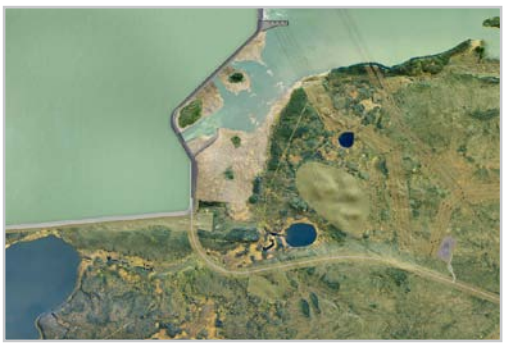


Keeyask Generation Project

Terrestrial Mitigation Implementation Plan

Hydropower Limited Partnership

Manitoba Conservation and Water Stewardship Client File 5550.00
Manitoba Environment Act Licence No. 3107

October 2015

KEEYASK GENERATION PROJECT

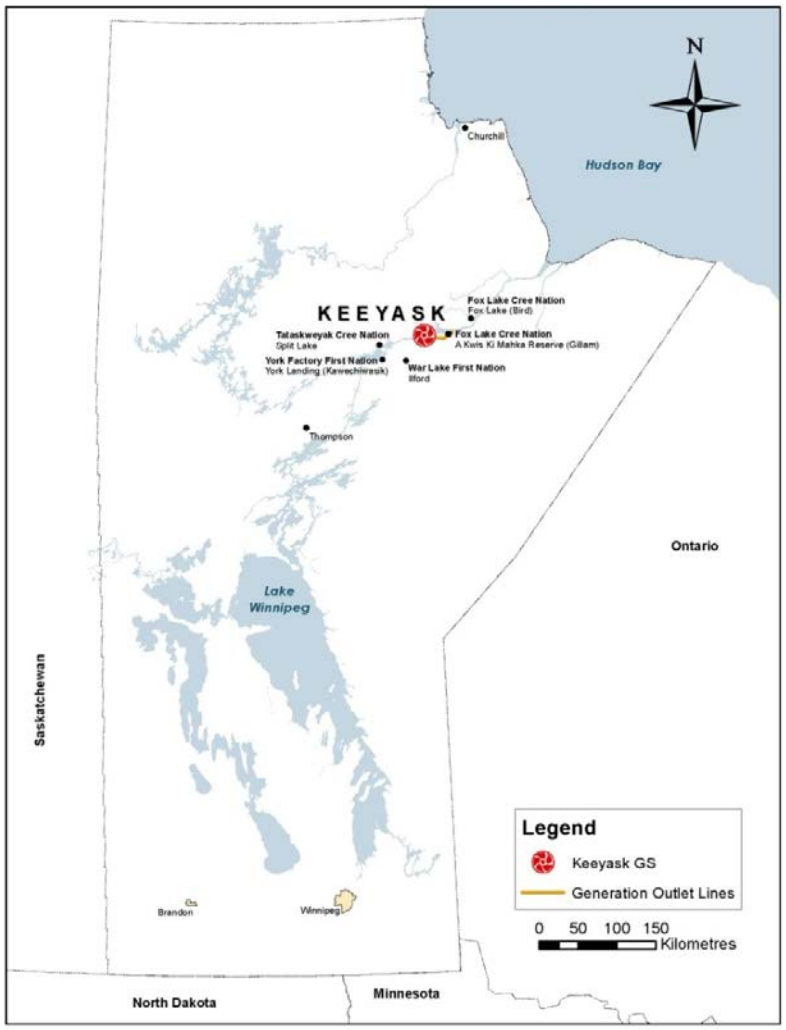
TERRESTRIAL MITIGATION IMPLEMENTATION PLAN

OCTOBER 2015

PREFACE

KEEYASK ENVIRONMENTAL PROTECTION PROGRAM

An Environmental Protection Program (the Program) has been developed to mitigate, manage and monitor potential environmental effects described in the *Keeyask Generation Project: Response to EIS Guidelines* during the construction and operation phases of the Keeyask Generation Project (the Project) shown on Map 1. The Program includes a collection of plans grouped in the following categories: Environmental Protection Plans, Environmental Management Plans, and Environmental Monitoring Plans.



Map 1: Location of Keeyask Generation Project

Figure 1 lists all of the plans included in the Program. It also demonstrates how the Program will be managed. The Keeyask Hydropower Limited Partnership (the Partnership) has delegated authority to Manitoba Hydro to manage construction and operation of the Project including implementation of the Program. The organizational structure of the Partnership for this aspect of the Project includes a Monitoring Advisory

Committee (MAC), which includes participants from each of the Keeyask Cree Nations (KCNs) and Manitoba Hydro. Manitoba Hydro will be guided on the implementation of the Program by the MAC, the Partnership Board of Directors and ongoing discussion with Regulators.

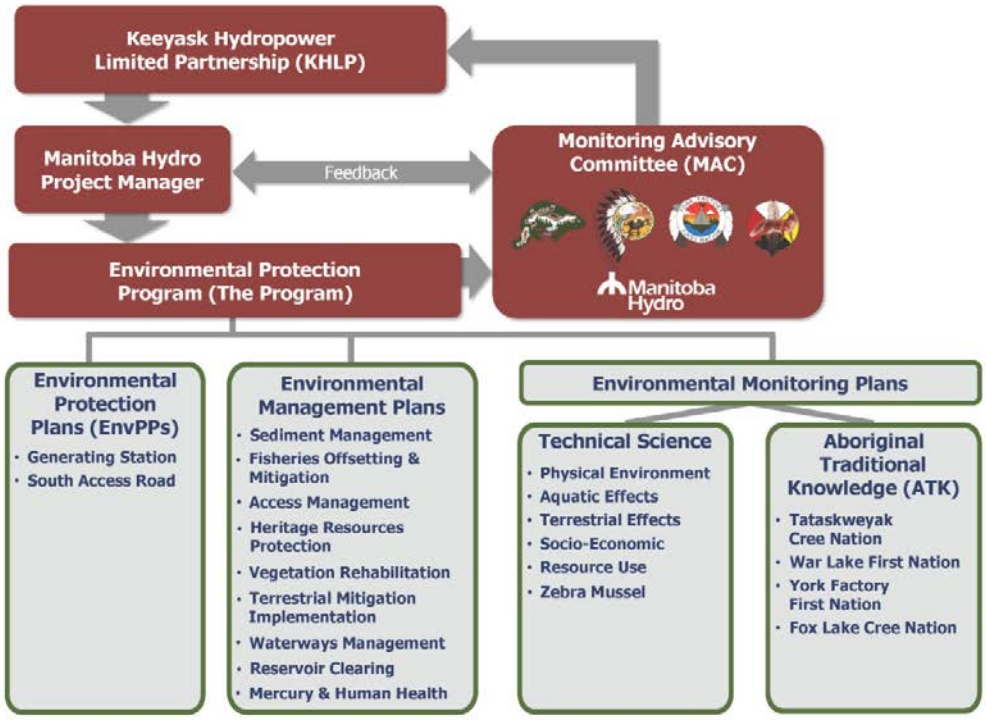


Figure 1: Environmental Protection Program

The Environmental Protection Plans (EnvPPs) provide detailed, site-specific environmental protection measures to be implemented by the contractors and construction staff to minimize environmental effects from construction of the generating station and south access road. They are designed for use as reference documents providing the best management practices to meet or exceed regulatory requirements. EnvPPs are organized by construction activity, highlighting measures to reduce the impact of a specific work activity (e.g., tree clearing or material placement in water). Contractors' compliance with the EnvPPs is a contractual obligation. Under Manitoba Hydro's construction site management, a Site Environmental Lead will be responsible for monitoring compliance and determining when corrective actions are required.

The Environmental Management Plans focus on minimizing effects on specific environmental parameters. They outline specific actions that must be taken during construction and in some cases into the operational phase to mitigate Project effects. The management plans include monitoring to determine success of the actions taken and to determine other actions that need to be undertaken (adaptive management). Implementation of these plans will involve Manitoba Hydro's staff, the KCNs, specialized consultants and contractors under the direction of the Project Manager.

The Environmental Monitoring Plans are designed to measure the actual effects of the Project, test predictions or identify unanticipated effects. During the course of the environmental assessment, numerous requirements for monitoring were identified. There will be both technical science monitoring and Aboriginal Traditional Knowledge (ATK) monitoring undertaken. The technical science monitoring will be conducted by Manitoba Hydro and specialized consultants contracted by Manitoba Hydro, who will in turn hire members of the KCNs to work with them to fulfil the monitoring activities. Manitoba Hydro will also have contracts with each of the KCNs to undertake ATK monitoring of the project.

The activities that occur and the results generated from the Environmental Protection Program will be discussed at MAC meetings. The MAC is an advisory committee to the Partnership Board of Directors and will review outcomes of the programs and, if appropriate provide advice and recommendations to the Partnership on additional monitoring or alternative mitigation measures that may be required. The MAC will provide a forum for collaboration among all partners. On behalf of the Partnership, the MAC will also ensure that the outcomes of the Environmental Protection Program are communicated more broadly on an annual basis to Members of the KCNs, regulators and the general public.

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF MAPS

Page

LIST OF PHOTOS

Page

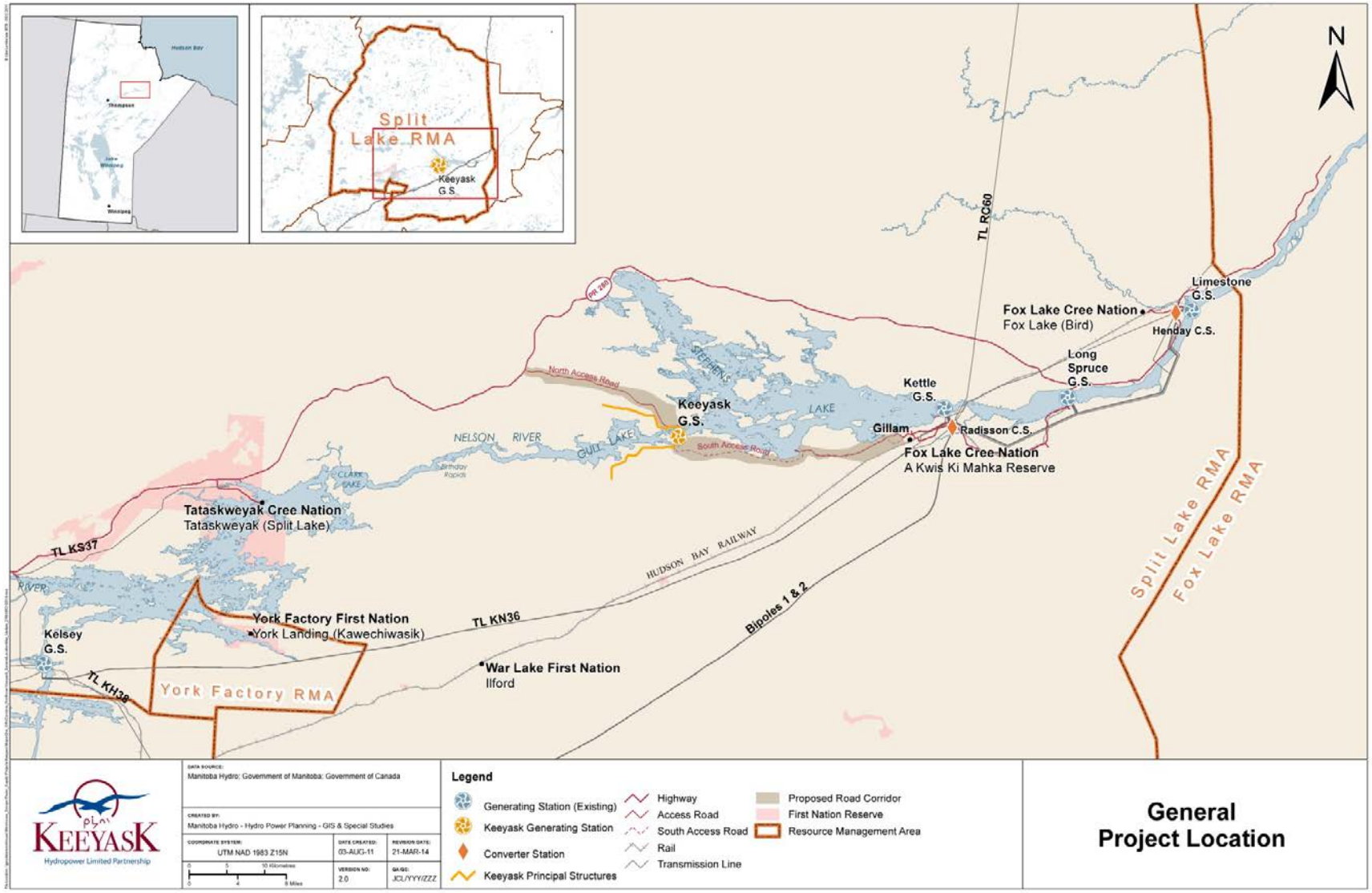
1.0 INTRODUCTION

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 entirely within the Split Lake Resource Management Area. The Project is approximately 725 kilometres (km) northwest 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 Spilt Lake, 180 km east-northeast of Thompson and 30 km west of Gillam (Map 2).

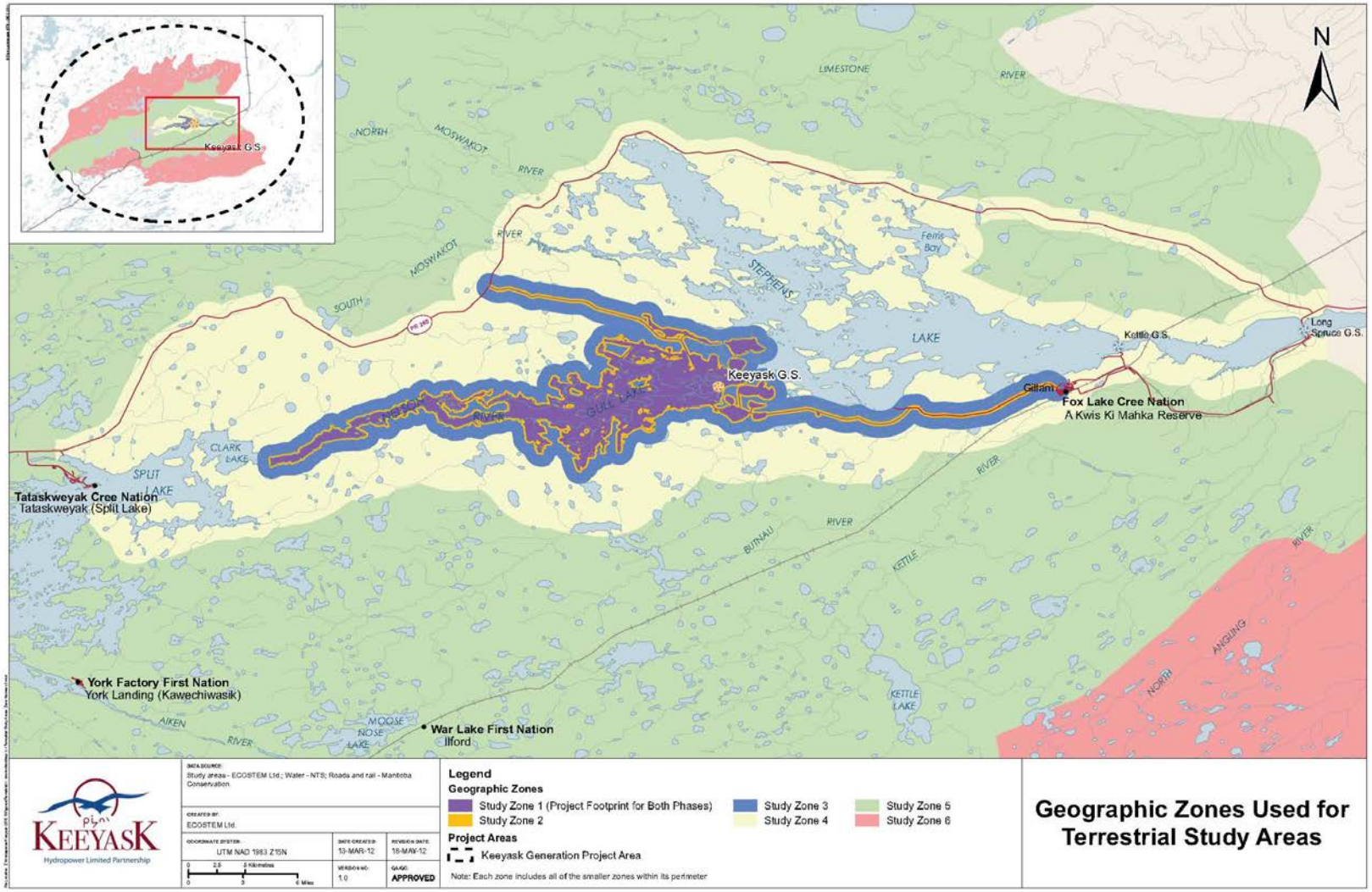
As part of the environmental assessment process for the Project, the Partnership carried out terrestrial environment baseline studies in the Keeyask region (Map 3), and committed to measures to avoid or mitigate the negative effects of the Project on the environment. There are a number of terrestrial mitigation measures outlined in the *Keeyask Generation Project Response to EIS Guidelines* document (hereafter referred to as the EIS; KHLP 2012). Some of these mitigation measures require detailed planning and design in their implementation (e.g. development of the marsh wetland area), while others are fairly simple measures (e.g., construction and installation of mallard nesting tunnels). The purpose of this plan is to provide detailed information on a number of the mitigation measures planned to minimize and/or offset environmental effects of the Project on the terrestrial environment, for the design and implementation stages.

The terrestrial mitigation measures that require some level of detailed design and construction are covered in this plan; other terrestrial mitigation measures that were either included in the overall Project design (i.e., routing of access roads and situating excavated material placement areas to avoid sensitive terrestrial habitat, including caribou calving habitat), or do not require detailed planning or construction, are outlined in the EIS (KHLP 2012), but are not included in this plan. For each measure that is covered in this plan, a brief overview of the existing environment, as well as a summary of Project effects from the EIS, is presented as background in order to provide context on the planned mitigation measures. Depending on where a given mitigation measure is in the planning/design stage, the level of detail presented for each measure within this plan will vary accordingly.

This plan outlines the implementation of, and any ongoing maintenance, of terrestrial mitigation measures for the Project. The monitoring of these measures, once in place, is covered under the *Keeyask Generation Project Terrestrial Environment Monitoring Plan* (TEMP). Reports on the ongoing implementation of the mitigation measures in this plan will be provided throughout the construction phase of the Project and continuing into the operation phase.



Map 2: Keeyask Generation Project Location



Map 3: Geographic zones used for terrestrial study areas for the Keeyask Generation Project EIS

2.0 TERRESTRIAL PLANTS, HABITAT AND ECOSYSTEMS

2.1 WETLAND DEVELOPMENT

2.1.1 BACKGROUND

Due to the high ecological and social importance of wetlands, there are provincial and federal policies related to wetland conservation (Sustainability Manitoba undated; Government of Canada 1991). These policies are particularly focused on regions where wetland losses have already been severe and wetland functions have been dramatically affected. In regions where wetlands are abundant and remain in a relatively pristine condition, it is anticipated that some degree of area loss can be absorbed without adversely affecting wetland function.

Wetlands accounted for approximately 90% of the land area in the Keeyask region (Study Zone 5, Map 3). The region is essentially one large wetland complex that is dotted with mineral-capped ridges and hills. Bog comprised 91% of the wetland area, followed by fen (8% of wetland area) and marsh (1% of wetland area).

The off-system (i.e., not located on the Nelson River) marsh wetland type was the only wetland type that received a high wetland function/quality score (based on factors including groundwater recharge, carbon sequestration, and biological diversity; see *Keeyask Generation Project Terrestrial Environment Supporting Volume* (TE SV of the EIS; KHLP 2012) for more details on the wetland function/quality scores) in the wetlands assessment, and therefore was considered to be a particularly important wetland type in the Keeyask region.

Focusing on particularly important wetlands (i.e., off-system marsh wetlands) for evaluation and mitigation was the approach followed for this Project assessment since the Project is located in a region with extensive wetlands that are in a relatively pristine condition (except along the Nelson River, where the water regime is very different due to the management of flows for the generation of electricity). The overall Project approach to effects on wetland function was to minimize wetland area loss and alteration, avoid globally, nationally or provincially significant wetlands and achieve no net area loss for other particularly important wetlands.

2.1.2 PROJECT EFFECTS AND MITIGATION

Project construction will directly remove and alter wetlands through activities such as clearing for Project infrastructure, excavating borrow areas, placing excavated material, reservoir clearing and flooding from coffer dam diversions. Edge effects and Project Footprint components that alter hydrology (*e.g.*, dykes redirecting drainage that is moving from inland areas towards the Nelson River) would be the primary indirect pathways for wetland effects during construction.

Reservoir expansion, additional edge effects and groundwater changes leading to habitat effects will be the primary pathways for Project effects during operation.

There are no globally, nationally or provincially significant wetlands in Study Zone 2 (Map 3).

Project construction and operation is predicted to affect up to 8,288 ha of wetlands, including 9 ha of off-system marsh (KHLP 2012). This total amount of affected off-system marsh does not include emergent vegetation patches that are too small to map, the inclusion of which could increase the amount of affected off-system marsh to approximately 12 ha.

Planned mitigation during construction includes the development of 12 ha of the off-system marsh wetland type within Study Zone 2. During operations, monitoring will be carried out under the TEMP to verify successful development of 12 ha of the off-system marsh wetland type; if monitoring determines that further measures are needed to achieve this commitment, additional wetland development will be implemented.

2.1.3 MITIGATION DETAILS

2.1.3.1 LOCATION

Based on input from the Project's technical experts and the Keeyask Cree Nations (KCNs) Partners, the future dewatered area, located downstream of the south dam, at the outfall of Gull Rapids Creek, was selected to develop the wetland habitat (Figure 2 shows the general location of this area). Developing the marsh wetland in the future dewatered area was noted to provide the greatest functional use as an educational area for local communities due to the high level of accessibility. Development of the marsh wetland in this area was also identified to reduce the overall Project footprint (as it would need to be rehabilitated following Project construction, and using this area would prevent additional disturbance of other existing wetland habitats that were assessed for potential enhancement) and was the most technically feasible, cost-effective location.

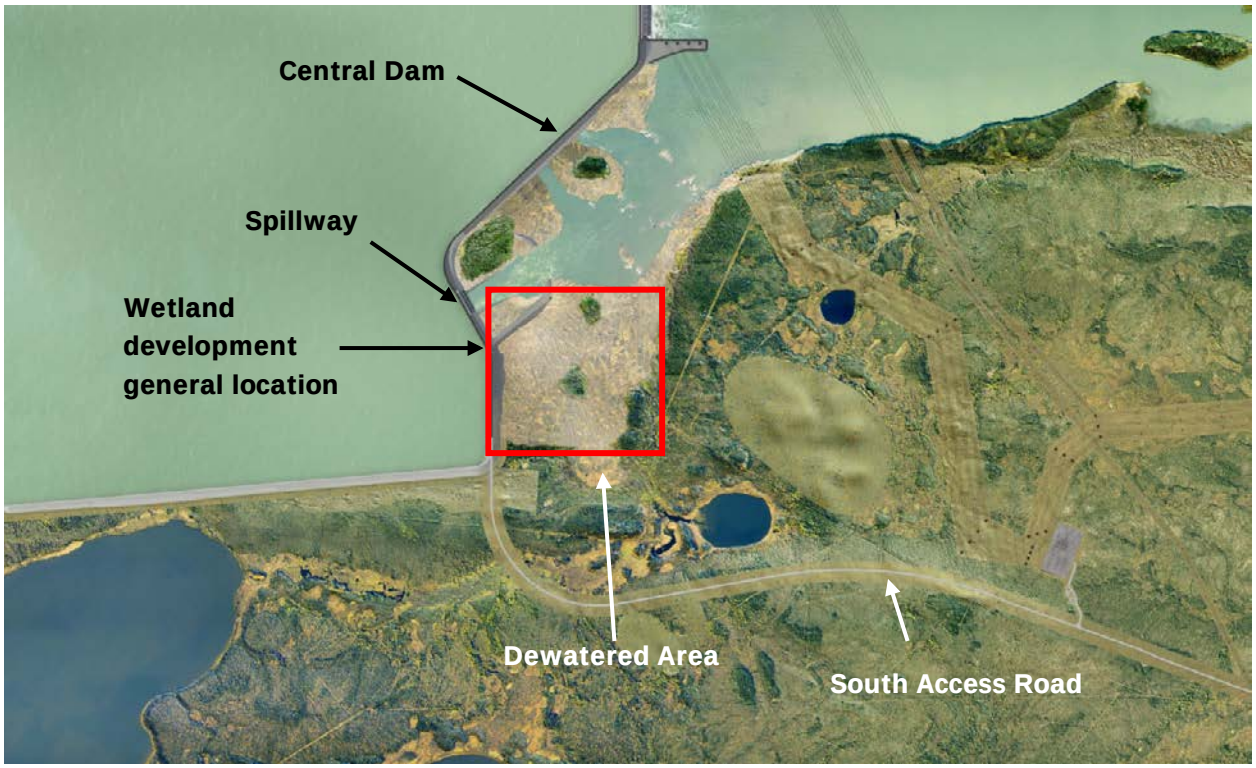


Figure 2: Wetland development area in the future dewatered area

2.1.3.2 DESIGN

Figure 3 below shows the concept design for the wetland habitat in the future dewatered area. The total area available for wetland development is 36 ha, which does not include the small dewatered bay to the south. The following is an estimate of the breakdown of the 36 ha that will be developed:

- 12 ha marsh wetland (wet meadow and emergent vegetation types)
- 17 ha open water
- 7 ha upland habitat

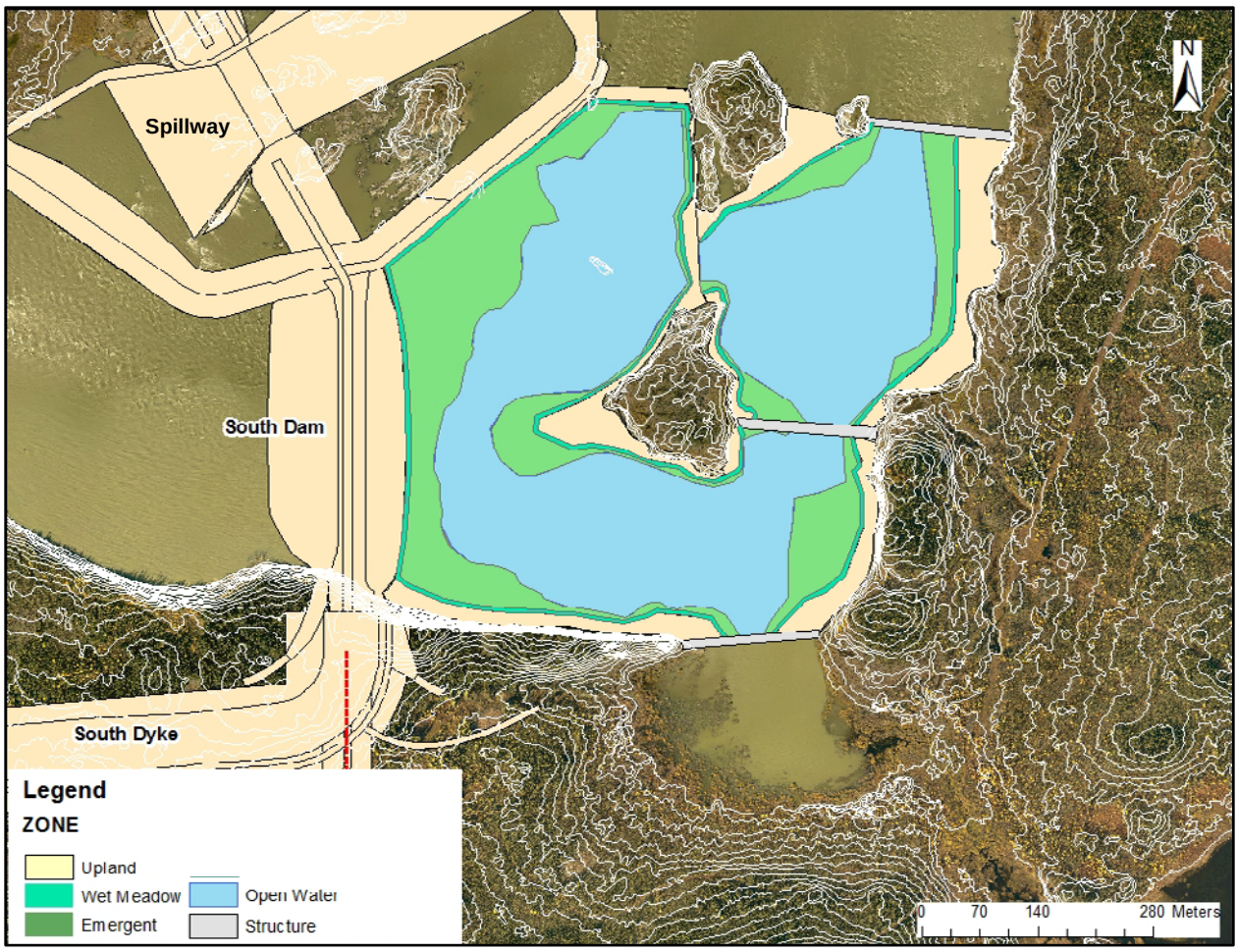


Figure 3: Conceptual wetland design

2.1.3.2.1 REVEGETATION STRATEGY

The revegetation strategy for the newly developed wetland area will incorporate development of wetland plant benches (contouring of the shoreline in a manner that provides defined water depths zones; see Figure 4 for an illustrative example of plant benches) to take advantage of natural topographical contours that exist to plant a range of wetland plants that thrive at various water depths. Of the wetland area to be created, around 70% will be open water with submerged and floating-leaved aquatic species. Plant benches will be created in the remaining 30% of the total wetland area (Figure 4). Incorporating wetland zones of 0.25 m and 1 m water depth will support the growth of emergent plant species. Species selection for the wetland areas will include wetland plants identified to be important to the KCNs.

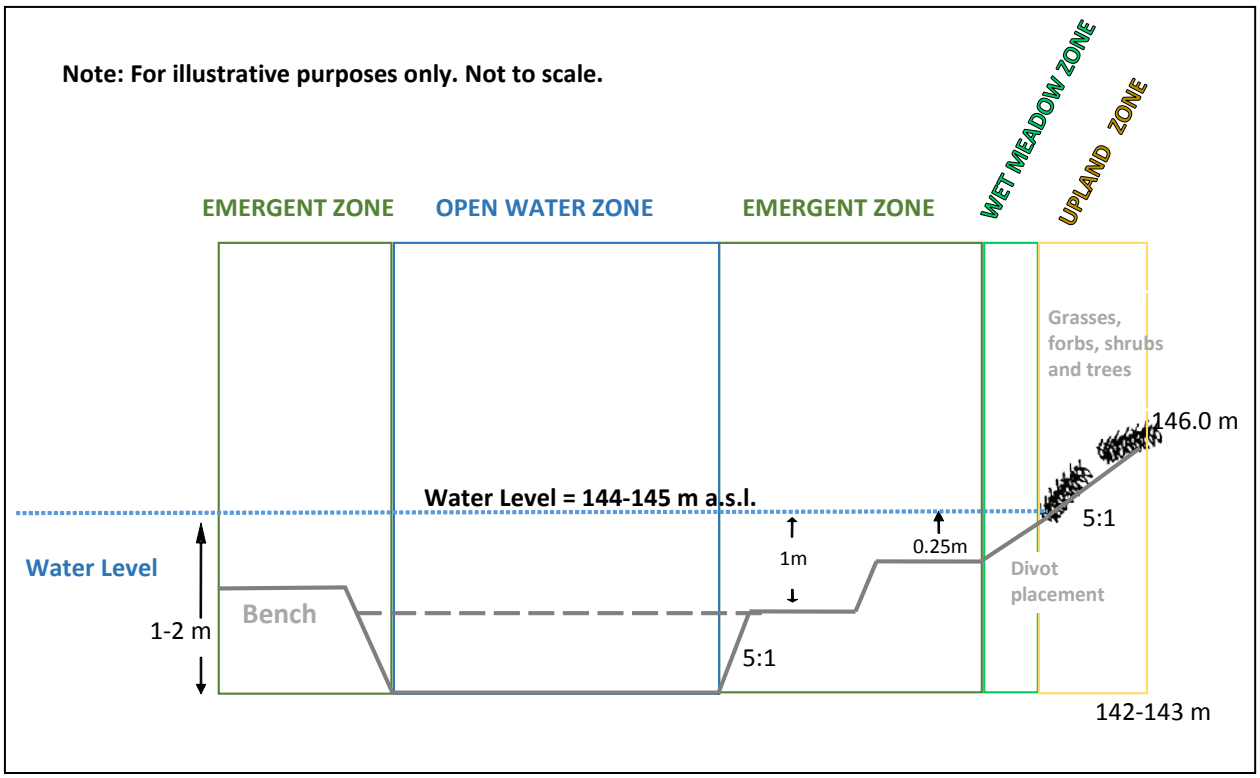


Figure 4: Wetland cross section example, showing different water depth zones that could be created using plant benches.

In addition to creating benches for emergent plant growth, a continuous divot of plant material (propagules) will be positioned around the wetland in the wet meadow zone to begin colonization of wet meadow species. These propagules will increase plant diversity in the future dewatered area, as well as minimizing the effects of erosion along the periphery of the wetland area.

The upland area to be developed will include a selection of native grasses, forbs, shrubs and trees. It may also support key upland species identified by the KCNs that are not incorporated into the wetland areas, including, but not limited to, sandbar willow and trapper's tea.

2.1.3.3 INSTALLATION

CONSTRUCTION METHODOLOGY

As the future dewatered area currently exists with a base of bedrock, mineral soil will be overlaid in the areas where planting is to occur. Mineral soil will be obtained from other Project areas, including clay borrow sources for the surface mineral layer (i.e., to provide suitable topsoil for wetland plant establishment). Access to the site for wetland construction will be done using previous construction access roads to the dewatered area. For the wetland benches, Class 1 fill (mineral soil) will be placed in the areas to be vegetated. For the upland area, Class 1 fill will be placed, then graded and shaped to ensure appropriate drainage. In addition,

the upland area would be amended with peat, to develop a good growth medium for upland species and a proper seedbed.

The wetland "ponds" (i.e., the open water areas shown in Figure 3) have been designed at different elevations (143 m and 144 m), allowing them to flow into one another, with the most downstream wetland pond being developed last. Berms and water control structures will be constructed to modify water levels with the wetland area, if required.

As the design for the wetland area covers a large footprint, phasing of the construction is proposed. The phasing of the wetland construction is scheduled to begin after Stage II dewatering, at which time the entire flow of the Nelson River will be diverted to pass through the partially completed spillway (2017-2019); however the timing is uncertain as the area may not be entirely dewatered during Stage II river diversion (i.e., as detailed bathymetry is not yet available for this area, it is not known exactly where water may remain in pooled portions). Since the area needs to be entirely dewatered prior to construction of the plant benches to ensure accurate placement and shaping of mineral material, the phasing of the wetland may be delayed past 2019. Mineral material placement, depending on site access, will occur during summer and fall, with revegetation activities occurring during the winter. Planting of the wetland area is proposed to be done over approximately four years, with a portion of the planting to be done in each of these years.

The revegetation approach is specific for each of the four water depth zones identified in the conceptual design (Figure 3 and Figure 4):

- **Open water zone (i.e., submerged and floating-leaved aquatic plants):** This zone would be created by constructing areas with water depths greater than 0.5m. For the open water area, success has been found using inoculation as a revegetation strategy for establishing aquatic plants. This involves collecting whole live submerged and floating-leaved aquatic plants from an existing population during the summer months and transporting them to the revegetation site, where attached seeds and rhizomes can facilitate establishment.

- **Emergent zone:** Wetland plants in this zone are to be planted on benches with water depths from 0.25 to 0.5 m.; these will provide appropriate water depths for the species. The emergent wetland plant material (propagules) will be transported from the nursery sites (explained on following page) to the wetland during winter dormancy to minimize stress. Emergent plant material will be placed in divots (i.e., depressions in the soil for the placement of wetland plant material) spread out over the wetland planting area, to provide an initial population for establishment over time.

- **Wet meadow zone:** Wetland plants in this zone will be planted between water depths of less than 0.25 m and up to the water line. The wet meadow zone also applies to the shoreline or periphery of the wetland design. Similar to the emergent wetland plant zone, wet meadow plant material will be transported in the winter, during dormancy to minimize stress, from selected nursery sites for planting on-site. Wet meadow plant material will be placed in a continuous divot that has been dug along the shoreline at the normal water level.

- **Upland zone:** Found above the water line, this zone will be incorporated particularly where the natural landscape is to be affected during the construction process. A multi-year seeding plan of select boreal northern native grasses and forbs, as well as hand planting of select shrub and tree species, will allow for the succession of this community into an upland area over time. Planting native grasses, in addition to

selected trees and shrubs, has been designed to stabilize soil in the upland areas until trees establish over time, minimizing erosion.

The revegetation strategy for each of these zones is that, over time, planted areas (i.e., the emergent zone and wet meadow zone) will fill in as species move outside of divots and colonize new areas, and the open water zone will support aquatic plants, both inoculated and colonized from the area. Although each zone proposed in the wetland concept design has been designed to be revegetated from a select list of species, natural colonization from the area will likely increase species diversity over time.

NURSERY SITES

The wetland revegetation strategy will use seed and nursery sites for the development of propagules. Nursery sites are areas that have been identified to have the appropriate hydraulic characteristics for wetland plant growth, that are then established with monocultures (i.e., all the same species) or communities of key plant species to be used in the wetland construction. An initial survey of suitable nursery sites in the Keeyask area identified several borrow pits and access road ditches. In general, these disturbed areas hold water and naturally support the growth of wetland vegetation.

All nursery sites will be developed to supply a diverse selection of high quality plant propagules. As a standard for wetland revegetation, it is also important that once finished with a nursery site, enough plant material will remain so that revegetation of the nursery site can occur naturally over time.

In addition to using propagules as a strategy for establishing the wetland plants, seed will be used to start nursery site growth on the constructed wetland itself. As most wetland plant seeds require moist, but not wet, environments for germination, the use of seed in the constructed wetland will be restricted to the wet meadow zone species. Seed will also be used for wetland enhancement in the two to three years following construction, to increase diversity and support establishing populations. For the upland revegetation, site-specific native seed mixes will be developed. Any seed to be used for the establishment of wetland vegetation will be either locally collected, or sourced from northern varieties. The establishment of non-native plant species will be avoided and any non-native plants will be removed if found within the developed wetland area.

CONTROL STRUCTURES

Although long-term water level control will not be required for marsh maintenance, temporary control of water levelsmay be required for construction (i.e., diverting of water to allow for equipment access, where needed). However, once divot construction and vegetation placement is completed within the wetland area, hydrological commissioning is required for two seasons of plant growth. During wetland commissioning, the main goal involves dewatering plant benches slightly below their designed water depths to stimulateinitial growth.

Temporary control structures will be needed at both of the wetland pond areas for commissioning. A pre-fabricated concrete drop with a plastic pipe is proposed (Figure 5), although other alternatives will also be considered.

Source: Ducks Unlimited Canada

Figure 5: Example wetland control structure

In addition to the wetland commissioning process, monitoring of the constructed wetland site for one to two years is necessary in order to determine wetland plant success. By monitoring during the commissioning phase, areas may be identified that require enhancement of wetland plants by hand planting to support the revegetation process. Ongoing monitoring of the developed wetland area will be covered under the TEMP.

INTERPRETIVE TRAIL

During the development of the wetland design concept, the KCNs discussed the importance of the developed wetland area as an opportunity for families, elders and youth to spend time together. Additional discussion identified the KCNs' desire to incorporate ancillary structures around the marsh wetland area once it is developed, in order to support its use as an educational/ecological area with walkways, signage, picnic tables and viewing mounds.

2.1.3.4 MAINTENANCE

If monitoring of the developed wetland area shows no additional need for enhancement, little to no maintenance or control is anticipated for the long-term success of the wetland plantings.

2.2 RE-VEGETATION OF LINEAR FEATURES

2.2.1 BACKGROUND

Intactness is the degree to which an ecosystem remains unaltered by features that remove habitat and increase the amount of fragmentation. Fragmentation is a landscape-level process in which development or natural disturbance progressively divides habitat blocks into smaller and more isolated segments; it can have negative effects on ecosystem processes as well as at the species level (KHLP 2012). Among other things, fragmentation creates edges, reduces the size of interior areas, isolates habitat and reduces connectivity.

2.2.2 PROJECT EFFECTS AND MITIGATION

The clearing of vegetation for Project linear feature development, including cutlines and trails, results in increased fragmentation of the landscape, and can lead to increased access to an area by humans and animals. This increase in linear features near the Project can lead to habitat disturbance, invasive plant spreading, accidental fires, and potential increased harvest of birds and mammals due to increased access.

As outlined in Clause 10 of the Project's licence (*Manitoba Environment Act* Licence No. 3107), all Project access routes, except for those required for ongoing Project maintenance, will be rehabilitated once they are no longer required. Additionally, except for existing resource-use trails, which will remain, Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of: habitat disturbance, invasive plant spreading, accidental fires and access-related effects.

2.2.3 MITIGATION DETAILS

The plans for the rehabilitation of all temporary Project footprints, including access routes, will be covered in the *Keeyask Generation Project Vegetation Rehabilitation Plan.*

For existing trails that intersect the Project footprint, a workshop will be held with KCNs resource users during the construction phase to determine which of the existing trails are currently used as resource use trails. Resource use trails identified through this process will not be blocked or revegetated. Details on the revegetation of the remaining trails that intersect the Project footprint will also be covered in the *Keeyask Generation Project Vegetation Rehabilitation Plan.*

3.0 AMPHIBIAN MITIGATION

3.1 RETENTION OF WOODY DEBRIS

3.1.1 BACKGROUND

The Keeyask area supports two species of amphibians, the boreal chorus frog and wood frog. Both species are considered common and widespread throughout Study Zone 4 (Map 3), concentrating in areas where suitable breeding habitat exists (*e.g.,* small ponds, marshes). While the historical breeding range for the northern leopard frog includes part of Study Zone 4, none were detected during the Keeyask environmental field studies.

3.1.2 PROJECT EFFECTS AND MITIGATION

Key potential effects of the Project on amphibians include habitat loss, alteration and fragmentation of habitat, Project-related disturbances such as noise, and frog mortality related to road traffic and winter clearing activities. Land clearing and grubbing activities associated with Project development will result in the loss and degradation of slightly more than 2% (18 ha) of the total available amphibian breeding habitat in Study Zone 4 (KHLP 2012).

Loss of amphibians and degradation/loss of amphibian habitat will be mitigated temporarily by retaining slash piles and woody debris (*i.e.,* snags and logs, mulched debris from tree clearing) in cleared, decommissioned borrow areas, until vegetation in these areas is re-established. Slash piles benefit amphibians by providing nursery cover and a source of food for juvenile frogs, winter cover, and potentially, may enhance habitat connectivity between breeding ponds and upland foraging habitat.

3.1.3 MITIGATION DETAILS

3.1.3.1 LOCATIONS

Slash piles and woody debris will be placed in areas having potential to support amphibians. Potential areas identified for slash pile mitigation include decommissioned borrow areas and rock quarries located outside of the future reservoir area. These areas will be selected after their potential to retain water (i.e., forming amphibian breeding habitat over the long-term) is ascertained. Identification of potential areas will be done through the construction-phase amphibian monitoring program under the TEMP.

Suitable sites will be determined for amphibian slash pile habitat enhancement during the construction phase of the Project. The following will be considered in determining the final location of these sites:

- In areas where decommissioned borrow areas occur between amphibian breeding habitat (i.e., ponds), habitat connectivity and amphibian survival can be enhanced by placing woody debris piles across the cleared area (in close proximity to the adjacent breeding ponds).
- In areas where decommissioned borrow areas retain water, slash piles can be used to provide temporary nursery cover and food for juvenile frogs, winter cover, and where practicable, to enhance habitat connectivity between breeding ponds and upland foraging habitat.
- If the Keeyask Infrastructure Project (KIP) borrow areas are decommissioned prior to the Project borrow areas and rock quarries, KIP sites will be considered for establishing slash pile protocols.
- Slash piles or woody debris will not be placed closer than 100 m from waterbodies and watercourses to prevent debris from entering the water, as prescribed in the Project Environmental Protection Plan (EnvPP).
- As slash piles may prevent the re-establishment of vegetation in borrow areas from acidic leachates and choking out or shading plants, the size and number of slash piles implemented will be kept to the minimum required to achieve the habitat enhancement benefits.

3.1.3.2 DESIGN

Woody debris or slash retained for amphibians habitat enhancement will consist of small formations of piled organic tree and shrub debris. Deciduous or coniferous brush or slash may be used as filling on the piles. Examples of woodchip and slash piles that provide amphibian habitat are depicted in Photos 1-3.

Reprinted with permission from J.T. Witiw, 2007

Photos 1, 2, and 3: Examples of wood chip and slash piles providing amphibian habitat

Woody debris will be placed in cone-shaped piles, about 1.0 m (3 ft) tall and from 2.0 – 4.0 m (6 to 12 ft) in diameter. As pile deterioration advances, these habitats are likely to attract juvenile frogs as they contain a ready micro-site supply of suitable moisture, thermal conditions, and food source, including a large variety of invertebrates and gastropods (Langor 2008). Although smaller piles tend to be less durable and will degrade over a shorter period of time, these structures should persist long enough for the surrounding vegetation to become re-established and provide alternate habitat for wood frogs and boreal chorus frogs. Temporary wood chip or slash piles will also provide habitat for other wildlife including insects, small mammals and birds.

Suggested density of slash piles is 6 to 8 per hectare of open land (California Department of Fish and Game 2008). However based on the objectives of amphibian mitigation for this Project, slash piles will be placed at about 50 m apart, with a focus of connecting areas containing suitable amphibian habitat along the edge of decommissioned borrow areas or from borrow pond edge to forest edge, depending upon the site (MacDonald 2008).

When revegetation activities occur in these borrow areas, slash piles will be seeded to encourage vegetative growth within the pile and surrounding area.

3.1.3.3 INSTALLATION

Slash piles will be created during the construction phase, using local woody debris retained during clearing for Project footprints. Woody materials will be stockpiled in cleared Project areas, and relocated to areas once they have been identified as candidate sites for amphibian habitat enhancement (i.e., following the decommissioning of each identified area). Under the advisement of the Project wildlife biologist, woody debris piles will be placed within recommended amphibian habitat enhancement areas.

In order to reduce any potential harm and/or displacement of wildlife species that may take advantage of the stockpiles retained for the amphibian habitat enhancement as denning/nesting habitat, any woody materials needed for this measure will be moved during the fall (i.e., between the end of August and December).

3.1.3.4 MAINTENANCE

No maintenance of woody debris or slash piles is proposed. The woody material will break down over time as the vegetation at a given site becomes re-established.

4.0 BIRD MITIGATION

4.1 COLONIAL WATERBIRD HABITAT

4.1.1 BACKGROUND

Three species of colonial waterbirds breed near the Project site on rocky islands and reefs in the Nelson River: ring-billed gull, herring gull and common tern. In the Keeyask EIS these species were treated as priority birds due to their use of rare environmental features (*e.g.,* rocky reefs and islands) for breeding. Their breeding habitat is considered rare as only a small number of the reefs and islands that occur within Study Zone 4 (Map 3) are considered ideal for nesting. Nesting islands used by colonial waterbirds are typically rocky, support little to no vegetation, have stable banks and have limited access by land predators.

Along the Nelson River, gulls and terns breed on rocky reefs and islands located within or in close proximity to foraging areas at Gull Rapids and Birthday Rapids. The highest concentrations of gulls and terns were observed breeding on reefs islands in Gull Rapids (upwards of 3,500 pairs of gulls and 100 pairs of terns). A common tern breeding colony was observed on a rocky island located just downstream of Birthday Rapids during EIS field studies, but more recently this island has been occupied by a ring-billed gull colony, averaging between 200-1,000 breeding pairs.

4.1.2 PROJECT EFFECTS AND MITIGATION

Project construction will result in the removal and/or degradation of approximately 2.7 ha of potential gull and tern breeding habitat. Less than 50% of this available habitat is typically used to support gull and tern colonies (KHLP 2012). Suitable alternate habitat for birds displaced during construction is currently limited within Study Zone 3 (Map 3).

The following measures will be implemented to offset the loss of colonial waterbird nesting habitat during the construction phase:

- Artificial nesting platforms for terns; and
- Development of new gull nesting habitat.

The following measures will be implemented during the construction phase to offset the loss of colonial waterbird nesting habitat during the operations phase:

- Building up an existing island so it provides a suitable nesting island following reservoir impoundment; and

- Clearing of vegetation on an existing treed island near Birthday Rapids, to provide a suitable nesting island.

4.1.3 MITIGATION DETAILS

4.1.3.1 ARTIFICIAL TERN NESTING PLATFORMS

Beginning in spring 2015, floating tern platforms will be made available to nesting terns during each year of Project construction. Nesting platforms for terns will be deployed within Gull Lake in accessible areas that provide some protection from wave action and currents, such as back bays and inlets (Map 4). Deployment of nesting platforms for terns will continue throughout construction and into operation. Once the reservoir is fully impounded, any new nesting islands that are created following reservoir impoundment will be mapped. Any new islands that are naturally created following flooding, as well as the permanent nesting island to be constructed during Project development, will be monitored for tern use. Once suitable permanent habitat is available, the use of nesting platforms will end.

Artificial nesting platforms have proven to be successful for colonial waterbird species in a number of locales throughout North America (Brennan 2009; BTCV 2009; Jarvie and Blokpoel 1996). These habitat replacements have most commonly been developed for terns that have lost habitat as a result of development and/or as a result of being out-competed by expanding gull populations (Dunlop et al. 1996). Photos 4 and 5 show examples of floating tern nest platforms installed in the Toronto Harbour area, initiated by the Canadian Wildlife Service (CWS) and the Metropolitan Toronto and Region Conservation Authority (MTRCA).

Courtesy of Toronto and Region Conservation Authority and Ken Sproule, respectively

Photos 4 and 5: Examples of tern nesting platforms

Map 4: Locations of artificial gull nesting habitat and tern nesting platforms during Project construction

4.1.3.1.1 CONSTRUCTION

Two or more nesting platforms will be constructed to provide temporary replacement habitat for common terns displaced from the Gull Rapids area (<100 pairs). The platform features will generally follow the information outlined in the Environment Canada document "Reefrafts for Common Terns and Fish – Guidelines for Design, Construction and Operation" (Jarvie and Blokpoel 1996). These will include the following features:

- Provide a total of between 40-50 m² of nesting habitat.
- Be designed and constructed in a manner that allows transport to and from the launch site on a tractor trailer.
- The top deck of the floating platform will have a layer of sand and gravel nesting substrate, secured from the Project site.
- Driftwood, large rocks or cinderblocks, and chick shelters (Jarvie and Blokpoel 1996) will be scattered on top of the substrate to increase the attractiveness of the nesting habitat.
- Platforms will be constructed with ramps so fledged chicks can access the water and return to the platform.
- Multiple pairs of common tern decoys will be added to each platform to encourage use by terns.
- Audio devices with tern vocalizations will be added to each platform to enhance social attraction. Options to stop the audio recordings once nesting has initiated on the platforms, such as pre-programming recordings to stop, or controlling them remotely, will be considered in the implementation of these devices.
- Platforms will be monitored regularly using spotting scopes from an elevated location on shore, or by helicopter overflights if platform locations are not easily accessible.
- Monitoring may be supplemented with remote cameras, installed in the spring on each nesting platform. These cameras could be programmed to capture images of the nesting platform each day to monitor nesting and chick development through the breeding period.

4.1.3.1.2 INSTALLATION AND MAINTENANCE

Deployment of platforms will occur after ice-out in late May or early June at Gull Lake. This timing coincides with the general arrival of breeding terns, and after the arrival of most gulls, who typically begin identifying nesting sites by mid-May. This deployment timing will subsequently minimize competition for suitable nesting habitat between ring-billed gulls and common terns. Floating platforms will be located in areas that provide some protection from wave action and currents, such as back bays and inlets (Map 4). Platforms will not be placed near established bald eagle nests and will be installed at least 50 m away from the shore to reduce the risk of predation from avian or land-based predators.

The tern platforms are designed to be left in place throughout the open water period and removed before ice begins to form. Ice conditions on Gull Lake during the winter make it necessary to remove the tern platforms in the fall, with re-deployment the following spring after ice-out.

The following seasonal activities will occur each year platforms are in use:

SPRING

- Multiple pairs of tern decoys, audio devices, and chick shelters will be installed on each nesting platform to encourage use by terns.
- Each of the nesting platforms may have a camera mounted onto the structure in the spring to supplement monitoring of the tern colony.
- Platforms will be deployed to their summer positions.

FALL

- After terns have migrated out of the Project area, retrieval of platforms from the Nelson River for winter storage in a secure location at the Project site.

Maintenance will occur twice annually in conjunction with spring deployment and fall retrieval of platforms. Platforms will be stored at the Project site when not in use.

Maintenance will occur as follows during the construction phase:

SPRING

- An inspection of platform structures will be completed to identify and repair any damage.
- Nesting substrate will topped up as needed.

FALL

- Prior to ice-up, all nesting platforms and associated components will be removed from the water for winter storage.

4.1.3.2 GULL NESTING HABITAT

4.1.3.2.1 CONSTRUCTION PHASE

The new gull nesting area will be developed during the first year of Project construction on the south shore of William Smith Island (west) (Map 4 and Map 5). This area will include the following features:

- The area (approximately 1.5 ha in size) will be cleared of existing vegetation, covered with rocky substrate and supplemented with boulders and driftwood to appear similar in structure and appearance to natural nesting sites;

- Eight large shipping containers will be placed in the nesting area and covered with gravel substrate to allow gulls to also nest on an elevated surface, as they commonly do in other portions of their breeding range (during the final year of construction, prior to reservoir impoundment, the shipping containers will be removed from William Smith Island);
- Gull decoys and audio devices will be placed on the elevated platforms and on ground-level substrate to attract gulls, and improve appeal of the new site to breeding gulls;
- Cameras will be installed to monitor the new nesting habitat, and evaluate the effectiveness of the area for gull breeding; and,
- Vehicular and human disturbance near the new gull nesting area will be limited.

4.1.3.2.2 CONSTRUCTION AND MAINTENANCE

Development of the construction phase gull nesting habitat on William Smith Island (west) started during the winter of 2014-15. The site will be prepared by the beginning of the gull breeding season in early May 2015. Environmental site staff will also ensure that the gull decoys, audio devices, and the monitoring camera are deployed before the start of the nesting season. If increased predator activity at the site is detected through monitoring, mitigation measures will be employed as deemed necessary.

Maintenance will occur twice annually in conjunction with spring preparation and fall cleanup of the site. Decoys, audio devices and the camera will be stored at a secure location at the Project site when not in use.

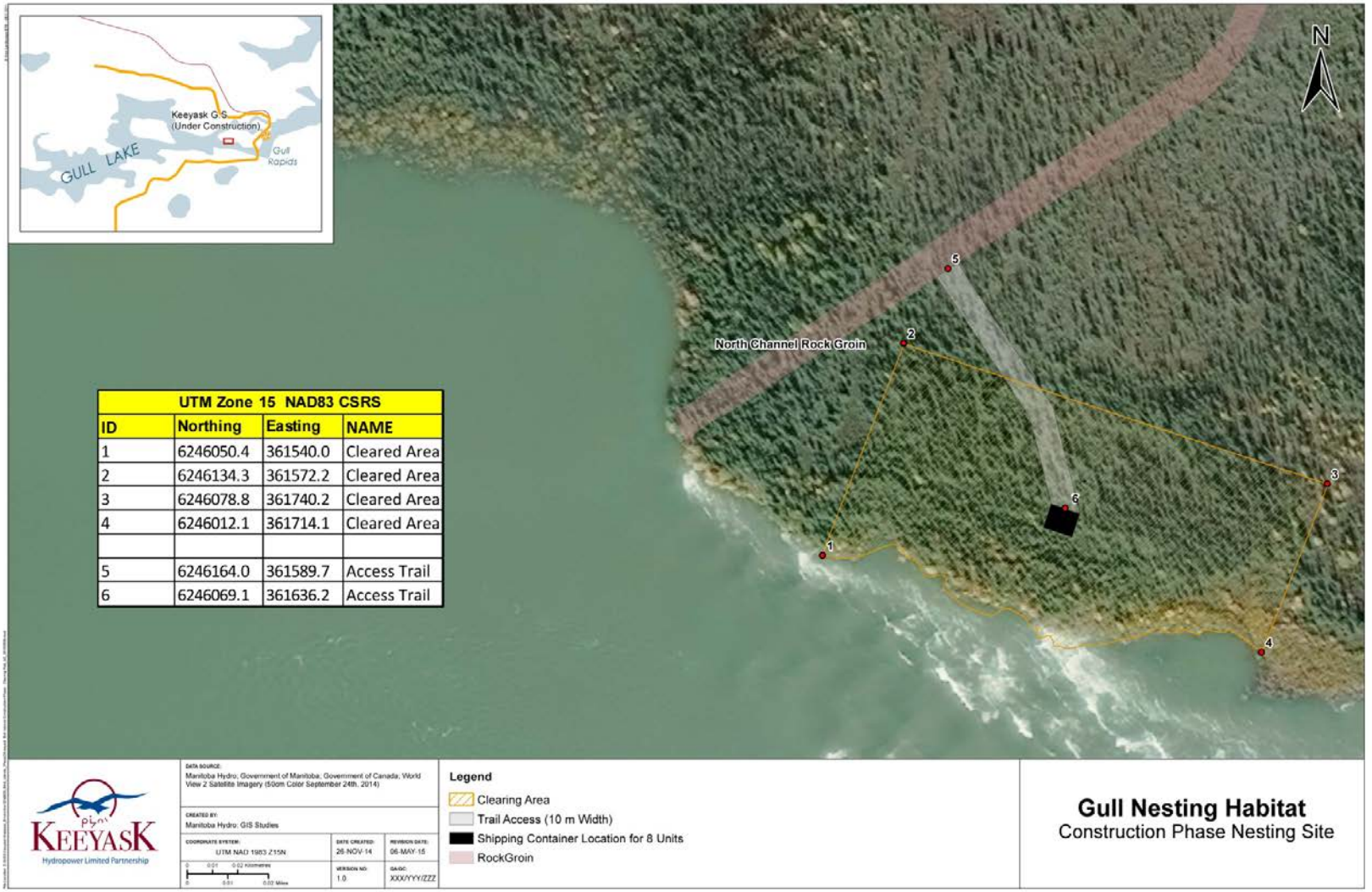
Maintenance will occur as follows:

SPRING

- An inspection of elevated platforms (shipping containers), camera, decoys and audio devices will be completed to identify and repair any damage.
- Nesting substrate will be inspected and topped up as needed, on both the elevated platforms and the ground.

FALL

- A fall inspection will be completed to identify any damage sustained throughout the season. Any damage will be corrected.
- Decoys, camera assembly and mount, and audio systems will be removed and stored appropriately.



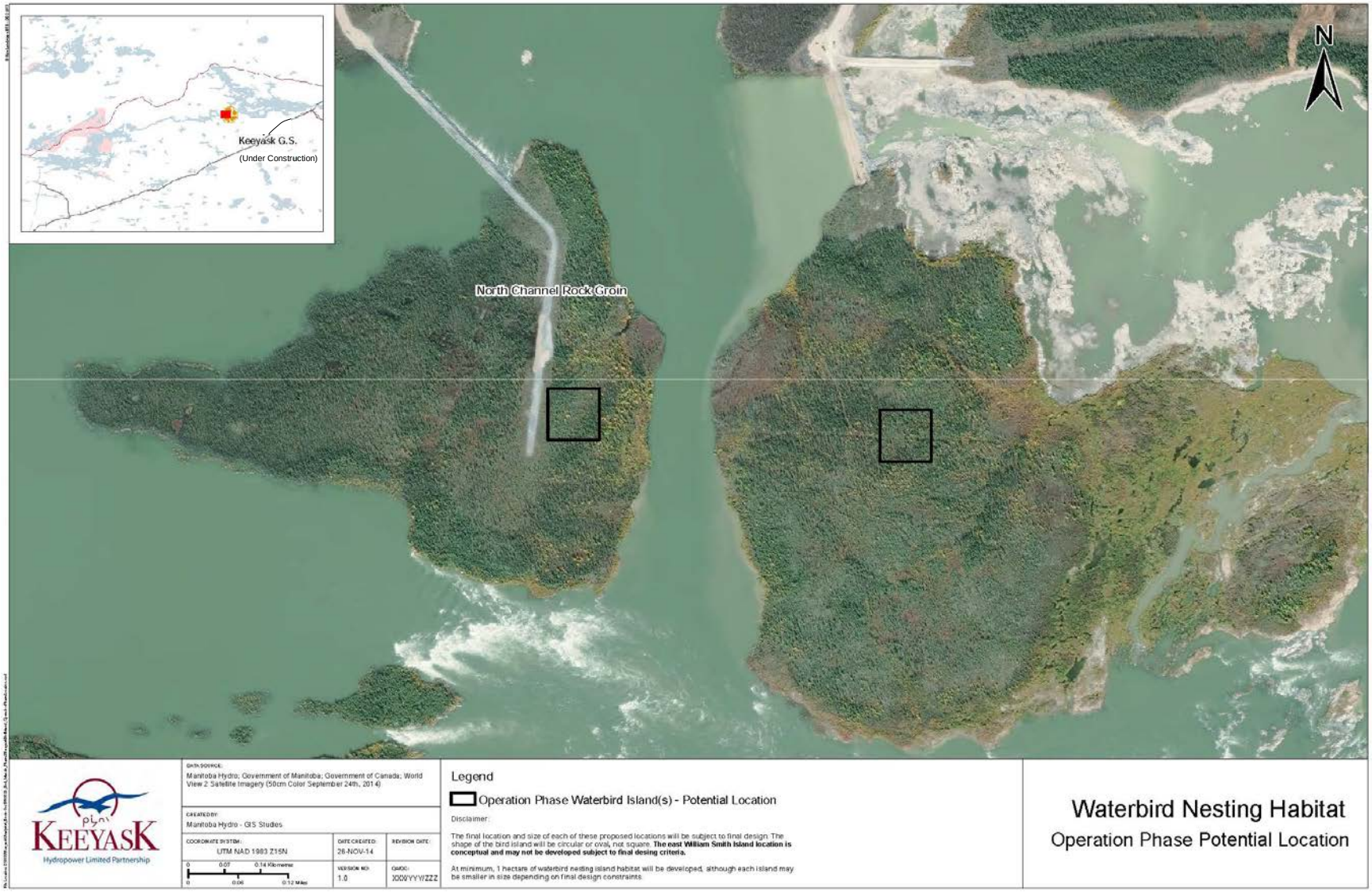
Map 5: Location of the construction phase gull nesting habitat area, on the south shore of William Smith Island (west)

4.1.3.2.3 OPERATION PHASE

To ensure that displaced gull and tern colonies continue to breed within Study Zone 3 during the operation phase of the Project, portions of William Smith Island will be modified and built up to serve as a colonial waterbird nesting area in the future reservoir (Map 6). One or two island areas may be included in the final design at this location.

During the construction phase of the Project, William Smith Island will be prepared (i.e., tree clearing) and enhanced (i.e., placement of gravel and rock substrate) to serve as a permanent, long-term colonial waterbird nesting island in the future reservoir. The future island area(s) will be a minimum of 1 ha in size (total) and comprised of rocky substrate and gravel to provide permanent, long-term nesting habitat for colonial waterbirds displaced from Gull Rapids and Birthday Rapids. If monitoring of the constructed gull habitat during the construction phase indicates the audio attractants used were successful in initiating the use of these new areas by waterbirds, these devices will also be considered for use during the first year or two of operation for the permanent waterbird nesting area.

An island at Birthday Rapids, another area known to provide suitable waterbird nesting habitat in the Project area, may also be enhanced to maintain suitable waterbird nesting habitat during the operations phase. Due to limited accessibility at this location, enhancement would likely include hand-clearing of vegetation and some surface material enhancement. It is expected that natural ice scouring of the island at this location will also aid in forming suitable site conditions for waterbird nesting habitat (i.e., bare rocky substrate with sparse vegetation).



Map 6: Potential location of operation phase waterbird nesting island(s) on William Smith Island (east and west)

4.2 MALLARD HABITAT REPLACEMENT

4.2.1 BACKGROUND

Mallards are dabbling ducks that feed on plant material (*e.g.,* pondweed and sedges) and aquatic insects (*e.g.*, amphipods) in shallow water. They are highly valued by the KCNs as a traditionally hunted species that not only migrates through but also breeds within Study Zone 4 (Map 3). Suitable mallard foraging and brood-rearing habitat (*i.e.,* concealment cover) in this area is associated with inland lakes and creeks that support marsh habitat; mallards generally nest close to the water.

4.2.2 PROJECT EFFECTS AND MITIGATION

Project development will result in the direct loss of 3% (1,716 ha) of the total amount of available mallard upland nesting cover habitat within Study Zone 4 (KHLP 2012).

Reservoir creation will result in the long-term loss of approximately 2.8% (1,896 ha) of the total available mallard brood-rearing habitat (*e.g.*, sluggish, sedge-filled creeks and wetlands) within Study Zone 4. Along the Nelson River, flooding of bays, inlets, creek mouths and shorelines will have a long-term adverse effect on the quality of local migratory staging habitats for mallards. The quality of staging habitats will decrease due to the loss of emergent vegetation, which provides food, shelter and cover for mallards.

Although upland nesting cover for mallards is generally not considered to be limiting in boreal Manitoba, the use of nesting tunnels in the newly developed wetland enhancement area (Section 2.1) will provide some temporary nesting habitat until vegetation becomes established in this area.

4.2.3 MITIGATION DETAILS

4.2.3.1 NESTING TUNNELS

Nesting tunnels are typically used in the Prairies, in areas where upland nesting cover has been substantially reduced as a result of agricultural practices. In these areas, occupancy by mallards has been observed to be between 50%-70% (Thompson *pers. comm.* 2011; Eskowich et al. 1998). Their application in boreal environments is limited to the boreal transition zone, which found mallard occupancy rates to be very low (Thompson *pers. comm.* 2011). Based on this information, only a small number of 'test' nesting tunnels will initially be deployed and monitored within the marsh wetland enhancement area. If monitoring results reveal occupancy results >50%, additional tunnels may be added in other wetland areas near the Project.

4.2.3.2 DESIGN

Nesting tunnels will be constructed following the design described by Eskowich *et al.* (1998):

Source: MHHC

Photo 6: Nesting tunnels used by Manitoba Habitat Heritage Corporation (MHHC) in southern Manitoba

TUNNEL STRUCTURE

- Tunnel cylinders will be constructed from 14-gauge welded-wire fencing with a 5-cm x 5-cm mesh.
- Using a 90-cm length of wire mesh, an inner tunnel approximately 30 cm in diameter will be formed.
- Flax straw or another durable grass or straw will be used as the nesting tunnel walls. One 23-kg-square bale makes approximately five to seven tunnels.
- Straw will be spread onto a 120 cm length of wire mesh to a depth of 5 cm and this mesh will be rolled tightly around the inner tunnel and secured together with galvanized wire to complete the nest tunnel structure.
- Softer nesting materials gathered from local grasses will be used inside the tunnels as a nesting base.
- The nesting tunnel base will be constructed of a 2.5-m-long, 4-cm-square steel tube pipe.
- A nesting tunnel cradle is fabricated from a 45-cm steel pipe, which is welded onto the top of a 75-cm long, 2.5-cm-square steel pipe to form a "T" which will slide into the base pipe.

- To complete the nesting tunnel cradle two lengths of 0.75-cm steel rod are bent to form a "U" shaped cradle and welded onto each end of the cradle support. The wire mesh nest tunnel is fastened to these cradle supports.
- Three equally spaced holes will be drilled in the 75-cm-long insert pipe and one hole will be drilled near the top of the 2.5-m-long base pipe for nesting tunnel height adjustments.

Five nesting tunnels will initially be installed in the newly developed wetland enhancement area (see Section 2.1) once it is constructed. Nesting tunnels will be positioned at the open water edge of the emergent vegetation zone, with tunnels facing toward open water (Eskowich *et al.* 1998).

4.2.3.3 CONSTRUCTION AND INSTALLATION

Nesting tunnels and bases will be pre-constructed and assembled at the installation site.

Installation of tunnels will occur once wetland vegetation within the newly developed wetland area has been planted. Installation will occur in early May, prior to the beginning of the nesting season.

Installation will occur as follows:

- The nesting tunnel base post will be pounded into the wetland bottom substrate to a depth of 1 meter or until the post is secure;
- The nesting tunnel cradle will be inserted into the base post and height adjusted so that the bottom of cradle is approximately 1 m above the water level;
- The nesting tunnel will be secured to the cradle with galvanized wire; and
- Local grasses will be used to fill the inside of the nesting tunnels one-half to two-thirds full to attract mallards during the nesting season.

4.2.3.4 MAINTENANCE

Nesting tunnels will require periodic maintenance (every few years) to ensure the structure is secure and equipped with adequate cover material (i.e., straw, grasses). During the first three years following installation, any damage to the structures will be addressed during a scheduled late-winter maintenance visit. Following this, maintenance will occur every 3 years that tunnels remain in place. The use of nesting tunnels will be monitored under the TEMP in conjunction with monitoring of the constructed marsh wetland area.

4.3 RAPTOR HABITAT REPLACEMENT

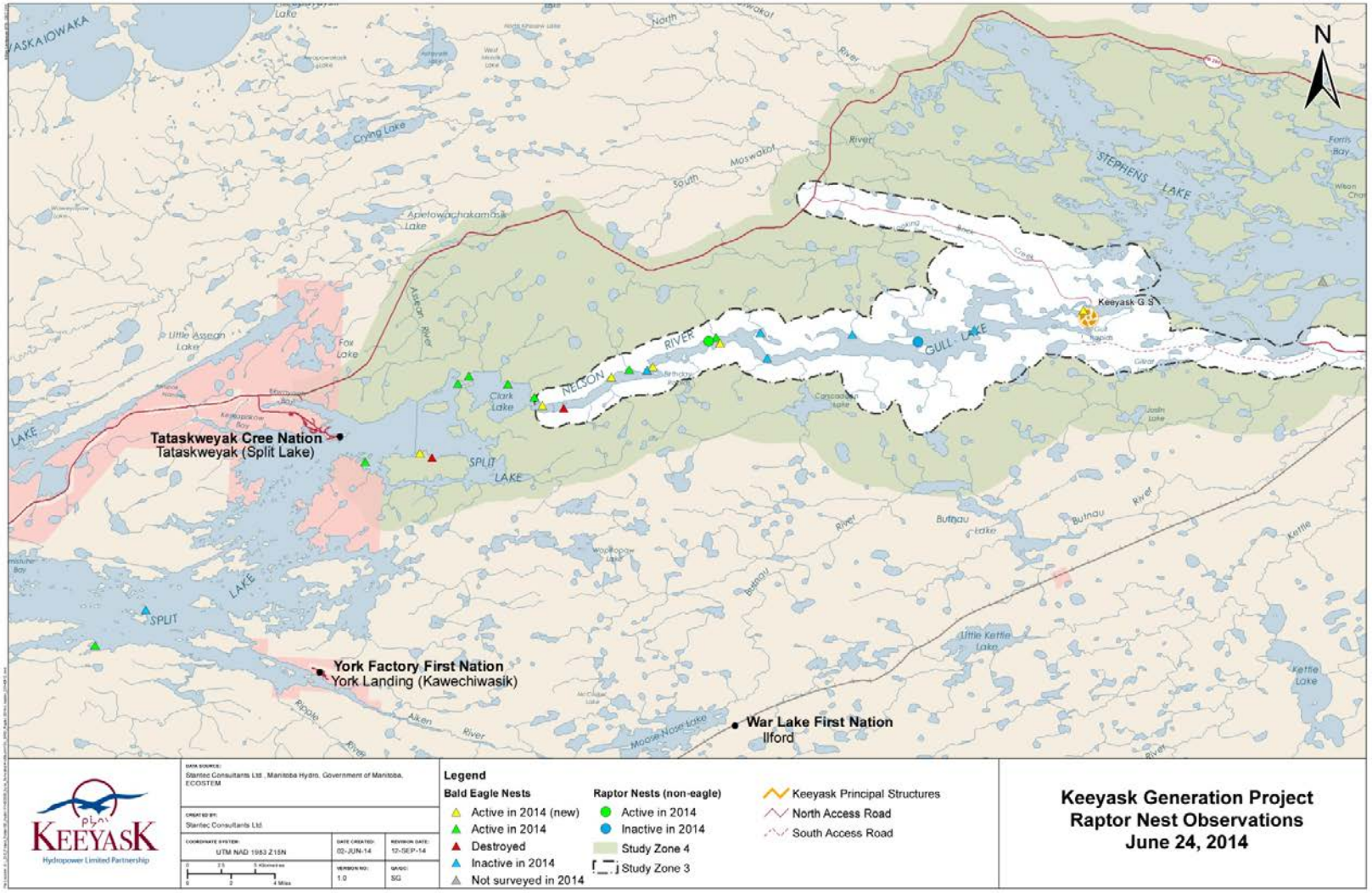
4.3.1 BACKGROUND

Bald eagle, a highly valued species by KCNs members, was the most common and abundant raptor found in the Keeyask region during EIS studies. Red-tailed hawks and northern harriers were other raptors also

frequently encountered. A total of nineteen raptor species (including eagles, hawks, falcons, ospreys and owls) potentially occur within Study Zone 4 (Map 3).

Bald eagles typically migrate into Study Zone 4 in March or April and initiate nesting shortly thereafter. The nests consist of sticks and commonly occur in tall trees adjacent to water. While it is common for these nests to be reused year after year, they are sometimes abandoned in favour of new sites, especially if they have been affected by environmental change such as forest fire or extreme weather events. In the summer of 2013, widespread forest fires burned a large portion of Study Zone 4, affecting some of the eagle nests currently located along the Nelson River. Since raptor nest locations are likely to change over time, efforts will be taken to update nest locations during the various stages of Project development, through the TEMP. Aerial surveys for raptor nests will occur in the summer (*e.g.,* July) in each year there is Project clearing planned.

Most bald eagle nests observed in Study Zone 4 occur along the Nelson River where forage (primarily medium- and larger-bodied fish) is abundant. Based on an aerial survey conducted in June 2014, 13 active bald eagle nests and one active hawk nest were documented along the Nelson River shoreline between and including Split Lake and Gull Rapids (Map 7). Of these, eight nests (located between Birthday Rapids and Gull Rapids) have the potential to be affected by Project development.



Map 7: Raptor nest observations within Study Zone 4 in summer 2014

4.3.2 PROJECT EFFECTS AND MITIGATION

Land clearing for the development of the Project will result in the loss of some potential raptor perching and/or nesting habitat. It is anticipated that Project clearing will require the removal of up to eight raptor nests located along the shores of the Nelson River (Map 7). The exact number and location will be verified by an aerial nesting survey conducted annually in July during each year that Project clearing occurs. As nests are removed by Project development, alternate sites for nest replacement will be identified.

Since peatland disintegration and mineral erosion along shorelines is anticipated to continue following reservoir creation, shoreline trees used for nesting by raptors will likely continue to be lost over time (*i.e.,* toppling at sites immediately adjacent to the waterway). Operation phase monitoring under the TEMP will determine if additional raptor nests need to be replaced in more suitable areas.

4.3.3 MITIGATION DETAILS

4.3.3.1 NEST PLATFORMS

All raptor nests that are observed to be active in a given year through annual summer aerial surveys (done through the TEMP), and are subsequently removed by Project development, will be replaced with artificial nest platforms in appropriate sites along the Nelson River shorelines. Sites for replacement nests will be determined in consultation with Manitoba Conservation and Water Stewardship (MCWS).

4.3.3.2 DESIGN

Nesting platforms will be approximately 1.5 m in diameter (large enough to accommodate a nest) and capable of supporting 200 lbs of accumulated nest material (MacDonald 2008). Platforms will be constructed out of untreated cedar and marine grade plywood (for longevity, >5 years) and attached to tall wooden poles (>10 m in height). Woody materials such as tree branches and shrub stems taken from cleared vegetation will be interwoven (to form a nest base) and secured to the nesting platform.

4.3.3.3 CONSTRUCTION AND INSTALLATION

In order to minimize disturbance to breeding raptors, removal of nests from trees will occur outside of the sensitive breeding period, in conjunction with Project clearing activities. To minimize future disturbance to eagle nesting platforms, all replacement nests will be situated such that they have a permanent buffer of 100 m from any other Project-related disturbance (i.e., ongoing construction activities or future reservoir expansion), as per Manitoba Forest Management Guidelines for Terrestrial Buffers (2010).

With the assistance of the Project bird biologist, appropriate sites for nest relocation will be determined. The following characteristics will be considered in determining the final location of these sites:

- To the extent feasible, nests should be relocated as close as possible to the original nest site.

- Nests should be no closer than 600m from other existing nests to reduce competition and territoriality (Mahaffy and Frenzel 1987).
- Poles should be higher than surrounding trees or features to allow for good visibility (Livingston *et al.* 1990).
- Peninsulas and areas near creek mouths provide good locations for nesting. Eagles nesting along the Nelson River tend to select trees in these areas due to high visibility of surrounding area.
- Relocation should be within 200m of the future shoreline of the Nelson River.
- Areas along the north shore of the Nelson River may provide better nest sites than areas along the south shore. A long-term study suggests protection from prevailing winds and maximization of sunlight (coming from the south) during crucial incubation periods are factors influencing nest selection in bald eagles (Gerrad *et al.* 1975). In Study Zone 3, the majority of nests are located along the north shore of the Nelson River.
- Accessibility to future shoreline areas, as the installation of a tall pole structure and nest platform requires heavy machinery.

4.3.3.4 MAINTENANCE

Since eagles maintain their own nests, no ongoing maintenance is proposed once the platforms are installed.

4.4 OLIVE-SIDED FLYCATCHER HABITAT REPLACEMENT

4.4.1 BACKGROUND

The olive-sided flycatcher is a neotropical migrant songbird listed as threatened by the *Species at Risk Act* (SARA; Schedule 1) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It breeds and nests in coniferous forests, often near forest openings and edges where tall trees are available for perching and where flying insects are abundant. This species is associated with mature forest stands with diverse canopy structure, bogs and post-fire habitats. Within Study Zone 4 (Map 3), primary olive-sided flycatcher breeding habitat is coniferous forest or woodland edge adjacent to wetlands, creeks and regenerating forests.

Bird studies within Study Area 3 revealed variable numbers of olive-sided flycatchers between 2001 and 2003. The majority of olive-sided flycatchers detected were in association with riparian habitat. From 2001-2003, the overall average breeding density of olive-sided flycatchers was 0.03 birds/ha (KHLP 2012).

Olive-sided flycatcher was identified as a Valued Ecosystem Component (VEC) in the EIS due to its regulatory status. Low offspring survival may impair this species' ability to maintain viable populations in suitable habitat, thus limiting its ability to recover from reduced habitat availability following environmental change. As a result, local olive-sided flycatcher populations may be more vulnerable to Project effects.

4.4.2 PROJECT EFFECTS AND MITIGATION

As land is cleared for Project development, approximately 3.7% (352 ha) of the regional primary olive-sided flycatcher breeding habitat will be lost or reduced in quality for the long-term (ECOSTEM et al. 2013).

Operation effects on olive-sided flycatcher are associated with the long-term loss of breeding habitat due to reservoir filling. Over time, peatland disintegration, shoreline erosion and changes to vegetation resulting from changes in groundwater elevation may contribute to the loss of some additional olive-sided flycatcher habitat (potential loss of up to 120 ha or 1% of total available olive-sided flycatcher habitat within Study Area 4.

In the EIS, proposed mitigation measures for olive-sided flycatcher included retaining some of the treed areas located within the future reservoir back bays to off-set some of the losses in olive-sided flycatcher habitat, and installing perching structures in open, decommissioned borrow areas that retain water (sources of invertebrates for olive-sided flycatchers). Following the submission of the EIS in 2012, the landscape within Study Zone 4 changed substantially following widespread forest fires in the summer of 2013. Habitat for olive-sided flycatcher has naturally been enhanced as a result of these fires, which create forest edge for nesting and perching poles (i.e., dead standing trees) for foraging. In light of these recent changes to the landscape, the proposed mitigation measures will be modified to include a smaller scale program.

4.4.3 MITIGATION DETAILS

Perching structures will be installed in open, decommissioned Project areas such are borrow or quarry areas that have permanent ponding present within them. Between 5 and 10 perching poles will initially be installed, and monitoring will help to determine whether any additional structures should be added throughout the construction phase. The design of the perching poles will include sizing the platform in a manner such that raptors are unlikely to use them (i.e., smaller in size).

Once borrow and quarry areas are no longer required for the Project, they will be reviewed for their potential suitability for the installation of perching structures. Use of the structures by olive-sided flycatcher, as well as any newly created olive-sided flycatcher habitat in the Project area, will be monitored and documented through the TEMP; if this measure is observed to be beneficial to olive-sided flycatcher, it may be expanded to other areas within the Project footprint. There is no planned maintenance for these structures.

4.5 COMMON NIGHTHAWK HABITAT REPLACEMENT

4.5.1 BACKGROUND

Common nighthawk is currently experiencing widespread declines throughout its range, and as such is listed as threatened under SARA (Schedule 1), and threatened under the *Manitoba Endangered Species and Ecosystems Act* and COSEWIC. Common nighthawks forage on flying insects at dusk, usually in forest openings that

support aquatic habitat (*e.g.,* wetlands, lakes) and/or regenerating forest where insects are abundant. Nests are constructed on the ground, often on hard, dry mineral substrates including rocky outcrops, forest openings, and regenerating forest supporting little ground vegetation. They are adapted to living in natural and human disturbed habitats, nesting on bare ground, sand or gravel substrates, and particularly favour recent burns.

During field studies, common nighthawks were observed foraging in habitats considered widespread and abundant throughout Study Zone 4 (*e.g.,* regenerating forests, bogs, wetlands, creeks and inland lakes; Map 3). Suitable nesting habitat, while widespread, was not considered abundant within Study Zone 4 at the time of the environmental assessment for the Project. However, the 2013 wildfire created more common nighthawk habitat within the Keeyask region.

4.5.2 PROJECT EFFECTS AND MITIGATION

As land is cleared for Project development, up to 750 ha (7.4%) of primary common nighthawk breeding habitat in Study Zone 4 will be lost or reduced in quality (ECOSTEM et al. 2013). Approximately 3,689 ha of suitable habitat will be temporarily created through reservoir clearing, resulting in a short-term increase in common nighthawk primary breeding habitat within Study Zone 4 during the construction period; however this area will be flooded during operations and as such will not provide any long-term habitat.

In the EIS, the KHLP made commitments to offset common nighthawk habitat loss by allocating portions of decommissioned borrow sites for common nighthawk nesting (i.e., leaving areas unvegetated, with bare mineral substrate). Due to the widespread creation of common nighthawk breeding habitat resulting from the 2013 wildfires, the value of this mitigation measure has likely lessened; however, a smaller scale program will still be implemented and monitoring through the TEMP will help to determine whether any additional areas should be added throughout the construction phase.

4.5.3 MITIGATION DETAILS

4.5.3.1 DESIGN

Highly territorial, common nighthawk maintains large territories of up to 28 ha in rural environments (COSWEIC 2007). Territory size is dependent upon availability of food resources and nest sites, with territory size decreasing with increasing resources (COSEWIC 2007). Within these territories, nighthawks will nest on the ground, in clearings containing low or no vegetation (Allen and Peters 2012; COSEWIC 2007). Suitable common nighthawk nesting habitat is associated with, but not limited to: forest clearings, rock outcrops, beaches and burned-over areas (COSEWIC 2007). Study on the minimum patch size or forest opening required to support common nighthawk nesting is lacking, however a European study of nightjar (a family of birds that includes nighthawks) habitat use found that clearings smaller than 0.7 ha were not occupied (Wichmann 2004).

Using 0.7 ha as a minimum patch size, habitat restoration will occur within select sites of decommissioned borrow areas. Sites selected will be on the flat, dry, upland portions of the borrow areas. Patches will be a minimum of 50 m wide and will be located adjacent to forest edge where possible (Wichmann 2004).

Substrate will consist of bare ground, which may be gravel or sand. Between 5 and 10 patches of common nighthawk habitat will initially be implemented, and monitoring through the TEMP will help to determine whether any additional areas should be added throughout the construction phase.

4.5.3.2 CONSTRUCTION AND INSTALLATION

Delineating areas for common nighthawk habitat restoration will occur following borrow area and quarry decommissioning. At this time, location and layout of areas retained for nighthawk habitat will be determined in conjunction with the Project bird biologist, with consideration of other borrow area mitigation measures, including revegetation plans for these areas. Any areas identified for common nighthawk habitat restoration will be clearly identified in the overall revegetation strategy, as outlined in the *Keeyask Generation Project Vegetation Rehabilitation Plan* (VRP).

4.5.3.3 MAINTENANCE

Common nighthawk habitat is periodically maintained through wildfire. Given that fire is a common occurrence in this area, additional maintenance (*i.e.,* clearing of any regenerating vegetation) is not proposed.

5.0 MAMMALS MITIGATION

5.1 BEAVER AND MUSKRAT

5.1.1 BACKGROUND

Beaver is a keystone species capable of creating aquatic habitats and altering terrestrial habitats for many wildlife species. Beaver are important to the KCNs for cultural, ecological and economic reasons. Beaver inhabit waterbodies in forested areas. During field studies for Keeyask, beavers were observed to be most active in stream and pond habitat types, and their presence was seldom detected in upland habitats. They may use ponds in northern ribbed fen habitat, and can be found around willows in glaciofluvial complexes. Beavers are not usually found along the Nelson River, as the water regime is not suitable for beaver habitat. Primary beaver habitat is generally in broadleaf forests, marsh, and tall shrubs. Secondary habitat is generally found in black spruce, jack pine, or tamarack-dominated stands, and areas with low vegetation or young regeneration.

The current regional beaver population in the Study Area 4 (Map 3) is estimated at approximately 250 active colonies, and there are 23 active lodges in the local area (Study Zone 3; Map 3).

Muskrats generally inhabit the edge of emergent vegetation zones, and are absent from large bodies of open water where wave action is greater. They require a source of permanent water such as marshes, ponds, lakes, streams, and rivers for habitat. In northern climates, muskrat occupy waterbodies that do not freeze to the bottom in winter.

Muskrat signs were observed in aquatic habitats in Study Zone 3 and Study Zone 4. Based on aerial surveys and signs on lake perimeters, muskrat select smaller waterbodies in these areas, which is consistent with their preference for ponds and slow-flowing rivers and streams. Relatively few muskrat appear to make use of the habitat on the shores of the Nelson River. Muskrat were active on lakes and in riparian and upland areas in Study Zone 1 in summer and winter, suggesting that they inhabit areas to be affected by the Project.

5.1.2 PROJECT EFFECTS AND MITIGATION

Project effects on beaver and muskrat during construction include habitat loss and mortality. Although vegetation clearing will begin during construction, habitat loss is considered in the operation effects, where it will primarily occur during reservoir impoundment, and become permanent. Between 20 and 30 active beaver colonies will be affected by clearing in Study Zone 3, which is less than 10% of the estimated population in Study Zone 4.

Project effects on beaver and muskrat during operation include habitat loss and alteration due in part to fluctuating water levels, and changes in distribution in Study Zone 3. The 1 m water level fluctuation within the reservoir will make the future shoreline unsuitable habitat for beaver. Reservoir impoundment will result

in a loss of beaver and muskrat habitat as creeks, tributaries, and small ponds and lakes will be flooded. As the reservoir impoundment will flood habitat for these species, beaver and muskrat will be humanely trapped out of affected areas to prevent the exposure and displacement deaths of these animals.

It is also anticipated that some culverts along the Project access roads may become blocked due to beaver dam construction. Beaver is one of nature's prolific engineers, often creating dams along or across access roads and at culverts in developed areas (McComb et al 1998, Curtis and Jensen 2004). In many cases, to avoid damage to culverts, roads or bridges from beaver dams rupturing or the impounding water, attempts are made to remove unwanted dams or to trap out beavers adjacent to dams. In almost all cases, dam removal efforts fail as beavers repair their damaged dam within a matter of days (Nolte et al. 2005). Removing problem beavers can be effective; however this approach can ultimately affect wetland function (McCall et al. 1996). Further, because beaver are territorial, dispersing animals would likely re-colonize vacant habitat and result in a recurring blockage problem. The perpetual removal of beaver is not the best management practice (Vermont Fish and Wildlife Department 2004). To address human safety hazards within the Project area, beaver baffles will be deployed at any culverts that are blocked due to beaver dam construction.

5.1.3 MITIGATION DETAILS

5.1.3.1 BEAVER BAFFLES

Beaver baffles (also commonly referred to as beaver bafflers or beaver deceivers) are physical structures that are installed at or around culvert entrances to prevent beavers from getting inside. Should safety issues arise due to flooding caused by beaver dam construction near Project culverts, beaver baffles (Photo 7) will be installed to avoid the removal of dams and beavers, where possible (Figure 6). The proven expertise of MCWS in installing these devices will be employed to remedy any problem beaver situations. Beaver pond levelers (see Photo 8) and other flow devices can also be utilized to regulate the amount of impounded water located behind beaver dams, which if ruptured, could wash out roads, culverts and bridges.

Source: Manitoba Conservation and Water Stewardship

Photo 7: Example of a beaver baffle installed on a culvert

Source: Manitoba Conservation and Water Stewardship

Photo 8: Example of a beaver pond leveler installed on a culvert

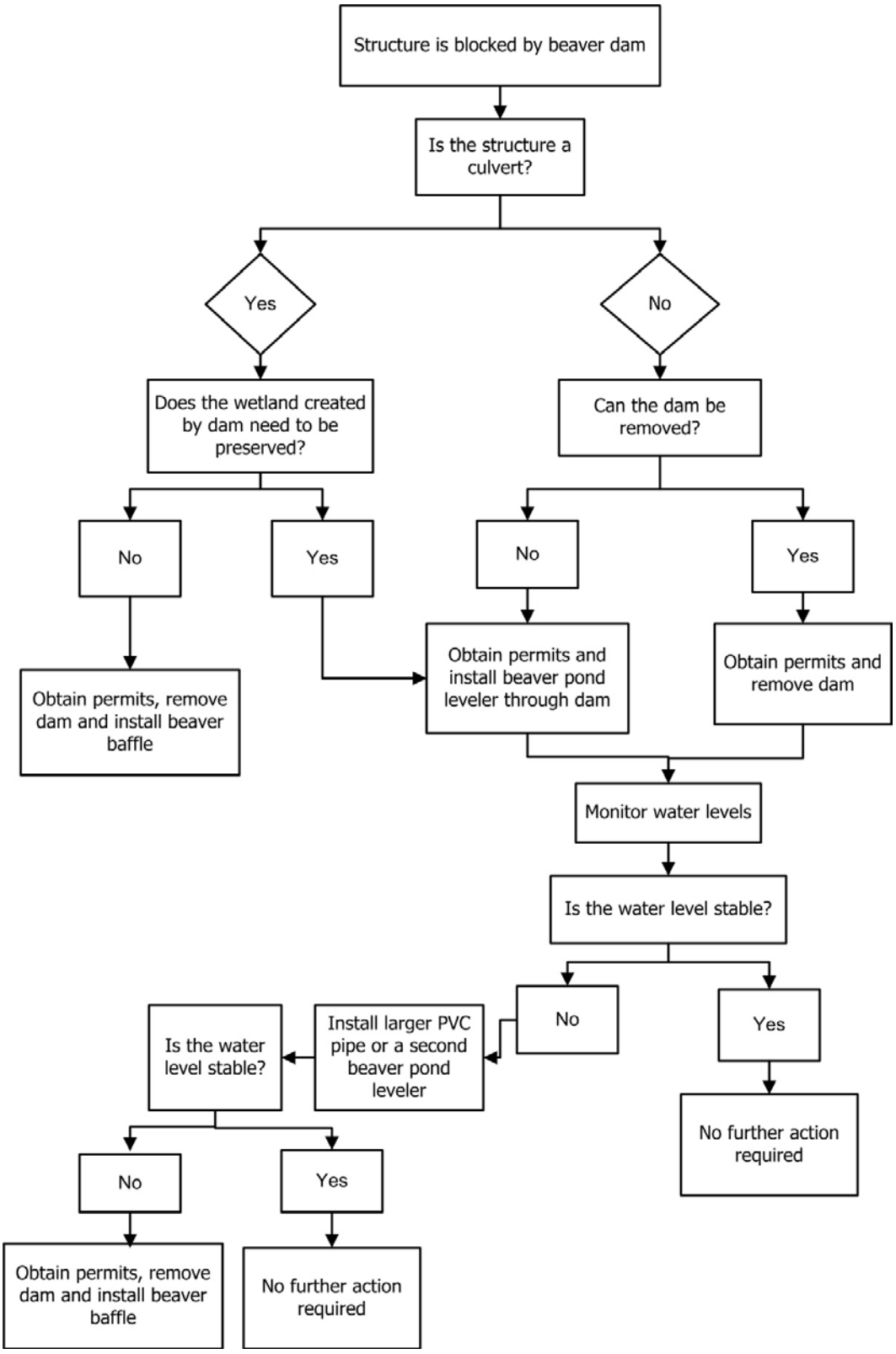


Figure 6: Decision tree for installation of beaver baffles and pond levelers

5.1.3.2 TRAPPING OF BEAVER AND MUSKRAT

Beaver and muskrat are important species in the Keeyask region, having cultural, economic, and ecological value. As the future reservoir impoundment will flood habitat for these species, beaver and muskrat will be humanely trapped from the reservoir footprint to manage inadvertent winter mortality that would likely occur during operation. This mitigation measure is designed to minimize the distress of these furbearers by removing individuals prior to reservoir impoundment.

Beaver monitoring (as described in the TEMP) will include an annual fall helicopter survey to locate beaver lodges in Study Zone 3 (Map 3). Helicopter flights will be flown at low-level using two observers. Beaver lodge locations will be recorded using GPS.

Registered trappers, ideally holders of the affected traplines, will search for and trap animals in Study Zone 1. Data from the aerial surveys will be provided to trappers to locate active beaver lodges; any muskrats present in these areas will also be trapped. In addition to the aerial surveys, ground searches of waterbodies and watercourses throughout the area may also be required to locate all lodges. Trappers will set traps for beaver and muskrat at appropriate locations. Traps will be checked and re-set regularly during the trapping season to ensure as many beaver and muskrat are trapped as possible. Trapping will follow humane trapping standards, as set in the Provincial guidelines. The disposition of beaver and muskrat meat and fur will follow all regulations and standards established by the Provincial authority.

Because it will likely take a few years to trap out many of the beaver and muskrat within the reservoir area, the program should begin two to three years prior to reservoir impoundment, and it should occur on a yearly basis until all vegetation is cleared from riparian areas or until the reservoir is impounded. The removal of beaver and muskrat by registered trappers will be monitored and quantified. The trapping protocol will be adjusted as needed to meet the reservoir clearing and impoundment schedules.

6.0 LITERATURE CITED

Allen, M. and K. Peters. 2012. Nest survival, phenology, and nest-site characteristics of common nighthawks in a New Jersey pine-barrens grassland. Wilson Journal of Ornithology. 124(1): 113-118.

Brennan, 2009: Floating Island Created for Nesting Birds in Anaheim; Living Green in Orange County, June 24, 2009.

British Trust for Conservation Volunteers. 2009: BTCV Handbook – Waterways & Wetlands; Chapter 11 Islands & Rafts.

California Department of Fish and Game. 2008. Brush and Slash Piles – Purpose and Need. Available online: https://r1.dfg.ca.gov/portal/ConservationPermitting/Timber/Wildlife/WildlifeHabitats/BrushSlashPiles/tabid/923/Default.aspx. Accessed June 11, 2014.

Canada Culvert. 2014a. Beaver Stop ®. Available online: http://www.canadaculvert.com/product/beaver-stop. Accessed February 13, 2014.

COSEWIC. 2007. COSEWIC Status Report on the Common Nighthawk. 27 pp. Available online at: http://novascotia.ca/natr/wildlife/biodiversity/pdf/statusreports/sr_CommonNighthawk.pdf

Curtis, P. D, and P. G. Jensen. 2004. Habitat features affecting beaver occupancy along roadsides in New York State. The Journal of Wildlife Management, Vol. 68, No. 2 (Apr., 2004), pp. 278-287.

Dunlop, C.L., H. Blokpoel, S. Jarvie. 1996. Nesting rafts as a management tool for a declining common tern (Sterna hirundo) colony. Colonial waterbirds. 14(2): 116-120

ECOSTEM Ltd., Wildlife Resources Consulting Services Inc., and Stantec Consulting Ltd. 2013. Keeyask Generation Project Environmental Studies Program Report #13-02: Habitat Relationships and Wildlife Habitat Quality Models for the Keeyask Region. Report Prepared for Manitoba Hydro. 456 pp.

Eskowich, K., D. McKinnon, G. Brewster, and K. Belcher. 1998. Preference and use of nest baskets and nest tunnels by mallards in the parkland of Saskatchewan. Wildlife Society Bulletin 26(4): 881-885.

Government of Canada. 1991.

Jarvie, S. and H. Blokpoel. 1996. Reefrafts for common terns and fish: guidelines for design, construction, and operation. Environment Canada, Downsview. ON, Canada. Great Lakes 2000 Cleanup Fund Fact Sheet.

Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project: Response to EIS Guidelines.

Langor, D.W. N.D. 2008. The benefits of chipper residue piles for biodiversity in boreal mixedwood forests. A research report produced by Natural Resources Canada, Canadian Forest Service for Daishowa Marubeni Inc., Peace River Division. 37pp.

Livingston, S.A., C.S. Todd, W.B. Krohn and R.B. Owen, Jr. 1990. Habitat models for nesting bald eagles in Maine. Journal of Wildlife Management 54(4): 644-653.

MacDonald, M. 2008. Washington State Department of Transportation Northwest Region Biology. WSDOT Guidance on Wildlife Habitat Structures in Wetland Mitigation Sites. Accessed online at: http://www.wsdot.wa.gov/NR/rdonlyres/9093EB40-A81E-4094-BAA9-C376435A8D06/0/Mit_HabitatStructure.pdf. Assessed June 11, 2014.

McCall, T.C., T.P. Hodgman, D.R. Diefenbach and R.B Owen, Jr. 1996. Beaver populations and their relation to wetland habitat and breeding waterfowl in Maine. Wetlands. Vol. 16, No.2. pp.163– 172.

McComb, W.C., Sedell, J.R. & Buchlolz, T.D. 1990 Dam- site selection by beavers in an eastern Oregon basin. Great Basin Naturalist, 50, 273-281.

Nolte, D., Arner, D. H., Paulson, J., Jones, J.C., and Trent, A. 2005. How To Keep Beavers from Plugging Culverts. USDA National Wildlife Research Center - Staff Publications. Paper 559.

Sustainability Manitoba. Undated. Applying Manitoba's Water Policies. 85 pp.

Thompson, J. 2011. Email correspondence between Jonathan Thompson (Senior Regional Research Biologist- Western Region, Ducks Unlimited Canada. Edmonton, Alberta), Chris Smith (Ducks Unlimited Canada, Boreal Program, The Pas, MB) and Leane Wyenberg (Stantec) on December 8, 2011.

Vermont Fish and Wildlife Department. 2004. Best management practices for resolving human-beaver conflicts in Vermont. Produced by Vermont Fish and Wildlife Department and Vermont Department of Environmental Conservation. Accessed at: http://www.vtfishandwildlife.com/library/reports_and_documents/Furbearer/Best_Management_Practices_for_Human-Beaver_Conflicts.pdf Pp. 28.