Keeyask Generation Project

Aquatic Effects Monitoring Plan

Benthic Invertebrate Monitoring Report

AEMP-2022-13

KEEYASK

Manitoba Environment, Climate and Parks Client File 5550.00
Manitoba Environment Act Licence No. 3107

2021 -2022

KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2022-13

BENTHIC INVERTEBRATE MONITORING IN THE NELSON RIVER FROM SPLIT LAKE TO STEPHENS LAKE, FALL 2021

Prepared for

Manitoba Hydro

By

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June 2022

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This report should be cited as:

G.J. Gill, L. Neufeld, and A. Watrin Prodaehl. 2022. Benthic invertebrate monitoring in the Nelson River from Split Lake to Stephens Lake, fall 2021. Keeyask Generation Project Aquatic Effects Monitoring Report #AEMP-2022-13. A report prepared for Manitoba Hydro by North/South Consultants Inc., June 2022. xv + 88.

SUMMARY

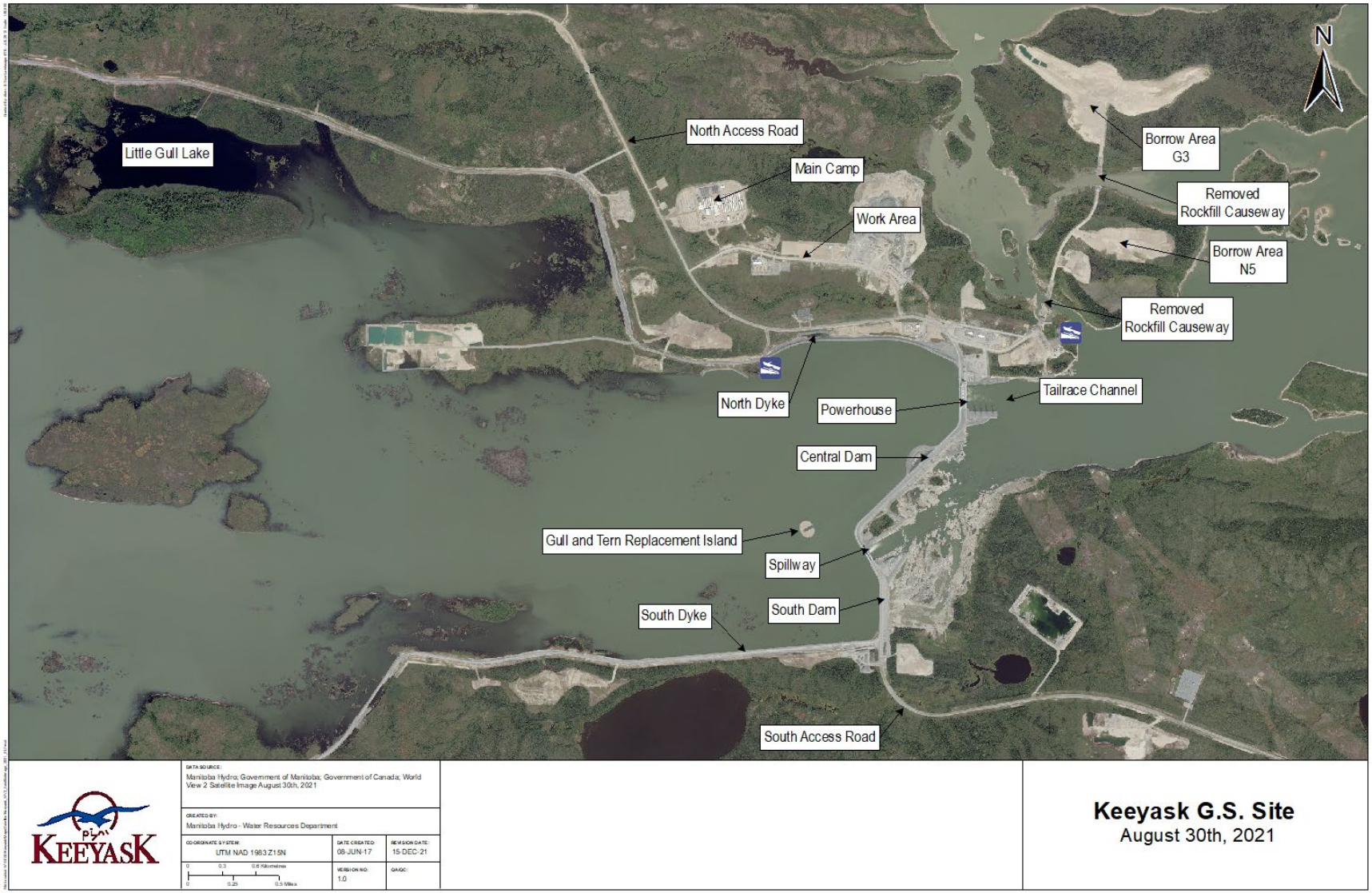
Background

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

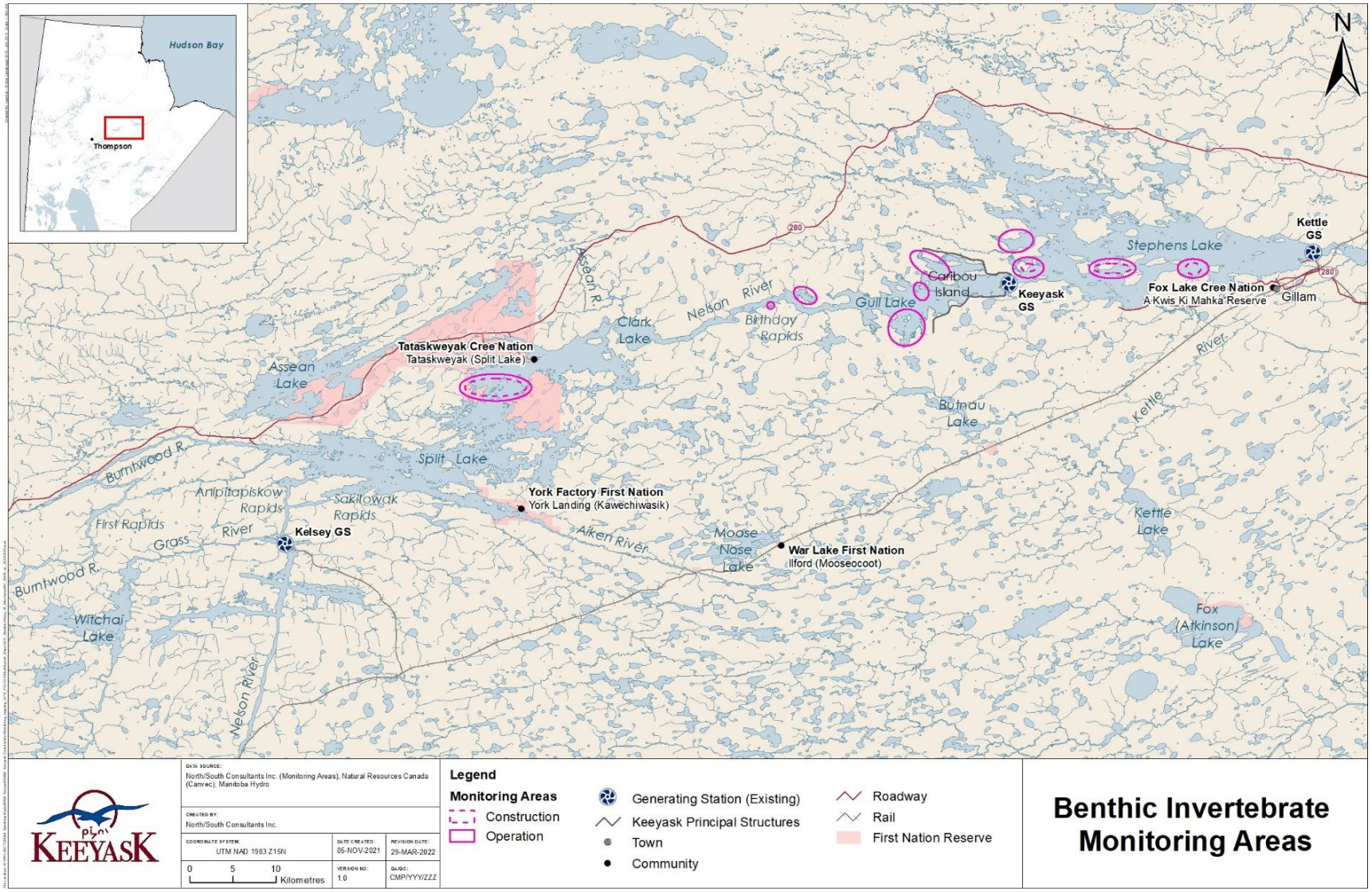
Construction of the Keeyask GS began in mid-July 2014 and instream work was completed in 2020. The reservoir was impounded with water levels being raised to full supply level between August 31 and September 5, 2020. Commissioning of the powerhouse turbines was initiated after impoundment and five of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

Benthic macroinvertebrates (BMIs) are tiny animals without backbones, such as insect larvae and clams that live in or on the bottom of lakes and rivers. Monitoring the BMI community is an important part of the overall plan to monitor the effects of the Keeyask GS on the aquatic environment. BMIs are often used to determine the health of lakes and rivers. BMIs are also a valuable food source for many species of fish, including Lake Sturgeon.

This report describes the results of the BMI community monitoring conducted during fall 2021, a year after the Keeyask reservoir was impounded. Samples were collected upstream of the physical effects of the Project in Split Lake, in the reservoir itself including newly flooded areas, and downstream of the generating station in Stephens Lake. The BMI community in Split Lake represents an environment where the inflow is regulated by upstream hydroelectric development but the lake itself has not been dammed to form a reservoir. In contrast, Stephens Lake is a 50-year-old reservoir, and its invertebrate community has developed over flooded former terrestrial land and a former river. Comparing the BMI community in the Keeyask reservoir to that of Split Lake shows how similar or different the BMI in the Keeyask reservoir are to an upstream lake on a regulated river system, while comparison to Stephens Lake indicates the possible long-term condition of the BMI in the Keeyask reservoir.



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



Map showing the areas where sampling for benthic macroinvertebrates was done in 2021.

Why is the study being done?

The monitoring of benthic invertebrates is being done to see how the abundance (how many bugs), composition (what kinds of bugs), and diversity (how many different kinds of bugs) in the Keeyask reservoir changes over time. This is important because flooding of the Keeyask reservoir caused many changes to the aquatic habitat that will affect the types and abundance of benthic invertebrates. Benthic invertebrates will also colonize the newly flooded areas over time. Changes to the invertebrate community can affect fish that rely on them as a food source.

What was done?

This report presents the results of benthic invertebrate monitoring from Split Lake to the Kettle GS in 2021 (see study map above). Sites in Split Lake were sampled to record the benthic invertebrate community in an area not directly affected by creation of the Keeyask reservoir and to show how the invertebrate community in a lake upstream can vary from year to year. Sites in Keeyask reservoir (from Clark Lake to the Keeyask GS) were sampled to show how the invertebrate community may be affected by the project from effects like flooding, fluctuating water levels, and changes in water quality, as well as record how newly flooded areas are colonized by invertebrates. Finally, sites in Stephens Lake immediately downstream of the GS were sampled to show how the benthic invertebrate community may be affected by changes in flow. Other sites in Stephens Lake show the year-to-year variation in the BMI community in a reservoir where water levels are controlled.

A total of 145 benthic invertebrate samples were collected in 2021. These included 15 samples in Split Lake, 60 samples in the Keeyask reservoir, and 55 samples in Stephens Lake. Sampling was conducted in Split Lake on August 16 (these data are collected as part of the CAMP); the Keeyask reservoir and Stephens Lake were sampled between September 15 and 26.

At each location, invertebrates were sampled in three areas: i) intermittently-exposed (IE; very close to shore measuring less than 1 m deep), ii) predominantly-wetted (PW; a little farther from shore measuring 1-3 m deep), iii) offshore (areas farthest from shore measuring 3-10 m deep).

Collecting a benthic invertebrate sample with a kicknet sampler (left) and a Ponar grab (right) in the Keeyask reservoir.

What was found?

In the Keeyask reservoir, all new aquatic habitat created by flooding in sampling area less than 1 m deep had been colonized by aquatic invertebrates and scuds (side-swimmers) were the most abundant group in this area. Sample sites in deeper waters (1-3 m) and greater than 3 m generally had an abundance of bugs within the range observed in Split and Stephens lakes. Mayflies were the most common group in many of the offshore sampling sites.

A bay to the north of the GS in Stephens Lake (see map below) was sampled as a reference area as it was a flooded backbay when Stephens Lake was formed and is a similar physical environment to the newly flooded backbays in the Keeyask reservoir. The BMI community was different from that in the backbays of the Keeyask reservoir and was made up of mostly worms and midges. This suggests that the BMI community in the Keeyask reservoir backbays will likely change over time.

What does it mean?

Sampling in 2021 provides a starting point for studying the changes in benthic invertebrate community in the Keeyask reservoir – the new aquatic habitats created from flooding terrestrial areas as well as the existing lake and river channels that now form the reservoir are still changing rapidly. In future years the BMI community within flooded areas of the Nelson River and Gull Lake will be compared to the pre-Project condition to see how these sites have changed. The overall BMI community in the Keeyask reservoir, including newly flooded areas, will also be compared to that of Split Lake and Stephens Lake to see how the new reservoir compares to a lake and an old reservoir, in particular whether the BMI community will be able to support fish that eat them.

What will be done next?

BMI monitoring will be conducted in 2022 and sampling will be conducted using the same collection methods, so that results can be compared between different years and trends can be seen.

ACKNOWLEDGEMENTS

We would like to thank Manitoba Hydro for the opportunity and resources to conduct this study.

Grant Connell, Leslie Flett, and Terry Kitchekeesik of Tataskweyak Cree Nation, and Stewart Anderson and Ray Mayham of Fox Lake Cree Nation are thanked for their local expertise and assistance in conducting the field work.

The collection of biological samples described in this report was authorized by Manitoba Water Stewardship, Fisheries Branch, under terms of the Scientific Collection Permits #08-21 and #20-21.

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1.0 INTRODUCTION

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

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

Benthic invertebrate baseline studies in the Keeyask study area were conducted between 1997 and 2006 in Split Lake, the Clark Lake to Gull Rapids reach of the Nelson River, and Stephens Lake (Lawrence and Fazakas 1997; Fazakas and Zrum 1999; Zrum and Neufeld 2001; Zrum and Bezte 2003; Zrum and Kroeker 2003; Juliano and Neufeld 2004, 2005; Sotiropoulos and Neufeld 2004; Neufeld 2007; and Capar 2008). Additional baseline data were collected in fall 2013 to augment the existing dataset and improve its utility for post-Project comparisons. As part of the CAMP, benthic invertebrate data are collected in Split Lake since 2009 (annually); and in Stephens Lake since 2009 (every three years) (CAMP 2014, CAMP 2017). The data are reviewed and used as an additional source of information for Project monitoring. Additionally, TSS, turbidity, and DO data collected during the PEMP and SMP were considered in the interpretation of benthic invertebrate monitoring results.

Construction monitoring (2014 to 2019) specifically addressed questions related to the biological effects of predicted increases in TSS on the benthic community due to in-stream work on the Nelson River and complemented the water quality program (Zrum and Gill 2015; Zrum and Gill 2016; Dawson 2017; 2018, 2019; Dawson and Neufeld 2020). Overall, the results observed in Stephens Lake throughout construction monitoring suggested that observed changes in the benthic invertebrate community metrics were more likely related to natural variation as opposed to the Project-related activities.

Operation monitoring of the benthic invertebrate community specifically addresses the biological effects of predicted flooding, sedimentation, increased frequency of water level fluctuations, and changes in surface water quality within the Keeyask reservoir as well as downstream of the Keeyask GS. Split Lake is upstream of the effects of the GS and was sampled as a reference site to indicate natural interannual variation in the invertebrate community. Data from Split Lake were

collected as part of Manitoba and Manitoba Hydro's Coordinated Aquatic Monitoring Program (CAMP).

The key questions during operation monitoring within the Keeyask reservoir are:

- *Has an area-wide, large increase in benthic invertebrate abundance, and a change in community composition, occurred in the long term in response to the increased availability of aquatic habitat and changes in substrates?*
- *Are benthic macroinvertebrate abundance and/or distribution in littoral habitat negatively affected by the increased frequency of water level fluctuations?*
- *Do low DO concentrations in areas of flooding and peat disintegration result in initially low levels of benthic abundance and richness?*
- *What is the ultimate abundance of benthos in the long term if DO depletion continues to occur during the winter months?*
- *Are there any unexpected effects on the upstream benthic invertebrate community that may be related to GS operation?*

The biological effects of the predicted alteration of flow, water velocities, water depths, and a reduction in ice scour downstream of the Keeyask GS are addressed by these key questions:

- *Have irregular flow patterns contributed to a reduction in benthic macroinvertebrate taxa richness?*
- *Has reduced ice scour in littoral habitat contributed to any change to the abundance and/or distribution of benthos?*
- *Are there any unexpected effects on the downstream benthic invertebrate community that may be related to GS operation?*

This report presents the results of benthic invertebrate sampling conducted in 2021, a full year after impoundment of the Keeyask reservoir in September 2020. It is expected that the benthic invertebrate community in the reservoir and immediately downstream of the GS in Stephens Lake is still undergoing substantive changes in response to the large changes in habitat as a result of impoundment and diversion of flow from the spillway to the powerhouse. Therefore, a detailed analysis of the post-impoundment invertebrate community and comparison to the pre-Project condition will be completed after the third year of monitoring in 2023 after initial colonization would largely be complete. This analysis will address the key questions listed above. It is anticipated that the BMI community would continue to evolve over time as aquatic habitat in the reservoir matures; therefore, BMI monitoring would continue at a reduced frequency in the future. Monitoring of the BMI community in Split Lake, an upstream lake with regulated inflows, will provide a measure of the BMI community in a non-dammed lake, including interannual variation. Comparisons to sites in Stephens Lake not immediately downstream of the GS (which are affected by operation of the Keeyask GS) will provide a measure of inter-annual variation in a reservoir where water levels are controlled.

2.0 STUDY SETTING

The study area encompasses an approximately 110 km long reach of the Nelson River from Split Lake to Stephens Lake (Map 1). This section of river offers a diversity of physical habitat conditions, including a variety of substrate types, and variable water depths (range 0–30 m) and velocities.

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

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

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

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

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

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

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

2.1 FLOWS, WATER LEVELS, AND KEEYASK OPERATIONS

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

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

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

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

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

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

3.0 METHODS

The AEMP is designed to compare benthic invertebrate community metrics at sites predicted to be most affected by the Project (*i.e.*, the Keeyask reservoir and Stephens Lake) to baseline and to upstream reference sites (*i.e.*, Split Lake). The AEMP sampling design is comparable to the current CAMP design whereby sampling areas (*i.e.*, habitat polygons) were stratified by water depth and constrained by other aquatic habitat attributes to minimize the inherent variability within the invertebrate data.

Invertebrate samples were collected from intermittently-exposed (IE; approximately 1 m deep), predominantly-wetted (PW; 1 to 3 m deep), and offshore (OS; 3 to 10 m deep) habitat polygons. Habitat attributes within sampling polygons were constrained to meet three criteria: consistent water movement (*i.e.*, standing water, low water velocity); homogeneous/consistent substrate; no aquatic macrophyte beds. The spatial extent of a sampling polygon was at least 100 m x 100 m, and large enough to adequately accommodate five replicate stations. Within each polygon, the locations of the five replicate stations were established by field crews and selected based on specific habitat attributes (*i.e.*, water depth, water velocity, substrate type, and absence of aquatic plants) and the spatial separation criteria outlined in Metal Mining Technical Guidance for EEM (Environment Canada 2012). By EEM definition, a replicate station is a specific, fixed sampling location that can be recognized, re-sampled, and defined quantitatively (*e.g.*, UTM position and a written description). The size of each replicate station was minimally 10 m x 10 m and separated from other replicate stations by at least 20 m.

Within the Keeyask reservoir, sampling areas were selected to represent a range of post-impoundment habitat types, as defined by the reservoir zones, including with flooded backbays (Map 3), Site selection within the flooded areas was often impacted due to the presence of flooded terrestrial vegetation (such as willows and Labrador tea). In several cases, this necessitated moving a polygon from the target area. This is discussed further in the results (Section 4.0).

3.1 FIELD PROCEDURES

Benthic invertebrates were sampled at IE sites using a kicknet. Within the IE polygon, a replicate station consisted of three kicknet samples. PW and OS sites were sampled using either a petite Ponar or Ekman dredge (each with an area of 0.023 m^2). A replicate station consisted of five benthic grab samples (three grabs were collected at Split Lake sites sampled under the CAMP). Individual grab samples were combined into one composite sample per replicate station. Each grab sample was sieved through a 500 micron (µm) mesh rinsing bucket. An acceptable sample required that the jaws be completely closed upon retrieval. If the jaws were not completely closed, the sample was discarded into a bucket (and disposed of once sampling was completed) and the procedure was repeated. All sampling equipment was rinsed before sampling at the next site. All material retained by the sieve bucket, including invertebrates, were transferred to labelled plastic

jars and fixed with 10% formalin. Invertebrate samples were shipped to the NSC laboratory (Winnipeg, MB) for processing.

An additional benthic grab was taken at each replicate station and sub-sampled with a 5 cm diameter core tube (0.002 square metres [m^2] surface area) to provide a sample of approximately 500 millilitres (mL) of sediment to characterize the benthic substrate in terms of total organic carbon (TOC) content, sand, silt, and clay (PSA). Sediment samples were sent chilled in coolers to ALS Laboratory Group (ALS; Winnipeg, MB) for analysis.

Water depth (maximum sampling depth in IE) and a description of the benthic substrate were recorded with every sample. The following supporting variables were measured/recorded within each replicate station:

- UTM position (hand-held GPS receiver);
- Water temperature (hand-held thermometer, below surface);
- Water transparency (Secchi disk, down and up measures);
- Water velocity (Swoffer current velocity meter at approximately 20 centimetres [cm] below water surface or visually estimated); and
- Aquatic macrophytes (if present, relative abundance and dominant type).

3.2 LAB PROCEDURES

At the NSC laboratory, samples from all locations were rinsed with water through a 500 µm sieve and sorted under a 3X magnifying lamp. The invertebrates were transferred to 70% ethanol prior to being identified to the appropriate taxonomic level. A Leica Mz125 microscope (maximum 100x magnification) and reference texts listed in Appendix 1 were used for taxonomic identification. Scientific names used followed the Integrated Taxonomic Information System (ITIS 2022) classification. Invertebrates were identified to major group (subclass, order, or family) and Ephemeroptera were identified to genus. All invertebrate identification and enumeration was performed by an invertebrate taxonomist at NSC.

Invertebrate samples were processed using the following NSC's Quality Assurance/Quality Control (QA/QC) guidelines (Appendix 2). Sorted samples were checked by a second laboratory technician (QA/QC technician) with a sorting efficiency of ≥ 95%. Additional invertebrates collected during the QA/QC process were combined with the original sample but counted separately. The QA/QC technician checked on a tray-by-tray basis so that the sample; the QA/QC technician sorted remaining invertebrates from the tray and recorded the number of missed invertebrates. The QA/QC technician also checked the bench sheet data to ensure it matched the sample data. Additionally, ten percent (10%) of the in-house identifications were randomly selected and re-identified by a second invertebrate taxonomist for QA/QC of identification and enumeration. The target overall accuracy level for in-house invertebrate identifications and enumeration was 95%. Corrections were used in place of data discrepancies.

Sorted samples will be retained and archived for the duration of the operation monitoring phase should further analysis be required. A reference collection of benthic invertebrates will be maintained to ensure taxonomic consistency throughout the monitoring program duration.

3.3 DATA ANALYSIS

The IE invertebrate counts were reported as abundance and expressed as the total number of invertebrates per kicknet sample. The PW and OS invertebrate counts were converted to density using the following equation: density (no. per m^2) = [(invertebrate count ÷ no. of grab samples) ÷ sampler area ($0.023m^2$)]× 100)

Abundance and density were used to characterize the invertebrate community in terms of quantity and relative proportions, these measures included: total invertebrates, major groups [Oligochaeta (aquatic worms), Crustacea (e.g., amphipods), Mollusca (snails and clams, including Pisidiidae), Coleoptera (beetles), Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies), Chironomidae (non-biting midges), Ceratopogonidae (biting midges), and other aquatic taxa that were categorized as Other (e.g., mites)], EPT index (percent Ephemeroptera, Plecoptera, and Trichoptera), percent Oligochaeta and Chironomidae, and ratio of EPT to Chironomidae.

Taxonomic richness (total and EPT) and Simpson's indices (diversity and evenness) were used to characterize the benthic invertebrate community in terms of diversity (to Family-level). Taxonomic richness is a measure of diversity and is the total number of taxa in a habitat (or sample). Simpson's diversity index was also used to quantify diversity as it provides more information about community structure than abundance or richness alone. Simpson's diversity index considers both richness and evenness and measures the probability that two individuals randomly selected from a sample will belong to the same taxon. Simpson's diversity index values (probabilities) range from zero (low diversity) to one (high diversity). Simpson's evenness index is calculated from the Simpson's diversity index and is a measure of the relative abundance of the different taxa making up the richness of a habitat (or sample). Evenness values range from zero (no evenness) to one (complete evenness).

Summary statistics (mean, ± SD [standard deviation], ± SE [standard error], median, minimum, and maximum) were calculated for each metric calculated.

4.0 RESULTS

Sampling was conducted at a single location in Split Lake on August 16 (Map 4) as part of CAMP. Five locations were sampled within the Keeyask reservoir (Map 5) and four within Stephens Lake (Map 6) between September 15 and 26. A total of 145 benthic invertebrate samples were collected. These included 15 samples in Split Lake, 60 samples in the Keeyask reservoir, and 55 samples in Stephens Lake. Sediment samples were collected at all sites except one (ONB-IE-R1) where rafted logs prevented access to the shallower water to collect a representative substrate sample.

Invertebrate data for individual replicate stations are presented in Appendix 3 and benthic sediment data are presented in Appendix 4.

4.1 SPLIT LAKE

Substrate within the IE habitat was largely silt (70%) with 4.1% total organic carbon (Figure 1). Mean total abundance was 625 invertebrates and total richness was 20 taxa (Table 2). The most abundant taxa were Oligochaeta and Chironomidae (Figure 2). Mean abundance of EPT was 22, Simpson's diversity index was 0.79, and the Simpson's evenness index was 0.25 (Table 2).

Sediment content in the nearshore PW polygon was largely silt (49%) and sand (44%), with 1.8% total organic carbon (Figure 3). Total invertebrate density was 3,229 invertebrates per m^2, with a mean total richness of 10 taxa (Table 3). Chironimidae were the dominant taxa, making up 61% of the total (Figure 4). The Simpson's diversity index in the predominantly-wetted portion of Split Lake was 0.57 and the Simpson's evenness index was 0.23 (Table 3).

Sediment composition within the offshore sampling polygon was 21% sand, 58% silt, and 21% clay, with 1.2% total organic carbon (Figure 5). Mean total invertebrate density was 625 invertebrates per m^2, with a mean total richness of 5 taxa (Table 4). The two dominant invertebrate groups were Bivalvia and Amphipoda (Figure 6). Mean Simpson's diversity index was 0.55, and the Simpson's evenness index was 0.53 (Table 4).

4.2 KEEYASK RESERVOIR DOWNSTREAM OF BIRTHDAY RAPIDS (ZONE 1A)

Substrate within the IE habitat, which was located in flooded, previously terrestrial habitat, was made of nearly even amounts of sand (32%), silt (35%) and clay (32%) with 1.0% total organic carbon (Figure 1). Mean total abundance was 914 invertebrates and total richness was seven taxa (Table 6). The most abundant taxa was Amphipoda, representing 41% of the total (Figure 2). EPT made up 7% of the total abundance, Simpson's diversity index was 0.47, and the Simpson's evenness index was 0.24 (Table 6).

Sediment content in the nearshore PW polygon was largely sand (63%) with 2.0% total organic carbon (Figure 3; Appendix 5). Total invertebrate density was 3,283 invertebrates per m^2, with a mean total richness of 11 taxa (Table 7). Chironimidae were the dominant taxa, making up 61% of the total (Figure 4). EPT made up 9% of the total abundance, Simpson's diversity index was 0.58, and the Simpson's evenness index was 0.24 (Table 7).

An offshore habitat polygon was not sampled in this area prior to 2021. Collecting suitable benthic samples in the OS at this site was challenging as the substrate throughout the area contained patches of cobble/boulder mixed amongst gravel/silt/clay substrates which resulted in many incomplete sampling attempts. Sediment composition (mean values) at this site was 35% sand, 44% silt, and 22% clay, with 1.4% total organic carbon (Figure 5). Mean total invertebrate density was 270 invertebrates per m^2, comprising five taxa (Table 8). The most dominant group was the Ephemeroptera, in which a single taxon comprised 62% of the total invertebrate composition (Ephemeridae: *Hexagenia*) (Figure 6). Mean Simpson's diversity index was 0.57, and the Simpson's evenness index was 0.53 (Table 8).

4.3 KEEYASK RESERVOIR UPSTREAM OF GULL LAKE (ZONE 7)

Substrate within the IE habitat was made largely of sand (95%) with 0.3% total organic carbon (Figure 1). Mean total abundance was 1,607 invertebrates and total richness was 12 taxa (Table 9). The most abundant taxa was Amphipoda, representing 79% of the total (Figure 2). EPT made up 1% of the total abundance, Simpson's diversity index was 0.68, and the Simpson's evenness index was 0.27 (Table 9).

Sediment content in the nearshore PW polygon was largely silt (61%) with large amounts of (13%) total organic carbon (Figure 3; Appendix 5). Total invertebrate density was 4,121 invertebrates per m^2, with a mean total richness of eight taxa (Table 10). Chironimidae were the dominant taxa, making up 78% of the total (Figure 4). EPT made up 3% of the total abundance, Simpson's diversity index was 0.58, and the Simpson's evenness index was 0.30 (Table 10).

Sediment composition in the offshore area was 35% sand, 44% silt, and 22% clay, with 1.4% total organic carbon (Figure 5). Mean total invertebrate density was 954 invertebrates per m^2, comprising five taxa (Table 11). The most dominant groups were Pisidiidae and Chironimidae (Figure 6). EPT made up 15% of the total abundance, Simpson's diversity index was 0.66, and the Simpson's evenness index was 0.69.

4.4 KEEYASK RESERVOIR BACKBAY ZONE 4

Field crews were not able to locate a suitable area to establish the IE polygon within the Zone 4 backbay site nearer to the PW and OS sampling sites. The IE habitat throughout the area

contained flooded willow/Labrador tea preventing access to the shoreline followed by water too deep for kicknet sampling. A site was established farther to the east along similar flooded shoreline (Map 5).

Substrate was largely sand (89%) with some silt (10%) and clay (1%), with total organic carbon of <1% (Figure 1). Mean total abundance was 308 invertebrates per sample and total richness was 11 taxa (Table 12). The three dominant taxa were Amphipoda, Oligochaeta, and Corixidae (water boatman) (Figure 2). EPT made up 4% of the total abundance, Simpson's diversity index was 0.58, and the Simpson's evenness index was 0.24 (Table 12).

The nearshore PW polygon was located within the Zone 4 backbay. Mean sediment content was 41.7% sand, 32.7% silt, and 25.6% clay, with 1.8% total organic carbon (Figure 3). Total invertebrate density was 1,878 invertebrates per m^2, with a mean total richness of nine taxa (Table 13). The three dominant taxa were: Chironomidae, Amphipoda and Oligochaeta with mean densities of 717, 438, and 312 invertebrates per m^2, respectively (Figure 4). EPT made up 22% of the total abundance, Simpson's diversity index was 0.71, and the Simpson's evenness index was 0.38.

The offshore polygon was located at the mouth of the Zone 4 back bay. The benthic substrate was described as predominantly clay with woody debris. Sediment composition (mean values) at this site was 38% sand, 55% silt, 7% clay, with 2.7% total organic carbon (Figure 5). Mean total invertebrate density at the site was 810 invertebrates per m^2, with a mean total richness of nine taxa (Table 14). The two dominant invertebrate groups were the Ephemeroptera (mainly *Hexagenia)*, and Bivalvia (mainly Pisidiidae) (Figure 6). Two EPT taxa comprised 45% of the invertebrate total. Mean Simpson's diversity index was 0.67, and the Simpson's evenness index was 0.38 (Table 14).

4.5 KEEYASK RESERVOIR BACKBAY ZONE 12

Substrate within the IE habitat was made largely of sand (68%) with 0.5% total organic carbon (Figure 1). Mean total abundance was 1,353 invertebrates per sample and total richness was ten taxa (Table 15). The most abundant taxa was Amphipoda, representing 76% of the total (Figure 2). EPT made up 4% of the total abundance, Simpson's diversity index was 0.47, and the Simpson's evenness index was 0.22 (Table 15).

Sediment content in the nearshore PW polygon was largely silt (79%) with large amounts of (9%) total organic carbon (Figure 3; Appendix 5). Total invertebrate density was 2,820 invertebrates per m^2, with a mean total richness of nine taxa (Table 16). Chironimidae were the dominant taxa, making up 69% of the total (Figure 4). EPT made up 16% of the total abundance, Simpson's diversity index was 0.53, and the Simpson's evenness index was 0.27 (Table 16).

The benthic substrate within the offshore polygon was described as predominantly clay. Sediment composition (mean values) at this site was 47% sand, 39% silt, and 15% clay, with 1.7% total organic carbon (Figure 5; Appendix 5). Mean total invertebrate density was 871 invertebrates per

m^2, with a mean total richness of eight taxa (Table 17). The dominant taxa were the Ephemeroptera and Chironimidae. Three EPT taxa comprised 39% of the invertebrate total. Mean Simpson's diversity index was 0.57, and mean evenness was 0.42 (Table 17).

4.6 KEEYASK RESERVOIR BACKBAY ZONE 8

Substrate within the IE habitat was made largely of sand (78%) with 0.4% total organic carbon (Figure 1). Mean total abundance was 1,306 invertebrates per sample and total richness was nine taxa (Table 18). The most abundant taxa was Amphipoda, representing 91% of the total (Figure 2). EPT made up 1% of the total abundance, Simpson's diversity index was 0.22, and the Simpson's evenness index was 0.16 (Table 18).

Sediment content in the nearshore PW polygon was largely silt (60%) with large amounts of (11%) total organic carbon (Figure 3). Total invertebrate density was 1,160 invertebrates per m^2, with a mean total richness of eight taxa (Table 19). Chironimidae were the dominant taxa, making up 78% of the total (Figure 4). EPT made up 11% of the total abundance, Simpson's diversity index was 0.45, and the Simpson's evenness index was 0.20 (Table 19).

Sediment composition in the offshore area was largely silt (76%) with 2.2% total organic carbon (Figure 5). Mean total invertebrate density was 667 invertebrates per m^2, comprising six taxa (Table 20). Ephemeroptera were the most abundant taxa and EPT made up 74% of the total abundance (Figure 6; Table 20). Simpson's diversity index was 0.46, and the Simpson's evenness index was 0.31 (Table 20).

4.7 STEPHENS LAKE O'NEIL BAY

Substrate within the IE habitat was made largely of clay (56%) with 0.8% total organic carbon (Table 21; Figure 1). Mean total abundance was low at only 47 invertebrates per sample and total richness was seven taxa (Table 22). The most abundant taxa were Chironimidae and Bivalvia (Figure 2). EPT made up only 1% of the total abundance, Simpson's diversity index was 0.74, and the Simpson's evenness index was 0.55 (Table 22).

Sediment content in the nearshore PW polygon was largely silt (52%) and sand (32%) with 2.4% total organic carbon (Figure 3). Total invertebrate density was 2,907 invertebrates per m^2, with a mean total richness of nine taxa (Table 23). Bivalvia were the dominant taxa (Figure 4). EPT made up 30% of the total abundance, Simpson's diversity index was 0.60, and the Simpson's evenness index was 0.34 (Table 23).

The benthic substrate in 2021 was described as predominantly clay which was supported by the sediment sample analysis where the mean composition was 70% silt, 20% clay, 9% sand, with 1.5% total organic carbon (Table 21: Figure 5). Mean total invertebrate density was 660 invertebrates per m^2, with a mean total richness of nine taxa (Table 24). The two dominant taxa were the Ephemeroptera and Chironomidae (Figure 6). Two EPT taxa comprised 53% of the

invertebrate total. Mean Simpson's diversity index was 0.66, and mean evenness was 0.38 (Table 24).

4.8 STEPHENS LAKE – 3 KM DOWNSTREAM OF THE KEEYASK GS

Substrate within the IE habitat was made largely of sand (53%) and silt (34%) with 1.3% total organic carbon (Figure 1). Mean total abundance was 407 invertebrates per sample made up of 15 taxa (Table 25). Corixidae (50%) and Oligochaeta (30%) were the dominant taxa (Figure 4). A single EPT taxa made up only 0.5% of the total abundance. Simpson's diversity index was 0.56, and the Simpson's evenness index was 0.17 (Table 25).

Sediment content in the nearshore PW polygon was largely silt (65%) with 2.5% organic carbon (Figure 3). Total invertebrate density was 3,539 invertebrates per m^2, with a mean total richness of 13 taxa (Table 26). Chironimidae were the dominant taxa, making up 62% of the total (Figure 4). EPT made up 19% of the total abundance. Simpson's diversity index was 0.60, and the Simpson's evenness index was 0.21 (Table 26).

Sediment composition in the offshore area was largely sand (49%) and silt (44%) with 1.9% total organic carbon (Figure 5). Mean total invertebrate density was 1,521 invertebrates per m^2, comprising nine taxa (Table 27). Chironimidae and Ephemeroptera were the most abundant taxa and EPT made up 39% of the total abundance (Figure 6; Table 27). Simpson's diversity index was 0.70, and the Simpson's evenness index was 0.37 (Table 27).

4.9 STEPHENS LAKE – 11 KM DOWNSTREAM OF THE KEEYASK GS

Substrate within the IE habitat was made largely of sand (97%) with 3.6% total organic carbon (Figure 1). Mean total abundance was 408 invertebrates per sample made up of 15 taxa (Table 28). Oligochaeta (45%) and Chironimidae (23%) were the dominant taxa (Figure 4). Two EPT taxa made up only 1% of the total abundance. Simpson's diversity index was 0.69, and the Simpson's evenness index was 0.23 (Table 28).

Sediment content in the nearshore PW polygon was largely silt (62%) with 2.5% organic carbon (Figure 3). Total invertebrate density 2,003 invertebrates per m^2, with a mean total richness of 13 taxa (Table 29). Chironimidae were the dominant taxa, making up 51% of the total (Figure 4). EPT made up 14% of the total abundance. Simpson's diversity index was 0.65, and the Simpson's evenness index was 0.22 (Table 29).

Sediment composition in the offshore area was largely silt (82%) with 2.3% total organic carbon (Figure 5). Mean total invertebrate density was 783 invertebrates per m^2, comprising eight taxa

(Table 30). Amphipoda and Ephemeroptera were the most abundant taxa and EPT made up 41% of the total abundance (Figure 6; Table 27). Simpson's diversity index was 0.71, and the Simpson's evenness index was 0.45 (Table 27).

4.10 STEPHENS LAKE – 25 KM DOWNSTREAM OF THE KEEYASK GS

Substrate within the IE habitat was made largely of sand (76%) with 0.4% total organic carbon (Figure 1). Mean total abundance was 185 invertebrates per sample made up of eight taxa (Table 31). Chironimidae (65%) was the dominant taxa (Figure 4). One EPT taxa made up only 2% of the total abundance. Simpson's diversity index was 0.43, and the Simpson's evenness index was 0.26 (Table 31).

The predominantly-wetted habitat in Stephens Lake at 25 km was not sampled in 2021 but will be sampled annually moving forward as part of the operation monitoring plan.

Sediment composition in the offshore area was largely silt (84%) with 2.0% total organic carbon (Figure 5). Mean total invertebrate density was 457 invertebrates per m^2, comprising six taxa (Table 32). Amphipoda and Bivalvia were the most abundant taxa, while EPT made up 21% of the total abundance (Figure 6; Table 32). Simpson's diversity index was 0.67, and the Simpson's evenness index was 0.55 (Table 32).

5.0 DISCUSSION

Monitoring of the benthic macroinvertebrate (BMI) community is being conducted within the Keeyask reservoir to record effects of habitat changes on the established BMI community, specifically the effects of flooding, sedimentation, increased frequency of water level fluctuations along the margins of the reservoir, and changes in water quality in backbays as set out in the key questions in Section 1.0. Colonization of flooded former terrestrial habitat is also being recorded. Downstream of the Keeyask GS, monitoring is being conducted to assess the biological effects of predicted alteration of flow, as well as water velocities and depths, and a reduction in ice scour immediately downstream of the GS. The benthic macroinvertebrate community was sampled within intermittently-exposed (IE) (*i.e.*, <1m deep), predominantly-wetted (PW) (*i.e.*, 1 to 3 m deep), and offshore (OS) (*i.e.*, 3 to 10 m) areas. One location in Split Lake, five in the Keeyask reservoir between Birthday Rapids and the Keeyask GS, and four in Stephens Lake were sampled in 2021 during the first year following reservoir impoundment.

Five areas within the Keeyask reservoir were sampled including three newly flooded backbays (Zones 4, 8, and 12), one area downstream of Birthday Rapids, and one area upstream of Gull Lake. Each were generally difficult to sample in the IE area due to the presence of flooded terrestrial vegetation such as willows. All flooded former terrestrial habitat had been colonized by aquatic invertebrates, and Amphipoda were the most abundant taxon. Densities of invertebrates in the PW, which comprised both pre-existing shoreline and newly flooded habitat depending on the location in the reservoir, was comparable to that measured in Split Lake and Stephens Lake. Chironomidae were generally the most abundant group, as was observed in Split Lake. Sediment samples collected from PW sites often contained large amounts (2-13%) of total organic carbon. Offshore areas contained the lowest invertebrate densities, however, Ephemeroptera were generally abundant indicating that conditions in the newly formed reservoir could support this group, which is generally considered sensitive to adverse environmental conditions such as low DO.

O'Neil Bay in Stephens Lake was sampled as a reference area as it is considered a future proxy for the flooded backbays in Keeyask reservoir. These areas showed a marked difference from the Keeyask reservoir sites. Invertebrate abundance was low in the IE areas with Chironimidae and Bivalvia as the most common taxa. Invertebrate density was high in PW habitats and consisted largely of Bivalvia. However, as was observed in the Keeyask reservoir, Ephemeroptera were common in the OS and the %EPT was high.

The benthic macroinvertebrate community was also monitored at three sites in Stephens Lake along the Nelson River mainstem approximately 3, 11, and 25 km downstream of the Keeyask GS, which were also sampled to monitor effects of sediment inputs during construction. The total abundance of invertebrates was similar at all three IE areas, with large numbers of Oligochaeta and Chironimidae. PW areas showed a higher overall invertebrate abundance but were also dominated by Chironimidae. As with other OS areas, the total invertebrate abundance was lower than in the PW area but generally contained large amounts of Ephemeroptera.

Initial results after the first year of impoundment in the Keeyask reservoir indicate that benthic macroinvertebrates have begun to colonize flooded former terrestrial habitats and that previously wetted aquatic habitat continues to support invertebrates. It is expected that the abundance and species composition will change rapidly in the first few years as colonization continues and aquatic habitat evolves. For example, if fine sediments deposit in the channels within Gull Lake, the benthic macroinvertebrate community will also change. In the long term, it may become more similar to what is observed in Stephens Lake. A detailed analysis of the post-impoundment invertebrate community and comparison to the pre-Project condition will be completed after the third year of consecutive monitoring in 2023 when colonization will be largely complete.

6.0 SUMMARY AND CONCLUSIONS

- The benthic macroinvertebrate community was sampled in one area in Split Lake, five in the Keeyask reservoir between Birthday Rapids and the Keeyask GS, and four in Stephens Lake in 2021.
- Three habitat types were sampled in each location including intermittently-exposed (IE) (i.e., <1m deep), predominantly-wetted (PW) (i.e., 1 to 3 m deep), and offshore (i.e., 3 to 10 m) areas.
- Five areas within the Keeyask reservoir were sampled including three newly flooded backbays (Zones 4, 8, and 12), one area downstream of Birthday Rapids, and one area upstream of Gull Lake. Each were generally difficult to sample in the IE area due to the presence of flooded terrestrial vegetation such as willows. All flooded former terrestrial habitat had been colonized by aquatic invertebrates and Amphipoda was the most abundant group. Sample sites in the PW and OS were comprised of previously wetted aquatic habitat or flooded habitat, depending on the location in the reservoir. Overall abundance was within the range observed in Split and Stephens lakes. Ephemeroptera were the most common group in many of the offshore sampling sites.
- O'Neil Bay in Stephens Lake was sampled as a reference area as it is considered a future proxy for the Keeyask reservoir. The benthic macroinvertebrate community composition at IE and PW sites was markedly different from that in the backbays of the Keeyask reservoir, suggesting that the BMI community in the reservoir will change over time.
- Three additional areas along the mainstem of the Nelson River were sampled in Stephens Lake. Large numbers of Oligochaeta and Chironimidae were present in the IE, while the PW was dominated by Chironimidae. As with other OS areas, the total invertebrate abundance was lower than in the PW area but generally contained large amounts of Ephemeroptera.
- As 2021 represents the first year of benthic macroinvertebrate monitoring following impoundment of the Keeyask reservoir, it is too early to make conclusions regarding changes to these communities as a result of the Project. Monitoring will continue in 2022 and 2023. After the BMI community becomes established in the newly formed aquatic habitat, analyses will address the key questions, focussing on changes pre/post Project and whether conditions in specific habitats in the reservoir (e.g., flooded backbays) are not suitable for BMI.

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TABLES

Table 1: Site and habitat data measured at benthic invertebrate monitoring sites sampled in the Split Lake area, 2021.

Site ID	Habitat Type	Year	Date	UTM coordinates (Zone 14U)		Water Temp (°C)	Water Depth (mean, m)	Water Velocity (mean, m/sec)	Secchi Depth (mean, m)	Algae Type	Dominant Substrate
				Easting	Northing						
SPLIT-IE	Intermittently Exposed	2021	16-Aug	673559	6232699	18	0.8	0.00	0.2	filamentous	clay/organic material
SPLIT-PW	Predominantly Wetted	2021	16-Aug	673695	6233045	18	1.1	0.00	0.4	filamentous	clay/gravel (and shells)
SPLIT-OS	Offshore	2021	16-Aug	678480	6233988	18	6.0	0.00	1.1	none	clay (and shells)

Table 2: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in Split Lake (SPLIT) in 2021.

IE SPLIT	Abundance (#)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	625.00	21.50	19.60	7.60	0.79	0.25
Minimum	210.00	8.71	18.00	6.00	0.73	0.18
Maximum	1608.00	32.53	21.00	9.00	0.84	0.33
1st Quartile	375.00	10.90	19.00	7.00	0.77	0.22
Median	431.00	22.95	20.00	8.00	0.78	0.25
3rd Quartile	501.00	32.38	20.00	8.00	0.82	0.26
Variance (n-1)	313506.50	129.54	1.30	1.30	0.00	0.00
Standard deviation (n-1)	559.92	11.38	1.14	1.14	0.04	0.06
Standard error of the mean	250.40	5.09	0.51	0.51	0.02	0.02

Table 3: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in Split Lake (SPLIT) in 2021.

PW SPLIT	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3228.88	16.48	10.40	2.20	0.57	0.23
Minimum	2048.71	10.61	9.00	1.00	0.45	0.19
Maximum	5612.30	28.57	14.00	5.00	0.68	0.31
1st Quartile	2697.95	13.11	9.00	1.00	0.49	0.20
Median	2856.65	13.90	10.00	2.00	0.60	0.20
3rd Quartile	2928.79	16.20	10.00	2.00	0.62	0.27
Variance (n-1)	1896005.26	49.69	4.30	2.70	0.01	0.00
Standard deviation (n-1)	1376.96	7.05	2.07	1.64	0.09	0.06
Standard error of the mean	615.79	3.15	0.93	0.73	0.04	0.02

Table 4: Summary statistics for benthic invertebrates in the offshore sampling polygons in Split Lake (SPLIT) in 2021.

Offshore SPLIT	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	626.15	18.50	5.00	1.20	0.55	0.53
Minimum	57.71	3.45	3.00	1.00	0.30	0.34
Maximum	1197.48	50.00	7.00	2.00	0.70	0.94
1st Quartile	389.54	6.02	4.00	1.00	0.51	0.36
Median	418.40	10.81	5.00	1.00	0.62	0.48
3rd Quartile	1067.64	22.22	6.00	1.00	0.64	0.52
Variance (n-1)	235900.05	361.86	2.50	0.20	0.03	0.06
Standard deviation (n-1)	485.70	19.02	1.58	0.45	0.16	0.24
Standard error of the mean	217.21	8.51	0.71	0.20	0.07	0.11

Table 5: Site and habitat data measured at benthic invertebrate monitoring sites sampled in Keeyask reservoir, 2021.

Site ID	Habitat Type	Year	Date	UTM coordinates (Zone 15U)		Water Temp (°C)	Water Depth (mean, m)	Water Velocity (mean, m/sec)	Secchi Depth (mean, m)	Algae Type	Dominant Substrate
				Easting	Northing						
NR_DSNAP-IE	Intermittently Exposed	2021	25-Sep	335818	6244848	10	0.6	0.02	0.9	filamentous	clay/sand
NR_DSNAP-PW	Predominantly Wetted	2021	25-Sep	336104	6244128	12	1.5	0.00	0.8	none	clay/sand/gravel
NR_DSNAP-OS	Offshore	2021	25-Sep	335967	6244281	12	4.9	0.05	0.9	none	clay
ZONE4_PAH-IE	Intermittently Exposed	2021	26-Sep	337662	6245425	12	0.5	0.00	0.8	filamentous	sand/clay/gravel
ZONE4_PAH-PW	Predominantly Wetted	2021	26-Sep	339465	6245240	11	3.6	0.00	0.8	none	clay/gravel
ZONE4_PAH-OS	Offshore	2021	25-Sep	338897	6245259	14	4.6	0.02	0.9	none	clay/organic material
ZONE12_SEEB-IE	Intermittently Exposed	2021	19-Sep	354143	6243415	14	0.6	0.00	0.9	filamentous	sand/clay/gravel
ZONE12_SEEB-PW	Predominantly Wetted	2021	23-Sep	354426	6243796	13	2.4	0.02	1.0	none	organic material
ZONE12_SEEB-OS	Offshore	2021	21-Sep	354671	6244022	14	7.9	0.03	0.8	none	clay
NR_USGULL-IE	Intermittently Exposed	2021	19-Sep	350570	6246611	15	0.6	0.00	0.9	filamentous	sand/clay/gravel
NR_USGULL-PW	Predominantly Wetted	2021	24-Sep	350638	6246570	13	2.7	0.00	0.9	none	organic material
NR_USGULL-OS	Offshore	2021	24-Sep	350290	6245740	14	6.3	0.00	1.0	none	clay
ZONE8_GULL-IE	Intermittently Exposed	2021	18-Sep	356243	6248575	13	0.8	0.00	0.6	filamentous	clay/organic material/sand
ZONE8_GULL-PW	Predominantly Wetted	2021	21-Sep	354595	6247543	14	2.8	0.02	0.8	none	organic material/clay
ZONE8_GULL-OS	Offshore	2021	21-Sep	356158	6248442	13	6.9	0.02	0.9	none	clay/organic material/sand

Table 6: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in the Keeyask reservoir (NR_DSNAP) downstream of Birthday Rapids in 2021.

IE NR_DSNAP	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	913.60	6.74	9.00	1.80	0.47	0.24
Minimum	471.00	1.86	8.00	1.00	0.21	0.14
Maximum	1598.00	13.16	11.00	2.00	0.69	0.36
1st Quartile	539.00	4.51	8.00	2.00	0.41	0.15
Median	644.00	6.08	9.00	2.00	0.51	0.25
3rd Quartile	1316.00	8.07	9.00	2.00	0.56	0.28
Variance (n-1)	259808.30	18.08	1.50	0.20	0.03	0.01
Standard deviation (n-1)	509.71	4.25	1.22	0.45	0.18	0.09
Standard error of the mean	227.95	1.90	0.55	0.20	0.08	0.04

Table 7: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in the Keeyask reservoir (NR_DSNAP) downstream of Birthday Rapids in 2021.

PW NR_DSNAP	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3282.95	9.26	10.60	4.60	0.58	0.24
Minimum	1272.51	2.11	10.00	3.00	0.40	0.17
Maximum	6120.15	19.05	12.00	6.00	0.71	0.31
1st Quartile	1644.74	5.51	10.00	4.00	0.53	0.19
Median	2389.20	9.48	10.00	5.00	0.57	0.21
3rd Quartile	4988.15	10.14	11.00	5.00	0.67	0.30
Variance (n-1)	4620458.39	40.46	0.80	1.30	0.01	0.00
Standard deviation (n-1)	2149.53	6.36	0.89	1.14	0.12	0.06
Standard error of the mean	961.30	2.84	0.40	0.51	0.05	0.03

Table 8: Summary statistics for benthic invertebrates in the offshore sampling polygons in the Keeyask reservoir (NR_DSNAP) downstream of Birthday Rapids in 2021.

OS NR_DSNAP	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	270.08	61.50	5.00	1.20	0.57	0.53
Minimum	43.28	35.00	3.00	1.00	0.31	0.36
Maximum	519.39	82.35	7.00	2.00	0.74	0.78
1st Quartile	147.16	48.84	4.00	1.00	0.57	0.47
Median	268.35	61.29	5.00	1.00	0.59	0.48
3rd Quartile	372.23	80.00	6.00	1.00	0.65	0.54
Variance (n-1)	34784.90	409.93	2.50	0.20	0.03	0.02
Standard deviation (n-1)	186.51	20.25	1.58	0.45	0.16	0.16
Standard error of the mean	83.41	9.05	0.71	0.20	0.07	0.07

Table 9: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in the Keeyask reservoir (NR_USGULL) upstream of Gull Lake in 2021.

IE NR_USGULL	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1607.20	0.68	12.00	1.40	0.68	0.27
Minimum	618.00	0.00	10.00	0.00	0.56	0.21
Maximum	2354.00	1.74	14.00	3.00	0.76	0.35
1st Quartile	1380.00	0.00	11.00	0.00	0.67	0.22
Median	1612.00	0.65	12.00	1.00	0.67	0.27
3rd Quartile	2072.00	0.99	13.00	3.00	0.72	0.31
Variance (n-1)	450977.20	0.54	2.50	2.30	0.01	0.00
Standard deviation (n-1)	671.55	0.73	1.58	1.52	0.07	0.06
Standard error of the mean	300.33	0.33	0.71	0.68	0.03	0.03

Table 10: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in the Keeyask reservoir (NR_USGULL) upstream of Gull Lake in 2021.

PW NR_USGULL	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	4120.50	3.26	8.40	1.80	0.58	0.30
Minimum	2216.07	0.00	6.00	0.00	0.47	0.21
Maximum	5713.30	6.06	10.00	3.00	0.64	0.41
1st Quartile	3220.22	2.15	8.00	1.00	0.57	0.28
Median	4639.89	2.88	9.00	2.00	0.59	0.29
3rd Quartile	4813.02	5.22	9.00	3.00	0.61	0.29
Variance (n-1)	1930929.21	5.93	2.30	1.70	0.00	0.01
Standard deviation (n-1)	1389.58	2.43	1.52	1.30	0.07	0.07
Standard error of the mean	621.44	1.09	0.68	0.58	0.03	0.03

Table 11: Summary statistics for benthic invertebrates in the offshore sampling polygons in the Keeyask reservoir (NR_USGULL) upstream of Gull Lake in 2021.

OS NR_USGULL	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	953.95	14.93	4.60	0.80	0.66	0.69
Minimum	484.76	0.00	3.00	0.00	0.54	0.49
Maximum	1800.55	30.77	7.00	1.00	0.75	0.94
1st Quartile	605.96	4.29	4.00	1.00	0.63	0.54
Median	761.77	18.18	4.00	1.00	0.64	0.67
3rd Quartile	1116.69	21.43	5.00	1.00	0.71	0.82
Variance (n-1)	280347.42	159.97	2.30	0.20	0.01	0.03
Standard deviation (n-1)	529.48	12.65	1.52	0.45	0.08	0.19
Standard error of the mean	236.79	5.66	0.68	0.20	0.04	0.08

Table 12: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in the Keeyask reservoir backbay Zone 4 (Z4_PAH) in 2021.

IE Z4_PAH	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	308.00	3.80	10.80	2.80	0.58	0.24
Minimum	180.00	1.27	9.00	2.00	0.34	0.15
Maximum	498.00	5.65	14.00	3.00	0.72	0.29
1st Quartile	192.00	2.41	9.00	3.00	0.60	0.20
Median	316.00	4.44	10.00	3.00	0.61	0.27
3rd Quartile	354.00	5.21	12.00	3.00	0.65	0.28
Variance (n-1)	17030.00	3.54	4.70	0.20	0.02	0.00
Standard deviation (n-1)	130.50	1.88	2.17	0.45	0.14	0.06
Standard error of the mean	58.36	0.84	0.97	0.20	0.06	0.03

Table 13: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in the Keeyask reservoir backbay Zone 4 (Z4_PAH) in 2021.

PW Z4_PAH	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1878.46	21.79	9.40	3.00	0.71	0.38
Minimum	415.51	2.31	8.00	1.00	0.67	0.29
Maximum	4371.54	45.83	12.00	5.00	0.77	0.48
1st Quartile	1004.16	11.09	9.00	3.00	0.69	0.33
Median	1731.30	13.50	9.00	3.00	0.71	0.40
3rd Quartile	1869.81	36.21	9.00	3.00	0.73	0.41
Variance (n-1)	2285447.45	337.11	2.30	2.00	0.00	0.01
Standard deviation (n-1)	1511.77	18.36	1.52	1.41	0.04	0.08
Standard error of the mean	676.08	8.21	0.68	0.63	0.02	0.03

Table 14: Summary statistics for benthic invertebrates in the offshore sampling polygons in the Keeyask reservoir backbay Zone 4 (Z4_PAH) in 2021.

OS Z4_PAH	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	810.25	44.70	8.60	2.00	0.67	0.38
Minimum	623.27	29.03	6.00	1.00	0.60	0.25
Maximum	1073.41	62.96	11.00	3.00	0.74	0.58
1st Quartile	623.27	31.52	7.00	2.00	0.64	0.34
Median	796.40	47.22	8.00	2.00	0.68	0.35
3rd Quartile	934.90	52.78	11.00	2.00	0.71	0.39
Variance (n-1)	38726.49	206.07	5.30	0.50	0.00	0.01
Standard deviation (n-1)	196.79	14.36	2.30	0.71	0.06	0.12
Standard error of the mean	88.01	6.42	1.03	0.32	0.03	0.05

Table 15: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in the Keeyask reservoir backbay Zone 12 (Z12_SEEB) in 2021.

IE Z12_SEEB	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1353.00	3.97	9.60	2.00	0.47	0.22
Minimum	44.00	1.76	6.00	1.00	0.35	0.14
Maximum	2728.00	6.82	11.00	3.00	0.56	0.37
1st Quartile	936.00	2.52	10.00	2.00	0.37	0.16
Median	1152.00	2.78	10.00	2.00	0.53	0.19
3rd Quartile	1905.00	5.98	11.00	2.00	0.55	0.23
Variance (n-1)	1030775.00	5.14	4.30	0.50	0.01	0.01
Standard deviation (n-1)	1015.27	2.27	2.07	0.71	0.10	0.09
Standard error of the mean	454.04	1.01	0.93	0.32	0.05	0.04

Table 16: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in the Keeyask reservoir backbay Zone 12 (Z12_SEEB) in 2021.

PW Z12_SEEB	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2820.29	15.67	8.80	3.80	0.53	0.27
Minimum	1038.78	6.67	5.00	2.00	0.29	0.16
Maximum	4657.20	23.41	11.00	6.00	0.69	0.35
1st Quartile	1774.58	7.34	9.00	3.00	0.40	0.24
Median	2501.73	19.72	9.00	4.00	0.58	0.29
3rd Quartile	4129.16	21.19	10.00	4.00	0.69	0.33
Variance (n-1)	2364031.95	64.34	5.20	2.20	0.03	0.01
Standard deviation (n-1)	1537.54	8.02	2.28	1.48	0.18	0.08
Standard error of the mean	687.61	3.59	1.02	0.66	0.08	0.04

Table 17: Summary statistics for benthic invertebrates in the offshore sampling polygons in the Keeyask reservoir backbay Zone 12 (Z12_SEEB) in 2021.

OS Z12_SEEB	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	870.84	39.31	8.40	1.80	0.57	0.42
Minimum	614.61	0.00	2.00	0.00	0.02	0.20
Maximum	1108.03	57.81	14.00	4.00	0.77	0.60
1st Quartile	787.74	40.85	7.00	1.00	0.65	0.31
Median	856.99	47.37	9.00	1.00	0.67	0.48
3rd Quartile	986.84	50.51	10.00	3.00	0.76	0.51
Variance (n-1)	35616.68	520.06	19.30	2.70	0.10	0.03
Standard deviation (n-1)	188.72	22.80	4.39	1.64	0.31	0.16
Standard error of the mean	84.40	10.20	1.96	0.73	0.14	0.07

Table 18: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in the Keeyask reservoir backbay Zone 8 (Z8_GULL) in 2021.

IE Z8_GULL	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1305.80	1.14	8.60	2.60	0.22	0.16
Minimum	271.00	0.00	5.00	0.00	0.14	0.12
Maximum	3072.00	2.22	11.00	5.00	0.29	0.25
1st Quartile	622.00	1.08	8.00	2.00	0.20	0.13
Median	1080.00	1.11	9.00	3.00	0.20	0.14
3rd Quartile	1484.00	1.30	10.00	3.00	0.25	0.17
Variance (n-1)	1185149.20	0.63	5.30	3.30	0.00	0.00
Standard deviation (n-1)	1088.65	0.79	2.30	1.82	0.06	0.05
Standard error of the mean	486.86	0.35	1.03	0.81	0.02	0.02

Table 19: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in the Keeyask reservoir backbay Zone 8 (Z8_GULL) in 2021.

PW Z8_GULL	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	1159.97	11.22	8.00	3.80	0.45	0.20
Minimum	0.00	0.00	0.00	0.00	0.28	0.11
Maximum	2371.88	29.45	13.00	6.00	0.54	0.23
1st Quartile	813.71	3.65	8.00	2.00	0.41	0.19
Median	1263.85	3.85	9.00	5.00	0.49	0.22
3rd Quartile	1350.42	19.15	10.00	6.00	0.52	0.23
Variance (n-1)	745305.10	158.21	23.50	7.20	0.01	0.00
Standard deviation (n-1)	863.31	12.58	4.85	2.68	0.12	0.06
Standard error of the mean	386.08	5.63	2.17	1.20	0.06	0.03

Table 20: Summary statistics for benthic invertebrates in the offshore sampling polygons in the Keeyask reservoir backbay Zone 8 (Z8_GULL) in 2021.

OS Z8_GULL	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	666.55	73.51	6.40	1.80	0.46	0.31
Minimum	389.54	63.48	4.00	1.00	0.38	0.23
Maximum	995.50	79.31	8.00	3.00	0.55	0.45
1st Quartile	502.08	72.00	6.00	1.00	0.43	0.27
Median	649.24	75.00	7.00	2.00	0.44	0.28
3rd Quartile	796.40	77.78	7.00	2.00	0.48	0.29
Variance (n-1)	57287.93	39.25	2.30	0.70	0.00	0.01
Standard deviation (n-1)	239.35	6.26	1.52	0.84	0.06	0.08
Standard error of the mean	107.04	2.80	0.68	0.37	0.03	0.04

Table 21: Site and habitat data measured at benthic invertebrate monitoring sites sampled in Stephens Lake area, 2021.

Site ID	Habitat Type	Year	Date	UTM coordinates (Zone 15U)		Water Temp (°C)	Water Depth (mean, m)	Water Velocity (mean, m/sec)	Secchi Depth (mean, m)	Algae Type	Dominant Substrate
				Easting	Northing						
ONB-IE	Intermittently Exposed	2021	17-Sep	365886	6250606	12	0.6	0.00	0.2	filamentous	clay/organic material
ONB-PW	Predominantly Wetted	2021	20-Sep	365872	6250703	11	2.7	0.06	0.6	none	organic material/clay/sand
ONB-OS	Offshore	2021	20-Sep	365053	6250844	13	4.9	0.05	0.5	none	clay/organic material
STL3KM-IE	Intermittently Exposed	2021	17-Sep	365574	6248875	13	0.4	0.00	0.7	filamentous	clay
STL3KM-PW	Predominantly Wetted	2021	23-Sep	365700	6248894	12	2.3	0.00	0.8	none	clay/organic material
STL3KM-OS	Offshore	2021	23-Sep	366151	6248942	12	5.7	0.00	0.8	none	clay/organic material/sand/cobble
STL11KM-IE	Intermittently Exposed	2021	16-Sep	376286	6248904	15	0.9	0.00	0.3	filamentous	sand/gravel/clay/organic material/boulder/cobble
STL11KMPW	Predominantly Wetted	2021	16-Sep	376479	6248787	15	2.2	0.06	0.8	none	clay/shell/organic material
STL11KM-OS	Offshore	2021	15-Sep	376312	6248633	15	6.4	0.06	0.8	none	clay/organic material
STL25KM-IE	Intermittently Exposed	2021	15-Sep	385757	6247569	16	0.6	0.00	0.8	filamentous	clay/gravel/sand/cobble
STL25KM-PW	Predominantly Wetted	2021	not sampled	-	-	-	-	0.00	-	-	-
STL25KM-OS	Offshore	2021	15-Sep	385543	6248068	11	8.5	0.01	0.9	none	clay

Table 22: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in O'Neil Bay in Stephens Lake (ONB) in 2021.

IE ONB	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	47.40	1.25	7.40	0.40	0.74	0.55
Minimum	27.00	0.00	6.00	0.00	0.63	0.45
Maximum	80.00	3.70	9.00	1.00	0.80	0.70
1st Quartile	35.00	0.00	6.00	0.00	0.73	0.50
Median	39.00	0.00	7.00	0.00	0.76	0.54
3rd Quartile	56.00	2.56	9.00	1.00	0.78	0.56
Variance (n-1)	444.30	3.11	2.30	0.30	0.00	0.01
Standard deviation (n-1)	21.08	1.76	1.52	0.55	0.07	0.09
Standard error of the mean	9.43	0.79	0.68	0.24	0.03	0.04

Table 23: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in O'Neil Bay in Stephens Lake (ONB) in 2021.

PW ONB	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2906.86	29.62	9.20	2.20	0.60	0.34
Minimum	380.89	2.12	6.00	2.00	0.27	0.12
Maximum	8171.75	59.09	12.00	3.00	0.75	0.48
1st Quartile	432.83	14.58	8.00	2.00	0.60	0.21
Median	2640.24	22.30	9.00	2.00	0.63	0.44
3rd Quartile	2908.59	50.00	11.00	2.00	0.74	0.46
Variance (n-1)	10072874.14	579.99	5.70	0.20	0.04	0.03
Standard deviation (n-1)	3173.78	24.08	2.39	0.45	0.19	0.16
Standard error of the mean	1419.36	10.77	1.07	0.20	0.09	0.07

Table 24: Summary statistics for benthic invertebrates in the offshore sampling polygons in O'Neil Bay in Stephens Lake (ONB) in 2021.

OS ONB	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	659.63	52.62	8.60	2.00	0.66	0.38
Minimum	476.11	37.65	7.00	2.00	0.49	0.26
Maximum	831.02	75.44	10.00	2.00	0.78	0.52
1st Quartile	493.42	39.58	8.00	2.00	0.57	0.28
Median	735.80	43.18	9.00	2.00	0.72	0.40
3rd Quartile	761.77	67.27	9.00	2.00	0.76	0.46
Variance (n-1)	26729.37	304.65	1.30	0.00	0.02	0.01
Standard deviation (n-1)	163.49	17.45	1.14	0.00	0.13	0.11
Standard error of the mean	73.12	7.81	0.51	0.00	0.06	0.05

Table 25: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in Stephens Lake 3 km downstream of the Keeyask GS (STL3KM) in 2021.

IE STL3KM	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	407.20	0.45	14.80	1.00	0.56	0.17
Minimum	99.00	0.00	13.00	0.00	0.38	0.11
Maximum	671.00	1.01	16.00	2.00	0.76	0.29
1st Quartile	196.00	0.21	14.00	1.00	0.44	0.11
Median	481.00	0.51	15.00	1.00	0.56	0.18
3rd Quartile	589.00	0.51	16.00	1.00	0.65	0.18
Variance (n-1)	61920.20	0.15	1.70	0.50	0.02	0.01
Standard deviation (n-1)	248.84	0.38	1.30	0.71	0.15	0.07
Standard error of the mean	111.28	0.17	0.58	0.32	0.07	0.03

Table 26: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in Stephens Lake 3 km downstream of the Keeyask GS (STL3KM) in 2021.

PW STL3KM	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	3538.78	19.19	12.60	4.20	0.60	0.21
Minimum	1411.01	11.42	11.00	2.00	0.49	0.13
Maximum	8111.15	29.43	17.00	6.00	0.72	0.28
1st Quartile	2588.30	14.87	11.00	4.00	0.54	0.18
Median	2614.27	17.55	11.00	4.00	0.56	0.21
3rd Quartile	2969.18	22.70	13.00	5.00	0.67	0.28
Variance (n-1)	6879137.62	49.74	6.80	2.20	0.01	0.00
Standard deviation (n-1)	2622.81	7.05	2.61	1.48	0.10	0.06
Standard error of the mean	1172.96	3.15	1.17	0.66	0.04	0.03

Table 27: Summary statistics for benthic invertebrates in the offshore sampling polygons in Stephens Lake 3 km downstream of the Keeyask GS (STL3KM) in 2021.

OS STL3KM	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	4	4	4	4	4	4
Mean	1521.38	38.88	9.25	2.75	0.70	0.37
Minimum	441.48	26.87	7.00	2.00	0.61	0.36
Maximum	2319.94	62.75	11.00	3.00	0.75	0.39
1st Quartile	1136.17	27.60	8.50	2.75	0.67	0.36
Median	1662.05	32.95	9.50	3.00	0.72	0.37
3rd Quartile	2047.26	44.23	10.25	3.00	0.74	0.37
Variance (n-1)	672237.08	278.76	2.92	0.25	0.00	0.00
Standard deviation (n-1)	819.90	16.70	1.71	0.50	0.07	0.01
Standard error of the mean	409.95	8.35	0.85	0.25	0.03	0.01

Table 28: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in Stephens Lake 11 km downstream of the Keeyask GS (STL11KM) in 2021.

IE STL11KM	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	407.80	1.10	14.80	2.20	0.69	0.23
Minimum	280.00	0.34	13.00	1.00	0.61	0.20
Maximum	585.00	2.86	16.00	3.00	0.74	0.30
1st Quartile	331.00	0.56	13.00	2.00	0.69	0.20
Median	354.00	0.82	16.00	2.00	0.71	0.22
3rd Quartile	489.00	0.91	16.00	3.00	0.71	0.22
Variance (n-1)	15779.70	1.02	2.70	0.70	0.00	0.00
Standard deviation (n-1)	125.62	1.01	1.64	0.84	0.05	0.04
Standard error of the mean	56.18	0.45	0.73	0.37	0.02	0.02

Table 29: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in Stephens Lake 11 km downstream of the Keeyask GS (STL11KM) in 2021.

PW STL11KM	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	2003.12	14.11	13.40	3.00	0.65	0.22
Minimum	969.53	0.85	12.00	2.00	0.60	0.19
Maximum	3038.43	28.57	15.00	4.00	0.75	0.31
1st Quartile	1272.51	5.80	13.00	3.00	0.63	0.19
Median	1748.61	17.01	13.00	3.00	0.63	0.21
3rd Quartile	2986.50	18.32	14.00	3.00	0.64	0.21
Variance (n-1)	926445.86	120.01	1.30	0.50	0.00	0.00
Standard deviation (n-1)	962.52	10.95	1.14	0.71	0.06	0.05
Standard error of the mean	430.45	4.90	0.51	0.32	0.03	0.02

Table 30: Summary statistics for benthic invertebrates in the predominantly-wetted sampling polygons in Stephens Lake 11 km downstream of the Keeyask GS (STL11KM) in 2021.

OS STL11KM	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	4	4	4	4	4	4
Mean	783.41	41.16	7.75	2.25	0.71	0.45
Minimum	588.64	38.10	7.00	2.00	0.68	0.39
Maximum	986.84	45.59	8.00	3.00	0.74	0.50
1st Quartile	692.52	39.79	7.75	2.00	0.71	0.42
Median	779.09	40.49	8.00	2.00	0.71	0.46
3rd Quartile	869.98	41.87	8.00	2.25	0.72	0.49
Variance (n-1)	28250.56	9.98	0.25	0.25	0.00	0.00
Standard deviation (n-1)	168.08	3.16	0.50	0.50	0.02	0.05
Standard error of the mean	84.04	1.58	0.25	0.25	0.01	0.02

Table 31: Summary statistics for benthic invertebrates in the intermittently-exposed sampling polygons in Stephens Lake 25 km downstream of the Keeyask GS (STL25KM) in 2021.

IE STL25KM	Abundance	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	184.80	1.91	7.80	1.20	0.43	0.26
Minimum	33.00	0.00	4.00	0.00	0.22	0.14
Maximum	477.00	4.00	13.00	3.00	0.56	0.32
1st Quartile	34.00	0.00	6.00	0.00	0.42	0.25
Median	50.00	2.52	7.00	1.00	0.44	0.29
3rd Quartile	330.00	3.03	9.00	2.00	0.53	0.30
Variance (n-1)	42604.70	3.32	11.70	1.70	0.02	0.01
Standard deviation (n-1)	206.41	1.82	3.42	1.30	0.13	0.07
Standard error of the mean	92.31	0.82	1.53	0.58	0.06	0.03

Table 32: Summary statistics for benthic invertebrates in the offshore sampling polygons in Stephens Lake 25 km downstream of the Keeyask GS (STL25KM) in 2021.

OS STL25KM	Density (#/m^2)	% EPT	Total Richness	EPT Richness	Simpson's Diversity	Simpson's Evenness
No. of samples (n)	5	5	5	5	5	5
Mean	457.06	20.99	6.00	1.80	0.67	0.55
Minimum	259.70	8.11	4.00	1.00	0.57	0.35
Maximum	640.58	43.33	8.00	3.00	0.76	0.68
1st Quartile	415.51	11.67	5.00	1.00	0.64	0.49
Median	450.14	18.75	6.00	2.00	0.68	0.59
3rd Quartile	519.39	23.08	7.00	2.00	0.71	0.63
Variance (n-1)	19573.06	190.37	2.50	0.70	0.00	0.02
Standard deviation (n-1)	139.90	13.80	1.58	0.84	0.07	0.13
Standard error of the mean	62.57	6.17	0.71	0.37	0.03	0.06

FIGURES

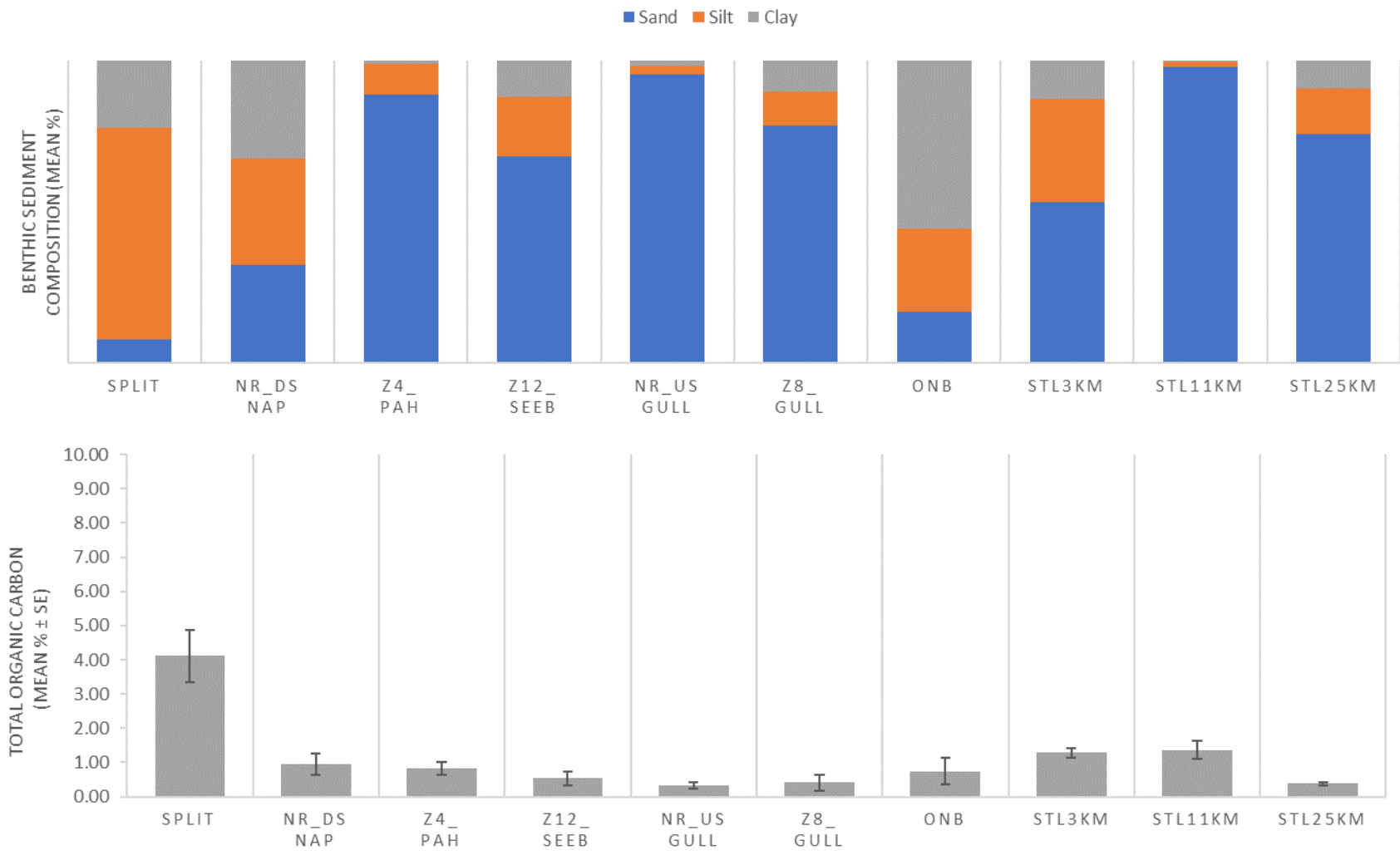


Figure 1: **Supporting substrate metrics for the intermittently-exposed sampling polygons of Split Lake (SPLIT), Nelson River to Gull Rapids (NR_DSNAP, Z4_PAH, SEEB, US_GULL, Z8_GULL), and in Stephens Lake (ONB, STL3KM, STL11KM, STL25KM) in 2021.**

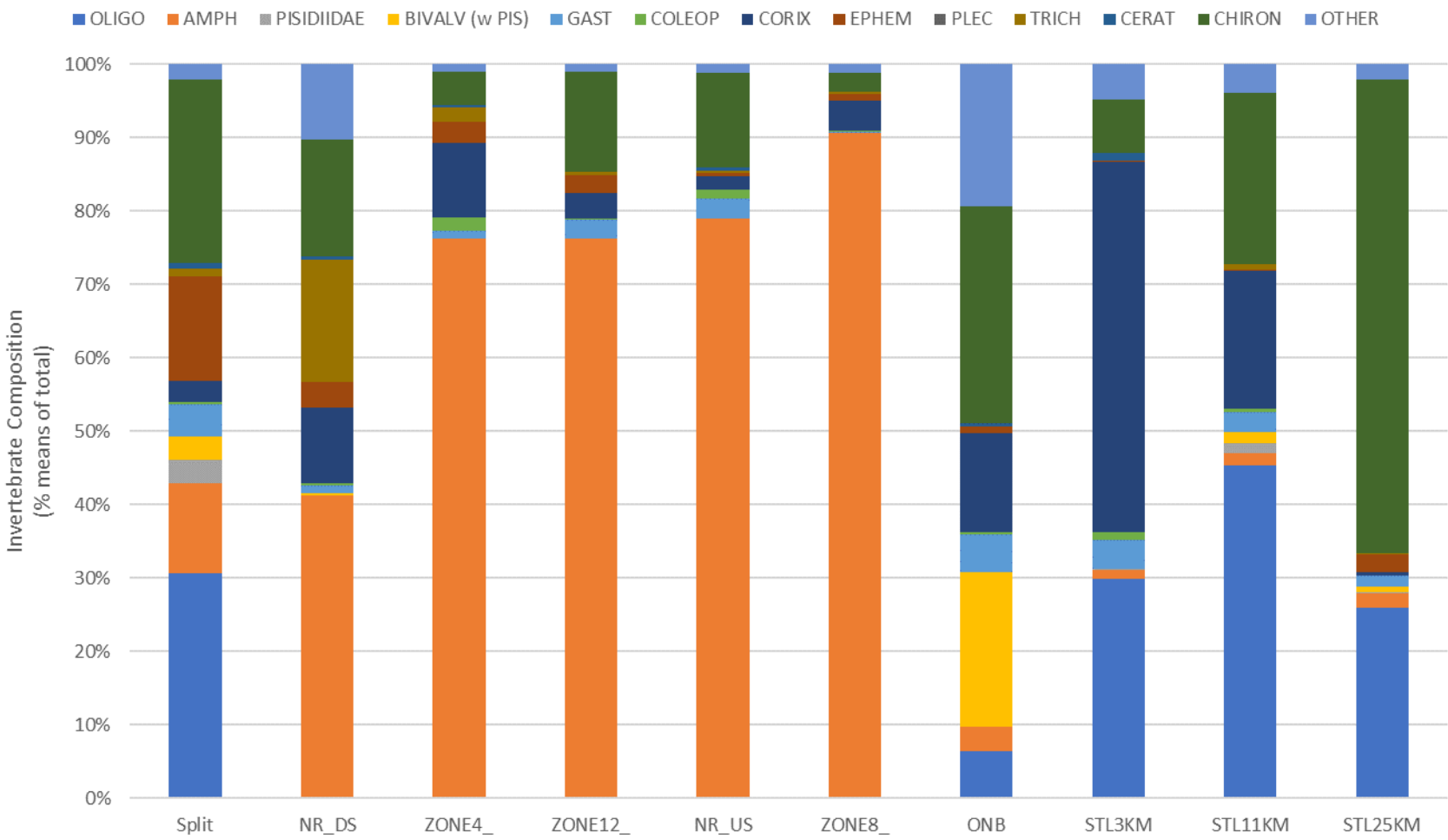


Figure 2. **Composition of major invertebrate groups in intermittently-exposed habitat of Split Lake (SPLIT), Nelson River to Gull Rapids (NR_DSNAP, Z4_PAH, SEEB, US_GULL, Z8_GULL), and in Stephens Lake (ONB, STL3KM, STL11KM, STL25KM) in 2021. (OLIGO: Oligochaeta; AMPH: Amphipoda; PISIDIIDAE; BIVALV (w PIS): Bivalvia including Pisidiidae; GAST: Gastropoda; COLEOP: Coleoptera; CORIX: Corixidae; EPHEM: Ephemeroptera; PLEC: Plecoptera; TRICH: Trichoptera; CERAT: Ceratopogonidae; CHIRON: Chironomidae; OTHER: remaining taxa)**

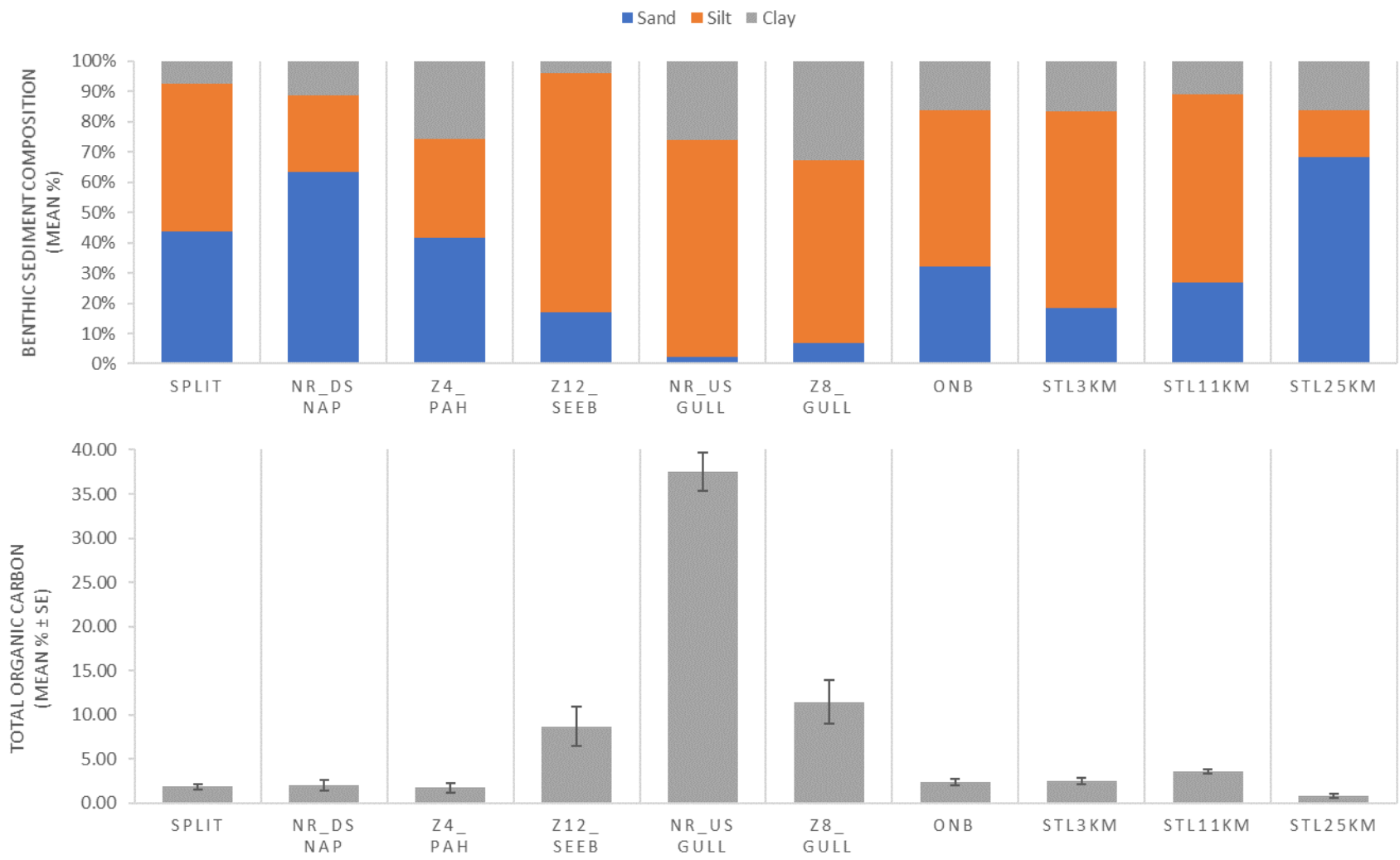


Figure 3: Supporting substrate metrics for the predominantly-wetted sampling polygons of Split Lake (SPLIT), Nelson River to Gull Rapids (NR_DSNAP, Z4_PAH, SEEB, US_GULL, Z8_GULL), and in Stephens Lake (ONB, STL3KM, STL11KM, STL25KM) in 2021.

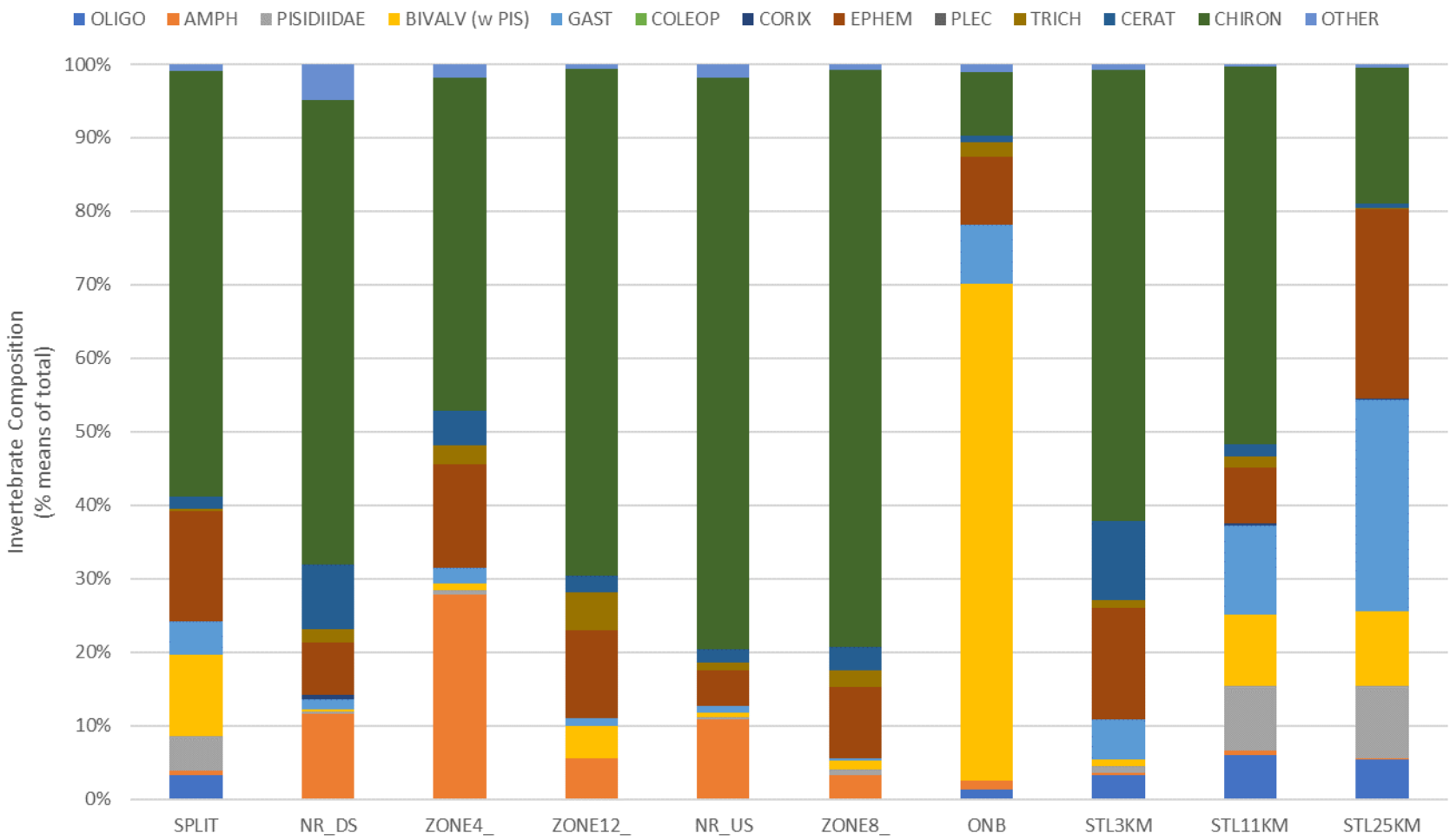


Figure 4. **Composition of major invertebrate groups in predominantly-wetted habitat of Split Lake (SPLIT), Nelson River to Gull Rapids (NR_DSNAP, Z4_PAH, SEEB, US_GULL, Z8_GULL), and in Stephens Lake (ONB, STL3KM, STL11KM, STL25KM) in 2021. (OLIGO: Oligochaeta; AMPH: Amphipoda; PISIDIIDAE; BIVALV (w PIS): Bivalvia including Pisidiidae; GAST: Gastropoda; COLEOP: Coleoptera; CORIX: Corixidae; EPHEM: Ephemeroptera; PLEC: Plecoptera; TRICH: Trichoptera; CERAT: Ceratopogonidae; CHIRON: Chironomidae; OTHER: remaining taxa)**

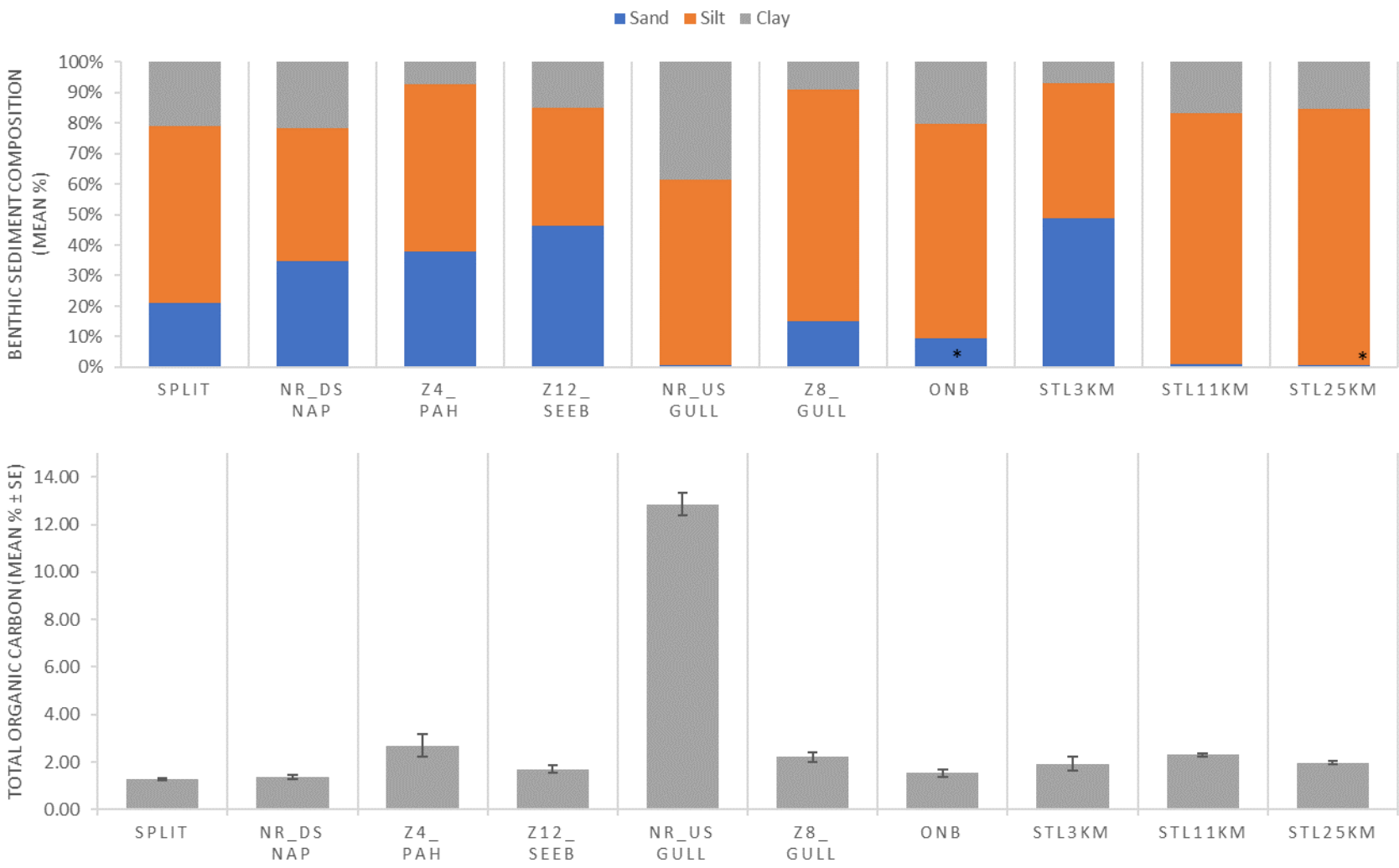


Figure 5: Supporting substrate metrics for the offshore sampling polygons of Split Lake (SPLIT), Nelson River to Gull Rapids (NR_DSNAP, Z4_PAH, SEEB, US_GULL, Z8_GULL), and in Stephens Lake (ONB, STL3KM, STL11KM, STL25KM) in 2021.

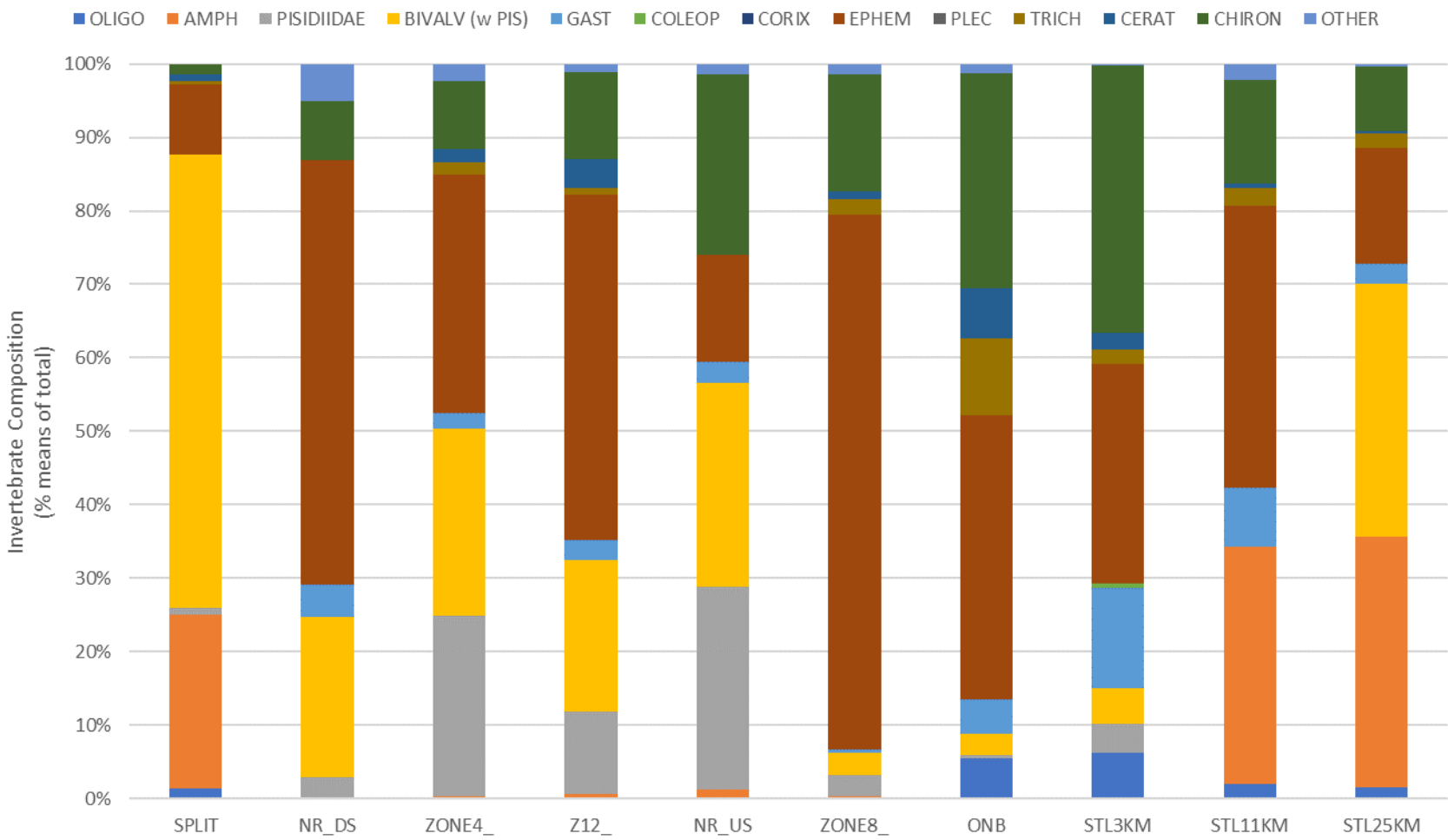
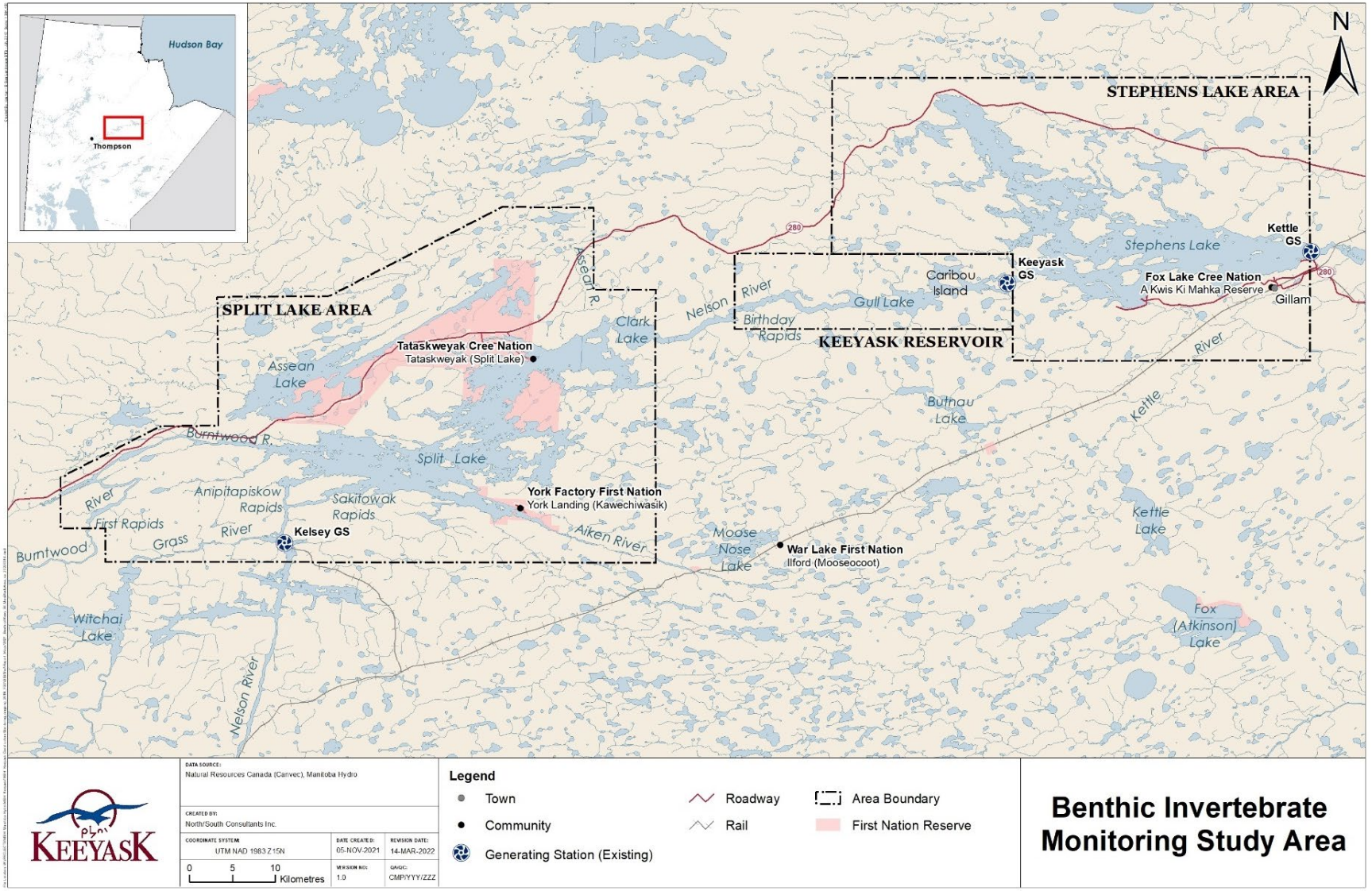
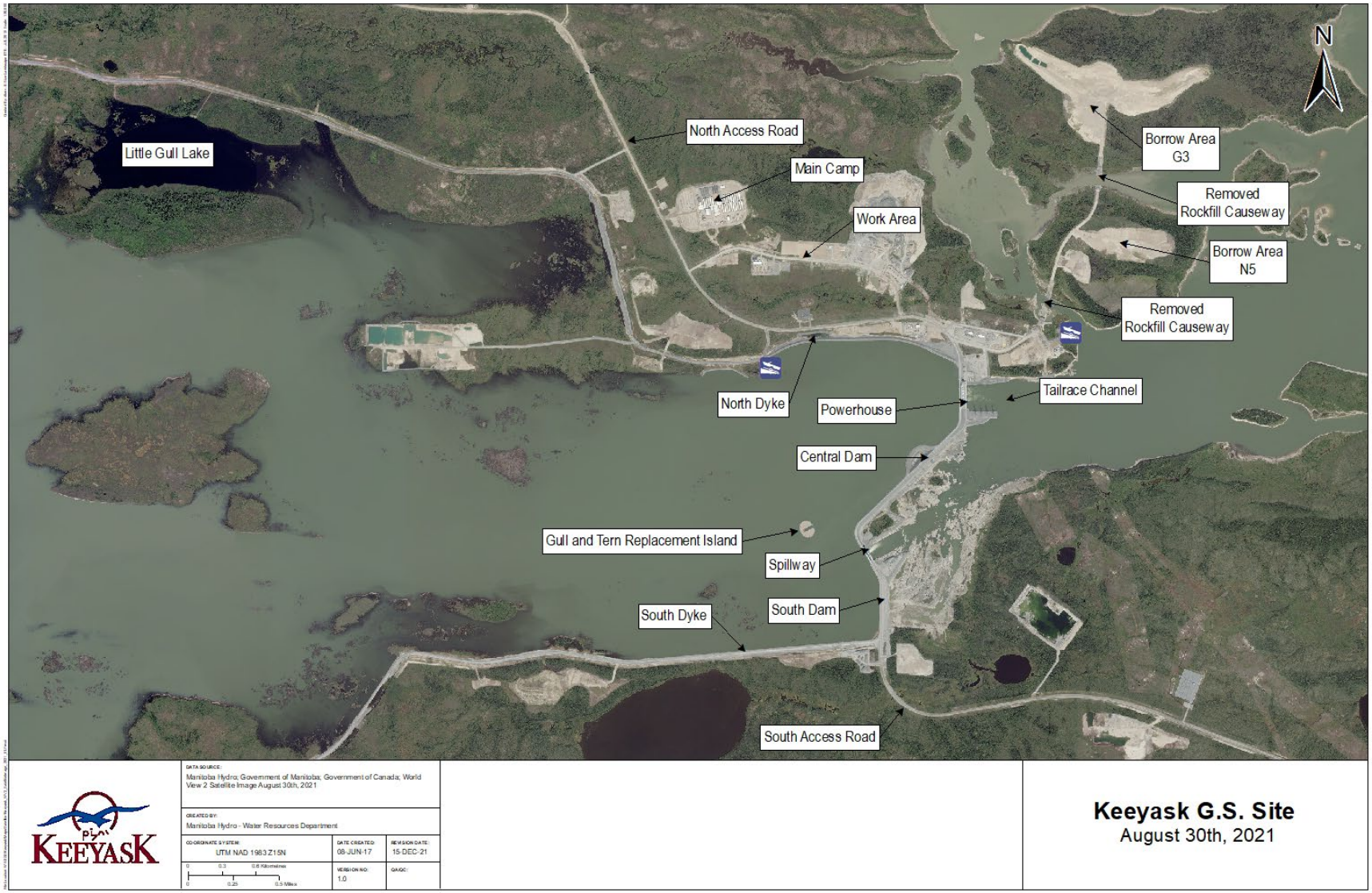


Figure 6. **Composition of major invertebrate groups in offshore habitat of Split Lake (SPLIT), Nelson River to Gull Rapids (NR_DSNAP, Z4_PAH, SEEB, US_GULL, Z8_GULL), and in Stephens Lake (ONB, STL3KM, STL11KM, STL25KM) in 2021. (OLIGO: Oligochaeta; AMPH: Amphipoda; PISIDIIDAE; BIVALV (w PIS): Bivalvia including Pisidiidae; GAST: Gastropoda; COLEOP: Coleoptera; CORIX: Corixidae; EPHEM: Ephemeroptera; PLEC: Plecoptera; TRICH: Trichoptera; CERAT: Ceratopogonidae; CHIRON: Chironomidae; OTHER: remaining taxa)**

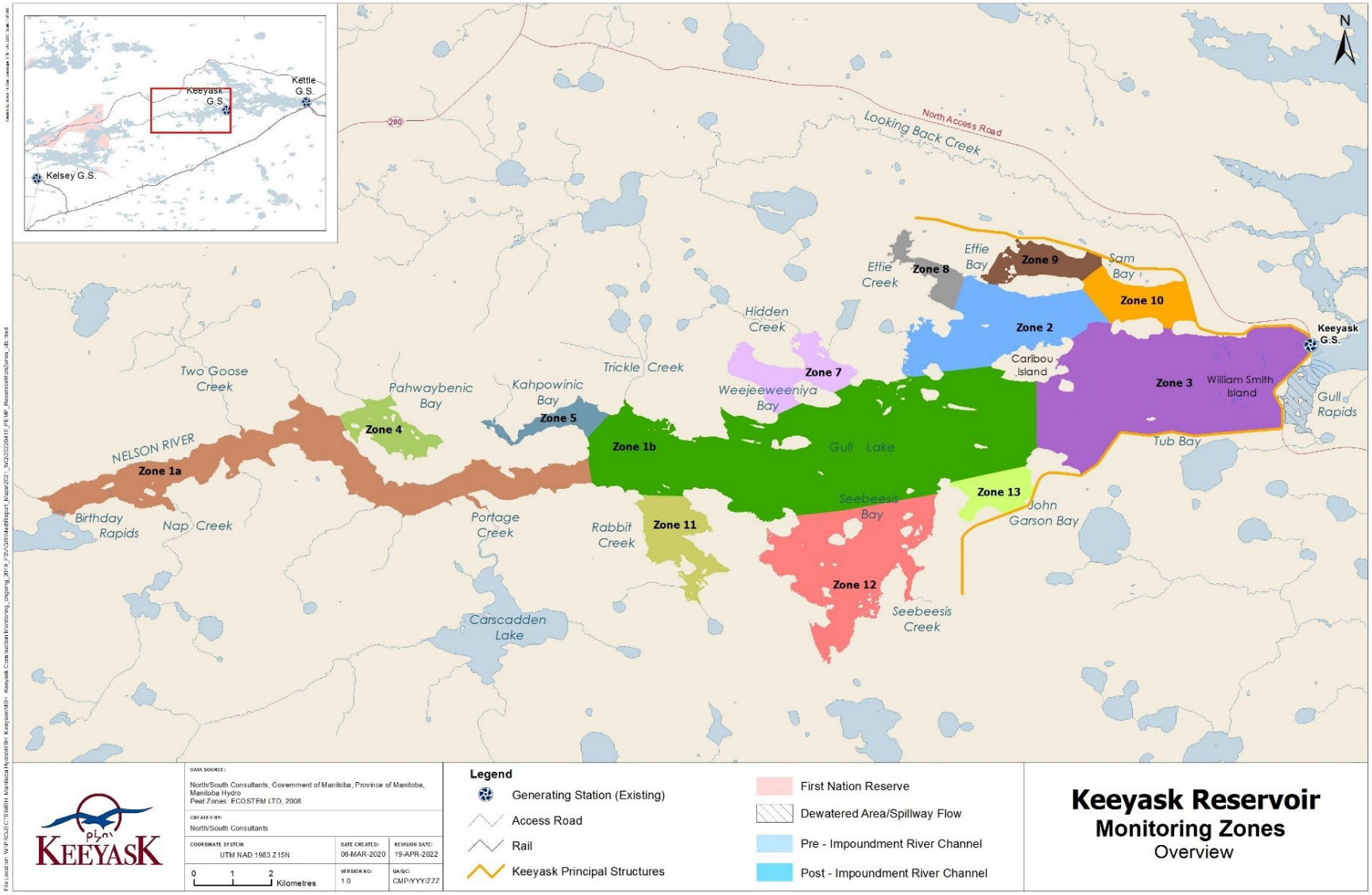
MAPS



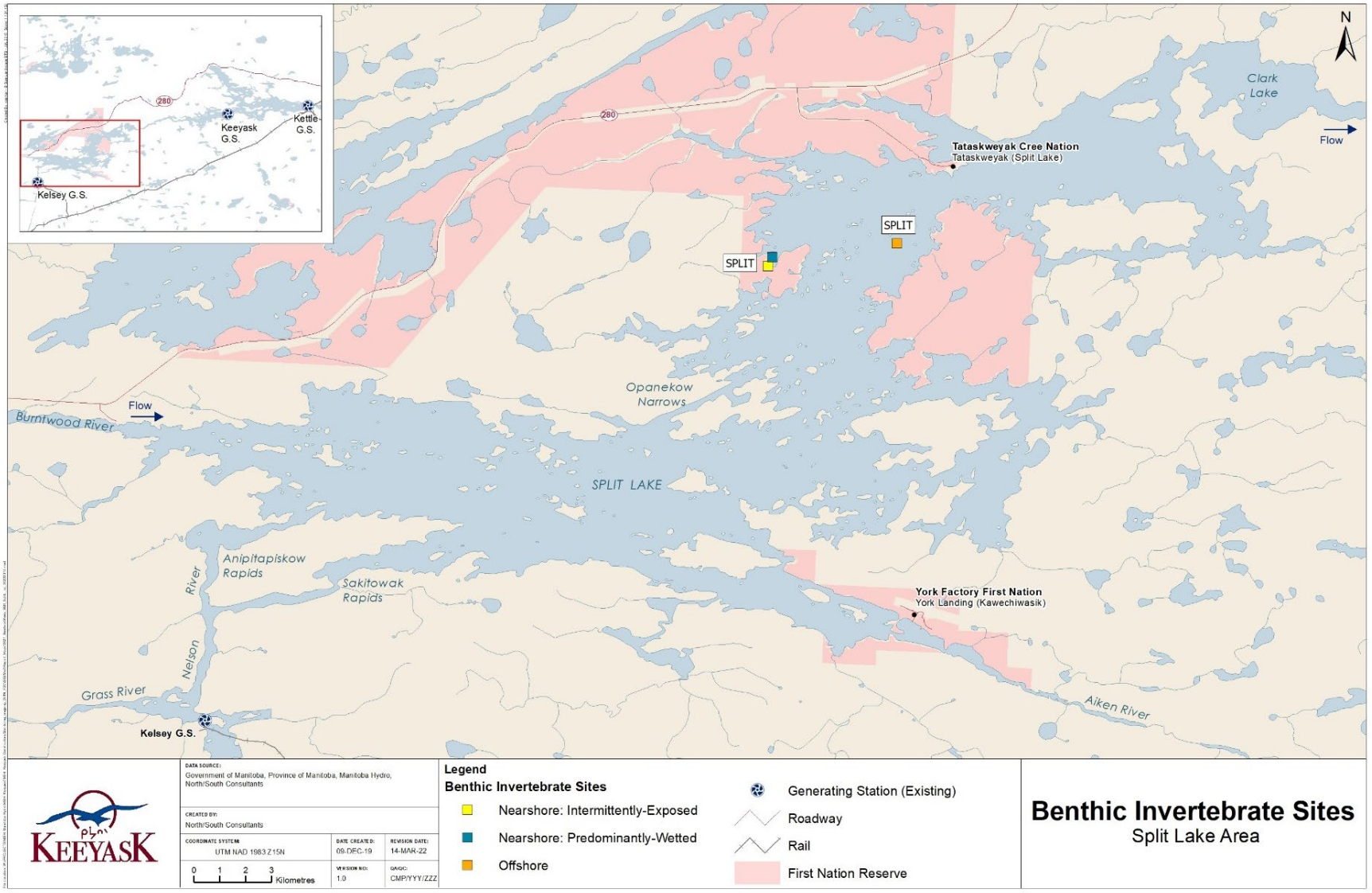
Map 1: Map of Nelson River showing the site of Keeyask Generating Station and the benthic invertebrate study setting.



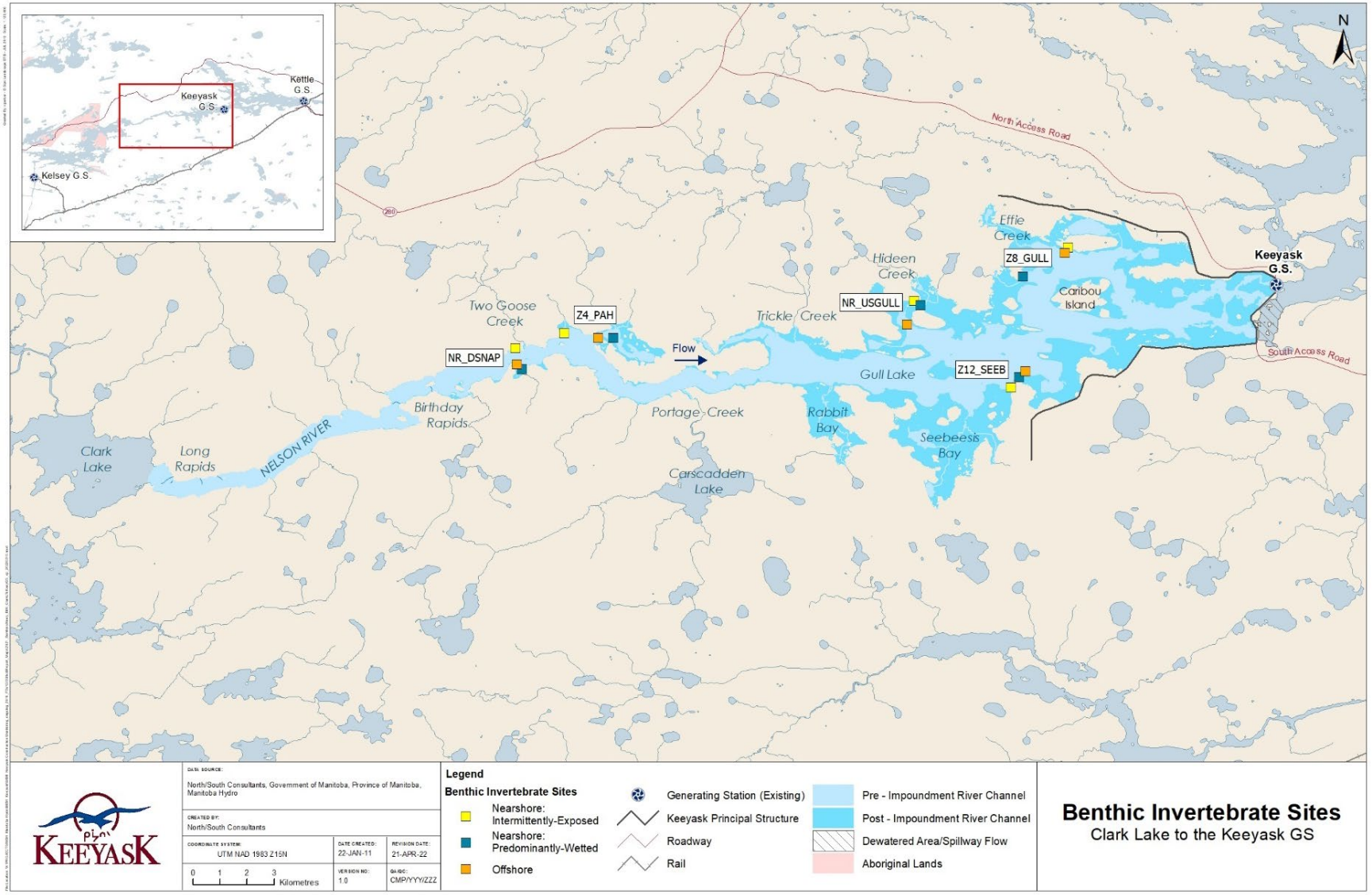
Map 2: Map of Nelson River showing the site of Keeyask Generating Station and the benthic invertebrate study setting.



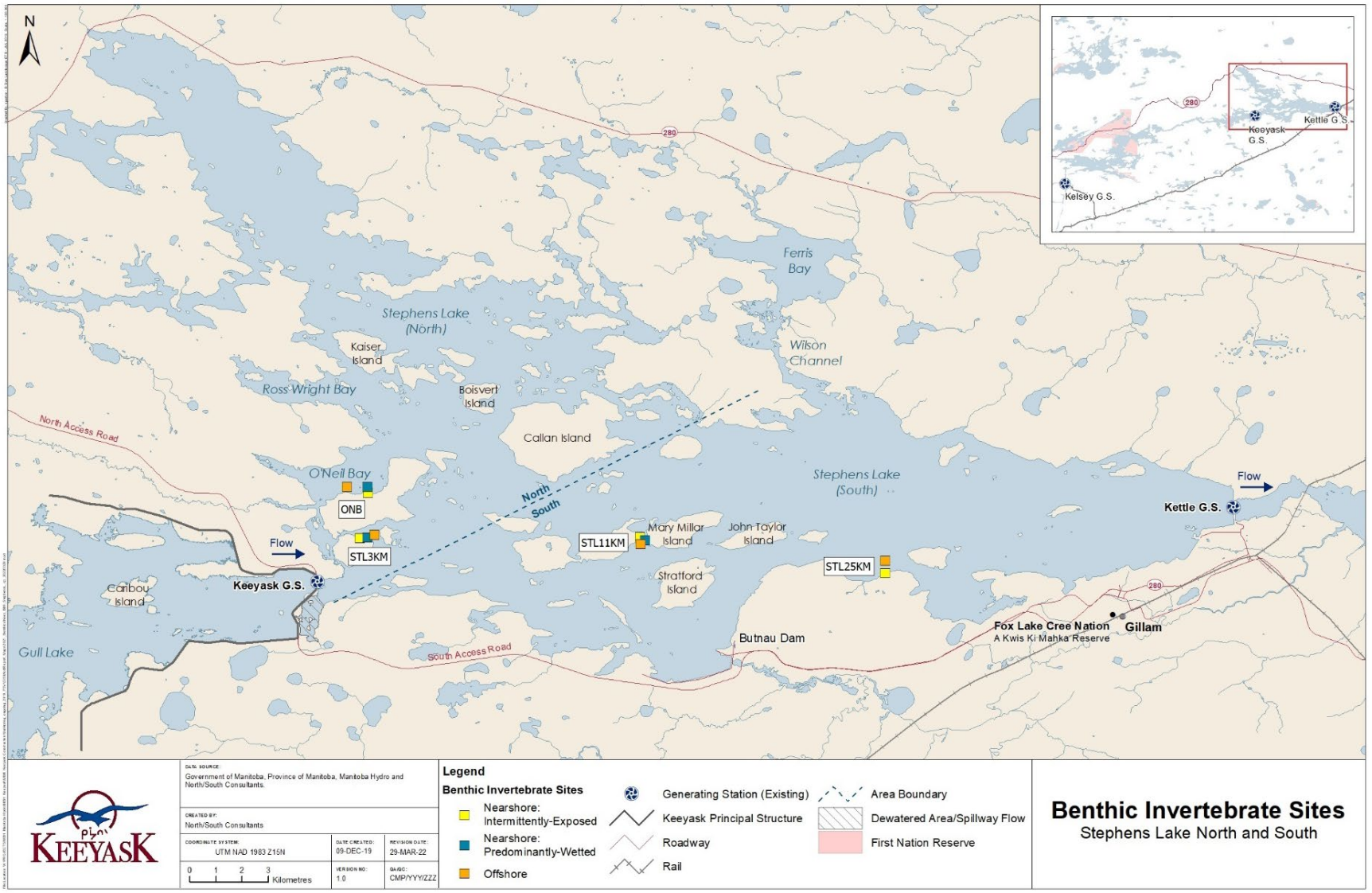
Map 3: Map of the Keeyask reservoir showing the zones used to define BMI sampling.



Map 4: Benthic invertebrate sampling sites in Split Lake, late summer2021.



Map 5: Benthic invertebrate sampling sites in the Keeyask reservoir, fall 2021.



Map 6: Benthic invertebrate sampling sites in Stephens Lake, fall 2021.

APPENDICES

APPENDIX 1: TAXONOMIC REFERENCES USED FOR BENTHIC MACROINVERTEBRATE IDENTIFICATIONS

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APPENDIX 2: QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) PROCEDURES

Detailed sample processing protocols are developed on a by-project-basis depending on the specific needs of each client. The following provides an overview of standard QA/QC procedures employed for each project.

Large &/or Rare Search for Samples Requiring Sub-Sampling

- Sample is washed and sieved using appropriate sized mesh;
- Entire sample is scanned for large &/or rare invertebrates in an appropriately sized tray. This scan is conducted on a per sample basis to avoid under-representing taxa that tend to occur singly or in few numbers that may be missed as a result of sub-sampling;
- Large organisms tend to occur in small numbers (*e.g.*, Belostomatidae, crayfish); these organisms are rare in relation to the overall number of organisms in the sample being processed. Based on the overall number of organisms in the sample, if an organism tends to occur rarely with respect to the rest of the organisms in the sample, this organism is removed (or more, if > 1) and retained in a separate vial for taxonomic identification; and
- Large &/or rare organisms are not included in the split correction and this is indicated clearly on the bench sheet. It is noted that there is a separate vial containing large &/or rare organisms.

Sample Processing

Sub-Sampling

- Most samples are sub-sampled (unless requested by the client) to decrease processing time. A minimum of 300 organisms processed ensures the inclusion of more rare taxa and permits comparisons of richness among sites;
- The entire sample is examined in a large tray and estimate the number of splits necessary to produce the appropriate number of aliquots needed to achieve a 300-organism target;
- If a sample contains > 300 organisms, large &/or rare invertebrates and any small fish are removed from the whole sample before sub-sampling (see above);
- When > 300 organisms are present, the sample is split into halves. In order to reduce any bias created by the mixing/splitting process, the well-cleaned and mixed sample is split using a 1.0 or 4.0 L [specific to sample volume] Folsom Plankton Splitter. Each sub-sample is subsequently sorted until at least 300 animals are counted. When the 300-organism count is achieved part way through a sub-sample, the remainder of this fraction is sorted so that a known fraction is sorted. All splitting information is recorded on the bench sheet.

- In sparse samples (*i.e.*, containing ~300 animals or less), the entire sample is processed;
- To be counted, a specimen must have enough intact body parts to permit its identification to the targeted level, and it must have a head (this prevents a body and detached head from being counted as two animals);
- Larval exuviae (exoskeleton remains), and empty shells (snails and clams) and cases (caddisflies) are not counted in the 300-fixed count. If there are no "live" molluscs in the sample, a few empty shells are set aside for identification; these are placed into vial with the large &/or rare specimens;
- The taxa Porifera, Nemata, Copepoda, Cladocera, Rotifera, Platyhelminthes, Ostracoda, and non-aquatic (terrestrial) taxa are not included in the 300 organism count because they are not considered as part of the benthic macroinvertebrate community. Typically, they are counted and their numbers recorded on the bench sheet.

Sorting Samples

- Sorting aquatic samples involves removing aquatic macroinvertebrates from organic and inorganic materials within each sample;
- All sorting is conducted with a 3x desktop magnifier or stereomicroscope [specific to Project];
- All sorted samples are checked by a 2nd laboratory technician (QA/QC technician);
- Any additional invertebrates collected during the QA/QC process are combined with the original sample, but counted separately;
- Sorting efficiency must be ≥ 95%. The QA/QC technician checks on a tray-by-tray basis so that the sample is handled as few times as possible; the QA/QC technician will sort any remaining invertebrates from the tray and record the number of missed invertebrates per tray;
- The QA/QC technician will also check the bench sheet data to ensure it matches the sample data; and
- Sorted invertebrate samples are stored in 70% ethanol prior to delivery to the taxonomist.

Verification of Taxonomic Identification

- NSC taxonomists regularly communicate with external taxonomic specialists to ensure accuracy and consistency.

Sample Identifications

- Samples are identified to the appropriate taxonomic level [specific to client] by an in-house or external taxonomist. Ten percent (10%) of the in-house identifications are randomly selected and sent to an external taxonomy specialist for QA/QC. The accuracy of the sample subset is assessed for identification and enumeration; all unknown invertebrates are sent to an external specialist; incorrect identifications and/or enumeration discrepancies are noted on the laboratory datasheet;

- The target overall accuracy level for in-house invertebrate identifications and enumeration is 95% at the Family level and 90% at the Genus level. Corrected identifications and enumeration values received from the external taxonomist are used in place of in-house data discrepancies. If the average error rate of audited samples is outside the target, the entire project must be re-identified by someone other than the original taxonomist.

Data Processing

- Data from field books and laboratory bench sheets are entered into an MS Excel® data template;
- Data templates specify the Project Name, Study Area, Site Location/Description, GPS coordinates (Global Positioning System), Site Label, Sampling Date, Time of Day, Gear Type, Sieve Mesh Size in Field/Laboratory, Presence or Absence of Vegetation/Algae, Water Temperature, Water Depth, Velocity, Substrate Type, Number of Splits, Taxonomic List, Life Stage, and Enumeration List;
- A 2nd and 3rd technician sequentially verify all entered data and formulae to original field book and laboratory bench sheets (*i.e.*, verification is done twice) and a final verification is conducted by the project biologist and/or report author.

APPENDIX 3:
BENTHIC INVERTEBRATE DATA FOR THE KEEYASK STUDY AREA, 2021

No table of figures entries found.

Table A3-1: Benthic invertebrate raw data output, Split Lake Area, 2021.
Split Lake

	Site/Sample ID	SPLIT-IE-R1	SPLIT-IE-R2	SPLIT-IE-R3	SPLIT-IE-R4	SPLIT-IE-R5	SPLIT-PW-R1	SPLIT-PW-R2	SPLIT-PW-R3	SPLIT-PW-R4	SPLIT-PW-R5	SPLIT-OS-R1	SPLIT-OS-R2	SPLIT-OS-R3	SPLIT-OS-R4	SPLIT-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.7	1.0	1.0	0.7	0.8	5.7	5.0	7.4	4.6	7.1	1.2	1.1	1.0	1.0	1.1
	SPLIT FACTOR CORRECTION	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--
Annelida	Oligochaeta (aquatic worms)	137	32	128	516	174	10	16	6	5	2	0	2	0	0	1
Amphipoda (scuds)	Gammaridae	0	1	4	0	2	0	0	0	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	38	65	137	68	69	0	1	0	0	4	0	0	0	0	1
	Pontoporeiidae	14	0	0	0	0	1	0	0	0	0	2	13	14	8	14
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	0	0	0	0	0	2	51	2	20	0	3	11	69	49
	Pisidiidae (findernail clams)	27	12	17	24	22	5	6	29	9	6	0	1	0	1	0
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	0	0	0	1	0	0	15	0	0	0	0	0	0
	Hydrobiidae (mud snails)	1	0	4	28	13	5	8	7	4	5	0	0	0	0	0
	Lymnaeidae (pond snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	2	6	12	6	0	0	0	0	0	0	0	0	0	0
	Valvatidae (valve snails)	1	2	2	48	17	1	0	6	0	2	0	0	0	0	0
Others	Laevicaudata (clam shrimps)	0	1	0	4	0	0	0	1	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	1	6	9	16	2	0	0	0	0	2	0	0	0	0	0
	Hirudinea (leeches)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	1	1	1	4	1	0	0	0	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	1	0	4	1	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	4	1	6	84	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	4	5	1	16	6	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	11	16	21	4	4	0	0	1	0	0	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	9	2	6	12	1	0	1	5	2	0	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	95	32	70	80	28	26	20	43	56	23	1	6	1	5	8
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	1	12	11	4	5	0	0	0	0	0	0	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	1	4	0	0	0	1	0	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	1	0	0	8	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	12	1	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	SPLIT-IE-R1	SPLIT-IE-R2	SPLIT-IE-R3	SPLIT-IE-R4	SPLIT-IE-R5	SPLIT-PW-R1	SPLIT-PW-R2	SPLIT-PW-R3	SPLIT-PW-R4	SPLIT-PW-R5	SPLIT-OS-R1	SPLIT-OS-R2	SPLIT-OS-R3	SPLIT-OS-R4	SPLIT-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	1	1	4	16	2	2	4	6	4	4	0	1	1	0	0
	Chaoboridae (larvae + pupae)	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	0	17	66	648	75	135	139	228	105	74	0	0	2	0	1

Table A3-2: Benthic invertebrate analysis output, Keeyask reservoir, 2021.
Nelson River Back Bay at unnamed creek DS of Nap Creek

	Site/Sample ID	NR_NAP-IE-R1	NR_NAP-IE-R2	NR_NAP-IE-R3	NR_NAP-IE-R4	NR_NAP-IE-R5	NR_NAP-PW-R1	NR_NAP-PW-R2	NR_NAP-PW-R3	NR_NAP-PW-R4	NR_NAP-PW-R5	NR_NAP-OS-R1	NR_NAP-OS-R2	NR_NAP-OS-R3	NR_NAP-OS-R4	NR_NAP-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.8	0.6	0.7	0.5	0.5	2.4	1.4	1.3	1.3	1.1	5.2	5.5	4.5	5.5	3.8
	SPLIT FACTOR CORRECTION	0.50	0.25	0.25	0.50	0.50	--	0.25	0.13	0.13	--	--	--	--	--	--
Annelida	Oligochaeta (aquatic worms)	440	1204	840	242	476	0	40	56	23	9	0	0	3	0	20
Amphipoda (scuds)	Gammaridae	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	82	216	192	52	22	0	0	80	77	12	0	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	4	0	0	0	0	0	0	0	0	1	1	2	14	8
	Pisidiidae (findernail clams)	0	0	0	0	0	0	4	0	0	0	0	0	0	2	2
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae (mud snails)	0	0	0	0	0	2	0	0	0	0	0	1	0	3	2
	Lymnaeidae (pond snails)	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	0	8	0	0	2	0	0	0	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae (valve snails)	0	0	0	0	0	0	0	8	11	1	0	0	0	0	0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0
	Hirudinea (leeches)	0	0	0	0	2	0	0	0	2	0	0	0	0	0	1
	Collembola (springtails)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	56	28	12	28	16	0	8	0	0	1	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	0	0	0	0	0	0	4	48	23	1	1	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	0	12	8	0	1	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	6	0	0	0	1	3	14	19	21	21
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	12	4	20	12	0	0	0	0	0	1	0	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	0	7	1	8	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	4	8	0	0	0	0	0	0	0
	Limnephilidae (larvae)	40	68	60	50	10	0	0	1	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	NR_NAP-IE-R1	NR_NAP-IE-R2	NR_NAP-IE-R3	NR_NAP-IE-R4	NR_NAP-IE-R5	NR_NAP-PW-R1	NR_NAP-PW-R2	NR_NAP-PW-R3	NR_NAP-PW-R4	NR_NAP-PW-R5	NR_NAP-OS-R1	NR_NAP-OS-R2	NR_NAP-OS-R3	NR_NAP-OS-R4	NR_NAP-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	2	4	0	0	0	0	52	40	46	18	0	0	0	0	0
	Chaoboridae (larvae + pupae)	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	71	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	44	64	4	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	8	0	2	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	10	48	140	20	0	0	144	448	385	145	0	1	3	1	6

Table A3-2: Benthic invertebrate analysis output, Keeyask reservoir, 2021.
Zone 4 Pahwaybenic Bay

	Site/Sample ID	Z4_PAH-IE-R1	Z4_PAH-IE-R2	Z4_PAH-IE-R3	Z4_PAH-IE-R4	Z4_PAH-IE-R5	Z4_PAH-PW-R1	Z4_PAH-PW-R2	Z4_PAH-PW-R3	Z4_PAH-PW-R4	Z4_PAH-PW-R5	Z4_PAH-OS-R1	Z4_PAH-OS-R2	Z4_PAH-OS-R3	Z4_PAH-OS-R4	Z4_PAH-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.5	0.5	0.6	0.5	0.5	6.7	2.9	2.8	2.5	2.9	4.6	4.7	4.5	4.7	4.5
	SPLIT FACTOR CORRECTION	--	0.50	--	0.50	--	0.13	--	0.13	0.13	0.50	--	--	0.50	0.50	0.25
Annelida	Oligochaeta (aquatic worms)	39	46	123	162	63	24	0	72	72	12	2	0	6	4	4
Amphipoda (scuds)	Gammaridae	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	403	112	130	112	86	192	1	2	56	2	1	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	0	0	0	0	0	1	0	0	0	1	3	0	2	0
	Pisidiidae (findernail clams)	0	0	0	0	0	0	0	0	0	6	22	23	14	52	36
	Unionidae (freshwater mussels)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	0	0	0	0	1	0	0	0	0	0	2	4	0
	Hydrobiidae (mud snails)	0	0	0	0	0	8	0	8	0	0	0	0	2	0	0
	Lymnaeidae (pond snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	9	0	1	0	1	0	0	0	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Valvatidae (valve snails)	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	0	0	0	0	0	0	0	0	8	0	2	2	0	2	0
	Hirudinea (leeches)	0	0	0	0	1	1	0	1	3	0	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	1	0	2	2	3
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	6	2	1	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	0	6	2	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	24	2	59	18	10	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	2	2	1	0	1	0	0	0	1	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	0	0	0	0	0	24	3	0	0	0	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	16	1	0	0	0	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	0	16	27	3	38	37	33	64	32	29
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	5	6	8	2	3	0	0	0	0	0	0	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	1	4	2	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
	Limnephilidae (larvae)	5	0	11	2	4	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	16	1	0	0	2	0	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	Z4_PAH-IE-R1	Z4_PAH-IE-R2	Z4_PAH-IE-R3	Z4_PAH-IE-R4	Z4_PAH-IE-R5	Z4_PAH-PW-R1	Z4_PAH-PW-R2	Z4_PAH-PW-R3	Z4_PAH-PW-R4	Z4_PAH-PW-R5	Z4_PAH-OS-R1	Z4_PAH-OS-R2	Z4_PAH-OS-R3	Z4_PAH-OS-R4	Z4_PAH-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	2	0	0	0	0	8	1	8	8	18	1	0	0	6	4
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	8	18	7	14	4	216	20	80	64	34	3	6	14	16	16

Table A3-2: Benthic invertebrate analysis output, Keeyask reservoir, 2021.
Zone 12 Nelson River Back Bay at Seebeesis Creek

	Site/Sample ID	Z12_SEEB -IE-R1	Z12_SEEB -IE-R2	Z12_SEEB -IE-R3	Z12_SEEB -IE-R4	Z12_SEEB -IE-R5	Z12_SEEB -PW-R1	Z12_SEEB -PW-R2	Z12_SEEB -PW-R3	Z12_SEEB -PW-R4	Z12_SEEB -PW-R5	Z12_SEEB -OS-R1	Z12_SEEB -OS-R2	Z12_SEEB -OS-R3	Z12_SEEB -OS-R4	Z12_SEEB -OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.7	0.7	0.5	0.6	0.7	2.8	2.6	2.0	2.5	2.3	8.0	7.8	7.9	8.0	7.8
	SPLIT FACTOR CORRECTION	0.13	--	0.25	0.13	0.06	0.13	0.25	0.25	0.06	0.13	--	--	--	--	0.50
Annelida	Oligochaeta (aquatic worms)	72	1	8	16	32	40	4	0	16	32	11	2	90	8	8
Amphipoda (scuds)	Gammaridae	32	0	48	64	48	0	0	0	0	0	1	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	632	29	924	2136	1152	24	16	12	9	24	2	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	0	0	0	0	40	4	0	16	8	2	23	1	8	6
	Pisidiidae (findernail clams)	0	0	0	0	0	0	0	0	0	0	19	11	0	8	10
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	0	8	0	0	0	0	0	0	0	2	0	0	6
	Hydrobiidae (mud snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae (pond snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	32	0	16	16	64	0	1	8	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	0	0	32	0	0	0	0	0	8	1	0	0	0	0
	Valvatidae (valve snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	0	1	0	8	16	0	0	0	0	0	1	1	0	0	0
	Hirudinea (leeches)	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	16	5	44	120	48	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	0	0	0	8	0	48	28	4	16	32	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	4	0	0	16	4	0	2	0	0	0	0	0	4
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	8	0	0	16	9	71	50	0	29	48
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	40	3	28	40	0	0	0	0	0	0	1	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	18	8	4	1	16	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	8	0	0	0	0	8	0	0	0	0	1	0	0	0	2
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	8	0	0	0	16	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	Z12_SEEB -IE-R1	Z12_SEEB -IE-R2	Z12_SEEB -IE-R3	Z12_SEEB -IE-R4	Z12_SEEB -IE-R5	Z12_SEEB -PW-R1	Z12_SEEB -PW-R2	Z12_SEEB -PW-R3	Z12_SEEB -PW-R4	Z12_SEEB -PW-R5	Z12_SEEB -OS-R1	Z12_SEEB -OS-R2	Z12_SEEB -OS-R3	Z12_SEEB -OS-R4	Z12_SEEB -OS-R5
	Polycentropodidae (larvae)	0	0	0	0	0	16	8	0	0	0	1	0	0	0	0
Diptera (true flies)	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ceratopogonidae (larvae)	0	0	0	0	0	32	4	0	0	0	2	1	0	2	12
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	8	0	24	0	0	0	0	0	0	8	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	80	5	48	280	496	288	128	92	400	152	14	6	0	13	18

Table A3-2: Benthic invertebrate analysis output, Keeyask reservoir, 2021.
Nelson River upstream extent of Gull Lake

	Site/Sample ID	NRGULL-IE-R1	NRGULL-IE-R2	NRGULL-IE-R3	NRGULL-IE-R4	NRGULL-IE-R5	NRGULL-PW-R1	NRGULL-PW-R2	NRGULL-PW-R3	NRGULL-PW-R4	NRGULL-PW-R5	NRGULL-OS-R1	NRGULL-OS-R2	NRGULL-OS-R3	NRGULL-OS-R4	NRGULL-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.6	0.7	0.6	0.6	0.6	2.5	2.7	2.6	2.6	3.0	6.2	6.4	6.2	6.4	6.4
	SPLIT FACTOR CORRECTION	0.13	0.13	0.25	0.25	0.13	0.25	0.25	0.13	0.25	0.13	0.13	0.13	0.06	0.13	0.25
Annelida	Oligochaeta (aquatic worms)	496	400	112	60	136	72	140	248	72	280	8	8	32	32	0
Amphipoda (scuds)	Gammaridae	360	672	820	392	592	4	0	0	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	1024	624	332	92	488	44	24	23	36	32	8	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0
	Pisidiidae (findernail clams)	0	0	0	0	0	0	4	0	0	0	32	0	80	48	20
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae (mud snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lymnaeidae (pond snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	40	80	16	12	8	0	0	1	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	8	4	0	1	8	0	2	4	1	0	0	0	0	0
	Valvatidae (valve snails)	0	8	0	0	0	0	0	0	0	0	2	16	1	0	0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	0	0	0	0	0	0	0	0	0	8	0	0	0	8	0
	Hirudinea (leeches)	15	40	12	7	3	8	0	1	4	3	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	2	16	8	2	16	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	8	8	0	5	8	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	8	72	28	8	8	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	24	0	8	0	0	0	0	16	16	24	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	0	0	0	0	0	3	16	0	64	12
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	4	4	0	4	0	0	8	8	0	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	8	0	4	0	0	0	0	0	4	8	0	0	0	0	0
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	NRGULL-IE-R1	NRGULL-IE-R2	NRGULL-IE-R3	NRGULL-IE-R4	NRGULL-IE-R5	NRGULL-PW-R1	NRGULL-PW-R2	NRGULL-PW-R3	NRGULL-PW-R4	NRGULL-PW-R5	NRGULL-OS-R1	NRGULL-OS-R2	NRGULL-OS-R3	NRGULL-OS-R4	NRGULL-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	16	0	4	4	0	16	0	0	12	0	0	0	0	0	0
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	336	136	256	32	120	204	80	264	380	296	16	48	16	56	24

Table A3-2: Benthic invertebrate analysis output, Keeyask reservoir, 2021.
Zone 8 Gull Lake

	Site/Sample ID	Z8_GULL-IE-R1	Z8_GULL-IE-R2	Z8_GULL-IE-R3	Z8_GULL-IE-R4	Z8_GULL-IE-R5	Z8_GULL-PW-R1	Z8_GULL-PW-R2	Z8_GULL-PW-R3	Z8_GULL-PW-R4	Z8_GULL-PW-R5	Z8_GULL-OS-R1	Z8_GULL-OS-R2	Z8_GULL-OS-R3	Z8_GULL-OS-R4	Z8_GULL-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.6	0.9	0.9	0.7	1.0	2.9	2.7	2.8	2.9	2.7	7.4	7.0	7.4	7.0	5.6
	SPLIT FACTOR CORRECTION	0.13	0.25	0.50	0.25	--	0.50	--	--	0.50	--	--	--	--	--	--
Annelida	Oligochaeta (aquatic worms)	0	0	0	16	4	0	11	1	26	0	1	0	8	3	14
Amphipoda (scuds)	Gammaridae	8	40	4	24	1	0	0	0	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	2840	1280	554	908	242	0	10	7	2	2	0	0	0	0	1
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
	Pisidiidae (findernail clams)	0	0	0	0	0	0	1	0	4	0	1	6	0	2	2
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Hydrobiidae (mud snails)	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0
	Lymnaeidae (pond snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvatidae (valve snails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	0	0	0	0	0	0	2	0	0	0	1	0	2	0	0
	Hirudinea (leeches)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	48	96	58	52	13	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	8	12	0	12	1	0	2	3	0	2	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	0	2	1	0	22	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	0	1	11	2	15	35	54	65	43	72
	Heptageniidae: Stenonema (larvae)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	8	0	0	8	1	0	0	0	0	1	0	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	0	3	1	4	2	0	0	2	3	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	0	1	0	0	0	0	0	2	0	1
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	8	0	0	4	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	Z8_GULL-IE-R1	Z8_GULL-IE-R2	Z8_GULL-IE-R3	Z8_GULL-IE-R4	Z8_GULL-IE-R5	Z8_GULL-PW-R1	Z8_GULL-PW-R2	Z8_GULL-PW-R3	Z8_GULL-PW-R4	Z8_GULL-PW-R5	Z8_GULL-OS-R1	Z8_GULL-OS-R2	Z8_GULL-OS-R3	Z8_GULL-OS-R4	Z8_GULL-OS-R5
	Ceratopogonidae (larvae)	0	0	0	0	0	0	7	0	10	3	1	0	2	0	1
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diptera (true flies)	Empididae (larvae)	48	12	0	8	1	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	88	36	0	40	7	0	232	68	102	98	5	14	11	6	23

Table A3-3: Benthic invertebrate analysis output, Stephens Lake Area, 2021.
Stephens Lake -North O'Neil Bay

	Site/Sample ID	ONB-IE-R1	ONB-IE-R2	ONB-IE-R3	ONB-IE-R4	ONB-IE-R5	ONB-PW-R1	ONB-PW-R2	ONB-PW-R3	ONB-PW-R4	ONB-PW-R5	ONB-OS-R1	ONB-OS-R2	ONB-OS-R3	ONB-OS-R4	ONB-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.7	0.7	0.6	0.5	0.6	1.9	2.6	2.7	2.6	3.6	4.1	4.2	4.7	5.8	5.7
	SPLIT FACTOR CORRECTION	--	0.50	--	--	--	0.25	--	--	0.25	0.13	--	--	0.50	--	--
Annelida	Oligochaeta (aquatic worms)	2	6	2	4	1	16	0	6	0	0	9	7	2	3	0
Amphipoda (scuds)	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	1	2	2	1	2	20	0	0	0	0	0	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	36	3	11	0	804	2	203	124	0	1	0	2	2	3
	Pisidiidae (findernail clams)	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae (mud snails)	0	0	0	2	0	12	6	17	20	2	4	2	2	1	0
	Lymnaeidae (pond snails)	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
	Physidae (bladder snails)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	0	0	0	0	4	0	1	0	0	0	0	0	1	0
	Valvatidae (valve snails)	0	8	1	1	0	20	3	26	20	0	3	2	2	0	1
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	8	10	3	6	18	0	0	0	1	0	0	0	0	0	0
	Acari (water mites)	0	0	1	0	0	0	3	2	4	8	3	1	0	0	1
	Hirudinea (leeches)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	5	2	13	11	1	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	1	0	0	0	0	12	22	46	52	24	27	30	16	35	40
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptophlebiidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	0	0	8	3	3	16	1	11	8	16	2	3
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	ONB-IE-R1	ONB-IE-R2	ONB-IE-R3	ONB-IE-R4	ONB-IE-R5	ONB-PW-R1	ONB-PW-R2	ONB-PW-R3	ONB-PW-R4	ONB-PW-R5	ONB-OS-R1	ONB-OS-R2	ONB-OS-R3	ONB-OS-R4	ONB-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	0	0	0	0	1	4	1	8	4	0	5	11	6	2	2
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	10	16	13	19	12	40	10	22	64	8	32	27	38	8	7

Table A3-3: Benthic invertebrate analysis output, Stephens Lake Area, 2021.
Stephens Lake - North 3 km downstream of Gull Rapids (at inlet to Stephens Lake)

	Site/Sample ID	STL3KM-IE--R1	STL3KM-IE--R2	STL3KM-IE--R3	STL3KM-IE--R4	STL3KM-IE--R5	STL3KM-PW-R1	STL3KM-PW-R2	STL3KM-PW-R3	STL3KM-PW-R4	STL3KM-PW-R5	STL3KM-OS-R1	STL3KM-OS-R2	STL3KM-OS-R3	STL3KM-OS-R4	STL3KM-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.5	0.3	0.3	0.5	0.3	2.6	2.4	2.4	2.3	1.8	5.9	5.7	5.7	5.7	5.5
	SPLIT FACTOR CORRECTION	--	--	0.50	--	0.25	--	--	--	--	0.25	0.50	0.25	0.25	na	--
Annelida	Oligochaeta (aquatic worms)	38	33	42	66	428	18	9	26	2	12	6	8	32		0
Amphipoda (scuds)	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Hyalellidae	1	2	16	6	2	7	0	0	0	1	0	0	0		0
	Pontoporeiidae	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Dreissenidae (zebra mussels)	0	0	0	0	0	4	0	0	0	0	2	4	0		0
	Pisidiidae (findernail clams)	0	1	0	0	0	1	3	2	2	8	10	4	12		3
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	2	0	0	0	0	0	0	0	0	0	8		0
	Hydrobiidae (mud snails)	0	1	0	0	0	0	1	0	4	16	18	28	24		7
	Lymnaeidae (pond snails)	3	12	12	8	14	0	0	1	2	20	0	0	0		0
	Physidae (bladder snails)	1	1	2	0	0	0	0	0	0	0	0	0	4		0
	Planorbidae (ramshorn snails)	1	0	0	2	8	0	1	0	0	28	0	0	0		0
	Valvatidae (valve snails)	5	5	0	2	0	3	0	1	7	28	6	0	4		1
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Acari (water mites)	0	5	2	2	21	2	2	0	3	4	0	0	0		0
	Hirudinea (leeches)	0	0	0	1	0	0	0	0	0	1	0	0	0		0
	Collembola (springtails)	4	1	0	13	4	0	0	0	0	0	0	0	0		0
	Sialidae (larvae)	0	0	0	0	0	0	0	2	1	0	2	0	0		0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	2	4	1	0	0	0	0	0	0	0	0		0
	Gyrinidae (adults)	0	0	0	1	0	0	0	0	0	0	0	0	0		0
	Haliplidae (larvae + adults)	0	0	2	0	0	0	0	0	0	0	0	0	4		0
	Hydraenidae (larvae + adults)	1	1	2	1	0	0	0	0	0	0	0	0	0		0
	Scirtidae (larvae + adults)	0	0	0	0	8	0	0	0	0	0	0	0	0		0
Corixidae	Corixidae (water boatman)	30	110	458	353	76	0	0	0	0	0	0	0	0		0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Baetidae: Procloeon (larvae)	1	0	0	0	0	0	0	0	0	0	0	0	0		0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Caenidae: Caenis (larvae)	0	0	0	0	0	9	1	1	0	16	0	1	0		0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	8	6	3	0	4	0	0	0		0
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	66	45	32	48	72	40	84	64		30
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Leptophlebiidae (larvae)	0	1	2	0	0	0	0	0	0	1	0	0	0		0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	1	0	0	0	0	0	0	0	0	0		0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Dipseudopsidae (larvae)	0	0	0	0	0	2	0	1	0	1	0	0	4		0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		1
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Leptoceridae (larvae)	0	0	0	0	0	3	1	0	3	13	4	1	4		1
	Limnephilidae (larvae)	0	0	1	0	0	0	0	0	0	0	0	0	0		0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0

	Site/Sample ID	STL3KM-IE--R1	STL3KM-IE--R2	STL3KM-IE--R3	STL3KM-IE--R4	STL3KM-IE--R5	STL3KM-PW-R1	STL3KM-PW-R2	STL3KM-PW-R3	STL3KM-PW-R4	STL3KM-PW-R5	STL3KM-OS-R1	STL3KM-OS-R2	STL3KM-OS-R3	STL3KM-OS-R4	STL3KM-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	0	5	2	0	12	41	24	11	55	88	4	8	4		0
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Dolichopodidae (larvae)	0	0	0	1	0	0	0	0	0	0	0	0	0		0
	Empididae (larvae)	2	0	0	0	0	0	0	0	0	0	0	0	0		0
	Limoniidae (larvae)	0	0	0	2	0	0	0	0	0	0	0	0	0		0
	Stratiomyidae (larvae)	0	0	0	0	1	0	0	0	0	0	0	0	0		0
	Tabanidae (larvae)	1	1	2	0	0	0	0	0	0	0	0	0	0		0
	Tipulidae (larvae)	4	8	10	0	12	0	0	0	0	0	0	0	0		0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	7	9	32	18	84	135	209	83	216	624	66	88	104		8

Table A3-3: Benthic invertebrate analysis output, Stephens Lake Area, 2021.
Stephens Lake - South 11 km downstream of Gull Rapids

	Site/Sample ID	STL11KM -IE-R1	STL11KM -IE-R2	STL11KM -IE-R3	STL11KM -IE-R4	STL11KM -IE-R5	STL11KM -PW-R1	STL11KM -PW-R2	STL11KM -PW-R3	STL11KM -PW-R4	STL11KM -PW-R5	STL11KM -OS-R1	STL11KM -OS-R2	STL11KM -OS-R3	STL11KM -OS-R4	STL11KM -OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.8	0.9	0.9	0.9	0.9	2.5	2.2	3.4	1.7	1.2	5.9	6.6	7.0	6.2	6.4
	SPLIT FACTOR CORRECTION	--	--	--	--	0.50	--	--	--	--	--	--	--	--	na	--
Annelida	Oligochaeta (aquatic worms)	160	144	189	104	340	3	4	4	15	50	4	0	3		0
Amphipoda (scuds)	Gammaridae	0	0	0	1	0	0	0	0	0	0	0	0	0		0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Hyalellidae	5	1	11	7	10	0	0	0	0	2	0	0	0		0
	Pontoporeiidae	0	0	0	0	0	1	1	2	0	1	45	23	30		19
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Dreissenidae (zebra mussels)	0	0	0	0	0	1	0	2	5	0	0	0	0		0
	Pisidiidae (findernail clams)	3	12	3	1	10	18	17	14	20	44	0	0	0		0
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	1	0	0	0		0
Gastropodaa (snails)	Gastropodaa - unidentified	2	3	2	1	0	1	0	0	0	1	0	0	0		2
	Hydrobiidae (mud snails)	0	0	0	0	0	6	10	5	18	7	2	16	4		4
	Lymnaeidae (pond snails)	9	4	3	2	4	0	0	0	0	11	0	0	0		0
	Physidae (bladder snails)	2	1	1	0	0	1	0	0	7	4	0	0	0		0
	Planorbidae (ramshorn snails)	6	3	1	0	2	1	0	0	6	4	0	0	0		0
	Valvatidae (valve snails)	1	4	5	0	2	1	6	3	39	24	0	1	0		0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Acari (water mites)	3	1	2	0	0	1	1	2	0	0	1	1	0		0
	Hirudinea (leeches)	0	0	0	0	0	0	0	0	0	0	1	0	0		0
	Collembola (springtails)	7	3	2	19	24	0	0	0	0	0	0	0	0		0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	1	1		3
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	0	1	0	0	0	0	0	0	0	0	0		0
	Gyrinidae (adults)	0	1	1	0	1	0	0	0	0	0	0	0	0		0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Hydraenidae (larvae + adults)	1	1	0	0	2	0	0	0	0	0	0	0	0		0
	Scirtidae (larvae + adults)	0	1	0	0	0	0	0	0	0	0	0	0	0		0
Corixidae	Corixidae (water boatman)	61	79	119	63	66	0	1	1	0	1	0	0	0		0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Baetidae: Procloeon (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Caenidae: Caenis (larvae)	0	0	0	0	0	0	0	0	1	1	0	0	0		0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	0	1	0	8	0	0	0	0		0
	Ephemeridae: Hexagenia (larvae)	0	0	0	1	0	22	27	27	9	0	43	37	31		28
	Heptageniidae: Stenonema (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Leptophlebiidae (larvae)	0	1	1	2	0	0	0	0	0	0	0	0	0		0
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Dipseudopsidae (larvae)	0	0	0	0	0	1	9	2	0	0	0	0	0		2
	Helicopsychidae (larvae)	1	0	0	0	0	0	0	0	0	0	0	0	0		0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Leptoceridae (larvae)	1	1	0	0	2	2	0	3	2	2	3	2	0		1
	Limnephilidae (larvae)	1	0	3	5	0	0	0	0	0	0	0	0	0		0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	1		0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0

	Site/Sample ID	STL11KM -IE-R1	STL11KM -IE-R2	STL11KM -IE-R3	STL11KM -IE-R4	STL11KM -IE-R5	STL11KM -PW-R1	STL11KM -PW-R2	STL11KM -PW-R3	STL11KM -PW-R4	STL11KM -PW-R5	STL11KM -OS-R1	STL11KM -OS-R2	STL11KM -OS-R3	STL11KM -OS-R4	STL11KM -OS-R5
Diptera (true flies)	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Ceratopogonidae (larvae)	0	0	0	0	0	4	3	1	12	1	0	0	2		0
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Empididae (larvae)	2	0	6	3	4	0	0	0	0	0	0	0	0		0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	Tipulidae (larvae)	0	0	4	0	0	0	0	0	0	0	0	0	0		0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	66	94	136	70	118	84	122	46	203	197	15	15	12		9

Table A3-3: Benthic invertebrate analysis output, Stephens Lake Area, 2021.
Stephens Lake - South 25 km downstream of Gull Rapids

	Site/Sample ID	STL25KM-IE-R1	STL25KM-IE-R2	STL25KM-IE-R3	STL25KM-IE-R4	STL25KM-IE-R5	STL25KM-OS-R1	STL25KM-OS-R2	STL25KM-OS-R3	STL25KM-OS-R4	STL25KM-OS-R5
Major Groups/ Taxa	Water Depth_INV (mean, m)	0.8	0.7	0.7	0.5	0.5	8.0	9.1	7.6	9.2	8.4
	SPLIT FACTOR CORRECTION	--	--	--	--	--	--	--	--	--	--
Annelida	Oligochaeta (aquatic worms)	2	4	1	90	143	0	0	0	1	3
Amphipoda (scuds)	Gammaridae	0	0	0	0	0	0	0	0	0	0
	Haustoriidae	0	0	0	0	0	0	0	0	0	0
	Hyalellidae	1	5	4	7	1	0	0	0	0	0
	Pontoporeiidae	0	0	0	0	0	16	13	24	19	18
Bivalvia (clams)	Bivalvia - unidentified	0	0	0	0	0	0	0	0	0	0
	Dreissenidae (zebra mussels)	0	0	0	5	1	35	0	8	8	40
	Pisidiidae (findernail clams)	0	1	0	0	0	0	0	0	0	0
	Unionidae (freshwater mussels)	0	0	0	0	0	0	0	0	0	0
Gastropodaa (snails)	Gastropodaa - unidentified	0	0	1	2	0	0	0	0	0	0
	Hydrobiidae (mud snails)	0	0	0	0	0	0	1	0	5	0
	Lymnaeidae (pond snails)	1	0	0	5	0	0	0	0	0	0
	Physidae (bladder snails)	0	0	0	1	1	0	0	0	0	0
	Planorbidae (ramshorn snails)	0	0	0	2	0	0	0	0	0	0
	Valvatidae (valve snails)	0	0	0	1	0	0	0	1	0	0
Others	Laevicaudata (clam shrimps)	0	0	0	0	0	0	0	0	0	0
	Mysidae (opposum shrimps)	0	0	0	0	0	0	0	0	0	0
	Acari (water mites)	0	1	1	6	4	0	0	0	0	1
	Hirudinea (leeches)	0	0	0	0	0	0	0	0	0	0
	Collembola (springtails)	0	0	0	0	0	0	0	0	0	0
	Sialidae (larvae)	0	0	0	0	0	0	0	0	0	0
Coleoptera (beetles)	Dytiscidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0
	Gyrinidae (adults)	0	0	0	0	0	0	0	0	0	0
	Haliplidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0
	Hydraenidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0
	Scirtidae (larvae + adults)	0	0	0	0	0	0	0	0	0	0
Corixidae	Corixidae (water boatman)	0	3	1	0	0	0	0	0	0	0
Ephemeroptera (mayflies)	Baetidae: Callibaetis (larvae)	0	0	0	0	0	0	0	0	0	0
	Baetidae: Procloeon (larvae)	0	0	0	0	0	0	0	0	0	0
	Baetiscidae: Baetisca (larvae)	0	0	0	0	0	0	0	0	0	0
	Caenidae: Caenis (larvae)	0	0	0	0	0	0	0	0	0	0
	Ephemerellidae: Eurylophella (larvae)	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Ephemera (larvae)	0	0	0	0	0	0	0	0	0	0
	Ephemeridae: Hexagenia (larvae)	0	0	0	0	0	7	10	11	9	4
	Heptageniidae: Stenonema (larvae)	0	0	0	1	2	0	0	0	0	0
	Leptophlebiidae (larvae)	0	2	0	10	8	0	0	0	0	1
	Metretopodidae: Siphloplecton (larvae)	0	0	0	0	0	0	0	0	0	0
Trichoptera (caddisflies)	Trichoptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0
	Dipseudopsidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Helicopsychidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Hydropsychidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Lepidostomatidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Leptoceridae (larvae)	0	0	0	1	0	0	3	1	0	1
	Limnephilidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Molannidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Phryganeidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Polycentropodidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Diptera - unidentified (pupae)	0	0	0	0	0	0	0	0	0	0

	Site/Sample ID	STL25KM-IE-R1	STL25KM-IE-R2	STL25KM-IE-R3	STL25KM-IE-R4	STL25KM-IE-R5	STL25KM-OS-R1	STL25KM-OS-R2	STL25KM-OS-R3	STL25KM-OS-R4	STL25KM-OS-R5
Diptera (true flies)	Ceratopogonidae (larvae)	0	0	0	0	0	0	0	1	0	0
	Chaoboridae (larvae + pupae)	0	0	0	0	0	0	0	0	0	0
	Dolichopodidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Empididae (larvae)	0	0	0	3	4	0	0	0	0	0
	Limoniidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Stratiomyidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Tabanidae (larvae)	0	0	0	0	0	0	0	0	0	0
	Tipulidae (larvae)	0	0	0	0	0	0	0	0	0	0
Chironomidae (non-biting midges)	Chironomidae (larvae + pupae)	30	34	25	343	166	2	3	6	6	6

APPENDIX 4:
BENTHIC SEDIMENT DATA FOR THE KEEYASK STUDY AREA, 2021

Table A4-1: Summary statistics: benthic sediment analysis total organ carbon, Split Lake Area, 2021. Split Lake

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	SPLIT-IE-R1	0.7	2.30	19.2	8.96	6.66	9.8	59.2	31.1	Silty clay
	SPLIT-IE-R2	1.0	2.80	23.3	7.49	4.70	2.1	76.8	21.1	Silt loam
	SPLIT-IE-R3	1.0	2.19	18.2	5.91	3.70	17.0	67.2	15.8	Silt loam
	SPLIT-IE-R4	0.7	3.76	31.3	5.83	2.10	1.5	70.2	28.3	Silty clay
	SPLIT-IE-R5	0.8	1.89	15.7	5.31	3.40	9.0	76.0	15.0	Silt loam
Predominantly Wetted	SPLIT-PW-R1	5.7	2.01	16.7	4.09	2.08	17.5	77.1	5.5	Silt loam
	SPLIT-PW-R2	5.0	1.44	12.0	3.92	2.48	30.3	63.6	6.1	Silt loam
	SPLIT-PW-R3	7.4	1.44	12.0	3.85	2.41	43.9	47.4	8.7	Loam
	SPLIT-PW-R4	4.6	1.24	10.3	2.68	1.44	63.3	29.0	7.7	Sandy loam
	SPLIT-PW-R5	7.1	1.57	13.1	2.53	0.96	64.3	26.6	9.1	Sandy loam
Offshore	SPLIT-OS-R1	1.2	2.08	17.3	3.43	1.35	11.3	51.7	37.0	Silty clay
	SPLIT-OS-R2	1.1	1.99	16.5	3.12	1.13	29.0	60.5	10.5	Silt loam
	SPLIT-OS-R3	1.0	2.12	17.7	3.29	1.17	21.2	64.5	14.3	Silt loam
	SPLIT-OS-R4	1.0	2.01	16.7	3.36	1.35	25.9	64.6	9.4	Silt loam
	SPLIT-OS-R5*	1.1	1.94	16.2	3.31	1.37	17.7	48.3	34.0	Silty clay

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-2: Benthic sediment analysis output, Keeyask reservoir, 2021.
Nelson River Back Bay at unnamed creek DS of Nap Creek

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05mm -2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	NAP-IE-R1*	0.8	3.54	29.5	4.57	1.03	8.9	43.6	47.5	Silty clay
	NAP-IE-R2	0.6	0.234	1.95	2.19	1.96	2.1	22.8	75.1	Clay
	NAP-IE-R3	0.7	2.55	21.2	3.69	1.14	60.9	35.7	3.4	Sandy loam
	NAP-IE-R4	0.5	3.41	28.4	4.01	<0.80	44.0	38.2	17.8	Loam
	NAP-IE-R5*	0.5	2.33	19.4	2.78	<0.56	46.3	35.7	18.0	Loam
Predominantly Wetted	NAP-PW-R1*	2.4	1.93	16.1	2.92	0.99	47.3	23.4	29.3	Sandy clay loam
	NAP-PW-R2*	1.4	1.62	13.5	4.15	2.53	54.7	41.3	4.0	Sandy loam
	NAP-PW-R3*	1.3	1.68	14.0	4.68	3.00	64.7	27.2	8.2	Sandy loam
	NAP-PW-R4*	1.3	1.86	15.5	5.05	3.20	57.2	30.2	12.6	Sandy loam
	NAP-PW-R5*	1.1	2.35	19.6	2.65	<0.53	94.0	3.4	2.6	Sand
Offshore	NAP-OS-R1*	5.2	2.27	18.9	3.32	1.05	42.3	30.4	27.3	Loam / Clay loam
	NAP-OS-R2*	5.5	1.99	16.6	3.46	1.47	33.7	52.8	13.5	Silt loam
	NAP-OS-R3*	4.5	1.95	16.2	3.35	1.40	41.6	46.1	12.3	Loam
	NAP-OS-R4*	5.5	1.83	15.2	3.11	1.28	22.6	38.7	38.7	Clay loam
	NAP-OS-R5	3.8	1.78	14.8	3.40	1.62	33.7	49.5	16.7	Silt loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-2: Benthic sediment analysis output, Keeyask reservoir, 2021.
Zone 4 Pahwaybenic Bay

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	Z4_PAH-IE-R1*	0.5	2.00	16.6	2.66	0.66	97.2	1.5	1.2	Sand
	Z4_PAH-IE-R2	0.5	2.34	19.5	2.86	<0.57	96.3	2.6	1.1	Sand
	Z4_PAH-IE-R3*	0.6	2.46	20.5	3.52	1.06	74.3	24.7	<1.0	Loamy sand
	Z4_PAH-IE-R4*	0.5	2.83	23.5	4.21	1.38	87.6	10.3	2.0	Sand
	Z4_PAH-IE-R5	0.5	2.26	18.8	3.07	0.81	87.8	10.9	1.3	Sand
Predominantly Wetted	Z4_PAH-PW-R1*	6.7	3.84	32.0	4.68	<0.94	1.3	70.8	28.0	Silt loam / Silty clay loam
	Z4_PAH-PW-R2	2.9	0.262	2.19	1.4	1.14	66.9	16.9	16.1	Sandy loam
	Z4_PAH-PW-R3*	2.8	0.162	1.35	1.59	1.43	59.4	18.0	22.5	Sandy clay loam
	Z4_PAH-PW-R4*	2.5	0.167	1.39	3.86	3.69	29.4	35.0	35.6	Clay loam
	Z4_PAH-PW-R5	2.9	0.154	1.28	2.24	2.09	51.5	22.9	25.7	Sandy clay loam
Offshore	Z4_PAH-OS-R1*	4.6	1.06	8.80	2.85	1.79	50.3	40.9	8.8	Loam
	Z4_PAH-OS-R2*	4.7	1.35	11.3	3.29	1.94	46.3	47.5	6.2	Sandy loam
	Z4_PAH-OS-R3*	4.5	1.26	10.5	3.72	2.46	44.7	47.7	7.6	Loam / Sandy loam
	Z4_PAH-OS-R4*	4.7	1.28	10.6	5.68	4.4	25.0	67.0	7.9	Silt loam
	Z4_PAH-OS-R5*	4.5	1.44	12.0	4.36	2.92	23.9	69.6	6.5	Silt loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-2: Benthic sediment analysis output, Keeyask reservoir, 2021.
Zone 12 Nelson River Back Bay at Seebeesis Creek

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	Z12_SEEB-IE-R1	0.7	2.07	17.3	2.13	<0.43	97.7	1.1	1.2	Sand
	Z12_SEEB-IE-R2	0.7	2.26	18.8	2.48	<0.50	97.4	1.4	1.2	Sand
	Z12_SEEB-IE-R3	0.5	0.755	6.29	1.93	1.18	32.2	53.2	14.6	Silt loam
	Z12_SEEB-IE-R4*	0.6	0.153	1.28	0.98	0.831	15.3	41.3	43.5	Silty clay
	Z12_SEEB-IE-R5	0.7	0.713	5.94	0.91	0.200	99.0	<1.0	<1.0	Sand
Predominantly Wetted	Z12_SEEB-PW-R1*	2.8	1.28	10.6	8.26	6.98	23.9	71.7	4.4	Silt loam
	Z12_SEEB-PW-R2*	2.6	1.26	10.5	17.7	16.4	19.5	73.2	7.2	Silt loam
	Z12_SEEB-PW-R3*	2.0	2.37	19.7	5.37	3.00	16.7	81.2	2.0	Silt
	Z12_SEEB-PW-R4*	2.5	0.619	5.16	11.0	10.4	13.7	81.6	4.6	Silt
	Z12_SEEB-PW-R5*	2.3	1.84	15.3	8.53	6.69	11.2	87.4	1.5	Silt
Offshore	Z12_SEEB-OS-R1*	8.0	1.32	11.0	3.05	1.73	35.6	36.6	27.8	Loam / Clay loam
	Z12_SEEB-OS-R2*	7.8	1.31	10.9	2.52	1.21	56.3	37.9	5.8	Sandy loam
	Z12_SEEB-OS-R3*	7.9	1.32	11.0	3.24	1.92	43.2	45.5	11.3	Loam
	Z12_SEEB-OS-R4*	8.0	1.06	8.82	2.53	1.47	40.3	38.0	21.7	Loam
	Z12_SEEB-OS-R5*	7.8	1.18	9.79	3.33	2.15	57.2	34.5	8.4	Sandy loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-2: Benthic sediment analysis output, and Keeyask reservoir, 2021.
Nelson River upstream extent of Gull Lake

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	NRGULL-IE-R1	0.6	0.438	3.65	0.71	0.28	97.5	1.2	1.2	Sand
	NRGULL-IE-R2	0.7	0.972	8.09	1.21	<0.24	98.6	<1.0	<1.0	Sand
	NRGULL-IE-R3	0.6	0.268	2.23	0.75	0.48	96.4	1.9	1.7	Sand
	NRGULL-IE-R4	0.6	1.180	9.87	1.36	<0.27	98.9	<1.0	<1.0	Sand
	NRGULL-IE-R5	0.6	0.947	7.89	1.56	0.61	85.0	10.5	4.6	Loamy sand
Predominantly Wetted	NRGULL-PW-R1*	2.5	0.490	4.09	42.2	41.7	2.2	72.1	25.8	Silt loam
	NRGULL-PW-R2*	2.7	0.463	3.86	42.9	42.4	1.9	69.4	28.6	Silty clay loam
	NRGULL-PW-R3*	2.6	0.410	3.41	35.8	35.4	<1.0	77.5	21.8	Silt loam
	NRGULL-PW-R4*	2.6	0.615	5.12	37.9	37.3	5.7	66.8	27.5	Silt loam / Silty clay loam
	NRGULL-PW-R5*	3.0	0.553	4.61	31.5	30.9	<1.0	72.6	27.0	Silt loam / Silty clay loam
Offshore	NRGULL-OS-R1*	6.2	0.577	4.81	12.5	11.9	<1.0	56.6	43.1	Silty clay
	NRGULL-OS-R2*	6.4	0.429	3.57	12.3	11.9	<1.0	61.7	37.9	Silty clay loam
	NRGULL-OS-R3*	6.2	0.420	3.50	14.7	14.3	<1.0	62.0	37.7	Silty clay loam
	NRGULL-OS-R4*	6.4	0.411	3.43	12.9	12.5	<1.0	60.2	39.0	Silty clay loam
	NRGULL-OS-R5*	6.4	0.343	2.85	14.0	13.7	<1.0	64.5	35.2	Silty clay loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-2: Benthic sediment analysis output, Keeyask reservoir, 2021.
Zone 8 Gull Lake

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	Z8_GULL-IE-R1	0.6	0.063	0.52	0.06	<0.050	98.7	<1.0	<1.0	Sand
	Z8_GULL-IE-R2	0.9	0.122	1.02	0.14	<0.050	97.7	<1.0	1.6	Sand
	Z8_GULL-IE-R3	0.9	0.233	1.94	0.26	<0.052	98.8	<1.0	<1.0	Sand
	Z8_GULL-IE-R4*	0.7	1.08	9.00	2.00	0.92	22.0	36.3	41.7	Clay
	Z8_GULL-IE-R5	1.0	1.18	9.79	2.24	1.06	74.8	18.8	6.4	Sandy loam
Predominantly Wetted	Z8_GULL-PW-R1*	2.9	0.457	3.81	8.61	8.15	1.7	55.7	42.6	Silty clay
	Z8_GULL-PW-R2*	2.7	0.31	2.58	10.7	10.4	1.6	72.0	26.4	Silt loam
	Z8_GULL-PW-R3*	2.8	0.27	2.25	6.19	5.92	3.9	39.0	57.1	Silty clay / Clay
	Z8_GULL-PW-R4*	2.9	0.454	3.78	13.2	12.7	17.0	56.2	26.8	Silt loam
	Z8_GULL-PW-R5*	2.7	0.456	3.80	20.6	20.1	10.1	78.3	11.6	Silt loam
Offshore	Z8_GULL-OS-R1*	7.4	2.16	18.0	4.52	2.36	1.6	88.5	9.9	Silt
	Z8_GULL-OS-R2*	7.0	2.17	18.0	4.54	2.37	1.5	89.0	9.6	Silt
	Z8_GULL-OS-R3*	7.4	2.15	17.9	4.28	2.13	<1.0	94.5	4.6	Silt
	Z8_GULL-OS-R4*	7.0	1.73	14.4	4.46	2.73	<1.0	89.4	10.0	Silt
	Z8_GULL-OS-R5*	5.6	0.585	4.87	2.09	1.51	72.0	17.3	10.7	Sandy loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-3: Benthic sediment analysis output, Stephens Lake Area, 2021.
Stephens Lake -North O'Neil Bay

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	ONB-IE-R1	sediment sample not collected because woody/organic debris was thick over substrate out to 3m water depth								
	ONB-IE-R2*	0.7	0.647	5.39	2.72	2.07	2.8	32.2	65.0	Clay
	ONB-IE-R3*	0.6	3.11	25.9	3.72	<0.74	5.0	41.9	53.1	Silty clay
	ONB-IE-R4*	0.5	3.55	29.6	3.88	<0.78	<1.0	23.4	75.6	Clay
	ONB-IE-R5*	0.6	1.72	14.3	1.85	<0.37	60.2	10.7	29.2	Sandy clay loam
Predominantly Wetted	ONB-PW-R1*	1.9	1.94	16.1	3.25	1.31	66.7	23.1	10.2	Sandy loam
	ONB-PW-R2*	2.6	1.75	14.6	4.65	2.90	20.1	59.1	20.8	Silt loam
	ONB-PW-R3	2.7	2.48	20.7	4.32	1.84	36.2	47.8	16.0	Loam
	ONB-PW-R4	2.6	2.08	17.3	4.24	2.16	35.1	52.8	12.1	Silt loam
	ONB-PW-R5	3.6	2.62	21.8	6.27	3.70	2.5	76.3	21.2	Silt loam
Offshore	ONB-OS-R1	4.1	2.68	22.3	4.32	1.64	10.0	78.7	11.3	Silt loam
	ONB-OS-R2	4.2	2.76	23.0	4.77	2.01	8.0	66.4	25.7	Silt loam
	ONB-OS-R3	4.7	2.55	21.2	4.00	1.45	24.3	54.9	20.8	Silt loam
	ONB-OS-R4	5.8	2.79	23.2	4.33	1.54	3.6	74.2	22.2	Silt loam
	ONB-OS-R5*	5.7	2.29	19.1	3.35	1.06	1.3	77.6	21.1	Silt loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-3: Benthic sediment analysis output, Stephens Lake Area, 2021.
Stephens Lake - North 3 km downstream of Gull Rapids (at inlet to Stephens Lake)

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	STL3KM-IE--R1*	0.5	1.75	14.6	2.86	1.11	60.8	31.1	8.2	Sandy loam
	STL3KM-IE--R2	0.3	2.14	17.8	3.97	1.83	57.8	26.6	15.7	Sandy loam
	STL3KM-IE--R3	0.3	0.807	6.73	1.86	1.05	47.1	38.3	14.6	Loam
	STL3KM-IE--R4	0.5	0.714	5.95	1.87	1.16	40.8	43.6	15.6	Loam
	STL3KM-IE--R5	0.3	0.809	6.74	2.08	1.27	58.9	31.7	9.4	Sandy loam
Predominantly Wetted	STL3KM-PW-R1*	2.6	2.07	17.3	4.39	2.32	31.4	54.6	14.1	Silt loam
	STL3KM-PW-R2*	2.4	2.39	19.9	4.34	1.95	12.9	70.1	17.0	Silt loam
	STL3KM-PW-R3*	2.4	2.10	17.5	5.66	3.60	22.0	61.8	16.2	Silt loam
	STL3KM-PW-R4*	2.3	2.23	18.5	4.16	1.93	14.5	68.8	16.7	Silt loam
	STL3KM-PW-R5	1.8	2.20	18.3	4.87	2.67	11.2	69.4	19.4	Silt loam
Offshore	STL3KM-OS-R1*	5.9	1.77	14.7	4.14	2.37	37.1	56.5	6.5	Silt loam
	STL3KM-OS-R2*	5.7	1.49	12.4	2.99	1.50	66.0	27.7	6.3	Sandy loam
	STL3KM-OS-R3*	5.7	1.72	14.3	4.44	2.72	44.3	47.1	8.6	Loam
	STL3KM-OS-R4	5.7	1.44	12.0	2.54	1.10	74.1	21.5	4.4	Sandy loam / Loamy sand
	STL3KM-OS-R5*	5.5	1.83	15.2	3.74	1.91	22.5	69.1	8.4	Silt loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-3: Benthic sediment analysis output, Stephens Lake Area, 2021.
Stephens Lake - South 11 km downstream of Gull Rapids

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	STL11KM-IE-R1	0.8	1.62	13.5	4.03	2.41	98.0	1.3	<1.0	Sand
	STL11KM-IE-R2	0.9	3.11	25.9	3.99	0.88	97.0	2.1	<1.0	Sand
	STL11KM-IE-R3	0.9	2.47	20.5	3.47	1.00	97.3	1.8	<1.0	Sand
	STL11KM-IE-R4	0.9	2.47	20.6	3.64	1.17	97.3	2.0	<1.0	Sand
	STL11KM-IE-R5	0.9	2.00	16.7	3.38	1.38	97.4	1.6	1.0	Sand
Predominantly Wetted	STL11KM-PW-R1	2.5	2.19	18.2	5.39	3.20	4.5	85.3	10.2	Silt
	STL11KM-PW-R2*	2.2	1.82	15.2	5.85	4.03	18.0	68.9	13.1	Silt loam
	STL11KM-PW-R3	3.4	2.05	17.1	5.34	3.30	1.4	85.9	12.7	Silt loam
	STL11KM-PW-R4*	1.7	1.58	13.2	5.88	4.30	50.8	37.4	11.9	Loam
	STL11KM-PW-R5	1.2	1.49	12.4	4.71	3.22	60.4	33.5	6.1	Sandy loam
Offshore	STL11KM-OS-R1	5.9	2.14	17.8	4.61	2.47	1.3	82.9	15.7	Silt loam
	STL11KM-OS-R2	6.6	2.24	18.6	4.65	2.41	1.6	85.8	12.6	Silt loam
	STL11KM-OS-R3*	7.0	2.12	17.7	4.25	2.13	<1.0	77.3	22.2	Silt loam
	STL11KM-OS-R4*	6.2	2.08	17.3	4.30	2.22	<1.0	79.8	19.9	Silt loam
	STL11KM-OS-R5*	6.4	2.18	18.2	4.48	2.30	<1.0	86.2	13.2	Silt loam

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.

Table A4-3: Benthic sediment analysis output, Stephens Lake Area, 2021.
Stephens Lake - South 25 km downstream of Gull Rapids

Habitat Type	Site/ Sample ID	Water Depth SED (m)	Inorganic Carbon (%)	$CaCO_3$ Equivalent	Total Carbon by Combustion (%)	Total Organic Carbon (%)	% Sand (2.0-0.05 mm)	% Silt (0.05 mm-2 µm)	% Clay (<2 µm)	Texture
Intermittently Exposed	STL25KM-IE-R1	0.2	1.88	15.70	2.18	<0.44	96.4	1.6	2.0	Sand
	STL25KM-IE-R2	0.2	2.83	23.60	3.40	<0.68	95.5	1.6	2.9	Sand
	STL25KM-IE-R3*	0.2	3.75	31.30	4.14	<0.83	21.1	47.0	31.9	Clay loam
	STL25KM-IE-R4	0.2	1.99	16.60	2.53	0.54	96.1	1.7	2.1	Sand
	STL25KM-IE-R5	0.3	3.33	27.80	3.92	<0.78	69.8	22.4	7.9	Sandy loam
Offshore	STL25KM-OS-R1*	8.0	2.48	20.60	4.49	2.01	<1.0	85.5	14.5	Silt loam
	STL25KM-OS-R2*	8.9	2.45	20.40	4.31	1.86	<1.0	85.6	14.3	Silt loam
	STL25KM-OS-R3*	8.1	2.43	20.20	4.58	2.15	1.0	77.9	21.1	Silt loam
	STL25KM-OS-R4*	9.5	2.69	22.40	4.58	1.89	<1.0	80.3	19.5	Silt loam
	STL25KM-OS-R5*	8.2	2.64	22.00	4.61	1.97	<1.0	91.1	8.2	Silt

*PSAL - Limited sample was available for Particle Size Analysis (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual.