

WATER POWER ACT LICENCES

KETTLE GENERATING STATION SHORT TERM LICENCE EXTENSION APPLICATION

SUPPORTING DOCUMENTATION

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WATERWAY APPROVALS & MONITORING DEPARTMENT
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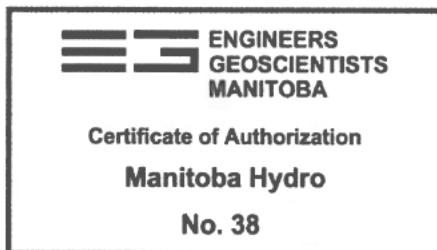


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April 7, 2022

1.0 INTRODUCTION

This report provides information in support of a short-term extension licence application. Manitoba Hydro requests this extension licence in accordance with Section 92 of The Water Power Regulation, Manitoba Regulation 25/88R of The Water Power Act.

Manitoba Hydro operates the Kettle Generating Station (GS) in accordance with the Final Licence for the Development of Water Power at the Kettle Rapids site on the Nelson River. This licence was issued in accordance with the provisions of The Water Power Act on July 19, 1990, covering a term of fifty (50) years from February 1, 1972 to November 1, 2022.

Manitoba Hydro requested a renewal licence on September 8, 2017. However due to licensing requirements for other projects, Manitoba Hydro is requesting a short-term extension licence to allow the license renewal to occur at a later date.

2.0 PROJECT COMPONENTS

2.1 Kettle Generating Station

The Kettle GS is located at the site of the former Kettle Rapids on the lower Nelson River as shown in Figure 1. It is approximately 6 km downstream of the Town of Gillam and can be accessed by PR 280. An overall site map outlining the layout of the major project components is shown in Figure 2, and Photograph 1 shows the Kettle Rapids GS powerhouse.

The Kettle GS is the second largest generating station on the lower Nelson River with a name plate capacity of 1,252.8 MW (1,680,000 horsepower). The station was constructed between 1966 and 1974, and the first turbine generator was commissioned in December 1970.

The station consists of a close-coupled intake/powerhouse with 12 vertical shaft fixed blade propeller turbine generator units (units), an adjoining short concrete non-overflow dam, an eight bay gated spillway, a main earth dam, a saddle dam across a ravine; an earth dam across the Butnau River, a Butnau River diversion channel, seven (7) closure and freeboard dikes, transmission lines and the Radisson HVDC Converter Station. Figures 3, 4, and 5 show the general arrangement of the concrete and earth fill structures. Table 1 summarizes major characteristics of the generating station. Table 2 summarizes major characteristics of the Kettle powerhouse, spillway, and earth-filled dikes.

Table 1: Kettle GS Major Characteristics

Construction Period	1966 to 1974
Capability	1,258.8 MW (1,680,000 horsepower)
Average Annual Generation	7,038 million kW-h
Waterfall Drop (head)	30 m
Maximum Licence Forebay Elevation	141.12 m (463.0 ft)

Table 2: Kettle GS Component Characteristics

<i>Powerhouse</i>	Number of Units	12
	Length	365.76 m
	Discharge Capacity (at full gate)	4,620 m ³ /s
	Power Production Units 1-12	12 units @ 104.4 MW = 1252.8 MW
<i>Spillway</i>	Number of Bays	Sluiceway with 8 bays
	Total Length	120.1 m
	Discharge Capacity (at full supply level*)	9,060 m ³ /s
<i>Dams and Dikes</i>	Material	Rockfill and Impervious fill
	Crest Elevation	Main Dam North: 144.17 m Main Dam South: 144.17 m to 144.48 m Saddle Dam: 144.2 m to 144.8 m Butnau Dam: 143.0 to 144.5 m Dike 1: 143.0 m Dikes 2A/2B/2C: 142.95 m Dike 3: 142.95 m Dike 4: 143.87 m Dike 5: 144.48 m Dike 6: 144.50 m
	Concrete Wave Barrier Height	Main Dam North: 146.3 m Main Dam South: 146.3 m Saddle Dam: 146.2 m
	Available Freeboard (From crest elevation at full supply level*)	Main Dam North: 3.05 m Main Dam South: 3.05 m to 3.36 m Saddle Dam: 3.08 m to 3.68 m Butnau Dam: 1.88 to 3.38 m Dike 1: 1.88 m Dikes 2A/2B/2C: 1.83 m Dike 3: 1.83 m Dike 4: 2.75 m Dike 5: 3.36 m Dike 6: 3.38 m

*Full Supply Level is 141.12 m measured at the powerhouse

2.2 Butnau Dam

The Butnau Dam was built in 1969 and is a component of the dam and dike system for the Kettle Generating Station. It is located 800 m upstream on the Butnau River, at the Nelson River junction, approximately 24 km west of the Kettle Generating Station. See Figure 1.

The purpose of the Butnau Dam is to contain the impoundment of Stephens Lake at the natural outlet of the Butnau River. A diversion channel was excavated between Cache Lake and the Kettle River to redirect the Butnau River flow directly into the Kettle River, which exits approximately 5 km downstream of the generating station into the Nelson River.

In response to seepage in the north abutment area of the Butnau River channel during initial impoundment of the reservoir, a slurry trench cut-off wall was constructed under a portion of the Butnau Dam in 1971.

The 5 km earth dam forms a portion of the southern boundary of the Kettle Rapids reservoir, known as Stephens Lake.

3.0 WATER POWER LICENSING REQUIREMENTS

3.1 Licence Terms

Condition #2 of the Final Licence stipulates that:

“The undertaking authorized to be maintained and operated by the Licensee under this Final License shall consist of the following: A powerhouse with twelve (12) vertical shaft hydro electric turbines, each of one hundred and forty thousand (140,000) horsepower capacity; an adjoining short concrete non-overflow dam section; a gated spillway; a main earth dam; a saddle dam across a ravine; an earth dam across the Butnau River; a Butnau River diversion channel; seven (7) closure and freeboard dikes; transmission lines; Radisson HVDC Converter Station; roads; and all plant machinery and equipment ...”

The powerhouse consists of twelve (12) vertical shaft hydro electric turbines, each of 104.4 MW (140,000 horsepower). Site requirements for the complete development, generation, transformation and transmission of the power were complete in 1974, including the Radisson HVDC Converter Station which became operational in 1971.

Condition #5 of the Final Licence stipulates that:

“The Licensee shall not raise the headwater, as measured at the powerhouse, higher than 463.0 feet above mean sea level, Canadian Geodetic Datum. A higher elevation may be created only with written permission by the Director and in accordance with Section 72 of the Regulation.”

Manitoba Hydro operates the Kettle GS so that the forebay water level does not exceed 141.1 m (463.0 feet). Compliance with this condition typically exceeds 99.9 percent using hourly water level measurements.

3.2 Licence Area

The licence area shown in Manitoba Environment, Climate and Parks file number 51-5-1099 covers approximately 1333 square km (515 square miles) upstream of the Kettle GS. Included as part of the license area are Gull Rapids, the Butnau River and Dam, Cache Lake, the Kettle River, Moose Lake now referred to as the Moose Nose of Stephens Lake, Stephens Lake, and the Limestone River.

The licence area is in Treaty 5 territory, within Fox Lake Cree Nation’s traditional territory and in the Split Lake Resource Management Area.

Manitoba Hydro is reviewing the licence area and will propose changes/refinements based on current cadastral information, updated geotechnical analysis of shoreline erosion and wind setup and wave uprush analysis. It is expected that the updated licence area will be submitted as part of the licence renewal process.

4.0 MONITORING PROGRAMS

4.1 Water Levels

The level of the Kettle Forebay (Stephens Lake) is controlled for optimum energy production within Manitoba Hydro’s system through the operation of Kettle GS. Daily and weekly cycling patterns allow Manitoba Hydro to match energy production to consumption patterns.

The Kettle forebay gauge consists of a float attached to a steel tape that is draped over a pulley connected to a Selsyn (self-synchronous) system. This system electronically transmits the angular position of the pulley to a receiving device in the control room. The positional information is converted to a water level, indicated on a display and also output to the Remote Transmittal Unit for transmission to

Manitoba Hydro's System Control Centre. Kettle Forebay water level measurements are taken continuously and recorded at the beginning of each hour.

Station operators take direct water level measurements monthly and monitor/maintain the Kettle gauge equipment as needed to ensure gauge performance and accuracy.

Data is collected on site and signed off by the operating supervisor. Data is then sent to the Energy Supply Planning Department of Manitoba Hydro, uploaded into a database and checked for errors. Data errors are then corrected or verified by plant operating staff with technical assistance from Energy Supply Planning staff as needed. Once data has been verified, it may be used for operations planning, studies, model development and reporting.

Manitoba Hydro prepared the Kettle Generating Station Licence Implementation Guide for Water Levels to document a common understanding of compliance with the water regime terms of the Kettle Water Power Act Licence. The report was approved by Manitoba in 2018.

Manitoba Hydro prepares an Annual Water Levels and Flows Compliance Report to document compliance with its Water Power Act licences. The report contains analysis of water level and flow data related to the licence conditions for the calendar year. Information specific to Kettle GS includes the analysis of forebay level data, maps, photos, project description, and gauge and data collection description. In addition to the annual report, Manitoba Hydro performs weekly licence compliance checks for all Water Power Act licence conditions. Manitoba Hydro reports licence limit exceedances to Manitoba Environment, Climate and Parks upon occurrence.

Real-time data for Kettle GS outflow and Stephens Lake water level is available on Manitoba Hydro's website.

4.2 Dam Safety

Manitoba Hydro's Dam Safety Program is based on the Canadian Dam Association (CDA 2007) Guidelines and operates in accordance with two key CDA principles:

Principle 1a

The public and the environment shall be protected from the effects of dam failure, as well as release of any or all retained fluids behind a dam, such that the risks are kept as low as reasonably practicable.

Principle 2d

Documented surveillance procedures shall be followed to provide early identification and to allow for timely mitigation of conditions that might affect dam safety.

Manitoba Hydro's program objectives aim to detect changes in the condition of dams and to initiate timely remedial measures when necessary. The program includes visual inspections, instrument data analysis, engineering analysis, testing, evaluations, and reporting. Manitoba Hydro maintains inspection guidelines for surveillance of concrete and embankment dams based on the dam classification, condition, and professional judgment.

Manitoba Hydro staff perform routine inspections of all water retaining and flow control structures at Kettle GS to ensure that these structures continue to perform as intended. Specialists from Manitoba Hydro's Asset Management Division perform additional inspections of all dams annually. A summary of key dam safety related activities and assessments is included in Manitoba Hydro's Annual Water Levels and Flows Compliance Report.

Dam Safety Reviews (DSR) of generating stations and water control structures are undertaken on a prescribed schedule. This type of review is a systematic evaluation of dam safety through a comprehensive performance assessment of the structures and review of original design, construction, operation and maintenance records to ensure that the generating station meets current industry standards. The CDA Guidelines are the applicable standard. Qualified external consulting engineering firms carry out DSRs and typically include a site inspection of the station, dams, and spillway gates, including mechanical and electrical aspects of gate operation. A comprehensive DSR report includes observed deficiencies and recommendations for follow-up. McMillen Jacobs Associates completed the most recent Kettle GS DSR in 2016. Several deficiency investigations are now complete, while the remaining items are prioritized within the appropriate work management system. The next DSR for Kettle GS is planned for 2026.

Manitoba Hydro maintains Dam Safety Emergency Preparedness Plans for all generating stations. These plans are consistent with the CDA's Dam Safety Guidelines and bulletins and are issued to local authorities and emergency response agencies to assist in responding to an emergency. The Kettle Dam Safety Emergency Preparedness Plan contains detailed information regarding the verification, and classification of the emergency, and contains communication notification and reporting procedures.

Manitoba Hydro updates notification charts in the emergency plans annually to reflect ongoing personnel and content change. Major revisions to the plans are

currently underway and will include updated dam breach mapping and a new format that aligns with the latest CDA emergency management guidance.

4.3 Aquatic Monitoring

The Kettle Generating Station falls within the Lower Nelson River Region of the Coordinated Aquatic Monitoring Program (CAMP). CAMP is a partnership program between the Manitoba government and Manitoba Hydro. It was established in 2008 as a long-term, system-wide aquatic monitoring program to track the condition of water bodies (rivers and lakes) affected by Manitoba Hydro's generating system.

Water and sediment quality, fish community, lower trophic levels, and mercury in fish are the parameters monitored in the Program. In addition to monitoring, CAMP has also collected information on waterways such as aquatic habitat inventories and sedimentation.

Monitoring sites in the Lower Nelson River Region extend from the Burntwood River through Assean, Split and Stephens lakes with the last site in the Nelson River, downstream of the Limestone Generating Station. Immediately upstream of the Kettle GS, CAMP monitoring occurs in Stephens Lake (the reservoir for the Kettle GS) every 3-years. Downstream of the Kettle GS, CAMP monitoring occurs in the Limestone GS forebay every 3-years.

5.0 COMMUNITY INVOLVEMENT, SYSTEM UPGRADES AND STUDIES

5.1 Community Involvement

Manitoba Hydro has a long history of interaction with the people living in the Kettle Generating Station licence area. Manitoba Hydro has worked with communities, groups and associations on various adverse effects settlement agreement processes, programs and on-going communications to address impacts from hydro-electric development and to strengthen working relationships. These agreement processes include the Northern Flood Agreement (NFA) and related NFA claims process, Comprehensive Implementation Agreements and other settlement agreements. Specifically, the Kettle Generating Station is included in the project description defined in the following settlement agreements:

- The Comprehensive Implementation Agreements (CIAs):
 - Split Lake (Tataskweyak) Cree Nation (1992), York Factory First Nation (1995), Nelson House (Nisichawayasihk) Cree Nation (1996) and Norway House Cree Nation (1997)
- Wabowden Community Council (1992)
- Fox Lake Cree Nation (2004)
- War Lake First Nation (2005)

- Nelson House Community Council (2006)
- Cross Lake Community Council (2010)

Manitoba Hydro also has several ongoing programs and communication initiatives that involve communities in the Kettle Generating Station licence area:

- Harmonized Gillam Development was established in 2007 as a forum for Fox Lake Cree Nation, the Town of Gillam and Manitoba Hydro to discuss areas of mutual interest, share information relevant to long term goals and objectives, and to identify and address challenges and opportunities.
- Manitoba Hydro's Waterways Management Program supports and promotes the safety of people traveling on waterways affected by its operations. This includes:
 - The Boat Patrol Program: Patrolling of affected waterways during open water season to reduce floating debris and make them safer for users. Boat patrol workers are seasonal Manitoba Hydro or contract employees hired from northern communities.
 - The Debris Management Program: Establishment of priorities for debris clearing activities to enhance safety on impacted waterways. Annual program implementation is done through collaboration with local communities.
 - Safe Ice Trails Program: Installation of safe ice trails by seasonal contract workers, typically resource users hired from local communities.
 - Water Level Forecast Notice Program: Water level forecasts are issued monthly to community leadership, broadcast on local radio in both Cree and English where possible and updated daily on the Manitoba Hydro website. In addition to the monthly forecasts, spring and fall water level and flow outlooks are provided to communities on the lower Nelson River.
- The *Kischi Sipi Namao* Committee, established in 2013, includes representation from local communities, Manitoba Hydro and Manitoba Sustainable Development. The Committee works to implement measures to protect and enhance sturgeon populations in the lower Nelson River from the Kelsey GS to Hudson Bay, as well as the Hayes, Gods and Echoing rivers and tributaries along the Nelson River that are important to these populations.
- Manitoba Hydro's Heritage Resource Management Program is designed to aid in heritage resource planning, management, training, and mitigation. Archaeological monitoring throughout Hydro's hydraulic system is completed annually.

Manitoba Hydro has a range of programs and policies designed to encourage and enhance Indigenous representation in projects and the operational workforce, and to promote the participation of northern Indigenous business in construction and operations activities.

5.2 System Upgrades

Construction of the GS began in the spring of 1966. The first generator was commissioned in December 1970 and seven more were operational by June 1973 when the station opened. The last of the 12 generators was commissioned in November 1974, bringing the total capacity of the GS to 1,258.8 MW (1,680,000 hp). To date, Manitoba Hydro has not replaced any of the original turbines.

Freeboard deficiencies identified through Manitoba Hydro's Dam Safety Program were mitigated during the summer of 1996. Part of the mitigation works included the installation of 1.5 m x 1.5 m x 3 m concrete blocks as wave barriers on the Main and Saddle Dams. The use of these blocks increased the freeboard beyond what was required to meet the Canadian Dam Safety Association Guidelines. The installation of this 1.5 m high wave barrier allows Manitoba Hydro to operate the forebay to the upper licence limit of 141.1 m (463 ft) during the open water period while still maintaining adequate freeboard for an extreme wind event.

An all-season safety boom was installed upstream of the spillway in 2019 to prevent public access to dangerous areas.

5.3 System Studies

In 2013 the Clean Environment Commission Bipole III Report recommended that Manitoba and Manitoba Hydro conduct a Regional Cumulative Effects Assessment (RCEA) for all Manitoba Hydro projects in the Nelson River sub-watershed which includes Kettle Generating Station. The RCEA reports are retrospective in nature and are based on the review, collation, synthesis and analysis of the numerous environmental and socio-economic studies, post-project environmental reviews, environmental impact assessments for proposed developments and monitoring programs that have been conducted by Manitoba Hydro, Manitoba, Canada, and affected communities and people over more than 50 years. Historical Kettle GS information can be found throughout the Phase I, Phase II and the Integrated Summary Reports.

6.0 CLOSURE STATEMENT

Manitoba Hydro continues to operate the Kettle GS in accordance with the Final Licence for the Development of Water Power at the Kettle Rapids Site on the Lower Nelson River. Manitoba Hydro operates and maintains the generating station and associated structures based on the Canadian Dam Association Guidelines.

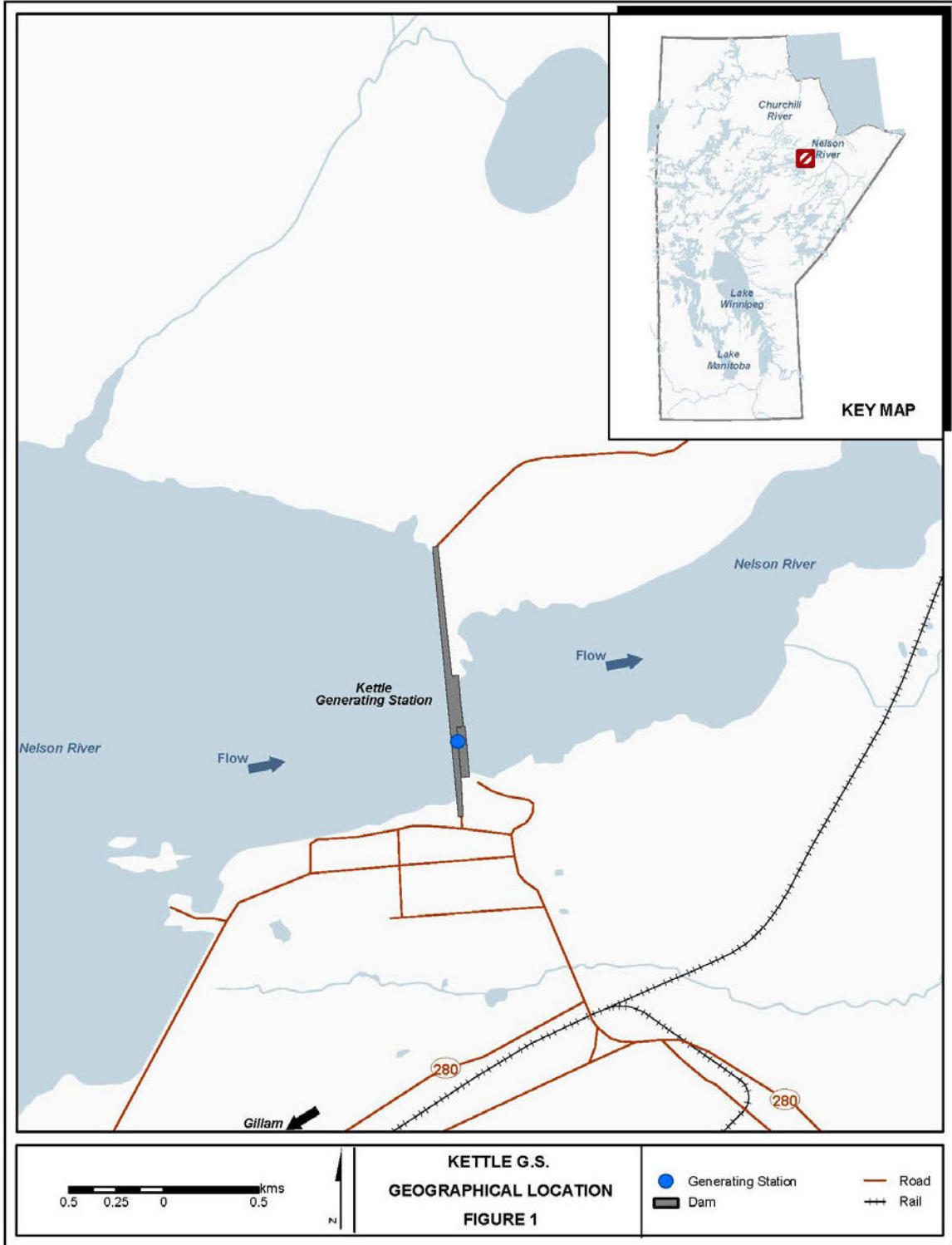


Figure 1: Kettle GS Geographical Location

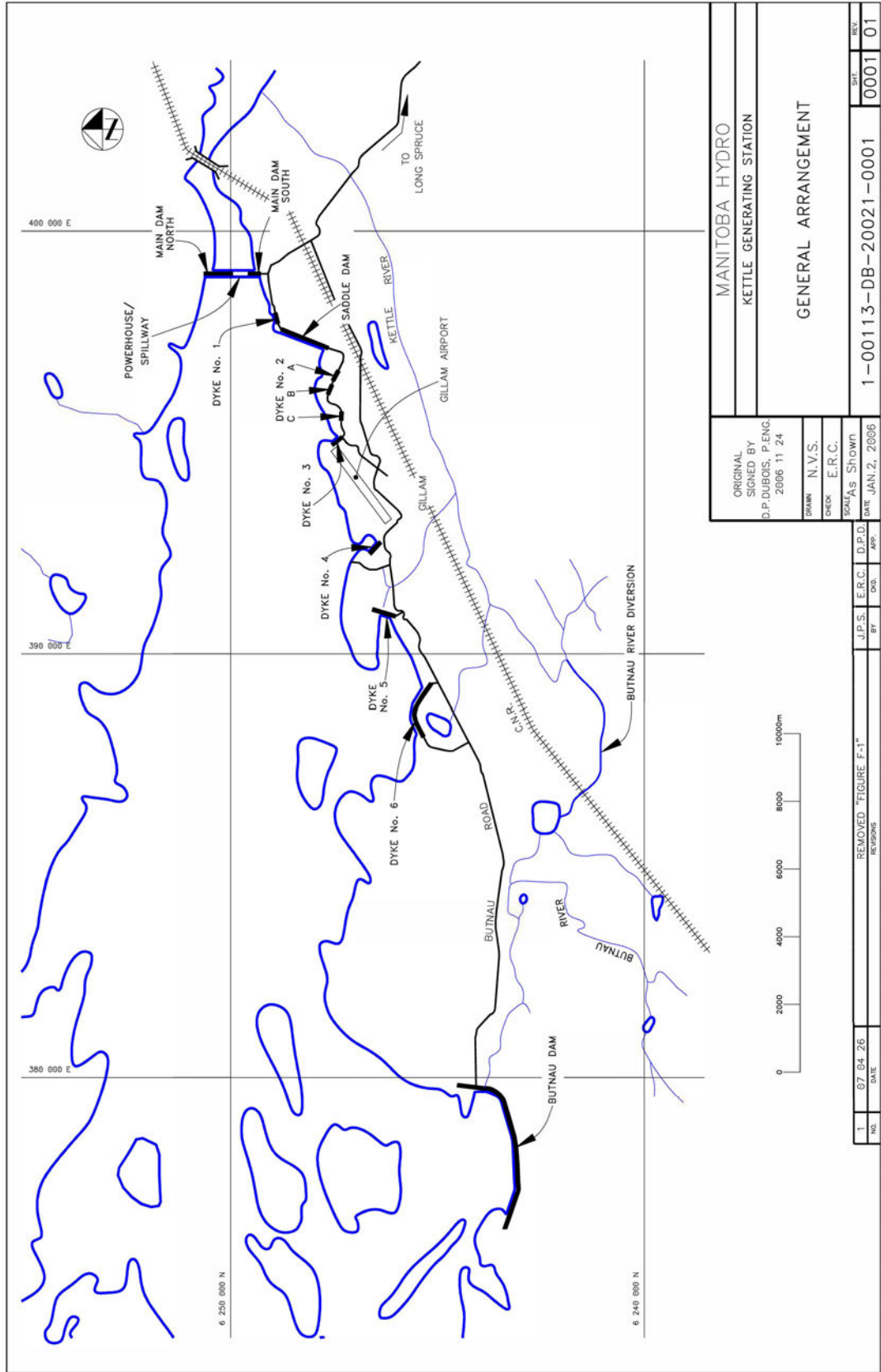


Figure 2: Kettle Generating Station General Arrangement

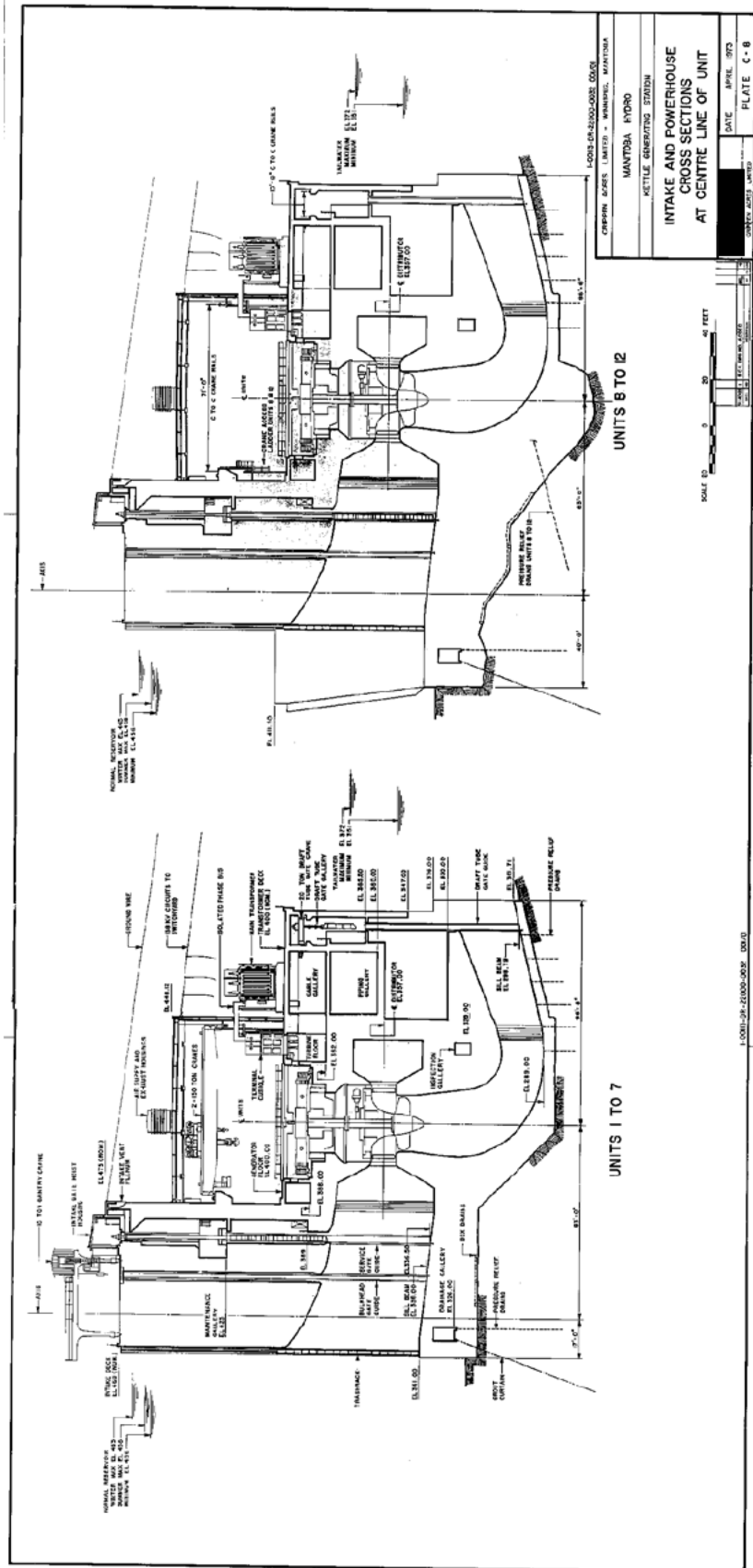


Figure 3: Main Unit Intake and Powerhouse Section.

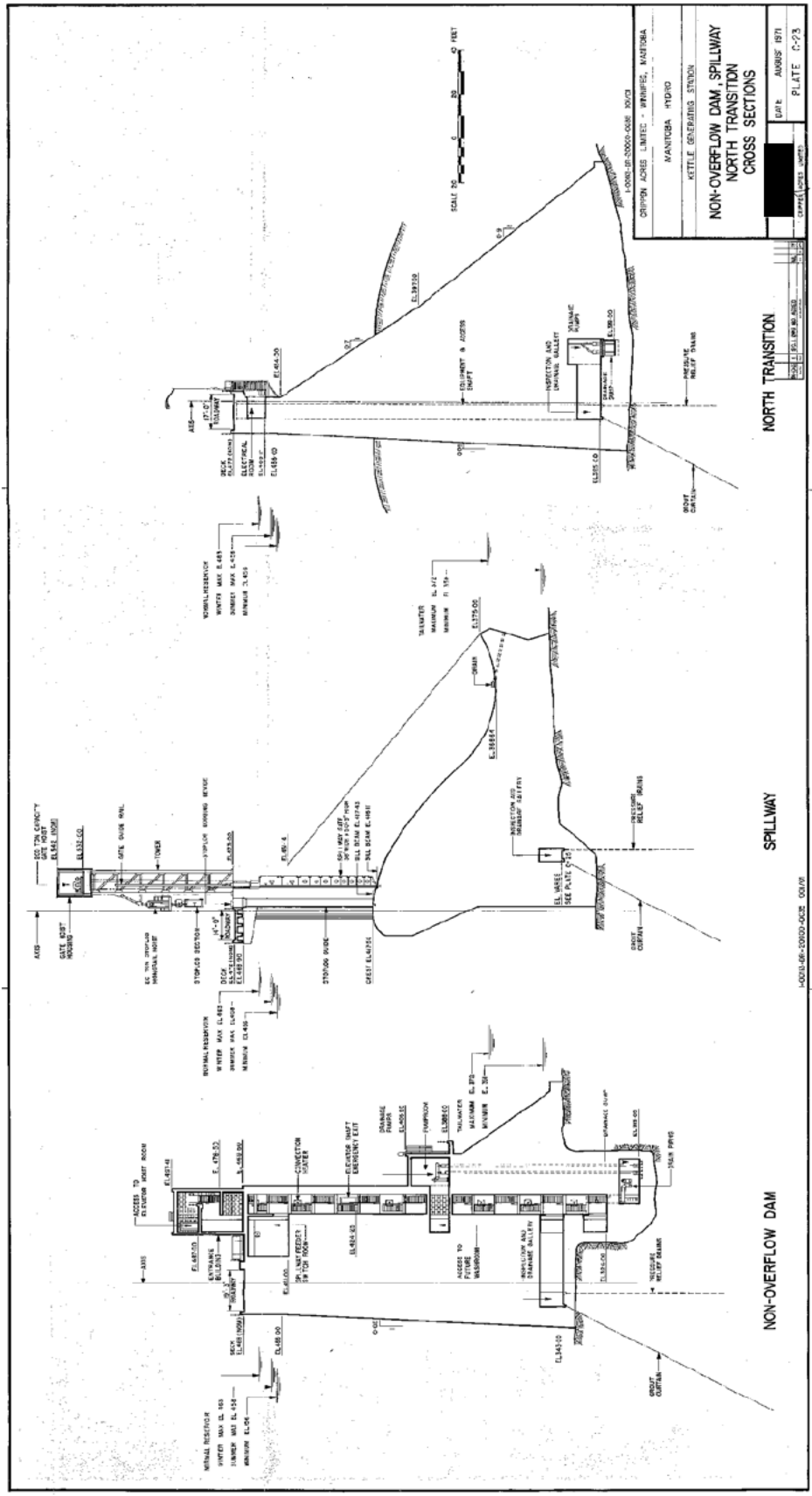


Figure 4: Spillway & Transition Cross Section.

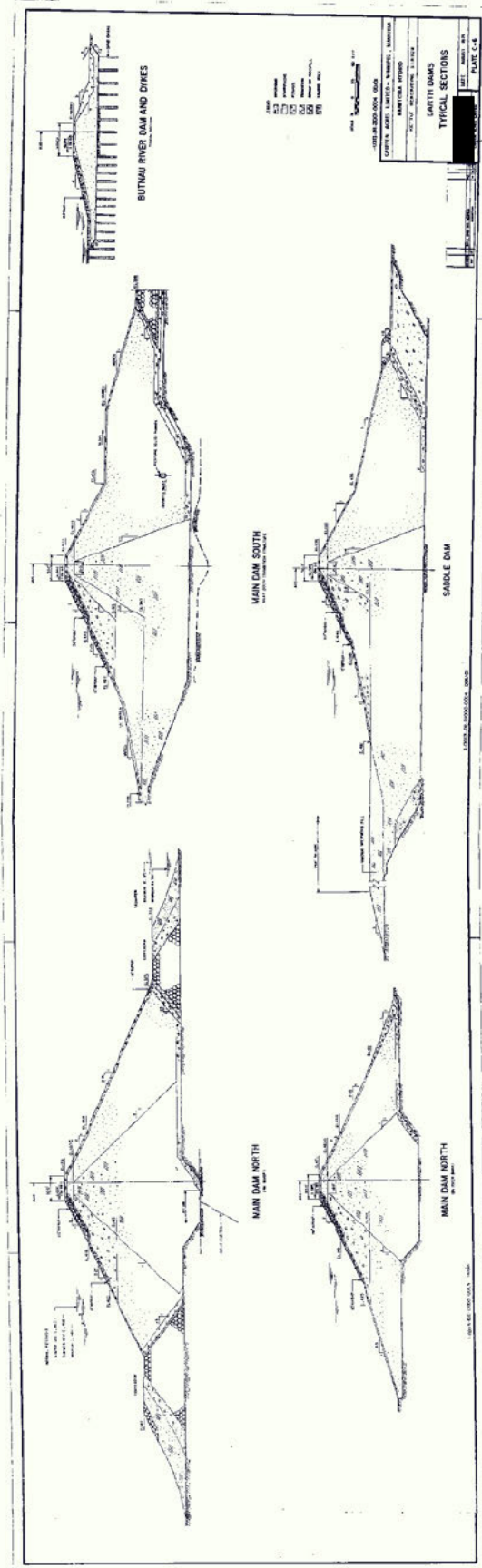


Figure 5: Earth Dam Sections.



Photograph 1: Kettle Generating Station