



Keeyask Generation Project
Terrestrial Effects Monitoring Plan

Bank Swallow Monitoring Report

TEMP-2017-08



KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2017-08

BANK SWALLOW MONITORING REPORT

Prepared for

Manitoba Hydro

By

Wildlife Resource Consulting Services MB Inc.

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station will affect the environment, and whether or not more needs to be done to reduce harmful effects.

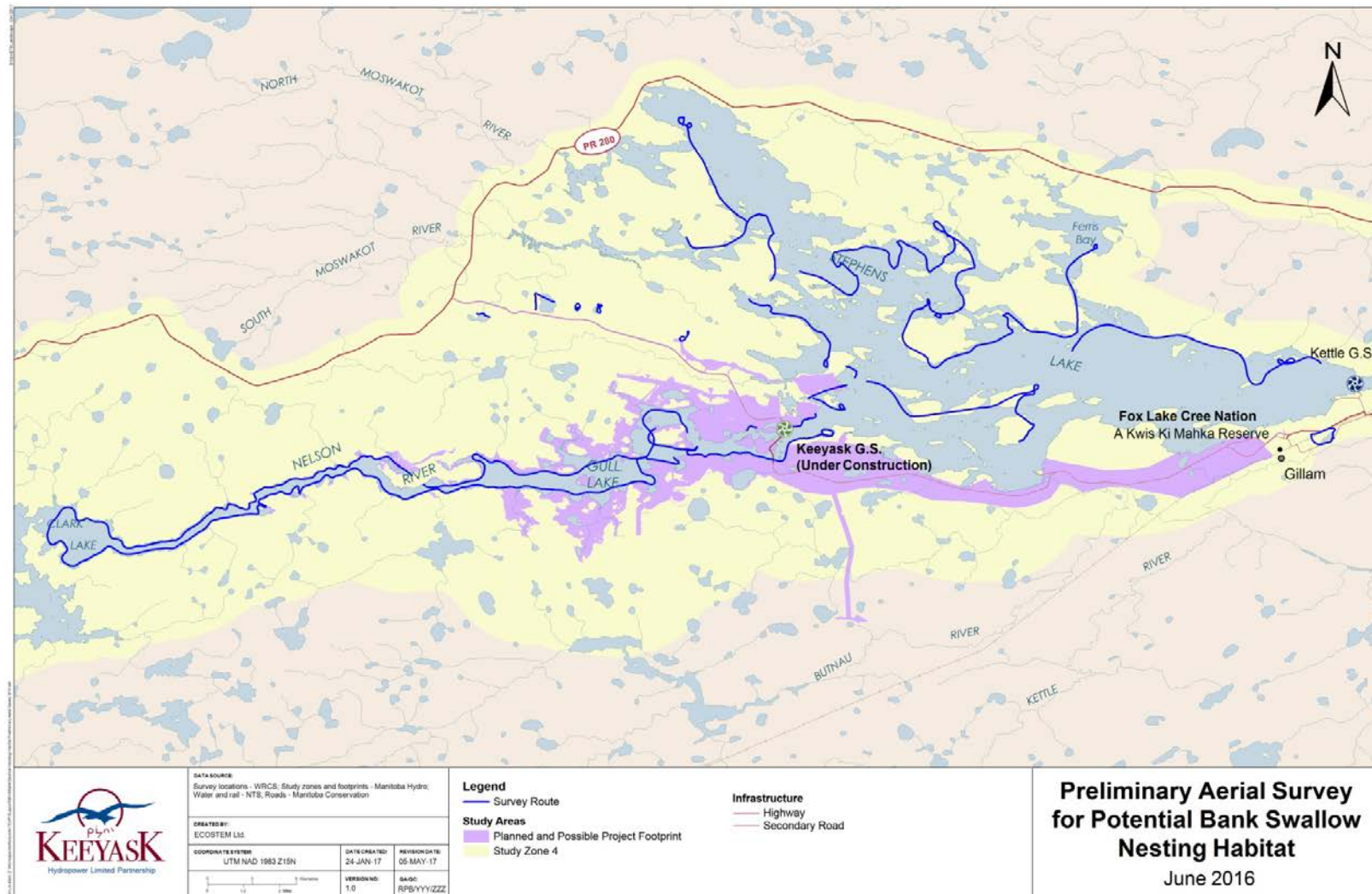
Relatively few bank swallows were observed in the region during pre-Project field studies; at most, 65 individuals were identified at three sites in a single year. Potential construction-related effects identified for bank swallow were loss or alteration of some breeding or foraging habitat; sensory disturbances from people, machinery, and equipment near breeding colonies; and possible increased mortality.

Why is the study being done?

Bank swallow is a priority bird because it was designated as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2013 (COSEWIC 2013), but it is not currently a listed species at risk in Manitoba. The main objectives of the 2016 bank swallow studies were to evaluate their presence or absence in the Keeyask region by acquiring baseline data, and to assess accidental mortality associated with the Project. Verification of anticipated Project effects will be conducted post-construction with a validated habitat quality model.

What was done?

Bank swallow colonies were identified in Study Zone 4 during aerial surveys in June 2016. Most colonies were revisited by boat in June and July throughout the breeding season. Birds and nest burrows were counted, and a series of photographs was taken at most sites. Two observers counted the number of swallows flying over a 10-minute period. The highest count of individuals were sampled and tallied at each colony. Two independent observers also counted the number of burrows in the photographs, and an estimate of the bank swallow population in Study Zone 4 was generated using the field and photograph counts.



What was found?

Seventeen bank swallow colonies were observed within Study Zone 4. Four hundred and seventy-three birds were counted in June and 354 in July. No birds were observed at three sites, each with fewer than 13 burrows, in either June or July. At the remaining colonies, a minimum of two individuals was observed in July and a maximum of 354 was observed in June. Colony size ranged from 1 to 1,600 burrows, not all of which were expected to be occupied. An estimated 2,000 breeding pairs (or 4,000 adults) inhabited Study Zone 4 in 2016. About one-half of the colonies were found on islands in Gull and Stephens lakes, while most of the remaining colonies were located on the shorelines of the Nelson River. A colony was formed from erosion processes shortly after a small peninsula separated from the mainland and formed two islands on Stephens Lake circa 2005, and a colony was observed in a Keeyask Infrastructure Project borrow area that was actively being rehabilitated with tree plantings.



Bank Swallows Near a Colony, July 2016

What does it mean?

Bank swallows rely on eroding mineral soils and steep banks for suitable nesting habitat. Bank swallow colony expansion was observed in Stephens Lake between 2009 and 2011, shortly after a peninsula separated from the mainland to form an island circa 2005. More bank swallow colonies were found in Study Zone 4 in 2016 than during pre-Project surveys that began in 2001. In 2016, the bank swallow population was well established, widely distributed and plentiful in Study Zone 4 during the early construction period. Data collected in 2016 will contribute to developing a habitat quality model.

What will be done next?

Monitoring that began in 2016 will continue every two years until 2024. A habitat quality model for bank swallow will be developed and will be validated with monitoring data. Nesting habitat loss due to Project infrastructure development, and indirect Project effects on terrestrial habitat and surface water types included in the model, will be determined and used to quantify the loss or alteration of bank swallow habitat.

STUDY TEAM

We would like to thank James Ehnes of ECOSTEM Ltd. and Wil DeWit, Manitoba Hydro, for providing maps and photographs. Biologists and technicians who designed, participated in, and drafted the survey results included:

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1.0 INTRODUCTION

Construction of the Keeyask Generation Project (the Project), a 695-megawatt hydroelectric generating station (GS) and associated facilities, began in July 2014. The Project is located at Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS.

The *Keeyask Generation Project Response to EIS Guidelines* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement Terrestrial Environment Supporting Volume* (TE SV). The *Terrestrial Effects Monitoring Plan* (TEMP) was developed as part of the licensing process for the Project. Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, bank swallow (*Riparia riparia*), during the construction and operation phases of the Project.

Bank swallows are small, insect-eating birds that migrate to Manitoba in spring (Weatherhead *et al.* 1985; Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2013). In the Keeyask region, the breeding season extends from late May to early August (Manitoba Breeding Bird Atlas 2012). Bank swallow is a priority bird for the Project because it was designated as threatened by COSEWIC in 2013 (COSEWIC 2013), but it is not currently a listed species at risk in Manitoba. Bank swallows are colonial breeders that excavate burrows in sandy riverbanks and gravel pits for nesting (Grieff 2003). Steep, nearly vertical banks are typically selected (Hjertaas 1984; COSEWIC 2013). Many burrows may be excavated in a single colony, but up to two thirds are unoccupied in a typical breeding season (Grieff 2003). The availability of suitable nesting habitat is a major factor limiting the size and distribution of breeding populations in Canada (COSEWIC 2013).

Relatively few bank swallows were observed in the Keeyask region during pre-Project field studies from 2001 to 2014; at most 65 individuals were identified at three sites in a single year. Potential construction-related effects identified for bank swallow were loss or alteration of some breeding or foraging habitat; sensory disturbances from people, machinery, and equipment near breeding colonies; and possible increased mortality. The objectives of the bank swallow studies, outlined in Section 5.8.6 of the TEMP, were to evaluate their presence or absence in suitable habitat in Study Zone 4 and to assess accidental mortality, in order to verify anticipated Project effects on these birds.

2.0 METHODS

Surveys for bank swallow were conducted from June 13 to July 6, 2016 in Study Zone 4, mainly at sites along the Nelson River from Birthday Rapids downstream to the Kettle GS area on Stephens Lake (Map 1). Preliminary aerial surveys were conducted by helicopter on June 13 and 16 to identify bank swallow nesting colonies in the study area. Shorelines on the Nelson River, Gull Lake, and Stephens Lake were surveyed. One colony near Gull Rapids was surveyed with an unmanned aerial vehicle (UAV) because it could not be reached by boat, or easily by foot. The locations of bank swallow colonies observed during aerial surveys for other birds were also noted.

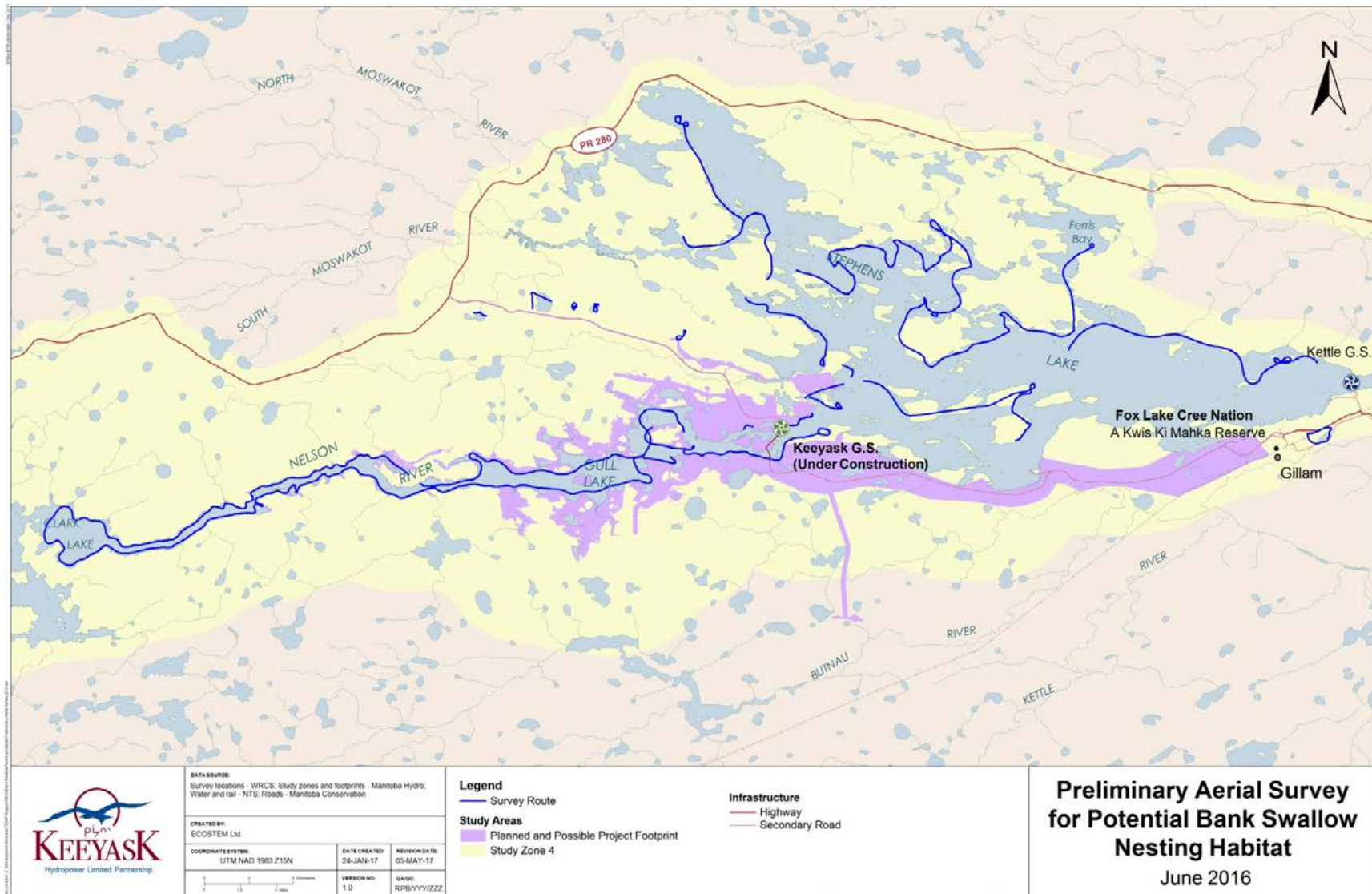
Most bank swallow nesting areas identified during the preliminary search were surveyed again by boat on June 21-22 and July 5-6 (Table 1), in the primary breeding period. Two sites were surveyed on foot on July 3. Surveys were conducted between 8:00 a.m. and 12:00 p.m., when observers counted birds and burrows at each colony. Two observers independently counted the number of bank swallows flying near the colony several times over a 10-minute period, up to 10 counts per period. The greatest of the two counts was recorded for each colony in June and in July. During boat surveys, one observer counted the number of burrows from the boat, which was driven parallel to the colony at a distance ranging from 30 to 50 metres offshore. A series of photographs was taken at 14 of the 17 nesting colonies surveyed. There were few burrows at the remaining colonies (sites 09, 10, and 17), which were accurately counted during the field survey. At site 05, a borrow area that was being rehabilitated was visited on foot and, burrows were counted on site. Two sites identified during the preliminary aerial/UAV search were not revisited by boat or foot due to unsuitable wind conditions that affected safe travel by boat, or other access restrictions.

Where possible, individual site photos were stitched together using Windows Photo Gallery. Using the resulting panoramas, and some individual photos that were cropped and magnified, the number of burrows was counted independently by two observers (Appendix 2). The mean of these counts and the preliminary field count, plus standard deviation and 95% confidence intervals, were calculated at each site for the June and July visits.

Table 1: Bank Swallow Nesting Colonies Surveyed in Summer 2016

Site	Location	Date Surveyed	Survey Type
1	15 V 328638 6242168	June 21, July 6	Boat
2	15 V 331606 6243531	June 21, July 6	Boat
3	15 V 346017 6243561	June 21, July 6	Boat
4	15 V 347288 6243533	June 21, July 6	Boat
5	15 V 346581 6254245	July 3	Foot
6	15 V 358235 6245942	June 21, July 6	Boat
7	15 V 357720 6247397	June 21, July 6	Boat
8	15 V 361788 6247421	July 3	Foot
9	15 V 363536 6245149	June 13	UAV
10	15 V 364806 6247412	July 5	Boat
11	15 V 365483 6246626	July 5	Boat
12	15 V 366476 6246968	June 22, July 5	Boat
13	15 V 369874 6247761	July 5	Boat
14	15 V 378819 6246929	June 22, July 5	Boat
15	15 V 378377 6249071	June 22, July 5	Boat
16	15 V 378855 6249312	June 22, July 5	Boat
17	15 V 394806 6251246	June 13	Aerial

The mean number of burrows at each colony (the larger of the observations from June and July) was multiplied by 0.5 to provide an estimate of the number of breeding pairs in Study Zone 4. This approach was used as there are typically more burrows in a colony than there are nesting pairs of bank swallows (Garrison 1999 in Falconer *et al.* 2016). New burrows are typically constructed each season (Garrison 1999 in Falconer *et al.* 2016), leaving many older, intact burrows unoccupied. In some cases, burrow excavation is abandoned as obstacles are encountered (Garrison 1999 in Falconer *et al.* 2016), resulting in more holes than birds to occupy them. Mean occupancy of bank swallow burrows ranges from 43 to 74% (Garrison 1999, BSC unpubl. data in COSEWIC 2013), and it was recently suggested that the number of breeding pairs in a colony can be estimated as 50% of the number of burrows (Wright *et al.* 2011). Based on this information, it was assumed that 50% burrow occupancy would provide a reasonably conservative estimate of the bank swallow population in Study Zone 4.



Map 1: Preliminary Aerial Survey for Potential Bank Swallow Nesting Habitat, June 2016

3.0 RESULTS

Seventeen bank swallow colonies were found in Study Zone 4 in 2016 (Map 2). Four hundred and seventy-three birds were counted in June and 354 in July. These totals are considerably higher than the 40 individuals observed between Clark Lake and Stephens Lake in July 2011 (Stantec 2013), and those documented during pre-Project surveys beginning in 2001.

No birds were observed at colony sites 01 and 03 during either survey in 2016, and none were observed at site 17, which was surveyed once. At sites where birds were observed, a minimum of two individuals were observed at site 10 in July and a maximum of 225 were observed at site 12 in June (Table 2). The colony at site 05 was in a borrow area (previously developed for the KIP), which was actively being rehabilitated by tree planting (Photo 1). The mean number of burrows at each colony ranged from 1 to 1,600. More burrows would typically be observed during July surveys than in June, because additional burrows are excavated as the breeding season progresses, such as observed at sites 01, 04, 07, 12, and 15. Variation in observer counts (see Appendix 1) was likely due in part to differences in photo angles; also, shadows may have resulted in more burrows being counted in June than in July at colony sites 02, 06, and 14. Ongoing erosion, collapsing burrows or differences in photography angles could also have resulted in declining counts at these sites.

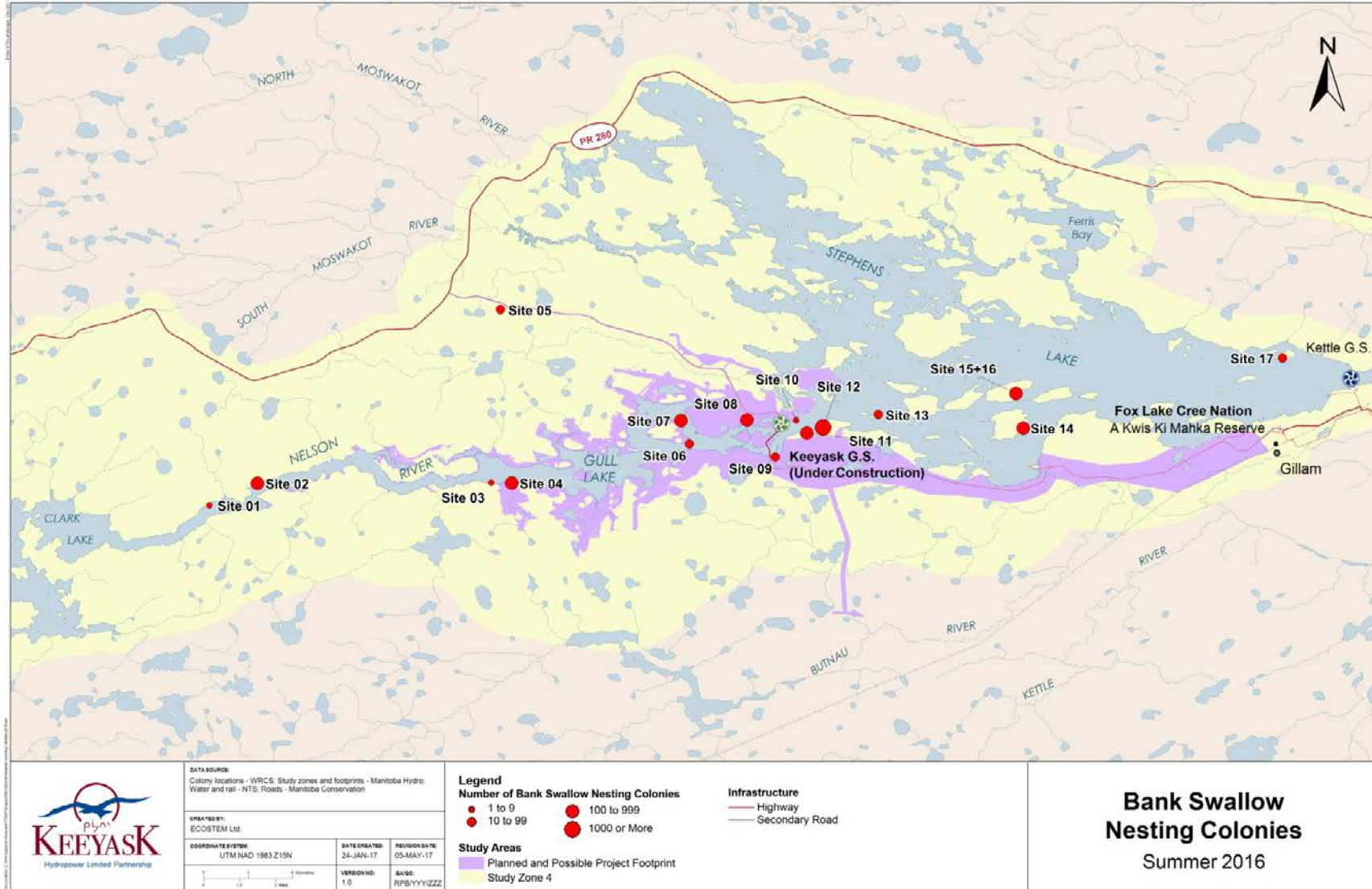
Table 2: Mean Number of Bank Swallow Burrows at 17 Colonies in Summer 2016

Colony	Survey Date	Number of Birds Observed	Mean Number of Burrows	Standard Deviation	95% Confidence Interval
01	June 21	0	3.0	0	0
	July 6	0	5.3	2.9	3
02	June 21	77	313.0	49.0	55
	July 6	35	306.3	78.5	89
03	June 21	0	1.0	0	0
	July 6	0	1.3	0.6	1
04	June 21	34	155.3	65.4	74
	July 6	28	182.7	60.4	68
05	July 3	31	84 ¹	–	–
06	June 21	11	68.7	20.8	24
	July 6	7	64.3	1.5	2
07	June 21	35	79.3	1.5	2
	July 6	11	139.0	45.0	51
08	July 3	21	125.0	15.4	17
09	June 13	12	10 ¹	–	–
10	July 5	2	2 ¹	–	–
11	July 5	77	421.0	37.4	42
12	June 22	225	1,568.3	341.4	386
	July 5	70	1,600.3	270.7	306

Table 2: Mean Number of Bank Swallow Burrows at 17 Colonies in Summer 2016

Colony	Survey Date	Number of Birds Observed	Mean Number of Burrows	Standard Deviation	95% Confidence Interval
13	July 5	27	89.0	17.1	19
14	June 22	3	180.0	7.8	9
	July 5	7	166.3	11.0	12
15+16 ²	June 22	76	324.7	26.4	30
	July 5	38	463.3	65.1	74
17	June 13	0	12 ¹	–	–
Total	June	473			
	July	354			

1. Only initial count from the field and by helicopter; photographs were not available.
2. Sites 15 and 16 were combined because colony 15 was small (mean of 9 burrows). Due to their close proximity of about 400 m, it may also be viewed as a single colony.



Map 2: Bank Swallow Nesting Colonies Surveyed in Summer 2016



Photo 1: Bank Swallow Colony at Site 05, Within a Borrow Pit, July 2016

Birds were observed at 14 sites (Photo 2, Photo 3). The remaining three sites consisted of 12 or fewer burrows. The largest colony was located at site 12 on Stephens Lake, and the smallest colony was at site 03 near Birthday Rapids. In general, there were fewer burrows in colonies located on sloped, shrubby banks (Photo 4) than those on steep banks with little vegetation (Photo 5). Most nesting burrows were located near the top of the banks.

The subpopulations of individual colonies in Study Zone 4 ranged from one (in this case assuming the single burrow was occupied) to 800 pairs, based on the greatest number of burrows observed at each site. The regional bank swallow population is estimated at 2,005 breeding pairs, or 4,010 individuals.

About one-half (8 of 17) of the bank swallow colonies were located on islands in Stephens Lake and Gull Lake, which included the largest colony of 1,600 burrows. The site 12 colony location was formed from erosion processes shortly after a small peninsula separated from the mainland and formed two islands on Stephens Lake (circa 2005; see Appendix 3). There was no evidence of any bank swallow colonies on the small island in 2008 imagery. A small to moderate-sized cluster of nesting burrows was first observed in 2011, suggesting that the colony first formed between 2009 and 2011. Substantial numbers of burrows were recorded on this island in 2016. The size of the pioneering bank swallow colony is unclear, and it is unknown whether or not the substantive increase in colony size five to seven years later might be attributed to con-specific attraction, high colony productivity and survival, or both.

A nest burrow likely depredated by an American black bear (*Ursus americanus*) was observed at site 05 (in a borrow area). It contained a dead bank swallow and two eggs (Photo 6, Photo 7). Incidental observations of other bird species near bank swallow colonies included American robin (*Turdus migratorius*), American white pelican (*Pelecanus erythrorhynchos*) bald eagle (*Haliaeetus leucocephalus*), belted kingfisher (*Megasceryle alcyon*), ring-billed gulls (*Larus delawarensis*) and common terns (*Sterna hirundo*). See photos in Appendix 4.



Photo 2: Bank Swallow and Nesting Burrows at Site 12, July 2016



Photo 3: Bank Swallows at Site 11, July 2016



Note: Red oval indicates a bank swallow burrow; also note toppled trees and bank erosion.

Photo 4: Small Bank Swallow Colony at Site 01, July 2016



Note: Red oval indicates bank swallow burrows

Photo 5: Portion of a Large Bank Swallow Colony at Site 12, June 2016



Photo 6: Bank Swallow Nest Burrow Depredated by a Bear, July 2016



Photo 7: Dead Bank Swallow and Egg at Nest Burrow Depredated by a Bear, July 2016

4.0 SUMMARY AND CONCLUSIONS

Seventeen bank swallow nesting colonies of various sizes were observed in Study Zone 4 in 2016. Four hundred and seventy-three birds were counted in June and 354 in July, which is substantially higher than any counts during pre-construction surveys beginning in 2001, where bank swallows were observed during surveys targeting waterfowl and other birds along the Nelson River. The regional bank swallow population was estimated at 2,005 breeding pairs, or 4,010 individuals. In 2016, the bank swallow population was well established, widely distributed and plentiful in Study Zone 4 during the early construction period.

Bank swallows rely on eroding mineral soils and steep banks to form suitable nesting habitat substrate, especially in the Keeyask region. For example, bank swallow colony expansion was observed between 2009 and 2011, shortly after a peninsula separated from the mainland to form an island in Stephens Lake circa 2005. As such, natural processes such as erosion, which can be exacerbated by high water flows or hydroelectric regulation, can affect local and regional shoreline habitat and in turn, bird populations.

Monitoring for bank swallows that began in 2016 will continue every two years until 2024. A habitat quality model for bank swallow will be developed and validated with these data. The validated habitat quality model will be applied to the post-Project terrestrial habitat map to identify and measure suitable nesting habitat. Nesting habitat loss due to Project development (including both direct and indirect Project effects on terrestrial habitat and surface water types included in the model) will be determined, and used to quantify the loss or alteration of bank swallow habitat.

5.0 LITERATURE CITED

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APPENDIX 1: BANK SWALLOW BURROW COUNTS

Colony	Survey Date	Observer 1 (Field Count)	Observer 2 (Photo Count)	Observer 3 (Photo Count)
01	June 21	3	3	3
	July 6	2	7	7
02	June 21	263	315	361
	July 6	229	304	386
03	June 21	1	1	1
	July 6	1	2	1
04	June 21	128	230	108
	July 6	221	214	113
05	July 3	84 ²	–	–
06	June 21	45	84	77
	July 6	64	66	63
07	June 21	81	79	78
	July 6	114	112	191
08	July 3	129	138	108
09	June 13	10 ²	–	–
10	July 5	2 ²	–	–
11	July 5	446	439	378
12	June 22	1,180	1,704	1,821
	July 5	1,291	1,794	1,716
13	July 5	71	105	91
14	June 22	189	176	175
	July 5	154	175	170
15+16 ⁴	June 22	348	296	330
	July 5	389	491	510
17	June 13	12 ²	–	–

1. Only initial count from the field; no photographs were reviewed.

2. Sites 15 and 16 were combined because colony 15 was small (mean of 9 burrows) and due to their proximity.

APPENDIX 2: EXAMPLE COUNT OF BURROWS IN PANORAMIC PHOTOGRAPH



Note that burrows are marked with coloured dots.

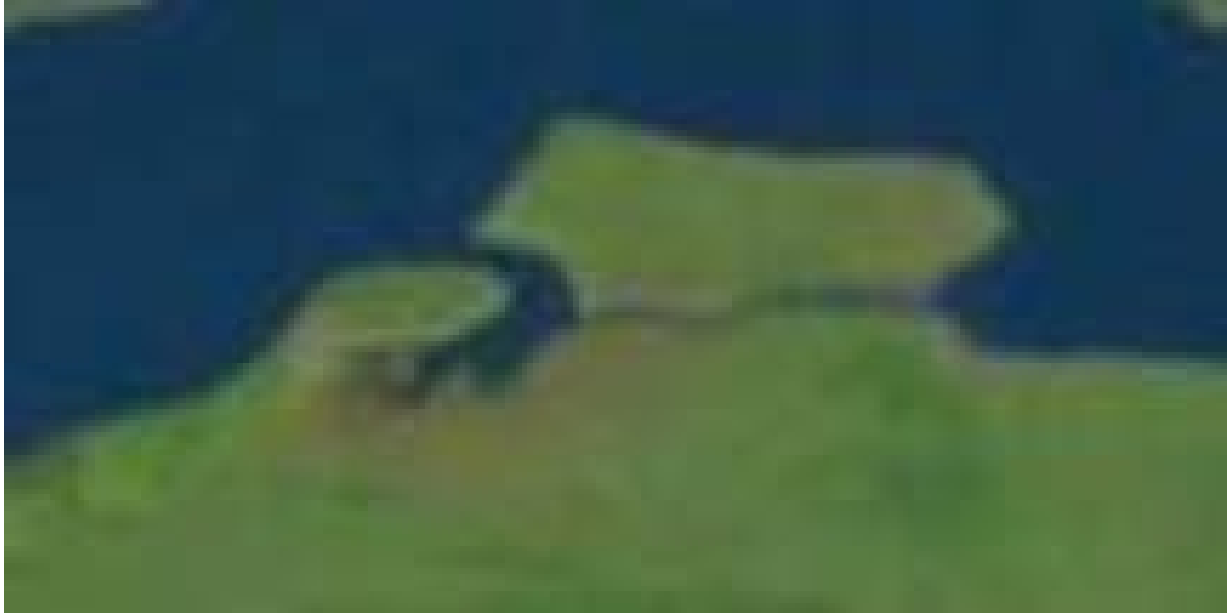
APPENDIX 3: EROSION AND FORMATION OF LARGE BANK SWALLOW COLONY ON STEPHENS LAKE



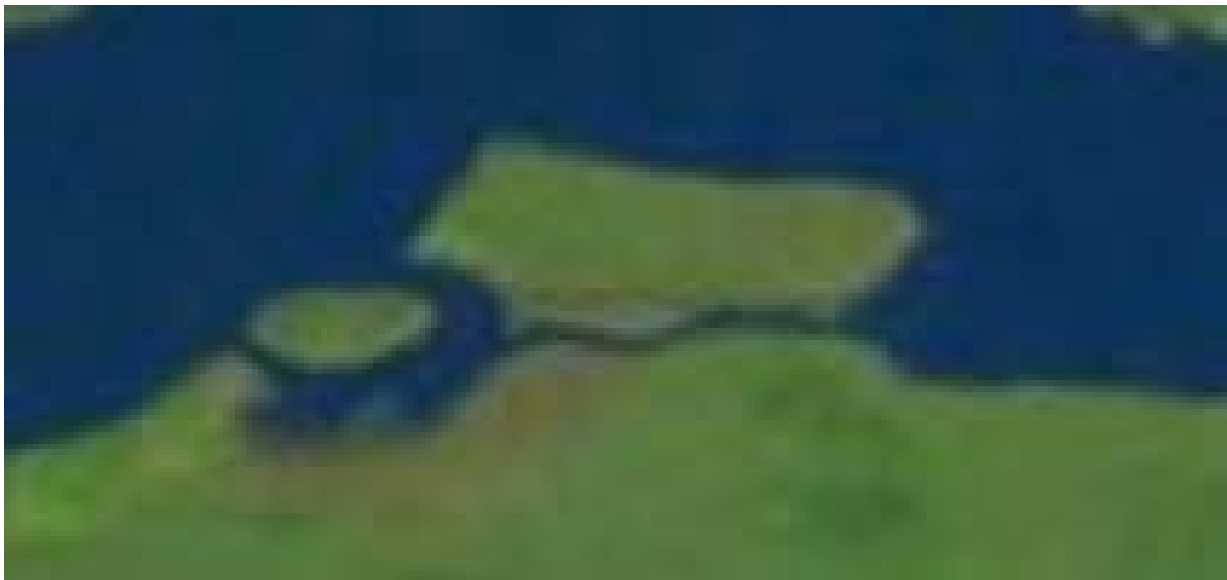
Landsat satellite image – August 28, 1999 (Future Site 12 in black box)



Air Photo – 1999- Future Site 12



Landsat satellite image – July 31, 2003- Future Site 12



Note: Channel has now formed. The mainland has separated into two islands.

Landsat satellite image – August 28, 2005- Future Site 12



Air Photo – 2006- Future Site 12



Air Photo – 2010 (Keeyask 10cm Satellite image)- Future Site 12



Note: Location of Site 12 bank swallow colony monitored in 2016 is circled in black. White cliff face on the south side of the island is clearly visible.

Worldview 2 Satellite image – September 24, 2014



Photo – 2008. No bank swallow burrows visible on south side of island (Site 12)



Photo – 2011. A moderate-sized cluster of bank swallow burrows visible south side of island (Site 12)



Photo – 2016. Large and nearly continuous cluster of bank swallow burrows visible on the south side of island (Site 12)



Photo – 2016. Close-up example of bank swallow nesting burrow cluster density on south side of island (Site 12)

APPENDIX 4: ADDITIONAL PHOTOS



American Robin



American White Pelicans



Bald Eagle



Bald Eagles



Belted Kingfisher