KEEYASK TRANSMISSION PROJECT WATERCOURSE CROSSINGS

POST-CONSTRUCTION MONITORING REPORT – 2017

December 2017

Prepared for:

Manitoba Hydro

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EXECUTIVE SUMMARY

As outlined in *The Environment Act* Licence for the Keeyask Transmission Project (Licence No. 3106), construction, operation, and maintenance of the Project will adhere to mitigation found within the EIS and supporting materials, as well as Environmental Protection Plans (EnvPP). Included in the Project EnvPP is an obligation to monitor the effectiveness of mitigation measures. This report provides documentation of site visits conducted at 46 watercourse crossing sites located along the temporary 138 KV AC Construction Power Line, four 138 kV AC Unit Transmission lines, and three 138 kV AC Generation Outlet Transmission lines during spring 2017.

The stage of construction varied between and within each component. Both the Construction Power Line (KN36) and the temporary Construction Power Line (KN36T) are complete. The right-of-way (RoW) and riparian buffer zones had been cleared along the full extent of the Generation Outlet Transmission lines. Only one of the three Generation Outlet Transmission Lines has been completed (KR1 line). Towers were not present for any of the KR2 and KR3 sections of the Generation Outlet Transmission line. Clearing of the RoW and riparian buffer zones was also complete for the Unit transmission lines.

Of the 46 crossing sites assessed, no mitigation measures were deemed not in compliance. KR2-Aqua-128, KR3-Aqua-129 and KR1-Aqua-130 had been identified in 2015 because the riparian buffer zone had been cleared to ground level. As a result, a closer look was taken in 2017 to monitor re-vegetation and erosion. Small shrubs and forbes were observed growing along the stream banks and no active sedimentation of the stream was seen in 2016 or 2017. Due to the naturally occurring re-vegetation and the marginal nature of the stream to fish, no further remediation is recommended.

ACKNOWLEDGEMENTS

Manitoba Hydro is thanked for the opportunity to conduct this project.

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1.0 INTRODUCTION

As outlined in *The Environment Act* Licence for the Keeyask Transmission Project (Licence No. 3106), construction, operation, and maintenance of the Project will adhere to mitigation found within the EIS and supporting materials as well as Environmental Protection Plans (EnvPP). Included in the Project EnvPP is an obligation to monitor the effectiveness of mitigation measures. Stream crossing monitoring consists of a minimum of one site visit to each identified stream crossing in the first spring and/or summer following construction and subsequent site visits as required. This report provides documentation of site visits conducted at 46 watercourse crossings located along the 138 KV AC temporary Construction Power Line, three 138 kV AC Generation Outlet Transmission lines, and four 138 kV Unit Transmission lines during spring 2017 (Maps 1-4).

2.0 STUDY AREA

The Keeyask Transmission Project Study Area (approximately 600 km^2) is found within the Nelson River watershed basin and the Lower Nelson River sub-basin. It includes the Nelson River from Gull Rapids and the southern shore of Stephens Lake east to the Kettle Generating Station. In addition, the study area includes the land south of these waterbodies to and beyond Butnau Lake.

The land bordering Stephens Lake includes areas of poor, moderate and well-drained soils, dominated by black spruce forest in upland areas and black spruce bogs, peatland and fens in low lying areas. Sand, gravel, cobble, and areas of organic material dominate the shoreline, with much of the shoreline being prone to erosion. Riparian vegetation typically includes willow and alder, black spruce, tamarack, and scattered stands of trembling aspen typically found where there is well drained soil. Typical of the Lower Nelson River sub-basin the study area consists of a large number of small round lakes, marsh and bog areas and numerous ephemeral and perennial tributaries.

Of the Project components, the Unit Transmission lines (KE) and the Construction Power Line (KN36) cross the Nelson River at the base of Gull Rapids. Fish habitat sensitivity was assigned ’moderate/high’; numerous forage fish species and larger bodied species such as Freshwater Drum, Goldeye, Lake Sturgeon, Lake Whitefish, Longnose Sucker, Mooneye, Northern Pike, Sauger, Walleye, White Sucker and Yellow Perch have been documented in this region.

Two medium-sized perennial rivers are present within the study area; the Butnau and the Kettle rivers. The Butnau River was diverted away from Stephens Lake through Cache Lake and into the Kettle River when the Kettle Generating Station was constructed. Similar to the smaller creeks in the area, habitat in the upper reaches of the Butnau and Kettle rivers are characterized by low water velocities, soft substrates, and abundant cover. Lower reaches of the Kettle River

and the Butnau River Diversion Channel are shallow, with moderate water velocity, and rocky substrate.

Fish habitat within the Butnau and Kettle rivers is considered to be of ‘moderate’ and ‘moderate/high’ sensitivity, respectively. Both rivers were found to be used extensively by Northern Pike for various life stages including spawning. Relatively uncommon, Walleye occur in both rivers and suitable spawning habitat is present in the Butnau River Diversion Channel and the lower Kettle River. White and Longnose sucker are also known to spawn in both rivers. Although documented in the Kettle/Butnau river system, Lake Whitefish were found to be uncommon.

The Generation Outlet Transmission lines (KR) and KN36 each cross the Butnau River once. The Kettle River is crossed at three locations by the three KR lines.

3.0 METHODS

Stream crossing sites were evaluated using Manitoba Hydro's Daily Inspection Reports and site visits in the spring of 2017 to assess the adherence to prescribed mitigation. Mitigation measures included those prescribed in the Keeyask Transmission Project Aquatic Environment Technical Report (2012) and the Keeyask Transmission Project Construction Environmental Protection Plan (2014) for the Construction Power, Generation Outlet, and Unit Transmission Lines and Stations.

Daily Inspection Reports on Manitoba Hydro's Environmental Protection Information Management System (EPIMS) were reviewed to identify where mitigation compliance was documented during construction and to focus field studies.

Field studies consisted of aerial reconnaissance at each site along the Construction Power, Generation Outlet and Unit transmission lines. If a stream crossing site was identified to be in non-compliance it was evaluated further. Stability of stream banks and floodplain was visually evaluated form the air and rutting, slumping, or other damage to the ground noted. The presence of slash or disturbed sediment within the buffer was noted, as well as any evidence of erosion. If landing was necessary, buffers were evaluated by measuring their width from the stream or floodplain and comparing to the width prescribed, as well as evaluating the amount of vegetation left in the buffer and the clearing method used.

Vehicle crossings were evaluated for appropriate grade and angle across the stream, and the presence of any organic debris remaining from a bridge. If any erosion control measures were in place (blankets, silt fences) their effectiveness was evaluated. Tower locations were assessed to determine if they adhered to prescribed mitigation. Photos of sites were taken to capture the overall state of the sites as well as any particular concerns. Any further reclamation needed to meet the prescribed mitigation was noted and if a follow-up site visit was needed for further monitoring of reclamation this was also noted.

4.0 RESULTS

Manitoba Hydro is currently constructing several components of the Keeyask Transmission Project. This report focuses on three of the components. Once completed, three 138 kV AC KR lines (formerly named KGOT) will transmit power from the new Keeyask Switching Station to the existing Radisson Converter Station over a distance of 38 km in a single corridor approximately 200 m wide. The KR lines cross nine watercourses, including the Kettle and Butnau rivers, and consist of 32 crossing sites. The completed 138 kV Construction Power Transmission Line (KN36) extends from the existing 138 kV KN36 transmission line in the south to the new construction power station located north of the Keeyask Generating Station. This line is approximately 21 km long, with a RoW 60 m wide along most its length (except for the locations where the line shares the RoW with KR lines), crosses five watercourses and includes five distinct crossing sites. Two additional sites at the Nelson River include the temporary Construction Power line. To transmit power from the Keeyask Generation Station to the new Keeyask Switching Station four 138 kV AC Unit Transmission Lines (KE) will be erected in a single corridor 4 km long and 265 m wide, cross two watercourses and include seven crossing sites in total.

Site visits to stream crossings were conducted June 26, 2017. The stage of construction varied between components (Appendix 1). At the time of the monitoring, construction of the temporary line (KN36T) and the Construction Power Lines (KN36) were complete. Clearing of the RoW and riparian buffer zones was completed at all watercourse crossings along the KR and Unit Transmission lines (KE), though only towers for the KR1 line were fully completed. Construction had not begun on the KR2, KR3 and the four Unit Transmission Lines.

Site Visits

Aerial surveys were conducted at 46 stream crossing sites. No ground surveys were deemed necessary. Construction at all stream crossings was compliant with prescribed mitigation where applicable, depending on the stage of construction. A summary of compliance with mitigation for all sites is available in Appendix 1.

KR Lines

Thirty-two sites at ten watercourse crossings were evaluated along the KR line. Non-compliance with respect to the prescribed mitigation was not observed at any of the thirty-two sites.

In 2015 a riparian buffer was not established during clearing at KR1-Aqua-128, KR3-Aqua-129, and KR2-Aqua-130 resulting in erosion and sedimentation of the stream. No mitigation measures have been implemented since 2015 but re-vegetation is occurring naturally. Small shrubs and forbes were observed growing along the banks of the stream and no sedimentation was observed during the survey in 2017. It is expected the vegetation will continue to grow and stabilize the banks and riparian zone. No further remediation is recommended.

KN36 Lines

Two watercourse crossing sites were evaluated for compliance to mitigation along the temporary Construction Power Line (KN36T-Aqua-100 and 101) as well as three sites along the Construction Power Line (KN36-Aqua-102 to 104). Non-compliance with respect to the prescribed mitigation was not observed at any of the KN36 sites.

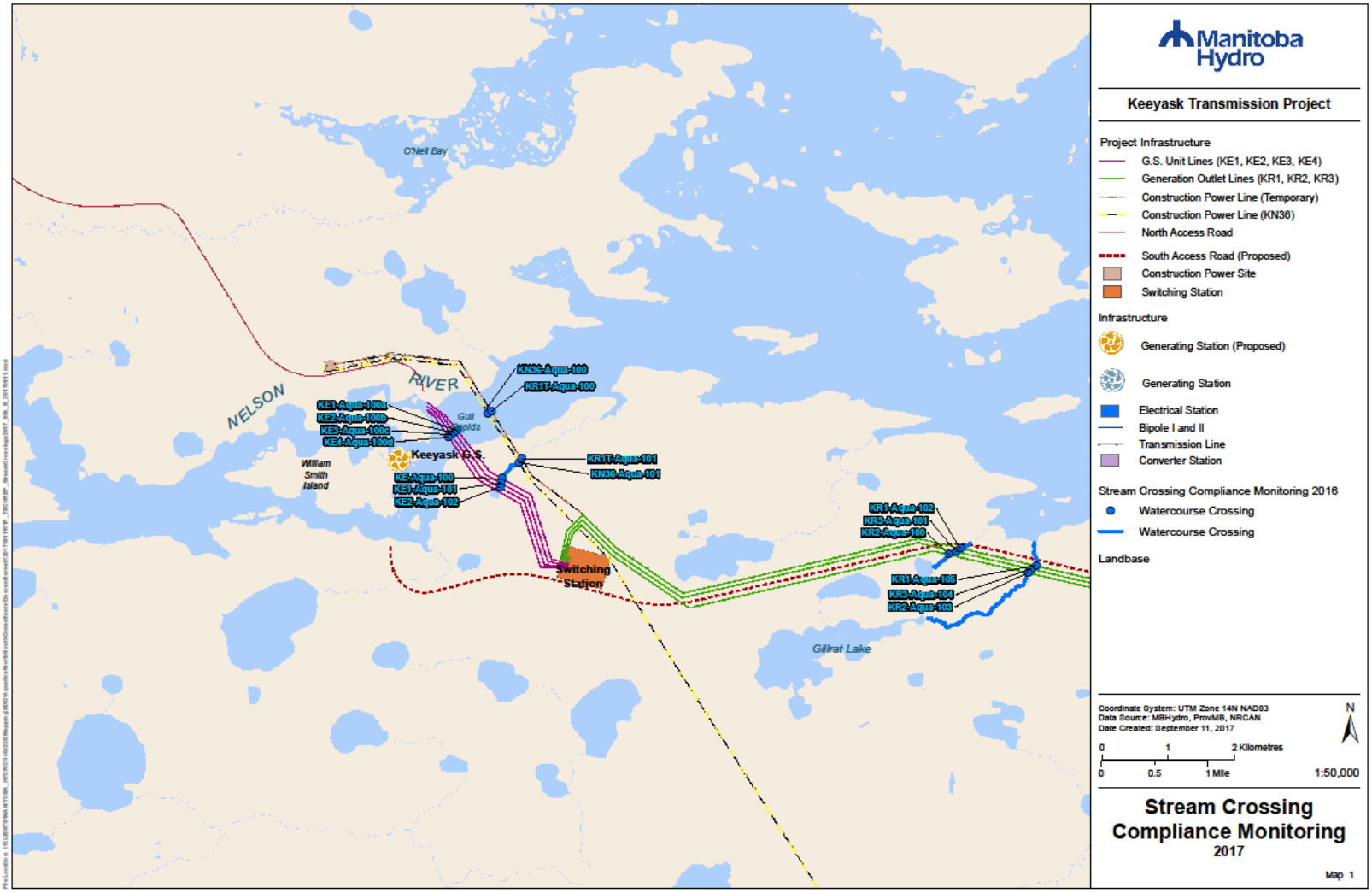
KE Lines

The seven watercourse crossing sites along the 4 km long Unit Transmission Line were evaluated in 2017 and non-compliance with respect to the prescribed mitigation was not observed.

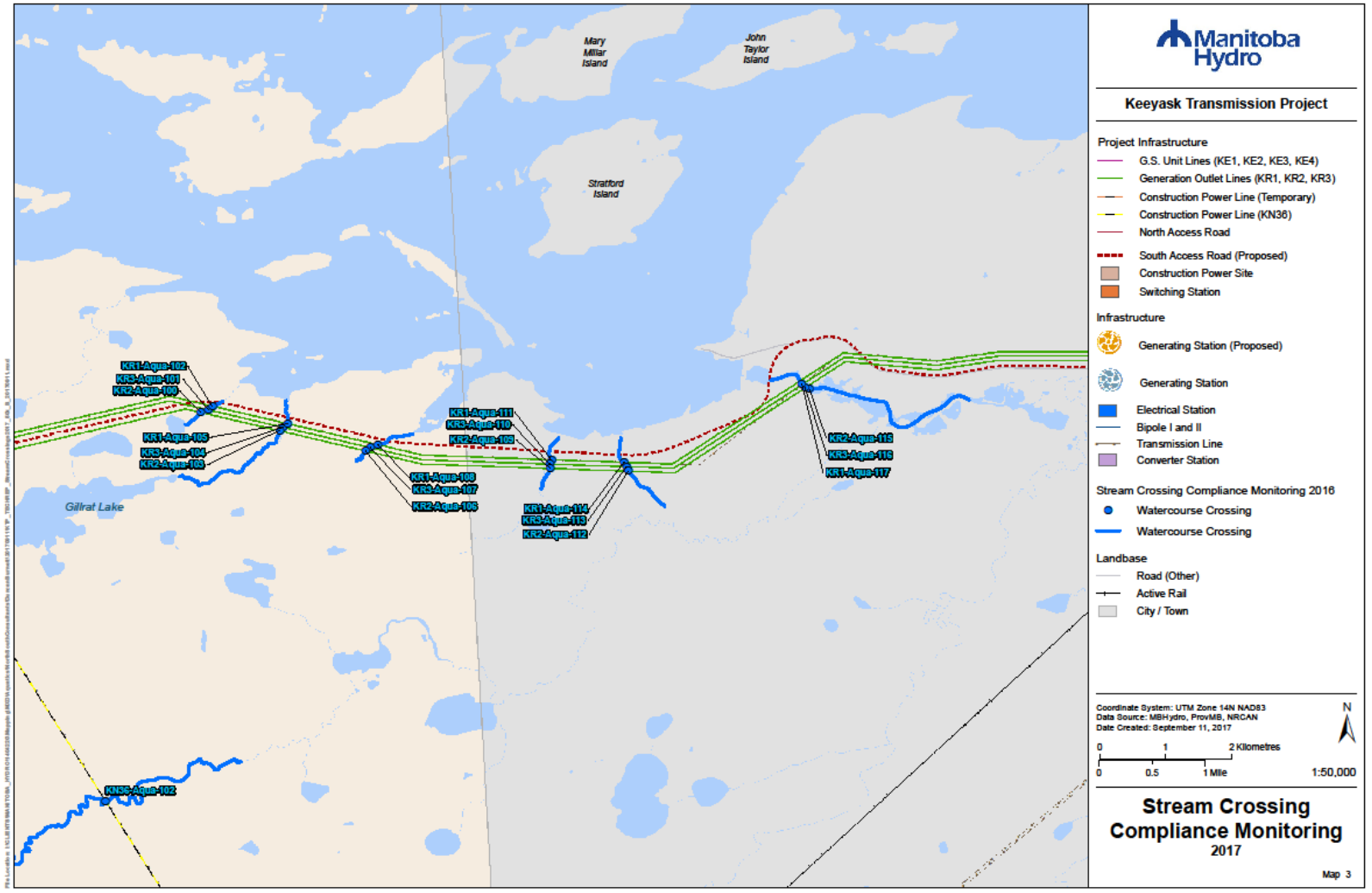
Table 1. Summary of stream crossings on KGOT, KN36 and KUL lines where non-compliance to mitigation was observed in previous monitoring years.

Segment	ESS ID	Name	Easting	Northing	Habitat Class	Compliance in 2016	Issue	Mitigation	Compliance in 2017
KR	KR1-Aqua-100, KR3-Aqua-101, KR2-Aqua-102	Unnamed tributary	371556 371691 371759	6244280 6244305 6244351	NA	N	Vehicle crossing; when access likely available via extant road	None recommended	Y
KR	KR1-Aqua-128, KR3-Aqua-129, KR2-Aqua-130	Unnamed tributary	382229	6244240	NA	N	Excessive clearing of riparian buffer	Continued monitoring of Riparian Buffer recovery	Y
KN36T	KN36T-Aqua-100	Nelson River	364883	6247024	NA	N	Excessive clearing of riparian buffer	None recommended; rock armouring appears to be effective	Y

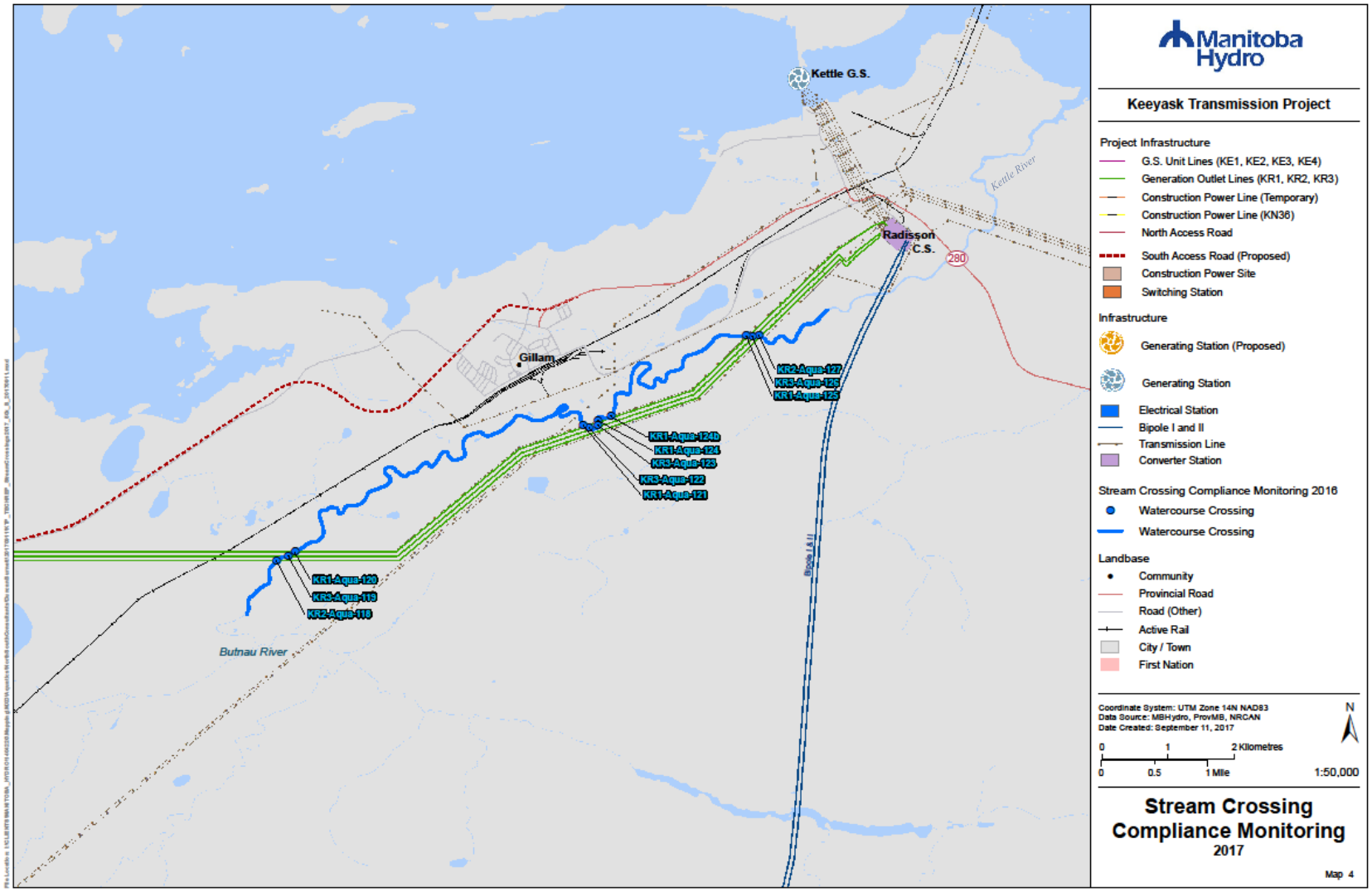
5.0 MAPS



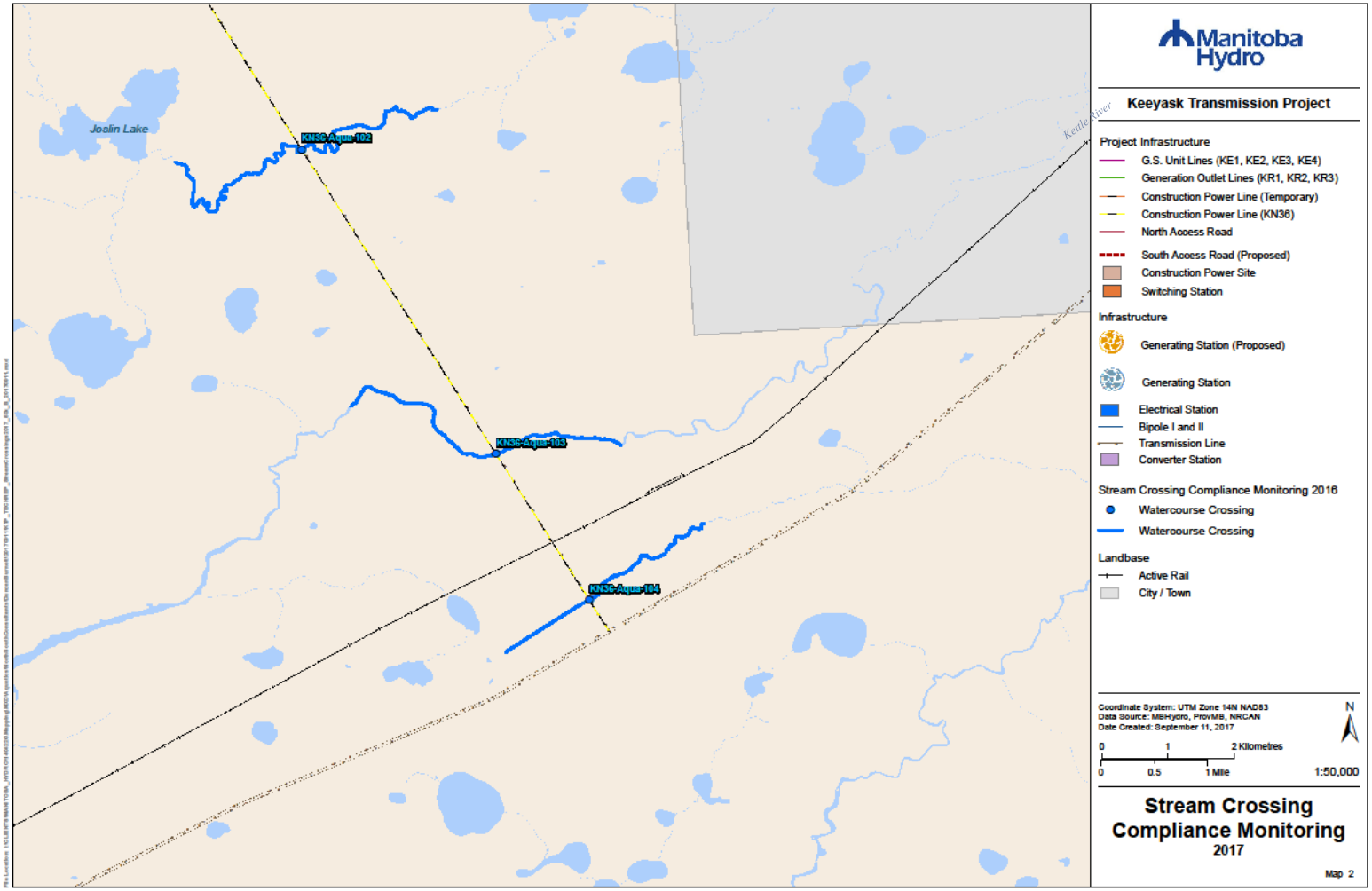
Map 1. Watercourse crossing locations for the proposed Unit Transmission Line and the western section of the Generation Outlet Transmission Lines, 2017.



Map 2. Watercourse crossings along the west-central section of the Generation Outlet Transmission Line, 2017.



Map 3. Watercourse crossings along the eastern section of the Generation Outlet Transmission Line, 2017.



Map 4. Watercourse crossings along the Construction Power Line, 2017.

6.0 PHOTOS

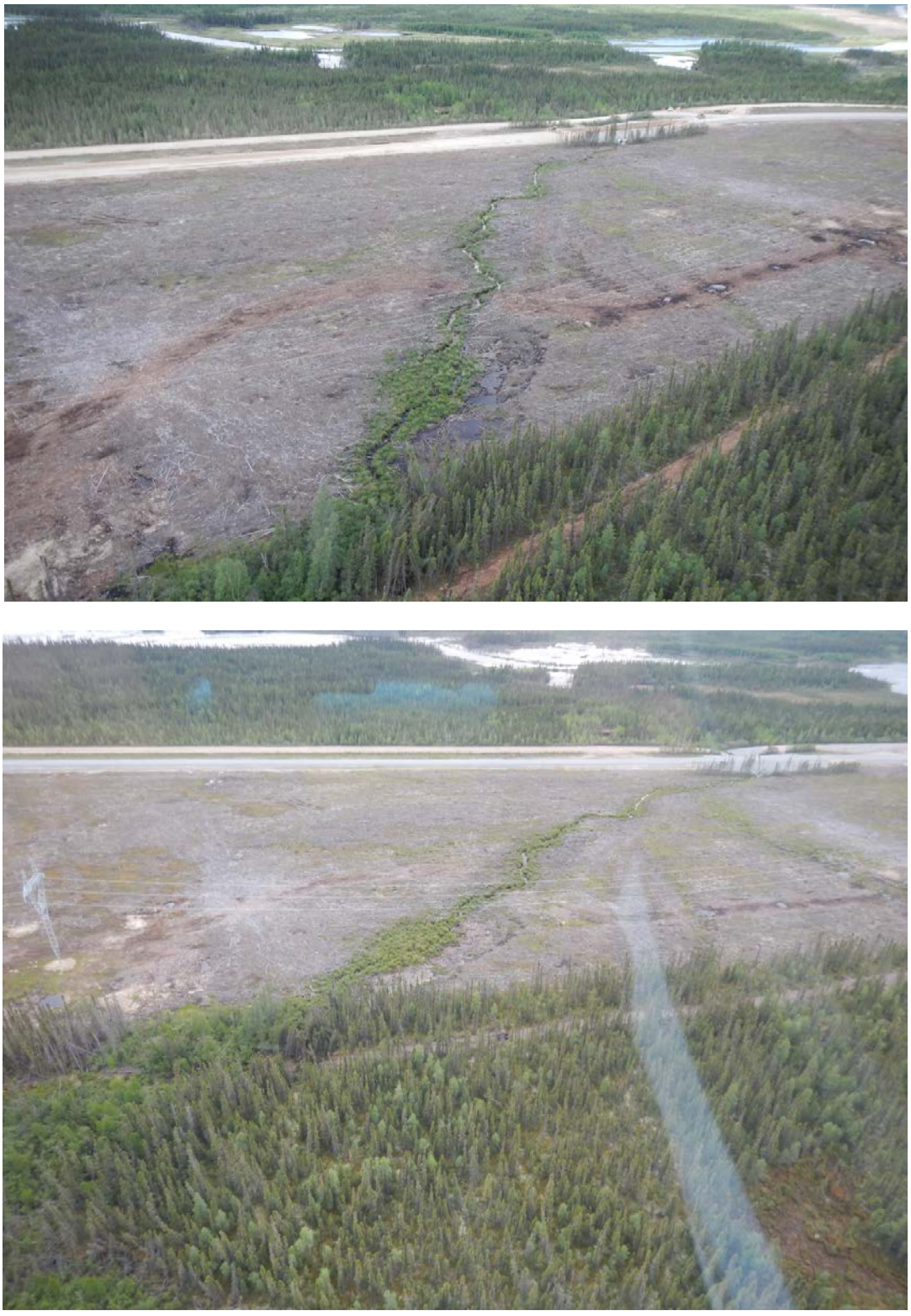


Photo 1. KR1-Aqua-128, KR3-Aqua-129, and KR2-Aqua-130 (tributary of the Butnau River). Un-mitigated stream crossing June 21, 2016 (top) and state as of June 26, 2017 (bottom).

Photo 2. KR1-Aqua-100, KR3-Aqua-101, and KR2-Aqua-102 (unnamed tributary). Evidence of a stream crossing through the RoW in June 2016 (top). No evidence of tracks in June 2017 with shrub re-growth present throughout the crossing.

7.0 APPENDIX 1: STREAM CROSSING COMPLIANCE SUMMARY

Table A1. Compliance with 21 mitigation measures for stream crossings on the 138 kV Generation Outlet, Unit transmission lines, and the Construction Power line, June 2017.

ESS	Name	Construction Status 2017	Cross Perpendicular to Channel	Structures Above Tree Line	Riparian Ground Cover Remain	Machine Free Zone 7 m	Riparian Buffer 30 m	Clearing Limits Marked	Construction on Frozen Ground	Riparian Vegetation Roots Intact	Slash Above the Tree Line	Revegate Disturbed Areas	Erosion Sediment Control Implemented	Temp. Crossings Only As Needed	Appropriate Temp.Crossing Design	Existing Access Used	Temp. Crossings Perpendicular	Clean Material for Temp. Crossing Removed	One-time Fording	Timing Window for Instream Work	Fording Under Acceptable Conditions	Stream Bank Protection	Temp. Bridge As Needed	Follow-up Site Inspection 2018
Watercourse Crossings of the three 138 kV AC Generation Outlet Transmission Lines																								
KR2-Aqua-100	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-101	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-102	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-103	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-104	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-105	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-106	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-107	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-108	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-109	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-110	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-111	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-112	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-113	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-114	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-115	Butnau R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N

Table A1. Continued.

ESS	Name	Construction Status 2017	Cross Perpendicular to Channel	Structures Above Tree Line	Riparian Ground Cover Remain	Machine Free Zone 7 m	Riparian Buffer 30 m	Clearing Limits Marked	Construction on Frozen Ground	Riparian Vegetation Roots Intact	Slash Above the Tree Line	Revegate Disturbed Areas	Erosion Sediment Control Implemented	Temp. Crossings Only As Needed	Appropriate Temp.Crossing Design	Existing Access Used	Temp. Crossings Perpendicular	Clean Material for Temp. Crossing Removed	One-time Fording	Timing Window for Instream Work	Fording Under Acceptable Conditions	Stream Bank Protection	Temp. Bridge As Needed	Follow-up Site Inspction 2018
KR3-Aqua-116	Butnau R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-117	Butnau R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-118	Kettle R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-119	Kettle R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-120	Kettle R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-121	Kettle R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-122	Kettle R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-123	Kettle R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-124	Kettle R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-124b	Kettle R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-125	Kettle R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-126	Kettle R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-127	Kettle R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1-Aqua-128	Unnamed Trib. To the Butnau R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR3-Aqua-129	Unnamed Trib. To the Butnau R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR2-Aqua-130	Unnamed Trib. To the Butnau R.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N

Table A1. Continued.

ESS	Name	Construction Status 2017	Cross Perpendicular to Channel	Structures Above Tree Line	Riparian Ground Cover Remain	Machine Free Zone 7 m	Riparian Buffer 30 m	Clearing Limits Marked	Construction on Frozen Ground	Riparian Vegetation Roots Intact	Slash Above the Tree Line	Revegate Disturbed Areas	Erosion Sediment Control Implemented	Temp. Crossings Only As Needed	Appropriate Temp.Crossing Design	Existing Access Used	Temp. Crossings Perpendicular	Clean Material for Temp. Crossing Removed	One-time Fording	Timing Window for Instream Work	Fording Under Acceptable Conditions	Stream Bank Protection	Temp. Bridge As Needed	Follow-up Site Inspection 2018
Watercourse Crossings of the Construction Power Line and the Temporary Construction Power Line																								
KR1T-Aqua-100	Nelson R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KR1T-Aqua-101	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KN36-Aqua-100	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KN36-Aqua-101	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KN36-Aqua-102	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KN36-Aqua-103	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KN36-Aqua-104	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
Watercourse Crossings of the four Unit Transmission Lines																								
KE-Aqua-100	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KE1-Aqua-101	Unnamed Trib.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KE2-Aqua-102	Unnamed Trib.	RC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KE1-Aqua-100a	Nelson R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KE2-Aqua-100b	Nelson R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KE3-Aqua-100c	Nelson R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N
KE4-Aqua-100d	Nelson R.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	NA	Y	Y	U	Y	N

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