
**APPLICATION OF 5900345 MANITOBA LTD.
FOR THE INTERIM LICENCE TO
USE AND STORE WATER FOR
POWER PURPOSES AT THE KEYYASK PROJECT
ON THE NELSON RIVER**

5900345 Manitoba Ltd., on behalf of Keyyask Hydropower Limited Partnership (KHLP), hereby applies for a licence to use and store the waters of the Nelson River for power purposes at Gull Rapids, immediately upstream of Stephen's Lake on provincial Crown land. The site is to be known as the Keyyask Generating Station and is approximately 180 km (112 miles) northeast of Thompson, 60 km (37 miles) northeast of Split Lake, and 30 km (18.6 miles) west of Gillam. The Project will be located entirely within the Split Lake Resource Management Area (SLRMA). This application is made pursuant to the provisions of The Water Power Act (C.C.S.M. c. W60). The following information is being provided in accordance with the requirements of The Water Power Regulation, being W60 - Manitoba Regulation 25/88R:

(a) Applicant

5900345 Manitoba Ltd. on behalf of Keyyask Hydropower Limited Partnership.

The Keyyask Hydropower Limited Partnership (KHLP) consists of 5900345 Manitoba Ltd. which is a wholly-owned subsidiary of Manitoba Hydro, and general partner of the KHLP. The KHLP consists of 5900345 Manitoba Ltd., the Manitoba Hydro-Electric Board, Cree Nation Partners Limited Partnership, comprised of Tataskweyak Cree Nation and War Lake First Nation, as well as York Factory First Nation Limited Partnership and Fox Lake Cree Nation Keyyask Investments Inc.

(b) Address

360 Portage Avenue
P.O. Box 815
R3C 2P4
Winnipeg, Manitoba

Occupation

Electric Utility

(c) River

Nelson River

(d) Place

Water will be impounded, diverted, and used at a proposed hydroelectric station called the Keeyask Generating Station, to be located at approximately 95°11'44"W and 56°20'55"N (0364316E, 6247045N, UTM NAD1983 Zone 15) Section 5 and 8, Township 85, Range 15 East of Principal Meridian, and will be returned to the river immediately downstream of the proposed hydroelectric station within the natural river channel. The location of the Keeyask Generation Project is shown in Figure 1.

(e) Maximum Quantity of Water

The maximum quantity of water estimated to be used for generation is approximately 4,100 m³/s (144,800 cfs) when the forebay is at its full supply level (FSL) of 159.0 m (521.7 feet) above sea level (asl), the station is operated at full gate discharge and Kettle Generating Station is at a forebay level of 139.6 m (458 feet) asl.

(f) Estimated Average Head

The estimated average head available for power production according to the development plan is approximately 18.3 m (60 feet). The head is expected to fluctuate between approximately 19.6 m (64.3 feet) and 17.8 m (58.4 feet).

(g) Initial Power Installation

Energy is not expected to be generated at the proposed Keeyask Generating Station until approximately eight years after the date of this application. The first

unit is scheduled to go into commercial service in November 2019 with a rated output of approximately 99.3MW (133,165 hp).

(h) Final Power Installation

Upon completion of the Keeyask Generating Station (GS), the maximum capacity will be approximately 695MW (932,000 hp). This will occur when the immediate forebay level at Keeyask GS is at its FSL of 159.0 m (521.7 feet) and the reservoir level for the downstream Kettle GS is at 139.6 m (458 feet). The Keeyask GS will have a capacity of approximately 630 MW when its forebay level is at its FSL of 159.0 m (521.7 feet) and the reservoir level at Kettle GS is at its FSL of 141.1 m (463 feet). The generating station capacity factor is estimated to be 78 percent. The estimated average annual energy that will be produced by Keeyask Generating Station will be 4,400 gigawatt-hours. The annual dependable energy is expected to be approximately 2,900 gigawatt-hours.

(i) Principal (Primary) Works

All elevations shown on the figures or referred to in this application are above sea level and are based on the Geodetic Survey of Canada (GS of C), Canadian Government Vertical Datum (CGVD) 1928, 1971 Local Adjustment which Manitoba Hydro generally refers to as GS of C CGVD28, 1969 Local Adjustment. The figures in this application use the UTM NAD 1983 Zone 15 coordinate system as the horizontal datum.

Three dimensional renderings of the arrangement of the principal works are shown in Figures 2 and 3. The plan view for the principal works is shown in Figure 4. Supporting infrastructure in and around the main construction site is shown in Figure 5. Construction of the project will require two stages of river diversion using cofferdams and rock groins as shown in Figures 6 to 8. The principal works are described below:

1. The Powerhouse Complex will contain seven vertical shaft fixed blade turbines and generators, each with an intake, scroll case and a draft tube.

The intake for each turbine unit will have three openings, each with a service gate. The Powerhouse Complex will be located within and adjacent to the north channel of the Nelson River. Two permanent concrete transition structures will connect the powerhouse complex to the North Dyke and Central Dam. A roadway that meets provincial requirements for a provincial road will be constructed on the Powerhouse Complex and the concrete transition structures. The Powerhouse Complex will have an approximate width of 248 m (813 feet), length of 68 m (224 feet), and a maximum height (from the bottom of the structure to the top of the intake hoist housing) of 62 m (203 feet). Figures 9 and 10 show a rendered image and a cross section of the Powerhouse Complex, respectively.

2. A reinforced concrete overflow Spillway will be located within the south channel of Gull Rapids approximately 1.5 km (0.9 miles) south of the Powerhouse. The Spillway will be approximately 119 m (390 feet) wide and 42 m (139 feet) long and will have seven (7) bays. Each of the seven bays will have hoist controlled gates approximately 13 m (43 feet) wide and 16 m (53 feet) high separated by 3.5 m (12 feet) thick piers. From the bottom of the structure to upstream bridge deck and excluding the gate hoist tower, the height will be approximately 24 m (77 feet). Two concrete transition structures will connect the Spillway to the Main and South Dams. The peak discharge during a probable maximum flood (PMF), is 12,700 m³/s (448,500 cfs) with the spillway passing 11,300 m³/s (399,000 cfs), and the remaining flow passing through the Powerhouse operating 6 units at speed no load. The peak water level immediately upstream of the Powerhouse during the PMF would be approximately 160.3 m (526 feet), The Spillway is designed to pass a flow of 8,700 m³/s (307,200 cfs) at a normal full supply level of 159.0 m (522 feet). A roadway that meets provincial requirements for a provincial road will be constructed on the Spillway and transition structures between the Spillway and main and

south dams. Figures 11 and 12 show a rendering and a cross section of the spillway, respectively.

3. Three earthfill dams (North, Central and South) will be constructed across Gull Rapids, creating a reservoir upstream of the powerhouse. The dams will be zoned earth fill embankments consisting of an impervious core with granular and crushed rock filters and outer rock shells. A roadway that meets provincial requirements for a provincial road will be constructed on the three earthfill dams. The North Dam will have a maximum height of approximately 25 m (82 feet) and will be approximately 100 m (328 feet) in length. To the north, it will connect with the North Dyke and to the south with the Powerhouse. The Central Dam will have a maximum height of approximately 28 m (92 feet) and will be approximately 1,600 m (5,300 feet) in length. It will extend from the Powerhouse to the Spillway. The South Dam will have a maximum height of approximately 22 m (72 feet) and a length of approximately 565 m (1900 feet). It will be constructed across the south channel of the river, extending from the Spillway to the South Dyke. The crest elevation for all three dams will range approximately between 162.0 m (532 feet) and 162.6 m (534 feet). Figure 13 shows typical cross sections of the three earthfill dams.
4. A series of discontinuous earth fill dykes which will be located along both sides of the river. To facilitate inspection and maintenance, a roadway will be constructed on top of the dykes, on high ground between the sections of the dykes and on transition structures. The combined length of the roadway sections and dykes will be approximately 11.6 km (7.2 miles) on the north side of the river and 11.2 km (7 miles) on the south side. The north and south dykes will have a maximum height of approximately 20 m (66 feet) and 13 m (43 feet) respectively.

The length of the north dyke is composed of approximately:

- 2,900 m (9,500 feet) of zoned impervious core on glacial tills;
- 185 m (600 feet) of granular dyke;

- 4,800 m (15,750 feet) of freeboard dykes; and
- 3,700 m (12,100 feet) of road sections.

The length of the south dyke is composed of approximately:

- 5,100 m (16,700 feet) of zoned impervious core on glacial tills;
- 5,400 m (17,700 feet) of freeboard dykes; and
- 700 m (2,300 feet) of road sections.

Typical cross sections for the dykes are shown in Figure 13.

5. A transmission tower spur (TTS) constructed with earth materials located along the southern edge of the tailrace channel will support four self supported transmission towers and foundations. The towers will support the transmission lines crossing the river to the south. The transmission tower spur is approximately 200 m (656 feet) long and the top of structure will be at approximately elevation 145.5 m (477 feet). Figure 2 shows the location of the TTS and Figure 14 shows the cross section of the structure.

(j) Storage

The reservoir created by the Keeyask Project will extend 42 km (26.1 miles) from the generating station to the outlet of Clark Lake. The normal FSL of the reservoir will be 159.0 m (521.7 feet) and the minimum operating level will be 158.0 m (518.4 feet) (wind eliminated water levels) as measured near the key structures. During normal operations, the reservoir level will fluctuate as much as 1 meter (3.3 feet) in a 24 hour period to utilize the available storage. Approximately 45 km² (11,120 acres) of land will be flooded immediately as a result of the Keeyask Project. The estimated surface area of the reservoir at elevation 159.0 m (521.7 feet) is approximately 93 km² (22,980 acres) during 50th percentile reservoir inflow conditions. Live reservoir storage at initial impoundment will be approximately 81.4 million m³ (66,000 acre-feet). The reservoir area is predicted to increase by 7 to 8 km² (1,730 acres to 1,977 acres) during the first 30 years of operations due to shoreline erosion and peat land disintegration. The total live reservoir storage with the additional reservoir expansion is predicted to be

approximately 84.9 – 85.4 million m³ (68,800 – 69,200 acre-feet). Figure 15 shows the flooded area in the reservoir for Keyask Generating Station.

(k) Description of Lands Required

The Keyask Hydropower Limited Partnership has a lease for the lands required for the north access road, camps, contractor work areas and other facilities on the north and south sides of the Nelson River (Figure 16). This lease grants a purchase right to the Partnership. The Partnership intends to purchase the leased lands and additional lands on the north and south side of the Nelson River and water lots in the Nelson River (Figure 17). These lands will be used for the principal structures and the south access road. After final commissioning the partnership will re-convey surplus lands to Manitoba.

1. Crown Lands

The following is an estimate of the Crown lands required which includes areas that will be purchased by the partnership (Figures 18 to 21):

Category A

“lands of the province not covered by water required for main diverting works, powerhouse, and similar works”, including construction work area, campsite, south dam, central dam, north dam and transition structures, Powerhouse, Spillway, rock quarries, granular and impervious borrow areas (Figure 22), intake and tailrace excavated channels, disposal areas for surplus excavated materials (Figure 23) and dykes located in portions of Twp. 84-R12 EPM, Twp. 84-R13 EPM, Twp. 85-R13 EPM, Twp. 85-R14 EPM, Twp. 85-R15 EPM, Twp. 84-R14 EPM and Twp. 84-R15 EPM.

... **3,250** hectares (8,028 acres) during construction

... **2,915** hectares (7,200 acres) during operation

Category B

“lands of the province covered by water required for the said purpose”, including cofferdams, spillway, south dam, central dam, north dam and transition structures, Powerhouse, Spillway, rock quarries, disposal areas for surplus excavated materials and channel excavations, located in portions of Twp. 84-R13 EPM, Twp. 85-R14 EPM, Twp. 85-R15 EPM, Twp. 84-R14 EPM and Twp. 84-R15 EPM.

... **557** hectares (1,376 acres) during construction

... **161** hectares (398 acres) during operations

Category C

“lands of the province required only to be flooded in connection with the storage or pondage of water”. This area includes the reservoir expansion that is predicted to occur during the first 30 years of the plant’s operation, much of it occurring within the first year of operation. This area is located in portions of Twp. 85-R15 EPM, Twp. 84-R15 EPM, Twp. 85-R14 EPM, Twp. 84-R14 EPM, Twp. 85-R13 EPM, Twp. 84-R13 EPM, Twp. 84-R12 EPM and Twp. 84-R11 EPM

... **0** hectares (0 acres) during construction

... **5,265** hectares (13,000 acres) during operations

Category D

“lands of the province required only for rights of way for water conduits, transmission lines, and similar works” including the following:

- i. One 138 kV transmission line connecting the construction power station, located north of Gull Rapids, to transmission line KN-36 located 22 km (13.7 miles) south of the site (Figure 24). This transmission line will be used as the primary source of construction power and as an off-site source of backup power during the operating phase. The current alignment and corridor

width is conceptual and subject to change. Lands are located in portions of Twp. 85-R15 EPM, Twp. 84-R15 EPM, Twp. 84-R16 EPM and Twp. 83-R16 EPM.

... **105** hectares (259 acres) is a preliminary estimate during the construction and operation phase.

- ii. Three generation outlet transmission lines connecting a switching station located on the south side of the river to the Radisson Converter Station located 38 km (23.6 miles) from the site, where the power will enter Manitoba Hydro's integrated system (Figure 24). One of these lines will be built earlier than the other two to provide a back-up source of power during construction. The current alignment and corridor width is conceptual and subject to change. The transmission lines are located in portions of Twp. 85-R15 EPM, Twp. 84-R15 EPM, Twp. 84-R16 EPM, Twp. 84-R17 EPM, Twp. 84-R18 EPM and Twp. 85-R18 EPM.

... **578** hectares (1428 acres) is a preliminary estimate during the construction and operation phase.

- iii. An additional transmission line connecting the switching station and the construction power station will be used to provide a back-up source of power during construction (Figure 24). This line is approximately 3 km (1.9 miles). The transmission lines are located in portions of Twp. 84-R15 EPM and Twp. 85-R15 EPM,

... **67.4** hectares (167 acres) is a preliminary estimate during the construction and operation phase.

- iv. A north access road from Provincial Road 280 to Gull Rapids will have a length of approximately 25 km (15.5 miles). The

access road will have a right-of-way width of 100 m (328 feet). Upon completion of the Keeyask GS, ownership of the road may be transferred to Manitoba Infrastructure and Transportation and become a provincial road. The north access road is located in portions of Twp. 85-R13 EPM, Twp. 85-R14 EPM and Twp. 85-R15 EPM.

... **234** hectares (578 acres) during the construction and operation phase.

- v. A south access road will have a length of approximately 34 km (21.1 miles) from Gull Rapids to Gillam. The south access road will include 14 km (8.7 miles) of new and 20 km (12.4 miles) of upgraded roadway. Upon completion of the Keeyask GS, ownership of the road may be transferred to Manitoba Infrastructure and Transportation and become a provincial road. This road will have a right-of-way width of 100 m (328 feet) and will be 14.4 km (8.9 miles) long. The south access road is located in portions of Twp. 84-R15 EPM, Twp. 84-R16 EPM, Twp. 84-R17 EPM, Twp. 85-R17 EPM, Twp. 85-R18 EPM.

... **329** hectares (813 acres)

during the construction and operation phase

Category E

“lands of the province, if any, required for substations, distributing stations, terminal stations, and similar works” including the following:

A construction power station located on the north side of the project will be used during construction and as a backup source of power during the operating phase and the switching station located on the south side of the Nelson River which connects transmission lines from Keeyask Generating Station to the Radisson Converter Station near Gillam. The construction power station and the switching

station are located in portions of Twp. 85-R15 EPM and Twp. 84-R15 EPM.

... **37.5** hectares (93 acres)

during the construction and operation phase

Total estimate of Crown lands required during construction (Figure 18 and 20)
5,157 hectares (12,700 acres)

Total estimate of Crown lands required during operations (Figure 19 and 21)
9,686 hectares (23,900 acres)

Note: this area includes area of the project footprint, newly flooded area and reservoir expansion.

2. Private Lands

There are no known private lands within the project area.

(1) Preliminary Plans

Preliminary Figures for the project are submitted herewith as Figures 1 to 24.

<i>Number</i>	<i>Figure Title</i>
1	Keeyask Generating Station - Project Location Plan
2	Keeyask Generating Station - General Arrangement – Looking Upstream
3	Keeyask Generating Station - General Arrangement – North View
4	Keeyask Generating Station - Principal Structures
5	Keeyask Generating Station - Supporting Infrastructure
6	Keeyask Generating Station - Stage I and Stage II Diversions
7	Keeyask Generating Station -Stage I Cofferdam and Groin Cross Section
8	Keeyask Generating Station -Stage II Cofferdams Cross Sections
9	Keeyask Generating Station - Powerhouse Complex
10	Keeyask Generating Station - Powerhouse Complex Cross Section
11	Keeyask Generating Station - Spillway
12	Keeyask Generating Station - Spillway Cross Section
13	Keeyask Generating Station - Dykes and Dams Typical Cross Sections
14	Keeyask Generating Station - Transmission Tower Spur and Related Cofferdam Section
15	Keeyask Generating Station - Projected Flooding Area and Water Surface Profiles
16	Keeyask Generating Station – Leased Lands

<i>Number</i>	<i>Figure Title</i>
17	Keyyask Generating Station – Projected Land Acquisition
18	Keyyask Generating Station – Project Lands Required - During Construction
19	Keyyask Generating Station – Project Lands Required -During Operation
20	Keyyask Generating Station – Project Lands Required - During Construction – Full Extent
21	Keyyask Generating Station – Project Lands Required -During Operation – Full Extent
22	Keyyask Generating Station - Potential Borrow Source and Quarries
23	Keyyask Generating Station - Excavated Material Placement Areas
24	Keyyask Generating Station – Preliminary Transmission Corridors

Table 1: List of Maps and Figures

(m) Neighboring Works

Neighboring works consist of the following:

- Wuskwatim Generating Station, approximately 270 km (167 miles) upstream on the Burntwood River;
- Kelsey Generating Station, approximately 92 km (57 miles) upstream on the Nelson River; and
- Kettle Generating Station, approximately 35 km (22 miles) downstream on the Nelson River.

(n) Discharges

Based on a calculation of historical flow records at Split Lake and Kettle Generating Station for the period of November 1977 to September 2011 the minimum, average and maximum discharges are approximately 1,330 cms (46,900 cfs), 3,170 m³/s (112,100 cfs) and 6,600 m³/s (223,100 cfs), respectively.

Approximate rates of discharge through the Keyyask Generating Station Powerhouse will be:

- Maximum: 4,100 m³/s (144,800 cfs)¹
- Average: 3,130 m³/s (110,400 cfs)²
- Minimum: 570 m³/s (20,100 cfs)³

Where:

¹Maximum rate of discharge occurs when Keeyask Generating Station reservoir is at its full supply level (FSL) and Kettle Generating Station is at 139.6 m (458 feet).

²Average rate of discharge is based on synthesized monthly long term flow data from the period of 1912 to 2006.

³Minimum rate of discharge is based on one unit operating at best gate when Keeyask Generating Station and Kettle Generating Station are at their respective full level supply (FSL).

(o) Undertaking

The KHLP has contracted with Manitoba Hydro to design, construct, operate and dispatch the station as part of the Manitoba Hydro integrated power system. Manitoba Hydro will also provide operations and maintenance services to the Keeyask Generating Station. All of the power generated by the project will be sold to the Manitoba Hydro-Electric Board.

It should be noted that all transmission required for this project will be owned by Manitoba Hydro and will not be owned by the limited partnership.

The total estimated in-service cost of the undertaking is approximately \$5.6 billion.

(p) Financial Standing

The Keeyask Generating Station Project will be financed by equity contributions from member subscriptions of the Keeyask Hydropower Limited Partnership. Most of the contributions will be provided by Manitoba Hydro in accordance with the Project Finance Agreement between the Partnership and Manitoba Hydro.

Manitoba Hydro will take security over the entire undertaking of the project. In accordance with the Limited Partnership Agreement, The Manitoba Hydro-

Electric Board will hold a 74.999% interest in the limited partnership. 5900345 Manitoba Ltd. will hold a 0.001% interest in the limited partnership. Cree Nation Partners Limited Partnership will hold a 15% interest in the limited partnership, York Factory First Nation Limited Partnership will hold a 5% interest in the limited partnership and Fox Lake Cree Nation Keeyask Investments Inc. will hold a 5% interest in the limited partnership.

(q) Licence Information

President.....K.R.F. Adams

Head Office
360 Portage Avenue
P.O. Box 815
R3C 2P4
Winnipeg, Manitoba

DATED at Winnipeg, Manitoba the 7th day of February, 2012.
5900345 Manitoba Ltd., on behalf of Keeyask Hydropower Limited Partnership

Per: **Original Signed**
Authorized Signing Officer