

Manitoba Hydro Lake Winnipeg Regulation & Jenpeg Generating Station Licence Implementation Guide

Prepared for:

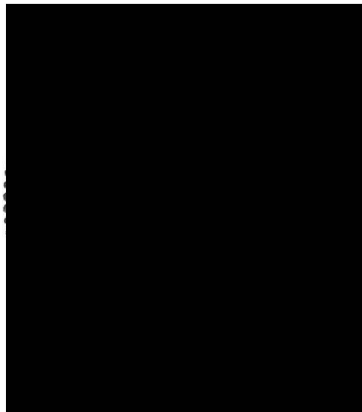
Manitoba Environment, Climate and Parks
1007 Century Street
Winnipeg, Manitoba R3M 0W4

Prepared by:

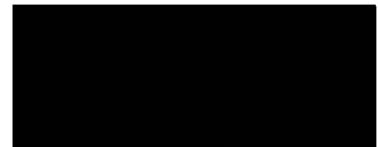
Waterway Approvals and Monitoring Department
Manitoba Hydro
360 Portage Avenue
Winnipeg, Manitoba R3C 0G8

May 2022

Manitoba Hydro
Lake Winnipeg Regulation & Jenpeg Generating
Station
Licence Implementation Guide



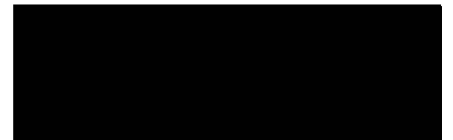
PREPARED BY:



REVIEWED BY:

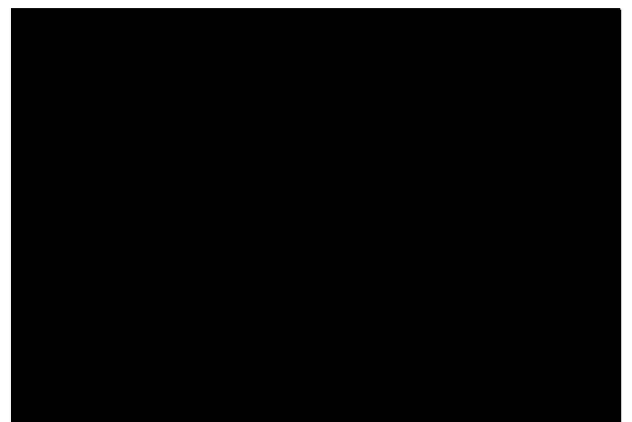


NOTED BY:



DATE:

2022-05-10



Executive Summary

Introduction

Manitoba Hydro prepared this guideline to document a common understanding of compliance with the Lake Winnipeg Regulation (LWR) and Jenpeg Generating Station (Jenpeg) Water Power Act Final Licences. The Water Power Act Licences specify operating limits and other requirements that must be met for compliance with the licences. As such, this document sets out the:

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

Lake Winnipeg

Data from eight water level gauges is used to determine Lake Winnipeg's water level. A set of averaging and weighting techniques, developed by the Ad Hoc Committee on Lake Winnipeg Datum¹, are employed to determine a water level that is representative of the entire lake and remove the effects of wind and waves.

The combined flow through the Jenpeg Generating Station and Control Structure and the natural flow in the Nelson River's East channel are used to determine the total outflow from Lake Winnipeg.

Playgreen Lake

Data from gauge 05UB704 located on Playgreen Lake above Whiskey Jack Narrows is used to determine the water level on Playgreen Lake. A five-day moving mean is applied to remove the effects of wind and waves.

Kiskittogisu Lake

Data from gauge 05UB017 located on Kiskittogisu Bay at Whiskey Jack Landing is used to determine the water level on Kiskittogisu Lake. A five-day moving mean is applied to remove the effects of wind and waves.

Kiskitto Lake

Data from gauge 05UB013 located on Kiskitto Lake is used to determine the water level on Kiskitto Lake. A daily average water level is used to remove the effects of wind and waves.

¹ Ad Hoc Committee on Lake Winnipeg Datum. 1982. Report on Lake Winnipeg Levels.

Compliance

Compliance with the LWR Final Licence is measured against hydraulic parameters specific to each portion of the project area as follows:

1. Water Levels

- Playgreen, Kiskittogisu and Kiskitto Lakes compliance is measured against the respective wind and wave eliminated water level.
- Lake Winnipeg water level compliance is dependent on the operational response described below.

2. Operating Conditions

- Jenpeg operating compliance is measured against the 24-hour rate of flow change.
- Lake Winnipeg operating compliance is measured against the wind and wave eliminated water level as well as the operational response when the water level is either above or below the 216.71 to 217.93 m (711 to 715 ft) operating range.

Reporting

In the event that water levels or flows are not in compliance with the LWR Water Power Act Licence, notification shall be made to Manitoba Environment, Climate and Parks 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 Environment, Climate and Parks. A record of water levels and licence compliance will also be provided in the Annual Water Level and Flows Report.

Ongoing and Other Requirements

The Water Power Act Final Licences and the associated cover letters from Manitoba specify a number of ongoing and other requirements that are not directly related to the day to day operation of LWR and Jenpeg. Manitoba Hydro will participate in and report on these additional requirements as directed.

Change Management

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

Table of Contents

Executive Summary	i
1. Introduction	1
1.1 Definitions	1
1.2 Quality Control.....	3
1.2.1 Benchmarks	4
1.2.2 Direct Water Level Measurements	4
1.2.3 Gauge Readings	4
1.3 Quality Assurance Procedure for Water Level Data	5
2. Jenpeg Outflow Rate of Change Calculation Procedure	6
3. Playgreen Lake Water Level	8
3.1 Wind-Eliminated Water Level Calculation Procedure	8
4. Kiskittogisu Lake Water Level.....	10
4.1 Wind-Eliminated Water Level Calculation Procedure	10
5. Kiskitto Lake Water Level.....	12
5.1 Wind-Eliminated Water Level Calculation Procedure	12
6. Lake Winnipeg.....	13
6.1 Wind-Eliminated Water Level Calculation Procedure	13
6.2 Lake Winnipeg Outflow	17
7. Compliance	18
7.1 Jenpeg Generating Station Outflow Rate of Change Water Power Act Licensing Requirement	18
7.2 Playgreen Lake Water Power Act Licensing Requirement.....	18
7.3 Kiskittogisu Lake Water Power Act Licensing Requirement	19
7.4 Kiskitto Lake Water Power Act Licensing Requirement.....	19
7.5 Lake Winnipeg Water Power Act Licensing Requirements.....	20
7.6 Reporting.....	21
7.6.1 Compliance Reporting.....	21
7.6.2 Maintenance and Emergencies.....	22
7.6.3 Regular Monthly Reporting.....	22
7.6.4 Regular Annual Reporting.....	22

8. Ongoing Requirements.....	24
8.1 System-Wide Monitoring Program	24
8.2 Public Safety and Debris Management Program.....	25
8.3 Indigenous Engagement Report.....	26
8.4 Large Area Planning, Studies, and Other Initiatives	27
8.5 Licence Modernization Processes	27
9. Change Management.....	28
Appendix A: Outlet Lakes Area Water Level Gauge Description Sheets	29
Appendix B: Lake Winnipeg Water Level Gauge Description Sheets	36

1. Introduction

The Province of Manitoba granted Manitoba Hydro an Interim Water Power Act Licence for Lake Winnipeg Regulation (LWR) on November 18, 1970, allowing the project to proceed. Manitoba Hydro received a Supplementary Interim Licence on August 8, 1972. The 1972 licence changed the number of outflow control structures from two to one and also moved the location downstream to the present Jenpeg site. This site also allowed for the addition of a generating station. Electricity generation at Jenpeg Generating Station (Jenpeg) was authorized by a separate Interim Water Power Act licence that was issued December 14, 1972. LWR was completed on August 1, 1976 and Jenpeg was completed November 1, 1979. Manitoba Hydro received Water Power Act Final Licences for LWR and Jenpeg on May 12, 2021.

The LWR Project was developed to achieve two main purposes: flood reduction around Lake Winnipeg and energy production on the Nelson River. LWR reduces peak levels on Lake Winnipeg by increasing outflow capacity during floods. LWR also provides greater flow reliability during the winter and enhances the availability and timing of water for electricity production at generating stations along the lower Nelson River.

Operating limits for Jenpeg are included in the LWR Water Power Act Final Licence. Ongoing and other requirements that are not directly related to the day to day operation are included in both the LWR and Jenpeg Water Power Act Final Licences and their cover letters.

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 Benchmarks means:

1) Lake Winnipeg

- The Ad Hoc Committee on Lake Winnipeg Datum² recommended the datum at Berens River hydrometric station Benchmark (BM) 78M079 to represent the Lake Winnipeg Datum (LWD). The committee indicated that the datum

² Ad Hoc Committee on Lake Winnipeg Datum. 1982. Report on Lake Winnipeg Levels.

at Berens River would be fixed at 223.16 m (732.15 ft), which is the 1960 Geodetic Survey of Canada (G.S. of C.) datum, and that all other datums for the various hydrometric stations on the lake would be adjusted to this master datum by water level transfer between the hydrometric station in question and that at Berens River.

- BM 78M079. A brass cap set in bedrock 7.32 m North of the Northwest corner of the Water Survey of Canada (WSC) gauge shelter at Berens River and 21.92 m Northeast from the Forestry property gate. G.S. of C., 1960 adjustment.

2) Playgreen Lake

- BM P4-1. A Manitoba Hydro brass cap in bedrock marked with a 0.91 m high T-bar 6.49 m East of the corner of the recorder shelter. G.S. of C. Canadian Government Vertical Datum (CGVD) 1928, 1969 local adjustment. This BM was established by Manitoba Hydro survey from G.S. of C. BM 68M017 (also known as Tait 2) located on Tait Island in the north end of Playgreen Lake.

3) Kiskittogisu Lake

- BM P5A-2. A 1.52 cm bolt set in bedrock approximately 28.93 m Southwest of the data collection platform (DCP) and tripod also marked with a 1.5 CM diameter rebar marker bar. G.S. of C. CGVD 1928, 1969 local adjustment. This BM was established by Manitoba Hydro survey from G.S. of C. BM 68M017 (also known as Tait 2) located on Tait Island in the north end of Playgreen Lake.

4) Kiskitto Lake

- BM Kisk2-2. WSC brass cap set in bedrock 2.99 m Northwest of the Northwest corner of the recorder shelter. WSC designation M7173. G.S. of C. CGVD 1928, 1969 local adjustment. This BM was established by Manitoba Hydro survey from G.S. of C. BM Kisk2-1 located on a small island in Kiskittogisu Lake about 2.57 km south of Metchanis Rapids.

Playgreen Lake Mean Daily Water Level (with wind and wave effects eliminated) means the water level on Playgreen Lake upstream of Whiskey Jack Narrows averaged over a five-day period to eliminate wind and wave effects;

Kiskittogisu Lake Mean Daily Water Level (with wind and wave effects eliminated) means the water level on Kiskittogisu Lake at Whiskey Jack Landing averaged over a five-day period to eliminate wind and wave effects;

Kiskitto Lake Daily Average Water Level (with wind and wave effects eliminated) means the daily average water level on the north-eastern part of Kiskitto Lake;

Jenpeg Mean Hourly Outflow means the hourly outflow at Jenpeg averaged over a 3-hour period to remove the effects of short-term weather and hydraulic events;

Jenpeg Outflow Rate of Change means the difference between the minimum and maximum **Jenpeg Mean Hourly Outflow** over any 24-hour period;

Lake Winnipeg Wind-Eliminated Water Level means the daily average water level on Lake Winnipeg with wind and wave effects eliminated calculated based on the methodology developed by the Ad Hoc Committee on Lake Winnipeg Datum³;

Daily Lake Winnipeg Outflow means the sum of daily average outflow measured at Jenpeg Generating Station and on the Nelson River East Channel.

1.2 Quality Control

Manitoba Hydro is a contributing party to Water Survey of Canada's (WSC) National Hydrometric Program (NHP), which is responsible for collecting, interpreting and disseminating standardized information about surface water availability. Through cost-sharing agreements, Manitoba Hydro operates gauges and analyses and disseminates data according to NHP processes and procedures. The NHP uses a quality assurance management system which is in compliance with the international standard ISO 9001:2000. All data are stored in the national HYDAT database.

The following tables indicate the owner and operator of all gauging stations used in monitoring licence compliance:

Table 1: Lake Winnipeg Gauging Stations

Lake Winnipeg Gauges	Owner	Operator
Gimli (05SB006)	WSC	WSC
Victoria Beach (05SA003)	WSC	WSC
Berens River (05RD005)	WSC	WSC
George Island (05RE003)	WSC	WSC
Mission Point (05SG001)	WSC	WSC
Pine Dock (05SD001)	WSC	WSC

³ Ad Hoc Committee on Lake Winnipeg Datum. 1982. Report on Lake Winnipeg Levels.

Matheson Island Landing (05SD002)	WSC	WSC
Montreal Point (05RF001)	WSC	Manitoba Hydro

Table 2: Outlet Lakes Area Gauging Stations

Outlet Lakes Area Gauges	Owner	Operator
Playgreen Lake (05UB704)*	Manitoba Hydro	Manitoba Hydro
Kiskittogisu Lake (05UB017)	WSC	Manitoba Hydro
Kiskitto Lake (05UB013)	WSC	Manitoba Hydro
Nelson River East Channel (05UB008)	WSC	Manitoba Hydro
Norway House (05UB001)	WSC	Manitoba Hydro

*Data not available in HYDAT database

1.2.1 Benchmarks

Vertical control surveys have been performed from **Controlling Benchmarks** to establish appropriate local benchmarks around Lake Winnipeg and the outlet lakes at hydrometric gauging stations.

1.2.2 Direct Water Level Measurements

Field staff visit the water level gauges bi-monthly with additional visits as necessary to maintain gauge performance. Direct water level measurements are taken during these visits and compared to the level indicated by the water level sensor. Direct water level measurements for lakes of this size are typically accurate to within 5 mm depending on weather conditions.

1.2.3 Gauge Readings

WSC and Manitoba Hydro use pressure sensors to determine water levels at their existing hydrometric gauging stations. The error in the reading provided by the pressure sensor is about 5 to 7.5 mm depending on the type of sensor used. If the technician visiting the site determines that the sensor reading is more than 10 mm different from the direct water level measured in accordance with Subsection 1.2.2, the logger is reset to the direct water level measurement. If the sensor reading is less than 10 mm different from the direct water level measured in accordance with Subsection 1.2.2, no change is made to the logger.

The Jenpeg forebay and tailrace water level gauges each consist 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 station operators at Jenpeg check the calibration of the gauges by comparing manual measurements with electronic readings in the control room once a month or as required. Direct water level measurements that differ by more than 2.5 mm are reported and repaired.

1.3 Quality Assurance Procedure for Water Level Data

Gauge Data

Water level data exists in three degrees of quality assurance – raw, provisional and final.

Raw data is real-time data that has been transmitted from the field. The only level of quality assurance is that which is built into the data collection system, described in Section 1.2. This level of data is used in the daily operation of Lake Winnipeg Regulation.

Provisional data is data processed by a qualified data assurance technician who reviews the field data and corrects obvious errors. The data is compared to all available relevant data in the area to verify its accuracy.

Final data has been through two levels of review by qualified technicians and a final review by a professional engineer. This data is considered publishable and has met the quality assurance standards of the National Hydrometric Program. This data is used for annual reporting described in Subsection 7.6.3 of this guide.

Jenpeg Plant Data

Jenpeg total outflow is calculated as the sum of the flow through the spillway and the flow through the powerhouse. Recorded forebay water levels, spill gate openings and spillway rating curves are used to calculate the flow through the spillway. Flow through the powerhouse is calculated using the recorded measurements of forebay and tailrace water levels, head losses through the intake, energy produced by each generating unit and unit efficiency curves. 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 Department staff as needed. Once data has been verified, it may be used for operations planning, studies, model development and reporting.

2. Jenpeg Outflow Rate of Change Calculation Procedure

Section 3.6 of the LWR Water Power Act Final Licence restricts the rate of change in outflow through the Jenpeg Generating Station during any 24-hour period. Jenpeg Generating Station outflow rate of change is influenced by water levels on Lake Winnipeg, operations at the Jenpeg Generating Station, local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. Non-project hydraulic impacts may result from upstream storage and release of water caused by changing ice conditions, inflows to Lake Winnipeg, and rapid spring runoff. To properly evaluate the outflow rate of change at Jenpeg, an averaging technique is used to remove short-term effects which do not affect the water level downstream on Cross Lake. Small, short-term weather and hydraulic events are smoothed out using a 3-hour moving mean.

The first step to calculate the **Jenpeg Outflow Rate of Change** is to calculate the **Jenpeg Mean Hourly Outflow** using a centred 3-hour moving mean as shown in equation 1:

$$JMHQ_i = \frac{JHQ_{i-1} + JHQ_i + JHQ_{i+1}}{3} \quad [1]$$

Where

$JMHQ$ = Jenpeg Mean Hourly Outflow at hour i

JHQ = Jenpeg hourly outflow at hour i

The **Jenpeg Outflow Rate of Change** is the difference between the highest and lowest **Jenpeg Mean Hourly Outflow** for any 24-hour period, which is calculated as follows.

$$JROC_i = |Max(JMHQ_{i \text{ to } i-23}) - Min(JMHQ_{i \text{ to } i-23})| \quad [2]$$

Where

$JROC_i$ = Jenpeg Outflow Rate of Change at hour i

$JMHQ$ = Jenpeg Mean Hourly Outflow at hour i

Figure 1 below provides a visual that demonstrates this calculation.

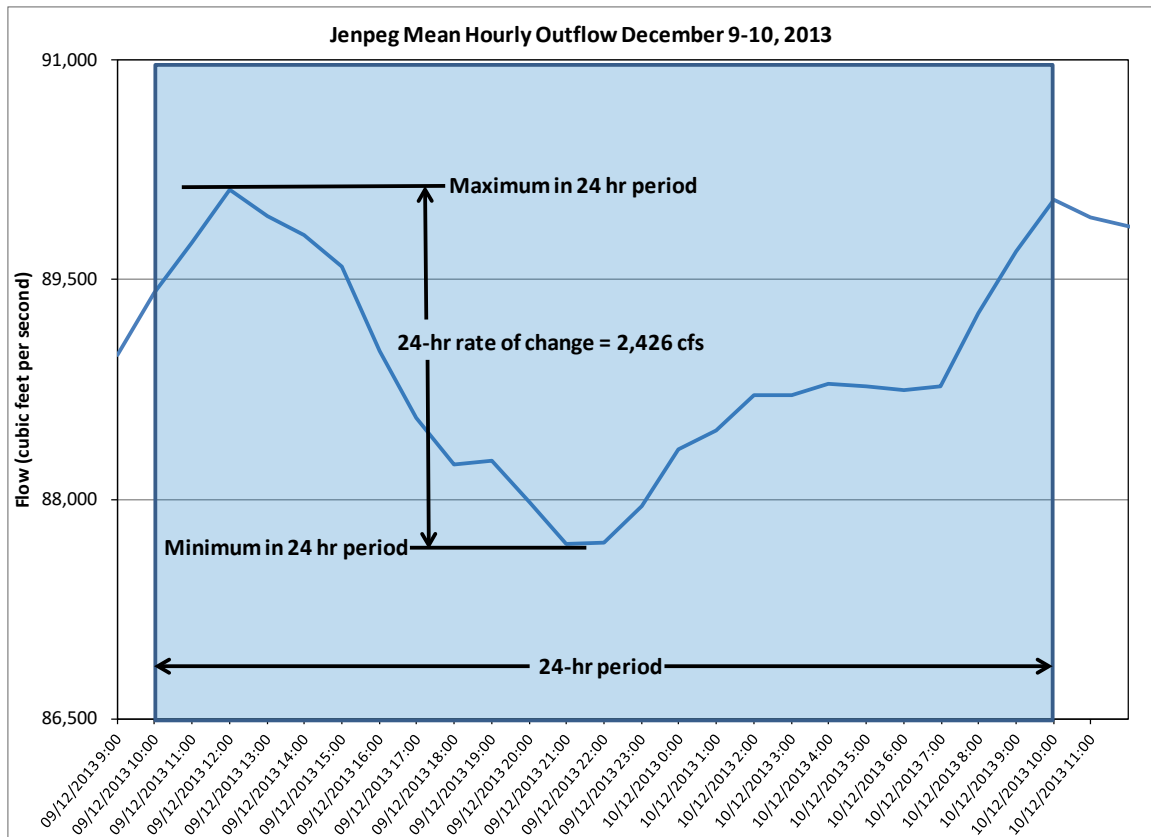


Figure 1: Jenpeg Outflow Rate of Change Calculation

3. Playgreen Lake Water Level

The elevation of Playgreen Lake is recorded above Whiskey Jack Narrows (05UB704). This gauge is owned and operated by Manitoba Hydro. A detailed gauge description is included in Appendix A.

3.1 Wind-Eliminated Water Level Calculation Procedure

Section 3.2 of the LWR Water Power Act Final Licence restricts the water level on Playgreen Lake. Playgreen Lake water levels are influenced by water levels on Lake Winnipeg, operations at the Jenpeg Generating Station, local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. Non-project hydraulic impacts may result from upstream storage and release of water caused by changing ice conditions, inflows to Lake Winnipeg, and rapid spring runoff. To properly evaluate the wind-eliminated water level, averaging techniques are used to remove these effects. Small, short-term weather and hydraulic events can be smoothed out using a daily average water level. Larger, long-term events require a longer duration averaging technique. For a lake of this size, a five-day moving mean is appropriate.

The **Playgreen Lake Mean Daily Water Level (with wind and wave effects eliminated)** is calculated as follows.

The first step is to calculate a daily average water level from the continuous (e.g. 5 minute) water levels.

$$PLDW = \frac{\sum_{i=1}^n PLW_i}{n} \quad [3]$$

Where

PLW = Playgreen Lake Water Level, measured at time i at 05UB704

$PLDW$ = Playgreen Lake Daily Average Water Level

n = Number of available water level measurements for that calendar day

A centred five-day moving mean as shown in equation 4 is then applied to the Playgreen Lake Daily Average Water Level data to produce the **Playgreen Lake Mean Daily Water Level (with wind and wave effects eliminated)**.

$$PWEWL_t = \frac{PLDW_{t-2} + PLDW_{t-1} + PLDW_t + PLDW_{t+1} + PLDW_{t+2}}{5} \quad [4]$$

Where

$PWEWL_t$ = Playgreen Lake Mean Daily Water Level (with wind and wave effects eliminated) for day t

4. Kiskittogisu Lake Water Level

Kiskittogisu Lake elevations are recorded at Whiskey Jack Landing (05UB017). This gauge is operated by Manitoba Hydro on behalf of WSC under the terms of the Canada-Manitoba Cost Sharing Agreement on Water Quantity and Quality Surveys. A detailed gauge description is included in Appendix A.

4.1 Wind-Eliminated Water Level Calculation Procedure

Section 3.2 of the LWR Water Power Act Final Licence restricts the water level on Kiskittogisu Lake. Kiskittogisu Lake water levels are influenced by water levels on Lake Winnipeg, operations at the Jenpeg Generating Station, local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. Non-project hydraulic impacts may result from upstream storage and release of water caused by changing ice conditions, inflows to Lake Winnipeg, and rapid spring runoff. To properly evaluate the wind-eliminated water level, averaging techniques are used to remove these effects. Small, short-term weather and hydraulic events can be smoothed out using a daily average water level. Larger, long-term events require a longer duration averaging technique. For a lake of this size, a five-day moving mean is appropriate.

The **Kiskittogisu Lake Mean Daily Water Level (with wind and wave effects eliminated)** is calculated as follows.

The first step is to calculate a daily average water level from the continuous (e.g. 5-minute) water levels.

$$KLDW = \frac{\sum_{i=1}^n K LW_i}{n} \quad [5]$$

Where

$K LW$ = Kiskittogisu Lake Water Level, measured at time i at 05UB017

$KLDW$ = Kiskittogisu Lake Daily Average Water Level

n = Number of available water level measurements for that calendar day

A centred five-day moving mean as shown in equation 6 is then applied to the Kiskittogisu Lake Daily Average Water Level data to produce the **Kiskittogisu Lake Mean Daily Water Level (with wind and wave effects eliminated)**.

$$KWEWL_l = \frac{KLDW_{l-2} + KLDW_{l-1} + KLDW_l + KLDW_{l+1} + KLDW_{l+2}}{5} \quad [6]$$

Where

$KWEWL_l$ = Kiskittogisu Lake Mean Daily Water Level (with wind and wave effects eliminated) for day l

5. Kiskitto Lake Water Level

Kiskitto Lake elevations are recorded on an island in the northeast part of Kiskitto Lake (05UB013). This gauge is operated by Manitoba Hydro on behalf of WSC under the terms of the Canada-Manitoba Cost Sharing Agreement on Water Quantity and Quality Surveys. A detailed gauge description is included in Appendix A.

5.1 Wind-Eliminated Water Level Calculation Procedure

Section 3.7 of the LWR Water Power Act Final Licence restricts the water level range on Kiskitto Lake. Kiskitto Lake water levels are influenced by the Kiskitto Inlet Structure, Black Duck Control Structure, local meteorological events and local inflow. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. A daily average is used to calculate a water level for Kiskitto Lake with wind and wave effects eliminated.

The **Kiskitto Lake Daily Average Water Level (with wind and wave effects eliminated)** is calculated as follows from the continuous (e.g. 5-minute) water levels.

$$KiskLDW = \frac{\sum_{i=1}^n KiskLW_i}{n} \quad [7]$$

Where

KiskLW = Kiskitto Lake Water Level, measured at time *i* at 05UB013

KiskLDW = **Kiskitto Lake Daily Average Water Level (with wind and wave effects eliminated)**

n = Number of available water level measurements for that calendar day

6. Lake Winnipeg

The **Wind-Eliminated Water Level on Lake Winnipeg** is calculated using a method developed collaboratively by Manitoba Hydro, Manitoba and WSC⁴. The following water level gauging stations are used:

- Gimli (05SB006)
- Victoria Beach (05SA003)
- Berens River (05RD005)
- George Island (05RE003)
- Mission Point (05SG001)
- Pine Dock (05SD001)
- Matheson Island Landing (05SD002)
- Montreal Point (05RF001)

Seven gauges are operated by WSC, while the gauge at Montreal Point is operated by Manitoba Hydro on behalf of WSC under the terms of the Canada-Manitoba Cost Sharing Agreement on Water Quantity and Quality Surveys. Detailed gauge descriptions for each of the eight Lake Winnipeg gauges is included in Appendix B.

Water level data is collected and published according to the procedures and Quality Control Assurance processes established by WSC. Real-time data is available but it is not recognized as official. Final data, or published data, is generated through several levels of reviews to verify compliance to applicable standards and includes recognition of the impact of other related environmental and contextual factors. (<https://wateroffice.ec.gc.ca/>)

6.1 Wind-Eliminated Water Level Calculation Procedure

Sections 3.2, 3.3 and 3.5 of the LWR Water Power Act Final Licence direct operation of the Jenpeg Generating Station and Control Structure according to Lake Winnipeg's water level. Lake Winnipeg water levels are influenced by operations at the Jenpeg Generating Station, local meteorological events and non-project hydraulic effects. Significant local weather impacts can result from heavy precipitation, the movement of high and low pressure cells and large wind effects. Non-project hydraulic impacts may result from inflows to Lake Winnipeg and rapid spring runoff.

The **Wind-Eliminated Water Level on Lake Winnipeg** is calculated as follows.

⁴ Ad Hoc Committee on Lake Winnipeg Datum. 1982. Report on Lake Winnipeg Levels.

A five step process is used to calculate the **Wind-Eliminated Water Level on Lake Winnipeg**. First the daily average elevations are calculated from hourly values at each of the eight gauging stations. These values are calculated as follows:

$$DAWL_g = \frac{\sum_{i=1}^n HWL_g}{n} \quad [8]$$

Where

$DAWL_g$ = Daily Average Water Level for gauge g , using all available hourly data, n

HWL_g = Measured Hourly Water Level from the top of the hour for gauge g

Second, an overall daily average for the lake is determined by weighting each of the stations by the inverse of its standard deviation. This step reduces the weight of stations with data that is quite variable and increases the weight for stations with data that is steadier. From time to time problems develop with gauges, due to the failure of the prime sensor or data transmission system. When data is missing the algorithm recognizes the deficiency, and calculates a weighted average for the lake based on the remaining stations adjusting the weighting factors so they total 1. This lake average is calculated as follows:

$$RNL_g = \frac{S_g}{MAX(S)} * 100 \quad [9]$$

$$X \left(\sum_{g=1}^n \frac{1}{RNL_g} \right) = 1 \quad [10]$$

$$W_g = \frac{X}{RNL_g} \quad [11]$$

$$LWDWL = \sum_{g=1}^n W_g * DAWL_g \quad [12]$$

Where:

RNL_g = The relative noise level in the gauge station data for gauge g

S_g = the standard deviation for gauge g

X = a computational constant

W_g = weighting factor for Lake Winnipeg Gauge g

$LWDWL$ = Lake Winnipeg Daily Average Water Level

The current relative noise levels and weighting factors were calculated using the procedure that was developed by the Ad Hoc Committee on Lake Winnipeg Datum¹. The only difference is that the relative noise levels and factors had to be re-calculated to account for the addition of the gauge at George Island in 1983.

Gauging Station	Relative Noise Level	Weighting Factor*
Gimli	100.00	0.0553
Victoria Beach	89.61	0.0617
Pine Dock	47.74	0.1158
Matheson Island	42.39	0.1304
Berens River	49.12	0.1125
George Island	21.27	0.2599
Mission Point	38.67	0.1429
Montreal Point	45.50	0.1215

*weighting factor for 8 gauges operating

Third, the maximum probable change in the still water level of the lake is limited by the maximum probable inflows and corresponding outflows. Therefore, the daily average lake elevation is adjusted so that it will not be greater than 0.018 metres above or below the previous day's adjusted mean. The intention of this step is to minimize the influence of erroneous data.

$$\begin{aligned}
 ROCLE_i = & \\
 ROCLE_{i-1} + \frac{(LWDWL_i - ROCLE_{i-1})}{|LWDWL_i - ROCLE_{i-1}|} * 0.018 & \quad \text{if } |LWDWL_i - ROCLE_{i-1}| > 0.018 \\
 LWDWL_i & \quad \text{if } |LWDWL_i - ROCLE_{i-1}| \leq 0.018
 \end{aligned} \tag{13}$$

Where:

$ROCLE_i$ = Rate of Change Limited Elevation or the adjusted Lake Winnipeg daily average water level on day i , to prevent the rate of change between days from exceeding 0.018 m

The fourth and fifth steps work in conjunction with each other. The fourth step is the application of the "saw tooth filter", and the fifth step is the five day moving mean over a 21-day window which produces the **Wind-Eliminated Water Level on Lake Winnipeg**.

The five day moving mean spans a 21-day window and produces a result for the eleventh day. It passes the 21 numbers and calculates 17 five-day averages; it then passes the 17

averages and calculates 13 five-day averages. It continues this process for a total of five passes which results in one number for the eleventh day. The “saw tooth filter” is a procedure that bypasses the moving means if three days in a row are ascending, descending or equal in order. If this happens then the middle day is chosen without any averaging taking place at all. These two steps are represented by the following equations.

for $p = 1$ to 5 passes

if $p = 1$

if $\{ROCLE_{i-1} > ROCLE_i > ROCLE_{i+1}$ or $ROCLE_{i-1} = ROCLE_i = ROCLE_{i+1}$ or $ROCLE_{i-1} < ROCLE_i < ROCLE_{i+1}\}$

$$SMWEL_{p,i} = ROCLE_i$$

else

$$SMWEL_{p,i} = \frac{ROCLE_{i-2} + ROCLE_{i-1} + ROCLE_i + ROCLE_{i+1} + ROCLE_{i+2}}{5}$$

else if $p = 2$ to 5

if $\{SMWEL_{p-1,i-1} > SMWEL_{p-1,i} > SMWEL_{p-1,i+1}$ or $SMWEL_{p-1,i-1} = SMWEL_{p-1,i} = SMWEL_{p-1,i+1}$ or $SMWEL_{p-1,i-1} < SMWEL_{p-1,i} < SMWEL_{p-1,i+1}\}$

$$SMWEL_{p,i} = SMWEL_{p-1,i}$$

else

$$SMWEL_{p,i} = \frac{SMWEL_{p-1,i-2} + SMWEL_{p-1,i-1} + SMWEL_{p-1,i} + SMWEL_{p-1,i+1} + SMWEL_{p-1,i+2}}{5}$$

end

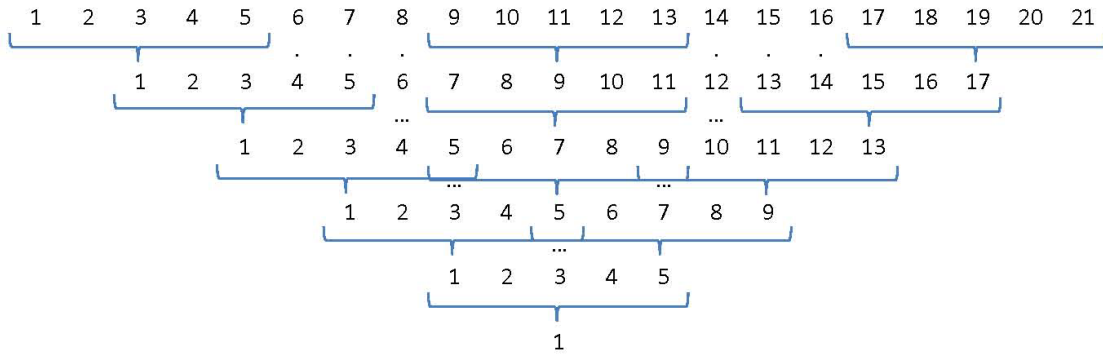
end

end

where:

$SMWEL_{p,i}$ = Smoothed Lake Winnipeg Water Elevation for pass p on day i

The figure below provides a visualization of the averaging process:



Water Survey of Canada provides Lake Winnipeg water level gauge information at: http://wateroffice.ec.gc.ca/search/search_e.html?sType=h2oArc.

Manitoba Hydro provides current Lake Winnipeg information at: https://www.hydro.mb.ca/corporate/water_regimes/lake_wpg_status.shtml.

6.2 Lake Winnipeg Outflow

The total Lake Winnipeg outflow is calculated by combining the Jenpeg total outflow, as described in Section 1.3, with the Nelson River East Channel flow (calculated below Sea River Falls at station 05UB008 based on a rating curve and the water level at upstream station 05UB001). These gauges are operated by Manitoba Hydro on behalf of WSC under the terms of the Canada-Manitoba Cost Sharing Agreement on Water Quantity and Quality Surveys. Detailed gauge descriptions are included in Appendix A.

Section 3.4 of the LWR Water Power Act Final Licence requires that a minimum total outflow from Lake Winnipeg be maintained at all times.

The **Daily Lake Winnipeg Outflow** is calculated as follows.

$$DLWQ = \frac{\sum_{i=1}^m JHQ_i}{m} + NEDQ \quad [14]$$

Where:

DLWQ = Daily Lake Winnipeg Outflow

JHQ = Jenpeg hourly total outflow

m = number of available hourly measurements at Jenpeg for a particular calendar day

NEDQ = Nelson River East Channel Daily Outflow as reported at gauge 05UB008.

7. Compliance

The following section specifies operating limits and reporting requirements that must be met for compliance with the Water Power Act Final Licence. In accordance with Section 7.2 of the Water Power Act Licence all water levels limits referred to in this document shall be understood to have wind and wave effects eliminated. In the event that the Licensee is requested by authorities to operate the structures for an emergency in such a way that causes a temporary exceedance of the licence limits, this event will not be considered a violation. Licence compliance is reported to Manitoba Environment, Climate and Parks as outlined in Section 7.6 below.

7.1 Jenpeg Generating Station Outflow Rate of Change Water Power Act Licensing Requirement

Jenpeg Outflow Rate of Change

Section 3.6 of the LWR Water Power Act Final Licence stipulates that:

“Subject to Section 3.5 of this Final Licence, but notwithstanding any other terms or conditions of this Final Licence, the Licensee shall operate Jen peg Control Structure in such a manner that any increase or decrease in the rate of the discharge therefrom during any 24-hour period shall not exceed 425 cubic metres per second (15,000 cubic feet per second).”

Compliance

Jenpeg operations shall be in compliance with the upper limit described above if the **Jenpeg Outflow Rate of Change** does not exceed 425 cubic metres per second (15,000 cubic feet per second).

7.2 Playgreen Lake Water Power Act Licensing Requirement

Operating Range

Section 3.2(b) of the LWR Water Power Act Final Licence stipulates that:

“The Licensee may regulate outflows for power purposes when the wind eliminated water levels are between: (b) Playgreen Lake - maximum 714.9 feet and minimum

707.0 feet, measured at the north end of Playgreen Lake, subject, however, to the provisions of Section 72 of the Regulations.”

Compliance

The Playgreen Lake level shall be in compliance with the limits described above if:

1. The **Playgreen Lake Mean Daily Water Level (with wind and wave effects eliminated)** does not exceed 714.9 feet, and
2. The **Playgreen Lake Mean Daily Water Level (with wind and wave effects eliminated)** does not recede below 707.0 feet.

7.3 Kiskittogisu Lake Water Power Act Licensing Requirement

Operating Range

Section 3.2(c) of the LWR Water Power Act Final Licence stipulates that:

“The Licensee may regulate outflows for power purposes when the wind eliminated water levels are between: (c) Kiskittogisu Lake - maximum 714.8 feet and minimum 706.0 feet, subject, however, to the provisions of Section 72 of the Regulations.”

Compliance

The Kiskittogisu Lake level shall be in compliance with the limits described above if:

1. The **Kiskittogisu Lake Mean Daily Water Level (with wind and wave effects eliminated)** does not exceed 714.8 feet, and
2. The **Kiskittogisu Lake Mean Daily Water Level (with wind and wave effects eliminated)** does not recede below 706.0 feet.

7.4 Kiskitto Lake Water Power Act Licensing Requirement

Operating Range

Section 3.7 of the LWR Water Power Act Final Licence stipulates that:

“The Licensee shall operate the Kiskitto Inlet Control Structure and Black Duck Control Structure in such a manner as to regulate water levels in Kiskitto Lake within natural ranges subject to the orders of the Director.”

As part of the Lake Winnipeg, Churchill and Nelson Rivers Study Board work in the 1970's, the natural range for Kiskitto Lake was estimated at between 686.0 and 702.3 ft⁵.

Compliance

The Kiskitto Lake level shall be in compliance with the limits described above if:

1. The **Kiskitto Lake Daily Average Water Level (with wind and wave effects eliminated)** does not exceed 702.3 feet, and
2. The **Kiskitto Lake Daily Average Water Level (with wind and wave effects eliminated)** does not recede below 686.0 feet.

7.5 Lake Winnipeg Water Power Act Licensing Requirements

Operating Range

Section 3.2 (a) of the LWR Water Power Act Final Licence stipulates that:

"The Licensee may regulate outflows for power purposes when the wind eliminated water levels are between: (a) Lake Winnipeg - maximum 715.0 feet and minimum 711.0 feet, subject, however, to the provisions of Section 72 of the Regulations."

In addition, Section 3.3 of the LWR Water Power Act Final Licence stipulates that:

"The Licensee shall, during periods when the water level in Lake Winnipeg is above elevation 217.93 metres (715.0 feet) ASL, operate Jenpeg Control Structure in such a manner as to effect the maximum discharge possible under the circumstances then prevailing until the water level of Lake Winnipeg recedes to elevation 217.93 metres (715.0 feet) ASL."

Also, Section 3.5 of the LWR Water Power Act Final Licence stipulates that:

"Notwithstanding any other terms or conditions of this Final Licence, the Licensee shall, during periods when the water level in Lake Winnipeg is below elevation 216.71 metres (711.0 feet) ASL, operate Jenpeg Control Structure as ordered by the Minister under Section 72 of the Water Power Regulation."

Compliance

Jenpeg operations shall be in compliance with the above stipulations if

⁵ Kiskitto Lake Regulation Committee. 1977. Kiskitto Lake Regulation Study.

1. Jenpeg is operated to maximize discharge when the **Wind-Eliminated Water Level on Lake Winnipeg** exceeds 217.93 m (715.0 ft) ASL, and
2. Jenpeg is operated as ordered by the Minister when the **Wind-Eliminated Water Level on Lake Winnipeg** recedes below 216.71 m (711.0 ft) ASL.

As the **Lake Winnipeg Wind-Eliminated Water Level** approaches 217.93 m (715.0 ft), Manitoba Hydro gradually increases Jenpeg discharge such that maximum discharge is typically reached a few days prior to Lake Winnipeg reaching 217.93 m (715.0 ft). Flow increases during these events must remain in compliance with the 425 cubic metres per second (15,000 cubic feet per second) **Jenpeg Outflow Rate of Change** limit described in Section 7.1 and are typically well below the limit.

Minimum Outflow

Section 3.4 of the LWR Water Power Act Final Licence stipulates that:

“The Licensee shall operate Jenpeg Control Structure in such a manner that the combined outflow of water from Lake Winnipeg through the natural and artificial channels at any time shall not be less than 708 cubic metres per second (25,000 cubic feet per second).”

Compliance

Jenpeg operations shall be in compliance with the above stipulations if the **Daily Lake Winnipeg Outflow** does not recede below 708 cubic metres per second (25,000 cubic feet per second).

7.6 Reporting

7.6.1 Compliance Reporting

In the event that the operation of Lake Winnipeg Regulation is not in compliance (using raw data) with the licence limits as described in Sections 7.1-7.5, notification shall be made to Manitoba Environment, Climate and Parks 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 Environment, Climate and Parks. Copies of all notifications and reports will be included in the Annual Water Levels and Flows Compliance Report.

7.6.2 Maintenance and Emergencies

During maintenance activities, such as routine gate inspections, and emergencies there may be times when Manitoba Hydro is required to violate 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 Environment, Climate and Parks 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.
3. Following the deviation, notification by letter is provided to Manitoba Environment, Climate and Parks on the details of the operation(s).

7.6.3 Regular Monthly Reporting

Section 7.4 of the LWR Water Power Act Final Licence stipulates that:

“The Licensee shall, to the satisfaction of the Director, provide a monthly forecast of water levels and flows in connection with the operation of the Undertaking.”

Manitoba Hydro will continue to provide monthly forecasts of water levels and flows at several locations to Manitoba Environment, Climate and Parks.

7.6.4 Regular Annual Reporting

Sections 7.5 and 7.3 of the LWR and Jenpeg Water Power Act Final Licences stipulate that:

“As provided for in Section 65 of the Water Power Regulation, the Licensee shall submit all information and data on water levels and flows necessary to enable the Director to determine compliance with this Final Licence and other approvals pertaining to water levels and flows in connection with the operation of the Undertaking.”

Compliance with the LWR and Jenpeg Water Power Act Final Licences is reported within the Annual Water Levels and Flows Compliance Report provided to Manitoba Environment, Climate and Parks. This report is intended to satisfy the requirements of Sections 7.5 and 7.3 of the LWR and Jenpeg Water Power Act Final Licences and contains information on data collection, verification, and reporting related to Water Power Act licences, as well as charts of recorded data and licence limits to demonstrate licence compliance during the year. It includes copies of correspondence between Manitoba Hydro and Manitoba

Environment, Climate and Parks regarding compliance issues or maintenance and emergency operations.

8. Ongoing Requirements

8.1 System-Wide Monitoring Program

Sections 7.8 and 7.6 of the LWR and Jenpeg Water Power Act Final Licences stipulate that:

“The Licensee shall, to the satisfaction of the Minister, continue to participate in a system-wide monitoring program in the lands and waters that are affected by the Undertaking, including Indigenous community participation and Indigenous traditional knowledge.”

The LWR and Jenpeg Water Power Act Final Licence cover letters from the Province of Manitoba also instruct Manitoba Hydro to:

“Work with Manitoba to expand the Coordinated Aquatic Monitoring Program to other areas including shoreline erosion, shoreline wetland issues (such as traditional plants, medicines and waterfowl) and monitoring of terrestrial and riparian components and shoreline health downstream of Lake Winnipeg with the inclusion of Indigenous community participation and Indigenous traditional knowledge.”

“Continue to monitor and evaluate water quality, including toxicology and methylmercury (MeHg) in fish.”

Manitoba Hydro and Manitoba signed a Memorandum of Understanding in 2006 as partners in the Coordinated Aquatic Monitoring Program (CAMP). The Program was created based on existing monitoring activities of Manitoba and Manitoba Hydro. CAMP standardized methods and sampling sites, ensuring that the resulting long-term, large-scale data set would be fully comparable over time and between sites. Since 2008, CAMP has been monitoring the aquatic environment of waterways affected by hydroelectric development and operations. CAMP monitoring includes hydrology, water quality, sediment quality, benthic macroinvertebrates, fish community and mercury in fish. As mentioned in the LWR and Jenpeg Water Power Act Final Licence transmittal letters, water quality and mercury in fish will continue to be monitored in the existing program.

When CAMP was first designed it was recognized that the program would evolve and include future monitoring of the physical environment; especially shorelines. CAMP is currently in the process of developing the shoreline monitoring program. This will be the first CAMP component to be created “from scratch”, as no comparable existing shoreline monitoring programs exist. With the challenge of designing a new component comes an

opportunity to incorporate the knowledge and experience of those who live on the system. In collaboration with the CAMP partners, Indigenous community participation and Indigenous traditional knowledge will be used in developing the shoreline monitoring component.

The initial step of shoreline monitoring is preparation and organization. CAMP is in the process of developing a scope, project management plan, Terms of Reference and engagement plan for this new endeavor. Some of the specific components to be included (as identified in the final licence letter from Manitoba) are: erosion, shoreline wetland issues, riparian components and shoreline health.

The goal of CAMP (and now shoreline monitoring) is to increase the understanding of hydroelectric effects and track change over time. The results of the monitoring data will be shared in the existing CAMP reporting framework, as well as any newly identified reporting mechanisms developed with communities. As per the MOU, CAMP currently prepares annual activity reports for the Minister of Environment, Climate and Parks, Minister of Natural Resources and Northern Development and the President/CEO of Manitoba Hydro. CAMP information (results, progress, and future plans) will continue to be shared with Manitoba, communities, and the public through workshops, meetings, and CAMP reporting. Manitoba has representatives participating in all aspects of CAMP and will continue to be included in the Program's progress, shoreline monitoring work, results, and future plans.

8.2 Public Safety and Debris Management Program

Sections 7.9 and 7.7 of the LWR and Jenpeg Water Power Act Final Licences stipulate that:

“The Licensee shall, to the satisfaction of the Minister, continue to implement a public safety and debris management program in lands and waters within the Severance Line, and report annually to the Director.”

Manitoba Hydro has a Waterways Management Program (WMP) in place to support and promote the safety of people travelling on waterways affected by Hydro's operations. The WMP includes boat patrols, debris management and safe ice trails. Manitoba Hydro works with Indigenous communities annually to implement the WMP throughout the affected waterways.

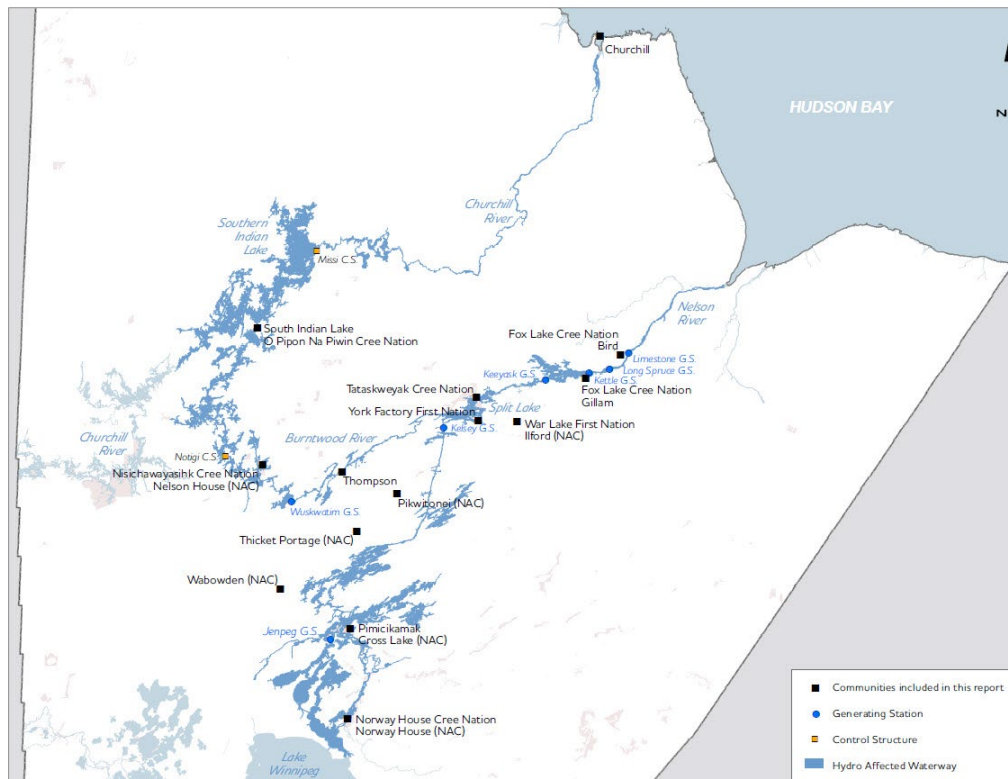
Manitoba Hydro will report on the WMP annually to the Director by providing an overview of the program as part of the information included with the Indigenous Engagement Report (see Section 8.3 below). Manitoba Hydro will also report on other access improvement and safety measures such as shoreline protection, portages and docks.

8.3 Indigenous Engagement Report

Sections 7.10 and 7.8 of the LWR and Jenpeg Water Power Act Final Licences stipulate that:

“The Licensee shall submit an annual report to the Director documenting the Licensee's engagement with Indigenous communities on the continued operation of the Undertaking.”

Manitoba Hydro will submit an annual report by June 1 each year that provides an overview of the forums, programs and activities through which it has engaged with Indigenous communities on the continued operation of CRD, LWR and the Jenpeg Generating Station. Map 1 shows the communities located along waterways affected by the continued operation of the noted projects, and that will be included in the annual report.



Map 1: Communities located along waterways affected by CRD, LWR and Jenpeg Generating Station

8.4 Large Area Planning, Studies, and Other Initiatives

The LWR and Jenpeg Water Power Act Final Licence cover letters from the Province of Manitoba instruct Manitoba Hydro to:

“Participate in any future large area planning initiative that may include studies in areas impacted by hydroelectric development, along with affected communities with other stakeholders.”

Sections 7.7 and 7.5 of the LWR and Jenpeg Water Power Act Final Licences stipulate that:

“The Licensee shall participate in future planning, studies and other initiatives as instructed by the Minister, in areas impacted by the Undertaking along with affected communities and other stakeholders.”

Manitoba Hydro will participate in any future large area planning or other studies and initiatives as directed by the Minister. Progress updates will be provided as required in the Annual Water Levels and Flows Compliance Report.

8.5 Licence Modernization Processes

The LWR and Jenpeg Water Power Act Final Licence cover letters from the Province of Manitoba instruct Manitoba Hydro to:

“Participate in the future licence modernization processes directed by the Province of Manitoba. The Province intends to evaluate the Water Power Act and Regulation to determine what amendments may be required for modernization”

Manitoba Hydro will participate in any future licence modernization processes as directed by Manitoba. Progress updates will be provided as required in the Annual Water Levels and Flows Compliance Report.

9. Change Management

Section 7.9 of the Jenpeg Water Power Act Final Licence stipulates that:

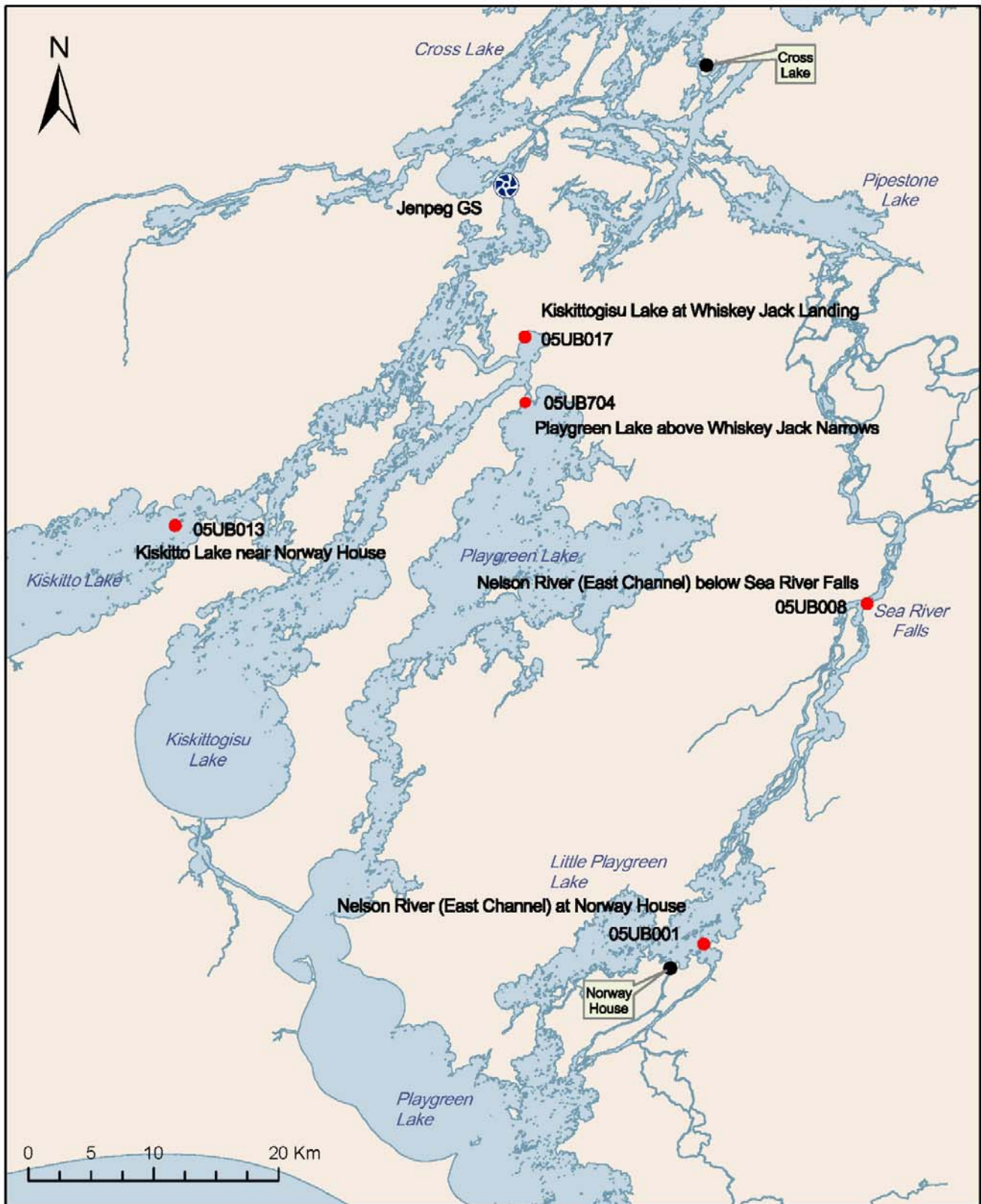
“The Licensee shall, to the satisfaction of the Minister, prepare a licence implementation guide, within one year of the date of this Final Licence.”

Section 7.11 of LWR Water Power Act Final Licence stipulates that:

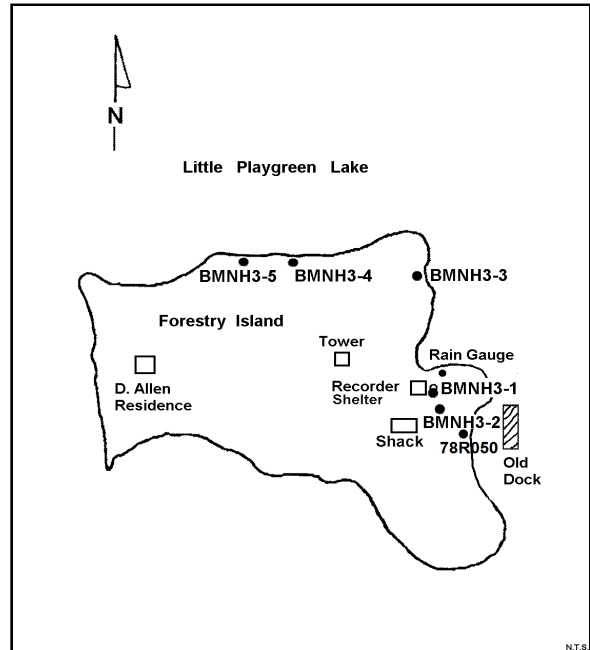
“The Licensee shall, to the satisfaction of the Minister, update the licence implementation guide, within one year of the date of this Final Licence.”

This version of this Guide initially fulfils these requirements. Proposed revisions to this Guide will be drafted by Manitoba Hydro as required or directed by Manitoba Environment, Climate and Parks. Following review and approval of revisions by Manitoba Environment, Climate and Parks, a revised copy of this Guide will be produced and distributed by Manitoba Hydro.

Appendix A: Outlet Lakes Area Water Level Gauge Description Sheets



Nelson River at Norway House



Number: **05UB001**

Name: **Nelson River at Norway House**

Latitude: 53° 59' 54.0" Longitude: -97° 47' 54.0"

UTM: 5984004.5 N 578770.1 E Zone: 14

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson (since July 1997)

Established: July 20, 1968

Location: On Forestry Island W of the village of Rossville and approximately 5.3 km NE from Fort Island.

Equipment: Sutron Satlink 2 DCP, firmware version 7.49, with a KPSI pressure transducer, a FTS DigiTemp water temperature sensor and Campbell Scientific air temperature sensor powered by a 12 V battery on a charger housed in an electrically heated Bally building with a GOES antenna.

Metering: Water levels are related to discharges at gauge 05UB008.

Access: Boat from the Natural Resources dock or helicopter.

Period of operation: 12 HR

Station Status: Active

Date: **2021-05-10**

Datum: GS of C CGVD28, 1969 Local Adjustment

Benchmarks:

BMNH3-2 - Master - Elevation 219.247 m. A brass cap located SE of BMNH3-1 and 17 m SE from the SE corner of the recorder shelter.

BMNH3-1- Elevation 219.193 m. The end of lowest bolt on S side of hydro pole set in bedrock 4.6 m E from the SE corner of the recorder shelter.

BMNH3-3 - Elevation - 219.688 m. A brass cap set in bedrock 20 m N of the recorder shelter.

78R050 – Elevation – 218.965 m. Provincial Surveys & Mapping Branch brass cap in bedrock 20.3 m SE from the SE corner of the DCP shelter

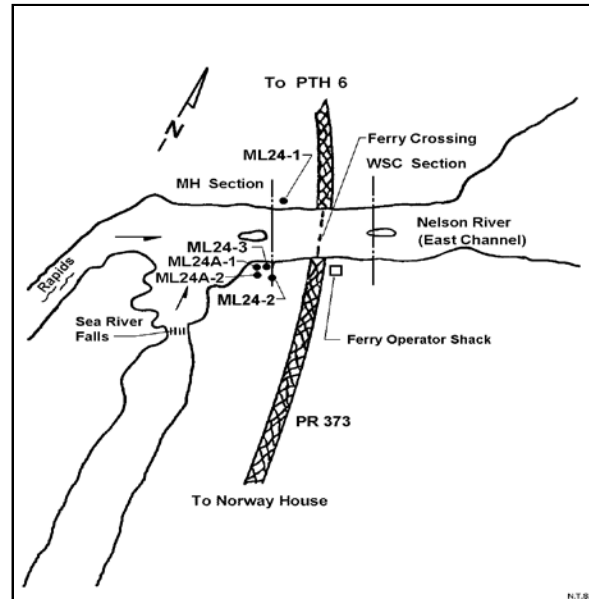
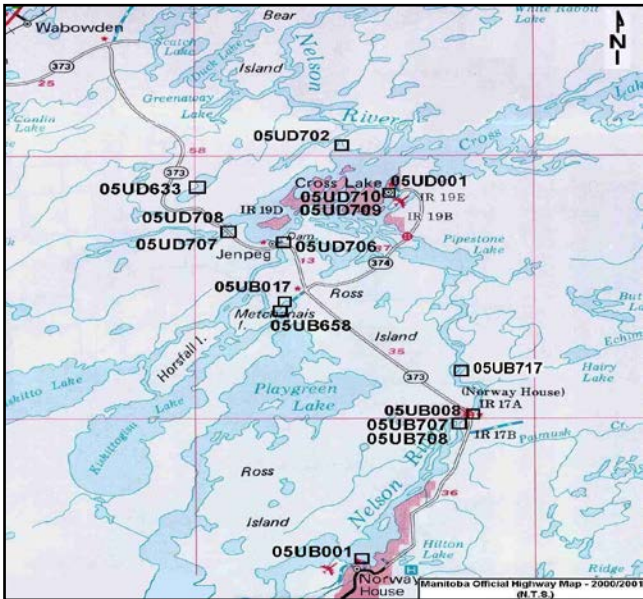
Additional Information:

Time Slot	00:20:10	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	207 East	Satellite Azimuth	156°
Archive Transmit	01:00:00	Antenna Angle	20°

OSH Concerns: **Watch for slippery rock, thin ice, and general site safety.**

Shelf Codes: HG, TW, TG, TA, VB, ZT.

Nelson River East Channel 1.9 km below Sea River Falls



Number: **05UB008**

Name: **Nelson River East Channel 1.9 km below Sea River Falls**

Latitude: 54° 14' 25.2" Longitude: -97° 35' 26.7"

UTM: 6011177.8 N 591840.6 E Zone: 14

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson (since July 1997)

Established: September, 1990

Location: Approximately 760 m below Sea River Falls and 200 m above the ferry crossing on the East Channel of the Nelson River.

Equipment: There is no equipment at this site since it is a metering section only.

Metering: Metering section approximately 760 m below Sea River Falls and 200 m above the ferry crossing on the East Channel of the Nelson River.

Access: Road then by boat

Station Status: Active

Period of Operation: 12QC

Date: 2014-07-08

Datum: G S of C CGVD28, 1969 Local Adjustment

Benchmarks:

ML24-2 - Master - (94-MH-95) - Elevation 218.321 m. A Manitoba Hydro brass cap in bedrock on the right bank of the Nelson River East Channel approximately 200 m above the ferry crossing and 6.0 m from the water's edge.

ML24A-1 - Elevation - 216.799 m. Manitoba Hydro brass cap in bedrock on the right bank of the Nelson River East Channel approximately 30 m upstream of the discharge station right bank anchor.

ML24A-2 - Elevation - 218.744 m. Manitoba Hydro brass cap in bedrock on the right bank of the Nelson River East Channel approximately 30 m upstream of the discharge station right bank anchor.

ML24-1 - Elevation - 216.512 m. Top of the eyebolt grouted into bedrock on the left bank of the Nelson River East Channel approximately 200 m upstream of the ferry crossing.

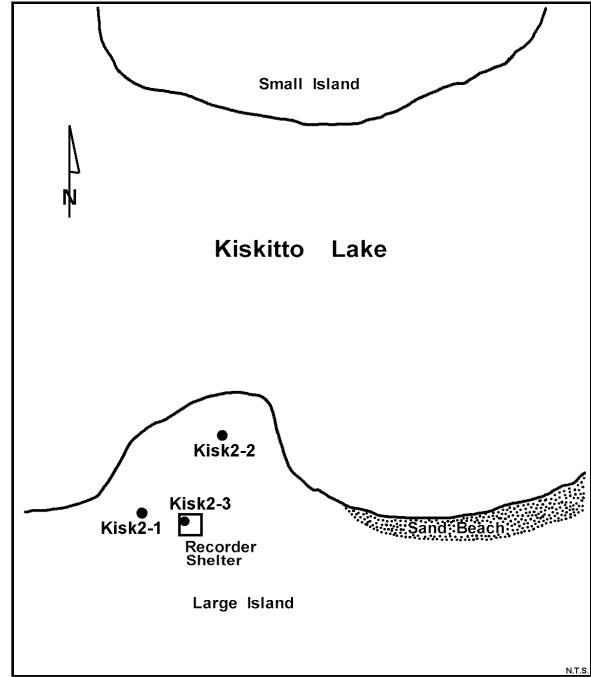
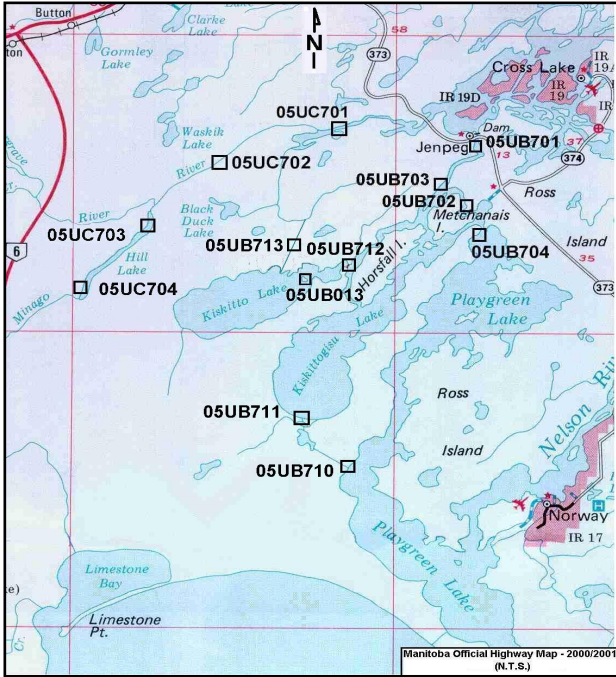
ML24-3 - Elevation 218.257 m. The top of an anchor bolt on the right bank at the metering section. The anchor bolt is placed in the top of a bedrock outcrop at the tree line.

OSH Concerns: **Watch for slippery rocks.**

Additional Information:

This is a metering section only. Discharges are related to water levels at Norway House gauge 05UB001. Water levels and flows are affected by Sea River Falls.

Kiskitto Lake near Norway House



Number: 05UB013

Name: Kiskitto Lake near Norway House

Drainage Area (km²): 932

Latitude: 54° 18' 11.6" **Longitude:** -98° 26' 19.3"

UTM: 6017416.9 N 536530.6 E **Zone:** 14

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson

Established: November, 1971

Location: On the N end of a small island approximately 8 km SW of the confluence of Kispachewuk Channel and the West Nelson River.

Equipment: Sutron Satlink 2 DCP, firmware version 7.49, with a Sutron Accubar, safe purge nitrogen system, tipping bucket rain gauge and external air temperature sensor powered by a 12 V battery connected to a solar panel housed in an Armco building with an GOES antenna.

Metering: N/A

Access: Helicopter, Boat, Snow Machine

Period of operation: 12 HR

Station Status: Active

Date: 2021-04-30

Datum: GS of C CGVD28, 1969 Local Adjustment

Benchmarks:

Kisk2-1 - Elevation 215.841 m. Water Survey of Canada brass cap set in bedrock 3 m NW of the NW corner of the recorder shelter. Water Survey of Canada designation M7172.

Kisk2-2 - Master - Elevation - 214.469 m. Water Survey of Canada brass cap set in bedrock 9 m NNE of the front of the recorder shelter. Water Survey of Canada designation M7173.

Kisk2-3 - Elevation - 215.798 m. Top of a tie down bolt inside the recorder shelter on the right side when facing the door. Water Survey of Canada designation M7171.

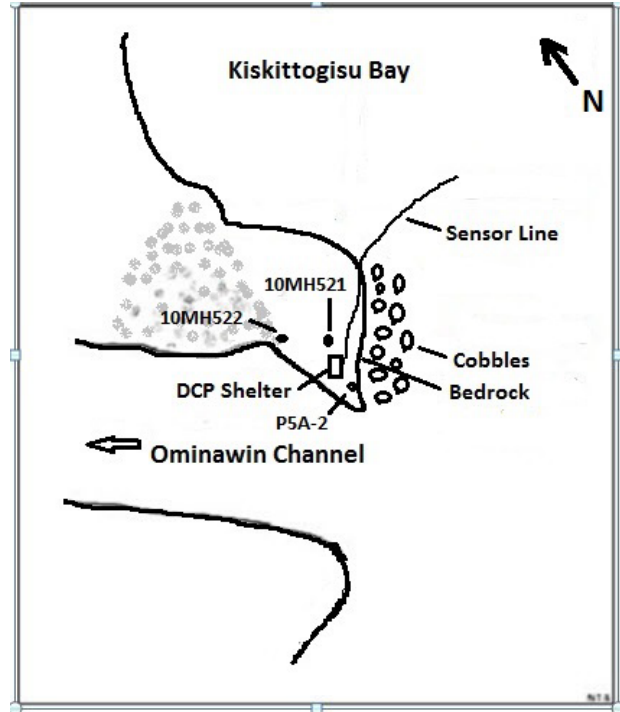
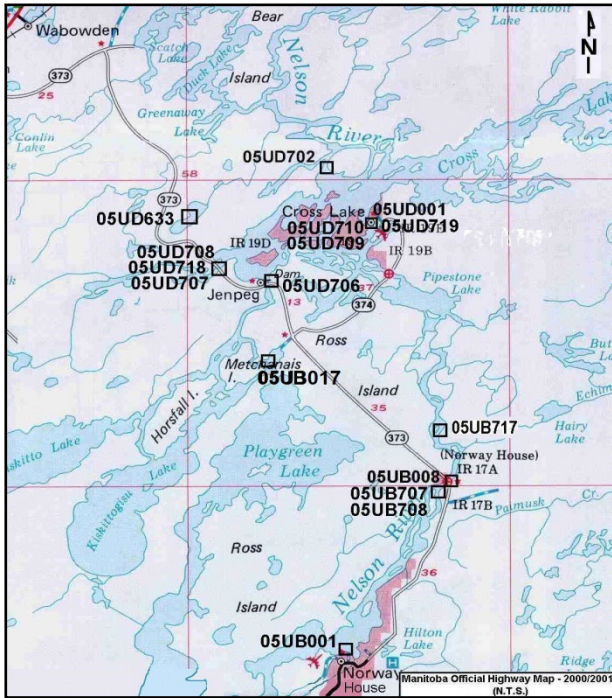
OSH Concerns: Watch for a thin layer of ice forming on the rock near water's edge in the fall prior to freeze up.

Additional Information:

Time Slot	00:20:30	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	207 East	Satellite Azimuth	156°
Archive Transmit	01:00:00	Antenna Angle	19.8°

Shelf Codes: HG, PC, TA, VB, ZT

Kiskittogisu Bay at Whiskey Jack Landing



Number: **05UB017**

Name: **Kiskittogisu Bay at Whiskey Jack Landing**

Latitude: 54° 25' 13.6" Longitude: -98° 00' 42.6"

UTM: 6030764.1 N 564111.0 E Zone: 14

Co-ordinate Source: NAD83

Operator: Manitoba Hydro, Thompson

Established: Manitoba Hydro - November 01, 2007.

Previous site of 05UB658 effective April 01, 2013.

Location: On the right bank of Kiskittogisu Bay at the Ominawin Channel proper entrance.

Equipment: Sutron Satlink 2 DCP, firmware version 7.49, with a FTS DigiTemp SDI 12 water temperature powered by a 12 V sealed lead acid battery and solar panel housed in a Hanover metal clad shelter. System includes a Sutron Accubar sensor with a nitrogen tank, Arctic safe purge system and regulator.

Metering: N/A

Access: Helicopter, snowmobile and boat

Station Status: Active

Station Operation: 12HR

Date: **2021-03-16**

Datum: GS of C CGVD28, 1969 Local Adjustment

Benchmarks:

P5A-2 - Master - Elevation - 218.270 m. A 16 mm bolt set in bedrock approximately 1.5 m SW of the DCP shelter also marked with a 16 mm diameter rebar marker bar with a brass tag stamped P5A-2.

10MH521 - Elevation - 218.844 m. A Manitoba Hydro brass cap stamped 10MH521, grouted into bedrock, marked with a 16 mm diameter rebar, 3.5 m NE of the DCP shelter.

10MH522 - Elevation - 219.000 m. A Manitoba Hydro brass cap stamped 10MH522, grouted into bedrock, marked with a 16 mm diameter rebar, 8.0 m N of the DCP shelter.

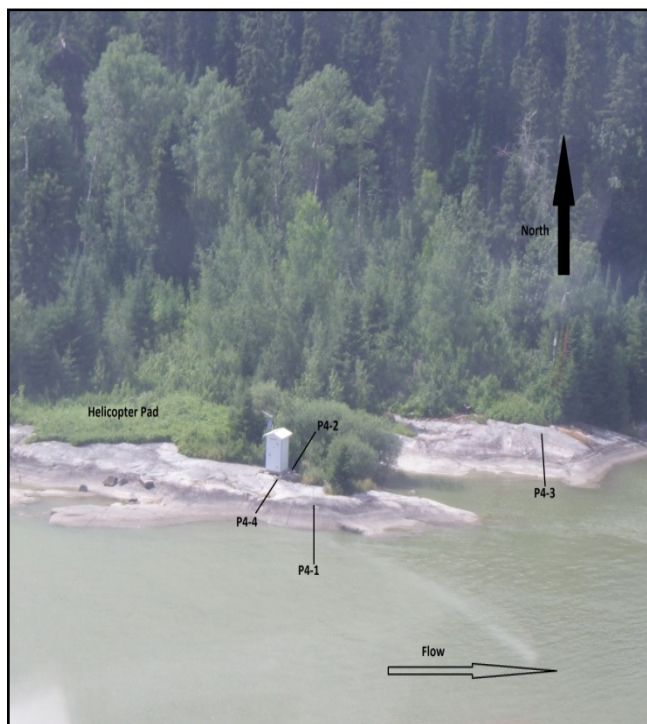
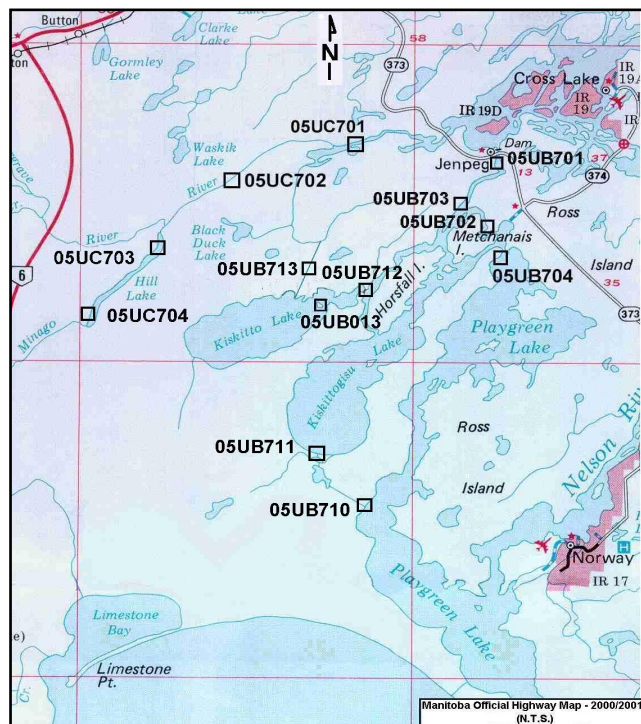
Additional Information:

Time Slot	00:27:20	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	207 East	Satellite Azimuth	156°
Report Rate	01:00:00	Antenna Angle	20°

Shef Codes: HG, VB, ZT, TW

OSH Concerns: **Large rocks with steep embankment. General site safety.**

Playgreen Lake 760 m above Whiskey Jack Narrows



Number: **05UB704**

Name: **Playgreen Lake 760 m above Whiskey Jack Narrows**

Latitude: 54° 23' 19.6" Longitude: -98° 00' 25.1"

UTM: 6027232.1 N 564483.6 E Zone: 14

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson

Established: 1970

Location: Located at the N end of Playgreen Lake on the left bank 760 m upstream of Whiskey Jack Narrows.

Equipment: Sutron Satlink II data logger, firmware version 7.49, with a OTT PLS pressure transducer and a FTS Digitemp high precision SDI-12 water temperature sensor powered by a Sealed lead acid 12 V battery connected to a solar panel all housed in a 1.2 m x 1.2 m metal clad shelter with a GOES antenna.

Metering: N/A

Access: Helicopter or boat

Period of operation: 12 HR

Station Status: Active

Date: **2021-05-07**

Datum: GS of C CGVD28, 1969 Local Adjustment

Benchmarks:

P4-1 - Master - Elevation - 218.283 m. A Manitoba Hydro brass cap stamped P4-1 in bedrock marked with a 0.9 m high T-bar 6.5 m E of the corner of the recorder shelter.

P4-2 - Elevation - 218.257 m. The top of an eyebolt tagged P4-2 grouted into bedrock, with the armoured cable running through it and marked by a rebar. It is 1.3 m N of the recorder shelter.

P4-3 - Elevation - 219.034 m. A Manitoba Hydro brass cap stamped P4-3 grouted into bedrock, and marked with a 0.9 m high angle iron. The brass cap is located 26 m N of the recorder shelter.

P4-4 - Elevation - 218.426 m. An eyebolt anchoring down the recorder shelter at the ESE corner of the recorder shelter.

Additional Information:

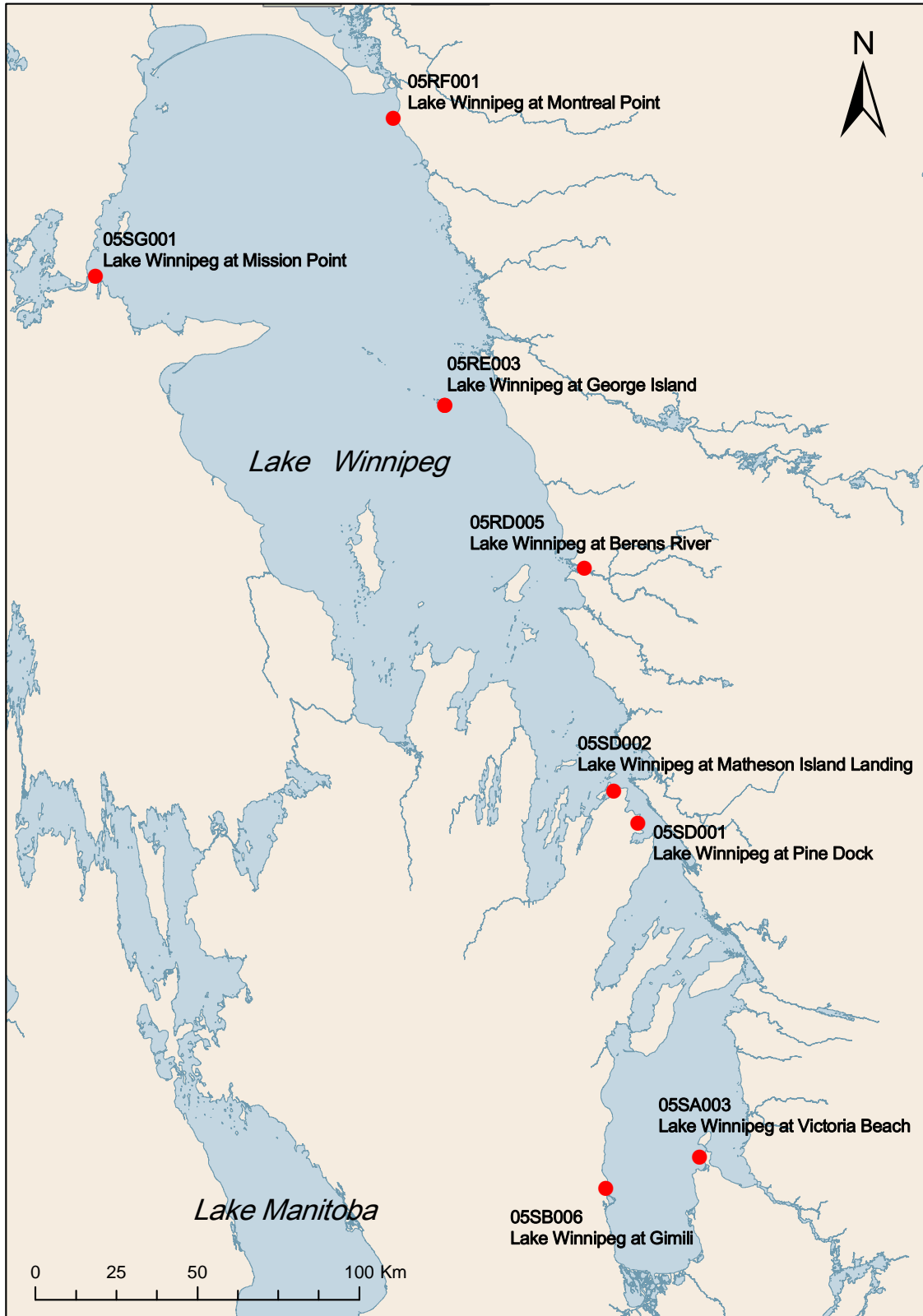
Time Slot	00:20:40	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	207 East	Satellite Azimuth	156°
Archive Transmit	01:00:00	Antenna Angle	17°

Water level is affected by Jenpeg Generating Station operations.

OSH Concerns: Watch for slippery rock. General site safety.

Shelf Codes: HG, TW, TG, VB, ZT

Appendix B: Lake Winnipeg Water Level Gauge Description Sheets





Water Survey of Canada - Station Description Report - 05RD005

LAKE WINNIPEG AT BERENS RIVER

Description as of: February 24, 2022

Technician Effective Date: 2020-01-13

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1966-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

WATER LEVELS AFFECTED BY WIND DIRECTIONS AND VELOCITY

Location

Lat/Long 52°21'11.9" N, 97°01'19.8" W

[Link to google maps](#)

Decimal Degrees (52.35331, -97.02217)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: ON FORESTRY PROPERTY AT BERENS RIVER NEAR FORESTRY DOCK, MOUTH OF BERENS RIVER

Remote Access: Yes

Access Method: AIRCRAFT

Access Remarks: Access by helicopter or float plane. Helicopter lands on pad at Forestry building. Float plane ties to dock at site.

Legal Land Designation: 7-18-39-4 E1

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

To convert to: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1976 ADJ.) **add** .043 m

Conversion Remark:

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

Description of Measurement Sections

NA

Occupational Health and Safety Considerations

USE CAUTION WHEN OPERATING AROUND AIRCRAFT. NO PHONE SERVICE IN AREA.



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL WALK-IN	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-05-09 16:13:43	cat
WET CELL	INSTALLATION TYPE	INACTIVE	2017-05-09 16:13:25	cat
ELECTRIC HEAT	INSTALLATION TYPE	INACTIVE	2016-02-18 13:24:40	No Power
A.C. POWER	INSTALLATION TYPE	INACTIVE	2016-02-18 13:24:34	No power

Devices

Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
1810052	LOGGER	SUTRON	SL3-SDI-1				installed as per LCM new
102420483	PRESSURE SENSOR	OTT HYDROMET	PLS				
805139	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A		456080B8		

Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
1810052	ACTIVE	647	647	647				2019-09-29 00:00:00
102420483	ACTIVE	647	647	647				2018-02-05 15:03:23
805139	ACTIVE	647	647	647				2010-03-02 11:30:00

Appendix - Agency IDs and Names

Agency ID	Agency Name
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map



Location map





Water Survey of Canada - Station Description Report - 05RE003

LAKE WINNIPEG AT GEORGE ISLAND

Description as of: February 24, 2022

Technician Effective Date: 2020-01-13

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1984-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

This station also has a secondary set of equipment; logger, sensor, GOES platform, solar panel, battery, etc.. Therefore it also has a separate Hydex listing; 05REX03. Please refer to this Hydex page for secondary logger, sensor, and GOES platform information.

Location

Lat/Long 52°49'06.3" N, 97°37'10.4" W

[Link to google maps](#)

Decimal Degrees (52.81842, -97.61956)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: Recorder shelter is approx. 30 m up the north shore of harbour, which is located on the SE shore of the island. Crown land.

Remote Access: Yes

Access Method: AIRCRAFT

Access Remarks: Float plane land on north or south shores depending on weather. Helicopter land on sand in bay.

Legal Land Designation: 25-44-2W

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

To convert to: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1976 ADJ.) **add** .043 m

Conversion Remark:

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

Description of Measurement Sections

Occupational Health and Safety Considerations

Proper float plane / helicopter procedures should be followed. Caution should be taken during landing and takeoff if using the bay access during windy times. Carry a satellite phone. When flying over open water, helicopter must have floats and PFD must be worn



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL WALK-IN	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-05-04 11:12:55	meow
WET CELL	INSTALLATION TYPE	INACTIVE	2017-05-04 11:12:43	meow

Devices

Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
420435	PRESSURE SENSOR	OTT HYDROMET	PLS				OTT PLS 102420435
1111211	LOGGER	SUTRON	SL2-G312-1				
1111235	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A		45471600		SL2 both logger and transmitter

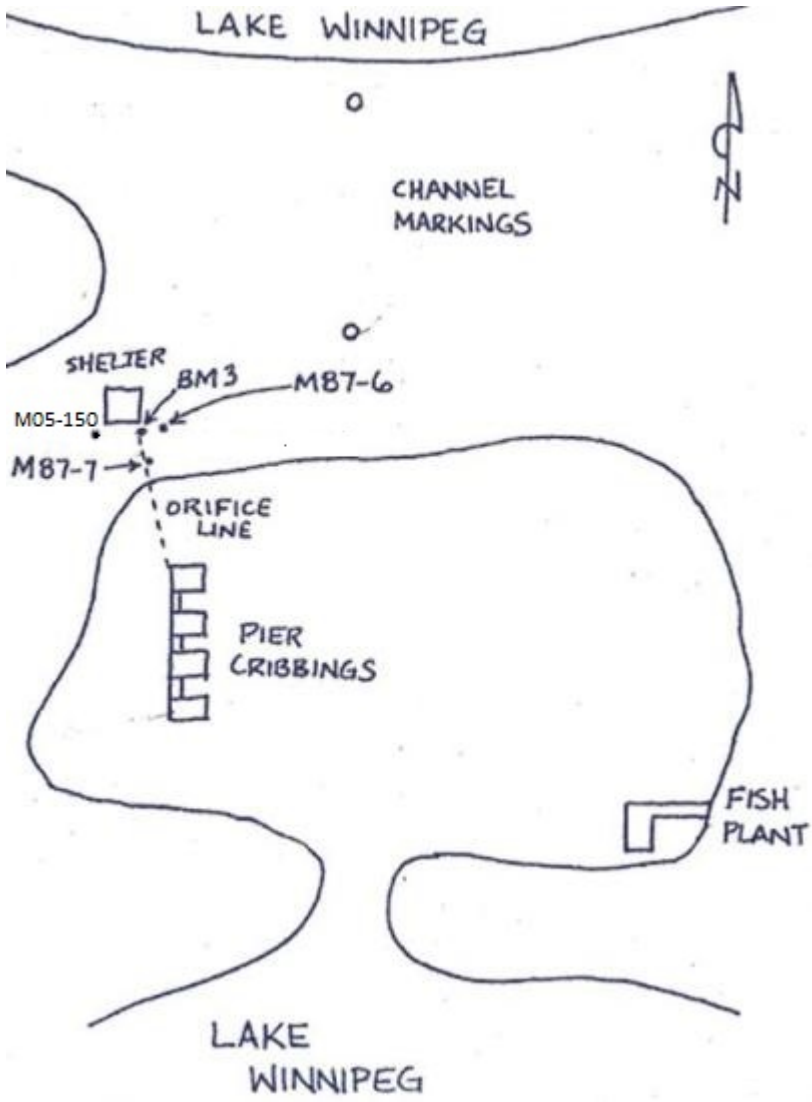
Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
420435	ACTIVE	647	385	385				2019-11-05 13:10:27
1111211	ACTIVE	647	385	385				2012-08-14 10:45:00
1111235	ACTIVE	647	647	647				2009-07-07 15:15:00

Appendix - Agency IDs and Names

Agency ID	Agency Name
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map

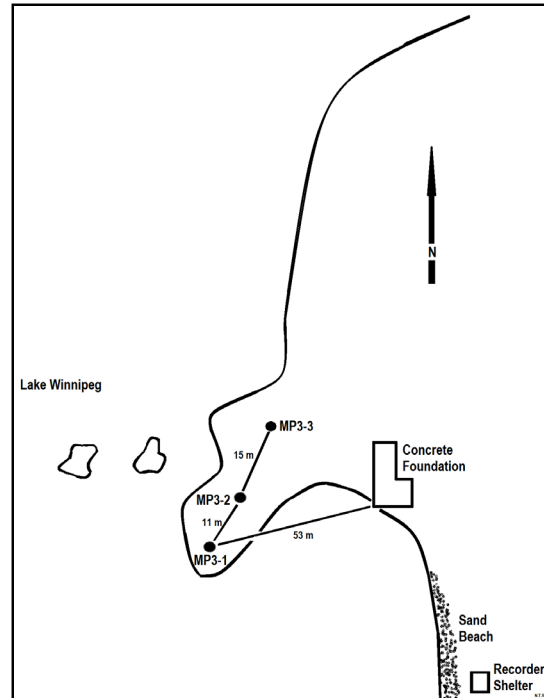
Site Map



Location map



Lake Winnipeg at Montreal Point



Number: **05RF001**

Name: **Lake Winnipeg at Montreal Point**

Drainage Area (km²): 978,000

Latitude: 53° 36' 56.0" Longitude: -97° 50' 24.0"

UTM: 5941375.0 N 576734.8 E Zone: 14

Coordinate Source: NAD83

Operator: Manitoba Hydro, Thompson (since July 1997)

Established: July 1967

Location: At Montreal Point on the E shore of Lake Winnipeg, near the outlet, 16 km S of Norway House and 3.5 km S of Warren Landing, on the sand beach S of an old concrete foundation.

Equipment: Sutron Satlink 2 DCP, firmware version 7.49, with an OTT PLS pressure transducer powered by a 12 V battery connected to a solar panel all housed in a Hanover metal clad shelter with a GOES antenna.

Metering: N/A

Access: Helicopter or boat

Period of Operation: 12HR

Station Status: Active

Date: **2021-09-15**

Datum: Lake Winnipeg Datum = GS of C CGVD28, 1960 datum at Berens River.

Benchmarks:

MP3-3 - Master - Elevation - 219.017 m. (UID 3730) A Water Survey of Canada brass cap stamped MP3-3 in bedrock, marked with a rebar 15.0 m NE of MP3-2. Also known as Geodetic Survey of Canada BM 68M033.

MP3-2 - Elevation - 218.553 m. (UID 3731) A Water Survey of Canada brass cap stamped MP3-2 in bedrock, marked with a rebar 11.0 m NE of MP3-1.

MP3-1 - Elevation - 218.361 m. (UID 3732) A Water Survey of Canada brass cap stamped MP3-1 in bedrock, marked with a rebar 53.0 m W from the SW corner of a concrete foundation.

Additional Information:

Time Slot	00:03:00	Transmit Window	00:00:10
Transmitter	HDR	Baud Rate	300
Channel	143 East	Satellite Azimuth	156°
Archive Transmit	01:00:00	Antenna Angle	20°

Water levels are affected by wind set up on the lake.

Shef Code: HG, VB, TW, ZT

OSH Concerns: **Deer mice have been observed at this site.**



Water Survey of Canada - Station Description Report - 05SA003

LAKE WINNIPEG AT VICTORIA BEACH

Description as of: February 24, 2022

Technician Effective Date: 2020-01-13

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1965-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

WATER LEVELS AFFECTED BY WIND DIRECTION AND VELOCITY

Location

Lat/Long 50°41'42.4" N, 96°33'43.8" W

[Link to google maps](#)

Decimal Degrees (50.69511, -96.56217)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: Located in Victoria Beach, travel North HWY 59 to Arthur Road then travel West to 1st Avenue then follow South to wharf. Gauge located midway on wharf.

Remote Access: No

Access Method: ROAD

Access Remarks: Access to gauge via wharf. Watch for pedestrian traffic on wharf. Wharf becomes ice and snow covered in winter.

Legal Land Designation: SE-09-20-07-E

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

To convert to: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1962 ADJ.) **add** .043 m

Conversion Remark:

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

Description of Measurement Sections

Occupational Health and Safety Considerations

Wharf can accumulate heavy ice cover and become very slippery during periods of strong winds and below freezing temperatures.



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
TILTING MAST STAND	SHELTER TYPE	ACTIVE	2018-07-09 19:02:58	
ALUMINUM LOOK-IN	SHELTER TYPE	ACTIVE	2018-07-09 19:02:57	
STEEL WALK-IN	SHELTER TYPE	INACTIVE	2018-08-30 09:24:59	not in use
WOODEN STAVE	WELL TYPE	INACTIVE	2018-08-30 09:24:38	not in use
A.C. POWER	INSTALLATION TYPE	INACTIVE	2018-08-30 09:24:07	not in shelter anymore
WET CELL	INSTALLATION TYPE	INACTIVE	2014-11-20 08:00:53	Not used

Devices

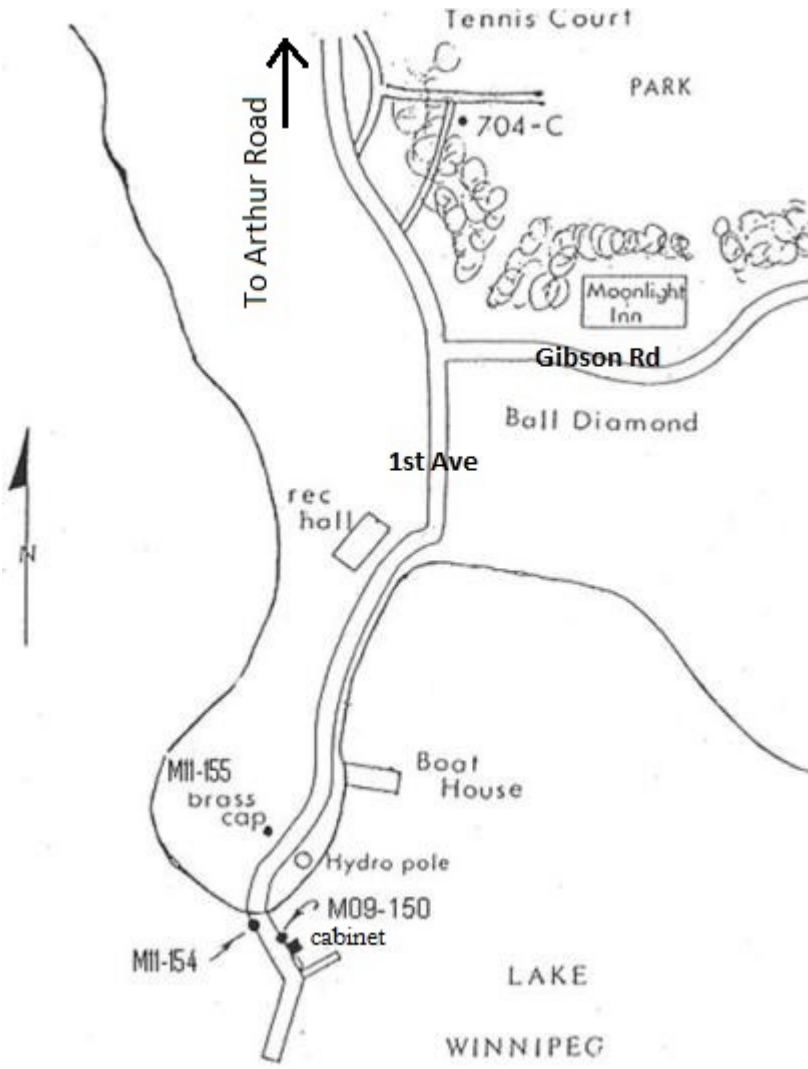
Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
1908929	LOGGER	SUTRON	SL3-SDI-1				installed
102420434	PRESSURE SENSOR	OTT HYDROMET	PLS				new
812098	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A		4A013452		SL2 both logger and transmitter

Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
1908929	ACTIVE	647	647	385				2020-07-22 11:54:09
102420434	ACTIVE	647	385	385				2018-03-15 07:37:02
812098	ACTIVE	647	647	385				2008-03-06 10:30:00

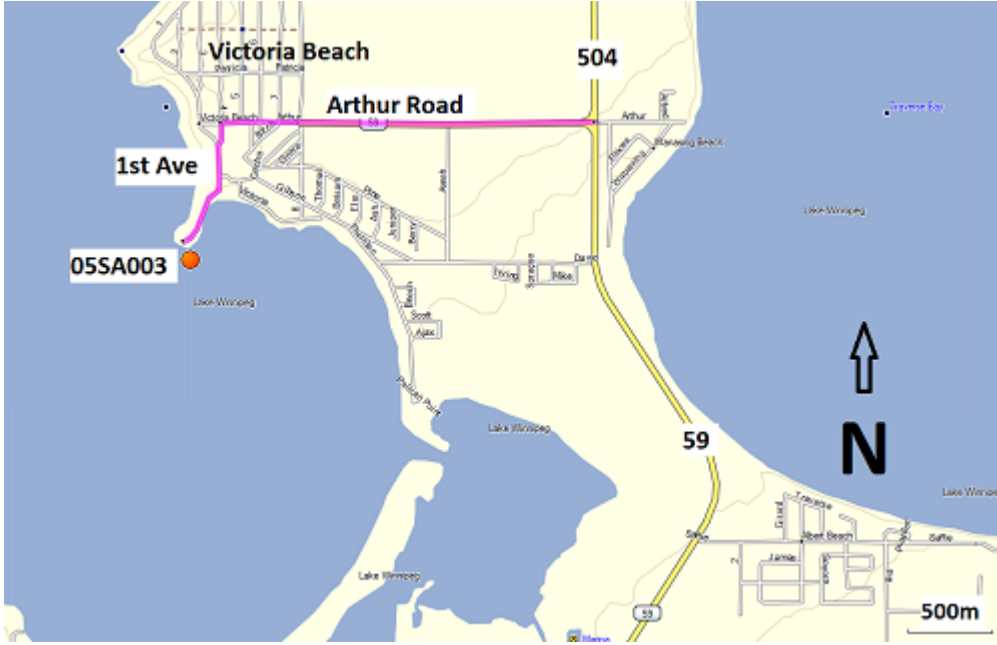
Appendix - Agency IDs and Names

Agency ID	Agency Name
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map



Location map





Water Survey of Canada - Station Description Report - 05SB006

LAKE WINNIPEG AT GIMLI

Description as of: February 24, 2022

Technician Effective Date: 2019-02-01

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1966-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

WATER LEVEL AFFECTED BY WIND DIRECTION AND VELOCITY. PRIOR TO JUL 30 1966 RECORDS WERE OBTAINED AT WINNIPEG BEACH

Location

Lat/Long 50°37'51.6" N, 96°58'54.0" W

[Link to google maps](#)

Decimal Degrees (50.63101, -96.98169)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: Located at east end of boat dock in Gimli Harbour, approx.300m Southeast of Centre and First Streets in Gimli, MB

Remote Access: No

Access Method: ROAD

Access Remarks:

Legal Land Designation: SE16-19-04-E1

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

To convert to: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1968 ADJ.) **add** .043 m

Conversion Remark: Add 0.043m to get to this datum. Conversion derivation metadata are unavailable, therefore this conversion may not be accurate. WSC estimates that GEODETIC SURVEY OF CANADA DATUM refers to CGVD28, however cannot confirm the epoch, age or accuracy of the conversion.

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

Description of Measurement Sections

Levels should be run to tape gauge in June and January from master benchmark.

Occupational Health and Safety Considerations

Vehicles are permitted on the dock leading out to the shelter. Take care for pedestrians. A trough heater and heat lamps are installed in the well. Take care to unplug before maintenance.



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
TILTING MAST STAND	SHELTER TYPE	ACTIVE	2018-07-09 18:58:53	
ALUMINUM LOOK-IN	SHELTER TYPE	ACTIVE	2018-07-09 18:58:53	

Devices

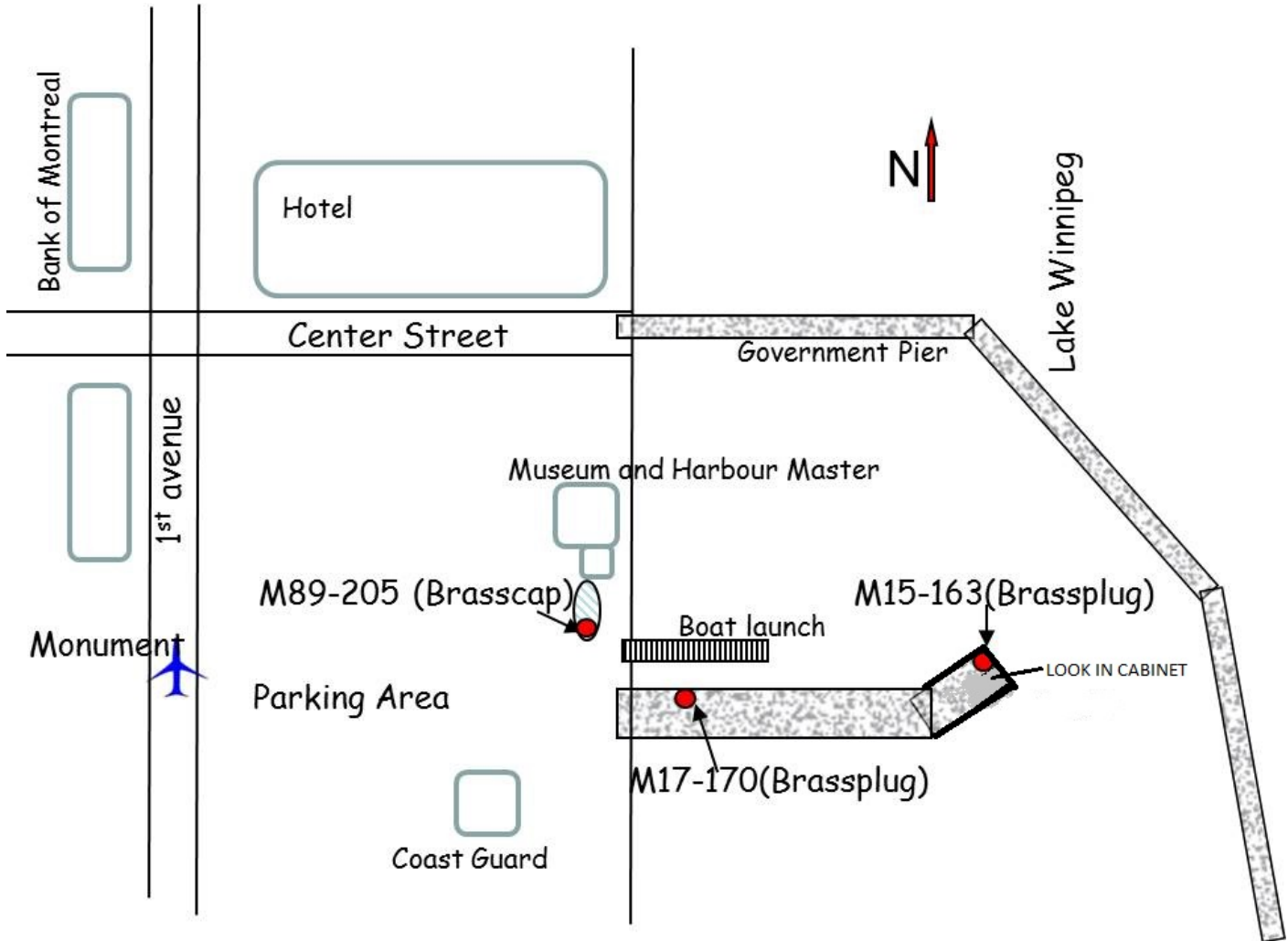
Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
111060	PRESSURE SENSOR	FTS	Bubbler	7.49			INSTALLED FTS BUBBLER
?4125	SATELLITE - GOES - HDR	FTS	G5				New FTS omni directional antennae installed.
074329	LOGGER	FTS	H1-G5-TLM				
70010083	PRESSURE SENSOR	CAMPBELL SCIENTIFIC	CS450				CS Submersible installed

Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
111060	ACTIVE	647	647	647				2021-03-18 13:44:53
?4125	ACTIVE	647	647	647				2019-05-30 12:55:41
074329	ACTIVE	647	647	647				2015-09-22 12:30:00
70010083	ACTIVE	647	647	647				2013-09-17 11:30:00

Appendix - Agency IDs and Names

Agency ID	Agency Name
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map



Location map





Water Survey of Canada - Station Description Report - 05SD001

LAKE WINNIPEG AT PINE DOCK

Description as of: February 24, 2022

Technician Effective Date: 2020-01-13

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1960-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

WATER LEVEL AFFECTED BY WIND DIRECTION AND VELOCITY

Location

Lat/Long 51°38'22.8" N, 96°48'11.9" W

[Link to google maps](#)

Decimal Degrees (51.63969, -96.80331)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: Located in the town of Pine Dock on Pine Avenue, 930m west of the intersection of Highway 234 and Pine Avenue, at the end of the road 3m south of the pier.

Remote Access: No

Access Method: ROAD, AIRCRAFT

Access Remarks:

Legal Land Designation: 10-31-5W

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

To convert to: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1964 ADJ.) **add** .024 m

Conversion Remark:

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

Description of Measurement Sections

Occupational Health and Safety Considerations

Slippery rocks at site



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL WALK-IN	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
ELECTRIC HEAT	INSTALLATION TYPE	INACTIVE	2017-05-08 13:47:45	cat
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-05-08 13:47:35	cat
WET CELL	INSTALLATION TYPE	INACTIVE	2017-05-08 13:47:20	cat
A.C. POWER	INSTALLATION TYPE	INACTIVE	2016-09-26 15:44:05	solar set up may 2016
TELEPHONE	INSTALLATION TYPE	INACTIVE	2014-11-18 09:19:50	Not used

Devices

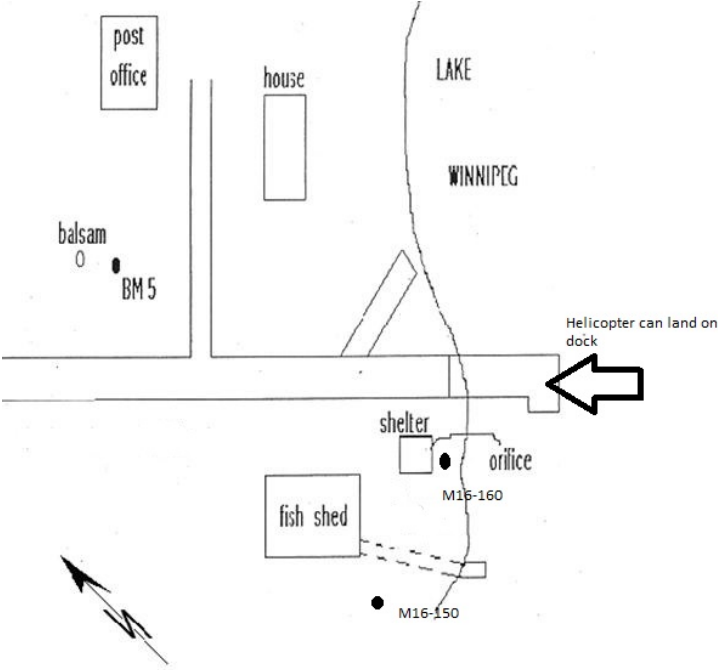
Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
420484	PRESSURE SENSOR	OTT HYDROMET	PLS				new
1111229	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A		4841F1D4		SL2 both logger and transmitter
1111229	LOGGER	SUTRON	SL2-G312-1				

Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
420484	ACTIVE	647	385	385				2017-03-15 17:41:45
1111229	ACTIVE	647	647	647				2012-06-15 14:00:00
1111229	ACTIVE	647	647	647				2012-06-15 14:00:00

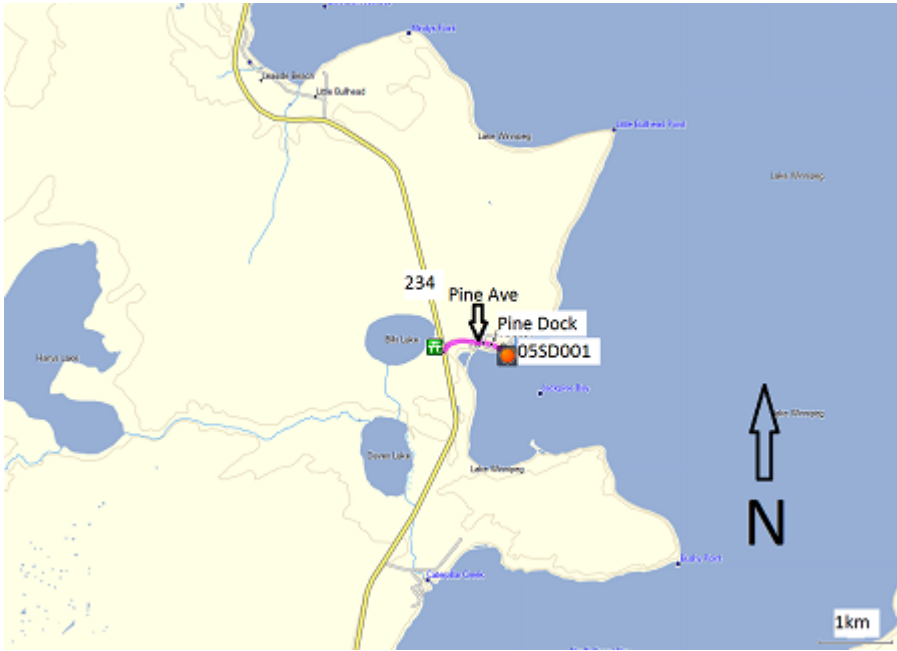
Appendix - Agency IDs and Names

Agency ID	Agency Name
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map



Location map





Water Survey of Canada - Station Description Report - 05SD002

LAKE WINNIPEG AT MATHESON ISLAND LANDING

Description as of: February 24, 2022

Technician Effective Date: 2020-01-13

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1997-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

RECORDS PRIOR TO 1962 WERE OBTAINED AT GOVERNMENT WHARF ON MATHESON ISLAND: LAT. 51 44 37, LONG. 96 55 08. WATER LEVELS AFFECTED BY WIND DIRECTION AND VELOCITY Logger set to DWL. **Building and Dock destroyed Oct 27, 2010; update BM locations once new dock built

Location

Lat/Long 51°43'26.2" N, 96°54'55.5" W

[Link to google maps](#)

Decimal Degrees (51.72394, -96.91544)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: Located approx. 90km north of the intersection of Highway 8 and Highway 234. Located approx. 2.5km NE of the Matheson Island Ferry Landing

Remote Access: No

Access Method: ROAD

Access Remarks: Updated location description

Legal Land Designation: 1-SW-2-32-4 E1

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

To convert to: GEODETIC SURVEY OF CANADA DATUM (LOCAL 1964 ADJ.) **add** .043 m

Conversion Remark:

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

Shoreline consists of mainly limestone type gravel

Description of Measurement Sections

Occupational Health and Safety Considerations

Tripping hazards around gauge. No cell phone service at gauge.



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL LOOK-IN	SHELTER TYPE	ACTIVE	2010-10-30 00:00:00	**Cabinet installed Oct 30, 2010
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-05-03 16:11:51	cat
WET CELL	INSTALLATION TYPE	INACTIVE	2014-11-18 12:46:43	Removed
PRES. REG. - SAFE PURGE II	INSTALLATION TYPE	INACTIVE	2014-10-16 12:47:13	Removed for repair

Devices

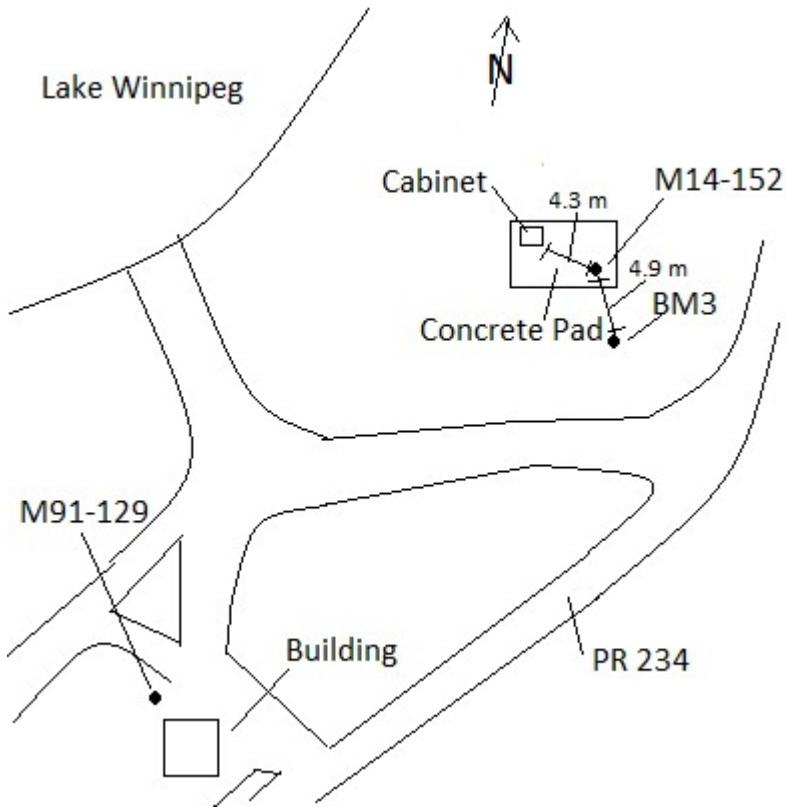
Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
2011044	LOGGER	SUTRON	SL3-SDI-1				Replaced existing logger as per LCM
416122	PRESSURE SENSOR	OTT HYDROMET	PLS				installed
1002286	SATELLITE - GOES - HDR	SUTRON	SATLINK2-G312-2A		4A017758		cat

Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
2011044	ACTIVE	5	5	5				2021-05-18 14:50:00
416122	ACTIVE	647	385	385				2017-07-18 13:49:34
1002286	ACTIVE	647	385	385				2011-04-11 00:00:01

Appendix - Agency IDs and Names

Agency ID	Agency Name
5	ABITIBI CONSOLIDATED
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)

Site map



Location map

Location Map





Water Survey of Canada - Station Description Report - 05SG001

LAKE WINNIPEG AT MISSION POINT

Description as of: February 24, 2022

Technician Effective Date: 2020-04-21

Province: MANITOBA

Station Status: ACTIVE

Latest operating record: Between 1972-Current, WATER LEVELS ONLY, RECORDING, CONTINUOUS

General Remarks:

Location

Lat/Long 53°11'28.0" N, 99°12'43.1" W

[Link to google maps](#)

Decimal Degrees (53.19112, -99.21198)

Horizontal Datum: NORTH AMERICAN DATUM 1983

Coordinate Source: GLOBAL POSITIONING SYSTEM - DIFFERENTIAL

Location Description: Near the outlet of the Saskatchewan River on Lake Manitoba. Appx. 3.3 km E of the boat launch. Larger boats can be rented from Hobbs resort (204) 639-2266

Remote Access: Yes

Access Method: AIRCRAFT, SNOWMOBILE, BOAT

Access Remarks: Summer access by boat, and UTV/snowmachine during the winter. Park near the Chief Peter Beardy Memorial Center during the winter.

Legal Land Designation: NW-31-48-12-W1

Site Description

Gauge Datum: LAKE WINNIPEG DATUM (1986)

Gross Drainage Area: 1020000 km²

Effective Drainage Area:

Description of Channel and Control

NA

Description of Measurement Sections

NA

Occupational Health and Safety Considerations

AIS Zone, stay off the Sask River channel during the winter. It is recommended that a larger boat/engine be used due to the large waves that can occur on the lake.



On-site Infrastructure and Deployed Devices

Facilities/Infrastructure

On-site Facility	Facility Type	Status	Effective Date	Remarks
STEEL WALK-IN	SHELTER TYPE	ACTIVE	1900-01-01 00:00:00	
SOLAR PANEL	INSTALLATION TYPE	INACTIVE	2017-04-20 12:35:17	Set to inactive as per WSC MB directive
CHARGING SYSTEM	INSTALLATION TYPE	INACTIVE	2017-04-20 12:35:03	Set to inactive as per WSC MB directive
WET CELL	INSTALLATION TYPE	INACTIVE	2017-04-20 12:34:35	Set to inactive as per WSC MB directive

Devices

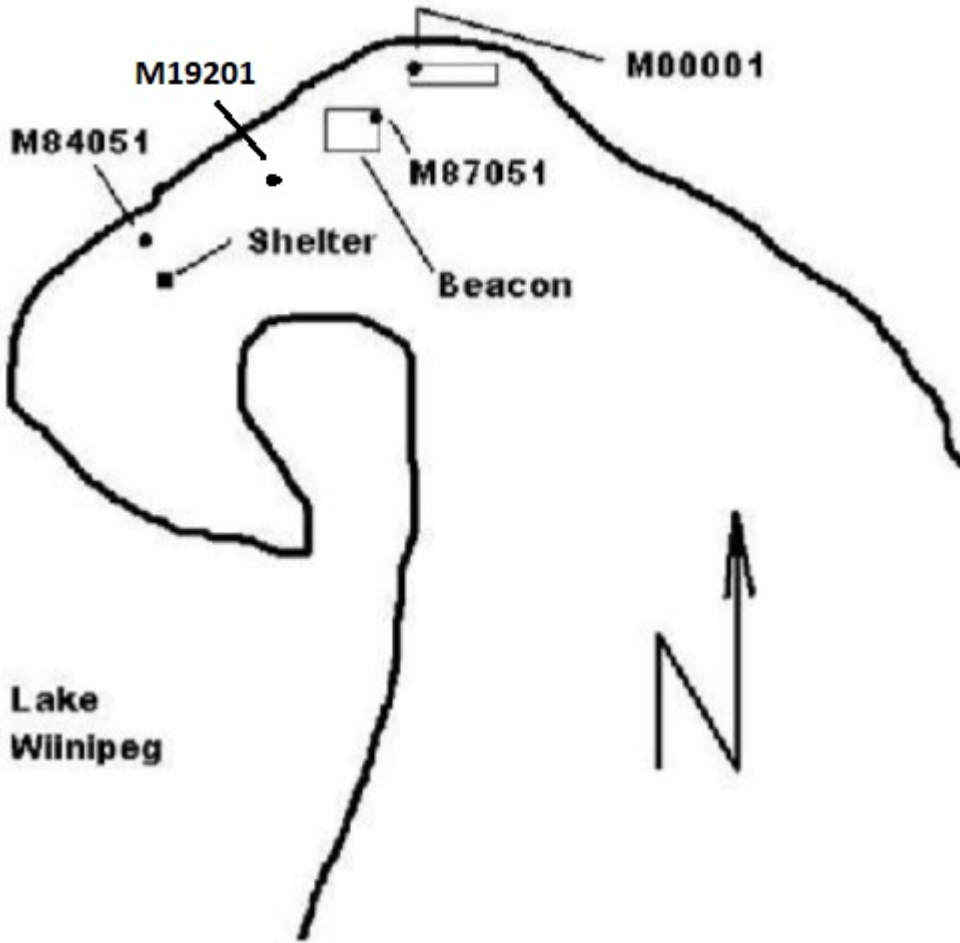
Serial No.	Category	Make	Model	Firmware	IP or PDT Address	Telephone No.	Remark
1810070	LOGGER	SUTRON	SL3-SDI-1	v8.32r3239			Firmware update
1806198	SATELLITE - GOES - HDR	SUTRON	SATLINK3-1-WSC		4a0101c8		Reinstalled the device to update serial number. APicanco//11Aug2021
1501142	COMPRESSORS	SUTRON	56-0133-25-1				

Serial No.	Status	Operating Agency	Owning Agency	Funding Agency	Purchase Cost	Purchase Date	Life Expectancy	Effective Date
1810070	ACTIVE	647	385	385				2021-03-09 13:37:09
1806198	ACTIVE	647	647	647				2019-02-26 12:01:00
1501142	ACTIVE	647	647	650				2016-01-19 15:30:00

Appendix - Agency IDs and Names

Agency ID	Agency Name
385	MANITOBA HYDRO
647	WATER SURVEY OF CANADA (DOE) (CANADA)
650	WEST KOOTENAY POWER

Site map



Location map

