

# Manitoba Hydro Limestone Generating Station Licence Implementation Guide for Water Levels

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Manitoba Hydro  
Limestone Generating Station  
Licence Implementation Guide for Water Levels

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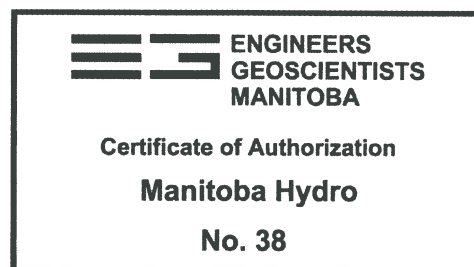
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# Executive Summary

## Introduction

Manitoba Hydro prepared this guide to document a common understanding of compliance with the water regime terms of the Limestone Water Power Act Licence. This document sets out the mutually understood and agreed to:

- 1) Methodology to be used for determining critical water levels;
- 2) Definition of licence compliance; and
- 3) Protocol for reporting.

## Limestone Forebay Water Level

The **Limestone Forebay Water Level** is directly measured at the beginning of each hour at the generating station.

## Compliance

The forebay water level shall be in compliance if the hourly **Limestone Forebay Water Level**:

- a) does not exceed 280.0 feet (85.3 m) by more than 0.1 feet (0.03 m); and
- b) does not exceed 280.0 feet (85.3 m) more than one time in any 24-hour period

## Reporting

In the event that the **Limestone Forebay Water Level** is not in compliance with the licence limit, Manitoba Hydro will notify Manitoba Sustainable Development within one week of the incident. A follow-up report on causes contributing to the event and changes to operations, if any are needed to prevent such an event in the future, will be provided to Manitoba Sustainable Development. A record of water levels and licence compliance will also be provided in an annual report.

## Change Management

Proposed revisions to this Guide will be drafted by Manitoba Hydro as required or directed by Manitoba Sustainable Development. Following review and approval of revisions by Manitoba Sustainable Development, a revised copy of this Guide will be produced and distributed by Manitoba Hydro.

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# 1. Introduction

The Limestone Generating Station is located 750 km north of the City of Winnipeg and 260 km south of the northern town of Churchill. Limestone is located on the lower Nelson River, 23 km downstream from the Long Spruce Generating Station and can be accessed by PR 290 as shown on the site map in the Appendix.

The Limestone Generating Station was constructed between 1985 and 1992 and is the largest in the Manitoba Hydro System. It has a total capacity of about 1,810,380 horsepower (1350 MW) through ten vertical turbine units each with a generating capacity of 181,038 horsepower (135 MW). This is greater than the current licensed capacity of 1,480,000 horsepower (1,104 MW). This is because the Interim Licence was issued with the understanding that the Conawapa Generating Station would be built shortly after, reducing generating capacity by increasing water levels downstream from Limestone. Another reason for the difference is that generating units at Limestone are larger than originally anticipated. Manitoba Hydro has requested a final licence and intends to have it reflect the higher generating capacity.

Manitoba Hydro operates the Limestone Generating Station in accordance with the Water Power Act Licence for the Development of Water Power at the Limestone Site on the Nelson River. The Interim Licence was issued in accordance with the provisions of *The Water Power Act* on July 9, 1976. The Supplementary Interim Licence was issued on October 15, 1984.

## 1.1 Definitions

For the purposes of this guide, unless the context otherwise requires, the following terms shall have the respective meanings set out below and grammatical variations of such terms shall have corresponding meanings:

**ASL** means above sea level

**Controlling Benchmark** means Geological Survey of Canada (GS of C) benchmark 533D2. The benchmark description of 533D2 is as follows: Bridge over Limestone River, 4.0 km northeast of northeast switch, at mileage 349.8 from the Pas, tablet in top of west or upstream end of ballast wall on south concrete abutment.

**Limestone Gauge** refers to a float attached to a steel tape that is draped over a pulley connected to a Selsyn (self-synchronous) system that measures the forebay water level.

**Limestone Forebay Water Level** means the hourly water level as measured by the **Limestone Gauge**.

## 1.2 Datum

In accordance with Article 8 of the Limestone Interim Water Power Act Licence, water level information for the operation of the Limestone Project is measured in terms of elevations **ASL**, GS of C, Canadian Government Vertical Datum (CGVD) 1928, 1929 Local Adjustment.

## 1.3 Quality Control

### 1.3.1 Benchmarks

Vertical control surveys have been performed to establish appropriate local benchmarks around the Limestone Generating Station.

Limestone benchmarks were established by level transfer from **Controlling Benchmarks** using spirit levelling methods.

### 1.3.2 Direct Water Level Measurements

Staff monitor the **Limestone Gauge** equipment and take direct water level measurements to maintain gauge performance. If the direct measurements differ by more than 0.025 m from the gauge reading, staff will take corrective action including re-calibrating the gauge if required.

### 1.3.3 Gauge Readings

The 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 position information is converted to a water level, indicated on a display and also output to the Remote Transmittal Unit for transmission to the System Control Centre. The system is generally capable of measuring water levels accurate to about 0.01 m.

## 1.4 Quality Assurance Procedure for Water Level Data

### Plant Data

Data is collected on site and signed off by the operating supervisor. Data is then sent to the Energy Operations Planning & Technology 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 Operations Planning & Technology staff as needed. Once data has been verified, it may be used for operations planning, studies, model development and reporting.



## 2. Limestone Forebay Water Level

Article 8 of the Interim Water Power Act licence places a limit on the **Limestone Forebay Water Level**. A map showing the location of the **Limestone Gauge** is provided in Appendix A. Water levels are largely influenced by flow releases at Kettle Generating Station, which sets the flow pattern for the lower Nelson River downstream from Stephens Lake. Water Levels are also influenced by operations at Long Spruce and Limestone Generating Stations, and local meteorological events. Due to the location of the **Limestone Gauge** and the size of the forebay, wind effects on the **Limestone Forebay Water Level** are negligible.

**Limestone Forebay Water Level** measurements are taken continuously and recorded at the beginning of each hour and reported to Manitoba Hydro's System Control Centre.

## 3. Compliance

### 3.1 Limestone Water Power Act Licensing Requirement

#### Maximum Water Level

Article 8 of the licence stipulates that:

*“The Licensee shall not raise the headwater of its development to an elevation higher than 280.0 feet above mean sea level, Canadian Geodetic Datum. A higher elevation may be created only with prior written permission by the Minister and in accordance with Section 72 of the Regulations.”*

The forebay water level shall be in compliance with the limit described above if the hourly

#### **Limestone Forebay Water Level:**

- c) does not exceed 280.0 feet (85.3 m) by more than 0.1 feet (0.03 m); and
- d) does not exceed 280.0 feet (85.3 m) more than one time in any 24-hour period

Based on the accuracy and location of the **Limestone Gauge**, Manitoba Hydro defines instances where the licence limit is exceeded by 0.1 feet (0.03 m) as reportable events.

## 3.2 Reporting

### 3.2.1 Compliance Reporting

In the event that the **Limestone Forebay Water Level** is not in compliance with the licence limit as described in Section 3.1, notification shall be made to Manitoba Sustainable Development within one week of the incident. A follow-up report on causes contributing to the event and changes to operations, if any are required to prevent such an event in the future, will be provided to Manitoba Sustainable Development.

### 3.2.2 Maintenance and Emergencies

During maintenance and emergencies there may be times when Manitoba Hydro is required to deviate from a licence condition for safety or other purposes. Manitoba Hydro will be considered compliant with the licence as long as:

1. Advanced notification is provided to Manitoba Sustainable Development of the upcoming licence deviation together with the reason. This will include a description of the operating plan, details of the expected licence deviation, a summary of

anticipated impacts to stakeholders, and confirmation that stakeholders will also be notified; and

2. Advanced notification is provided to stakeholders of pertinent impacts to flow and water levels; and
3. Following the deviation, notification by letter is provided to Manitoba Sustainable Development on the details of the operation(s).

### **3.2.3 Regular Annual Reporting**

Water levels and licence compliance will be reported annually to Manitoba Sustainable Development.

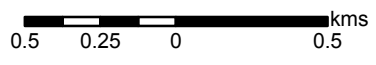
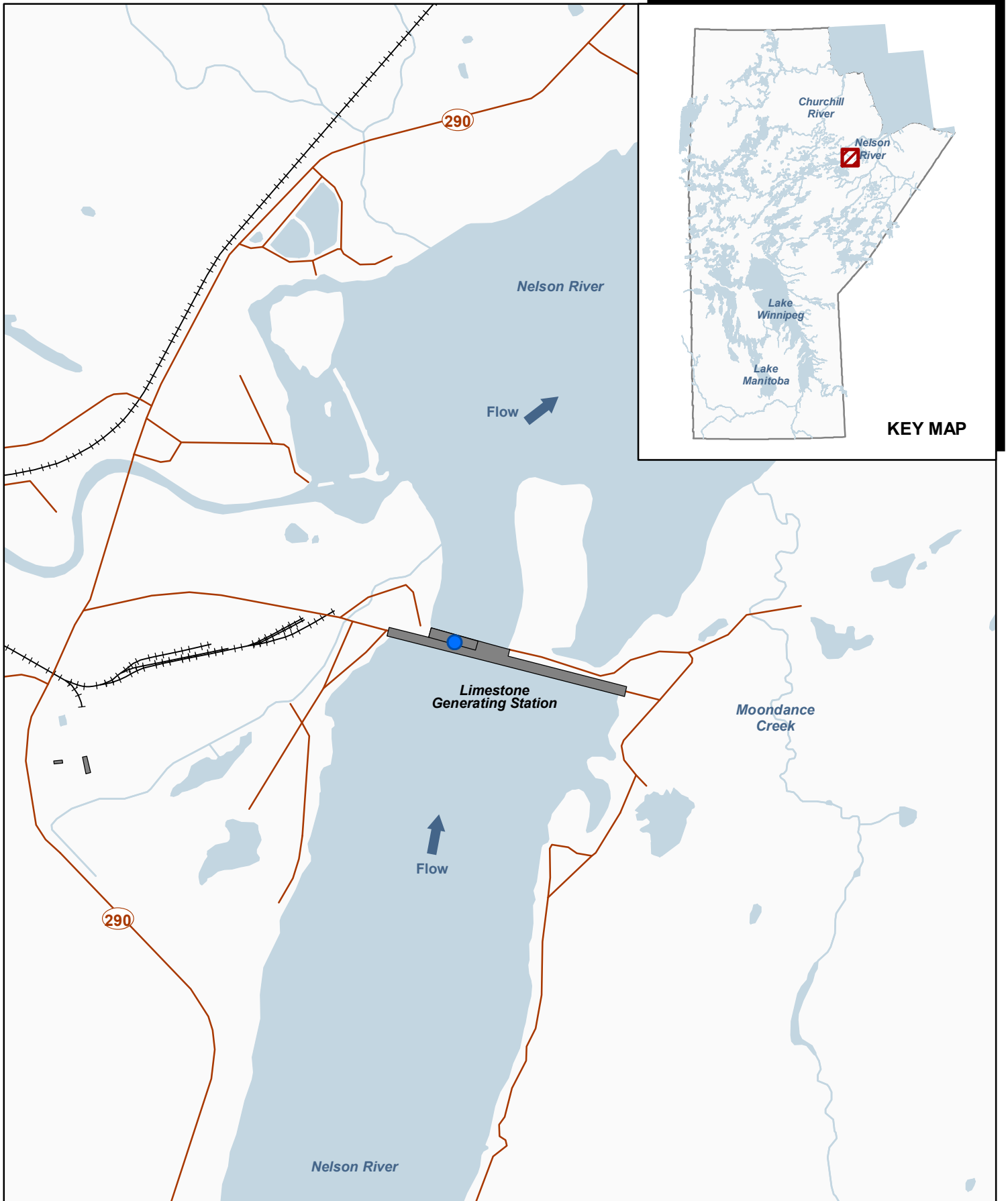
## 4. Change Management

### 4.1 Regular Updates

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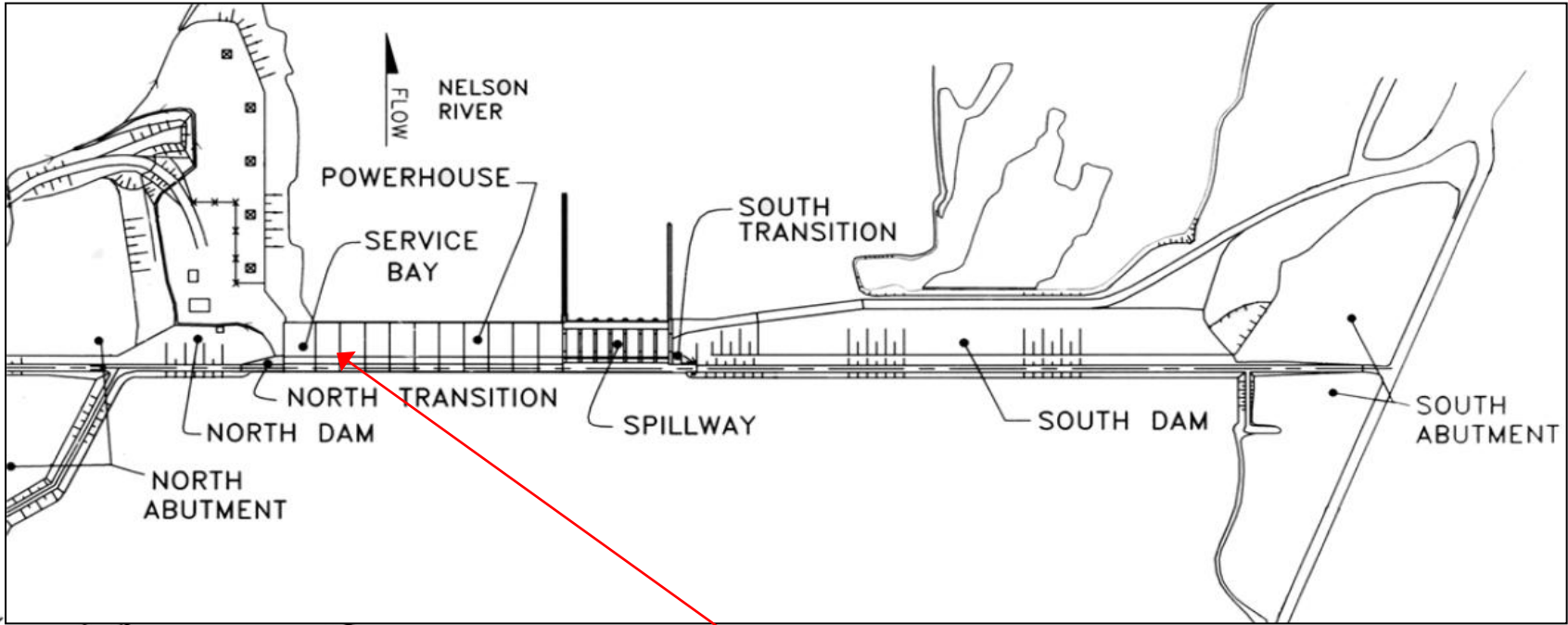
## Appendix A

### Site Map and Forebay Water Level Gauge Location

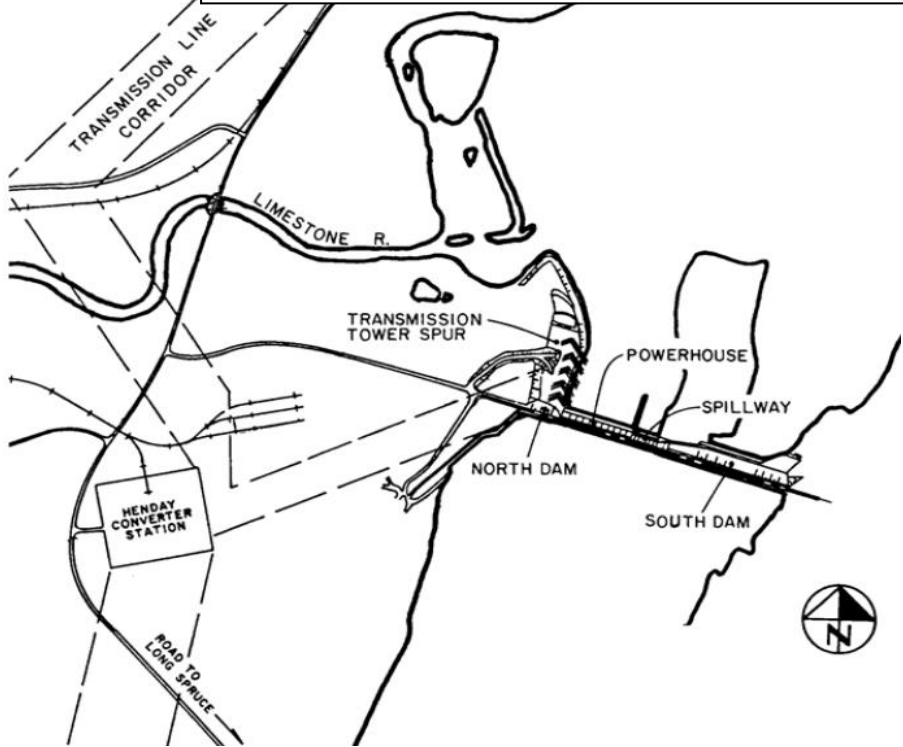



**LIMESTONE G.S.  
GEOGRAPHICAL LOCATION**  
**FIGURE 1**

- Generating Station
- Dam
- Road
- +++ Rail



**FOREBAY GAUGE LOCATION**  
 - located in the powerhouse  
 - stilling well is located on the sixth floor by unit #1 intake gates



	MANITOBA HYDRO	
	HYDRAULIC OPERATIONS DEPARTMENT	
	LIMESTONE GENERATING STATION	
	FOREBAY GAUGE LOCATION	
	PROJECT	
	LICENCE IMPLEMENTATION GUIDE	FIGURE 2