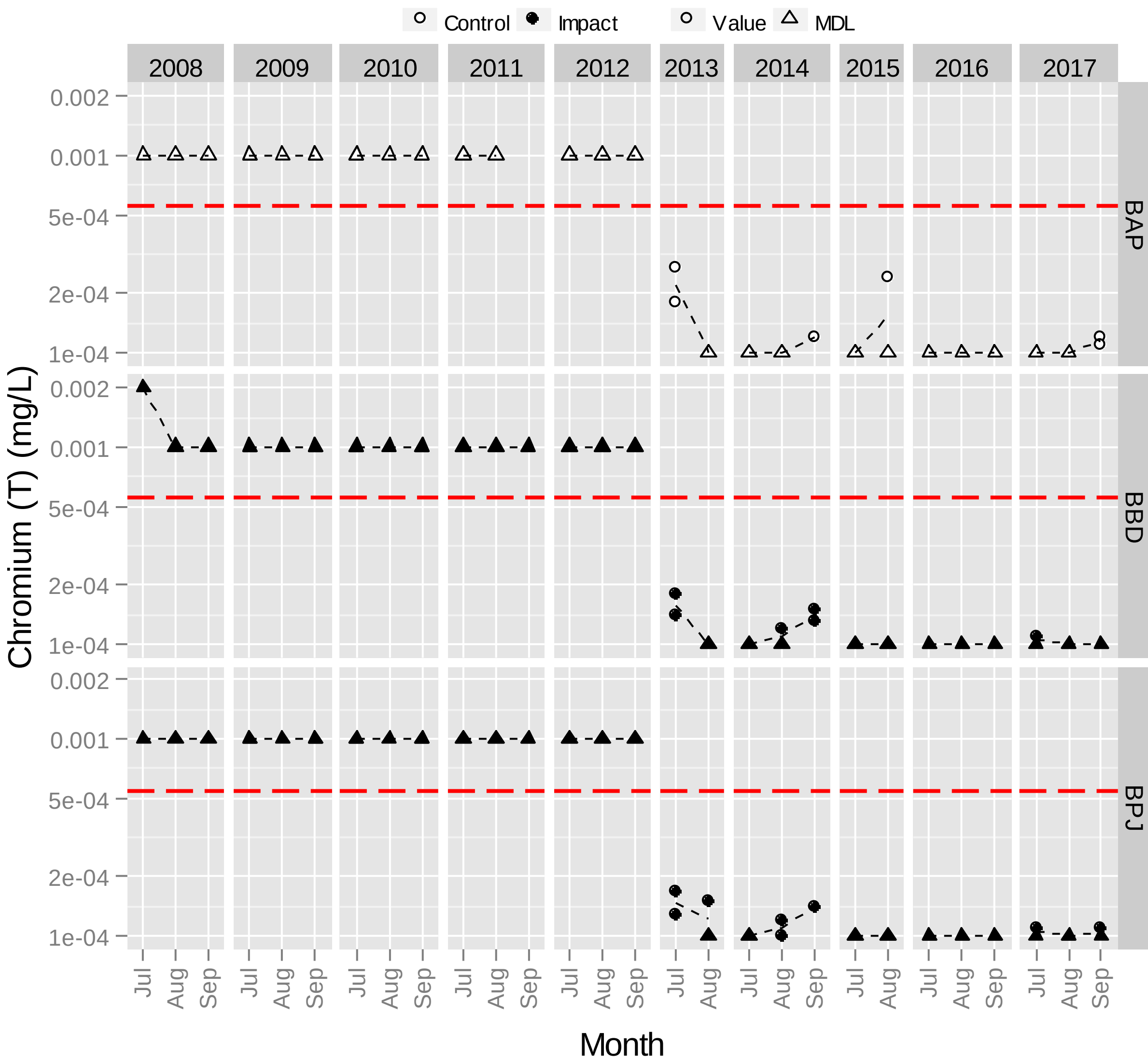


Figure 3.3-29. Total copper (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

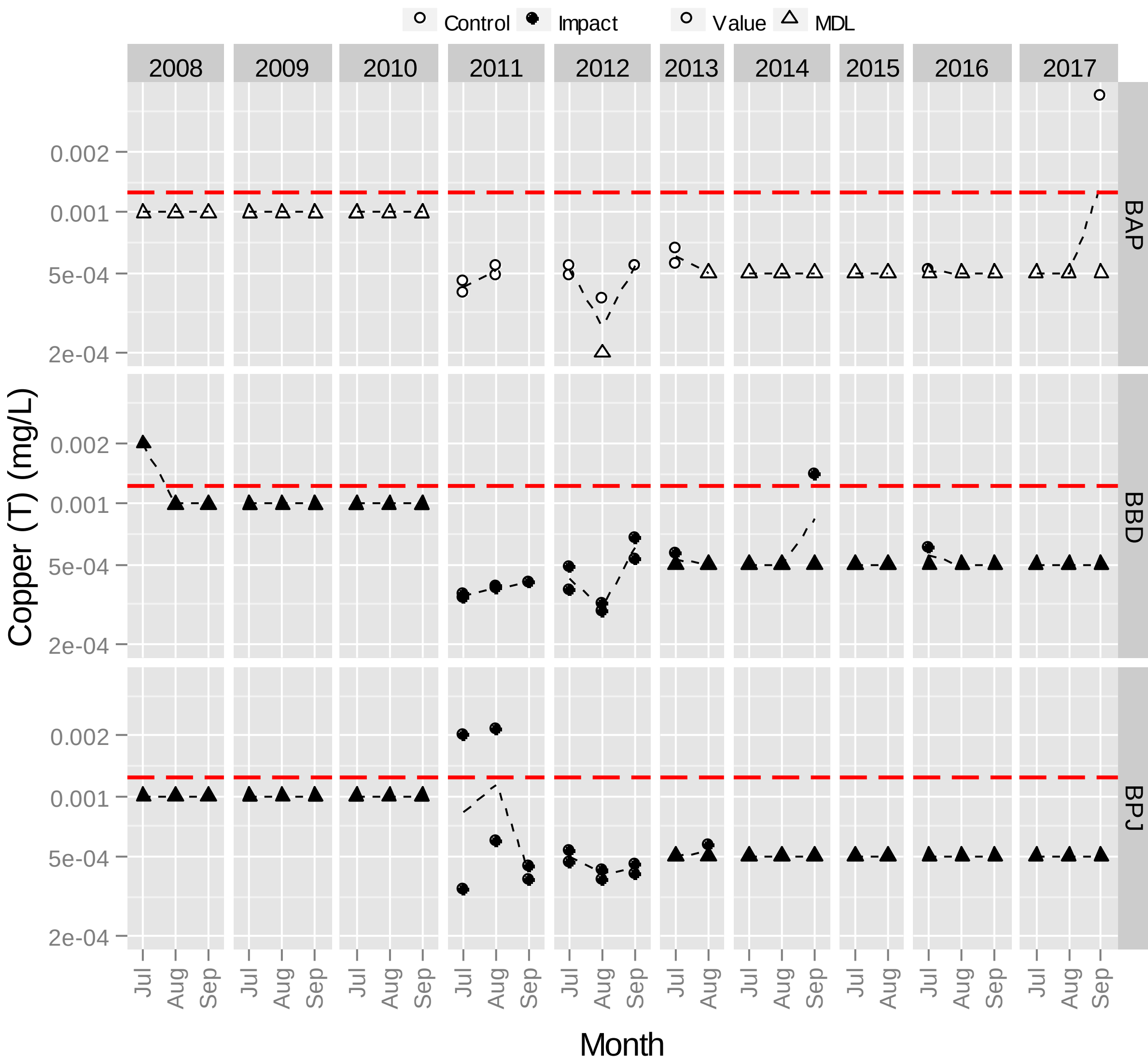


Figure 3.3-30. Total iron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

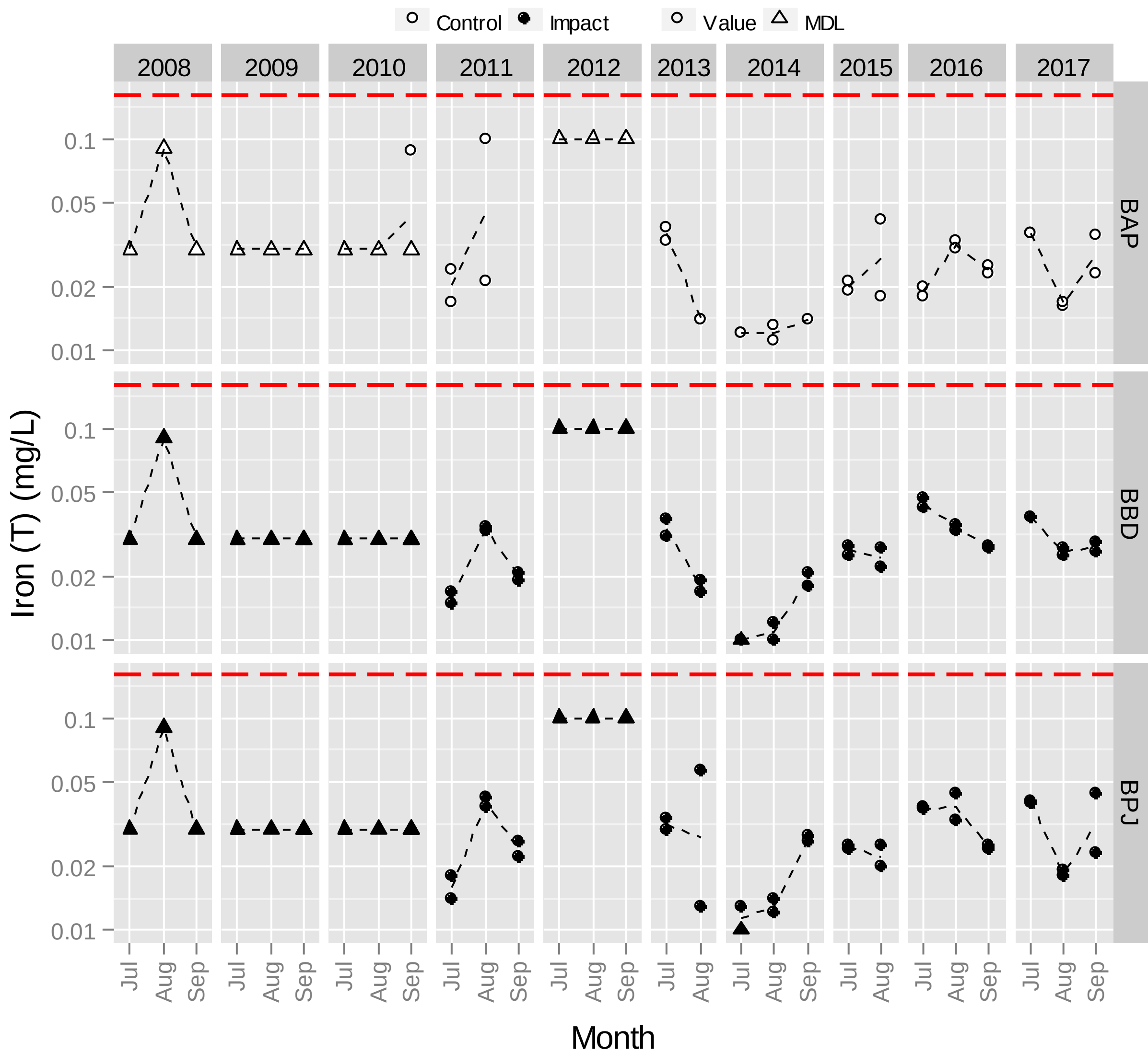


Figure 3.3-31. Total lithium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

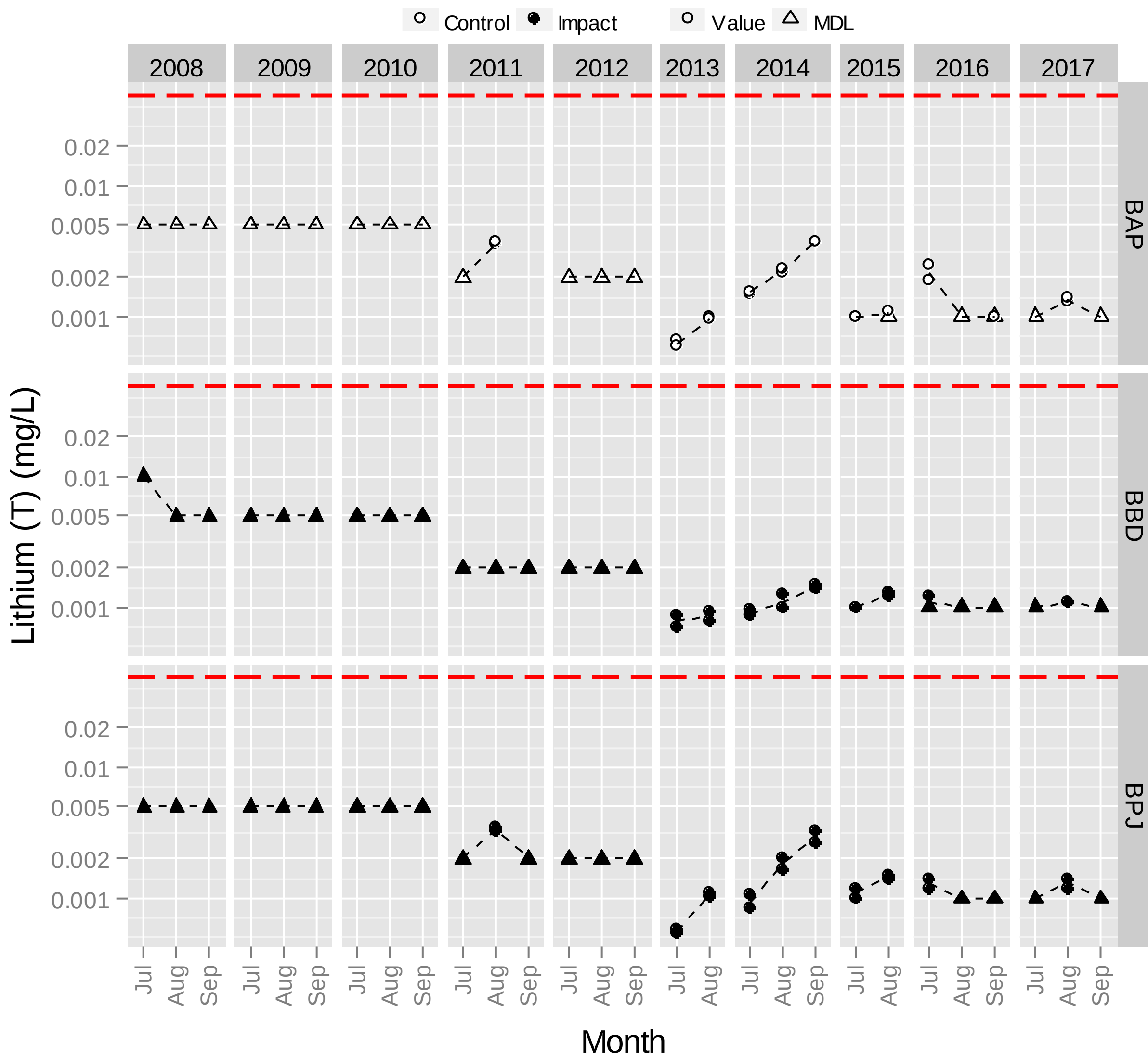


Figure 3.3-32. Total magnesium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

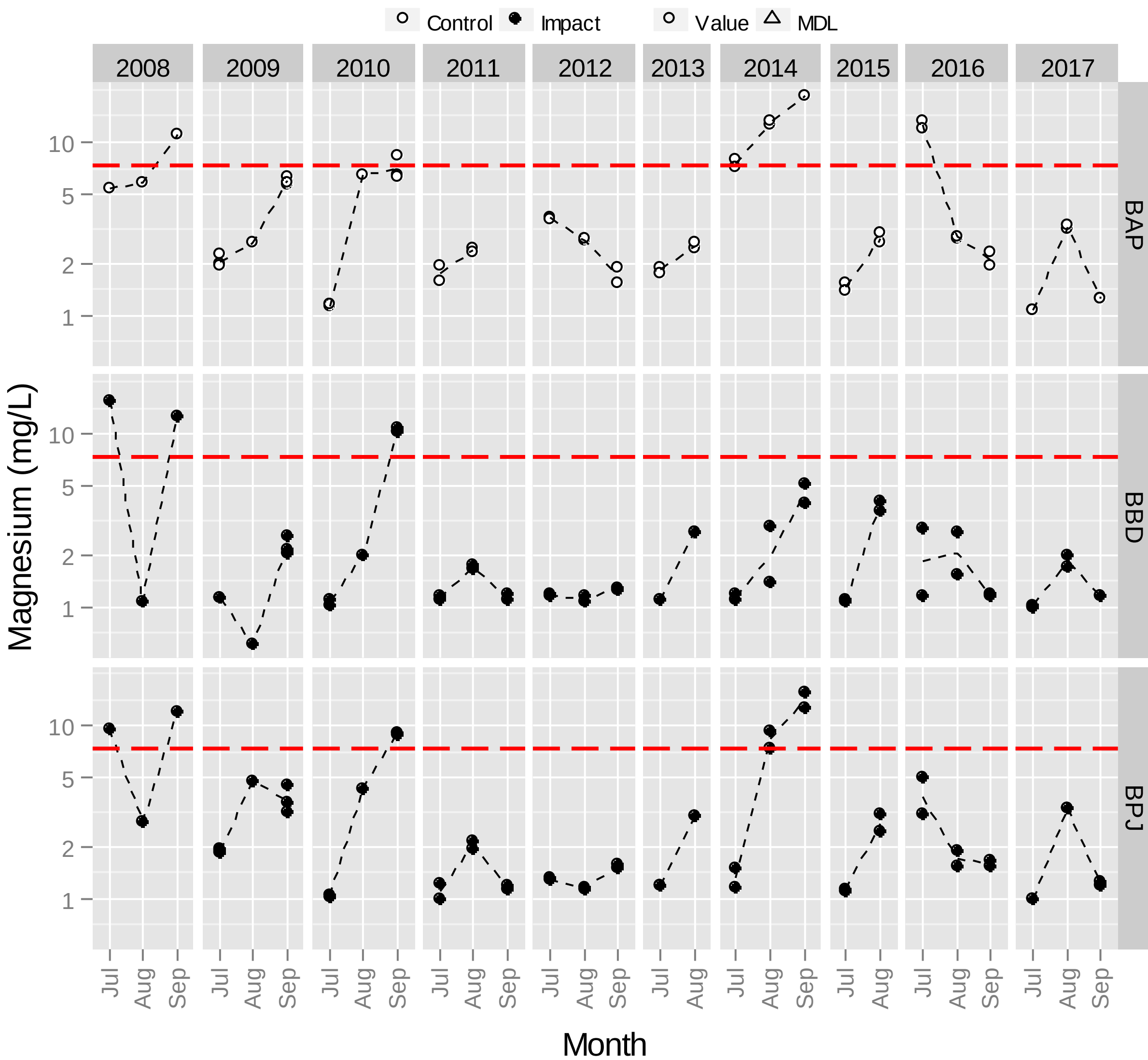


Figure 3.3-33. Total Manganese (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

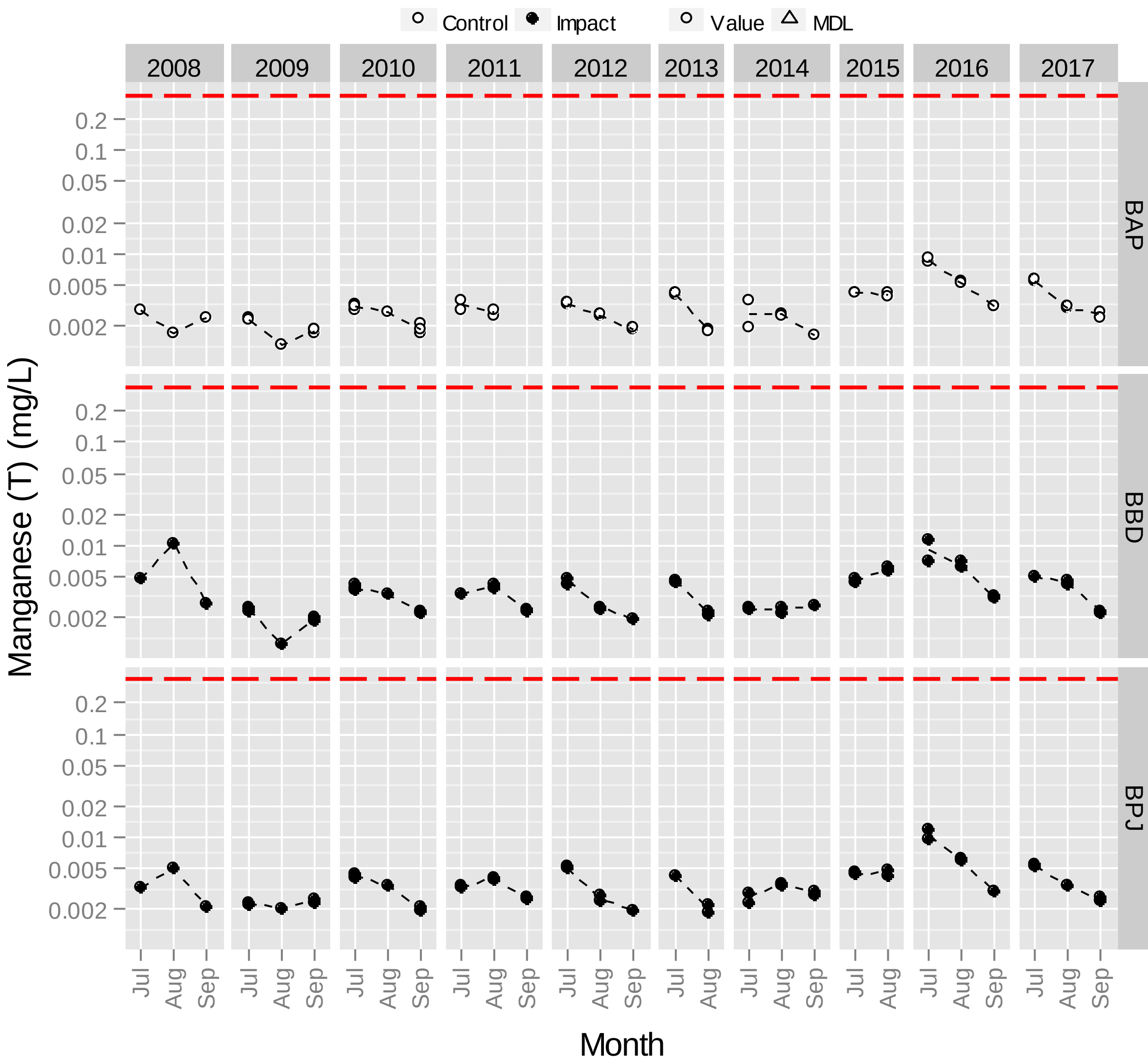


Figure 3.3-34. Total molybdenum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

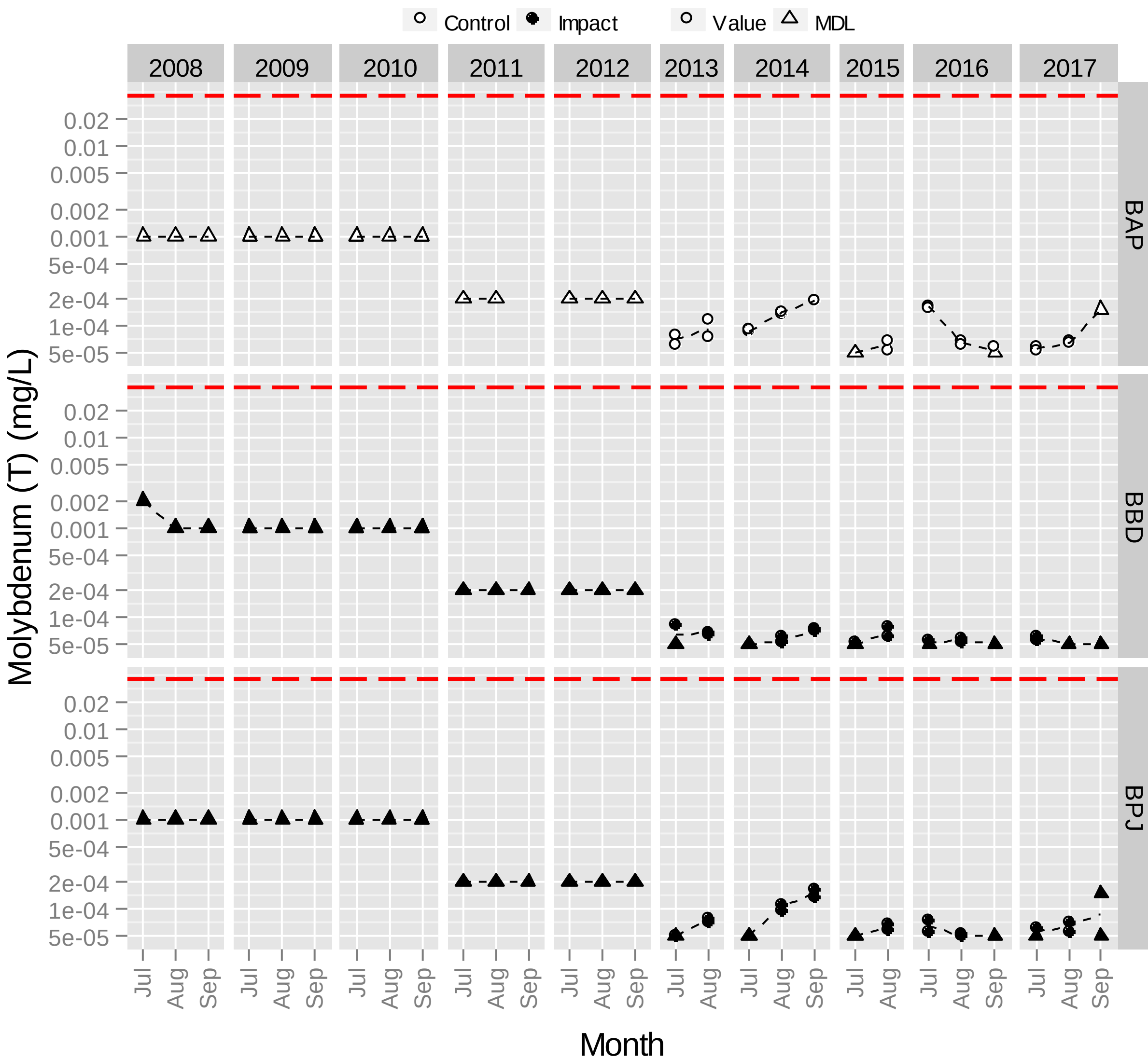


Figure 3.3-35. Total potassium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

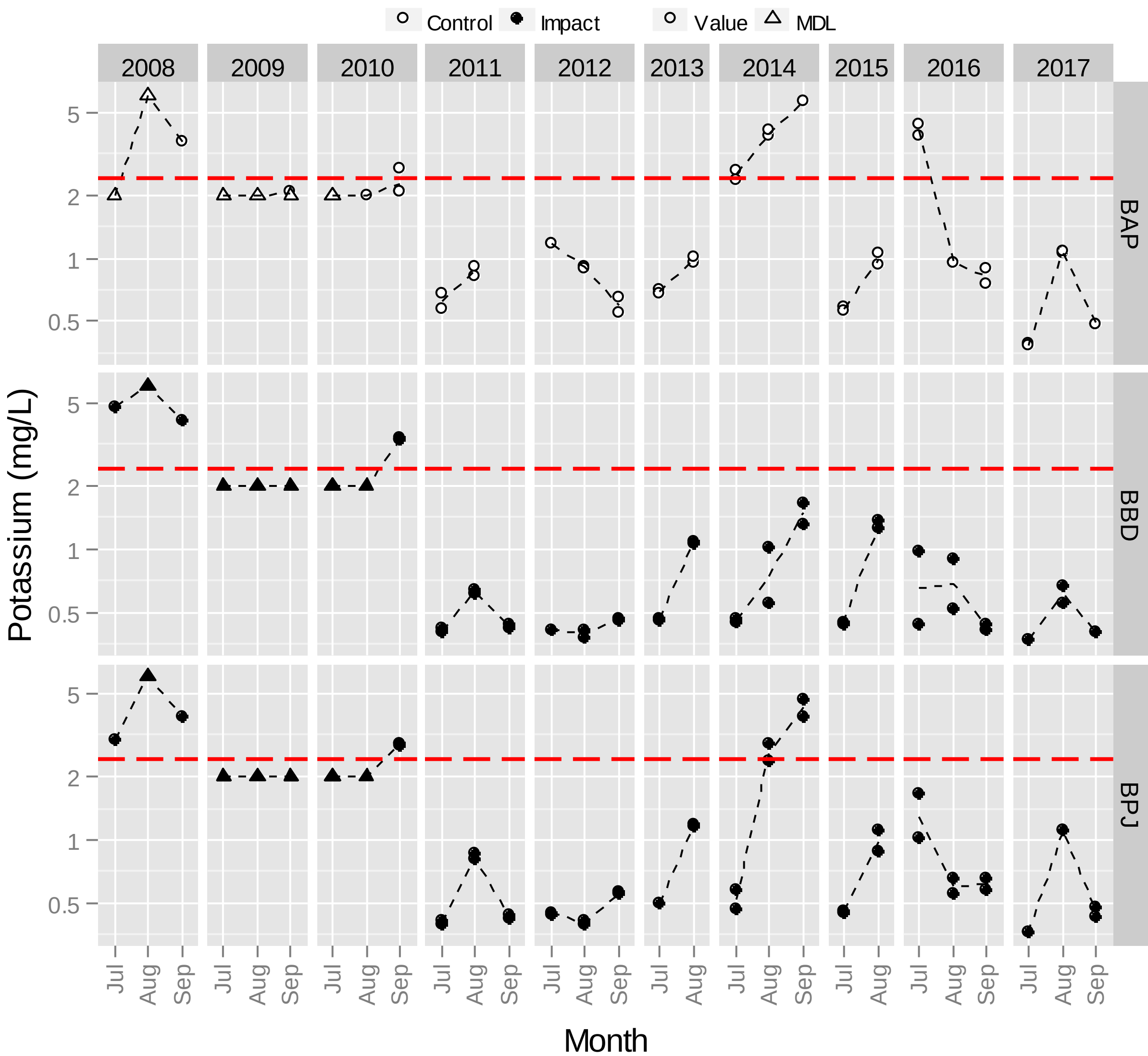


Figure 3.3-36. Total sodium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

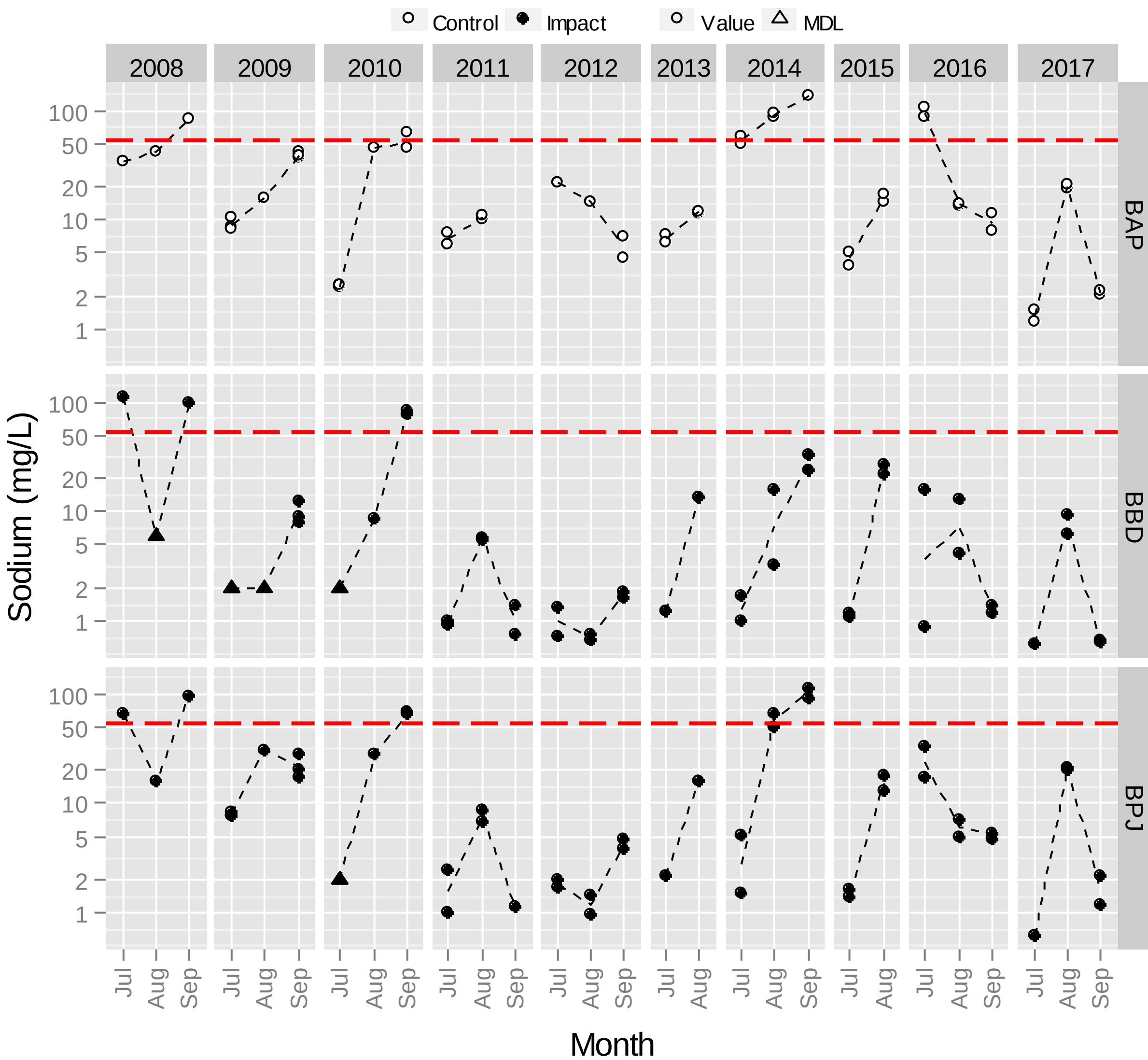


Figure 3.3-37. Total strontium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

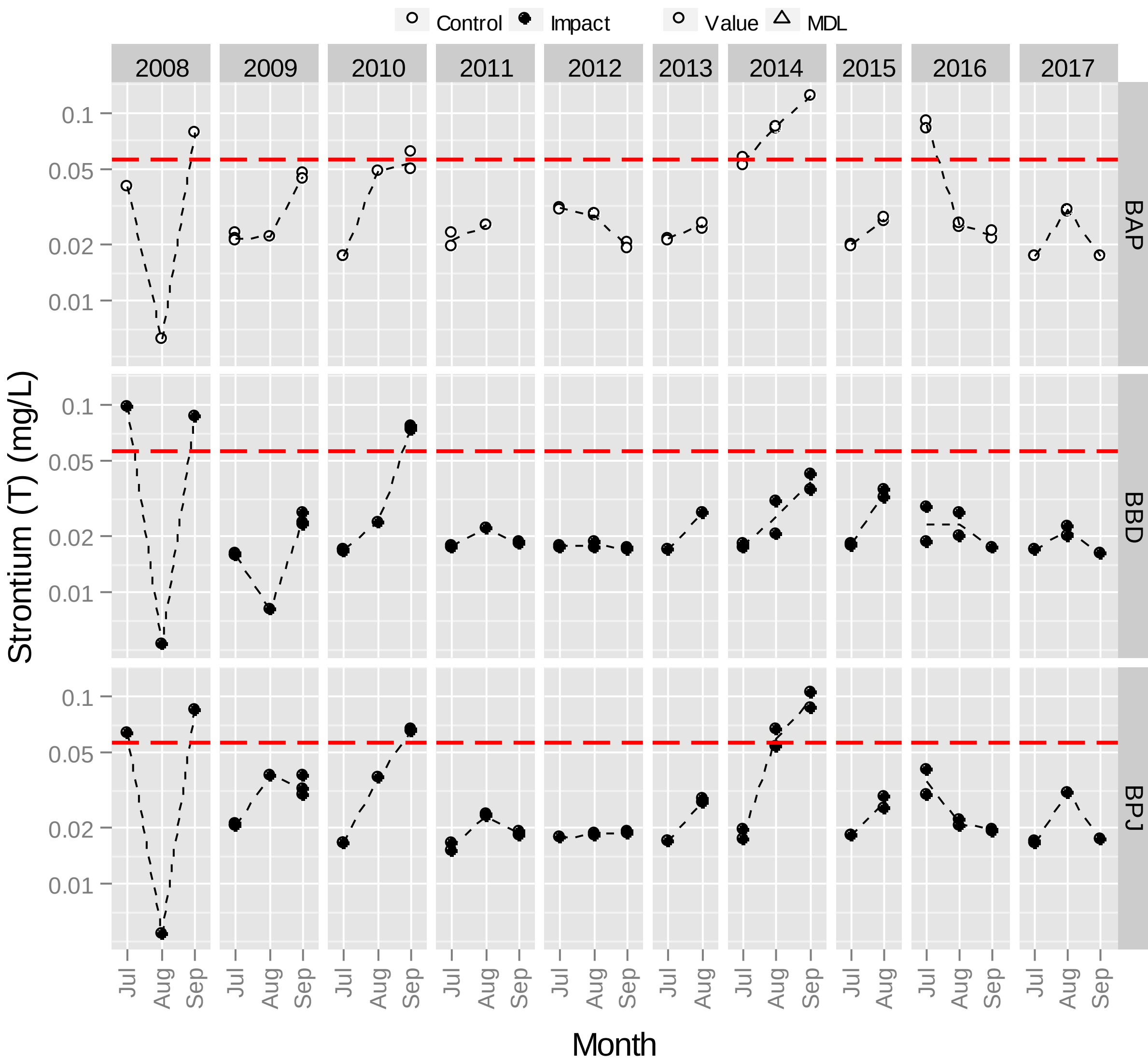


Figure 3.3-38. Total titanium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

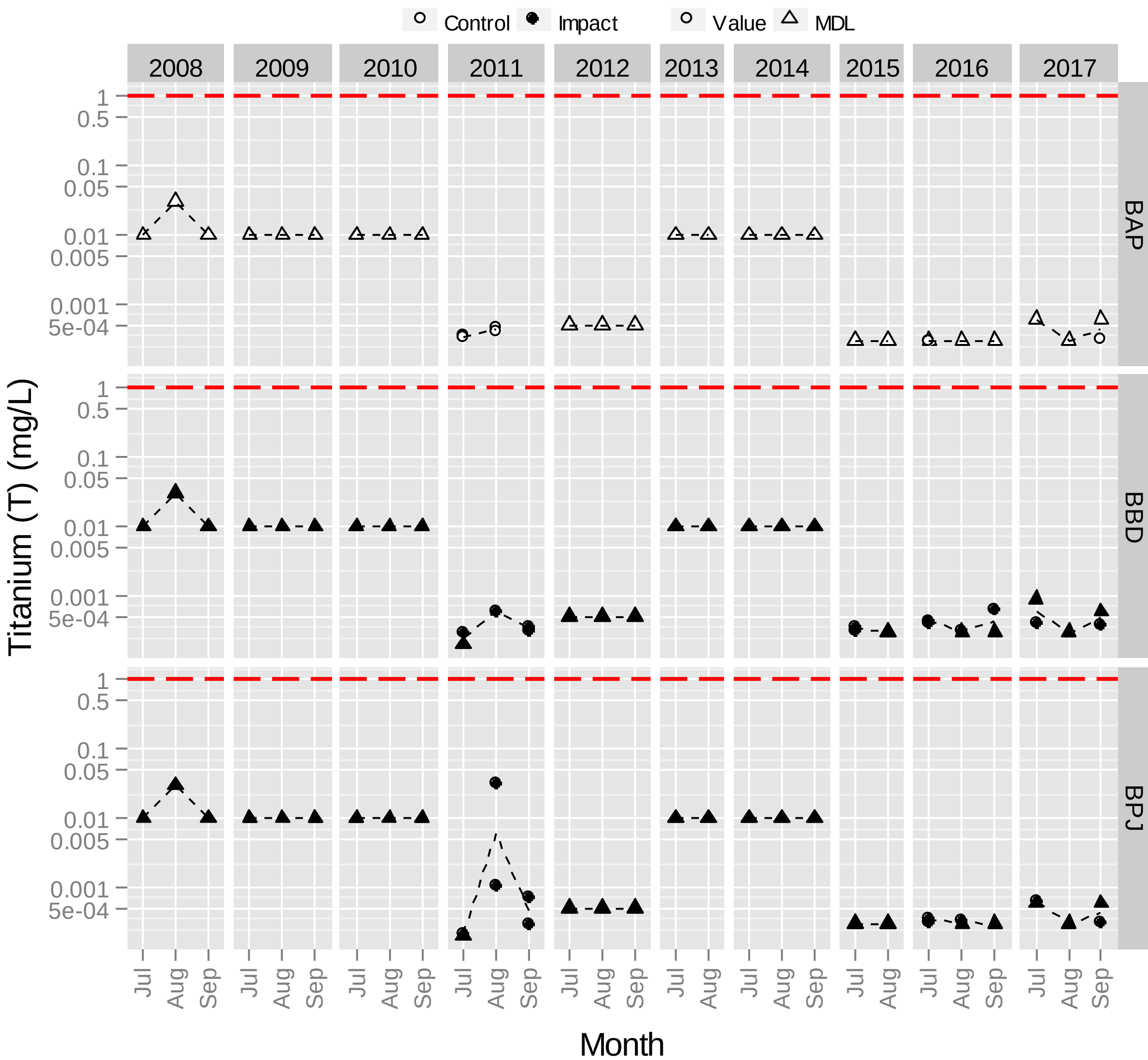


Figure 3.3-39. Total uranium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

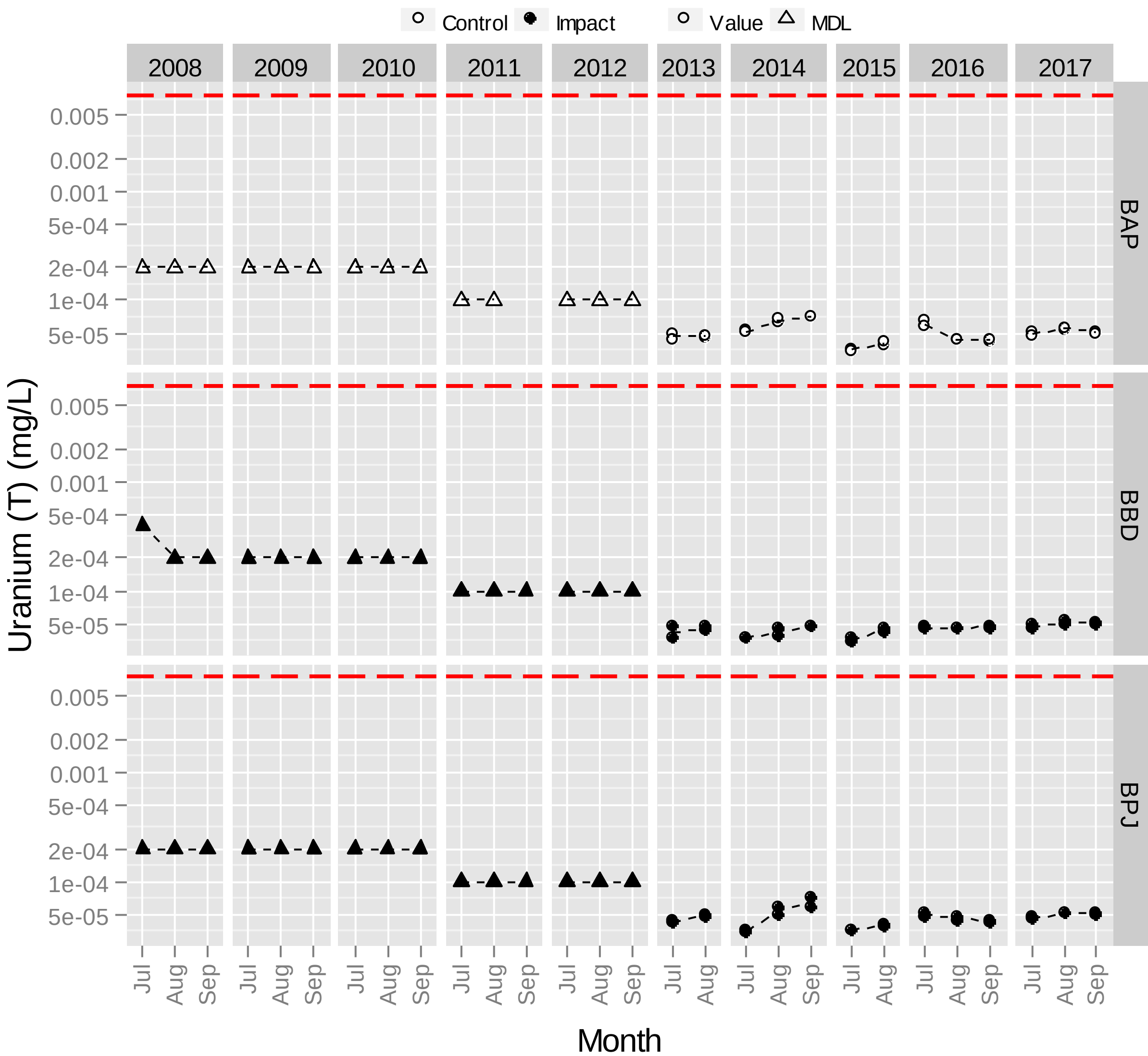


Figure 3.3-40. Dissolved aluminum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

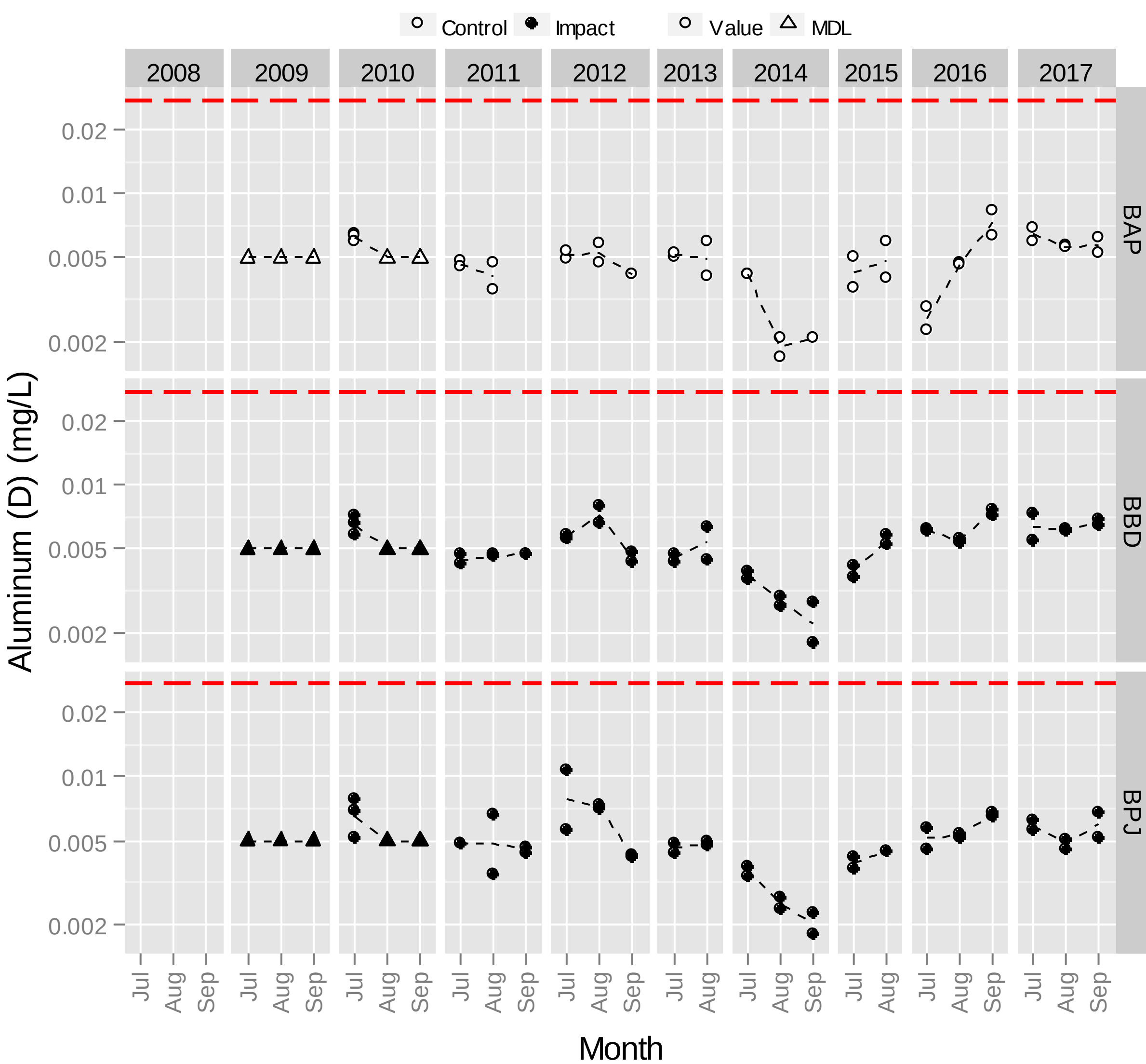


Figure 3.3-41. Dissolved arsenic (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

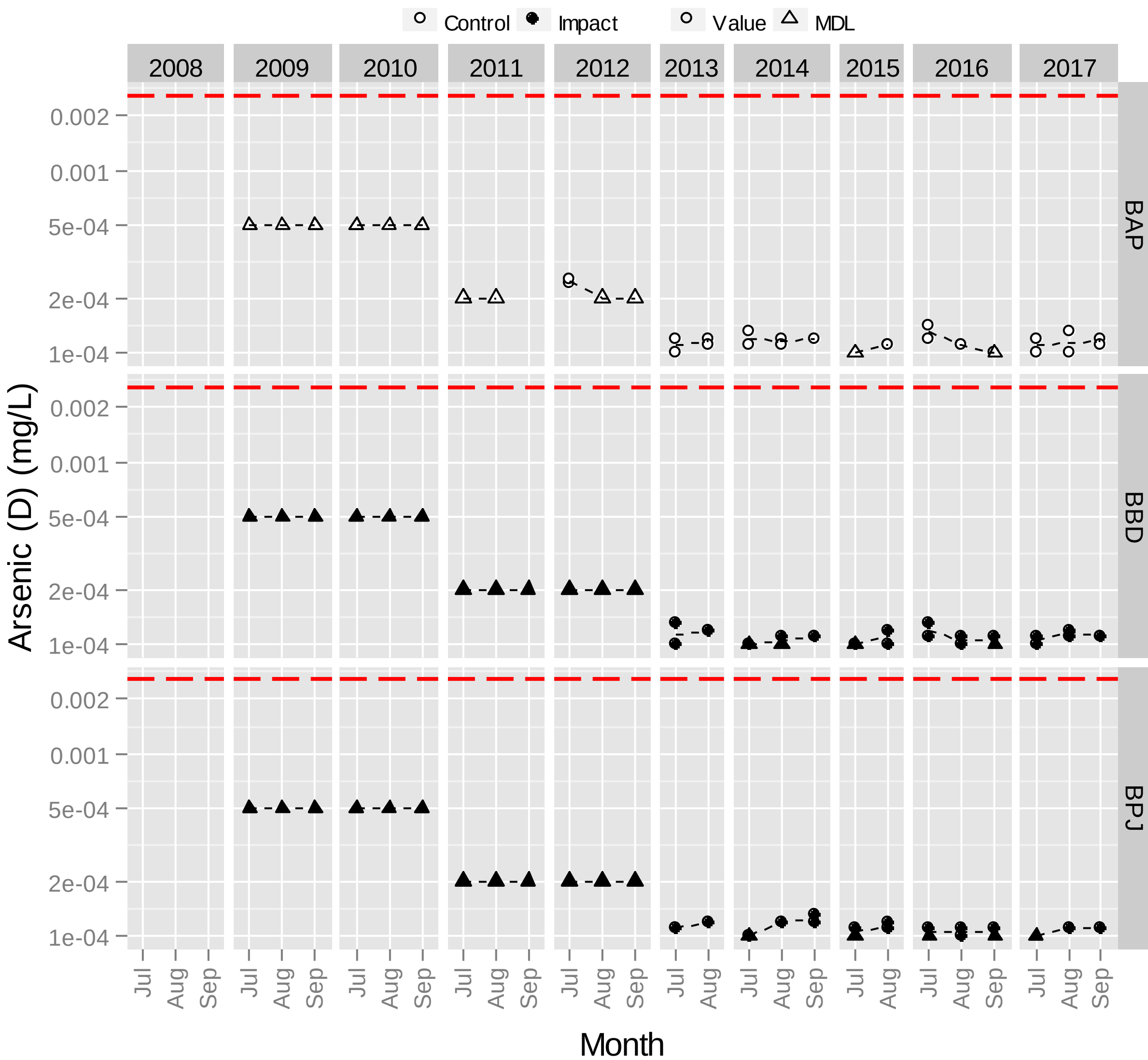


Figure 3.3-42. Dissolved barium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

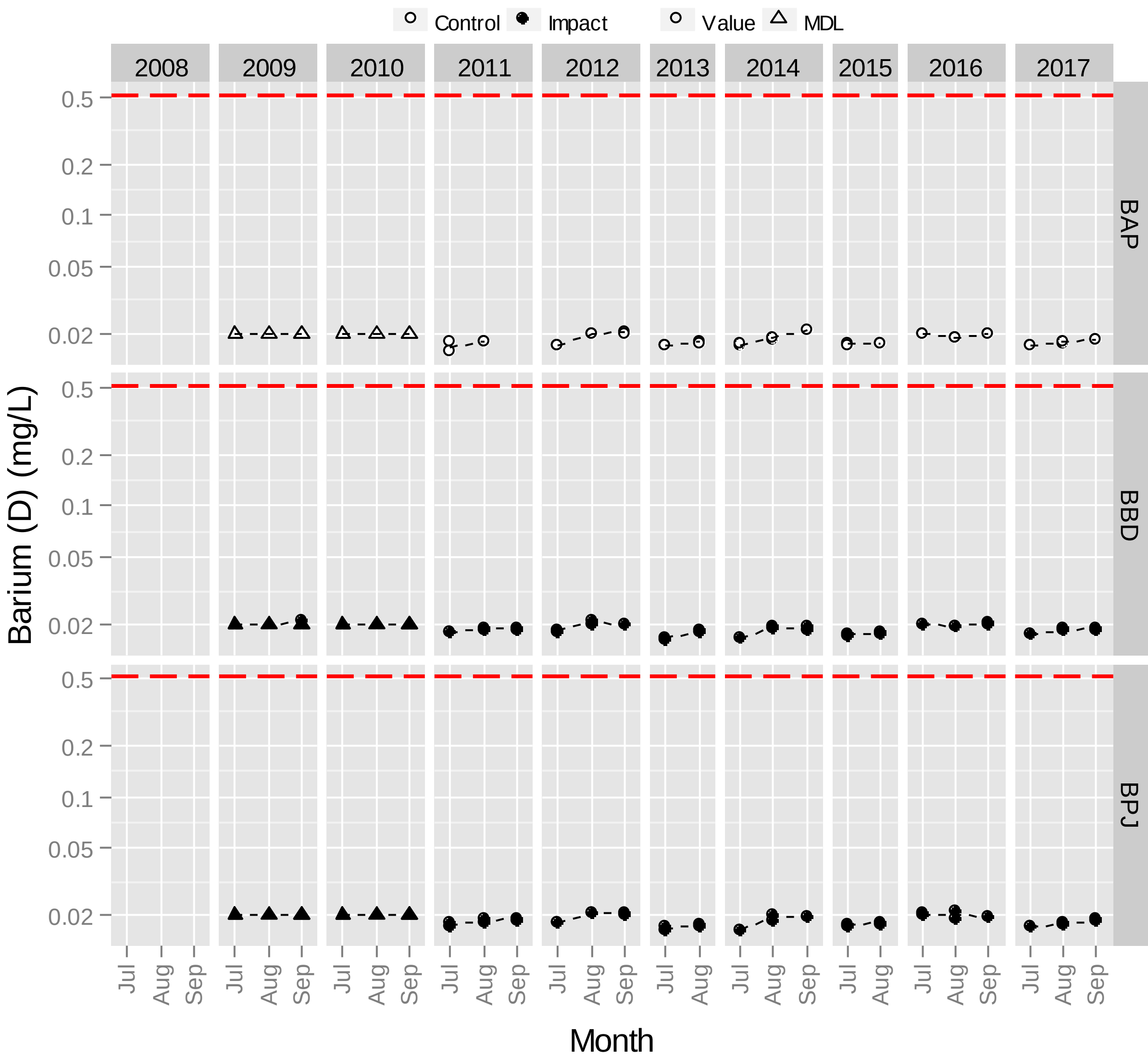


Figure 3.3-43. Dissolved boron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

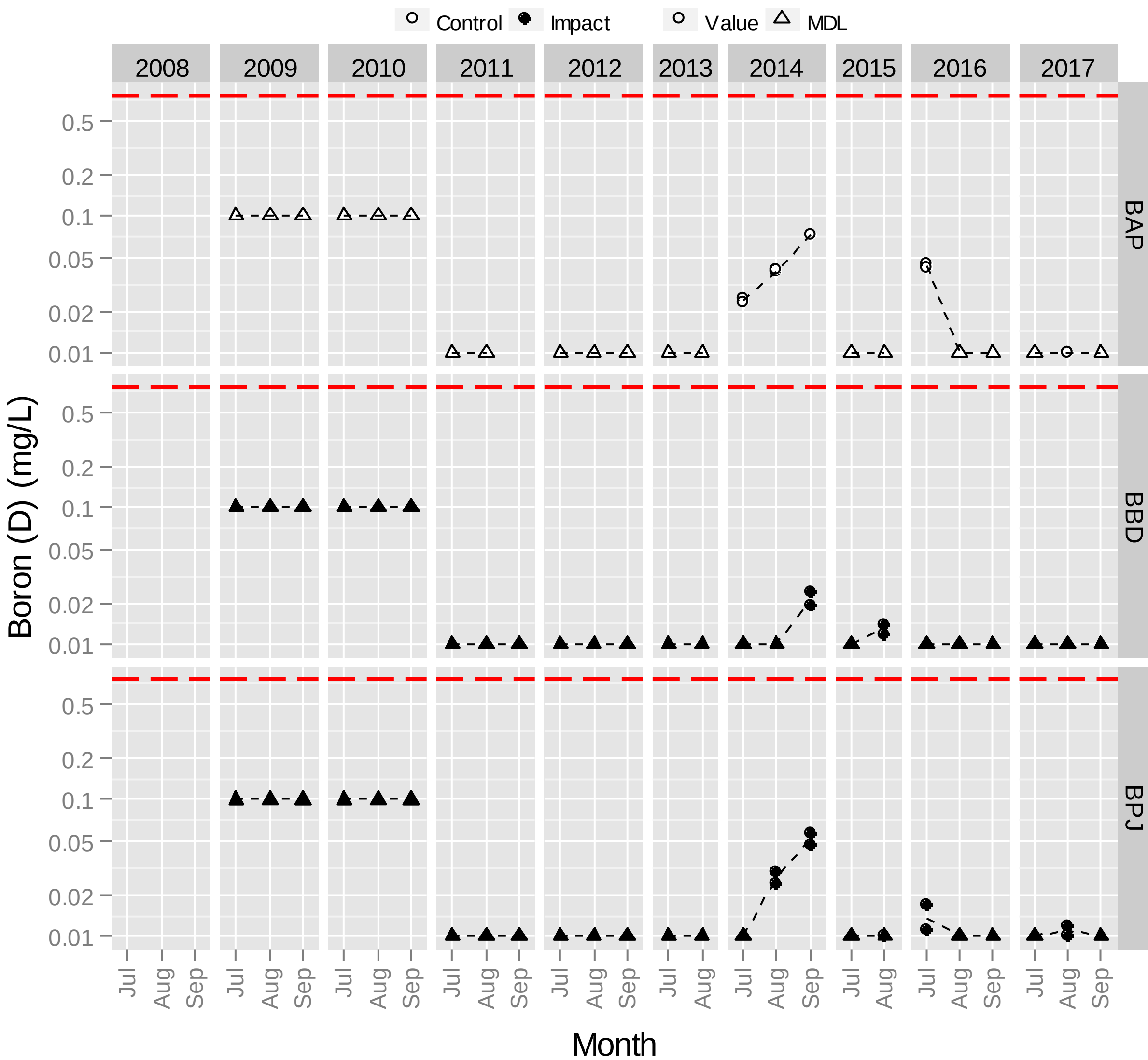


Figure 3.3-44. Dissolved copper (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

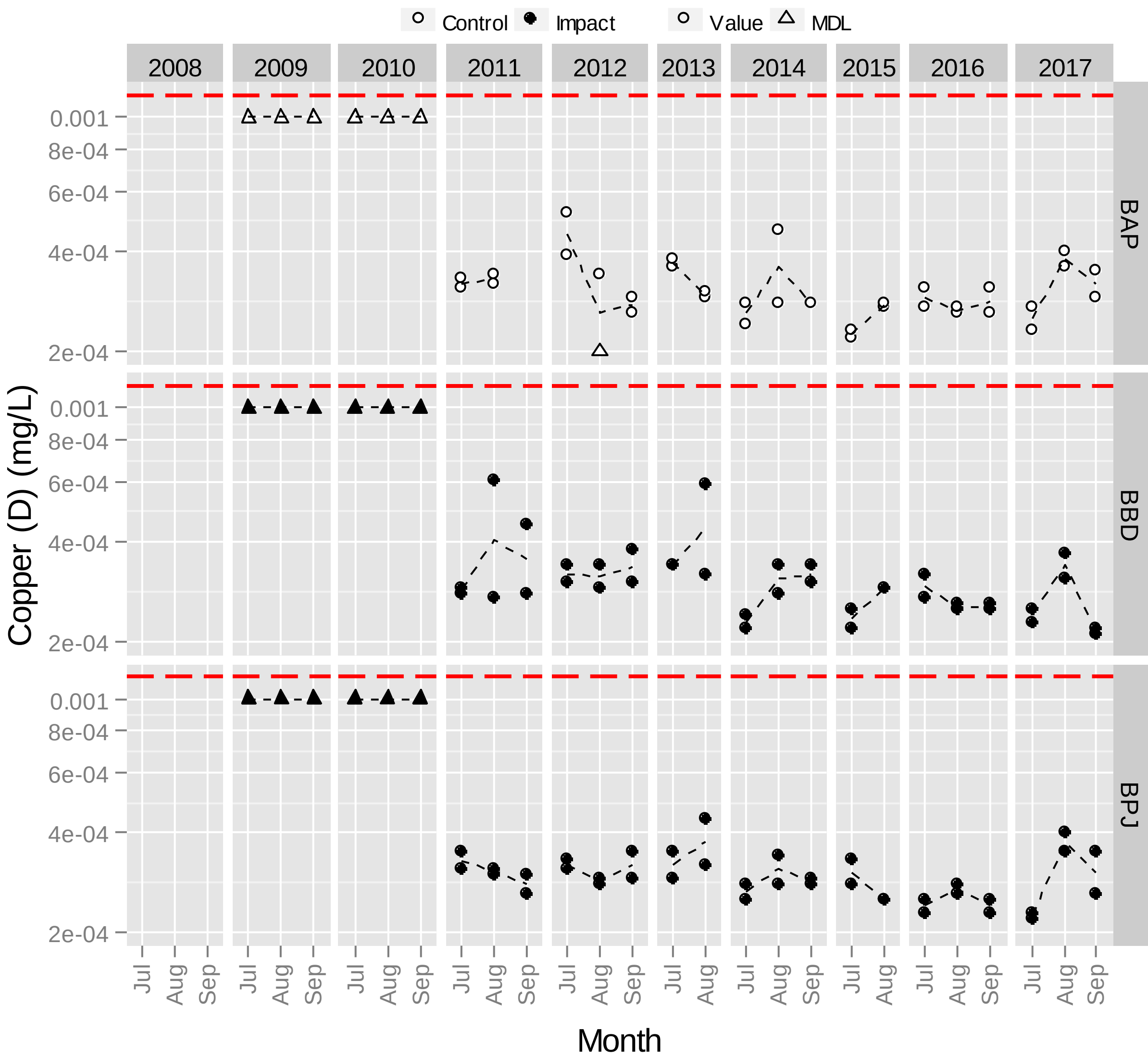


Figure 3.3-45. Dissolved lithium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

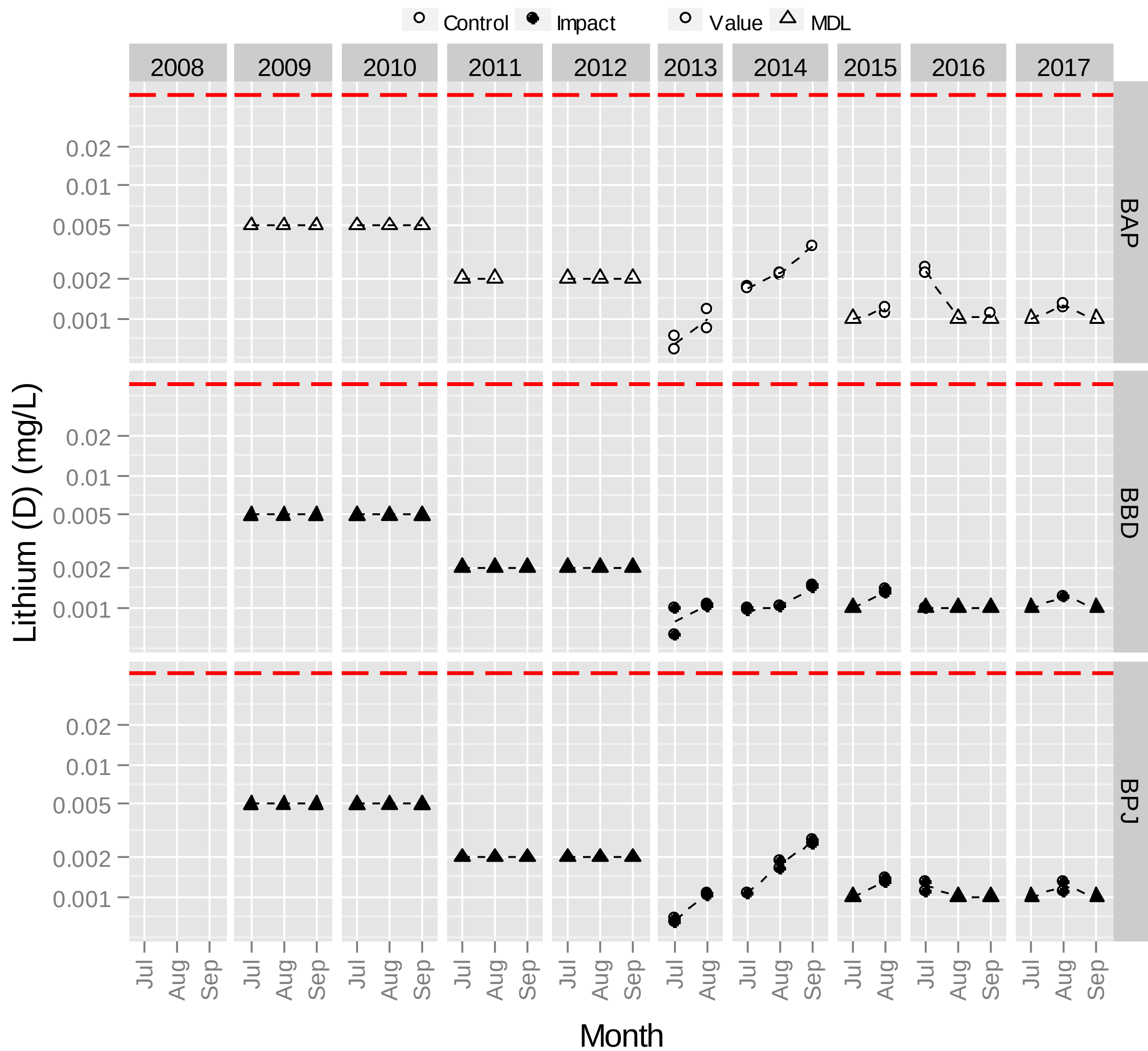


Figure 3.3-46. Dissolved manganese (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

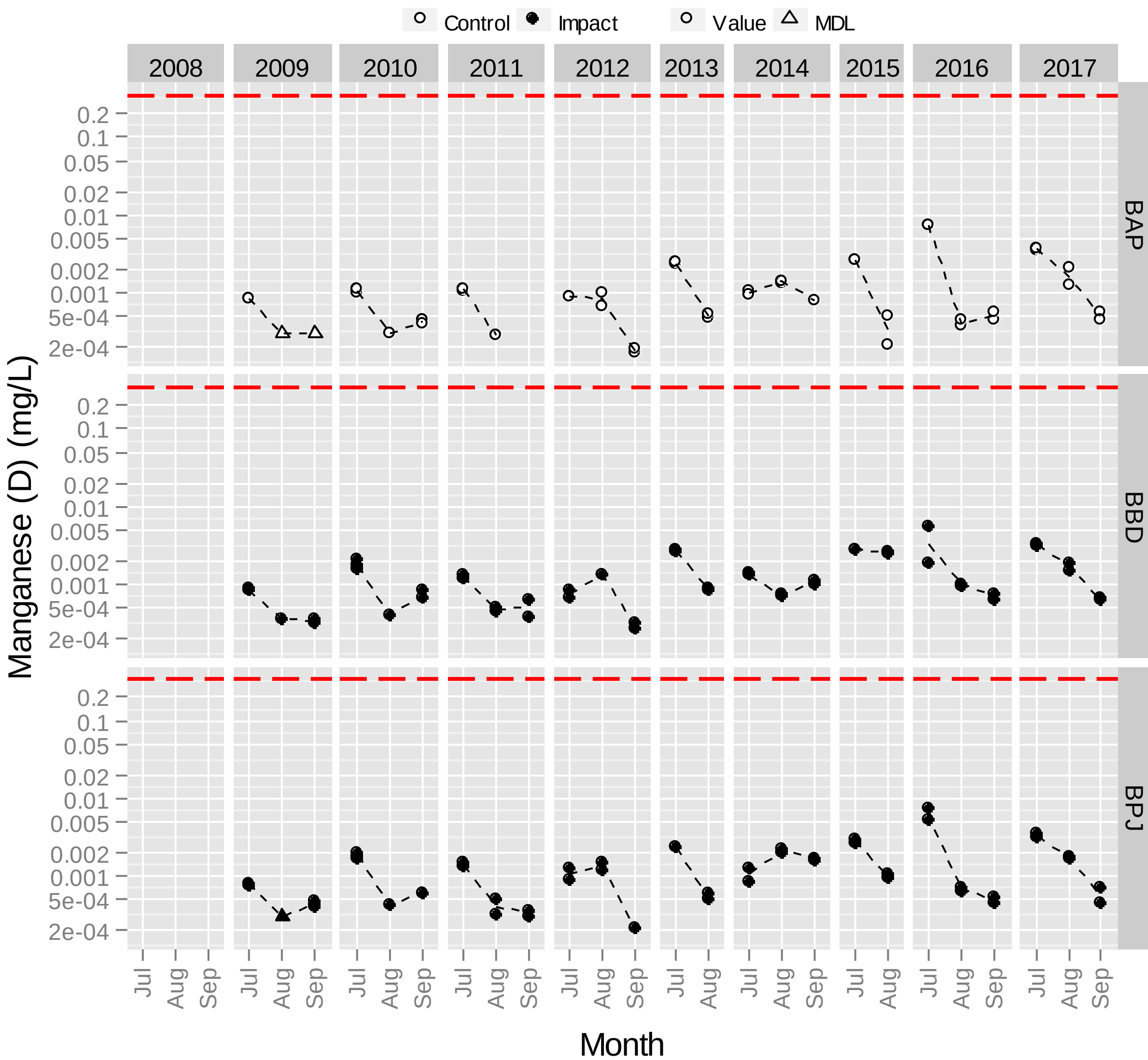


Figure 3.3-47. Dissolved molybdenum (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

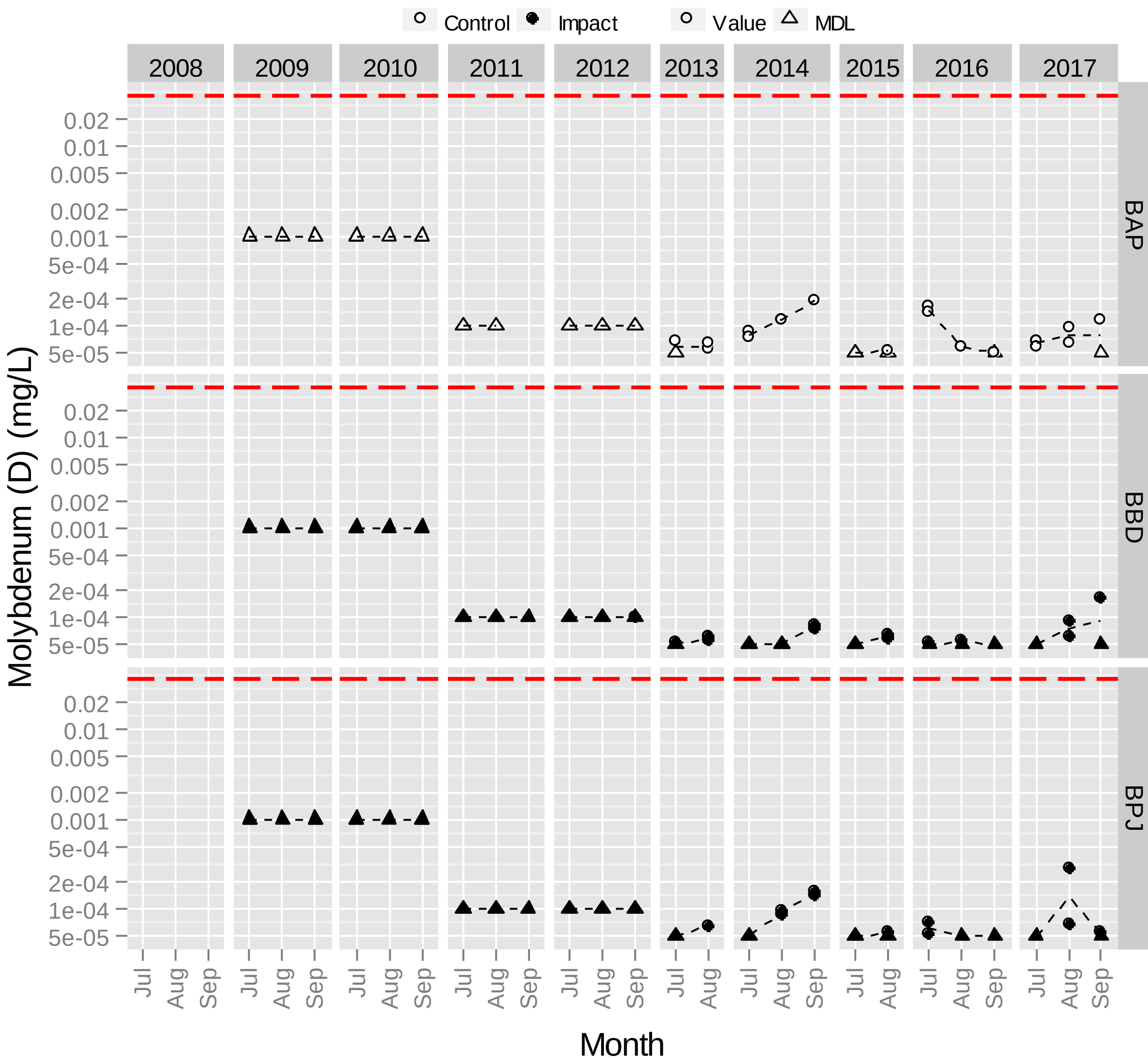


Figure 3.3-48. Dissolved strontium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

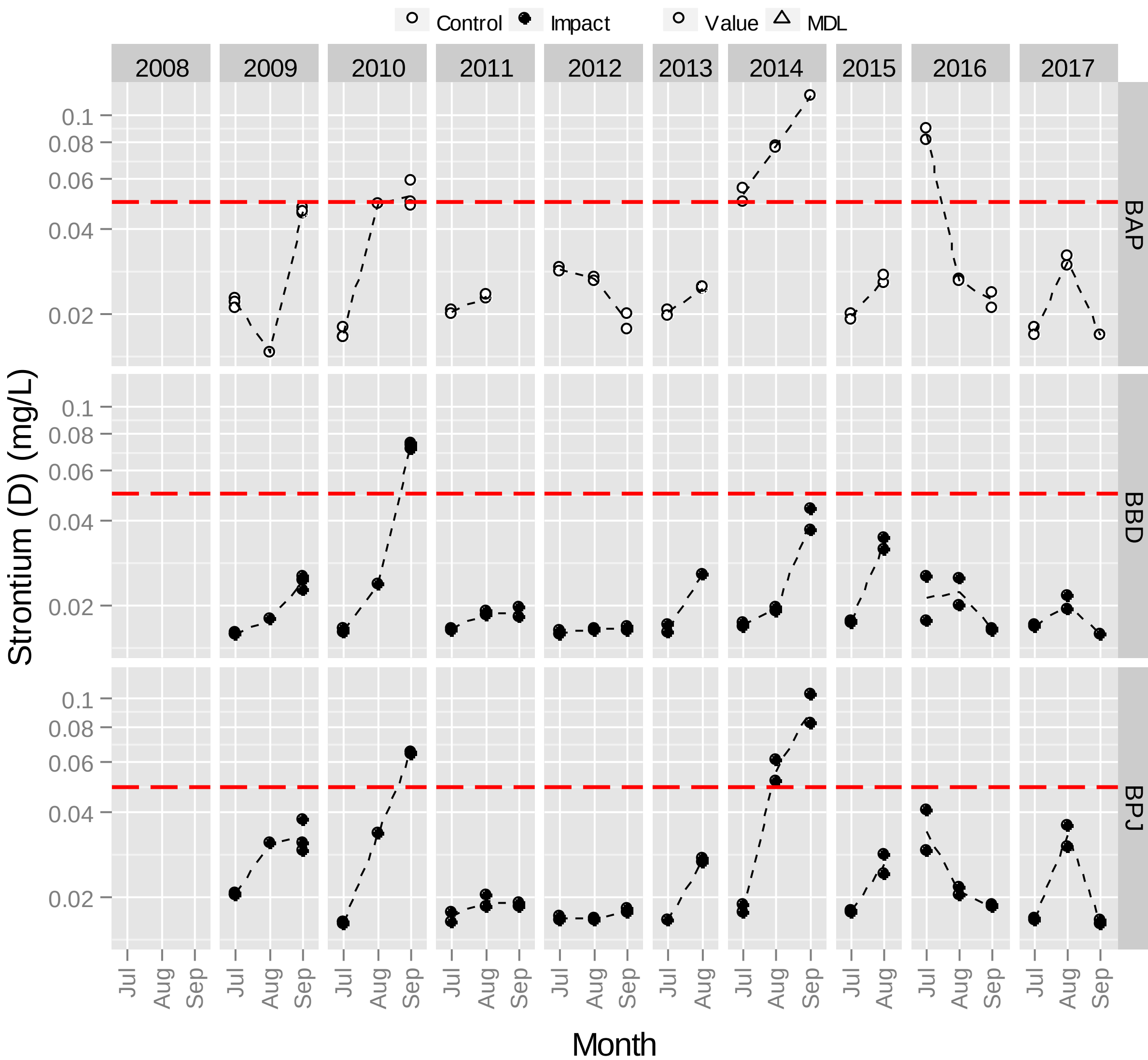
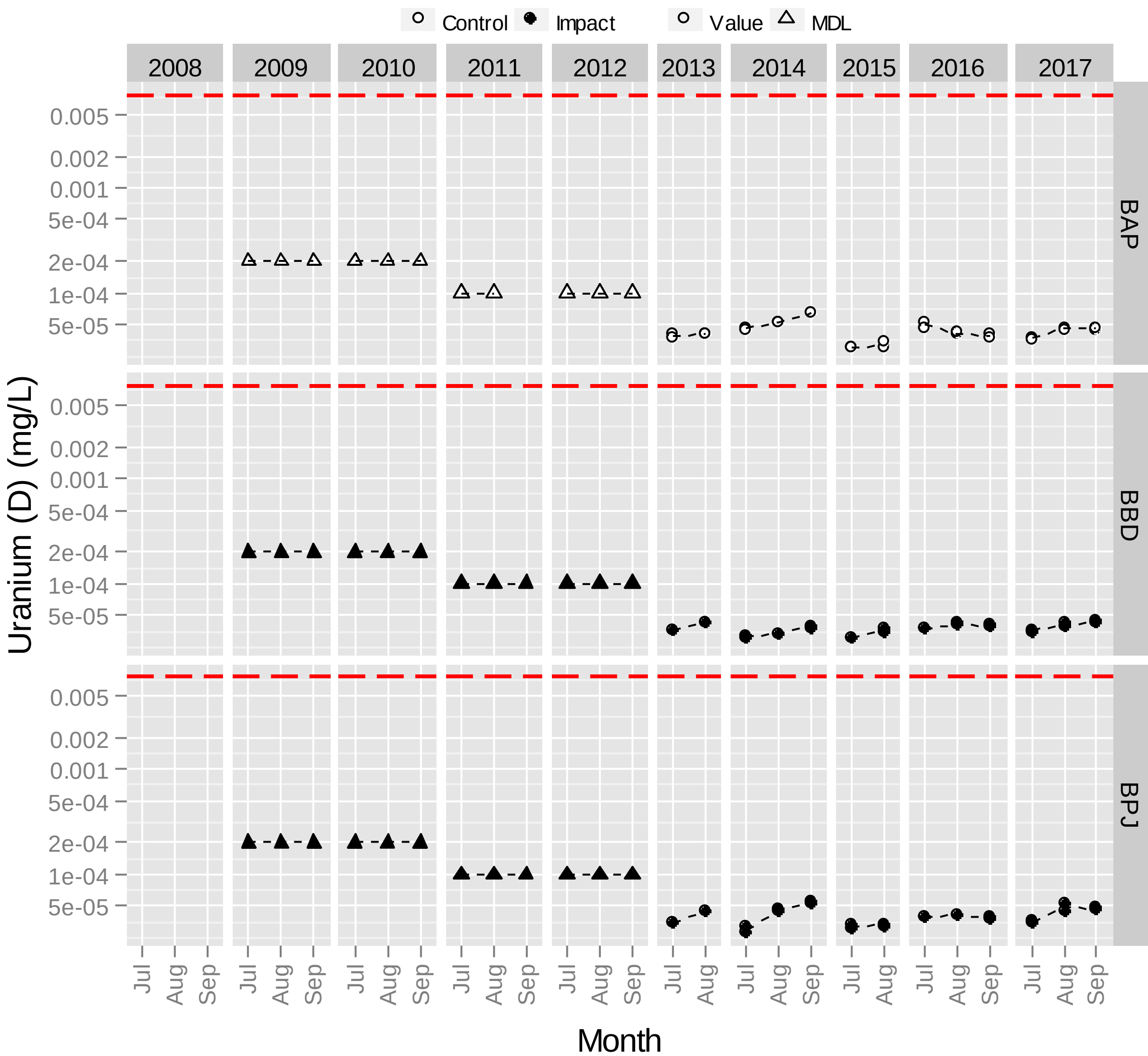


Figure 3.3-49. Dissolved uranium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.



3.3.3. Sediment Chemistry

3.3.3.1. General Observations

Baker Lake has multiple confounding influences that potentially affect water quality (including potential inputs from the Hamlet of Baker Lake's sewage lagoons and landfill, which are situated in a watershed that discharges seasonally into Baker Lake between BBD and BPJ). Shipping-related influence on sediment metals concentrations would be limited to disturbance of bottom sediments from ship propeller wash and possibly from contaminant introductions (e.g., discharges, leaks, or spills); no spills were reported in 2017.

Sediment core chemistry and grab chemistry data were collected from BAP, BES, BPJ, and BBD synoptic with the benthic invertebrate sampling locations. Ten replicate core samples and five replicate grab samples were collect at each area. The sediment sampling areas are depicted in (**Figure 1.3-3**).

3.3.3.2. Temporal and Spatial Trend Interpretation

The 2017 sediment chemistry results are presented in the following tables along with the updated trigger values specific to Baker Lake:

- Core chemistry (metals, TOC): **Table 3.3-3**
- Grab chemistry (metals, particle size, TOC): **Table 3.3-4**
- Grab chemistry (hydrocarbons and PAHs): **Table 3.3-5**
- Results of the BACI analysis for the 2017 core chemistry: **Table 3.3-6**

To help with interpretation of long-term temporal and spatial trends, concentrations of individual metals have been plotted in **Figure 3.3-51** to **Figure 3.3-58**. Metals concentrations are shown by area/basin for the different sampling methods (grab [data points] vs core samples [box and whisker plots]). The red dashed line in each of sediment metals figures is the Baker Lake trigger value. The box and whisker plots illustrate the statistical distribution of core samples within each area. Data interpretation for the box and whisker plots is as follows:

- The horizontal line inside the box represents the median concentration
- The upper and lower margins of the box represent the upper (75^{th}) and lower (25^{th}) percentile concentrations, respectively (the "interquartile" range)
- The vertical lines represent maximum and/or minimum concentrations (provided at least one value falls outside the box but within 1.5 times the interquartile range)
- 'x's that occur beyond the maximum or minimum lines represent concentrations that are greater than 1.5 times the interquartile distance and indicate 'outlier' concentrations that are real, but don't fit within the distribution of the rest of the data, for whatever reason.

Formal BA statistical analysis of changes in sediment chemistry parameters was completed on the 2017 Baker Lake core chemistry results using the same approach described for the Meadowbank project lakes.

Arsenic at BPJ was the only exceedance of a sediment trigger value in the 2017 sediment core data set (**Figure 3.3-52**). As seen in the plot, arsenic concentrations at BPJ have consistently exceeded the trigger since monitoring started in 2008. BA statistical analysis confirmed that arsenic concentrations are not trending higher. As in previous years, concentrations of hydrocarbons and PAH's in the composite sediment samples were below their respective MDL's at the reference and exposure areas (**Table 3.3-5**).

There continues to be no evidence of any barge-related impacts to sediment metals or organics concentrations at impact areas in Baker Lake. The majority of the influence of barge traffic would be disturbance and re-settling of existing sediment particles. Although sediment grain size is inherently different between exposure and reference areas, there was no pattern of change for any metal over time that would suggest metals contamination, such as from loss of anti-fouling paint from the hulls of barges.

Table 3.3–3. Sediment core chemistry, Baker Lake study lakes, 2017.

Lake & Basin	Screening Criteria			Baker Lake - Barge Dock BBD									
Area-Replicate ID	CCME[1]	Baker Laker[2]		SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date	ISQG	Trigger	Threshold	11-Aug-17	11-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17
Physical & Organic Parameters													
Moisture (%)				43.1	36.4	40.6	30.3	47.8	49.7	33.8	33.7	22.2	33.3
pH				6.58	6.93	6.83	6.86	6.69	6.42	6.57	7.02	6.30	6.59
TOC (% dw)				0.644	0.382	0.503	0.334	0.728	0.719	0.4	0.4	0.115	0.307
Total Metals (mg/kg dw)													
Aluminum				8290	5860	7060	5220	8720	8290	6880	5870	4320	5130
Antimony				0.13	0.1	0.37	*<0.10*	0.15	0.13	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Arsenic*	5.9	7.6		6.06	5.83	5.37	4.34	**8.47**	**8.3**	7.57	4.3	4.39	3.4
Barium				97.8	89.1	95.6	59.1	111	106	69	63.6	42.4	51.1
Beryllium				0.35	0.26	0.29	0.22	0.35	0.34	0.29	0.26	0.18	0.22
Bismuth				*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.23	0.23	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron				6.3	*<5.0*	5.2	*<5.0*	6.1	7	5.7	*<5.0*	*<5.0*	*<5.0*
Cadmium	0.6	0.32	0.6	0.073	0.043	0.069	0.035	0.065	0.064	0.038	0.044	*<0.020*	0.036
Calcium				2680	2160	2490	1650	3170	2990	2440	2000	1230	1540
Chromium	37.3	26.8	37.3	18.4	13.5	15.8	11.5	20	18.7	15.3	12.1	6.32	11.2
Cobalt				6.54	4.91	5.97	4.22	7.25	6.23	4.9	4.46	2.99	3.93
Copper	35.7	20.3	35.7	10.7	6.97	8.62	5.92	11.7	9.92	7.29	7.33	3.21	5.74
Iron				15600	12300	14100	11200	18900	17600	13500	11600	9090	10100
Lead	35	19.5	35	9.2	6.53	7.4	4.92	9.57	9.81	6.5	5.64	2.81	4.9
Lithium				11.4	8.4	9.6	7.9	11.8	10.7	9	8.3	7.1	7.70
Magnesium				4830	3560	4200	3450	5060	4640	3960	3620	2870	3380
Manganese				343	371	392	245	444	389	439	298	143	198
Mercury	0.17	0.088	0.17	0.0059	*<0.0050*	0.0067	*<0.0050*	0.0072	0.0073	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Molybdenum				0.66	0.52	0.68	0.45	0.85	0.85	0.89	0.49	0.33	0.36
Nickel				12.9	9.24	11.10	8.3	13.5	12.2	10.2	8.69	5.5	8.53
Phosphorus				762	707	755	557	1040	871	668	554	357	459
Potassium				1430	990	1180	820	1500	1510	1200	960	680	830
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				138	83	104	75	125	118	91	66	*<50*	56
Strontium				44	34.2	37.3	29.6	44.4	47.2	42.3	37.6	27.8	28.4
Thallium				0.074	*<0.050*	0.057	*<0.050*	0.072	0.067	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				383	283	348	219	439	459	381	328	205	230
Uranium				1.85	1.14	1.5	0.979	1.92	1.81	1.31	1.11	0.534	0.96
Vanadium				21.3	15.7	19.4	13.8	23.6	22.2	18.1	14.9	11.1	13.3
Zinc	123	73.1	123	37.3	26.6	31.5	23.7	38.4	35.1	28.1	25.5	16.8	23.3

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.3–3. Sediment core chemistry, Baker Lake study lakes, 2017.

Lake & Basin	**Screening Criteria**			**Baker Lake - Proposed Jetty**									
				BPJ									
Area-Replicate ID	**CCME**[1]	**Baker Laker**[2]		**SC-1**	**SC-2**	**SC-3**	**SC-4**	**SC-5**	**SC-6**	**SC-7**	**SC-8**	**SC-9**	**SC-10**
Date	ISQG	Trigger	Threshold	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17
Physical & Organic Parameters													
Moisture (%)				59.6	55.5	46.8	54.1	40.5	46.2	31	36.4	41.1	44.5
pH				6.79	6.87	6.71	6.33	6.68	6.58	6.84	7.07	6.78	6.6
TOC (% dw)				0.811	0.751	0.598	0.711	0.398	0.613	0.336	0.351	0.307	0.661
Total Metals (mg/kg dw)													
Aluminum				10400	11400	9110	11300	6650	10200	7560	6740	6650	9670
Antimony				0.16	0.16	0.14	0.21	0.11	0.19	0.12	0.12	*<0.10*	0.11
Arsenic*	5.9	7.6		**17.3**	**24.6**	**31.5**	**10.1**	**8.48**	7.0	**8.7**	**10.8**	**12.8**	**42.4**
Barium				182	140	153	106.0	76.2	90.1	69.3	128	115	127
Beryllium				0.47	0.49	0.38	0.48	0.29	0.5	0.36	0.32	0.31	0.44
Bismuth				0.24	0.25	0.22	0.25	*<0.20*	0.27	*<0.20*	*<0.20*	*<0.20*	0.23
Boron				8.7	10	7.7	10.3	5.5	8.5	6.1	6	5.3	8.1
Cadmium	0.6	0.32	0.6	0.11	0.11	0.05	0.078	0.05	0.06	0.035	0.053	0.059	0.057
Calcium				3030	3190	2800	3090	1910	2670	2230	2010	2220	2990
Chromium	37.3	26.8	37.3	24.1	25.6	20.4	24.8	14.9	24.1	17.6	15.4	16.2	21.9
Cobalt				9.35	8.96	9.18	8.79	5.79	7.48	6.13	5.65	6.26	6.98
Copper	35.7	20.3	35.7	10.4	11.2	9.24	11.80	7.1	11.5	7.46	10.5	5.85	8.86
Iron				24300	25600	29000	22100	14600	20000	15100	16000	18200	28500
Lead	35	19.5	35	10.8	11.4	9.18	10.8	6.44	11	7.12	6.54	6.73	9.68
Lithium				13.4	14.4	11.4	14.7	8.9	14.7	11	9.4	9.2	12.70
Magnesium				5640	5940	4840	5950	3800	5800	4250	3790	4010	5270
Manganese				5190	1450	2890	925	864	776	609	1140	3310	1700
Mercury	0.17	0.088	0.17	0.0122	0.012	0.0088	0.008	0.0054	0.0074	*<0.0050*	*<0.0050*	*<0.0050*	0.0075
Molybdenum				2.40	1.68	2.04	2.84	1.12	1.65	1.05	1.5	2	1.45
Nickel				16.5	16.5	13.00	15.9	10.1	15.1	10.8	10.3	11.0	13.3
Phosphorus				1110	1260	1620	888	700	820	741	733	737	1480
Potassium				2020	2230	1730	2420	1290	2070	1480	1370	1210	1800
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				199	221	166	199	135	174	120	114	117	164
Strontium				56.6	63.4	53.1	59.7	41.2	49.5	44.7	45.2	50.4	57.7
Thallium				0.094	0.096	0.069	0.101	0.056	0.097	0.067	0.065	0.064	0.078
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				467	524	405	567	330	383	343	326	394	460
Uranium				2.26	2.34	1.89	2.61	1.46	3.14	1.66	1.96	1.42	2.09
Vanadium				28.6	30.6	25.1	33.3	18.7	31.9	22.8	21.9	22.5	27.6
Zinc	123	73.1	123	47.9	48.9	38.5	46.9	30.1	44.9	31.1	29.6	31.0	40.7

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.3–3. Sediment core chemistry, Baker Lake study lakes, 2017.

Lake & Basin	Screening Criteria			Baker Lake - Akilahaarjuk Point									
				BAP									
Area-Replicate ID	CCME[1]	Baker Laker[2]		SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date	ISQG	Trigger	Threshold	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17
Physical & Organic Parameters													
Moisture (%)				29.6	35.7	31.1	33.9	30	28.1	33.8	29.2	32.8	27.5
pH				5.79	6.96	6.33	6.58	5.8	6.7	6.36	7.08	6.73	7.7
TOC (% dw)				0.205	0.378	0.288	0.314	0.121	0.161	0.348	0.094	0.307	0.151
Total Metals (mg/kg dw)													
Aluminum				4090	4860	4390	5010	4350	3450	4100	3760	4560	3760
Antimony				0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.12
Arsenic*	5.9	7.6		3.14	7.4	3.36	5.29	2.54	2.9	2.78	2.2	3.02	2.84
Barium				315	437	447	593.0	402	423	243	255	273	340
Beryllium				0.28	0.31	0.31	0.3	0.29	0.25	0.27	0.28	0.31	0.25
Bismuth				*<0.20*	0.2	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron				5.3	5.9	5.7	6	5.6	*<5.0*	5.2	5.3	5.3	*<5.0*
Cadmium	0.6	0.32	0.6	*<0.020*	0.028	*<0.020*	0.023	*<0.020*	*<0.020*	0.023	*<0.020*	0.022	*<0.020*
Calcium				1770	2670	2230	2560	2010	2170	1670	1510	1760	1780
Chromium	37.3	26.8	37.3	13.9	14.4	14.3	16.5	14.7	12.5	13.4	13.3	14.8	12.9
Cobalt				3.43	4.20	3.18	3.86	3.56	3.06	3.6	3.23	3.63	3.3
Copper	35.7	20.3	35.7	3.54	5.1	3.82	4.55	3.7	2.92	4.49	3.6	5.08	2.96
Iron				10900	13900	13200	15600	12300	13800	11400	11000	12600	11800
Lead	35	19.5	35	3.31	4.24	4.06	4.51	3.66	3.51	4.1	3.49	4.03	3.16
Lithium				6.8	7.5	6.6	7.1	6.9	5.5	6.9	6.3	7.2	5.90
Magnesium				2770	2980	2630	2910	2800	2200	2750	2550	2960	2450
Manganese				112	369	110	174	106	126	97.8	99.1	172	344
Mercury	0.17	0.088	0.17	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Molybdenum				0.26	0.62	0.26	0.4	0.29	0.38	0.32	0.3	0.36	0.3
Nickel				8.5	8.89	7.79	8.9	8.38	6.68	8.4	7.95	8.8	7.27
Phosphorus				615	775	696	840	632	701	551	456	574	571
Potassium				1030	1140	1080	1220	1100	820	1040	930	1060	900
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				61	91	71	87	67	54	78	58	76	57
Strontium				39.5	45.7	46	48.2	42.9	40.5	36.4	40.4	38.7	40.5
Thallium				0.054	0.055	*<0.050*	0.053	*<0.050*	*<0.050*	0.051	*<0.050*	*<0.050*	*<0.050*
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				257	326	321	397	302	269	242	212	262	273
Uranium				0.958	1.24	1.18	1.28	1.07	0.955	1.18	0.926	1.07	0.859
Vanadium				15.6	19	20	23.3	18.3	20	17.7	16.1	17.6	17.5
Zinc	123	73.1	123	17.3	20.5	17.3	20	17.8	14	18.5	15.4	19.4	14.8

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.3–3. Sediment core chemistry, Baker Lake study lakes, 2017.

Lake & Basin	Screening Criteria			Baker Lake - East Shore									
				BES									
Area-Replicate ID	CCME[1]	Baker Laker[2]		SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10
Date	ISQG	Trigger	Threshold	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17
Physical & Organic Parameters													
Moisture (%)				39.3	31.5	37.7	42.7	37.6	37.1	40.4	50.1	36.2	32.9
pH				6.94	7.15	6.99	7.03	6.99	7.06	7.41	7.16	7.18	7.49
TOC (% dw)				0.378	0.246	0.361	0.428	0.342	0.366	0.384	0.734	0.37	0.277
Total Metals (mg/kg dw)													
Aluminum				6270	5100	6220	6950	5210	5890	7480	8720	5740	4780
Antimony				0.12	0.1	0.12	0.14	0.11	0.12	0.19	0.16	0.13	0.11
Arsenic*	5.9	7.6		3.50	2.69	3.38	4.16	3.63	3.5	4.25	5.3	3.39	2.68
Barium				223	155	197	225.0	176	148	237	248	166	171
Beryllium				0.35	0.28	0.34	0.39	0.3	0.33	0.38	0.47	0.33	0.26
Bismuth				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.22	*<0.20*	*<0.20*
Boron				6.4	5.2	6.2	7.1	*<5.0*	6	7.7	8.6	5.4	*<5.0*
Cadmium	0.6	0.32	0.6	0.041	0.023	0.035	0.04	0.032	0.034	0.051	0.064	0.045	0.026
Calcium				2450	1740	2240	2330	2240	2330	2670	2710	2220	1870
Chromium	37.3	26.8	37.3	18.8	16.6	19	20.8	16.5	16.7	22.9	24.8	18.5	15
Cobalt				4.95	4.04	4.83	5.4	4.36	4.67	5.95	6.84	5.08	3.92
Copper	35.7	20.3	35.7	4.78	4.04	4.93	5.72	4.54	4.72	5.9	8.25	4.8	3.77
Iron				14000	11400	14000	14800	13600	13700	15700	17700	14200	11100
Lead	35	19.5	35	4.86	3.51	4.8	5.33	4.55	4.91	5.72	7.08	4.92	3.73
Lithium				9.4	8.4	9.4	10.3	8.4	9	11.6	13.4	9.7	8.20
Magnesium				3970	3600	4090	4440	3560	3820	4770	5310	3970	3270
Manganese				640	701	475	485	417	363	534	589	492	372
Mercury	0.17	0.088	0.17	*<0.0050*	*<0.0050*	0.0051	0.0057	*<0.0050*	0.0055	0.0053	0.0086	*<0.0050*	*<0.0050*
Molybdenum				0.51	0.46	0.41	0.54	0.41	0.43	0.59	0.68	0.48	0.44
Nickel				11.3	10.2	11.50	12.8	9.98	10.3	14.4	15.3	11.7	9.47
Phosphorus				709	466	643	705	761	718	835	833	779	579
Potassium				1350	1100	1320	1460	1050	1230	1650	1950	1190	1000
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				97	75	102	116	84	98	127	161	97	77
Strontium				42.3	34.1	39.7	44.9	33.8	39.3	49	51.4	36	32.4
Thallium				0.062	*<0.050*	0.058	0.07	0.051	0.053	0.076	0.090	0.061	*<0.050*
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				405	318	381	404	307	380	398	440	289	279
Uranium				1.23	0.888	1.17	1.46	1.1	1.2	1.56	1.83	1.22	0.998
Vanadium				21.4	16.6	21	21.9	19.7	20.4	23.6	26.3	20.7	16.6
Zinc	123	73.1	123	24.5	20.3	25.5	27.6	22.4	23.9	31	36.5	26.2	19.9

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.3–4. Conventional sediment grab chemistry, particle size, and total metals (mg/kg), Baker Lake, 2017.

Lake & Basin	Screening Criteria			Baker Lake																			
				Barge Dock					Proposed Jetty					Akilahaarjuk Point					East Shore				
Area-Replicate ID	CCME[1]	Baker Laker[2]		BBD-1	BBD-2	BBD-3	BBD-4	BBD-5	BPJ-1	BPJ-2	BPJ-3	BPJ-4	BPJ-5	BAP-1	BAP-2	BAP-3	BAP-4	BAP-5	BES-1	BES-2	BES-3	BES-4	BES-5
Date	ISQG	Trigger	Threshold	11-Aug-17	11-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17
Physical & Organic Parameters																							
Moisture (%)				30.9	29.5	38.1	30	28.7	55.7	50.5	48.7	38.4	44.3	35.7	38.4	31.9	44.4	28.7	34.9	40.1	40.6	36	28
pH				6.66	6.8	6.87	6.72	6.67	7.14	6.81	6.61	6.78	6.62	6.98	6.45	6.46	6.24	7.64	7.34	7.21	6.85	7.54	7.44
TOC (% dw)				0.299	0.306	0.383	0.216	0.284	0.793	0.699	0.567	0.411	0.526	0.338	0.465	0.277	0.687	0.063	0.34	0.351	0.468	0.352	0.268
Particle Size																							
% Gravel (>2mm)				*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	2.6	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	*<1.0*	2.8	*<1.0*	*<1.0*	*<1.0*	*<1.0*
% Sand (2.00mm - 0.063mm)				62.1	69.3	31.5	74.0	68.5	21.8	30.4	22.2	32.6	40.8	71.9	66.9	81.1	64.3	90.7	72.2	66.7	68.8	74.5	73.9
% Silt (0.063mm - 4µm)				33.6	27.3	58.6	23.6	27.5	66.2	58.7	64	54.5	50.8	24.9	29	17.2	31.9	8.4	22	29.8	27.1	21.5	23.1
% Clay (<4µm)				4.3	3.4	9.5	2.4	4	12	11	13.8	10.4	8.3	3.2	4.1	1.7	3.7	*<1.0*	3.00	3.5	4.1	3.4	3.1
Total Metals (mg/kg dw)																							
Aluminum				5520	4580	6940	4880	4900	9260	8700	9660	9200	7660	4910	5650	4010	5280	3040	5460	6380	6050	5150	5190
Antimony				*<0.10*	*<0.10*	0.16	*<0.10*	*<0.10*	0.15	0.14	0.15	0.13	0.11	0.14	0.15	0.15	0.17	0.13	0.13	0.15	0.12	0.11	0.12
Arsenic*	5.9	7.6		5.16	6.5	5.1	5.71	4.47	**24.4**	**16.3**	**10.9**	**14.3**	**8.52**	5.05	5.82	3.17	4.09	2.01	3.1	4.08	4.65	3.11	3.03
Barium				58.3	62	70.4	54.7	50.8	166	117	95.1	93.3	95.3	429	396	327	283	230	186	199	161	148	154
Beryllium				0.26	0.21	0.31	0.21	0.23	0.48	0.41	0.47	0.44	0.35	0.32	0.37	0.3	0.35	0.24	0.31	0.35	0.34	0.32	0.32
Bismuth				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.23	0.2	0.31	0.2	*<0.20*	*<0.20*	*<0.20*	*<0.20*	0.33	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Boron				*<5.0*	*<5.0*	5.2	*<5.0*	*<5.0*	8.2	7.8	8.7	7.8	5.9	6.4	7	5.4	7.1	*<5.0*	5.6	6.2	5.7	5	5.5
Cadmium	0.6	0.32	0.6	0.039	0.036	0.044	0.026	0.03	0.104	0.074	0.065	0.064	0.058	0.028	0.031	0.024	0.046	*<0.020*	0.034	0.044	0.036	0.03	0.032
Calcium				1800	1590	2420	1650	1600	2810	2670	2780	2710	2440	2220	2380	1900	2070	1510	2270	2270	2150	2030	2140
Chromium	37.3	26.8	37.3	13.2	11.3	19.2	11.4	11.4	23	21.5	23.8	24.1	19.3	17.4	18.3	14.6	17.1	12.3	18.5	20.8	20.4	17.5	18.7
Cobalt				4.57	4.05	5.7	3.79	3.96	8.89	8.15	7.55	5.98	6.49	4.14	4.26	3.38	4.39	2.93	4.56	5.19	4.89	4.23	4.43
Copper	35.7	20.3	35.7	6.65	5.35	10.2	4.77	5.39	9.96	9.14	11	9.53	8.11	4.76	5.8	4.34	7.2	2.8	4.62	6.48	5.05	4.19	4.98
Iron				11500	11500	15200	10900	10500	25500	22800	20200	19200	17000	13500	14400	12100	14000	10400	13300	13800	13800	12600	12600
Lead	35	19.5	35	5.44	4.6	7.43	4.52	4.59	10.1	9.06	10	8.7	8.13	4.54	5.99	3.91	5.48	3.17	4.6	5.33	5.12	4.38	4.45
Lithium				8.7	7.2	9.8	7.5	7.6	12.4	11.9	13.1	12.5	10.30	8.10	9.20	7	8.90	5.60	8.9	9.4	9.8	8.8	8.8
Magnesium				3520	3030	4040	3150	3140	5100	4760	5230	5030	4390	3140	3530	2710	3460	2260	3750	4120	3880	3390	3480
Manganese				234	268	437	196	231	3690	1940	981	911	2990	223	169	102	130	220	492	877	650	520	344
Mercury	0.17	0.088	0.17	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*	0.0129	0.0088	0.0074	0.0053	0.0093	*<0.0050*	0.0057	*<0.0050*	0.0061	*<0.0050*	0.0059	0.0055	0.0061	*<0.0050*	*<0.0050*
Molybdenum				0.41	0.43	0.54	0.39	0.89	2.65	1.75	1.55	1.33	1.51	0.51	0.47	0.33	0.53	0.27	0.41	0.58	0.54	0.51	0.37
Nickel				8.9	7.66	11.80	7.7	7.79	15.3	13.5	14.6	13.4	12.4	10.3	10.4	8.47	11	7.07	11.3	12.4	12.3	10.6	11.2
Phosphorus				554	560	928	502	551	1120	1060	875	1050	803	692	757	653	661	556	708	644	643	627	682
Potassium				950	770	1350	840	920	1940	1810	2080	1940	1460	1270	1430	1020	1400	730	1160	1380	1350	1160	1210
Selenium				*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*	*<0.20*
Silver				*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	0.11	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*	*<0.10*
Sodium				72	57	99	58	61	173	151	173	144	126	88	146	67	108	*<50*	97	104	101	83	80
Strontium				31.1	24.8	39	30	31	55.5	53.1	54.8	55.9	46.5	45.6	47.3	39.2	43.4	33.5	36.7	40.5	38.2	35.4	37.2
Sulfur				*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*	*<1000*
Thallium				*<0.050*	*<0.050*	0.063	*<0.050*	*<0.050*	0.085	0.077	0.088	0.078	0.062	0.057	0.066	0.054	0.068	*<0.050*	0.05	0.072	0.062	0.058	0.055
Tin				*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*	*<2.0*
Titanium				251	203	344	263	257	448	431	475	448	377	351	375	262	302	178	324	383	345	303	320
Uranium				1.06	0.891	1.59	1.98	1.09	2.21	1.97	2.25	2.01	1.57	1.28	1.49	1.14	1.65	1.03	1.13	1.31	1.22	1.11	1.05
Vanadium				14.8	13.5	20	13.6	13.7	27.3	26	27.6	26.2	22.1	20	22.4	18.1	21.6	15.1	20.6	20.5	20.3	18.9	18.8
Zinc	123	73.1	123	25.6	26.7	31.6	21.5	23	44.7	39.9	42	38.4	35.1	22.8	26.6	18.9	26	14.6	24.8	26.7	26.3	22.7	23.3

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002. ISQG = Interim freshwater Sediment Quality Guideline.
2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.
3. Thresholds are set equal to CCME ISQG guidelines, where available.

"*" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table 3.3–5. Hydrocarbon and PAH results from composite sediment grabs at Baker Lake, 2017.

Lake	CCME (2002) Guidelines[1]	Baker Lake			
Area ID		**BBD**	**BPJ**	**BAP**	**BES**
Date	ISQG	12-Aug-17	11-Aug-17	9-Aug-17	10-Aug-17
Physical Parameters					
Moisture (%)		28.4	47.0	34.0	36.8
Aggregate Organics (mg/kg)					
Mineral Oil and Grease		*<500*	*<500*	*<500*	*<500*
Hydrocarbons (mg/kg)					
EPH10-19		*<200*	*<200*	*<200*	*<200*
EPH19-32		*<200*	*<200*	*<200*	*<200*
LEPH		*<200*	*<200*	*<200*	*<200*
HEPH		*<200*	*<200*	*<200*	*<200*
Polycyclic Aromatic Hydrocarbons (mg/kg)					
Acenaphthene	0.00671	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Acenaphthylene	0.00587	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Anthracene	0.0469	*<0.0040*	*<0.0040*	*<0.0040*	*<0.0040*
Benzo(a)anthracene	0.0317	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(a)pyrene	0.0319	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(b)fluoranthene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(b+j+k)fluoranthene		*<0.015*	*<0.015*	*<0.015*	*<0.015*
Benzo(g,h,i)perylene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
Benzo(k)fluoranthene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
Chrysene	0.0571	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Dibenz(a,h)anthracene	0.00622	*<0.0050*	*<0.0050*	*<0.0050*	*<0.0050*
Fluoranthene	0.111	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Fluorene	0.0212	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Indeno(1,2,3-c,d)pyrene		*<0.010*	*<0.010*	*<0.010*	*<0.010*
2-Methylnaphthalene	0.0202	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Naphthalene	0.0346	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Phenanthrene	0.0419	*<0.010*	*<0.010*	*<0.010*	*<0.010*
Pyrene	0.053	*<0.010*	*<0.010*	*<0.010*	*<0.010*
d10-Acenaphthene (%)		74.5	76.2	78.3	72
d12-Chrysene (%)		85.4	86.8	84	70.3
d8-Naphthalene (%)		74.5	81.6	76.4	72.2
d10-Phenanthrene (%)		82.2	85.7	86.4	71.3
B(a)P Total Potency Equivalent		*<0.020*	*<0.020*	*<0.020*	*<0.020*
IACR (CCME)		*<0.15*	*<0.15*	*<0.15*	*<0.15*

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Table 3.3-6. Results of the before-after statistical analysis of sediment core chemistry data for Baker Lake, 2017.

Baker Lake - Proposed Jetty		
Parameter	Trigger	Mean
Arsenic	7.6	17.4
Cadmium	0.32	
Chromium	26.8	
Copper	20.3	
Lead	19.5	
Mercury	0.088	
Zinc	73.1	

Notes:
Mean concentration (mg/kg dw) of 10 replicate samples.
Blank cells indicate the trigger value was not exceeded in 2017.

Baker Lake - Proposed Jetty									
Parameter	**Test Area**	**n(B)**	**n(A)**	**Estimate**	**SE**	**P-value**[1]	**Proportional change**		
							exp(Est)	**LCI**	**UCI**
Arsenic	BPJ	20	5	0.009	0.378	0.491	1.01	0.46	2.20

Notes:
1. **Bolded** values are p-values < 0.05
Test area in 2017 compared to the before period
n(B) = number of paired months in the "before" period
n(A) = number of paired months in the "after" period (i.e., in 2017)
Estimate = BA model estimate of the 2017 change in mean for log-transformed data
SE = standard error of the estimate
P-value = one-tailed test of the null hypothesis of no change or a decrease in mean concentration
Exp(Est.) = estimated proportional change
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 3.3-50. Sediment grain size composition in sediment samples from Baker Lake since 2008.

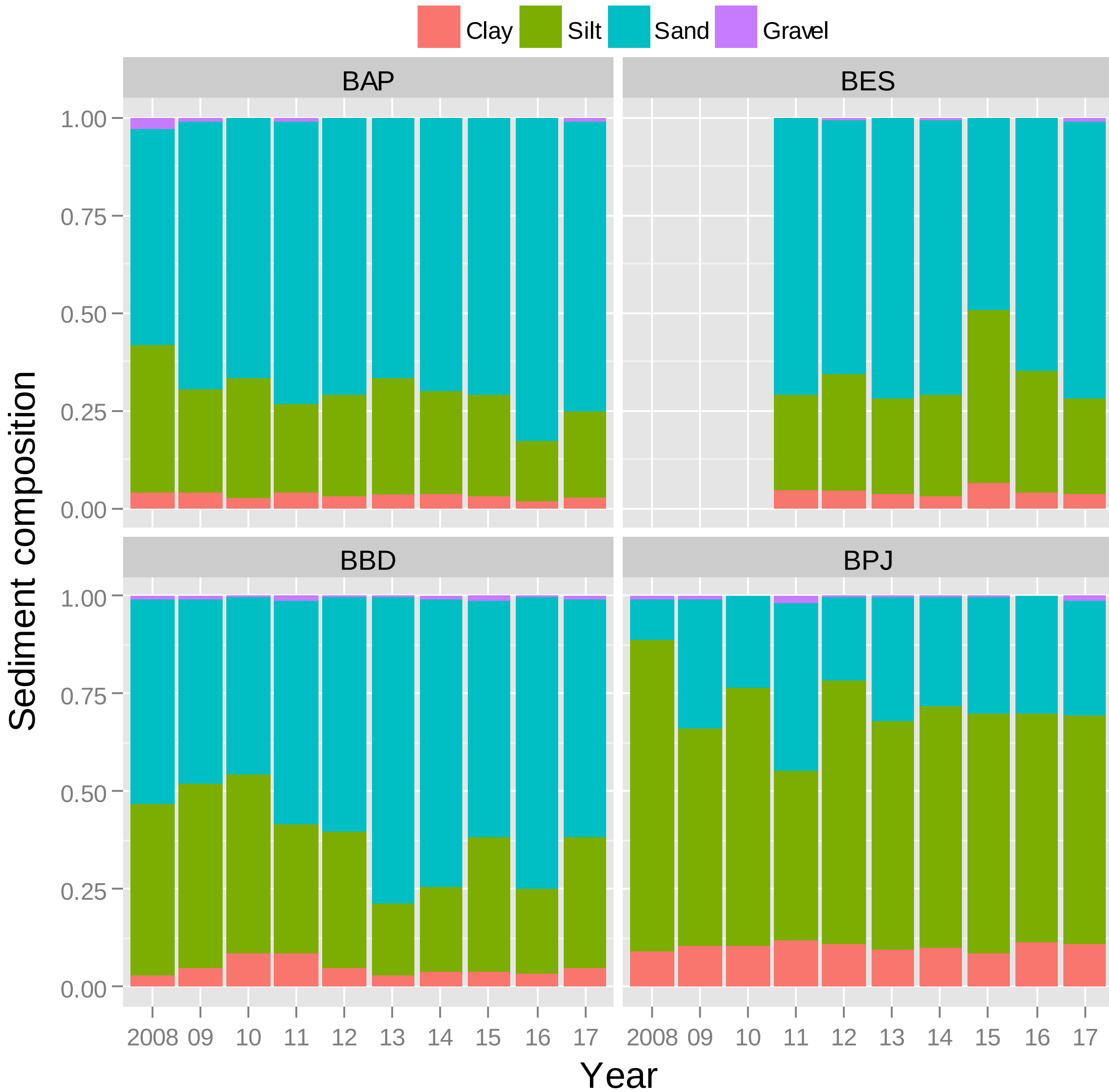


Figure 3.3-51. Total Aluminum (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker.

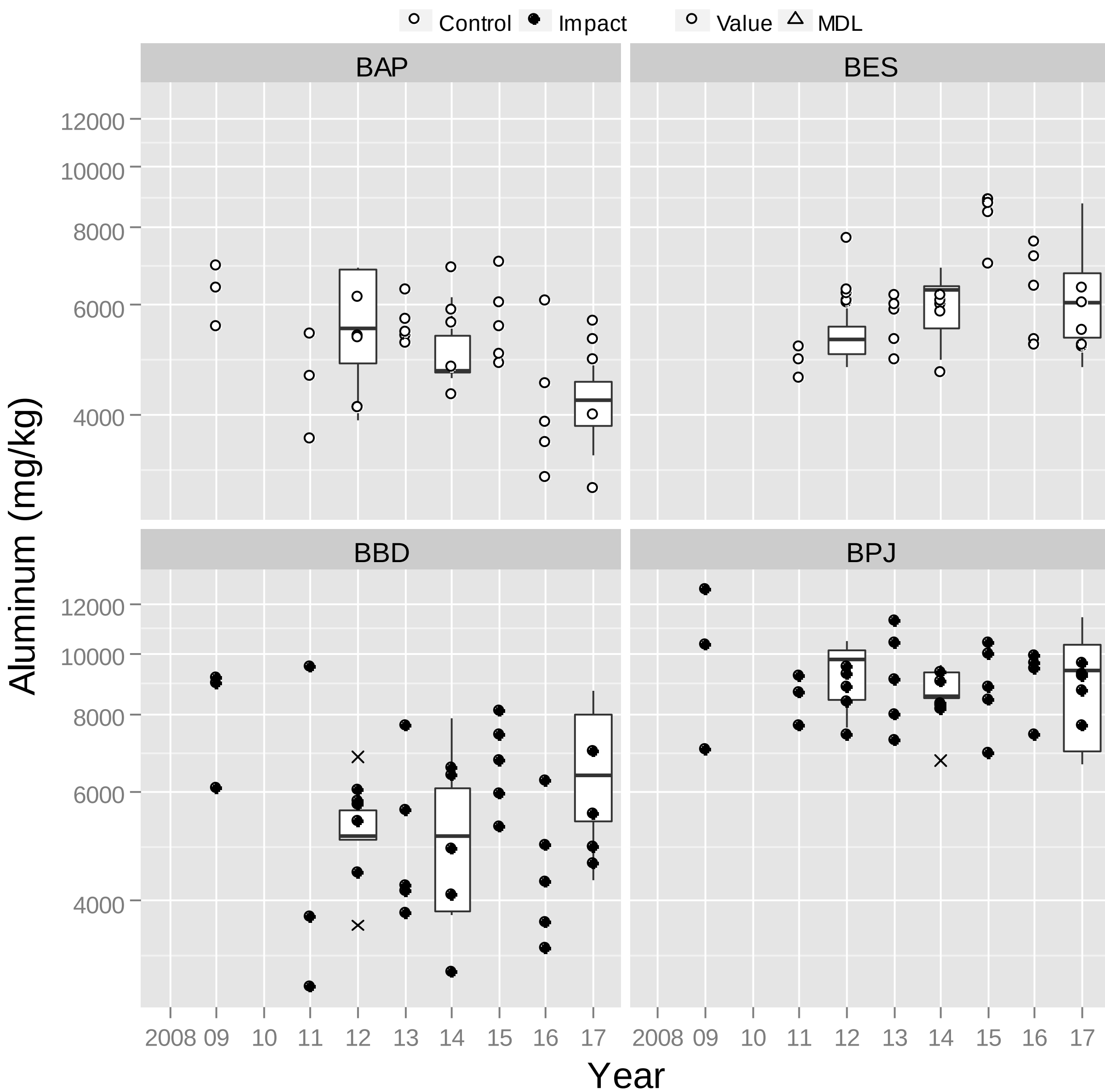


Figure 3.3-52. Total Arsenic (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.

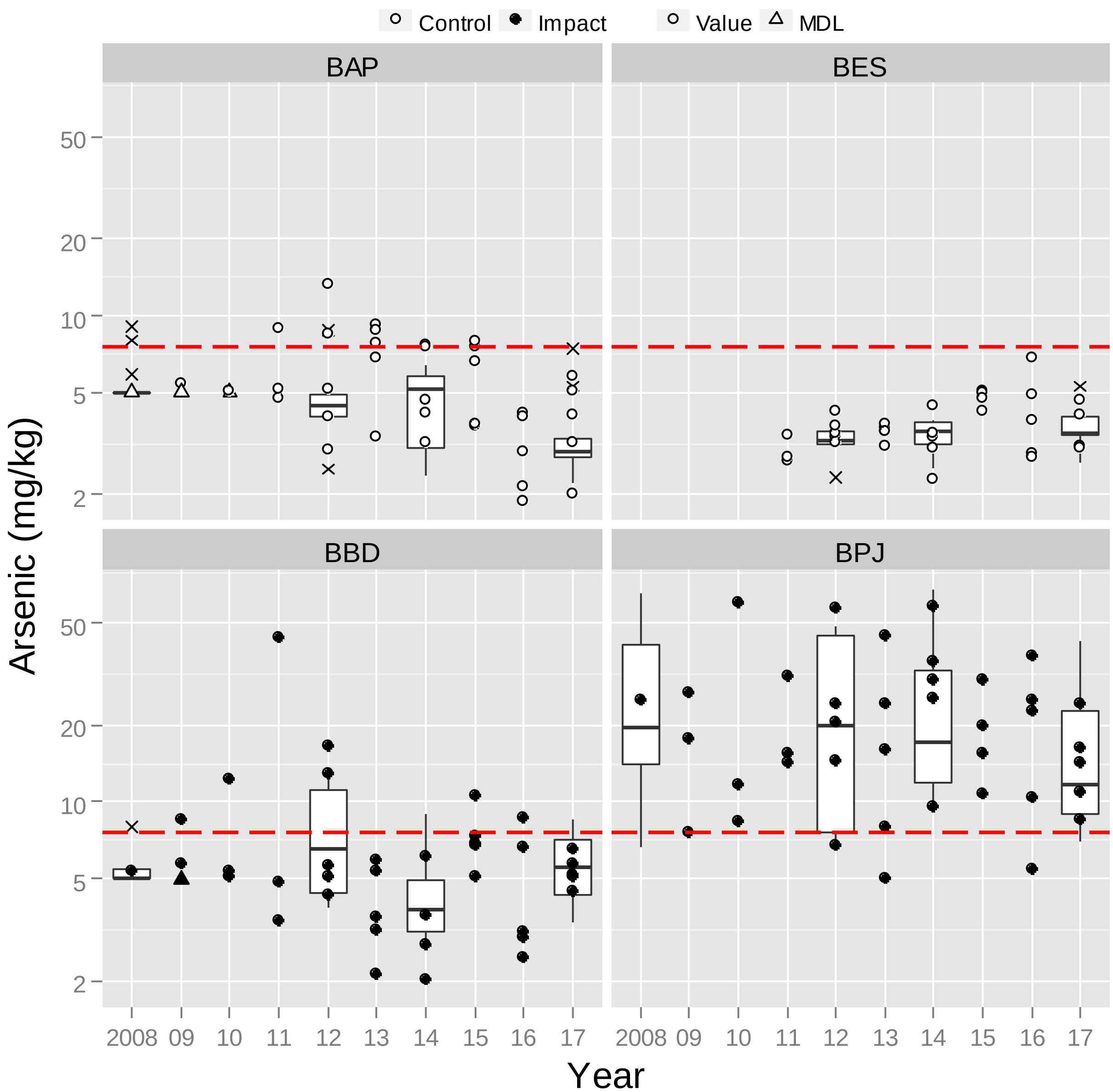


Figure 3.3-53. Total Cadmium (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.

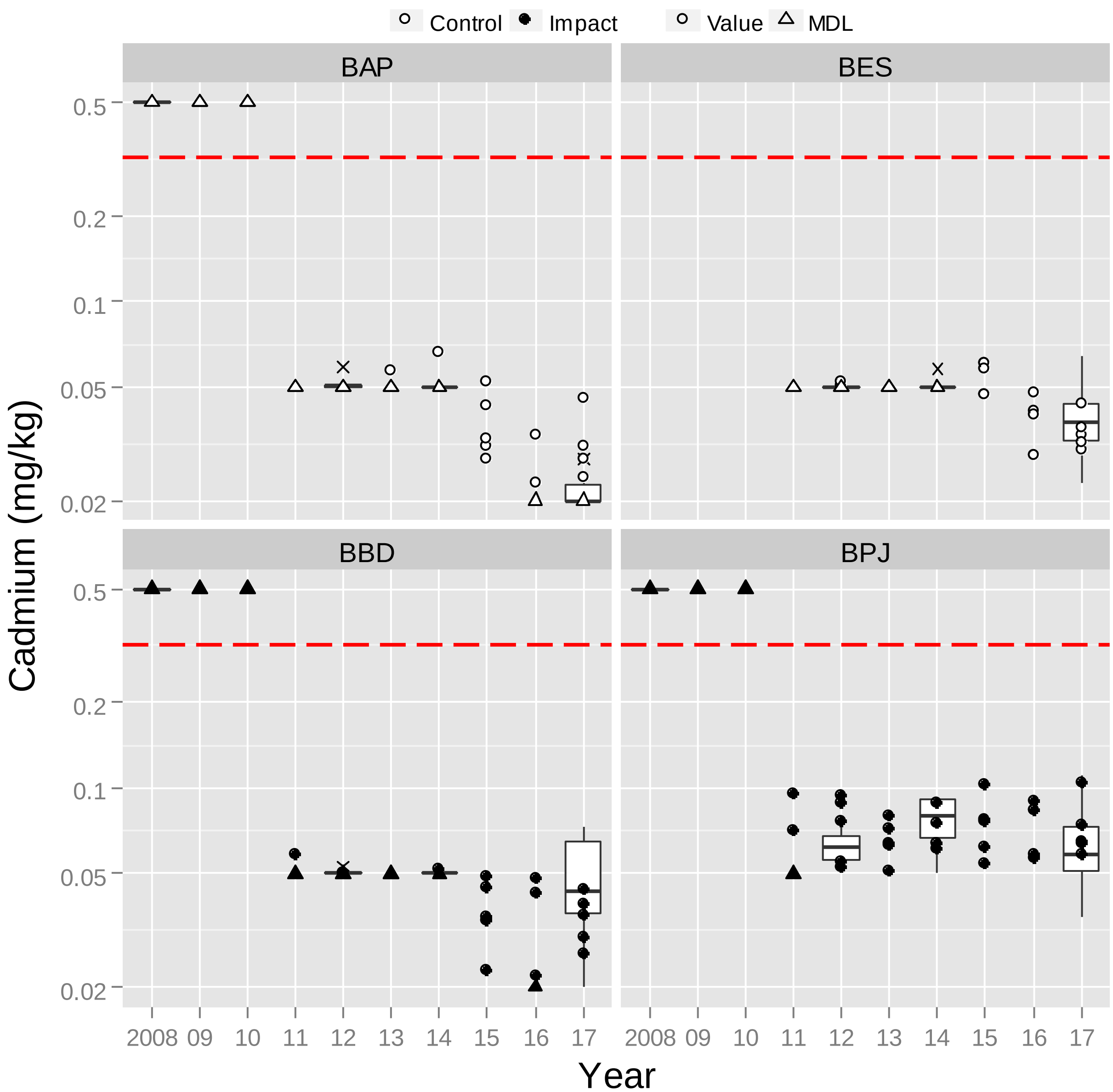


Figure 3.3-54. Total Chromium (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.

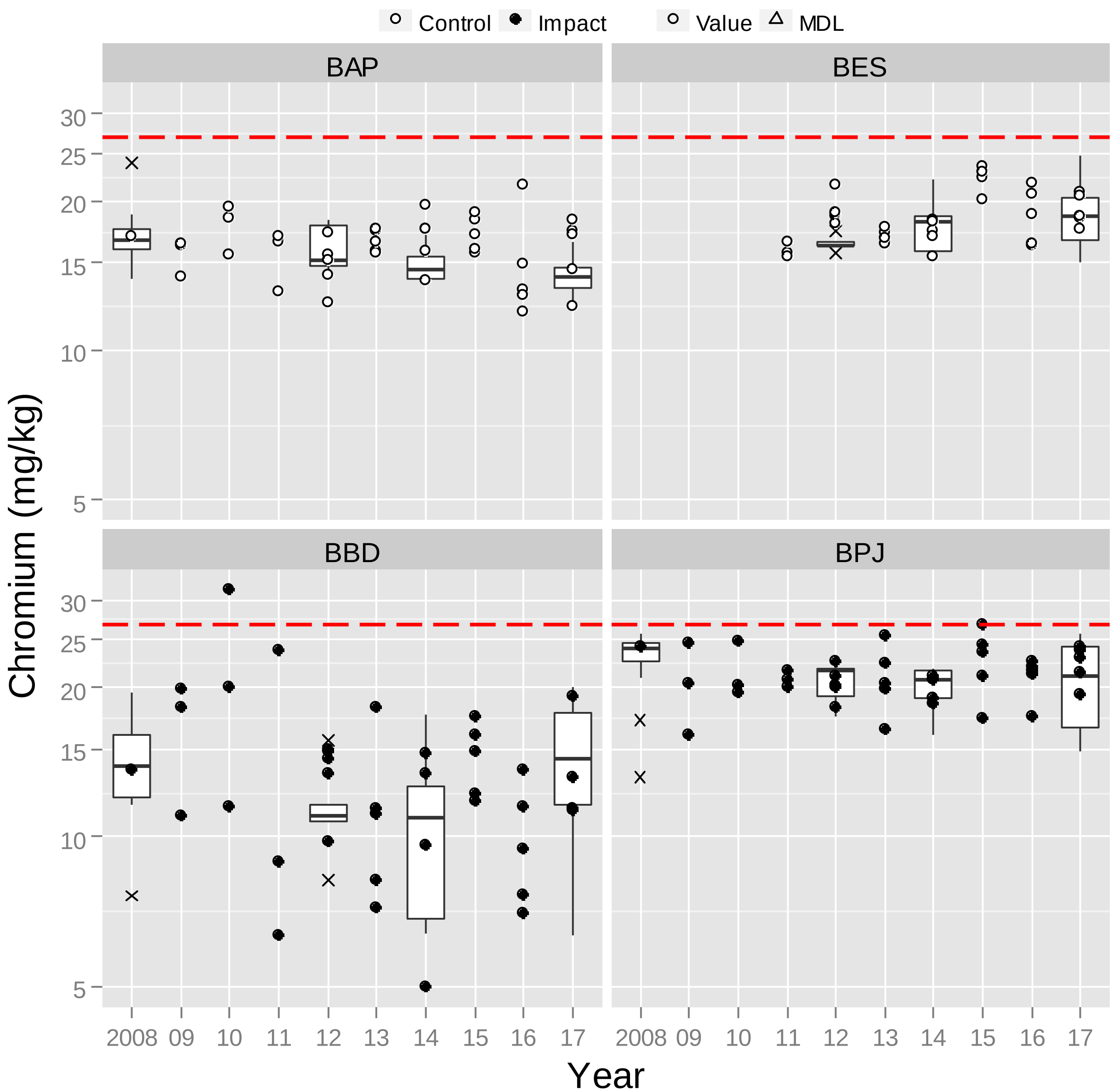


Figure 3.3-55. Total Copper (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.

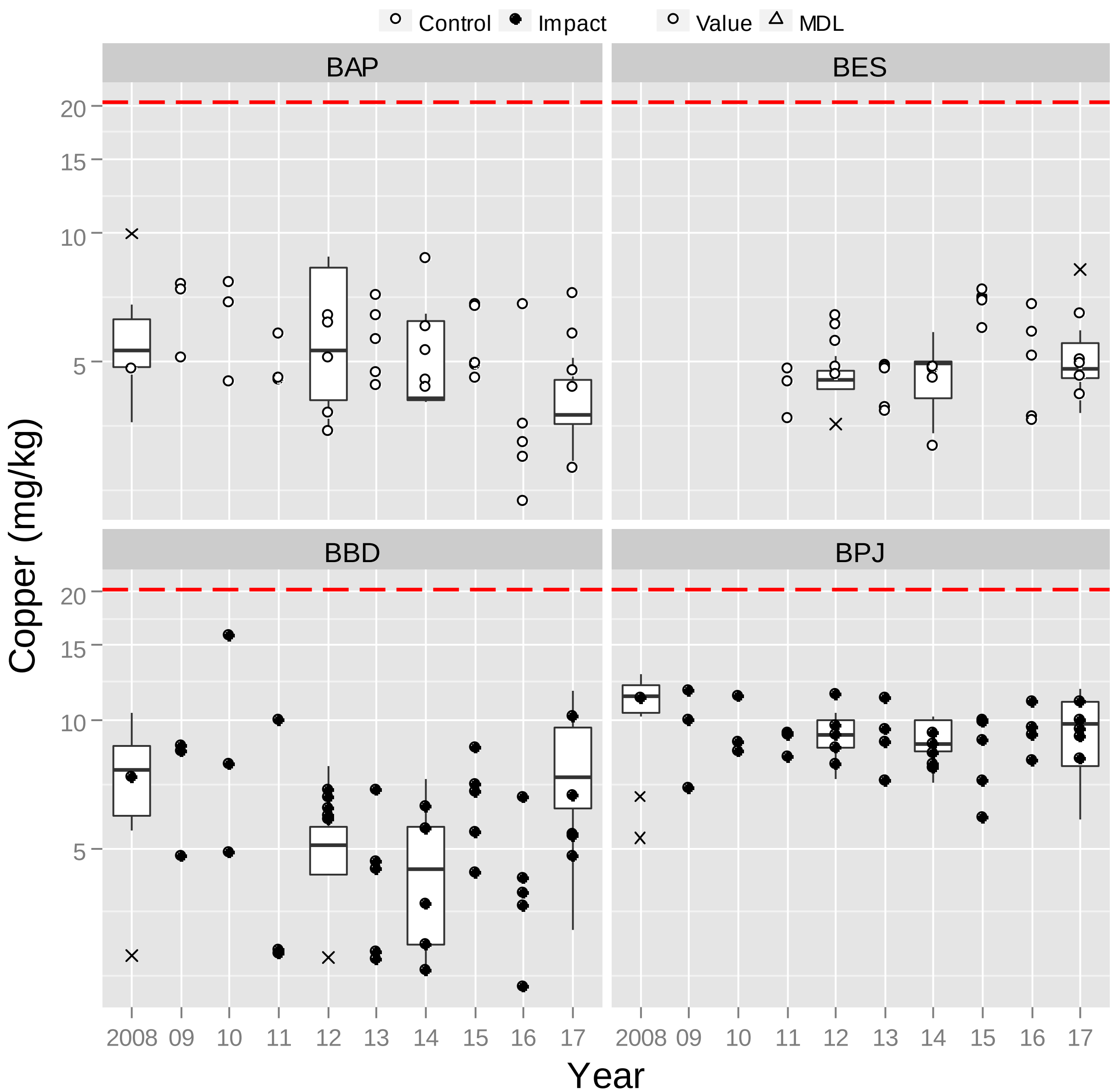


Figure 3.3-56. Total Lead (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.

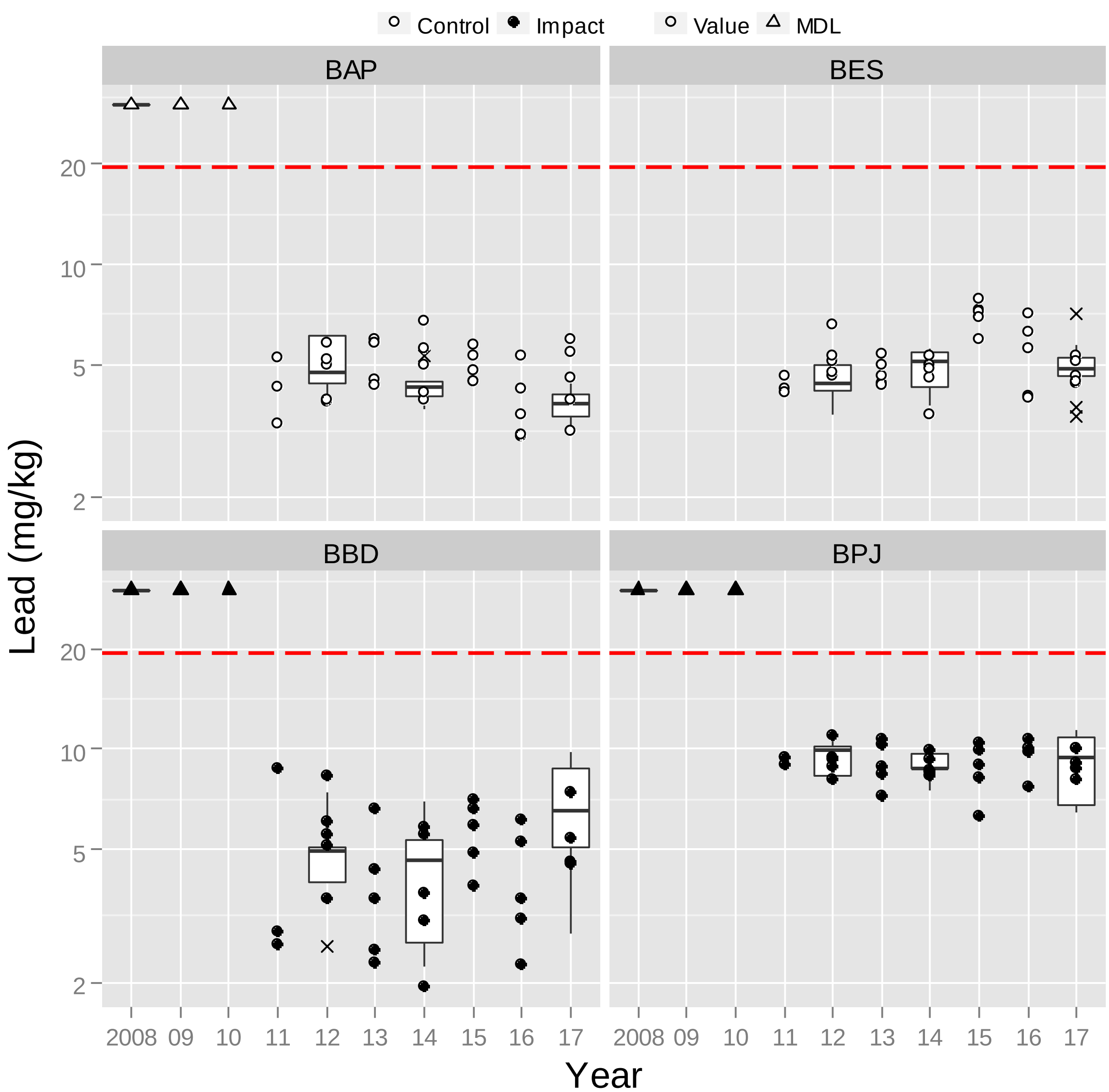


Figure 3.3-57. Total Mercury (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.

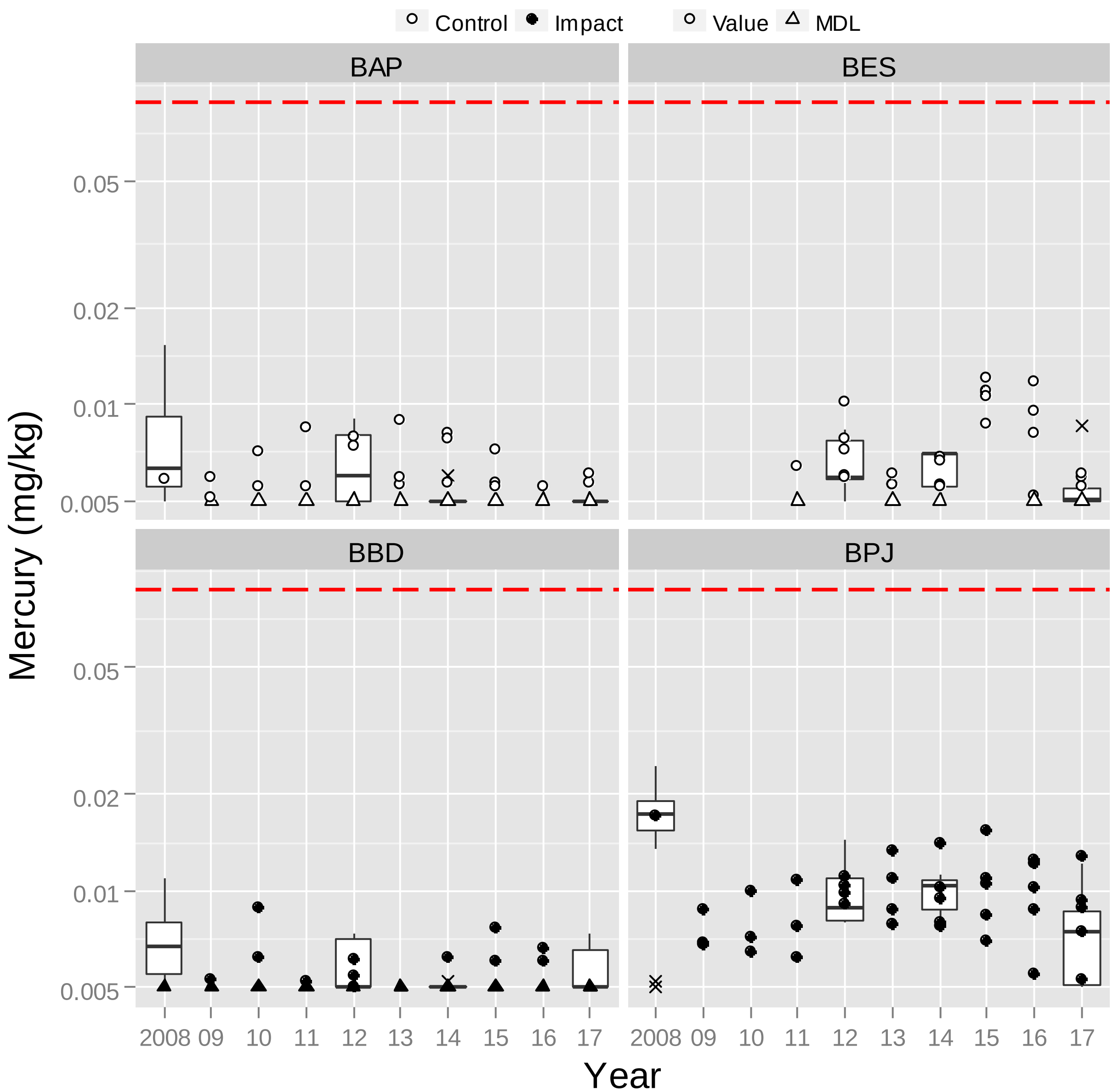
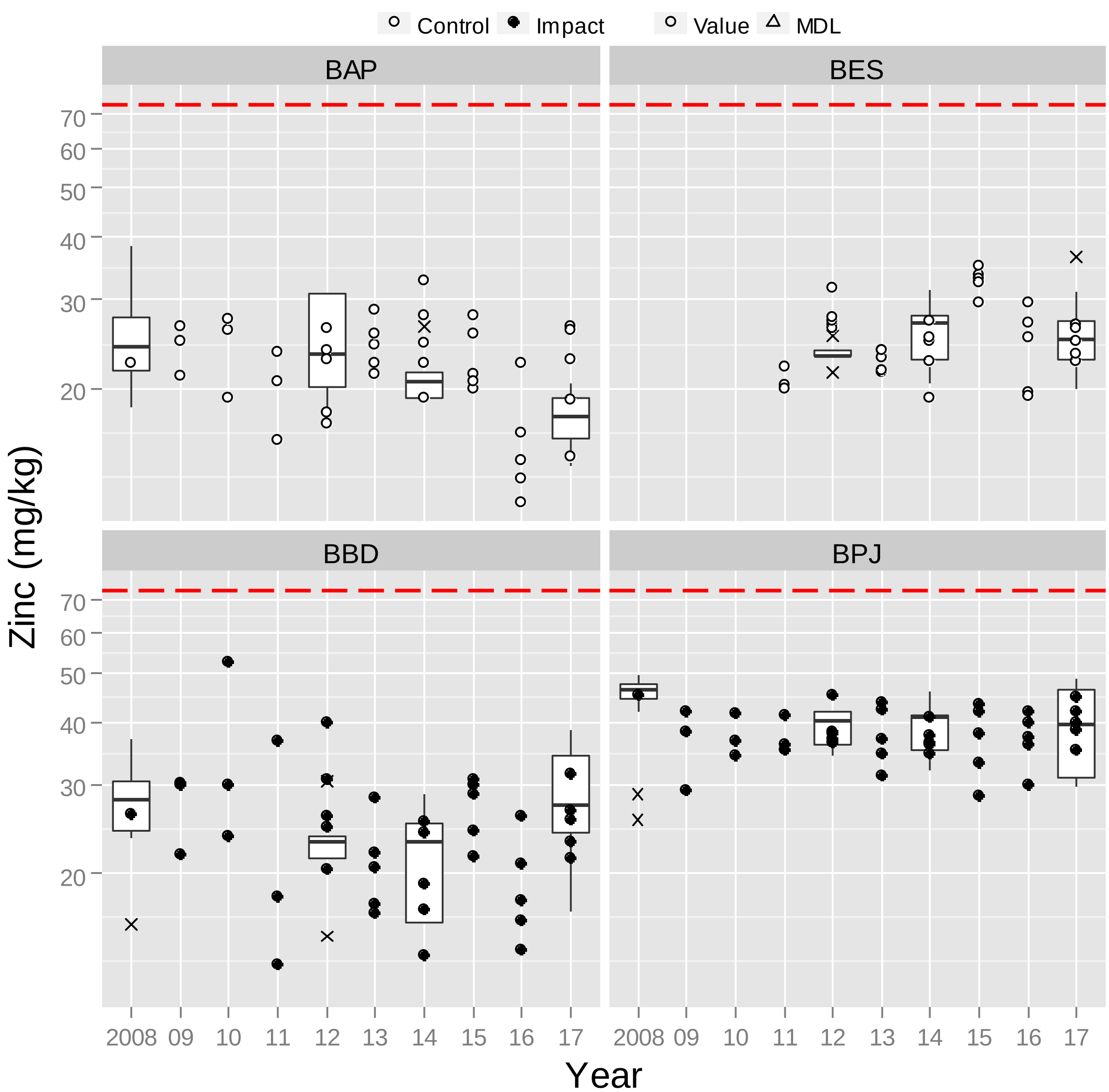


Figure 3.3-58. Total Zinc (mg/kg) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: The red dashed line represents the trigger values. Grab samples = dots; Core samples = box and whisker.



3.3.4. Phytoplankton

3.3.4.1. General Observations

The phytoplankton community of Baker Lake is relatively similar to the Meadowbank Lakes despite some seasonal differences in water quality due to the competing influences of less saline water from the Thelon River and more saline water from the deeper portion of Baker Lake (see **Section 3.3.1**). Taxonomic composition and biomass in Baker Lake were similar to the Meadowbank study lakes, with chrysophytes (e.g., *Chrysococcus*, *Kephyrion*, *Dinobryon*) comprising the dominant taxonomic group since monitoring began in 2008. Cryptophytes and diatoms typically comprise the second and third most abundant groups in Baker Lake as shown in **Figure 3.3-61**. Mean summer phytoplankton biomass in Baker Lake is generally similar to the Meadowbank lakes, reaching a maximum of between 200 to 300 mg/m^3.

3.3.4.2. Temporal and Spatial Trend Interpretation

No winter/spring sampling has been conducted at Baker Lake areas so interpretations are limited to summer open water period (which coincides with barge activity). Because of the large size of Baker Lake, it is unlikely that barge traffic (in the absence of a fuel or chemical spill) could influence whole-lake phytoplankton community.

The 2017 density and biomass results for phytoplankton are provided in **Table 3.3-7**. The results for the BACI model statistical tests of the 2017 results against baseline/reference conditions are provided in **Table 3.3-8**. No trigger (20%) effect sizes were exceeded for total biomass or species richness at Baker stations BBD and BPJ.

Major findings at Baker Lake areas for chlorophyll-a, biomass, species richness and major taxa group composition are as follows:

- *Chlorophyll-a* – Concentrations at reference area BAP historically range between 0.4 to 1 µg/L (**Figure 3.3-59**). In 2017, maximum chlorophyll-a concentrations, up to 1.23 µg/L, were measured in September. Overall, range and pattern of chlorophyll-a concentrations in 2017 for three Baker Lake areas were similar relative to previous years.
- *Total biomass* – Phytoplankton biomass was broadly lower at BAP, BPJ, and BBD in 2017 relative to previous years. Importantly, annual variation in biomass co-vary between the control and impact stations (**Figure 3.3-60**). Seasonally (i.e., monthly) there is greater variability between stations. Lower biomass was particularly evident at BAP in 2017, with values ranging between 120 and 160 mg/m^3, compared to the typical range of between 150 and 300 mg/m^3 for this location (**Figure 3.3-60**). Perceived lower biomass is likely related, at least in part, to the early timing of the sampling event in August and cooler conditions in Baker Lake in general (see **Section 3.3.1.2**). The important aspect of this assessment is the direction of change in biomass (lower) was observed at all three locations in 2017. There was a non-statistically significant 30% increase in phytoplankton biomass at BBD relative to BAP (p=0.228); this result is likely due in part to the lower biomass in 2017 at reference BAP, combined with natural variability. Overall, phytoplankton biomass in Baker Lake continues to show consistent patterns of seasonal change, with absolute biomass estimates at the exposure areas remaining within the range of previously-reported values.
- *Major taxa composition* – there were no apparent differences in relative composition of phytoplankton communities between BAP and impact areas BBD and BPJ in 2017 (**Figure 3.3-62**). Chrysophytes are the dominant taxa in terms of biomass at the reference and exposure areas, making up ~40 to 50% of the total phytoplankton biomass in each area. Diatoms, and

cryptophytes make up about 20 to 25% each, and the remainder of the biomass is made up of chlorophytes and dinoflagellates (**Table 3.3-7**).

- *Species richness* – Taxa richness, like biomass, was within the range previously noted for the exposure and reference areas (**Figure 3.3-63**). Seasonal trends of lower richness in July relative to August and September were again observed in the 2017 monitoring cycle. There appears to be a potential slight downwards shift in species richness in Baker Lake (**Figure 3.3-63**), suggesting a possible regional trend developing. As was discussed for total biomass, the most important observation is the pattern of change among stations over time. Richness was slightly lower at all areas in 2017, but there were no statistically significant changes between the control station (BAP) and impact stations (BPJ and BBD).

Phytoplankton biomass will continue to be monitored for potential temporal trends, but no follow-up measures are recommended other than routine monitoring for 2018.

Table 3.3–7. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2017.

Area-Replicate	Date	Phytoplankton Biomass (mg/m^3)								Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**		
Baker Akilahaarjuk Point											
BAP-49	6-Jul-17	0	3.8	0	60	35.50	14	7.35	122	32	0.78
BAP-50	6-Jul-17	0	1.7	0	42	24.61	56	17.18	141	26	0.78
BAP-51	9-Aug-17	0	6.1	0	75	24.66	9	7.29	122	37	0.86
BAP-52	9-Aug-17	0	9.4	0	78	22.89	10	2.78	123	36	0.76
BAP-53	30-Sep-17	0	9.7	0	58	47.48	43	1.81	161	33	0.82
BAP-54	30-Sep-17	0	3.3	0	42	42.06	42	5.64	135	33	0.87
Percent Density or Biomass		***<0.1***	***4.2***	***<0.1***	***44***	***25***	***22***	***5.2***			
Baker Barge Dock											
BBD-49	6-Jul-17	0	2.3	0	75	25.55	56.0	17.83	177	31	0.71
BBD-50	6-Jul-17	0	2.2	0	70	43.62	44	29.97	190	29	0.78
BBD-51	10-Aug-17	0	8.8	0	98	59.90	19	10.45	196	38	0.85
BBD-52	10-Aug-17	0	5.4	0.0	111	58.53	15	10.80	201	37	0.83
BBD-53	30-Sep-17	0	9.0	0	41	41.83	41	2.07	135	30	0.78
BBD-54	30-Sep-17	0	5	0	40	48.66	56	7.87	157	30	0.79
Percent Density or Biomass		***<0.1***	***3.1***	***<0.1***	***41***	***26***	***22***	***7.5***			
Baker Proposed Jetty											
BPJ-49	6-Jul-17	0	6.0	0	88	37.71	43	14.68	190	32	0.71
BPJ-50	6-Jul-17	0	4.3	0	85	20.45	35	12.41	157	31	0.81
BPJ-51	9-Aug-17	0	5.6	0	47	31.93	16	6.07	107	36	0.82
BPJ-52	9-Aug-17	0	6.4	0	56	33.89	17	0.82	114	38	0.84
BPJ-53	30-Sep-17	0	5.4	0	58	17.05	21	0.43	101	27	0.72
BPJ-54	30-Sep-17	2	6.1	0	81	51.41	48	0.43	189	29	0.76
Percent Density or Biomass		***0.24***	***3.9***	***<0.1***	***48***	***22***	***21***	***4.1***			
All 2017 Locations Relative Density or Biomass (%)		***<0.1***	***3.7***	***<0.1***	***44***	***25***	***22***	***5.7***			

Table 3.3–7. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Baker Lake, 2017.

Area-Replicate	Date	Phytoplankton Density (cells/L)							
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	**TOTAL**
Baker Akilahaarjuk Point									
BAP-49	6-Jul-17	0	100,776	200	1,221,880	121,360	101,576	1,200	1,546,992
BAP-50	6-Jul-17	200	35,920	0	1,049,064	101,792	376,568	2,800	1,566,344
BAP-51	9-Aug-17	28,736	510,264	0	627,808	260,672	65,056	1,400	1,493,936
BAP-52	9-Aug-17	0	1,171,992	0	834,544	268,256	73,040	1,400	2,349,232
BAP-53	30-Sep-17	0	123,728	0	963,056	97,720	313,312	200	1,498,016
BAP-54	30-Sep-17	0	114,944	0	589,488	116,856	279,792	800	1,101,880
Percent Density or Biomass		***0.30***	***22***	***<0.1***	***55***	***10***	***13***	***<0.1***	
Baker Barge Dock									
BBD-49	6-Jul-17	200	35,920	0	1,107,536	78,240	349,232	2,800	1,573,928
BBD-50	6-Jul-17	0	35,920	0	1,279,552	135,128	270,408	4,800	1,725,808
BBD-51	10-Aug-17	0	862,080	0	831,960	302,256	116,944	1,000	2,114,240
BBD-52	10-Aug-17	0	668,512	0	815,208	254,616	88,208	1,000	1,827,544
BBD-53	30-Sep-17	0	208,936	0	962,856	147,360	228,304	400	1,547,856
BBD-54	30-Sep-17	0	122,528	0	1,063,832	116,888	292,376	1,200	1,596,824
Percent Density or Biomass		***<0.1***	***19***	***<0.1***	***58***	***10.0***	***13***	***0.11***	
Baker Proposed Jetty									
BPJ-49	6-Jul-17	200	86,208	0	1,523,808	86,840	324,480	9,184	2,030,720
BPJ-50	6-Jul-17	0	100,576	0	1,379,928	61,688	266,808	1,400	1,810,400
BPJ-51	9-Aug-17	0	690,264	0	598,272	173,864	129,512	1,200	1,593,112
BPJ-52	9-Aug-17	0	396,120	0	641,176	166,312	136,896	600	1,341,104
BPJ-53	30-Sep-17	0	150,864	0	833,544	63,736	111,560	200	1,159,904
BPJ-54	30-Sep-17	200	129,312	0	1,106,736	130,424	292,560	200	1,659,432
Percent Density or Biomass		***<0.1***	***16***	***<0.1***	***63***	***7.1***	***13***	***0.13***	
All 2017 Locations Relative Density or Biomass (%)		***<0.1***	***19***	***<0.1***	***59***	***9.1***	***13***	***0.11***	

Table 3.3–8. Results of the BACI tests for phytoplankton variables at Baker Lake areas.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total biomass	BBD	24	3	0.26	0.21	0.23	30	-16	101
	BPJ	24	3	0.02	0.18	0.91	2	-29	46
Species	BBD	24	3	-0.04	0.05	0.44	-4	-13	6
	BPJ	24	3	-0.07	0.05	0.19	-6	-15	4

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate positive (increases) or negative (reduced) effect sizes of 20% or more

Test area = area compared to control (BAP)

n(B) = number of months in the "before" period

n(A) = number of months in the "after" period (i.e., in 2017)

Estimate = BACI model estimate of the 2017 change in mean for log-transformed data

SE = standard error of the estimate

P-value = two-tailed test of the null hypothesis of no change

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 3.3-59. Chlorophyll-a (µg/L) in water samples from Baker Lake since 2008.

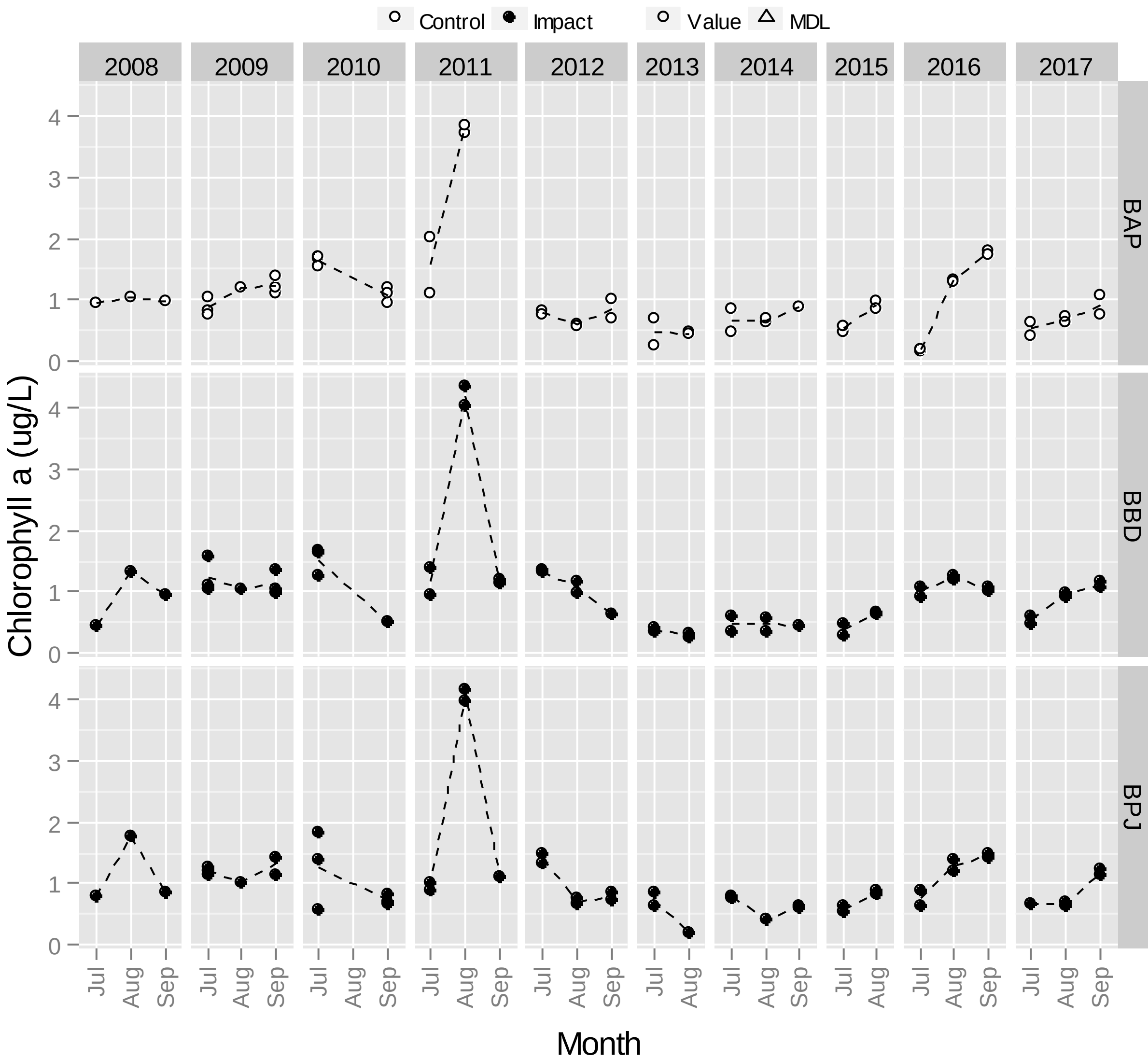


Figure 3.3-60. Total phytoplankton biomass (mg/m^3) from Baker Lake since 2008.

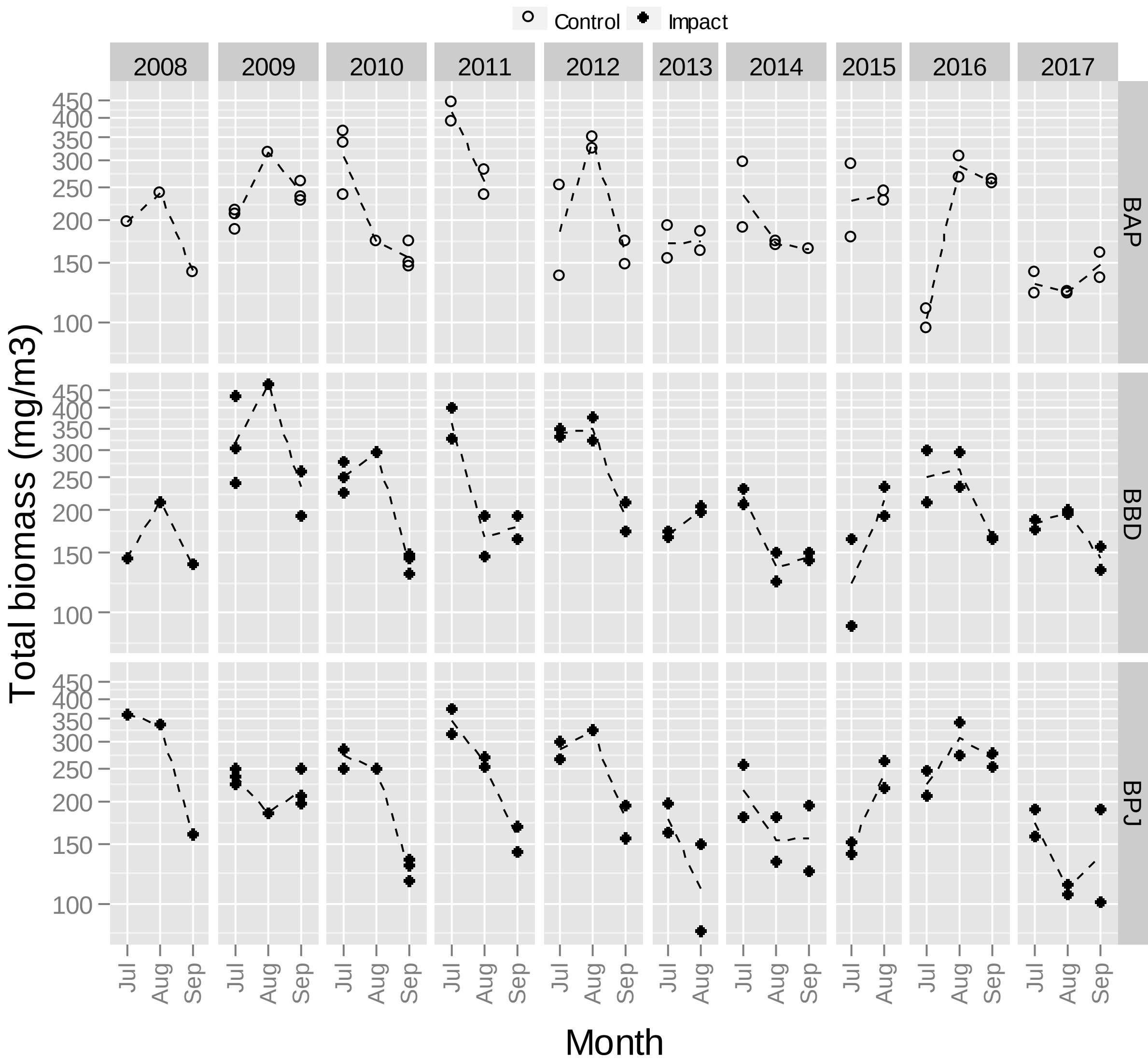


Figure 3.3-61. Phytoplankton biomass (mg/m^3) by major taxa group from Baker Lake since 2008.

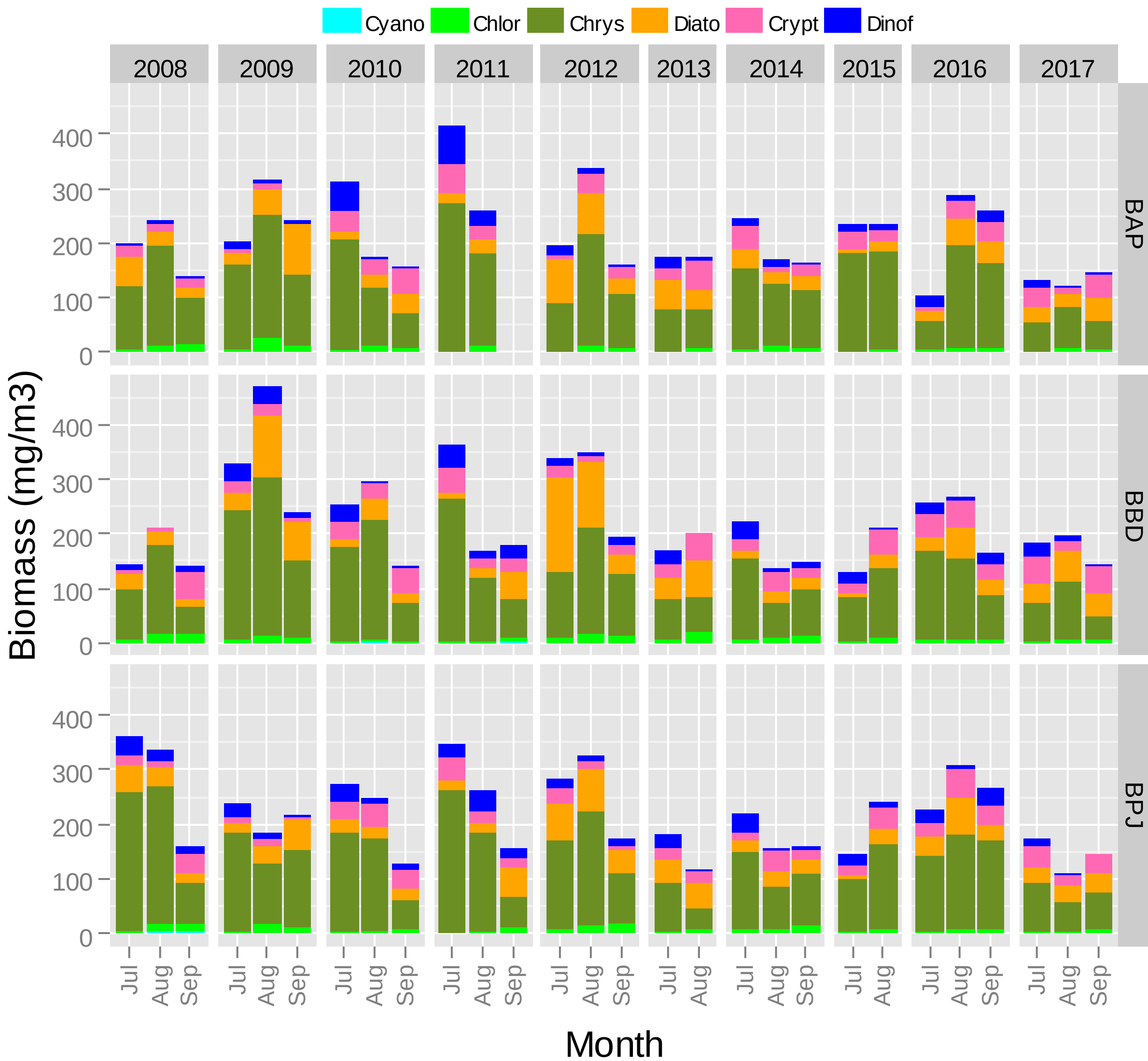


Figure 3.3-62. Phytoplankton relative biomass by major taxa group from Baker Lake since 2008.

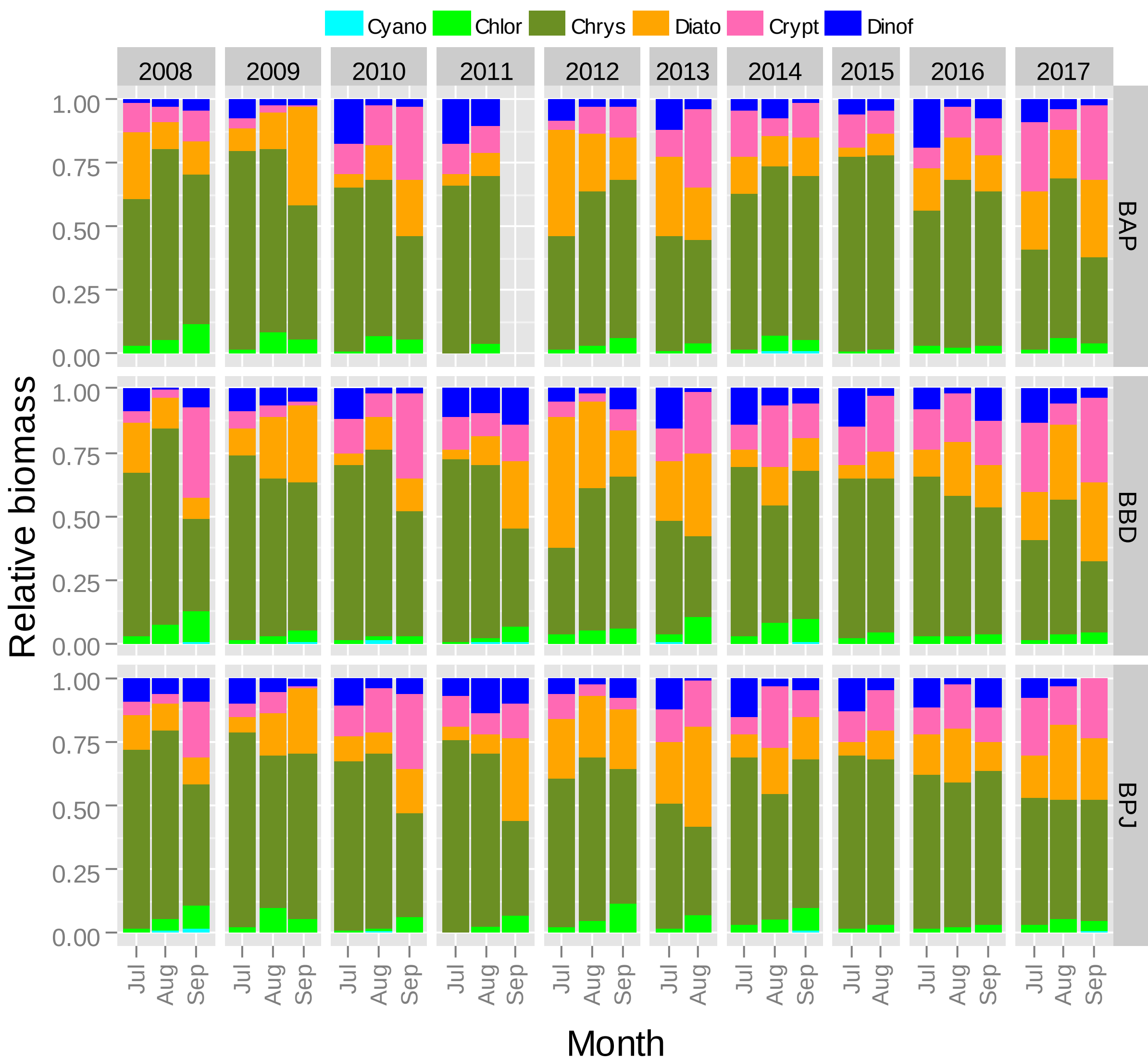
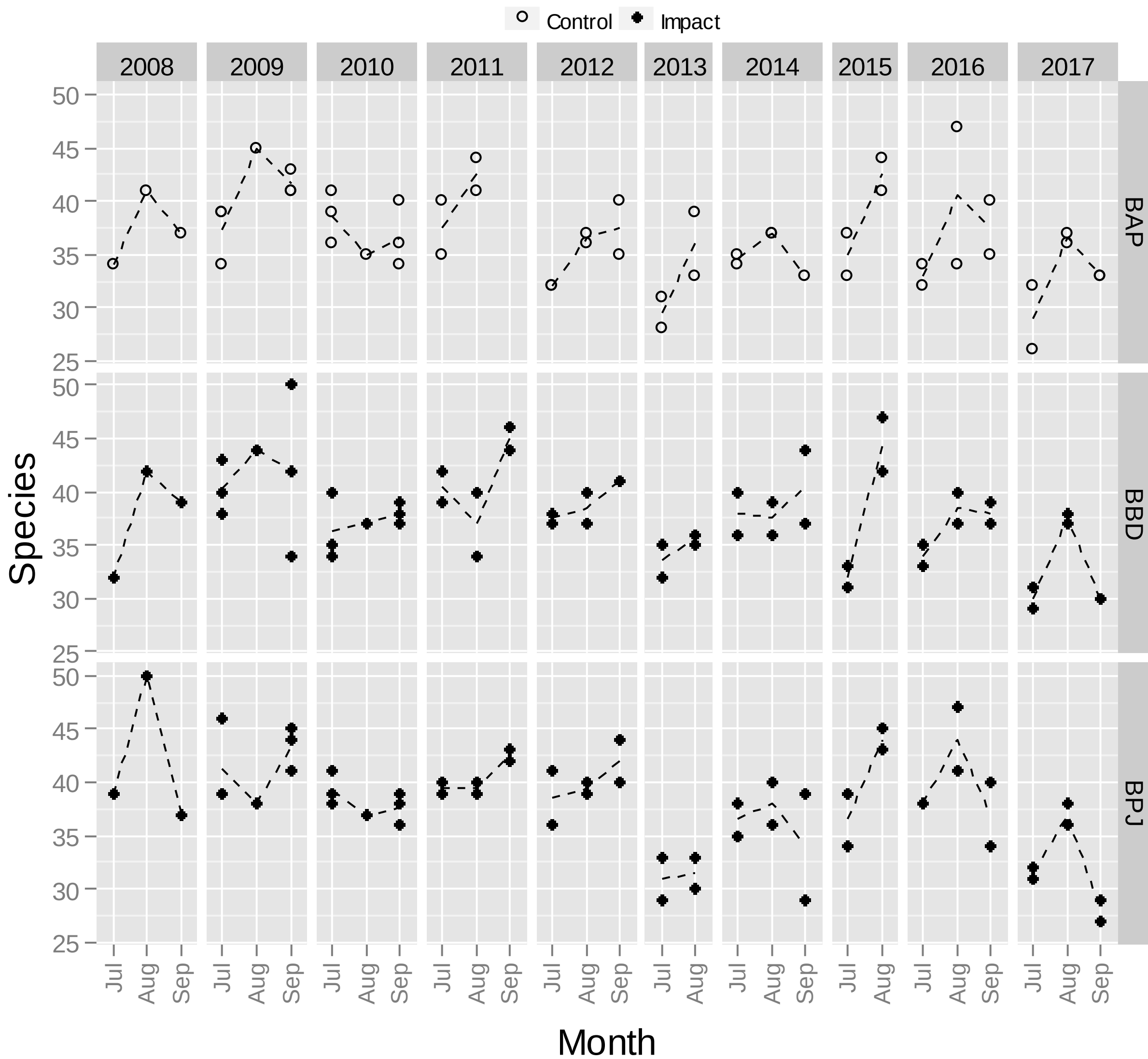


Figure 3.3-63. Phytoplankton species richness from Baker Lake since 2008.



3.3.5. Benthic Invertebrates

3.3.5.1. General Observations

Benthic invertebrates have been collected from Baker Lake annually in August since 2008. Baker Lake was added to the core program to ensure that monitoring was also in place to track activities in that area related primarily to barge traffic and shipping. There are two near-field impact areas, one targeting the hamlet's barge landing area (BBD) and the other Agnico's fuel storage facility (BPJ). The initial (since 2008) reference area (BAP) is several kilometers to the east of the hamlet along the north shore of the lake. A second reference area (BES) was added in 2011 to provide a broader perspective for temporal patterns in benthic community structure.

Abundance and species composition of benthic invertebrate communities at Baker Lake are strongly affected by a variety of parameters, including grain size, water depth and sediment organic content (as discussed in **Section 3.2.5.1**). Investigations in the Meadowbank lakes and Baker Lake have targeted areas of similar depth and grain size (i.e., dominated by silt/clay with a small [<5%] sand fraction). Unlike the Meadowbank study lakes, sediment grain size in Baker Lake has tended to be more variable and less predictable at all locations, with consistently coarser grain size (more sandy) than observed in Meadowbank lakes (see the 2017 results in **Table 3.3-4** as an example of the variability within, and between areas). Higher sand content is typically associated with a lower TOC concentration, which in turn influences the type of benthic community.

Similar to Meadowbank study lakes, the Baker Lake benthic community is generally characterized by relatively low abundance and taxa richness. Benthic invertebrate community abundance at Baker Lake often exceeds 2,000 organisms/m^2 (**Figure 3.3-64**), which is higher than typically-reported benthic invertebrate abundance at the Meadowbank study area lakes (**Figure 3.2-67**). Annual variability was sometimes high, as seen for example at BBD (e.g., from 2008 to 2009). There have also been fairly consistent spatial differences in abundance between areas (e.g., BBD and BPJ have generally had lower abundance than BAP). Taxa richness historically ranged from 5 to 19 in exposure areas and from approximately 15 to 22 in reference areas, although considerable within-station variability in taxa richness has been documented, particularly at the exposure areas BBD and BPJ (e.g., **Figure 3.3-67**).

The benthic invertebrate community in Baker Lake is dominated by the aquatic larval stages of insects, especially chironomids (Family Chironomidae), both in terms of abundance (**Figure 3.3-65** and **Figure 3.3-66**) and taxa richness (**Figure 3.3-68** and **Figure 3.3-69**). The next most abundant group is typically Mollusca (clams) especially, *Cyclocalyx/Neopisidium*, genera of the family Sphaeriidae (fingernail clams). Oligochaete worms can also be relatively abundant in the lake sediments, possibly because of higher sand content; generally, at least one oligochaete taxon was present at most area/year combinations.

3.3.5.2. Temporal and Spatial Trend Interpretation

Abundance and richness results from 2017 are shown in **Table 3.3-9**. Details regarding historical trends are discussed in the 2011 CREMP (Azimuth, 2012a). This report focuses on the 2017 results and trends over the last four years. BACI model results are presented in **Table 3.3-10** (abundance) and **Table 3.3-11** (richness). Key results are described below:

- *Total abundance* – Mean 2017 abundance was generally similar to the higher means observed in previous years at all Baker Lake areas (**Figure 3.3-64**)[27]. BES had the highest abundance measured in any one replicate to date (4913 organisms/m^2); this value was only slightly higher than previous maximum abundance at BES in 2013. There was a wider range in abundance between replicates at BPJ in 2017 relative to 2016 (between 800 and 5850 organisms/m^2), but this range is still similar or less than spread seen in previous years. Overall, the BACI analysis shows moderate to large increases in abundance at the exposure areas relative to the reference areas for 2017, as well as for the 2-, 3-, and 4-year "after" periods, but with high statistical uncertainty (**Table 3.3-10**). In summary, there is no indication that barge traffic is having an adverse effect on benthic invertebrate community abundance at the exposure areas in Baker Lake.
- *Major taxa group abundance and relative abundance* – As discussed previously, the benthic invertebrate communities at reference and impact areas in Baker Lake are comprised primarily of chironomid larvae. However, the relative proportion of different taxa is markedly different for the impact areas BBD and BPJ compared to reference are BAP (apart from 2008; **Figure 3.3-65** and **Figure 3.3-66**). Since 2009, between approximately 25 to 60% of individuals at BAP have been oligochaetes, compared to less than 10% at the impact areas and reference area BES (which was added in 2011 to provide a reference area with more similar characteristics to the exposure areas). As was the case in 2015 and 2016, the dominant oligochaete taxa in terms of density at BAP in 2017 were from the Naididae subfamilies Rhyacodrilinae (*Rhyacodrilus sp*) and Tubificinae (see **Appendix D**). *Rhyacodrilus sp* were identified in at least three replicate samples from BES, BBD, and BPJ, but at lower abundances. The differences observed in major taxa composition between the two reference areas is completely natural.
- *Taxa richness* – Mean taxa richness was high across all Baker Lake areas in 2017 (**Figure 3.3-67**). Geometric means for total richness were the highest among all years for BES, BBD, and BPJ, and second highest at BAP. Consequently, the BACI model results showed positive, yet uncertain ($p>0.1$) effects sizes for total richness in 2017 and the 2-year, 3-year, and 4-year time periods (**Table 3.3-11**).
- *Major taxa group richness and relative richness* – From a taxa richness perspective, impact areas BBD and BPJ appear reasonably similar to both reference areas (BES and BAP), with insects dominating the communities (**Figure 3.3-68** and **Figure 3.3-69**). There were no apparent trends in species composition, indicating the barge operations are not adversely affecting the community.

Monitoring results to date have been variable across the sites. A detailed discussion on early trends is presented in the 2012 CREMP (Azimuth, 2013). At present there is no evidence that development-related activities are adversely affecting the benthic invertebrate community, especially in light of no apparent barge-related effects to water quality and sediment chemistry.

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[27] One sample collected from BPJ in 2016 had substantially low abundance compared to the other four replicates that year. The low abundance was attributed to propeller wash from the tug boat that was working to pull the barge off the shore just prior to sample collection. This sample is thus excluded from **Figure 3.3-64**.

Table 3.3–9. Benthic invertebrate abundance (#/m2) and richness (# taxa) by major taxa group, Baker Lake, 2017.

Area-Replicate	Date	Depth (m)	Abundance (#/m²)				Total Abundance	Richness (# taxa)				Total Richness	Simpson's Diversity	Bray-Curtis Index
			Oligochaetes	Insects	Molluscs	Other Taxa[1]		Oligochaetes	Insects	Molluscs	Other Taxa[1]			
Baker Akilahaarjuk Point														
BAP-1	9-Aug-17	8.3	1087	3978	761	130	5957	4	15	1	5	25	0.914	0.217
BAP-2	9-Aug-17	7.8	630	4848	413	261	6152	4	20	2	3	29	0.916	0.227
BAP-3	9-Aug-17	7.8	957	6065	565	283	7870	4	17	1	3	25	0.917	0.259
BAP-4	9-Aug-17	7.7	239	6478	0	43	6761	4	17	0	2	23	0.894	0.337
BAP-5	9-Aug-17	8.6	152	2174	196	500	3022	2	11	1	4	18	0.877	0.207
Area Mean			***613***	***4709***	***387***	***243***	***5952***	***4***	***16***	***1***	***3***	***24***	***0.904***	***0.249***
Baker Barge Dock														
BBD-1	11-Aug-17	8.6	65	3370	22	0	3457	2	13	1	0	16	0.682	0.453
BBD-2	11-Aug-17	8.4	65	7457	196	109	7826	2	14	2	2	20	0.489	0.611
BBD-3	12-Aug-17	8.1	0	6370	43	43	6457	0	13	1	2	16	0.554	0.617
BBD-4	12-Aug-17	8.2	87	3543	130	65	3826	2	11	2	2	17	0.761	0.455
BBD-5	12-Aug-17	9.2	0	2739	0	196	2935	0	17	0	3	20	0.842	0.415
Area Mean			***43***	***4696***	***78***	***83***	***4900***	***1***	***14***	***1***	***2***	***18***	***0.665***	***0.510***
Baker East Shore														
BES-1	10-Aug-17	7.8	239	2696	261	674	3870	3	16	1	5	25	0.918	0.277
BES-2	10-Aug-17	8.2	370	2457	326	283	3435	2	14	1	2	19	0.921	0.221
BES-3	10-Aug-17	8	152	3478	587	696	4913	1	12	1	5	19	0.880	0.198
BES-4	10-Aug-17	8.3	43	2478	435	435	3391	2	15	1	3	21	0.910	0.156
BES-5	10-Aug-17	7.9	87	1848	391	370	2696	2	13	1	3	19	0.901	0.183
Area Mean			***178***	***2591***	***400***	***491***	***3661***	***2***	***14***	***1***	***4***	***21***	***0.906***	***0.207***
Baker Proposed Jetty														
BPJ-1	11-Aug-17	8.4	217	3761	1348	522	5848	1	13	1	4	19	0.814	0.467
BPJ-2	11-Aug-17	7.9	43	3087	0	283	3413	1	18	0	3	22	0.922	0.372
BPJ-3	11-Aug-17	8.6	43	2000	87	413	2543	1	14	1	4	20	0.931	0.328
BPJ-4	11-Aug-17	7.6	65	630	65	109	870	1	12	1	4	18	0.922	0.583
BPJ-5	11-Aug-17	8.3	43	1913	43	65	2065	1	12	1	1	15	0.900	0.411
Area Mean			***83***	***2278***	***309***	***278***	***2948***	***1***	***14***	***1***	***3***	***19***	***0.898***	***0.432***

Notes:

1. "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, Pionidae, Harpacticoida, and O. Notostraca).

Table 3.3–10. Results of the BACI tests for benthic invertebrate abundance at Baker Lake areas.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2017	BBD	9	1	0.64	1.13	0.71	90	-86	2489
	BPJ	9	1	0.76	1.00	0.77	115	-78	2042
2016-2017	BBD	8	2	0.34	0.86	0.65	40	-81	920
	BPJ	8	2	1.09	0.69	0.92	198	-40	1369
2015-2017	BBD	7	3	0.52	0.71	0.76	68	-67	764
	BPJ	7	3	0.97	0.59	0.93	165	-33	943
2014-2017	BBD	6	4	0.20	0.64	0.62	22	-72	434
	BPJ	6	4	0.71	0.59	0.87	104	-48	692

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate negative effect sizes (reductions) of 20% or more

Test area = area compared to control (BAP)

n(B) = number of years in the "before" period

n(A) = number of years in the "after" period

Estimate = BACI model estimate of the after-period change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or an increase in mean

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Table 3.3–11. Results of the BACI tests for benthic invertebrate taxa richness at Baker Lake areas.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2017	BBD	9	1	0.27	0.31	0.80	31	-36	166
	BPJ	9	1	0.40	0.38	0.84	49	-37	254
2016-2017	BBD	8	2	0.19	0.23	0.78	21	-29	106
	BPJ	8	2	0.46	0.26	0.94	58	-14	189
2015-2017	BBD	7	3	0.20	0.20	0.83	22	-23	93
	BPJ	7	3	0.36	0.23	0.92	44	-16	147
2014-2017	BBD	6	4	0.16	0.19	0.79	17	-24	81
	BPJ	6	4	0.39	0.21	0.95	48	-8	138

Notes:

* **Bolded** values are P-values < 0.1

Shaded cells indicate negative effect sizes (reductions) of 20% or more

Test area = area compared to control (BAP)

n(B) = number of years in the "before" period

n(A) = number of years in the "after" period

Estimate = BACI model estimate of the after-period change in mean for log-transformed data

SE = standard error of the estimate

P-value = one-tailed test of the null hypothesis of no change or an increase in mean

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1))

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval

Figure 3.3-64. Benthic invertebrate total abundance (#/m^2) from Baker Lake since 2008.

Note: All Baker Lake benthic invertebrate plots exclude samples BBD-3 (2009), BPJ-2 (2012), and BPJ-4 (2016) as part of the QA process. Refer to **Section 3.1.5** for details.

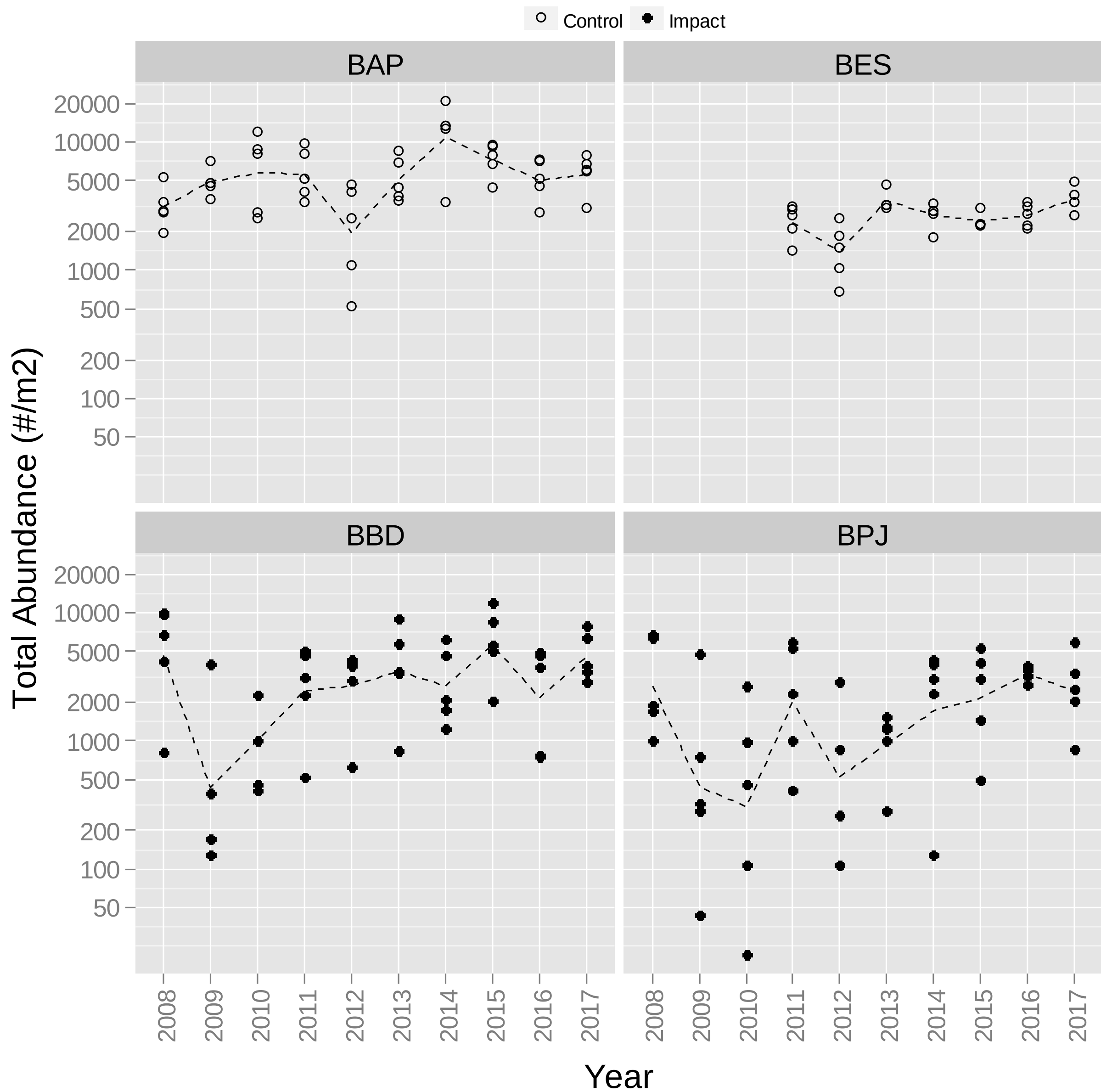


Figure 3.3-65. Benthic invertebrate abundance (#/m^2) by major taxa group from Baker Lake since 2008.

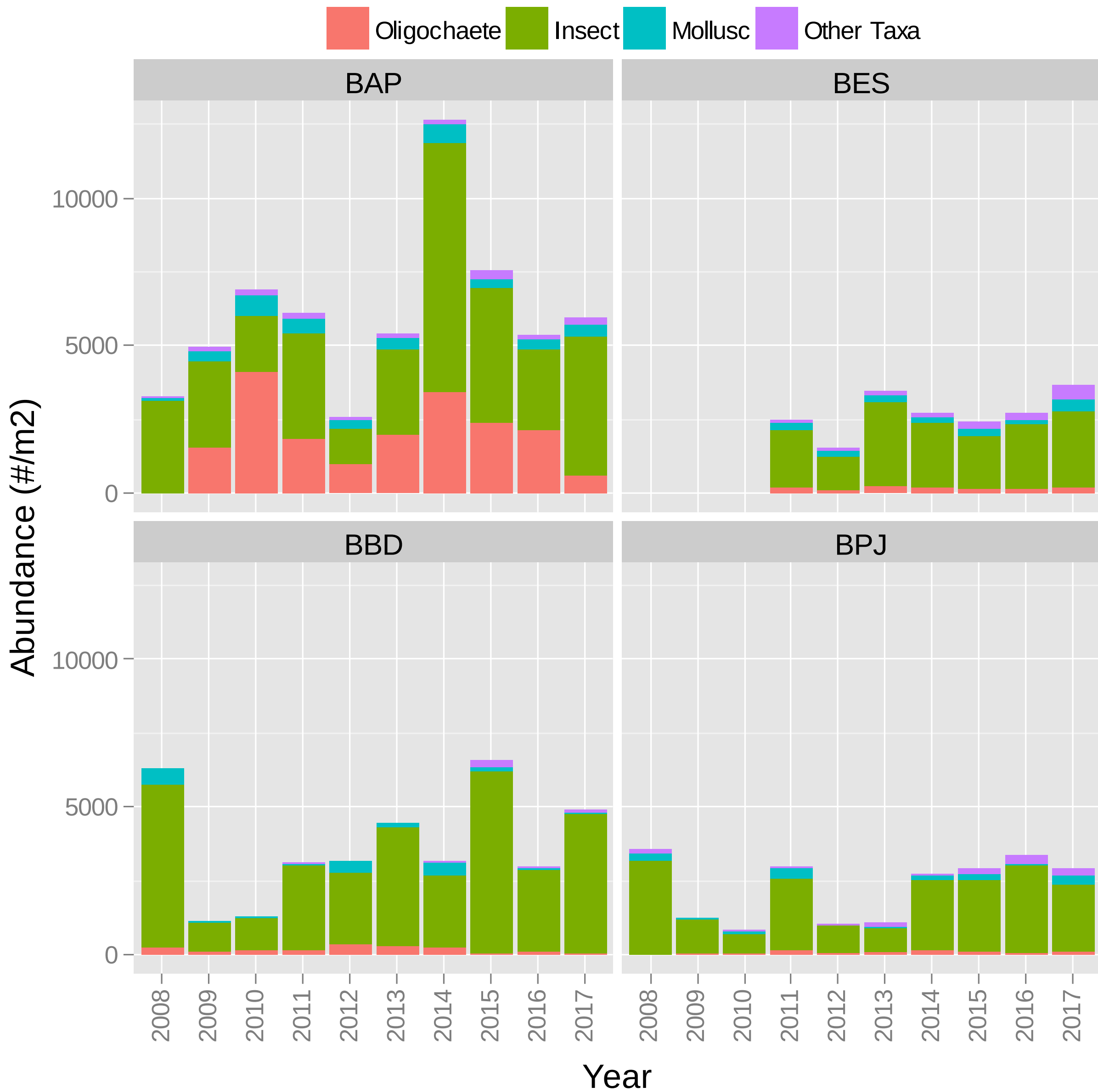


Figure 3.3-66. Benthic Invertebrate relative abundance by major taxa group from Baker Lake since 2008.

Figure 3.3-67. Benthic invertebrate total richness (# taxa) from Baker Lake since 2008.

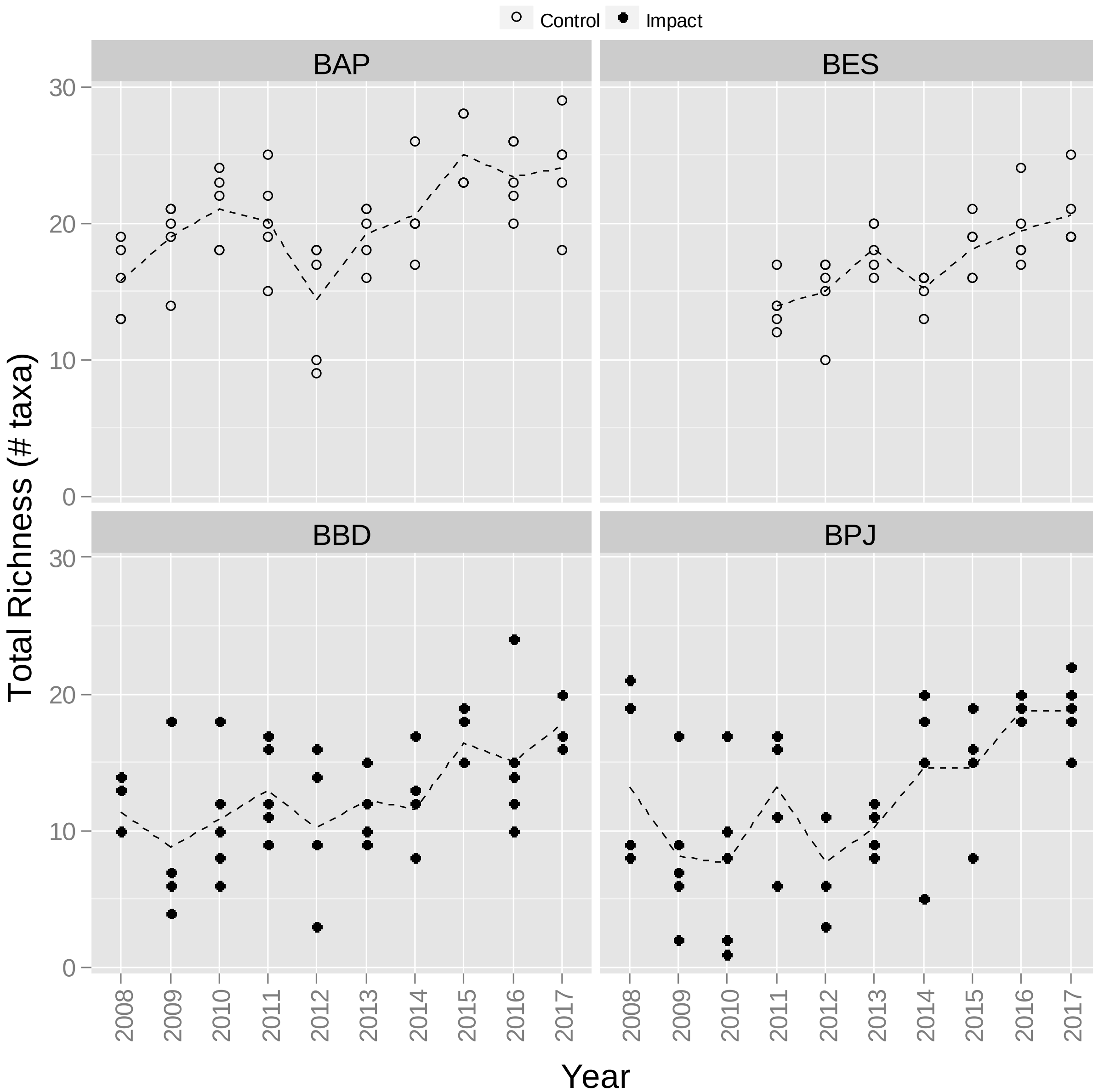


Figure 3.3-68. Benthic invertebrate richness (# taxa) by major taxa group from Baker Lake since 2008.

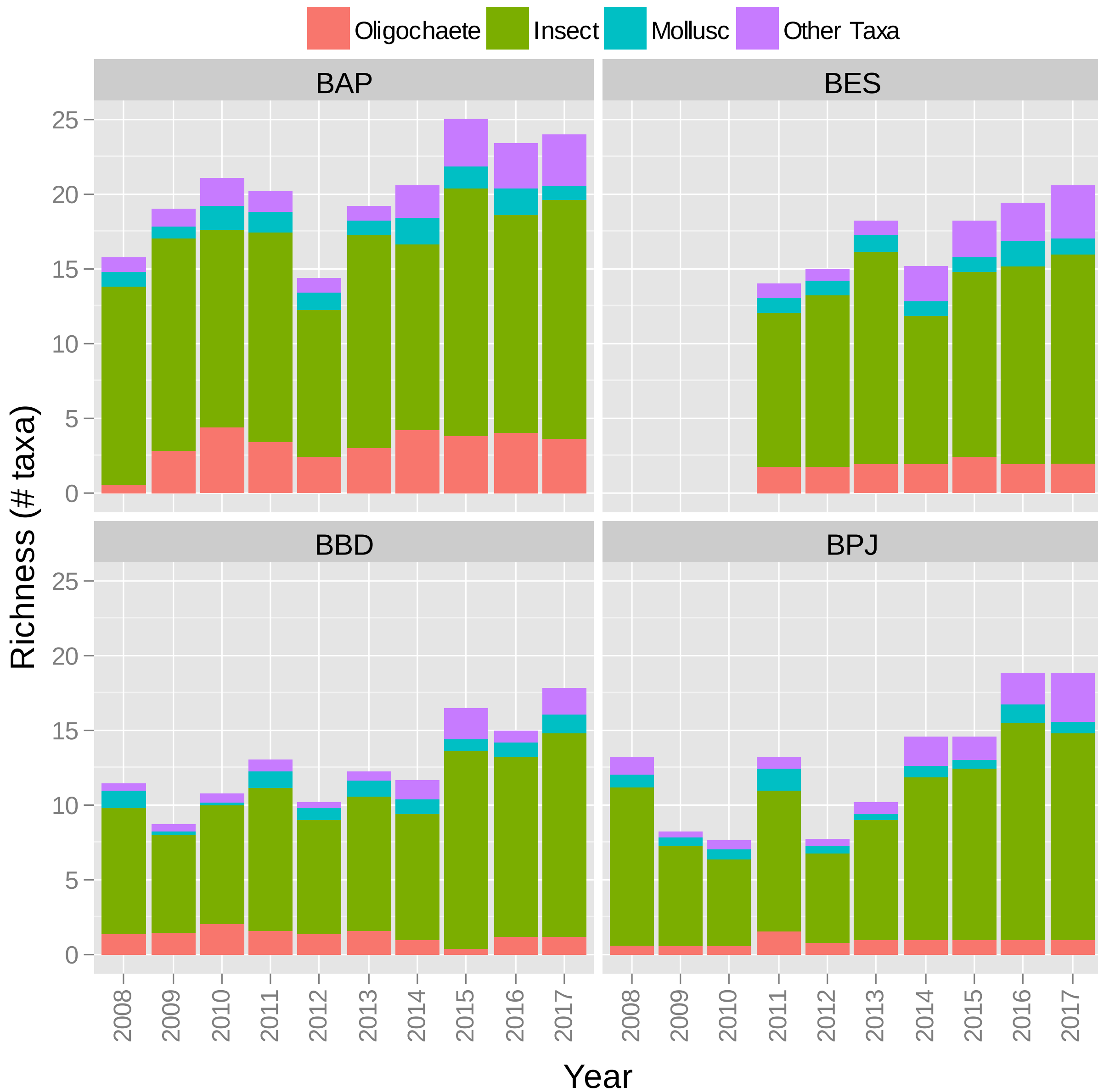
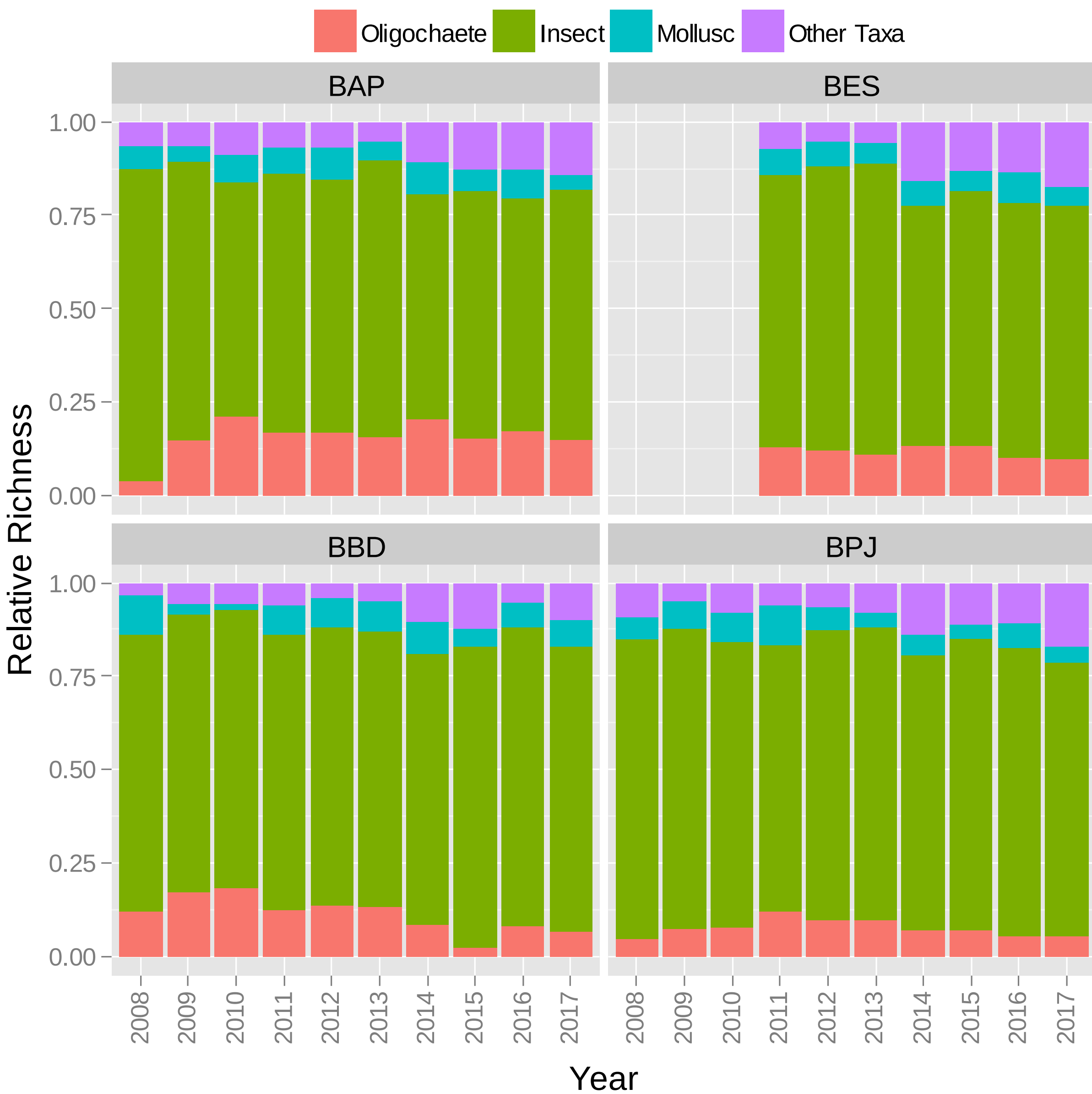


Figure 3.3-69. Benthic invertebrate relative richness by major taxa group from Baker Lake since 2008.



4. SUMMARY AND IMPLICATIONS FOR MANAGEMENT

4.1. Summary of the 2017 CREMP Program

The CREMP focuses on identifying changes in limnological parameters, water and sediment chemistry, or changes to primary (phytoplankton) and secondary (benthic invertebrate community) aquatic producers that may be associated with mine development activities. This is accomplished through the application of a temporal/spatial trend assessment that includes application of quantitative decision criteria (i.e., early warning "triggers" and action "thresholds") to facilitate immediate and objective decision-making regarding appropriate management actions. This information is integrated annually into the Aquatic Ecosystem Monitoring Program (AEMP) for holistic environmental management and decision making.

Meadowbank Study Lakes

CREMP monitoring started in 2006 and in-water mine development started in 2008. Key mine development activities that could result in changes to the aquatic receiving environment include: East Dike construction (2008), Bay-Goose Dike construction (2009-10), dewatering of lakes and impoundments (2009-11 [Second Portage, Third Portage], 2013 [Vault], 2016 [Phaser]), effluent discharge (2012 to 2014 [TPN]; 2014 to present [WAL and SP]), and general site-related mining activities that mostly generate dust (e.g., rock crushing, blasting, ore and waste hauling; 2008 to present). Key findings for 2017 are summarized in **Table 4.1-1**:

- *Water Chemistry* – Statistically significant mine-related changes were detected relative to baseline/reference conditions at one or more near-field (NF) areas for alkalinity (SP); conductivity (TPN, TPE, SP, WAL); hardness (TPN, TPE, SP, WAL); major cations (i.e., calcium, potassium, magnesium, and sodium [TPN, TPE, SP, WAL]); TDS (TPN, TPE, SP, WAL), and TKN (WAL). In the absence of effects-based thresholds (e.g., CCME water quality criteria) for these parameters, their triggers were set at the 95th percentile of baseline data. While these results represent mine-related changes, the observed concentrations are still relatively low and unlikely to adversely affect aquatic life. There were no trigger exceedances in 2017 for any water quality parameters with CCME water quality guidelines, including metals. **The trends in water chemistry will be monitored in 2018**.
- *Sediment Chemistry* – Quantitative trigger analysis was completed on metals data from the sediment core samples (1.5 cm horizon). Grab samples were also submitted for analysis in 2017 for analysis of habitat variables (particle size and TOC), metals, and organics analysis on the top 3-5 cm of sediment. As new data were available, trigger values were updated in 2017 for use in deciding which metals to carry forward in formal BA statistical analysis of changes compared to baseline conditions.

  The core sample results showed that chromium concentrations continue to exceed the trigger value at TPE, and statistically significant changes compared to the baseline period were identified in the BA statistical analysis. While grab sample results showed a reduction in 2016, they also increased in 2017. The increasing trend in chromium concentrations at this location was investigated in detail in 2015, when a targeted bioavailability study was conducted to assess sediment geochemistry and toxicity at TPE; those results indicated that the changes in chromium, likely related to dike construction material, did not pose risks to the benthic community. However, current chromium concentrations are no longer comparable to the results from 2015 upon which the conclusion of no toxicity was based. **Recommended management actions for 2018 are to repeat the coring program to verify if the continued increase observed**

in 2017 was real or if conditions had stabilized and repeat the bioavailability study that was undertaken in 2015 (i.e., to see if the changes are ecologically relevant).

Wally Lake was the only other NF station with trigger exceedances in the sediment sample collected in 2017. Lead and chromium were only marginally above their respective trigger values, but arsenic was approximately 2.5-times higher in 2017 relative to the baseline and trending higher relative to the last coring cycle in 2014. However, there is some uncertainty regarding whether this trend to real or due to natural spatial heterogeneity. Notwithstanding, no effects to benthic invertebrate community richness or abundance were identified in the 2017 BACI analysis. **Recommended management actions for 2018 are to repeat the coring program to verify the nature of the observed trend (i.e., real or due to spatial heterogeneity) and conduct a targeted bioavailability study (i.e., to see if the changes are ecologically relevant).**

- *Phytoplankton Community* – Phytoplankton biomass was statistically significantly higher at TPE, SP, and WAL in 2017 relative to reference/baseline conditions. The observed increase in the BACI assessment was not linked back to any observable Site-related activities. Higher biomass would be expect to occur if nutrient loading to the areas was identified in the BACI analysis of water chemistry, but nutrient concentrations remain well below levels associated with increased primary productivity. Changes in biomass identified in the BACI assessment appear to be due largely to lower biomass at INUG (the reference area) in 2017 compared to the baseline period, whereas the opposite was true at the NF areas. The divergent patterns of phytoplankton biomass between INUG and the NF areas resulted in a large "perceived" increase in biomass for the NF areas. The absolute biomass values at the NF are in line with their historical values. Taking into consideration all the lines of evidence (BACI and absolute values plotted over time), there is no evidence to suggest mining operations are increasing primary productivity in the NF areas. Phytoplankton richness was similar to previous monitoring cycles. **The trends in phytoplankton biomass and richness will be reviewed again in 2018**.
- *Benthic Invertebrate Community* – Benthic invertebrate abundance at TPE in 2017 was lower relative to INUG, consistent with observations from 2015 and 2016. The only statistically significant reduction in abundance was for the expanded 2015-2017 temporal assessment relative to INUG. However, the absolute total abundance at TPE in 2017 is consistent with recent years and well within the range of natural variability. The "apparent" decrease in abundance at TPE relative to the baseline period is indicative of slightly divergent trends between INUG and TPE. Mean total abundance at INUG has increased slightly in the "after" period relative to the baseline 2006-2008 years, whereas TPE has remained relatively consistent throughout the "after" period, with 2009-2011 being the exception. Richness at TPE has remained consistent throughout the monitoring period, indicating that mining activities are not adversely affecting the structure of the benthic invertebrate community. Taking into consideration all available benthic invertebrate data at TPE, there is little to suggest mining activities are negatively impacting the community. No adverse effects were noted at the other NF areas in 2017. **The trends in benthic invertebrate abundance and richness will be reviewed again in 2018**.

Baker Lake

CREMP monitoring at Baker Lake started in 2008. Key mine-related activities include barge/shipping traffic and general land-based activities associated with the tank farm area. No spills of fuels, hydrocarbons or any other materials were reported in the vicinity of the barge dock or jetty in 2017.

- *Chemistry* – There were no cases where water quality parameters exceeded the triggers in 2017. Sediment arsenic concentrations exceeded the trigger value at BPJ as has been the case dating back to when monitoring started in 2008. Importantly, there is no increasing trend in arsenic concentrations at this location. **The trends in water and sediment chemistry (grab) will be monitored in 2018**.
- *Biological Communities* – no changes in the biological communities were attributable to Agnico Eagle's activities in Baker Lake, and as such, no follow-up management actions are required for 2018 beyond routine monitoring.

Table 4.1–1. Summary of key findings from the 2017 CREMP.

Variable Type & Variable	Magnitude[1]	Spatial Scale[2]	Causation[3]	Permanence[4]	Uncertainty[5]	Comments	Management Action[6]
Exposure - Limnology							
Oxygen	**0**	n/a	n/a	n/a	?	All stations - consistent with previous years	**0**
Temperature	**0**	n/a	n/a	n/a	?	All stations - consistent with previous years	**0**
Conductivity	**0**	Moderate	High	Low	?	Specific conductivity readings at WAL in 2017 were at the upper end of the range reported for previous monitoring cycles for most months, particularly for sample collected near the diffuser. Plume investigations in 2016 and 2017 by C. Portt and Associates confirm effluent concentrations to 1% are confined to within approximately 700 m of the diffuser. No action beyond routine monitoring is recommended for 2018.	**1**
Exposure - Water Chemistry							
Conventionals	**1**	Large	High	Low	?	The following parameters were elevated relative to reference/baseline conditions. However, concentrations suggest low potential for adverse effects: **Alkalinity** (SP); **Conductivity** (TPN, TPE, SP, WAL); **Hardness** (TPN, TPE, SP, WAL); **Ca/K/Mg/Na** (TPN, TPE, SP, WAL); **TDS** (TPN, TPE, SP, WAL)	**1**
Nutrients	**1**	Small	Low	Low	??	The following parameters were elevated relative to reference/baseline conditions: **TKN** (WAL) Exceedance were sporadic (not all months) and the absolute concentrations were low. Low likelihood of adverse effects.	**1**
Total Metals	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**
Dissolved Metals	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**
Total Suspended Solids	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**

Notes:

[1] **Magnitude Ratings (narrative in brackets used in the absence of specific triggers/thresholds):**
- 0 – 'no exceedances of triggers or thresholds (or no apparent changes from baseline of concern)
- 1 – 'early warning trigger exceeded (or change from baseline warranting concern)
- 2 – threshold exceeded (or change from baseline exceeding magnitude of concern)

[2] **Spatial Scale Ratings:**
- n/a – no magnitude of effect, therefore not evaluated
- Small – localized
- Moderate – sub-basin to basin
- Large – basin to whole lake

[3] **Causation Ratings:**
- n/a – no magnitude of effect, therefore not evaluated
- Low – no evidence for a mine-related source
- Moderate – some likelihood of a mine-related source
- High – the source of the problem is very likely to be mine-related

[4] **Permanence Ratings:**
- n/a –no magnitude of effect, therefore not evaluated
- Low – rapidly reversible (e.g., months to years)
- Moderate – slowly reversible (e.g., years to decades)
- High – largely irreversible (e.g., decades +)

[5] **Uncertainty Ratings:**
- ? – low uncertainty
- ?? – moderate uncertainty
- ??? – high uncertainty

[6] **Management Actions:**
- 0 – 'no action beyond routine CREMP monitoring
- 1 – continued trend monitoring in 2017
- 2 – active follow-up with more detailed quantitative assessment in 2018

Table 4.1–1. Summary of key findings from the 2017 CREMP.

Variable Type & Variable	Magnitude[1]	Spatial Scale[2]	Causation[3]	Permanence[4]	Uncertainty[5]	Comments	Management Action[6]
Exposure - Sediment Chemistry							
Physical	**0**	n/a	n/a	n/a	?		**0**
Total Metals	**2**	Moderate (TPE Cr) Unknown (WAL As, Cr, Pb)	High (TPE Cr) Unknown (WAL As, Cr, Pb)	Moderate (TPE Cr) Unknown (WAL As, Cr, Pb)	? (TPE) ??? (WAL As, Cr, Pb)	The following parameters were elevated relative to reference/baseline conditions: *Meadowbank* - **Arsenic** (WAL); **Chromium** (TPE, WAL); **Lead** (WAL) *Baker Lake* - **Arsenic** (BPJ) **TPE** - Chromium concentrations continue to exceed the trigger at TPE. 2017 results indicate concentrations are increasing. Targeted study in 2015 showed lack of bioavailability and toxicity to benthic invertebrates. **WAL** - Arsenic concentrations in core samples collected in 2017 were elevated relative to baseline and compared to the 2014 coring cycle results. Chromium and lead exceedances were marginal. Coring is recommended in 2018 to verify the nature of the trend observed (i.e., related to mining or natural spatial heterogeneity). **BPJ** - Arsenic continues to exceed the trigger. No evidence of increasing concentrations over time.	**0** = SP, TPN, and BL **2 =** WAL (As) and TPE (Cr)
Organics	**0**	n/a	n/a	n/a	?	No trigger exceedances.	**0**

Notes:

[1] **Magnitude Ratings (narrative in brackets used in the absence of specific triggers/thresholds):**
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Table 4.1–1. Summary of key findings from the 2017 CREMP.

Variable Type & Variable	Magnitude[1]	Spatial Scale[2]	Causation[3]	Permanence[4]	Uncertainty[5]	Comments	Management Action[6]
Effects - Phytoplankton							
Chlorophyll-a	**0**	n/a	n/a	n/a	?	No evidence of increased phytoplankton productivity based on chlorophyll-a data.	**0**
Total Biomass	**2**	Large	Low	Low	???	Statistically significant increases in phytoplankton biomass were detected for the NF stations in the BACI analysis of 2017 data relative to reference/baseline conditions. Effect sizes of biomass increases ranged between 46% (SP) to 87% (WAL). There was no plausible linkage between increased biomass in 2017 and site-related activities (see **Section 3.2.4.2** for details).	**0**
Taxa Richness	**0**	n/a	n/a	n/a	?	Taxa richness increased 12% (p=0.09) at WAL relative to reference/baseline conditions. The slight increase in diversity is not above the trigger value of 20%.	**0**
Effects - Benthic Invertebrates							
Total Abundance	**0**	n/a	n/a	n/a	?	Decreased abundance at TPE relative to INUG in the past four years relative to reference/baseline conditions. The only statistically significant difference was for 3 after years (2015-2017). The differences are primarily driven by increased abundance at INUG while abundance at TPE has been relatively stable and consistent with baseline sampling results (**Figure 3.2-67** and **Figure 3.2-68**).	**0**
Total Richness	**0**	n/a	n/a	n/a	?	Richness continues to track higher for most stations. The benthic communities are dominated by chironomids, and the relative proportion of major taxa remains stable at all stations.	**0**

Notes:

[1] **Magnitude Ratings (narrative in brackets used in the absence of specific triggers/thresholds):**
- 0 – 'no exceedances of triggers or thresholds (or no apparent changes from baseline of concern)
- 1 – 'early warning trigger exceeded (or change from baseline warranting concern)
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- High – largely irreversible (e.g., decades +)

[5] **Uncertainty Ratings:**
- ? – low uncertainty
- ?? – moderate uncertainty
- ??? – high uncertainty

[6] **Management Actions:**
- 0 – 'no action beyond routine CREMP monitoring
- 1 – continued trend monitoring in 2017
- 2 – active follow-up with more detailed quantitative assessment in 2018

4.2. Monitoring Components for 2018

The current status of the rationale, framework, strategy, methods, triggers/thresholds, and scope of the CREMP were documented in the *CREMP: 2015 Plan Update* (Azimuth, 2015b). A key aspect of the updated plan was the design of the new results-based sampling strategy outlined in **Section 2.2.3** to improve program efficiency at the mid-field and far-field Meadowbank areas when warranted. The current program for 2018 is summarized in **Table 4.2-1**. Based on the outcome of the water quality screening results at NF and MF areas in the context of this new assessment framework (**Section 3.2.2.2**), the full CREMP program (through ice and open water) is limited to the NF areas in 2018. Through-ice limnology and water chemistry sampling at TPS, TE, and TEFF is planned for a minimum of one, but ideally two events in 2018 depending on ice conditions. In addition, contingency water samples may need to be collected during the limnology-only through ice sampling event(s) at the NF areas if anomalous *in-situ* limnology results are observed.

Follow-up sediment coring is planned at TPE and WAL in 2018 to verify trends of increasing chromium at TPE and arsenic at WAL and determine, to the extent possible, whether the increases are related to the mine. In addition to the limited coring program, targeted bioavailability studies (**Section 3.2.3.2**) using sequential extraction analyses and sediment toxicity tests are planned at TPE and WAL to determine if the current concentrations of chromium at TPE and arsenic at WAL have the potential to adversely affect the benthic invertebrate community. Based on the most recent analysis of the benthic invertebrate community data from 2017, there is little evidence to suggest mining activities are negatively impacting the benthic invertebrate communities in either lake. Sequential extraction and toxicity test results link exposure concentrations to ecological effects. These two lines of evidence, when combined with benthic invertebrate taxonomy data, can provide added certainty regarding the potential for ecological effects to the benthic invertebrate community under current conditions.

Table 4.2–1. Monitoring components planned for 2018 CREMP.

Project Lake	Area ID	Through-Ice						Open-Water			Through-Ice		
		Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Reference Areas													
Inuggugayualik	**INUG**			Limno[1] Water Phyto		Limno[1] Water Phyto	**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**		
Pipedream	**PDL**						**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**		
Near-Field Areas													
Third Portage	**TPE**	Limno[2]	Limno[2]	Limno[1] Water Phyto	Limno[2]	Limno[1] Water Phyto	**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**	Limno[2]	Limno[2]
	TPN	Limno[2]	Limno[2]	Limno[1] Water Phyto	Limno[2]	Limno[1] Water Phyto	**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**	Limno[2]	Limno[2]
Second Portage	**SP**	Limno[2]	Limno[2]	Limno[1] Water Phyto	Limno[2]	Limno[1] Water Phyto	**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**	Limno[2]	Limno[2]
Wally	**WAL**	Limno[2]	Limno[2]	Limno[1] Water Phyto	Limno[2]	Limno[1] Water Phyto	**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**	Limno[2]	Limno[2]
Mid-Field Areas													
Third Portage	**TPS**			Limno[3] Water		Limno[3] Water	**Ice not safe**				**Ice not safe**		
Tehek	**TE**			Limno[3] Water		Limno[3] Water	**Ice not safe**				**Ice not safe**		
Far-Field Areas													
Tehek	**TEFF**			Limno[3] Water		Limno[3] Water	**Ice not safe**				**Ice not safe**		

Table 4.2–1. Monitoring components planned for 2018 CREMP.

Project Lake	Area ID	Through-Ice						Open-Water			Through-Ice		
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Baker Lake	BBD						**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**		
	BPJ						**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**		
	BAP						**Ice not safe**	Limno[1] Water Phyto	Limno[1] Water Phyto Sed Benthos	Limno[1] Water Phyto	**Ice not safe**		
	BES						**Ice not safe**		Sed Benthos		**Ice not safe**		

Notes:

Limno[1]: 2 depth profiles per sampling event per year.

Limno[2]: 1 limno depth profile should be collected at key near-field areas (TPN, TPE, SP, and WAL) to reduce uncertainty regarding the potential occurrence of changes over winter; water chemistry will also be collected if profiling shows unusual results.

Limno[3]: 2 depth profiles for a minimum of 1, but ideally 2 sampling events per year at mid-field and far-field stations (paired with sample timing at INUG).

Water: 2 replicate samples from 3m depth; same locations as limno.

Phyto: 2 replicate samples from 3m depth; same locations as limno.

Sed: 1 composite for organics (LEPH, HEPH, PAH(low), Mineral Oil and Grease); 5 replicates for physical (TOC, Grain Size, Moisture)

Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

5. REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2012. Water Quality Standards. 18 AAC 70. Amended as of April 8, 2012. Juneau, AK, USA. Available at: Link. Accessed March 2014.

Agnico Eagle Mines Ltd. (Agnico). 2011. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring 2010, Meadowbank Mine. Report prepared by Agnico Eagle Mines Ltd., Baker Lake, NU.

Azimuth Consulting Group (Azimuth). 2017a. Core Receiving Environment Monitoring Program (CREMP) 2016, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2017.

Azimuth. 2017b. Whale Tail Pit Core Receiving Environment Monitoring Program (CREMP): Rationale for Selection of Reference Areas. Technical Memorandum prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU, November 10, 2017.

Azimuth. 2016. Core Receiving Environment Monitoring Program (CREMP) 2015, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2016.

Azimuth. 2015a. Aquatic Effects Management Program (AEMP), Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. November, 2015.

Azimuth. 2015b. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. November, 2015.

Azimuth. 2015c. Core Receiving Environment Monitoring Program (CREMP) 2014, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2015.

Azimuth. 2014. Core Receiving Environment Monitoring Program (CREMP) 2013, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2014.

Azimuth. 2013. Core Receiving Environment Monitoring Program (CREMP) 2012, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2013.

Azimuth. 2012a. Aquatic Effects Monitoring Program – Core Receiving Environment Monitoring Program 2011, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2012.

Azimuth. 2012b. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction TSS Effects Assessment Study 2011, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2012.

Azimuth. 2012c. Aquatic Effects Management Program (AEMP), Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. December, 2012.

Azimuth. 2012d. Core Receiving Environment Monitoring Program (CREMP): Design Document 2012, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. December, 2012.

Azimuth. 2011a. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction TSS Effects Assessment Study 2010, Meadowbank Mine. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2011.

Azimuth. 2011b. Aquatic Effects Monitoring Program – Core Receiving Environment Monitoring Program 2010, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March, 2011.

Azimuth. 2010a. Aquatic Effects Monitoring Program – Core Receiving Environment Monitoring Program 2009, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU.

Azimuth. 2010b. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring 2009, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU.

Azimuth. 2010c. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction TSS Effects Assessment Study 2009, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU.

Azimuth. 2010d. Core Receiving Environment Monitoring Program (CREMP): 2010 Plan Update, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. June 2010.

Azimuth. 2009a. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring 2008, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Vancouver, BC. March 2009.

Azimuth. 2009b. Aquatic Effects Monitoring Program – Targeted Study: Second Portage Lake TSS Effects Assessment Study 2008, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Vancouver, BC. March 2009.

Azimuth. 2009c. Aquatic Effects Monitoring Program – Receiving Environment Monitoring 2008, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Vancouver, BC. March 2009.

Azimuth. 2008a. Aquatic Effects Management Program Monitoring – Meadowbank Gold Project, 2007. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Vancouver, BC. March 2008.

Azimuth. 2008b. Aquatic Effects Management Program Monitoring – Meadowbank Gold Project, 2006. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico Eagle Mines Ltd., Vancouver, BC. March 2008.

Azimuth. 2005a. Aquatic Effects Management Program (AEMP) – Meadowbank Gold Project. 2005. A report prepared by Azimuth Consulting Group, Vancouver for Cumberland Resources Ltd. October, 2005.

Azimuth. 2005b. Baseline Aquatic Ecosystem Report (BAER) – Meadowbank Gold Project. A report prepared by Azimuth Consulting Group Inc., Vancouver for Cumberland Resources Ltd. October, 2005.

CCME (Canadian Council of Ministers of the Environment) 2007. Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, 1999, updated December 2007.

CCME. 2002. Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life, 1999, updated 2002.

CCME. 1999. Polycyclic Aromatic Hydrocarbons (PAHs). Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life.

CCME. 1995. Protocol for the derivation of Canadian sediment quality guidelines for the protection of aquatic life. CCME EPC-98E. Prepared by Environment Canada, Guidelines Division, Technical Secretariat of the CCME Task Group on Water Quality Guidelines, Ottawa. [Reprinted in Canadian environmental quality guidelines, Chapter 6, Canadian Council of Ministers of the Environment, 1999, Winnipeg.]

Cumberland Resources Ltd. (Cumberland). 2005. Meadowbank Gold Project. Final Environmental Impact Statement. November, 2005.

EEM (Environmental Effects Monitoring). 2011. Metal Mining Environmental Effects Monitoring Technical Guidance Document. Can be viewed at Environment Canada's website: Link

EVS Environment Consultants. 1999. Fisheries evaluation of candidate reference lakes, Meadowbank Gold Project Nunavut, 1998. A report prepared for Cumberland Resources Ltd., Vancouver BC by EVS Environment Consultants, North Vancouver, April 1999. 60 pp.

Kalff, J., H.J. Kling, S.H. Holmgren, and H.E. Welch, 1975. Phytoplankton, phytoplankton growth and biomass cycles in an unpolluted and in a polluted polar lake. Verh. int. Verein. Limnol. 19: 487–495.

Kasprzak, P., J. Padisák, R. Koschel, L. Krienitz, and F. Gervais. 2008. Chlorophyll *a* concentration across a trophic gradient of lakes: An estimator of phytoplankton biomass? *Limnologica.* 38: 327–338.

McKee P., R. Watters, and D.L. Lush. 1989. Aquatic Baseline Conditions – Kiggavik Project Area. Environmental Assessment – Supporting Document No. 4. Report prepared by Beak Consultants Limited for Urangesellschaft Canada Limited. December 1989.

Science Advisory Board (SAB) for Contaminated Sites in British Columbia. 2008. Guidance for Detailed Ecological Risk Assessments (DERA) in British Columbia. British Columbia, Canada.

Smith, R. 2013. Integrated Water Quality Report 2012. Monaghan and Louth. Published by the Environmental Protection Agency, Ireland. Edited by Ray Smith.

Weber-Scannell, P.K and L.K. Duffy. 2007. Effects of Total Dissolved Solids on Aquatic Organisms: A Review of Literature and Recommendation for Salmonid Species. Amer. J. Environ. Sci. 3: 1-6.

Welch, H.E., J.A. Legault, and H.J. Kling. 1989. Phytoplankton, nutrients, and primary production in fertilized and natural lakes at Saqvaqjuac, N.W.T. Can. J. Fish. Aquat. Sci. 46: 90-107.

Wetzel, R.G. 1983. Limnology. W.B. Saunders Co. Toronto Ont. 743 pp.

WLWB. 2013. AEMP - Version 3.1 – Response Framework. Decision from Wek'èezhìi Land and Water Board Meeting of August 12, 2013. File W2009L2-0001 (Type "A"). Letter to Diavik Diamond Mine Inc., Yellowknife, NWT, Canada.

APPENDICES

APPENDIX A – WATER QUALITY PLOTS

Appendix A1 – Meadowbank Water Quality Plots, 2006-2017

LIST OF FIGURES – APPENDIX A1

Figure A1-1. Carbonate alkalinity (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

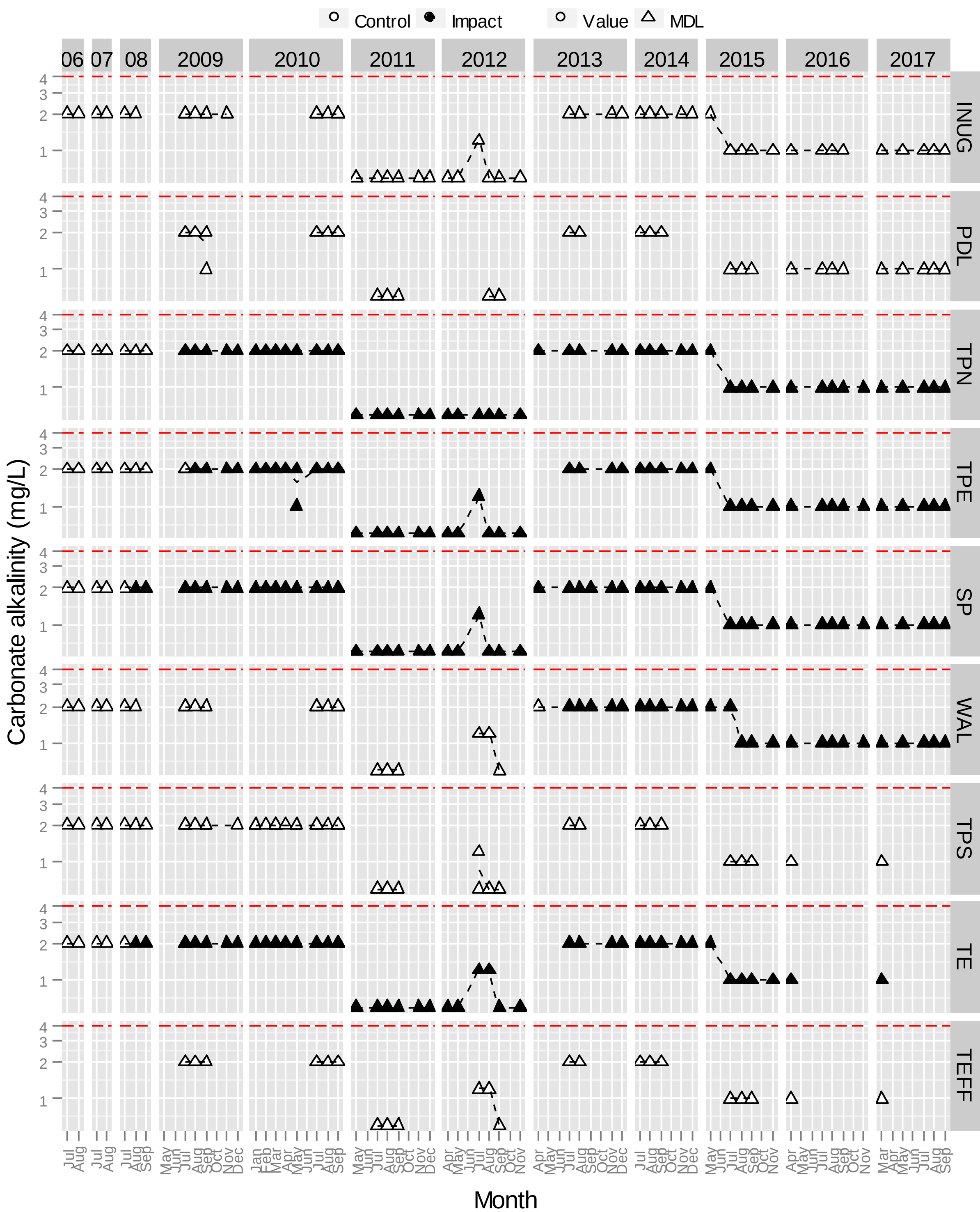


Figure A1-2. Nitrite-N (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

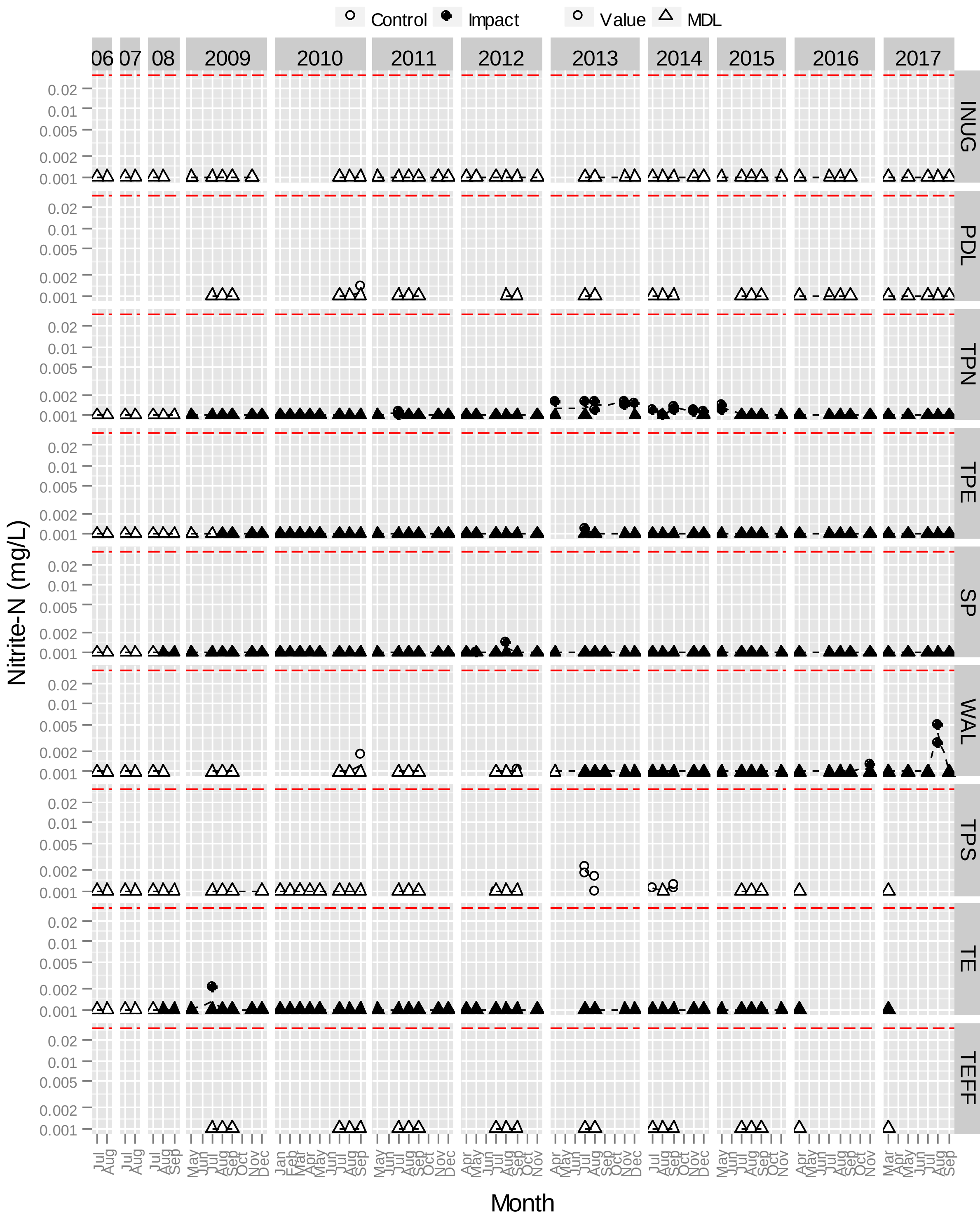


Figure A1-3. Orthophosphate (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

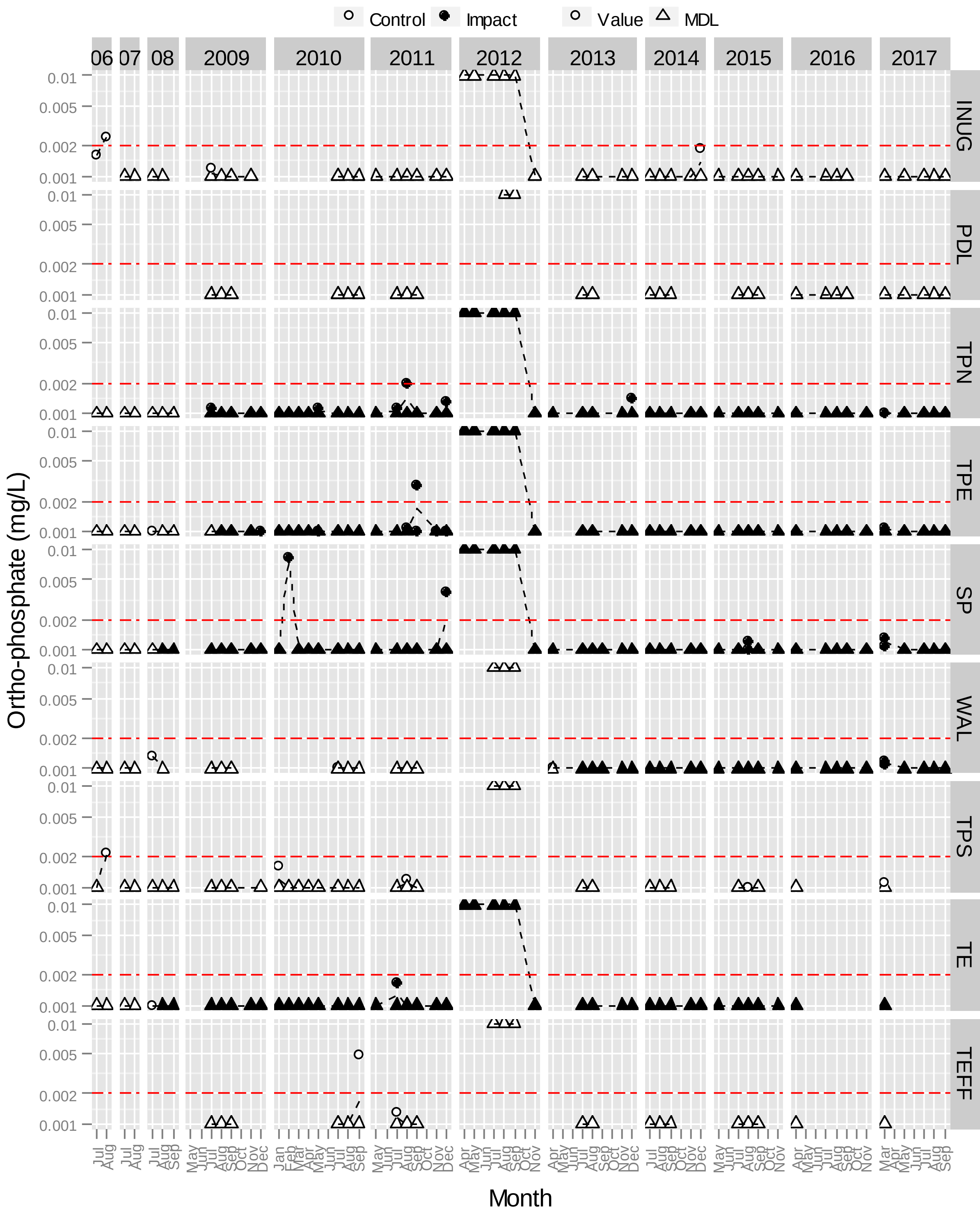


Figure A1-4. Total cyanide (mg/L) in water samples from Meadowbank study lakes since 2014.

Note: No trigger for total cyanide. Detection limit lowered from 0.005 mg/L in 2014 to 0.001 mg/L in 2015.

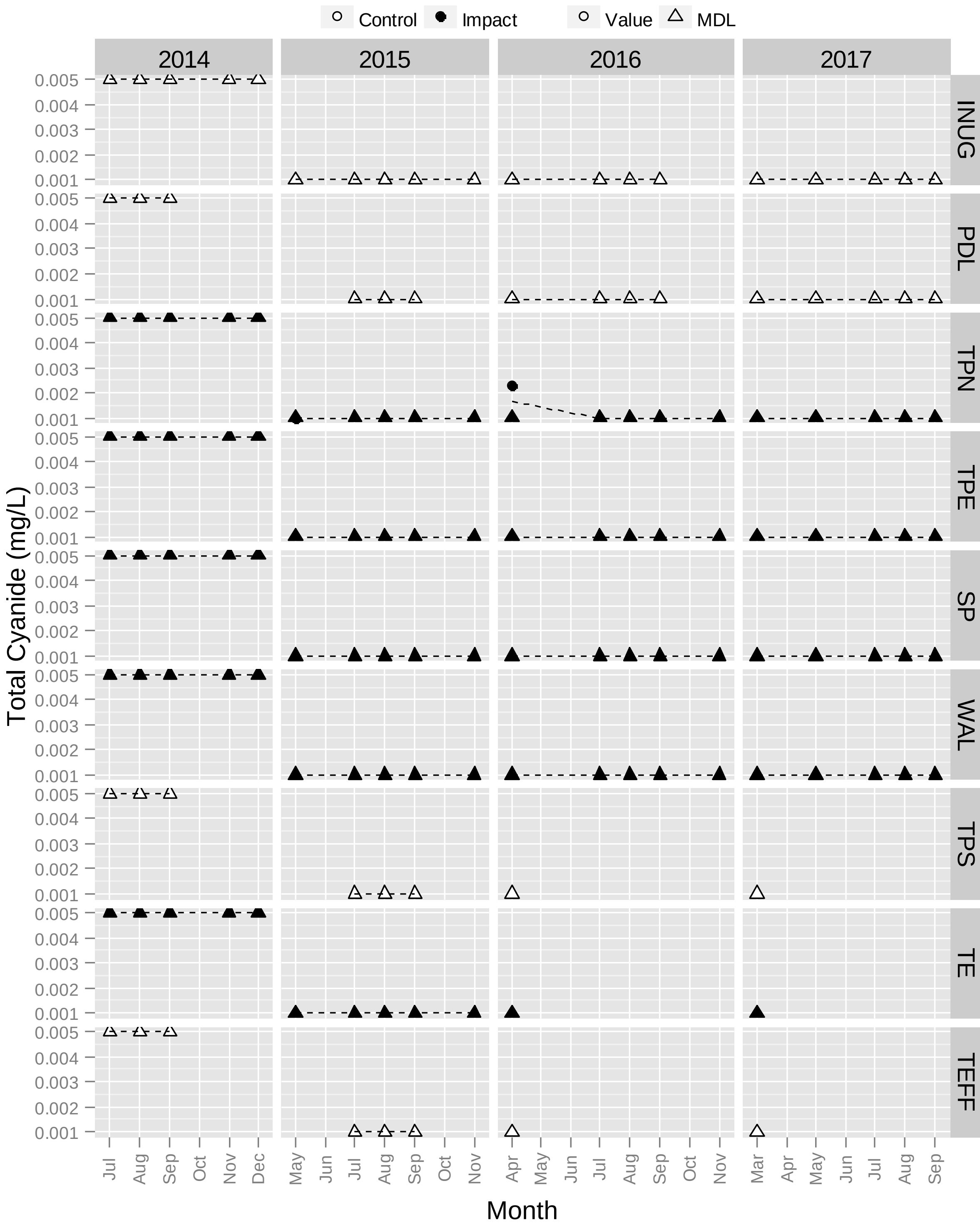


Figure A1-5. Free cyanide (mg/L) in water samples from Meadowbank study lakes since 2014.

Note: No trigger for free cyanide. Detection limit lowered from 0.005 mg/L in 2014 to 0.001 mg/L in 2015.

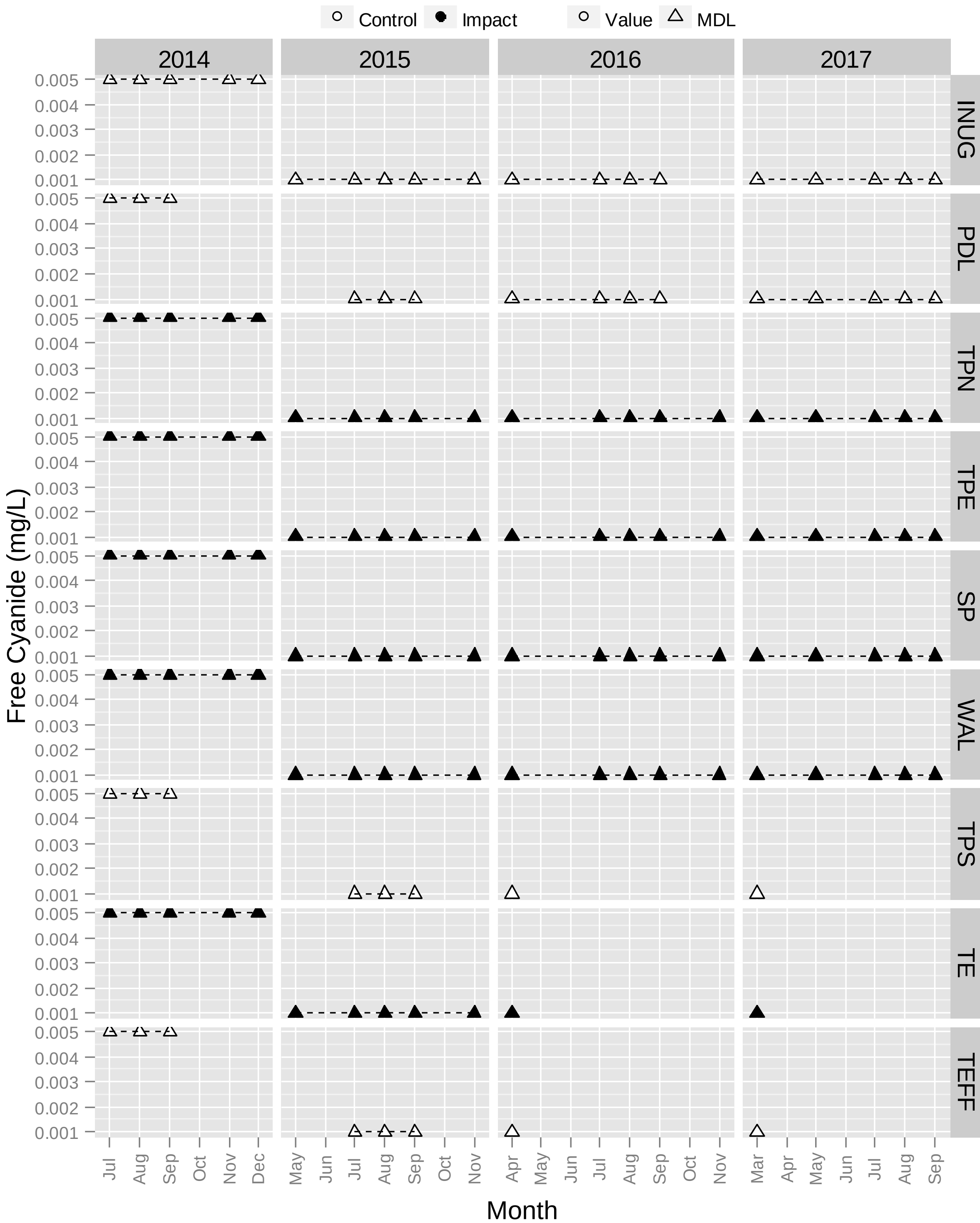


Figure A1-6. Total antimony (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

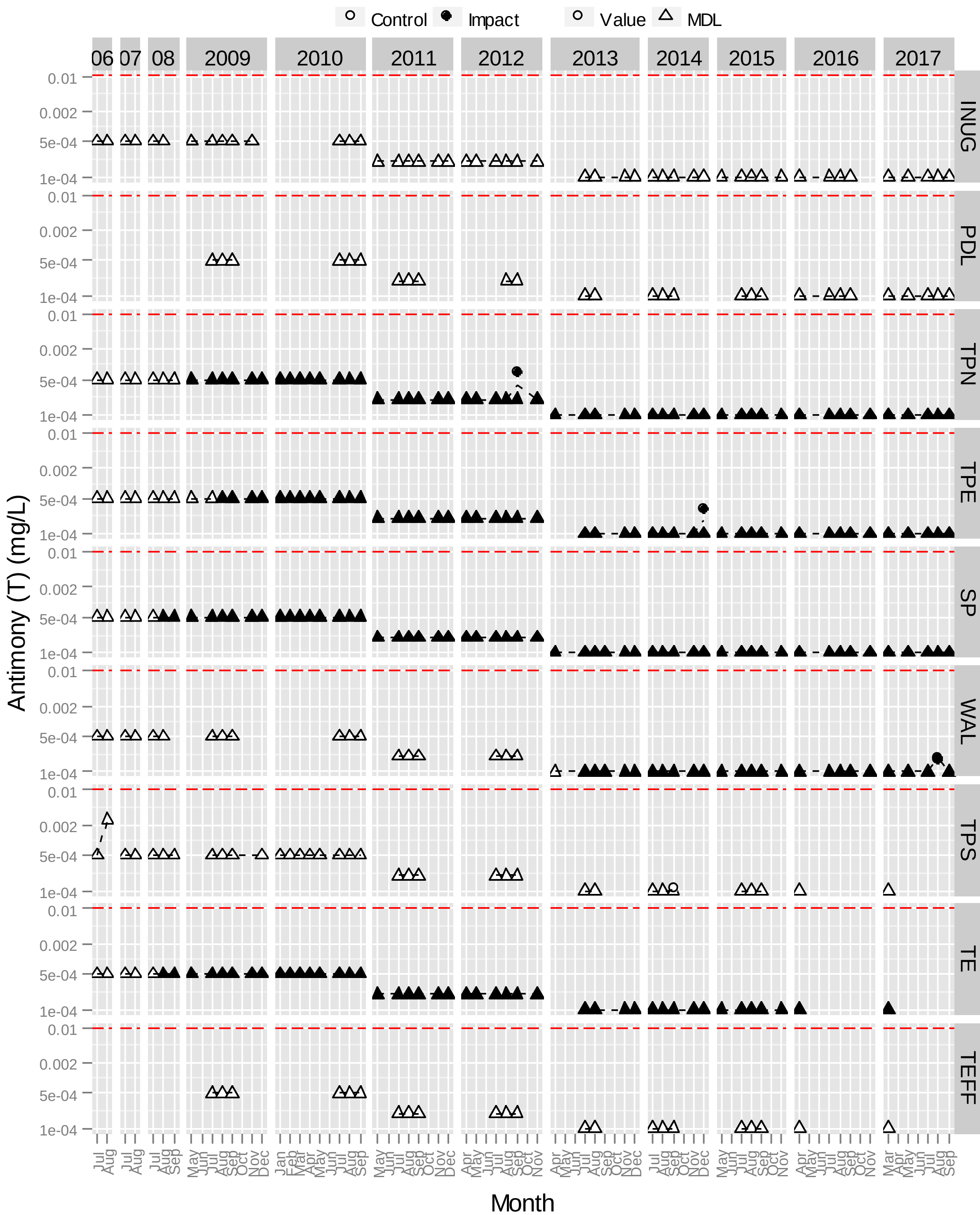


Figure A1-7. Total beryllium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

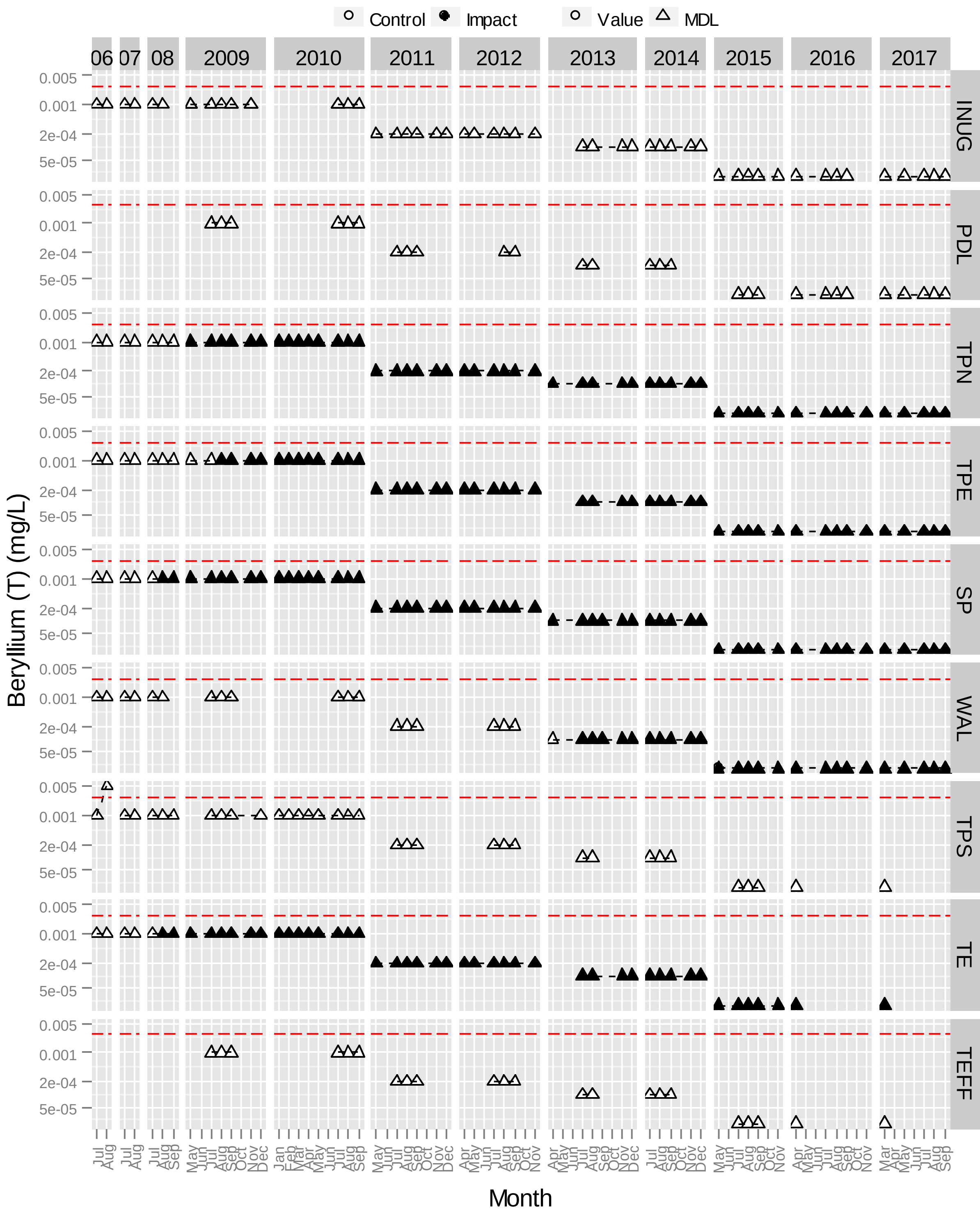


Figure A1-8. Total boron (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

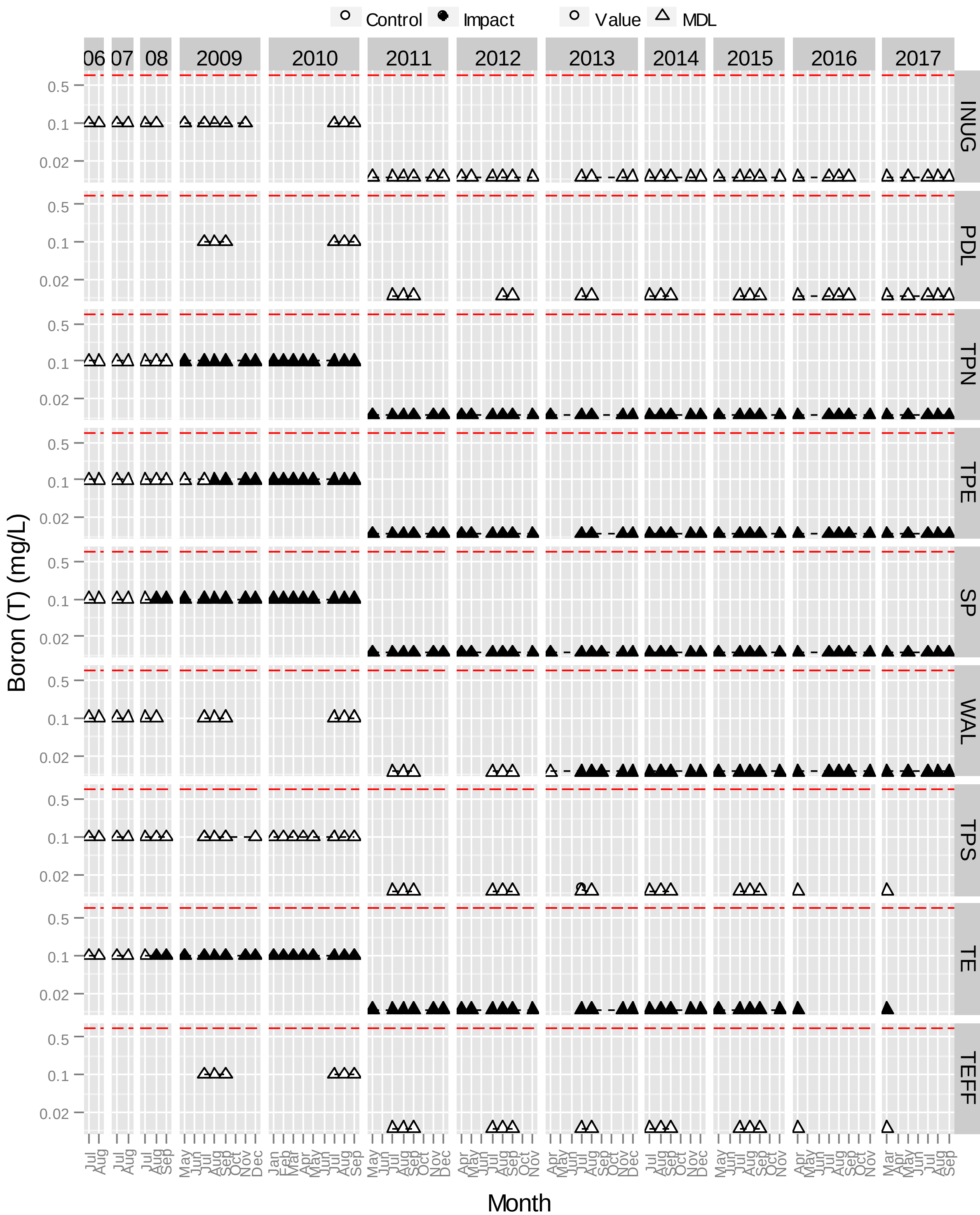


Figure A1-9. Total cadmium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

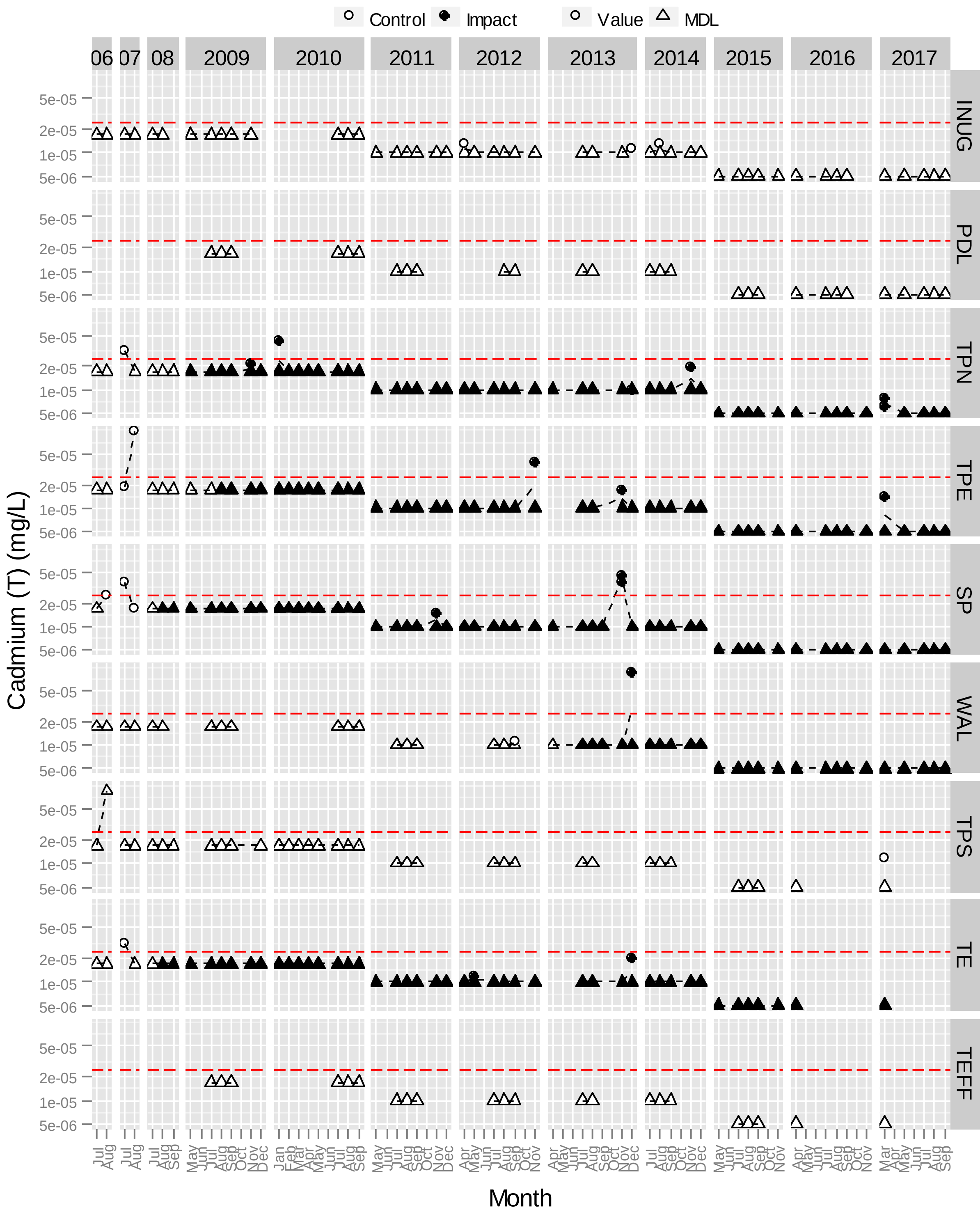


Figure A1–10. Total lead (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

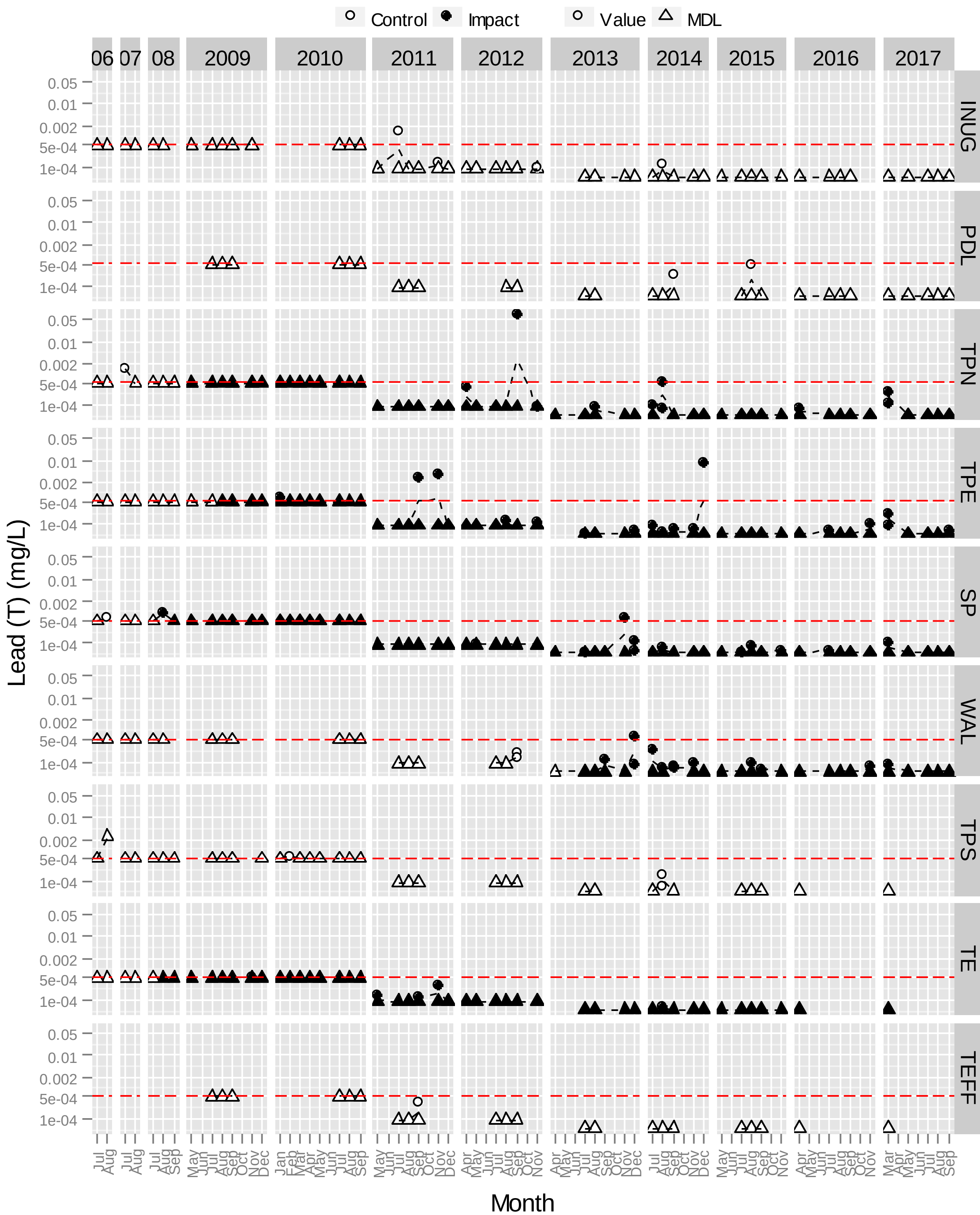


Figure A1–11. Total lithium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

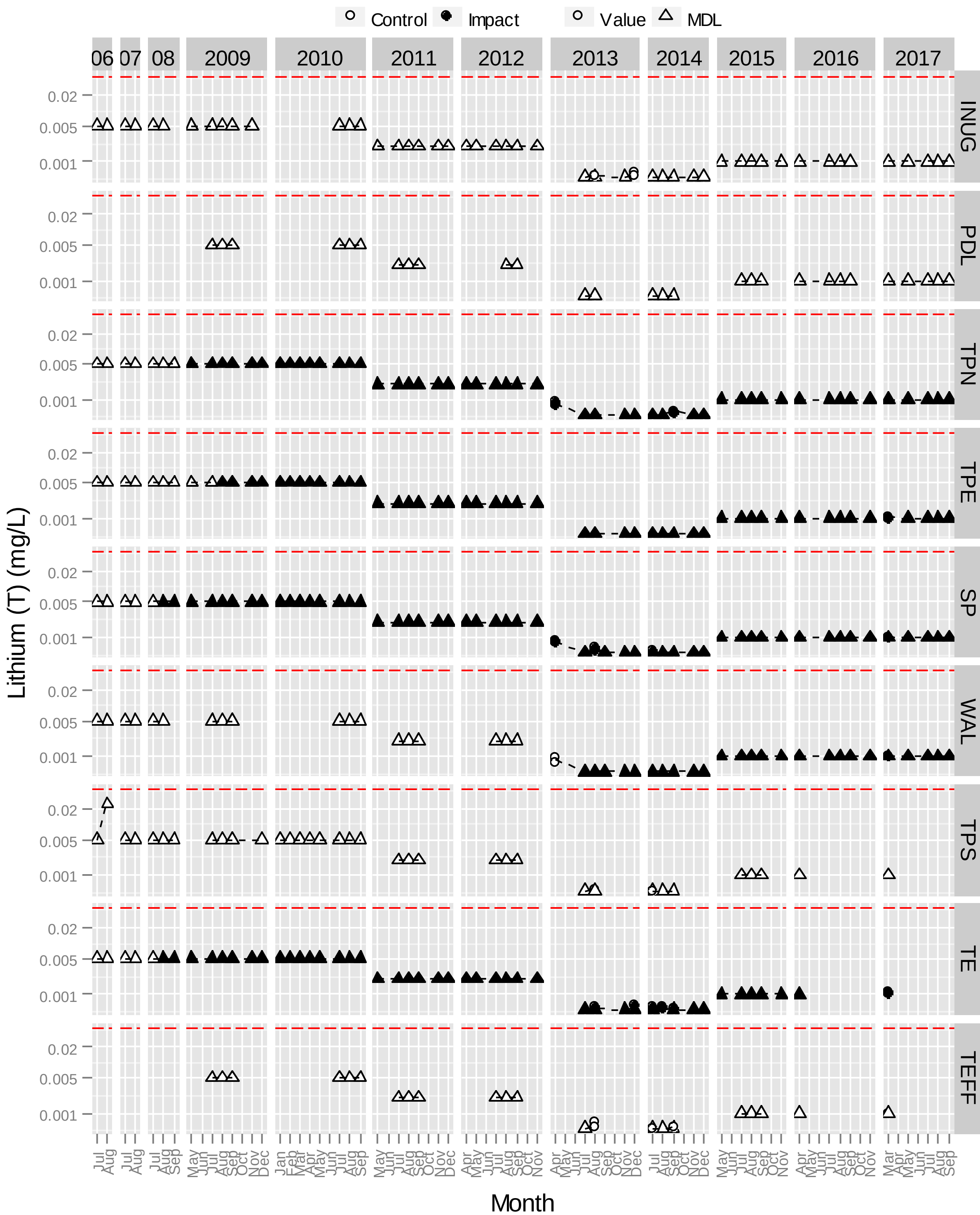


Figure A1–12. Total mercury (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

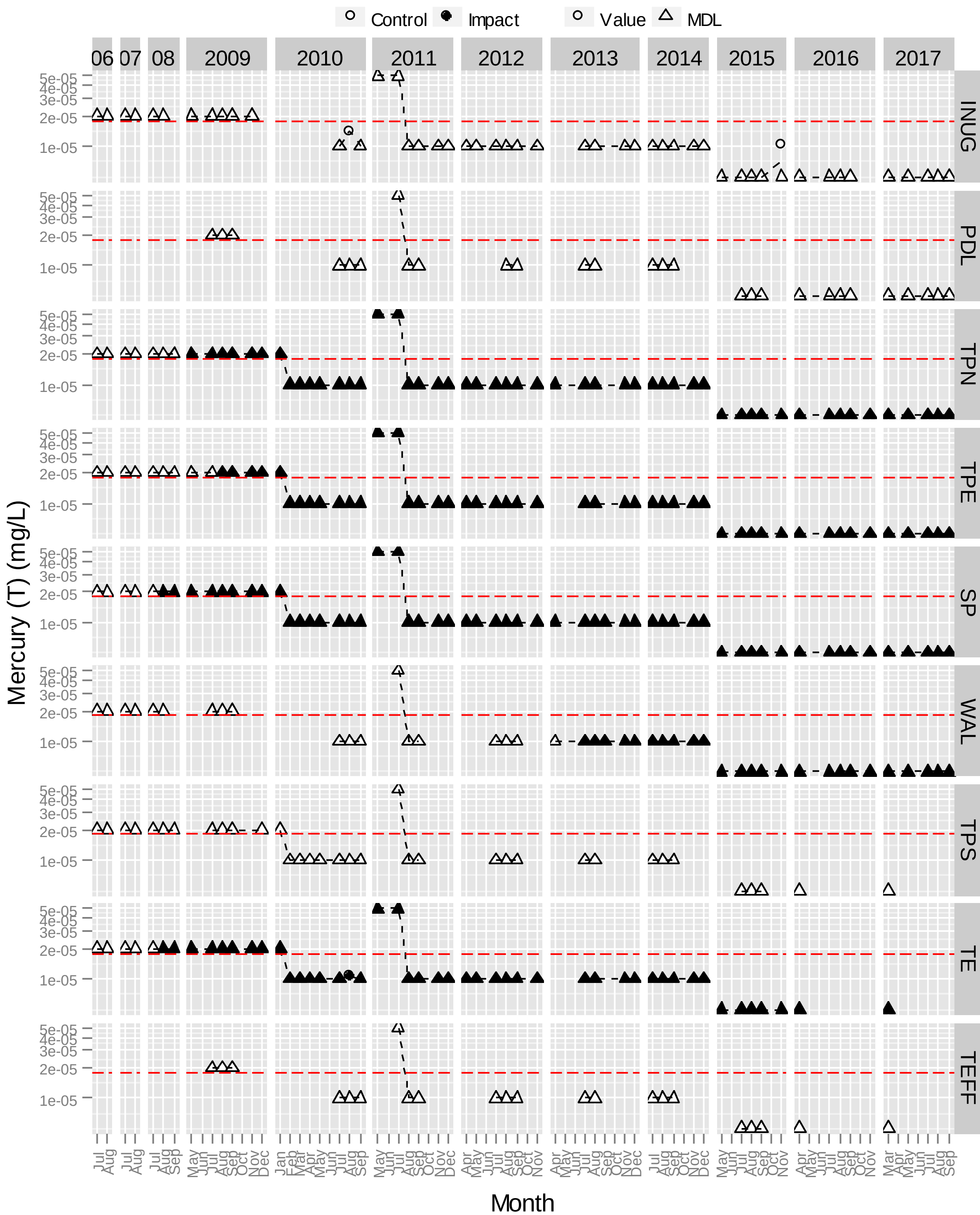


Figure A1–13. Total nickel (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

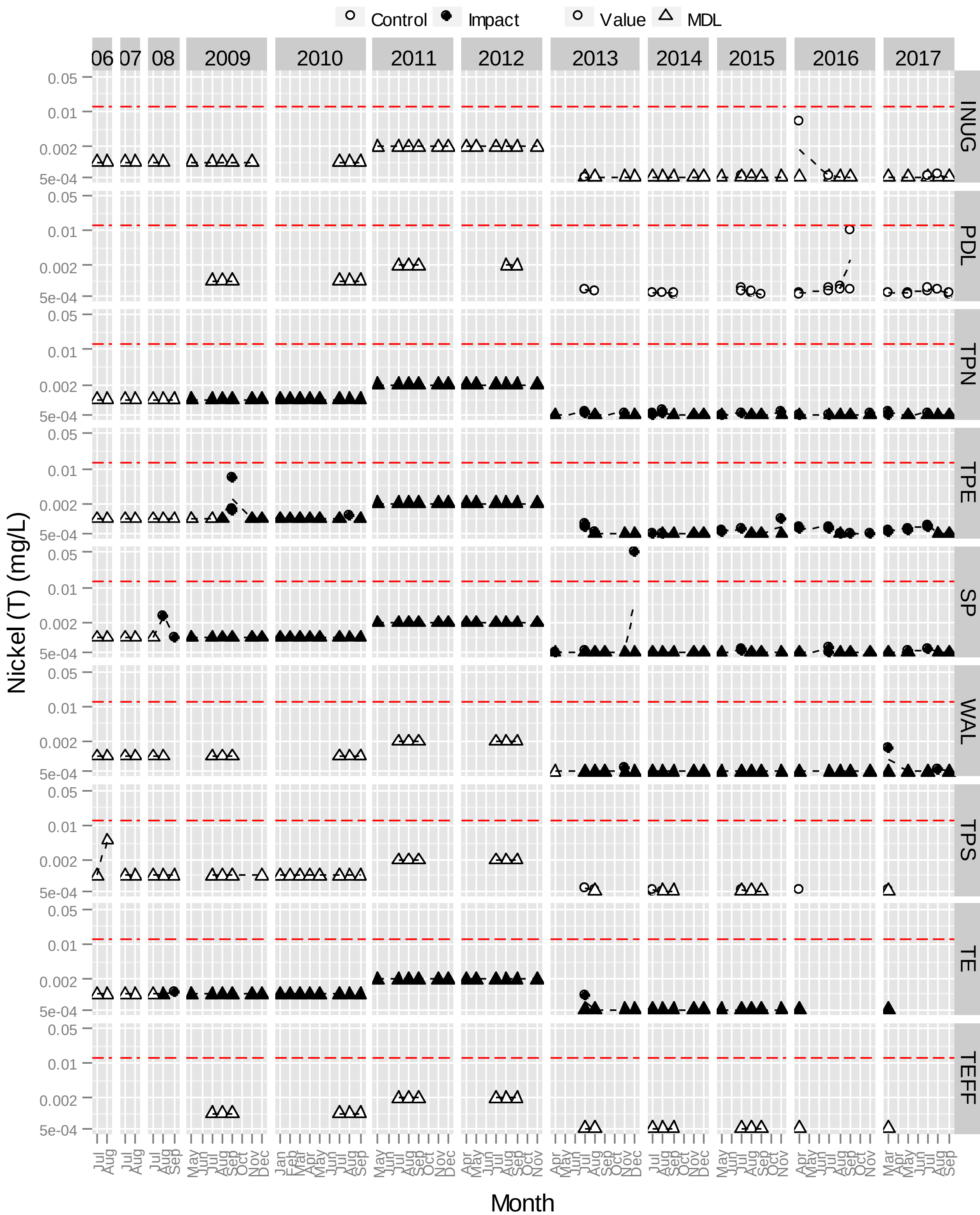


Figure A1–14. Total selenium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

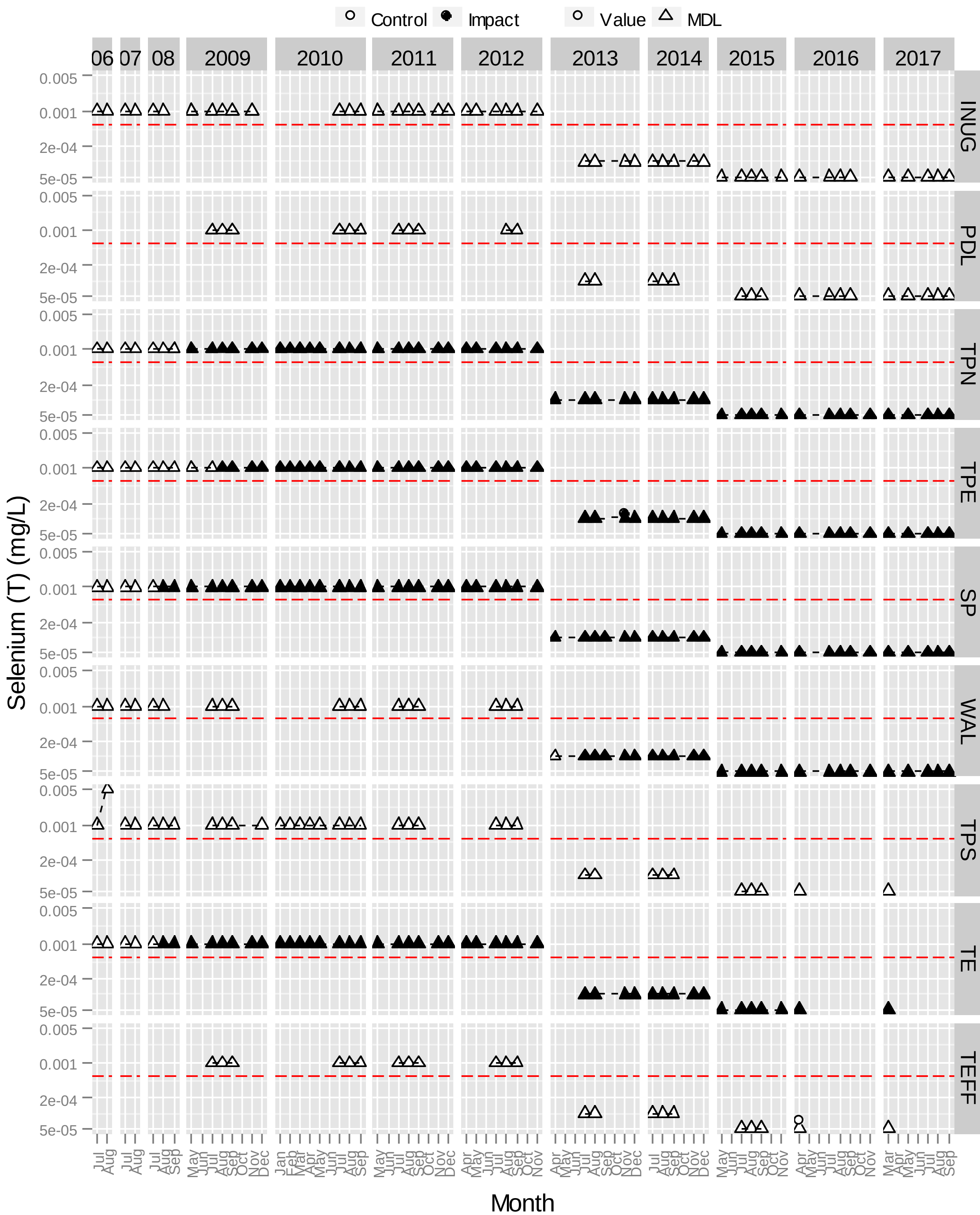


Figure A1–15. Total thallium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

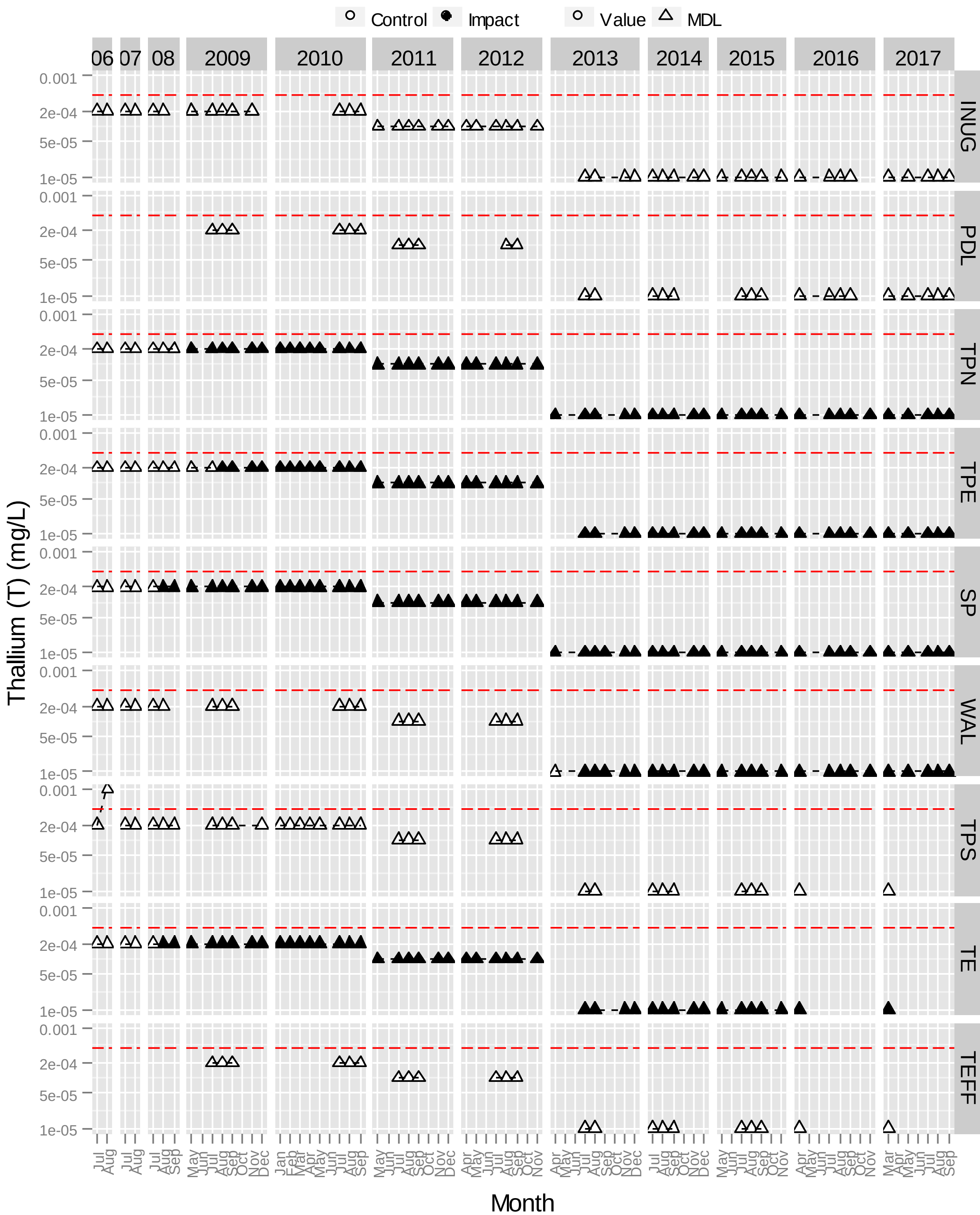


Figure A1–16. Total tin (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

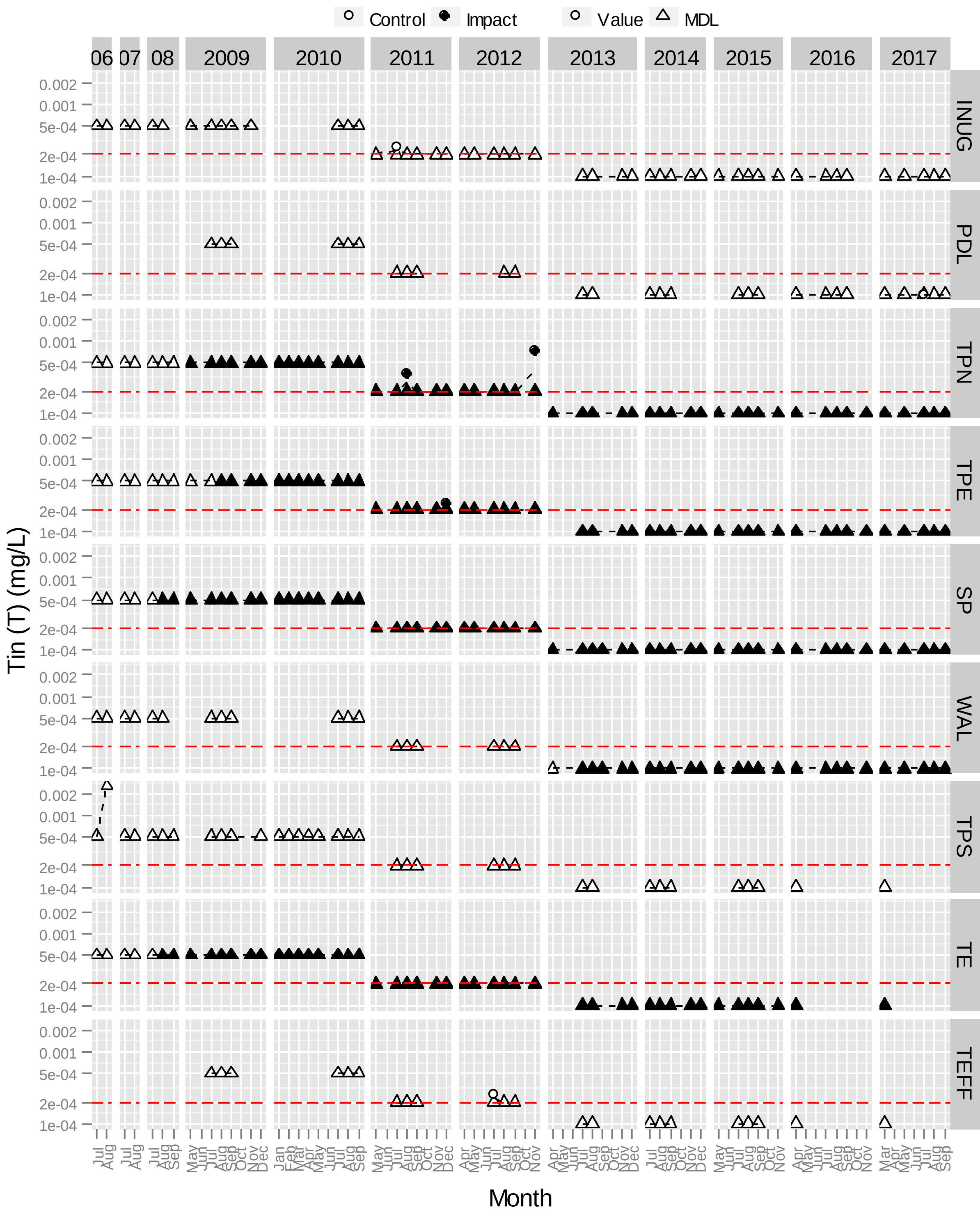


Figure A1–17. Total titanium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

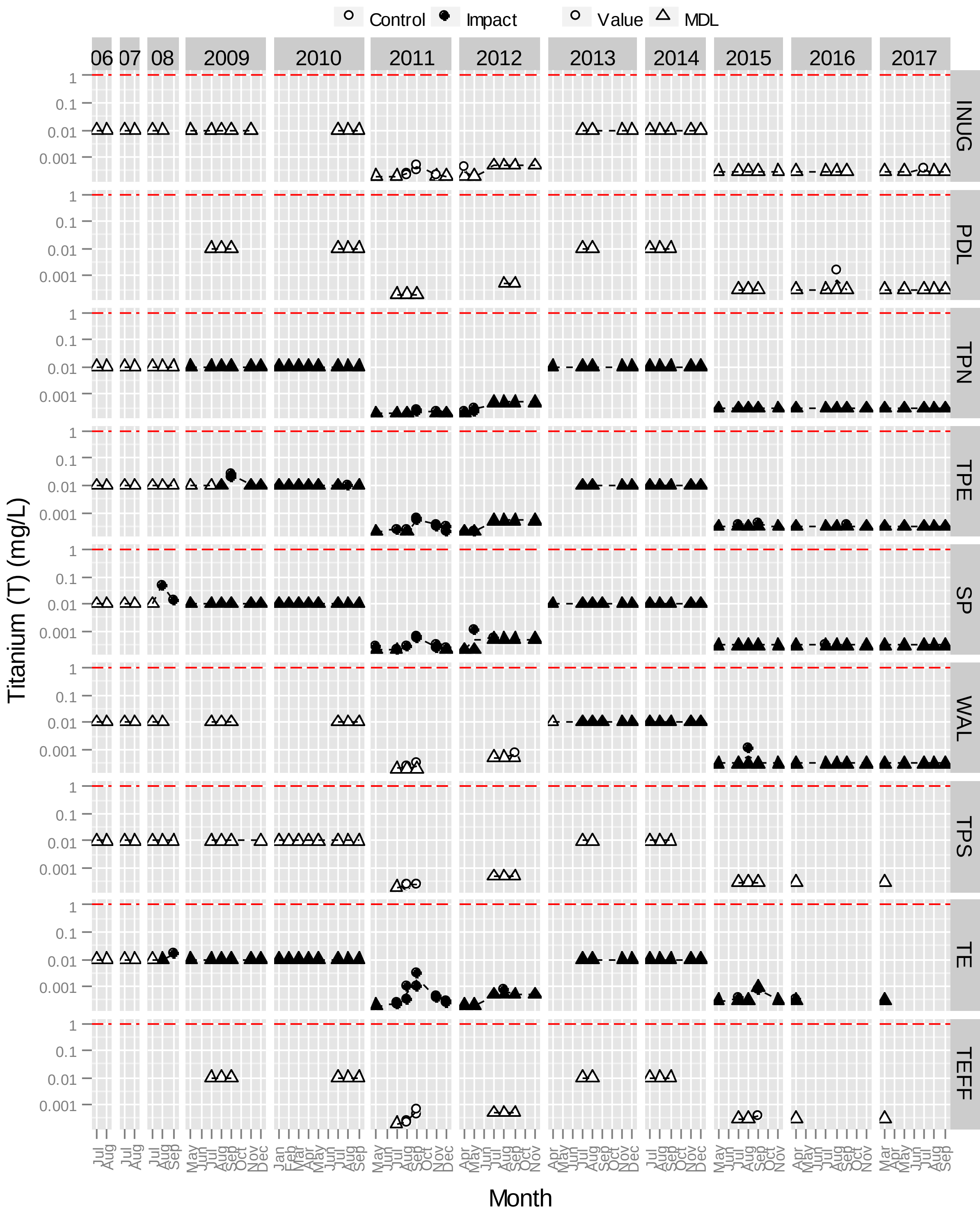


Figure A1–18. Total vanadium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

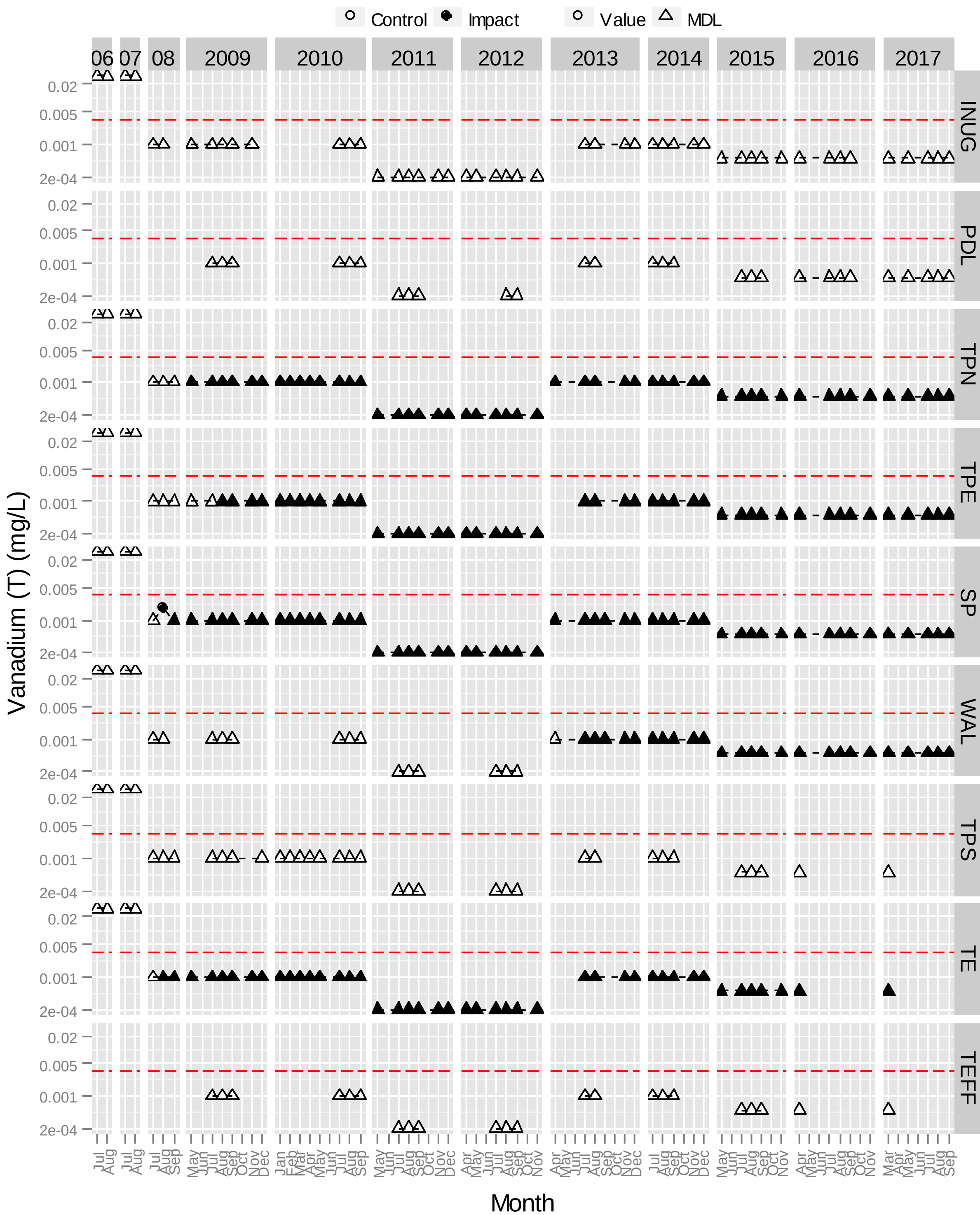


Figure A1–19. Total zinc (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

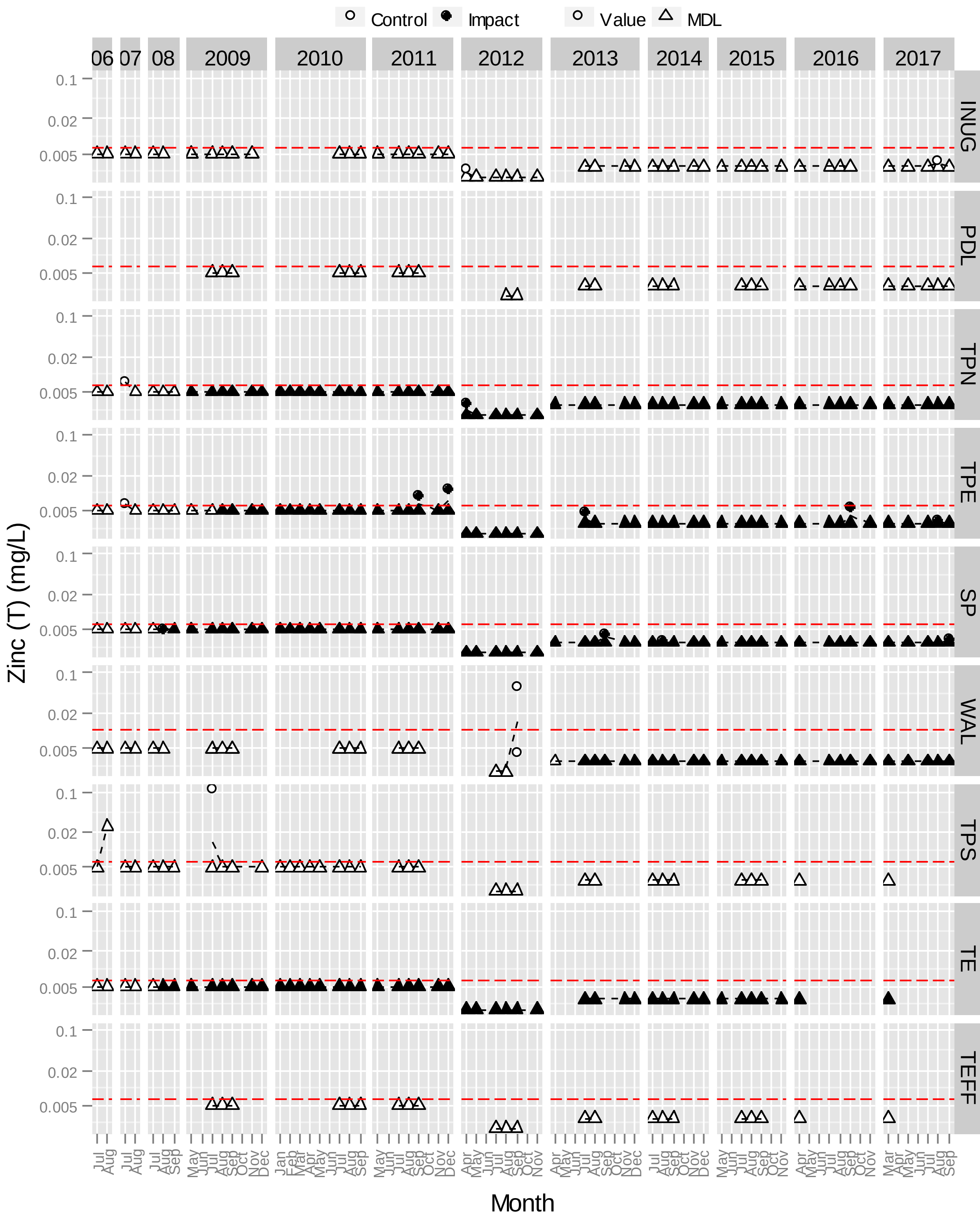


Figure A1–20. Dissolved antimony (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

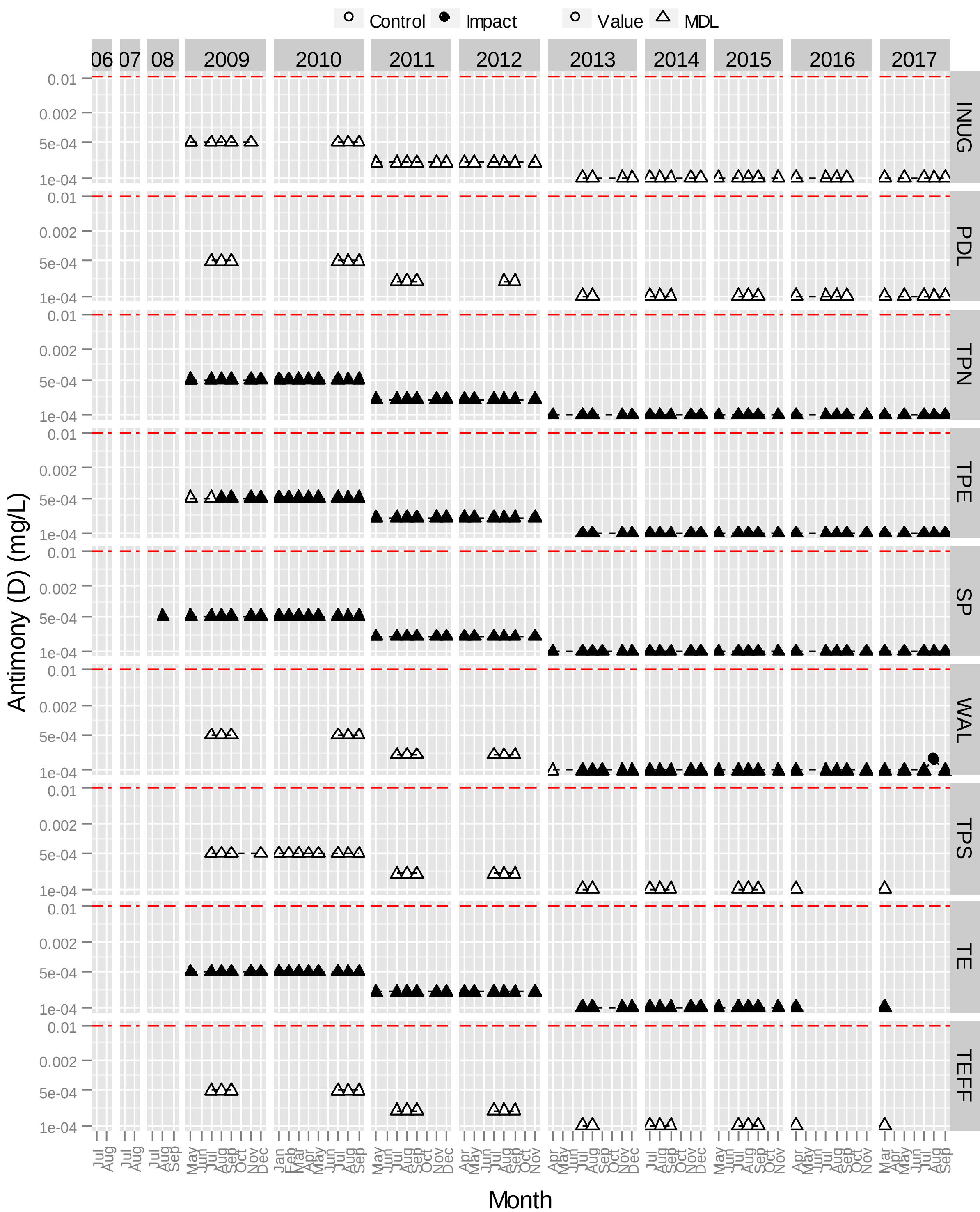


Figure A1–21. Dissolved beryllium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

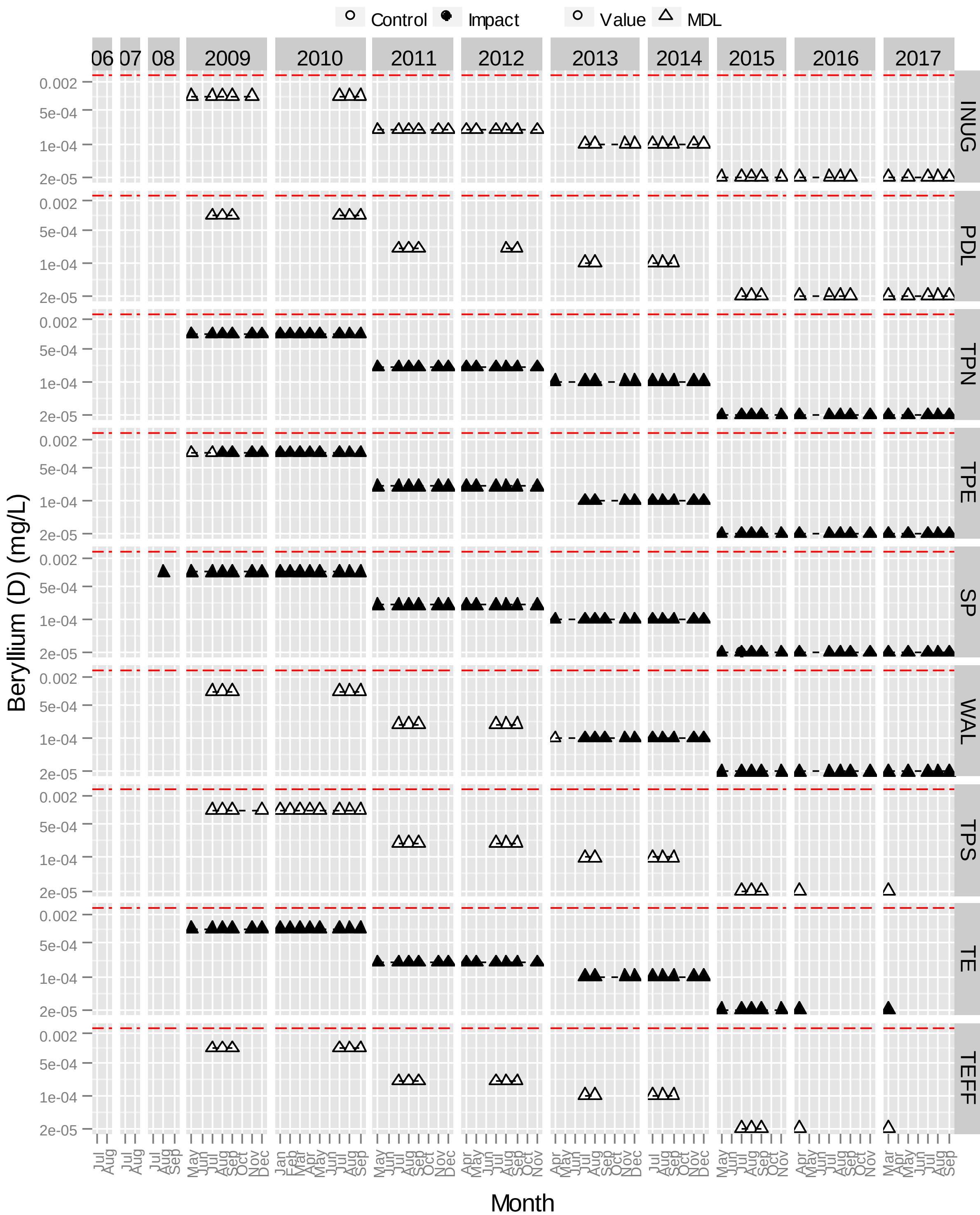


Figure A1–22. Dissolved boron (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

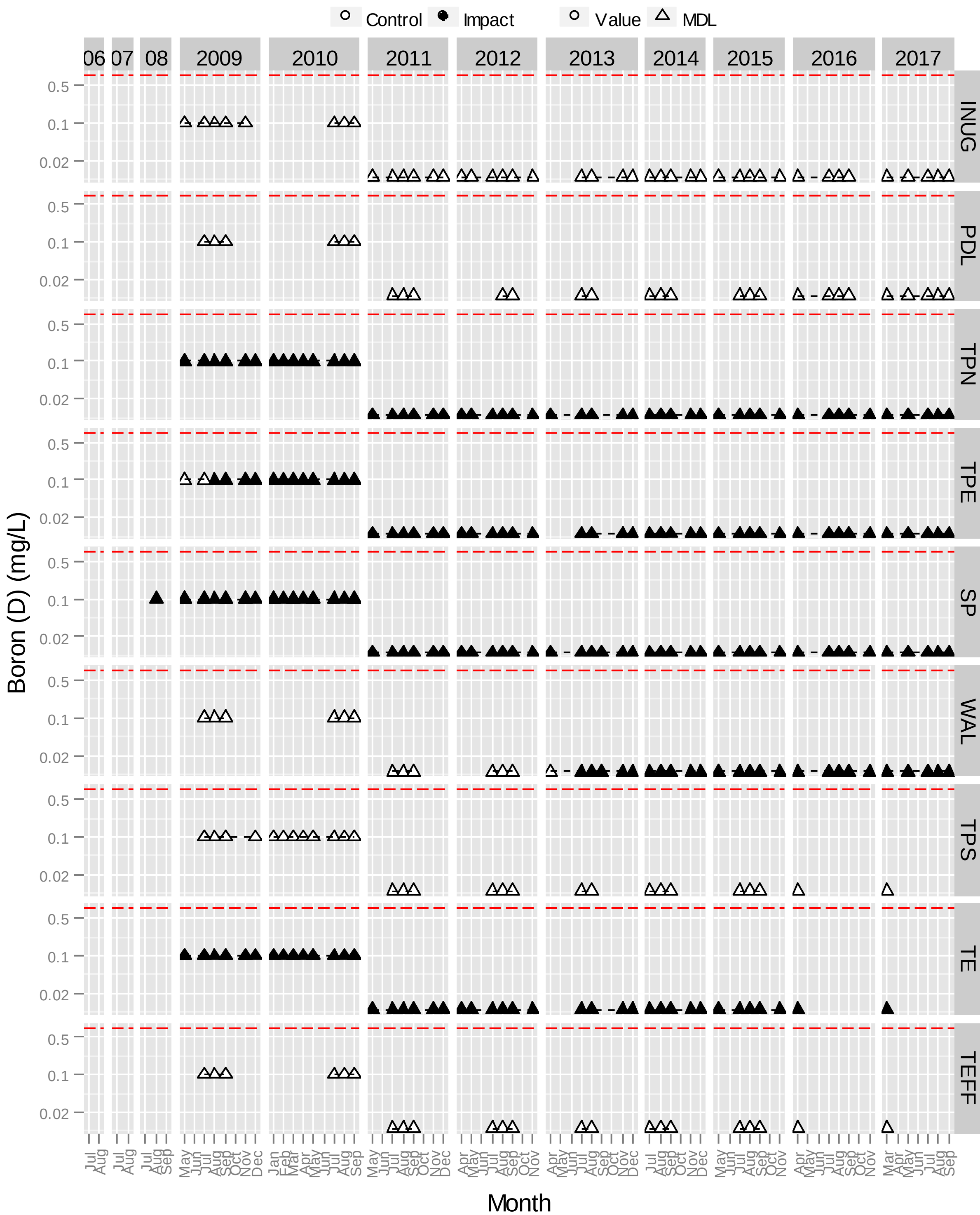


Figure A1–23. Dissolved cadmium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

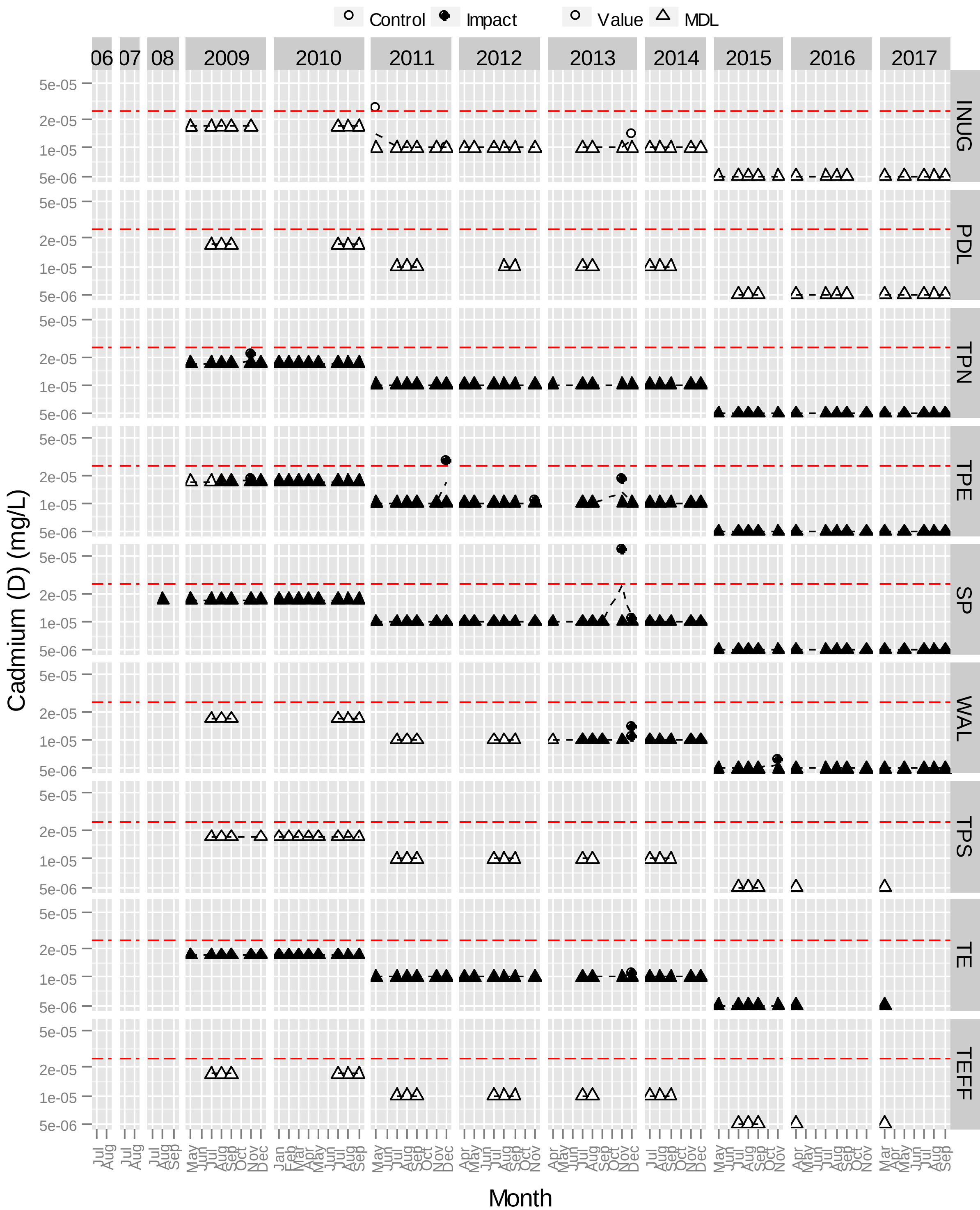


Figure A1–24. Dissolved chromium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

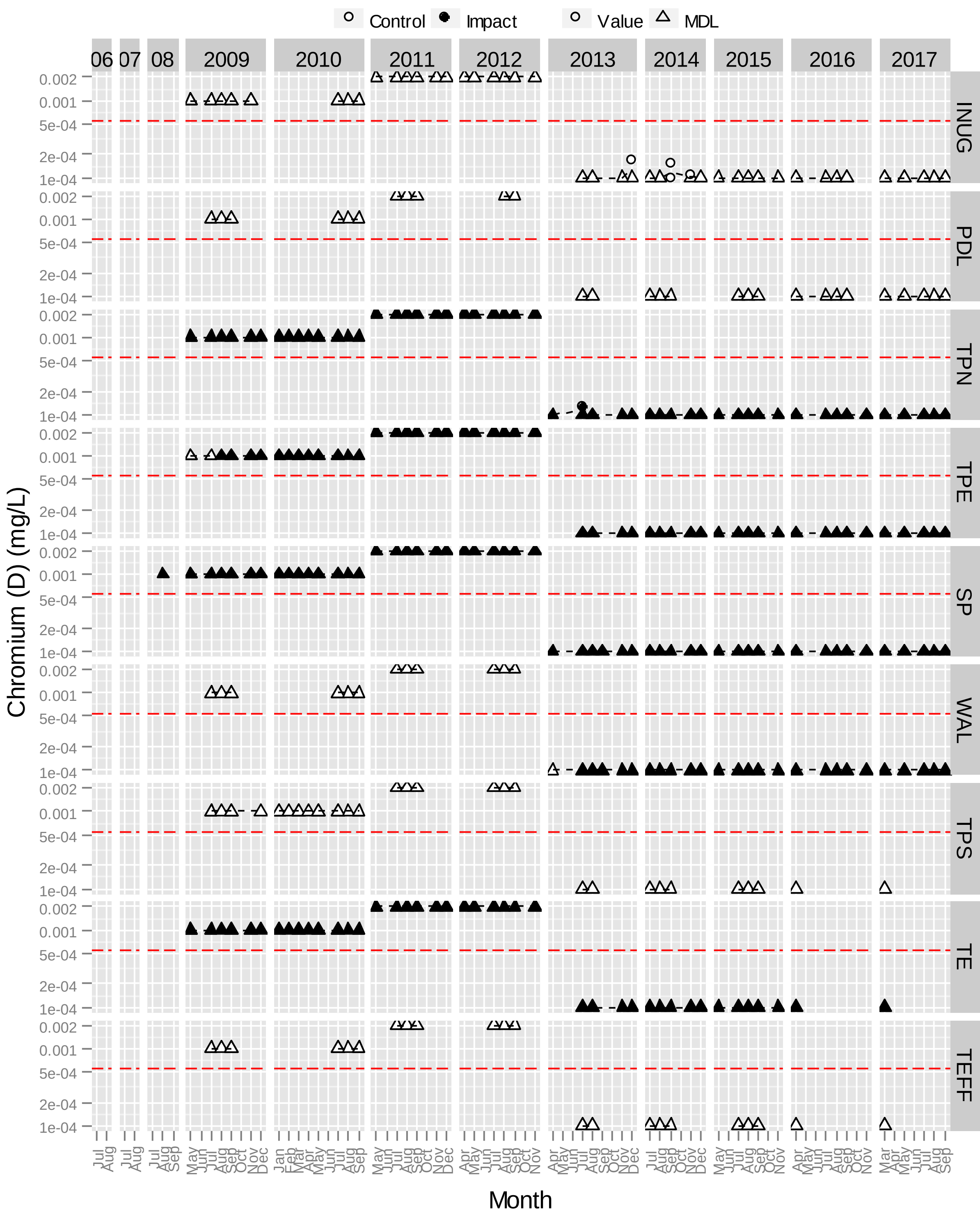


Figure A1–25. Dissolved iron (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

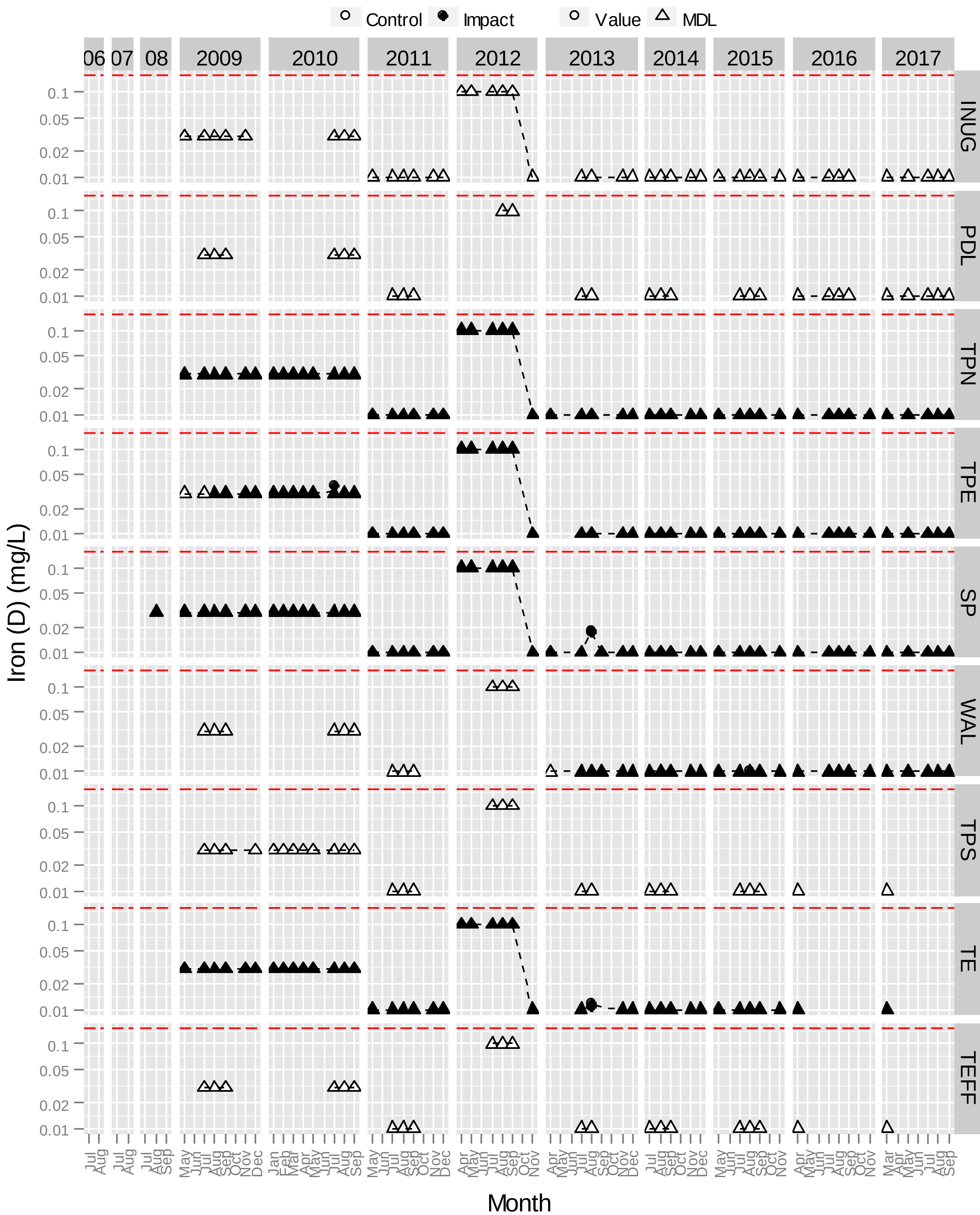


Figure A1–26. Dissolved lead (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

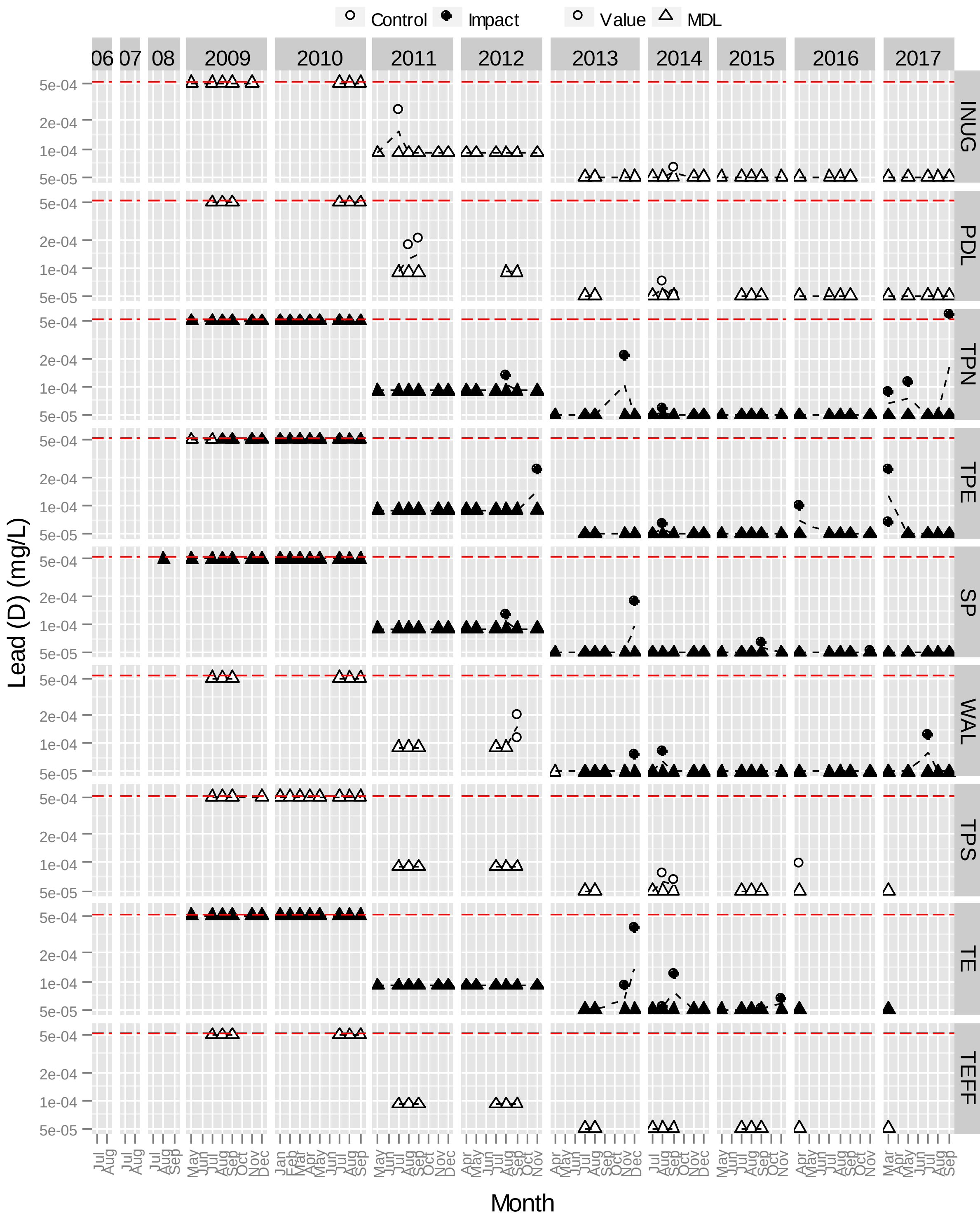


Figure A1–27. Dissolved lithium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

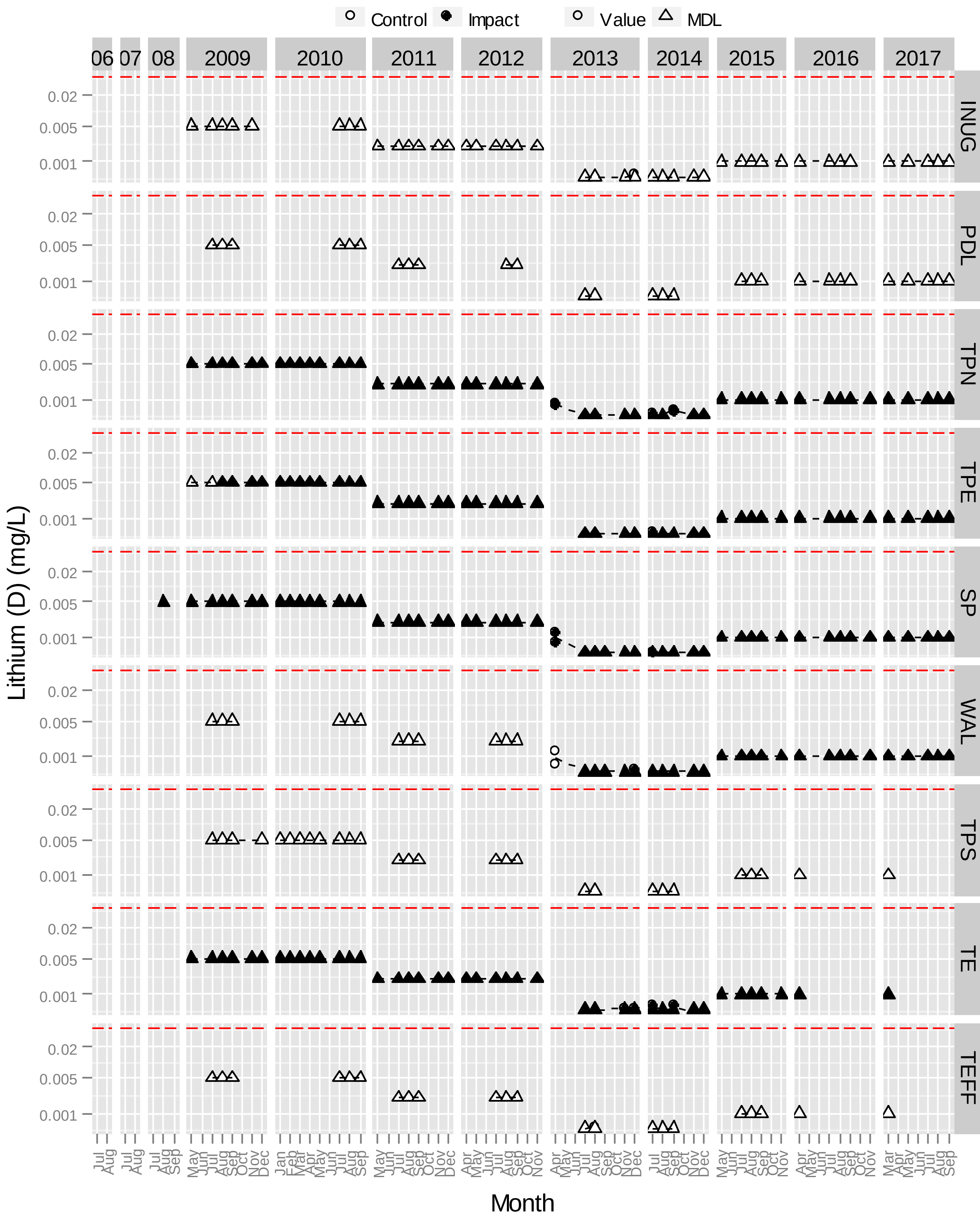


Figure A1–28. Dissolved mercury (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

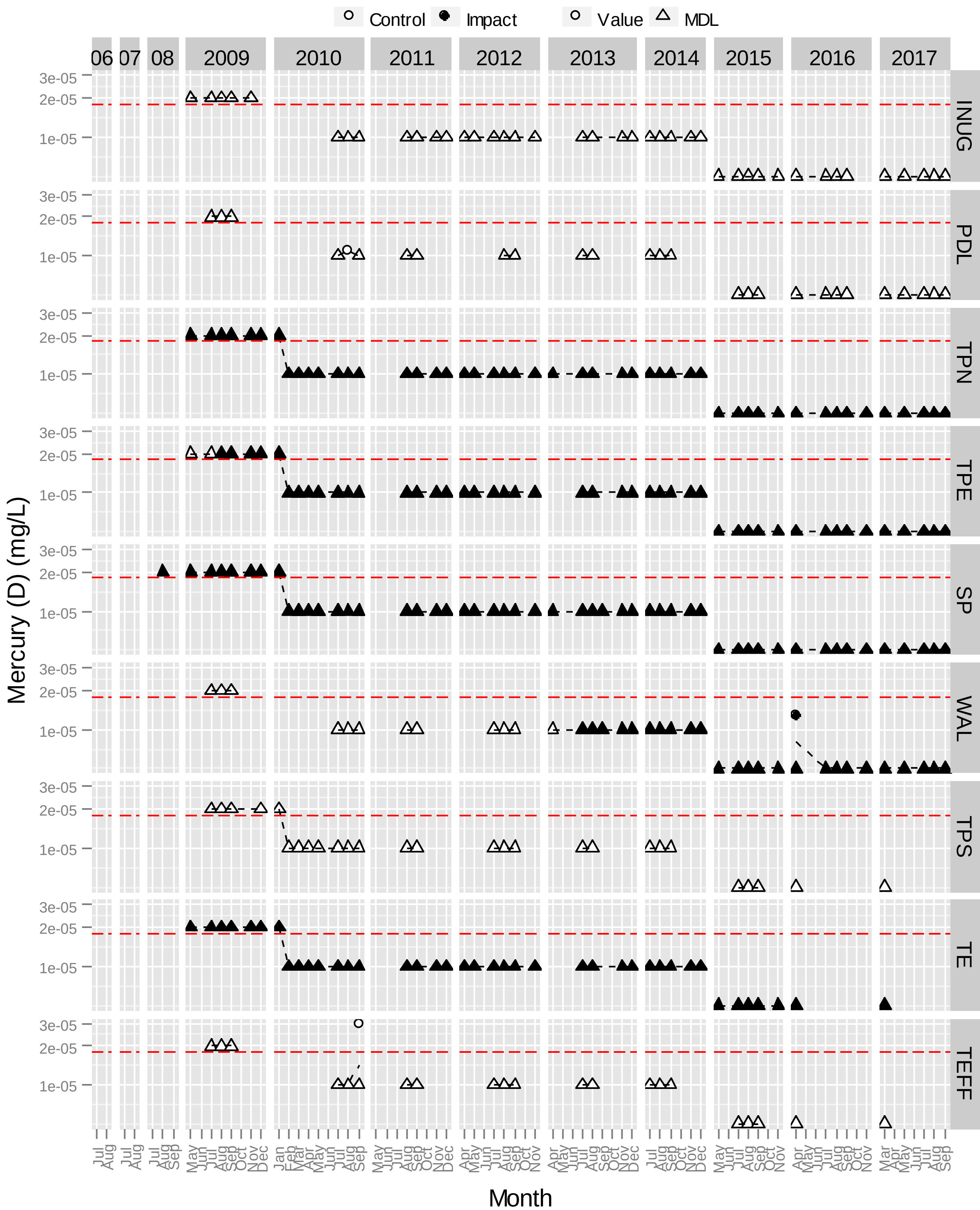


Figure A1–29. Dissolved nickel (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

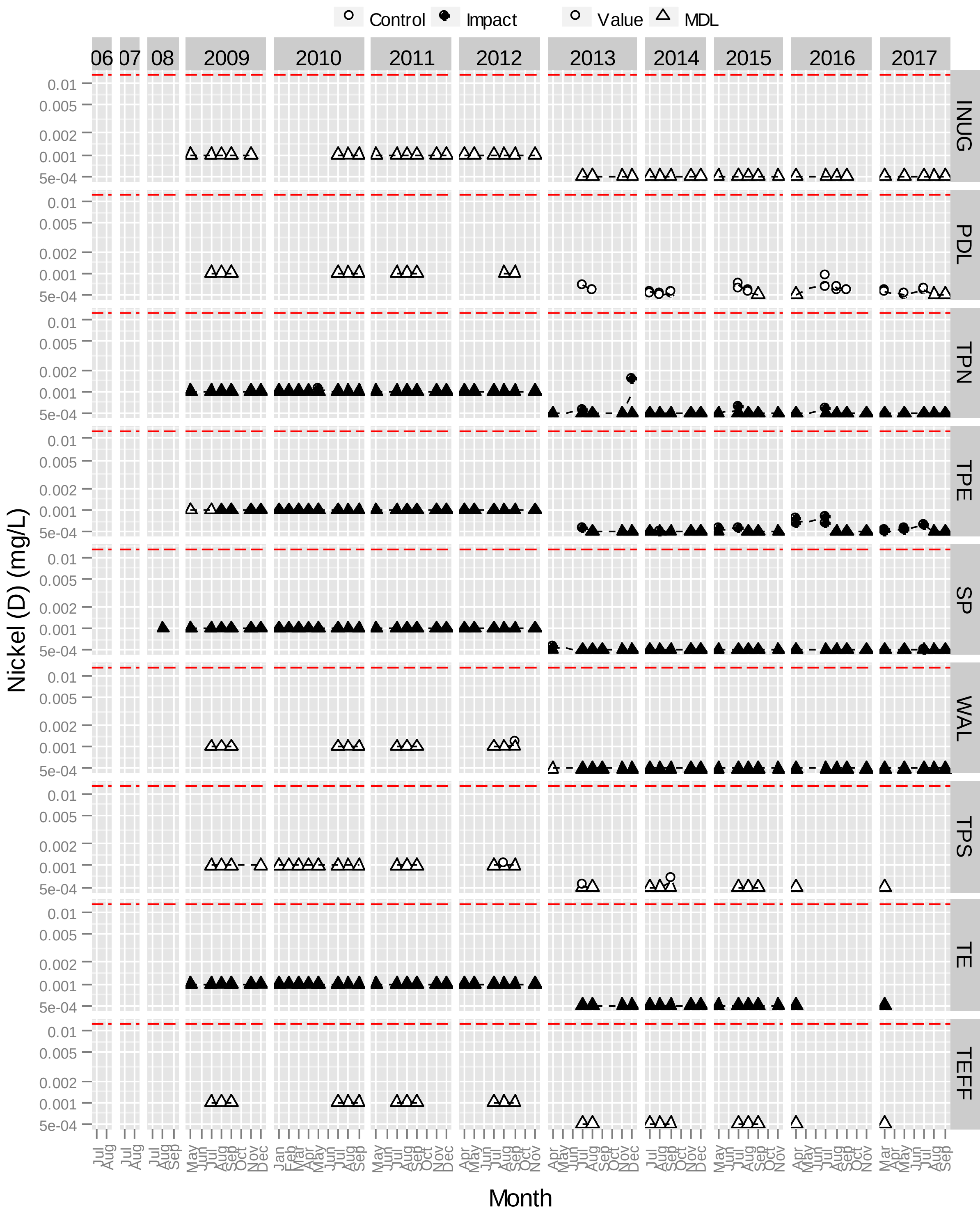


Figure A1–30. Dissolved selenium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

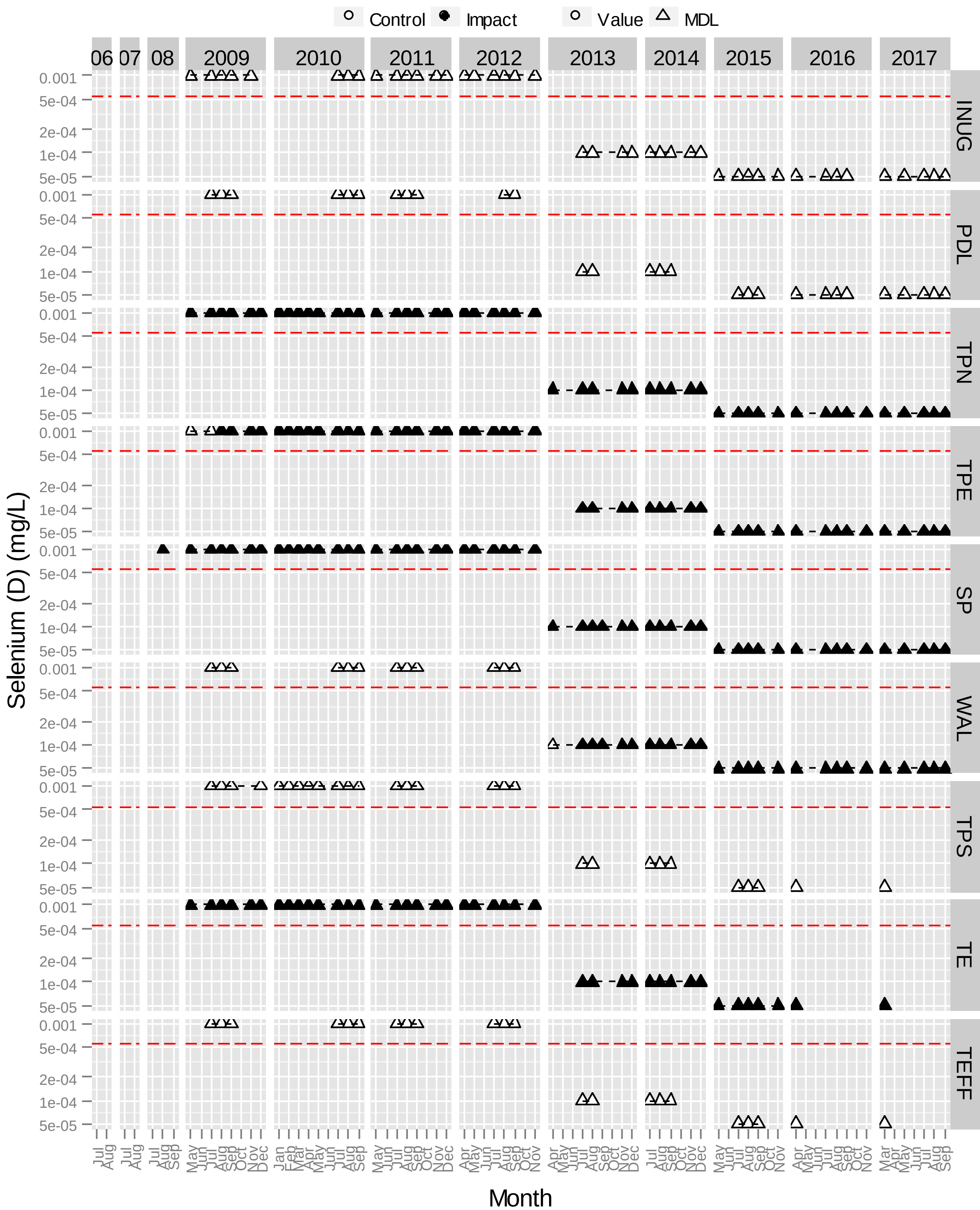


Figure A1–31. Dissolved thallium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

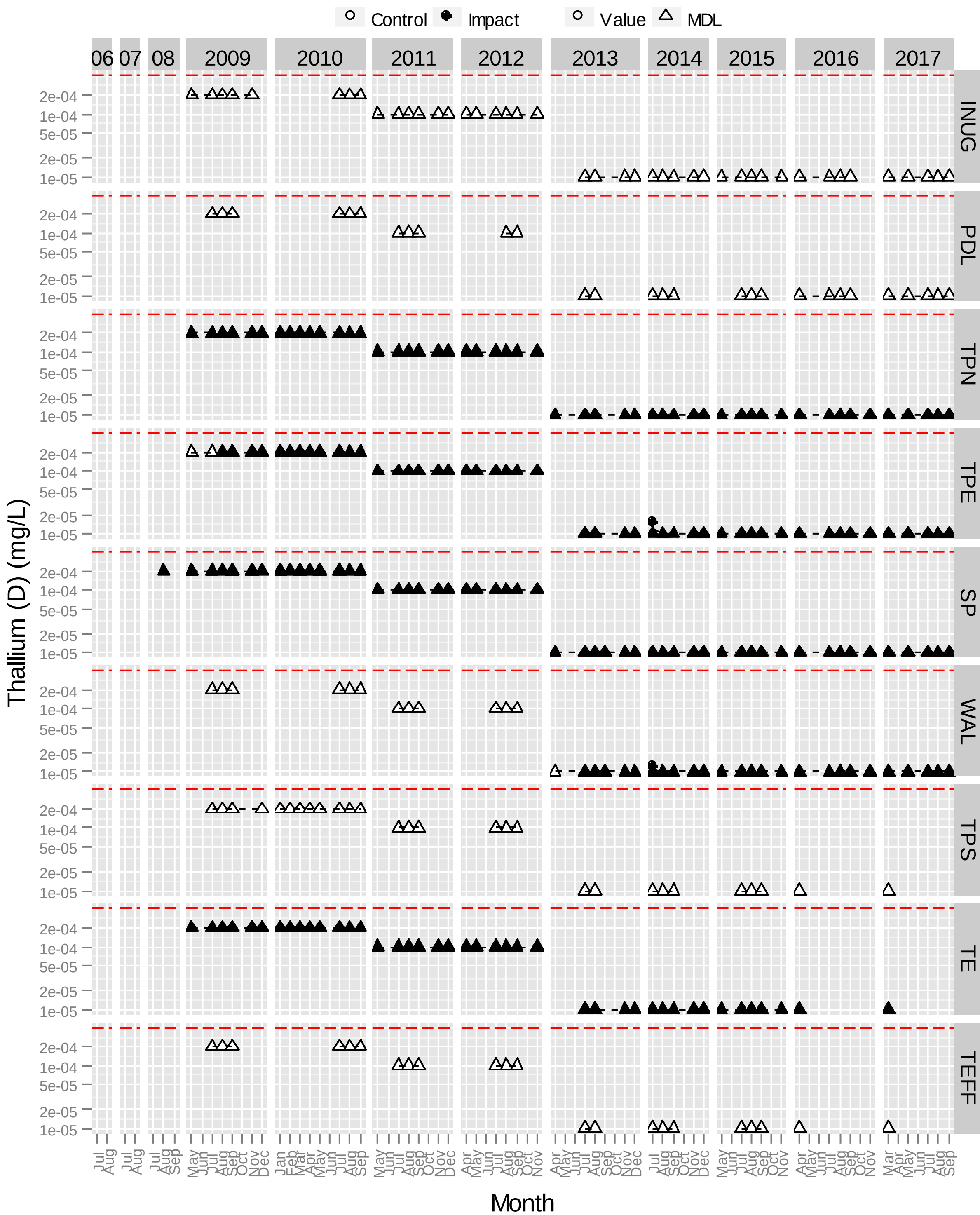


Figure A1–32. Dissolved tin (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

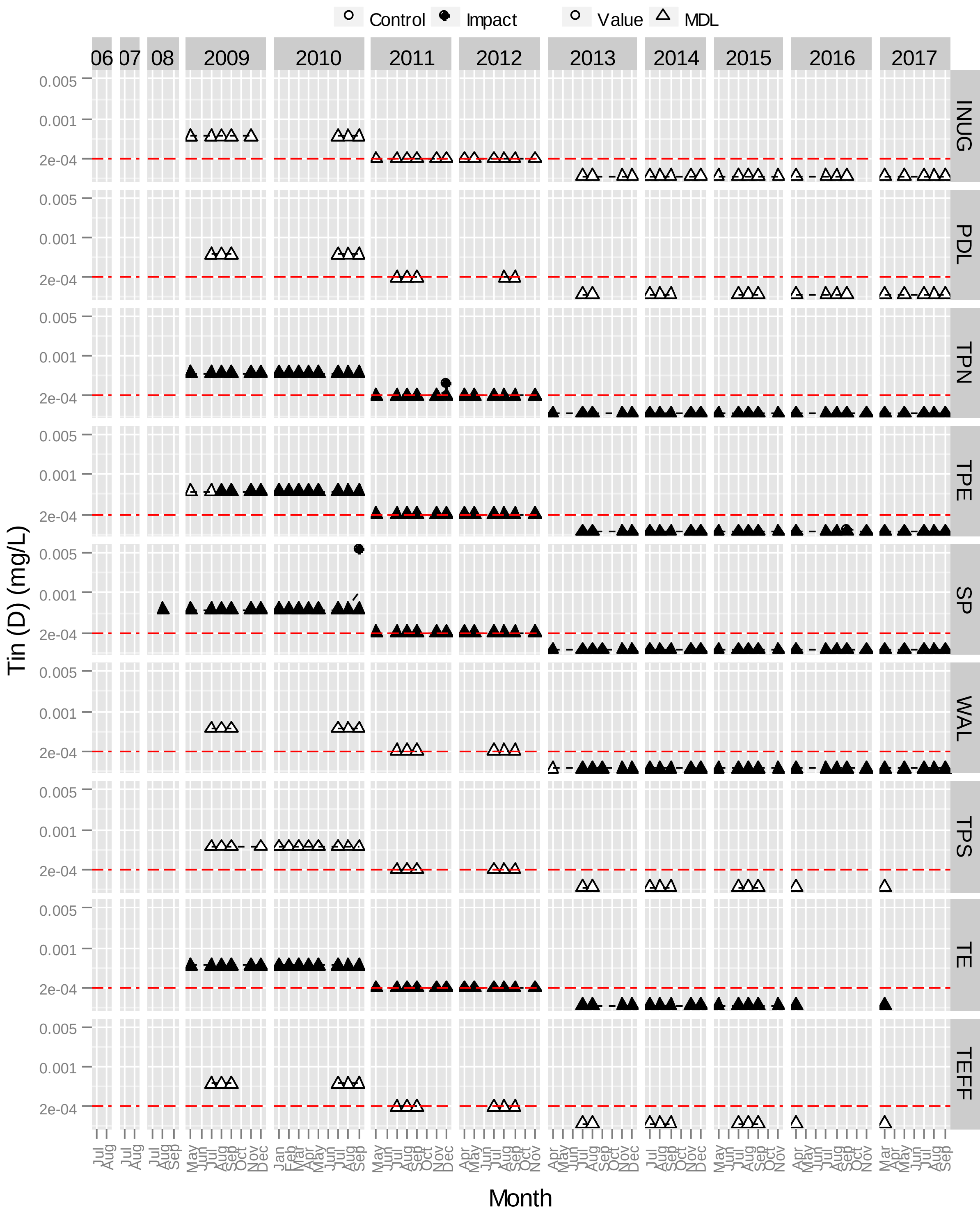


Figure A1–33. Dissolved titanium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

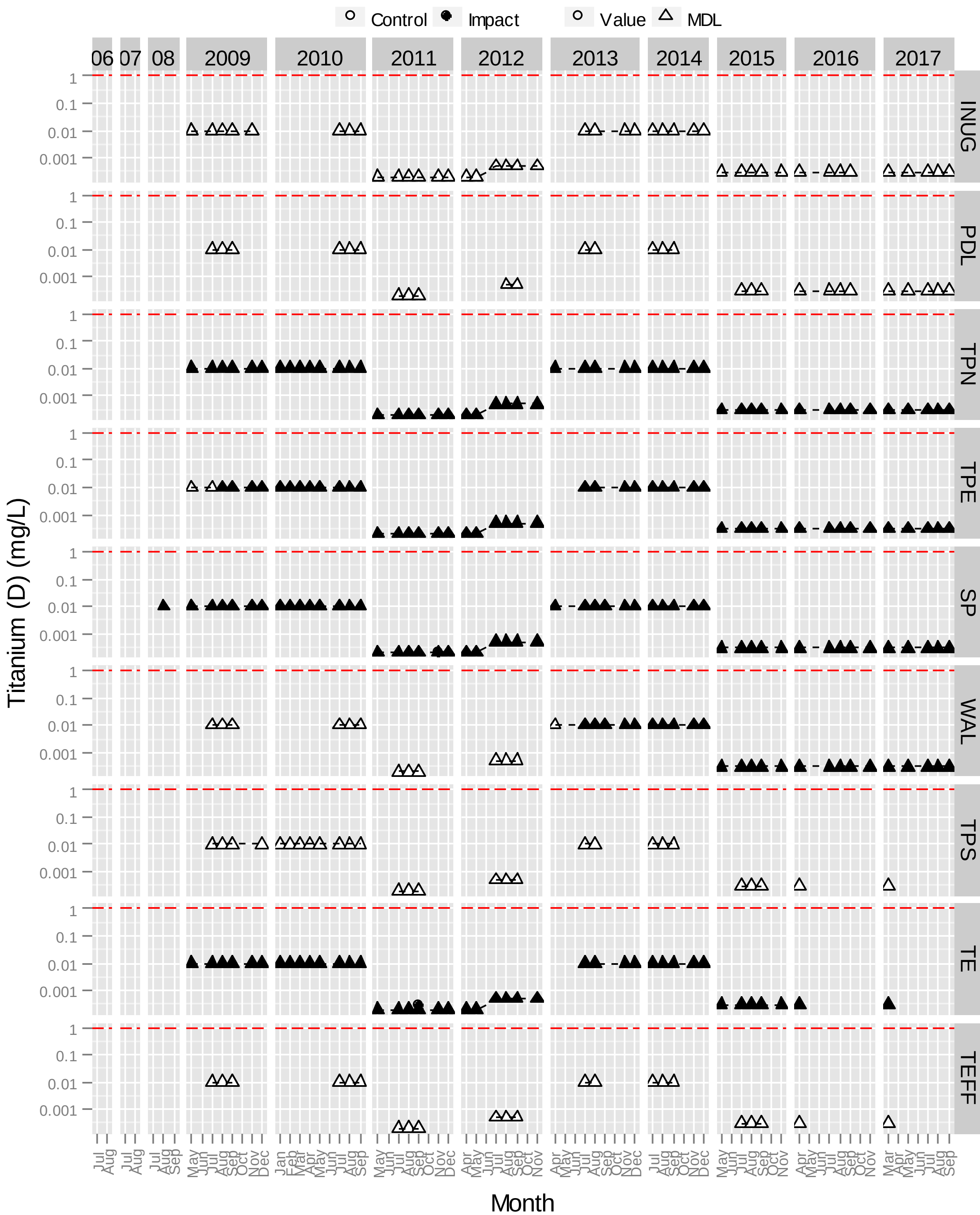


Figure A1–34. Dissolved vanadium (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).

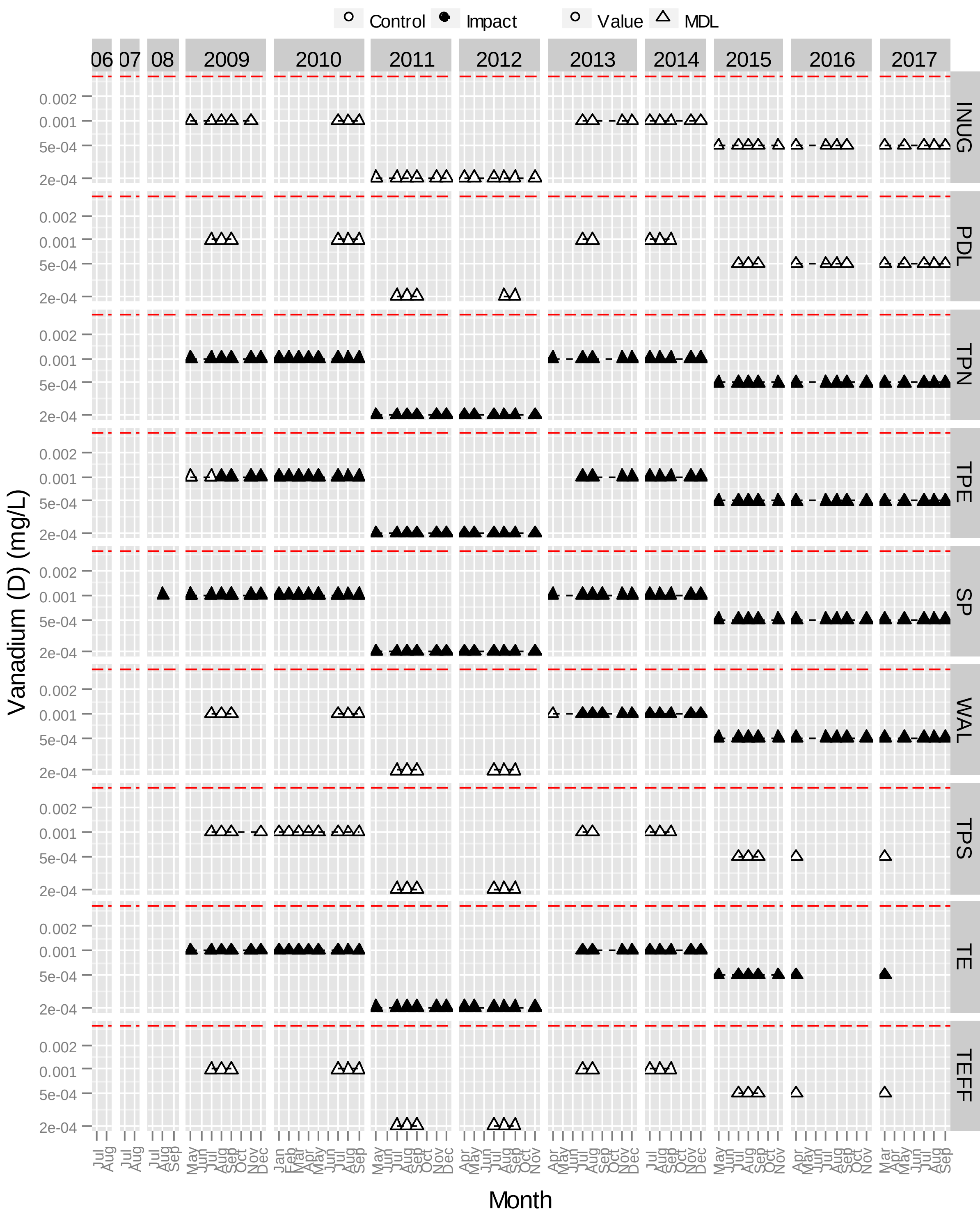
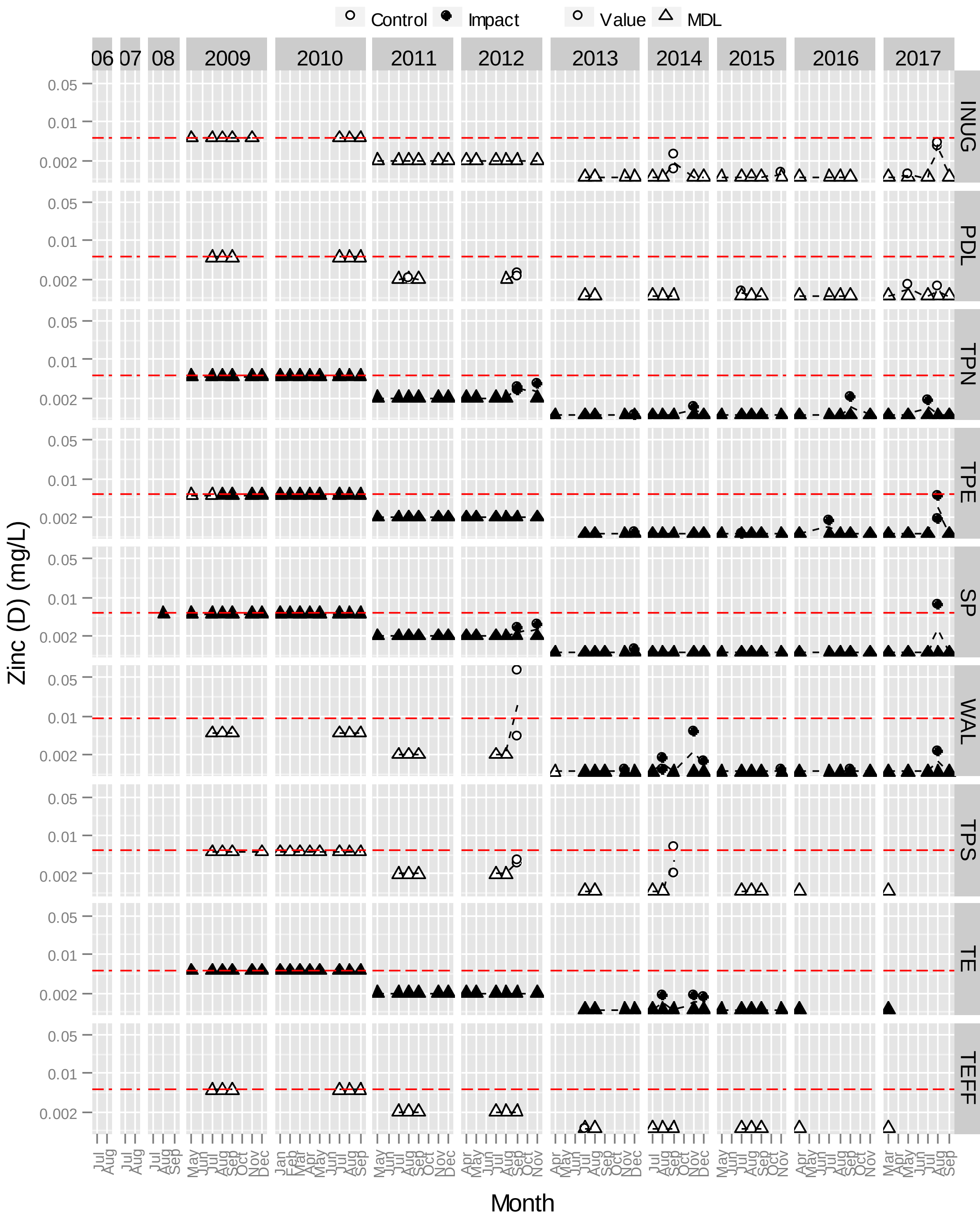


Figure A1–35. Dissolved zinc (mg/L) in water samples from Meadowbank study lakes since 2006.

Note: The red dashed line is the trigger value (separate trigger for WAL).



Appendix A2 – Baker Lake Water Quality Plots, 2008-2017

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Figure A2-1. Carbonate alkalinity (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

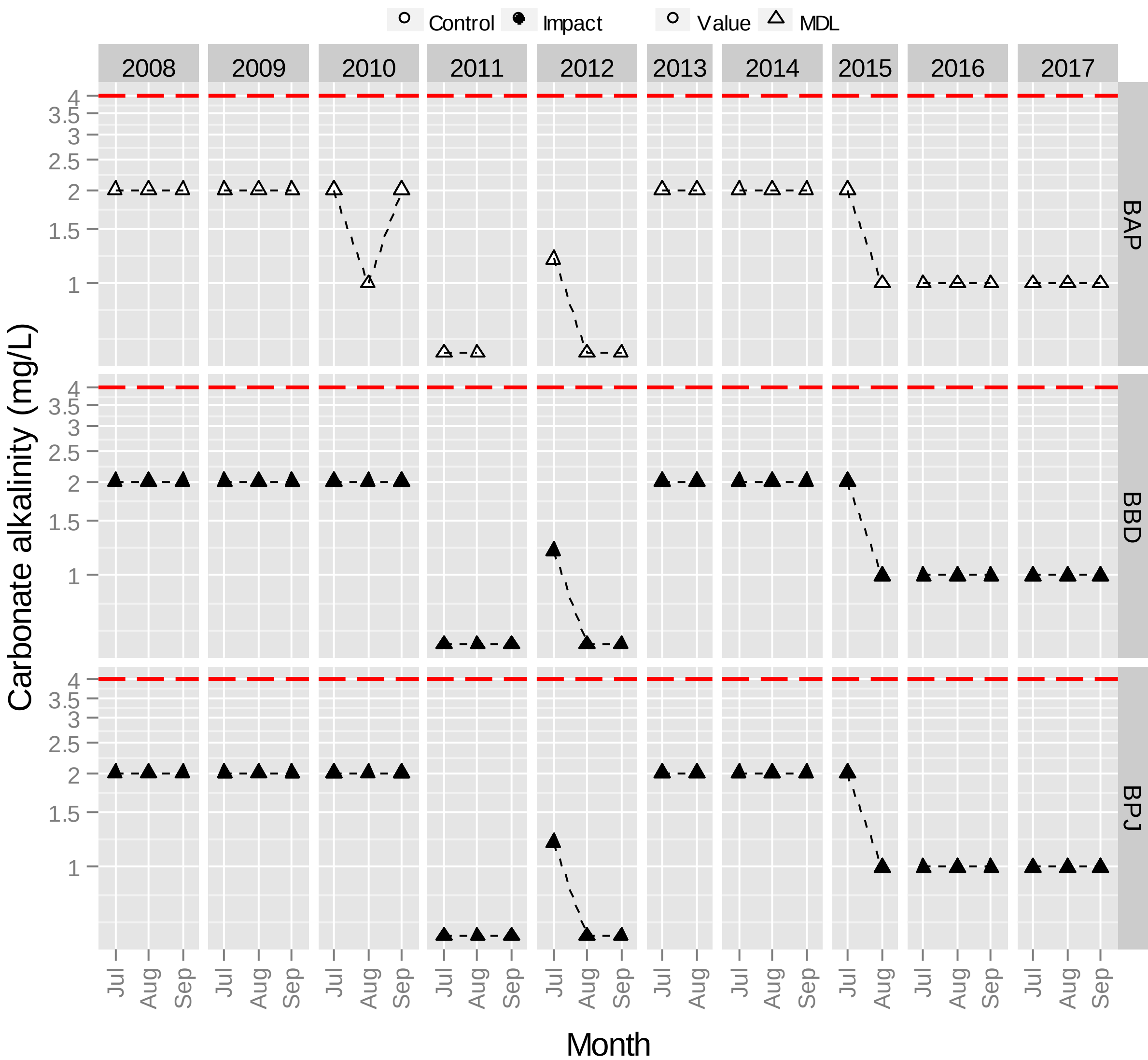


Figure A2–2. Nitrite-N (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

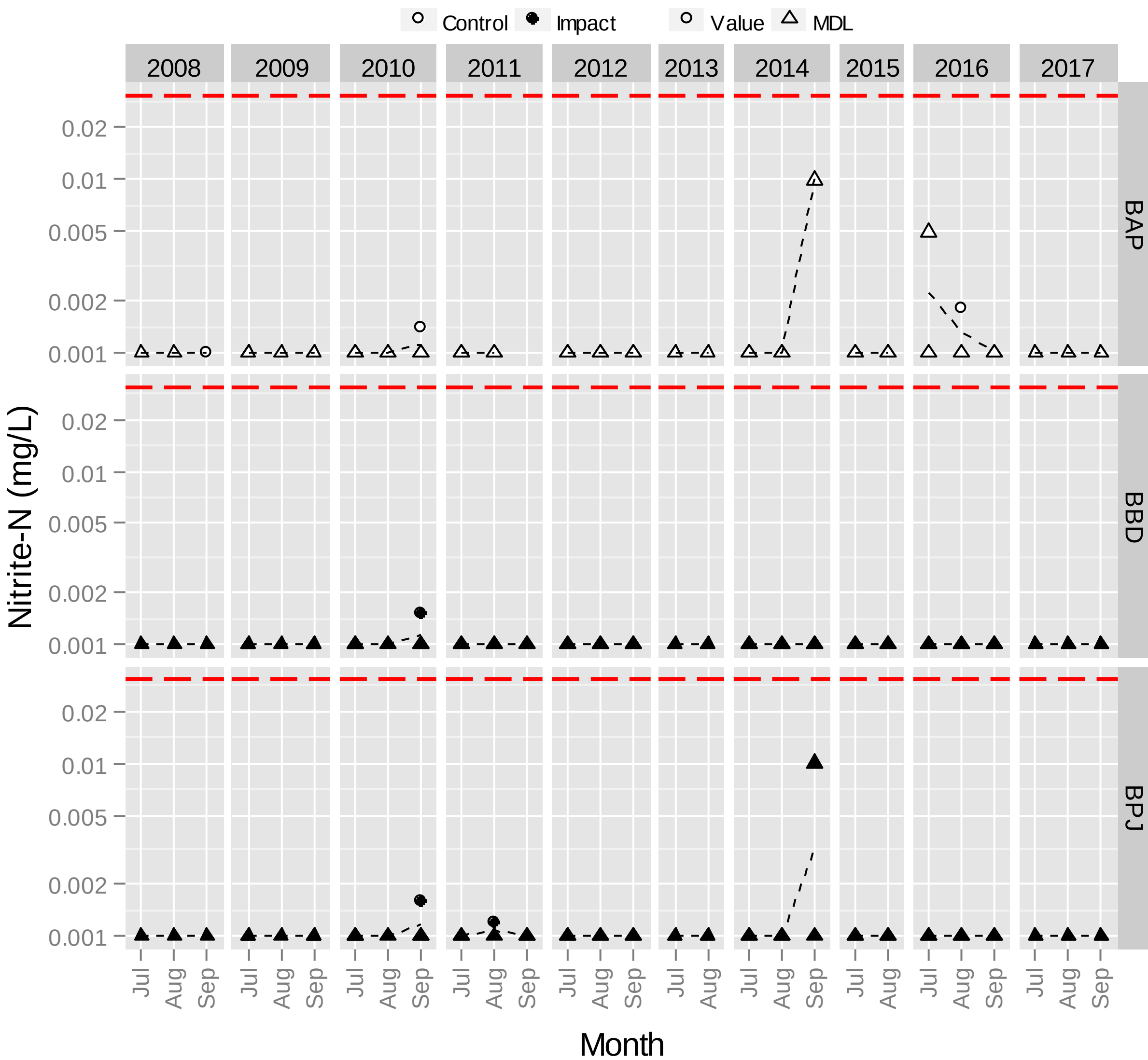


Figure A2–3. Total cyanide (mg/L) in water samples from Baker Lake since 2014.

Note: No trigger for total cyanide. Detection limit lowered from 0.005 mg/L in 2014 to 0.001 mg/L in 2015.

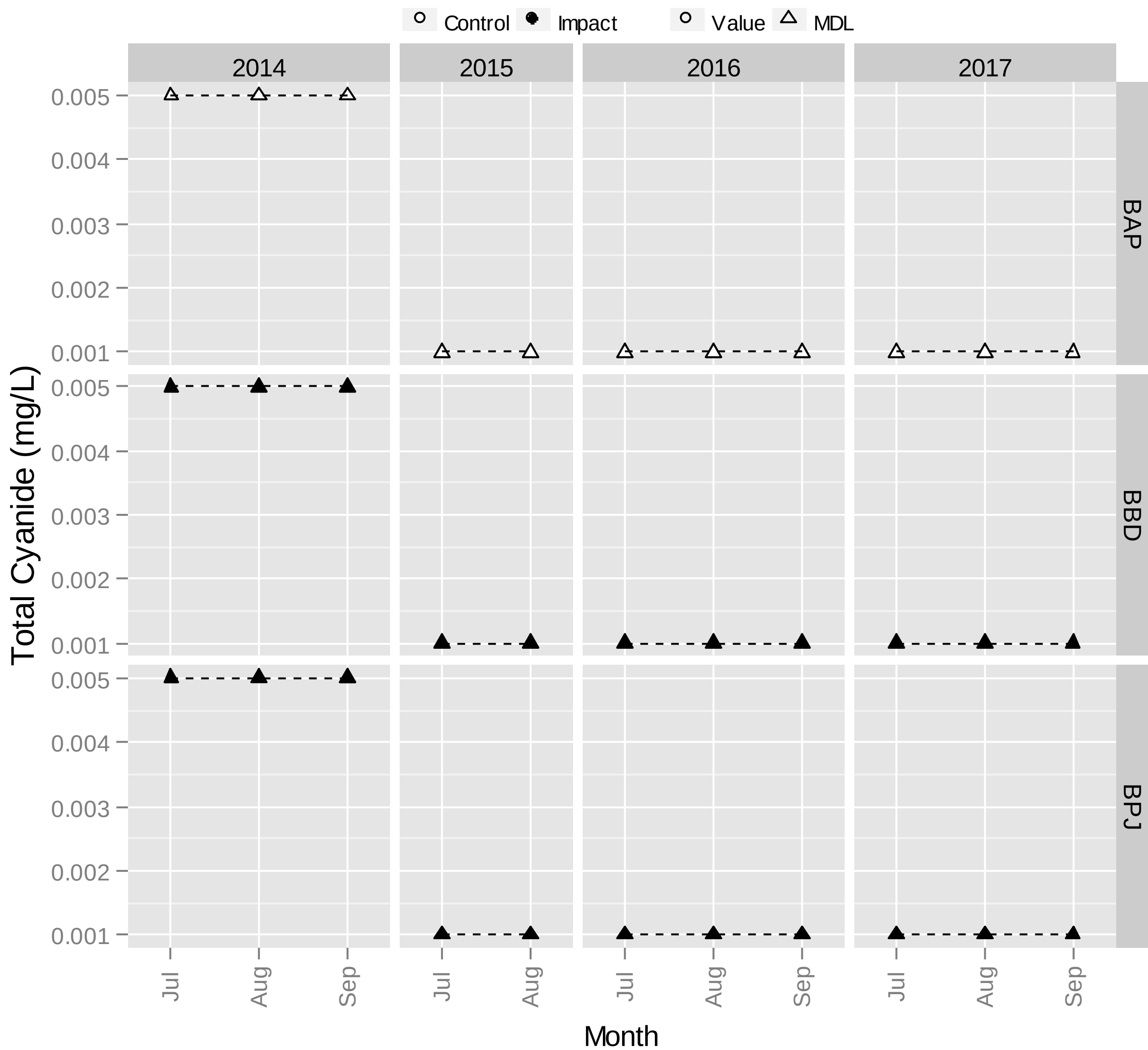


Figure A2–4. Free cyanide (mg/L) in water samples from Baker Lake since 2014.

Note: No trigger for free cyanide. Detection limit lowered from 0.005 mg/L in 2014 to 0.001 mg/L in 2015.

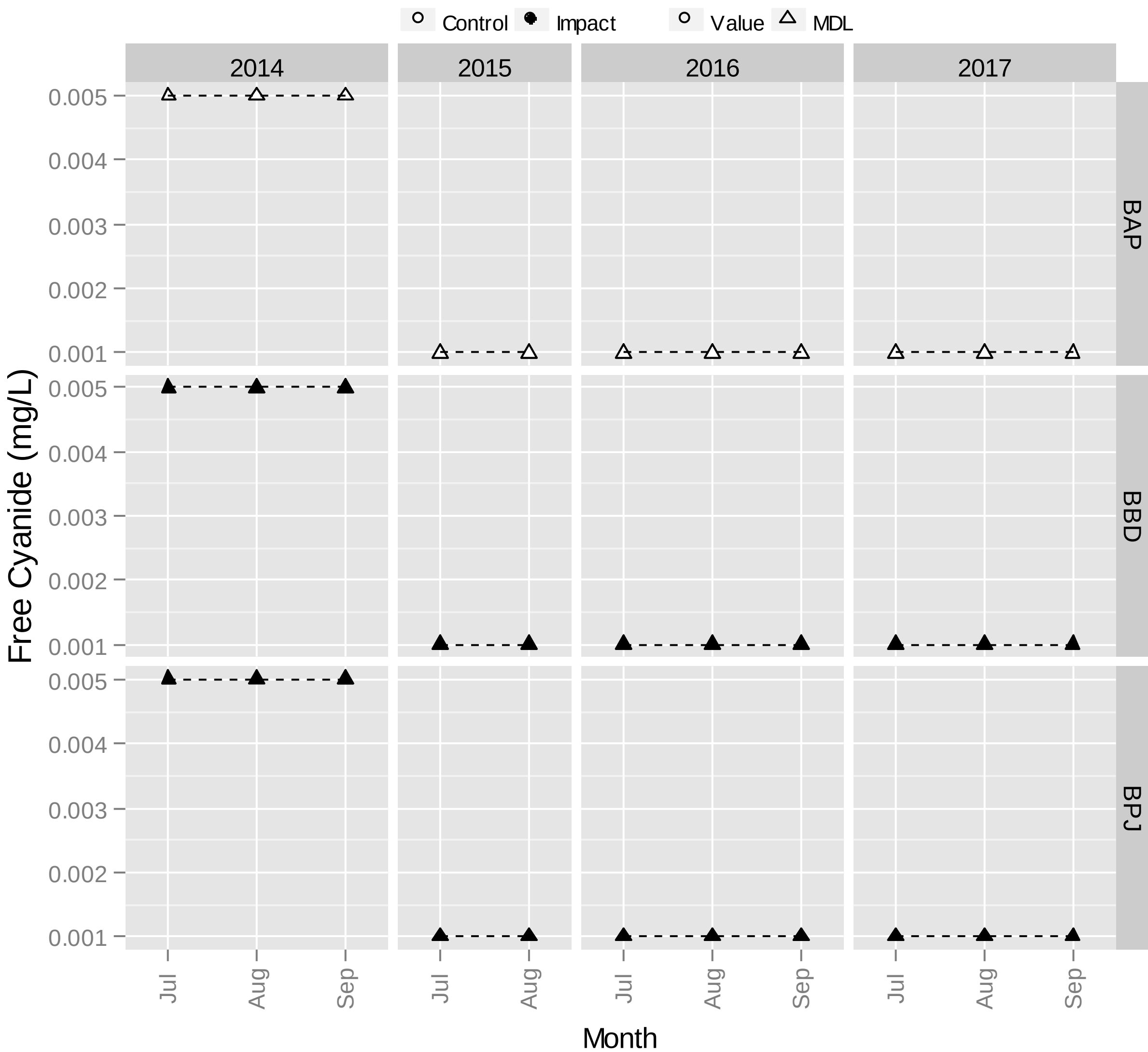


Figure A2–5. Total antimony (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

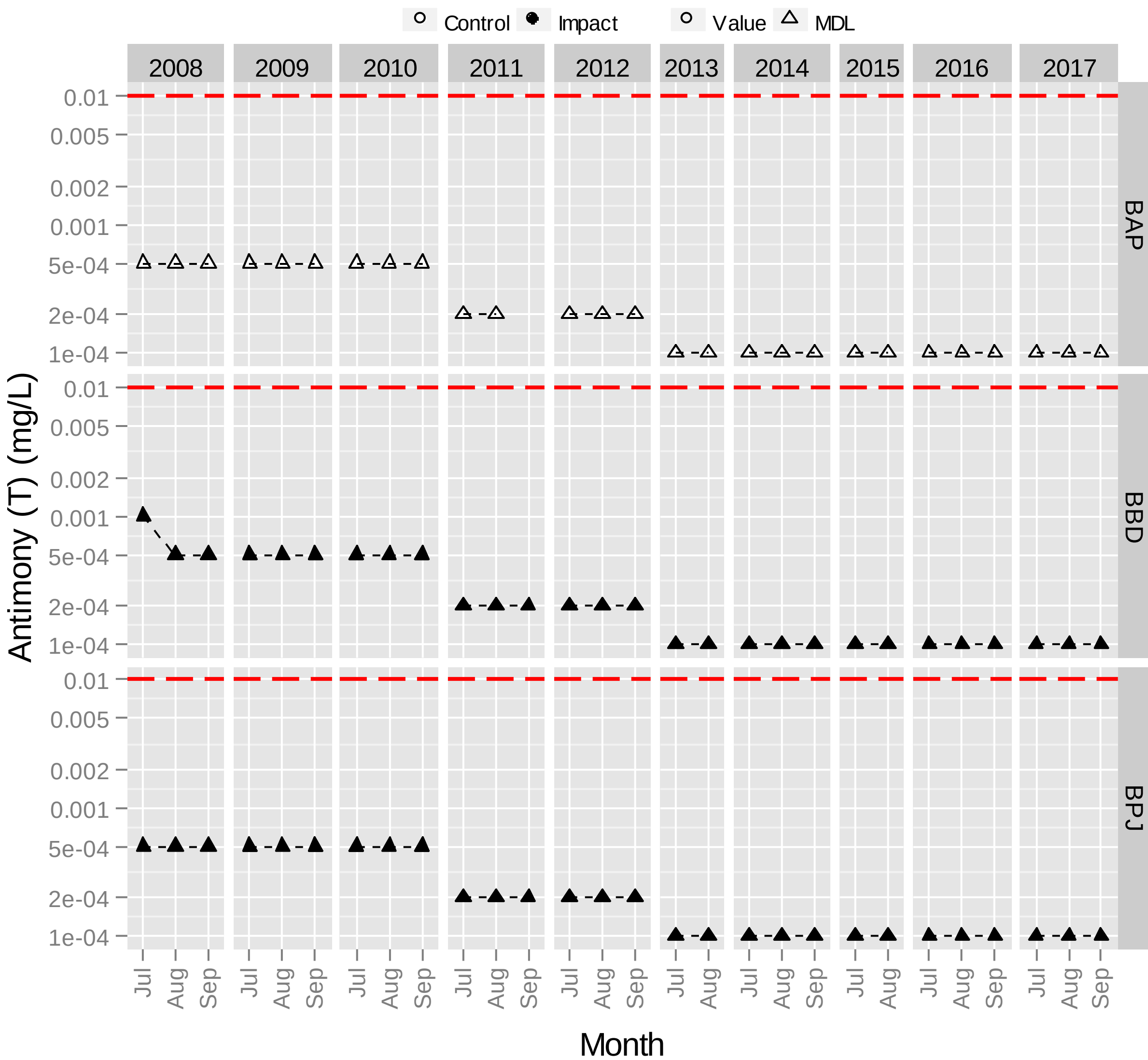


Figure A2–6. Total beryllium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

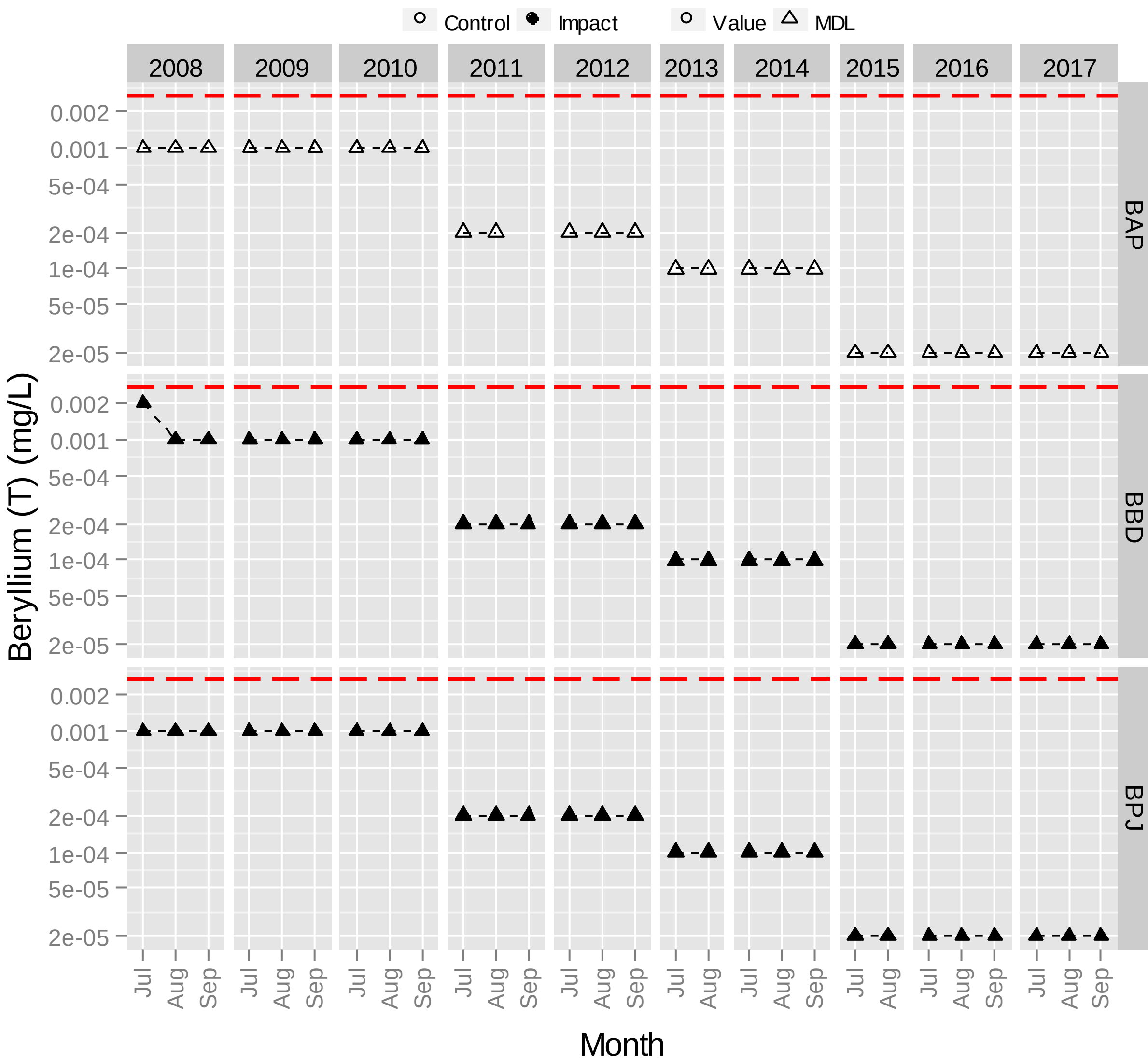


Figure A2–7. Total cadmium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

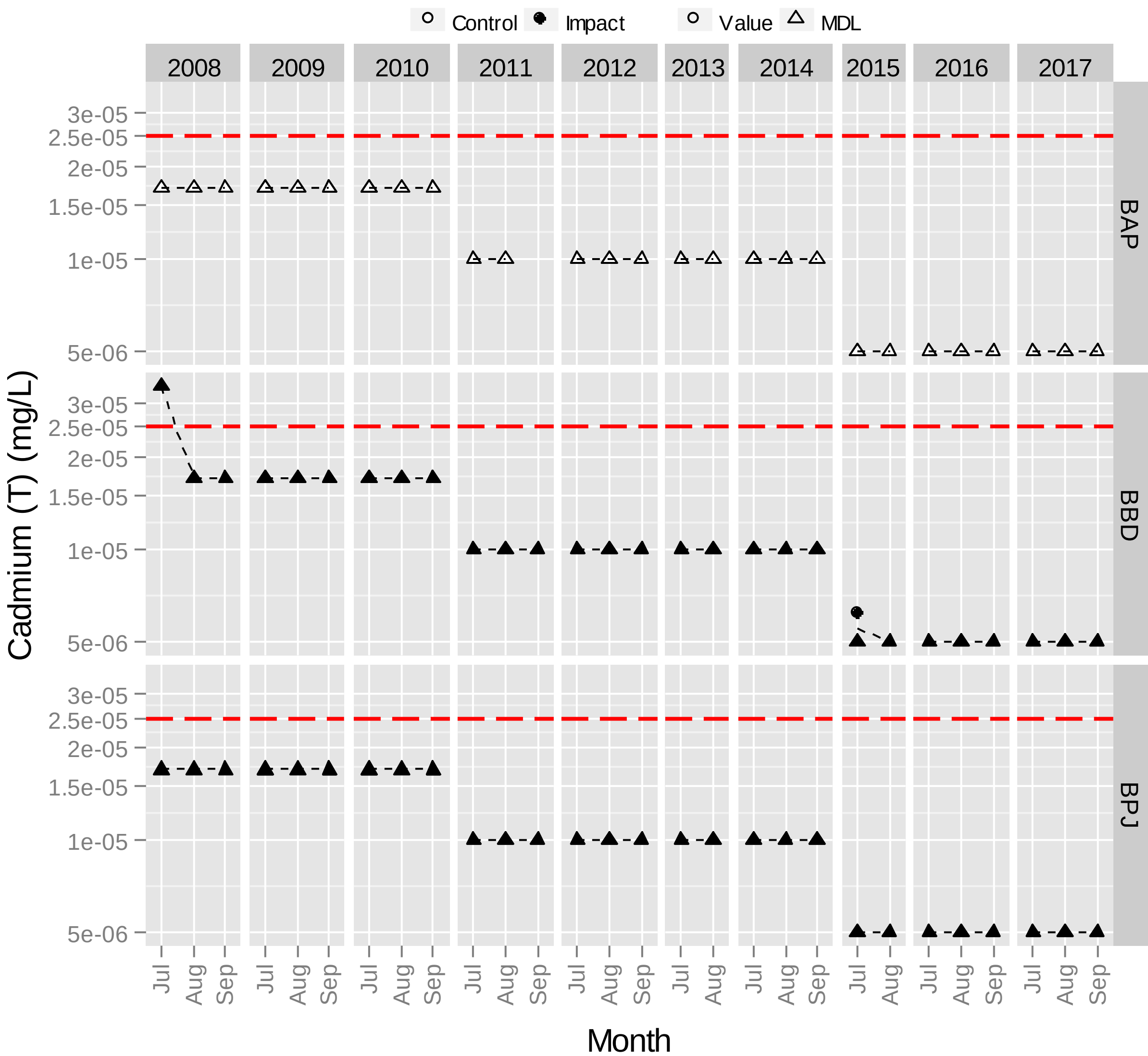


Figure A2–8. Total lead (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

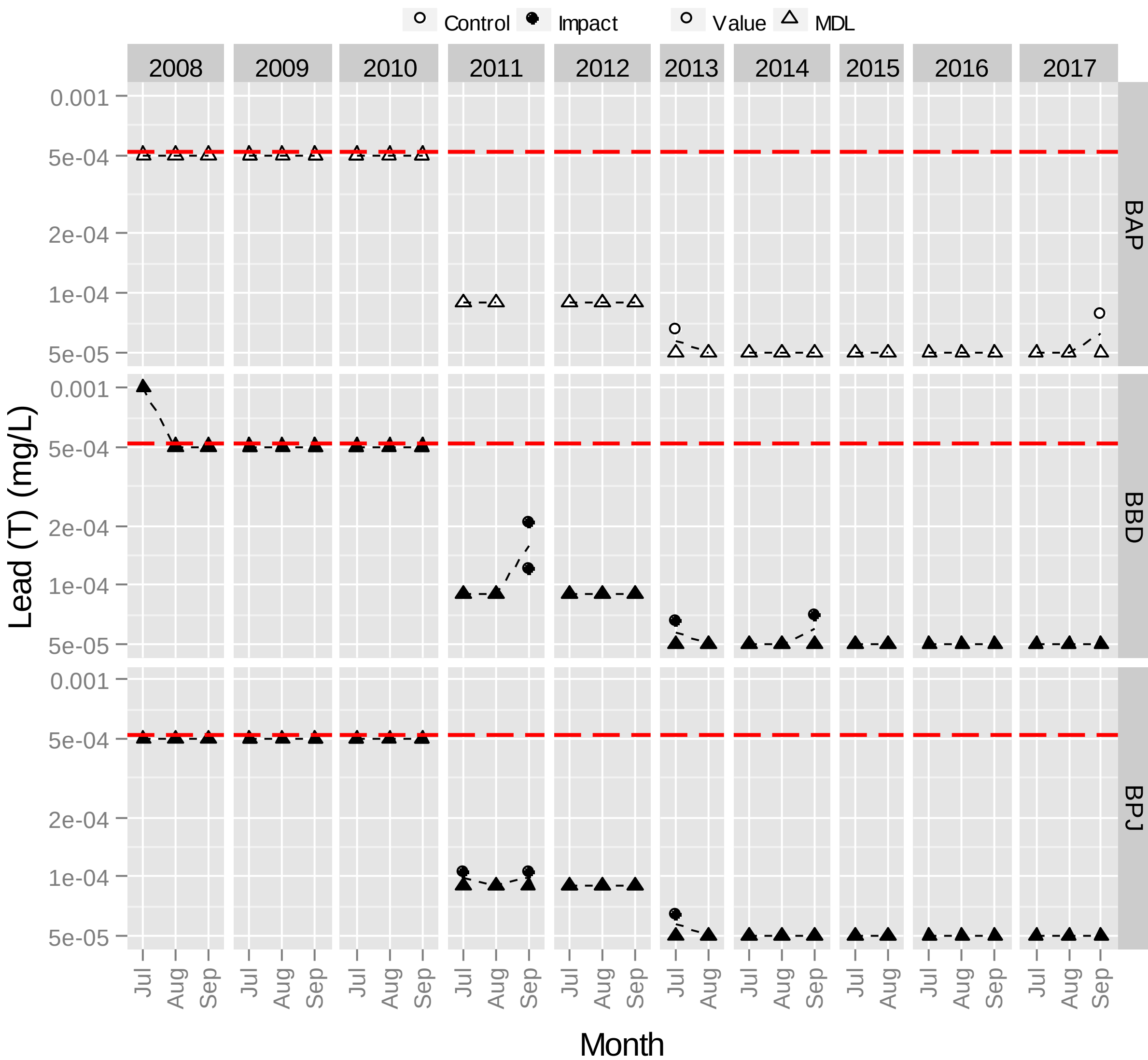


Figure A2–9. Total mercury (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

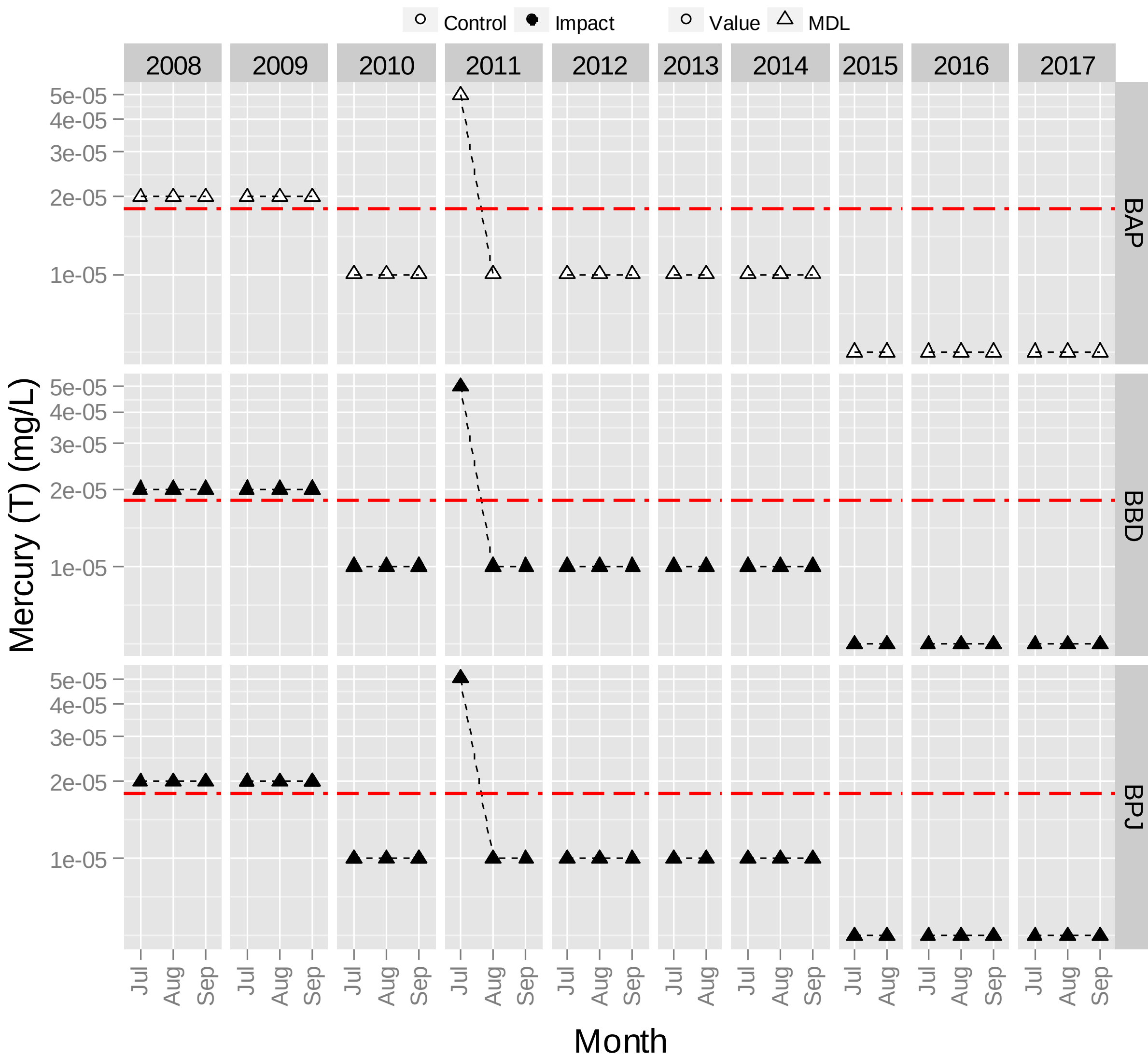


Figure A2–10. Total nickel (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

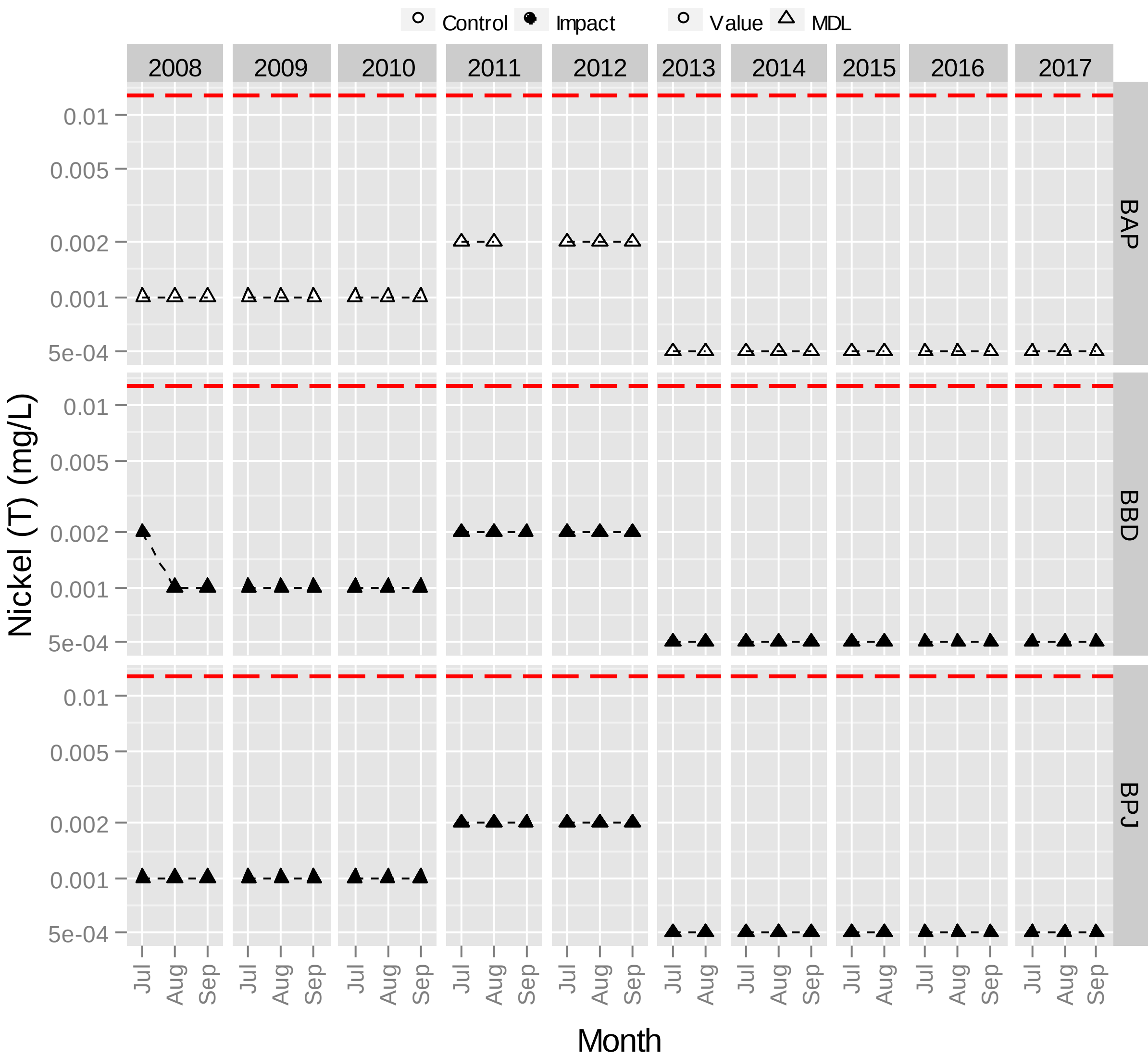


Figure A2–11. Total selenium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

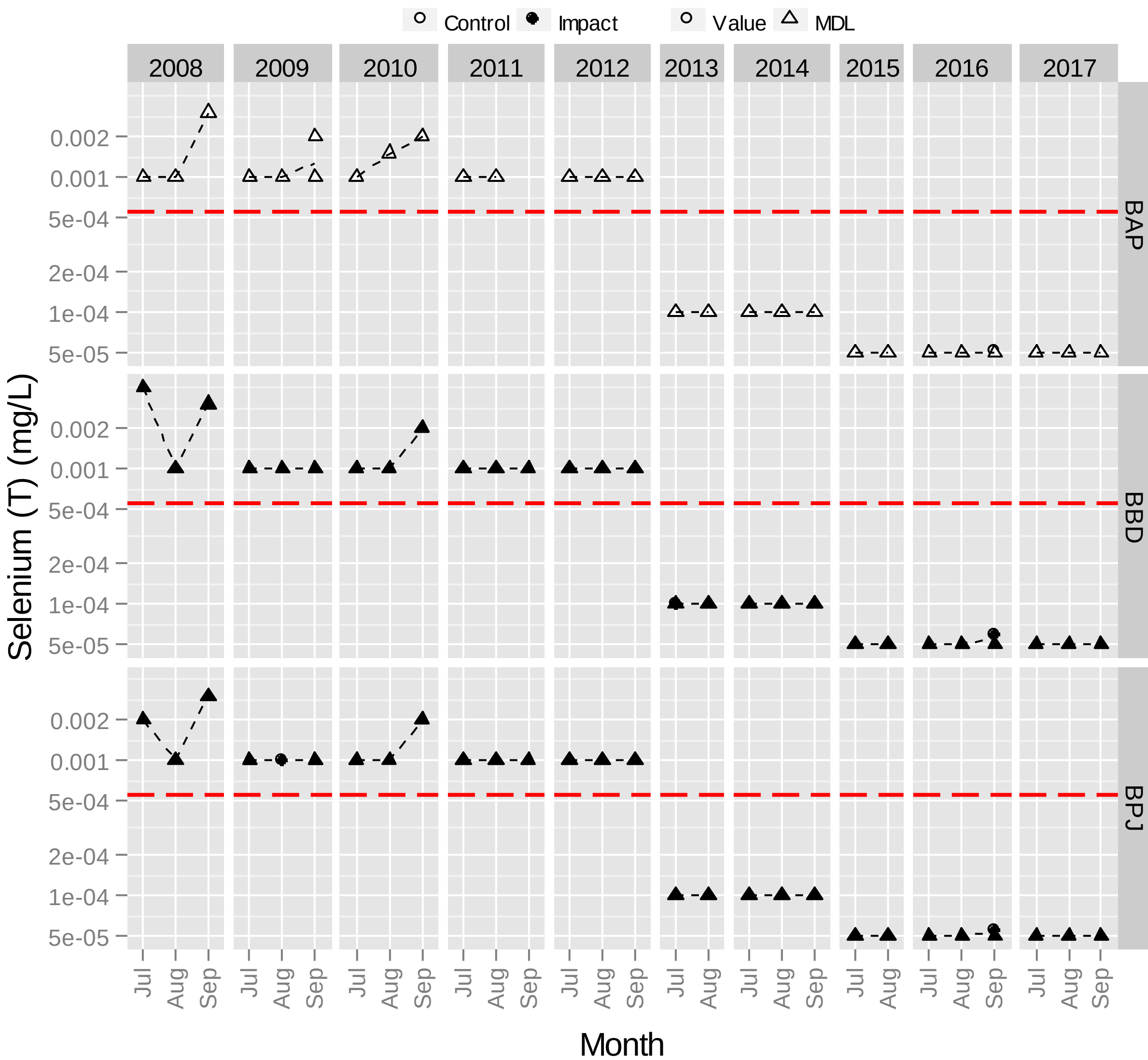


Figure A2–12. Total thallium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

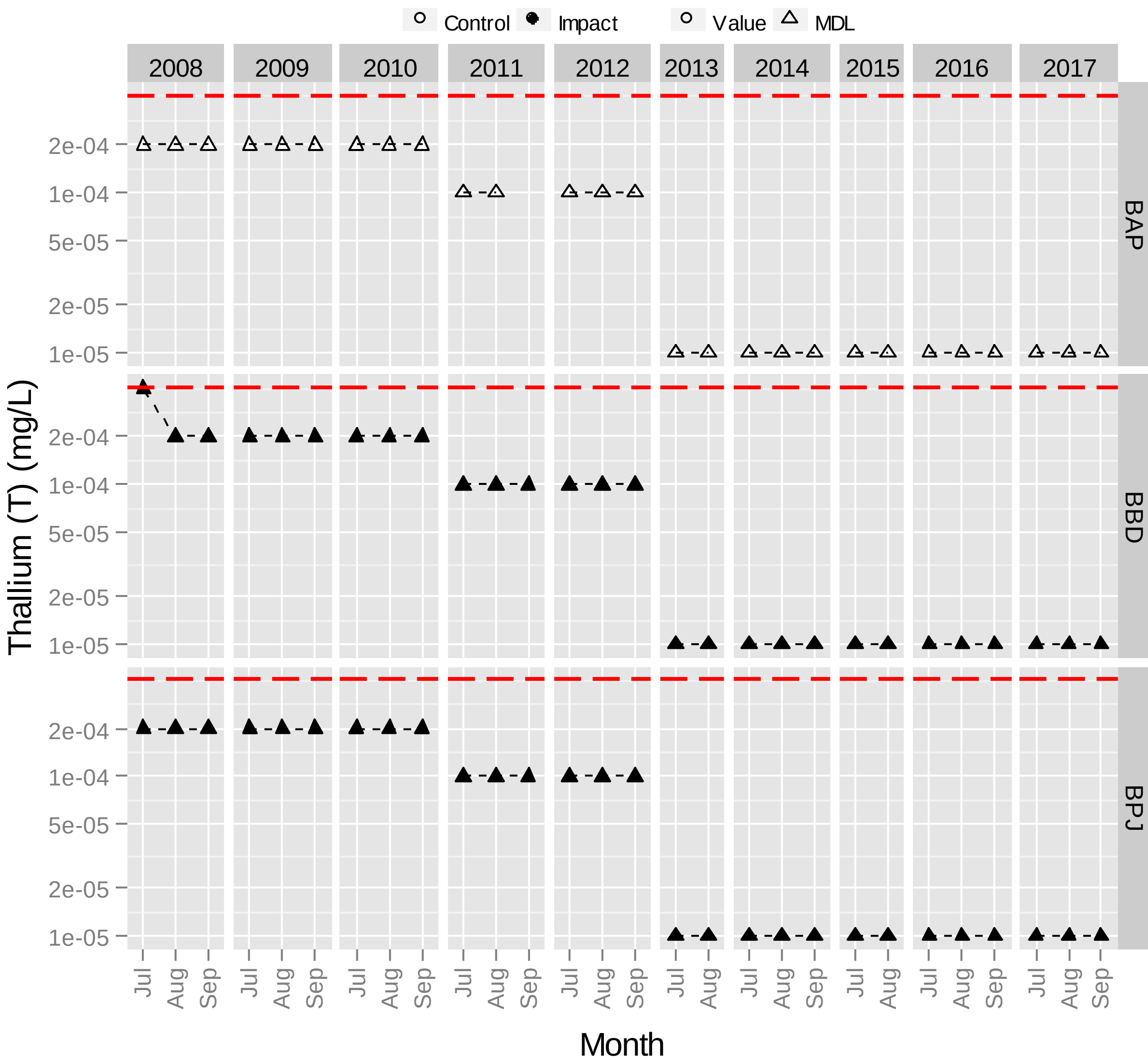


Figure A2–13. Total tin (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

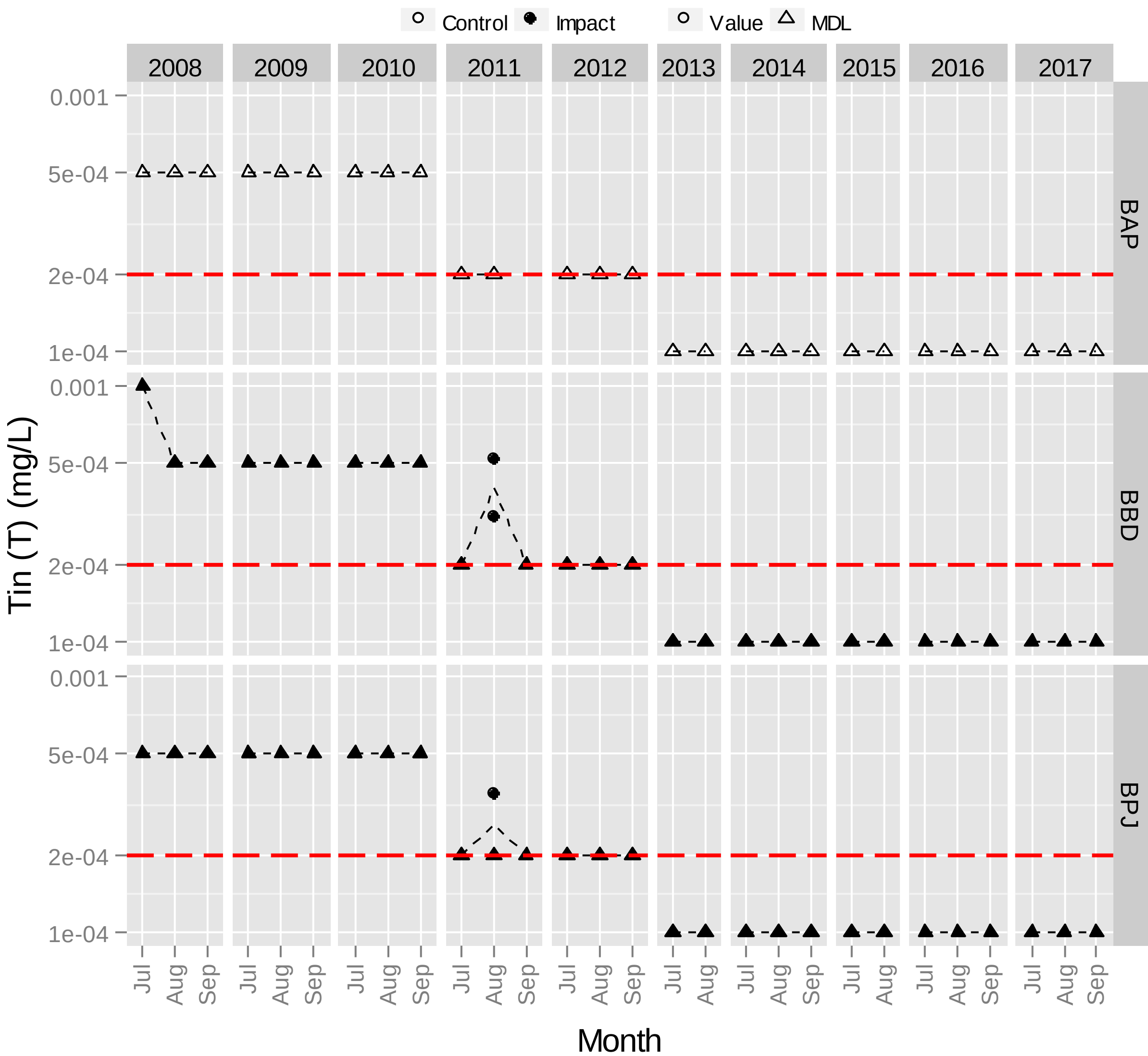


Figure A2–14. Total vanadium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

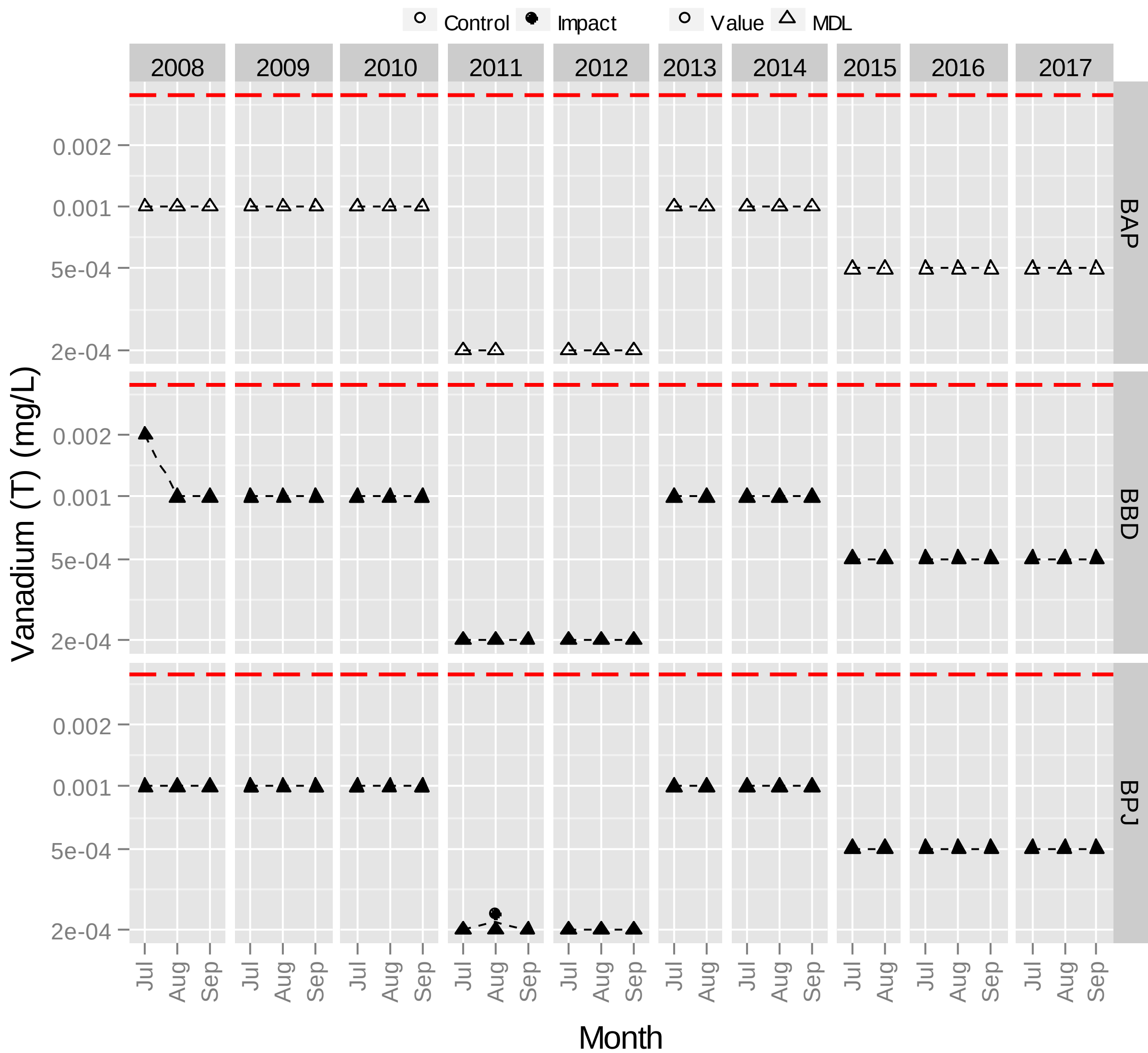


Figure A2–15. Total zinc (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

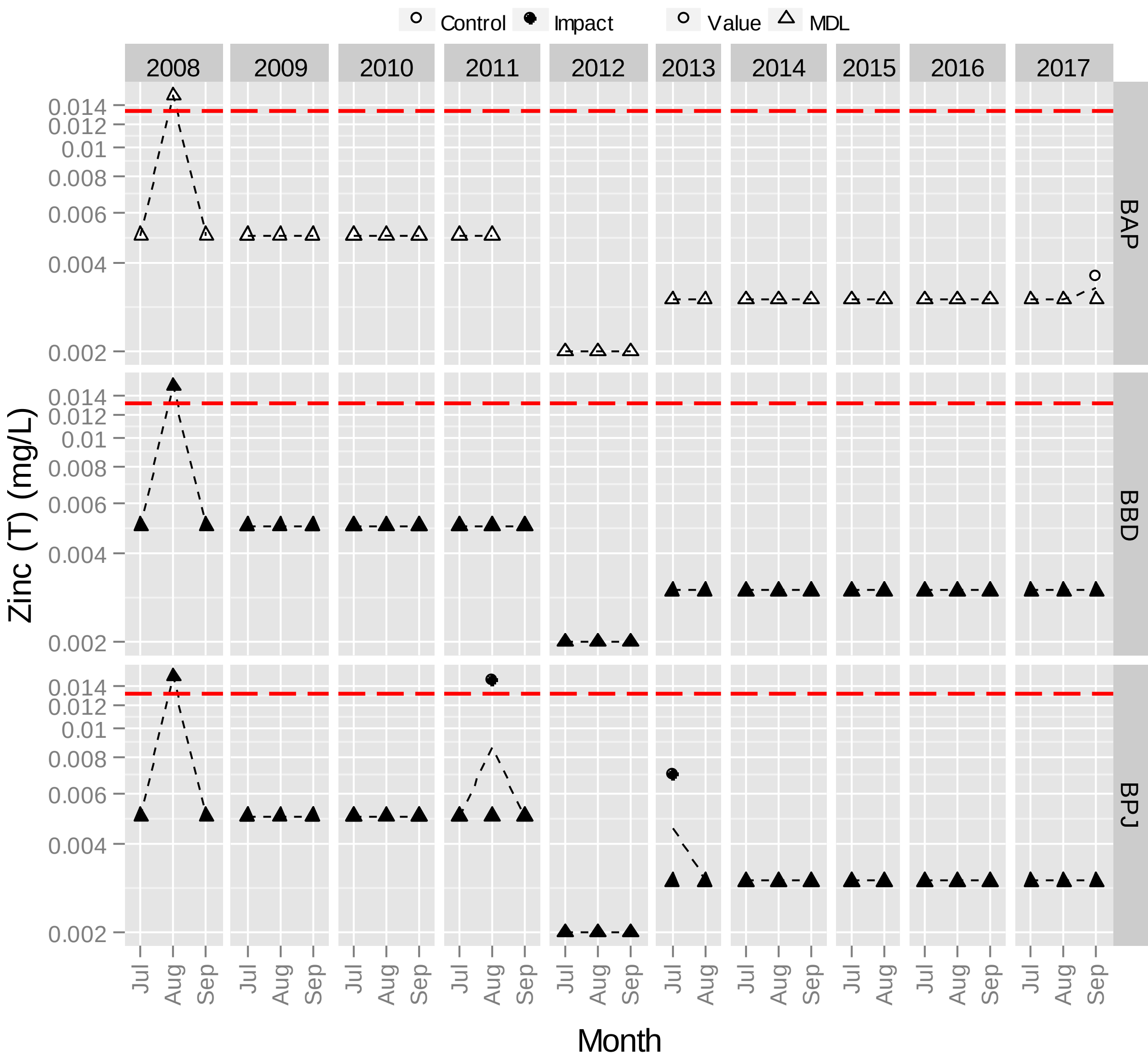


Figure A2–16. Dissolved antimony (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

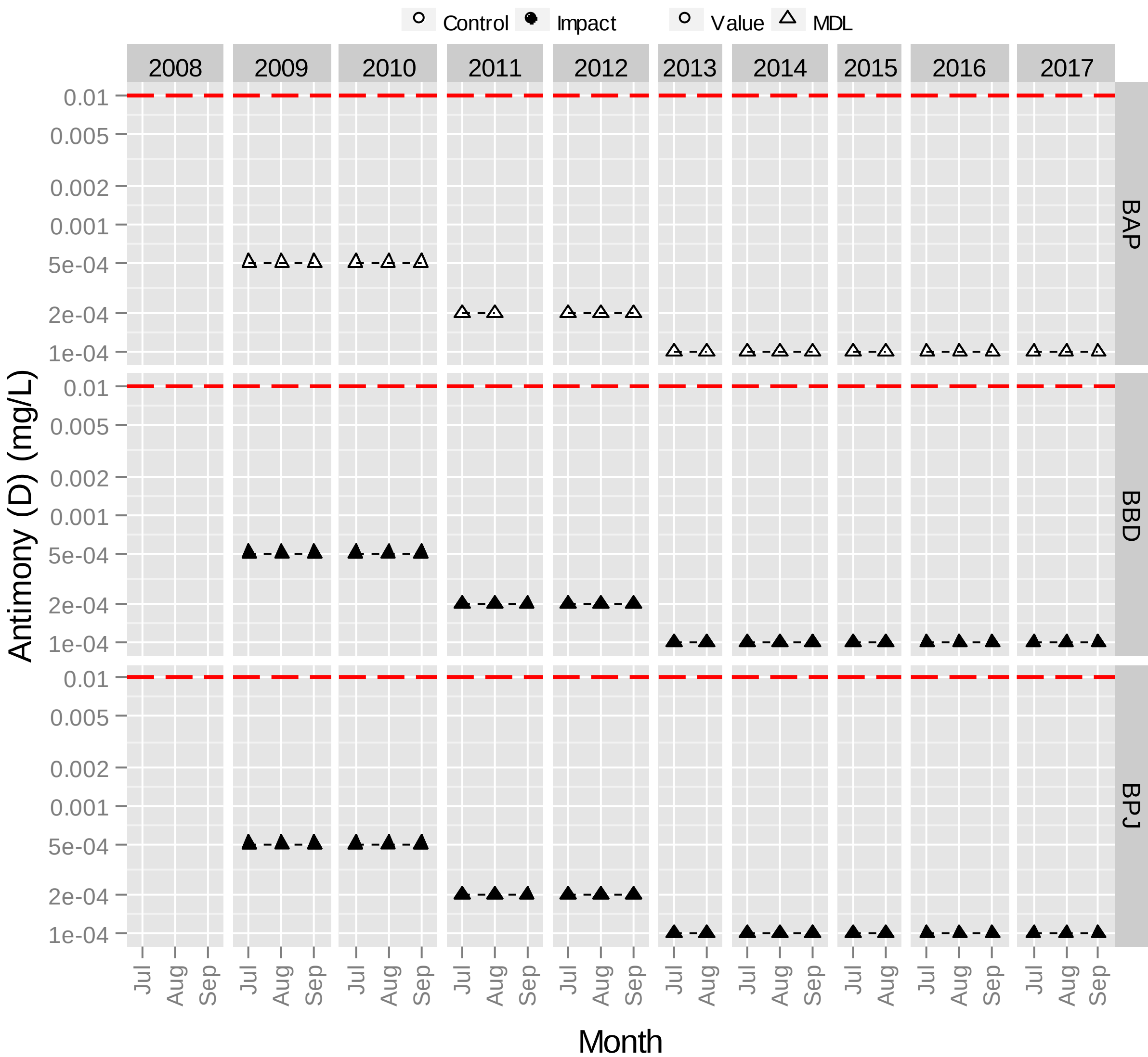


Figure A2–17. Dissolved beryllium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

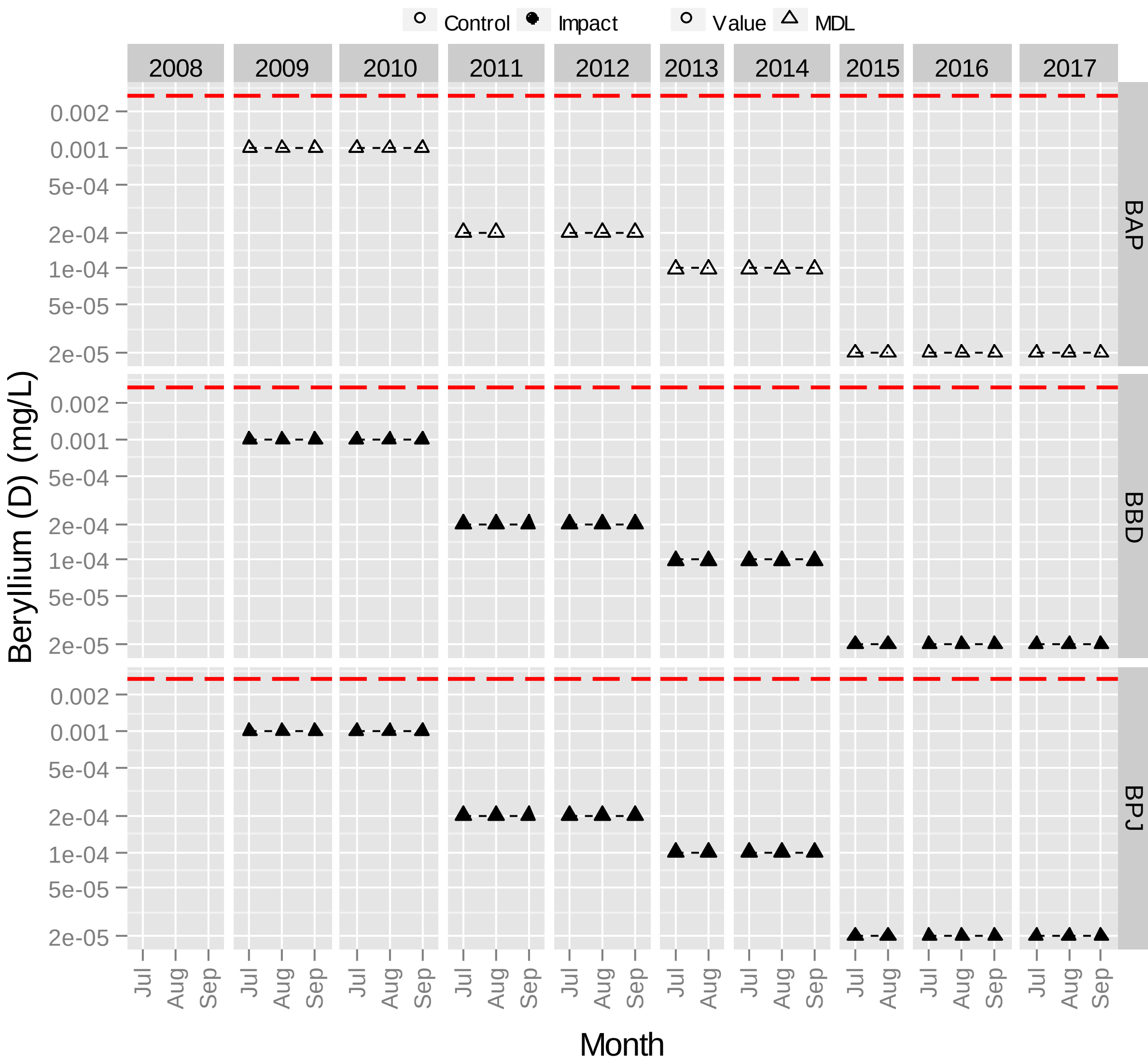


Figure A2–18. Dissolved cadmium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

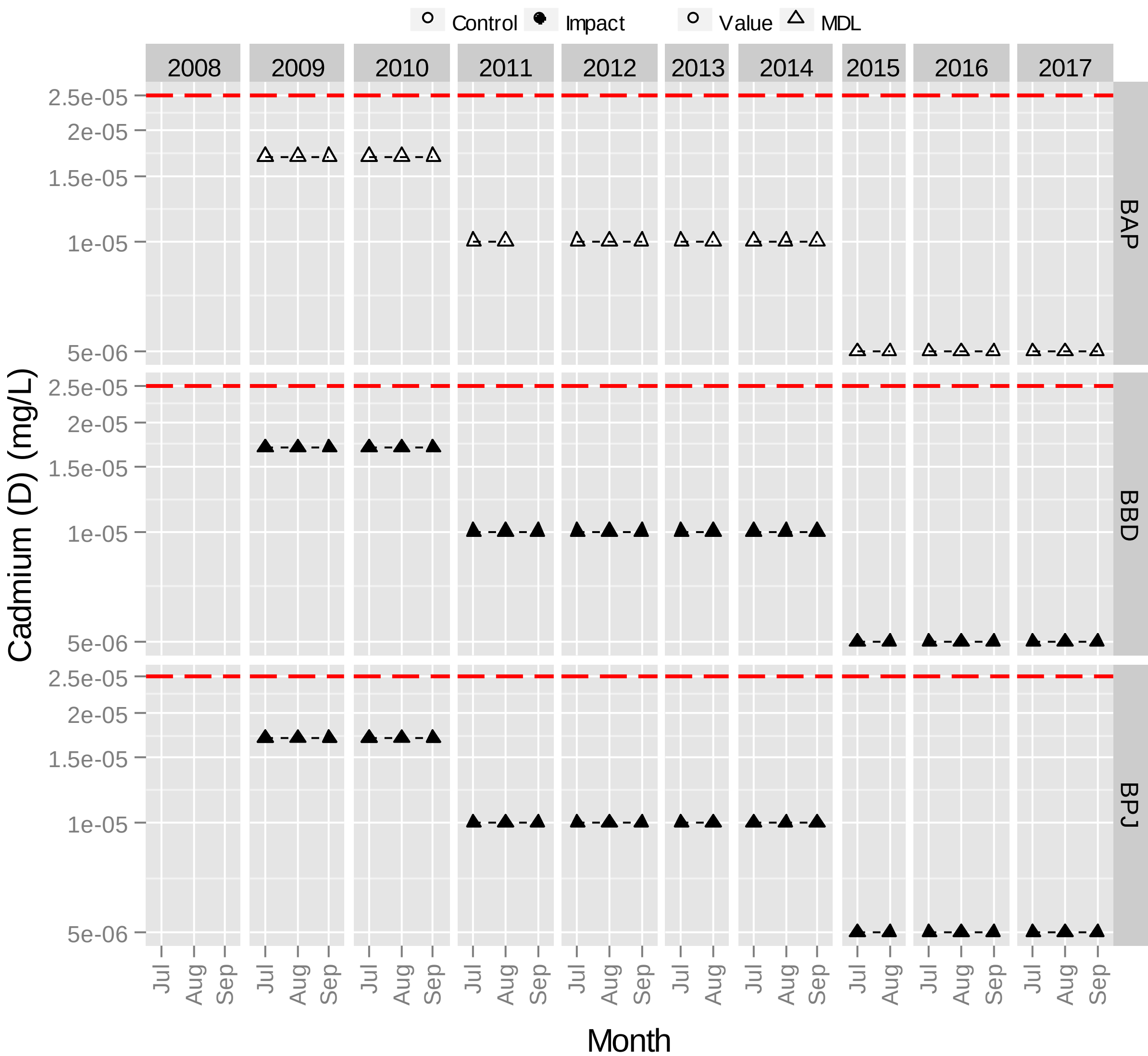


Figure A2–19. Dissolved chromium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

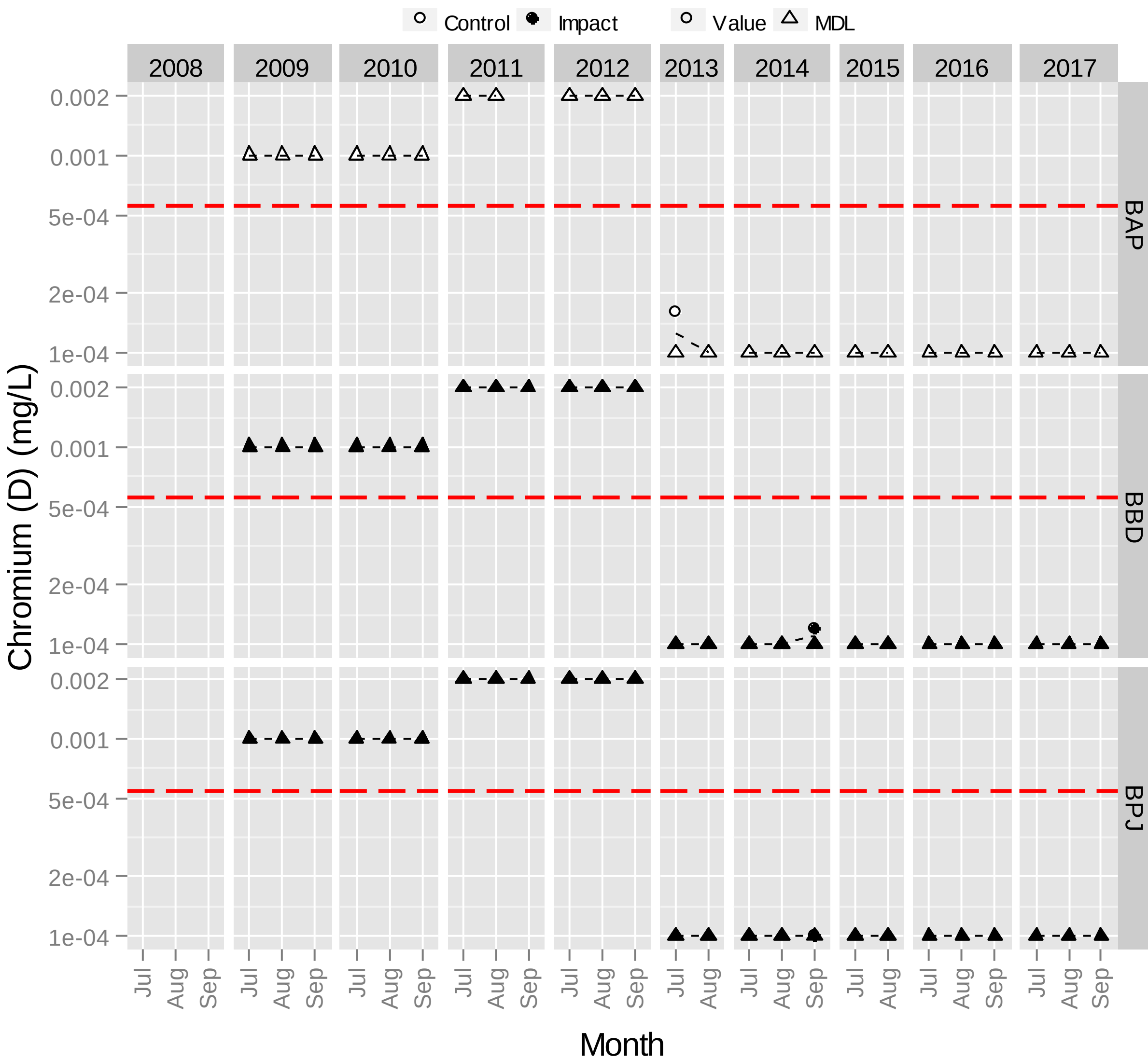


Figure A2–20. Dissolved iron (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

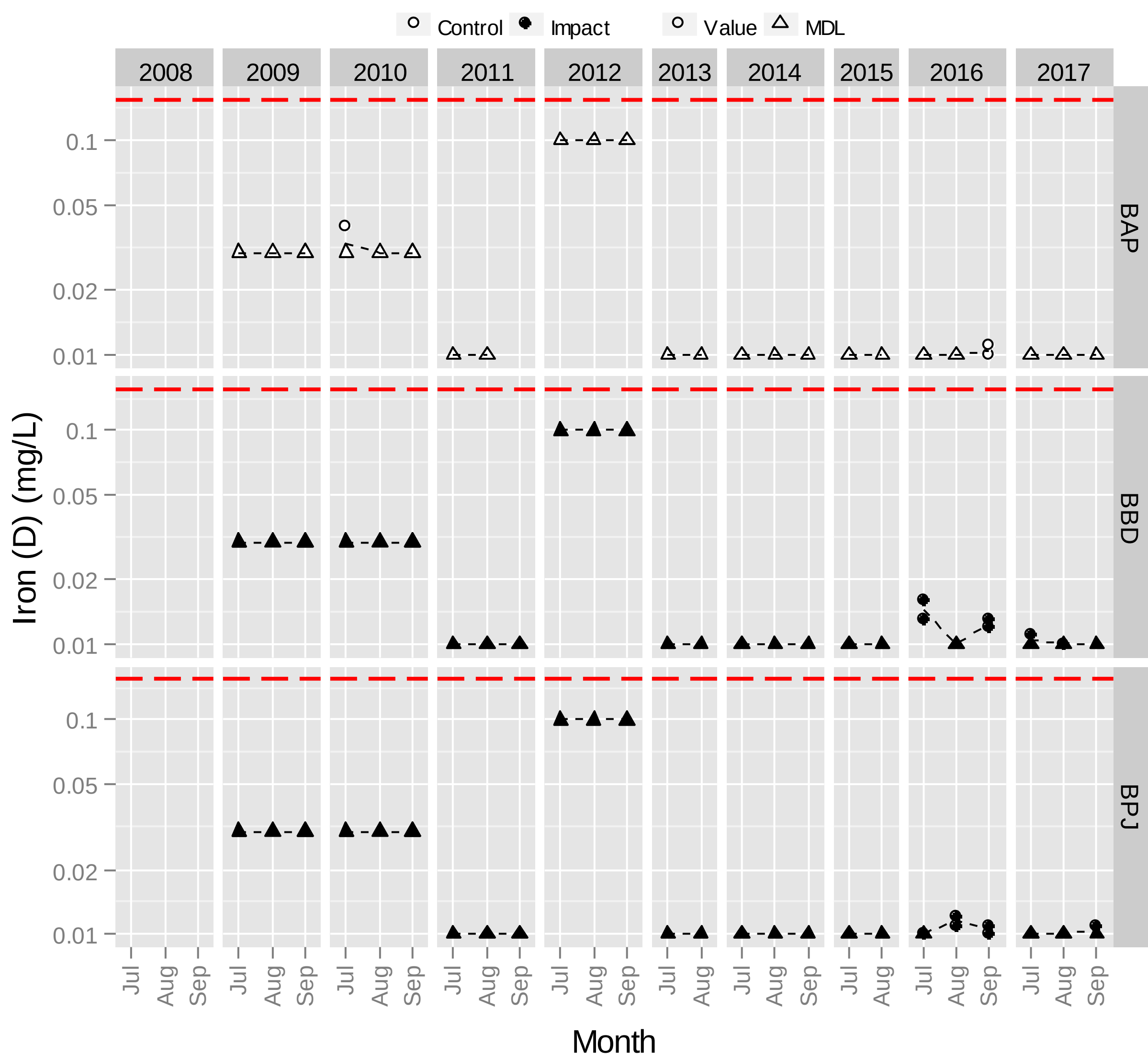


Figure A2–21. Dissolved lead (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

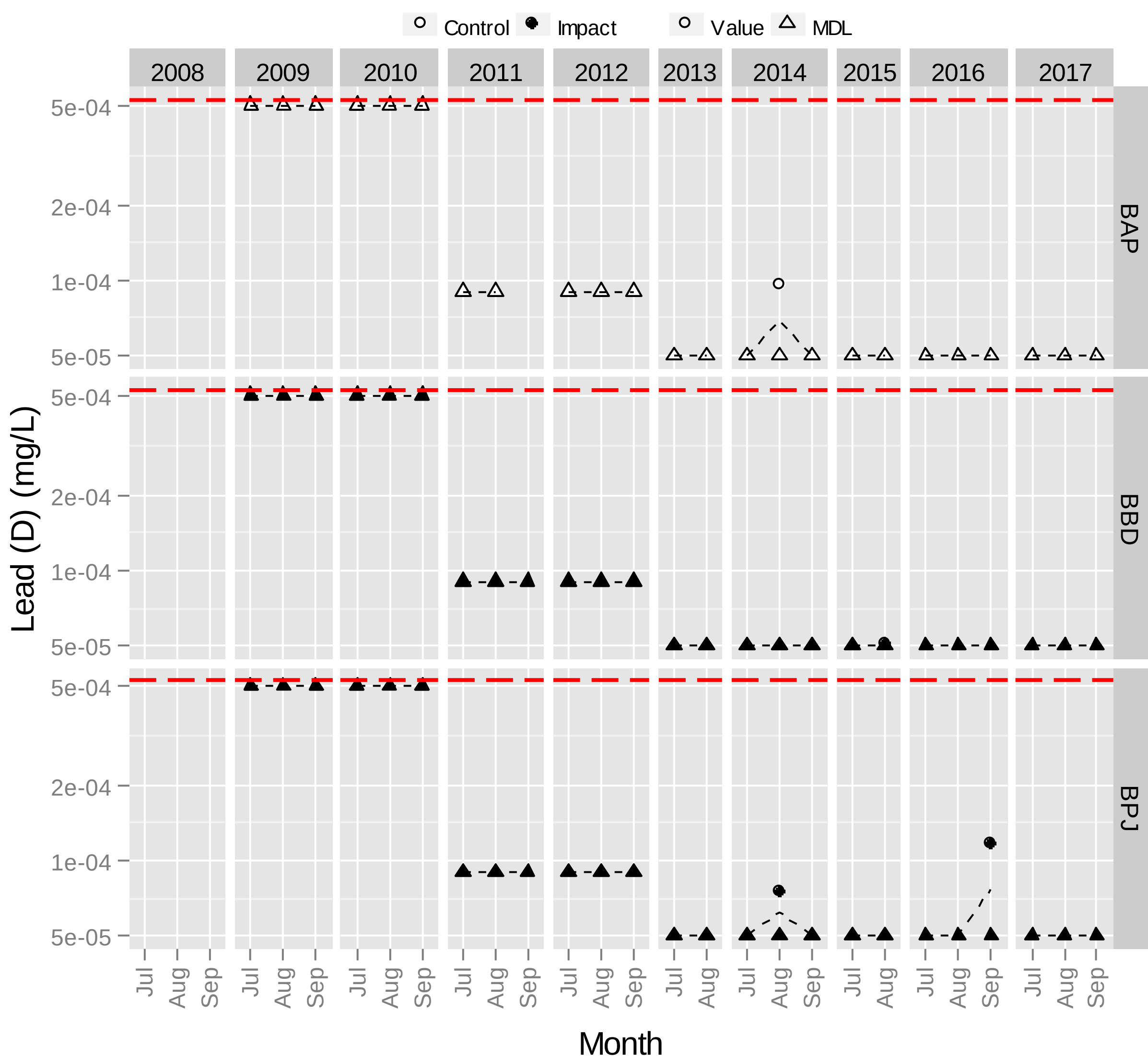


Figure A2–22. Dissolved mercury (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

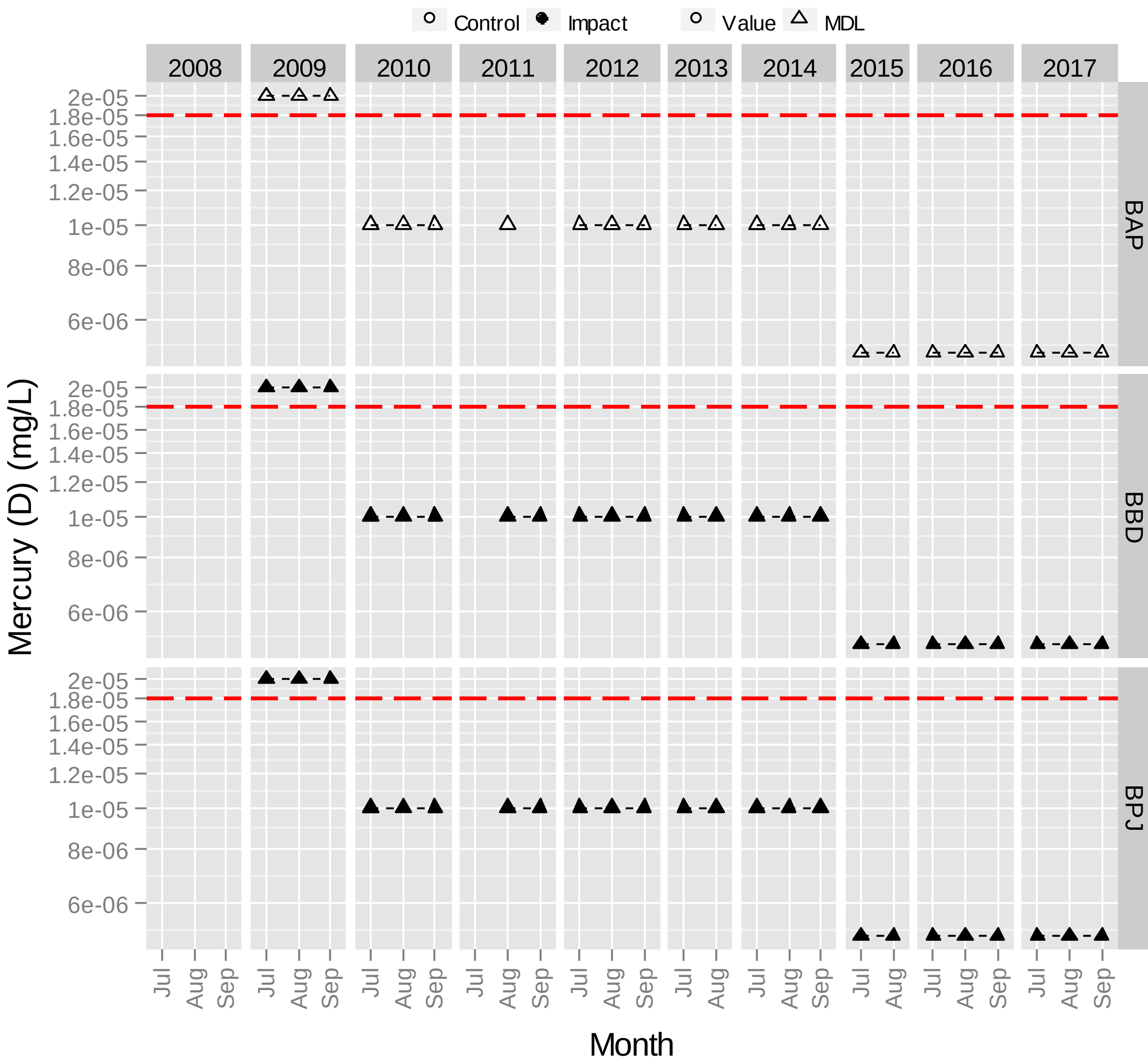


Figure A2–23. Dissolved nickel (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

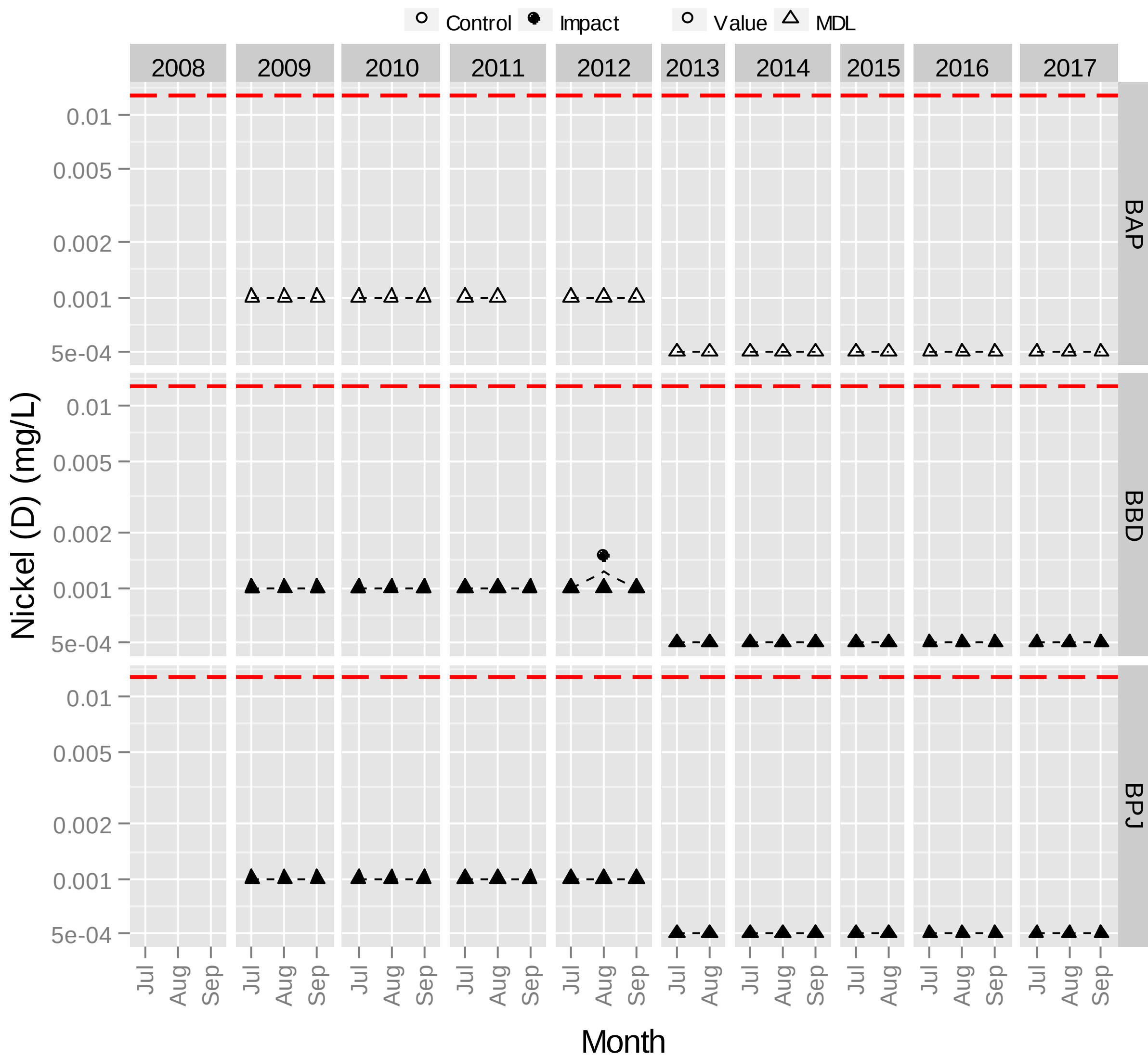


Figure A2–24. Dissolved selenium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

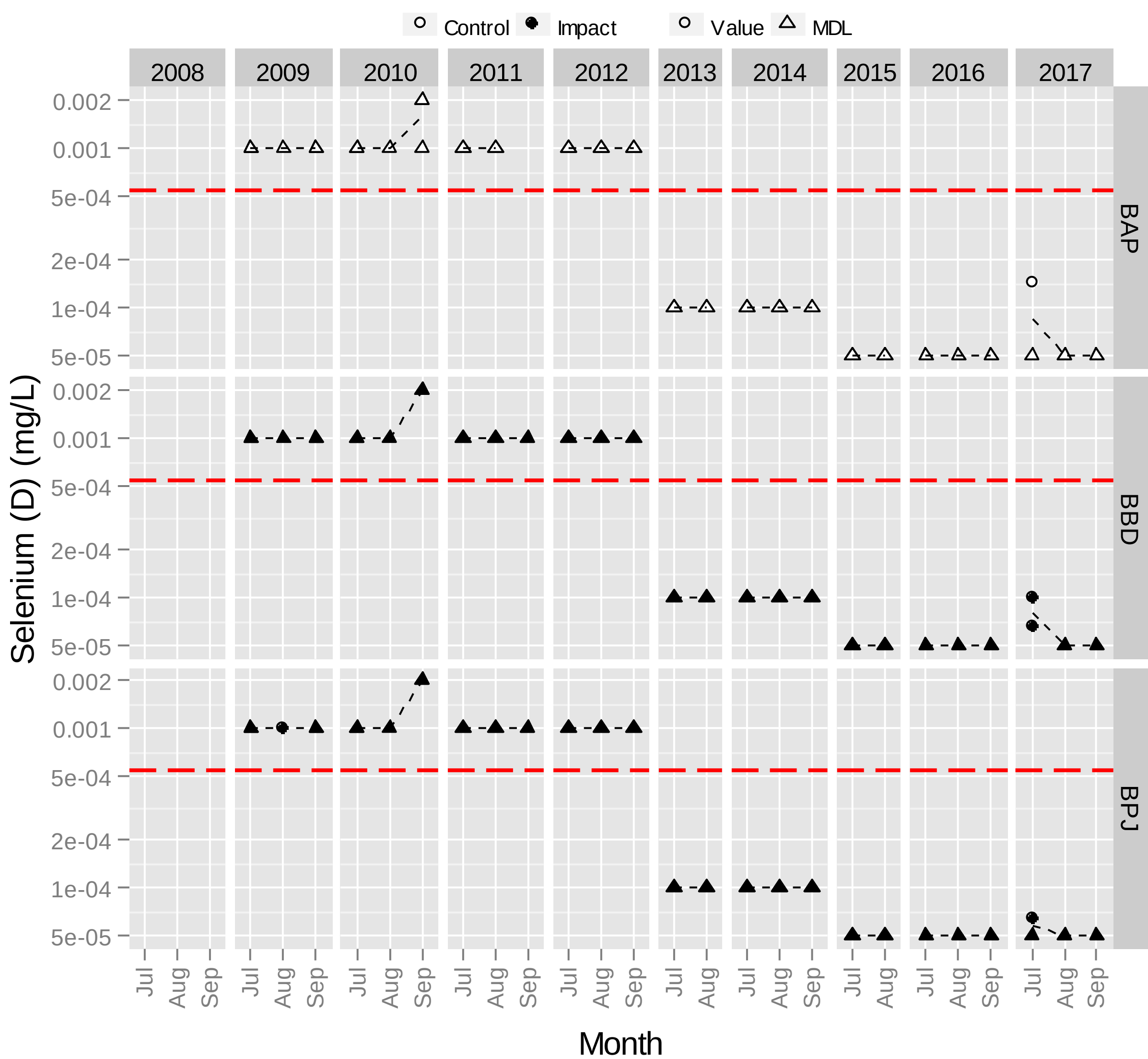


Figure A2–25. Dissolved thallium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

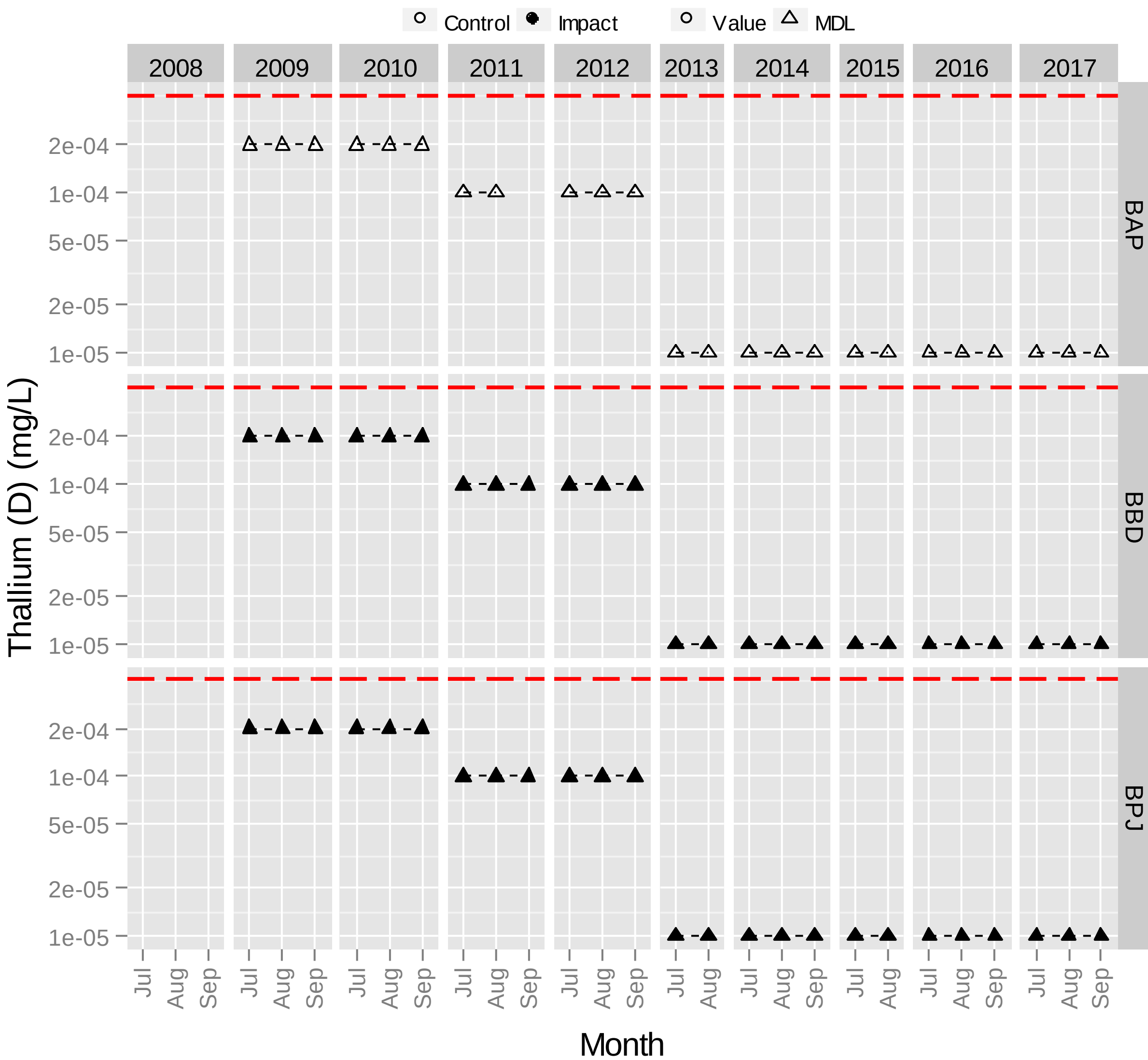


Figure A2–26. Dissolved tin (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

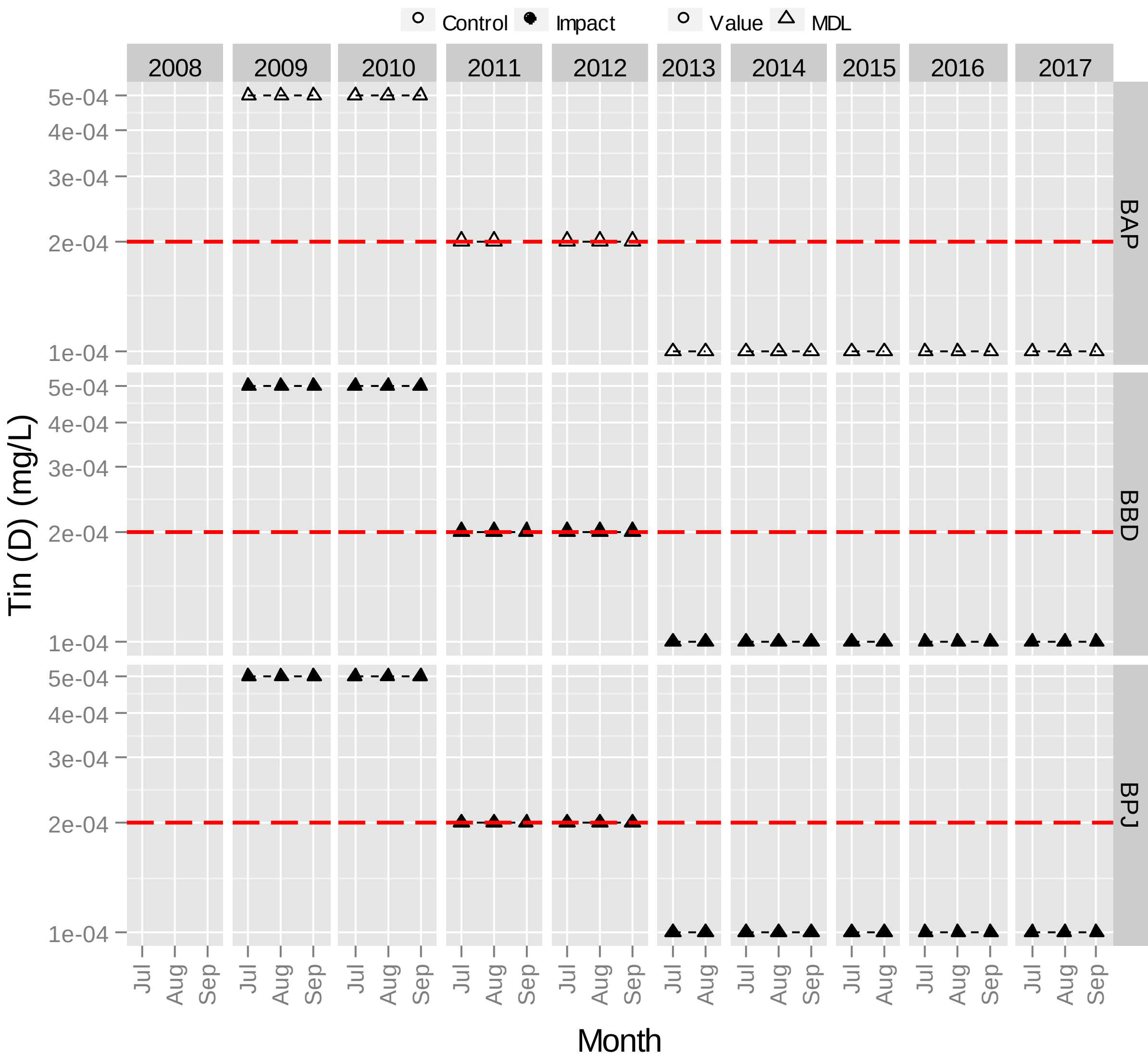


Figure A2–27. Dissolved titanium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

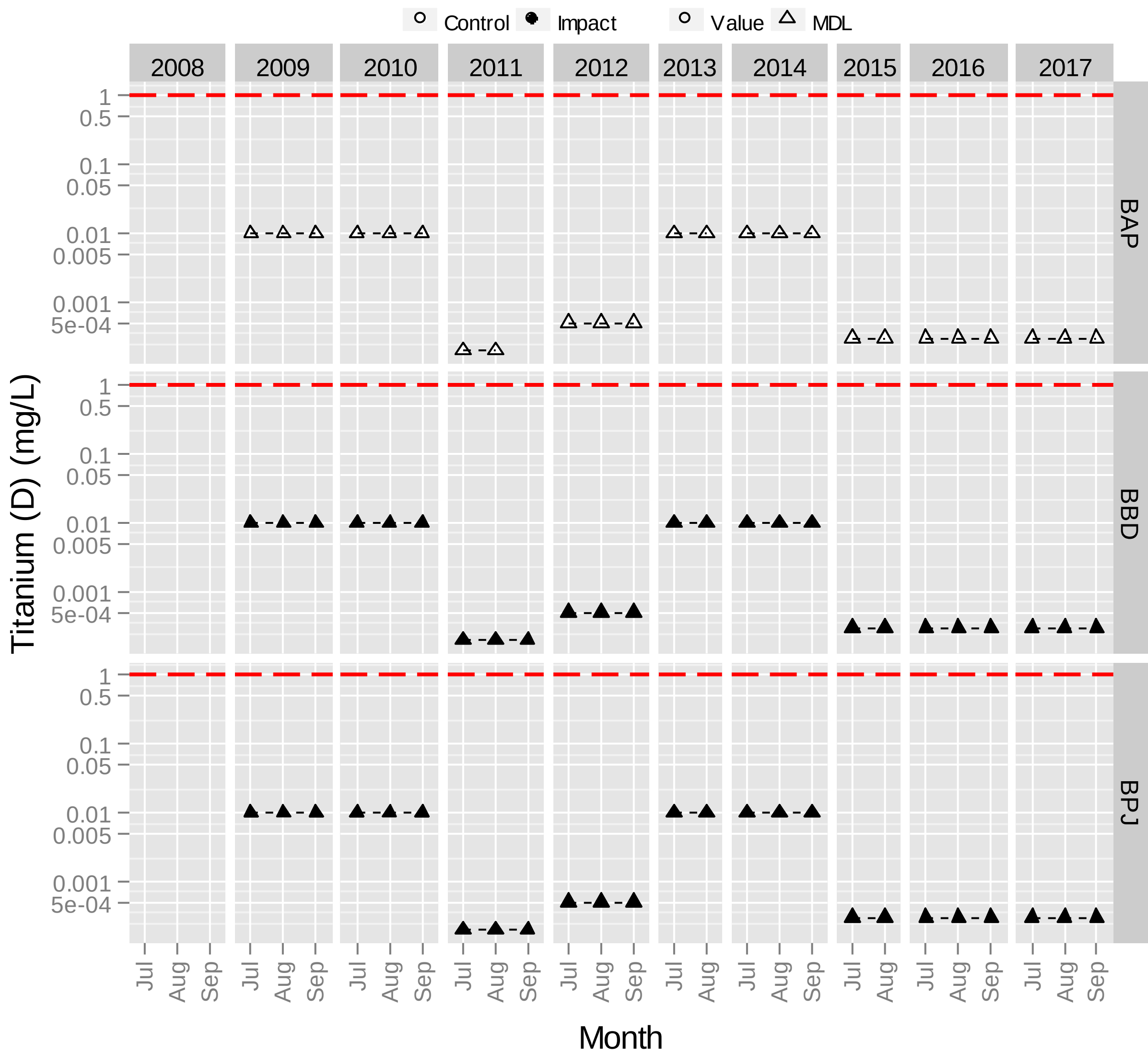


Figure A2–28. Dissolved vanadium (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.

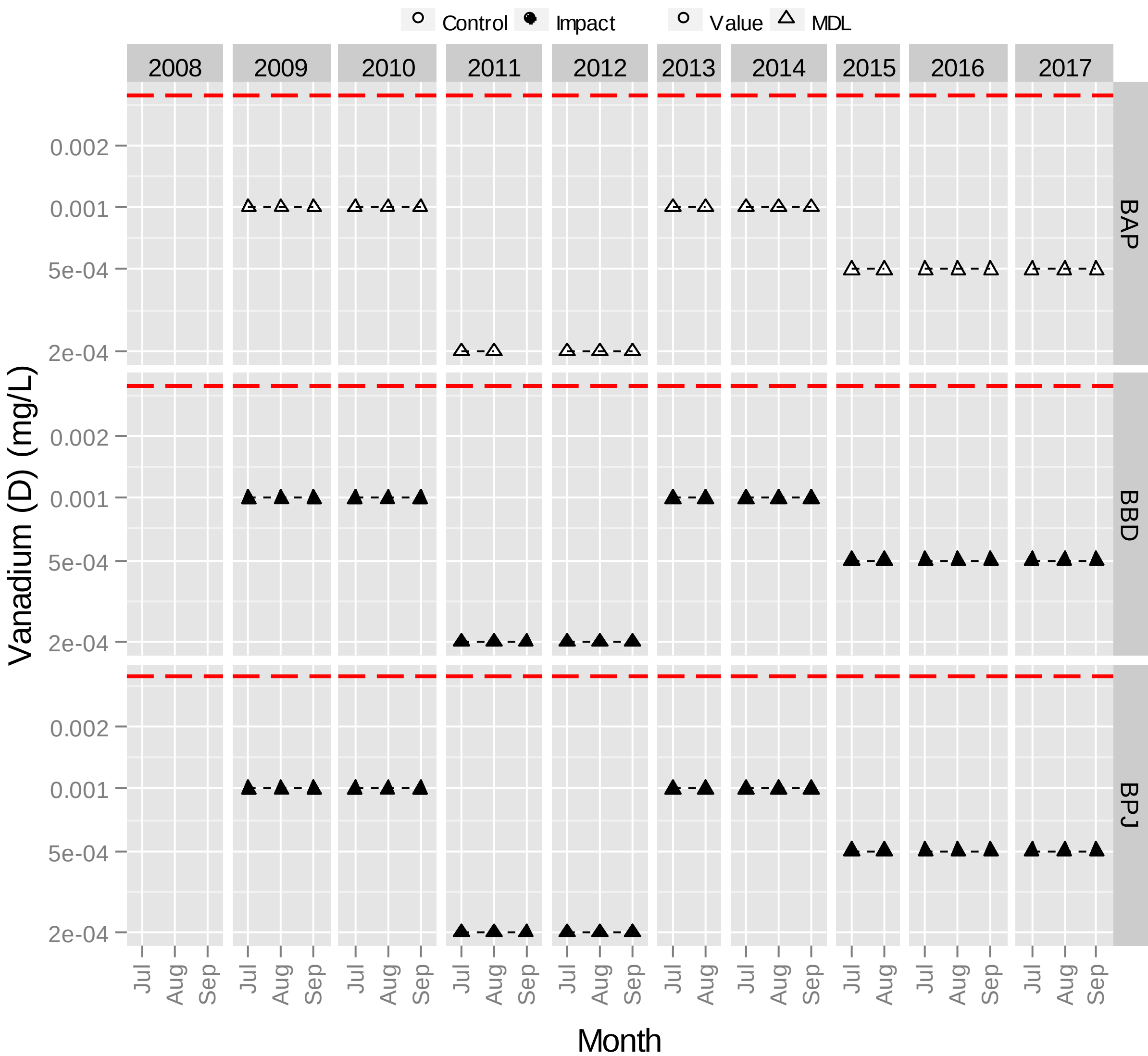
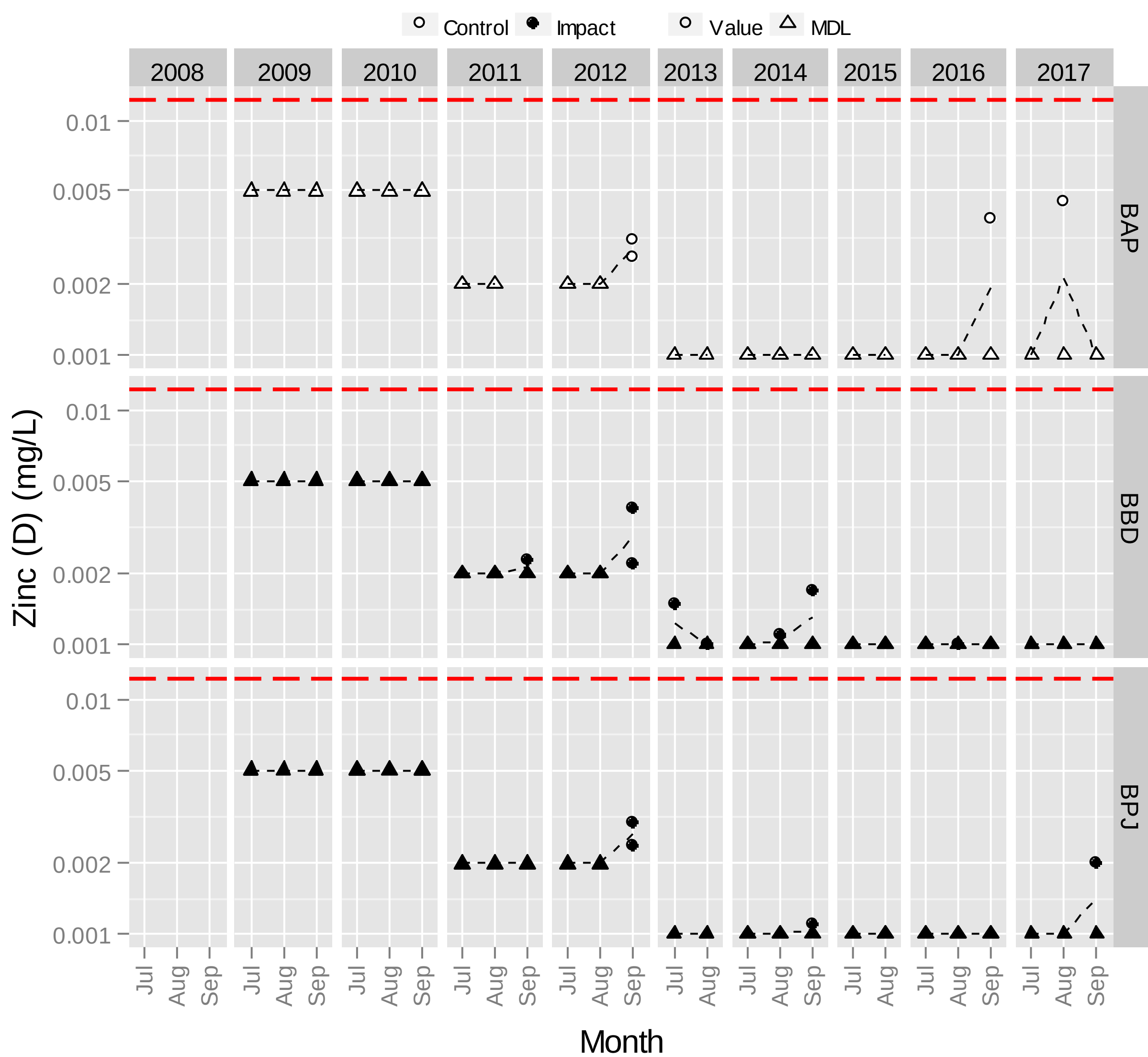


Figure A2–29. Dissolved zinc (mg/L) in water samples from Baker Lake since 2008.

Note: The red dashed line is the trigger value specific to Baker Lake.



APPENDIX B – PHYTOPLANKTON RAW DATA, 2017

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

Code	Species Name	Area-Replicate ID / Date	BAP - 49S 6-Jul-17	BAP - 50S 6-Jul-17	BAP - 51S 9-Aug-17	BAP - 51SR 9-Aug-17	BAP - 52S 9-Aug-17	BAP - 53S 30-Sep-17	BAP - 54S 30-Sep-17	BBD - 49S 6-Jul-17
	Cyanophyte									
1012	*Aphanothece sp.*		-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*		-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*		-	-	+	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*		-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*		-	+	-	-	-	-	-	+
1073	*Snowella sp*		-	-	-	-	-	-	-	-
1129	*Planktothrix*		-	-	-	-	-	-	-	-
	Chlorophytes									
2100	*Pyramidomonas tetrarhynchus Schmarda*		-	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*		+	+	+	+	+	+	+	+
2112	*Sphaerocystis schroeteri Chodat*		-	-	-	-	-	-	-	-
2121	*Oocystis lacustris Chodat*		-	-	+	+	+	+	-	-
2132	*Scenedesmus denticulatus Lagerhiem*		-	-	-	-	-	-	+	-
2137	*Dictyosphaerium simplex Sukja*		+	-	+	+	+	-	-	-
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*		+	+	+	+	+	+	+	+
2142	*Monoraphidium sp. a*		-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*		-	-	-	-	-	-	+	-
2145	*Crucigenia quadrata Morr.*		-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*		-	-	-	-	-	-	-	-
2169	*Planctonema lauterbornii Schmidle*		-	-	-	-	-	-	-	-
2178	*Cosmarium sp.*		-	-	-	-	-	-	-	-
2182	*Euastrum spp.*		-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*		-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*		+	-	+	+	+	-	-	-
2193	*Staurodesmus paradoxum Meyen*		-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*		-	-	-	-	-	+	-	-
2204	*Ankyra judai (G.M. Smith) Fott*		+	-	-	-	-	-	-	-
2205	*Mougeotia sp.*		-	-	-	-	-	+	-	-
2206	*Botryococcus braunii Kutzing*		-	-	-	-	+	+	-	-
2215	*Tetraedron caudatum (Corda) Hansgrig*		-	-	+	+	+	+	+	-
2235	*Ankistrodesmus spiralis Lemmermann*		+	+	+	+	+	+	-	+
2247	*Oocystis gigas Archer*		-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*		-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*		-	-	+	+	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*		-	-	-	-	-	-	-	-
	Euglenophyte									
3305	*Trachelomonas volvocina Ehrenberg*		+	-	-	-	-	-	-	-
	Chrysophyte									
4351	*Small chrysophyceae*		+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*		+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*		+	+	-	-	-	-	-	+
4357	*Chrysococcus sp.*		+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*		-	-	-	-	+	-	-	-
4361	*Kephyrion boreale Skuja*		-	-	-	-	-	-	-	-
4362	*Kephyrion sp.*		+	+	+	+	+	+	+	+
4363	*Spiniferomonas sirrata****************		-	-	+	-	+	-	+	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*		-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*		-	-	+	+	+	-	+	+
4372	*Mallomonas tonsurata Teiling and Krieger*		-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*		+	+	+	+	+	+	+	-
4381	*Dinobryon mucronutom Nygaard*		-	-	-	-	-	+	+	-
4383	*Dinobryon bavaricum Imhof*		-	-	+	+	+	+	+	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*		-	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*		+	+	+	+	+	+	+	+
4390	*Dinobryon sociale Ehrenberg*		+	+	-	-	-	-	-	+
4393	*Dinobryon spp.*		-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*		-	-	-	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*		+	+	+	+	+	+	+	+
4400	*Ochromonas sp.*		-	-	-	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*		-	-	-	-	-	-	-	+
4403	*Chrysosphaerella longispina Lauterborn*		-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*		-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*		-	-	+	+	+	+	+	+
4414	*Stichogloea spp.*		-	-	-	-	-	-	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*		+	-	+	+	+	+	+	-
4436	*Dinobryon attenatum Hill*		-	-	-	-	+	-	-	-
4437	*Pteridomonas sp.*		-	-	+	+	-	-	-	-
	Diatoms									
5507	*Cyclotella stelligera Cleve and Grunow*		+	+	+	+	+	+	+	+
5509	*Cyclotella ocellata Pant.*		+	+	+	+	+	+	+	+
5511	*Rhizosolenia eriense H.L. Smith*		+	-	+	+	+	-	-	+
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*		+	-	-	-	-	+	+	+
5514	*Tabellaria flocculsa (Roth) Kutzing*		-	-	+	+	+	+	+	+
5515	*Fragilaria crotonensis Kitton*		-	-	+	+	+	-	-	-
5518	*Synedra acus Kutzing*		+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*		-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*		+	+	+	+	+	+	+	+
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*		+	+	-	+	+	+	+	+
5544	*Pinnularia sp.*		-	-	+	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*		+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*		-	-	-	-	-	+	+	-
5866	*Surirella ovata Kutzing*		-	-	+	+	+	-	-	-
	Crytophyte									
6554	*Rhodomonas minuta Skuja*		+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*		+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*		-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*		+	+	-	-	-	+	+	+
6568	*Katablepharis ovalis Skuja*		+	+	-	-	+	+	+	+
	Dinoflagellates									
7631	*Gymnodinium helveticum Penard*		-	-	-	-	-	-	-	-
7632	*Gymnodinium sp.*		+	+	+	+	-	-	+	+
7635	*Peridinium willei Huitfeldt-Kaas*		-	-	-	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*		+	+	+	+	+	-	+	+
7641	*Peridinium aciculiferum Lemmermann*		+	+	+	+	-	+	-	+
7644	*Ceratium hirundenella (Muller) Schrank*		-	-	-	-	-	-	-	-
	Taxa Richness per Sample		**32**	**26**	**37**	**35**	**36**	**33**	**33**	**31**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

Code	Species Name	Area-Replicate ID	BBD - 49SR	BBD - 50S	BBD - 51S	BBD - 52S	BBD - 53S	BBD - 54S	BPJ - 49S	BPJ - 50S
		Date	6-Jul-17	6-Jul-17	10-Aug-17	10-Aug-17	30-Sep-17	30-Sep-17	6-Jul-17	6-Jul-17
	Cyanophyte									
1012	*Aphanothece sp.*		-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*		-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*		-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*		-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*		-	-	-	-	-	-	+	-
1073	*Snowella sp*		-	-	-	-	-	-	-	-
1129	*Planktothrix*		-	-	-	-	-	-	-	-
	Chlorophytes									
2100	*Pyramidomonas tetrarhynchus Schmarda*		-	-	-	+	-	-	-	-
2105	*Chlamydomonas spp.*		-	+	+	+	-	-	-	+
2112	*Sphaerocystis schroeteri Chodat*		-	-	+	+	-	-	-	-
2121	*Oocystis lacustris Chodat*		+	-	+	+	+	-	-	-
2132	*Scenedesmus denticulatus Lagerhiem*		-	-	-	-	+	-	-	-
2137	*Dictyosphaerium simplex Sukja*		-	-	+	+	+	-	-	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*		+	-	-	-	+	+	+	+
2142	*Monoraphidium sp. a*		-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*		-	-	-	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*		-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*		-	-	+	+	-	+	-	-
2169	*Planctonema lauterbornii Schmidle*		-	-	+	-	-	-	-	-
2178	*Cosmarium sp.*		-	-	-	-	-	-	-	-
2182	*Euastrum spp.*		-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*		-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*		-	-	-	+	+	+	-	-
2193	*Staurodesmus paradoxum Meyen*		-	-	-	-	+	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*		-	-	-	-	-	-	+	-
2204	*Ankyra judai (G.M. Smith) Fott*		-	-	-	-	-	+	-	-
2205	*Mougeotia sp.*		-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*		-	-	-	-	+	+	-	-
2215	*Tetraedron caudatum (Corda) Hansgrig*		-	-	+	+	+	+	-	-
2235	*Ankistrodesmus spiralis Lemmermann*		+	+	+	+	+	+	+	+
2247	*Oocystis gigas Archer*		-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*		-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*		-	-	+	+	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*		-	-	-	-	-	-	-	-
	Euglenophyte									
3305	*Trachelomonas volvocina Ehrenberg*		-	-	-	-	-	-	-	-
	Chrysophyte									
4351	*Small chrysophyceae*		+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*		+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*		+	+	-	-	-	-	+	+
4357	*Chrysococcus sp.*		+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*		-	-	-	-	-	-	-	+
4361	*Kephyrion boreale Skuja*		-	-	-	+	-	-	-	-
4362	*Kephyrion sp.*		+	+	+	+	+	+	+	+
4363	*Spiniferomonas sirrata*****************		-	-	+	+	-	+	-	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*		-	-	-	-	-	+	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*		+	+	-	+	+	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*		-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*		-	+	+	+	+	+	+	+
4381	*Dinobryon mucronutom Nygaard*		-	-	-	-	-	-	-	-
4383	*Dinobryon bavaricum Imhof*		-	-	+	+	-	-	-	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*		-	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*		+	+	+	+	-	-	+	+
4390	*Dinobryon sociale Ehrenberg*		+	+	-	+	-	-	+	+
4393	*Dinobryon spp.*		-	-	+	-	-	-	-	-
4394	*Epiphyxis sp.*		-	-	-	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*		+	+	-	+	+	+	+	+
4400	*Ochromonas sp.*		-	-	-	-	-	-	+	-
4401	*Uroglena volvox Ehrenberg*		-	+	-	-	-	-	+	+
4403	*Chrysosphaerella longispina Lauterborn*		-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*		-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*		+	+	+	+	-	+	+	+
4414	*Stichogloea spp.*		-	-	+	-	-	-	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*		+	+	+	+	+	+	+	+
4436	*Dinobryon attenatum Hill*		-	-	+	-	-	-	+	-
4437	*Pteridomonas sp.*		-	-	-	-	-	-	-	-
	Diatoms									
5507	*Cyclotella stelligera Cleve and Grunow*		+	+	+	+	+	+	+	+
5509	*Cyclotella ocellata Pant.*		+	+	+	-	+	-	+	-
5511	*Rhizosolenia eriense H.L. Smith*		+	+	+	+	+	-	+	+
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*		+	-	+	+	+	+	-	+
5514	*Tabellaria flocculsa (Roth) Kutzing*		+	-	+	+	+	+	-	-
5515	*Fragilaria crotonensis Kitton*		-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*		+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*		-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*		+	+	+	+	+	+	+	+
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*		+	+	+	+	-	-	+	+
5544	*Pinnularia sp.*		-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*		+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*		-	-	-	-	-	-	-	-
5866	*Surirella ovata Kutzing*		-	-	-	-	-	-	-	-
	Crytophyte									
6554	*Rhodomonas minuta Skuja*		+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*		+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*		-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*		+	+	-	-	+	+	+	-
6568	*Katablepharis ovalis Skuja*		+	+	+	-	-	+	+	+
	Dinoflagellates									
7631	*Gymnodinium helveticum Penard*		-	-	+	-	-	-	-	+
7632	*Gymnodinium sp.*		+	+	+	+	+	+	+	+
7635	*Peridinium willei Huitfeldt-Kaas*		+	-	-	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*		-	+	+	+	+	+	+	+
7641	*Peridinium aciculiferum Lemmermann*		+	+	+	+	-	+	+	+
7644	*Ceratium hirundenella (Muller) Schrank*		-	-	-	-	-	-	-	-
	Taxa Richness per Sample		**30**	**29**	**38**	**37**	**30**	**30**	**32**	**31**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

Code	Species Name Area-Replicate ID / Date	BPJ - 51S	BPJ - 52S	BPJ - 53S	BPJ - 54S	INUG - 86S	INUG - 87S	INUG - 87SR	INUG - 88S
		10-Aug-17	10-Aug-17	30-Sep-17	30-Sep-17	29-Mar-17	29-Mar-17	29-Mar-17	7-May-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	+	+	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	-	-	-	-	-	-	-	-
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	+	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	+	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*	+	-	-	+	+	-	-	-
2112	*Sphaerocystis schroeteri Chodat*	-	-	-	-	-	-	-	-
2121	*Oocystis lacustris Chodat*	+	+	+	+	-	-	-	+
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	+	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	+	+	-	-	-	-	-	-
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	-	+	+	+	-	-	-	-
2142	*Monoraphidium sp. a*	-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	-	-	-	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*	-	-	+	-	-	-	-	-
2169	*Planctonema lauterbornii Schmidle*	-	-	-	-	-	-	-	-
2178	*Cosmarium sp.*	-	-	-	-	-	-	-	-
2182	*Euastrum spp.*	-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*	-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	+	+	-	-	+	+	+	-
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	-	-	-	-	-	-	-	-
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*	-	-	-	-	+	+	+	+
2215	*Tetraedron caudatum (Corda) Hansgrig*	+	+	+	+	-	-	-	-
2235	*Ankistrodesmus spiralis Lemmermann*	-	-	+	+	-	-	-	-
2247	*Oocystis gigas Archer*	+	+	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	+	+	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	-	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	+	+	-	-	-	-	-	-
4361	*Kephyrion boreale Skuja*	-	-	-	-	-	-	-	-
4362	*Kephyrion sp.*	+	+	+	-	+	+	+	+
4363	*Spiniferomonas sirrata****************	+	+	+	-	-	-	-	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	+	+	-	+	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*	-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	+	-	+	+	-	-	-	-
4381	*Dinobryon mucronutom Nygaard*	-	-	-	-	-	-	-	-
4383	*Dinobryon bavaricum Imhof*	+	+	-	-	-	-	-	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	-	-	-	-	+	-	-	-
4388	*Dinobryon sertularia Ehrenberg*	+	+	+	+	-	-	-	-
4390	*Dinobryon sociale Ehrenberg*	-	-	-	-	-	-	-	-
4393	*Dinobryon spp.*	-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*	-	-	-	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*	+	+	+	+	+	+	+	-
4400	*Ochromonas sp.*	-	+	-	-	-	-	-	+
4401	*Uroglena volvox Ehrenberg*	-	-	-	-	-	-	-	-
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	-	+	+	+	-	-	-	-
4414	*Stichogloea spp.*	-	+	-	-	-	-	-	+
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	+	+	+	+	+	+	+	+
4436	*Dinobryon attenatum Hill*	+	+	-	-	-	-	-	-
4437	*Pteridomonas sp.*	-	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	+	+	+	+	+	+	+	+
5509	*Cyclotella ocellata Pant.*	-	+	-	+	-	-	-	-
5511	*Rhizosolenia eriense H.L. Smith*	+	+	-	-	-	-	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	-	-	+	+	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*	-	+	+	+	-	-	-	-
5515	*Fragilaria crotonensis Kitton*	+	+	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	+	+	+	-	+	-	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	+	+	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	+	+	+	+	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	+	+	+	+	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	-	-	-	-	-	-	-	-
5866	*Surirella ovata Kutzing*	+	+	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*	+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*	-	-	+	+	-	-	-	-
6568	*Katablepharis ovalis Skuja*	+	+	+	+	+	+	-	-
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	-	-	-	-	-
7632	*Gymnodinium sp.*	+	+	-	-	+	+	+	-
7635	*Peridinium willei Huitfeldt-Kaas*	-	-	-	-	+	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*	+	+	+	+	-	-	+	-
7641	*Peridinium aciculiferum Lemmermann*	+	-	-	-	-	-	-	-
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**36**	**38**	**27**	**29**	**18**	**16**	**14**	**14**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

		Area-Replicate ID	INUG - 89S	INUG - 90S	INUG - 91S	INUG - 92S	INUG - 93S	INUG - 94S	INUG - 95S	INUG - 95SR
Code	Species Name	Date	7-May-17	22-Jul-17	22-Jul-17	25-Aug-17	25-Aug-17	23-Sep-17	23-Sep-17	23-Sep-17
	Cyanophyte									
1012	*Aphanothece sp.*		-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*		-	-	+	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*		-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*		-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*		-	+	+	+	+	+	+	+
1073	*Snowella sp*		-	+	-	-	-	-	-	-
1129	*Planktothrix*		-	-	-	-	-	-	-	-
	Chlorophytes									
2100	*Pyramidomonas tetrarhynchus Schmarda*		-	-	-	+	-	-	+	-
2105	*Chlamydomonas spp.*		+	-	+	+	-	-	-	-
2112	*Sphaerocystis schroeteri Chodat*		-	-	+	+	+	-	+	-
2121	*Oocystis lacustris Chodat*		+	+	-	+	+	+	+	+
2132	*Scenedesmus denticulatus Lagerhiem*		-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*		-	-	-	+	+	+	+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*		-	+	-	-	-	-	-	-
2142	*Monoraphidium sp. a*		-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*		-	-	-	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*		-	-	+	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*		-	+	+	+	+	+	+	+
2169	*Planctonema lauterbornii Schmidle*		-	-	-	+	-	-	-	-
2178	*Cosmarium sp.*		-	-	-	+	-	-	-	-
2182	*Euastrum spp.*		-	-	+	-	+	-	-	-
2186	*Xanthidium sp.*		-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*		+	+	+	+	+	+	+	+
2193	*Staurodesmus paradoxum Meyen*		-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*		-	+	+	-	-	+	+	+
2204	*Ankyra judai (G.M. Smith) Fott*		-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*		-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*		+	+	-	+	+	+	+	+
2215	*Tetraedron caudatum (Corda) Hansgrig*		-	-	-	-	+	+	+	+
2235	*Ankistrodesmus spiralis Lemmermann*		-	-	-	+	+	+	-	+
2247	*Oocystis gigas Archer*		-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*		-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*		-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*		+	-	-	-	-	-	-	-
	Euglenophyte									
3305	*Trachelomonas volvocina Ehrenberg*		-	-	-	-	-	-	-	-
	Chrysophyte									
4351	*Small chrysophyceae*		+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*		+	+	-	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*		-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*		+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*		-	-	-	+	-	-	-	-
4361	*Kephyrion boreale Skuja*		-	-	-	-	+	-	-	-
4362	*Kephyrion sp.*		+	+	+	+	+	+	+	+
4363	*Spiniferomonas sirrata****************		-	+	-	-	+	+	+	+
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*		-	+	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*		-	-	-	-	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*		-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*		-	-	+	-	+	+	+	+
4381	*Dinobryon mucronutom Nygaard*		-	+	+	-	-	+	+	-
4383	*Dinobryon bavaricum Imhof*		-	+	+	+	+	+	+	+
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*		-	+	+	+	+	+	+	+
4388	*Dinobryon sertularia Ehrenberg*		-	+	+	+	+	-	-	-
4390	*Dinobryon sociale Ehrenberg*		-	+	+	+	+	+	+	+
4393	*Dinobryon spp.*		-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*		-	-	-	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*		-	+	+	-	-	-	-	-
4400	*Ochromonas sp.*		-	-	-	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*		-	-	+	-	-	+	+	+
4403	*Chrysosphaerella longispina Lauterborn*		-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*		-	-	-	+	+	-	-	-
4413	*Chrysochromulina laurentiana Kling*		-	+	+	+	+	+	+	+
4414	*Stichogloea spp.*		+	+	+	+	+	+	+	+
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*		-	+	-	-	-	-	-	-
4436	*Dinobryon attenatum Hill*		-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*		-	-	-	-	-	-	-	-
	Diatoms									
5507	*Cyclotella stelligera Cleve and Grunow*		+	+	+	+	+	+	+	+
5509	*Cyclotella ocellata Pant.*		-	+	+	+	+	+	+	+
5511	*Rhizosolenia eriense H.L. Smith*		-	+	+	-	+	+	+	+
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*		-	-	-	+	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*		-	-	-	+	+	-	+	+
5515	*Fragilaria crotonensis Kitton*		-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*		+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*		-	-	-	-	-	+	-	-
5524	*Asterionella formosa Hassall*		-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*		-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*		-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*		+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*		-	-	+	-	-	-	-	-
5866	*Surirella ovata Kutzing*		-	-	-	-	-	-	-	-
	Crytophyte									
6554	*Rhodomonas minuta Skuja*		+	-	-	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*		+	-	-	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*		-	+	+	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*		-	-	-	-	-	-	-	-
6568	*Katablepharis ovalis Skuja*		+	-	+	+	+	-	+	-
	Dinoflagellates									
7631	*Gymnodinium helveticum Penard*		-	-	-	-	-	+	-	-
7632	*Gymnodinium sp.*		-	+	+	+	+	+	+	+
7635	*Peridinium willei Huitfeldt-Kaas*		-	-	-	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*		-	+	-	+	+	+	-	+
7641	*Peridinium aciculiferum Lemmermann*		-	-	-	-	-	-	-	-
7644	*Ceratium hirundenella (Muller) Schrank*		-	+	-	-	-	-	-	-
	Taxa Richness per Sample		**16**	**32**	**31**	**35**	**35**	**33**	**33**	**31**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

Code	Species Name / *Area-Replicate ID* / *Date*	INUG - 96S 2-Nov-17	INUG - 97S 2-Nov-17	PDL - 51S 27-Mar-17	PDL - 52S 27-Mar-17	PDL - 53S 10-May-17	PDL - 53SR 10-May-17	PDL - 54S 10-May-17	PDL - 55S 8-Jul-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	+	+	+	+	+	+	+	+
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	-	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	-	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*	-	-	-	+	+	+	-	-
2112	*Sphaerocystis schroeteri Chodat*	+	-	-	-	-	-	-	-
2121	*Oocystis lacustris Chodat*	+	+	-	-	-	+	-	+
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	+	+	-	+	+	+	+	-
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	-	-	-	-	-	-	-	-
2142	*Monoraphidium sp. a*	-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	-	-	-	-	+	-	-	-
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*	+	+	+	+	-	+	+	+
2169	*Planctonema lauterbornii Schmidle*	-	-	-	-	-	-	-	-
2178	*Cosmarium sp.*	-	-	-	-	-	-	-	-
2182	*Euastrum spp.*	-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*	-	+	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	+	+	+	+	+	+	+	+
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	+	+	+	+	-	-	+	+
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*	+	-	+	+	-	+	+	+
2215	*Tetraedron caudatum (Corda) Hansgrig*	+	-	-	-	-	-	+	+
2235	*Ankistrodesmus spiralis Lemmermann*	+	+	-	-	-	-	-	-
2247	*Oocystis gigas Archer*	-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	-	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	+
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	-	+	-	-	-	-	-	-
4361	*Kephyrion boreale Skuja*	-	-	+	-	-	-	+	+
4362	*Kephyrion sp.*	+	+	+	+	+	+	+	+
4363	*Spiniferomonas sirrata****************	-	-	-	-	-	-	+	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	-	-	-	-	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*	+	+	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	+	+	-	-	-	-	-	+
4381	*Dinobryon mucronutom Nygaard*	-	-	-	-	-	-	-	-
4383	*Dinobryon bavaricum Imhof*	+	+	+	+	+	+	+	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	+	+	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*	-	-	-	-	-	-	-	+
4390	*Dinobryon sociale Ehrenberg*	+	+	-	-	-	-	-	+
4393	*Dinobryon spp.*	-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*	-	-	-	-	-	-	-	+
4396	*Chrysolkos skuja (Nauwerck) Willen*	+	+	-	+	+	+	+	+
4400	*Ochromonas sp.*	-	-	-	-	-	+	+	-
4401	*Uroglena volvox Ehrenberg*	-	-	-	-	-	-	-	+
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	+	+	-	-	-	-	-	+
4414	*Stichogloea spp.*	-	-	+	+	-	-	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	+	+	+	+	+	+	+	-
4436	*Dinobryon attenatum Hill*	-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*	-	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	+	+	+	-	+	-	-	+
5509	*Cyclotella ocellata Pant.*	-	-	-	-	+	-	-	+
5511	*Rhizosolenia eriense H.L. Smith*	+	+	+	+	+	+	+	+
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	-	-	-	-	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*	-	-	-	-	-	-	-	-
5515	*Fragilaria crotonensis Kitton*	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	-	-	-	-	-	-	-	-
5866	*Surirella ovata Kutzing*	-	-	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*	+	+	+	+	-	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*	-	-	-	-	-	-	-	-
6568	*Katablepharis ovalis Skuja*	-	-	-	-	+	+	-	+
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	-	-	-	-	+
7632	*Gymnodinium sp.*	-	-	+	-	+	+	+	+
7635	*Peridinium willei Huitfeldt-Kaas*	-	-	-	+	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*	-	-	+	-	-	-	-	+
7641	*Peridinium aciculiferum Lemmermann*	-	-	-	+	+	+	-	+
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**28**	**27**	**21**	**22**	**21**	**23**	**23**	**32**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

Code	Species Name	Area-Replicate ID / Date	PDL - 56S 8-Jul-17	PDL - 57S 24-Aug-17	PDL - 57SR 24-Aug-17	PDL - 58S 24-Aug-17	PDL - 59S 1-Oct-17	PDL - 60S 1-Oct-17	PDL - 61S 2-Nov-17	PDL - 62S 2-Nov-17
	Cyanophyte									
1012	*Aphanothece sp.*		-	-	-	-	+	+	-	-
1014	*Chroococcus limneticus Lemmermann*		-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*		-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*		-	-	-	-	-	+	-	-
1054	*Planktolyngbya limnetica*		+	+	+	+	+	+	+	+
1073	*Snowella sp*		-	-	-	-	-	-	-	-
1129	*Planktothrix*		-	-	-	-	-	-	-	-
	Chlorophytes									
2100	*Pyramidomonas tetrarhynchus Schmarda*		-	+	+	+	-	-	-	-
2105	*Chlamydomonas spp.*		+	+	+	+	-	+	+	-
2112	*Sphaerocystis schroeteri Chodat*		-	+	+	+	-	-	-	-
2121	*Oocystis lacustris Chodat*		+	+	+	+	-	-	-	+
2132	*Scenedesmus denticulatus Lagerhiem*		-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*		-	+	+	+	+	+	+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*		-	-	-	-	+	-	-	-
2142	*Monoraphidium sp. a*		-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*		-	+	+	+	-	-	-	-
2145	*Crucigenia quadrata Morr.*		-	-	-	-	+	+	-	-
2167	*Elakatothrix gelatinosa Willen*		+	+	+	+	+	+	+	+
2169	*Planctonema lauterbornii Schmidle*		-	+	-	-	-	-	-	-
2178	*Cosmarium sp.*		-	-	-	-	-	-	-	-
2182	*Euastrum spp.*		-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*		-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*		+	+	+	+	+	+	-	+
2193	*Staurodesmus paradoxum Meyen*		-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*		+	+	+	+	+	+	-	+
2204	*Ankyra judai (G.M. Smith) Fott*		-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*		-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*		-	+	+	+	-	-	-	-
2215	*Tetraedron caudatum (Corda) Hansgrig*		+	+	+	+	+	+	+	-
2235	*Ankistrodesmus spiralis Lemmermann*		-	+	+	+	-	-	-	-
2247	*Oocystis gigas Archer*		-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*		-	-	-	-	+	+	-	-
2509	*Scenedesmus ecornis*		-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*		-	-	-	-	-	-	-	-
	Euglenophyte									
3305	*Trachelomonas volvocina Ehrenberg*		-	-	-	-	-	-	-	-
	Chrysophyte									
4351	*Small chrysophyceae*		+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*		+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*		+	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*		+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*		-	+	+	+	+	+	-	-
4361	*Kephyrion boreale Skuja*		-	+	+	+	-	-	-	+
4362	*Kephyrion sp.*		+	+	+	+	+	+	+	+
4363	*Spiniferomonas sirrata*****************		-	-	-	-	-	-	+	+
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*		-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*		-	-	-	-	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*		-	-	-	-	-	-	+	-
4378	*Dinobryon borgei Lemmermann*		+	-	-	+	+	+	-	+
4381	*Dinobryon mucronutom Nygaard*		-	-	-	+	+	+	+	-
4383	*Dinobryon bavaricum Imhof*		+	+	+	+	+	+	+	+
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*		-	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*		+	+	+	+	+	+	+	-
4390	*Dinobryon sociale Ehrenberg*		+	+	+	+	-	-	+	+
4393	*Dinobryon spp.*		-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*		-	-	-	-	+	+	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*		+	+	-	+	+	-	-	-
4400	*Ochromonas sp.*		-	-	-	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*		+	-	-	-	-	-	-	-
4403	*Chrysosphaerella longispina Lauterborn*		-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*		-	+	+	-	+	+	-	-
4413	*Chrysochromulina laurentiana Kling*		+	+	+	+	+	+	+	+
4414	*Stichogloea spp.*		-	+	+	+	+	+	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*		+	+	+	-	+	+	+	+
4436	*Dinobryon attenatum Hill*		-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*		-	-	-	-	-	-	-	-
	Diatoms									
5507	*Cyclotella stelligera Cleve and Grunow*		+	+	+	+	+	+	-	+
5509	*Cyclotella ocellata Pant.*		+	+	+	+	+	+	+	-
5511	*Rhizosolenia eriense H.L. Smith*		+	+	+	+	+	+	+	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*		-	-	-	-	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*		+	+	-	-	+	+	-	-
5515	*Fragilaria crotonensis Kitton*		-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*		+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*		-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*		-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*		-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*		-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*		+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*		-	+	+	+	+	+	-	-
5866	*Surirella ovata Kutzing*		-	-	-	-	-	-	-	-
	Crytophyte									
6554	*Rhodomonas minuta Skuja*		+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*		+	-	+	+	-	-	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*		-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*		-	-	-	-	-	-	-	-
6568	*Katablepharis ovalis Skuja*		+	-	+	-	-	-	-	+
	Dinoflagellates									
7631	*Gymnodinium helveticum Penard*		-	-	-	-	-	-	-	-
7632	*Gymnodinium sp.*		+	+	+	+	+	+	+	+
7635	*Peridinium willei Huitfeldt-Kaas*		-	-	+	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*		+	+	+	+	-	-	-	-
7641	*Peridinium aciculiferum Lemmermann*		+	-	-	-	+	-	-	-
7644	*Ceratium hirundenella (Muller) Schrank*		-	-	-	-	-	-	-	-
	Taxa Richness per Sample		**32**	**38**	**38**	**37**	**35**	**34**	**24**	**24**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

	Area-Replicate ID	SP - 100S	SP - 101S	SP - 102S	SP - 102SR	SP - 103S	SP - 104S	SP - 105S	SP - 106S
Code	*Species Name* / *Date*	26-Mar-17	26-Mar-17	5-May-17	5-May-17	5-May-17	2-Jul-17	2-Jul-17	26-Aug-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	-	-	-	-	+	-	-	+
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	-	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	-	-	-	-	-	-	-	+
2105	*Chlamydomonas spp.*	-	-	-	+	+	-	-	+
2112	*Sphaerocystis schroeteri Chodat*	-	-	-	-	-	-	-	+
2121	*Oocystis lacustris Chodat*	-	-	-	-	-	-	+	+
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	+	+	+	+	+	-	-	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	-	-	-	-	-	+	+	+
2142	*Monoraphidium sp. a*	-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	-	-	-	-	-	-	-	+
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*	-	-	-	-	-	-	-	-
2169	*Planctonema lauterbornii Schmidle*	-	-	-	-	-	-	-	-
2178	*Cosmarium sp.*	-	-	-	-	-	-	-	-
2182	*Euastrum spp.*	-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*	-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	-	-	-	-	-	-	+	+
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	-	-	-	+	-	-	+	+
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	+
2206	*Botryococcus braunii Kutzing*	-	-	-	-	-	-	-	+
2215	*Tetraedron caudatum (Corda) Hansgrig*	-	-	-	-	-	+	+	+
2235	*Ankistrodesmus spiralis Lemmermann*	+	+	+	+	+	-	-	+
2247	*Oocystis gigas Archer*	-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	-	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	-	-	-	-	-	+	-	+
4361	*Kephyrion boreale Skuja*	-	-	-	-	-	-	-	-
4362	*Kephyrion sp.*	-	-	+	+	+	+	+	+
4363	*Spiniferomonas sirrata*****************	-	+	-	-	-	-	-	+
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	-	-	-	-	-	-	+	-
4372	*Mallomonas tonsurata Teiling and Krieger*	-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	-	+	-	-	-	+	+	+
4381	*Dinobryon mucronutom Nygaard*	-	-	-	-	-	-	-	+
4383	*Dinobryon bavaricum Imhof*	-	-	-	+	-	-	-	+
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	-	-	-	-	-	-	-	+
4388	*Dinobryon sertularia Ehrenberg*	-	-	-	-	+	+	+	+
4390	*Dinobryon sociale Ehrenberg*	-	-	-	-	-	+	+	+
4393	*Dinobryon spp.*	-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*	-	-	-	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*	+	-	-	-	-	+	+	+
4400	*Ochromonas sp.*	+	+	-	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*	-	-	-	-	-	+	+	-
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	-	-	-	-	-	+	+	+
4414	*Stichogloea spp.*	-	-	-	-	-	-	+	+
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	+	+	+	+	+	-	-	+
4436	*Dinobryon attenatum Hill*	-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*	-	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	-	+	+	+	+	+	-	+
5509	*Cyclotella ocellata Pant.*	+	-	-	-	+	+	+	+
5511	*Rhizosolenia eriense H.L. Smith*	-	-	-	-	-	-	-	+
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	-	-	-	-	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*	-	-	-	-	-	-	-	+
5515	*Fragilaria crotonensis Kitton*	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	-	-	-	-	-	-	-	+
5866	*Surirella ovata Kutzing*	-	-	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	+	+	+	-	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*	+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	+	-	-
6565	*Cryptomonas rostratiformis Skuja*	+	+	-	+	-	-	-	-
6568	*Katablepharis ovalis Skuja*	+	-	-	-	-	+	+	-
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	-	-	+	-	-
7632	*Gymnodinium sp.*	+	-	-	-	+	-	+	+
7635	*Peridinium willei Huitfeldt-Kaas*	-	-	-	-	-	+	-	+
7639	*Peridinium pusillum (Penard) Lemmermann*	+	-	+	-	-	+	+	+
7641	*Peridinium aciculiferum Lemmermann*	-	-	-	-	-	-	+	-
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**17**	**15**	**13**	**15**	**17**	**24**	**26**	**42**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

	Area-Replicate ID	SP - 107S	SP - 108S	SP - 109S	TE - 92S	TE - 93S	TEFF - 45S	TEFF - 46S	TPE - 100S
Code	*Species Name* / *Date*	26-Aug-17	14-Sep-17	14-Sep-17	29-Mar-17	29-Mar-17	29-Mar-17	29-Mar-17	24-Mar-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	+	+	+	+	+	+	+	+
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	-	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	+	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*	+	-	-	-	-	+	-	-
2112	*Sphaerocystis schroeteri Chodat*	+	-	-	-	-	-	-	-
2121	*Oocystis lacustris Chodat*	+	-	-	-	+	-	-	+
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	+	+	+	-	+	+	+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	+	+	+	-	-	-	-	-
2142	*Monoraphidium sp. a*	-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	+	+	+	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*	+	-	+	-	-	-	-	-
2169	*Planctonema lauterbornii Schmidle*	-	-	+	-	-	-	-	-
2178	*Cosmarium sp.*	+	-	-	-	-	-	-	-
2182	*Euastrum spp.*	-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*	-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	+	+	+	-	-	-	-	-
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	-	-	-	-	+	-	-	-
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*	+	+	+	-	-	-	-	+
2215	*Tetraedron caudatum (Corda) Hansgrig*	+	+	+	-	-	-	-	+
2235	*Ankistrodesmus spiralis Lemmermann*	+	+	-	+	-	+	+	+
2247	*Oocystis gigas Archer*	-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	-	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	-	-	-	-	-	-	-	-
4361	*Kephyrion boreale Skuja*	+	+	-	-	-	+	-	-
4362	*Kephyrion sp.*	+	+	+	+	+	-	+	+
4363	*Spiniferomonas sirrata****************	-	-	+	-	-	-	-	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	-	+	-	-	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*	-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	+	+	+	+	-	-	-	-
4381	*Dinobryon mucronutom Nygaard*	-	+	-	-	-	-	-	-
4383	*Dinobryon bavaricum Imhof*	+	+	+	+	+	+	-	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	+	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*	-	+	-	-	+	-	-	-
4390	*Dinobryon sociale Ehrenberg*	+	-	-	-	-	-	-	-
4393	*Dinobryon spp.*	-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*	-	+	+	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*	+	+	+	-	+	-	+	+
4400	*Ochromonas sp.*	-	-	-	-	-	-	+	-
4401	*Uroglena volvox Ehrenberg*	-	-	-	-	-	-	-	-
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	+	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	+	+	+	-	-	+	-	-
4414	*Stichogloea spp.*	+	+	+	-	-	-	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	+	+	-	+	+	-	+	-
4436	*Dinobryon attenatum Hill*	-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*	+	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	+	+	+	+	+	+	-	+
5509	*Cyclotella ocellata Pant.*	-	-	-	-	-	-	-	-
5511	*Rhizosolenia eriense H.L. Smith*	+	-	-	-	+	+	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	-	-	-	-	+	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*	+	-	+	-	-	-	-	-
5515	*Fragilaria crotonensis Kitton*	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	+	+	-	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	+	+	+	-	-	-	-	-
5866	*Surirella ovata Kutzing*	-	-	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*	+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*	+	-	-	-	-	-	+	+
6568	*Katablepharis ovalis Skuja*	+	-	-	+	+	-	-	-
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	-	-	-	-	-
7632	*Gymnodinium sp.*	+	+	-	+	+	+	+	-
7635	*Peridinium willei Huitfeldt-Kaas*	-	-	+	+	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*	+	-	+	+	+	-	+	-
7641	*Peridinium aciculiferum Lemmermann*	-	+	-	+	-	+	-	-
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**41**	**31**	**29**	**18**	**22**	**18**	**17**	**17**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

	Area-Replicate ID	TPE - 100SR	TPE - 101S	TPE - 102S	TPE - 103S	TPE - 104S	TPE - 104SR	TPE - 105S	TPE - 106S
Code	Species Name Date	24-Mar-17	24-Mar-17	4-May-17	5-May-17	1-Jul-17	1-Jul-17	1-Jul-17	27-Aug-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	-	-	-	-	-	-	+	+
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	-	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	-	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*	-	-	-	+	+	-	+	+
2112	*Sphaerocystis schroeteri Chodat*	-	-	-	-	-	-	-	-
2121	*Oocystis lacustris Chodat*	+	+	-	-	+	+	+	-
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	+	+	-	-	-	+	+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	-	-	-	-	+	+	+	+
2142	*Monoraphidium sp. a*	-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	-	-	-	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	+	-	-
2167	*Elakatothrix gelatinosa Willen*	-	-	-	+	-	-	-	+
2169	*Planctonema lauterbornii Schmidle*	-	-	-	-	-	-	-	+
2178	*Cosmarium sp.*	-	-	-	-	-	-	-	-
2182	*Euastrum spp.*	-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*	-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	-	-	-	-	+	+	+	+
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	-	-	-	-	+	+	+	-
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*	+	+	-	+	-	-	-	+
2215	*Tetraedron caudatum (Corda) Hansgrig*	+	-	-	-	+	+	+	+
2235	*Ankistrodesmus spiralis Lemmermann*	+	+	+	+	-	-	-	-
2247	*Oocystis gigas Archer*	-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	-	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	+	-	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	-	-	-	-	-	-	-	+
4361	*Kephyrion boreale Skuja*	-	-	-	-	-	-	+	-
4362	*Kephyrion sp.*	+	+	+	-	+	+	+	+
4363	*Spiniferomonas sirrata*****************	-	-	-	+	+	+	+	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	-	-	-	-	-	-	-	+
4372	*Mallomonas tonsurata Teiling and Krieger*	-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	-	-	+	-	+	-	-	+
4381	*Dinobryon mucronutom Nygaard*	-	-	-	-	-	-	-	+
4383	*Dinobryon bavaricum Imhof*	-	-	-	-	-	-	-	+
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	-	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*	-	-	+	-	+	+	+	+
4390	*Dinobryon sociale Ehrenberg*	-	-	-	-	+	+	+	+
4393	*Dinobryon spp.*	-	-	-	+	-	-	-	-
4394	*Epiphyxis sp.*	-	-	-	-	-	-	-	+
4396	*Chrysolkos skuja (Nauwerck) Willen*	-	+	+	-	+	+	+	-
4400	*Ochromonas sp.*	+	-	-	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*	-	-	-	-	+	+	+	+
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	-	+	+	-	+	+	+	+
4414	*Stichogloea spp.*	-	-	-	-	-	-	-	+
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	-	+	+	+	-	-	-	-
4436	*Dinobryon attenatum Hill*	-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*	-	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	+	+	-	+	-	-	-	+
5509	*Cyclotella ocellata Pant.*	-	+	-	-	-	-	+	+
5511	*Rhizosolenia eriense H.L. Smith*	-	-	-	-	-	-	-	+
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	-	-	-	-	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*	-	+	-	-	-	-	+	-
5515	*Fragilaria crotonensis Kitton*	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	-	-	-	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	-	-	-	-	-	-	-	-
5866	*Surirella ovata Kutzing*	-	-	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*	+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*	-	-	-	-	+	+	+	+
6568	*Katablepharis ovalis Skuja*	-	-	-	-	+	+	+	-
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	-	-	-	-	-
7632	*Gymnodinium sp.*	-	-	+	+	-	+	+	+
7635	*Peridinium willei Huitfeldt-Kaas*	-	+	-	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*	+	-	+	-	+	+	+	+
7641	*Peridinium aciculiferum Lemmermann*	-	-	-	+	+	-	-	-
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**16**	**18**	**15**	**16**	**25**	**25**	**28**	**34**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

	Area-Replicate ID	TPE - 107S	TPE - 108S	TPE - 109S	TPN - 100S	TPN - 101S	TPN - 102S	TPN - 103S	TPN - 104S
Code	Species Name / Date	27-Aug-17	18-Sep-17	18-Sep-17	25-Mar-17	25-Mar-17	7-May-17	7-May-17	4-Jul-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	+	-	-	-	-	-	-	-
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	-	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	-	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*	+	-	-	+	-	+	-	-
2112	*Sphaerocystis schroeteri Chodat*	-	-	-	-	-	-	-	-
2121	*Oocystis lacustris Chodat*	+	+	+	+	+	+	+	+
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	+	+	+	-	+	+	-	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	+	+	+	-	-	-	-	-
2142	*Monoraphidium sp. a*	-	-	-	+	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	-	-	-	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*	+	+	+	-	-	-	-	-
2169	*Planctonema lauterbornii Schmidle*	-	-	-	-	-	-	-	-
2178	*Cosmarium sp.*	-	-	-	-	-	-	-	-
2182	*Euastrum spp.*	-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*	-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	+	+	+	-	-	-	-	-
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	-	+	+	-	-	-	-	-
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*	+	-	-	-	+	+	+	-
2215	*Tetraedron caudatum (Corda) Hansgrig*	+	+	+	+	-	-	-	+
2235	*Ankistrodesmus spiralis Lemmermann*	-	+	+	+	+	+	-	-
2247	*Oocystis gigas Archer*	-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	+	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	-	-	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	+	-	-	-	-	-	-	-
4361	*Kephyrion boreale Skuja*	+	+	+	-	-	-	-	-
4362	*Kephyrion sp.*	+	+	+	-	+	-	-	+
4363	*Spiniferomonas sirrata*****************	-	+	+	-	-	-	-	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	+	+	-	-	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*	-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	-	+	+	-	-	-	-	-
4381	*Dinobryon mucronutom Nygaard*	+	+	+	-	-	-	-	+
4383	*Dinobryon bavaricum Imhof*	+	+	+	-	-	-	+	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	-	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*	+	+	+	+	-	-	-	+
4390	*Dinobryon sociale Ehrenberg*	+	-	-	-	-	-	-	+
4393	*Dinobryon spp.*	-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*	+	+	+	-	-	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*	-	-	-	-	-	+	-	+
4400	*Ochromonas sp.*	-	-	-	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*	+	-	-	-	-	-	-	+
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	+	+	+	-	-	-	-	+
4414	*Stichogloea spp.*	+	+	-	-	-	-	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	-	-	-	+	+	+	-	-
4436	*Dinobryon attenatum Hill*	-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*	-	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	+	+	+	-	-	-	-	+
5509	*Cyclotella ocellata Pant.*	+	+	+	-	-	+	-	-
5511	*Rhizosolenia eriense H.L. Smith*	-	-	-	-	-	-	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	+	-	-	-	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*	-	-	+	-	-	-	-	-
5515	*Fragilaria crotonensis Kitton*	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	+	+	+	+	-	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	-	-	-	-	-	-	-	-
5866	*Surirella ovata Kutzing*	-	-	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	+	+	+	+	+	+	+	-
6558	*Cryptomonas erosa Ehrenberg*	+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*	+	+	-	-	-	-	-	+
6568	*Katablepharis ovalis Skuja*	-	-	+	-	-	+	-	-
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	+	-	-	-	-
7632	*Gymnodinium sp.*	+	+	+	+	+	-	-	+
7635	*Peridinium willei Huitfeldt-Kaas*	-	-	-	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*	+	+	+	+	+	+	-	+
7641	*Peridinium aciculiferum Lemmermann*	-	-	-	-	-	+	-	-
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**34**	**31**	**30**	**17**	**15**	**16**	**10**	**20**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

	Area-Replicate ID	TPN - 105S	TPN - 106S	TPN - 107S	TPN - 108S	TPN - 109S	TPS - 57S	TPS - 58S	WAL - 69S
Code	*Species Name* / *Date*	4-Jul-17	27-Aug-17	27-Aug-17	16-Sep-17	16-Sep-17	25-Mar-17	25-Mar-17	26-Mar-17
	Cyanophyte								
1012	*Aphanothece sp.*	-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*	-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*	-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*	-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*	-	+	+	-	-	-	-	-
1073	*Snowella sp*	-	-	-	-	-	-	-	-
1129	*Planktothrix*	-	-	-	-	-	-	-	-
	Chlorophytes								
2100	*Pyramidomonas tetrarhynchus Schmarda*	-	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*	-	-	-	-	-	-	-	-
2112	*Sphaerocystis schroeteri Chodat*	-	+	+	-	-	-	-	+
2121	*Oocystis lacustris Chodat*	+	+	+	-	+	+	+	-
2132	*Scenedesmus denticulatus Lagerhiem*	-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*	-	+	+	+	+	+	+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*	+	+	+	+	+	-	-	-
2142	*Monoraphidium sp. a*	-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*	-	+	-	-	-	-	-	-
2145	*Crucigenia quadrata Morr.*	-	-	-	-	-	-	-	-
2167	*Elakatothrix gelatinosa Willen*	-	+	+	+	+	-	+	-
2169	*Planctonema lauterbornii Schmidle*	-	-	-	-	-	-	-	-
2178	*Cosmarium sp.*	-	+	+	-	-	-	-	-
2182	*Euastrum spp.*	-	-	+	-	-	-	-	-
2186	*Xanthidium sp.*	-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*	-	+	+	+	+	-	-	-
2193	*Staurodesmus paradoxum Meyen*	-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*	-	-	+	-	-	-	-	-
2204	*Ankyra judai (G.M. Smith) Fott*	-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*	-	-	-	-	-	-	-	-
2206	*Botryococcus braunii Kutzing*	-	+	+	+	+	+	+	+
2215	*Tetraedron caudatum (Corda) Hansgrig*	+	+	+	+	+	-	-	-
2235	*Ankistrodesmus spiralis Lemmermann*	-	-	-	-	-	+	+	+
2247	*Oocystis gigas Archer*	-	-	-	-	-	-	-	-
2260	*Monomastix minuta Skuja*	-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*	-	-	-	-	-	-	-	-
2512	*Scenedesmus acuminatus Chodat*	-	-	-	-	-	-	-	-
	Euglenophyte								
3305	*Trachelomonas volvocina Ehrenberg*	-	-	-	-	-	-	-	-
	Chrysophyte								
4351	*Small chrysophyceae*	+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*	+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*	-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*	+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*	-	-	+	+	-	-	-	-
4361	*Kephyrion boreale Skuja*	+	+	-	-	-	-	-	-
4362	*Kephyrion sp.*	+	+	+	+	+	-	+	-
4363	*Spiniferomonas sirrata****************	-	+	+	+	+	-	-	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*	-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*	-	-	+	-	-	-	-	-
4372	*Mallomonas tonsurata Teiling and Krieger*	-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*	-	+	-	+	+	-	-	-
4381	*Dinobryon mucronutom Nygaard*	+	-	-	+	+	-	-	-
4383	*Dinobryon bavaricum Imhof*	-	+	+	+	+	-	-	-
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*	-	-	-	-	-	-	-	-
4388	*Dinobryon sertularia Ehrenberg*	+	+	+	-	-	-	-	-
4390	*Dinobryon sociale Ehrenberg*	+	+	+	+	+	-	-	-
4393	*Dinobryon spp.*	-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*	+	+	+	-	+	-	-	-
4396	*Chrysolkos skuja (Nauwerck) Willen*	+	+	+	-	-	+	-	-
4400	*Ochromonas sp.*	-	-	-	-	-	-	-	+
4401	*Uroglena volvox Ehrenberg*	+	-	-	-	-	-	-	-
4403	*Chrysosphaerella longispina Lauterborn*	-	-	-	-	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*	-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*	+	+	+	+	+	+	+	-
4414	*Stichogloea spp.*	-	+	+	+	+	-	-	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*	-	-	+	-	-	+	+	+
4436	*Dinobryon attenatum Hill*	-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*	-	-	-	-	-	-	-	-
	Diatoms								
5507	*Cyclotella stelligera Cleve and Grunow*	+	+	+	+	+	+	+	-
5509	*Cyclotella ocellata Pant.*	+	+	+	+	+	-	-	-
5511	*Rhizosolenia eriense H.L. Smith*	-	-	-	-	-	-	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*	-	-	-	+	-	-	-	+
5514	*Tabellaria flocculsa (Roth) Kutzing*	-	-	-	-	-	-	-	-
5515	*Fragilaria crotonensis Kitton*	-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*	+	+	+	-	+	-	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*	-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*	-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*	-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*	-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*	+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*	-	-	-	-	+	+	+	-
5866	*Surirella ovata Kutzing*	-	-	-	-	-	-	-	-
	Crytophyte								
6554	*Rhodomonas minuta Skuja*	-	-	-	+	+	+	+	-
6558	*Cryptomonas erosa Ehrenberg*	-	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*	-	-	-	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*	+	+	+	+	+	-	-	-
6568	*Katablepharis ovalis Skuja*	-	-	-	-	-	-	-	-
	Dinoflagellates								
7631	*Gymnodinium helveticum Penard*	-	-	-	-	-	-	-	+
7632	*Gymnodinium sp.*	+	+	+	-	-	+	+	-
7635	*Peridinium willei Huitfeldt-Kaas*	-	-	-	-	-	-	-	-
7639	*Peridinium pusillum (Penard) Lemmermann*	+	-	+	+	-	+	-	-
7641	*Peridinium aciculiferum Lemmermann*	-	-	-	-	-	-	-	-
7644	*Ceratium hirundenella (Muller) Schrank*	-	-	-	-	-	-	-	-
	Taxa Richness per Sample	**22**	**32**	**35**	**26**	**27**	**17**	**18**	**14**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

		Area-Replicate ID	WAL - 70S	WAL - 71S	WAL - 72S	WAL - 73S	WAL - 74S	WAL - 75S	WAL - 76S	WAL - 77S
Code	Species Name	Date	26-Mar-17	7-May-17	7-May-17	1-Jul-17	1-Jul-17	26-Aug-17	26-Aug-17	16-Sep-17
	Cyanophyte									
1012	*Aphanothece sp.*		-	-	-	-	-	-	-	-
1014	*Chroococcus limneticus Lemmermann*		-	-	-	-	-	-	-	-
1026	*Merismopedia tenuissima Lemmermann*		-	-	-	-	-	-	-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*		-	-	-	-	-	-	-	-
1054	*Planktolyngbya limnetica*		-	-	-	-	-	-	-	+
1073	*Snowella sp*		-	-	-	-	-	-	-	+
1129	*Planktothrix*		-	-	-	-	-	-	-	-
	Chlorophytes									
2100	*Pyramidomonas tetrarhynchus Schmarda*		-	-	-	-	-	-	-	-
2105	*Chlamydomonas spp.*		-	+	+	+	+	+	+	-
2112	*Sphaerocystis schroeteri Chodat*		-	-	-	-	-	+	+	+
2121	*Oocystis lacustris Chodat*		-	+	+	+	-	+	+	+
2132	*Scenedesmus denticulatus Lagerhiem*		-	-	-	-	-	-	-	-
2137	*Dictyosphaerium simplex Sukja*		+	+	+	+	-	+	+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*		-	-	-	+	+	+	+	+
2142	*Monoraphidium sp. a*		-	-	-	-	-	-	-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*		-	-	-	-	-	+	+	+
2145	*Crucigenia quadrata Morr.*		-	-	-	-	-	-	+	-
2167	*Elakatothrix gelatinosa Willen*		-	-	-	+	+	+	+	+
2169	*Planctonema lauterbornii Schmidle*		-	-	-	-	-	-	+	-
2178	*Cosmarium sp.*		-	-	-	-	-	-	-	-
2182	*Euastrum spp.*		-	-	-	-	-	-	-	-
2186	*Xanthidium sp.*		-	-	-	-	-	-	-	-
2187	*Staurodesmus extensus (Andersson) Teiling*		-	-	-	-	-	+	-	-
2193	*Staurodesmus paradoxum Meyen*		-	-	-	-	-	-	-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*		-	-	-	+	+	-	-	-
2204	*Ankyra judai (G.M. Smith) Fott*		-	-	-	-	-	-	-	-
2205	*Mougeotia sp.*		-	-	-	-	-	-	+	-
2206	*Botryococcus braunii Kutzing*		+	+	+	+	+	+	+	+
2215	*Tetraedron caudatum (Corda) Hansgrig*		-	-	+	+	+	+	+	+
2235	*Ankistrodesmus spiralis Lemmermann*		+	+	+	+	+	+	+	+
2247	*Oocystis gigas Archer*		-	-	-	-	-	+	+	-
2260	*Monomastix minuta Skuja*		-	-	-	-	-	-	-	-
2509	*Scenedesmus ecornis*		-	-	-	-	-	+	-	-
2512	*Scenedesmus acuminatus Chodat*		-	-	-	-	-	-	-	-
	Euglenophyte									
3305	*Trachelomonas volvocina Ehrenberg*		-	-	-	-	-	-	-	-
	Chrysophyte									
4351	*Small chrysophyceae*		+	+	+	+	+	+	+	+
4352	*Large chrysophyceae*		+	+	+	+	+	+	+	+
4355	*Chrysochromulina parva Lackey*		-	-	-	-	-	-	-	-
4357	*Chrysococcus sp.*		+	+	+	+	+	+	+	+
4358	*Chrysostephanospaera globulifera Scherffel*		-	-	-	-	-	+	+	-
4361	*Kephyrion boreale Skuja*		-	-	-	+	+	-	+	+
4362	*Kephyrion sp.*		+	+	+	+	+	+	+	+
4363	*Spiniferomonas sirrata***************		-	-	-	-	-	+	+	-
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*		-	-	-	-	-	-	-	-
4368	*Mallomonas crassisquama (Asmund) Fott*		-	-	+	-	+	+	+	-
4372	*Mallomonas tonsurata Teiling and Krieger*		-	-	-	-	-	-	-	-
4378	*Dinobryon borgei Lemmermann*		-	-	-	+	+	+	+	+
4381	*Dinobryon mucronutom Nygaard*		-	-	-	-	-	-	-	+
4383	*Dinobryon bavaricum Imhof*		-	+	+	-	-	+	+	+
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*		-	-	-	-	-	+	+	+
4388	*Dinobryon sertularia Ehrenberg*		-	-	-	+	+	+	+	-
4390	*Dinobryon sociale Ehrenberg*		-	-	-	+	+	+	+	+
4393	*Dinobryon spp.*		-	-	-	-	-	-	-	-
4394	*Epiphyxis sp.*		-	-	-	-	-	-	+	+
4396	*Chrysolkos skuja (Nauwerck) Willen*		-	-	-	+	+	+	-	+
4400	*Ochromonas sp.*		+	-	+	-	-	-	-	-
4401	*Uroglena volvox Ehrenberg*		-	-	-	+	+	+	+	-
4403	*Chrysosphaerella longispina Lauterborn*		-	-	-	+	-	-	-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*		-	-	-	-	-	-	-	-
4413	*Chrysochromulina laurentiana Kling*		-	-	-	+	+	+	+	+
4414	*Stichogloea spp.*		-	-	-	-	+	+	+	-
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*		+	+	+	-	-	+	+	+
4436	*Dinobryon attenatum Hill*		-	-	-	-	-	-	-	-
4437	*Pteridomonas sp.*		-	-	-	-	-	-	-	-
	Diatoms									
5507	*Cyclotella stelligera Cleve and Grunow*		+	-	+	+	+	+	+	+
5509	*Cyclotella ocellata Pant.*		-	-	-	+	+	+	+	+
5511	*Rhizosolenia eriense H.L. Smith*		-	-	-	+	+	-	-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*		+	-	-	-	-	-	-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*		-	-	-	+	-	-	-	-
5515	*Fragilaria crotonensis Kitton*		-	-	-	-	-	-	-	-
5518	*Synedra acus Kutzing*		+	+	+	+	+	+	+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*		-	-	-	-	-	-	-	-
5524	*Asterionella formosa Hassall*		-	-	-	-	-	-	-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*		-	-	-	-	-	-	-	-
5544	*Pinnularia sp.*		-	-	-	-	-	-	-	-
5551	*Cyclotella michiganiana Skvortzow*		+	+	+	+	+	+	+	+
5720	*Cyclotella bodanica Eulenst.*		-	+	+	+	-	+	+	+
5866	*Surirella ovata Kutzing*		-	-	-	-	-	-	-	-
	Crytophyte									
6554	*Rhodomonas minuta Skuja*		+	+	+	+	+	+	+	+
6558	*Cryptomonas erosa Ehrenberg*		+	+	+	+	+	+	+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*		-	-	+	-	-	-	-	-
6565	*Cryptomonas rostratiformis Skuja*		-	+	+	+	+	-	-	-
6568	*Katablepharis ovalis Skuja*		+	+	+	+	+	+	+	-
	Dinoflagellates									
7631	*Gymnodinium helveticum Penard*		-	-	-	+	+	-	-	+
7632	*Gymnodinium sp.*		+	+	-	+	+	+	+	-
7635	*Peridinium willei Huitfeldt-Kaas*		+	-	-	-	-	+	-	+
7639	*Peridinium pusillum (Penard) Lemmermann*		+	+	+	+	+	+	+	+
7641	*Peridinium aciculiferum Lemmermann*		-	-	+	+	+	+	-	-
7644	*Ceratium hirundenella (Muller) Schrank*		-	-	-	-	-	-	-	-
	Taxa Richness per Sample		**19**	**20**	**25**	**36**	**33**	**42**	**42**	**35**

Table B–1. Presence (+) / Absence (-) matrix of phytoplankton species in Meadowbank study lakes and Baker Lake, 2017.

Code	Species Name	Area-Replicate ID / Date	WAL - 77SR 16-Sep-17	WAL - 78S 16-Sep-17
	Cyanophyte			
1012	*Aphanothece sp.*		-	-
1014	*Chroococcus limneticus Lemmermann*		-	-
1026	*Merismopedia tenuissima Lemmermann*		-	-
1033	*Rhabdogloea lineare Schmidle and Lauterborn*		-	-
1054	*Planktolyngbya limnetica*		+	-
1073	*Snowella sp*		+	-
1129	*Planktothrix*		-	-
	Chlorophytes			
2100	*Pyramidomonas tetrarhynchus Schmarda*		-	-
2105	*Chlamydomonas spp.*		-	-
2112	*Sphaerocystis schroeteri Chodat*		-	-
2121	*Oocystis lacustris Chodat*		+	+
2132	*Scenedesmus denticulatus Lagerhiem*		-	-
2137	*Dictyosphaerium simplex Sukja*		+	+
2138	*Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova*		+	+
2142	*Monoraphidium sp. a*		-	-
2143	*Monoraphidium minutum (Nag.) Komarkova-Legnerova*		+	+
2145	*Crucigenia quadrata Morr.*		-	-
2167	*Elakatothrix gelatinosa Willen*		-	-
2169	*Planctonema lauterbornii Schmidle*		-	-
2178	*Cosmarium sp.*		-	-
2182	*Euastrum spp.*		-	-
2186	*Xanthidium sp.*		-	-
2187	*Staurodesmus extensus (Andersson) Teiling*		-	+
2193	*Staurodesmus paradoxum Meyen*		-	-
2199	*Spondylosium planum (Wolle) W. and G.S. West*		-	-
2204	*Ankyra judai (G.M. Smith) Fott*		-	-
2205	*Mougeotia sp.*		-	-
2206	*Botryococcus braunii Kutzing*		+	+
2215	*Tetraedron caudatum (Corda) Hansgrig*		+	+
2235	*Ankistrodesmus spiralis Lemmermann*		+	+
2247	*Oocystis gigas Archer*		-	-
2260	*Monomastix minuta Skuja*		-	-
2509	*Scenedesmus ecornis*		-	-
2512	*Scenedesmus acuminatus Chodat*		-	-
	Euglenophyte			
3305	*Trachelomonas volvocina Ehrenberg*		-	-
	Chrysophyte			
4351	*Small chrysophyceae*		+	+
4352	*Large chrysophyceae*		+	+
4355	*Chrysochromulina parva Lackey*		-	-
4357	*Chrysococcus sp.*		+	+
4358	*Chrysostephanospaera globulifera Scherffel*		-	-
4361	*Kephyrion boreale Skuja*		+	+
4362	*Kephyrion sp.*		+	+
4363	*Spiniferomonas sirrata*****************		-	+
4367	*Mallomonas duerrschmidtiae Siver, Hamer and Kling*		-	-
4368	*Mallomonas crassisquama (Asmund) Fott*		-	+
4372	*Mallomonas tonsurata Teiling and Krieger*		-	-
4378	*Dinobryon borgei Lemmermann*		+	+
4381	*Dinobryon mucronutom Nygaard*		+	+
4383	*Dinobryon bavaricum Imhof*		+	+
4384	*Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger*		+	+
4388	*Dinobryon sertularia Ehrenberg*		-	-
4390	*Dinobryon sociale Ehrenberg*		+	+
4393	*Dinobryon spp.*		-	-
4394	*Epiphyxis sp.*		+	+
4396	*Chrysolkos skuja (Nauwerck) Willen*		+	+
4400	*Ochromonas sp.*		-	-
4401	*Uroglena volvox Ehrenberg*		-	-
4403	*Chrysosphaerella longispina Lauterborn*		-	-
4411	*Bitrichia chodatii (Reverdin) Chodat*		-	-
4413	*Chrysochromulina laurentiana Kling*		+	+
4414	*Stichogloea spp.*		-	+
4418	*Salpingoeca frequentissima (Zach.) Lemmermann*		-	+
4436	*Dinobryon attenatum Hill*		-	-
4437	*Pteridomonas sp.*		-	-
	Diatoms			
5507	*Cyclotella stelligera Cleve and Grunow*		+	+
5509	*Cyclotella ocellata Pant.*		+	+
5511	*Rhizosolenia eriense H.L. Smith*		-	-
5513	*Tabellaria fenestrata (Lyngbye) Kutzing*		-	-
5514	*Tabellaria flocculsa (Roth) Kutzing*		-	+
5515	*Fragilaria crotonensis Kitton*		-	-
5518	*Synedra acus Kutzing*		+	+
5523	*Synedra ulna (Nitzsch) Ehrenberg*		-	-
5524	*Asterionella formosa Hassall*		-	-
5540	*Aulacoseira italica v subarctica (O. Muller) Simonsen*		-	-
5544	*Pinnularia sp.*		-	-
5551	*Cyclotella michiganiana Skvortzow*		+	+
5720	*Cyclotella bodanica Eulenst.*		+	+
5866	*Surirella ovata Kutzing*		-	-
	Crytophyte			
6554	*Rhodomonas minuta Skuja*		+	+
6558	*Cryptomonas erosa Ehrenberg*		+	+
6562	*Cryptomonas reflexa (Marsson) Skuja*		-	-
6565	*Cryptomonas rostratiformis Skuja*		+	+
6568	*Katablepharis ovalis Skuja*		-	-
	Dinoflagellates			
7631	*Gymnodinium helveticum Penard*		+	+
7632	*Gymnodinium sp.*		+	+
7635	*Peridinium willei Huitfeldt-Kaas*		-	+
7639	*Peridinium pusillum (Penard) Lemmermann*		+	+
7641	*Peridinium aciculiferum Lemmermann*		-	-
7644	*Ceratium hirundenella (Muller) Schrank*		-	-
	Taxa Richness per Sample		**33**	**38**

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Phytoplankton species data for CREMP 2017

** 1st number in **species code** = group 1=cyanophyte 2=chlorophyte
3= Euglenophyte 4=chrysophyte 5=diatoms 6=Cryptophyte 7=Dinoflagellates
***R=QA\QC sample
** total daily biomass is sum of all species on a date.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
BAP - 49S	6-Jul-17	2105	Chlamydomonas spp.	21552	0.51	5.00	3.00	23.60
BAP - 49S	6-Jul-17	2137	Dictyosphaerium simplex Sukja	35920	0.15	2.00	2.00	4.20
BAP - 49S	6-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.12	46.00	1.80	78.00
BAP - 49S	6-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.60	12.00	387.40
BAP - 49S	6-Jul-17	2204	Ankyra judai (G.M. Smith) Fott	7184	0.69	19.00	3.60	96.70
BAP - 49S	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	21552	1.22	36.00	2.00	56.50
BAP - 49S	6-Jul-17	3305	Trachelomonas volvocina Ehrenberg	200	0.41	18.00	18.00	2035.80
BAP - 49S	6-Jul-17	4351	Small chrysophyceae	344832	3.17	2.60	2.60	9.20
BAP - 49S	6-Jul-17	4352	Large chrysophyceae	43104	7.74	7.00	7.00	179.60
BAP - 49S	6-Jul-17	4355	Chrysochromulina parva Lackey	35920	2.35	5.00	5.00	65.40
BAP - 49S	6-Jul-17	4357	Chrysococcus sp.	625008	31.88	4.60	4.60	51.00
BAP - 49S	6-Jul-17	4362	Kephyrion sp.	14368	0.13	2.60	2.60	9.20
BAP - 49S	6-Jul-17	4378	Dinobryon borgei Lemmermann	21552	0.94	9.20	3.00	43.40
BAP - 49S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	35920	8.13	12.00	6.00	226.20
BAP - 49S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	400	1.36	0.00	0.00	3390.00
BAP - 49S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
BAP - 49S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	200	0.40	0.00	0.00	1991.00
BAP - 49S	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	71840	2.12	5.50	3.20	29.50
BAP - 49S	6-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.64	5.50	3.20	29.50
BAP - 49S	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
BAP - 49S	6-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.72	4.00	8.00	100.50
BAP - 49S	6-Jul-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.37	9.00	3.00	63.60
BAP - 49S	6-Jul-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.14	74.00	6.00	697.40
BAP - 49S	6-Jul-17	5518	Synedra acus Kutzing	5600	0.65	110.00	2.00	115.20
BAP - 49S	6-Jul-17	5524	Asterionella formosa Hassall	3400	0.29	82.00	2.00	85.90
BAP - 49S	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	3600	28.94	156.00	8.10	8038.70
BAP - 49S	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	79024	1.94	2.50	5.00	24.50
BAP - 49S	6-Jul-17	6554	Rhodomonas minuta Skuja	79024	11.52	11.60	6.00	145.80
BAP - 49S	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	800	0.99	24.60	12.00	1236.50
BAP - 49S	6-Jul-17	6565	Cryptomonas rostratiformis Skuja	200	0.42	31.00	14.00	2120.90
BAP - 49S	6-Jul-17	6568	Katablepharis ovalis Skuja	21552	1.22	9.00	4.00	56.50
BAP - 49S	6-Jul-17	7632	Gymnodinium sp.	200	2.30	28.00	28.00	11494.00
BAP - 49S	6-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.44	16.60	16.60	2395.10
BAP - 49S	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	400	3.62	30.00	24.00	9047.80
BAP - 50S	6-Jul-17	1054	Planktolyngbya limnetica	200	0.05	216.00	1.20	244.30
BAP - 50S	6-Jul-17	2105	Chlamydomonas spp.	14368	0.34	5.00	3.00	23.60
BAP - 50S	6-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	7184	0.56	46.00	1.80	78.00
BAP - 50S	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.81	36.00	2.00	56.50
BAP - 50S	6-Jul-17	4351	Small chrysophyceae	258624	2.38	2.60	2.60	9.20
BAP - 50S	6-Jul-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
BAP - 50S	6-Jul-17	4355	Chrysochromulina parva Lackey	21552	1.41	5.00	5.00	65.40
BAP - 50S	6-Jul-17	4357	Chrysococcus sp.	567536	28.94	4.60	4.60	51.00
BAP - 50S	6-Jul-17	4362	Kephyrion sp.	21552	0.20	2.60	2.60	9.20
BAP - 50S	6-Jul-17	4378	Dinobryon borgei Lemmermann	14368	0.62	9.20	3.00	43.40
BAP - 50S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	200	0.68	0.00	0.00	3390.00
BAP - 50S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
BAP - 50S	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	150864	4.45	5.50	3.20	29.50
BAP - 50S	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.73	10.50	21.00	1818.40
BAP - 50S	6-Jul-17	5509	Cyclotella ocellata Pant.	28736	2.89	4.00	8.00	100.50
BAP - 50S	6-Jul-17	5518	Synedra acus Kutzing	2000	0.23	110.00	2.00	115.20
BAP - 50S	6-Jul-17	5524	Asterionella formosa Hassall	3400	0.29	82.00	2.00	85.90
BAP - 50S	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	2600	18.89	141.00	8.10	7265.70
BAP - 50S	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	64656	1.58	2.50	5.00	24.50
BAP - 50S	6-Jul-17	6554	Rhodomonas minuta Skuja	330464	48.18	11.60	6.00	145.80
BAP - 50S	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	1600	1.95	24.20	12.00	1216.40
BAP - 50S	6-Jul-17	6565	Cryptomonas rostratiformis Skuja	1400	2.97	31.00	14.00	2120.90
BAP - 50S	6-Jul-17	6568	Katablepharis ovalis Skuja	43104	2.44	9.00	4.00	56.50
BAP - 50S	6-Jul-17	7632	Gymnodinium sp.	600	5.46	25.90	25.90	9097.00
BAP - 50S	6-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	1200	2.67	16.20	16.20	2226.10
BAP - 50S	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	1000	9.05	30.00	24.00	9047.80
BAP - 51S	9-Aug-17	1026	Merismopedia tenuissima Lemmermann	28736	0.29	0.00	0.00	10.00
BAP - 51S	9-Aug-17	2105	Chlamydomonas spp.	21552	1.26	7.00	4.00	58.60
BAP - 51S	9-Aug-17	2121	Oocystis lacustris Chodat	7184	0.17	5.00	3.00	23.60
BAP - 51S	9-Aug-17	2137	Dictyosphaerium simplex Sukja	402304	1.69	2.00	2.00	4.20
BAP - 51S	9-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.12	46.00	1.80	78.00
BAP - 51S	9-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.40	12.00	376.10
BAP - 51S	9-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
BAP - 51S	9-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	21552	1.27	34.00	2.10	58.90
BAP - 51S	9-Aug-17	2509	Scenedesmus ecornis	14368	0.34	6.20	3.30	23.60
BAP - 51S	9-Aug-17	4351	Small chrysophyceae	43104	0.61	3.00	3.00	14.10
BAP - 51S	9-Aug-17	4352	Large chrysophyceae	35920	6.45	7.00	7.00	179.60
BAP - 51S	9-Aug-17	4357	Chrysococcus sp.	316096	20.67	5.00	5.00	65.40
BAP - 51S	9-Aug-17	4362	Kephyrion sp.	21552	0.20	2.60	2.60	9.20
BAP - 51S	9-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
BAP - 51S	9-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.60	10.00	1026.30
BAP - 51S	9-Aug-17	4378	Dinobryon borgei Lemmermann	7184	0.31	9.10	3.00	42.90
BAP - 51S	9-Aug-17	4383	Dinobryon bavaricum Imhof	35920	8.13	12.00	6.00	226.20

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
BAP - 51S	9-Aug-17	4383	Dinobryon bavaricum Imhof	600	1.19	0.00	0.00	1991.00
BAP - 51S	9-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
BAP - 51S	9-Aug-17	4388	Dinobryon sertularia Ehrenberg	2000	6.78	0.00	0.00	3390.00
BAP - 51S	9-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	57472	1.97	6.00	3.30	34.20
BAP - 51S	9-Aug-17	4413	Chrysochromulina laurentiana Kling	57472	23.43	9.20	9.20	407.70
BAP - 51S	9-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.86	5.60	3.20	30.00
BAP - 51S	9-Aug-17	4437	Pteridomonas sp.	7184	1.38	8.20	8.20	192.50
BAP - 51S	9-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.36	10.50	21.00	1818.40
BAP - 51S	9-Aug-17	5509	Cyclotella ocellata Pant.	14368	1.44	4.00	8.00	100.50
BAP - 51S	9-Aug-17	5511	Rhizosolenia eriense H.L. Smith	129312	10.97	12.00	3.00	84.80
BAP - 51S	9-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	3400	4.54	26.00	14.00	1334.10
BAP - 51S	9-Aug-17	5515	Fragilaria crotonensis Kitton	4000	1.14	68.00	4.00	284.80
BAP - 51S	9-Aug-17	5518	Synedra acus Kutzing	6400	0.80	120.00	2.00	125.70
BAP - 51S	9-Aug-17	5524	Asterionella formosa Hassall	8000	0.84	100.00	2.00	104.70
BAP - 51S	9-Aug-17	5544	Pinnularia sp.	400	0.94	91.00	8.10	2344.60
BAP - 51S	9-Aug-17	5551	Cyclotella michiganiana Skvortzow	93392	2.16	2.45	4.90	23.10
BAP - 51S	9-Aug-17	5866	Surirella ovata Kutzing	1200	1.48	24.00	14.00	1231.50
BAP - 51S	9-Aug-17	6554	Rhodomonas minuta Skuja	64656	8.45	10.40	6.00	130.70
BAP - 51S	9-Aug-17	6558	Cryptomonas erosa Ehrenberg	400	0.47	23.60	12.00	1186.30
BAP - 51S	9-Aug-17	7632	Gymnodinium sp.	400	2.23	22.00	22.00	5575.30
BAP - 51S	9-Aug-17	7632	Gymnodinium sp.	200	2.06	27.00	27.00	10306.00
BAP - 51S	9-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.19	15.60	15.60	1987.80
BAP - 51S	9-Aug-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BAP - 51SR	9-Aug-17	2105	Chlamydomonas spp.	14368	0.84	7.00	4.00	58.60
BAP - 51SR	9-Aug-17	2121	Oocystis lacustris Chodat	28736	0.68	5.00	3.00	23.60
BAP - 51SR	9-Aug-17	2137	Dictyosphaerium simplex Sukja	495696	2.08	2.00	2.00	4.20
BAP - 51SR	9-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	35920	2.80	46.00	1.80	78.00
BAP - 51SR	9-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.23	13.40	12.00	376.10
BAP - 51SR	9-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
BAP - 51SR	9-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.82	33.00	2.10	57.10
BAP - 51SR	9-Aug-17	2509	Scenedesmus ecornis	57472	1.36	6.20	3.30	23.60
BAP - 51SR	9-Aug-17	4351	Small chrysophyceae	122128	1.72	3.00	3.00	14.10
BAP - 51SR	9-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
BAP - 51SR	9-Aug-17	4357	Chrysococcus sp.	294544	19.26	5.00	5.00	65.40
BAP - 51SR	9-Aug-17	4362	Kephyrion sp.	7184	0.07	2.60	2.60	9.20
BAP - 51SR	9-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.60	10.00	1026.30
BAP - 51SR	9-Aug-17	4378	Dinobryon borgei Lemmermann	7184	0.31	9.10	3.00	42.90
BAP - 51SR	9-Aug-17	4383	Dinobryon bavaricum Imhof	21552	4.88	12.00	6.00	226.20
BAP - 51SR	9-Aug-17	4383	Dinobryon bavaricum Imhof	400	0.80	0.00	0.00	1991.00
BAP - 51SR	9-Aug-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
BAP - 51SR	9-Aug-17	4388	Dinobryon sertularia Ehrenberg	1200	4.07	0.00	0.00	3390.00
BAP - 51SR	9-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	35920	1.23	6.00	3.30	34.20
BAP - 51SR	9-Aug-17	4413	Chrysochromulina laurentiana Kling	57472	23.43	9.20	9.20	407.70
BAP - 51SR	9-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43	5.60	3.20	30.00
BAP - 51SR	9-Aug-17	4437	Pteridomonas sp.	7184	1.38	8.20	8.20	192.50
BAP - 51SR	9-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
BAP - 51SR	9-Aug-17	5509	Cyclotella ocellata Pant.	14368	1.44	4.00	8.00	100.50
BAP - 51SR	9-Aug-17	5511	Rhizosolenia eriense H.L. Smith	186784	15.84	12.00	3.00	84.80
BAP - 51SR	9-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	800	1.07	26.00	14.00	1334.10
BAP - 51SR	9-Aug-17	5515	Fragilaria crotonensis Kitton	11800	3.36	68.00	4.00	284.80
BAP - 51SR	9-Aug-17	5518	Synedra acus Kutzing	3800	0.48	120.00	2.00	125.70
BAP - 51SR	9-Aug-17	5524	Asterionella formosa Hassall	5200	0.54	100.00	2.00	104.70
BAP - 51SR	9-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	1200	5.63	91.00	8.10	4689.20
BAP - 51SR	9-Aug-17	5551	Cyclotella michiganiana Skvortzow	64656	1.49	2.45	4.90	23.10
BAP - 51SR	9-Aug-17	5866	Surirella ovata Kutzing	1800	2.22	24.00	14.00	1231.50
BAP - 51SR	9-Aug-17	6554	Rhodomonas minuta Skuja	35920	4.69	10.40	6.00	130.70
BAP - 51SR	9-Aug-17	6558	Cryptomonas erosa Ehrenberg	200	0.24	23.60	12.00	1186.30
BAP - 51SR	9-Aug-17	7632	Gymnodinium sp.	200	1.84	26.00	26.00	9202.80
BAP - 51SR	9-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	1000	1.99	15.60	15.60	1987.80
BAP - 51SR	9-Aug-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BAP - 52S	9-Aug-17	2105	Chlamydomonas spp.	7184	0.42	7.00	4.00	58.60
BAP - 52S	9-Aug-17	2121	Oocystis lacustris Chodat	79024	1.86	5.00	3.00	23.60
BAP - 52S	9-Aug-17	2137	Dictyosphaerium simplex Sukja	1041680	4.38	2.00	2.00	4.20
BAP - 52S	9-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.12	46.00	1.80	78.00
BAP - 52S	9-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.15	13.40	12.00	376.10
BAP - 52S	9-Aug-17	2206	Botryococcus braunii Kutzing	600	0.54	12.00	12.00	904.80
BAP - 52S	9-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
BAP - 52S	9-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.85	34.00	2.10	58.90
BAP - 52S	9-Aug-17	4351	Small chrysophyceae	28736	0.41	3.00	3.00	14.10
BAP - 52S	9-Aug-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
BAP - 52S	9-Aug-17	4357	Chrysococcus sp.	395120	25.84	5.00	5.00	65.40
BAP - 52S	9-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.00	8.10	8.10	278.30
BAP - 52S	9-Aug-17	4362	Kephyrion sp.	57472	0.47	2.50	2.50	8.20
BAP - 52S	9-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
BAP - 52S	9-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.60	10.00	1026.30
BAP - 52S	9-Aug-17	4378	Dinobryon borgei Lemmermann	50288	2.16	9.10	3.00	42.90
BAP - 52S	9-Aug-17	4383	Dinobryon bavaricum Imhof	79024	17.88	12.00	6.00	226.20
BAP - 52S	9-Aug-17	4383	Dinobryon bavaricum Imhof	400	0.80	0.00	0.00	1991.00
BAP - 52S	9-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
BAP - 52S	9-Aug-17	4388	Dinobryon sertularia Ehrenberg	600	2.03	0.00	0.00	3390.00
BAP - 52S	9-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	93392	3.19	6.00	3.30	34.20
BAP - 52S	9-Aug-17	4413	Chrysochromulina laurentiana Kling	35920	14.64	9.20	9.20	407.70
BAP - 52S	9-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.29	5.60	3.20	30.00
BAP - 52S	9-Aug-17	4436	Dinobryon attenatum Hill	7184	0.90	9.60	5.00	125.70
BAP - 52S	9-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.36	10.50	21.00	1818.40
BAP - 52S	9-Aug-17	5509	Cyclotella ocellata Pant.	14368	1.44	4.00	8.00	100.50
BAP - 52S	9-Aug-17	5511	Rhizosolenia eriense H.L. Smith	129312	10.97	12.00	3.00	84.80
BAP - 52S	9-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	800	1.07	26.00	14.00	1334.10

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
BAP - 52S	9-Aug-17	5515	Fragilaria crotonensis Kitton	2400	0.68	68.00	4.00	284.80
BAP - 52S	9-Aug-17	5518	Synedra acus Kutzing	11200	1.41	120.00	2.00	125.70
BAP - 52S	9-Aug-17	5524	Asterionella formosa Hassall	8000	0.84	100.00	2.00	104.70
BAP - 52S	9-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	600	2.81	91.00	8.10	4689.20
BAP - 52S	9-Aug-17	5551	Cyclotella michiganiana Skvortzow	100576	2.32	2.45	4.90	23.10
BAP - 52S	9-Aug-17	5866	Surirella ovata Kutzing	800	0.99	24.00	14.00	1231.50
BAP - 52S	9-Aug-17	6554	Rhodomonas minuta Skuja	64656	8.45	10.40	6.00	130.70
BAP - 52S	9-Aug-17	6558	Cryptomonas erosa Ehrenberg	1200	1.42	23.60	12.00	1186.30
BAP - 52S	9-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.30	7.70	4.00	41.40
BAP - 52S	9-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	1400	2.78	15.60	15.60	1987.80
BAP - 53S	30-Sep-17	2105	Chlamydomonas spp.	14368	0.34	5.00	3.00	23.60
BAP - 53S	30-Sep-17	2121	Oocystis lacustris Chodat	28736	1.45	6.00	4.00	50.30
BAP - 53S	30-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.12	46.00	1.80	78.00
BAP - 53S	30-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
BAP - 53S	30-Sep-17	2205	Mougeotia sp.	1400	5.06	46.00	10.00	3612.80
BAP - 53S	30-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
BAP - 53S	30-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	35920	0.17	3.00	3.00	4.70
BAP - 53S	30-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.90	36.00	2.10	62.30
BAP - 53S	30-Sep-17	4351	Small chrysophyceae	265808	3.75	3.00	3.00	14.10
BAP - 53S	30-Sep-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
BAP - 53S	30-Sep-17	4357	Chrysococcus sp.	495696	32.42	5.00	5.00	65.40
BAP - 53S	30-Sep-17	4362	Kephyrion sp.	43104	0.67	3.10	3.10	15.60
BAP - 53S	30-Sep-17	4378	Dinobryon borgei Lemmermann	7184	0.37	9.00	3.30	51.30
BAP - 53S	30-Sep-17	4381	Dinobryon mucronutom Nygaard	7184	0.86	9.10	5.00	119.10
BAP - 53S	30-Sep-17	4383	Dinobryon bavaricum Imhof	14368	3.25	12.00	6.00	226.20
BAP - 53S	30-Sep-17	4383	Dinobryon bavaricum Imhof	14368	3.25	12.00	6.00	226.20
BAP - 53S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	400	0.50	0.00	0.00	1250.00
BAP - 53S	30-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	28736	0.76	5.60	3.00	26.40
BAP - 53S	30-Sep-17	4413	Chrysochromulina laurentiana Kling	21552	8.50	9.10	9.10	394.60
BAP - 53S	30-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.30	5.50	3.00	25.90
BAP - 53S	30-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1200	2.18	10.50	21.00	1818.40
BAP - 53S	30-Sep-17	5509	Cyclotella ocellata Pant.	7184	0.72	4.00	8.00	100.50
BAP - 53S	30-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	4800	3.98	88.00	6.00	829.40
BAP - 53S	30-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	21000	30.17	28.00	14.00	1436.80
BAP - 53S	30-Sep-17	5518	Synedra acus Kutzing	8200	0.94	110.00	2.00	115.20
BAP - 53S	30-Sep-17	5524	Asterionella formosa Hassall	25400	2.50	94.00	2.00	98.40
BAP - 53S	30-Sep-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	1000	4.86	130.00	6.90	4861.10
BAP - 53S	30-Sep-17	5551	Cyclotella michiganiana Skvortzow	28736	0.70	2.50	5.00	24.50
BAP - 53S	30-Sep-17	5720	Cyclotella bodanica Eulenst.	200	1.41	16.50	33.00	7056.20
BAP - 53S	30-Sep-17	6554	Rhodomonas minuta Skuja	294544	37.02	10.00	6.00	125.70
BAP - 53S	30-Sep-17	6558	Cryptomonas erosa Ehrenberg	4000	4.75	23.60	12.00	1186.30
BAP - 53S	30-Sep-17	6565	Cryptomonas rostratiformis Skuja	400	0.82	30.00	14.00	2052.50
BAP - 53S	30-Sep-17	6568	Katablepharis ovalis Skuja	14368	0.81	9.00	4.00	56.50
BAP - 53S	30-Sep-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BAP - 54S	30-Sep-17	2105	Chlamydomonas spp.	7184	0.17	5.00	3.00	23.60
BAP - 54S	30-Sep-17	2132	Scenedesmus denticulatus Lagerhiem	14368	0.62	7.70	4.00	43.00
BAP - 54S	30-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	21552	1.68	46.00	1.80	78.00
BAP - 54S	30-Sep-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.50	11.00	4.00	69.10
BAP - 54S	30-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	64656	0.30	3.00	3.00	4.70
BAP - 54S	30-Sep-17	4351	Small chrysophyceae	186784	2.63	3.00	3.00	14.10
BAP - 54S	30-Sep-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
BAP - 54S	30-Sep-17	4357	Chrysococcus sp.	193968	12.69	5.00	5.00	65.40
BAP - 54S	30-Sep-17	4362	Kephyrion sp.	35920	0.56	3.10	3.10	15.60
BAP - 54S	30-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.66	5.60	5.60	92.00
BAP - 54S	30-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.60	10.00	1026.30
BAP - 54S	30-Sep-17	4378	Dinobryon borgei Lemmermann	7184	0.37	9.00	3.30	51.30
BAP - 54S	30-Sep-17	4381	Dinobryon mucronutom Nygaard	7184	0.88	9.40	5.00	123.00
BAP - 54S	30-Sep-17	4383	Dinobryon bavaricum Imhof	14368	3.25	12.00	6.00	226.20
BAP - 54S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
BAP - 54S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	200	0.25	0.00	0.00	1250.00
BAP - 54S	30-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.38	5.60	3.00	26.40
BAP - 54S	30-Sep-17	4413	Chrysochromulina laurentiana Kling	35920	14.17	9.10	9.10	394.60
BAP - 54S	30-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	64656	1.67	5.50	3.00	25.90
BAP - 54S	30-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
BAP - 54S	30-Sep-17	5509	Cyclotella ocellata Pant.	14368	1.44	4.00	8.00	100.50
BAP - 54S	30-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	7800	6.47	88.00	6.00	829.40
BAP - 54S	30-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	17000	24.43	28.00	14.00	1436.80
BAP - 54S	30-Sep-17	5518	Synedra acus Kutzing	4600	0.53	110.00	2.00	115.20
BAP - 54S	30-Sep-17	5524	Asterionella formosa Hassall	21400	2.11	94.00	2.00	98.40
BAP - 54S	30-Sep-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	400	1.94	130.00	6.90	4861.10
BAP - 54S	30-Sep-17	5551	Cyclotella michiganiana Skvortzow	50288	1.23	2.50	5.00	24.50
BAP - 54S	30-Sep-17	5720	Cyclotella bodanica Eulenst.	400	2.82	16.50	33.00	7056.20
BAP - 54S	30-Sep-17	6554	Rhodomonas minuta Skuja	265808	33.41	10.00	6.00	125.70
BAP - 54S	30-Sep-17	6558	Cryptomonas erosa Ehrenberg	6600	7.83	23.60	12.00	1186.30
BAP - 54S	30-Sep-17	6565	Cryptomonas rostratiformis Skuja	200	0.41	30.00	14.00	2052.50
BAP - 54S	30-Sep-17	6568	Katablepharis ovalis Skuja	7184	0.41	9.00	4.00	56.50
BAP - 54S	30-Sep-17	7632	Gymnodinium sp.	600	5.21	25.50	25.50	8682.00
BAP - 54S	30-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.43	16.00	16.00	2144.70
BBD - 49S	6-Jul-17	1054	Planktolyngbya limnetica	200	0.04	160.00	1.20	181.00
BBD - 49S	6-Jul-17	2105	Chlamydomonas spp.	7184	0.17	5.00	3.00	23.60
BBD - 49S	6-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	7184	0.56	46.00	1.80	78.00
BBD - 49S	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	21552	1.53	41.00	2.10	71.00
BBD - 49S	6-Jul-17	4351	Small chrysophyceae	122128	1.26	2.70	2.70	10.30
BBD - 49S	6-Jul-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
BBD - 49S	6-Jul-17	4355	Chrysochromulina parva Lackey	43104	2.82	5.00	5.00	65.40
BBD - 49S	6-Jul-17	4357	Chrysococcus sp.	761504	38.84	4.60	4.60	51.00
BBD - 49S	6-Jul-17	4362	Kephyrion sp.	35920	0.46	2.90	2.90	12.80
BBD - 49S	6-Jul-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.22	21.00	10.00	1099.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
BBD - 49S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	28736	6.50	12.00	6.00	226.20
BBD - 49S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	1000	3.39	0.00	0.00	3390.00
BBD - 49S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
BBD - 49S	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	43104	1.35	5.50	3.30	31.40
BBD - 49S	6-Jul-17	4401	Uroglena volvox Ehrenberg	7184	0.81	6.00	6.00	113.10
BBD - 49S	6-Jul-17	4413	Chrysochromulina laurentiana Kling	35920	14.17	9.10	9.10	394.60
BBD - 49S	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.67	11.00	22.00	2090.70
BBD - 49S	6-Jul-17	5509	Cyclotella ocellata Pant.	21552	2.42	4.15	8.30	112.30
BBD - 49S	6-Jul-17	5511	Rhizosolenia eriense H.L. Smith	7184	0.46	9.00	3.00	63.60
BBD - 49S	6-Jul-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.14	76.00	6.00	716.30
BBD - 49S	6-Jul-17	5514	Tabellaria flocculsa (Roth) Kutzing	400	0.53	26.00	14.00	1334.10
BBD - 49S	6-Jul-17	5518	Synedra acus Kutzing	1200	0.14	110.00	2.00	115.20
BBD - 49S	6-Jul-17	5524	Asterionella formosa Hassall	1000	0.09	82.00	2.00	85.90
BBD - 49S	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	2800	19.05	132.00	8.10	6802.00
BBD - 49S	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	43104	1.06	2.50	5.00	24.50
BBD - 49S	6-Jul-17	6554	Rhodomonas minuta Skuja	337648	49.23	11.60	6.00	145.80
BBD - 49S	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	3400	4.20	24.60	12.00	1236.50
BBD - 49S	6-Jul-17	6565	Cryptomonas rostratiformis Skuja	1000	2.12	31.00	14.00	2120.90
BBD - 49S	6-Jul-17	6568	Katablepharis ovalis Skuja	7184	0.41	9.00	4.00	56.50
BBD - 49S	6-Jul-17	7632	Gymnodinium sp.	400	2.90	24.00	24.00	7238.20
BBD - 49S	6-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	1000	2.27	16.30	16.30	2267.60
BBD - 49S	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	1400	12.67	30.00	24.00	9047.80
BBD - 49SR	6-Jul-17	2121	Oocystis lacustris Chodat	21552	0.53	5.20	3.00	24.50
BBD - 49SR	6-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.12	46.00	1.80	78.00
BBD - 49SR	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	14368	1.02	41.00	2.10	71.00
BBD - 49SR	6-Jul-17	4351	Small chrysophyceae	193968	2.00	2.70	2.70	10.30
BBD - 49SR	6-Jul-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
BBD - 49SR	6-Jul-17	4355	Chrysochromulina parva Lackey	86208	5.64	5.00	5.00	65.40
BBD - 49SR	6-Jul-17	4357	Chrysococcus sp.	711216	36.27	4.60	4.60	51.00
BBD - 49SR	6-Jul-17	4362	Kephyrion sp.	28736	0.37	2.90	2.90	12.80
BBD - 49SR	6-Jul-17	4368	Mallomonas crassisquama (Asmund) Fott	800	0.88	21.00	10.00	1099.60
BBD - 49SR	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
BBD - 49SR	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	800	2.71	0.00	0.00	3390.00
BBD - 49SR	6-Jul-17	4390	Dinobryon sociale Ehrenberg	14368	3.25	12.00	6.00	226.20
BBD - 49SR	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	43104	1.35	5.50	3.30	31.40
BBD - 49SR	6-Jul-17	4413	Chrysochromulina laurentiana Kling	21552	8.50	9.10	9.10	394.60
BBD - 49SR	6-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.60	3.00	26.40
BBD - 49SR	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.84	11.00	22.00	2090.70
BBD - 49SR	6-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.81	4.15	8.30	112.30
BBD - 49SR	6-Jul-17	5511	Rhizosolenia eriense H.L. Smith	14368	0.91	9.00	3.00	63.60
BBD - 49SR	6-Jul-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.57	76.00	6.00	716.30
BBD - 49SR	6-Jul-17	5514	Tabellaria flocculsa (Roth) Kutzing	200	0.27	26.00	14.00	1334.10
BBD - 49SR	6-Jul-17	5518	Synedra acus Kutzing	2400	0.28	110.00	2.00	115.20
BBD - 49SR	6-Jul-17	5524	Asterionella formosa Hassall	800	0.07	82.00	2.00	85.90
BBD - 49SR	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	2200	16.87	132.00	8.60	7667.60
BBD - 49SR	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	21552	0.53	2.50	5.00	24.50
BBD - 49SR	6-Jul-17	6554	Rhodomonas minuta Skuja	323280	47.13	11.60	6.00	145.80
BBD - 49SR	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	2400	2.97	24.60	12.00	1236.50
BBD - 49SR	6-Jul-17	6565	Cryptomonas rostratiformis Skuja	1000	2.12	31.00	14.00	2120.90
BBD - 49SR	6-Jul-17	6568	Katablepharis ovalis Skuja	14368	0.81	9.00	4.00	56.50
BBD - 49SR	6-Jul-17	7632	Gymnodinium sp.	1200	8.69	24.00	24.00	7238.20
BBD - 49SR	6-Jul-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
BBD - 49SR	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	1000	9.05	30.00	24.00	9047.80
BBD - 50S	6-Jul-17	2105	Chlamydomonas spp.	7184	0.17	5.00	3.00	23.60
BBD - 50S	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	28736	2.04	41.00	2.10	71.00
BBD - 50S	6-Jul-17	4351	Small chrysophyceae	344832	4.41	2.90	2.90	12.80
BBD - 50S	6-Jul-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
BBD - 50S	6-Jul-17	4355	Chrysochromulina parva Lackey	14368	0.94	5.00	5.00	65.40
BBD - 50S	6-Jul-17	4357	Chrysococcus sp.	660928	33.71	4.60	4.60	51.00
BBD - 50S	6-Jul-17	4362	Kephyrion sp.	21552	0.28	2.90	2.90	12.80
BBD - 50S	6-Jul-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.22	21.00	10.00	1099.60
BBD - 50S	6-Jul-17	4378	Dinobryon borgei Lemmermann	7184	0.37	9.00	3.30	51.30
BBD - 50S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	35920	8.13	12.00	6.00	226.20
BBD - 50S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	400	1.36	0.00	0.00	3390.00
BBD - 50S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	200	0.40	0.00	0.00	1991.00
BBD - 50S	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	114944	3.61	5.50	3.30	31.40
BBD - 50S	6-Jul-17	4401	Uroglena volvox Ehrenberg	7184	0.81	6.00	6.00	113.10
BBD - 50S	6-Jul-17	4413	Chrysochromulina laurentiana Kling	28736	11.34	9.10	9.10	394.60
BBD - 50S	6-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.64	5.50	3.20	29.50
BBD - 50S	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
BBD - 50S	6-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.78	4.10	8.20	108.30
BBD - 50S	6-Jul-17	5511	Rhizosolenia eriense H.L. Smith	7184	0.46	9.00	3.00	63.60
BBD - 50S	6-Jul-17	5518	Synedra acus Kutzing	2800	0.32	110.00	2.00	115.20
BBD - 50S	6-Jul-17	5524	Asterionella formosa Hassall	4800	0.41	82.00	2.00	85.90
BBD - 50S	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	4800	37.92	136.00	8.60	7900.00
BBD - 50S	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	107760	2.64	2.50	5.00	24.50
BBD - 50S	6-Jul-17	6554	Rhodomonas minuta Skuja	251440	36.66	11.60	6.00	145.80
BBD - 50S	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	4000	4.95	24.60	12.00	1236.50
BBD - 50S	6-Jul-17	6565	Cryptomonas rostratiformis Skuja	600	1.27	31.00	14.00	2120.90
BBD - 50S	6-Jul-17	6568	Katablepharis ovalis Skuja	14368	0.81	9.00	4.00	56.50
BBD - 50S	6-Jul-17	7632	Gymnodinium sp.	1200	11.04	26.00	26.00	9202.80
BBD - 50S	6-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	2000	4.45	16.20	16.20	2226.10
BBD - 50S	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	1600	14.48	30.00	24.00	9047.80
BBD - 51S	10-Aug-17	2105	Chlamydomonas spp.	7184	0.17	5.00	3.00	23.60
BBD - 51S	10-Aug-17	2112	Sphaerocystis schroeteri Chodat	28736	0.26	2.60	2.60	9.20
BBD - 51S	10-Aug-17	2121	Oocystis lacustris Chodat	50288	1.33	5.60	3.00	26.40
BBD - 51S	10-Aug-17	2137	Dictyosphaerium simplex Sukja	682480	2.87	2.00	2.00	4.20
BBD - 51S	10-Aug-17	2167	Elakatothrix gelatinosa Willen	14368	0.25	11.00	2.00	17.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
BBD - 51S	10-Aug-17	2169	Planctonema lauterbornii Schmidle	7184	1.81	20.00	4.00	251.30
BBD - 51S	10-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
BBD - 51S	10-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.69	34.00	2.10	58.90
BBD - 51S	10-Aug-17	2509	Scenedesmus ecornis	14368	0.28	6.20	3.00	19.50
BBD - 51S	10-Aug-17	4351	Small chrysophyceae	71840	1.01	3.00	3.00	14.10
BBD - 51S	10-Aug-17	4352	Large chrysophyceae	71840	12.90	7.00	7.00	179.60
BBD - 51S	10-Aug-17	4357	Chrysococcus sp.	380752	24.90	5.00	5.00	65.40
BBD - 51S	10-Aug-17	4362	Kephyrion sp.	28736	0.41	3.00	3.00	14.10
BBD - 51S	10-Aug-17	4363	Spiniferomonas sirrata***************	14368	1.71	6.10	6.10	118.80
BBD - 51S	10-Aug-17	4378	Dinobryon borgei Lemmermann	28736	1.27	8.80	3.10	44.30
BBD - 51S	10-Aug-17	4383	Dinobryon bavaricum Imhof	28736	6.50	12.00	6.00	226.20
BBD - 51S	10-Aug-17	4383	Dinobryon bavaricum Imhof	3200	10.85	0.00	0.00	3390.00
BBD - 51S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
BBD - 51S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	2600	13.22	0.00	0.00	5085.00
BBD - 51S	10-Aug-17	4393	Dinobryon spp.	64656	1.67	5.50	3.00	25.90
BBD - 51S	10-Aug-17	4413	Chrysochromulina laurentiana Kling	43104	17.01	9.10	9.10	394.60
BBD - 51S	10-Aug-17	4414	Stichogloea spp.	7184	0.36	6.00	4.00	50.30
BBD - 51S	10-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	64656	2.35	6.00	3.40	36.30
BBD - 51S	10-Aug-17	4436	Dinobryon attenatum Hill	14368	1.86	9.90	5.00	129.60
BBD - 51S	10-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.73	10.50	21.00	1818.40
BBD - 51S	10-Aug-17	5509	Cyclotella ocellata Pant.	28736	3.59	4.30	8.60	124.90
BBD - 51S	10-Aug-17	5511	Rhizosolenia eriense H.L. Smith	122128	7.77	9.00	3.00	63.60
BBD - 51S	10-Aug-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	600	0.42	74.00	6.00	697.40
BBD - 51S	10-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	1400	2.01	28.00	14.00	1436.80
BBD - 51S	10-Aug-17	5518	Synedra acus Kutzing	12800	1.61	120.00	2.00	125.70
BBD - 51S	10-Aug-17	5524	Asterionella formosa Hassall	38400	4.02	100.00	2.00	104.70
BBD - 51S	10-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	4400	37.47	140.00	8.80	8515.00
BBD - 51S	10-Aug-17	5551	Cyclotella michiganiana Skvortzow	93392	2.29	2.50	5.00	24.50
BBD - 51S	10-Aug-17	6554	Rhodomonas minuta Skuja	107760	16.25	12.00	6.00	150.80
BBD - 51S	10-Aug-17	6558	Cryptomonas erosa Ehrenberg	2000	2.27	22.60	12.00	1136.00
BBD - 51S	10-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.29	7.60	4.00	40.30
BBD - 51S	10-Aug-17	7631	Gymnodinium helveticum Penard	200	4.81	51.00	30.00	24033.20
BBD - 51S	10-Aug-17	7632	Gymnodinium sp.	200	2.83	30.00	30.00	14137.20
BBD - 51S	10-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	400	1.01	16.90	16.90	2527.30
BBD - 51S	10-Aug-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BBD - 52S	10-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	200	0.10	13.00	12.00	490.10
BBD - 52S	10-Aug-17	2105	Chlamydomonas spp.	14368	0.34	5.00	3.00	23.60
BBD - 52S	10-Aug-17	2112	Sphaerocystis schroeteri Chodat	43104	0.40	2.60	2.60	9.20
BBD - 52S	10-Aug-17	2121	Oocystis lacustris Chodat	21552	0.57	5.60	3.00	26.40
BBD - 52S	10-Aug-17	2137	Dictyosphaerium simplex Sukja	510064	2.14	2.00	2.00	4.20
BBD - 52S	10-Aug-17	2167	Elakatothrix gelatinosa Willen	14368	0.25	11.00	2.00	17.30
BBD - 52S	10-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.60	12.00	387.40
BBD - 52S	10-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
BBD - 52S	10-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.85	34.00	2.10	58.90
BBD - 52S	10-Aug-17	2509	Scenedesmus ecornis	28736	0.56	6.20	3.00	19.50
BBD - 52S	10-Aug-17	4351	Small chrysophyceae	50288	0.71	3.00	3.00	14.10
BBD - 52S	10-Aug-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
BBD - 52S	10-Aug-17	4357	Chrysococcus sp.	502880	32.89	5.00	5.00	65.40
BBD - 52S	10-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
BBD - 52S	10-Aug-17	4362	Kephyrion sp.	14368	0.20	3.00	3.00	14.10
BBD - 52S	10-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
BBD - 52S	10-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.22	21.00	10.00	1099.60
BBD - 52S	10-Aug-17	4378	Dinobryon borgei Lemmermann	21552	0.95	8.80	3.10	44.30
BBD - 52S	10-Aug-17	4383	Dinobryon bavaricum Imhof	14368	3.25	12.00	6.00	226.20
BBD - 52S	10-Aug-17	4383	Dinobryon bavaricum Imhof	5800	19.66	0.00	0.00	3390.00
BBD - 52S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
BBD - 52S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	4600	23.39	0.00	0.00	5085.00
BBD - 52S	10-Aug-17	4390	Dinobryon sociale Ehrenberg	14368	3.25	12.00	6.00	226.20
BBD - 52S	10-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	79024	2.05	5.50	3.00	25.90
BBD - 52S	10-Aug-17	4413	Chrysochromulina laurentiana Kling	43104	17.01	9.10	9.10	394.60
BBD - 52S	10-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28736	1.04	6.00	3.40	36.30
BBD - 52S	10-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.73	10.50	21.00	1818.40
BBD - 52S	10-Aug-17	5511	Rhizosolenia eriense H.L. Smith	86208	5.48	9.00	3.00	63.60
BBD - 52S	10-Aug-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	4400	3.07	74.00	6.00	697.40
BBD - 52S	10-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	5000	7.18	28.00	14.00	1436.80
BBD - 52S	10-Aug-17	5518	Synedra acus Kutzing	19800	2.49	120.00	2.00	125.70
BBD - 52S	10-Aug-17	5524	Asterionella formosa Hassall	48800	5.11	100.00	2.00	104.70
BBD - 52S	10-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	3800	32.36	140.00	8.80	8515.00
BBD - 52S	10-Aug-17	5551	Cyclotella michiganiana Skvortzow	86208	2.11	2.50	5.00	24.50
BBD - 52S	10-Aug-17	6554	Rhodomonas minuta Skuja	86208	13.00	12.00	6.00	150.80
BBD - 52S	10-Aug-17	6558	Cryptomonas erosa Ehrenberg	2000	2.27	22.60	12.00	1136.00
BBD - 52S	10-Aug-17	7632	Gymnodinium sp.	600	8.48	30.00	30.00	14137.20
BBD - 52S	10-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.51	16.90	16.90	2527.30
BBD - 52S	10-Aug-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BBD - 53S	30-Sep-17	2121	Oocystis lacustris Chodat	35920	1.81	6.00	4.00	50.30
BBD - 53S	30-Sep-17	2132	Scenedesmus denticulatus Lagerhiem	14368	0.61	7.60	4.00	42.40
BBD - 53S	30-Sep-17	2137	Dictyosphaerium simplex Sukja	57472	0.24	2.00	2.00	4.20
BBD - 53S	30-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	35920	2.80	46.00	1.80	78.00
BBD - 53S	30-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.60	12.00	387.40
BBD - 53S	30-Sep-17	2193	Staurodesmus paradoxum Meyen	200	0.59	26.60	24.00	2963.80
BBD - 53S	30-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
BBD - 53S	30-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
BBD - 53S	30-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	43104	2.69	36.00	2.10	62.30
BBD - 53S	30-Sep-17	4351	Small chrysophyceae	229888	3.24	3.00	3.00	14.10
BBD - 53S	30-Sep-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
BBD - 53S	30-Sep-17	4357	Chrysococcus sp.	632192	32.24	4.60	4.60	51.00
BBD - 53S	30-Sep-17	4362	Kephyrion sp.	57472	0.90	3.10	3.10	15.60
BBD - 53S	30-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.70	10.00	1031.50

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
BBD - 53S	30-Sep-17	4378	Dinobryon borgei Lemmermann	7184	0.37	9.00	3.30	51.30
BBD - 53S	30-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.19	5.60	3.00	26.40
BBD - 53S	30-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.22	5.60	3.20	30.00
BBD - 53S	30-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
BBD - 53S	30-Sep-17	5509	Cyclotella ocellata Pant.	21552	2.69	4.30	8.60	124.90
BBD - 53S	30-Sep-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.37	9.00	3.00	63.60
BBD - 53S	30-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	1000	0.83	88.00	6.00	829.40
BBD - 53S	30-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	24200	32.91	26.50	14.00	1359.80
BBD - 53S	30-Sep-17	5518	Synedra acus Kutzing	1000	0.10	96.00	2.00	100.50
BBD - 53S	30-Sep-17	5524	Asterionella formosa Hassall	12800	1.26	94.00	2.00	98.40
BBD - 53S	30-Sep-17	5551	Cyclotella michiganiana Skvortzow	64656	1.58	2.50	5.00	24.50
BBD - 53S	30-Sep-17	6554	Rhodomonas minuta Skuja	222704	33.58	12.00	6.00	150.80
BBD - 53S	30-Sep-17	6558	Cryptomonas erosa Ehrenberg	5200	6.27	24.00	12.00	1206.40
BBD - 53S	30-Sep-17	6565	Cryptomonas rostratiformis Skuja	400	0.82	30.00	14.00	2052.50
BBD - 53S	30-Sep-17	7632	Gymnodinium sp.	200	1.64	25.00	25.00	8181.20
BBD - 53S	30-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.43	16.00	16.00	2144.70
BBD - 54S	30-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	21552	1.68	46.00	1.80	78.00
BBD - 54S	30-Sep-17	2167	Elakatothrix gelatinosa Willen	21552	0.37	11.00	2.00	17.30
BBD - 54S	30-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.60	12.00	387.40
BBD - 54S	30-Sep-17	2204	Ankyra judai (G.M. Smith) Fott	7184	0.49	16.00	3.30	68.40
BBD - 54S	30-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
BBD - 54S	30-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	43104	0.20	3.00	3.00	4.70
BBD - 54S	30-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.79	36.00	2.10	62.30
BBD - 54S	30-Sep-17	4351	Small chrysophyceae	452592	6.38	3.00	3.00	14.10
BBD - 54S	30-Sep-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
BBD - 54S	30-Sep-17	4357	Chrysococcus sp.	510064	26.01	4.60	4.60	51.00
BBD - 54S	30-Sep-17	4362	Kephyrion sp.	28736	0.45	3.10	3.10	15.60
BBD - 54S	30-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.66	5.60	5.60	92.00
BBD - 54S	30-Sep-17	4367	Mallomonas duerrschmidtiae Siver, Hamer and Kling	600	0.63	19.90	10.00	1042.00
BBD - 54S	30-Sep-17	4378	Dinobryon borgei Lemmermann	14368	0.74	9.00	3.30	51.30
BBD - 54S	30-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.19	5.60	3.00	26.40
BBD - 54S	30-Sep-17	4413	Chrysochromulina laurentiana Kling	7184	2.83	9.10	9.10	394.60
BBD - 54S	30-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.86	5.60	3.20	30.00
BBD - 54S	30-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1000	1.82	10.50	21.00	1818.40
BBD - 54S	30-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	4200	3.48	88.00	6.00	829.40
BBD - 54S	30-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	28600	38.89	26.50	14.00	1359.80
BBD - 54S	30-Sep-17	5518	Synedra acus Kutzing	4400	0.44	96.00	2.00	100.50
BBD - 54S	30-Sep-17	5524	Asterionella formosa Hassall	28400	2.79	94.00	2.00	98.40
BBD - 54S	30-Sep-17	5551	Cyclotella michiganiana Skvortzow	50288	1.23	2.50	5.00	24.50
BBD - 54S	30-Sep-17	6554	Rhodomonas minuta Skuja	265808	40.08	12.00	6.00	150.80
BBD - 54S	30-Sep-17	6558	Cryptomonas erosa Ehrenberg	11400	13.75	24.00	12.00	1206.40
BBD - 54S	30-Sep-17	6565	Cryptomonas rostratiformis Skuja	800	1.64	30.00	14.00	2052.50
BBD - 54S	30-Sep-17	6568	Katablepharis ovalis Skuja	14368	0.66	8.10	4.00	45.80
BBD - 54S	30-Sep-17	7632	Gymnodinium sp.	400	3.27	25.00	25.00	8181.20
BBD - 54S	30-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	400	0.86	16.00	16.00	2144.70
BBD - 54S	30-Sep-17	7641	Peridinium aciculiferum Lemmermann	400	3.74	31.00	24.00	9349.40
BPJ - 49S	6-Jul-17	1054	Planktolyngbya limnetica	200	0.04	171.00	1.20	193.40
BPJ - 49S	6-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	71840	5.36	44.00	1.80	74.60
BPJ - 49S	6-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
BPJ - 49S	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	7184	0.41	33.00	2.10	57.10
BPJ - 49S	6-Jul-17	4351	Small chrysophyceae	244256	2.52	2.70	2.70	10.30
BPJ - 49S	6-Jul-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
BPJ - 49S	6-Jul-17	4355	Chrysochromulina parva Lackey	71840	4.70	5.00	5.00	65.40
BPJ - 49S	6-Jul-17	4357	Chrysococcus sp.	1027312	63.28	4.90	4.90	61.60
BPJ - 49S	6-Jul-17	4362	Kephyrion sp.	7184	0.09	2.90	2.90	12.80
BPJ - 49S	6-Jul-17	4378	Dinobryon borgei Lemmermann	7184	0.37	9.10	3.30	51.90
BPJ - 49S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
BPJ - 49S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	800	1.59	0.00	0.00	1991.00
BPJ - 49S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
BPJ - 49S	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	86208	2.23	5.50	3.00	25.90
BPJ - 49S	6-Jul-17	4400	Ochromonas sp.	7184	0.81	8.60	5.00	112.60
BPJ - 49S	6-Jul-17	4401	Uroglena volvox Ehrenberg	21552	2.44	6.00	6.00	113.10
BPJ - 49S	6-Jul-17	4413	Chrysochromulina laurentiana Kling	7184	2.83	9.10	9.10	394.60
BPJ - 49S	6-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.18	5.20	3.00	24.50
BPJ - 49S	6-Jul-17	4436	Dinobryon attenatum Hill	7184	0.93	9.90	5.00	129.60
BPJ - 49S	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	1400	2.55	10.50	21.00	1818.40
BPJ - 49S	6-Jul-17	5509	Cyclotella ocellata Pant.	28736	3.00	4.05	8.10	104.30
BPJ - 49S	6-Jul-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.37	9.00	3.00	63.60
BPJ - 49S	6-Jul-17	5518	Synedra acus Kutzing	3600	0.41	110.00	2.00	115.20
BPJ - 49S	6-Jul-17	5524	Asterionella formosa Hassall	6200	0.56	86.00	2.00	90.10
BPJ - 49S	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	3800	29.30	146.00	8.20	7710.30
BPJ - 49S	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	21552	0.53	2.50	5.00	24.50
BPJ - 49S	6-Jul-17	6554	Rhodomonas minuta Skuja	280176	39.42	11.20	6.00	140.70
BPJ - 49S	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	1000	1.21	24.00	12.00	1206.40
BPJ - 49S	6-Jul-17	6565	Cryptomonas rostratiformis Skuja	200	0.45	33.00	14.00	2257.80
BPJ - 49S	6-Jul-17	6568	Katablepharis ovalis Skuja	43104	2.22	8.60	4.00	51.60
BPJ - 49S	6-Jul-17	7632	Gymnodinium sp.	7184	2.91	10.00	8.80	405.50
BPJ - 49S	6-Jul-17	7632	Gymnodinium sp.	1000	8.18	25.00	25.00	8181.20
BPJ - 49S	6-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	800	1.72	16.00	16.00	2144.70
BPJ - 49S	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	200	1.87	31.00	24.00	9349.40
BPJ - 50S	6-Jul-17	2105	Chlamydomonas spp.	14368	0.34	5.10	3.00	24.00
BPJ - 50S	6-Jul-17	2137	Dictyosphaerium simplex Sukja	28736	0.12	2.00	2.00	4.20
BPJ - 50S	6-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	28736	2.14	44.00	1.80	74.60
BPJ - 50S	6-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.64	33.00	2.10	57.10
BPJ - 50S	6-Jul-17	4351	Small chrysophyceae	366384	3.77	2.70	2.70	10.30
BPJ - 50S	6-Jul-17	4352	Large chrysophyceae	28736	5.16	7.00	7.00	179.60
BPJ - 50S	6-Jul-17	4355	Chrysochromulina parva Lackey	57472	3.76	5.00	5.00	65.40
BPJ - 50S	6-Jul-17	4357	Chrysococcus sp.	639376	39.39	4.90	4.90	61.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
BPJ - 50S	6-Jul-17	4358	Chrysostephanospaera globulifera Scherffel	21552	7.18	8.60	8.60	333.00
BPJ - 50S	6-Jul-17	4362	Kephyrion sp.	28736	0.41	3.00	3.00	14.10
BPJ - 50S	6-Jul-17	4378	Dinobryon borgei Lemmermann	14368	0.75	9.10	3.30	51.90
BPJ - 50S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	57472	13.00	12.00	6.00	226.20
BPJ - 50S	6-Jul-17	4388	Dinobryon sertularia Ehrenberg	400	0.80	0.00	0.00	1991.00
BPJ - 50S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
BPJ - 50S	6-Jul-17	4390	Dinobryon sociale Ehrenberg	200	0.25	0.00	0.00	1250.00
BPJ - 50S	6-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	79024	2.05	5.50	3.00	25.90
BPJ - 50S	6-Jul-17	4401	Uroglena volvox Ehrenberg	28736	3.25	6.00	6.00	113.10
BPJ - 50S	6-Jul-17	4413	Chrysochromulina laurentiana Kling	7184	2.83	9.10	9.10	394.60
BPJ - 50S	6-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.12	5.50	3.00	25.90
BPJ - 50S	6-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
BPJ - 50S	6-Jul-17	5511	Rhizosolenia eriense H.L. Smith	14368	0.91	9.00	3.00	63.60
BPJ - 50S	6-Jul-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.14	72.00	6.00	678.60
BPJ - 50S	6-Jul-17	5518	Synedra acus Kutzing	3600	0.41	110.00	2.00	115.20
BPJ - 50S	6-Jul-17	5524	Asterionella formosa Hassall	4400	0.40	86.00	2.00	90.10
BPJ - 50S	6-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	2600	16.61	121.00	8.20	6390.00
BPJ - 50S	6-Jul-17	5551	Cyclotella michiganiana Skvortzow	35920	0.88	2.50	5.00	24.50
BPJ - 50S	6-Jul-17	6554	Rhodomonas minuta Skuja	222704	31.33	11.20	6.00	140.70
BPJ - 50S	6-Jul-17	6558	Cryptomonas erosa Ehrenberg	1000	1.21	24.00	12.00	1206.40
BPJ - 50S	6-Jul-17	6568	Katablepharis ovalis Skuja	43104	2.22	8.60	4.00	51.60
BPJ - 50S	6-Jul-17	7631	Gymnodinium helveticum Penard	200	4.71	50.00	30.00	23561.90
BPJ - 50S	6-Jul-17	7632	Gymnodinium sp.	400	4.60	28.00	28.00	11494.00
BPJ - 50S	6-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.29	16.00	16.00	2144.70
BPJ - 50S	6-Jul-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BPJ - 51S	10-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	200	0.10	13.00	12.00	490.10
BPJ - 51S	10-Aug-17	2105	Chlamydomonas spp.	7184	0.19	5.60	3.00	26.40
BPJ - 51S	10-Aug-17	2121	Oocystis lacustris Chodat	57472	1.63	6.00	3.00	28.30
BPJ - 51S	10-Aug-17	2137	Dictyosphaerium simplex Sukja	581904	2.44	2.00	2.00	4.20
BPJ - 51S	10-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.90	12.00	404.70
BPJ - 51S	10-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
BPJ - 51S	10-Aug-17	2247	Oocystis gigas Archer	200	0.48	18.00	16.00	2412.70
BPJ - 51S	10-Aug-17	2509	Scenedesmus ecornis	28736	0.58	6.00	3.10	20.10
BPJ - 51S	10-Aug-17	4351	Small chrysophyceae	71840	1.01	3.00	3.00	14.10
BPJ - 51S	10-Aug-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
BPJ - 51S	10-Aug-17	4357	Chrysococcus sp.	280176	18.32	5.00	5.00	65.40
BPJ - 51S	10-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.39	8.60	8.60	333.00
BPJ - 51S	10-Aug-17	4362	Kephyrion sp.	43104	0.74	3.20	3.20	17.20
BPJ - 51S	10-Aug-17	4363	Spiniferomonas sirrata***************	14368	1.71	6.10	6.10	118.80
BPJ - 51S	10-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	600	0.66	21.00	10.00	1099.60
BPJ - 51S	10-Aug-17	4378	Dinobryon borgei Lemmermann	7184	0.22	6.00	3.10	30.20
BPJ - 51S	10-Aug-17	4383	Dinobryon bavaricum Imhof	14368	3.25	12.00	6.00	226.20
BPJ - 51S	10-Aug-17	4383	Dinobryon bavaricum Imhof	600	1.19	0.00	0.00	1991.00
BPJ - 51S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	35920	8.13	12.00	6.00	226.20
BPJ - 51S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	800	2.71	0.00	0.00	3390.00
BPJ - 51S	10-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	93392	2.82	6.00	3.10	30.20
BPJ - 51S	10-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.25	6.00	3.30	34.20
BPJ - 51S	10-Aug-17	4436	Dinobryon attenatum Hill	7184	0.93	9.90	5.00	129.60
BPJ - 51S	10-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	1400	2.93	11.00	22.00	2090.70
BPJ - 51S	10-Aug-17	5511	Rhizosolenia eriense H.L. Smith	79024	5.03	9.00	3.00	63.60
BPJ - 51S	10-Aug-17	5515	Fragilaria crotonensis Kitton	3200	0.92	69.00	4.00	289.00
BPJ - 51S	10-Aug-17	5518	Synedra acus Kutzing	5800	0.73	120.00	2.00	125.70
BPJ - 51S	10-Aug-17	5523	Synedra ulna (Nitzsch) Ehrenberg	1000	1.70	180.00	6.00	1696.50
BPJ - 51S	10-Aug-17	5524	Asterionella formosa Hassall	7800	0.89	109.00	2.00	114.10
BPJ - 51S	10-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	2600	16.48	120.00	8.20	6337.20
BPJ - 51S	10-Aug-17	5551	Cyclotella michiganiana Skvortzow	71840	1.66	2.45	4.90	23.10
BPJ - 51S	10-Aug-17	5866	Surirella ovata Kutzing	1200	1.60	26.00	14.00	1334.10
BPJ - 51S	10-Aug-17	6554	Rhodomonas minuta Skuja	122128	15.66	10.20	6.00	128.20
BPJ - 51S	10-Aug-17	6558	Cryptomonas erosa Ehrenberg	200	0.25	25.00	12.00	1256.60
BPJ - 51S	10-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.29	7.60	4.00	40.30
BPJ - 51S	10-Aug-17	7632	Gymnodinium sp.	400	2.90	24.00	24.00	7238.20
BPJ - 51S	10-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.36	16.30	16.30	2267.60
BPJ - 51S	10-Aug-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
BPJ - 52S	10-Aug-17	2121	Oocystis lacustris Chodat	14368	0.41	6.00	3.00	28.30
BPJ - 52S	10-Aug-17	2137	Dictyosphaerium simplex Sukja	323280	1.36	2.00	2.00	4.20
BPJ - 52S	10-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	28736	2.24	46.00	1.80	78.00
BPJ - 52S	10-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.90	12.00	404.70
BPJ - 52S	10-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
BPJ - 52S	10-Aug-17	2247	Oocystis gigas Archer	800	1.93	18.00	16.00	2412.70
BPJ - 52S	10-Aug-17	2509	Scenedesmus ecornis	14368	0.29	6.00	3.10	20.10
BPJ - 52S	10-Aug-17	4351	Small chrysophyceae	64656	0.91	3.00	3.00	14.10
BPJ - 52S	10-Aug-17	4352	Large chrysophyceae	43104	7.74	7.00	7.00	179.60
BPJ - 52S	10-Aug-17	4357	Chrysococcus sp.	387936	25.37	5.00	5.00	65.40
BPJ - 52S	10-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.39	8.60	8.60	333.00
BPJ - 52S	10-Aug-17	4362	Kephyrion sp.	35920	0.62	3.20	3.20	17.20
BPJ - 52S	10-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
BPJ - 52S	10-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	400	0.44	21.00	10.00	1099.60
BPJ - 52S	10-Aug-17	4383	Dinobryon bavaricum Imhof	21552	4.88	12.00	6.00	226.20
BPJ - 52S	10-Aug-17	4383	Dinobryon bavaricum Imhof	400	0.80	0.00	0.00	1991.00
BPJ - 52S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
BPJ - 52S	10-Aug-17	4388	Dinobryon sertularia Ehrenberg	1000	3.39	0.00	0.00	3390.00
BPJ - 52S	10-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.43	6.00	3.10	30.20
BPJ - 52S	10-Aug-17	4400	Ochromonas sp.	7184	0.47	7.80	4.00	65.30
BPJ - 52S	10-Aug-17	4413	Chrysochromulina laurentiana Kling	7184	2.83	9.10	9.10	394.60
BPJ - 52S	10-Aug-17	4414	Stichogloea spp.	7184	0.36	6.00	4.00	50.30
BPJ - 52S	10-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.49	6.00	3.30	34.20
BPJ - 52S	10-Aug-17	4436	Dinobryon attenatum Hill	7184	0.93	9.90	5.00	129.60
BPJ - 52S	10-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	1400	2.93	11.00	22.00	2090.70

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
BPJ - 52S	10-Aug-17	5509	Cyclotella ocellata Pant.	7184	0.53	3.60	7.20	73.30
BPJ - 52S	10-Aug-17	5511	Rhizosolenia eriense H.L. Smith	107760	6.85	9.00	3.00	63.60
BPJ - 52S	10-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	2400	3.08	25.00	14.00	1282.80
BPJ - 52S	10-Aug-17	5515	Fragilaria crotonensis Kitton	6600	1.91	69.00	4.00	289.00
BPJ - 52S	10-Aug-17	5518	Synedra acus Kutzing	10600	1.33	120.00	2.00	125.70
BPJ - 52S	10-Aug-17	5523	Synedra ulna (Nitzsch) Ehrenberg	400	0.68	180.00	6.00	1696.50
BPJ - 52S	10-Aug-17	5524	Asterionella formosa Hassall	11800	1.31	106.00	2.00	111.00
BPJ - 52S	10-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	1800	12.27	126.00	8.30	6817.40
BPJ - 52S	10-Aug-17	5551	Cyclotella michiganiana Skvortzow	14368	0.33	2.45	4.90	23.10
BPJ - 52S	10-Aug-17	5866	Surirella ovata Kutzing	2000	2.67	26.00	14.00	1334.10
BPJ - 52S	10-Aug-17	6554	Rhodomonas minuta Skuja	122128	15.66	10.20	6.00	128.20
BPJ - 52S	10-Aug-17	6558	Cryptomonas erosa Ehrenberg	400	0.50	25.00	12.00	1256.60
BPJ - 52S	10-Aug-17	6568	Katablepharis ovalis Skuja	14368	0.58	7.60	4.00	40.30
BPJ - 52S	10-Aug-17	7632	Gymnodinium sp.	400	0.36	3.00	24.00	904.80
BPJ - 52S	10-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.45	16.30	16.30	2267.60
BPJ - 53S	30-Sep-17	2121	Oocystis lacustris Chodat	21552	0.56	5.50	3.00	25.90
BPJ - 53S	30-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	28736	2.39	49.00	1.80	83.10
BPJ - 53S	30-Sep-17	2167	Elakatothrix gelatinosa Willen	21552	0.37	11.00	2.00	17.30
BPJ - 53S	30-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	50288	0.24	3.00	3.00	4.70
BPJ - 53S	30-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.79	36.00	2.10	62.30
BPJ - 53S	30-Sep-17	4351	Small chrysophyceae	129312	1.82	3.00	3.00	14.10
BPJ - 53S	30-Sep-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
BPJ - 53S	30-Sep-17	4357	Chrysococcus sp.	589088	38.53	5.00	5.00	65.40
BPJ - 53S	30-Sep-17	4362	Kephyrion sp.	21552	0.30	3.00	3.00	14.10
BPJ - 53S	30-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
BPJ - 53S	30-Sep-17	4378	Dinobryon borgei Lemmermann	7184	0.35	8.60	3.30	49.00
BPJ - 53S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	35920	8.13	12.00	6.00	226.20
BPJ - 53S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	200	0.25	0.00	0.00	1250.00
BPJ - 53S	30-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.43	5.60	3.20	30.00
BPJ - 53S	30-Sep-17	4413	Chrysochromulina laurentiana Kling	14368	5.67	9.10	9.10	394.60
BPJ - 53S	30-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.60	3.00	26.40
BPJ - 53S	30-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1200	2.18	10.50	21.00	1818.40
BPJ - 53S	30-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	1000	0.83	88.00	6.00	829.40
BPJ - 53S	30-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	6000	8.62	28.00	14.00	1436.80
BPJ - 53S	30-Sep-17	5518	Synedra acus Kutzing	5400	0.62	110.00	2.00	115.20
BPJ - 53S	30-Sep-17	5524	Asterionella formosa Hassall	20000	1.95	93.00	2.00	97.40
BPJ - 53S	30-Sep-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	1400	2.15	41.00	6.90	1533.10
BPJ - 53S	30-Sep-17	5551	Cyclotella michiganiana Skvortzow	28736	0.70	2.50	5.00	24.50
BPJ - 53S	30-Sep-17	6554	Rhodomonas minuta Skuja	100576	15.17	12.00	6.00	150.80
BPJ - 53S	30-Sep-17	6558	Cryptomonas erosa Ehrenberg	3400	4.20	24.60	12.00	1236.50
BPJ - 53S	30-Sep-17	6565	Cryptomonas rostratiformis Skuja	400	0.82	30.00	14.00	2052.50
BPJ - 53S	30-Sep-17	6568	Katablepharis ovalis Skuja	7184	0.33	8.10	4.00	45.80
BPJ - 53S	30-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.43	16.00	16.00	2144.70
BPJ - 54S	30-Sep-17	1129	Planktothrix	200	2.01	355.00	6.00	10037.40
BPJ - 54S	30-Sep-17	2105	Chlamydomonas spp.	7184	1.08	8.00	6.00	150.80
BPJ - 54S	30-Sep-17	2121	Oocystis lacustris Chodat	7184	0.19	5.60	3.00	26.40
BPJ - 54S	30-Sep-17	2132	Scenedesmus denticulatus Lagerhiem	14368	0.62	7.70	4.00	43.00
BPJ - 54S	30-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	28736	2.39	49.00	1.80	83.10
BPJ - 54S	30-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	43104	0.20	3.00	3.00	4.70
BPJ - 54S	30-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.62	36.00	2.00	56.50
BPJ - 54S	30-Sep-17	4351	Small chrysophyceae	186784	2.63	3.00	3.00	14.10
BPJ - 54S	30-Sep-17	4352	Large chrysophyceae	50288	9.03	7.00	7.00	179.60
BPJ - 54S	30-Sep-17	4357	Chrysococcus sp.	725584	47.45	5.00	5.00	65.40
BPJ - 54S	30-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.60	10.00	1026.30
BPJ - 54S	30-Sep-17	4378	Dinobryon borgei Lemmermann	28736	1.41	8.60	3.30	49.00
BPJ - 54S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
BPJ - 54S	30-Sep-17	4388	Dinobryon sertularia Ehrenberg	200	0.25	0.00	0.00	1250.00
BPJ - 54S	30-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	21552	0.69	6.00	3.20	32.20
BPJ - 54S	30-Sep-17	4413	Chrysochromulina laurentiana Kling	43104	17.01	9.10	9.10	394.60
BPJ - 54S	30-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.14	5.60	3.00	26.40
BPJ - 54S	30-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
BPJ - 54S	30-Sep-17	5509	Cyclotella ocellata Pant.	14368	1.79	4.30	8.60	124.90
BPJ - 54S	30-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	10800	8.96	88.00	6.00	829.40
BPJ - 54S	30-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	23600	33.91	28.00	14.00	1436.80
BPJ - 54S	30-Sep-17	5518	Synedra acus Kutzing	3400	0.39	110.00	2.00	115.20
BPJ - 54S	30-Sep-17	5524	Asterionella formosa Hassall	12400	1.21	93.00	2.00	97.40
BPJ - 54S	30-Sep-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	400	2.11	141.00	6.90	5272.40
BPJ - 54S	30-Sep-17	5551	Cyclotella michiganiana Skvortzow	64656	1.58	2.50	5.00	24.50
BPJ - 54S	30-Sep-17	6554	Rhodomonas minuta Skuja	265808	40.08	12.00	6.00	150.80
BPJ - 54S	30-Sep-17	6558	Cryptomonas erosa Ehrenberg	5000	6.18	24.60	12.00	1236.50
BPJ - 54S	30-Sep-17	6565	Cryptomonas rostratiformis Skuja	200	0.41	30.00	14.00	2052.50
BPJ - 54S	30-Sep-17	6568	Katablepharis ovalis Skuja	21552	0.99	8.10	4.00	45.80
BPJ - 54S	30-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.43	16.00	16.00	2144.70
DUP - 1	1-Mar-17	2137	Dictyosphaerium simplex Sukja	21277	0.09	2.00	2.00	4.20
DUP - 1	1-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	3546	0.24	36.00	2.20	68.40
DUP - 1	1-Mar-17	4351	Small chrysophyceae	177305	2.50	3.00	3.00	14.10
DUP - 1	1-Mar-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
DUP - 1	1-Mar-17	4357	Chrysococcus sp.	102837	5.24	4.60	4.60	51.00
DUP - 1	1-Mar-17	4362	Kephyrion sp.	14184	0.27	3.30	3.30	18.80
DUP - 1	1-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.09	5.60	2.90	24.70
DUP - 1	1-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.13	9.30	18.60	1263.50
DUP - 1	1-Mar-17	5551	Cyclotella michiganiana Skvortzow	3546	0.07	2.30	4.60	19.10
DUP - 1	1-Mar-17	6554	Rhodomonas minuta Skuja	10638	1.34	10.00	6.00	125.70
DUP - 1	1-Mar-17	6558	Cryptomonas erosa Ehrenberg	600	0.67	22.20	12.00	1115.90
DUP - 1	1-May-17	2112	Sphaerocystis schroeteri Chodat	28369	0.95	4.00	4.00	33.50
DUP - 1	1-May-17	2121	Oocystis lacustris Chodat	21277	0.52	5.20	3.00	24.50
DUP - 1	1-May-17	2137	Dictyosphaerium simplex Sukja	14184	0.06	2.00	2.00	4.20
DUP - 1	1-May-17	2178	Cosmarium sp.	100	0.14	20.00	20.00	1396.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
DUP - 1	1-May-17	4351	Small chrysophyceae	191489	2.70	3.00	3.00	14.10
DUP - 1	1-May-17	4352	Large chrysophyceae	10638	1.91	7.00	7.00	179.60
DUP - 1	1-May-17	4357	Chrysococcus sp.	117021	7.65	5.00	5.00	65.40
DUP - 1	1-May-17	4361	Kephyrion boreale Skuja	3546	0.44	6.20	6.20	124.80
DUP - 1	1-May-17	4362	Kephyrion sp.	3546	0.06	3.10	3.10	15.60
DUP - 1	1-May-17	4400	Ochromonas sp.	3546	0.28	9.00	4.10	79.20
DUP - 1	1-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.31	5.50	3.20	29.50
DUP - 1	1-May-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.15	9.95	19.90	1547.40
DUP - 1	1-May-17	5518	Synedra acus Kutzing	100	0.01	110.00	2.00	115.20
DUP - 1	1-May-17	5551	Cyclotella michiganiana Skvortzow	3546	0.08	2.40	4.80	21.70
DUP - 1	1-May-17	6554	Rhodomonas minuta Skuja	35461	4.46	10.00	6.00	125.70
DUP - 1	1-May-17	6558	Cryptomonas erosa Ehrenberg	800	0.92	23.00	12.00	1156.10
DUP - 1	1-May-17	6568	Katablepharis ovalis Skuja	3546	0.14	7.60	4.00	40.30
DUP - 1	1-May-17	7632	Gymnodinium sp.	100	1.03	27.00	27.00	10306.00
DUP - 1	1-Jul-17	2121	Oocystis lacustris Chodat	50288	1.26	5.30	3.00	25.00
DUP - 1	1-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	57472	4.29	44.00	1.80	74.60
DUP - 1	1-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.11	15.20	14.00	564.50
DUP - 1	1-Jul-17	2205	Mougeotia sp.	200	0.54	50.00	8.30	2705.30
DUP - 1	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
DUP - 1	1-Jul-17	4351	Small chrysophyceae	64656	0.53	2.50	2.50	8.20
DUP - 1	1-Jul-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
DUP - 1	1-Jul-17	4357	Chrysococcus sp.	718400	46.98	5.00	5.00	65.40
DUP - 1	1-Jul-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
DUP - 1	1-Jul-17	4362	Kephyrion sp.	28736	0.45	3.10	3.10	15.60
DUP - 1	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	35920	8.13	12.00	6.00	226.20
DUP - 1	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	800	2.71	0.00	0.00	3390.00
DUP - 1	1-Jul-17	4390	Dinobryon sociale Ehrenberg	200	0.25	0.00	0.00	1250.00
DUP - 1	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.18	5.20	3.00	24.50
DUP - 1	1-Jul-17	4400	Ochromonas sp.	7184	0.63	9.00	4.30	87.10
DUP - 1	1-Jul-17	4401	Uroglena volvox Ehrenberg	35920	4.06	6.00	6.00	113.10
DUP - 1	1-Jul-17	4413	Chrysochromulina laurentiana Kling	35920	14.64	9.20	9.20	407.70
DUP - 1	1-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.55	3.65	7.30	76.40
DUP - 1	1-Jul-17	5518	Synedra acus Kutzing	600	0.06	100.00	2.00	104.70
DUP - 1	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	122128	2.04	2.20	4.40	16.70
DUP - 1	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	400	0.90	33.00	14.00	2257.80
DUP - 1	1-Jul-17	7632	Gymnodinium sp.	4000	21.11	21.60	21.60	5276.70
DUP - 1	1-Jul-17	7632	Gymnodinium sp.	800	15.05	33.00	33.00	18816.60
DUP - 1	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	1000	1.59	15.50	14.00	1590.70
DUP - 1	1-Aug-17	2121	Oocystis lacustris Chodat	28736	0.74	5.50	3.00	25.90
DUP - 1	1-Aug-17	2137	Dictyosphaerium simplex Sukja	704032	2.96	2.00	2.00	4.20
DUP - 1	1-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	35920	2.80	46.00	1.80	78.00
DUP - 1	1-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	7184	0.03	3.00	3.00	4.70
DUP - 1	1-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.85	34.00	2.10	58.90
DUP - 1	1-Aug-17	4351	Small chrysophyceae	21552	0.28	2.90	2.90	12.80
DUP - 1	1-Aug-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
DUP - 1	1-Aug-17	4357	Chrysococcus sp.	172416	9.98	4.80	4.80	57.90
DUP - 1	1-Aug-17	4362	Kephyrion sp.	143680	2.24	3.10	3.10	15.60
DUP - 1	1-Aug-17	4378	Dinobryon borgei Lemmermann	7184	0.31	9.10	3.00	42.90
DUP - 1	1-Aug-17	4383	Dinobryon bavaricum Imhof	21552	4.88	12.00	6.00	226.20
DUP - 1	1-Aug-17	4383	Dinobryon bavaricum Imhof	600	1.19	0.00	0.00	1991.00
DUP - 1	1-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
DUP - 1	1-Aug-17	4388	Dinobryon sertularia Ehrenberg	400	0.80	0.00	0.00	1991.00
DUP - 1	1-Aug-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
DUP - 1	1-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	35920	0.94	5.20	3.10	26.20
DUP - 1	1-Aug-17	4401	Uroglena volvox Ehrenberg	7184	0.81	6.00	6.00	113.10
DUP - 1	1-Aug-17	4413	Chrysochromulina laurentiana Kling	28736	11.34	9.10	9.10	394.60
DUP - 1	1-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.86	5.60	3.20	30.00
DUP - 1	1-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	600	0.94	10.00	20.00	1570.80
DUP - 1	1-Aug-17	5509	Cyclotella ocellata Pant.	14368	1.05	3.60	7.20	73.30
DUP - 1	1-Aug-17	5511	Rhizosolenia eriense H.L. Smith	64656	4.11	9.00	3.00	63.60
DUP - 1	1-Aug-17	5515	Fragilaria crotonensis Kitton	1400	0.47	80.00	4.00	335.10
DUP - 1	1-Aug-17	5518	Synedra acus Kutzing	8600	1.08	120.00	2.00	125.70
DUP - 1	1-Aug-17	5524	Asterionella formosa Hassall	16600	1.70	98.00	2.00	102.60
DUP - 1	1-Aug-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	2000	14.94	145.00	8.10	7471.80
DUP - 1	1-Aug-17	5551	Cyclotella michiganiana Skvortzow	57472	1.10	2.30	4.60	19.10
DUP - 1	1-Aug-17	6554	Rhodomonas minuta Skuja	71840	9.39	10.40	6.00	130.70
DUP - 1	1-Aug-17	6558	Cryptomonas erosa Ehrenberg	200	0.24	24.10	12.00	1211.40
DUP - 1	1-Aug-17	7632	Gymnodinium sp.	200	2.06	27.00	27.00	10306.00
DUP - 1	1-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.44	16.60	16.60	2395.10
DUP - 1	1-Aug-17	7641	Peridinium aciculiferum Lemmermann	400	3.62	30.00	24.00	9047.80
DUP - 1	1-Sep-17	1054	Planktolyngbya limnetica	16400	1.85	100.00	1.20	113.10
DUP - 1	1-Sep-17	2112	Sphaerocystis schroeteri Chodat	28736	0.30	2.70	2.70	10.30
DUP - 1	1-Sep-17	2121	Oocystis lacustris Chodat	28736	0.74	5.50	3.00	25.90
DUP - 1	1-Sep-17	2137	Dictyosphaerium simplex Sukja	215520	0.91	2.00	2.00	4.20
DUP - 1	1-Sep-17	2167	Elakatothrix gelatinosa Willen	122128	1.92	10.00	2.00	15.70
DUP - 1	1-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	1000	0.56	15.20	14.00	564.50
DUP - 1	1-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
DUP - 1	1-Sep-17	2206	Botryococcus braunii Kutzing	800	0.72	12.00	12.00	904.80
DUP - 1	1-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	35920	0.17	3.00	3.00	4.70
DUP - 1	1-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	21552	1.34	36.00	2.10	62.30
DUP - 1	1-Sep-17	4351	Small chrysophyceae	79024	1.11	3.00	3.00	14.10
DUP - 1	1-Sep-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
DUP - 1	1-Sep-17	4357	Chrysococcus sp.	409488	20.88	4.60	4.60	51.00
DUP - 1	1-Sep-17	4358	Chrysostephanospaera globulifera Scherffel	14368	3.30	7.60	7.60	229.80
DUP - 1	1-Sep-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
DUP - 1	1-Sep-17	4362	Kephyrion sp.	28736	0.41	3.00	3.00	14.10
DUP - 1	1-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	400	0.42	20.00	10.00	1047.20
DUP - 1	1-Sep-17	4378	Dinobryon borgei Lemmermann	35920	1.84	9.00	3.30	51.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
DUP - 1	1-Sep-17	4381	Dinobryon mucronutom Nygaard	7184	0.94	10.00	5.00	130.90
DUP - 1	1-Sep-17	4383	Dinobryon bavaricum Imhof	71840	16.25	12.00	6.00	226.20
DUP - 1	1-Sep-17	4383	Dinobryon bavaricum Imhof	4000	7.96	0.00	0.00	1991.00
DUP - 1	1-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	28736	11.50	15.60	7.00	400.20
DUP - 1	1-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1400	5.81	0.00	0.00	4150.00
DUP - 1	1-Sep-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
DUP - 1	1-Sep-17	4401	Uroglena volvox Ehrenberg	28736	3.25	6.00	6.00	113.10
DUP - 1	1-Sep-17	4413	Chrysochromulina laurentiana Kling	50288	19.84	9.10	9.10	394.60
DUP - 1	1-Sep-17	4414	Stichogloea spp.	14368	0.72	6.00	4.00	50.30
DUP - 1	1-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	2600	4.80	10.55	21.10	1844.50
DUP - 1	1-Sep-17	5509	Cyclotella ocellata Pant.	79024	6.81	3.80	7.60	86.20
DUP - 1	1-Sep-17	5511	Rhizosolenia eriense H.L. Smith	57472	3.66	9.00	3.00	63.60
DUP - 1	1-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	600	0.80	26.00	14.00	1334.10
DUP - 1	1-Sep-17	5518	Synedra acus Kutzing	1000	0.09	90.00	2.00	94.20
DUP - 1	1-Sep-17	5551	Cyclotella michiganiana Skvortzow	280176	6.08	2.40	4.80	21.70
DUP - 1	1-Sep-17	6554	Rhodomonas minuta Skuja	21552	2.71	10.00	6.00	125.70
DUP - 1	1-Sep-17	6558	Cryptomonas erosa Ehrenberg	600	0.74	24.60	12.00	1236.50
DUP - 1	1-Sep-17	7631	Gymnodinium helveticum Penard	200	4.71	50.00	30.00	23561.90
DUP - 1	1-Sep-17	7632	Gymnodinium sp.	600	9.36	31.00	31.00	15598.50
DUP - 2	1-Mar-17	2100	Pyramidomonas tetrarhynchus Schmarda	100	0.06	13.90	13.00	615.00
DUP - 2	1-Mar-17	2137	Dictyosphaerium simplex Sukja	63830	0.27	2.00	2.00	4.20
DUP - 2	1-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	35461	2.43	36.00	2.20	68.40
DUP - 2	1-Mar-17	4351	Small chrysophyceae	241135	3.40	3.00	3.00	14.10
DUP - 2	1-Mar-17	4352	Large chrysophyceae	10638	1.91	7.00	7.00	179.60
DUP - 2	1-Mar-17	4357	Chrysococcus sp.	187943	9.59	4.60	4.60	51.00
DUP - 2	1-Mar-17	4400	Ochromonas sp.	3546	0.31	9.00	4.30	87.10
DUP - 2	1-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	31915	0.79	5.60	2.90	24.70
DUP - 2	1-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.13	9.45	18.90	1325.60
DUP - 2	1-Mar-17	5509	Cyclotella ocellata Pant.	3546	0.24	3.50	7.00	67.30
DUP - 2	1-Mar-17	5511	Rhizosolenia eriense H.L. Smith	3546	0.23	9.00	3.00	63.60
DUP - 2	1-Mar-17	5518	Synedra acus Kutzing	800	0.09	110.00	2.00	115.20
DUP - 2	1-Mar-17	5551	Cyclotella michiganiana Skvortzow	14184	0.27	2.30	4.60	19.10
DUP - 2	1-Mar-17	6554	Rhodomonas minuta Skuja	31915	4.01	10.00	6.00	125.70
DUP - 2	1-Mar-17	6558	Cryptomonas erosa Ehrenberg	1400	1.62	23.00	12.00	1156.10
DUP - 2	1-Mar-17	6568	Katablepharis ovalis Skuja	17731	0.75	7.80	4.00	42.50
DUP - 2	1-Mar-17	7632	Gymnodinium sp.	3546	1.31	11.00	8.00	368.60
DUP - 2	1-Mar-17	7632	Gymnodinium sp.	100	0.92	26.00	26.00	9202.80
DUP - 2	1-May-17	2105	Chlamydomonas spp.	3546	0.06	5.00	2.50	16.40
DUP - 2	1-May-17	2121	Oocystis lacustris Chodat	10638	0.26	5.20	3.00	24.50
DUP - 2	1-May-17	2137	Dictyosphaerium simplex Sukja	56738	0.24	2.00	2.00	4.20
DUP - 2	1-May-17	2206	Botryococcus braunii Kutzing	300	0.53	15.00	15.00	1767.10
DUP - 2	1-May-17	2215	Tetraedron caudatum (Corda) Hansgrig	3546	0.02	3.00	3.00	4.70
DUP - 2	1-May-17	2235	Ankistrodesmus spiralis Lemmermann	14184	1.05	39.00	2.20	74.10
DUP - 2	1-May-17	4351	Small chrysophyceae	85106	1.09	2.90	2.90	12.80
DUP - 2	1-May-17	4352	Large chrysophyceae	7092	1.17	6.80	6.80	164.60
DUP - 2	1-May-17	4357	Chrysococcus sp.	127660	8.35	5.00	5.00	65.40
DUP - 2	1-May-17	4362	Kephyrion sp.	17731	0.51	3.80	3.80	28.70
DUP - 2	1-May-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
DUP - 2	1-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.31	5.40	3.20	29.00
DUP - 2	1-May-17	5518	Synedra acus Kutzing	100	0.01	88.00	2.00	92.20
DUP - 2	1-May-17	5551	Cyclotella michiganiana Skvortzow	131206	2.85	2.40	4.80	21.70
DUP - 2	1-May-17	6554	Rhodomonas minuta Skuja	14184	1.78	10.00	6.00	125.70
DUP - 2	1-May-17	6558	Cryptomonas erosa Ehrenberg	600	0.69	23.00	12.00	1156.10
DUP - 2	1-May-17	7631	Gymnodinium helveticum Penard	100	2.36	50.00	30.00	23561.90
DUP - 2	1-May-17	7632	Gymnodinium sp.	900	7.02	24.60	24.60	7794.80
DUP - 2	1-May-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.21	16.00	16.00	2144.70
DUP - 2	1-May-17	7641	Peridinium aciculiferum Lemmermann	100	0.90	30.00	24.00	9047.80
DUP - 2	1-Jul-17	2105	Chlamydomonas spp.	7184	0.19	5.60	3.00	26.40
DUP - 2	1-Jul-17	2121	Oocystis lacustris Chodat	7184	0.19	5.50	3.00	25.90
DUP - 2	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	7184	0.03	3.00	3.00	4.70
DUP - 2	1-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	14368	1.02	41.00	2.10	71.00
DUP - 2	1-Jul-17	4351	Small chrysophyceae	323280	3.33	2.70	2.70	10.30
DUP - 2	1-Jul-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
DUP - 2	1-Jul-17	4355	Chrysochromulina parva Lackey	14368	0.94	5.00	5.00	65.40
DUP - 2	1-Jul-17	4357	Chrysococcus sp.	718400	36.64	4.60	4.60	51.00
DUP - 2	1-Jul-17	4362	Kephyrion sp.	28736	0.37	2.90	2.90	12.80
DUP - 2	1-Jul-17	4368	Mallomonas crassisquama (Asmund) Fott	400	0.44	21.00	10.00	1099.60
DUP - 2	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	400	1.36	0.00	0.00	3390.00
DUP - 2	1-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
DUP - 2	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	93392	2.76	5.50	3.20	29.50
DUP - 2	1-Jul-17	4400	Ochromonas sp.	7184	0.58	9.60	4.00	80.40
DUP - 2	1-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.00	3.20	26.80
DUP - 2	1-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.25	11.00	22.00	2090.70
DUP - 2	1-Jul-17	5509	Cyclotella ocellata Pant.	21552	2.42	4.15	8.30	112.30
DUP - 2	1-Jul-17	5511	Rhizosolenia eriense H.L. Smith	28736	1.83	9.00	3.00	63.60
DUP - 2	1-Jul-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.14	76.00	6.00	716.30
DUP - 2	1-Jul-17	5514	Tabellaria flocculsa (Roth) Kutzing	800	1.07	26.00	14.00	1334.10
DUP - 2	1-Jul-17	5518	Synedra acus Kutzing	2600	0.30	110.00	2.00	115.20
DUP - 2	1-Jul-17	5524	Asterionella formosa Hassall	6000	0.52	82.00	2.00	85.90
DUP - 2	1-Jul-17	5540	Aulacoseira italica v subarctica (O. Muller) Simonsen	4800	40.99	147.00	8.60	8538.90
DUP - 2	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	136496	3.34	2.50	5.00	24.50
DUP - 2	1-Jul-17	6554	Rhodomonas minuta Skuja	158048	23.04	11.60	6.00	145.80
DUP - 2	1-Jul-17	6558	Cryptomonas erosa Ehrenberg	2200	2.72	24.60	12.00	1236.50
DUP - 2	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	800	1.70	31.00	14.00	2120.90
DUP - 2	1-Jul-17	6568	Katablepharis ovalis Skuja	28736	1.62	9.00	4.00	56.50
DUP - 2	1-Jul-17	7632	Gymnodinium sp.	1000	7.24	24.00	24.00	7238.20
DUP - 2	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.45	16.30	16.30	2267.60
DUP - 2	1-Jul-17	7641	Peridinium aciculiferum Lemmermann	3000	27.14	30.00	24.00	9047.80

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
DUP - 2	1-Aug-17	1054	Planktolyngbya limnetica	1200	0.20	146.00	1.20	165.10
DUP - 2	1-Aug-17	2105	Chlamydomonas spp.	21552	0.52	5.10	3.00	24.00
DUP - 2	1-Aug-17	2121	Oocystis lacustris Chodat	122128	3.22	5.60	3.00	26.40
DUP - 2	1-Aug-17	2137	Dictyosphaerium simplex Sukja	122128	0.51	2.00	2.00	4.20
DUP - 2	1-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	287360	22.41	46.00	1.80	78.00
DUP - 2	1-Aug-17	2167	Elakatothrix gelatinosa Willen	7184	0.12	11.00	2.00	17.30
DUP - 2	1-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.18	14.20	13.00	457.50
DUP - 2	1-Aug-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
DUP - 2	1-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	136496	0.64	3.00	3.00	4.70
DUP - 2	1-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.90	36.00	2.10	62.30
DUP - 2	1-Aug-17	4351	Small chrysophyceae	251440	3.22	2.90	2.90	12.80
DUP - 2	1-Aug-17	4352	Large chrysophyceae	43104	7.74	7.00	7.00	179.60
DUP - 2	1-Aug-17	4355	Chrysochromulina parva Lackey	7184	0.47	5.00	5.00	65.40
DUP - 2	1-Aug-17	4357	Chrysococcus sp.	869264	50.33	4.80	4.80	57.90
DUP - 2	1-Aug-17	4362	Kephyrion sp.	43104	0.74	3.20	3.20	17.20
DUP - 2	1-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.66	5.60	5.60	92.00
DUP - 2	1-Aug-17	4378	Dinobryon borgei Lemmermann	28736	1.47	9.00	3.30	51.30
DUP - 2	1-Aug-17	4383	Dinobryon bavaricum Imhof	64656	14.63	12.00	6.00	226.20
DUP - 2	1-Aug-17	4383	Dinobryon bavaricum Imhof	600	1.19	0.00	0.00	1991.00
DUP - 2	1-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
DUP - 2	1-Aug-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
DUP - 2	1-Aug-17	4393	Dinobryon spp.	7184	0.19	5.20	3.10	26.20
DUP - 2	1-Aug-17	4394	Epiphyxis sp.	14368	1.09	9.10	4.00	76.20
DUP - 2	1-Aug-17	4411	Bitrichia chodatii (Reverdin) Chodat	7184	0.36	6.00	4.00	50.30
DUP - 2	1-Aug-17	4413	Chrysochromulina laurentiana Kling	79024	32.22	9.20	9.20	407.70
DUP - 2	1-Aug-17	4414	Stichogloea spp.	28736	1.45	6.00	4.00	50.30
DUP - 2	1-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.51	5.60	3.20	30.00
DUP - 2	1-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	3400	6.18	10.50	21.00	1818.40
DUP - 2	1-Aug-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.15	81.00	6.00	763.40
DUP - 2	1-Aug-17	5518	Synedra acus Kutzing	5200	0.50	92.00	2.00	96.30
DUP - 2	1-Aug-17	5551	Cyclotella michiganiana Skvortzow	409488	7.82	2.30	4.60	19.10
DUP - 2	1-Aug-17	5720	Cyclotella bodanica Eulenst.	200	1.41	16.50	33.00	7056.20
DUP - 2	1-Aug-17	6554	Rhodomonas minuta Skuja	136496	17.58	9.60	6.20	128.80
DUP - 2	1-Aug-17	6558	Cryptomonas erosa Ehrenberg	5000	6.03	24.00	12.00	1206.40
DUP - 2	1-Aug-17	7632	Gymnodinium sp.	2000	16.56	25.10	25.10	8279.80
DUP - 2	1-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.31	16.10	16.10	2185.10
DUP - 2	1-Aug-17	7641	Peridinium aciculiferum Lemmermann	200	1.87	31.00	24.00	9349.40
INUG - 86S	29-Mar-17	1012	Aphanothece sp.	3546	0.18	0.00	0.00	50.00
INUG - 86S	29-Mar-17	2105	Chlamydomonas spp.	3546	0.06	5.00	2.50	16.40
INUG - 86S	29-Mar-17	2187	Staurodesmus extensus (Andersson) Teiling	100	0.04	14.00	13.00	444.70
INUG - 86S	29-Mar-17	2206	Botryococcus braunii Kutzing	500	0.58	13.00	13.00	1150.30
INUG - 86S	29-Mar-17	4351	Small chrysophyceae	269504	1.29	2.10	2.10	4.80
INUG - 86S	29-Mar-17	4352	Large chrysophyceae	21277	2.41	6.00	6.00	113.10
INUG - 86S	29-Mar-17	4357	Chrysococcus sp.	216312	14.15	5.00	5.00	65.40
INUG - 86S	29-Mar-17	4362	Kephyrion sp.	3546	0.09	3.60	3.60	24.40
INUG - 86S	29-Mar-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	3546	1.48	15.00	7.30	418.50
INUG - 86S	29-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	10638	0.32	5.60	3.20	30.00
INUG - 86S	29-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.10	5.20	3.20	27.90
INUG - 86S	29-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.18	10.55	21.10	1844.50
INUG - 86S	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	21277	0.33	2.15	4.30	15.60
INUG - 86S	29-Mar-17	6554	Rhodomonas minuta Skuja	28369	3.57	10.00	6.00	125.70
INUG - 86S	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	1000	1.12	22.20	12.00	1115.90
INUG - 86S	29-Mar-17	6568	Katablepharis ovalis Skuja	3546	0.15	7.70	4.00	41.40
INUG - 86S	29-Mar-17	7632	Gymnodinium sp.	400	3.08	24.50	24.50	7700.10
INUG - 86S	29-Mar-17	7635	Peridinium willei Huitfeldt-Kaas	100	2.57	36.60	36.60	25670.90
INUG - 87S	29-Mar-17	1012	Aphanothece sp.	3546	0.16	0.00	0.00	46.00
INUG - 87S	29-Mar-17	2187	Staurodesmus extensus (Andersson) Teiling	100	0.04	14.00	13.00	444.70
INUG - 87S	29-Mar-17	2206	Botryococcus braunii Kutzing	600	0.69	13.00	13.00	1150.30
INUG - 87S	29-Mar-17	4351	Small chrysophyceae	191489	0.92	2.10	2.10	4.80
INUG - 87S	29-Mar-17	4352	Large chrysophyceae	42553	5.31	6.20	6.20	124.80
INUG - 87S	29-Mar-17	4357	Chrysococcus sp.	92199	6.03	5.00	5.00	65.40
INUG - 87S	29-Mar-17	4362	Kephyrion sp.	3546	0.06	3.10	3.10	15.60
INUG - 87S	29-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	10638	0.29	5.10	3.20	27.30
INUG - 87S	29-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	17731	0.51	5.40	3.20	29.00
INUG - 87S	29-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	300	0.55	10.50	21.00	1818.40
INUG - 87S	29-Mar-17	5518	Synedra acus Kutzing	100	0.01	93.00	2.10	107.40
INUG - 87S	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	14184	0.24	2.20	4.40	16.70
INUG - 87S	29-Mar-17	6554	Rhodomonas minuta Skuja	88653	11.14	10.00	6.00	125.70
INUG - 87S	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	600	0.68	22.50	12.00	1131.00
INUG - 87S	29-Mar-17	6568	Katablepharis ovalis Skuja	10638	0.48	8.00	4.00	44.70
INUG - 87S	29-Mar-17	7632	Gymnodinium sp.	100	0.72	24.00	24.00	7238.20
INUG - 87SR	29-Mar-17	2187	Staurodesmus extensus (Andersson) Teiling	100	0.04	14.00	13.00	444.70
INUG - 87SR	29-Mar-17	2206	Botryococcus braunii Kutzing	400	0.46	13.00	13.00	1150.30
INUG - 87SR	29-Mar-17	4351	Small chrysophyceae	159575	0.77	2.10	2.10	4.80
INUG - 87SR	29-Mar-17	4352	Large chrysophyceae	31915	3.98	6.20	6.20	124.80
INUG - 87SR	29-Mar-17	4357	Chrysococcus sp.	120567	7.89	5.00	5.00	65.40
INUG - 87SR	29-Mar-17	4362	Kephyrion sp.	3546	0.06	3.10	3.10	15.60
INUG - 87SR	29-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.10	5.10	3.20	27.30
INUG - 87SR	29-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7092	0.21	5.40	3.20	29.00
INUG - 87SR	29-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.30	9.80	19.60	1478.40
INUG - 87SR	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	14184	0.22	2.15	4.30	15.60
INUG - 87SR	29-Mar-17	6554	Rhodomonas minuta Skuja	102837	12.93	10.00	6.00	125.70
INUG - 87SR	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	400	0.44	22.00	12.00	1105.80
INUG - 87SR	29-Mar-17	7632	Gymnodinium sp.	200	1.48	24.20	24.20	7420.70
INUG - 87SR	29-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.11	14.00	12.30	1109.00
INUG - 88S	7-May-17	2121	Oocystis lacustris Chodat	35461	0.87	5.20	3.00	24.50
INUG - 88S	7-May-17	2206	Botryococcus braunii Kutzing	600	1.06	15.00	15.00	1767.10
INUG - 88S	7-May-17	4351	Small chrysophyceae	85106	0.78	2.60	2.60	9.20

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
INUG - 88S	7-May-17	4352	Large chrysophyceae	14184	2.55	7.00	7.00	179.60
INUG - 88S	7-May-17	4357	Chrysococcus sp.	78014	5.10	5.00	5.00	65.40
INUG - 88S	7-May-17	4362	Kephyrion sp.	3546	0.06	3.10	3.10	15.60
INUG - 88S	7-May-17	4400	Ochromonas sp.	3546	0.22	9.00	3.60	61.10
INUG - 88S	7-May-17	4414	Stichogloea spp.	3546	0.18	6.00	4.00	50.30
INUG - 88S	7-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.30	5.20	3.20	27.90
INUG - 88S	7-May-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.13	9.30	18.60	1263.50
INUG - 88S	7-May-17	5518	Synedra acus Kutzing	100	0.01	84.00	2.00	88.00
INUG - 88S	7-May-17	5551	Cyclotella michiganiana Skvortzow	21277	0.36	2.20	4.40	16.70
INUG - 88S	7-May-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
INUG - 88S	7-May-17	6558	Cryptomonas erosa Ehrenberg	400	0.46	23.00	12.00	1156.10
INUG - 89S	7-May-17	2105	Chlamydomonas spp.	3546	0.08	5.00	3.00	23.60
INUG - 89S	7-May-17	2121	Oocystis lacustris Chodat	531915	7.50	5.10	2.30	14.10
INUG - 89S	7-May-17	2187	Staurodesmus extensus (Andersson) Teiling	100	0.04	14.00	13.00	444.70
INUG - 89S	7-May-17	2206	Botryococcus braunii Kutzing	400	0.63	14.40	14.40	1563.50
INUG - 89S	7-May-17	2512	Scenedesmus acuminatus Chodat	21277	0.83	7.00	4.00	39.10
INUG - 89S	7-May-17	4351	Small chrysophyceae	70922	0.65	2.60	2.60	9.20
INUG - 89S	7-May-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
INUG - 89S	7-May-17	4357	Chrysococcus sp.	81560	5.33	5.00	5.00	65.40
INUG - 89S	7-May-17	4362	Kephyrion sp.	3546	0.05	2.90	2.90	12.80
INUG - 89S	7-May-17	4414	Stichogloea spp.	7092	0.36	6.00	4.00	50.30
INUG - 89S	7-May-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.13	9.50	19.00	1346.80
INUG - 89S	7-May-17	5518	Synedra acus Kutzing	100	0.01	88.00	2.00	92.20
INUG - 89S	7-May-17	5551	Cyclotella michiganiana Skvortzow	24823	0.41	2.20	4.40	16.70
INUG - 89S	7-May-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
INUG - 89S	7-May-17	6558	Cryptomonas erosa Ehrenberg	900	1.04	23.00	12.00	1156.10
INUG - 89S	7-May-17	6568	Katablepharis ovalis Skuja	17731	0.71	7.60	4.00	40.30
INUG - 90S	22-Jul-17	1054	Planktolyngbya limnetica	2400	0.42	156.00	1.20	176.40
INUG - 90S	22-Jul-17	1073	Snowella sp	200	0.10	0.00	0.00	500.00
INUG - 90S	22-Jul-17	2121	Oocystis lacustris Chodat	14368	0.41	6.00	3.00	28.30
INUG - 90S	22-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.00	41.00	1.80	69.60
INUG - 90S	22-Jul-17	2167	Elakatothrix gelatinosa Willen	93392	1.19	8.10	2.00	12.70
INUG - 90S	22-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.10	14.60	13.00	483.60
INUG - 90S	22-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
INUG - 90S	22-Jul-17	2206	Botryococcus braunii Kutzing	200	0.18	12.00	12.00	904.80
INUG - 90S	22-Jul-17	4351	Small chrysophyceae	337648	2.16	2.30	2.30	6.40
INUG - 90S	22-Jul-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
INUG - 90S	22-Jul-17	4357	Chrysococcus sp.	538800	35.24	5.00	5.00	65.40
INUG - 90S	22-Jul-17	4362	Kephyrion sp.	43104	0.74	3.20	3.20	17.20
INUG - 90S	22-Jul-17	4363	Spiniferomonas sirrata***************	7184	0.63	5.50	5.50	87.10
INUG - 90S	22-Jul-17	4367	Mallomonas duerrschmidtiae Siver, Hamer and Kling	200	0.20	19.40	10.00	1015.80
INUG - 90S	22-Jul-17	4381	Dinobryon mucronutom Nygaard	7184	0.83	8.80	5.00	115.20
INUG - 90S	22-Jul-17	4383	Dinobryon bavaricum Imhof	14368	3.25	12.00	6.00	226.20
INUG - 90S	22-Jul-17	4383	Dinobryon bavaricum Imhof	1800	4.91	0.00	0.00	2725.00
INUG - 90S	22-Jul-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	21552	8.63	15.60	7.00	400.20
INUG - 90S	22-Jul-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	600	3.05	0.00	0.00	5085.00
INUG - 90S	22-Jul-17	4388	Dinobryon sertularia Ehrenberg	79024	17.88	12.00	6.00	226.20
INUG - 90S	22-Jul-17	4388	Dinobryon sertularia Ehrenberg	1200	4.07	0.00	0.00	3390.00
INUG - 90S	22-Jul-17	4390	Dinobryon sociale Ehrenberg	50288	11.38	12.00	6.00	226.20
INUG - 90S	22-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	28736	0.74	5.50	3.00	25.90
INUG - 90S	22-Jul-17	4413	Chrysochromulina laurentiana Kling	64656	25.51	9.10	9.10	394.60
INUG - 90S	22-Jul-17	4414	Stichogloea spp.	57472	2.89	6.00	4.00	50.30
INUG - 90S	22-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.78	5.10	3.20	27.30
INUG - 90S	22-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.08	9.50	19.00	1346.80
INUG - 90S	22-Jul-17	5509	Cyclotella ocellata Pant.	35920	2.42	3.50	7.00	67.30
INUG - 90S	22-Jul-17	5511	Rhizosolenia eriense H.L. Smith	14368	0.91	9.00	3.00	63.60
INUG - 90S	22-Jul-17	5518	Synedra acus Kutzing	1200	0.12	96.00	2.00	100.50
INUG - 90S	22-Jul-17	5551	Cyclotella michiganiana Skvortzow	71840	1.66	2.45	4.90	23.10
INUG - 90S	22-Jul-17	6562	Cryptomonas reflexa (Marsson) Skuja	400	0.28	20.00	10.00	698.10
INUG - 90S	22-Jul-17	7632	Gymnodinium sp.	1400	16.09	28.00	28.00	11494.00
INUG - 90S	22-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	0.90	14.60	14.00	1498.30
INUG - 90S	22-Jul-17	7644	Ceratium hirundenella (Muller) Schrank	200	4.71	50.00	30.00	23561.90
INUG - 91S	22-Jul-17	1014	Chroococcus limneticus Lemmermann	28736	1.11	4.20	4.20	38.80
INUG - 91S	22-Jul-17	1054	Planktolyngbya limnetica	1400	0.28	175.00	1.20	197.90
INUG - 91S	22-Jul-17	2105	Chlamydomonas spp.	7184	0.14	5.00	2.70	19.10
INUG - 91S	22-Jul-17	2112	Sphaerocystis schroeteri Chodat	28736	0.70	3.60	3.60	24.40
INUG - 91S	22-Jul-17	2145	Crucigenia quadrata Morr.	57472	0.27	3.00	3.00	4.70
INUG - 91S	22-Jul-17	2167	Elakatothrix gelatinosa Willen	28736	0.39	8.60	2.00	13.50
INUG - 91S	22-Jul-17	2182	Euastrum spp.	200	0.37	22.00	22.00	1858.40
INUG - 91S	22-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.19	14.60	13.00	483.60
INUG - 91S	22-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08	6.00	6.00	37.70
INUG - 91S	22-Jul-17	4351	Small chrysophyceae	416672	4.29	2.70	2.70	10.30
INUG - 91S	22-Jul-17	4357	Chrysococcus sp.	682480	44.63	5.00	5.00	65.40
INUG - 91S	22-Jul-17	4362	Kephyrion sp.	64656	1.11	3.20	3.20	17.20
INUG - 91S	22-Jul-17	4378	Dinobryon borgei Lemmermann	7184	0.33	8.60	3.20	46.10
INUG - 91S	22-Jul-17	4381	Dinobryon mucronutom Nygaard	14368	1.66	8.80	5.00	115.20
INUG - 91S	22-Jul-17	4383	Dinobryon bavaricum Imhof	400	1.09	0.00	0.00	2725.00
INUG - 91S	22-Jul-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.88	15.60	7.00	400.20
INUG - 91S	22-Jul-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1000	5.09	0.00	0.00	5085.00
INUG - 91S	22-Jul-17	4388	Dinobryon sertularia Ehrenberg	100576	22.75	12.00	6.00	226.20
INUG - 91S	22-Jul-17	4388	Dinobryon sertularia Ehrenberg	200	0.68	0.00	0.00	3390.00
INUG - 91S	22-Jul-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20
INUG - 91S	22-Jul-17	4390	Dinobryon sociale Ehrenberg	400	0.50	0.00	0.00	1250.00
INUG - 91S	22-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.18	5.30	3.00	25.00
INUG - 91S	22-Jul-17	4401	Uroglena volvox Ehrenberg	14368	1.63	6.00	6.00	113.10
INUG - 91S	22-Jul-17	4413	Chrysochromulina laurentiana Kling	64656	25.51	9.10	9.10	394.60
INUG - 91S	22-Jul-17	4414	Stichogloea spp.	14368	0.72	6.00	4.00	50.30
INUG - 91S	22-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.36	10.50	21.00	1818.40

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
INUG - 91S	22-Jul-17	5509	Cyclotella ocellata Pant.	21552	1.45	3.50	7.00	67.30
INUG - 91S	22-Jul-17	5511	Rhizosolenia eriense H.L. Smith	7184	0.46	9.00	3.00	63.60
INUG - 91S	22-Jul-17	5518	Synedra acus Kutzing	600	0.06	96.00	2.00	100.50
INUG - 91S	22-Jul-17	5551	Cyclotella michiganiana Skvortzow	64656	1.49	2.45	4.90	23.10
INUG - 91S	22-Jul-17	5720	Cyclotella bodanica Eulenst.	200	1.41	16.50	33.00	7056.20
INUG - 91S	22-Jul-17	6562	Cryptomonas reflexa (Marsson) Skuja	200	0.14	19.60	10.00	684.20
INUG - 91S	22-Jul-17	6568	Katablepharis ovalis Skuja	14368	0.69	8.30	4.00	48.10
INUG - 91S	22-Jul-17	7632	Gymnodinium sp.	400	4.60	28.00	28.00	11494.00
INUG - 92S	25-Aug-17	1054	Planktolyngbya limnetica	8800	1.60	161.00	1.20	182.10
INUG - 92S	25-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	400	0.20	13.20	12.00	497.60
INUG - 92S	25-Aug-17	2105	Chlamydomonas spp.	7184	0.17	5.00	3.00	23.60
INUG - 92S	25-Aug-17	2112	Sphaerocystis schroeteri Chodat	14368	0.13	2.60	2.60	9.20
INUG - 92S	25-Aug-17	2121	Oocystis lacustris Chodat	50288	1.42	6.00	3.00	28.30
INUG - 92S	25-Aug-17	2137	Dictyosphaerium simplex Sukja	431040	1.81	2.00	2.00	4.20
INUG - 92S	25-Aug-17	2167	Elakatothrix gelatinosa Willen	57472	0.90	10.00	2.00	15.70
INUG - 92S	25-Aug-17	2169	Planctonema lauterbornii Schmidle	21552	4.88	18.00	4.00	226.20
INUG - 92S	25-Aug-17	2178	Cosmarium sp.	600	1.12	22.00	22.00	1858.40
INUG - 92S	25-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.07	12.60	12.00	332.50
INUG - 92S	25-Aug-17	2206	Botryococcus braunii Kutzing	1400	0.73	10.00	10.00	523.60
INUG - 92S	25-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	64656	4.14	37.00	2.10	64.10
INUG - 92S	25-Aug-17	4351	Small chrysophyceae	79024	1.11	3.00	3.00	14.10
INUG - 92S	25-Aug-17	4352	Large chrysophyceae	35920	6.45	7.00	7.00	179.60
INUG - 92S	25-Aug-17	4357	Chrysococcus sp.	431040	28.19	5.00	5.00	65.40
INUG - 92S	25-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.56	8.80	8.80	356.80
INUG - 92S	25-Aug-17	4362	Kephyrion sp.	21552	0.30	3.00	3.00	14.10
INUG - 92S	25-Aug-17	4383	Dinobryon bavaricum Imhof	107760	24.38	12.00	6.00	226.20
INUG - 92S	25-Aug-17	4383	Dinobryon bavaricum Imhof	4000	5.00	0.00	0.00	1250.00
INUG - 92S	25-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	3.00	16.30	7.00	418.20
INUG - 92S	25-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.80	0.00	0.00	4510.00
INUG - 92S	25-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
INUG - 92S	25-Aug-17	4390	Dinobryon sociale Ehrenberg	35920	8.13	12.00	6.00	226.20
INUG - 92S	25-Aug-17	4411	Bitrichia chodatii (Reverdin) Chodat	21552	1.08	6.00	4.00	50.30
INUG - 92S	25-Aug-17	4413	Chrysochromulina laurentiana Kling	57472	22.68	9.10	9.10	394.60
INUG - 92S	25-Aug-17	4414	Stichogloea spp.	100576	5.06	6.00	4.00	50.30
INUG - 92S	25-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	1000	1.82	10.50	21.00	1818.40
INUG - 92S	25-Aug-17	5509	Cyclotella ocellata Pant.	35920	4.18	4.20	8.40	116.40
INUG - 92S	25-Aug-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.15	81.00	6.00	763.40
INUG - 92S	25-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	400	0.48	23.60	14.00	1211.00
INUG - 92S	25-Aug-17	5518	Synedra acus Kutzing	200	0.02	91.00	2.00	95.30
INUG - 92S	25-Aug-17	5551	Cyclotella michiganiana Skvortzow	179600	3.43	2.30	4.60	19.10
INUG - 92S	25-Aug-17	6554	Rhodomonas minuta Skuja	21552	1.81	9.60	5.00	83.80
INUG - 92S	25-Aug-17	6558	Cryptomonas erosa Ehrenberg	200	0.23	23.00	12.00	1156.10
INUG - 92S	25-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.29	7.60	4.00	40.30
INUG - 92S	25-Aug-17	7632	Gymnodinium sp.	400	2.90	24.00	24.00	7238.20
INUG - 92S	25-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	400	0.92	16.40	16.40	2309.60
INUG - 93S	25-Aug-17	1054	Planktolyngbya limnetica	13200	2.40	161.00	1.20	182.10
INUG - 93S	25-Aug-17	2112	Sphaerocystis schroeteri Chodat	28736	0.26	2.60	2.60	9.20
INUG - 93S	25-Aug-17	2121	Oocystis lacustris Chodat	64656	1.83	6.00	3.00	28.30
INUG - 93S	25-Aug-17	2137	Dictyosphaerium simplex Sukja	294544	1.24	2.00	2.00	4.20
INUG - 93S	25-Aug-17	2167	Elakatothrix gelatinosa Willen	71840	1.13	10.00	2.00	15.70
INUG - 93S	25-Aug-17	2182	Euastrum spp.	400	0.74	22.00	22.00	1858.40
INUG - 93S	25-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.13	12.60	12.00	332.50
INUG - 93S	25-Aug-17	2206	Botryococcus braunii Kutzing	1600	0.84	10.00	10.00	523.60
INUG - 93S	25-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	7184	0.03	3.00	3.00	4.70
INUG - 93S	25-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.84	37.00	2.10	64.10
INUG - 93S	25-Aug-17	4351	Small chrysophyceae	100576	1.42	3.00	3.00	14.10
INUG - 93S	25-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
INUG - 93S	25-Aug-17	4357	Chrysococcus sp.	452592	29.60	5.00	5.00	65.40
INUG - 93S	25-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
INUG - 93S	25-Aug-17	4362	Kephyrion sp.	35920	0.51	3.00	3.00	14.10
INUG - 93S	25-Aug-17	4363	Spiniferomonas sirrata***************	14368	1.54	5.90	5.90	107.50
INUG - 93S	25-Aug-17	4378	Dinobryon borgei Lemmermann	35920	1.66	8.60	3.20	46.10
INUG - 93S	25-Aug-17	4383	Dinobryon bavaricum Imhof	64656	14.63	12.00	6.00	226.20
INUG - 93S	25-Aug-17	4383	Dinobryon bavaricum Imhof	6000	7.50	0.00	0.00	1250.00
INUG - 93S	25-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	3.00	16.30	7.00	418.20
INUG - 93S	25-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	600	2.49	0.00	0.00	4150.00
INUG - 93S	25-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
INUG - 93S	25-Aug-17	4390	Dinobryon sociale Ehrenberg	64656	14.63	12.00	6.00	226.20
INUG - 93S	25-Aug-17	4411	Bitrichia chodatii (Reverdin) Chodat	28736	1.45	6.00	4.00	50.30
INUG - 93S	25-Aug-17	4413	Chrysochromulina laurentiana Kling	21552	8.50	9.10	9.10	394.60
INUG - 93S	25-Aug-17	4414	Stichogloea spp.	143680	7.23	6.00	4.00	50.30
INUG - 93S	25-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
INUG - 93S	25-Aug-17	5509	Cyclotella ocellata Pant.	21552	2.51	4.20	8.40	116.40
INUG - 93S	25-Aug-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.37	9.00	3.00	63.60
INUG - 93S	25-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	400	0.48	23.60	14.00	1211.00
INUG - 93S	25-Aug-17	5518	Synedra acus Kutzing	600	0.06	91.00	2.00	95.30
INUG - 93S	25-Aug-17	5551	Cyclotella michiganiana Skvortzow	136496	2.61	2.30	4.60	19.10
INUG - 93S	25-Aug-17	6554	Rhodomonas minuta Skuja	7184	0.60	9.60	5.00	83.80
INUG - 93S	25-Aug-17	6558	Cryptomonas erosa Ehrenberg	400	0.46	23.00	12.00	1156.10
INUG - 93S	25-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.26	7.20	4.00	36.20
INUG - 93S	25-Aug-17	7632	Gymnodinium sp.	7184	2.65	11.00	8.00	368.60
INUG - 93S	25-Aug-17	7632	Gymnodinium sp.	600	4.34	24.00	24.00	7238.20
INUG - 93S	25-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	400	1.01	16.90	16.90	2527.30
INUG - 94S	23-Sep-17	1054	Planktolyngbya limnetica	11600	1.31	100.00	1.20	113.10
INUG - 94S	23-Sep-17	2121	Oocystis lacustris Chodat	28736	0.74	5.50	3.00	25.90
INUG - 94S	23-Sep-17	2137	Dictyosphaerium simplex Sukja	114944	0.48	2.00	2.00	4.20
INUG - 94S	23-Sep-17	2167	Elakatothrix gelatinosa Willen	129312	2.03	10.00	2.00	15.70
INUG - 94S	23-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	800	0.48	15.60	14.00	594.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
INUG - 94S	23-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
INUG - 94S	23-Sep-17	2206	Botryococcus braunii Kutzing	1200	0.63	10.00	10.00	523.60
INUG - 94S	23-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
INUG - 94S	23-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	79024	4.46	36.00	2.00	56.50
INUG - 94S	23-Sep-17	4351	Small chrysophyceae	193968	2.73	3.00	3.00	14.10
INUG - 94S	23-Sep-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
INUG - 94S	23-Sep-17	4357	Chrysococcus sp.	466960	23.81	4.60	4.60	51.00
INUG - 94S	23-Sep-17	4362	Kephyrion sp.	21552	0.30	3.00	3.00	14.10
INUG - 94S	23-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
INUG - 94S	23-Sep-17	4378	Dinobryon borgei Lemmermann	43104	2.21	9.00	3.30	51.30
INUG - 94S	23-Sep-17	4381	Dinobryon mucronutom Nygaard	7184	0.94	10.00	5.00	130.90
INUG - 94S	23-Sep-17	4383	Dinobryon bavaricum Imhof	71840	16.25	12.00	6.00	226.20
INUG - 94S	23-Sep-17	4383	Dinobryon bavaricum Imhof	2600	5.18	0.00	0.00	1991.00
INUG - 94S	23-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	35920	14.38	15.60	7.00	400.20
INUG - 94S	23-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1600	6.64	0.00	0.00	4150.00
INUG - 94S	23-Sep-17	4390	Dinobryon sociale Ehrenberg	14368	3.25	12.00	6.00	226.20
INUG - 94S	23-Sep-17	4401	Uroglena volvox Ehrenberg	35920	4.06	6.00	6.00	113.10
INUG - 94S	23-Sep-17	4413	Chrysochromulina laurentiana Kling	50288	19.84	9.10	9.10	394.60
INUG - 94S	23-Sep-17	4414	Stichogloea spp.	50288	2.53	6.00	4.00	50.30
INUG - 94S	23-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1800	3.37	10.60	21.20	1870.80
INUG - 94S	23-Sep-17	5509	Cyclotella ocellata Pant.	71840	6.19	3.80	7.60	86.20
INUG - 94S	23-Sep-17	5511	Rhizosolenia eriense H.L. Smith	114944	7.31	9.00	3.00	63.60
INUG - 94S	23-Sep-17	5518	Synedra acus Kutzing	1600	0.15	90.00	2.00	94.20
INUG - 94S	23-Sep-17	5523	Synedra ulna (Nitzsch) Ehrenberg	200	0.49	260.00	6.00	2450.40
INUG - 94S	23-Sep-17	5551	Cyclotella michiganiana Skvortzow	222704	5.46	2.50	5.00	24.50
INUG - 94S	23-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.81	10.00	6.00	125.70
INUG - 94S	23-Sep-17	6558	Cryptomonas erosa Ehrenberg	200	0.25	24.60	12.00	1236.50
INUG - 94S	23-Sep-17	7631	Gymnodinium helveticum Penard	400	9.42	50.00	30.00	23561.90
INUG - 94S	23-Sep-17	7632	Gymnodinium sp.	400	5.65	30.00	30.00	14137.20
INUG - 94S	23-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.45	16.30	16.30	2267.60
INUG - 95S	23-Sep-17	1054	Planktolyngbya limnetica	12600	1.43	100.00	1.20	113.10
INUG - 95S	23-Sep-17	2100	Pyramidomonas tetrarhynchus Schmarda	200	0.16	15.60	14.00	800.50
INUG - 95S	23-Sep-17	2112	Sphaerocystis schroeteri Chodat	50288	0.71	3.00	3.00	14.10
INUG - 95S	23-Sep-17	2121	Oocystis lacustris Chodat	43104	1.12	5.50	3.00	25.90
INUG - 95S	23-Sep-17	2137	Dictyosphaerium simplex Sukja	272992	1.15	2.00	2.00	4.20
INUG - 95S	23-Sep-17	2167	Elakatothrix gelatinosa Willen	158048	2.48	10.00	2.00	15.70
INUG - 95S	23-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	1400	0.84	15.70	14.00	602.30
INUG - 95S	23-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
INUG - 95S	23-Sep-17	2206	Botryococcus braunii Kutzing	800	0.72	12.00	12.00	904.80
INUG - 95S	23-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
INUG - 95S	23-Sep-17	4351	Small chrysophyceae	229888	3.24	3.00	3.00	14.10
INUG - 95S	23-Sep-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
INUG - 95S	23-Sep-17	4357	Chrysococcus sp.	632192	32.24	4.60	4.60	51.00
INUG - 95S	23-Sep-17	4362	Kephyrion sp.	50288	0.71	3.00	3.00	14.10
INUG - 95S	23-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.63	5.50	5.50	87.10
INUG - 95S	23-Sep-17	4378	Dinobryon borgei Lemmermann	57472	2.95	9.00	3.30	51.30
INUG - 95S	23-Sep-17	4381	Dinobryon mucronutom Nygaard	7184	0.94	10.00	5.00	130.90
INUG - 95S	23-Sep-17	4383	Dinobryon bavaricum Imhof	71840	16.25	12.00	6.00	226.20
INUG - 95S	23-Sep-17	4383	Dinobryon bavaricum Imhof	4200	8.36	0.00	0.00	1991.00
INUG - 95S	23-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	28736	11.50	15.60	7.00	400.20
INUG - 95S	23-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1400	5.81	0.00	0.00	4150.00
INUG - 95S	23-Sep-17	4390	Dinobryon sociale Ehrenberg	35920	8.13	12.00	6.00	226.20
INUG - 95S	23-Sep-17	4401	Uroglena volvox Ehrenberg	35920	4.06	6.00	6.00	113.10
INUG - 95S	23-Sep-17	4413	Chrysochromulina laurentiana Kling	21552	8.50	9.10	9.10	394.60
INUG - 95S	23-Sep-17	4414	Stichogloea spp.	28736	1.45	6.00	4.00	50.30
INUG - 95S	23-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.27	11.05	22.10	2119.40
INUG - 95S	23-Sep-17	5509	Cyclotella ocellata Pant.	21552	1.86	3.80	7.60	86.20
INUG - 95S	23-Sep-17	5511	Rhizosolenia eriense H.L. Smith	71840	4.57	9.00	3.00	63.60
INUG - 95S	23-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	400	0.53	26.00	14.00	1334.10
INUG - 95S	23-Sep-17	5518	Synedra acus Kutzing	1800	0.17	90.00	2.00	94.20
INUG - 95S	23-Sep-17	5551	Cyclotella michiganiana Skvortzow	201152	4.37	2.40	4.80	21.70
INUG - 95S	23-Sep-17	6554	Rhodomonas minuta Skuja	7184	0.90	10.00	6.00	125.70
INUG - 95S	23-Sep-17	6558	Cryptomonas erosa Ehrenberg	1200	1.48	24.60	12.00	1236.50
INUG - 95S	23-Sep-17	6568	Katablepharis ovalis Skuja	7184	0.34	8.20	4.00	46.90
INUG - 95S	23-Sep-17	7632	Gymnodinium sp.	400	5.65	30.00	30.00	14137.20
INUG - 95SR	23-Sep-17	1054	Planktolyngbya limnetica	15200	1.72	100.00	1.20	113.10
INUG - 95SR	23-Sep-17	2121	Oocystis lacustris Chodat	7184	0.19	5.50	3.00	25.90
INUG - 95SR	23-Sep-17	2137	Dictyosphaerium simplex Sukja	352016	1.48	2.00	2.00	4.20
INUG - 95SR	23-Sep-17	2167	Elakatothrix gelatinosa Willen	143680	2.26	10.00	2.00	15.70
INUG - 95SR	23-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	1000	0.60	15.70	14.00	602.30
INUG - 95SR	23-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
INUG - 95SR	23-Sep-17	2206	Botryococcus braunii Kutzing	600	0.54	12.00	12.00	904.80
INUG - 95SR	23-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
INUG - 95SR	23-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	7184	0.45	36.00	2.10	62.30
INUG - 95SR	23-Sep-17	4351	Small chrysophyceae	186784	2.63	3.00	3.00	14.10
INUG - 95SR	23-Sep-17	4352	Large chrysophyceae	28736	5.16	7.00	7.00	179.60
INUG - 95SR	23-Sep-17	4357	Chrysococcus sp.	574720	29.31	4.60	4.60	51.00
INUG - 95SR	23-Sep-17	4362	Kephyrion sp.	43104	0.61	3.00	3.00	14.10
INUG - 95SR	23-Sep-17	4363	Spiniferomonas sirrata***************	14368	1.25	5.50	5.50	87.10
INUG - 95SR	23-Sep-17	4378	Dinobryon borgei Lemmermann	28736	1.47	9.00	3.30	51.30
INUG - 95SR	23-Sep-17	4383	Dinobryon bavaricum Imhof	71840	16.25	12.00	6.00	226.20
INUG - 95SR	23-Sep-17	4383	Dinobryon bavaricum Imhof	4000	7.96	0.00	0.00	1991.00
INUG - 95SR	23-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	43104	17.25	15.60	7.00	400.20
INUG - 95SR	23-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1400	5.81	0.00	0.00	4150.00
INUG - 95SR	23-Sep-17	4390	Dinobryon sociale Ehrenberg	21552	4.88	12.00	6.00	226.20
INUG - 95SR	23-Sep-17	4401	Uroglena volvox Ehrenberg	71840	8.13	6.00	6.00	113.10
INUG - 95SR	23-Sep-17	4413	Chrysochromulina laurentiana Kling	35920	14.17	9.10	9.10	394.60
INUG - 95SR	23-Sep-17	4414	Stichogloea spp.	43104	2.17	6.00	4.00	50.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
INUG - 95SR	23-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.70	11.05	22.10	2119.40
INUG - 95SR	23-Sep-17	5509	Cyclotella ocellata Pant.	28736	2.48	3.80	7.60	86.20
INUG - 95SR	23-Sep-17	5511	Rhizosolenia eriense H.L. Smith	50288	3.20	9.00	3.00	63.60
INUG - 95SR	23-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	800	1.07	26.00	14.00	1334.10
INUG - 95SR	23-Sep-17	5518	Synedra acus Kutzing	1000	0.09	90.00	2.00	94.20
INUG - 95SR	23-Sep-17	5551	Cyclotella michiganiana Skvortzow	186784	4.05	2.40	4.80	21.70
INUG - 95SR	23-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.81	10.00	6.00	125.70
INUG - 95SR	23-Sep-17	6558	Cryptomonas erosa Ehrenberg	5800	7.17	24.60	12.00	1236.50
INUG - 95SR	23-Sep-17	7632	Gymnodinium sp.	200	3.12	31.00	31.00	15598.50
INUG - 95SR	23-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.36	16.30	16.30	2267.60
INUG - 96S	2-Nov-17	1054	Planktolyngbya limnetica	3400	0.52	136.00	1.20	153.80
INUG - 96S	2-Nov-17	2112	Sphaerocystis schroeteri Chodat	7184	0.18	3.60	3.60	24.40
INUG - 96S	2-Nov-17	2121	Oocystis lacustris Chodat	43104	1.12	5.50	3.00	25.90
INUG - 96S	2-Nov-17	2137	Dictyosphaerium simplex Sukja	251440	1.06	2.00	2.00	4.20
INUG - 96S	2-Nov-17	2167	Elakatothrix gelatinosa Willen	14368	0.29	13.00	2.00	20.40
INUG - 96S	2-Nov-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.25	14.00	12.00	410.50
INUG - 96S	2-Nov-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
INUG - 96S	2-Nov-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
INUG - 96S	2-Nov-17	2215	Tetraedron caudatum (Corda) Hansgrig	7184	0.03	3.00	3.00	4.70
INUG - 96S	2-Nov-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.87	35.00	2.10	60.60
INUG - 96S	2-Nov-17	4351	Small chrysophyceae	244256	3.13	2.90	2.90	12.80
INUG - 96S	2-Nov-17	4352	Large chrysophyceae	50288	9.03	7.00	7.00	179.60
INUG - 96S	2-Nov-17	4357	Chrysococcus sp.	186784	8.91	4.50	4.50	47.70
INUG - 96S	2-Nov-17	4362	Kephyrion sp.	64656	1.01	3.10	3.10	15.60
INUG - 96S	2-Nov-17	4372	Mallomonas tonsurata Teiling and Krieger	600	0.91	24.00	11.00	1520.50
INUG - 96S	2-Nov-17	4378	Dinobryon borgei Lemmermann	35920	1.54	9.10	3.00	42.90
INUG - 96S	2-Nov-17	4383	Dinobryon bavaricum Imhof	7184	1.63	12.00	6.00	226.20
INUG - 96S	2-Nov-17	4383	Dinobryon bavaricum Imhof	1600	2.00	0.00	0.00	1250.00
INUG - 96S	2-Nov-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	50288	19.61	15.20	7.00	390.00
INUG - 96S	2-Nov-17	4390	Dinobryon sociale Ehrenberg	35920	8.13	12.00	6.00	226.20
INUG - 96S	2-Nov-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.18	5.20	3.00	24.50
INUG - 96S	2-Nov-17	4413	Chrysochromulina laurentiana Kling	14368	6.25	9.40	9.40	434.90
INUG - 96S	2-Nov-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.38	5.60	3.00	26.40
INUG - 96S	2-Nov-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.51	9.30	18.60	1263.50
INUG - 96S	2-Nov-17	5511	Rhizosolenia eriense H.L. Smith	71840	5.59	11.00	3.00	77.80
INUG - 96S	2-Nov-17	5518	Synedra acus Kutzing	1600	0.15	88.00	2.00	92.20
INUG - 96S	2-Nov-17	5551	Cyclotella michiganiana Skvortzow	560352	13.73	2.50	5.00	24.50
INUG - 96S	2-Nov-17	6554	Rhodomonas minuta Skuja	21552	2.71	10.00	6.00	125.70
INUG - 96S	2-Nov-17	6558	Cryptomonas erosa Ehrenberg	200	0.23	23.10	12.00	1161.10
INUG - 97S	2-Nov-17	1054	Planktolyngbya limnetica	6600	1.23	165.00	1.20	186.60
INUG - 97S	2-Nov-17	2121	Oocystis lacustris Chodat	35920	0.85	5.00	3.00	23.60
INUG - 97S	2-Nov-17	2137	Dictyosphaerium simplex Sukja	344832	1.45	2.00	2.00	4.20
INUG - 97S	2-Nov-17	2167	Elakatothrix gelatinosa Willen	79024	1.61	13.00	2.00	20.40
INUG - 97S	2-Nov-17	2186	Xanthidium sp.	7184	1.25	10.00	10.00	174.50
INUG - 97S	2-Nov-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.25	14.00	12.00	410.50
INUG - 97S	2-Nov-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
INUG - 97S	2-Nov-17	2235	Ankistrodesmus spiralis Lemmermann	35920	2.18	35.00	2.10	60.60
INUG - 97S	2-Nov-17	4351	Small chrysophyceae	308912	3.95	2.90	2.90	12.80
INUG - 97S	2-Nov-17	4352	Large chrysophyceae	35920	6.45	7.00	7.00	179.60
INUG - 97S	2-Nov-17	4357	Chrysococcus sp.	596272	28.44	4.50	4.50	47.70
INUG - 97S	2-Nov-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.56	8.80	8.80	356.80
INUG - 97S	2-Nov-17	4362	Kephyrion sp.	28736	0.54	3.30	3.30	18.80
INUG - 97S	2-Nov-17	4372	Mallomonas tonsurata Teiling and Krieger	200	0.30	24.00	11.00	1520.50
INUG - 97S	2-Nov-17	4378	Dinobryon borgei Lemmermann	21552	0.92	9.10	3.00	42.90
INUG - 97S	2-Nov-17	4383	Dinobryon bavaricum Imhof	21552	4.88	12.00	6.00	226.20
INUG - 97S	2-Nov-17	4383	Dinobryon bavaricum Imhof	2600	3.25	0.00	0.00	1250.00
INUG - 97S	2-Nov-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	5.71	15.50	7.00	397.70
INUG - 97S	2-Nov-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.40	0.00	0.00	1991.00
INUG - 97S	2-Nov-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20
INUG - 97S	2-Nov-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.38	5.60	3.00	26.40
INUG - 97S	2-Nov-17	4413	Chrysochromulina laurentiana Kling	21552	9.37	9.40	9.40	434.90
INUG - 97S	2-Nov-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.33	5.60	3.00	26.40
INUG - 97S	2-Nov-17	5507	Cyclotella stelligera Cleve and Grunow	600	0.76	9.30	18.60	1263.50
INUG - 97S	2-Nov-17	5511	Rhizosolenia eriense H.L. Smith	71840	2.49	11.00	2.00	34.60
INUG - 97S	2-Nov-17	5518	Synedra acus Kutzing	4400	0.41	88.00	2.00	92.20
INUG - 97S	2-Nov-17	5551	Cyclotella michiganiana Skvortzow	581904	14.26	2.50	5.00	24.50
INUG - 97S	2-Nov-17	6554	Rhodomonas minuta Skuja	7184	0.90	10.00	6.00	125.70
INUG - 97S	2-Nov-17	6558	Cryptomonas erosa Ehrenberg	200	0.23	23.10	12.00	1161.10
PDL - 51S	27-Mar-17	1054	Planktolyngbya limnetica	11000	1.49	120.00	1.20	135.70
PDL - 51S	27-Mar-17	2167	Elakatothrix gelatinosa Willen	3546	0.08	15.00	2.00	23.60
PDL - 51S	27-Mar-17	2187	Staurodesmus extensus (Andersson) Teiling	800	0.44	15.00	14.00	549.80
PDL - 51S	27-Mar-17	2199	Spondylosium planum (Wolle) W. and G.S. West	17731	0.67	6.00	6.00	37.70
PDL - 51S	27-Mar-17	2206	Botryococcus braunii Kutzing	500	0.45	12.00	12.00	904.80
PDL - 51S	27-Mar-17	4351	Small chrysophyceae	53192	0.38	2.40	2.40	7.20
PDL - 51S	27-Mar-17	4352	Large chrysophyceae	21277	3.82	7.00	7.00	179.60
PDL - 51S	27-Mar-17	4357	Chrysococcus sp.	106383	6.96	5.00	5.00	65.40
PDL - 51S	27-Mar-17	4361	Kephyrion boreale Skuja	3546	0.34	5.70	5.70	97.00
PDL - 51S	27-Mar-17	4362	Kephyrion sp.	21277	0.66	3.90	3.90	31.10
PDL - 51S	27-Mar-17	4383	Dinobryon bavaricum Imhof	28369	6.42	12.00	6.00	226.20
PDL - 51S	27-Mar-17	4414	Stichogloea spp.	3546	0.18	6.00	4.00	50.30
PDL - 51S	27-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.11	5.60	3.20	30.00
PDL - 51S	27-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.12	9.15	18.30	1203.30
PDL - 51S	27-Mar-17	5511	Rhizosolenia eriense H.L. Smith	14184	2.14	12.00	4.00	150.80
PDL - 51S	27-Mar-17	5518	Synedra acus Kutzing	900	0.09	100.00	2.00	104.70
PDL - 51S	27-Mar-17	5551	Cyclotella michiganiana Skvortzow	42553	0.81	2.30	4.60	19.10
PDL - 51S	27-Mar-17	6554	Rhodomonas minuta Skuja	17731	2.23	10.00	6.00	125.70
PDL - 51S	27-Mar-17	6558	Cryptomonas erosa Ehrenberg	400	0.45	22.50	12.00	1131.00
PDL - 51S	27-Mar-17	7632	Gymnodinium sp.	3546	1.18	9.90	8.00	331.80

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
PDL - 51S	27-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.19	15.40	15.40	1912.30
PDL - 52S	27-Mar-17	1054	Planktolyngbya limnetica	10100	1.33	116.00	1.20	131.20
PDL - 52S	27-Mar-17	2105	Chlamydomonas spp.	3546	0.08	5.00	3.00	23.60
PDL - 52S	27-Mar-17	2137	Dictyosphaerium simplex Sukja	42553	0.18	2.00	2.00	4.20
PDL - 52S	27-Mar-17	2167	Elakatothrix gelatinosa Willen	10638	0.28	14.00	2.20	26.60
PDL - 52S	27-Mar-17	2187	Staurodesmus extensus (Andersson) Teiling	2000	1.10	15.00	14.00	549.80
PDL - 52S	27-Mar-17	2199	Spondylosium planum (Wolle) W. and G.S. West	3546	0.13	6.00	6.00	37.70
PDL - 52S	27-Mar-17	2206	Botryococcus braunii Kutzing	1700	1.54	12.00	12.00	904.80
PDL - 52S	27-Mar-17	4351	Small chrysophyceae	163121	1.17	2.40	2.40	7.20
PDL - 52S	27-Mar-17	4352	Large chrysophyceae	31915	5.73	7.00	7.00	179.60
PDL - 52S	27-Mar-17	4357	Chrysococcus sp.	88653	5.80	5.00	5.00	65.40
PDL - 52S	27-Mar-17	4362	Kephyrion sp.	14184	0.44	3.90	3.90	31.10
PDL - 52S	27-Mar-17	4383	Dinobryon bavaricum Imhof	21277	4.81	12.00	6.00	226.20
PDL - 52S	27-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.10	5.10	3.20	27.30
PDL - 52S	27-Mar-17	4414	Stichogloea spp.	3546	0.18	6.00	4.00	50.30
PDL - 52S	27-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.28	5.60	3.00	26.40
PDL - 52S	27-Mar-17	5511	Rhizosolenia eriense H.L. Smith	28369	4.28	12.00	4.00	150.80
PDL - 52S	27-Mar-17	5518	Synedra acus Kutzing	1100	0.12	100.00	2.00	104.70
PDL - 52S	27-Mar-17	5551	Cyclotella michiganiana Skvortzow	17731	0.34	2.30	4.60	19.10
PDL - 52S	27-Mar-17	6554	Rhodomonas minuta Skuja	63830	8.34	10.40	6.00	130.70
PDL - 52S	27-Mar-17	6558	Cryptomonas erosa Ehrenberg	1200	1.36	22.50	12.00	1131.00
PDL - 52S	27-Mar-17	7635	Peridinium willei Huitfeldt-Kaas	100	2.24	35.00	35.00	22449.30
PDL - 52S	27-Mar-17	7641	Peridinium aciculiferum Lemmermann	100	0.90	30.00	24.00	9047.80
PDL - 53S	10-May-17	1054	Planktolyngbya limnetica	5000	0.77	136.00	1.20	153.80
PDL - 53S	10-May-17	2105	Chlamydomonas spp.	3546	0.09	5.10	3.00	24.00
PDL - 53S	10-May-17	2137	Dictyosphaerium simplex Sukja	42553	0.18	2.00	2.00	4.20
PDL - 53S	10-May-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	3546	0.17	7.70	4.00	48.40
PDL - 53S	10-May-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.22	15.00	14.00	549.80
PDL - 53S	10-May-17	4351	Small chrysophyceae	70922	1.00	3.00	3.00	14.10
PDL - 53S	10-May-17	4352	Large chrysophyceae	14184	2.55	7.00	7.00	179.60
PDL - 53S	10-May-17	4357	Chrysococcus sp.	145390	8.96	4.90	4.90	61.60
PDL - 53S	10-May-17	4362	Kephyrion sp.	3546	0.10	3.80	3.80	28.70
PDL - 53S	10-May-17	4383	Dinobryon bavaricum Imhof	21277	4.81	12.00	6.00	226.20
PDL - 53S	10-May-17	4396	Chrysolkos skuja (Nauwerck) Willen	17731	0.53	5.60	3.20	30.00
PDL - 53S	10-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.11	6.00	3.10	30.20
PDL - 53S	10-May-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.12	9.15	18.30	1203.30
PDL - 53S	10-May-17	5509	Cyclotella ocellata Pant.	3546	0.31	3.80	7.60	86.20
PDL - 53S	10-May-17	5511	Rhizosolenia eriense H.L. Smith	42553	4.37	12.00	3.30	102.60
PDL - 53S	10-May-17	5518	Synedra acus Kutzing	1800	0.19	100.00	2.00	104.70
PDL - 53S	10-May-17	5551	Cyclotella michiganiana Skvortzow	14184	0.33	2.45	4.90	23.10
PDL - 53S	10-May-17	6554	Rhodomonas minuta Skuja	67376	8.47	10.00	6.00	125.70
PDL - 53S	10-May-17	6568	Katablepharis ovalis Skuja	3546	0.15	7.70	4.00	41.40
PDL - 53S	10-May-17	7632	Gymnodinium sp.	3546	1.65	11.00	9.00	466.50
PDL - 53S	10-May-17	7632	Gymnodinium sp.	500	9.41	33.00	33.00	18816.60
PDL - 53S	10-May-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
PDL - 53SR	10-May-17	1054	Planktolyngbya limnetica	6300	0.97	136.00	1.20	153.80
PDL - 53SR	10-May-17	2105	Chlamydomonas spp.	3546	0.09	5.10	3.00	24.00
PDL - 53SR	10-May-17	2121	Oocystis lacustris Chodat	10638	0.28	5.60	3.00	26.40
PDL - 53SR	10-May-17	2137	Dictyosphaerium simplex Sukja	28369	0.12	2.00	2.00	4.20
PDL - 53SR	10-May-17	2167	Elakatothrix gelatinosa Willen	7092	0.16	14.00	2.00	22.00
PDL - 53SR	10-May-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.11	15.00	14.00	549.80
PDL - 53SR	10-May-17	2206	Botryococcus braunii Kutzing	200	0.18	12.00	12.00	904.80
PDL - 53SR	10-May-17	4351	Small chrysophyceae	49645	0.70	3.00	3.00	14.10
PDL - 53SR	10-May-17	4352	Large chrysophyceae	21277	3.82	7.00	7.00	179.60
PDL - 53SR	10-May-17	4357	Chrysococcus sp.	141844	8.74	4.90	4.90	61.60
PDL - 53SR	10-May-17	4362	Kephyrion sp.	3546	0.10	3.80	3.80	28.70
PDL - 53SR	10-May-17	4383	Dinobryon bavaricum Imhof	28369	6.42	12.00	6.00	226.20
PDL - 53SR	10-May-17	4396	Chrysolkos skuja (Nauwerck) Willen	10638	0.32	5.60	3.20	30.00
PDL - 53SR	10-May-17	4400	Ochromonas sp.	3546	0.27	9.10	4.00	76.20
PDL - 53SR	10-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.11	6.00	3.10	30.20
PDL - 53SR	10-May-17	5511	Rhizosolenia eriense H.L. Smith	49645	5.09	12.00	3.30	102.60
PDL - 53SR	10-May-17	5518	Synedra acus Kutzing	1100	0.12	100.00	2.00	104.70
PDL - 53SR	10-May-17	5551	Cyclotella michiganiana Skvortzow	7092	0.16	2.45	4.90	23.10
PDL - 53SR	10-May-17	6554	Rhodomonas minuta Skuja	85106	10.70	10.00	6.00	125.70
PDL - 53SR	10-May-17	6558	Cryptomonas erosa Ehrenberg	100	0.12	23.40	12.00	1176.20
PDL - 53SR	10-May-17	6568	Katablepharis ovalis Skuja	7092	0.29	7.70	4.00	41.40
PDL - 53SR	10-May-17	7632	Gymnodinium sp.	500	9.41	33.00	33.00	18816.60
PDL - 53SR	10-May-17	7641	Peridinium aciculiferum Lemmermann	100	0.90	30.00	24.00	9047.80
PDL - 54S	10-May-17	1054	Planktolyngbya limnetica	5100	0.81	141.00	1.20	159.50
PDL - 54S	10-May-17	2137	Dictyosphaerium simplex Sukja	42553	0.18	2.00	2.00	4.20
PDL - 54S	10-May-17	2167	Elakatothrix gelatinosa Willen	3546	0.08	14.00	2.00	22.00
PDL - 54S	10-May-17	2187	Staurodesmus extensus (Andersson) Teiling	700	0.38	15.00	14.00	549.80
PDL - 54S	10-May-17	2199	Spondylosium planum (Wolle) W. and G.S. West	3546	0.13	6.00	6.00	37.70
PDL - 54S	10-May-17	2206	Botryococcus braunii Kutzing	100	0.09	12.00	12.00	904.80
PDL - 54S	10-May-17	2215	Tetraedron caudatum (Corda) Hansgrig	3546	0.02	3.00	3.00	4.70
PDL - 54S	10-May-17	4351	Small chrysophyceae	198582	2.80	3.00	3.00	14.10
PDL - 54S	10-May-17	4352	Large chrysophyceae	21277	3.82	7.00	7.00	179.60
PDL - 54S	10-May-17	4357	Chrysococcus sp.	237589	14.64	4.90	4.90	61.60
PDL - 54S	10-May-17	4361	Kephyrion boreale Skuja	3546	0.33	5.60	5.60	92.00
PDL - 54S	10-May-17	4362	Kephyrion sp.	3546	0.10	3.80	3.80	28.70
PDL - 54S	10-May-17	4363	Spiniferomonas sirrata***************	3546	0.33	5.60	5.60	92.00
PDL - 54S	10-May-17	4383	Dinobryon bavaricum Imhof	28369	6.42	12.00	6.00	226.20
PDL - 54S	10-May-17	4396	Chrysolkos skuja (Nauwerck) Willen	28369	0.85	5.60	3.20	30.00
PDL - 54S	10-May-17	4400	Ochromonas sp.	3546	0.23	7.90	4.00	66.20
PDL - 54S	10-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.32	6.00	3.10	30.20
PDL - 54S	10-May-17	5511	Rhizosolenia eriense H.L. Smith	95745	9.82	12.00	3.30	102.60
PDL - 54S	10-May-17	5518	Synedra acus Kutzing	1200	0.14	110.00	2.00	115.20
PDL - 54S	10-May-17	5551	Cyclotella michiganiana Skvortzow	10638	0.25	2.45	4.90	23.10

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
PDL - 54S	10-May-17	6554	Rhodomonas minuta Skuja	63830	8.02	10.00	6.00	125.70
PDL - 54S	10-May-17	6558	Cryptomonas erosa Ehrenberg	400	0.46	23.10	12.00	1161.10
PDL - 54S	10-May-17	7632	Gymnodinium sp.	3546	1.31	11.00	8.00	368.60
PDL - 55S	8-Jul-17	1054	Planktolyngbya limnetica	2000	0.33	146.00	1.20	165.10
PDL - 55S	8-Jul-17	2121	Oocystis lacustris Chodat	43104	1.03	5.10	3.00	24.00
PDL - 55S	8-Jul-17	2167	Elakatothrix gelatinosa Willen	14368	0.27	12.00	2.00	18.80
PDL - 55S	8-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	1200	0.51	14.20	12.00	422.30
PDL - 55S	8-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
PDL - 55S	8-Jul-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
PDL - 55S	8-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
PDL - 55S	8-Jul-17	4351	Small chrysophyceae	459776	5.89	2.90	2.90	12.80
PDL - 55S	8-Jul-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
PDL - 55S	8-Jul-17	4355	Chrysochromulina parva Lackey	7184	0.47	5.00	5.00	65.40
PDL - 55S	8-Jul-17	4357	Chrysococcus sp.	402304	20.52	4.60	4.60	51.00
PDL - 55S	8-Jul-17	4361	Kephyrion boreale Skuja	7184	0.90	6.20	6.20	124.80
PDL - 55S	8-Jul-17	4362	Kephyrion sp.	79024	1.36	3.20	3.20	17.20
PDL - 55S	8-Jul-17	4378	Dinobryon borgei Lemmermann	21552	0.98	9.00	3.10	45.30
PDL - 55S	8-Jul-17	4388	Dinobryon sertularia Ehrenberg	337648	76.38	12.00	6.00	226.20
PDL - 55S	8-Jul-17	4388	Dinobryon sertularia Ehrenberg	1600	3.19	0.00	0.00	1991.00
PDL - 55S	8-Jul-17	4390	Dinobryon sociale Ehrenberg	86208	19.50	12.00	6.00	226.20
PDL - 55S	8-Jul-17	4390	Dinobryon sociale Ehrenberg	4400	5.50	0.00	0.00	1250.00
PDL - 55S	8-Jul-17	4394	Epiphyxis sp.	21552	1.37	7.60	4.00	63.70
PDL - 55S	8-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	100576	2.41	5.10	3.00	24.00
PDL - 55S	8-Jul-17	4401	Uroglena volvox Ehrenberg	553168	62.56	6.00	6.00	113.10
PDL - 55S	8-Jul-17	4413	Chrysochromulina laurentiana Kling	71840	33.28	9.60	9.60	463.20
PDL - 55S	8-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
PDL - 55S	8-Jul-17	5509	Cyclotella ocellata Pant.	35920	3.89	4.10	8.20	108.30
PDL - 55S	8-Jul-17	5511	Rhizosolenia eriense H.L. Smith	122128	7.77	9.00	3.00	63.60
PDL - 55S	8-Jul-17	5518	Synedra acus Kutzing	8400	0.77	88.00	2.00	92.20
PDL - 55S	8-Jul-17	5551	Cyclotella michiganiana Skvortzow	50288	1.31	2.55	5.10	26.00
PDL - 55S	8-Jul-17	6554	Rhodomonas minuta Skuja	28736	3.76	10.40	6.00	130.70
PDL - 55S	8-Jul-17	6558	Cryptomonas erosa Ehrenberg	3200	4.05	25.20	12.00	1266.70
PDL - 55S	8-Jul-17	6568	Katablepharis ovalis Skuja	43104	2.49	9.10	4.00	57.80
PDL - 55S	8-Jul-17	7631	Gymnodinium helveticum Penard	200	4.81	51.00	30.00	24033.20
PDL - 55S	8-Jul-17	7632	Gymnodinium sp.	3000	17.65	22.40	22.40	5884.90
PDL - 55S	8-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	1800	3.86	16.00	16.00	2144.70
PDL - 55S	8-Jul-17	7641	Peridinium aciculiferum Lemmermann	3000	27.14	30.00	24.00	9047.80
PDL - 56S	8-Jul-17	1054	Planktolyngbya limnetica	1600	0.33	180.00	1.20	203.60
PDL - 56S	8-Jul-17	2105	Chlamydomonas spp.	14368	0.72	6.00	4.00	50.30
PDL - 56S	8-Jul-17	2121	Oocystis lacustris Chodat	21552	0.52	5.10	3.00	24.00
PDL - 56S	8-Jul-17	2167	Elakatothrix gelatinosa Willen	7184	0.14	12.00	2.00	18.80
PDL - 56S	8-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.22	13.30	12.00	370.50
PDL - 56S	8-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81	6.00	6.00	37.70
PDL - 56S	8-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
PDL - 56S	8-Jul-17	4351	Small chrysophyceae	402304	5.15	2.90	2.90	12.80
PDL - 56S	8-Jul-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
PDL - 56S	8-Jul-17	4355	Chrysochromulina parva Lackey	7184	0.47	5.00	5.00	65.40
PDL - 56S	8-Jul-17	4357	Chrysococcus sp.	495696	25.28	4.60	4.60	51.00
PDL - 56S	8-Jul-17	4362	Kephyrion sp.	150864	2.59	3.20	3.20	17.20
PDL - 56S	8-Jul-17	4378	Dinobryon borgei Lemmermann	21552	0.98	9.00	3.10	45.30
PDL - 56S	8-Jul-17	4383	Dinobryon bavaricum Imhof	1800	3.58	0.00	0.00	1991.00
PDL - 56S	8-Jul-17	4388	Dinobryon sertularia Ehrenberg	21552	4.88	12.00	6.00	226.20
PDL - 56S	8-Jul-17	4390	Dinobryon sociale Ehrenberg	35920	8.13	12.00	6.00	226.20
PDL - 56S	8-Jul-17	4390	Dinobryon sociale Ehrenberg	2800	3.50	0.00	0.00	1250.00
PDL - 56S	8-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	50288	1.23	5.20	3.00	24.50
PDL - 56S	8-Jul-17	4401	Uroglena volvox Ehrenberg	517248	58.50	6.00	6.00	113.10
PDL - 56S	8-Jul-17	4413	Chrysochromulina laurentiana Kling	100576	46.59	9.60	9.60	463.20
PDL - 56S	8-Jul-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.39	5.10	3.20	27.30
PDL - 56S	8-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.63	10.00	20.00	1570.80
PDL - 56S	8-Jul-17	5509	Cyclotella ocellata Pant.	35920	3.89	4.10	8.20	108.30
PDL - 56S	8-Jul-17	5511	Rhizosolenia eriense H.L. Smith	172416	10.97	9.00	3.00	63.60
PDL - 56S	8-Jul-17	5514	Tabellaria flocculsa (Roth) Kutzing	800	1.03	25.00	14.00	1282.80
PDL - 56S	8-Jul-17	5518	Synedra acus Kutzing	5200	0.47	86.00	2.00	90.10
PDL - 56S	8-Jul-17	5551	Cyclotella michiganiana Skvortzow	86208	2.24	2.55	5.10	26.00
PDL - 56S	8-Jul-17	6554	Rhodomonas minuta Skuja	57472	7.51	10.40	6.00	130.70
PDL - 56S	8-Jul-17	6558	Cryptomonas erosa Ehrenberg	2000	2.53	25.20	12.00	1266.70
PDL - 56S	8-Jul-17	6568	Katablepharis ovalis Skuja	14368	0.83	9.10	4.00	57.80
PDL - 56S	8-Jul-17	7632	Gymnodinium sp.	1800	12.08	23.40	23.40	6708.80
PDL - 56S	8-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	2600	5.58	16.00	16.00	2144.70
PDL - 56S	8-Jul-17	7641	Peridinium aciculiferum Lemmermann	3000	27.14	30.00	24.00	9047.80
PDL - 57S	24-Aug-17	1054	Planktolyngbya limnetica	9800	2.22	200.00	1.20	226.20
PDL - 57S	24-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	400	0.20	13.40	12.00	505.20
PDL - 57S	24-Aug-17	2105	Chlamydomonas spp.	7184	0.20	6.00	3.00	28.30
PDL - 57S	24-Aug-17	2112	Sphaerocystis schroeteri Chodat	7184	0.07	2.60	2.60	9.20
PDL - 57S	24-Aug-17	2121	Oocystis lacustris Chodat	35920	0.85	5.00	3.00	23.60
PDL - 57S	24-Aug-17	2137	Dictyosphaerium simplex Sukja	229888	0.97	2.00	2.00	4.20
PDL - 57S	24-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.81	9.00	4.00	56.50
PDL - 57S	24-Aug-17	2167	Elakatothrix gelatinosa Willen	93392	1.32	9.00	2.00	14.10
PDL - 57S	24-Aug-17	2169	Planctonema lauterbornii Schmidle	7184	1.63	18.00	4.00	226.20
PDL - 57S	24-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.15	13.60	12.00	387.40
PDL - 57S	24-Aug-17	2199	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81	6.00	6.00	37.70
PDL - 57S	24-Aug-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
PDL - 57S	24-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	35920	0.17	3.00	3.00	4.70
PDL - 57S	24-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	35920	2.36	38.00	2.10	65.80
PDL - 57S	24-Aug-17	4351	Small chrysophyceae	57472	0.53	2.60	2.60	9.20
PDL - 57S	24-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
PDL - 57S	24-Aug-17	4357	Chrysococcus sp.	272992	16.82	4.90	4.90	61.60
PDL - 57S	24-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.39	8.60	8.60	333.00

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume μm^3
PDL - 57S	24-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
PDL - 57S	24-Aug-17	4362	Kephyrion sp.	21552	0.34	3.10	3.10	15.60
PDL - 57S	24-Aug-17	4383	Dinobryon bavaricum Imhof	57472	13.00	12.00	6.00	226.20
PDL - 57S	24-Aug-17	4383	Dinobryon bavaricum Imhof	400	0.50	0.00	0.00	1250.00
PDL - 57S	24-Aug-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
PDL - 57S	24-Aug-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20
PDL - 57S	24-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.20	5.50	3.10	27.70
PDL - 57S	24-Aug-17	4411	Bitrichia chodatii (Reverdin) Chodat	7184	0.36	6.00	4.00	50.30
PDL - 57S	24-Aug-17	4413	Chrysochromulina laurentiana Kling	7184	2.93	9.20	9.20	407.70
PDL - 57S	24-Aug-17	4414	Stichogloea spp.	50288	2.53	6.00	4.00	50.30
PDL - 57S	24-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23	6.00	3.20	32.20
PDL - 57S	24-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	1000	2.09	11.00	22.00	2090.70
PDL - 57S	24-Aug-17	5509	Cyclotella ocellata Pant.	57472	7.95	4.45	8.90	138.40
PDL - 57S	24-Aug-17	5511	Rhizosolenia eriense H.L. Smith	35920	3.05	12.00	3.00	84.80
PDL - 57S	24-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	1000	1.33	26.00	14.00	1334.10
PDL - 57S	24-Aug-17	5518	Synedra acus Kutzing	1400	0.13	91.00	2.00	95.30
PDL - 57S	24-Aug-17	5551	Cyclotella michiganiana Skvortzow	57472	1.41	2.50	5.00	24.50
PDL - 57S	24-Aug-17	5720	Cyclotella bodanica Eulenst.	200	1.17	15.50	31.00	5849.40
PDL - 57S	24-Aug-17	6554	Rhodomonas minuta Skuja	7184	0.60	9.60	5.00	83.80
PDL - 57S	24-Aug-17	7632	Gymnodinium sp.	400	2.05	21.40	21.40	5131.40
PDL - 57S	24-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.45	16.30	16.30	2267.60
PDL - 57SR	24-Aug-17	1054	Planktolyngbya limnetica	7200	1.63	200.00	1.20	226.20
PDL - 57SR	24-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	200	0.10	13.40	12.00	505.20
PDL - 57SR	24-Aug-17	2105	Chlamydomonas spp.	14368	0.41	6.00	3.00	28.30
PDL - 57SR	24-Aug-17	2112	Sphaerocystis schroeteri Chodat	28736	0.26	2.60	2.60	9.20
PDL - 57SR	24-Aug-17	2121	Oocystis lacustris Chodat	21552	0.51	5.00	3.00	23.60
PDL - 57SR	24-Aug-17	2137	Dictyosphaerium simplex Sukja	186784	0.78	2.00	2.00	4.20
PDL - 57SR	24-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41	9.00	4.00	56.50
PDL - 57SR	24-Aug-17	2167	Elakatothrix gelatinosa Willen	93392	1.32	9.00	2.00	14.10
PDL - 57SR	24-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.15	13.60	12.00	387.40
PDL - 57SR	24-Aug-17	2199	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81	6.00	6.00	37.70
PDL - 57SR	24-Aug-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
PDL - 57SR	24-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
PDL - 57SR	24-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.95	38.00	2.10	65.80
PDL - 57SR	24-Aug-17	4351	Small chrysophyceae	28736	0.26	2.60	2.60	9.20
PDL - 57SR	24-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
PDL - 57SR	24-Aug-17	4357	Chrysococcus sp.	402304	24.78	4.90	4.90	61.60
PDL - 57SR	24-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.39	8.60	8.60	333.00
PDL - 57SR	24-Aug-17	4361	Kephyrion boreale Skuja	14368	1.71	6.10	6.10	118.80
PDL - 57SR	24-Aug-17	4362	Kephyrion sp.	28736	0.45	3.10	3.10	15.60
PDL - 57SR	24-Aug-17	4383	Dinobryon bavaricum Imhof	7184	1.63	12.00	6.00	226.20
PDL - 57SR	24-Aug-17	4383	Dinobryon bavaricum Imhof	800	1.00	0.00	0.00	1250.00
PDL - 57SR	24-Aug-17	4388	Dinobryon sertularia Ehrenberg	21552	4.88	12.00	6.00	226.20
PDL - 57SR	24-Aug-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20
PDL - 57SR	24-Aug-17	4411	Bitrichia chodatii (Reverdin) Chodat	7184	0.36	6.00	4.00	50.30
PDL - 57SR	24-Aug-17	4413	Chrysochromulina laurentiana Kling	14368	5.86	9.20	9.20	407.70
PDL - 57SR	24-Aug-17	4414	Stichogloea spp.	93392	4.70	6.00	4.00	50.30
PDL - 57SR	24-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23	6.00	3.20	32.20
PDL - 57SR	24-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.67	11.00	22.00	2090.70
PDL - 57SR	24-Aug-17	5509	Cyclotella ocellata Pant.	28736	3.98	4.45	8.90	138.40
PDL - 57SR	24-Aug-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.83	12.00	3.00	84.80
PDL - 57SR	24-Aug-17	5518	Synedra acus Kutzing	2200	0.21	91.00	2.00	95.30
PDL - 57SR	24-Aug-17	5551	Cyclotella michiganiana Skvortzow	71840	1.76	2.50	5.00	24.50
PDL - 57SR	24-Aug-17	5720	Cyclotella bodanica Eulenst.	600	3.51	15.50	31.00	5849.40
PDL - 57SR	24-Aug-17	6554	Rhodomonas minuta Skuja	14368	1.20	9.60	5.00	83.80
PDL - 57SR	24-Aug-17	6558	Cryptomonas erosa Ehrenberg	200	0.23	22.40	12.00	1125.90
PDL - 57SR	24-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.25	7.00	4.00	34.20
PDL - 57SR	24-Aug-17	7632	Gymnodinium sp.	200	1.03	21.40	21.40	5131.40
PDL - 57SR	24-Aug-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
PDL - 57SR	24-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.45	16.30	16.30	2267.60
PDL - 58S	24-Aug-17	1054	Planktolyngbya limnetica	13600	3.08	200.00	1.20	226.20
PDL - 58S	24-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	800	0.40	13.40	12.00	505.20
PDL - 58S	24-Aug-17	2105	Chlamydomonas spp.	7184	0.20	6.00	3.00	28.30
PDL - 58S	24-Aug-17	2112	Sphaerocystis schroeteri Chodat	57472	0.53	2.60	2.60	9.20
PDL - 58S	24-Aug-17	2121	Oocystis lacustris Chodat	14368	0.34	5.00	3.00	23.60
PDL - 58S	24-Aug-17	2137	Dictyosphaerium simplex Sukja	445408	1.87	2.00	2.00	4.20
PDL - 58S	24-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41	9.00	4.00	56.50
PDL - 58S	24-Aug-17	2167	Elakatothrix gelatinosa Willen	107760	1.52	9.00	2.00	14.10
PDL - 58S	24-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.23	13.60	12.00	387.40
PDL - 58S	24-Aug-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
PDL - 58S	24-Aug-17	2206	Botryococcus braunii Kutzing	1200	0.63	10.00	10.00	523.60
PDL - 58S	24-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
PDL - 58S	24-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.95	38.00	2.10	65.80
PDL - 58S	24-Aug-17	4351	Small chrysophyceae	35920	0.33	2.60	2.60	9.20
PDL - 58S	24-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
PDL - 58S	24-Aug-17	4357	Chrysococcus sp.	201152	12.39	4.90	4.90	61.60
PDL - 58S	24-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.39	8.60	8.60	333.00
PDL - 58S	24-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
PDL - 58S	24-Aug-17	4362	Kephyrion sp.	21552	0.34	3.10	3.10	15.60
PDL - 58S	24-Aug-17	4378	Dinobryon borgei Lemmermann	21552	1.04	9.00	3.20	48.30
PDL - 58S	24-Aug-17	4381	Dinobryon mucronutom Nygaard	7184	0.90	9.60	5.00	125.70
PDL - 58S	24-Aug-17	4383	Dinobryon bavaricum Imhof	64656	14.63	12.00	6.00	226.20
PDL - 58S	24-Aug-17	4383	Dinobryon bavaricum Imhof	1000	1.25	0.00	0.00	1250.00
PDL - 58S	24-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
PDL - 58S	24-Aug-17	4390	Dinobryon sociale Ehrenberg	64656	14.63	12.00	6.00	226.20
PDL - 58S	24-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	50288	1.39	5.50	3.10	27.70
PDL - 58S	24-Aug-17	4413	Chrysochromulina laurentiana Kling	14368	5.86	9.20	9.20	407.70
PDL - 58S	24-Aug-17	4414	Stichogloea spp.	28736	1.45	6.00	4.00	50.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
PDL - 58S	24-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.84	11.00	22.00	2090.70
PDL - 58S	24-Aug-17	5509	Cyclotella ocellata Pant.	21552	2.98	4.45	8.90	138.40
PDL - 58S	24-Aug-17	5511	Rhizosolenia eriense H.L. Smith	43104	2.74	9.00	3.00	63.60
PDL - 58S	24-Aug-17	5518	Synedra acus Kutzing	1800	0.17	91.00	2.00	95.30
PDL - 58S	24-Aug-17	5551	Cyclotella michiganiana Skvortzow	50288	1.23	2.50	5.00	24.50
PDL - 58S	24-Aug-17	5720	Cyclotella bodanica Eulenst.	400	2.34	15.50	31.00	5849.40
PDL - 58S	24-Aug-17	6554	Rhodomonas minuta Skuja	7184	0.60	9.60	5.00	83.80
PDL - 58S	24-Aug-17	6558	Cryptomonas erosa Ehrenberg	600	0.71	23.60	12.00	1186.30
PDL - 58S	24-Aug-17	7632	Gymnodinium sp.	800	4.11	21.40	21.40	5131.40
PDL - 58S	24-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	400	0.91	16.30	16.30	2267.60
PDL - 59S	1-Oct-17	1012	Aphanothece sp.	7184	0.36	0.00	0.00	50.00
PDL - 59S	1-Oct-17	1054	Planktolyngbya limnetica	20800	3.43	146.00	1.20	165.10
PDL - 59S	1-Oct-17	2137	Dictyosphaerium simplex Sukja	43104	0.18	2.00	2.00	4.20
PDL - 59S	1-Oct-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	7184	0.50	41.00	1.80	69.60
PDL - 59S	1-Oct-17	2145	Crucigenia quadrata Morr.	28736	0.04	2.00	2.00	1.40
PDL - 59S	1-Oct-17	2167	Elakatothrix gelatinosa Willen	21552	0.41	12.00	2.00	18.80
PDL - 59S	1-Oct-17	2187	Staurodesmus extensus (Andersson) Teiling	2000	0.82	14.00	12.00	410.50
PDL - 59S	1-Oct-17	2199	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08	6.00	6.00	37.70
PDL - 59S	1-Oct-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
PDL - 59S	1-Oct-17	2260	Monomastix minuta Skuja	21552	0.43	6.00	3.10	20.10
PDL - 59S	1-Oct-17	4351	Small chrysophyceae	28736	0.41	3.00	3.00	14.10
PDL - 59S	1-Oct-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
PDL - 59S	1-Oct-17	4357	Chrysococcus sp.	294544	15.02	4.60	4.60	51.00
PDL - 59S	1-Oct-17	4358	Chrysostephanospaera globulifera Scherffel	21552	8.50	9.10	9.10	394.60
PDL - 59S	1-Oct-17	4362	Kephyrion sp.	79024	1.11	3.00	3.00	14.10
PDL - 59S	1-Oct-17	4378	Dinobryon borgei Lemmermann	14368	0.62	9.10	3.00	42.90
PDL - 59S	1-Oct-17	4381	Dinobryon mucronutom Nygaard	7184	0.94	10.00	5.00	130.90
PDL - 59S	1-Oct-17	4383	Dinobryon bavaricum Imhof	79024	17.88	12.00	6.00	226.20
PDL - 59S	1-Oct-17	4383	Dinobryon bavaricum Imhof	5800	11.55	0.00	0.00	1991.00
PDL - 59S	1-Oct-17	4388	Dinobryon sertularia Ehrenberg	800	1.88	0.00	0.00	2350.00
PDL - 59S	1-Oct-17	4394	Epiphyxis sp.	21552	1.63	9.00	4.00	75.40
PDL - 59S	1-Oct-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.19	5.50	3.00	25.90
PDL - 59S	1-Oct-17	4411	Bitrichia chodatii (Reverdin) Chodat	7184	0.36	6.00	4.00	50.30
PDL - 59S	1-Oct-17	4413	Chrysochromulina laurentiana Kling	35920	14.17	9.10	9.10	394.60
PDL - 59S	1-Oct-17	4414	Stichogloea spp.	186784	9.40	6.00	4.00	50.30
PDL - 59S	1-Oct-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.60	3.00	26.40
PDL - 59S	1-Oct-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
PDL - 59S	1-Oct-17	5509	Cyclotella ocellata Pant.	7184	0.72	4.00	8.00	100.50
PDL - 59S	1-Oct-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.68	11.00	3.00	77.80
PDL - 59S	1-Oct-17	5514	Tabellaria flocculsa (Roth) Kutzing	1200	1.64	26.60	14.00	1364.90
PDL - 59S	1-Oct-17	5518	Synedra acus Kutzing	1800	0.23	120.00	2.00	125.70
PDL - 59S	1-Oct-17	5551	Cyclotella michiganiana Skvortzow	79024	1.32	2.20	4.40	16.70
PDL - 59S	1-Oct-17	5720	Cyclotella bodanica Eulenst.	200	1.24	15.80	31.60	6195.70
PDL - 59S	1-Oct-17	6554	Rhodomonas minuta Skuja	7184	0.99	11.00	6.00	138.20
PDL - 59S	1-Oct-17	7632	Gymnodinium sp.	1000	5.58	22.00	22.00	5575.30
PDL - 59S	1-Oct-17	7641	Peridinium aciculiferum Lemmermann	200	1.87	31.00	24.00	9349.40
PDL - 60S	1-Oct-17	1012	Aphanothece sp.	7184	0.36	0.00	0.00	50.00
PDL - 60S	1-Oct-17	1033	Rhabdogloea lineare Schmidle and Lauterborn	7184	0.17	11.00	2.00	23.00
PDL - 60S	1-Oct-17	1054	Planktolyngbya limnetica	23400	3.86	146.00	1.20	165.10
PDL - 60S	1-Oct-17	2105	Chlamydomonas spp.	7184	0.16	4.60	3.00	21.70
PDL - 60S	1-Oct-17	2137	Dictyosphaerium simplex Sukja	71840	0.30	2.00	2.00	4.20
PDL - 60S	1-Oct-17	2145	Crucigenia quadrata Morr.	28736	0.04	2.00	2.00	1.40
PDL - 60S	1-Oct-17	2167	Elakatothrix gelatinosa Willen	28736	0.54	12.00	2.00	18.80
PDL - 60S	1-Oct-17	2187	Staurodesmus extensus (Andersson) Teiling	1600	0.66	14.00	12.00	410.50
PDL - 60S	1-Oct-17	2199	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35	6.00	6.00	37.70
PDL - 60S	1-Oct-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
PDL - 60S	1-Oct-17	2260	Monomastix minuta Skuja	35920	0.72	6.00	3.10	20.10
PDL - 60S	1-Oct-17	4351	Small chrysophyceae	79024	1.11	3.00	3.00	14.10
PDL - 60S	1-Oct-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
PDL - 60S	1-Oct-17	4357	Chrysococcus sp.	330464	16.85	4.60	4.60	51.00
PDL - 60S	1-Oct-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.83	9.10	9.10	394.60
PDL - 60S	1-Oct-17	4362	Kephyrion sp.	57472	0.81	3.00	3.00	14.10
PDL - 60S	1-Oct-17	4378	Dinobryon borgei Lemmermann	21552	0.92	9.10	3.00	42.90
PDL - 60S	1-Oct-17	4381	Dinobryon mucronutom Nygaard	7184	0.94	10.00	5.00	130.90
PDL - 60S	1-Oct-17	4383	Dinobryon bavaricum Imhof	71840	16.25	12.00	6.00	226.20
PDL - 60S	1-Oct-17	4383	Dinobryon bavaricum Imhof	6200	12.34	0.00	0.00	1991.00
PDL - 60S	1-Oct-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
PDL - 60S	1-Oct-17	4388	Dinobryon sertularia Ehrenberg	200	0.47	0.00	0.00	2350.00
PDL - 60S	1-Oct-17	4394	Epiphyxis sp.	14368	1.08	9.00	4.00	75.40
PDL - 60S	1-Oct-17	4411	Bitrichia chodatii (Reverdin) Chodat	7184	0.36	6.00	4.00	50.30
PDL - 60S	1-Oct-17	4413	Chrysochromulina laurentiana Kling	43104	17.01	9.10	9.10	394.60
PDL - 60S	1-Oct-17	4414	Stichogloea spp.	114944	5.78	6.00	4.00	50.30
PDL - 60S	1-Oct-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.60	3.00	26.40
PDL - 60S	1-Oct-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
PDL - 60S	1-Oct-17	5509	Cyclotella ocellata Pant.	21552	3.08	4.50	9.00	143.10
PDL - 60S	1-Oct-17	5511	Rhizosolenia eriense H.L. Smith	35920	2.79	11.00	3.00	77.80
PDL - 60S	1-Oct-17	5514	Tabellaria flocculsa (Roth) Kutzing	2000	2.73	26.60	14.00	1364.90
PDL - 60S	1-Oct-17	5518	Synedra acus Kutzing	3000	0.38	120.00	2.00	125.70
PDL - 60S	1-Oct-17	5551	Cyclotella michiganiana Skvortzow	43104	0.72	2.20	4.40	16.70
PDL - 60S	1-Oct-17	5720	Cyclotella bodanica Eulenst.	400	2.48	15.80	31.60	6195.70
PDL - 60S	1-Oct-17	6554	Rhodomonas minuta Skuja	7184	0.99	11.00	6.00	138.20
PDL - 60S	1-Oct-17	7632	Gymnodinium sp.	1000	5.58	22.00	22.00	5575.30
PDL - 61S	2-Nov-17	1054	Planktolyngbya limnetica	6400	0.84	116.00	1.20	131.20
PDL - 61S	2-Nov-17	2105	Chlamydomonas spp.	21552	0.51	5.00	3.00	23.60
PDL - 61S	2-Nov-17	2137	Dictyosphaerium simplex Sukja	179600	0.75	2.00	2.00	4.20
PDL - 61S	2-Nov-17	2167	Elakatothrix gelatinosa Willen	14368	0.29	13.00	2.00	20.40
PDL - 61S	2-Nov-17	2215	Tetraedron caudatum (Corda) Hansgrig	7184	0.03	3.00	3.00	4.70
PDL - 61S	2-Nov-17	4351	Small chrysophyceae	387936	5.47	3.00	3.00	14.10

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
PDL - 61S	2-Nov-17	4352	Large chrysophyceae	35920	6.45	7.00	7.00	179.60
PDL - 61S	2-Nov-17	4357	Chrysococcus sp.	459776	28.32	4.90	4.90	61.60
PDL - 61S	2-Nov-17	4362	Kephyrion sp.	35920	0.37	2.70	2.70	10.30
PDL - 61S	2-Nov-17	4363	Spiniferomonas sirrata***************	21552	2.20	5.80	5.80	102.20
PDL - 61S	2-Nov-17	4372	Mallomonas tonsurata Teiling and Krieger	200	0.32	25.00	11.00	1583.90
PDL - 61S	2-Nov-17	4381	Dinobryon mucronutom Nygaard	14368	1.79	9.50	5.00	124.40
PDL - 61S	2-Nov-17	4383	Dinobryon bavaricum Imhof	21552	4.88	12.00	6.00	226.20
PDL - 61S	2-Nov-17	4383	Dinobryon bavaricum Imhof	1400	1.75	0.00	0.00	1250.00
PDL - 61S	2-Nov-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
PDL - 61S	2-Nov-17	4388	Dinobryon sertularia Ehrenberg	200	0.68	0.00	0.00	3390.00
PDL - 61S	2-Nov-17	4390	Dinobryon sociale Ehrenberg	1600	3.19	0.00	0.00	1991.00
PDL - 61S	2-Nov-17	4413	Chrysochromulina laurentiana Kling	57472	22.68	9.10	9.10	394.60
PDL - 61S	2-Nov-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.60	3.00	26.40
PDL - 61S	2-Nov-17	5509	Cyclotella ocellata Pant.	7184	0.75	4.05	8.10	104.30
PDL - 61S	2-Nov-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.37	9.00	3.00	63.60
PDL - 61S	2-Nov-17	5518	Synedra acus Kutzing	800	0.08	91.00	2.00	95.30
PDL - 61S	2-Nov-17	5551	Cyclotella michiganiana Skvortzow	57472	1.41	2.50	5.00	24.50
PDL - 61S	2-Nov-17	6554	Rhodomonas minuta Skuja	35920	4.52	10.00	6.00	125.70
PDL - 61S	2-Nov-17	6558	Cryptomonas erosa Ehrenberg	400	0.48	24.00	12.00	1206.40
PDL - 61S	2-Nov-17	7632	Gymnodinium sp.	7184	2.55	10.60	8.00	355.20
PDL - 62S	2-Nov-17	1054	Planktolyngbya limnetica	17600	2.45	123.00	1.20	139.10
PDL - 62S	2-Nov-17	2121	Oocystis lacustris Chodat	43104	1.12	5.50	3.00	25.90
PDL - 62S	2-Nov-17	2137	Dictyosphaerium simplex Sukja	352016	1.48	2.00	2.00	4.20
PDL - 62S	2-Nov-17	2167	Elakatothrix gelatinosa Willen	7184	0.15	13.00	2.00	20.40
PDL - 62S	2-Nov-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.25	14.00	12.00	410.50
PDL - 62S	2-Nov-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
PDL - 62S	2-Nov-17	4351	Small chrysophyceae	208336	2.94	3.00	3.00	14.10
PDL - 62S	2-Nov-17	4352	Large chrysophyceae	50288	9.03	7.00	7.00	179.60
PDL - 62S	2-Nov-17	4357	Chrysococcus sp.	373568	23.01	4.90	4.90	61.60
PDL - 62S	2-Nov-17	4361	Kephyrion boreale Skuja	7184	0.73	5.80	5.80	102.20
PDL - 62S	2-Nov-17	4362	Kephyrion sp.	21552	0.57	3.70	3.70	26.50
PDL - 62S	2-Nov-17	4363	Spiniferomonas sirrata***************	7184	0.73	5.80	5.80	102.20
PDL - 62S	2-Nov-17	4378	Dinobryon borgei Lemmermann	7184	0.31	9.10	3.00	42.90
PDL - 62S	2-Nov-17	4383	Dinobryon bavaricum Imhof	28736	6.50	12.00	6.00	226.20
PDL - 62S	2-Nov-17	4383	Dinobryon bavaricum Imhof	1800	2.25	0.00	0.00	1250.00
PDL - 62S	2-Nov-17	4390	Dinobryon sociale Ehrenberg	79024	17.88	12.00	6.00	226.20
PDL - 62S	2-Nov-17	4390	Dinobryon sociale Ehrenberg	7400	14.73	0.00	0.00	1991.00
PDL - 62S	2-Nov-17	4413	Chrysochromulina laurentiana Kling	57472	22.68	9.10	9.10	394.60
PDL - 62S	2-Nov-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.38	5.60	3.00	26.40
PDL - 62S	2-Nov-17	5507	Cyclotella stelligera Cleve and Grunow	600	0.94	10.00	20.00	1570.80
PDL - 62S	2-Nov-17	5518	Synedra acus Kutzing	3200	0.30	91.00	2.00	95.30
PDL - 62S	2-Nov-17	5551	Cyclotella michiganiana Skvortzow	107760	2.64	2.50	5.00	24.50
PDL - 62S	2-Nov-17	5551	Cyclotella michiganiana Skvortzow	43104	1.37	9.00	3.00	31.80
PDL - 62S	2-Nov-17	6554	Rhodomonas minuta Skuja	64656	8.13	10.00	6.00	125.70
PDL - 62S	2-Nov-17	6558	Cryptomonas erosa Ehrenberg	200	0.24	24.00	12.00	1206.40
PDL - 62S	2-Nov-17	6568	Katablepharis ovalis Skuja	7184	0.29	7.60	4.00	40.30
PDL - 62S	2-Nov-17	7632	Gymnodinium sp.	200	3.12	31.00	31.00	15598.50
SP - 100S	26-Mar-17	2137	Dictyosphaerium simplex Sukja	14184	0.06	2.00	2.00	4.20
SP - 100S	26-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	7092	0.53	39.00	2.20	74.10
SP - 100S	26-Mar-17	4351	Small chrysophyceae	177305	3.33	3.30	3.30	18.80
SP - 100S	26-Mar-17	4352	Large chrysophyceae	3546	0.49	6.40	6.40	137.30
SP - 100S	26-Mar-17	4357	Chrysococcus sp.	173759	11.36	5.00	5.00	65.40
SP - 100S	26-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.11	5.50	3.30	31.40
SP - 100S	26-Mar-17	4400	Ochromonas sp.	7092	0.59	9.00	4.20	83.10
SP - 100S	26-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.28	5.60	3.00	26.40
SP - 100S	26-Mar-17	5509	Cyclotella ocellata Pant.	3546	0.24	3.50	7.00	67.30
SP - 100S	26-Mar-17	5518	Synedra acus Kutzing	600	0.07	110.00	2.00	115.20
SP - 100S	26-Mar-17	5551	Cyclotella michiganiana Skvortzow	7092	0.16	2.45	4.90	23.10
SP - 100S	26-Mar-17	6554	Rhodomonas minuta Skuja	35461	4.46	10.00	6.00	125.70
SP - 100S	26-Mar-17	6558	Cryptomonas erosa Ehrenberg	2200	2.65	24.00	12.00	1206.40
SP - 100S	26-Mar-17	6565	Cryptomonas rostratiformis Skuja	300	0.64	31.00	14.00	2120.90
SP - 100S	26-Mar-17	6568	Katablepharis ovalis Skuja	3546	0.16	8.00	4.00	44.70
SP - 100S	26-Mar-17	7632	Gymnodinium sp.	400	2.11	21.60	21.60	5276.70
SP - 100S	26-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	300	0.64	16.00	16.00	2144.70
SP - 101S	26-Mar-17	2137	Dictyosphaerium simplex Sukja	14184	0.06	2.00	2.00	4.20
SP - 101S	26-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	10638	0.79	39.00	2.20	74.10
SP - 101S	26-Mar-17	4351	Small chrysophyceae	99291	1.87	3.30	3.30	18.80
SP - 101S	26-Mar-17	4352	Large chrysophyceae	10638	1.46	6.40	6.40	137.30
SP - 101S	26-Mar-17	4357	Chrysococcus sp.	92199	6.03	5.00	5.00	65.40
SP - 101S	26-Mar-17	4363	Spiniferomonas sirrata***************	3546	0.31	5.50	5.50	87.10
SP - 101S	26-Mar-17	4378	Dinobryon borgei Lemmermann	3546	0.16	8.00	3.30	45.60
SP - 101S	26-Mar-17	4400	Ochromonas sp.	3546	0.26	8.90	4.00	74.60
SP - 101S	26-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.09	5.60	3.00	26.40
SP - 101S	26-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.11	9.00	18.00	1145.10
SP - 101S	26-Mar-17	5518	Synedra acus Kutzing	400	0.05	110.00	2.00	115.20
SP - 101S	26-Mar-17	5551	Cyclotella michiganiana Skvortzow	46099	1.06	2.45	4.90	23.10
SP - 101S	26-Mar-17	6554	Rhodomonas minuta Skuja	3546	0.49	11.00	6.00	138.20
SP - 101S	26-Mar-17	6558	Cryptomonas erosa Ehrenberg	1800	2.17	24.00	12.00	1206.40
SP - 101S	26-Mar-17	6565	Cryptomonas rostratiformis Skuja	500	1.06	31.00	14.00	2120.90
SP - 102S	5-May-17	2137	Dictyosphaerium simplex Sukja	42553	0.20	2.10	2.10	4.80
SP - 102S	5-May-17	2235	Ankistrodesmus spiralis Lemmermann	10638	0.79	39.00	2.20	74.10
SP - 102S	5-May-17	4351	Small chrysophyceae	70922	1.00	3.00	3.00	14.10
SP - 102S	5-May-17	4352	Large chrysophyceae	10638	2.44	7.60	7.60	229.80
SP - 102S	5-May-17	4357	Chrysococcus sp.	145390	9.51	5.00	5.00	65.40
SP - 102S	5-May-17	4362	Kephyrion sp.	3546	0.08	3.50	3.50	22.40
SP - 102S	5-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.13	6.00	3.40	36.30
SP - 102S	5-May-17	5507	Cyclotella stelligera Cleve and Grunow	300	0.34	9.00	18.00	1145.10
SP - 102S	5-May-17	5518	Synedra acus Kutzing	100	0.01	110.00	2.00	115.20

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
SP - 102S	5-May-17	5551	Cyclotella michiganiana Skvortzow	21277	0.46	2.40	4.80	21.70
SP - 102S	5-May-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
SP - 102S	5-May-17	6558	Cryptomonas erosa Ehrenberg	800	0.97	24.20	12.00	1216.40
SP - 102S	5-May-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.21	16.00	16.00	2144.70
SP - 102SR	5-May-17	2105	Chlamydomonas spp.	3546	0.08	4.70	3.00	22.10
SP - 102SR	5-May-17	2137	Dictyosphaerium simplex Sukja	35461	0.17	2.10	2.10	4.80
SP - 102SR	5-May-17	2199	Spondylosium planum (Wolle) W. and G.S. West	3546	0.13	6.00	6.00	37.70
SP - 102SR	5-May-17	2235	Ankistrodesmus spiralis Lemmermann	3546	0.26	39.00	2.20	74.10
SP - 102SR	5-May-17	4351	Small chrysophyceae	92199	1.30	3.00	3.00	14.10
SP - 102SR	5-May-17	4352	Large chrysophyceae	3546	0.81	7.60	7.60	229.80
SP - 102SR	5-May-17	4357	Chrysococcus sp.	156028	10.20	5.00	5.00	65.40
SP - 102SR	5-May-17	4362	Kephyrion sp.	7092	0.16	3.50	3.50	22.40
SP - 102SR	5-May-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
SP - 102SR	5-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.13	6.00	3.40	36.30
SP - 102SR	5-May-17	5507	Cyclotella stelligera Cleve and Grunow	300	0.34	9.00	18.00	1145.10
SP - 102SR	5-May-17	5518	Synedra acus Kutzing	300	0.03	110.00	2.00	115.20
SP - 102SR	5-May-17	5551	Cyclotella michiganiana Skvortzow	24823	0.54	2.40	4.80	21.70
SP - 102SR	5-May-17	6558	Cryptomonas erosa Ehrenberg	500	0.61	24.20	12.00	1216.40
SP - 102SR	5-May-17	6565	Cryptomonas rostratiformis Skuja	100	0.21	30.00	14.00	2052.50
SP - 103S	5-May-17	1054	Planktolyngbya limnetica	100	0.02	154.00	1.20	174.20
SP - 103S	5-May-17	2105	Chlamydomonas spp.	3546	0.08	5.00	3.00	23.60
SP - 103S	5-May-17	2137	Dictyosphaerium simplex Sukja	10638	0.05	2.10	2.10	4.80
SP - 103S	5-May-17	2235	Ankistrodesmus spiralis Lemmermann	21277	1.44	39.00	2.10	67.50
SP - 103S	5-May-17	4351	Small chrysophyceae	106383	1.50	3.00	3.00	14.10
SP - 103S	5-May-17	4352	Large chrysophyceae	17731	3.32	7.10	7.10	187.40
SP - 103S	5-May-17	4357	Chrysococcus sp.	117021	7.65	5.00	5.00	65.40
SP - 103S	5-May-17	4362	Kephyrion sp.	3546	0.06	3.10	3.10	15.60
SP - 103S	5-May-17	4388	Dinobryon sertularia Ehrenberg	100	0.20	0.00	0.00	1950.00
SP - 103S	5-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.13	6.00	3.40	36.30
SP - 103S	5-May-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.14	9.70	19.40	1433.60
SP - 103S	5-May-17	5509	Cyclotella ocellata Pant.	3546	0.25	3.55	7.10	70.30
SP - 103S	5-May-17	5518	Synedra acus Kutzing	600	0.07	110.00	2.00	115.20
SP - 103S	5-May-17	5551	Cyclotella michiganiana Skvortzow	28369	0.62	2.40	4.80	21.70
SP - 103S	5-May-17	6554	Rhodomonas minuta Skuja	17731	2.23	10.00	6.00	125.70
SP - 103S	5-May-17	6558	Cryptomonas erosa Ehrenberg	1200	1.45	24.00	12.00	1206.40
SP - 103S	5-May-17	7632	Gymnodinium sp.	700	3.54	21.30	21.30	5059.80
SP - 104S	2-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	35920	2.80	46.00	1.80	78.00
SP - 104S	2-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	14368	0.07	3.00	3.00	4.70
SP - 104S	2-Jul-17	4351	Small chrysophyceae	258624	3.65	3.00	3.00	14.10
SP - 104S	2-Jul-17	4352	Large chrysophyceae	35920	6.45	7.00	7.00	179.60
SP - 104S	2-Jul-17	4357	Chrysococcus sp.	545984	27.85	4.60	4.60	51.00
SP - 104S	2-Jul-17	4358	Chrysostephanospaera globulifera Scherffel	43104	14.35	8.60	8.60	333.00
SP - 104S	2-Jul-17	4362	Kephyrion sp.	100576	1.57	3.10	3.10	15.60
SP - 104S	2-Jul-17	4378	Dinobryon borgei Lemmermann	28736	1.22	9.00	3.00	42.40
SP - 104S	2-Jul-17	4388	Dinobryon sertularia Ehrenberg	79024	17.88	12.00	6.00	226.20
SP - 104S	2-Jul-17	4388	Dinobryon sertularia Ehrenberg	16400	37.06	0.00	0.00	2260.00
SP - 104S	2-Jul-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20
SP - 104S	2-Jul-17	4390	Dinobryon sociale Ehrenberg	600	0.75	0.00	0.00	1250.00
SP - 104S	2-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	28736	0.86	5.60	3.20	30.00
SP - 104S	2-Jul-17	4401	Uroglena volvox Ehrenberg	517248	58.50	6.00	6.00	113.10
SP - 104S	2-Jul-17	4413	Chrysochromulina laurentiana Kling	64656	25.51	9.10	9.10	394.60
SP - 104S	2-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.63	10.00	20.00	1570.80
SP - 104S	2-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.70	3.95	7.90	96.80
SP - 104S	2-Jul-17	5518	Synedra acus Kutzing	8600	0.80	89.00	2.00	93.20
SP - 104S	2-Jul-17	5551	Cyclotella michiganiana Skvortzow	50288	1.16	2.45	4.90	23.10
SP - 104S	2-Jul-17	6554	Rhodomonas minuta Skuja	50288	7.02	11.10	6.00	139.50
SP - 104S	2-Jul-17	6558	Cryptomonas erosa Ehrenberg	2200	2.69	24.30	12.00	1221.50
SP - 104S	2-Jul-17	6562	Cryptomonas reflexa (Marsson) Skuja	400	0.27	19.60	10.00	684.20
SP - 104S	2-Jul-17	6568	Katablepharis ovalis Skuja	7184	0.35	8.30	4.00	48.10
SP - 104S	2-Jul-17	7631	Gymnodinium helveticum Penard	200	4.90	52.00	30.00	24504.40
SP - 104S	2-Jul-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.89	36.00	36.00	24429.00
SP - 104S	2-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.22	15.70	15.70	2026.30
SP - 105S	2-Jul-17	2121	Oocystis lacustris Chodat	28736	0.74	5.50	3.00	25.90
SP - 105S	2-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	43104	3.22	44.00	1.80	74.60
SP - 105S	2-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.40	12.00	376.10
SP - 105S	2-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
SP - 105S	2-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
SP - 105S	2-Jul-17	4351	Small chrysophyceae	229888	3.24	3.00	3.00	14.10
SP - 105S	2-Jul-17	4352	Large chrysophyceae	71840	12.90	7.00	7.00	179.60
SP - 105S	2-Jul-17	4357	Chrysococcus sp.	502880	25.65	4.60	4.60	51.00
SP - 105S	2-Jul-17	4362	Kephyrion sp.	57472	0.90	3.10	3.10	15.60
SP - 105S	2-Jul-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	20.00	10.00	1047.20
SP - 105S	2-Jul-17	4378	Dinobryon borgei Lemmermann	14368	0.61	9.00	3.00	42.40
SP - 105S	2-Jul-17	4388	Dinobryon sertularia Ehrenberg	79024	17.88	12.00	6.00	226.20
SP - 105S	2-Jul-17	4388	Dinobryon sertularia Ehrenberg	13800	31.19	0.00	0.00	2260.00
SP - 105S	2-Jul-17	4390	Dinobryon sociale Ehrenberg	143680	32.50	12.00	6.00	226.20
SP - 105S	2-Jul-17	4390	Dinobryon sociale Ehrenberg	800	1.00	0.00	0.00	1250.00
SP - 105S	2-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	50288	1.51	5.60	3.20	30.00
SP - 105S	2-Jul-17	4401	Uroglena volvox Ehrenberg	1149440	130.00	6.00	6.00	113.10
SP - 105S	2-Jul-17	4413	Chrysochromulina laurentiana Kling	79024	31.18	9.10	9.10	394.60
SP - 105S	2-Jul-17	4414	Stichogloea spp.	14368	0.72	6.00	4.00	50.30
SP - 105S	2-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.63	3.60	7.90	88.20
SP - 105S	2-Jul-17	5518	Synedra acus Kutzing	12400	1.16	89.00	2.00	93.20
SP - 105S	2-Jul-17	5551	Cyclotella michiganiana Skvortzow	64656	1.58	2.50	5.00	24.50
SP - 105S	2-Jul-17	6554	Rhodomonas minuta Skuja	143680	20.04	11.10	6.00	139.50
SP - 105S	2-Jul-17	6558	Cryptomonas erosa Ehrenberg	1400	1.71	24.30	12.00	1221.50
SP - 105S	2-Jul-17	6568	Katablepharis ovalis Skuja	7184	0.35	8.30	4.00	48.10
SP - 105S	2-Jul-17	7632	Gymnodinium sp.	400	2.23	22.00	22.00	5575.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
SP - 105S	2-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	2800	5.67	15.70	15.70	2026.30
SP - 105S	2-Jul-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
SP - 106S	26-Aug-17	1054	Planktolyngbya limnetica	600	0.15	220.00	1.20	248.80
SP - 106S	26-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	400	0.21	14.00	12.00	527.80
SP - 106S	26-Aug-17	2105	Chlamydomonas spp.	7184	0.32	5.30	4.00	44.40
SP - 106S	26-Aug-17	2112	Sphaerocystis schroeteri Chodat	43104	0.81	3.30	3.30	18.80
SP - 106S	26-Aug-17	2121	Oocystis lacustris Chodat	64656	1.14	5.00	2.60	17.70
SP - 106S	26-Aug-17	2137	Dictyosphaerium simplex Sukja	431040	1.81	2.00	2.00	4.20
SP - 106S	26-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	71840	5.60	46.00	1.80	78.00
SP - 106S	26-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	43104	2.44	9.00	4.00	56.50
SP - 106S	26-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	1200	0.46	13.60	12.00	387.40
SP - 106S	26-Aug-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
SP - 106S	26-Aug-17	2205	Mougeotia sp.	200	0.72	46.00	10.00	3612.80
SP - 106S	26-Aug-17	2206	Botryococcus braunii Kutzing	800	0.42	10.00	10.00	523.60
SP - 106S	26-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	143680	0.68	3.00	3.00	4.70
SP - 106S	26-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	64656	4.03	36.00	2.10	62.30
SP - 106S	26-Aug-17	4351	Small chrysophyceae	71840	0.66	2.60	2.60	9.20
SP - 106S	26-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
SP - 106S	26-Aug-17	4357	Chrysococcus sp.	531616	34.77	5.00	5.00	65.40
SP - 106S	26-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.39	8.60	8.60	333.00
SP - 106S	26-Aug-17	4362	Kephyrion sp.	14368	0.22	3.10	3.10	15.60
SP - 106S	26-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.77	5.90	5.90	107.50
SP - 106S	26-Aug-17	4378	Dinobryon borgei Lemmermann	35920	1.73	9.00	3.20	48.30
SP - 106S	26-Aug-17	4381	Dinobryon mucronutom Nygaard	7184	0.91	9.70	5.00	127.00
SP - 106S	26-Aug-17	4383	Dinobryon bavaricum Imhof	43104	9.75	12.00	6.00	226.20
SP - 106S	26-Aug-17	4383	Dinobryon bavaricum Imhof	800	1.59	0.00	0.00	1991.00
SP - 106S	26-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.83	0.00	0.00	4150.00
SP - 106S	26-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
SP - 106S	26-Aug-17	4388	Dinobryon sertularia Ehrenberg	200	0.68	0.00	0.00	3390.00
SP - 106S	26-Aug-17	4390	Dinobryon sociale Ehrenberg	35920	8.13	12.00	6.00	226.20
SP - 106S	26-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.20	5.60	3.10	28.20
SP - 106S	26-Aug-17	4413	Chrysochromulina laurentiana Kling	79024	32.22	9.20	9.20	407.70
SP - 106S	26-Aug-17	4414	Stichogloea spp.	57472	2.89	6.00	4.00	50.30
SP - 106S	26-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46	6.00	3.20	32.20
SP - 106S	26-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.36	10.50	21.00	1818.40
SP - 106S	26-Aug-17	5509	Cyclotella ocellata Pant.	21552	2.17	4.00	8.00	100.50
SP - 106S	26-Aug-17	5511	Rhizosolenia eriense H.L. Smith	7184	0.46	9.00	3.00	63.60
SP - 106S	26-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	1400	1.87	26.00	14.00	1334.10
SP - 106S	26-Aug-17	5518	Synedra acus Kutzing	5400	0.53	94.00	2.00	98.40
SP - 106S	26-Aug-17	5551	Cyclotella michiganiana Skvortzow	761504	17.59	2.45	4.90	23.10
SP - 106S	26-Aug-17	5720	Cyclotella bodanica Eulenst.	400	2.57	16.00	32.00	6434.00
SP - 106S	26-Aug-17	6554	Rhodomonas minuta Skuja	7184	0.90	10.00	6.00	125.70
SP - 106S	26-Aug-17	6558	Cryptomonas erosa Ehrenberg	1800	2.26	25.00	12.00	1256.60
SP - 106S	26-Aug-17	7632	Gymnodinium sp.	600	6.90	28.00	28.00	11494.00
SP - 106S	26-Aug-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
SP - 106S	26-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	1400	3.17	16.30	16.30	2267.60
SP - 107S	26-Aug-17	1054	Planktolyngbya limnetica	2200	0.55	220.00	1.20	248.80
SP - 107S	26-Aug-17	2100	Pyramidomonas tetrarhynchus Schmarda	200	0.11	14.00	12.00	527.80
SP - 107S	26-Aug-17	2105	Chlamydomonas spp.	7184	0.32	5.30	4.00	44.40
SP - 107S	26-Aug-17	2112	Sphaerocystis schroeteri Chodat	7184	0.14	3.30	3.30	18.80
SP - 107S	26-Aug-17	2121	Oocystis lacustris Chodat	100576	1.78	5.00	2.60	17.70
SP - 107S	26-Aug-17	2137	Dictyosphaerium simplex Sukja	553168	2.32	2.00	2.00	4.20
SP - 107S	26-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	287360	22.41	46.00	1.80	78.00
SP - 107S	26-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	28736	1.62	9.00	4.00	56.50
SP - 107S	26-Aug-17	2167	Elakatothrix gelatinosa Willen	35920	0.56	10.00	2.00	15.70
SP - 107S	26-Aug-17	2178	Cosmarium sp.	200	0.28	20.00	20.00	1396.30
SP - 107S	26-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	1400	0.54	13.60	12.00	387.40
SP - 107S	26-Aug-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
SP - 107S	26-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	165232	0.78	3.00	3.00	4.70
SP - 107S	26-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	43104	2.69	36.00	2.10	62.30
SP - 107S	26-Aug-17	4351	Small chrysophyceae	114944	1.06	2.60	2.60	9.20
SP - 107S	26-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
SP - 107S	26-Aug-17	4357	Chrysococcus sp.	553168	36.18	5.00	5.00	65.40
SP - 107S	26-Aug-17	4361	Kephyrion boreale Skuja	7184	0.66	5.60	5.60	92.00
SP - 107S	26-Aug-17	4362	Kephyrion sp.	79024	1.23	3.10	3.10	15.60
SP - 107S	26-Aug-17	4378	Dinobryon borgei Lemmermann	43104	2.08	9.00	3.20	48.30
SP - 107S	26-Aug-17	4383	Dinobryon bavaricum Imhof	43104	9.75	12.00	6.00	226.20
SP - 107S	26-Aug-17	4383	Dinobryon bavaricum Imhof	400	0.80	0.00	0.00	1991.00
SP - 107S	26-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	35920	4.56	9.70	5.00	127.00
SP - 107S	26-Aug-17	4390	Dinobryon sociale Ehrenberg	21552	4.88	12.00	6.00	226.20
SP - 107S	26-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	21552	0.61	5.60	3.10	28.20
SP - 107S	26-Aug-17	4411	Bitrichia chodatii (Reverdin) Chodat	7184	0.36	6.00	4.00	50.30
SP - 107S	26-Aug-17	4413	Chrysochromulina laurentiana Kling	79024	32.22	9.20	9.20	407.70
SP - 107S	26-Aug-17	4414	Stichogloea spp.	316096	15.90	6.00	4.00	50.30
SP - 107S	26-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23	6.00	3.20	32.20
SP - 107S	26-Aug-17	4437	Pteridomonas sp.	7184	1.24	7.90	7.90	172.10
SP - 107S	26-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	2800	5.09	10.50	21.00	1818.40
SP - 107S	26-Aug-17	5511	Rhizosolenia eriense H.L. Smith	14368	0.91	9.00	3.00	63.60
SP - 107S	26-Aug-17	5514	Tabellaria flocculsa (Roth) Kutzing	200	0.27	26.00	14.00	1334.10
SP - 107S	26-Aug-17	5518	Synedra acus Kutzing	6000	0.59	94.00	2.00	98.40
SP - 107S	26-Aug-17	5551	Cyclotella michiganiana Skvortzow	495696	11.45	2.45	4.90	23.10
SP - 107S	26-Aug-17	5720	Cyclotella bodanica Eulenst.	800	5.15	16.00	32.00	6434.00
SP - 107S	26-Aug-17	6554	Rhodomonas minuta Skuja	50288	6.32	10.00	6.00	125.70
SP - 107S	26-Aug-17	6558	Cryptomonas erosa Ehrenberg	2600	3.27	25.00	12.00	1256.60
SP - 107S	26-Aug-17	6565	Cryptomonas rostratiformis Skuja	200	0.45	33.00	14.00	2257.80
SP - 107S	26-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.29	7.60	4.00	40.30
SP - 107S	26-Aug-17	7632	Gymnodinium sp.	600	6.90	28.00	28.00	11494.00
SP - 107S	26-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	800	1.81	16.30	16.30	2267.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m³	length µm	width µm	cell volume µm³
SP - 108S	14-Sep-17	1054	Planktolyngbya limnetica	400	0.05	111.00	1.20	125.50
SP - 108S	14-Sep-17	2137	Dictyosphaerium simplex Sukja	150864	0.72	2.10	2.10	4.80
SP - 108S	14-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	229888	16.00	41.00	1.80	69.60
SP - 108S	14-Sep-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.50	11.00	4.00	69.10
SP - 108S	14-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	400	0.15	13.60	12.00	387.40
SP - 108S	14-Sep-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
SP - 108S	14-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	79024	0.37	3.00	3.00	4.70
SP - 108S	14-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	21552	1.16	31.00	2.10	53.70
SP - 108S	14-Sep-17	4351	Small chrysophyceae	79024	1.11	3.00	3.00	14.10
SP - 108S	14-Sep-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
SP - 108S	14-Sep-17	4357	Chrysococcus sp.	416672	21.25	4.60	4.60	51.00
SP - 108S	14-Sep-17	4361	Kephyrion boreale Skuja	14368	1.71	6.10	6.10	118.80
SP - 108S	14-Sep-17	4362	Kephyrion sp.	136496	2.57	3.30	3.30	18.80
SP - 108S	14-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.20	19.40	10.00	1015.80
SP - 108S	14-Sep-17	4378	Dinobryon borgei Lemmermann	43104	1.89	9.30	3.00	43.80
SP - 108S	14-Sep-17	4381	Dinobryon mucronutom Nygaard	21552	2.82	10.00	5.00	130.90
SP - 108S	14-Sep-17	4383	Dinobryon bavaricum Imhof	7184	1.63	12.00	6.00	226.20
SP - 108S	14-Sep-17	4383	Dinobryon bavaricum Imhof	50288	11.38	12.00	6.00	226.20
SP - 108S	14-Sep-17	4383	Dinobryon bavaricum Imhof	2800	5.57	0.00	0.00	1991.00
SP - 108S	14-Sep-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
SP - 108S	14-Sep-17	4394	Epiphyxis sp.	14368	1.12	9.30	4.00	77.90
SP - 108S	14-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.43	5.20	3.30	29.70
SP - 108S	14-Sep-17	4413	Chrysochromulina laurentiana Kling	93392	38.08	9.20	9.20	407.70
SP - 108S	14-Sep-17	4414	Stichogloea spp.	14368	0.72	6.00	4.00	50.30
SP - 108S	14-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.18	5.20	3.00	24.50
SP - 108S	14-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1000	1.98	10.80	21.60	1978.80
SP - 108S	14-Sep-17	5518	Synedra acus Kutzing	3200	0.31	94.00	2.00	98.40
SP - 108S	14-Sep-17	5551	Cyclotella michiganiana Skvortzow	330464	8.10	2.50	5.00	24.50
SP - 108S	14-Sep-17	5720	Cyclotella bodanica Eulenst.	200	1.06	15.00	30.00	5301.40
SP - 108S	14-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.99	11.00	6.00	138.20
SP - 108S	14-Sep-17	6558	Cryptomonas erosa Ehrenberg	2000	2.51	25.00	12.00	1256.60
SP - 108S	14-Sep-17	7632	Gymnodinium sp.	1000	6.04	22.60	22.60	6044.00
SP - 108S	14-Sep-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
SP - 109S	14-Sep-17	1054	Planktolyngbya limnetica	1200	0.15	111.00	1.20	125.50
SP - 109S	14-Sep-17	2137	Dictyosphaerium simplex Sukja	150864	0.72	2.10	2.10	4.80
SP - 109S	14-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	208336	14.50	41.00	1.80	69.60
SP - 109S	14-Sep-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.50	11.00	4.00	69.10
SP - 109S	14-Sep-17	2167	Elakatothrix gelatinosa Willen	35920	0.62	11.00	2.00	17.30
SP - 109S	14-Sep-17	2169	Planctonema lauterbornii Schmidle	14368	1.99	11.00	4.00	138.20
SP - 109S	14-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.23	13.60	12.00	387.40
SP - 109S	14-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
SP - 109S	14-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	122128	0.57	3.00	3.00	4.70
SP - 109S	14-Sep-17	4351	Small chrysophyceae	129312	1.82	3.00	3.00	14.10
SP - 109S	14-Sep-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
SP - 109S	14-Sep-17	4357	Chrysococcus sp.	646560	32.97	4.60	4.60	51.00
SP - 109S	14-Sep-17	4362	Kephyrion sp.	150864	2.84	3.30	3.30	18.80
SP - 109S	14-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.85	6.10	6.10	118.80
SP - 109S	14-Sep-17	4378	Dinobryon borgei Lemmermann	43104	2.11	8.60	3.30	49.00
SP - 109S	14-Sep-17	4383	Dinobryon bavaricum Imhof	35920	8.13	12.00	6.00	226.20
SP - 109S	14-Sep-17	4383	Dinobryon bavaricum Imhof	1400	2.79	0.00	0.00	1991.00
SP - 109S	14-Sep-17	4394	Epiphyxis sp.	28736	2.22	9.20	4.00	77.10
SP - 109S	14-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.21	5.20	3.30	29.70
SP - 109S	14-Sep-17	4413	Chrysochromulina laurentiana Kling	114944	46.86	9.20	9.20	407.70
SP - 109S	14-Sep-17	4414	Stichogloea spp.	50288	2.53	6.00	4.00	50.30
SP - 109S	14-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1400	2.77	10.80	21.60	1978.80
SP - 109S	14-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	200	0.26	25.20	14.00	1293.10
SP - 109S	14-Sep-17	5518	Synedra acus Kutzing	5600	0.55	94.00	2.00	98.40
SP - 109S	14-Sep-17	5551	Cyclotella michiganiana Skvortzow	201152	4.93	2.50	5.00	24.50
SP - 109S	14-Sep-17	5720	Cyclotella bodanica Eulenst.	400	2.12	15.00	30.00	5301.40
SP - 109S	14-Sep-17	6554	Rhodomonas minuta Skuja	71840	9.93	11.00	6.00	138.20
SP - 109S	14-Sep-17	6558	Cryptomonas erosa Ehrenberg	3000	3.77	25.00	12.00	1256.60
SP - 109S	14-Sep-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
SP - 109S	14-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.32	15.60	14.00	1601.00
TE - 92S	29-Mar-17	1054	Planktolyngbya limnetica	100	0.01	116.00	1.20	131.20
TE - 92S	29-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	49645	3.87	41.00	2.20	77.90
TE - 92S	29-Mar-17	4351	Small chrysophyceae	99291	1.40	3.00	3.00	14.10
TE - 92S	29-Mar-17	4352	Large chrysophyceae	17731	3.18	7.00	7.00	179.60
TE - 92S	29-Mar-17	4357	Chrysococcus sp.	198582	10.13	4.60	4.60	51.00
TE - 92S	29-Mar-17	4362	Kephyrion sp.	3546	0.07	3.30	3.30	18.80
TE - 92S	29-Mar-17	4378	Dinobryon borgei Lemmermann	3546	0.18	9.00	3.30	51.30
TE - 92S	29-Mar-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
TE - 92S	29-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.11	5.60	3.20	30.00
TE - 92S	29-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.15	9.80	19.60	1478.40
TE - 92S	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	31915	0.74	2.45	4.90	23.10
TE - 92S	29-Mar-17	6554	Rhodomonas minuta Skuja	56738	7.13	10.00	6.00	125.70
TE - 92S	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	2500	3.02	24.00	12.00	1206.40
TE - 92S	29-Mar-17	6568	Katablepharis ovalis Skuja	3546	0.15	7.90	4.00	43.60
TE - 92S	29-Mar-17	7632	Gymnodinium sp.	3546	1.19	10.00	8.00	335.10
TE - 92S	29-Mar-17	7632	Gymnodinium sp.	1000	9.20	26.00	26.00	9202.80
TE - 92S	29-Mar-17	7635	Peridinium willei Huitfeldt-Kaas	100	2.63	36.90	36.90	26307.40
TE - 92S	29-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.21	16.00	16.00	2144.70
TE - 92S	29-Mar-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
TE - 93S	29-Mar-17	1054	Planktolyngbya limnetica	600	0.10	144.00	1.20	162.90
TE - 93S	29-Mar-17	2121	Oocystis lacustris Chodat	3546	0.07	5.10	2.70	19.50
TE - 93S	29-Mar-17	2137	Dictyosphaerium simplex Sukja	21277	0.09	2.00	2.00	4.20
TE - 93S	29-Mar-17	2199	Spondylosium planum (Wolle) W. and G.S. West	3546	0.13	6.00	6.00	37.70
TE - 93S	29-Mar-17	4351	Small chrysophyceae	56738	0.80	3.00	3.00	14.10
TE - 93S	29-Mar-17	4352	Large chrysophyceae	10638	1.91	7.00	7.00	179.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
TE - 93S	29-Mar-17	4357	Chrysococcus sp.	237589	12.12	4.60	4.60	51.00
TE - 93S	29-Mar-17	4362	Kephyrion sp.	3546	0.07	3.30	3.30	18.80
TE - 93S	29-Mar-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
TE - 93S	29-Mar-17	4388	Dinobryon sertularia Ehrenberg	3546	0.80	12.00	6.00	226.20
TE - 93S	29-Mar-17	4388	Dinobryon sertularia Ehrenberg	200	0.43	0.00	0.00	2150.00
TE - 93S	29-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.12	5.90	3.30	33.60
TE - 93S	29-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.11	5.60	3.20	30.00
TE - 93S	29-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.15	9.80	19.60	1478.40
TE - 93S	29-Mar-17	5511	Rhizosolenia eriense H.L. Smith	3546	0.40	9.00	4.00	113.10
TE - 93S	29-Mar-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	100	0.13	77.00	8.00	1290.10
TE - 93S	29-Mar-17	5518	Synedra acus Kutzing	100	0.01	93.00	2.00	97.40
TE - 93S	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	3546	0.08	2.45	4.90	23.10
TE - 93S	29-Mar-17	6554	Rhodomonas minuta Skuja	63830	8.02	10.00	6.00	125.70
TE - 93S	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	1500	1.81	24.00	12.00	1206.40
TE - 93S	29-Mar-17	6568	Katablepharis ovalis Skuja	3546	0.15	7.90	4.00	43.60
TE - 93S	29-Mar-17	7632	Gymnodinium sp.	10638	3.56	10.00	8.00	335.10
TE - 93S	29-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	400	0.86	16.00	16.00	2144.70
TEFF - 45S	29-Mar-17	1054	Planktolyngbya limnetica	3400	0.38	100.00	1.20	113.10
TEFF - 45S	29-Mar-17	2105	Chlamydomonas spp.	3546	0.09	5.20	3.00	24.50
TEFF - 45S	29-Mar-17	2105	Chlamydomonas spp.	3546	1.19	10.00	8.00	335.10
TEFF - 45S	29-Mar-17	2137	Dictyosphaerium simplex Sukja	14184	0.06	2.00	2.00	4.20
TEFF - 45S	29-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	14184	1.10	41.00	2.20	77.90
TEFF - 45S	29-Mar-17	4351	Small chrysophyceae	49645	0.70	3.00	3.00	14.10
TEFF - 45S	29-Mar-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
TEFF - 45S	29-Mar-17	4357	Chrysococcus sp.	322695	21.10	5.00	5.00	65.40
TEFF - 45S	29-Mar-17	4361	Kephyrion boreale Skuja	3546	0.42	6.10	6.10	118.80
TEFF - 45S	29-Mar-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
TEFF - 45S	29-Mar-17	4413	Chrysochromulina laurentiana Kling	3546	1.64	9.60	9.60	463.20
TEFF - 45S	29-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.15	9.80	19.60	1478.40
TEFF - 45S	29-Mar-17	5511	Rhizosolenia eriense H.L. Smith	3546	0.30	12.00	3.00	84.80
TEFF - 45S	29-Mar-17	5518	Synedra acus Kutzing	100	0.01	96.00	2.00	100.50
TEFF - 45S	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	24823	0.57	2.45	4.90	23.10
TEFF - 45S	29-Mar-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
TEFF - 45S	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	1200	1.48	24.60	12.00	1236.50
TEFF - 45S	29-Mar-17	7632	Gymnodinium sp.	10638	3.56	10.00	8.00	335.10
TEFF - 45S	29-Mar-17	7632	Gymnodinium sp.	100	0.63	22.90	22.90	6287.90
TEFF - 45S	29-Mar-17	7641	Peridinium aciculiferum Lemmermann	200	1.93	32.00	24.00	9651.00
TEFF - 46S	29-Mar-17	1054	Planktolyngbya limnetica	1400	0.15	96.00	1.20	108.60
TEFF - 46S	29-Mar-17	2137	Dictyosphaerium simplex Sukja	63830	0.31	2.10	2.10	4.80
TEFF - 46S	29-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	28369	2.21	41.00	2.20	77.90
TEFF - 46S	29-Mar-17	4351	Small chrysophyceae	14184	0.20	3.00	3.00	14.10
TEFF - 46S	29-Mar-17	4352	Large chrysophyceae	21277	3.82	7.00	7.00	179.60
TEFF - 46S	29-Mar-17	4357	Chrysococcus sp.	223404	14.61	5.00	5.00	65.40
TEFF - 46S	29-Mar-17	4362	Kephyrion sp.	21277	0.44	3.40	3.40	20.60
TEFF - 46S	29-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	14184	0.43	5.60	3.20	30.00
TEFF - 46S	29-Mar-17	4400	Ochromonas sp.	39007	4.46	9.10	4.90	114.40
TEFF - 46S	29-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	17731	0.57	5.60	3.30	31.90
TEFF - 46S	29-Mar-17	5518	Synedra acus Kutzing	100	0.01	96.00	2.00	100.50
TEFF - 46S	29-Mar-17	5551	Cyclotella michiganiana Skvortzow	17731	0.41	2.45	4.90	23.10
TEFF - 46S	29-Mar-17	6554	Rhodomonas minuta Skuja	21277	2.67	10.00	6.00	125.70
TEFF - 46S	29-Mar-17	6558	Cryptomonas erosa Ehrenberg	1100	1.36	24.60	12.00	1236.50
TEFF - 46S	29-Mar-17	6565	Cryptomonas rostratiformis Skuja	100	0.22	32.00	14.00	2189.30
TEFF - 46S	29-Mar-17	7632	Gymnodinium sp.	100	0.63	22.90	22.90	6287.90
TEFF - 46S	29-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	300	0.57	15.40	15.40	1912.30
TPE - 100S	24-Mar-17	1054	Planktolyngbya limnetica	100	0.01	110.00	1.20	124.40
TPE - 100S	24-Mar-17	2121	Oocystis lacustris Chodat	10638	0.26	5.20	3.00	24.50
TPE - 100S	24-Mar-17	2137	Dictyosphaerium simplex Sukja	28369	0.12	2.00	2.00	4.20
TPE - 100S	24-Mar-17	2206	Botryococcus braunii Kutzing	500	0.66	13.60	13.60	1317.10
TPE - 100S	24-Mar-17	2215	Tetraedron caudatum (Corda) Hansgrig	14184	0.07	3.00	3.00	4.70
TPE - 100S	24-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	74468	5.66	40.00	2.20	76.00
TPE - 100S	24-Mar-17	4351	Small chrysophyceae	92199	0.95	2.70	2.70	10.30
TPE - 100S	24-Mar-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
TPE - 100S	24-Mar-17	4357	Chrysococcus sp.	163121	10.67	5.00	5.00	65.40
TPE - 100S	24-Mar-17	4362	Kephyrion sp.	14184	0.24	3.20	3.20	17.20
TPE - 100S	24-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.11	5.60	3.20	30.00
TPE - 100S	24-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.16	10.00	20.00	1570.80
TPE - 100S	24-Mar-17	5518	Synedra acus Kutzing	400	0.04	96.00	2.00	100.50
TPE - 100S	24-Mar-17	5551	Cyclotella michiganiana Skvortzow	131206	2.51	2.30	4.60	19.10
TPE - 100S	24-Mar-17	6554	Rhodomonas minuta Skuja	46099	5.79	10.00	6.00	125.70
TPE - 100S	24-Mar-17	6558	Cryptomonas erosa Ehrenberg	2900	3.57	24.50	12.00	1231.50
TPE - 100S	24-Mar-17	6565	Cryptomonas rostratiformis Skuja	100	0.21	31.00	14.00	2120.90
TPE - 100SR	24-Mar-17	2121	Oocystis lacustris Chodat	31915	0.78	5.20	3.00	24.50
TPE - 100SR	24-Mar-17	2137	Dictyosphaerium simplex Sukja	14184	0.06	2.00	2.00	4.20
TPE - 100SR	24-Mar-17	2206	Botryococcus braunii Kutzing	500	0.66	13.60	13.60	1317.10
TPE - 100SR	24-Mar-17	2215	Tetraedron caudatum (Corda) Hansgrig	10638	0.05	3.00	3.00	4.70
TPE - 100SR	24-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	74468	5.66	40.00	2.20	76.00
TPE - 100SR	24-Mar-17	4351	Small chrysophyceae	67376	0.69	2.70	2.70	10.30
TPE - 100SR	24-Mar-17	4352	Large chrysophyceae	17731	3.18	7.00	7.00	179.60
TPE - 100SR	24-Mar-17	4357	Chrysococcus sp.	148936	9.74	5.00	5.00	65.40
TPE - 100SR	24-Mar-17	4362	Kephyrion sp.	3546	0.06	3.20	3.20	17.20
TPE - 100SR	24-Mar-17	4400	Ochromonas sp.	7092	0.51	8.60	4.00	72.00
TPE - 100SR	24-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	300	0.47	10.00	20.00	1570.80
TPE - 100SR	24-Mar-17	5518	Synedra acus Kutzing	100	0.01	96.00	2.00	100.50
TPE - 100SR	24-Mar-17	5551	Cyclotella michiganiana Skvortzow	117021	2.24	2.30	4.60	19.10
TPE - 100SR	24-Mar-17	6554	Rhodomonas minuta Skuja	60284	7.58	10.00	6.00	125.70
TPE - 100SR	24-Mar-17	6558	Cryptomonas erosa Ehrenberg	3400	4.19	24.50	12.00	1231.50
TPE - 100SR	24-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.18	15.00	15.00	1767.10
TPE - 101S	24-Mar-17	2121	Oocystis lacustris Chodat	3546	0.08	5.00	3.00	23.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
TPE - 101S	24-Mar-17	2137	Dictyosphaerium simplex Sukja	7092	0.03	2.00	2.00	4.20
TPE - 101S	24-Mar-17	2206	Botryococcus braunii Kutzing	600	0.79	13.60	13.60	1317.10
TPE - 101S	24-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	35461	2.90	43.00	2.20	81.70
TPE - 101S	24-Mar-17	4351	Small chrysophyceae	81560	0.84	2.70	2.70	10.30
TPE - 101S	24-Mar-17	4352	Large chrysophyceae	7092	1.27	7.00	7.00	179.60
TPE - 101S	24-Mar-17	4357	Chrysococcus sp.	109929	7.19	5.00	5.00	65.40
TPE - 101S	24-Mar-17	4362	Kephyrion sp.	7092	0.12	3.20	3.20	17.20
TPE - 101S	24-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.09	5.60	3.00	26.40
TPE - 101S	24-Mar-17	4413	Chrysochromulina laurentiana Kling	3546	1.64	9.60	9.60	463.20
TPE - 101S	24-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	14184	0.46	6.00	3.20	32.20
TPE - 101S	24-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.16	10.00	20.00	1570.80
TPE - 101S	24-Mar-17	5509	Cyclotella ocellata Pant.	17731	1.30	3.60	7.20	73.30
TPE - 101S	24-Mar-17	5514	Tabellaria flocculsa (Roth) Kutzing	100	0.15	30.00	14.00	1539.40
TPE - 101S	24-Mar-17	5551	Cyclotella michiganiana Skvortzow	195036	3.73	2.30	4.60	19.10
TPE - 101S	24-Mar-17	6554	Rhodomonas minuta Skuja	14184	1.78	10.00	6.00	125.70
TPE - 101S	24-Mar-17	6558	Cryptomonas erosa Ehrenberg	2200	2.71	24.50	12.00	1231.50
TPE - 101S	24-Mar-17	7635	Peridinium willei Huitfeldt-Kaas	100	2.50	36.30	36.30	25044.90
TPE - 102S	4-May-17	2235	Ankistrodesmus spiralis Lemmermann	56738	4.20	39.00	2.20	74.10
TPE - 102S	4-May-17	4351	Small chrysophyceae	70922	1.00	3.00	3.00	14.10
TPE - 102S	4-May-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
TPE - 102S	4-May-17	4357	Chrysococcus sp.	195036	12.76	5.00	5.00	65.40
TPE - 102S	4-May-17	4362	Kephyrion sp.	10638	0.28	3.70	3.70	26.50
TPE - 102S	4-May-17	4378	Dinobryon borgei Lemmermann	3546	0.17	9.00	3.20	48.30
TPE - 102S	4-May-17	4388	Dinobryon sertularia Ehrenberg	3546	0.80	12.00	6.00	226.20
TPE - 102S	4-May-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.11	5.60	3.30	31.90
TPE - 102S	4-May-17	4413	Chrysochromulina laurentiana Kling	3546	1.40	9.10	9.10	394.60
TPE - 102S	4-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28369	0.95	5.90	3.30	33.60
TPE - 102S	4-May-17	5551	Cyclotella michiganiana Skvortzow	10638	0.20	2.30	4.60	19.10
TPE - 102S	4-May-17	6554	Rhodomonas minuta Skuja	49645	6.24	10.00	6.00	125.70
TPE - 102S	4-May-17	6558	Cryptomonas erosa Ehrenberg	800	0.98	24.30	12.00	1221.50
TPE - 102S	4-May-17	7632	Gymnodinium sp.	3546	1.31	11.00	8.00	368.60
TPE - 102S	4-May-17	7632	Gymnodinium sp.	100	0.63	22.90	22.90	6287.90
TPE - 102S	4-May-17	7639	Peridinium pusillum (Penard) Lemmermann	300	0.47	15.40	14.00	1580.40
TPE - 103S	5-May-17	2105	Chlamydomonas spp.	3546	0.09	5.50	3.00	25.90
TPE - 103S	5-May-17	2167	Elakatothrix gelatinosa Willen	3546	0.08	14.00	2.00	22.00
TPE - 103S	5-May-17	2206	Botryococcus braunii Kutzing	100	0.05	10.00	10.00	523.60
TPE - 103S	5-May-17	2235	Ankistrodesmus spiralis Lemmermann	56738	4.20	39.00	2.20	74.10
TPE - 103S	5-May-17	4351	Small chrysophyceae	46099	0.65	3.00	3.00	14.10
TPE - 103S	5-May-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
TPE - 103S	5-May-17	4357	Chrysococcus sp.	95745	6.26	5.00	5.00	65.40
TPE - 103S	5-May-17	4363	Spiniferomonas sirrata***************	3546	0.42	6.10	6.10	118.80
TPE - 103S	5-May-17	4393	Dinobryon spp.	3546	0.11	5.60	3.30	31.90
TPE - 103S	5-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	35461	1.19	5.90	3.30	33.60
TPE - 103S	5-May-17	5507	Cyclotella stelligera Cleve and Grunow	100	0.21	11.00	22.00	2090.70
TPE - 103S	5-May-17	5551	Cyclotella michiganiana Skvortzow	14184	0.27	2.30	4.60	19.10
TPE - 103S	5-May-17	6554	Rhodomonas minuta Skuja	21277	2.67	10.00	6.00	125.70
TPE - 103S	5-May-17	6558	Cryptomonas erosa Ehrenberg	1200	1.48	24.50	12.00	1231.50
TPE - 103S	5-May-17	7632	Gymnodinium sp.	10638	3.92	11.00	8.00	368.60
TPE - 103S	5-May-17	7632	Gymnodinium sp.	600	6.12	26.90	26.90	10191.90
TPE - 103S	5-May-17	7641	Peridinium aciculiferum Lemmermann	100	0.93	31.00	24.00	9349.40
TPE - 104S	1-Jul-17	2105	Chlamydomonas spp.	7184	0.07	4.00	2.20	10.10
TPE - 104S	1-Jul-17	2121	Oocystis lacustris Chodat	35920	0.86	5.10	3.00	24.00
TPE - 104S	1-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	93392	6.97	44.00	1.80	74.60
TPE - 104S	1-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.11	15.20	14.00	564.50
TPE - 104S	1-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
TPE - 104S	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	64656	0.30	3.00	3.00	4.70
TPE - 104S	1-Jul-17	4351	Small chrysophyceae	294544	2.71	2.60	2.60	9.20
TPE - 104S	1-Jul-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
TPE - 104S	1-Jul-17	4357	Chrysococcus sp.	919552	60.14	5.00	5.00	65.40
TPE - 104S	1-Jul-17	4362	Kephyrion sp.	35920	0.62	3.20	3.20	17.20
TPE - 104S	1-Jul-17	4363	Spiniferomonas sirrata***************	7184	0.63	5.50	5.50	87.10
TPE - 104S	1-Jul-17	4378	Dinobryon borgei Lemmermann	7184	0.31	9.10	3.00	42.90
TPE - 104S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
TPE - 104S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	3600	12.20	0.00	0.00	3390.00
TPE - 104S	1-Jul-17	4390	Dinobryon sociale Ehrenberg	21552	4.88	12.00	6.00	226.20
TPE - 104S	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	28736	0.88	5.70	3.20	30.60
TPE - 104S	1-Jul-17	4401	Uroglena volvox Ehrenberg	93392	10.56	6.00	6.00	113.10
TPE - 104S	1-Jul-17	4413	Chrysochromulina laurentiana Kling	43104	18.75	9.40	9.40	434.90
TPE - 104S	1-Jul-17	5518	Synedra acus Kutzing	600	0.05	86.00	2.00	90.10
TPE - 104S	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	100576	2.46	2.50	5.00	24.50
TPE - 104S	1-Jul-17	6554	Rhodomonas minuta Skuja	43104	3.61	9.60	5.00	83.80
TPE - 104S	1-Jul-17	6558	Cryptomonas erosa Ehrenberg	1200	1.42	23.60	12.00	1186.30
TPE - 104S	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	600	1.35	33.00	14.00	2257.80
TPE - 104S	1-Jul-17	6568	Katablepharis ovalis Skuja	14368	0.74	8.60	4.00	51.60
TPE - 104S	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	0.96	15.60	14.00	1601.00
TPE - 104S	1-Jul-17	7641	Peridinium aciculiferum Lemmermann	200	1.81	30.00	24.00	9047.80
TPE - 104SR	1-Jul-17	2121	Oocystis lacustris Chodat	21552	0.52	5.10	3.00	24.00
TPE - 104SR	1-Jul-17	2137	Dictyosphaerium simplex Sukja	14368	0.06	2.00	2.00	4.20
TPE - 104SR	1-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	122128	9.11	44.00	1.80	74.60
TPE - 104SR	1-Jul-17	2145	Crucigenia quadrata Morr.	28736	0.14	3.00	3.00	4.70
TPE - 104SR	1-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.12	15.30	15.00	612.80
TPE - 104SR	1-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
TPE - 104SR	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	43104	0.20	3.00	3.00	4.70
TPE - 104SR	1-Jul-17	4351	Small chrysophyceae	222704	2.05	2.60	2.60	9.20
TPE - 104SR	1-Jul-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
TPE - 104SR	1-Jul-17	4357	Chrysococcus sp.	1012944	66.25	5.00	5.00	65.40
TPE - 104SR	1-Jul-17	4362	Kephyrion sp.	14368	0.25	3.20	3.20	17.20
TPE - 104SR	1-Jul-17	4363	Spiniferomonas sirrata***************	21552	1.88	5.50	5.50	87.10

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
TPE - 104SR	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	28736	6.50	12.00	6.00	226.20
TPE - 104SR	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	3000	10.17	0.00	0.00	3390.00
TPE - 104SR	1-Jul-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
TPE - 104SR	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.44	5.70	3.20	30.60
TPE - 104SR	1-Jul-17	4401	Uroglena volvox Ehrenberg	64656	7.31	6.00	6.00	113.10
TPE - 104SR	1-Jul-17	4413	Chrysochromulina laurentiana Kling	28736	12.50	9.40	9.40	434.90
TPE - 104SR	1-Jul-17	5518	Synedra acus Kutzing	800	0.07	86.00	2.00	90.10
TPE - 104SR	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	35920	0.88	2.50	5.00	24.50
TPE - 104SR	1-Jul-17	6554	Rhodomonas minuta Skuja	28736	2.41	9.60	5.00	83.80
TPE - 104SR	1-Jul-17	6558	Cryptomonas erosa Ehrenberg	800	0.95	23.60	12.00	1186.30
TPE - 104SR	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	400	0.90	33.00	14.00	2257.80
TPE - 104SR	1-Jul-17	6568	Katablepharis ovalis Skuja	28736	1.48	8.60	4.00	51.60
TPE - 104SR	1-Jul-17	7632	Gymnodinium sp.	200	1.45	24.00	24.00	7238.20
TPE - 104SR	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	400	0.62	15.20	14.00	1559.90
TPE - 105S	1-Jul-17	1054	Planktolyngbya limnetica	200	0.04	184.00	1.20	208.10
TPE - 105S	1-Jul-17	2105	Chlamydomonas spp.	7184	0.07	4.00	2.20	10.10
TPE - 105S	1-Jul-17	2121	Oocystis lacustris Chodat	14368	0.34	5.10	3.00	24.00
TPE - 105S	1-Jul-17	2137	Dictyosphaerium simplex Sukja	14368	0.06	2.00	2.00	4.20
TPE - 105S	1-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	179600	13.40	44.00	1.80	74.60
TPE - 105S	1-Jul-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.11	15.20	14.00	564.50
TPE - 105S	1-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
TPE - 105S	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
TPE - 105S	1-Jul-17	4351	Small chrysophyceae	366384	3.37	2.60	2.60	9.20
TPE - 105S	1-Jul-17	4357	Chrysococcus sp.	1185360	77.52	5.00	5.00	65.40
TPE - 105S	1-Jul-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
TPE - 105S	1-Jul-17	4362	Kephyrion sp.	28736	0.49	3.20	3.20	17.20
TPE - 105S	1-Jul-17	4363	Spiniferomonas sirrata***************	14368	1.32	5.60	5.60	92.00
TPE - 105S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	35920	8.13	12.00	6.00	226.20
TPE - 105S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	2800	9.49	0.00	0.00	3390.00
TPE - 105S	1-Jul-17	4390	Dinobryon sociale Ehrenberg	14368	3.25	12.00	6.00	226.20
TPE - 105S	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	35920	1.10	5.70	3.20	30.60
TPE - 105S	1-Jul-17	4401	Uroglena volvox Ehrenberg	35920	4.06	6.00	6.00	113.10
TPE - 105S	1-Jul-17	4413	Chrysochromulina laurentiana Kling	57472	24.99	9.40	9.40	434.90
TPE - 105S	1-Jul-17	5509	Cyclotella ocellata Pant.	14368	1.10	3.65	7.30	76.40
TPE - 105S	1-Jul-17	5514	Tabellaria flocculsa (Roth) Kutzing	200	0.30	29.00	14.00	1488.10
TPE - 105S	1-Jul-17	5518	Synedra acus Kutzing	200	0.02	86.00	2.00	90.10
TPE - 105S	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	100576	2.46	2.50	5.00	24.50
TPE - 105S	1-Jul-17	6554	Rhodomonas minuta Skuja	14368	1.20	9.60	5.00	83.80
TPE - 105S	1-Jul-17	6558	Cryptomonas erosa Ehrenberg	3000	3.56	23.60	12.00	1186.30
TPE - 105S	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	600	1.35	33.00	14.00	2257.80
TPE - 105S	1-Jul-17	6568	Katablepharis ovalis Skuja	28736	1.48	8.60	4.00	51.60
TPE - 105S	1-Jul-17	7632	Gymnodinium sp.	400	3.68	26.00	26.00	9202.80
TPE - 105S	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	0.96	15.60	14.00	1601.00
TPE - 106S	27-Aug-17	1054	Planktolyngbya limnetica	2000	0.37	165.00	1.20	186.60
TPE - 106S	27-Aug-17	2105	Chlamydomonas spp.	7184	0.17	5.00	3.00	23.60
TPE - 106S	27-Aug-17	2137	Dictyosphaerium simplex Sukja	646560	2.72	2.00	2.00	4.20
TPE - 106S	27-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	488512	40.60	49.00	1.80	83.10
TPE - 106S	27-Aug-17	2167	Elakatothrix gelatinosa Willen	129312	2.03	10.00	2.00	15.70
TPE - 106S	27-Aug-17	2169	Planctonema lauterbornii Schmidle	14368	2.80	15.50	4.00	194.80
TPE - 106S	27-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	1600	0.74	14.30	13.00	464.00
TPE - 106S	27-Aug-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
TPE - 106S	27-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	136496	0.64	3.00	3.00	4.70
TPE - 106S	27-Aug-17	4351	Small chrysophyceae	64656	0.67	2.70	2.70	10.30
TPE - 106S	27-Aug-17	4352	Large chrysophyceae	57472	10.32	7.00	7.00	179.60
TPE - 106S	27-Aug-17	4357	Chrysococcus sp.	617824	40.41	5.00	5.00	65.40
TPE - 106S	27-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.56	8.80	8.80	356.80
TPE - 106S	27-Aug-17	4362	Kephyrion sp.	28736	0.26	2.60	2.60	9.20
TPE - 106S	27-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	1200	1.20	19.10	10.00	1000.10
TPE - 106S	27-Aug-17	4378	Dinobryon borgei Lemmermann	21552	1.11	9.00	3.30	51.30
TPE - 106S	27-Aug-17	4381	Dinobryon mucronutom Nygaard	14368	1.71	9.10	5.00	119.10
TPE - 106S	27-Aug-17	4383	Dinobryon bavaricum Imhof	28736	6.50	12.00	6.00	226.20
TPE - 106S	27-Aug-17	4383	Dinobryon bavaricum Imhof	8000	15.93	0.00	0.00	1991.00
TPE - 106S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
TPE - 106S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	400	1.36	0.00	0.00	3390.00
TPE - 106S	27-Aug-17	4390	Dinobryon sociale Ehrenberg	28736	6.50	12.00	6.00	226.20
TPE - 106S	27-Aug-17	4394	Epiphyxis sp.	14368	1.09	9.10	4.00	76.20
TPE - 106S	27-Aug-17	4401	Uroglena volvox Ehrenberg	28736	3.25	6.00	6.00	113.10
TPE - 106S	27-Aug-17	4413	Chrysochromulina laurentiana Kling	107760	46.86	9.40	9.40	434.90
TPE - 106S	27-Aug-17	4414	Stichogloea spp.	143680	7.23	6.00	4.00	50.30
TPE - 106S	27-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.73	10.50	21.00	1818.40
TPE - 106S	27-Aug-17	5509	Cyclotella ocellata Pant.	35920	3.61	4.00	8.00	100.50
TPE - 106S	27-Aug-17	5511	Rhizosolenia eriense H.L. Smith	21552	1.37	9.00	3.00	63.60
TPE - 106S	27-Aug-17	5518	Synedra acus Kutzing	11200	0.96	82.00	2.00	85.90
TPE - 106S	27-Aug-17	5551	Cyclotella michiganiana Skvortzow	1027312	17.16	2.20	4.40	16.70
TPE - 106S	27-Aug-17	6554	Rhodomonas minuta Skuja	7184	0.60	9.60	5.00	83.80
TPE - 106S	27-Aug-17	6558	Cryptomonas erosa Ehrenberg	400	0.45	22.60	12.00	1136.00
TPE - 106S	27-Aug-17	6565	Cryptomonas rostratiformis Skuja	400	0.77	28.00	14.00	1915.70
TPE - 106S	27-Aug-17	7632	Gymnodinium sp.	200	1.45	24.00	24.00	7238.20
TPE - 106S	27-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	1400	3.23	16.40	16.40	2309.60
TPE - 107S	27-Aug-17	1054	Planktolyngbya limnetica	1200	0.22	165.00	1.20	186.60
TPE - 107S	27-Aug-17	2105	Chlamydomonas spp.	28736	0.68	5.00	3.00	23.60
TPE - 107S	27-Aug-17	2121	Oocystis lacustris Chodat	28736	0.68	5.00	3.00	23.60
TPE - 107S	27-Aug-17	2137	Dictyosphaerium simplex Sukja	840528	3.53	2.00	2.00	4.20
TPE - 107S	27-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	423856	35.22	49.00	1.80	83.10
TPE - 107S	27-Aug-17	2167	Elakatothrix gelatinosa Willen	143680	2.26	10.00	2.00	15.70
TPE - 107S	27-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	1200	0.56	14.30	13.00	464.00
TPE - 107S	27-Aug-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
TPE - 107S	27-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	129312	0.61	3.00	3.00	4.70

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
TPE - 107S	27-Aug-17	4351	Small chrysophyceae	122128	1.26	2.70	2.70	10.30
TPE - 107S	27-Aug-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
TPE - 107S	27-Aug-17	4357	Chrysococcus sp.	352016	23.02	5.00	5.00	65.40
TPE - 107S	27-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.56	8.80	8.80	356.80
TPE - 107S	27-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
TPE - 107S	27-Aug-17	4362	Kephyrion sp.	21552	0.20	2.60	2.60	9.20
TPE - 107S	27-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	800	0.80	19.10	10.00	1000.10
TPE - 107S	27-Aug-17	4381	Dinobryon mucronutom Nygaard	7184	0.86	9.10	5.00	119.10
TPE - 107S	27-Aug-17	4383	Dinobryon bavaricum Imhof	57472	13.00	12.00	6.00	226.20
TPE - 107S	27-Aug-17	4383	Dinobryon bavaricum Imhof	6600	13.14	0.00	0.00	1991.00
TPE - 107S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	21552	4.88	12.00	6.00	226.20
TPE - 107S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	800	2.71	0.00	0.00	3390.00
TPE - 107S	27-Aug-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20
TPE - 107S	27-Aug-17	4394	Epiphyxis sp.	28736	2.19	9.10	4.00	76.20
TPE - 107S	27-Aug-17	4401	Uroglena volvox Ehrenberg	43104	4.88	6.00	6.00	113.10
TPE - 107S	27-Aug-17	4413	Chrysochromulina laurentiana Kling	86208	37.49	9.40	9.40	434.90
TPE - 107S	27-Aug-17	4414	Stichogloea spp.	186784	9.40	6.00	4.00	50.30
TPE - 107S	27-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.73	10.50	21.00	1818.40
TPE - 107S	27-Aug-17	5509	Cyclotella ocellata Pant.	50288	5.05	4.00	8.00	100.50
TPE - 107S	27-Aug-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	1200	0.92	81.00	6.00	763.40
TPE - 107S	27-Aug-17	5518	Synedra acus Kutzing	8200	0.74	86.00	2.00	90.10
TPE - 107S	27-Aug-17	5551	Cyclotella michiganiana Skvortzow	1091968	18.24	2.20	4.40	16.70
TPE - 107S	27-Aug-17	6554	Rhodomonas minuta Skuja	35920	3.01	9.60	5.00	83.80
TPE - 107S	27-Aug-17	6558	Cryptomonas erosa Ehrenberg	1400	1.59	22.60	12.00	1136.00
TPE - 107S	27-Aug-17	6565	Cryptomonas rostratiformis Skuja	200	0.38	28.00	14.00	1915.70
TPE - 107S	27-Aug-17	7632	Gymnodinium sp.	400	2.90	24.00	24.00	7238.20
TPE - 107S	27-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	1000	2.31	16.40	16.40	2309.60
TPE - 108S	18-Sep-17	2121	Oocystis lacustris Chodat	21552	0.57	5.60	3.00	26.40
TPE - 108S	18-Sep-17	2137	Dictyosphaerium simplex Sukja	258624	1.09	2.00	2.00	4.20
TPE - 108S	18-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	495696	38.66	46.00	1.80	78.00
TPE - 108S	18-Sep-17	2167	Elakatothrix gelatinosa Willen	21552	0.30	9.00	2.00	14.10
TPE - 108S	18-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.10	14.60	13.00	483.60
TPE - 108S	18-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
TPE - 108S	18-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	79024	0.37	3.00	3.00	4.70
TPE - 108S	18-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	35920	2.24	36.00	2.10	62.30
TPE - 108S	18-Sep-17	4351	Small chrysophyceae	287360	2.96	2.70	2.70	10.30
TPE - 108S	18-Sep-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
TPE - 108S	18-Sep-17	4357	Chrysococcus sp.	517248	33.83	5.00	5.00	65.40
TPE - 108S	18-Sep-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
TPE - 108S	18-Sep-17	4362	Kephyrion sp.	114944	1.62	3.00	3.00	14.10
TPE - 108S	18-Sep-17	4363	Spiniferomonas sirrata***************	21552	2.56	6.10	6.10	118.80
TPE - 108S	18-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	400	0.39	18.40	10.00	963.40
TPE - 108S	18-Sep-17	4378	Dinobryon borgei Lemmermann	35920	1.52	9.00	3.00	42.40
TPE - 108S	18-Sep-17	4381	Dinobryon mucronutom Nygaard	35920	4.52	9.60	5.00	125.70
TPE - 108S	18-Sep-17	4383	Dinobryon bavaricum Imhof	380752	86.13	12.00	6.00	226.20
TPE - 108S	18-Sep-17	4383	Dinobryon bavaricum Imhof	23800	47.39	0.00	0.00	1991.00
TPE - 108S	18-Sep-17	4388	Dinobryon sertularia Ehrenberg	43104	9.75	12.00	6.00	226.20
TPE - 108S	18-Sep-17	4394	Epiphyxis sp.	14368	1.17	9.70	4.00	81.30
TPE - 108S	18-Sep-17	4413	Chrysochromulina laurentiana Kling	35920	14.17	9.10	9.10	394.60
TPE - 108S	18-Sep-17	4414	Stichogloea spp.	28736	1.45	6.00	4.00	50.30
TPE - 108S	18-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.59	9.80	19.60	1478.40
TPE - 108S	18-Sep-17	5509	Cyclotella ocellata Pant.	28736	2.89	4.00	8.00	100.50
TPE - 108S	18-Sep-17	5518	Synedra acus Kutzing	3000	0.26	83.00	2.00	86.90
TPE - 108S	18-Sep-17	5551	Cyclotella michiganiana Skvortzow	294544	5.63	2.30	4.60	19.10
TPE - 108S	18-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.52	10.00	5.50	105.60
TPE - 108S	18-Sep-17	6558	Cryptomonas erosa Ehrenberg	2000	2.41	24.00	12.00	1206.40
TPE - 108S	18-Sep-17	6565	Cryptomonas rostratiformis Skuja	400	0.88	32.00	14.00	2189.30
TPE - 108S	18-Sep-17	7632	Gymnodinium sp.	200	1.12	22.00	22.00	5575.30
TPE - 108S	18-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.29	16.00	16.00	2144.70
TPE - 109S	18-Sep-17	2121	Oocystis lacustris Chodat	14368	0.38	5.60	3.00	26.40
TPE - 109S	18-Sep-17	2137	Dictyosphaerium simplex Sukja	179600	0.75	2.00	2.00	4.20
TPE - 109S	18-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	431040	33.62	46.00	1.80	78.00
TPE - 109S	18-Sep-17	2167	Elakatothrix gelatinosa Willen	21552	0.30	9.00	2.00	14.10
TPE - 109S	18-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	600	0.29	14.60	13.00	483.60
TPE - 109S	18-Sep-17	2199	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54	6.00	6.00	37.70
TPE - 109S	18-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	136496	0.64	3.00	3.00	4.70
TPE - 109S	18-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	28736	1.79	36.00	2.10	62.30
TPE - 109S	18-Sep-17	4351	Small chrysophyceae	222704	2.29	2.70	2.70	10.30
TPE - 109S	18-Sep-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
TPE - 109S	18-Sep-17	4357	Chrysococcus sp.	560352	36.65	5.00	5.00	65.40
TPE - 109S	18-Sep-17	4361	Kephyrion boreale Skuja	21552	2.56	6.10	6.10	118.80
TPE - 109S	18-Sep-17	4362	Kephyrion sp.	100576	1.42	3.00	3.00	14.10
TPE - 109S	18-Sep-17	4363	Spiniferomonas sirrata***************	28736	3.41	6.10	6.10	118.80
TPE - 109S	18-Sep-17	4378	Dinobryon borgei Lemmermann	14368	0.61	9.00	3.00	42.40
TPE - 109S	18-Sep-17	4381	Dinobryon mucronutom Nygaard	50288	6.32	9.60	5.00	125.70
TPE - 109S	18-Sep-17	4383	Dinobryon bavaricum Imhof	359200	81.25	12.00	6.00	226.20
TPE - 109S	18-Sep-17	4383	Dinobryon bavaricum Imhof	36000	71.68	0.00	0.00	1991.00
TPE - 109S	18-Sep-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
TPE - 109S	18-Sep-17	4394	Epiphyxis sp.	35920	2.92	9.70	4.00	81.30
TPE - 109S	18-Sep-17	4413	Chrysochromulina laurentiana Kling	43104	17.01	9.10	9.10	394.60
TPE - 109S	18-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	600	0.89	9.80	19.60	1478.40
TPE - 109S	18-Sep-17	5509	Cyclotella ocellata Pant.	28736	2.89	4.00	8.00	100.50
TPE - 109S	18-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	200	0.28	27.00	14.00	1385.40
TPE - 109S	18-Sep-17	5518	Synedra acus Kutzing	2000	0.17	83.00	2.00	86.90
TPE - 109S	18-Sep-17	5551	Cyclotella michiganiana Skvortzow	352016	6.72	2.30	4.60	19.10
TPE - 109S	18-Sep-17	6554	Rhodomonas minuta Skuja	28736	3.03	10.00	5.50	105.60
TPE - 109S	18-Sep-17	6558	Cryptomonas erosa Ehrenberg	2400	2.90	24.00	12.00	1206.40
TPE - 109S	18-Sep-17	6568	Katablepharis ovalis Skuja	7184	0.34	8.20	4.00	46.90

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
TPE - 109S	18-Sep-17	7632	Gymnodinium sp.	200	1.12	22.00	22.00	5575.30
TPE - 109S	18-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	1000	2.14	16.00	16.00	2144.70
TPN - 100S	25-Mar-17	2105	Chlamydomonas spp.	17731	0.83	5.60	4.00	46.90
TPN - 100S	25-Mar-17	2121	Oocystis lacustris Chodat	3546	0.09	5.50	3.00	25.90
TPN - 100S	25-Mar-17	2142	Monoraphidium sp. a	3546	0.20	9.00	4.00	56.50
TPN - 100S	25-Mar-17	2215	Tetraedron caudatum (Corda) Hansgrig	10638	0.05	3.00	3.00	4.70
TPN - 100S	25-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	14184	1.13	42.00	2.20	79.80
TPN - 100S	25-Mar-17	4351	Small chrysophyceae	99291	1.02	2.70	2.70	10.30
TPN - 100S	25-Mar-17	4352	Large chrysophyceae	10638	1.91	7.00	7.00	179.60
TPN - 100S	25-Mar-17	4357	Chrysococcus sp.	223404	11.39	4.60	4.60	51.00
TPN - 100S	25-Mar-17	4388	Dinobryon sertularia Ehrenberg	21277	4.81	12.00	6.00	226.20
TPN - 100S	25-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.11	6.00	3.20	32.20
TPN - 100S	25-Mar-17	5518	Synedra acus Kutzing	100	0.01	100.00	2.00	104.70
TPN - 100S	25-Mar-17	5551	Cyclotella michiganiana Skvortzow	276596	6.39	2.45	4.90	23.10
TPN - 100S	25-Mar-17	6554	Rhodomonas minuta Skuja	17731	2.23	10.00	6.00	125.70
TPN - 100S	25-Mar-17	6558	Cryptomonas erosa Ehrenberg	800	0.98	24.40	12.00	1226.50
TPN - 100S	25-Mar-17	7631	Gymnodinium helveticum Penard	100	2.50	53.00	30.00	24975.70
TPN - 100S	25-Mar-17	7632	Gymnodinium sp.	400	4.60	28.00	28.00	11494.00
TPN - 100S	25-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.21	16.00	16.00	2144.70
TPN - 101S	25-Mar-17	2121	Oocystis lacustris Chodat	3546	0.09	5.50	3.00	25.90
TPN - 101S	25-Mar-17	2137	Dictyosphaerium simplex Sukja	39007	0.16	2.00	2.00	4.20
TPN - 101S	25-Mar-17	2206	Botryococcus braunii Kutzing	100	0.09	12.00	12.00	904.80
TPN - 101S	25-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	3546	0.28	42.00	2.20	79.80
TPN - 101S	25-Mar-17	4351	Small chrysophyceae	99291	1.02	2.70	2.70	10.30
TPN - 101S	25-Mar-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
TPN - 101S	25-Mar-17	4357	Chrysococcus sp.	70922	3.62	4.60	4.60	51.00
TPN - 101S	25-Mar-17	4362	Kephyrion sp.	3546	0.10	3.80	3.80	28.70
TPN - 101S	25-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.34	6.00	3.20	32.20
TPN - 101S	25-Mar-17	5518	Synedra acus Kutzing	600	0.06	100.00	2.00	104.70
TPN - 101S	25-Mar-17	5551	Cyclotella michiganiana Skvortzow	74468	1.72	2.45	4.90	23.10
TPN - 101S	25-Mar-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
TPN - 101S	25-Mar-17	6558	Cryptomonas erosa Ehrenberg	2600	3.19	24.40	12.00	1226.50
TPN - 101S	25-Mar-17	7632	Gymnodinium sp.	300	3.45	28.00	28.00	11494.00
TPN - 101S	25-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.21	16.00	16.00	2144.70
TPN - 102S	7-May-17	2105	Chlamydomonas spp.	10638	0.24	4.70	3.00	22.10
TPN - 102S	7-May-17	2121	Oocystis lacustris Chodat	74468	1.68	5.10	2.90	22.50
TPN - 102S	7-May-17	2137	Dictyosphaerium simplex Sukja	14184	0.06	2.00	2.00	4.20
TPN - 102S	7-May-17	2206	Botryococcus braunii Kutzing	800	0.72	12.00	12.00	904.80
TPN - 102S	7-May-17	2235	Ankistrodesmus spiralis Lemmermann	49645	4.15	44.00	2.20	83.60
TPN - 102S	7-May-17	4351	Small chrysophyceae	81560	1.15	3.00	3.00	14.10
TPN - 102S	7-May-17	4357	Chrysococcus sp.	216312	14.15	5.00	5.00	65.40
TPN - 102S	7-May-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.10	5.50	3.20	29.50
TPN - 102S	7-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.09	5.60	3.00	26.40
TPN - 102S	7-May-17	5509	Cyclotella ocellata Pant.	17731	1.85	4.05	8.10	104.30
TPN - 102S	7-May-17	5551	Cyclotella michiganiana Skvortzow	166667	3.85	2.45	4.90	23.10
TPN - 102S	7-May-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
TPN - 102S	7-May-17	6558	Cryptomonas erosa Ehrenberg	100	0.13	24.90	12.00	1251.60
TPN - 102S	7-May-17	6568	Katablepharis ovalis Skuja	3546	0.17	8.00	4.20	46.90
TPN - 102S	7-May-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.19	15.30	15.30	1875.30
TPN - 102S	7-May-17	7641	Peridinium aciculiferum Lemmermann	100	0.93	31.00	24.00	9349.40
TPN - 103S	7-May-17	2121	Oocystis lacustris Chodat	2936171	66.06	5.10	2.90	22.50
TPN - 103S	7-May-17	2206	Botryococcus braunii Kutzing	300	0.27	12.00	12.00	904.80
TPN - 103S	7-May-17	2512	Scenedesmus acuminatus Chodat	56738	1.51	7.00	3.30	26.60
TPN - 103S	7-May-17	4351	Small chrysophyceae	56738	0.80	3.00	3.00	14.10
TPN - 103S	7-May-17	4357	Chrysococcus sp.	78014	5.10	5.00	5.00	65.40
TPN - 103S	7-May-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
TPN - 103S	7-May-17	5518	Synedra acus Kutzing	400	0.04	100.00	2.00	104.70
TPN - 103S	7-May-17	5551	Cyclotella michiganiana Skvortzow	21277	0.49	2.45	4.90	23.10
TPN - 103S	7-May-17	6554	Rhodomonas minuta Skuja	3546	0.45	10.00	6.00	125.70
TPN - 103S	7-May-17	6558	Cryptomonas erosa Ehrenberg	1300	1.63	24.90	12.00	1251.60
TPN - 104S	4-Jul-17	2121	Oocystis lacustris Chodat	28736	0.70	5.20	3.00	24.50
TPN - 104S	4-Jul-17	2137	Dictyosphaerium simplex Sukja	28736	0.12	2.00	2.00	4.20
TPN - 104S	4-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	43104	0.20	3.00	3.00	4.70
TPN - 104S	4-Jul-17	4351	Small chrysophyceae	64656	0.47	2.40	2.40	7.20
TPN - 104S	4-Jul-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
TPN - 104S	4-Jul-17	4357	Chrysococcus sp.	524432	34.30	5.00	5.00	65.40
TPN - 104S	4-Jul-17	4362	Kephyrion sp.	21552	0.34	3.10	3.10	15.60
TPN - 104S	4-Jul-17	4381	Dinobryon mucronutom Nygaard	7184	0.87	9.30	5.00	121.70
TPN - 104S	4-Jul-17	4388	Dinobryon sertularia Ehrenberg	21552	4.88	12.00	6.00	226.20
TPN - 104S	4-Jul-17	4388	Dinobryon sertularia Ehrenberg	800	2.71	0.00	0.00	3390.00
TPN - 104S	4-Jul-17	4390	Dinobryon sociale Ehrenberg	400	1.00	0.00	0.00	2500.00
TPN - 104S	4-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	28736	0.70	5.20	3.00	24.50
TPN - 104S	4-Jul-17	4401	Uroglena volvox Ehrenberg	14368	1.63	6.00	6.00	113.10
TPN - 104S	4-Jul-17	4413	Chrysochromulina laurentiana Kling	7184	2.93	9.20	9.20	407.70
TPN - 104S	4-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.23	9.00	18.00	1145.10
TPN - 104S	4-Jul-17	5518	Synedra acus Kutzing	400	0.04	100.00	2.00	104.70
TPN - 104S	4-Jul-17	5551	Cyclotella michiganiana Skvortzow	143680	2.40	2.20	4.40	16.70
TPN - 104S	4-Jul-17	6558	Cryptomonas erosa Ehrenberg	400	0.47	23.20	12.00	1166.20
TPN - 104S	4-Jul-17	6565	Cryptomonas rostratiformis Skuja	200	0.42	31.00	14.00	2120.90
TPN - 104S	4-Jul-17	7632	Gymnodinium sp.	4400	23.22	21.60	21.60	5276.70
TPN - 104S	4-Jul-17	7632	Gymnodinium sp.	2000	37.63	33.00	33.00	18816.60
TPN - 104S	4-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	600	0.95	15.50	14.00	1590.70
TPN - 105S	4-Jul-17	2121	Oocystis lacustris Chodat	14368	0.36	5.30	3.00	25.00
TPN - 105S	4-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	43104	3.22	44.00	1.80	74.60
TPN - 105S	4-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	64656	0.30	3.00	3.00	4.70
TPN - 105S	4-Jul-17	4351	Small chrysophyceae	107760	1.38	2.90	2.90	12.80
TPN - 105S	4-Jul-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
TPN - 105S	4-Jul-17	4357	Chrysococcus sp.	589088	38.53	5.00	5.00	65.40

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
TPN - 105S	4-Jul-17	4361	Kephyrion boreale Skuja	7184	0.77	5.90	5.90	107.50
TPN - 105S	4-Jul-17	4362	Kephyrion sp.	28736	0.45	3.10	3.10	15.60
TPN - 105S	4-Jul-17	4381	Dinobryon mucronutom Nygaard	7184	0.87	9.30	5.00	121.70
TPN - 105S	4-Jul-17	4388	Dinobryon sertularia Ehrenberg	43104	9.75	12.00	6.00	226.20
TPN - 105S	4-Jul-17	4388	Dinobryon sertularia Ehrenberg	400	1.36	0.00	0.00	3390.00
TPN - 105S	4-Jul-17	4390	Dinobryon sociale Ehrenberg	400	0.50	0.00	0.00	1250.00
TPN - 105S	4-Jul-17	4394	Epiphyxis sp.	7184	0.48	7.90	4.00	66.20
TPN - 105S	4-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	35920	0.88	5.20	3.00	24.50
TPN - 105S	4-Jul-17	4401	Uroglena volvox Ehrenberg	28736	3.25	6.00	6.00	113.10
TPN - 105S	4-Jul-17	4413	Chrysochromulina laurentiana Kling	28736	11.72	9.20	9.20	407.70
TPN - 105S	4-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.23	9.00	18.00	1145.10
TPN - 105S	4-Jul-17	5509	Cyclotella ocellata Pant.	14368	1.10	3.65	7.30	76.40
TPN - 105S	4-Jul-17	5518	Synedra acus Kutzing	400	0.04	100.00	2.00	104.70
TPN - 105S	4-Jul-17	5551	Cyclotella michiganiana Skvortzow	107760	1.80	2.20	4.40	16.70
TPN - 105S	4-Jul-17	6565	Cryptomonas rostratiformis Skuja	400	0.90	33.00	14.00	2257.80
TPN - 105S	4-Jul-17	7632	Gymnodinium sp.	5200	27.44	21.60	21.60	5276.70
TPN - 105S	4-Jul-17	7632	Gymnodinium sp.	1000	18.82	33.00	33.00	18816.60
TPN - 105S	4-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	800	1.27	15.50	14.00	1590.70
TPN - 106S	27-Aug-17	1054	Planktolyngbya limnetica	400	0.05	121.00	1.20	136.80
TPN - 106S	27-Aug-17	2112	Sphaerocystis schroeteri Chodat	86208	1.62	3.30	3.30	18.80
TPN - 106S	27-Aug-17	2121	Oocystis lacustris Chodat	114944	3.03	5.60	3.00	26.40
TPN - 106S	27-Aug-17	2137	Dictyosphaerium simplex Sukja	158048	0.66	2.00	2.00	4.20
TPN - 106S	27-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	107760	8.41	46.00	1.80	78.00
TPN - 106S	27-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41	9.00	4.00	56.50
TPN - 106S	27-Aug-17	2167	Elakatothrix gelatinosa Willen	93392	1.62	11.00	2.00	17.30
TPN - 106S	27-Aug-17	2178	Cosmarium sp.	200	0.28	20.00	20.00	1396.30
TPN - 106S	27-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.09	14.20	13.00	457.50
TPN - 106S	27-Aug-17	2206	Botryococcus braunii Kutzing	800	0.42	10.00	10.00	523.60
TPN - 106S	27-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	50288	0.24	3.00	3.00	4.70
TPN - 106S	27-Aug-17	4351	Small chrysophyceae	64656	0.83	2.90	2.90	12.80
TPN - 106S	27-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
TPN - 106S	27-Aug-17	4357	Chrysococcus sp.	280176	17.26	4.90	4.90	61.60
TPN - 106S	27-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
TPN - 106S	27-Aug-17	4362	Kephyrion sp.	7184	0.12	3.20	3.20	17.20
TPN - 106S	27-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.66	5.60	5.60	92.00
TPN - 106S	27-Aug-17	4378	Dinobryon borgei Lemmermann	7184	0.33	9.00	3.10	45.30
TPN - 106S	27-Aug-17	4383	Dinobryon bavaricum Imhof	215520	48.75	12.00	6.00	226.20
TPN - 106S	27-Aug-17	4383	Dinobryon bavaricum Imhof	2800	5.57	0.00	0.00	1991.00
TPN - 106S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
TPN - 106S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	200	0.40	0.00	0.00	1991.00
TPN - 106S	27-Aug-17	4390	Dinobryon sociale Ehrenberg	35920	8.13	12.00	6.00	226.20
TPN - 106S	27-Aug-17	4394	Epiphyxis sp.	14368	0.92	7.60	4.00	63.70
TPN - 106S	27-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	14368	0.38	5.60	3.00	26.40
TPN - 106S	27-Aug-17	4413	Chrysochromulina laurentiana Kling	28736	11.34	9.10	9.10	394.60
TPN - 106S	27-Aug-17	4414	Stichogloea spp.	14368	0.72	6.00	4.00	50.30
TPN - 106S	27-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
TPN - 106S	27-Aug-17	5509	Cyclotella ocellata Pant.	57472	6.45	4.15	8.30	112.30
TPN - 106S	27-Aug-17	5518	Synedra acus Kutzing	1400	0.12	82.00	2.00	85.90
TPN - 106S	27-Aug-17	5551	Cyclotella michiganiana Skvortzow	560352	13.73	2.50	5.00	24.50
TPN - 106S	27-Aug-17	6558	Cryptomonas erosa Ehrenberg	200	0.23	22.70	12.00	1141.00
TPN - 106S	27-Aug-17	6565	Cryptomonas rostratiformis Skuja	600	1.23	30.00	14.00	2052.50
TPN - 106S	27-Aug-17	7632	Gymnodinium sp.	800	5.79	24.00	24.00	7238.20
TPN - 107S	27-Aug-17	1054	Planktolyngbya limnetica	200	0.03	121.00	1.20	136.80
TPN - 107S	27-Aug-17	2112	Sphaerocystis schroeteri Chodat	43104	0.81	3.30	3.30	18.80
TPN - 107S	27-Aug-17	2121	Oocystis lacustris Chodat	43104	1.14	5.60	3.00	26.40
TPN - 107S	27-Aug-17	2137	Dictyosphaerium simplex Sukja	107760	0.45	2.00	2.00	4.20
TPN - 107S	27-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	172416	13.45	46.00	1.80	78.00
TPN - 107S	27-Aug-17	2167	Elakatothrix gelatinosa Willen	114944	1.99	11.00	2.00	17.30
TPN - 107S	27-Aug-17	2178	Cosmarium sp.	400	0.56	20.00	20.00	1396.30
TPN - 107S	27-Aug-17	2182	Euastrum spp.	200	0.37	22.00	22.00	1858.40
TPN - 107S	27-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.09	14.20	13.00	457.50
TPN - 107S	27-Aug-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
TPN - 107S	27-Aug-17	2206	Botryococcus braunii Kutzing	1600	0.84	10.00	10.00	523.60
TPN - 107S	27-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
TPN - 107S	27-Aug-17	4351	Small chrysophyceae	14368	0.18	2.90	2.90	12.80
TPN - 107S	27-Aug-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
TPN - 107S	27-Aug-17	4357	Chrysococcus sp.	337648	20.80	4.90	4.90	61.60
TPN - 107S	27-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.00	8.10	8.10	278.30
TPN - 107S	27-Aug-17	4362	Kephyrion sp.	28736	0.49	3.20	3.20	17.20
TPN - 107S	27-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.66	5.60	5.60	92.00
TPN - 107S	27-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	200	0.21	19.60	10.00	1026.30
TPN - 107S	27-Aug-17	4383	Dinobryon bavaricum Imhof	143680	32.50	12.00	6.00	226.20
TPN - 107S	27-Aug-17	4383	Dinobryon bavaricum Imhof	1400	2.79	0.00	0.00	1991.00
TPN - 107S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
TPN - 107S	27-Aug-17	4388	Dinobryon sertularia Ehrenberg	400	0.80	0.00	0.00	1991.00
TPN - 107S	27-Aug-17	4390	Dinobryon sociale Ehrenberg	43104	9.75	12.00	6.00	226.20
TPN - 107S	27-Aug-17	4394	Epiphyxis sp.	21552	1.37	7.60	4.00	63.70
TPN - 107S	27-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	7184	0.19	5.60	3.00	26.40
TPN - 107S	27-Aug-17	4413	Chrysochromulina laurentiana Kling	28736	11.34	9.10	9.10	394.60
TPN - 107S	27-Aug-17	4414	Stichogloea spp.	57472	2.89	6.00	4.00	50.30
TPN - 107S	27-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.25	6.00	3.30	34.20
TPN - 107S	27-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.36	10.50	21.00	1818.40
TPN - 107S	27-Aug-17	5509	Cyclotella ocellata Pant.	43104	4.84	4.15	8.30	112.30
TPN - 107S	27-Aug-17	5518	Synedra acus Kutzing	800	0.07	82.00	2.00	85.90
TPN - 107S	27-Aug-17	5551	Cyclotella michiganiana Skvortzow	639376	15.66	2.50	5.00	24.50
TPN - 107S	27-Aug-17	6558	Cryptomonas erosa Ehrenberg	1000	1.14	22.70	12.00	1141.00
TPN - 107S	27-Aug-17	6565	Cryptomonas rostratiformis Skuja	600	1.23	30.00	14.00	2052.50
TPN - 107S	27-Aug-17	7632	Gymnodinium sp.	1000	7.24	24.00	24.00	7238.20

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
TPN - 107S	27-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.48	16.60	16.60	2395.10
TPN - 108S	16-Sep-17	2137	Dictyosphaerium simplex Sukja	272992	1.15	2.00	2.00	4.20
TPN - 108S	16-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	129312	10.09	46.00	1.80	78.00
TPN - 108S	16-Sep-17	2167	Elakatothrix gelatinosa Willen	21552	0.37	11.00	2.00	17.30
TPN - 108S	16-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.60	12.00	387.40
TPN - 108S	16-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
TPN - 108S	16-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	7184	0.03	3.00	3.00	4.70
TPN - 108S	16-Sep-17	4351	Small chrysophyceae	114944	1.62	3.00	3.00	14.10
TPN - 108S	16-Sep-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
TPN - 108S	16-Sep-17	4357	Chrysococcus sp.	272992	13.92	4.60	4.60	51.00
TPN - 108S	16-Sep-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.15	8.30	8.30	299.40
TPN - 108S	16-Sep-17	4362	Kephyrion sp.	21552	0.44	3.40	3.40	20.60
TPN - 108S	16-Sep-17	4363	Spiniferomonas sirrata***************	7184	0.70	5.70	5.70	97.00
TPN - 108S	16-Sep-17	4378	Dinobryon borgei Lemmermann	21552	1.12	9.10	3.30	51.90
TPN - 108S	16-Sep-17	4381	Dinobryon mucronutom Nygaard	28736	3.61	9.60	5.00	125.70
TPN - 108S	16-Sep-17	4383	Dinobryon bavaricum Imhof	201152	45.50	12.00	6.00	226.20
TPN - 108S	16-Sep-17	4383	Dinobryon bavaricum Imhof	8800	17.52	0.00	0.00	1991.00
TPN - 108S	16-Sep-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
TPN - 108S	16-Sep-17	4413	Chrysochromulina laurentiana Kling	21552	8.50	9.10	9.10	394.60
TPN - 108S	16-Sep-17	4414	Stichogloea spp.	43104	2.17	6.00	4.00	50.30
TPN - 108S	16-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
TPN - 108S	16-Sep-17	5509	Cyclotella ocellata Pant.	35920	3.61	4.00	8.00	100.50
TPN - 108S	16-Sep-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17	90.00	6.00	848.20
TPN - 108S	16-Sep-17	5551	Cyclotella michiganiana Skvortzow	308912	5.90	2.30	4.60	19.10
TPN - 108S	16-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.81	10.00	6.00	125.70
TPN - 108S	16-Sep-17	6558	Cryptomonas erosa Ehrenberg	800	0.99	24.60	12.00	1236.50
TPN - 108S	16-Sep-17	6565	Cryptomonas rostratiformis Skuja	400	0.85	31.00	14.00	2120.90
TPN - 108S	16-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.48	16.60	16.60	2395.10
TPN - 109S	16-Sep-17	2121	Oocystis lacustris Chodat	86208	2.03	5.00	3.00	23.60
TPN - 109S	16-Sep-17	2137	Dictyosphaerium simplex Sukja	122128	0.51	2.00	2.00	4.20
TPN - 109S	16-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	165232	12.89	46.00	1.80	78.00
TPN - 109S	16-Sep-17	2167	Elakatothrix gelatinosa Willen	35920	0.62	11.00	2.00	17.30
TPN - 109S	16-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.09	14.20	13.00	457.50
TPN - 109S	16-Sep-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
TPN - 109S	16-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	28736	0.14	3.00	3.00	4.70
TPN - 109S	16-Sep-17	4351	Small chrysophyceae	71840	1.01	3.00	3.00	14.10
TPN - 109S	16-Sep-17	4352	Large chrysophyceae	21552	3.87	7.00	7.00	179.60
TPN - 109S	16-Sep-17	4357	Chrysococcus sp.	143680	7.33	4.60	4.60	51.00
TPN - 109S	16-Sep-17	4362	Kephyrion sp.	35920	0.74	3.40	3.40	20.60
TPN - 109S	16-Sep-17	4363	Spiniferomonas sirrata***************	14368	1.39	5.70	5.70	97.00
TPN - 109S	16-Sep-17	4378	Dinobryon borgei Lemmermann	14368	0.75	9.10	3.30	51.90
TPN - 109S	16-Sep-17	4381	Dinobryon mucronutom Nygaard	14368	1.81	9.60	5.00	125.70
TPN - 109S	16-Sep-17	4383	Dinobryon bavaricum Imhof	201152	45.50	12.00	6.00	226.20
TPN - 109S	16-Sep-17	4383	Dinobryon bavaricum Imhof	5600	11.15	0.00	0.00	1991.00
TPN - 109S	16-Sep-17	4390	Dinobryon sociale Ehrenberg	21552	4.88	12.00	6.00	226.20
TPN - 109S	16-Sep-17	4394	Epiphyxis sp.	7184	0.54	9.00	4.00	75.40
TPN - 109S	16-Sep-17	4413	Chrysochromulina laurentiana Kling	7184	2.83	9.10	9.10	394.60
TPN - 109S	16-Sep-17	4414	Stichogloea spp.	14368	0.72	6.00	4.00	50.30
TPN - 109S	16-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	1000	1.82	10.50	21.00	1818.40
TPN - 109S	16-Sep-17	5509	Cyclotella ocellata Pant.	28736	2.89	4.00	8.00	100.50
TPN - 109S	16-Sep-17	5518	Synedra acus Kutzing	200	0.02	81.00	2.00	84.80
TPN - 109S	16-Sep-17	5551	Cyclotella michiganiana Skvortzow	308912	5.90	2.30	4.60	19.10
TPN - 109S	16-Sep-17	5720	Cyclotella bodanica Eulenst.	200	1.29	16.00	32.00	6434.00
TPN - 109S	16-Sep-17	6554	Rhodomonas minuta Skuja	7184	0.90	10.00	6.00	125.70
TPN - 109S	16-Sep-17	6558	Cryptomonas erosa Ehrenberg	2000	2.47	24.60	12.00	1236.50
TPN - 109S	16-Sep-17	6565	Cryptomonas rostratiformis Skuja	600	1.23	30.00	14.00	2052.50
TPS - 57S	25-Mar-17	2121	Oocystis lacustris Chodat	3546	0.08	4.90	3.00	23.10
TPS - 57S	25-Mar-17	2137	Dictyosphaerium simplex Sukja	35461	0.17	2.10	2.10	4.80
TPS - 57S	25-Mar-17	2206	Botryococcus braunii Kutzing	300	0.19	10.60	10.60	623.60
TPS - 57S	25-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	28369	2.21	41.00	2.20	77.90
TPS - 57S	25-Mar-17	4351	Small chrysophyceae	21277	0.30	3.00	3.00	14.10
TPS - 57S	25-Mar-17	4352	Large chrysophyceae	10638	1.91	7.00	7.00	179.60
TPS - 57S	25-Mar-17	4357	Chrysococcus sp.	74468	3.32	4.40	4.40	44.60
TPS - 57S	25-Mar-17	4396	Chrysolkos skuja (Nauwerck) Willen	3546	0.10	5.70	3.00	26.90
TPS - 57S	25-Mar-17	4413	Chrysochromulina laurentiana Kling	3546	1.40	9.10	9.10	394.60
TPS - 57S	25-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.10	5.50	3.20	29.50
TPS - 57S	25-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
TPS - 57S	25-Mar-17	5551	Cyclotella michiganiana Skvortzow	78014	1.91	2.50	5.00	24.50
TPS - 57S	25-Mar-17	5720	Cyclotella bodanica Eulenst.	700	4.09	15.50	31.00	5849.40
TPS - 57S	25-Mar-17	6554	Rhodomonas minuta Skuja	17731	2.23	10.00	6.00	125.70
TPS - 57S	25-Mar-17	6558	Cryptomonas erosa Ehrenberg	2300	2.88	24.90	12.00	1251.60
TPS - 57S	25-Mar-17	7632	Gymnodinium sp.	100	0.65	23.20	23.20	6538.30
TPS - 57S	25-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.20	17.30	15.00	2038.10
TPS - 58S	25-Mar-17	2121	Oocystis lacustris Chodat	21277	0.49	4.90	3.00	23.10
TPS - 58S	25-Mar-17	2137	Dictyosphaerium simplex Sukja	39007	0.19	2.10	2.10	4.80
TPS - 58S	25-Mar-17	2167	Elakatothrix gelatinosa Willen	14184	0.39	16.00	2.10	27.70
TPS - 58S	25-Mar-17	2206	Botryococcus braunii Kutzing	1100	0.69	10.60	10.60	623.60
TPS - 58S	25-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	14184	1.10	41.00	2.20	77.90
TPS - 58S	25-Mar-17	4351	Small chrysophyceae	35461	0.50	3.00	3.00	14.10
TPS - 58S	25-Mar-17	4352	Large chrysophyceae	7092	1.27	7.00	7.00	179.60
TPS - 58S	25-Mar-17	4357	Chrysococcus sp.	117021	5.22	4.40	4.40	44.60
TPS - 58S	25-Mar-17	4362	Kephyrion sp.	3546	0.09	3.60	3.60	24.40
TPS - 58S	25-Mar-17	4413	Chrysochromulina laurentiana Kling	10638	4.20	9.10	9.10	394.60
TPS - 58S	25-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	10638	0.29	5.50	3.10	27.70
TPS - 58S	25-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
TPS - 58S	25-Mar-17	5518	Synedra acus Kutzing	100	0.01	100.00	2.00	104.70
TPS - 58S	25-Mar-17	5551	Cyclotella michiganiana Skvortzow	113475	2.78	2.50	5.00	24.50
TPS - 58S	25-Mar-17	5720	Cyclotella bodanica Eulenst.	300	1.75	15.50	31.00	5849.40

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
TPS - 58S	25-Mar-17	6554	Rhodomonas minuta Skuja	14184	1.78	10.00	6.00	125.70
TPS - 58S	25-Mar-17	6558	Cryptomonas erosa Ehrenberg	2000	2.50	24.90	12.00	1251.60
TPS - 58S	25-Mar-17	7632	Gymnodinium sp.	3546	1.19	10.00	8.00	335.10
WAL - 69S	26-Mar-17	2112	Sphaerocystis schroeteri Chodat	117021	2.20	3.30	3.30	18.80
WAL - 69S	26-Mar-17	2137	Dictyosphaerium simplex Sukja	42553	0.18	2.00	2.00	4.20
WAL - 69S	26-Mar-17	2206	Botryococcus braunii Kutzing	1500	1.36	12.00	12.00	904.80
WAL - 69S	26-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	3546	0.28	41.00	2.20	77.90
WAL - 69S	26-Mar-17	4351	Small chrysophyceae	173759	1.60	2.60	2.60	9.20
WAL - 69S	26-Mar-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
WAL - 69S	26-Mar-17	4357	Chrysococcus sp.	138298	5.75	4.30	4.30	41.60
WAL - 69S	26-Mar-17	4400	Ochromonas sp.	17731	1.47	9.00	4.20	83.10
WAL - 69S	26-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.09	5.20	3.10	26.20
WAL - 69S	26-Mar-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	5100	4.13	86.00	6.00	810.50
WAL - 69S	26-Mar-17	5518	Synedra acus Kutzing	1000	0.10	100.00	2.00	104.70
WAL - 69S	26-Mar-17	5551	Cyclotella michiganiana Skvortzow	24823	0.47	2.30	4.60	19.10
WAL - 69S	26-Mar-17	6558	Cryptomonas erosa Ehrenberg	1700	2.07	24.20	12.00	1216.40
WAL - 69S	26-Mar-17	7631	Gymnodinium helveticum Penard	100	2.17	46.00	30.00	21677.00
WAL - 70S	26-Mar-17	2137	Dictyosphaerium simplex Sukja	42553	0.20	2.10	2.10	4.80
WAL - 70S	26-Mar-17	2206	Botryococcus braunii Kutzing	100	0.09	12.00	12.00	904.80
WAL - 70S	26-Mar-17	2235	Ankistrodesmus spiralis Lemmermann	3546	0.28	41.00	2.20	77.90
WAL - 70S	26-Mar-17	4351	Small chrysophyceae	141844	1.30	2.60	2.60	9.20
WAL - 70S	26-Mar-17	4352	Large chrysophyceae	10638	1.91	7.00	7.00	179.60
WAL - 70S	26-Mar-17	4357	Chrysococcus sp.	109929	4.57	4.30	4.30	41.60
WAL - 70S	26-Mar-17	4362	Kephyrion sp.	14184	0.24	3.20	3.20	17.20
WAL - 70S	26-Mar-17	4400	Ochromonas sp.	3546	0.29	9.90	4.00	82.90
WAL - 70S	26-Mar-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	3546	0.10	5.20	3.20	27.90
WAL - 70S	26-Mar-17	5507	Cyclotella stelligera Cleve and Grunow	700	0.93	9.45	18.90	1325.60
WAL - 70S	26-Mar-17	5513	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.65	86.00	6.00	810.50
WAL - 70S	26-Mar-17	5518	Synedra acus Kutzing	300	0.03	110.00	2.00	115.20
WAL - 70S	26-Mar-17	5551	Cyclotella michiganiana Skvortzow	3546	0.07	2.30	4.60	19.10
WAL - 70S	26-Mar-17	6554	Rhodomonas minuta Skuja	10638	1.34	10.00	6.00	125.70
WAL - 70S	26-Mar-17	6558	Cryptomonas erosa Ehrenberg	1800	2.19	24.20	12.00	1216.40
WAL - 70S	26-Mar-17	6568	Katablepharis ovalis Skuja	3546	0.16	8.10	4.00	45.80
WAL - 70S	26-Mar-17	7632	Gymnodinium sp.	100	0.60	22.60	22.60	6044.00
WAL - 70S	26-Mar-17	7635	Peridinium willei Huitfeldt-Kaas	100	2.57	36.60	36.60	25670.90
WAL - 70S	26-Mar-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.16	15.30	14.00	1570.20
WAL - 71S	7-May-17	2105	Chlamydomonas spp.	3546	0.10	6.00	3.00	28.30
WAL - 71S	7-May-17	2121	Oocystis lacustris Chodat	14184	0.37	5.50	3.00	25.90
WAL - 71S	7-May-17	2137	Dictyosphaerium simplex Sukja	3546	0.01	2.00	2.00	4.20
WAL - 71S	7-May-17	2206	Botryococcus braunii Kutzing	100	0.05	10.00	10.00	523.60
WAL - 71S	7-May-17	2235	Ankistrodesmus spiralis Lemmermann	21277	1.78	44.00	2.20	83.60
WAL - 71S	7-May-17	4351	Small chrysophyceae	78014	1.10	3.00	3.00	14.10
WAL - 71S	7-May-17	4352	Large chrysophyceae	7092	1.27	7.00	7.00	179.60
WAL - 71S	7-May-17	4357	Chrysococcus sp.	159575	10.44	5.00	5.00	65.40
WAL - 71S	7-May-17	4362	Kephyrion sp.	3546	0.11	3.90	3.90	31.10
WAL - 71S	7-May-17	4383	Dinobryon bavaricum Imhof	3546	0.80	12.00	6.00	226.20
WAL - 71S	7-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	35461	1.07	6.00	3.10	30.20
WAL - 71S	7-May-17	5518	Synedra acus Kutzing	800	0.08	96.00	2.00	100.50
WAL - 71S	7-May-17	5551	Cyclotella michiganiana Skvortzow	3546	0.09	2.50	5.00	24.50
WAL - 71S	7-May-17	5720	Cyclotella bodanica Eulenst.	100	0.71	16.50	33.00	7056.20
WAL - 71S	7-May-17	6554	Rhodomonas minuta Skuja	46099	5.79	10.00	6.00	125.70
WAL - 71S	7-May-17	6558	Cryptomonas erosa Ehrenberg	1600	2.00	24.90	12.00	1251.60
WAL - 71S	7-May-17	6565	Cryptomonas rostratiformis Skuja	500	1.13	33.00	14.00	2257.80
WAL - 71S	7-May-17	6568	Katablepharis ovalis Skuja	3546	0.18	8.60	4.00	51.60
WAL - 71S	7-May-17	7632	Gymnodinium sp.	100	0.48	21.00	21.00	4849.00
WAL - 71S	7-May-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.19	15.50	15.50	1949.80
WAL - 72S	7-May-17	2105	Chlamydomonas spp.	10638	0.30	6.00	3.00	28.30
WAL - 72S	7-May-17	2121	Oocystis lacustris Chodat	53192	1.38	5.50	3.00	25.90
WAL - 72S	7-May-17	2137	Dictyosphaerium simplex Sukja	21277	0.09	2.00	2.00	4.20
WAL - 72S	7-May-17	2206	Botryococcus braunii Kutzing	100	0.05	10.00	10.00	523.60
WAL - 72S	7-May-17	2215	Tetraedron caudatum (Corda) Hansgrig	3546	0.02	3.00	3.00	4.70
WAL - 72S	7-May-17	2235	Ankistrodesmus spiralis Lemmermann	28369	2.37	44.00	2.20	83.60
WAL - 72S	7-May-17	4351	Small chrysophyceae	99291	1.40	3.00	3.00	14.10
WAL - 72S	7-May-17	4352	Large chrysophyceae	3546	0.64	7.00	7.00	179.60
WAL - 72S	7-May-17	4357	Chrysococcus sp.	429078	28.06	5.00	5.00	65.40
WAL - 72S	7-May-17	4362	Kephyrion sp.	3546	0.11	3.90	3.90	31.10
WAL - 72S	7-May-17	4368	Mallomonas crassisquama (Asmund) Fott	100	0.11	20.30	10.00	1062.90
WAL - 72S	7-May-17	4383	Dinobryon bavaricum Imhof	10638	2.41	12.00	6.00	226.20
WAL - 72S	7-May-17	4400	Ochromonas sp.	3546	0.29	9.00	4.20	83.10
WAL - 72S	7-May-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	17731	0.54	6.00	3.10	30.20
WAL - 72S	7-May-17	5507	Cyclotella stelligera Cleve and Grunow	600	0.89	9.80	19.60	1478.40
WAL - 72S	7-May-17	5518	Synedra acus Kutzing	1200	0.12	96.00	2.00	100.50
WAL - 72S	7-May-17	5551	Cyclotella michiganiana Skvortzow	10638	0.26	2.50	5.00	24.50
WAL - 72S	7-May-17	5720	Cyclotella bodanica Eulenst.	100	0.64	16.00	32.00	6434.00
WAL - 72S	7-May-17	6554	Rhodomonas minuta Skuja	127660	16.05	10.00	6.00	125.70
WAL - 72S	7-May-17	6558	Cryptomonas erosa Ehrenberg	2000	2.50	24.90	12.00	1251.60
WAL - 72S	7-May-17	6562	Cryptomonas reflexa (Marsson) Skuja	100	0.08	21.60	10.00	754.00
WAL - 72S	7-May-17	6565	Cryptomonas rostratiformis Skuja	300	0.68	33.00	14.00	2257.80
WAL - 72S	7-May-17	6568	Katablepharis ovalis Skuja	10638	0.50	8.20	4.00	46.90
WAL - 72S	7-May-17	7639	Peridinium pusillum (Penard) Lemmermann	100	0.19	15.50	15.50	1949.80
WAL - 72S	7-May-17	7641	Peridinium aciculiferum Lemmermann	200	1.87	31.00	24.00	9349.40
WAL - 73S	1-Jul-17	2105	Chlamydomonas spp.	7184	0.36	6.00	4.00	50.30
WAL - 73S	1-Jul-17	2121	Oocystis lacustris Chodat	14368	0.25	5.00	2.60	17.70
WAL - 73S	1-Jul-17	2137	Dictyosphaerium simplex Sukja	28736	0.12	2.00	2.00	4.20
WAL - 73S	1-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	28736	2.09	43.00	1.80	72.90
WAL - 73S	1-Jul-17	2167	Elakatothrix gelatinosa Willen	14368	0.28	12.60	2.00	19.80
WAL - 73S	1-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
WAL - 73S	1-Jul-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume µm^3
WAL - 73S	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
WAL - 73S	1-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	57472	3.58	36.00	2.10	62.30
WAL - 73S	1-Jul-17	4351	Small chrysophyceae	208336	1.92	2.60	2.60	9.20
WAL - 73S	1-Jul-17	4352	Large chrysophyceae	14368	2.58	7.00	7.00	179.60
WAL - 73S	1-Jul-17	4357	Chrysococcus sp.	625008	29.81	4.50	4.50	47.70
WAL - 73S	1-Jul-17	4361	Kephyrion boreale Skuja	7184	0.77	5.90	5.90	107.50
WAL - 73S	1-Jul-17	4362	Kephyrion sp.	150864	2.35	3.10	3.10	15.60
WAL - 73S	1-Jul-17	4378	Dinobryon borgei Lemmermann	28736	1.47	9.00	3.30	51.30
WAL - 73S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	172416	39.00	12.00	6.00	226.20
WAL - 73S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	12400	24.69	0.00	0.00	1991.00
WAL - 73S	1-Jul-17	4390	Dinobryon sociale Ehrenberg	71840	16.25	12.00	6.00	226.20
WAL - 73S	1-Jul-17	4390	Dinobryon sociale Ehrenberg	1400	1.75	0.00	0.00	1250.00
WAL - 73S	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	122128	3.22	5.60	3.00	26.40
WAL - 73S	1-Jul-17	4401	Uroglena volvox Ehrenberg	1602032	181.19	6.00	6.00	113.10
WAL - 73S	1-Jul-17	4403	Chrysosphaerella longispina Lauterborn	7184	3.76	10.00	10.00	523.60
WAL - 73S	1-Jul-17	4413	Chrysochromulina laurentiana Kling	122128	48.19	9.10	9.10	394.60
WAL - 73S	1-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	1400	2.55	10.50	21.00	1818.40
WAL - 73S	1-Jul-17	5509	Cyclotella ocellata Pant.	21552	1.45	3.50	7.00	67.30
WAL - 73S	1-Jul-17	5511	Rhizosolenia eriense H.L. Smith	86208	5.48	9.00	3.00	63.60
WAL - 73S	1-Jul-17	5514	Tabellaria flocculsa (Roth) Kutzing	400	0.53	26.00	14.00	1334.10
WAL - 73S	1-Jul-17	5518	Synedra acus Kutzing	37600	3.54	90.00	2.00	94.20
WAL - 73S	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	64656	1.08	2.20	4.40	16.70
WAL - 73S	1-Jul-17	5720	Cyclotella bodanica Eulenst.	200	1.41	16.50	33.00	7056.20
WAL - 73S	1-Jul-17	6554	Rhodomonas minuta Skuja	57472	5.64	10.00	5.30	98.10
WAL - 73S	1-Jul-17	6558	Cryptomonas erosa Ehrenberg	2800	3.32	23.60	12.00	1186.30
WAL - 73S	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	800	1.81	33.00	14.00	2257.80
WAL - 73S	1-Jul-17	6568	Katablepharis ovalis Skuja	28736	1.62	9.00	4.00	56.50
WAL - 73S	1-Jul-17	7631	Gymnodinium helveticum Penard	400	9.42	50.00	30.00	23561.90
WAL - 73S	1-Jul-17	7632	Gymnodinium sp.	7184	2.31	9.60	8.00	321.70
WAL - 73S	1-Jul-17	7632	Gymnodinium sp.	2000	14.48	24.00	24.00	7238.20
WAL - 73S	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	1600	3.07	16.30	15.00	1920.30
WAL - 73S	1-Jul-17	7641	Peridinium aciculiferum Lemmermann	1000	9.65	32.00	24.00	9651.00
WAL - 74S	1-Jul-17	2105	Chlamydomonas spp.	14368	0.34	5.00	3.00	23.60
WAL - 74S	1-Jul-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	7.45	43.00	4.80	518.70
WAL - 74S	1-Jul-17	2167	Elakatothrix gelatinosa Willen	14368	0.28	12.60	2.00	19.80
WAL - 74S	1-Jul-17	2199	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27	6.00	6.00	37.70
WAL - 74S	1-Jul-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
WAL - 74S	1-Jul-17	2215	Tetraedron caudatum (Corda) Hansgrig	21552	0.10	3.00	3.00	4.70
WAL - 74S	1-Jul-17	2235	Ankistrodesmus spiralis Lemmermann	35920	2.24	36.00	2.10	62.30
WAL - 74S	1-Jul-17	4351	Small chrysophyceae	366384	3.37	2.60	2.60	9.20
WAL - 74S	1-Jul-17	4352	Large chrysophyceae	7184	1.29	7.00	7.00	179.60
WAL - 74S	1-Jul-17	4357	Chrysococcus sp.	272992	13.02	4.50	4.50	47.70
WAL - 74S	1-Jul-17	4361	Kephyrion boreale Skuja	7184	0.77	5.90	5.90	107.50
WAL - 74S	1-Jul-17	4362	Kephyrion sp.	114944	1.79	3.10	3.10	15.60
WAL - 74S	1-Jul-17	4368	Mallomonas crassisquama (Asmund) Fott	600	0.66	21.00	10.00	1099.60
WAL - 74S	1-Jul-17	4378	Dinobryon borgei Lemmermann	43104	2.21	9.00	3.30	51.30
WAL - 74S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	136496	30.88	12.00	6.00	226.20
WAL - 74S	1-Jul-17	4388	Dinobryon sertularia Ehrenberg	13800	27.48	0.00	0.00	1991.00
WAL - 74S	1-Jul-17	4390	Dinobryon sociale Ehrenberg	93392	21.13	12.00	6.00	226.20
WAL - 74S	1-Jul-17	4390	Dinobryon sociale Ehrenberg	1800	2.25	0.00	0.00	1250.00
WAL - 74S	1-Jul-17	4396	Chrysolkos skuja (Nauwerck) Willen	79024	2.09	5.60	3.00	26.40
WAL - 74S	1-Jul-17	4401	Uroglena volvox Ehrenberg	1681056	190.13	6.00	6.00	113.10
WAL - 74S	1-Jul-17	4413	Chrysochromulina laurentiana Kling	258624	102.05	9.10	9.10	394.60
WAL - 74S	1-Jul-17	4414	Stichogloea spp.	28736	1.45	6.00	4.00	50.30
WAL - 74S	1-Jul-17	5507	Cyclotella stelligera Cleve and Grunow	600	1.09	10.50	21.00	1818.40
WAL - 74S	1-Jul-17	5509	Cyclotella ocellata Pant.	7184	0.48	3.50	7.00	67.30
WAL - 74S	1-Jul-17	5511	Rhizosolenia eriense H.L. Smith	64656	4.11	9.00	3.00	63.60
WAL - 74S	1-Jul-17	5518	Synedra acus Kutzing	31800	3.00	90.00	2.00	94.20
WAL - 74S	1-Jul-17	5551	Cyclotella michiganiana Skvortzow	86208	1.44	2.20	4.40	16.70
WAL - 74S	1-Jul-17	6554	Rhodomonas minuta Skuja	165232	16.21	10.00	5.30	98.10
WAL - 74S	1-Jul-17	6558	Cryptomonas erosa Ehrenberg	2200	2.61	23.60	12.00	1186.30
WAL - 74S	1-Jul-17	6565	Cryptomonas rostratiformis Skuja	1400	3.16	33.00	14.00	2257.80
WAL - 74S	1-Jul-17	6568	Katablepharis ovalis Skuja	64656	3.65	9.00	4.00	56.50
WAL - 74S	1-Jul-17	7631	Gymnodinium helveticum Penard	600	14.14	50.00	30.00	23561.90
WAL - 74S	1-Jul-17	7632	Gymnodinium sp.	21552	6.93	9.60	8.00	321.70
WAL - 74S	1-Jul-17	7632	Gymnodinium sp.	2400	17.37	24.00	24.00	7238.20
WAL - 74S	1-Jul-17	7639	Peridinium pusillum (Penard) Lemmermann	2400	4.61	16.30	15.00	1920.30
WAL - 74S	1-Jul-17	7641	Peridinium aciculiferum Lemmermann	800	7.72	32.00	24.00	9651.00
WAL - 75S	26-Aug-17	2105	Chlamydomonas spp.	7184	0.31	5.20	4.00	43.60
WAL - 75S	26-Aug-17	2112	Sphaerocystis schroeteri Chodat	28736	0.45	3.10	3.10	15.60
WAL - 75S	26-Aug-17	2121	Oocystis lacustris Chodat	158048	4.09	5.50	3.00	25.90
WAL - 75S	26-Aug-17	2137	Dictyosphaerium simplex Sukja	330464	1.39	2.00	2.00	4.20
WAL - 75S	26-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	114944	9.55	49.00	1.80	83.10
WAL - 75S	26-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41	9.00	4.00	56.50
WAL - 75S	26-Aug-17	2167	Elakatothrix gelatinosa Willen	7184	0.12	11.00	2.00	17.30
WAL - 75S	26-Aug-17	2187	Staurodesmus extensus (Andersson) Teiling	200	0.08	13.60	12.00	387.40
WAL - 75S	26-Aug-17	2206	Botryococcus braunii Kutzing	1800	0.94	10.00	10.00	523.60
WAL - 75S	26-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	100576	0.47	3.00	3.00	4.70
WAL - 75S	26-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	7184	0.42	34.00	2.10	58.90
WAL - 75S	26-Aug-17	2247	Oocystis gigas Archer	400	0.97	18.00	16.00	2412.70
WAL - 75S	26-Aug-17	2509	Scenedesmus ecornis	14368	0.56	7.00	4.00	39.10
WAL - 75S	26-Aug-17	4351	Small chrysophyceae	107760	1.52	3.00	3.00	14.10
WAL - 75S	26-Aug-17	4352	Large chrysophyceae	28736	5.16	7.00	7.00	179.60
WAL - 75S	26-Aug-17	4357	Chrysococcus sp.	531616	34.77	5.00	5.00	65.40
WAL - 75S	26-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	7184	2.00	8.10	8.10	278.30
WAL - 75S	26-Aug-17	4362	Kephyrion sp.	21552	0.20	2.60	2.60	9.20
WAL - 75S	26-Aug-17	4363	Spiniferomonas sirrata***************	21552	1.98	5.60	5.60	92.00
WAL - 75S	26-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	600	0.60	19.20	10.00	1005.30

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
WAL - 75S	26-Aug-17	4378	Dinobryon borgei Lemmermann	28736	1.30	9.00	3.10	45.30
WAL - 75S	26-Aug-17	4383	Dinobryon bavaricum Imhof	165232	37.38	12.00	6.00	226.20
WAL - 75S	26-Aug-17	4383	Dinobryon bavaricum Imhof	7400	9.25	0.00	0.00	1250.00
WAL - 75S	26-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	800	3.32	0.00	0.00	4150.00
WAL - 75S	26-Aug-17	4388	Dinobryon sertularia Ehrenberg	14368	3.25	12.00	6.00	226.20
WAL - 75S	26-Aug-17	4390	Dinobryon sociale Ehrenberg	114944	26.00	12.00	6.00	226.20
WAL - 75S	26-Aug-17	4396	Chrysolkos skuja (Nauwerck) Willen	21552	0.65	5.60	3.20	30.00
WAL - 75S	26-Aug-17	4401	Uroglena volvox Ehrenberg	35920	4.06	6.00	6.00	113.10
WAL - 75S	26-Aug-17	4413	Chrysochromulina laurentiana Kling	7184	2.83	9.10	9.10	394.60
WAL - 75S	26-Aug-17	4414	Stichogloea spp.	35920	1.81	6.00	4.00	50.30
WAL - 75S	26-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23	6.00	3.20	32.20
WAL - 75S	26-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	1600	2.91	10.50	21.00	1818.40
WAL - 75S	26-Aug-17	5509	Cyclotella ocellata Pant.	7184	0.81	4.15	8.30	112.30
WAL - 75S	26-Aug-17	5518	Synedra acus Kutzing	600	0.06	90.00	2.00	94.20
WAL - 75S	26-Aug-17	5551	Cyclotella michiganiana Skvortzow	531616	13.02	2.50	5.00	24.50
WAL - 75S	26-Aug-17	5720	Cyclotella bodanica Eulenst.	200	1.41	16.50	33.00	7056.20
WAL - 75S	26-Aug-17	6554	Rhodomonas minuta Skuja	28736	2.82	10.00	5.30	98.10
WAL - 75S	26-Aug-17	6558	Cryptomonas erosa Ehrenberg	5000	6.03	24.00	12.00	1206.40
WAL - 75S	26-Aug-17	6568	Katablepharis ovalis Skuja	7184	0.26	7.20	4.00	36.20
WAL - 75S	26-Aug-17	7632	Gymnodinium sp.	2200	14.02	23.00	23.00	6370.60
WAL - 75S	26-Aug-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
WAL - 75S	26-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	800	1.75	16.10	16.10	2185.10
WAL - 75S	26-Aug-17	7641	Peridinium aciculiferum Lemmermann	400	3.62	30.00	24.00	9047.80
WAL - 76S	26-Aug-17	2105	Chlamydomonas spp.	43104	1.88	5.20	4.00	43.60
WAL - 76S	26-Aug-17	2112	Sphaerocystis schroeteri Chodat	28736	0.45	3.10	3.10	15.60
WAL - 76S	26-Aug-17	2121	Oocystis lacustris Chodat	50288	1.30	5.50	3.00	25.90
WAL - 76S	26-Aug-17	2137	Dictyosphaerium simplex Sukja	237072	1.00	2.00	2.00	4.20
WAL - 76S	26-Aug-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	122128	10.15	49.00	1.80	83.10
WAL - 76S	26-Aug-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41	9.00	4.00	56.50
WAL - 76S	26-Aug-17	2145	Crucigenia quadrata Morr.	28736	0.14	3.00	3.00	4.70
WAL - 76S	26-Aug-17	2167	Elakatothrix gelatinosa Willen	7184	0.12	11.00	2.00	17.30
WAL - 76S	26-Aug-17	2169	Planctonema lauterbornii Schmidle	14368	2.82	15.60	4.00	196.00
WAL - 76S	26-Aug-17	2205	Mougeotia sp.	200	1.43	63.00	12.00	7125.10
WAL - 76S	26-Aug-17	2206	Botryococcus braunii Kutzing	1000	0.52	10.00	10.00	523.60
WAL - 76S	26-Aug-17	2215	Tetraedron caudatum (Corda) Hansgrig	100576	0.47	3.00	3.00	4.70
WAL - 76S	26-Aug-17	2235	Ankistrodesmus spiralis Lemmermann	14368	0.87	35.00	2.10	60.60
WAL - 76S	26-Aug-17	2247	Oocystis gigas Archer	400	0.97	18.00	16.00	2412.70
WAL - 76S	26-Aug-17	4351	Small chrysophyceae	122128	1.72	3.00	3.00	14.10
WAL - 76S	26-Aug-17	4352	Large chrysophyceae	50288	9.03	7.00	7.00	179.60
WAL - 76S	26-Aug-17	4357	Chrysococcus sp.	603456	39.47	5.00	5.00	65.40
WAL - 76S	26-Aug-17	4358	Chrysostephanospaera globulifera Scherffel	200	0.06	8.10	8.10	278.30
WAL - 76S	26-Aug-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
WAL - 76S	26-Aug-17	4362	Kephyrion sp.	71840	0.66	2.60	2.60	9.20
WAL - 76S	26-Aug-17	4363	Spiniferomonas sirrata***************	7184	0.66	5.60	5.60	92.00
WAL - 76S	26-Aug-17	4368	Mallomonas crassisquama (Asmund) Fott	400	0.40	19.20	10.00	1005.30
WAL - 76S	26-Aug-17	4378	Dinobryon borgei Lemmermann	7184	0.33	9.00	3.10	45.30
WAL - 76S	26-Aug-17	4383	Dinobryon bavaricum Imhof	122128	27.63	12.00	6.00	226.20
WAL - 76S	26-Aug-17	4383	Dinobryon bavaricum Imhof	4400	5.50	0.00	0.00	1250.00
WAL - 76S	26-Aug-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.66	0.00	0.00	4150.00
WAL - 76S	26-Aug-17	4388	Dinobryon sertularia Ehrenberg	7184	1.63	12.00	6.00	226.20
WAL - 76S	26-Aug-17	4390	Dinobryon sociale Ehrenberg	28736	6.50	12.00	6.00	226.20
WAL - 76S	26-Aug-17	4394	Epiphyxis sp.	7184	0.55	9.10	4.00	76.20
WAL - 76S	26-Aug-17	4401	Uroglena volvox Ehrenberg	21552	2.44	6.00	6.00	113.10
WAL - 76S	26-Aug-17	4413	Chrysochromulina laurentiana Kling	21552	8.50	9.10	9.10	394.60
WAL - 76S	26-Aug-17	4414	Stichogloea spp.	50288	2.53	6.00	4.00	50.30
WAL - 76S	26-Aug-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93	6.00	3.20	32.20
WAL - 76S	26-Aug-17	5507	Cyclotella stelligera Cleve and Grunow	1000	1.82	10.50	21.00	1818.40
WAL - 76S	26-Aug-17	5509	Cyclotella ocellata Pant.	21552	2.42	4.15	8.30	112.30
WAL - 76S	26-Aug-17	5518	Synedra acus Kutzing	1600	0.15	90.00	2.00	94.20
WAL - 76S	26-Aug-17	5551	Cyclotella michiganiana Skvortzow	603456	14.78	2.50	5.00	24.50
WAL - 76S	26-Aug-17	5720	Cyclotella bodanica Eulenst.	200	1.41	16.50	33.00	7056.20
WAL - 76S	26-Aug-17	6554	Rhodomonas minuta Skuja	43104	4.55	10.00	5.50	105.60
WAL - 76S	26-Aug-17	6558	Cryptomonas erosa Ehrenberg	3400	4.10	24.00	12.00	1206.40
WAL - 76S	26-Aug-17	6568	Katablepharis ovalis Skuja	14368	0.52	7.20	4.00	36.20
WAL - 76S	26-Aug-17	7632	Gymnodinium sp.	800	5.10	23.00	23.00	6370.60
WAL - 76S	26-Aug-17	7639	Peridinium pusillum (Penard) Lemmermann	1400	3.06	16.10	16.10	2185.10
WAL - 77S	16-Sep-17	1054	Planktolyngbya limnetica	200	0.02	106.00	1.20	119.90
WAL - 77S	16-Sep-17	1073	Snowella sp	200	0.10	0.00	0.00	500.00
WAL - 77S	16-Sep-17	2112	Sphaerocystis schroeteri Chodat	28736	0.45	3.10	3.10	15.60
WAL - 77S	16-Sep-17	2121	Oocystis lacustris Chodat	150864	4.27	6.00	3.00	28.30
WAL - 77S	16-Sep-17	2137	Dictyosphaerium simplex Sukja	93392	0.39	2.00	2.00	4.20
WAL - 77S	16-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	71840	5.36	44.00	1.80	74.60
WAL - 77S	16-Sep-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.90	10.00	4.00	62.80
WAL - 77S	16-Sep-17	2167	Elakatothrix gelatinosa Willen	7184	0.11	10.00	2.00	15.70
WAL - 77S	16-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
WAL - 77S	16-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	107760	0.51	3.00	3.00	4.70
WAL - 77S	16-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	71840	4.35	35.00	2.10	60.60
WAL - 77S	16-Sep-17	4351	Small chrysophyceae	222704	3.14	3.00	3.00	14.10
WAL - 77S	16-Sep-17	4352	Large chrysophyceae	57472	10.32	7.00	7.00	179.60
WAL - 77S	16-Sep-17	4357	Chrysococcus sp.	581904	38.06	5.00	5.00	65.40
WAL - 77S	16-Sep-17	4361	Kephyrion boreale Skuja	7184	0.90	6.20	6.20	124.80
WAL - 77S	16-Sep-17	4362	Kephyrion sp.	143680	1.84	2.90	2.90	12.80
WAL - 77S	16-Sep-17	4378	Dinobryon borgei Lemmermann	28736	1.22	9.00	3.00	42.40
WAL - 77S	16-Sep-17	4381	Dinobryon mucronutom Nygaard	14368	1.81	9.60	5.00	125.70
WAL - 77S	16-Sep-17	4383	Dinobryon bavaricum Imhof	301728	68.25	12.00	6.00	226.20
WAL - 77S	16-Sep-17	4383	Dinobryon bavaricum Imhof	3800	7.57	0.00	0.00	1991.00
WAL - 77S	16-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	600	2.49	0.00	0.00	4150.00
WAL - 77S	16-Sep-17	4390	Dinobryon sociale Ehrenberg	57472	13.00	12.00	6.00	226.20

Table B–2. Phytoplankton species data, Meadowbank study lakes and Baker Lake, 2017.

Station	Date	Species code	Species name	density cells/L	biomass mg/m^3	length µm	width µm	cell volume $µm^3$
WAL - 77S	16-Sep-17	4394	Epiphyxis sp.	14368	1.12	9.30	4.00	77.90
WAL - 77S	16-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	43104	1.25	5.40	3.20	29.00
WAL - 77S	16-Sep-17	4413	Chrysochromulina laurentiana Kling	64656	25.51	9.10	9.10	394.60
WAL - 77S	16-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19	5.50	3.00	25.90
WAL - 77S	16-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	400	0.73	10.50	21.00	1818.40
WAL - 77S	16-Sep-17	5509	Cyclotella ocellata Pant.	79024	6.81	3.80	7.60	86.20
WAL - 77S	16-Sep-17	5518	Synedra acus Kutzing	3200	0.27	82.00	2.00	85.90
WAL - 77S	16-Sep-17	5551	Cyclotella michiganiana Skvortzow	639376	10.68	2.20	4.40	16.70
WAL - 77S	16-Sep-17	5720	Cyclotella bodanica Eulenst.	1200	9.26	17.00	34.00	7717.30
WAL - 77S	16-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.81	10.00	6.00	125.70
WAL - 77S	16-Sep-17	6558	Cryptomonas erosa Ehrenberg	5000	5.83	23.20	12.00	1166.20
WAL - 77S	16-Sep-17	7631	Gymnodinium helveticum Penard	400	9.42	50.00	30.00	23561.90
WAL - 77S	16-Sep-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
WAL - 77S	16-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	200	0.40	15.60	15.60	1987.80
WAL - 77SR	16-Sep-17	1054	Planktolyngbya limnetica	800	0.10	106.00	1.20	119.90
WAL - 77SR	16-Sep-17	1073	Snowella sp	600	0.30	0.00	0.00	500.00
WAL - 77SR	16-Sep-17	2121	Oocystis lacustris Chodat	136496	3.86	6.00	3.00	28.30
WAL - 77SR	16-Sep-17	2137	Dictyosphaerium simplex Sukja	114944	0.48	2.00	2.00	4.20
WAL - 77SR	16-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	86208	45.76	44.00	4.80	530.80
WAL - 77SR	16-Sep-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	21552	1.35	10.00	4.00	62.80
WAL - 77SR	16-Sep-17	2206	Botryococcus braunii Kutzing	200	0.10	10.00	10.00	523.60
WAL - 77SR	16-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	150864	0.71	3.00	3.00	4.70
WAL - 77SR	16-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	50288	3.05	35.00	2.10	60.60
WAL - 77SR	16-Sep-17	4351	Small chrysophyceae	179600	2.53	3.00	3.00	14.10
WAL - 77SR	16-Sep-17	4352	Large chrysophyceae	28736	5.16	7.00	7.00	179.60
WAL - 77SR	16-Sep-17	4357	Chrysococcus sp.	617824	40.41	5.00	5.00	65.40
WAL - 77SR	16-Sep-17	4361	Kephyrion boreale Skuja	7184	0.90	6.20	6.20	124.80
WAL - 77SR	16-Sep-17	4362	Kephyrion sp.	193968	2.48	2.90	2.90	12.80
WAL - 77SR	16-Sep-17	4378	Dinobryon borgei Lemmermann	43104	1.83	9.00	3.00	42.40
WAL - 77SR	16-Sep-17	4381	Dinobryon mucronutom Nygaard	28736	3.61	9.60	5.00	125.70
WAL - 77SR	16-Sep-17	4383	Dinobryon bavaricum Imhof	287360	65.00	12.00	6.00	226.20
WAL - 77SR	16-Sep-17	4383	Dinobryon bavaricum Imhof	3000	5.97	0.00	0.00	1991.00
WAL - 77SR	16-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.83	0.00	0.00	4150.00
WAL - 77SR	16-Sep-17	4390	Dinobryon sociale Ehrenberg	71840	16.25	12.00	6.00	226.20
WAL - 77SR	16-Sep-17	4394	Epiphyxis sp.	28736	2.24	9.30	4.00	77.90
WAL - 77SR	16-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	64656	1.88	5.40	3.20	29.00
WAL - 77SR	16-Sep-17	4413	Chrysochromulina laurentiana Kling	57472	22.68	9.10	9.10	394.60
WAL - 77SR	16-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	800	1.45	10.50	21.00	1818.40
WAL - 77SR	16-Sep-17	5509	Cyclotella ocellata Pant.	43104	3.72	3.80	7.60	86.20
WAL - 77SR	16-Sep-17	5518	Synedra acus Kutzing	3800	0.33	82.00	2.00	85.90
WAL - 77SR	16-Sep-17	5551	Cyclotella michiganiana Skvortzow	545984	9.12	2.20	4.40	16.70
WAL - 77SR	16-Sep-17	5720	Cyclotella bodanica Eulenst.	800	6.17	17.00	34.00	7717.30
WAL - 77SR	16-Sep-17	6554	Rhodomonas minuta Skuja	7184	0.90	10.00	6.00	125.70
WAL - 77SR	16-Sep-17	6558	Cryptomonas erosa Ehrenberg	6000	7.00	23.20	12.00	1166.20
WAL - 77SR	16-Sep-17	6565	Cryptomonas rostratiformis Skuja	600	1.35	33.00	14.00	2257.80
WAL - 77SR	16-Sep-17	7631	Gymnodinium helveticum Penard	200	4.71	50.00	30.00	23561.90
WAL - 77SR	16-Sep-17	7632	Gymnodinium sp.	400	3.77	26.20	26.20	9416.80
WAL - 77SR	16-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	400	0.80	15.60	15.60	1987.80
WAL - 78S	16-Sep-17	2121	Oocystis lacustris Chodat	14368	0.41	6.00	3.00	28.30
WAL - 78S	16-Sep-17	2137	Dictyosphaerium simplex Sukja	14368	0.06	2.00	2.00	4.20
WAL - 78S	16-Sep-17	2138	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	107760	57.20	44.00	4.80	530.80
WAL - 78S	16-Sep-17	2143	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.50	11.00	4.00	69.10
WAL - 78S	16-Sep-17	2187	Staurodesmus extensus (Andersson) Teiling	1000	0.42	14.10	12.00	416.40
WAL - 78S	16-Sep-17	2206	Botryococcus braunii Kutzing	400	0.21	10.00	10.00	523.60
WAL - 78S	16-Sep-17	2215	Tetraedron caudatum (Corda) Hansgrig	71840	0.34	3.00	3.00	4.70
WAL - 78S	16-Sep-17	2235	Ankistrodesmus spiralis Lemmermann	71840	4.35	35.00	2.10	60.60
WAL - 78S	16-Sep-17	4351	Small chrysophyceae	165232	2.33	3.00	3.00	14.10
WAL - 78S	16-Sep-17	4352	Large chrysophyceae	28736	5.16	7.00	7.00	179.60
WAL - 78S	16-Sep-17	4357	Chrysococcus sp.	768688	50.27	5.00	5.00	65.40
WAL - 78S	16-Sep-17	4361	Kephyrion boreale Skuja	7184	0.85	6.10	6.10	118.80
WAL - 78S	16-Sep-17	4362	Kephyrion sp.	100576	1.29	2.90	2.90	12.80
WAL - 78S	16-Sep-17	4363	Spiniferomonas sirrata***************	21552	1.88	5.50	5.50	87.10
WAL - 78S	16-Sep-17	4368	Mallomonas crassisquama (Asmund) Fott	600	0.62	19.60	10.00	1026.30
WAL - 78S	16-Sep-17	4378	Dinobryon borgei Lemmermann	86208	3.66	9.00	3.00	42.40
WAL - 78S	16-Sep-17	4381	Dinobryon mucronutom Nygaard	43104	5.42	9.60	5.00	125.70
WAL - 78S	16-Sep-17	4383	Dinobryon bavaricum Imhof	330464	74.75	12.00	6.00	226.20
WAL - 78S	16-Sep-17	4383	Dinobryon bavaricum Imhof	4800	9.56	0.00	0.00	1991.00
WAL - 78S	16-Sep-17	4384	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1000	4.15	0.00	0.00	4150.00
WAL - 78S	16-Sep-17	4390	Dinobryon sociale Ehrenberg	7184	1.63	12.00	6.00	226.20
WAL - 78S	16-Sep-17	4394	Epiphyxis sp.	21552	1.73	9.60	4.00	80.40
WAL - 78S	16-Sep-17	4396	Chrysolkos skuja (Nauwerck) Willen	43104	1.25	5.40	3.20	29.00
WAL - 78S	16-Sep-17	4413	Chrysochromulina laurentiana Kling	93392	36.85	9.10	9.10	394.60
WAL - 78S	16-Sep-17	4414	Stichogloea spp.	21552	1.08	6.00	4.00	50.30
WAL - 78S	16-Sep-17	4418	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.22	5.60	3.20	30.00
WAL - 78S	16-Sep-17	5507	Cyclotella stelligera Cleve and Grunow	200	0.36	10.50	21.00	1818.40
WAL - 78S	16-Sep-17	5509	Cyclotella ocellata Pant.	100576	8.67	3.80	7.60	86.20
WAL - 78S	16-Sep-17	5514	Tabellaria flocculsa (Roth) Kutzing	800	1.07	26.00	14.00	1334.10
WAL - 78S	16-Sep-17	5518	Synedra acus Kutzing	6800	0.58	82.00	2.00	85.90
WAL - 78S	16-Sep-17	5551	Cyclotella michiganiana Skvortzow	854896	14.28	2.20	4.40	16.70
WAL - 78S	16-Sep-17	5720	Cyclotella bodanica Eulenst.	400	3.09	17.00	34.00	7717.30
WAL - 78S	16-Sep-17	6554	Rhodomonas minuta Skuja	14368	1.81	10.00	6.00	125.70
WAL - 78S	16-Sep-17	6558	Cryptomonas erosa Ehrenberg	8800	10.31	23.30	12.00	1171.20
WAL - 78S	16-Sep-17	6565	Cryptomonas rostratiformis Skuja	600	1.27	31.00	14.00	2120.90
WAL - 78S	16-Sep-17	7631	Gymnodinium helveticum Penard	200	4.71	50.00	30.00	23561.90
WAL - 78S	16-Sep-17	7632	Gymnodinium sp.	600	4.91	25.00	25.00	8181.20
WAL - 78S	16-Sep-17	7635	Peridinium willei Huitfeldt-Kaas	200	4.49	35.00	35.00	22449.30
WAL - 78S	16-Sep-17	7639	Peridinium pusillum (Penard) Lemmermann	600	1.19	15.60	15.60	1987.80

APPENDIX C – PHYTOPLANKTON PLOTS

Appendix C1 – Meadowbank Phytoplankton Plots, 2006-2017

LIST OF FIGURES – APPENDIX C1

Figure C1-1. Cyanophyte biomass (mg/m^3) from Meadowbank study lakes since 2006.

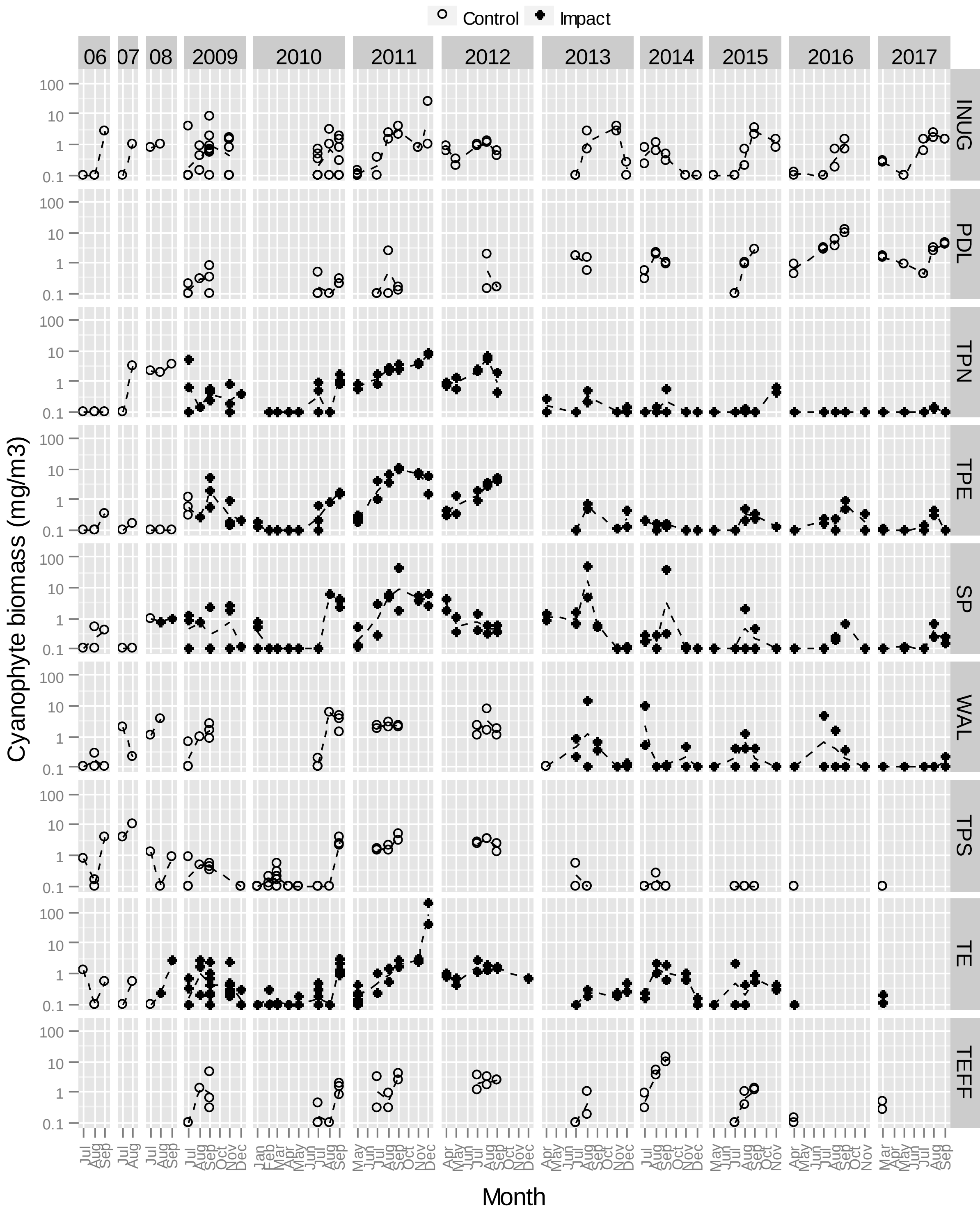



Figure C1–2. Chlorophyte biomass (mg/m^3) from Meadowbank study lakes since 2006.

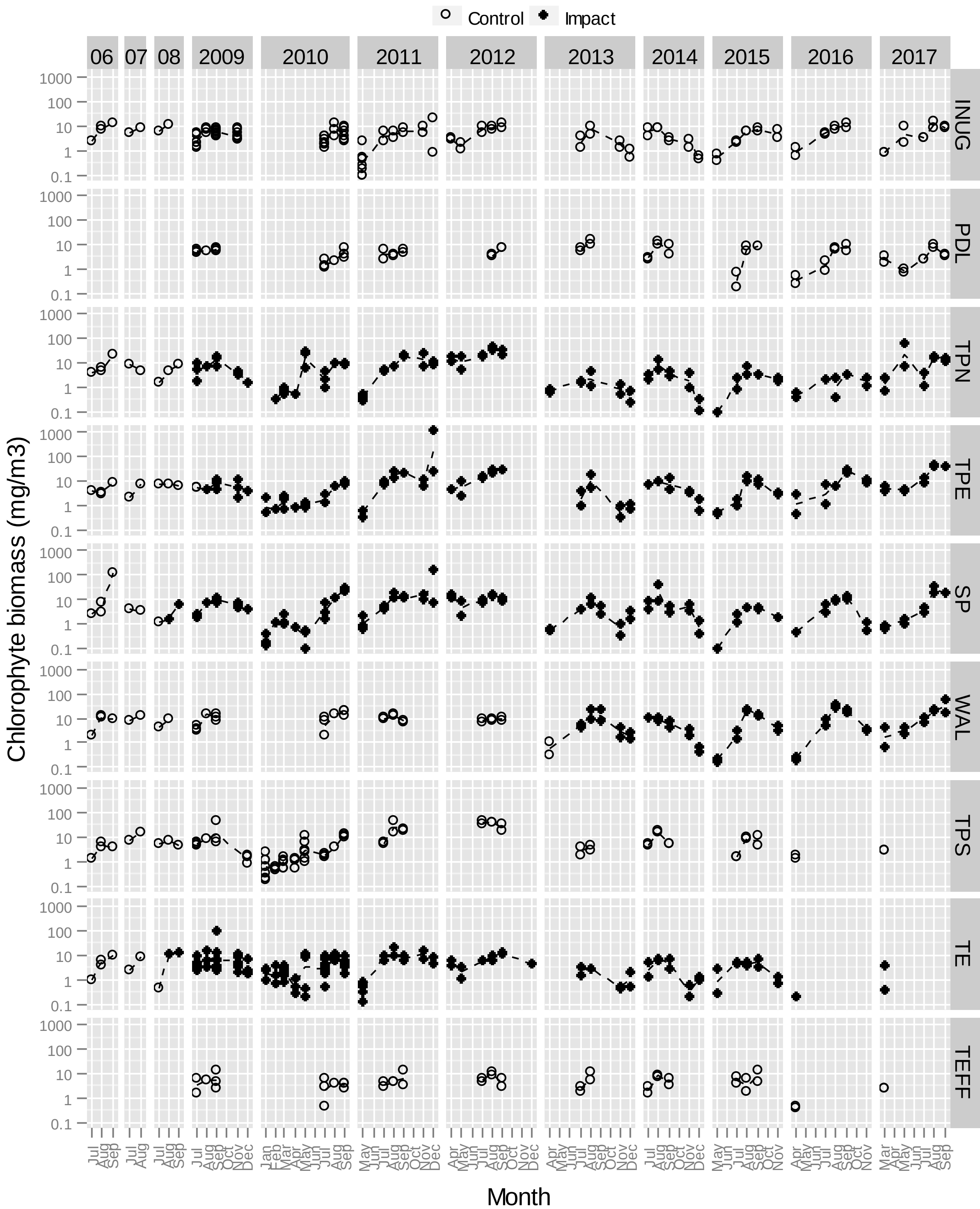


Figure C1–3. Chrysophyte biomass (mg/m^3) from Meadowbank study lakes since 2006.

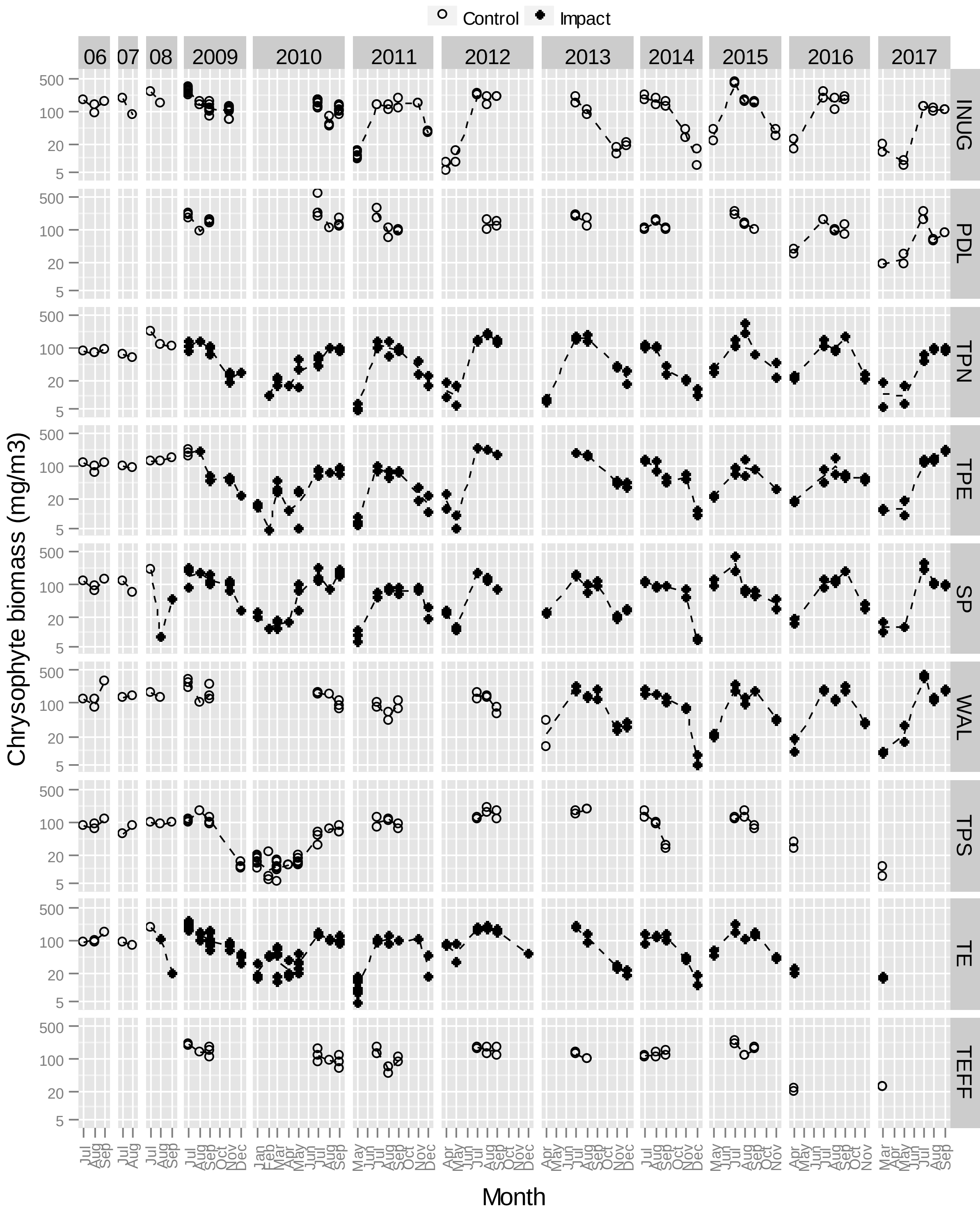


Figure C1–4. Diatom biomass (mg/m^3) from Meadowbank study lakes since 2006.

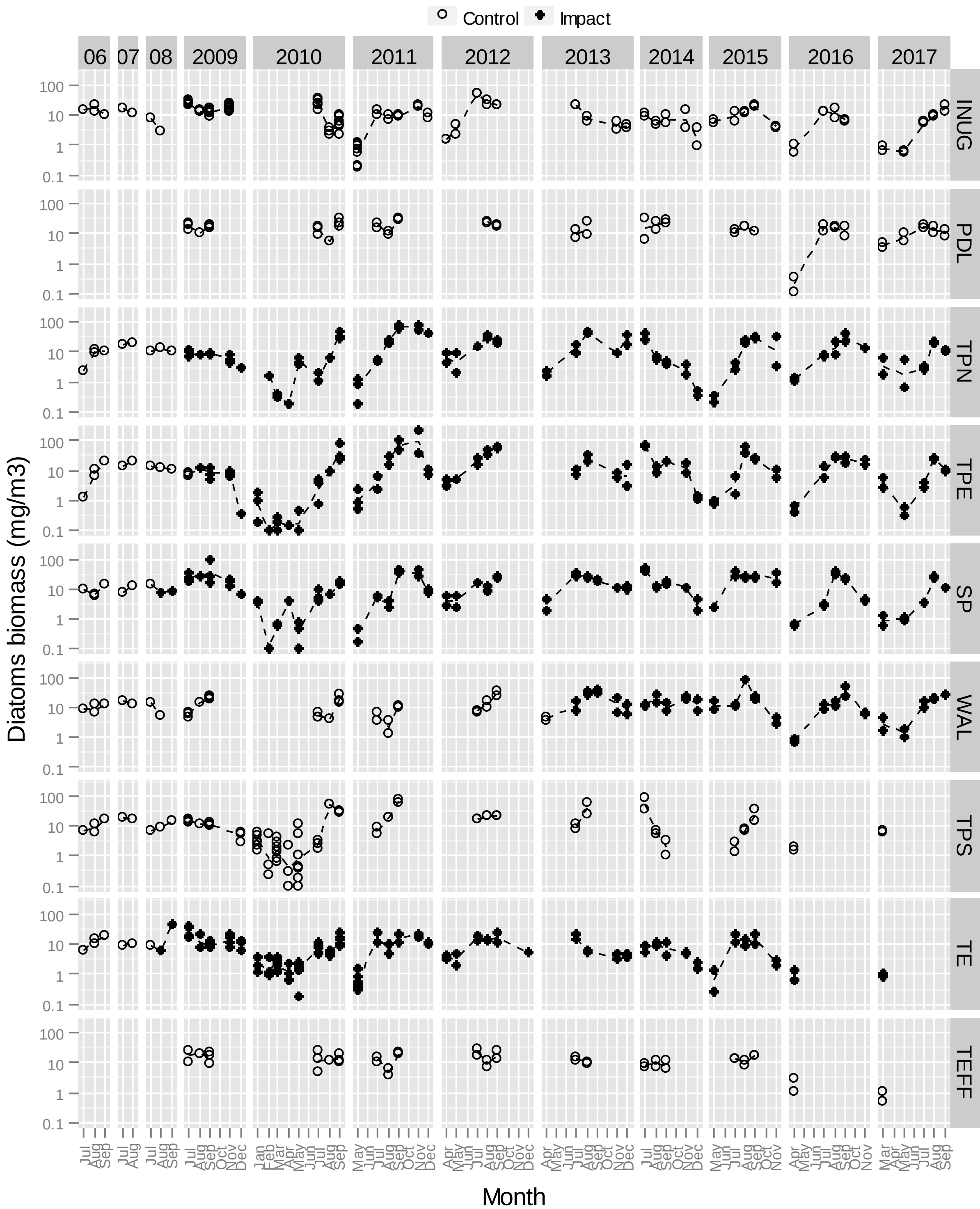


Figure C1–5. Cryptophyte biomass (mg/m^3) from Meadowbank study lakes since 2006.

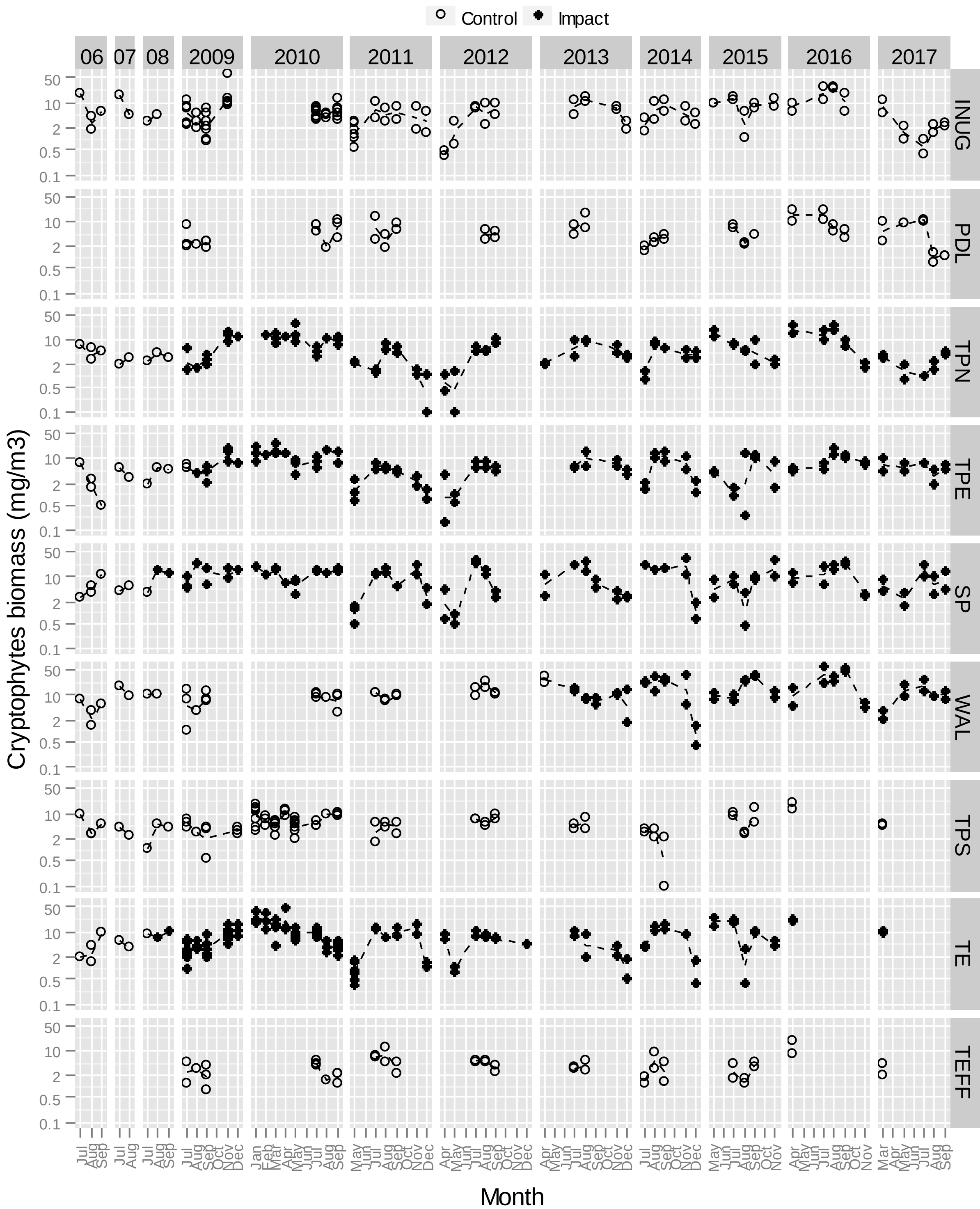


Figure C1–6. Dinoflagellate biomass (mg/m[3]) from Meadowbank study lakes since 2006.

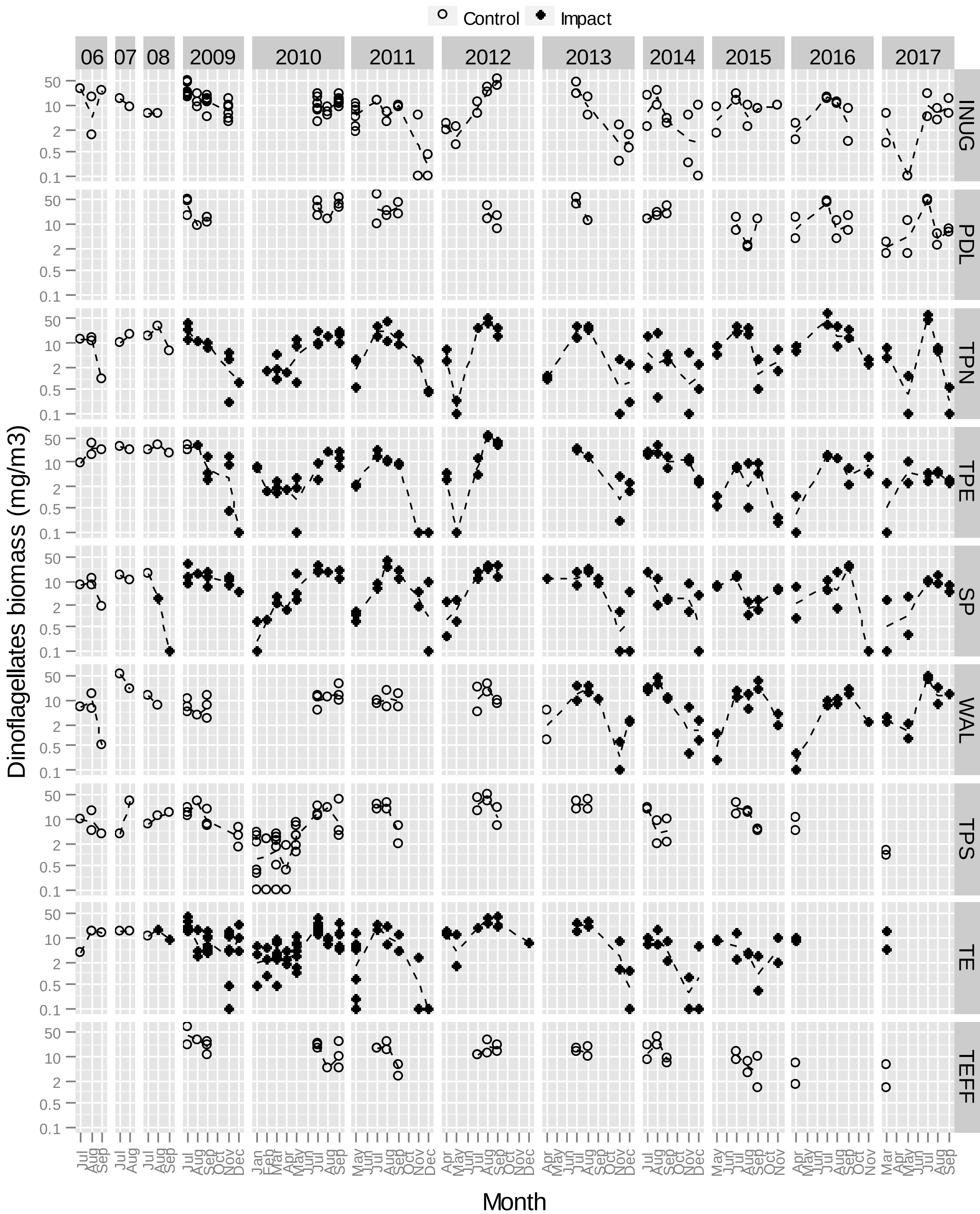


Figure C1–7. Total phytoplankton density (cells/L) from Meadowbank study lakes since 2006.

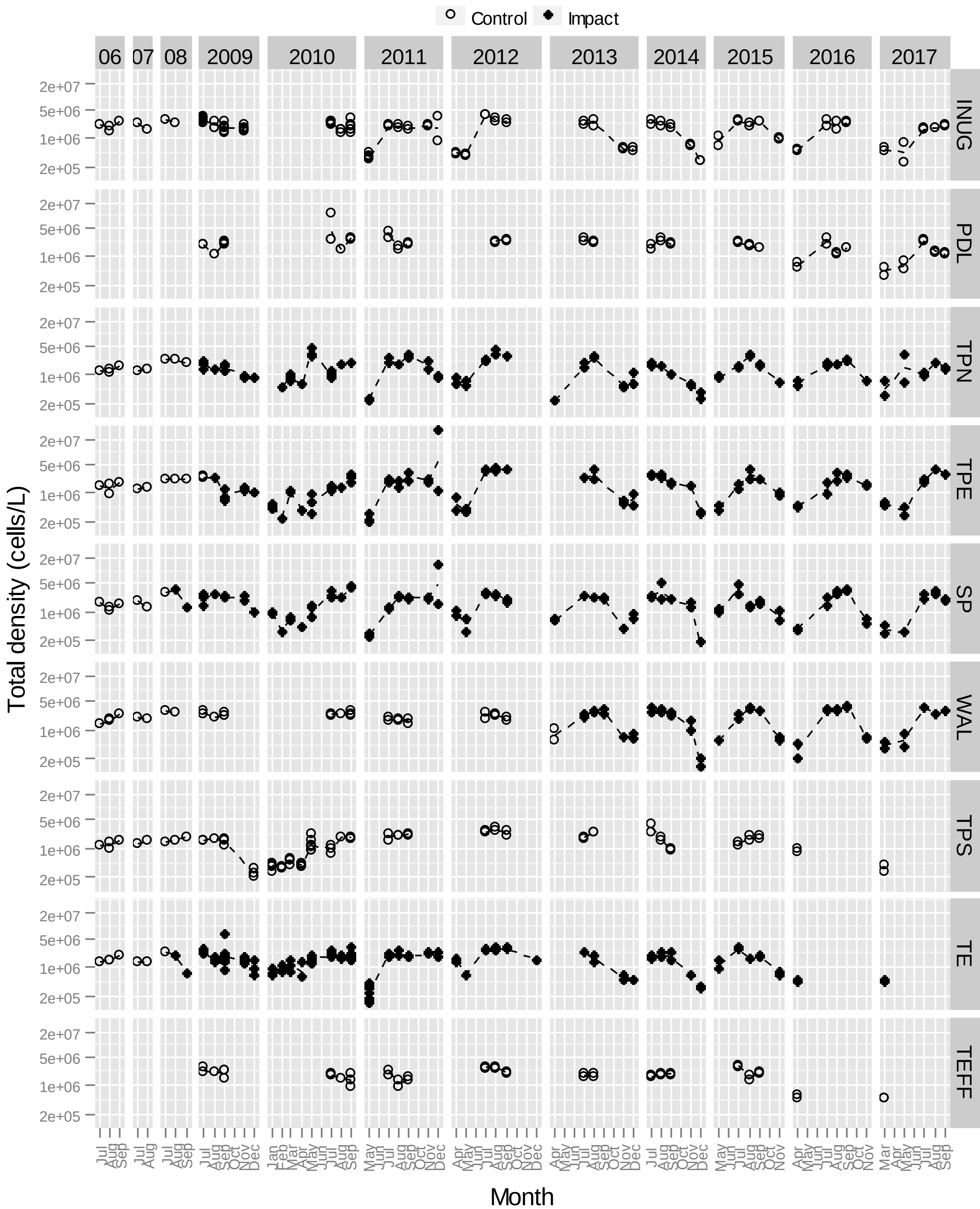


Figure C1–8. Phytoplankton density (cells/L) by major taxa group from Meadowbank study lakes since 2006.

Figure C1–9. Relative phytoplankton density by major taxa group from Meadowbank study lakes since 2006.

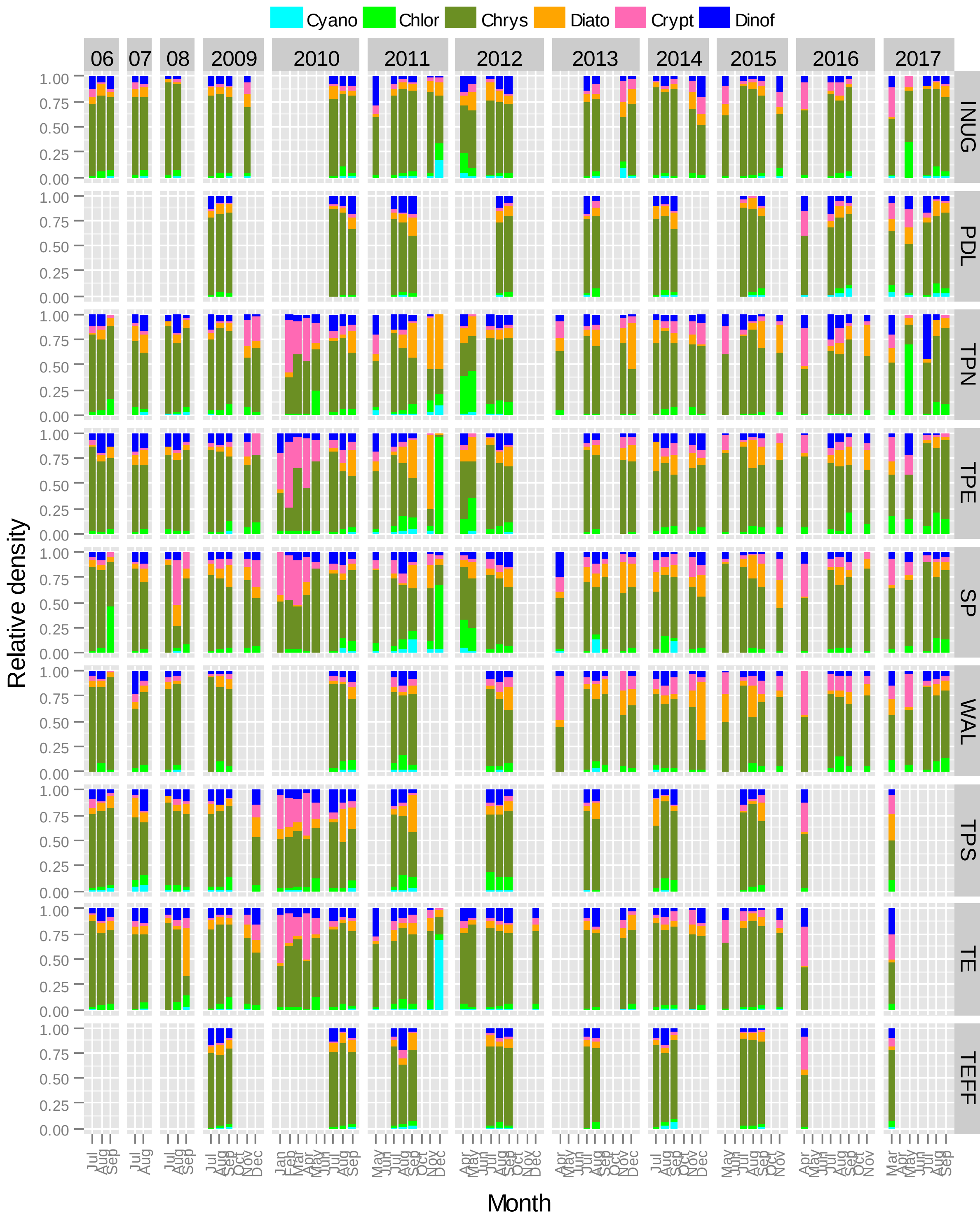


Figure C1–10. Cyanophyte density (cells/L) from Meadowbank study lakes since 2006.

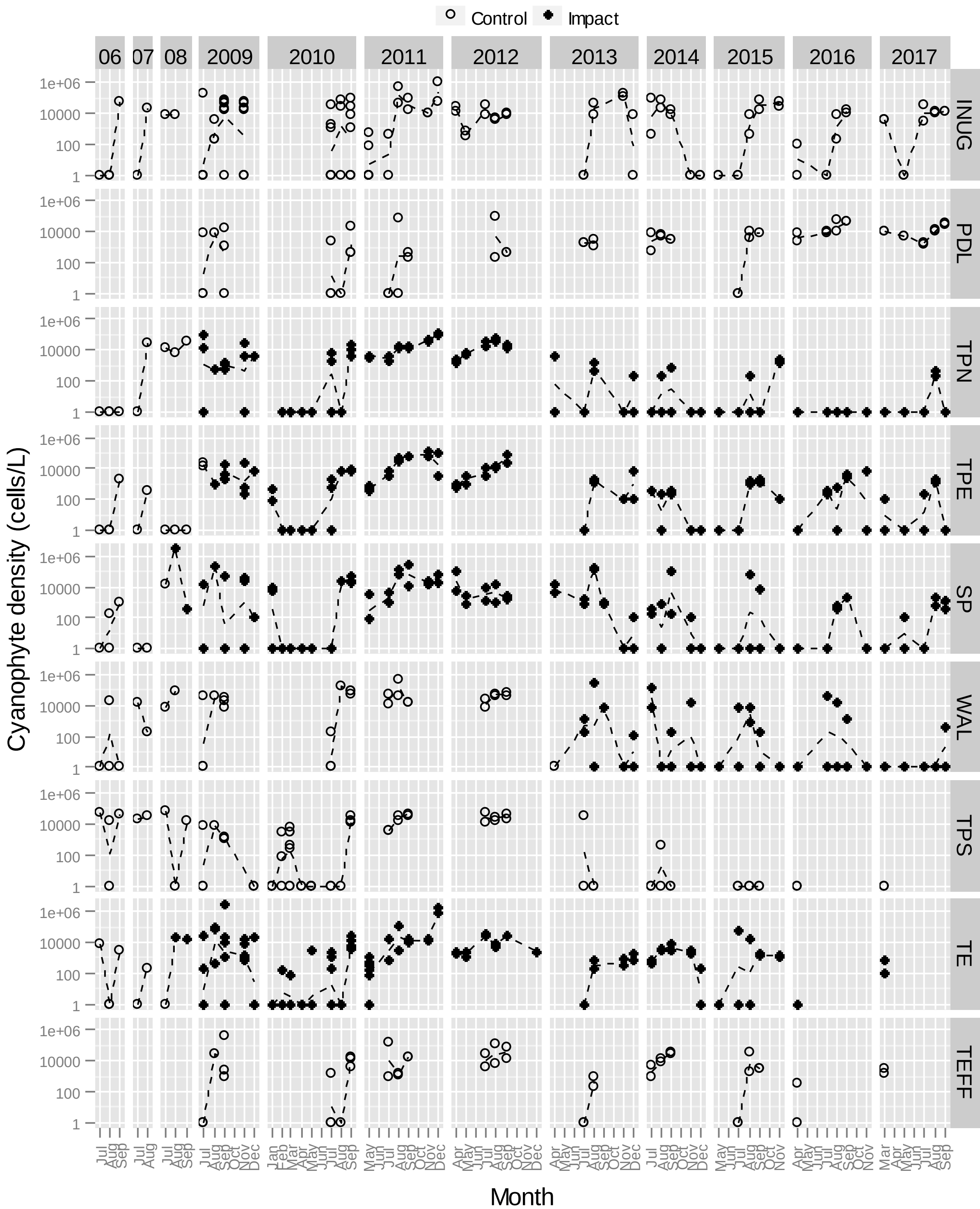


Figure C1–11. Chlorophyte density (cells/L) from Meadowbank study lakes since 2006.

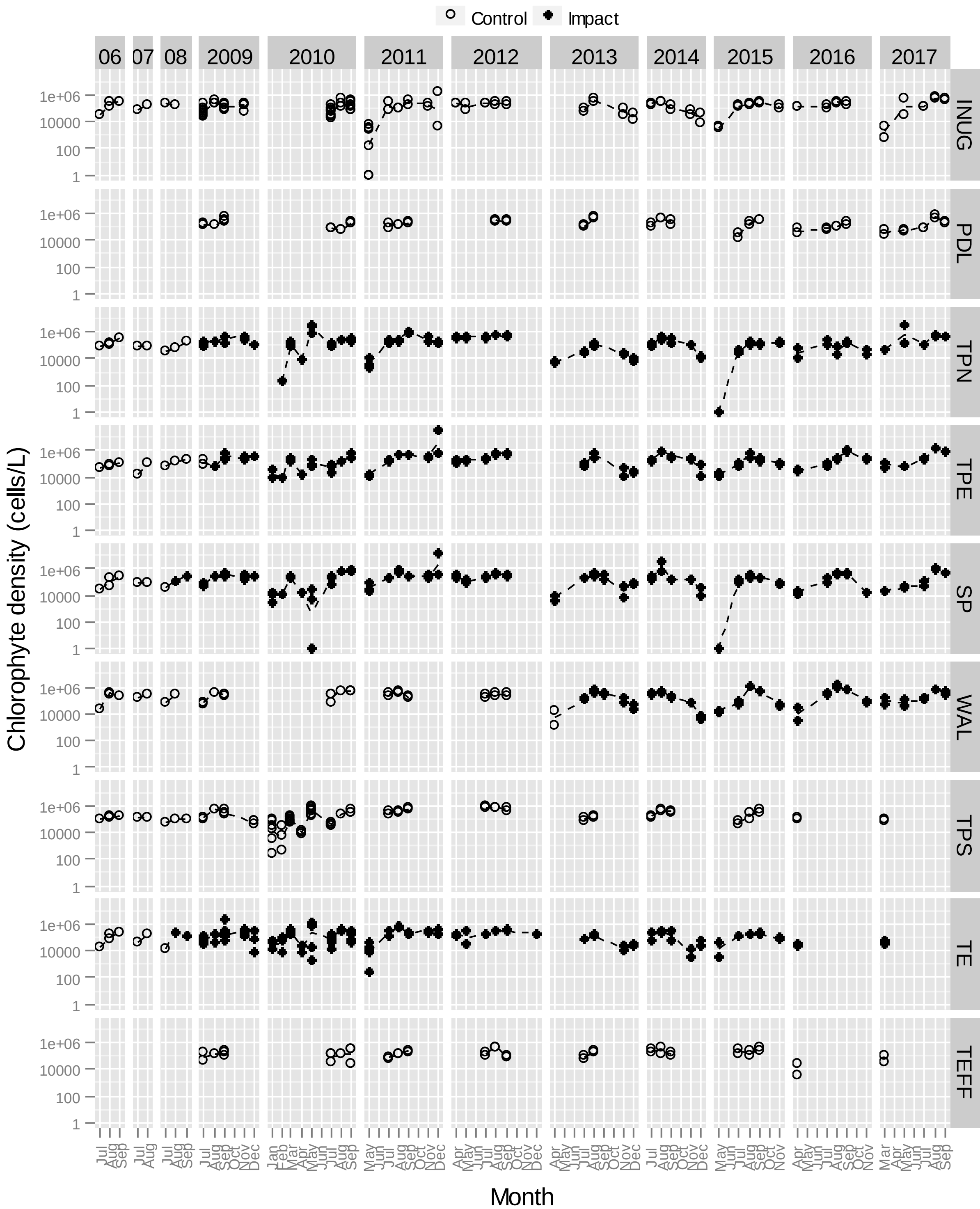


Figure C1–12. Chrysophyte density (cells/L) from Meadowbank study lakes since 2006.

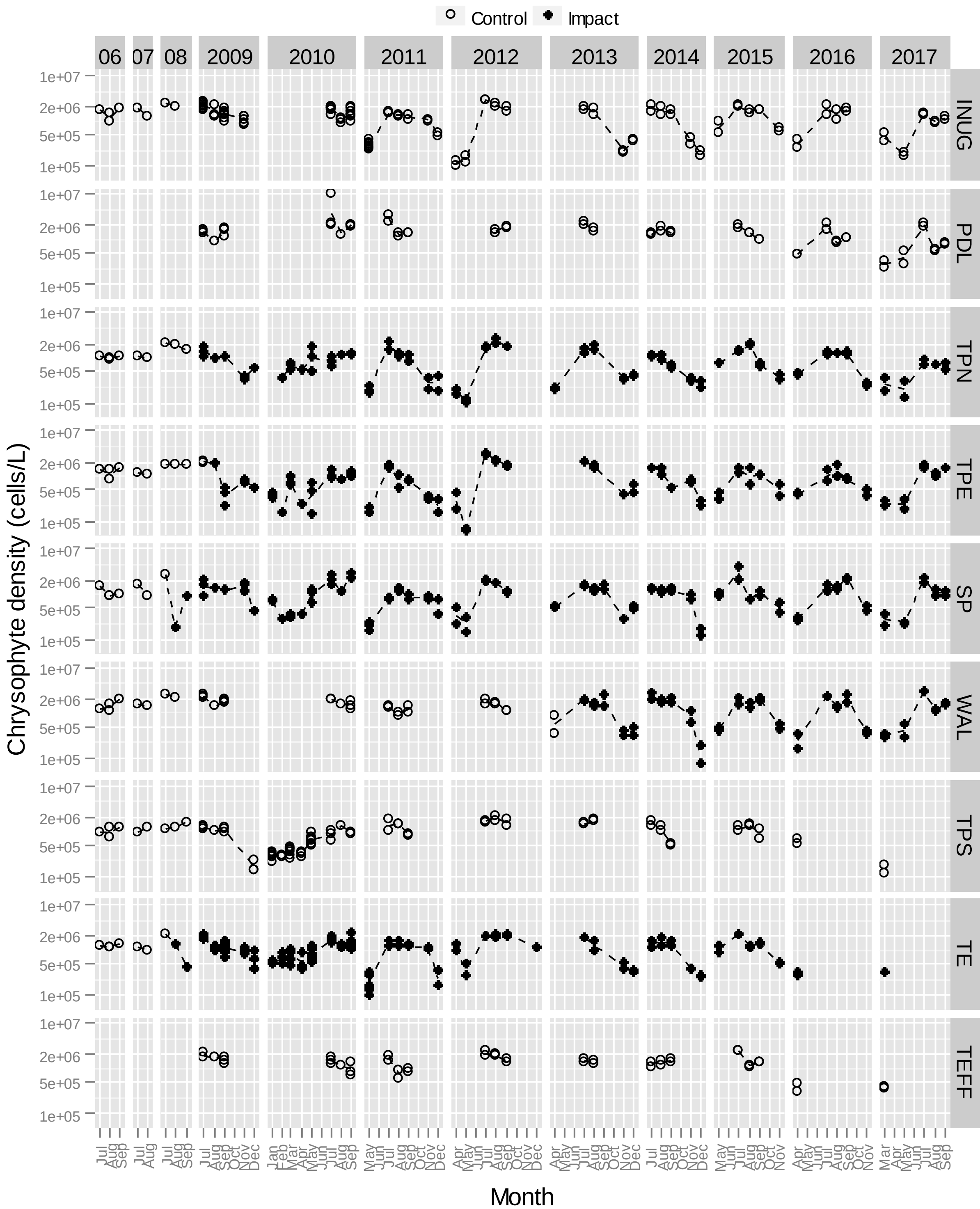


Figure C1–13. Diatom density (cells/L) from Meadowbank study lakes since 2006.

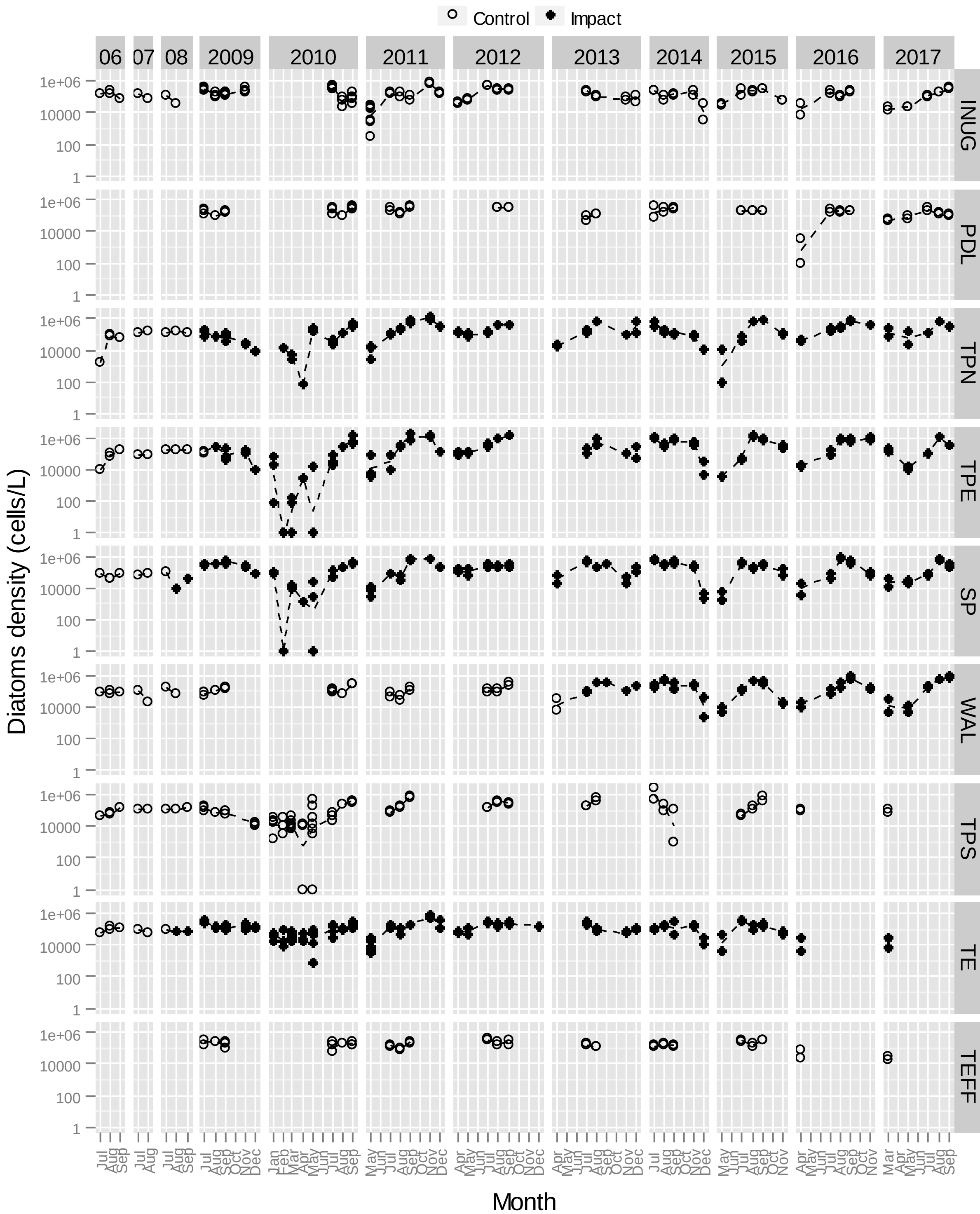


Figure C1–14. Cryptophytes density (cells/L) from Meadowbank study lakes since 2006.

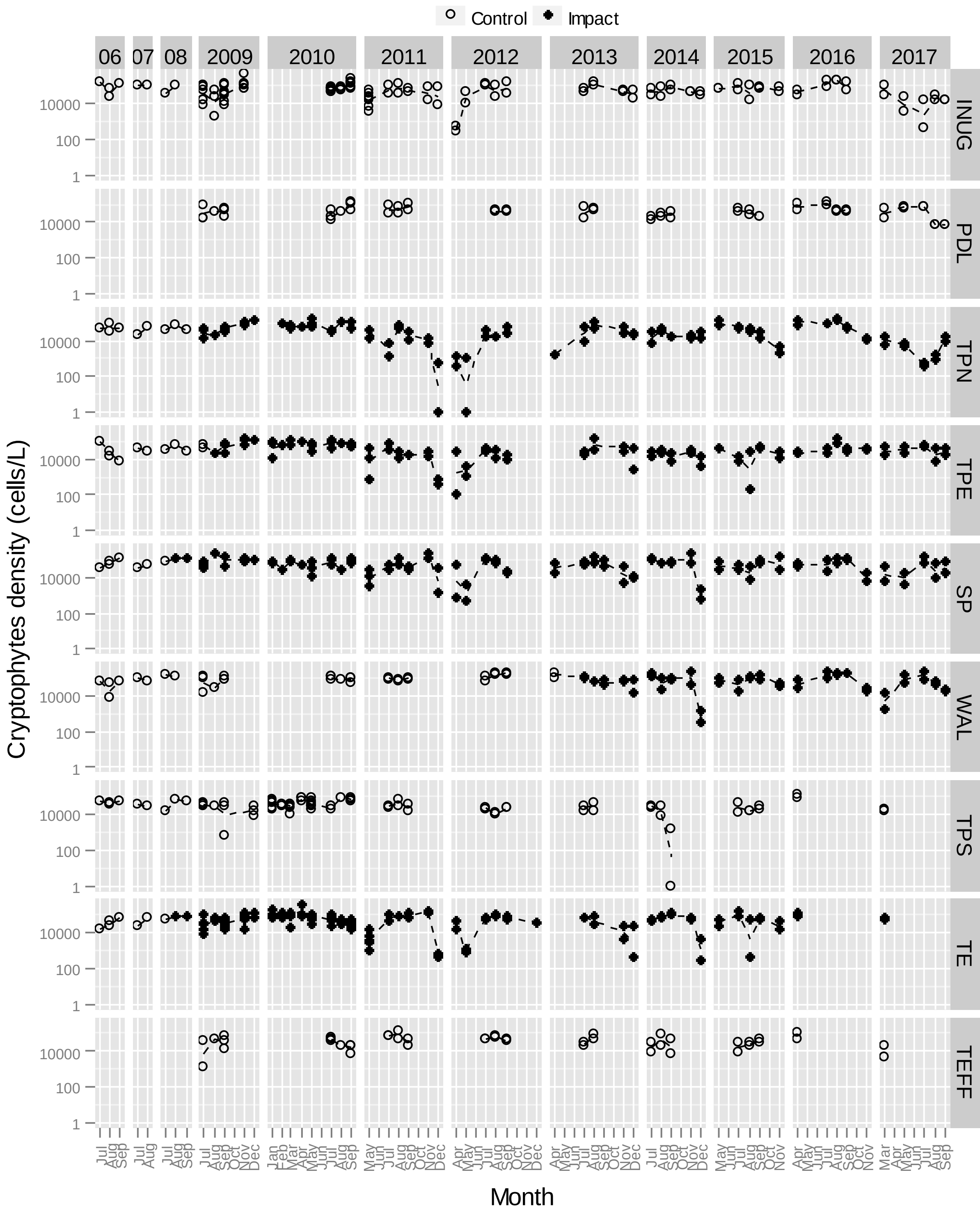


Figure C1–15. Dinoflagellates density (cells/L) from Meadowbank study lakes since 2006.

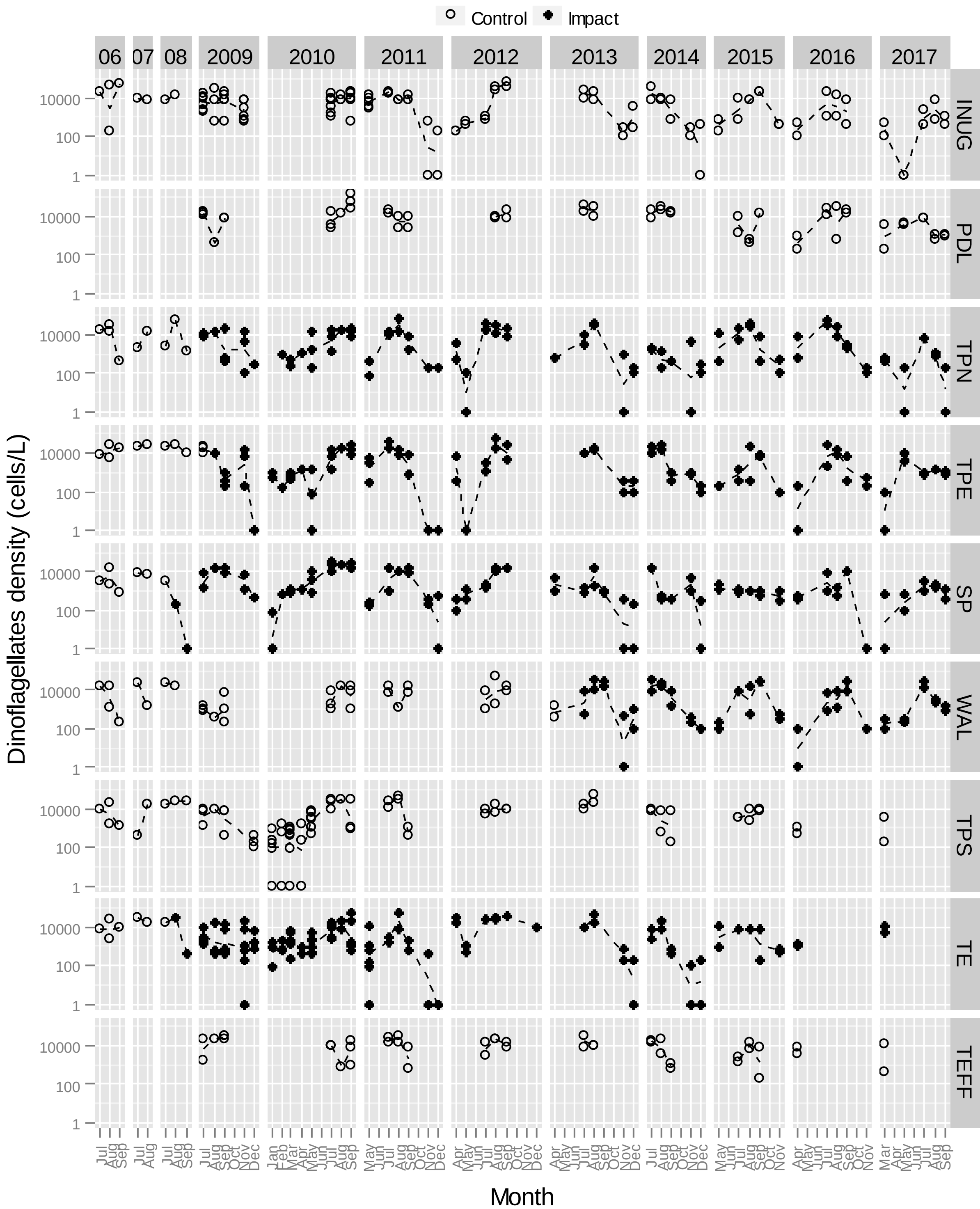
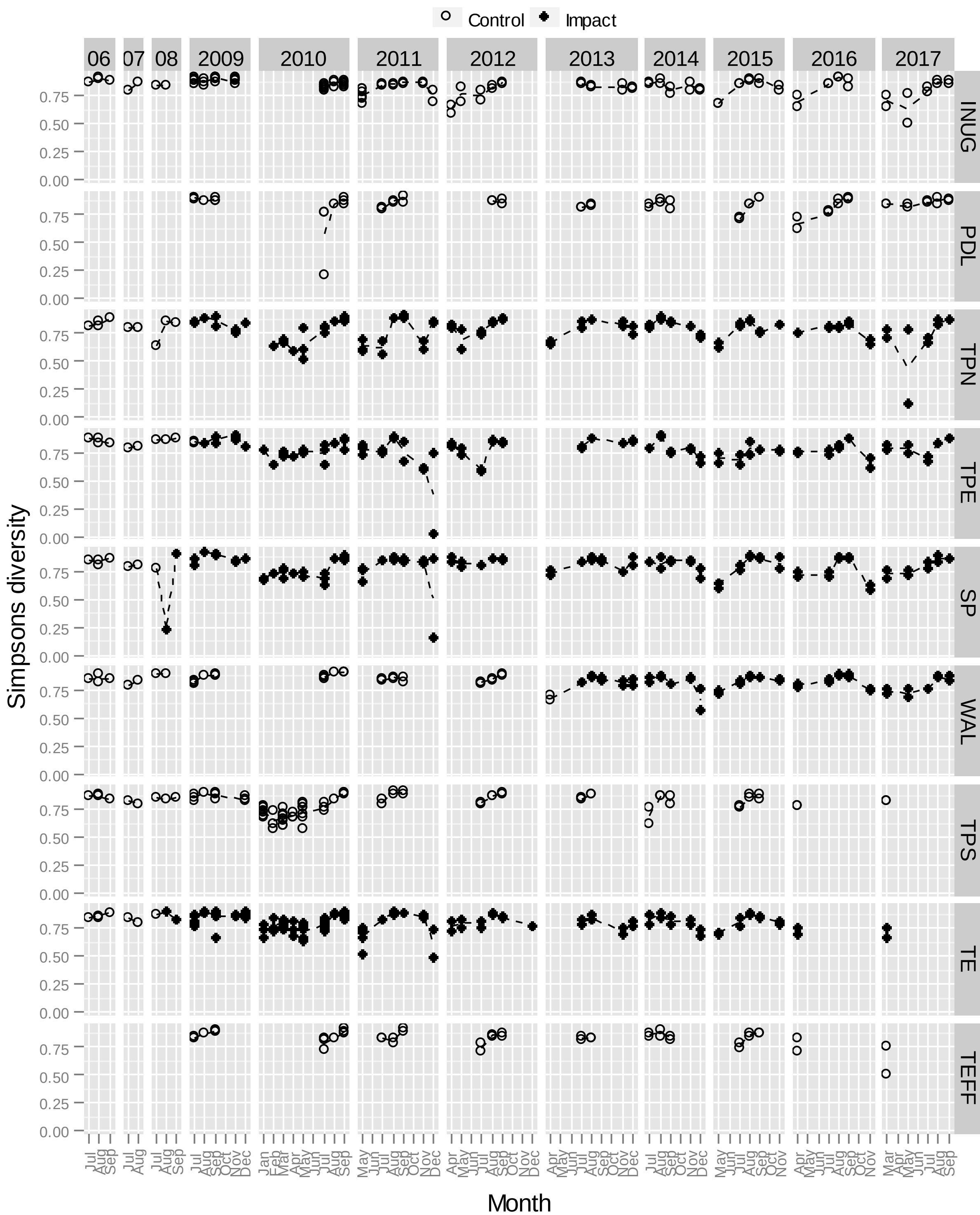


Figure C1–16. Simpson's Diversity for the phytoplankton community from Meadowbank study lakes since 2006.



Appendix C2 – Baker Lake Phytoplankton Plots, 2008-2017

LIST OF FIGURES – APPENDIX C2

Figure C2-1. Cyanophyte biomass (mg/m^3) from Baker Lake since 2008.

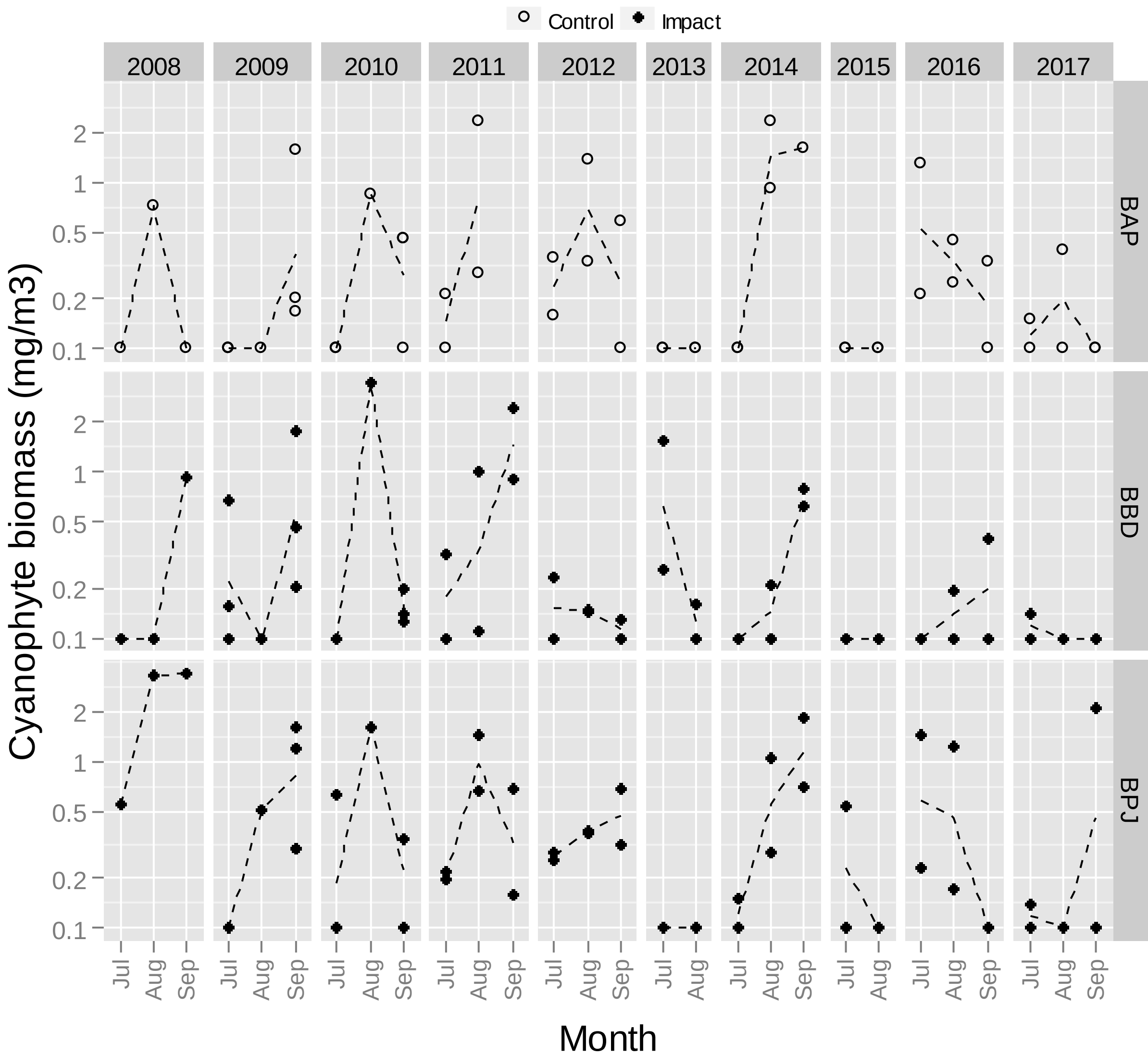


Figure C2–2. Chlorophyte biomass (mg/m^3) from Baker Lake since 2008.

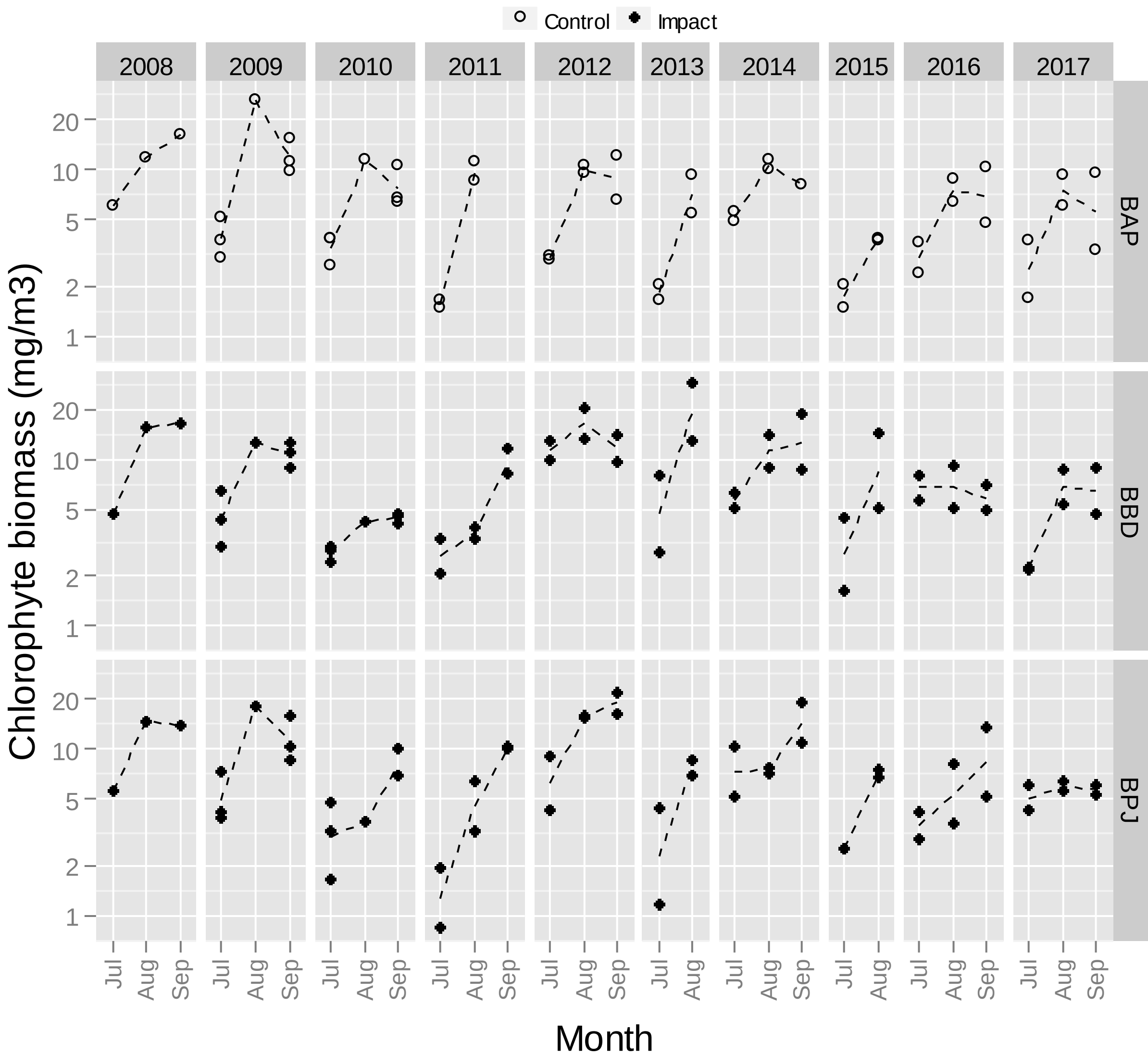


Figure C2–3. Chrysophyte biomass (mg/m^3) from Baker Lake since 2008.

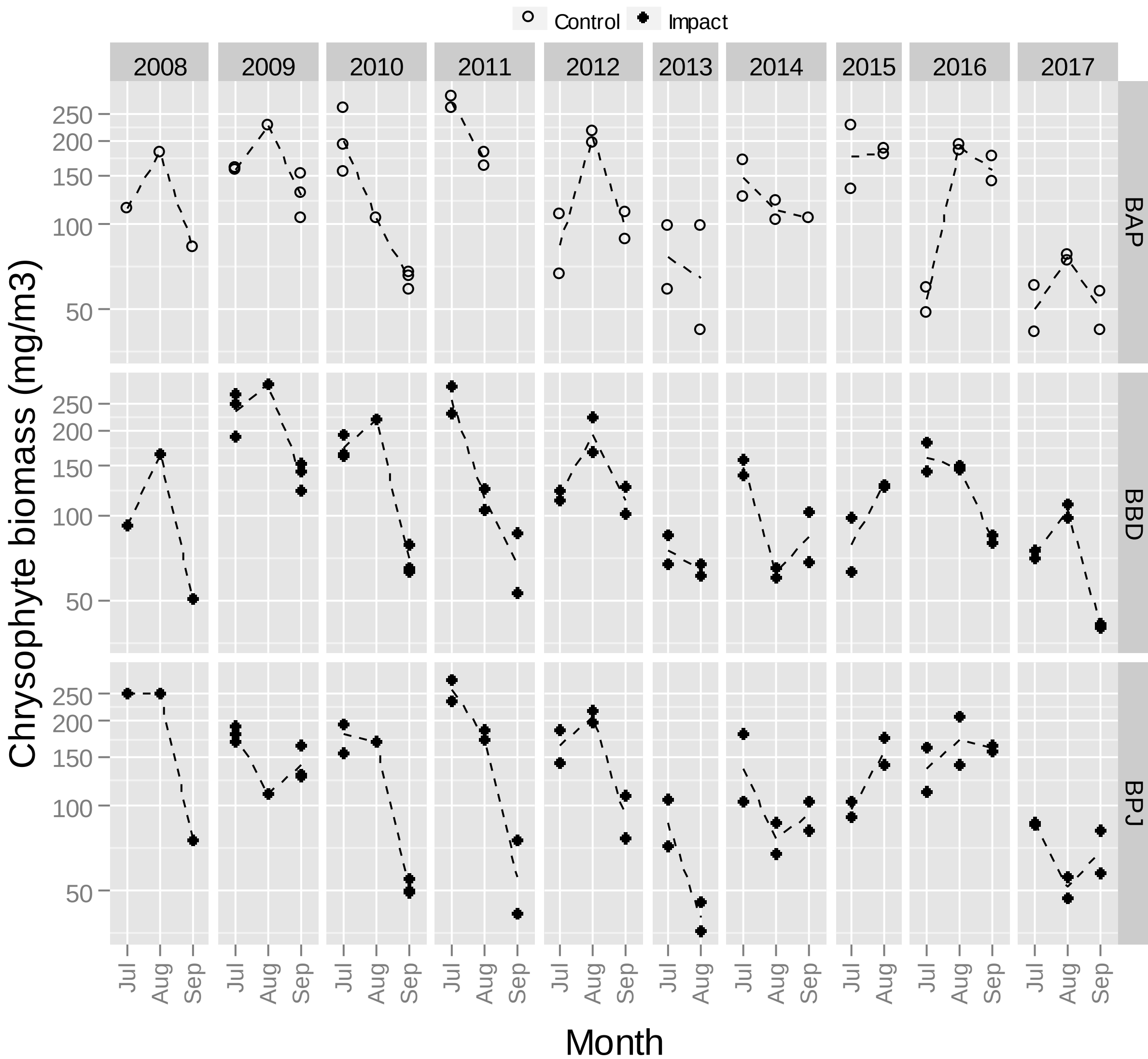


Figure C2–4. Diatom biomass (mg/m³) from Baker Lake since 2008.

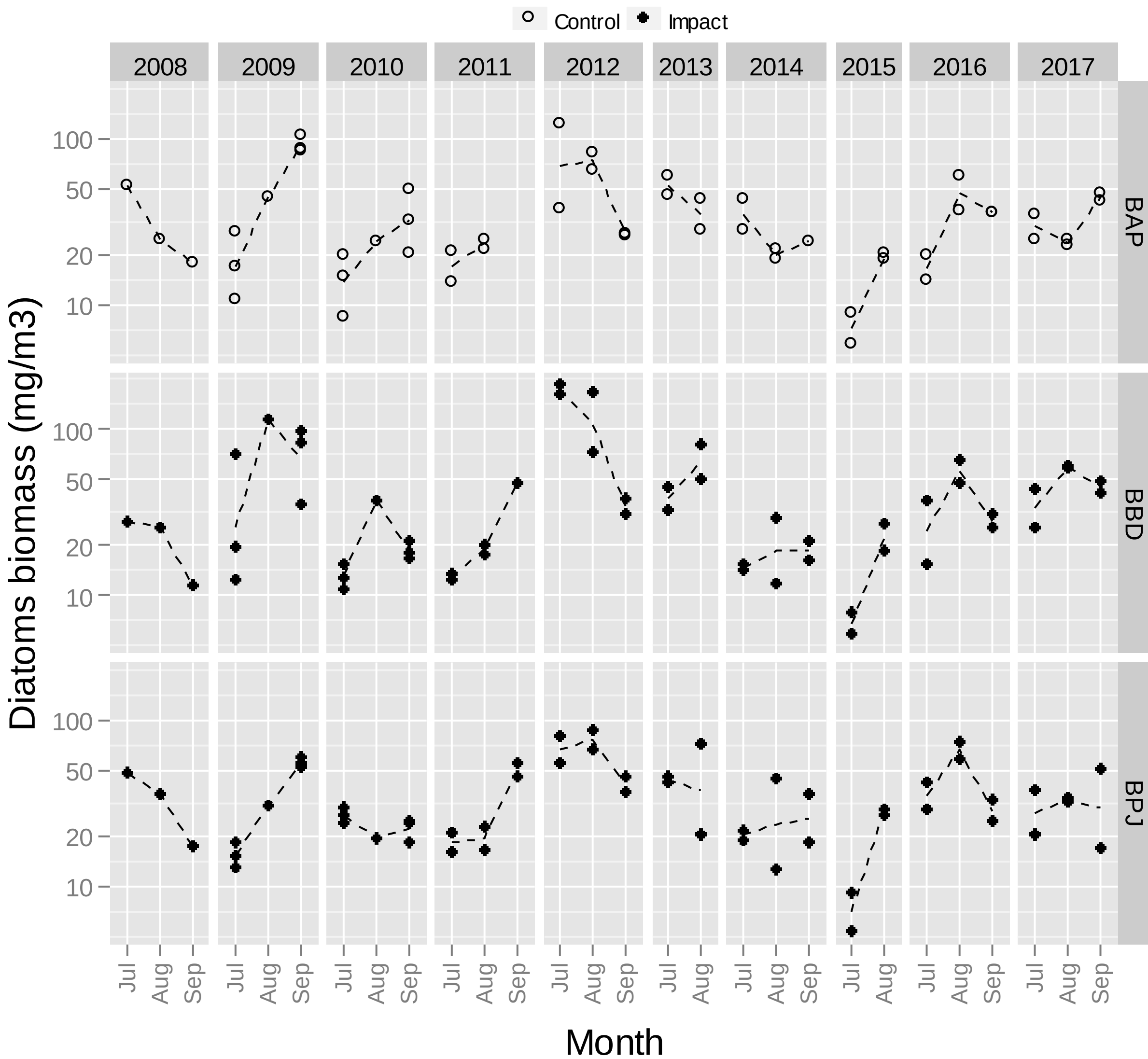


Figure C2–5. Cryptophyte biomass (mg/m^3) from Baker Lake since 2008.

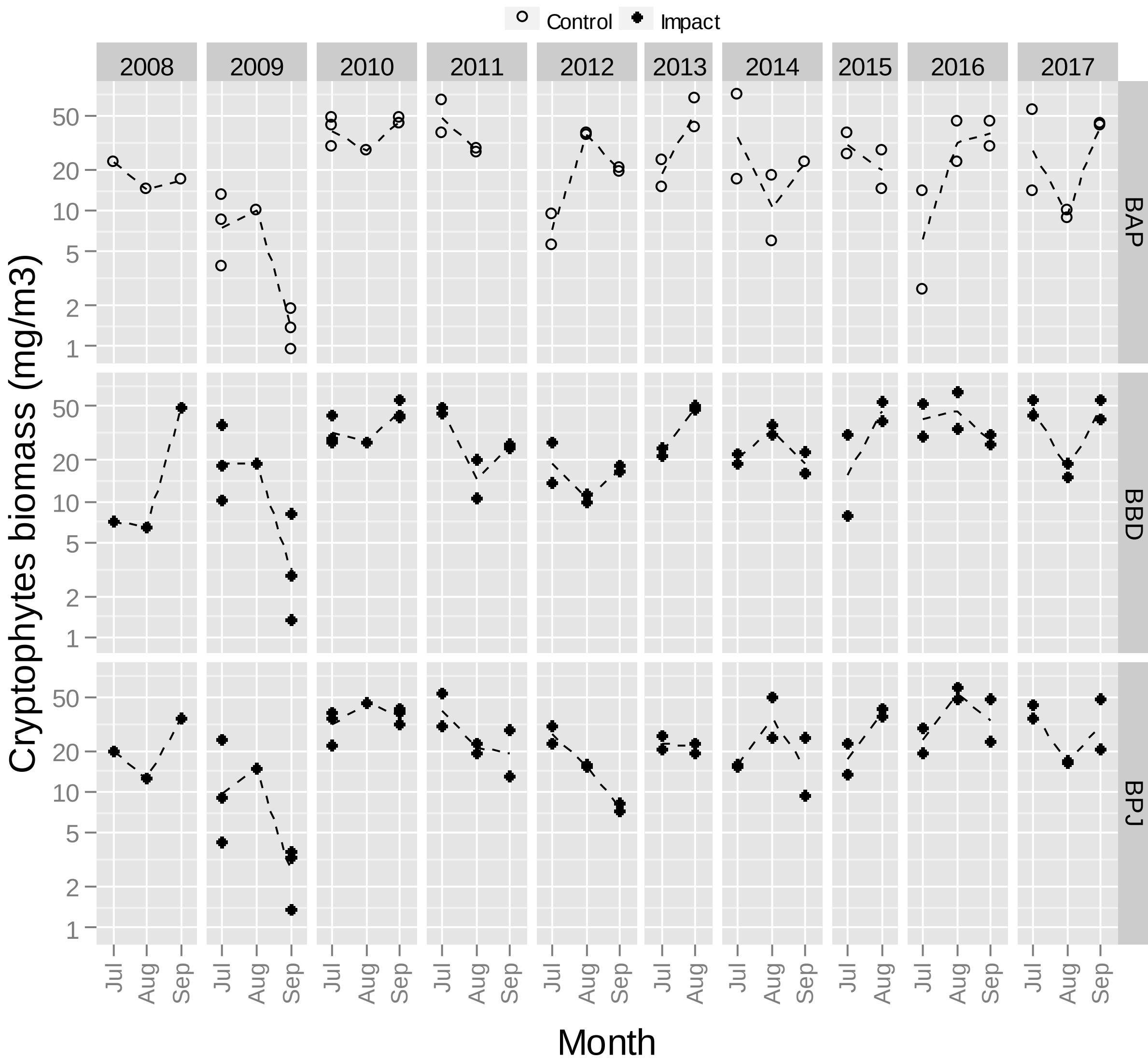


Figure C2–6. Dinoflagellate biomass (mg/m^3) from Baker Lake since 2008.

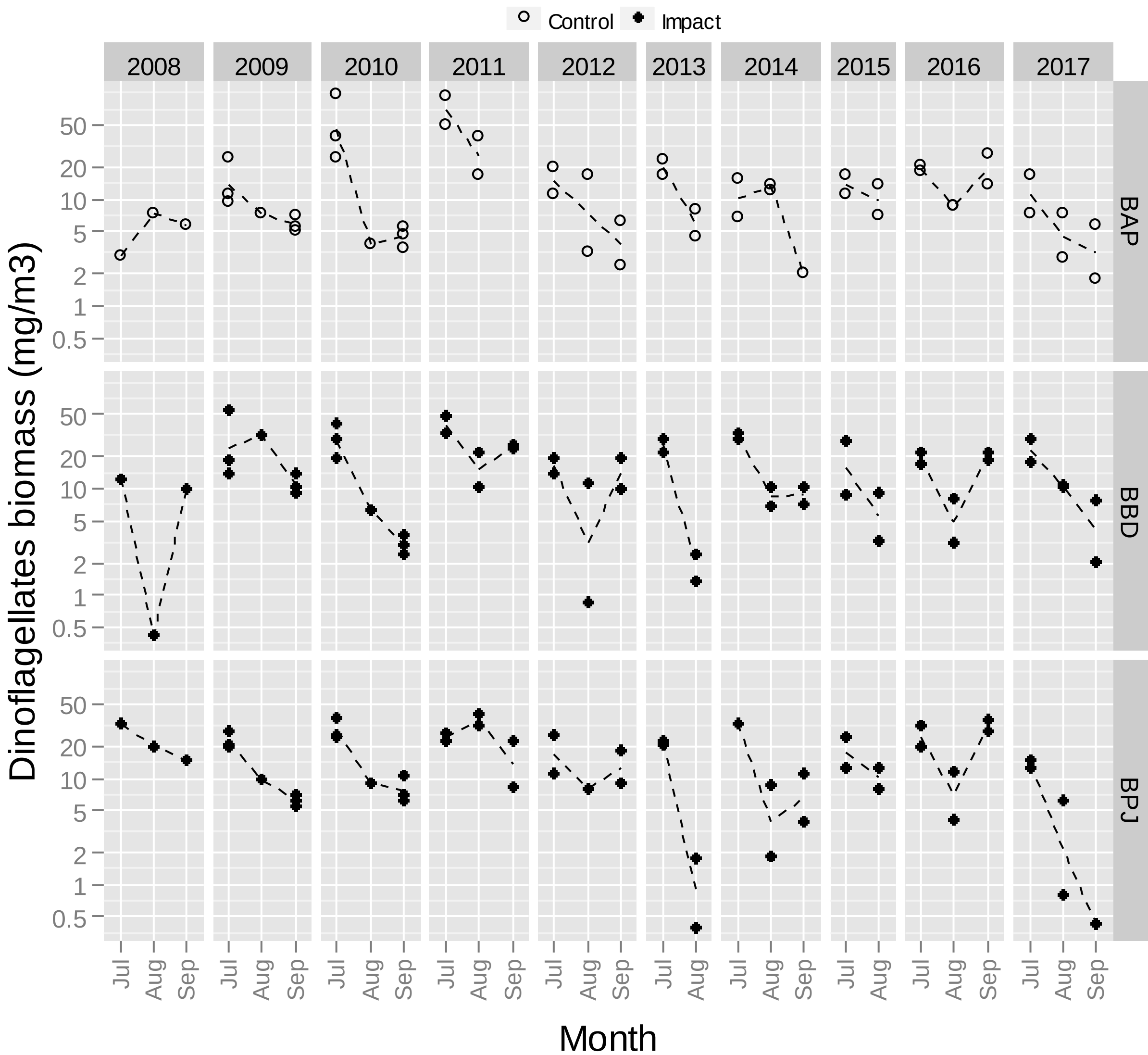


Figure C2–7. Total phytoplankton density (cells/L) from Baker Lake since 2008.

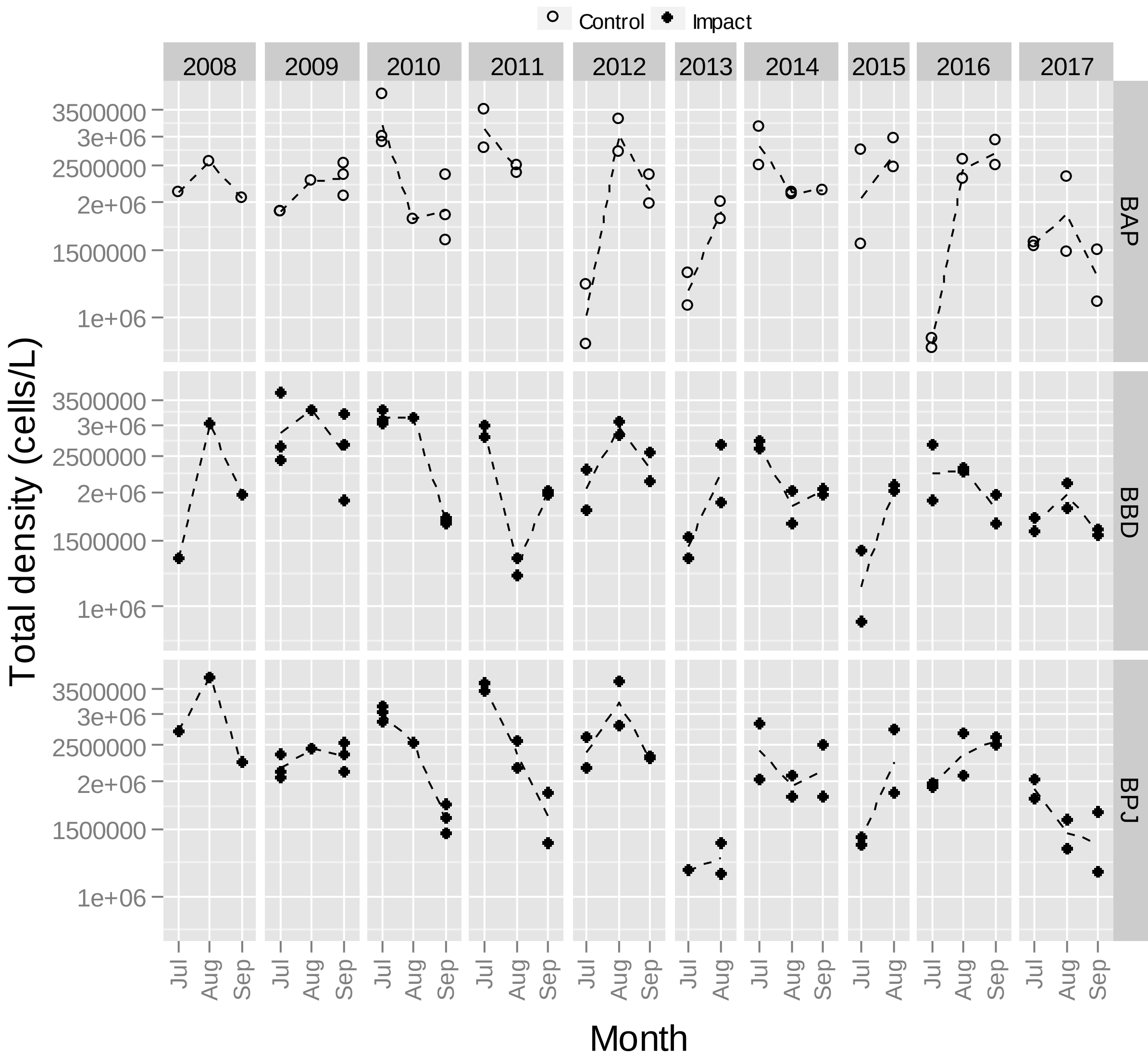


Figure C2–8. Phytoplankton density (cells/L) by major taxa group from Baker Lake since 2008.

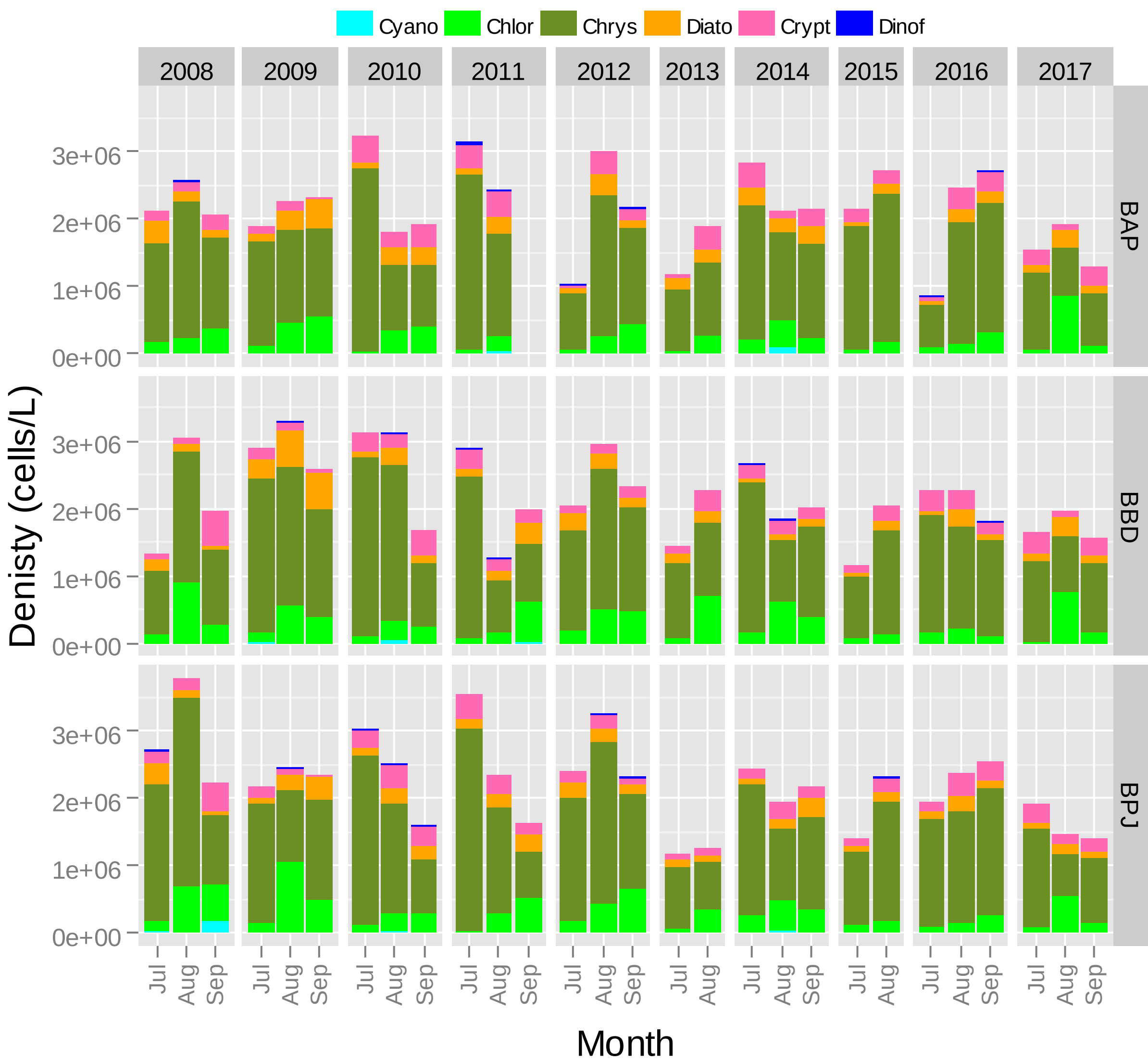


Figure C2–9. Relative phytoplankton density by major taxa group from Baker Lake since 2008.

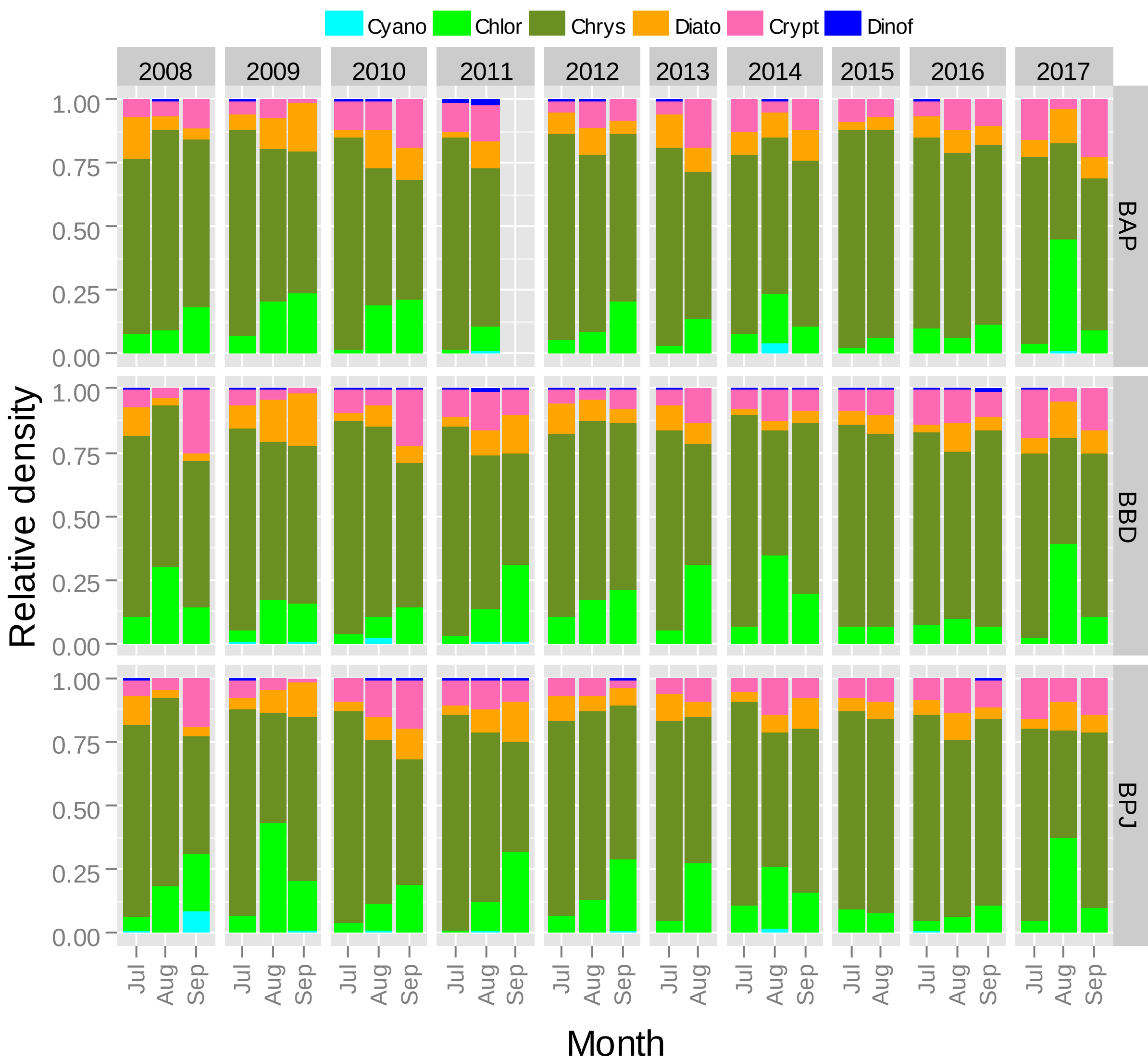


Figure C2–10. Cyanophyte density (cells/L) from Baker Lake since 2008.

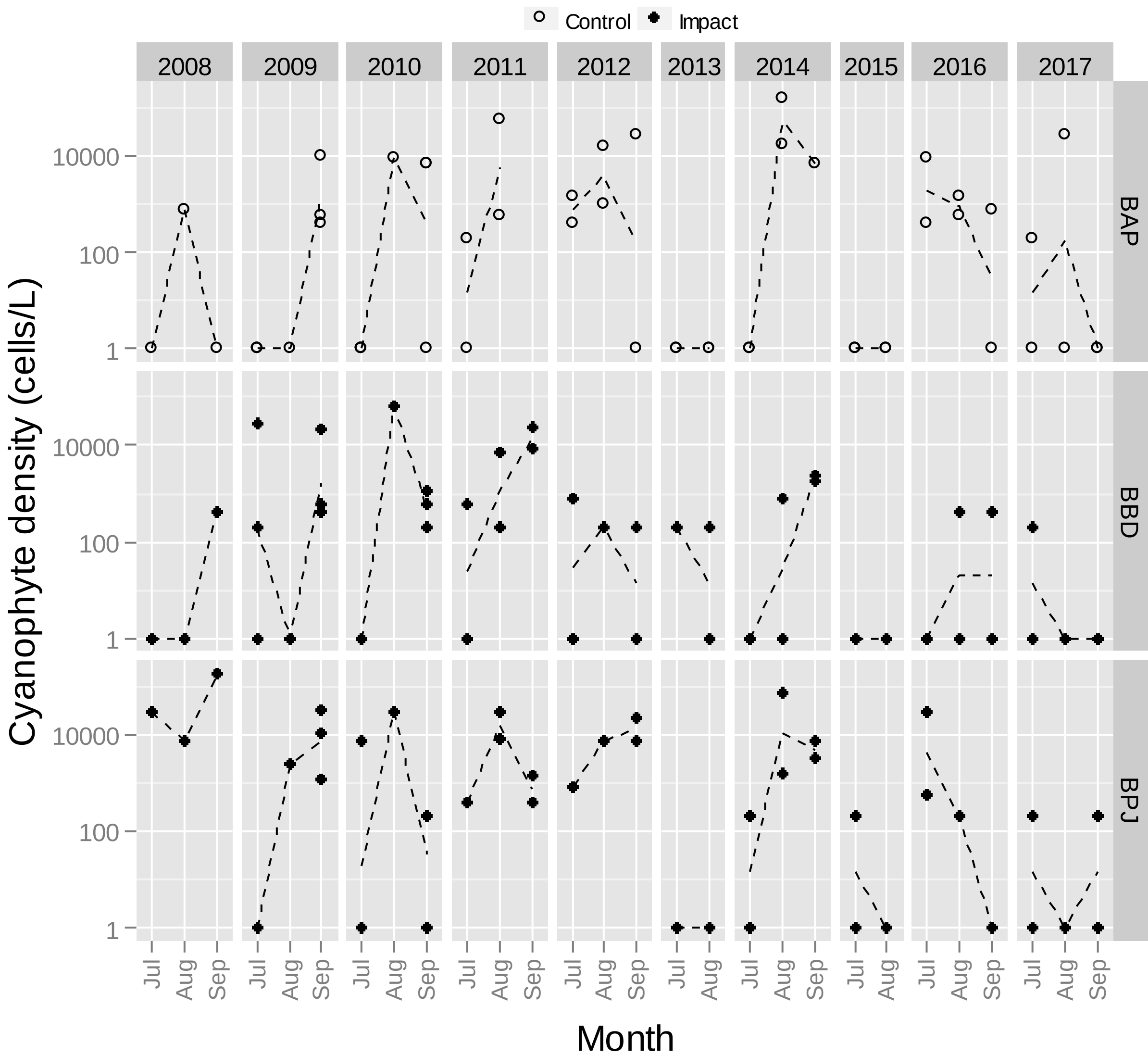


Figure C2–11. Chlorophyte density (cells/L) from Baker Lake since 2008.

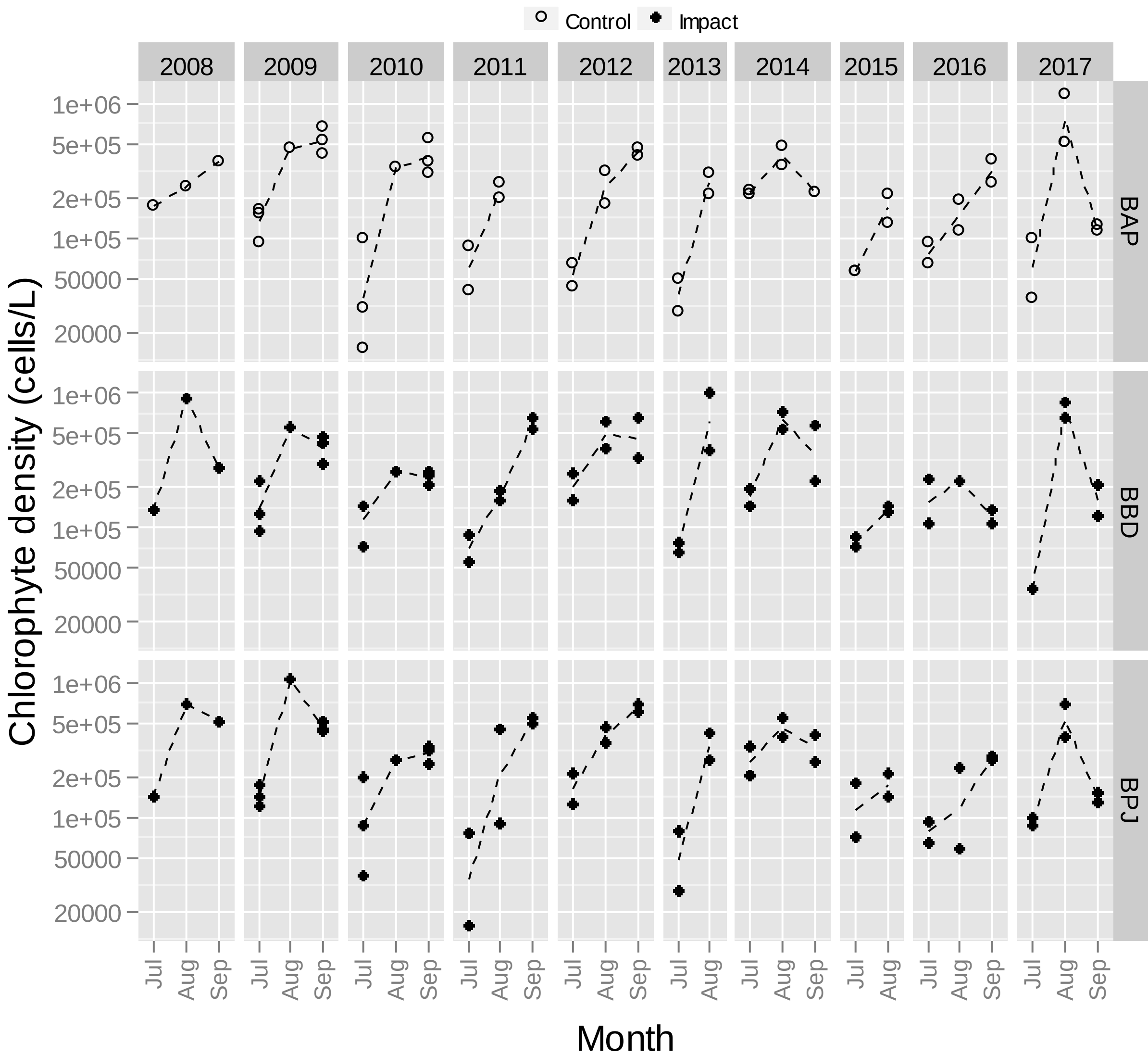


Figure C2–12. Chrysophyte density (cells/L) from Baker Lake since 2008.

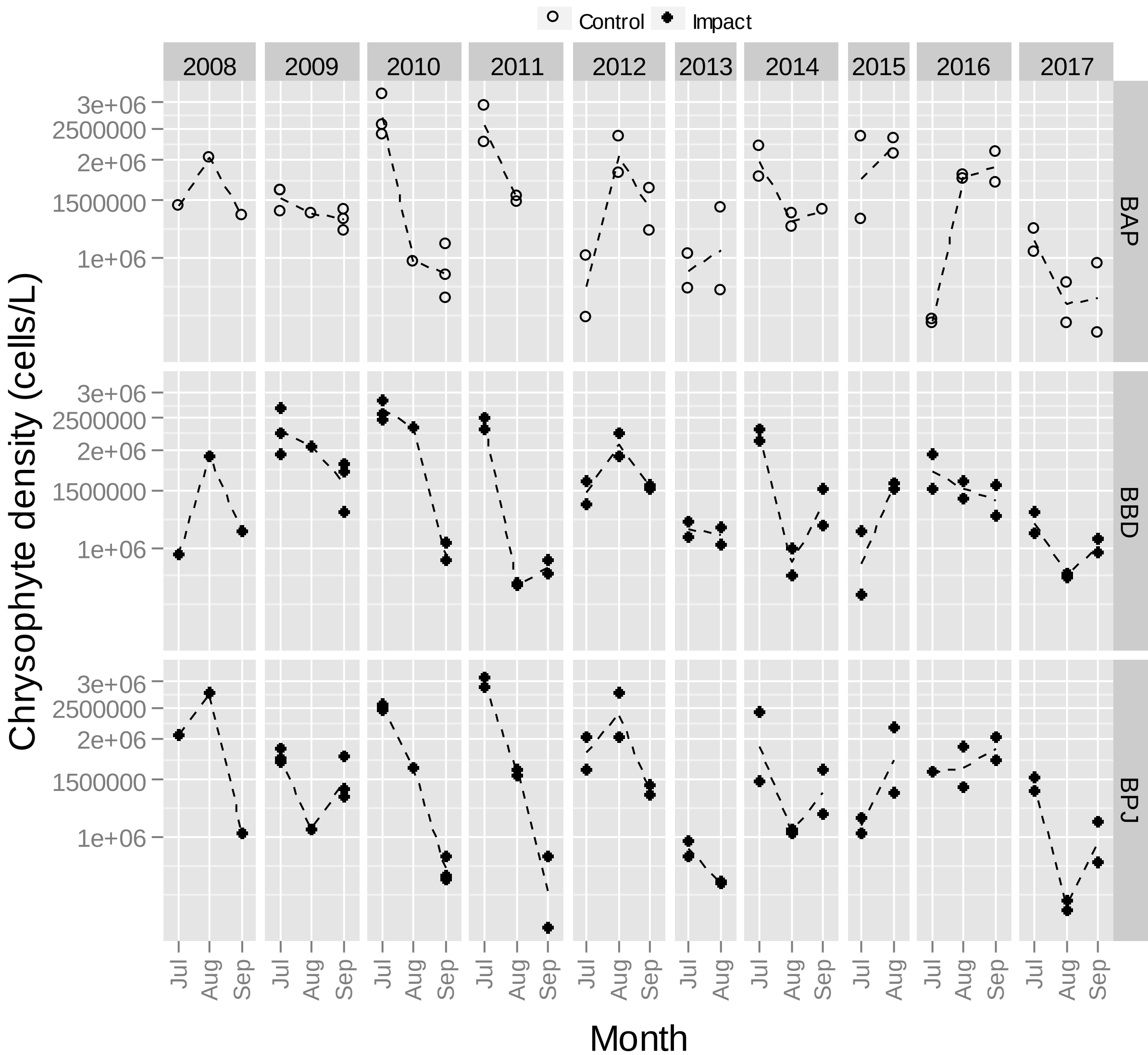


Figure C2–13. Diatom density (cells/L) from Baker Lake since 2008.

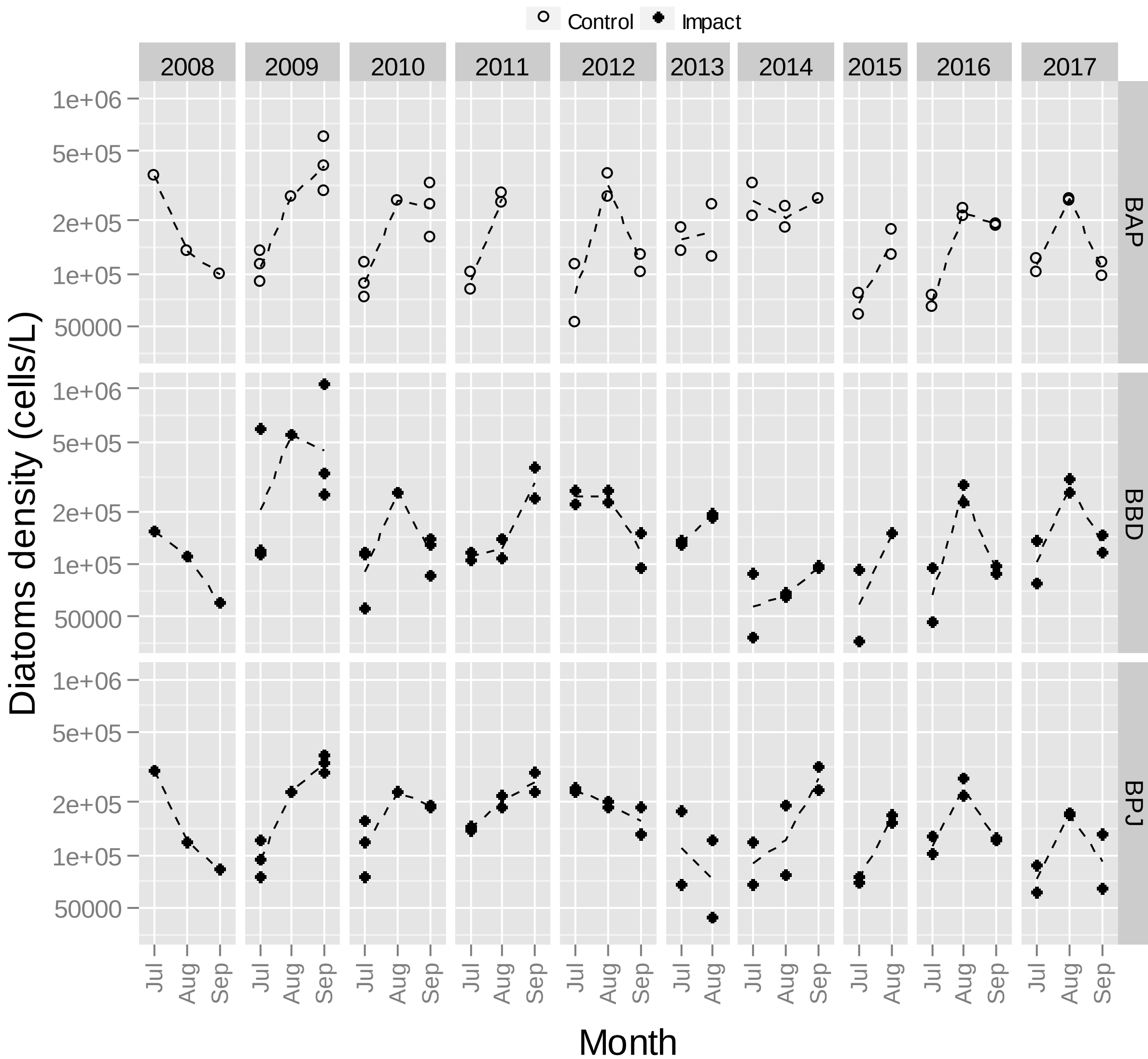


Figure C2–14. Cryptophytes density (cells/L) from Baker Lake since 2008.

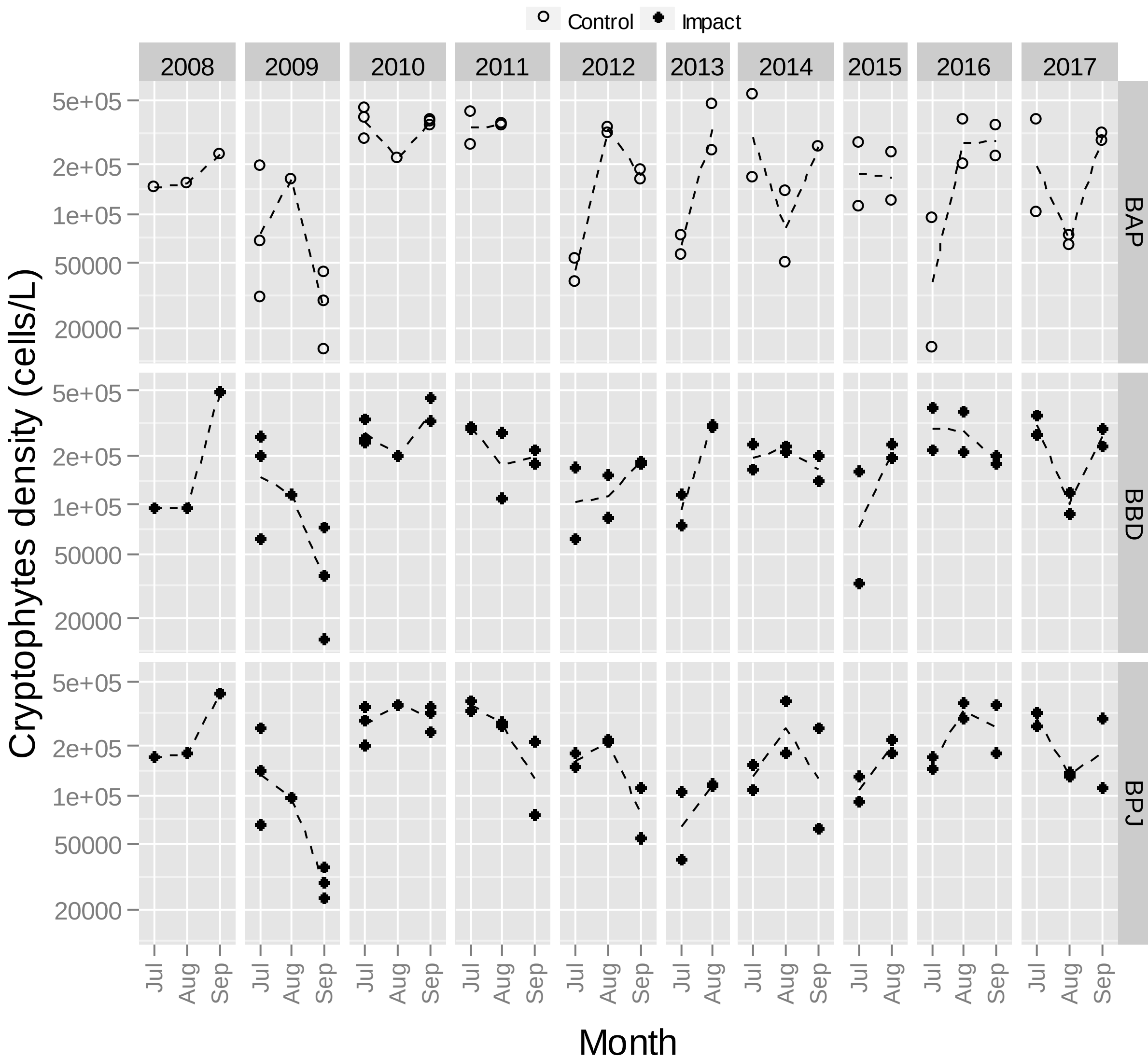


Figure C2–15. Dinoflagellates density (cells/L) from Baker Lake since 2008.

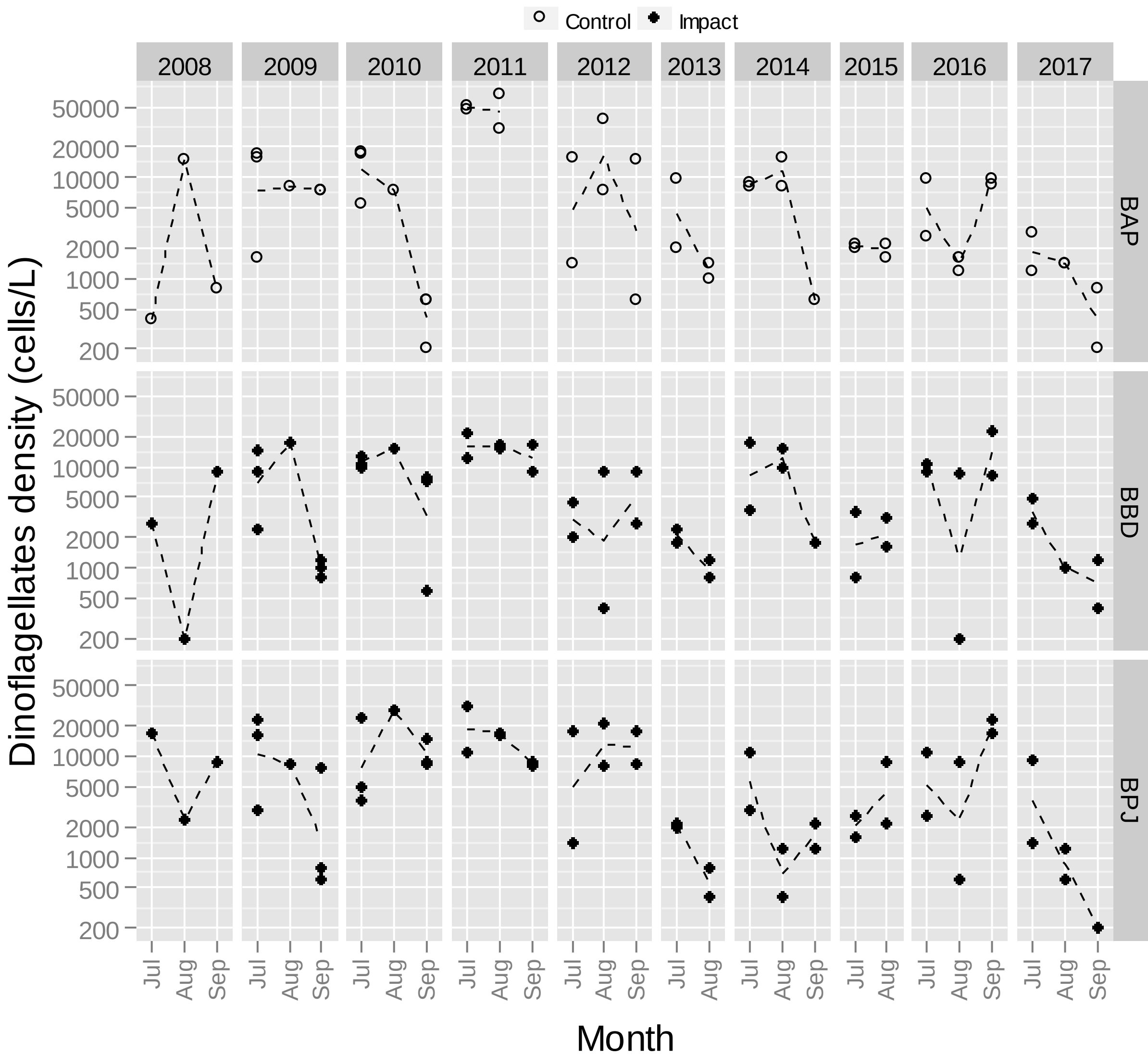
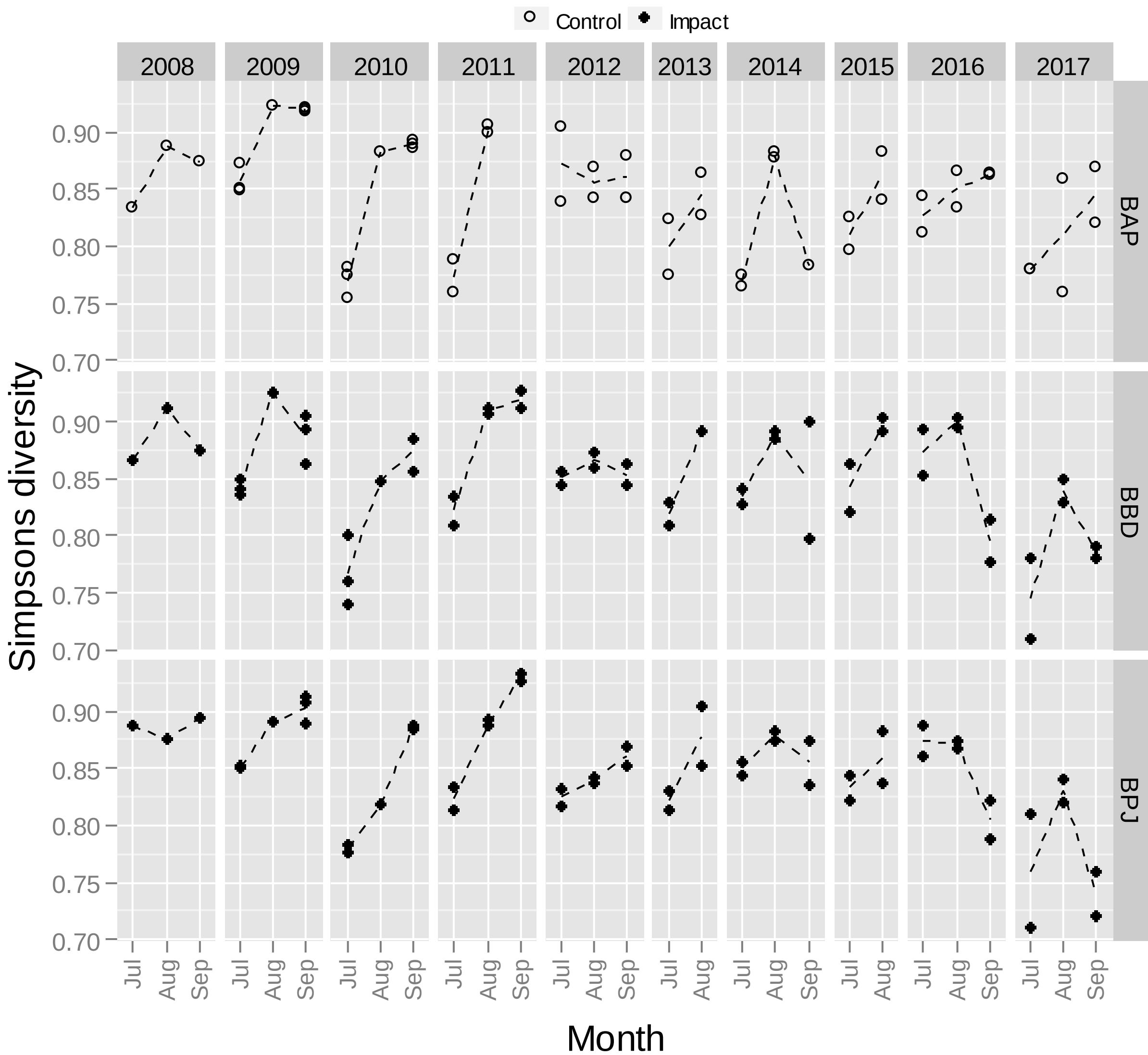


Figure C2–16. Simpson's Diversity for the phytoplankton community from Baker Lake since 2008.



APPENDIX D – BENTHIC INVERTEBRATE RAW DATA, 2017

Appendix D. Raw benthic invertebrate data from the 2017 Meadowbank sampling program.

Program	Baker Lake															Baker Lake				
Lake Name	Baker Akilahaarjuk Point					Baker Barge Dock					Baker East Shore					Baker Proposed Jetty				
Station	BAP					BBD					BES					BPJ				
Control/Impact	Control					Impact					Control					Impact				
Replicate[1]	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
DepthOfSample (m)	8.3	7.8	7.8	7.7	8.6	8.6	8.4	8.1	8.2	9.2	7.8	8.2	8	8.3	7.9	8.4	7.9	8.6	7.6	8.3
# Grabs/sample	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Date	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	9-Aug-17	11-Aug-17	11-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17
Season (Month)	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August
ROUNDWORMS																				
P. Nemata	16	19	8	3	5	5	-	2	1	6	3	3	3	7	1	6	17	5	-	1
FLATWORMS																				
P. Platyhelminthes																				
Cl. Turbellaria																				
indeterminate	2	8	8	-	8	-	3	-	2	4	15	-	18	14	15	3	7	7	2	-
ANNELIDS																				
P. Annelida																				
WORMS																				
Cl. Oligochaeta																				
F. Enchytraeidae	-	-	-	-	1	-	-	-	-	-	4	12	-	1	2	-	-	-	3	-
F. Naididae																				
S.F. Naidinae																				
Nais	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae																				
Limnodrilus hoffmeisteri	5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tasserkidrilus americanus	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	3	7	11	2	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae																				
Rhyacodrilus coccineus	8	2	4	1	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	32	18	22	1	6	2	2	-	3	-	5	5	7	1	2	10	2	2	-	2
F. Lumbriculidae																				
Lumbriculus	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																				
P. Arthropoda																				
MITES																				
Cl. Arachnida																				
O. Acarina																				
immature	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	1	-	-
F. Acalyptonotidae																				
Acalyptonotus	1	2	1	-	-	-	-	-	-	-	5	-	5	2	1	5	-	4	-	-
F. Hygrobatidae																				
Hygrobates	1	-	-	-	11	-	-	1	-	1	1	-	1	-	-	3	-	-	1	-
F. Lebertiidae																				
Lebertia	1	2	4	1	1	-	2	1	1	4	9	12	5	4	1	11	4	5	1	3
F. Oxidae																				
Oxus	1	-	-	1	3	-	-	-	-	-	1	1	1	-	-	-	2	2	1	-
F. Pionidae																				
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS																				
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS																				
Cl. Ostracoda	15	5	9	7	-	12	11	3	16	-	-	12	1	3	-	3	5	2	1	-
TADPOLE SHRIMP																				
O. Notostraca																				
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS																				
Cl. Insecta																				
CADDISFLIES																				
O. Trichoptera																				
F. Apataniidae																				
Apatania	1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
F. Limnephilidae																				
Grensia praeterita	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES																				
O. Diptera																				
MIDGES																				
F. Chironomidae																				
chironomid pupae	40	58	65	51	42	19	15	7	29	8	29	25	43	32	24	25	17	14	10	17
S.F. Chironominae																				
Cladotanytarsus	-	1	-	-	-	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-
Constempellina	14	14	32	21	8	13	28	35	50	8	29	20	53	14	9	9	25	17	-	7
Corynocera ambigua	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corynocera ?oliveri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	39	15	45	51	8	-	6	3	-	-	1	-	-	-	-	2	7	12	1	11
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma	1	3	6	1	2	-	1	1	-	5	2	3	2	7	1	-	-	-	1	2
Paratanytarsus	5	5	14	36	-	-	-	-	-	-	3	4	7	6	5	-	-	-	3	-
Polypedilum	-	-	-	-	-	1	-	-	4	21	-	-	-	-	-	-	1	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	5	-	-	-	2	2	3	2	3	1	1	-	1	1	-	-	-	-	-
Stictochironomus	19	16	36	9	1	86	255	194	64	47	-	4	-	-	-	93	1	-	-	1
Tanytarsus	13	40	22	43	4	8	12	10	1	5	4	7	9	3	1	5	15	12	2	19
S.F. Diamesinae																				
Protanypus	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	5	2	-	-
Potthastia	-	1	1	-	-	-	-	-	-	1	2	-	-	-	-	-	1	-	-	-
S.F. Orthocladiinae																				
Abiskomyia	-	1	1	1	-	3	2	1	1	-	1	-	-	-	-	7	15	4	1	-
Cricotopus/Orthocladius	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
Heterotrissocladius	15	11	9	10	7	6	4	2	1	8	2	8	5	8	6	6	1	2	2	5
Hydrobaenus	-	-	-	5	-	1	1	-	-	-	-	1	-	2	-	-	2	-	-	-
Mesocricotopus	4	11	14	1	8	1	-	-	-	3	11	4	-	12	6	5	2	1	1	4
Nanocladius	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-
Paracladius	7	9	5	-	-	-	1	4	2	3	-	2	5	2	-	4	13	4	3	7
Parakiefferiella	1	1	1	1	-	-	-	-	1	2	6	10	-	2	1	1	2	1	-	-
Psectrocladius	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
S.F. Prodiamesinae																				
Monodiamesa	9	12	10	20	10	2	5	14	5	5	17	12	10	11	9	5	15	4	1	5
S.F. Tanypodinae																				
Ablabesmyia	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Procladius	9	7	10	32	7	10	8	17	3	3	7	11	12	4	15	5	11	9	-	4
Thienemannimyia complex	2	1	-	-	1	2	1	1	-	1	1	-	2	-	-	-	-	2	-	-
F. Empididae																				
Neoplasta	3	8	5	10	2	-	2	-	-	-	2	1	2	5	3	5	5	3	1	-
Wiedemannia	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	2
pupae	1	2	1	1	-	1	-	-	-	1	5	-	7	3	2	-	2	4	-	1
MOLLUSCS																				
P. Mollusca																				
SNAILS																				
Cl. Gastropoda																				
F. Valvatidae																				
Valvata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS																				
Cl. Bivalvia																				
F. Sphaeriidae																				
Cyclocalyx/Neopisidium	35	14	26	-	9	1	7	-	5	-	12	15	27	20	18	62	-	4	3	2
Cyclocalyx	-	5	-	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R (Richness) - totals [2,3]																				
Total	25	29	25	23	18	16	20	16	17	20	25	19	19	21	19	19	22	20	18	15
Oligochaete	4	4	4	4	2	2	2	0	2	0	3	2	1	2	2	1	1	1	1	1
Insect	15	20	17	17	11	13	14	13	11	17	16	14	12	15	13	13	18	14	12	12
Mollusc	1	2	1	0	1	1	2	1	2	0	1	1	1	1	1	1	0	1	1	1
Other[4]	5	3	3	2	4	0	2	2	2	3	5	2	5	3	3	4	3	4	4	1
Abundance (raw) - totals [5,6]																				
Total	274	283	362	311	139	159	360	297	176	135	178	158	226	156	124	269	157	117	40	95
Oligochaete	50	29	44	11	7	3	3	0	4	0	11	17	7	2	4	10	2	2	3	2
Insect	183	223	279	298	100	155	343	293	163	126	124	113	160	114	85	173	142	92	29	88
Mollusc	35	19	26	0	9	1	9	2	6	0	12	15	27	20	18	62	0	4	3	2
Other[4]	6	12	13	2	23	0	5	2	3	9	31	13	32	20	17	24	13	19	5	3
Abundance - totals (#/m^2) [5]																				
Total	5957	6152	7870	6761	3022	3457	7826	6457	3826	2935	3870	3435	4913	3391	2696	5848	3413	2543	870	2065
Oligochaete	1087	630	957	239	152	65	65	0	87	0	239	370	152	43	87	217	43	43	65	43
Insect	3978	4848	6065	6478	2174	3370	7457	6370	3543	2739	2696	2457	3478	2478	1848	3761	3087	2000	630	1913
Mollusc	761	413	565	0	196	22	196	43	130	0	261	326	587	435	391	1348	0	87	65	43
Other[4]	130	261	283	43	500	0	109	43	65	196	674	283	696	435	370	522	283	413	109	65

Notes:

1. Benthic invertebrate count data shown in this table for individual replicates (i.e., replicate 1, 2, 3, 4, 5) at INUG, PDL, and WAL are the added counts from two replicates enumerated separately. Benthic invertebrate count data for individual replicates from all other Stations are the result of a single count from a composite of two grabs.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures are only included in the richness totals if no other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Appendix D. Raw benthic invertebrate data from the 2017 Meadowbank sampling program.

Program	Meadowbank Reference Lakes										Meadowbank Study Lakes									
Lake Name	Inuggugayualik Lake					Pipedream Lake					Second Portage Lake					Third Portage Lake - East Basin				
Station	INUG					PDL					SP					TPE				
Control/Impact	Control					Control					Impact					Impact				
Replicate[1]	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
DepthOfSample (m)	7	7.3	7.5	7.9	8.1	8	6.9	6.9	8	7.5	7.9	8.1	8.7	7.8	8.1	8.1	7.9	8.4	8.1	7.8
# Grabs/sample	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Date	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	25-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	22-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17	23-Aug-17
Season (Month)	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August	August
ROUNDWORMS																				
P. Nemata	2	2	1	3	-	3	3	1	-	1	3	2	2	1	4	3	-	5	4	-
FLATWORMS																				
P. Platyhelminthes																				
Cl. Turbellaria																				
indeterminate	2	-	-	2	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-
ANNELIDS																				
P. Annelida																				
WORMS																				
Cl. Oligochaeta																				
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae																				
S.F. Naidinae																				
Nais	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae																				
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	2	3	-	-	-	-	-	2	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae																				
Rhyacodrilus coccineus	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	3	1	4	9	5
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae																				
Lumbriculus	-	1	1	1	3	2	2	-	1	1	-	1	2	-	-	-	1	1	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																				
P. Arthropoda																				
MITES																				
Cl. Arachnida																				
O. Acarina																				
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae																				
Acalyptonotus	-	-	-	-	-	1	-	-	-	-	4	-	2	1	2	2	1	-	-	1
F. Hygrobatidae																				
Hygrobates	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-
F. Lebertiidae																				
Lebertia	-	-	-	-	-	-	-	-	1	-	1	2	3	1	-	-	-	-	-	1
F. Oxidae																				
Oxus	1	4	1	-	1	-	-	-	-	-	-	2	-	1	1	-	-	-	-	-
F. Pionidae																				
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS																				
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS																				
Cl. Ostracoda	1	1	3	1	3	9	1	5	7	6	13	4	12	2	15	33	44	87	121	82
TADPOLE SHRIMP																				
O. Notostraca																				
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS																				
Cl. Insecta																				
CADDISFLIES																				
O. Trichoptera																				
F. Apataniidae																				
Apatania	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
F. Limnephilidae																				
Grensia praeterita	1	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	1
TRUE FLIES																				
O. Diptera																				
MIDGES																				
F. Chironomidae																				
chironomid pupae	1	-	3	1	3	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-
S.F. Chironominae																				
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Constempellina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corynocera ?oliveri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	4	4	34	35	37	-	9	2	-	-	18	64	50	31	17	9	23	8	25	5
Microtendipes	-	-	4	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	3	2	3	8	-	1	-	-	-	-	-	-	-	-	33	34	28	35	66
Polypedilum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Stictochironomus	7	4	14	5	17	10	7	3	5	5	4	3	2	5	2	-	6	4	3	2
Tanytarsus	1	-	-	4	13	-	5	1	1	-	-	-	-	-	-	-	-	2	4	3
S.F. Diamesinae																				
Protanypus	1	-	1	2	-	-	-	-	-	1	2	-	-	1	1	-	2	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
S.F. Orthocladiinae																				
Abiskomyia	-	-	-	-	2	-	-	-	-	2	4	5	3	3	2	10	5	5	6	5
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	2	-	-	1	-	1	-	-	-	-	-	-	-	-	-	2	-	1	-	1
Hydrobaenus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nanocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladius	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	-	-	-	1	4	3	3	1	2	2	6	5	5	13	5	7	6	6
Zalutschia	1	-	1	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae																				
Monodiamesa	3	2	3	3	3	-	-	-	-	1	2	2	-	2	3	1	2	-	-	-
S.F. Tanypodinae																				
Ablabesmyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Procladius	8	8	1	4	6	17	8	4	11	6	14	3	9	7	6	19	10	11	14	14
Thienemannimyia complex	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	6	6	11	8	17
F. Empididae																				
Neoplasta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wiedemannia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCS																				
P. Mollusca																				
SNAILS																				
Cl. Gastropoda																				
F. Valvatidae																				
Valvata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS																				
Cl. Bivalvia																				
F. Sphaeriidae																				
Cyclocalyx/Neopisidium	19	22	15	15	19	20	3	1	10	8	43	17	34	24	42	47	25	46	32	63
Cyclocalyx	-	-	2	2	6	3	7	-	1	-	-	-	1	-	-	-	-	-	-	-
Sphaerium nitidum	4	1	1	1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R (Richness) - totals [2,3]																				
Total	15	10	13	16	15	11	12	8	10	8	11	11	11	12	11	11	13	13	11	15
Oligochaete	0	1	1	1	2	1	2	1	1	1	0	1	1	1	0	1	2	2	1	1
Insect	11	6	8	11	9	6	8	6	5	6	7	6	6	7	7	8	9	10	9	11
Mollusc	2	2	3	3	3	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1
Other[4]	2	1	1	1	1	2	0	0	2	0	3	3	2	3	3	1	1	0	0	2
Abundance (raw) - totals [5,6]																				
Total	57	50	83	92	139	58	50	19	35	25	96	103	113	83	82	145	122	130	144	192
Oligochaete	0	1	1	1	5	2	4	3	1	1	0	1	2	2	0	3	2	5	9	5
Insect	31	22	63	71	102	31	36	15	21	16	46	79	71	54	36	93	94	79	103	122
Mollusc	23	23	18	18	31	23	10	1	11	8	43	17	35	24	42	47	25	46	32	63
Other[4]	3	4	1	2	1	2	0	0	2	0	7	6	5	3	4	2	1	0	0	2
Abundance - totals (#/m^2) [5]																				
Total	1239	1087	1804	2000	3022	1261	1087	413	761	543	2087	2239	2457	1804	1783	3152	2652	2826	3130	4174
Oligochaete	0	22	22	22	109	43	87	65	22	22	0	22	43	43	0	65	43	109	196	109
Insect	674	478	1370	1543	2217	674	783	326	457	348	1000	1717	1543	1174	783	2022	2043	1717	2239	2652
Mollusc	500	500	391	391	674	500	217	22	239	174	935	370	761	522	913	1022	543	1000	696	1370
Other[4]	65	87	22	43	22	43	0	0	43	0	152	130	109	65	87	43	22	0	0	43

1. Benthic invertebrate count data shown in this table for individual replicates (i.e., replicate 1, 2, 3, 4, 5) at INUG, PDL, and WAL are the added counts from two replicates enumerated separately. Benthic invertebrate count data for individual replicates from all other Stations are the result of a single count from a composite of two grabs.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures are only included in the richness totals if no other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

Appendix D. Raw benthic invertebrate data from the 2017 Meadowbank sampling program.

Program										
Lake Name	Third Portage Lake - North Basin					Wally Lake				
Station	TPN					WAL				
Control/Impact	Impact					Impact				
Replicate[1]	1	2	3	4	5	1	2	3	4	5
DepthOfSample (m)	8.4	8.3	8.4	8.3	8.8	8	8.3	7.9	7.9	7.5
# Grabs/sample	2	2	2	2	2	2	2	2	2	2
Date	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17	26-Aug-17
Season (Month)	August	August	August	August	August	August	August	August	August	August
ROUNDWORMS										
P. Nemata	1	-	-	-	-	-	-	2	2	1
FLATWORMS										
P. Platyhelminthes										
Cl. Turbellaria										
indeterminate	-	1	-	-	-	1	1	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-
F. Naididae										
S.F. Naidinae										
Nais	-	-	-	-	-	-	-	-	-	-
S.F. Tubificinae										
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	1	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	-	-
S.F. Rhyacodrilinae										
Rhyacodrilus coccineus	-	1	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae										
Lumbriculus	1	1	-	2	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae										
Acalyptonotus	-	-	1	-	-	-	-	-	-	1
F. Hygrobatidae										
Hygrobates	2	-	-	-	2	-	-	-	-	-
F. Lebertiidae										
Lebertia	-	-	-	-	-	1	-	3	2	3
F. Oxidae										
Oxus	-	-	-	1	1	1	-	1	1	3
F. Pionidae										
indeterminate	-	-	-	-	-	-	-	-	-	-
HARPACTICOIDS										
O. Harpacticoida	-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS										
Cl. Ostracoda	19	14	6	20	12	9	6	12	11	30
TADPOLE SHRIMP										
O. Notostraca										
Lepidurus arcticus	-	-	-	-	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
F. Apataniidae										
Apatania	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae										
Grensia praeterita	-	2	-	-	-	2	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	-	-	-	-	-	-	-	-	-	-
S.F. Chironominae										
Cladotanytarsus	-	-	-	-	-	-	6	29	17	34
Constempellina	-	-	-	-	-	-	-	-	-	-
Corynocera ambigua	-	-	-	-	-	33	44	66	90	102
Corynocera ?oliveri	-	-	-	-	-	10	29	68	69	38
Dicrotendipes	-	-	-	-	-	-	-	9	2	2
Micropsectra	22	7	1	4	2	7	-	12	4	10
Microtendipes	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	1	2	1	-	10	3	-	4
Polypedilum	-	-	-	-	-	-	-	-	-	-
Sergentia	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-
Stictochironomus	33	11	11	23	-	37	19	24	30	58
Tanytarsus	7	-	2	2	-	14	15	22	17	20
S.F. Diamesinae										
Protanypus	1	1	-	2	-	-	-	-	1	-
Potthastia	-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae										
Abiskomyia	-	-	-	-	1	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	2	3	9	5	-	-	-	-	-	-
Hydrobaenus	-	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	1	-	1	-	-	-	-	-	-
Nanocladius	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-
Psectrocladius	4	2	1	4	3	-	-	-	-	-
Zalutschia	3	-	-	-	-	-	-	-	-	-
Orthocladiinae *Genus "Greenland"*	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae										
Monodiamesa	-	1	3	2	-	1	1	-	1	-
S.F. Tanypodinae										
Ablabesmyia	-	-	-	-	-	-	-	-	-	-
Procladius	10	10	9	9	3	9	6	12	10	15
Thienemannimyia complex	5	4	6	12	3	-	-	1	-	-
F. Empididae										
Neoplasta	-	-	-	-	-	-	-	-	-	-
Wiedemannia	-	1	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Valvatidae										
Valvata	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae										
Cyclocalyx/Neopisidium	21	31	4	18	6	7	9	4	9	23
Cyclocalyx	-	-	-	-	-	18	17	39	16	35
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-
R (Richness) - totals [2,3]										
Total	13	15	11	14	9	13	11	14	14	14
Oligochaete	2	2	0	1	0	0	0	0	0	0
Insect	9	11	9	11	6	8	8	10	10	9
Mollusc	1	1	1	1	1	2	2	2	2	2
Other[4]	1	1	1	1	2	3	1	2	2	3
Abundance (raw) - totals [5,6]										
Total	112	77	48	87	22	141	157	293	269	348
Oligochaete	2	2	0	2	0	0	0	0	0	0
Insect	87	43	43	66	13	113	130	246	241	283
Mollusc	21	31	4	18	6	25	26	43	25	58
Other[4]	2	1	1	1	3	3	1	4	3	7
Abundance - totals (#/m^2) [5]										
Total	2435	1674	1043	1891	478	3065	3413	6370	5848	7565
Oligochaete	43	43	0	43	0	0	0	0	0	0
Insect	1891	935	935	1435	283	2457	2826	5348	5239	6152
Mollusc	457	674	87	391	130	543	565	935	543	1261
Other[4]	43	22	22	22	65	65	22	87	65	152

1. Benthic invertebrate count data shown in this table for individual replicates (i.e., replicate 1, 2, 3, 4, 5) at INUG, PDL, and WAL are the added counts from two replicates enumerated separately. Benthic invertebrate count data for individual replicates from all other Stations are the result of a single count from a composite of two grabs.
2. Richness totals exclude P. Nemata, Cl. Ostracoda, indeterminates (O. Acarina, F. Lumbriculidae), immatures (S.F. Tubificinae, O. Acarina), and pupae.
3. Pupae and immatures are only included in the richness totals if no other life stages are present in the replicate sample.
4. Other Taxa include: Cl. Turbellaria, F. Acalyptonotidae, F. Hygrobatidae, F. Lebertiidae, F. Oxidae, F. Pionidae, O. Harpacticoida, O. Notostraca, and F. Gammaracanthidae.
5. Abundance totals exclude P. Nemata and Cl. Ostracoda.
6. Raw abundance from two grabs (grab area = 0.023 m^2).

APPENDIX E – BENTHIC INVERTEBRATE PLOTS

Benthic Invertebrate Plots

Appendix E1 – Meadowbank Benthic Invertebrate Plots, 2006-2017

LIST OF FIGURES – APPENDIX E1

Figure E1-1. Oligochaete abundance (#/m^2) from Meadowbank study lakes since 2006.

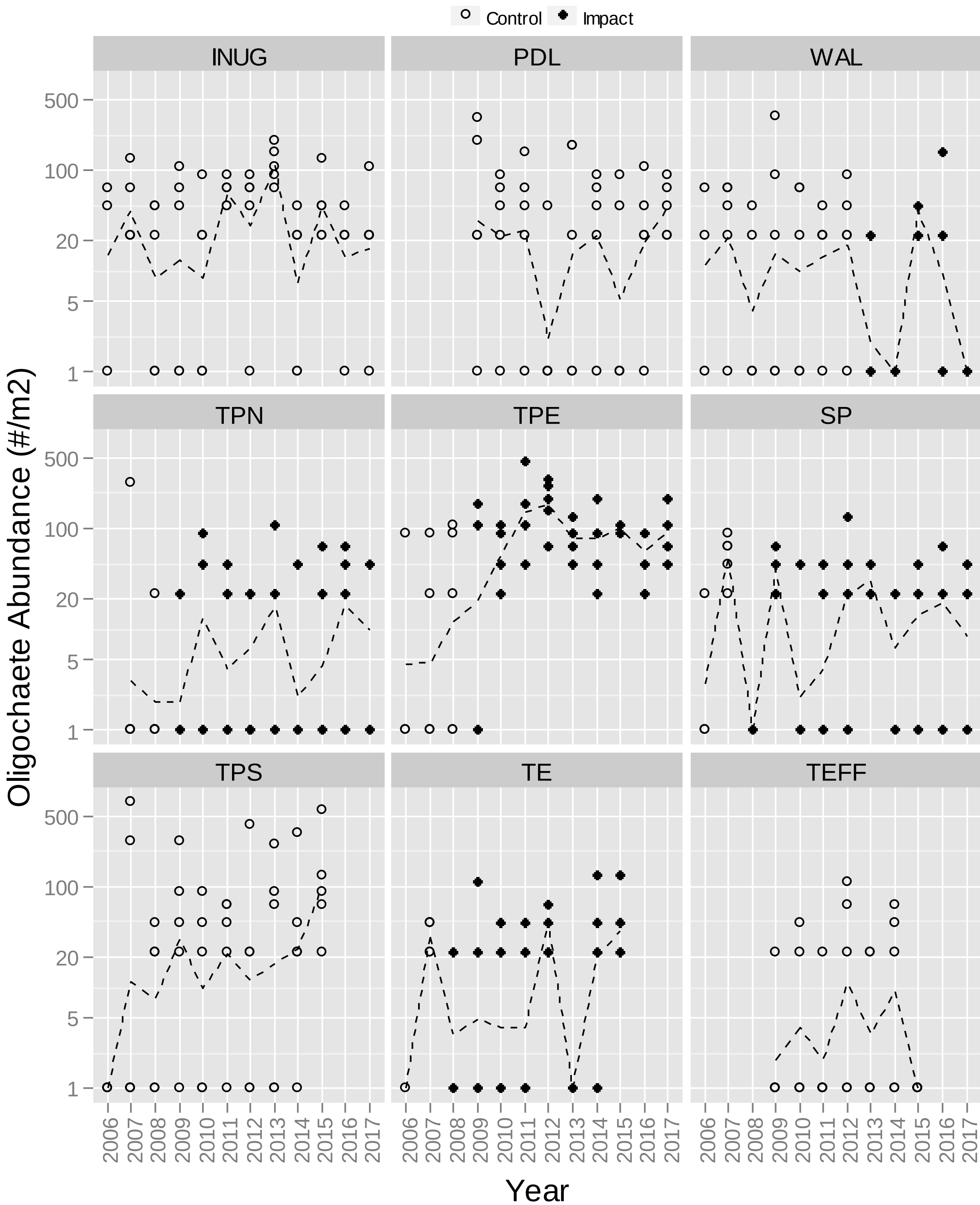


Figure E1–2. Insect abundance (#/m^2) from Meadowbank study lakes since 2006.

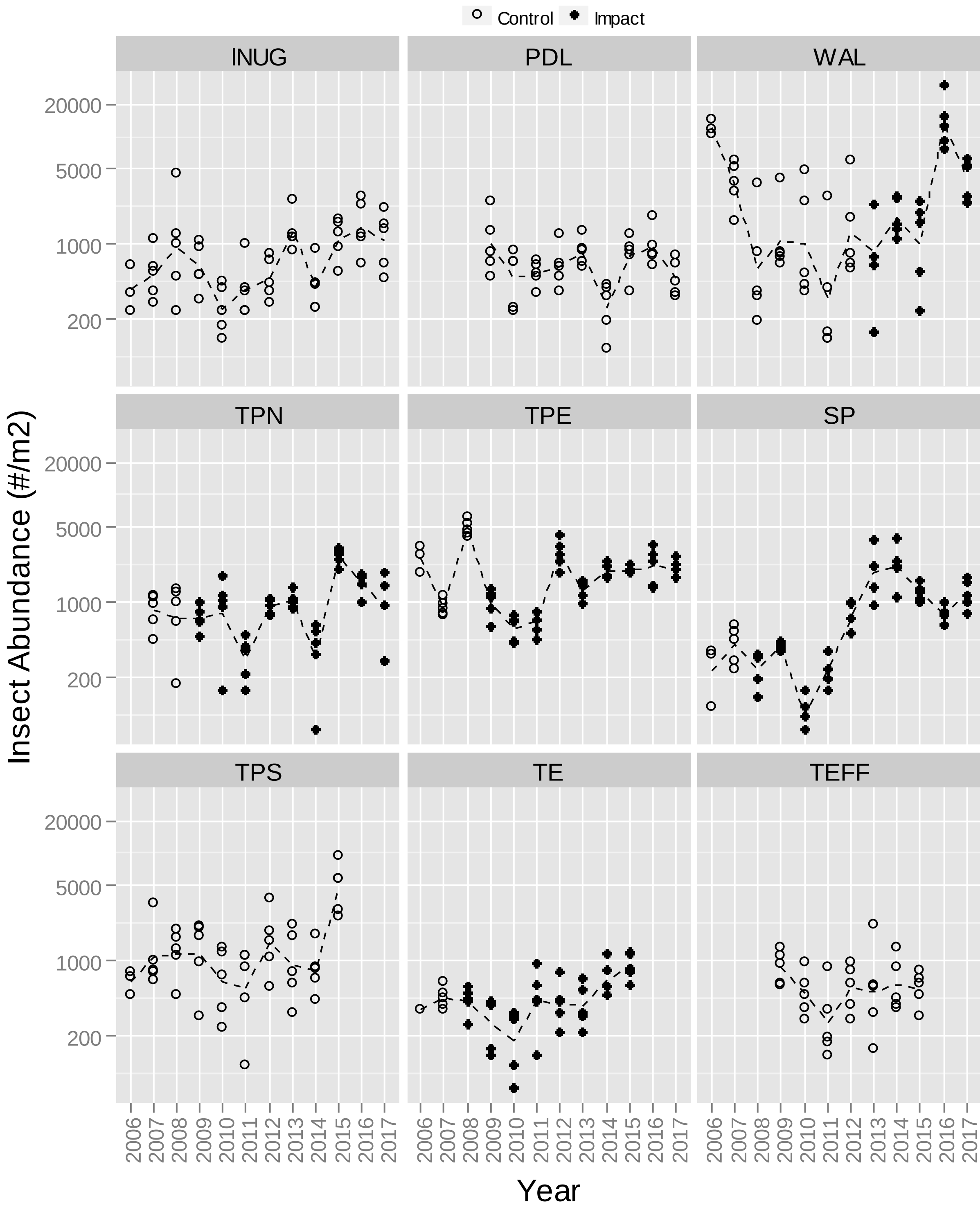


Figure E1–3. Mollusc abundance (#/m[2]) from Meadowbank study lakes since 2006.

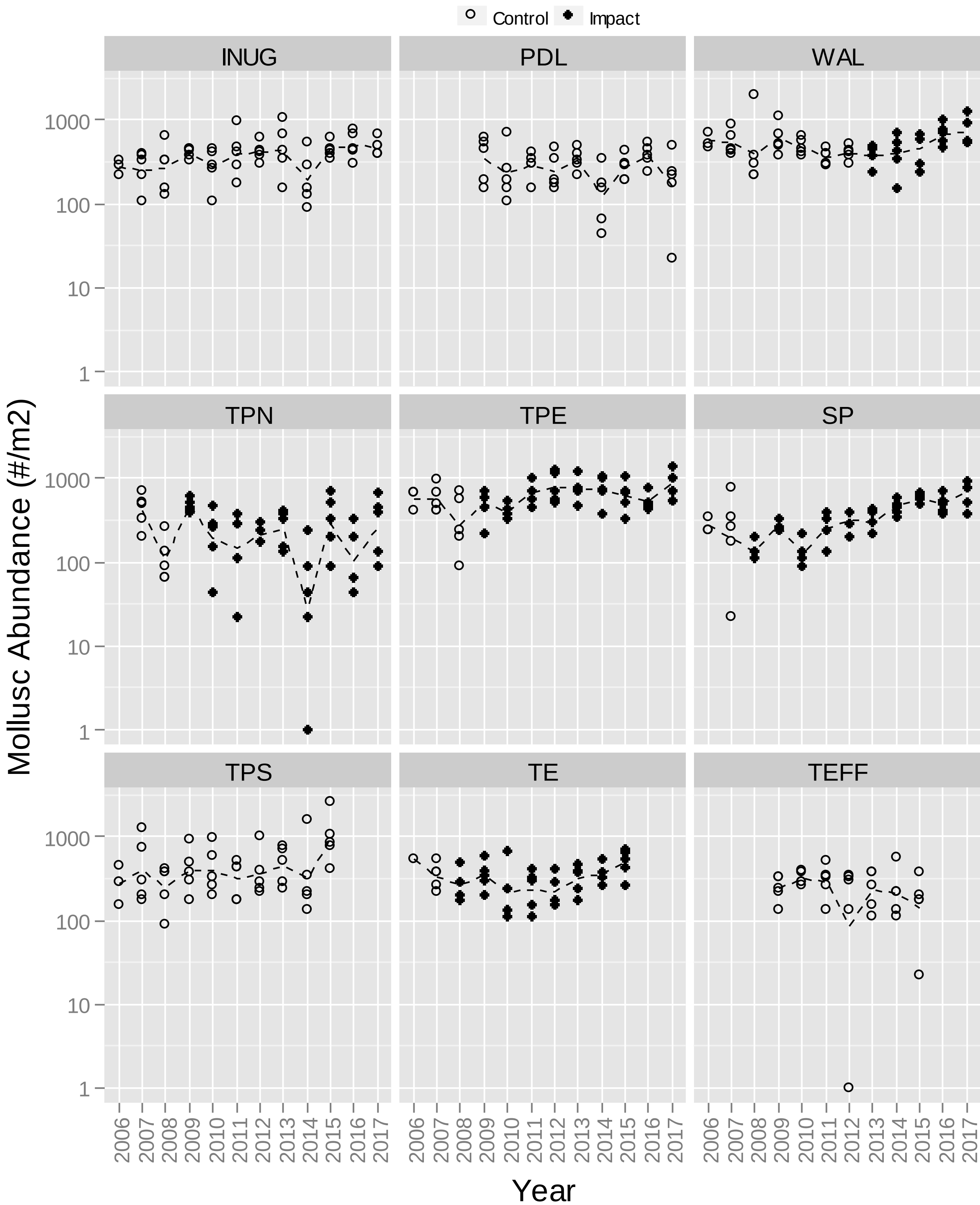


Figure E1–4. Other taxa abundance (#/m^2) from Meadowbank study lakes since 2006.

Note: "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, and O. Notostraca).

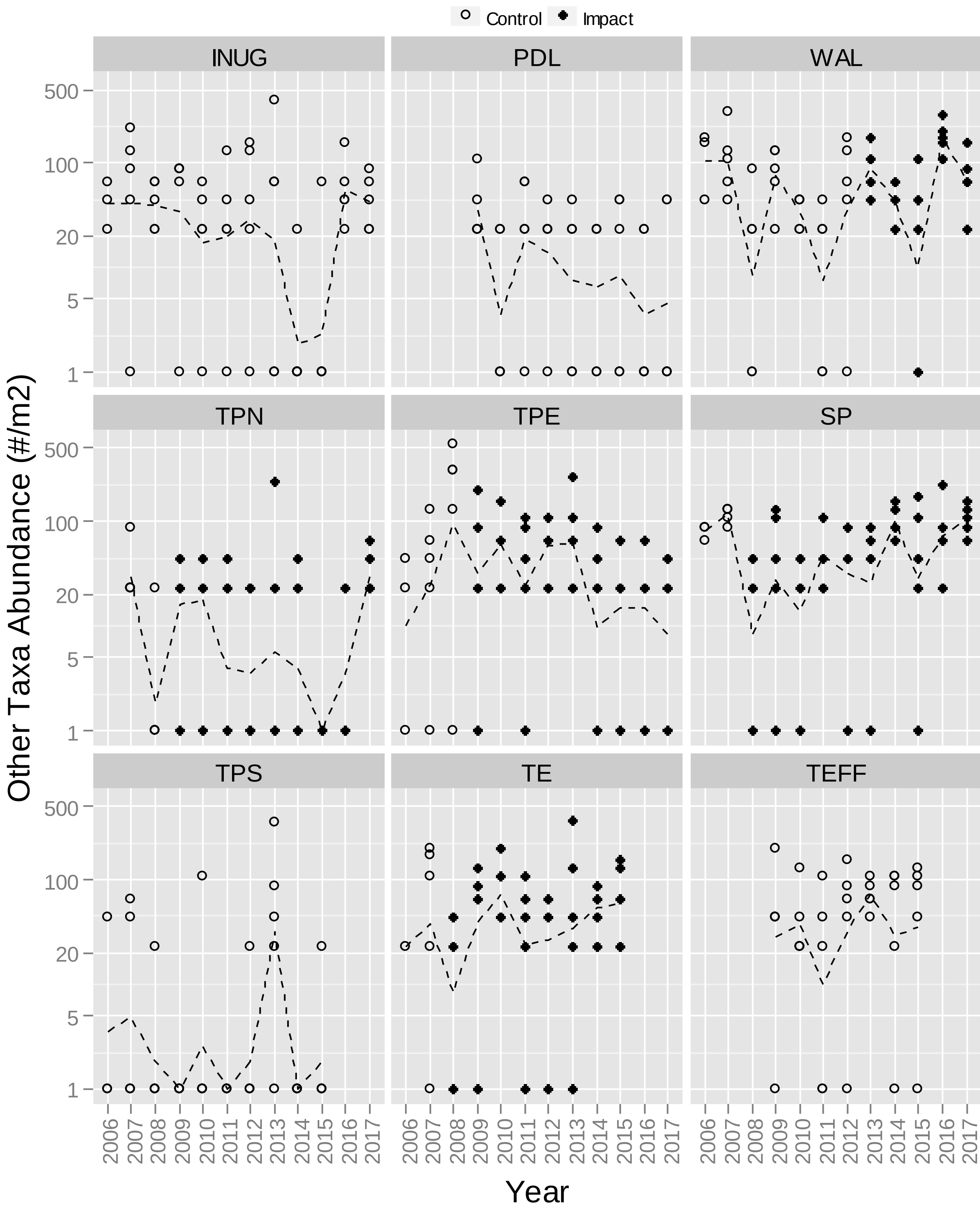


Figure E1–5. Oligochaete richness (# of taxa) from Meadowbank study lakes since 2006.

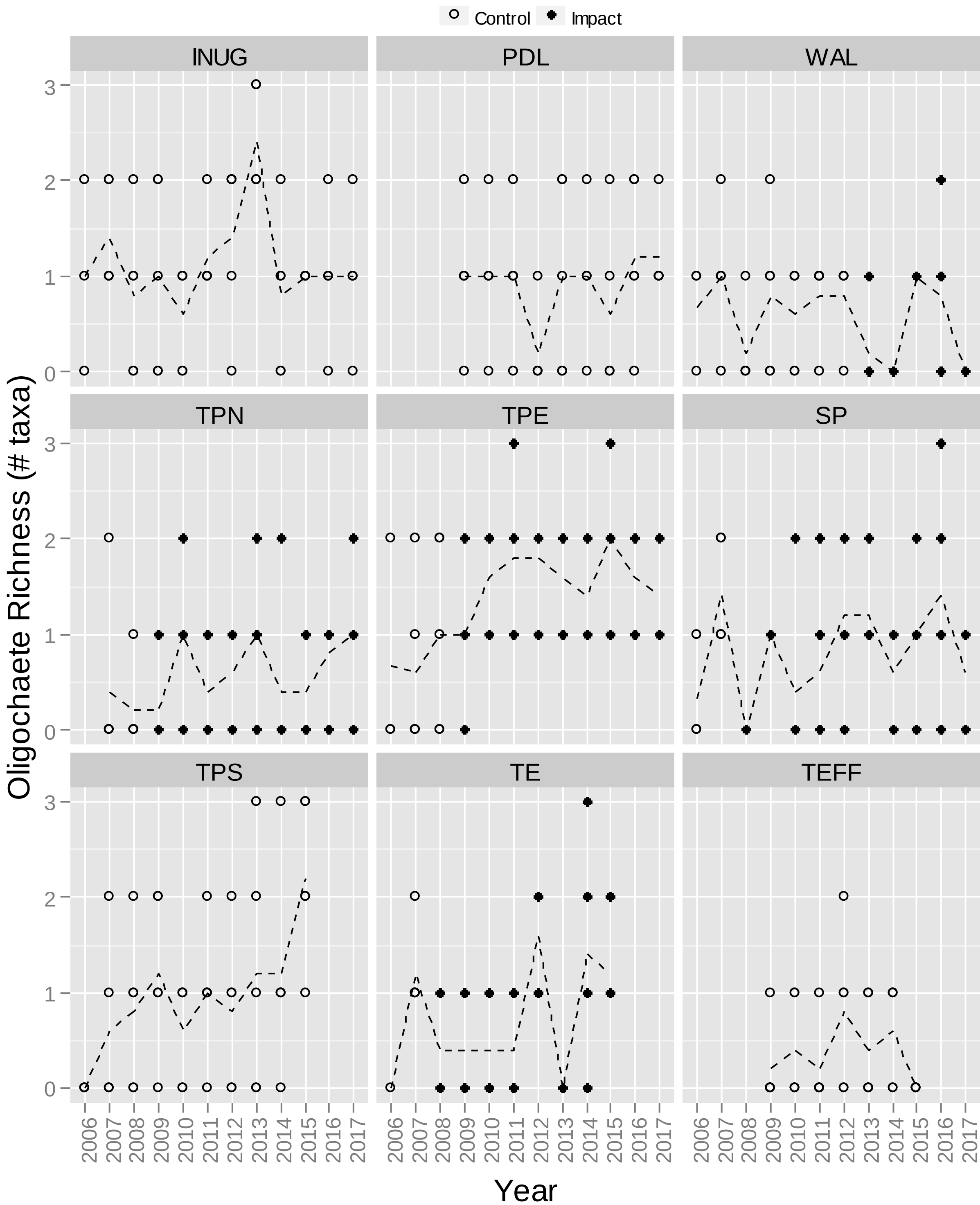


Figure E1–6. Insect richness (# of taxa) from Meadowbank study lakes since 2006.

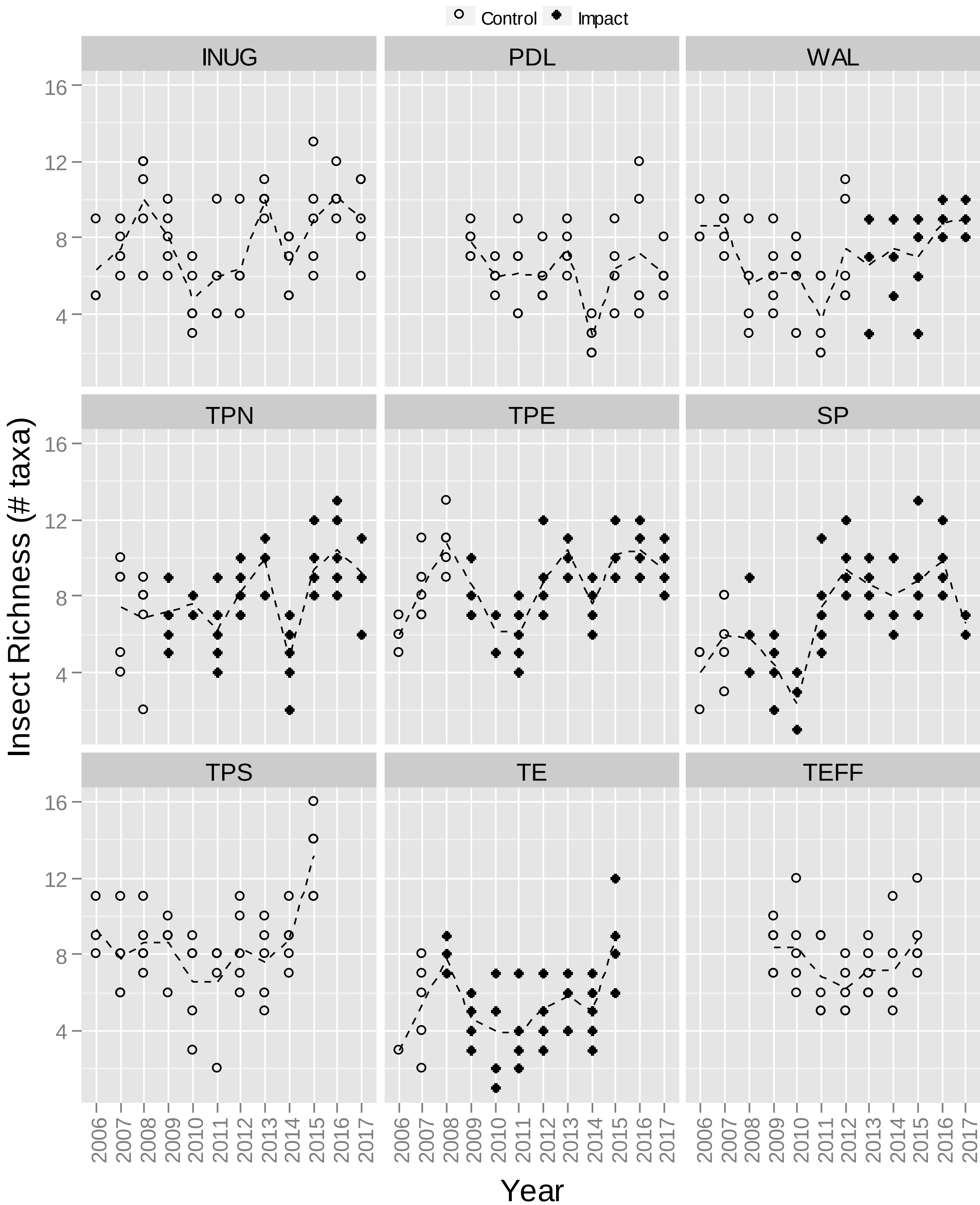


Figure E1–7. Mollusc richness (# of taxa) from Meadowbank study lakes since 2006.

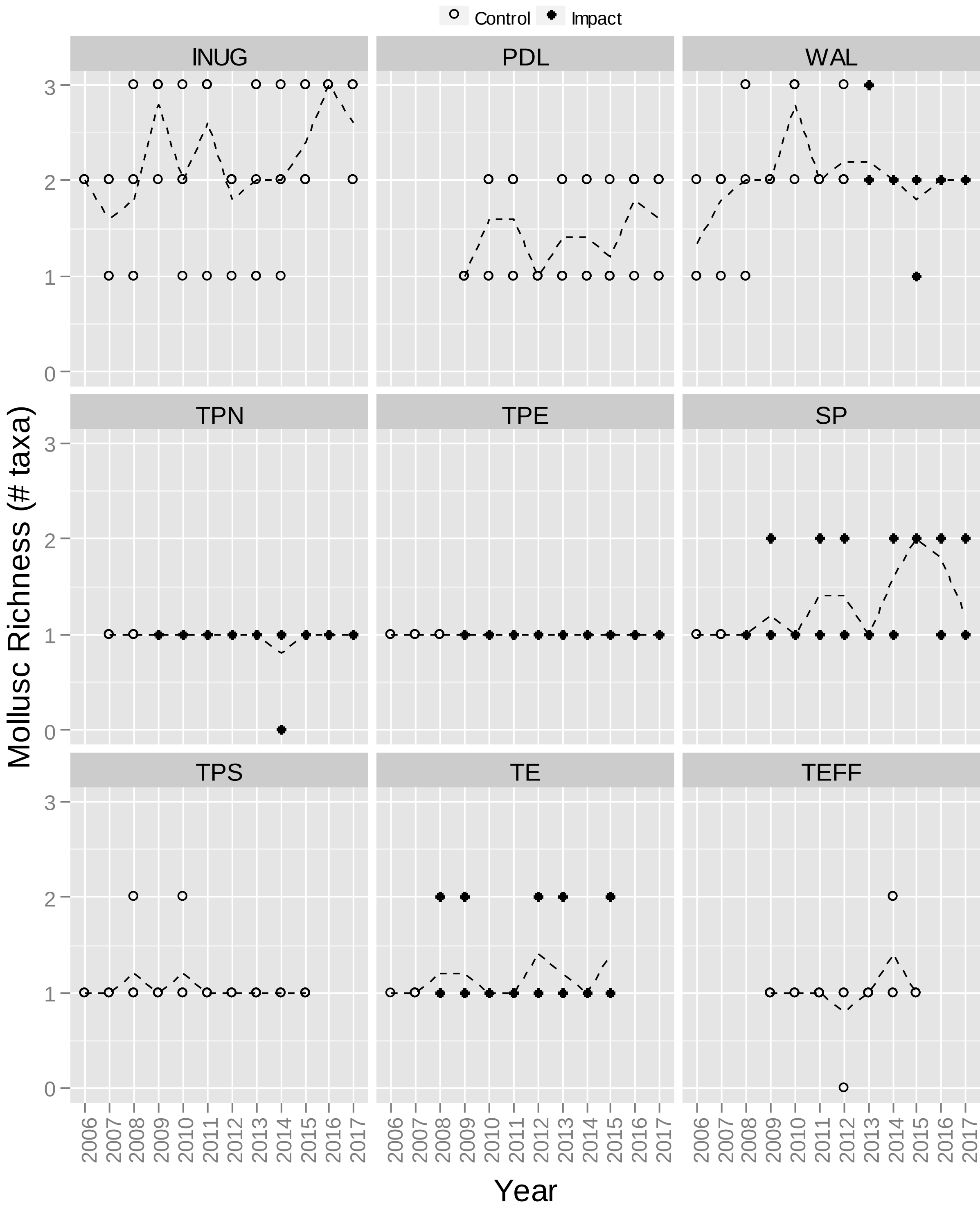


Figure E1–8. Other taxa richness (# of taxa) from Meadowbank study lakes since 2006.

Note: "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, and O. Notostraca).

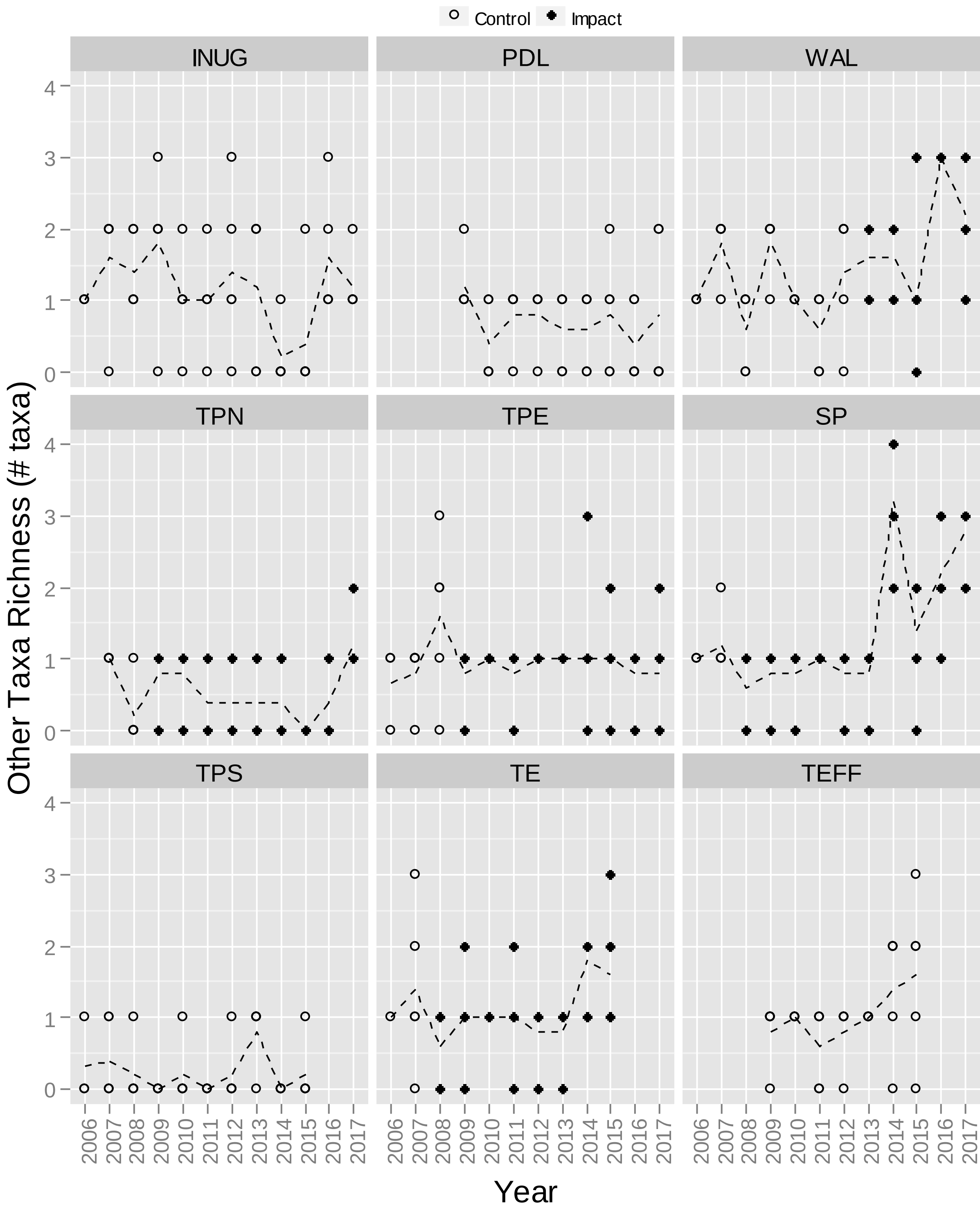


Figure E1–9. Simpson's Diversity for the benthic invertebrate community at the Meadowbank study lakes since 2006.

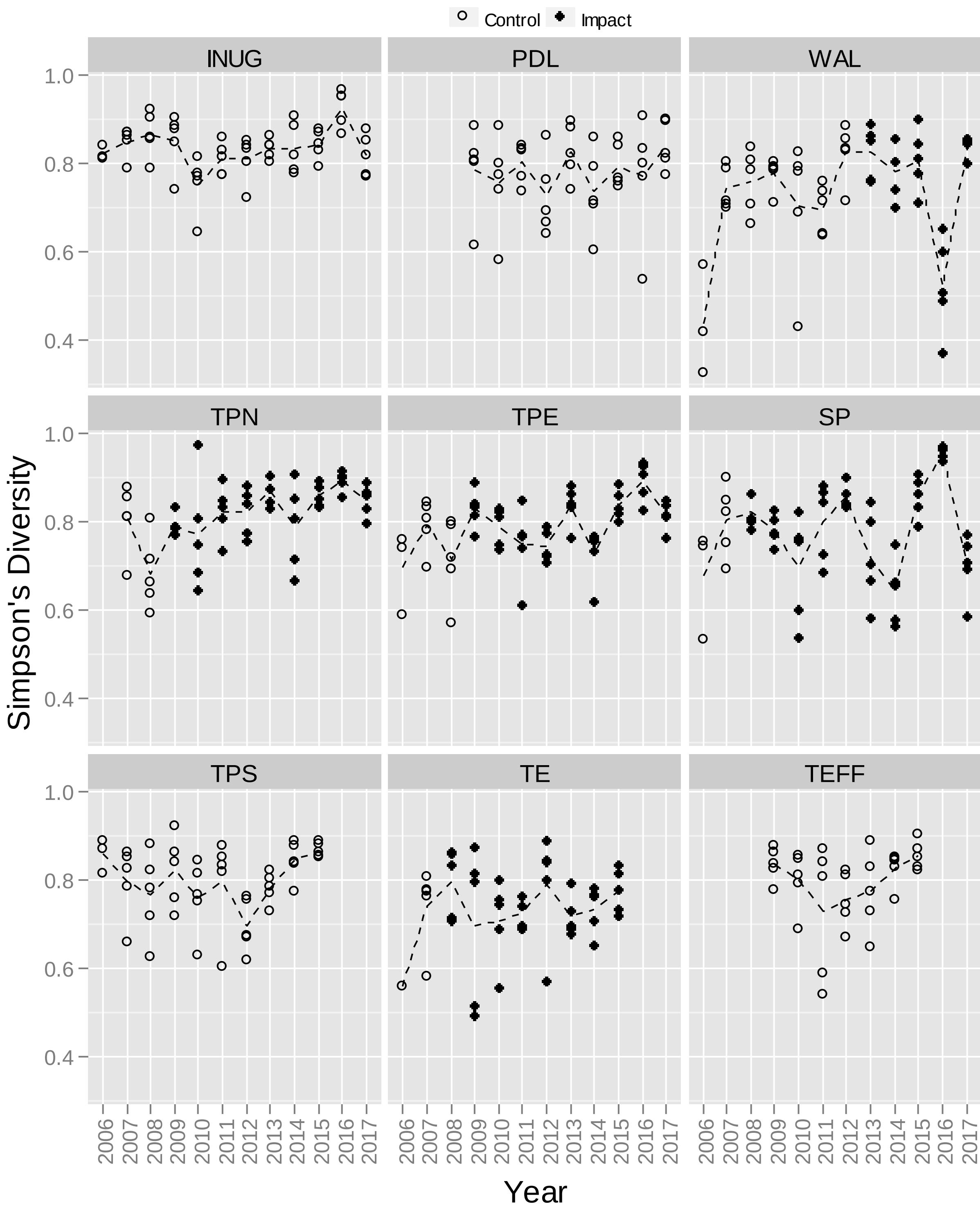
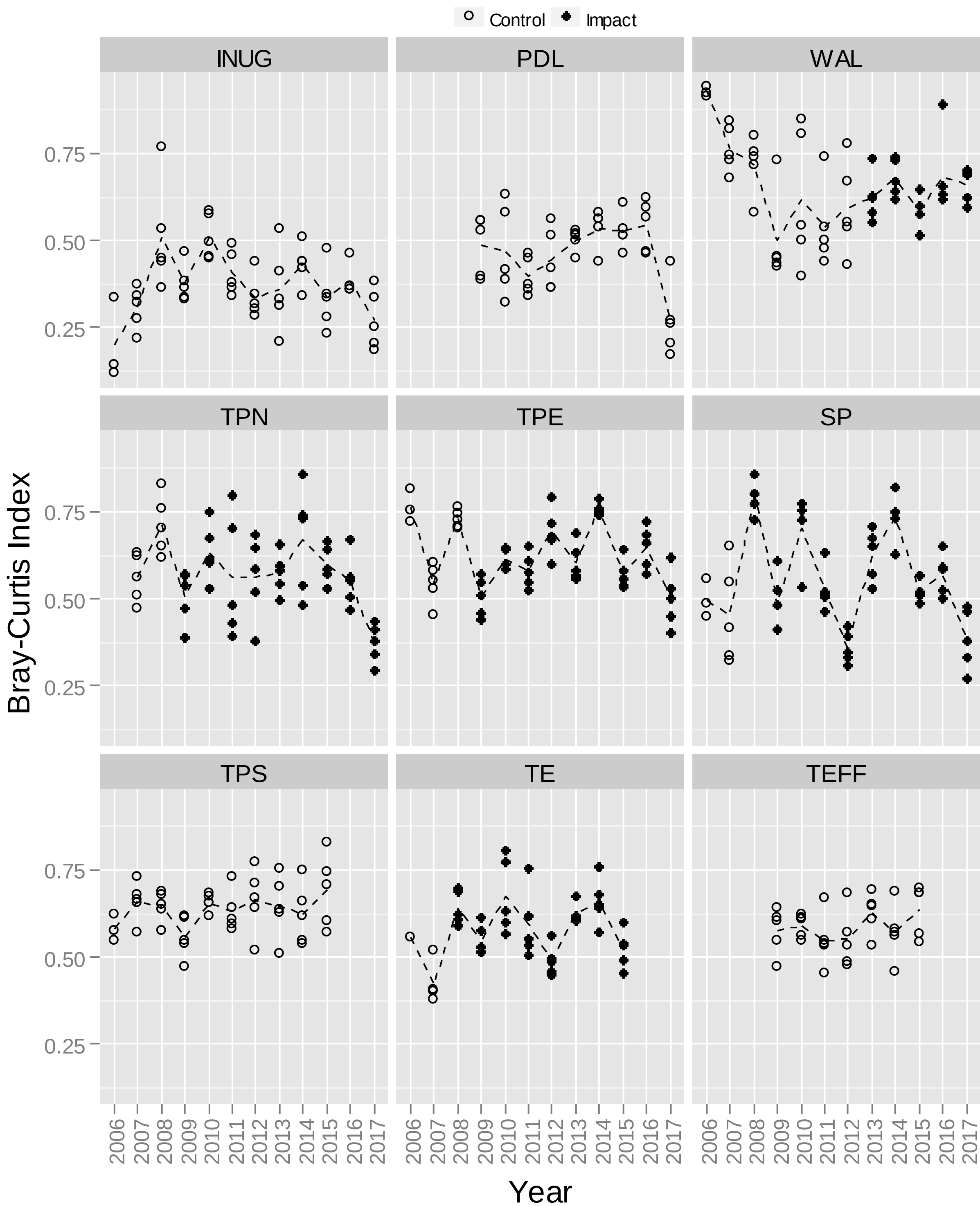


Figure E1–10. Bray-Curtis Index for the benthic invertebrate community at the Meadowbank study lakes since 2006.



Appendix E2 – Baker Lake Benthic Invertebrate Plots, 2006-2017

LIST OF FIGURES – APPENDIX E2

Note: All Baker Lake benthic invertebrate plots exclude samples BBD-3 (2009), BPJ-2 (2012), and BPJ-4 (2016) as part of the QA process. Refer to **Section 3.1.5** for details.

Figure E2-1. Oligochaete abundance (#/m^2) from Baker Lake since 2008.

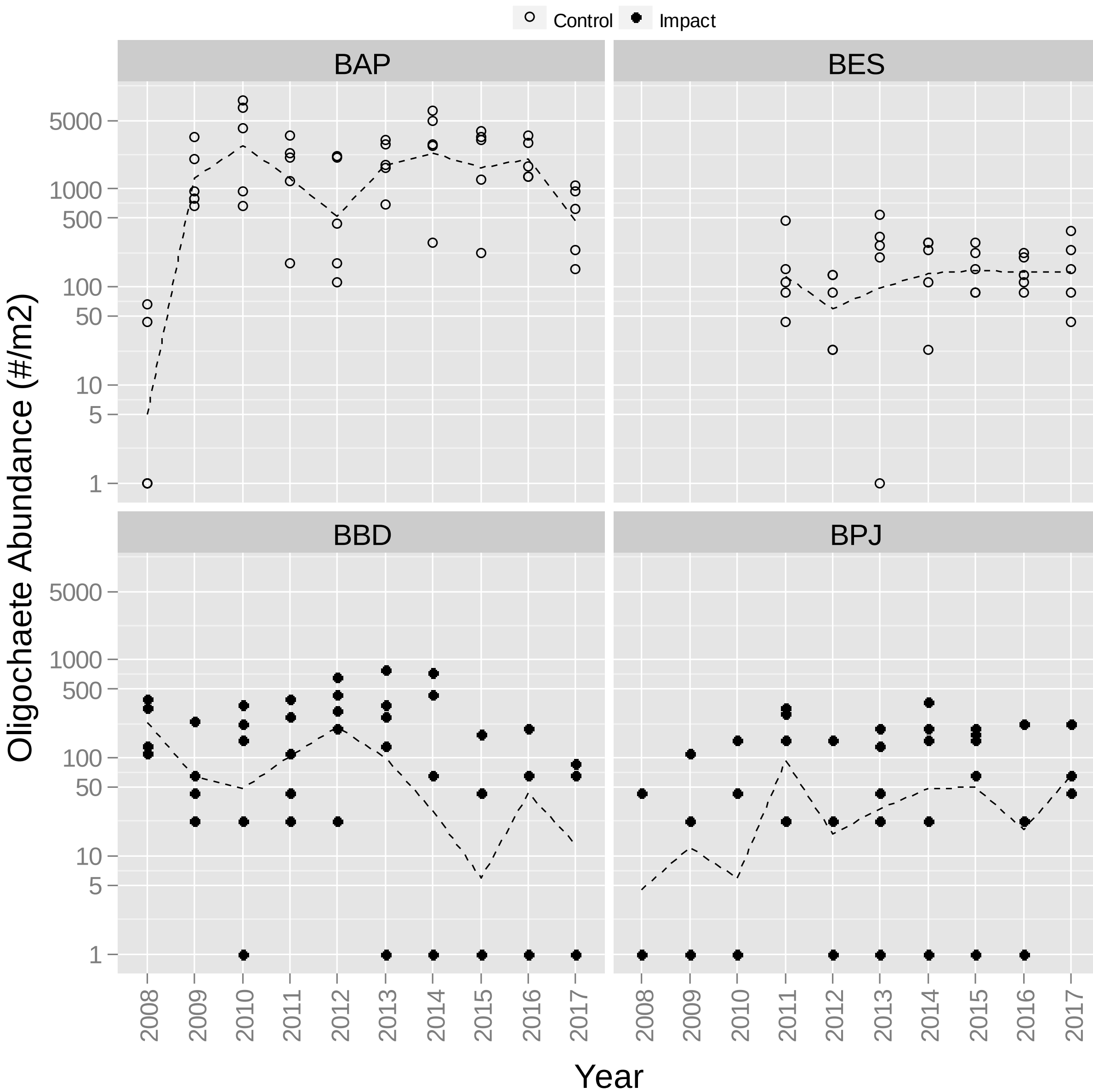


Figure E2–2. Insect abundance (#/m^2) from Baker Lake since 2008.

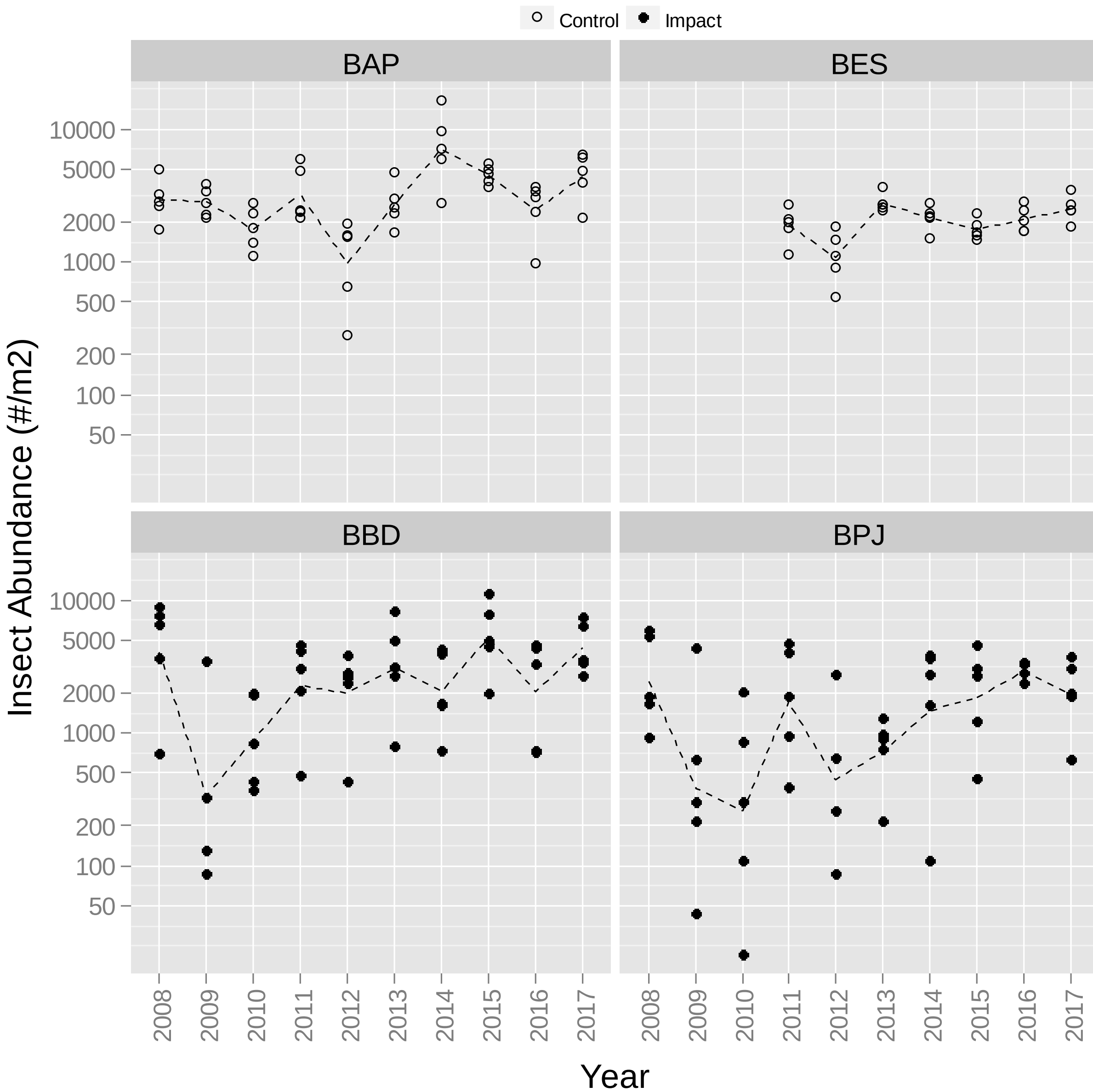


Figure E2–3. Mollusc abundance (#/m^2) from Baker Lake since 2008.

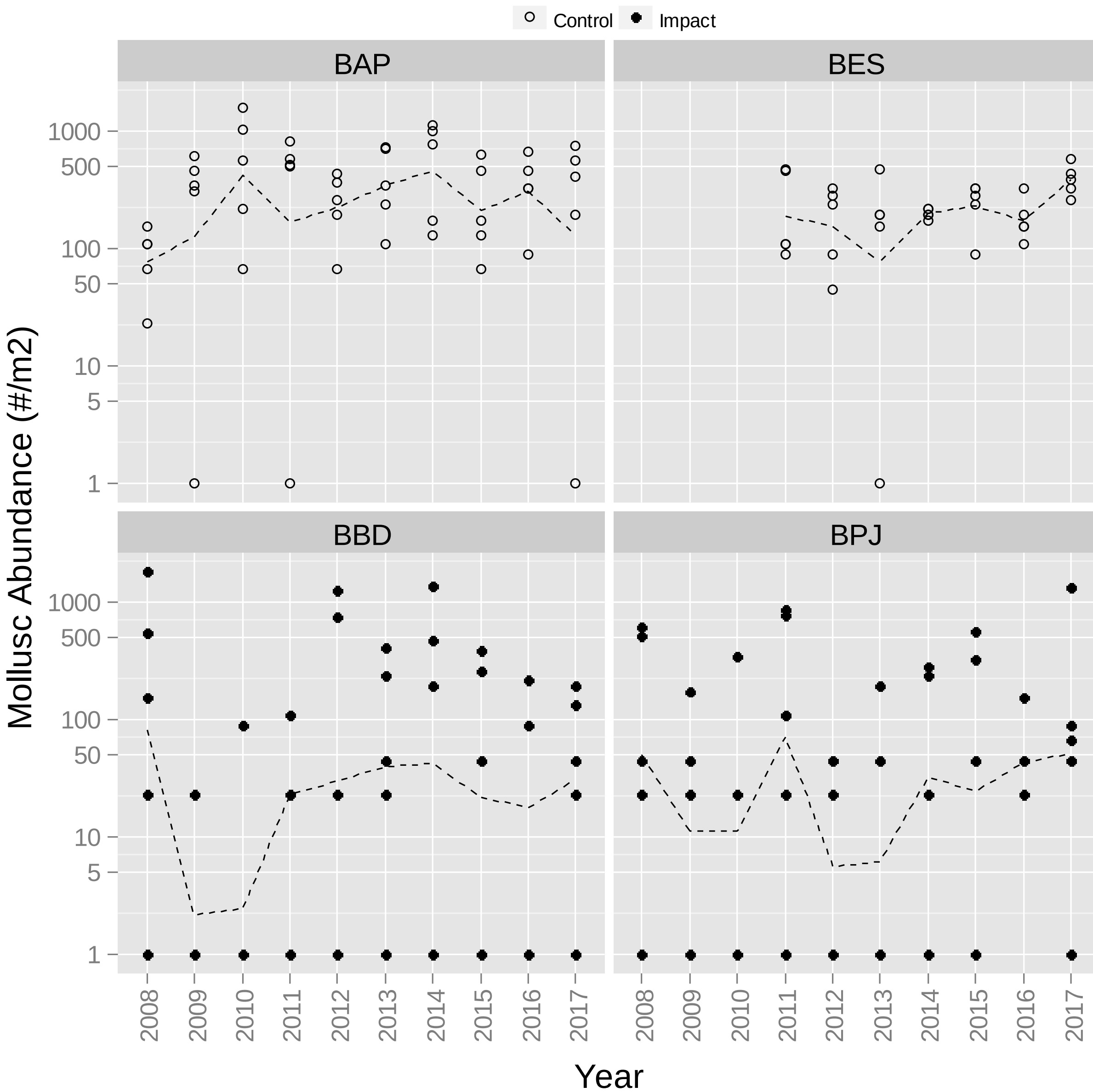


Figure E2–4. Other taxa abundance (#/m^2) from Baker Lake since 2008.

Note: "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, and O. Notostraca).

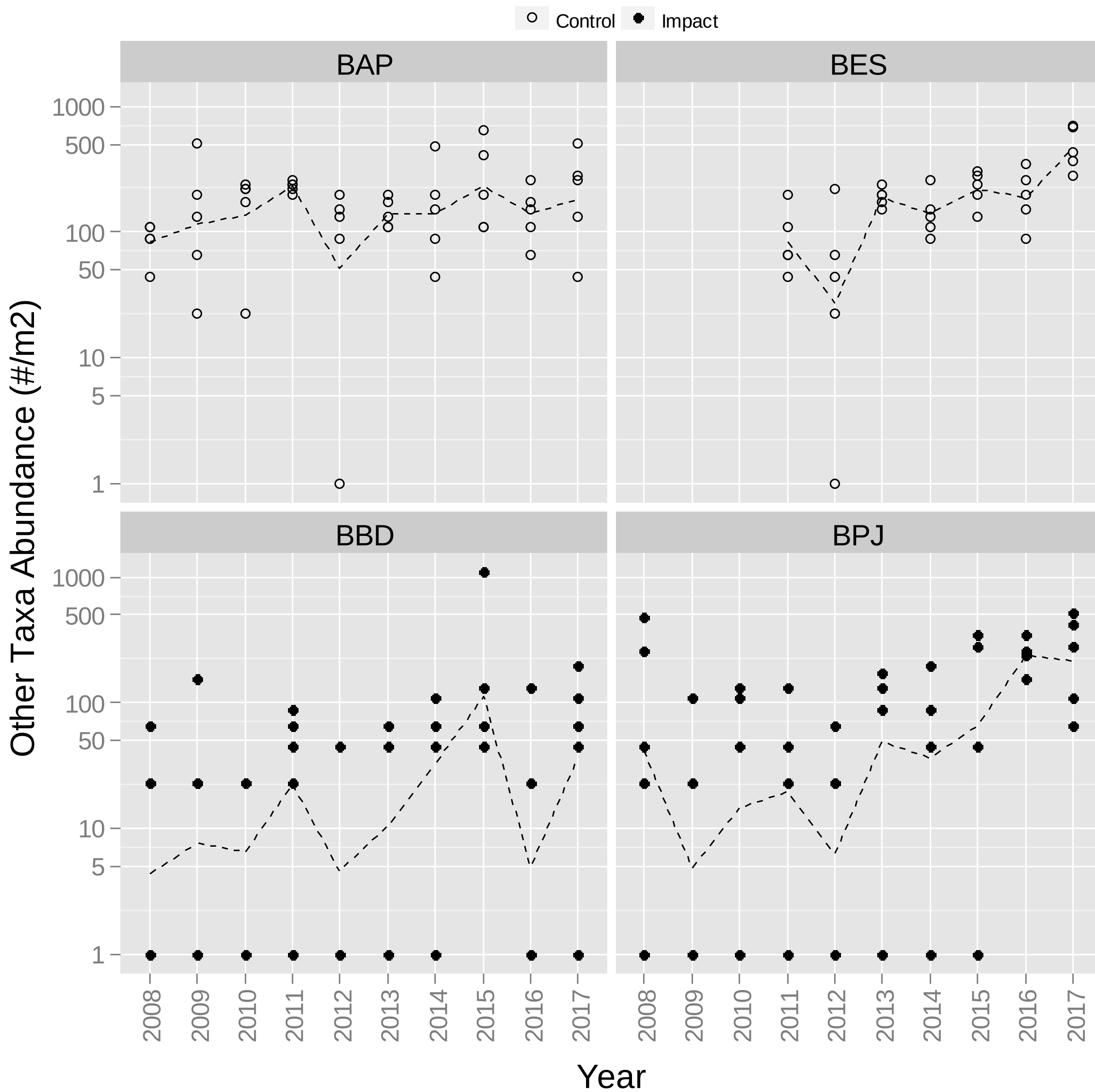


Figure E2–5. Oligochaete richness (# of taxa) from Baker Lake since 2008.

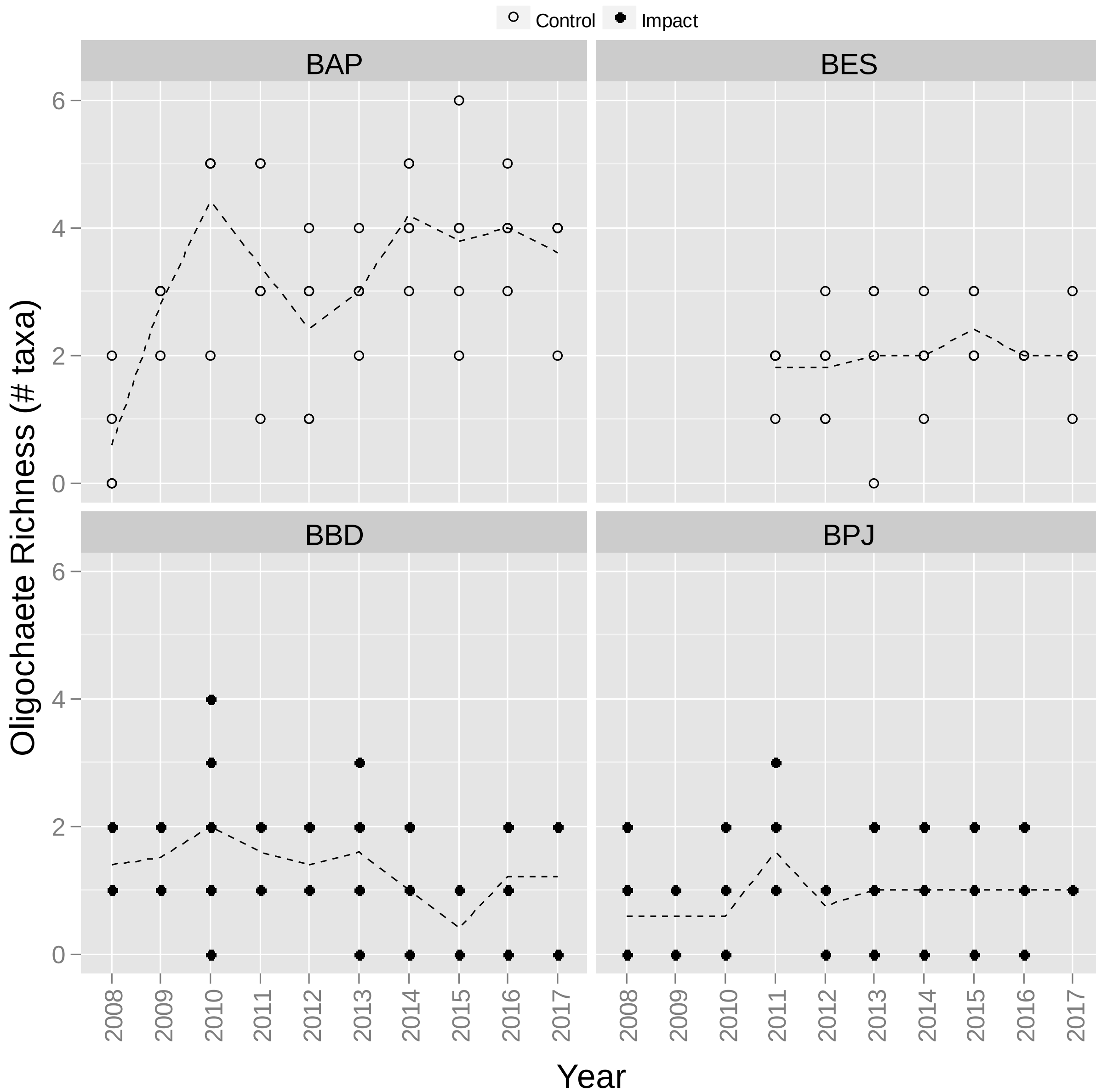


Figure E2–6. Insect richness (# of taxa) from Baker Lake since 2008.

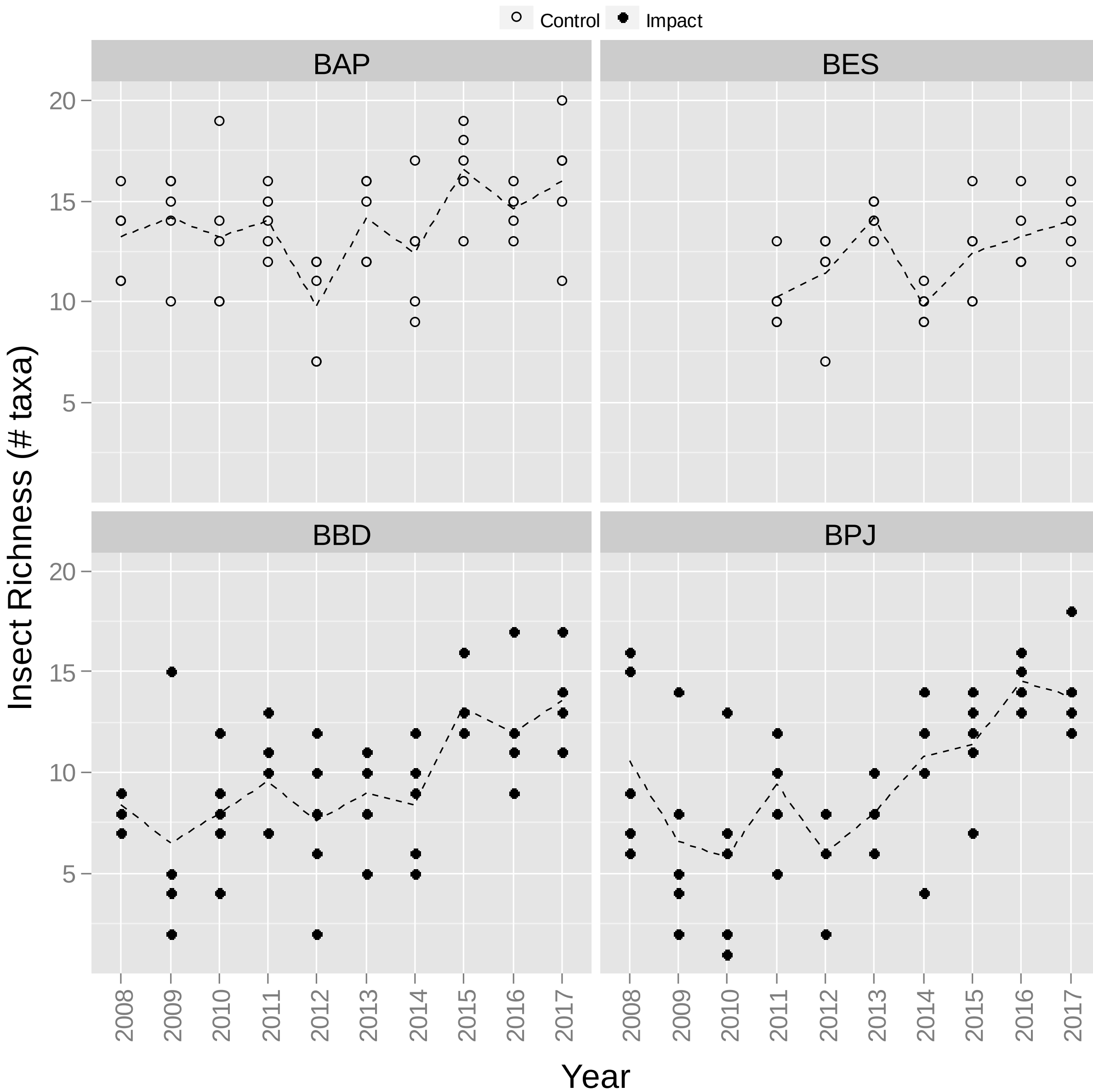


Figure E2–7. Mollusc richness (# of taxa) from Baker Lake since 2008.

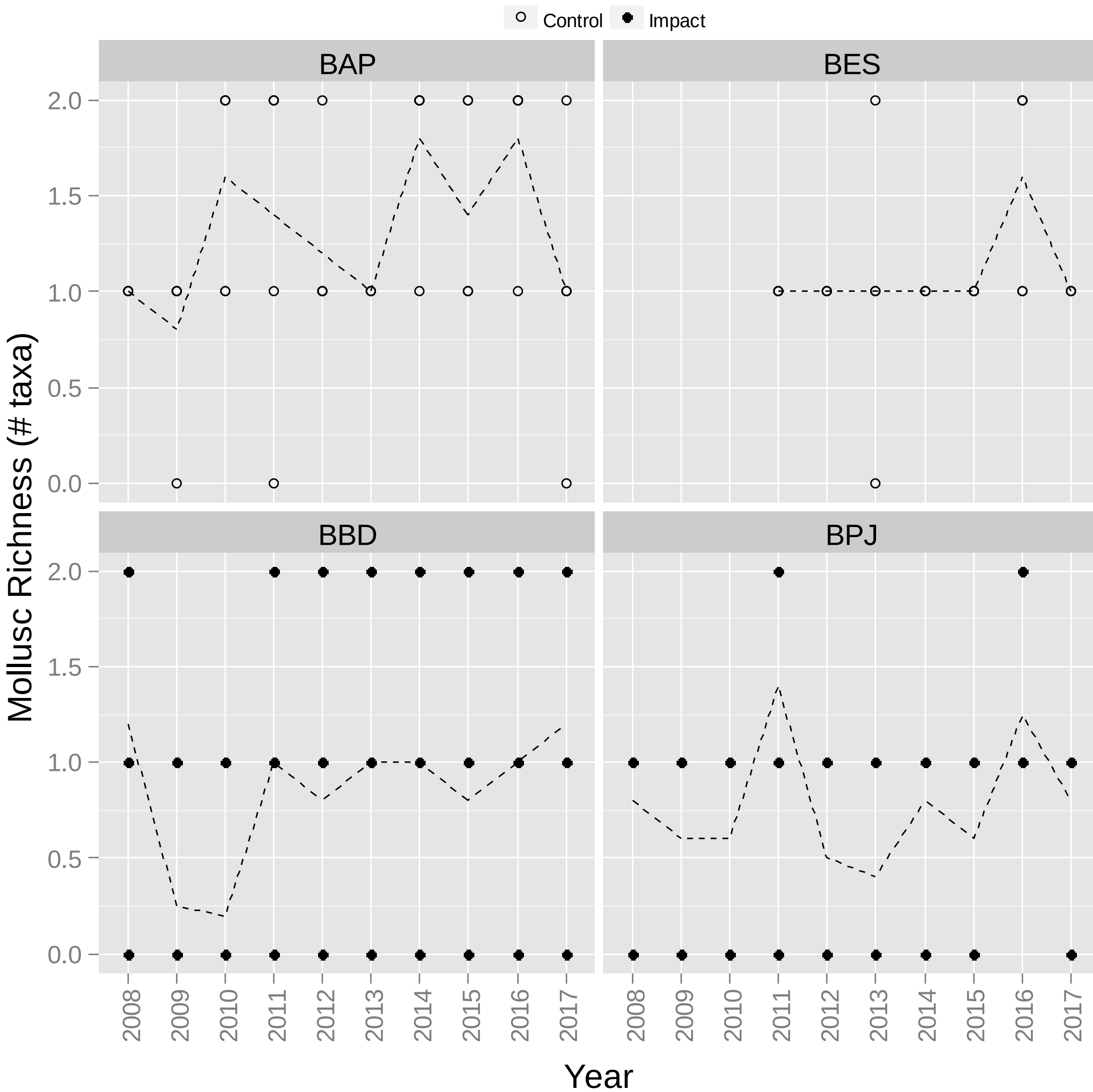


Figure E2‒8. Other taxa richness (# of taxa) from Baker Lake since 2008.

Note: "Other taxa" includes flatworms (Turbellaria) and arthropods (Acalyptonotidae, Hygrobatidae, Lebertiidae, Oxidae, and O. Notostraca).

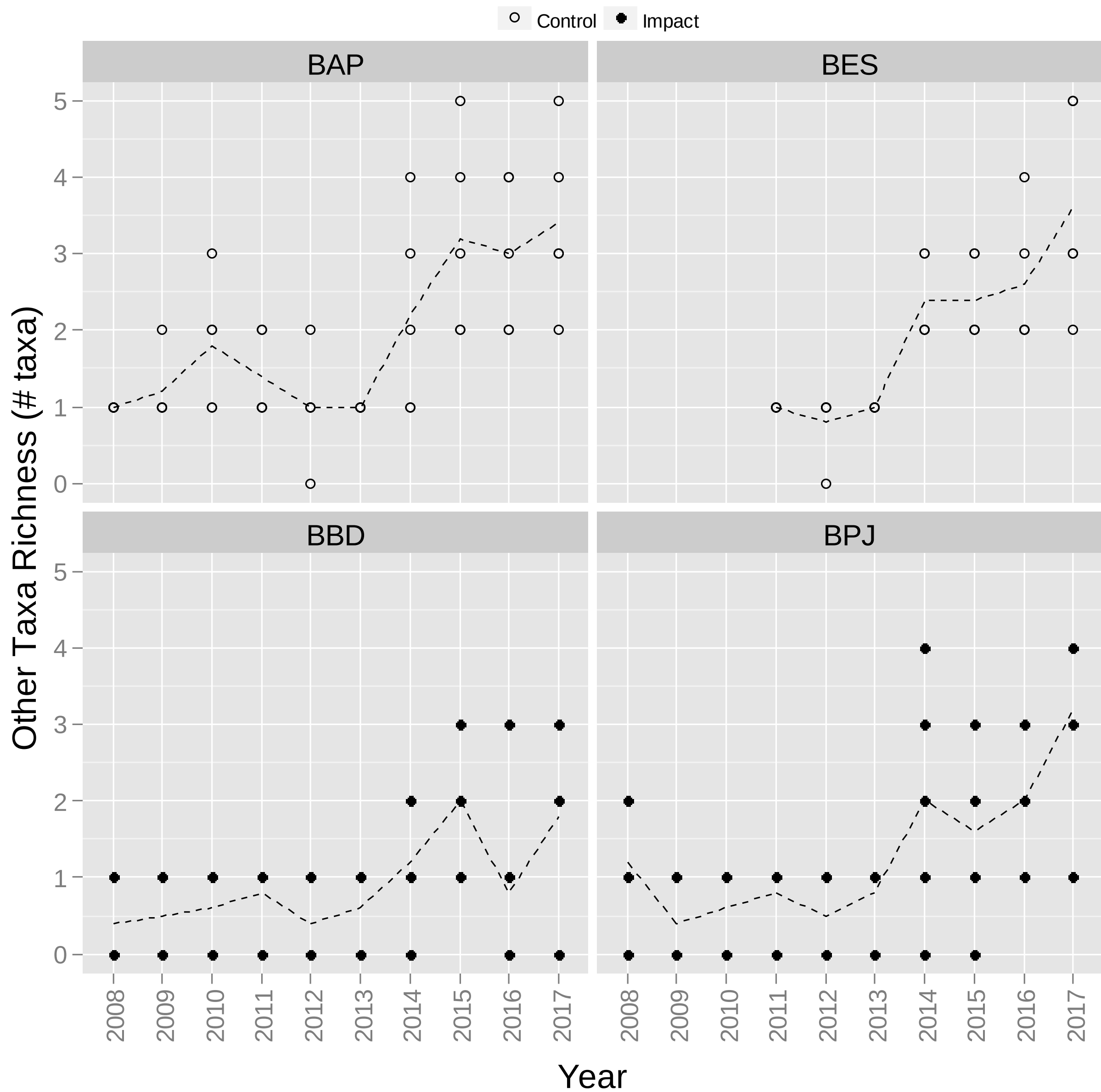


Figure E2–9. Simpson's Diversity for the benthic invertebrate community at Baker Lake since 2006.

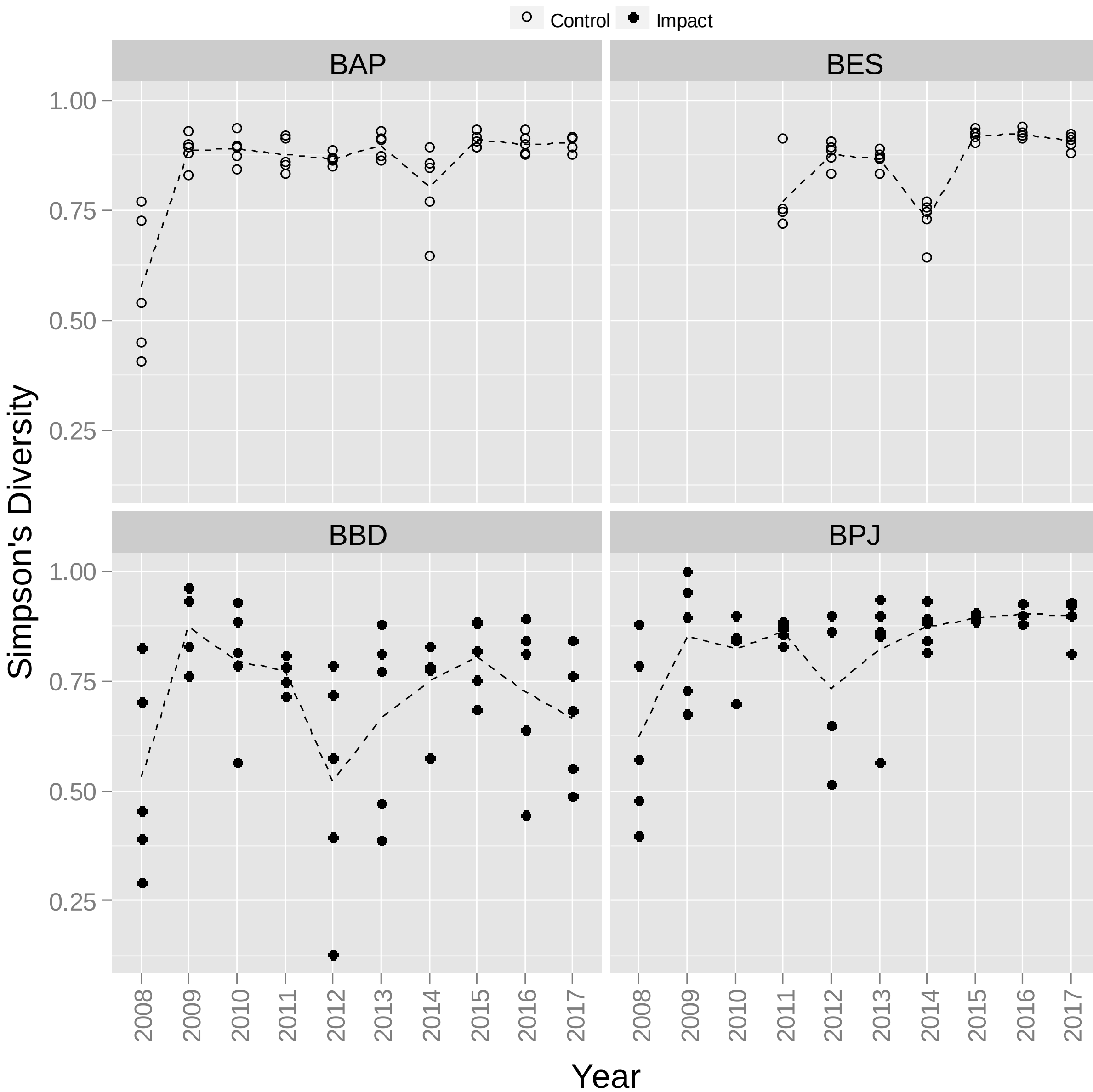
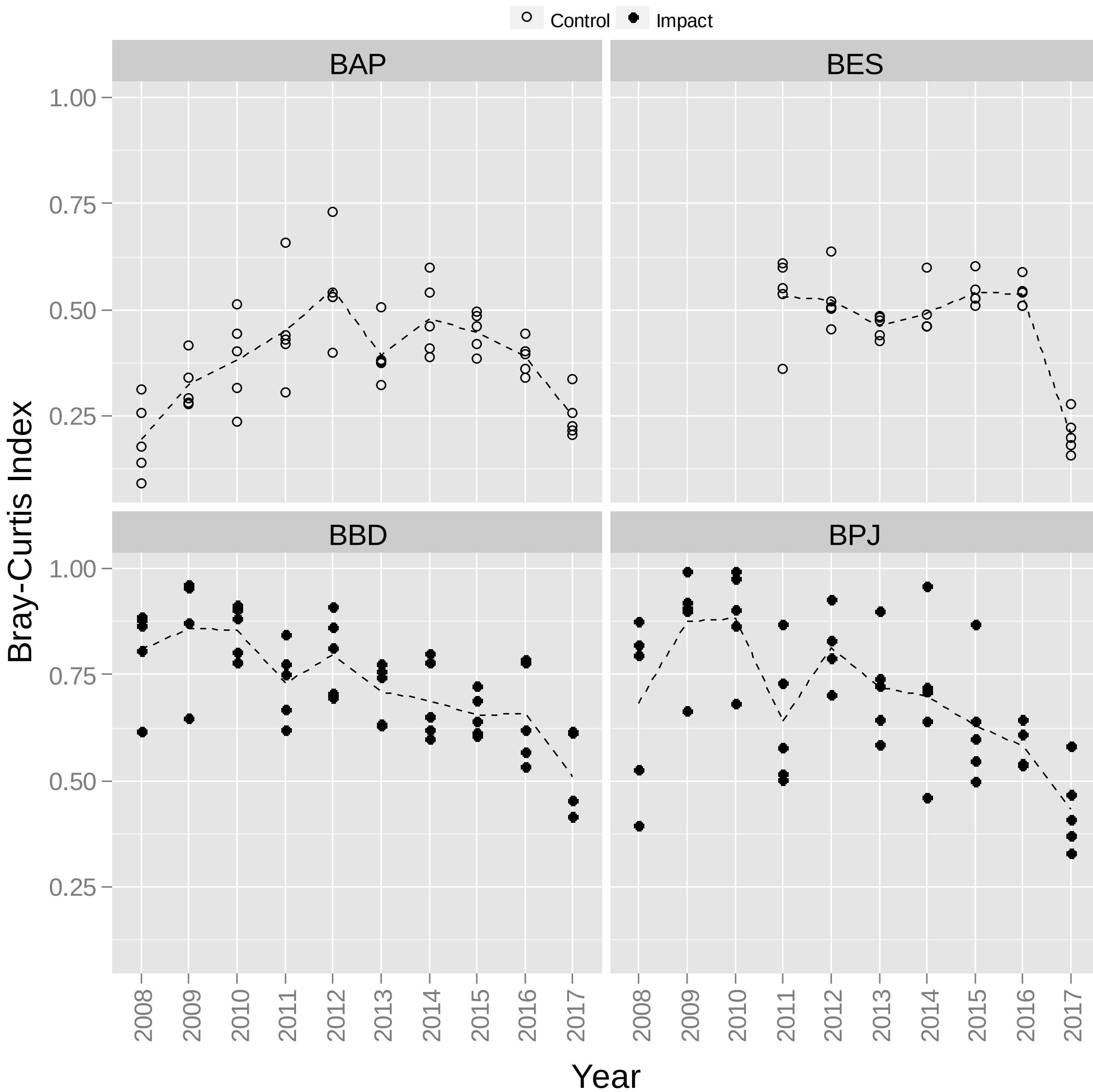


Figure E2–10. Bray-Curtis Index for the benthic invertebrate community at Baker Lake since 2008.



APPENDIX F – ALS LABORATORY REPORTS, 2017

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 04-APR-17
Report Date: 17-APR-17 15:04 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1908589

Project P.O. #: NOT SUBMITTED
Job Reference: CREMP MEADOWBANK SURFACEWATER
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL 13-APR-17 09:47

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1908589-1 Surface Water 24-MAR-17 10:30 TPE-100	L1908589-2 Surface Water 24-MAR-17 11:30 TPE-101	L1908589-3 Surface Water 25-MAR-17 14:00 TPN-100	L1908589-4 Surface Water 25-MAR-17 12:45 TPN-101	L1908589-5 Surface Water 25-MAR-17 10:00 TPS-57
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.086	0.043	0.166	0.089	0.159

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1908589-6 Surface Water 25-MAR-17 11:00 TPS-58	L1908589-7 Surface Water 26-MAR-17 14:40 SP-100	L1908589-8 Surface Water 26-MAR-17 16:00 SP-101	L1908589-9 Surface Water 26-MAR-17 16:30 WAL-69	L1908589-10 Surface Water 27-MAR-17 WAL-70
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.096	0.184	0.165	0.140	0.150

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908589-11	L1908589-12			
	Description	Surface Water	Surface Water			
	Sampled Date	24-MAR-17	26-MAR-17			
	Sampled Time					
	Client ID	MAR-DUP-01	MAR-DUP-02			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.084	0.148			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID / Description / Sampled Date / Sampled Time / Client ID	L1908589-1 Surface Water 24-MAR-17 10:30 TPE-100	L1908589-2 Surface Water 24-MAR-17 11:30 TPE-101	L1908589-3 Surface Water 25-MAR-17 14:00 TPN-100	L1908589-4 Surface Water 25-MAR-17 12:45 TPN-101	L1908589-5 Surface Water 25-MAR-17 10:00 TPS-57
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	35.5	38.5	34.9	33.4	34.3
	Hardness (as CaCO3) (mg/L)	12.6	13.1	11.2	10.7	11.3
	pH (pH)	7.03	7.11	7.07	7.01	7.04
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	24.4	23.7	21.5	19.3	21.0
	Turbidity (NTU)	0.16	0.23	0.16	0.18	0.17
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.8	9.7	7.9	7.2	7.4
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.8	9.7	7.9	7.2	7.4
	Ammonia, Total (as N) (mg/L)	0.0180	0.0209	0.0202	0.0192	0.0221
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.94	0.95	0.92	0.87	0.93
	Fluoride (F) (mg/L)	0.083	0.087	0.076	0.072	0.076
	Nitrate (as N) (mg/L)	0.0263	0.0180	0.0439	0.0401	0.0417
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.124	0.142	0.133	0.132	0.136
	Orthophosphate-Dissolved (as P) (mg/L)	0.0011	<0.0010	0.0010	0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0022	0.0029	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	6.08	6.17	5.92	5.57	5.89
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.62	1.51	1.48	1.56	1.77
	Total Organic Carbon (mg/L)	1.58	1.73	1.46	1.66	1.79
Total Metals	Aluminum (Al)-Total (mg/L)	0.0032	0.0039	0.0040	0.0050	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00033	0.00043	0.00024	0.00021	0.00021
	Barium (Ba)-Total (mg/L)	0.00363	0.00391	0.00452	0.00351	0.00364
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000136	<0.0000050	0.0000076	0.0000061	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.96	3.23	2.74	2.55	2.67
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1908589-6 Surface Water 25-MAR-17 11:00 TPS-58	L1908589-7 Surface Water 26-MAR-17 14:40 SP-100	L1908589-8 Surface Water 26-MAR-17 16:00 SP-101	L1908589-9 Surface Water 26-MAR-17 16:30 WAL-69	L1908589-10 Surface Water 27-MAR-17 WAL-70
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	34.4	43.5	42.6	67.4	65.7
	Hardness (as CaCO3) (mg/L)	11.5	16.0	15.8	25.5	25.0
	pH (pH)	7.04	7.22	7.21	6.96	7.07
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	18.4	27.4	26.4	44	34
	Turbidity (NTU)	0.16	0.15	0.22	0.20	0.15
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.7	11.8	11.7	20.2	20.2
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	7.7	11.8	11.7	20.2	20.2
	Ammonia, Total (as N) (mg/L)	0.0276	0.0158	0.0156	0.0302	0.0310
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.92	1.00	0.96	1.15	1.13
	Fluoride (F) (mg/L)	0.076	0.080	0.075	0.059	0.058
	Nitrate (as N) (mg/L)	0.0427	0.0158	0.0126	0.0992	0.0912
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.151	0.148	0.317	0.319	0.198
	Orthophosphate-Dissolved (as P) (mg/L)	0.0011	0.0013	0.0011	0.0011	0.0012
	Phosphorus (P)-Total Dissolved (mg/L)	0.0025	0.0022	0.0027	0.0028	0.0030
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0023	<0.0020	0.0028	0.0026
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	0.92	0.91
	Sulfate (SO4) (mg/L)	5.90	5.91	5.61	6.99	6.87
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.79	1.91	1.90	2.48	2.31
	Total Organic Carbon (mg/L)	1.67	1.95	1.84	2.64	2.66
Total Metals	Aluminum (Al)-Total (mg/L)	0.0032	0.0056	0.0039	0.0043	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00020	0.00033	0.00028	0.00031	0.00029
	Barium (Ba)-Total (mg/L)	0.00358	0.00365	0.00333	0.00387	0.00379
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000117	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.71	4.19	4.08	7.03	6.90
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L1908589-11	L1908589-12	L1908589-13	L1908589-14	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	24-MAR-17	26-MAR-17	24-MAR-17	24-MAR-17	
	Sampled Time			09:00	08:30	
	Client ID	MAR-DUP-01	MAR-DUP-02	MAR-EB-01	MAR-DI-01	
WATER						
Physical Tests	Conductivity (uS/cm)	36.0	61.4	<2.0	<2.0	
	Hardness (as CaCO3) (mg/L)	12.6	24.9	<0.50	<0.50	
	pH (pH)	7.07	7.30	5.20	5.24	
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	23.8	44	<3.0	<3.0	
	Turbidity (NTU)	0.19	0.20	0.13	<0.10	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.8	21.1	<1.0	<1.0	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	8.8	21.1	<1.0	<1.0	
	Ammonia, Total (as N) (mg/L)	0.0180	0.0310	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.94	1.12	<0.10	<0.10	
	Fluoride (F) (mg/L)	0.084	0.058	<0.020	<0.020	
	Nitrate (as N) (mg/L)	0.0263	0.0914	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.182	0.206	0.061	<0.050	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0011	0.0015	<0.0010	0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0025	0.0028	<0.0020	0.0020	
	Phosphorus (P)-Total (mg/L)	0.0020	0.0021	<0.0020	<0.0020	
	Silicate (as SiO2) (mg/L)	<0.50	0.94	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	6.07	6.83	<0.30	<0.30	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.80	2.34	<0.50	<0.50	
	Total Organic Carbon (mg/L)	1.54	2.32	<0.50	<0.50	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0060	0.0056	RRV 0.0044	<0.0030	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00032	0.00031	<0.00010	<0.00010	
	Barium (Ba)-Total (mg/L)	0.00366	0.00378	RRV 0.000220	<0.000050	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	2.97	6.78	<0.050	<0.050	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908589-1	L1908589-2	L1908589-3	L1908589-4	L1908589-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	24-MAR-17	24-MAR-17	25-MAR-17	25-MAR-17	25-MAR-17
	Sampled Time	10:30	11:30	14:00	12:45	10:00
	Client ID	TPE-100	TPE-101	TPN-100	TPN-101	TPS-57
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00062	0.00052	0.00061	<0.00050	0.00051
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000222	0.000092	0.000111	0.000273	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.16	1.31	1.14	1.10	1.16
	Manganese (Mn)-Total (mg/L)	0.00054	0.00044	0.00057	0.00056	0.00052
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000178	0.000191	0.000181	0.000181	0.000185
	Nickel (Ni)-Total (mg/L)	0.00056	0.00060	0.00056	0.00050	0.00053
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.63	0.72	0.64	0.61	0.65
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.091	0.089	0.062	0.062	0.058
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.32	1.45	1.44	1.36	1.44
	Strontium (Sr)-Total (mg/L)	0.0134	0.0145	0.0128	0.0119	0.0125
	Sulfur (S)-Total (mg/L)	1.96	2.12	1.90	1.83	1.99
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000040	0.000046	0.000040	0.000038	0.000040
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0017	0.0013	0.0012	0.0016	0.0013
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00031	0.00036	0.00018	0.00018	0.00020
	Barium (Ba)-Dissolved (mg/L)	0.00411	0.00411	0.00380	0.00361	0.00384
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.09	3.22	2.69	2.54	2.72
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1908589-6 Surface Water 25-MAR-17 11:00 TPS-58	L1908589-7 Surface Water 26-MAR-17 14:40 SP-100	L1908589-8 Surface Water 26-MAR-17 16:00 SP-101	L1908589-9 Surface Water 26-MAR-17 16:30 WAL-69	L1908589-10 Surface Water 27-MAR-17 WAL-70
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00062	0.00059	0.00113	0.00106
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	0.000110	0.000082	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0010	<0.0010	0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.15	1.48	1.39	2.10	2.07
	Manganese (Mn)-Total (mg/L)	0.00059	0.00045	0.00052	0.00145	0.00124
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000189	0.000198	0.000186	0.000445	0.000428
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00143	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.66	0.69	0.63	0.75	0.73
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.065	0.177	0.182	0.486	0.471
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.46	1.27	1.13	0.960	0.894
	Strontium (Sr)-Total (mg/L)	0.0126	0.0191	0.0187	0.0350	0.0342
	Sulfur (S)-Total (mg/L)	1.98	2.00	1.92	2.51	2.32
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000040	0.000047	0.000044	0.000073	0.000069
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0020	0.0016	0.0013	0.0015
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00020	0.00031	0.00028	0.00030	0.00032
	Barium (Ba)-Dissolved (mg/L)	0.00387	0.00390	0.00358	0.00413	0.00406
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.82	4.06	4.04	6.91	6.77
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908589-11	L1908589-12	L1908589-13	L1908589-14
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	24-MAR-17	26-MAR-17	24-MAR-17	24-MAR-17
	Sampled Time			09:00	08:30
	Client ID	MAR-DUP-01	MAR-DUP-02	MAR-EB-01	MAR-DI-01
Grouping	**Analyte**				
WATER					
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00053	0.00108	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000214	<0.000050	RRV 0.000098	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.18	2.08	<0.10	<0.10
	Manganese (Mn)-Total (mg/L)	0.00057	0.00130	RRV 0.00012	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000177	0.000423	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00056	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.64	0.73	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.094	0.463	RRV 0.096	<0.050
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.33	0.904	<0.050	<0.050
	Strontium (Sr)-Total (mg/L)	0.0132	0.0344	<0.00020	<0.00020
	Sulfur (S)-Total (mg/L)	1.84	2.28	<0.50	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000041	0.000069	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0041	<0.0010	<0.0010	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00030	0.00029	<0.00010	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00414	0.00417	0.000076	<0.000050
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.07	6.72	<0.050	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908589-1	L1908589-2	L1908589-3	L1908589-4	L1908589-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	24-MAR-17	24-MAR-17	25-MAR-17	25-MAR-17	25-MAR-17
	Sampled Time	10:30	11:30	14:00	12:45	10:00
	Client ID	TPE-100	TPE-101	TPN-100	TPN-101	TPS-57
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00044	0.00047	0.00037	0.00040	0.00039
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000066	0.000243	<0.000050	0.000087	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.20	1.22	1.08	1.05	1.11
	Manganese (Mn)-Dissolved (mg/L)	0.00017	0.00018	0.00010	0.00013	0.00023
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000163	0.000174	0.000166	0.000172	0.000181
	Nickel (Ni)-Dissolved (mg/L)	0.00051	0.00052	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.64	0.64	0.59	0.57	0.62
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.052	<0.050	<0.050	<0.050	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.37	1.36	1.39	1.31	1.44
	Strontium (Sr)-Dissolved (mg/L)	0.0137	0.0143	0.0125	0.0120	0.0127
	Sulfur (S)-Dissolved (mg/L)	1.83	1.88	1.83	1.70	1.89
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000037	0.000042	0.000033	0.000034	0.000037
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908589-6	L1908589-7	L1908589-8	L1908589-9	L1908589-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	25-MAR-17	26-MAR-17	26-MAR-17	26-MAR-17	27-MAR-17
	Sampled Time	11:00	14:40	16:00	16:30	
	Client ID	TPS-58	SP-100	SP-101	WAL-69	WAL-70
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00038	0.00055	0.00055	0.00100	0.00099
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.09	1.41	1.38	2.01	1.97
	Manganese (Mn)-Dissolved (mg/L)	0.00030	0.00026	0.00021	0.00049	0.00058
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000176	0.000173	0.000174	0.000423	0.000403
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.61	0.65	0.63	0.71	0.69
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	<0.050	0.130	0.147	0.424	0.425
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.39	1.23	1.14	0.890	0.857
	Strontium (Sr)-Dissolved (mg/L)	0.0133	0.0182	0.0190	0.0339	0.0337
	Sulfur (S)-Dissolved (mg/L)	1.82	1.91	1.86	2.17	2.14
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000039	0.000045	0.000042	0.000070	0.000065
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908589-11	L1908589-12	L1908589-13	L1908589-14
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	24-MAR-17	26-MAR-17	24-MAR-17	24-MAR-17
	Sampled Time			09:00	08:30
	Client ID	MAR-DUP-01	MAR-DUP-02	MAR-EB-01	MAR-DI-01
Grouping	**Analyte**				
WATER					
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00044	0.00108	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000060	0.000057	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.21	1.98	<0.10	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00018	0.00053	<0.00010	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000165	0.000399	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00051	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.64	0.69	<0.10	<0.10
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.052	0.430	<0.050	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.37	0.862	<0.050	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.0139	0.0331	<0.00020	<0.00020
	Sulfur (S)-Dissolved (mg/L)	1.85	2.21	<0.50	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000037	0.000063	<0.000010	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0030 RRV	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1908589-6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1908589-6
Matrix Spike	Total Organic Carbon	MS-B	L1908589-10, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1908589-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1908589-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1908589-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1908589-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Potassium (K)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Silicon (Si)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Sulfur (S)-Total	MS-B	L1908589-10, -11, -12, -13, -14, -7, -8, -9
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1908589-2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

ALK-TITR-VA Water Alkalinity Species by Titration APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BR-L-IC-N-VA Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA Filter Chlorophyll a by Fluorometer (Filter) EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA Water Chloride in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA Water Low Level Free Cyanide in water by CFA ASTM 7237

Reference Information

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Short olding Time
Ru Processing

ALS

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

COC # ______

Page 1 of 1

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☐ PDF ☐ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	ryan.vanengen@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Meadowbank Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	**Sampler:**

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on t	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved Metals (F/P)						Number of Containers
	TPE-100	24-Mar-17	10:30	Surface Water	X	X	X			X	X						5
	TPE-101	24-Mar-17	11:30	Surface Water	X	X	X			X	X						5
	TPN-100	25-Mar-17	14:00	Surface Water	X	X	X			X	X						5
	TPN-101	25-Mar-17	12:45	Surface Water	X	X	X			X	X						5
	TPS-57	25-Mar-17	10:00	Surface Water	X	X	X			X	X						5
	TPS-58	25-Mar-17	11:00	Surface Water	X	X	X			X	X						5
	SP-100	26-Mar-17	14:40	Surface Water	X	X	X			X	X						5
	SP-101	26-Mar-17	16:00	Surface Water	x	X	X			X	x						5
	WAL-69	26-Mar-17	16:30	Surface Water	X	X	X			X	X						5
	WAL-70	26-Mar-17		Surface Water	X	X	X			X	X						5
	MAR-DUP-01	24-Mar-17		Surface Water	X	X	X			X	X						5
	MAR-DUP-02	26-Mar-17		Surface Water	X	X	X			X	X						5
	MAR-EB-01	24-Mar-17	9:00	Surface Water	X	X	X			X	X						5
	MAR-DI-01	24-Mar-17	8:30	Surface Water	X	X	X			X	X						5

L1908589-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Martin T.	Date (dd-mmm-yy) 27-Mar-17	Time (hh-mm) 9:00	Received by: JC	Date: APR - 4 2017	Time: 8:50 am	Temperature: 8,9,9,9,9,9 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 04-APR-17
Report Date: 17-APR-17 14:21 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1908598

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Comments:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908598-1	L1908598-2	L1908598-3	L1908598-4	L1908598-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	27-MAR-17	27-MAR-17	29-MAR-17	29-MAR-17	29-MAR-17
	Sampled Time	10:45	11:39	09:50	10:15	11:05
	Client ID	PDL-51	PDL-52	TEFF-45	TEFF-46	TE-92
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.351	0.257	0.152	0.241	0.233

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908598-6	L1908598-7	L1908598-8		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	29-MAR-17	29-MAR-17	29-MAR-17		
	Sampled Time	11:55	14:30	14:57		
	Client ID	TE-93	INUG-86	INUG-87		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.193	0.091	0.117		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1908598-1	L1908598-2	L1908598-3	L1908598-4	L1908598-5
	Sample ID	L1908598-1	L1908598-2	L1908598-3	L1908598-4	L1908598-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	27-MAR-17	27-MAR-17	29-MAR-17	29-MAR-17	29-MAR-17
	Sampled Time	10:45	11:39	09:50	10:15	11:05
	Client ID	PDL-51	PDL-52	TEFF-45	TEFF-46	TE-92
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	22.4	22.0	24.6	18.1	38.4
	Hardness (as CaCO3) (mg/L)	9.34	9.24	8.59	6.40	14.9
	pH (pH)	7.18	7.18	6.98	6.95	7.33
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	12.9	15.7	14.0	13.7	25.5
	Turbidity (NTU)	0.16	0.15	0.16	0.15	0.17
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.1	7.6	6.3	4.7	11.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.1	7.6	6.3	4.7	11.0
	Ammonia, Total (as N) (mg/L)	0.0106	0.0105	0.0073	0.0060	0.0101
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.64	0.63	0.77	0.73	1.05
	Fluoride (F) (mg/L)	0.037	0.037	0.067	0.061	0.084
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0137
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.114	0.106	0.106	0.100	0.129
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.61
	Sulfate (SO4) (mg/L)	1.74	1.70	2.94	2.35	5.08
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.72	1.58	1.52	1.41	1.95
	Total Organic Carbon (mg/L)	1.81	1.70	1.91	1.38	1.95
Total Metals	Aluminum (Al)-Total (mg/L)	0.0033	<0.0030	0.0055	0.0032	0.0039
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00017	0.00015	0.00010	<0.00010	0.00021
	Barium (Ba)-Total (mg/L)	0.00199	0.00194	0.00272	0.00251	0.00347
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.39	2.28	2.07	1.45	3.83
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908598-6	L1908598-7	L1908598-8	L1908598-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	29-MAR-17	29-MAR-17	29-MAR-17		
	Sampled Time	11:55	14:30	14:57		
	Client ID	TE-93	INUG-86	INUG-87	TRAV-1-MAR	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	31.8	21.0 RRV	18.1 RRV	<2.0	
	Hardness (as CaCO3) (mg/L)	12.3	6.71	6.50	<0.50 HTC	
	pH (pH)	7.24	7.00 RRV	7.00 RRV	5.30	
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	22.2	13.7	13.4	<3.0	
	Turbidity (NTU)	0.16	0.19	0.17	<0.10	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.1	5.9 RRV	5.7 RRV	<1.0	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	9.1	5.9	5.7	<1.0	
	Ammonia, Total (as N) (mg/L)	0.0131	0.0148	0.0158	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.96	0.86	0.84	<0.10	
	Fluoride (F) (mg/L)	0.082	0.067	0.062	<0.020	
	Nitrate (as N) (mg/L)	0.0075	<0.0050	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.127	0.143	0.145	<0.050	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0021	0.0032	<0.0020	
	Silicate (as SiO2) (mg/L)	0.56	<0.50	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	4.09	1.01	0.99	<0.30	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.88	2.07	1.92		
	Total Organic Carbon (mg/L)	1.73	2.08	2.01	<0.50	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0041	0.0041	0.0039	<0.0030	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00015	0.00010	<0.00010	<0.00010	
	Barium (Ba)-Total (mg/L)	0.00317	0.00192	0.00180	<0.000050	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	2.99	1.31	1.28	<0.050	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID / Description / Sampled Date / Sampled Time / Client ID	L1908598-1 Surface Water 27-MAR-17 10:45 PDL-51	L1908598-2 Surface Water 27-MAR-17 11:39 PDL-52	L1908598-3 Surface Water 29-MAR-17 09:50 TEFF-45	L1908598-4 Surface Water 29-MAR-17 10:15 TEFF-46	L1908598-5 Surface Water 29-MAR-17 11:05 TE-92
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00057
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0010	<0.0010	0.0011
	Magnesium (Mg)-Total (mg/L)	0.88	0.83	0.88	0.69	1.38
	Manganese (Mn)-Total (mg/L)	0.00064	0.00068	0.00075	0.00071	0.00062
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000058	<0.000050	0.000152
	Nickel (Ni)-Total (mg/L)	0.00058	0.00057	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.39	0.37	0.51	0.47	0.67
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.147	0.146	0.186	0.148	0.246
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.542	0.510	0.804	0.740	1.07
	Strontium (Sr)-Total (mg/L)	0.00960	0.00918	0.0107	0.00866	0.0185
	Sulfur (S)-Total (mg/L)	0.54	0.58	0.99	1.04	1.64
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000021	0.000022	0.000041	0.000036	0.000054
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0041	<0.0010	0.0014	0.0013	0.0011
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00014	0.00014	0.00010	<0.00010	0.00019
	Barium (Ba)-Dissolved (mg/L)	0.00218	0.00208	0.00283	0.00264	0.00359
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.34	2.34	2.08	1.48	3.78
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1908598-6	L1908598-7	L1908598-8	L1908598-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	29-MAR-17	29-MAR-17	29-MAR-17		
	Sampled Time	11:55	14:30	14:57		
	Client ID	TE-93	INUG-86	INUG-87	TRAV-1-MAR	
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	1.17	0.86	0.82	<0.10	
	Manganese (Mn)-Total (mg/L)	0.00047	0.00066	0.00065	<0.00010	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000104	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.63	0.44	0.42	<0.10	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.234	0.178	0.177	<0.050	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.983	0.656	0.619	<0.050	
	Strontium (Sr)-Total (mg/L)	0.0150	0.00745	0.00724	<0.00020	
	Sulfur (S)-Total (mg/L)	1.38	<0.50	<0.50	<0.50	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000051	0.000042	0.000041	<0.000010	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0014	0.0022	0.0025		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00015	<0.00010	<0.00010		
	Barium (Ba)-Dissolved (mg/L)	0.00327	0.00220	0.00195		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	3.05	1.33	1.28		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1908598-1	L1908598-2	L1908598-3	L1908598-4	L1908598-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	27-MAR-17	27-MAR-17	29-MAR-17	29-MAR-17	29-MAR-17
	Sampled Time	10:45	11:39	09:50	10:15	11:05
	Client ID	PDL-51	PDL-52	TEFF-45	TEFF-46	TE-92
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00061	0.00087	0.00035	0.00031	0.00052
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.85	0.83	0.83	0.66	1.33
	Manganese (Mn)-Dissolved (mg/L)	0.00055	0.00053	0.00034	0.00032	0.00028
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.000058	<0.000050	0.000138
	Nickel (Ni)-Dissolved (mg/L)	0.00057	0.00054	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.37	0.36	0.49	0.45	0.64
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.117	0.125	0.146	0.103	0.217
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.533	0.503	0.743	0.691	1.03
	Strontium (Sr)-Dissolved (mg/L)	0.00954	0.00927	0.0107	0.00858	0.0178
	Sulfur (S)-Dissolved (mg/L)	0.52	0.55	0.86	0.70	1.55
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000021	0.000019	0.000035	0.000032	0.000045
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1908598-6	L1908598-7	L1908598-8	L1908598-9	
		Description	Surface Water	Surface Water	Surface Water	Surface Water	
		Sampled Date	29-MAR-17	29-MAR-17	29-MAR-17		
		Sampled Time	11:55	14:30	14:57		
		Client ID	TE-93	INUG-86	INUG-87	TRAV-1-MAR	
Grouping	**Analyte**						
WATER							
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)		0.00043	0.00034	0.00033		
	Iron (Fe)-Dissolved (mg/L)		<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)		<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)		1.14	0.82	0.80		
	Manganese (Mn)-Dissolved (mg/L)		0.00025	0.00027	0.00031		
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)		0.000101	<0.000050	<0.000050		
	Nickel (Ni)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)		0.60	0.43	0.42		
	Selenium (Se)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)		0.183	0.149	0.135		
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)		0.937	0.624	0.593		
	Strontium (Sr)-Dissolved (mg/L)		0.0149	0.00735	0.00701		
	Sulfur (S)-Dissolved (mg/L)		1.21	<0.50	<0.50		
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)		0.000047	0.000041	0.000039		
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)		<0.0010	<0.0010	<0.0010		
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1908598-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1908598-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L1908598-9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L1908598-9
Matrix Spike	Iron (Fe)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1908598-9
Matrix Spike	Manganese (Mn)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Total	MS-B	L1908598-9
Matrix Spike	Potassium (K)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L1908598-9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L1908598-5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L1908598-9
Matrix Spike	Sulfur (S)-Total	MS-B	L1908598-1, -2, -3, -4
Matrix Spike	Ammonia, Total (as N)	MS-B	L1908598-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1908598-1, -2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are

Reference Information

determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA Filter Chlorophyll a by Fluorometer (Filter) EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA Water Chloride in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA Water Low Level Free Cyanide in water by CFA ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA Water Low Level Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS

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

COC #

Page

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard	☐ Other
☑ PDF ☑ Excel	☐ Digital ☐ Fax
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Short Holding Time
Rush Processing

L1908598-COFC

Sample #	Sample Identification (This desc... th)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a	Number of Containers
							P	F/P	P	P	F/P	P	F/P	F	
	PDL-51	27-Mar-17	10:45	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	PDL-52	27-Mar-17	11:39	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	TEFF-45	29-Mar-17	9:50	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	TEFF-46	29-Mar-17	10:15	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	TE-92	29-Mar-17	11:05	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	TE-93	29-Mar-17	11:55	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	INUG-86	29-Mar-17	14:30	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	INUG-87	29-Mar-17	14:57	Surface Water	X	X	X	X	X	X	X	X	X	X	10
	TRAV-1-MAR	-	-	Surface Water	X	X	X		X	X		X			5

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz	30-Mar-17	8:00	Shayan	April.4	8:50	17 17.8 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 12-MAY-17
Report Date: 25-MAY-17 17:50 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1925440

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Comments: Please note that the Chlorophyll 'a' tube for sample INUG-88 contained 2 filters, while the tube for sample INUG-89 contained 0 filters. Both filters were tested and the results were entered as INUG-88 & INUG-89 respectively.

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1925440-1	L1925440-2	L1925440-3	L1925440-4	L1925440-7
	Sample ID	L1925440-1	L1925440-2	L1925440-3	L1925440-4	L1925440-7
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	04-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17	07-MAY-17
	Sampled Time	14:54	14:14	15:27	16:00	08:45
	Client ID	TPE-102	TPE-103	SP-103	SP-102	INUG-88
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.099	0.082	0.109	0.156	0.088

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-8	L1925440-9	L1925440-10	L1925440-11	L1925440-12
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17
	Sampled Time	08:45	09:40	11:46	13:05	13:05
	Client ID	CREMP DUP 1	INUG-89	TPN-102	TPN-103	CREMP DUP 2
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.095	0.080	0.134	0.115	0.101

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-13	L1925440-14			
	Description	Surface Water	Surface Water			
	Sampled Date	07-MAY-17	07-MAY-17			
	Sampled Time	14:33	15:14			
	Client ID	WAL-71	WAL-72			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.127	0.172			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-1	L1925440-2	L1925440-3	L1925440-4	L1925440-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	04-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17
	Sampled Time	14:54	14:14	15:27	16:00	17:00
	Client ID	TPE-102	TPE-103	SP-103	SP-102	CREMP DI BLANK
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	39.2	36.6	42.0	43.2	<2.0
	Hardness (as CaCO3) (mg/L)	13.4	13.0	16.1	16.8	<0.50
	pH (pH)	7.13	7.10	7.16	7.25	5.37
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	26.0	29.2	27.6	26.5	<3.0
	Turbidity (NTU)	0.26	0.15	0.18	0.14	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.8	8.7	11.4	12.1	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.8	8.7	11.4	12.1	<1.0
	Ammonia, Total (as N) (mg/L)	0.0179	0.0190	0.0146	0.0152	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.98	0.94	1.01	1.04	<0.10
	Fluoride (F) (mg/L)	0.091	0.086	0.085	0.078	<0.020
	Nitrate (as N) (mg/L)	0.0262	0.0368	0.0261	0.0173	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.135	0.140	0.130	0.146	<0.050
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	6.51	6.25	6.21	6.06	<0.30
Cyanides	Cyanide, Total (mg/L)	<0.0010 HTP	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010 HTP	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.45	1.40	1.53	1.61	<0.50
	Total Organic Carbon (mg/L)	1.49	1.56	1.67	1.64	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0040	<0.0030	0.0043	0.0032	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00041	0.00033	0.00033	0.00027	<0.00010
	Barium (Ba)-Total (mg/L)	0.00435	0.00399	0.00373	0.00335	<0.000050
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.54	3.11	4.17	4.39	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00013	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1925440-6	L1925440-7	L1925440-8	L1925440-9	L1925440-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	05-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17
	Sampled Time	17:15	08:45	08:45	09:40	11:46
	Client ID	CREMP EB-1	INUG-88	CREMP DUP 1	INUG-89	TPN-102
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	17.6	17.0	17.4	29.3
	Hardness (as CaCO3) (mg/L)	<0.50	6.48	6.32	6.54	9.94
	pH (pH)	5.34	6.81	6.81	6.87	7.00
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	<3.0	12.6	12.9	13.3	18.1
	Turbidity (NTU)	<0.10	0.15	0.15	0.16	0.14
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	5.3	5.3 RRV	5.6	6.5
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0 RRV	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0 RRV	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	5.3	5.3 RRV	5.6	6.5
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0155	0.0160	0.0139	0.0169
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.10	0.83	0.83	0.84	0.81
	Fluoride (F) (mg/L)	<0.020	0.063	0.063	0.064	0.071
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0060	0.0399
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	<0.050	0.129	0.128	0.121	0.131
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	<0.30	1.00	1.00	1.03	5.31
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.13 RRV	1.58	1.65	1.67	6.42 RRV
	Total Organic Carbon (mg/L)	<0.50	1.61	1.60	1.75	1.69 RRV
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0043	0.0033	0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00017
	Barium (Ba)-Total (mg/L)	<0.000050	0.00204	0.00194	0.00199	0.00326
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	<0.050	1.27	1.26	1.33	2.40
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-11	L1925440-12	L1925440-13	L1925440-14	L1925440-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	09-MAY-17
	Sampled Time	13:05	13:05	14:33	15:14	07:30
	Client ID	TPN-103	CREMP DUP 2	WAL-71	WAL-72	CREMP TB-1
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	29.3	29.7	54.1	61.3	<2.0
	Hardness (as CaCO3) (mg/L)	9.61	9.60	23.1	26.2	
	pH (pH)	7.00	6.99	7.27	7.28	5.34
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	18.8	17.5	31	38	<3.0
	Turbidity (NTU)	0.15	0.15	0.14	0.13	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.2	6.4	17.2	21.2	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	6.2	6.4	17.2	21.2	<1.0
	Ammonia, Total (as N) (mg/L)	0.0177	0.0186	0.0191	0.0195	0.0060
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.80	0.80	1.05	1.24	<0.10
	Fluoride (F) (mg/L)	0.069	0.069	0.057	0.061	<0.020
	Nitrate (as N) (mg/L)	0.0409	0.0412	0.0765	0.107	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.103	0.115	0.162	0.165	<0.050
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	0.0042	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	0.89	0.91	<0.50
	Sulfate (SO4) (mg/L)	5.26	5.27	6.26	7.20	<0.30
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.24	1.34	2.08	2.45	
	Total Organic Carbon (mg/L)	1.43	1.34	2.16	2.36	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00016	0.00018	0.00027	0.00029	<0.00010
	Barium (Ba)-Total (mg/L)	0.00319	0.00306	0.00353	0.00430	<0.000050
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.38	2.46	6.40	7.29	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00015	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-1	L1925440-2	L1925440-3	L1925440-4	L1925440-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	04-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17
	Sampled Time	14:54	14:14	15:27	16:00	17:00
	Client ID	TPE-102	TPE-103	SP-103	SP-102	CREMP DI BLANK
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00051	<0.00050	0.00152	0.00062	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.34	1.20	1.37	1.43	<0.10
	Manganese (Mn)-Total (mg/L)	0.00043	0.00040	0.00041	0.00037	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000185	0.000171	0.000179	0.000179	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00064	0.00059	0.00053	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.70	0.62	0.64	0.62	<0.10
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.11	<0.10	0.18	0.21	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.53	1.42	1.30	1.17	<0.050
	Strontium (Sr)-Total (mg/L)	0.0161	0.0142	0.0193	0.0199	<0.00020
	Sulfur (S)-Total (mg/L)	2.25	2.07	2.06	1.99	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000048	0.000042	0.000051	0.000045	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0017	0.0020	0.0021	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00032	0.00037	0.00031	0.00028	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00373	0.00413	0.00386	0.00359	<0.000050
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.33	3.31	4.26	4.43	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-6	L1925440-7	L1925440-8	L1925440-9	L1925440-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	05-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17
	Sampled Time	17:15	08:45	08:45	09:40	11:46
	Client ID	CREMP EB-1	INUG-88	CREMP DUP 1	INUG-89	TPN-102
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	<0.10	0.76	0.76	0.78	0.94
	Manganese (Mn)-Total (mg/L)	<0.00010	0.00078	0.00077	0.00080	0.00053
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000522	<0.000050	0.000156
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	<0.10	0.39	0.39	0.41	0.51
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	0.19	0.19	0.20	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	<0.050	0.589	0.579	0.600	1.21
	Strontium (Sr)-Total (mg/L)	<0.00020	0.00698	0.00704	0.00720	0.0113
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	<0.50	<0.50	1.75
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	<0.000010	0.000039	0.000039	0.000043	0.000035
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0036	0.0020	0.0033	0.0016
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00018
	Barium (Ba)-Dissolved (mg/L)	<0.000050	0.00207	0.00199	0.00202	0.00335
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	<0.050	1.35	1.30	1.33	2.41
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-11	L1925440-12	L1925440-13	L1925440-14	L1925440-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	09-MAY-17
	Sampled Time	13:05	13:05	14:33	15:14	07:30
	Client ID	TPN-103	CREMP DUP 2	WAL-71	WAL-72	CREMP TB-1
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00098	0.00109	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.92	0.94	1.80	2.05	<0.10
	Manganese (Mn)-Total (mg/L)	0.00052	0.00052	0.00096	0.00119	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000151	0.000154	0.000320	0.000354	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.50	0.51	0.63	0.71	<0.10
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	0.45	0.52	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.19	1.27	0.810	0.913	<0.050
	Strontium (Sr)-Total (mg/L)	0.0112	0.0115	0.0315	0.0353	<0.00020
	Sulfur (S)-Total (mg/L)	1.78	1.85	2.14	2.52	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000034	0.000035	0.000053	0.000060	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0011	<0.0010	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00017	0.00018	0.00026	0.00028	
	Barium (Ba)-Dissolved (mg/L)	0.00320	0.00325	0.00351	0.00417	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	2.29	2.33	6.32	7.10	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-1	L1925440-2	L1925440-3	L1925440-4	L1925440-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	04-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17	05-MAY-17
	Sampled Time	14:54	14:14	15:27	16:00	17:00
	Client ID	TPE-102	TPE-103	SP-103	SP-102	CREMP DI BLANK
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00043	0.00043	0.00058	0.00065	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.23	1.15	1.34	1.39	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00016	0.00016	0.00029	0.00025	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000172	0.000192	0.000223	0.000203	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00053	0.00055	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.64	0.67	0.69	0.68	<0.10
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.065	0.056	0.159	0.186	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.42	1.42	1.27	1.18	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.0150	0.0148	0.0203	0.0211	<0.00020
	Sulfur (S)-Dissolved (mg/L)	2.23	2.39	2.41	2.26	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000043	0.000040	0.000048	0.000045	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-6	L1925440-7	L1925440-8	L1925440-9	L1925440-10
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	05-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17
	Sampled Time	17:15	08:45	08:45	09:40	11:46
	Client ID	CREMP EB-1	INUG-88	CREMP DUP 1	INUG-89	TPN-102
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00021	0.00045	0.00027	0.00029	0.00032
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000113
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	<0.10	0.76	0.75	0.78	0.95
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00063	0.00056	0.00057	0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000170
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	<0.10	0.43	0.42	0.45	0.57
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	<0.050	0.177	0.166	0.176	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	<0.050	0.606	0.598	0.619	1.28
	Strontium (Sr)-Dissolved (mg/L)	<0.00020	0.00743	0.00724	0.00762	0.0117
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.72	0.71	0.69	2.03
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	<0.000010	0.000040	0.000038	0.000038	0.000030
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1925440-11	L1925440-12	L1925440-13	L1925440-14	L1925440-15
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	07-MAY-17	07-MAY-17	07-MAY-17	07-MAY-17	09-MAY-17
	Sampled Time	13:05	13:05	14:33	15:14	07:30
	Client ID	TPN-103	CREMP DUP 2	WAL-71	WAL-72	CREMP TB-1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00028	0.00029	0.00083	0.00096	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)	0.94	0.92	1.78	2.05	
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00027	0.00031	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000154	0.000167	0.000331	0.000378	
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.55	0.54	0.66	0.75	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	<0.050	<0.050	0.450	0.528	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	1.22	1.23	0.821	0.943	
	Strontium (Sr)-Dissolved (mg/L)	0.0114	0.0115	0.0326	0.0375	
	Sulfur (S)-Dissolved (mg/L)	1.92	1.98	2.34	3.08	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000030	0.000031	0.000051	0.000061	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1925440-1	TPE-102	WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.
L1925440-3	SP-103	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-1, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-1, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-11, -12, -13, -14
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-10
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1925440-6
Matrix Spike	Total Organic Carbon	MS-B	L1925440-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1925440-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Boron (B)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1925440-1
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1925440-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1925440-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1925440-10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTP	Sample preparation or preservation hold time was exceeded.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Reference Information

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BR-L-IC-N-VA Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA Filter Chlorophyll a by Fluorometer (Filter) EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA Water Chloride in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA Water Low Level Free Cyanide in water by CFA ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA Water Low Level Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

Reference Information

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location

Reference Information

VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Enviro

L1925440-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
1	TPE-102	04-May-17	14:54	Surface Water	X	X	X	X	X	X	X	X	X	X			9
2	TPE-103	05-May-17	14:14	Surface Water	X	X	X	X	X	X	X	X	X	X			9
3	SP-103	05-May-17	15:27	Surface Water	X	X	X	X	X	X	X	X	X	X			9
4	SP-102	05-May-17	16:00	Surface Water	X	X	X	X	X	X	X	X	X	X			9
5	CREMP DI BLANK	05-May-17	17:00	Surface Water	X	X	X	X	X	X	X	X	X				9
6	CREMP EB-1	05-May-17	17:15	Surface Water	X	X	X	X	X	X	X	X	X				9
7	INUG-88	07-May-17	8:45	Surface Water	X	X	X	X	X	X	X	X	X	X			9
8	CREMP DUP 1	07-May-17	8:45	Surface Water	X	X	X	X	X	X	X	X	X	X			9
9	INUG-89	07-May-17	9:40	Surface Water	X	X	X	X	X	X	X	X	X	X			9
10	TPN-102	07-May-17	11:46	Surface Water	X	X	X	X	X	X	X	X	X	X			9
11	TPN-103	07-May-17	13:05	Surface Water	X	X	X	X	X	X	X	X	X	X			9
12	CREMP DUP 2	07-May-17	13:05	Surface Water	X	X	X	X	X	X	X	X	X	X			9
13	WAL-71	07-May-17	14:33	Surface Water	X	X	X	X	X	X	X	X	X	X			9
14	WAL-72	07-May-17	15:14	Surface Water	X	X	X	X	X	X	X	X	X	X			9
15	CREMP TB-1	09-May-17	7:30	Surface Water	X	X	X	X	X	X	X	X	X				9

Short Holding Time

Rush Processing

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

L1925440-COFC

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Tom Thomson	Date (dd-mmm-yy) 9-May-17	Time (hh-mm) 7:30	Received by: JC	Date: MAY 1 2 2017	Time: 8:25 Am	Temperature: 15.3 16 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 15-MAY-17
Report Date: 25-MAY-17 11:46 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1926208

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1926208-1	L1926208-2			
	Description	SURFACE WATE	SURFACE WATE			
	Sampled Date	11-MAY-17	11-MAY-17			
	Sampled Time	14:55	15:33			
	Client ID	MAY PDL-53	MAY PDL-54			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.338	0.207			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1926208-1	L1926208-2			
	Description	SURFACE WATE	SURFACE WATE			
	Sampled Date	11-MAY-17	11-MAY-17			
	Sampled Time	14:55	15:33			
	Client ID	MAY PDL-53	MAY PDL-54			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	23.4	22.9			
	Hardness (as CaCO3) (mg/L)	9.03	8.90			
	pH (pH)	7.06	7.09			
	Total Suspended Solids (mg/L)	<1.0	1.1			
	Total Dissolved Solids (mg/L)	9.2	13.1			
	Turbidity (NTU)	0.13	0.14			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.7	7.5			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	7.7	7.5			
	Ammonia, Total (as N) (mg/L)	0.0089	0.0090			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	0.63	0.62			
	Fluoride (F) (mg/L)	0.039	0.038			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.116	0.106			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020			
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020			
	Silicate (as SiO2) (mg/L)	<0.50	<0.50			
	Sulfate (SO4) (mg/L)	1.71	1.69			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.77	1.58			
	Total Organic Carbon (mg/L)	1.77	1.72			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00016	0.00015			
	Barium (Ba)-Total (mg/L)	0.00203	0.00194			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	2.38	2.33			
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1926208-1	L1926208-2			
	Description	SURFACE WATE	SURFACE WATE			
	Sampled Date	11-MAY-17	11-MAY-17			
	Sampled Time	14:55	15:33			
	Client ID	MAY PDL-53	MAY PDL-54			
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)	0.83	0.79			
	Manganese (Mn)-Total (mg/L)	0.00056	0.00059			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00056	0.00055			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.36	0.35			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.15	0.15			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.535	0.510			
	Strontium (Sr)-Total (mg/L)	0.00973	0.00952			
	Sulfur (S)-Total (mg/L)	0.69	0.59			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.000022	0.000020			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00014	0.00015			
	Barium (Ba)-Dissolved (mg/L)	0.00204	0.00199			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	2.31	2.29			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1926208-1	L1926208-2			
	Description	SURFACE WATE	SURFACE WATE			
	Sampled Date	11-MAY-17	11-MAY-17			
	Sampled Time	14:55	15:33			
	Client ID	MAY PDL-53	MAY PDL-54			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00039	0.00038			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	0.79	0.77			
	Manganese (Mn)-Dissolved (mg/L)	0.00018	0.00018			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000051	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	0.00050	0.00051			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.35	0.35			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.113	0.125			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.513	0.502			
	Strontium (Sr)-Dissolved (mg/L)	0.00968	0.00941			
	Sulfur (S)-Dissolved (mg/L)	0.62	0.66			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000018	0.000018			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0016	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1926208-1, -2
Matrix Spike	Dissolved Organic Carbon	MS-B	L1926208-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1926208-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1926208-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1926208-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

Reference Information

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC # ____________

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Eric Franz

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
[redacted]																	
[redacted]	MAY PDL-53	11-May-47	14:55	Surface Water	X	X	X	X	X	X	X	X	X	X			10
[redacted]	MAY PDL-54	11-May-17	15:33	Surface Water	X	X	X	X	X	X	X	X	X	X			10

L1926208-COFC

Short Holding Time
Rush Processing

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Tom Thomson	11-May-17	8:00	CEF	May15	10:55am	13 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 10-JUL-17
Report Date: 20-JUL-17 12:38 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1955650

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-1	L1955650-2	L1955650-3	L1955650-4	L1955650-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	01-JUL-17	01-JUL-17	01-JUL-17	01-JUL-17	02-JUL-17
	Sampled Time	09:35	10:14	14:30	15:30	14:29
	Client ID	TPE-104	TPE-105	WAL-74	WAL-73	SP-104
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	29.1	27.2	33.0	34.6	35.2
	Hardness (as CaCO3) (mg/L)	9.60	9.56	14.3	14.3	13.9
	pH (pH)	7.12	7.12	7.34	7.35	7.21
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	19.4	20.8	25.0	23.3	24.2
	Turbidity (NTU)	0.23	0.24	0.39	0.33	0.41
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.5	6.9	11.5	12.1	10.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	7.5	6.9	11.5	12.1	10.1
	Ammonia, Total (as N) (mg/L)	0.0071	0.0068	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.67	0.66	0.65	0.66	0.86
	Fluoride (F) (mg/L)	0.071	0.071	0.043	0.042	0.060
	Nitrate (as N) (mg/L)	0.0240	0.0229	<0.0050	0.0075	0.0167
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.091	0.095	0.127	0.123	0.111
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0040	<0.0040 DLM	<0.0040	0.0059	0.0050
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	0.51	0.52	<0.50
	Sulfate (SO4) (mg/L)	4.34	4.25	3.54	3.68	4.68
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.19	1.50	2.56	2.25	2.02
	Total Organic Carbon (mg/L)	1.38	1.53	2.45	2.44	2.10
Total Metals	Aluminum (Al)-Total (mg/L)	0.0082	0.0092	0.0112	0.0128	0.0128
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00036	0.00035	0.00024	0.00023	0.00026
	Barium (Ba)-Total (mg/L)	0.00312	0.00294	0.00228	0.00240	0.00295
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.47	2.37	3.85	4.11	3.78
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00014	0.00013	<0.00010	0.00012

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1955650-6	L1955650-7	L1955650-8	L1955650-9	L1955650-10
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	02-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17
	Sampled Time	14:58	10:30	11:00	13:15	13:15
	Client ID	SP-105	JULY DI-1	JULY EB-1	TPN-105	JULY CREMP DUP-1
WATER						
Physical Tests	Conductivity (uS/cm)	35.2	<2.0	<2.0	27.5	26.6
	Hardness (as CaCO3) (mg/L)	13.7	<0.50	<0.50		
	pH (pH)	7.21	5.40	5.58	6.97	6.97
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	24.2	<3.0	<3.0	17.0	19.7
	Turbidity (NTU)	0.34	<0.10	0.11	0.18	0.18
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.3	<1.0	<1.0	6.2	6.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	10.3	<1.0	<1.0	6.2	6.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.84	<0.10	<0.10	0.75	0.70
	Fluoride (F) (mg/L)	0.062	<0.020	<0.020	0.064	0.063
	Nitrate (as N) (mg/L)	0.0149	<0.0050	<0.0050	0.0372	0.0357
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.106	<0.050	<0.050		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0047	<0.0020	<0.0020		
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	4.67	<0.30	<0.30	4.38	4.33
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.94	<0.50	RRV 2.78		
	Total Organic Carbon (mg/L)	1.98	<0.50	RRV <0.50		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0133	<0.0030	<0.0030		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00023	<0.00010	<0.00010		
	Barium (Ba)-Total (mg/L)	0.00287	<0.000050	RRV 0.000102		
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Total (mg/L)	3.66	<0.050	RRV 0.073		
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-11				
	Description	SURFACE WATE				
	Sampled Date	04-JUL-17				
	Sampled Time	13:55				
	Client ID	TPN-104				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	26.4				
	Hardness (as CaCO3) (mg/L)					
	pH (pH)	7.00				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	19.4				
	Turbidity (NTU)	0.19				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.8				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	5.8				
	Ammonia, Total (as N) (mg/L)					
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	0.71				
	Fluoride (F) (mg/L)	0.063				
	Nitrate (as N) (mg/L)	0.0406				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)					
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)					
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	4.42				
Cyanides	Cyanide, Total (mg/L)					
	Cyanide, Free (mg/L)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-1	L1955650-2	L1955650-3	L1955650-4	L1955650-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	01-JUL-17	01-JUL-17	01-JUL-17	01-JUL-17	02-JUL-17
	Sampled Time	09:35	10:14	14:30	15:30	14:29
	Client ID	TPE-104	TPE-105	WAL-74	WAL-73	SP-104
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00090	0.00091	0.00070
	Iron (Fe)-Total (mg/L)	0.016	0.017	0.028	0.030	0.027
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.90	0.86	1.09	1.15	1.20
	Manganese (Mn)-Total (mg/L)	0.00340	0.00329	0.00349	0.00339	0.00351
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000126	0.000123	0.000183	0.000269	0.000187
	Nickel (Ni)-Total (mg/L)	0.00076	0.00068	<0.00050	<0.00050	0.00060
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.43	0.41	0.37	0.39	0.46
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.14	0.14	0.33	0.33	0.28
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.02	0.976	0.559	0.558	0.838
	Strontium (Sr)-Total (mg/L)	0.0113	0.0110	0.0200	0.0213	0.0186
	Sulfur (S)-Total (mg/L)	1.35	1.45	1.23	1.38	1.68
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000053	0.000051	0.000064	0.000068	0.000061
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0024	0.0027	0.0045	0.0046	0.0033
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00032	0.00028	0.00021	0.00019	0.00021
	Barium (Ba)-Dissolved (mg/L)	0.00299	0.00293	0.00235	0.00207	0.00268
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.41	2.31	3.84	3.92	3.70
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-6	L1955650-7	L1955650-8	L1955650-9	L1955650-10
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	02-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17
	Sampled Time	14:58	10:30	11:00	13:15	13:15
	Client ID	SP-105	JULY DI-1	JULY EB-1	TPN-105	JULY CREMP DUP-1
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	0.00066	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	0.027	<0.010	<0.010		
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	1.13	<0.10	<0.10		
	Manganese (Mn)-Total (mg/L)	0.00306	<0.00010	<0.00010		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000203	RRV 0.000132	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.00059	<0.00050	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.44	<0.10	<0.10		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	0.26	<0.10	<0.10		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	0.809	<0.050	<0.050		
	Strontium (Sr)-Total (mg/L)	0.0179	<0.00020	RRV 0.00038		
	Sulfur (S)-Total (mg/L)	1.65	<0.50	<0.50		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Total (mg/L)	0.000065	<0.000010	<0.000010		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	RRV 0.0033		
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0030	<0.0010	<0.0010		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00022	<0.00010	<0.00010		
	Barium (Ba)-Dissolved (mg/L)	0.00276	<0.000050	RRV 0.000065		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	3.63	<0.050	RRV 0.057		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-11				
	Description	SURFACE WATE				
	Sampled Date	04-JUL-17				
	Sampled Time	13:55				
	Client ID	TPN-104				
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location					
	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Bismuth (Bi)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-1	L1955650-2	L1955650-3	L1955650-4	L1955650-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	01-JUL-17	01-JUL-17	01-JUL-17	01-JUL-17	02-JUL-17
	Sampled Time	09:35	10:14	14:30	15:30	14:29
	Client ID	TPE-104	TPE-105	WAL-74	WAL-73	SP-104
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00034	0.00033	0.00080	0.00069	0.00057
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.000123	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.87	0.92	1.14	1.10	1.13
	Manganese (Mn)-Dissolved (mg/L)	0.00283	0.00282	0.00220	0.00213	0.00222
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000178	0.000112	0.000174	0.000189	0.000182
	Nickel (Ni)-Dissolved (mg/L)	0.00061	0.00063	<0.00050	<0.00050	0.00051
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.44	0.47	0.40	0.39	0.47
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.096	0.101	0.285	0.264	0.219
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.01	1.00	0.586	0.497	0.796
	Strontium (Sr)-Dissolved (mg/L)	0.0107	0.0104	0.0195	0.0196	0.0177
	Sulfur (S)-Dissolved (mg/L)	1.28	1.35	1.06	1.12	1.54
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000043	0.000043	0.000054	0.000058	0.000055
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L1955650-6	L1955650-7	L1955650-8	L1955650-9	L1955650-10
Description		SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
Sampled Date		02-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17
Sampled Time		14:58	10:30	11:00	13:15	13:15
Client ID		SP-105	JULY DI-1	JULY EB-1	TPN-105	JULY CREMP DUP-1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00053	<0.00020	<0.00020		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)	1.12	<0.10	<0.10		
	Manganese (Mn)-Dissolved (mg/L)	0.00217	<0.00010	<0.00010		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000164	<0.000050	<0.000050		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	0.47	<0.10	<0.10		
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	0.222	<0.050	<0.050		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	0.814	<0.050	<0.050		
	Strontium (Sr)-Dissolved (mg/L)	0.0171	<0.00020	RRV 0.00032		
	Sulfur (S)-Dissolved (mg/L)	1.64	<0.50	<0.50		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.000053	<0.000010	<0.000010		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	RRV 0.0028		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1955650-11				
	Description	SURFACE WATE				
	Sampled Date	04-JUL-17				
	Sampled Time	13:55				
	Client ID	TPN-104				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Phosphorus (P)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silicon (Si)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Strontium (Sr)-Dissolved (mg/L)					
	Sulfur (S)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					
	Zinc (Zn)-Dissolved (mg/L)					
	Zirconium (Zr)-Dissolved (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1955650-2	TPE-105	UCM	Unknown sample container (non-ALS) submitted for metals analysis (excluding Hg). ALS cannot verify container cleanliness or suitability for trace metals tests.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Aluminum (Al)-Total	MB-LOR	L1955650-7, -8
Method Blank	Arsenic (As)-Total	MB-LOR	L1955650-7, -8
Method Blank	Barium (Ba)-Total	MB-LOR	L1955650-7, -8
Method Blank	Manganese (Mn)-Total	MB-LOR	L1955650-7, -8
Matrix Spike	Dissolved Organic Carbon	MS-B	L1955650-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1955650-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1955650-8
Matrix Spike	Dissolved Organic Carbon	MS-B	L1955650-8
Matrix Spike	Dissolved Organic Carbon	MS-B	L1955650-8
Matrix Spike	Total Organic Carbon	MS-B	L1955650-1, -2, -3, -4, -5, -6
Matrix Spike	Total Organic Carbon	MS-B	L1955650-8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1955650-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Phosphorus (P)-Total Dissolved	MS-B	L1955650-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

ALS Test Code	Matrix	Test Description	Method Reference**
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

Reference Information

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are

Reference Information

available for these types of samples.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC #

Report To

Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway, Vancouver, BC V6K2G8
Phone:	604-730-1220
Fax:	

Invoice To Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report? ☐ Yes ☑ No

Company:
Contact:
Address:
Phone: Fax:

Lab Work Order # (lab use only)

Report Format / Distribution
☑ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax
Email 1: efranz@azimuthgroup.ca
Email 2: marie-pier.marcil@agnicoeagle.com
Email 3: robin.allard@agnicoeagle.com

Client / Project Information
Job #: Meadowbank CREMP - Surfacewater
PO / AFE:
LSD:
Quote #: Q39503

ALS Contact: Brent Mack **Sampler:** Eric Franz

Service Requested (Rush for routine analysis subject to availability)
◉ Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPE-104	01-Jul-17	9:35	Surface Water	X	X	X	X	X	X	X	X	X				9
	TPE-105	01-Jul-17	10:14	Surface Water	X	X	X	X	X	X	X	X	X				9
	WAL-74	01-Jul-17	14:30	Surface Water	X	X	X	X	X	X	X	X	X				9
	WAL-73	01-Jul-17	15:30	Surface Water	X	X	X	X	X	X	X	X	X				9
	SP-104	02-Jul-17	14:29	Surface Water	X	X	X	X	X	X	X	X	X				9
	SP-105	02-Jul-17	14:58	Surface Water	X	X	X	X	X	X	X	X	X				9
	JULY DI-1	04-Jul-17	10:30	Surface Water	X	X	X	X	X	X	X	X	X				10
	JULY EB-1	04-Jul-17	11:00	Surface Water	X	X	X	X	X	X	X	X	X				9
	TPN-105	04-Jul-17	13:15	Surface Water	X	X	X	X	X	X	X	X	X				9
	JULY CREMP DUP-1	04-Jul-17	13:15	Surface Water	X	X	X	X	X	X	X	X	X				9
	TPN-104	04-Jul-17	13:55	Surface Water	X	X	X	X	X	X	X	X	X				9

L1955650-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Paul July 10@ 10:55

21.5°C

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 13-JUL-17
Report Date: 24-JUL-17 12:34 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1957992

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1957992-1	L1957992-2	L1957992-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	04-JUL-17	04-JUL-17	04-JUL-17		
	Sampled Time	13:15	13:15	13:55		
	Client ID	TPN-105	JULY CREMP DUP-1	TPN-104		
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	8.25	8.64	8.39		
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	<0.0050	0.0068	0.0076		
	Total Kjeldahl Nitrogen (mg/L)	0.096	0.090	0.091		
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020		
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.46	1.71	1.52		
	Total Organic Carbon (mg/L)	1.51	1.72	1.48		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0064	0.0056	0.0059		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00021	0.00019	0.00019		
	Barium (Ba)-Total (mg/L)	0.00288	0.00270	0.00276		
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Total (mg/L)	2.08	2.09	2.05		
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00013		
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.010		
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	0.89	0.85	0.84		
	Manganese (Mn)-Total (mg/L)	0.00247	0.00235	0.00228		
	Molybdenum (Mo)-Total (mg/L)	0.000148	0.000135	0.000140		
	Nickel (Ni)-Total (mg/L)	0.00054	0.00054	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.45	0.43	0.43		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	<0.10		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	1.10	1.03	1.05		
	Strontium (Sr)-Total (mg/L)	0.0108	0.00973	0.00993		
	Sulfur (S)-Total (mg/L)	1.54	1.48	1.52		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1957992-1	L1957992-2	L1957992-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	04-JUL-17	04-JUL-17	04-JUL-17		
	Sampled Time	13:15	13:15	13:55		
	Client ID	TPN-105	JULY CREMP DUP-1	TPN-104		
Grouping	**Analyte**					
WATER						
Total Metals	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Total (mg/L)	0.000042	0.000042	0.000038		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0018	0.0022	0.0016		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00016	0.00018	0.00014		
	Barium (Ba)-Dissolved (mg/L)	0.00261	0.00261	0.00273		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)	1.95	2.08	2.00		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00030	0.00032	0.00030		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)	0.82	0.84	0.82		
	Manganese (Mn)-Dissolved (mg/L)	0.00182	0.00195	0.00185		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000136	0.000135	0.000157		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	0.42	0.43	0.43		
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	0.067	0.069	0.060		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	1.00	1.01	1.01		
	Strontium (Sr)-Dissolved (mg/L)	0.00975	0.0103	0.00983		
	Sulfur (S)-Dissolved (mg/L)	1.48	1.48	1.47		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1957992-1	L1957992-2	L1957992-3		
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE		
	Sampled Date	04-JUL-17	04-JUL-17	04-JUL-17		
	Sampled Time	13:15	13:15	13:55		
	Client ID	TPN-105	JULY CREMP DUP-1	TPN-104		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Uranium (U)-Dissolved (mg/L)	0.000037	0.000036	0.000034		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0019	0.0014	<0.0010		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1957992-1, -2, -3
Matrix Spike	Dissolved Organic Carbon	MS-B	L1957992-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L1957992-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L1957992-1, -2, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1957992-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1957992-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1957992-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1957992-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1957992-1, -2, -3
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1957992-1, -2, -3
Matrix Spike	Barium (Ba)-Total	MS-B	L1957992-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1957992-1, -2, -3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1957992-1, -2, -3
Matrix Spike	Manganese (Mn)-Total	MS-B	L1957992-1, -2, -3
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L1957992-1, -2, -3
Matrix Spike	Sodium (Na)-Total	MS-B	L1957992-1, -2, -3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1957992-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

ALS Test Code	Matrix	Test Description	Method Reference**
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

ALS Test Code	Matrix	Test Description	Method Reference**
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

ALS Test Code	Matrix	Test Description	Method Reference**
CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

ALS Test Code	Matrix	Test Description	Method Reference**
CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

ALS Test Code	Matrix	Test Description	Method Reference**
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑Standard ☐Other	
☑PDF ☑Excel ☐Digital ☐Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPN-105	04-Jul-17	13:15	Surface Water			X	X	X			X	X				5
	JULY CREMP DUP-1	04-Jul-17	13:15	Surface Water			X	X	X			X	X				5
	TPN-104	04-Jul-17	13:55	Surface Water			X	X	X			X	X				5

L1957992-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
			PAUL	JUL 13	9:30	21°C. 20°C				

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To Same as Report ?	☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
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Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPN-105	04-Jul-17	13:15	Surface Water			X	X	X			X	X				5
	JULY CREMP DUP-1	04-Jul-17	13:15	Surface Water			X	X	X			X	X				5
	TPN-104	04-Jul-17	13:55	Surface Water			X	X	X			X	X				5

L1957992-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

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Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
			DAIH	JUL. 13	9:30	21°C 20°C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 13-JUL-17
Report Date: 25-JUL-17 11:51 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1958001

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP -SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1958001-1	L1958001-2	L1958001-3	L1958001-4	L1958001-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17
	Sampled Time	12:15	13:45	15:32	15:32	16:03
	Client ID	BAP-49	BAP-50	BBD-49	JULY CREMP DUP 2	BBD-50
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	30.8	28.3	24.1	23.8	24.2
	Hardness (as CaCO3) (mg/L)	10.3	9.96	9.86	9.93	9.74
	pH (pH)	7.06	7.09	7.09	7.11	7.11
	Total Suspended Solids (mg/L)	1.3	1.0	<1.0	1.8	1.6
	Total Dissolved Solids (mg/L)	19.4	19.0	18.1	16.2	17.1
	Turbidity (NTU)	0.71	0.81	0.76	0.72	0.95
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.4	8.1	8.4	8.7	8.6
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.4	8.1	8.4	8.7	8.6
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	2.89	2.25	1.21	1.21	1.21
	Fluoride (F) (mg/L)	0.058	0.059	0.060	0.060	0.059
	Nitrate (as N) (mg/L)	0.0277	0.0286	0.0281	0.0275	0.0274
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.170	0.165	0.173	0.165	0.165
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0024	<0.0020	0.0028	0.0028	0.0026
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	0.85	0.76	0.62	0.61	0.61
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.47	3.49	3.44	3.44	3.46
	Total Organic Carbon (mg/L)	3.45	3.70	3.64	3.58	3.54
Total Metals	Aluminum (Al)-Total (mg/L)	0.0256	0.0245	0.0259	0.0352	0.0281
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00011	0.00011	0.00010	0.00011	0.00011
	Barium (Ba)-Total (mg/L)	0.0162	0.0162	0.0165	0.0165	0.0166
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.25	2.24	2.21	2.40	2.29
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00014	0.00011

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1958001-6	L1958001-7	L1958001-8	L1958001-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17	
	Sampled Time	10:45	11:15	10:37	10:58	
	Client ID	BPJ-49	BPJ-50	PDL-55	PDL-56	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	24.1	24.3	20.9	20.9	
	Hardness (as CaCO3) (mg/L)	9.90	9.82	8.46	8.49	
	pH (pH)	7.12	7.11	7.05	7.07	
	Total Suspended Solids (mg/L)	1.2	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	17.3	18.7	12.0	13.4	
	Turbidity (NTU)	0.74	0.81	0.19	0.33	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.2	8.5	7.2	7.0	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	8.2	8.5	7.2	7.0	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	1.20	1.21	0.58	0.61	
	Fluoride (F) (mg/L)	0.058	0.060	0.034	0.036	
	Nitrate (as N) (mg/L)	0.0284	0.0279	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.168	0.168	0.090	0.090	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0040	0.0027	<0.0020	DLM <0.010	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	0.61	0.62	1.59	1.69	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.58	3.54	1.78	1.62	
	Total Organic Carbon (mg/L)	3.54	3.54	1.89	1.99	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0288	0.0319	0.0034	0.0043	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00012	<0.00010	0.00014	0.00017	
	Barium (Ba)-Total (mg/L)	0.0164	0.0166	0.00184	0.00208	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	2.26	2.26	2.08	2.11	
	Chromium (Cr)-Total (mg/L)	0.00011	<0.00010	<0.00010	0.00025	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1958001-1	L1958001-2	L1958001-3	L1958001-4	L1958001-5
	Sample ID	L1958001-1	L1958001-2	L1958001-3	L1958001-4	L1958001-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17
	Sampled Time	12:15	13:45	15:32	15:32	16:03
	Client ID	BAP-49	BAP-50	BBD-49	JULY CREMP DUP 2	BBD-50
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00081	<0.00050
	Iron (Fe)-Total (mg/L)	0.036	0.036	0.038	0.038	0.038
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.07	1.07	1.00	1.00	1.02
	Manganese (Mn)-Total (mg/L)	0.00532	0.00560	0.00501	0.00491	0.00494
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000059	0.000052	0.000060	0.000052	0.000056
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.39	0.38	0.37	0.36	0.37
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.28	0.28	0.28	0.28	0.27
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.48	1.16	0.619	0.608	0.625
	Strontium (Sr)-Total (mg/L)	0.0173	0.0171	0.0169	0.0184	0.0171
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	DLM <0.00060	DLM <0.00060	0.00040	DLM <0.00090	DLM <0.00090
	Uranium (U)-Total (mg/L)	0.000051	0.000048	0.000046	0.000052	0.000049
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0173	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0060	0.0069	0.0073	0.0079	0.0055
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00012	0.00010	0.00011	0.00010	0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0171	0.0170	0.0175	0.0174	0.0174
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.32	2.28	2.31	2.34	2.33
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1958001-6	L1958001-7	L1958001-8	L1958001-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17	
	Sampled Time	10:45	11:15	10:37	10:58	
	Client ID	BPJ-49	BPJ-50	PDL-55	PDL-56	
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Iron (Fe)-Total (mg/L)	0.040	0.041	<0.010	<0.010	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	1.01	1.00	0.76	0.82	
	Manganese (Mn)-Total (mg/L)	0.00520	0.00534	0.00170	0.00193	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000062	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00062	0.00072	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.36	0.36	0.31	0.36	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.29	0.28	0.17	0.18	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.613	0.625	0.473	0.524	
	Strontium (Sr)-Total (mg/L)	0.0168	0.0167	0.00902	0.00881	
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	0.56	0.55	
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00010	
	Titanium (Ti)-Total (mg/L)	DLM <0.00060	0.00065	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000045	0.000047	0.000026	0.000023	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0056	0.0062	0.0022	0.0023	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010	0.00013	0.00013	
	Barium (Ba)-Dissolved (mg/L)	0.0172	0.0170	0.00190	0.00193	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	2.32	2.33	2.15	2.16	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1958001-1	L1958001-2	L1958001-3	L1958001-4	L1958001-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17
	Sampled Time	12:15	13:45	15:32	15:32	16:03
	Client ID	BAP-49	BAP-50	BBD-49	JULY CREMP DUP 2	BBD-50
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00027	0.00023	0.00025	0.00024	0.00023
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.011	0.012	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.09	1.03	0.99	0.99	0.96
	Manganese (Mn)-Dissolved (mg/L)	0.00359	0.00378	0.00343	0.00344	0.00320
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000069	0.000059	<0.000050	0.000054	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.42	0.40	0.38	0.38	0.37
	Selenium (Se)-Dissolved (mg/L)	<0.000050	0.000144	0.000099	0.000071	0.000067
	Silicon (Si)-Dissolved (mg/L)	0.218	0.215	0.216	0.214	0.207
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.62	1.15	0.629	0.629	0.604
	Strontium (Sr)-Dissolved (mg/L)	0.0178	0.0168	0.0170	0.0171	0.0168
	Sulfur (S)-Dissolved (mg/L)	0.82	<0.50	<0.50	<0.50	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000038	0.000036	0.000036	0.000036	0.000035
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0042	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1958001-6	L1958001-7	L1958001-8	L1958001-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17
	Sampled Time	10:45	11:15	10:37	10:58
	Client ID	BPJ-49	BPJ-50	PDL-55	PDL-56
Grouping	**Analyte**				
WATER					
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00022	0.00023	0.00039	0.00041
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.00	0.97	0.75	0.75
	Manganese (Mn)-Dissolved (mg/L)	0.00319	0.00349	0.00128	0.00131
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00058	0.00060
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.38	0.38	0.33	0.34
	Selenium (Se)-Dissolved (mg/L)	0.000065	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.217	0.204	0.136	0.139
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.614	0.618	0.467	0.471
	Strontium (Sr)-Dissolved (mg/L)	0.0169	0.0166	0.00894	0.00887
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	0.54	0.52
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000035	0.000036	0.000020	0.000019
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1958001-8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1958001-8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1958001-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L1958001-7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

Reference Information

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

Reference Information

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑Standard ☐Other		◉Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑PDF ☑Excel ☐Digital ☐Fax		○Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Eric Franz

Analysis Request — Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	BAP-49	06-Jul-17	12:15	Surface Water	X	X	X	X	X	X	X	X	X				9
	BAP-50	06-Jul-17	13:45	Surface Water	X	X	X	X	X	X	X	X	X				9
	BBD-49	06-Jul-17	15:32	Surface Water	X	X	X	X	X	X	X	X	X				9
	JULY CREMP DUP 2	06-Jul-17	15:32	Surface Water	X	X	X	X	X	X	X	X	X				9
	BBD-50	06-Jul-17	16:03	Surface Water	X	X	X	X	X	X	X	X	X				9
	BPJ-49	06-Jul-17	10:45	Surface Water	X	X	X	X	X	X	X	X	X				9
	BPJ-50	06-Jul-17	11:15	Surface Water	X	X	X	X	X	X	X	X	X				9
	PDL-55	08-Jul-17	10:37	Surface Water	X	X	X	X	X	X	X	X	X				9
	PDL-56	08-Jul-17	10:58	Surface Water	X	X	X	X	X	X	X	X	X				8

L1958001-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by: PAUL	Date: JULY 13	Time: 08:30	Temperature: 21,20°C	Verified by:	Date:	Time:	Observations:

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 27-JUL-17
Report Date: 03-AUG-17 15:57 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1965475

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP -SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965475-1	L1965475-2	L1965475-3	L1965475-4	L1965475-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	01-JUL-17	01-JUL-17	01-JUL-17	01-JUL-17	02-JUL-17
	Sampled Time	09:35	10:14	14:30	15:30	14:29
	Client ID	TPE-104	TPE-105	WAL-74	WAL-73	SP-104
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.166	0.158	0.711	1.23	0.461

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965475-6	L1965475-7	L1965475-8	L1965475-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	02-JUL-17	04-JUL-17	04-JUL-17	04-JUL-17	
	Sampled Time	14:58	13:15	13:15	13:55	
	Client ID	SP-105	TPN-105	JULY CREMP DUP-1	TPN-104	
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.510	0.135	0.096	0.095	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q39503	
Lab Work Order # (lab use only)		ALS Contact:	Brent Mack	Sampler: Eric Franz

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	TPE-104	01-Jul-17	9:35	Surface Water										X			1
	TPE-105	01-Jul-17	10:14	Surface Water										X			1
	WAL-74	01-Jul-17	14:30	Surface Water										X			1
	WAL-73	01-Jul-17	15:30	Surface Water										X			1
	SP-104	02-Jul-17	14:29	Surface Water										X			1
	SP-105	02-Jul-17	14:58	Surface Water										X			1
	TPN-105	04-Jul-17	13:15	Surface Water										X			1
	JULY CREMP DUP-1	04-Jul-17	13:15	Surface Water										X			1
	TPN-104	04-Jul-17	13:55	Surface Water										X			1

L1965475-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

L1965475-COFC

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Tom Thomson	5-Jul-17	7:50	JC	JUL 2 7 2017	850AM	17 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 27-JUL-17
Report Date: 08-AUG-17 17:36 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1965480

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965480-2	L1965480-3	L1965480-4	L1965480-5	L1965480-6
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17	06-JUL-17
	Sampled Time	13:45	15:32	15:32	16:03	10:45
	Client ID	BAP-50	BBD-49	JULY CREMP DUP2	BBD-50	BPJ-49
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.628	0.609	0.615	0.476	0.653

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1965480-7 Surface Water 06-JUL-17 11:15 BPJ-50	L1965480-8 Surface Water 08-JUL-17 10:37 PDL-55	L1965480-9 Surface Water 08-JUL-17 10:58 PDL-56	L1965480-10 Surface Water 22-JUL-17 14:00 INUG-90	L1965480-11 Surface Water 22-JUL-17 14:30 INUG-91
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.684	0.416	0.380	0.258	0.282

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965480-10	L1965480-11			
	Description	Surface Water	Surface Water			
	Sampled Date	22-JUL-17	22-JUL-17			
	Sampled Time	14:00	14:30			
	Client ID	INUG-90	INUG-91			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	14.4	14.5			
	Hardness (as CaCO3) (mg/L)	5.65	5.60			
	pH (pH)	6.59	6.65			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	10.8	11.6			
	Turbidity (NTU)	0.34	0.32			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.3	4.9			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	5.3	4.9			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	0.71	0.71			
	Fluoride (F) (mg/L)	0.056	0.056			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.106	0.110			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020			
	Phosphorus (P)-Total (mg/L)	0.0022	0.0034			
	Silicate (as SiO2) (mg/L)	<0.50	<0.50			
	Sulfate (SO4) (mg/L)	0.79	0.79			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.87	1.82			
	Total Organic Carbon (mg/L)	1.92	1.97			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0095	0.0101			
	Antimony (Sb)-Total (mg/L)		<0.00010			
	Arsenic (As)-Total (mg/L)	0.00014	0.00011			
	Barium (Ba)-Total (mg/L)	0.00183	0.00179			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	1.12	1.11			
	Chromium (Cr)-Total (mg/L)	0.00018	<0.00010			

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965480-10	L1965480-11			
	Description	Surface Water	Surface Water			
	Sampled Date	22-JUL-17	22-JUL-17			
	Sampled Time	14:00	14:30			
	Client ID	INUG-90	INUG-91			
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.016	0.016			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)	0.72	0.72			
	Manganese (Mn)-Total (mg/L)	0.00291	0.00300			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00051			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.38	0.38			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.19	0.19			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.605	0.595			
	Strontium (Sr)-Total (mg/L)	0.00663	0.00656			
	Sulfur (S)-Total (mg/L)	<0.50	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00039			
	Uranium (U)-Total (mg/L)	0.000055	0.000056			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0030	0.0033			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.00178	0.00175			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	1.10	1.10			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1965480-10	L1965480-11			
	Description	Surface Water	Surface Water			
	Sampled Date	22-JUL-17	22-JUL-17			
	Sampled Time	14:00	14:30			
	Client ID	INUG-90	INUG-91			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00040	0.00027			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	0.71	0.69			
	Manganese (Mn)-Dissolved (mg/L)	0.00061	0.00055			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.37	0.35			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.152	0.164			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.578	0.564			
	Strontium (Sr)-Dissolved (mg/L)	0.00642	0.00636			
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000044	0.000045			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1965480-10, -11
Matrix Spike	Total Organic Carbon	MS-B	L1965480-10, -11

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC #

Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	BAP-49	06-Jul-17	12:15	Surface Water										X			1
	BAP-50	06-Jul-17	13:45	Surface Water										X			1
	BBD-49	06-Jul-17	15:32	Surface Water										X			1
	JULY CREMP DUP 2	06-Jul-17	15:32	Surface Water										X			1
	BBD-50	06-Jul-17	16:03	Surface Water										X			1
	BPJ-49	06-Jul-17	10:45	Surface Water										X			1
	BPJ-50	06-Jul-17	11:15	Surface Water										X			1
	PDL-55	08-Jul-17	10:37	Surface Water										X			1
	PDL-56	08-Jul-17	10:58	Surface Water										X			1
	INUG-90	22-Jul-17	14:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	INUG-91	22-Jul-17	14:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10

L1965480-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

L1965480-COFC

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Martin Theriault	24-Jul-17	9:00	JT	JUL 27 2017	850 AM	17 °C				

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 17-AUG-17
Report Date: 24-AUG-17 16:13 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1976488

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP 2017 CORING
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-1	L1976488-2	L1976488-3	L1976488-4	L1976488-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
	Sampled Time	10:07	10:20	10:51	10:59	11:50
	Client ID	BAP-SC-1	BAP-SC-2	BAP-SC-3	BAP-SC-4	BAP-SC-5
SOIL						
Physical Tests	Moisture (%)	29.6	35.7	31.1	33.9	30.0
	pH (1:2 soil:water) (pH)	5.79	6.96	6.33	6.58	5.80
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.205	0.378	0.288	0.314	0.121
Metals	Aluminum (Al) (mg/kg)	4090	4860	4390	5010	4350
	Antimony (Sb) (mg/kg)	0.14	0.14	0.13	0.13	0.13
	Arsenic (As) (mg/kg)	3.14	7.40	3.36	5.29	2.54
	Barium (Ba) (mg/kg)	315	437	447	593	402
	Beryllium (Be) (mg/kg)	0.28	0.31	0.31	0.30	0.29
	Bismuth (Bi) (mg/kg)	<0.20	0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	5.3	5.9	5.7	6.0	5.6
	Cadmium (Cd) (mg/kg)	<0.020	0.028	<0.020	0.023	<0.020
	Calcium (Ca) (mg/kg)	1770	2670	2230	2560	2010
	Chromium (Cr) (mg/kg)	13.9	14.4	14.3	16.5	14.7
	Cobalt (Co) (mg/kg)	3.43	4.20	3.18	3.86	3.56
	Copper (Cu) (mg/kg)	3.54	5.10	3.82	4.55	3.70
	Iron (Fe) (mg/kg)	10900	13900	13200	15600	12300
	Lead (Pb) (mg/kg)	3.31	4.24	4.06	4.51	3.66
	Lithium (Li) (mg/kg)	6.8	7.5	6.6	7.1	6.9
	Magnesium (Mg) (mg/kg)	2770	2980	2630	2910	2800
	Manganese (Mn) (mg/kg)	112	369	110	174	106
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo) (mg/kg)	0.26	0.62	0.26	0.40	0.29
	Nickel (Ni) (mg/kg)	8.54	8.89	7.79	8.86	8.38
	Phosphorus (P) (mg/kg)	615	775	696	840	632
	Potassium (K) (mg/kg)	1030	1140	1080	1220	1100
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	61	91	71	87	67
	Strontium (Sr) (mg/kg)	39.5	45.7	46.0	48.2	42.9
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.054	0.055	<0.050	0.053	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	257	326	321	397	302
	Tungsten (W) (mg/kg)	<0.50	<0.50	0.56	<0.50	<0.50
	Uranium (U) (mg/kg)	0.958	1.24	1.18	1.28	1.07
	Vanadium (V) (mg/kg)	15.6	19.0	20.0	23.3	18.3
	Zinc (Zn) (mg/kg)	17.3	20.5	17.3	20.0	17.8

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-6	L1976488-7	L1976488-8	L1976488-9	L1976488-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
	Sampled Time	12:19	13:02	13:41	14:09	14:49
	Client ID	BAP-SC-6	BAP-SC-7	BAP-SC-8	BAP-SC-9	BAP-SC-10
SOIL						
Physical Tests	Moisture (%)	28.1	33.8	29.2	32.8	27.5
	pH (1:2 soil:water) (pH)	6.70	6.36	7.08	6.73	7.70
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.161	0.348	0.094	0.307	0.151
Metals	Aluminum (Al) (mg/kg)	3450	4100	3760	4560	3760
	Antimony (Sb) (mg/kg)	0.13	0.13	0.13	0.12	0.12
	Arsenic (As) (mg/kg)	2.88	2.78	2.22	3.02	2.84
	Barium (Ba) (mg/kg)	423	243	255	273	340
	Beryllium (Be) (mg/kg)	0.25	0.27	0.28	0.31	0.25
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	<5.0	5.2	5.3	5.3	<5.0
	Cadmium (Cd) (mg/kg)	<0.020	0.023	<0.020	0.022	<0.020
	Calcium (Ca) (mg/kg)	2170	1670	1510	1760	1780
	Chromium (Cr) (mg/kg)	12.5	13.4	13.3	14.8	12.9
	Cobalt (Co) (mg/kg)	3.06	3.60	3.23	3.63	3.30
	Copper (Cu) (mg/kg)	2.92	4.49	3.60	5.08	2.96
	Iron (Fe) (mg/kg)	13800	11400	11000	12600	11800
	Lead (Pb) (mg/kg)	3.51	4.10	3.49	4.03	3.16
	Lithium (Li) (mg/kg)	5.5	6.9	6.3	7.2	5.9
	Magnesium (Mg) (mg/kg)	2200	2750	2550	2960	2450
	Manganese (Mn) (mg/kg)	126	97.8	99.1	172	344
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo) (mg/kg)	0.38	0.32	0.30	0.36	0.30
	Nickel (Ni) (mg/kg)	6.68	8.40	7.95	8.78	7.27
	Phosphorus (P) (mg/kg)	701	551	456	574	571
	Potassium (K) (mg/kg)	820	1040	930	1060	900
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	54	78	58	76	57
	Strontium (Sr) (mg/kg)	40.5	36.4	40.4	38.7	40.5
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	<0.050	0.051	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	269	242	212	262	273
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.955	1.18	0.926	1.07	0.859
	Vanadium (V) (mg/kg)	20.0	17.7	16.1	17.6	17.5
	Zinc (Zn) (mg/kg)	14.0	18.5	15.4	19.4	14.8

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-11	L1976488-12	L1976488-13	L1976488-14	L1976488-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	09:58	10:35	11:13	11:53	12:09
	Client ID	BES-SC-1	BES-SC-2	BES-SC-3	BES-SC-4	BES-SC-5
SOIL						
Physical Tests	Moisture (%)	39.3	31.5	37.7	42.7	37.6
	pH (1:2 soil:water) (pH)	6.94	7.15	6.99	7.03	6.99
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.378	0.246	0.361	0.428	0.342
Metals	Aluminum (Al) (mg/kg)	6270	5100	6220	6950	5210
	Antimony (Sb) (mg/kg)	0.12	0.10	0.12	0.14	0.11
	Arsenic (As) (mg/kg)	3.50	2.69	3.38	4.16	3.63
	Barium (Ba) (mg/kg)	223	155	197	225	176
	Beryllium (Be) (mg/kg)	0.35	0.28	0.34	0.39	0.30
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	6.4	5.2	6.2	7.1	<5.0
	Cadmium (Cd) (mg/kg)	0.041	0.023	0.035	0.040	0.032
	Calcium (Ca) (mg/kg)	2450	1740	2240	2330	2240
	Chromium (Cr) (mg/kg)	18.8	16.6	19.0	20.8	16.5
	Cobalt (Co) (mg/kg)	4.95	4.04	4.83	5.40	4.36
	Copper (Cu) (mg/kg)	4.78	4.04	4.93	5.72	4.54
	Iron (Fe) (mg/kg)	14000	11400	14000	14800	13600
	Lead (Pb) (mg/kg)	4.86	3.51	4.80	5.33	4.55
	Lithium (Li) (mg/kg)	9.4	8.4	9.4	10.3	8.4
	Magnesium (Mg) (mg/kg)	3970	3600	4090	4440	3560
	Manganese (Mn) (mg/kg)	640	701	475	485	417
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	0.0051	0.0057	<0.0050
	Molybdenum (Mo) (mg/kg)	0.51	0.46	0.41	0.54	0.41
	Nickel (Ni) (mg/kg)	11.3	10.2	11.5	12.8	9.98
	Phosphorus (P) (mg/kg)	709	466	643	705	761
	Potassium (K) (mg/kg)	1350	1100	1320	1460	1050
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	97	75	102	116	84
	Strontium (Sr) (mg/kg)	42.3	34.1	39.7	44.9	33.8
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.062	<0.050	0.058	0.070	0.051
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	405	318	381	404	307
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.23	0.888	1.17	1.46	1.10
	Vanadium (V) (mg/kg)	21.4	16.6	21.0	21.9	19.7
	Zinc (Zn) (mg/kg)	24.5	20.3	25.5	27.6	22.4

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-16	L1976488-17	L1976488-18	L1976488-19	L1976488-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	12:47	13:48	14:20	14:42	15:13
	Client ID	BES-SC-6	BES-SC-7	BES-SC-8	BES-SC-9	BES-SC-10
SOIL						
Physical Tests	Moisture (%)	37.1	40.4	50.1	36.2	32.9
	pH (1:2 soil:water) (pH)	7.06	7.41	7.16	7.18	7.49
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.366	0.384	0.734	0.370	0.277
Metals	Aluminum (Al) (mg/kg)	5890	7480	8720	5740	4780
	Antimony (Sb) (mg/kg)	0.12	0.19	0.16	0.13	0.11
	Arsenic (As) (mg/kg)	3.46	4.25	5.30	3.39	2.68
	Barium (Ba) (mg/kg)	148	237	248	166	171
	Beryllium (Be) (mg/kg)	0.33	0.38	0.47	0.33	0.26
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	0.22	<0.20	<0.20
	Boron (B) (mg/kg)	6.0	7.7	8.6	5.4	<5.0
	Cadmium (Cd) (mg/kg)	0.034	0.051	0.064	0.045	0.026
	Calcium (Ca) (mg/kg)	2330	2670	2710	2220	1870
	Chromium (Cr) (mg/kg)	16.7	22.9	24.8	18.5	15.0
	Cobalt (Co) (mg/kg)	4.67	5.95	6.84	5.08	3.92
	Copper (Cu) (mg/kg)	4.72	5.90	8.25	4.80	3.77
	Iron (Fe) (mg/kg)	13700	15700	17700	14200	11100
	Lead (Pb) (mg/kg)	4.91	5.72	7.08	4.92	3.73
	Lithium (Li) (mg/kg)	9.0	11.6	13.4	9.7	8.2
	Magnesium (Mg) (mg/kg)	3820	4770	5310	3970	3270
	Manganese (Mn) (mg/kg)	363	534	589	492	372
	Mercury (Hg) (mg/kg)	0.0055	0.0053	0.0086	<0.0050	<0.0050
	Molybdenum (Mo) (mg/kg)	0.43	0.59	0.68	0.48	0.44
	Nickel (Ni) (mg/kg)	10.3	14.4	15.3	11.7	9.47
	Phosphorus (P) (mg/kg)	718	835	833	779	579
	Potassium (K) (mg/kg)	1230	1650	1950	1190	1000
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	98	127	161	97	77
	Strontium (Sr) (mg/kg)	39.3	49.0	51.4	36.0	32.4
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.053	0.076	0.090	0.061	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	380	398	440	289	279
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.20	1.56	1.83	1.22	0.998
	Vanadium (V) (mg/kg)	20.4	23.6	26.3	20.7	16.6
	Zinc (Zn) (mg/kg)	23.9	31.0	36.5	26.2	19.9

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1976488-21 Sediment 11-AUG-17 08:44 BBJ-SC-1	L1976488-22 Sediment 11-AUG-17 09:30 BBJ-SC-2	L1976488-23 Sediment 11-AUG-17 10:02 BBJ-SC-3	L1976488-24 Sediment 11-AUG-17 10:43 BBJ-SC-4	L1976488-25 Sediment 11-AUG-17 11:28 BBJ-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	59.6	55.5	46.8	54.1	40.5
	pH (1:2 soil:water) (pH)	6.79	6.87	6.71	6.33	6.68
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.811	0.751	0.598	0.711	0.398
Metals	Aluminum (Al) (mg/kg)	10400	11400	9110	11300	6650
	Antimony (Sb) (mg/kg)	0.16	0.16	0.14	0.21	0.11
	Arsenic (As) (mg/kg)	17.3	24.6	31.5	10.1	8.48
	Barium (Ba) (mg/kg)	182	140	153	106	76.2
	Beryllium (Be) (mg/kg)	0.47	0.49	0.38	0.48	0.29
	Bismuth (Bi) (mg/kg)	0.24	0.25	0.22	0.25	<0.20
	Boron (B) (mg/kg)	8.7	10.0	7.7	10.3	5.5
	Cadmium (Cd) (mg/kg)	0.110	0.110	0.050	0.078	0.050
	Calcium (Ca) (mg/kg)	3030	3190	2800	3090	1910
	Chromium (Cr) (mg/kg)	24.1	25.6	20.4	24.8	14.9
	Cobalt (Co) (mg/kg)	9.35	8.96	9.18	8.79	5.79
	Copper (Cu) (mg/kg)	10.4	11.2	9.24	11.8	7.10
	Iron (Fe) (mg/kg)	24300	25600	29000	22100	14600
	Lead (Pb) (mg/kg)	10.8	11.4	9.18	10.8	6.44
	Lithium (Li) (mg/kg)	13.4	14.4	11.4	14.7	8.9
	Magnesium (Mg) (mg/kg)	5640	5940	4840	5950	3800
	Manganese (Mn) (mg/kg)	5190	1450	2890	925	864
	Mercury (Hg) (mg/kg)	0.0122	0.0120	0.0088	0.0080	0.0054
	Molybdenum (Mo) (mg/kg)	2.40	1.68	2.04	2.84	1.12
	Nickel (Ni) (mg/kg)	16.5	16.5	13.0	15.9	10.1
	Phosphorus (P) (mg/kg)	1110	1260	1620	888	700
	Potassium (K) (mg/kg)	2020	2230	1730	2420	1290
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	199	221	166	199	135
	Strontium (Sr) (mg/kg)	56.6	63.4	53.1	59.7	41.2
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.094	0.096	0.069	0.101	0.056
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	467	524	405	567	330
	Tungsten (W) (mg/kg)	<0.50	<0.50	0.65	<0.50	<0.50
	Uranium (U) (mg/kg)	2.26	2.34	1.89	2.61	1.46
	Vanadium (V) (mg/kg)	28.6	30.6	25.1	33.3	18.7
	Zinc (Zn) (mg/kg)	47.9	48.9	38.5	46.9	30.1

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-26	L1976488-27	L1976488-28	L1976488-29	L1976488-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	12:37	12:55	13:31	13:52	14:37
	Client ID	BBJ-SC-6	BBJ-SC-7	BBJ-SC-8	BBJ-SC-9	BBJ-SC-10
SOIL						
Physical Tests	Moisture (%)	46.2	31.0	36.4	41.1	44.5
	pH (1:2 soil:water) (pH)	6.58	6.84	7.07	6.78	6.60
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.613	0.336	0.351	0.307	0.661
Metals	Aluminum (Al) (mg/kg)	10200	7560	6740	6650	9670
	Antimony (Sb) (mg/kg)	0.19	0.12	0.12	<0.10	0.11
	Arsenic (As) (mg/kg)	7.01	8.70	10.8	12.8	42.4
	Barium (Ba) (mg/kg)	90.1	69.3	128	115	127
	Beryllium (Be) (mg/kg)	0.50	0.36	0.32	0.31	0.44
	Bismuth (Bi) (mg/kg)	0.27	<0.20	<0.20	<0.20	0.23
	Boron (B) (mg/kg)	8.5	6.1	6.0	5.3	8.1
	Cadmium (Cd) (mg/kg)	0.060	0.035	0.053	0.059	0.057
	Calcium (Ca) (mg/kg)	2670	2230	2010	2220	2990
	Chromium (Cr) (mg/kg)	24.1	17.6	15.4	16.2	21.9
	Cobalt (Co) (mg/kg)	7.48	6.13	5.65	6.26	6.98
	Copper (Cu) (mg/kg)	11.5	7.46	10.5	5.85	8.86
	Iron (Fe) (mg/kg)	20000	15100	16000	18200	28500
	Lead (Pb) (mg/kg)	11.0	7.12	6.54	6.73	9.68
	Lithium (Li) (mg/kg)	14.7	11.0	9.4	9.2	12.7
	Magnesium (Mg) (mg/kg)	5800	4250	3790	4010	5270
	Manganese (Mn) (mg/kg)	776	609	1140	3310	1700
	Mercury (Hg) (mg/kg)	0.0074	<0.0050	<0.0050	<0.0050	0.0075
	Molybdenum (Mo) (mg/kg)	1.65	1.05	1.50	2.00	1.45
	Nickel (Ni) (mg/kg)	15.1	10.8	10.3	11.0	13.3
	Phosphorus (P) (mg/kg)	820	741	733	737	1480
	Potassium (K) (mg/kg)	2070	1480	1370	1210	1800
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	174	120	114	117	164
	Strontium (Sr) (mg/kg)	49.5	44.7	45.2	50.4	57.7
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.097	0.067	0.065	0.064	0.078
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	383	343	326	394	460
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	0.56
	Uranium (U) (mg/kg)	3.14	1.66	1.96	1.42	2.09
	Vanadium (V) (mg/kg)	31.9	22.8	21.9	22.5	27.6
	Zinc (Zn) (mg/kg)	44.9	31.1	29.6	31.0	40.7

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-31	L1976488-32	L1976488-33	L1976488-34	L1976488-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17
	Sampled Time	15:32	16:09	08:43	09:00	09:54
	Client ID	BBD-SC-1	BBD-SC-2	BBD-SC-3	BBD-SC-4	BBD-SC-5
SOIL						
Physical Tests	Moisture (%)	43.1	36.4	40.6	30.3	47.8
	pH (1:2 soil:water) (pH)	6.58	6.93	6.83	6.86	6.69
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.644	0.382	0.503	0.334	0.728
Metals	Aluminum (Al) (mg/kg)	8290	5860	7060	5220	8720
	Antimony (Sb) (mg/kg)	0.13	0.10	0.37	<0.10	0.15
	Arsenic (As) (mg/kg)	6.06	5.83	5.37	4.34	8.47
	Barium (Ba) (mg/kg)	97.8	89.1	95.6	59.1	111
	Beryllium (Be) (mg/kg)	0.35	0.26	0.29	0.22	0.35
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	0.23
	Boron (B) (mg/kg)	6.3	<5.0	5.2	<5.0	6.1
	Cadmium (Cd) (mg/kg)	0.073	0.043	0.069	0.035	0.065
	Calcium (Ca) (mg/kg)	2680	2160	2490	1650	3170
	Chromium (Cr) (mg/kg)	18.4	13.5	15.8	11.5	20.0
	Cobalt (Co) (mg/kg)	6.54	4.91	5.97	4.22	7.25
	Copper (Cu) (mg/kg)	10.7	6.97	8.62	5.92	11.7
	Iron (Fe) (mg/kg)	15600	12300	14100	11200	18900
	Lead (Pb) (mg/kg)	9.20	6.53	7.40	4.92	9.57
	Lithium (Li) (mg/kg)	11.4	8.4	9.6	7.9	11.8
	Magnesium (Mg) (mg/kg)	4830	3560	4200	3450	5060
	Manganese (Mn) (mg/kg)	343	371	392	245	444
	Mercury (Hg) (mg/kg)	0.0059	<0.0050	0.0067	<0.0050	0.0072
	Molybdenum (Mo) (mg/kg)	0.66	0.52	0.68	0.45	0.85
	Nickel (Ni) (mg/kg)	12.9	9.24	11.1	8.33	13.5
	Phosphorus (P) (mg/kg)	762	707	755	557	1040
	Potassium (K) (mg/kg)	1430	990	1180	820	1500
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	138	83	104	75	125
	Strontium (Sr) (mg/kg)	44.0	34.2	37.3	29.6	44.4
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.074	<0.050	0.057	<0.050	0.072
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	383	283	348	219	439
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.85	1.14	1.50	0.979	1.92
	Vanadium (V) (mg/kg)	21.3	15.7	19.4	13.8	23.6
	Zinc (Zn) (mg/kg)	37.3	26.6	31.5	23.7	38.4

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-36	L1976488-37	L1976488-38	L1976488-39	L1976488-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17
	Sampled Time	10:33	11:03	11:45	12:05	12:15
	Client ID	BBD-SC-6	BBD-SC-7	BBD-SC-8	BBD-SC-9	BBD-SC-10
SOIL						
Physical Tests	Moisture (%)	49.7	33.8	33.7	22.2	33.3
	pH (1:2 soil:water) (pH)	6.42	6.57	7.02	6.30	6.59
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.719	0.400	0.400	0.115	0.307
Metals	Aluminum (Al) (mg/kg)	8290	6880	5870	4320	5130
	Antimony (Sb) (mg/kg)	0.13	<0.10	<0.10	<0.10	<0.10
	Arsenic (As) (mg/kg)	8.26	7.57	4.26	4.39	3.40
	Barium (Ba) (mg/kg)	106	69.0	63.6	42.4	51.1
	Beryllium (Be) (mg/kg)	0.34	0.29	0.26	0.18	0.22
	Bismuth (Bi) (mg/kg)	0.23	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	7.0	5.7	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	0.064	0.038	0.044	<0.020	0.036
	Calcium (Ca) (mg/kg)	2990	2440	2000	1230	1540
	Chromium (Cr) (mg/kg)	18.7	15.3	12.1	6.32	11.2
	Cobalt (Co) (mg/kg)	6.23	4.90	4.46	2.99	3.93
	Copper (Cu) (mg/kg)	9.92	7.29	7.33	3.21	5.74
	Iron (Fe) (mg/kg)	17600	13500	11600	9090	10100
	Lead (Pb) (mg/kg)	9.81	6.50	5.64	2.81	4.90
	Lithium (Li) (mg/kg)	10.7	9.0	8.3	7.1	7.7
	Magnesium (Mg) (mg/kg)	4640	3960	3620	2870	3380
	Manganese (Mn) (mg/kg)	389	439	298	143	198
	Mercury (Hg) (mg/kg)	0.0073	<0.0050	<0.0050	<0.0050	<0.0050
	Molybdenum (Mo) (mg/kg)	0.85	0.89	0.49	0.33	0.36
	Nickel (Ni) (mg/kg)	12.2	10.2	8.69	5.45	8.53
	Phosphorus (P) (mg/kg)	871	668	554	357	459
	Potassium (K) (mg/kg)	1510	1200	960	680	830
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	118	91	66	<50	56
	Strontium (Sr) (mg/kg)	47.2	42.3	37.6	27.8	28.4
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.067	<0.050	<0.050	<0.050	<0.050
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	459	381	328	205	230
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.81	1.31	1.11	0.534	0.960
	Vanadium (V) (mg/kg)	22.2	18.1	14.9	11.1	13.3
	Zinc (Zn) (mg/kg)	35.1	28.1	25.5	16.8	23.3

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976488-41	L1976488-42	L1976488-43	L1976488-44
	Description	Sediment	Sediment	Sediment	Sediment
	Sampled Date				
	Sampled Time				
	Client ID	CREMP DUP-SC-7	CREMP DUP-SC-8	CREMP DUP-SC-9	CREMP DUP-SC-10
SOIL					
Physical Tests	Moisture (%)	46.3	40.5	48.5	44.9
	pH (1:2 soil:water) (pH)	6.02	6.90	6.29	6.18
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.761	0.445	0.553	0.695
Metals	Aluminum (Al) (mg/kg)	6270	6390	10400	7410
	Antimony (Sb) (mg/kg)	0.17	0.13	0.14	0.11
	Arsenic (As) (mg/kg)	5.05	3.69	9.14	6.13
	Barium (Ba) (mg/kg)	287	211	89.4	103
	Beryllium (Be) (mg/kg)	0.42	0.35	0.48	0.30
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	0.24	<0.20
	Boron (B) (mg/kg)	7.6	6.6	8.7	6.1
	Cadmium (Cd) (mg/kg)	0.057	0.040	0.068	0.053
	Calcium (Ca) (mg/kg)	2190	2270	3040	2780
	Chromium (Cr) (mg/kg)	18.6	19.2	23.4	16.9
	Cobalt (Co) (mg/kg)	5.27	5.00	7.56	5.64
	Copper (Cu) (mg/kg)	8.65	5.08	10.7	8.76
	Iron (Fe) (mg/kg)	14900	13800	19200	15600
	Lead (Pb) (mg/kg)	6.19	5.08	10.5	7.61
	Lithium (Li) (mg/kg)	10.2	9.8	13.4	10.0
	Magnesium (Mg) (mg/kg)	3990	4220	5770	4330
	Manganese (Mn) (mg/kg)	158	526	849	295
	Mercury (Hg) (mg/kg)	0.0062	0.0051	0.0082	0.0073
	Molybdenum (Mo) (mg/kg)	0.68	0.47	0.97	1.53
	Nickel (Ni) (mg/kg)	12.1	12.0	14.9	11.1
	Phosphorus (P) (mg/kg)	623	672	811	840
	Potassium (K) (mg/kg)	1620	1370	1910	1330
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	117	105	171	103
	Strontium (Sr) (mg/kg)	44.3	40.8	55.7	42.1
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.086	0.063	0.083	0.062
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	343	375	515	453
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	2.06	1.31	2.12	1.57
	Vanadium (V) (mg/kg)	25.0	20.8	27.4	21.0
	Zinc (Zn) (mg/kg)	29.8	27.0	44.6	33.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976488-1	L1976488-2	L1976488-3	L1976488-4	L1976488-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
	Sampled Time	10:07	10:20	10:51	10:59	11:50
	Client ID	BAP-SC-1	BAP-SC-2	BAP-SC-3	BAP-SC-4	BAP-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	4.6	3.5	4.6	4.6	5.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1976488-6	L1976488-7	L1976488-8	L1976488-9	L1976488-10
		Description	Sediment	Sediment	Sediment	Sediment	Sediment
		Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
		Sampled Time	12:19	13:02	13:41	14:09	14:49
		Client ID	BAP-SC-6	BAP-SC-7	BAP-SC-8	BAP-SC-9	BAP-SC-10
Grouping	**Analyte**						
SOIL							
Metals	Zirconium (Zr) (mg/kg)		4.4	4.5	4.5	3.6	4.2

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1976488-11	L1976488-12	L1976488-13	L1976488-14	L1976488-15
		Description	Sediment	Sediment	Sediment	Sediment	Sediment
		Sampled Date	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
		Sampled Time	09:58	10:35	11:13	11:53	12:09
		Client ID	BES-SC-1	BES-SC-2	BES-SC-3	BES-SC-4	BES-SC-5
Grouping	**Analyte**						
SOIL							
Metals	Zirconium (Zr) (mg/kg)		2.7	3.4	2.9	2.8	2.2

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976488-16	L1976488-17	L1976488-18	L1976488-19	L1976488-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	12:47	13:48	14:20	14:42	15:13
	Client ID	BES-SC-6	BES-SC-7	BES-SC-8	BES-SC-9	BES-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	2.3	3.8	2.9	2.7	3.1

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976488-21	L1976488-22	L1976488-23	L1976488-24	L1976488-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	08:44	09:30	10:02	10:43	11:28
	Client ID	BBJ-SC-1	BBJ-SC-2	BBJ-SC-3	BBJ-SC-4	BBJ-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	3.6	5.5	3.0	7.5	4.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976488-26	L1976488-27	L1976488-28	L1976488-29	L1976488-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	12:37	12:55	13:31	13:52	14:37
	Client ID	BBJ-SC-6	BBJ-SC-7	BBJ-SC-8	BBJ-SC-9	BBJ-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	7.4	6.6	4.4	3.6	4.1

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L1976488-31	L1976488-32	L1976488-33	L1976488-34	L1976488-35
Description		Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date		11-AUG-17	11-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17
Sampled Time		15:32	16:09	08:43	09:00	09:54
Client ID		BBD-SC-1	BBD-SC-2	BBD-SC-3	BBD-SC-4	BBD-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	5.2	3.4	4.2	3.5	4.4

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1976488-36	L1976488-37	L1976488-38	L1976488-39	L1976488-40
	Sample ID	L1976488-36	L1976488-37	L1976488-38	L1976488-39	L1976488-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17
	Sampled Time	10:33	11:03	11:45	12:05	12:15
	Client ID	BBD-SC-6	BBD-SC-7	BBD-SC-8	BBD-SC-9	BBD-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	4.6	5.0	3.5	2.9	3.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976488-41	L1976488-42	L1976488-43	L1976488-44	
	Description	Sediment	Sediment	Sediment	Sediment	
	Sampled Date					
	Sampled Time					
	Client ID	CREMP DUP-SC-7	CREMP DUP-SC-8	CREMP DUP-SC-9	CREMP DUP-SC-10	
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	5.1	2.5	6.9	4.1	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAFS.

ALS Test Code	Matrix	Test Description	Method Reference**
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.

ALS Test Code	Matrix	Test Description	Method Reference**
MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

ALS Test Code	Matrix	Test Description	Method Reference**
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

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

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

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

L1976488-COFC

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

COC #

Report To
Company: Azimuth Consulting Group
Contact: Eric Franz
Address: 218-2902 West Broadway
Vancouver, BC V6K2G8
Phone: 604-730-1220 Fax:

Invoice To Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report? ☐ Yes ☑ No
Company:
Contact:
Address:
Phone: Fax:

Report Format / Distribution
☐ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax
Email 1: efranz@azimuthgroup.ca
Email 2: gmann@azimuthgroup.ca
Email 3: robin.allard@agnicoeagle.com

Client / Project Information
Job #: Meadowbank CREMP 2017 Coring
PO / AFE:
LSD:

Quote #: Q38011

ALS Contact: Brent Mack **Sampler:** Eric Franz

Service Requested (Rush for routine analysis subject to availability)
◉ Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Lab Work Order # (lab use only)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	BAP-SC-1	09-Aug-17	10:07	Sediment	X	X	1
	BAP-SC-2	09-Aug-17	10:20	Sediment	X	X	1
	BAP-SC-3	09-Aug-17	10:51	Sediment	X	X	1
	BAP-SC-4	09-Aug-17	10:59	Sediment	X	X	1
	BAP-SC-5	09-Aug-17	11:50	Sediment	X	X	1
	BAP-SC-6	09-Aug-17	12:19	Sediment	X	X	1
	BAP-SC-7	09-Aug-17	13:02	Sediment	X	X	1
	BAP-SC-8	09-Aug-17	13:41	Sediment	X	X	1
	BAP-SC-9	09-Aug-17	14:09	Sediment	X	X	1
	BAP-SC-10	09-Aug-17	14:49	Sediment	X	X	1
	BES-SC-1	10-Aug-17	9:58	Sediment	X	X	1
	BES-SC-2	10-Aug-17	10:34	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Sediment core samples from Baker Lake stations (BAP, BES, BPJ, BBD)

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 13-Aug-17	Time (hh-mm) 9:00	Received by: PAUL	Date: AUG 17	Time: 08:30	Temperature: 18.1 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1976488-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	BES-SC-3	10-Aug-17	11:13	Sediment	X	X	1
	BES-SC-4	10-Aug-17	11:53	Sediment	X	X	1
	BES-SC-5	10-Aug-17	12:09	Sediment	X	X	1
	BES-SC-6	10-Aug-17	12:47	Sediment	X	X	1
	BES-SC-7	10-Aug-17	13:48	Sediment	X	X	1
	BES-SC-8	10-Aug-17	14:20	Sediment	X	X	1
	BES-SC-9	10-Aug-17	14:42	Sediment	X	X	1
	BES-SC-10	10-Aug-17	15:13	Sediment	X	X	1
	BPJ-SC-1	11-Aug-17	8:44	Sediment	X	X	1
	BPJ-SC-2	11-Aug-17	9:30	Sediment	X	X	1
	BPJ-SC-3	11-Aug-17	10:02	Sediment	X	X	1
	BPJ-SC-4	11-Aug-17	10:43	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz	13-Aug-17	9:00	PAUL	AUG 17	08:30	18.1 °C				

ALS Environmental

L1976488-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	BPJ-SC-5	11-Aug-17	11:28	Sediment	X	X	1
	BPJ-SC-6	11-Aug-17	12:37	Sediment	X	X	1
	BPJ-SC-7	11-Aug-17	12:55	Sediment	X	X	1
	BPJ-SC-8	11-Aug-17	13:31	Sediment	X	X	1
	BPJ-SC-9	11-Aug-17	13:52	Sediment	X	X	1
	BPJ-SC-10	11-Aug-17	14:37	Sediment	X	X	1
	BBD-SC-1	11-Aug-17	15:32	Sediment	X	X	1
	BBD-SC-2	11-Aug-17	16:09	Sediment	X	X	1
	BBD-SC-3	12-Aug-17	8:43	Sediment	X	X	1
	BBD-SC-4	12-Aug-17	9:00	Sediment	X	X	1
	BBD-SC-5	12-Aug-17	9:54	Sediment	X	X	1
	BBD-SC-6	12-Aug-17	10:33	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz	13-Aug-17	9:00	PAUL	AUG 17	08:30	18·1 °C				

L1976488-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # ______

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To Same as Report ?	☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	BBD-SC-7	12-Aug-17	11:03	Sediment	X	X	1
	BBD-SC-8	12-Aug-17	11:45	Sediment	X	X	1
	BBD-SC-9	12-Aug-17	12:05	Sediment	X	X	1
	BBD-SC-10	12-Aug-17	12:15	Sediment	X	X	1
	CREMP DUP-SC-7	-	-	Sediment	X	X	1
	CREMP DUP-SC-8	-	-	Sediment	X	X	1
	CREMP DUP-SC-9	-	-	Sediment	X	X	1
	CREMP DUP-SC-10	-	-	Sediment	X	X	1
				Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz	13-Aug-17	9:00	PAUL	AUG 17	08:30	18-1 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 31-AUG-17
Report Date: 12-SEP-17 16:18 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1984230

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP 2017 CORING
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-1	L1984230-2	L1984230-3	L1984230-4	L1984230-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
	Sampled Time	14:28	15:00	15:29	15:43	16:20
	Client ID	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.8	86.4	87.3	88.0	87.1
	pH (1:2 soil:water) (pH)	6.28	6.32	6.34	6.31	6.39
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.67	4.25	4.58	4.87	4.54
Metals	Aluminum (Al) (mg/kg)	25700	23500	23100	26000	25700
	Antimony (Sb) (mg/kg)	0.33	0.34	0.36	0.39	0.36
	Arsenic (As) (mg/kg)	24.1	29.2	26.9	28.3	31.1
	Barium (Ba) (mg/kg)	119	103	121	147	127
	Beryllium (Be) (mg/kg)	1.90	1.65	1.55	1.71	1.65
	Bismuth (Bi) (mg/kg)	2.61	2.31	2.13	2.35	2.20
	Boron (B) (mg/kg)	9.0	7.5	7.0	7.9	7.8
	Cadmium (Cd) (mg/kg)	0.222	0.228	0.569	0.746	0.511
	Calcium (Ca) (mg/kg)	2620	2500	3130	3210	3020
	Chromium (Cr) (mg/kg)	178	186	219	224	264
	Cobalt (Co) (mg/kg)	17.0	19.6	20.1	22.2	22.5
	Copper (Cu) (mg/kg)	56.3	51.8	48.8	55.8	52.5
	Iron (Fe) (mg/kg)	49200	55900	47500	51900	52600
	Lead (Pb) (mg/kg)	24.7	22.9	23.5	26.5	24.4
	Lithium (Li) (mg/kg)	50.0	41.4	38.3	42.1	39.3
	Magnesium (Mg) (mg/kg)	12000	11600	12600	13200	14300
	Manganese (Mn) (mg/kg)	1440	2800	3210	4130	3180
	Mercury (Hg) (mg/kg)	0.0217	0.0229	0.0269	0.0276	0.0259
	Molybdenum (Mo) (mg/kg)	4.55	4.62	4.33	4.71	4.64
	Nickel (Ni) (mg/kg)	92.9	90.6	159	191	163
	Phosphorus (P) (mg/kg)	537	517	530	600	578
	Potassium (K) (mg/kg)	4540	4020	3780	4380	4200
	Selenium (Se) (mg/kg)	0.67	0.71	0.77	0.91	0.79
	Silver (Ag) (mg/kg)	0.15	0.23	0.25	0.22	0.23
	Sodium (Na) (mg/kg)	179	164	169	197	189
	Strontium (Sr) (mg/kg)	21.3	19.4	21.0	23.7	22.5
	Sulfur (S) (mg/kg)	2200	1800	2200	2700	2300
	Thallium (Tl) (mg/kg)	0.425	0.368	0.479	0.552	0.477
	Tin (Sn) (mg/kg)	4.0	4.8	4.2	4.5	4.6
	Titanium (Ti) (mg/kg)	895	803	704	815	770
	Tungsten (W) (mg/kg)	1.08	1.08	1.09	1.24	1.10
	Uranium (U) (mg/kg)	17.7	15.5	13.8	15.7	14.0
	Vanadium (V) (mg/kg)	46.1	43.2	43.0	47.8	47.7
	Zinc (Zn) (mg/kg)	113	100	107	125	113

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-6	L1984230-7	L1984230-8	L1984230-9	L1984230-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
	Sampled Time	16:59	17:27	17:34	17:49	17:58
	Client ID	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	88.2	86.0	88.5	82.8	81.8
	pH (1:2 soil:water) (pH)	6.64	6.61	6.32	6.24	6.22
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.25	4.34	4.34	3.55	3.53
Metals	Aluminum (Al) (mg/kg)	25100	24000	24500	25800	26400
	Antimony (Sb) (mg/kg)	0.35	0.36	0.30	0.28	0.27
	Arsenic (As) (mg/kg)	29.3	29.2	23.2	25.9	19.1
	Barium (Ba) (mg/kg)	116	152	109	111	128
	Beryllium (Be) (mg/kg)	1.49	1.54	1.59	1.60	1.79
	Bismuth (Bi) (mg/kg)	2.09	2.10	2.08	2.16	2.46
	Boron (B) (mg/kg)	7.9	7.8	8.0	7.9	8.1
	Cadmium (Cd) (mg/kg)	0.388	1.09	0.233	0.292	0.240
	Calcium (Ca) (mg/kg)	2770	2880	3200	2350	2310
	Chromium (Cr) (mg/kg)	257	212	195	184	126
	Cobalt (Co) (mg/kg)	21.7	21.8	17.6	19.0	18.7
	Copper (Cu) (mg/kg)	49.9	53.9	46.4	54.6	57.9
	Iron (Fe) (mg/kg)	53600	51700	46000	49800	44700
	Lead (Pb) (mg/kg)	23.0	25.5	21.4	22.7	23.6
	Lithium (Li) (mg/kg)	38.3	37.1	40.1	47.1	51.3
	Magnesium (Mg) (mg/kg)	13900	12200	12100	12500	10900
	Manganese (Mn) (mg/kg)	3560	9920	1770	2480	2290
	Mercury (Hg) (mg/kg)	0.0247	0.0260	0.0256	0.0218	0.0204
	Molybdenum (Mo) (mg/kg)	4.85	5.38	3.70	4.38	3.70
	Nickel (Ni) (mg/kg)	135	235	94.6	101	83.7
	Phosphorus (P) (mg/kg)	551	532	499	504	442
	Potassium (K) (mg/kg)	4100	4010	4160	4450	4840
	Selenium (Se) (mg/kg)	0.77	0.78	0.79	0.81	0.67
	Silver (Ag) (mg/kg)	0.29	0.18	0.19	0.14	0.14
	Sodium (Na) (mg/kg)	182	176	195	170	180
	Strontium (Sr) (mg/kg)	21.1	22.0	21.4	19.5	19.6
	Sulfur (S) (mg/kg)	2400	2000	2100	1700	1800
	Thallium (Tl) (mg/kg)	0.432	0.645	0.374	0.403	0.445
	Tin (Sn) (mg/kg)	3.0	4.1	4.7	2.6	3.3
	Titanium (Ti) (mg/kg)	800	785	781	933	968
	Tungsten (W) (mg/kg)	1.16	1.00	0.95	1.01	0.93
	Uranium (U) (mg/kg)	13.2	14.0	13.6	15.9	18.2
	Vanadium (V) (mg/kg)	46.9	44.2	43.9	47.8	45.3
	Zinc (Zn) (mg/kg)	106	127	99.5	111	118

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-11	L1984230-12	L1984230-13	L1984230-14	L1984230-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	09:39	10:04	10:20	10:36	10:52
	Client ID	TPN-SC-1	TPN-SC-2	TPN-SC-3	TPN-SC-4	TPN-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	83.7	81.2	81.2	56.2	80.6
	pH (1:2 soil:water) (pH)	6.34	6.15	6.19	5.98	5.90
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.58	3.91	4.27	1.08	3.08
Metals	Aluminum (Al) (mg/kg)	18400	15900	16600	10800	16300
	Antimony (Sb) (mg/kg)	0.28	0.25	0.22	<0.10	0.18
	Arsenic (As) (mg/kg)	19.5	18.9	19.0	13.8	10.9
	Barium (Ba) (mg/kg)	78.0	64.0	66.5	36.1	62.0
	Beryllium (Be) (mg/kg)	1.12	0.95	1.02	0.54	1.01
	Bismuth (Bi) (mg/kg)	1.17	0.99	0.94	0.44	0.99
	Boron (B) (mg/kg)	7.5	6.3	7.2	<5.0	5.6
	Cadmium (Cd) (mg/kg)	0.171	0.142	0.204	0.061	0.114
	Calcium (Ca) (mg/kg)	2220	1740	2100	838	1610
	Chromium (Cr) (mg/kg)	135	119	129	71.5	112
	Cobalt (Co) (mg/kg)	12.3	11.1	11.8	6.86	9.30
	Copper (Cu) (mg/kg)	55.7	45.5	47.6	21.6	45.5
	Iron (Fe) (mg/kg)	35500	36700	35300	21300	26700
	Lead (Pb) (mg/kg)	17.5	15.6	15.0	6.61	13.6
	Lithium (Li) (mg/kg)	27.5	23.4	25.6	21.6	26.8
	Magnesium (Mg) (mg/kg)	9020	8100	8300	5840	7740
	Manganese (Mn) (mg/kg)	529	507	576	281	335
	Mercury (Hg) (mg/kg)	0.0241	0.0191	0.0219	<0.0050	0.0139
	Molybdenum (Mo) (mg/kg)	4.02	3.40	3.29	2.61	2.06
	Nickel (Ni) (mg/kg)	69.1	58.3	66.9	38.2	56.2
	Phosphorus (P) (mg/kg)	628	599	643	230	582
	Potassium (K) (mg/kg)	2650	2250	2380	1520	2330
	Selenium (Se) (mg/kg)	0.66	0.56	0.58	<0.20	0.51
	Silver (Ag) (mg/kg)	0.21	0.15	0.20	<0.10	0.15
	Sodium (Na) (mg/kg)	141	129	125	65	113
	Strontium (Sr) (mg/kg)	18.1	14.4	17.3	8.49	14.4
	Sulfur (S) (mg/kg)	1300	1100	1400	<1000	<1000
	Thallium (Tl) (mg/kg)	0.208	0.175	0.174	0.105	0.177
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	472	418	463	417	444
	Tungsten (W) (mg/kg)	0.71	0.79	0.75	<0.50	0.78
	Uranium (U) (mg/kg)	14.5	11.7	11.8	6.03	12.2
	Vanadium (V) (mg/kg)	34.9	30.3	31.5	19.9	30.6
	Zinc (Zn) (mg/kg)	84.4	70.5	73.5	47.7	69.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L1984230-16	L1984230-17	L1984230-18	L1984230-19	L1984230-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	11:49	14:16	14:23	14:41	14:57
	Client ID	TPN-SC-6	TPN-SC-7	TPN-SC-8	TPN-SC-9	TPN-SC-10
SOIL						
Physical Tests	Moisture (%)	86.0	80.6	76.0	80.5	77.0
	pH (1:2 soil:water) (pH)	6.33	6.06	6.14	5.98	6.23
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.74	3.71	2.25	3.17	2.79
Metals	Aluminum (Al) (mg/kg)	16900	16800	13800	17900	14700
	Antimony (Sb) (mg/kg)	0.24	0.23	0.16	0.21	0.18
	Arsenic (As) (mg/kg)	24.7	15.8	11.6	17.2	13.5
	Barium (Ba) (mg/kg)	65.4	64.1	47.6	67.6	57.6
	Beryllium (Be) (mg/kg)	0.98	0.98	0.75	1.02	0.79
	Bismuth (Bi) (mg/kg)	0.94	0.90	0.78	1.06	0.76
	Boron (B) (mg/kg)	6.6	6.4	5.2	7.6	6.3
	Cadmium (Cd) (mg/kg)	0.243	0.203	0.071	0.096	0.120
	Calcium (Ca) (mg/kg)	2100	2030	1310	1780	1650
	Chromium (Cr) (mg/kg)	153	138	99.9	125	116
	Cobalt (Co) (mg/kg)	16.7	11.4	9.01	11.5	10.8
	Copper (Cu) (mg/kg)	41.7	44.8	35.4	42.6	32.8
	Iron (Fe) (mg/kg)	38100	30800	23100	32000	27600
	Lead (Pb) (mg/kg)	15.7	14.2	11.7	15.3	12.0
	Lithium (Li) (mg/kg)	25.5	25.9	22.8	30.4	25.6
	Magnesium (Mg) (mg/kg)	9100	8750	6800	8690	7930
	Manganese (Mn) (mg/kg)	1300	388	356	568	579
	Mercury (Hg) (mg/kg)	0.0219	0.0184	0.0143	0.0199	0.0139
	Molybdenum (Mo) (mg/kg)	3.52	2.83	1.75	2.40	1.97
	Nickel (Ni) (mg/kg)	79.6	65.8	45.3	60.5	55.9
	Phosphorus (P) (mg/kg)	535	583	342	456	373
	Potassium (K) (mg/kg)	2290	2300	1970	2690	2180
	Selenium (Se) (mg/kg)	0.51	0.47	0.32	0.39	0.28
	Silver (Ag) (mg/kg)	0.20	0.16	<0.10	0.13	0.11
	Sodium (Na) (mg/kg)	145	118	103	127	107
	Strontium (Sr) (mg/kg)	16.1	16.1	12.6	16.3	15.2
	Sulfur (S) (mg/kg)	1600	1200	<1000	1100	<1000
	Thallium (Tl) (mg/kg)	0.185	0.185	0.135	0.197	0.162
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	422	443	404	538	468
	Tungsten (W) (mg/kg)	0.71	0.68	<0.50	0.54	0.70
	Uranium (U) (mg/kg)	11.3	10.9	9.54	12.5	9.16
	Vanadium (V) (mg/kg)	31.7	32.3	25.0	32.2	27.4
	Zinc (Zn) (mg/kg)	73.5	73.4	55.7	74.3	62.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-21	L1984230-22	L1984230-23	L1984230-24	L1984230-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17
	Sampled Time	14:18	14:28	15:03	15:35	16:08
	Client ID	SP-SC-1	SP-SC-2	SP-SC-3	SP-SC-4	SP-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.8	84.0	87.1	86.6	84.3
	pH (1:2 soil:water) (pH)	6.24	6.24	6.20	6.06	6.20
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.94	4.09	4.87	4.36	4.05
Metals	Aluminum (Al) (mg/kg)	20800	20800	21200	21300	21900
	Antimony (Sb) (mg/kg)	0.32	0.26	0.29	0.27	0.26
	Arsenic (As) (mg/kg)	33.0	31.4	27.0	33.4	27.1
	Barium (Ba) (mg/kg)	113	114	105	110	113
	Beryllium (Be) (mg/kg)	1.60	1.72	1.68	1.68	1.82
	Bismuth (Bi) (mg/kg)	1.84	1.96	1.93	1.93	2.04
	Boron (B) (mg/kg)	7.8	6.5	7.7	8.0	7.9
	Cadmium (Cd) (mg/kg)	0.340	0.250	0.244	0.160	0.228
	Calcium (Ca) (mg/kg)	2430	2300	2480	2150	2290
	Chromium (Cr) (mg/kg)	96.2	81.0	90.6	78.4	81.4
	Cobalt (Co) (mg/kg)	16.1	14.3	14.3	14.8	14.0
	Copper (Cu) (mg/kg)	62.4	63.2	60.4	61.9	64.0
	Iron (Fe) (mg/kg)	57600	60800	48800	67100	62300
	Lead (Pb) (mg/kg)	20.0	19.6	20.3	19.2	20.0
	Lithium (Li) (mg/kg)	34.8	36.8	36.7	36.4	37.6
	Magnesium (Mg) (mg/kg)	8780	8360	8710	8350	8400
	Manganese (Mn) (mg/kg)	5350	4040	2320	3030	2220
	Mercury (Hg) (mg/kg)	0.0462	0.0292	0.0347	0.0326	0.0285
	Molybdenum (Mo) (mg/kg)	6.44	6.15	4.97	5.89	5.56
	Nickel (Ni) (mg/kg)	77.9	65.1	67.2	55.7	60.4
	Phosphorus (P) (mg/kg)	615	471	562	511	491
	Potassium (K) (mg/kg)	3670	3560	3660	3810	3850
	Selenium (Se) (mg/kg)	0.70	0.65	0.52	0.65	0.55
	Silver (Ag) (mg/kg)	0.27	0.15	0.17	0.16	0.14
	Sodium (Na) (mg/kg)	175	158	176	194	173
	Strontium (Sr) (mg/kg)	20.8	19.4	20.4	18.8	19.4
	Sulfur (S) (mg/kg)	1600	1300	1600	1300	1400
	Thallium (Tl) (mg/kg)	0.318	0.320	0.315	0.303	0.330
	Tin (Sn) (mg/kg)	2.2	<2.0	2.7	<2.0	2.2
	Titanium (Ti) (mg/kg)	625	592	642	667	666
	Tungsten (W) (mg/kg)	0.76	0.67	0.80	0.74	0.72
	Uranium (U) (mg/kg)	15.1	16.9	16.5	16.1	18.0
	Vanadium (V) (mg/kg)	35.5	35.2	36.0	35.4	36.2
	Zinc (Zn) (mg/kg)	102	102	102	97.5	105

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-26	L1984230-27	L1984230-28	L1984230-29	L1984230-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17
	Sampled Time	16:17	17:01	17:32	17:40	17:50
	Client ID	SP-SC-6	SP-SC-7	SP-SC-8	SP-SC-9	SP-SC-10
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.2	85.6	85.7	83.8	84.2
	pH (1:2 soil:water) (pH)	6.32	6.26	6.23	6.25	6.44
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.38	4.76	4.33	4.28	4.23
Metals	Aluminum (Al) (mg/kg)	20600	22400	22500	26600	28100
	Antimony (Sb) (mg/kg)	0.31	0.29	0.27	0.30	0.31
	Arsenic (As) (mg/kg)	47.6	29.9	31.8	37.6	32.1
	Barium (Ba) (mg/kg)	105	115	118	124	141
	Beryllium (Be) (mg/kg)	1.68	1.73	1.75	1.89	1.95
	Bismuth (Bi) (mg/kg)	1.88	1.97	2.01	2.15	2.26
	Boron (B) (mg/kg)	7.8	8.3	8.2	9.1	9.6
	Cadmium (Cd) (mg/kg)	0.205	0.219	0.239	0.193	0.292
	Calcium (Ca) (mg/kg)	2360	2580	2370	2580	2620
	Chromium (Cr) (mg/kg)	81.5	108	95.5	96.6	107
	Cobalt (Co) (mg/kg)	13.7	15.6	14.1	15.9	18.9
	Copper (Cu) (mg/kg)	61.0	61.8	63.3	71.0	75.7
	Iron (Fe) (mg/kg)	75200	51900	66700	72700	67400
	Lead (Pb) (mg/kg)	19.1	20.2	19.9	21.8	22.4
	Lithium (Li) (mg/kg)	34.3	37.5	37.6	42.6	44.2
	Magnesium (Mg) (mg/kg)	8100	9420	8970	10400	10900
	Manganese (Mn) (mg/kg)	3750	3090	3080	3040	3950
	Mercury (Hg) (mg/kg)	0.0350	0.0356	0.0325	0.0358	0.0376
	Molybdenum (Mo) (mg/kg)	7.95	5.01	5.95	6.21	5.80
	Nickel (Ni) (mg/kg)	56.9	73.4	64.8	66.2	81.0
	Phosphorus (P) (mg/kg)	547	562	500	562	610
	Potassium (K) (mg/kg)	3580	3850	3900	4710	4950
	Selenium (Se) (mg/kg)	0.77	0.61	0.63	0.62	0.63
	Silver (Ag) (mg/kg)	0.19	0.18	0.19	0.17	0.16
	Sodium (Na) (mg/kg)	161	183	183	204	208
	Strontium (Sr) (mg/kg)	20.0	21.5	20.8	21.7	22.8
	Sulfur (S) (mg/kg)	1300	1600	1300	1300	1500
	Thallium (Tl) (mg/kg)	0.293	0.324	0.334	0.347	0.384
	Tin (Sn) (mg/kg)	<2.0	2.9	2.9	3.2	2.1
	Titanium (Ti) (mg/kg)	610	637	637	753	780
	Tungsten (W) (mg/kg)	0.73	0.72	0.73	0.65	0.69
	Uranium (U) (mg/kg)	15.8	16.5	17.1	17.8	18.3
	Vanadium (V) (mg/kg)	34.1	37.6	36.9	42.4	44.6
	Zinc (Zn) (mg/kg)	95.3	102	104	120	129

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984230-31	L1984230-32	L1984230-33	L1984230-34	L1984230-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17
	Sampled Time	09:40	10:17	10:29	11:00	11:24
	Client ID	WAL-SC-1	WAL-SC-2	WAL-SC-3	WAL-SC-4	WAL-SC-5
SOIL						
Physical Tests	Moisture (%)	89.3	89.7	89.1	89.6	90.7
	pH (1:2 soil:water) (pH)	6.66	6.39	6.84	6.66	6.50
Organic / Inorganic Carbon	Total Organic Carbon (%)	8.91	8.69	9.37	8.74	9.01
Metals	Aluminum (Al) (mg/kg)	21100	21700	19600	21300	22600
	Antimony (Sb) (mg/kg)	0.50	0.53	0.50	0.48	0.47
	Arsenic (As) (mg/kg)	48.1	51.5	54.8	55.5	91.4
	Barium (Ba) (mg/kg)	110	112	107	119	131
	Beryllium (Be) (mg/kg)	1.72	1.75	1.63	1.67	1.69
	Bismuth (Bi) (mg/kg)	1.97	2.08	1.99	2.17	2.19
	Boron (B) (mg/kg)	12.6	12.0	10.5	9.0	10.6
	Cadmium (Cd) (mg/kg)	0.443	0.442	0.452	0.441	0.553
	Calcium (Ca) (mg/kg)	4810	4290	4550	4230	4300
	Chromium (Cr) (mg/kg)	61.4	63.9	58.3	61.7	63.9
	Cobalt (Co) (mg/kg)	10.5	10.7	10.1	10.9	12.4
	Copper (Cu) (mg/kg)	140	147	144	152	172
	Iron (Fe) (mg/kg)	43700	45000	45700	47800	59000
	Lead (Pb) (mg/kg)	33.6	34.2	33.8	36.5	36.7
	Lithium (Li) (mg/kg)	36.4	37.8	34.8	34.7	33.8
	Magnesium (Mg) (mg/kg)	7920	8030	7330	8100	8210
	Manganese (Mn) (mg/kg)	532	623	596	703	824
	Mercury (Hg) (mg/kg)	0.0695	0.0656	0.0734	0.0597	0.0695
	Molybdenum (Mo) (mg/kg)	10.4	10.6	11.8	11.6	13.1
	Nickel (Ni) (mg/kg)	57.8	59.2	55.4	59.0	64.5
	Phosphorus (P) (mg/kg)	871	869	793	758	887
	Potassium (K) (mg/kg)	3580	3780	3250	3610	3810
	Selenium (Se) (mg/kg)	0.83	0.92	0.83	0.87	1.06
	Silver (Ag) (mg/kg)	0.53	0.55	0.58	0.55	0.69
	Sodium (Na) (mg/kg)	207	238	176	178	199
	Strontium (Sr) (mg/kg)	32.7	30.2	30.2	28.9	29.4
	Sulfur (S) (mg/kg)	2600	2600	2600	2600	2900
	Thallium (Tl) (mg/kg)	0.308	0.323	0.295	0.323	0.341
	Tin (Sn) (mg/kg)	3.1	3.5	2.1	4.0	2.4
	Titanium (Ti) (mg/kg)	618	754	471	521	585
	Tungsten (W) (mg/kg)	1.45	2.18	1.32	1.50	1.39
	Uranium (U) (mg/kg)	15.9	16.4	16.0	17.0	18.4
	Vanadium (V) (mg/kg)	33.0	34.2	31.0	33.4	34.7
	Zinc (Zn) (mg/kg)	125	126	122	128	136

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1984230-36 Sediment 26-AUG-17 11:47 WAL-SC-6	L1984230-37 Sediment 26-AUG-17 12:00 WAL-SC-7	L1984230-38 Sediment 26-AUG-17 12:38 WAL-SC-8	L1984230-39 Sediment 26-AUG-17 12:54 WAL-SC-9	L1984230-40 Sediment 26-AUG-17 13:31 WAL-SC-10
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	91.1	91.2	90.0	90.2	89.1
	pH (1:2 soil:water) (pH)	6.53	6.76	6.70	6.27	6.43
Organic / Inorganic Carbon	Total Organic Carbon (%)	9.34	9.40	8.93	9.43	9.82
Metals	Aluminum (Al) (mg/kg)	21600	23500	24100	20400	19700
	Antimony (Sb) (mg/kg)	0.49	0.52	0.51	0.48	0.52
	Arsenic (As) (mg/kg)	67.2	70.7	67.9	57.7	53.0
	Barium (Ba) (mg/kg)	125	125	137	103	113
	Beryllium (Be) (mg/kg)	1.77	1.90	1.92	1.55	1.44
	Bismuth (Bi) (mg/kg)	2.28	2.35	2.38	1.98	1.92
	Boron (B) (mg/kg)	11.4	12.5	12.1	11.5	11.9
	Cadmium (Cd) (mg/kg)	0.490	0.463	0.513	0.442	0.464
	Calcium (Ca) (mg/kg)	4640	5240	4800	4910	5020
	Chromium (Cr) (mg/kg)	61.5	65.3	66.9	58.3	57.0
	Cobalt (Co) (mg/kg)	10.5	11.2	11.5	10.7	10.7
	Copper (Cu) (mg/kg)	161	165	169	134	131
	Iron (Fe) (mg/kg)	52000	56500	53200	43100	43700
	Lead (Pb) (mg/kg)	39.3	41.2	40.3	35.2	34.4
	Lithium (Li) (mg/kg)	34.2	36.5	36.8	33.4	32.0
	Magnesium (Mg) (mg/kg)	7750	8570	8710	8000	7790
	Manganese (Mn) (mg/kg)	483	633	566	412	466
	Mercury (Hg) (mg/kg)	0.0757	0.0743	0.0682	0.0744	0.0752
	Molybdenum (Mo) (mg/kg)	14.4	14.2	12.9	11.1	9.44
	Nickel (Ni) (mg/kg)	59.0	62.3	63.2	57.4	56.8
	Phosphorus (P) (mg/kg)	823	945	951	993	934
	Potassium (K) (mg/kg)	3640	4020	4170	3580	3520
	Selenium (Se) (mg/kg)	1.03	0.98	0.98	0.85	0.84
	Silver (Ag) (mg/kg)	0.65	0.61	0.66	0.53	0.52
	Sodium (Na) (mg/kg)	188	206	215	192	190
	Strontium (Sr) (mg/kg)	30.8	34.3	32.4	32.3	32.6
	Sulfur (S) (mg/kg)	2600	2900	2800	3200	2900
	Thallium (Tl) (mg/kg)	0.354	0.351	0.378	0.323	0.308
	Tin (Sn) (mg/kg)	2.2	2.3	2.1	2.3	2.4
	Titanium (Ti) (mg/kg)	564	610	643	593	588
	Tungsten (W) (mg/kg)	1.46	1.42	1.39	1.36	1.29
	Uranium (U) (mg/kg)	19.1	18.5	19.1	15.8	14.8
	Vanadium (V) (mg/kg)	33.8	36.3	37.2	31.4	31.5
	Zinc (Zn) (mg/kg)	130	140	144	129	121

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

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	Sample ID	L1984230-41	L1984230-42	L1984230-43	L1984230-44	L1984230-45
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17
	Sampled Time	09:25	09:45	10:27	11:02	11:45
	Client ID	INUG-SC-1	INUG-SC-2	INUG-SC-3	INUG-SC-4	INUG-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	83.7	82.9	84.2	84.4	84.3
	pH (1:2 soil:water) (pH)	5.61	5.60	5.83	5.70	5.66
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.52	4.20	4.76	5.27	4.99
Metals	Aluminum (Al) (mg/kg)	19200	24800	22000	17600	22300
	Antimony (Sb) (mg/kg)	0.19	0.23	0.25	0.25	0.26
	Arsenic (As) (mg/kg)	117	18.1	39.2	39.4	50.3
	Barium (Ba) (mg/kg)	109	134	144	122	138
	Beryllium (Be) (mg/kg)	1.19	1.54	1.38	1.13	1.40
	Bismuth (Bi) (mg/kg)	1.12	1.45	1.28	1.08	1.26
	Boron (B) (mg/kg)	6.6	8.6	8.2	6.9	8.3
	Cadmium (Cd) (mg/kg)	0.163	0.235	0.359	0.268	0.364
	Calcium (Ca) (mg/kg)	1820	2270	1910	1830	2530
	Chromium (Cr) (mg/kg)	95.8	124	108	89.5	112
	Cobalt (Co) (mg/kg)	16.6	15.9	26.6	20.3	17.6
	Copper (Cu) (mg/kg)	42.8	55.2	49.7	41.8	51.1
	Iron (Fe) (mg/kg)	104000	55700	83100	87700	82100
	Lead (Pb) (mg/kg)	13.9	18.0	16.7	15.1	16.1
	Lithium (Li) (mg/kg)	22.2	29.6	25.0	20.2	24.9
	Magnesium (Mg) (mg/kg)	8510	10900	9420	7510	9700
	Manganese (Mn) (mg/kg)	2800	1380	4190	3860	2160
	Mercury (Hg) (mg/kg)	0.0291	0.0332	0.0345	0.0382	0.0385
	Molybdenum (Mo) (mg/kg)	9.60	3.12	6.09	5.10	4.97
	Nickel (Ni) (mg/kg)	77.1	97.6	117	93.0	102
	Phosphorus (P) (mg/kg)	1700	1360	878	1300	1820
	Potassium (K) (mg/kg)	2990	3950	3540	2860	3650
	Selenium (Se) (mg/kg)	0.65	0.68	0.77	0.68	0.83
	Silver (Ag) (mg/kg)	0.13	0.20	0.16	0.16	0.22
	Sodium (Na) (mg/kg)	167	187	163	136	188
	Strontium (Sr) (mg/kg)	22.0	27.2	24.0	21.6	26.8
	Sulfur (S) (mg/kg)	1500	1600	1700	1500	1600
	Thallium (Tl) (mg/kg)	0.200	0.256	0.278	0.207	0.258
	Tin (Sn) (mg/kg)	2.5	2.1	<2.0	2.1	<2.0
	Titanium (Ti) (mg/kg)	462	612	544	429	586
	Tungsten (W) (mg/kg)	0.60	0.77	0.58	0.65	0.71
	Uranium (U) (mg/kg)	13.9	18.7	16.6	13.6	17.0
	Vanadium (V) (mg/kg)	32.1	42.0	36.6	29.9	37.1
	Zinc (Zn) (mg/kg)	84.0	102	98.2	81.9	103

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-46	L1984230-47	L1984230-48	L1984230-49	L1984230-50
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17
	Sampled Time	12:20	13:02	13:10	13:16	13:20
	Client ID	INUG-SC-6	INUG-SC-7	INUG-SC-8	INUG-SC-9	INUG-SC-10
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.9	86.7	85.9	84.7	84.3
	pH (1:2 soil:water) (pH)	5.23	5.35	5.41	5.62	5.68
Organic / Inorganic Carbon	Total Organic Carbon (%)	6.00	5.89	5.82	4.49	5.01
Metals	Aluminum (Al) (mg/kg)	17600	17900	20500	19100	19900
	Antimony (Sb) (mg/kg)	0.25	0.25	0.24	0.22	0.23
	Arsenic (As) (mg/kg)	88.6	115	35.5	186	117
	Barium (Ba) (mg/kg)	123	119	126	118	117
	Beryllium (Be) (mg/kg)	1.21	1.17	1.32	1.24	1.29
	Bismuth (Bi) (mg/kg)	1.07	1.11	1.25	1.16	1.20
	Boron (B) (mg/kg)	7.8	7.7	8.0	6.1	8.0
	Cadmium (Cd) (mg/kg)	0.326	0.273	0.308	0.230	0.252
	Calcium (Ca) (mg/kg)	1940	2170	2310	1900	2130
	Chromium (Cr) (mg/kg)	88.6	90.7	104	97.9	99.5
	Cobalt (Co) (mg/kg)	16.6	18.6	14.8	17.0	13.0
	Copper (Cu) (mg/kg)	44.8	42.8	48.9	45.1	47.3
	Iron (Fe) (mg/kg)	130000	107000	73000	141000	125000
	Lead (Pb) (mg/kg)	15.7	15.3	17.6	14.3	15.2
	Lithium (Li) (mg/kg)	19.4	20.4	24.0	22.2	22.4
	Magnesium (Mg) (mg/kg)	7620	7790	8940	8510	8560
	Manganese (Mn) (mg/kg)	2080	2640	990	2650	1400
	Mercury (Hg) (mg/kg)	0.0500	0.0448	0.0475	0.0340	0.0353
	Molybdenum (Mo) (mg/kg)	6.81	6.36	4.52	9.96	8.62
	Nickel (Ni) (mg/kg)	86.1	94.0	90.3	83.4	75.6
	Phosphorus (P) (mg/kg)	2990	3240	1510	3950	2680
	Potassium (K) (mg/kg)	2890	3000	3250	3010	3170
	Selenium (Se) (mg/kg)	0.84	0.80	0.78	0.73	0.77
	Silver (Ag) (mg/kg)	0.20	0.18	0.22	0.18	0.20
	Sodium (Na) (mg/kg)	148	171	163	166	163
	Strontium (Sr) (mg/kg)	22.0	24.3	24.3	21.8	24.3
	Sulfur (S) (mg/kg)	1900	1900	1700	1400	1600
	Thallium (Tl) (mg/kg)	0.195	0.207	0.213	0.205	0.198
	Tin (Sn) (mg/kg)	2.5	2.0	2.4	2.9	<2.0
	Titanium (Ti) (mg/kg)	426	435	472	402	539
	Tungsten (W) (mg/kg)	0.63	0.63	0.64	0.70	0.71
	Uranium (U) (mg/kg)	14.9	14.5	16.9	14.8	15.4
	Vanadium (V) (mg/kg)	29.9	30.5	34.9	32.5	33.5
	Zinc (Zn) (mg/kg)	87.1	84.9	94.1	88.6	92.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1984230-51	L1984230-52	L1984230-53	L1984230-54	L1984230-55
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
	Sampled Time	09:45	11:00	11:30	12:30	12:57
	Client ID	PDL-SC-1	PDL-SC-2	PDL-SC-3	PDL-SC-4	PDL-SC-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	81.3	83.7	87.7	80.3	79.5
	pH (1:2 soil:water) (pH)	6.36	5.92	5.23	6.18	6.50
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.05	3.55	6.09	3.16	2.70
Metals	Aluminum (Al) (mg/kg)	21300	20100	17400	22100	19400
	Antimony (Sb) (mg/kg)	0.32	0.25	0.30	0.33	0.30
	Arsenic (As) (mg/kg)	39.4	11.4	29.4	39.2	32.1
	Barium (Ba) (mg/kg)	86.4	102	81.6	91.0	78.8
	Beryllium (Be) (mg/kg)	1.11	0.96	0.92	1.18	1.00
	Bismuth (Bi) (mg/kg)	1.06	0.83	0.79	1.12	0.93
	Boron (B) (mg/kg)	7.6	7.2	9.4	7.7	7.0
	Cadmium (Cd) (mg/kg)	0.146	0.248	0.286	0.136	0.105
	Calcium (Ca) (mg/kg)	2200	2510	2250	2490	2310
	Chromium (Cr) (mg/kg)	143	134	117	148	135
	Cobalt (Co) (mg/kg)	18.2	11.5	12.2	17.3	14.5
	Copper (Cu) (mg/kg)	57.0	46.9	47.0	54.9	47.4
	Iron (Fe) (mg/kg)	43200	28700	33600	44600	38100
	Lead (Pb) (mg/kg)	16.7	14.8	15.4	18.1	15.1
	Lithium (Li) (mg/kg)	28.3	27.7	24.1	29.5	25.4
	Magnesium (Mg) (mg/kg)	11100	11100	9670	11800	10100
	Manganese (Mn) (mg/kg)	1250	314	306	1050	777
	Mercury (Hg) (mg/kg)	0.0159	0.0184	0.0247	0.0178	0.0168
	Molybdenum (Mo) (mg/kg)	3.09	1.60	3.11	3.24	3.23
	Nickel (Ni) (mg/kg)	93.7	88.1	93.8	91.9	80.4
	Phosphorus (P) (mg/kg)	569	572	649	601	548
	Potassium (K) (mg/kg)	2900	2800	2480	3040	2810
	Selenium (Se) (mg/kg)	0.39	0.43	0.45	0.48	0.32
	Silver (Ag) (mg/kg)	<0.10	0.24	0.24	0.11	<0.10
	Sodium (Na) (mg/kg)	118	112	108	121	113
	Strontium (Sr) (mg/kg)	21.8	21.9	20.1	24.2	22.4
	Sulfur (S) (mg/kg)	1200	1100	1900	1200	<1000
	Thallium (Tl) (mg/kg)	0.211	0.186	0.184	0.220	0.179
	Tin (Sn) (mg/kg)	<2.0	2.5	2.4	2.9	<2.0
	Titanium (Ti) (mg/kg)	482	570	451	512	501
	Tungsten (W) (mg/kg)	0.51	0.54	0.54	0.58	<0.50
	Uranium (U) (mg/kg)	10.5	7.69	7.88	10.3	8.47
	Vanadium (V) (mg/kg)	38.3	35.8	32.0	40.1	35.4
	Zinc (Zn) (mg/kg)	86.3	84.8	84.0	90.2	75.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984230-56	L1984230-57	L1984230-58	L1984230-59	L1984230-60
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
	Sampled Time	14:23	14:31	14:39	14:04	14:51
	Client ID	PDL-SC-6	PDL-SC-7	PDL-SC-8	PDL-SC-9	PDL-SC-10
SOIL						
Physical Tests	Moisture (%)	81.4	79.6	86.8	72.5	81.3
	pH (1:2 soil:water) (pH)	6.22	6.13	5.37	6.25	6.31
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.88	2.48	5.19	1.86	3.01
Metals	Aluminum (Al) (mg/kg)	17500	16500	16200	19900	20500
	Antimony (Sb) (mg/kg)	0.30	0.28	0.29	0.26	0.32
	Arsenic (As) (mg/kg)	36.9	30.4	18.6	41.6	36.8
	Barium (Ba) (mg/kg)	83.0	77.8	72.1	79.3	83.6
	Beryllium (Be) (mg/kg)	0.91	0.83	0.92	1.03	1.10
	Bismuth (Bi) (mg/kg)	0.82	0.77	0.74	1.01	1.04
	Boron (B) (mg/kg)	6.5	5.7	7.2	5.4	7.0
	Cadmium (Cd) (mg/kg)	0.175	0.141	0.254	0.239	0.157
	Calcium (Ca) (mg/kg)	2320	2170	2430	1800	2320
	Chromium (Cr) (mg/kg)	118	111	110	128	139
	Cobalt (Co) (mg/kg)	16.4	14.6	11.0	21.9	17.9
	Copper (Cu) (mg/kg)	42.0	37.6	43.1	52.5	54.9
	Iron (Fe) (mg/kg)	39600	36500	28100	41000	41800
	Lead (Pb) (mg/kg)	14.4	13.4	14.7	15.3	16.4
	Lithium (Li) (mg/kg)	23.0	21.7	22.7	27.2	27.2
	Magnesium (Mg) (mg/kg)	9410	9160	8820	10200	10700
	Manganese (Mn) (mg/kg)	3200	2650	273	2480	1540
	Mercury (Hg) (mg/kg)	0.0213	0.0182	0.0250	0.0139	0.0167
	Molybdenum (Mo) (mg/kg)	3.00	2.64	2.90	3.81	3.00
	Nickel (Ni) (mg/kg)	92.4	75.8	86.2	104	95.0
	Phosphorus (P) (mg/kg)	584	551	556	427	561
	Potassium (K) (mg/kg)	2590	2420	2400	2660	2950
	Selenium (Se) (mg/kg)	0.50	0.40	0.44	0.24	0.36
	Silver (Ag) (mg/kg)	0.15	0.14	0.23	<0.10	<0.10
	Sodium (Na) (mg/kg)	111	98	101	84	111
	Strontium (Sr) (mg/kg)	22.5	20.6	20.2	18.4	22.4
	Sulfur (S) (mg/kg)	<1000	<1000	1400	<1000	1100
	Thallium (Tl) (mg/kg)	0.174	0.167	0.175	0.201	0.202
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	487	491	471	532	473
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	7.36	6.75	7.20	10.5	10.3
	Vanadium (V) (mg/kg)	32.8	31.5	30.6	37.8	37.3
	Zinc (Zn) (mg/kg)	71.6	67.3	75.3	83.3	82.8

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984230-61	L1984230-62	L1984230-63	L1984230-64	L1984230-65
	Sample ID	L1984230-61	L1984230-62	L1984230-63	L1984230-64	L1984230-65
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date					
	Sampled Time					
	Client ID	CREMP DUP-SC-1	CREMP DUP-SC-2	CREMP DUP-SC-3	CREMP DUP-SC-4	CREMP DUP-SC-5
SOIL						
Physical Tests	Moisture (%)	86.0	88.3	82.9	89.7	84.8
	pH (1:2 soil:water) (pH)	6.27	6.21	5.84	6.51	5.74
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.35	4.69	3.40	8.34	4.52
Metals	Aluminum (Al) (mg/kg)	27000	25100	15700	20800	17100
	Antimony (Sb) (mg/kg)	0.32	0.39	0.22	0.47	0.27
	Arsenic (As) (mg/kg)	34.9	27.1	15.6	47.0	10.3
	Barium (Ba) (mg/kg)	131	145	62.6	120	91.8
	Beryllium (Be) (mg/kg)	2.00	1.71	1.03	1.64	0.86
	Bismuth (Bi) (mg/kg)	2.47	2.29	1.14	2.28	0.77
	Boron (B) (mg/kg)	9.2	8.2	5.5	8.9	6.8
	Cadmium (Cd) (mg/kg)	0.210	0.814	0.105	0.424	0.261
	Calcium (Ca) (mg/kg)	2930	3010	1690	4160	2360
	Chromium (Cr) (mg/kg)	109	201	109	60.1	115
	Cobalt (Co) (mg/kg)	18.0	21.9	9.52	10.2	9.96
	Copper (Cu) (mg/kg)	74.0	55.1	48.4	149	41.9
	Iron (Fe) (mg/kg)	60100	49200	31000	43100	24700
	Lead (Pb) (mg/kg)	23.6	26.4	15.8	36.9	14.6
	Lithium (Li) (mg/kg)	41.4	41.0	23.8	32.7	23.9
	Magnesium (Mg) (mg/kg)	10500	12500	7550	7810	9220
	Manganese (Mn) (mg/kg)	3530	4440	305	598	270
	Mercury (Hg) (mg/kg)	0.0337	0.0289	0.0172	0.0575	0.0202
	Molybdenum (Mo) (mg/kg)	6.45	4.72	3.39	11.2	1.78
	Nickel (Ni) (mg/kg)	75.4	193	53.3	56.8	75.5
	Phosphorus (P) (mg/kg)	646	547	606	724	503
	Potassium (K) (mg/kg)	4820	4240	2360	3540	2470
	Selenium (Se) (mg/kg)	0.61	0.90	0.58	0.84	0.38
	Silver (Ag) (mg/kg)	0.15	0.22	0.12	0.57	0.24
	Sodium (Na) (mg/kg)	197	199	111	174	100
	Strontium (Sr) (mg/kg)	23.8	22.8	14.6	28.1	20.9
	Sulfur (S) (mg/kg)	1900	2600	1100	2400	1200
	Thallium (Tl) (mg/kg)	0.393	0.573	0.195	0.339	0.174
	Tin (Sn) (mg/kg)	3.1	2.6	<2.0	2.4	<2.0
	Titanium (Ti) (mg/kg)	820	824	443	542	473
	Tungsten (W) (mg/kg)	0.85	1.12	0.96	1.39	<0.50
	Uranium (U) (mg/kg)	19.8	15.4	13.2	17.0	7.19
	Vanadium (V) (mg/kg)	43.1	45.2	29.6	32.0	30.8
	Zinc (Zn) (mg/kg)	117	125	69.3	124	72.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-66				
	Description	Sediment				
	Sampled Date					
	Sampled Time					
	Client ID	CREMP DUP-SC-6				
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	84.4				
	pH (1:2 soil:water) (pH)	5.65				
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.68				
Metals	Aluminum (Al) (mg/kg)	21100				
	Antimony (Sb) (mg/kg)	0.22				
	Arsenic (As) (mg/kg)	18.7				
	Barium (Ba) (mg/kg)	117				
	Beryllium (Be) (mg/kg)	1.34				
	Bismuth (Bi) (mg/kg)	1.22				
	Boron (B) (mg/kg)	7.7				
	Cadmium (Cd) (mg/kg)	0.256				
	Calcium (Ca) (mg/kg)	1960				
	Chromium (Cr) (mg/kg)	104				
	Cobalt (Co) (mg/kg)	14.3				
	Copper (Cu) (mg/kg)	47.8				
	Iron (Fe) (mg/kg)	51800				
	Lead (Pb) (mg/kg)	15.6				
	Lithium (Li) (mg/kg)	23.7				
	Magnesium (Mg) (mg/kg)	9020				
	Manganese (Mn) (mg/kg)	1430				
	Mercury (Hg) (mg/kg)	0.0314				
	Molybdenum (Mo) (mg/kg)	3.09				
	Nickel (Ni) (mg/kg)	84.9				
	Phosphorus (P) (mg/kg)	1200				
	Potassium (K) (mg/kg)	3410				
	Selenium (Se) (mg/kg)	0.62				
	Silver (Ag) (mg/kg)	0.17				
	Sodium (Na) (mg/kg)	157				
	Strontium (Sr) (mg/kg)	23.7				
	Sulfur (S) (mg/kg)	1500				
	Thallium (Tl) (mg/kg)	0.219				
	Tin (Sn) (mg/kg)	<2.0				
	Titanium (Ti) (mg/kg)	565				
	Tungsten (W) (mg/kg)	0.60				
	Uranium (U) (mg/kg)	15.7				
	Vanadium (V) (mg/kg)	34.7				
	Zinc (Zn) (mg/kg)	89.1				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-1	L1984230-2	L1984230-3	L1984230-4	L1984230-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
	Sampled Time	14:28	15:00	15:29	15:43	16:20
	Client ID	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	3.2	2.7	2.7	3.0	3.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-6	L1984230-7	L1984230-8	L1984230-9	L1984230-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
	Sampled Time	16:59	17:27	17:34	17:49	17:58
	Client ID	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	2.7	2.1	2.4	3.0	3.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-11	L1984230-12	L1984230-13	L1984230-14	L1984230-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	09:39	10:04	10:20	10:36	10:52
	Client ID	TPN-SC-1	TPN-SC-2	TPN-SC-3	TPN-SC-4	TPN-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.7	1.2	1.4	2.1	1.3

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-16	L1984230-17	L1984230-18	L1984230-19	L1984230-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	11:49	14:16	14:23	14:41	14:57
	Client ID	TPN-SC-6	TPN-SC-7	TPN-SC-8	TPN-SC-9	TPN-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.1	1.4	1.1	1.7	1.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-21	L1984230-22	L1984230-23	L1984230-24	L1984230-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17
	Sampled Time	14:18	14:28	15:03	15:35	16:08
	Client ID	SP-SC-1	SP-SC-2	SP-SC-3	SP-SC-4	SP-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.4	1.8	1.5	1.4	1.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1984230-26 Sediment 22-AUG-17 16:17 SP-SC-6	L1984230-27 Sediment 22-AUG-17 17:01 SP-SC-7	L1984230-28 Sediment 22-AUG-17 17:32 SP-SC-8	L1984230-29 Sediment 22-AUG-17 17:40 SP-SC-9	L1984230-30 Sediment 22-AUG-17 17:50 SP-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.2	1.4	1.8	2.1	2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-31	L1984230-32	L1984230-33	L1984230-34	L1984230-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17
	Sampled Time	09:40	10:17	10:29	11:00	11:24
	Client ID	WAL-SC-1	WAL-SC-2	WAL-SC-3	WAL-SC-4	WAL-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	2.9	1.7	3.3	3.1	2.5

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-36	L1984230-37	L1984230-38	L1984230-39	L1984230-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17
	Sampled Time	11:47	12:00	12:38	12:54	13:31
	Client ID	WAL-SC-6	WAL-SC-7	WAL-SC-8	WAL-SC-9	WAL-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	2.9	3.0	2.8	4.2	3.5

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984230-41	L1984230-42	L1984230-43	L1984230-44	L1984230-45
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17
	Sampled Time	09:25	09:45	10:27	11:02	11:45
	Client ID	INUG-SC-1	INUG-SC-2	INUG-SC-3	INUG-SC-4	INUG-SC-5
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.5	2.5	1.4	1.0	1.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-46	L1984230-47	L1984230-48	L1984230-49	L1984230-50
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17
	Sampled Time	12:20	13:02	13:10	13:16	13:20
	Client ID	INUG-SC-6	INUG-SC-7	INUG-SC-8	INUG-SC-9	INUG-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.5	1.4	2.0	1.9	1.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-51	L1984230-52	L1984230-53	L1984230-54	L1984230-55
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
	Sampled Time	09:45	11:00	11:30	12:30	12:57
	Client ID	PDL-SC-1	PDL-SC-2	PDL-SC-3	PDL-SC-4	PDL-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	1.1	2.0	2.2	1.3	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-56	L1984230-57	L1984230-58	L1984230-59	L1984230-60
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
	Sampled Time	14:23	14:31	14:39	14:04	14:51
	Client ID	PDL-SC-6	PDL-SC-7	PDL-SC-8	PDL-SC-9	PDL-SC-10
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	<1.0	<1.0	1.7	1.7	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1984230-61 Sediment CREMP DUP-SC-1	L1984230-62 Sediment CREMP DUP-SC-2	L1984230-63 Sediment CREMP DUP-SC-3	L1984230-64 Sediment CREMP DUP-SC-4	L1984230-65 Sediment CREMP DUP-SC-5
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	2.0	2.4	1.5	3.4	2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984230-66				
	Description	Sediment				
	Sampled Date					
	Sampled Time					
	Client ID	CREMP DUP-SC-6				
Grouping	**Analyte**					
SOIL						
Metals	Zirconium (Zr) (mg/kg)	2.0				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984230-67	L1984230-68	L1984230-69		
	Sample ID	L1984230-67	L1984230-68	L1984230-69		
	Description	Other	Other	Other		
	Sampled Date	25-AUG-17	24-AUG-17	26-AUG-17		
	Sampled Time	09:15	09:20	09:25		
	Client ID	CREMP SWIPE-SC-1	CREMP SWIPE-SC-2	CREMP SWIPE-SC-3		
SWAB						
Metals	Aluminum (Al)-Total (mg)	0.929	0.845	0.648		
	Antimony (Sb)-Total (mg)	<0.020	<0.020	<0.020		
	Arsenic (As)-Total (mg)	<0.020	<0.020	<0.020		
	Barium (Ba)-Total (mg)	1.77	1.58	1.28		
	Beryllium (Be)-Total (mg)	<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Total (mg)	<0.020	<0.020	<0.020		
	Cadmium (Cd)-Total (mg)	<0.0010	<0.0010	<0.0010		
	Calcium (Ca)-Total (mg)	0.50	0.44	0.37		
	Chromium (Cr)-Total (mg)	<0.0020	<0.0020	<0.0020		
	Cobalt (Co)-Total (mg)	<0.0010	<0.0010	<0.0010		
	Copper (Cu)-Total (mg)	<0.0010	<0.0010	<0.0010		
	Iron (Fe)-Total (mg)	0.028	0.023	0.024		
	Lead (Pb)-Total (mg)	<0.0040	<0.0040	<0.0040		
	Lithium (Li)-Total (mg)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg)	<0.10	<0.10	<0.10		
	Manganese (Mn)-Total (mg)	0.00091	0.00072	0.00066		
	Molybdenum (Mo)-Total (mg)	<0.0030	<0.0030	<0.0030		
	Nickel (Ni)-Total (mg)	<0.0050	<0.0050	<0.0050		
	Phosphorus (P)-Total (mg)	<0.030	<0.030	<0.030		
	Potassium (K)-Total (mg)	1.00	0.88	0.77		
	Selenium (Se)-Total (mg)	<0.020	<0.020	<0.020		
	Silver (Ag)-Total (mg)	<0.0010	<0.0010	<0.0010		
	Sodium (Na)-Total (mg)	2.79	2.34	2.14		
	Strontium (Sr)-Total (mg)	0.0119	0.0106	0.00848		
	Thallium (Tl)-Total (mg)	<0.020	<0.020	<0.020		
	Tin (Sn)-Total (mg)	<0.0030	<0.0030	<0.0030		
	Titanium (Ti)-Total (mg)	<0.0010	<0.0010	<0.0010		
	Vanadium (V)-Total (mg)	<0.0030	<0.0030	<0.0030		
	Zinc (Zn)-Total (mg)	1.31	1.18	0.935		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1984230-32	WAL-SC-2	L1S	Less than 1 gram of sieved soil or sediment was available for metals digestion. No significant impact on results is expected.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)	DUP-H	L1984230-1, -2, -3, -4, -5, -6, -61, -62, -63, -64, -65, -66, -7
Duplicate	Arsenic (As)	DUP-H	L1984230-1, -2, -3, -4, -5, -6, -61, -62, -63, -64, -65, -66, -7
Duplicate	Sulfur (S)	DUP-H,J	L1984230-1, -2, -3, -4, -5, -6, -61, -62, -63, -64, -65, -66, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
DUP-H,J	Duplicate results outside ALS DQO, due to sample heterogeneity. Duplicate results and limits are expressed in terms of absolute difference.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAFS.

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.

MET-MG-ICP-VA	Swab	Metals in Swab by ICPOES	NIOSH 7303/EPA 6010B

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods (NMAM). The procedure involves a hot block digestion of the swab material, using a combination of nitric acid and hydrochloric acid. Instrumental analysis of the swab extract is by inductively coupled plasma - optical emission spectrophotometry (EPA 6010B).

MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

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

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

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

L1984230-COFC

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

COC #

Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☐ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	gmann@azimuthgroup.ca
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP 2017 Coring
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q38011
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	TPE-SC-1	23Aug17	14:28	Sediment	X	X	1
	TPE-SC-2		15:00	Sediment	X	X	1
	TPE-SC-3		15:29	Sediment	X	X	1
	TPE-SC-4		15:43	Sediment	X	X	1
	TPE-SC-5		16:20	Sediment	X	X	1
	TPE-SC-6		16:59	Sediment	X	X	1
	TPE-SC-7		17:27	Sediment	X	X	1
	TPE-SC-8		17:34	Sediment	X	X	1
	TPE-SC-9		17:49	Sediment	X	X	1
	TPE-SC-10		17:58	Sediment	X	X	1
	TPN-SC-1	27Aug17	9:39	Sediment	X	X	1
	TPN-SC-2	27Aug17	10:04	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 28Aug17	Time (hh-mm) 6:20	Received by:	Date:	Time:	Temperature: °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1984230-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution

☐ Standard ☐ Other

☑ PDF ☑ Excel ☐ Digital ☐ Fax

Email 1: efranz@azimuthgroup.ca
Email 2: gmann@azimuthgroup.ca
Email 3: robin.allard@agnicoeagle.com

Client / Project Information

Job #: Meadowbank CREMP 2017 Coring
PO / AFE:
LSD:

Quote #: Q38011

ALS Contact: Brent Mack
Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

◉ Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	TPN-SC-3	27Aug17	10:20	Sediment	X	X	1
	TPN-SC-4		10:36	Sediment	X	X	1
	TPN-SC-5		10:52	Sediment	X	X	1
	TPN-SC-6		11:49	Sediment	X	X	1
	TPN-SC-7		14:16	Sediment	X	X	1
	TPN-SC-8		14:23	Sediment	X	X	1
	TPN-SC-9		14:41	Sediment	X	X	1
	TPN-SC-10		14:57	Sediment	X	X	1
	SP-SC-1	22Aug17	14:18	Sediment	X	X	1
	SP-SC-2		14:28	Sediment	X	X	1
	SP-SC-3		15:03	Sediment	X	X	1
	SP-SC-4		15:35	Sediment	X	X	1

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz			Shayan	Aug. 31	840	17, 18 °C				

ALS Environmental

L1984230-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
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Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	SP-SC-5	22 Aug 17	16:08	Sediment	X	X	1
	SP-SC-6	↓	16:17	Sediment	X	X	1
	SP-SC-7	↓	17:01	Sediment	X	X	1
	SP-SC-8	↓	17:32	Sediment	X	X	1
	SP-SC-9	↓	17:40	Sediment	X	X	1
	SP-SC-10	↓	17:50	Sediment	X	X	1
	WAL-SC-1	26 Aug 17	9:40	Sediment	X	X	1
	WAL-SC-2	↓	10:17	Sediment	X	X	1
	WAL-SC-3	↓	10:29	Sediment	X	X	1
	WAL-SC-4	↓	11:00	Sediment	X	X	1
	WAL-SC-5	↓	11:24	Sediment	X	X	1
	WAL-SC-6	↓	11:47	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Shayan	Date: Aug. 31	Time: 840	Temperature: 17, 18°C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

ALS Envi

L1984230-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway, Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
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- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	WAL-SC-7	26 Aug 17	12:00	Sediment	X	X	1
	WAL-SC-8		12:38	Sediment	X	X	1
	WAL-SC-9		12:54	Sediment	X	X	1
	WAL-SC-10		13:31	Sediment	X	X	1
	INUG-SC-1	25 Aug 17	9:25	Sediment	X	X	1
	INUG-SC-2		9:45	Sediment	X	X	1
	INUG-SC-3		10:27	Sediment	X	X	1
	INUG-SC-4		11:02	Sediment	X	X	1
	INUG-SC-5		11:45	Sediment	X	X	1
	INUG-SC-6		12:20	Sediment	X	X	1
	INUG-SC-7		13:02	Sediment	X	X	1
	INUG-SC-8		13:10	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Shayan	Date: Aug. 31	Time: 840	Temperature: 17,18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

ALS

L1984230-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
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Sampler:	Eric Franz

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- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	INUG-SC-9	25 Aug 17	13:16	Sediment	X	X	1
	INUG-SC-10	25 Aug 17	13:20	Sediment	X	X	1
	PDL-SC-1	24 Aug 17	9:45	Sediment	X	X	1
	PDL-SC-2		11:00	Sediment	X	X	1
	PDL-SC-3		11:30	Sediment	X	X	1
	PDL-SC-4		12:30	Sediment	X	X	1
	PDL-SC-5		12:57	Sediment	X	X	1
	PDL-SC-6		14:23	Sediment	X	X	1
	PDL-SC-7		14:31	Sediment	X	X	1
	PDL-SC-8		14:39	Sediment	X	X	1
	PDL-SC-9		14:44	Sediment	X	X	1
	PDL-SC-10		14:51	Sediment	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: [signature]	Date: Aug. 31	Time: 840	Temperature: 17,18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1984230-COFC

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COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP 2017 Coring
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	CREMP DUP-SC-1	–	–	Sediment	X	X	1
	CREMP DUP-SC-2	–	–	Sediment	X	X	1
	CREMP DUP-SC-3	–	–	Sediment	X	X	1
	CREMP DUP-SC-4	–	–	Sediment	X	X	1
	CREMP DUP-SC-5	–	–	Sediment	X	X	1
	CREMP DUP-SC-6	–	–	Sediment	X	X	1
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Shayan	Date: Aug 21	Time: 840	Temperature: 17,18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1984230-COFC

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

COC #

Report To

Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To Same as Report ?	☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution

☐ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax

Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com

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LSD:	
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Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC	Number of Containers
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	[redacted]			~~Sediment~~	~~X~~	~~X~~	X
	CREMP SWIPE-SC-1	25Aug17	9:15	Other	X		1
	CREMP SWIPE-SC-2	24Aug17	9:20	Other	X		1
	CREMP SWIPE-SC-3	26Aug17	9:25	Other	X		1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
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Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz			Shuyan	Aug. 31	840	12, 18 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 17-AUG-17
Report Date: 19-SEP-17 16:07 (MT)
Version: FINAL REV. 2

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1976494

Project P.O. #: NOT SUBMITTED
Job Reference: CREMP MEADOWBANK SEDIMENT
C of C Numbers:
Legal Site Desc:

Comments:

19-SEP-2017 This report replaces the previous version and includes new data for Metals for sample ALS ID -8.

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-1	L1976494-2	L1976494-3	L1976494-4	L1976494-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
	Sampled Time	10:07	10:59	11:50	13:02	14:09
	Client ID	BAP-1	BAP-2	BAP-3	BAP-4	BAP-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	35.7	38.4	31.9	44.4	28.7
	pH (1:2 soil:water) (pH)	6.98	6.45	6.46	6.24	7.64
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	71.9	66.9	81.1	64.3	90.7
	% Silt (0.063mm - 4um) (%)	24.9	29.0	17.2	31.9	8.4
	% Clay (<4um) (%)	3.2	4.1	1.7	3.7	<1.0
	Texture	Loamy sand	Loamy sand	Sand	Sandy loam	Sand
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.338	0.465	0.277	0.687	0.063
Metals	Aluminum (Al) (mg/kg)	4910	5650	4010	5280	3040
	Antimony (Sb) (mg/kg)	0.14	0.15	0.15	0.17	0.13
	Arsenic (As) (mg/kg)	5.05	5.82	3.17	4.09	2.01
	Barium (Ba) (mg/kg)	429	396	327	283	230
	Beryllium (Be) (mg/kg)	0.32	0.37	0.30	0.35	0.24
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	0.33	<0.20
	Boron (B) (mg/kg)	6.4	7.0	5.4	7.1	<5.0
	Cadmium (Cd) (mg/kg)	0.028	0.031	0.024	0.046	<0.020
	Calcium (Ca) (mg/kg)	2220	2380	1900	2070	1510
	Chromium (Cr) (mg/kg)	17.4	18.3	14.6	17.1	12.3
	Cobalt (Co) (mg/kg)	4.14	4.26	3.38	4.39	2.93
	Copper (Cu) (mg/kg)	4.76	5.80	4.34	7.20	2.80
	Iron (Fe) (mg/kg)	13500	14400	12100	14000	10400
	Lead (Pb) (mg/kg)	4.54	5.99	3.91	5.48	3.17
	Lithium (Li) (mg/kg)	8.1	9.2	7.0	8.9	5.6
	Magnesium (Mg) (mg/kg)	3140	3530	2710	3460	2260
	Manganese (Mn) (mg/kg)	223	169	102	130	220
	Mercury (Hg) (mg/kg)	<0.0050	0.0057	<0.0050	0.0061	<0.0050
	Molybdenum (Mo) (mg/kg)	0.51	0.47	0.33	0.53	0.27
	Nickel (Ni) (mg/kg)	10.3	10.4	8.47	11.0	7.07
	Phosphorus (P) (mg/kg)	692	757	653	661	556
	Potassium (K) (mg/kg)	1270	1430	1020	1400	730
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)	88	146	67	108	<50
	Strontium (Sr) (mg/kg)	45.6	47.3	39.2	43.4	33.5
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.057	0.066	0.054	0.068	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976494-6	L1976494-7	L1976494-8	L1976494-9	L1976494-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	14:15	09:58	11:13	12:09	13:48
	Client ID	BAP-COMP	BES-1	BES-2	BES-3	BES-4
SOIL						
Physical Tests	Moisture (%)	34.0	34.9	40.1	40.6	36.0
	pH (1:2 soil:water) (pH)		7.34	7.21	6.85	7.54
Particle Size	% Gravel (>2mm) (%)		2.8	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)		72.2	66.7	68.8	74.5
	% Silt (0.063mm - 4um) (%)		22.0	29.8	27.1	21.5
	% Clay (<4um) (%)		3.0	3.5	4.1	3.4
	Texture		Loamy sand	Loamy sand	Loamy sand	Loamy sand
Organic / Inorganic Carbon	Total Organic Carbon (%)		0.344	0.351	0.468	0.352
Metals	Aluminum (Al) (mg/kg)		5460	6380	6050	5150
	Antimony (Sb) (mg/kg)		0.13	0.15	0.12	0.11
	Arsenic (As) (mg/kg)		3.10	4.08	4.65	3.11
	Barium (Ba) (mg/kg)		186	199	161	148
	Beryllium (Be) (mg/kg)		0.31	0.35	0.34	0.32
	Bismuth (Bi) (mg/kg)		<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)		5.6	6.2	5.7	5.0
	Cadmium (Cd) (mg/kg)		0.034	0.044	0.036	0.030
	Calcium (Ca) (mg/kg)		2270	2270	2150	2030
	Chromium (Cr) (mg/kg)		18.5	20.8	20.4	17.5
	Cobalt (Co) (mg/kg)		4.56	5.19	4.89	4.23
	Copper (Cu) (mg/kg)		4.62	6.48	5.05	4.19
	Iron (Fe) (mg/kg)		13300	13800	13800	12600
	Lead (Pb) (mg/kg)		4.60	5.33	5.12	4.38
	Lithium (Li) (mg/kg)		8.9	9.4	9.8	8.8
	Magnesium (Mg) (mg/kg)		3750	4120	3880	3390
	Manganese (Mn) (mg/kg)		492	877	650	520
	Mercury (Hg) (mg/kg)		0.0059	0.0055	0.0061	<0.0050
	Molybdenum (Mo) (mg/kg)		0.41	0.58	0.54	0.51
	Nickel (Ni) (mg/kg)		11.3	12.4	12.3	10.6
	Phosphorus (P) (mg/kg)		708	644	643	627
	Potassium (K) (mg/kg)		1160	1380	1350	1160
	Selenium (Se) (mg/kg)		<0.20	<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)		<0.10	<0.10	<0.10	<0.10
	Sodium (Na) (mg/kg)		97	104	101	83
	Strontium (Sr) (mg/kg)		36.7	40.5	38.2	35.4
	Sulfur (S) (mg/kg)		<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)		0.050	0.072	0.062	0.058

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976494-11	L1976494-12	L1976494-13	L1976494-14	L1976494-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-17	10-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	14:42	14:50	08:44	10:02	11:28
	Client ID	BES-5	BES-COMP	BBJ-1	BBJ-2	BBJ-3
SOIL						
Physical Tests	Moisture (%)	28.0	36.8	55.7	50.5	48.7
	pH (1:2 soil:water) (pH)	7.44		7.14	6.81	6.61
Particle Size	% Gravel (>2mm) (%)	<1.0		<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	73.9		21.8	30.4	22.2
	% Silt (0.063mm - 4um) (%)	23.1		66.2	58.7	64.0
	% Clay (<4um) (%)	3.1		12.0	11.0	13.8
	Texture	Loamy sand		Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.268		0.793	0.699	0.567
Metals	Aluminum (Al) (mg/kg)	5190		9260	8700	9660
	Antimony (Sb) (mg/kg)	0.12		0.15	0.14	0.15
	Arsenic (As) (mg/kg)	3.03		24.4	16.3	10.9
	Barium (Ba) (mg/kg)	154		166	117	95.1
	Beryllium (Be) (mg/kg)	0.32		0.48	0.41	0.47
	Bismuth (Bi) (mg/kg)	<0.20		0.23	0.20	0.31
	Boron (B) (mg/kg)	5.5		8.2	7.8	8.7
	Cadmium (Cd) (mg/kg)	0.032		0.104	0.074	0.065
	Calcium (Ca) (mg/kg)	2140		2810	2670	2780
	Chromium (Cr) (mg/kg)	18.7		23.0	21.5	23.8
	Cobalt (Co) (mg/kg)	4.43		8.89	8.15	7.55
	Copper (Cu) (mg/kg)	4.98		9.96	9.14	11.0
	Iron (Fe) (mg/kg)	12600		25500	22800	20200
	Lead (Pb) (mg/kg)	4.45		10.1	9.06	10.0
	Lithium (Li) (mg/kg)	8.8		12.4	11.9	13.1
	Magnesium (Mg) (mg/kg)	3480		5100	4760	5230
	Manganese (Mn) (mg/kg)	344		3690	1940	981
	Mercury (Hg) (mg/kg)	<0.0050		0.0129	0.0088	0.0074
	Molybdenum (Mo) (mg/kg)	0.37		2.65	1.75	1.55
	Nickel (Ni) (mg/kg)	11.2		15.3	13.5	14.6
	Phosphorus (P) (mg/kg)	682		1120	1060	875
	Potassium (K) (mg/kg)	1210		1940	1810	2080
	Selenium (Se) (mg/kg)	<0.20		<0.20	<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10		<0.10	<0.10	0.11
	Sodium (Na) (mg/kg)	80		173	151	173
	Strontium (Sr) (mg/kg)	37.2		55.5	53.1	54.8
	Sulfur (S) (mg/kg)	<1000		<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.055		0.085	0.077	0.088

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-16	L1976494-17	L1976494-18	L1976494-19	L1976494-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	12:55	13:52	14:00	15:32	16:09
	Client ID	BBJ-4	BBJ-5	BBJ-COMP	BBD-1	BBD-2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	38.4	44.3	47.0	30.9	29.5
	pH (1:2 soil:water) (pH)	6.78	6.62		6.66	6.80
Particle Size	% Gravel (>2mm) (%)	2.6	<1.0		<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	32.6	40.8		62.1	69.3
	% Silt (0.063mm - 4um) (%)	54.5	50.8		33.6	27.3
	% Clay (<4um) (%)	10.4	8.3		4.3	3.4
	Texture	Silt loam	Silt loam		Sandy loam	Sandy loam / Loamy sand
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.411	0.526		0.299	0.306
Metals	Aluminum (Al) (mg/kg)	9200	7660		5520	4580
	Antimony (Sb) (mg/kg)	0.13	0.11		<0.10	<0.10
	Arsenic (As) (mg/kg)	14.3	8.52		5.16	6.50
	Barium (Ba) (mg/kg)	93.3	95.3		58.3	62.0
	Beryllium (Be) (mg/kg)	0.44	0.35		0.26	0.21
	Bismuth (Bi) (mg/kg)	0.20	<0.20		<0.20	<0.20
	Boron (B) (mg/kg)	7.8	5.9		<5.0	<5.0
	Cadmium (Cd) (mg/kg)	0.064	0.058		0.039	0.036
	Calcium (Ca) (mg/kg)	2710	2440		1800	1590
	Chromium (Cr) (mg/kg)	24.1	19.3		13.2	11.3
	Cobalt (Co) (mg/kg)	5.98	6.49		4.57	4.05
	Copper (Cu) (mg/kg)	9.53	8.11		6.65	5.35
	Iron (Fe) (mg/kg)	19200	17000		11500	11500
	Lead (Pb) (mg/kg)	8.70	8.13		5.44	4.60
	Lithium (Li) (mg/kg)	12.5	10.3		8.7	7.2
	Magnesium (Mg) (mg/kg)	5030	4390		3520	3030
	Manganese (Mn) (mg/kg)	911	2990		234	268
	Mercury (Hg) (mg/kg)	0.0053	0.0093		<0.0050	<0.0050
	Molybdenum (Mo) (mg/kg)	1.33	1.51		0.41	0.43
	Nickel (Ni) (mg/kg)	13.4	12.4		8.94	7.66
	Phosphorus (P) (mg/kg)	1050	803		554	560
	Potassium (K) (mg/kg)	1940	1460		950	770
	Selenium (Se) (mg/kg)	<0.20	<0.20		<0.20	<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10		<0.10	<0.10
	Sodium (Na) (mg/kg)	144	126		72	57
	Strontium (Sr) (mg/kg)	55.9	46.5		31.1	24.8
	Sulfur (S) (mg/kg)	<1000	<1000		<1000	<1000
	Thallium (Tl) (mg/kg)	0.078	0.062		<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-21	L1976494-22	L1976494-23	L1976494-24	L1976494-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17	
	Sampled Time	09:08	10:25	11:30	11:35	
	Client ID	BBD-3	BBD-4	BBD-5	BBD-COMP	CREMP DUP-1
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	38.1	30.0	28.7	28.4	51.5
	pH (1:2 soil:water) (pH)	6.87	6.72	6.67		6.65
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0		<1.0
	% Sand (2.0mm - 0.063mm) (%)	31.5	74.0	68.5		30.9
	% Silt (0.063mm - 4um) (%)	58.6	23.6	27.5		58.3
	% Clay (<4um) (%)	9.5	2.4	4.0		10.7
	Texture	Silt loam	Loamy sand	Sandy loam		Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.383	0.216	0.284		0.766
Metals	Aluminum (Al) (mg/kg)	6940	4880	4900		8220
	Antimony (Sb) (mg/kg)	0.16	<0.10	<0.10		0.14
	Arsenic (As) (mg/kg)	5.10	5.71	4.47		15.5
	Barium (Ba) (mg/kg)	70.4	54.7	50.8		109
	Beryllium (Be) (mg/kg)	0.31	0.21	0.23		0.40
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20		0.31
	Boron (B) (mg/kg)	5.2	<5.0	<5.0		7.2
	Cadmium (Cd) (mg/kg)	0.044	0.026	0.030		0.058
	Calcium (Ca) (mg/kg)	2420	1650	1600		2460
	Chromium (Cr) (mg/kg)	19.2	11.4	11.4		20.3
	Cobalt (Co) (mg/kg)	5.70	3.79	3.96		8.03
	Copper (Cu) (mg/kg)	10.2	4.77	5.39		8.82
	Iron (Fe) (mg/kg)	15200	10900	10500		21800
	Lead (Pb) (mg/kg)	7.43	4.52	4.59		8.50
	Lithium (Li) (mg/kg)	9.8	7.5	7.6		11.1
	Magnesium (Mg) (mg/kg)	4040	3150	3140		4540
	Manganese (Mn) (mg/kg)	437	196	231		1820
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	<0.0050		0.0084
	Molybdenum (Mo) (mg/kg)	0.54	0.39	0.89		1.88
	Nickel (Ni) (mg/kg)	11.8	7.73	7.79		13.1
	Phosphorus (P) (mg/kg)	928	502	551		994
	Potassium (K) (mg/kg)	1350	840	920		1670
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20		<0.20
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10		<0.10
	Sodium (Na) (mg/kg)	99	58	61		147
	Strontium (Sr) (mg/kg)	39.0	30.0	31.0		48.5
	Sulfur (S) (mg/kg)	<1000	<1000	<1000		<1000
	Thallium (Tl) (mg/kg)	0.063	<0.050	<0.050		0.075

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-26	L1976494-27			
	Description	Sediment	Sediment			
	Sampled Date					
	Sampled Time					
	Client ID	CREMP DUP-2	CREMP COMP DUP-1			
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	39.8	28.4			
	pH (1:2 soil:water) (pH)	7.02				
Particle Size	% Gravel (>2mm) (%)	<1.0				
	% Sand (2.0mm - 0.063mm) (%)	66.4				
	% Silt (0.063mm - 4um) (%)	29.9				
	% Clay (<4um) (%)	3.7				
	Texture	Loamy sand				
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.451				
Metals	Aluminum (Al) (mg/kg)	5890				
	Antimony (Sb) (mg/kg)	0.14				
	Arsenic (As) (mg/kg)	4.05				
	Barium (Ba) (mg/kg)	191				
	Beryllium (Be) (mg/kg)	0.33				
	Bismuth (Bi) (mg/kg)	<0.20				
	Boron (B) (mg/kg)	5.7				
	Cadmium (Cd) (mg/kg)	0.040				
	Calcium (Ca) (mg/kg)	2120				
	Chromium (Cr) (mg/kg)	19.8				
	Cobalt (Co) (mg/kg)	5.10				
	Copper (Cu) (mg/kg)	4.90				
	Iron (Fe) (mg/kg)	13900				
	Lead (Pb) (mg/kg)	4.77				
	Lithium (Li) (mg/kg)	9.2				
	Magnesium (Mg) (mg/kg)	3810				
	Manganese (Mn) (mg/kg)	807				
	Mercury (Hg) (mg/kg)	0.0059				
	Molybdenum (Mo) (mg/kg)	0.54				
	Nickel (Ni) (mg/kg)	12.2				
	Phosphorus (P) (mg/kg)	651				
	Potassium (K) (mg/kg)	1320				
	Selenium (Se) (mg/kg)	<0.20				
	Silver (Ag) (mg/kg)	<0.10				
	Sodium (Na) (mg/kg)	98				
	Strontium (Sr) (mg/kg)	37.6				
	Sulfur (S) (mg/kg)	<1000				
	Thallium (Tl) (mg/kg)	0.062				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-1	L1976494-2	L1976494-3	L1976494-4	L1976494-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
	Sampled Time	10:07	10:59	11:50	13:02	14:09
	Client ID	BAP-1	BAP-2	BAP-3	BAP-4	BAP-5
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	351	375	262	302	178
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.28	1.49	1.14	1.65	1.03
	Vanadium (V) (mg/kg)	20.0	22.4	18.1	21.6	15.1
	Zinc (Zn) (mg/kg)	22.8	26.6	18.9	26.0	14.6
	Zirconium (Zr) (mg/kg)	4.7	5.4	5.0	5.4	3.9
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1976494-6	L1976494-7	L1976494-8	L1976494-9	L1976494-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	14:15	09:58	11:13	12:09	13:48
	Client ID	BAP-COMP	BES-1	BES-2	BES-3	BES-4
SOIL						
Metals	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)		324	383	345	303
	Tungsten (W) (mg/kg)		<0.50	0.55	<0.50	<0.50
	Uranium (U) (mg/kg)		1.13	1.31	1.22	1.11
	Vanadium (V) (mg/kg)		20.6	20.5	20.3	18.9
	Zinc (Zn) (mg/kg)		24.8	26.7	26.3	22.7
	Zirconium (Zr) (mg/kg)		2.8	2.5	2.4	2.6
Aggregate Organics	Mineral Oil and Grease (mg/kg)	<500				
Hydrocarbons	EPH10-19 (mg/kg)	<200				
	EPH19-32 (mg/kg)	<200				
	LEPH (mg/kg)	<200				
	HEPH (mg/kg)	<200				
	Surrogate: 2-Bromobenzotrifluoride (%)	80.3				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.0050				
	Acenaphthylene (mg/kg)	<0.0050				
	Anthracene (mg/kg)	<0.0040				
	Benz(a)anthracene (mg/kg)	<0.010				
	Benzo(a)pyrene (mg/kg)	<0.010				
	Benzo(b&j)fluoranthene (mg/kg)	<0.010				
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.015				
	Benzo(g,h,i)perylene (mg/kg)	<0.010				
	Benzo(k)fluoranthene (mg/kg)	<0.010				
	Chrysene (mg/kg)	<0.010				
	Dibenz(a,h)anthracene (mg/kg)	<0.0050				
	Fluoranthene (mg/kg)	<0.010				
	Fluorene (mg/kg)	<0.010				
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010				
	2-Methylnaphthalene (mg/kg)	<0.010				
	Naphthalene (mg/kg)	<0.010				
	Phenanthrene (mg/kg)	<0.010				
	Pyrene (mg/kg)	<0.010				
	Surrogate: Acenaphthene d10 (%)	78.3				
	Surrogate: Chrysene d12 (%)	84.0				
	Surrogate: Naphthalene d8 (%)	76.4				
	Surrogate: Phenanthrene d10 (%)	86.4				
	B(a)P Total Potency Equivalent (mg/kg)	<0.020				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-11	L1976494-12	L1976494-13	L1976494-14	L1976494-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-17	10-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	14:42	14:50	08:44	10:02	11:28
	Client ID	BES-5	BES-COMP	BBJ-1	BBJ-2	BBJ-3
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0		<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)	320		448	431	475
	Tungsten (W) (mg/kg)	<0.50		<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	1.05		2.21	1.97	2.25
	Vanadium (V) (mg/kg)	18.8		27.3	26.0	27.6
	Zinc (Zn) (mg/kg)	23.3		44.7	39.9	42.0
	Zirconium (Zr) (mg/kg)	3.2		3.4	3.4	5.9
Aggregate Organics	Mineral Oil and Grease (mg/kg)		<500			
Hydrocarbons	EPH10-19 (mg/kg)		<200			
	EPH19-32 (mg/kg)		<200			
	LEPH (mg/kg)		<200			
	HEPH (mg/kg)		<200			
	Surrogate: 2-Bromobenzotrifluoride (%)		76.9			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.0050			
	Acenaphthylene (mg/kg)		<0.0050			
	Anthracene (mg/kg)		<0.0040			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		<0.0050			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	2-Methylnaphthalene (mg/kg)		<0.010			
	Naphthalene (mg/kg)		<0.010			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Surrogate: Acenaphthene d10 (%)		72.0			
	Surrogate: Chrysene d12 (%)		70.3			
	Surrogate: Naphthalene d8 (%)		72.2			
	Surrogate: Phenanthrene d10 (%)		71.3			
	B(a)P Total Potency Equivalent (mg/kg)		<0.020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-16	L1976494-17	L1976494-18	L1976494-19	L1976494-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	12:55	13:52	14:00	15:32	16:09
	Client ID	BBJ-4	BBJ-5	BBJ-COMP	BBD-1	BBD-2
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0		<2.0	<2.0
	Titanium (Ti) (mg/kg)	448	377		251	203
	Tungsten (W) (mg/kg)	<0.50	<0.50		<0.50	<0.50
	Uranium (U) (mg/kg)	2.01	1.57		1.06	0.891
	Vanadium (V) (mg/kg)	26.2	22.1		14.8	13.5
	Zinc (Zn) (mg/kg)	38.4	35.1		25.6	26.7
	Zirconium (Zr) (mg/kg)	5.4	2.5		3.1	2.4
Aggregate Organics	Mineral Oil and Grease (mg/kg)			<500		
Hydrocarbons	EPH10-19 (mg/kg)			<200		
	EPH19-32 (mg/kg)			<200		
	LEPH (mg/kg)			<200		
	HEPH (mg/kg)			<200		
	Surrogate: 2-Bromobenzotrifluoride (%)			85.5		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)			<0.0050		
	Acenaphthylene (mg/kg)			<0.0050		
	Anthracene (mg/kg)			<0.0040		
	Benz(a)anthracene (mg/kg)			<0.010		
	Benzo(a)pyrene (mg/kg)			<0.010		
	Benzo(b&j)fluoranthene (mg/kg)			<0.010		
	Benzo(b+j+k)fluoranthene (mg/kg)			<0.015		
	Benzo(g,h,i)perylene (mg/kg)			<0.010		
	Benzo(k)fluoranthene (mg/kg)			<0.010		
	Chrysene (mg/kg)			<0.010		
	Dibenz(a,h)anthracene (mg/kg)			<0.0050		
	Fluoranthene (mg/kg)			<0.010		
	Fluorene (mg/kg)			<0.010		
	Indeno(1,2,3-c,d)pyrene (mg/kg)			<0.010		
	2-Methylnaphthalene (mg/kg)			<0.010		
	Naphthalene (mg/kg)			<0.010		
	Phenanthrene (mg/kg)			<0.010		
	Pyrene (mg/kg)			<0.010		
	Surrogate: Acenaphthene d10 (%)			76.2		
	Surrogate: Chrysene d12 (%)			86.8		
	Surrogate: Naphthalene d8 (%)			81.6		
	Surrogate: Phenanthrene d10 (%)			85.7		
	B(a)P Total Potency Equivalent (mg/kg)			<0.020		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-21	L1976494-22	L1976494-23	L1976494-24	L1976494-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17	
	Sampled Time	09:08	10:25	11:30	11:35	
	Client ID	BBD-3	BBD-4	BBD-5	BBD-COMP	CREMP DUP-1
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		<2.0
	Titanium (Ti) (mg/kg)	344	263	257		405
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50		<0.50
	Uranium (U) (mg/kg)	1.59	1.98	1.09		1.86
	Vanadium (V) (mg/kg)	20.0	13.6	13.7		24.6
	Zinc (Zn) (mg/kg)	31.6	21.5	23.0		38.9
	Zirconium (Zr) (mg/kg)	5.1	3.3	3.5		3.0
Aggregate Organics	Mineral Oil and Grease (mg/kg)				<500	
Hydrocarbons	EPH10-19 (mg/kg)				<200	
	EPH19-32 (mg/kg)				<200	
	LEPH (mg/kg)				<200	
	HEPH (mg/kg)				<200	
	Surrogate: 2-Bromobenzotrifluoride (%)				81.4	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)				<0.0050	
	Acenaphthylene (mg/kg)				<0.0050	
	Anthracene (mg/kg)				<0.0040	
	Benz(a)anthracene (mg/kg)				<0.010	
	Benzo(a)pyrene (mg/kg)				<0.010	
	Benzo(b&j)fluoranthene (mg/kg)				<0.010	
	Benzo(b+j+k)fluoranthene (mg/kg)				<0.015	
	Benzo(g,h,i)perylene (mg/kg)				<0.010	
	Benzo(k)fluoranthene (mg/kg)				<0.010	
	Chrysene (mg/kg)				<0.010	
	Dibenz(a,h)anthracene (mg/kg)				<0.0050	
	Fluoranthene (mg/kg)				<0.010	
	Fluorene (mg/kg)				<0.010	
	Indeno(1,2,3-c,d)pyrene (mg/kg)				<0.010	
	2-Methylnaphthalene (mg/kg)				<0.010	
	Naphthalene (mg/kg)				<0.010	
	Phenanthrene (mg/kg)				<0.010	
	Pyrene (mg/kg)				<0.010	
	Surrogate: Acenaphthene d10 (%)				74.5	
	Surrogate: Chrysene d12 (%)				85.4	
	Surrogate: Naphthalene d8 (%)				74.5	
	Surrogate: Phenanthrene d10 (%)				82.2	
	B(a)P Total Potency Equivalent (mg/kg)				<0.020	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-26	L1976494-27
	Description	Sediment	Sediment
	Sampled Date		
	Sampled Time		
	Client ID	CREMP DUP-2	CREMP COMP DUP-1
Grouping	**Analyte**		
SOIL			
Metals	Tin (Sn) (mg/kg)	<2.0	
	Titanium (Ti) (mg/kg)	334	
	Tungsten (W) (mg/kg)	<0.50	
	Uranium (U) (mg/kg)	1.19	
	Vanadium (V) (mg/kg)	20.2	
	Zinc (Zn) (mg/kg)	25.5	
	Zirconium (Zr) (mg/kg)	2.1	
Aggregate Organics	Mineral Oil and Grease (mg/kg)		<500
Hydrocarbons	EPH10-19 (mg/kg)		<200
	EPH19-32 (mg/kg)		<200
	LEPH (mg/kg)		<200
	HEPH (mg/kg)		<200
	Surrogate: 2-Bromobenzotrifluoride (%)		76.1
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.0050
	Acenaphthylene (mg/kg)		<0.0050
	Anthracene (mg/kg)		<0.0040
	Benz(a)anthracene (mg/kg)		<0.010
	Benzo(a)pyrene (mg/kg)		<0.010
	Benzo(b&j)fluoranthene (mg/kg)		<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015
	Benzo(g,h,i)perylene (mg/kg)		<0.010
	Benzo(k)fluoranthene (mg/kg)		<0.010
	Chrysene (mg/kg)		<0.010
	Dibenz(a,h)anthracene (mg/kg)		<0.0050
	Fluoranthene (mg/kg)		<0.010
	Fluorene (mg/kg)		<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010
	2-Methylnaphthalene (mg/kg)		<0.010
	Naphthalene (mg/kg)		<0.010
	Phenanthrene (mg/kg)		<0.010
	Pyrene (mg/kg)		<0.010
	Surrogate: Acenaphthene d10 (%)		78.1
	Surrogate: Chrysene d12 (%)		87.5
	Surrogate: Naphthalene d8 (%)		78.5
	Surrogate: Phenanthrene d10 (%)		85.1
	B(a)P Total Potency Equivalent (mg/kg)		<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1976494-1	L1976494-2	L1976494-3	L1976494-4	L1976494-5
	Sample ID	L1976494-1	L1976494-2	L1976494-3	L1976494-4	L1976494-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17	09-AUG-17
	Sampled Time	10:07	10:59	11:50	13:02	14:09
	Client ID	BAP-1	BAP-2	BAP-3	BAP-4	BAP-5
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	IACR (CCME) (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1976494-6 Sediment 09-AUG-17 14:15 BAP-COMP	L1976494-7 Sediment 10-AUG-17 09:58 BES-1	L1976494-8 Sediment 10-AUG-17 11:13 BES-2	L1976494-9 Sediment 10-AUG-17 12:09 BES-3	L1976494-10 Sediment 10-AUG-17 13:48 BES-4
Grouping	**Analyte**						
SOIL							
Polycyclic Aromatic Hydrocarbons	IACR (CCME) (mg/kg)		<0.15				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-11	L1976494-12	L1976494-13	L1976494-14	L1976494-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	10-AUG-17	10-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	14:42	14:50	08:44	10:02	11:28
	Client ID	BES-5	BES-COMP	BBJ-1	BBJ-2	BBJ-3
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	IACR (CCME) (mg/kg)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1976494-16	L1976494-17	L1976494-18	L1976494-19	L1976494-20
	Sample ID	L1976494-16	L1976494-17	L1976494-18	L1976494-19	L1976494-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17	11-AUG-17
	Sampled Time	12:55	13:52	14:00	15:32	16:09
	Client ID	BBJ-4	BBJ-5	BBJ-COMP	BBD-1	BBD-2
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	IACR (CCME) (mg/kg)			<0.15		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1976494-21	L1976494-22	L1976494-23	L1976494-24	L1976494-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	12-AUG-17	12-AUG-17	12-AUG-17	12-AUG-17	
	Sampled Time	09:08	10:25	11:30	11:35	
	Client ID	BBD-3	BBD-4	BBD-5	BBD-COMP	CREMP DUP-1
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	IACR (CCME) (mg/kg)				<0.15	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-26	L1976494-27			
	Description	Sediment	Sediment			
	Sampled Date					
	Sampled Time					
	Client ID	CREMP DUP-2	CREMP COMP DUP-1			
Grouping	**Analyte**					
SOIL						
Polycyclic Aromatic Hydrocarbons	IACR (CCME) (mg/kg)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976494-28	L1976494-29			
	Description	Other	Other			
	Sampled Date	11-AUG-17	09-AUG-17			
	Sampled Time	08:15	09:45			
	Client ID	CREMP SWIPE-1	CREMP SWIPE-2			
Grouping	**Analyte**					
SWAB						
Metals	Aluminum (Al)-Total (mg)	0.922	0.818			
	Antimony (Sb)-Total (mg)	<0.020	<0.020			
	Arsenic (As)-Total (mg)	<0.020	<0.020			
	Barium (Ba)-Total (mg)	1.61	1.43			
	Beryllium (Be)-Total (mg)	<0.00050	<0.00050			
	Bismuth (Bi)-Total (mg)	<0.020	<0.020			
	Cadmium (Cd)-Total (mg)	<0.0010	<0.0010			
	Calcium (Ca)-Total (mg)	0.47	0.42			
	Chromium (Cr)-Total (mg)	0.0054	0.0106			
	Cobalt (Co)-Total (mg)	<0.0010	<0.0010			
	Copper (Cu)-Total (mg)	<0.0010	<0.0010			
	Iron (Fe)-Total (mg)	0.038	0.072			
	Lead (Pb)-Total (mg)	<0.0040	<0.0040			
	Lithium (Li)-Total (mg)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg)	<0.10	<0.10			
	Manganese (Mn)-Total (mg)	0.00130	0.00124			
	Molybdenum (Mo)-Total (mg)	<0.0030	<0.0030			
	Nickel (Ni)-Total (mg)	<0.0050	<0.0050			
	Phosphorus (P)-Total (mg)	<0.030	<0.030			
	Potassium (K)-Total (mg)	0.95	0.85			
	Selenium (Se)-Total (mg)	<0.020	<0.020			
	Silver (Ag)-Total (mg)	<0.0010	<0.0010			
	Sodium (Na)-Total (mg)	2.53	2.31			
	Strontium (Sr)-Total (mg)	0.0107	0.00961			
	Thallium (Tl)-Total (mg)	<0.020	<0.020			
	Tin (Sn)-Total (mg)	<0.0030	<0.0030			
	Titanium (Ti)-Total (mg)	<0.0010	<0.0010			
	Vanadium (V)-Total (mg)	<0.0030	<0.0030			
	Zinc (Zn)-Total (mg)	1.23	1.07			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Copper (Cu)	DUP-H	L1976494-8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

EPH-TUMB-FID-VA	Soil	EPH in Solids by Tumbler and GCFID	BC MOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAFS.

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
LEPH/HEPH-CALC-VA	Soil	LEPHs and HEPHs	BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated
by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene
are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.

MET-MG-ICP-VA	Swab	Metals in Swab by ICPOES	NIOSH 7303/EPA 6010B

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods (NMAM). The procedure involves a hot block digestion of the swab material, using a combination of nitric acid and hydrochloric acid. Instrumental analysis of the swab extract is by inductively coupled plasma - optical emission spectrophotometry (EPA 6010B).

MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

OGG-TUMB-SG-VA	Soil	Mineral Oil & Grease in Soil	CCME PETROLEUM HYDROCARBONS-GRAVIMETRIC

This analysis is carried out in accordance with the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." A subsample of the sediment/soil is extracted with 1:1 hexane:acetone using a rotary extraction apparatus. The extract undergoes a silica-gel clean-up to remove polar compounds, and is analyzed gravimetrically. Mineral Oil and Grease is equivalent to fraction F4G of the Canada-wide Standard for Petroleum Hydrocarbons.

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

PAH-TMB-H/A-MS-VA	Soil	PAH - Rotary Extraction (Hexane/Acetone)	EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary

Reference Information

column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

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

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

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

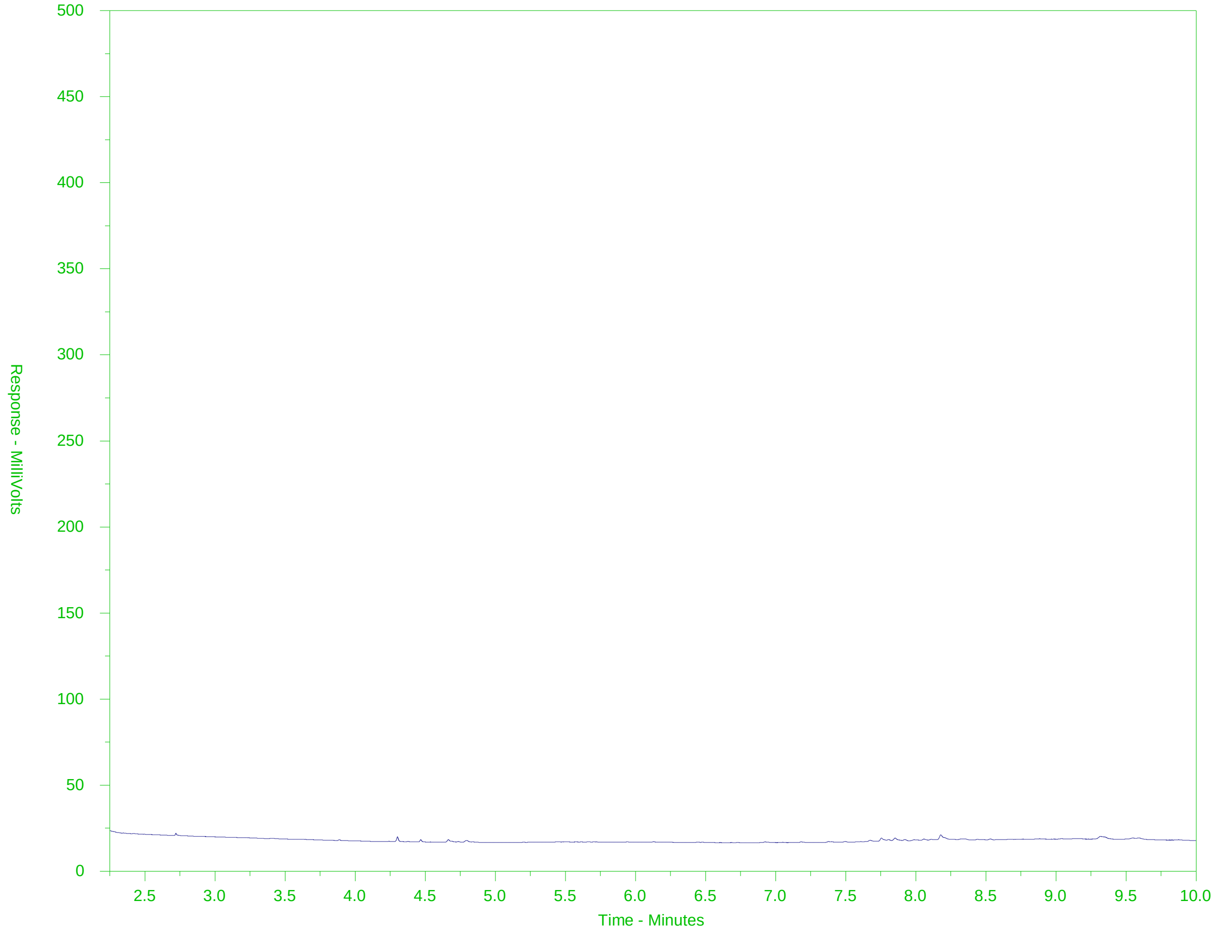
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1976494-6
Client Sample ID: BAP-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

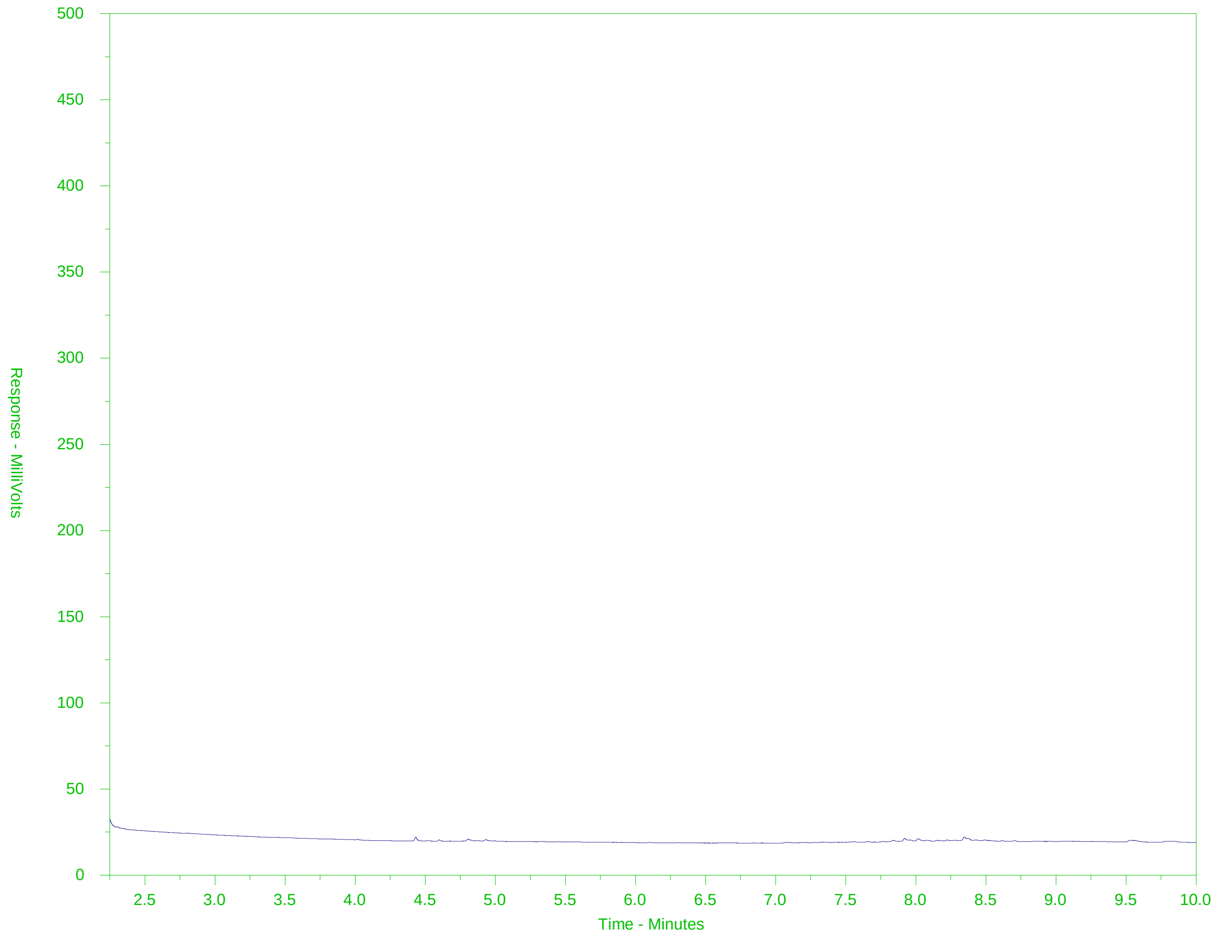
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG2598769-4#L1976494-6
Client Sample ID: BAP-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

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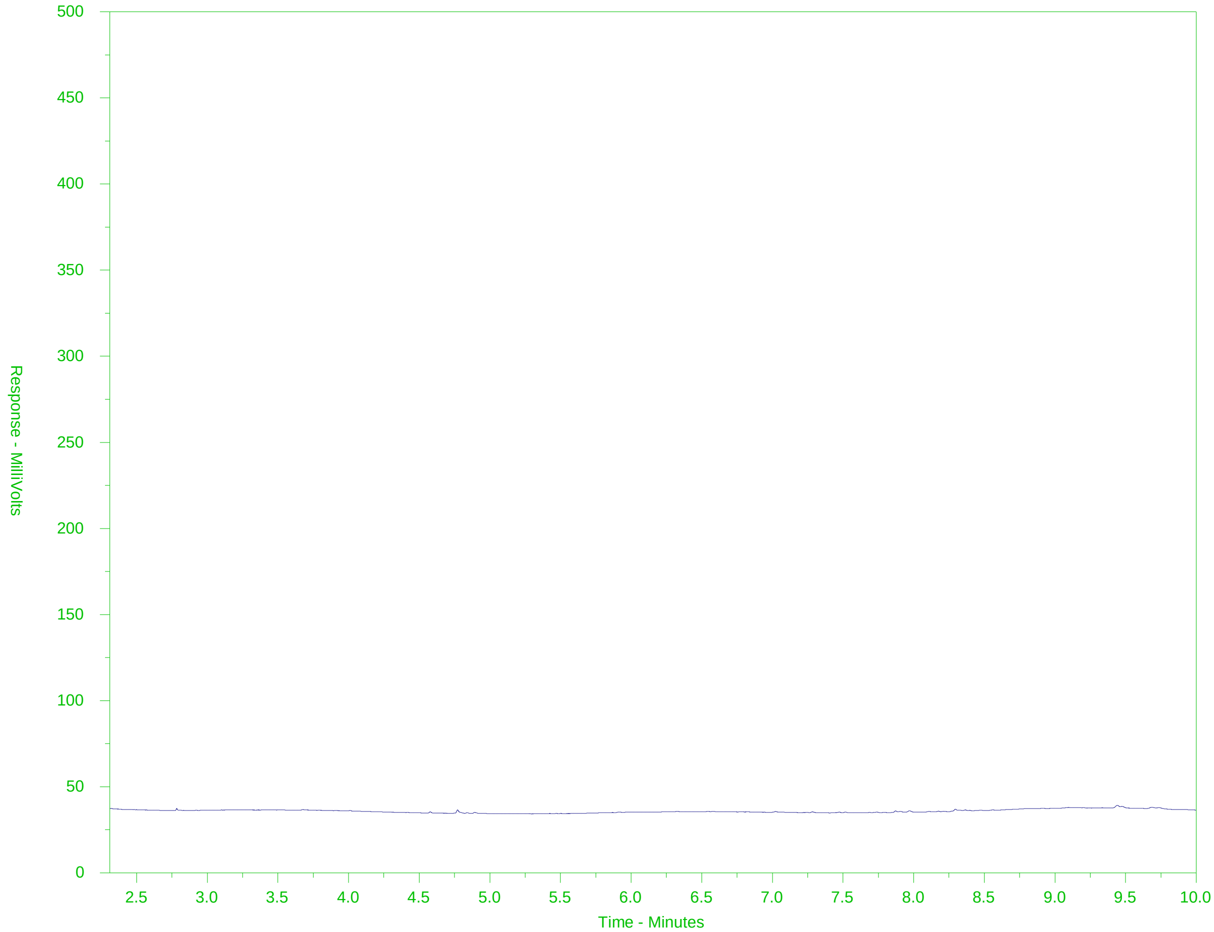
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1976494-12
Client Sample ID: BES-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

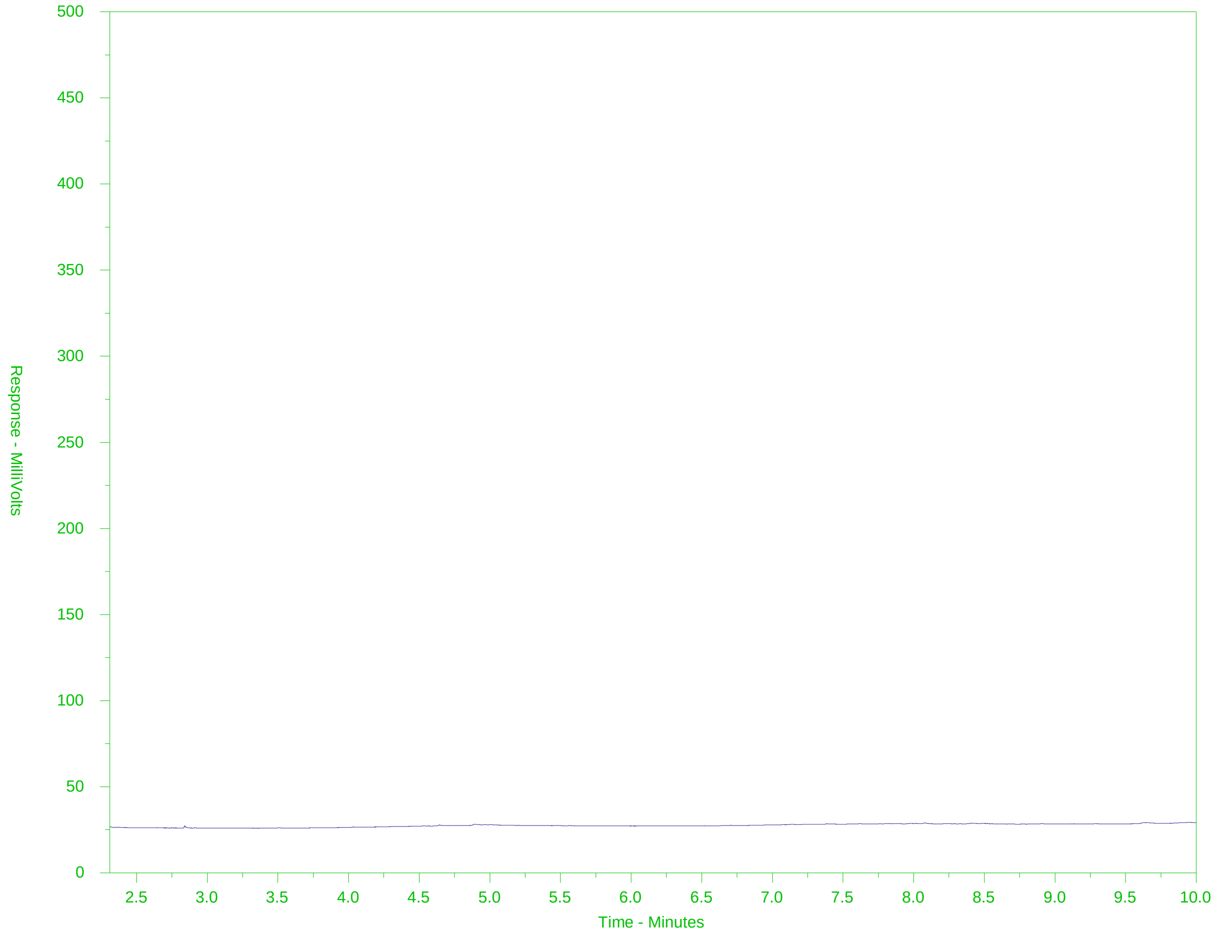
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG2597687-4#L1976494-12
Client Sample ID: BES-COMP



←—— EPH10-19 ——→	←—— EPH19-32 ——→	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	←—— Motor Oils/ Lube Oils/ Grease ——→	
←—— Diesel/ Jet Fuels ——→		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

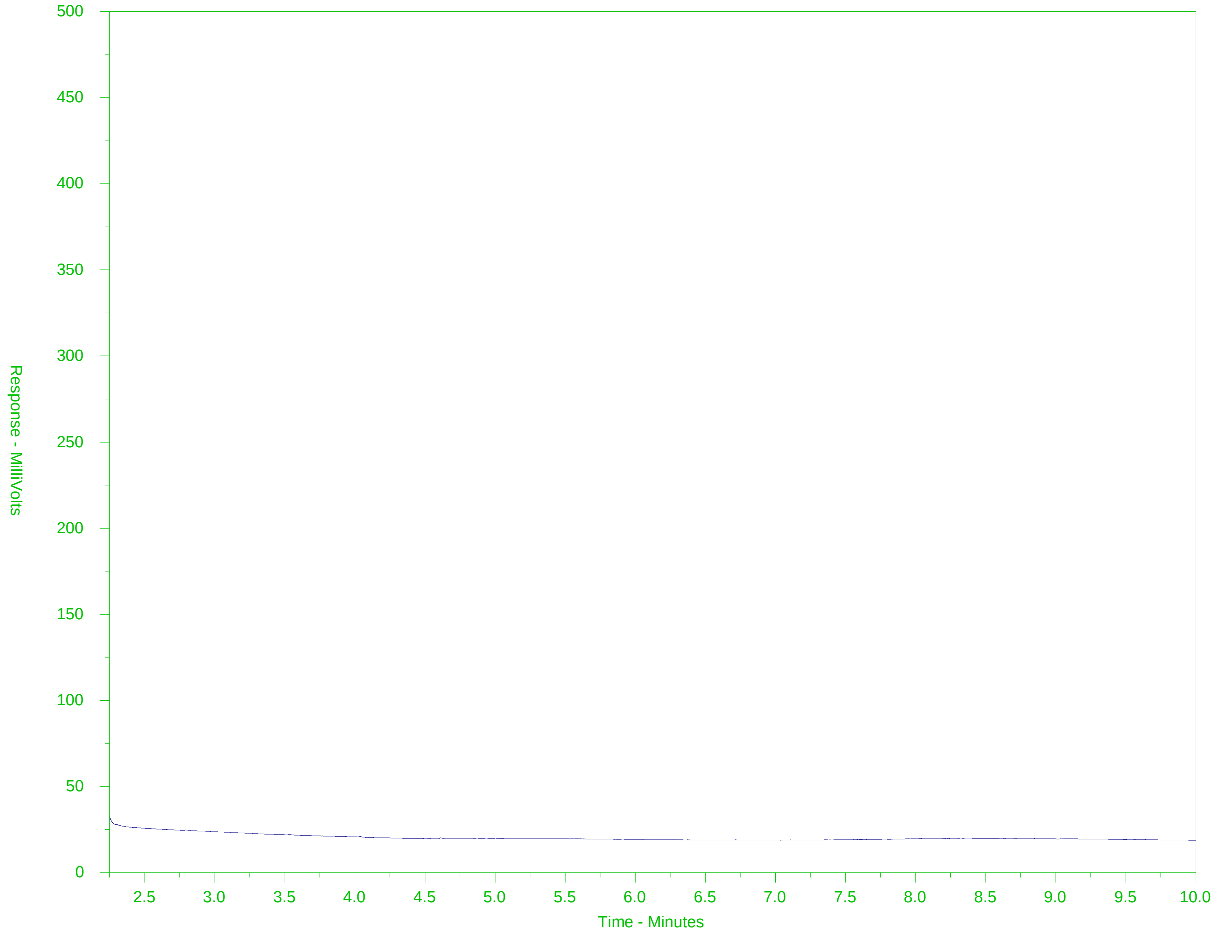
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1976494-18
Client Sample ID: BBJ-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

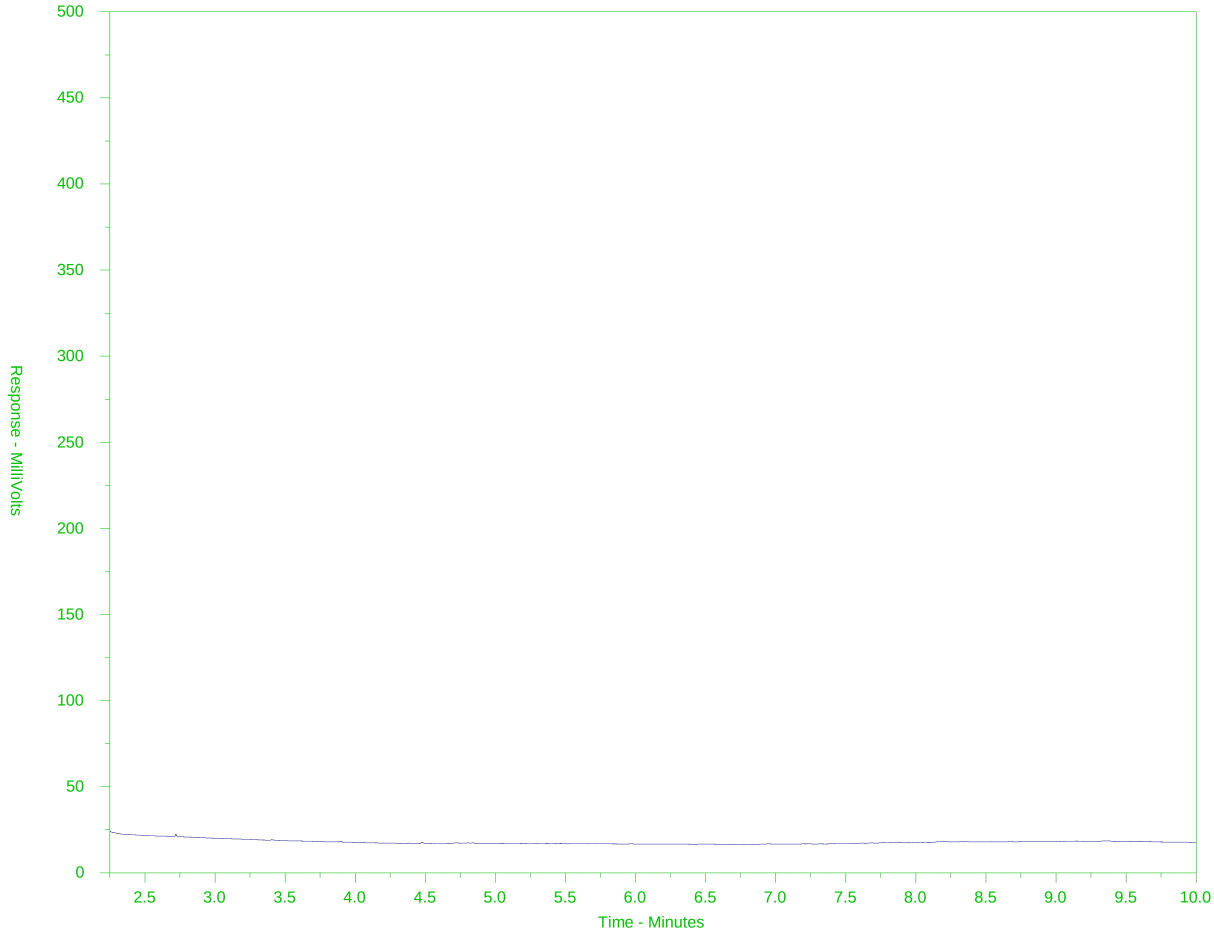
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG2596289-4#L1976494-18
Client Sample ID: BBJ-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

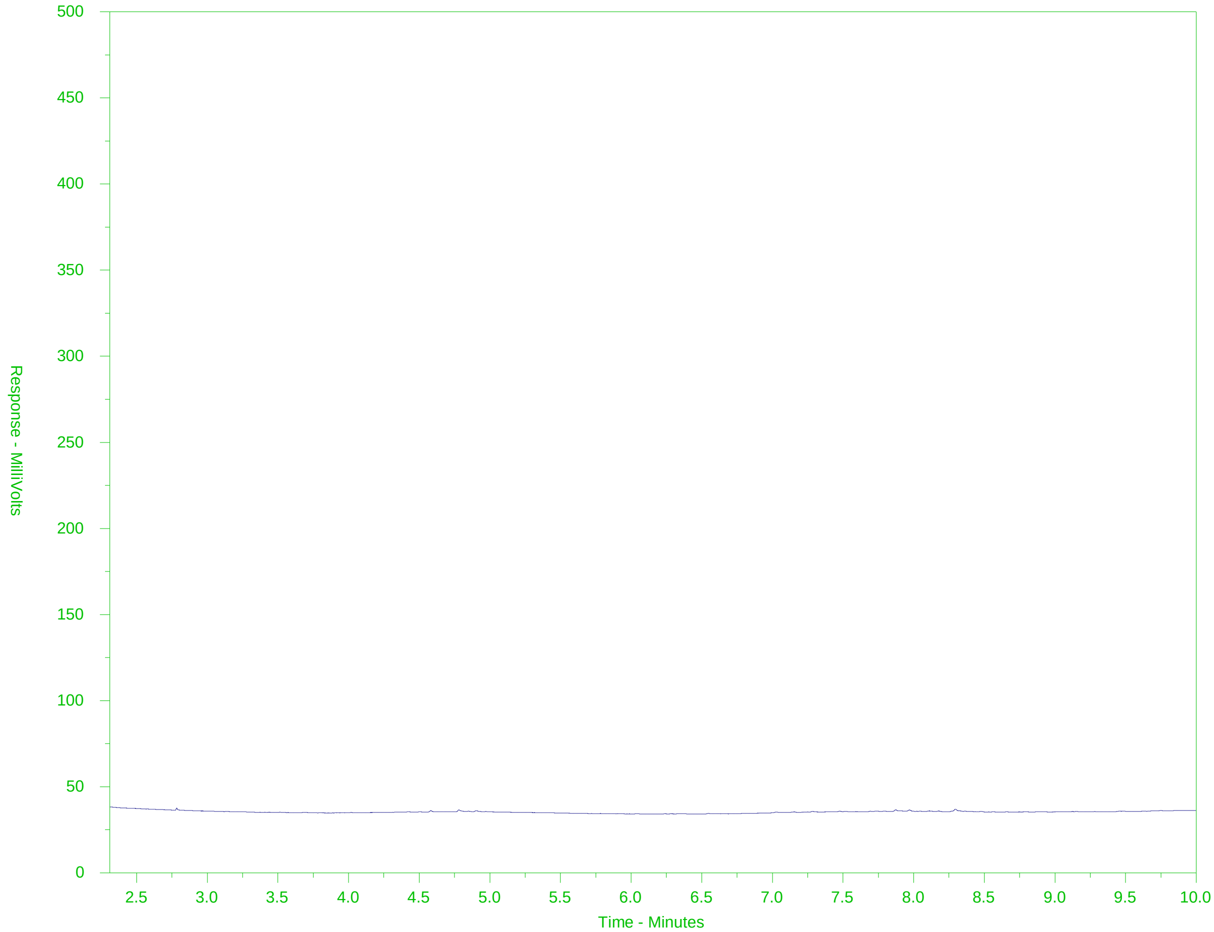
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1976494-24
Client Sample ID: BBD-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

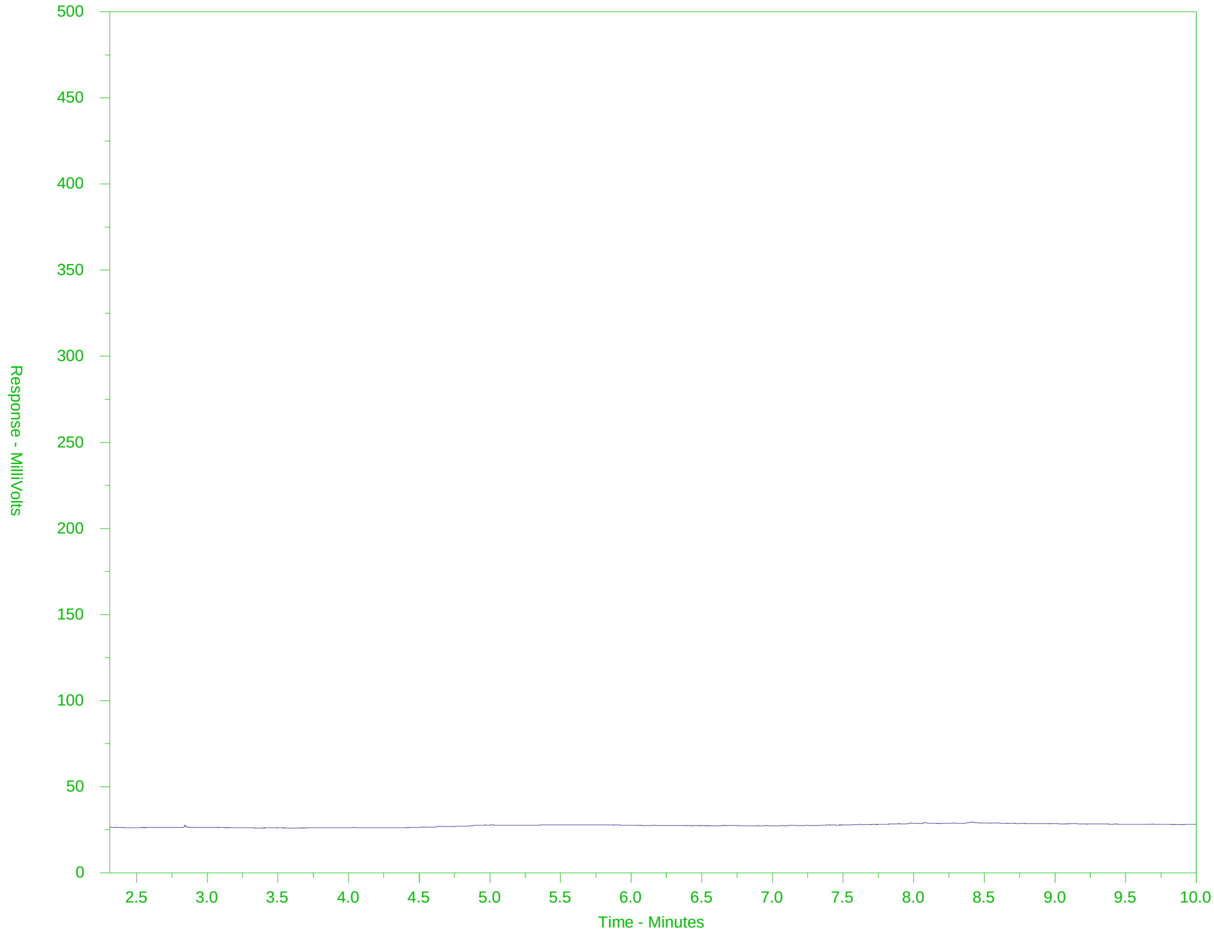
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1976494-27
Client Sample ID: CREMP COMP DUP-1



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS

L1976494-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Meadowbank Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	BAP-1	09-Aug-17	10:07	Sediment	X	X		2
	BAP-2	09-Aug-17	10:59	Sediment	X	X		2
	BAP-3	09-Aug-17	11:50	Sediment	X	X		2
	BAP-4	09-Aug-17	13:02	Sediment	X	X		2
	BAP-5	09-Aug-17	14:09	Sediment	X	X		2
	BAP-COMP	09-Aug-17	14:15	Sediment			X	1
	BES-1	10-Aug-17	9:58	Sediment	X	X		2
	BES-2	10-Aug-17	11:13	Sediment	X	X		2
	BES-3	10-Aug-17	12:09	Sediment	X	X		2
	BES-4	10-Aug-17	13:48	Sediment	X	X		2
	BES-5	10-Aug-17	14:42	Sediment	X	X		2
	BES-COMP	10-Aug-17	14:50	Sediment			X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Sediment grab samples from Baker Lake stations (BAP, BES, BPJ, BBD)

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 13-Aug-17	Time (hh-mm) 9:00	Received by: PAUL	Date: AUG 17	Time: 08:30	Temperature: 18.1 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1976494-COFC

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

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Azimuth Consulting Group	☐ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Vancouver, BC V6K2G8	Email 2:	gmann@azimuthgroup.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com	

Invoice To		Client / Project Information	
Same as Report ?	☑ Yes ☐ No	Job #:	CREMP Meadowbank Sediment
Hardcopy of Invoice with Report?	☐ Yes ☑ No	PO / AFE:	
Company:		LSD:	
Contact:			
Address:		Quote #:	Q38011
Phone: Fax:		ALS Contact: Brent Mack	Sampler: Eric Franz
Lab Work Order # (lab use only)			

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG									Number of Containers
	BPJ-1	11-Aug-17	8:44	Sediment	X	X										2
	BPJ-2	11-Aug-17	10:02	Sediment	X	X										2
	BPJ-3	11-Aug-17	11:28	Sediment	X	X										2
	BPJ-4	11-Aug-17	12:55	Sediment	X	X										2
	BPJ-5	11-Aug-17	13:52	Sediment	X	X										2
	BPJ-COMP	11-Aug-17	14:00	Sediment			X									1
	BBD-1	11-Aug-17	15:32	Sediment	X	X										2
	BBD-2	11-Aug-17	16:09	Sediment	X	X										2
	BBD-3	12-Aug-17	9:08	Sediment	X	X										2
	BBD-4	12-Aug-17	10:25	Sediment	X	X										2
	BBD-5	12-Aug-17	11:30	Sediment	X	X										2
	BBD-COMP	12-Aug-17	11:35	Sediment			X									1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 13-Aug-17	Time (hh-mm) 9:00	Received by: PAUL	Date: AUG 17	Time: 08:30	Temperature: 18·1 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1976494-COFC

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To Same as Report ?	☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Meadowbank Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	CREMP DUP-1	-	-	Sediment	X	X		2
	CREMP DUP-2	-	-	Sediment	X	X		2
	CREMP COMP DUP-1	-	-	Sediment			X	1
	CREMP SWIPE-1	11-Aug-17	8:15	Other	X			1
	CREMP SWIPE-2	09-Aug-17	9:45	Other	X			1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Eric Franz	13-Aug-17	9:00	PAUL	AUG 17	08:30	18.1 °C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 31-AUG-17
Report Date: 19-SEP-17 13:26 (MT)
Version: FINAL REV. 2

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1984228

Project P.O. #: NOT SUBMITTED
Job Reference: CREMP MEADOWBANK SEDIMENT
C of C Numbers:
Legal Site Desc:

Comments:

19-SEP-2017 This report replaces the previous version and contains a change to the PAH data for one sample due to its elevated Moisture content

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-1	L1984228-2	L1984228-3	L1984228-4	L1984228-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17
	Sampled Time	14:50	15:30	16:00	16:35	17:28
	Client ID	SP-1	SP-2	SP-3	SP-4	SP-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.3	85.0	85.5	85.9	85.5
	pH (1:2 soil:water) (pH)	6.15	5.99	6.20	6.38	6.22
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	1.9	1.8	1.7	1.4	<1.0
	% Silt (0.063mm - 4um) (%)	74.4	70.6	69.2	69.1	70.4
	% Clay (<4um) (%)	23.7	27.6	29.2	29.5	28.9
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.96	3.69	4.04	4.01	3.90
Metals	Aluminum (Al) (mg/kg)	23100	23300	25400	24300	24600
	Antimony (Sb) (mg/kg)	0.26	0.23	0.26	0.27	0.26
	Arsenic (As) (mg/kg)	26.6	25.0	27.2	30.7	27.5
	Barium (Ba) (mg/kg)	122	107	123	124	121
	Beryllium (Be) (mg/kg)	1.89	1.85	2.08	1.96	2.00
	Bismuth (Bi) (mg/kg)	2.12	2.16	2.33	2.20	2.30
	Boron (B) (mg/kg)	8.6	8.6	9.7	8.9	8.8
	Cadmium (Cd) (mg/kg)	0.280	0.171	0.307	0.277	0.238
	Calcium (Ca) (mg/kg)	2400	1980	2270	2230	2200
	Chromium (Cr) (mg/kg)	80.2	73.1	78.8	82.9	80.9
	Cobalt (Co) (mg/kg)	13.5	12.5	16.6	16.6	16.4
	Copper (Cu) (mg/kg)	66.5	65.8	78.1	72.9	71.8
	Iron (Fe) (mg/kg)	60200	54600	53800	62400	63300
	Lead (Pb) (mg/kg)	20.7	19.7	22.0	20.8	21.7
	Lithium (Li) (mg/kg)	37.5	39.0	42.9	39.2	41.0
	Magnesium (Mg) (mg/kg)	8770	8390	8970	8930	8970
	Manganese (Mn) (mg/kg)	1590	990	2700	2200	1690
	Mercury (Hg) (mg/kg)	0.0292	0.0229	0.0293	0.0274	0.0261
	Molybdenum (Mo) (mg/kg)	6.24	5.50	6.07	6.17	6.01
	Nickel (Ni) (mg/kg)	62.9	51.1	68.9	70.9	62.1
	Phosphorus (P) (mg/kg)	490	458	540	547	530
	Potassium (K) (mg/kg)	4230	4230	4640	4400	4420
	Selenium (Se) (mg/kg)	0.63	0.44	0.48	0.61	0.61
	Silver (Ag) (mg/kg)	0.17	<0.10	<0.10	0.12	0.12
	Sodium (Na) (mg/kg)	193	173	178	184	199
	Strontium (Sr) (mg/kg)	20.3	18.4	20.4	19.8	20.0
	Sulfur (S) (mg/kg)	1300	1300	1400	1400	1500
	Thallium (Tl) (mg/kg)	0.361	0.339	0.404	0.370	0.368
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-6	L1984228-7	L1984228-8	L1984228-9	L1984228-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
	Sampled Time	17:35	14:28	15:07	15:43	16:20
	Client ID	SP-COMP	TPE-1	TPE-2	TPE-3	TPE-4
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	85.5	84.7	84.7	87.5	86.4
	pH (1:2 soil:water) (pH)		6.19	6.19	6.34	6.35
Particle Size	% Gravel (>2mm) (%)		<1.0	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)		4.8	5.6	<1.0	<1.0
	% Silt (0.063mm - 4um) (%)		66.6	64.4	72.5	71.1
	% Clay (<4um) (%)		28.5	30.1	26.6	28.2
	Texture		Silt loam	Silt loam	Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)		3.57	3.40	4.29	3.96
Metals	Aluminum (Al) (mg/kg)		25300	26200	24500	23900
	Antimony (Sb) (mg/kg)		0.26	0.27	0.29	0.27
	Arsenic (As) (mg/kg)		21.3	21.7	22.2	20.1
	Barium (Ba) (mg/kg)		112	117	113	113
	Beryllium (Be) (mg/kg)		1.83	1.94	1.72	1.70
	Bismuth (Bi) (mg/kg)		2.40	2.60	2.30	2.25
	Boron (B) (mg/kg)		8.9	9.4	8.5	7.8
	Cadmium (Cd) (mg/kg)		0.136	0.176	0.319	0.289
	Calcium (Ca) (mg/kg)		2210	2240	2560	2460
	Chromium (Cr) (mg/kg)		155	141	179	152
	Cobalt (Co) (mg/kg)		16.3	17.1	17.8	16.6
	Copper (Cu) (mg/kg)		52.3	57.3	52.1	50.5
	Iron (Fe) (mg/kg)		46500	50400	46400	44800
	Lead (Pb) (mg/kg)		21.2	22.9	22.1	21.1
	Lithium (Li) (mg/kg)		46.6	48.1	42.8	42.5
	Magnesium (Mg) (mg/kg)		11100	10800	11500	10600
	Manganese (Mn) (mg/kg)		1350	1610	2060	1950
	Mercury (Hg) (mg/kg)		0.0176	0.0169	0.0226	0.0204
	Molybdenum (Mo) (mg/kg)		3.95	4.92	4.11	3.81
	Nickel (Ni) (mg/kg)		74.9	75.2	105	99.7
	Phosphorus (P) (mg/kg)		451	442	506	459
	Potassium (K) (mg/kg)		4520	4810	4200	4200
	Selenium (Se) (mg/kg)		0.54	0.47	0.84	0.76
	Silver (Ag) (mg/kg)		<0.10	<0.10	0.13	0.11
	Sodium (Na) (mg/kg)		179	186	191	183
	Strontium (Sr) (mg/kg)		19.1	19.7	20.2	19.2
	Sulfur (S) (mg/kg)		1500	1500	1900	1800
	Thallium (Tl) (mg/kg)		0.376	0.407	0.410	0.411
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984228-11	L1984228-12	L1984228-13	L1984228-14	L1984228-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	23-AUG-17	23-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	16:54	17:00	09:50	11:30	12:00
	Client ID	TPE-5	TPE-COMP	TPN-1	TPN-2	TPN-3
SOIL						
Physical Tests	Moisture (%)	87.4	86.9	86.6	83.4	72.9
	pH (1:2 soil:water) (pH)	6.62		6.06	6.00	6.25
Particle Size	% Gravel (>2mm) (%)	<1.0		<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	<1.0		11.5	18.3	42.5
	% Silt (0.063mm - 4um) (%)	71.8		68.9	63.9	42.8
	% Clay (<4um) (%)	27.4		19.7	17.9	14.7
	Texture	Silt loam		Silt loam	Silt loam	Loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.21		4.59	3.35	1.72
Metals	Aluminum (Al) (mg/kg)	23400		18100	16700	9020
	Antimony (Sb) (mg/kg)	0.28		0.26	0.25	<0.10
	Arsenic (As) (mg/kg)	23.9		17.1	14.5	7.04
	Barium (Ba) (mg/kg)	103		79.9	71.4	36.7
	Beryllium (Be) (mg/kg)	1.55		1.22	1.15	0.50
	Bismuth (Bi) (mg/kg)	2.10		1.23	1.14	0.54
	Boron (B) (mg/kg)	7.1		7.7	6.7	<5.0
	Cadmium (Cd) (mg/kg)	0.230		0.197	0.246	0.045
	Calcium (Ca) (mg/kg)	2530		2130	1710	792
	Chromium (Cr) (mg/kg)	215		127	109	54.8
	Cobalt (Co) (mg/kg)	18.7		11.6	11.1	6.54
	Copper (Cu) (mg/kg)	47.7		58.2	51.8	22.0
	Iron (Fe) (mg/kg)	48100		32600	30100	15500
	Lead (Pb) (mg/kg)	20.6		17.9	16.0	7.42
	Lithium (Li) (mg/kg)	40.4		28.3	26.4	16.7
	Magnesium (Mg) (mg/kg)	12400		8610	7820	4300
	Manganese (Mn) (mg/kg)	1840		465	305	298
	Mercury (Hg) (mg/kg)	0.0219		0.0225	0.0175	0.0058
	Molybdenum (Mo) (mg/kg)	3.78		3.42	2.41	1.44
	Nickel (Ni) (mg/kg)	102		67.5	63.2	29.7
	Phosphorus (P) (mg/kg)	474		652	721	205
	Potassium (K) (mg/kg)	3810		2730	2560	1470
	Selenium (Se) (mg/kg)	0.67		0.72	0.50	<0.20
	Silver (Ag) (mg/kg)	0.18		0.22	0.14	<0.10
	Sodium (Na) (mg/kg)	181		135	126	65
	Strontium (Sr) (mg/kg)	19.1		17.7	15.5	8.10
	Sulfur (S) (mg/kg)	2000		1200	<1000	<1000
	Thallium (Tl) (mg/kg)	0.342		0.217	0.216	0.101
	Tin (Sn) (mg/kg)	<2.0		<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-16	L1984228-17	L1984228-18	L1984228-19	L1984228-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	26-AUG-17	26-AUG-17
	Sampled Time	12:40	13:30	13:40	09:23	10:24
	Client ID	TPN-4	TPN-5	TPN-COMP	WAL-1	WAL-2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	42.2	62.3	64.3	89.9	89.5
	pH (1:2 soil:water) (pH)	6.33	6.20		6.66	6.80
Particle Size	% Gravel (>2mm) (%)	14.0	<1.0		<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	53.1	40.7		4.7	<1.0
	% Silt (0.063mm - 4um) (%)	21.6	37.8		78.5	79.3
	% Clay (<4um) (%)	11.4	21.5		16.8	19.8
	Texture	Sandy loam	Loam		Silt loam	Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.529	1.05		7.48	7.52
Metals	Aluminum (Al) (mg/kg)	13800	18700		19900	20800
	Antimony (Sb) (mg/kg)	<0.10	0.15		0.42	0.42
	Arsenic (As) (mg/kg)	7.87	20.1		31.2	31.3
	Barium (Ba) (mg/kg)	54.9	79.0		116	120
	Beryllium (Be) (mg/kg)	0.75	1.15		1.59	1.68
	Bismuth (Bi) (mg/kg)	0.69	1.11		1.99	2.14
	Boron (B) (mg/kg)	<5.0	5.8		10.0	8.8
	Cadmium (Cd) (mg/kg)	0.039	0.079		0.472	0.453
	Calcium (Ca) (mg/kg)	1120	1340		4120	3950
	Chromium (Cr) (mg/kg)	76.4	106		57.6	60.8
	Cobalt (Co) (mg/kg)	7.35	12.8		9.09	8.91
	Copper (Cu) (mg/kg)	26.5	45.6		133	147
	Iron (Fe) (mg/kg)	22600	38000		33400	33700
	Lead (Pb) (mg/kg)	9.03	14.4		32.3	33.5
	Lithium (Li) (mg/kg)	26.9	33.1		34.7	35.2
	Magnesium (Mg) (mg/kg)	6850	8690		7570	7750
	Manganese (Mn) (mg/kg)	306	619		368	365
	Mercury (Hg) (mg/kg)	<0.0050	0.0061		0.0539	0.0449
	Molybdenum (Mo) (mg/kg)	1.03	2.22		7.66	8.54
	Nickel (Ni) (mg/kg)	41.7	56.2		52.6	54.6
	Phosphorus (P) (mg/kg)	220	517		694	649
	Potassium (K) (mg/kg)	2160	2990		3460	3560
	Selenium (Se) (mg/kg)	<0.20	<0.20		0.73	0.77
	Silver (Ag) (mg/kg)	<0.10	<0.10		0.51	0.54
	Sodium (Na) (mg/kg)	82	114		196	191
	Strontium (Sr) (mg/kg)	12.0	14.1		28.1	26.6
	Sulfur (S) (mg/kg)	<1000	<1000		2000	2000
	Thallium (Tl) (mg/kg)	0.151	0.221		0.305	0.318
	Tin (Sn) (mg/kg)	<2.0	<2.0		<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984228-21	L1984228-22	L1984228-23	L1984228-24	L1984228-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17	25-AUG-17
	Sampled Time	11:19	11:59	12:54	13:00	09:30
	Client ID	WAL-3	WAL-4	WAL-5	WAL-COMP	INUG-1
SOIL						
Physical Tests	Moisture (%)	90.3	89.9	89.1	89.2	85.3
	pH (1:2 soil:water) (pH)	6.83	6.78	6.59		6.02
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0		<1.0
	% Sand (2.0mm - 0.063mm) (%)	1.1	2.1	3.2		4.0
	% Silt (0.063mm - 4um) (%)	76.6	76.1	80.8		74.1
	% Clay (<4um) (%)	22.3	21.8	16.1		22.0
	Texture	Silt loam	Silt loam	Silt loam		Silt loam
Organic / Inorganic Carbon	Total Organic Carbon (%)	8.10	7.15	7.86		4.61
Metals	Aluminum (Al) (mg/kg)	21100	21400	18000		17600
	Antimony (Sb) (mg/kg)	0.43	0.38	0.38		0.21
	Arsenic (As) (mg/kg)	44.7	26.8	40.4		25.0
	Barium (Ba) (mg/kg)	122	114	91.4		96.6
	Beryllium (Be) (mg/kg)	1.69	1.67	1.43		1.19
	Bismuth (Bi) (mg/kg)	2.15	2.17	1.79		1.10
	Boron (B) (mg/kg)	11.0	9.5	10.4		6.4
	Cadmium (Cd) (mg/kg)	0.467	0.401	0.368		0.169
	Calcium (Ca) (mg/kg)	4050	3770	3900		1640
	Chromium (Cr) (mg/kg)	58.4	57.9	53.7		93.2
	Cobalt (Co) (mg/kg)	9.44	8.83	9.18		14.6
	Copper (Cu) (mg/kg)	155	146	117		43.2
	Iron (Fe) (mg/kg)	39600	31500	32400		59000
	Lead (Pb) (mg/kg)	34.8	33.0	29.2		13.6
	Lithium (Li) (mg/kg)	35.4	37.6	32.1		22.6
	Magnesium (Mg) (mg/kg)	7500	7770	7150		7910
	Manganese (Mn) (mg/kg)	382	318	319		1620
	Mercury (Hg) (mg/kg)	0.0611	0.0453	0.0558		0.0315
	Molybdenum (Mo) (mg/kg)	11.5	8.63	7.82		3.81
	Nickel (Ni) (mg/kg)	55.4	54.8	48.2		72.2
	Phosphorus (P) (mg/kg)	746	616	730		1250
	Potassium (K) (mg/kg)	3670	3740	3190		2830
	Selenium (Se) (mg/kg)	0.86	0.67	0.70		0.57
	Silver (Ag) (mg/kg)	0.61	0.49	0.48		0.15
	Sodium (Na) (mg/kg)	182	172	166		131
	Strontium (Sr) (mg/kg)	28.0	27.1	25.7		19.6
	Sulfur (S) (mg/kg)	1700	1400	1600		<1000
	Thallium (Tl) (mg/kg)	0.324	0.311	0.292		0.178
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID / Description / Sampled Date / Sampled Time / Client ID		L1984228-26 Sediment 25-AUG-17 10:27 INUG-2	L1984228-27 Sediment 25-AUG-17 11:02 INUG-3	L1984228-28 Sediment 25-AUG-17 11:45 INUG-4	L1984228-29 Sediment 25-AUG-17 12:20 INUG-5	L1984228-30 Sediment 25-AUG-17 12:30 INUG-COMP
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	83.3	84.1	85.3	85.8	84.9
	pH (1:2 soil:water) (pH)	6.34	6.08	5.93	5.70	
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	
	% Sand (2.0mm - 0.063mm) (%)	6.9	4.3	3.5	2.8	
	% Silt (0.063mm - 4um) (%)	68.6	69.8	67.8	68.5	
	% Clay (<4um) (%)	24.5	25.9	28.8	28.7	
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.74	4.18	4.56	4.98	
Metals	Aluminum (Al) (mg/kg)	19300	20500	19500	19800	
	Antimony (Sb) (mg/kg)	0.19	0.18	0.19	0.21	
	Arsenic (As) (mg/kg)	22.0	14.6	41.7	23.3	
	Barium (Ba) (mg/kg)	95.8	126	117	126	
	Beryllium (Be) (mg/kg)	1.24	1.33	1.28	1.29	
	Bismuth (Bi) (mg/kg)	1.12	1.17	1.13	1.14	
	Boron (B) (mg/kg)	7.0	8.2	8.2	9.0	
	Cadmium (Cd) (mg/kg)	0.203	0.285	0.255	0.329	
	Calcium (Ca) (mg/kg)	1620	2110	2020	2000	
	Chromium (Cr) (mg/kg)	101	102	96.2	99.3	
	Cobalt (Co) (mg/kg)	17.6	13.3	12.5	14.0	
	Copper (Cu) (mg/kg)	44.6	45.2	45.1	45.8	
	Iron (Fe) (mg/kg)	48900	39700	59900	50800	
	Lead (Pb) (mg/kg)	12.2	14.1	13.5	14.0	
	Lithium (Li) (mg/kg)	24.6	25.6	23.4	24.3	
	Magnesium (Mg) (mg/kg)	8430	8880	8390	8520	
	Manganese (Mn) (mg/kg)	2180	1090	1110	954	
	Mercury (Hg) (mg/kg)	0.0244	0.0358	0.0315	0.0347	
	Molybdenum (Mo) (mg/kg)	4.15	2.72	4.02	3.79	
	Nickel (Ni) (mg/kg)	73.5	88.4	78.5	91.3	
	Phosphorus (P) (mg/kg)	635	1030	1620	1370	
	Potassium (K) (mg/kg)	3220	3420	3380	3440	
	Selenium (Se) (mg/kg)	0.51	0.55	0.61	0.59	
	Silver (Ag) (mg/kg)	<0.10	0.18	0.20	0.22	
	Sodium (Na) (mg/kg)	135	163	162	170	
	Strontium (Sr) (mg/kg)	21.1	24.9	23.8	24.6	
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	
	Thallium (Tl) (mg/kg)	0.243	0.229	0.208	0.232	
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1984228-31	L1984228-32	L1984228-33	L1984228-34	L1984228-35
	Sample ID	L1984228-31	L1984228-32	L1984228-33	L1984228-34	L1984228-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
	Sampled Time	10:15	11:20	11:30	12:50	12:57
	Client ID	PDL-1	PDL-2	PDL-3	PDL-4	PDL-5
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	81.8	84.1	85.7	80.8	79.2
	pH (1:2 soil:water) (pH)	6.21	5.94	5.62	6.21	6.29
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	<1.0
	% Sand (2.0mm - 0.063mm) (%)	2.8	9.0	7.7	6.6	7.1
	% Silt (0.063mm - 4um) (%)	77.2	72.3	74.0	73.4	75.1
	% Clay (<4um) (%)	20.0	18.8	18.3	20.0	17.7
	Texture	Silt	Silt loam	Silt loam / Silt	Silt	Silt
Organic / Inorganic Carbon	Total Organic Carbon (%)	3.22	3.28	4.37	2.92	2.50
Metals	Aluminum (Al) (mg/kg)	20600	17900	15900	17300	18200
	Antimony (Sb) (mg/kg)	0.29	0.23	0.24	0.25	0.26
	Arsenic (As) (mg/kg)	38.1	8.74	12.6	32.9	34.3
	Barium (Ba) (mg/kg)	85.5	94.6	79.0	72.2	77.0
	Beryllium (Be) (mg/kg)	1.05	0.87	0.81	0.94	0.93
	Bismuth (Bi) (mg/kg)	1.02	0.72	0.69	0.90	0.90
	Boron (B) (mg/kg)	7.9	6.7	7.0	5.3	6.0
	Cadmium (Cd) (mg/kg)	0.135	0.269	0.255	0.115	0.164
	Calcium (Ca) (mg/kg)	2130	2270	2040	1770	1860
	Chromium (Cr) (mg/kg)	139	118	106	121	125
	Cobalt (Co) (mg/kg)	17.5	10.3	9.81	16.0	16.7
	Copper (Cu) (mg/kg)	53.1	42.5	39.8	44.9	45.5
	Iron (Fe) (mg/kg)	39900	23000	22700	35600	37200
	Lead (Pb) (mg/kg)	15.3	12.6	12.5	13.7	13.9
	Lithium (Li) (mg/kg)	27.7	26.0	23.0	25.2	26.0
	Magnesium (Mg) (mg/kg)	10500	9650	8590	9140	9730
	Manganese (Mn) (mg/kg)	1080	270	253	1090	1210
	Mercury (Hg) (mg/kg)	0.0142	0.0112	0.0195	0.0124	0.0129
	Molybdenum (Mo) (mg/kg)	2.87	1.36	1.91	2.62	2.82
	Nickel (Ni) (mg/kg)	89.4	78.0	75.0	75.9	86.6
	Phosphorus (P) (mg/kg)	558	467	472	445	482
	Potassium (K) (mg/kg)	3050	2600	2330	2410	2590
	Selenium (Se) (mg/kg)	0.31	0.31	0.42	0.23	0.26
	Silver (Ag) (mg/kg)	<0.10	0.21	0.23	<0.10	<0.10
	Sodium (Na) (mg/kg)	113	99	107	79	85
	Strontium (Sr) (mg/kg)	22.2	21.1	18.6	17.0	19.3
	Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
	Thallium (Tl) (mg/kg)	0.195	0.166	0.159	0.170	0.178
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-36	L1984228-37	L1984228-38	L1984228-39	L1984228-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17				
	Sampled Time	13:10				
	Client ID	PDL-COMP	CREMP DUP-3	CREMP DUP-4	CREMP DUP-5	CREMP COMP DUP-2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	81.2	85.7	84.2	86.6	66.9
	pH (1:2 soil:water) (pH)		6.17	6.17	6.14	
Particle Size	% Gravel (>2mm) (%)		<1.0	<1.0	<1.0	
	% Sand (2.0mm - 0.063mm) (%)		<1.0	5.3	<1.0	
	% Silt (0.063mm - 4um) (%)		68.9	71.2	68.7	
	% Clay (<4um) (%)		30.8	23.5	30.6	
	Texture		Silt loam	Silt loam	Silt loam	
Organic / Inorganic Carbon	Total Organic Carbon (%)		3.93	3.75	4.10	
Metals	Aluminum (Al) (mg/kg)		22200	19300	21400	
	Antimony (Sb) (mg/kg)		0.25	0.17	0.23	
	Arsenic (As) (mg/kg)		26.0	21.7	18.9	
	Barium (Ba) (mg/kg)		111	98.3	107	
	Beryllium (Be) (mg/kg)		1.80	1.23	1.46	
	Bismuth (Bi) (mg/kg)		2.07	1.10	2.00	
	Boron (B) (mg/kg)		7.7	7.0	7.3	
	Cadmium (Cd) (mg/kg)		0.201	0.204	0.282	
	Calcium (Ca) (mg/kg)		2050	1640	2100	
	Chromium (Cr) (mg/kg)		74.1	96.4	134	
	Cobalt (Co) (mg/kg)		15.0	17.0	15.6	
	Copper (Cu) (mg/kg)		65.1	42.8	45.5	
	Iron (Fe) (mg/kg)		57500	48900	38900	
	Lead (Pb) (mg/kg)		18.9	12.1	18.3	
	Lithium (Li) (mg/kg)		39.2	24.5	39.1	
	Magnesium (Mg) (mg/kg)		8110	8050	9400	
	Manganese (Mn) (mg/kg)		1530	2150	1940	
	Mercury (Hg) (mg/kg)		0.0254	0.0233	0.0182	
	Molybdenum (Mo) (mg/kg)		5.55	4.04	3.33	
	Nickel (Ni) (mg/kg)		57.3	71.2	90.5	
	Phosphorus (P) (mg/kg)		522	610	427	
	Potassium (K) (mg/kg)		4070	3150	3850	
	Selenium (Se) (mg/kg)		0.53	0.53	0.72	
	Silver (Ag) (mg/kg)		0.11	0.11	<0.10	
	Sodium (Na) (mg/kg)		156	132	153	
	Strontium (Sr) (mg/kg)		17.9	21.0	16.8	
	Sulfur (S) (mg/kg)		<1000	<1000	1300	
	Thallium (Tl) (mg/kg)		0.329	0.234	0.379	
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984228-1	L1984228-2	L1984228-3	L1984228-4	L1984228-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17
	Sampled Time	14:50	15:30	16:00	16:35	17:28
	Client ID	SP-1	SP-2	SP-3	SP-4	SP-5
SOIL						
Metals	Titanium (Ti) (mg/kg)	795	761	801	721	755
	Tungsten (W) (mg/kg)	0.72	0.71	0.69	0.67	0.76
	Uranium (U) (mg/kg)	18.0	19.1	21.5	19.7	20.1
	Vanadium (V) (mg/kg)	38.2	37.4	40.2	38.6	39.5
	Zinc (Zn) (mg/kg)	113	103	118	114	113
	Zirconium (Zr) (mg/kg)	1.5	1.8	1.8	1.8	2.0
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME) (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-6	L1984228-7	L1984228-8	L1984228-9	L1984228-10
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	22-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
	Sampled Time	17:35	14:28	15:07	15:43	16:20
	Client ID	SP-COMP	TPE-1	TPE-2	TPE-3	TPE-4
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)		897	999	814	818
	Tungsten (W) (mg/kg)		0.83	0.82	1.04	0.96
	Uranium (U) (mg/kg)		17.1	19.7	15.6	15.0
	Vanadium (V) (mg/kg)		45.2	46.7	44.3	42.1
	Zinc (Zn) (mg/kg)		106	112	107	105
	Zirconium (Zr) (mg/kg)		3.1	3.7	2.8	3.0
Aggregate Organics	Mineral Oil and Grease (mg/kg)	<500				
Hydrocarbons	EPH10-19 (mg/kg)	DLHM <700				
	EPH19-32 (mg/kg)	DLHM <700				
	LEPH (mg/kg)	<700				
	HEPH (mg/kg)	<700				
	Surrogate: 2-Bromobenzotrifluoride (%)	98.8				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	DLHM <0.010				
	Acenaphthylene (mg/kg)	DLHM <0.010				
	Anthracene (mg/kg)	DLHM <0.0080				
	Benz(a)anthracene (mg/kg)	DLHM <0.020				
	Benzo(a)pyrene (mg/kg)	DLHM <0.020				
	Benzo(b&j)fluoranthene (mg/kg)	DLHM <0.020				
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.028				
	Benzo(g,h,i)perylene (mg/kg)	DLHM <0.020				
	Benzo(k)fluoranthene (mg/kg)	DLHM <0.020				
	Chrysene (mg/kg)	DLHM <0.020				
	Dibenz(a,h)anthracene (mg/kg)	DLHM <0.010				
	Fluoranthene (mg/kg)	DLHM <0.020				
	Fluorene (mg/kg)	DLHM <0.020				
	Indeno(1,2,3-c,d)pyrene (mg/kg)	DLHM <0.020				
	2-Methylnaphthalene (mg/kg)	DLHM <0.020				
	Naphthalene (mg/kg)	DLHM <0.020				
	Phenanthrene (mg/kg)	DLHM <0.020				
	Pyrene (mg/kg)	DLHM <0.020				
	Surrogate: Acenaphthene d10 (%)	103.1				
	Surrogate: Chrysene d12 (%)	92.9				
	Surrogate: Naphthalene d8 (%)	98.2				
	Surrogate: Phenanthrene d10 (%)	98.3				
	B(a)P Total Potency Equivalent (mg/kg)	<0.020				
	IACR (CCME) (mg/kg)	<0.21				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1984228-11 Sediment 23-AUG-17 16:54 TPE-5	L1984228-12 Sediment 23-AUG-17 17:00 TPE-COMP	L1984228-13 Sediment 27-AUG-17 09:50 TPN-1	L1984228-14 Sediment 27-AUG-17 11:30 TPN-2	L1984228-15 Sediment 27-AUG-17 12:00 TPN-3
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	732		498	529	346
	Tungsten (W) (mg/kg)	1.09		0.92	0.70	0.94
	Uranium (U) (mg/kg)	13.5		15.5	14.8	6.90
	Vanadium (V) (mg/kg)	44.3		34.8	31.3	16.9
	Zinc (Zn) (mg/kg)	101		84.2	81.5	38.9
	Zirconium (Zr) (mg/kg)	3.2		1.8	2.5	1.1
Aggregate Organics	Mineral Oil and Grease (mg/kg)		2730			
Hydrocarbons	EPH10-19 (mg/kg)		<700 DLHM			
	EPH19-32 (mg/kg)		<700 DLHM			
	LEPH (mg/kg)		<700			
	HEPH (mg/kg)		<700			
	Surrogate: 2-Bromobenzotrifluoride (%)		84.5			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)		<0.010 DLHM			
	Acenaphthylene (mg/kg)		<0.010 DLHM			
	Anthracene (mg/kg)		<0.010 DLHM			
	Benz(a)anthracene (mg/kg)		<0.010			
	Benzo(a)pyrene (mg/kg)		<0.010			
	Benzo(b&j)fluoranthene (mg/kg)		<0.010			
	Benzo(b+j+k)fluoranthene (mg/kg)		<0.015			
	Benzo(g,h,i)perylene (mg/kg)		<0.010			
	Benzo(k)fluoranthene (mg/kg)		<0.010			
	Chrysene (mg/kg)		<0.010			
	Dibenz(a,h)anthracene (mg/kg)		<0.010 DLHM			
	Fluoranthene (mg/kg)		<0.010			
	Fluorene (mg/kg)		<0.010			
	Indeno(1,2,3-c,d)pyrene (mg/kg)		<0.010			
	2-Methylnaphthalene (mg/kg)		<0.020 DLB			
	Naphthalene (mg/kg)		<0.030 DLB			
	Phenanthrene (mg/kg)		<0.010			
	Pyrene (mg/kg)		<0.010			
	Surrogate: Acenaphthene d10 (%)		79.5			
	Surrogate: Chrysene d12 (%)		87.6			
	Surrogate: Naphthalene d8 (%)		78.5			
	Surrogate: Phenanthrene d10 (%)		87.1			
	B(a)P Total Potency Equivalent (mg/kg)		<0.020			
	IACR (CCME) (mg/kg)		<0.15			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-16	L1984228-17	L1984228-18	L1984228-19	L1984228-20
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	26-AUG-17	26-AUG-17
	Sampled Time	12:40	13:30	13:40	09:23	10:24
	Client ID	TPN-4	TPN-5	TPN-COMP	WAL-1	WAL-2
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	547	673		625	599
	Tungsten (W) (mg/kg)	<0.50	0.74		1.46	1.43
	Uranium (U) (mg/kg)	8.61	15.4		15.0	16.0
	Vanadium (V) (mg/kg)	24.4	34.0		31.0	32.7
	Zinc (Zn) (mg/kg)	59.5	76.0		115	116
	Zirconium (Zr) (mg/kg)	3.0	3.3		3.1	2.8
Aggregate Organics	Mineral Oil and Grease (mg/kg)			<500		
Hydrocarbons	EPH10-19 (mg/kg)			<240 DLHM		
	EPH19-32 (mg/kg)			<240 DLHM		
	LEPH (mg/kg)			<240		
	HEPH (mg/kg)			<240		
	Surrogate: 2-Bromobenzotrifluoride (%)			91.5		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)			<0.0050		
	Acenaphthylene (mg/kg)			<0.0050		
	Anthracene (mg/kg)			<0.0040		
	Benz(a)anthracene (mg/kg)			<0.010		
	Benzo(a)pyrene (mg/kg)			<0.010		
	Benzo(b&j)fluoranthene (mg/kg)			<0.010		
	Benzo(b+j+k)fluoranthene (mg/kg)			<0.015		
	Benzo(g,h,i)perylene (mg/kg)			<0.010		
	Benzo(k)fluoranthene (mg/kg)			<0.010		
	Chrysene (mg/kg)			<0.010		
	Dibenz(a,h)anthracene (mg/kg)			<0.0050		
	Fluoranthene (mg/kg)			<0.010		
	Fluorene (mg/kg)			<0.010		
	Indeno(1,2,3-c,d)pyrene (mg/kg)			<0.010		
	2-Methylnaphthalene (mg/kg)			<0.010		
	Naphthalene (mg/kg)			<0.010		
	Phenanthrene (mg/kg)			<0.010		
	Pyrene (mg/kg)			<0.010		
	Surrogate: Acenaphthene d10 (%)			85.7		
	Surrogate: Chrysene d12 (%)			93.0		
	Surrogate: Naphthalene d8 (%)			85.8		
	Surrogate: Phenanthrene d10 (%)			91.5		
	B(a)P Total Potency Equivalent (mg/kg)			<0.020		
	IACR (CCME) (mg/kg)			<0.15		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1984228-21	L1984228-22	L1984228-23	L1984228-24	L1984228-25
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17	25-AUG-17
	Sampled Time	11:19	11:59	12:54	13:00	09:30
	Client ID	WAL-3	WAL-4	WAL-5	WAL-COMP	INUG-1
SOIL						
Metals	Titanium (Ti) (mg/kg)	572	622	578		431
	Tungsten (W) (mg/kg)	1.26	1.25	1.47		0.59
	Uranium (U) (mg/kg)	16.9	16.6	14.2		14.0
	Vanadium (V) (mg/kg)	33.6	33.7	29.1		31.8
	Zinc (Zn) (mg/kg)	125	122	114		80.5
	Zirconium (Zr) (mg/kg)	2.5	2.6	3.3		1.6
Aggregate Organics	Mineral Oil and Grease (mg/kg)				550	
Hydrocarbons	EPH10-19 (mg/kg)				DLHM <840	
	EPH19-32 (mg/kg)				DLHM <840	
	LEPH (mg/kg)				<840	
	HEPH (mg/kg)				<840	
	Surrogate: 2-Bromobenzotrifluoride (%)				83.1	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)				DLHM <0.010	
	Acenaphthylene (mg/kg)				DLHM <0.010	
	Anthracene (mg/kg)				DLHM <0.010	
	Benz(a)anthracene (mg/kg)				<0.010	
	Benzo(a)pyrene (mg/kg)				<0.010	
	Benzo(b&j)fluoranthene (mg/kg)				<0.010	
	Benzo(b+j+k)fluoranthene (mg/kg)				<0.015	
	Benzo(g,h,i)perylene (mg/kg)				<0.010	
	Benzo(k)fluoranthene (mg/kg)				<0.010	
	Chrysene (mg/kg)				<0.010	
	Dibenz(a,h)anthracene (mg/kg)				DLHM <0.010	
	Fluoranthene (mg/kg)				<0.010	
	Fluorene (mg/kg)				<0.010	
	Indeno(1,2,3-c,d)pyrene (mg/kg)				<0.010	
	2-Methylnaphthalene (mg/kg)				DLB <0.020	
	Naphthalene (mg/kg)				DLB <0.030	
	Phenanthrene (mg/kg)				<0.010	
	Pyrene (mg/kg)				<0.010	
	Surrogate: Acenaphthene d10 (%)				81.9	
	Surrogate: Chrysene d12 (%)				94.1	
	Surrogate: Naphthalene d8 (%)				81.5	
	Surrogate: Phenanthrene d10 (%)				89.7	
	B(a)P Total Potency Equivalent (mg/kg)				<0.020	
	IACR (CCME) (mg/kg)				<0.15	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-26	L1984228-27	L1984228-28	L1984228-29	L1984228-30
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17
	Sampled Time	10:27	11:02	11:45	12:20	12:30
	Client ID	INUG-2	INUG-3	INUG-4	INUG-5	INUG-COMP
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	520	577	558	586	
	Tungsten (W) (mg/kg)	0.50	0.57	0.57	0.56	
	Uranium (U) (mg/kg)	15.4	15.1	14.4	15.3	
	Vanadium (V) (mg/kg)	33.7	35.3	33.8	34.5	
	Zinc (Zn) (mg/kg)	82.0	90.1	92.6	97.2	
	Zirconium (Zr) (mg/kg)	1.1	1.4	1.6	2.0	
Aggregate Organics	Mineral Oil and Grease (mg/kg)					1380
Hydrocarbons	EPH10-19 (mg/kg)					DLHM <600
	EPH19-32 (mg/kg)					DLHM <600
	LEPH (mg/kg)					<600
	HEPH (mg/kg)					<600
	Surrogate: 2-Bromobenzotrifluoride (%)					85.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					DLHM <0.010
	Acenaphthylene (mg/kg)					DLHM <0.010
	Anthracene (mg/kg)					DLHM <0.010
	Benz(a)anthracene (mg/kg)					<0.010
	Benzo(a)pyrene (mg/kg)					<0.010
	Benzo(b&j)fluoranthene (mg/kg)					<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)					<0.015
	Benzo(g,h,i)perylene (mg/kg)					<0.010
	Benzo(k)fluoranthene (mg/kg)					<0.010
	Chrysene (mg/kg)					<0.010
	Dibenz(a,h)anthracene (mg/kg)					DLHM <0.010
	Fluoranthene (mg/kg)					<0.010
	Fluorene (mg/kg)					<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)					<0.010
	2-Methylnaphthalene (mg/kg)					DLB <0.020
	Naphthalene (mg/kg)					DLB <0.020
	Phenanthrene (mg/kg)					<0.010
	Pyrene (mg/kg)					<0.010
	Surrogate: Acenaphthene d10 (%)					83.3
	Surrogate: Chrysene d12 (%)					97.0
	Surrogate: Naphthalene d8 (%)					82.3
	Surrogate: Phenanthrene d10 (%)					93.0
	B(a)P Total Potency Equivalent (mg/kg)					<0.020
	IACR (CCME) (mg/kg)					<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-31	L1984228-32	L1984228-33	L1984228-34	L1984228-35
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
	Sampled Time	10:15	11:20	11:30	12:50	12:57
	Client ID	PDL-1	PDL-2	PDL-3	PDL-4	PDL-5
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)	503	537	471	373	462
	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	9.50	6.95	6.51	8.23	8.24
	Vanadium (V) (mg/kg)	38.7	32.7	29.7	33.1	34.8
	Zinc (Zn) (mg/kg)	85.8	79.8	75.1	74.0	77.5
	Zirconium (Zr) (mg/kg)	<1.0	1.5	1.6	<1.0	<1.0
Aggregate Organics	Mineral Oil and Grease (mg/kg)					
Hydrocarbons	EPH10-19 (mg/kg)					
	EPH19-32 (mg/kg)					
	LEPH (mg/kg)					
	HEPH (mg/kg)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)					
	Acenaphthylene (mg/kg)					
	Anthracene (mg/kg)					
	Benz(a)anthracene (mg/kg)					
	Benzo(a)pyrene (mg/kg)					
	Benzo(b&j)fluoranthene (mg/kg)					
	Benzo(b+j+k)fluoranthene (mg/kg)					
	Benzo(g,h,i)perylene (mg/kg)					
	Benzo(k)fluoranthene (mg/kg)					
	Chrysene (mg/kg)					
	Dibenz(a,h)anthracene (mg/kg)					
	Fluoranthene (mg/kg)					
	Fluorene (mg/kg)					
	Indeno(1,2,3-c,d)pyrene (mg/kg)					
	2-Methylnaphthalene (mg/kg)					
	Naphthalene (mg/kg)					
	Phenanthrene (mg/kg)					
	Pyrene (mg/kg)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					
	B(a)P Total Potency Equivalent (mg/kg)					
	IACR (CCME) (mg/kg)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-36	L1984228-37	L1984228-38	L1984228-39	L1984228-40
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	24-AUG-17				
	Sampled Time	13:10				
	Client ID	PDL-COMP	CREMP DUP-3	CREMP DUP-4	CREMP DUP-5	CREMP COMP DUP-2
Grouping	**Analyte**					
SOIL						
Metals	Titanium (Ti) (mg/kg)		680	522	723	
	Tungsten (W) (mg/kg)		0.64	0.50	0.72	
	Uranium (U) (mg/kg)		17.6	14.6	13.0	
	Vanadium (V) (mg/kg)		35.9	32.9	38.1	
	Zinc (Zn) (mg/kg)		106	81.3	98.2	
	Zirconium (Zr) (mg/kg)		1.6	<1.0	1.8	
Aggregate Organics	Mineral Oil and Grease (mg/kg)	1280				710
Hydrocarbons	EPH10-19 (mg/kg)	<480 DLHM				<300 DLHM
	EPH19-32 (mg/kg)	<480 DLHM				<300 DLHM
	LEPH (mg/kg)	<480				<300
	HEPH (mg/kg)	<480				<300
	Surrogate: 2-Bromobenzotrifluoride (%)	96.8				95.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.010 DLHM				<0.0050
	Acenaphthylene (mg/kg)	<0.010 DLHM				<0.0050
	Anthracene (mg/kg)	<0.010 DLHM				<0.0040
	Benz(a)anthracene (mg/kg)	<0.010				<0.010
	Benzo(a)pyrene (mg/kg)	<0.010				<0.010
	Benzo(b&j)fluoranthene (mg/kg)	<0.010				<0.010
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.015				<0.015
	Benzo(g,h,i)perylene (mg/kg)	<0.010				<0.010
	Benzo(k)fluoranthene (mg/kg)	<0.010				<0.010
	Chrysene (mg/kg)	<0.010				<0.010
	Dibenz(a,h)anthracene (mg/kg)	<0.010 DLHM				<0.0050
	Fluoranthene (mg/kg)	<0.010				<0.010
	Fluorene (mg/kg)	<0.010				<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010				<0.010
	2-Methylnaphthalene (mg/kg)	<0.010				<0.010
	Naphthalene (mg/kg)	<0.020 DLB				<0.010
	Phenanthrene (mg/kg)	<0.010				<0.010
	Pyrene (mg/kg)	<0.010				<0.010
	Surrogate: Acenaphthene d10 (%)	89.5				92.7
	Surrogate: Chrysene d12 (%)	99.8				105.5
	Surrogate: Naphthalene d8 (%)	87.6				91.7
	Surrogate: Phenanthrene d10 (%)	97.0				100.4
	B(a)P Total Potency Equivalent (mg/kg)	<0.020				<0.020
	IACR (CCME) (mg/kg)	<0.15				<0.15

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-1	L1984228-2	L1984228-3	L1984228-4	L1984228-5
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17	22-AUG-17
Sampled Time	14:50	15:30	16:00	16:35	17:28
Client ID	SP-1	SP-2	SP-3	SP-4	SP-5
Grouping **Analyte**					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-6	L1984228-7	L1984228-8	L1984228-9	L1984228-10
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	22-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17	23-AUG-17
Sampled Time	17:35	14:28	15:07	15:43	16:20
Client ID	SP-COMP	TPE-1	TPE-2	TPE-3	TPE-4
Grouping **Analyte**					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1984228-11	L1984228-12	L1984228-13	L1984228-14	L1984228-15
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	23-AUG-17	23-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	16:54	17:00	09:50	11:30	12:00
	Client ID	TPE-5	TPE-COMP	TPN-1	TPN-2	TPN-3
Grouping	**Analyte**					
SOIL						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-16	L1984228-17	L1984228-18	L1984228-19	L1984228-20
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	27-AUG-17	27-AUG-17	27-AUG-17	26-AUG-17	26-AUG-17
Sampled Time	12:40	13:30	13:40	09:23	10:24
Client ID	TPN-4	TPN-5	TPN-COMP	WAL-1	WAL-2
Grouping **Analyte**					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-21	L1984228-22	L1984228-23	L1984228-24	L1984228-25
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	26-AUG-17	26-AUG-17	26-AUG-17	26-AUG-17	25-AUG-17
Sampled Time	11:19	11:59	12:54	13:00	09:30
Client ID	WAL-3	WAL-4	WAL-5	WAL-COMP	INUG-1
Grouping / Analyte					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-26	L1984228-27	L1984228-28	L1984228-29	L1984228-30
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17	25-AUG-17
Sampled Time	10:27	11:02	11:45	12:20	12:30
Client ID	INUG-2	INUG-3	INUG-4	INUG-5	INUG-COMP
Grouping **Analyte**					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-31	L1984228-32	L1984228-33	L1984228-34	L1984228-35
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17	24-AUG-17
Sampled Time	10:15	11:20	11:30	12:50	12:57
Client ID	PDL-1	PDL-2	PDL-3	PDL-4	PDL-5
Grouping **Analyte**					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1984228-36	L1984228-37	L1984228-38	L1984228-39	L1984228-40
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	24-AUG-17				
Sampled Time	13:10				
Client ID	PDL-COMP	CREMP DUP-3	CREMP DUP-4	CREMP DUP-5	CREMP COMP DUP-2
Grouping / **Analyte**					
SOIL					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L1984228-41	L1984228-42	L1984228-43
Description		Other	Other	Other
Sampled Date		24-AUG-17	27-AUG-17	26-AUG-17
Sampled Time		10:00	09:20	09:00
Client ID		CREMP SWIPE-3	CREMP SWIPE-4	CREMP SWIPE-5
Grouping	**Analyte**			
SWAB				
Metals	Aluminum (Al)-Total (mg)	0.864	0.807	0.794
	Antimony (Sb)-Total (mg)	<0.020	<0.020	<0.020
	Arsenic (As)-Total (mg)	<0.020	<0.020	<0.020
	Barium (Ba)-Total (mg)	1.56	1.54	1.55
	Beryllium (Be)-Total (mg)	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Total (mg)	<0.020	<0.020	<0.020
	Cadmium (Cd)-Total (mg)	<0.0010	<0.0010	<0.0010
	Calcium (Ca)-Total (mg)	0.43	0.43	0.43
	Chromium (Cr)-Total (mg)	0.0023	0.0046	0.0065
	Cobalt (Co)-Total (mg)	<0.0010	<0.0010	<0.0010
	Copper (Cu)-Total (mg)	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Total (mg)	0.035	0.045	0.050
	Lead (Pb)-Total (mg)	<0.0040	<0.0040	<0.0040
	Lithium (Li)-Total (mg)	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg)	<0.10	<0.10	<0.10
	Manganese (Mn)-Total (mg)	0.00073	0.00106	0.00174
	Molybdenum (Mo)-Total (mg)	<0.0030	<0.0030	<0.0030
	Nickel (Ni)-Total (mg)	<0.0050	<0.0050	<0.0050
	Phosphorus (P)-Total (mg)	<0.030	<0.030	<0.030
	Potassium (K)-Total (mg)	0.85	0.90	0.90
	Selenium (Se)-Total (mg)	<0.020	<0.020	<0.020
	Silver (Ag)-Total (mg)	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg)	2.43	2.44	2.50
	Strontium (Sr)-Total (mg)	0.0105	0.0104	0.0104
	Thallium (Tl)-Total (mg)	<0.020	<0.020	<0.020
	Tin (Sn)-Total (mg)	<0.0030	<0.0030	<0.0030
	Titanium (Ti)-Total (mg)	<0.0010	<0.0010	<0.0010
	Vanadium (V)-Total (mg)	<0.0030	<0.0030	<0.0030
	Zinc (Zn)-Total (mg)	1.13	1.11	1.12

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1984228-1	SP-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-10	TPE-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-11	TPE-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-13	TPN-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-14	TPN-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-15	TPN-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-17	TPN-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-19	WAL-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-2	SP-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-20	WAL-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-21	WAL-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-22	WAL-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-23	WAL-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-25	INUG-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-26	INUG-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-27	INUG-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-28	INUG-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-29	INUG-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-3	SP-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-31	PDL-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-32	PDL-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-33	PDL-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-34	PDL-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-35	PDL-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-37	CREMP DUP-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-38	CREMP DUP-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-39	CREMP DUP-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-4	SP-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-5	SP-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-7	TPE-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-8	TPE-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L1984228-9	TPE-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)

Qualifiers for Individual Parameters Listed:

Reference Information

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLHM	Detection Limit Adjusted: Sample has High Moisture Content

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

EPH-TUMB-FID-VA	Soil	EPH in Solids by Tumbler and GCFID	BC MOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAFS.

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
LEPH/HEPH-CALC-VA	Soil	LEPHs and HEPHs	BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated
by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene
are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.

MET-MG-ICP-VA	Swab	Metals in Swab by ICPOES	NIOSH 7303/EPA 6010B

This analysis is carried out using procedures adapted from Method 7303 in the NIOSH Manual of Analytcial Methods (NMAM). The procedure involves a hot block digestion of the swab material, using a combination of nitric acid and hydrochloric acid. Instrumental analysis of the swab extract is by inductively coupled plasma - optical emission spectrophotometry (EPA 6010B).

MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

OGG-TUMB-SG-VA	Soil	Mineral Oil & Grease in Soil	CCME PETROLEUM HYDROCARBONS-GRAVIMETRIC

This analysis is carried out in accordance with the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." A subsample of the sediment/soil is extracted with 1:1 hexane:acetone using a rotary extraction apparatus. The extract undergoes a silica-gel clean-up to remove polar compounds, and is analyzed gravimetrically. Mineral Oil and Grease is equivalent to fraction F4G of the Canada-wide Standard for Petroleum Hydrocarbons.

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

PAH-TMB-H/A-MS-VA	Soil	PAH - Rotary Extraction (Hexane/Acetone)	EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

Reference Information

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

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

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

Laboratory Definition Code	**Laboratory Location**
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

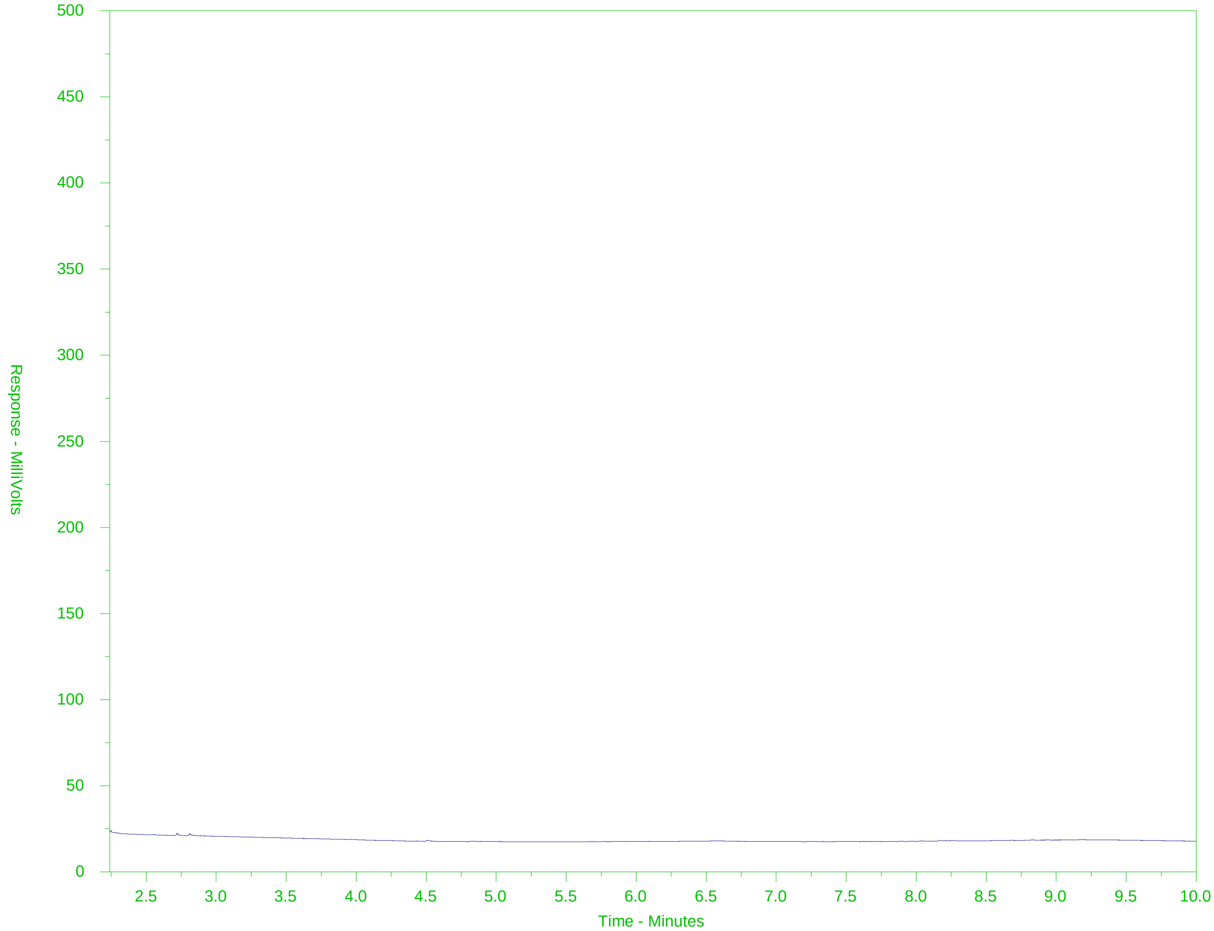
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-6
Client Sample ID: SP-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

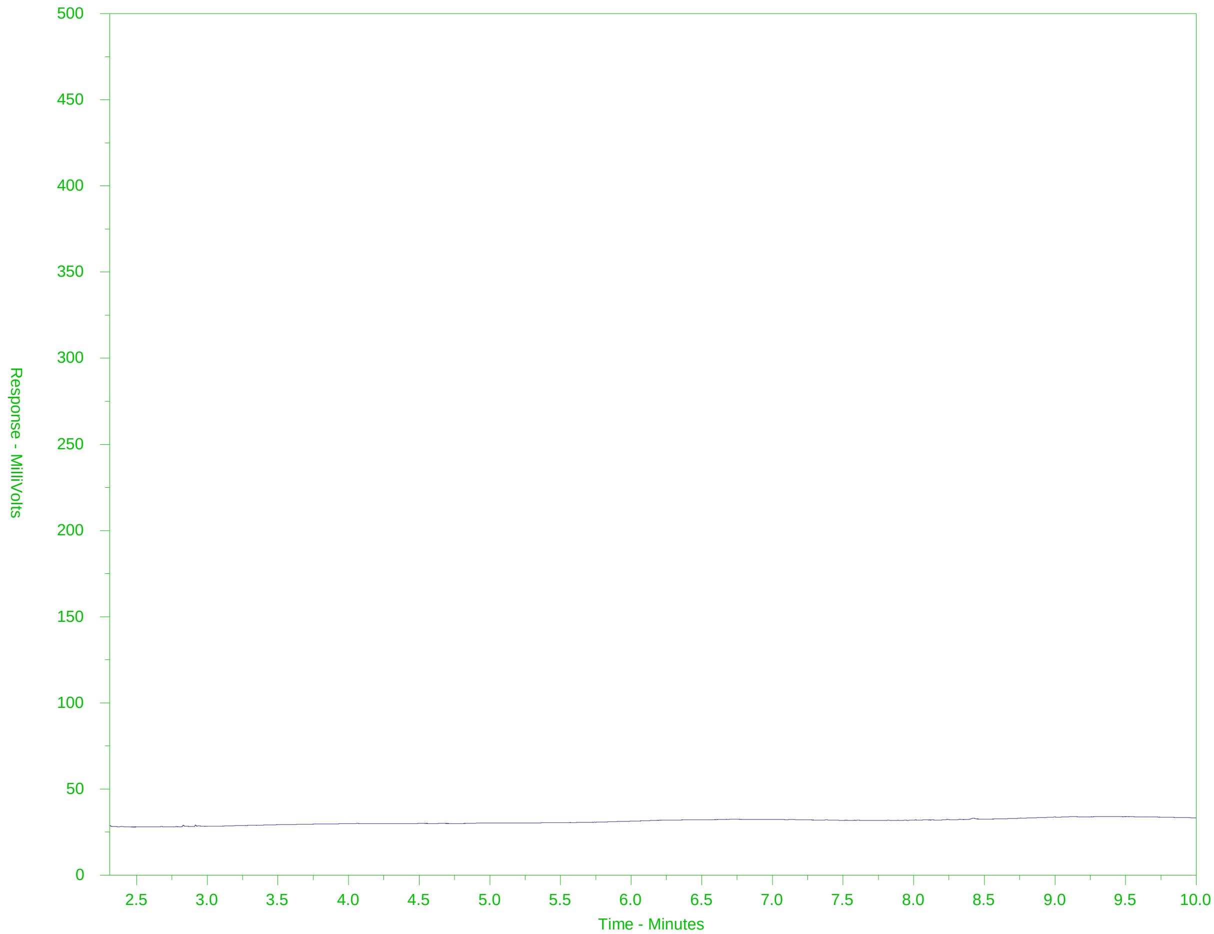
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-12
Client Sample ID: TPE-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

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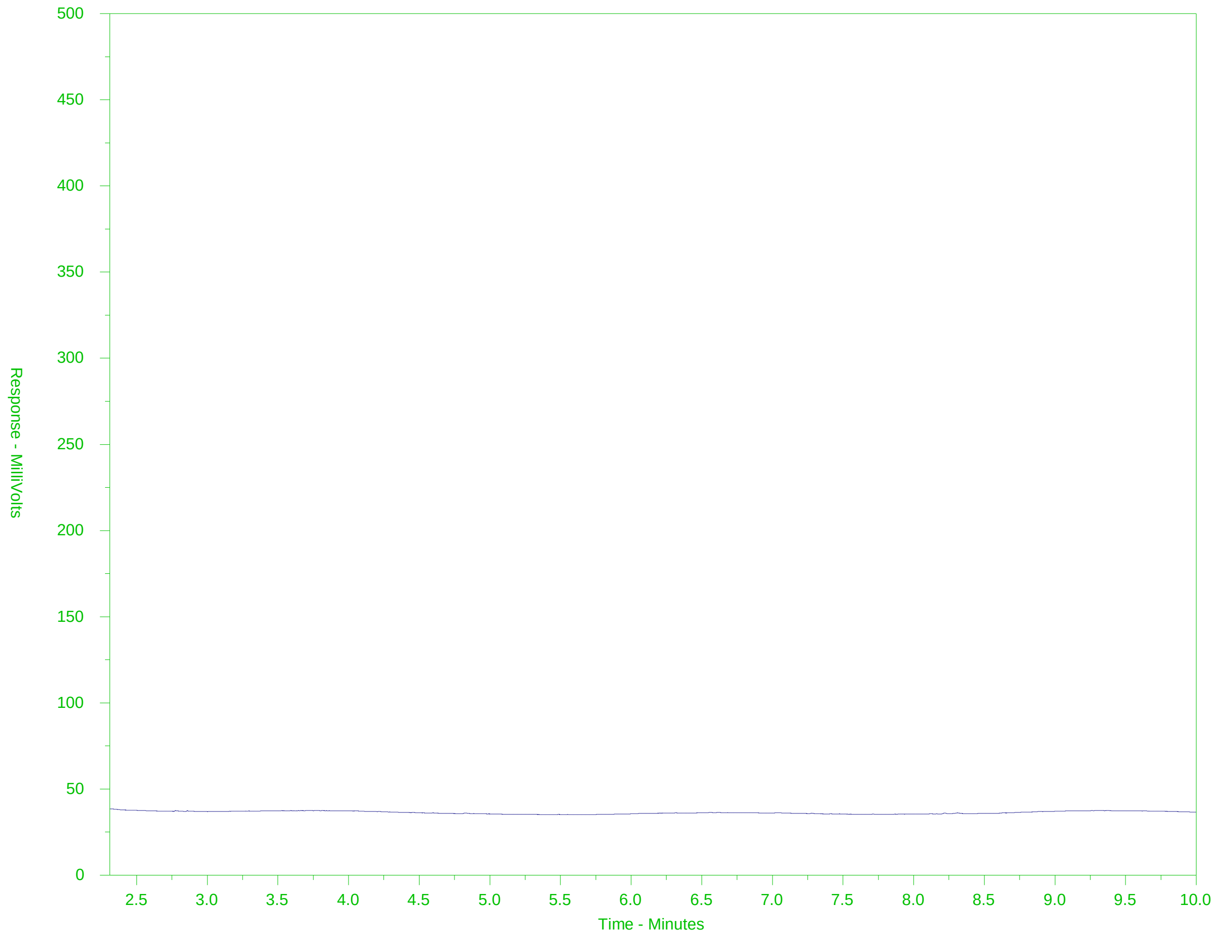
BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-18
Client Sample ID: TPN-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

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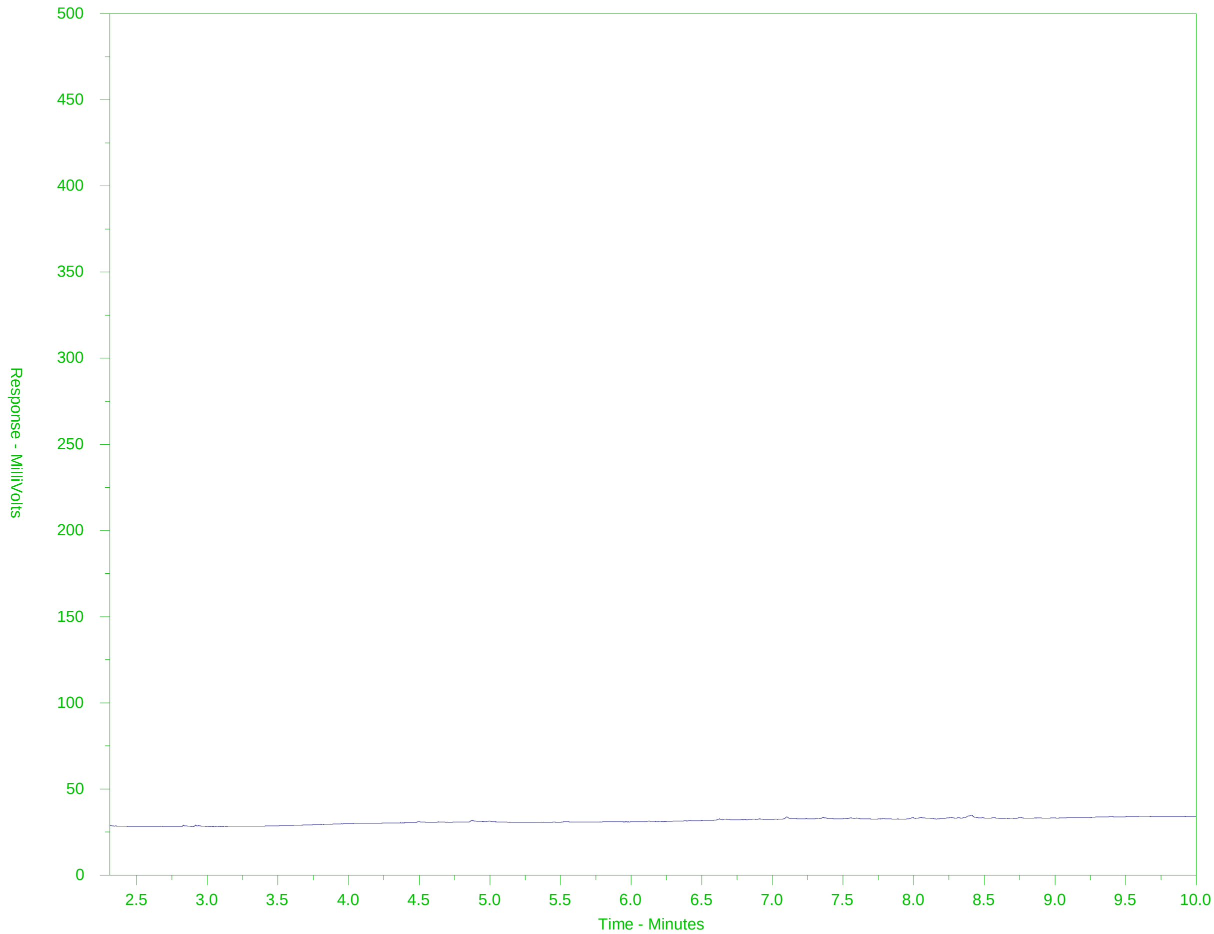
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-24
Client Sample ID: WAL-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

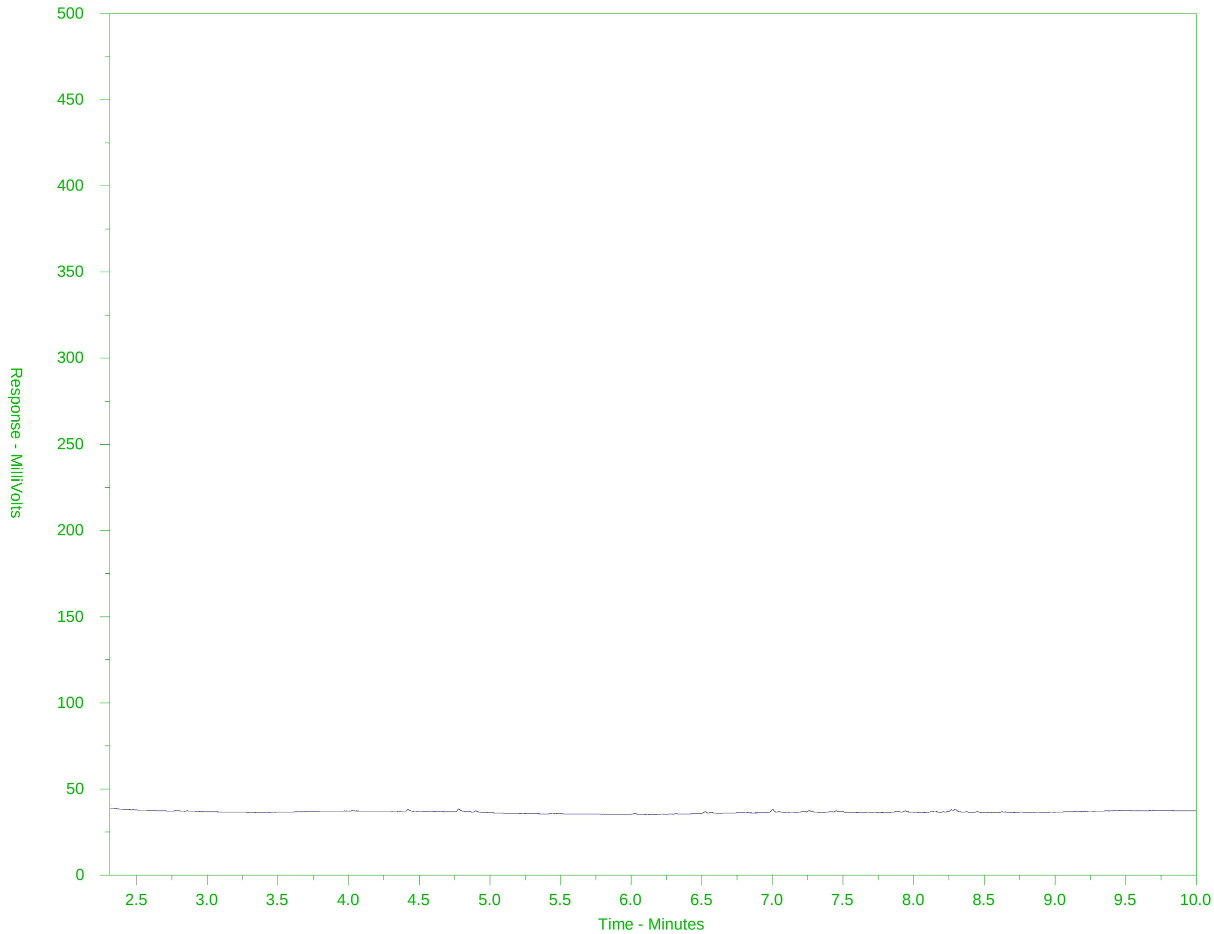
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WG2608999-4#L1984228-24
Client Sample ID: WAL-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

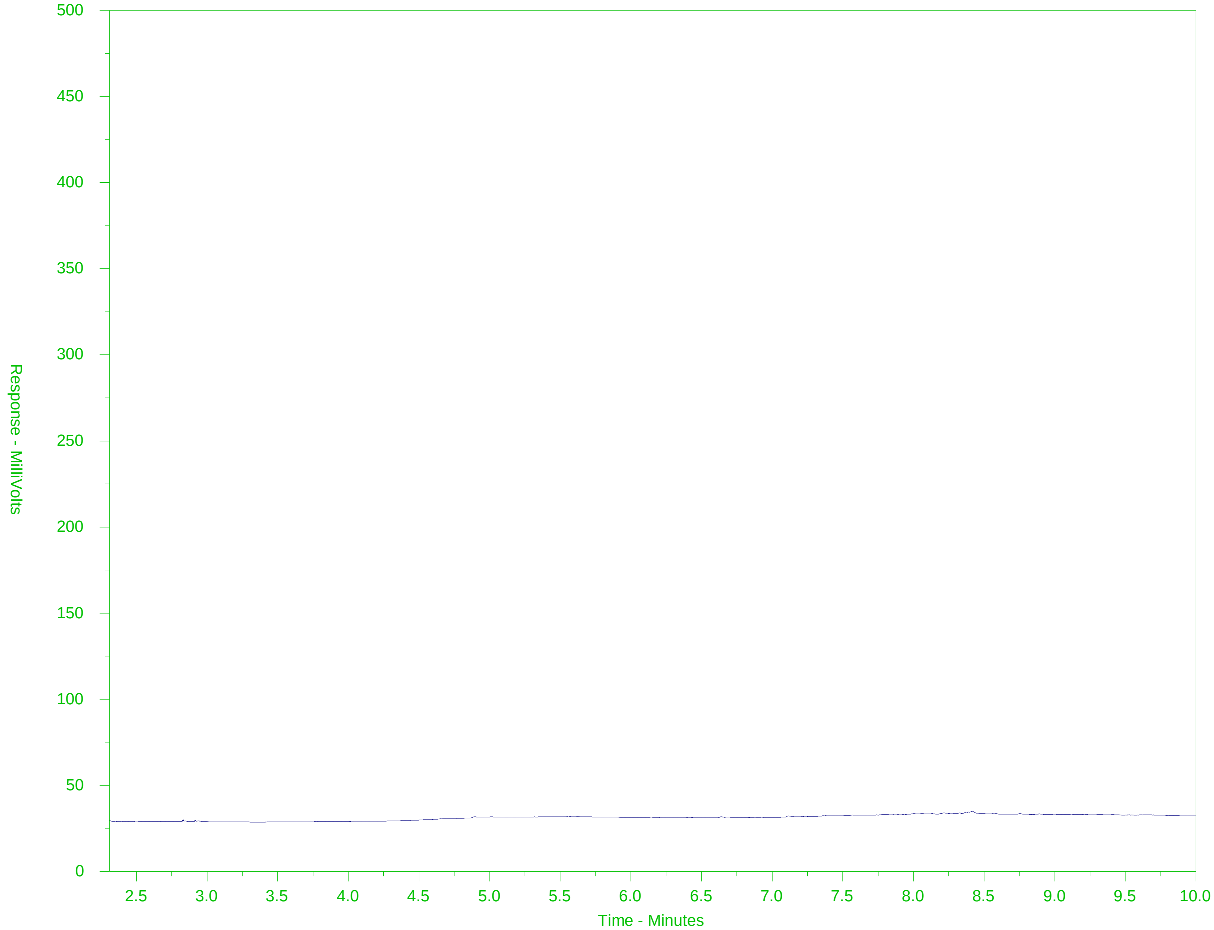
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-30
Client Sample ID: INUG-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

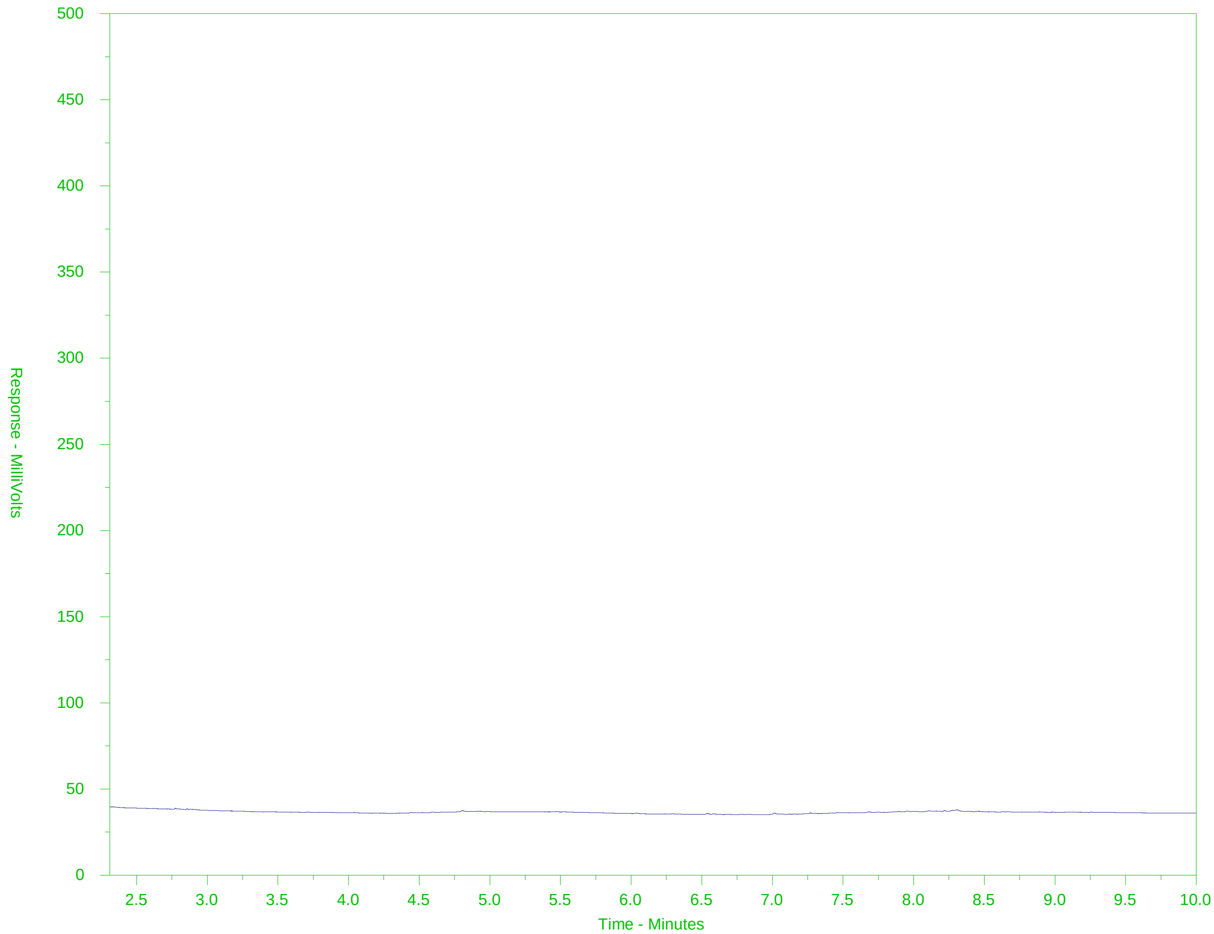
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-36
Client Sample ID: PDL-COMP



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

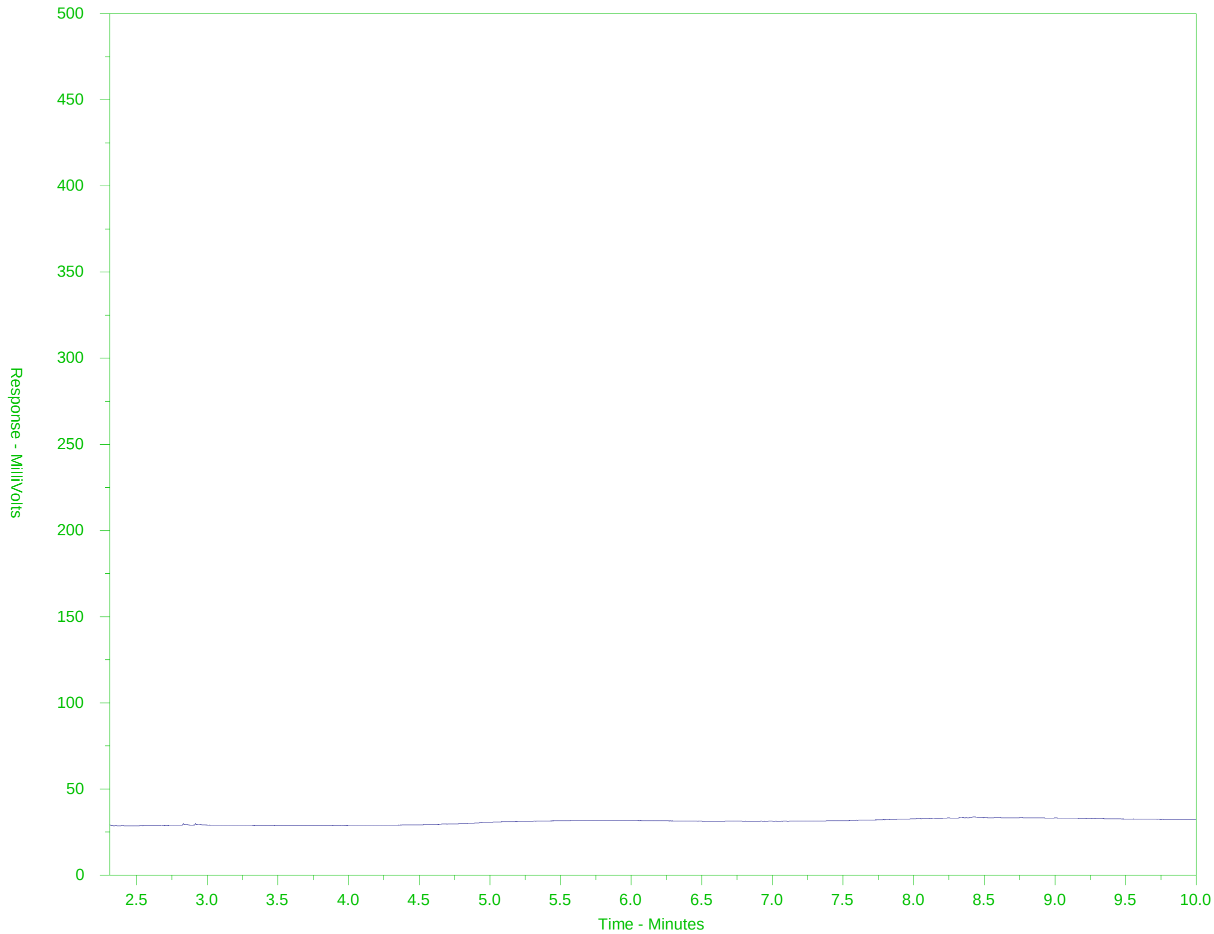
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1984228-40
Client Sample ID: CREMP COMP DUP-2



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L1984228-COFC

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

COC #

Report To
Company: Azimuth Consulting Group
Contact: Eric Franz
Address: 218-2902 West Broadway
Vancouver, BC V6K2G8
Phone: 604-730-1220 Fax:

Invoice To Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report? ☐ Yes ☑ No
Company:
Contact:
Address:
Phone: Fax:

Lab Work Order # (lab use only)

Report Format / Distribution
☐ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax
Email 1: efranz@azimuthgroup.ca
Email 2: gmann@azimuthgroup.ca
Email 3: robin.allard@agnicoeagle.com

Client / Project Information
Job #: CREMP Meadowbank Sediment
PO / AFE:
LSD:
Quote #: Q38011

ALS Contact: Brent Mack **Sampler:** Eric Franz

Service Requested (Rush for routine analysis subject to availability)
◉ Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	SP-1	22-Aug-17	14:50	Sediment	X	X		2
	SP-2	↓	15:30	Sediment	X	X		2
	SP-3	↓	16:00	Sediment	X	X		2
	SP-4	↓	16:35	Sediment	X	X		2
	SP-5	↓	17:28	Sediment	X	X		2
	SP-COMP	↓	17:35	Sediment			X	1
	TPE-1	23-Aug-17	14:28	Sediment	X	X		2
	TPE-2	↓	15:07	Sediment	X	X		2
	TPE-3	↓	15:43	Sediment	X	X		2
	TPE-4	↓	16:20	Sediment	X	X		2
	TPE-5	↓	16:54	Sediment	X	X		2
	TPE-COMP	↓	17:00	Sediment			X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 28 Aug 17	Time (hh-mm) 6:30	Received by: Dhayan	Date: Aug. 31	Time: 840	Temperature: 17, 18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

L1984228-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Meadowbank Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	TPN-1	27-Aug-17	9:50	Sediment	X	X		2
	TPN-2		11:30	Sediment	X	X		2
	TPN-3		12:00	Sediment	X	X		2
	TPN-4		12:40	Sediment	X	X		2
	TPN-5		13:30	Sediment	X	X		2
	TPN-COMP		13:40	Sediment			X	1
	WAL-1	26-Aug-17	9:23	Sediment	X	X		2
	WAL-2		10:24	Sediment	X	X		2
	WAL-3		11 19	Sediment	X	X		2
	WAL-4		11:59	Sediment	X	X		2
	WAL-5		12:54	Sediment	X	X		2
	WAL-COMP		13:00	Sediment			X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Shayan	Date: Aug. 31	Time: 840	Temperature: 17,18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1984228-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway
	Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Meadowbank Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

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- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	INUG-1	25-Aug-17	9:30	Sediment	X	X		2
	INUG-2		10:27	Sediment	X	X		2
	INUG-3		11:02	Sediment	X	X		2
	INUG-4		11:45	Sediment	X	X		2
	INUG-5		12:20	Sediment	X	X		2
	INUG-COMP		12:30	Sediment			X	1
	PDL-1	24-Aug-17	10:15	Sediment	X	X		2
	PDL-2		11:20	Sediment	X	X		2
	PDL-3		11:30	Sediment	X	X		2
	PDL-4		12:50	Sediment	X	X		2
	PDL-5		12:57	Sediment	X	X		2
	PDL-COMP		13:10	Sediment			X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Shayan	Date: Aug.31	Time: 840	Temperature: 17, 18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

L1984228-COFC

ALS

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

COC # ______

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☐ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	CREMP Meadowbank Sediment
PO / AFE:	
LSD:	
Quote #:	Q38011
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals, pH, Moisture	TOC, Grain size	PAHs, LEPHs, HEPHs, MOG	Number of Containers
	[redacted]	[redacted]						[redacted]
	[redacted]	[redacted]						[redacted]
	CREMP DUP-3	–	–	Sediment	X	X		2
	CREMP DUP-4	–	–	Sediment	X	X		2
	CREMP DUP-5	–	–	Sediment	X	X		2
	[redacted]	[redacted]						[redacted]
	CREMP COMP DUP-2	–	–	Sediment			X	1
	[redacted]	[redacted]						[redacted]
	[redacted]	[redacted]						[redacted]
	CREMP SWIPE-3	24-Aug-17	10:00	Other	X			1
	CREMP SWIPE-4	27-Aug-17	9:20	Other	X			1
	CREMP SWIPE-5	26-Aug-17	9:00	Other	X			1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Shayan	Date: Aug.31	Time: 840	Temperature: 17, 18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 17-AUG-17
Report Date: 31-AUG-17 15:01 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1976502

Project P.O. #:	NOT SUBMITTED
Job Reference:	MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:	
Legal Site Desc:	

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976502-1	L1976502-2	L1976502-3	L1976502-4	L1976502-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-AUG-17	09-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	15:30	16:30	16:50	17:25	15:45
	Client ID	BAP-51	BAP-52	BBD-51	BBD-52	BPJ-51
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.715	0.641	0.932	0.984	0.648

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976502-6	L1976502-7			
	Description	Surface Water	Surface Water			
	Sampled Date	10-AUG-17	10-AUG-17			
	Sampled Time	16:00				
	Client ID	BPJ-52	CREMP AUG DUP -1			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.701	0.574			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976502-1	L1976502-2	L1976502-3	L1976502-4	L1976502-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	09-AUG-17	09-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
	Sampled Time	15:30	16:30	16:50	17:25	15:45
	Client ID	BAP-51	BAP-52	BBD-51	BBD-52	BPJ-51
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	153	158	85.6	59.3	165
	Hardness (as CaCO3) (mg/L)	22.4	22.7	15.7	13.8	22.8
	pH (pH)	6.94	7.00	7.01	7.01	6.99
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	93	94	57	45	95
	Turbidity (NTU)	0.69	0.42	0.60	0.82	0.56
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.4	9.1	8.8	8.7	8.4
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	9.4	9.1	8.8	8.7	8.4
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	0.127	0.137	0.067	0.050	0.133
	Chloride (Cl) (mg/L)	38.0	38.8	18.6	12.0	39.3
	Fluoride (F) (mg/L)	0.061	0.061	0.055	0.054	0.060
	Nitrate (as N) (mg/L)	0.0371	0.0367	0.0241	0.0197	0.0389
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.153	0.162	0.171	0.161	0.143
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0025	<0.020 DLM	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	5.86	5.98	3.04	2.09	6.05
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.22	3.21	3.35	3.23	3.19
	Total Organic Carbon (mg/L)	3.22	3.40	3.43	3.36	3.31
Total Metals	Aluminum (Al)-Total (mg/L)	0.0118	0.0136	0.0169	0.0168	0.0134
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00012	0.00013	0.00011	0.00012	0.00013
	Barium (Ba)-Total (mg/L)	0.0170	0.0173	0.0175	0.0187	0.0175
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.011	0.011	<0.010	<0.010	0.011
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.13	3.10	2.65	2.51	3.12
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976502-6	L1976502-7			
	Description	Surface Water	Surface Water			
	Sampled Date	10-AUG-17	10-AUG-17			
	Sampled Time	16:00				
	Client ID	BPJ-52	CREMP AUG DUP -1			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	159	165			
	Hardness (as CaCO3) (mg/L)	21.9	21.0			
	pH (pH)	7.00	7.03			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	96	92			
	Turbidity (NTU)	0.72	1.05			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	9.0	9.2			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	9.0	9.2			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	0.131	0.136			
	Chloride (Cl) (mg/L)	39.4	38.0			
	Fluoride (F) (mg/L)	0.060	0.060			
	Nitrate (as N) (mg/L)	0.0390	0.0395			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.149	0.155			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020			
	Phosphorus (P)-Total (mg/L)	0.0025	<0.0020			
	Silicate (as SiO2) (mg/L)	<0.50	<0.50			
	Sulfate (SO4) (mg/L)	6.04	5.87			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.11	3.21			
	Total Organic Carbon (mg/L)	3.13	3.20			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0125	0.0125			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00012	0.00012			
	Barium (Ba)-Total (mg/L)	0.0174	0.0174			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	0.011	0.011			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	3.15	3.12			
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L1976502-1	L1976502-2	L1976502-3	L1976502-4	L1976502-5
Description		Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Sampled Date		09-AUG-17	09-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
Sampled Time		15:30	16:30	16:50	17:25	15:45
Client ID		BAP-51	BAP-52	BBD-51	BBD-52	BPJ-51
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.016	0.017	0.025	0.027	0.018
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0013	0.0014	0.0011	0.0011	0.0014
	Magnesium (Mg)-Total (mg/L)	3.15	3.31	1.99	1.69	3.36
	Manganese (Mn)-Total (mg/L)	0.00295	0.00301	0.00461	0.00417	0.00334
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	0.0000239	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000067	0.000063	<0.000050	<0.000050	0.000057
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	1.05	1.09	0.67	0.55	1.11
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.21	0.22	0.21	0.21	0.22
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	19.5	20.8	9.30	6.19	21.1
	Strontium (Sr)-Total (mg/L)	0.0300	0.0304	0.0226	0.0202	0.0305
	Sulfur (S)-Total (mg/L)	2.00	2.02	1.06	0.72	2.02
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000053	0.000056	0.000049	0.000053	0.000051
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0057	0.0056	0.0062	0.0061	0.0046
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00010	0.00013	0.00011	0.00012	0.00011
	Barium (Ba)-Dissolved (mg/L)	0.0177	0.0180	0.0184	0.0191	0.0175
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.010	0.010	<0.010	<0.010	0.012
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.43	3.15	2.71	2.56	3.68
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976502-6	L1976502-7			
	Description	Surface Water	Surface Water			
	Sampled Date	10-AUG-17	10-AUG-17			
	Sampled Time	16:00				
	Client ID	BPJ-52	CREMP AUG DUP -1			
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.019	0.017			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0012	0.0012			
	Magnesium (Mg)-Total (mg/L)	3.31	3.27			
	Manganese (Mn)-Total (mg/L)	0.00331	0.00318			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000071	0.000065			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	1.10	1.09			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	0.23	0.22			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	20.6	20.1			
	Strontium (Sr)-Total (mg/L)	0.0304	0.0299			
	Sulfur (S)-Total (mg/L)	1.91	1.91			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.000052	0.000049			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0051	0.0055			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00011	0.00013			
	Barium (Ba)-Dissolved (mg/L)	0.0180	0.0178			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	3.12	3.06			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1976502-1	L1976502-2	L1976502-3	L1976502-4	L1976502-5
		Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		Sampled Date	09-AUG-17	09-AUG-17	10-AUG-17	10-AUG-17	10-AUG-17
		Sampled Time	15:30	16:30	16:50	17:25	15:45
		Client ID	BAP-51	BAP-52	BBD-51	BBD-52	BPJ-51
Grouping	**Analyte**						
WATER							
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)		0.00040	0.00036	0.00031	0.00037	0.00040
	Iron (Fe)-Dissolved (mg/L)		<0.010	<0.010	<0.010	0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)		0.0012	0.0013	0.0012	0.0012	0.0013
	Magnesium (Mg)-Dissolved (mg/L)		3.37	3.60	2.17	1.80	3.32
	Manganese (Mn)-Dissolved (mg/L)		0.00205	0.00124	0.00191	0.00154	0.00167
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)		0.000064	0.000095	0.000093	0.000061	DTC 0.000281
	Nickel (Ni)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)		0.092	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)		1.24	1.28	0.80	0.67	1.17
	Selenium (Se)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)		0.174	0.173	0.165	0.160	0.178
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)		19.9	21.8	9.72	6.40	21.3
	Strontium (Sr)-Dissolved (mg/L)		0.0319	0.0295	0.0217	0.0193	0.0359
	Sulfur (S)-Dissolved (mg/L)		2.07	1.98	1.21	0.83	2.08
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)		0.000047	0.000044	0.000040	0.000043	0.000053
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)		0.0045	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1976502-6	L1976502-7			
	Description	Surface Water	Surface Water			
	Sampled Date	10-AUG-17	10-AUG-17			
	Sampled Time	16:00				
	Client ID	BPJ-52	CREMP AUG DUP -1			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00035	0.00035			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0011			
	Magnesium (Mg)-Dissolved (mg/L)	3.42	3.25			
	Manganese (Mn)-Dissolved (mg/L)	0.00179	0.00139			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000068	0.000087			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	1.16	1.15			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	0.184	0.170			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	21.6	20.6			
	Strontium (Sr)-Dissolved (mg/L)	0.0302	0.0292			
	Sulfur (S)-Dissolved (mg/L)	2.15	1.90			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000045	0.000044			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Zinc (Zn)-Dissolved	MB-LOR	L1976502-2, -3, -4, -5, -6, -7
Method Blank	Zinc (Zn)-Dissolved	MB-LOR	L1976502-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L1976502-1, -2
Matrix Spike	Dissolved Organic Carbon	MS-B	L1976502-3, -4, -5, -6, -7
Matrix Spike	Total Organic Carbon	MS-B	L1976502-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1976502-3, -4, -5, -6, -7
Matrix Spike	Total Organic Carbon	MS-B	L1976502-3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Total	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Phosphorus (P)-Total	MS-B	L1976502-1
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1976502-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

Reference Information

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA Water Low Level Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

L1976502-COFC

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

COC #:

Page 1 of 1

Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	gmann@azimuthgroup.ca
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	BAP-51	09-Aug-17	15:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	BAP-52	09-Aug-17	16:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	BBD-51	10-Aug-17	16:50	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	BBD-52	10-Aug-17	17:25	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	BPJ-51	10-Aug-17	15:45	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	BPJ-52	10-Aug-17	16:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	CREMP AUG DUP-1	-	-	Surface Water	X	X	X	X	X	X	X	X	X	X			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy) 13-Aug-17	Time (hh-mm) 9:00	Received by: PAUL	Date: AUG 17	Time: 08:30	Temperature: 16.8 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 01-SEP-17
Report Date: 14-SEP-17 15:46 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1985253

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1985253-1	L1985253-2	L1985253-3	L1985253-4	L1985253-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	25-AUG-17	25-AUG-17	24-AUG-17	24-AUG-17	26-AUG-17
		Sampled Time	14:26	14:02	15:30	15:50	14:10
		Client ID	INUG-92	INUG-93	PDL-57	PDL-58	WAL-75
Grouping	**Analyte**						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		0.257	0.312	0.217	0.255	0.890

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-6	L1985253-7	L1985253-8	L1985253-9	L1985253-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	13:45	16:00	15:15	16:35	17:00
	Client ID	WAL-76	TPN-106	TPN-107	TPE-106	TPE-107
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.878	0.294	0.462	0.644	0.817

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-11	L1985253-12	L1985253-13		
	Description	Water	Water	Water		
	Sampled Date	26-AUG-17	26-AUG-17			
	Sampled Time	16:00	16:20			
	Client ID	SP-106	SP-107	CREMP AUG DUP-2		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.462	0.535	0.426		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-1	L1985253-2	L1985253-3	L1985253-4	L1985253-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-AUG-17	25-AUG-17	24-AUG-17	24-AUG-17	26-AUG-17
	Sampled Time	14:26	14:02	15:30	15:50	14:10
	Client ID	INUG-92	INUG-93	PDL-57	PDL-58	WAL-75
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	15.4	15.1	19.9	22.1	55.7
	Hardness (as CaCO3) (mg/L)	5.68	5.78	8.80	8.77	22.9
	pH (pH)	6.84	6.86	7.06	7.02	7.37
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.1	<1.0	1.5
	Total Dissolved Solids (mg/L)	14.9	15.3	17.5	15.8	46
	Turbidity (NTU)	0.36	0.41	0.23	0.28	0.44
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	4.9 RRV	4.5	7.4	7.3	14.8
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	4.9	4.5	7.4	7.3	14.8
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0482
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.74	0.75	0.61	0.60	1.27
	Fluoride (F) (mg/L)	0.061	0.058	0.034	0.035	0.053
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.268
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0048
	Total Kjeldahl Nitrogen (mg/L)	0.148	0.110	0.091	0.104	0.185
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.51
	Sulfate (SO4) (mg/L)	0.86	0.87	1.65	1.65	8.29
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.75	1.88	1.67	1.62	2.30
	Total Organic Carbon (mg/L)	2.11	1.96	1.74	1.80	2.73
Total Metals	Aluminum (Al)-Total (mg/L)	0.0075	0.0072	0.0047	0.0044	0.0101
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00019
	Arsenic (As)-Total (mg/L)	0.00015	0.00015	0.00024	0.00022	0.00043
	Barium (Ba)-Total (mg/L)	0.00167	0.00176	0.00190	0.00188	0.00382
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	1.13	1.13	2.25	2.22	6.52
	Chromium (Cr)-Total (mg/L)	DLB <0.00015	DLB <0.00015	<0.00010	0.00459	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1985253-6	L1985253-7	L1985253-8	L1985253-9	L1985253-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	13:45	16:00	15:15	16:35	17:00
	Client ID	WAL-76	TPN-106	TPN-107	TPE-106	TPE-107
WATER						
Physical Tests	Conductivity (uS/cm)	54.7	25.6	25.5	27.7	27.7
	Hardness (as CaCO3) (mg/L)	22.4	8.85	8.87	10.4	10.1
	pH (pH)	7.38	6.90	6.89	7.00	6.99
	Total Suspended Solids (mg/L)	1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	39.0	19.4	19.0	20.7	21.0
	Turbidity (NTU)	0.52	0.25	0.31	0.36	0.38
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	15.0	5.9	6.1	7.2	6.8
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	15.0	5.9	6.1	7.2	6.8
	Ammonia, Total (as N) (mg/L)	0.0471	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.25	0.73	0.73	0.71	0.73
	Fluoride (F) (mg/L)	0.054	0.062	0.061	0.071	0.070
	Nitrate (as N) (mg/L)	0.253	0.0240	0.0220	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	0.0027	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.225	0.082	0.078	0.079	0.086
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	0.51	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	8.09	4.64	4.64	4.71	4.71
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.31	1.33	1.24	1.62	1.58
	Total Organic Carbon (mg/L)	2.33	1.56	1.54	1.61	1.79
Total Metals	Aluminum (Al)-Total (mg/L)	0.0117	0.0049	0.0044	0.0056	0.0053
	Antimony (Sb)-Total (mg/L)	0.00018	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00044	0.00020	0.00020	0.00048	0.00048
	Barium (Ba)-Total (mg/L)	0.00384	0.00297	0.00287	0.00285	0.00277
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	6.40	2.19	2.17	2.57	2.58
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	DLB <0.00015	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1985253-11	L1985253-12	L1985253-13	L1985253-14	L1985253-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	26-AUG-17		28-AUG-17	28-AUG-17
	Sampled Time	16:00	16:20		20:15	20:40
	Client ID	SP-106	SP-107	CREMP AUG DUP-2	CREMP AUG EB-1	DREMP AUG DI-1
WATER						
Physical Tests	Conductivity (uS/cm)	34.8	35.1	33.1	<2.0	<2.0
	Hardness (as CaCO3) (mg/L)	14.2	14.3	14.3	<0.50	<0.50
	pH (pH)	7.21	7.23	7.17	5.27	5.19
	Total Suspended Solids (mg/L)	1.1	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	23.7	25.7	25.0	<3.0	<3.0
	Turbidity (NTU)	0.47	0.34	0.26	<0.10	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.3	10.4	10.4	<1.0	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	10.3	10.4	10.4	<1.0	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.84	0.84	0.84	<0.10	<0.10
	Fluoride (F) (mg/L)	0.067	0.065	0.064	<0.020	<0.020
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.087	0.108	0.079	<0.050	<0.050
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.020 DLM	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	4.90	4.90	4.91	<0.30	<0.30
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.82	1.76	1.93	<0.50	<0.50
	Total Organic Carbon (mg/L)	2.12	1.89	1.97	<0.50	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0066	0.0065	0.0064	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00034	0.00034	0.00032	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	0.00273	0.00271	0.00265	0.000095 RRV	<0.000050
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.76	3.78	3.82	<0.050	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00015 DLB	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L1985253-1	L1985253-2	L1985253-3	L1985253-4	L1985253-5
	Sample ID	L1985253-1	L1985253-2	L1985253-3	L1985253-4	L1985253-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-AUG-17	25-AUG-17	24-AUG-17	24-AUG-17	26-AUG-17
	Sampled Time	14:26	14:02	15:30	15:50	14:10
	Client ID	INUG-92	INUG-93	PDL-57	PDL-58	WAL-75
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00062	0.00134
	Iron (Fe)-Total (mg/L)	0.014	0.017	<0.010	0.037	0.028
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	0.70	0.71	0.80	0.78	1.77
	Manganese (Mn)-Total (mg/L)	0.00201	0.00203	0.00136	0.00171	0.00452
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000060	0.00134
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00055	0.00066	0.00069	0.00055
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.40	0.37	0.37	0.81
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.18	0.18	0.17	0.15	0.26
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.601	0.596	0.525	0.527	0.968
	Strontium (Sr)-Total (mg/L)	0.00610	0.00622	0.00901	0.00888	0.0354
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	0.57	0.68	3.12
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000040	0.000039	0.000022	0.000021	0.000292
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0038	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0034	0.0011	0.0012	0.0033
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00017
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010	0.00014	0.00014	0.00034
	Barium (Ba)-Dissolved (mg/L)	0.00158	0.00164	0.00177	0.00183	0.00355
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.11	1.14	2.21	2.20	6.28
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-6	L1985253-7	L1985253-8	L1985253-9	L1985253-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	13:45	16:00	15:15	16:35	17:00
	Client ID	WAL-76	TPN-106	TPN-107	TPE-106	TPE-107
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00128	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.030	<0.010	<0.010	0.012	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.77	0.87	0.89	0.98	0.95
	Manganese (Mn)-Total (mg/L)	0.00444	0.00147	0.00150	0.00118	0.00117
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00130	0.000135	0.000151	0.000157	0.000163
	Nickel (Ni)-Total (mg/L)	0.00055	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.81	0.50	0.52	0.54	0.55
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.25	<0.10	<0.10	<0.10	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.939	1.16	1.18	1.15	1.13
	Strontium (Sr)-Total (mg/L)	0.0353	0.00987	0.00987	0.0111	0.0111
	Sulfur (S)-Total (mg/L)	3.12	1.83	1.72	1.82	1.82
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000275	0.000032	0.000033	0.000042	0.000044
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0035	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0033	0.0020	0.0019	0.0029	0.0028
	Antimony (Sb)-Dissolved (mg/L)	0.00016	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00035	0.00014	0.00013	0.00037	0.00035
	Barium (Ba)-Dissolved (mg/L)	0.00354	0.00270	0.00268	0.00261	0.00266
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	6.12	2.10	2.12	2.54	2.47
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-11	L1985253-12	L1985253-13	L1985253-14	L1985253-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	26-AUG-17		28-AUG-17	28-AUG-17
	Sampled Time	16:00	16:20		20:15	20:40
	Client ID	SP-106	SP-107	CREMP AUG DUP-2	CREMP AUG EB-1	DREMP AUG DI-1
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00062	0.00061	0.00071	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.021	0.021	0.020	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	RRV 0.000231	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.19	1.22	1.20	<0.10	<0.10
	Manganese (Mn)-Total (mg/L)	0.00220	0.00206	0.00208	<0.00010	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000178	0.000201	0.000187	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.57	0.55	0.56	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.17	0.17	0.17	<0.10	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.946	0.933	0.921	<0.050	<0.050
	Strontium (Sr)-Total (mg/L)	0.0171	0.0173	0.0173	<0.00020	<0.00020
	Sulfur (S)-Total (mg/L)	2.02	1.79	1.93	<0.50	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000046	0.000047	0.000043	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0032	0.0028	0.0026	<0.0010	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00024	0.00023	0.00023	<0.00010	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00250	0.00243	0.00258	<0.000050	<0.000050
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	3.73	3.69	3.71	<0.050	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-1	L1985253-2	L1985253-3	L1985253-4	L1985253-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-AUG-17	25-AUG-17	24-AUG-17	24-AUG-17	26-AUG-17
	Sampled Time	14:26	14:02	15:30	15:50	14:10
	Client ID	INUG-92	INUG-93	PDL-57	PDL-58	WAL-75
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00034	0.00033	0.00038	0.00040	0.00106
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.71	0.71	0.80	0.79	1.75
	Manganese (Mn)-Dissolved (mg/L)	0.00092	0.00085	0.00028	0.00025	0.00118
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.000117	0.000059	0.00133
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.36	0.37	0.33	0.33	0.74
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.134	0.141	0.119	0.117	0.205
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.570	0.566	0.500	0.504	0.913
	Strontium (Sr)-Dissolved (mg/L)	0.00667	0.00680	0.00971	0.00973	0.0358
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	0.60	0.57	2.81
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000037	0.000036	0.000018	0.000018	0.000270
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0035	0.0041	<0.0010	0.0015	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-6	L1985253-7	L1985253-8	L1985253-9	L1985253-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17	27-AUG-17
	Sampled Time	13:45	16:00	15:15	16:35	17:00
	Client ID	WAL-76	TPN-106	TPN-107	TPE-106	TPE-107
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00111	0.00033	0.00033	0.00038	0.00034
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.73	0.88	0.87	0.97	0.96
	Manganese (Mn)-Dissolved (mg/L)	0.00113	0.00078	0.00062	0.00040	0.00046
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00128	0.000159	0.000134	0.000156	0.000152
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.72	0.46	0.47	0.50	0.48
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.193	<0.050	<0.050	0.056	0.053
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.893	1.11	1.11	1.09	1.09
	Strontium (Sr)-Dissolved (mg/L)	0.0346	0.0105	0.0107	0.0117	0.0117
	Sulfur (S)-Dissolved (mg/L)	2.76	1.71	1.63	1.63	1.59
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000229	0.000030	0.000028	0.000029	0.000039
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0024	<0.0010	<0.0010	0.0019	0.0048
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1985253-11	L1985253-12	L1985253-13	L1985253-14	L1985253-15
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-17	26-AUG-17		28-AUG-17	28-AUG-17
	Sampled Time	16:00	16:20		20:15	20:40
	Client ID	SP-106	SP-107	CREMP AUG DUP-2	CREMP AUG EB-1	DREMP AUG DI-1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00059	0.00065	0.00058	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.20	1.23	1.22	<0.10	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00088	0.00071	0.00068	<0.00010	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000193	0.000269	0.000245	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.50	0.52	0.50	<0.10	<0.10
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.131	0.135	0.137	<0.050	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.881	0.895	0.885	<0.050	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.0177	0.0180	0.0179	<0.00020	<0.00020
	Sulfur (S)-Dissolved (mg/L)	1.80	1.70	1.67	<0.50	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000043	0.000042	0.000042	<0.000010	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0073	0.0017	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	MB-LOR	L1985253-1, -10, -11, -12, -13, -14, -15, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1985253-7
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1985253-14, -15
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1985253-14, -15

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

Reference Information

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

Reference Information

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

L1985253-COFC

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

COC #

Page 1 of 2

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway, Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:

Invoice To	
Same as Report ?	☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com

Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Lab Work Order # (lab use only)

Analysis Request — Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
	INUG-92	25 AUG 17	14:26	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	INUG-93	25 AUG 17	14:02	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	PDL-57	24 AUG 17	15:30	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	PDL-58	24 AUG 17	15:50	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	WAL-75	26 AUG 17	14:10	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	WAL-76	26 AUG 17	13:45	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	TPN-106	27 AUG 17	16:00	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	TPN-107	27 AUG 17	15:15	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	TPE-106	27 AUG 17	16:35	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	TPE-107	27 AUG 17	17:00	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	SP-106	26 AUG 17	16:00	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	SP-107	26 AUG 17	16:20	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy): 29 AUG 17	Time (hh-mm): 6:20	Received by: Cade	Date: Sept 1	Time: 1340	Temperature: 14.7 14.2 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

L1985253-COFC

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

COC #

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	gmann@azimuthgroup.ca
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)
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Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	CREMP AUG DUP-2	–	–	water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			10
	CREMP AUG EB-1	28AUG17	20:15	water	✓	✓	✓	✓	✓	✓	✓	✓	✓				9
	CREMP AUG DI-1	28AUG17	20:40	water	✓	✓	✓	✓	✓	✓	✓	✓	✓				9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Eric Franz	Date (dd-mmm-yy)	Time (hh-mm)	Received by: Cade	Date: Sept 1	Time: 1340	Temperature: 14.7 14.2 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 15-SEP-17
Report Date: 28-SEP-17 17:01 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1992770

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID / Description / Sampled Date / Sampled Time / Client ID	L1992770-1 / Surface Water / 09-SEP-17 / 15:00 / BPJ-53				
Grouping	**Analyte**						
WATER							
Physical Tests	Conductivity (uS/cm)		88.7				
	Hardness (as CaCO3) (mg/L)		14.9				
	pH (pH)		7.16				
	Total Suspended Solids (mg/L)		<1.0				
	Total Dissolved Solids (mg/L)		58				
	Turbidity (NTU)		0.41				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)		9.2				
	Alkalinity, Carbonate (as CaCO3) (mg/L)		<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)		<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)		9.2				
	Ammonia, Total (as N) (mg/L)		0.0134				
	Bromide (Br) (mg/L)		0.069				
	Chloride (Cl) (mg/L)		17.3				
	Fluoride (F) (mg/L)		0.053				
	Nitrate (as N) (mg/L)		0.0279				
	Nitrite (as N) (mg/L)		<0.0010				
	Total Kjeldahl Nitrogen (mg/L)		0.165				
	Orthophosphate-Dissolved (as P) (mg/L)		0.0012				
	Phosphorus (P)-Total Dissolved (mg/L)		0.0023				
	Phosphorus (P)-Total (mg/L)		0.0023				
	Silicate (as SiO2) (mg/L)		<0.50				
	Sulfate (SO4) (mg/L)		2.88				
Cyanides	Cyanide, Total (mg/L)		<0.0010				
	Cyanide, Free (mg/L)		<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)		3.39				
	Total Organic Carbon (mg/L)		3.53				
Total Metals	Aluminum (Al)-Total (mg/L)		0.0165				
	Antimony (Sb)-Total (mg/L)		<0.00010				
	Arsenic (As)-Total (mg/L)		0.00014				
	Barium (Ba)-Total (mg/L)		0.0181				
	Beryllium (Be)-Total (mg/L)		<0.000020				
	Bismuth (Bi)-Total (mg/L)		<0.000050				
	Boron (B)-Total (mg/L)		<0.010				
	Cadmium (Cd)-Total (mg/L)		<0.0000050				
	Calcium (Ca)-Total (mg/L)		2.61				
	Chromium (Cr)-Total (mg/L)		<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1992770-1
	Description	Surface Water
	Sampled Date	09-SEP-17
	Sampled Time	15:00
	Client ID	BPJ-53
Grouping	**Analyte**	
WATER		
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050
	Iron (Fe)-Total (mg/L)	0.024
	Lead (Pb)-Total (mg/L)	<0.000050
	Lithium (Li)-Total (mg/L)	0.0012
	Magnesium (Mg)-Total (mg/L)	2.10
	Manganese (Mn)-Total (mg/L)	0.00322
	Mercury (Hg)-Total (mg/L)	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000068
	Nickel (Ni)-Total (mg/L)	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050
	Potassium (K)-Total (mg/L)	0.68
	Selenium (Se)-Total (mg/L)	<0.000050
	Silicon (Si)-Total (mg/L)	0.18
	Silver (Ag)-Total (mg/L)	<0.000010
	Sodium (Na)-Total (mg/L)	9.04
	Strontium (Sr)-Total (mg/L)	0.0228
	Sulfur (S)-Total (mg/L)	0.97
	Thallium (Tl)-Total (mg/L)	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030
	Uranium (U)-Total (mg/L)	0.000047
	Vanadium (V)-Total (mg/L)	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD
	Dissolved Metals Filtration Location	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0042
	Antimony (Sb)-Dissolved (mg/L)	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00023
	Barium (Ba)-Dissolved (mg/L)	0.0178
	Beryllium (Be)-Dissolved (mg/L)	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.61
	Chromium (Cr)-Dissolved (mg/L)	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1992770-1				
	Description	Surface Water				
	Sampled Date	09-SEP-17				
	Sampled Time	15:00				
	Client ID	BPJ-53				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00028				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	2.02				
	Manganese (Mn)-Dissolved (mg/L)	0.00090				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000052				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.72				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	0.131				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	8.92				
	Strontium (Sr)-Dissolved (mg/L)	0.0224				
	Sulfur (S)-Dissolved (mg/L)	0.84				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000042				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Barium (Ba)-Dissolved	MB-LOR	L1992770-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L1992770-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1992770-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1992770-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1992770-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1992770-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1992770-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1992770-1
Matrix Spike	Sodium (Na)-Total	MS-B	L1992770-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1992770-1
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1992770-1
Matrix Spike	Sulfate (SO4)	MS-B	L1992770-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

Reference Information

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Reference Information

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

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

COC #

Report To			Report Format / Distribution	
Company:	Azimuth Consulting Group		☑Standard ☐Other	
Contact:	Eric Franz		☑PDF ☑Excel ☐Digital ☐Fax	
Address:	218-2902 West Broadway		Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8		Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220	Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No		Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No		Job #:	Meadowbank CREMP - Surfacewater
Company:			PO / AFE:	
Contact:			LSD:	
Address:				
Phone:		Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)	[redacted]		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P (P)	DOC (F/P)	T-CN (Low), Free CN (Low) (P)	Total mercury (P)	Dissolved mercury (F/P)	Total Metals (P)	Dissolved metals (F/P)	Chlorophyll-a (F)			Number of Containers
[redacted]	BPJ-53	09-Sep-17	15:00	Surface Water	X	X	X	X	X	X	X	X	X				9

L1992770-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
			AMANRAJ	SEP 15	08:40	18.3°C				

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 21-SEP-17
Report Date: 04-OCT-17 12:22 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1994955

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP - SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-1	L1994955-2	L1994955-3	L1994955-4	L1994955-5
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	09-SEP-17	14-SEP-17	14-SEP-17	16-SEP-17	16-SEP-17
	Sampled Time	15:00	15:00	16:00	16:00	17:00
	Client ID	BPJ-53	SP-108	SP-109	WAL-77	WAL-78
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.767	0.603	0.724	1.08	0.940

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-6	L1994955-7			
	Description	SURFACE WATE	SURFACE WATE			
	Sampled Date	17-SEP-17	17-SEP-17			
	Sampled Time	10:00	11:00			
	Client ID	TPN-108	TPN-109			
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.571	0.616			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-2	L1994955-3	L1994955-4	L1994955-5	L1994955-6
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	14-SEP-17	14-SEP-17	16-SEP-17	16-SEP-17	17-SEP-17
	Sampled Time	15:00	16:00	16:00	17:00	10:00
	Client ID	SP-108	SP-109	WAL-77	WAL-78	TPN-108
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	38.5	36.8	42.1	42.3	26.7
	Hardness (as CaCO3) (mg/L)	13.7	14.0	17.3	16.8	8.60
	pH (pH)	7.28	7.31	7.41	7.39	7.06
	Total Suspended Solids (mg/L)	<1.0	1.1	1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	23.2	23.7	27.3	27.0	18.0
	Turbidity (NTU)	0.30	0.32	0.36	0.35	0.26
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	10.9	11.0	13.7	14.2	6.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	10.9	11.0	13.7	14.2	6.3
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.88	0.88	0.89	0.90	0.76
	Fluoride (F) (mg/L)	0.070	0.072	0.057	0.056	0.069
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0204	0.0219	0.0185
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.122	0.105	0.121	0.119	0.073
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	4.94	4.94	5.12	5.18	4.67
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.57	1.56	2.13	2.18	1.33
	Total Organic Carbon (mg/L)	1.86	1.65	2.27	2.14	1.46
Total Metals	Aluminum (Al)-Total (mg/L)	0.0064	0.0068	0.0044	0.0047	0.0065
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00025	0.00024	0.00032	0.00033	0.00018
	Barium (Ba)-Total (mg/L)	0.00254	0.00252	0.00225	0.00228	0.00270
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	3.67	3.71	4.74	4.70	2.11
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-7				
	Description	SURFACE WATE				
	Sampled Date	17-SEP-17				
	Sampled Time	11:00				
	Client ID	TPN-109				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	26.5				
	Hardness (as CaCO3) (mg/L)	8.60				
	pH (pH)	7.06				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	17.1				
	Turbidity (NTU)	0.23				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.3				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	6.3				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	0.76				
	Fluoride (F) (mg/L)	0.071				
	Nitrate (as N) (mg/L)	0.0204				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.097				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Silicate (as SiO2) (mg/L)	<0.50				
	Sulfate (SO4) (mg/L)	4.66				
Cyanides	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.36				
	Total Organic Carbon (mg/L)	1.45				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0052				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	0.00016				
	Barium (Ba)-Total (mg/L)	0.00285				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	2.09				
	Chromium (Cr)-Total (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1994955-2	L1994955-3	L1994955-4	L1994955-5	L1994955-6
		Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
		Sampled Date	14-SEP-17	14-SEP-17	16-SEP-17	16-SEP-17	17-SEP-17
		Sampled Time	15:00	16:00	16:00	17:00	10:00
		Client ID	SP-108	SP-109	WAL-77	WAL-78	TPN-108
Grouping	**Analyte**						
WATER							
Total Metals	Cobalt (Co)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)		0.00065	0.00064	0.00091	0.00089	<0.00050
	Iron (Fe)-Total (mg/L)		0.020	0.021	0.018	0.018	<0.010
	Lead (Pb)-Total (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)		1.23	1.27	1.40	1.41	0.86
	Manganese (Mn)-Total (mg/L)		0.00225	0.00227	0.00268	0.00279	0.00156
	Mercury (Hg)-Total (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)		0.000196	0.000196	0.000438	0.000466	0.000135
	Nickel (Ni)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)		0.53	0.53	0.54	0.55	0.47
	Selenium (Se)-Total (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)		0.16	0.16	0.24	0.24	<0.10
	Silver (Ag)-Total (mg/L)		0.000032	0.000031	0.000020	0.000018	0.000020
	Sodium (Na)-Total (mg/L)		0.864	0.879	0.669	0.680	1.06
	Strontium (Sr)-Total (mg/L)		0.0177	0.0179	0.0245	0.0250	0.0100
	Sulfur (S)-Total (mg/L)		1.85	1.73	1.96	1.82	1.78
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)		0.000045	0.000045	0.000075	0.000073	0.000034
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0034	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0022	0.0028	0.0019	0.0019	0.0031
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)		0.00021	0.00022	0.00029	0.00027	0.00016
	Barium (Ba)-Dissolved (mg/L)		0.00239	0.00255	0.00223	0.00213	0.00280
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)		3.58	3.55	4.64	4.55	2.03
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-7				
	Description	SURFACE WATE				
	Sampled Date	17-SEP-17				
	Sampled Time	11:00				
	Client ID	TPN-109				
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	0.90				
	Manganese (Mn)-Total (mg/L)	0.00145				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000142				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.49				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	<0.10				
	Silver (Ag)-Total (mg/L)	0.000014				
	Sodium (Na)-Total (mg/L)	1.12				
	Strontium (Sr)-Total (mg/L)	0.0100				
	Sulfur (S)-Total (mg/L)	1.75				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Uranium (U)-Total (mg/L)	0.000035				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0031				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00016				
	Barium (Ba)-Dissolved (mg/L)	0.00281				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	2.02				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-2	L1994955-3	L1994955-4	L1994955-5	L1994955-6
	Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
	Sampled Date	14-SEP-17	14-SEP-17	16-SEP-17	16-SEP-17	17-SEP-17
	Sampled Time	15:00	16:00	16:00	17:00	10:00
	Client ID	SP-108	SP-109	WAL-77	WAL-78	TPN-108
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00050	0.00055	0.00086	0.00082	0.00033
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.17	1.26	1.38	1.32	0.86
	Manganese (Mn)-Dissolved (mg/L)	0.00084	0.00083	0.00098	0.00093	0.00068
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000175	0.000180	0.000420	0.000422	0.000128
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.50	0.53	0.54	0.52	0.49
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.127	0.130	0.209	0.201	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.814	0.871	0.658	0.633	1.09
	Strontium (Sr)-Dissolved (mg/L)	0.0170	0.0172	0.0241	0.0241	0.00969
	Sulfur (S)-Dissolved (mg/L)	1.68	1.63	1.66	1.81	1.56
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000038	0.000036	0.000065	0.000061	0.000028
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1994955-7				
	Description	SURFACE WATE				
	Sampled Date	17-SEP-17				
	Sampled Time	11:00				
	Client ID	TPN-109				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00035				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	DTC 0.000598				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	0.86				
	Manganese (Mn)-Dissolved (mg/L)	0.00080				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000177				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.49				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	1.09				
	Strontium (Sr)-Dissolved (mg/L)	0.00975				
	Sulfur (S)-Dissolved (mg/L)	1.54				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000025				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1994955-2, -3, -4, -5, -6, -7
Matrix Spike	Total Organic Carbon	MS-B	L1994955-2, -3, -4, -5, -6, -7
Matrix Spike	Mercury (Hg)-Total	MS-B	L1994955-2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1994955-2, -3, -4, -5, -6, -7
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1994955-2, -3, -4, -5, -6, -7
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1994955-2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA | Water | Diss. Mercury in Water by CVAAS or CVAFS | APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA | Water | Total Mercury in Water by CVAAS or CVAFS | EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA | Water | Dissolved Metals in Water by CRC ICPMS | APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA | Water | Total Metals in Water by CRC ICPMS | EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA | Water | Ammonia in Water by Fluorescence | APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA | Water | Ammonia in Water by Fluorescence | J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA | Water | Nitrite in Water by IC (Low Level) | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA | Water | Nitrate in Water by IC (Low Level) | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA | Water | Total P in Water by Colour | APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA | Water | Total Dissolved P in Water by Colour | APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA | Water | pH by Meter (Automated) | APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA | Water | Diss. Orthophosphate in Water by Colour | APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA | Water | Silicate by Colourimetric analysis | APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by

Reference Information

the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # ______

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	BPJ-53	09-Sep-17	15:00	Surface Water										X			1
	SP-108	14-Sep-17	15:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	SP-109	14-Sep-17	16:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	WAL-77	16-Sep-17	16:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	WAL-78	16-Sep-17	17:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPN-108	17-Sep-17	10:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	TPN-109	17-Sep-17	11:00	Surface Water	X	X	X	X	X	X	X	X	X	X			10

L1994955-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 22-SEP-17
Report Date: 03-OCT-17 17:31 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1995845

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1995845-1	L1995845-2	L1995845-3		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	18-SEP-17	18-SEP-17	06-JUL-17		
	Sampled Time	10:40	11:20			
	Client ID	TPE-108	TPE-109	BAP-49		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.513	0.489	0.423		

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1995845-1	L1995845-2			
	Description	Surface Water	Surface Water			
	Sampled Date	18-SEP-17	18-SEP-17			
	Sampled Time	10:40	11:20			
	Client ID	TPE-108	TPE-109			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	29.8	29.1			
	Hardness (as CaCO3) (mg/L)	10.1	9.99			
	pH (pH)	7.10	7.16			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	20.2	15.6			
	Turbidity (NTU)	0.29	0.29			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.8	7.8			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	7.8	7.8			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	0.75	0.76			
	Fluoride (F) (mg/L)	0.080	0.081			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.110	0.095			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020			
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020			
	Silicate (as SiO2) (mg/L)	<0.50	<0.50			
	Sulfate (SO4) (mg/L)	4.78	4.80			
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010			
	Cyanide, Free (mg/L)	<0.0010	<0.0010			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.50	1.38			
	Total Organic Carbon (mg/L)	1.51	1.56			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0058	0.0052			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00044	0.00041			
	Barium (Ba)-Total (mg/L)	0.00290	0.00272			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	2.56	2.52			
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00011			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1995845-1	L1995845-2			
	Description	Surface Water	Surface Water			
	Sampled Date	18-SEP-17	18-SEP-17			
	Sampled Time	10:40	11:20			
	Client ID	TPE-108	TPE-109			
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.000065	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Total (mg/L)	0.95	0.94			
	Manganese (Mn)-Total (mg/L)	0.00127	0.00125			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000189	0.000148			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.52	0.51			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	<0.10	<0.10			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	1.05	1.06			
	Strontium (Sr)-Total (mg/L)	0.0111	0.0111			
	Sulfur (S)-Total (mg/L)	1.67	1.64			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.000039	0.000036			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0018	0.0022			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00038	0.00037			
	Barium (Ba)-Dissolved (mg/L)	0.00258	0.00270			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	2.54	2.49			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1995845-1	L1995845-2			
	Description	Surface Water	Surface Water			
	Sampled Date	18-SEP-17	18-SEP-17			
	Sampled Time	10:40	11:20			
	Client ID	TPE-108	TPE-109			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00035	0.00037			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	0.91	0.92			
	Manganese (Mn)-Dissolved (mg/L)	0.00033	0.00050			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000148	0.000142			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.51	0.50			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	<0.050	<0.050			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.02	1.04			
	Strontium (Sr)-Dissolved (mg/L)	0.0109	0.0109			
	Sulfur (S)-Dissolved (mg/L)	1.48	1.53			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000025	0.000030			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1995845-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1995845-1, -2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Phosphorus (P)-Total Dissolved	MS-B	L1995845-1, -2
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1995845-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

Reference Information

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Michelle
Sept. 22 '17
10:50 17°C

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # ____________

Page 1 of 1

Report To		Report Format / Distribution	
Company:	Azimuth Consulting Group	☑ Standard ☐ Other	
Contact:	Eric Franz	☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
Lab Work Order # (lab use only)	[redacted]	ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
[redacted]	TPE-108	18-Sep-17	10:40	Surface Water	X	X	X	X	X	X	X	X	X	X			10
[redacted]	TPE-109	18-Sep-17	11:20	Surface Water	X	X	X	X	X	X	X	X	X	X			10
[redacted]	BAP-49	06-July-17	—	"										X			1
[redacted]																	

L1995845-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 29-SEP-17
Report Date: 12-OCT-17 16:09 (MT)
Version: FINAL

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L1999750

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1999750-1	L1999750-2	L1999750-4		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	23-SEP-17	23-SEP-17	23-SEP-17		
	Sampled Time	10:30	10:30	10:30		
	Client ID	INUG-95	INUG-94	SEPT DUP 1		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.499	0.555	0.526		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1999750-1	L1999750-2	L1999750-3	L1999750-4	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	23-SEP-17	23-SEP-17	23-SEP-17	23-SEP-17	
	Sampled Time	10:30	10:30	07:30	10:30	
	Client ID	INUG-95	INUG-94	SEPT EB 1	SEPT DUP 1	
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	15.2	15.1	<2.0	15.2	
	Hardness (as CaCO3) (mg/L)	6.01	5.69	<0.50	5.96	
	pH (pH)	6.89	6.89	5.55	6.89	
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Total Dissolved Solids (mg/L)	10.8	10.0	<3.0 RRV	6.9	
	Turbidity (NTU)	0.29	0.33	0.24	0.30	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	5.3	5.1	<1.0	5.4	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	5.3	5.1	<1.0	5.4	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.75	0.75	<0.10	0.75	
	Fluoride (F) (mg/L)	0.059	0.059	<0.020	0.060	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.108	0.111	<0.050	0.116	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	0.86	0.85	<0.30	0.88	
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.70	1.66	<0.50	1.70	
	Total Organic Carbon (mg/L)	1.59	2.13	<0.50	1.76	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0053	0.0057	0.0142	0.0059	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00014	<0.00010	
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Barium (Ba)-Total (mg/L)	0.00158	0.00159	0.000323	0.00156	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Calcium (Ca)-Total (mg/L)	1.12	1.13	0.050	1.11	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00021	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1999750-1	L1999750-2	L1999750-3	L1999750-4
		Description	Surface Water	Surface Water	Surface Water	Surface Water
		Sampled Date	23-SEP-17	23-SEP-17	23-SEP-17	23-SEP-17
		Sampled Time	10:30	10:30	07:30	10:30
		Client ID	INUG-95	INUG-94	SEPT EB 1	SEPT DUP 1
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)		<0.00050	<0.00050	0.00069	<0.00050
	Iron (Fe)-Total (mg/L)		0.011	0.011	0.028	0.012
	Lead (Pb)-Total (mg/L)		<0.000050	<0.000050	0.00302	<0.000050
	Lithium (Li)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)		0.74	0.75	<0.10	0.74
	Manganese (Mn)-Total (mg/L)		0.00191	0.00193	0.00064	0.00195
	Mercury (Hg)-Total (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)		<0.000050	<0.000050	<0.000050	0.000099
	Nickel (Ni)-Total (mg/L)		<0.00050	<0.00050	0.00134	<0.00050
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)		0.37	0.37	<0.10	0.37
	Selenium (Se)-Total (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)		0.18	0.15	<0.10	0.15
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)		0.598	0.592	<0.050	0.597
	Strontium (Sr)-Total (mg/L)		0.00651	0.00670	0.00031	0.00659
	Sulfur (S)-Total (mg/L)		<0.50	<0.50	<0.50	<0.50
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)		0.000042	0.000045	<0.000010	0.000045
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		<0.0030	<0.0030	0.0038	<0.0030
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0016	0.0018	<0.0010	0.0015
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved (mg/L)		0.00162	0.00164	0.000148	0.00169
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)		1.16	1.05	<0.050	1.13
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1999750-1	L1999750-2	L1999750-3	L1999750-4
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	23-SEP-17	23-SEP-17	23-SEP-17	23-SEP-17
	Sampled Time	10:30	10:30	07:30	10:30
	Client ID	INUG-95	INUG-94	SEPT EB 1	SEPT DUP 1
Grouping	**Analyte**				
WATER					
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00037	0.00037	0.00071	0.00035
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.00157	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.76	0.75	<0.10	0.76
	Manganese (Mn)-Dissolved (mg/L)	0.00041	0.00037	0.00033	0.00036
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00111	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.41	0.40	<0.10	0.42
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.121	0.118	<0.050	0.113
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.730	0.632	<0.050	0.601
	Strontium (Sr)-Dissolved (mg/L)	0.00655	0.00589	0.00031	0.00621
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	<0.50	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000034	0.000028	<0.000010	0.000031
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0036	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1999750-1, -2, -3, -4
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1999750-1, -2, -3, -4
Matrix Spike	Silicate (as SiO2)	MS-B	L1999750-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA	Water	Low Level Free Cyanide in water by CFA	ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA	Water	Low Level Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Report To	
Company:	Azimuth Consulting Group
Contact:	Eric Franz
Address:	218-2902 West Broadway Vancouver, BC V6K2G8
Phone:	604-730-1220 Fax:
Invoice To	Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☑ No
Company:	
Contact:	
Address:	
Phone:	Fax:
Lab Work Order # (lab use only)	

Report Format / Distribution	
☑ Standard ☐ Other	
☑ PDF ☑ Excel ☐ Digital ☐ Fax	
Email 1:	efranz@azimuthgroup.ca
Email 2:	marie-pier.marcil@agnicoeagle.com
Email 3:	robin.allard@agnicoeagle.com
Client / Project Information	
Job #:	Meadowbank CREMP - Surfacewater
PO / AFE:	
LSD:	
Quote #:	Q39503
ALS Contact:	Brent Mack
Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
	INUG-95	23-Sep-17	10:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	INUG-94	23-Sep-17	10:30	Surface Water	X	X	X	X	X	X	X	X	X	X			10
	SEPT EB 1	23-Sep-17	7:30	Surface Water	X	X	X	X	X	X	X	X	X				9
	SEPT DUP 1	23-Sep-17	10:30	Surface Water	X	X	X	X	X	X	X	X	X				9

L1999750-COFC

Special Instr- uctions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includ- es: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2,NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

Also provide

form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

the ALS location addresses phone numbers and sample container / preservation / holding time table for common analyses.

Chaya Sep. 29 850 15C

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 06-OCT-17
Report Date: 20-DEC-17 17:48 (MT)
Version: FINAL REV. 2

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2003561

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Comments:
20-DEC-2017 This report replaces the previous version and contains updated Copper data for sample ALS ID L2003561-6.

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2003561-1	L2003561-2	L2003561-3	L2003561-4	L2003561-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17
	Sampled Time	07:45	08:15	09:02	09:50	10:30
	Client ID	BBD-53	BBD-54	BPJ-54	BPJ-53	BAP-54
WATER						
Physical Tests	Conductivity (uS/cm)	24.1	24.3	25.5	27.9	36.9
	Hardness (as CaCO3) (mg/L)	10.3	10.2	10.4	10.2	10.6
	pH (pH)	7.13	7.16	7.16	7.17	7.14
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	20.1	21.4	20.6	21.9	25.2
	Turbidity (NTU)	0.46	0.58	0.88	0.65	0.53
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.3	8.5	8.6	8.7	8.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.3	8.5	8.6	8.7	8.7
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.50	1.45	1.75	2.44	4.49
	Fluoride (F) (mg/L)	0.049	0.049	0.049	0.047	0.048
	Nitrate (as N) (mg/L)	0.0274	0.0270	0.0260	0.0244	0.0216
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.135	0.132	0.120	0.152	0.154
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0025	0.0027	0.0024	0.0024	0.0022
	Phosphorus (P)-Total (mg/L)	0.0035	0.0038	0.0052	0.0039	0.0046
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	0.56	0.56	0.61	0.71	1.00
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.42	3.43	3.46	3.95	3.31
	Total Organic Carbon (mg/L)	3.55	3.38	3.70	3.41	3.56
Total Metals	Aluminum (Al)-Total (mg/L)	0.0234	0.0288	0.0412	0.0427	0.0169
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00013	0.00013	0.00015	0.00015	0.00014
	Barium (Ba)-Total (mg/L)	0.0193	0.0196	0.0249	0.0195	0.0195
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.34	2.29	2.35	2.40	2.37
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00011

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003561-6	L2003561-7	L2003561-8	L2003561-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-SEP-17	01-OCT-17	01-OCT-17	01-SEP-17
	Sampled Time	10:55	09:24	10:05	
	Client ID	BAP-53	PDL-59	PDL-60	SEPT DUP-1
Grouping	**Analyte**				
WATER					
Physical Tests	Conductivity (uS/cm)	34.8	22.4	21.5	25.5
	Hardness (as CaCO3) (mg/L)	10.7	8.43	8.56	9.94
	pH (pH)	7.17	7.13	7.15	7.18
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	25.6	14.3	13.8	21.9
	Turbidity (NTU)	0.72	0.21	0.25	1.03
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.7	7.7	7.6	8.7
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.7	7.7	7.6	8.7
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	4.25	0.62	0.62	1.75
	Fluoride (F) (mg/L)	0.049	0.035	0.035	0.047
	Nitrate (as N) (mg/L)	0.0218	<0.0050	<0.0050	0.0259
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.159	0.076	0.077	0.155
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0021	<0.0020	<0.0020	0.0028
	Phosphorus (P)-Total (mg/L)	0.0043	<0.0020	<0.0020	0.0042
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	<0.50	<0.50
	Sulfate (SO4) (mg/L)	0.96	1.67	1.68	0.60
Cyanides	Cyanide, Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Cyanide, Free (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.42	1.48	1.43	3.38
	Total Organic Carbon (mg/L)	3.41	1.50	1.58	3.53
Total Metals	Aluminum (Al)-Total (mg/L)	0.0637	0.0044	0.0053	0.0428
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00012	0.00016	0.00016	0.00013
	Barium (Ba)-Total (mg/L)	0.0195	0.00186	0.00190	0.0203
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	2.36	2.21	2.22	2.33
	Chromium (Cr)-Total (mg/L)	0.00012	<0.00010	0.00011	0.00017

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003561-1	L2003561-2	L2003561-3	L2003561-4	L2003561-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17
	Sampled Time	07:45	08:15	09:02	09:50	10:30
	Client ID	BBD-53	BBD-54	BPJ-54	BPJ-53	BAP-54
Grouping	**Analyte**					
WATER						
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00330	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.026	0.029	0.041	0.044	0.023
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	0.000119	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.15	1.15	1.17	1.19	1.26
	Manganese (Mn)-Total (mg/L)	0.00215	0.00233	0.00258	0.00266	0.00238
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	DLB <0.00015	<0.000050	DLB <0.00015
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.40	0.40	0.43	0.48
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.16	0.18	0.17	0.18	0.13
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.666	0.642	0.965	1.18	2.22
	Strontium (Sr)-Total (mg/L)	0.0162	0.0163	0.0165	0.0174	0.0172
	Sulfur (S)-Total (mg/L)	<0.50	<0.50	<0.50	<0.50	0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	0.00517	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	DLM <0.00060	0.00039	0.00070	DLM <0.00060	0.00031
	Uranium (U)-Total (mg/L)	0.000049	0.000052	0.000052	0.000052	0.000050
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0069	0.0065	0.0075	0.0068	0.0052
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00011	0.00011	0.00011	0.00011	0.00011
	Barium (Ba)-Dissolved (mg/L)	0.0187	0.0192	0.0193	0.0190	0.0186
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.31	2.27	2.34	2.27	2.29
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2003561-6	L2003561-7	L2003561-8	L2003561-9
	Description	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-SEP-17	01-OCT-17	01-OCT-17	01-SEP-17
	Sampled Time	10:55	09:24	10:05	
	Client ID	BAP-53	PDL-59	PDL-60	SEPT DUP-1
WATER					
Total Metals	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.035	<0.010	<0.010	0.053
	Lead (Pb)-Total (mg/L)	0.000078	<0.000050	<0.000050	0.000067
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.24	0.77	0.79	1.09
	Manganese (Mn)-Total (mg/L)	0.00274	0.00123	0.00119	0.00289
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	DLB <0.00015	DLB <0.00015	DLB <0.00015	DLB <0.00015
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00055	0.00056	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.48	0.35	0.36	0.43
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.15	0.15	0.15	0.18
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	2.09	0.501	0.516	0.784
	Strontium (Sr)-Total (mg/L)	0.0171	0.00903	0.00897	0.0163
	Sulfur (S)-Total (mg/L)	<0.50	0.68	0.58	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	DLM <0.00060	<0.00030	<0.00030	DLM <0.0018
	Uranium (U)-Total (mg/L)	0.000051	0.000022	0.000022	0.000054
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0036	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0062	0.0016	0.0016	0.0064
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00012	0.00016	0.00014	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0187	0.00180	0.00182	0.0189
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	2.31	2.16	2.19	2.25
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003561-1	L2003561-2	L2003561-3	L2003561-4	L2003561-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17
	Sampled Time	07:45	08:15	09:02	09:50	10:30
	Client ID	BBD-53	BBD-54	BPJ-54	BPJ-53	BAP-54
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00021	0.00022	0.00118	0.00026	0.00035
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.012	0.011	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000136	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	1.12	1.11	1.12	1.10	1.19
	Manganese (Mn)-Dissolved (mg/L)	0.00062	0.00068	0.00074	0.00070	0.00045
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	DTC 0.000167	<0.000050	0.000127	0.000056	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.38	0.38	0.39	0.42	0.46
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	0.090	0.082	0.087	0.079	0.078
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.659	0.629	0.918	1.10	2.12
	Strontium (Sr)-Dissolved (mg/L)	0.0159	0.0158	0.0159	0.0160	0.0167
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00014	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000044	0.000043	0.000047	0.000048	0.000046
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0020	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003561-6	L2003561-7	L2003561-8	L2003561-9	
	Description	Surface Water	Surface Water	Surface Water	Surface Water	
	Sampled Date	30-SEP-17	01-OCT-17	01-OCT-17	01-SEP-17	
	Sampled Time	10:55	09:24	10:05		
	Client ID	BAP-53	PDL-59	PDL-60	SEPT DUP-1	
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00029	0.00042	0.00041	0.00026	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.011	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)	1.20	0.74	0.75	1.05	
	Manganese (Mn)-Dissolved (mg/L)	0.00056	0.00034	0.00038	0.00071	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000117	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.45	0.34	0.36	0.40	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	0.079	0.108	0.112	0.086	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	2.04	0.480	0.485	0.773	
	Strontium (Sr)-Dissolved (mg/L)	0.0167	0.00863	0.00869	0.0156	
	Sulfur (S)-Dissolved (mg/L)	<0.50	0.54	0.62	<0.50	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000045	0.000017	0.000018	0.000046	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0015	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Molybdenum (Mo)-Total	MB-LOR	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L2003561-5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L2003561-5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L2003561-4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L2003561-4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2003561-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2003561-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2003561-1
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2003561-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2003561-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2003561-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2003561-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2003561-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2003561-1, -2
Matrix Spike	Cadmium (Cd)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2003561-1, -2
Matrix Spike	Copper (Cu)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2003561-1, -2
Matrix Spike	Manganese (Mn)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2003561-1, -2
Matrix Spike	Potassium (K)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2003561-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2003561-1, -2
Matrix Spike	Sulfur (S)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Total	MS-B	L2003561-3, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-L-IC-N-VA Water Chloride in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-L-CFA-VA Water Low Level Free Cyanide in water by CFA ASTM 7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-L-CFA-VA Water Low Level Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are

Reference Information

available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-LOW-VA	Water	Low Level TDS (3.0mg/L) by Gravimetric	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environ

L2003561-COFC

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

COC #

Report To			
Company:	Azimuth Consulting Group		
Contact:	Eric Franz		
Address:	218-2902 West Broadway		
	Vancouver, BC V6K2G8		
Phone:	604-730-1220	Fax:	
Invoice To	Same as Report ?	☑ Yes	☐ No
Hardcopy of Invoice with Report?		☐ Yes	☑ No
Company:			
Contact:			
Address:			
Phone:		Fax:	
Lab Work Order # (lab use only)	[redacted]		

rmat / Distribution			
☑ Standard	☐ Other		
☑ PDF	☑ Excel	☐ Digital	☐ Fax
Email 1:	efranz@azimuthgroup.ca		
Email 2:	marie-pier.marcil@agnicoeagle.com		
Email 3:	robin.allard@agnicoeagle.com		
Client / Project Information			
Job #:	Meadowbank CREMP - Surfacewater		
PO / AFE:			
LSD:			
Quote #:	Q39503		
ALS Contact:	Brent Mack	Sampler:	Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
[redacted]	BBD--53	30-Sep-17	7:45	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]	BBD-54	30-Sep-17	8:15	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]	BPJ-54	30-Sep-17	9:02	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]	BPJ-53	30-Sep-17	9:50	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]	BAP-54 → BAP53 @ 10:55	30-Sep-17	10:30	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]	PDL-59	01-Oct-17	9:24	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]	PDL-60	01-Oct-17	10:05	Surface Water	X	X	X	X	X	X	X	X	X				9
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	
[redacted]																	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

L2003561-COFC

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Tom Thomson	Date (dd-mmm-yy) 3-Oct-17	Time (hh-mm) 9:00	Received by: SC	Date: OCT - 6 2017	Time: 845AM	Temperature: 16,16 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

OCT - 6 2017

GENF 20.00 Front

AZIMUTH CONSULTING GROUP INC.
ATTN: Eric Franz
218 - 2902 West Broadway
Vancouver BC V6K 2G8

Date Received: 06-OCT-17
Report Date: 15-NOV-17 12:24 (MT)
Version: FINAL REV. 2

Client Phone: 604-730-1220

Certificate of Analysis

Lab Work Order #: L2003562

Project P.O. #: NOT SUBMITTED
Job Reference: MEADOWBANK CREMP-SURFACEWATER
C of C Numbers:
Legal Site Desc:

Comments:

15-NOV-2017 This report replaces the previous version and contains updated Chlorophyll 'a' data which was recalculated using 500mL of filtered sample.

Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003562-1	L2003562-2	L2003562-3	L2003562-4	L2003562-5
	Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	Sampled Date	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17	30-SEP-17
	Sampled Time	07:45	08:15	09:02	09:50	10:30
	Client ID	BBD-53	BBD-54	BPJ-54	BPJ-53	BAP-54
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	1.16	1.06	1.23	1.13	1.06

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2003562-6	L2003562-7	L2003562-8		
	Description	Surface Water	Surface Water	Surface Water		
	Sampled Date	01-OCT-17	01-OCT-17	30-SEP-17		
	Sampled Time	09:24	10:05	09:02		
	Client ID	PDL-59	PDL-60	SEPT-DUP-1		
Grouping	**Analyte**					
FILTER						
Plant Pigments	Chlorophyll a (ug/L)	0.652	0.570	1.15		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

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UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

L2003562-COFC

Request Form
568 9878
1

COC # ____

Report To			
Company:	Azimuth Consulting Group	☑ Standard	☐ Other
Contact:	Eric Franz	☑ PDF ☑ Excel	☐ Digital ☐ Fax
Address:	218-2902 West Broadway	Email 1:	efranz@azimuthgroup.ca
	Vancouver, BC V6K2G8	Email 2:	marie-pier.marcil@agnicoeagle.com
Phone:	604-730-1220 Fax:	Email 3:	robin.allard@agnicoeagle.com
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank CREMP - Surfacewater
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q39503
[redacted]		ALS Contact: Brent Mack	Sampler: Eric Franz

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Conventionals** see notes	TSS-Low, TDS-Low	TOC, Ammonia, TKN, Total P	DOC	T-CN (Low), Free CN (Low)	Total mercury	Dissolved mercury	Total Metals	Dissolved metals	Chlorophyll-a			Number of Containers
							P	F/P	P	P	F/P	P	F/P	F			
[redacted]	BBD--53	30-Sep-17	7:45	Surface Water										X			
[redacted]	BBD-54	30-Sep-17	8:15	Surface Water										X			
[redacted]	BPJ-54	30-Sep-17	9:02	Surface Water										X			
[redacted]	BPJ-53	30-Sep-17	9:50	Surface Water										X			
[redacted]	BAP-54 → BAP53 @ 10:55	30-Sep-17	10:30	Surface Water										X			
[redacted]	PDL-59	01-Oct-17	9:24	Surface Water										X			
[redacted]	PDL-60	01-Oct-17	10:05	Surface Water										X			
[redacted]	INUG-95	23-Sep-17	10:41	Surface Water										X			
[redacted]	INUG-94	23-Sep-17	10:00	Surface Water										X			
[redacted]	TPE-109	18-Sep-17	11:30	Surface Water										X			
[redacted]	TPE-108	18-Sep-17	11:00	Surface Water										X			
[redacted]	TPN-108	16-Sep-17	9:30	Surface Water										X			
[redacted]	TPN-109	16-Sep-17	10:30	Surface Water										X			
[redacted]	WAL-78	16-Sep-17	15:15	Surface Water										X			
[redacted]	WAL-77	16-Sep-17	15:30	Surface Water										X			
[redacted]	SP-109	14-Sep-17	14:00	Surface Water										X			
[redacted]	SP-108	14-Sep-17	14:45	Surface Water										X			
[redacted]	SEPT-DUP 1	23-Sep-17	10:00	Surface Water										X			
[redacted]	SEPT-DUP 1	30-Sep-17	9:02	Surface Water										X			

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

**Conventionals includes: Alk Species, pH, EC, Turbidity, Conductivity, Anions (F, NO2, NO3, Br, SO4), low-level Chloride, Silicate, TD-P, and Ortho-PO4.

L2003562-COFC

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Tom Thomson	3-Oct-17	9:00	JC		845AM	16,16 °C				

GENF 20.00 Front

OCT - 6 2017

APPENDIX G – 2017 LIMNOLOGY DATA

Limnology data from the 2017 CREMP.

SampleID	Station	LocationName	Date	Month	Parameter (Temp, DO, Cond, etc.)	Units	Gear / Instrument	Zone	Easting	Northing	Total Depth at Location	Ice Thickness	0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m	20 m
SP-limno	SP	Second Portage Lake	1/9/2017	January	Temperature	C	AEM probes	14W	639509	7213818	5.5	1		0.5	0.6	0.6	0.7	0.8															
SP-limno	SP	Second Portage Lake	1/9/2017	January	Cond (uS)	uS/cm	AEM probes	14W	639509	7213818	5.5	1		41	41	41	40	32															
SP-limno	SP	Second Portage Lake	1/9/2017	January	DO (mg/L)	mg/L	AEM probes	14W	639509	7213818	5.5	1		12.3	13.1	13.1	12.7	12.8															
TPN-limno	TPN	Third Portage Lake - North Basin	1/14/2017	January	Temperature	C	AEM probes	14W	636728	7215329	20	1		0.19	0.23	0.37	0.45	0.47	0.58	0.67	0.98	1.06	1.13	1.15	1.21	1.25	1.28	1.33					
TPN-limno	TPN	Third Portage Lake - North Basin	1/14/2017	January	Cond (uS)	uS/cm	AEM probes	14W	636728	7215329	20	1		9	10	10	11	11	12	14	15	17	18	20	20	22	23	23					
TPN-limno	TPN	Third Portage Lake - North Basin	1/14/2017	January	DO (mg/L)	mg/L	AEM probes	14W	636728	7215329	20	1		14.6	14.8	14.9	14.3	14.2	13.8	13.5	13.4	13.2	13	12.7	12.8	12.6	12.6	12.6					
WAL-limno	WAL	Wally Lake	1/14/2017	January	Temperature	C	AEM probes	15W	360456	7221176	5.2	1		0.19	0.22	0.38	0.63	1.03															
WAL-limno	WAL	Wally Lake	1/14/2017	January	Cond (uS)	uS/cm	AEM probes	15W	360456	7221176	5.2	1		10	11	12	10	27															
WAL-limno	WAL	Wally Lake	1/14/2017	January	DO (mg/L)	mg/L	AEM probes	15W	360456	7221176	5.2	1		7.4	6.4	5.6	5.4	7.7															
TPE-limno	TPE	Third Portage Lake - East Basin	1/24/2017	January	Temperature	C	AEM probes	14W	639105	7212277	16	1		0.8	1	1.3	1.4	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.8	1.9	2	2					
TPE-limno	TPE	Third Portage Lake - East Basin	1/24/2017	January	Cond (uS)	uS/cm	AEM probes	14W	639105	7212277	16	1		24	22	22	21	20	20	20	20	20	21	20	20	21	20	20					
TPE-limno	TPE	Third Portage Lake - East Basin	1/24/2017	January	DO (mg/L)	mg/L	AEM probes	14W	639105	7212277	16	1		13.7	12.4	12.1	11.7	11.8	11.6	11.4	11	10.8	11	11.1	10.8	10.5	10.5	10.6					
TPN-limno	TPN	Third Portage Lake - North Basin	2/13/2017	February	Temperature	C	AEM probes	14W	636784	7214034	11	1		0.26	0.42	0.53	0.62	0.78	0.9	1	1.04	1.14	1.2										
TPN-limno	TPN	Third Portage Lake - North Basin	2/13/2017	February	Cond (uS)	uS/cm	AEM probes	14W	636784	7214034	11	1		30	28	27	26	25	24	24	24	23	22										
TPN-limno	TPN	Third Portage Lake - North Basin	2/13/2017	February	DO (mg/L)	mg/L	AEM probes	14W	636784	7214034	11	1		14.4	14.7	14.8	14.8	14.6	14.5	14.3	14	14.2	14.2										
SP-limno	SP	Second Portage Lake	2/13/2017	February	Temperature	C	AEM probes	14W	639987	7213809	13	1		0.43	0.85	1.09	1.34	1.46	1.5	1.56	1.61	1.64	1.7	1.87	2.17								
SP-limno	SP	Second Portage Lake	2/13/2017	February	Cond (uS)	uS/cm	AEM probes	14W	639987	7213809	13	1		31	29	29	28	28	29	29	29	29	29	30	30								
SP-limno	SP	Second Portage Lake	2/13/2017	February	DO (mg/L)	mg/L	AEM probes	14W	639987	7213809	13	1		14.4	15	15.2	15.1	14.7	14.5	14.2	14.1	13.9	13.8	13.7									
TPE-limno	TPE	Third Portage Lake - East Basin	2/13/2017	February	Temperature	C	AEM probes	14W	638965	7211485	8	1		0.28	0.66	0.91	1.16	1.36	1.49	1.56													
TPE-limno	TPE	Third Portage Lake - East Basin	2/13/2017	February	Cond (uS)	uS/cm	AEM probes	14W	638965	7211485	8	1		27	25	22	22	21	22	21													
TPE-limno	TPE	Third Portage Lake - East Basin	2/13/2017	February	DO (mg/L)	mg/L	AEM probes	14W	638965	7211485	8	1		17.5	17.7	16.9	16.4	15.5	14.4														
WAL-limno	WAL	Wally Lake	2/25/2017	February	Temperature	C	AEM probes	15W	362040	7223476	5	1		1.2	1.4	1.4	1.3																
WAL-limno	WAL	Wally Lake	2/25/2017	February	Cond (uS)	uS/cm	AEM probes	15W	362040	7223476	5	1		44	45	44	39																
WAL-limno	WAL	Wally Lake	2/25/2017	February	DO (mg/L)	mg/L	AEM probes	15W	362040	7223476	5	1		13.7	12.7	12.7	11.8																
TPE-100	TPE	Third Portage Lake - East Basin	3/24/2017	March	Temperature	C	AEM probes	14W	637784	7210265	20	1		1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2	2.1	2.2	2.4	2.9					
TPE-100	TPE	Third Portage Lake - East Basin	3/24/2017	March	Cond (uS)	uS/cm	AEM probes	14W	637784	7210265	20	1		27	26	25	24	24	23	23	23	23	22	22	22	21	22	22					
TPE-100	TPE	Third Portage Lake - East Basin	3/24/2017	March	DO (mg/L)	mg/L	AEM probes	14W	637784	7210265	20	1		14	13.2	12.6	12.2	11.9	11.8	11.5	11.1	10.9	10.5	10.5	10.3	10.1	9.6	9.5					
TPE-101	TPE	Third Portage Lake - East Basin	3/24/2017	March	Temperature	C	AEM probes	14W	639309	7210415	5.2	1		1	1.4	1.6	1.9	2.5															
TPE-101	TPE	Third Portage Lake - East Basin	3/24/2017	March	Cond (uS)	uS/cm	AEM probes	14W	639309	7210415	5.2	1		28	27	25	23	22															
TPE-101	TPE	Third Portage Lake - East Basin	3/24/2017	March	DO (mg/L)	mg/L	AEM probes	14W	639309	7210415	5.2	1		16.9	15.6	14.7	14	13.6															
TPN-100	TPN	Third Portage Lake - North Basin	3/25/2017	March	Temperature	C	AEM probes	14W	635693	7212774	5.5	1		0.6	0.8	0.9	1	1.2															
TPN-100	TPN	Third Portage Lake - North Basin	3/25/2017	March	Cond (uS)	uS/cm	AEM probes	14W	635693	7212774	5.5	1		29	28	27	26	26															
TPN-100	TPN	Third Portage Lake - North Basin	3/25/2017	March	DO (mg/L)	mg/L	AEM probes	14W	635693	7212774	5.5	1		16.5	15.9	15.3	14.9	13															
TPN-101	TPN	Third Portage Lake - North Basin	3/25/2017	March	Temperature	C	AEM probes	14W	634929	7214061	20	1		0.7	0.8	0.9	1	1.1	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.9	1.9					
TPN-101	TPN	Third Portage Lake - North Basin	3/25/2017	March	Cond (uS)	uS/cm	AEM probes	14W	634929	7214061	20	1		25	24	23	22	22	21	21	21	21	21	21	20	20	19	18					
TPN-101	TPN	Third Portage Lake - North Basin	3/25/2017	March	DO (mg/L)	mg/L	AEM probes	14W	634929	7214061	20	1		15.7	15.1	14.6	14.2	14	13.8	13.6	13.4	13.4	13.2	13.2	13	12.9	12.6	12.2					
TPS-57	TPS	Third Portage Lake - South Basin	3/25/2017	March	Temperature	C	AEM probes	14W	635700	7209458	9	1		0.6	0.7	0.8	1	1.1	1.2	1.3	1.6												
TPS-57	TPS	Third Portage Lake - South Basin	3/25/2017	March	Cond (uS)	uS/cm	AEM probes	14W	635700	7209458	9	1		28	27	26	24	23	23	23	22												
TPS-57	TPS	Third Portage Lake - South Basin	3/25/2017	March	DO (mg/L)	mg/L	AEM probes	14W	635700	7209458	9	1		16.9	15.3	14.7	14.2	13.8	13.4	12.8	11.4												
TPS-58	TPS	Third Portage Lake - South Basin	3/25/2017	March	Temperature	C	AEM probes	14W	633897	7209398	20	1		0.4	0.5	0.5	0.6	0.7	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8					
TPS-58	TPS	Third Portage Lake - South Basin	3/25/2017	March	Cond (uS)	uS/cm	AEM probes	14W	633897	7209398	20	1		27	25	24	23	22	21	21	21	20	20	20	20	19	19	18					
TPS-58	TPS	Third Portage Lake - South Basin	3/25/2017	March	DO (mg/L)	mg/L	AEM probes	14W	633897	7209398	20	1		16.2	15.9	14.8	14.6	14.3	13.8	13.5	13.4	13.3	13.3	13.2	13.2	13	12.7	12.1					
SP-100	SP	Second Portage Lake	3/26/2017	March	Temperature	C	AEM probes	14W	639936	7213808	10	1		0.7	1	1.2	1.2	1.3	1.4	1.5	1.5	1.6											
SP-100	SP	Second Portage Lake	3/26/2017	March	Cond (uS)	uS/cm	AEM probes	14W	639936	7213808	10	1		35	35	34	33	33	32	32	32	31											
SP-100	SP	Second Portage Lake	3/26/2017	March	DO (mg/L)	mg/L	AEM probes	14W	639936	7213808	10	1		15	13.8	13.3	12.7	12.6	12.5	12.1	11.9	10.1											
SP-101	SP	Second Portage Lake	3/26/2017	March	Temperature	C	AEM probes	14W	640295	7212545	12	1		0.7	1	1.2	1.5	1.7	1.8	2	2.1	2.1	2.1	2.3									
SP-101	SP	Second Portage Lake	3/26/2017	March	Cond (uS)	uS/cm	AEM probes	14W	640295	7212545	12	1		36	35	34	34	33	33	33	33	33	34	35									
SP-101	SP	Second Portage Lake	3/26/2017	March	DO (mg/L)	mg/L	AEM probes	14W	640295	7212545	12	1		15.3	14.8	13.2	12.8	12.2	11.5	10.9	9.9	8.9	7.7	8.3									
WAL-69	WAL	Wally Lake	3/26/2017	March	Temperature	C	AEM probes	15W	360997	7221932	9	1		0.4	1.2	1.7	2.3	2.4	2.5	2.6	2.6												
WAL-69	WAL	Wally Lake	3/26/2017	March	Cond (uS)	uS/cm	AEM probes	15W	360997	7221932	9	1		59	55	53	48	47	47	47	46												
WAL-69	WAL	Wally Lake	3/26/2017	March	DO (mg/L)	mg/L	AEM probes	15W	360997	7221932	9	1		15.5	13.3	12.3	12	12.1	12.1	11.8	12												
WAL-70	WAL	Wally Lake	3/26/2017	March	Temperature	C	AEM probes	15W	360422	7221447	5.2	1		0.4	1	1.7	1.9																
WAL-70	WAL	Wally Lake	3/26/2017	March	Cond (uS)	uS/cm	AEM probes	15W	360422	7221447	5.2	1		59	56	53	50																
WAL-70	WAL	Wally Lake	3/26/2017	March	DO (mg/L)	mg/L	AEM probes	15W	360422	7221447	5.2	1		14.5	13.6	12.4	11.3																
PDL-51	PDL	Pipedream Lake	3/27/2017	March	Temperature	C	Azi ProPlus	14W	631261	7225119	22.4	1			0.48	0.6	0.67	0.75	0.84	0.91	0.96	0.99	1.02	1.04	1.09	1.1	1.4	1.6					
PDL-51	PDL	Pipedream Lake	3/27/2017	March	Cond (uS)	uS/cm	Azi ProPlus	14W	631261	7225119	22.4	1			17	17	16	16	16	16	16	16	16	17	18	19	20	24					
PDL-51	PDL	Pipedream Lake	3/27/2017	March	DO (mg/L)	mg/L	Azi ProPlus	14W	631261	7225119	22.4	1			13.9	13.8	13.6	13.5	13.6	13.5	13.6	13.6	13.5	13.4	13.4	13.3	13.3	13.5					
PDL-52	PDL	Pipedream Lake	3/27/2017	March	Temperature	C	Azi ProPlus	14W	632532	7224780	17.8	1			0.54	0.63	0.69	0.77	0.83	0.89	0.93	0.98	1.02	1.05	1.08	1.12	1.14	1.2					
PDL-52	PDL	Pipedream Lake	3/27/2017	March	Cond (uS)	uS/cm	Azi ProPlus	14W	632532	7224780	17.8	1			20	19	19	18	19	20	20	20	19	19	19	19	20	20					
PDL-52	PDL	Pipedream Lake	3/27/2017	March	DO (mg/L)	mg/L	Azi ProPlus	14W	632532	7224780	17.8	1			14.9	14.3	14.4	14.4	14.4	14.3	14.1	14.2	14.1	14	13.9	14	13.8	13.9					
INUG-86	INUG	Inuggugayualik Lake	3/29/2017	March	Temperature	C	Azi ProPlus	14W	621994	7215673		1																					
INUG-86	INUG	Inuggugayualik Lake	3/29/2017	March	Cond (uS)	uS/cm	Azi ProPlus	14W	621994	7215673		1																					
INUG-86	INUG	Inuggugayualik Lake	3/29/2017	March	DO (mg/L)	mg/L	Azi ProPlus	14W	621994	7215673		1																					
INUG-87	INUG	Inuggugayualik Lake	3/29/2017	March	Temperature	C	Azi ProPlus	14W	622413	7215739	15.1	1			1.01	1.3	1.49	1.7	1.87	2.02	2.21	2.34	2.48	2.59	2.74	2.97	3.21						
INUG-87	INUG	Inuggugayualik Lake	3/29/2017	March	Cond (uS)	uS/cm	Azi ProPlus	14W	622413	7215739	15.1	1			11	10	11	11	11	11	11	12	12	13	12	13	12						
INUG-87	INUG	Inuggugayualik Lake	3/29/2017	March	DO (mg/L)	mg/L	Azi ProPlus	14W	622413	7215739	15.1	1			13.5	12.4	12.1	12	12.1	11.3	10.6	10.4	9.9	9.2	8.4	7.6	7.3						
TE-92	TE	Tehek Lake	3/29/2017	March	Temperature	C	Azi ProPlus	15W	360304	7213011	5.2	1			0.34	0.46	0.59	0.74															
TE-92	TE	Tehek Lake	3/29/2017	March	Cond (uS)	uS/cm	Azi ProPlus	15W	360304	7213011	5.2	1			28	29	30	30															
TE-92	TE	Tehek Lake	3/29/2017	March	DO (mg/L)	mg/L	Azi ProPlus	15W	360304	7213011	5.2	1			17.5	17.1	17.4	16.9															
TE-93	TE	Tehek Lake	3/29/2017	March	Temperature	C	Azi ProPlus	15W	360937	7212444	13.7	1			0.42	0.55	0.65	0.84	1.11	1.46	1.73	1.97	2.12	2.24	2.42	2.65							
TE-93	TE	Tehek Lake	3/29/2017	March	Cond (uS)	uS/cm	Azi ProPlus	15W	360937	7212444	13.7	1			22	24	26	27	26	24	23	23	23	23	23	23							
TE-93	TE	Tehek Lake	3/29/2017	March	DO (mg/L)	mg/L	Azi ProPlus	15W	360937	7212444	13.7	1			16.4	15.4	15	14	12.8	11.8	11.3	11	10.4	10	9.8	7.9							
TEFF-45	TEFF	Tehek Lake - Farfield	3/29/2017	March	Temperature	C	Azi ProPlus	15W	362460	7208990	10.5	1			0.32	0.59	0.76	1	1.25	1.57	1.99	2.33	2.56										
TEFF-45	TEFF	Tehek Lake - Farfield	3/29/2017	March	Cond (uS)	uS/cm	Azi ProPlus	15W	362460	7208990	10.5	1			17	15	16	18	18	17	15	15	15										
TEFF-45	TEFF	Tehek Lake - Farfield	3/29/2017	March	DO (mg/L)	mg/L	Azi ProPlus	15W	362460	7208990	10.5	1			17.2	15.9	14.7	14.5	12.7	12.4	10.7	10.1	10.2										
TEFF-46	TEFF	Tehek Lake - Farfield	3/29/2017	March	Temperature	C	Azi ProPlus	15W	362459	7209503	8.7	1			0.47	0.76	0.83	1.01	1.27	1.73	2.06												
TEFF-46	TEFF	Tehek Lake - Farfield	3/29/2017	March	Cond (uS)	uS/cm	Azi ProPlus	15W	362459	7209503	8.7	1			13	13	14	18	18	15	14												
TEFF-46	TEFF	Tehek Lake - Farfield	3/29/2017	March	DO (mg/L)	mg/L	Azi ProPlus	15W	362459	7209503	8.7	1			15.8	15.1	14.5	13.6	12.2	12.5	12												
TPN-limno	TPN	Third Portage Lake - North Basin	4/13/2017	April	Temperature	C	AEM Hanna	14W	636658	7214370	11	1		0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.5										
TPN-limno	TPN	Third Portage Lake - North Basin	4/13/2017	April	Cond (uS)	uS/cm	AEM Hanna	14W	636658	7214370	11	1		34	35	29	28	28	19	20	20	20	19										
TPN-limno	TPN	Third Portage Lake - North Basin	4/13/2017	April	DO (mg/L)	mg/L	AEM Hanna	14W	636658	7214370	11	1		14.8	14.2	13.4	13.1	12.8	12.5	12.3	12.2	12	11.9										
TPE-limno	TPE	Third Portage Lake - East Basin	4/13/2017	April	Temperature	C	AEM Hanna	14W	639019	7212324	5.5	1		0.7	0.9	1	1	0.9															
TPE-limno	TPE	Third Portage Lake - East Basin	4/13/2017	April	Cond (uS)	uS/cm	AEM Hanna	14W	639019	7212324	5.5	1		31	32	32	31	29															
TPE-limno	TPE	Third Portage Lake - East Basin	4/13/2017	April	DO (mg/L)	mg/L	AEM Hanna	14W	639019	7212324	5.5	1		14.6	14.3	13.6	13.3	13.2															

Limnology data from the 2017 CREMP.

SampleID	Station	LocationName	Date	Month	Parameter (Temp, DO, Cond, etc.)	Units	Gear / Instrument	Zone	Easting	Northing	Total Depth at Location	Ice Thickness	0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m	20 m
SP-limno	SP	Second Portage Lake	4/13/2017	April	Temperature	C	AEM Hanna	14W	640705	7213263	7.3	1		0.7	1.1	1.2	1.3	1.3	1.3	1.3													
SP-limno	SP	Second Portage Lake	4/13/2017	April	Cond (uS)	uS/cm	AEM Hanna	14W	640705	7213263	7.3	1		32	32	31	33																
SP-limno	SP	Second Portage Lake	4/13/2017	April	DO (mg/L)	mg/L	AEM Hanna	14W	640705	7213263	7.3	1		14.4	13.8	13.2	12.8	12.5	12.3	12.2													
WAL-limno	WAL	Wally Lake	4/15/2017	April	Temperature	C	AEM Hanna	15W	362095	7223548	7	1		1.5	1.9	2.1	2.2	2.4	2.6														
WAL-limno	WAL	Wally Lake	4/15/2017	April	Cond (uS)	uS/cm	AEM Hanna	15W	362095	7223548	7	1		63.6	55.4	52.3	51.1	50.4															
WAL-limno	WAL	Wally Lake	4/15/2017	April	DO (mg/L)	mg/L	AEM Hanna	15W	362095	7223548	7	1		12.5	12.2	12	11.8	11.7	12.1														
TPE-102	TPE	Third Portage Lake - East Basin	5/4/2017	May	Temperature	C	AEM probes	14W	639203	7210740	5			0.6	0.9	1.1	1.2	1.2															
TPE-102	TPE	Third Portage Lake - East Basin	5/4/2017	May	Cond (uS)	uS/cm	AEM probes	14W	639203	7210740	5																						
TPE-102	TPE	Third Portage Lake - East Basin	5/4/2017	May	DO (mg/L)	mg/L	AEM probes	14W	639203	7210740	5			15.3	14.5	14.2	12.8	12.2															
TPE-103	TPE	Third Portage Lake - East Basin	5/4/2017	May	Temperature	C	AEM probes	14W	638605	7211031	5			0.9	0.9	1.4	2.1																
TPE-103	TPE	Third Portage Lake - East Basin	5/4/2017	May	Cond (uS)	uS/cm	AEM probes	14W	638605	7211031	5			34	32	30	30																
TPE-103	TPE	Third Portage Lake - East Basin	5/4/2017	May	DO (mg/L)	mg/L	AEM probes	14W	638605	7211031	5			15.1	14.5	13.5	12.2																
SP-102	SP	Second Portage Lake	5/5/2017	May	Temperature	C	AEM probes	14W	640147	7214182	10.3			0.7	0.9	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.2										
SP-102	SP	Second Portage Lake	5/5/2017	May	Cond (uS)	uS/cm	AEM probes	14W	640147	7214182	10.3			36	35	35	34	33	32	32	33	33	33										
SP-102	SP	Second Portage Lake	5/5/2017	May	DO (mg/L)	mg/L	AEM probes	14W	640147	7214182	10.3			14.1	13.4	12.7	12.1	11.6	11.8	11.8	11.7	11	11										
SP-103	SP	Second Portage Lake	5/5/2017	May	Temperature	C	AEM probes	14W	639682	7214256	5			0.6	0.8	0.9	0.9																
SP-103	SP	Second Portage Lake	5/5/2017	May	Cond (uS)	uS/cm	AEM probes	14W	639682	7214256	5			34	33	31	30																
SP-103	SP	Second Portage Lake	5/5/2017	May	DO (mg/L)	mg/L	AEM probes	14W	639682	7214256	5			14.4	13.8	12.6	11.7																
INUG-88	INUG	Inuggugayualik Lake	5/7/2017	May	Temperature	C	AEM probes	14W	622158	7214901	16			1	1.4	1.6	2	2.2	2.3	2.4	2.5	2.6	2.7	2.9	3	3.1	3.1	3.2					
INUG-88	INUG	Inuggugayualik Lake	5/7/2017	May	Cond (uS)	uS/cm	AEM probes	14W	622158	7214901	16			13	13	13	13	13	13	13	13	13	14	14	15	15	15	15					
INUG-88	INUG	Inuggugayualik Lake	5/7/2017	May	DO (mg/L)	mg/L	AEM probes	14W	622158	7214901	16			13.8	12	11.9	11.5	11.1	10.7	10.2	9.7	9.3	8.8	8.4	7.9	7.3	7.1	7.1					
INUG-89	INUG	Inuggugayualik Lake	5/7/2017	May	Temperature	C	AEM probes	14W	622215	7215683	14			1	1.3	1.6	1.8	2	2.1	2.2	2.3	2.4	2.4	2.4	2.4	2.4							
INUG-89	INUG	Inuggugayualik Lake	5/7/2017	May	Cond (uS)	uS/cm	AEM probes	14W	622215	7215683	14			12	12	12	13	14	14	15	15	15	15	16	16	16							
INUG-89	INUG	Inuggugayualik Lake	5/7/2017	May	DO (mg/L)	mg/L	AEM probes	14W	622215	7215683	14			13.8	12.5	11.8	11.3	11.1	10.8	10.4	9.9	9.7	9.3	8.7	8.6	8.6							
TPN-102	TPN	Third Portage Lake - North Basin	5/7/2017	May	Temperature	C	AEM probes	14W	635855	7213366	20			0.7	0.8	0.9	1.1	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.7					
TPN-102	TPN	Third Portage Lake - North Basin	5/7/2017	May	Cond (uS)	uS/cm	AEM probes	14W	635855	7213366	20			25	24	23	22	21	21	20	20	20	20	20	20	20	20	20					
TPN-102	TPN	Third Portage Lake - North Basin	5/7/2017	May	DO (mg/L)	mg/L	AEM probes	14W	635855	7213366	20			14.8	14.5	14.4	14.3	14.2	14	13.8	12.7	12.7	12.6	12.5	12.4	12.5	12.2	12.1					
TPN-103	TPN	Third Portage Lake - North Basin	5/7/2017	May	Temperature	C	AEM probes	14W	634919	7213954	13			0.6	0.7	0.8	0.8	0.9	0.9	1	1	1	1	1	1								
TPN-103	TPN	Third Portage Lake - North Basin	5/7/2017	May	Cond (uS)	uS/cm	AEM probes	14W	634919	7213954	13			27	26	25	24	23	22	22	21	21	21	21	20								
TPN-103	TPN	Third Portage Lake - North Basin	5/7/2017	May	DO (mg/L)	mg/L	AEM probes	14W	634919	7213954	13			14.6	14.3	13.9	13.4	13.2	13.2	13	12.4	12.2	11.8	11.5	11.2								
WAL-71	WAL	Wally Lake	5/7/2017	May	Temperature	C	AEM probes	15W	361786	7222858	7			1.1	1.8	2.1	2.2	2.3	2.3														
WAL-71	WAL	Wally Lake	5/7/2017	May	Cond (uS)	uS/cm	AEM probes	15W	361786	7222858	7			48	46	45	44	44	43														
WAL-71	WAL	Wally Lake	5/7/2017	May	DO (mg/L)	mg/L	AEM probes	15W	361786	7222858	7			12.3	10.9	10.3	10.1	9.3	9.3														
WAL-72	WAL	Wally Lake	5/7/2017	May	Temperature	C	AEM probes	15W	361183	7222274	5			0.6	1	1.4	1.7																
WAL-72	WAL	Wally Lake	5/7/2017	May	Cond (uS)	uS/cm	AEM probes	15W	361183	7222274	5			57	54	51	48																
WAL-72	WAL	Wally Lake	5/7/2017	May	DO (mg/L)	mg/L	AEM probes	15W	361183	7222274	5			12.5	13	11.8	11.5																
PDL-53	PDL	Pipedream Lake	5/10/2017	May	Temperature	C	AEM probes	14W	631625	7224861	32			0.5	0.6	0.6	0.7	0.4	0.4	0.8	0.8	0.9	1	1.1	1.1	1.2	1.2	1.3					
PDL-53	PDL	Pipedream Lake	5/10/2017	May	Cond (uS)	uS/cm	AEM probes	14W	631625	7224861	32			16	16	16	16	16	16	16	16	16	16	16	16	17	16	16					
PDL-53	PDL	Pipedream Lake	5/10/2017	May	DO (mg/L)	mg/L	AEM probes	14W	631625	7224861	32			13.8	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.7	13.6	13.6	13.6					
PDL-54	PDL	Pipedream Lake	5/10/2017	May	Temperature	C	AEM probes	14W	632568	7225031	26			0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1	1	1	1.1	1					
PDL-54	PDL	Pipedream Lake	5/10/2017	May	Cond (uS)	uS/cm	AEM probes	14W	632568	7225031	26			17	17	17	17	17	17	17	17	17	17	17	18	18	18	18					
PDL-54	PDL	Pipedream Lake	5/10/2017	May	DO (mg/L)	mg/L	AEM probes	14W	632568	7225031	26			14.1	13.6	13.6	13.4	13.4	13.5	13.5	13.4	13.2	13.2	13.6	13.6	13.4	13.1	12.9					
TPE-104	TPE	Third Portage Lake - East Basin	7/1/2017	July	Temperature	C	AEM probes	14W	639471	7211253	7.3			11.5	8.61	7.57	6.96	6.49	6.23	6.22													
TPE-104	TPE	Third Portage Lake - East Basin	7/1/2017	July	Cond (uS)	uS/cm	AEM probes	14W	639471	7211253	7.3			26.5	26.7	26.9	27.5	27.2	27.4	27.7													
TPE-104	TPE	Third Portage Lake - East Basin	7/1/2017	July	DO (mg/L)	mg/L	AEM probes	14W	639471	7211253	7.3			11.83	12.5	12.9	12.99	13.06	13.09	13.1													
TPE-105	TPE	Third Portage Lake - East Basin	7/1/2017	July	Temperature	C	AEM probes	14W	639787	7210501	6.3			11.04	9.5	8.34	7.08	6.7	6.44														
TPE-105	TPE	Third Portage Lake - East Basin	7/1/2017	July	Cond (uS)	uS/cm	AEM probes	14W	639787	7210501	6.3			26.3	26.3	26.4	26.4	26.4	26.5														
TPE-105	TPE	Third Portage Lake - East Basin	7/1/2017	July	DO (mg/L)	mg/L	AEM probes	14W	639787	7210501	6.3			12.15	12.43	12.73	12.88	13	13.04														
WAL-73	WAL	Wally Lake	7/1/2017	July	Temperature	C	AEM probes	15W	360844	7222060	11.3			14.42	11.51	9.25	8.12	7.74	7.52	7.17	6.77	6.62	6.44	6.3									
WAL-73	WAL	Wally Lake	7/1/2017	July	Cond (uS)	uS/cm	AEM probes	15W	360844	7222060	11.3			34.7	33.5	33.7	33.3	33.4	33.3	33.5	33.6	33.7	33.8	34									
WAL-73	WAL	Wally Lake	7/1/2017	July	DO (mg/L)	mg/L	AEM probes	15W	360844	7222060	11.3			11.33	11.87	12.82	13.01	13.08	13.09	13.15	13.14	13.05	12.99	12.87									
WAL-74	WAL	Wally Lake	7/1/2017	July	Temperature	C	AEM probes	15W	361765	7221549	5.4			13.15	10.68	9.22	8.67	8.32															
WAL-74	WAL	Wally Lake	7/1/2017	July	Cond (uS)	uS/cm	AEM probes	15W	361765	7221549	5.4			33.6	33.2	32.5	32.8	32.8															
WAL-74	WAL	Wally Lake	7/1/2017	July	DO (mg/L)	mg/L	AEM probes	15W	361765	7221549	5.4			11.86	12.32	12.77	13.01	13.11															
SP-104	SP	Second Portage Lake	7/2/2017	July	Temperature	C	AEM probes	14W	640034	7213970	14.8			15.17	10.97	9.18	8.33	7.73	7.25	6.76	6.48	5.99	5.99	5.98	5.93	5.86	5.84						
SP-104	SP	Second Portage Lake	7/2/2017	July	Cond (uS)	uS/cm	AEM probes	14W	640034	7213970	14.8			35	34.4	34.3	34.3	34.3	34.2	34.1	34.1	34.1	34.1	34.1	34	33.9	34.1						
SP-104	SP	Second Portage Lake	7/2/2017	July	DO (mg/L)	mg/L	AEM probes	14W	640034	7213970	14.8			10.9	11.99	12.73	13.09	13.29	13.25	13.6	13.69	13.81	13.64	13.58	13.53	13.37	13.32						
SP-105	SP	Second Portage Lake	7/2/2017	July	Temperature	C	AEM probes	14W	640336	7212513	7.4			14.64	13.82	9.05	7.96	7.44	7.24	7.08													
SP-105	SP	Second Portage Lake	7/2/2017	July	Cond (uS)	uS/cm	AEM probes	14W	640336	7212513	7.4			34	33.8	33.5	34	34	34	34													
SP-105	SP	Second Portage Lake	7/2/2017	July	DO (mg/L)	mg/L	AEM probes	14W	640336	7212513	7.4			10.8	11.18	12.2	12.42	12.73	12.91	13.02													
TPN-104	TPN	Third Portage Lake - North Basin	7/4/2017	July	Temperature	C	AEM probes	14W	634461	7215808	14			12.28	12.26	11.2	7.5	6.5	5.62	5.33	4.98	4.83	4.72	4.6	4.49	4.47	4.46						
TPN-104	TPN	Third Portage Lake - North Basin	7/4/2017	July	Cond (uS)	uS/cm	AEM probes	14W	634461	7215808	14																						
TPN-104	TPN	Third Portage Lake - North Basin	7/4/2017	July	DO (mg/L)	mg/L	AEM probes	14W	634461	7215808	14			11.98	12.04	12.31	12.57	12.97	13.32	13.41	13.54	13.59	13.63	13.67	13.69	13.65	13.62						
TPN-105	TPN	Third Portage Lake - North Basin	7/4/2017	July	Temperature	C	AEM probes	14W	635857	7215527	9.3			10.86	10.84	10.81	10.79	10.62	7.49	5.68	5.21	5.36											
TPN-105	TPN	Third Portage Lake - North Basin	7/4/2017	July	Cond (uS)	uS/cm	AEM probes	14W	635857	7215527	9.3																						
TPN-105	TPN	Third Portage Lake - North Basin	7/4/2017	July	DO (mg/L)	mg/L	AEM probes	14W	635857	7215527	9.3			12.18	12.19	12.22	12.23	12.25	12.55	12.96	13.02	11.6											
BAP-49	BAP	Baker Akilahaarjuk Point	7/6/2017	July	Temperature	C	AEM probes	15W	364108	7131109	10.4			5	4.97	4.92	4.9	4.9	4.74	4.72	4.75	4.71	4.68										
BAP-49	BAP	Baker Akilahaarjuk Point	7/6/2017	July	Cond (uS)	uS/cm	AEM probes	15W	364108	7131109	10.4			30.3	30.1	30	30	29.9	30.2	30.2	30.1	30.4	30.5										
BAP-49	BAP	Baker Akilahaarjuk Point	7/6/2017	July	DO (mg/L)	mg/L	AEM probes	15W	364108	7131109	10.4			12.91	12.98	13.03	13.04	13.05	13.08	13.08	13.06	13.07	13.07										
BAP-50	BAP	Baker Akilahaarjuk Point	7/6/2017	July	Temperature	C	AEM probes	15W	363719	7131122	17			4.94	4.97	4.94	4.97	5.01	4.93	4.91	4.91	4.87	4.82	4.84	4.83	4.84	4.7	4.77	4.71				
BAP-50	BAP	Baker Akilahaarjuk Point	7/6/2017	July	Cond (uS)	uS/cm	AEM probes	15W	363719	7131122	17			29.2	29	29.4	29.1	28.5	29.5	29.3	29.4	30	30.2	29.6	30.1	30.1	31	30.9	32				
BAP-50	BAP	Baker Akilahaarjuk Point	7/6/2017	July	DO (mg/L)	mg/L	AEM probes	15W	363719	7131122	17			12.85	12.97	13.05	13.06	13.07	13.11	13.1	13.11	13.13	13.12	13.11	13.12	13.11	13.12	13.08	13.11				
BBD-49	BBD	Baker Barge Dock	7/6/2017	July	Temperature	C	AEM probes	14W	644617	7135175	13.4			5.73	5.74	5.71	5.66	5.72	5.64	5.61	5.56	5.55	5.53	5.5	5.49	5.53							
BBD-49	BBD	Baker Barge Dock	7/6/2017	July	Cond (uS)	uS/cm	AEM probes	14W	644617	7135175	13.4			24.3	24.4	24.4	24.2	24.3	24.4	24.3	24.2	24.4	24.4	24.4	24.4	24.4							
BBD-49	BBD	Baker Barge Dock	7/6/2017	July	DO (mg/L)	mg/L	AEM probes	14W	644617	7135175	13.4			12.84	12.88	12.89	12.91	12.9	12.91	12.91	12.92	12.94	12.94	12.94	12.95	12.92							
BBD-50	BBD	Baker Barge Dock	7/6/2017	July	Temperature	C	AEM probes	14W	643951	7135298	10.8			6.02	5.99	5.98	5.96	5.98	5.87	5.98	5.72	5.71	5.68										
BBD-50	BBD	Baker Barge Dock	7/6/2017	July	Cond (uS)	uS/cm	AEM probes	14W	643951	7135298	10.8			24.4	24.4	24.4	24.3	24.4	24.4	24.4	24.4	24.3	24.4										
BBD-50	BBD	Baker Barge Dock	7/6/2017	July	DO (mg/L)	mg/L	AEM probes	14W	643951	7135298	10.8			12.73	12.77	12.81	12.83	12.84	12.86	12.87	12.92	12.9	12.91										
BPJ-49	BPJ	Baker Proposed Jetty	7/6/2017	July	Temperature	C	AEM probes	15W	356793	7134246	16.4			5.65	5.58	5.43	5.5	5.39	5.15	5.08	5.09	5.1	5.08	5.07	5.05	5.06	5.06	5.06	5.06				
BPJ-49	BPJ	Baker Proposed Jetty	7/6/2017	July	Cond (uS)	uS/cm	AEM probes	15W	356793	7134246	16.4			24.3	24.3	24.4	24.4	24.4	24.3	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	25.2				
BPJ-49	BPJ	Baker Proposed Jetty	7/6/2017	July	DO (mg/L)	mg/L	AEM probes	15W	356793	7134246	16.4			12.93	12.95	12.97	12.97	13.05	13.1	13.1	13.11	13.09	13.1	13.08	13.06	13.06	13.05	13.05	11.06				
BPJ-50	BPJ	Baker Proposed Jetty	7/6/2017	July	Temperature	C	AEM probes	15W	357329	7134017	11.8			5.99	5.97	5.89		5.79	5.67	5.44	5.43	5.43	5.43	5.44									
BPJ-50	BPJ	Baker Proposed Jetty	7/6/2017	July	Cond (uS)	uS/cm	AEM probes	15W	357329	7134017	11.8			24.5	24.6	24.5	24.4	24.4	24.3	24.3	24.3	24.4	24.3	24.4									
BPJ-50	BPJ	Baker Proposed Jetty	7/6/2017	July	DO (mg/L)	mg/L	AEM probes	15W	357329	7134017	11.8			12.81	12.84	12.89	12.93	12.95	13.01	12.99	12.96	12.97	12.97	12.97									

Limnology data from the 2017 CREMP.

SampleID	Station	LocationName	Date	Month	Parameter (Temp, DO, Cond, etc.)	Units	Gear / Instrument	Zone	Easting	Northing	Total Depth at Location	Ice Thickness	0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m	20 m
PDL-55	PDL	Pipedream Lake	7/8/2017	July	Temperature	C	AEM probes	14W	631739	7225132	29.4			6.46	6.48	6.44	6.46	6.38	6.42	6.35	5.99	5.81	5.77	5.75	5.67	5.67	5.65	5.62	5.62	5.61	5.61	5.61	5.6
PDL-55	PDL	Pipedream Lake	7/8/2017	July	Cond (uS)	uS/cm	AEM probes	14W	631739	7225132	29.4			21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.4	21.4	21.4	21.4	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5
PDL-55	PDL	Pipedream Lake	7/8/2017	July	DO (mg/L)	mg/L	AEM probes	14W	631739	7225132	29.4			12.13	12.69	12.84	12.96	13.04	13.08	13.09	13.21	13.23	13.27	13.28	13.31	13.32	13.44	13.38	13.38	13.38	13.38	13.37	13.38
PDL-56	PDL	Pipedream Lake	7/8/2017	July	Temperature	C	AEM probes	14W	632451	7225354	15			6.33	6.32	6.32	6.32	6.31	6.31	6.31	6.3	6.29	6.3	6.31	6.03	6.22	6.23						
PDL-56	PDL	Pipedream Lake	7/8/2017	July	Cond (uS)	uS/cm	AEM probes	14W	632451	7225354	15			21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2						
PDL-56	PDL	Pipedream Lake	7/8/2017	July	DO (mg/L)	mg/L	AEM probes	14W	632451	7225354	15			13.01	13.03	13.06	13.09	13.08	13.1	13.1	13.11	13.12	13.12	13.14	13.21	13.14	13.15						
INUG-90	INUG	Inuggugayualik Lake	7/22/2017	July	Temperature	C	AEM probes	14W	622799	7215656	9.7			11.95	11.95	11.86	11.69	11.07	10.82	10.74	10.7	10.69											
INUG-90	INUG	Inuggugayualik Lake	7/22/2017	July	Cond (uS)	uS/cm	AEM probes	14W	622799	7215656	9.7			15.4	15.4	15.4	15.3	15.3	15.3	15.3	15.3	16.1											
INUG-30	INUG	Inuggugayualik Lake	7/22/2017	July	DO (mg/L)	mg/L	AEM probes	14W	622799	7215656	9.7			11.05	11.23	11.3	11.34	11.47	11.44	11.41	11.39												
INUG-91	INUG	Inuggugayualik Lake	7/22/2017	July	Temperature	C	AEM probes	14W	622545	7215429	5.32			11.92	11.87	11.92	11.3	10.94															
INUG-91	INUG	Inuggugayualik Lake	7/22/2017	July	Cond (uS)	uS/cm	AEM probes	14W	622545	7215429	5.32			15.3	15.3	15.3	15.3	15.3															
INUG-91	INUG	Inuggugayualik Lake	7/22/2017	July	DO (mg/L)	mg/L	AEM probes	14W	622545	7215429	5.32			11.05	11.04	11.15	11.16	11.27															
BAP-51	BAP	Baker Akilahaarjuk Point	8/9/2017	August	Temperature	C	Azi ProPlus	15W	364032	7130984	13.9		7.1	7	7	6.9	6.5	6.2	5.9	5.8	5.8	5.8	5.8	5.7	5.7	5.7							
BAP-51	BAP	Baker Akilahaarjuk Point	8/9/2017	August	Cond (uS)	uS/cm	Azi ProPlus	15W	364032	7130984	13.9		163.9	164	163.9	164.6	165.8	170.3	176.1	176.5	176.6	176.6	176.8	177.7	177.8	178.5							
BAP-51	BAP	Baker Akilahaarjuk Point	8/9/2017	August	DO (mg/L)	mg/L	Azi ProPlus	15W	364032	7130984	13.9		11.77	11.79	11.79	11.85	11.99	12.04	12.03	12.06	12.14	12.04	11.99	12.07	12.07	12.06							
BAP-52	BAP	Baker Akilahaarjuk Point	8/9/2017	August	Temperature	C	Azi ProPlus	15W	364432	7130900	10.9		6.9	6.8	6.8	6.8	6.5	6.5	6.5	6.4	6.1	6.3	5.8										
BAP-52	BAP	Baker Akilahaarjuk Point	8/9/2017	August	Cond (uS)	uS/cm	Azi ProPlus	15W	364432	7130900	10.9		166.7	166.8	168.2	167.3	171	172.3	172.4	173.9	175.3	176.3	177.4										
BAP-52	BAP	Baker Akilahaarjuk Point	8/9/2017	August	DO (mg/L)	mg/L	Azi ProPlus	15W	364432	7130900	10.9		11.89	11.83	11.87	11.86	11.88	11.84	11.9	11.97	11.86	12.07	11.88										
BBD-51	BBD	Baker Barge Dock	8/10/2017	August	Temperature	C	Azi ProPlus	14W	644755	7135147	12.9		11.9	11.3	10.8	8.9	8.6	6.9	6.5	6.3	6.2	6.1	6	5.9	5.9								
BBD-51	BBD	Baker Barge Dock	8/10/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	644755	7135147	12.9		24.9	23.6	23.9	80.3	92.6	134.2	146.1	148.9	150.5	152.4	155	155.3	156								
BBD-51	BBD	Baker Barge Dock	8/10/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	644755	7135147	12.9		10.24	10.06	10.23	10.93	10.97	11.26	11.75	11.87	11.88	11.86	11.85	11.86	11.83								
BBD-52	BBD	Baker Barge Dock	8/10/2017	August	Temperature	C	Azi ProPlus	14W	644613	7135317	6.7		11.9	11.4	10.6	10.1	9.6	6.6	6.1														
BBD-52	BBD	Baker Barge Dock	8/10/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	644613	7135317	6.7		29.1	24.5	35	57.3	69.1	145.3	153.8														
BBD-52	BBD	Baker Barge Dock	8/10/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	644613	7135317	6.7		10.28	9.83	10.07	10.7	10.43	11.6	11.38														
BPJ-51	BPJ	Baker Proposed Jetty	8/10/2017	August	Temperature	C	Azi ProPlus	15W	356482	7134126	28.3		6.5	6.3	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.1	6	6	5.9	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.7
BPJ-51	BPJ	Baker Proposed Jetty	8/10/2017	August	Cond (uS)	uS/cm	Azi ProPlus	15W	356482	7134126	28.3		158.4	159.5	159.6	159.5	159.4	159.2	158.6	158.5	158.7	158.7	158.7	158.8	158.5	158.5	158.8	158.8	158.8	158.9	159.2	159.3	159.6
BPJ-51	BPJ	Baker Proposed Jetty	8/10/2017	August	DO (mg/L)	mg/L	Azi ProPlus	15W	356482	7134126	28.3		12.66	12.72	12.71	12.84	12.8	12.73	12.86	12.64	12.83	12.63	12.43	12.52	12.47	12.34	12.37	12.35	12.34	12.32	12.37	12.3	12.21
BPJ-52	BPJ	Baker Proposed Jetty	8/10/2017	August	Temperature	C	Azi ProPlus	15W	356768	7134084	24.2		6.6	6.3	6.1	6.1	6	6	6	6	6	6	6	5.9	5.9	5.9	5.8	5.8	5.7	5.6	5.6	5.6	5.6
BPJ-52	BPJ	Baker Proposed Jetty	8/10/2017	August	Cond (uS)	uS/cm	Azi ProPlus	15W	356768	7134084	24.2		156.1	155.3	155.3	155.6	155.5	155.5	156	156.4	158.1	158.5	158.7	15.8	158.7	158.7	158.8	159	159.7	160.6	160.6	160.6	160.7
BPJ-52	BPJ	Baker Proposed Jetty	8/10/2017	August	DO (mg/L)	mg/L	Azi ProPlus	15W	356768	7134084	24.2		12.18	12.26	12.15	12.21	12.28	12.27	12.21	12.15	12.17	12.24	12.14	12.32	12.32	12.31	12.33	12.29	12.26	12.33	12.32	12.29	12.44
PDL-57	PDL	Pipedream Lake	8/24/2017	August	Temperature	C	Azi ProPlus	14W	630687	7224063	9.5		12.5	12.3	12.3	12.3	12.3	12.2	12.2	12.1	11.9	11.9											
PDL-57	PDL	Pipedream Lake	8/24/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	630687	7224063	9.5		21	21	21	21	21	21	21	21	20.9	20.9											
PDL-57	PDL	Pipedream Lake	8/24/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	630687	7224063	9.5		10.04	10.01	10.03	10.03	10	10.06	10	10.02	10.09	9.97											
PDL-58	PDL	Pipedream Lake	8/24/2017	August	Temperature	C	Azi ProPlus	14W	630682	7222961	7		12.4	12.4	12.4	12.4	12.3	12.3	12.3	12.3													
PDL-58	PDL	Pipedream Lake	8/24/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	630682	7222961	7		21	21	21	21	21	21	21	21													
PDL-58	PDL	Pipedream Lake	8/24/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	630682	7222961	7		10.03	10.03	10	9.95	10.03	10.04	10.04	10.1													
INUG-92	INUG	Inuggugayualik Lake	8/25/2017	August	Temperature	C	Azi ProPlus	14W	622826	7216839	7		13.4	13.4	13.4	13.4	13.3	13.3	13.3														
INUG-92	INUG	Inuggugayualik Lake	8/25/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	622826	7216839	7		15	15	15	15	15	15	15														
INUG-92	INUG	Inuggugayualik Lake	8/25/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	622826	7216839	7		9.86	9.85	9.88	9.84	9.8	9.9	9.87														
INUG-93	INUG	Inuggugayualik Lake	8/25/2017	August	Temperature	C	Azi ProPlus	14W	622682	7216817	8		13.6	13.6	13.6	13.6	13.6	13.6	13.5	13.5													
INUG-93	INUG	Inuggugayualik Lake	8/25/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	622682	7216817	8		15	14.9	15	15	15	15	15.1	15.1													
INUG-93	INUG	Inuggugayualik Lake	8/25/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	622682	7216817	8		10.24	10.21	10.3	10.3	10.32	10.38	10.38	10.36													
SP-106	SP	Second Portage Lake	8/26/2017	August	Temperature	C	Azi ProPlus	14W	639531	7213670	8.9		13.5	13.5	13.5	13.5	13.5	13.4	13.4	13.4	13.4												
SP-106	SP	Second Portage Lake	8/26/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	639531	7213670	8.9		35	35	35	35	35	35.1	35.1	35.3	35.3												
SP-106	SP	Second Portage Lake	8/26/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	639531	7213670	8.9		10.62	10.63	10.57	10.59	10.42	10.58	10.65	10.58	10.55												
SP-107	SP	Second Portage Lake	8/26/2017	August	Temperature	C	Azi ProPlus	14W	639589	7213886	5.4		13.5	13.6	13.6	13.6	13.6	13.6															
SP-107	SP	Second Portage Lake	8/26/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	639589	7213886	5.4		35.4	35.4	35.4	35.4	35.4	35.4															
SP-107	SP	Second Portage Lake	8/26/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	639589	7213886	5.4		10.96	11	11.03	11	11.07	11.11															
WAL-75	WAL	Wally Lake	8/26/2017	August	Temperature	C	Azi ProPlus	15W	360975	7220405	9.2		13.5	13.5	13.4	13.5	13.5	13.5	13.5	13.4	13.4												
WAL-75	WAL	Wally Lake	8/26/2017	August	Cond (uS)	uS/cm	Azi ProPlus	15W	360975	7220405	9.2		55.1	55	55.3	55.3	55.8	55.8	55.5	55.7	55.7												
WAL-75	WAL	Wally Lake	8/26/2017	August	DO (mg/L)	mg/L	Azi ProPlus	15W	360975	7220405	9.2		10.5	10.49	10.53	10.5	10.44	10.48	10.45	10.42	10.41												
WAL-76	WAL	Wally Lake	8/26/2017	August	Temperature	C	Azi ProPlus	15W	360862	7220520	7.5		13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4													
WAL-76	WAL	Wally Lake	8/26/2017	August	Cond (uS)	uS/cm	Azi ProPlus	15W	360862	7220520	7.5		54.9	54.9	54.8	54.9	54.9	54.7	54.9	54.9													
WAL-76	WAL	Wally Lake	8/26/2017	August	DO (mg/L)	mg/L	Azi ProPlus	15W	360862	7220520	7.5		9.97	9.98	10	9.94	9.9	10.01	9.94	9.91													
TPE-106	TPE	Third Portage Lake - East Basin	8/27/2017	August	Temperature	C	Azi ProPlus	14W	638493	7211609	6.9		12.9	12.9	12.9	12.9	12.9	12.9	12.9														
TPE-106	TPE	Third Portage Lake - East Basin	8/27/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	638493	7211609	6.9		28.5	28.5	28.5	28.6	28.5	28.6	28.5														
TPE-106	TPE	Third Portage Lake - East Basin	8/27/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	638493	7211609	6.9		9.92	9.92	9.86	9.86	9.94	9.89	9.9														
TPE-107	TPE	Third Portage Lake - East Basin	8/27/2017	August	Temperature	C	Azi ProPlus	14W	637282	7212026	8.3		12.9	12.9	12.9	13	13	13	13	13	13												
TPE-107	TPE	Third Portage Lake - East Basin	8/27/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	637282	7212026	8.3		28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4												
TPE-107	TPE	Third Portage Lake - East Basin	8/27/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	637282	7212026	8.3		9.86	9.88	9.92	9.92	9.87	9.78	9.87	9.94	9.68												
TPN-106	TPN	Third Portage Lake - North Basin	8/27/2017	August	Temperature	C	Azi ProPlus	14W	635356	7214214	8.8		12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1												
TPN-106	TPN	Third Portage Lake - North Basin	8/27/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	635356	7214214	8.8		25.9	25.9	25.9	26	25.9	26	26	25.9	25.9												
TPN-106	TPN	Third Portage Lake - North Basin	8/27/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	635356	7214214	8.8		10.27	10.27	10.25	10.2	10.25	10.34	10.25	10.25	10.31												
TPN-107	TPN	Third Portage Lake - North Basin	8/27/2017	August	Temperature	C	Azi ProPlus	14W	636375	7215520	10.6		12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1										
TPN-107	TPN	Third Portage Lake - North Basin	8/27/2017	August	Cond (uS)	uS/cm	Azi ProPlus	14W	636375	7215520	10.6		26	26	26	26	26	25.9	26	26	25.9	26	26										
TPN-107	TPN	Third Portage Lake - North Basin	8/27/2017	August	DO (mg/L)	mg/L	Azi ProPlus	14W	636375	7215520	10.6		10.24	10.28	10.19	10.2	10.22	10.25	10.26	10.28	10.14	10.18	10.11										
SP-108	SP	Second Portage Lake	9/14/2017	September	Temperature	C	AEM probes	14W	640370	7212541	9.83		7.35	7.35	7.33	7.33	7.34	7.3	7.31	7.29	7.29	7.28											
SP-108	SP	Second Portage Lake	9/14/2017	September	Cond (uS)	uS/cm	AEM probes	14W	640370	7212541	9.83		36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.4	36.5	36.4											
SP-108	SP	Second Portage Lake	9/14/2017	September	DO (mg/L)	mg/L	AEM probes	14W	640370	7212541	9.83		12.17	12.25	12.28	12.28	12.27	12.29	12.28	12.28	12.28	12.29											
SP-109	SP	Second Portage Lake	9/14/2017	September	Temperature	C	AEM probes	14W	640694	7213142	7.04		7.6	7.6	7.59	7.59	7.6	7.55	7.54														
SP-109	SP	Second Portage Lake	9/14/2017	September	Cond (uS)	uS/cm	AEM probes	14W	640694	7213142	7.04		36.6	36.7	36.6	36.6	36.6	36.6	36.6														
SP-109	SP	Second Portage Lake	9/14/2017	September	DO (mg/L)	mg/L	AEM probes	14W	640694	7213142	7.04		12.12	12.12	12.13	12.19	12.17	12.2	12.22														
TPN-108	TPN	Third Portage Lake - North Basin	9/16/2017	September	Temperature	C	AEM probes	14W	635367	7216092	5.02		8.41	8.41	8.41	8.41	8.41	8.41															
TPN-108	TPN	Third Portage Lake - North Basin	9/16/2017	September	Cond (uS)	uS/cm	AEM probes	14W	635367	7216092	5.02		27	27	27	27	26.9	27															
TPN-108	TPN	Third Portage Lake - North Basin	9/16/2017	September	DO (mg/L)	mg/L	AEM probes	14W	635367	7216092	5.02		10.38	10.89	11.11	11.21	11.27	11.32															
TPN-109	TPN	Third Portage Lake - North Basin	9/16/2017	September	Temperature	C	AEM probes	14W	636462	7212831	15		8.58	8.58	8.57	8.57	8.58	8.57	8.57	8.57	8.56	8.57	8.56	8.56	8.56	8.56	8.56						
TPN-109	TPN	Third Portage Lake - North Basin	9/16/2017	September	Cond (uS)	uS/cm	AEM probes	14W	636462	7212831	15		26.9	26.8	26.9	26.9	26.9	26.9	26.8	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9						
TPN-109	TPN	Third Portage Lake - North Basin	9/16/2017	September	DO (mg/L)	mg/L	AEM probes	14W	636462	7212831	15		11.15	11.22	11.25	11.27	11.29	11.29	11.29	11.29	11.3	11.29	11.29	11.29	11.29	11.29	11.29						
WAL-77	WAL	Wally Lake	9/16/2017	September	Temperature	C	AEM probes	15W	360931	7221897	5.03		6.82	6.59	6.53	6.46	6.43	6.4															
WAL-77	WAL	Wally Lake	9/16/2017	September	Cond (uS)	uS/cm	AEM probes	15W	360931	7221897	5.03		41.9	42.1	42	40.9	42.2	12															
WAL-77	WAL	Wally Lake	9/16/2017	September	DO (mg/L)	mg/L	AEM probes	15W	360931	7221897	5.03		14.03	14	13.95	13.86	13.78	13.73															
WAL-78	WAL	Wally Lake	9/16/2017	September	Temperature	C	AEM probes	15W	361106	7221976	6.7		6.88	6.57	6.57	6.51	6.5	6.49	6.51														
WAL-78	WAL	Wally Lake	9/16/2017	September	Cond (uS)	uS/cm	AEM probes	15W	361106	7221976	6.7		41.7	42.1	42.1	42.1	42.1	42.2	42.1														
WAL-78	WAL	Wally Lake	9/16/2017	September	DO (mg/L)	mg/L	AEM probes	15W	361106	7221976	6.7		14.11	14.18	14.21	14.21	14.21	14.21	14.19														

Limnology data from the 2017 CREMP.

SampleID	Station	LocationName	Date	Month	Parameter (Temp, DO, Cond, etc.)	Units	Gear / Instrument	Zone	Easting	Northing	Total Depth at Location	Ice Thickness	0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m	20 m
TPE-108	TPE	Third Portage Lake - East Basin	9/18/2017	September	Temperature	C	AEM probes	14W	639555	7211567	5		7.67	7.67	7.67	7.67	7.67	7.68															
TPE-108	TPE	Third Portage Lake - East Basin	9/18/2017	September	Cond (uS)	uS/cm	AEM probes	14W	639555	7211567	5		33	32.9	33	32.9	33	33															
TPE-108	TPE	Third Portage Lake - East Basin	9/18/2017	September	DO (mg/L)	mg/L	AEM probes	14W	639555	7211567	5		11.2	11.19	11.17	11.12	11.07	10.96															
TPE-109	TPE	Third Portage Lake - East Basin	9/18/2017	September	Temperature	C	AEM probes	14W	638330	7211147	5.22		7.53	7.53	7.46	7.44	7.45	7.44															
TPE-109	TPE	Third Portage Lake - East Basin	9/18/2017	September	Cond (uS)	uS/cm	AEM probes	14W	638330	7211147	5.22		32.1	32.6	32.7	32.7	32.7	32.7															
TPE-109	TPE	Third Portage Lake - East Basin	9/18/2017	September	DO (mg/L)	mg/L	AEM probes	14W	638330	7211147	5.22		11.18	11.12	11.08	11.03	10.96	10.8															
INUG-94	INUG	Inuggugayualik Lake	9/23/2017	September	Temperature	C	AEM probes	14W	621851	7214873	6.4		6.78	6.8	6.8	6.8	6.8	6.8	6.8														
INUG-94	INUG	Inuggugayualik Lake	9/23/2017	September	Cond (uS)	uS/cm	AEM probes	14W	621851	7214873	6.4		16.6	16.6	16.6	16.6	16.6	16.6	16.6														
INUG-94	INUG	Inuggugayualik Lake	9/23/2017	September	DO (mg/L)	mg/L	AEM probes	14W	621851	7214873	6.4		11.52	11.52	11.52	11.51	11.51	11.51	11.5														
INUG-95	INUG	Inuggugayualik Lake	9/23/2017	September	Temperature	C	AEM probes	14W	622797	7215497	7		6.77	6.79	6.8	6.81	6.79	6.79	6.78														
INUG-95	INUG	Inuggugayualik Lake	9/23/2017	September	Cond (uS)	uS/cm	AEM probes	14W	622797	7215497	7		16.5	16.5	16.6	16.6	16.6	16.6	16.6														
INUG-95	INUG	Inuggugayualik Lake	9/23/2017	September	DO (mg/L)	mg/L	AEM probes	14W	622797	7215497	7		11.5	11.47	11.48	11.48	11.48	11.48	11.48														
BAP-53	BAP	Baker Akilahaarjuk Point	9/30/2017	September	Temperature	C	AEM probes	15W	363269	7131294	12.2		6.65	6.68	6.71	6.65	6.77	6.78	6.77	6.78	6.77	6.74	6.71	6.72	6.57								
BAP-53	BAP	Baker Akilahaarjuk Point	9/30/2017	September	Cond (uS)	uS/cm	AEM probes	15W	363269	7131294	12.2		37.1	37.2	37.3	37.1	37.4	37.4	37.6	37.2	37.4	37.6	37.3	37.5	37.3								
BAP-53	BAP	Baker Akilahaarjuk Point	9/30/2017	September	DO (mg/L)	mg/L	AEM probes	15W	363269	7131294	12.2		11.49	11.47	11.47	11.47	11.45	11.46	11.46	11.48	11.46	11.45	11.46	11.47	11.49								
BAP-54	BAP	Baker Akilahaarjuk Point	9/30/2017	September	Temperature	C	AEM probes	15W	364032	7131179	8.4		6.83	6.84	6.85	6.85	6.85	6.85	6.85	6.84	6.84												
BAP-54	BAP	Baker Akilahaarjuk Point	9/30/2017	September	Cond (uS)	uS/cm	AEM probes	15W	364032	7131179	8.4		37.7	37.5	37.7	37.7	37.7	37.7	37.7	37.7	37.8												
BAP-54	BAP	Baker Akilahaarjuk Point	9/30/2017	September	DO (mg/L)	mg/L	AEM probes	15W	364032	7131179	8.4		11.46	11.45	11.45	11.45	11.45	11.45	11.44	11.44	11.43												
BBD-53	BBD	Baker Barge Dock	9/30/2017	September	Temperature	C	AEM probes	14W	644069	7135303	9.6		6.03	6.04	6.04	6.06	6.08	6.07	6.08	6.08	6.08	6.08	6.1										
BBD-53	BBD	Baker Barge Dock	9/30/2017	September	Cond (uS)	uS/cm	AEM probes	14W	644069	7135303	9.6		26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.2	26.1	26.2											
BBD-53	BBD	Baker Barge Dock	9/30/2017	September	DO (mg/L)	mg/L	AEM probes	14W	644069	7135303	9.6		11.71	11.68	11.68	11.67	11.68	11.68	11.68	11.68	11.67	11.67											
BBD-54	BBD	Baker Barge Dock	9/30/2017	September	Temperature	C	AEM probes	14W	644811	7135208	10.5		5.81	5.85	5.86	5.85	5.85	5.81	5.83	5.77	5.77	5.67	5.75										
BBD-54	BBD	Baker Barge Dock	9/30/2017	September	Cond (uS)	uS/cm	AEM probes	14W	644811	7135208	10.5		25.9	25.9	25.9	25.9	25.9	25.9	25.9	26	26	26	26										
BBD-54	BBD	Baker Barge Dock	9/30/2017	September	DO (mg/L)	mg/L	AEM probes	14W	644811	7135208	10.5		11.73	11.73	11.72	11.74	11.73	11.74	11.74	11.75	11.75	11.75	11.76										
BPJ-53	BPJ	Baker Proposed Jetty	9/30/2017	September	Temperature	C	AEM probes	15W	357390	7133937	7.3		6.45	6.37	6.39	6.37	6.4	6.21	6.22	6													
BPJ-53	BPJ	Baker Proposed Jetty	9/30/2017	September	Cond (uS)	uS/cm	AEM probes	15W	357390	7133937	7.3		29.4	29.4	29.4	29.4	29	29	28.3	28.2													
BPJ-53	BPJ	Baker Proposed Jetty	9/30/2017	September	DO (mg/L)	mg/L	AEM probes	15W	357390	7133937	7.3		11.67	11.58	11.58	11.58	11.57	11.61	11.62	11.67													
BPJ-54	BPJ	Baker Proposed Jetty	9/30/2017	September	Temperature	C	AEM probes	15W	356938	7134260	9.2		5.99	5.99	5.98	6.03	6.04	6	6.01	6.04	5.97	5.94											
BPJ-54	BPJ	Baker Proposed Jetty	9/30/2017	September	Cond (uS)	uS/cm	AEM probes	15W	356938	7134260	9.2		27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.2	27.2	27.1											
BPJ-54	BPJ	Baker Proposed Jetty	9/30/2017	September	DO (mg/L)	mg/L	AEM probes	15W	356938	7134260	9.2		11.67	11.67	11.67	11.67	11.66	11.66	11.65	11.65	11.65	11.65											
PDL-59	PDL	Pipedream Lake	10/1/2017	September	Temperature	C	AEM probes	14W	632733	7224742	12.3		6.08	6.08	6.1	6.09	6.12	6.1	6.11	6.12	6.11	6.11	6.09	6.1	6.1								
PDL-59	PDL	Pipedream Lake	10/1/2017	September	Cond (uS)	uS/cm	AEM probes	14W	632733	7224742	12.3		22.6	22.6	22.6	22.6	22.6	22.5	22.6	22.6	22.6	22.6	22.6	22.6	23								
PDL-59	PDL	Pipedream Lake	10/1/2017	September	DO (mg/L)	mg/L	AEM probes	14W	632733	7224742	12.3		11.71	11.56	11.51	11.49	11.48	11.48	11.48	11.49	11.48	11.48	11.48	11.48	10.78								
PDL-60	PDL	Pipedream Lake	10/1/2017	September	Temperature	C	AEM probes	14W	629760	7224213	11.6		5.58	5.58	5.58	5.56	5.58	5.56	5.5	5.37	5.47	5.46	5.41	5.35									
PDL-60	PDL	Pipedream Lake	10/1/2017	September	Cond (uS)	uS/cm	AEM probes	14W	629760	7224213	11.6		22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6									
PDL-60	PDL	Pipedream Lake	10/1/2017	September	DO (mg/L)	mg/L	AEM probes	14W	629760	7224213	11.6		11.69	11.68	11.66	11.65	11.65	11.66	11.68	11.69	11.66	11.66	11.68	11.69									
TPE-limno	TPE	Third Portage Lake - East Basin	11/11/2017	November	Temperature	C	AEM probes	14W	638216	7212002	11.2	0.56		0.82	0.7	0.74	0.84	0.95	1.03	1.14	1.56	2.47	2.72	2.89									
TPE-limno	TPE	Third Portage Lake - East Basin	11/11/2017	November	Cond (uS)	uS/cm	AEM probes	14W	638216	7212002	11.2	0.56		35.7	32.3	31.6	31.5	31.7	32	32.1	33.6	36	50.4	55.7									
TPE-limno	TPE	Third Portage Lake - East Basin	11/11/2017	November	DO (mg/L)	mg/L	AEM probes	14W	638216	7212002	11.2	0.56		15.22	15.55	15.46	15.43	15.33	15.22	15.15	14.93	13.87	12.89	12.47									
SP-limno	SP	Second Portage Lake	11/11/2017	November	Temperature	C	AEM probes	14W	639711	7214076	12.4	0.6		0.73	0.95	0.92	1	1.06	1.09	1.13	1.1	1.21	1.33	1.54	1.81								
SP-limno	SP	Second Portage Lake	11/11/2017	November	Cond (uS)	uS/cm	AEM probes	14W	639711	7214076	12.4	0.6		41.1	40.2	39.9	40.1	40.3	40.3	40.5	40.7	40.8	40.8	41	40.6								
SP-limno	SP	Second Portage Lake	11/11/2017	November	DO (mg/L)	mg/L	AEM probes	14W	639711	7214076	12.4	0.6		16.61	16.34	16.04	15.8	15.67	15.45	15.32	15.19	15.15	15.08	14.87	14.6								
WAL-limno	WAL	Wally Lake	11/16/2017	November	Temperature	C	AEM probes	15W	361825	7222855	8			0.93	1.33	1.56	1.66	1.79	1.91	2.01													
WAL-limno	WAL	Wally Lake	11/16/2017	November	Cond (uS)	uS/cm	AEM probes	15W	361825	7222855	8			51.2	47.7	48.3	48.8	48.4	48.2	48.6													
WAL-limno	WAL	Wally Lake	11/16/2017	November	DO (mg/L)	mg/L	AEM probes	15W	361825	7222855	8			15.45	14.61	14.42	14.3	14.21	14.29	14.36													
TPN-limno	TPN	Third Portage Lake - North Basin	11/19/2017	November	Temperature	C	AEM probes	14W	636609	7214603	13.5			0.53	0.64	0.71	0.77	0.89	0.93	0.94	0.97	1.03	1.06	1.08	1.18	1.24							
TPN-limno	TPN	Third Portage Lake - North Basin	11/19/2017	November	Cond (uS)	uS/cm	AEM probes	14W	636609	7214603	13.5			30.7	28.5	28.2	27.8	27.8	27.8	27.9	27.9	28.1	28.2	28.1	27.9	28							
TPN-limno	TPN	Third Portage Lake - North Basin	11/19/2017	November	DO (mg/L)	mg/L	AEM probes	14W	636609	7214603	13.5			14.85	14.79	14.64	14.5	14.32	14.2	14.08	14.01	13.96	13.95	13.95	13.93	13.91							
TPE-limno	TPE	Third Portage Lake - East Basin	12/6/2017	December	Temperature	C	AEM probes	14W	638250	7211971	11				0.66	0.83	0.95	1.08	1.2	1.33	1.62	2.49	2.97										
TPE-limno	TPE	Third Portage Lake - East Basin	12/6/2017	December	Cond (uS)	uS/cm	AEM probes	14W	638250	7211971	11				33.6	32.5	31.8	32.1	32.1	32.6	34.4	34.4	32.8										
TPE-limno	TPE	Third Portage Lake - East Basin	12/6/2017	December	DO (mg/L)	mg/L	AEM probes	14W	638250	7211971	11				15.4	15.71	15.49	15.33	15.11	14.48	14.73	14.13	12.47										
TPN-limno	TPN	Third Portage Lake - North Basin	12/6/2017	December	Temperature	C	AEM probes	14W	637043	7213454	15.3				0.58	0.71	0.83	0.88	0.93	0.99	1.02	1.07	1.1	1.14	1.16	1.21	1.26	1.37					
TPN-limno	TPN	Third Portage Lake - North Basin	12/6/2017	December	Cond (uS)	uS/cm	AEM probes	14W	637043	7213454	15.3				28.7	28.9	28	27.8	27.9	28	28.1	28.1	28	28.1	28.2	28.3	28.5	28.4					
TPN-limno	TPN	Third Portage Lake - North Basin	12/6/2017	December	DO (mg/L)	mg/L	AEM probes	14W	637043	7213454	15.3				14.22	14.5	14.53	14.5	14.36	14.26	14.17	14.13	14.11	14.07	14.02	13.98	13.96	13.91					
SP-limno	SP	Second Portage Lake	12/6/2017	December	Temperature	C	AEM probes	14W	639516	7214256	5.5				0.83	1	1.13	1.21															
SP-limno	SP	Second Portage Lake	12/6/2017	December	Cond (uS)	uS/cm	AEM probes	14W	639516	7214256	5.5				40.9	40.7	40.3	40.9															
SP-limno	SP	Second Portage Lake	12/6/2017	December	DO (mg/L)	mg/L	AEM probes	14W	639516	7214256	5.5				15.43	15.35	15.27	15.09															
WAL-limno	WAL	Wally Lake	12/10/2017	December	Temperature	C	AEM probes	15W	362319	7222978	15				1.48	1.84	2.07	2.15	2.2	2.22	2.25	2.28	2.31	2.22	2.33	2.34	2.35						
WAL-limno	WAL	Wally Lake	12/10/2017	December	Cond (uS)	uS/cm	AEM probes	15W	362319	7222978	15				53.2	49.8	50.4	51.3	51.6	51.9	52	51.8	51.9	52	52.2	52.3	52.4						
WAL-limno	WAL	Wally Lake	12/10/2017	December	DO (mg/L)	mg/L	AEM probes	15W	362319	7222978	15				14.67	14.76	14.55	14.1	13.85	13.66	13.45	13.26	13.11	12.94	12.78	12.65	12.53						