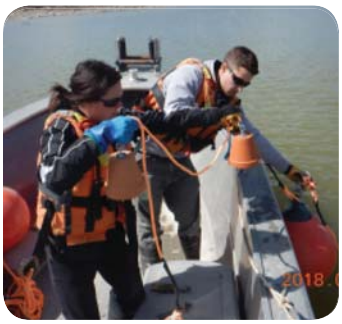
Keeyask Generation Project

Zebra Mussel Monitoring Plan

Zebra Mussel Annual Monitoring Report

ZMMP-2019-01



KEEYASK

Manitoba Sustainable Development Client File 5550.00
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2018 -2019

KEEYASK GENERATION PROJECT

ZEBRA MUSSEL MONITORING PLAN

REPORT #ZMMP-2019-01

ANNUAL REPORT

APRIL 2018 TO MARCH 2019

Prepared by

Manitoba Hydro

&

North/South Consultants, Inc.

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SUMMARY

Zebra mussels are an aquatic, invasive species that grow on hard materials in the water, such as rocks and pipes, and can become so prolific they cause major problems for utilities. Although not found in the Keeyask region, they are found on Lake Winnipeg, which is connected to the Nelson River. The *Zebra Mussel Monitoring Plan* (ZMMP) was developed and is being implemented in accordance with the Keeyask *Environment Act* Licence to monitor and manage the impacts of zebra mussels on the Keeyask Project.

A key component of the ZMMP is to ensure that Keeyask employees and visitors are aware of zebra mussels and the provincial regulations for cleaning watercraft, water-related equipment, trailers, and motor vehicles to prevent them from spreading. Zebra mussel education and awareness was promoted in 2018 at Keeyask in the site orientation session, by displaying aquatic invasive species posters in lunch rooms across the Project site, and by distributing an electronic information bulletin to all parties on site.

A hot water decontamination unit was constructed in 2016 to prevent the spread of zebra mussels to or from Keeyask. All incoming and outgoing watercraft and water-related equipment (anchors, nets, paddles, etc.) were inspected for the presence of zebra mussels and decontaminated, if they were leaving the Nelson River Control Zone. In 2018, eighty-eight inspections were conducted and one, hot-water decontamination was performed. At the main entrance to Keeyask off of PR 280, a sign was posted reminding site users to report watercraft and water-related equipment for inspection and decontamination.

During 2018, water samples were collected from the Nelson River at Keeyask and analysed for zebra mussel “veligers” (microscopic mussel larvae) that would potentially indicate zebra mussels are present in the area. Also in 2018, three monitoring sites were established in the Keeyask reservoir and artificial substrates were deployed to track colonization, if any, by zebra mussels. Finally, in-water infrastructure including safety booms and buoys were visually inspected for zebra mussels upon removal from the Nelson River at the end of the open-water season. No zebra mussels or veligers were detected during the monitoring conducted in 2018.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station at Gull (Keeyask) 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. Construction of the Project began in July 2014.

Although none of the aquatic invertebrate species identified during the environmental assessment of the Project were listed as invasive in accordance with the Invasive Species Council of Manitoba's listing at the time (KHLP 2012), the Project's *Environment Act* Licence #3107 (Clause 18) directed the Keeyask Hydropower Limited Partnership (KHLP) to develop a Zebra Mussel Monitoring Plan to "*monitor and adaptively manage impacts to the Development (Project) associated with zebra mussels and participate with the Government of Manitoba on treatment programs within the Keeyask reservoir.*"

The *Zebra Mussel Monitoring Plan* (ZMMP) was submitted by the KHLP in December 2015 (KHLP 2015) and was subsequently approved by Manitoba Sustainable Development. This report summarizes the results and activities conducted from April 2018 to March 2019 in accordance with the ZMMP.

2.0 ZEBRA MUSSEL MONITORING 2018

The ZMMP methodology is designed to assess zebra mussel presence using four approaches, as follows:

1. Education and awareness;
2. Water quality sampling;
3. Colonization/adult sampling;
4. Visual inspections of in-water infrastructure.

The work undertaken to implement each of these approaches is summarized below.

2.1 EDUCATION AND AWARENESS

In 2018, Keeyask's environmental inspectors received training on the requirements of the various aquatic invasive species legislation, as well as provincially approved inspection and decontamination techniques for zebra mussels and other common aquatic invasive species (AIS).

The site orientation session given to all other Keeyask employees, contractors, and visitors includes a section on AIS and provides the regulatory requirements for decontaminating watercraft and water-related equipment. Aquatic invasive species information posters are also displayed in Manitoba Hydro and contractor lunch rooms around the construction site to familiarize people about what to look for and how they can follow up if they find something. Finally, an information bulletin on zebra mussels and other aquatic invasive species was distributed to all contractors on site in May 2018.

A decontamination unit was constructed at Keeyask in September 2016 to prevent the transfer of zebra mussels from boats and equipment used elsewhere to Gull and Stephens lakes, as well as to prevent the spread of zebra mussels or veligers from the Keeyask site, should they move into the Keeyask region from further upstream. The unit consists of a hot water (≥60 °C) sprayer and a drain pad designed to allow wash water to rapidly infiltrate the ground and prevent it from flowing off the pad. The unit meets the Provincial requirements for AIS decontamination.

In the fall of 2018, a sign was posted at the main gate to notify those groups bringing watercraft to the Keeyask site, that Keeyask is in the Nelson River Control Zone and personnel must report for an inspection and/or decontamination of watercraft and water-related equipment when entering and leaving the Project site (Photo 1).

Photo 1: In 2018, a sign was posted at the main gate to remind site users to report for inspection of watercraft and water-related equipment

Watercraft and equipment users were informed that whenever watercraft/equipment are removed from the Nelson River (including Gull Lake and Stephens Lake), general provisions (*i.e.*, clean, drain, dry) should be performed. In addition, when leaving Keeyask, any watercraft or equipment leaving the Nelson River Control Zone needs to be decontaminated prior to departure unless they can 1) provide proof of an exemption permit issued from Manitoba Sustainable Development or 2) the party has access to decontamination facilities and agrees to provide records to Manitoba Hydro after decontamination in accordance with the provincial *Aquatic Invasive Species Regulation*.

2.1.1 RESULTS

From April 2018 to March 2019, all watercraft and water-related equipment was inspected for AIS upon arrival and departure from Keeyask. In total, eighty-eight inspections were conducted and one decontamination (Photo 2) was performed on incoming and outgoing watercraft and water-related equipment.

The decontamination water drains down onto a gravel pad designed to allow rapid infiltration into the ground, preventing it from flowing away from the site.

Photo 2: A boat being decontaminated by rinsing with hot water (≥60 °C) on June 25, 2018

2.1.2 NEXT STEPS

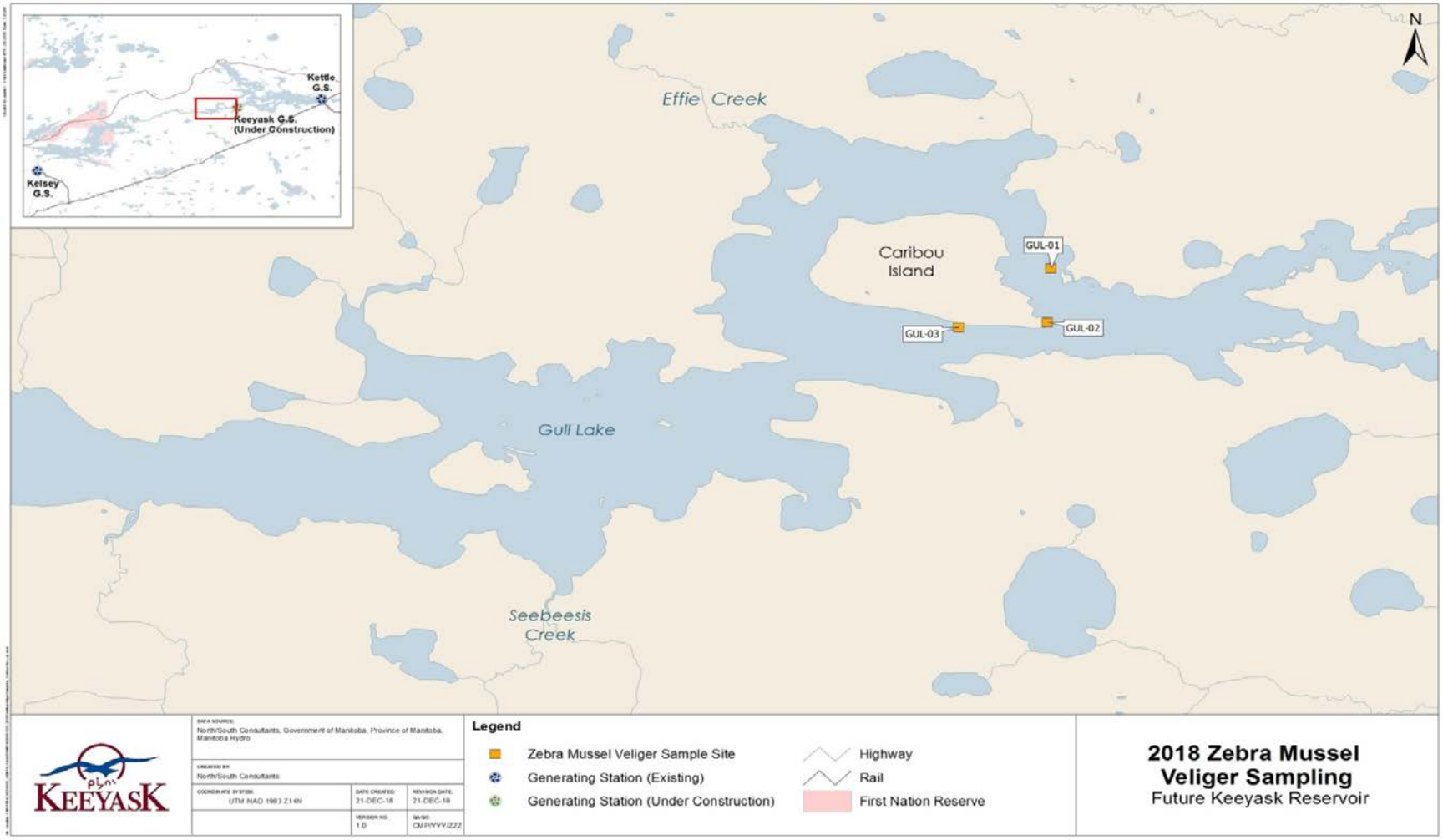
AIS inspections and decontamination will continue in 2019. In the summer, signs will be posted at the upstream and downstream boat launches to notify site users that Keeyask is in the Nelson River Control Zone, and remind personnel to report for inspection/decontamination of watercraft and water-related equipment when entering and leaving Keeyask. The signs will also list Keeyask's standard AIS requirements when launching or removing watercraft/equipment from the Nelson River.

2.2 VELIGER SAMPLING

Zebra mussel veligers (larval mussels) were sampled upstream of the Keeyask GS construction site on September 18, 2018. One sample (tow) was collected from three locations within 7 km upstream of the construction site (Map 1). Sites were similar to those sampled in September 2017. These sites were chosen in areas that were near a structure suitable for zebra mussel

colonization (*i.e.*, ice booms at GUL-03 and acoustic receiver at GUL-02) and subject to heavy use with the potential for zebra mussel introduction (*i.e.*, Gull Lake boat launch; GUL-01).

Samples were collected with a plankton net consisting of a 30 cm diameter ring with bridle; a 1 meter long, 63 micron mesh net; and a removable weighted cod end for sample retrieval. Samples were collected using the horizontal tow (used in areas of low water velocity; boat is driven) method. The net was released, allowed to sink ~3 m, and tied to the stern of the boat. The boat was driven slowly (travelling approximately 1 m every 3 seconds) for a total of 20 m.



Map 1: Sampling sites for zebra mussel veliger monitoring in the Keeyask Study Area, September 18, 2018

All sampling information was recorded onto field data sheets that included sample date and time, sample ID, water temperature (˚C), location (UTM), Secchi depth (m), water depth (m), water velocity (m/sec), start time, and tow distance (m). Site specific data are presented in Table 1.

After retrieval, the entire net was rinsed from the outside to ensure all of the sample material was washed into the cod end. Contents were thoroughly rinsed into a labelled sample jar. Samples were preserved using 70% denatured ethanol (alcohol to sample ratio = 2:1). All samples were stored for transport in a cooler and sent to ALS Laboratories (Winnipeg, MB) for analysis.

2.2.1 RESULTS

No zebra mussel veligers were found in any of the sampled collected in September 2018.

2.2.2 NEXT STEPS

Annual sampling for zebra mussel veligers will continue. Sampling will next be conducted in August/September 2019.

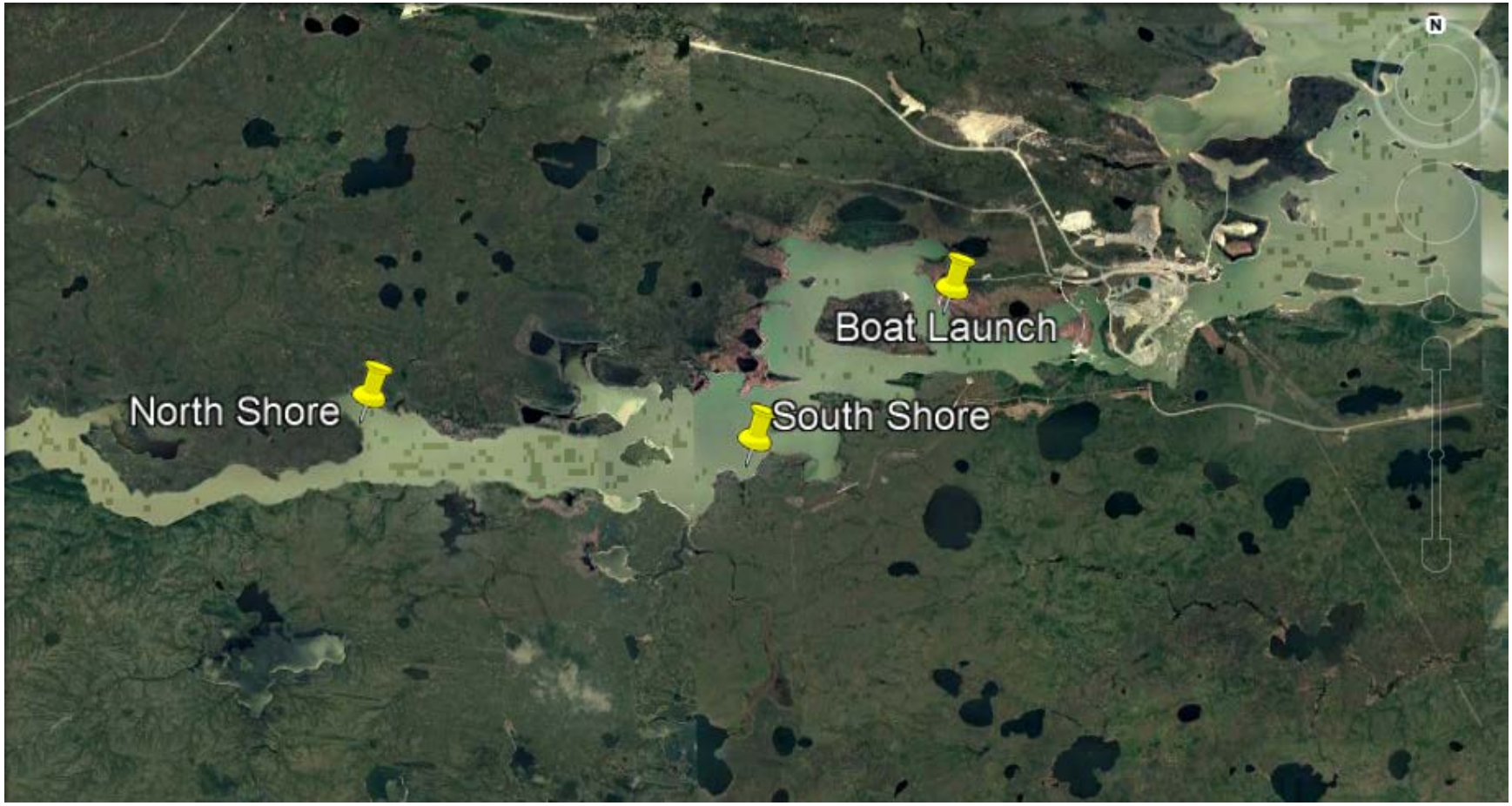
Table 1: Site specific data collected at zebra mussel veliger sampling sites upstream of the Keeyask GS construction site during September 2018

Sample ID	Sample Date	Sample Time	Water Temperature (°C)	15V (NAD 83)		Water Velocity (m/s)	Water Depth (m)	Secchi Depth (m)	Sample Method	Distance (m)
				Easting	Northing					
GUL-01	18-Sep-18	11:50	9	358480	6246753	0.12	5.5	0.45	Horizontal	20
GUL-02	18-Sep-18	12:05	9	358441	6246026	0.33	4.5	0.45	Horizontal	20
GUL-03	18-Sep-18	12:15	9	357380	6245958	0.62	5.0	0.45	Horizontal	20

2.3 COLONIZATION / ADULT SAMPLING

Monitoring for adult zebra mussel colonization was done by establishing three sites in the Keeyask reservoir for placement of artificial substrates. Artificial substrates were deployed on May 30, 2018. Sites were located in low-flow areas (0.1-1.0 m/s) with a depth of approximately 4 m (Map 2). At each site, terra cotta flower pots were used as artificial substrates; they were suspended in series along a rope at 1, 2, and 3 m depths (Photo 3), anchored in place with a cinderblock, and kept suspended in the water column by a buoy at the surface.

A more robust design was used for the deployments this monitoring season and fewer issues with lost or damaged equipment were encountered compared to 2017. At each location, separate lines were used to suspend the pots (substrates) and anchor the monitoring site, so there was no need to remove the cinderblock each time the substrates were checked. More durable ropes were also used to protect from wear and tear and reduce the potential for the substrates to be lost. Nonetheless, due to the fragility of the terra cotta substrates, there were a few instances where substrates were found to be damaged and were replaced.



Map 2: Location of sites in the Keeyask reservoir where artificial substrates were deployed to monitor for zebra mussel colonization

Photo 3: Deploying the artificial substrates at the Keeyask reservoir boat launch site on May 30, 2018

All three sites were checked monthly during the open-water period for presence/absence of zebra mussels and a photograph was taken of each side of the substrate (Figure 6). If present, adult zebra mussels were to be counted and recorded. Site visits also included visual inspections of adjacent rocks, crevices, woody debris, docks, and vegetation for the presence of zebra mussels. On September 14, 2018, the artificial substrate and anchors (cinderblocks) were removed for the season and were inspected for the presence of zebra mussels and photographed on all sides.

On July 11, 2018, three substrates were found to be damaged—two at the north shore site and one at the south shore. The broken substrates were replaced on July 13, 2018. One substrate was found damaged at the south shore site on August 17, 2018 and was replaced immediately. On September 14, 2018, one of the substrates was damaged at the north shore site but it was not replaced because the monitoring equipment was being removed for the season.

2.3.1 RESULTS

During each site visit in 2018 to inspect and/or remove the artificial substrates (Photo 4), and inspect of the surrounding, natural substrates, there was no evidence of zebra mussel colonization (adult or juvenile).

Note: Algae and aquatic invertebrates were present on the substrate but there was no evidence of zebra mussel colonization.

Photo 4: Photo of a monitoring substrate being checked for colonization by zebra mussels at the Keeyask reservoir boat launch site on August 17, 2018

2.3.2 NEXT STEPS

Monitoring will take place again in 2019. Staff are considering replacing the terra cotta pots with a substrate material that is less fragile, to reduce equipment damage and loss during the monitoring season.

2.4 VISUAL INSPECTIONS OF IN-WATER INFRASTRUCTURE

Keeyask site staff undertook visual inspections of in-water infrastructure for signs of zebra mussels. In 2018, this included inspecting:

- sections of the seasonal safety boom that had been removed from the Nelson River for dry storage over the winter (Photo 5); and
- warning buoys that are deployed downstream of Gull Rapids during the open-water season, after removal for the winter (Photo 6).

Photo 5: Parts of the open-water safety boom that had been removed for winter storage were visually inspected for the presence of adult and juvenile zebra mussels

The warning buoys and sections of the safety boom that had been in the river were carefully inspected for the presence of adult mussels or byssal threads (a tuft of hair-like fibers that zebra mussels use to attach to underwater surfaces). The buoys and safety boom were also inspected

for the presence of young zebra mussels by running a hand over the surfaces, as newly settled mussels on smooth surfaces can feel like sandpaper.

Photo 6: Warning buoys that are deployed downstream of Gull Rapids during the open-water season were removed for winter storage and were visually inspected for the presence of adult and juvenile zebra mussels

2.4.1 RESULTS

In 2018, no adult or juvenile zebra mussels or evidence of byssal threads were found on any surfaces of the in-water infrastructure.

2.4.2 NEXT STEPS

In-water infrastructure will be inspected again at the end of the open water season in 2019, once it is removed for the season.

3.0 CONCLUSIONS

The Keeyask ZMMP was implemented in 2018 in accordance with the Keeyask *Environment Act* Licence, and included education and awareness activities to mitigate the introduction of zebra mussels at the Keeyask site, as well as to conduct veliger sampling, colonization sampling, and visual inspections of in-water infrastructure as means to locate zebra mussels, if any, at the Keeyask site.

To date, no zebra mussels or veligers have been found at Keeyask. Monitoring will continue in 2019 following the same approach.

4.0 LITERATURE CITED

Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project Environmental Impact Statement: Response to EIS Guidelines, Winnipeg, Manitoba. June 2012. 1,200 pp.

Keeyask Hydropower Limited Partnership (KHLP), 2015. Keeyask Generation Project: Zebra Mussel Monitoring Plan. Winnipeg, Manitoba. June 2015.