SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

Data Report

APM-REP-01332-0362 **April 2023**

KGS Group

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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

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

Shallow Groundwater Monitoring Network, Ignace Area

Data Report

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22 St. Clair Avenue, Fourth Floor
Toronto, Ontario
M4T 2S3

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PREPARED BY:

Ian Deniset, M.Sc., P.Geo.
Environmental Geologist / Geophysicist

PREPARED BY:

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

REVIEWED BY:

Annie Dietrich, M.Sc., P.Eng., P.Geo.
Senior Hydrogeological Engineer

APPROVED BY:

Jason Mann, M.Sc., P.Geo., FGC
Principal and Environment Department Head

Client Information

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

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1.0 INTRODUCTION

1.1 Overview

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) was retained by the Nuclear Waste Management Organization (NWMO) to install a shallow groundwater monitoring network near Ignace, Ontario. The Nuclear Waste Management Organization ("NWMO") is responsible for implementing Adaptive Phased Management ("APM"), Canada's plan for the long-term management of used nuclear fuel. The ultimate objective of APM is the centralized containment and isolation of used nuclear fuel in a deep geological repository located at a safe site in an informed and willing host community. NWMO is committed to implementing the project in a manner that protects human health, safety, security and the environment, while fostering the long-term well-being of the community and region in which it is implemented. The installation of a shallow groundwater monitoring network in the Ignace area is part of Phase 2 Geoscientific Preliminary Site Investigations phase of NWMO's APM Site Selection process.

The purpose and long-term objectives of the installed network are to characterize the hydrogeological conditions of the upper 100 m of bedrock within the area, facilitate the ongoing collection of groundwater samples, and allow for continual measurement of groundwater level fluctuations.

Field activities associated with the project commenced May 17, 2021 and were completed October 20, 2021. This report summarizes the work completed within those dates, as well as the analysis, interpretation, and results of data collected.

1.2 Scope of Work

Completion of the shallow groundwater monitoring network involved installation of nine 100 m deep wells across three sites: IG_MWA, IG_MWB, and IG_MWC. Three wells were installed at each site, with the associated work being completed in the following four distinct Work Packages with associated Test Plan documents shown in backets:

1. Work Package A – Site Infrastructure (APM-PLAN-01332-0394)
2. Work Package B – Borehole Drilling and Logging of Cuttings (APM-PLAN-01332-0395)
3. Work Package C – Geophysical Logging (APM-PLAN-01332-0396)
4. Work Package D – Groundwater Monitoring Well Network (APM-PLAN-01332-0397)

Every Work Package (WP) was completed at each site in the order listed above, with work starting at IG_MWB, progressing to IG_MWA, and finishing at IG_MWC. The detailed Scope of Work for each WP can be found in the associated Test Plans listed above, and a summary of methodologies is included in this report.

2.0 PROJECT LOCATION

2.1 Land Acknowledgment

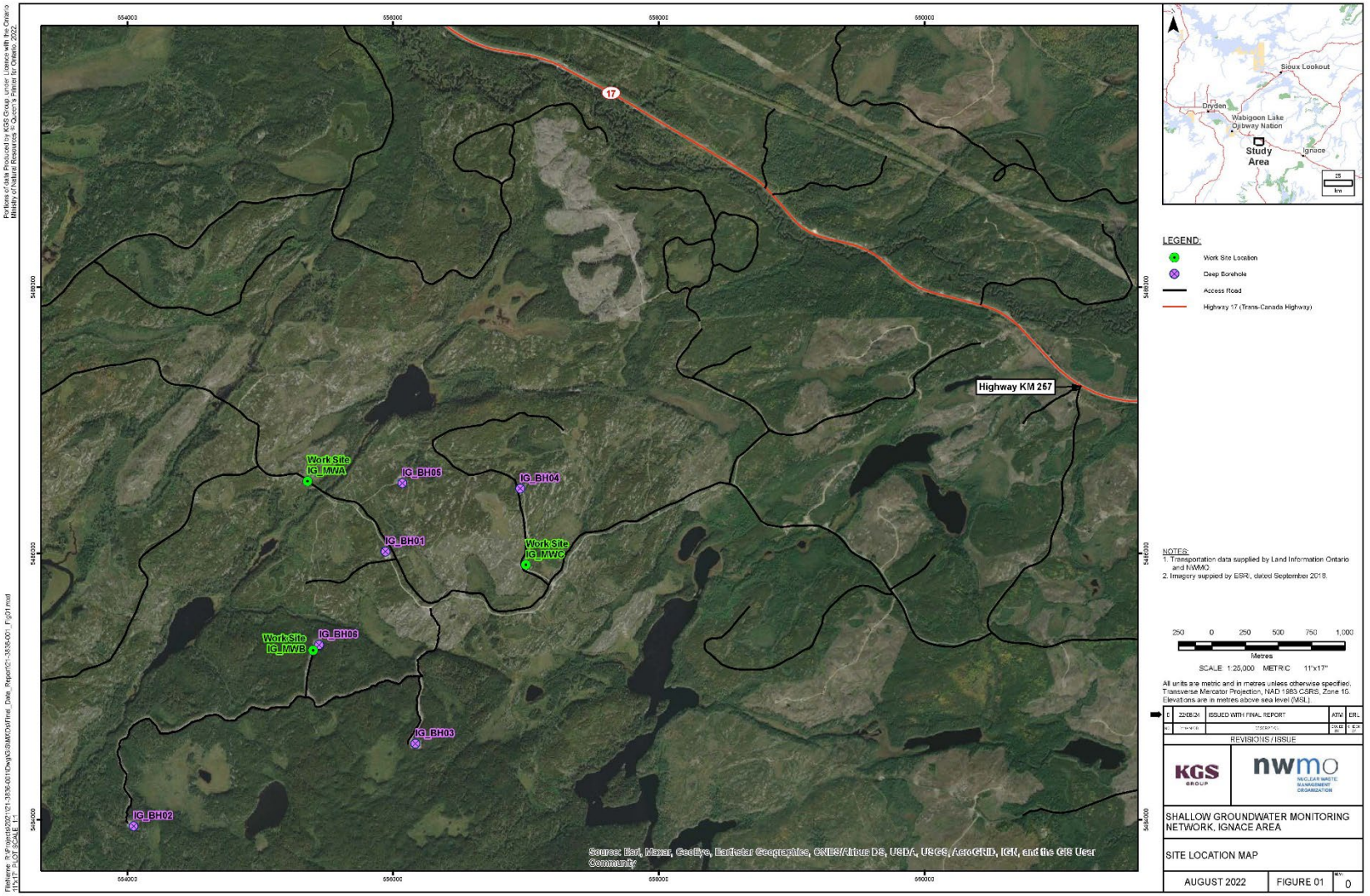
It is important to acknowledge that this project was completed on the traditional territory of the Anishinaabe people of Treaty Three and the Métis. KGS Group and its subcontractors are grateful for being given the opportunity to complete work within the area, and are thankful for the generations of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

2.2 Study Area

The Potential Repository Area where the network of shallow groundwater wells was installed is situated approximately 40 km west of Ignace, Ontario, 5 km south of the TransCanada Highway and Tower Road junction. The Potential Repository Area is located in the northwestern portion of the Revell batholith (Figure 01 on the following page).

Field work as part of Phase 2 Geoscientific Preliminary Site Investigations had commenced in the area prior to the start of this project work and included among other the drilling of four 1000 m deep boreholes. An additional two deep boreholes were also completed throughout the duration of project work. As a result, a well-maintained network of pre-existing gravel roads were available within the area allowing all sites to be accessed by vehicle. A general layout of the project area showing existing access roads, deep borehole locations, and site locations is provided on Figure 01.

FIGURE 01. SITE LOCATION MAP



2.3 Site Layout

All three sites (IG_MWA, IG_MWB, and IG_MWC) are situated off pre-existing access roads. IG_MWA (Figure 02) is positioned approximately 0.5 km west of deep borehole IG_BH05, IG_MWB (Figure 03) is located directly at deep borehole IG_BH06 site, and IG_MWC (Figure 04) is situated approximately 0.5 km south of deep borehole IG_BH04. Each site was constructed in a similar manner, and consisted of three drill pads, one refueling pad, one storage SeaCan, and one office trailer. Additional infrastructure was placed across each site as required. Within each site, drill pads were arranged in a triangular layout and connected via gravel pathways to other site infrastructure.

FIGURE 02. WORK SITE A

WELL ID	NORTHING	EASTING	ELEVATION	CODE
IG_MWA01	5486569.95	555336.47	407.69	TOP_CASING
IG_MWA02	5486543.93	555377.05	405.81	TOP_CASING
IG_MWA03	5486594.67	555378.37	407.77	TOP_CASING

FIGURE 03. WORK SITE B

WELL ID	NORTHING	EASTING	ELEVATION	CODE
IG_MWBO1	5485333.13	555457.37	418.44	TOP_CASING
IG_MWBO2	5485333.36	555419.71	418.39	TOP_CASING
IG_MWBO3	5485286.71	555447.38	419.62	TOP_CASING

FIGURE 04. WORK SITE C

WELL ID	NORTHING	EASTING	ELEVATION	CODE
IG_MWC_01	5485929.48	556981.71	428.27	TOP_CASING
IG_MWC_02	5485905.10	556937.76	432.46	TOP_CASING
IG_MWC_03	5485882.72	556982.57	425.91	TOP_CASING

3.0 WPA – SITE INFRASTRUCTURE

3.1 Overview

The primary objective of WPA, Site Infrastructure, was to establish the necessary infrastructure at all three sites to facilitate the subsequent completion of WPB (Borehole Drilling), WPC (Geophysical Logging), and WPD (Groundwater Monitoring Well Installation and Hydraulic Testing). Work associated with WPA included site preparation, placement of temporary site infrastructure, and the continual maintenance of all three sites throughout field activities. Work Package A also included site demobilization at project end.

KGS Group served as the constructor for all WPA activities and acted as the manager / field supervisor for subconsultants Raymond Vauclair Projects (RVP) and Ricci Contracting.

Further details regarding the scope of WPA can be found in the associated Test Plan (APM-PLAN-01332-0394).

3.2 Field Activities and Methodology

Work Package A field activities began May 17, 2021 at IG_MWB and were complete October 20, 2021 at IG_MWC (key dates are provided in Table 1). Work included the preparation of each site (surveying, clearing/grubbing, construction of pathways, etc.), the construction of refueling and drill pads, and the mobilization and demobilization of infrastructure. A review of completed field activities is provided in the sections below.

TABLE 3: MOBILIZATION AND DEMOBILIZATION DATES

Site	Mobilization Start Date	Demobilization End Date
IG_MWA	May 21, 2021	October 20, 2021
IG_MWB	May 17, 2021	August 6, , 2021
IG_MWC	May 26, 2021	October 20, 2021

3.2.1 SITE PREPARATION

Site preparation activities began on May 17, 2021 at IG_MWB and with site setup completed by June 2, 2021 at IG_MWC. Similar tasks were completed at all three sites; however, fewer steps were required for IG_MWB due to a pre-existing pad had been constructed for deep borehole IG_BH06. All construction services and heavy machinery for site preparation work were provided by subcontractor RVP.

Preparation activities completed at each site included:

- Surveying of site boundaries and infrastructure extents.
- Placement of straw wattles on the downgradient side of site.

- Clearing and grubbing of vegetation at pad, office/storage SeaCan, and access pathway locations (not required for IG_MWB).
- Placement and compaction of granular material to construct access pathways (not required for IG_MWB).
- Placement of one office SeaCan, one storage SeaCan, and one light plant.
- Placement of appropriate first aid and firefighting equipment in storage SeaCan.
- Placement of 8 ft high security fencing around site perimeter.
- Postage of appropriate signage (first aid, muster point, construction ahead, etc.).

3.2.2 REFUELING AND DRILL PAD CONSTRUCTION

Pad construction began at IG_MWB on May 18, 2021 and finished June 1, 2021 at IG_MWC. One refueling pad and three drill pads were built at each site, with the same construction methodology employed for all sites. As with site preparation activities, all construction services and heavy machinery for pad construction were provided by subcontractor RVP. Start and end dates for the construction of each pad are provided in Table 2, with the final pad layout for each site shown on Figures 02, 03 and 04.

TABLE 4: PAD CONSTRUCTION START AND END DATES

Pad	Star Date	End Date
IG_MWA Refueling	May 23, 2021	May 24, 2021
IG_MWA01	May 25, 2021	May 27, 2021
IG_MWA02	May 24, 2021	May 25, 2021
IG_MWA03	May 25, 2021	May 27, 2021
IG_MWB Refueling	May 19, 2021	May 20, 2021
IG_MWB01	May 18, 2021	May 21, 2021
IG_MWB02	May 19, 2021	May 22, 2021
IG_MWB03	May 18, 2021	May 19, 2021
IG_MWC Refueling	May 28, 2021	May 28, 2021
IG_MWC01	May 29, 2021	May 30, 2021
IG_MWC02	May 29, 2021	May 30, 2021
IG_MWC03	May 28, 2021	June 01, 2021

Refueling pads were constructed using the following methodology:

- Construction of perimeter berm on three sides of pad.
- Placement of geofabric over entire pad area and berms.
- Placement, grading (1-2%), and compaction of 6-inches of sand over geofabric.
- Placement of prefabricated 40 ml Linear Low Density Polyethylene (LLDPE) liner over compacted sand and pad berms.

- Placement and compaction of 6-inches of sand over LLDPE.
- Placement of geofabric over sand layer.
- Placement of 6-inches of granular/black gravel over sand.
- Placement of granular material over pad berms to key-in LLDPE liner.

Drill pads were constructed using the following methodology:

- Construction of perimeter berm on three sides of pad.
- Placement of geofabric over entire pad area and berms.
- Placement, grading (1-2%), and compaction of 6-inches of sand over geofabric.
- Placement of prefabricated 40 ml Linear Low Density Polyethylene (LLDPE) liner over compacted sand and pad berms.
- Placement and compaction of 3-inches of sand over LLDPE.
- Placement of Geogrid over compacted sand.
- Placement of 6-inches of granular/black gravel over sand.
- Placement of granular material over pad berms to key-in LLDPE liner.
- Installation of 2-inch overflow pipe with attached inline hydrocarbon filter at lowest portion (sump) of pad for treatment of run-off water.

3.2.3 DEMOBILIZATION

Following the completion of all field activities for WPB, WPC, and WPD, site decommissioning and demobilization were completed. Demobilization and site decommissioning of site IG_MWB occurred from August 03 to August 06, 2021 and of sites IG_MWA and IG_MWC between October 15 and 20, 2021.

Demobilization activities included, but were not limited to:

- Removal of all temporary site infrastructure (SeaCans, washrooms, perimeter fencing, straw wattles, etc.).
- Removal of household garbage, litter, or any other waste material remaining on site.
- Removal of both LLDPE liner and geofabric from refueling pads.
- Removal of LLDPE liner and GEOGRID from all drill pads.
- The bottom geotextile material was left in place at all drill pads at sites IG_MWA and IG_MWC.
- Regrading and removal of berms from all drill and refueling pads.
- Return of care, custody, and control of all sites from KGS Group to the NWMO.

Further detail regarding site demobilization is given in the Demobilization Report (APM-REP-01332-0363).

3.3 Results

A total of nine drill pads and three fuelling pads with liners and berms were constructed in preparation of the work planned in Work Packages B, C, and D. Temporary infrastructure such as perimeter fencing, straw wattles for sediment control mitigation, portable washrooms setup and cleaned regularly as well as a site storage container and a site office with generator and light plants were supplied and made ready to be used for the duration of the field work.

3.4 Quality Assurance

All work carried out through the duration of WPA was completed in accordance with the Project Quality Plan (APM-PLAN-01332-0390). As such, all relevant field activities and associated data were recorded in checklist forms developed by KGS Group where appropriate. Additionally, Daily Site Activity (DSA) reports were generated throughout the duration of WPA to provide a record of daily work activities and field conditions. All checklists were verified and signed-off according to the Project Quality Plan and provided to NWMO in the data delivery package for WPA.

Equipment inspections completed prior to mobilization and daily inspections were also recorded and were documented in DSA reports and applicable checklists. All WPA Quality Assurance documentation was supplied in the final WPA data delivery.

Relevant checklists for WPA are summarized in table 3 below.

TABLE 3: CHECKLISTS FOR WORK PACKAGE A

Checklist	Description
Access Pathway Construction	A checklist to verify and confirm that site access paths were constructed as design.
Drill Site Construction	A checklist to verify and confirm that the drill pads were constructed as designed and document any changes required.
Decommissioning and Demobilization	A checklist to verify and confirm that the decommissioning of the site was completed as per the test plan and demobilization was completed.
Establishment of Temporary Infrastructure	A checklist to verify and confirm that the planned temporary infrastructure items were supplied, installed and commissioned as per the test plan and document any changes required.
Pre-Mobilization and Mobilization	A checklist to verify and confirm that all equipment brought to the study site met the condition requirements listed in the environmental management plan, the health and safety plan and the test plan.
Refueling Area Construction	A checklist to verify and confirm that the refueling pads were constructed as designed and document any changes required.
Site Preparation	A checklist to verify and confirm that the work area prior to pad construction was setup as per the test plan.

3.5 Data Delivery

The final data delivery package was submitted to NWMO on October 19, 2022. File naming conventions were in accordance with the PQP and the DMP. The final data delivery package included the following:

- Signed scans of all DQCFs and checklists
- Signed copies of all Daily Site Activity Reports specific to WPA

- As-built Layout Figures
- Completed JSAs and Training Records
- Health, Safety and Environmental Incident reports
- Field Notes
- Completed Environmental Inspection forms
- Completed data collection checklist
- Supporting metadata file

4.0 WPB – BOREHOLE DRILLING

4.1 Overview

The primary objective of WPB, Borehole Drilling, was to drill and geologically describe three 100 m deep boreholes at each site (nine in total). Work associated with WPB included borehole drilling, installation of surface casing, collection, photography and submission of rock chip samples, geologic logging of rock chip samples, the management of produced rock cuttings and formation water as well as final data delivery.

KGS Group served as the constructor for all WPB activities and acted as the manager / field supervisor and for Quality Assurance (QA) for subcontractor Maple Leaf Drilling Ltd. (MLD). Additionally, KGS Group was responsible for the collection, logging, photography, quality checks and submission of all rock chip samples. All work was documented and verified on data quality confirmation forms (DQCFs).

Further details regarding the scope of WPB can be found in the associated Test Plan (APM-PLAN-01332-0395).

4.2 Field Activities and Methodology

Work Package B activities began at IG_MWB on May 31, 2021 and finished July 20, 2021 at IG_MWC (key dates are provided in 4). Completed work involved all activities associated with borehole drilling and the collection / logging / photography of produced rock chips. A review of completed field activities is provided in the sections below.

4.2.1 BOREHOLE DRILLING

Borehole drilling activities began at IG_MWB03 on June 05, 2021 and were completed at IG_MWC03 July 20, 2021 (start and end dates for each borehole are provided in 4). Similar procedures were used for the drilling of all boreholes and included: setup of drilling equipment over the borehole location, installation of surface casing, advancement of borehole to design depth, and flushing / clearing of drill cuttings from the completed well bore.

TABLE 4: BOREHOLE DRILLING DATES AND SURVEY DETAILS

Borehole	Start Date	End Date	Northing	Easting	Ground Elevation	TOC Elevation
IG_MWA01	July 01, 2021	July 03, 2021	5486569.946	555336.474	406.779	407.689
IG_MWA02	June 18, 2021	June 20, 2021	5486543.934	555377.05	404.808	405.813
IG_MWA03	July 02, 2021	July 05, 2021	5486594.665	555378.372	406.950	407.765

Borehole	Start Date	End Date	Northing	Easting	Ground Elevation	TOC Elevation
IG_MWB01	June 07, 2021	June 15, 2021	5485333.309	555457.642	417.361	418.441
IG_MWB02	June 06, 2021	June 12, 2021	5485333.698	555419.453	417.616	418.396
IG_MWB03	June 05, 2021	June 09, 2021	5485286.506	555447.356	418.478	419.623
IG_MWC01	July 08, 2021	July 11, 2021	5485929.477	556981.711	427.412	428.267
IG_MWC02	July 08, 2021	July 10, 2021	5485905.102	556937.763	431.550	432.455
IG_MWC03	July 09, 2021	July 17, 2021	5485882.72	556982.573	424.940	425.905

Prior to drilling each borehole, required equipment was setup at the pre-surveyed well location. A section of LLDP collar with a 381 mm dimeter was placed at the borehole location first and sealed to the existing pad liner using both a specialized adhesive tape and bentonite pellets. A track mounted MobileDrill B54X drill rig was then moved in place over the collar and fitted with a 266 mm Down The Hole (DRH) air hammer bit powered by a trailer mounted Pinnacle Drilling Products LP HP915 Compressor. A diverter was then placed atop the casing, and was connected to a cyclone separator with a 1 m^3 soil bag situated beneath to capture produced cuttings. A dust suppression system was also installed inline between the diverter and cyclone separator. During operation, the dust suppression system used water sourced from the Town of Ignace and a nozzle located within the diverter pipe to reduce airborne fines produced during drilling. Finally, a piece of non-woven geofabric was placed around the drill collar to capture and contain any errant cuttings.

Following equipment setup, surface casing installation was completed. Using the 266 mm DTH bit, a 6 m borehole was advanced into the underlying bedrock. No drilling fluid was used during surface casing installation at IG_MWB and IG_MWA, however, due to continued issues arising from drilling without fluid, both IG_MWA01 and IG_MWA03 were advanced using fluorescein traced water (100 ppb). A total of 72 liters of fluorescein traced water was used to drill IG_MWA01 and a total of 305.8 liters was used to advance the surface casing at IG_MWA03. Following drilling, a 203 mm outer diameter (200 mm inner diameter) steel casing with centralizers was inserted into the borehole to a depth of 6.0 m below ground surface, plumbed, and cemented in place. Cement was placed within the annular space via tremie line and was allowed to cure for 24 hours prior to any further drilling activity. Final cement mix values were recorded, and samples were collected to ensure a sufficient cure had been achieved prior to resuming drilling activities.

After a minimum of 24 hours and confirming adequate set, the drill rig was repositioned over casing and fitted with a 143 mm DTH bit. The borehole was then advanced to design depth in a continuous manner, with parameters such as run number, run duration, and depth recorded regularly. If water was observed during

drilling, the rig was halted, and the approximate rate of recharge was measured using water level readings recorded at set time intervals. All 143 mm diameter borehole sections were drilled without the use of drilling fluid. Table 5 below summarizes key borehole drilling observations.

TABLE 5: BOREHOLE DRILLING SUMMARY

Borehole ID	Number of Times Water Producing Fractures Observed	Depth (mbgs)	Estimated Flow Rate (lpm)
IG_MWA01	1	14 to 16	3.4
IG_MWA02	1	98 to 100	0.03
IG_MWA03	1	40 to 42	1.2
IG_MWB01	1	8 to 9	0.15
IG_MWB02	1	5 to 6	0.15 to 0.8
IG_MWB03	2	5 to 6 46 to 48	<0.1 <0.05
IG_MWC01	None	-	-
IG_MWC02	1	10 to 12	0.46
IG_MWC03	None	-	-

Once design depth had been reached, the borehole was airlifted to remove excess cuttings and improve fluid clarity for WPC activities. To flush the borehole, the drill rig was positioned over the casing and compressed air was continuously injected through the drilling rods to flush the entire well volume. Ejected water was captured within a tote below the cyclone separator and pumped to a wastewater tank as needed. This flushing process was completed a total of three times for each borehole, with the approximate volume of water ejected documented each time and documented on the DSAR for that day. Note that due to dry borehole conditions, IG_MWB02 was not airlifted using the drill rig; alternatively, the wellbore was flushed using 1109 liters of fluorescence traced (100 ppb) water following those procedures outlined in the WPB Test Plan.

4.2.2 BOREHOLE SAMPLE COLLECTION, LOGGING AND PHOTOGRAPHY

Borehole sample collection, logging and photography were completed contemporaneously with drilling activities, beginning at IG_MWB03 on June 05, 2021 and finishing at IG_MWC03 on July 20, 2021. All logging activities were completed using the same methodology and followed the steps detailed in "Logging of Cuttings - Standard Operating Procedures" provided in the WPB Test Plan. General logging procedures for each borehole included the collection and preparation of samples, geologic description and logging and photographing of samples, and sample submission.

Samples were collected at predetermined depths during the drilling process, with one sample collected every 1 meter above 10 m of drilled depth, and one sample collected every 2 m at depths greater than 10 m drilled depth. 53-54 samples were collected on average from each borehole for a total of 481 rock chip samples. All samples were collected directly from the base of the cyclone separator and were caught while drilling advanced through the target depth. Once acquired, samples were rinsed using a 2 mm sieve in Town of Ignace water to remove all fines for logging. Rinsed samples were then transferred to resealable bags labeled with both the borehole ID and depth acquired.

A representative portion from each rinsed sample was then selected and geologically logged. Each selected portion of cuttings was first evenly distributed and described for lithology, color, primary lithology, and any observable alteration. The described cuttings were then gathered, placed on a neutral-colored surface, and photographed under consistent lighting. All captured photos included both a millimeter scale and sample label indicating borehole ID and sample depth.

Once logged and photographed, a 1 kg portion of each sample was weighed out using a calibrated scale and retained for submission to the NWMO. Retained samples were placed in labeled resealable bags and stored in a 20 L bucket indicating the corresponding borehole ID and depth range (multiple buckets per wellbore). All samples were then transferred to the NWMO Town of Ignace office with an accompanying Chain of Custody form.

Logged information was recorded on a physical Data Quality Confirmation Form- Borehole Logging and then transcribed into a digital (Microsoft Excel) DQCF and provided with the final data deliverable package. A summary of the logging information recorded on the DQCF is given by borehole below.

Borehole IG_MWA01 – A total of 52 rock chip samples were collected from this borehole. The majority of rock chip samples (88.5%) were classified as tonalite with five samples described as granite (9.6%) and one sample (1.9%) described as granite and amphibolite.

The colours observed were typically a light grey or grey and pink. Grey colored rock chips accounted for 86.6% of the samples collected while 11.5% of samples were described as grey and pink, and one sample (1.9%) was described as brown.

The rock chip samples were either unaltered (A1) or weakly altered (A2). Unaltered rock chip samples accounted for 73.1% of the samples collected while weakly altered samples accounted for the remaining 26.9% of samples. The weak alteration was associated with the presence of hematite with most of the weak alteration occurring between the depth of 22 m and 66 m.

Borehole IG_MWA02 – A total of 53 rock chip samples were collected from this borehole. Of the rock chips sampled, 52.8% were classified as tonalite while 41.5% of samples were classified as granite and 5.7% of samples were amphibolite.

The colours ranged from a light grey to reddish-brown. Of the rock chips sampled, 52.8% were described as pink and grey, 32.1% as grey, 5.7% as pink, 5.7% as reddish-brown, 1.9% as brown, and 1.9% as dark grey.

The majority of rock chip samples (54.8%) were described as weakly altered. Unaltered samples accounted for 39.5% of the samples while moderately altered samples accounted for the remaining 5.7%. Of note, the most intense alteration occurred between the depth of 90 m and 96 m and was associated with pervasive hematization. While advancing this borehole, no water was intersected until below the 90 m depth.

Borehole IG_MWA03 – A total of 54 rock chip samples were collected from this borehole. Of the rock chips sampled, 92.6% were described as tonalite and 5.6% of samples were classified as granite. The remaining 1.8% of samples were described as syenite.

Most samples were grey in colour, accounting for 87.1% of the samples. Other observed colours included 7.4% of samples described as pink, 3.7% of samples described as grey-pink, and 1.8% of samples described as brown to grey. The brown to grey sample was at the rock surface.

All rock chip samples (100%) were described as being unaltered (A1). Trace amounts of hematite alteration was observed, most of which occurred in the upper 6 m of the borehole.

Borehole IG_MWB01 – A total of 51 rock chip samples were collected from this borehole. All of the rock chip samples (100%) from this borehole were classified as tonalite.

Of the rock chips sampled, 96.1% of the samples were grey in colour while 3.9% of samples were described as grey-rust. The rust colour was associated with hematite alteration.

Of the rock chips sampled, 49.0% were described as being unaltered (A1) and 49.0% were described as being weakly altered (A2), while 2.0% of rock chip samples were described as moderately altered (A3). The moderately altered rock chip sample was collected from the 7 m to 8 m depth. Alteration was associated with hematite and a small amount of chlorite was also noted below the 82 m depth.

Borehole IG_MWB02– A total of 54 rock chip samples were collected from this borehole. All of the rock chip samples (100%) were classified as tonalite. There was a slight increase in the K-feldspar content from 72 m to 76 m, but the K-feldspar content remained too low to change the rock type classification.

The rock chip colour was consistent over the entire depth of the borehole with 100% of the samples being described as grey in colour.

There was no notable alteration in this borehole. All of the rock chip samples (100%) were described as unaltered (A1).

Borehole IG_MWB03 - A total of 54 rock chip samples were collected from this borehole. Of the rock chips sampled, 92.6% of samples were described as tonalite, 5.6% of samples as granite, and the remaining 1.8% of samples as amphibolite.

The rock chip colour was fairly consistent except for the amphibolite sample intersected at the 86 m to 88 m depth. Of the rock chips sampled, 98.1% were described as grey and 1.9% as black.

Of the rock chips sampled, 94.4% of samples were described as unaltered (A1). The remaining 5.6% of rock chip samples were described as slightly altered (A2). The alteration is associated with either trace amounts of hematite or trace amounts of chlorite. All slightly altered samples were intersected between the depth of 38 m and 52 m.

Borehole IG_MWC01 – A total of 54 rock chip samples were collected from this borehole. Of the rock chips sampled, 87.0% of samples were classified as tonalite and the remaining 13.0% of samples were classified as granite. Most of the granite samples were intersected in the upper 7 m of the borehole.

The rock chip colour typically varied from grey to pink. Of the rock chips sampled, 44.5% of samples were described as grey, 29.6% as grey-pink, 18.5% as pink, and the remining 7.4% of samples were described as red in colour. All the red coloured samples were intersected between the 24 m and 34 m depth and are associated with hematite and chlorite alteration.

Of the rock chips sampled, 57.4% were described as being unaltered (A1), 29.6% were described as being slightly altered, and the remaining 13.0% were described as being moderately altered (A3). The moderately altered samples were mostly intersected between depths of 20 m and 34 m.

Borehole IG_MWC02 – A total of 54 rock chip samples were collected from this borehole. Of the rock chips sampled, 88.9% were classified as tonalite and 7.4% as granite, all from a depth of 84 m to 96 m. The remaining 3.7% of samples were classified as syenite and intersected between 80 m and 84 m.

Of the rock chips sampled, 81.5% were described as grey in colour, 11.1% as grey-pink, and the remaining 7.4% of samples as being pink in colour. The majority of the grey-pink and pink coloured samples were intersected between the depths of 80 m and 96 m and were associated with hematite alteration.

Most of the rock chip samples (87.0%) were described as being unaltered (A1). The remaining 13.0% of rock chip samples were described as being slightly altered. The slightly altered samples were intersected between depths of 80 m and 94 m, with alteration associated with hematite and occasionally with chlorite.

Borehole IG_MWC03 – A total of 55 rock chip samples were collected from this borehole. All of the rock chip samples (100%) were classified as tonalite.

The rock chip samples varied in color from grey to pink. Of the rock chips sampled, 49.1% were described as grey, 30.9% as pink and the remaining 20.0% of samples were described as grey-pink.

Of the rock chips sampled, 56.3% of samples were described as unaltered (A1). The remaining 44% of the rock chip samples were described as being slightly altered. The alteration was observed to be associated with weak hematization which was present throughout the vast majority of the borehole.

4.3 Results

Results from drilling and logging activities were compiled and summarized into an as-built drawing for each monitoring well. Each final as-built provides a description of borehole construction details, logged geology over the drilled depth, and the location and ID of collected samples. Final as-builts are provided in Appendix A.

Additional borehole logging and borehole details were recorded on DQCFs and transcribed into the NWMO provided acQuire geodatabase importer csv templates. The templates provided to KGS Group for WPB

included IMP-02 Borehole Details_R1, IMP-04 Borehole Diameter Details_R1, IMP-05 Borehole Construction Details_R1 and IMP-16 Drilling Parameters_R1. These acQuire importer csv's were submitted as part of the data delivery package.

4.4 Quality Assurance

All work carried out through the duration of WPB was completed in accordance with the Project Quality Plan (APM-PLAN-01332-0390). As such, all relevant field activities and associated data were recorded in Data Quality Confirmation Forms (DQCF's) where appropriate. Additionally, Daily Site Activity (DSA) reports and Contractor Inspection forms were generated throughout the duration of WPB to provide a record of daily work activities and field conditions. All DQCFs were verified and signed-off according to the Project Quality Plan and provided to NWMO in the data delivery package for WPB.

Equipment and instrumentation calibrations were also recorded and were documented in the DSA reports. Equipment calibrations relevant to WPB activities included a digital weight scale, an RKI Eagle II gas monitor, and an AquaFluor Handheld Fluorometer. All WPB Quality Assurance documentation and data files were supplied in the final WPB data delivery.

Relevant DQCFs for WPB are summarized in 6 below.

TABLE 6: DATA QUALITY CONFIRMATION FORMS (DQCF) FOR WORK PACKAGE B

DQCF	Description
Borehole Logging Form	Provides all borehole logging data such as date and time, run number, sample ID's, sample interval, and geologic description (lithology, mineralogy, color, alteration). One (1) per borehole.
Drilling Record Form	Provides all borehole drilling data such as date and time, run information (number, interval length, top depth, bottom depth), water level if observed, and flow rate if applicable. One (1) per borehole.
Water Accounting Form	Provides data for when / if water was added to a borehole including: subject borehole, date and time of water added, volume added, date and time of water removal, and volume of water removed.
Surface Casing Installation	Provides a record of surface casing installation, including: • Casing specification • Grout specifications • Final installation details One (1) per wellbore.

4.5 Data Delivery

The final data delivery package was approved by NWMO on April 21, 2022. File naming conventions were in accordance with the PQP and the DMP. The final data delivery package included the following:

- Completed acQuire Importers
- Calibration Certificates
- Signed scans of all DQCFs and a digitized DQCFs
- Signed copies of all Daily Site Activity Reports specific to WPB
- Rock chip photos, categorized by borehole and phot files named accordingly.
- Completed data collection checklist
- Supporting metadata file

5.0 WPC – GEOPHYSICAL LOGGING

5.1 Overview

The primary object of WPC, Geophysical Logging, was to acquire a continuous suite of geophysical logs in each borehole. Activities involved in WPC completion included data acquisition, data processing, documentation of quality assurance procedures (field calibrations / testing, acquisition procedures, etc.), and final data delivery. Interpretation of geophysical logs was not included in the scope of WPC.

KGS Group served as the constructor for all WPC activities and acted as the manager / field supervisor and Quality Assurance and Control for geophysical logging subcontractor, DGI Geosciences Inc. (DGI). DGI was responsible for all logging services, including the supply of all equipment required for geophysical logging, completion of data acquisition, completion of data processing, and data delivery.

Further details regarding the scope of WPC can be found in the associated Test Plan (APM-PLAN-01332-0396).

5.2 Field Activities and Methodology

Work Package C field activities were completed in two campaigns: campaign one was completed at IG_MWB between June 30, 2021 and July 4, 2021 and campaign two began July 21, 2021 at IG_MWA and finished July 27, 2021 at IG_MWC. Work included the acquisition of geophysical data and the subsequent processing / delivery of collected data. A review of completed work is provided in the sections below.

5.2.1 GEOPHYSICAL LOGGING

Geophysical logging activities began on June 30, 2021 at IG_MWB03 and were completed July 27, 2021 at IG_MWC03. The same methodology was used to acquire data in all boreholes, and included the setup of equipment at the borehole location, testing of each probe pre / post logging, and data acquisition.

Equipment setup was completed both at the onset of each day and / or for any new borehole location. Equipment setup remained the same for all boreholes and involved:

- Positioning of geophysical logging vehicle in line with the wellbore.
- Attachment of wireline pully system to surface casing with strapping.
- Positioning and securing of wireline winch in geophysical logging vehicle.
- Startup of generator and all electronics required for logging (logging computer and logging box).
- Connection of logging box to winch and odometer.
- Measurement and recoding of surface casing height (only once per borehole).
- Measurement and recording of distance from winch to surface casing.

Following equipment setup, borehole logging was commenced. A total of five (5) geophysical probes were run in each wellbore (Table 7), with the acquisition order of each based predominantly on available time and tool logging speed. For all wellbores however, the 3-Arm Mechanical Caliper was acquired first to ensure no obstructions were present and verify end of hole depth. Use of the 3-Arm caliper to determine hole conditions was necessitated due to the loss of the “Dummy Probe” in IG_MWB01 at the onset of the first

logging campaign. Several attempts were made to recover the lost probe; however, none were successful, and the probe was isolated at the bottom of the wellbore using bentonite prior to well construction.

TABLE 7: GEOPHYSICAL PROBES LOGGED

Probe	Serial Number	Description
2PEA-1000/F	2724	Measures formation resistivity, single point resistance, self-potential, natural gamma, fluid resistivity, and fluid temperature
Q40-CAL	6109	Measures borehole diameter using three linked arms positioned against the wellbore wall
HFP-2293	8109	Measures both direction and flow rate of fluid within the borehole
QL40 OBI-2G	202001	Captures a continuous 360° unwrapped image of the borehole wall
QL40 ABI 2G	201905	Measures a continuous 360° unwrapped acoustic profile of the borehole wall

During logging, each probe was acquired using the logging parameters outlined in the WPC Test Plan and summarized in Table 8. The intervals logged were dependant on the probe being used and the borehole construction. Probes requiring fluid (i.e. resistivity meter, heat pulse flow meter, and acoustical televiewer) could only be used over the water filled interval of each borehole. Whereas, the resistivity probe could only be run in the uncased portion of each borehole (independent of water level).

Regardless of specific probe parameters, general logging steps for all boreholes included:

- Completion and documentation of pre-run calibration and/or system checks.
- Positioning of logging tool at top of casing and recording of pre-run zero depth value.
- Acquisition of data at pre-determined logging speed and sampling rate.
- Acquisition of repeat data as specified in test plan.
- Repositioning of logging tool at top of casing and recording of post-run zero depth value.
- Completion and documentation of required post-run calibration and/or system checks.

Further details on logging methodology for individual probes can be found in the WPC Geophysical Logging Test Plan APM-PLAN-01332-0396.

TABLE 8: GEOPHYSICAL LOGGING SUMMARY

Borehole	Probe	Date Logged	Logging Speed [m/min]	Sample Interval [m]	Winch	Logged Interval [m]
IG_MWA01	Resistivity (2PEA-1000)	July 23, 2021	5	0.05	MSI-MXC 1000 m	9.11 – 98.56
	Mechanical Caliper (QL40-CAL)	July 23, 2021	5	0.05	MSI-MXC 1000 m	1.46 – 99.70
	Heat Pulse Flow Meter (HFP-2293)	July 24, 2021	N/A	5	MSI-MXC 1000 m	5.0 – 95.0
	Optical Televiewer (QL40 OBI-2G)	July 23, 2021	3	0.0016	MSI-MVB 480 m 4-Core	1.39 – 98.51
	Acoustic Televiewer (QL40 ABI 2G)	July 24, 2021	1.3	0.0021	MSI-MVB 480 m 4-Core	6.0 – 97.30
IG_MWA02	Resistivity (2PEA-1000)	July 21, 2021	5	0.05	MSI-MXC 1000 m	8.97 – 99.61
	Mechanical Caliper (QL40-CAL)	July 21, 2021	5	0.05	MSI-MXC 1000 m	1.33 – 99.65
	Heat Pulse Flow Meter (HFP-2293)	July 22, 2021	N/A	5	MSI-MXC 1000 m	5.0 – 98.0
	Optical Televiewer (QL40 OBI-2G)	July 21, 2021	3	0.0016	MSI-MVB 480 m 4-Core	1.23 – 98.50
	Acoustic Televiewer (QL40 ABI 2G)	July 21, 2021	1.2	0.0021	MSI-MVB 480 m 4-Core	6.0 – 91.01
IG_MWA03	Resistivity (2PEA-1000)	July 22, 2021	5	0.05	MSI-MXC 1000 m	9.16 – 98.51
	Mechanical Caliper (QL40-CAL)	July 22, 2021	5	0.05	MSI-MXC 1000 m	1.52 – 99.70

Borehole	Probe	Date Logged	Logging Speed [m/min]	Sample Interval [m]	Winch	Logged Interval [m]
	Heat Pulse Flow Meter (HFP-2293)	July 23, 2021	N/A	5	MSI-MXC 1000 m	5.0 – 98.0
	Optical Televiewer (QL40 OBI-2G)	July 23, 2021	3	0.016	MSI-MVB 480 m 4-Core	1.32 – 98.51
	Acoustic Televiewer (QL40 ABI 2G)	July 22, 2021	1.3	0.0021	MSI-MVB 480 m 4-Core	5.90 – 98.50
IG_MWB01	Resistivity (2PEA-1000)	July 02, 2021	5	0.05	MSI-MXC 1000 m	8.88 – 98.03
	Mechanical Caliper (QL40-CAL)	July 01, 2021	5	0.05	MSI-MXC 1000 m	1.23 – 99.0
	Heat Pulse Flow Meter (HFP-2293)	July 03, 2021	N/A	5	MSI-MXC 1000 m	5.0 – 98.0
	Optical Televiewer (QL40 OBI-2G)	July 02, 2021	4	0.016	MSI-MXC 1000 m	1.27 – 98.01
	Acoustic Televiewer (QL40 ABI 2G)	July 02, 2021	0.9	0.0021	MSI-MXC 1000 m	1.51 – 98.01
IG_MWB02	Resistivity (2PEA-1000)	July 04, 2021	5	0.05	MSI-MXC 1000 m	9.18 – 98.02
	Mechanical Caliper (QL40-CAL)	July 03, 2021	5	0.05	MSI-MXC 1000 m	1.58 – 99.4
	Heat Pulse Flow Meter (HFP-2293)	July 04, 2021	N/A	5	MSI-MXC 1000 m	18.0 – 98.02
	Optical Televiewer (QL40 OBI-2G)	July 03, 2021	4	0.016	MSI-MXC 1000 m	1.64 – 97.01

Borehole	Probe	Date Logged	Logging Speed [m/min]	Sample Interval [m]	Winch	Logged Interval [m]
	Acoustic Televiewer (QL40 ABI 2G)	July 03, 2021	1	0.0021	MSI-MXC 1000 m	18.5 – 98.51
IG_MWB03	Resistivity (2PEA-1000)	June 30, 2021	5	0.05	MSI-MXC 1000 m	8.80 – 98.52
	Mechanical Caliper (QL40-CAL)	June 30, 2021	5	0.05	MSI-MXC 1000 m	1.13 – 99.5
	Heat Pulse Flow Meter (HFP-2293)	July 01, 2021	N/A	5	MSI-MXC 1000 m	5 – 98.0
	Optical Televiewer (QL40 OBI-2G)	June 30, 2021	0.016	4	MSI-MXC 1000 m	1.25 – 98.5
	Acoustic Televiewer (QL40 ABI 2G)	July 01, 2021	0.9	0.021	MSI-MXC 1000 m	1.39 – 98.5
IG_MWC01	Resistivity (2PEA-1000)	July 24, 2021	5	0.05	MSI-MXC 1000 m	9.14 – 99.09
	Mechanical Caliper (QL40-CAL)	July 24, 2021	5	0.05	MSI-MXC 1000 m	1.50 – 100.45
	Heat Pulse Flow Meter (HFP-2293)	July 25, 2021	N/A	5	MSI-MXC 1000 m	5.0 – 99.0
	Optical Televiewer (QL40 OBI-2G)	July 25, 2021	3	0.016	MSI-MVB 480 m 4-Core	1.40 – 99.0
	Acoustic Televiewer (QL40 ABI 2G)	July 25, 2021	1.3	0.0021	MSI-MVB 480 m 4-Core	6.0 – 99.02

Borehole	Probe	Date Logged	Logging Speed [m/min]	Sample Interval [m]	Winch	Logged Interval [m]
IG_MWC02	Resistivity (2PEA-1000)	July 27, 2021	5	0.05	MSI-MXC 1000 m	9.11 – 99.36
	Mechanical Caliper (QL40-CAL)	July 26, 2021	5	0.05	MSI-MXC 1000 m	1.47 – 100.49
	Heat Pulse Flow Meter (HFP-2293)	July 27, 2021	N/A	5	MSI-MXC 1000 m	10.0 – 99.0
	Optical Televiewer (QL40 OBI-2G)	July 27, 2021	3	0.016	MSI-MVB 480 m 4-Core	5.99 – 99.27
	Acoustic Televiewer (QL40 ABI 2G)	July 27, 2021	1.3	0.0021	MSI-MVB 480 m 4-Core	7.20 – 99.25
IG_MWC03	Resistivity (2PEA-1000)	July 26, 2021	5	0.05	MSI-MXC 1000 m	9.01 – 99.36
	Mechanical Caliper (QL40-CAL)	July 25, 2021	5	0.05	MSI-MXC 1000 m	1.33 – 100.40
	Heat Pulse Flow Meter (HFP-2293)	July 26, 2021	N/A	5	MSI-MXC 1000 m	5.0 – 99.0
	Optical Televiewer (QL40 OBI-2G)	July 26, 2021	3	0.016	MSI-MVB 480 m 4-Core	1.31 – 99.50
	Acoustic Televiewer (QL40 ABI 2G)	July 26, 2021	1.3	0.0021	MSI-MVB 480 m 4-Core	5.99 – 99.25

5.3 Data Processing

All data processing was completed by DGI Geoscience personnel in office with no pre-processing completed in field. At the end of each day, all collected data was uploaded in raw format to a secure server and was subjected to initial processing and quality control within 24 hours by DGI staff. Following quality control checks, preliminary processing was completed to generate interim logs for WPD activities. Final processing

was completed after the conclusion of all field activities, and final logs were delivered with all associated documentation and data once finished. General processing steps for each log are provided in Table 9.

TABLE 9: SUMMARY OF GEOPHYSICAL PROCESSING

Probe	Processing Summary
2PEA-1000/F (Resistivity)	General QA/QC (data gaps, excessive errors, repeatability checks, etc.), depth correction, spike removal/filtering (if required).
Q40-CAL (3-Arm Caliper)	General QA/QC (data gaps, excessive errors, repeatability checks, etc.), depth correction, spike removal/filtering (if required).
HFP-2293 (Heat Pulse Flow Meter)	Average and standard deviation calculations for repeated measurements, flow rate calculations, depth correction.
QL40 OBI-2G (Optical Televiewer)	General QA/QC (data gaps, excessive errors, repeatability checks, etc.), removal of magnetic interference, depth correction, spike removal/filtering (if required), azimuth interpolation (if required), borehole deviation analysis via minimum curvature.
QL40 ABI 2G (Acoustic Televiewer)	General QA/QC (data gaps, excessive errors, repeatability checks, etc.), removal of magnetic interference, depth correction, spike removal/filtering (if required), azimuth interpolation (if required), borehole deviation analysis via minimum curvature.

5.3.1 PRELIMINARY DATA

Preliminary processing was carried out shortly after data acquisition and was completed to support subsequent WPD activities. Resultant logs were delivered within 7 days of acquisition and were used primarily to identify suitable zones for packer testing and to select final intervals for monitoring well screens. Due to the need for accurate interval / screen zone values, preliminary processing was focused on depth corrections and accuracy. Preliminary logs were delivered via digital transfer and were provided in both WellCAD and PDF formats.

5.3.2 FINAL DATA

Final data processing was carried out for all boreholes following the completion of field activities. Data for individual probes were processed in accordance with those procedures outlined in the WPC Test Plan, with general processing involving depth corrections, removal of spikes and spurious data points, and the application of select filters. Final data processing also included the creation and delivery of logs in appropriate file formats as specified in both the WPC Test Plan (APM-PLAN-01332-0396) and the Data Management Plan (APM-PLAN-01332-0391).

5.4 Results

Final data was combined to generate a set of composited well logs in PDF format for each borehole (Appendix B). Additionally, all accompanying processed and raw data was delivered with the final composite

logs and was provided in file formats appropriate for each probe. A summary of generated file types and a general description of each is provided in Table 10.

TABLE 10: RAW AND PROCESSED FILE TYPES FOR WPC DATA

File	Description
.las	Log ASCII Standard files for both raw and final processed logging data
.wcl	WellCAD files containing final composite logs
.rd	Tool specific files for 2PEA-1000 probe raw logging data
.tfd	Tool files containing raw logging data
.mh	Tool specific files for HFP-2293 probe raw logging data

5.5 Quality Assurance

All work carried out through the duration of WPC was completed in accordance with the Project Quality Plan (APM-PLAN-01332-0390). As such, all relevant field activities and associated data were recorded in Data Quality Confirmation Forms (DQCFs) where appropriate. Additionally, Daily Site Activity (DSA) reports and DQCFs were generated throughout the duration of WPC to provide a record of daily work activities and data quality.

All geophysical probes were tested throughout the duration of project activities to ensure proper operation and accurate data collection. Completed testing included premobilization bench testing prior to field activities and pre- and post-logging functionality /calibration tests on site at all borehole locations. Data and results from testing / calibrations were recorded in appropriate file formats and documented in DQCFs. Both wireline winches used during logging were also checked for proper operation at the start of each field campaign, with depth encoder functionality verified and recorded in appropriate field forms. The Pre-mobilization Bench Testing Reports and Quality Confirmation Reports for all the geophysical probes used to complete WPC activities are provided in Appendices C-1 and C-2.

All WPC Quality Assurance documentation and data files were supplied in the final WPC data delivery. Relevant DQCFs for WPC are summarized in Table 11 below.

TABLE 11: DATA QUALITY CONFIRMATION FORMS (DQCF) FOR WORK PACKAGE C

DQCF	Description
Daily Quality Control Record	Provides a summary of data acquired (number of runs, interval logged, etc.) and associated data quality. One (1) per tool per borehole.
Probe Field Test Record	Provides a summary of field test results. One (1) per tool per borehole.
Daily Record of Geophysical Logging	Provides a summary of geophysical data acquired each day including runs completed, observed data quality, and interval logged. One (1) per day.

DQCF	Description
Winch Odometer Record Form	Provides a summary of winch odometer field testing results. One (1) per winch per field campaign.
Premobilization Bench Test Form	Provides a summary of probe calibration and functionality testing completed prior to mobilization. One (1) per geophysical probe.

5.6 Data Delivery

The final data delivery package was approved by NWMO on May 16, 2022. File naming conventions were in accordance with the PQP and the DMP. The final data delivery package included the following:

- All final and raw geophysical logging data with supporting files in various formats (.bmp, .las, .csv, .pdf, .png, .wcl, .rd, .tfd, .mh, .docx, .xlsx, .tol, .sub)
- Completed Data collection checklist
- Completed DQCFs
- Supporting metadata file

6.0 WPD – GROUNDWATER MONITORING WELL INSTALLATION AND HYDRAULIC TESTING

6.1 Overview

The primary objective of Work Package D, Groundwater Monitoring Well Installation and Hydraulic Testing, was to install a Waterloo multilevel monitoring well system by Solinst in all nine (9) boreholes drilled during WPB and complete hydraulic testing. Hydraulic testing comprised of packer testing of targeted intervals within each borehole based on the WPC geophysical information and to complete hydraulic testing of each multilevel interval after the multi-level monitoring well was installed and developed. Activities associated with WPD included completion of hydraulic testing in select open boreholes via a double packer pneumatic system, installation of a Waterloo multilevel monitoring system in each borehole, completion of hydraulic testing of each interval using the installed Solinst Waterloo monitoring equipment, processing and analysis of collected data and data reporting.

KGS Group served as the primary constructor for all WPD activities and was responsible for:

- Procurement and installation of all monitoring well infrastructure.
- Completion of all hydraulic testing.
- Analysis and interpretation of hydraulic testing results.

In addition, KGS Group was the site supervisor for their subcontractor Maple Leaf Drilling (MLD). MLD was responsible for providing, installing, and operating the double packer assembly, as well as assisting with the installation of monitoring well infrastructure and supply and installation of backfill materials.

All DQCFs developed to record data and measurements are included in Appendix I.

6.2 Field Activities and Methodology

Field activities were completed over two separate mobilizations, with field work at Site IG_MWB occurring between July 15 and August 02, 2021 and at Sites IG_MWA and IG_MWC occurring between September 09 and October 02, 2021. Two mobilizations were required due to supplier/manufacturer delays caused by raw material shortages of the Solinst Waterloo well casing. Completion of Site IG_MWB was prioritized by the project team so that planned field activities by others would not be negatively impacted.

WPD field activities were divided into three stages of work: Stage 1 – Pre-Multilevel Installation Hydraulic Testing, Stage 2 – Installation of Solinst Waterloo Multilevel monitoring wells and Stage 3 – Well Development and Multilevel Hydraulic Testing. Table 12 below summarizes the keys dates of the three stages.

TABLE 12: SUMMARY OF WPD KEY DATES

Borehole	Stage 1		Stage 2		Stage 3
	Packer Testing Start	Parker Testing End	Well Install Start	Well Install End	Multilevel Hydraulic Testing
IG_MWA01	September 10, 2021	September 11, 2021	September 16, 2021	September 24, 2021	September 29 to October 01, 2021
IG_MWA02	Not Tested	Not Tested	September 09, 2021	September 24, 2021	September 29 to 30, 2021
IG_MWA03	September 11, 2021	September 12, 2021	September 13, 2021	September 26, 2021	September 30 to October 01, 2021
IG_MWB01	July 15, 2021	July 16, 2021	July 19, 2021	July 26, 2021	July 30 to August 01, 2021
IG_MWB02	Not Tested	Not Tested	July 17, 2021	July 20, 2021	July 30 to August 01, 2021
IG_MWB03	July 16, 2021	July 17, 2021	July 18, 2021	July 24, 2021	July 27 to August 01, 2021
IG_MWC01	September 13, 2021	September 14, 2021	September 21, 2021	September 26, 2021	September 29 to 30, 2021
IG_MWC02	September 15, 2021	September 16, 2021	September 23, 2021	September 28, 2021	September 29 to 30, 2021
IG_MWC03	September 16, 2021	September 17, 2021	September 23, 2021	September 27, 2021	September 29 to 30, 2021

6.2.1 STAGE 1 PRE-MULTILEVEL INSTALLATION HYDRAULIC TESTING

Pre-multilevel installation hydraulic testing was conducted in seven (7) of the nine (9) open boreholes using a double packer assembly with a fixed spacing interval of 1.8 m. This initial hydraulic testing using a double-packer pneumatic slug induction system was proposed by KGS Group to ensure that higher hydraulic conductive zones could be adequately tested because the Waterloo multilevel system double-valved pumping system components have a maximum limit on flow rate of 250 mL/min for inducing a change in head that is measurable for hydraulic conductivity estimation and assessment.

KGS Group and Subject Matter Experts from NWMO (the project team) met twice prior to mobilizing to the field for WPD, to review the geophysical logging results from WPC to decide which borehole and which geological features would be hydraulically tested using the packer system. Two (2) boreholes, IG_MWA02 and IG_MWB02 were not tested, using the packer system, because the project team decided that the data did not indicate fractures/features with hydraulic conductivity characteristics likely to be of higher flows for testing. Preference for packer testing was given to potentially higher hydraulic conductivity (K) zones such as

open fractures, contact zones and water inflows observed during drilling. The team used WPC geophysical data to assist with selection of testing zones, which included geophysical logs such as optical and acoustic televiewers, heat pulse flow meter readings, caliper, resistivity and drilling records. A total of seven zones were identified for hydraulic packer testing. Table 13 below summarizes the criteria and observations made for each zone selected.

TABLE 13: MONITORING WELL DESIGN CRITERIA

Borehole ID	Packer Testing Targets		Rationale						
	Top of Target Zone (m)	Bottom of Target Zone (m)	Heat Pulse Flow Meter (HPFM)	OTV	ATV	Caliper	SP Resistivity (SP)	Drilling Records	Zone Selected for Testing (Y/N)
IG_MWA01	12.2	14	Little to no flow observed	Open fracture	Open fracture	Change in diameter	Slight change measured	Field flow measurement (3.4 L/min)	Y
IG_MWA02	No packer test planned		-	-	-	-	-	-	N
IG_MWA03	40.6	42.4	Little to no flow observed	SH fracture set observed	SH fracture set observed	Yes, a change is measured	Slight decrease observed	1.2L/min was measured during drilling	Y
IG_MWB01	7.6	8.4	2.4 L/min flow	Open fracture observed below bottom of casing	Clearly an open fracture	Significantly more open	Small increase in SP	Inflow observed at 8 mbgs	Y
IG_MWB02	74.8	75.2	4.8 L/min	Partially open HF	Clearly indicates a HF	Slight change seen	Deviation of the trend line observed	No water observed while drilling, only when completed, 0.5 m/24 hours	N
	94.8	97.8	Little to no flow measured	Cloudy, but fracture is visible	Two fractures are very clearly seen	Yes, increase in BH diameter observed	Yes, spike in SP values	No inflow observed	N
IG_MWB03	83.6	85.4	Little to no flow measured	Contact at amphibolite lens	Yes, open fracture	Yes, change in BH diameter	Yes, spike in SP values	No inflow observed during drilling below 46 to 48 mbgs	Y
IG_MWC01	90	91.8	Slight outflows measured	H fracture observed	H fracture observed	Slightly open fracture measured	Slight change observed	Nothing observed	Y
IG_MWC02	93	94.8	Small outflows measured	SH fracture observed	SH fracture observed	Slightly open fracture measured	Increase in SP Resistivity observed	Nothing observed	Y
IG_MWC03	70.4	72.2	Some outflow was measured	SH fracture observed	SH fracture observed	Slight open fracture measured	No change observed	Nothing observed	Y
		Key:	H	Horizontal					
			SV	Sub-vertical					
			SH	Sub-horizontal					

The slug testing in the open boreholes used a double packer assembly that induces change in water column heads pneumatically by either pressurization or vacuum. The system was adapted and tested by Patrick Quinn of the University of Guelph, as referenced in his thesis "High Resolution Packer Testing in Fractured Sedimentary Rock" (2009). The slug testing system was adapted and designed to conduct slug testing using a pneumatic system in low permeability bedrock fracture zones. A significant advantage to the system and method is that the system does not require the injection or removal of formation water, which is an important project requirement. The packer assembly also allows for pressures to be monitored above, below and inside the test interval using fixed non-vented vibrating wire pressure transducers with a dedicated datalogger recording measurements at 2 second intervals. Details of the packer assembly and specific methodologies used are detailed in Section 3.3 of the test plan (APM-PLAN-01332-0397).

Equipment setup and hydraulic slug testing included the steps listed below, and observations and measurements were recorded in Data Quality Confirmation Forms (DQCF05 and DQCF06, see Section 6.6) :

- Double packer was assembled at surface with a vibrating wire transducer fixed above and below the packer assembly and a third transducer fixed within the testing zone (space between the two packers).
- The entire packer assembly was disinfected using an isopropyl alcohol solution and rinsed with distilled water and wiped down with clean disposable paper towels.
- Vibrating wire transducers were calibrated following the manufacturer's instructions and dataloggers prepared and tested prior to lowering the unit down the borehole.
- Calculations for minimum packer inflation pressure and the number of rods required to achieve the targeted depth were completed.
- Packer assembly was lowered to the target depth using a mobile winch truck owned and operated by Maple Leaf Drilling Ltd.
- When the target depth was reached, the packer assembly was left suspended in the water column to stabilize from the water displaced from lowering the unit prior to inflating the packers. Stabilization was monitored using the transducers. Stabilization was accepted after the transducers measured three equal readings 5 minutes apart.
- Once the transducers had stabilized in the open borehole, the packers were inflated to the pressure required to seal against the borehole walls as well as, overcome the pressure head of the water column. Again, the assembly was left to stabilize until three consecutive readings at 5-minute intervals indicated no changes.
- The hydraulic test was initiated using a small air compressor that pressurized the test interval increasing the pressure of the test interval and water flows out of the pipe and into the formation. Once the pressure applied to the water column of the test zone had stabilized, the pressure was released at surface, inducing an instantaneous displacement out of the formation into the pipe, effectively creating a rising head test and this displacement/recovery was recorded with the vibrating wire transducer datalogger.
- When the recovery to static conditions was relatively quick (e.g. <30 minutes), more than one rising head test was able to be conducted to demonstrate repeatability and improve data confidence. At least two rising head tests were completed in each borehole.

- Before removal of the packer assembly equipment and advancing to the next borehole, the preliminary data was verified in the field by the technical lead for completeness (e.g. the entire displacement and recovery cycle was recorded and saved) and recovery to static conditions was complete.
- These steps were followed for each subsequent test.
- DQCF001, DQCF02, DQCF03, DQCF04, DQCF05 and DQCF06 were used to record the measurements and observations of the steps described above and have been provided as part of the WPD Data Delivery to NWMO, are described on Table 17 of Section 6.6 and included in Appendix I.

6.2.2 STAGE 2 MULTILEVEL MONITORING WELL ASSEMBLY AND INSTALLATION

The installation of the Solinst Waterloo multilevel monitoring well system occurred at Site IG_MWB boreholes between July 15 and August 1, 2021, and at Sites IG_MWA and IG_MWC between Sept 11 and October 01, 2021. The target depths of each monitoring port and thickness of sand packs for each monitoring well were decided by KGS Group and the NWMO Subject Matter Experts (SMEs), the project team in two separate monitoring well design workshops held on July 9th, 2021 and August 19, 2021. To determine the design intervals, the team used the geophysical logs, mainly optical and acoustic tele viewers and caliper logs for determining the monitoring interval design details.

For each multilevel installation, an installation plan was prepared in the field by the technical lead using DQCF07 to calculate the optimal combination of well casing lengths needed to ensure that the depth of the monitoring port was installed close to the planned depths. This was required because the well casing was provided by the supplier in fixed lengths of 1ft, 2ft and 5ft and as such the total lengths of casing needed to be pre-calculated to ensure monitoring interval depth targets were able to be achieved before assembly started. All quantities of components used to construct each multilevel well were recorded on DQCF07 which was used to develop the well construction log provided in Appendix A using gINT. Table 14 summarizes the final as-built multilevel monitoring well construction details.

TABLE 14: SUMMARY OF MULTILEVEL MONITORING WELL INSTALLATIONS

Well	Interval ID	Port	VW Serial Number	VW Pressure Rating	Port Depth [mbgs]	Top of Sand Pack [mbgs]	Bottom of Sand Pack [mbgs]	Sand Pack Thickness [m]
IG_MWA01	C	Port 1	2120835	350 kPa	13.25	12.77	13.57	0.80
	B	Port 2	2125472	700 kPa	54.55	53.29	55.61	2.32
	A	Port 3	2123768	1 MPa	62.02	61.44	62.54	1.10
IG_MWA02	C	Port 1	2120829	350 kPa	10.45	9.41	12.35	2.94
	B	Port 2	2125473	700 kPa	42.07	40.50	43.06	2.56
	A	Port 3	2123769	1 MPa	87.99	85.92	88.84	2.92

Well	Interval ID	Port	VW Serial Number	VW Pressure Rating	Port Depth [mbgs]	Top of Sand Pack [mbgs]	Bottom of Sand Pack [mbgs]	Sand Pack Thickness [m]
IG_MWA03	C	Port 1	2120833	350 kPa	25.50	24.59	25.99	1.40
	B	Port 2	2125475	700 kPa	40.89	39.99	42.55	2.56
	A	Port 3	2123773	1 MPa	84.94	84.39	86.64	2.25
IG_MWB01	C	Port 1	2120831	350 kPa	7.98	7.40	8.70	1.30
	B	Port 2	2120828	350 kPa	31.67	31.07	32.37	1.50
	A	Port 3	2125477	700 kPa	68.39	66.24	70.37	4.13
IG_MWB02	C	Port 1	2125478	700 kPa	52.21	51.70	53.00	1.30
	B	Port 2	2125471	700 kPa	63.97	63.03	64.98	1.95
	A	Port 3	2123765	1 MPa	95.29	94.40	97.35	2.95
IG_MWB03	C	Port 1	2120836	350 kPa	22.55	21.31	23.29	1.98
	B	Port 2	2125476	700 kPa	43.17	41.91	44.01	2.10
	A	Port 3	2123770	1 MPa	84.88	83.21	85.71	2.50
IG_MWC01	C	Port 1	2120830	350 kPa	25.98	25.25	26.65	1.40
	B	Port 2	2125470	700 kPa	55.70	54.65	56.53	1.89
	A	Port 3	2123767	1 MPa	91.21	89.96	92.61	2.65
IG_MWC02	C	Port 1	2120832	350 kPa	11.46	9.93	12.17	2.24
	B	Port 2	2125474	700 kPa	68.61	67.38	69.27	1.89
	A	Port 3	2123766	1 MPa	93.75	93.08	94.45	1.37
IG_MWC03	C	Port 1	2120834	350 kPa	39.27	37.94	40.09	2.15
	B	Port 2	2123772	1 MPa	62.28	61.36	63.18	1.82
	A	Port 3	2123771	1 MPa	71.58	70.92	72.28	1.36

For backfilling, depths of the bentonite and sand were measured in the field using a combination of two types of measuring devices. The primary device was a tag-line the was a 110 m long length of 9.52 mm ID (3/8 inch) High Density Polyethylene (HDPE) tubing, with a 2 m long steel rod attached to the bottom of the tubing for weight. In the field, the tubing was laid out along the ground in a straight line and a 60 m long steel tape measure was used to mark every 5 m along the tubing. The second depth measuring device was a 100 m

Solinst tag line with etched markings every centimeter. This was used to check against and verify the primary tag line.

Field Challenges

The following challenges were encountered in the field during the multilevel monitoring well assembly and installation.

Deviation of the Planned Monitoring Intervals of IG_MWA02

During the installation of multilevel IG_MWA02, it was discovered that the initial depth to bottom used to calculate the length of well casing needed did not agree with the calculated length of well casing above ground stickup height (i.e. the length of well casing above ground at the end of the installation was higher than calculated). This resulted in the monitoring port depths and sand pack intervals being higher than planned by 0.81 m for IG_MWA02_A, 0.72 m for IG_MWA02_B and 0.75 m for IG_MWA02_C once well construction was completed. KGS Group was able to test each of the monitoring ports by purging them three times over 3 days and recording pressure head measurements and volumes purged, proving that each of the zones responded to pumping and would be able to be sampled in the future. KGS Group then revised the as-built depths based on pressure readings and revised that backfill interval depths and recorded on the DQCF. KGS Group presented the deviations to NWMO and accepted based on the evidence provided (i.e. each zone fully recovered each time it was purged).

Tagline Verification

The above noted discrepancy between the actual length of well casing installed and calculated length of well casing initiated a series of field checks and verifications of the tools used to measure downhole. KGS Group began by checking and verifying the 5 m intervals marked on the PEX tubing using a survey grade steel measuring tape stretched out on the ground and comparing the measuring tape to the markings on the PEX tubing. Any changes were noted in the field file and clearly remarked on the PEX tubing. A second Solinst tagline with factory gradations was also borrowed from NWMO as a secondary verification of the PEX tubing. However, the 100 meter Solinst tagline was not able to measure depth to bottom of the open boreholes as all boreholes were over drilled to at least 100.5 m depth.

Change in Methodology for Multilevel Design Process

Initially, the multilevel design calculations were based on the measured depth to bottom, which ensured that the multilevel casing would be placed on the bottom of the borehole and built from the bottom upwards. After the deviation to the installation of IG_MWA02, KGS Group changed the design process for calculating well casing quantities to not be dependent on the depth to bottom measurement. Instead, the calculation to determine the quantity of casing lengths assumed that the depth to bottom of the borehole was always 100 m below ground surface. This ensured that when the entire length of well casing had been lowered down the borehole, it could be held in place (suspended) at surface until backfill materials (filter sand and bentonite) could be placed to effectively secure the well casing so that the monitoring ports would all be at their target depths.

Installation Methodology

The Waterloo multilevel monitoring well system by Solinst was installed in each of the nine boreholes following the manufacturer's instructions as provided in Appendix C of the WPD Test Plan APM-PLAN-01332-0397. The installation sequence was as follows: well assembly, monitoring port preparation and installation, backfilling of the borehole annulus, and wellhead completion. The methodology used in the installation is described in the following sections and a photo log showing key steps is provided in Appendix F.

Well Assembly

The following steps were followed during the assembly of the multi-level monitoring wells:

- All required quantities of equipment and components of the monitoring well infrastructure were arranged near the borehole as per the field well construction plan.
- Plastic sheeting (minimum 3 ft wide) was laid out to a length of approximately 110 m to provide a clean surface on which the system was assembled (Photos 1 and 2).
- A distance equal to the design depth of the bottom monitoring port was be measured out from the borehole along the plastic sheeting, and a reference marker was placed; this reference point was used to determine tubing length during port installation.
- An installation clamp was installed on the surface casing to hold the assembled portion of the monitoring well in place as the well was being constructed (Photo 3).
- Before each length of casing was joined, the installers checked to ensure the rubber O-ring was in place.
- Well casing was assembled and installed following this sequence:
  - Installed a base plug on the first section of casing and lowered into the borehole and secured in place using the installation clamp.
  - Additional sections of casing were added by joining them joined to the previously installed length of casing held within the installation clamp; the assembled portion was then lowered into the borehole and clamped in place ready for the next length of well casing (Photo 4).
  - Assembly continued in this manner until the pre-determined design depth of the bottom port was reached.
  - Well casing centralizers were installed every two lengths of casing added (approximately 3.3 meters or 10 ft) to ensure the well casing was centered in the borehole.

Monitoring Port Preparation and Installation

The following steps were followed during the preparation and installation of monitoring ports:

- A zero reading was taken for all VWs by placing them in a bucket filled with distilled water and let to soak for a minimum of 30 minutes or until stabilization is achieved (Photo 5).
- The VW transducer was removed from the bucket, a zero value was recorded which was compared to the factory zero value to ensure that the two did not differed by more than 0.1%, the zero reading was recorded on DQCF07.
- The VW was connected to the stainless-steel port stems and the VW wire was uncoiled the full length equal to the reference marker prepared in the steps above (Photo 6).
- The pump and associated tubing was installed onto the stainless-steel port as per the Solinst manual (Photo 7).
- The remaining casing sections and stainless-steal ports were assembled and installed:

  - Individual sections of casing were connected and threaded over the VW cable and sample/drive tubing (Photo 7).
  - Assembled and 'threaded' sections of casing were joined to the previously installed portion of casing held within the installation clamp; the joined sections were then lowered into the borehole and clamped in place once again (Photos 8 and 9).
  - Remaining stainless steel ports with corresponding VW and double valve pumps were installed at their specified design depths following these procedures; however, drive and sample tubing lengths for each subsequent ports were referenced to the bottom port tubing instead of the previously used reference marker.
- The monitoring equipment was tested prior to backfilling to ensure proper connections and performance, including:
  - All VWs were checked and compared against a manual depth to water measurement and recorded on DQCF07.
  - All pumps were checked for proper pumping discharge; all discharge water was captured and disposed of at a licensed waste disposal facility (Photos 10 and 11).

Backfilling of the Borehole Annulus

The borehole annulus was backfilled starting from the bottom, the following steps were followed during the backfilling of each borehole annulus:

- The depth and thickness of each sand pack and bentonite zones was determined in the previously mentioned multilevel design workshops.
- Placement of clean silica sand was done by hand from surface. The sand was allowed to settle naturally, with depth measurements monitored and recorded using a weighted tag line.
- Coated slow hydrating ¼-inch bentonite pellets were used to seal between each of the port intervals. The pellets were placed by hand from surface and allowed to settle naturally, with depth measurements monitored and recorded using a weighted tag line. These pellets were used between each of the monitoring intervals. However, once the shallowest monitoring zone sand pack had been placed, a minimum 2.0 m thick layer of pellets was placed with the remaining borehole annulus sealed with a bentonite grout mixture to surface using a tremie line and grout pump.
- Backfilling progress and the depth of each bentonite seal and sand pack zone was monitored/verified using the weighted tag line.
- Backfilling details and quantities were recorded on DQCF07.

Field Challenge: While backfilling the bottom 30 meters of the open borehole at IG_MWA01 with bentonite chips (not the coated pellets), the bentonite bridged at approximately 4.5 m below ground surface where the borehole diameter transitioned from 200 mm to 143 mm. Once the bridge was successfully removed, the team placed a 154 mm diameter PVC pipe in the borehole to sit on the borehole transition ledge to ensure that the bentonite chips did not accumulate and would fall to the bottom of the borehole.

Wellhead Completion

The following steps were followed during the completion of each wellhead and manifold installation:

- The PVC casing was cut to achieve the desired final stick-up height; the final stick up was recorded on DQCF07.

- The VW cable, sample tube, and drive tube for each monitoring port was threaded through the prelabeled manifold openings and secured as per the manufacturer's instructions.
- A locking well cover was placed onto the well casing (Photo 12).
- The 4-channel datalogger was setup and connected inside the well cover.
- Province of Ontario Well Tags registered to NWMO were attached to the casings. Copies of the well record were completed and submitted by Maple Leaf Drilling who is a licensed well driller in Ontario and are provided in Appendix E.

6.2.3 STAGE 3 MULTILEVEL SLUG TESTING

Following completion of monitoring well installation, a rising head slug test was conducted in each of the monitoring depth intervals (three depth intervals in each multilevel system) using the permanently installed double valve pumps and vibrating wire transducer assemblies. Testing procedures for each monitored interval, listed in approximate chronological order, included:

Pre-Test Steps:

- Connected the Geokon GK-404 Handheld Readout device to the vibrating wire (VW) transducer and recorded the VW serial number, static measurement, date, time and temperature on the field form for slug tests.
- As per the manufacturer's instructions, included in Appendix C of the WPD – Groundwater Monitoring Well Installation and Hydraulic Testing (APM-PLAN-01332-0397), setup and connected the electronic control unit (Model 464) using compressed air to the double valve pump of the specific interval being tested.
- Setup the vibrating wire and datalogger recording interval to the shortest possible time interval (10 seconds) for the duration of the test (initial drawdown and recovery stages were both captured on the dataloggers). The datalogger setup followed all instructions for Vibrating Wire and Datalogger procedures found in Appendix G of the WPD – Groundwater Monitoring Well Installation and Hydraulic Testing (APM-PLAN-01332-0397). A field laptop was connected to the datalogger for manual VW readings during the slug tests, and to ensure continuous recording of data during the test.

Slug-Test Steps:

- To initiate the rising head slug test, the following steps were completed, with data recorded on DQCF09 found in Appendix I:
  - Recorded the static VW reading and time.
  - Initiated the test by starting a stopwatch timer and the Solinst pump at its maximum flow rate to quickly pump down the water level in the monitoring zone. Recorded purge pump check data and verification on the DQCF08.
  - Purged all formation water into a bucket or other container of known volume to measure flow rate. Transferred all formation water to large disposal tanks.
  - Continued pumping until water stopped coming to surface. Recorded the purge time and recorded a manual VW reading as the initial measurement for the pump test. In several monitoring zones, the Solinst pump could not pump at a high enough flow rate to completely drawdown the water level. Where this occurred, the VW readings were checked to ensure water level stabilization, indicated by no change to the pressure readings over time for a period of several minutes. After stabilization

occurred, the pump was shut off, the rising head test was initiated, and the proceeding steps continued.
    - All purge water from the slug test was collected in a bucket with volumes measured and recorded on the DQCF09. Purge water was transferred to a larger waste water container for disposal as per the EMP (APM-PLAN-01332-0393).
- Turned off the pump and recorded the recovery manually by reading VW readouts from the datalogger and connected field laptop. During this time, the datalogger recorded and saved VW readings every 10 seconds.
- The rising head slug test was considered complete when one or the other of the following conditions had been met:
    - 80% recovery was measured and recorded by the data logger. This was checked at various times, and the amount of time required to achieve 80% recovery was highly variable between monitoring wells and depth zones within monitoring wells, or;
    - If, after 24 hours since initiating the test, the monitored zone had not yet recovered to 80% but had recovered more than 60%, the test was considered complete. However, the datalogger continued to record even after this point in time, to allow for proceeding of rising head slug testing at other intervals.
    - If after 24 hours the well had not recovered 60%, then the well was revisited to monitor recovery progression.
- Following completion of a rising head slug test, the data file was downloaded from the datalogger and saved on a field laptop. VW data was checked for completeness and reasonableness given known depths and expected drawdown/recovery curves.

6.3 Data Processing

All data processing of the data collected from the vibrating wire transducers and dataloggers was completed using in-house vibrating wire conversion excel spreadsheets created by KGS Group. This spreadsheet uses VW conversion factors and polynomial equation provided by the manufacturer on the calibration certificates (Appendix D) with analysis completed using AQTESOLV Pro for Windows version 4.5 software.

6.3.1 PRE-MULTILEVEL INSTALLATION HYDRAULIC TEST DATA PROCESSING

Processing and analysis of pre-multilevel installation hydraulic test data was completed using the following procedures:

- The downloaded hydraulic test data was processed by copying the raw CSV data downloaded from the VW datalogger into the vibrating wire conversion spreadsheet. The spreadsheet was setup to convert the raw data into pressures using the polynomial equation and factory provided conversion factors given on each calibration certificate (Appendix D-1).
- Pressure data from the VW transducers as part of the pre-multilevel installation hydraulic testing was outputted in the form of RST datalogger proprietary B Units unique to RST vibrating wire sensors. B-Units can best be described as a proportional value to the frequency squared of 100 cycles of vibration

applied by a precise quartz oscillator (Frequency^2 x 10-3). The relationship between B-unit readings and the pressure being exerted on the diaphragm is expressed by the following equation:

$$P=CF (L_0-L)$$

P= Corrected Pressure Reading
CF= Linear Calibration Factor in kPa\B-Unit digit. The CF is unique value for each manufactured VW sensor, as determined by the initial laboratory calibration
L_0= Initial B-Unit Reading at zero applied pressure on the diaphragm. The L_0 is a unique value for each manufactured VW sensor and is determined by the initial laboratory calibration
L=B-Unit readings under the currently applied pressure on the diaphragm

- Using a polynomial equation provided by the manufacturer, pressure in B units was converted to pressure in kPa and ultimately to hydraulic head (meters) using a standard conversion factor. The polynomial equation incorporated calibrated zero readings (VW pressure, temperature and barometric pressure) and manufacturer-provided gauge factors unique to each VW. An example spreadsheet showing the imported raw data and conversion to pressure head is included in Appendix D of the WPD – Groundwater Monitoring Well Installation and Hydraulic Testing (APM-PLAN-01332-0397).

- Pressure (MPa) is calculated with the Polynomial equation:

$$P=A(L^2) + B(L) + C - Tk(T_0-T) + (S_0-S)$$

P = pressure, in MPa
A, B, C are polynomial gauge factors provided on the VW calibration certificate
L_0, L =initial (installation zero reading) and current readings, in B units
Tk = Temperature Correction Factor, in MPa/°C
T_0, T= initial (installation zero reading) and current temperature, in degrees C
S_0, S= initial (installation zero reading) and current barometric pressure readings, in MPa

- KGS Group then imported the converted data into a data processing template specifically developed for converting all pressure readings and time values to water displacement (m) and elapsed time for importing into the analysis software AQTESOLV Pro.
- Displacement (m) is calculated as follows:

$$Displacement = h_0-h$$

h = measured water level or pressure head, in m
h_0 = static water level or pressure head, in m

6.3.2 MULTILEVEL SLUG TEST DATA PROCESSING

Processing and analysis of multilevel slug test data was completed using the following procedures:

- The downloaded hydraulic test data was processed using the raw CSV downloaded from the vibrating wire datalogger. The raw data was corrected and converted to pressure head (m) using the vibrating wire polynomial equation, which is provided by the manufacturer and incorporates the calibrated zero readings unique to each vibrating wire. The polynomial equation details are provided below. Vibrating wire calibration certificates are provided in Appendix D-2.

- The Geokon Data loggers were setup by KGS Group using the gauge factors provided by the manufacturer to automatically output to meters of H2O. The internal pressure calculation done by the datalogger uses the following polynomial equation:

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

P = Pressure (kPa)
A and **B** are polynomial gauge factors provided on the VW calibration certificate
C= Calculated by setting **P**=0 and R_1= initial field zero reading
R_1 =current readings, in Digit (Dg) units
K=Thermal factor (given on calibration certificate) in kPa/°C
T_0, T_1= initial (installation zero reading) and current temperature, in degrees C
S_0, S_1= initial (installation zero reading) and current barometric pressure readings, in kPa

- KGS Group used a data processing template specifically developed for converting all pressure readings and time values to water displacement (m) and elapsed time for importing into the analysis software AQTESOLV Pro. Displacement is calculated in as follows:

$$\text{Displacement} = h_0-h$$

h = meters of water for a time
h_0 = static water level or pressure head

6.4 Hydraulic Assessment

All pressure head readings measured by the vibrating wire pressure transducers during packer rising head testing (RST VWs) and for the Solinst multilevel rising head testing (GEOKON VWs) were plotted as piezometric head (as an elevation in meters above sea level, m.a.s.l.) over time. Hydrographs developed for the packer rising head testing periods are provided in Appendix G-1 and Appendix G-2 for the Solinst multilevel rising head tests.

In general, slug tests results showed an overdamped response which is most often associated with low hydraulic conductivity. Based on the responses observed, KGS Group chose two straight-line solutions for partially penetrating wells in unconfined aquifers, those being Bouwer-Rice (1976) and Hvorslev (1951) as the semi-analytical method of analysis of the hydraulic testing results for estimating hydraulic conductivities. A description of each of the Bouwer-Rice and Hvorslev solutions as stated in the AQTESOLV for Windows Help module is given below:

- **Bouwer-Rice (1976):** developed as a semi-analytical method for the analysis of an overdamped slug test in a fully or partially penetrating well in an unconfined aquifer, employing a quasi-steady-state model that ignores elastic storage in the aquifer. Bouwer (1989) observed that this model could also be applied to approximate conditions in confined aquifers. This was because the water-table boundary in an unconfined aquifer has little effect on slug test response unless the top of the well screen is positioned close to the boundary.

- **Hvorslev (1951):** developed a semi-analytical method for the analysis of an overdamped slug test in a fully or partially penetrating well in a homogeneous, anisotropic confined aquifer. This method employs a quasi-steady-state model that ignores elastic storage in the aquifer.

Parameters and assumptions used for all AQTESOLV assessment are provided in Appendix H-1 for the packer testing hydraulic assessments and Appendix H-2 for the Solinst multilevel hydraulic assessments.

The rising head test data was plotted as normalized heads using the following method:

$$\textbf{Normalized head} = H_t/H_0$$

where H_t is head displacement at time and H_0 is initial displacement

In AQTESOLV, a straight line solution was plotted to best fit the normalized head data. AQTESOLV generated reports and hydraulic conductivity data have been provided as part of the WPD Data Delivery to NWMO.

In some instances, two distinct slopes were observed in some of the assessments. This can usually be attributed to one of the following two reasons:

- Drainage of the sand pack/recharge of the sand pack for early time displacement measurements (i.e. first 60 seconds) attributed to the sand pack filter material having a significantly higher permeability (k) than the formation/fracture of the borehole; or
- More than one fracture or weathered feature present having an influence on the permeability of the zone being monitored.

In most of the data assessed in this scope of work, if the slope change occurs at a point in time >60 seconds since pumping stopped, then it was treated as there being more than one fracture or weathered feature present. If this effect was observed, KGS Group also fitted a line to the late time data and included these values in the ranges of hydraulic conductivity reported on Tables 15 and 16. Figures 5 and 6 show the difference between a normal straight-line slug test data set and a slug test data set with two distinct slopes.

FIGURE 5. TYPICAL STRAIGHT-LINE SLUG TEST RESULTS

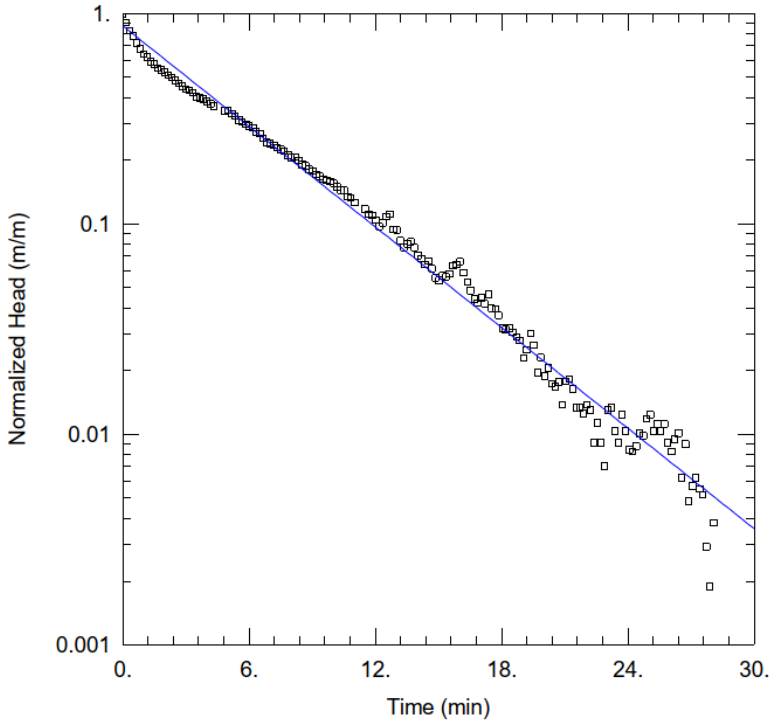
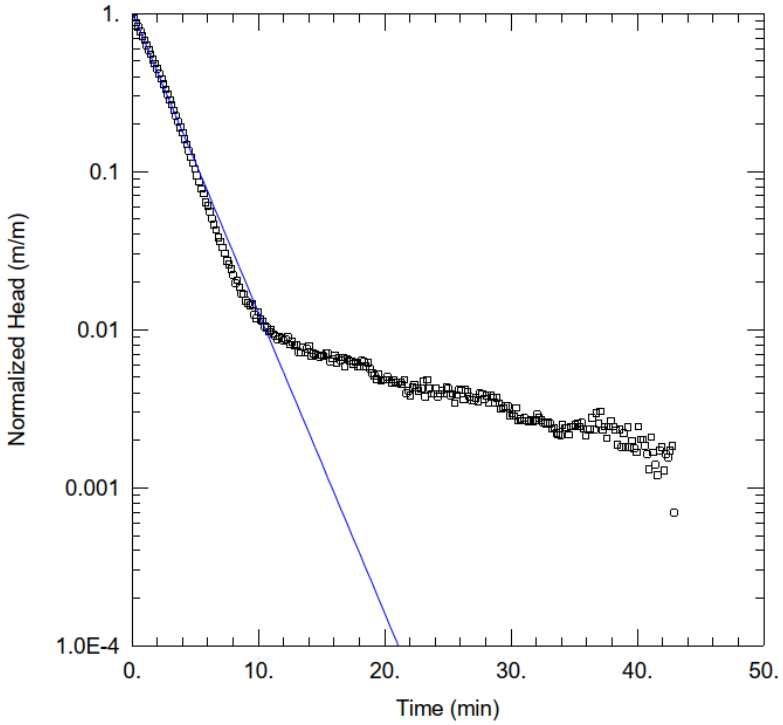


FIGURE 6. DOUBLE-STRAIGHT-LINE SLUG TEST RESULTS



6.5 Summary of Results

Hydraulic assessment results are summarized for each slug test method below. All raw and processed data sets and final AQTESOLV reports have been provided to NWMO as part of the WPD Data Delivery.

6.5.1 PRE-MULTILEVEL INSTALLATION RISING HEAD TEST RESULTS

A total of seven (7) packer tests were completed in IG_MWA01, IG_MWA03, IG_MWB01, IG_MWB03, IG_MWC01, IG_MWC02 and IG_MWC03. Table 15 gives a range of the results of the hydraulic conductivities estimated from the assessments using Hvorslev and Bouwer-Rice solutions completed in AQTESOLV.

TABLE 15: RESULTS OF PACKER TESTING RISING HEAD TESTS

Well	# of Tests Completed	Testing Dates	Test Interval Depths		Estimates of Hydraulic Conductivity (K) (1)	
			Top (mbgs)	Bottom (mbgs)	High (m/sec)	Low (m/sec)
IG_MWA01	3	Sept 11, 2021	13.11	14.99	1.8E-04	1.2E-04
IG_MWA03	2	Sept 12, 2021	41.44	43.32	9.9E-06	8.7E-06
IG_MWB01	3	July 15-15, 2021	7.42	9.30	4.4E-04	3.0E-04
IG_MWB03	1	July 17-18, 2021	85.11	86.99	2.4E-07	2.31E-07
IG_MWC01	3	Sept 14-15, 2021	90.87	92.75	3.9E-05	1.4E-06
IG_MWC02	2	Sept 15-16	93.00	94.80	5.1E-07	9.1E-09
IG_MWC03	2	Sept 16-18, 2021	70.40	72.20	1.9E-08	1.7E-09

Note: (1) As determined from the two solutions applied in the assessment of data.

6.5.2 SOLINST MULTILEVEL RISING HEAD TEST RESULTS

Rising head tests were conducted on all multilevel monitoring zones for a total of twenty-seven (27) tests completed. Table 16 gives a range of the results of the hydraulic conductivities estimated from the assessments completed in AQTESOLV.

TABLE 16: RESULTS OF SOLINST MULTILEVEL RISING HEAD TESTS

Well	Interval ID	Test Date	Monitored Zone Interval Depth (mbgs)		Estimates of Hydraulic Conductivity (K) [1]	
			Top	Bottom	High (m/sec)	Low (m/sec)
IG_MWA01	C	29-Sep-21	12.8	13.6	9.32E-08	5.1E-09
	B	30-Sep-21	53.3	55.6	1.03E-08	4.98E-10
	A	1-Oct-21	61.4	62.5	2.82E-09	2.52E-09
IG_MWA02	C	30-Sep-21	9.4	12.4	6.49E-08	3.72E-08
	B	30-Sep-21	40.5	43.1	2.09E-09	1.79E-09
	A	29-Sep-21	85.9	88.8	1.98E-09	1.91E-09
IG_MWA03	C	30-Sep-21	24.6	26.0	1.60E-08	1.50E-08
	B	30-Sep-21	40.0	42.6	7.84E-09	7.51E-09
	A	1-Oct-21	84.4	86.6	6.17E-09	5.75E-09
IG_MWB01	C	30-Jul-21	7.4	8.7	[1]	[1]
	B	31-Jul-21	31.1	32.4	6.24E-09	5.14E-09
	A	1-Aug-21	66.2	70.4	3.08E-10	2.94E-10
IG_MWB02	C	30-Jul-21	51.7	53.0	7.71E-10	6.77E-10
	B	31-Jul-21	63.0	65.0	5.05E-10	4.56E-10
	A	1-Aug-21	94.4	97.4	1.14E-10	8.95E-11
IG_MWB03	C	30-Jul-21	21.3	23.3	4.05E-09	8.72E-10
	B	27-Jul-21	41.9	44.0	6.19E-10	5.56E-10

Well	Interval ID	Test Date	Monitored Zone Interval Depth (mbgs)		Estimates of Hydraulic Conductivity (K) (1)	
			Top	Bottom	High (m/sec)	Low (m/sec)
	A	1-Aug-21	83.2	85.7	2.39E-08	2.29E-08
IG_MWC01	C	29-Sep-21	25.4	26.7	2.95E-08	2.51E-08
	B	30-Sep-21	54.7	56.5	8.37E-09	7.58E-09
	A	30-Sep-21	90.0	92.6	7.78E-10	7.48E-10
IG_MWC02	C	30-Sep-21	9.9	12.2	4.16E-08	3.22E-08
	B	30-Sep-21	67.4	69.3	1.69E-08	1.55E-08
	A	29-Sep-21	93.1	94.5	1.51E-07	2.0E-08
IG_MWC03	C	30-Sep-21	37.9	40.1	3.06E-08	2.61E-09
	B	29-Sep-21	61.4	63.2	9.66E-09	8.84E-09
	A	30-Sep-21	70.9	72.3	1.15E-08	1.05E-08

Note: (1) As determined from the two solutions applied in the assessment of data. (2) The hydraulic conductivity of the test zone is > than the maximum pumping rate.

6.6 Quality Assurance

All work carried out through the duration of WPD was completed in accordance with the Project Quality Plan (APM-PLAN-01332-0390). As such, all relevant field activities and associated data were recorded in Data Quality Confirmation Forms (DQCF's) where appropriate. Additionally, Daily Site Activity (DSA) reports were generated throughout the duration of WPD to provide a record of daily work activities and field conditions. Table 17 below lists and describes the DQCFs used to document WPD data collection activities and are included in Appendix I.

TABLE 17: DATA QUALITY CONFIRMATION FORMS (DQCF) FOR WORK PACKAGE D

DQCF	Description
DataQualityConfirmationForm01	Packer Testing Interval Selection- Provides information and justification for selection of the specific depth interval to be packer tested or why a packer test was not selected.
DataQualityConfirmationForm02	Equipment Decontamination Checklist- Confirmation and verification that equipment used for packer tests was cleaned and decontaminated prior to use.
DataQualityConfirmationForm03	Packer Testing Zone Specifications –Summary of data used to inflate the packers based on depths and water levels to ensure packers sealed against the borehole walls.
DataQualityConfirmationForm04	Double Packer Assembly – Detailed the steps to be followed for preparing the packer assembly for use.
DataQualityConfirmationForm05	Test Depth Control – Details the data used to determine and check depth of the packer assembly, based on packer assembly physical dimensions, pressure readings, number of rods used and stickup measurements.
DataQualityConfirmationForm06	Slug Testing Field Data Checks and Verification – Record of manual measurements of pressure readings during packer testing, pre-inflation, post inflation and during testing.
DataQualityConfirmationForm07	Well Construction – Details all the components used to construct each multi-level monitoring well as well as quality checks of the vibrating wire instruments installed.
DataQualityConfirmationForm08	Purging Pump Verification and Flow Rate Check – Verification that pumps installed as part of the multilevel monitoring well system functioned post installation and recorded flow rates.
DataQualityConfirmationForm09	Slug Testing Field Form – Record of manual measurements of hydraulic testing for each interval using the Solinst Waterloo multilevel system.

Verification and checks of the vibrating wire instruments and double-valved pumps were completed in the field prior to installation. Factory calibration certificates for each of the vibrating wire pressure transducers (RST Instrument and GEOKON) are included in Appendix D-1 and D-2 respectively.

6.7 Data Delivery

The final data delivery package was approved by NWMO on August 17, 2022. File naming conventions were in accordance with the PQP and the DMP. The final data delivery package included the following:

- Completed acQuire Importer file

- Signed scans of all DQCFs and a digitized DQCFs
- GEOKON Vibrating Wire Calibration Certificates
- GEOKON Datalogger Configuration Setup Files
- Hydraulic Testing Data Sets and Assessment Reports
- Hydrographs
- Well Logs
- Completed Data collection checklist
- Supporting metadata file

7.0 SUMMARY

KGS Group completed the scoped work under the Purchase Order #2001095 that was divided into the following four Work Packages: A-Site Infrastructure, B-Bore Drilling and Logging, C-Geophysical Logging, and D-Groundwater Monitoring Well Installation and Hydraulic Testing. Work was performed following the main project documents and test plans developed for each Work Package and summarized below

Work Package A - consisted of construction of nine drilling pads fully lined for water containment and drainage controls; construction of three fully lined pads used for fuel storage and refueling of equipment; and supply, installation and removal of temporary infrastructure such as fencing, storage containers, washrooms, generators and portable light plants. After all the field work of work packages B, C and D were completed, site restoration and removal of the temporary infrastructure was completed for each of the three sites. A demobilization report was prepared and issued to NWMO that documented and recorded the details of work completed as for restoring the sites and finalizing the return of care and custody to NWMO.

Work Package B - consisted of drilling nine 100-meter-deep boreholes using an air-rotary drill rig. A 200 mm diameter steel surface casing was reamed to 6 m depth and cemented in place before advancing the drilling to the target depth of 100 meters. The remaining 6 to 100 meter depths were drilled as 143 mm diameter open boreholes. During drilling, rock chip samples were collected, field described, photographed and submitted to NWMO for storage. Each borehole was purged using compressed air three times to remove drill cuttings to ensure boreholes were open and free of debris to 100 meters. All drill cuttings were diverted into large $1m^3$ soil bags and disposed of at the Township of Ignace Waste Disposal site. Purge water was captured in the lined drill pad containment system and pumped into large holding tanks and disposed of by licensed waste water handling and disposal companies.

Work Package C - consisted of down-hole logging of each of the nine boreholes drilled in the Work Package B scope of work. Each borehole was logged with the optical and acoustic televiewers, the mechanical caliper, the natural gamma probe, normal resistivity, spontaneous potential, single point resistance, fluid conductivity, temperature and a heat pulse flow meter probe. After data processing, the results were assessed by NWMO and KGS Group to determine the depth intervals for packer testing and the design for each of the multilevel monitoring well installations.

Work Package D - consisted of conducting hydraulic testing of fractures using a double-packer system that used pressurization of the test water column to induce rising head tests. Pressure head data was measured using a vibrating wire sensor inside the test interval as well as vibrating wire sensors installed below and above the packer assembly. Each of the vibrating wire sensor measurements were automatically recorded using single channel dataloggers. A total of seven double-packer hydraulic tests were conducted prior to beginning the installation of the Solinst Waterloo multilevel system. Two boreholes were not tested with the double-packer system prior to installation of the multilevel system because there were no geological features (i.e. fractures or weathered zones) observed in the geophysical data that met the pre-installation packer testing criteria. After packer testing was completed, KGS Group installed a Solinst Waterloo multilevel monitoring well in each of the nine boreholes. Each multilevel monitoring well consisted of three distinct monitoring zones, typically a deep zone a middle monitoring zone and a shallow zone. Each zone included a sample port, a dedicated vibrating wire sensor and a double-valve pump enveloped by a filter sand pack.

Special coated bentonite pellets were used to seal each zone from the others. After installation was completed, each monitoring zone was purged to dry three times to develop the sand pack and prepare them for hydraulic testing. Finally, once all zones had recovered and stabilized to static conditions, a rising head slug test was completed. Displacement of the pressure head of the test zones were measured using a dedicated vibrating wire and datalogger. Purge water was collected at surface and disposed of at a licenses water treatment facility in the Town of Ignace. All hydraulic test data was processed and analyzed using AQTESOLV software to estimate hydraulic conductivities for each of the monitoring zones and packer tests intervals. Hydraulic conductivity estimates ranged from as high as 1.0E-4 to as low as 1E-11 m/sec.

Before demobilizing from the study site, KGS Group programmed all of the dataloggers to record pressure head measurements every six hours and ensured that all well head boxes were secured, locked and the protective fencing was closed.

KGS Group completed the field scope of work and demobilized on October 20, 2021. Handover of care and custody of the three sites was formally completed on January 12, 2022.

8.0 REFERENCES

Project Quality Plan (PQP) APM-PLAN-01332-0390

Data Management Plan (DMP) APM-PLAN-01332-0391

Health and Safety Plan (HSP) APM-PLAN-01332-0392

Environmental Management Plan (EMP) APM-PLAN-01332-0393

WPA – Site Infrastructure APM-PLAN-01332-0394

WPB – Borehole Drilling and Logging APM-PLAN-01332-0395

WPC – Geophysical Logging APM-PLAN-01332-0396

WPD – Groundwater Monitoring Well Installation and Hydraulic Testing APM-PLAN-01332-0397

Demobilization Report APM-REP-01332-0363

Bouwer, H., 1989. The Bouwer and Rice slug test—an update, Ground Water, vol. 27, no.3, pp.34-309

Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bull. No. 36, Waterways Exper. Sta. Corps of Engrs, U.S. Army, Vicksburg, Mississippi, pp. 1-50.

Quinn, P 2009, 'High Resolution Packer Testing in Fractured Sedimentary Rock', PhD thesis, University of Guelph, Guelph.

Zlotnik, V., 1994. Interpretation of slug and packer tests in anisotropic aquifers, Ground Water, vol. 32, no. 5, pp. 761-766.

APPENDIX A

Borehole and Well Construction Logs

KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA01

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	406.78 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	0.91 m / 407.69 m (Standpipe)
DESCRIPTION	IG_MWA	**DATE DRILLED**	7-1-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,486,569.95
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 555,336.47
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
406	1	5		**TOPSOIL/ORGANICS** - Brown, organics/overburden.	405.8				IG_MWA01_1.0
405	2			Greyish brown, sand (medium-coarse), some silt.	404.8				IG_MWA01_2.0
				Grey, silt, some sand.	404.2				
404	3	10		**BGT** - grey, some k-feldspar, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_3.0
403	4	15		BGT, grey, some k-feldspar, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_4.0
402	5			BGT, grey, some k-feldspar, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_5.0
401	6	20		BGT, grey, trace k-feldspare, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_6.0
400	7	25		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, trace hematite, A1.			6.0		IG_MWA01_7.0
399	8			BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_8.0
398	9	30		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_9.0
397	10	35		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, trace hematite, A1.			9.3		IG_MWA01_10.0
396	11			BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, trace hematite, A1.					
395	12	40		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_12.0
394	13						12.8		
						Port C	13.3		
393	14	45		**GRANITE** - grey and pink, with k-feldspar, qtz, feldspar, biotite, trace hematite, A2.	392.8		13.6		IG_MWA01_14.0
392	15	50							
391	16			**BGT** - grey, trace k-feldspar, qtz, feldspar, biotite, trace hematite, A1.	390.8				IG_MWA01_16.0
390	17	55							
389	18	60		BGT, grey, some k-feldspar, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_18.0
388	19								
387	20	65							IG_MWA01_20.0

WATER LEVELS

CONTRACTOR **Maple Leaf Drilling Ltd.**	INSPECTOR **T. PACKULAK**
APPROVED E. LEVAY	DATE 6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
386	21 70		BGT, grey, some k-feldspar, qtz, feldspar, biotite, trace hematite, A1.					
385	22		BGT, grey and pink, with k-feldspar, qtz, feldspar, biotite, trace hematite, A2.					IG_MWA01_22.0
384	23 75							
383	24		BGT, grey, some k-feldspar, qtz, feldspar, biotite, trace hematite, A1.					IG_MWA01_24.0
382	25 80							
381	26 85		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, A1.					IG_MWA01_26.0
380	27							
379	28 90		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA01_28.0
378	29 95							
377	30		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, A2.					IG_MWA01_30.0
376	31 100							
375	32 105		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, A2.					IG_MWA01_32.0
374	33							
373	34 110		BGT, grey, some k-feldspar with grout, qtz, feldspar, biotite, A2.					IG_MWA01_34.0
372	35 115							
371	36			370.8				IG_MWA01_36.0
370	37 120		**GRANITE** - grey and pink, with k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					
369	38 125			368.8				IG_MWA01_38.0
368	39		**GRANITE AND AMPHIBOLITE** - brown, qtz, feldspar, biotite, amphibole, A2, tr. hematite.					
367	40 130			366.8				IG_MWA01_40.0
366	41 135		**BGT** - grey, with k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					
365	42		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA01_42.0
364	43 140							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA01

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
363	44	145		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_44.0
362	45								
361	46	150		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_46.0
360	47	155							
359	48				358.8				IG_MWA01_48.0
				GRANITE - grey and pink, with k-feldspar, qtz, feldspar, biotite, A1.					
358	49	160							
357	50			Granite, grey and pink, with k-feldspar, qtz, feldspar, biotite, A2.					IG_MWA01_50.0
356	51	165							
355	52	170			354.8				IG_MWA01_52.0
				BGT - grey, some k-feldspar, qtz, feldspar, biotite, A1.					
354	53						53.3		
353	54	175		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.		Port B	54.6		IG_MWA01_54.0
352	55	180					55.6		
351	56				350.8				IG_MWA01_56.0
				GRANITE - grey and pink, granite to amphibolite, qtz, feldspar, biotite, amphibole, tr. hematite.					
350	57	185							
349	58	190			348.8				IG_MWA01_58.0
				BGT - grey, some k-feldspar, qtz, feldspar, biotite, A1.					
348	59								
347	60	195		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_60.0
346	61	200					61.4		
345	62			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.		Port A	62.0		IG_MWA01_62.0
344	63	205					62.5		
343	64	210		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA01_64.0
342	65								
341	66	215		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_66.0
340	67	220							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

KGS_LOG_COLMTEST U:\FMS\21-3836-001\21-3836-001_WELLLOGS_DRAFT.GPJ

KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA01

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
339	68	225		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_68.0
338	69						68.7		
337	70	230		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_70.0
336	71	235							
335	72			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA01_72.0
334	73	240							
333	74			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_74.0
332	75	245							
331	76	250		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_76.0
330	77								
329	78	255		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA01_78.0
328	79	260							
327	80			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_80.0
326	81	265							
325	82			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_82.0
324	83	270							
323	84	275		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_84.0
322	85								
321	86	280		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA01_86.0
320	87	285							
319	88			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA01_88.0
318	89	290							
317	90	295		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_90.0
316	91								

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
315	92 300		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA01_92.0
314	93 305							
313	94 310		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_94.0
312	95							
311	96 315		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA01_96.0
310	97 320							
309	98		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA01_98.0
308	99 325							
307	100			306.8		100.0		IG_MWA01_100.0
306	101 330		Notes: 1. End of test hole at 100.35 m. 2. Test hole remained open to 100.35 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120835 5. Zone 2 (B): Middle port; VW2125472 6. Zone 3 (A): Deep port; VW2123768					
305	102 335							
304	103							
303	104 340							
302	105 345							
301	106							
300	107 350							
299	108 355							
298	109							
297	110 360							
296	111 365							
295	112							
294	113 370							
293	114 375							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA02

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	404.81 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	1.01 m / 405.82 m (Standpipe)
DESCRIPTION	IG_MWA	**DATE DRILLED**	6-18-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,486,543.93
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 555,377.05
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
404	1	5		**TOPSOIL/ORGANICS** - Brown, organics/overburden.	403.8				IG_MWA02_1.0
403	2			**CLAY** - Greyish brown, silty clay.					IG_MWA02_2.0
402	3	10		**BGT** - grey, some k-feldspar; bedrock at 2.85 m, qtz, feldspar, biotite, tr. hematite, A2.	402.0				IG_MWA02_3.0
				BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					
401	4	15		BGT, grey, grout flakes and granite, qtz, feldspar, biotite, A1.					IG_MWA02_4.0
400	5			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_5.0
399	6	20		**GRANITE** - grey and pink, some k-feldspar with grout, qtz, feldspar, biotite, A2, tr. hematite.	398.8		6.0		IG_MWA02_6.0
							6.4		
398	7	25		GRANITE, grey and pink, with k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_7.0
397	8			GRANITE, grey and pink, with k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA02_8.0
396	9	30		GRANITE, grey and pink, with k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA02_9.0
							9.4		
395	10			GRANITE, grey and pink, with k-feldspar, qtz, feldspar, biotite, A2, tr. hematite, tr. chlorite.					IG_MWA02_10.0
		35				Port C	10.5		
394	11								
393	12	40		**BGT** - grey and pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite, tr. chlorite.	392.8				IG_MWA02_12.0
							12.4		
392	13	45		BGT, grey and pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_14.0
391	14								
390	15	50							
389	16			BGT, grey and pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_16.0
388	17	55							
387	18			BGT, grey and pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_18.0
386	19	60							
385	20	65							IG_MWA02_20.0

WATER LEVELS

CONTRACTOR	INSPECTOR
Maple Leaf Drilling Ltd.	**J. BURNS**
APPROVED	DATE
E. LEVAY	6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA02

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
384	21 / 70		BGT, grey and pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					
383	22							IG_MWA02_22.0
			BGT, grey and pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					
382	23 / 75							
381	24							IG_MWA02_24.0
			BGT, grey and pink, some k-feldspar, qtz, feldspar, biotite, A1.					
380	25 / 80							
379	26 / 85							IG_MWA02_26.0
			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					
378	27 / 90							
377	28							IG_MWA02_28.0
			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					
376	29 / 95							
375	30							IG_MWA02_30.0
			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					
374	31 / 100							
373	32 / 105							IG_MWA02_32.0
			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					
372	33 / 110							
371	34			370.8				IG_MWA02_34.0
			AMPHIBOLITE - grey, mostly dark grey and brown amphibolite, A2, hematite.					
370	35 / 115							
369	36			368.8				IG_MWA02_36.0
			GRANITE - pink and grey, with k-keldspar, qtz, feldspar, biotite, A2, tr. hematite.					
368	37 / 120							
367	38							IG_MWA02_38.0
			GRANITE, pink and grey, with k-keldspar, qtz, feldspar, biotite, A2, tr. hematite.					
366	39 / 125							
365	40 / 130							IG_MWA02_40.0
			GRANITE, pink, k-feldspar rich, qtz, feldspar, biotite, A2, tr. hematite.			40.5		
364	41 / 135							
363	42			362.8	Port B	42.1		IG_MWA02_42.0
			GRANITE AND AMPHIBOLITE - brown, 1/2 amphibolite, 1/2 granite, A2, tr. hematite.					
362	43 / 140					43.1		

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
361	44	145		**GRANITE** - pink, granite with trace amphibolite, qtz, feldspar, biotite, A2, tr. hematite.	360.8				IG_MWA02_44.0
360	45								
359	46	150		GRANITE, pink and grey, granite with trace hematite, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_46.0
358	47	155							
357	48			GRANITE, pink and grey, granite with trace amphibolite, qtz, feldspar, biotite, A1.					IG_MWA02_48.0
356	49	160							
355	50			GRANITE, pink and grey, trace hematite, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_50.0
354	51	165							
353	52	170		**BGT** - grey, fresh BGT, harder, qtz, feldspar, biotite, A1.	352.8				IG_MWA02_52.0
352	53								
351	54	175		BGT, grey, fresh BGT, dark grey, qtz, feldspar, biotite, A1.					IG_MWA02_54.0
350	55	180							
349	56			BGT, grey, fresh, dark grey, qtz, feldspar, biotite, A1.					IG_MWA02_56.0
348	57	185							
347	58			BGT, grey, fresh, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA02_58.0
346	59	190							
345	60			BGT, grey, fresh bgt, light grey, qtz, feldspar, biotite, A1.					IG_MWA02_60.0
344	61	195							
343	62			BGT, grey, some k-feldspar, trace hematite, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWA02_62.0
342	63	200							
341	64			**GRANITE** - pink and grey, with k-feldspar, qtz, feldspar, biotote, A2, tr. hematite.	340.8				IG_MWA02_64.0
340	65	205							
339	66			**BGT** - grey, trace k-feldspar, qtz, feldspar, biotote, A2, tr. hematite.	338.8				IG_MWA02_66.0
338	67	210							
		215							
		220							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
337	68	225		BGT, grey, trace k-feldspar, qtz, feldspar, biotote, A1.					IG_MWA02_68.0
336	69								
335	70	230			334.8				IG_MWA02_70.0
				GRANITE - pink, with k-feldspar, qtz, feldspar, biotote, A2, tr. hematite.					
334	71								
333	72	235			332.8				IG_MWA02_72.0
				BGT - pink and grey, some k-feldspar, qtz, feldspar, biotote, A1.					
332	73	240							
331	74			BGT, pink and grey, some k-feldspar, qtz, feldspar, biotote, A1.					IG_MWA02_74.0
330	75	245							
329	76	250		BGT, pink and grey, some k-feldspar, qtz, feldspar, biotote, A1.					IG_MWA02_76.0
328	77								
327	78	255		BGT, pink and grey, some k-feldspar, qtz, feldspar, biotote, A1.					IG_MWA02_78.0
326	79	260							
325	80			BGT, pink and grey, some k-feldspar, qtz, feldspar, biotote, A1.					IG_MWA02_80.0
324	81	265							
323	82				322.8				IG_MWA02_82.0
		270		**GRANITE** - pink and grey, with k-feldspar, qtz, feldspar, biotote, A2, tr. hematite.					
322	83								
321	84	275		GRANITE, pink and grey, with k-feldspar, qtz, feldspar, biotote, A2, tr. hematite.					IG_MWA02_84.0
320	85	280							
319	86			GRANITE, pink and grey, with k-feldspar, qtz, feldspar, biotote, A2, tr. hematite.			85.9		IG_MWA02_86.0
318	87	285							
317	88				316.8	Port A	88.0		IG_MWA02_88.0
		290		**AMPHIBOLITE** - dark grey, amphibolite, some granite, very soft, A1.			88.8		
316	89								
315	90	295			314.8				IG_MWA02_90.0
				GRANITE - red-brown, hematite altered granite, qtz, feldspar, biotote, pervasive hematite.					
314	91								

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA02

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
313–291	92–114 (300–375)		GRANITE, red-brown, hematite altered granite, qtz, feldspar, biotote, pervasive hematite.					IG_MWA02_92.0
			GRANITE, red-brown, hematite altered granite, qtz, feldspar, biotote, pervasive hematite.					IG_MWA02_94.0
			GRANITE, pink and grey, granite, trace hematite, qtz, feldspar, biotote, A2, tr. hematite.					IG_MWA02_96.0
			GRANITE, pink and grey, water (<0.5 gpm), qtz, feldspar, biotote, A2, tr. hematite.					IG_MWA02_98.0
				304.8				IG_MWA02_100.0
			Notes: 1. End of test hole at 100.36 m. 2. Test hole remained open to 100.36 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120829 5. Zone 2 (B): Middle port; VW2125473 6. Zone 3 (A): Deep port; VW2123769			100.4		

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA03

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	406.95 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	0.82 m / 407.77 m (Standpipe)
DESCRIPTION	IG_MWA	**DATE DRILLED**	7-2-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,486,594.67
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 555,378.37
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
406	1	5		**SILTY SAND** - Brown, Sand, some silt.	405.3				IG_MWA03_1.0
405	2			**BGT** - brown to grey, silt; bedrock at 1.70 m, qtz, feldspar, biotite. BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA03_2.0
404	3	10		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA03_3.0
403	4			BGT, pink, with k-feldspar, qtz, feldspar, biotite, A1, hematite.					IG_MWA03_4.0
402	5	15		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA03_5.0
401	6	20		BGT, grey, some grout, qtz, feldspar, biotite, A1.			6.0		IG_MWA03_6.0
400	7			BGT, grey, trace feldspar with grout, qtz, feldspar, biotite, A1.					IG_MWA03_7.0
399	8	25		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_8.0
398	9	30		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_9.0
397	10			BGT, grey, with k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_10.0
396	11	35							
395	12	40		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_12.0
394	13								
393	14	45		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_14.0
392	15	50							
391	16			BGT, grey, fresh bgt, qtz, feldspar, biotite, A1.					IG_MWA03_16.0
390	17	55							
389	18			BGT, grey, fresh bgt, qtz, feldspar, biotite, A1.					IG_MWA03_18.0
388	19	60							
387	20	65							IG_MWA03_20.0

WATER LEVELS

CONTRACTOR: **Maple Leaf Drilling Ltd.**

INSPECTOR: **T. PACKULAK**

APPROVED: E. LEVAY

DATE: 6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS DIAGRAM	LOG OF INSTALLS DEPTH (m)	SAMPLE TYPE	NUMBER
386	21 70		BGT, grey, fresh bgt, qtz, feldspar, biotite, A1.					
385	22			385.0		21.6		IG_MWA03_22.0
384	23 75		**GRANITE** - pink-grey, with k-feldspar, qtz, feldspar, biotite, A1.					
383	24			383.0				IG_MWA03_24.0
382	25 80		**BGT** - grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.			24.6		
381	26 85		BGT, grey, some amphibolite, qtz, feldspar, biotite, amphibole, A1.		Port C	25.5 26.0		IG_MWA03_26.0
380	27							
379	28 90		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_28.0
378	29 95							
377	30		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_30.0
376	31 100							
375	32 105		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_32.0
374	33							
373	34 110		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_34.0
372	35 115							
371	36		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_36.0
370	37 120							
369	38 125		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_38.0
368	39							
367	40 130		BGT, grey, fresh, qtz, feldspar, biotite, A1.			40.0		IG_MWA03_40.0
366	41 135				Port B	40.9		
365	42		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_42.0
364	43 140					42.6		

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

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TEST HOLE LOG

HOLE NO.
IG_MWA03

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
363	44	145		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_44.0
362	45								
361	46	150			361.0				IG_MWA03_46.0
				GRANITE - pink, with k-feldspar, qtz, feldspar, biotite, A1.					
360	47	155							
359	48			Granite, pink, with k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_48.0
358	49	160							
357	50			Granite, pink, with k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_50.0
356	51	165							
355	52	170		**BGT** - grey-pink, with k-feldspar, qtz, feldspar, biotite, A1.	355.0				IG_MWA03_52.0
354	53								
353	54	175		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_54.0
352	55	180							
351	56			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWA03_56.0
350	57	185							
349	58	190		**SYENITE** - pink, with k-feldspar, feldspar, biotite, quartz, A1.	349.0				IG_MWA03_58.0
348	59								
347	60	195		**BGT** - grey, some k-feldspar, qtz, feldspar, biotite, A1.	347.0				IG_MWA03_60.0
346	61	200							
345	62			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_62.0
344	63	205							
343	64	210		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_64.0
342	65								
341	66	215		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWA03_66.0
340	67	220							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
339	68 225		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.				IG_MWA03_68.0
338	69						
337	70 230		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWA03_70.0
336	71						
335	72 235		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWA03_72.0
334	73 240						
333	74		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWA03_74.0
332	75 245						
331	76 250		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWA03_76.0
330	77						
329	78 255		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.				IG_MWA03_78.0
328	79						
327	80 260		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.				IG_MWA03_80.0
326	81 265						
325	82		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.				IG_MWA03_82.0
324	83 270						
323	84 275		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.				IG_MWA03_84.0
322	85				84.4 Port A 84.9		
321	86 280		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.		86.6		IG_MWA03_86.0
320	87 285						
319	88		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.				IG_MWA03_88.0
318	89 290						
317	90 295		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWA03_90.0
316	91						

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWA03

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
315	92	300		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.					IG_MWA03_92.0
314	93	305							
313	94	310		BGT, grey, some k-keldspar, qtz, feldspar, biotite, A1.					IG_MWA03_94.0
312	95								
311	96	315		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_96.0
310	97								
309	98	320		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWA03_98.0
308	99	325							
307	100				307.0				IG_MWA03_100.0
306	101	330		Notes: 1. End of test hole at 100.35 m. 2. Test hole remained open to 100.35 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120833 5. Zone 2 (B): Middle port; VW2125475 6. Zone 3 (A): Deep port; VW2123773			100.4		
305	102	335							
304	103								
303	104	340							
302	105	345							
301	106								
300	107	350							
299	108	355							
298	109								
297	110	360							
296	111	365							
295	112								
294	113	370							
293	114	375							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB01

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	417.36 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	1.08 m / 418.44 m (Standpipe)
DESCRIPTION	IG_MWB	**DATE DRILLED**	6-7-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,485,333.31
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 555,457.64
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
417	0	0		**COBBLES** - white-orange, wet sand and cobbles.					
416	1	5		Felsic Igneous, white-orange, wet sand and cobbles.					IG_MWB01_1.0
415	2			Felsic Igneous, white-orange, wet sand and cobbles.					IG_MWB01_2.0
414	3	10							IG_MWB01_3.0
					413.7				
413	4	15		**BGT** - grey, bedrock at 3.70 m, qtz, feldspar, biotite, A1. BGT, grey, damp, no dust generation, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWB01_4.0
412	5			BGT, grey, damp, no dust generation, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWB01_5.0
411	6	20		BGT, grey, fresh, trace to minor grout, qtz, feldspar, biotite, A1.			6.0		IG_MWB01_6.0
410	7	25		BGT, grey-rust, trace grout, hematite, qtz, feldspar, biotite, A3.			7.4		IG_MWB01_7.0
409	8			BGT, grey-rust, trace grout, hematite, qtz, feldspar, biotite, A2.		Port C	8.0		IG_MWB01_8.0
408	9	30		BGT, grey, trace grout, trace hematite, qtz, feldspar, biotite, A2.			8.7		IG_MWB01_9.0
407	10	35		BGT, grey, fresh, trace hematite, qtz, feldspar, biotite, A2.					IG_MWB01_10.0
406	11								
405	12	40		BGT, grey, fresh with trace grout, qtz, feldspar, biotite, A1.					IG_MWB01_12.0
404	13								
403	14	45		BGT, grey, fresh with trace grout, qtz, feldspar, biotite, A1.					IG_MWB01_14.0
402	15	50							
401	16			BGT, grey, fresh with trace grout and hematite, qtz, feldspar, biotite, A2.					IG_MWB01_16.0
400	17	55							
399	18	60		BGT, grey, fresh with trace grout and hematite, qtz, feldspar, biotite, A2.					IG_MWB01_18.0
398	19								
	20	65							IG_MWB01_20.0

WATER LEVELS

CONTRACTOR **Maple Leaf Drilling Ltd.**	INSPECTOR **S. DHEILLY**
APPROVED E. LEVAY	DATE 6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
397			BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.				
396	21 70						
395	22		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.				IG_MWB01_22.0
394	23 75						
393	24 80		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB01_24.0
392	25						
391	26 85		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB01_26.0
390	27 90						
389	28		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.				IG_MWB01_28.0
388	29 95						
387	30 100		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.				IG_MWB01_30.0
386	31				31.1		
				Port B	31.7		
385	32 105		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.		32.4		IG_MWB01_32.0
384	33 110						
383	34		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.				IG_MWB01_34.0
382	35 115						
381	36 120		BGT, grey, fresh with trace hematite and smokey quartz, qtz, feldspar, biotite, A2.				IG_MWB01_36.0
380	37						
379	38 125		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB01_38.0
378	39						
377	40 130		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB01_40.0
376	41 135						
375	42		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.				IG_MWB01_42.0
374	43 140						

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
S. DHEILLY

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
373	44 145		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.					IG_MWB01_44.0
372	45							
	46 150		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.					IG_MWB01_46.0
371	47							
370	48 155		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.					IG_MWB01_48.0
369	49 160							
368	50 165		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_50.0
367	51							
366	52 170		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_52.0
365	53							
364	54 175		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_54.0
363	55 180							
362	56		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_56.0
361	185							
360	57							
359	58 190		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_58.0
358	59 195							
357	60		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_60.0
356	61 200							
355	62		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_62.0
354	205 63							
353	64 210		BGT, grey, fresh with trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWB01_64.0
352	65							
351	215 66		BGT, grey, fresh with trace k-feldspar, qtz, feldspar, biotite, A1.			66.2		IG_MWB01_66.0
	67 220							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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APPROVED
E. LEVAY

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6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWB01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
349	68 225		BGT, grey, fresh, qtz, feldspar, biotite, A1.		Port A	68.4		IG_MWB01_68.0
348	69							
347	70 230		BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.			70.4		IG_MWB01_70.0
346	71 235							
345	72		BGT, grey, fresh with trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWB01_72.0
344	73 240							
343	74		BGT, grey, fresh with trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWB01_74.0
342	75 245							
341	76 250		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_76.0
340	77							
339	78 255		BGT, grey, fresh with trace hematite and k-feldspar, qtz, feldspar, biotite, A2.					IG_MWB01_78.0
338	79 260							
337	80		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.					IG_MWB01_80.0
336	81 265							
335	82 270		BGT, grey, fresh with trace hematite and chlorite, qtz, feldspar, biotite, A2.					IG_MWB01_82.0
334	83							
333	84 275		BGT, grey, fresh with trace hematite and chlorite, qtz, feldspar, biotite, A2.					IG_MWB01_84.0
332	85 280							
331	86		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_86.0
330	87 285							
329	88		BGT, grey, fresh with trace chlorite and k-feldspar, qtz, feldspar, biotite, A2.					IG_MWB01_88.0
328	89 290							
327	90 295		BGT, grey, fresh with trace k-feldspar and smokey quartz, qtz, feldspar, biotite, A1.					IG_MWB01_90.0
	91							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
S. DHEILLY

APPROVED
E. LEVAY

DATE
6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWB01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
326	300							
	92		BGT, grey, fresh with trace hematite and k-feldspar, qtz, feldspar, biotite, A2.					IG_MWB01_92.0
325	93							
324	305							
	94		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_94.0
323	310							
	95							
322								
	96		BGT, grey, fresh with trace hematite, qtz, feldspar, biotite, A2.					IG_MWB01_96.0
321	315							
	97							
320								
	98		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB01_98.0
319								
	99							
318	325							
	100			317.4				IG_MWB01_100.0
317	330		Notes: 1. End of test hole at 100.57 m. 2. Test hole remained open to 100.57 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120831 5. Zone 2 (B): Middle port; VW2120828 6. Zone 3 (A): Deep port; VW2125477			100.6		
	101							
316								
	102							
315	335							
	103							
314								
	104							
313	340							
	105							
312								
	106							
311	345							
	107							
310								
	108							
309	350							
	109							
308								
	110							
307	355							
	111							
306								
	112							
305	360							
	113							
304								
	114							
303	365							
	370							
	375							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
S. DHEILLY

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E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB02

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	417.62 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	0.78 m / 418.40 m (Standpipe)
DESCRIPTION	IG_MWB	**DATE DRILLED**	6-6-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,485,333.7
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 555,419.45
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
417	1	5		**FILL** - black-grey, gravel and sand fill.	416.5				
416	2			**BGT** - grey, bedrock at 1.10 m, qtz, feldspar, biotite, A1.					IG_MWB02_1.0
415	3	10		BGT, grey, fresh granodiorite, qtz, feldspar, biotite, A1.					IG_MWB02_2.0
414	4	15		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_3.0
413	5			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_4.0
412	6	20		BGT, grey, water at 5.85 m, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWB02_5.0
411	7	25		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.			6.0		IG_MWB02_6.0
410	8			BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_7.0
409	9	30		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_8.0
408	10			BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_9.0
407	11	35		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_10.0
406	12	40		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_12.0
405	13								
404	14	45		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_14.0
403	15	50							
402	16			BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_16.0
401	17	55							
400	18	60		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_18.0
399	19								
398	20	65							IG_MWB02_20.0

WATER LEVELS

CONTRACTOR	INSPECTOR
Maple Leaf Drilling Ltd.	**J. BURNS**
APPROVED	DATE
E. LEVAY	6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
397	21	70		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					
396	22			BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_22.0
395	23	75							
394	24			BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_24.0
393	25	80							
392	26	85		BGT, grey, dry, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_26.0
391	27								
390	28	90		BGT, grey, unaltered, fresh appearance, qtz, feldspar, biotite, A1.					IG_MWB02_28.0
389	29	95							
388	30			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_30.0
387	31	100							
386	32	105		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWB02_32.0
385	33								
384	34	110		BGT, grey, fresh, trace amphibolite, qtz, feldspar, biotite, A1.					IG_MWB02_34.0
383	35	115							
382	36			BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.					IG_MWB02_36.0
381	37	120							
380	38	125		BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.					IG_MWB02_38.0
379	39								
378	40	130		BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.					IG_MWB02_40.0
377	41	135							
376	42			BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.					IG_MWB02_42.0
375	43	140							
374									

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB02

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
ELEV (m)							
373	44 — 145		BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.				IG_MWB02_44.0
372	45 — 150		BGT, grey, fresh with trace amphibolite, qtz, feldspar, biotite, A1.				IG_MWB02_46.0
371	46 — 155				47.0		
370	47 — 160		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_48.0
369	48 — 165						
368	49 — 170		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_50.0
367	50 — 175				51.7		IG_MWB02_52.0
366	51 — 180		BGT, grey, fresh, trace k-feldspar, qtz, feldspar, biotite, A1.	Port C	52.2		
365	52 — 185				53.0		
364	53 — 190		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_54.0
363	54 — 195						
362	55 — 200		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_56.0
361	56 — 205						
360	57 — 210		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_58.0
359	58 — 215						
358	59 — 220		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_60.0
357	60						
356	61		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_62.0
355	62				63.0		
354	63		BGT, grey, fresh, qtz, feldspar, biotite, A1.	Port B	64.0		IG_MWB02_64.0
353	64				65.0		
352	65		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_66.0
351	66						
	67						

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
350	68	225		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_68.0
349	69							
348	70	230		BGT, grey, trace k-feldspar, trace amphibolite, qtz, feldspar, biotite, A1.				IG_MWB02_70.0
347	71							
346	72	235		BGT, grey, k-feldspar content increasing, qtz, feldspar, biotite, A1.				IG_MWB02_72.0
345	73	240						
344	74			BGT, grey, trace k-feldspar, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_74.0
343	75	245						
342	76	250		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_76.0
341	77							
340	78	255		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_78.0
339	79	260						
338	80			BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_80.0
337	81	265						
336	82	270		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_82.0
335	83							
334	84	275		BGT, grey, fresh, trace amphibolite, qtz, feldspar, biotite, A1.				IG_MWB02_84.0
333	85	280						
332	86			BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_86.0
331	87	285						
330	88	290		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWB02_88.0
329	89							
328	90	295		BGT, grey, fresh, trace k-feldspar, dry, qtz, feldspar, biotite, A1.				IG_MWB02_90.0
327	91							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

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DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB02

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
326	300 92		BGT, grey, fresh, trace k-feldspar, dry, qtz, feldspar, biotite, A1.					IG_MWB02_92.0
325	305 93							
324	94		BGT, grey, fresh, trace chlorite, qtz, feldspar, biotite, A2.					IG_MWB02_94.0
323	310 95					94.4		
322					Port A	95.3		
321	315 96		BGT, grey, fresh, dry, qtz, feldspar, biotite, A1.					IG_MWB02_96.0
320	320 97					97.4		
319	98		BGT, grey, fresh, dry, qtz, feldspar, biotite, A1.					IG_MWB02_98.0
318	325 99							
317	100			317.6				IG_MWB02_100.0
316	330 101		Notes: 1. End of test hole at 100.66 m. 2. Test hole remained open to 100.66 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2125478 5. Zone 2 (B): Middle port; VW2125471 6. Zone 3 (A): Deep port; VW2123765			100.7		
315	335 102							
314	103 340							
313	104							
312	345 105							
311	106							
310	350 107							
309	108							
308	355 109							
307	110 360							
306	111							
305	365 112							
304	113 370							
303	114 375							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWB03

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	418.48 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	1.15 m / 419.62 m (Standpipe)
DESCRIPTION	IG_MWB	**DATE DRILLED**	6-5-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,485,286.51
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 555,447.36
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
418	0	0		**FILL** - black-grey, gravel and sand fill.					
	1				417.3				IG_MWB03_1.0
417		5		**BGT** - grey, bedrock at 1.18 m, qtz, feldspar, biotite, A1.					
	2			BGT, grey, qtz, feldspar, biotite, A1.					IG_MWB03_2.0
416									
	3	10		BGT, grey, qtz, feldspar, biotite, A1.					IG_MWB03_3.0
415									
	4			BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_4.0
414		15							
	5			BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_5.0
413									
	6	20		BGT, grey, bentonite in sample from plug, qtz, feldspar, biotite, A1.			6.0		IG_MWB03_6.0
412									
	7			BGT, grey, bentonite in sample from plug, qtz, feldspar, biotite, A1.					IG_MWB03_7.0
411		25							
	8			BGT, grey, qtz, feldspar, biotite, A1.					IG_MWB03_8.0
410									
	9	30		BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_9.0
409									
	10			BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_10.0
408		35							
	11								
407									
	12	40		BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_12.0
406									
	13								
405		45							
	14			BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_14.0
404									
	15	50							
403									
	16			BGT, grey, dry, qtz, feldspar, biotite, A1.					IG_MWB03_16.0
402		55							
	17								
401									
	18	60		BGT, grey, higher k-feldspar content, qtz, feldspar, biotite, A1.			18.3		IG_MWB03_18.0
400									
	19								
399		65			398.5				IG_MWB03_20.0
	20								

WATER LEVELS

CONTRACTOR **Maple Leaf Drilling Ltd.**	INSPECTOR **J. BURNS**
APPROVED E. LEVAY	DATE 6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWB03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
			ELEV (m)				
398			**GRANITE** - grey, slightly damp, qtz, feldspar, biotite, A1.				
397	21 70				21.3		IG_MWB03_22.0
396	22		Granite, grey, slightly damp, qtz, feldspar, biotite, A1.	Port C	22.6		
395	23 75				23.3		IG_MWB03_24.0
394	24 80		Granite, grey, slightly damp, qtz, feldspar, biotite, A1.				
393	25						
392	26 85		392.5 **BGT** - grey, slightly damp, qtz, feldspar, biotite, A1.				IG_MWB03_26.0
391	27 90						
390	28		BGT, grey, slightly damp, qtz, feldspar, biotite, A1.				IG_MWB03_28.0
389	29 95						
388	30 100		BGT, grey, slightly damp, qtz, feldspar, biotite, A1.				IG_MWB03_30.0
387	31						
386	32 105		BGT, grey, slightly damp, qtz, feldspar, biotite, A1.				IG_MWB03_32.0
385	33 110						
384	34		BGT, grey, slightly damp, qtz, feldspar, biotite, A1.				IG_MWB03_34.0
383	35 115						
382	36 120		BGT, grey, slightly damp, qtz, feldspar, biotite, A1.				IG_MWB03_36.0
381	37						
380	38 125		BGT, grey, slightly damp, qtz, feldspar, biotite, A2, tr. hematite.				IG_MWB03_38.0
379	39 130						
378	40		BGT, grey, damp, qtz, feldspar, biotite, A1.				IG_MWB03_40.0
377	41 135						
376	42 140		BGT, grey, some moisture at 43 m, qtz, feldspar, biotite, A1.		41.9		IG_MWB03_42.0
375	43			Port A	43.2		

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

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6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWB03

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
	44	145		BGT, grey, damp, qtz, feldspar, biotite, A1.			44.0		IG_MWB03_44.0
374	45								
373		150							
	46			BGT, grey, damp, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWB03_46.0
372	47	155							
371	48			BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_48.0
370	49	160							
369	50			BGT, grey, damp, trace chlorite, qtz, feldspar, biotite, A2.					IG_MWB03_50.0
368		165							
367	51								
	52	170		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_52.0
366	53								
365		175							
	54			BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_54.0
364	55	180							
363									
	56	185		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_56.0
362	57								
361		190							
	58			BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_58.0
360	59								
359		195							
	60			BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_60.0
358	61	200							
357									
	62			BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_62.0
356	63	205							
355									
	64	210		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_64.0
354	65								
353		215							
	66			BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_66.0
352	67	220							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

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DATE
6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWB03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
351	68 225		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_68.0
350	69							
349	70 230		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_70.0
348	71							
347	72 235		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_72.0
346	73 240							
345	74		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_74.0
344	75 245							
343	76 250		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_76.0
342	77							
341	78 255		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_78.0
340	79							
339	80 260		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_80.0
338	81 265							
337	82		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_82.0
336	83 270					83.2		
335	84 275		BGT, grey, darker grey, qtz, feldspar, biotite, A1.					IG_MWB03_84.0
334	85				Port B	84.9		
333	280					85.7		
	86		**AMPHIBOLITE** - black, aphanitic, mostly amplibolite, A1.	332.5				IG_MWB03_86.0
332	87 285							
331	88		**BGT** - grey, slightly darker grey, qtz, feldspar, biotite, A1.	330.5				IG_MWB03_88.0
330	89 290							
329	90 295		BGT, grey, back to normal light grey, qtz, feldspar, biotite, A1.					IG_MWB03_90.0
328	91							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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TEST HOLE LOG

HOLE NO.
IG_MWB03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
327	300							
	92		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_92.0
326	93 — 305							
325								
	94		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_94.0
324	310							
	95							
323								
	96 — 315		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_96.0
322								
	97							
321	320							
	98		BGT, grey, damp, qtz, feldspar, biotite, A1.					IG_MWB03_98.0
320								
	99 — 325							
319								
	100			318.5				IG_MWB03_100.0
318	330		Notes: 1. End of test hole at 100.50 m. 2. Test hole remained open to 100.50 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120836 5. Zone 2 (B): Middle port; VW2125476 6. Zone 3 (A): Deep port; VW2123770			100.5		
	101							
317								
	102 — 335							
316								
	103							
315	340							
	104							
314								
	105 — 345							
313								
	106							
312	350							
	107							
311								
	108 — 355							
310								
	109							
309	360							
	110							
308								
	111 — 365							
307								
	112							
306	370							
	113							
305								
	114							
304	375							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
J. BURNS

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DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC01

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	427.41 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	0.86 m / 428.27 m (Standpipe)
DESCRIPTION	IG_MWC	**DATE DRILLED**	7-8-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,485,929.48
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 556,981.71
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
427	0	0		**OVERBURDEN** - brown, overburden/organics.					
					426.4				
426	1	5		**BGT** - grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC01_1.0
	2			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC01_2.0
425	3	10			424.4				IG_MWC01_3.0
				GRANITE - grey - pink, with k-feldspar, qtz, feldspar, biotite, A1.					
424	4			Granite, colour, with k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC01_4.0
423		15							IG_MWC01_5.0
	5			Granite, pink, with k-feldspar, qtz, feldspar, biotite, A3.					
422	6	20		Granite, pink, with k-feldspar, qtz, feldspar, biotite, A2.			6.0		IG_MWC01_6.0
421					420.4				IG_MWC01_7.0
	7	25		**BGT** - grey - pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					
420	8			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_8.0
419	9	30		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC01_9.0
418	10			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_10.0
417		35							
416	11								
	12	40		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC01_12.0
415	13								
414		45							
	14			BGT, grey - pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_14.0
413	15	50							
412	16			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_16.0
411		55							
	17								
410	18	60		BGT, grey - pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC01_18.0
409	19								
408		65							
	20								IG_MWC01_20.0

WATER LEVELS

CONTRACTOR	INSPECTOR
Maple Leaf Drilling Ltd.	**T. PACKULAK**
APPROVED	DATE
E. LEVAY	6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
407			BGT, pink, some k-feldspar, qtz, feldspar, biotite, A3, tr. hematite.					
406	21 70							
405	22		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A3, tr. hematite.			22.3		IG_MWC01_22.0
404	23 75							
403	24 80		BGT, red, some k-feldspar, qtz, feldspar, biotite, A3, tr. hematite, tr. chlorite, tr. calcite.					IG_MWC01_24.0
402	25					25.3		
401	26 85		BGT, red, some k-feldspar, qtz, feldspar, biotite, A3, hematite, tr. chlorite.		Port C	26.0		IG_MWC01_26.0
400	27 90					26.7		
399	28		BGT, red, some k-feldspar, qtz, feldspar, biotite, A3, hematite, tr. chlorite.					IG_MWC01_28.0
398	29 95							
397	30 100		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_30.0
396	31							
395	32 105		BGT, red, some k-feldspar, qtz, feldspar, biotite, A3, hematite, tr. chlorite.					IG_MWC01_32.0
394	33 110							
393	34		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_34.0
392	35 115							
391	36 120		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_36.0
390	37							
389	38 125		BGT, pink, with k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_38.0
388	39 130							
387	40		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_40.0
386	41 135							
385	42		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_42.0
384	43 140							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC01

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
383	44	145		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_44.0
382	45								
	46	150			381.4				IG_MWC01_46.0
381				**GRANITE** - grey-pink, with k-feldspar, qtz, feldspar, biotite, A1.					
380	47	155							
	48				379.4				IG_MWC01_48.0
379				**BGT** - grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					
378	49	160							
	50	165		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC01_50.0
377	51								
376		170							
	52			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_52.0
375	53	175							
374									
	54			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC01_54.0
373							54.7		
	55	180				Port B	55.7		
372									
	56			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_56.0
371		185					56.5		
	57								
370									
	58	190		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC01_58.0
369	59								
368		195							
	60			BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_60.0
367	61	200							
366									
	62			BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_62.0
365		205							
	63								
364									
	64	210		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC01_64.0
363	65								
362		215							
	66			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_66.0
361									
	67	220							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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E. LEVAY

DATE
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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC01

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
359	68	225		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_68.0
358	69								
357	70	230		**GRANITE** - grey-pink, with k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.	357.4				IG_MWC01_70.0
356	71	235							
355	72			**BGT** - grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.	355.4				IG_MWC01_72.0
354	73	240							
353	74			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_74.0
352	75	245							
351	76	250		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_76.0
350	77								
349	78	255		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC01_78.0
348	79	260							
347	80			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_80.0
346	81	265							
345	82	270		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC01_82.0
344	83								
343	84	275		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, hematite.					IG_MWC01_84.0
342	85	280							
341	86			BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_86.0
340	87	285							
339	88	290		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_88.0
338	89								
337	90	295		**GRANITE** - grey-pink, with k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.	337.4		90.0		IG_MWC01_90.0
	91								

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC01

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
				335.4	Port A	91.2		
			BGT - grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_92.0
						92.6		
			BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_94.0
			BGT, grey-pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC01_96.0
			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC01_98.0
				327.4				IG_MWC01_100.0
			Notes: 1. End of test hole at 101.90 m. 2. Test hole remained open to 101.90 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120830 5. Zone 2 (B): Middle port; VW2125470 6. Zone 3 (A): Deep port; VW2123767			101.9		

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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DATE
6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWC02

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	431.55 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	0.91 m / 432.46 m (Standpipe)
DESCRIPTION	IG_MWC	**DATE DRILLED**	7-8-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,485,905.1
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 556,937.76
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
431				**OVERBURDEN** - brown, overburden/organics.					
	1				430.6				IG_MWC02_1.0
430		5		**BGT** - grey, BGT, tr. feldspar, qtz, feldspar, biotite, A1, tr. hematite.					
	2			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC02_2.0
429									
	3	10		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC02_3.0
428									
	4			BGT, grey, some k-feldspar, qtz, feldspar, A1, tr. hematite.					IG_MWC02_4.0
427		15							
	5			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC02_5.0
426									
	6	20		BGT, grey, fresh, qtz, feldspar, biotite, A1.			6.0		IG_MWC02_6.0
425									
	7			BGT, grey, qtz, feldspar, biotite, A1, tr. hematite.			6.9		IG_MWC02_7.0
424		25							
	8			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC02_8.0
423									
	9	30		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC02_9.0
422									
	10			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.			9.9		IG_MWC02_10.0
421		35							
	11					Port C	11.5		
420									IG_MWC02_12.0
	12	40		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.			12.2		
419									
	13								
418		45							
	14			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC02_14.0
417									
	15	50							
416									
	16			BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC02_16.0
415		55							
	17								
414									
	18	60		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC02_18.0
413									
	19								
412		65							
	20								IG_MWC02_20.0

WATER LEVELS

CONTRACTOR: **Maple Leaf Drilling Ltd.**

INSPECTOR: **T. PACKULAK**

APPROVED: E. LEVAY

DATE: 6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWC02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
411	21	70		BGT, grey, fresh, qtz, feldspar, biotite, A1.				
410	22			BGT, grey, fresh, tr. k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_22.0
409	23	75						
408	24			BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_24.0
407	25	80						
406	26	85		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_26.0
405	27							
404	28	90		BGT, grey, trace k-feldpsar, qtz, feldspar, biotite, A1.				IG_MWC02_28.0
403	29	95						
402	30			BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_30.0
401	31	100						
400	32	105		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_32.0
399	33							
398	34	110		BGT, grey, trace k-feldpsar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_34.0
397	35	115						
396	36			BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_36.0
395	37	120						
394	38	125		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_38.0
393	39							
392	40	130		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_40.0
391	41	135						
390	42			BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_42.0
389	43	140						
388								

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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DATE
6-10-2022

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TEST HOLE LOG

HOLE NO.
IG_MWC02

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
387	44 145		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_44.0
386	45 150		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_46.0
385	46						
384	47 155		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_48.0
383	48						
382	49 160		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_50.0
381	50 165						
380	51		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_52.0
379	52 170						
378	53 175		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_54.0
377	54						
376	55 180		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_56.0
375	56 185						
374	57		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_58.0
373	58 190						
372	59 195		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_60.0
371	60						
370	61 200		BGT, grey, fresh, qtz, feldspar, biotite, A1.				IG_MWC02_62.0
369	62 205						
368	63		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.				IG_MWC02_64.0
367	64 210						
366	65 215		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC02_66.0
365	66						
	67 220						

ELEV (m)

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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TEST HOLE LOG

HOLE NO.
IG_MWC02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS DIAGRAM	LOG OF INSTALLS DEPTH (m)	SAMPLE TYPE	NUMBER
364	68	225		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.			67.4		IG_MWC02_68.0
363	69	230				Port B	68.6		
362	70	230		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.			69.3		IG_MWC02_70.0
361	71	235							
360	72	235		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC02_72.0
359	73	240							
358	74	240		BGT, grey, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC02_74.0
357	75	245							
356	76	250		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC02_76.0
355	77	255							
354	78	255		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC02_78.0
353	79	260							
352	80	260			351.6				IG_MWC02_80.0
				SYENITE - pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite, tr. chlorite.					
351	81	265							
350	82	270		Syenite, pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite, tr. chlorite.					IG_MWC02_82.0
349	83	270							
348	84	275			347.6				IG_MWC02_84.0
				GRANITE - pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.					
347	85	280							
346	86	280		Granite, pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC02_86.0
345	87	285							
344	88	290			343.6				IG_MWC02_88.0
				BGT - grey-pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.					
343	89	290							
342	90	295		BGT, grey-pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC02_90.0
341	91								

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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TEST HOLE LOG

HOLE NO.
IG_MWC02

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
340	92	300							
				GRANITE - grey-pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.	339.6				IG_MWC02_92.0
339	93	305					93.1		
338						Port A	93.8		IG_MWC02_94.0
	94			Granite, grey-pink, with k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.			94.5		
337		310							
336	95								
	96	315			335.6				IG_MWC02_96.0
335				**BGT** - grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					
	97								
334		320							IG_MWC02_98.0
	98			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					
333									
	99	325							
332									
	100				331.6				IG_MWC02_100.0
331		330							
	101			Notes: 1. End of test hole at 101.02 m. 2. Test hole remained open to 101.02 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120832 5. Zone 2 (B): Middle port; VW2125474 6. Zone 3 (A): Deep port; VW2123766			101.0		
330	102	335							
329	103								
		340							
328	104								
327	105	345							
326	106								
325		350							
	107								
324	108	355							
323	109								
322		360							
	110								
321	111	365							
320	112								
319		370							
	113								
318	114	375							
317									

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC03

CLIENT		**PROJECT NO.**	21-3836-001
PROJECT	**Shallow Groundwater Monitoring Network, Ignace Area**	**SURFACE ELEV.**	424.94 m
LOCATION	Ignace, ON	**TOC STICK-UP / ELEV.**	0.97 m / 425.91 m (Standpipe)
DESCRIPTION	IG_MWC	**DATE DRILLED**	7-9-2021
DRILL RIG / HAMMER	Mobile B54X Track Mounted Drill Rig with Downhole Hammer	**UTM (m)**	N 5,485,882.72
METHOD(S)	0.0 m to 6.0 m: Hammer Drill with Air Lift, 266 mm ø		E 556,982.57
	6.0 m to 100.4 m: Hammer Drill with Air Lift, 143 mm ø		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
424	1	5		**BGT** - pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					
423	2			BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_1.0
422	3	10		BGT, pink-grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC03_2.0
421	4	15		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_3.0
420	5			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_4.0
419	6	20		BGT, pink-grey, some k-feldspar, qtz, feldspar, biotite, A2.					IG_MWC03_5.0
418	7	25		BGT, pink, some k-feldspar, with granite, qtz, feldspar, biotite, A2, hematite.			6.0		IG_MWC03_6.0
417	8			BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_7.0
416	9	30		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_8.0
415	10			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_9.0
414	11	35		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_10.0
413	12	40		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.					IG_MWC03_12.0
412	13								
411	14	45		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_14.0
410	15	50							
409	16			BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_16.0
408	17	55							
407	18			BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_18.0
406	19	60							
405	20	65							IG_MWC03_20.0

WATER LEVELS

CONTRACTOR	INSPECTOR
Maple Leaf Drilling Ltd.	**T. PACKULAK**
APPROVED	DATE
E. LEVAY	6-10-2022

KGS_LOG_COLMTEST U:\FMS\21-3836-001\21-3836-001_WELLLOGS_DRAFT.GPJ

KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
404	21 70		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					
403	22		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_22.0
402	23 75							
401	24 80		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_24.0
400	25							
399	26 85		BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_26.0
398	27 90							
397	28		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC03_28.0
396	29 95							
395	30		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_30.0
394	31 100							
393	32 105		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_32.0
392	33							
391	34 110		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC03_34.0
390	35 115					34.7		
389	36		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1.					IG_MWC03_36.0
388	37 120							
387	38 125		BGT, pink, some k-feldspar, some amphibolite, qtz, feldspar, biotite, amphibole, A2, hematite.			37.9		IG_MWC03_38.0
386	39				Port C	39.3		
385	40 130		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.			40.1		IG_MWC03_40.0
384	41 135							
383	42		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.					IG_MWC03_42.0
382	43 140							

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

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6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC03

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
381	44	145		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_44.0
380	45							
379	46	150		BGT, pink-grey, some k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_46.0
378	47	155						
377	48			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_48.0
376	49	160						
375	50			BGT, pink, with k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_50.0
374	51	165						
373	52			BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_52.0
372	53	170						
371	54			BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_54.0
370	55	175						
369	56			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_56.0
368	57	180						
367	58			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, hematite.				IG_MWC03_58.0
366	59	185						
365	60			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, hematite.				IG_MWC03_60.0
364	61	190				61.4		
363	62			BGT, grey-pink, with k-feldspar, qtz, feldspar, biotite, A1, hematite.	Port B	62.3		IG_MWC03_62.0
362	63	195				63.2		
361	64			BGT, grey-pink, some k-feldspar, qtz, feldspar, biotite, A1, hematite.				IG_MWC03_64.0
360	65	200						
359	66			BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, hematite.				IG_MWC03_66.0
358	67	205						
		210						
		215						
		220						

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

APPROVED
E. LEVAY

DATE
6-10-2022

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
357	68 225		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_68.0
356	69						
355	70 230		BGT, grey, with k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_70.0
354	71				70.9		
	235			Port A	71.6		
353	72		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.		72.3		IG_MWC03_72.0
352	73 240						
351	74		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_74.0
350	75 245						
349	76 250		BGT, pink, some k-feldspar, qtz, feldspar, biotite, A2, hematite.				IG_MWC03_76.0
348	77						
347	78 255		BGT, pink-grey, some k-feldspar, qtz, feldspar, biotite, A2, tr. hematite.				IG_MWC03_78.0
346	79 260						
345	80		BGT, pink-grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_80.0
344	81 265						
343	82 270		BGT, grey, some k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_82.0
342	83						
341	84 275		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_84.0
340	85 280						
339	86		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_86.0
338	87 285						
337	88		BGT, grey, fresh, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_88.0
336	89 290						
335	90 295		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.				IG_MWC03_90.0
334	91						

WATER LEVELS

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KGS GROUP

TEST HOLE LOG

HOLE NO.
IG_MWC03

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	LOG OF INSTALLS: DIAGRAM	LOG OF INSTALLS: DEPTH (m)	SAMPLE TYPE	NUMBER
333	92		BGT, grey, trace k-feldspar, qtz, feldspar, biotite, A1, tr. hematite.					IG_MWC03_92.0
331	94		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC03_94.0
329	96		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC03_96.0
327	98		BGT, grey, fresh, qtz, feldspar, biotite, A1.					IG_MWC03_98.0
325	100			324.9				IG_MWC03_100.0
324	101		Notes: 1. End of test hole at 100.96 m. 2. Test hole remained open to 100.96 m upon completion of drilling/digging. 3. Locking protective cover installed at surface. 4. Zone 1 (C): Shallow port; VW2120834 5. Zone 2 (B): Middle port; VW2123772 6. Zone 3 (A): Deep port; VW2125771			101.0		

WATER LEVELS

CONTRACTOR
Maple Leaf Drilling Ltd.

INSPECTOR
T. PACKULAK

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E. LEVAY

DATE
6-10-2022

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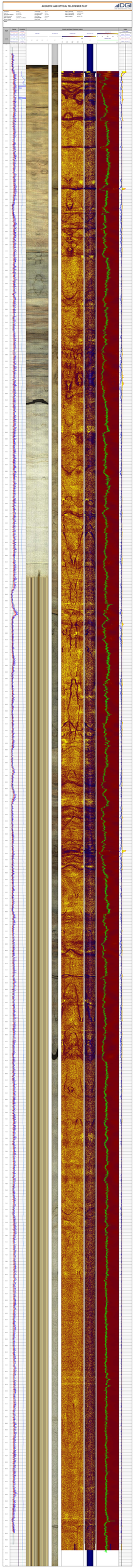
APPENDIX B

Composited Geophysical Logging Results

ACOUSTIC AND OPTICAL TELEVIEWER PLOT

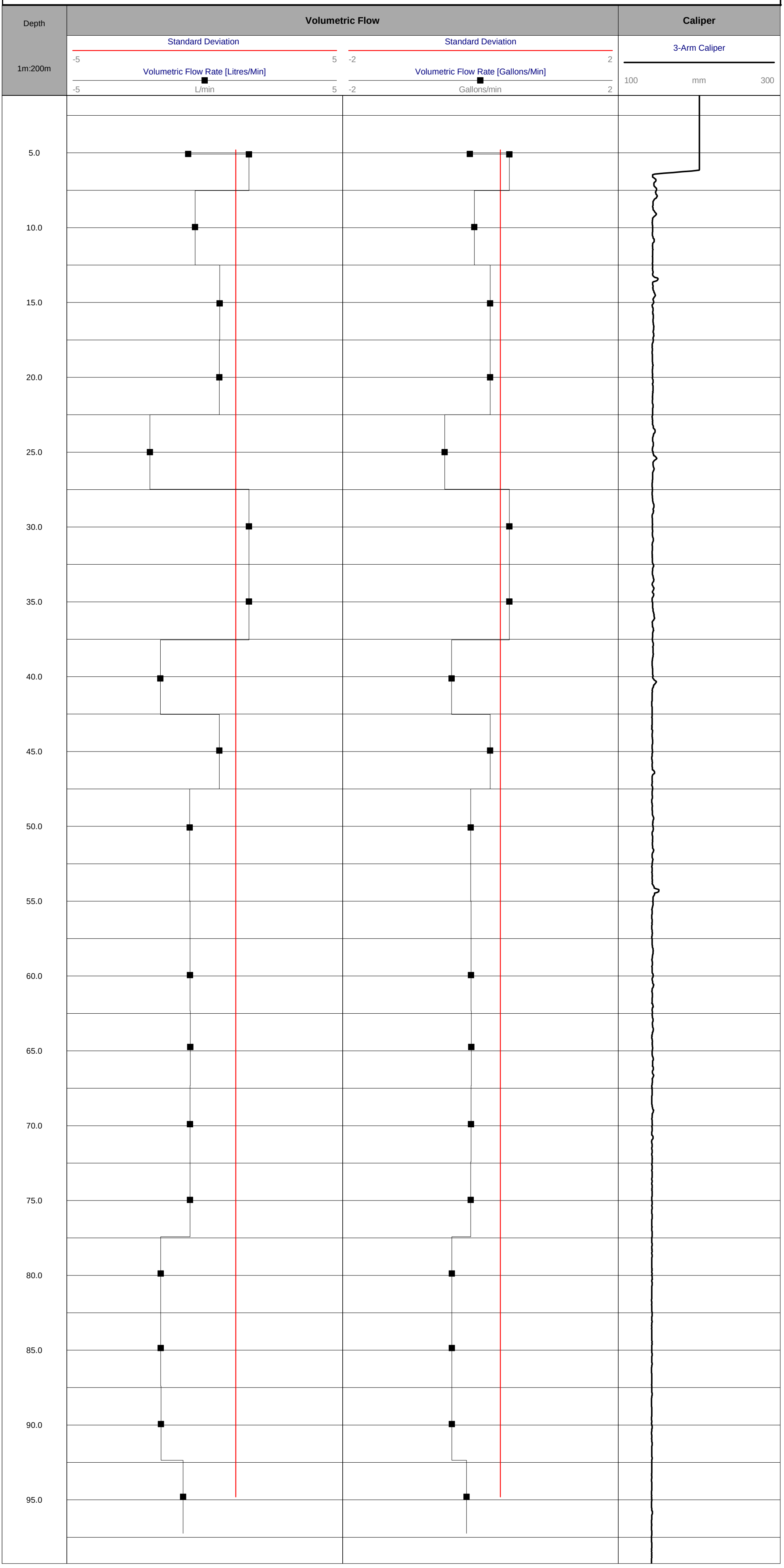


FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555336.474
Hole ID:	IG-MWA01	**Surveyed Depth:**	97.6 m	**UTM Y (Northing):**	5486569.946
Acquisition date(s):	Jul 23, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	407.689
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	n/a		

Notes:



PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555336.474
Hole ID:	IG-MWA01	**Surveyed Depth:**	98.5 m	**UTM Y (Northing):**	5486569.946
Acquisition date(s):	Jul 23, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	407.689
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:

Depth

1m:500m

Physical Rock Properties

Natural Gamma — 0 CPS 200
Natural Gamma Repeat — 0 CPS 200
Natural Gamma — 0 API 200
Natural Gamma Repeat — 0 API 200

8" Rel. Resistivity — 0 Ohm-m 100000
16" Rel. Resistivity — 0 Ohm-m 100000
32" Rel. Resistivity — 0 Ohm-m 100000
64" Rel. Resistivity — 0 Ohm-m 100000

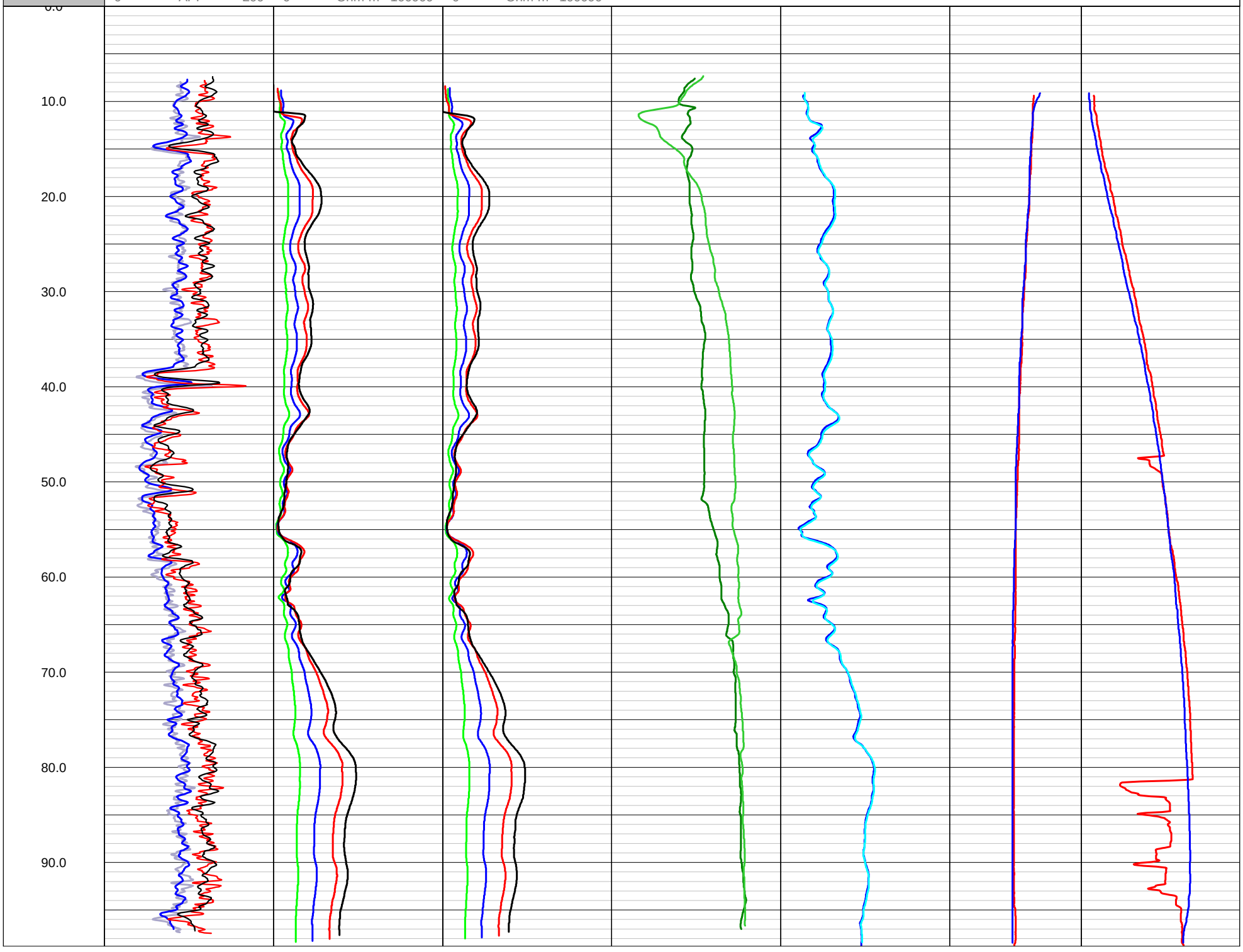
8" Rel. Resistivity Repeat — 0 Ohm-m 100000
16" Rel. Resistivity Repeat — 0 Ohm-m 100000
32" Rel. Resistivity Repeat — 0 Ohm-m 100000
64" Rel. Resistivity Repeat — 0 Ohm-m 100000

SP — -200 mV 600
SP Repeat — -200 mV 600

SP Resistivity — 0 Ohm 14000
SP Resistivity Repeat — 0 Ohm 14000

Temperature — 0 'C 10
Temperature Repeat — 0 'C 10

Fluid Resistivity — 50 Ohm-m 110
Fluid Resistivity Repeat — 50 Ohm-m 110

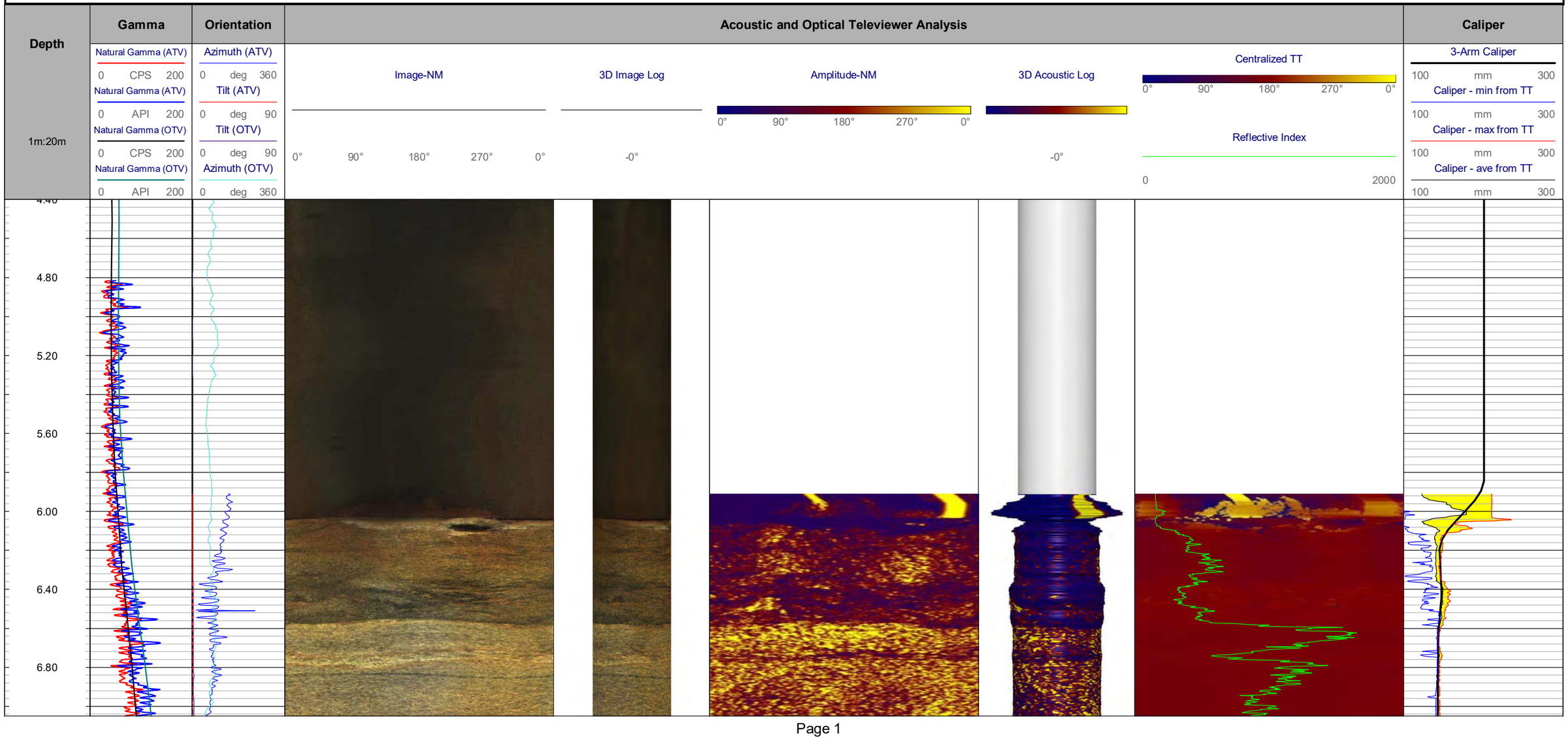


ACOUSTIC AND OPTICAL TELEVIEWER PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555377.05
Hole ID:	IG-MWA02	**Surveyed Depth:**	100 m	**UTM Y (Northing):**	5486543.934
Acquisition date(s):	Jul 21, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	405.813
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:



Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

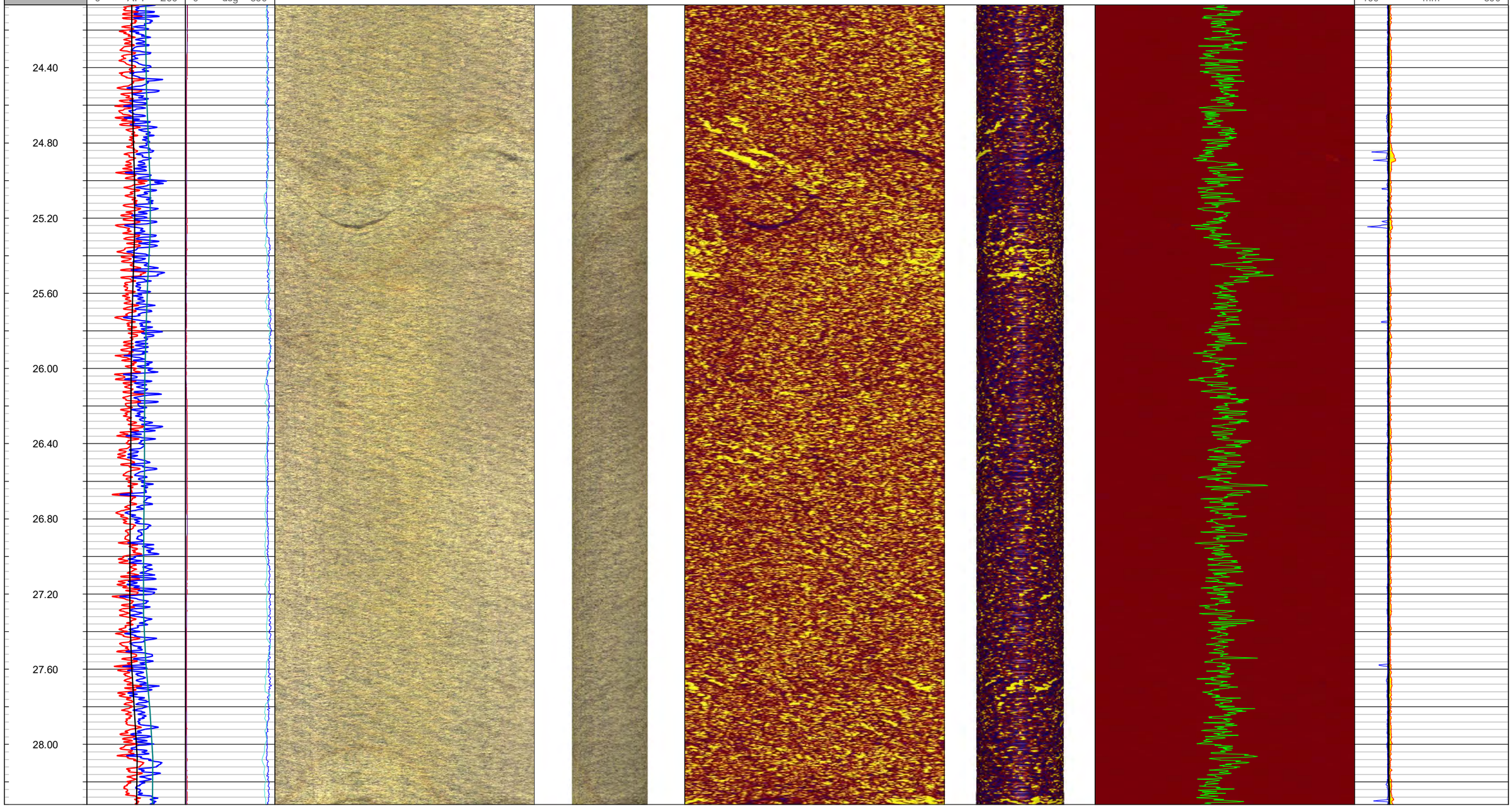
7.20
7.60
8.00
8.40
8.80
9.20
9.60
10.00
10.40
10.80
11.20

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
11.60								
12.00								
12.40								
12.80								
13.20								
13.60								
14.00								
14.40								
14.80								
15.20								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
15.60								
16.00								
16.40								
16.80								
17.20								
17.60								
18.00								
18.40								
18.80								
19.20								
19.60								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
20.00								
20.40								
20.80								
21.20								
21.60								
22.00								
22.40								
22.80								
23.20								
23.60								
24.00								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

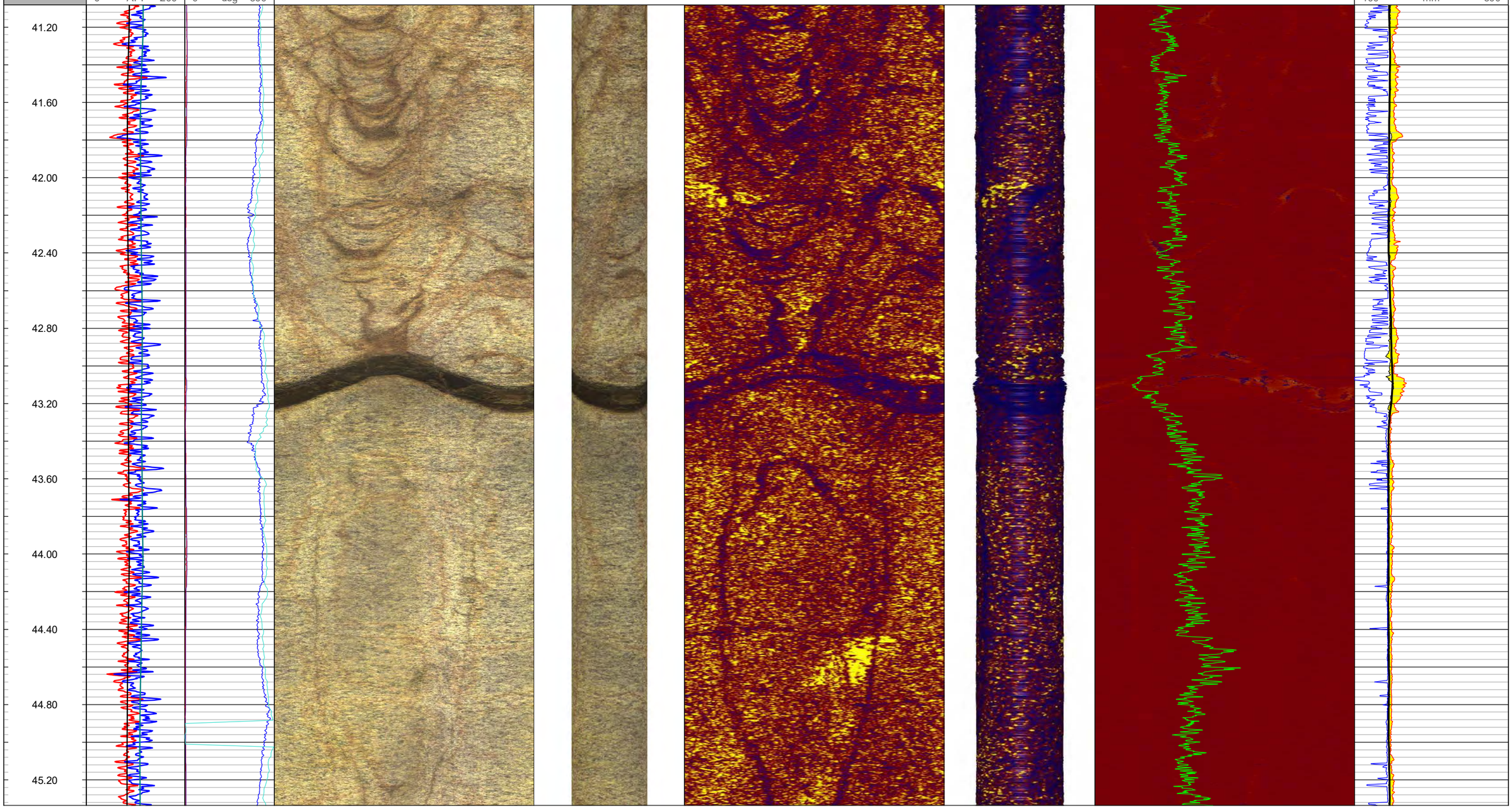


Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
28.40								
28.80								
29.20								
29.60								
30.00								
30.40								
30.80								
31.20								
31.60								
32.00								
32.40								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
32.80								
33.20								
33.60								
34.00								
34.40								
34.80								
35.20								
35.60								
36.00								
36.40								
36.80								

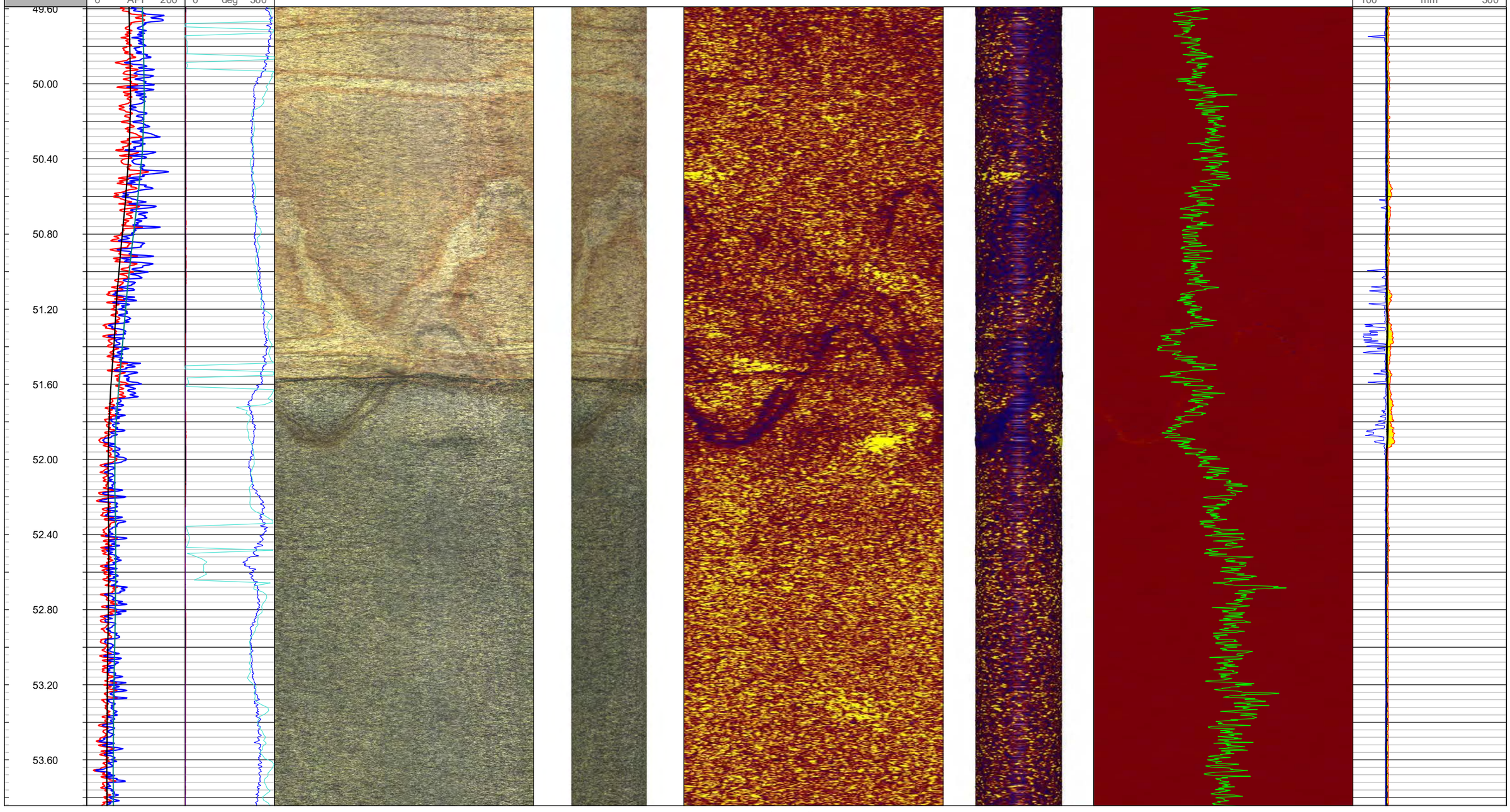
Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
37.20								
37.60								
38.00								
38.40								
38.80								
39.20								
39.60								
40.00								
40.40								
40.80								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

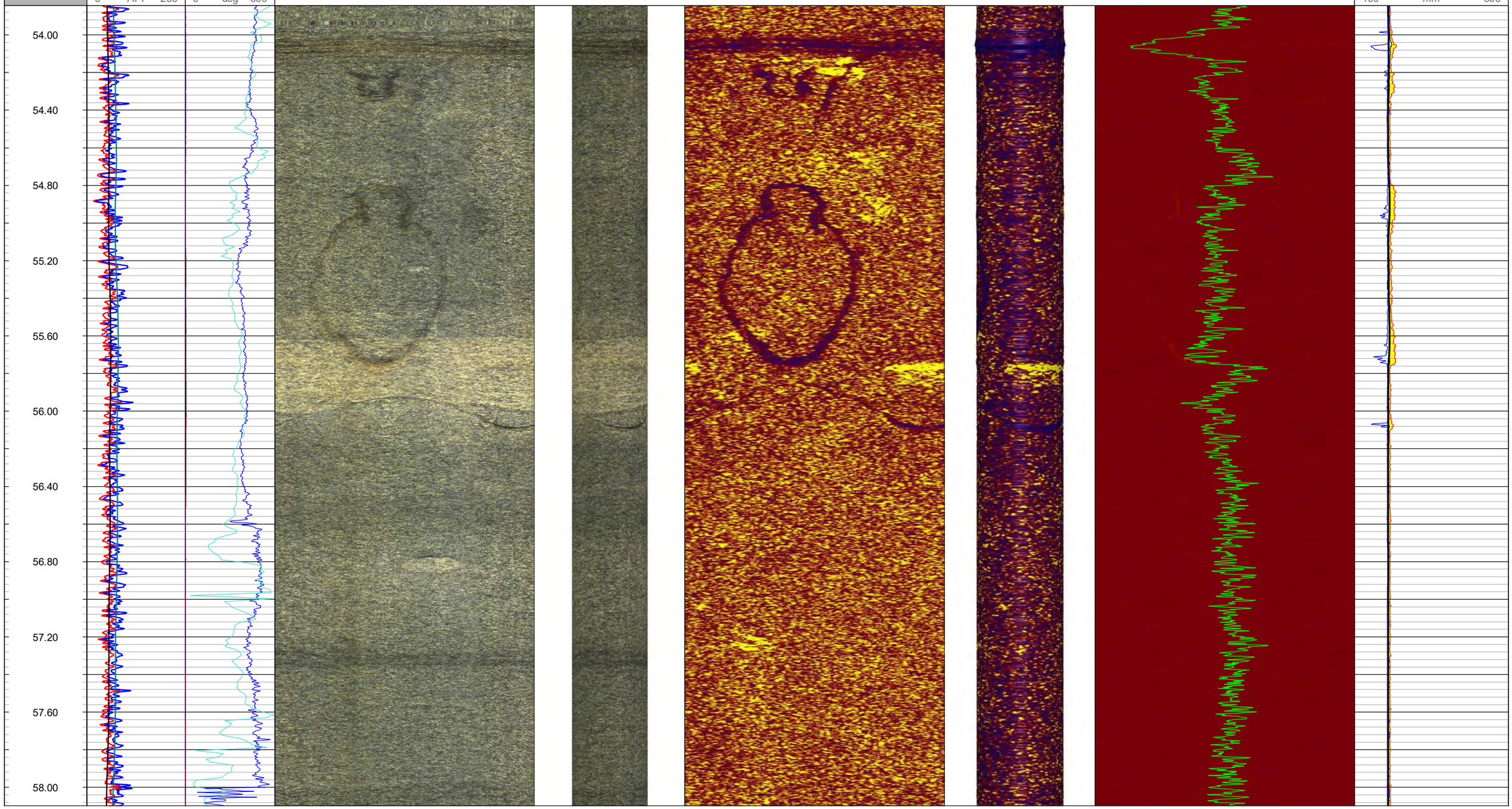


Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
45.60								
46.00								
46.40								
46.80								
47.20								
47.60								
48.00								
48.40								
48.80								
49.20								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300



Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300



Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
58.40								
58.80								
59.20								
59.60								
60.00								
60.40								
60.80								
61.20								
61.60								
62.00								

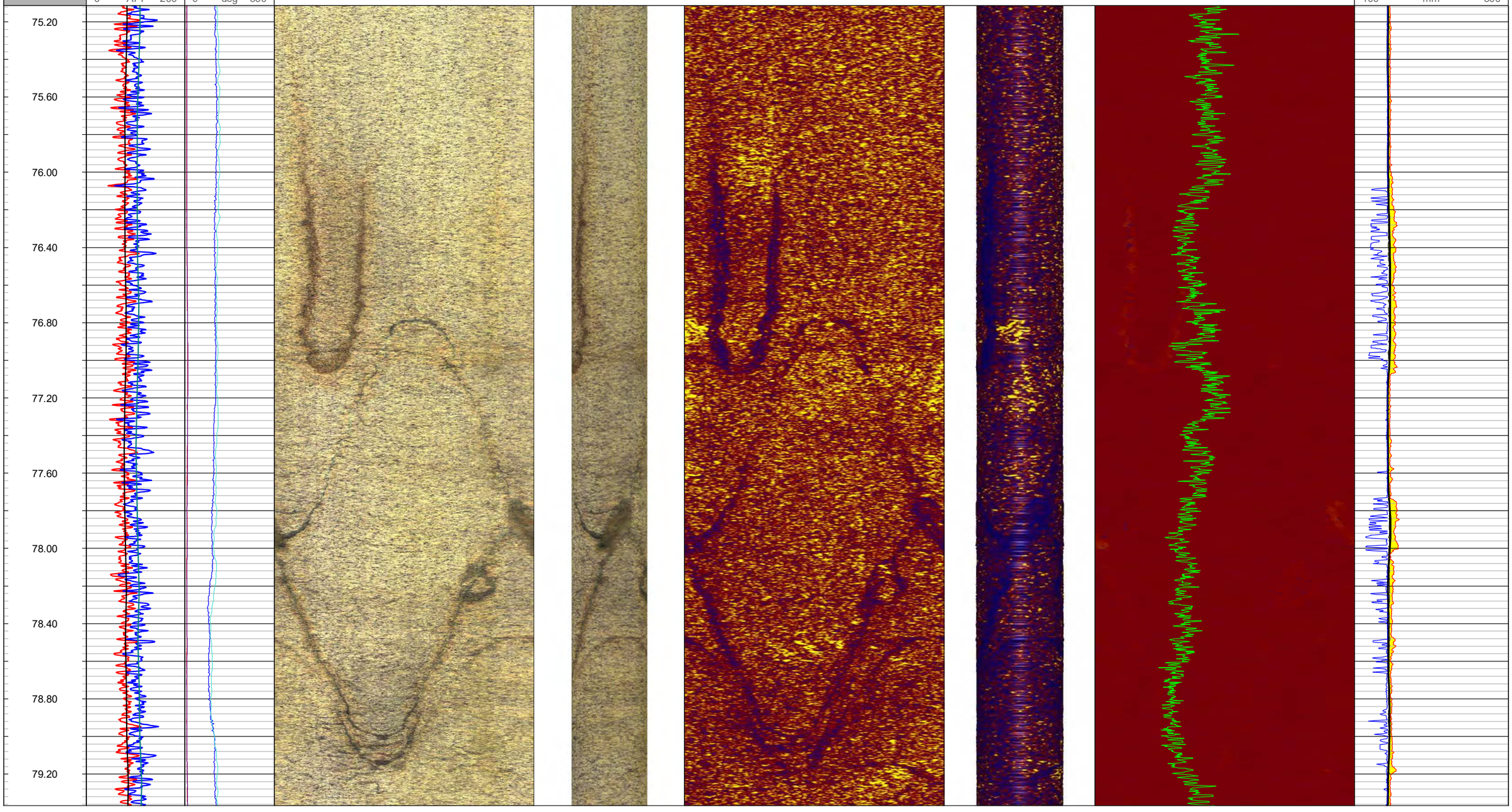
Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
62.40								
62.80								
63.20								
63.60								
64.00								
64.40								
64.80								
65.20								
65.60								
66.00								
66.40								

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

66.80
67.20
67.60
68.00
68.40
68.80
69.20
69.60
70.00
70.40
70.80

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300
71.20								
71.60								
72.00								
72.40								
72.80								
73.20								
73.60								
74.00								
74.40								
74.80								

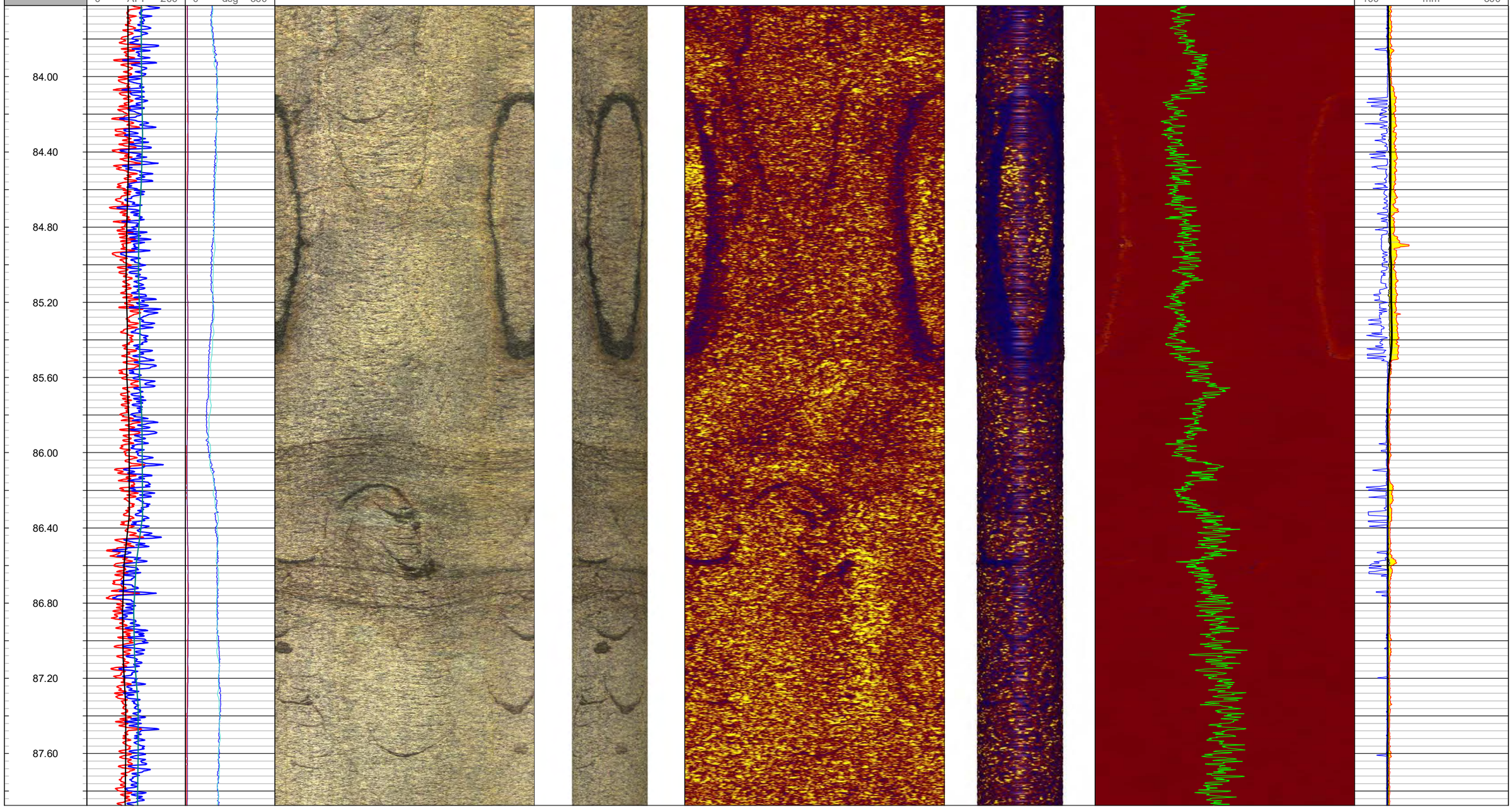
Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300



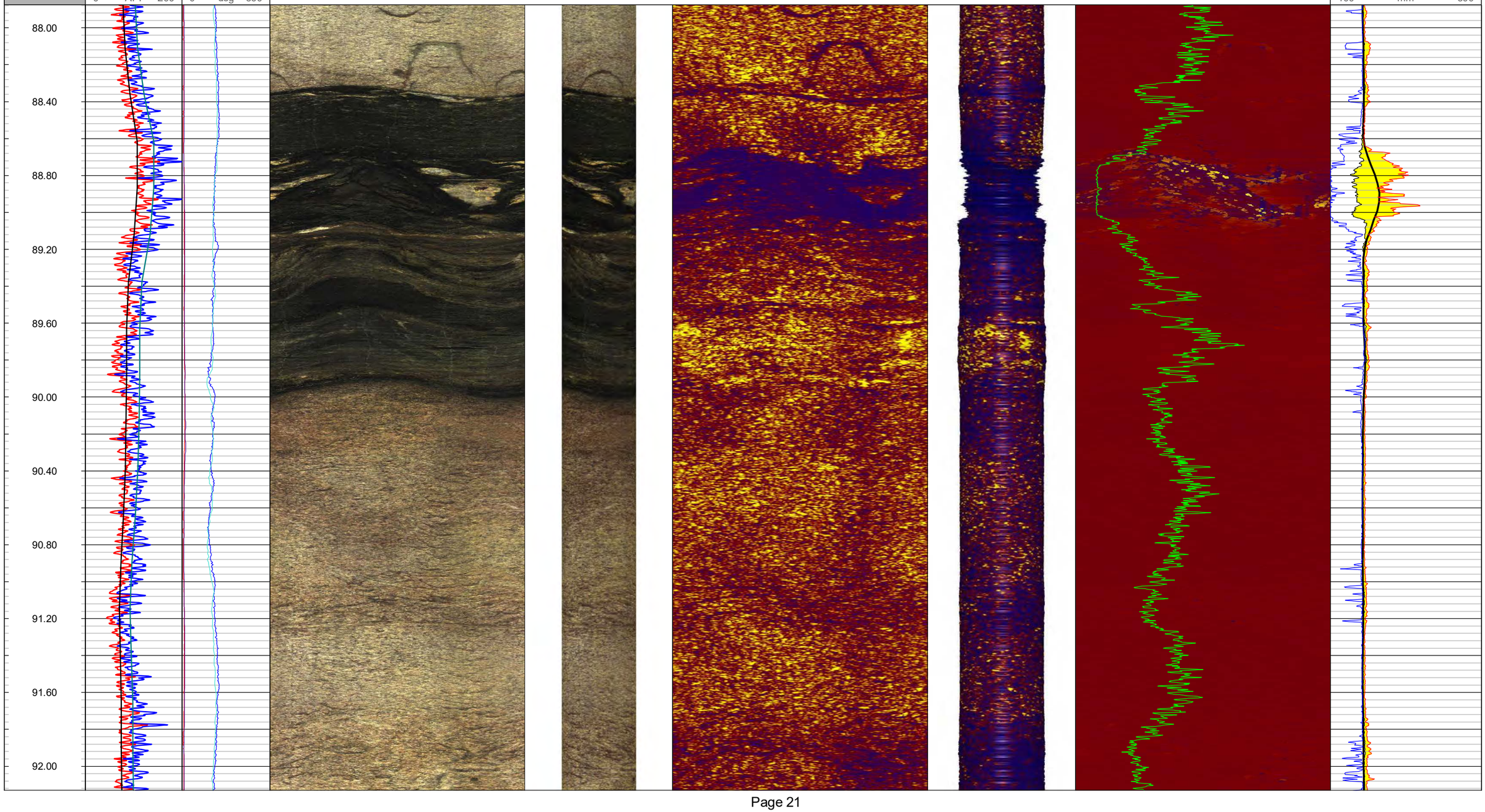
Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

79.60
80.00
80.40
80.80
81.20
81.60
82.00
82.40
82.80
83.20
83.60

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300



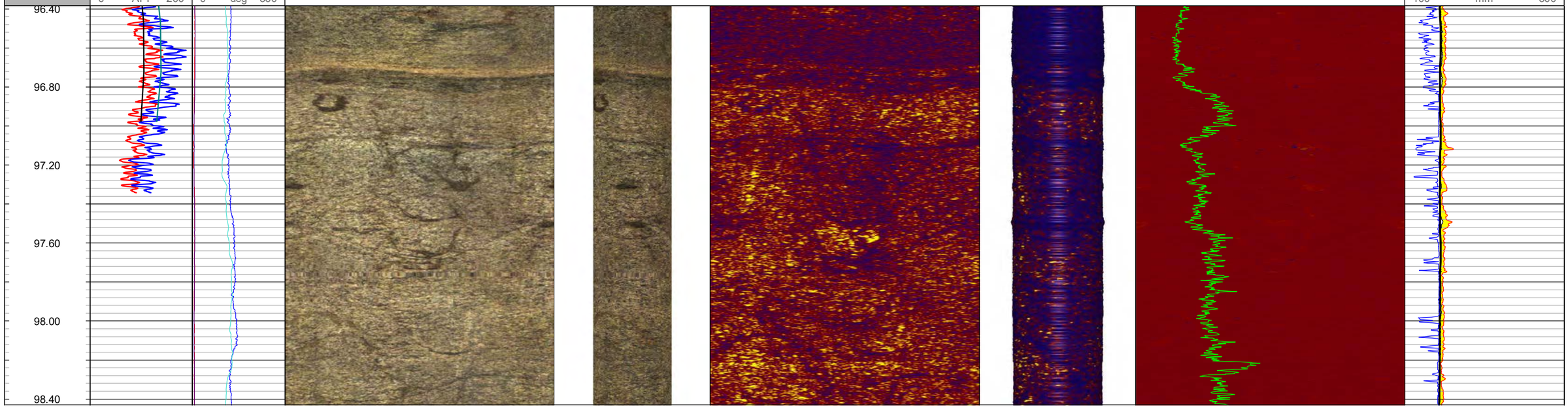
Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300



Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

92.40
92.80
93.20
93.60
94.00
94.40
94.80
95.20
95.60
96.00

Depth	Gamma	Orientation	Acoustic and Optical Televiewer Analysis					Caliper
1m:20m	Natural Gamma (ATV) 0 CPS 200 Natural Gamma (ATV) 0 API 200 Natural Gamma (OTV) 0 CPS 200 Natural Gamma (OTV) 0 API 200	Azimuth (ATV) 0 deg 360 Tilt (ATV) 0 deg 90 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log -0°	Amplitude-NM 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 2000	3-Arm Caliper 100 mm 300 Caliper - min from TT 100 mm 300 Caliper - max from TT 100 mm 300 Caliper - ave from TT 100 mm 300

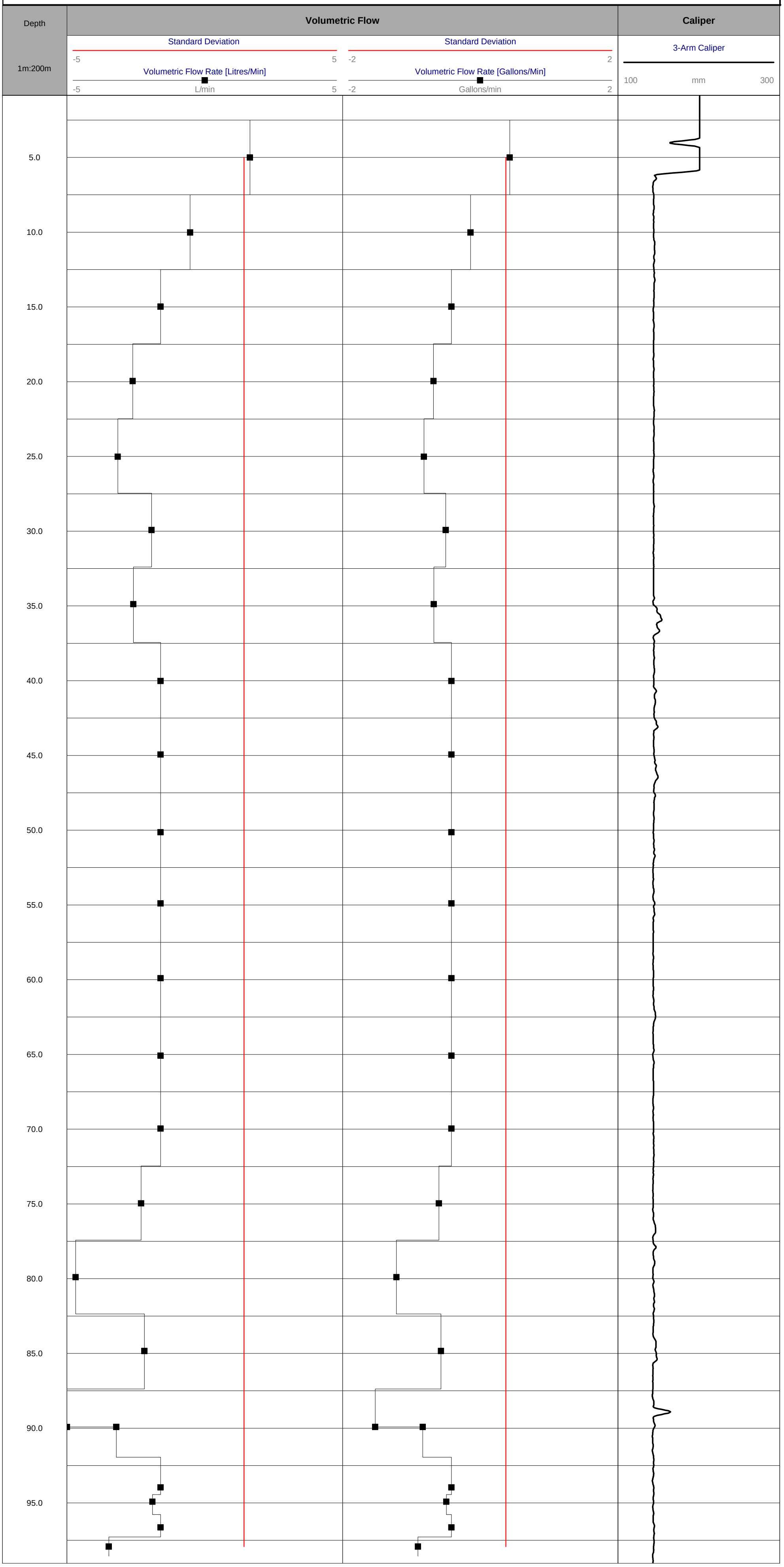


FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555377.05
Hole ID:	IG-MWA02	**Surveyed Depth:**	100 m	**UTM Y (Northing):**	5486543.934
Acquisition date(s):	Jul 22, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	405.813
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:



PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555377.05
Hole ID:	IG-MWA02	**Surveyed Depth:**	100 m	**UTM Y (Northing):**	5486543.934
Acquisition date(s):	Jul 21, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	405.813
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:

Depth

1m:500m

Physical Rock Properties

Natural Gamma: 0 CPS 200
Natural Gamma Repeat: 0 CPS 200
Natural Gamma: 0 API 200
Natural Gamma Repeat: 0 API 200

8" Rel. Resistivity: 0 Ohm-m 100000
16" Rel. Resistivity: 0 Ohm-m 100000
32" Rel. Resistivity: 0 Ohm-m 100000
64" Rel. Resistivity: 0 Ohm-m 100000

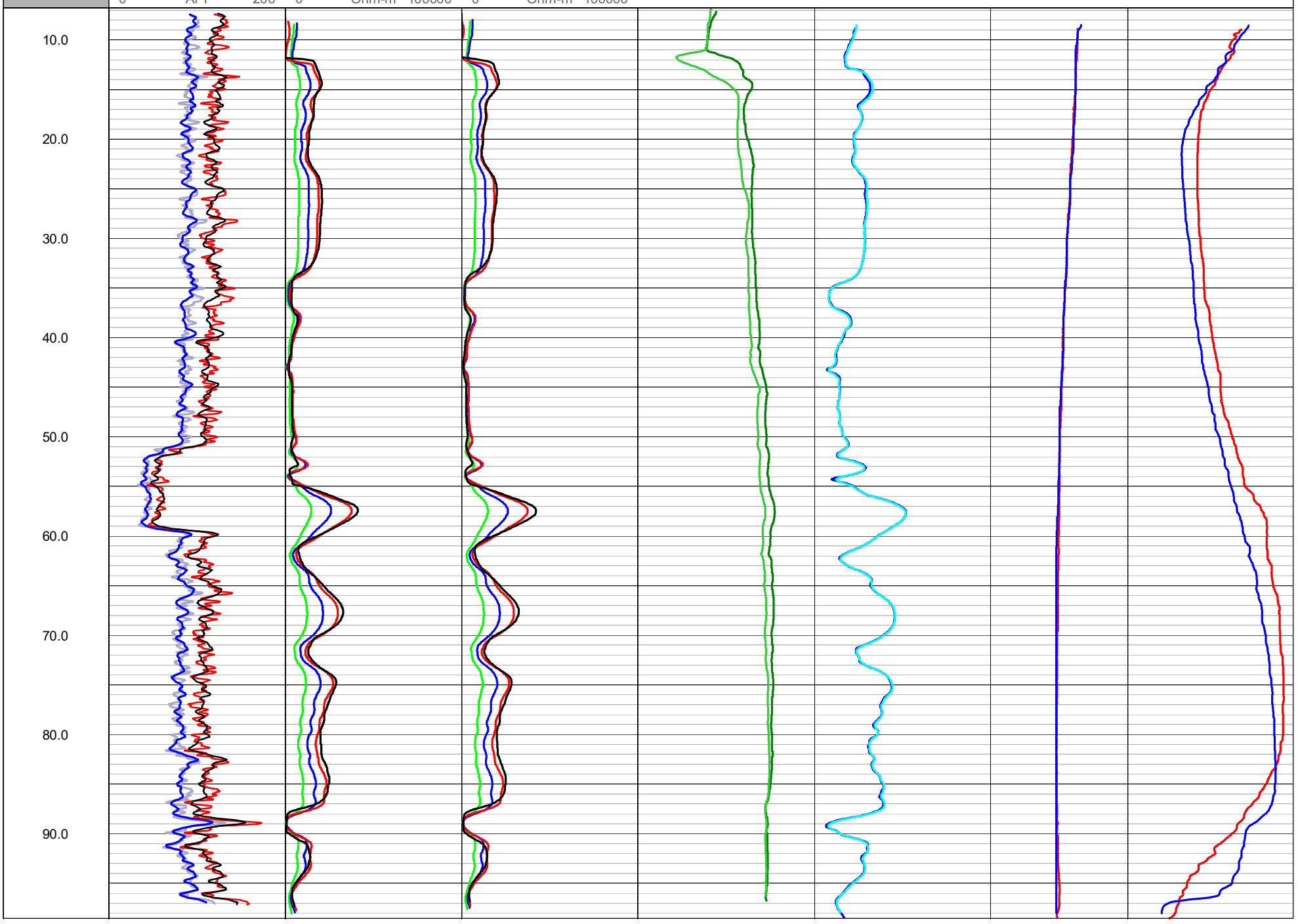
8" Rel. Resistivity Repeat: 0 Ohm-m 100000
16" Rel. Resistivity Repeat: 0 Ohm-m 100000
32" Rel. Resistivity Repeat: 0 Ohm-m 100000
64" Rel. Resistivity Repeat: 0 Ohm-m 100000

SP: -200 mV 600
SP Repeat: -200 mV 600

SP Resistivity: 0 Ohm 14000
SP Resistivity Repeat: 0 Ohm 14000

Temperature: 0 'C 10
Temperature Repeat: 0 'C 10

Fluid Resistivity: 50 Ohm-m 110
Fluid Resistivity Repeat: 50 Ohm-m 110



ACOUSTIC AND OPTICAL TELEVIEWER PLOT

Well Name		Survey Company		Client	
Field Name		Survey Date		Job Number	
Surface Location		Log Interval		Log Direction	
Rig Contractor		Casing Type / Grade		Casing Weight	
Rig Elevation		Casing Depth		Casing Diameter	
Water Level		Drilling Fluid Type		Fluid Density	
Remarks					

Logged By		Processed By	
Viewed By		Interpreted By	
Time Since Circulation		Max Recorded Temp	
Logger On Bottom		Unit Number	

Depth	Optical	Acoustic	Acoustic and Optical Amplitude Analysis	Orient
Scale 1:20	Scale 1:20	Scale 1:20	Scale 1:20	Scale 1:20
Depth	Optical	Acoustic	Acoustic and Optical Amplitude Analysis	Orient

FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555378.372
Hole ID:	IG-MWA03	**Surveyed Depth:**	98.5 m	**UTM Y (Northing):**	5486594.665
Acquisition date(s):	Jul 23, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	407.765
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	n/a		

Notes:

PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555378.372
Hole ID:	IG-MWA03	**Surveyed Depth:**	98.5 m	**UTM Y (Northing):**	5486594.665
Acquisition date(s):	Jul 22, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	407.765
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:

Depth

1m:500m

Physical Rock Properties

Natural Gamma — 0 CPS 200
Natural Gamma Repeat — 0 CPS 200
Natural Gamma — 0 API 200
Natural Gamma Repeat — 0 API 200

8" Rel. Resistivity — 0 Ohm-m 100000
16" Rel. Resistivity — 0 Ohm-m 100000
32" Rel. Resistivity — 0 Ohm-m 100000
64" Rel. Resistivity — 0 Ohm-m 100000

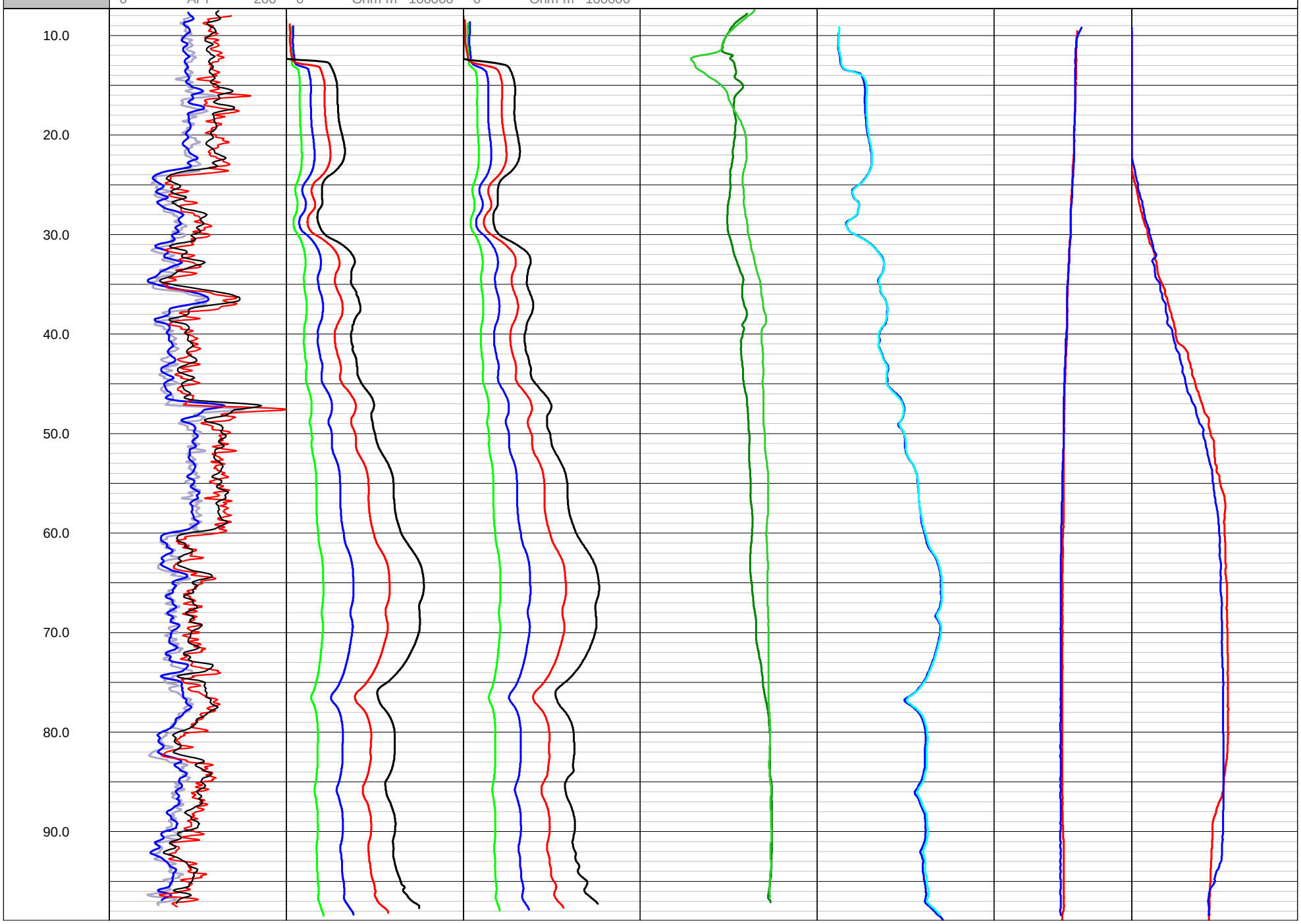
8" Rel. Resistivity Repeat — 0 Ohm-m 100000
16" Rel. Resistivity Repeat — 0 Ohm-m 100000
32" Rel. Resistivity Repeat — 0 Ohm-m 100000
64" Rel. Resistivity Repeat — 0 Ohm-m 100000

SP — -200 mV 600
SP Repeat — -200 mV 600

SP Resistivity — 0 Ohm 14000
SP Resistivity Repeat — 0 Ohm 14000

Temperature — 0 'C 10
Temperature Repeat — 0 'C 10

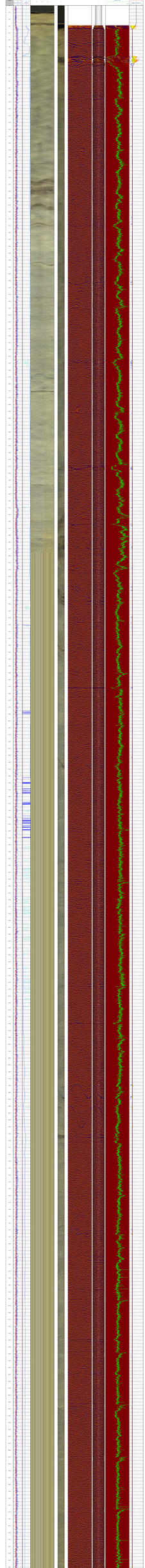
Fluid Resistivity — 50 Ohm-m 110
Fluid Resistivity Repeat — 50 Ohm-m 110



ACOUSTIC AND OPTICAL TELEVIEWER PLOT

DGI
Deep Exploration Technology

Operator	[redacted]	**Total Depth**	1,000 m	**Min. Hole Diameter**	100 mm
Well Name	[redacted]	**Casing Depth**	47 m	**Max. Hole Diameter**	100 mm
Well Location	[redacted]	**Casing Weight**	47 m	**Min. Casing ID**	100 mm
Rig Contractor	[redacted]	**Casing Type**	Open	**Max. Casing ID**	100 mm
Rig Number	0	**Water Level**	0 m		
Date Logged	0 days 0 weeks				



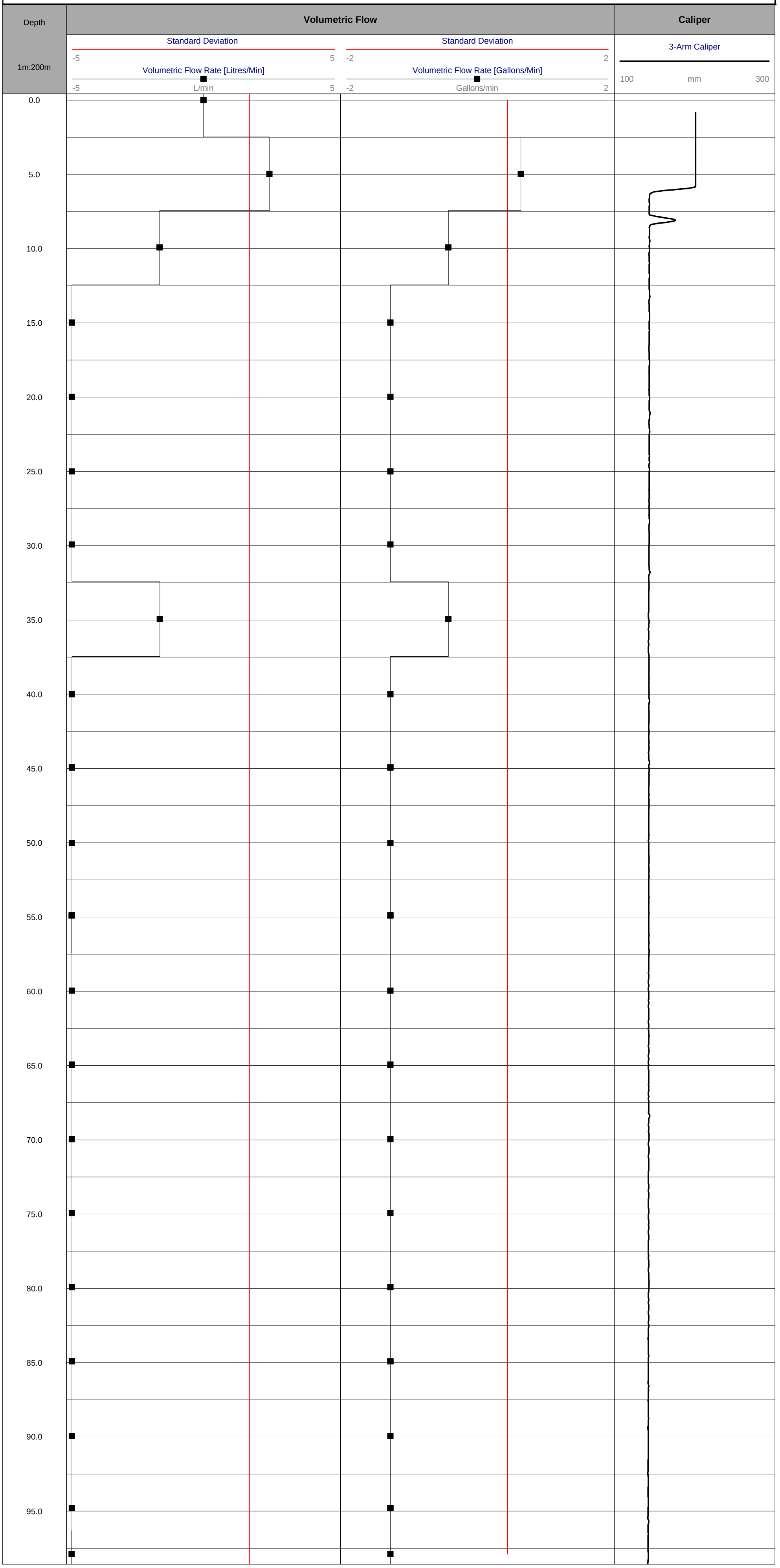
FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555457.642
Hole ID:	IG-MWB01	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485333.309
Acquisition date(s):	Jul. 03, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	418.441
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	---		

Notes:

The volumetric flow rate was calculated off the max sampling time we received of 10 seconds in most instances as there was very little or no flow present



PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555457.642
Hole ID:	IG-MWB01	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485333.309
Acquisition date(s):	Jul 02, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	418.441
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	---		

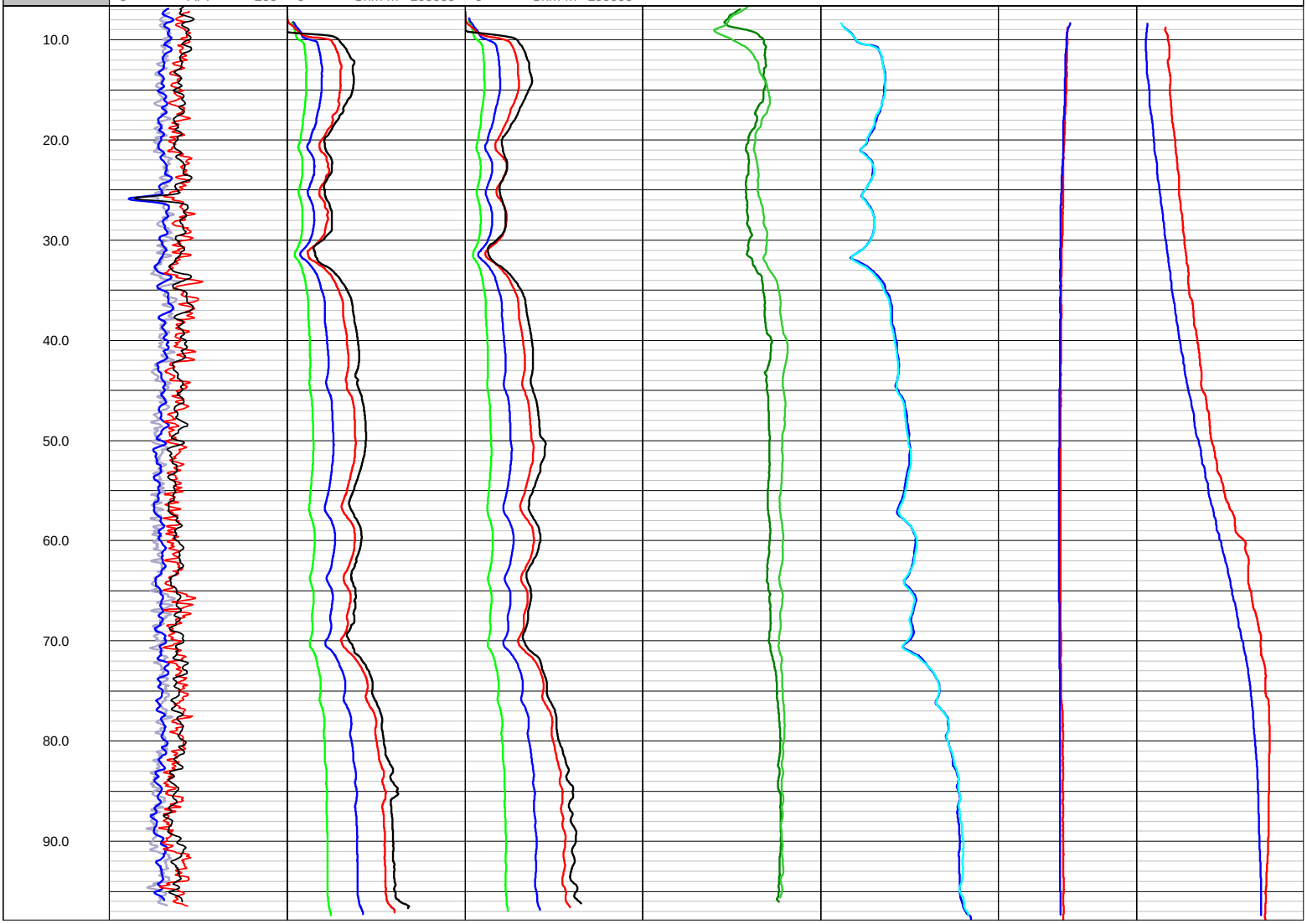
Notes:

Depth

1m:500m

Physical Rock Properties

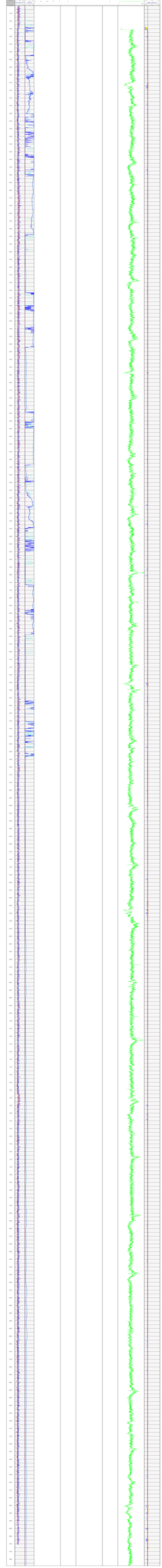
Natural Gamma	8" Rel. Resistivity	8" Rel. Resistivity Repeat	SP	SP Resistivity	Temperature	Fluid Resistivity	
0 CPS 200	0 Ohm-m 100000	0 Ohm-m 100000	-200 mV 600	0 Ohm 14000	0 'C 10	-5 Ohm-m 50	
Natural Gamma Repeat	16" Rel. Resistivity	16" Rel. Resistivity Repeat					
0 CPS 200	0 Ohm-m 100000	0 Ohm-m 100000					
Natural Gamma	32" Rel. Resistivity	32" Rel. Resistivity Repeat	SP Repeat	SP Resistivity Repeat	Temperature Repeat	Fluid Resistivity Repeat	
0 API 200	0 Ohm-m 100000	0 Ohm-m 100000	-200 mV 600	0 Ohm 14000	0 'C 10	-5 Ohm-m 50	
Natural Gamma Repeat	64" Rel. Resistivity	64" Rel. Resistivity Repeat					
0 API 200	0 Ohm-m 100000	0 Ohm-m 100000					



ACOUSTIC AND OPTICAL TELEVIEWER PLOT

DGI
Deep Exploration Tech

Company:	Unknown	Total Depth:	1000 m	Start Date/Time:	2020-01-01 00:00
Well:	Well 1	Fluid Sample @:	0 m	End Date/Time:	2020-01-01 00:00
Field:	Unknown	Max Deviation:	0.0°	Client Representative:	Unknown
Well Reference:	N - Not Set	Total Gain:	0.00 dB	Logged Interval:	1000 m - 0 m
Logging Contractor:	Unknown	Acoustic Offset:	0.0 m		
Logging Engineer:	Unknown	Optical Offset:	0.0 m		
Comments:					



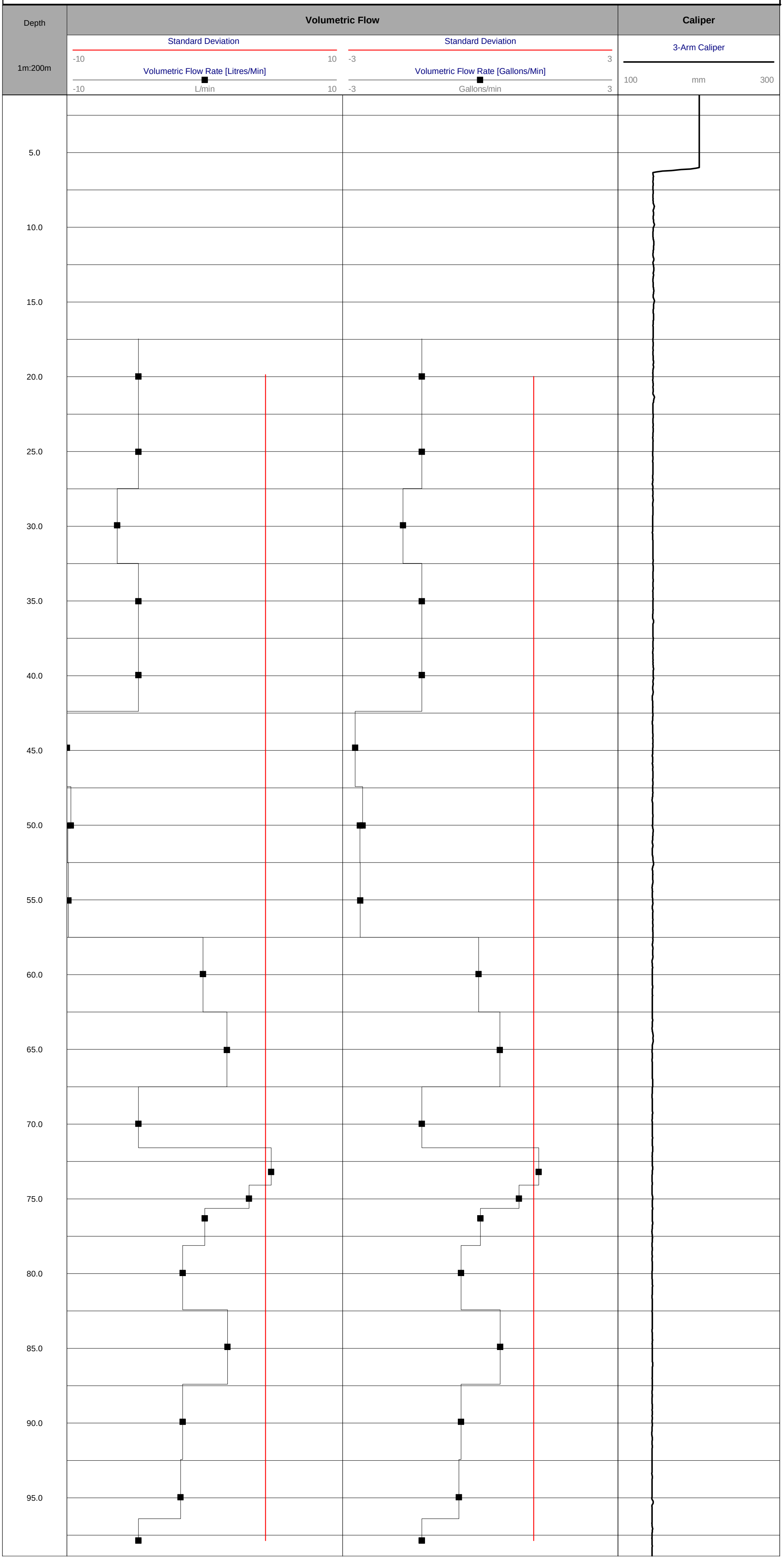
FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555419.453
Hole ID:	IG-MWB02	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485333.698
Acquisition date(s):	Jul 03, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	418.396
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	---		
Survey Day(s):	1	**Fluid Level:**	18 m		

Notes:

The volumetric flow rate was calculated off the max sampling time we received of 10 seconds in most instances as there was very little or no flow present



PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555419.453
Hole ID:	IG-MWB02	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485333.698
Acquisition date(s):	Jul 04, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	418.396
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	18 m		

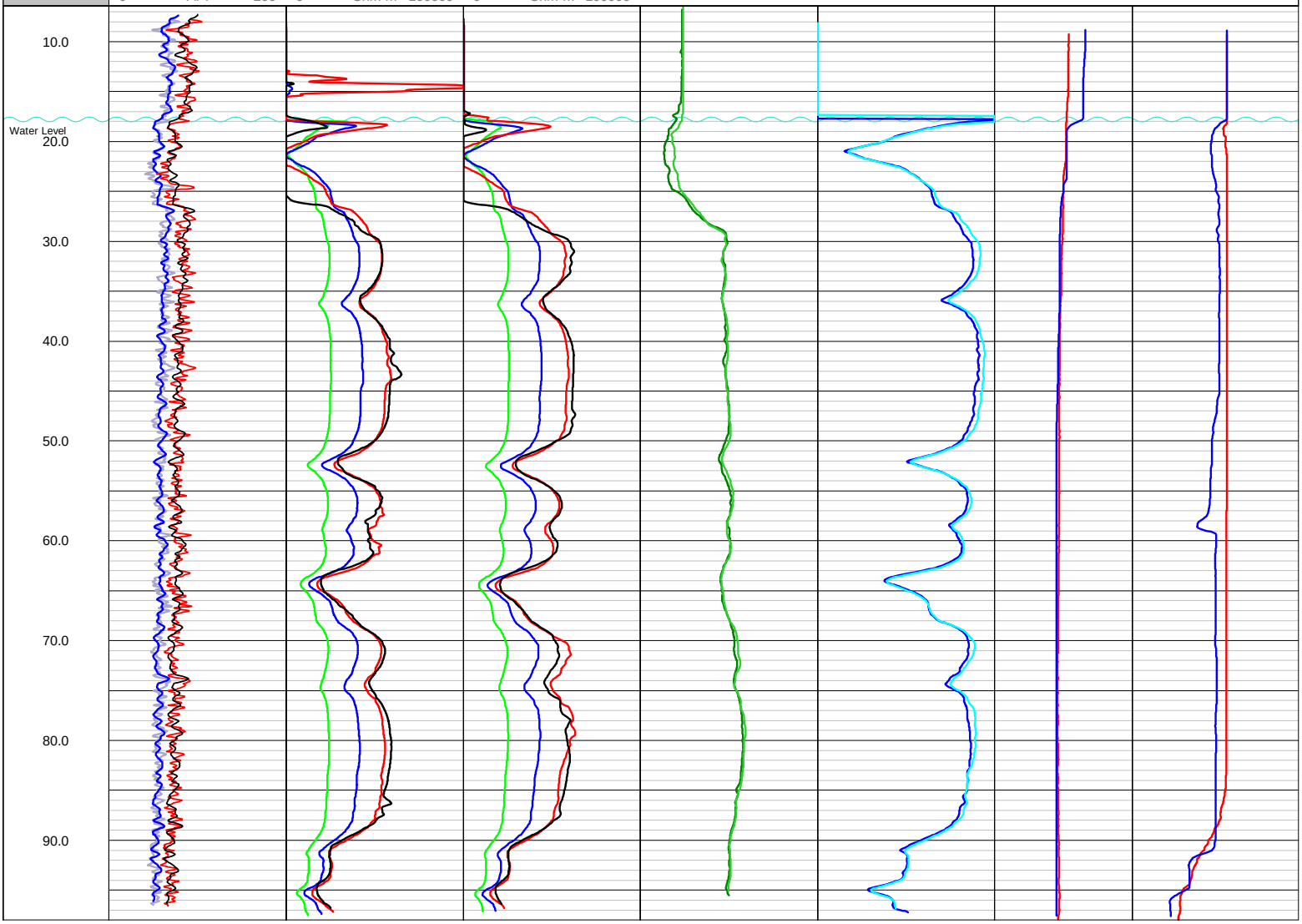
Notes:

2PEA SN2724

Depth

1m:500m

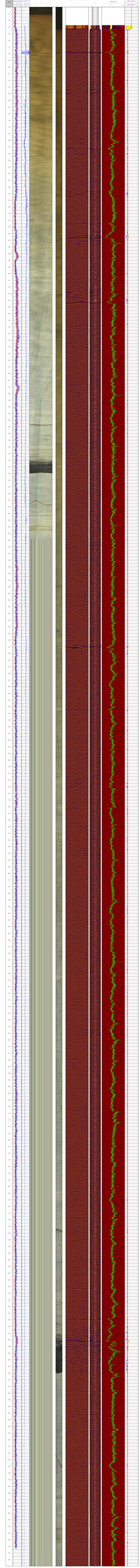
Natural Gamma 0 CPS 200	8" Rel. Resistivity 0 Ohm-m 100000	8" Rel. Resistivity Repeat 0 Ohm-m 100000	SP -200 mV 600	SP Resistivity 0 Ohm 14000	Temperature 0 'C 10	Fluid Resistivity 100 Ohm-m 200
Natural Gamma Repeat 0 CPS 200	16" Rel. Resistivity 0 Ohm-m 100000	16" Rel. Resistivity Repeat 0 Ohm-m 100000				
Natural Gamma 0 API 200	32" Rel. Resistivity 0 Ohm-m 100000	32" Rel. Resistivity Repeat 0 Ohm-m 100000	SP Repeat -200 mV 600	SP Resistivity Repeat 0 Ohm 14000	Temperature Repeat 0 'C 10	Fluid Resistivity Repeat 100 Ohm-m 200
Natural Gamma Repeat 0 API 200	64" Rel. Resistivity 0 Ohm-m 100000	64" Rel. Resistivity Repeat 0 Ohm-m 100000				



ACOUSTIC AND OPTICAL TELEVIEWER PLOT

DGI
Deep Groundwater Investigations

Borehole:	[redacted]	Total Depth:	[redacted] m	Log Interval:	[redacted] m
Location:	[redacted]	Casing Depth:	[redacted] m	Log Speed:	[redacted] m/hr
Reference Point:	[redacted]	Water Depth:	[redacted] m	Log Company:	DGI
Log Engineer:	[redacted]	Water Salinity:	[redacted]	Log Operator:	[redacted]
Date Logged:	[redacted]	Fluid Type:	Fresh		
Run Number:	1				



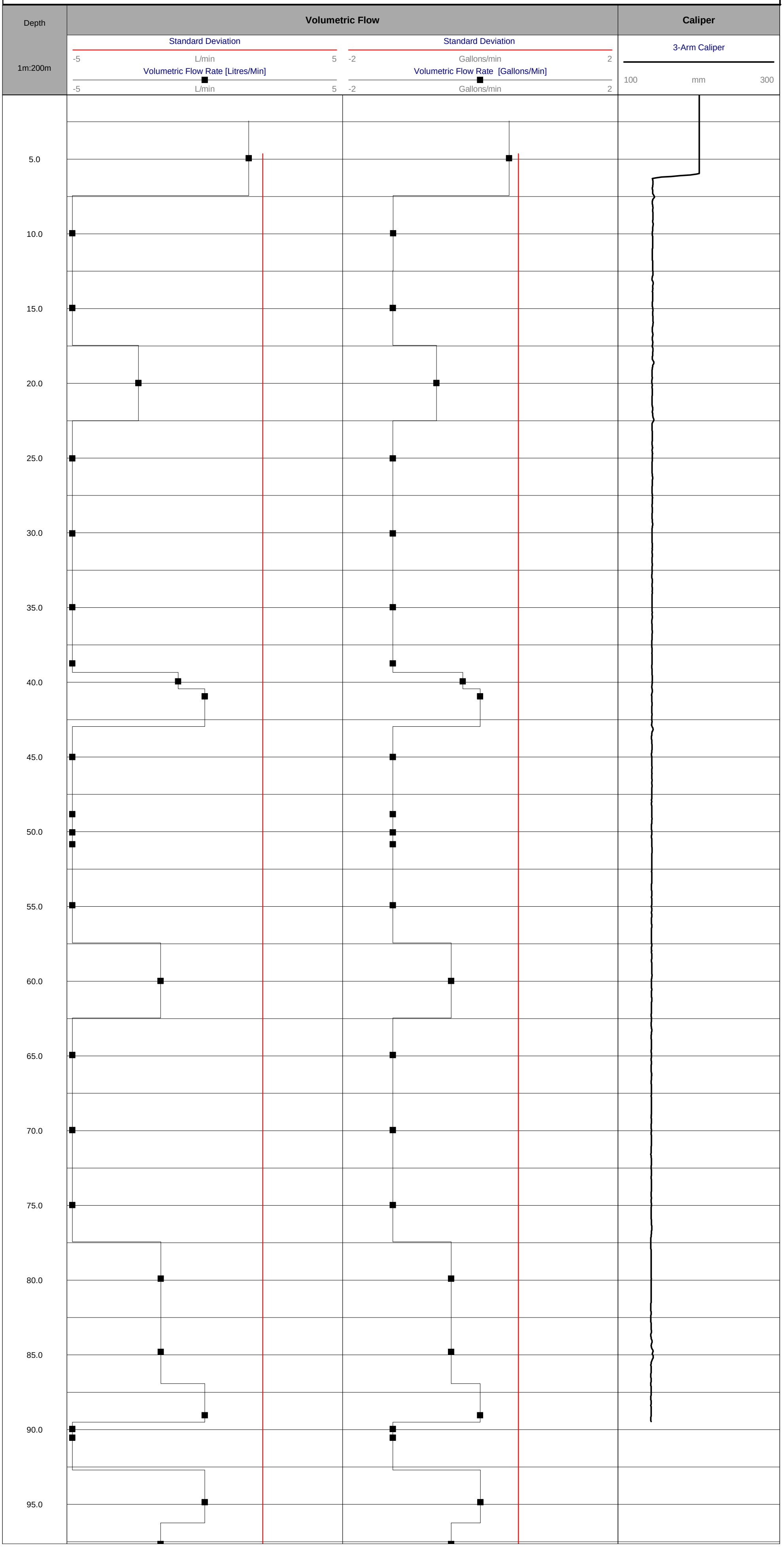
FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555447.356
Hole ID:	IG-MWB03	**Surveyed Depth:**	100 m	**UTM Y (Northing):**	5485286.506
Acquisition date(s):	Jun 30, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	419.623
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	---		

Notes:

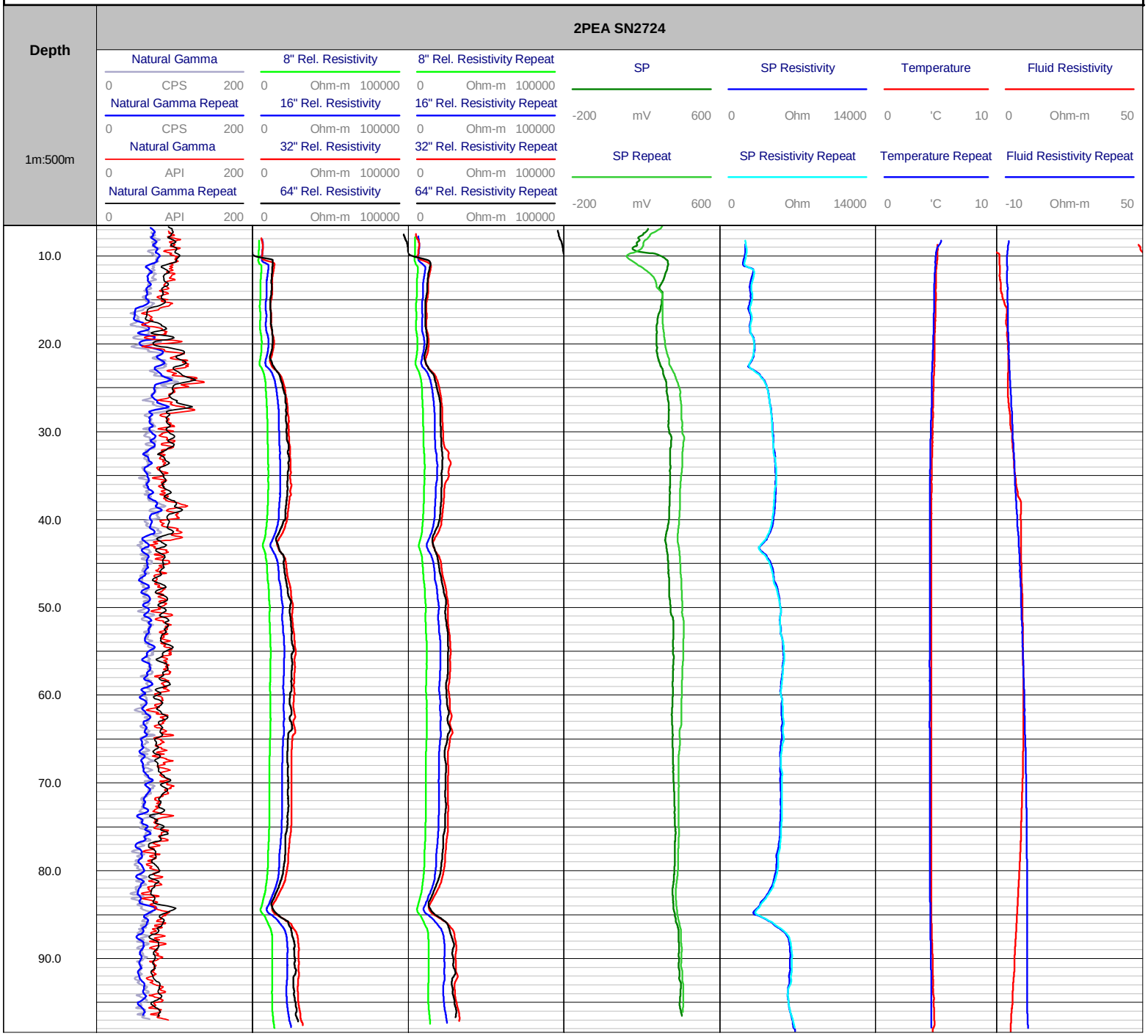
The volumetric flow rate was calculated off the max sampling time we received of 10 seconds in most instances as there was very little or no flow present.



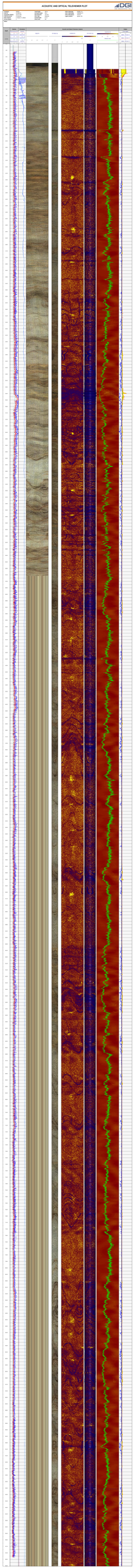
PHYSICAL PROPERTIES PLOT

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	555447.356
Hole ID:	IG-MWB03	**Surveyed Depth:**	100 m	**UTM Y (Northing):**	5485286.506
Acquisition date(s):	Jun 30, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	419.623
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6 m		
Survey Day(s):	1	**Fluid Level:**	2 m		

Notes:



ACOUSTIC AND OPTICAL TELEVIEWER PLOT

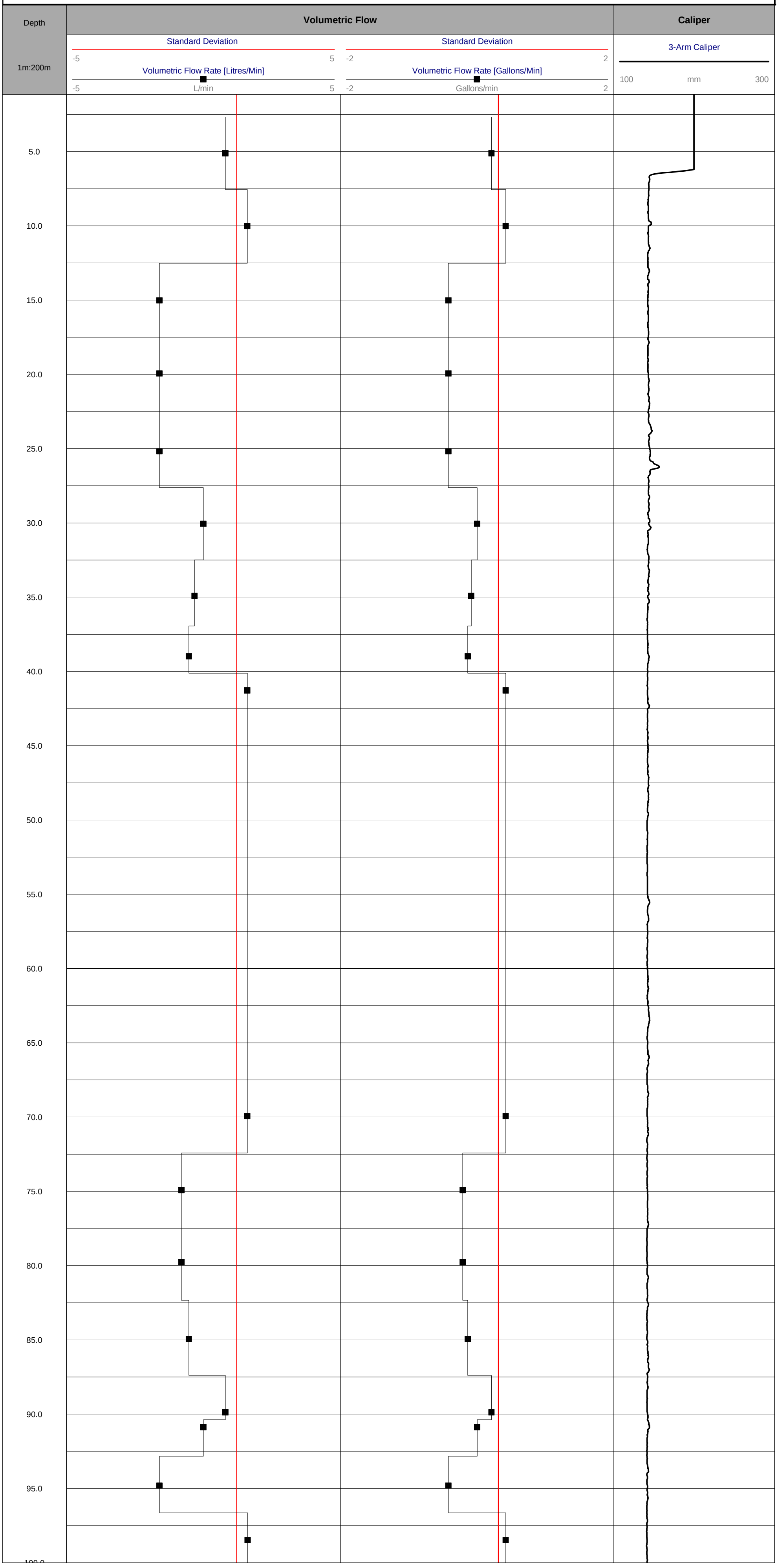


FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	556981.711
Hole ID:	IG-MWC01	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485929.477
Acquisition date(s):	Jul 25, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	428.267
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	n/a		

Notes:



PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	556981.711
Hole ID:	IG-MWC01	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485929.477
Acquisition date(s):	Jul 24, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	428.267
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:

Depth

1m:500m

Physical Rock Properties

Natural Gamma: 0 CPS 200
Natural Gamma Repeat: 0 CPS 200
Natural Gamma: 0 API 200
Natural Gamma Repeat: 0 API 200

8" Rel. Resistivity: 0 Ohm-m 100000
16" Rel. Resistivity: 0 Ohm-m 100000
32" Rel. Resistivity: 0 Ohm-m 100000
64" Rel. Resistivity: 0 Ohm-m 100000

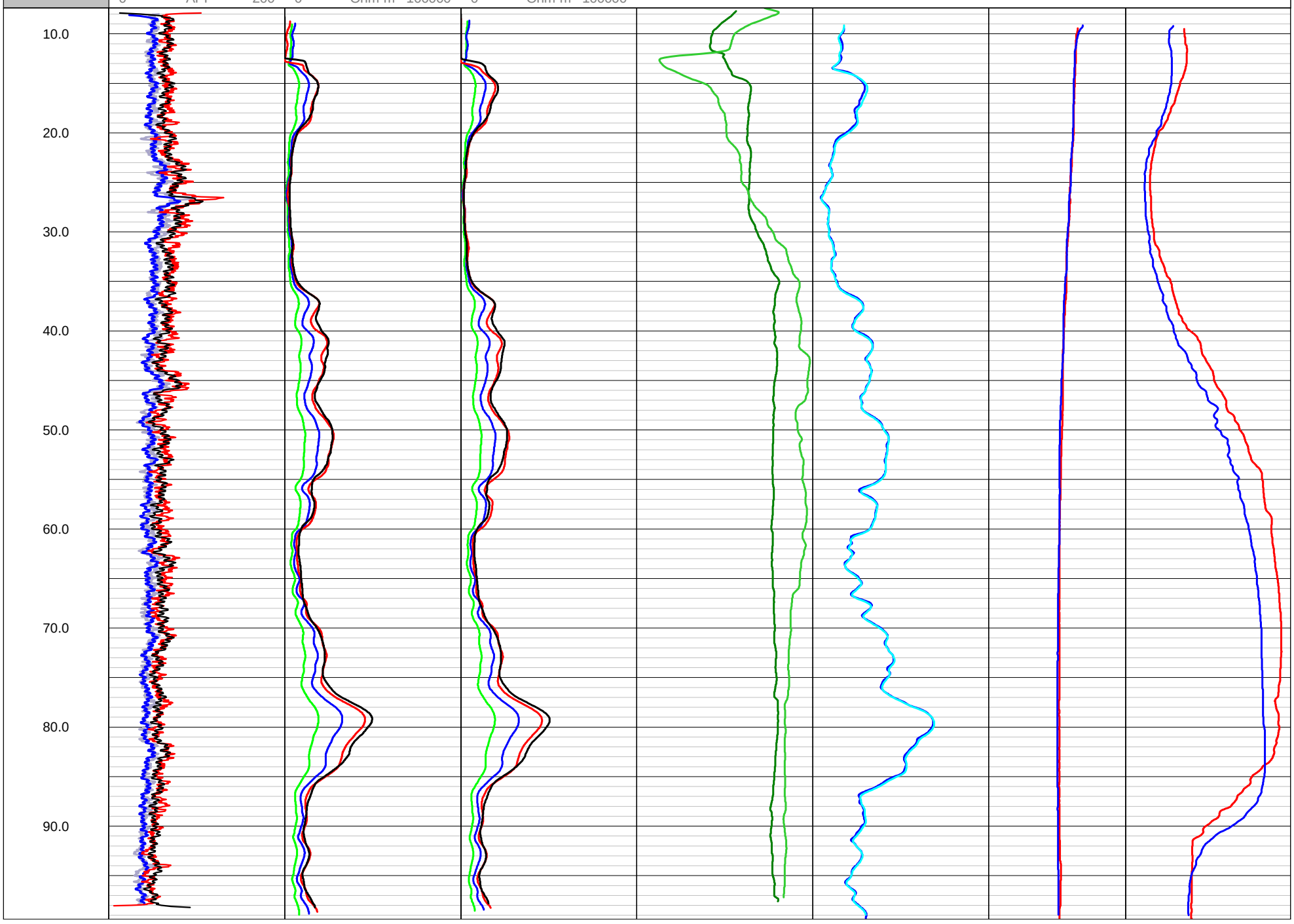
8" Rel. Resistivity Repeat: 0 Ohm-m 100000
16" Rel. Resistivity Repeat: 0 Ohm-m 100000
32" Rel. Resistivity Repeat: 0 Ohm-m 100000
64" Rel. Resistivity Repeat: 0 Ohm-m 100000

SP: -200 mV 650
SP Repeat: -200 mV 650

SP Resistivity: 0 Ohm 14000
SP Resistivity Repeat: 0 Ohm 14000

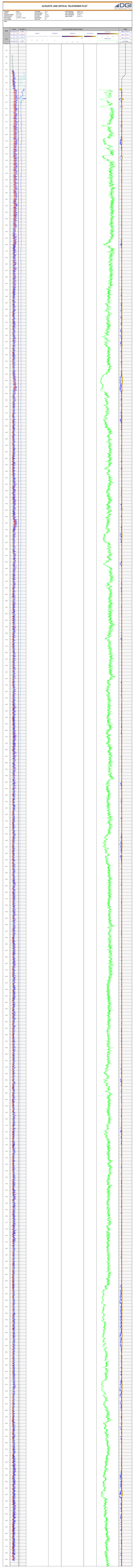
Temperature: 0 'C 10
Temperature Repeat: 0 'C 10

Fluid Resistivity: 50 Ohm-m 150
Fluid Resistivity Repeat: 50 Ohm-m 150



ACOUSTIC AND OPTICAL TELEVIEWER PLOT

Client:		Azimuth Reference:	Grid N	Log Interval:	0.5000 ft
Well Name:		Declination:	0.00°	Log Direction:	Down
Location:		Grid Convergence:	0.00°	Log Speed:	1.00 ft/s
Survey Company:		Total Correction:	0.00°	Log Filter:	0.00 ft
Survey Date:	1 January 0, 0000	Vertical Scale:	1:20		
Survey Type:		Horizontal Scale:	1:20		
Notes:					

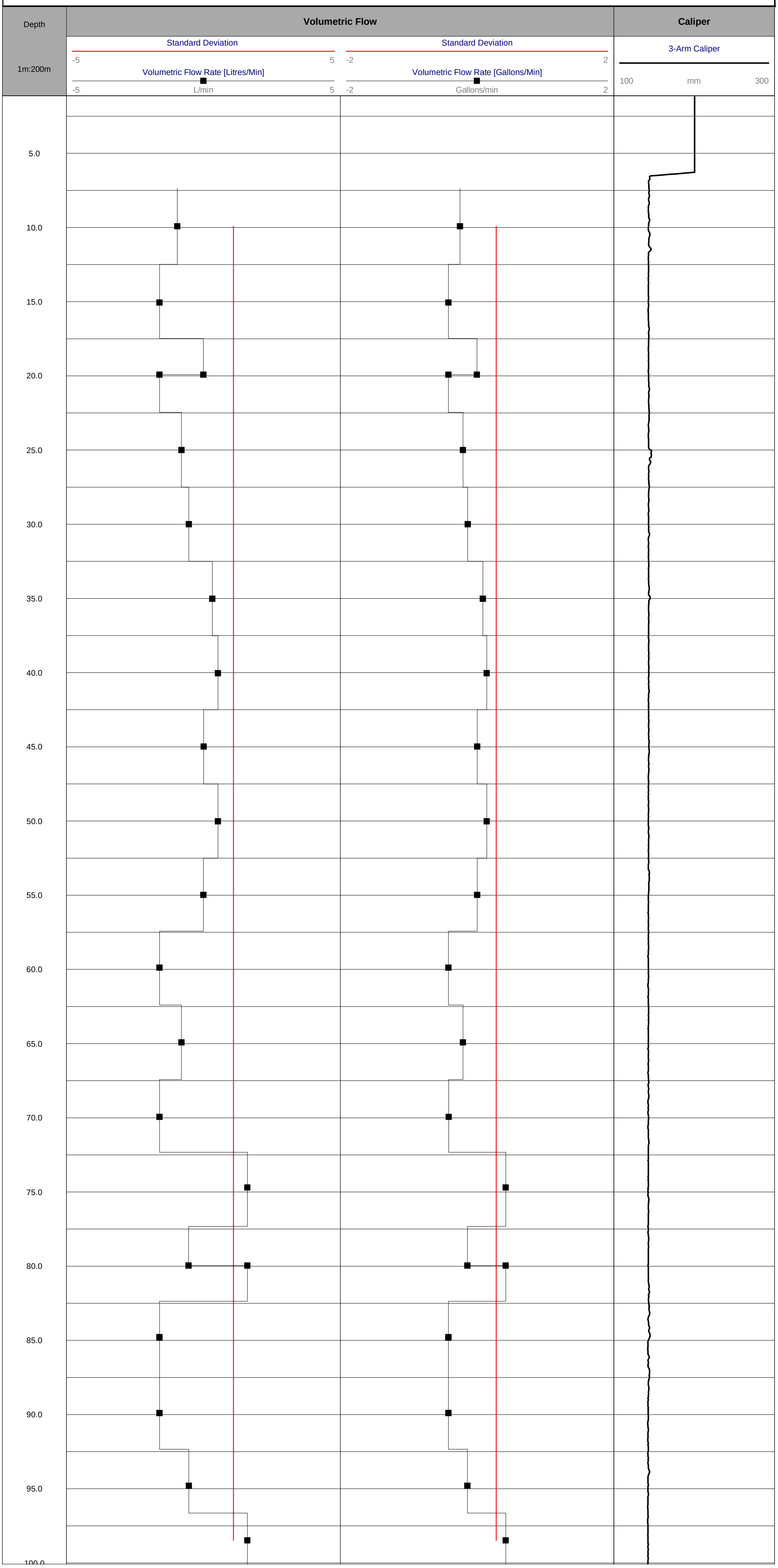


FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	556937.763
Hole ID:	IG-MWC02	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485905.102
Acquisition date(s):	Jul 27, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	432.455
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	n/a		

Notes:



PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	556937.763
Hole ID:	IG-MWC02	**Surveyed Depth:**	99.3 m	**UTM Y (Northing):**	5485905.102
Acquisition date(s):	Jul 27, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	432.455
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:

Depth

1m:500m

Physical Rock Properties

Natural Gamma: 0 CPS 200
Natural Gamma Repeat: 0 CPS 200
Natural Gamma: 0 API 200
64" Rel. Resistivity: 0 API 200

8" Rel. Resistivity: 0 Ohm-m 100000
16" Rel. Resistivity: 0 Ohm-m 100000
32" Rel. Resistivity: 0 Ohm-m 100000
64" Rel. Resistivity: 0 Ohm-m 100000

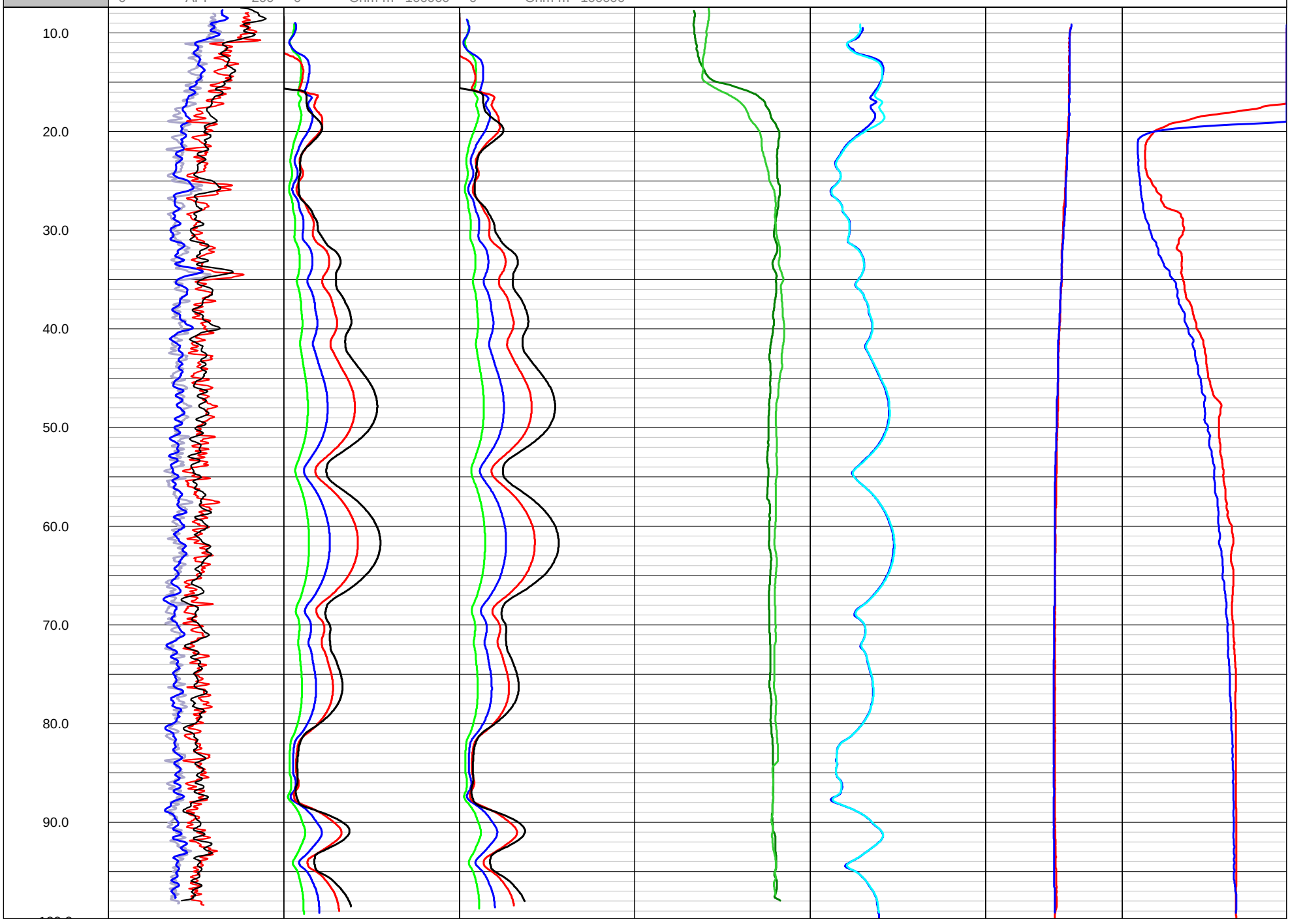
8" Rel. Resistivity Repeat: 0 Ohm-m 100000
16" Rel. Resistivity Repeat: 0 Ohm-m 100000
32" Rel. Resistivity Repeat: 0 Ohm-m 100000
64" Rel. Resistivity Repeat: 0 Ohm-m 100000

SP: -200 mV 600
SP Repeat: -200 mV 600

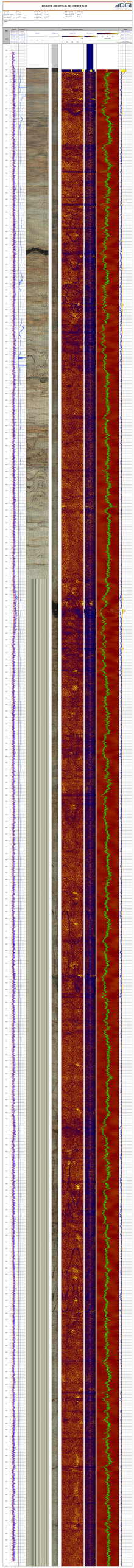
SP Resistivity: 0 Ohm 14000
SP Resistivity Repeat: 0 Ohm 14000

Temperature: 0 'C 10
Temperature Repeat: 0 'C 10

Fluid Resistivity: 50 Ohm-m 110
Fluid Resistivity Repeat: 50 Ohm-m 110



ACOUSTIC AND OPTICAL TELEVIEWER PLOT



FLOWMETER

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	556982.573
Hole ID:	IG-MWC03	**Surveyed Depth:**	99 m	**UTM Y (Northing):**	5485882.72
Acquisition date(s):	Jul 26, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	425.905
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	n/a		

Notes:

PHYSICAL PROPERTIES PLOT

DGI GEOSCIENCE INC.

Company:	NWMO	**Total Depth:**	100 m	**UTM X (Easting):**	556982.573
Hole ID:	IG-MWC03	**Surveyed Depth:**	99.3 m	**UTM Y (Northing):**	5485882.72
Acquisition date(s):	Jul 26, 2021	**Hole Diameter:**	143 mm	**UTM Z (Elevation):**	425.905
Field Personnel:	R. Morrison	**Hole Type:**	Diamond	**Legal Location:**	Ignace, ON
Data Analysis:	S. Reese, R. Leblanc	**Casing Depth:**	6.2 m		
Survey Day(s):	1	**Fluid Level:**	3.6 m		

Notes:

Depth

1m:500m

Physical Rock Properties

Natural Gamma: 0 CPS 200
Natural Gamma Repeat: 0 CPS 200
Natural Gamma: 0 API 200
Natural Gamma Repeat: 0 API 200

8" Rel. Resistivity: 0 Ohm-m 100000
16" Rel. Resistivity: 0 Ohm-m 100000
32" Rel. Resistivity: 0 Ohm-m 100000
64" Rel. Resistivity: 0 Ohm-m 100000

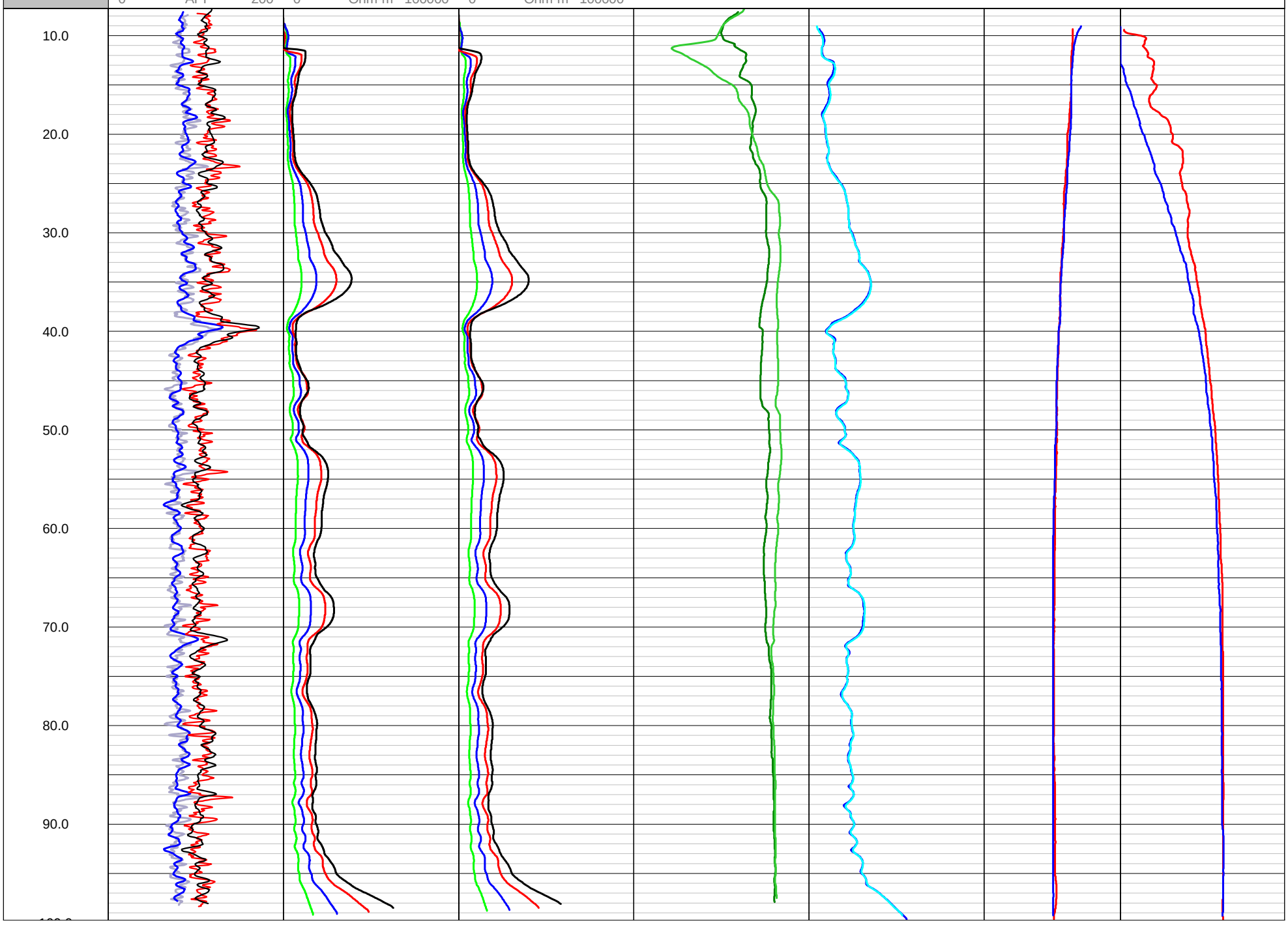
8" Rel. Resistivity Repeat: 0 Ohm-m 100000
16" Rel. Resistivity Repeat: 0 Ohm-m 100000
32" Rel. Resistivity Repeat: 0 Ohm-m 100000
64" Rel. Resistivity Repeat: 0 Ohm-m 100000

SP: -200 mV 600
SP Repeat: -200 mV 600

SP Resistivity: 0 Ohm 14000
SP Resistivity Repeat: 0 Ohm 14000

Temperature: 0 'C 10
Temperature Repeat: 0 'C 10

Fluid Resistivity: 40 Ohm-m 110
Fluid Resistivity Repeat: 40 Ohm-m 110



APPENDIX C

Geophysical Instrumentation Calibration and Standardized Testing Reports

APPENDIX C-1

Pre-mobilization Geophysical Probe Bench Testing Reports

DGI GEOSCIENCE INC.

Head Office:
405 - 119 Spadina Avenue
Toronto, ON - M5V 2L1
416.361.3191

Operations Centre:
7 - 121 Welham Road
Barrie, ON - L4N 8Y3
705.730.7992

ACOUSTIC TELEVIEWER - PRE MOBILIZATION BENCH TEST

Date:	June 16th 2021
Operator:	Reid Morrison
Probe Model:	ALT QL ABI2G-GR
Probe Serial Number:	201905
Probe Resolution and Accuracy	Orientation: 3 axis fluxgate magnetometer, 3 accelerometers Inclination accuracy: 0.5 degree Azimuth accuracy: 1.2 degree

Probe is factory calibrated by the manufacturer and does not require further calibration by DGI. Bench test is conducted at DGI's operation center prior to mobilization to ensure the probe is functional and the probe is giving the correct deviation outputs.

Test 1: Inclination Test

Filename: 676_DGI-BT_ABI2G-GR_201905_TILT_061621.tfd

Theoretical Inclination	Inclination Measured by Tool
90 degrees	89.9
0 degrees	0.4

Inclination Test Results:
☒Passed
☐Not Passed

Test 2: Azimuth Test

Filename: 676_DGI-BT_ABI2G-GR_201905_AZ_061621.tfd

Theoretical Azimuth	Azimuth Measured by Tool
0 degrees	0.1
90 degrees	89.9
180 degrees	180.0
270 degrees	270.0

Azimuth Test Results:
☒Passed
☐Not Passed

Test 3: Roll Test

Filename: 676_DGI-BT_ABI2G-GR_201905_ROLL_061621.tfd

Theoretical Roll Azimuth	Roll Measured by Tool	Tilt Measured by Tool
0 degrees	0.1	89.2
90 degrees	90.1	89.3
180 degrees	179.9	89.4
270 degrees	270.2	89.3

Roll Test Results:

☒Passed

☐Not Passed

General Inspection and Performance

Item	Pass	Fail	Comments
Visual Inspection for Damage	☒	☐	Brand New
Probe Startup	☒	☐	No Errors
Probe Telemetry	☒	☐	Clean
Probe Weight	☒	☐	8.578 kg

Acoustic Televiewer Bench Test – Overall Results

☒Passed

☐Not Passed

Reid Morrison	Andrew Torgerson	Roxanne Leblanc
Test Operator	**Operation Center Supervisor**	**Senior Data Analyst**

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NATURAL GAMMA - PRE MOBILIZATION BENCH TEST

Date:	06-16-21
Operator:	Reid Morrison
Probe Model:	
Probe Serial Number:	4049
Probe Resolution and Accuracy	0-100K CPS Gamma, Accuracy 1% FS, Resolution 0.02% FS

Probe is factory calibrated by the manufacturer and does not require further calibration by DGI. Bench test is conducted at DGI's operation center prior to mobilization to ensure the probe is functional.

Test 1: Natural Gamma CPS in Air

Filename: 676_DGI-BT_MSPRSh_2724_Calcheck_061621.rd

Record a file of natural gamma cps measured in air.

Average CPS	Min CPS	Max CPS	Standard Deviation CPS
97.16578	70.4967	125.578	10.71462

Test Results:

☒Passed
☐Not Passed

General Inspection and Performance

Item	Pass	Fail	Comments
Visual Inspection for Damage	☒	☐	
Probe Startup	☒	☐	
Probe Telemetry	☒	☐	

Natural Gamma Bench Test – Overall Results
☒Passed
☐Not Passed

Reid Morrison	Andrew Torgerson	Roxanne Leblanc
Test Operator	**Operation Center Supervisor**	**Senior Data Analyst**

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705.730.7992

HEATPULSE FLOWMETER - PRE MOBILIZATION BENCH TEST

Date:	June 21st 2021
Operator:	Reid Morrison
Probe Model:	GeoVista Heat Pulse Flowmeter
Probe Serial Number:	8012
Probe Resolution and Accuracy	

Bench test is conducted at DGI's operation center prior to mobilization to ensure the probe is functional. Probe is factory calibrated.

General Inspection and Performance

Item	Pass	Fail	Comments
Visual Inspection for Damage	☒	☐	Brand New
Probe Startup	☒	☐	No issues
Probe Telemetry	☒	☐	No issues, no errors
Weight			6.5kg

Heatpulse Flowmeter Bench Test – Overall Results

☒Passed
☐Not Passed

Reid Morrison	Andrew Torgerson	Roxanne Leblanc
Test Operator	**Operation Center Supervisor**	**Senior Data Analyst**

DGI GEOSCIENCE INC.

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705.730.7992

MECHANICAL CALIPER - PRE MOBILIZATION BENCH TEST

Date:	June 16th 2021
Operator:	Reid Morrison
Probe Model:	ALT QL 3-Arm Caliper
Probe Serial Number:	6109
Probe Resolution and Accuracy	Caliper measurement: 2.25" to 16"(standard arms) 57.2mm to 406mm

Bench test is conducted at DGI's operation center prior to mobilization to ensure the probe is functional. Probe is calibrated using manufacturer provided calibration jigs prior to each survey run.

Test 1: Calibration Jig Test

Filename: 676_DGI-BT_ALTQL3AC_6109_061621.tfd

Theoretical Caliper Measurement	Actual Caliper Measurement
Ref Point A : 10.2cm	Actual Ref Value A: 10.18cm
Ref Point B: 15.2cm	Actual Ref Value B: 15.20cm

Calibration Jig Test Results:

☒Passed

☐Not Passed

General Inspection and Performance

Item	Pass	Fail	Comments
Visual Inspection for Damage	☒	☐	No visible damage
Probe Startup	☒	☐	Clean startup, required calibration
Probe Telemetry	☒	☐	No Errors
Probe Weight	☒	☐	11.51kg

Mechanical Caliper Bench Test – Overall Results

☒Passed

☐Not Passed

Reid Morrison	Andrew Torgerson	Roxanne Leblanc
Test Operator	**Operation Center Supervisor**	**Senior Data Analyst**

DGI GEOSCIENCE INC.

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416.361.3191

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705.730.7992

OPTICAL TELEVIEWER - PRE MOBILIZATION BENCH TEST

Date:	June 16th 2021
Operator:	Reid Morrison
Probe Model:	ALT QL OBI2G-GR
Probe Serial Number:	202001
Probe Resolution and Accuracy	Orientation: 3 axis fluxgate magnetometer, 3 accelerometers Inclination accuracy: 0.5 degree Azimuth accuracy: 1.2 degree

Probe is factory calibrated by the manufacturer and does not require further calibration by DGI. Bench test is conducted at DGI's operation center prior to mobilization to ensure the probe is functional and the probe is giving the correct deviation outputs.

Test 1: Inclination Test

Filename: 676_DGI-BT_OBI2G-GR_202001_TILT_061621.tfd

Theoretical Inclination	Inclination Measured by Tool
90 degrees	90.0
0 degrees	0.5

Inclination Test Results:
☒Passed
☐Not Passed

Test 2: Azimuth Test

Filename: 676_DGI-BT_OBI2G-GR_202001_AZ_061621.tfd

Theoretical Azimuth	Azimuth Measured by Tool
0 degrees	359.7
90 degrees	90.5
180 degrees	180.6
270 degrees	270.5

Azimuth Test Results:

☒Passed
☐Not Passed

DGI GEOSCIENCE INC.

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Toronto, ON - M5V 2L1
416.361.3191

Operations Centre:
7 - 121 Welham Road
Barrie, ON - L4N 8Y3
705.730.7992

Test 3: Roll Test

Filename: 676_DGI-BT_OBI2G-GR_202001_ROLL_061621.tfd

Theoretical Roll Azimuth	Roll Measured by Tool	Tilt Measured by Tool
0 degrees	1.0	91.1
90 degrees	90.5	91.1
180 degrees	180.2	91.0
270 degrees	270.1	91.0

Roll Test Results:

☒Passed
☐Not Passed

General Inspection and Performance

Item	Pass	Fail	Comments
Visual Inspection for Damage	☒	☐	Brand New
Probe Startup	☒	☐	Clean Start
Probe Telemetry	☒	☐	No errors during test
Probe Weight	☒	☐	6.5kg

Optical Televiewer Bench Test – Overall Results

☒Passed
☐Not Passed

Reid Morrison	Andrew Torgerson	Roxanne Leblanc
Test Operator	**Operation Center Supervisor**	**Senior Data Analyst**

DGI GEOSCIENCE INC.

Head Office:
405 - 119 Spadina Avenue
Toronto, ON - M5V 2L1
416.361.3191

Operations Centre:
7 - 121 Welham Road
Barrie, ON - L4N 8Y3
705.730.7992

POLY RESISTIVITY - PRE MOBILIZATION BENCH TEST

Date:	06-16-21
Operator:	Reid Morrison
Probe Model:	2PEA Poly Resistivity - Gamma
Probe Serial Number:	2724 Poly – 4049 Gamma
Probe Resolution and Accuracy	High Range Normal Resistivity Measurement: 0 to 2500 ohm-m Normal Resistivity and SPR Accuracy: 1 % Normal Resistivity and SPR Resolution: 0.02 %

Bench test is conducted at DGI's operation center prior to mobilization to ensure the probe is functional.

Test 1: RSP Calibrator

Filename: 676_DGI-BT_MSPRSh_2724_Calcheck_061621.rd

R8	**50K**	**R16**	**50K**	**R32**	**50K**	**R64**	**50K**	**SPR**	**50K**
25	23.52	**50**	46.86	**100**	97.17	**200**	212.61	**20**	19.79
500	501.08	**1000**	1002.49	**2000**	2002.00	**4000**	3980.31	**250**	250.11
5000	4999.81	**10000**	9999.53	**20000**	19999.88	**40000**	39999.16	**2500**	2500.13

Test Results:
☒Passed
☐Not Passed

General Inspection and Performance

Item	Pass	Fail	Comments
Visual Inspection for Damage	☐	☐	Insulation intact
Probe Startup	☐	☐	Ran on MGX
Probe Telemetry	☐	☐	Clean, no errors
Probe Weight	☐	☐	10.1 Kg

Poly Resistivity Bench Test – Overall Results
☒Passed
☐Not Passed

Reid Morrison	Andrew Torgerson	Roxanne Leblanc
Test Operator	**Operation Center Supervisor**	**Senior Data Analyst**

APPENDIX C-2

Geophysical Probe Quality Confirmation Reports

DGI GEOSCIENCE INC.

Winch Odometer Record Sheet

Project: L-676

Client: KGS

Date: July 21st 2021 - Day

Completed by: R. Morrison

PARAMETER:	
Winch Model:	MSI MXB 480m 4-core
Winch SN:	4016
Length of benchmark (measured with tape)	● meters 1m
Odometer out length measured	1m
Odometer in length measured	1m
Difference between benchmark and out reading	0.00
Difference between benchmark and in reading	0.00
Difference between in and out reading	0.00
Calibration Acceptable	✓ Yes | No
Comments: Performed under KGS supervision, Approved.	

DGI GEOSCIENCE INC.

Winch Odometer Record Sheet

Project: L-676

Client: KGS-VM WO

Date: JUNE 30/2

Completed by: R. MORRISON

PARAMETER:	
Winch Model:	MSI - MXC 1000m
Winch SN:	4231
Length of benchmark (measured with tape)	~~10 meters~~ 1m
Odometer out length measured	1.00m
Odometer in length measured	1.00m
Difference between benchmark and out reading	0.00
Difference between benchmark and in reading	0.00
Difference between in and out reading	0.00
Calibration Acceptable	(Yes) | No
Comments:	

DGI GEOSCIENCE INC.

Winch Odometer Record Sheet

Project: L-676

Client: KGS

Date: July 21st 2021 - Day

Completed by: R. Morrison

PARAMETER:	
Winch Model:	MSI MXC 1000m Single core
Winch SN:	4231
Length of benchmark (measured with tape)	● meters 1m
Odometer out length measured	1m
Odometer in length measured	1m
Difference between benchmark and out reading	0.00
Difference between benchmark and in reading	0.00
Difference between in and out reading	0.00
Calibration Acceptable	✓ Yes | No
Comments: Performed under KGS supervision, Approved.	

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site B IG_MWB03	Date: June 30, 2021
Issued Date: July 2, 2021 – Rev 0	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
3 Arm Caliper	Reid Morrison	1.13	99.5	98.37	IRD	Good.
Optical Televiewer	Reid Morrison	1.25	98.5	97.25	IRD	Some sections of log were re-run due to data gaps. Data issues were resolved after tool restart. All data good.
Electrical Resistivity	Reid Morrison	8.80	98.52	89.72	IRD	Good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site B Rev 0	Date: July 1, 2021
Issued Date: July 2, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
MWB03 – Acoustic Televiewer	Reid Morrison	1.39	98.5	97.11	IRD	Data quality was good. Some gaps observed; however, missing areas were minimal. Tool was occasionally off center due to size of centralizers and changes in borehole diameter. Tool tilt can be corrected for during post processing.
MWB03 – Heat Pulse Flow Meter	Reid Morrison	5	98	93	IRD	Data was noisy below 50 m. Noise was lower in upper portion of borehole. DGI processor believes data is noisy due to lack of flow in water column.

MWB01 – 3 Arm Caliper	Reid Morrison	1.23	99.0	97.77	IRD	Good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site B Rev 0	Date: July 2, 2021
Issued Date: November 4, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWB01 – Optical Televiewer	Reid Morrison	1.27	98.01	96.74	IRD	Data quality was good in final run; water clarity was better than IG_MWB03. Note that tool was removed from hole to address data quality issues during original down hole run.
IG_MWB01 – Acoustical Televiewer	Reid Morrison	1.51	98.01	96.5	IRD	Data quality was good.
IG_MWB01 – Resistivity Probe	Reid Morrison	8.88	98.03	89.15	IRD	Data quality was good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site B Rev 0	Date: July 3, 2021
Issued Date: November 4, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWB01 – Heat Pulse Flow Meter	Reid Morrison	5.0	98.0	93.0	IRD	Data quality was good.
IG_MWB02 – Caliper	Reid Morrison	1.58	99.4	97.82	IRD	Data quality was good.
IG_MWB02 – Optical Televiewer	Reid Morrison	1.64	97.01	95.37	IRD	Image quality limited due to fluoresceine tracer (green tint). Lower 10 m of borehole cloudy. Features still visible despite presence of fluoresceine.
IG_MBB02 – Acoustic Televiewer	Reid Morrison	18.5	98.51	80.01	IRD	All data good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site B	Date: July 4, 2021
Issued Date: July 5, 2021 Rev 0	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWB02 – Heat Pulse Flow Meter	Reid Morrison	18.0	98.0	80.0	IRD	Data quality was good.
IG_MWB02 – Resistivity	Reid Morrison	9.18	98.02	88.84	IRD	Data quality was good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site A Rev 0.	Date: July 21, 2021
Issued Date: July 22, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWA02 – 3 Arm Caliper	Reid Morrison	1.33	99.65	98.32	IRD	Data quality was good.
IG_MWA02 – Resistivity	Reid Morrison	8.97	99.61	90.64	IRD	Data quality was good.
IG_MWA02 – Optical Televiewer	Reid Morrison	1.23	98.50	97.27	IRD	Very good image quality.
IG_MWA02 – Acoustic Televiewer	Reid Morrison	6.0	91.01	85.05	IRD	Data of good quality.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site A Rev 0	Date: July 22, 2021
Issued Date: July 24, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWA02 – Heat Pulse Flow Meter	Reid Morrison	5.0	98.0	93.0	IRD	Data is good quality.
IG_MWA03 – 3 Arm Caliper	Reid Morrison	1.52	99.70	98.18	IRD	Data quality was good.
IG_MWA03 – Resistivity	Reid Morrison	9.16	98.51	89.35	IRD	Data quality was good.
IG_MWA03 – Acoustic Televiewer	Reid Morrison	5.90	98.50	92.6	IRD	Data of good quality.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site A Rev 0	Date: July 23, 2021
Issued Date: July 24, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWA03 – Heat Pulse Flow Meter	Reid Morrison	5.0	98.0	93.0	IRD	Data is valid despite noisy traced due to low flow conditions.
IG_MWA03 – Optical Televiewer	Reid Morrison	1.32	98.51	97.19	IRD	Data is of good quality.
IG_MWA01 – 3 Arm Caliper	Reid Morrison	1.46	99.70	98.24	IRD	Data quality was good.
IG_MWA01 – Resistivity	Reid Morrison	9.11	98.56	89.45	IRD	Data quality was good.
IG_MWA01 – Optical Televiewer	Reid Morrison	1.39	98.51	97.12	IRD	Data is of good quality.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: Site A and Site C	Date: July 24, 2021
Issued Date: July 26, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWA01 – Heat Pulse Flow Meter	Reid Morrison	5.0	95.0	90.0	IRD	Data is valid despite noisy traces due to low flow conditions.
IG_MWA01 – Acoustic Televiewer	Reid Morrison	6.0	97.3	91.3	IRD	Data is of good quality.
IG_MWC01 – 3 Arm Caliper	Reid Morrison	1.50	100.45	98.95	IRD	Data quality is good.
IG_MWC01 – Resistivity	Reid Morrison	9.14	99.09	89.95	IRD	Data quality is good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: SIte C Rev 0	Date: July 25, 2021
Issued Date: July 26, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWC01 – Heat Pulse Flow Meter	Reid Morrison	5.0	99.0	94.0	IRD	Data is valid despite noisy traces due to low flow conditions.
IG_MWC01 – Acoustic Televiewer	Reid Morrison	6.0	99.02	93.02	IRD	Data is of good quality.
IG_MWC01 – Optical Televiewer	Reid Morrison	1.40	99.0	97.6	IRD	Fluid clarity and acquired data is of good quality.
IG_MWC03 – 3 Arm Caliper	Reid Morrison	1.33	100.40	99.07	IRD	Data quality is good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: SIte C Rev 1	Date: July 26, 2021
Issued Date: July 28, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWC03 – Resistivity	Reid Morrison	9.01	99.36	90.35	IRD	Data is of good quality.
IG_MWC03 – Heat Pulse Flow Meter	Reid Morrison	5.0	99.0	94.0	IRD	Data is valid; clean traces.
IG_MWC03 – Acoustic Televiewer	Reid Morrison	5.99	99.25	93.26	IRD	Data is of good quality.
IG_MWC03 – Optical Televiewer	Reid Morrison	1.31	99.50	98.19	IRD	Fluid clarity and acquired data is of good quality.
IG_MWC02 – 3 Arm Caliper	Reid Morrison	1.47	100.49	99.02	IRD	Data quality is good.

Daily Quality Confirmation Report

Project: Shallow Groundwater Monitoring Network, Ignace Area	KGS Project No: 21-3836-001
Client: Nuclear Waste Management Organization	Client Recipient: Mostafa Khorshidi
Work Package: WPC - Geophysical Logging	Prepared By: Ian Deniset
Site: SIte C Rev 0	Date: July 27, 2021
Issued Date: November 4, 2021	Issued By: Eric Levay
Verified By: Ian Deniset	

Log Name	Logged By	From [m]	To [m]	Total Len. [m]	Reviewed By	Data Quality
IG_MWC02 – Resistivity	Reid Morrison	9.11	99.36	90.25	IRD	Data is of good quality.
IG_MWC02 – Heat Pulse Flow Meter	Reid Morrison	10.0	99.0	89.0	IRD	Data is valid; however, traces were variable between noisy and entirely flat.
IG_MWC02 – Acoustic Televiewer	Reid Morrison	7.20	99.25	92.05	IRD	Data is of good quality.
IG_MWC02 – Optical Televiewer	Reid Morrison	5.99	99.27	93.28	IRD	Fluid clarity and acquired data is of good quality.

APPENDIX D

Vibrating Wire Calibration Certificates

APPENDIX D-1

RST Instruments Vibrating Wire Calibration Certificates

Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Monitor with Confidence

Vibrating Wire Piezometer

Customer:	KGS GROUP
Sales Order:	227934
Customer ID:	
Model:	VW2100-1.0
Serial Number:	VW131955
Mfg Number:	P131955
Range:	1.0 MPa
Cable Length:	110 meters
Cable Marking:	815849 m to 815960 m
Cable Type:	EL380004
Cable Colour Code:	Red/Black (Coil) Green/White (Thermistor)
Thermistor Type:	3K

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8951	8953	8952	0.001	0.08	0.000	0.02
0.200	8292	8292	8292	0.200	-0.03	0.200	-0.02
0.400	7629	7629	7629	0.399	-0.06	0.400	-0.02
0.600	6964	6964	6964	0.600	-0.04	0.600	0.01
0.800	6298	6299	6299	0.800	0.02	0.800	0.03
1.000	5634	5634	5634	1.000	0.04	1.000	-0.02
Max Error (%)					0.08		0.03

Linear Calibration Factor: **CF = 3.0130e-04 MPa/B unit**
Temperature Correction Factor: **Tk = -2.0413e-04 MPa/°C rise**

Polynomial Gauge Factor:
A = -3.9750e-10 MPa/(B unit)² **B = -2.9550e-04 MPa/B unit** **C = calculate (see below) MPa**

Users must establish site zero readings for calculation purposes
Polynomial C = -[A(L_0^2) + B(L_0)]

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in MPa
B units = $Hz^2/1000$ ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	05 May 2021	8937	21.6	1022.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Ora Nygren **Date:** 05/05/2021

Approved: Kailah Toews **Date:** 05/05/2021

Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:	KGS GROUP
Sales Order:	227934
Customer ID:	
Model:	VW2100-1.0
Serial Number:	VW131967
Mfg Number:	P131967
Range:	1.0 MPa
Cable Length:	110 meters
Cable Marking:	919414 m to 919525 m
Cable Type:	EL380004
Cable Colour Code:	Red/Black (Coil) Green/White (Thermistor)
Thermistor Type:	3K

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8836	8836	8836	0.001	0.12	0.000	0.02
0.200	8167	8167	8167	0.200	-0.04	0.200	-0.03
0.400	7494	7494	7494	0.399	-0.09	0.400	-0.01
0.600	6819	6819	6819	0.599	-0.07	0.600	0.01
0.800	6142	6142	6142	0.800	0.00	0.800	0.02
1.000	5464	5465	5465	1.001	0.08	1.000	-0.02
Max Error (%)					0.12		0.03

Linear Calibration Factor: **CF = 2.9652e-04 MPa/B unit**
Temperature Correction Factor: **Tk = -1.2157e-04 MPa/°C rise**

Polynomial Gauge Factor:
A = -6.5293e-10 MPa/(B unit)² **B = -2.8718e-04 MPa/B unit** **C = calculate (see below) MPa**

Users must establish site zero readings for calculation purposes
Polynomial C = -[A(L_0^2) + B(L_0)]

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in MPa
B units = $Hz^2/1000$ ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	05 May 2021	8825	21.5	1022.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Ora Nygren **Date:** 05/05/2021

Approved: Kailah Toews **Date:** 05/05/2021

Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Monitor with Confidence

Vibrating Wire Piezometer

Customer:	KGS GROUP
Sales Order:	227934
Customer ID:	
Model:	VW2100-1.0
Serial Number:	VW131971
Mfg Number:	P131971
Range:	1.0 MPa
Cable Length:	110 meters
Cable Marking:	919526 m to 919637 m
Cable Type:	EL380004
Cable Colour Code:	Red/Black (Coil) Green/White (Thermistor)
Thermistor Type:	3K

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	9020	9020	9020	0.001	0.12	0.000	0.00
0.200	8360	8361	8360	0.200	-0.02	0.200	-0.00
0.400	7698	7699	7699	0.399	-0.10	0.400	-0.00
0.600	7034	7035	7035	0.599	-0.11	0.600	-0.01
0.800	6367	6366	6367	0.800	0.00	0.800	0.03
1.000	5699	5699	5699	1.001	0.10	1.000	-0.01
Max Error (%)					0.12		0.03

Linear Calibration Factor: CF = 3.0105e-04 MPa/B unit
Temperature Correction Factor: Tk = -1.8063e-04 MPa/°C rise

Polynomial Gauge Factor:
A = -7.9851e-10 MPa/(B unit)² B = -2.8930e-04 MPa/B unit C = calculate (see below) MPa

Users must establish site zero readings for calculation purposes
Polynomial C = -[A(L_0^2) + B(L_0)]

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in MPa
B units = $Hz^2/1000$ ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	05 May 2021	9014	21.6	1022.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Ora Nygren **Date:** 05/05/2021

Approved: Kailah Toews **Date:** 05/05/2021

APPENDIX D-2

GEOKON Vibrating Wire Calibration Certificates

GEOKON®

IG_MW101
Shallow

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120835

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Brian Hartley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9241	9242	9242	0.413	0.12	0.013	0.00
70.0	8653	8654	8654	69.88	-0.03	69.97	0.00
140.0	8063	8063	8063	139.6	-0.11	140.0	-0.01
210.0	7470	7471	7471	209.6	-0.09	210.0	0.01
279.9	6876	6876	6876	279.9	-0.02	280.0	0.01
350.0	6279	6279	6279	350.4	0.11	350.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1181 (kPa/ digit)

Polynomial Gauge factors: A: -3.489E-07 B: -0.1127 C:

Thermal Factor (K): -0.04843 (kPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.01714 (psi/ digit)

Polynomial Gauge Factors: A: -5.061E-08 B: -0.01635 C:

Thermal Factor (K): -0.007024 (psi/ °C)

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9240 Temperature: 21.3 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

IG-MWA01
Mid.

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125472

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Ryan Gentry

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8849	8849	8849	1.174	0.17	0.052	0.01
140.0	8022	8023	8023	139.8	-0.04	139.9	-0.01
280.0	7191	7191	7191	279.2	-0.11	280.0	0.01
420.0	6356	6356	6356	419.2	-0.11	420.0	0.00
560.0	5517	5517	5517	559.9	-0.02	560.1	0.00
700.1	4674	4675	4675	701.2	0.16	700.0	0.00

(kPa) Linear Gauge Factor (G): -0.1677 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -4.613E-07 **B:** -0.1614 **C:**

Thermal Factor (K): 0.1337 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02432 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -6.69E-08 **B:** -0.02342 **C:**

Thermal Factor (K): 0.01940 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8852 **Temperature:** 20.8 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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IG-MW101 Deep

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123768

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Power Supply

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8859	8860	8860	0.002	0.21	0.000	0.01
0.2	8161	8161	8161	0.199	-0.05	0.200	-0.02
0.4	7456	7456	7456	0.399	-0.14	0.400	0.01
0.6	6749	6749	6749	0.598	-0.16	0.600	-0.01
0.8	6036	6036	6036	0.800	-0.01	0.800	0.02
1.0	5321	5321	5321	1.002	0.19	1.000	-0.01

(MPa) Linear Gauge Factor (G): -0.0002826 (MPa/ digit)

Polynomial Gauge factors: A: -1.167E-09 B: -0.0002660 C:

Thermal Factor (K): 0.0001726 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.04098 (psi/ digit)

Polynomial Gauge Factors: A: -1.693E-07 B: -0.03858 C:

Thermal Factor (K): 0.02504 (psi/ °C)

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

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.

Factory Zero Reading: 8863 Temperature: 21.7 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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D6-MWA02
Port 1 (Shallow)

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120829

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Ryan Hanby

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9161	9162	9162	0.293	0.08	0.034	0.01
70.0	8568	8569	8569	69.90	-0.02	69.96	0.00
140.0	7974	7974	7974	139.7	-0.10	139.9	-0.03
210.0	7376	7377	7377	209.8	-0.04	210.0	0.02
279.9	6779	6779	6779	279.9	0.00	280.0	0.02
350.0	6180	6180	6180	350.2	0.06	350.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1174 (kPa/ digit)

Polynomial Gauge factors: A: -2.301E-07 B: -0.1138 C:

Thermal Factor (K): -0.08787 (kPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.01702 (psi/ digit)

Polynomial Gauge Factors: A: -3.337E-08 B: -0.01651 C:

Thermal Factor (K): -0.01275 (psi/ °C)

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9161 Temperature: 20.7 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

IG-MWA02 Mid Part 2

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125473

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Ryan Conley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9018	9019	9019	1.277	0.18	0.121	0.02
140.0	8205	8206	8206	139.7	-0.05	139.8	-0.03
280.0	7387	7387	7387	279.0	-0.14	279.8	-0.01
420.0	6562	6563	6563	419.3	-0.09	420.2	0.03
560.0	5737	5737	5737	559.9	-0.03	560.1	0.00
700.1	4907	4907	4907	701.2	0.16	700.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1702 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -4.962E-07 **B:** -0.1633 **C:**

Thermal Factor (K): -0.04021 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02469 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -7.197E-08 **B:** -0.02369 **C:**

Thermal Factor (K): -0.005832 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9024 **Temperature:** 21.0 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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I6-MW402
Port 3 Deep

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123769

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ronnie Hinkley

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8916	8917	8917	0.002	0.21	0.000	0.00
0.2	8207	8207	8207	0.200	-0.03	0.200	0.00
0.4	7493	7493	7493	0.399	-0.15	0.400	0.00
0.6	6775	6775	6775	0.599	-0.15	0.600	0.00
0.8	6053	6053	6053	0.800	-0.04	0.800	-0.01
1.0	5326	5326	5326	1.002	0.22	1.000	0.00

(MPa) Linear Gauge Factor (G): -0.0002785 (MPa/ digit)

Polynomial Gauge factors: A: -1.166E-09 B: -0.0002619 C:

Thermal Factor (K): 0.0001309 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.04040 (psi/ digit)

Polynomial Gauge Factors: A: -1.692E-07 B: -0.03799 C:

Thermal Factor (K): 0.01898 (psi/ °C)

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

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.

Factory Zero Reading: 8922 Temperature: 21.8 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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D6_MW403
Shallow

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120833

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Ronnie Kirby

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8901	8901	8901	0.479	0.14	0.031	0.01
70.0	8321	8321	8321	69.88	-0.03	69.95	-0.01
140.0	7738	7738	7738	139.6	-0.11	140.0	-0.02
210.0	7153	7153	7153	209.6	-0.09	210.0	0.00
279.9	6565	6566	6566	279.9	0.00	280.0	0.02
350.0	5976	5977	5977	350.4	0.11	350.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1197 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -3.753E-07 **B:** -0.1141 **C:**

Thermal Factor (K): -0.06437 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.01736 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -5.443E-08 **B:** -0.01655 **C:**

Thermal Factor (K): -0.009336 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8895 **Temperature:** 21.5 °C **Barometer:** 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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E6 - MWA 08 mid

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125475

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Power Reading

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9203	9204	9204	1.102	0.16	0.009	0.00
140.0	8385	8385	8385	139.9	-0.02	140.0	-0.01
280.0	7562	7563	7563	279.3	-0.09	280.0	0.01
420.0	6737	6737	6737	419.2	-0.11	420.0	0.00
560.0	5907	5908	5908	559.9	-0.03	560.0	-0.01
700.1	5074	5074	5074	701.2	0.16	700.1	0.00

(kPa) Linear Gauge Factor (G): -0.1695 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -4.457E-07 **B:** -0.1632 **C:**

Thermal Factor (K): -0.01007 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02459 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -6.465E-08 **B:** -0.02367 **C:**

Thermal Factor (K): -0.001461 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9210 **Temperature:** 21.8 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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16-MW403 deep

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123773

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ronnie Hadley

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8978	8978	8978	0.002	0.19	0.000	0.01
0.2	8265	8266	8266	0.199	-0.05	0.200	-0.01
0.4	7548	7548	7548	0.398	-0.16	0.400	-0.01
0.6	6826	6826	6826	0.599	-0.14	0.600	0.01
0.8	6101	6101	6101	0.800	-0.04	0.800	0.00
1.0	5371	5372	5372	1.002	0.19	1.000	0.00

(MPa) Linear Gauge Factor (G): -0.0002773 (MPa/ digit)

Polynomial Gauge factors: A: -1.108E-09 B: -0.0002614 C:

Thermal Factor (K): 0.00009673 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.04021 (psi/ digit)

Polynomial Gauge Factors: A: -1.606E-07 B: -0.03791 C:

Thermal Factor (K): 0.01403 (psi/ °C)

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

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.

Factory Zero Reading: 8980 Temperature: 22.6 °C Barometer: 998.9 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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IG_MWB01
Port 1: Shallow

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Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120831

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Ronnie Conley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9178	9178	9178	0.466	0.13	0.020	0.01
70.0	8582	8582	8582	69.90	-0.02	69.97	0.00
140.0	7983	7984	7984	139.6	-0.12	140.0	-0.02
210.0	7383	7383	7383	209.6	-0.11	209.9	-0.01
279.9	6778	6779	6779	280.0	0.01	280.1	0.04
350.0	6174	6174	6174	350.4	0.11	350.0	-0.02

(kPa) Linear Gauge Factor (G): -0.1165 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -3.66E-07 **B:** -0.1109 **C:**

Thermal Factor (K): -0.03788 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.01690 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -5.309E-08 **B:** -0.01608 **C:**

Thermal Factor (K): -0.005495 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9175 **Temperature:** 21.1 °C **Barometer:** 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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J6_MW501
Port 2 - Middle

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120828

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Ryan Hanby

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9024	9025	9025	0.411	0.12	0.046	0.01
70.0	8432	8432	8432	69.93	-0.01	69.99	0.00
140.0	7838	7838	7838	139.6	-0.11	139.9	-0.04
210.0	7242	7243	7243	209.5	-0.13	209.8	-0.05
279.9	6639	6639	6639	280.3	0.11	280.4	0.12
350.0	6043	6044	6044	350.2	0.05	349.8	-0.06

(kPa) Linear Gauge Factor (G): -0.1173 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -2.954E-07 **B:** -0.1129 **C:**

Thermal Factor (K): -0.05648 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.01702 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -4.284E-08 **B:** -0.01637 **C:**

Thermal Factor (K): -0.008192 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9025 **Temperature:** 21.5 °C **Barometer:** 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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16 MW801
Po.13 Deep

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125477

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Paul Conley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8874	8874	8874	0.835	0.12	-0.013	0.00
140.0	8041	8042	8042	139.9	-0.02	140.1	0.01
280.0	7207	7207	7207	279.3	-0.09	280.0	0.00
420.0	6369	6369	6369	419.3	-0.10	419.9	-0.01
560.0	5527	5527	5527	559.9	-0.02	560.1	0.01
700.1	4683	4683	4683	700.9	0.12	700.0	0.00

(kPa) Linear Gauge Factor (G): -0.1670 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -3.604E-07 **B:** -0.1622 **C:**

Thermal Factor (K): -0.008454 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02423 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -5.228E-08 **B:** -0.02352 **C:**

Thermal Factor (K): -0.001226 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8873 **Temperature:** 20.7 °C **Barometer:** 999 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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IG-MWB02
Port 1 - Shallow

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125478

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Dean C Lowdin

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8892	8892	8892	0.989	0.14	0.156	0.02
140.0	8050	8051	8051	139.7	-0.05	139.8	-0.03
280.0	7204	7204	7204	279.2	-0.11	279.8	-0.02
420.0	6352	6353	6353	419.5	-0.07	420.1	0.02
560.0	5499	5500	5500	560.1	0.01	560.2	0.03
700.1	4646	4646	4646	700.7	0.10	699.9	-0.02

(kPa) Linear Gauge Factor (G): -0.1648 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -3.399E-07 **B:** -0.1602 **C:**

Thermal Factor (K): -0.02054 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02390 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -4.929E-08 **B:** -0.02324 **C:**

Thermal Factor (K): -0.002979 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8895 **Temperature:** 20.5 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125471

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Dean C Coudray

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9035	9036	9036	0.750	0.11	0.034	0.00
140.0	8201	8201	8201	139.9	-0.02	139.9	-0.01
280.0	7363	7363	7363	279.6	-0.06	280.0	0.01
420.0	6524	6524	6524	419.4	-0.08	419.9	-0.01
560.0	5680	5681	5681	560.0	0.00	560.1	0.01
700.1	4836	4837	4837	700.7	0.10	700.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1667 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -2.823E-07 **B:** -0.1628 **C:**

Thermal Factor (K): 0.08611 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02418 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -4.094E-08 **B:** -0.02361 **C:**

Thermal Factor (K): 0.01249 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9039 **Temperature:** 20.5 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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IG-MWB02
Port 3 - Deep

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123765

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Dean O Cowdrey

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8971	8972	8972	0.002	0.21	0.000	-0.01
0.2	8254	8254	8254	0.200	-0.03	0.200	0.01
0.4	7532	7532	7532	0.398	-0.16	0.400	0.01
0.6	6806	6807	6807	0.598	-0.19	0.600	-0.01
0.8	6075	6075	6075	0.800	-0.05	0.800	0.00
1.0	5339	5339	5339	1.002	0.22	1.000	0.00

(MPa) Linear Gauge Factor (G): -0.0002753 (MPa/ digit)

Polynomial Gauge factors: A: -1.229E-09 B: -0.0002577 C:

Thermal Factor (K): 0.00004628 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.03993 (psi/ digit)

Polynomial Gauge Factors: A: -1.783E-07 B: -0.03738 C:

Thermal Factor (K): 0.006713 (psi/ °C)

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

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.

Factory Zero Reading: 8973 Temperature: 21.5 °C Barometer: 998.9 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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JG-MW803
SHALLOW

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120836

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Paul Hadley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8965	8966	8966	0.172	0.05	0.047	0.01
70.0	8358	8359	8359	69.94	-0.01	69.95	-0.01
140.0	7750	7751	7751	139.8	-0.06	139.9	-0.03
210.0	7141	7141	7141	209.9	-0.02	210.0	0.00
279.9	6530	6530	6530	280.1	0.05	280.1	0.05
350.0	5921	5922	5922	350.1	0.01	349.9	-0.03

(kPa) Linear Gauge Factor (G): -0.1149 (kPa/ digit)

Polynomial Gauge factors: A: -9.136E-08 B: -0.1136 C:

Thermal Factor (K): -0.07520 (kPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.01667 (psi/ digit)

Polynomial Gauge Factors: A: -1.325E-08 B: -0.01647 C:

Thermal Factor (K): -0.01091 (psi/ °C)

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8962 Temperature: 21.5 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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IG-MWB03
MID Port 2

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125476

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Ryan Hanby

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8902	8902	8902	1.361	0.19	0.150	0.02
140.0	8090	8090	8090	139.5	-0.08	139.8	-0.04
280.0	7271	7270	7271	278.8	-0.16	279.9	0.00
420.0	6447	6445	6446	419.0	-0.13	420.1	0.02
560.0	5618	5619	5619	559.8	-0.04	560.1	0.01
700.1	4787	4787	4787	701.2	0.16	700.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1701 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -5.687E-07 **B:** -0.1623 **C:**

Thermal Factor (K): -0.01400 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02467 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -8.249E-08 **B:** -0.02354 **C:**

Thermal Factor (K): -0.002030 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8905 **Temperature:** 20.4 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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J6_MWB03
Deep

GEOKON®

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123770

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ronnie Cooley

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8945	8946	8946	0.002	0.18	0.000	0.00
0.2	8239	8239	8239	0.200	-0.04	0.200	-0.01
0.4	7527	7527	7527	0.399	-0.12	0.400	0.02
0.6	6813	6814	6814	0.598	-0.16	0.600	-0.01
0.8	6095	6095	6095	0.800	-0.05	0.800	-0.01
1.0	5372	5372	5372	1.002	0.19	1.000	0.01

(MPa) Linear Gauge Factor (G): -0.0002799 (MPa/ digit)

Polynomial Gauge factors: A: -1.075E-09 B: -0.0002645 C:

Thermal Factor (K): 0.0001177 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.04059 (psi/ digit)

Polynomial Gauge Factors: A: -1.56E-07 B: -0.03836 C:

Thermal Factor (K): 0.01707 (psi/ °C)

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

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.

Factory Zero Reading: 8948 Temperature: 23.1 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

EG-MW01
Shallow

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120830

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Ravi Reddy

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9011	9011	9011	0.231	0.07	0.008	0.00
70.0	8408	8408	8408	69.98	0.00	70.02	0.01
140.0	7805	7805	7805	139.7	-0.08	139.9	-0.04
210.0	7199	7199	7199	209.8	-0.04	210.0	0.01
279.9	6592	6593	6593	280.0	0.01	280.0	0.02
350.0	5985	5986	5986	350.2	0.05	350.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1157 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -1.749E-07 **B:** -0.1131 **C:**

Thermal Factor (K): -0.06236 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.01678 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -2.537E-08 **B:** -0.01640 **C:**

Thermal Factor (K): -0.009045 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9011 **Temperature:** 20.7 °C **Barometer:** 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

BC-MW601
Middle

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125470

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Ryan Conley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8965	8966	8966	1.136	0.16	0.070	0.01
140.0	8173	8173	8173	139.6	-0.06	139.9	-0.02
280.0	7375	7375	7375	279.0	-0.13	280.0	0.01
420.0	6573	6574	6574	419.0	-0.14	420.0	0.01
560.0	5768	5768	5768	559.8	-0.04	560.1	0.00
700.1	4959	4959	4959	701.1	0.15	700.0	-0.01

(kPa) Linear Gauge Factor (G): -0.1747 (kPa/ digit)

Polynomial Gauge factors: A: -5.343E-07 B: -0.1673 C:

Thermal Factor (K): 0.07335 (kPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.02534 (psi/ digit)

Polynomial Gauge Factors: A: -7.75E-08 B: -0.02426 C:

Thermal Factor (K): 0.01064 (psi/ °C)

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8971 Temperature: 20.8 °C Barometer: 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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IG-MW01 Deep

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123767

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ramon Hardy

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8972	8972	8972	0.001	0.15	0.000	0.00
0.2	8305	8305	8305	0.200	-0.03	0.200	0.00
0.4	7635	7635	7635	0.399	-0.12	0.400	-0.01
0.6	6961	6961	6961	0.599	-0.09	0.600	0.02
0.8	6286	6286	6286	0.800	-0.03	0.800	-0.01
1.0	5607	5607	5607	1.001	0.15	1.000	0.00

(MPa) Linear Gauge Factor (G): -0.0002972 (MPa/ digit)

Polynomial Gauge factors: A: -9.526E-10 B: -0.0002833 C:

Thermal Factor (K): 0.0003682 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.04310 (psi/ digit)

Polynomial Gauge Factors: A: -1.382E-07 B: -0.04109 C:

Thermal Factor (K): 0.05340 (psi/ °C)

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

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.

Factory Zero Reading: 8973 Temperature: 21.7 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

IG-MWC02
Shallow

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120832

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician:

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9136	9137	9137	0.175	0.05	0.039	0.01
70.0	8539	8540	8540	69.80	-0.05	69.88	-0.03
140.0	7938	7939	7939	139.9	-0.04	140.1	0.02
210.0	7339	7340	7340	209.7	-0.06	209.9	-0.01
279.9	6738	6738	6738	279.9	-0.02	280.0	0.01
350.0	6135	6136	6136	350.1	0.03	350.0	0.00

(kPa) Linear Gauge Factor (G): -0.1166 (kPa/ digit)

Polynomial Gauge factors: A: -1.533E-07 B: -0.1143 C:

Thermal Factor (K): -0.1003 (kPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.01691 (psi/ digit)

Polynomial Gauge Factors: A: -2.224E-08 B: -0.01657 C:

Thermal Factor (K): -0.01455 (psi/ °C)

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9134 Temperature: 21.8 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

I6_MWC02 middle

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-700 kPa

Date of Calibration: June 07, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2125474

Temperature: 23.70 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.4 mbar

Cable Length: 300 feet

Technician: Ryan Cooley

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9026	9027	9027	1.236	0.18	0.008	0.00
140.0	8186	8186	8186	139.8	-0.04	140.0	0.00
280.0	7341	7341	7341	279.0	-0.13	280.0	0.01
420.0	6491	6492	6492	419.1	-0.13	420.0	0.00
560.0	5638	5638	5638	559.7	-0.04	560.0	-0.01
700.1	4779	4779	4779	701.3	0.18	700.1	0.00

(kPa) Linear Gauge Factor (G): -0.1648 **(kPa/ digit)**

Polynomial Gauge factors: **A:** -5.052E-07 **B:** -0.1578 **C:**

Thermal Factor (K): -0.02472 **(kPa/ °C)**

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

(psi) Linear Gauge Factor (G): -0.02391 **(psi/ digit)**

Polynomial Gauge Factors: **A:** -7.327E-08 **B:** -0.02289 **C:**

Thermal Factor (K): -0.003585 **(psi/ °C)**

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9029 **Temperature:** 20.5 °C **Barometer:** 997.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

IG.MWC02
Deep

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123766

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ryan Hadley

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9048	9048	9048	0.002	0.22	0.000	0.00
0.2	8328	8329	8329	0.200	-0.03	0.200	0.00
0.4	7603	7604	7604	0.399	-0.15	0.400	0.01
0.6	6875	6875	6875	0.598	-0.16	0.600	0.00
0.8	6142	6142	6142	0.800	-0.04	0.800	-0.01
1.0	5403	5404	5404	1.002	0.23	1.000	0.01

(MPa) Linear Gauge Factor (G): -0.0002744 (MPa/ digit)

Polynomial Gauge factors: A: -1.185E-09 B: -0.0002573 C:

Thermal Factor (K): 0.0001570 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.03980 (psi/ digit)

Polynomial Gauge Factors: A: -1.718E-07 B: -0.03732 C:

Thermal Factor (K): 0.02277 (psi/ °C)

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

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.

Factory Zero Reading: 9049 Temperature: 21.7 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

ZG MW103 Shallow

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-350 kPa

Date of Calibration: May 04, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2120834

Temperature: 22.60 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 988.9 mbar

Cable Length: 150 feet

Technician: Marco Godoy

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9102	9102	9102	0.229	0.07	0.068	0.02
70.0	8494	8495	8495	69.85	-0.04	69.93	-0.01
140.0	7885	7886	7886	139.6	-0.11	139.8	-0.05
210.0	7272	7273	7273	209.9	-0.02	210.1	0.04
279.9	6661	6661	6661	280.0	0.01	280.0	0.03
350.0	6049	6049	6049	350.1	0.02	349.9	-0.02

(kPa) Linear Gauge Factor (G): -0.1146 (kPa/ digit)

Polynomial Gauge factors: A: -1.617E-07 B: -0.1122 C:

Thermal Factor (K): -0.05533 (kPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.01662 (psi/ digit)

Polynomial Gauge Factors: A: -2.345E-08 B: -0.01627 C:

Thermal Factor (K): -0.008024 (psi/ °C)

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

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 kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 9101 Temperature: 21.3 °C Barometer: 996.7 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

IG_MW003
Mine

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123772

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ryan Hartley

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9226	9226	9226	0.002	0.22	0.000	0.00
0.2	8511	8511	8511	0.199	-0.06	0.200	0.00
0.4	7790	7790	7790	0.398	-0.18	0.400	0.01
0.6	7065	7066	7066	0.598	-0.20	0.600	0.00
0.8	6335	6336	6336	0.799	-0.06	0.800	-0.01
1.0	5600	5600	5600	1.002	0.23	1.000	0.00

(MPa) Linear Gauge Factor (G): -0.0002758 (MPa/ digit)

Polynomial Gauge factors: A: -1.31E-09 B: -0.0002564 C:

Thermal Factor (K): 0.0002224 (MPa/ °C)

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

(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

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.

Factory Zero Reading: 9231 Temperature: 23.3 °C Barometer: 998.9 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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GEOKON®

26-MW003 Deep

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500SOL-1 MPa

Date of Calibration: June 11, 2021

This calibration has been verified/validated as of 06/23/2021

Serial Number: 2123771

Temperature: 23.50 °C

Calibration Instruction: CI-Pressure Transducers 7 kPa~3.5 MPa

Barometric Pressure: 996.5 mbar

Cable Length: 400 feet

Technician: Ronnie Cooley

Applied Pressure (MPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8980	8979	8980	0.002	0.21	0.000	0.00
0.2	8282	8282	8282	0.200	-0.03	0.200	0.00
0.4	7581	7581	7581	0.398	-0.18	0.400	-0.03
0.6	6873	6873	6873	0.599	-0.13	0.600	0.03
0.8	6164	6164	6164	0.800	-0.04	0.800	-0.01
1.0	5449	5449	5449	1.002	0.21	1.000	0.00

(MPa) Linear Gauge Factor (G): -0.0002832 (MPa/ digit)

Polynomial Gauge factors: A: -1.226E-09 B: -0.0002655 C:

Thermal Factor (K): 0.0001375 (MPa/ °C)

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

(psi) Linear Gauge Factor (G): -0.04108 (psi/ digit)

Polynomial Gauge Factors: A: -1.778E-07 B: -0.03851 C:

Thermal Factor (K): 0.01994 (psi/ °C)

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

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.

Factory Zero Reading: 8982 Temperature: 22.8 °C Barometer: 998.9 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

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APPENDIX E

Ontario Regulation 903 Well Records

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below) A340758

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	~~[illegible]~~ NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th Floor	Toronto	ON	M4T2S3	4169849814

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555337	5486570		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown-Grey			Sand-medium to coarse	0	2.55
Grey	Quartz, Feldspar, Biotite	Some K feldspar	Biotite Granodiorite - Tonalite	2.55	100
			MW A01		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	~~0~~	Bentonite-Cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	~~0.48~~ 0.15	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Fresh	Untested	Other, specify
3.3	☐		☐	☐	
	☐		☐	☐	
	☐		☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

see attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLELEAF DRILLING LTD	7212

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUNNYSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0S3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VANLINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3483		2021/07/23

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2021/07/03

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Audit No. Z381388

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Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A340759

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th Floor	Toronto	ON	M4T2S3	4169834981 4

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555377	5486544		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown			Organics	0	1.0
Brown			Silty Clay	1.0	2.8
Grey			Biotite Granodiorite-Tonalite	2.8	6
Grey+Pink			Granite	6.0	12.0
Grey			Biotite Granodiorite-Tonalite	12.0	34.0
Grey			Amphibolite	34.0	36.0
Pink+Grey			Granite	36.0	52.0
Grey			Biotite Granodiorite-Tonalite	52.0	82.0
Pink+Grey			MW A02 Granite	82.0	100.0

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
		Bentonite-cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☑ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	steel	0.48 #	0.	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
4.5	☐	☐ Fresh ☐ Untested ☐ Other, specify	0	6.0	30.5
	☐	☐ Fresh ☐ Untested ☐ Other, specify	6.0	100.0	12.7
	☐	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLE LEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUNNYSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0S3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VAN LINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3183		2022/02/22

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2021/06/18

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Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A340760

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th Floor	Toronto	ON	M4T2S3	4169834988

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	565378	5486595		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown			Sand some silt	0	2.0
Grey			Biotite Granodiorite-Tonalite	2.0	46.0
Pink			Granite	46.0	52.0
Grey-Pink			Biotite Granodiorite-Tonalite	52.0	100.0
			MW A03		

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
		Bentonite-cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☑ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	0.48	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify
43'	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLE LEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
2024 SPRINGFIELD RD	SUNNYSIDE	MB	R5R0S3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2042424084	VAN LINGE, KURT	3148		2021/08/12

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

see attached site plan

Comments:

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2021/08/05

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Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A 340761

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th floor	Toronto	ON	M4T2S3	4169349814

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555458	5485833		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
White Orange			Sand & Cobbles	0	3.7
Grey	Quartz, Feldspar, Biotite		Biotite Granodiorite - Tonalite	3.7	100.0
			MW B07		

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
		Bentonite-cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☑ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	0.48	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
2.6	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

see attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLELEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUMMERSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0J3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VANHINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3483		2022/08/22

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2022/06/07

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Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A 340762

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NMWO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th floor	Toronto	ON	M4T2S3	4169894981H

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555419	5485334		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey			Sand & gravel	0	1.1
Grey	Quartz, Feldspar, Biotite		Biotite-Granodiorite-Tonalite	1.1	100.0
			MW B02		

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
		Bentonite-Cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☑ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	0.48	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
14.8	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping _____ hrs + _____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLE LEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUNNYSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0S3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VAN LINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3148		2022/09/22

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2021/06/06

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Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A340763

Well Record

Regulation 903 Ontario Water Resources Act

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Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th Floor	Toronto	ON	M4T2S3	4169349814

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555447	5485287		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey			Sand & gravel	0	1.1
Grey	Quartz, Feldspar, Biotite		Biotite Granodiorite - Tonalite	1.1	100.0
			MW B03		

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
		Bentonite-cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☑ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	0.48	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
3.5	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLE LEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUNNYSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0J3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VAN LINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3483		2022/02/22

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2021 06 05

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Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A340764

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th floor	Toronto	ON	M4T2S3	4169349814

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora	Ignace	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555698	5485929		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown			Organics	0	1.0
Grey	Quartz, Feldspar, Biotite		Biotite Granodiorite-Tonalite	1.0	3.0
Grey Pink	Quartz, Feldspar, Biotite		Granite	3.0	7.0
Grey Pink	Quartz, Feldspar, Biotite		Biotite Granodiorite-Tonalite	7.0	100.0
			MW C07		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	~~6.0~~	Bentonite-cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☑ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	0.15 ~~0.15~~	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Fresh	Untested	Other, specify
3.5	☐		☐	☐	
	☐		☐	☐	
	☐		☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLE LEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUNNYSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0S3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VAN LINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3183		2021/08/25

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2021/08/05

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Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A340765

Well Record

Regulation 903 Ontario Water Resources Act

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Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th floor	Toronto	ON	M4T2S3	4169349814

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	554693	5485905		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown			Organics	0	1.0
Grey	Quartz, Feldspar, Biotite		Biotite Granodiorite - Tonalite	1.0	82.0
Pink	Quartz, Feldspar, Biotite		Syenite	82.0	84.0
Grey-Pink	Quartz, Feldspar, Biotite		Granite	84.0	88.0
Grey	Quartz, Feldspar, Biotite		Biotite Granodiorite-Tonalite	88.0	100.0
			MW C02		

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
		Bentonite - cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	0.15 0.118	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLELEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 Springfield Rd	Sunnyside

Province	Postal Code	Business E-mail Address
MB	R5R0S3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VAN INGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3183		2022/02/22

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No		2022/02/08

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Well Tag No. (Place Sticker and/or Print Below): A340766

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Measurements recorded in: ☑ Metric ☐ Imperial

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	NWMO		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
22 St. Clair Ave East 4th floor	Toronto	ON	M4T2S3	4169934981

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession

County/District/Municipality	City/Town/Village	Province	Postal Code
Kenora		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	15	555698	5485883		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Pink	Quartz, Feldspar, Biotite		Biotite Granodiorite-Tonalite	0	100
			MW C03		

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	~~6.0~~	Bentonite Cement	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
20cm	Steel	~~0.15~~ 0.118	0	6.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify
2.8	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	6.0	30.5
6.0	100.0	12.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min/GPM)

Well production (l/min/GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See attached site plan

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
MAPLELEAF DRILLING LTD	7012

Business Address (Street Number/Name)	Municipality
2024 SPRINGFIELD RD	SUNNYSIDE

Province	Postal Code	Business E-mail Address
MB	R5R0J3	office@mapleleafdrilling.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2042243084	VANLINGE, KURT

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3143		2021/08/12

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2021/07/09

Ministry Use Only

Audit No. Z381387

Received

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Ministry's Copy

17
MW-A02
MW-A01
MW-A03
MW-c02
MW-C01
MW-C03
MW-B01
MW-B02
MW-B03
3D
1,000 m
Camera: 13,561 m 49°31'03"N 92°15'38"W 425 m

APPENDIX F

Multilevel Monitoring Well Construction Photo Log

Photo 1: IG_MWB01 – Setup of the polysheet and reference marker (bucket).

Photo 2: IG_MWB02 – Preparing well construction materials such as casing, VW wiring and vent and drive tubing for the pumps.

Photo 3: Adding another length of well casing and securing int place with the casing clamp.

Photo 4: IG_MWA – Well casing lengths laid out on the polysheet ready to be added.

Photo 5: Preparing vibrating wires for a zero reading before connecting to the stain-less steel port.

Photo 6: Vibrating wire and pump attached to the port.

Photo 8: Completed port assembly with pump and VW connected and secured to the well casing.

Photo 9: Monitoring port before being lowered into the borehole.

Photo 10: Preparing the well manifold to test pumps before backfilling.

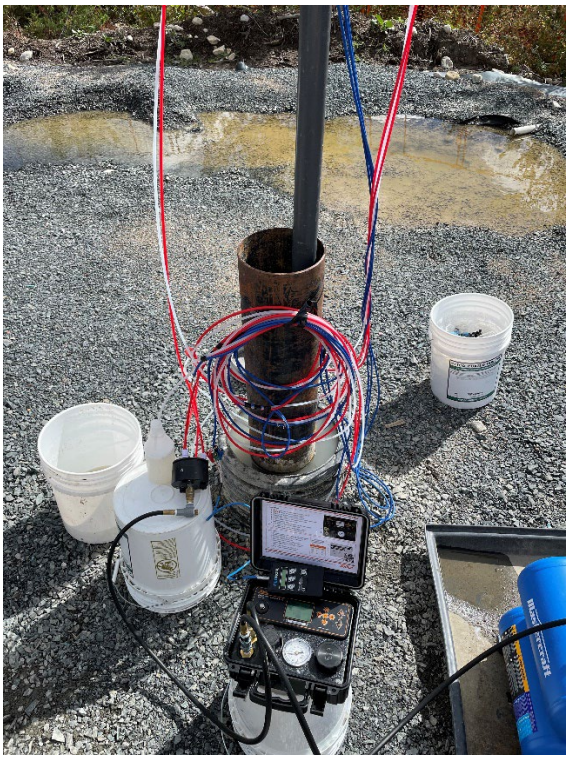


Photo 11: Development and purging of the monitoring intervals prior to backfilling.

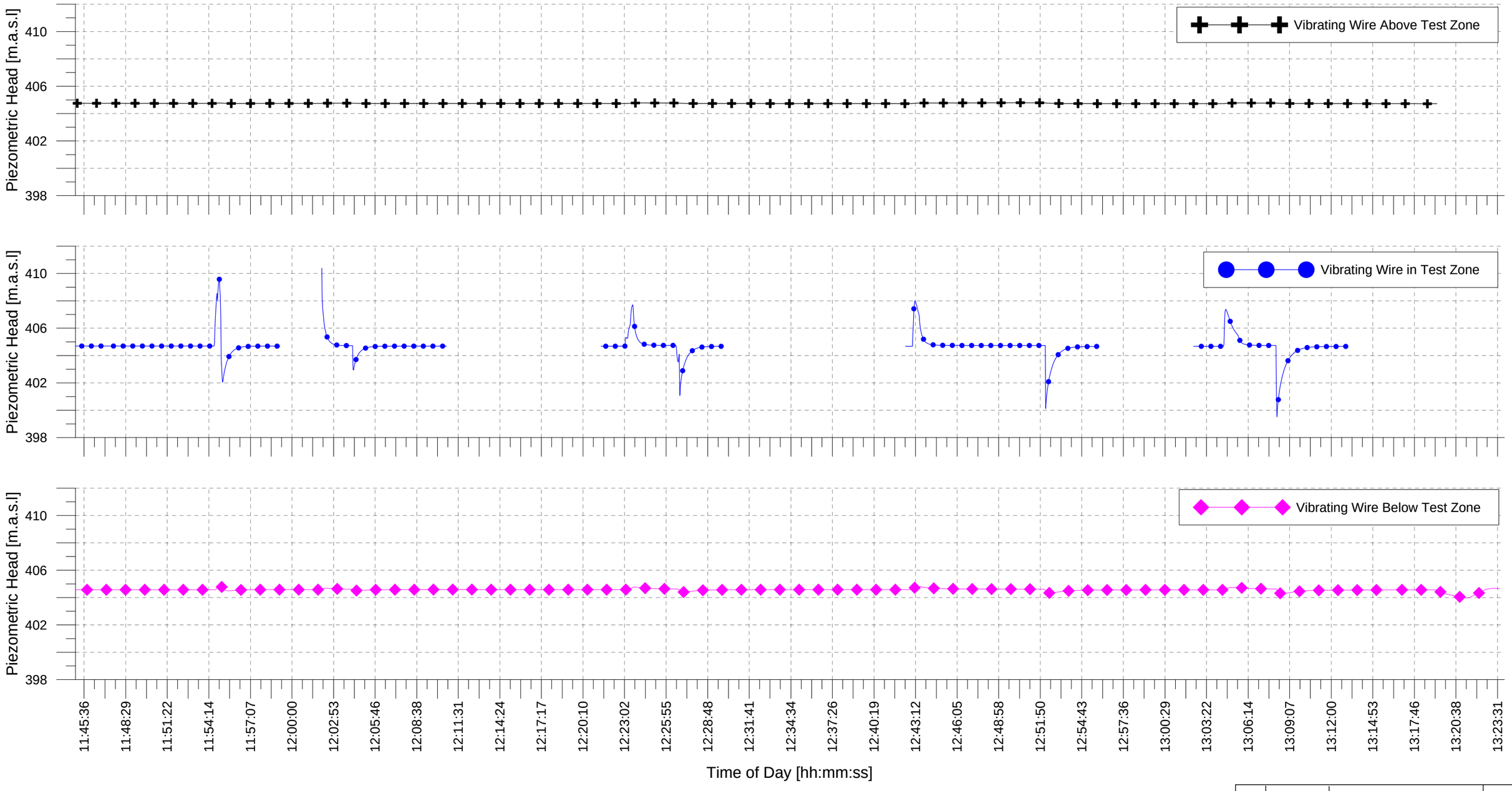
Photo 12: IG_MWB03 – Finished well with cover and security fencing installed.

APPENDIX G

Hydrographs

APPENDIX G-1

Packer Test Data



Notes:
1. Packer testing completed on September 11, 2021
2. Packer assembly installed down-hole September 10, 2021

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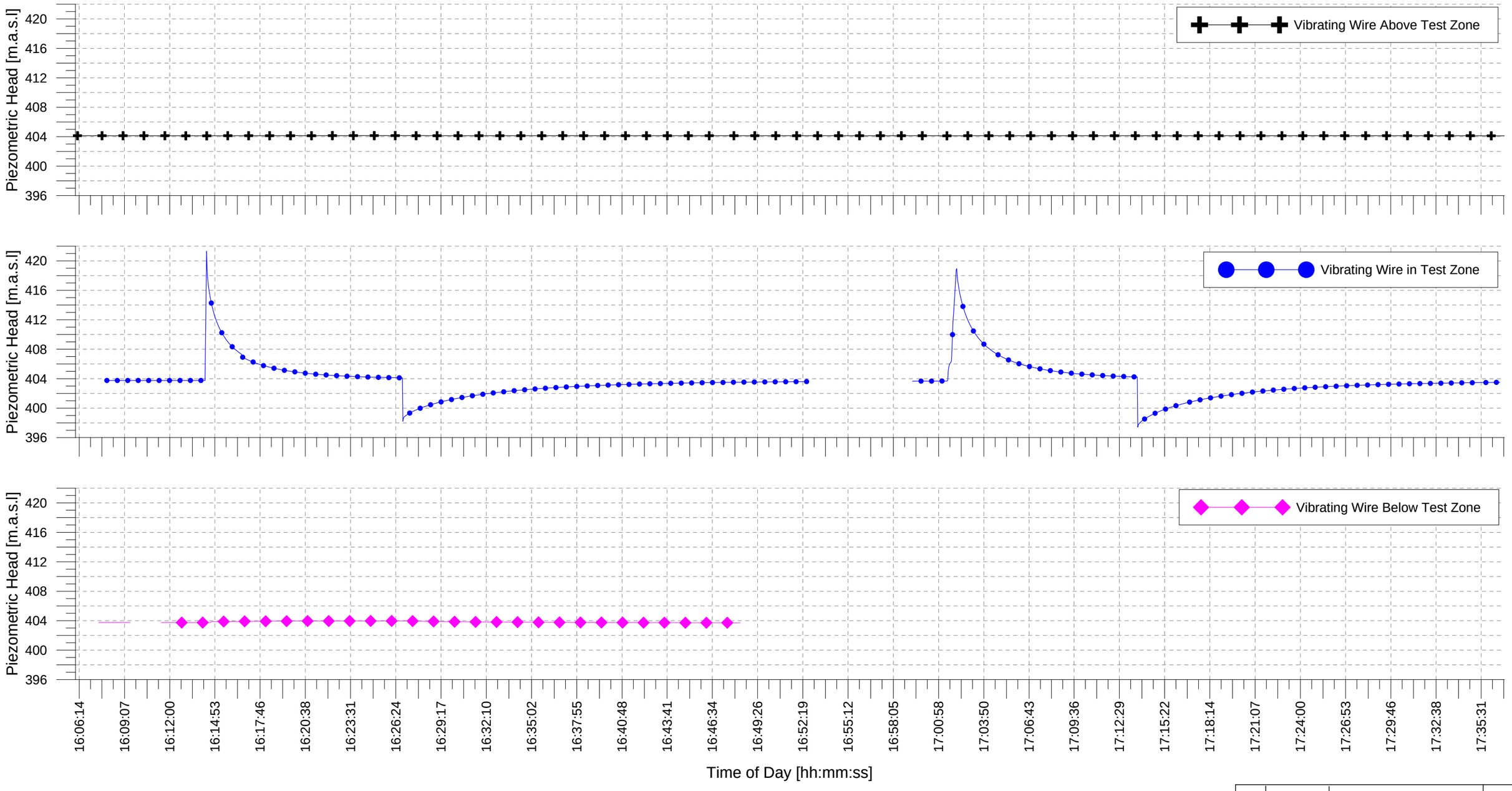
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PACKER TEST RESULTS FOR IG_MWA01

JUNE 2022 | FIGURE E-1-1 | REV: 0



Notes:
1. Test interval 43.32 - 41.44 mbgs
2. Packer testing completed on September 12, 2021
3. Packer assembly installed down-hole September 11, 2021

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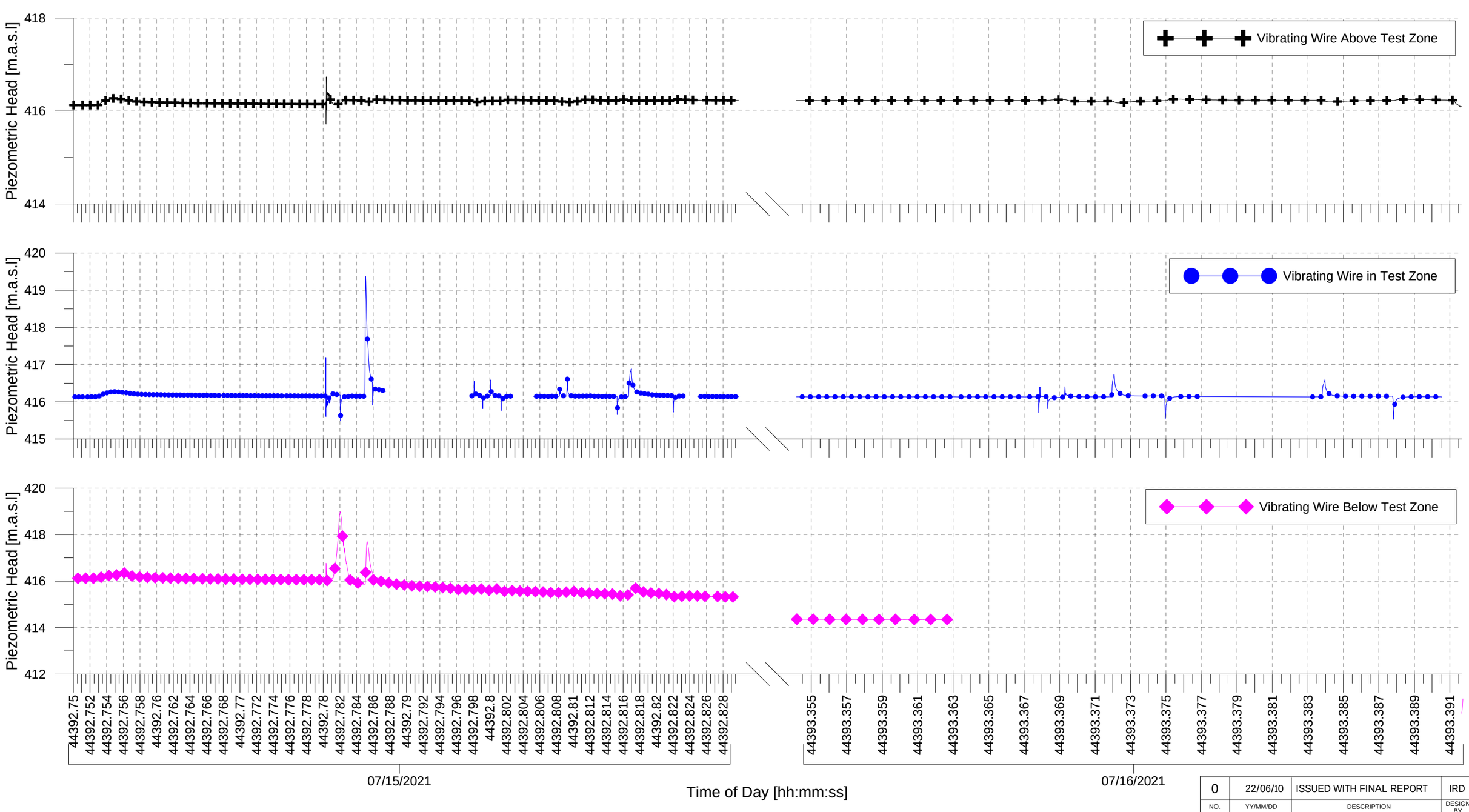
PACKER TEST RESULTS FOR IG_MWA03

JUNE 2022 | FIGURE E-1-2 | REV: 0



Notes:
1. Test interval 8.4 - 7.6 mbgs
2. Packer testing completed on July 15-16, 2021
3. Packer assembly installed down-hole July 15, 2021

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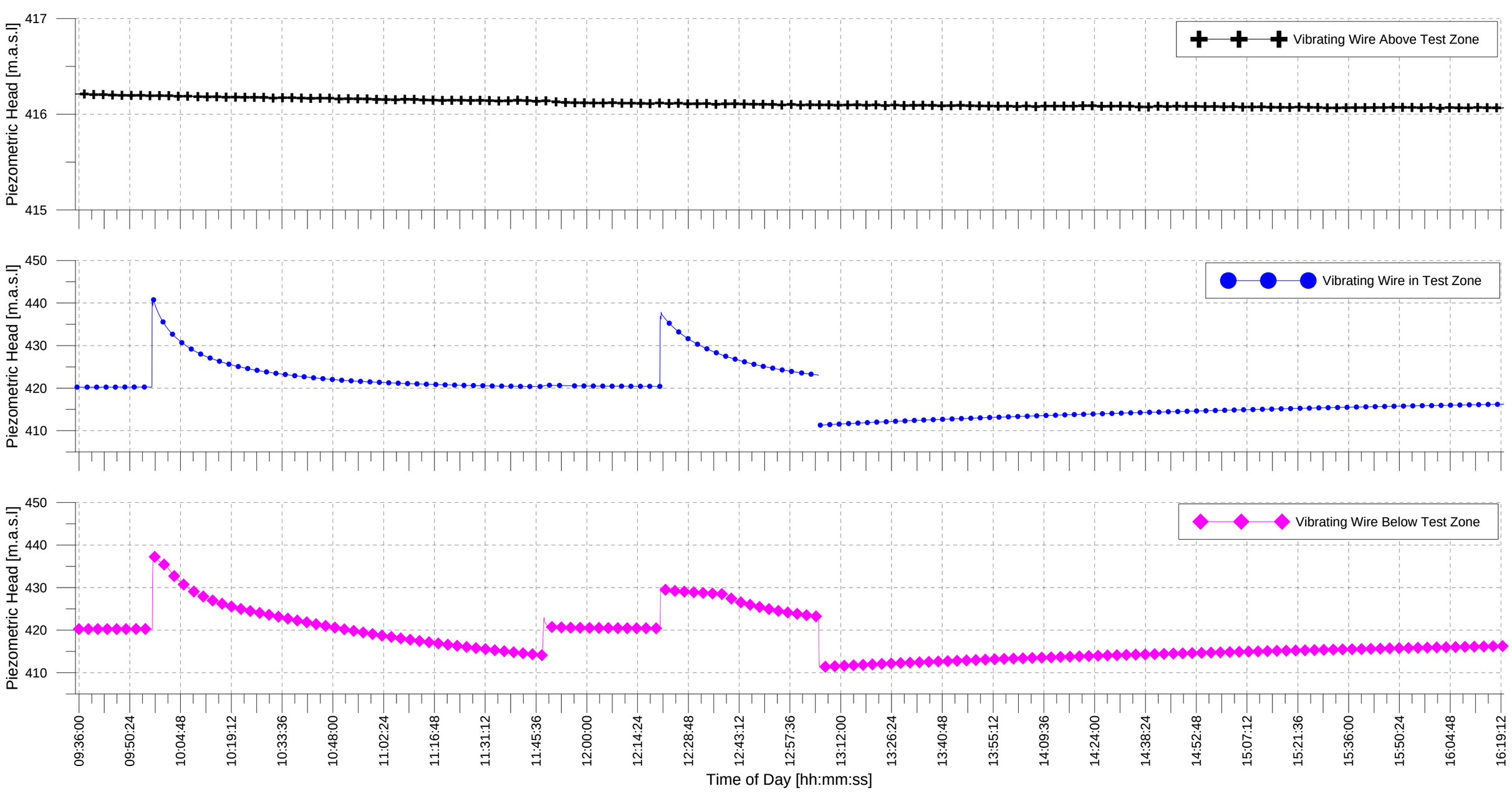
PACKER TEST RESULTS FOR IG_MWB01

JUNE 2022 | FIGURE E-1-3 | REV: 0



Notes:
1. Test interval 86.99 to 85.11 mbgs
2. Packer testing completed on July 17, 2021
3. Packer assembly installed down-hole July 16, 2021

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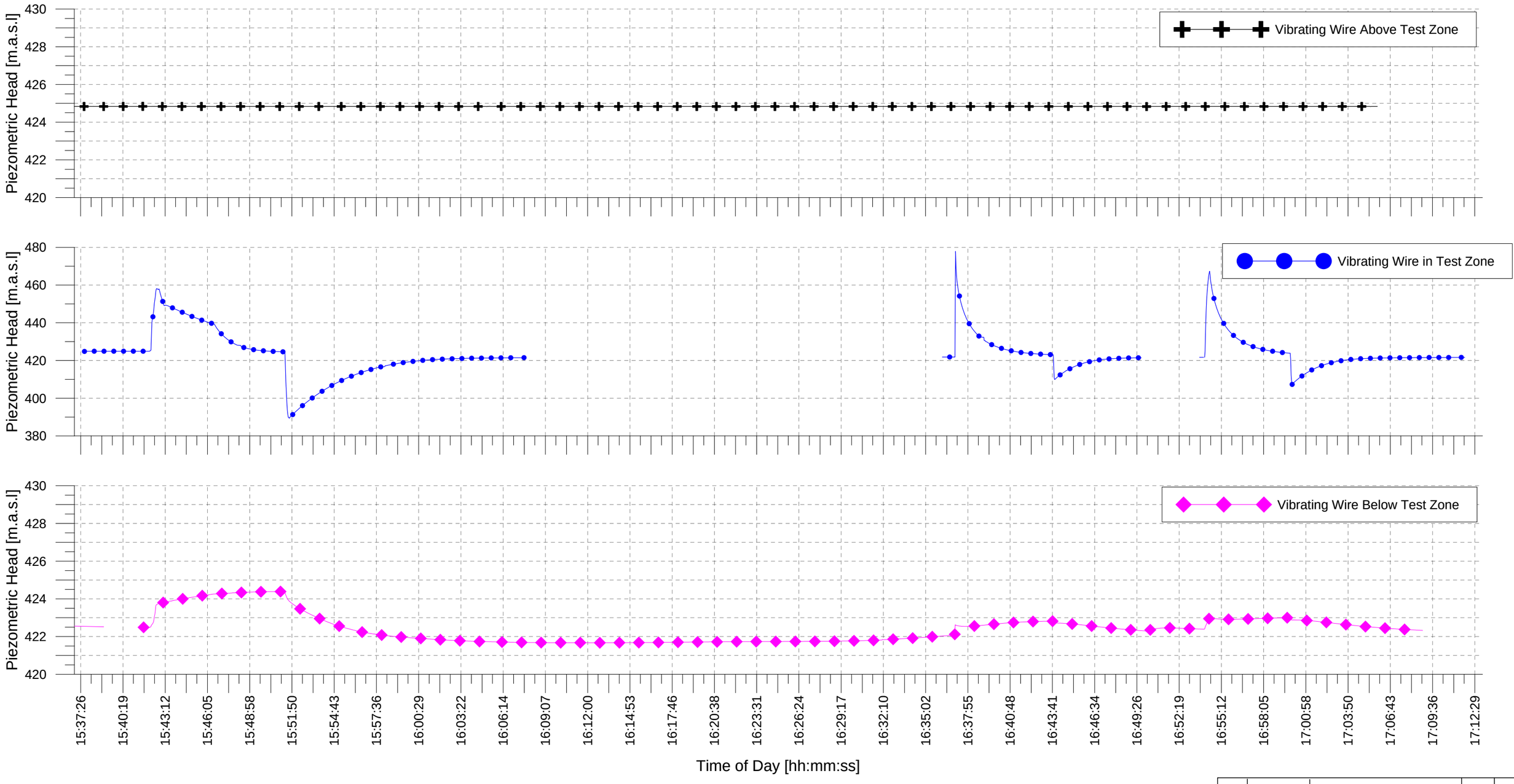
PACKER TEST RESULTS FOR IG_MWB03

JUNE 2022 | FIGURE E-1-4 | REV: 0



Notes:
1. Test interval 92.73 - 90.85 mbgs
2. Packer testing completed on September 14, 2021
3. Packer assembly installed down-hole September 13, 2021

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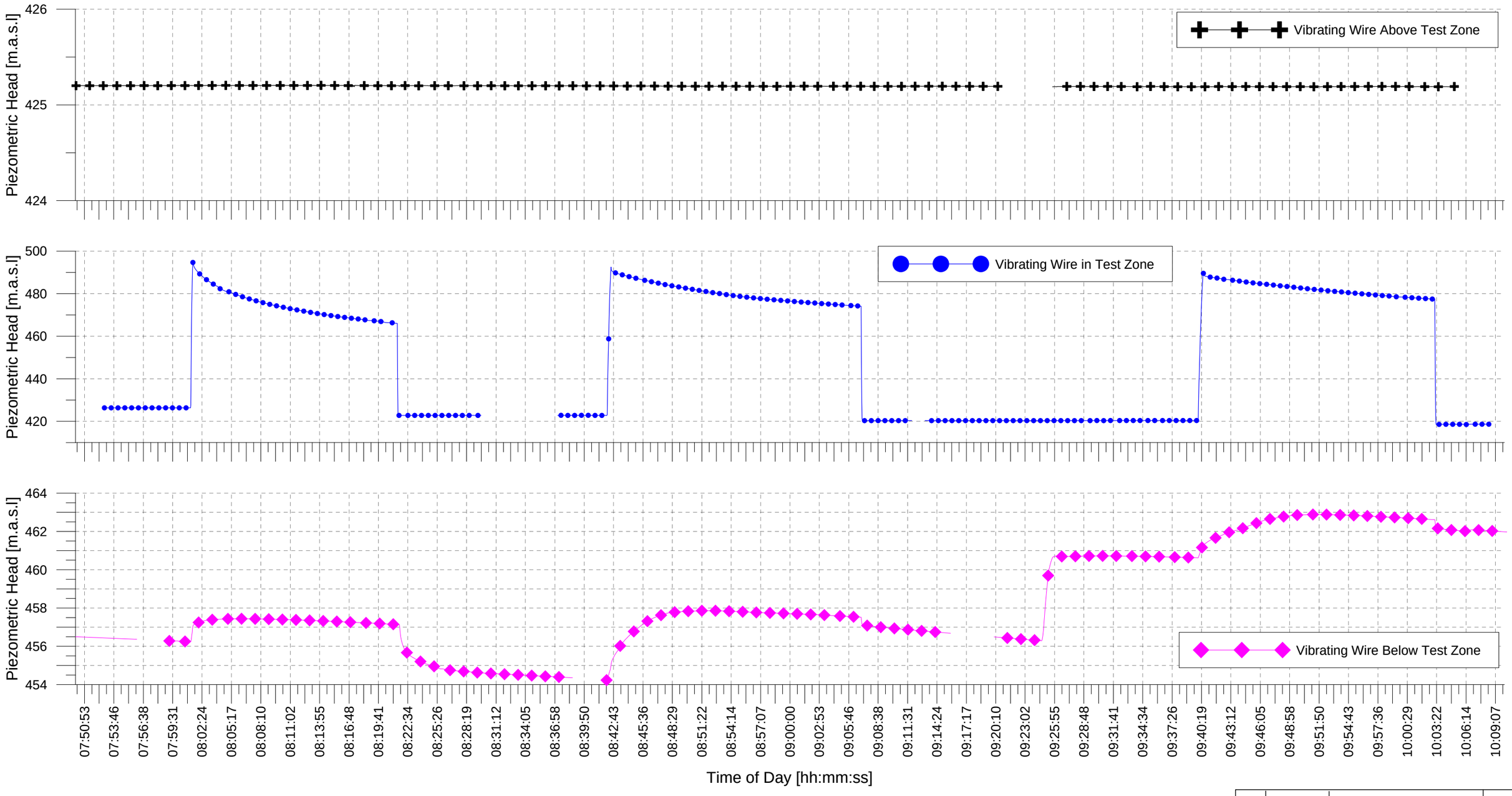
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PACKER TEST RESULTS FOR IG_MWC01

JUNE 2022 | FIGURE E-1-5 | REV: 0



Notes:
1. Test interval 94.8 to 93.0 mbgs
2. Packer testing completed on September 16, 2021
3. Packer assembly installed down-hole September 14, 2021

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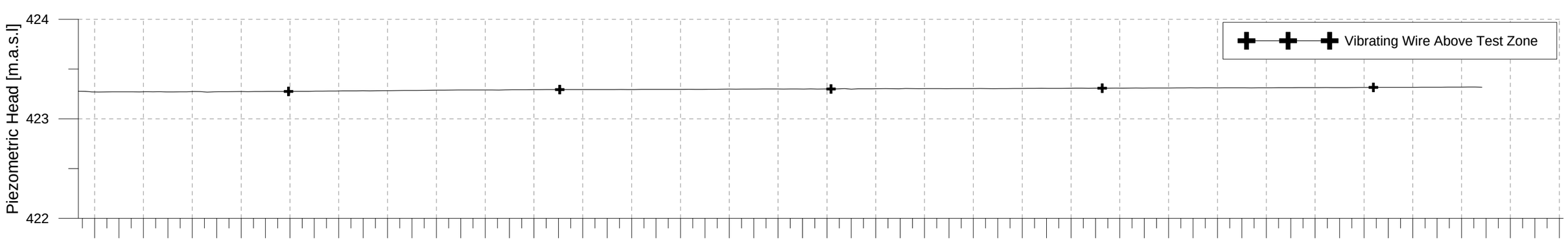
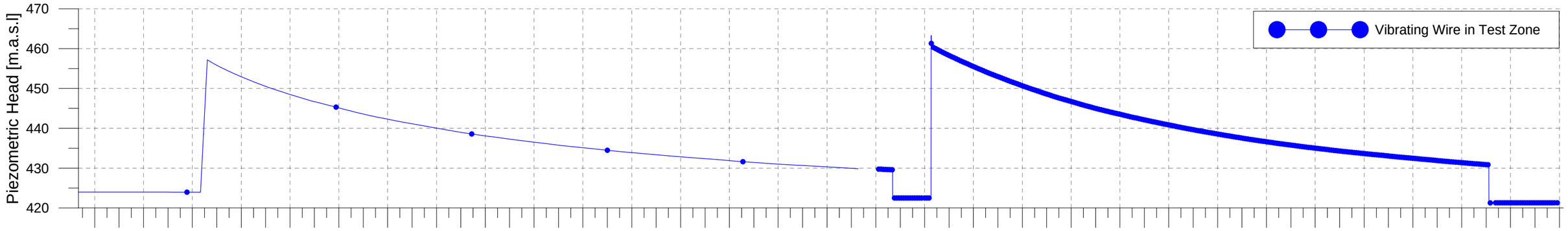
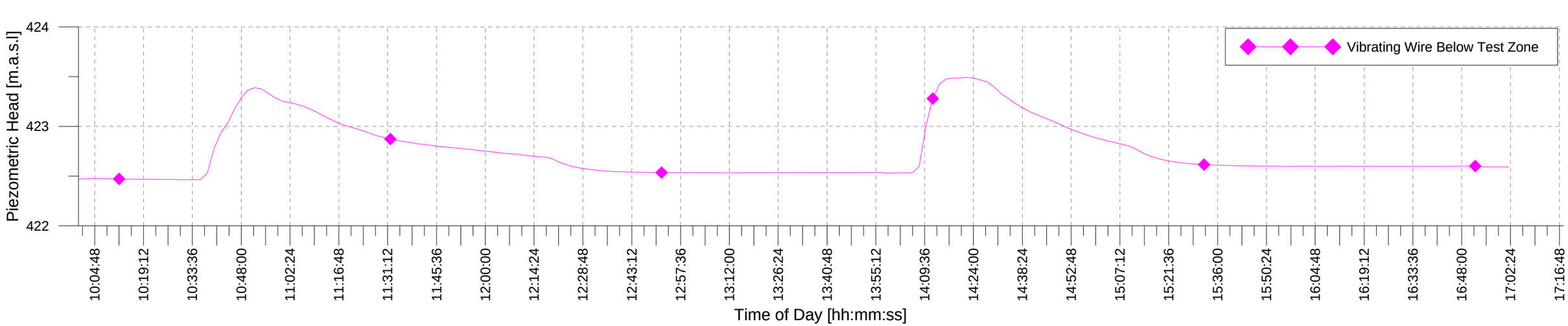
PACKER TEST RESULTS FOR IG_MWC02

JUNE 2022	FIGURE E-1-6	REV: 0







Notes:
1. Test interval 72.2 to 70.4 mbgs
2. Packer testing completed on September 17, 2021
3. Packer assembly installed down-hole September 16, 2021

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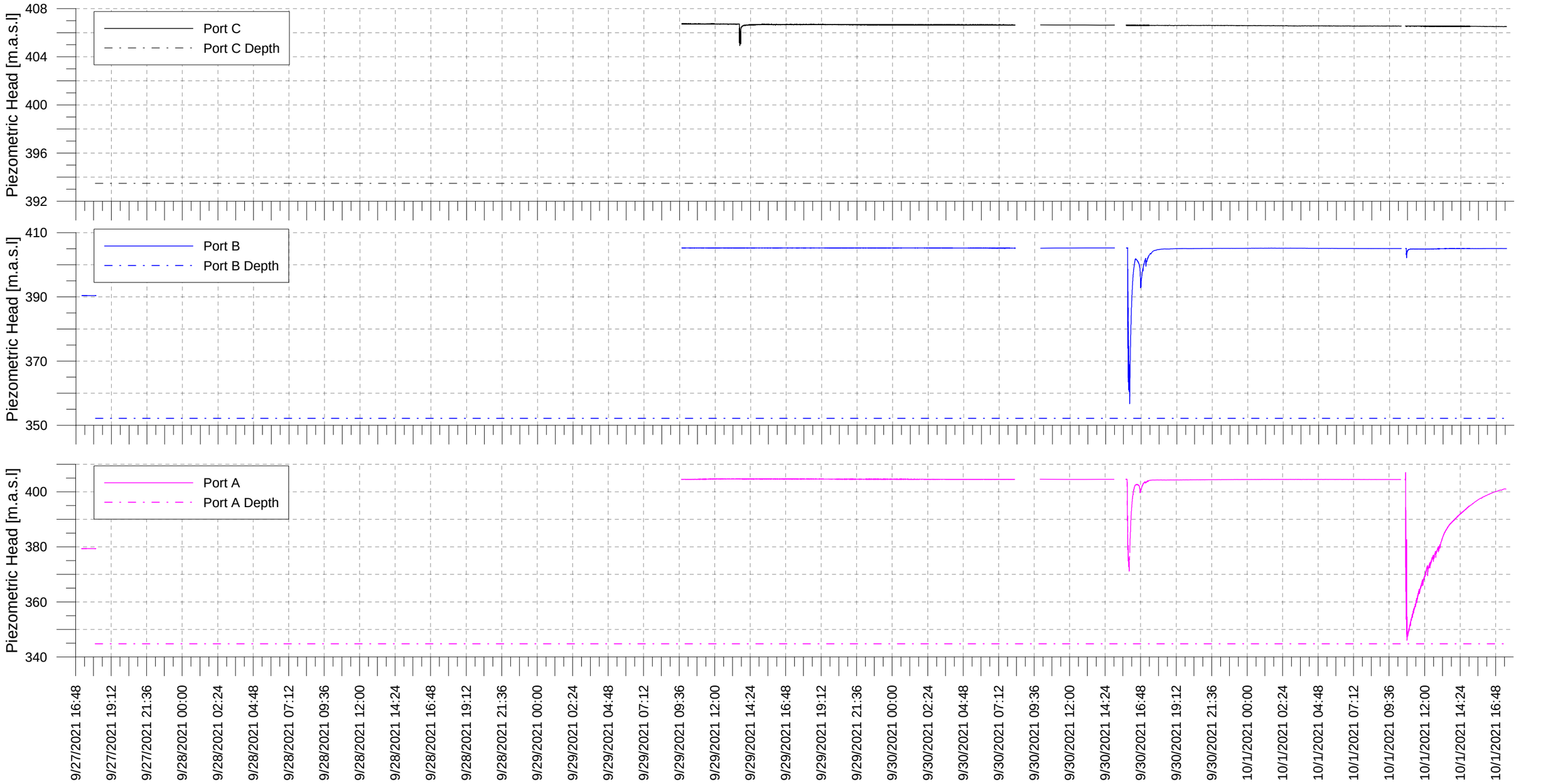
PACKER TEST RESULTS FOR IG_MWC03

JUNE 2022 | FIGURE E-1-7 | REV: 0

APPENDIX G-2

Solinst Multilevel Test Data



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.

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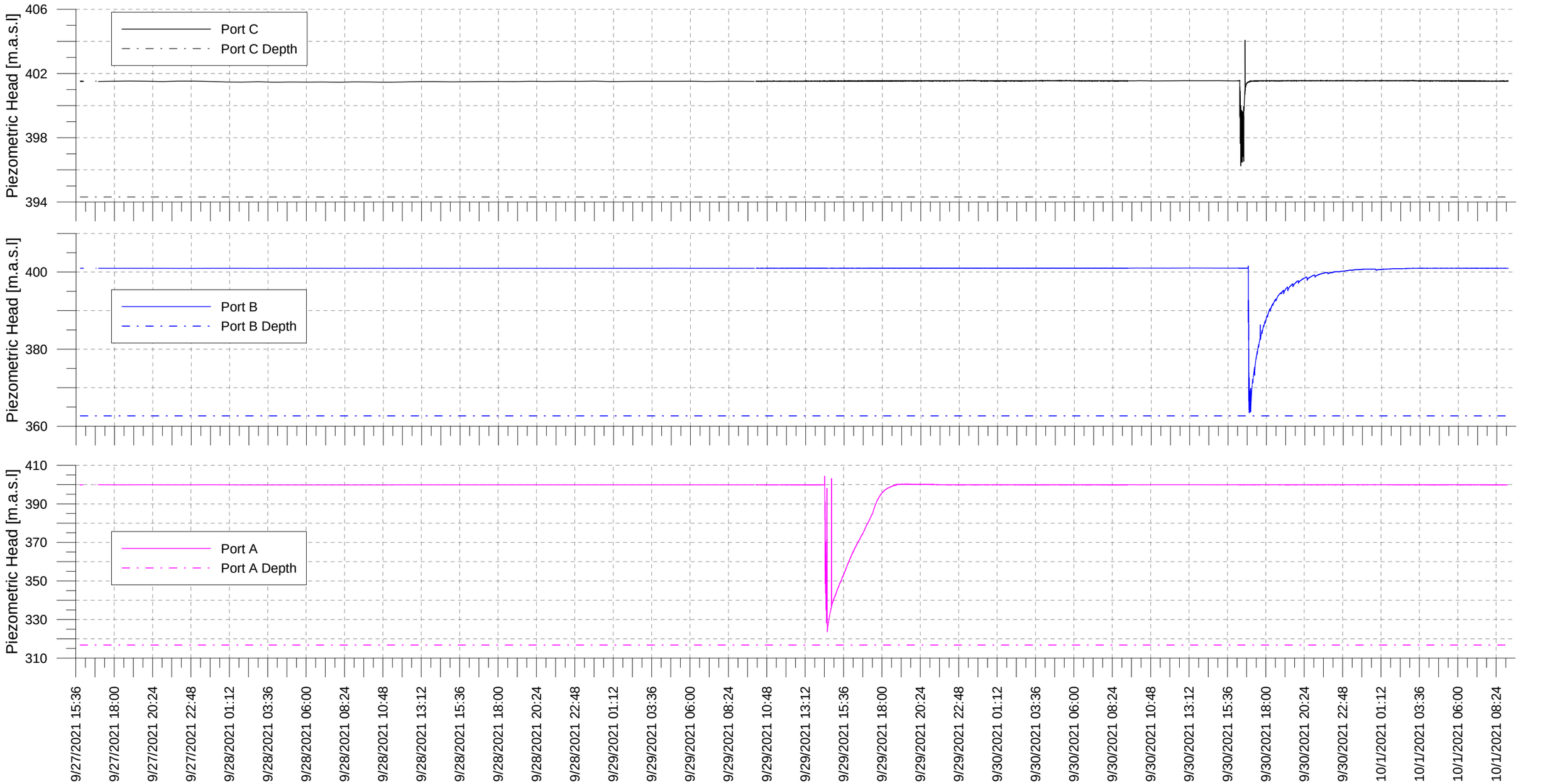
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PIEZOMETRIC HEAD FOR IG_MWA01

JUNE 2022 | FIGURE E-2-1 | 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 port located at 316.81 m.a.s.l.

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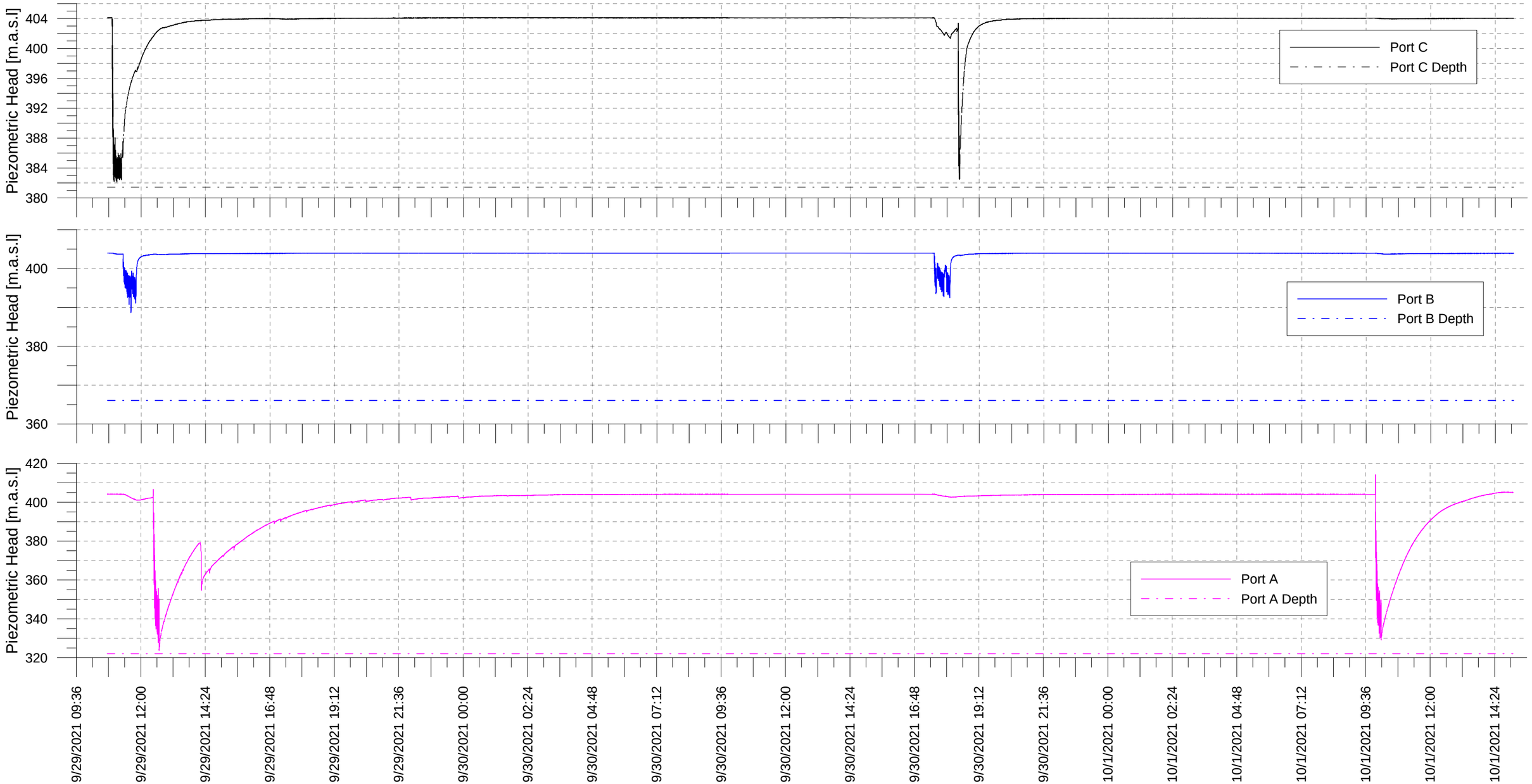
PIEZOMETRIC HEAD FOR IG_MWA02

JUNE 2022 | FIGURE E-2-2 | 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

PIEZOMETRIC HEAD FOR IG_MWA03

JUNE 2022 | FIGURE E-2-3 | REV: 0

Piezometric Head [m.a.s.l]

Port C
Port C Depth

Port B
Port B Depth

Port A
Port A Depth

Date - Time [M/dd/yyy hh:mm]

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.

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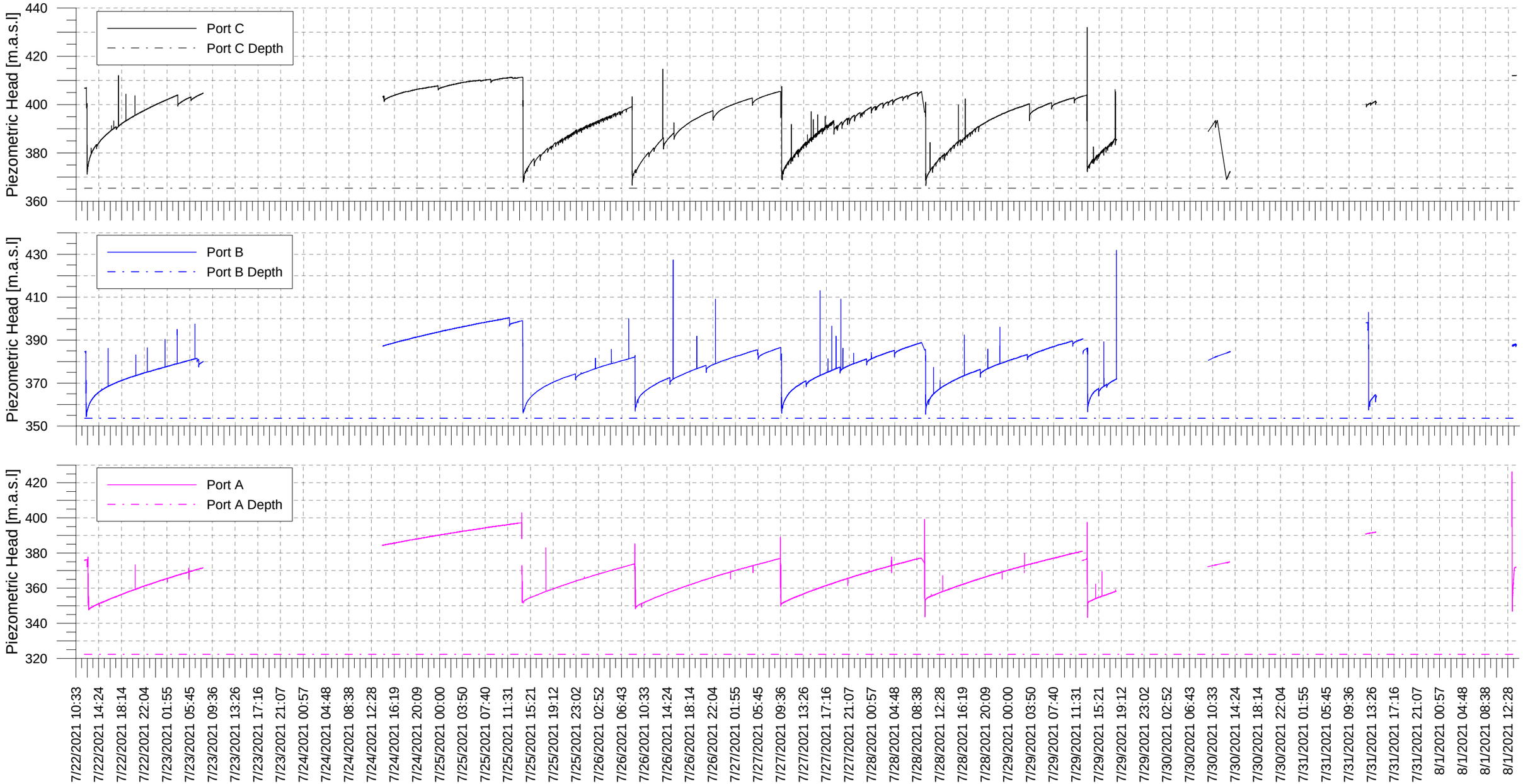
PIEZOMETRIC HEAD FOR IG_MWB01

APRIL 2023 | FIGURE E-2-4 | REV: 1



Date - Time [M/dd/yyy hh:mm]

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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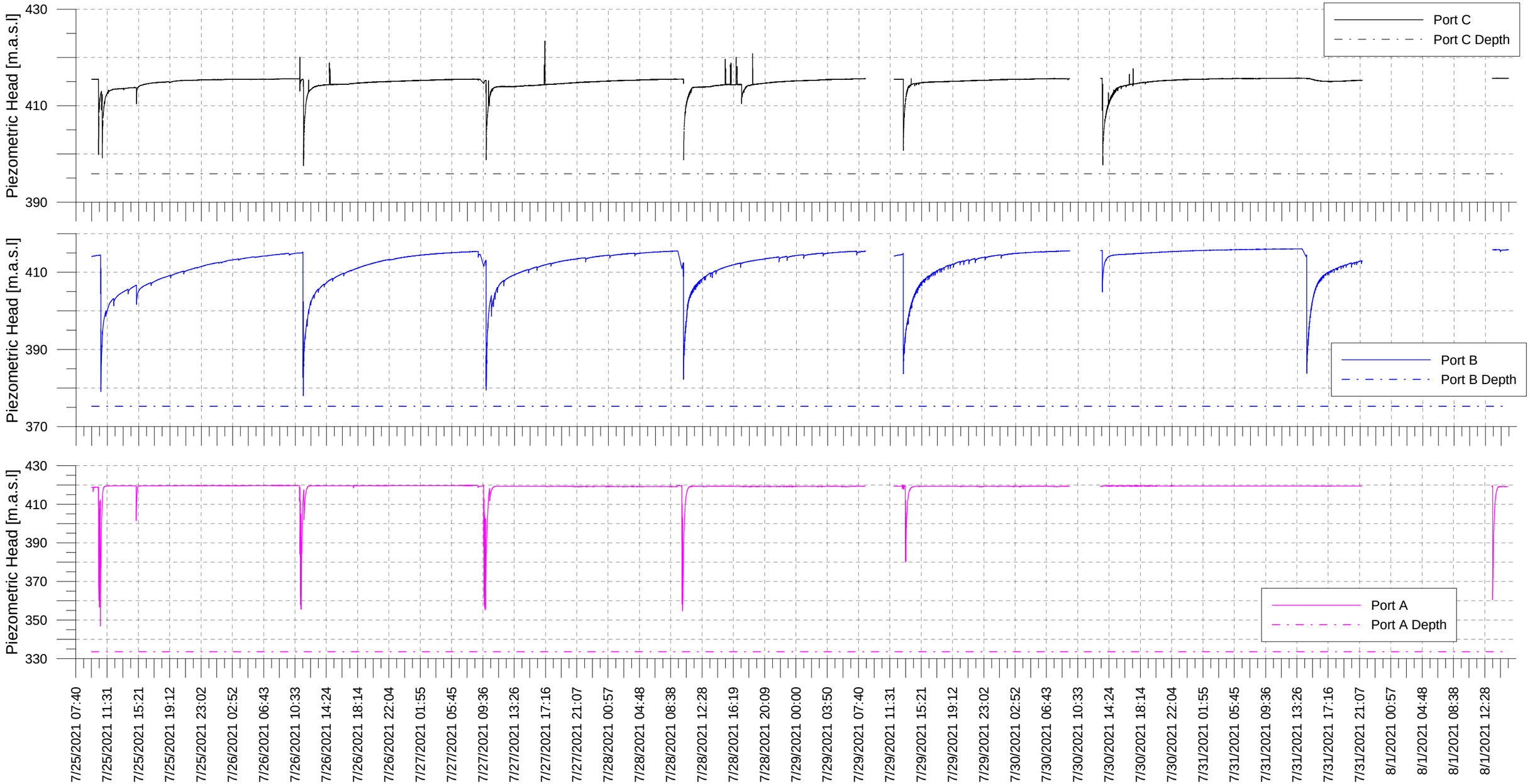
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PIEZOMETRIC HEAD FOR IG_MWB02

MARCH 2022 | FIGURE E-2-5 | 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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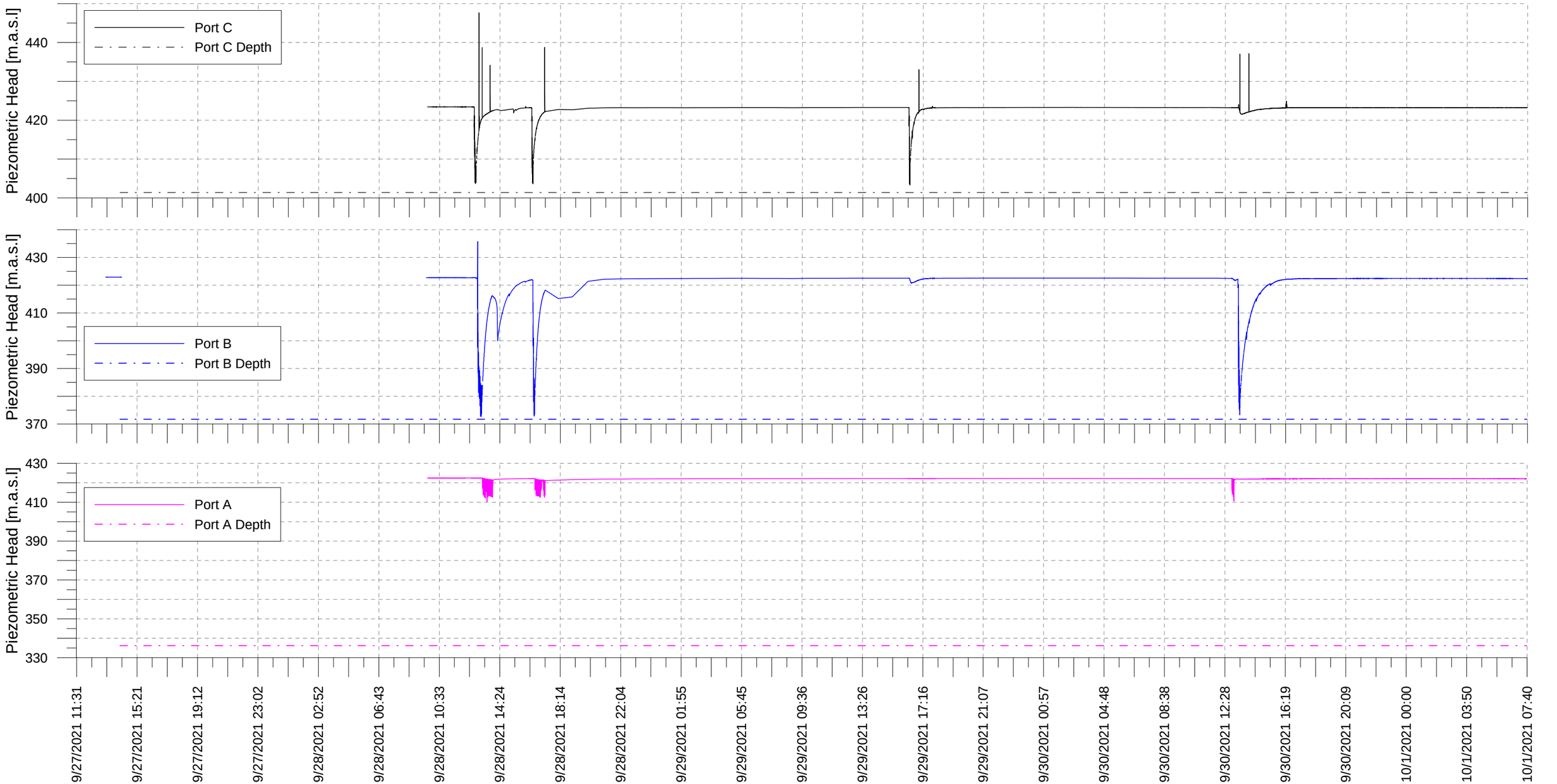
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PIEZOMETRIC HEAD FOR IG_MWB03

JUNE 2022 | FIGURE E-2-6 | 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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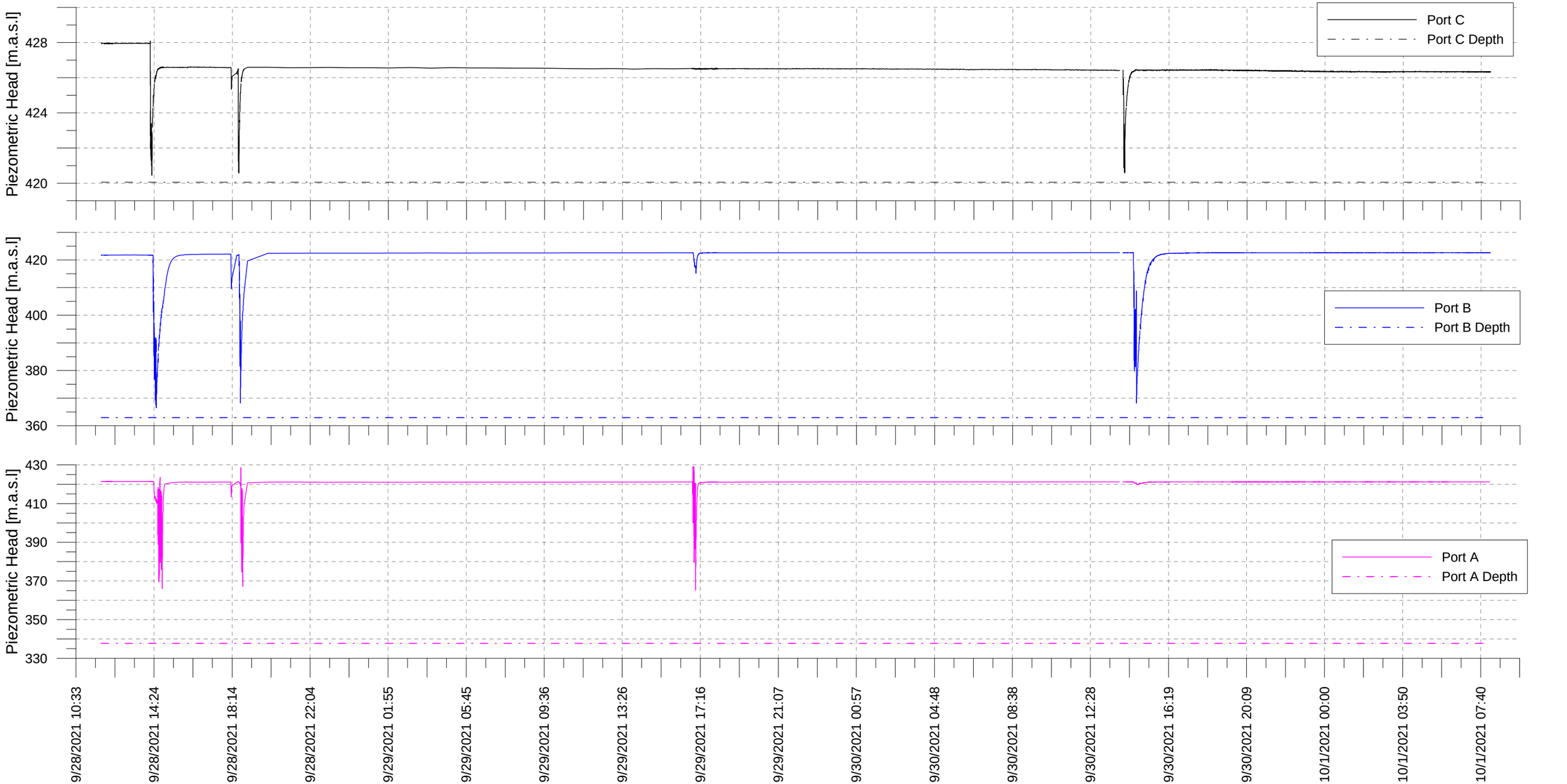
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PIEZOMETRIC HEAD FOR IG_MWC01

JUNE 2022 | FIGURE E-2-7 | 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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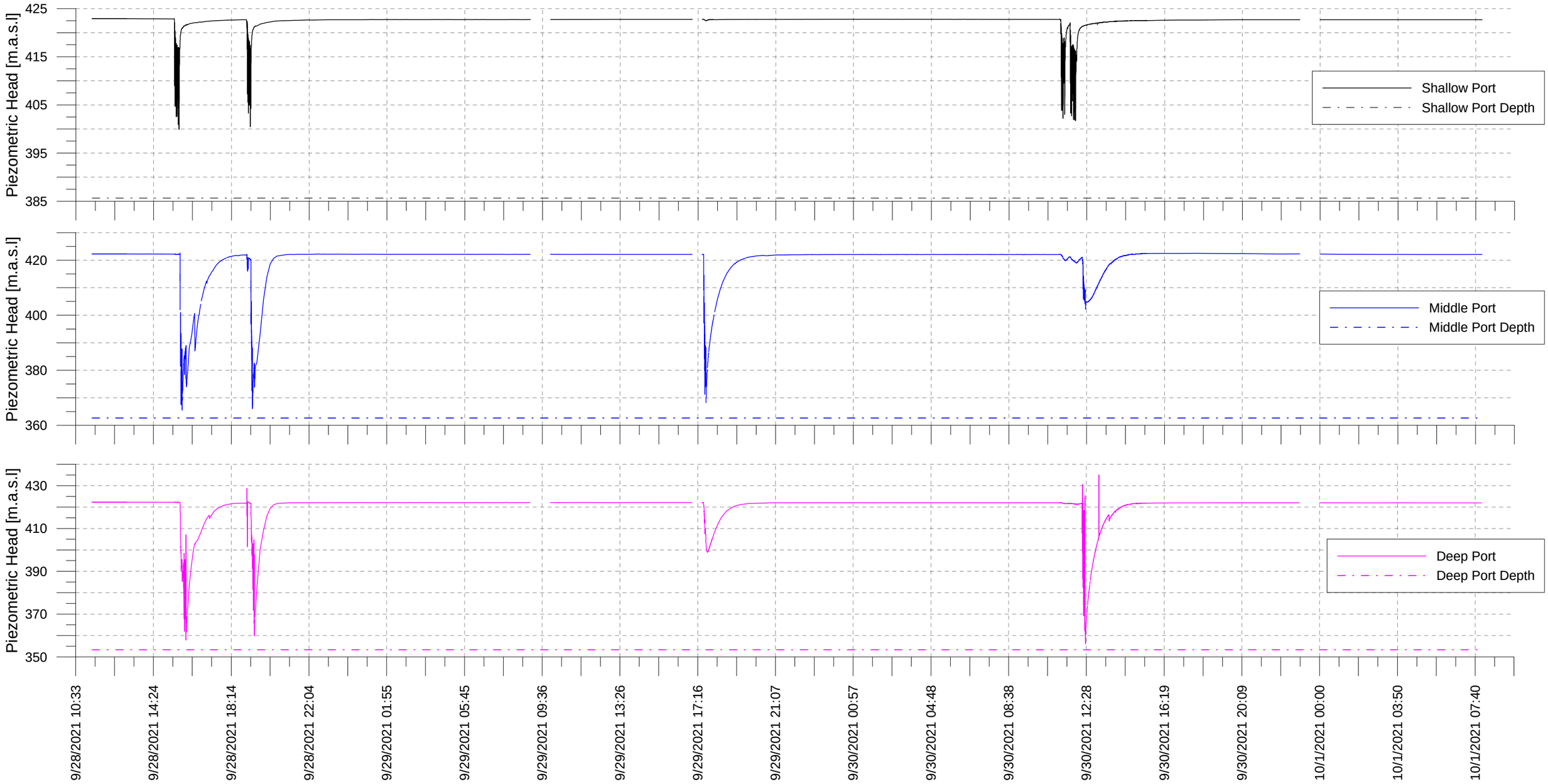
SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PIEZOMETRIC HEAD FOR IG_MWC02

JUNE 2022 | FIGURE E-2-8 | REV: 0



Notes:
1. Shallow port located at 385.64 m.a.s.l.
2. Middle port located at 362.64 m.a.s.l.
3. Deep port located at 353.34 m.a.s.l.

NO.	YY/MM/DD	DESCRIPTION	DESIGN BY	CHECKED BY
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SHALLOW GROUNDWATER MONITORING NETWORK, IGNACE AREA

PIEZOMETRIC HEAD FOR IG_MWC03

JUNE 2022 | FIGURE E-2-9 | REV: 0

APPENDIX H

Hydraulic Assessment Parameters

APPENDIX H-I

Packer Testing Assessment Parameters

Appendix H-1
Packer Testing Hydraulic Assessment Parameters

Packer Test Assessment Inputs

Parameter	Units	MWA01 - 13.11 to 14.99 mbgs			MWA03- 41.44 to 43.32 mbgs		MWB01 - 7.42 to 9.3 mbgs				MWB03 - 85.11 to	MWC01 - 90.87 to 92.75 mbgs			MWC02 - 93 to 94.8 mbgs			MWC03 - 70.4 to 72.2 mbgs	
		RHT#1	RHT#2	RHT#3	RHT#1	RHT#2	RHT#1	RHT#2	RHT#3	RHT#4	RHT#1	RHT#1	RHT#2	RHT#3	RHT#1	RHT#2	RHT#3	RHT#1	RHT#2
Static DTW	mbgs	2.21	2.21	2.21	3.27	3.27	1.49	1.49	1.49	1.49	2.24	2.62	2.62	2.62	6.115	6.115	6.115	1.61	1.61
H(0)	m	2.64	1.76	3.62	5.546	6.34	0.33	0.38	0.49	0.41	8.99	35.54	11.96	14.35	3.58	2.57	1.82	1.01	2.72
H	m	12.78	12.78	12.78	40.05	40.05	7.81	7.81	7.81	7.81	84.75	90.13	90.13	90.13	88.685	88.685	88.685	70.59	70.59
b	m	97.79	97.79	97.79	96.73	96.73	98.51	98.51	98.51	98.51	97.76	97.38	97.38	97.38	93.885	93.885	93.885	98.39	98.39
Kv/Kh	unitless	1	1	1	1	1	1								1	1	1	1	1
d	m	10.9	10.9	10.9	38.17	38.17	5.93	5.93	5.93	5.93	82.87	88.25	88.25	88.25	86.885	86.885	86.885	68.79	68.79
L	m	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
r(c)	m	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635
r(eq)	m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
r(p)	m	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127
r(w)	m	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635
r(sk)	m	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635

APPENDIX H-2

Solinst Multilevel Assessment Parameters

Appendix H-2
Solinst Multilevel Hydraulic Assessment Parameters

Solinst Testing Assessment Inputs_Rev1

Parameter	Units	MWA01			MWA02			MWA03			MWB01			MWB02			MWB03			MWC01			MWC02			MWC03		
		C	B	A	C	B	A	C	B	A	C	B	A	C	B	A	C	B	A	C	B	A	C	B	A	C	B	A
		Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3	Port 1	Port 2	Port 3
		Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep	Shallow	Middle	Deep
Static DTW	mbgs	2.21			3.5			3.21			1.49			13.98			2.24			2.62			6.115			1.61		
Static Pressure Head	m	13.251	53.056	59.701	7.247	38.338	83.123	22.641	37.906	81.992	7.183	23.247	57.067	41.337	31.961	74.927	19.764	40.124	86.053	21.859	50.414	86.004	6.351	59.7	83.423	37.035	59.427	68.396
Depth to Top of Monitoring Zone	mbgs	12.8	53.3	61.4	9.4	40.5	85.9	24.6	40	84.4	7.4	31.1	66.2	51.7	63	94.4	21.3	41.9	83.2	25.3	54.7	90	9.9	67.4	93.1	37.9	61.4	70.9
Depth to Bottom of Monitoring Zone	mbgs	13.6	55.6	62.5	12.4	43.1	88.8	26	42.6	86.6	8.7	32.4	70.4	53	65	97.4	23.3	44	85.7	26.7	56.5	92.6	12.2	69.3	94.5	40.1	63.2	72.3
H(0)	m	1.802	48.45	58.42	5.029	37.3	76.315	21.582	11.445	74.953	0.184	7.737	56	35.576	30.135	49.399	17.891	35.953	59.101	19.935	48.827	11.59	5.811	54.397	55.866	18.503	53.853	65.675
H	m	13.251	53.056	59.701	7.247	38.338	83.123	22.641	37.906	81.992	7.183	23.247	57.067	41.337	31.961	74.927	19.764	40.124	86.053	21.859	50.414	86.004	6.351	59.7	83.423	37.035	59.427	68.396
b	m	97.79			96.5			96.79			98.51			86.02			97.76			97.38			93.885			98.39		
Kv/Kh	unitless	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
d	m	10.59	51.09	59.19	5.9	37	82.4	21.39	36.79	81.19	5.91	29.61	64.71	37.72	49.02	80.42	19.06	39.66	80.96	22.68	52.08	87.38	3.785	61.285	86.985	36.29	59.79	69.29
L	m	0.8	2.3	1.1	3	2.6	2.9	1.4	2.6	2.2	1.3	1.3	4.2	1.3	2	3	2	2.1	2.5	1.4	1.8	2.6	2.3	1.9	1.4	2.2	1.8	1.4
r(c)	m	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318	0.004318
r(eq)	m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
r(p)	m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
r(w)	m	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635
r(sk)	m	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635	0.0635

APPENDIX I

Work Package D Data Quality Confirmation Form Templates

Form ID: WPD-KGS-01_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING Packer Testing Interval Selection		Project No.: 21-3836-001	
Test Zone Name				
Test Zone Depth Range				
Key Criteria for WPD Packer Testing	Criteria Observed?	Notes	Completed By:	
			Initial	Date / Time
Other (explain)				

Senior Reviewer Sign-off
Reviewed by: Eric Levay

Signature Date

Form ID: WPD-KGS-02_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING EQUIPMENT DECONTAMINATION CHECKLIST	Project No.: 21-3836-001

Test Zone Name	
Test Zone Depth	
Date Completed	

Equipment Description	Applicable? (Y/N)	Use of Latex Gloves	Removal of Loose Contamination	Detergent Wash	Deionized Water Rinse	Completed by:	
						Initial	Date / Time
Wireline packer tools							
P borehole packer							
RST Transducer							
Water level indicator							

Senior Reviewer Sign-off
Reviewed by:

Signature Date

Form ID: WPD-KGS-03_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING PACKER TESTING ZONE SPECIFICATIONS	Project No.: 21-3836-001
Test Zone Name		
Test Zone Depth Range (m)		

Specification Description	Values	Notes	Completed By:	
			Initial	Date / Time
Current Depth of Borehole (mbgs)				
Stickup (m)				
Depth to Water (m) from TOC				
Depth to Water (mbgs)	0	Static Water Level		
Top of Target Test Interval (mbgs)				
Bottom of Target Test Interval (mbgs)				
Interval Length (m)	0			
Packer Spacing (m)				
Depth to Top of Upper Packer (mbgs)	-1.33			
Depth of Bottom of Top Packer (mbgs)				
Depth of Top of Lower Packer (mbgs)	0			
Static Water Column Above Test Zone (m)	0			
Top Transducer Depth (mbgs)	-1.86			
Middle Transducer Depth (mbgs)	0.575			
Bottom Transducer Depth (mbgs)	3.465			
Test injection pressure at collar (PSI)				
Maximum Test Injection pressure at collar (meters of water displaced)	0.0			
Packer Inflation				
Packer Maximum Working Pressure for BH diameter (PSI)		From RST Packer Inflation Curve		
Pressure to contact borehole wall (PSI)				
P1 = Static Head of Water above Packer (PSI)	0			
P2 = Test Injection pressure at collar + head of water in shaft	0			
Factor of Safety (PSI)	50			
Ppmax = P1 + packer max working pressure for hole diameter	0			
Ppmin = P2 + P to contact borehole wall + 50 psi	50			
Actual Packer Inflation Pressure (PSI)				
Pull Test Completed?				

Senior Reviewer Sign-off

Reviewed by:

Signature Date

KGS Group
Form 04 - Double Packer Assembly

Form ID: WPD-KGS-04_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD- HYDRAULIC TESTING DOUBLE PACKER ASSEMBLY	Project No.: 21-3836-001
Borehole Name		

	Date and Time	Initials
List all main steps in assembling the double packer assembly in the field and confirm with sign-off at right.		
Upper and lower packers have been secured to the perforated interval pipe		
Inflation lines have been connected to the correct ports		
VW's have been positioned and secured to the packer drop pipe and distance measured from a single reference point (e.g. bottom of the upper packer joint)		
VW Transducer calibration checks		

Senior Reviewer & Approver Sign-off
Reviewed and Approved by: Eric Levay

Signature Date

KGS Group
Form 5 - Packer Test Depth Control

Form ID: WPD-KGS-05_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING TEST DEPTH CONTROL	Project No.: 21-3836-001

Test Zone Name	0
Test Zone Depth Range	
Date Tested	

Total # of 6m Test Rods on Site		Total # of 3.0m Test Rods on Site		Total # of 1.5 m Test Rods on Site		Planned Test Interval Depth(mbgs)		Upper (mbgs)			
Total Length to bottom of upper packer (m)		Total Length to top of bottom packer (m)	1.88	TOC Stickup length (m)				Lower (mbgs)			
Length of upper packer element (m)		Length of lower packer element (m)		length from Interval Transducer to top of interval (m)						Confirmation by Water Level Measurements	

Corrected Test Interval		Top of Upper Packer (mbgs)	Bottom of Upper Packer (mbgs)	Top of Lower Packer (mbgs)	Bottom of Lower Packer (mbgs)	# of 6m Rods Downhole	# of 1.5 m rods Downhole	# of 3.0m rods Downhole	Packer Rod Stickup (maTOC)	Interval Transducer Reading (B Units)	Calculated Depth to Water from Interval Transducer (m of head)	Measured Depth to Water (m below TOC)
Top (mbgs)	Bottom (mbgs											
	1.88	0.00	0.00	1.88	1.88				0.00		0.00	

Enter Data
Calculation

Instructions:
1) Enter # of test rods on site
2) Enter distance from xover to top of upper packer and lower packer
3) Enter distance from Interval Transducer to Top of Interval
4) Enter length of packer elements
5) Enter depth to top and bottom of test interval
6) Enter # of 3m and 1.5 m test rods above the packer such that the calculated stickup is desired (typically 0.5 - 2 mags)
7) Measure depth to water below stickup using water level indicator
8) Enter the interval transducer pressure reading
9) Confirm calculated depth to water from pressure transducer is equal to measured depth to water

Corrected Depth of packers based on VW readings

	mH2O	m below TOC	mbgs
Top VW		0.00	0.00
Mid VW		0.00	0.00
Bottom VW		0.00	0.00

Calculated Depth of Middle VW below upper packer (m)	0.58
Difference between actual and calculated	-0.58
Calculated depth of Top VW	0.00
Calculated Depth of VW (Mid) mbgs	0.00
Calculated depth of Bottom VW	0.00

Senior Reviewer & Approver Sign-off
Reviewed and Approved by:

Signature Date

Form ID: WPD-KGS-06_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING SLUG TEST FIELD DATA CHECKS AND VERIFICATION	Project No.: 21-3836-001

Monitoring Well:

Date Double Packers Installed	Test #	Total Length of pipe (m)	Number of Packer Rods Used	Top Packer Depth (m BGS)	Bottom Packer Depth (m BGS)	Packer Spacing (m) (From bottom of top packer to top of bottom packer)	Pressue Applied to Inflate Packers (PSI)	Time Packers Inflated	Date and Time Packers Removed

Pre-Installation Vibrating Wire/Datalogger Setup and Checks

	Serial Number	Zero Reading (Prior to placing down-hole)	Datalogger Unit #	Datalogger Reading Interval (seconds)	Relative Depth (m) - from bottom of top packer	Date and Time	Initials
Top VW							
Middle VW							
Bottom VW							

Slug Test Stabilization (Pre-Slug Pressurization)

VW Position	Initial Stabilization Pre-Test Readings								Has the VW reading stabilized?	Initials
	1		2		3		4		(Y/N)	
	Time	Reading	Time	Reading	Time	Reading	Time	Reading		
Top VW										
Middle VW										
Bottom VW										

Slug Test Data (Pressurized and Rising/Falling Head Test)

VW Position	Pressure Applied to System (PSI)	Pressurized System VW Readings	Pressurized Pre-Slug Test Stabilization Readings								Has the VW reading stabilized?	Pressure Reading of the Packer System (PSI)	Time Slug Test Initiated
			1		2		3		4		(Y/N)		
			Time	Reading	Time	Reading	Time	Reading	Time	Reading			
Top VW													
Middle VW													
Bottom VW													

KGS Group
Form 06 - Slug Testing using Double Packers

Slug Test Data (Recovery)													
VW Position	Slug Test Recovery Readings								Has the VW reading stabilized?	% Recovery	Time Slug Test Stopped	Data Downloaded	Initials
	after test 1		during test 2 (between pressure and		after test 3		4		(Y/N)			(Y/N)	
	Time	Reading	Time	Reading	Time	Reading	Time	Reading					
Top VW													
Middle VW													
Bottom VW													

Sign-off
Test Completed by:

Signature Date

Reviewed by:

Signature Date

Form ID: WPD-KGS-07_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING WELL CONSTRUCTION LOG AND VERIFICATION	Project No.: 21-3836-001

SHEET 1 of 1

Site:		Depth to Water:		m	Date:
Borehole:		Final Stickup:		m	Client: Nuclear Waste Management Organization
Borehole Depth (mbgs):		Borehole Diam.:		mm	
Interval ID		C	B	A	
Planned Depth to Top of Port (m)					

Interval ID	C	B	A
Actual Depth to Top of Port (m)			

Interval Diff. (m)	Depth to Top (mbgs)	Unit Length (m)	Qnty.	Description of Component	Zone No.	Tubing/VW Wire Length (m)	Monitoring Equipment Description
0.00	99.00						
0	99.00						
0	99.00						
0	99.00						
0	99.00						
0.00	99.00						
0.00	99.00						
0	99.00						
0	99.00						
0	99.00						
0.00	99.00						
0	99.00						
0	99.00						
0	99.00						
0	99.00						
0.00	99.00						
0.00	99.00						

Equipment Required					
Unit	#	Initials	Unit	#	Initials
5' PVC Casing			SS Double Valve Pump		
2' PVC Casing			Well Head Manifold		
1' PVC Casing			VW Piezometer		
PVC Baseplug			Support Clamp		
SS Port			Data Logger		

VW Piezometers and Double Valve Pump Quality Checks						
Zero Reading - Before Installation					Are the readings valid and acceptable (Y/N)	Initials
Interval ID	Serial #	Reading (Hz)	Temp.	Pump Functioning (Y/N)		
C						
B						
A						
After Installed, before backfilled					Are the readings valid and acceptable (Y/N)	Initials
Interval ID	Serial #	Reading (Hz)	Temp.	Pump Functioning (Y/N)		
C						
B						
A						
Post Backfilling - Date:					Are the readings valid and acceptable (Y/N)	Initials
Interval ID	Serial #	Reading (m H2O)	Temp.	Pump Functioning (Y/N)		
C						
B						
A						

Backfill Details					
Depth From (mbgs)	Depth To (mbgs)	Backfill Material Description	# Bags/Pails Used	Comments	Initials

Sign-off

Completed by:

Signature Date

Reviewed by:

Signature Date

KGS Group
Form 08 - Purge Pump Check

Form ID: WPD-KGS-08_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING PURGING PUMP VERIFICATION AND FLOW RATE CHECK	Project No.: 21-3836-001
Purging Pump model	Micro Double valve stainless steel purge pump (Solinst Model #408) with Pneumatic Pump Control Unit Solinst Model 464	

Zone	Pressure Applied (PSI)	Volume Purged (L)		Time Elapsed (min)	Actual Calculated Flow Rate	Checked by:	
						Initial	Date / Time

Notes:

Senior Reviewer Sign-off
Reviewed by:

Signature Date

KGS Group
Form 09 - Slug Test Field Form

Form ID: WPD-KGS-09_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING SLUG TEST FIELD FORM	Project No.: 21-3836-001

Well ID:		Test Conducted by:	
Date:		Test Zone Interval ID:	
Time:		Static VW Reading:	
Time Interval of Datalogger:		Flow Rate (mL/min):	
Time Pumping Started:		Total volume purged from monitoring zone (L):	
Time Pumping Stopped:			

Elapsed Time Since Pumping Stopped (min)	VW Manual Reading (m H2O)	Elapsed Time Since Pumping Stopped (min)	VW Manual Reading (m H2O)

Sign-off

Completed by:

Reviewed by: Eric Levay

Signature Date

Signature Date

KGS Group
Form 09 - Slug Test Field Form

Form ID: WPD-KGS-09_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING SLUG TEST FIELD FORM	Project No.: 21-3836-001

Well ID:		Test Conducted by:	
Date:		Test Zone Interval ID:	
Time:		Static VW Reading:	
Time Interval of Datalogger:		Flow Rate (mL/min):	
Time Pumping Started:		Total volume purged from monitoring zone (L):	
Time Pumping Stopped:			

Elapsed Time Since Pumping Stopped (min)	VW Manual Reading (m H2O)	Elapsed Time Since Pumping Stopped (min)	VW Manual Reading (m H2O)

Sign-off

Completed by:

Reviewed by: Eric Levay

Signature Date

Signature Date

KGS Group
Form 09 - Slug Test Field Form

Form ID: WPD-KGS-09_Rev0	NWMO IGNACE SHALLOW GROUNDWATER DRILLING WPD - HYDRAULIC TESTING SLUG TEST FIELD FORM	Project No.: 21-3836-001

Well ID:		Test Conducted by:	
Date:		Test Zone Interval ID:	
Time:		Static VW Reading:	
Time Interval of Datalogger:		Flow Rate (mL/min):	
Time Pumping Started:		Total volume purged from monitoring zone (L):	
Time Pumping Stopped:			

Elapsed Time Since Pumping Stopped (min)	VW Manual Reading (m H2O)	Elapsed Time Since Pumping Stopped (min)	VW Manual Reading (m H2O)

Sign-off

Completed by:

Reviewed by: Eric Levay

Signature Date

Signature Date

KGS
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Experience in Action