GROUNDWATER MONITORING OF SHALLOW WELL NETWORKS

Ignace Pressure Data Annual Report 2023

APM-REP-01332-0412 **November 2024**

KGS Group

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

This report has been prepared under contract to NWMO. The report has been reviewed by NWMO, but the views and conclusions are those of the authors and do not necessarily represent those of the NWMO.

Nuclear Waste Management Organization
22 St. Clair Avenue East, 4th Floor
Toronto, Ontario
M4T 2S3
Canada

Tel: 416-934-9814
Web: www.nwmo.ca

Groundwater Monitoring of Shallow Well Networks – Ignace Pressure Data Annual Report 2023

APM-REP-01332-0412

Submitted to:

Nuclear Waste Management Organization
22 St. Clair Avenue, Fourth Floor
Toronto, Ontario
M4T 2S3

Revision:

Final Rev 0

KGS Group Project:

22-3836-001

Date:

November 25, 2024

Prepared by:

Matthew Pries, B.Sc.
Environmental Engineer-in-Training

Reviewed by:

Eric Levay, C.E.T., PMP
Senior Environmental Technologist

Approved by:

Jason Mann, M.Sc., P.Geo., FGC
Principal

Project Name:	Groundwater Monitoring of Shallow Well Networks
Project Number:	22-3836-001
Client PO Number:	2001456
Document Name:	Ignace Pressure Data Annual Report 2023 APM-REP-01332-0412

Client:	Nuclear Waste Management Organization (NWMO)
Address:	22 St. Clair Avenue, Fourth Floor
City:	Toronto
Province:	Ontario
Postal Code:	M4T 2S3
Client Contact:	Alexandre Cachunjua
Telephone:	647-259-4875
Email:	acachunjua@nwmo.ca

REVISION HISTORY

Rev.	Issue Date	Revision Details	Prepared by	Reviewed by	Approved by
A	August 13, 2024	Draft report for review	M. Pries	E. Levay	-
B	November 08, 2024	Addressed reviewer comments	S. Singh	E. Levay	-
0	November 25, 2024	Issued for approval	M. Pries	E. Levay	J. Mann

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STATEMENT OF LIMITATIONS AND CONDITIONS

Limitations

This report has been prepared for Nuclear Waste Management Organization (NWMO) in accordance with the agreement between KGS Group and NWMO (the "Agreement"). This report represents KGS Group's professional judgment and exercising due care consistent with the preparation of similar reports. The information and recommendations in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole, and sections or parts should not be read out of context.

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1.0 INTRODUCTION

1.1 Overview

The Groundwater Monitoring of Shallow Well Networks project is part of the Phase 2 Geoscientific Preliminary Field Investigations of the NWMO's Adaptive Phased Management (APM) Site Selection Phase. As part of the Phase 2 Preliminary Field Investigations, NWMO has established a shallow groundwater monitoring network at the two potential candidate sites in Canada. The sites are located in the Wabigoon Lake Ojibway Nation (WLON)-Ignace Area in Northwestern Ontario and Saugeen Ojibway Nation (SON)-South Bruce area in Southern Ontario. The objective of this project is to retrieve, on a quarterly basis, measurements of groundwater pressures and temperatures that are collected from installed dataloggers, and to collect groundwater samples for chemical analyses. The collection of this information is necessary to evaluate shallow groundwater system behaviour and characteristics.

A separate test plan was prepared for each of the two locations so that details specific to each site can be properly captured and planned for. The field work for the WLON-Ignace site started in the beginning of the third quarter (Q3) of year 2022 (i.e., in July 2022), followed by another field event late in Q3 2022, and additional field events each quarter thereafter. No field event was conducted in Q1 2023, at the request of the NWMO, for a total of seven (7) field events: three in 2022, three in 2023, and one in 2024.

This annual report presents the work completed and the data findings/analysis for the groundwater pressure data collected between January 1, 2023, and April 6, 2024 from the shallow well network in the WLON-Ignace area, also referred to as the Revell Site.

1.2 Scope of Work

The objective of the groundwater monitoring and sampling program is to collect groundwater pressure measurements and baseline groundwater samples from each of the 27 permanently installed monitoring well intervals over two (2) years, starting in July 2022, and ending in April 2024. This annual report focuses on the findings and analysis for the groundwater temperature and pressure data for all of 2023 and the first quarter (Q1) of 2024, which includes four field events (no field event was conducted in Q1 2023). A separate report will present the groundwater sampling results for the same period. Activities conducted and described in this report include:

- Mobilization of personnel and all required equipment
- Downloading of pressure and temperature data from each well interval via the Vibrating Wire Piezometer (VWP) transducers.
- Summary of the monitoring data, including graphical presentation of pressure data results

Additional details regarding the work involved in completing specific activities outlined in the test plan are provided in Section 3.0 below. Task-specific activities to ensure health and safety, environment, data management, and quality assurance compliance are also described.

2.0 PROJECT LOCATION

2.1 Land Acknowledgment

It is important to acknowledge that this project was completed on the traditional territory of the Anishinaabe people of Treaty Three. KGS Group and its subcontractors are grateful for being given the opportunity to complete work within the area and are thankful for the generations of people who have taken care of the land for thousands of years.

2.2 Study Area

The Revell site is located on the Canadian Shield, approximately 43 km northwest of the Town of Ignace, 21 km southeast of the Wabigoon Lake Ojibway Nation, and 260 km northwest of Lake Superior (NWMO, 2023), Figure 1.

The ground surface elevation at the western boundary of the Revell site where the Wabigoon River lies, is at 368 metres above sea level (masl), while it increases to 554 masl at the southeastern boundary of the site (NWMO, 2023). The site area is comprised of rolling surfaces of Canadian Shield bedrock that is either covered with shallow glacial deposits or is exposed to the ground surface. This reflects an interplay between glacial action and rock resistance, with weaker rocks having been eroded to lower elevations while more resistant rocks forming the topographic highs (Renwick, 2009). The two major surface soils in the Ignace area are clay and sand of morainal, glaciofluvial or glaciolcustrial origin (Golder, 2013).

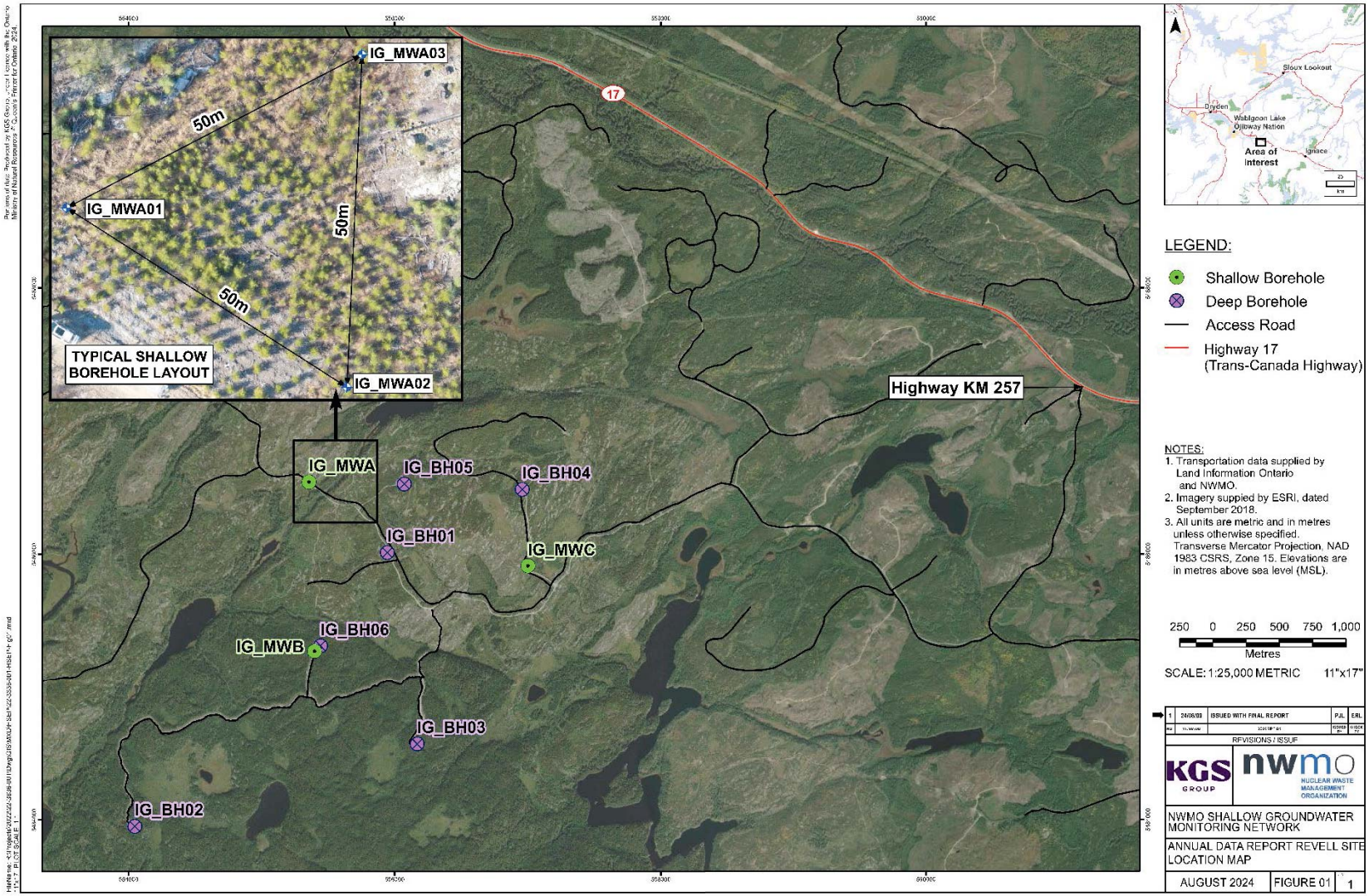
The Ignace area lies within the Superior Province of Canadian Shield and is underlain by Archean bedrock created from several ancient and tectonically stable plates, and gradually accumulated juvenile arc terranes (Card and Ciesielski, 1986). Within the Superior Province, the area is situated in the central portion of Wabigoon Subprovince which is comprised of thin greenstone belts that are separated by large felsic plutonic rock masses (Stone, 2010a). A number of granite and granodioritic batholiths dominate the bedrock geology of the Ignace area (Stone, 2010a). The geological setting of the Ignace area is discussed in detail by Golder, 2013.

There are numerous lakes in the Ignace area which are interconnected by a network of rivers such as the English, Wabigoon, and Turtle rivers. These rivers drain into the Nelson River which further flows into the Hudson Bay as its largest contributor of fresh water (NWMO, 2013). Details about the three tertiary-scale watersheds and several quaternary-scale watersheds in the Ignace area are provided in the Phase 1 Geoscientific Desktop Study by NWMO, 2013.

A total of nine (9) 100 m deep multilevel monitoring wells were drilled and installed in 2021 (KGS Group, 2023). Three multilevel monitoring wells were drilled and installed at three separate sites. Each multilevel monitoring well is comprised of three discrete depths/zones that have dedicated pressure monitoring instrumentation, to measure and record groundwater pressures and temperatures, thus, leading to a total of 27 separate monitoring well points. The three pressure monitoring instruments are connected to a datalogger on surface. Each multilevel well also has equipment for collecting groundwater samples. The three multilevel monitoring well sites include (Figure 1):

- IG_MWA
- IG_MWB
- IG_MWC

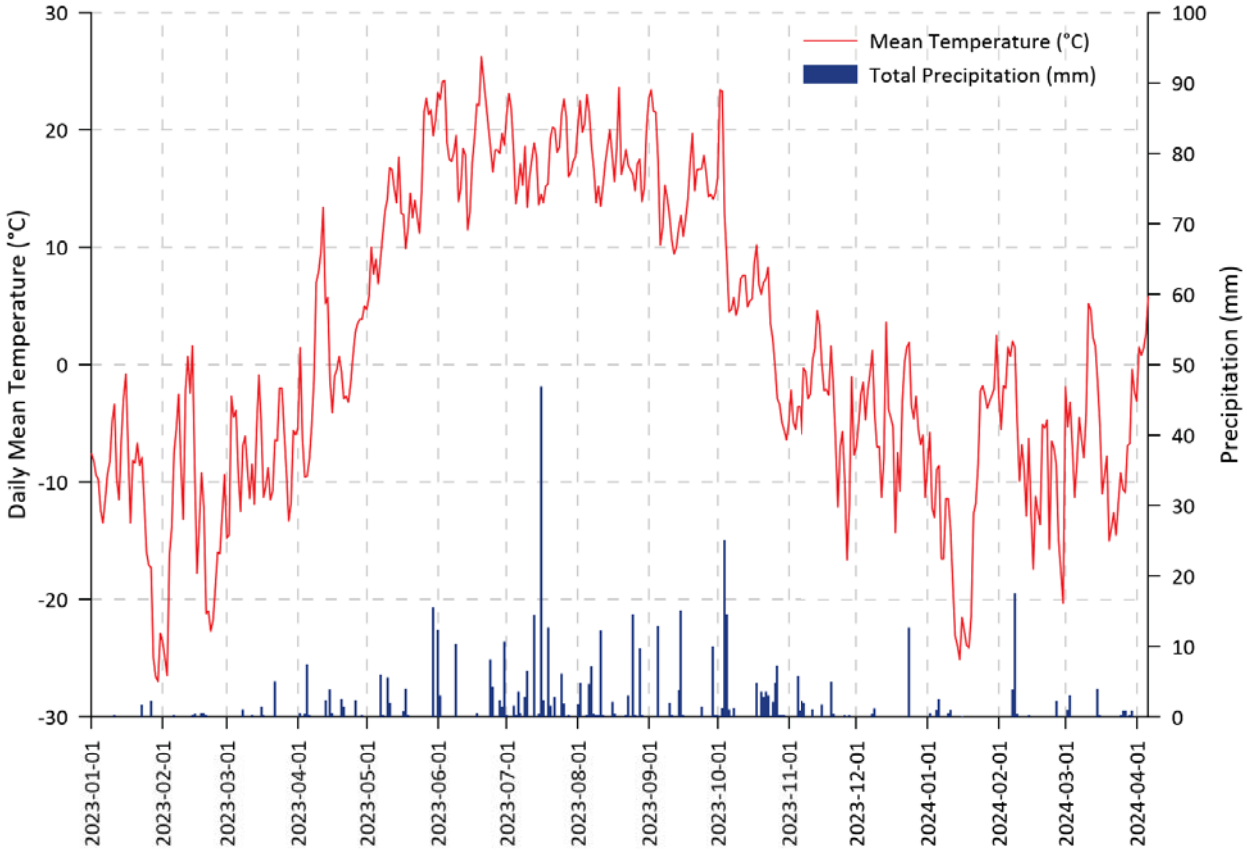
FIGURE 1 SITE LOCATION



2.3 Climate

The study area is subject to a humid continental climate of the warm summer subtype (Dfb under the Köppen climate classification defined by Kottek et al., (2006)). The closest weather station that exhibits the 1981-2010 Climate Normal Data is located in Dryden, ON, and is located approximately 49 kms Northwest of the Site (Environment and Climate Change Canada, 2017). The monthly average temperature varies from -16.8 ^{o}C in January to 18.9 ^{o}C in July as per the 1981 – 2010 Canadian Climate Normal. The area receives an average annual rainfall precipitation of 555.8 mm and 174.7 mm of snowfall precipitation, with a total annual precipitation of 719.7 mm. The wettest months are June and July (Environment and Climate Change Canada, 2017). The daily temperature and precipitation data for the year 2022 was available from the Dryden (Regional) weather station that is located at about 50 kms Northwest of the Ignace Site and is presented below on Figure 2:

FIGURE 2 SITE CLIMATE



2.4 Geology and Hydrogeology

The Ignace area comprises of a number of granitic to granodioritic batholiths as described by Stone, 2010a. A number of geological units identified by Golder (2011) in their initial screening report of the Ignace area include: Indian Lake Batholith, Revell Batholith, and the White Otter Lake Batholith.

The Revell Site is located in the Revell Batholith, which was formed about 2.7 billion years ago (Percival & Easton, 2007) and is located in the western portion of the Wabigoon Sub-Province of the Superior Province. It is also surrounded by the greenstone belts that are composed of old volcanic and sedimentary rocks (Golder, 2013). The lithology of the shallow bedrock (<101 m below ground surface) at the Revell Site was interpreted from the borehole drilling and geophysical logging of the shallow monitoring well drilling sites (IG_MWA, IG_MWB, and IG_MWC) (KGS Group, 2023).

There is minimal overburden material in the area leading to high bedrock exposure at the surface. The three main suites of plutonic rock in the Revell batholith, include (oldest to youngest): a Biotite Tonalite to Granodiorite suite, Hornblende Tonalite to Granodiorite suite, and a Biotite Granite to Granodiorite suite. The rocks of Biotite Tonalite to Granodiorite suite are present along the northeastern and southwestern margins of the Revell batholith. The main type of rock within this suite is a medium-grained, white to grey biotite tonalite to granodiorite (NWMO, 2023).

The rocks in the Hornblende Tonalite to Granodiorite suite include high compositions of tonalite (igneous plutonic rock) with lower compositions of granodiorite, granite, quartz diorite and quartz monzodiorite.

The rocks in the Biotite Granite to Granodiorite suite are typically coarse grained, with white to pink in colour and are weakly to massively foliated. This suite consists of high composition of granite to lower compositions of granodiorite and tonalite rocks. The rocks of this suite are present in most of the northern, southern, and central portions of Revell batholith (WSP, 2023).

The shallow BGT (Biotite Granodiorite-Tonalite) bedrock aquifers in the region are formed within the fractured bedrock zones which occur within the upper few metres, to over 100 m of the uppermost BGT bedrock formations. Transmissive zones for groundwater flow are formed by the network of vertical to subvertical joints and horizontal bedding plane partings within the upper igneous bedrock strata. Thus, groundwater quantity and quality within the shallow bedrock aquifers varies across the region based on the different chemical and physical characteristics of the individual bedrock formations, and subregional to regional groundwater flow paths.

The borehole logs indicate that monitoring well intervals are predominately installed within the BGT formation, with six of the twenty-seven in total being installed within granite or granite amphibolite rock formation (KGS Group, 2023).

3.0 GROUNDWATER MONITORING OF SHALLOW WELL NETWORK

3.1 Overview

Monitoring and sampling activities were scheduled to be completed by KGS Group on a quarterly basis. Each quarterly monitoring event consisted of checking and downloading data from the dataloggers at each of the nine (9) multilevel monitoring wells, followed by purging select intervals, measuring water chemistry parameters and collecting groundwater samples and submitting them for laboratory analysis. The results of the groundwater sampling programs are summarized in a separate report. A detailed Test Plan for the Revell Site was prepared in advance of the first field event. The Test Plan outlines all the equipment, methodologies, criteria, and steps needed to achieve the desired outcomes of the project within the confines of the approved scope of work.

Wells to be sampled were pre-determined together with the NWMO project team in advance of the event. For each quarterly event, technical work within the pressure data collection scope followed the same general procedures as outlined below, but was not limited to:

- Pre-mobilization equipment and material checks
- Mobilization of all personnel
- Check and download all nine dataloggers, verify that the 4-channel datalogger was functioning and in good working order, perform maintenance on the datalogger if required, field check the data, and saved data following the DMP on the field laptop (See Section 3.3).
- Store, process, and prepare the data collected from dataloggers for analysis and submission to NWMO.
- Prepare separate pressure data quarterly reports

The steps outlined above are detailed further as pre-mobilization and mobilization activities, fluid pressure and temperature monitoring, and data assessment and reporting activities. All data collected in the field was recorded directly onto approved Data Quality Confirmation Forms (DQCFs) as per the approved Project Quality Plan (PQP), the Data Management Plan (DMP), and the Test Plan.

3.2 Health, Safety and Environment Activities

As per the Health, Safety and Environment Management Plan (HSEP), developed for the project, the KGS Group project team held a pre-job meeting via MS Teams to review the HSEP and the Test Plan to ensure all team members understood their roles and the expectations given the planned scope of work.

While the field team was working on site, the Field Lead/Supervisor held daily tailgate meetings with the field crew at the beginning of their workday to review the planned work activities, the related health, safety, and environmental issues related to the planned work and specific hazards associated with each task and mitigation and control measures related to the hazards. All Job Safety Analysis (JSA) forms were updated as needed and signed off by the field team. Completed JSAs have been provided with the data package. An example of some of the specific hazards identified during the field event included:

- Heavy lifting.
- Compressed gas.

- Water containment.
- Slips, trips, and falls.
- Hand tool safety.
- Use/handling of cleaning detergents and sample preservatives.
- Highway driving.
- Tire punctures from driving on gravel roads, narrow forest access roads, etc.
- Wildlife crossings/encounters.
- Weather (e.g., heavy rain, thunderstorms, lightning protocols).

No health and safety or environmental incidents occurred during any of the field events in 2023 or Q1 2024. The field lead conducted a daily environmental inspection at each of the sites using a prescribed checklist.

3.3 Fluid Pressure and Temperature Monitoring

The Q2 2023 field event was completed between June 19 and 25, 2023, the Q3 2023 field event between September 25 and 28, 2023, the Q4 2023 field event between December 4 and 6, 2023, and the Q1 2024 field event between April 3 and 6, 2024. No field event was conducted in Q1 2023 at the request of the NWMO. Fluid pressure and temperature monitoring was facilitated by 27 permanently installed GEOKON 4500SOL vibrating wire piezometer (VWP) pressure transducers connected to dedicated GEOKON 8002-4-2 four channel dataloggers (one datalogger connected to three transducers per multilevel monitoring well), which were programmed to record a measurement every 6 hours. The vibrating wire pressure transducers and dataloggers are components of the Solinst Waterloo Multilevel system installed in 2021. Each multilevel monitoring well consists of three discrete depth intervals capable of measuring fluid pressure and temperature independently.

3.3.1 TRANSDUCER DOWNLOADS

KGS Group followed the steps outlined by the manufacturer, GEOKON, for connecting and downloading data from all nine dataloggers using the manufacturer's supplied communication cable and field laptop.

At the end of each field event, downloaded data were saved on the KGS Group File Management System (FMS) in accordance with the DMP. The unprocessed datafiles (as a CSV) were included in each quarterly data deliverable package.

Checks of the data were performed in the field to verify that the data were downloaded properly, and any errors were flagged for review by a senior reviewer. Any deviations were recorded directly onto an electronic version of *DQCF02-Datalogger Download* and were provided with each quarterly data deliverable package.

3.3.2 TRANSDUCER DATA PROCESSING

Data processing of the vibrating wire transducer data from Ignace was completed using an excel based vibrating wire conversion spreadsheet created by KGS Group. This excel conversion spreadsheet for each monitoring well was updated with all the data. The post-processed excel spreadsheet for each monitoring well was included with each quarterly data deliverable package.

The processing and analysis of each groundwater pressure dataset followed the same general procedure, outlined below:

- The downloaded data (pressure and temperature) was processed using the raw CSV downloaded from the Geokon datalogger. The raw pressure data is recorded on the Geokon datalogger as meters of water (mH20) above the VWP also referred to as hydraulic head, which was calculated by the datalogger program, based on the polynomial correction factor provided on the manufacturer's calibration certificate and is unique for each vibrating wire transducer. The equation used by the datalogger software to calculate groundwater pressures is as follows:

(psi) Linear Gauge Factor (G): -0.04000 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -1.901E-07 **B:** -0.03718 **C:** _____

Thermal Factor (K): 0.03225 **(psi/ °C)**

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

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Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in MPa or psi. Barometric compensation is not required with vented transducers.

- Because the vibrating wire transducers are installed in sealed wells, it is expected that fluctuations in barometric pressure will be significantly attenuated at the depths of the transducers. Therefore, no barometric compensation has been applied.
- The hydraulic head pressure data was converted to hydraulic head elevations, calculated based on the known port elevations for each monitoring interval using the equation given below:
- Hydraulic Head Elevation = Elevation of Vibrating Wire (meters above sea level (masl)) + Hydraulic Head (mH20)
- The raw downloaded data file was not altered. KGS Group imported the raw dataset into the Excel vibrating wire spreadsheet (NWMO Ignace Test Plan) before processing.

3.3.3 QUALITY ASSURANCE OF THE PRESSURE DATA

Raw data files were not altered. KGS Group imported the raw datasets into the Excel spreadsheets and the data were processed as described above. Error values such as negative values (e.g., -9999) were removed. Other anomalous data points such as sudden negative or positive spikes were reviewed individually against calendar dates and times to assess correlations with weather, hydrogeological, or hydrological events, or activities at/around the well.

The most common type of error seen in the data were errors caused by pressure measurements outside the minimum pressure range of the vibrating wire transducer (See details in 3.3.4). This error was corrected by KGS Group during early August 2023 with a change in the datalogger configuration setup .

3.3.4 DEVIATIONS AND CHALLENGES

The following deviations and or challenges were identified by KGS Group field staff during the 2023 and Q1 2024 field programs:

- There was no field event conducted in Q1 2023. This was at the request of the NWMO.

- After the Q2 2023 monitoring event was completed, KGS Group indicated that the datalogger software by GEOKON had been replaced and upgraded to a new software called AGENT. KGS Group recommended upgrading all the dataloggers with the new AGENT software configuration files before the Q3 2023 monitoring program occurred. NWMO accepted the recommendation and KGS Group updated all the dataloggers to the new AGENT software.
- On August 3 and 4, 2023, KGS Group reconfigured all 9 of the GEOKON dataloggers with the updated AGENT software. This activity generated new datalogger configuration files that are required when different users connect to the dataloggers with a laptop other than the one used during the initial datalogger configuration and setup. These files were issued to NWMO for their use.
- The Q1 2024 field event was initially planned to take place in March; however, due to severe weather it was rescheduled in collaboration with the NWMO project manager to be conducted April 3 to 6, 2024.

No other changes to the planned monitoring program were identified.

3.3.5 QA/QC OF FIELD DATA AND DATALOGGER DATA

KGS Group completed the QA/QC of the field data that was captured on Data Quality Confirmation Forms used to capture datalogger readings at the time of downloading (DQCF02)

This was completed as part of the preparation of each quarterly data deliverable. Each DQCF was reviewed by a senior reviewer for formatting, consistency of information being recorded, errors in the values and identification of values that were outside of the expected ranges. Where an error was found that error was highlighted, and a note was made of the correction.

After the review was completed, the DQCF was signed off on by the preparer and the verifier.

Identified Errors in the Field Data

No errors were identified in the review of the field data.

Identified Errors in the Datalogger Data

Errors in the downloaded datasets are shown on Table 1 below, these raw data points were filtered out of the processed data were identified in the following intervals:

TABLE 1 ERRORS IDENTIFIED IN THE DATALOGGER DATASET

Monitoring Interval	Date	Number of Data Points	Resolution
IG_MWA01_C	March 21, 2023, at 08:00	1	Removed from the dataset
	Between April 7, 2023, at 00:00 and April 8, 2023, at 16:00	11	
	April 12, 2023, at 20:00	1	
	April 16, 2023, between 04:00 and 12:00	3	
	Between May 20, 2023, at 16:00 and May 21, 2023, at 12:00	6	
	Between May 27, 2023, at 12:00 and May 28, 2023, at 00:00	4	
	Between June 11, 2023, at 20:00 and June 12, 2023, at 12:00	5	

Monitoring Interval	Date	Number of Data Points	Resolution
	June 29, 2023, at 08:00	1	
	June 29, 2023, at 16:00	1	
	Between July 2, 2023, at 12:00 and July 7, 2023, at 04:00	29	
	July 8, 2023, at 00:00	1	
	July 8, 2023, at 08:00	1	
IG_MWB01_C	Between July 17, 2023, at 16:00 and August 3, 2023, at 16:00	106	
	Between August 4, 2023, at 10:47 and August 4, 2023, at 10:53	7	
IG_MWB02_C	March 10, 2023, at 18:00	1	
IG_MWB03_C	April 29, 2023, at 18:00	1	

3.4 Hydraulic Head Results

Hydraulic heads and hydraulic head elevations were calculated for each monitoring interval using the data processing methodology described in Section 3.3.2. Table 2 provides a summary of the calculated minimum and maximum hydraulic head elevations for the reporting period, as measured by the vibrating wire pressure transducers. Note that short-term spikes or dips in hydraulic head were removed from the dataset before calculating the minimum and maximum values. The calculated hydraulic head elevations were plotted against time on a hydrograph for each monitoring well interval. Each hydrograph was reviewed, and error values (listed in Section 3.3.5) were filtered out and not shown on the hydrograph. Hydrographs are provided in Appendix A.

TABLE 2 HYDRAULIC HEAD ELEVATION RANGES (1)

Well		A Interval		B Interval		C Interval	
		Hydraulic Head [m.a.s.l.]	Date (yyyy-mm-dd hh:mm)	Hydraulic Head [m.a.s.l.]	Date (yyyy-mm-dd hh:mm)	Hydraulic Head [m.a.s.l.]	Date (yyyy-mm-dd hh:mm)
IG_MWA01	MAX	404.20	2023-04-28 12:00	405.51	2023-05-14 4:00	406.81	2023-05-13 16:00
	MIN	401.84	2023-10-04 6:00	402.61	2023-10-04 6:00	403.25	2023-10-21 0:00
	RANGE	2.37	-	2.91	-	3.57	-
IG_MWA02	MAX	400.04	2023-05-14 6:00	401.30	2023-05-14 6:00	401.72	2023-05-14 6:00
	MIN	399.12	2023-10-04 6:00	400.11	2023-10-04 6:00	400.52	2023-10-04 6:00
	RANGE	0.92	-	1.19	-	1.21	-

Well		A Interval		B Interval		C Interval	
		Hydraulic Head [m.a.s.l.]	Date (yyyy-mm-dd hh:mm)	Hydraulic Head [m.a.s.l.]	Date (yyyy-mm-dd hh:mm)	Hydraulic Head [m.a.s.l.]	Date (yyyy-mm-dd hh:mm)
IG_MWA03	MAX	404.02	2023-05-14 12:00	404.26	2023-05-01 0:00	404.54	2023-04-30 18:00
	MIN	401.58	2023-10-04 6:00	401.79	2023-10-04 6:00	402.05	2023-10-04 6:00
	RANGE	2.44	-	2.47	-	2.48	-
IG_MWB01	MAX	419.00	2023-05-14 12:00	409.81	2024-01-19 12:00	417.30	2023-04-15 6:00
	MIN	417.70	2023-10-04 6:00	407.97	2023-02-14 0:00	416.17	2023-03-03 18:00
	RANGE	1.30	-	1.83	-	1.13	-
IG_MWB02	MAX	416.68	2024-04-05 12:00	417.34	2023-05-26 6:00	417.16	2023-05-24 12:00
	MIN	415.60	2023-10-04 6:00	416.17	2023-10-04 6:00	415.84	2023-10-04 6:00
	RANGE	1.08	-	1.17	-	1.32	-
IG_MWB03	MAX	419.29	2023-01-13 0:00	417.77	2023-05-14 12:00	416.40	2023-04-15 12:00
	MIN	418.08	2023-08-16 18:00	416.65	2023-10-04 6:00	415.43	2023-03-03 18:00
	RANGE	1.20	-	1.12	-	0.97	-
IG_MWC01	MAX	421.71	2023-05-14 6:00	422.31	2023-05-14 6:00	423.83	2023-05-14 6:00
	MIN	419.48	2023-10-04 6:00	420.15	2023-10-04 6:00	421.18	2023-10-04 6:00
	RANGE	2.23	-	2.16	-	2.66	-
IG_MWC02	MAX	421.49	2023-05-14 6:00	422.86	2023-05-08 6:00	427.15	2023-04-28 12:00
	MIN	419.16	2023-10-04 6:00	420.27	2023-10-04 6:00	422.36	2023-10-04 6:00
	RANGE	2.33	-	2.59	-	4.79	-
IG_MWC03	MAX	422.10	2023-05-14 6:00	422.39	2023-05-14 12:00	423.26	2023-05-14 6:00
	MIN	419.83	2023-10-04 6:00	419.95	2023-10-04 6:00	420.76	2023-10-04 6:00
	RANGE	2.28	-	2.44	-	2.50	-

Note: (1) As measured by the vibrating wire pressure transducers

3.4.1 HYDROGRAPH OBSERVATIONS

Hydraulic head elevations were generally stable or slightly declining from January 1, 2023, until early April, when they began to rise due to spring melt before peaking between late April and mid-May. The 2023 spring peak was also the absolute maximum hydraulic head elevation recorded during the reporting period in all intervals except IG_MWB01_B, IG_MWB02_A, and IG_MWB03_A. After the spring peak, hydraulic head elevations in most wells declined during the remainder of spring and throughout summer, reaching the absolute minimum (for the reporting period) in early to mid-October 2023 in all intervals except IG_MWB01_B, IG_MWB01_C, IG_MWB03_A, and IG_MWB03_C. From late October 2023 to the end of the

reporting period in early April 2024, hydraulic heads in most wells increased gradually. During the same period, several intervals (particularly the shallow C intervals) showed a series of peaks and declines where sharp increases of some peaks correlated with precipitation events. Notably, the precipitation on December 24, 2023, and February 7 and 8, 2024 – which were closely followed by steep rises in several hydrographs – fell as rain during periods when ambient air temperatures were above 0 °C (Environment and Climate Change Canada, 2024). The snow-melt associated with these precipitation events seem to have contributed to the increases in hydraulic heads following these events.

The nearest Environment Canada weather data for the reporting period that was available at the time of this report were from the Dryden Regional weather station (Climate ID: 6032125). The Dryden weather station is located approximately 49 km northwest of the Revell Site. Daily total precipitation data were plotted on the hydrographs in Appendix A for the purpose of assessing correlations between precipitation events and hydraulic head elevation changes.

In general, there were rarely clear hydrograph responses to precipitation; however, there are significant limitations in interpreting correlation between precipitation and groundwater hydraulic heads, given the geographical separation between the weather station and the study area.

In this section, discussion of hydraulic head ranges and minimum and maximum values are based on a filtered dataset that does not include short-term spikes (increases or decreases) that are interpreted to be a result of activity at the well (i.e., purging of an interval), rather than changes representative of the pressures in the unconfined bedrock. Table 2 provides a summary of hydraulic head elevation min/max ranges for all intervals.

IG_MWA01 (Figure A-1):

The hydrographs for well IG_MWA01 followed the general trends described above. Notably, a relatively quick increase of the hydraulic heads during the 2023 spring peak, with most of the increase in hydraulic heads happening within an approximately seven-day period between April 9 and April 16, 2023. Hydraulic head increases during the spring were approximately 3.5 m in IG_MWA01_C, 2.8 m in IG_MWA01_B, and 2.3 m in IG_MWA01_A. The absolute maximum hydraulic head recorded during the reporting period occurred in all intervals at IG_MWA01 between April 28 and May 14, 2023. After the spring peak, hydraulic heads in all intervals declined until reaching the absolute minimum in October. The succession of peaks and troughs observed on the hydrographs between November 2023 and the end of the reporting period are the highest magnitude in the shallow interval IG_MWA01_C, with a peak-trough difference of approximately 2.2 m, while in the deep interval IG_MWA01_A, the peak-trough difference was approximately 1.3 m.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 2.37 m in IG_MWA01_A, 2.91 m in IG_MWA01_B, and 3.57 m in IG_MWA01_C

There are two large downward spikes visible on the IG_MWA01_A hydrograph between April 9 and May 7, 2023. These are due to purging and sampling conducted by NWMO, separate from this contract. There are also two smaller downward spikes on the IG_MWA01_C hydrograph on September 27 and December 4, 2023. These are due to KGS Group purging and sampling this interval.

IG_MWA02 (Figure A-2):

The hydrographs for IG_MWA02 followed the previously discussed general trends; however, all of the fluctuations were of a smaller magnitude than most of the other wells. The absolute maximum occurred on

May 14, 2023 in all intervals, and the absolute minimum on October 4, 2023. There were no significant fluctuations between November 2023 and the end of the reporting period in IG_MWA02, unlike some of the other wells.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 0.92 m in IG_MWA02_A, 1.19 m in IG_MWA02_B, and 1.21 m in IG_MWA02_C.

IG_MWA03 (Figure A-3):

The hydrographs for IG_MWA03 followed the general trends described above. Hydraulic head changes due to the 2023 spring melt resulted in increases of approximately 2.3 m in intervals IG_MWA03_C and IG_MWA03_B, and 2.2 m in IG_MWA03_A. The absolute maximum hydraulic head recorded during the reporting period occurred between April 30 and May 14, 2023, in all intervals. After the 2023 spring peak, hydraulic heads in all intervals declined until reaching the absolute minimum on October 4, 2023. The fluctuating hydraulic heads observed between late November 2023 and the end of the reporting period in early April 2024 are correlated with the previously discussed winter rainfall and warming events. The greatest peak-trough differences in hydraulic heads during this period were approximately 1.0 m in all intervals at IG_MWA03.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 2.44 m in IG_MWA03_A, 2.47 m in IG_MWA03_B, and 2.48 m in IG_MWA03_C.

There are several downward spikes visible on the hydrographs for all intervals. These are due to purging and sampling activities conducted at the well by NWMO and KGS Group at several points throughout the reporting period.

Notably, the hydraulic heads in all intervals at IG_MWA03 followed each other very closely, rarely differing by more than 0.5 m. There are also downward spikes in all intervals concurrent with purging and sampling conducted only in interval IG_MWA03_B, indicating vertical pressure interconnection within the rock.

IG_MWB01 (Figure A-4):

All intervals in well IG_MWB01 reflected the general trends described above from the beginning of the reporting period until July 2023. The spring 2023 increases in hydraulic heads are approximately 1.2 m in IG_MWB01_C, 1.3 m in IG_MWB01_B, and 0.8 m in IG_MWB01_A. The absolute maximums for IG_MWB01_C and IG_MWB01_A occur in mid-April and mid-May, respectively. Following the spring peak, hydraulic heads drop in all intervals until July 2023, after which each interval responds differently over the period.

In IG_MWB01_C, the hydraulic head flatlines between mid-June and mid-July, after which there is a period during which error values were recorded before readings resume in early August. For the remainder of the reporting period, the hydraulic head showed small fluctuations around a central value of approximately 416.5 m, with a generally level trend.

In IG_MWB01_B, the hydraulic head was mostly stable throughout summer 2023 until early October, then increased until January 2024, when it reached its absolute maximum, and was stable for the remainder of the reporting period.

In IG_MWB01_A, hydraulic head decreased from the 2023 spring peak until reaching its absolute minimum in early October 2023, after which it gradually increased throughout the remainder of the reporting period.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 1.30 m in IG_MWB01_A, 1.83 m in IG_MWB01_B, and 1.13 m in IG_MWB01_C.

IG_MWB02 (Figure A-5):

All monitoring intervals at IG_MWB02 were consistent with the general trends discussed above; however, repeated purging/sampling by NWMO between April 26, 2023, and May 12, 2023, resulted in downward spikes in the hydraulic head data within this period, and is not considered representative of tracking the characteristics of the groundwater response to the 2023 spring melt at this well. Nevertheless, it is evident that water levels were increasing during this period, and hydraulic heads reached their absolute maximum in intervals IG_MWB02_B and IG_MWB02_C on May 26, 2023, and May 24, 2023, respectively. After the spring increase hydraulic heads decreased throughout the summer, reaching the absolute minimum in all intervals on October 4, 2023, and then gradually increased for the remainder of the reporting period, with interval IG_MWB02_A reaching its absolute maximum on April 5, 2024.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 1.08 m in IG_MWB02_A, 1.17 m in IG_MWB02_B, and 1.32 m in IG_MWB02_C.

IG_MWB03 (Figure A-6):

Each of the intervals in IG_MWB03 displayed different trends during the reporting period, with only IG_MWB03_B following the general trends described above.

In IG_MWB03_C, the hydraulic head decreased gradually from the beginning of 2023 to the absolute minimum on March 3, 2023, and then was stable until the beginning of April, when it rose due to spring melting of the snowpack, reaching the absolute maximum on April 15, 2023. Following the spring peak, the hydraulic head decreased gradually until July 2023, after which it remained relatively stable until the end of the reporting period.

The hydraulic head in IG_MWB03_B was consistent with the general trends discussed above, with the absolute maximum occurring during the spring peak on May 14, 2023, then decreasing throughout the remainder of spring and summer until reaching the absolute minimum on October 4, 2023, and gradually increasing during the remainder of the reporting period.

The hydraulic head in IG_MWB03_A was at its absolute maximum on January 13, 2023, shortly after the beginning of the reporting period, and then gradually declined until mid-April, 2023. A series of noisy data was then observed lasting for approximately two weeks, before the hydraulic head stabilized for the rest of spring and summer, showing no significant changes apart from two short-term downward spikes resulting from purging activities. The absolute minimum hydraulic head occurred on August 16, 2023. From early October 2023 until the end of the reporting period, hydraulic head in the interval increased gradually.

There are a series of downward spikes visible in one or more intervals on June 21 and 22, 2023, September 26, 2023, December 6, 2023, January 19, 2024, and April 5, 2024. These are due to activities at the well conducted by either NWMO or KGS Group.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 1.20 m in IG_MWB03_A, 1.12 m in IG_MWB03_B, and 0.97 m in IG_MWB03_C.

IG_MWC01 (Figure A-7):

The hydraulic heads recorded in all intervals in IG_MWC01 were consistent with the general trends described at the beginning of Section 3.4.1. The spring rises in hydraulic head were approximately 1.6 m in IG_MWC01_C, 1.2 m in IG_MWC01_B, and 1.2 m in IG_MWC01_A. The absolute maximum hydraulic head occurred in all intervals on May 14, 2023. After the spring peak, hydraulic heads declined until reaching the absolute minimum on October 4 in all intervals. In intervals IG_MWC01_B and IG_MWC01_A, heads then began to increase gradually and continued climbing until the end of the reporting period. In interval IG_MWC01_C, there were a series of four peaks and declines between October 4, 2023, and the end of the reporting period. These were correlated with local rainfall and/or warming events.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 2.23 m in IG_MWC01_A, 2.16 m in IG_MWC01_B, and 2.66 m in IG_MWC01_C.

There are a series of downward spikes visible in one or more intervals on April 30, 2023, June 24, 2023, September 28, 2023, and December 5, 2023. These were due to activities at the well conducted by either NWMO or KGS Group. There is also one large upward spike in interval IG_MWC01_C on July 19, 2023 that is unexplained, but is only for a single data point and is not shown on the hydrograph A-7.

IG_MWC02 (Figure A-8):

The hydraulic heads recorded in all intervals in IG_MWC02 were consistent with the general trends described at the beginning of Section 3.4.1. The spring increases in hydraulic head were approximately 3.3 m in IG_MWC02_C, 1.3 m in IG_MWC02_B, and 1.5 m in IG_MWC02_A. The magnitude of the increase in IG_MWC02_B would likely have been greater, but repeated purging/sampling at the well during the period resulted in the loss of some data. The absolute maximum hydraulic head occurred in all intervals between April 28, 2023 and May 14, 2023. After the spring peak, hydraulic heads declined until reaching the absolute minimum on October 4 in all intervals. In intervals IG_MWC02_B and IG_MWC02_A, heads then began to increase gradually and continued climbing until January 2024, followed by a brief and shallow decline which reversed following a rainfall event on February 7 and 8, 2024, increasing again until the end of the reporting period. In interval IG_MWC02_C, there were a series of peaks and declines between October 4, 2023, and the end of the reporting period. These were correlated with local rainfall and/or warming events.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 2.33 m in IG_MWC02_A, 2.59 m in IG_MWC02_B, and 4.79 m in IG_MWC02_C.

There were a series of downwards spikes in hydraulic heads in all intervals at IG_MWC02 between April 27, 2023, and May 12, 2023. These were due to NWMO conducting purging/sampling activities at the well.

IG_MWC03 (Figure A-9):

The hydraulic heads recorded in all intervals in IG_MWC03 were consistent with the general trends described at the beginning of Section 3.4.1. The spring rises in hydraulic head were approximately 1.5 m in IG_MWC03_C, 1.4 m in IG_MWC03_B, and 1.3 m in IG_MWC03_A. The absolute maximum hydraulic head occurred in all intervals on May 14, 2023. After the spring peak, hydraulic heads declined until reaching the absolute minimum on October 4 in all intervals. In interval IG_MWC03_A, the hydraulic head then began to increase gradually and continued climbing until mid-January 2024, followed by a brief and shallow decline which reversed following a rainfall event on February 7 and 8, 2024, increasing again until the end of the reporting period. In intervals IG_MWC03_B and IG_MWC03_C, there were a series of small peaks and

declines between October 4, 2023, and the end of the reporting period. These were correlated with local rainfall and/or warming events.

The range between the absolute minimum and maximum hydraulic heads recorded during the reporting period was 2.28 m in IG_MWC03_A, 2.44 m in IG_MWC03_B, and 2.50 m in IG_MWC03_C.

3.4.2 VERTICAL GROUNDWATER GRADIENTS

Vertical groundwater gradients between depth intervals were calculated at each monitoring well location using the VW transducer-measured groundwater hydraulic heads. Gradients were calculated as the difference in groundwater hydraulic heads between two monitoring intervals divided by the vertical distance between the middle of each interval:

$$\frac{(Zone\ B\ GW\ Head - Zone\ A\ GW\ Head)}{(Middle\ of\ Zone\ B\ Elevation\ -\ Middle\ of\ Zone\ A\ Elevation)}$$

Groundwater is considered to move vertically from an interval of higher hydraulic head to an interval of lower hydraulic head, except where an aquitard is present. Table 3 summarizes the range of vertical groundwater gradients between monitoring intervals at each monitoring well location. Gradients with less than 0.009 m/m are interpreted as being in a hydrostatic condition which is essentially a very low gradient and difficult to accurately measure.

Generally, vertical gradient directions remained consistent throughout the reporting period except for:

- IG_MWA03: Hydrostatic or near-hydrostatic downward gradient between intervals IG_MWA03_B and IG_MWA03_A from January 1, 2023 until early April, 2023, then variable, but always small, downward gradient from interval B to interval A for remainder of reporting period.
- IG_MWC03: Downward gradient from interval IG_MWC03_B to IG_MWC03_A for the majority of the reporting period, with brief instances of hydrostatic or weak upward gradients on January 28, 2023, sporadically from late February to early April 2023, and on December 5, 2023.

Between the shallow and intermediate depth intervals (intervals C and B, respectively), the vertical gradients were downward from interval C to interval B in all wells except IG_MWB02 and IG_MWB03, where an upward vertical gradient existed throughout the reporting period.

Between the intermediate and deep depth intervals (intervals B and A, respectively), the vertical gradients were downward from interval B to interval A in all wells except IG_MWB01 and IG_MWB03, where an upward vertical gradient existed throughout the reporting period, and wells IG_MWA03 and IG_MWC03, where gradients varied as discussed above.

All monitoring well intervals are within the upper 100 m of bedrock, which is mostly comprised of Biotite Granodiorite-Tonalite rock and is understood to be a single aquifer unit with some vertical interconnection between depth intervals. This indicates that the observed vertical gradients would likely have driven some groundwater flow in the direction of the gradient, although the rates of flow are unknown.

TABLE 3 HYDRAULIC HEAD VERTICAL GRADIENTS SUMMARY

Well		Between Intervals C and B			Between Intervals B and A		
		Vertical Gradient [m/m]	Date/Time	Description	Vertical Gradient [m/m]	Date/Time	Description
IG_MWA01	MAX	0.039	2023-04-28 20:00	Downward from C to B	0.224	2023-12-16 12:00	Downward from B to A
	MIN	0.012	2023-10-27 6:00	Downward from C to B	0.085	2023-02-27 18:00	Downward from B to A
	RANGE	0.027	-	-	0.139	-	-
IG_MWA02	MAX	0.015	2023-06-26 18:00	Downward from C to B	0.028	2023-05-12 18:00	Downward from B to A
	MIN	0.011	2024-02-28 12:00	Downward from C to B	0.021	2023-10-20 0:00	Downward from B to A
	RANGE	0.003	-	-	0.007	-	-
IG_MWA03	MAX	0.019	2024-03-28 12:00	Downward from C to B	0.012	2023-12-04 18:00	Downward from B to A
	MIN	0.012	2023-01-17 12:00	Downward from C to B	0.001	2023-01-06 12:00	Hydrostatic, no vertical gradient interpreted between B and A
	RANGE	0.006	-	-	0.011	-	-
IG_MWB01	MAX	0.377	2023-04-13 0:00	Downward from C to B	-0.283	2023-01-15 12:00	Upward from A to B
	MIN	0.281	2024-03-30 6:00	Downward from C to B	-0.231	2023-12-16 0:00	Upward from A to B
	RANGE	0.095	-	-	0.052	-	-
IG_MWB02	MAX	-0.040	2024-03-12 18:00	Upward from B to C	0.031	2023-04-13 0:00	Downward from B to A
	MIN	-0.012	2024-02-29 6:00	Upward from B to C	0.010	2023-04-12 6:00	Downward from B to A
	RANGE	0.027	-	-	0.020	-	-
IG_MWB03	MAX	-0.087	2024-03-04 6:00	Upward from B to C	-0.049	2023-01-02 6:00	Upward from A to B
	MIN	-0.032	2023-04-13 12:00	Upward from B to C	-0.015	2023-05-18 6:00	Upward from A to B
	RANGE	0.056	-	-	0.034	-	-
IG_MWC01	MAX	0.064	2023-04-16 0:00	Downward from C to B	0.021	2023-07-30 8:34	Downward from B to A
	MIN	0.035	2023-10-04 6:00	Downward from C to B	0.015	2023-01-04 6:00	Downward from B to A
	RANGE	0.029	-	-	0.006	-	-
IG_MWC02	MAX	0.089	2023-04-12 18:00	Downward from C to B	0.065	2023-04-26 18:00	Downward from B to A
	MIN	0.036	2023-10-05 0:00	Downward from C to B	0.041	2023-07-26 16:00	Downward from B to A
	RANGE	0.053	-	-	0.024	-	-
IG_MWC03	MAX	0.049	2023-04-13 6:00	Downward from C to B	0.041	2023-05-04 12:00	Downward from B to A
	MIN	0.026	2023-02-22 12:00	Downward from C to B	-0.002	2023-03-13 6:00	Hydrostatic, no vertical gradient interpreted between B and A
	RANGE	0.023	-	-	0.044	-	-

3.5 Groundwater Temperatures

Temperature data recorded by the pressure transducers were plotted against time, with data from all the intervals plotted together according to well site (IG_MWA, IG_MWB, and IG_MWC) in Appendix B.

Most of the intervals had nearly constant temperatures, varying by 0.2 °C or less in all intervals except IG_MWA01_C, IGMWA02_C, IG_MWB01_C, and IG_MWC02_C.

IG_MWA:

With the exception of intervals IG_MWA01_C and IG_MWA02_C, groundwater temperatures at well site IG_MWA were between 5.0 and 5.9 °C, with temperatures in each interval varying by 0.1 °C or less.

In IG_MWA01_C, the temperature was steady at 6.9 °C from the beginning of the reporting period until the end of March 2023, when it began to decline gradually until reaching a minimum of 6.4 °C at the end of July 2023 and remaining stable throughout August and into early September 2023 before climbing again to 6.9 °C by late December 2023, and remaining there for the rest of the reporting period. The range between minimum and maximum groundwater temperatures in this interval was 0.5 °C.

In IG_MWA02_C, the temperature was 7.4 °C from the beginning of the reporting period until late January 2023, when it began to decline gradually until reaching a minimum of 6.5 °C in mid-June 2023. It remained stable until mid-August 2023, then climbed again to 7.4 °C, where it remained from early December 2023 to late January 2024 before beginning to decline again, falling to 7.0 °C at the end of the reporting period. The range between minimum and maximum groundwater temperatures in this interval was 0.9 °C.

IG_MWB:

Other than interval IG_MWB01_C, groundwater temperatures at well site IG_MWA were between 4.7 and 5.5 °C, with temperatures in each interval varying by 0.2 °C or less.

In IG_MWB01_C, the temperature declined from 7.3 °C at the beginning of the reporting period to a minimum of 5.4 °C in late May 2023. There is then a period of error values and questionable data from late June until early August 2023 before the trend resumes, with temperatures rising steadily to a peak of 8.0 °C in late November 2023, then falling to 6.1 °C at the end of the reporting period. The range between minimum and maximum groundwater temperatures in this interval was 2.6 °C.

IG_MWC:

Other than interval IG_MWC02_C, groundwater temperatures at well site IG_MWA were between 5.3 and 6.1 °C, with temperatures in each interval varying by 0.1 °C or less. There are two downward spikes in interval IG_MWC03_A in late November and early December 2023; however, these are most likely anomalous values that are not representative of significant temperature changes in the local groundwater.

In IG_MWC02_C, the temperature declined from 7.9 °C at the beginning of the reporting period to a minimum of 6.5 °C in mid-June 2023. It remained stable until the beginning of August 2023, then rose steadily to a peak of 7.9 °C, where it stayed from early December 2023 to mid-January 2024, then declined to 7.1 °C at the end of the reporting period. The range between minimum and maximum groundwater temperatures in this interval was 1.4 °C.

4.0 SUMMARY

Four groundwater monitoring events were completed in the reporting period from January 1, 2023, to April 7, 2024. These took place between June 19 and 25, 2023, for the Q2 2023 event; between September 25 and 28, 2023, for the Q3 2023 event; between December 4 and 6, 2023, for the Q4 2023 event; and between April 3 and 6, 2024, for the Q1 2024 event. No monitoring event took place in Q1 2023 at the request of NWMO.

During these field programs KGS Group downloaded the data from all 27 permanently installed vibrating wire piezometer (VWP) pressure transducers via dedicated dataloggers. All pressure data were compiled into separate quarterly data deliverable packages along with separate quarterly reports as part of the final deliverables for each quarter.

5.0 REFERENCES

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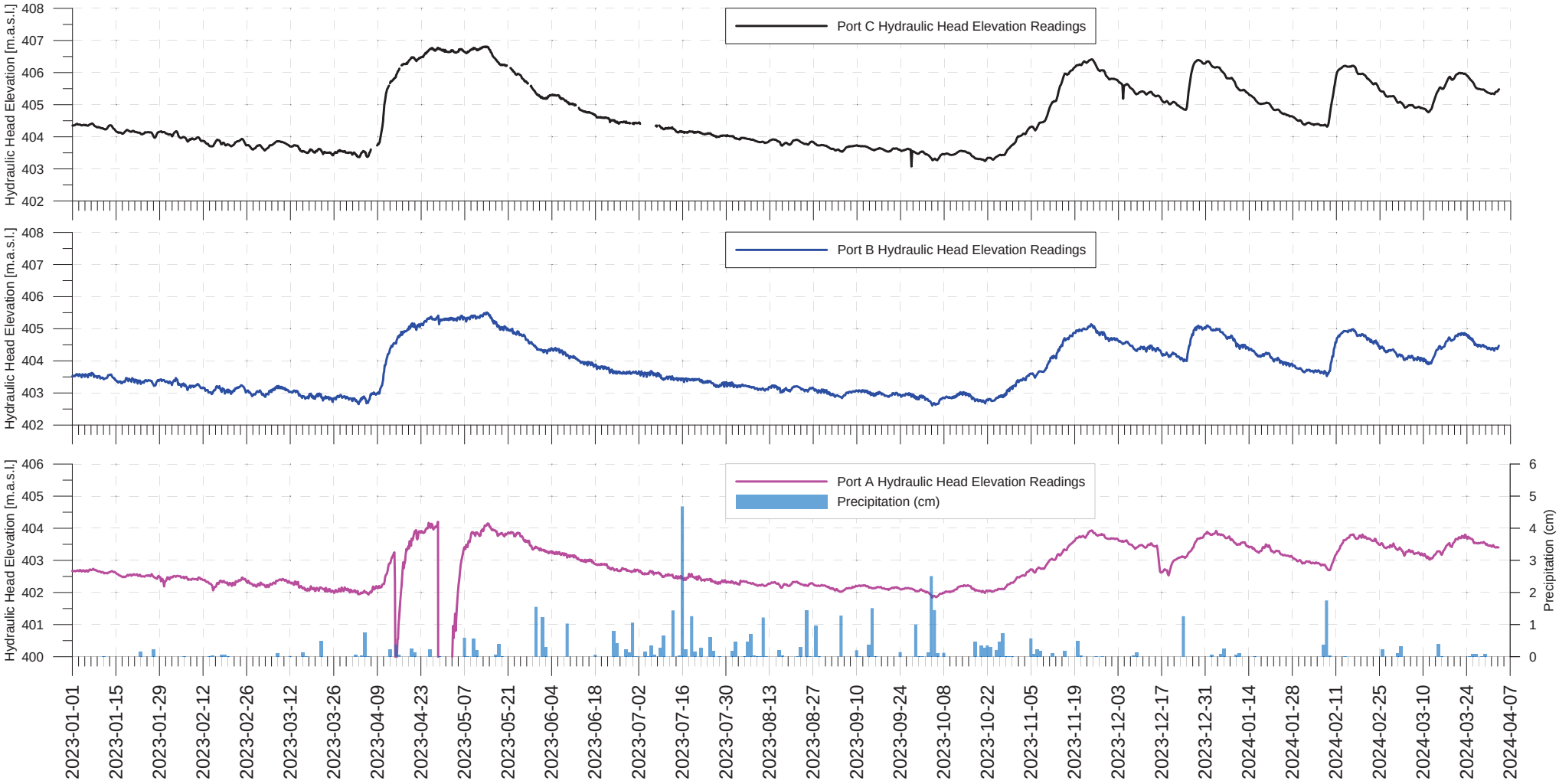
APPENDIX A

Hydrographs



Notes:
1. Port C located at 393.48 m.a.s.l.
2. Port B located at 352.18 m.a.s.l.
3. Port A located at 344.78 m.a.s.l.

NO.	DD/MM/YY	DESCRIPTION	DESIGN BY	CHECKED BY
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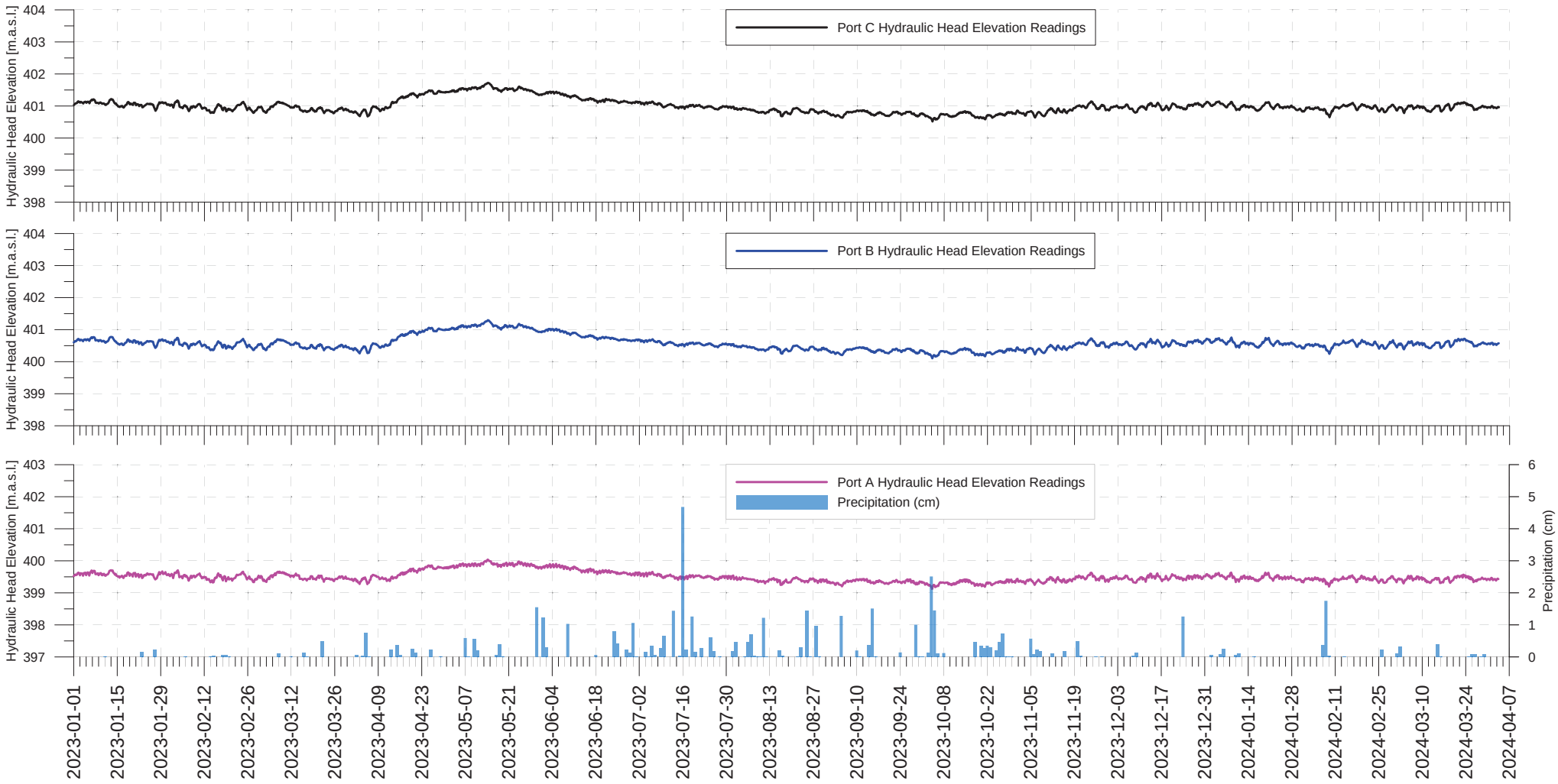
nwmo NUCLEAR WASTE MANAGEMENT ORGANIZATION

SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWA01
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-1 | REV: 0



Notes:
1. Port C located at 394.31 m.a.s.l.
2. Port B located at 362.71 m.a.s.l.
3. Port A located at 316.81 m.a.s.l.

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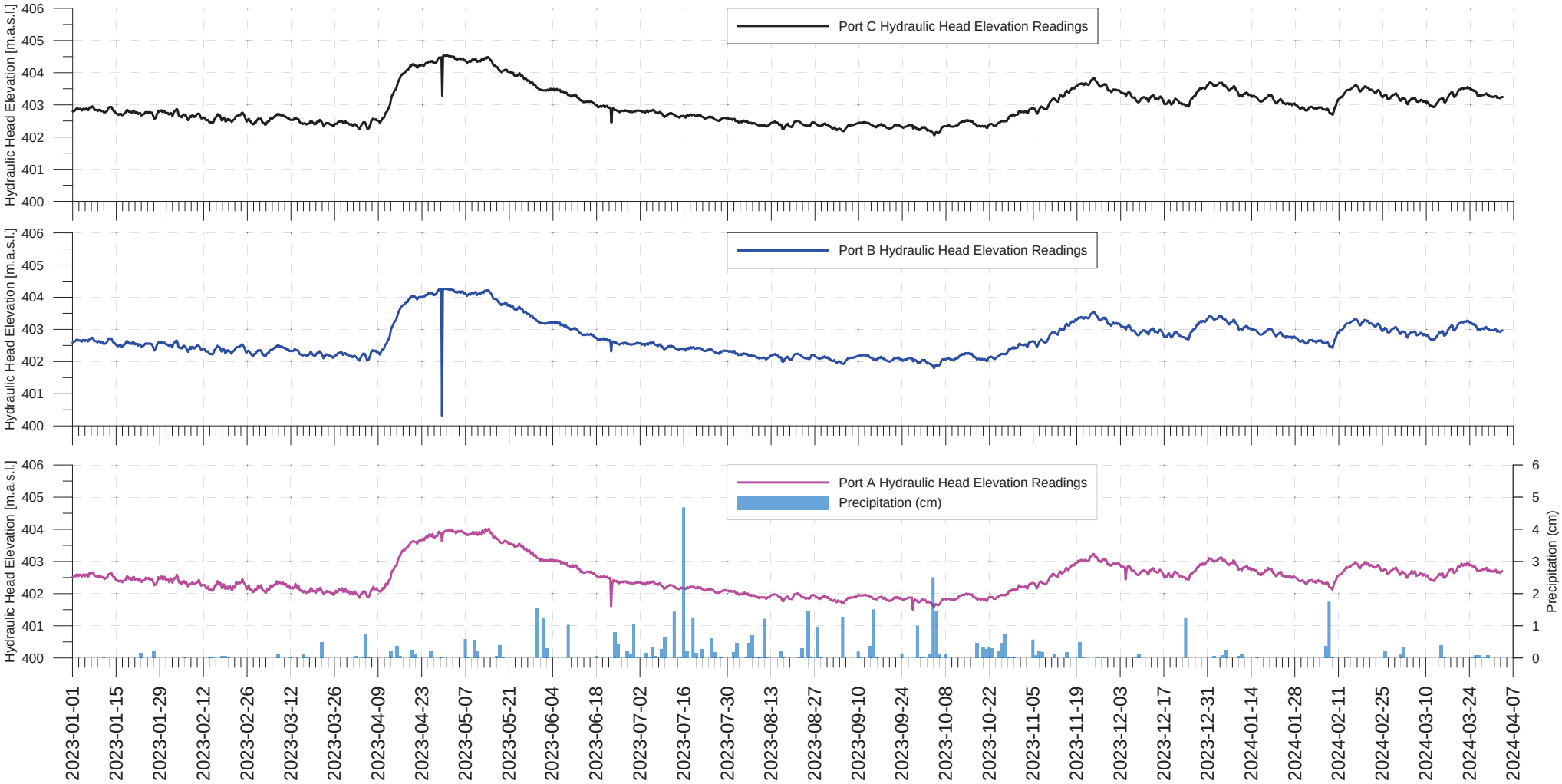
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWA02
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-2 | REV: 0



Notes:
1. Port C located at 381.45 m.a.s.l.
2. Port B located at 366.05 m.a.s.l.
3. Port A located at 322.05 m.a.s.l.

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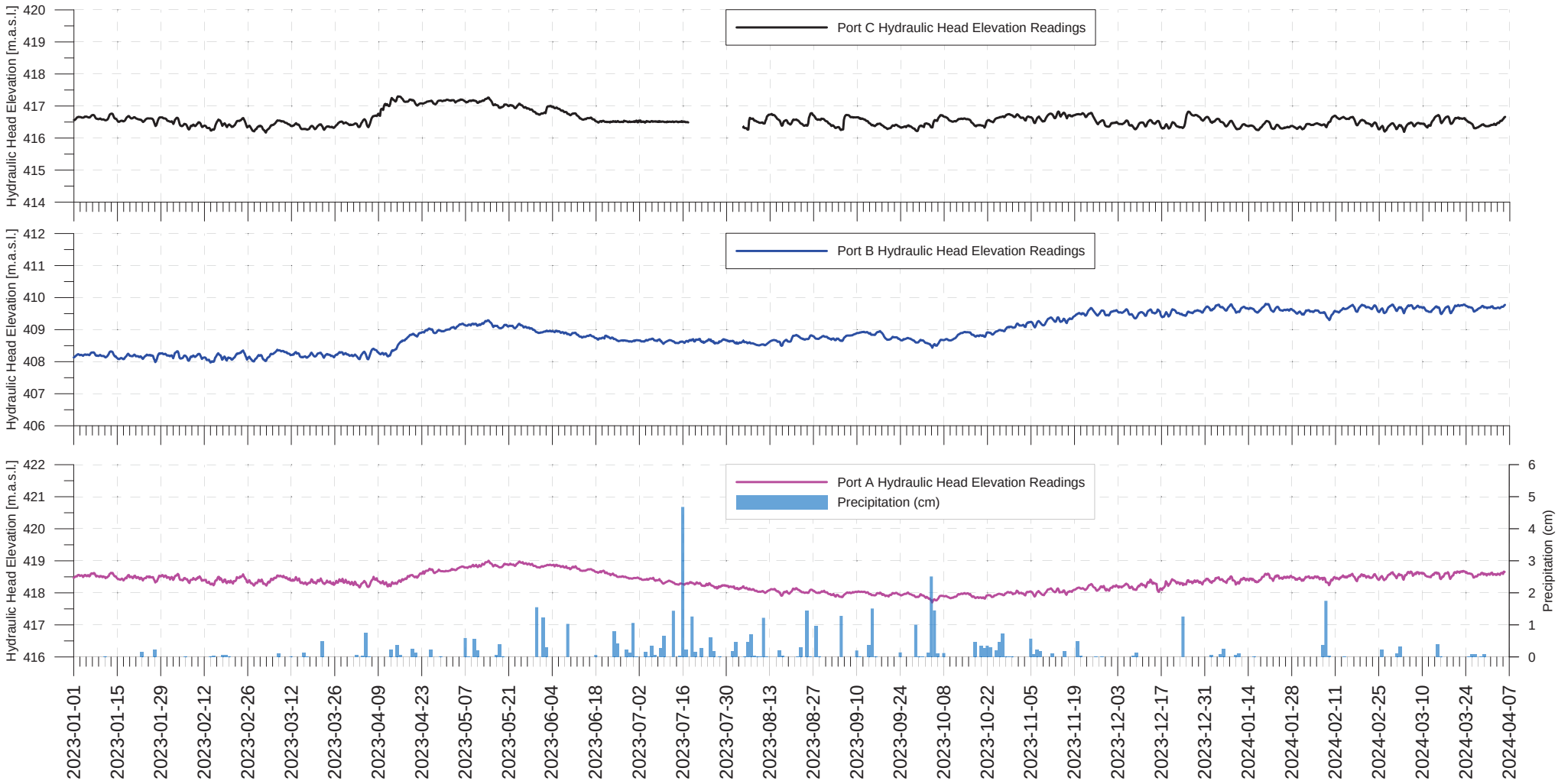
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWA03
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-3 | REV: 0



Notes:
1. Port C located at 409.36 m.a.s.l.
2. Port B located at 385.66 m.a.s.l.
3. Port A located at 348.96 m.a.s.l.
4. Data gap for Port C from July 17, 2023 to August 4, 2023

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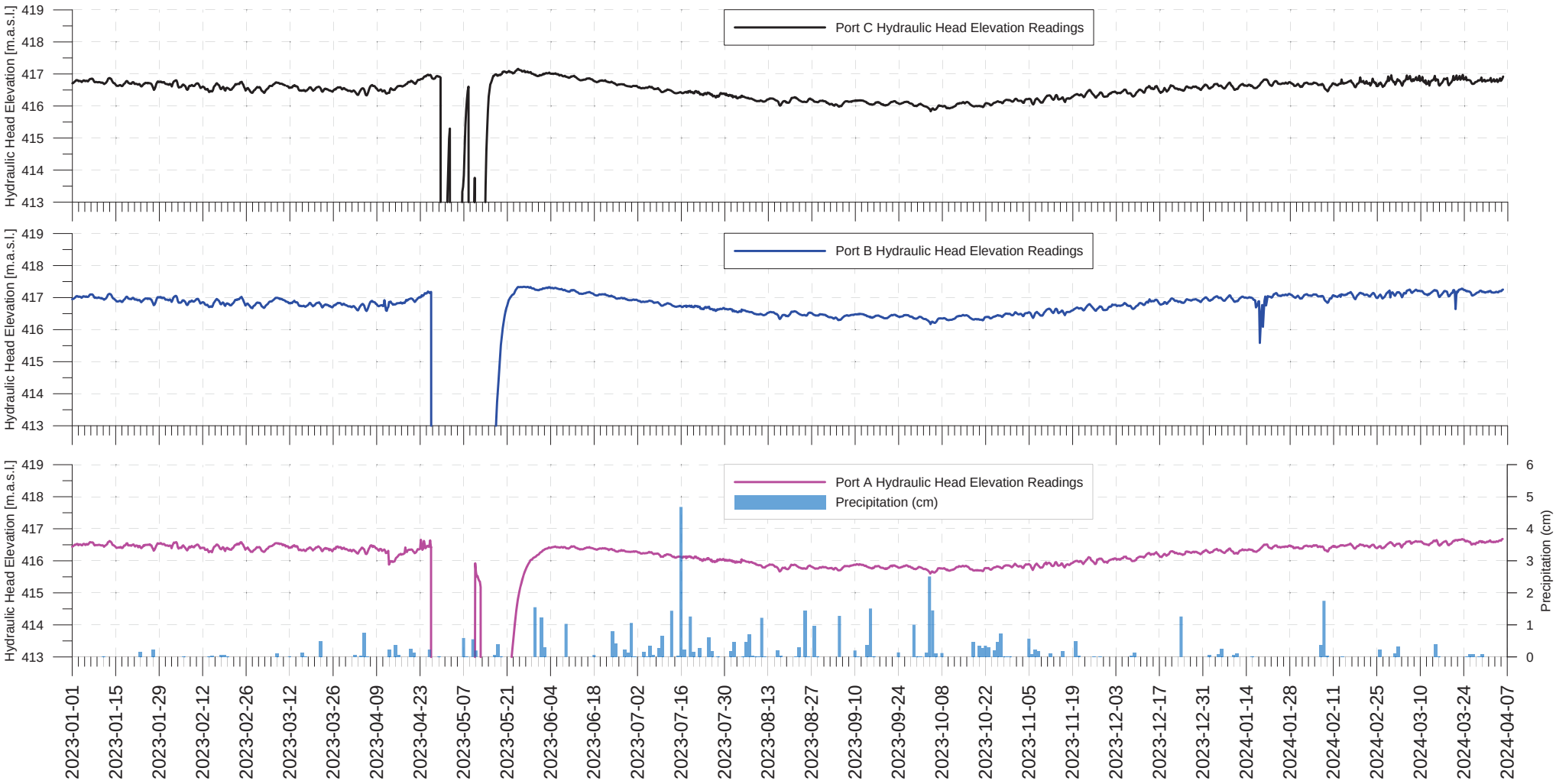
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWB01
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-4 | REV. 0



Notes:
1. Port C located at 365.42 m.a.s.l.
2. Port B located at 353.62 m.a.s.l.
3. Port A located at 322.32 m.a.s.l.

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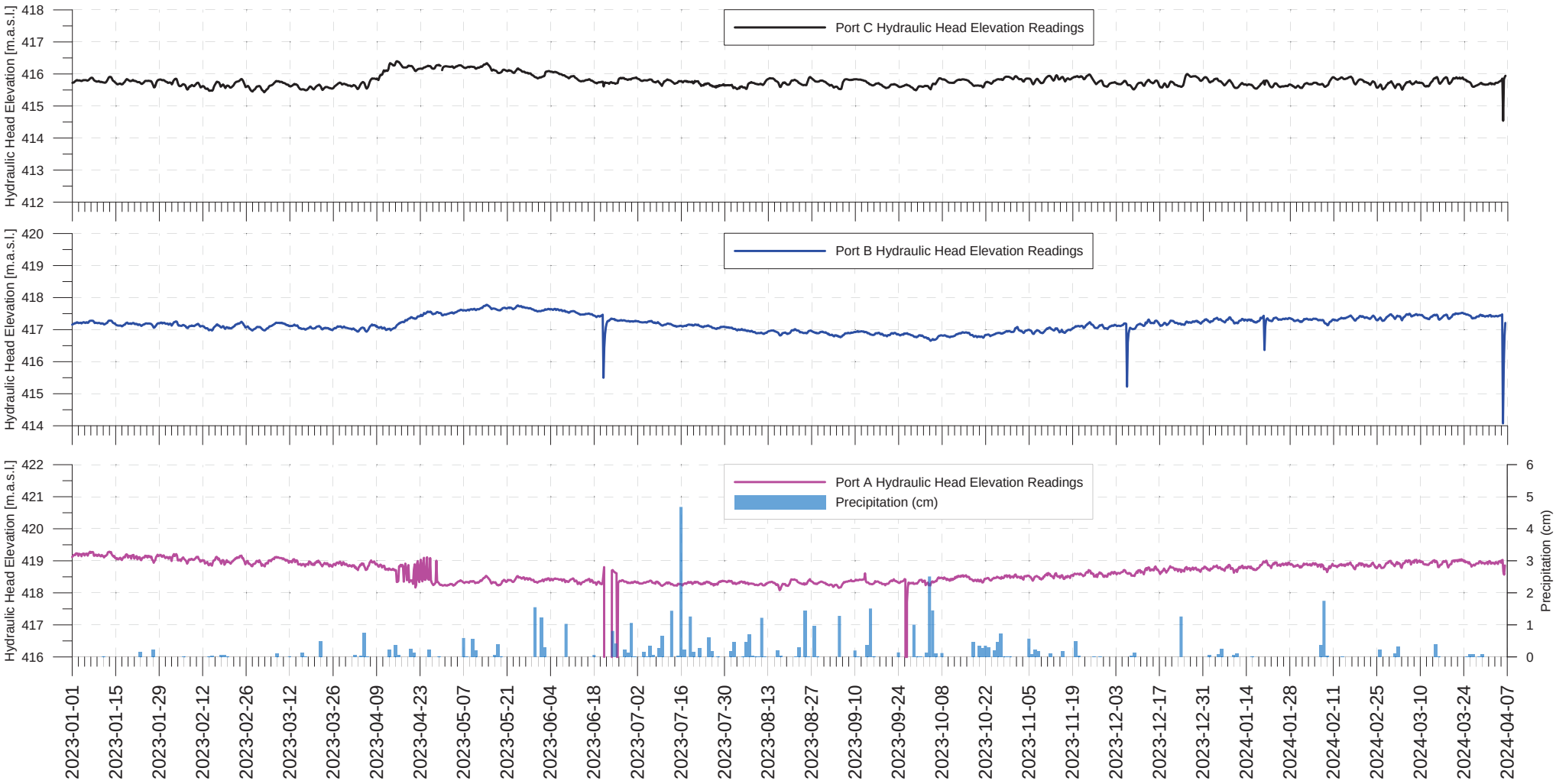
HYDRAULIC HEAD ELEVATIONS: IG_MWB02
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-5 | REV. 0



Notes:
1. Port C located at 395.88 m.a.s.l.
2. Port B located at 375.28 m.a.s.l.
3. Port A located at 333.58 m.a.s.l.

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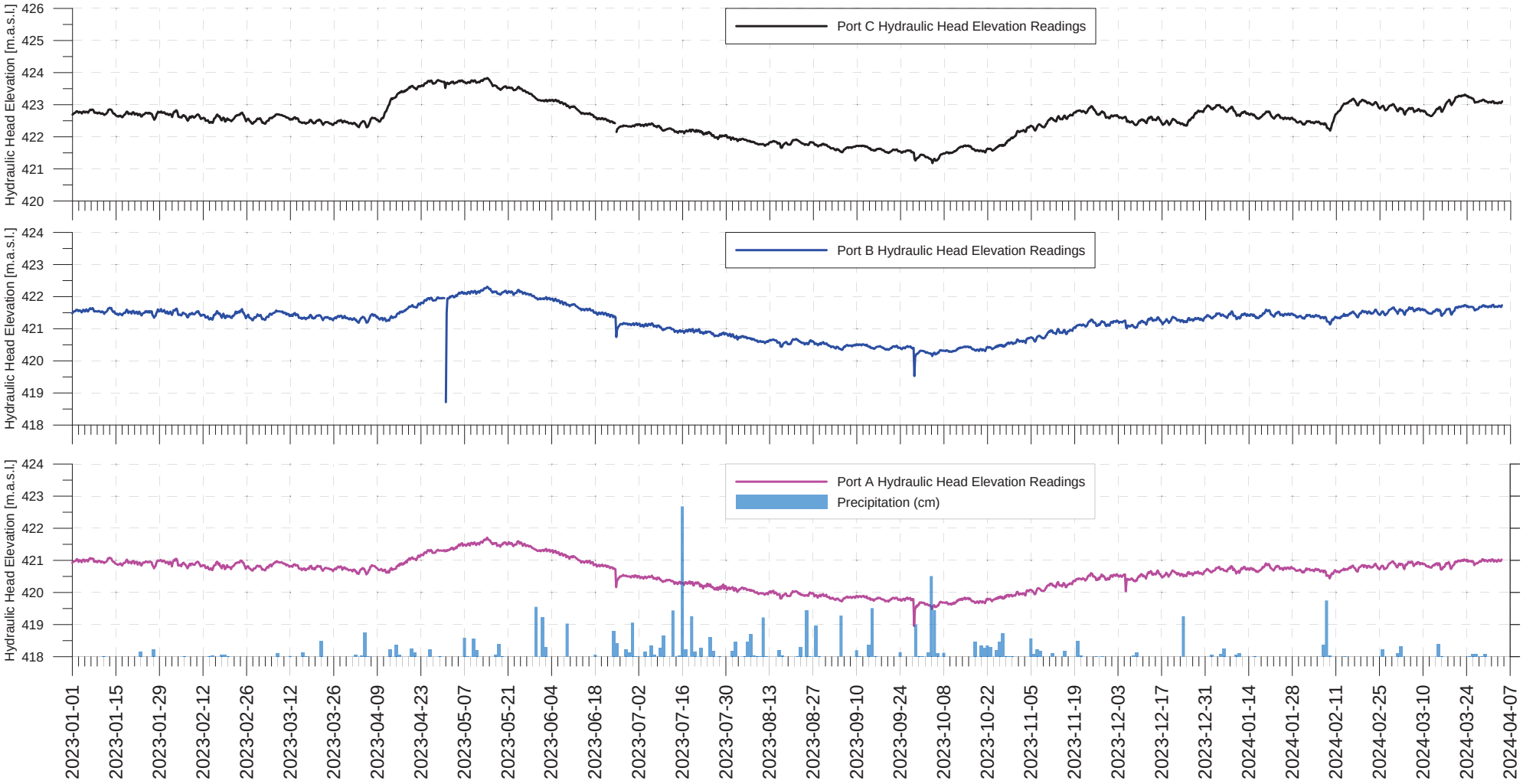
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWB03
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-6 | REV: 0



Notes:
1. Port C located at 401.41 m.a.s.l.
2. Port B located at 371.71 m.a.s.l.
3. Port A located at 336.21 m.a.s.l.

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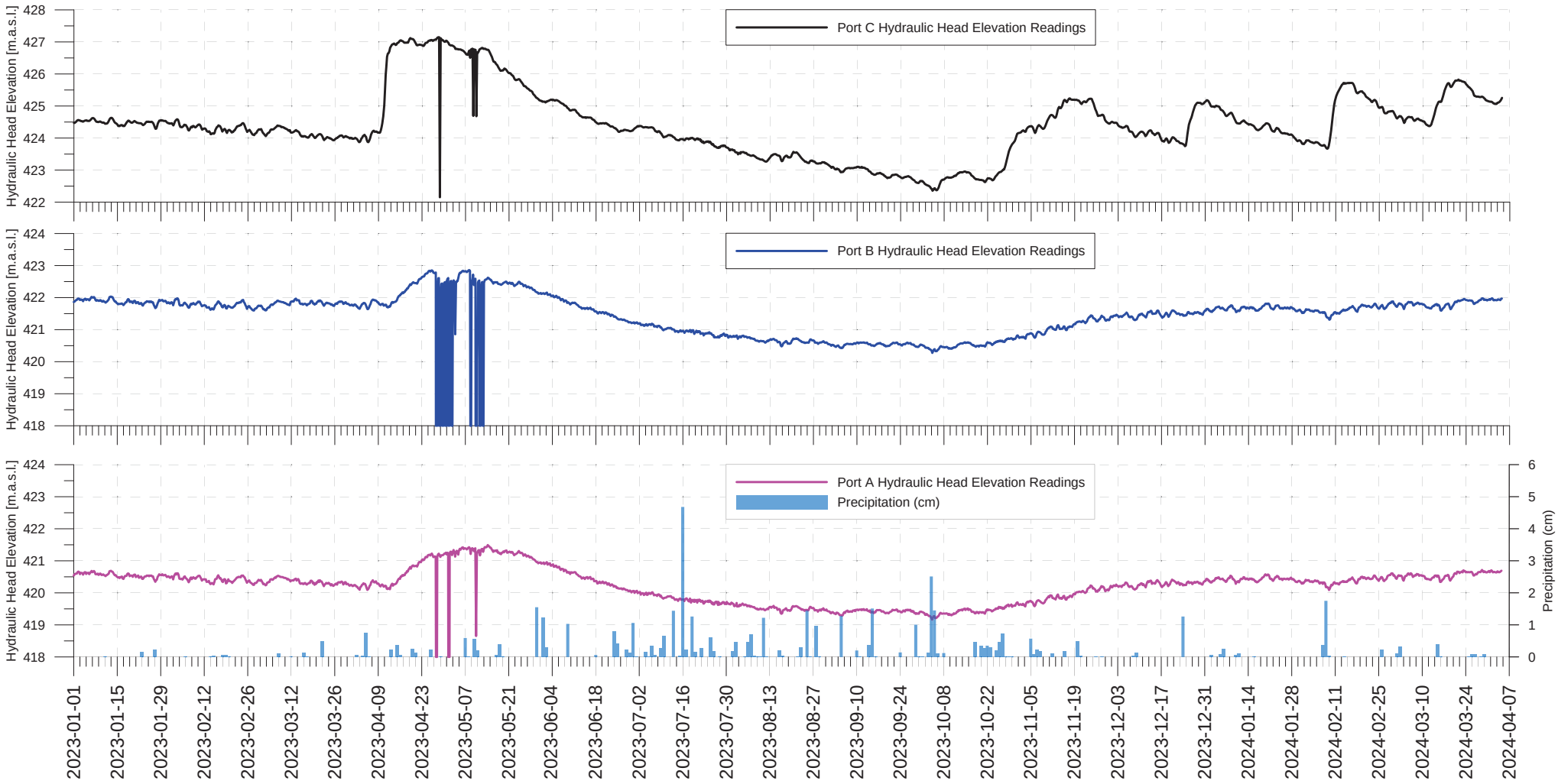
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWC01
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-7 | REV: 0



Notes:
1. Port C located at 420.05 m.a.s.l.
2. Port B located at 362.95 m.a.s.l.
3. Port A located at 337.75 m.a.s.l.

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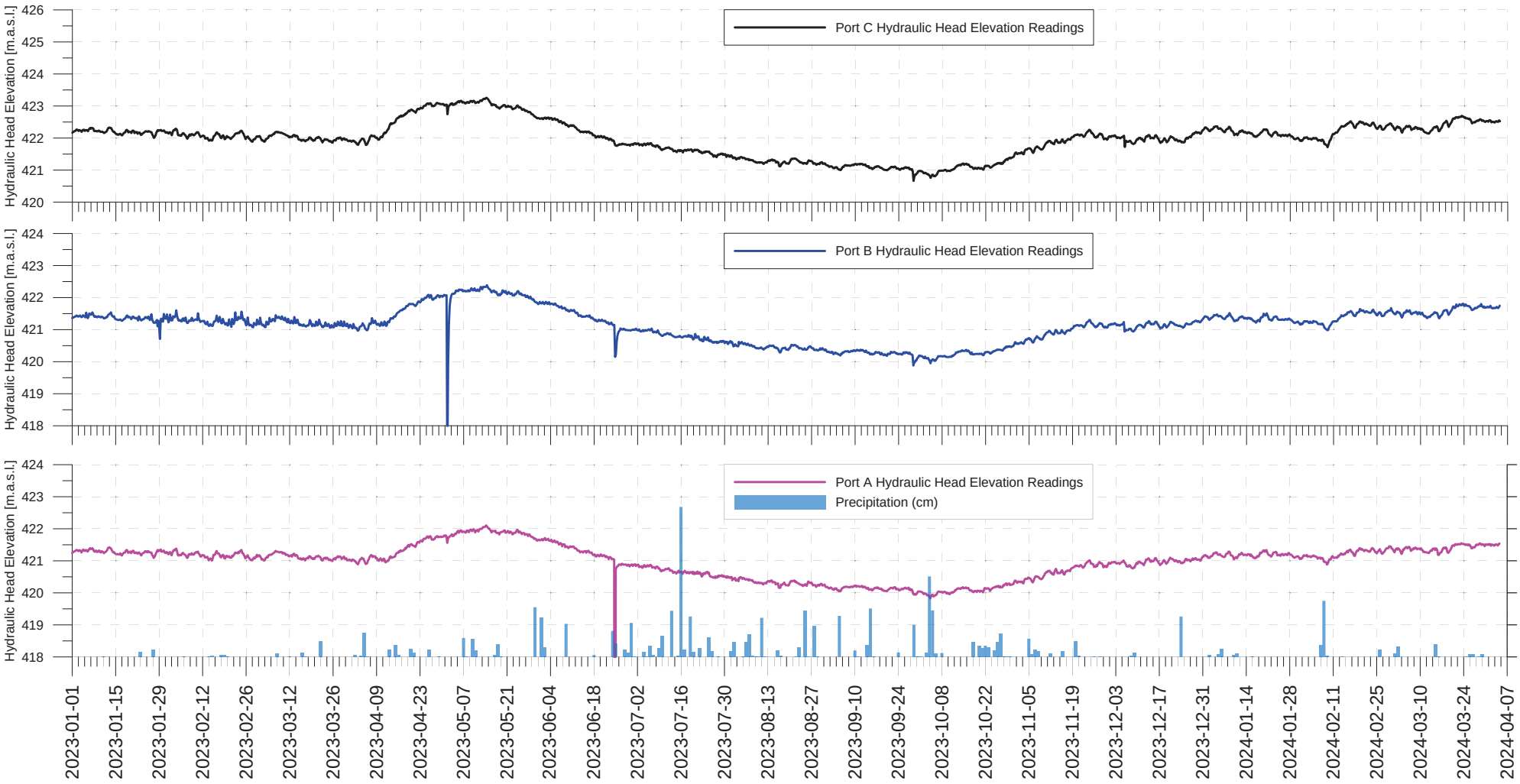
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWC02
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-8 | REV. 0



Notes:
1. Port C located at 385.64 m.a.s.l.
2. Port B located at 362.64 m.a.s.l.
3. Port A located at 353.34 m.a.s.l.

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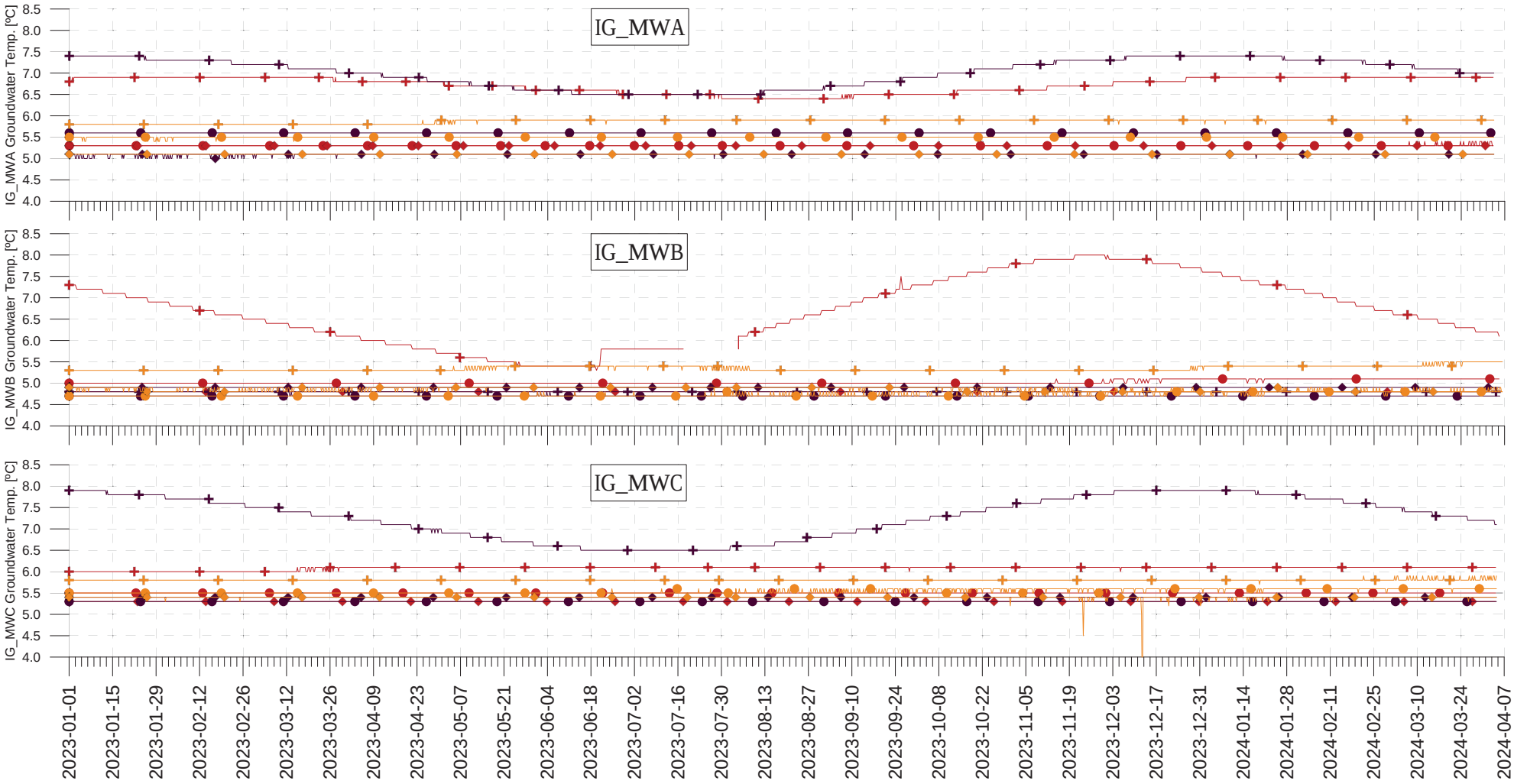
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

HYDRAULIC HEAD ELEVATIONS: IG_MWC03
2023 and Q1 2024

NOVEMBER 2024 | FIGURE A-9 | REV: 0

APPENDIX B

Groundwater Temperature Graphs



Note:
IG_MWX = IG_MWA, IG_MWB, or IG_MWC

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GROUNDWATER TEMPERATURES: ALL WELLS

NOVEMBER 2024 | FIGURE B-1 | REV: 0