Keeyask Generation Project

Environmental Protection Plan

Environmental Protection Plan Report

EnvPP-2017-01

KEEYASK

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KEEYASK GENERATION PROJECT

ENVIRONMENTAL PROTECTION PLAN

REPORT #ENVPP-2017-01

ENVIRONMENTAL PROTECTION PLAN ANNUAL REPORT

April 2016 – March 2017

Prepared By

Manitoba Hydro

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SUMMARY

The *Generating Station Construction Environmental Protection Plan* and the *South Access Road Environmental Protection Plan* (EnvPPs) were developed for the Keeyask Generation Project (the Project) to minimize the environmental impacts of construction on the environment. They contain specific measures for people at site to follow while they are doing their work. All people working at Keeyask are expected to follow the EnvPPs. The site environmental team is responsible for enforcing the environmental protection plans and reporting on what took place. This report describes the efforts that were undertaken in 2016 and the highlights are presented below.

Water Quality

At Keeyask, water that is pumped from the site to the river must contain less than 25 mg/L of total suspended solids (TSS), which is a measurement of the amount of silt and slay (sediment) that is carried in water. When the TSS is too high, it is pumped into thick vegetation on land where it seeps into the ground and the sediment filters out. In 2016, there was so much water that seeped through one of the cofferdams that there was not enough land to pump it to and it had to be pumped directly to the river for approximately eight hours to prevent flooding in the work area. Provincial and Federal regulators were informed when this occurred. Besides sediment, water with high concentrations of ammonia and nitrate (nutrients) had to be pumped into thick vegetation, which took up enough of the nutrients so that water quality in the river was not impaired.

Fish

Areas that become isolated from the river by cofferdams have the water pumped out so that Project structures can be built in the dry. Before all of the water is pumped out, fish that are found must be captured and released back into the river. In 2016, 167 isolated fish, mostly Longnose Suckers, were captured and released to the river.

Wildlife

Wildlife interactions are monitored daily by the site environmental staff and other construction personnel. Observations of wildlife at site in 2016 included caribou, moose, bear, wolverine, lynx, wolf, red fox, arctic fox, marten, otter, beaver, muskrat, snowshoe hare, and wood frog. Two fox dens were located within the construction area. One den was found in a borrow pit and the other within the future reservoir area. In accordance with the EnvPP, a 50 meter buffer was established around both dens. One of the protected foxes had a litter of kits.

Despite taking measures such as using wildlife proof garbage bins to reduce wildlife from being attracted to the work site, bears are sometimes present at the site and pose a safety concern. In 2016, there were six bears that were trapped at the site and re-located by the Manitoba

Sustainable Development Conservation Officer.

Three wildlife mortalities were caused by site vehicles. All wildlife mortalities were reported to the local Conservation Officer.

Birds

The Project is being constructed on traditional nesting habitat for gulls and terns. In order to minimize the number of gulls and terns that nest in active construction areas, a bird control program is undertaken each year. The program was successful in keeping birds from nesting in the construction area and only one nest, containing no eggs, had to be removed in 2016.

Project clearing is scheduled in the winter, outside of the breeding bird nesting period (April 24-August 25) to minimize effects to breeding birds. If clearing is required during the nesting period, pre-clearing nest surveys are conducted before the clearing can commence. In 2016, two pre-clearing surveys took place. There was no nesting activity observed during one survey and the clearing in that area proceeded. Nesting was noted at multiple locations during the second survey, so clearing did not proceed until after the nesting period was over.

In February 2017, five eagle nest platforms were installed along the future reservoir shoreline to replace the nests that will be lost because of the Project.

Invasive Species

Invasive species are of concern because once they are introduced into an area, they can quickly spread and may crowd out native species. During 2016, 10 invasive plant species were found at the project site. To reduce their spread, herbicides were sprayed in a few areas in late August 2016.

Zebra mussels, which are small, clam-like animals, are known as an “aquatic invasive species” because they reproduce quickly and have no natural predators. Precautions are being taken to ensure that the Project does not contribute to the spread of this invasive species. Although zebra mussels have not been found at Keeyask, a decontamination unit was constructed at the site in September of 2016 to prevent the spread of zebra mussels on boats and equipment that have been used elsewhere. Four instances of decontamination were carried out on site.

Hazardous Material Releases

Between April 1 2016 and March 31 2017, there were 15 hazardous material releases at the site that were reportable according to legislation. Manitoba Hydro notified regulatory authorities about each release and the spills were cleaned up in accordance with regulations.

Heritage Resources

A chert flake (a stone tool that can be used as a scraper or a knife) was discovered by site Environmental Inspectors on Caribou Island. The find was reported to the Project Archaeologist and the site was registered as an Archaeological site with the province.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF PHOTOS

LIST OF APPENDICES

1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695 megawatt hydroelectric generating station and associated facilities at Gull Rapids on the lower Nelson River in northern Manitoba, immediately upstream of Stephens Lake. The Project is located within the Spilt Lake Resource Management Area and located approximately 30 km west of Gillam (Map 1).

Construction of the Keeyask Generation Project began in July 2014, once the *Environment Act* Licence (the Licence), *Fisheries Act* Authorization and other required permits were in place. The Licence states that an Environmental Protection Plan (EnvPP) was required prior to construction commencing and it was to define the communication process and specific requirements for how work related to the Keeyask Project will be conducted in order to mitigate the effects of the Project's construction on the environment.

Two Environmental Protection Plans (EnvPPs) were developed to mitigate and manage the potential environmental effects during the construction phase of the Project: The *Keeyask Generation Project, Generating Station Construction Environmental Protection Plan* (July 2014) and the *Keeyask Generation Project, South Access Road Environmental Protection Plan* (July 2014). Both EnvPPs provide detailed, easy to follow, site-specific environmental protection measures that are implemented by the contractors and construction staff to minimize environmental impacts during construction of the Project. The plans were approved by Manitoba Sustainable Development (then Manitoba Conservation and Water Stewardship), and are currently being implemented. The Project has a full-time Site Environmental Lead (SEL), one Environmental Officer and eleven Environmental Inspectors who conduct daily compliance monitoring to ensure the mitigation measures outlined in the EnvPPs and all environmental legislation and approvals are implemented and followed during construction of the Project.

Some of the specific areas that are covered in the EnvPP include (but are not limited to):

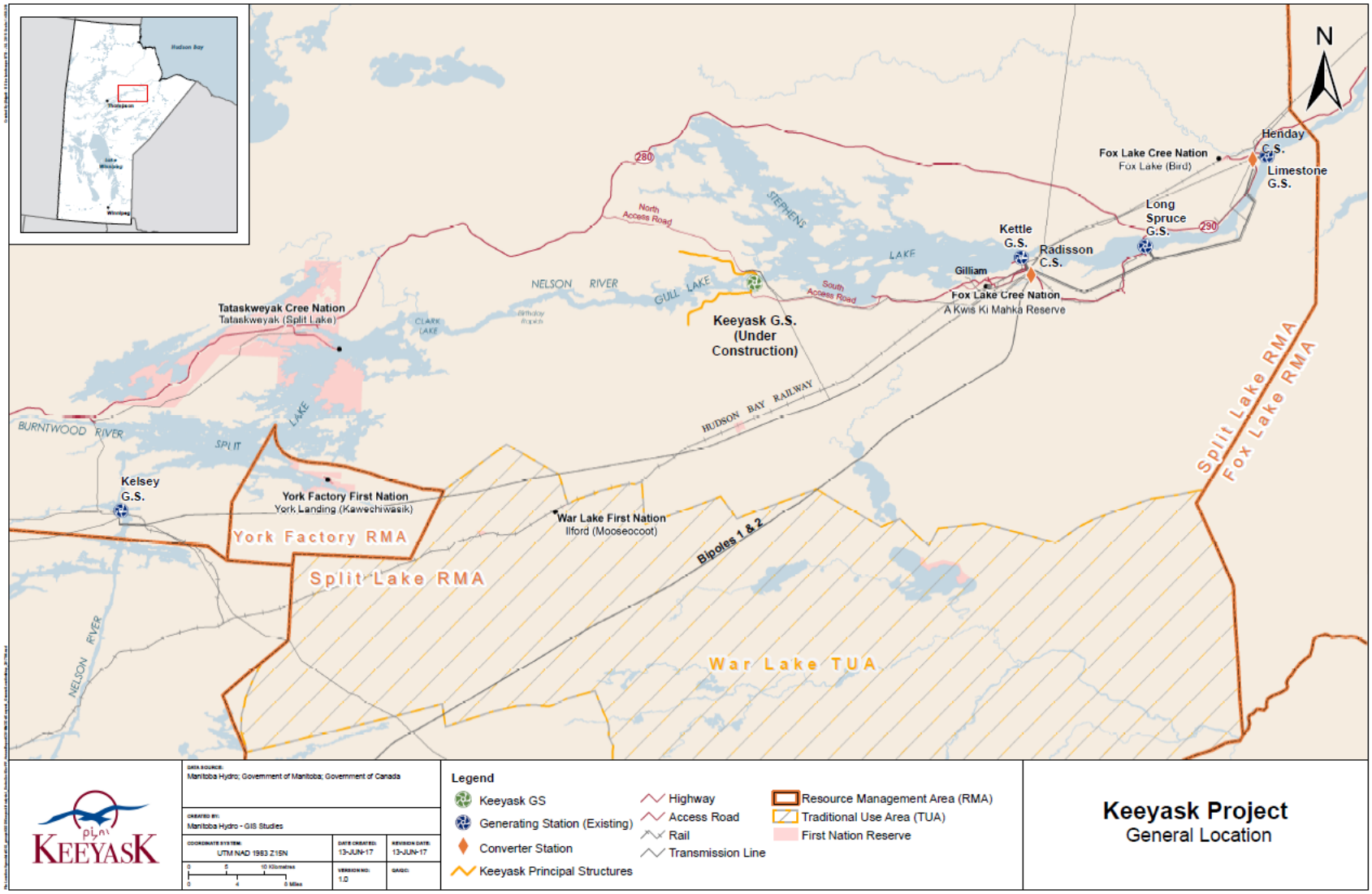
- Hazardous material storage and disposal requirements;
- Checking water quality prior to release from the construction site;
- Preventing the spread of terrestrial and aquatic invasive species;
- Erosion and sediment control requirements;
- Specific requirements to follow when clearing, such as the requirement to conduct breeding bird surveys and/or maintaining buffers around wildlife dens, etc;
- Heritage resources and the process to follow when one is found; and
- General fish and wildlife protection measures within the construction area.

All personnel working or visiting the Project site are responsible for following the measures set out in the EnvPPs. As outlined in the EnvPPs, an annual report will be provided to Manitoba Sustainable Development on the compliance monitoring undertaken during construction of the Project. The report provides an update on construction and a report on the various activities

undertaken in accordance with the EnvPPs, for the reporting year. The following reports have previously been submitted:

- *Manitoba Hydro, 2015 Keeyask Generation Project 2015. Environmental Protection Plan Monitoring Report – Annual Monitoring Report July 2014 – March 2015. Winnipeg, Manitoba June 2015.*
- *Manitoba Hydro, 2016. Environmental Protection Plan Annual Report April 2015 – March 2016. Keeyask Generation Project Environmental Protection plan Report # EnvPP-2016-01. June 2016.*

This report summarizes EnvPP monitoring from April 1, 2016 to March 31, 2017.



Map 1: General project location

2.0 CONSTRUCTION UPDATE

The summer of 2016 was to be the first of two peak construction years on the Keeyask Generation Project. In the past year activities shifted from the construction of temporary river management structures and excavation to concrete placement and construction of the permanent earth structures. While the summer started off strong, the season ended without reaching the targets for the amount of concrete poured at the powerhouse and spillway, or meeting targets for the earthworks in the north dyke, central and north dams. To set the Project up for success in 2017 and beyond, Manitoba Hydro, together with the General Civil Contractor, developed a recovery plan to minimize the delay in schedule and the cost increase. Development of this plan was based on an intensive review to understand the root causes of underperformance and defining actions that can lead to positive change. Revised cost and schedule goals were established that considered progress and actual costs to date.

The previous control budget of $6.5 billion was increased to $8.7 billion and the in-service date of November 2019 was revised to August 2021. 2018 will now be an additional peak construction year. These changes were approved by the Keeyask Hydropower Limited Partnership (KHLP) Board in March 2017. The Project team is working to complete the Project with minimal delay and the least possible incremental cost while continuing to meet the Project commitments.

Progress on the Project is made possible by the site services provided by the partner First Nations' business ventures, which provide security, employee retention and support, emergency medical services, catering, janitorial services, and camp maintenance. These services are essential to the success of the Project.

2.1 CONCRETE WORK

This past year, approximately 80,000 m^3 of concrete was placed in the Powerhouse (Photo 1 & Photo 2), Intake (Photo 1 & Photo 2), Tailrace, Service Bay and Spillway (Photo 3) areas. Although this is less that was planned for 2016, this volume represents about one quarter of the total volume of concrete required to build the Project and is enough concrete to build a sidewalk from Thompson, Manitoba to the Canada/United States border. In order to reach the volumes required, two fully licensed and functioning batch plants are operated on site. The aggregates (rock and sand) needed for concrete production is sourced locally from borrow pits and quarries. The water used in the process is also withdrawn from the Nelson River. The final component, cement, is shipped in to the site.

Green cutting water used in the placement of concrete is treated with carbon dioxide to neutralize the pH to a range between six and nine before it is reused in concrete production or discharged in the vegetation.

Blasting is ongoing in the Spillway and Powerhouse areas for excavation of the foundation. Blasting in the quarries is required to source rock for construction. Based on the distance between the blasting locations and water, overpressures (the pressure caused by a shock wave over and above normal atmospheric pressure) were predicted to be less than the guideline value stated in the *Guidelines for the Use of Explosives in or near Canadian Fisheries Waters*.

Photo 1: Ongoing construction of the Powerhouse and Intake structures - May 2016

Photo 2: Ongoing construction of the Powerhouse and Intake structures - December 2016

Photo 3: Upstream view of ongoing construction of the Spillway structures - December 2016

2.2 PERMANENT EARTH STRUCTURES

Significant progress was also made on the permanent earth structures including the North Dam, Central Dam and North Dyke (Photo 4). Once completed, these structures will retain water in the future reservoir. The materials used to build the structures are being hauled from the borrow pits and rock quarries on site. Construction of these structures will continue throughout the next year.

Three unanticipated alterations to existing structures were required during the reporting period. In the spring of 2016, an extension of the Central Dam Cofferdam and re-alignment of the Tailrace summer level cofferdam was required due to leakage from a geological feature (i.e., fissures in the bedrock). In the fall of 2016, a re-installation of the North Channel Rock Groin was required to prevent ice jamming in Gull Rapids. In anticipation of forecasted high water levels, a Stage II North Channel Rock Groin top-up began in the spring of 2017 (Photo 5).

Photo 4: Aerial view of a section of the North Dyke construction

Photo 5: Stage II North Channel Rock Groin top-up in preparation for high spring 2017 water levels

2.3 SOUTH ACCESS ROAD

Construction of the South Access Road was completed in November 2016 by Amisk Construction, a joint venture partnership consisting of the Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation) and Sigfusson Northern Ltd. When the principal structures of the Generating Station are complete, the South Access Road will provide a direct link between Gillam and the Generating Station (Photo 6).

Photo 6: Gravel placement advancing on the South Access Road

2.4 RESERVOIR CLEARING

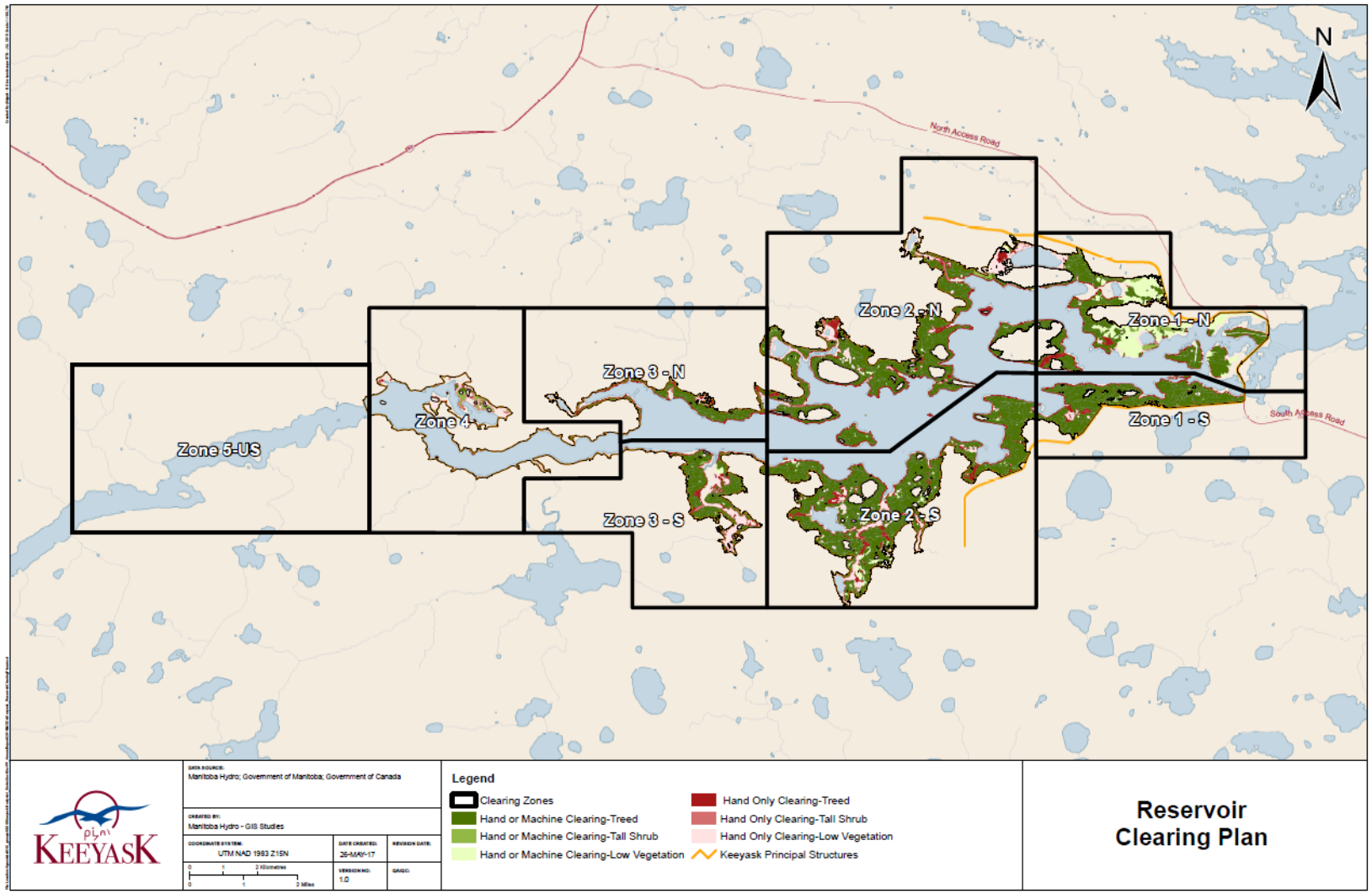
Reservoir clearing involves the removal of specified woody vegetation (i.e., trees and shrubs taller than 5 ft in height) from the areas that will be flooded between the existing Nelson River shoreline and the future reservoir shoreline following impoundment. The purpose of the clearing is to:

- Minimize the impacts on the fishery by removing standing trees and shrubs;
- Improve access to the future shoreline by creating shore access locations;
- Minimize safety hazards from large floating debris to boating and fishing by removing large vegetation; and
- Improve the aesthetics of the future landscape.

Amisk Construction resumed clearing activities on the south side of the river in the fall of 2016. By the end of March 2017, approximately 94% of the reservoir clearing was completed. Clearing

is conducted in the winter months while the ground is frozen, to minimize the impacts on the soil, ground vegetation, and surrounding wildlife. Most of this work was undertaken by heavy machinery, while hand clearing was utilized in environmentally sensitive sites. Clearing of the reservoir area is required prior to impoundment of the Reservoir (Map 2). Caribou calving islands in the reservoir area that are greater than 0.5 hectares and will remain above the water after flooding were marked with flagging tape and will be left undisturbed from clearing activities. All clearing was conducted as outlined in the *Keeyask Generation Project Reservoir Clearing Plan* and slash piles were burned (Photo 7), with the exception of a portion that was made available to partner First Nations members for firewood.

Photo 7: Slash piled in the reservoir clearing area before burning



Map 2: Reservoir clearing zones and clearing methods

2.5 MAIN CAMP

Work is underway to expand the Keeyask Main Camp by 120 rooms in response to the projected workforce required to achieve the updated Project schedule. Britco, the Main Camp contractor, returned to site in early 2017 to begin installation of the additional dorm units which will be required for at least the next two years.

3.0 MONITORING AND FOLLOW UP RELATED TO CONSTRUCTION

3.1 AQUATIC ENVIRONMENT

3.1.1 WATER QUALITY MONITORING

Management of seepage water within the cofferdams (Powerhouse, Spillway and Central Dam) took place continuously throughout the year. Sump pumps are used to transfer seepage water to the Nelson River. Impounded water cannot be released directly into the Nelson River if the Total Suspended Solids (TSS – such as clay and sand) concentration is greater than 25 mg/L. TSS is managed because if sediment concentrations get too high, there is potential to disturb the aquatic ecosystem.

At site, TSS in the water is determined using turbidity measurements and calculating the TSS from those measurements using a mathematical relationship. The relationship was developed prior to the Project and is provided in the *Sediment Management Plan for In-stream Construction.* Turbidity is measured optically, by passing light through a sample and then measuring how much it scatters off of the suspended material in the sample. For example, higher turbidity means there is more light scattered in a sample of water because there is more suspended material present. It can be measured in the field using a turbidity meter (Photo 8). Turbidity is relied on to determine the TSS, as measurements and results are available immediately, whereas TSS is measured in a laboratory using a method involving filtering and drying a sample, so obtaining immediate results is not possible. By calculating the TSS results quickly, action can be taken to prevent exceedences of the 25 mg/L limit.

During the reporting year, seepage water was sampled at regular intervals (Photo 9) and checked using a turbidity meter to confirm TSS requirements were met. When the calculated TSS exceeded 25 mg/L, water was pumped onto vegetated land areas to filter out the sediment prior to it entering the river.

Photo 8: A Site Environmental Inspector measuring the turbidity in water samples taken at Keeyask

Photo 9: A Site Environmental Inspector taking a water sample in the field

Impounded water is also routinely tested for ammonia, nitrite and nitrate. These nutrients are bi-products from the compounds used in the blasting agents. Since blasting takes place inside the cofferdams, impounded water can potentially come into contact with blasting residue. The concentrations of ammonia, nitrite and nitrate are essentially that of fertilizer, which can be beneficial for vegetation, but has the potential to cause an increase in algae blooms if released into the water. Also, certain forms of ammonia can be toxic to aquatic life if the concentration is too high. When nutrient levels exceed the Manitoba Water Quality Standards, Objectives, and Guidelines for Freshwater Aquatic Life, the water is not released to the Nelson River.

Over the past year, water containing these nutrients was stored at the Project site in an isolated quarry pit within Q-7 (Map 3). The water was released into a vegetated land area over the summer months, utilizing a series of water pipelines and a sprinkler system, to reduce the excess nutrients. Water quality parameters were tested along the discharge route to ensure the Manitoba Water Quality Standards, Objectives, and Guidelines for Freshwater Aquatic Life were met prior to it entering the Nelson River.

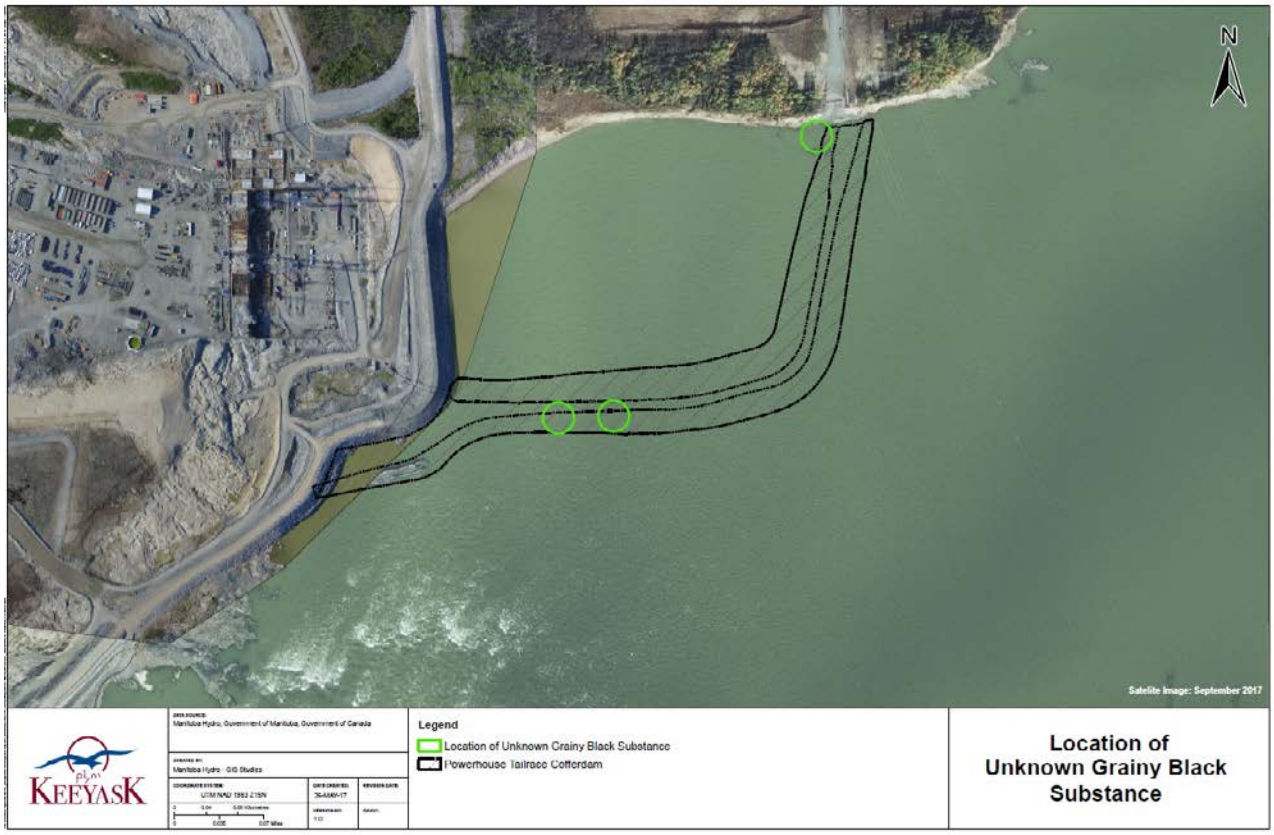
Map 3: Location of the Q-7 quarry. Water containing nutrients is pumped to the pits outlined in red

3.1.2 WATER QUALITY INCIDENTS

On August 12 and 13, 2016, during the installation of additional sump pumps at the Central Dam Cofferdam, impounded water within the cofferdam was released to the Nelson River that had a TSS concentration greater than 25 mg/L. The release of the water was needed because a leak within the Central Dam Cofferdam was flooding an active construction area. Due to the high rate of leakage, there was not sufficient time for any sediment to settle out, leading to the high sediment content of the water discharged. In order to repair the leak, the impounded water needed to be pumped out to the river. The high TSS discharge event occurred over a period of approximately eight hours, with the highest TSS levels occurring over two hours. During this period, the measured discharge turbidity ranged from 1,334 NTU to a peak of 2,859 NTU. Based on a relationship between turbidity and TSS developed for the *Sediment Management Plan for In-Stream Construction*, the corresponding calculated TSS values ranged from 1,051 mg/L to 2,256 mg/L. Information on this event was provided to Fisheries and Oceans Canada, Environment Canada and Manitoba Sustainable Development. Based on an assessment by North/South Consultants, there were no measurable adverse effects on fish and fish habitat caused by this event.

On November 5, 2016, a black, grainy substance was observed on the surface of the water inside the inner groin of the Stage II Summer Level Tailrace Cofferdam while conducting visual inspections of the in-stream work (Photo 10 and Map 4). That same day samples of the water and the substance were collected for analysis by an accredited laboratory and a marine boom was installed between the inner and outer groins to prevent the substance from entering the Nelson River. In-stream work was temporarily suspended between November 7 and 11, 2016, until the sample results provided evidence that the substance was non-hazardous. The analysis results indicated that the substance was mainly comprised of silicon, aluminum, and iron – the main elements that comprise feldspars and pyrite, which are common rocks in the geology around Keeyask. This suggests that the substance was likely rock dust and did not pose a substantial environmental risk in the small volume that had been observed.

Photo 10: The grainy, black substance observed floating on the water inside the inner groin of the Stage II Summer Level Tailrace Cofferdam on November 5, 2016



Map 4: Locations where the grainy, black substance was observed floating on the water inside the inner and outer groins of the Stage II Summer Level Tailrace Cofferdam November 5-7, 2016

In December 2016, an investigation began near Work Area A when water was observed to be seeping through a vegetated area. The water had a sewage-like odour, leading to an investigation into whether the nearby lift station had sprung a leak. After the area was excavated and the pipes were inspected, it was concluded that there was no leakage and the odour was attributed to the saturated peat present at the site. Although the regulators were notified, there were no follow-up actions required (Photo 11).

Photo 11: Excavation of lift station for pipe inspection near Work Area A

3.1.3 FISH SALVAGE

Areas that become isolated from the river by cofferdams are dewatered and fish salvages are conducted in accordance to the Project's *Fisheries Act Authorization* 11-HCAA-CA1-01695. The fish captured are released to surrounding water bodies. Fish salvages within the cofferdams occurred in 2014 and 2015.

In 2016, there were some isolated pools that remained in the previously wetted river channels. During dewatering activities, fish were found in some of these isolated pools. Dip nets were used to collect fish, which were then placed in tubs and released to Stephens Lake (Photo 12).

There were 167 fish captured and seven different species caught in 2016. Survival following release was >95%; observed mortalities occurred in a few of the small-bodied species captures. A list of all species captured during the 2016 salvage can be found below and in Appendix 1, Table A1. Capture numbers and the proportion of catch are provided in Appendix 1, Table A2. Photo 13 and Photo 14 illustrate examples of the large-bodied catch and relatively good health exhibited, despite the confinement and turbidity occurring in the isolated pools.

The predominant species in the catch was Longnose Sucker, comprising 62% of all fish caught, followed in abundance by Emerald Shiner (24%) and Lake Chub (8%); the remaining 6% of the catch included Burbot, Walleye, Shorthead Redhorse, and Longnose Dace. General observations of fish size during handling, as well as length measurements obtained from a subset of the large-bodied catch during the salvages, indicate that the catch comprised a mix of adult and juvenile fish. There was no Lake Sturgeon captured. The location of the 2016 fish salvages is shown in Figure 1.

Figure 1: 2016 fish salvage locations associated within the Central Dam Cofferdam

Photo 12: Final fish removal from pooled water prior to complete drainage

Photo 13: Longnose Sucker captured in Central Dam Cofferdam

Photo 14: Walleye prior to release to receiving waters

A fish salvage could not be conducted prior to winter within the impoundment area of the Tailrace Summer Level Cofferdam, once the work stopped on November 30, 2016. Because of this, the inner and outer rock groins were left open to allow fish to move freely in and out of the area during the winter (visible in Photo 15).

Photo 15: Aerial view of the Tailrace Summer Level Cofferdam in the winter, showing the location of the inner and outer rock groins (red lines) and gap left for fish movement

3.2 TERRESTRIAL ENVIRONMENT

3.2.1 EROSION AND SEDIMENT CONTROL

Manitoba Hydro site environmental personnel conducted regular inspections and monitored the erosion and sediment control measures installed onsite to ensure they were functioning correctly and being maintained. Various types of erosion control measures, such as silt fences, vegetated buffers and rip rap, were installed in active construction areas to help reduce erosion and protect nearby water bodies.

Permanent erosion control (rock armouring) has been installed on the north bank of the Nelson River in preparation for impounding the Reservoir (Photo 16).

Photo 16: Permanent erosion control measures installed on the north bank of the Nelson River

Organic matter was placed along certain sections of the slopes of the South Access Road Right-of-Way (ROW) and the entire length of the slopes were seeded with an approved grass seed mixture to help stabilize the slopes and prevent erosion (Photo 17).

Photo 17: Organic matter spread along the slope embankments of the South Access Road right-of-way

3.2.2 DUST CONTROL

Dust control measures were used by the contractor to minimize the amount of dust generated by construction traffic on the access roads. As noted in the EnvPP, only water and dust suppression products approved by the Site Environmental Lead are to be used to control dust on the access roads. During this reporting period, water or calcium chloride was used to control dust. The water is sourced locally from the river and fish screens are placed over the pump intake.

3.2.3 WILDLIFE

Wildlife interactions within the Project footprint are monitored on a daily basis by the site environmental staff and other construction personnel. Observations of wildlife (some examples are provided in Photo 18 to Photo 21) within the reporting period included, but were not limited to:

- **Amphibians**: wood frog;
- **Birds:** Canada goose, common eider, common nighthawk, eagle, gull, mallard, pelican, ptarmigan, raven, red tailed hawk, robin, sandhill crane, sandpiper, sharptail grouse, snowy owl, swan, tern, and white throated sparrow; and
- **Mammals:** arctic fox, bear, beaver, caribou, ground hog, lynx, marten, moose, muskrat, otter, red fox, snowshoe hare, wolf, and wolverine.

To reduce wildlife attraction to the work areas, food waste is disposed in wildlife-proof containers. As well, kitchen waste areas are surrounded by fences to limit access to wildlife. Project staff are also reminded of the importance of not feeding the wildlife. An example of a poster used to educate staff is shown in Photo 22.

Two fox dens were found by Site Environmental Inspectors within the Project footprint. In the winter of 2015, a fox den was discovered in the G-1 borrow pit. A 50-meter buffer was installed around the den that prevented any activities from disturbing the den. A trail camera was installed by the den and revealed that in May 2016 the fox was successful in birthing healthy kits (Photo 23). A second fox den was found in the reservoir clearing area. A buffer was set up around the den to prevent people and equipment from accessing the area.

Photo 18: Arctic fox

Photo 19: Wood frog

Photo 20: Moose

Photo 21: Arctic foxes

Photo 22: Example of signage on site prohibiting the feeding of wildlife

Photo 23: Trail camera photo of a fox and her kits in the G-1 borrow pit

3.2.4 WILDLIFE MORTALITIES

Over the course of the reporting period a total of 10 wildlife mortalities were reported. These are shown in Table 1. Notification of these mortalities was provided to the local Conservation Officer.

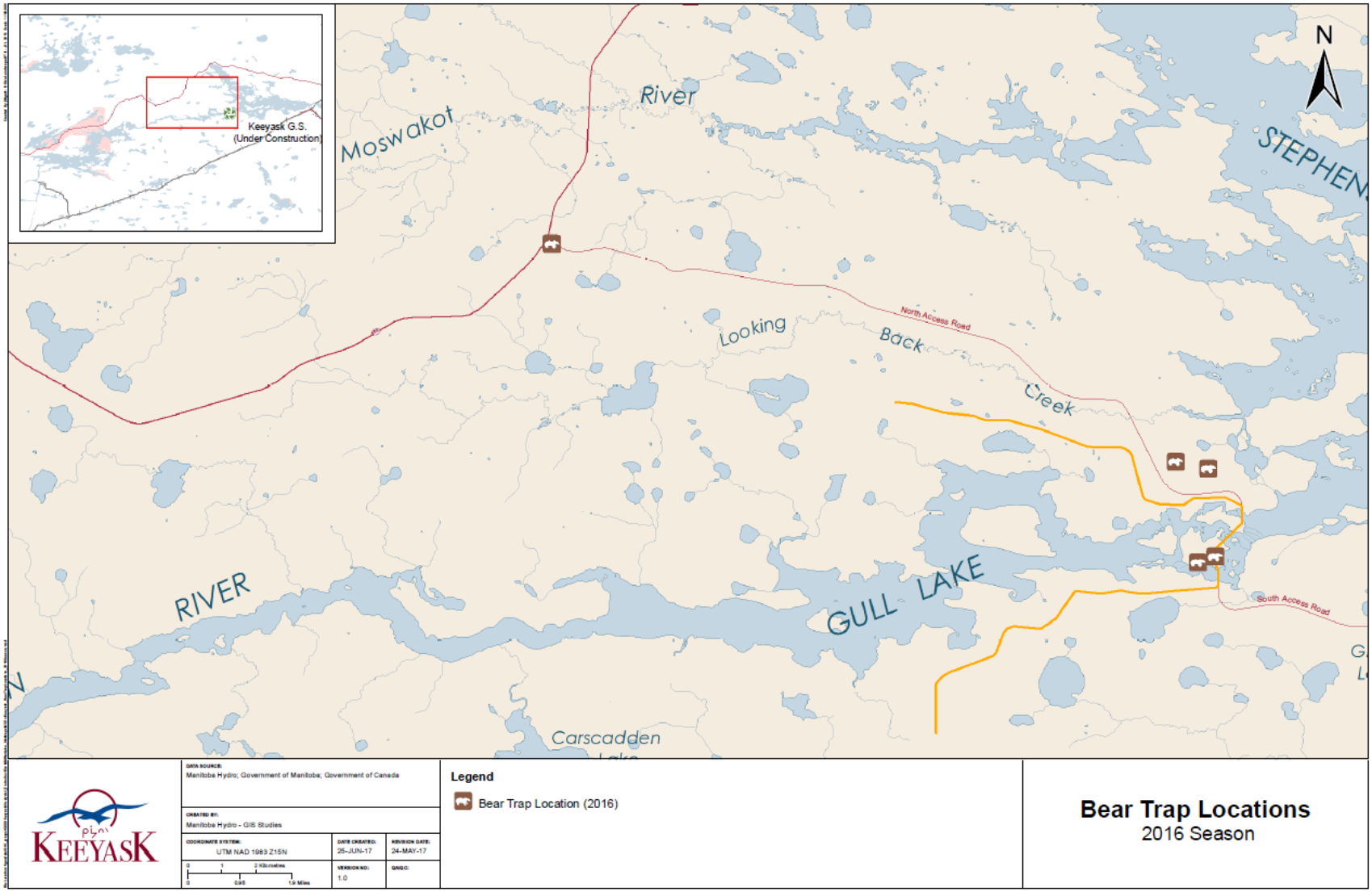
Table 1: Wildlife Mortalities for the Reporting Period (April 1, 2016 to March 31, 2017)

Date	Species	Cause
June 3, 2016	Spruce or Ruffed Grouse (only head and neck remained)	Unknown
August 18, 2016	Juvenile Ring-billed Gull	Attacked by a hawk
August 19, 2016	Common Nighthawk	Natural causes
August 22, 2016	Ring-billed Gull	Unknown
August 23, 2016	Common Raven	Unknown
August 29, 2016	Common Raven	Unknown
October 10, 2016	Red Fox	Vehicle collision
November 6, 2016	Muskrat	Unknown
December17, 2016	Willow Ptarmigan	Vehicle collision
March 16, 2017	Woodchuck	Vehicle collision

3.2.5 WILDLIFE RELOCATIONS

Measures are taken to reduce the attractants to the Project site, such as wildlife-proof waste bins, fencing around waste disposal sites, and policies against littering. However, in some cases bears are still around the Project site and pose a safety concern. In these cases, bear culvert traps are set at the Start-up Camp and the Main Camp in consultation with the local Conservation Officer. An example of a bear culvert trap can be seen in Photo 24.

In 2016, a total of six re-locations occurred in the late summer and early fall (August 16, August 25, September 11, September 15, September 19, and September 21). All bears were removed from site using a bear trap and relocated by the local Conservation Officer (Map 5).



Map 5: Locations at site where culvert traps were set for bears in 2016

Photo 24: Manitoba Sustainable Development relocating a bear caught at the Project site using a culvert trap

3.2.6 GULL AND TERN CONTROL

3.2.6.1 BACKGROUND

The Project is being constructed on traditional nesting habitat for gulls and terns. Thousands of ring-billed gulls and lesser numbers of herring gulls and common terns can nest in the Gull Rapids area each year. It was recognized that the presence of such a large number of birds in the Project area could lead to property damage and safety issues during the construction period. In order to protect property, onsite workers and the birds, a program to deter gulls and terns from nesting in permitted construction areas has been in place since 2014.

Falconry was chosen as the preferred primary gull and tern control method as the use of raptors is an effective, natural and biologically driven way to deter gulls and terns. As raptors are natural predators of gulls and terns, the gulls and terns instinctively try to avoid the raptors. The raptors

used at Keeyask are trained to chase the gulls and terns away from the construction areas and then return to their handlers (Photo 25).

As gulls and terns are protected in Canada under the *Migratory Birds Convention Act*, Manitoba Hydro applied for a Migratory Birds Damage or Danger permit from Environment Canada prior to starting the gull and tern control program. Permit 16-MB-DO28 was issued in 2016 by Environment Canada for the Keeyask Generation Project.

Photo 25: Raptor on patrol in the Gull and Tern Control Area

3.2.6.2 METHODOLOGY

The gull and tern control program began on April 29, 2016 and continued daily until July 16, 2016. Map 6 shows the active construction area (the permitted gull and tern control area) where the gull and tern control program occurred.

Raptor species used during the 2016 gull and tern control program included: gyrfalcons, peregrine falcons (Photo 26), and Harris's hawks (Photo 27). Up to six different raptors were on site at any time.

Photo 26: A peregrine falcon used in the Project's Gull and Tern Control Program

Photo 27: A Harris's hawk used in the Project's gull and tern control program

The raptors were flown in the gull and tern control area and the constant presence of these predators encouraged gulls and terns to move away from these areas and seek other suitable locations to nest.

While falconry was the main method of control used in the gull and tern control program, it had some limitations. For example, raptors could not be flown on snowy or windy days. In order to address these limitations, falconry was supported by the use of other deterrent methods such as stock whips, pyrotechnics, drones, and sport kites (Photo 28).

The gull and tern control area was checked daily for the presence of ring-billed gull, herring gull and common tern nests and eggs. In the case that gull or tern nests and/or eggs are found, they are removed, destroyed and left in the environment.

Photo 28: A kite used in the gull and tern control program

3.2.6.3 RESULTS

Falconry, in combination with other bird control methods, was successfully used to move gulls and terns out of the control area. Habituation to the control methods did not occur as the gulls and terns were under a real, rather than a perceived threat. While the threat provided by the presence of the raptors was real, no gulls or terns were killed by raptors during this control program.

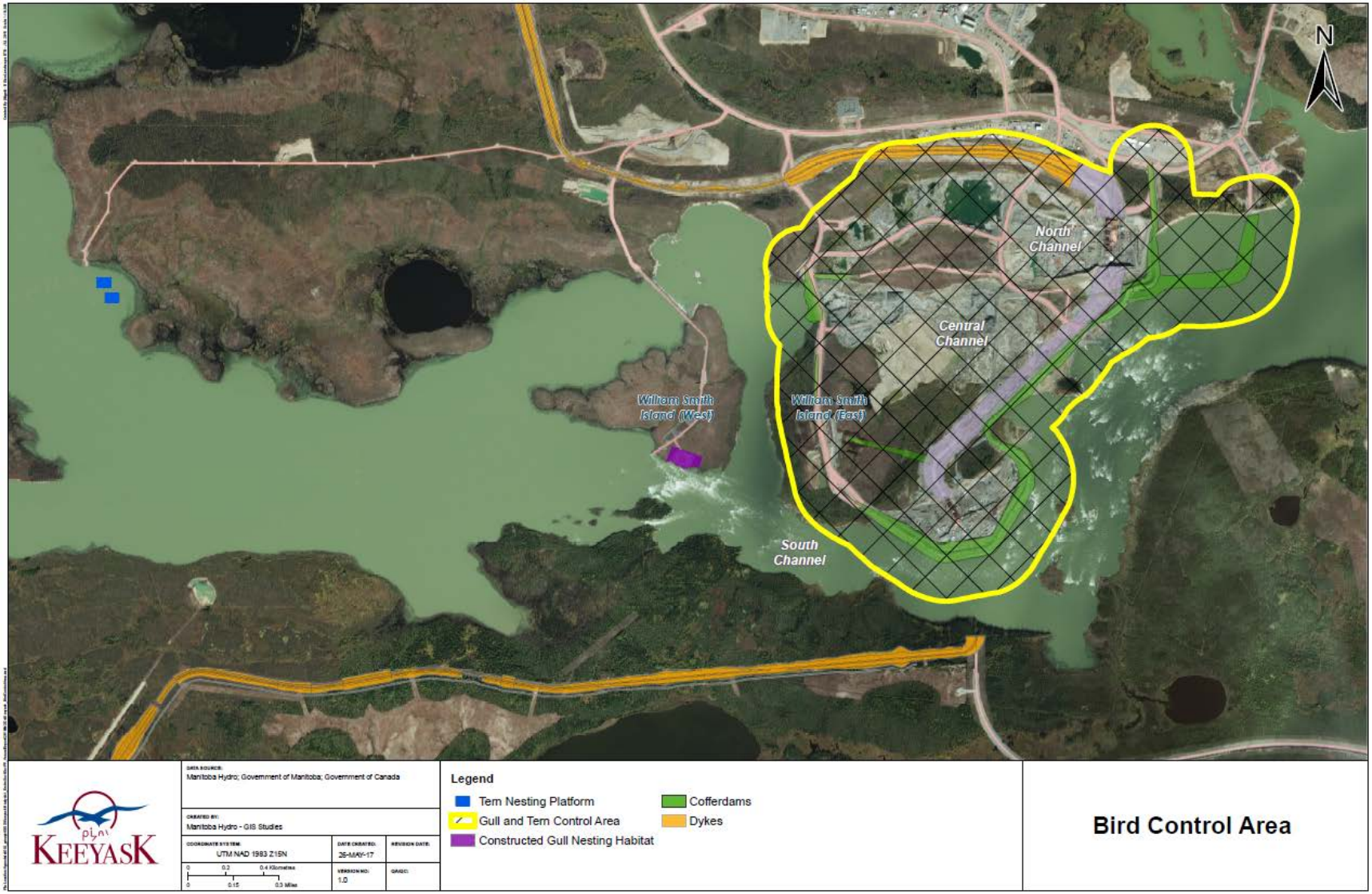
Daily bird counts (in the morning, afternoon and evening) took place to estimate the total number of ring-billed gulls, herring gulls and common terns present in the control area. Ring-billed gulls were the most numerous (daily estimates ranged from 0-380). Herring gulls were present in small numbers (daily estimates ranged from 0-20) and there were few common terns (daily estimates ranged from 0-25). The largest numbers of ring-billed gulls were seen in the bird control area in May, with the numbers declining through June and July. The largest numbers of herring gulls were recorded in the control area in late-May and early-June. Common terns were most numerous in the bird control area in June.

Under the Environment Canada Permit 16-MB-D028, one herring gull nest was removed in May 2016 (Photo 29). This was the only nest removed in 2016, and no eggs were removed as part of the 2016 gull and tern control program.

Alternate, constructed, nesting habitat was also available for gulls and terns in 2016. Constructed gull habitat was available starting in April and tern platforms were installed in June. While no nesting occurred at the constructed gull habitat area, a pair of terns successfully nested on a tern platform in 2016 (Photo 30).

Photo 29: Herring gull nest removed from the gull and tern control area in May 2016

Photo 30: Tern chick on floating nesting platform



Map 6: Gull and tern control area for 2016

3.2.7 PRE-CLEARING NEST SURVEYS

As stated in the *Keeyask Generation Project Avian Management Plan*, the majority of clearing is completed outside of the breeding bird nesting period (April 24 to August 25). In 2016, two pre-clearing nest surveys were conducted for clearing that was proposed to occur within the breeding bird nesting period.

The pre-clearing nest surveys were conducted as outlined in the Avian Management Plan, which is an appendix to the Project Environmental Protection Plans. The pre-clearing nest surveys were conducted within seven days prior to the proposed clearing activities taking place. Each pre-clearing nest survey was conducted using transects, with surveyors walking slowly along transects through the proposed area to be cleared, spaced approximately 10 metres apart. Any nests that were found were photographed, and UTM coordinates were collected with a Garmin hand-held GPS unit. The nest locations were then buffered with either flagging tape or stakes to ensure that the nest location was not disturbed.

The first pre-clearing nest survey was conducted on May 30, 2016 in an area of approximately 1.25 hectares near the Spillway Cofferdam. The searched area had been partially cleared previously, and included some wet shrub habitat (Photo 31).

No active nests, eggs or broods were observed during the pre-clearing nest survey and clearing proceeded after the survey was completed.

Photo 31: Pre-clearing nest survey search area near the Spillway Cofferdam

The second pre-clearing nest survey took place on June 7, 2016 in a contractor work yard. An area of approximately 35 metres x 35 metres was surveyed.

The surveyed area included a tree stand composed of tall, mature black spruce trees approximately 14 metres tall. The understory vegetation was generally sparse, but there were many wind-fallen trees and snags. The area adjacent to the stand of mature spruce included a small wetland with sedges and willows.

One active northern flicker nest was found (Photo 32) during the pre-clearing nest search and at least one white-throated sparrow was alarm calling (an indication that it had a nest nearby). Although a nest was not located during the pre-clearing survey, calls from a black-backed woodpecker indicated it also may have had a nest in the proposed area to be cleared.

Due to the widespread nesting activity recorded in the area surveyed, clearing did not proceed at this location within the breeding bird nesting period.

Photo 32: Active northern flicker nest observed during a pre-clearing nest search

3.2.8 BLACK BEAR DEN SURVEYS

A pre-clearing bear den survey was conducted in October 2016 within portions of the reservoir clearing area on the south side of the Nelson River that were scheduled for clearing in the winter of 2016/2017 (Map 7).

Black bear are a common mammal species found in the Keeyask region that require dens for the birthing and rearing of young, as well as for hibernating over winter. Black bears are sensitive to human disturbance near active den sites. If any active bear dens are found during pre-clearing surveys, a setback distance of 100 m is established around the den for protection.

The survey was focused in habitat types where black bear dens were most likely to occur. About 1,157 ha were searched. Up to 15 surveyors walked along parallel transects within the search area, 10 to 20 metres apart, and looked for black bear signs.

No active black bear dens were found during the 2016 surveys. A single black bear excavation was observed incidentally outside of the planned area to be cleared (Photo 33). As no black bear dens were observed within the planned area to be cleared, no setback buffers were required.

Other mammal dens observed during the survey included six red fox dens and two American marten dens.

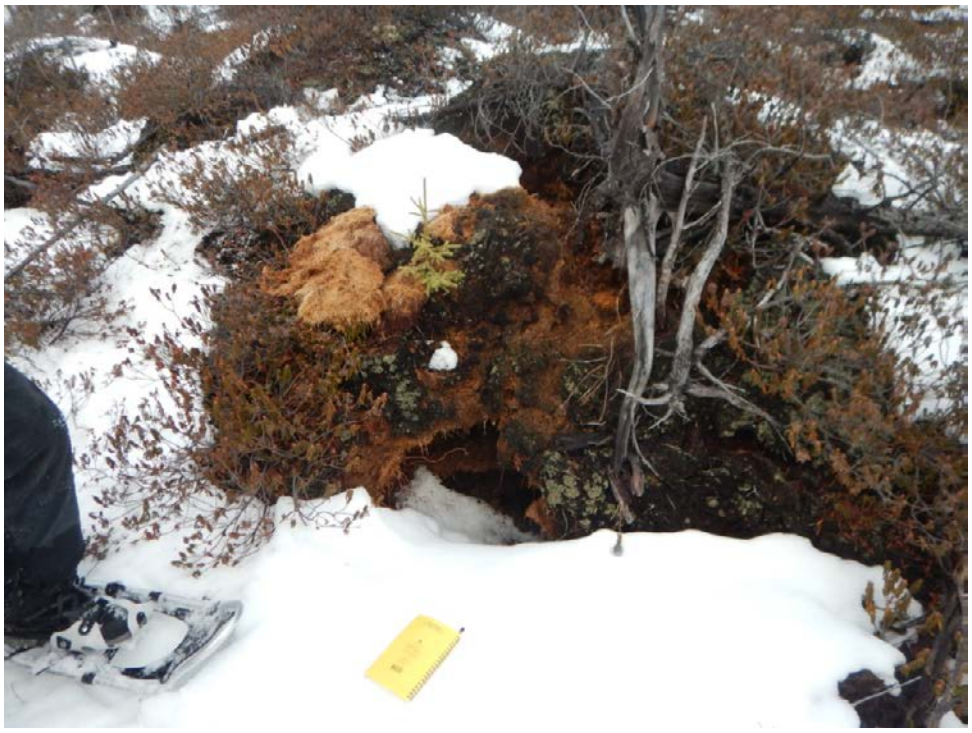
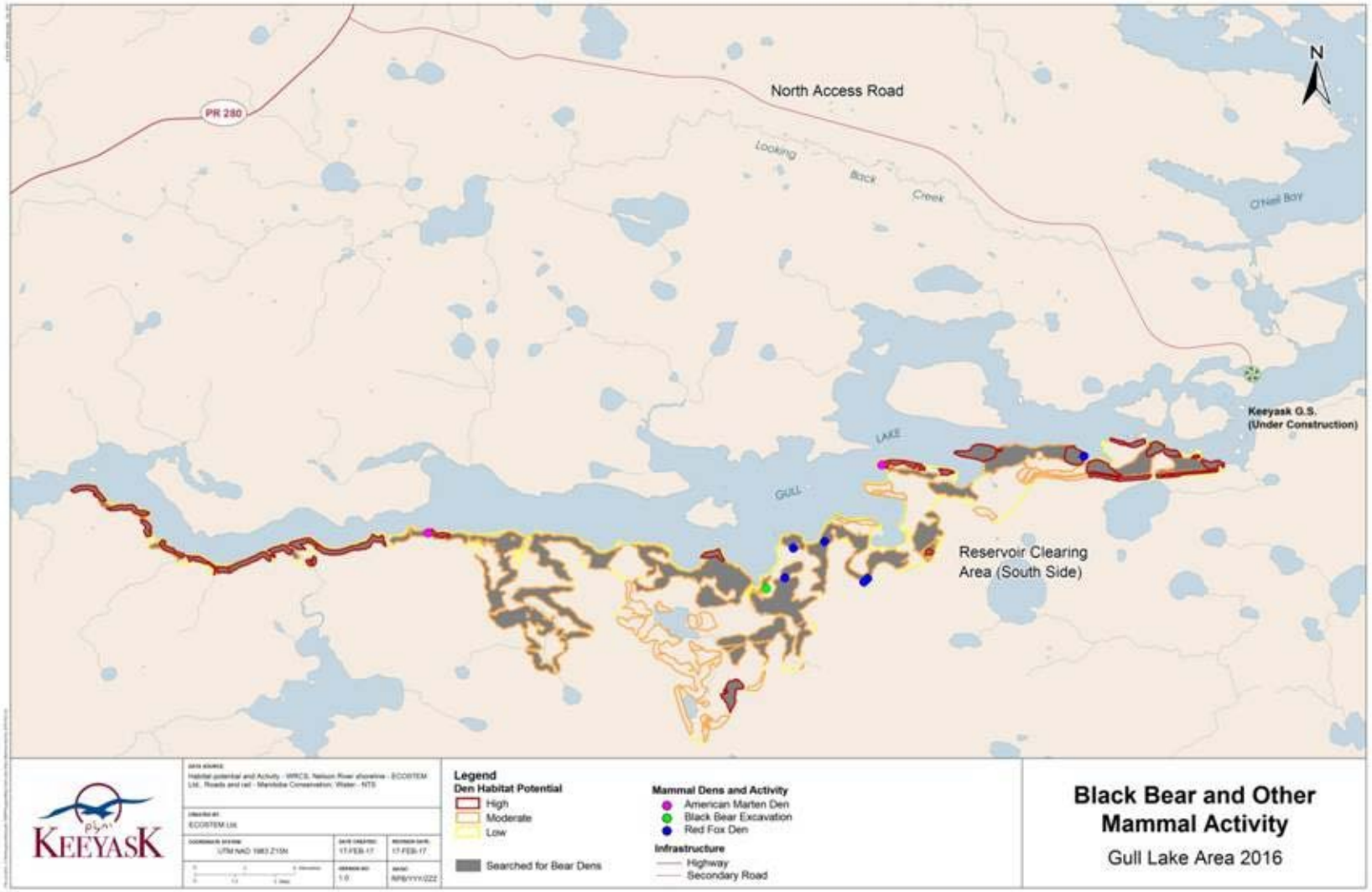


Photo 33: Black bear excavation



Map 7: Black bear and other mammal activity in the Gull Lake area for 2016

3.2.9 BALD EAGLE NESTS AND REMOVAL

Bald eagles are the most common and abundant raptor species to inhabit areas along the Nelson River in the Keeyask region. Protection measures for bald eagle nests found during the construction of the Project are outlined in the Project's Environmental Protection Plans and the Avian Management Plan.

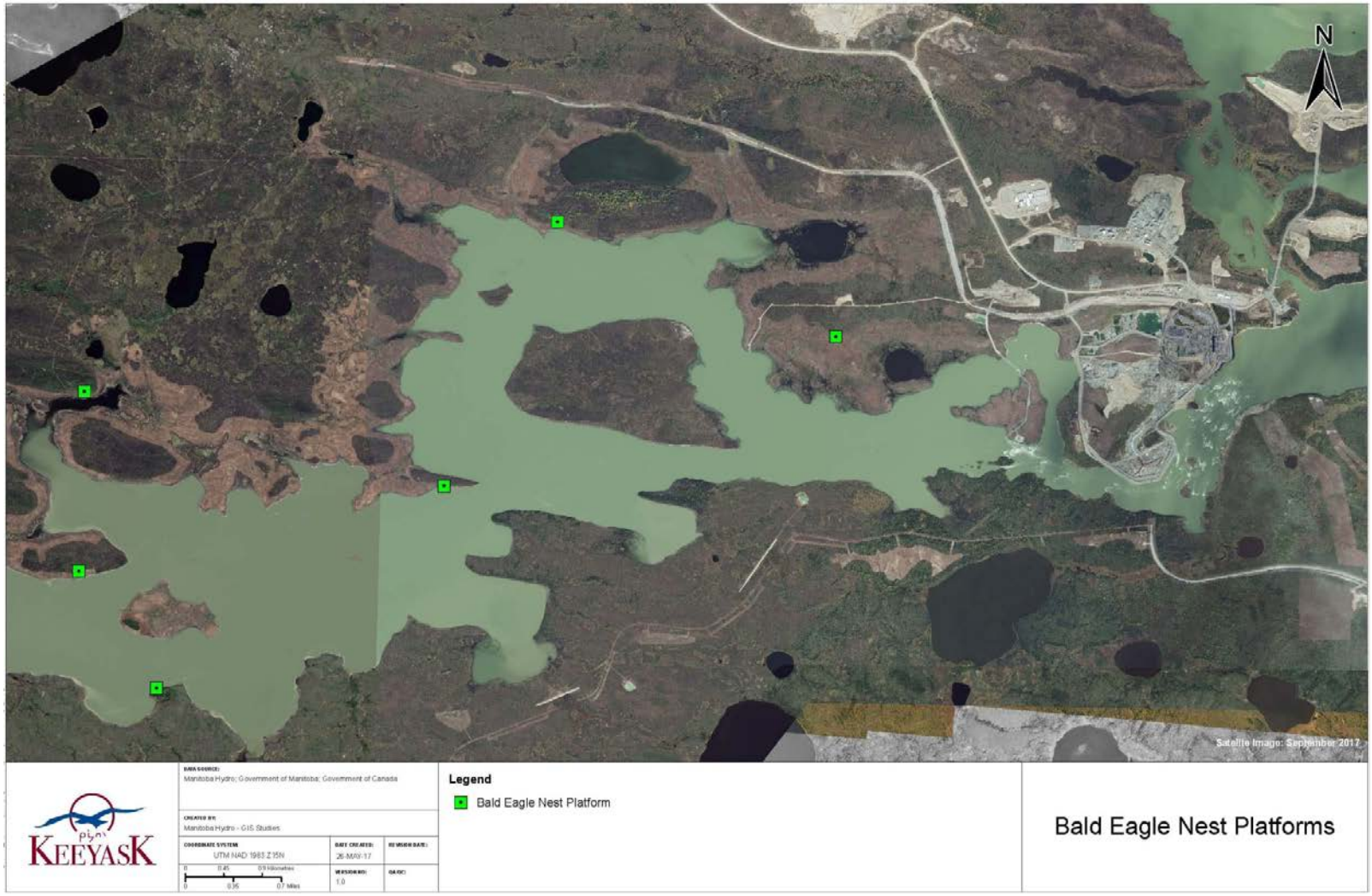
As previously reported in the 2015 and 2016 Keeyask Generation Project EnvPP annual reports, two recently active bald eagle nests were removed from the Project footprint between the beginning of the Project and March 31, 2016. Both nests were removed in the winter when they were not occupied by nesting bald eagles. In October 2016, a third recently active bald eagle nest was removed during Project clearing. The nest had previously been used by eagles, but was not occupied by nesting bald eagles at the time of removal.

During reservoir clearing in 2016, two single trees were left standing in the future reservoir area. Photo 34 shows one of these trees with an occupied bald eagle nest in 2016, which shows the value of not removing the nest prior to impoundment. In February 2017, while clearing on the south side of the future reservoir area, an unoccupied eagle nest was discovered. A decision was made to leave the tree with the nest standing, so it is available for use by bald eagles in future nesting seasons. The nest will be monitored in the summer of 2017 to determine if it is active. These trees will remain in place, but will eventually fall over after impoundment of the reservoir. The tree will then likely be removed by a Keeyask boat patrol crew.

Photo 34: Single tree left standing in the future reservoir area and used by bald eagles for nesting in 2016

On February 27th and 28th, 2017, five eagle nest platforms were installed at sites along the future reservoir shoreline to replace the five recently active bald eagle nests that have been, or will be, affected by Project development (see Map 8 for locations). All five of the platforms, such as the one shown in Photo 35, were installed on the north side of the Nelson River where the majority of bald eagle nests are naturally found in the Project area.

Photo 35: Installing a bald eagle nesting platform



Map 8: Bald Eagle Nest Platform Locations

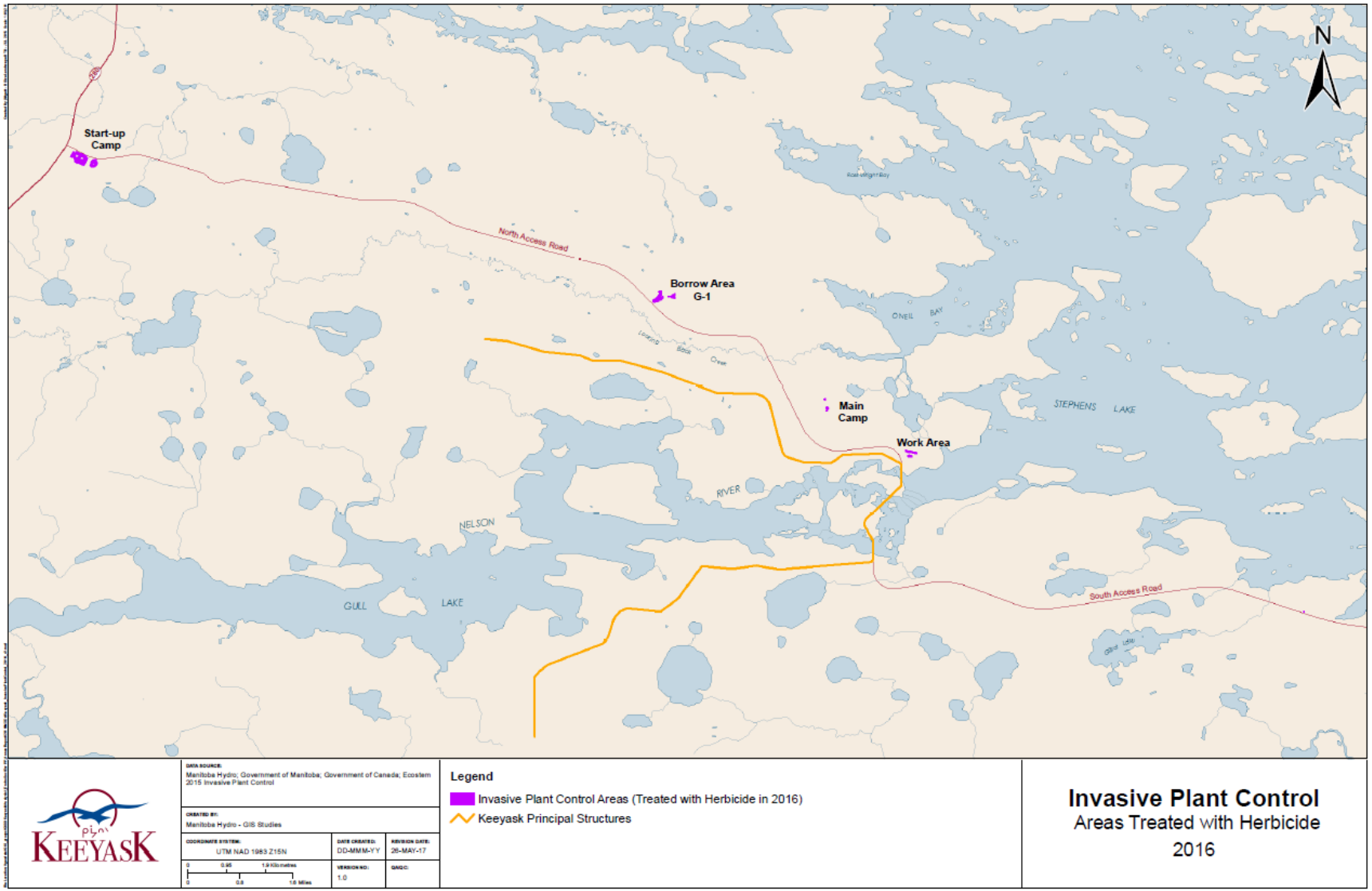
3.2.10 INVASIVE PLANT CONTROL

Invasive and non-native plants are of concern because once they are introduced into newly disturbed areas, which can happen from vehicles or footwear, they can quickly spread and may crowd out native plant species. It was predicted that invasive and/or non-native plants would be confined within human-disturbed areas, and not crowd out native species or change the local vegetation in the Project area. To confirm this, invasive plant surveys are conducted each year in and around the Project construction areas to determine if they are affecting native plants.

As described in the Project Environmental Protection Plans, means to mitigate impacts of invasive species on site include the requirement for vehicles coming to site to arrive clean, sourcing materials locally, and using native seed mixes for planting in disturbed areas. Despite these measures, several species of invasive or non-native plants were observed during monitoring surveys at the Project site, largely within the areas first developed under the Keeyask Infrastructure Project that are now part of the larger Project footprint. A total of 16 invasive species were previously observed during the fall 2015 surveys. An example of one is shown in Photo 36.

Based on recommendations from invasive plant monitoring, herbicide was applied on August 24 and 25, 2016 in portions of four key areas, including the Start-up Camp, Borrow Area G-1, Main Camp, and Work Area B, where the highest concentrations of invasive plants occurred (Map 9). Monitoring of these areas will be ongoing. Ultimately, revegetation of native plant species through the Project's Vegetation Rehabilitation Plan is intended to dramatically reduce the distribution and abundance of the invasive species observed to date on the Project site.

Photo 36: Perennial Sow thistle found near the Start-Up Camp parking lot



Map 9: Invasive plant control areas that were treated with herbicide in 2016

3.2.11 AQUATIC INVASIVE SPECIES

Zebra mussels are an aggressive, non-native clam-like species that are now found in Manitoba's water bodies. Federal and provincial legislation came about in 2015 to contain and prevent the spread of zebra mussels, which have been found in Manitoba's southern water bodies that connect to the Nelson River.

Zebra mussel monitoring at Gull Lake was conducted in 2016 by taking water samples and having them analyzed at a lab to see if young zebra mussels (not visible to the naked eye) were present. None were found. There are currently no documented zebra mussels in the Nelson River.

Although zebra mussels have not been found near Keeyask, a decontamination unit was constructed at the site in September of 2016 to prevent the spread of zebra mussels from boats and equipment that have been used elsewhere (Photo 37).

Whenever watercraft/water-related equipment is removed from the Nelson River (including Gull Lake and Stephens Lake), decontamination must occur, in addition to general cleaning provisions (i.e., clean, drain, dry) before the watercraft/water-related equipment enters another water body. This is to ensure aquatic invasive species (AIS) are killed and removed before watercraft and water-related equipment are placed into a different water body.

Four instances of decontamination were carried out in 2016, which involved spraying boats, trailers and any other water-based equipment with hot water (>60°C) over all parts that came into contact with the water. The water ran off onto a constructed pad, which was built in such a way to allow the water to rapidly infiltrate into the ground, preventing it from flowing off the site.

Photo 37: AIS decontamination of barge before it enters the Nelson River

4.0 HAZARDOUS MATERIAL RELEASES

Hazardous Materials Spill Response Plans are in place and set the standard for spill prevention planning, responding to hazardous materials spills, reporting requirements and clean-up of spills. All spills, regardless of quantity, are reported and cleaned up.

4.1 REPORTABLE RELEASES OF HAZARDOUS MATERIALS

During the reporting period there were a total of 15 hazardous material releases that were reportable quantities as per the *Environmental Accident Reporting Regulation* under the *Dangerous Goods Handling and Transportation Act*. Manitoba Hydro notified regulatory authorities following each of these releases. The contaminated material was removed and disposed of as hazardous material. Soil and/or water samples were subsequently collected around each spill site to ensure the Canadian Council of the Ministers of the Environment guidelines were met to ensure the clean-up was complete.

Details of the releases are provided in Table 2.

Table 2: Hazardous Materials releases during the reporting period (April 1, 2016 to March 31, 2017)

Volume (Approximate)	Released	Details
40 L	On Land	In April, concrete admixture was released onto a gravel pad during refilling of storage tanks due to human error.
8 L	On Land	In May, glycol was released from a D9 dozer at the Central Dam Blanket North Groin when a hose came loose from the heater unit on the back of the dozer.
7.5 L	On Land	In August, glycol was released from a water truck on the South Access Road Right-Of-Way when a hose from the coolant system began to leak.
1000 L	On Land	In September, gray water was released onto a gravel pad at the Main Camp after a blockage in the main sewer line during backwash operations at the Main Camp Water Plant.
2140 L	On Land	In September, carbon dioxide (CO_2) was released to the atmosphere after a vapor feed line on a Praxair CO_2 System was struck, creating a kink in the line. Generator power to the area also shut off, resulting in the refrigeration unit for the tank shutting off, causing the tank to become pressurized and release CO_2 to the atmosphere through an emergency vent. The vapor feed line was repaired and barriers have been put into place to protect against future damage. Daily inspections have also been implemented.

Volume (Approximate)	Released	Details
Treatment 200 L	On Land	In September, hydraulic oil was released from a 740 rock truck when the main hydraulic line blew while working in G3.
2.5 L	In Water	In September, diesel was released from a water pump into a water filled ditch along the North Access Road.
25 L	On Land	In October, gear oil was released from a 773 rock truck from Q7B east to the Tailrace Cofferdam. The release was a result of a broken differential.
60 L	On Land	In October, glycol was released from a D10 dozer working in Q7B East when the lower radiator hose blew.
20 L	On Land	In November, transmission fluid was released in Q7B West when a transmission line failed on a 740 rock truck.
9 L	On Land	In December, glycol was released from a failed water pump located in the WAA Fuel and Lube parking area.
7 L	On Land	In February, glycol was released at the Intake construction area from a Vac Tron unit with a leaking hose.
12 L	On Land	In February, engine oil was released from a rock drill working in the downstream Spillway area. The release was a result of a double O-ring installed during a filter change.
5 L	In Water	In March, hydraulic oil was released to water. A D6 dozer broke through the ice on the muskeg while doing reservoir clearing on the south side.
140 L	On Land	In March, diesel fuel was released from a freight truck as a result of a punctured hose. The release was concentrated in two areas, the main gate and the Work Area A warehouse location.

5.0 HERITAGE RESOURCES

5.1 CARIBOU ISLAND

Environmental Officers have received basic training regarding artifact identification, and their presence in the construction zone facilitates the immediate reporting of discovered heritage resources to the Project Manager and Project Archaeologist. There was one instance during the reporting period where a re-touched chert flake was discovered on Caribou Island by the Keeyask Environmental Inspectors (Photo 38). A re-touched chert flake is a quickly made stone tool that can be used as a scraper or a knife. The Project Archaeologist was notified and the location was investigated during scheduled monitoring activities. Subsequently, the site was registered as an archaeological site.

Photo 38: A heritage resource (re-touched chert flake) discovered on Caribou Island

6.0 NON-CONFORMANCE

Seepage water from the cofferdams is pumped directly into the Nelson River if the end-of-pipe Total Suspended Solids (TSS) concentration is less than 25 mg/L. TSS is determined based on the relationship between TSS and turbidity, as described in the Project's *Sediment Management Plan for In-Stream Construction*.

The following discharge event occurred in which end-of-pipe TSS concentration exceeded 25 mg/L. Notifications were provided to Fisheries and Oceans Canada and Manitoba Sustainable Development.

AUGUST 12-13, 2016

During installation of additional sump pumps at the Central Dam Cofferdam, impounded water within the cofferdam was released to the Nelson River that had a TSS concentration greater than 25 mg/L. The high TSS discharge event (i.e., discharge TSS >25 mg/L) occurred over a period of approximately eight hours. For a period of approximately two hours, the highest TSS levels occurred. During this period, the measured discharge turbidity ranged from 1,334 NTU to a peak of 2,859 NTU. Based on a relationship between turbidity and TSS developed for the *Sediment Management Plan for In-stream Construction*, the corresponding calculated TSS values ranged from 1,051 mg/L to 2,256 mg/L. Information on this event was provided to Fisheries and Oceans Canada, Environment Canada and Manitoba Sustainable Development.

7.0 REGULATORY INTERACTION

7.1 PERMITS AND APPROVALS

7.1.1 *ENVIRONMENT ACT* LICENCE

Environment Act Licence No. 3107 was issued on July 2, 2014.

The following alterations were submitted to and approved by Manitoba Sustainable Development (Table 3):

Table 3: *Environment Act* Licence No. 3107 Alterations

Date Submitted	Date of Response	Description

April 6, 2016	April 25, 2016	• Due to an unexpected geological feature in the bedrock, an alteration to *Environment Act* Licence (EAL) No. 3107 was requested to:
		  • Extend the Central Dam Cofferdam beyond the footprint limits; and
		  • Re-align the Tailrace Summer Level Cofferdam beyond the footprint limits.
		• The potential environmental effects resulting from the proposed alteration are not expected to be significant, and the alteration was approved.

October 28, 2016	November 4, 2016	• In order to stabilize ice coverage upstream of Gull Lake and reduce the potential for ice jamming in Gull Rapids, an alteration to *Environment Act* Licence (EAL) No. 3107 was requested to: • Re-install the North Channel Rock Groin extension into the south channel of Gull Rapids. • The potential environmental effects resulting from the proposed alteration are not expected to be significant, and the alteration was approved.

Date Submitted	Date of Response	Description
March 28, 2017	March 30, 2017	• In order to widen the river channel and reduce the potential for ice jamming, an alteration to *Environment Act* Licence (EAL) No. 3107 was requested to: • Increase the footprint of the North Channel Rock Groin (NCRG) by approximately 1000 m^2; • Conduct work on the NCRG during the restricted activity timing window for in-stream work up until April 15, or 15 days after receiving regulatory approval; • Remove material from the NCRG during the summer restricted activity timing window (May 15 – July 15) if the water elevation at the NCRG reaches 156.5 m and there is a forecast for even higher flows; and • If portions of the NCRG are removed (by either controlled or un-controlled overtopping), rebuild the NCRG in the summer or fall of 2017 (potentially during the fall restricted activity timing window). • The potential environmental effects resulting from the proposed alteration are not expected to be significant, and the alteration was approved. A condition of the approval is that the EAB Branch is notified upon completion of the widening activities and prior to any removal activities.

7.1.2 *FISHERIES ACT* AUTHORIZATION

Fisheries Act Authorization No. 11-HCAA-CA1-01695 was issued on July 15, 2014.

The following amendments were submitted and approved by Fisheries and Oceans Canada.

Table 4: *Fisheries Act* Authorization Amendments

Date Submitted	Date and Type of Response	Description

April 6, 2016	April 18, 2016 – amendment could not be issued for CDCD	• Due to a response based on unforeseen geological conditions and a change in schedule, an amendment to the *Fisheries Act* Authorization to:
		  • Conduct in-stream work on the Central Dam Cofferdam Extension during the fall and spring restricted activity timing window (up to May 15); and
		  • Conduct in-stream work on the Tailrace Summer Level Cofferdam during the fall restricted activity timing window (up to September 15).
		• April 18, 2016 - Email received from DFO:
		  • It was acknowledged that the proposed work changes will not add to, or otherwise substantially change, the serious harm authorized by DFO.
		  • The turnaround time requested for a response was not sufficient; therefore DFO will not be able to provide a timing modification. If work proceeds, it would be at the Company's own risk.

August 31, 2016	September 30, 2016	• The original request was made on April 7, 2016 to conduct in-stream work on the Tailrace Summer Level Cofferdam during the fall restricted activity timing window (up to September 15, 2016).
		  • Work on the cofferdam was delayed because other work was deemed more critical, therefore it was requested to continue placing rock fill material until December 15, 2016.
		• September 30, 2016 – Email received that large rock material for the inner and outer rock groin could be placed with the following mitigation:
		  • Construction of the cofferdam from the upstream to the downstream direction to allow fish to escape as water levels decline; and
		  • Not sealing and dewatering the cofferdam until the open water season when a fish salvage can be conducted (July 15, 2017).

Date Submitted	Date and Type of Response	Description
October 28, 2016	November 2, 2016	• Due to high water levels, requested to re-install the North Channel Rock Groin (NCRG) extension to counteract the high flows and promote the formation of an ice cover at the ice boom. • DFO indicated that work is already considered part of the Project that is authorized.

March 28, 2017	April 4, 2017	• Due to high water levels, requested to:
		  • Increase the footprint of the North Channel Rock Groin (NCRG) by approximately 1000 m^2;
		  • Conduct work on the NCRG during the restricted activity timing window for in-stream work up until April 15, or 15 days after receiving regulatory approval;
		  • Remove material from the NCRG during the summer restricted activity timing window (May 15 – July 15) if the water elevation at the NCRG reaches 156.5 m and there is a forecast for even higher flows; and
		  • If portions of the NCRG are removed (by either controlled or un-controlled overtopping), rebuild the NCRG in the summer or fall of 2017 (potentially during the fall restricted activity timing window).
		• DFO indicated that work is already considered part of the Project that is authorized.

7.2 SITE VISITS AND INSPECTIONS

During the reporting period there were four (4) site visits and one (1) site inspection conducted at the Project site by personnel from Manitoba Sustainable Development, Environment Canada, and Fisheries and Oceans Canada. There were no concerns noted.

8.0 LITERATURE CITED

Wright, D.G. and G.E. Hopky. 1998.Guidelines for the use of explosives in or near Canadian fisheries waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34p.

APPENDIX 1:
FISH SPECIES CAPTURED DURING FISH SALVAGE

Table A1: Scientific names, common names and abbreviations for fish species captured during the fish salvage from June 26 to November 13, 2016

Scientific Name	Common Name	Species Code
Catostomus catostomus	Longnose Sucker	LNSC
Moxostoma macrolepidotum	Shorthead Redhorse	SHRD
Couesius plumbeus	Lake Chub	LKCH
Notropis atherinoides	Emerald Shiner	EMSH
Rhinichthys cataractae	Longnose Dace	LNDC
Lota lota	Burbot	BURB
Sander vitreus	Walleye	WALL

Table A2: Number and proportion of fish species caught in all isolation areas during the 2016 fish salvage activities

Name	Number of Fish Captured	Percentage of the Total Catch (%)
Longnose Sucker	104	62
Emerald Shiner	40	24
Lake Chub	14	8
Burbot	5	3
Walleye	2	1
Shorthead Redhorse	1	<1
Longnose Dace	1	<1
Total	**167**	**100**