PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING, IGNACE AREA

WP09 Data Report - Westbay MP38 Casing Completion for IG_BH01

APM-REP-01332-0237 **November 2019**

Golder Associates Ltd.

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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

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

REPORT

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WP9 Data Report - Westbay MP38 Casing Completion for IG_BH01

Submitted to:

Nuclear Waste Management Organization
22 St. Clair Avenue East
6th Floor
Toronto, Ontario
M4T 2S3

Submitted by:

Golder Associates Ltd.
6925 Century Avenue, Suite #100, Mississauga, Ontario, L5N 7K2, Canada

+1 905 567 4444

1671632 (1911)

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WP9 DATA REPORT – WESTBAY MP38 CASING COMPLETION FOR IG_BH01

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Client: Nuclear Waste Management Organization (NWMO)
22 St. Clair Avenue East, Sixth Floor
Toronto, Ontario
M4T 2S3

Client Contact:	Eric Sykes	Maria Sánchez-Rico Castejón
Email:	esykes@nwmo.ca	msanchez@nwmo.ca

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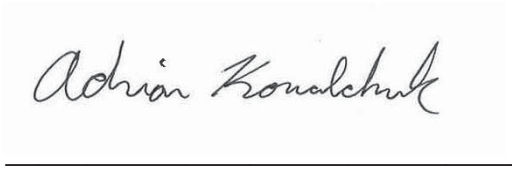

Prepared by: _____

Adrian Kowalchuk, B.Sc., P.Geo.
Environmental Geoscientist

Reviewed by: _____

Joe Carvalho, Ph.D., P.Eng.
Senior Geotechnical Engineer - Principal

Approved by: _____

George Schneider, M.Sc., P.Geo.
Senior Geoscientist - Principal

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1.0 INTRODUCTION

The Initial Borehole Drilling and Testing project in the Wabigoon and Ignace Area, Ontario is part of Phase 2 Geoscientific Preliminary Field Investigations of the NWMO's Adaptive Phased Management (APM) Site Selection Phase.

This project involves the drilling and testing of the first of three deep boreholes within the northern portion of the Revell batholith. The first drilled borehole, IG_BH01, is located a direct distance of approximately 21 km southeast of the Wabigoon Lake Ojibway Nation and a direct distance of 43 km northwest of the Town of Ignace. Access to the IG_BH01 drill site is via Highway 17 and primary logging roads, as shown on Figure 1.

The project was carried out by a team led by Golder Associates Ltd. (Golder) on behalf of the NWMO. The overall program is described in the Initial Borehole Characterization Plan (Golder 2017). This report describes the methodology, activities and results for Work Package 9 (WP9): Westbay MP38 Casing Completion for IG_BH01.

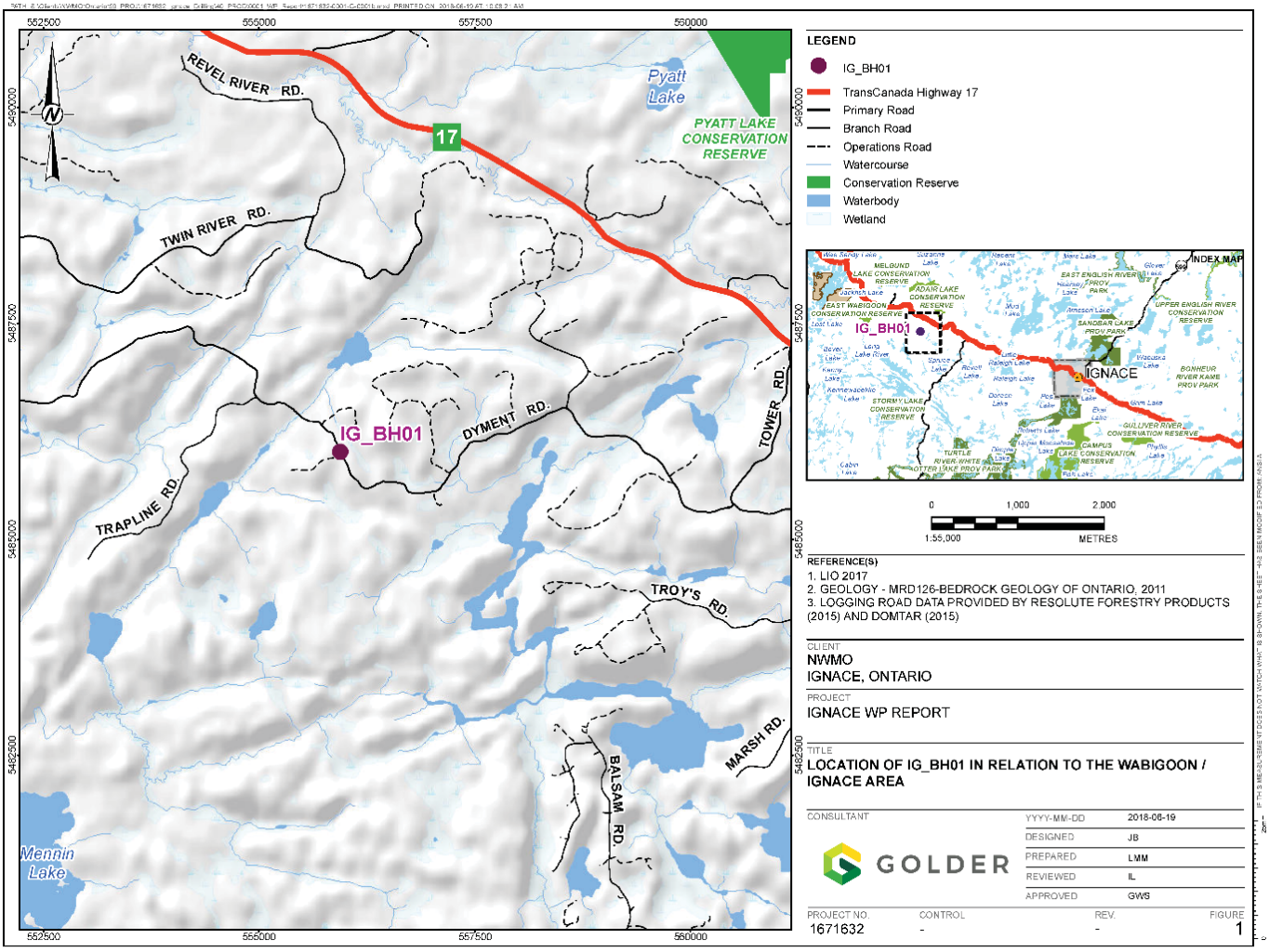

Figure 1: Location of IG_BH01 in relation to the Wabigoon / Ignace Area

2.0 BACKGROUND INFORMATION

2.1 Geological Setting

The approximately 2.7 billion year old Revell batholith is located in the western part of the Wabigoon Subprovince of the Archean Superior Province. The batholith is roughly elliptical in shape trending northwest, is approximately 40 km in length, 15 km in width, and covers an area of approximately 455 km^2. It is likely that the batholith is approximately 2 km to 3 km thick through the center of the northern portion (SGL, 2015). The Revell batholith is surrounded by the Raleigh Lake (to the north and east) and Bending Lake (to the southwest) greenstone belts (Figure 2).

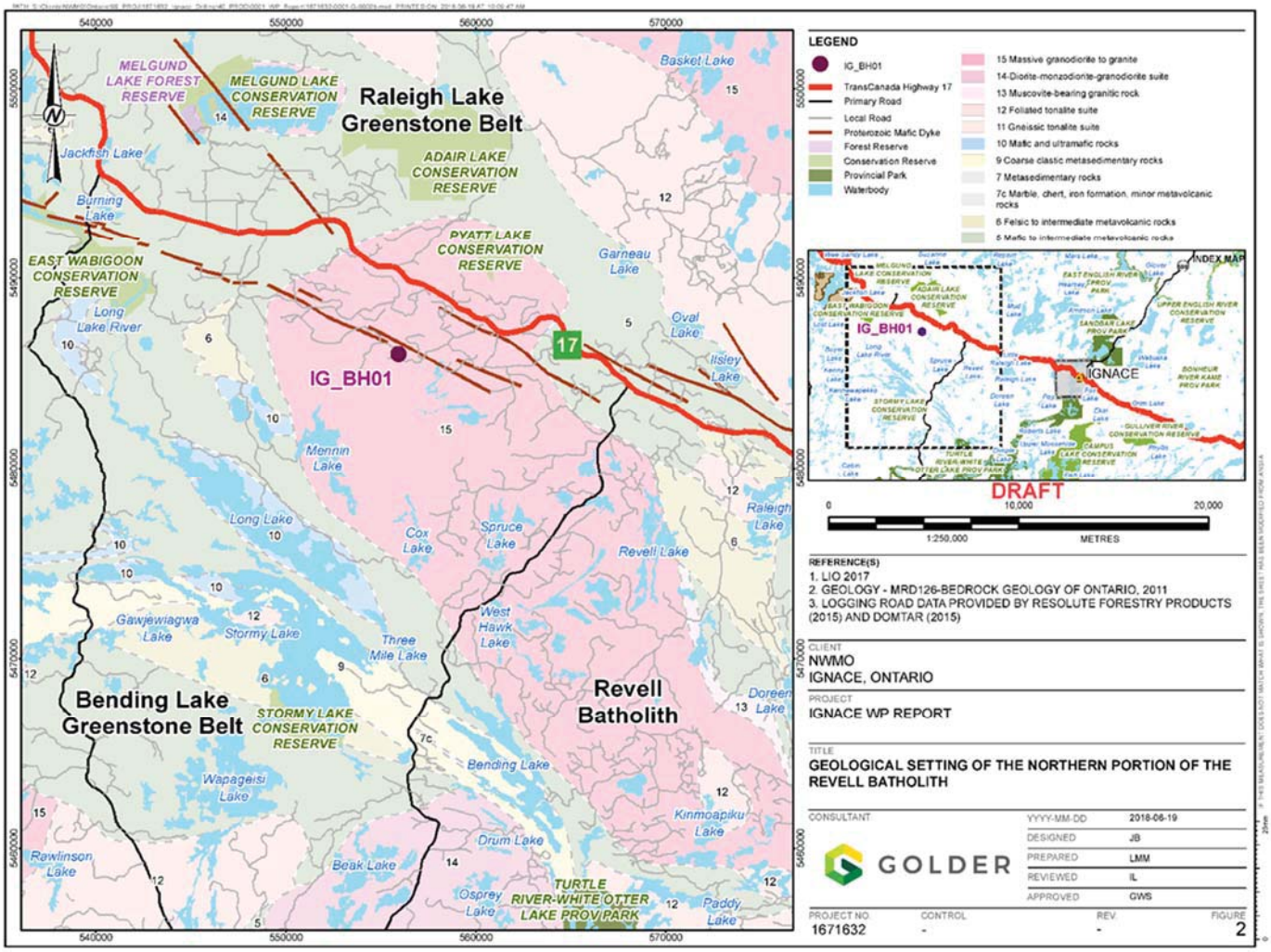

Figure 2: Geological setting of the northern portion of the Revell batholith

Borehole IG_BH01 is within an investigation area of approximately 19 km^2 in size situated in the northern portion of the Revell batholith. Bedrock exposure in this area is very good due to minimal overburden, few water bodies, and relatively recent logging activities. Ground elevations generally range from 400 to 450 m above sea level (masl). The ground surface broadly slopes towards the northwest as indicated by the flow direction of the main rivers in the area (Revell and Mennin rivers). Local water courses within the investigation area tend to flow to the southwest towards Mennin Lake.

The northern portion of the Revell batholith is composed mainly of granodiorite and tonalite, which together form a relatively homogeneous intrusive granitoid complex. The granodiorite and tonalite are massive to weakly foliated. Overall, the tonalite transitions gradationally into granodiorite and no distinct contact relationships between these two rock types are typically observed. There is also a younger granite intrusion, which is observed southeast of the investigation area and primarily in the central portion of the Revell batholith. The granite, which is massive to weakly foliated, post-dates and intrudes into the granodiorite-tonalite intrusive complex (Golder and PGW 2017).

Long, narrow valleys are located along the western and southern limits of the investigation area (Figure 1). These local valleys host creeks and small lakes that drain to the southwest and may represent the surface expression of structural features that extend into the bedrock. A broad valley is located along the eastern limits of the investigation area and hosts a more continuous, un-named water body that flows to the south. The linear and segmented nature of this waterbody's shorelines may also represent the surface expression of structural features that extend into the bedrock.

Details of the lithological units and structures found within the investigation area are provided in Golder and PGW, 2017.

2.2 Technical Objectives

The Westbay MP38 system is intended to isolate specific depth intervals within IG_BH01 and includes 20 monitoring zones to depths up to 1,000 m for measurement of hydraulic pressures and collection of groundwater samples. The MP38 system can also be used to perform hydraulic tests in the isolated zones.

3.0 DESCRIPTION OF ACTIVITIES

Drilling of IG_BH01 commenced on November 2, 2017 and was completed to a depth of 1,000 m on January 16, 2018. The borehole was drilled at a nominal diameter of 98 mm (HQ-size) by diamond coring methods. The borehole collar was surveyed on March 15, 2018 by J. D. Barnes Limited (N5486016.45; E555943.5 Elevation: 430.72 masl).

On completion of coring, IG_BH01 was flushed with 25 ppb fluorescein traced fresh water prior to geophysical surveys. Approximately 37,000 litres representing over 6 borehole volumes (borehole volume with HQ rods) was flushed through the borehole. No further flushing was carried out prior to the Westbay installation in early March following the completion of down-hole geophysical surveys and packer testing.

Installation of Westbay MP38 multilevel monitoring casings was performed by staff of Westbay Instruments with support provided by Golder in accordance with planned installation procedures. Installation of the MP38 casing involved the following activities:

- Westbay system design and preparation of a Westbay Completion Log.
- Layout, numbering and visual inspection of all MP38 casing components at an off-site location and at the well head, including measurement of the length of each Westbay casing section.
- Installation of a guide tube to protect the casing string during lowering.
- Lowering and testing of MP38 casing components into the borehole in the sequence indicated on the approved Westbay Completion Log.
- Pre-inflation pressure profiling.

- Packer inflation and guide tube removal.
- Wellhead completion and post-installation pressure profiling.

These activities are described in greater detail in the following subsections.

3.1 Westbay System Components

The Westbay system consists of an assemblage of modular casing, packers and valved port couplings. Fluid samples and in-situ fluid pressures are obtained using an electronic probe that is lowered inside the casing to access the valved ports. Different system components are illustrated on Figure 3.

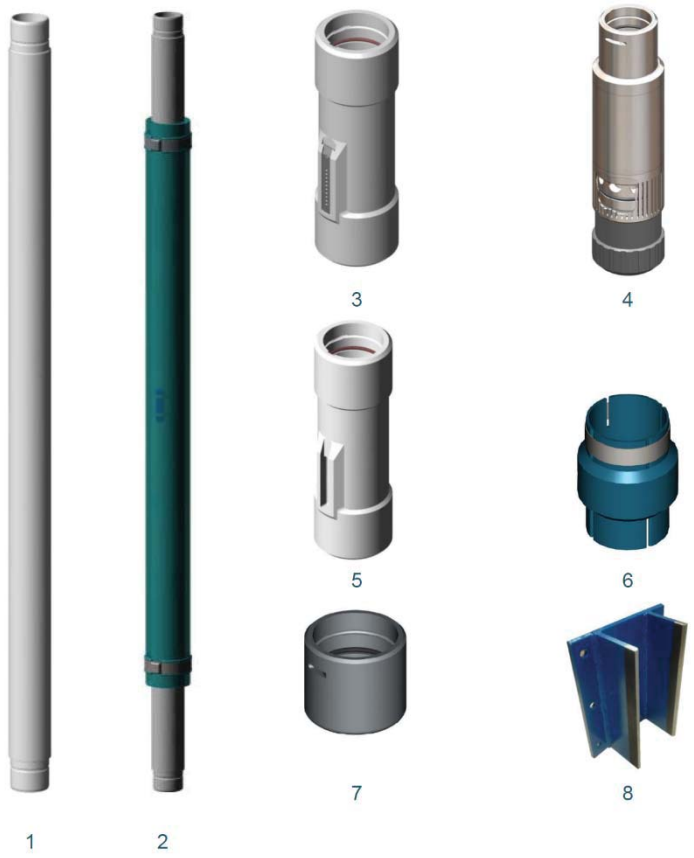

Figure 3: Westbay MP38 System Components

1 - MP38 Casing; **2 -** MP38 Packer – 74 mm (1.5 m); **3 -** MP38 Measurement Port; **4** - MP38 Hydraulic Pumping Port; **5** - MP38 Regular Coupling; **6** - Magnetic Location Collar; **7 -** MP38 End Cap; **8 -** MP38 Monopod Attachment Bracket

3.2 Preparation of the Monitoring Well Design

Test intervals within the Westbay MP-38 system were selected to either target specific zones in the borehole where increased frequency of structures as well as in-flows during fluid flow electrical conductivity profiling were observed, or to broadly monitor the evolution of hydraulic pressures and groundwater chemistry in regularly spaced intervals of the rock mass with increasing depth in the borehole. The length of test intervals is defined as the distance between the bottom of the upper packer and the top of the lower packer. The selected interval lengths were a function of the characteristics of specific zones and the purpose of the planned testing for that interval.

Generally, a measurement port was placed a uniform distance below each packer to allow for pressure measurements and to permit squeeze relief venting during packer inflation. Magnetic locating collars were placed 0.6 m below measurement ports in key intervals. Pumping ports were located within intervals where collection of groundwater samples was desired. These intervals typically corresponded to observed in-flows during fluid flow electrical conductivity logging.

The results of core logging (WP3), groundwater sampling (WP7) and geophysics (WP5) were used to finalize test interval selection along with the results from packer testing conducted immediately prior to the Westbay system installation. Since hydraulic measurement ports were also located beneath the bottom packer for each interval, it was possible to measure pressures in the zones between test intervals. A summary of test intervals and their rationale is provided in Table 1.

Table 1: Westbay MP38 Test Intervals and Selection Rationale

Interval No.	Depth Interval (bottom of upper packer to top of lower packer)		Reasoning for Test Interval Selection
	Top (mBGS)	Bottom (mBGS)	
IG_BH01_T_INT_020	65.9	124.3	Allow sampling of near-surface groundwater
IG_BH01_T_INT_019	125.2	144.8	Allow potential groundwater sample collection and pressure monitoring (increased fracture frequency observed in core logging and ATV log, inflow observed in fluid conductivity logging).
IG_BH01_T_INT_018	145.7	195.0	Interval between IG_BH01_T_INT_017 and IG_BH01_T_INT_019
IG_BH01_T_INT_017	195.9	227.0	Allow sampling of groundwater (Increased fracture frequency observed in core logging and ATV log, inflow observed in fluid conductivity logging).
IG_BH01_T_INT_016	227.9	303.1	Interval between IG_BH01_T_INT_015 and IG_BH01_T_INT_017
IG_BH01_T_INT_015	304.0	321.4	Permit groundwater sampling and hydraulic testing near the inferred transition to a potential intermediate groundwater system.
IG_BH01_T_INT_014	322.3	405.1	Interval between IG_BH01_T_INT_013 and IG_BH01_T_INT_015
IG_BH01_T_INT_013	406.0	427.9	Permit groundwater sampling and hydraulic testing within the rock mass zone above the repository horizon.
IG_BH01_T_INT_012	428.8	488.8	Interval between IG_BH01_T_INT_011 and IG_BH01_T_INT_013
IG_BH01_T_INT_011	489.7	513.2	Allow for pressure monitoring and hydraulic testing over intact section of repository horizon.
IG_BH01_T_INT_010	514.1	536.1	Allow for pressure monitoring and hydraulic testing over intact section of repository horizon.
IG_BH01_T_INT_009	537.0	570.3	Permit groundwater sample collection, pressure monitoring and hydraulic testing over interval at repository horizon with observed increase in fracture frequency.
IG_BH01_T_INT_008	571.2	624.2	Interval between IG_BH01_T_INT_007 and IG_BH01_T_INT_009

Interval No.	Depth Interval (bottom of upper packer to top of lower packer)		Reasoning for Test Interval Selection
	Top (mBGS)	Bottom (mBGS)	
IG_BH01_T_INT_007	625.1	645.6	Allow groundwater sample collection and pressure monitoring (increased fracture frequency observed in core logging and ATV log, inflow observed during fluid conductivity logging).
IG_BH01_T_INT_006	646.5	698.9	Packer required for load support.
IG_BH01_T_INT_005	699.8	765.1	Packer required for load support.
IG_BH01_T_INT_004	766.0	800.2	Allow sampling of groundwater (increased fracture frequency observed in core logging and ATV log, inflow observed during fluid conductivity logging).
IG_BH01_T_INT_003	801.1	884.6	Packer required for load support.
IG_BH01_T_INT_002	885.5	973.1	Packer required for load support.
IG_BH01_T_INT_001	974.0	1001.2	Allow sampling of the deepest bedrock horizons (increased fracture frequency observed in core logging and ATV log, inflow observed during fluid conductivity logging).

Following test interval selection, the depth of packer placement was refined using data from the caliper log, core logging, and televiewers to ensure packers were located in sections of borehole having a sparse fracture frequency and consistent diameter. In addition to the primary function of creating a borehole annular seal between adjacent monitoring intervals, the Westbay packers also support the weight of the Westbay completion, and loads imposed by long term or short term hydraulic gradients across packers. The maximum distance between packers should be less than 100 m for load-sharing reasons.

The well design is composed of the test interval selection and packer placement, and was used to prepare a Westbay Completion Log, which specifies the location of the Westbay System components in the well including serial numbers for each packer, pumping port and measurement port coupling. A copy of the Westbay Completion Log is provided in the Westbay Completion Report included with this document as Appendix A.

3.3 Layout of Westbay Casing Components

A pre-installation layout of Westbay casing components was carried out at an offsite warehouse in Ignace. The required MP38 casing components (tubing, couplings, magnetic location collars, etc.) were laid out on a raised rack. Each casing length was numbered and measured, beginning with the lowermost, as an aid to confirming the proper sequence of components. The appropriate Westbay System couplings were attached to each casing section according to the Westbay Completion Log, and magnetic location collars were attached 0.6 m below the top of the measurement port couplings in the monitoring intervals (see Figure 4). The serial numbers for each packer, pumping port and measurement port coupling were recorded on the Westbay Completion Log.

Following pre-installation layout, the components were re-sealed in their respective plastic bags, labelled, and re-packaged for transportation to the drill site.

Figure 4: Pre-assembly of Westbay MP38 components

A - Positioning of magnetic location collars beneath measurement ports. **B** – Pre-assembled components were checked against the design log, sealed in individual plastic bags, and labelled prior to transport to the well head location.

During the pre-installation layout, Golder requested a number of minor revisions to the Westbay Completion Log in order to provide a better balance between the pre-ordered 3.0 and 1.5 m lengths of casing, and to allow for a greater separation between the bottom of the Westbay casing and the bottom of the borehole. These revisions were incorporated into the Westbay Completion Log provided in Appendix A.

3.4 Lowering of Westbay Casing Components

On delivery to the IG_BH01 drill site, the MP38 System components were arranged in sequence on layout racks located within the core logging trailer, and checked against the Westbay Completion Log. A temporary casing (guide tube) of steel HQ drill rods was lowered into the borehole to a depth of 667 m to protect the Westbay components from material dislodging from the borehole wall during installation. The inside of the guide tube was checked during installation to confirm that it was free of obstructions and smooth.

Each section of Westbay casing was visually inspected to confirm that the inside was clear and that the joint anchor wires were properly installed before attachment of a section of Westbay tubing to the downhole casing string. The Westbay tubing weight, differential pressure (both inside to outside, and outside to inside) and the buoyancy force on the casing bottom were maintained within operating limits through the regular addition of fluorescein-traced water (25 ppb) to the inside of the Wesbay casing.

Each connection in the Westbay casing was pressure tested using the MP38 Joint Test Tool and the test results recorded on the Westbay Completion Log. A minimum test pressure of 1 MPa and a minimum test duration of 1 minute was used for the joint testing with the test pass criteria of no observable water leakage. A record of each successful joint test and the placement of each component was noted on the Westbay Completion Log.

After the Westbay System string was lowered into the borehole, the water level inside the Westbay System completion was monitored under a negative gradient (approximately 135 m) for thirty minutes to confirm hydraulic integrity of the completion (refer to Appendix A for measurements).

3.5 Pre-inflation Pressure Profile

Prior to inflating the packers, a pre-inflation pressure profile was carried out on March 6, 2018 to confirm the operation of all pressure measurement ports downhole and to establish the open hole pressure profile. These measurements were carried out using the MOSDAX pressure profile tool and are reported in Appendix B.

Figure 5 illustrates the pre-inflation pressure profile and estimated piezometric levels in formations outside measurement ports profile for IG_BH01 assuming freshwater. As shown, the head increases linearly with depth to about 780 m after which the head increases at a slightly greater rate consistent with a slight but progressive increase in groundwater density.

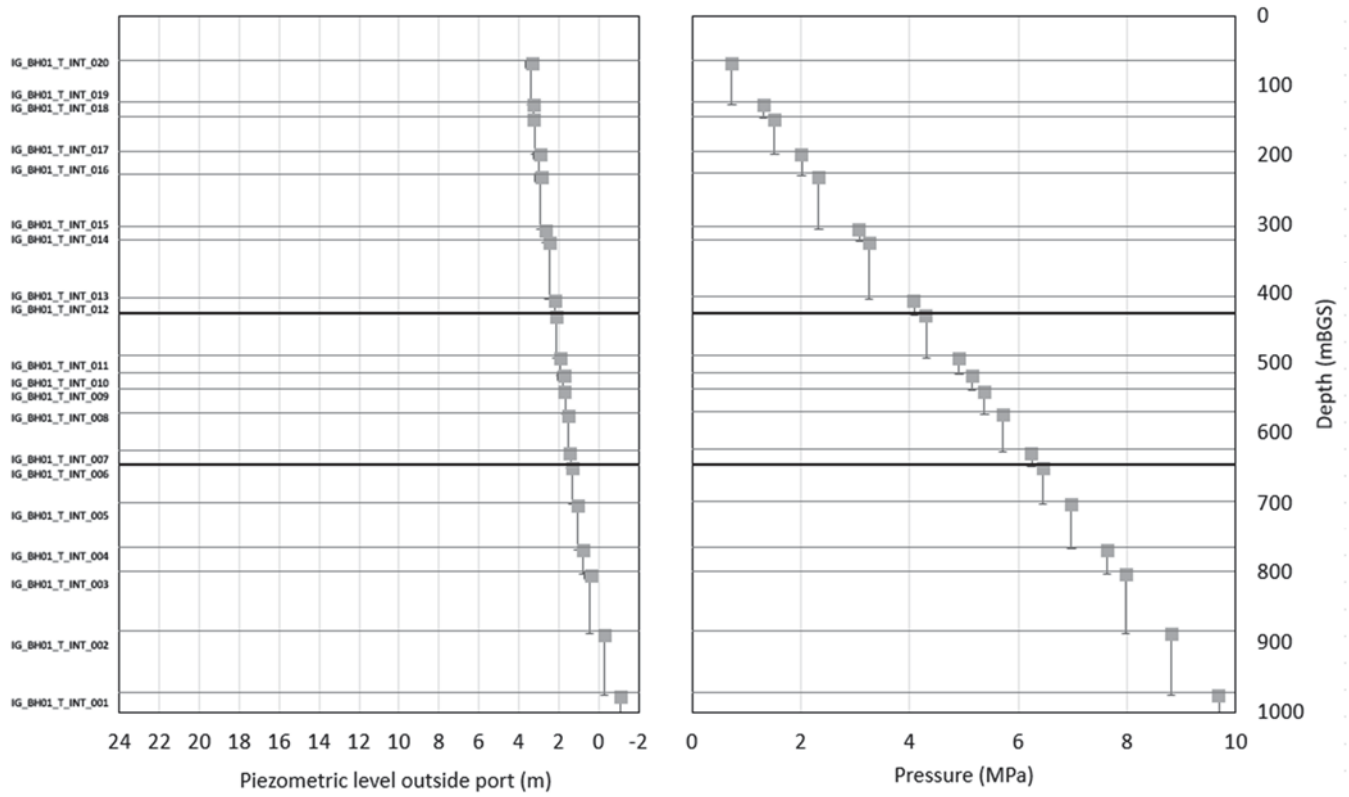

Figure 5: IG_BH01 Pre-Inflation Pressure Profile

Temperature measurements were made to an accuracy of ± 0.1 °C during the pre-inflation pressure profiling. The resulting temperature profile (Figure 6) shows a linear increase with depth from approximately 5.6 °C in the upper 100 m to 14.1 °C at 977 m depth. Excluding the first interval, the temperature increase was nearly perfectly linear with an intercept of 4.1 °C and a slope 10.2 °C per kilometre of depth (R^2 = 0.998).

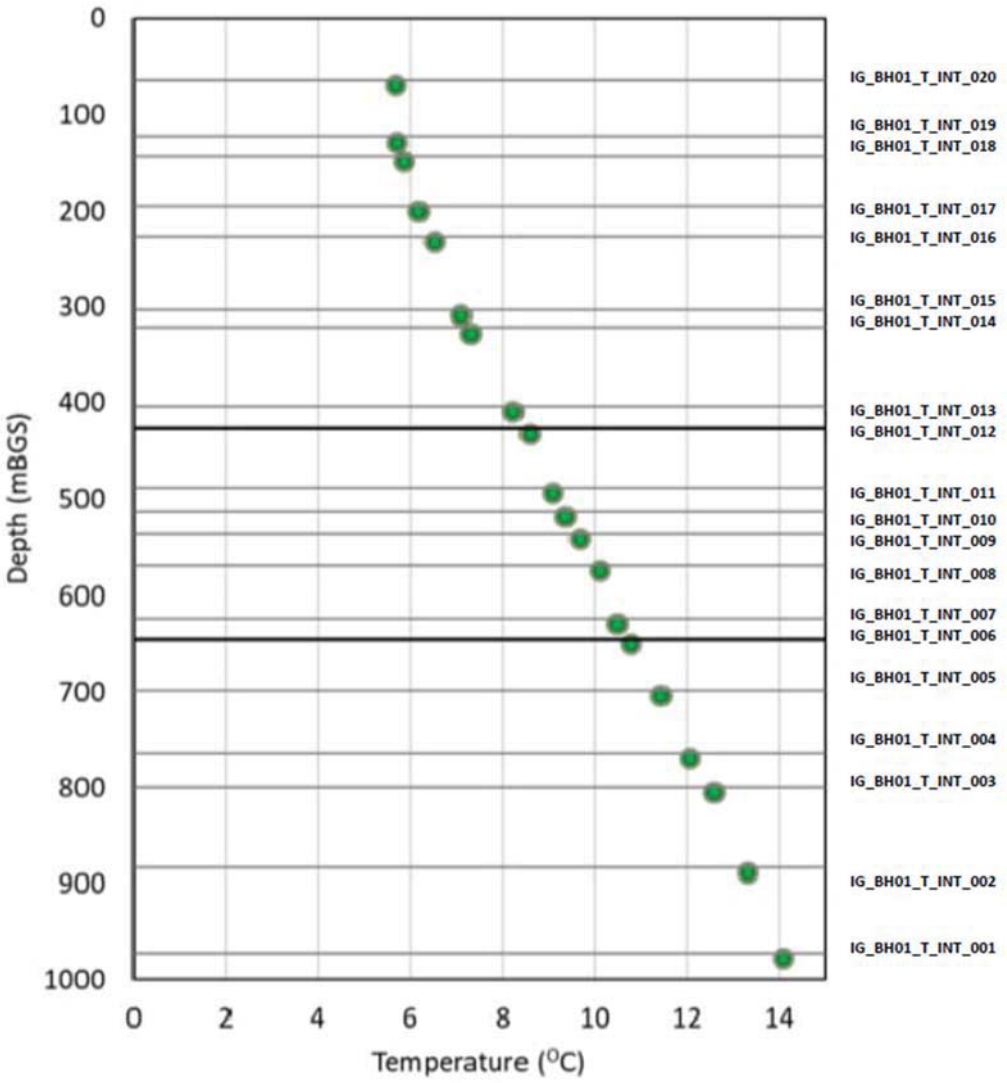

Figure 6: IG_BH01 Pre-Inflation Temperature Profile

3.6 Packer Inflation

Packers were inflated using the Westbay Model No. 6055 vented inflation tool (Figure 7) with fluoroscein-traced water. The five packers exposed below the base of the guide tube were inflated in sequence beginning with the lowest. Following the inflation of the lowest five packers, the system was destressed (thereby reducing the long-term load on the upper components) by placing the entire string under a tension of 3350 kN then clamping the casing string to the wellhead at an indicated weight of 220 kN. The final positions of the Westbay casing components (ports and packers) are shown on the as-built Tubing Summary Log in Appendix A.

Figure 7: Packer Inflation

A – Pre-inflation checks of packer inflation tooling. **B** – Hose reel delivering pressurized water to the inflation tool.

The guide tube was then removed and the remaining packers inflated in order (lower to higher). Injection pressure (packer element pressure) and pumped volume were measured at intervals (typically one reading for each 0.5 litres pumped) and recorded manually on a separate Packer Inflation Field Record for each packer (Appendix B). Packer inflation was completed between March 7 and March 10, 2018.

3.7 Final Testing / Post-emplacement Profiling

Following the packer inflation and final measurements of the Westbay MP38 component string, a post-emplacement pressure profile was obtained on March 11, 2018. The Westbay MOSDAX pressure probe was used to measure formation pressures in the packer-isolated borehole intervals outside the Westbay casing. Pressures measured by this equipment are total, or absolute pressures, which include groundwater pressure and atmospheric pressure. The atmospheric pressure component is removed from the formation pressure by measuring the atmospheric pressure with the probe at ground level and subtracting the atmospheric pressure (at the time of measurement) from the formation pressure. These measurements are reported in Appendix C while a graphical presentation of the results is shown on Figure 8.

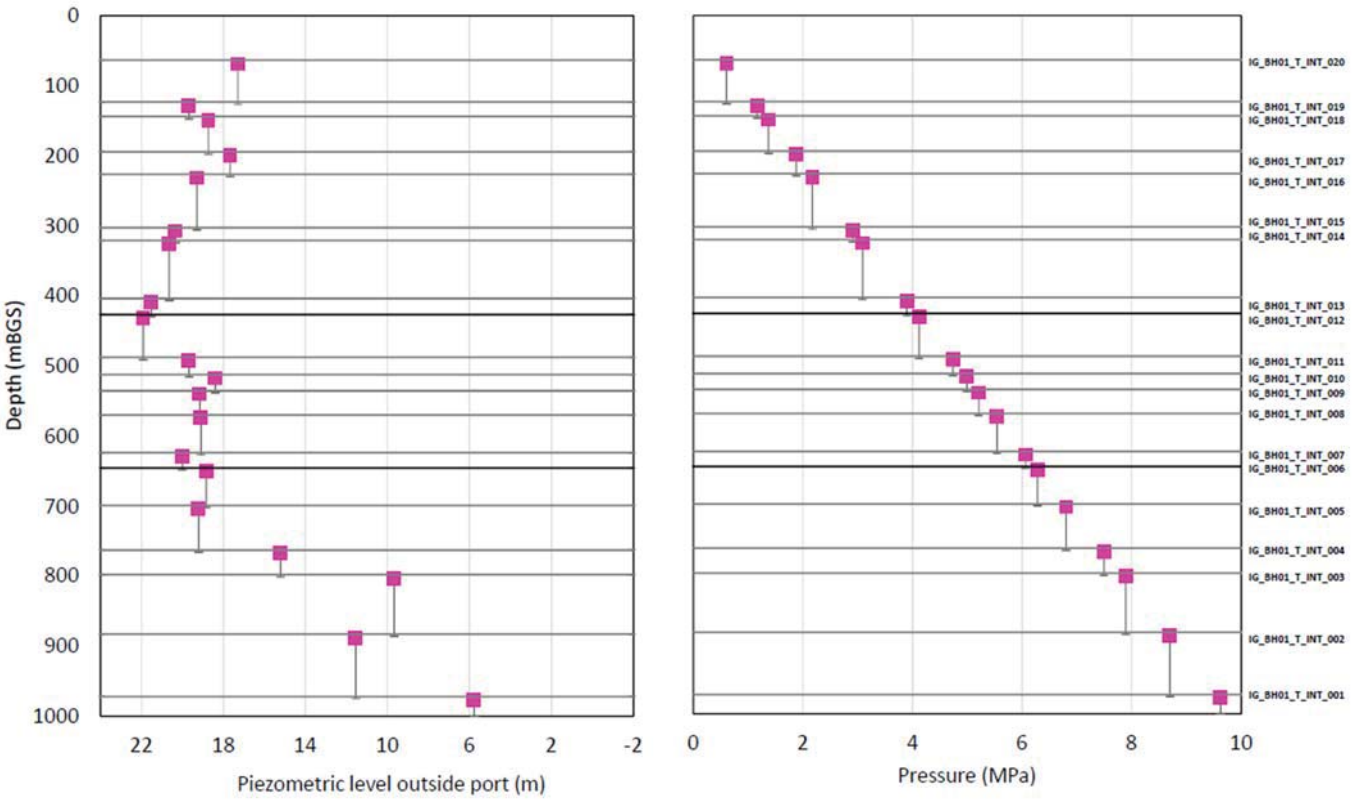

Figure 8: IG_BH01 Post-Inflation Pressure Profile taken on March 11, 2018

The post-inflation pressure profile (above) shows changes from open-hole pressures (Figure 5). These measurements are not considered to be representative of equilibrium conditions, however. Long-term formation pressure conditions will develop over time as packer-isolated test intervals re-equilibrate from drilling and testing disturbances. Subsequent post-emplacement pressure profile measurements were obtained on April 5, 2018 and July 4, 2018. A plot showing the measured interval pressures over time is provided in Figure 9, and the measurements are reported in Appendix C.

The post-inflation thermal gradient did not vary significantly from that obtained during the pre-inflation measurements.

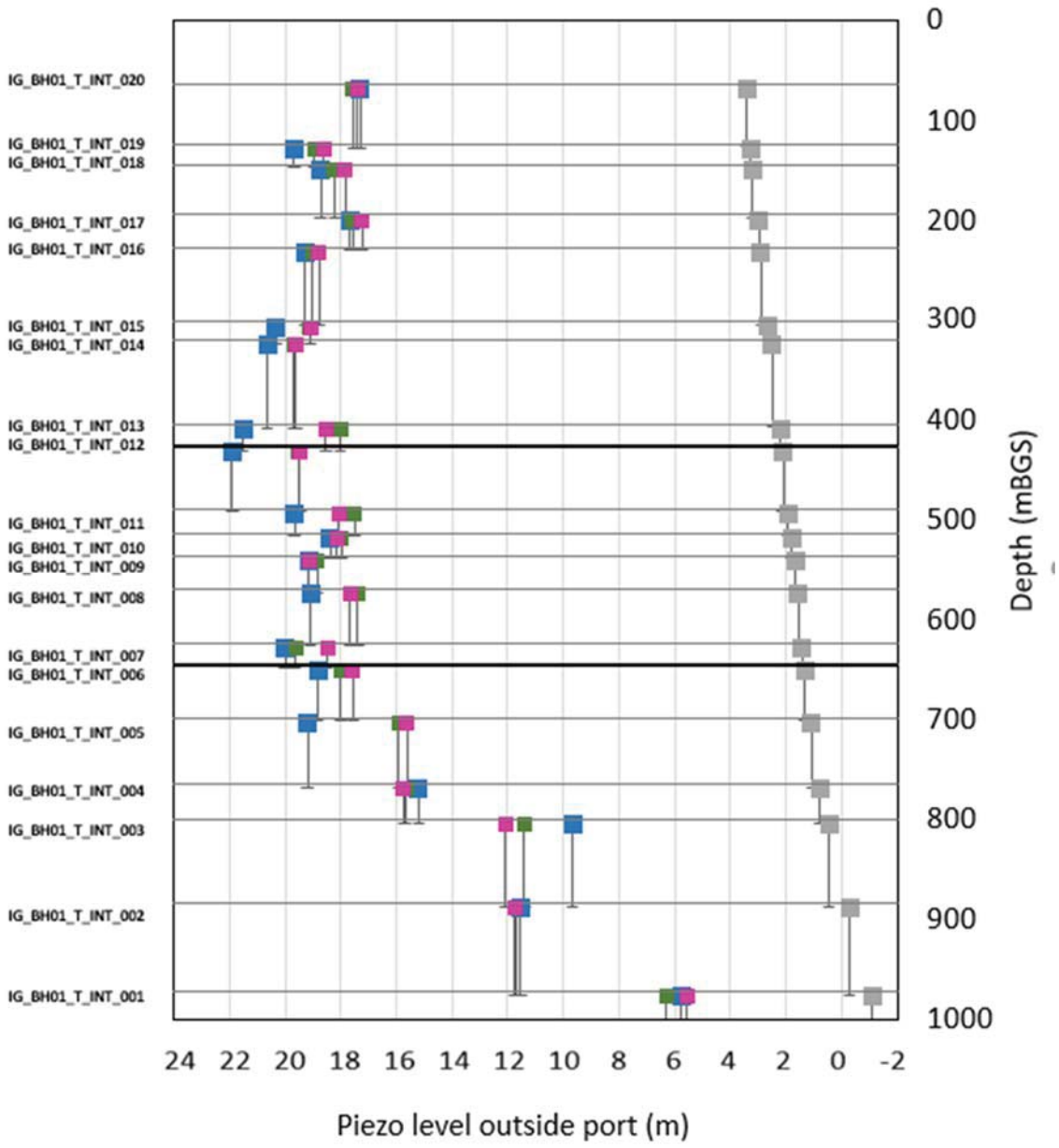

Figure 9: IG_BH01 Changes in Post-Emplacement Pressure Profiles – March to July 2018

Measured on: July 4, 2018; April 5, 2018; March 11, 2018 March 6, 2018. Absolute pressure is not shown as the data from the three rounds of post-inflation pressure measurements cannot be distinguished at the relevant scaling.

3.8 Wellhead Completion

Following the MP38 installation, and post-inflation pressure profiling, the wellhead was completed by emplacing a Westbay MP38 cap and threading on steel PWT riser with locking cap and monopod bracket (Figure 10).

Figure 10: IG_BH01 Final Wellhead Configuration

The ground surface surrounding the wellhead was graded to allow for the drainage of precipitation and snowmelt. The borehole collar location and stick-up were surveyed on March 15, 2018. Elevations are summarized on the following table.

Table 2: Wellhead Elevations

Northing (m)	Easting (m)	Elevation (masl)	Measurement Point
5486016.42	555943.35	431.43	Top of monopod bracket
5486016.45	555943.35	431.04	Top of Westbay casing
5486016.45	555943.50	430.72	Top of Bedrock

Note:
Elevations are Geodetic and referenced to the Ministry of Transportation of Ontario benchmark No. 00819668142, having a recorded elevation of 409.07 metres.

4.0 DATA QUALITY AND USE

Data presented in this report describe the installation and completion of Westbay MP38 multilevel monitoring casings in borehole IG_BH01 as well as the rationale for selection of multilevel monitoring intervals. Initial post-inflation pressure data obtained from these completions support the conclusion that the MP38 casing systems are operating as intended.

5.0 REFERENCES

Golder (Golder Associates Ltd.), 2017. Phase 2 Initial Borehole Drilling and Testing - Ignace Area – Initial Borehole Characterization Plan for IG_BH01.

Golder and PGW (Golder Associates Ltd. and Paterson Grant and Watson Ltd.), 2017. Phase 2 Geoscientific Preliminary Assessment, Geological Mapping, Township of Ignace and Area, Ontario: APM-REP-01332-0225.

SGL (Sander Geophysics Limited), 2015. Phase 2 Geoscientific Preliminary Assessment, Acquisition, Processing and Interpretation of High-Resolution Airborne Geophysical Data, Township of Ignace, Ontario. Prepared for Nuclear Waste Management Organization (NWMO). NWMO Report Number: APM-REP-06145-0002.

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https://golderassociates.sharepoint.com/sites/13226g/technical work/wp9 westbay installation/31 wp9 data report 2018-2019/07 - nov final/1671632 (1911) ig_bh01 wp9 report 28nov2019 r7a.docx

APPENDIX A

Westbay MP38 Completion Report

Completion Report – rev. 3

Well Name: IG_BH01

May 16, 2019

Completion Report – rev. 3

Well Name: IG_BH01

Project Number: WB973

Prepared for:

Golder Associates Ltd.

Prepared by:

Westbay Instruments
A Division of Nova Metrix Ground Monitoring (Canada) Limited.
8610 Glenlyon Parkway
Unit 134
Burnaby, BC
V5J 0B6

CONTENTS

TABLES

FIGURES

APPENDICES: IG-BH01

1. Introduction

This report and the attached Appendices document the technical services carried out by Westbay Instruments (Westbay) under Golder Associates (Golder) P.O. 1671632(1910) dated November 17, 2017. A Westbay System completion was installed in borehole IG_BH01 at a site near Ignace, ON, Canada

Westbay technical services representatives Mr. Anthony Morgan and Mr. Tony Kim were on site for installation of the Westbay System from February 22 to March 11, 2018. Golder representative Dr. Charles Mitz was on-site to supervise the installation of the Westbay System.

This report documents the installation tasks and related Quality Assurance (QA) checks.

2. Pre-Installation Activities

The borehole was drilled/cored at a nominal diameter of 98 mm (HQ-size) by diamond coring methods. Water labelled with 100 ppb fluorescein was used as a lubricant during coring. An HWT surface casing (nominal 114.3 mm OD) was driven to 69 meters in the borehole.

Borehole logging and packer testing were performed prior to the installation of the Westbay System, after the borehole had been flushed with approximately 37,000 L of 25 ppb traced water. The borehole logging included Static Fluid Temperature / Resistivity, Flowing Fluid Electrical Conductivity, Mechanical Caliper, Optical Televiewer, Acoustic Televiewer, Natural Gamma, Electromagnetic Induction (Apparent Conductivity), Magnetic Susceptibility, Neutron, Gamma-Gamma, Full Waveform Sonic, Normal Resistivity, Spontaneous Potential and Single Point Resistance, Heat-Pulse Flowmeter, Spectral Gamma, and Borehole Deviation. For the packer testing, slug and pulse tests, constant rate and constant pressure pumping and injection tests were performed.

(Note: all depths are with respect to ground surface. Monitoring well reference elevations were not available at the time of writing).

3. Installation

Westbay Instruments technical services representatives Mr. Anthony Morgan and Mr. Tony Kim, and Dr. Charles Mitz of Golder were on site to install the Westbay System in IG_BH01 as indicated below in Table 1.

(Note: Monitoring well reference elevation was not available at the time of writing).

Table 1: Summary of Westbay System Installation

Well Name.	Field Installation Dates	Total Depth (m)	MP38 Tubing Length (m)	No. Monitoring Zones
IG_BH01	March 3 to March 11, 2018	1001.2	997.2	20

The Westbay System in IG_BH01 was installed according to the procedure described below. A summary of the QA checks conducted during the installation, including the dates for each task is documented on the Westbay Field QA Summary Form in Appendix A.

3.1 Preparation of Westbay System Design

Packer depths for the borehole were provided to Westbay by Golder. A well design was created based on these depths. The well design was used to prepare a Westbay Completion Log, which specifies the location of the Westbay System components in the well. This log was reviewed and approved in the field by Golder prior to installation of the Westbay System. The Westbay Completion Log as approved was used as an installation guide in the field. A field copy of the log is in Appendix B.

A measurement port coupling was included in 20 monitoring zones to measure groundwater formation pressures and collect groundwater formation samples. A Model 0206 hydraulic pumping port coupling was included in 8 selected zones to provide purging and hydraulic conductivity testing capabilities. Golder requested that optional geotextile filters (made of Polyethylene terephthalate [PET] fabric) were to be installed over the measurement port couplings.

A summary of the installed Westbay System components is shown on Table 2 below. (also in the Summary Completion Log Legend in Appendix C).

Table 2: Summary of Installed Westbay System Components

Well Name	Packers (0238)	Measurement Ports (0205)	Pumping Ports (0206)
IG_BH01	20	20	8

3.2 Layout of Westbay System Tubing Components

Prior to the installation, the Westbay System components were set out in a heated warehouse according to the sequence indicated on the Westbay Completion Log. Data collected during the layout were recorded on the Tubing Summary (field copy) in Appendix D, and the Summary Completion Log (field copy) in Appendix E. Each casing length was numbered and measured beginning with the lowermost as an aid to confirming the proper sequence of components. The appropriate Westbay System couplings were attached to each casing section. Magnetic location collars were attached 0.6 meter below the top of the measurement port couplings in the monitoring intervals. The components were re-sealed in their plastic protective covers and re-boxed for transport to site. Once on site the components were arranged on racks in a heated trailer.

Each component was visually inspected. Serial numbers for each packer, pumping port and measurement port coupling were recorded on the Westbay Completion Log (field copy) in Appendix B. The component layout was confirmed with the log before the components were lowered into the borehole.

Notes about design revisions: After the layout of Westbay components was completed, the design was modified as instructed by the on-site Golder representative and as indicated on the Westbay Completion Log (field copy).

- Item # 2 (P/N 020105 MP38 Casing) and attached regular coupling were removed to provide increased space between the bottom of the borehole and the bottom of the Westbay completion string. The removal was noted on the Tubing Summary (Appendix D). The item numbering scheme on the Westbay Completion Log (field copy) and the Tubing Summary was not adjusted to reflect this item removal.
- The approved design included components above ground level (items #368 to 372) which are used as a temporary stick-up during handling of the Westbay casing string and retrieval of the temporary guide

tube as described in Section 3.7 below. The uppermost permanently installed Westbay casing item is #367 as noted on the Summary Completion Log in Appendix C, equivalent to #368 on the Westbay Completion Log (field copy) in Appendix B and Tubing Summary (field copy) in Appendix D.

3.3 Lowering of Westbay System Components

Steel HQ drill rods were lowered into the borehole to a depth of 667 meters to provide temporary protection from materials dislodged from the borehole wall during installation of the Westbay tubing string. The Westbay System components were lowered into the guide tube by a hoist rig. Each joint was tested with a minimum internal hydraulic pressure of 150-psi for one minute to confirm hydraulic seals. A record of each successful joint test and the placement of each component are noted by check marks on the Westbay Completion Log. Water labelled with 25 ppb Fluorescein supplied by Golder was added to the Westbay System when necessary to counter buoyancy effects while components were lowered into the borehole and was used for as a secondary test of joint seals during lowering.

3.4 Hydraulic Integrity Testing

On March 6, 2018, after the Westbay System string was lowered into the borehole, the water level inside the Westbay System completion was monitored at a depth different from the open borehole water level for a minimum period of thirty minutes to confirm hydraulic integrity of the completion. The data from the hydraulic integrity test are shown on the third page of the Westbay Completion Log (field copy) in Appendix B and in Table 3 below.

Table 3: Hydraulic Integrity Test

Well Name	March 6, 2018	Fluid Levels	
	Time	Inside Tubing	Outside Tubing
IG_BH01	12:50	137.88m (452.26 ft)	*3.60m (11.8 ft)
	13:00	137.88m (452.26 ft)	*Measurement was taken on
	13:10	137.87m (452.21 ft)	March 3, 2018 just prior to
	13:20	137.87m (452.21 ft)	lowering Westbay System.
	13:30	137.87m (452.21 ft)	
	13:40	137.87m (452.21 ft)	
	13:50	137.87m (452.21 ft)	
	14:00	137.87m (452.21 ft)	

3.5 Positioning of Westbay System Completion

After the completion of hydraulic integrity testing, the Westbay System was positioned as illustrated on the Westbay Completion Log. The Westbay System was supported in this position while packer inflation was carried out. The positioning of the Westbay System components is based on the "nominal" lengths of

Westbay System components. The positioning calculations do not include allowances for borehole temperature or deviation effects.

Figure 1, entitled "MOSDAX Transducer Position" illustrates how the position of the MOSDAX transducer position is correlated to the reference position at the top of a measurement port. Figure 2, titled "Dimensions of Packer Seals and Monitoring Zones" outlines the calculations used to determine the packer depths and length of each monitoring zone.

3.6 Pre-inflation Profile

On March 6, 2018 a pre-inflation pressure profile performed prior to inflating the packers, in order to confirm the proper position and operation of measurement ports and magnetic collars. All measurement ports and magnetic collars were confirmed to be operating properly and correctly positioned within the borehole. A plot of the Pre-inflation Piezometric levels in all zones is shown on Figure 3. Note that the plot includes a reference to 'equivalent depth to water' which is the calculated piezometric level as defined on the Westbay Piezometric Pressures/Levels Field Data and Calculation Sheet completed for each pressure profile. The field data calculation sheets for the pre-inflation pressure profile are provided in Appendix F.

3.7 Inflation of Westbay System Packers

The Westbay System packers were inflated sequentially beginning at the bottom of the well using water traced with 25 ppb Fluorescein provided by Golder.

The packer inflation was coordinated with removal of the temporary guide tube. The guide tube was initially positioned to at a depth of 667 meters below ground surface (mbgs), allowing the lower five packers to be exposed in the open borehole. After the five lower packers were inflated, the guide tube was removed. During removal of the guide tube, the Westbay tubing was held in place by the five inflated lower packers.

The Westbay Model No. 6055 vented inflation tool was used for packer inflation. All the packers appear to have inflated properly. The data for inflation of each packer are provided on the Westbay Packer Inflation Records included in Appendix G.

3.8 De-Stressing of Westbay System

Westbay's procedure for de-stressing the Westbay tubing was used to reduce the long-term load on the upper components. In this procedure the initial hanging weight of the Westbay string is applied in increments to selected packers after they have been inflated. In this process the top of the Westbay completion is lowered, and the positions of the shallower ports and packers are affected. Thus, after all packers have been inflated, the weight of the Westbay completion is distributed among the packers. The final clamp-off weight is supported at the well top. The depths of ports and packers are adjusted to account for the cumulative effect of the lowering. A summary of the de-stressing results is provided in Table 4. The final positions of the Westbay casing components (ports and packers) are shown on the Summary Completion Log (Appendix C) and Tables 5 and 6 (Appendix H).

Table 4: Summary of De-Stressing Results

Well Name	Weight after inflating 5 packers (lb)	Final Clamp-off Weight	Total Vertical Movement at surface (m)	Beginning stick-up (m)	End stick-up (m)
IG_BH01	750	50	0.95	2.24	1.29

*Measurements of distance and weight taken from the temporary stick-up above datum before wellhead completion was built. The weight scale output is in pounds (lb).

4. Formation Pressure Measurements

On March 13, 2018, after the completion of packer inflation, formation pressures were measured at each of the 20 measurement ports. At that time, the formation pressures may not have recovered from the pre-installation activities. Effects on formation pressures are more likely to occur in monitoring zones located in low-permeability geological formations, and longer-term monitoring may be required to establish representative fluid pressures.

A plot of the post-inflation piezometric pressure and groundwater levels is provided in Figure 4. Note that the plot includes a reference to 'equivalent depth to water' which is the calculated piezometric level as defined on the Westbay Piezometric Pressures/Levels Field Data and Calculation Sheet completed for each pressure profile The field data calculation sheets for the post-inflation pressure profile are provided in Appendix I.

The post-inflation data were examined to confirm proper operation of the measurement ports and to confirm the proper operation of packer seals between monitoring zones.

Future pressure profile measurements: It should be noted that for QA purposes, the post-inflation formation pressure measurements used the same port depths as the pre-inflation pressure measurements. These do not include adjustments for the effect of the de-stressing procedure whereby the as-built depths of shallower ports are slightly deeper than the pre-inflation depths. Future pressure profile measurements and calculations should use the adjusted port depths documented in Tables 5 and 6 in Appendix H.

In conclusion, the subject Westbay System completion was installed successfully as documented in this report.

Figure 1:

MOSDAX Transducer Position

In a Westbay MP38 System Measurement Port Coupling P/N 0205

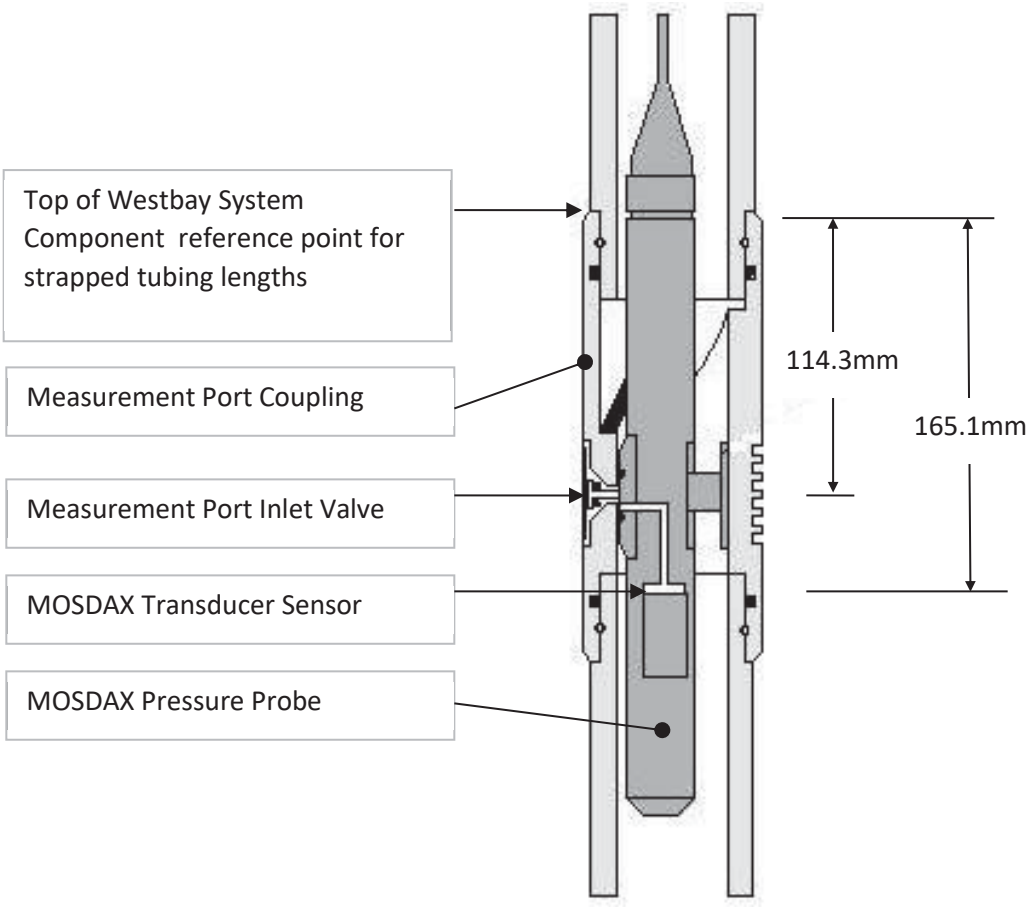
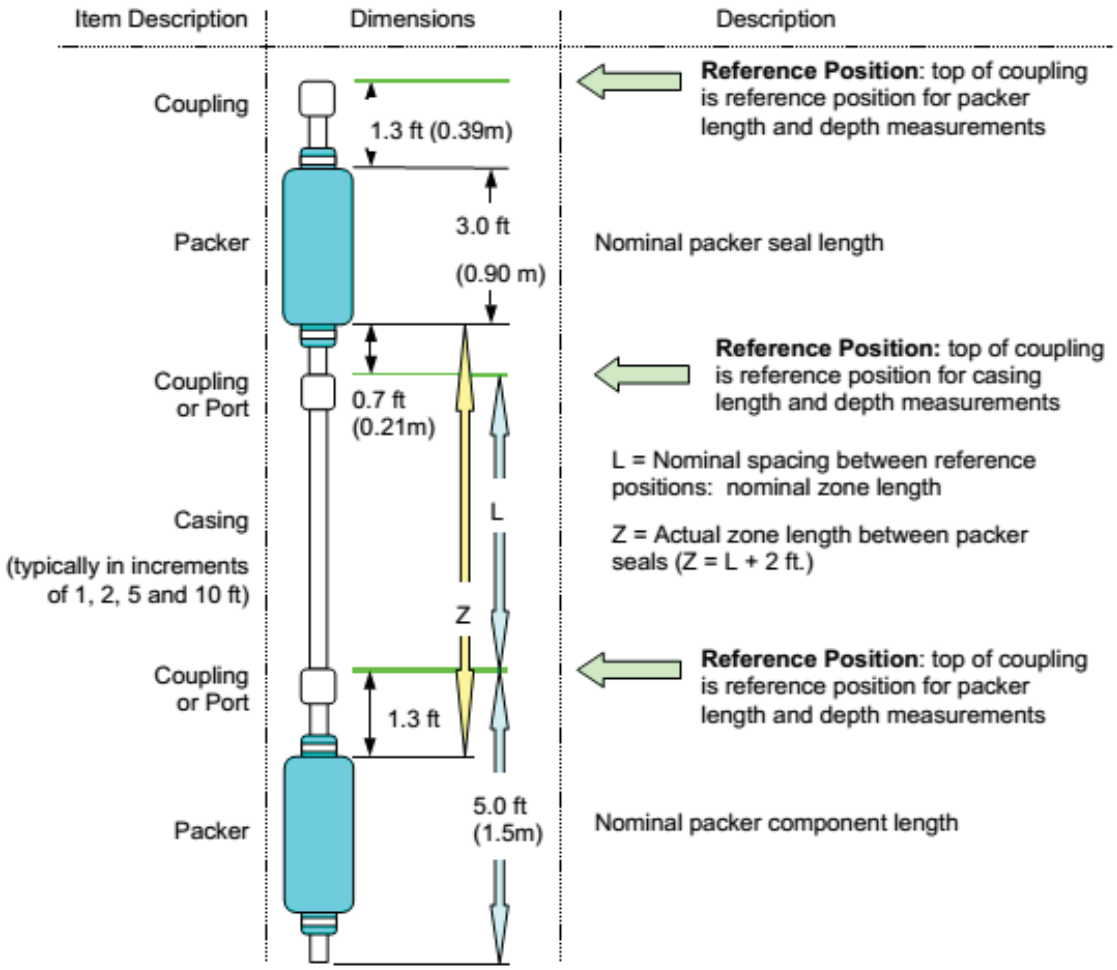


Figure 2:

Dimensions of Packer Seals and Monitoring Zones Westbay MP38 System 0238 Packers

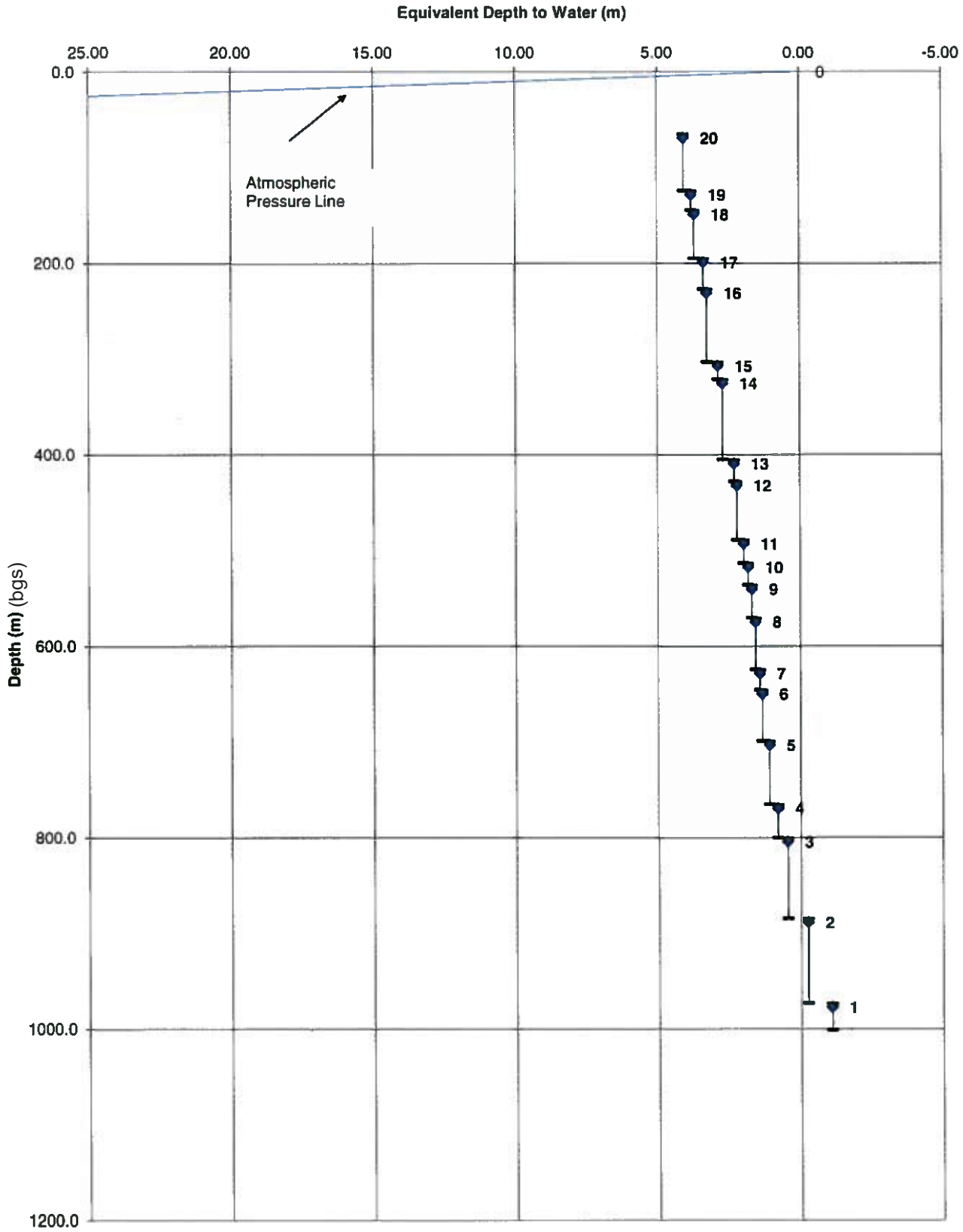


Discussion Points:

- The top of a coupling (Regular Coupling, Measurement Port or Pumping Port) is the reference point for describing nominal depths and nominal lengths. Actual positions of packer seals and zone lengths are determined with respect to the appropriate reference positions.
- Packer Position Example: A packer with a nominal depth of 50 ft (15.2m), will have a nominal packer seal position of 51.3 to 54.3 ft. (15.59 to 16.49m)
- Zone Length Example: A zone whose upper packer is at 50 ft (15.2m) and bottom packer is at 70 ft (21.3m) will have a nominal zone length of 15 ft (4.6m) and an actual zone length (between packer seals) of 15.0+1.3+0.7 = 17.0ft. (4.6 + 0.39 + 0.2 = 5.19m)
- Information on the position of Measurement Port Valve and MOSDAX Transducer sensor, used for detailed calculation of piezometric level measurements, are described separately.

Piezometric Profile:
Monitoring Well:IG_BH01

Profile Date:March 6,2018
Comments:Pre-Inflation Profile



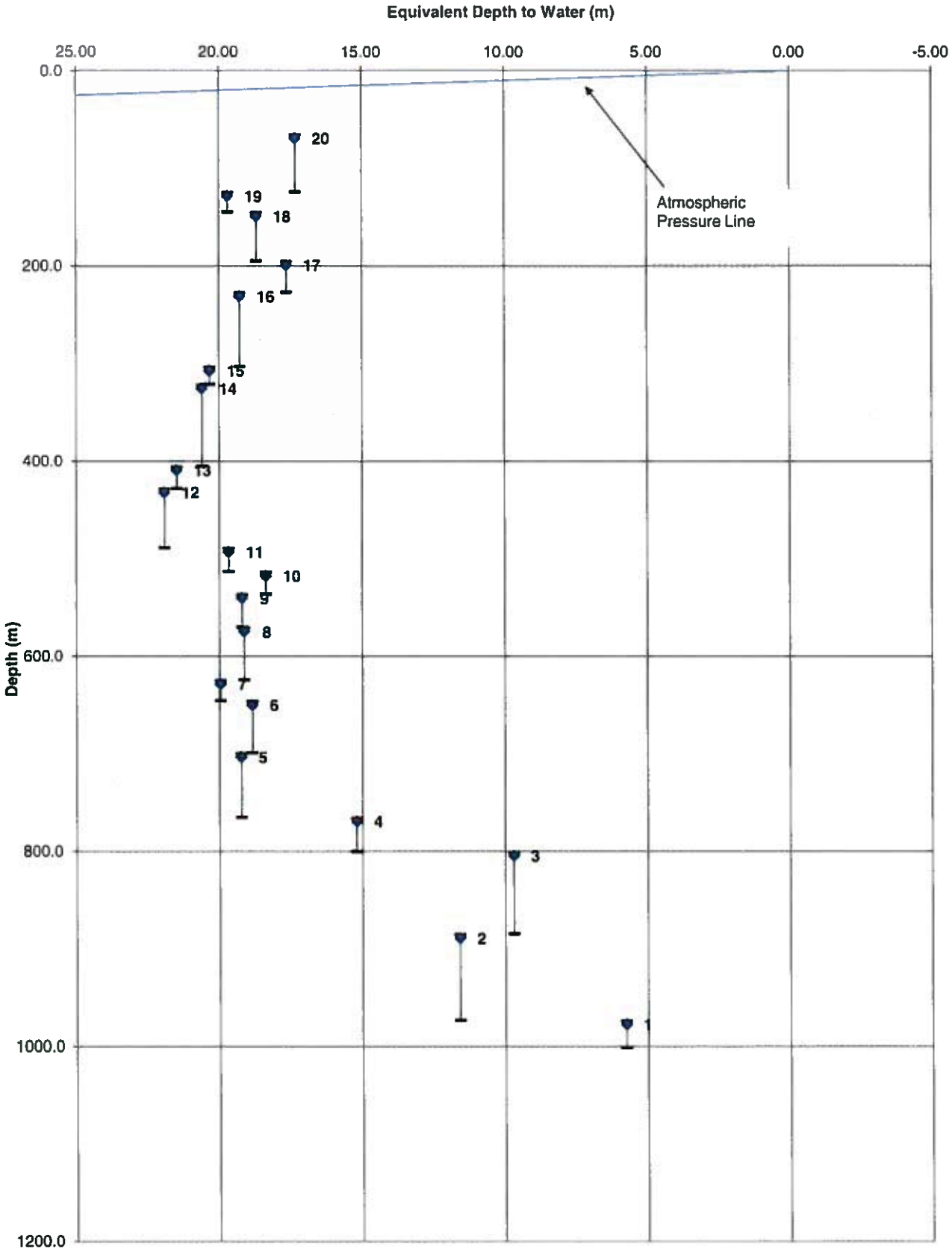
Client:
Site:Ignace, ON
Datum:Ground Level

Figure3

Plote By:TK Date:March 26/18
Checked By:DL Date:Apr 2/18
Westbay Project: WB 973

Piezometric Profile:
Monitoring Well:IG-BH01

Profile Date:March 11,2018
Comments:Post-Inflation Profile



Client:
Site:
Datum:Ground Level

Figure 4

Plot By: TK Date: March 26/2018
Checked By: DC Date: Apr 2/18
Westbay Project:WB973

APPENDIX A
IG-BH01

WESTBAY FIELD QA SUMMARY FORM

Westbay Field QA Summary Form - 1 page

Westbay Field QA Summary Form

Client: Golder / NWMO Project: 108973

Well: IG_BH01

			Check ✔	Initials	Date
1	**Client Data and Approvals**				
	1.1	Client design request and Borehole/Well information	V	TK	Feb 25/18
	1.2	Client approved final design (file name: IG_BH01R)	V	TK	Feb 28/18
	1.3	Client decision on filter sleeves for Measurement Ports	V	TK	Feb 28/18
	1.4	Client approval to install, including well and borehole conditions	V	TK	Feb 28/18 + March 3/18
Comments					
	Hold Point – Design and well information are complete				
2	**Layout of Completion Components**				
	2.1	Installation Log and Confirmation Log printed from approved design (file name: IG_BH01R)	V	TK	Feb 28/18
	2.2	Components taken from inventory	V	TK	Feb 28/18
	2.3	Layout completed according to log, plus copy S/N and packer data)	V	TK/AM	Feb 28 ~ March 2/2018
	2.3	Independent confirmation of layout (use Confirmation Log)	V	TK/AM	Feb 28 ~ March 2/2018
	2.4	Independent check on laid out length vs design length	V	TK/AM	Feb 28 ~ March 2/2018
Comments					
	Hold Point – Layout is good to install				
3	**Lowering of Completion String**				
	3.1	Independent staff for layout rack and installation check list	V	AK/CM	March 1/18
	3.2	Components individually verified with approved log (with call-back repeat)	V	AK/CM	March 1/18
	3.3	Pressure test tool and apparatus verified	V	TK/AM	March 3/18
	3.4	Components pass pressure test	V	TK/AM	Mar 3 ~ Mar 6/18
	3.5	Tensile loads managed within system limits	V	TK/AM	Mar 3 - Mar 6/18
	3.6	Depth to water in Westbay tube checked and adjusted	V	TK/AM	Mar 3 - Mar 6/18
	3.7	Hydraulic integrity test is passed	V	TK/AM	Mar 6/18
	3.8	Pre-Inflation profile is completed, analyzed and accepted	V	TK/AM	Mar 6/18
	3.9	Top of Westbay tubing is positioned according to the approved log	V	TK/AM	Mar 6/18
Comments					
	Hold Point – Completion is good to inflate packers				
4	**Packer Inflation**				
	4.1	Inflation tool and apparatus verified	V	TK/AM	Mar 7 ~ Mar 9/18
	4.2	Inflation data recorded on forms at time of inflation	V	TK/AM	Mar 7 ~ Mar 10/18
	4.3	Inflation V and P consistent with BH diameter and packer model	V	TK/AM	Mar 7 ~ Mar 10/18
	4.4	De-stressing procedure followed (if required)	V	TK/AM	Mar 7 ~ Mar 10/18
	4.5	All packers inflated normally	V	TK/AM	Mar 7 ~ Mar 10/18
	4.6	Post inflation profile completed, analyzed and accepted	V	TK/AM	Mar 11/18
Comments					
	Hold Point – Packer inflation is complete				
5	**Documentation**				
	5.1	Wellhead completion sketch completed	V	TK	Mar 11/18
	5.2	Draft completion Log and pressure profile data given to client	V	TK	Mar 11/18
	5.3	Completion Report data appendix is complete	V	TK	Mar 26/18
	Installation and Documents Complete				

Signature: _____ **Date:** March 26/2018

APPENDIX B

IG-BH01

WESTBAY COMPLETION LOG (FIELD COPY)

Westbay Completion Log (field copy) - 22 pages

Westbay Completion Log

Company: Golder/NWMO
Well: IG_BH01
Site: Ignace,ON
Project: Groundwater Characterization Study

Job No: WB973
Author: TK

Well Information

Reference Datum: Ground Level
Elevation of Datum: 0.00 m.
MP Casing Top: 0.00 m.
MP Casing Length: 998.73 m.

Borehole Depth: 1000.00 m.
Borehole Inclination: Vertical
Borehole Diameter: 98.00 mm

Well Description:
Plastic MP38 System
Other References:

File Information

File Name: IG_BH01R.WWD
Report Date: Wed Feb 28 18:44:54 2018

File Date: Feb 28 18:37:17 2018

Comments

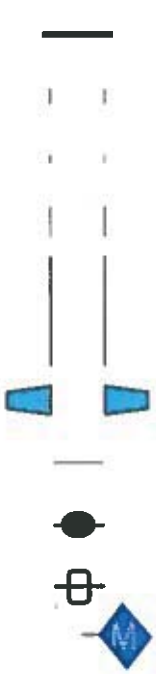
- Datum is ground level
- Filter sock on MP
- DTW was 19.4 m on ~~Dec~~ TK Jan 4/2018
- Guide tube is at ~~767~~ 667 m

Log Information

Borehole condition confirmed.	(method) Optical televiewer	Date: Feb / 2018
MP well design & preparation.	By: TK	Date: Feb 28 / 2018
MP well design checked.	By: TK / AH / CM	Date: Feb 28 / 2018
MP well and borehole approved to install.	By:	Date: March 5 2018

Legend

(Qty) MP Components
(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(11) 020102 - MP38 Casing 3 (2F/0.6M)

(1) 020101 - MP38 Casing 4 (1F/0.3M)

(48) 020105 - MP38 Casing 2 (5F/1.5M)

(292) 020110 - MP38 Casing 1 (10F/3M)

(20) 0238 - MP38 Packer - 74mm (5F/1.5M)

(344) 0202 - MP38 Regular Coupling

(20) 0205 - MP38 Measurement Port

(8) 0206 - MP38 Hydraulic Pumping Port

(14) 0216 - Magnetic Location Collar

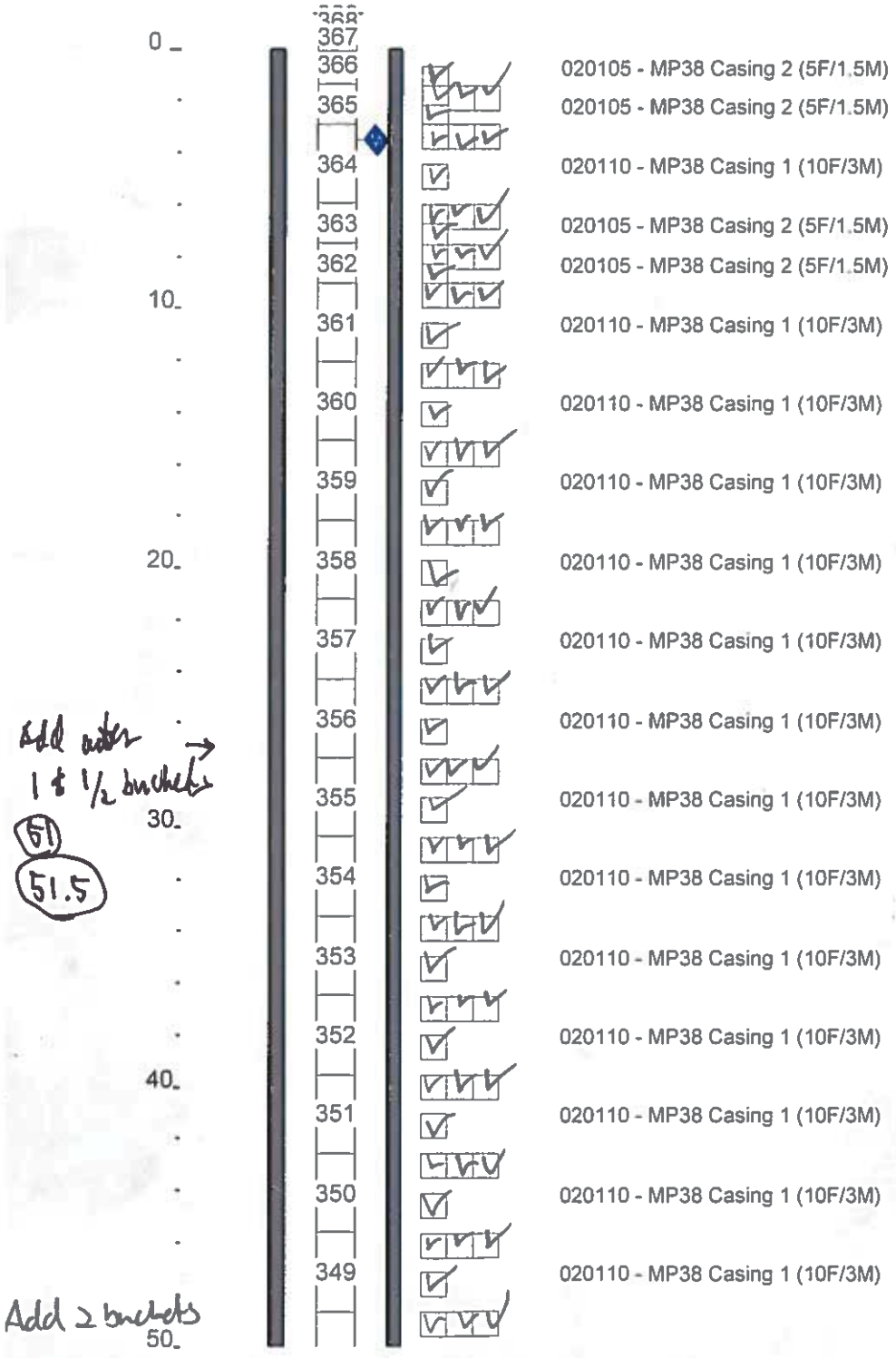
Geology

Backfill/Casing

Mild Steel

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Add water → 1 & 1/2 buckets

51

51.5

Add 2 buckets

50

51

Serial Numbers

ADD
#367 2FT
368 2FT
369 1FT
370 2FT

10:50 am Mar 6 / 2018
lowered to #366

HYDRAULIC INTEGRITY TEST

12:50	~~343.26 FT~~ ~~342.26 FT~~ 442.26 FT
13:00	452.26 FT
13:10	452.21 FT
13:20	452.21 FT
13:30	452.21 FT
13:40	452.21 FT
13:50	462.21 FT
14:00	452.21 FT

WESTBAY IS WATERTIGHT
MARCH 6TH 2018
AM / TK

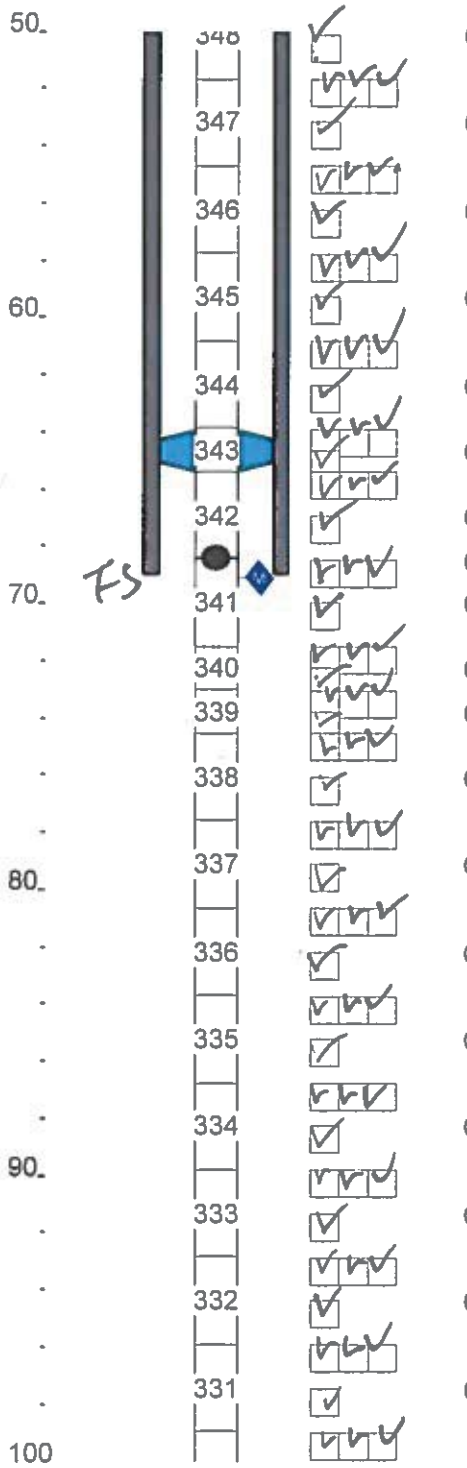
Tool P=280

Mar 6/2018
Resum lowering
@ 20 cm

Wed Feb 28 18:42:20 2018

Westbay Completion Log
Golder/NWMO

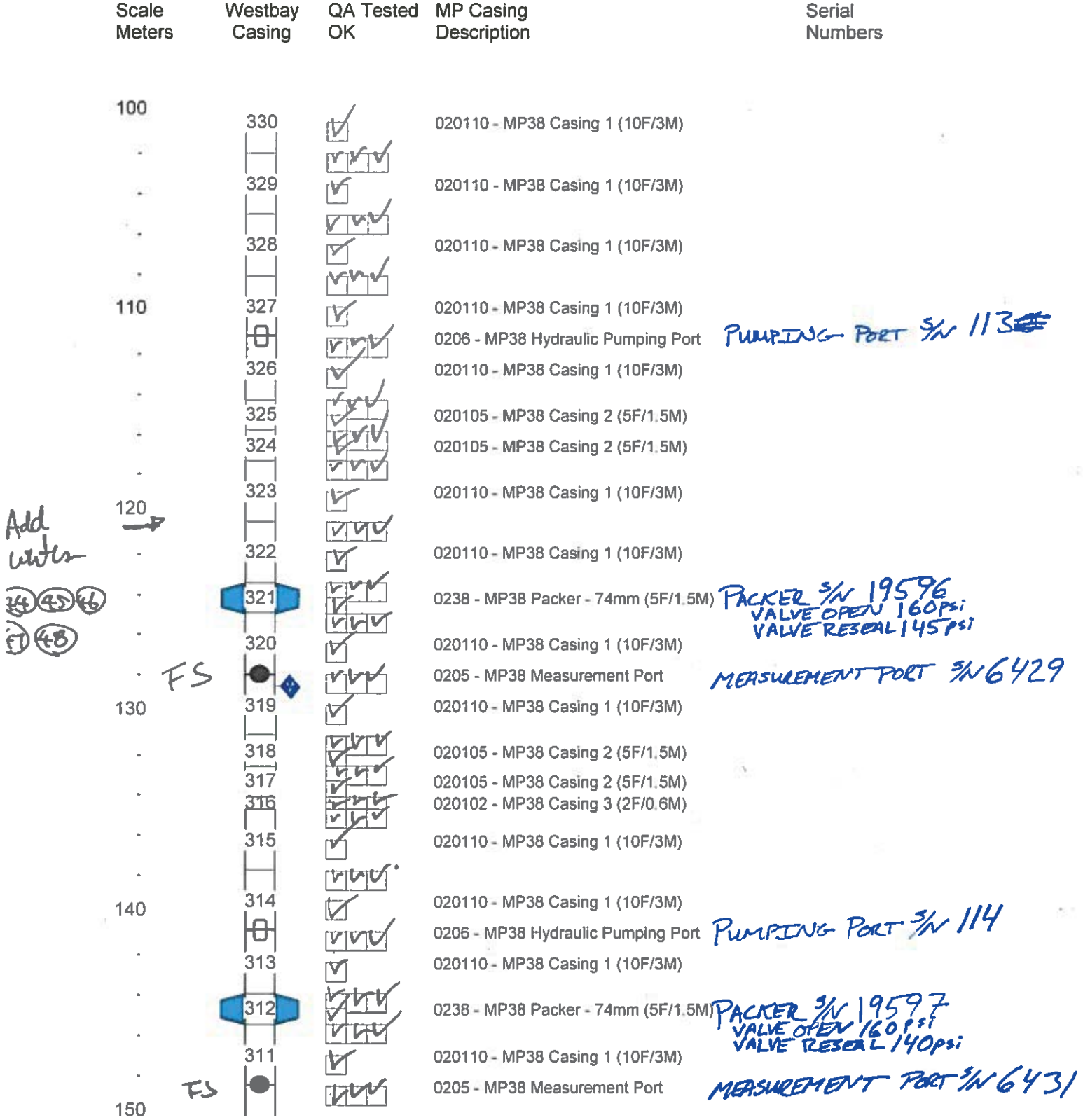
Job No: WB973
Well: IG_BH01



Wed Feb 28 18:42:21 2018

Westbay Completion Log
Golder/NWMO

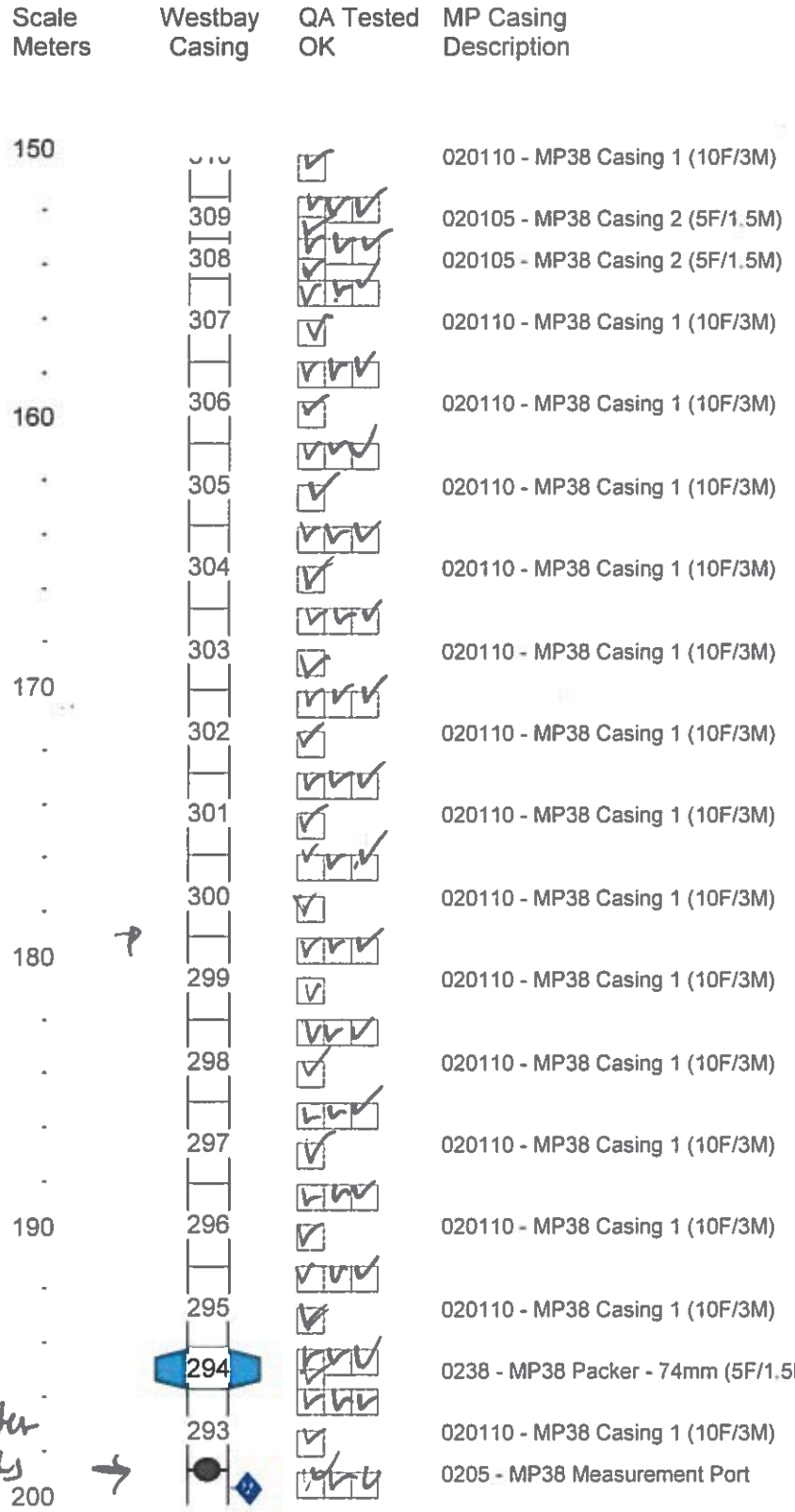
Job No: WB973
Well: IG_BH01



Wed Feb 28 18:42:21 2018

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



PACKER S/N 19600
VALVE OPEN 165 psi
VALVE RESEAL 145 psi

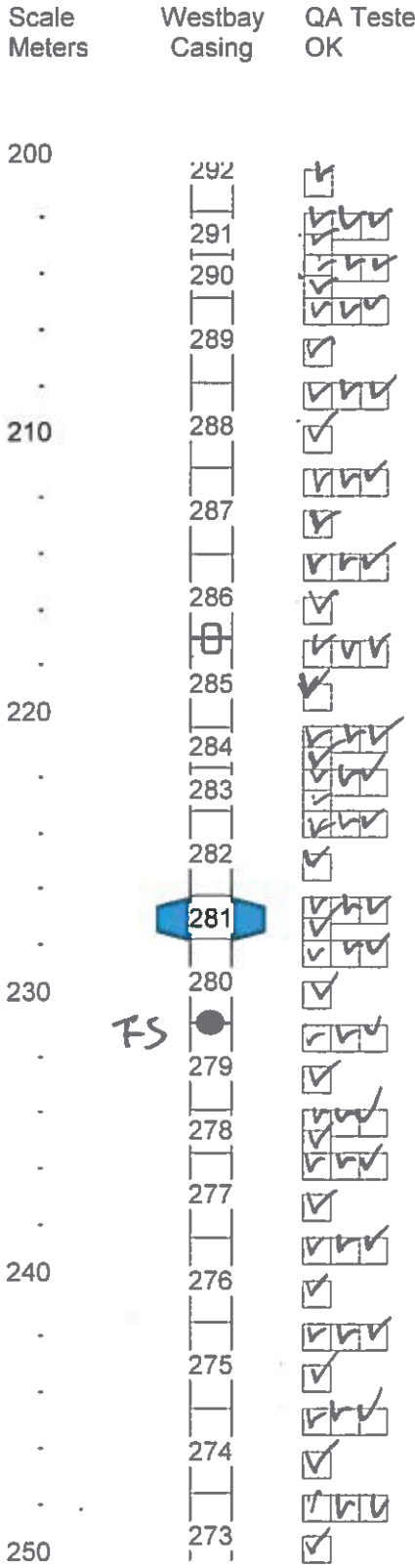
MEASUREMENT PORT S/N 8579

Add water
5 buckets

Wed Feb 28 18:42:21 2018

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



PUMPING PORT S/N 116

PACKER S/N 19601
VALVE OPEN 165 psi
VALVE RESEAL 145 psi

MEASUREMENT PORT S/N 9243

FS

#274 swapped with new casing

Wed Feb 28 18:42:21 2018

Westbay Completion Log
Golder/NWMO

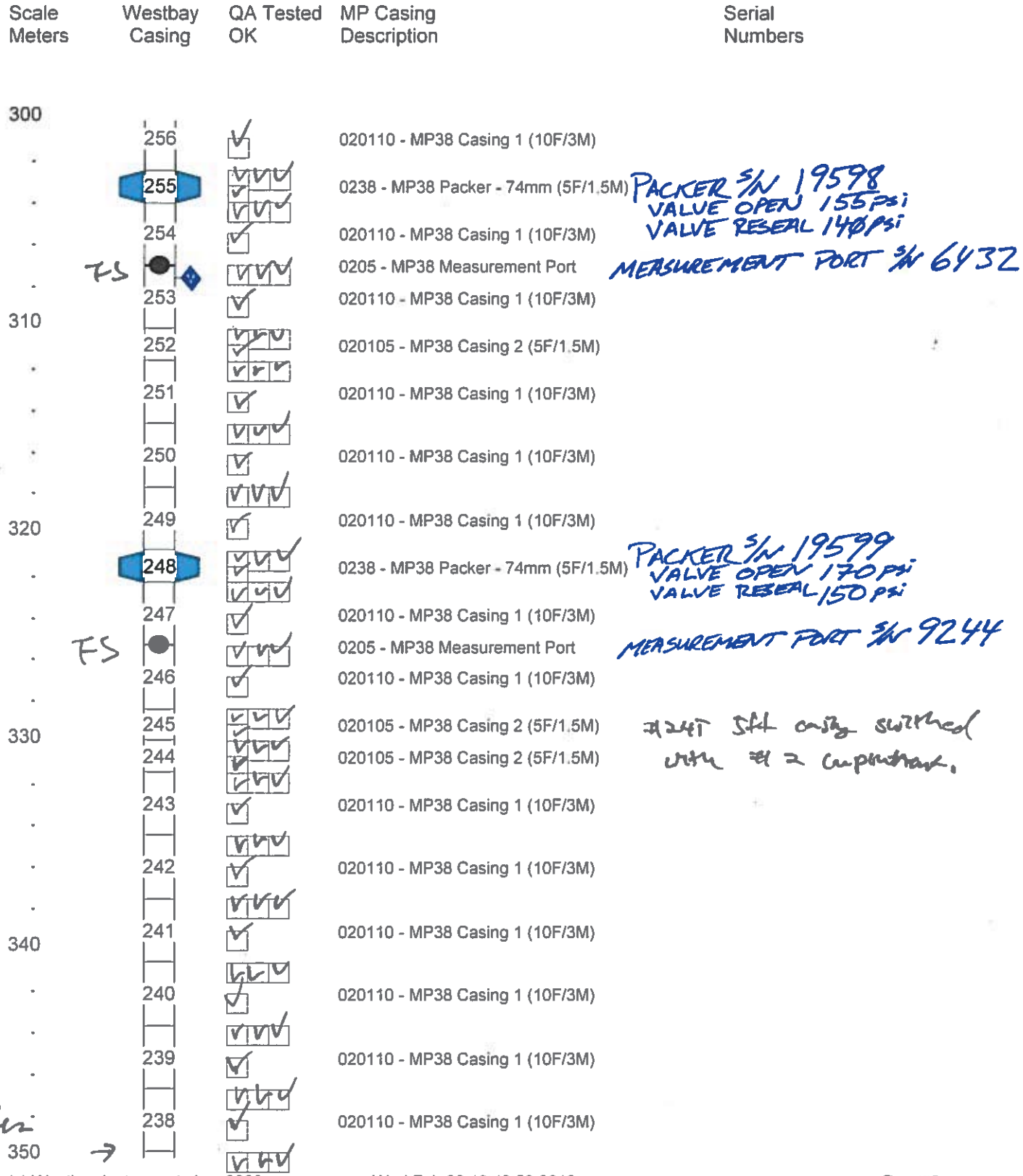
Job No: WB973
Well: IG_BH01

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
250				
	272		020110 - MP38 Casing 1 (10F/3M)	
	271		020110 - MP38 Casing 1 (10F/3M)	
	270		020110 - MP38 Casing 1 (10F/3M)	
260	269		020110 - MP38 Casing 1 (10F/3M)	#269 swapped with #267 casing.
	268		020110 - MP38 Casing 1 (10F/3M)	
	267		020110 - MP38 Casing 1 (10F/3M)	
270	266		020110 - MP38 Casing 1 (10F/3M)	
	265		020110 - MP38 Casing 1 (10F/3M)	
	264		020110 - MP38 Casing 1 (10F/3M)	
Add 5 couplers	263		020110 - MP38 Casing 1 (10F/3M)	
280	262		020110 - MP38 Casing 1 (10F/3M)	
	261		020110 - MP38 Casing 1 (10F/3M)	
	260		020110 - MP38 Casing 1 (10F/3M)	
290	259		020110 - MP38 Casing 1 (10F/3M)	
	258		020110 - MP38 Casing 1 (10F/3M)	
	257		020110 - MP38 Casing 1 (10F/3M)	
300				

Wed Feb 28 18:42:53 2018

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Add water:
4 buckets
30 31 32 33

Wed Feb 28 18:42:53 2018

Westbay Completion Log
Golder/NWMO

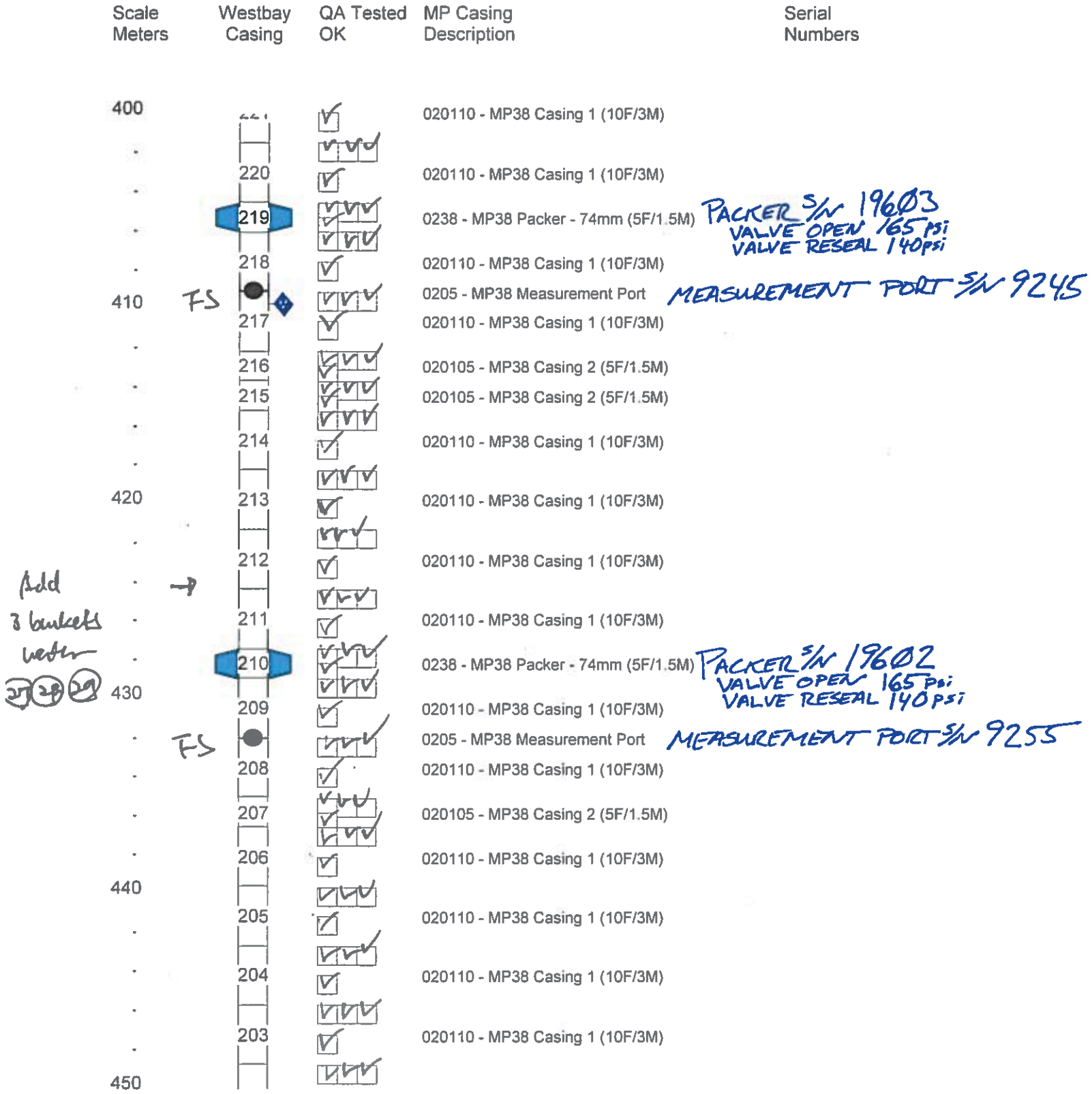
Job No: WB973
Well: IG_BH01

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
350				
	237		020110 - MP38 Casing 1 (10F/3M)	
	236		020110 - MP38 Casing 1 (10F/3M)	
	235		020110 - MP38 Casing 1 (10F/3M)	
360	234		020110 - MP38 Casing 1 (10F/3M)	
	233		020110 - MP38 Casing 1 (10F/3M)	
	232		020110 - MP38 Casing 1 (10F/3M)	
370	231		020110 - MP38 Casing 1 (10F/3M)	
	230		020110 - MP38 Casing 1 (10F/3M)	
	229		020110 - MP38 Casing 1 (10F/3M)	
	228		020110 - MP38 Casing 1 (10F/3M)	
380	227		020110 - MP38 Casing 1 (10F/3M)	
	226		020110 - MP38 Casing 1 (10F/3M)	
	225		020110 - MP38 Casing 1 (10F/3M)	
390	224		020110 - MP38 Casing 1 (10F/3M)	
	223		020110 - MP38 Casing 1 (10F/3M)	
	222		020110 - MP38 Casing 1 (10F/3M)	
400				

Wed Feb 28 18:42:53 2018

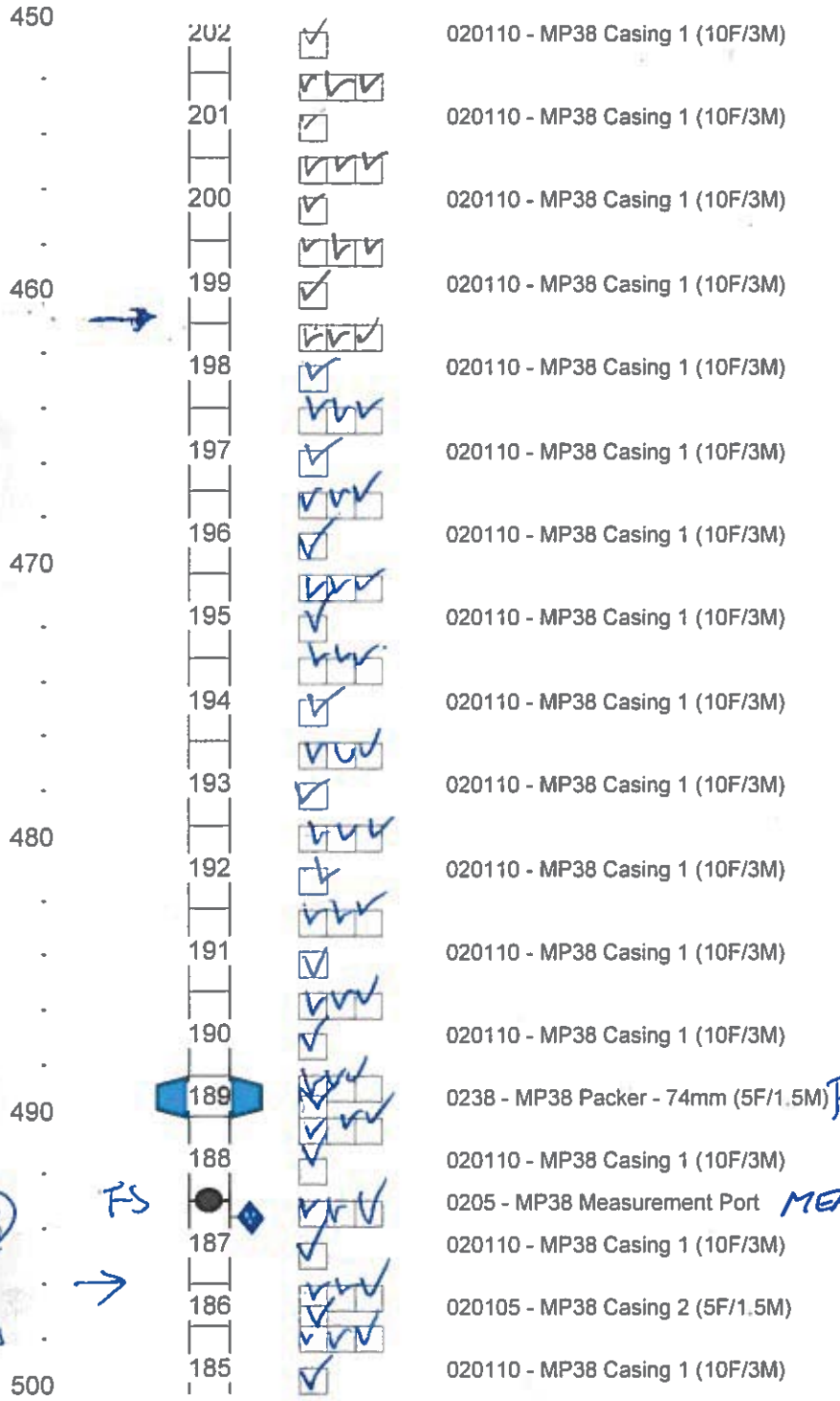
Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Mar 5 / 2018
Joint test tool: 280/280/280
B=0 Resume
# 1618 in the hdl.

Mar 4/2018
1836 stopped.

PACKER S/N 19595
VALVE OPEN 165 psi
VALVE RESEAL 140 psi

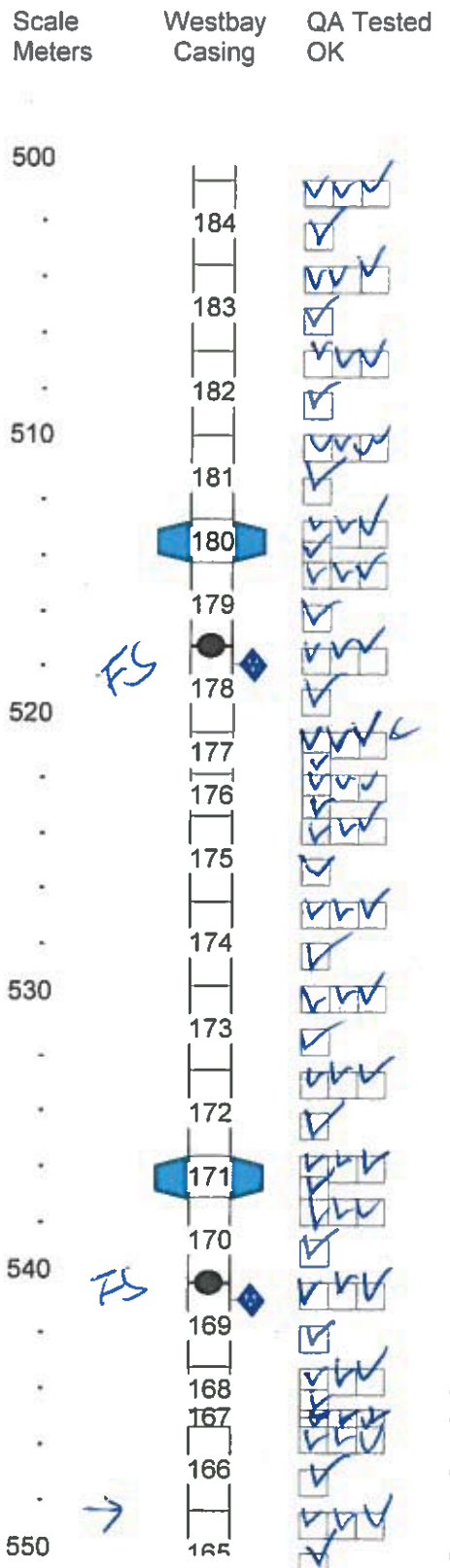
MEASUREMENT PORT S/N 9246

25 27 26

Add 3 buckets of water

Westbay Completion Log
Golder/NWMO

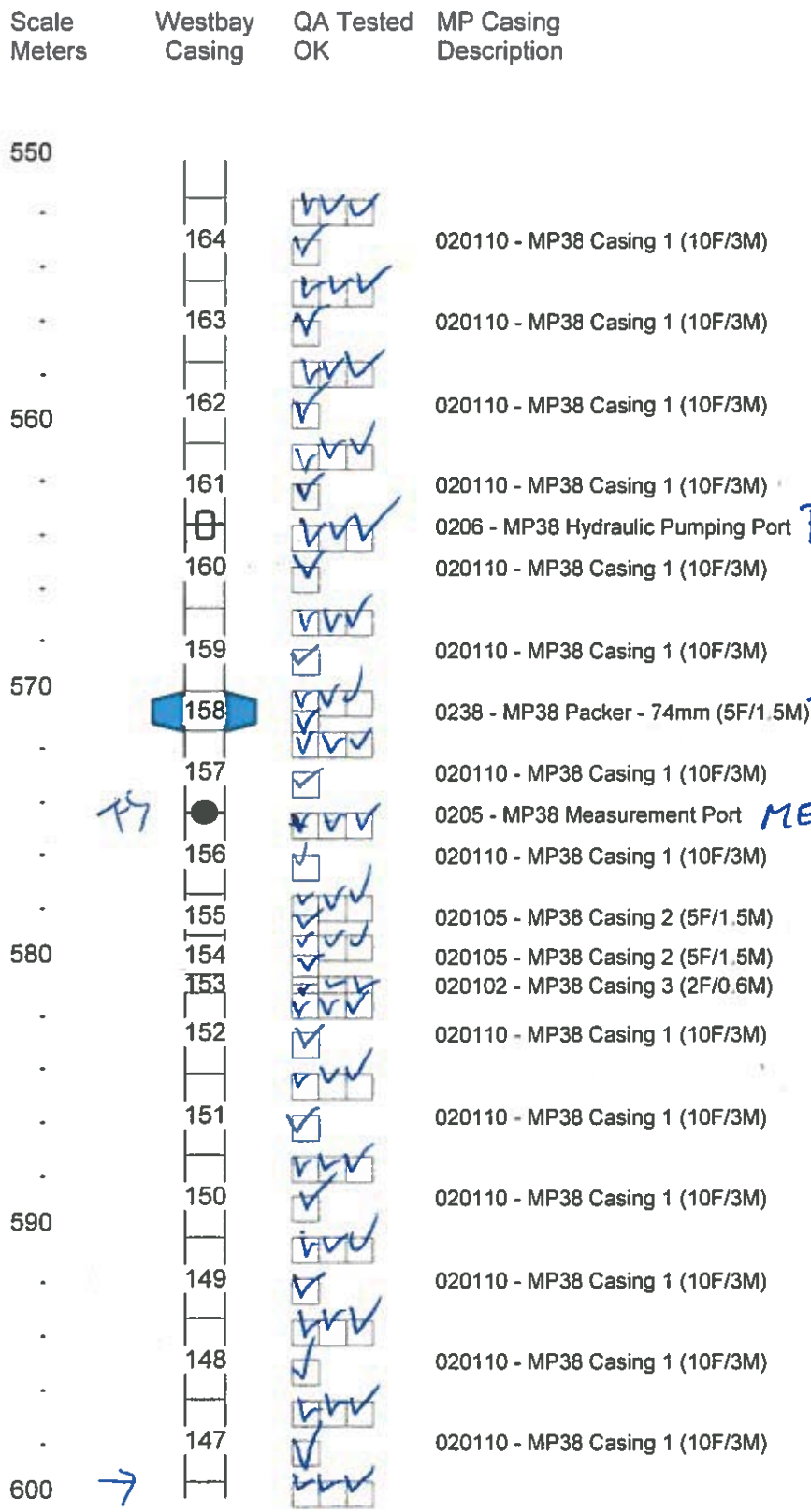
Job No: WB973
Well: IG_BH01



Wed Feb 28 18:43:16 2018

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



PUMPING PORT S/N 115

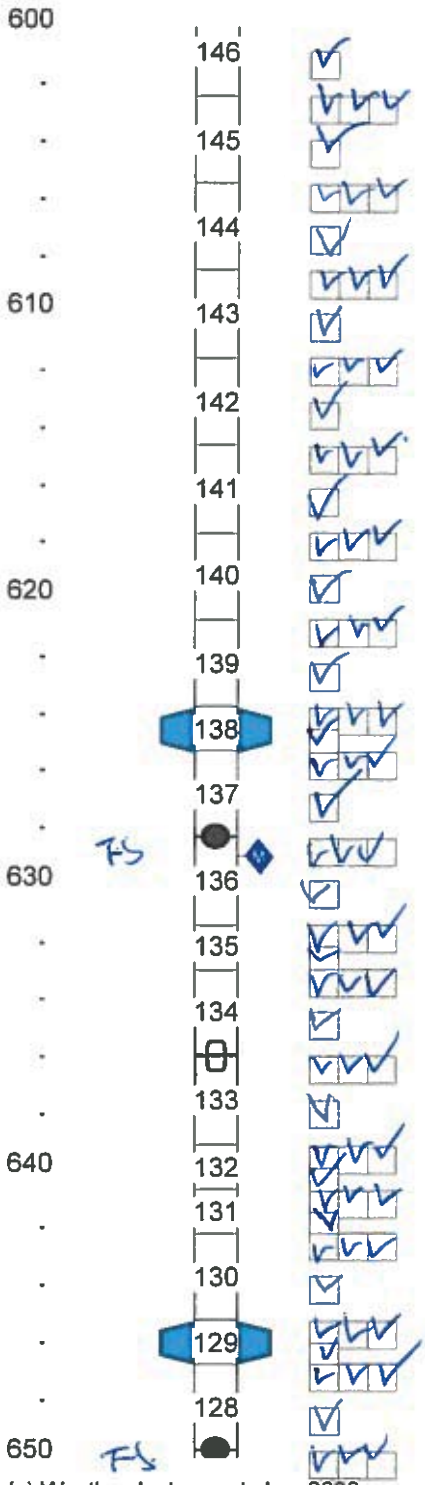
PACKER S/N 19584
VALVE OPEN 170 psi
VALVE RESEAL 155 psi

MEASUREMENT PORT S/N 8730

(14) (20)
Add water
2 buckets

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



PACKER S/N 19585
VALVE OPEN 165 psi
VALVE RESEAL 165 psi

MEASUREMENT PORT S/N 9241

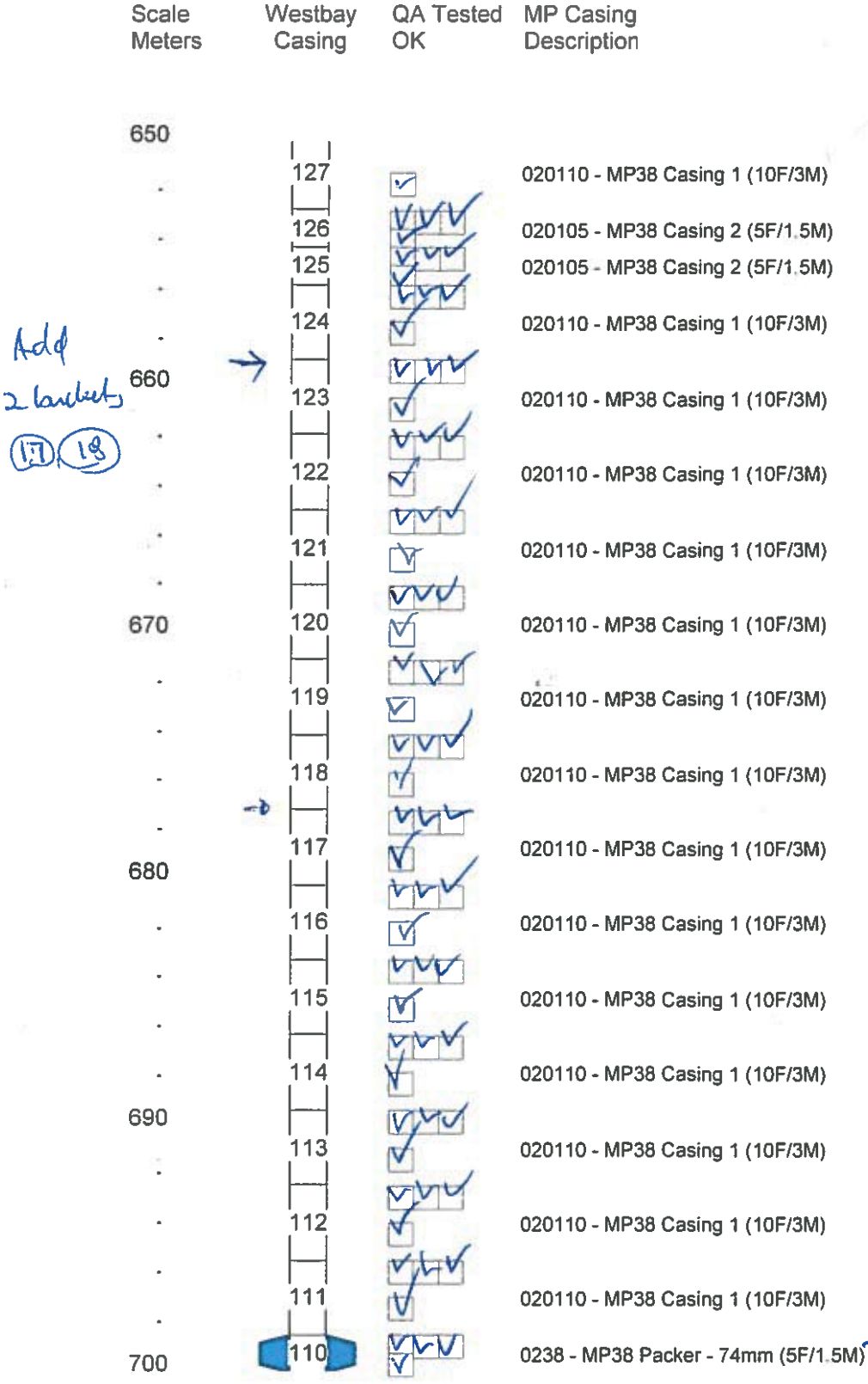
PUMPING PORT S/N 117
#133 ⇒ #264
cut in casing (10 ft)
scratch.

PACKER S/N 19586
VALVE OPEN 165 psi
VALVE RESEAL 145 psi

MEASUREMENT PORT S/N 8535

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01

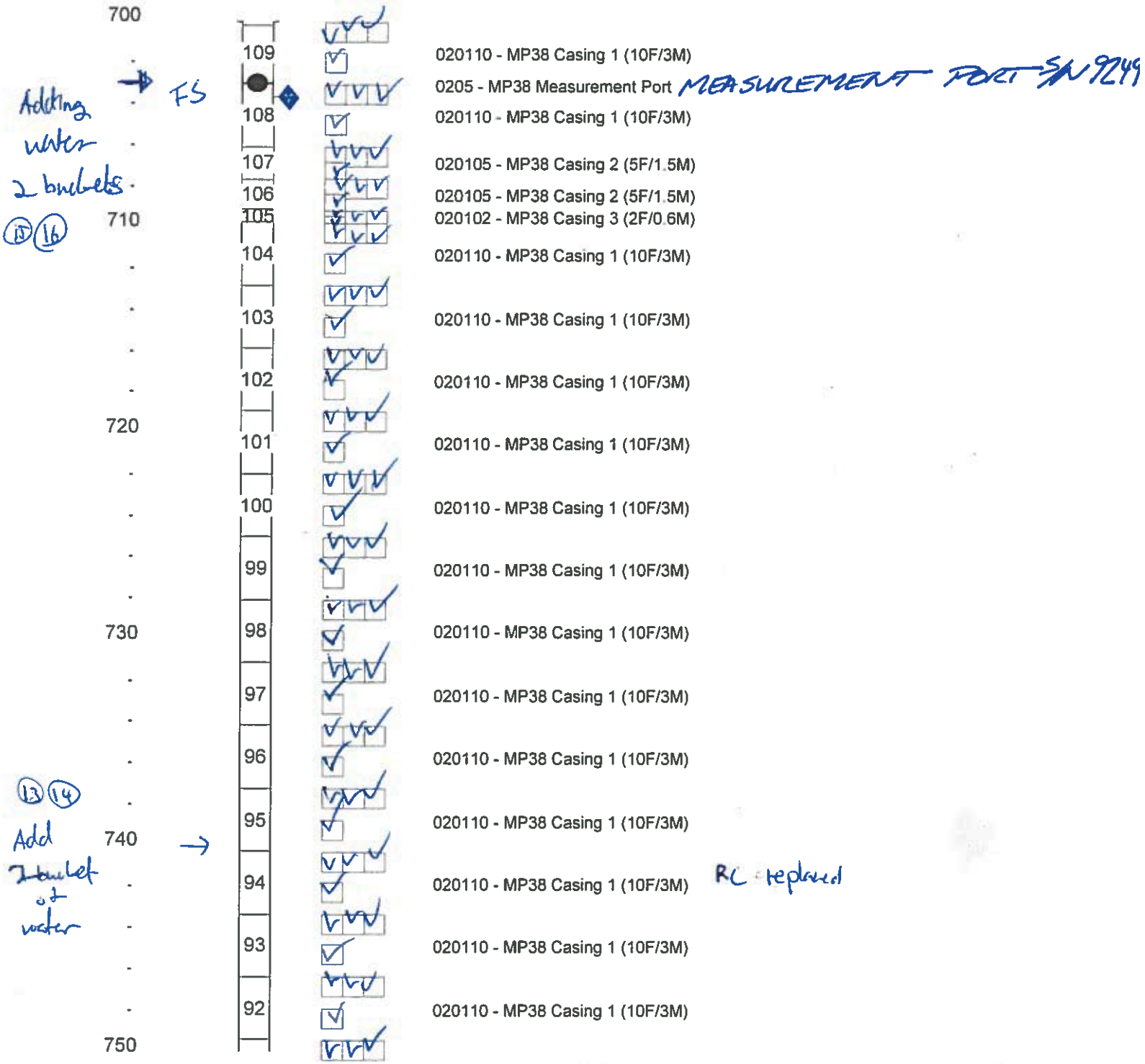


Add 2 buckets (17) (18)

PACKER S/N 1959
VALVE OPEN 165 psi
VALVE RESEAL 150psi

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Wed Feb 28 18:43:16 2018

Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
750				
	91	☑	020110 - MP38 Casing 1 (10F/3M)	
	90	☑	020110 - MP38 Casing 1 (10F/3M)	
	89	☑	020110 - MP38 Casing 1 (10F/3M)	
760	88	☑	020110 - MP38 Casing 1 (10F/3M)	
	87	☑	020110 - MP38 Casing 1 (10F/3M)	
	86	☑	0238 - MP38 Packer - 74mm (5F/1.5M)	PACKER S/N 19588 VALVE OPEN 160psi VALVE RESEAL 145psi
	85	☑	020110 - MP38 Casing 1 (10F/3M)	
770	TS	☑	0205 - MP38 Measurement Port	MEASUREMENT PORT S/N 9248
	84	☑	020110 - MP38 Casing 1 (10F/3M)	
	83	☑	020105 - MP38 Casing 2 (5F/1.5M)	
	82	☑	020105 - MP38 Casing 2 (5F/1.5M)	
	81	☑	020110 - MP38 Casing 1 (10F/3M)	
780	80	☑	020110 - MP38 Casing 1 (10F/3M)	
	79	☑	020110 - MP38 Casing 1 (10F/3M)	
		☑	0206 - MP38 Hydraulic Pumping Port	S/N 107 PUMPING PORT S/N 107
	78	☑	020110 - MP38 Casing 1 (10F/3M)	
	77	☑	020105 - MP38 Casing 2 (5F/1.5M)	
790	76	☑	020105 - MP38 Casing 2 (5F/1.5M)	
	75	☑	020110 - MP38 Casing 1 (10F/3M)	
	74	☑	020110 - MP38 Casing 1 (10F/3M)	
	73	☑	020110 - MP38 Casing 1 (10F/3M)	
800		☑		

Add (12) 1 bucket water

Add (11) 1 bucket of water

Wed Feb 28 18:44:10 2018

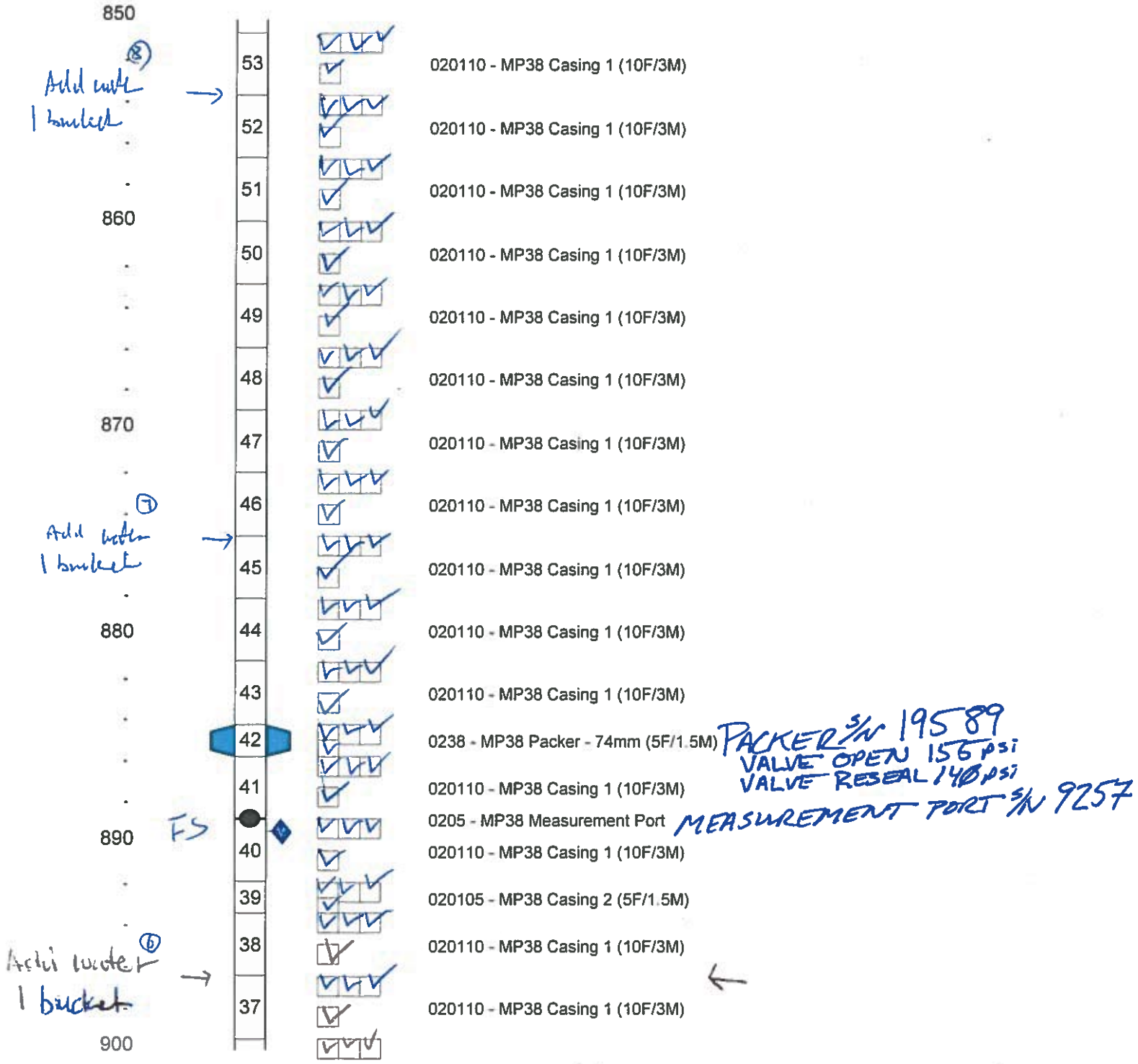
Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01

Scale Meters	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
800	72	✓	0238 - MP38 Packer - 74mm (5F/1.5M)	PACKER S/N 19587 VALVE OPEN 175 psi VALVE RESEAL 160 psi
	71	✓	020110 - MP38 Casing 1 (10F/3M)	
FS		✓	0205 - MP38 Measurement Port	MEASUREMENT PORT S/N 9254
⑩ Add one bucket →	70	✓	020110 - MP38 Casing 1 (10F/3M)	
	69	✓	020105 - MP38 Casing 2 (5F/1.5M)	
810	68	✓	020105 - MP38 Casing 2 (5F/1.5M)	
	67	✓	020102 - MP38 Casing 3 (2F/0.6M)	
	66	✓	020110 - MP38 Casing 1 (10F/3M)	
	65	✓	020110 - MP38 Casing 1 (10F/3M)	
	64	✓	020110 - MP38 Casing 1 (10F/3M)	
820	63	✓	020110 - MP38 Casing 1 (10F/3M)	
	62	✓	020110 - MP38 Casing 1 (10F/3M)	Mon 4/2018 ; Tool P: 280 B=25mm Resume lowering
	61	✓	020110 - MP38 Casing 1 (10F/3M)	
⑨ → 830 Add water 1 bucket	60	✓	020110 - MP38 Casing 1 (10F/3M)	← #60 in the bucket. 18:30 Mon 3/2018
	59	✓	020110 - MP38 Casing 1 (10F/3M)	
	58	✓	020110 - MP38 Casing 1 (10F/3M)	
840	57	✓	020110 - MP38 Casing 1 (10F/3M)	
	56	✓	020110 - MP38 Casing 1 (10F/3M)	
	55	✓	020110 - MP38 Casing 1 (10F/3M)	
850	54	✓	020110 - MP38 Casing 1 (10F/3M)	

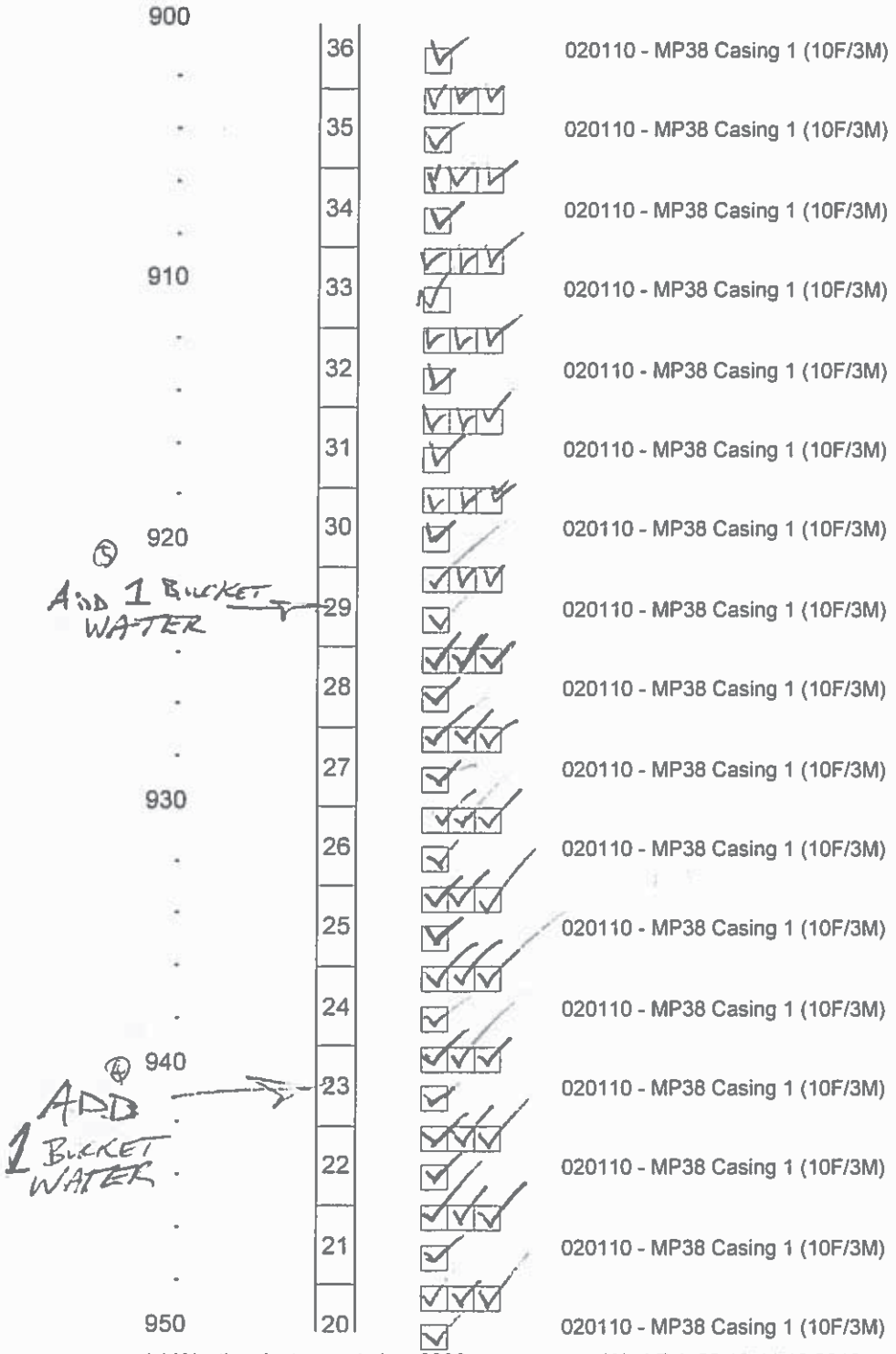
Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



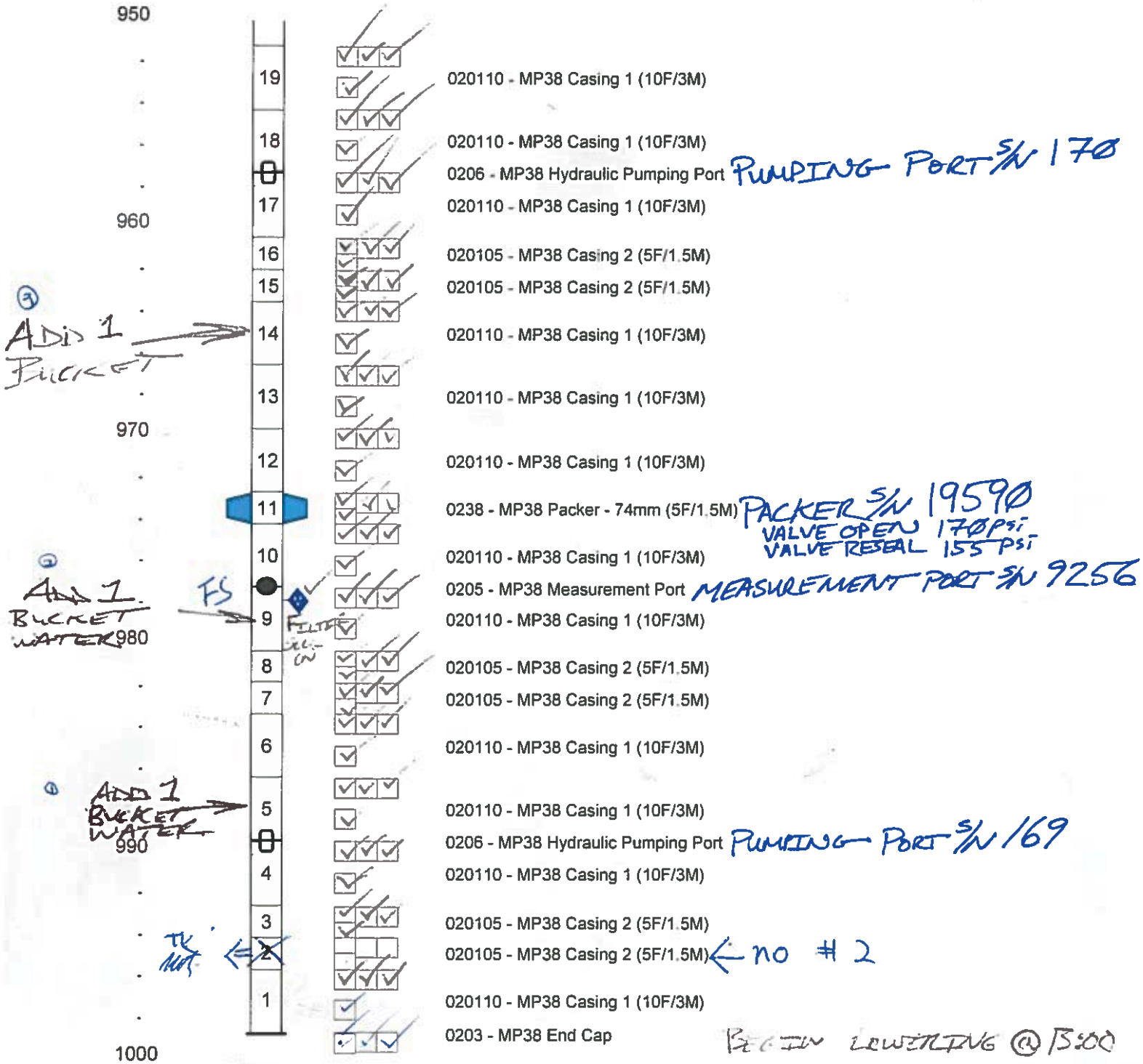
Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Westbay Completion Log
Golder/NWMO

Job No: WB973
Well: IG_BH01



Wed Feb 28 18:44:11 2018

Bottom up test config. 820 psi
JOINT TEST TOOL P 300

APPENDIX C

IG-BH01

SUMMARY COMPLETION LOG

Summary Completion Log - 5 pages

Summary Completion Log

Company: Golder Associates Ltd.
Well: IG_BH01
Site: Ignace,ON
Project: Westbay MP38 Casing Completion

Job No: WB973
Author: TK

Well Information

Reference Datum: Ground Level
Elevation of Datum: 430.72m.
MP Casing Top: 0.33 magl.MP
Casing Length: 997.21 mbgl.

Borehole Depth: 1001.2 m.
Borehole Inclination: Vertical
Borehole Diameter: 98.00 mm

Well Description:
Plastic MP38 System
Other References:

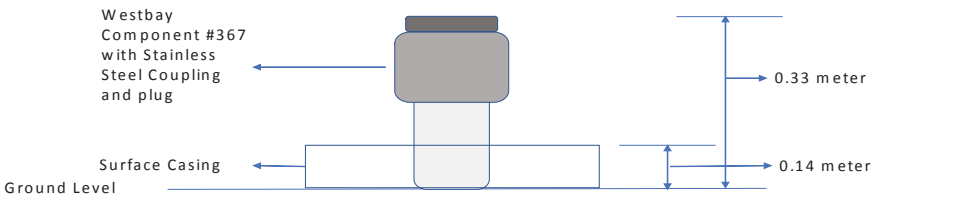
File Information

File Name: IGBH01AB.WWD
Report Date: Tue Mar 20 10:42:27 2018

File Date: Mar 20 09:41:30 2018

Sketch of Wellhead Completion

IG_BH01 Completion Sketch

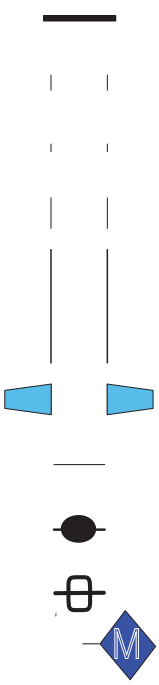


Not to Scale

Legend

(Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(11) 020102 - MP38 Casing 3 (2F/0.6M)

(1) 020101 - MP38 Casing 4 (1F/0.3M)

(48) 020105 - MP38 Casing 2 (5F/1.5M)

(292) 020110 - MP38 Casing 1 (10F/3M)

(20) 0238 - MP38 Packer - 74mm (5F/1.5M)

(344) 0202 - MP38 Regular Coupling

(20) 0205 - MP38 Measurement Port

(8) 0206 - MP38 Hydraulic Pumping Port

(14) 0216 - Magnetic Location Collar

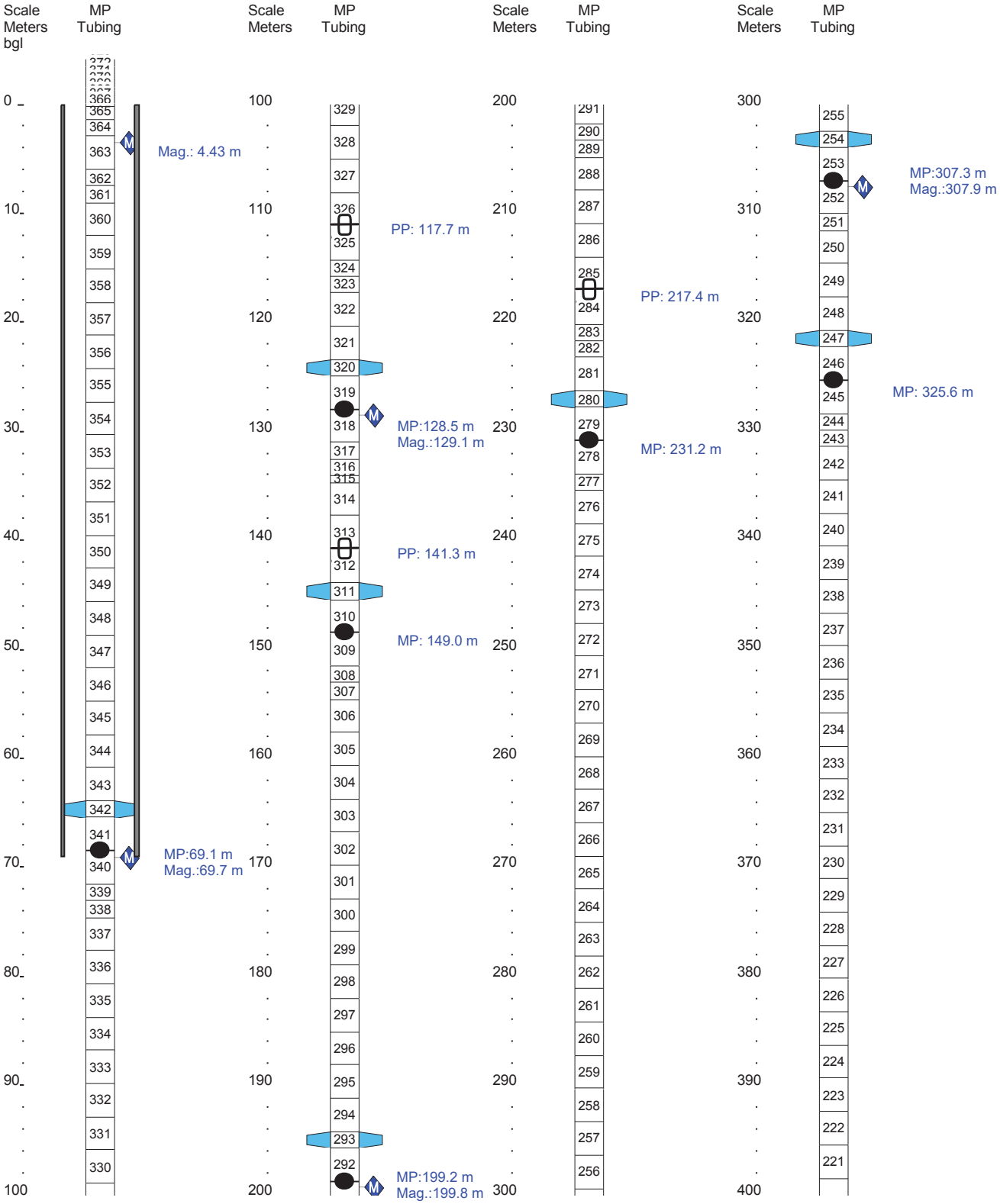
Geology

Backfill/Casing

Mild Steel

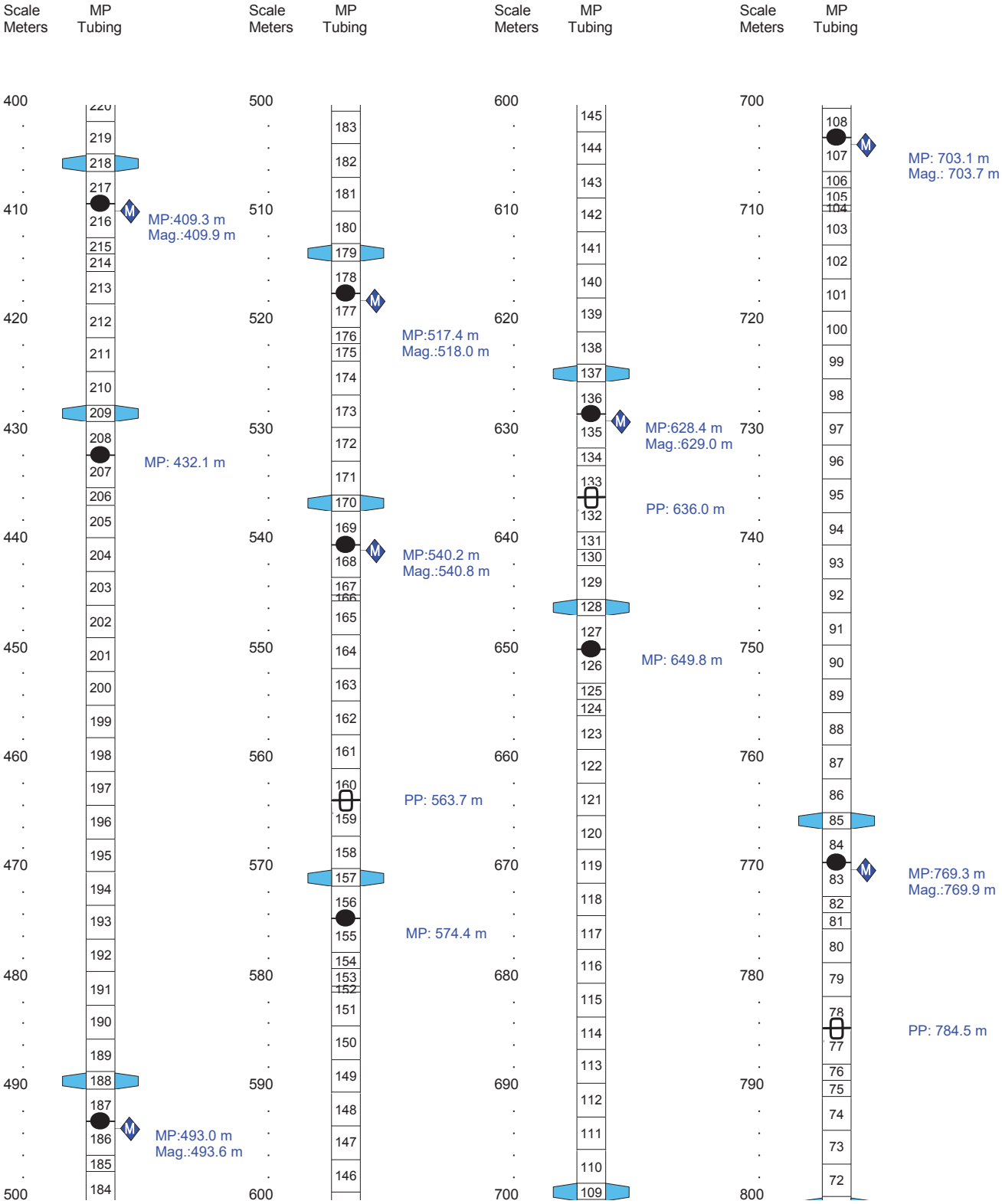
Summary Completion Log
Golder Associates Ltd

Job No: WB973
Well: IG_BH01



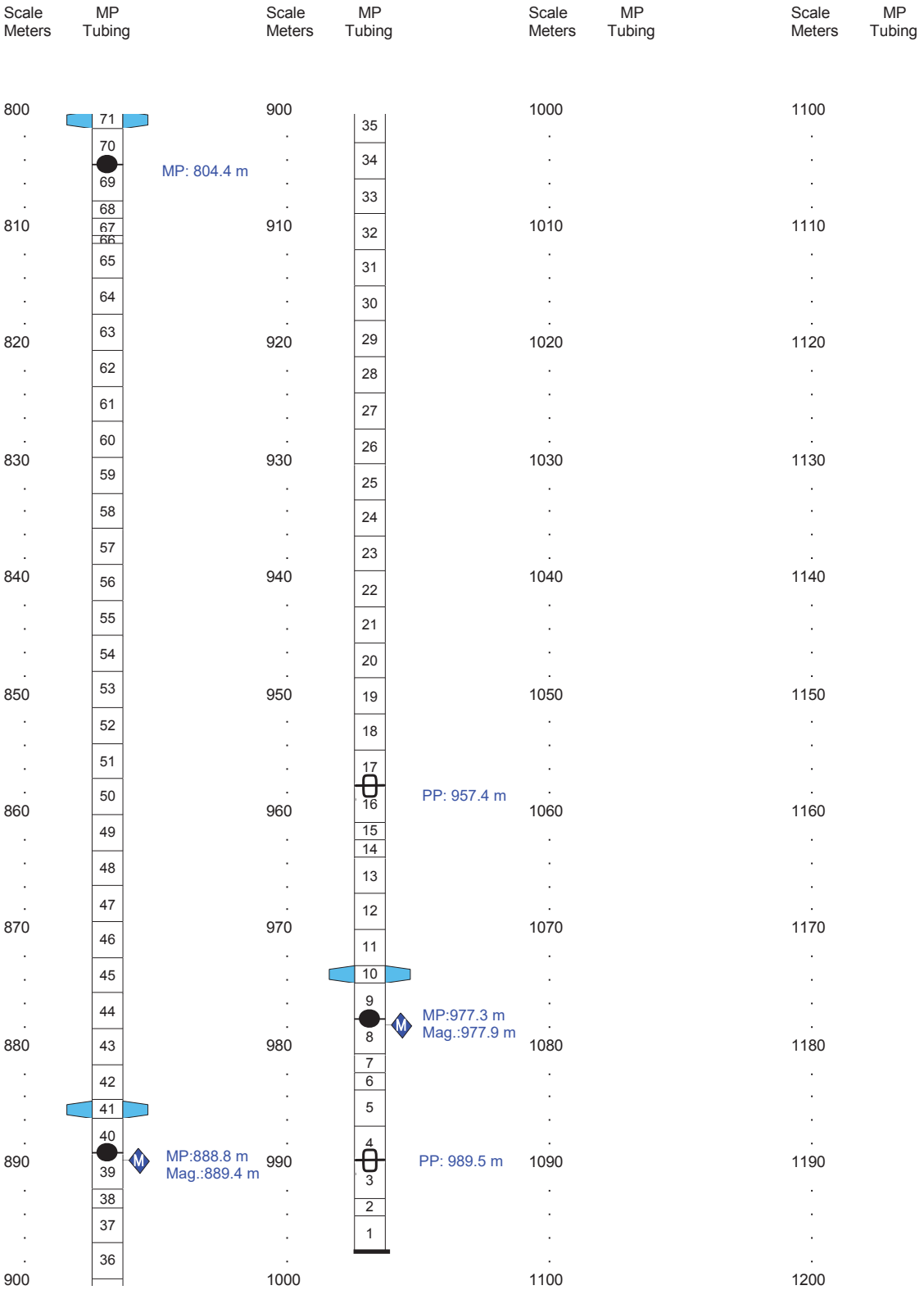
Summary Completion Log
Golder Associates Ltd.

Job No: WB973
Well: IG_BH01



Summary Completion Log
Golder Associates Ltd

Job No: WB973
Well: IG_BH01



APPENDIX D

IG_BH01

TUBING SUMMARY (FIELD COPY)

Tubing Summary (field copy) - 8 pages

Feb 28 – Hour 2 / 2016 TK/AM

1/8

IG-BH01 Tubing Summary (field copy)

No	Comp. Part#	Coupling Part#	Accessory Part #	Depth	Packer Top	Packer Bottom	Measured Length
369	0203			-1.3649			
368	020102	0202		-1.3171			
367	020102	0202		-0.7075			
366	020105	0202		-0.09793			
365	020105	0202		1.426			
364	020110	0202	0216	2.9499			3.046
363	020105	0202		5.9978			1.522
362	020105	0202		7.5217			1.521
361	020110	0202		9.0456			3.047
360	020110	0202		12.093			3.047
359	020110	0202		15.141			3.046
358	020110	0202		18.189			3.048
357	020110	0202		21.237			3.051
356	020110	0202		24.285			3.047
355	020110	0202		27.333			3.045
354	020110	0202		30.381			3.049
353	020110	0202		33.428			3.045
352	020110	0202		36.476			3.046
351	020110	0202		39.524			3.045
350	020110	0202		42.572			3.049
349	020110	0202		45.62			3.049
348	020110	0202		48.668			3.045
347	020110	0202		51.716			3.045
346	020110	0202		54.763			3.046
345	020110	0202		57.811			3.047
344	020110	0202		60.859			3.046
343	0238	0202		63.907	64.297	65.197	1.522
342	020110	0202		65.431			3.045
341	020110	0205	0216	68.479			3.047
340	020105	0202		71.527			1.521
339	020105	0202		73.051			1.521
338	020110	0202		74.574			3.046
337	020110	0202		77.622			3.045
336	020110	0202		80.67			3.045
335	020110	0202		83.718			3.045
334	020110	0202		86.766			3.045
333	020110	0202		89.814			3.046
332	020110	0202		92.862			3.047
331	020110	0202		95.909			3.045
330	020110	0202		98.957			3.045
329	020110	0202		102.01			3.045
328	020110	0202		105.05			3.045
327	020110	0202		108.1			3.046
326	020110	0206		111.15			3.126
325	020105	0202		114.27			1.523

TGR + 10cm from Datum

324	020105	0202		115.8			1.521
323	020110	0202		117.32			3.045
322	020110	0202		120.37			3.045
321	0238	0202		123.42	123.81	124.71	1.522
320	020110	0202		124.94			3.045
319	020110	0205	0216	127.99			3.045
318	020105	0202		131.04			1.524
317	020105	0202		132.56			1.523
316	020102	0202		134.08			0.609
315	020110	0202		134.69			3.046
314	020110	0202		137.74			3.046
313	020110	0206		140.79			3.126
312	0238	0202		143.91	144.3	145.2	1.521
311	020110	0202		145.44			3.046
310	020110	0205		148.48			3.046
309	020105	0202		151.53			1.521
308	020105	0202		153.06			1.521
307	020110	0202		154.58			3.046
306	020110	0202		157.63			3.048
305	020110	0202		160.68			3.049
304	020110	0202		163.72			3.048
303	020110	0202		166.77			3.044
302	020110	0202		169.82			3.046
301	020110	0202		172.87			3.047
300	020110	0202		175.92			3.046
299	020110	0202		178.96			3.043 ← lst.
298	020110	0202		182.01			3.044
297	020110	0202		185.06			3.046
296	020110	0202		188.11			3.045
295	020110	0202		191.15			3.045
294	0238	0202		194.2	194.59	195.49	1.523
293	020110	0202		195.73			3.045
292	020110	0205	0216	198.77			3.049
291	020105	0202		201.82			1.522
290	020105	0202		203.35			1.521
289	020110	0202		204.87			3.045
288	020110	0202		207.92			3.045
287	020110	0202		210.97			3.046
286	020110	0202		214.01			3.045
285	020110	0206		217.06			3.125
284	020105	0202		220.19			1.520
283	020105	0202		221.71			1.520
282	020110	0202		223.23			3.045
281	0238	0202		226.28	226.67	227.57	1.522
280	020110	0202		227.81			3.045
279	020110	0205		230.85			3.047
278	020105	0202		233.9			1.520

277	020110	0202		235.42			3.045
276	020110	0202		238.47			3.044
275	020110	0202		241.52			3.044
274	020110	0202		244.57			3.045
273	020110	0202		247.62			3.046
272	020110	0202		250.66			3.045
271	020110	0202		253.71			3.045
270	020110	0202		256.76			3.044
269	020110	0202		259.81			3.044
268	020110	0202		262.86			3.045
267	020110	0202		265.9			3.044
266	020110	0202		268.95			3.043
265	020110	0202		272			3.045
264	020110	0202		275.05			3.045
263	020110	0202		278.09			3.045
262	020110	0202		281.14			3.044
261	020110	0202		284.19			3.047
260	020110	0202		287.24			3.044
259	020110	0202		290.29			3.045
258	020110	0202		293.33			3.045
257	020110	0202		296.38			3.045
256	020110	0202		299.43			3.045
255	0238	0202		302.48	302.87	303.77	1.521
254	020110	0202		304			3.045
253	020110	0205	0216	307.05			3.045
252	020105	0202		310.1			1.520
251	020110	0202		311.62			3.045
250	020110	0202		314.67			3.045
249	020110	0202		317.72			3.045
248	0238	0202		320.76	321.15	322.05	~~1.530~~ 1.522
247	020110	0202		322.29			3.044
246	020110	0205		325.34			3.044
245	020105	0202		328.38			1.521
244	020105	0202		329.91			1.521
243	020110	0202		331.43			3.046
242	020110	0202		334.48			3.045
241	020110	0202		337.53			3.045
240	020110	0202		340.58			3.045
239	020110	0202		343.62			3.050
238	020110	0202		346.67			3.046
237	020110	0202		349.72			3.047
236	020110	0202		352.77			3.044
235	020110	0202		355.81			3.044 ← 2nd.
234	020110	0202		358.86			3.045
233	020110	0202		361.91			3.044
232	020110	0202		364.96			3.044
231	020110	0202		368.01			3.046

230	020110	0202		371.05			3.046
229	020110	0202		374.1			3.047
228	020110	0202		377.15			3.047
227	020110	0202		380.2			3.044
226	020110	0202		383.25			3.047
225	020110	0202		386.29			3.045
224	020110	0202		389.34			3.046
223	020110	0202		392.39			3.046
222	020110	0202		395.44			3.044
221	020110	0202		398.48			3.045
220	020110	0202		401.53			3.045
219	0238	0202		404.58	404.97	405.87	1.521
218	020110	0202		406.1			3.046
217	020110	0205	0216	409.15			3.046
216	020105	0202		412.2			1.521
215	020105	0202		413.72			1.521
214	020110	0202		415.25			3.045
213	020110	0202		418.3			3.044
212	020110	0202		421.34			3.046
211	020110	0202		424.39			3.045
210	0238	0202		427.44	427.83	428.73	1.524
209	020110	0202		428.96			3.047
208	020110	0205		432.01			3.045
207	020105	0202		435.06			1.525
206	020110	0202		436.58			3.047
205	020110	0202		439.63			3.046
204	020110	0202		442.68			3.046
203	020110	0202		445.73			3.045
202	020110	0202		448.77			3.047
201	020110	0202		451.82			3.045
200	020110	0202		454.87			3.045
199	020110	0202		457.92			3.049
198	020110	0202		460.97			3.046
197	020110	0202		464.01			3.045
196	020110	0202		467.06			3.046
195	020110	0202		470.11			3.044
194	020110	0202		473.16			3.046
193	020110	0202		476.21			3.045
192	020110	0202		479.25			3.045
191	020110	0202		482.3			3.045
190	020110	0202		485.35			3.045
189	0238	0202		488.4	488.79	489.69	1.522
188	020110	0202		489.92			3.047
187	020110	0205	0216	492.97			3.045
186	020105	0202		496.02			1.521
185	020110	0202		497.54			3.047
184	020110	0202		500.59			3.046

183	020110	0202		503.64			3.046 ← 3rd
182	020110	0202		506.68			3.045
181	020110	0202		509.73			3.044
180	0238	0202		512.78	513.17	514.07	1.521
179	020110	0202		514.3			3.045
178	020110	0205	0216	517.35			3.045
177	020105	0202		520.4			1.521
176	020105	0202		521.92			1.521
175	020110	0202		523.45			3.045
174	020110	0202		526.49			3.045
173	020110	0202		529.54			3.049
172	020110	0202		532.59			3.048
171	0238	0202		535.64	536.03	536.93	1.521
170	020110	0202		537.16			3.049
169	020110	0205	0216	540.21			3.045
168	020105	0202		543.26			1.520
167	020102	0202		544.78			0.609
166	020110	0202		545.39			3.046
165	020110	0202		548.44			3.048
164	020110	0202		551.49			3.047
163	020110	0202		554.53			3.047
162	020110	0202		557.58			3.052
161	020110	0202		560.63			3.045
160	020110	0206		563.68			3.126
159	020110	0202		566.8			3.045
158	0238	0202		569.85	570.24	571.14	1.523
157	020110	0202		571.37			3.047
156	020110	0205		574.42			3.046
155	020105	0202		577.47			1.520
154	020105	0202		578.99			1.524
153	020102	0202		580.52			0.608
152	020110	0202		581.13			3.046
151	020110	0202		584.18			3.047
150	020110	0202		587.22			3.046
149	020110	0202		590.27			3.046
148	020110	0202		593.32			3.045
147	020110	0202		596.37			3.044
146	020110	0202		599.41			3.050
145	020110	0202		602.46			3.045
144	020110	0202		605.51			3.046
143	020110	0202		608.56			3.048
142	020110	0202		611.61			3.049
141	020110	0202		614.65			3.046
140	020110	0202		617.7			3.051 3.051
139	020110	0202		620.75			3.047
138	0238	0202		623.8	624.19	625.09	1.522
137	020110	0202		625.32			3.046

136	020110	0205	0216	628.37			3.045
135	020105	0202		631.42			1.521
134	020110	0202		632.94			3.046
133	020110	0206		635.99			3.126
132	020105	0202		639.11			1.522
131	020105	0202		640.64			1.521
130	020110	0202		642.16			3.045
129	0238	0202		645.21	645.6	646.5	1.522
128	020110	0202		646.73			3.047
127	020110	0205		649.78			3.045
126	020105	0202		652.83			1.523
125	020105	0202		654.35			1.521
124	020110	0202		655.88			3.046
123	020110	0202		658.92			3.047
122	020110	0202		661.97			3.045
121	020110	0202		665.02			3.046
120	020110	0202		668.07			3.045 — 4th.
119	020110	0202		671.12			3.046
118	020110	0202		674.16			3.045
117	020110	0202		677.21			3.045
116	020110	0202		680.26			3.045
115	020110	0202		683.31			3.045
114	020110	0202		686.35			3.046
113	020110	0202		689.4			3.045
112	020110	0202		692.45			3.047
111	020110	0202		695.5			3.046
110	0238	0202		698.55	698.94	699.84	1.521
109	020110	0202		700.07			3.047
108	020110	0205	0216	703.12			3.045
107	020105	0202		706.17			1.521
106	020105	0202		707.69			1.522
105	020102	0202		709.21			0.611
104	020110	0202		709.82			3.045
103	020110	0202		712.87			3.045
102	020110	0202		715.92			3.045
101	020110	0202		718.97			3.045
100	020110	0202		722.01			3.045
99	020110	0202		725.06			3.045
98	020110	0202		728.11			3.045
97	020110	0202		731.16			3.045
96	020110	0202		734.21			3.045
95	020110	0202		737.25			3.045
94	020110	0202		740.3			3.046
93	020110	0202		743.35			3.046
92	020110	0202		746.4			3.045
91	020110	0202		749.44			3.046
90	020110	0202		752.49			3.047

89	020110	0202		755.54			3.048
88	020110	0202		758.59			3.047
87	020110	0202		761.64			3.046
86	0238	0202		764.68	765.07	765.97	1.522
85	020110	0202		766.21			3.046
84	020110	0205	0216	769.26			3.046
83	020105	0202		772.3			1.521
82	020105	0202		773.83			1.522
81	020110	0202		775.35			3.045
80	020110	0202		778.4			3.046
79	020110	0202		781.45			3.045
78	020110	0206		784.5			3.127
77	020105	0202		787.62			1.522
76	020105	0202		789.14			1.521
75	020110	0202		790.67			3.049
74	020110	0202		793.71			3.046
73	020110	0202		796.76			3.048
72	0238	0202		799.81	800.2	801.1	1.522
71	020110	0202		801.33			3.047
70	020110	0205		804.38			3.045
69	020105	0202		807.43			1.521
68	020105	0202		808.95			1.521
67	020102	0202		810.48			0.608
66	020110	0202		811.09			3.045
65	020110	0202		814.14			3.051
64	020110	0202		817.18			3.047
63	020110	0202		820.23			3.050
62	020110	0202		823.28			3.046 ← SCL
61	020110	0202		826.33			3.045
60	020110	0202		829.37			3.044
59	020110	0202		832.42			3.045
58	020110	0202		835.47			3.046
57	020110	0202		838.52			3.045
56	020110	0202		841.57			3.044
55	020110	0202		844.61			3.045
54	020110	0202		847.66			3.045
53	020110	0202		850.71			3.045
52	020110	0202		853.76			3.046
51	020110	0202		856.81			3.048
50	020110	0202		859.85			3.045
49	020110	0202		862.9			3.044
48	020110	0202		865.95			3.045
47	020110	0202		869			3.046
46	020110	0202		872.04			3.044
45	020110	0202		875.09			3.046
44	020110	0202		878.14			3.045
43	020110	0202		881.19			3.044

42	0238	0202		884.24	884.63	885.53	1.522
41	020110	0202		885.76			3.045
40	020110	0205	0216	888.81			3.045
39	020105	0202		891.86			1.522
38	020110	0202		893.38			3.046
37	020110	0202		896.43			3.048
36	020110	0202		899.48			3.046
35	020110	0202		902.52			3.048
34	020110	0202		905.57			3.047
33	020110	0202		908.62			3.046
32	020110	0202		911.67			3.046
31	020110	0202		914.71			3.046
30	020110	0202		917.76			3.045
29	020110	0202		920.81			3.045
28	020110	0202		923.86			3.047
27	020110	0202		926.91			3.047
26	020110	0202		929.95			3.045
25	020110	0202		933			3.049
24	020110	0202		936.05			3.044
23	020110	0202		939.1			3.045
22	020110	0202		942.15			3.045
21	020110	0202		945.19			3.045
20	020110	0202		948.24			3.045
19	020110	0202		951.29			3.046
18	020110	0202		954.34			3.048
17	020110	0206		957.38			3.123
16	020105	0202		960.51			1.521
15	020105	0202		962.03			1.522
14	020110	0202		963.56			3.044
13	020110	0202		966.6			3.045
12	020110	0202		969.65			3.045
11	0238	0202		972.7	973.09	973.99	1.523
10	020110	0202		974.22			3.045
9	020110	0205	0216	977.27			3.045
8	020105	0202		980.32			1.523
7	020105	0202		981.84			1.522
6	020110	0202		983.37			3.047
5	020110	0202		986.42			3.045
4	020110	0206		989.46			3.124
3	020105	0202		992.59			1.523
2	020105	0202		994.11			1.522
1	020110	0202		995.64			3.045
0	0203			998.68			.05

3.045

APPENDIX E

IG-BH01

SUMMARY COMPLETION LOG (FIELD COPY)

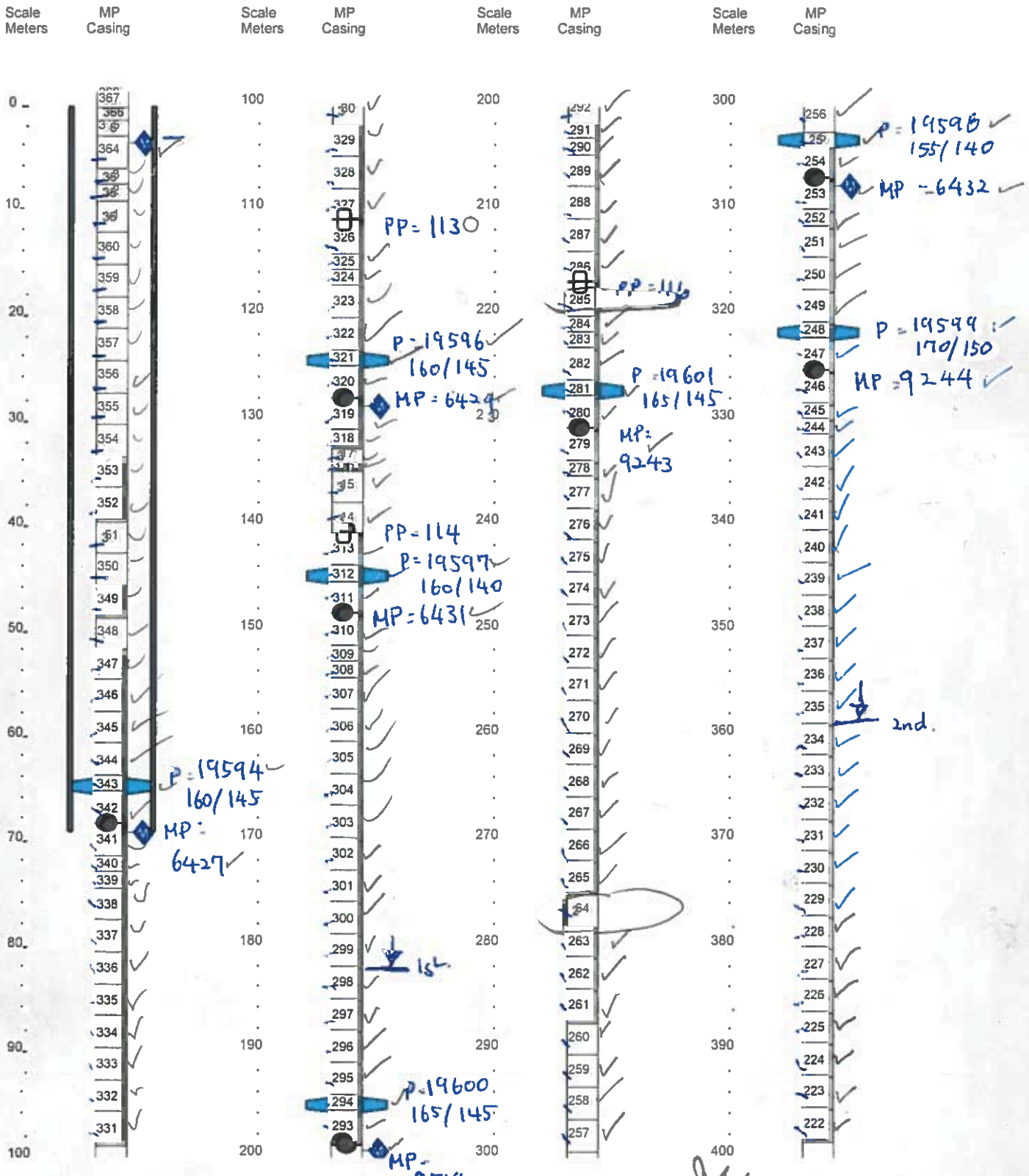
Summary Completion Log (field copy) - 3 pages

Feb 28 - March 2 /2018

Tk 1 dm

Summary Completion Log (field copy)
Golder/NWMO

Job No: WB973
Well: IG_BH01

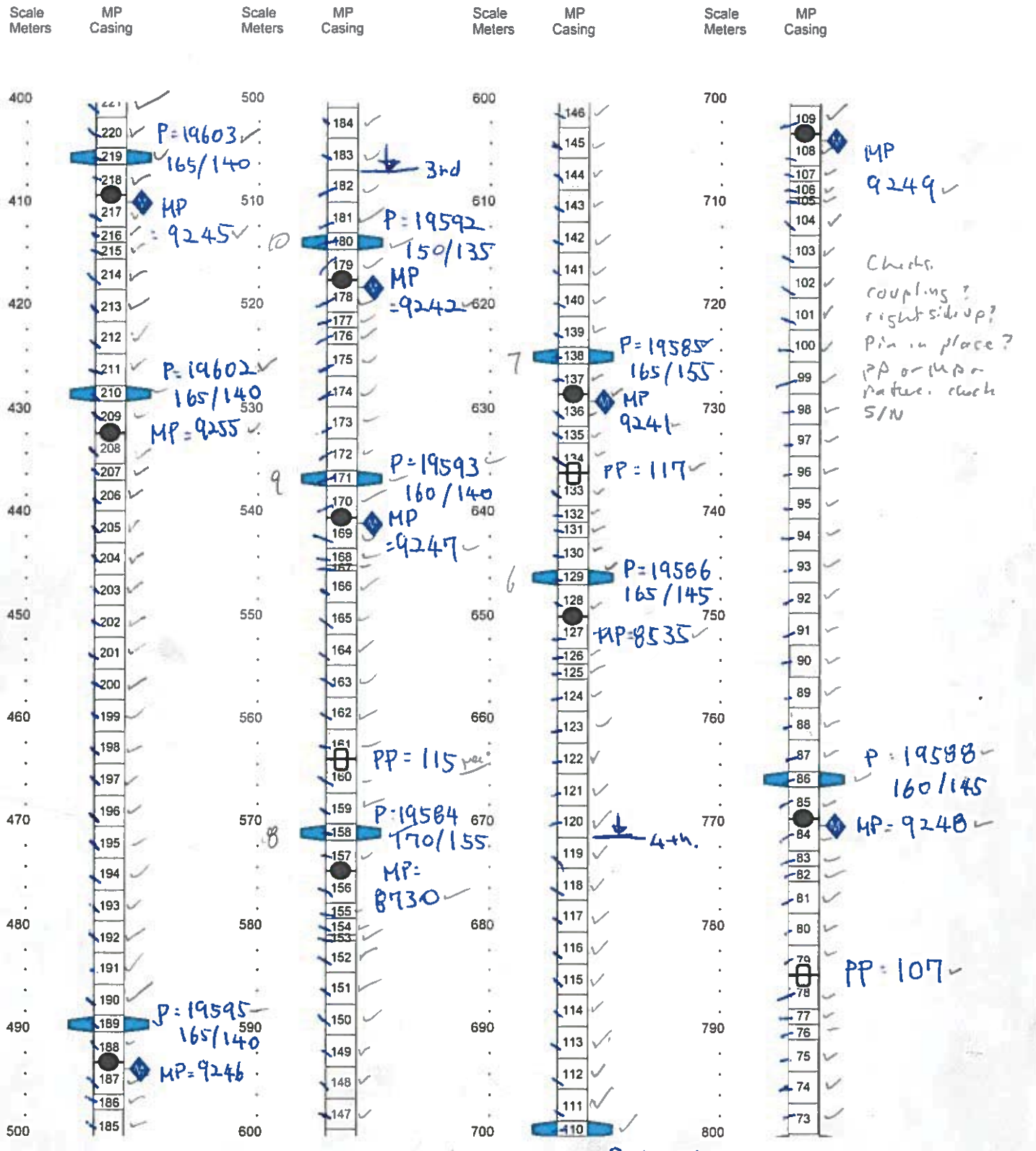


Adrian Kelly
March 1, 2018

March 1, 2018

Summary Completion Log (field copy)
Golder/NWMO

Job No: WB973
Well: IG_BH01

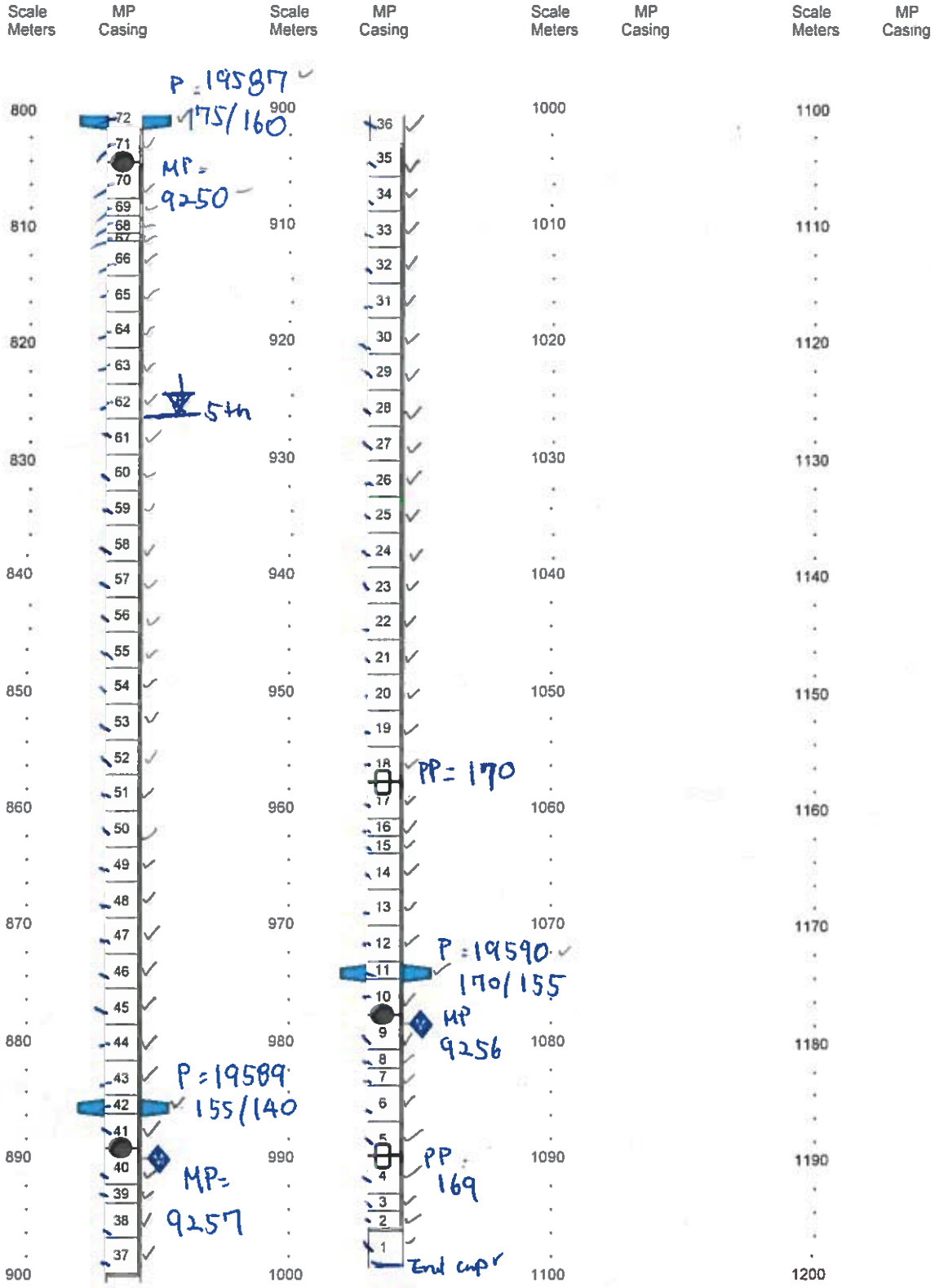


adrian Kent
MAR 1 2018

Mark 1 2018

Summary Completion Log (field copy)
Golder/NWMO

Job No: WB973
Well: IG_BH01



March 1, 2018

March 1, 2018

APPENDIX F
IG-BH01

PRE-INFLATION PRESSURE PROFILE

Pre-Inflation Field Data and Calculation Sheet (March 6, 2018) - 2 pages

Westbay Instruments

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Pre-Inflation Profile

Well No.: IG_BH01
Datum: GROUND LEVEL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: VERTICLE

Probe Type: OPEN/CLOSE SAMPLER
Serial No.: EMS 4960
Probe Range: 2000psi
Westbay Casing Type: MP38
Sampler Valve Position: CLOSED

Date: MARCH 6TH 2018
Client: NWMO/GOLDERS
Job No.: WB973
Location: IG_BH01
Weather: CLEAR & SUNNY ~0°C
Operator: AM/TK

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start:	Pressure	14.05 psi	Finish: 14.07
	Temp	11.8°C	5.59
	Time	14:55	18.58

P_{atm} 14.05 psi

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
1	977.27			1219.56	1405.28	15:50	14.07	1219.63	978.36	-1.09	977.27-338.81=88.46m
2	888.81			1092.73	1278.32	16:05	13.31	1092.74	889.08	~~-0.3~~	Dz=0.27
3	804.38			971.83	1157.21	16:19	12.57	971.81	803.91	+0.47	889.4-885.36=4.04
4	769.26			921.53	1106.80	16:27	12.04	921.52	768.46	+0.80	804.38-4.04=800.34
5	703.12			826.78	1012.33	16:35	11.41	826.83	702.03	+1.09	PEAK 2100PSI 703.12-700.25=2.87
6	649.78			750.35	936.13	16:45	10.76	750.43	648.44	+1.34	649.78-2.87=646.91
7	628.37			719.75	905.56	16:54	10.46	719.77	626.94	+1.43	628.37-625.79=2.58
8	574.42			642.51	828.66	17:03	10.10	642.51	572.86	+1.56	574.42-2.58=571.84
9	540.21			593.48	779.85	17:09	9.67	593.47	538.54	+1.67	
10	517.35			560.77	747.17	17:16	9.34	560.82	515.56	+1.79	
11	492.97			525.83	712.31	17:26	9.07	525.85	491.04	+1.93	492.97-490.81=2.16
12	432.01			438.59	625.36	17:36	8.57	~~427~~	429.89	+2.12	432.01-2.16=429.85 2ND P1=438.53
13	409.15			405.90	592.75	17:44	8.22	405.93	406.96	+2.19	409.15-407.29=1.86
14	325.34			285.90	473.14	17:58	7.30		322.85	+2.49	325.34-1.86=323.48
15	307.05			259.65	446.94	18:08	7.08	259.72	304.42	+2.63	307.05-305.50=1.55

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O | Dz = piezometric level in zone | Patm = atmospheric pressure | H = pressure head of water in zone | Dp = true depth of measurement port

ARM OUT 15 ROT SHOE OUT 23 ROT IN AIR, SHOE IN 23 ROT IN AIR, ARM IN 16 ROT

COLLAR @ 3.55m
COLLAR @ 973.53m
COLLAR @ 335.36m

COLLAR @ 700.25
COLLAR @ 625.79
COLLAR @ 537.89

COLLAR @ 490.81
COLLAR @ 407.29
COLLAR @ 305.50

Westbay Instruments

Westbay Piezometric Pressures/Levels

Pre - Inflation Profile

Field Data and Calculation Sheet

Well No.: IG_BH01
Datum: GROUND LEVEL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: VERTICLE

Probe Type: O/C SAMPLER
Serial No.: IMS 4960
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: CLOSED

Date: MARCH 6TH, 2018
Client: GOLDER / NWMO
Job No.: 08973
Location: Ignace, ON
Weather: CLEAR & SUNNY
Operator: AM / TK

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 14.05 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

		Finish:
Start: Pressure	14.05	14.07
Temp	11.8°C	5.59
Time	14:55	18.50

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
16	230.85			150.47	338.19	18:19	6.57	150.53	227.95	+2.90	230.85 - 1.55 = 229.3
17	198.77			104.56	292.47	18:25	6.17	104.61	195.79	+2.98	198.77 - 197.49 = 1.28
18	148.48			32.57	220.63	18:33	5.84	32.55	145.27	+3.21	148.48 - 128 = 147.2
19	127.99			14.35	191.41	18:38	5.69	14.40	124.73	+3.26	
20	68.48			14.27	106.60	18:45	5.66	14.21	65.08	+3.40	

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

COLLAR @ 197.49
COLLAR @ 126.90
COLLAR @ 2.24

APPENDIX G
IG-BH01

WESTBAY SYSTEM PACKER INFLATION RECORDS

Westbay System Packer Inflation Records - 22 pages

Sheet 1 of 22

Westbay Packer Inflation Record

Project: GOLDER / NWMO Project No.: WB973 Well No.: IG_RH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MAR 7TH 2018

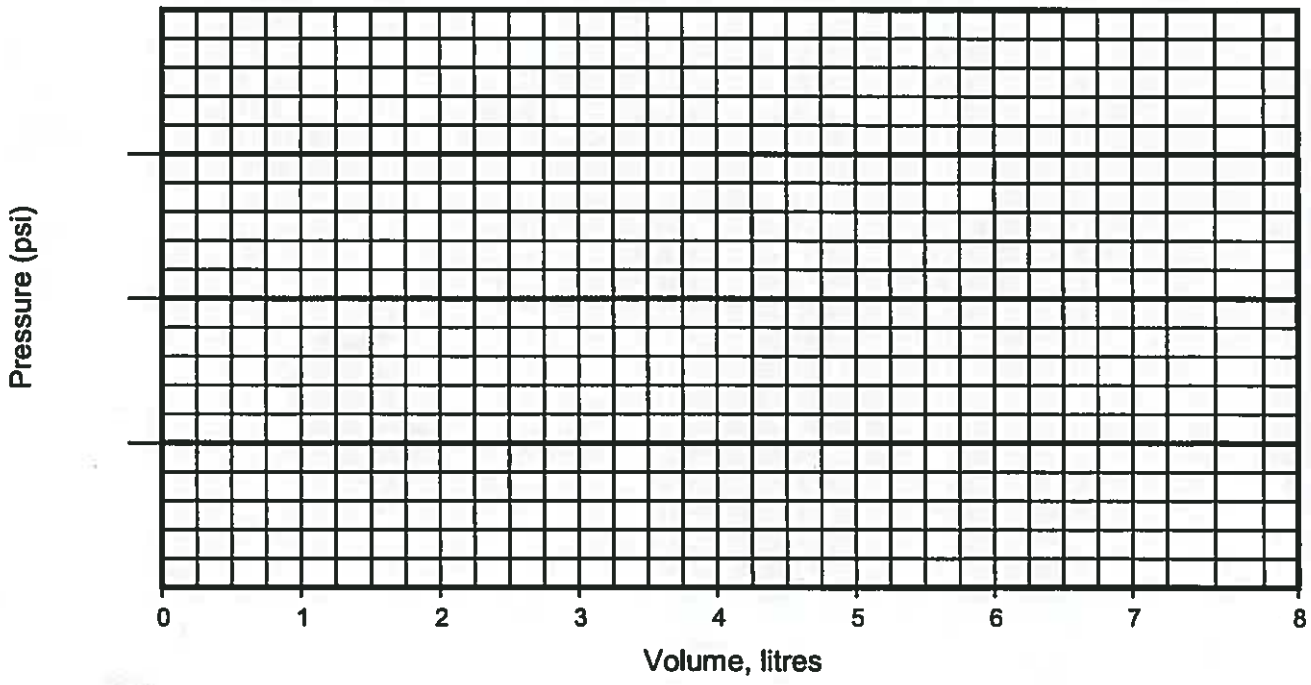
Packer No. BLANK WALL TEST Depth (ft / m): 982.71 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: N/A psi Final Line Pressure, P_L: N/A psi Tool Pressure, P_T: 700 psi

Borehole Water Level: N/A (ft / m) = N/A psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = N/A psi

Volume, litres	1/2	1	1 1/4	1 1/2	1 3/4	1.9	2	3/4		
Pressure, psi	385	680	820	900	1000	1120	1200	0		
Volume, litres										
Pressure, psi										



Comments: Packer # BLANK WALL TEST Time - 16:26

~4

Sheet 2 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MAR 7, 2018

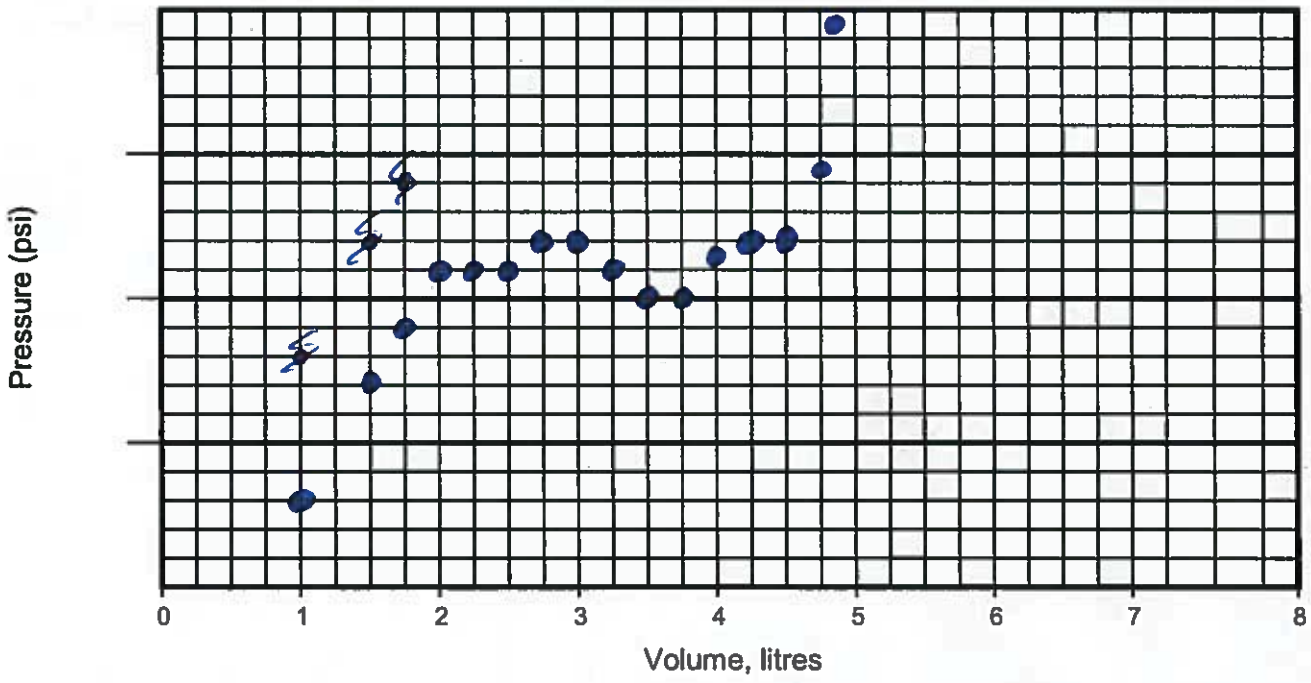
Packer No. 1, ~~COMP #12~~, 5/N/1990 Depth (ft / m): 972.7 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 155 psi Final Line Pressure, P_L: 995 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 146 psi

Volume, litres	1/2	1	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	~~3~~ 3 1/4
Pressure, psi	460	830	870	890	910	910	910	920	920	910
Volume, litres	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	4 7/8	3 3/4		
Pressure, psi	900	900	915	920	920	945	995	0		



Comments: Packer # 1, COMPONENT #10 Time - 17:33

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB 973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 7TH 2018

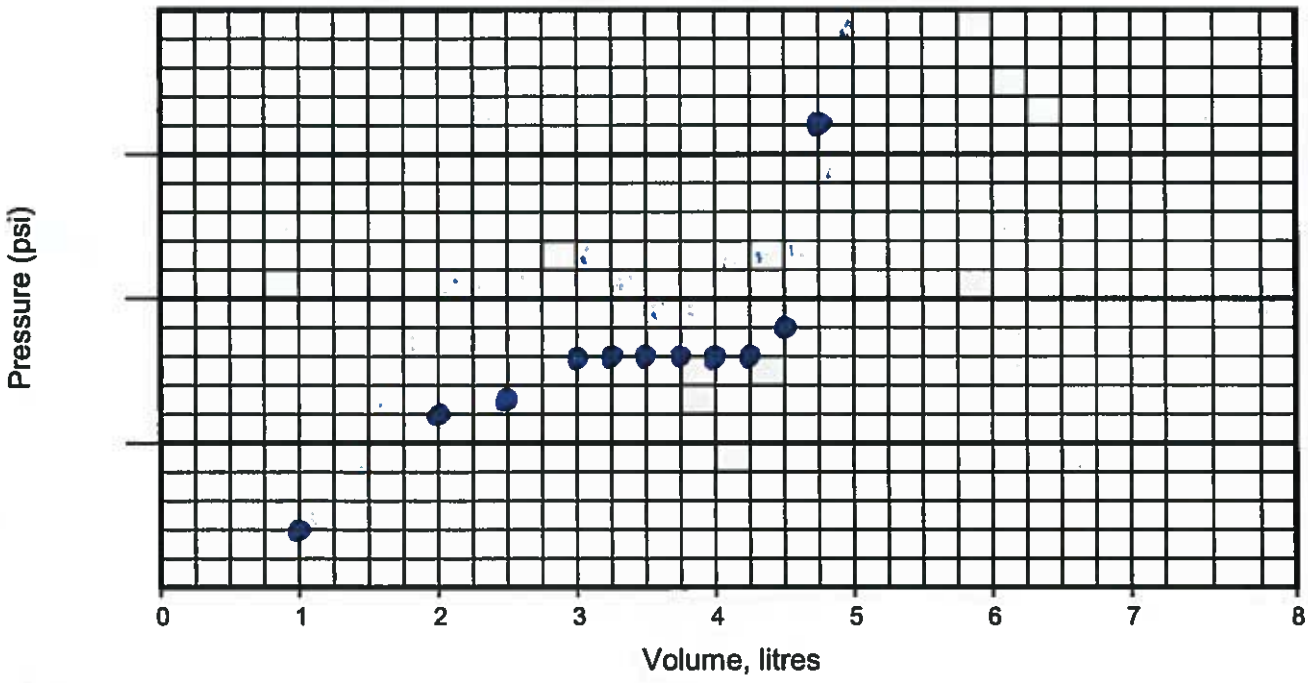
Packer No. 2, ~~Comp #43~~ S/N 19589 Depth (ft / m): 884.24 Inflation Tool No.: TIW1087

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 960 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: 24m (ft / m) = ~76 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 126 psi

Volume, litres	1	2	2 1/2	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
Pressure, psi	820	860	865	880	880	880	880	880	880	890
Volume, litres	4 3/4	3 3/4								
Pressure, psi	960	0								



Comments: Packer # 2, COMPONENT #41 Time - 19:00

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB 973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 7TH 2018

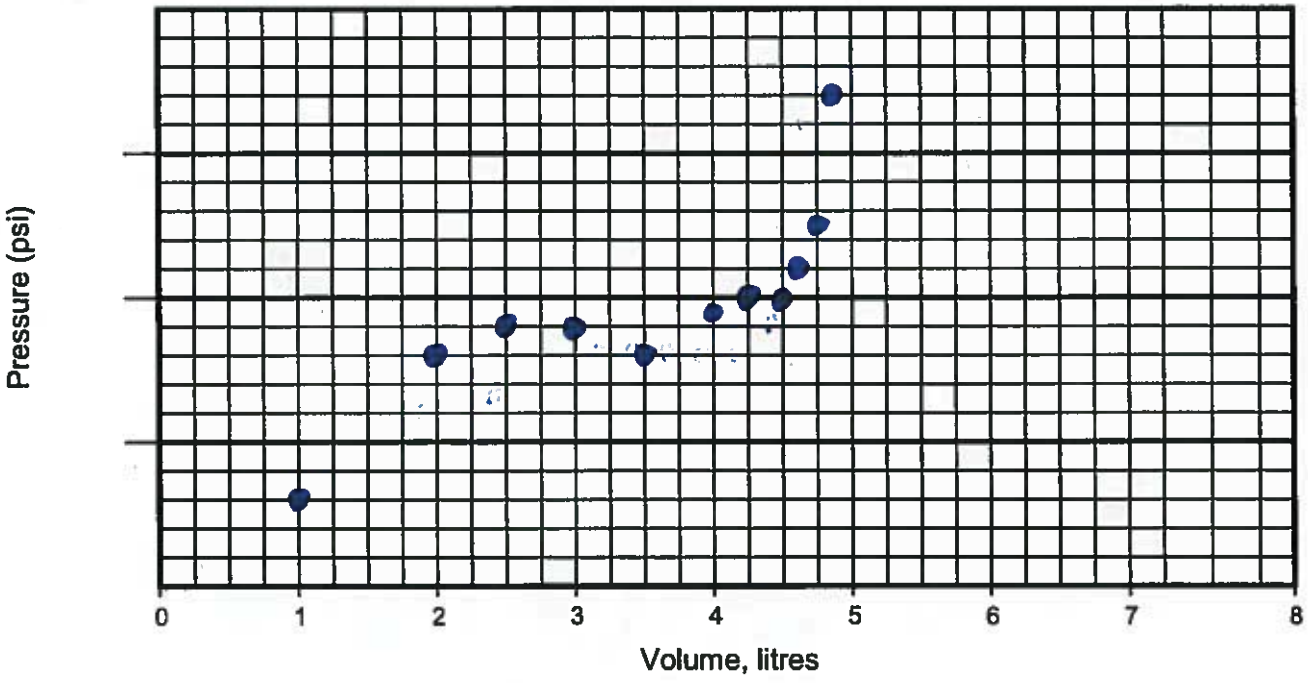
Packer No. 3, ~~COMPONENT #1 S/N 1987~~ Depth (ft / m): 799.81 Inflation Tool No.: TIW1087

Packer Valve Pressure, P_V: 160 psi Final Line Pressure, P_L: 970 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 116 psi

Volume, litres	1	2	2 1/2	3	~~3 1/4~~	3 1/2	4	4 1/4	4 1/2	4 5/8
Pressure, psi	830	880	890	890	/	880	895	900	900	910
Volume, litres	4 3/4	4 7/8	3 7/8							
Pressure, psi	925	970	0							



Comments: Packer # 3, COMPONENT #1 Time - 19:55

FINAL VOLUME ESTIMATED @ 3 3/4 → 3 7/8 BASED ON PACKERS #1, #2, #4, & #5.

5

Sheet 5 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB 973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 8TH 2018

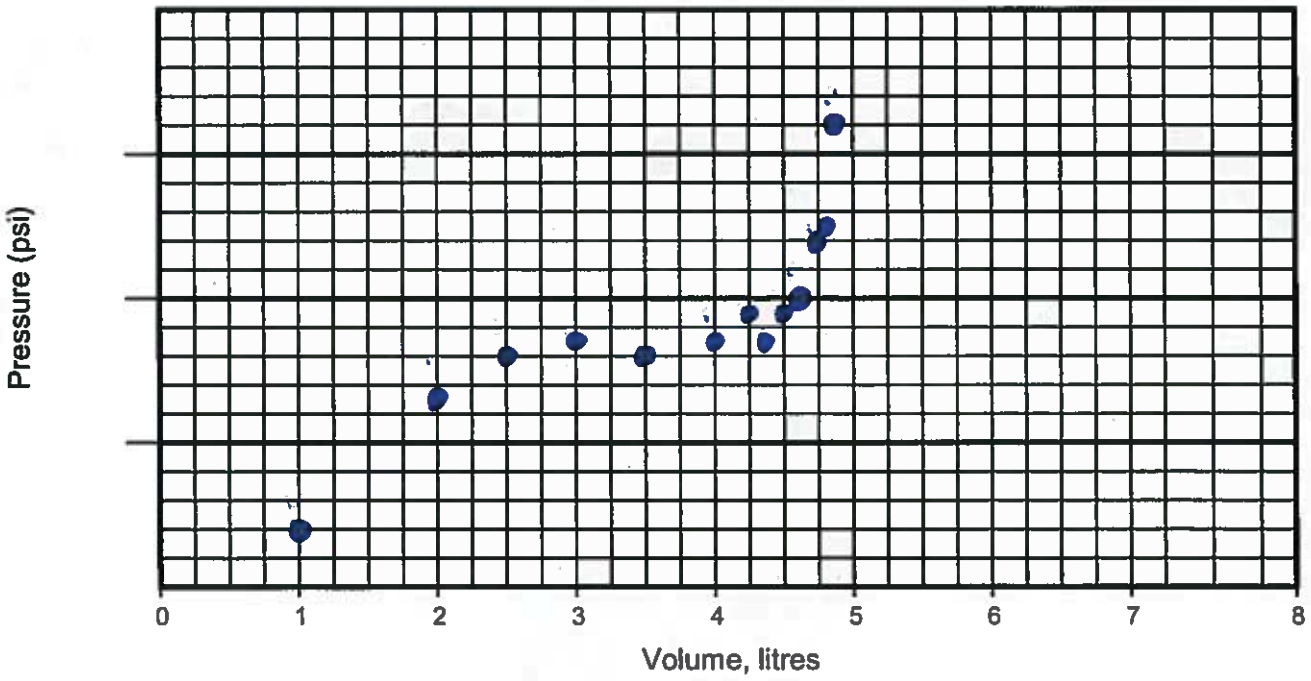
Packer No. 4, ~~COMP # 86~~ S/N 9588 Depth (ft / m): 764.68 Inflation Tool No.: TIW1087

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 960 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 121 psi

Volume, litres	1	2	2 1/2	3	3 1/2	4	4 1/4	4 3/8	4 1/2	4 5/8
Pressure, psi	820	865	880	885	880	885	895	885	895	900
Volume, litres	4 3/4	4.8	4 7/8	3 7/8						
Pressure, psi	920	925	960	0						



Comments: Packer # 4, COMPONENT # 85 Time - 10:43

Sheet 6 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 8TH 2018

Packer No. 5, ~~COMPONENT #~~ S/N 19591 Depth (ft / m): 698.55 Inflation Tool No.: TIW1087

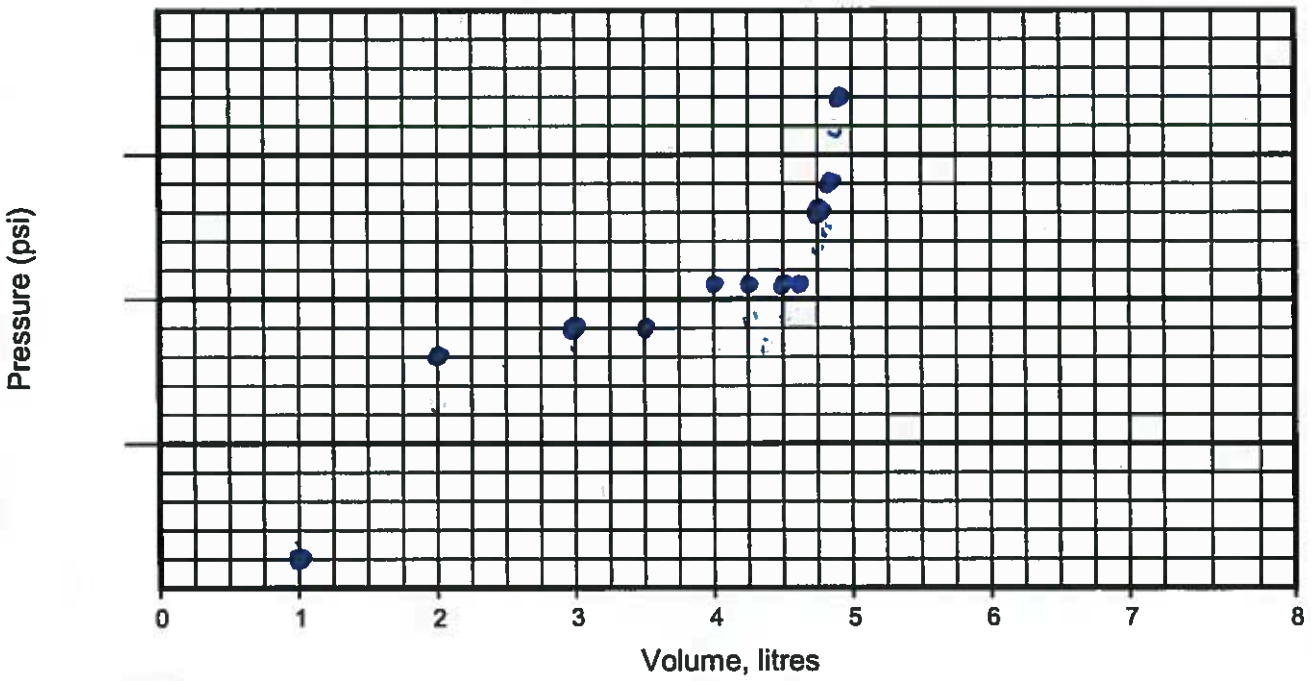
Packer Valve Pressure, P_V: 150 psi Final Line Pressure, P_L: 970 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4M (ft / m) = 6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 126 psi

Volume, litres	±	1	2	3	3½	4	4¼	4½	4⅝	4¾
Pressure, psi	~~698~~ 670	810	880	890	890	905	905	905	905	930
Volume, litres	4.8	4.85	3⅞							
Pressure, psi	940	970	0							

PACKER DEPTH WRITTEN IN WRONG LOCATION



Comments: Packer # 5, COMPONENT # 109 Time - 11:43

Sheet 7 of 22

Westbay Packer Inflation Record

Project: GOLDER/NAMO Project No.: WB 973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MAR 9, 2018

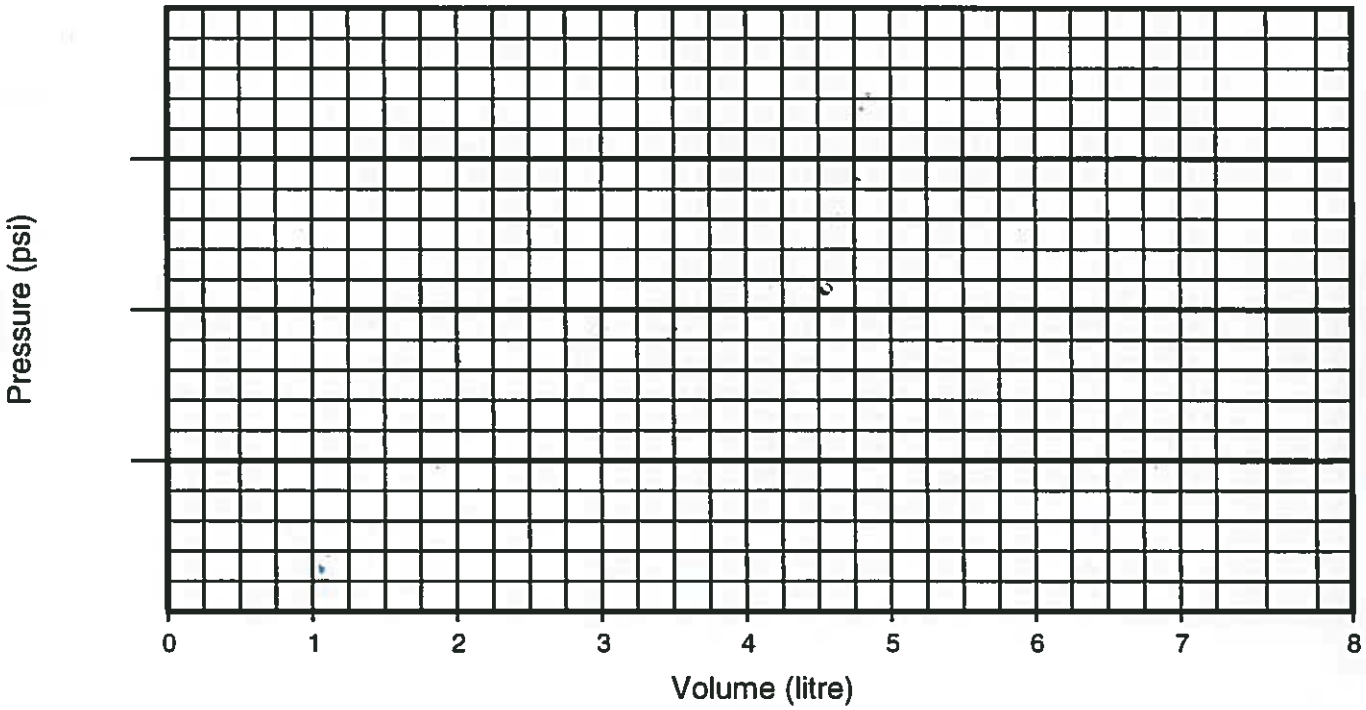
Packer No. BLANK WALL TEST Depth (ft / m): 710.12 Inflation Tool No.: TIW1037

Packer Valve Pressure, P_V: N/A psi Final Line Pressure, P_L: N/A psi Tool Pressure, P_T: 700 psi

Borehole Water Level: N/A (ft / m) = N/A psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = N/A psi

Volume, litres	1/2	1	1 1/4	1 1/2	1 3/4	2	1/2			
Pressure, psi	400	675	780	930	1060	1210	0			
Volume, litres										
Pressure, psi										



Comments: BLANK WALL TEST Time - 10:54

Sheet 8 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB 973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

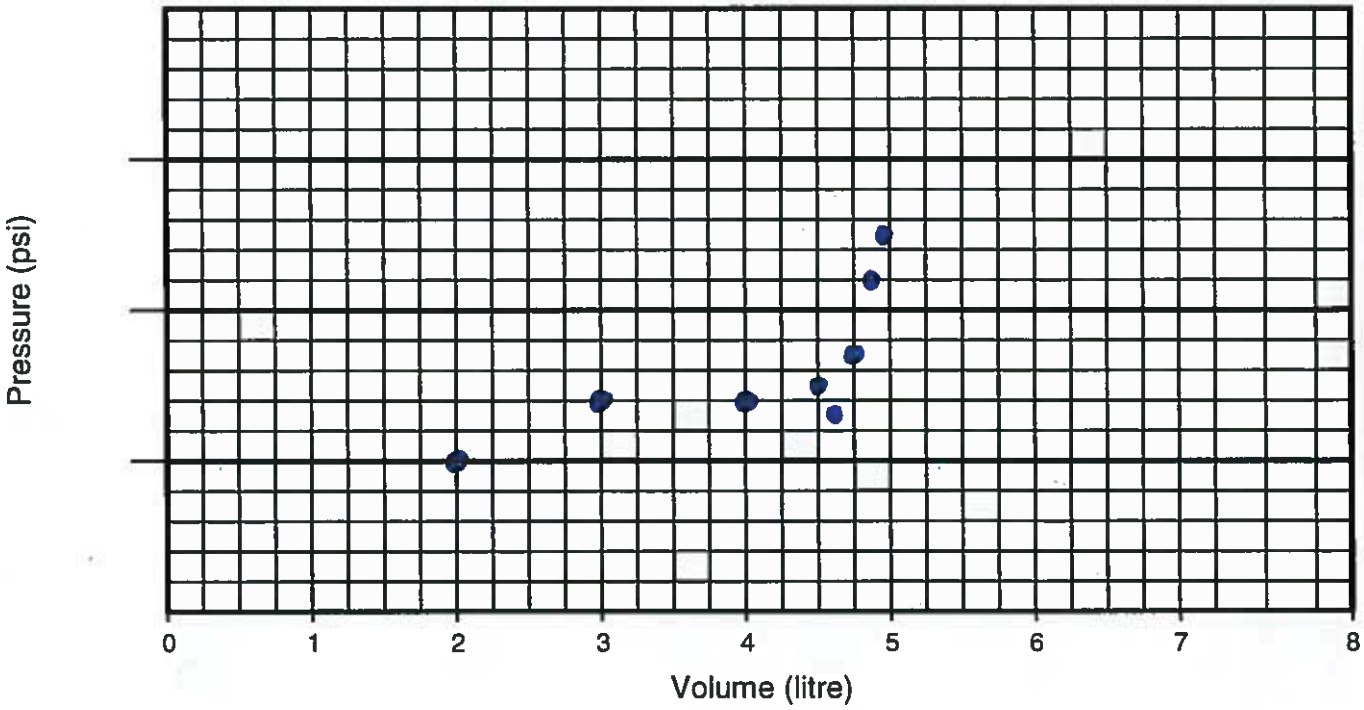
Packer No. 6, ~~Comp 129~~, S/N 19586 Depth (ft / m): 645.21 Inflation Tool No.: TIW1087

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 925 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 86 psi

Volume, litres	1	2	3	4	4 1/2	~~4 1/2~~	4 5/8	4 3/4	4 7/8	4.9
Pressure, psi	775	850	870	870	875	X	865	885	910	925
Volume, litres	3 7/8									
Pressure, psi	0									



Comments: PACKER #6, COMPONENT #128 Time - 12:37

Sheet 9 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

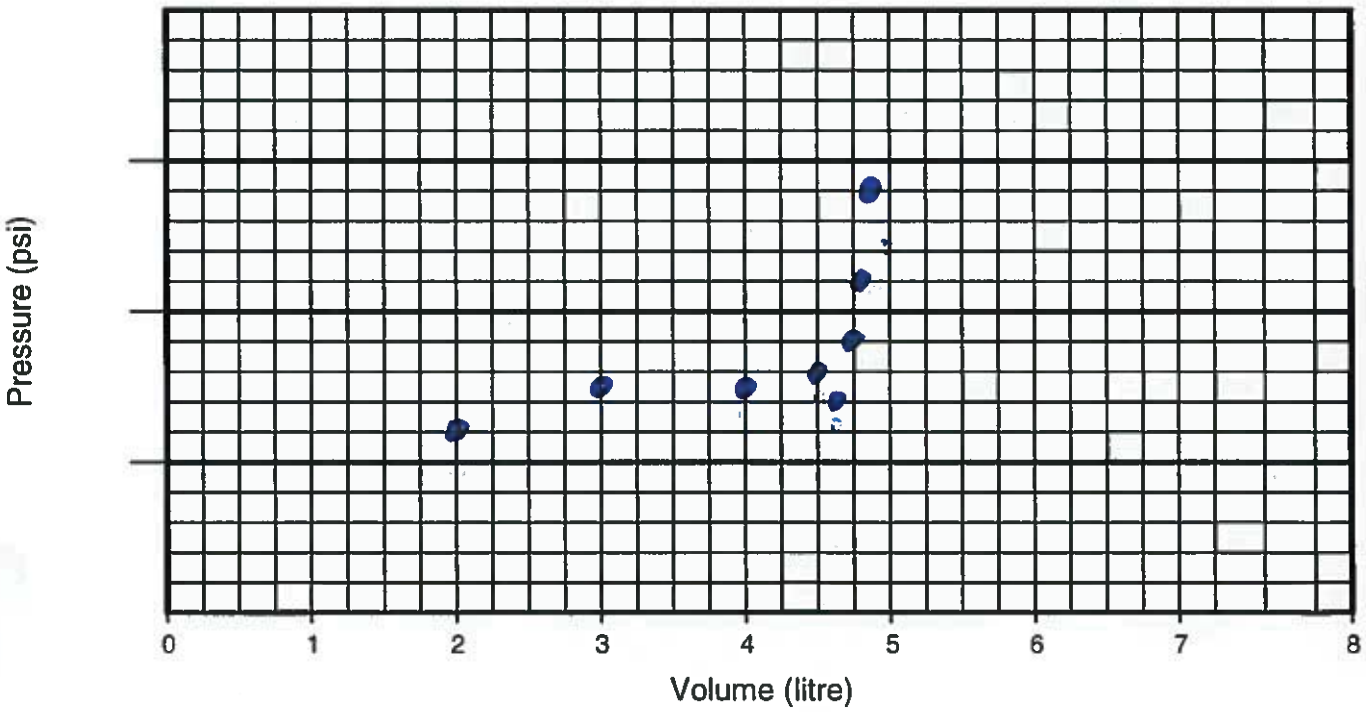
Packer No. 7, ~~COMP # 138~~, S/N 19586 Depth (ft / m): 623.8 Inflation Tool No.: TIW1087

Packer Valve Pressure, P_V: 155 psi Final Line Pressure, P_L: 940 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~14m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 91 psi

Volume, litres	1	2	3	4	~~4 1/4~~	4 1/2	4 5/8	4 3/4	4.8	4 7/8
Pressure, psi	770	860	875	875	X	880	870	890	910	940
Volume, litres	3.8									
Pressure, psi	0									



Comments: PACKER #7, COMPONENT #137 Time - 13:49

Sheet 10 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

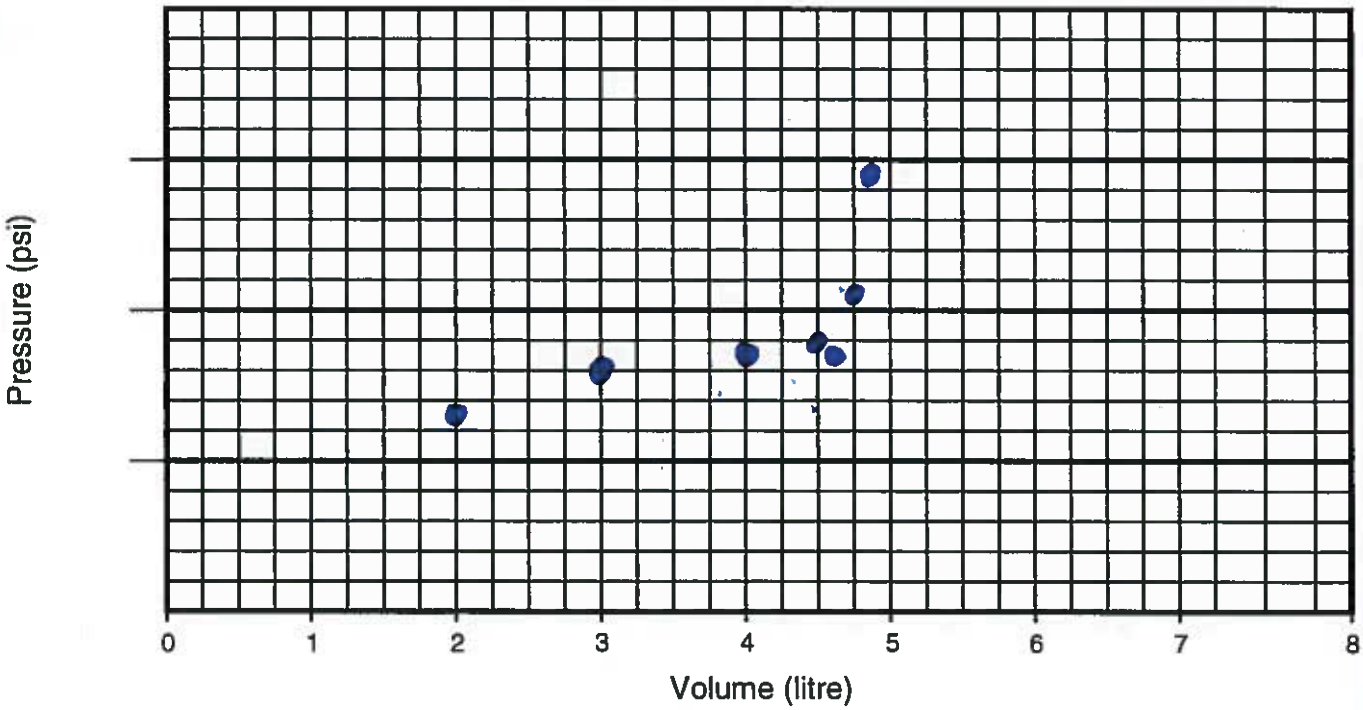
Packer No. 8, ~~COMP 158 S/N~~ 19584 Depth (ft / m): 569.85 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 155 psi Final Line Pressure, P_L: 945 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 96 psi

Volume, litres	1	2	3	4	4 1/2	4 5/8	4 3/4	4 7/8	3 7/8	
Pressure, psi	800	865	880	885	890	885	905	945	0	
Volume, litres										
Pressure, psi										



Comments: PACKER #8, COMPONENT # 157 Time - 14:37

Sheet 11 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

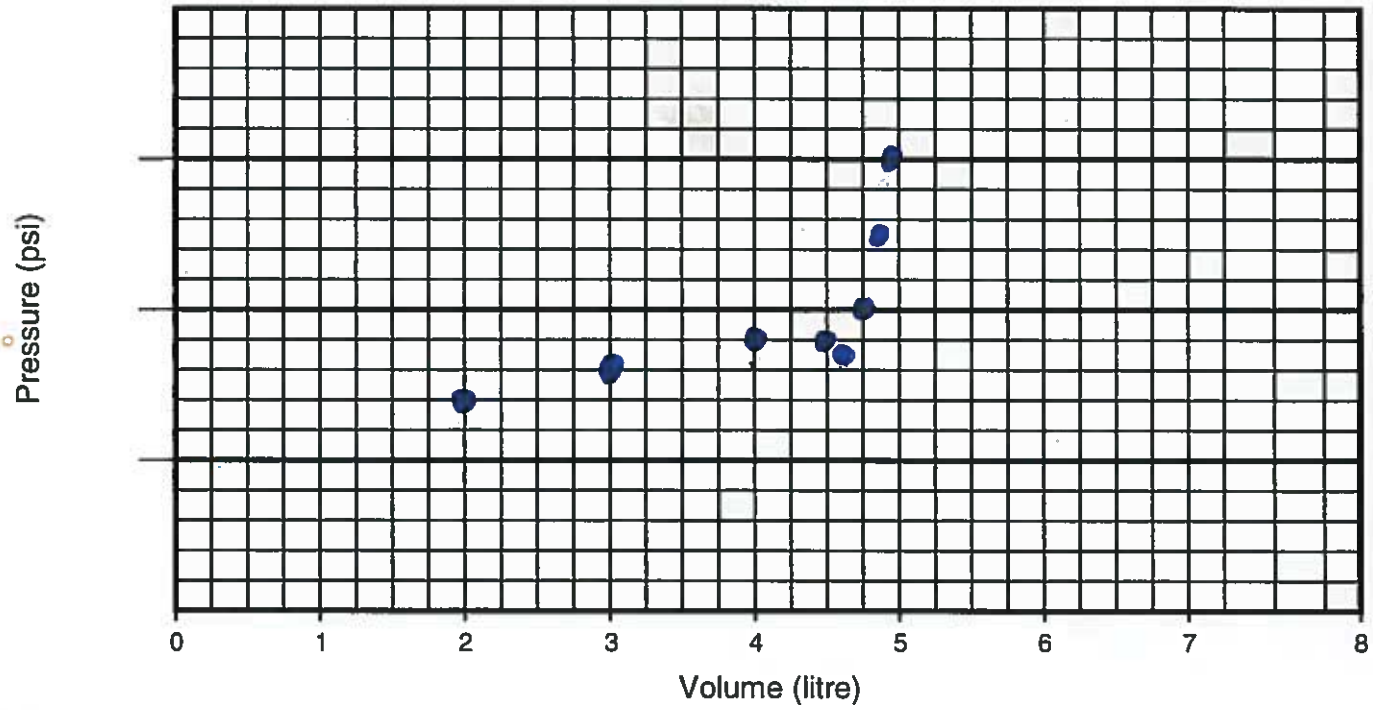
Packer No. 9, COMP #170, S/N 9593 Depth (ft / m): 535.64 Inflation Tool No.: TIW1087

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 950 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6psi psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 116 psi

Volume, litres	1	2	3	4	4 1/2	4 5/8	4 3/4	4 7/8	4.9	3 3/4
Pressure, psi	795	870	880	890	890	885	900	925	950	0
Volume, litres										
Pressure, psi										



Comments: PACKER #9, COMPONENT #170 Time - 15:43

Sheet 12 of 22

Westbay Packer Inflation Record

Project: GOLDER/NUMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

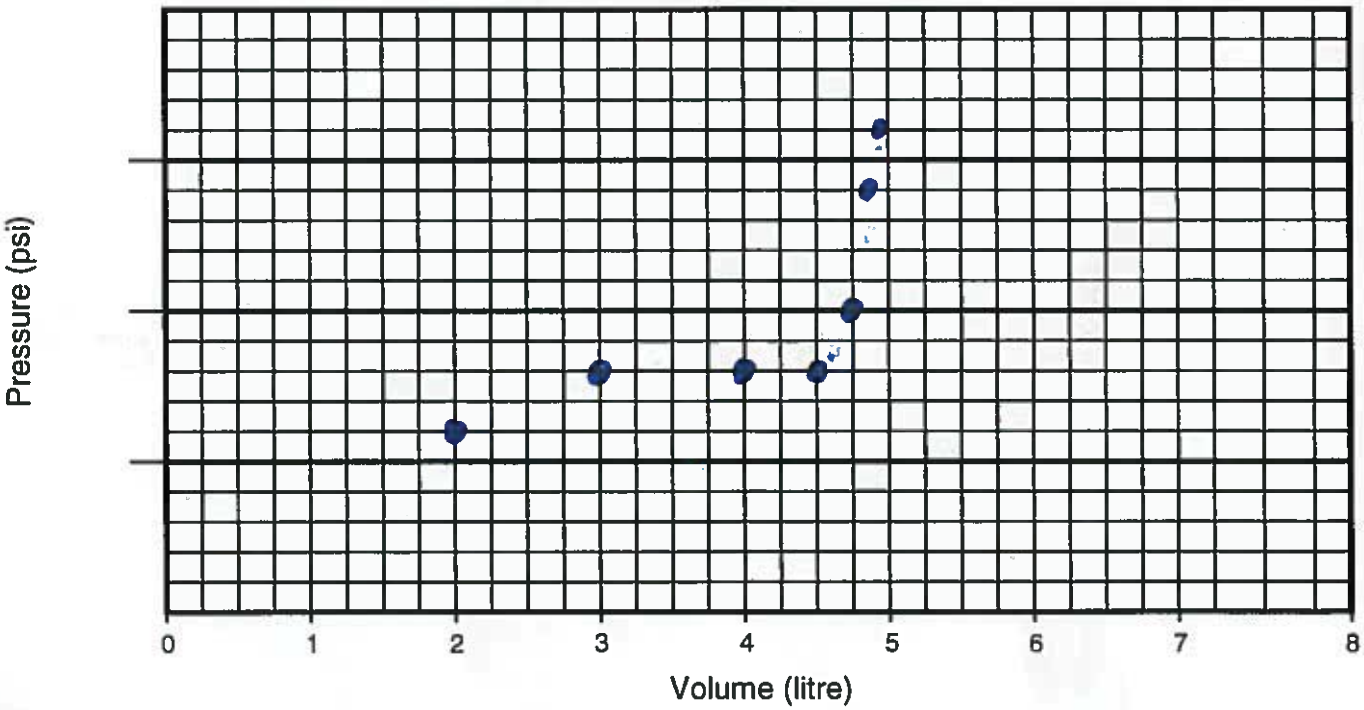
Packer No. 10, ~~COMP#180~~ S/N 9592 Depth (ft / m): 572.78 Inflation Tool No.: TIN1087

Packer Valve Pressure, P_V: 135 psi Final Line Pressure, P_L: 960 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 131 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	4.9	3 3/4	
Pressure, psi	795	860	880	880	880	960	940	960	Ø	
Volume, litres										
Pressure, psi										



Comments: PACKER #10, COMPONENT #179 Time - 16:21

Sheet 13 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB 973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

Packer No. ~~11, COMP # 189~~ S/N 19595 Depth (ft / m): 488.4 Inflation Tool No.: IW 1087

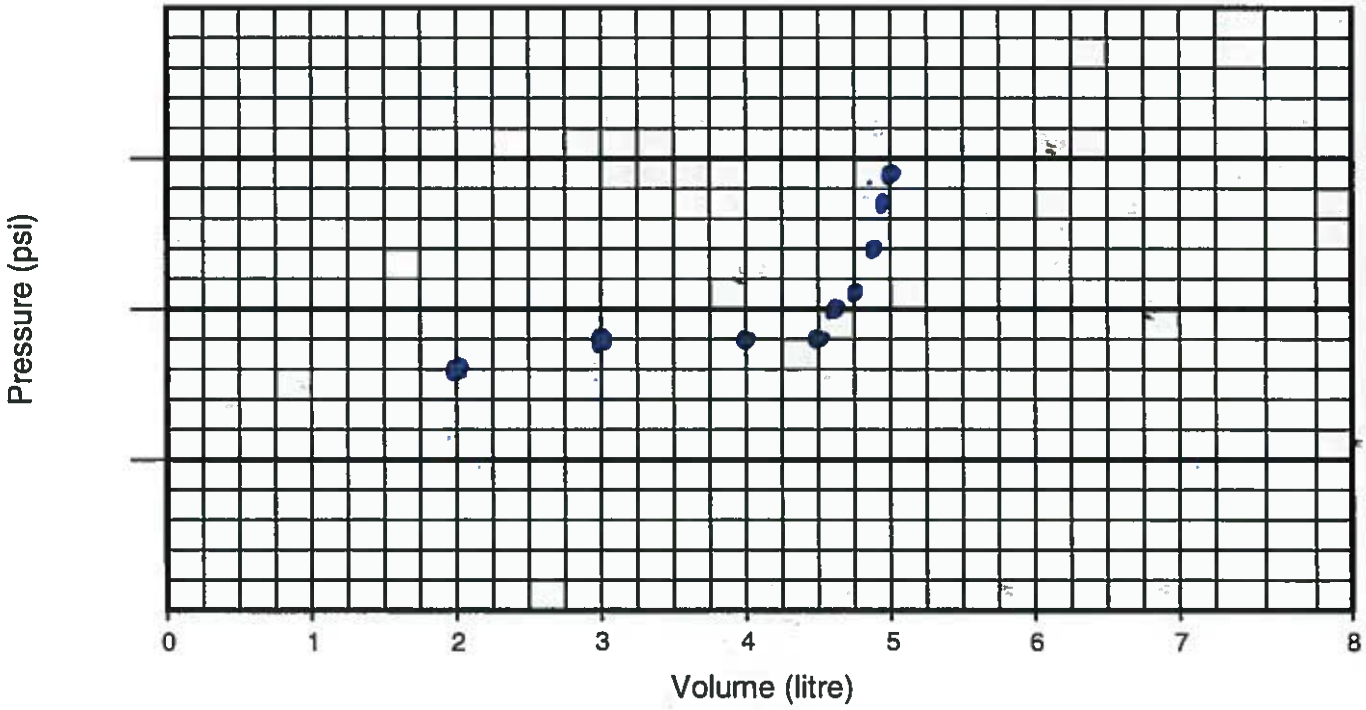
Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 945 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~14m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 111 psi

4 5/8 IS CORRECT VOLUME → ~~4 3/4~~

Volume, litres	1	2	3	4	4 1/2	4 5/8	4 3/4	4 7/8	4.9	5
Pressure, psi	760	880	890	890	890	900	905	920	935	945
Volume, litres	3 7/8									
Pressure, psi	0									



Comments: PACKER # 11, COMPONENT # 188 Time - 17:57

Sheet 14 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

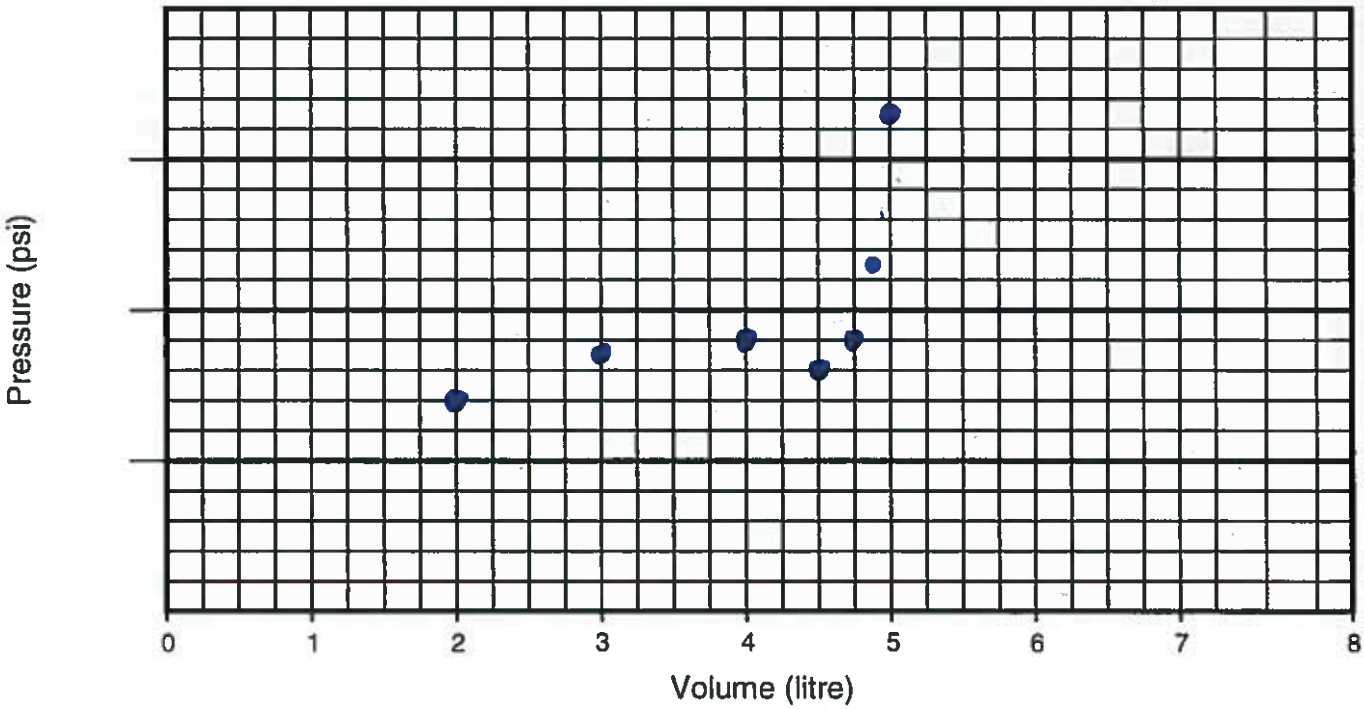
Packer No. 12 ~~Comp # 209~~ S/N 19602 Depth (ft / m): 427.44 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 40 psi Final Line Pressure, P_L: 965 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 131 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	3 7/8	
Pressure, psi	800	870	885	890	880	890	915	965	0	
Volume, litres										
Pressure, psi										



Comments: PACKER #12, COMPONENT #209 Time - 18:39

Sheet 15 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 9TH 2018

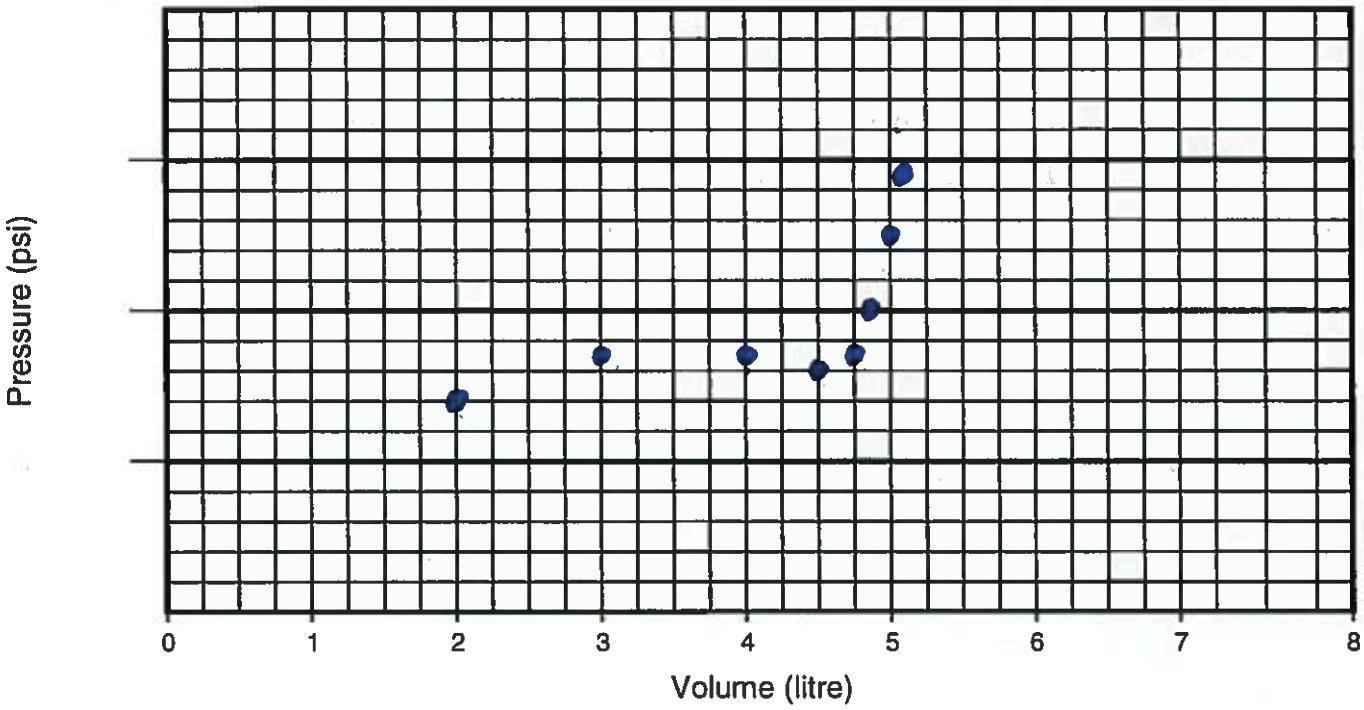
Packer No. 13, ~~Comp 219~~ S/N 19603 Depth (ft / m): 464.58 Inflation Tool No.: JIN 1087

Packer Valve Pressure, P_V: 146 psi Final Line Pressure, P_L: 945 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~24m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 111 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	5.1	3 7/8
Pressure, psi	765	870	885	885	880	885	900	925	945	0
Volume, litres										
Pressure, psi										



Comments: PACKER 13, COMPONENT # 218 Time - 19:40

Sheet 16 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 10TH 2018

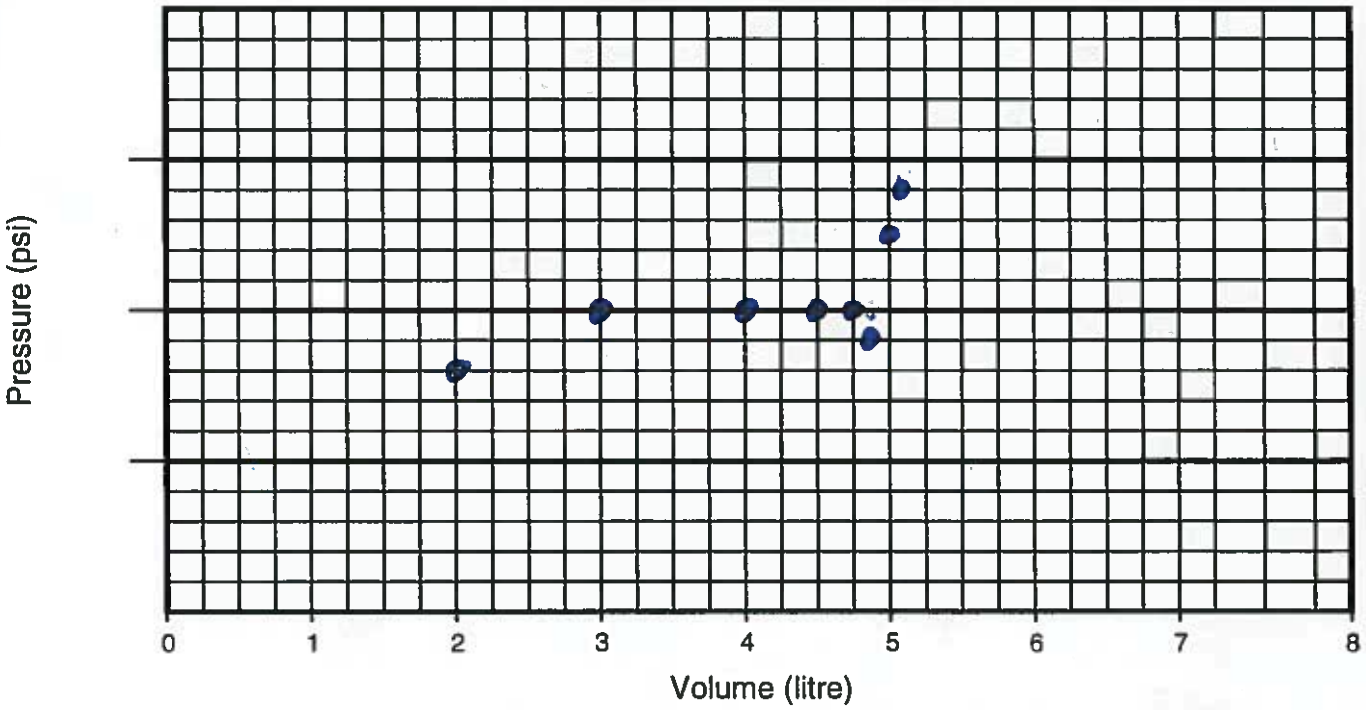
Packer No. 14, ~~COMP#248 S/N 19599~~ Depth (ft / m): ~~320~~ SEE BELOW Inflation Tool No.: DIW 1087

Packer Valve Pressure, P_V: 150 psi Final Line Pressure, P_L: 940 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 96 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	5.1	3.9
Pressure, psi	795	880	900	900	900	900	890	925	940	0
Volume, litres										
Pressure, psi										



Comments: PACKER #14, COMPONENT #247 Time - 9:55

DEPTH: 320.76M

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 16TH 2018

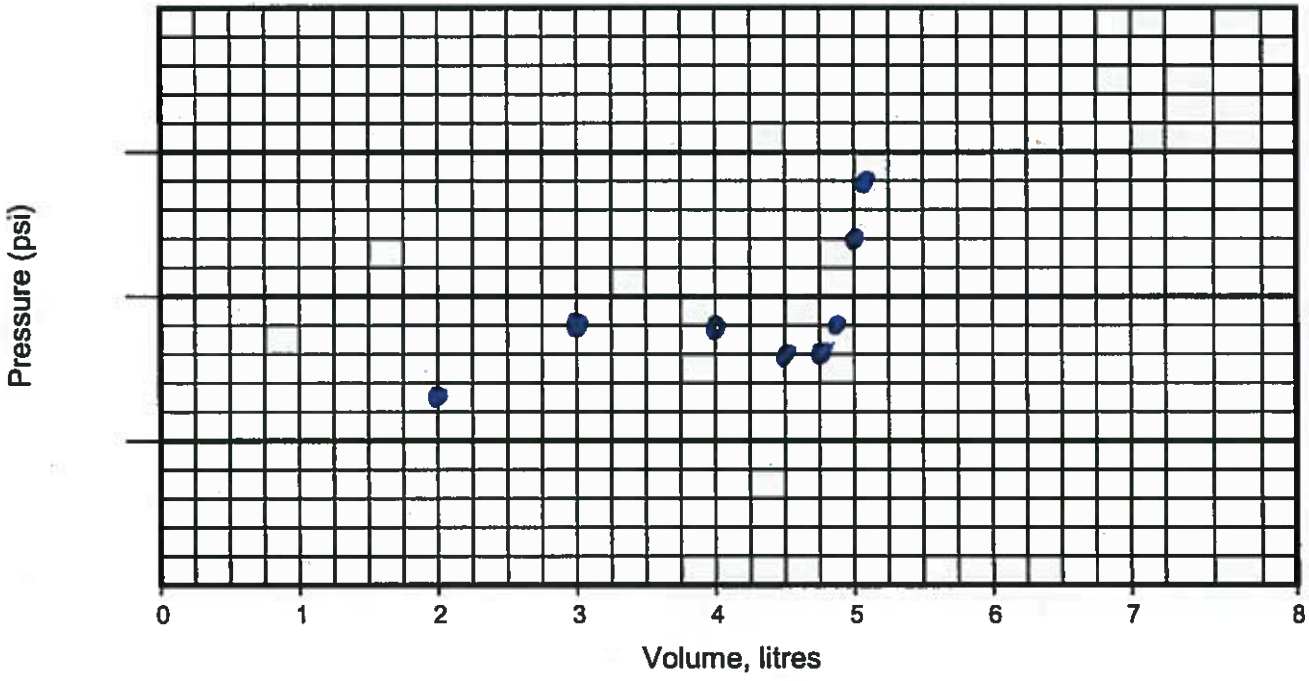
Packer No.: #15, ~~Comp 255~~, S/N 19598 Depth (ft / m): 302.48 Inflation Tool No.: TEW1087

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 940 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~~24m~~ (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 106 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	5.1	4.1
Pressure, psi	765	865	890	890	880	880	890	920	940	0
Volume, litres										
Pressure, psi										



Comments: Packer # 15, COMPONENT #254 Time - 10:57

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: NB973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 10TH 2018

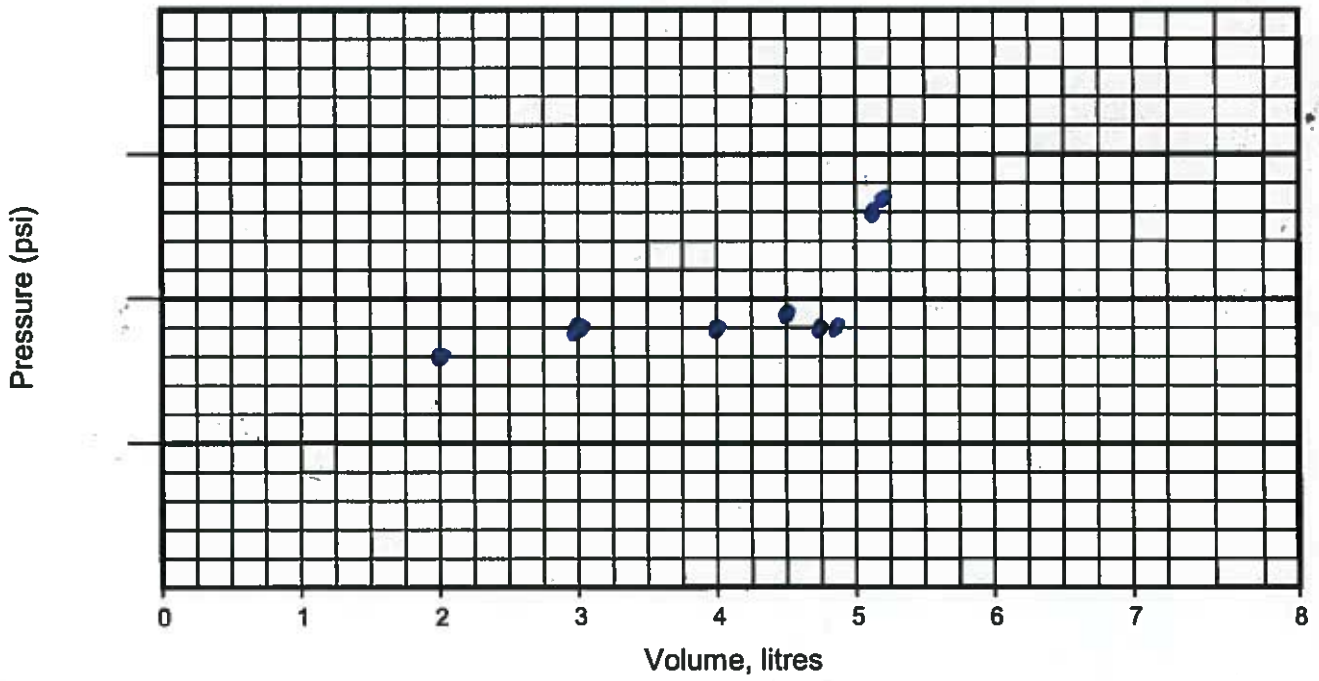
Packer No. 16, ~~Comp 281~~ S/N 196801 Depth (ft / m): 226.28 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 935 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 96 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	5 1/8	5.2
Pressure, psi	750	880	890	890	895	890	890	895	930	935
Volume, litres	4									
Pressure, psi	0									



Comments: Packer # 16, COMPONENT # 280 Time - 12:00

Sheet 9 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG_BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 18TH 2018

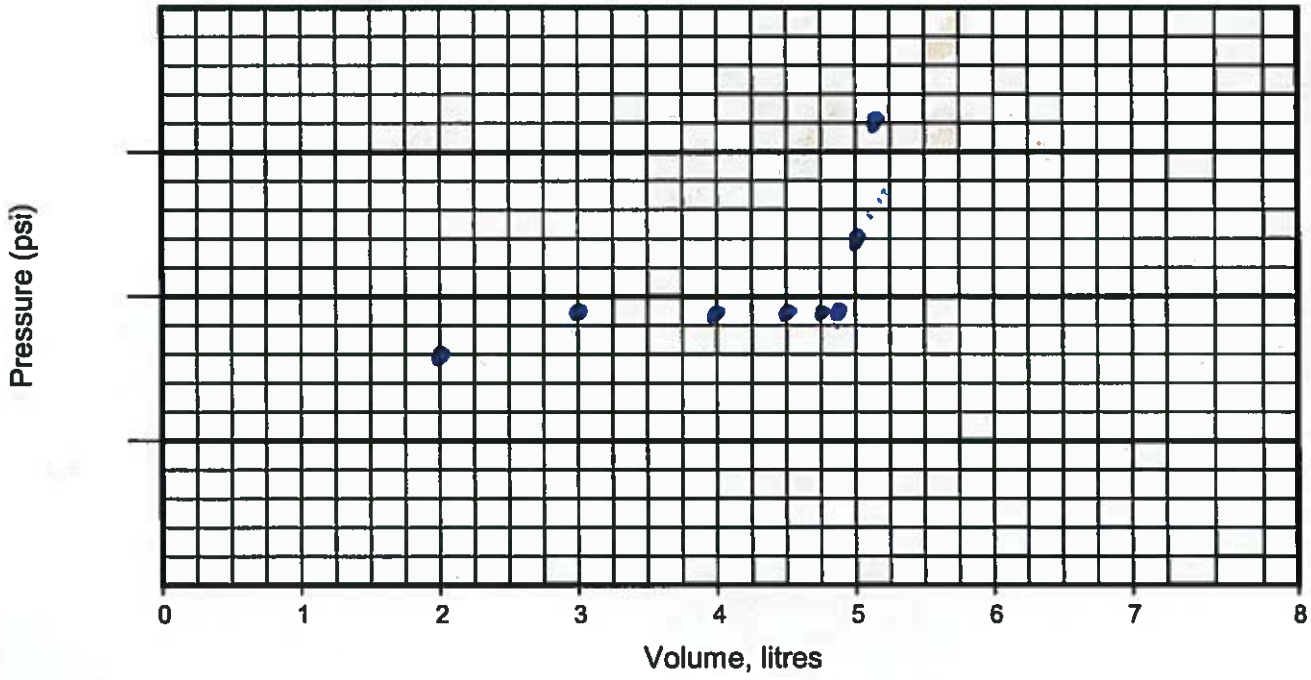
Packer No. 17, ~~COMP 294~~ S/N 19600 Depth (ft / m): 194.2 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 960 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 121 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	5 1/8	4 1/8
Pressure, psi	785	880	895	895	895	895	895	920	960	0
Volume, litres										
Pressure, psi										



Comments: Packer # 17, COMPONENT # 293 Time - 13:01

Sheet 20 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB 973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 10TH 2018

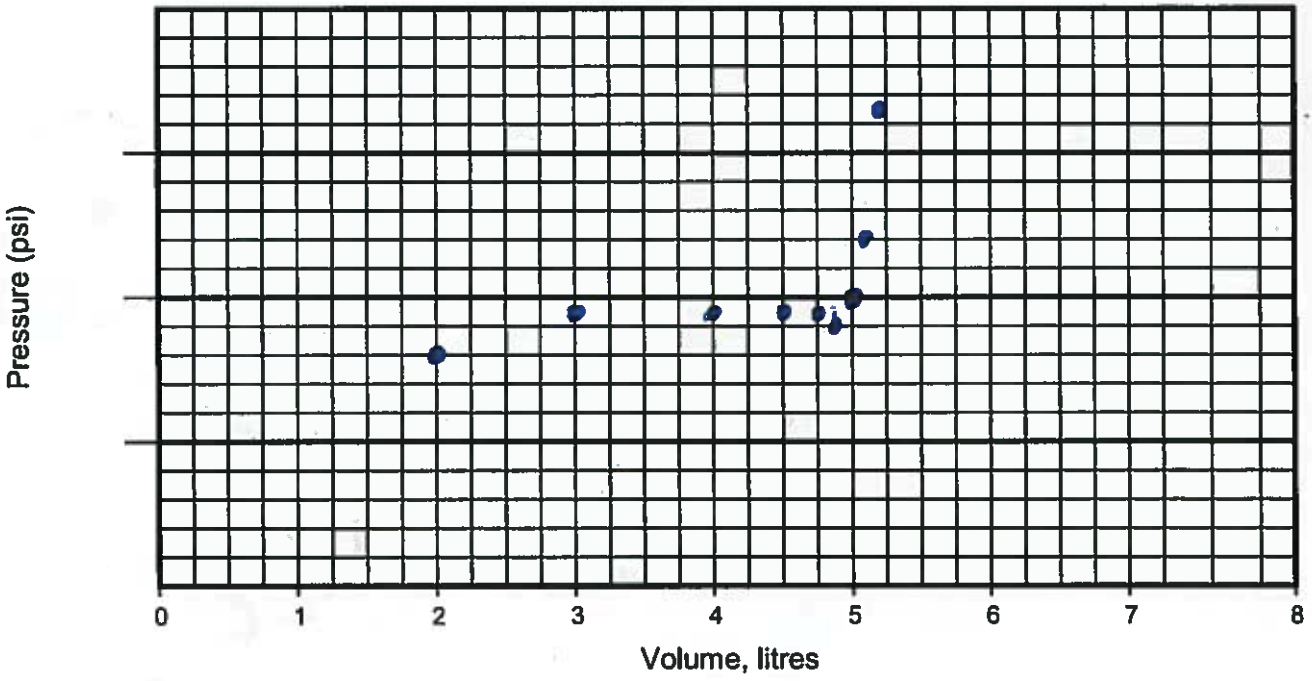
Packer No. 18, ~~COMP# 312~~ S/N 19597 Depth (ft / m): 143.91 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 965 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~~24m~~ (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 131 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	4 7/8	5	5.1	5.2
Pressure, psi	765	~~880~~	895	895	895	895	~~890~~	~~900~~	~~920~~	965
Volume, litres	4.1									
Pressure, psi	0									



Comments: Packer # 18, COMPONENT #311 Time - 13:57

Sheet 21 of 22

Westbay Packer Inflation Record

Project: GOLDER/NWMO Project No.: WB973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 10TH 2018

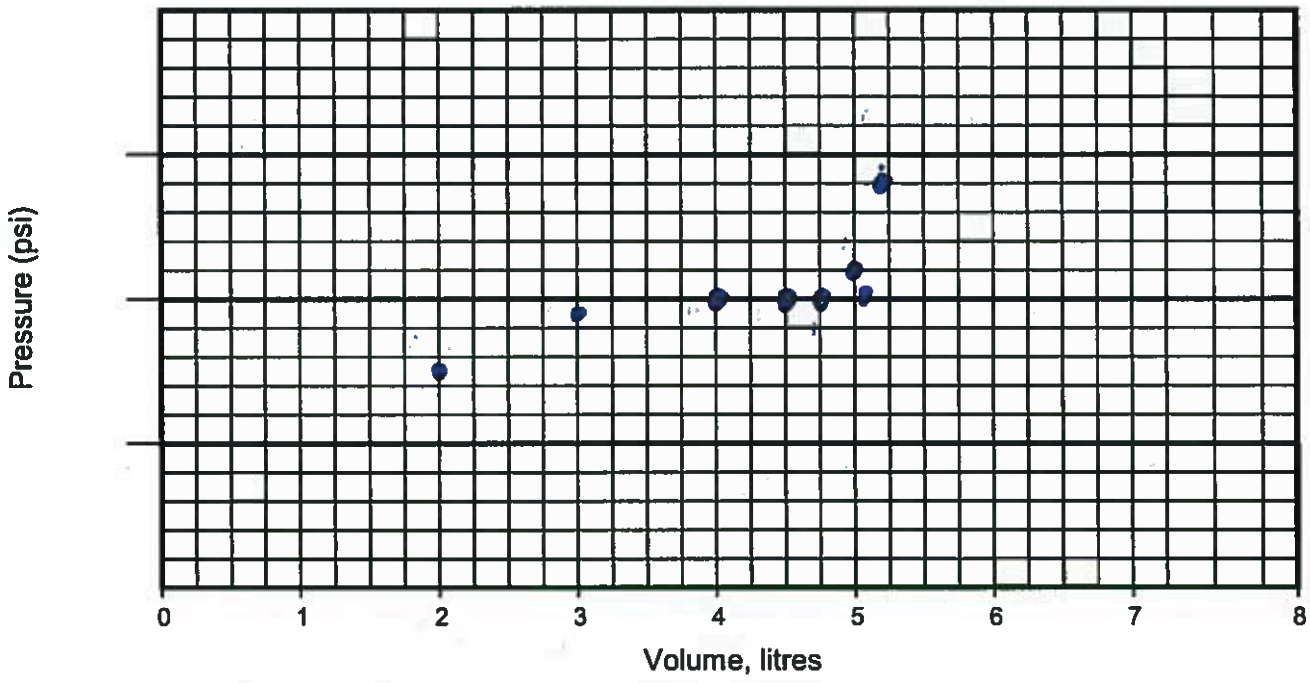
Packer No. 19, ~~COMP 324~~ S/N 19596 Depth (ft / m): 123.42 Inflation Tool No.: TIW 1087

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 940 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 101 psi

Volume, litres	1	2	3	4	4 1/2	4 3/4	5	5.1	5.2	4 1/8
Pressure, psi	775	875	895	900	900	900	910	900	940	0
Volume, litres										
Pressure, psi										



Comments: Packer # 19, COMPONENT # 320 Time - 14:50

Westbay Packer Inflation Record

Project: GOLDER/NAMO Project No.: WD973 Well No.: IG-BH01

Location: IGNACE, ONTARIO Completed by: AM/TK Date Inflated: MARCH 10TH 2008

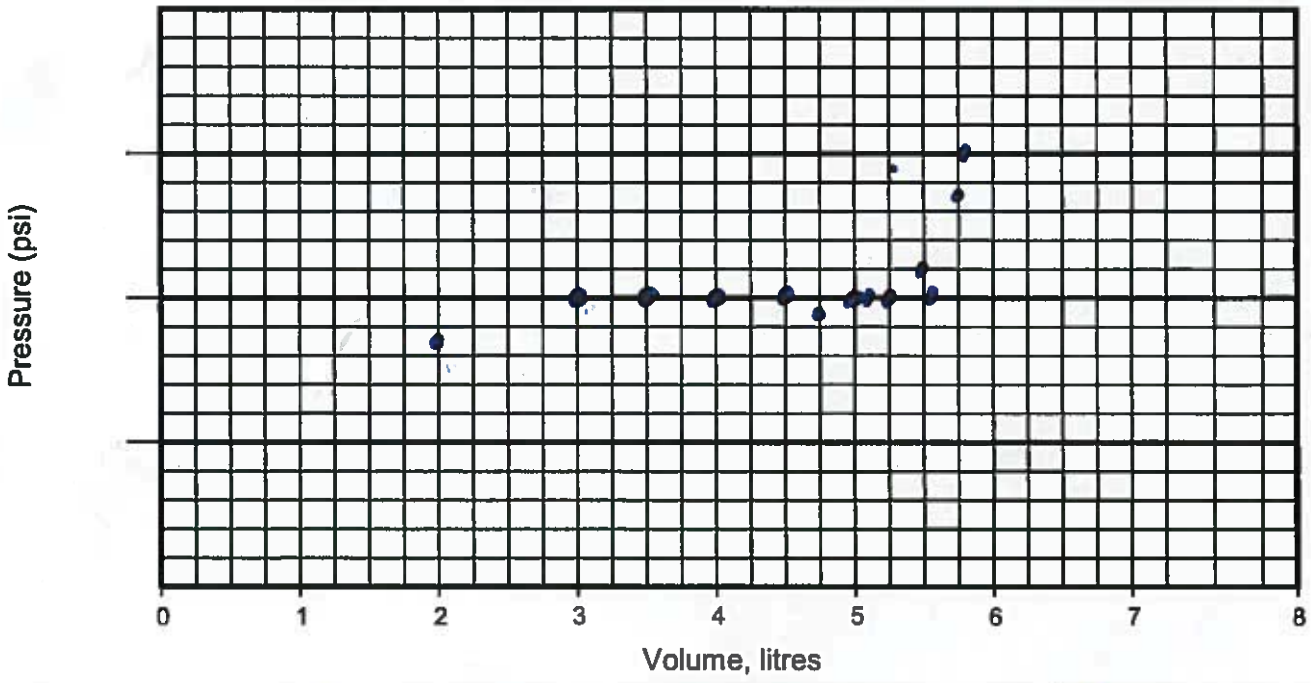
Packer No. 20, ~~COMP#343, 3/N 1994~~ Depth (ft / m): 63.987 Inflation Tool No.: TIN 1087

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 950 psi Tool Pressure, P_T: 700 psi

Borehole Water Level: ~4m (ft / m) = ~6 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 111 psi

Volume, litres	1	2	3	3 1/2	4	4 1/2	4 3/4	5	5 1/8	5 1/4
Pressure, psi	750	885	900	900	900	900	895	900	900	900
Volume, litres	5 1/2	5.6	5 3/4	5.8	4 1/2					
Pressure, psi	910	900	935	950	0					



Comments: Packer # 20, COMPONENT # 342 Time - 16:02

#20 PACKER INSIDE BOREHOLE CASING

APPENDIX H
IG-BH01

AS-BUILT TABLES 5 AND 6

As-Built Packer and Port Summary (Table 5)	- 1 page
As-Built Tubing Summary (Table 6)	- 7 pages

TABLE 5
As-Built Packer and Port Summary

Interval No.	Measurement Port Depth (m)	Pumping Port Depth (m)	Magnetic Collar Depth (m)	Top of Interval (m)	Bottom of Interval (m)	Comments
1	977.3	989.5	977.9	974.0	1001.2	
2	888.8	957.4	889.4	885.5	973.1	
3	804.4			801.1	884.6	
4	769.3	784.5	769.9	766.0	800.2	
5	703.1		703.7	699.8	765.1	
6	649.8			646.5	698.9	
7	628.4	636.0	629.0	625.1	645.6	
8	574.4			571.2	624.2	
9	540.2	563.7	540.8	537.0	570.3	
10	517.4		518.0	514.1	536.1	
11	493.0		493.6	489.7	513.2	
12	432.1			428.8	488.8	
13	409.3		409.9	406.0	427.9	
14	325.6			322.3	405.1	
15	307.3		307.9	304.0	321.4	
16	231.2			227.9	303.1	
17	199.2	217.4	199.8	195.9	227.0	
18	149.0			145.7	195.0	
19	128.5	141.3	129.1	125.2	144.8	
20	69.1	117.7	69.7	65.9	124.3	

Note 1: All depth measurements in meters below ground surface.
Note 2: All depth measurements use 'Nominal' casing lengths.
Note 3: Not corrected for borehole deviation or borehole temperature effects.
Note 4: All Westbay Port depth measurements to upper edge of coupling item.
Note 5: Depths for top and bottom of zone based on packer seal position.

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
373	0203						-4.11	0.05	N/A	N/A
372	020102		0202				-4.06	0.61	N/A	N/A
371	020102		0202				-3.45	0.61	N/A	N/A
370	020102		0202				-2.84	0.61	N/A	N/A
369	020102		0202				-2.23	0.61	N/A	N/A
368	020101		0202				-1.62	0.30	N/A	N/A
367	020102		0202				-1.32	0.61	N/A	-0.4
366	020102		0202				-0.71	0.61	N/A	0.2
365	020105		0202				-0.10	1.52	N/A	0.8
364	020105		0202				1.43	1.52	N/A	2.3
363	020110		0202		0216	4.4	2.95	3.05	3.046	3.8
362	020105		0202				6.00	1.52	1.522	6.9
361	020105		0202				7.52	1.52	1.521	8.4
360	020110		0202				9.05	3.05	3.047	9.9
359	020110		0202				12.09	3.05	3.047	12.9
358	020110		0202				15.14	3.05	3.046	16.0
357	020110		0202				18.19	3.05	3.048	19.0
356	020110		0202				21.24	3.05	3.051	22.1
355	020110		0202				24.29	3.05	3.047	25.1
354	020110		0202				27.33	3.05	3.045	28.1
353	020110		0202				30.38	3.05	3.049	31.2
352	020110		0202				33.43	3.05	3.045	34.2
351	020110		0202				36.48	3.05	3.046	37.2
350	020110		0202				39.52	3.05	3.045	40.3
349	020110		0202				42.57	3.05	3.049	43.3
348	020110		0202				45.62	3.05	3.049	46.3
347	020110		0202				48.67	3.05	3.045	49.4
346	020110		0202				51.72	3.05	3.045	52.4
345	020110		0202				54.76	3.05	3.046	55.5
344	020110		0202				57.81	3.05	3.047	58.5
343	020110		0202				60.86	3.05	3.046	61.5
342	0238	19594	0202				63.91	1.524	1.522	64.6
341	020110		0202				65.43	3.05	3.045	66.1
340	020110		0205	6427	0216	69.7	68.48	3.05	3.047	69.1
339	020105		0202				71.53	1.52	1.521	72.2
338	020105		0202				73.05	1.52	1.521	73.7
337	020110		0202				74.57	3.05	3.046	75.2
336	020110		0202				77.62	3.05	3.045	78.3
335	020110		0202				80.67	3.05	3.045	81.3
334	020110		0202				83.72	3.05	3.045	84.3
333	020110		0202				86.77	3.05	3.045	87.4
332	020110		0202				89.81	3.05	3.046	90.4
331	020110		0202				92.86	3.05	3.047	93.5
330	020110		0202				95.91	3.05	3.045	96.5
329	020110		0202				98.96	3.05	3.045	99.5
328	020110		0202				102.01	3.04	3.045	102.6
327	020110		0202				105.05	3.05	3.045	105.6
326	020110		0202				108.10	3.05	3.046	108.7
325	020110		0206	113			111.15	3.12	3.126	111.7
324	020105		0202				114.27	1.53	1.523	114.8
323	020105		0202				115.80	1.52	1.521	116.3
322	020110		0202				117.32	3.05	3.045	117.9
321	020110		0202				120.37	3.05	3.045	120.9
320	0238	19596	0202				123.42	1.52	1.522	123.9
319	020110		0202				124.94	3.05	3.045	125.5
318	020110		0205	6429	0216	129.1	127.99	3.05	3.045	128.5
317	020105		0202				131.04	1.52	1.521	131.6
316	020105		0202				132.56	1.52	1.523	133.1
315	020102		0202				134.08	0.61	0.609	134.6
314	020110		0202				134.69	3.05	3.046	135.2
313	020110		0202				137.74	3.05	3.046	138.2
312	020110		0206	114			140.79	3.12	3.126	141.3
311	0238	19597	0202				143.91	1.53	1.521	144.4

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
310	020110		0202				145.44	3.04	3.046	145.9
309	020110		0205	6431			148.48	3.05	3.046	149.0
308	020105		0202				151.53	1.53	1.521	152.0
307	020105		0202				153.06	1.52	1.521	153.5
306	020110		0202				154.58	3.05	3.046	155.0
305	020110		0202				157.63	3.05	3.048	158.1
304	020110		0202				160.68	3.04	3.049	161.1
303	020110		0202				163.72	3.05	3.048	164.2
302	020110		0202				166.77	3.05	3.044	167.2
301	020110		0202				169.82	3.05	3.046	170.3
300	020110		0202				172.87	3.05	3.047	173.3
299	020110		0202				175.92	3.04	3.046	176.3
298	020110		0202				178.96	3.05	3.043	179.4
297	020110		0202				182.01	3.05	3.044	182.4
296	020110		0202				185.06	3.05	3.046	185.5
295	020110		0202				188.11	3.04	3.045	188.5
294	020110		0202				191.15	3.05	3.045	191.6
293	0238	19600	0202				194.20	1.53	1.523	194.6
292	020110		0202				195.73	3.04	3.045	196.1
291	020110		0205	8519	0216	199.8	198.77	3.05	3.049	199.2
290	020105		0202				201.82	1.53	1.522	202.2
289	020105		0202				203.35	1.52	1.521	203.7
288	020110		0202				204.87	3.05	3.045	205.3
287	020110		0202				207.92	3.05	3.045	208.3
286	020110		0202				210.97	3.04	3.045	211.3
285	020110		0202				214.01	3.05	3.045	214.4
284	020110		0206	116			217.06	3.13	3.125	217.4
283	020105		0202				220.19	1.52	1.52	220.5
282	020105		0202				221.71	1.52	1.52	222.1
281	020110		0202				223.23	3.05	3.045	223.6
280	0238	19601	0202				226.28	1.53	1.522	226.6
279	020110		0202				227.81	3.04	3.045	228.2
278	020110		0205	9243			230.85	3.05	3.047	231.2
277	020105		0202				233.90	1.52	1.52	234.2
276	020110		0202				235.42	3.05	3.045	235.8
275	020110		0202				238.47	3.05	3.044	238.8
274	020110		0202				241.52	3.05	3.044	241.8
273	020110		0202				244.57	3.05	3.045	244.9
272	020110		0202				247.62	3.04	3.046	247.9
271	020110		0202				250.66	3.05	3.045	251.0
270	020110		0202				253.71	3.05	3.045	254.0
269	020110		0202				256.76	3.05	3.044	257.1
268	020110		0202				259.81	3.05	3.044	260.1
267	020110		0202				262.86	3.04	3.045	263.2
266	020110		0202				265.90	3.05	3.044	266.2
265	020110		0202				268.95	3.05	3.043	269.2
264	020110		0202				272.00	3.05	3.045	272.3
263	020110		0202				275.05	3.04	3.045	275.3
262	020110		0202				278.09	3.05	3.045	278.4
261	020110		0202				281.14	3.05	3.044	281.4
260	020110		0202				284.19	3.05	3.047	284.5
259	020110		0202				287.24	3.05	3.044	287.5
258	020110		0202				290.29	3.04	3.045	290.5
257	020110		0202				293.33	3.05	3.045	293.6
256	020110		0202				296.38	3.05	3.045	296.6
255	020110		0202				299.43	3.05	3.045	299.7
254	0238	19598	0202				302.48	1.52	1.521	302.7
253	020110		0202				304.00	3.05	3.045	304.2
252	020110		0205	6432	0216	307.9	307.05	3.05	3.045	307.3

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
251	020105		0202				310.10	1.52	1.52	310.3
250	020110		0202				311.62	3.05	3.045	311.9
249	020110		0202				314.67	3.05	3.045	314.9
248	020110		0202				317.72	3.04	3.045	317.9
247	0238	19599	0202				320.76	1.53	1.522	321.0
246	020110		0202				322.29	3.05	3.044	322.5
245	020110		0205	9244			325.34	3.04	3.044	325.6
244	020105		0202				328.38	1.53	1.521	328.6
243	020105		0202				329.91	1.52	1.521	330.1
242	020110		0202				331.43	3.05	3.046	331.6
241	020110		0202				334.48	3.05	3.045	334.7
240	020110		0202				337.53	3.05	3.045	337.7
239	020110		0202				340.58	3.04	3.045	340.8
238	020110		0202				343.62	3.05	3.05	343.8
237	020110		0202				346.67	3.05	3.046	346.9
236	020110		0202				349.72	3.05	3.047	349.9
235	020110		0202				352.77	3.04	3.044	353.0
234	020110		0202				355.81	3.05	3.044	356.0
233	020110		0202				358.86	3.05	3.045	359.0
232	020110		0202				361.91	3.05	3.044	362.1
231	020110		0202				364.96	3.05	3.044	365.1
230	020110		0202				368.01	3.04	3.046	368.2
229	020110		0202				371.05	3.05	3.046	371.2
228	020110		0202				374.10	3.05	3.047	374.3
227	020110		0202				377.15	3.05	3.047	377.3
226	020110		0202				380.20	3.05	3.044	380.4
225	020110		0202				383.25	3.04	3.047	383.4
224	020110		0202				386.29	3.05	3.045	386.4
223	020110		0202				389.34	3.05	3.046	389.5
222	020110		0202				392.39	3.05	3.046	392.5
221	020110		0202				395.44	3.04	3.044	395.6
220	020110		0202				398.48	3.05	3.045	398.6
219	020110		0202				401.53	3.05	3.045	401.7
218	0238	19603	0202				404.58	1.52	1.521	404.7
217	020110		0202				406.10	3.05	3.046	406.2
216	020110		0205	9245	0216	409.9	409.15	3.05	3.046	409.3
215	020105		0202				412.20	1.52	1.521	412.3
214	020105		0202				413.72	1.53	1.521	413.8
213	020110		0202				415.25	3.05	3.045	415.4
212	020110		0202				418.30	3.04	3.044	418.4
211	020110		0202				421.34	3.05	3.046	421.4
210	020110		0202				424.39	3.05	3.045	424.5
209	0238	19602	0202				427.44	1.52	1.521	427.5
208	020110		0202				428.96	3.05	3.047	429.1
207	020110		0205	9255			432.01	3.05	3.045	432.1
206	020105		0202				435.06	1.52	1.525	435.2
205	020110		0202				436.58	3.05	3.047	436.7
204	020110		0202				439.63	3.05	3.046	439.7
203	020110		0202				442.68	3.05	3.046	442.8
202	020110		0202				445.73	3.04	3.045	445.8
201	020110		0202				448.77	3.05	3.047	448.9
200	020110		0202				451.82	3.05	3.045	451.9
199	020110		0202				454.87	3.05	3.045	454.9
198	020110		0202				457.92	3.05	3.049	458.0
197	020110		0202				460.97	3.04	3.046	461.0
196	020110		0202				464.01	3.05	3.045	464.1
195	020110		0202				467.06	3.05	3.046	467.1
194	020110		0202				470.11	3.05	3.044	470.2
193	020110		0202				473.16	3.05	3.046	473.2
192	020110		0202				476.21	3.04	3.045	476.3
191	020110		0202				479.25	3.05	3.045	479.3
190	020110		0202				482.30	3.05	3.045	482.4
189	020110		0202				485.35	3.05	3.045	485.4

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
188	0238	19595	0202				488.40	1.52	1.522	488.4
187	020110		0202				489.92	3.05	3.047	490.0
186	020110		0205	9246	0216	493.6	492.97	3.05	3.045	493.0
185	020105		0202				496.02	1.52	1.521	496.1
184	020110		0202				497.54	3.05	3.047	497.6
183	020110		0202				500.59	3.05	3.046	500.6
182	020110		0202				503.64	3.04	3.046	503.7
181	020110		0202				506.68	3.05	3.045	506.7
180	020110		0202				509.73	3.05	3.044	509.8
179	0238	19592	0202				512.78	1.52	1.521	512.8
178	020110		0202				514.30	3.05	3.045	514.3
177	020110		0205	9242	0216	518.0	517.35	3.05	3.045	517.4
176	020105		0202				520.40	1.52	1.521	520.4
175	020105		0202				521.92	1.53	1.521	521.9
174	020110		0202				523.45	3.04	3.045	523.5
173	020110		0202				526.49	3.05	3.045	526.5
172	020110		0202				529.54	3.05	3.049	529.6
171	020110		0202				532.59	3.05	3.048	532.6
170	0238	19593	0202				535.64	1.52	1.521	535.7
169	020110		0202				537.16	3.05	3.049	537.2
168	020110		0205	9247	0216	540.8	540.21	3.05	3.045	540.2
167	020105		0202				543.26	1.52	1.52	543.3
166	020102		0202				544.78	0.61	0.609	544.8
165	020110		0202				545.39	3.05	3.046	545.4
164	020110		0202				548.44	3.05	3.048	548.5
163	020110		0202				551.49	3.04	3.047	551.5
162	020110		0202				554.53	3.05	3.047	554.5
161	020110		0202				557.58	3.05	3.052	557.6
160	020110		0202				560.63	3.05	3.045	560.6
159	020110		0206	115			563.68	3.12	3.126	563.7
158	020110		0202				566.80	3.05	3.045	566.8
157	0238	19584	0202				569.85	1.52	1.523	569.9
156	020110		0202				571.37	3.05	3.047	571.4
155	020110		0205	8730			574.42	3.05	3.046	574.4
154	020105		0202				577.47	1.52	1.52	577.5
153	020105		0202				578.99	1.53	1.521	579.0
152	020102		0202				580.52	0.61	0.608	580.5
151	020110		0202				581.13	3.05	3.046	581.1
150	020110		0202				584.18	3.04	3.047	584.2
149	020110		0202				587.22	3.05	3.046	587.2
148	020110		0202				590.27	3.05	3.046	590.3
147	020110		0202				593.32	3.05	3.045	593.3
146	020110		0202				596.37	3.04	3.044	596.4
145	020110		0202				599.41	3.05	3.05	599.4
144	020110		0202				602.46	3.05	3.045	602.5
143	020110		0202				605.51	3.05	3.046	605.5
142	020110		0202				608.56	3.05	3.048	608.6
141	020110		0202				611.61	3.04	3.049	611.6
140	020110		0202				614.65	3.05	3.046	614.7
139	020110		0202				617.70	3.05	3.051	617.7
138	020110		0202				620.75	3.05	3.047	620.8
137	0238	19585	0202				623.80	1.52	1.522	623.8
136	020110		0202				625.32	3.05	3.046	625.3
135	020110		0205	9241	0216	629.0	628.37	3.05	3.045	628.4
134	020105		0202				631.42	1.52	1.521	631.4
133	020110		0202				632.94	3.05	3.046	632.9
132	020110		0206	117			635.99	3.12	3.126	636.0
131	020105		0202				639.11	1.53	1.522	639.1
130	020105		0202				640.64	1.52	1.521	640.6
129	020110		0202				642.16	3.05	3.045	642.2
128	0238	19586	0202				645.21	1.52	1.522	645.2
127	020110		0202				646.73	3.05	3.047	646.7
126	020110		0205	8535			649.78	3.05	3.045	649.8

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
125	020105		0202				652.83	1.52	1.523	652.8
124	020105		0202				654.35	1.53	1.521	654.4
123	020110		0202				655.88	3.04	3.046	655.9
122	020110		0202				658.92	3.05	3.047	658.9
121	020110		0202				661.97	3.05	3.045	662.0
120	020110		0202				665.02	3.05	3.046	665.0
119	020110		0202				668.07	3.05	3.045	668.1
118	020110		0202				671.12	3.04	3.046	671.1
117	020110		0202				674.16	3.05	3.045	674.2
116	020110		0202				677.21	3.05	3.045	677.2
115	020110		0202				680.26	3.05	3.045	680.3
114	020110		0202				683.31	3.04	3.045	683.3
113	020110		0202				686.35	3.05	3.046	686.4
112	020110		0202				689.40	3.05	3.045	689.4
111	020110		0202				692.45	3.05	3.047	692.5
110	020110		0202				695.50	3.05	3.046	695.5
109	0238	19591	0202				698.55	1.52	1.521	698.6
108	020110		0202				700.07	3.05	3.047	700.1
107	020110		0205	9249	0216	703.7	703.12	3.05	3.045	703.1
106	020105		0202				706.17	1.52	1.521	706.2
105	020105		0202				707.69	1.52	1.522	707.7
104	020102		0202				709.21	0.61	0.611	709.2
103	020110		0202				709.82	3.05	3.045	709.8
102	020110		0202				712.87	3.05	3.045	712.9
101	020110		0202				715.92	3.05	3.045	715.9
100	020110		0202				718.97	3.04	3.045	719.0
99	020110		0202				722.01	3.05	3.045	722.0
98	020110		0202				725.06	3.05	3.045	725.1
97	020110		0202				728.11	3.05	3.045	728.1
96	020110		0202				731.16	3.05	3.045	731.2
95	020110		0202				734.21	3.04	3.045	734.2
94	020110		0202				737.25	3.05	3.045	737.3
93	020110		0202				740.30	3.05	3.046	740.3
92	020110		0202				743.35	3.05	3.046	743.4
91	020110		0202				746.40	3.04	3.045	746.4
90	020110		0202				749.44	3.05	3.046	749.4
89	020110		0202				752.49	3.05	3.047	752.5
88	020110		0202				755.54	3.05	3.048	755.5
87	020110		0202				758.59	3.05	3.047	758.6
86	020110		0202				761.64	3.04	3.046	761.6
85	0238	19588	0202				764.68	1.53	1.522	764.7
84	020110		0202				766.21	3.05	3.046	766.2
83	020110		0205	9248	0216	769.9	769.26	3.04	3.046	769.3
82	020105		0202				772.30	1.53	1.521	772.3
81	020105		0202				773.83	1.52	1.522	773.8
80	020110		0202				775.35	3.05	3.045	775.4
79	020110		0202				778.40	3.05	3.046	778.4
78	020110		0202				781.45	3.05	3.045	781.5
77	020110		0206	107			784.50	3.12	3.127	784.5
76	020105		0202				787.62	1.52	1.522	787.6
75	020105		0202				789.14	1.53	1.521	789.1
74	020110		0202				790.67	3.04	3.049	790.7
73	020110		0202				793.71	3.05	3.046	793.7
72	020110		0202				796.76	3.05	3.048	796.8
71	0238	19587	0202				799.81	1.52	1.522	799.8
70	020110		0202				801.33	3.05	3.047	801.3
69	020110		0205	9250			804.38	3.05	3.045	804.4
68	020105		0202				807.43	1.52	1.521	807.4
67	020105		0202				808.95	1.53	1.521	809.0
66	020102		0202				810.48	0.61	0.608	810.5
65	020110		0202				811.09	3.05	3.045	811.1
64	020110		0202				814.14	3.04	3.051	814.1
63	020110		0202				817.18	3.05	3.047	817.2

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
62	020110		0202				820.23	3.05	3.05	820.2
61	020110		0202				823.28	3.05	3.046	823.3
60	020110		0202				826.33	3.04	3.045	826.3
59	020110		0202				829.37	3.05	3.044	829.4
58	020110		0202				832.42	3.05	3.045	832.4
57	020110		0202				835.47	3.05	3.046	835.5
56	020110		0202				838.52	3.05	3.045	838.5
55	020110		0202				841.57	3.04	3.044	841.6
54	020110		0202				844.61	3.05	3.045	844.6
53	020110		0202				847.66	3.05	3.045	847.7
52	020110		0202				850.71	3.05	3.045	850.7
51	020110		0202				853.76	3.05	3.046	853.8
50	020110		0202				856.81	3.04	3.048	856.8
49	020110		0202				859.85	3.05	3.045	859.9
48	020110		0202				862.90	3.05	3.044	862.9
47	020110		0202				865.95	3.05	3.045	866.0
46	020110		0202				869.00	3.04	3.046	869.0
45	020110		0202				872.04	3.05	3.044	872.0
44	020110		0202				875.09	3.05	3.046	875.1
43	020110		0202				878.14	3.05	3.045	878.1
42	020110		0202				881.19	3.05	3.049	881.2
41	0238	19589	0202				884.24	1.52	1.522	884.2
40	020110		0202				885.76	3.05	3.045	885.8
39	020110		0205	9257	0216	889.4	888.81	3.05	3.045	888.8
38	020105		0202				891.86	1.52	1.522	891.9
37	020110		0202				893.38	3.05	3.046	893.4
36	020110		0202				896.43	3.05	3.048	896.4
35	020110		0202				899.48	3.04	3.046	899.5
34	020110		0202				902.52	3.05	3.048	902.5
33	020110		0202				905.57	3.05	3.047	905.6
32	020110		0202				908.62	3.05	3.046	908.6
31	020110		0202				911.67	3.04	3.046	911.7
30	020110		0202				914.71	3.05	3.046	914.7
29	020110		0202				917.76	3.05	3.045	917.8
28	020110		0202				920.81	3.05	3.045	920.8
27	020110		0202				923.86	3.05	3.047	923.9
26	020110		0202				926.91	3.04	3.047	926.9
25	020110		0202				929.95	3.05	3.045	930.0
24	020110		0202				933.00	3.05	3.049	933.0
23	020110		0202				936.05	3.05	3.044	936.1
22	020110		0202				939.10	3.05	3.045	939.1
21	020110		0202				942.15	3.04	3.045	942.2
20	020110		0202				945.19	3.05	3.045	945.2
19	020110		0202				948.24	3.05	3.045	948.2
18	020110		0202				951.29	3.05	3.046	951.3
17	020110		0202				954.34	3.04	3.048	954.3
16	020110		0206	170			957.38	3.13	3.123	957.4
15	020105		0202				960.51	1.52	1.521	960.5
14	020105		0202				962.03	1.53	1.522	962.0
13	020110		0202				963.56	3.04	3.044	963.6
12	020110		0202				966.60	3.05	3.045	966.6
11	020110		0202				969.65	3.05	3.045	969.7
10	0238	19590	0202				972.70	1.52	1.523	972.7
9	020110		0202				974.22	3.05	3.045	974.2
8	020110		0205	9256	0216	977.9	977.27	3.05	3.045	977.3
7	020105		0202				980.32	1.52	1.523	980.3
6	020105		0202				981.84	1.53	1.522	981.8
5	020110		0202				983.37	3.05	3.047	983.4
4	020110		0202				986.42	3.04	3.045	986.4
3	020110		0206	169			989.46	3.13	3.124	989.5
2	020105		0202				992.59	1.52	1.523	992.6
1	020110		0202				994.11	3.05	3.045	994.1
0	0203						997.16	0.05	0.050	997.2

Item No.	Component P/N	Component S/N	Coupling P/N	Coupling S/N	Accessory P/N	Mag Collar (m)	Initial Depth (m)	Nominal Length (m)	Measured Length (m)	Final Depth (m)
Depths are with respect to the ground level.										
* Component positions are referenced to the top of the subject Westbay System coupling.										
* Packer positions are referenced to the top Westbay System coupling on the packer.										
Monitoring zone dimensions are determined as described on the attached “Dimensions of Packer Seals and Monitoring Zones”.										
The position of a MOSDAX Transducer in a Measurement Port is illustrated in the attached “MOSDAX Transducer Position”.										
This information may be used in calculating piezometric levels.										

APPENDIX I
IG-BH01

POST INFLATION PRESSURE PROFILE

Post-Inflation Field Data and Calculation Sheet (March 11, 2018) - 3 page

Westbay Instruments

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Post Inflation Profile

MARCH 11TH 2018

Well No.: IG-BH01
Datum: GROUND LEVEL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: VERTICLE

Probe Type: O/C SAMPLER
Serial No.: EMS4960
Probe Range: 2000 PSI
Westbay Casing Type: MP38
Sampler Valve Position: CLOSED

Date: MARCH 12
Client: GOLDER'S/NWMO
Job No.: WB 973
Location: IGNACE, ON
Weather: OVERCAST FREEZING
Operator: AM/TK

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 14.17 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start	Finish
Pressure	14.17	14.10
Temp	6.71	5.81
Time	~~8:44~~ 8:20	12:33

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
1	977.47			1380.28	1395.96	8:57	13.85		971.72	5.55	
					1395.81	9:02	13.98		971.62	5.65	
					1395.65	9:08	14.01	1380.38	971.50	5.77	
2	888.81			1253.40	1261.60	9:21	13.49		877.24	11.57	
					1261.57	9:26	13.27	1253.31			
3	804.38			1132.03	1144.23	9:38	12.60		794.54	9.84	888.81-804.38=84.43
					1144.26	9:43	12.36	1132.01	794.68	9.70	
4	769.26			1081.49	1086.46	9:49	12.09		754.07	15.19	
					1086.44	9:54	11.95	1081.49			
5	703.12			986.57	986.64	10:10	11.27		683.87	19.25	703.12-649.78=53.34
					986.65	10:13	11.26	986.71			
6	649.78			910.23	911.37	10:18	10.98		630.94	18.84	
					911.35	10:20	10.82	910.14			
~~7~~	~~608.37~~			879.46							
			CONT'	NEXT				PAGE			

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

COLLAR @ 974.08m, COLLAR @ 886.15m, COLLAR @ 767.06, COLLAR @ 701.24, COLLAR @ 626.78, COLLAR @ 538.81
COLLAR @ 516.08m, COLLAR @ 491.71m, COLLAR @ 408.18, COLLAR @ 306.50, ~~498.69m~~ COLLAR @ 198.69m
COLLAR @ 128.18, COLLAR @ 68.97m, COLLAR @ 3.75

Westbay Instruments

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Post Inflation Profile

Well No.: IG - BH01
Datum: GROUND LEVEL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: VERTICLE

Probe Type: O/C SAMPLER
Serial No.: EMS 4960
Probe Range: 2000 PSI
Westbay Casing Type: MP38
Sampler Valve Position: CLOSED

Date: MARCH 11TH, 2015
Client: GOLDER / AWMC
Job No.: 10R973
Location: Ignace, ON
Weather: OVERCAST
Operator: AM / TK

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start:	Finish:
Pressure	14.17	14.10
Temp	6.71	5.81
Time	8:20	12:34

P_{atm} 14.17 psi

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
7	628.37			879.35	879.27	10:29	10.46		608.37	20.00	
					879.34	10:33	10.44	879.40			
8	574.42			802.02	803.78	10:39	10.15		555.28	19.14	574.42 - 628.37 = -53.95
					803.81	10:41	10.02	802.02			
9	540.21			752.94	755.08	10:45	9.72		521.03	19.18	
					755.07	10:47	9.64	752.83			
10	517.35			720.10	723.73	10:51	9.43		498.99	18.36	
					723.71	10:53	9.36	720.10			
11	492.97			685.15	687.22	10:56	9.17		473.31	19.66	
					687.25	10:58	9.10	685.14			
12	432.01			597.74	597.44	11:03	8.74		410.18	21.83	492.97 - 432.01 = 60.96
					597.46	11:05	8.55	597.71			
13	409.15			564.94	565.57	11:10	8.27		387.76	21.39	
					565.60	11:12	8.20	565.64			
						CONT	NEXT	PAGE			

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Westbay Instruments

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Post Inflation Profile.

Well No.: IG_BH01
Datum: GROUND LEVEL
Elev. G.S.:
Height of Westbay above G.S.:
Elev. top of Westbay Casing:
Reference Elevation:
Borehole angle: VERTICLE

Probe Type: O/C SAMPLER
Serial No.: EMS 4960
Probe Range: 2000 PSI
Westbay Casing Type: MP 38
Sampler Valve Position: CLOSED

Date: MARCH 11TH, 2018
Client: GOLDER / NWMO
Job No.: WB973
Location: IGNACE, ON
Weather: OVERCAST
Operator: TM / TK

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 14.17 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

		Start:	Finish:
Pressure		14.17	14.10
Temp		6.71	5.81
Time		8:20	12:33

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (m) H = (P2-Patm)/w	Piez. Level Outside Port (m) Dz = Dp - H	Comments
14	325.34			444.91	447.80	11:22	7.62		304.94	20.40	409.15-325.34=83.81
					447.81	11:24	7.43				
15	307.05			418.77	422.22	11:28	7.21		286.85	20.10	
					422.24	11:30	7.14	418.79			
16	230.85			309.64	315.49	11:37	6.70		211.90	18.95	307.05-230.85=76.2
					315.57	11:40	6.48	309.67			
17	198.77			263.74	272.29	11:49	6.10		181.52	17.25	
					272.31	11:51	6.08	263.80			
18	148.48			191.85	199.41	12:00	5.77		130.27	18.21	198.77-148.48=50.29
					199.41	12:03	5.69	191.85			
19	127.99			162.41	168.91	12:11	5.57		108.82	19.17	
					168.91	12:16	5.57	162.41			
20	68.48			77.36	87.84	12:22	5.51		57.81m	16.67	
					87.87	12:25	5.51	77.43			

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2C Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port


Westbay
Instruments

APPENDIX B

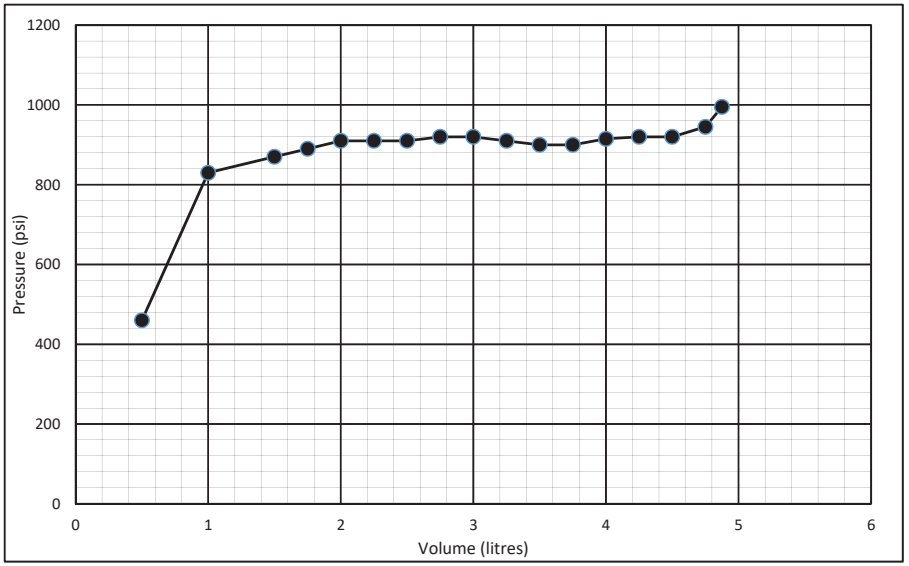
Packer Inflation Records

GOLDER	**WP9 - Westbay MP38 Casing Installation** **Record of Packer Inflation**	**Project No.:** **1671632 (1910/1911)**

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	1 (s/n 19590)	155.0	995.0	700.0	4.0	6.0	146.0	*2018-03-07; 16:40*	*cwm*
Other (explain)	972.7 m								

Volume (L)	Pressure (psi)
0.5	460
1	830
1.5	870
1.75	890
2	910
2.25	910
2.5	910
2.75	920
3	920
3.25	910
3.5	900
3.75	900
4	915
4.25	920
4.5	920
4.75	945
4.875	995



Golder Senior Reviewer & Approver Sign-off

Reviewed by:

07-Mar-18

Signature Date

Approved by:

01-May-18

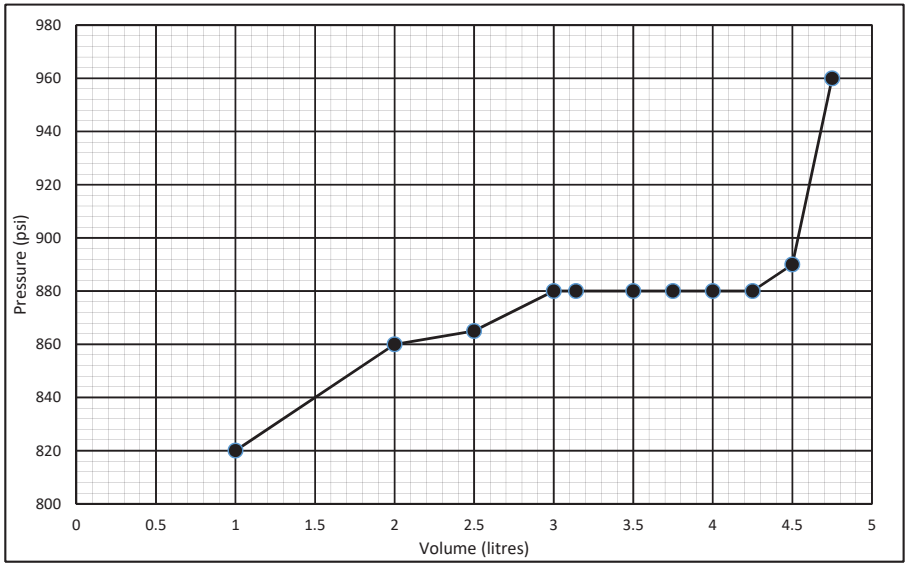
Signature Date

GOLDER	WP9 - Westbay MP38 Casing Installation Record of Packer Inflation	Project No.: 1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	2 (s/n 19589)	140.0	960.0	700.0	4.0	6.0	126.0	*2018-03-07; 18:40*	*cwm*
Other (explain)	884.24 m								

Volume (L)	Pressure (psi)
1	820
2	860
2.5	865
3	880
3.14	880
3.5	880
3.75	880
4	880
4.25	880
4.5	890
4.75	960



Golder Senior Reviewer & Approver Sign-off

Reviewed by:

07-Mar-18

Signature Date

Approved by:

01-May-18

Signature Date

GOLDER

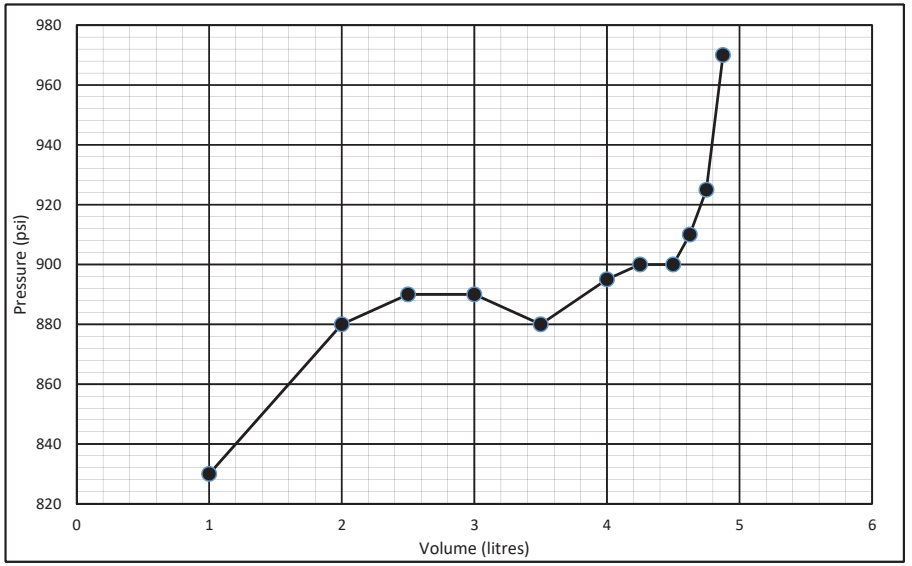
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	3 (s/n 19587)	160.0	970.0	700.0	4.0	6.0	116.0	*2018-03-07; 19:30*	*cwm*
Other (explain)									

Volume (L)	Pressure (psi)
1	830
2	880
2.5	890
3	890
3.5	880
4	895
4.25	900
4.5	900
4.625	910
4.75	925
4.875	970



Golder Senior Reviewer & Approver Sign-off

Reviewed by:

07-Mar-18

Signature Date

Approved by:

01-May-18

Signature Date

GOLDER

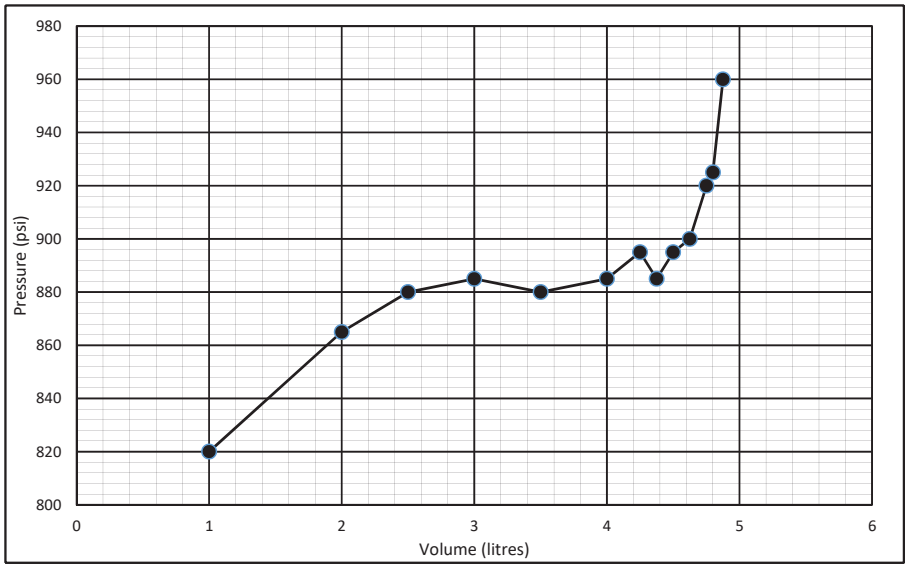
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.: 1671632 (1910/1911))

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	4 (s/n 19588)	145.0	960.0	700.0	4.0	6.0	121.0	*2018-03-08; 9:30*	*cwm*
Other (explain)	764.68 m								

Volume (L)	Pressure (psi)
1	820
2	865
2.5	880
3	885
3.5	880
4	885
4.25	895
4.375	885
4.5	895
4.625	900
4.75	920
4.8	925
4.875	960



Golder Senior Reviewer & Approver Sign-off

Reviewed by:

08-Mar-18

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Approved by:

01-May-18

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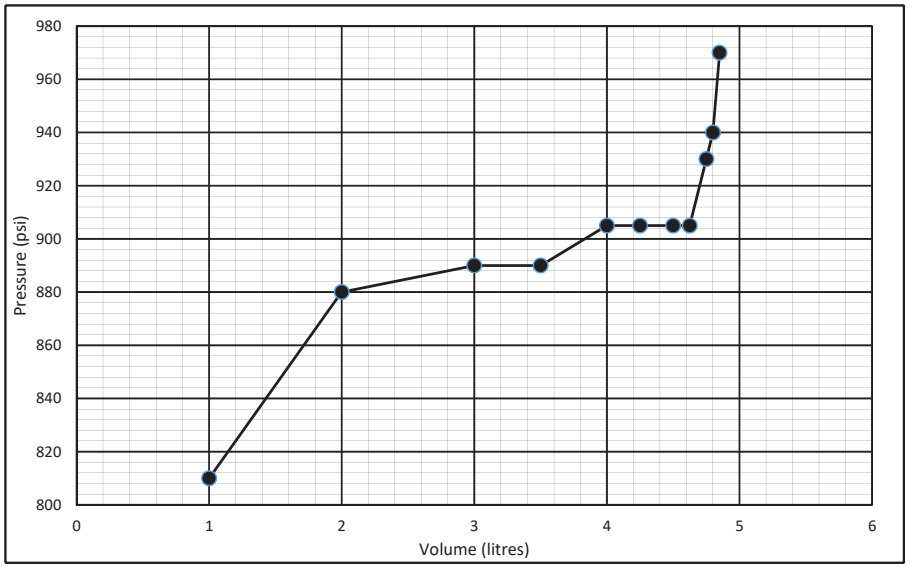
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	5 (s/n 19591)	150.0	970.0	700.0	4.0	6.0	126.0	*2018-03-08; 11:30*	*cwm*
Other (explain)	698.55 m								

Volume (L)	Pressure (psi)
1	810
2	880
3	890
3.5	890
4	905
4.25	905
4.5	905
4.625	905
4.75	930
4.8	940
4.85	970



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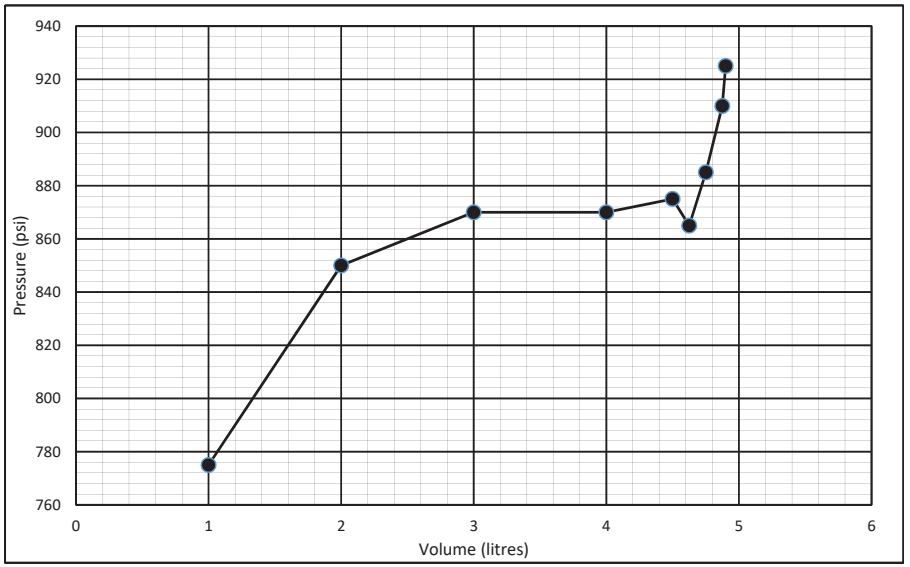
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	6 (s/n 19586)	145.0	925.0	700.0	4.0	6.0	86.0	*2018-03-09; 12:37*	*cwm*
Other (explain)	645.21 m								

Volume (L)	Pressure (psi)
1	775
2	850
3	870
4	870
4.5	875
4.625	865
4.75	885
4.875	910
4.9	925



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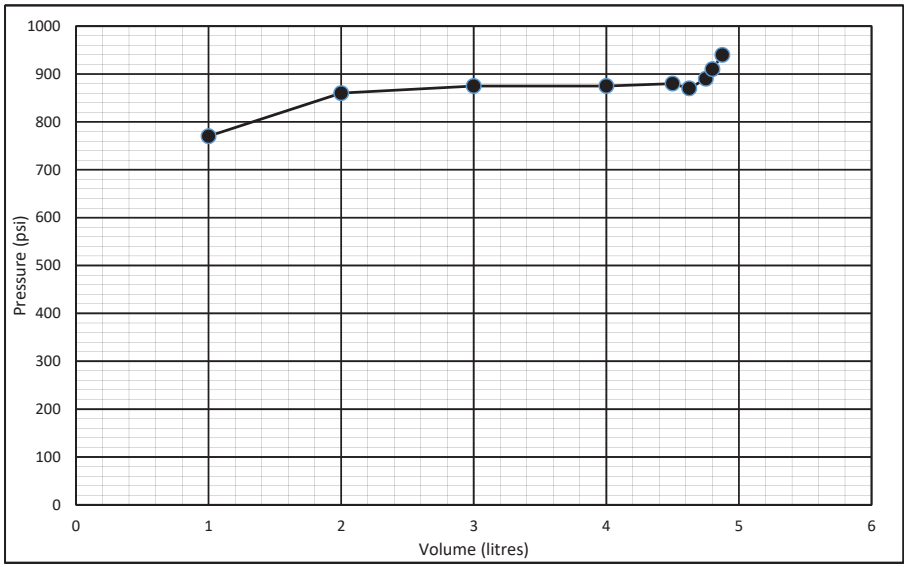
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	7 (s/n 19585)	155.0	940.0	700.0	4.0	6.0	91.0	*2018-03-09; 13:49*	*cwm*
Other (explain)	623.8 m								

Volume (L)	Pressure (psi)
1	770
2	860
3	875
4	875
4.5	880
4.625	870
4.75	890
4.8	910
4.875	940



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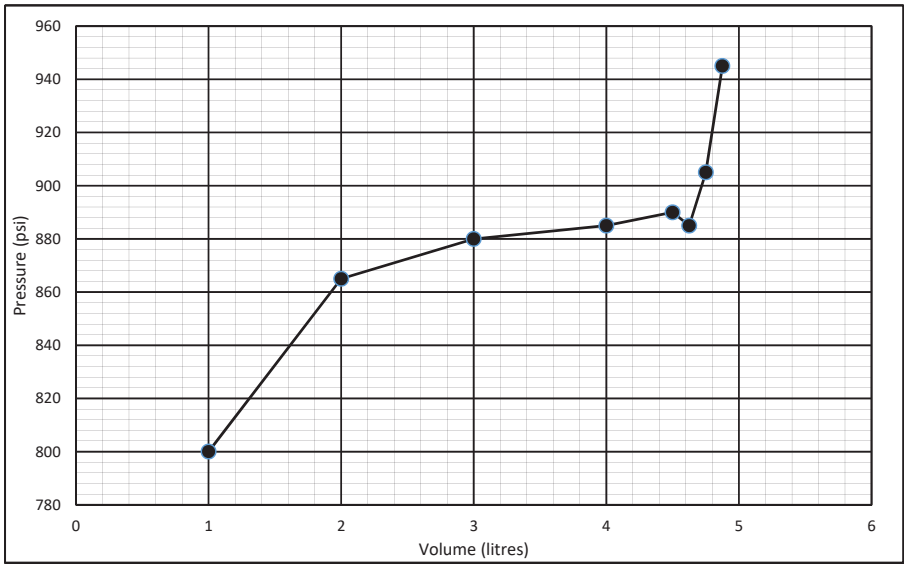
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	8 (s/n 19584)	155.0	945.0	700.0	4.0	6.0	96.0	*2018-03-09; 14:37*	*cwm*
Other (explain)	569.85 m								

Volume (L)	Pressure (psi)
1	800
2	865
3	880
4	885
4.5	890
4.625	885
4.75	905
4.875	945



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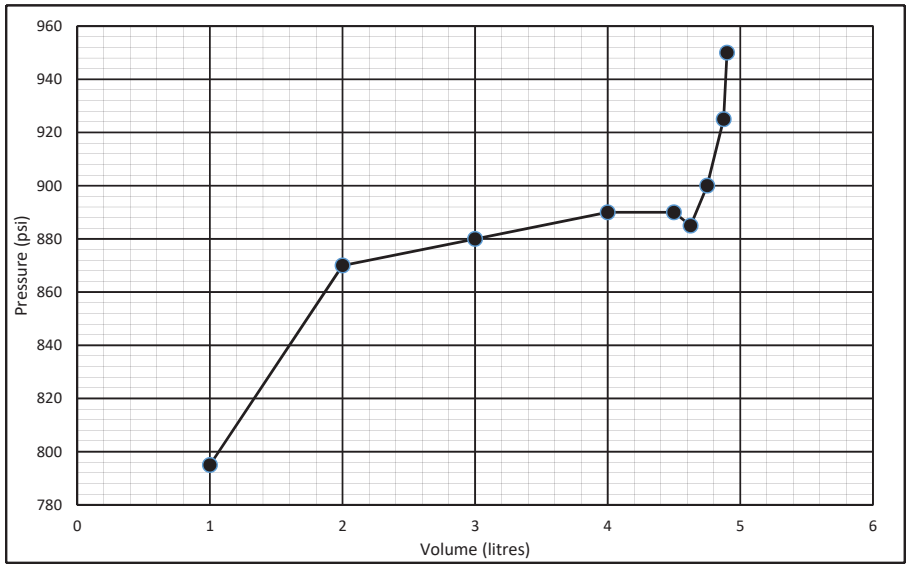
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	9 (s/n 19593)	140.0	950.0	700.0	4.0	6.0	116.0	*2018-03-09; 15:43*	*cwm*
Other (explain)	535.64 m								

Volume (L)	Pressure (psi)
1	795
2	870
3	880
4	890
4.5	890
4.625	885
4.75	900
4.875	925
4.9	950



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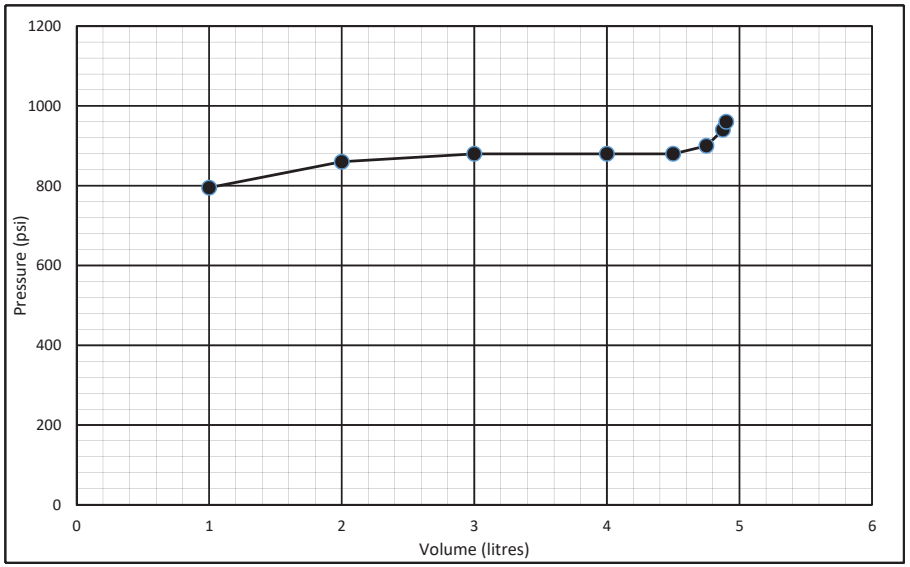
GOLDER	WP9 - Westbay MP38 Casing Installation Record of Packer Inflation	Project No.: 1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	10 (s/n 19592)	135.0	960.0	700.0	4.0	6.0	131.0	*2018-03-09; 16:21*	*cwm*
Other (explain)	512.78 m								

Volume (L)	Pressure (psi)
1	795
2	860
3	880
4	880
4.5	880
4.75	900
4.875	940
4.9	960



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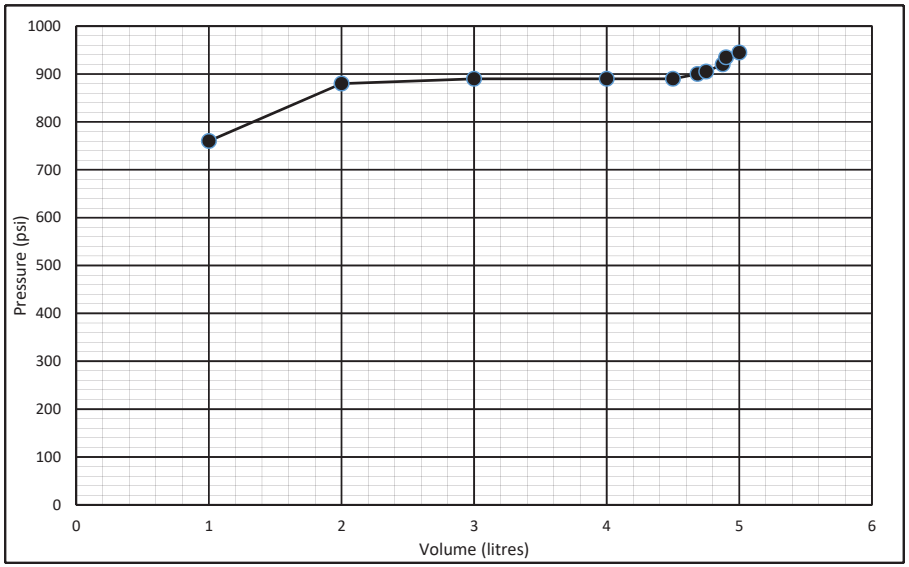
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	11 (s/n 19595)	140.0	945.0	700.0	4.0	6.0	111.0	*2018-03-09; 17:57*	*cwm*
Other (explain)	488.4 m								

Volume (L)	Pressure (psi)
1	760
2	880
3	890
4	890
4.5	890
4.685	900
4.75	905
4.875	920
4.9	935
5	945



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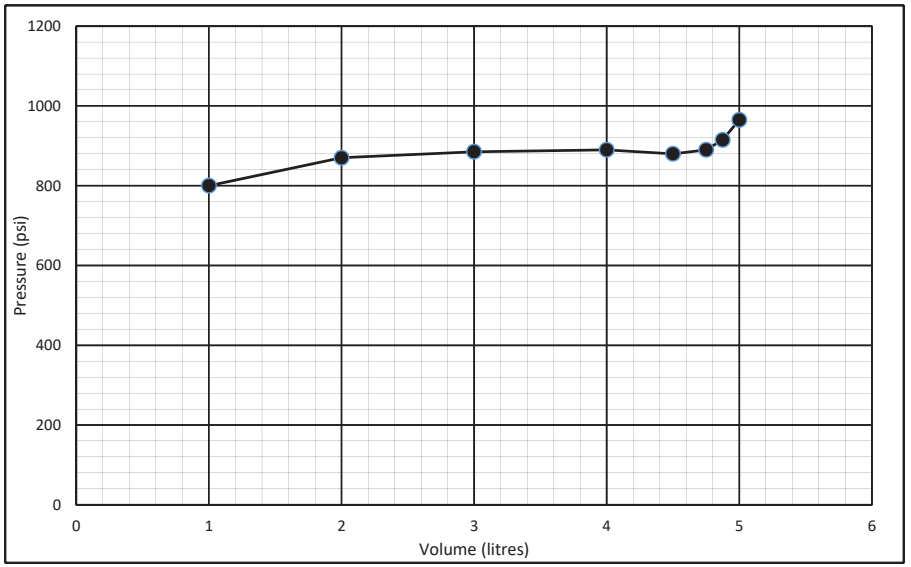
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	12 (s/n 19602)	140.0	965.0	700.0	4.0	6.0	131.0	*2018-03-09; 18:45*	*cwm*
Other (explain)	427.44 m								

Volume (L)	Pressure (psi)
1	800
2	870
3	885
4	890
4.5	880
4.75	890
4.875	915
5	965



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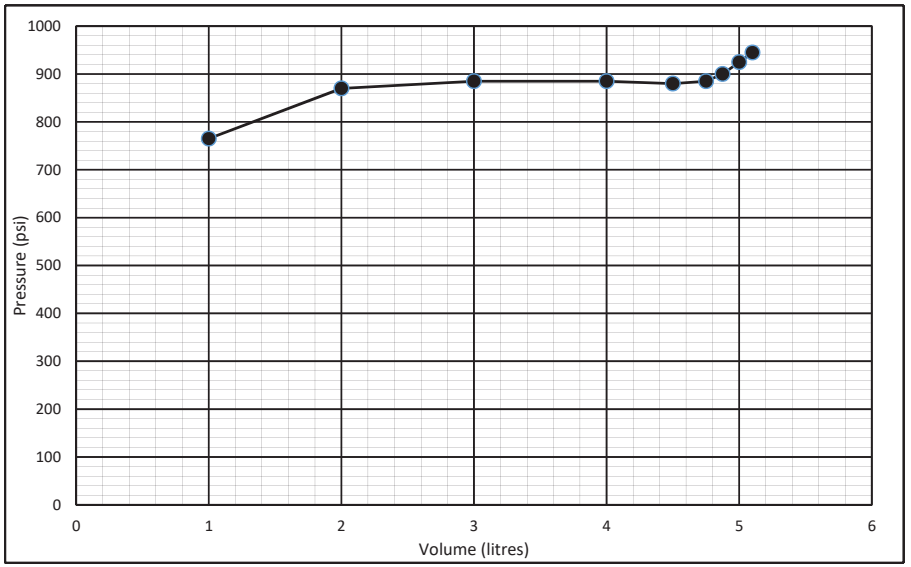
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	13 (s/n 19603)	140.0	945.0	700.0	4.0	6.0	111.0	*2018-03-09; 19:30*	*cwm*
Other (explain)	404.58 m								

Volume (L)	Pressure (psi)
1	765
2	870
3	885
4	885
4.5	880
4.75	885
4.875	900
5	925
5.1	945



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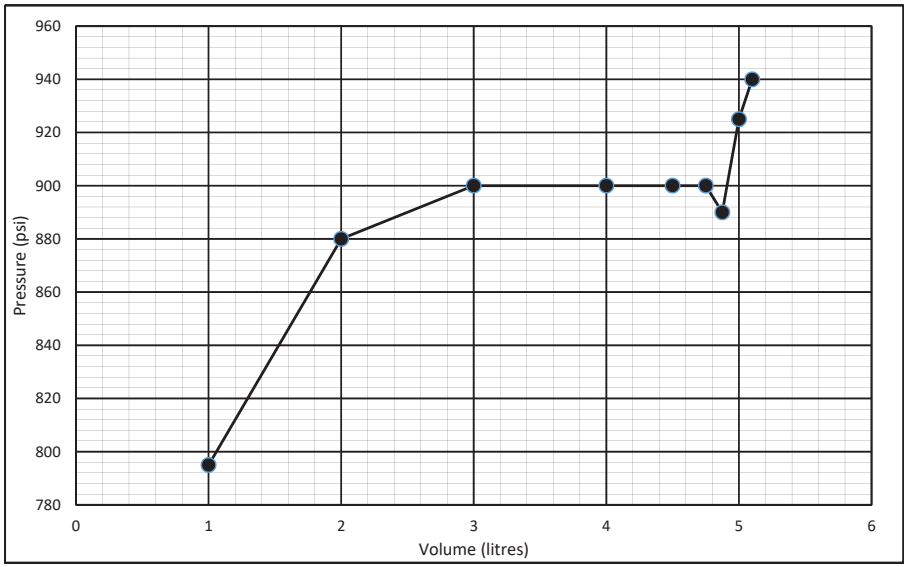
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	14 (s/n 19599)	150.0	940.0	700.0	4.0	6.0	96.0	*2018-03-10; 9:55*	*cwm*
Other (explain)	320.76 m								

Volume (L)	Pressure (psi)
1	795
2	880
3	900
4	900
4.5	900
4.75	900
4.875	890
5	925
5.1	940



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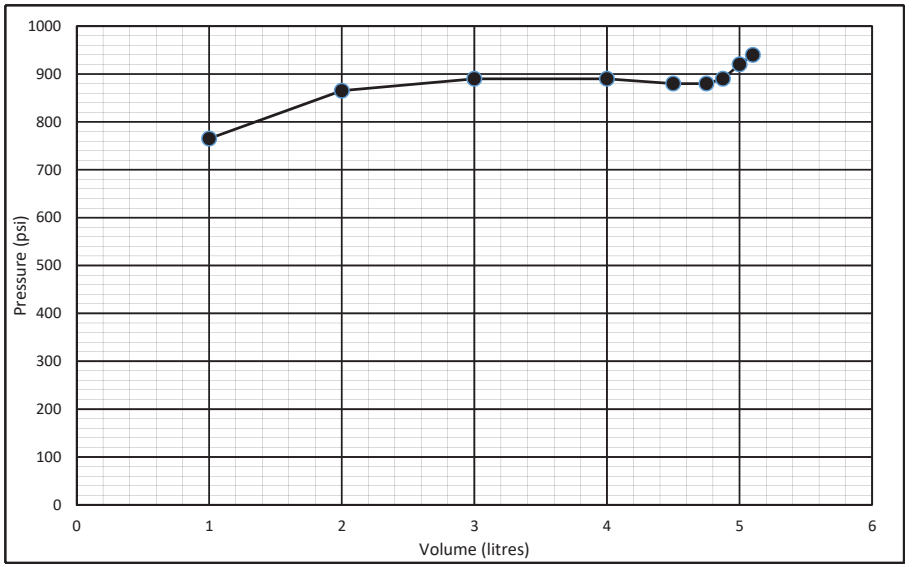
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	15 (s/n 19598)	140.0	940.0	700.0	4.0	6.0	106.0	*2018-03-10; 10:57*	*cwm*
Other (explain)	302.45 m								

Volume (L)	Pressure (psi)
1	765
2	865
3	890
4	890
4.5	880
4.75	880
4.875	890
5	920
5.1	940



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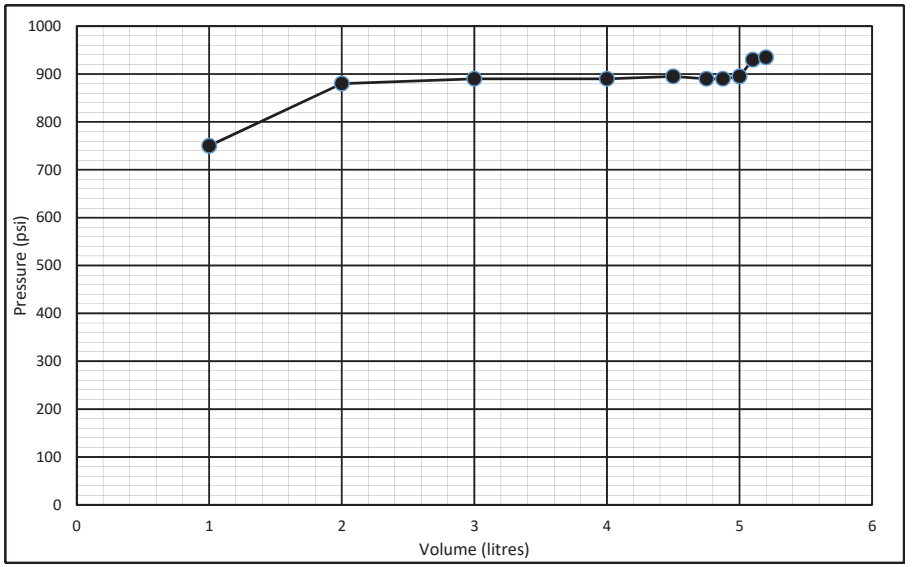
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	16 (s/n 19601)	145.0	935.0	700.0	4.0	6.0	96.0	*2018-03-10; 12:00*	*cwm*
Other (explain)	226.28 m								

Volume (L)	Pressure (psi)
1	750
2	880
3	890
4	890
4.5	895
4.75	890
4.875	890
5	895
5.1	930
5.2	935



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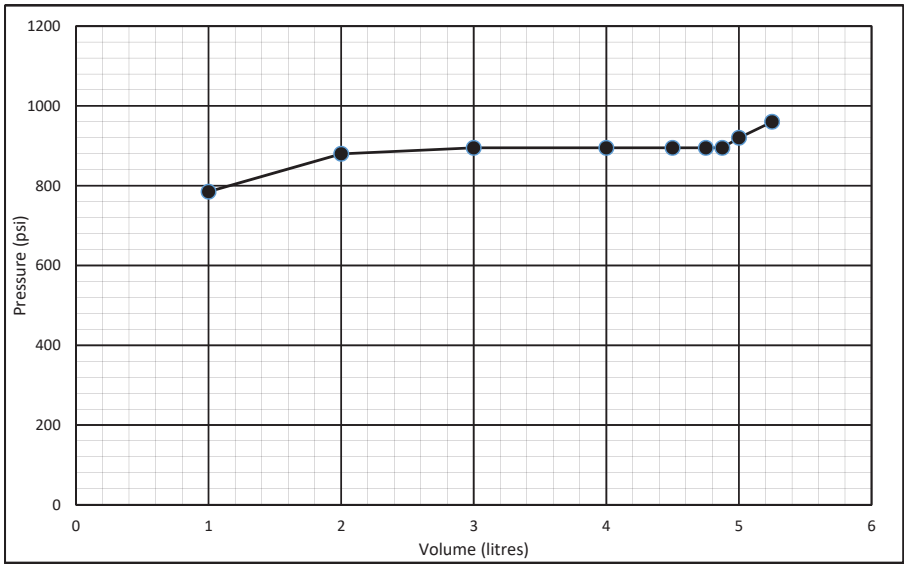
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	17 (s/n 19600)	145.0	960.0	700.0	4.0	6.0	121.0	*2018-03-10; 13:01*	*cwm*
Other (explain)	194.20 m								

Volume (L)	Pressure (psi)
1	785
2	880
3	895
4	895
4.5	895
4.75	895
4.875	895
5	920
5.25	960



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Project No.:
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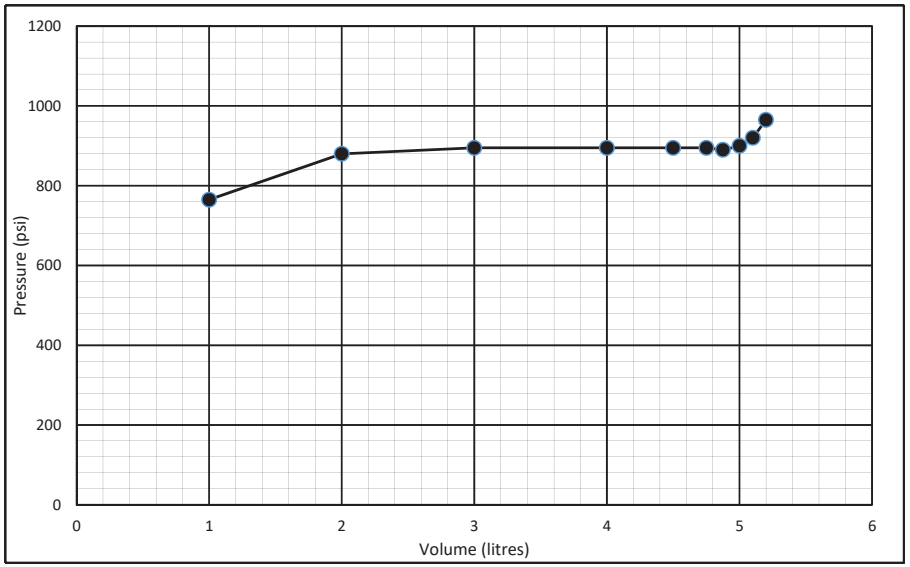
Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	18 (s/n 19597)	140.0	965.0	700.0	4.0	6.0	131.0	*2018-03-10; 13:54*	*cwm*
Other (explain)	143.91								

Volume (L)	Pressure (psi)
1	765
2	880
3	895
4	895
4.5	895
4.75	895
4.875	890
5	900
5.1	920
5.2	965



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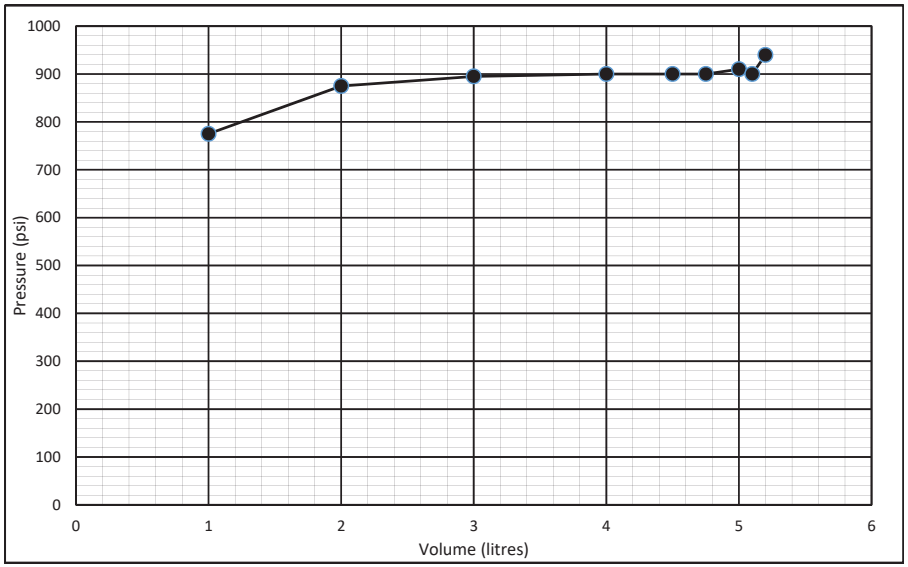
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	19 (s/n 19596)	145.0	940.0	700.0	4.0	6.0	101.0	*2018-03-10; 14:05*	*cwm*
Other (explain)	123.42 m								

Volume (L)	Pressure (psi)
1	775
2	875
3	895
4	900
4.5	900
4.75	900
5	910
5.1	900
5.2	940



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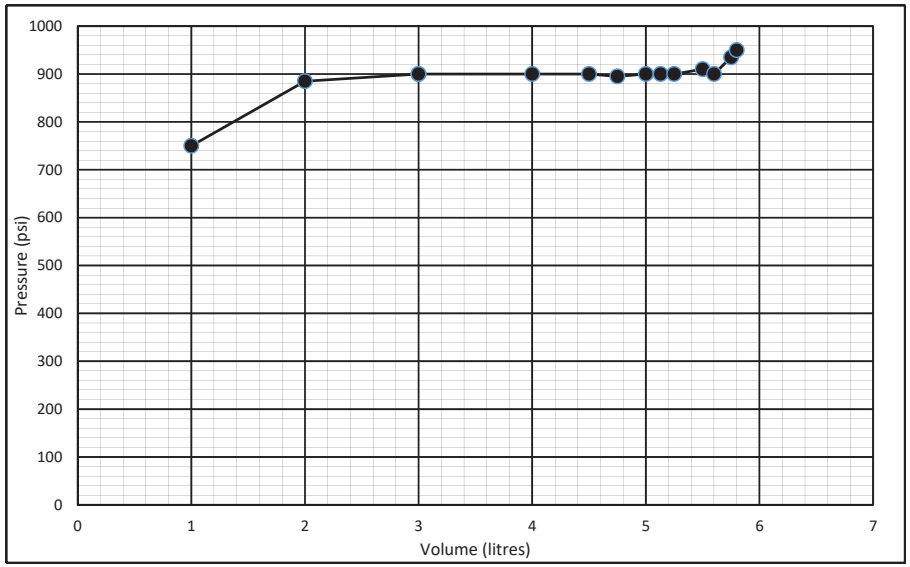
WP9 - Westbay MP38 Casing Installation
Record of Packer Inflation

Project No.:
1671632 (1910/1911)

Test # IG_BH01_HT_001

	Packer No.	Packer Valve Pressure, P_V (psi)	Final Line Pressure, P_L (psi)	Tool Pressure, P_T (psi)	Borehole Water Level (m)	Equivalent Borehole Pressure, P_W (psi)	Calc. Packer Element Pressure $P_E = P_L + P_W - P_V - P_T$ (psi)	Date and Time	Initials
Packers and Inflation Line	20 (s/n 19594)	145.0	950.0	700.0	4.0	6.0	111.0	*2018-03-10; 16:02*	*cwm*
Other (explain)	63.907 m								

Volume (L)	Pressure (psi)
1	750
2	885
3	900
3	900
4	900
4.5	900
4.75	895
5	900
5.13	900
5.25	900
5.5	910
5.6	900
5.75	935
5.8	950



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APPENDIX C

Pressure Measurement Records

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NWMO IGNACE DRILLING
WESTBAY SYSTEM
PIEZOMETRIC PRESSURES/LEVELS

Project No.:
1671632 (1910/1911)

IG_BH01_HT_001

Datum: Ground level
Elev. G.S.: 430.72
Height of Westbay above G.S.: 0.32
Elev. Top of Westbay Casing: 431.04
Reference Elevation: 430.72
Borehole angle: 90

Probe Type: Open/close sampler
Serial No.: EMS4960
Probe Range: 13790 kPa
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Weather: Clear and sunny (-8 C)
Operator: NWMO
Date: 06-Mar-18

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure	96.871378	Finish: Pressure	97.0092732
Temp.	11.8	Temp.	5.59
Time	14:55	Time	18:50

Note:
Arm Out 15 ROT, Shoe Out 23 ROT In Air, Shoe In 23 ROT in Air, Arm In 16 ROT

P_{atm} 96.9403256

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings								Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Comments
				Inside Casing (P1)	Inside Casing (P1) (kPa)	Outside Casing (P2)	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Inside Casing (P1)	Inside Casing (P1) (kPa)			
20	69.1	69.1	69.1	14.27	98.39	106.60	734.98	18:45:00	5.66	14.21	97.97	65.08	4.02	
19	128.5	128.5	128.5	14.35	98.94	191.41	1319.73	18:38:00	5.69	14.4	99.28	124.72	3.78	
18	149	149	149	32.51	224.15	220.63	1521.19	18:33:00	5.84	32.55	224.42	145.27	3.73	
17	199.2	199.2	199.2	104.56	720.92	292.47	2016.51	18:25:00	6.17	104.61	721.26	195.79	3.41	
16	231.2	231.2	231.2	150.47	1037.45	338.19	2331.74	18:19:00	6.51	150.53	1037.87	227.95	3.25	
15	307.3	307.3	307.3	259.65	1790.22	446.94	3081.54	18:08:00	7.08	259.72	1790.71	304.43	2.87	
14	325.6	325.6	325.6	285.90	1971.21	473.14	3262.19	17:58:00	7.3	-	-	322.85	2.75	
13	409.3	409.3	409.3	405.90	2798.58	592.75	4086.87	17:44:00	8.22	405.93	2798.79	406.97	2.33	
12	432.1	432.1	432.1	438.59	3023.97	625.36	4311.71	17:36:00	8.57	-	-	429.90	2.20	
11	493	493	493	525.83	3625.47	712.31	4911.21	17:26:00	9.07	525.85	3625.61	491.05	1.95	
10	517.4	517.4	517.4	560.77	3866.37	747.17	5151.56	17:16:00	9.34	560.82	3866.72	515.57	1.83	
9	540.2	540.2	540.2	593.48	4091.90	779.85	5376.88	17:09:00	9.67	593.47	4091.83	538.55	1.65	
8	574.4	574.4	574.4	642.51	4429.95	828.66	5713.41	17:03:00	10.1	642.51	4429.95	572.88	1.52	
7	628.4	628.4	628.4	719.75	4962.50	905.56	6243.62	16:54:00	10.46	719.77	4962.64	626.96	1.44	
6	649.8	649.8	649.8	750.35	5173.48	936.13	6454.39	16:45:00	10.76	750.43	5174.03	648.45	1.35	
5	703.1	703.1	703.1	826.78	5700.45	1012.33	6979.77	16:35:00	11.41	826.83	5700.79	702.04	1.06	
4	769.3	769.3	769.3	921.53	6353.73	1106.80	7631.12	16:27:00	12.04	921.52	6353.66	768.48	0.82	
3	804.4	804.4	804.4	971.83	6700.53	1157.21	7978.69	16:19:00	12.57	971.81	6700.40	803.93	0.47	
2	888.8	888.8	888.8	1092.73	7534.11	1278.32	8813.71	16:05:00	13.31	1092.74	7534.18	889.10	-0.30	
1	977.3	977.3	977.3	1219.56	8408.57	1405.28	9689.07	15:50:00	14.07	1219.63	8409.06	978.39	-1.09	

Golder Senior Reviewer & Approver Sign-off

Reviewed by:

06-Mar-18

Signature Date

Approved by:

08-Aug-18

Signature Date

GOLDER

NWMO IGNACE DRILLING
WESTBAY SYSTEM
PIEZOMETRIC PRESSURES/LEVELS

Project No.:
1671632 (1910/1911)

IG_BH01_HT_001

Datum: Ground level
Elev. G.S.: 430.72
Height of Westbay above G.S.: 0.32
Elev. Top of Westbay Casing: 431.04
Reference Elevation: 430.72
Borehole angle: 90

Probe Type: Open/close sampler
Serial No.: EMS4960
Probe Range: 13790 kPa
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Weather: Cloudy (-10 C)
Operator: NWMO
Date: 11-Mar-18

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure	97.7	Finish: Pressure	97.22
Temp.	6.71	Temp.	5.81
Time	8:20	Time	12:33

Note:
Arm Out 15 ROT, Shoe Out 23 ROT In Air, Shoe In 23 ROT in Air, Arm In 16 ROT, Dp is taken from the Log position, rather than from the port position from cable, to P_{atm} 97.46

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings								Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Comments
				Inside Casing (P1)	Inside Casing (P1) (kPa)	Outside Casing (P2)	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Inside Casing (P1)	Inside Casing (P1) (kPa)			
20	69.1		69.1	77.36	533.38	87.84	605.64	12:22:00	5.51	77.43	533.86	51.83	17.27	
19	128.5		128.5	162.41	1119.78	168.91	1164.59	12:11:00	5.57	162.41	1119.78	108.85	19.65	
18	149		149	191.85	1322.76	199.41	1374.88	12:00:00	5.69	191.85	1322.76	130.30	18.70	
17	199.2		199.2	263.74	1818.42	272.29	1877.37	11:49:00	6.08	263.80	1818.84	181.55	17.65	
16	231.2		231.2	309.64	2134.89	315.51	2175.37	11:37:00	6.48	309.67	2135.10	211.94	19.26	
15	307.3		307.3	418.77	2887.32	422.24	2911.24	11:28:00	7.14	418.79	2887.46	287.00	20.30	
14	325.6		325.6	444.91	3067.55	447.81	3087.54	11:22:00	7.43	-	-	304.99	20.61	
13	409.3		409.3	564.94	3895.13	565.60	3899.68	11:10:00	8.20	565.04	3895.82	387.82	21.48	
12	432.1		432.1	597.74	4121.27	597.46	4119.34	11:03:00	8.55	597.79	4121.62	410.23	21.87	
11	493		493	685.15	4723.94	687.25	4738.42	10:56:00	9.10	685.14	4723.88	473.37	19.63	
10	517.4		517.4	720.10	4964.92	723.71	4989.81	10:51:00	9.36	720.10	4964.92	499.02	18.38	
9	540.2		540.2	752.94	5191.34	755.07	5206.03	10:47:00	9.64	752.83	5190.58	521.07	19.13	
8	574.4		574.4	802.02	5529.74	803.81	5542.08	10:39:00	10.02	802.02	5529.74	555.35	19.05	
7	628.4		628.4	879.33	6062.77	879.34	6062.84	10:29:00	10.44	879.40	6063.25	608.46	19.94	
6	649.8		649.8	910.23	6275.82	911.35	6283.54	10:18:00	10.82	910.11	6275.02	630.98	18.82	
5	703.1		703.1	986.57	6802.16	986.65	6802.71	10:10:00	11.26	986.71	6803.13	683.93	19.17	
4	769.3		769.3	1081.49	7456.61	1086.44	7490.74	9:54:00	11.95	1081.49	7456.61	754.11	15.19	
3	804.4		804.4	1132.03	7805.08	1144.20	7888.98	9:38:00	12.36	1132.01	7804.94	794.73	9.67	
2	888.8		888.8	1253.20	8640.51	1261.57	8698.22	9:21:00	13.49	1253.31	8641.27	877.27	11.53	
1	977.3		977.3	1380.28	9516.70	1395.65	9622.67	8:57:00	14.01	1380.30	9516.84	971.56	5.74	

Golder Senior Reviewer & Approver Sign-off

Reviewed by:

11-Mar-18

Signature Date

Approved by:

08-Aug-18

Signature Date

GOLDER

NWMO IGNACE DRILLING
WESTBAY SYSTEM
PIEZOMETRIC PRESSURES/LEVELS

Project No.:
1671632 (1910/1911)

IG_BH01_HT_001

Datum: Ground level
Elev. G.S.: 430.72
Height of Westbay above G.S.: 0.32
Elev. Top of Westbay Casing: 431.04
Reference Elevation: 430.72
Borehole angle: 90

Probe Type: Open/close sampler
Serial No.: EMS4960
Probe Range: 13790 kPa
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Weather: Cloudy (-5 C)
Operator: NWMO
Date: 05-Apr-18

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure	97.08	Finish: Pressure	97.01
Temp.	16.04	Temp.	5.79
Time	9:55	Time	15:46

Note:
Arm Out 15 ROT, Shoe Out 23 ROT In Air, Shoe In 23 ROT in Air, Arm In 16 ROT "Port position" in angled boreholes refers to position along drillhole. True depth (Dp

P_{atm} 97.045

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings								Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Comments
				Inside Casing (P1)	Inside Casing (P1) (kPa)	Outside Casing (P2)	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Inside Casing (P1)	Inside Casing (P1) (kPa)			
20	69.1	70	69.1	75.90	523.31	87.46	603.02	15:41:00	5.45	75.90	523.31	51.61	17.49	
19	128.5	-	128.5	161.03	1110.26	169.92	1171.56	15:32:00	5.54	160.96	1109.78	109.60	18.90	
18	149	149.4	149	190.40	1312.76	200.10	1379.64	15:23:00	5.68	190.40	1312.76	130.82	18.18	
17	199.2	199.1	199.2	262.36	1808.91	272.43	1878.34	15:15:00	5.99	262.36	1808.91	181.69	17.51	
16	231.2	231.2	231.2	308.26	2125.38	315.90	2178.05	14:58:00	6.38	308.24	2125.24	212.26	18.94	
15	307.3	307.1	307.3	417.40	2877.87	423.94	2922.96	14:45:00	7.09	417.36	2877.60	288.24	19.06	
14	325.6	-	325.6	443.49	3057.76	449.14	3096.71	14:38:00	7.33	443.51	3057.90	305.96	19.64	
13	409.3	408.9	409.3	563.60	3885.89	570.56	3933.87	14:23:00	8.12	563.62	3886.02	391.35	17.95	
12	432.1	431	432.1	596.30	4111.35	600.81	4142.44	14:12:00	8.40	596.33	4111.55	412.63	19.47	
11	493	492.5	493	683.71	4714.02	690.28	4759.31	13:59:00	9.01	683.74	4714.22	475.55	17.45	
10	517.4	516.9	517.4	718.67	4955.06	724.31	4993.94	13:49:00	9.26	718.65	4954.92	499.48	17.92	
9	540.2	540	540.2	751.44	5181.00	755.50	5208.99	13:28:00	9.51	751.47	5181.21	521.41	18.79	
8	574.4	-	574.4	800.63	5520.15	806.20	5558.56	13:23:00	9.84	800.55	5519.60	557.07	17.33	
7	628.4	627.5	628.4	877.92	6053.05	879.79	6065.94	13:05:00	10.40	877.49	6050.08	608.82	19.58	
6	649.8	649.5	649.8	908.65	6264.92	912.56	6291.88	12:54:00	10.60	908.70	6265.27	631.87	17.93	
5	703.1	702.3	703.1	985.14	6792.30	991.31	6834.84	12:23:00	11.23	985.19	6792.65	687.25	15.85	
4	769.3	768	769.3	1080.03	7446.55	1085.81	7486.40	12:05:00	11.95	1080.03	7446.55	753.71	15.59	
3	804.4	803.3	804.4	1130.45	7794.18	1141.77	7872.23	11:54:00	12.38	1130.44	7794.11	793.06	11.34	
2	888.8	887.6	888.8	1251.75	8630.52	1261.31	8696.43	11:42:00	13.20	1251.74	8630.45	877.13	11.67	
1	977.3	975.8	977.3	1378.80	9506.50	1394.89	9617.43	11:20:00	14.02	1378.82	9506.63	971.07	6.23	

Golder Senior Reviewer & Approver Sign-off

Reviewed by:

06-Apr-18

Signature Date

Approved by:

08-Aug-18

Signature Date

GOLDER

NWMO IGNACE DRILLING
WESTBAY SYSTEM
PIEZOMETRIC PRESSURES/LEVELS

Project No.:
1671632 (1910/1911)

IG_BH01_HT_001

Datum: Ground level
Elev. G.S.: 430.72
Height of Westbay above G.S.: 0.32
Elev. Top of Westbay Casing: 431.04
Reference Elevation: 430.72
Borehole angle: 90

Probe Type: Open/close sampler
Serial No.: EMS4960
Probe Range: 13790 kPa
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Weather: Windy and rainy, 20 C
Operator: NWMO
Date: 04-Jul-18

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure 97.4919064
Temp. 22.2
Time 11:19

Finish: Pressure 97.1471684
Temp. 6.2
Time 16:22

Note:
Arm Out 15 ROT, Shoe Out 23 ROT In Air, Shoe In 23 ROT in Air, Arm In 16 ROT "Port position" in angled boreholes refers to position along drillhole. True depth (Dp

P_{atm} 97.3195374

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings							Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Comments
				Inside Casing (P1)	Inside Casing (P1) (kPa)	Outside Casing (P2)	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Inside Casing (P1)				
20	69.1	69.8	69.1	73.93	509.73	87.64	604.26	16:15:00	5.34	74.00	510.21	51.71	17.39	
19	128.5	129	128.5	159.07	1096.75	170.35	1174.52	16:06:00	5.42	159.07	1096.75	109.87	18.63	
18	149	149.5	149	188.32	1298.42	200.61	1383.16	15:57:00	5.57	188.32	1298.42	131.15	17.85	
17	199.2	199.04	199.2	260.34	1794.98	272.87	1881.37	15:45:00	5.98	260.35	1795.05	181.97	17.23	
16	231.2	232	231.2	306.26	2111.59	316.17	2179.92	15:37:00	6.42	306.30	2111.86	212.42	18.78	
15	307.3	307.3	307.3	415.34	2863.67	423.94	2922.96	15:13:00	7.06	415.36	2863.81	288.21	19.09	
14	325.6	325.5	325.6	441.53	3044.24	449.20	3097.13	15:06:00	7.34	441.51	3044.11	305.98	19.62	
13	409.3	409.2	409.3	561.56	3871.82	569.77	3928.43	14:56:00	8.06	561.64	3872.37	390.77	18.53	
12	432.1	431.9	432.1	594.38	4098.11	600.85	4142.72	14:47:00	8.32	594.36	4097.97	412.63	19.47	
11	493	492.1	493	681.73	4700.36	689.42	4753.39	14:32:00	8.98	681.77	4700.64	474.91	18.09	
10	517.4	517	517.4	716.70	4941.47	724.01	4991.88	14:24:00	9.23	716.67	4941.27	499.24	18.16	
9	540.2	539.6	540.2	749.45	5167.28	755.01	5205.61	14:15:00	9.49	749.47	5167.42	521.04	19.16	
8	574.4	-	574.4	798.54	5505.74	805.73	5555.31	14:04:00	9.87	798.56	5505.88	556.71	17.69	
7	628.4	626.9	628.4	875.97	6039.60	881.37	6076.83	13:54:00	10.35	875.97	6039.60	609.91	18.49	
6	649.8	649.8	649.8	906.62	6250.93	913.12	6295.74	13:38:00	10.57	906.61	6250.86	632.23	17.57	
5	703.1	702.2	703.1	983.20	6778.93	991.67	6837.33	13:08:00	11.15	983.20	6778.93	687.48	15.62	
4	769.3	768.1	769.3	1078.01	7432.62	1085.63	7485.16	12:45:00	11.95	1078.00	7432.55	753.55	15.75	
3	804.4	802.3	804.4	1128.42	7780.19	1140.73	7865.06	12:34:00	12.37	1128.40	7780.05	792.30	12.10	
2	888.8	886.5	888.8	1249.65	8616.04	1261.29	8696.29	12:19:00	13.28	1249.73	8616.59	877.09	11.71	
1	977.3	974.4	977.3	1376.76	9492.43	1395.86	9624.12	12:05:00	13.88	1376.73	9492.22	971.73	5.57	

Golder Senior Reviewer & Approver Sign-off

Reviewed by:

05-Jul-18

Signature Date

Approved by:

08-Aug-18

Signature Date

GOLDER

NWMO IGNACE DRILLING
WESTBAY SYSTEM
PIEZOMETRIC PRESSURES/LEVELS

Project No.:
1671632 (1910/1911)

IG_BH01_HT_001

Datum: Ground level
Elev. G.S.: 430.72
Height of Westbay above G.S.: 0.32
Elev. Top of Westbay Casing: 431.04
Reference Elevation: 430.72
Borehole angle: 90

Probe Type: Open/close sampler
Serial No.: EMS4960
Probe Range: 13790 kPa
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Weather: Sunny (-5 C)
Operator: NWMO
Date: 17-Oct-18

Ambient Reading (P_{atm}) (pressure, temperature, time)

Start: Pressure	97	Finish: Pressure	98.2
Temp.	11.81	Temp.	5.5
Time	11:14	Time	16:15

Note:
Arm Out 15 ROT, Shoe Out 23 ROT In Air, Shoe In 23 ROT in Air, Arm In 16 ROT "Port position" in angled boreholes refers to position along drillhole. True depth (Dp

P_{atm} 97.6

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m)	Fluid Pressure Readings								Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Comments
				Inside Casing (P1)	Inside Casing (P1) (kPa)	Outside Casing (P2)	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Inside Casing (P1)	Inside Casing (P1) (kPa)			
20	69.1	70	69.1	72.80	501.94	88.01	606.81	16:05:40	5.32	72.80	501.94	51.94	17.16	
19	128.5	-	128.5	157.87	1088.48	170.80	1177.63	15:57:35	5.45	157.87	1088.48	110.16	18.34	
18	149	149.4	149	187.25	1291.04	200.86	1384.88	15:51:30	5.66	187.25	1291.04	131.30	17.70	
17	199.2	199.1	199.2	259.21	1787.19	273.24	1883.92	15:45:20	6.06	259.21	1787.19	182.20	17.00	
16	231.2	231.2	231.2	305.14	2103.87	315.71	2176.74	15:39:20	6.38	305.10	2103.59	212.07	19.13	
15	307.3	307.1	307.3	414.24	2856.09	423.75	2921.65	15:31:15	7.1	414.22	2855.95	288.05	19.25	
14	325.6	-	325.6	440.40	3036.45	449.07	3096.23	15:26:30	7.37	440.43	3036.66	305.86	19.74	
13	409.3	408.9	409.3	560.52	3864.65	569.65	3927.60	15:16:45	8.2	560.49	3864.44	390.66	18.64	
12	432.1	431	432.1	593.22	4090.11	600.87	4142.85	15:10:45	8.6	593.21	4090.04	412.61	19.49	
11	493	492.5	493	680.66	4692.99	689.35	4752.90	14:23:20	8.99	680.70	4693.26	474.84	18.16	
10	517.4	516.9	517.4	715.67	4934.37	723.87	4990.91	14:16:30	9.2	715.72	4934.72	499.11	18.29	
9	540.2	540	540.2	748.48	5160.59	755.03	5205.75	14:10:10	9.56	748.46	5160.45	521.03	19.17	
8	574.4	-	574.4	797.59	5499.19	805.77	5555.59	14:04:20	9.92	797.60	5499.26	556.71	17.69	
7	628.4	627.5	628.4	875.05	6033.26	881.51	6077.80	13:56:55	10.33	875.06	6033.33	609.98	18.42	
6	649.8	649.5	649.8	905.37	6242.31	913.23	6296.50	13:41:30	10.69	905.37	6242.31	632.28	17.52	
5	703.1	702.3	703.1	981.91	6770.03	1014.41	6994.11	13:33:00	11.13	981.90	6769.96	703.44	-0.34	
4	769.3	768	769.3	1076.75	7423.93	1085.75	7485.99	12:38:27	11.96	1076.83	7424.48	753.61	15.69	
3	804.4	803.3	804.4	1127.19	7771.70	1147.05	7908.63	12:31:58	12.2	1127.23	7771.98	796.72	7.68	
2	888.8	887.6	888.8	1248.51	8608.18	1261.40	8697.05	12:05:31	13.31	1248.45	8607.76	877.14	11.66	
1	977.3	975.8	977.3	-	-	1396.06	9625.50	11:52:31	13.58	1375.55	9484.09	971.84	5.46	

Golder Senior Reviewer & Approver Sign-off

Reviewed by:

20-Oct-18

Signature Date

Approved by:

14-Feb-19

Signature Date

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