PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING – SOUTH BRUCE

WP02: Data Report for Borehole Drilling and Coring at SB_BH01

APM-REP-01332-0316 **November 2022**

Geofirma Engineering

nwmo
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Phase 2 Initial Borehole Drilling and Testing, South Bruce

WP02: Data Report for Borehole Drilling and Coring at SB_BH01

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1 INTRODUCTION

Geofirma Engineering Ltd. (Geofirma) completed the drilling and coring program at SB_BH01 drill site at 1021 Concession Road 8, northwest of Teeswater, Ontario. This report provides a detailed summary on one component of the Geofirma Engineering Ltd. geoscientific investigations as part of the NWMO Phase 2 Initial Borehole Drilling and Testing Program within the South Bruce area, near Teeswater, Ontario (Figure 1). Specifically, this report describes the activities associated with Geofirma's WP02-Test Plan (Geofirma Engineering Ltd., 2021a), to complete drilling, coring, and casing for borehole SB_BH01.

1.1 Background

Geofirma was retained by the Nuclear Waste Management Organization (NWMO) to complete a drilling and testing program for two deep bedrock boreholes (SB_BH01 & SB_BH02) as part of the NWMO's Phase 2 Geoscientific Preliminary Field Investigations. The full scope of this deep drilling and testing program is described by in the Initial Borehole Characterization Plan (Geofirma Engineering Ltd., 2020a).

Since 2010, the NWMO has been engaged in a multi-year, community-driven, site selection process to identify a site where Canada's used nuclear fuel can be safely contained and isolated in a deep geological repository. This study will assist NWMO in assessing the suitability of the South Bruce area to host a deep geologic repository (DGR) for the long-term storage of high-level radioactive waste. NWMO is currently studying multiple areas in Ontario and ultimately intend to decide on a single community with which to ratify a formal hosting agreement for the used nuclear fuel repository between an informed, willing community and the NWMO. NWMO's process is called the Adaptive Phased Management (APM) plan and comprises multiple phases.

Phase 1 of NWMO's APM plan included preliminary desktop studies using available geoscientific information and a set of key geoscientific characteristics and factors that can be realistically assessed at the desktop phase of the Preliminary Assessment. The Phase 1 Preliminary Assessment of the South Bruce area identified the Cobourg Formation as the preferred host formation for a deep geological repository for used nuclear fuel. The Initial Borehole Drilling and Testing study is a key component of the Phase 2 Geoscientific Preliminary Field Investigations of the NWMO's APM plan.

Boreholes SB_BH01 and SB_BH02 are located approximately 4 km northwest of the community of Teeswater, Ontario. SB_BH01 was drilled through the entire sedimentary bedrock sequence to approximately 20 m into the Precambrian basement, to a total depth of 880.84 mBGS. The borehole was drilled using PQ3 wireline coring equipment that produces a 123 mm nominal diameter borehole and 83 mm nominal diameter core.

The drilling program described in this report was completed to obtain high-quality data representing subsurface conditions at SB_BH01 drill sites. Supplemental reports have been prepared by Geofirma illustrating other aspects of the geoscientific investigations.



LEGEND

- SB_BH01 Drill Site
- Municipality of South Bruce
- Municipality of Brockton
- Township of Huron-Kinloss
- Provincially Significant Wetland
- Wetland
- Waterbody
- Watercourse
- Major Road
- Local / Street
- OGSRL Well Locations

INSET MAP



Figure 1
Location of SB_BH01 Drill Site

Scale 1:60,000

0 500 1,000 2,000 3,000 4,000
Meters

N

Projection: NAD 1983 UTM Zone 17N

Source: NWMO, Ontario GeoBase

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster

PROJECT No. 20-211-1

NWMO South Bruce
Drilling and Testing

DESIGN: ADG
CAD/GIS: ADG
CHECK: SNS
REV: 0

DATE: 2022-11-30

GEOFIRMA ENGINEERING

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1.2 Geological Setting

The sequence of rocks encountered in the SB_BH01 borehole consist of Paleozoic-aged strata that were deposited within the Michigan Basin northwest of the Algonquin Arch in Southwestern Ontario. The Michigan Basin is a circular-shaped cratonic basin that is composed primarily of shallow marine carbonates, evaporites, and shales that were deposited while eastern North America was in tropical latitudes during the Paleozoic Era (Armstrong and Carter 2006). West of the Algonquin Arch, strata from the Michigan Basin tend to gradually dip westward into the Michigan Basin. Borehole SB_BH01 was drilled through the entire Paleozoic sequence to approximately 20 m into the Precambrian basement, which is composed of high-grade metamorphic rocks of the Grenville Province.

1.3 Technical Objectives

The primary objective of the drilling and coring program was to obtain high-quality data that is representative of the conditions during the drilling and coring of the SB_BH01 borehole.

The technical objectives of the borehole drilling for SB_BH01, drilling, coring and casing installation activities were:

- The collection of high-quality bedrock core, which will allow geological and geotechnical core logging and the collection of core samples (WP03). Core samples will be used for laboratory testing programs to characterize the bedrock environment.
- To provide opportunity to complete supplementary studies such as borehole geophysical logging (WP05), hydraulic testing (WP06) and opportunistic groundwater sampling (WP07) while drilling.
- To provide stable borehole walls to allow for future testing the installation of a Westbay multilevel monitoring system for long term pressure and chemistry monitoring (WP09).
- To ensure the subsurface groundwater is not contaminated and water table environments are isolated through the use of casing and potentially borehole grouting following testing.

In addition, the objectives related to the drilling fluid management and tracer usage included:

- Optimize core recovery and borehole stability through the use of drilling fluids;
- Flush drill cuttings from the borehole;
- Maintain pressure control of the borehole to prevent potential blowouts in accordance with the requirements of the MNRF's Oil, Gas and Salt Resources Act (OGSRA);
- Trace drilling fluids using a combination of stable water isotopes, tritium, sodium fluorescein and measured field parameters; and
- Monitor the flow in/out of the borehole to identify opportunities to collect opportunistic groundwater samples (WP07).

2 DESCRIPTION OF ACTIVITIES

Geofirma was the Lead Contractor for all borehole drilling and coring activities associated with SB_BH01 WP02. Geofirma subcontracted Vital Drilling, based in Haileybury, Ontario to complete this work and Vital subcontracted with TW Marsh Drilling, based in Bothwell, Ontario to complete the drilling and casing installation associated with the upper approximate 30 mBGS due to the larger borehole and casing size requirements. SB_BH01 was completed with an open bedrock interval from 152.89 mBGS (~9.7 metres below the top of the Salina Formation F-Unit shale) to 880.82 mBGS (~20 metres into the Precambrian basement).

During normal drilling operations, drilling operations were conducted 24 hours per day, 7 days per week. Drill site staffing was organized into two 12-hour shifts, with day shift running from 7am to 7pm and night shift running from 7pm to 7am. A total of 6-10 staff were typically on site throughout the drilling; including Geofirma staff and the drilling contractor crew, with a larger crew present during the day shift. A typical dayshift crew included the following staff:

- 1 x Geofirma Site Supervisor (WP01)
- 1 x Geofirma Drilling Monitor (WP02)
- 1 x Geofirma Core Logger (WP03)
- 1 x Geofirma Field Technician (WP03)
- 1 x Vital Drilling Foreman
- 1 x Vital Driller
- 2 x Vital Drilling Helpers

The Geofirma Drilling Monitor was the primary communication link to the drilling contractor's on-site crew. The Geofirma Drilling Monitor also had the responsibility to verify that all drilling activities were being completed in accordance with the approved Geofirma WP02 Test Plan (Geofirma Engineering Ltd., 2021a) and to document all pertinent information associated with WP02, including but not limited to:

- drilling rig setup and operations;
- establishing depth reference measurement benchmarks for WP02 activities;
- management of drill cuttings and drilling fluid collection and disposal;
- tracking borehole depth and orientation and ensuring borehole deviation measurements were collected as required;
- documenting observations during drilling and recording of drilling parameters;
- ensuring casing programs were followed and documenting the installation and cementing of casing strings;
- testing all fresh water source used during the project;
- measuring drilling fluid parameters during drilling;
- monitoring drilling fluid volume changes during drilling

- collecting drilling fluid samples every 50m during coring operations;
- ensuring borehole flushing of fluids was completed before borehole geophysics and as required after drilling completed; and,
- recording air and noise monitoring results daily.

2.1 Provincial Drilling Regulations and Permits

2.1.1 Drilling License / Permit

The drilling and testing of SB_BH01 was not considered to be under the jurisdiction of the Ontario Ministry of Northern Development, Mines, Natural Resources, and Forestry (MNDMNRF) and on their direction to NWMO was not required to obtain a drilling license as per the Ontario Oil, Gas and Salt Resources Act (OGSRA).

While not under MNDMNRF license, but as best practice, all work associated with the drilling program was completed conforming to the guidance of the MNDMNRF Oil, Gas and Salt Resources of Ontario, Provincial Operating Standards, Version, 2.0 (MNR Standards dated 2002) which covers Well Drilling and Works regulated by the OGSRA. As such, blow-out prevention (BOP) equipment was utilized for all drilling activities below top of the Salina Formation F-Unit shale to address the possibility of potential gas-pressurization issues; however, no significant oil or gas was encountered while drilling SB_BH01.

Geofirma completed all of the following deliverables typically associated with an MNDMNRF licensed well and provided to NWMO to keep on record:

- MNDMNRF Form 1 – Application for a Well License
- MNDMNRF Class 1 Examiner Report – Well Drilling & Plugging, Casing and Cementing (to be submitted within 10 days after inspection date – inspections required for each cementing operation in accordance with API specifications and associated with BOP equipment)
- MNDMNRF Form 7 – Drilling and Completion Report (to be submitted within 60 days after well completion including borehole geophysics, hydraulic testing and Westbay installation)

Copies of these documents are included in the data delivery associated with this report.

All deliverables prepared in accordance with MNDMNRF requirements (i.e. the forms listed above) are required to express depths in units of metres below the drill rig Kelly Bushing (BKB). As the drilling rigs used on this project did not include a Kelly Bushing, the drill rig foot clamp was used in place and the conventional nomenclature of mBKB was followed. For reporting purposes, the ground surface reference datum was measured to be approximately 2.59 mBKB of the drilling rig at SB_BH01.

MECP - As an administrative, safety and transparency measure, Geofirma will tag the deep boreholes and submit a well record to the Ontario Ministry of Environment, Conservation and Parks (MECP).

2.1.2 MECP PTTW Regulations

The Ontario Water Resources Act (OWRA) and the Water Taking Regulation (O. Reg. 387/04), a regulation under the OWRA, require anyone taking more than a total of 50,000 litres of water in a day

to obtain a Permit to Take Water (PTTW) from the Ontario Ministry of Environment, Conservation and Parks (MECP).

During borehole drilling, specifically while enlarging the borehole using air hammering techniques, this requirement became a consideration due to the large volumes of water produces as drilling returns. Due to the nature of this project and to minimize any delays associated with obtaining a PTTW, Geofirma alternatively cemented the permeable sections of the borehole to effectively seal off the bedrock to allow air hammering drilling to continue without exceeding 50,000 L per day.

2.2 Health, Safety, And Environment

All field activities were completed in accordance with the requirements outlined in the project-specific Health, Safety and Environment Plan (HSEP) prepared by Geofirma and approved by NWMO (Geofirma Engineering Ltd., 2020b).

Pre-job briefings were conducted at the beginning of every shift (day and night) by the Geofirma Site Supervisor and/or Geofirma Drilling Monitor with mandatory attendance of all site personnel field day onsite to discuss the daily work plan, health and safety concerns, and any relevant changes to procedures. If any staff or contractors arrived at site during the shift, the Geofirma Site Supervisor completed a separate pre-job briefing at that time. All staff signed a pre-job briefing form to acknowledge the planned scope of work and associated risks.

Geofirma and Vital completed comprehensive “pre-drilling” rig inspections of the TW Marsh cable tool rig on April 29, 2021 and the Vital rotary coring rig on May 30, 2021. In addition to the pre-drilling inspections of rigs, Vital also completed daily rig inspections to ensure equipment was functioning properly and that safety around the drilling operations were maintained throughout the drilling program.

2.2.1 Air Monitoring

Air monitoring was completed throughout the drilling and coring program. These air monitors were typically located on the drill rig floor and the maximum values were recorded during each shift. When replacing an air monitor with low batteries, the replacement air monitor would either complete a bump test or calibration test before being placed on the drill rig floor. The values recorded throughout the program were recorded in the Data Quality Confirmation (DQC) Form and can be seen in Appendix F.

One major adverse air quality event occurred during the purging activities associated with OGW3, this event had high concentrations of H_2S. During the swabbing and purging activities it was recorded that the CO values exceeded the permissible exposure limit (25ppm) and H_2S values were high (9 ppm) yet still not exceeding prescribed limits (15 ppm). These levels along with the observed odour and blackish water led the Geofirma site supervisor to stop all work onsite and ensure all personnel were away from the effected area until a safety procedure was implemented. Following this exceedance, a safety procedure was implemented, including ensuring respirator masks were available onsite and personnel working in the area completed a fit test for the masks.

2.2.2 Noise Monitoring

Noise monitoring was completed for the first 24 hours of the drilling and coring process. Monitoring was completed at various major points around site, including outside the core logging trailer, directly beside the drill rig, at the east, south, and west fence line, and at the Vital drilling shack. Along with these values a survey was completed to determine a boundary required for hearing protection, this was completed by assessing all areas around the drill rig as it was drilling and recording where the values exceeded the maximum allowable decibels. A baseline survey was completed prior to the commencement of drilling to assess the changes associated with the drill rig. A variety of measurements were then taken at varying times throughout the first section of drilling and coring, these values are included within Appendix F.

2.3 Data Quality Assurance and Quality Control

Several data quality assurance and quality control (QA/QC) measures were implemented by Geofirma staff during the program and subsequent analysis and reporting. Verification of results was completed following acceptance criteria and verification procedures outlined in Section 6 of the Drilling and Coring Test Plan (Geofirma Engineering Ltd., 2021a) and the Geofirma Project Quality Plan (Geofirma Engineering Ltd., 2020c). All data acquisition and analysis were reviewed, verified, dated, and signed by a second Geofirma technical staff member who was not directly involved in the work being reviewed.

During shift changes (ie. 7am and 7pm) and during crew-switchout periods (i.e. approximately every 2 weeks), Geofirma and Vital staff held meetings to report and discuss information about the previous shift activities. These meetings varied in length and were typically 10-15 minutes, but durations were longer as required based on the amount and complexity of the information needing to be shared.

All equipment was calibrated prior to use and daily calibration checks were completed to ensure accuracy of data.

Laboratories completing analysis of drilling fluid samples complete their own independent and rigorous internal laboratory QA/QC programs in accordance with best industry practices and certified procedures.

3 SUMMARY OF DRILLING, CORING, AND CASING INSTALLATION

Drilling of SB_BH01 started on April 29, 2021 and was completed on September 18, 2021. While the overall duration is longer than normally would be considered required to simply drill a borehole to the target depth, the schedule is influenced by many factors unique to this project, including but not limited to:

- Mobilization of a second drilling rig (cable tool rig) to complete the drilling of larger diameter boreholes and installation of surface casing into competent bedrock.
- Loss of drilling fluid circulation which impacted coring progress, most notably including:
    - Difficult drilling conditions due to large fracture zones and high permeability within the upper shallow bedrock between Surface Casing setting depth and Production Casing setting depth.
    - Drilling through an interpreted reef structure within the Guelph Formation.
- Stopping drilling to collect 7 opportunistic groundwater (OGW) samples, each taking 3-5 days duration.
- Managing the entire planning and drilling program during a global pandemic (COVID19) which is an unprecedented undertaking.

TW Marsh started mobilization and setup of their cable tool rig and equipment on April 15, 2021. Vital Drilling crews were also onsite to assist with TW Marsh operations. TW Marsh completed drilling from ground surface to approximately 36.2 mBGS along with the installation of conductor casing and surface casing strings over a period of approximately 21 days between April 29 and May 20, 2021. Demobilization of the TW Marsh cable tool rig and setup of the Vital coring rig occurred over approximately 12 days between May 21 and June 2, 2021. Vital completed drilling the remainder of the borehole (along with intermediate casing installation and various testing programs) over a period of approximately 3 months between June 3 and September 18, 2021.

A summary of the SB_BH01 drilling related activities are presented in Figure 2. The final drilled depth of the borehole was 880.84 m below ground surface (BGS) based on the count of drill rods and the final stickup.

Drilling SB_BH01 finished on September 18, 2021. This was followed by an opportunistic groundwater sampling event (WP07), the final borehole gyro survey, and demobilization of the drilling equipment to SB_BH02. Following demobilization at SB_BH01; borehole geophysics (WP05) and hydraulic testing (WP06) were completed. Following geophysical logging and hydraulic testing, a Westbay MP55 multilevel monitoring system was installed (WP09).

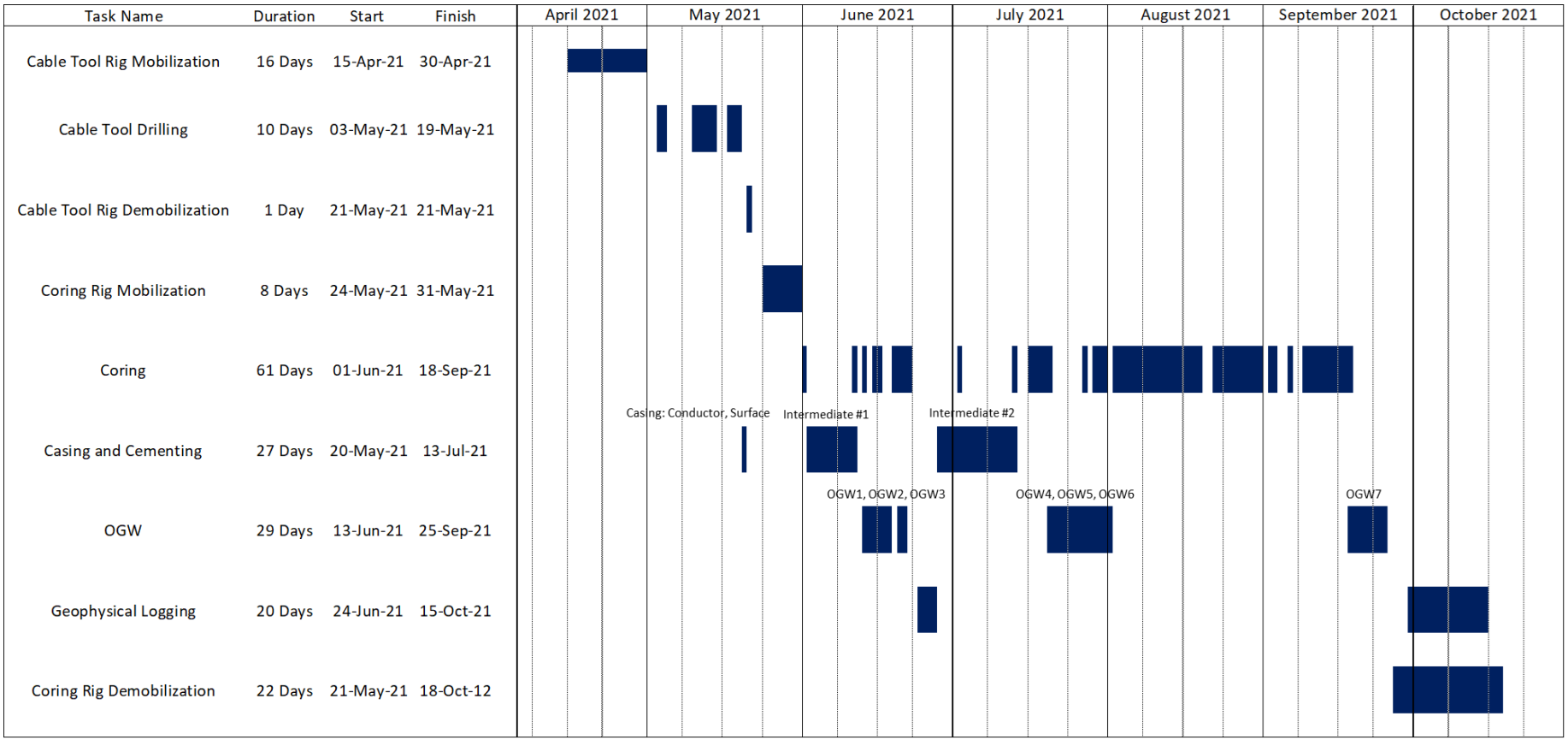


Figure 2: Summary of Drilling, Coring, Casing, and Sampling Activities for SB_BH01

3.1 Drilling Equipment and Setup

As previously discussed, SB_BH01 was drilled using two different drilling rigs. The overburden and upper 12.8 m of bedrock (total depth of 36.2 mBGS) was drilled by TW Marsh using a cable tool drilling rig to install the conductor and the surface casings as the required hole was larger than what the coring rig could achieve. Following the cable tool drilling, Vital completed the drilling program using a conventional mineral exploration coring rig outfitted to accommodate the MNDMNRF requirements for drilling, continuous coring, and casing activities from 35.2 mBGS to 880.84 mBGS.

Prior to drilling operations, a cellar (pit) was constructed at the location of the borehole. The purpose of the cellar was to provide adequate depth below ground surface to install blowout preventer equipment for drilling activities. A pit was excavated, and a 1.8 m diameter corrugated steel culvert was installed to approximately 2 m below ground surface to form the cellar.

3.1.1 Cable Tool Rig and Associated Equipment

A truck mounted Bucyrus-Erie cable tool drilling rig, operated by TW Marsh Drilling, was used to install the conductor casing and surface casing and complete the drilling program from ground surface to a depth of 36.2mBGS. The cable tool drilling rig was positioned at ground level over the borehole and rigged in place. Figure 3 shows a picture of the cable tool rig setup at SB_BH01.

3.1.2 Coring Rig and Associated Equipment

A truck mounted Atlas Copco Christensen CS4002 series all-hydraulic diamond core drill, operated by Vital Drilling, was used to complete the drilling program from 36.2 mBGS to the total depth of the borehole. This drilling rig was equipped with a hollow spindle with chuck rotation unit capable of delivering a maximum torque of 6291 Nm (4640 ft-lb) and a rotation speed up to 1300 rpm.

The drilling rig was installed on top of a steel substructure frame used to elevate the rig above ground level by approximately 2m which provided sufficient space (along with the 2m deep cellar) to accommodate the blow out prevention (BOP) equipment stack. A set of secondary containment berms as containment to minimize drill fluid entering the environment. Beside the Drill Rig two half round tanks, with a full capacity of 25 m^3 each, were used as a drill fluid source for the drilling program. Figure 4 shows the layout of drilling equipment at the SB_BH01 site.

Vital used conventional mineral exploration drilling and wireline coring equipment to complete the rock coring program. Triple-tube P-size wireline coring equipment (PQ3) manufactured by Boart Longyear was used with a diamond impregnated reaming shell that an 83 mm (3 ¼-inch) diameter high quality core in 3.00 m lengths. Coring equipment used at SB_BH01 produced a 122.6 mm (4 7/8-inch) diameter borehole from 35.65 mBGS to the total depth of the borehole. When possible, core runs were retrieved in 3.00 m lengths and further processed by Geofirma staff. In-field core length drilled for each core run has been recorded within the DQC, located in Appendix A.

Various coring bits were used to complete the continuous coring of SB_BH01 including diamond impregnated, surface set diamond, and polycrystalline diamond (PCD). Throughout the drilling program bits were typically operated with a bit rotation speed of approximately 600 to 800 revolutions per minute

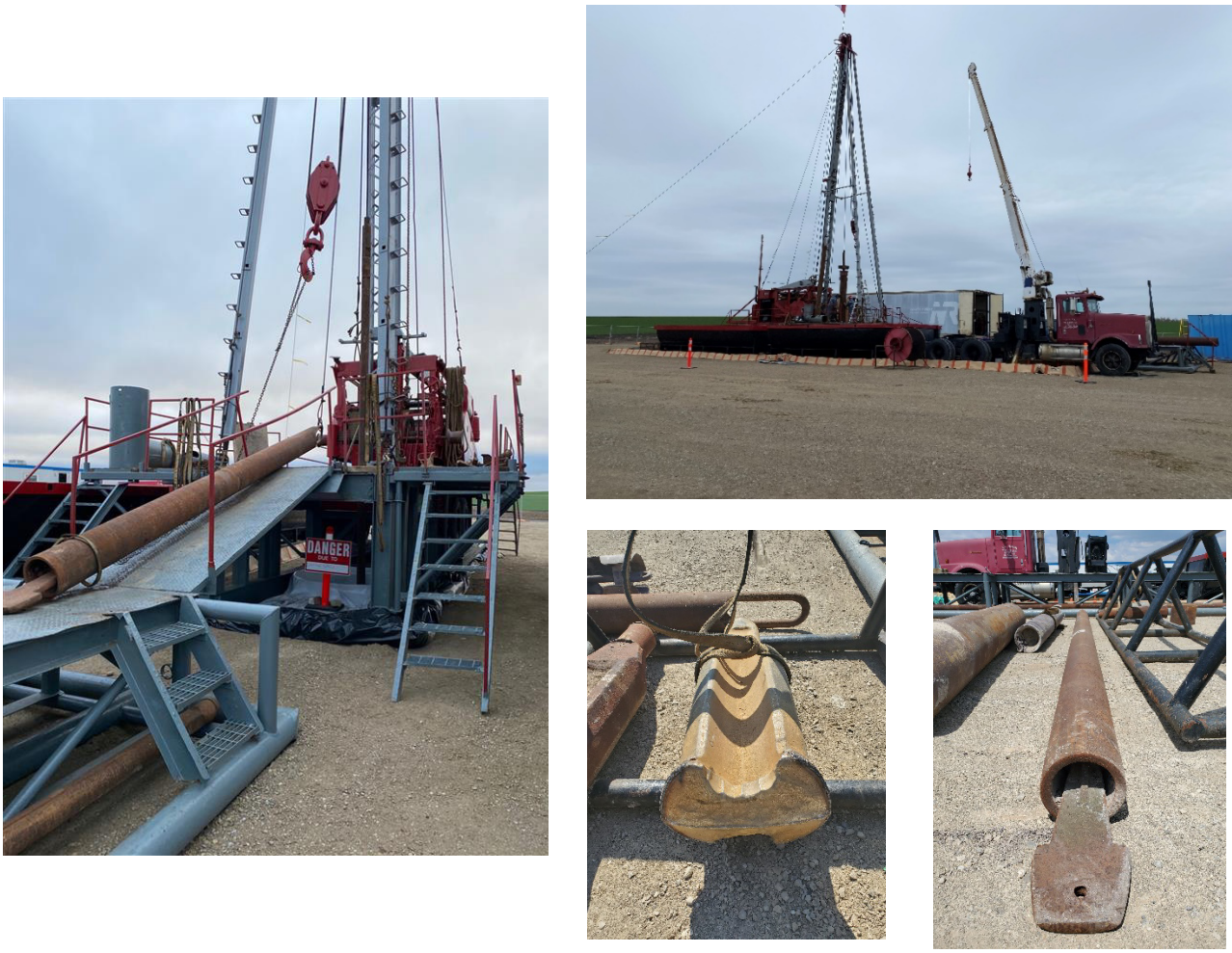


Figure 3: Setup of Cable Tool Drilling Rig and Equipment SB_BH01

(RPM) with a torque pressure of approximately 2,500 to 3,400 pounds per square inch (17,237 to 23,442 kPa).

Occasionally the drillers would halt drilling and collect a partially drilled core run due to a drilling blockage, typically caused by certain formation types and drilling fluid properties. When this occurred the driller would record the length drilled which, if possible, was confirmed with the retrieved core length. Core runs were still labeled in three meters segments, when possible, and the partially cored sections were labeled as 'CR##A', 'CR##B', etc. within the DQC until a full three-meter length was achieved.

The Geofirma drilling monitor communicated the core depth to the Geofirma core logger to ensure an accurate final depth and total core recovery. Analysis of the core was completed in association with WP03, therefore is not included within this WP02 report.

Once coring was completed to a desired casing set depth the boreholes were enlarged using a down-hole air hammer and associated equipment to provide sufficient annual space between the outside diameter of the steel casing and the borehole wall during cementing operations.



Figure 4: Setup of Coring Drilling Rig and Equipment SB_BH01.

Top Left and Bottom Right: **Coring drilling rig setup;**
Top Middle: **Vertical check during casing installation;**
Top Right: **Compressor used with downhole air hammer equipment;**
Bottom Left: **Air hammer equipment**

3.1.3 Blowout Prevention (BOP) Equipment

The potential to encounter highly pressurized zones while drilling required the use of Blowout Prevention (BOP) Equipment. BOP equipment was installed and used in accordance with MNDMNRF guidelines during rotary drilling (coring) operations after the surface casing string was installed. No BOP equipment was used during drilling above this depth while using the cable tool rig. After installation, the BOP equipment was pressure tested in accordance with the specifications outlined in drilling license application.

Drilling between 35.65 mBGS to 66.41 mBGS (after surface casing installment and before intermediate casing installment) used Class A (rotary) well control equipment (Figure 6a), including:

- 11” annular BOP - 3000 psi with flow nipple diverter.

Drilling below 66.41 mBGS to 880.84 mBGS (after Production Casing (main BOP string) installment until the end of the borehole 880.84 mBGS) used full stack Class B (rotary) well control equipment (shown in Figure 5 and Figure 6b), including:

- 9” flow nipple on top.
- 9” annular BOP – 3000 psi.
- 9” blind and pipe rams – 3000 psi with pipe ram inserts.
- 9” drilling spool with check value and manual value on one side and hydraulic control remote (HCR) and manual valve on opposite side.
- Accumulator system, flare stack and flare tank.

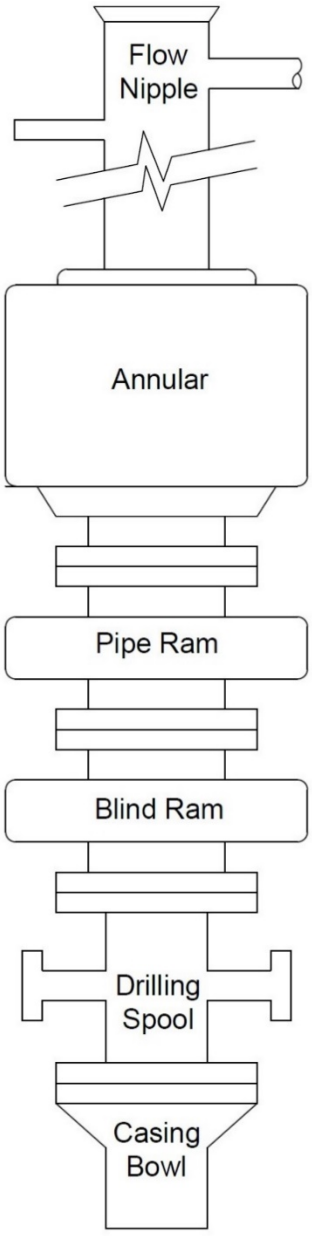


Figure 5: Example BOP Equipment

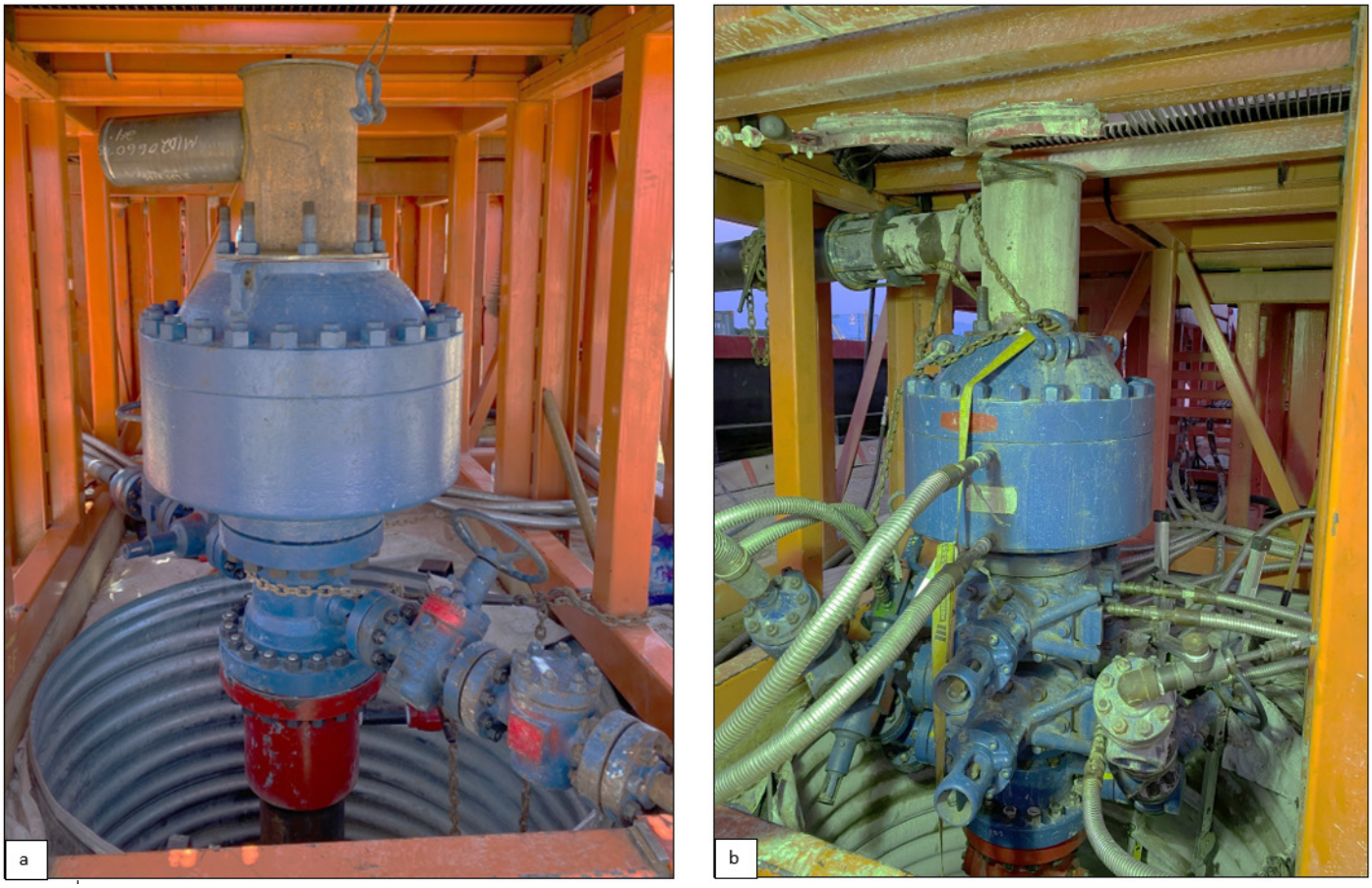


Figure 6: BOP Setups During Bedrock Drilling

a.) Class A (rotary) annular BOP with flow diverter used while drilling bedrock from 35.65 mBGS to 66.41 mBGS

b.) Class B (rotary) full stack BOP setup while drilling bedrock from 66.41 mBGS to 880.84 mBGS

3.1.4 Drilling Fluid Cleaning System

The drilling fluid return from the borehole, containing cuttings, was cleaned prior to being recycled and re-used for drilling operations by being pumped back downhole. The drilling fluid cleaning equipment system (Portable Paramount Centrifuge System manufactured by Multi-Power Products) was a closed loop system and comprised a diesel-powered hydraulic motor-driven centrifuge assembly, two fluid pumps and a 1,135 L (300 USGal) holding tank. This equipment was used in series with two ½ round mud tanks with interior baffles and a full capacity of 25 m^3 each that allowed the heavier cuttings to settle. All tanks and drilling equipment was equipped with drive on portable berm systems to contain any spills or leaks that may occur. The settlement tanks were emptied using a vacuum truck as required and the contents trucked offsite for disposal. Figure 7 shows the drilling fluid cleaning system equipment at SB_BH01.



Figure 7: Drilling Fluid Cleaning System During Coring Operations at SB_BH01

3.2 Drilling and Casing Sequencing and Progress

3.2.1 Drilling and Casing Sequencing

To meet the casing requirements of the MNDMNRF Operating Standards, multiple telescoped-casing installations were necessary to provide a permanent seal between various aquifers within the Devonian and Silurian formations and to provide suitable blow-out prevention in the event of drilling through a gas-pressurized zone. To accommodate this, SB_BH01 was drilled in the following five distinct stages as summarized in Table 1 and shown in Figure 8:

Stage 1: Conductor Borehole and Casing Installation (0 to 16.2 mBGS)
Drill through overburden material using cable tool rig while advancing conductor casing (406.4 mm OD) to produce ~406 mm diameter borehole from ground surface to top of bedrock.

Stage 2: Surface Borehole and Casing Installation (16.2 to 36.25 mBGS)
Continue drilling through shallow weathered bedrock using cable tool rig to produce a borehole with a minimum diameter of 375 mm (14 ¾”). Install 298 mm ± (11 3/4”) OD diameter Surface Casing to seal off overburden sediment from the bedrock groundwater environment.

Stage 3: Intermediate Borehole to and Intermediate Casing Installation (36.25 to 66.38 mBGS)
Continuously core using Class A (rotary) annular BOP with freshwater drilling fluid and PQ3 wireline equipment from bottom of cement to 66.38 mBGS. Enlarge borehole to 273 mm +/- (10 3/4”) and install 219 mm +/- (8 5/8”) OD Intermediate Casing to seal off any potential salty water

below this depth from cross connecting with any shallow freshwater aquifer(s) used by nearby residences as a potable water supply source.

Stage 4: Intermediate Borehole to Salina Fm F-Unit shale and Production Casing (main BOP string) (66.38 to 152.82 mBGS)

Continuously core using Class B (rotary) full stack BOP with freshwater drilling fluid and PQ3 wireline equipment from bottom of cement to approximately 5 m into the Salina F Unit shale. Complete borehole geophysical logging of the upper bedrock interval (bottom of Intermediate Casing to top of Salina Formation F Unit shale). Enlarge borehole to 196 mm +/- (7 3/4”) and install 139.7 mm +/- (5 ½”) OD Production Casing (main BOP string) to allow P-size coring (123 mm) below Salina F Unit shale and seal off any shallow freshwater aquifer(s) for drilling with brine.

Stage 5: Main Borehole to Precambrian Basement (152.82 to 880.84 mBGS)

Continuously core using Class B (rotary) full stack BOP with brine drilling fluid and PQ3 wireline equipment to produce a 123 mm +/- (4 7/8”) open borehole from the Salina F Unit shale to total depth approximately 20 m into Precambrian basement.

Table 1: Summary of Borehole and Casing Sizes for SB_BH01

Drilling Sequencing Stage	Casing String/Borehole	Casing Grade	Casing Weight (kg/m)	Bottom Depth (mBGS)	Borehole Diameter		Casing Size (OD)		Casing Size (ID)	
					(inch)	(mm)	(inch)	(mm)	(inch)	(mm)
Stage 1	Overburden (Conductor)	LS	n/a	23.45	16	406	16	406	15.3	388
Stage 2	Surface	J-55	42	36.25	14 ¾	362	11 ¾	298.5	11 1/16	281.5
Stage 3	Intermediate	K-55	254	66.38	10 ¾	265	8 5/8	219	8 1/8	206
Stage 4	Production (BOP)	K-55	14	152.82	7 ¾	197	5 ½	139	5	127
Stage 5	Main Borehole	n/a	n/a	880.84	4 7/8	123	open hole		open hole	

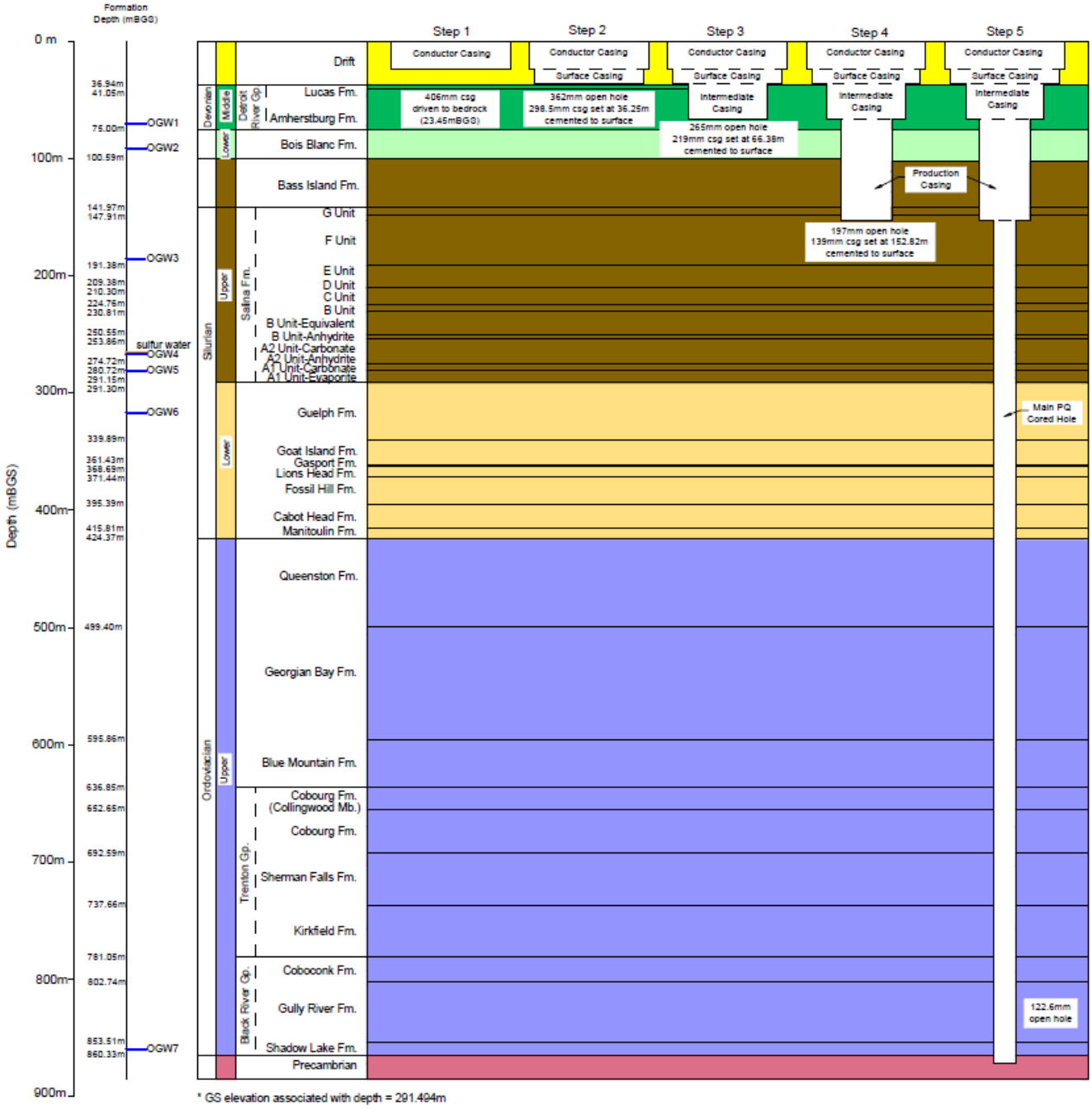


Figure 8: Bedrock Drilling and Casing Installation Sequence – Borehole SB_BH01

3.2.2 Coring Rates and Drilling Progress

The coring times for a 3.00 m length of core typically ranged from 10-15 minutes for softer shale or argillaceous-rich formations such as the Salina G-Unit, Cabot Head, Queenston and Blue Mountain Formations, as well as for the dolostone Lions Head Formation. Core times were typically longer, ranging between 1-2 hours, for harder dolostone and limestone formations such as the Lucas, Amherstburg, Bass Islands, Cobourg, Kirkfield, and Gull River and the Cambrian sandstone. The average coring time was around 30 minutes.

Drilling progress by date is presented in Figure 9 and Figure 10. The daily drilling progress varied based bit changes, equipment maintenance, drilling fluid preparation, time sensitive core sampling (WP03), and opportunistic groundwater sampling (WP07). The average progress over a 24-hour period for days with productive drilling was 12.23 m with a maximum daily drilled depth of 30.34 m achieved on June 1, 2021.

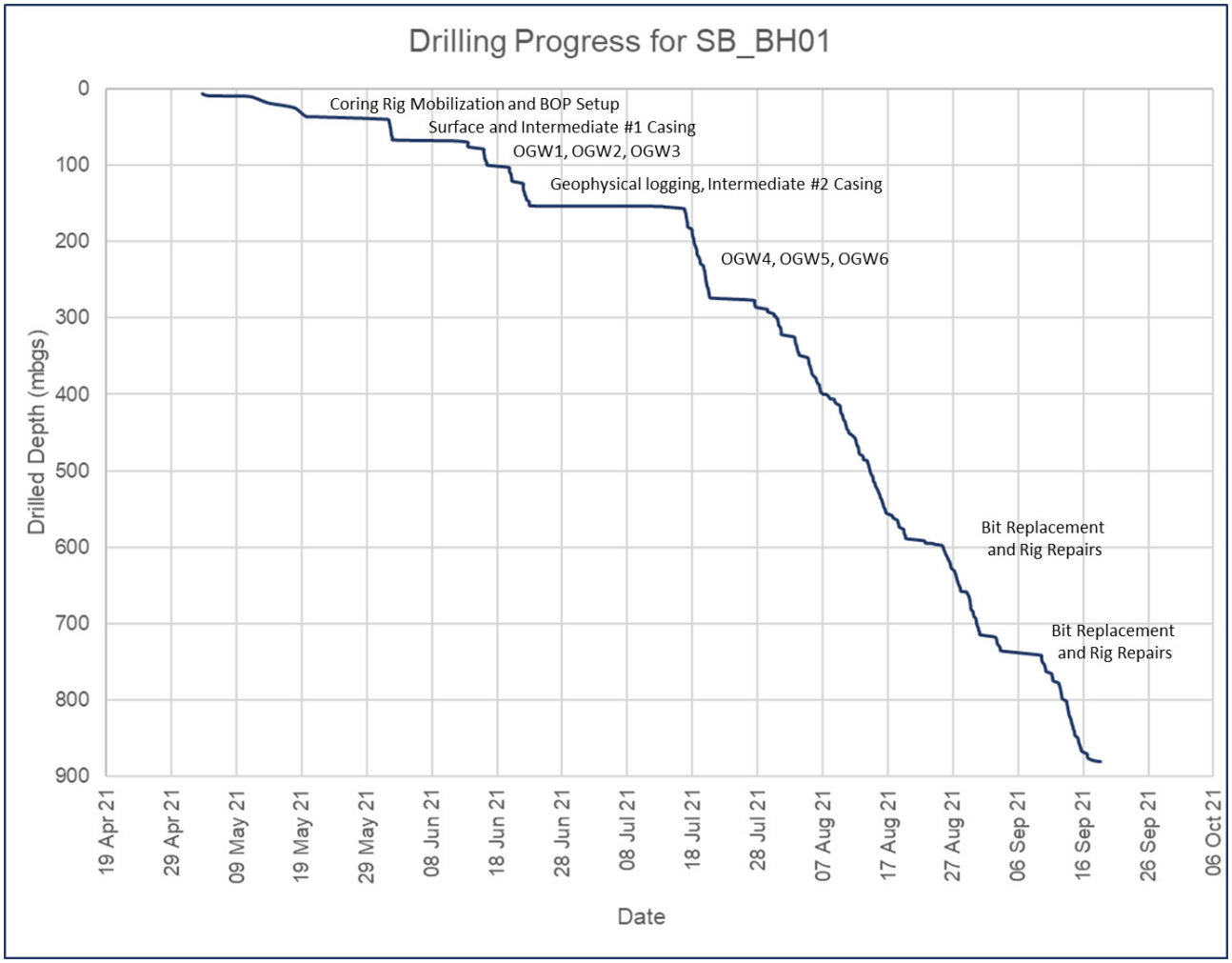


Figure 9: SB_BH01 Drilling Progress

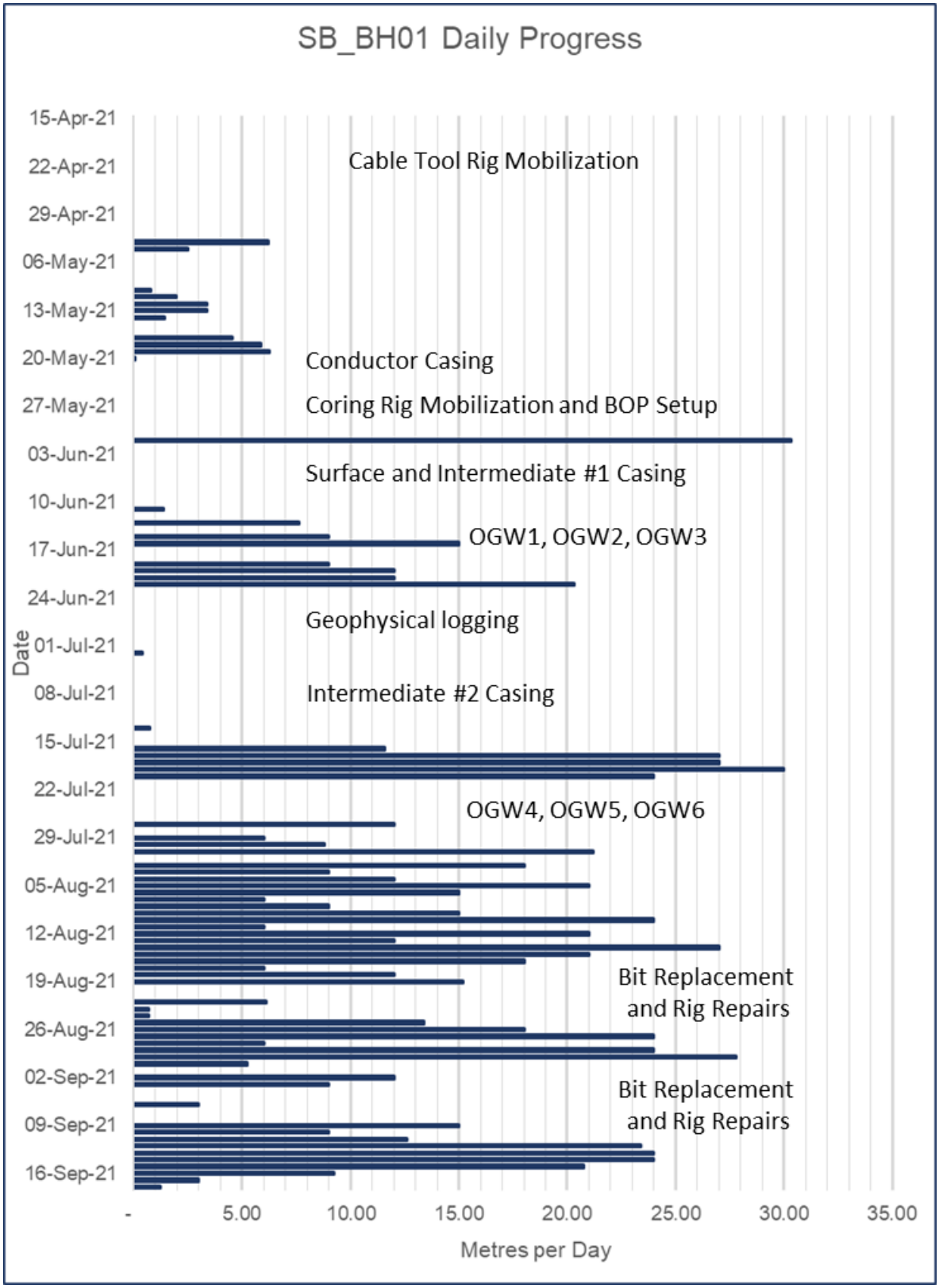


Figure 10: SB_BH01 Daily Progress

3.3 Casing Installation and Cementing Details

As discussed in Section 3.2, four different diameter casings were installed at BH01 at varying depths: the conductor casing, surface casing, intermediate casing, and production casing. Table 1 summarizes the casing details for each section of borehole. The conductor casing was driven and installed during the cable tool drilling process and therefore did not include any cementing. The surface casing was also installed during the cable tool drilling process and was cemented in place. The intermediate and production casings were installed during the rotary drilling / coring process and also cemented in place.

All casings were completed in accordance with the requirements set out in the Geofirma Test Plan (Geofirma Engineering Ltd., 2021a) including requirements for QA checks and documentation, borehole flushing, installation of centralizers, and cementing procedures. The annulus space between the outside of the steel casing and the borehole wall (or between any two casing strings) was fully cemented to surface following procedures in accordance with MNRF Provincial Operating Standards (POS). All cementing operations were completed by Integral Pumping Services (IPS), based in Merlin, Ontario. The casing installation checklist was completed on the day of installation for each casing installation and a sample checklist can be viewed in Appendix A. The cement level in the annulus after curing for each casing installation was measured to determine if remedial cementing operations were required. Vital Drilling topped up all annular spaces to surface.

The cable tool drilling process did not require a need to enlarge the borehole size prior to installation of surface casing. Throughout the cable drilling process, soil cuttings were collected for 3.0m intervals, when available. These samples were put through a sieve, cleaned, logged, and saved in a Ziploc bag.

During coring operations, the borehole required enlargement following coring of a target interval prior to casing installation which was accomplished by Vital Drilling using air hammer drilling techniques to create an adequately sized hole to meet MNDMNRF POS requirements. During the air hammering process, a large industrial compressor was used to inject highly pressurized air for cooling the drill bit and flushing cuttings out of the borehole. As discussed in Section 3.5, this process produced a large amount of water due to the significant permeability in the section of rock being drilled which would require a permit (PTTW) from the MECP as the volume produced was greater than 50,000 L/day. Through discussions with NWMO it was decided to continue the drilling operations without exceeding the 50,000 L/day extraction limit and therefore not require a PTTW. Geofirma looked into alternate drilling techniques but due to difficulties obtaining equipment during the COVID19 global pandemic this was not possible in the required timeframe. Ultimately, to minimize the volume of water produced during drilling, and to specifically remain below the threshold requiring a PTTW, Geofirma and NWMO decided to pump cement into the borehole following coring and prior to borehole enlargement to effectively seal off the highly permeable zones. These remedial cementing events (termed cement plugs or squeezes) were completed a total of four times during the drilling of the upper borehole as part of casing installation operations.

Table 2 summarizes the details including depths and dates for each casing installation and cement plus event. Figure 11 shows some pictures of the casing installation and cementing operations. Each casing installation and cementing event is discussed in further detail below.

Table 2: Casing and Cementing Summary for SB-BH01

Borehole Section	Cement Event ID	Date	Cement Interval (mBGS)	Rational
Overbuden / Conductor Casing	n/a	May 20 / 20	n/a	driven into bedrock – no cementing
Surface Casing	Surface Casing	May 20/20	0 to 36.25	Casing install - cement to surface
Intermediate Casing	Plug #1	June 6/20	36.25 to 66.65	Excessive permeability would exceed PTTW - cement plug to seal prior to air hammering and Intermediate Casing (BOP) install
Intermediate Casing	Intermediate Casing	June 9/20	0 to 66.65	Casing install - cement to surface
Production Casing	Plug #2	June 28/20	66.38 to 152.89	Excessive permeability would exceed PTTW - cement plug to seal prior to air hammering and Production Casing (BOP) install
Production Casing	Plug#3	June 29/20	66.38 to 152.89	Previous cement plug did not work, repeat
Production Casing	Plug#4	July 5/20	66.38 to 152.89	Previous cement plug did not work, repeat
Production Casing	Production Casing (BOP)	July 11/20	0 to 153.46	Casing install - cement to surface

3.3.1 Conductor Casing (0 to 23.45 mBGS)

A steel conductor casing with a nominal outside diameter (OD) of 406.4 mm was installed by TW Marsh through the overburden material and driven using a cable tool rig into competent bedrock at a depth of approximately 23.45 mBGS. Driving the conductor casing while cable tool drilling resulted in a borehole diameter equal to the OD of the steel casing. The purpose of the conductor casing was to seal off the overburden sediment from the bedrock groundwater environment.

3.3.2 Surface Casing (0 to 36.25 mBGS)

Prior to hanging the surface casing, the borehole was drilled with a diameter of 375 mm into competent bedrock to a depth of 36.25 mBGS by TW Marsh using the cable tool rig. The purpose of the surface casing was to seal off the shallow permeable bedrock and any connection to the overburden – bedrock contact aquifer with the underlying competent bedrock aquifer(s). The final casing depth was selected

by Geofirma based on drilling properties and soil cuttings. Following drilling of the surface borehole, a steel surface casing with a nominal OD of 298 mm was installed by TW Marsh and Vital and was cemented into the rock.



Figure 11: Casing Installation Operations.

Top Left: **Installation of centralizers;**
Top Middle: **Pressure monitoring of cement injection;**
Top Right: **Cement head on casing;**
Bottom: **Cement truck and rig setup with casing on racks**

Cementing was completed by IPS on May 21, 2021 and an MRNF Class 1 Examiner was present to ensure the casing was cemented properly. IPS recorded volumes, pressures, and final cement composition associated with the cementing job. 50% of excess cement volume was used and approximately 0.1 m^3 of grout was return to surface. Three cement samples were taken at varying times during the cement job, at the beginning, middle, and end, to ensure the cement hardens adequately before drilling proceeds. No grout return samples were collected during the short duration (< 1 min) returns were observed at surface.

3.3.3 Intermediate Casing – Cement Plug #1 (36.25 to 66.6 mBGS)

Prior to hanging the intermediate casing string, the upper bedrock was continuously cored and the borehole required enlargement to a diameter of 273 mm by Vital Drilling using air hammer drilling equipment and the coring rig. The open borehole interval requiring enlargement extended below the surface casing and to a depth of 66.65 mBGS and was significantly fractured with high permeability which resulted in loss of circulation during coring. As discussed above, Geofirma and NWMO decided to inject a cement plug in the entire open interval to seal off the fractures and hence reduce the permeability further into the bedrock prior to enlarging using air hammer techniques.

Cementing was completed by IPS on June 6, 2021 and an MRNF Class 1 Examiner was present to observe. IPS recorded volumes, pressures, and final cement composition associated with the cementing job. The cement design included 5.3 tonne of Class G cement with the addition of loss circulation fibres. A total of 4.0 m^3 of cement with the addition of loss circulation fibres was injected (including 100% of excess cement volume). No returns to surface were observed during injection, however during displacement with fresh water returns to surface were achieved with the annular BOP bag closed. Displacement was continued until a maximum pressure of 2000 kPa was achieved using 1.3 m^3 of fresh water, resulting in the top of cement measured approximately 23.5m below the drilling rig floor (~20.93 mBGS). Three cement samples were taken at varying times during the cement job, at the beginning, middle, and end, to ensure the cement hardens adequately before drilling proceeds. In addition, two grout samples were taken of the grout returning to surface.

The cement plug was allowed to cure for a minimum of 24 hours prior to coring through the cement to create a pilot hole, followed by resuming air hammering drilling to enlarge the borehole. While the cement plug did not completely seal off the borehole, it was effective in reducing the volume of water produced while air hammering to below the 50,000 L/day threshold.

3.3.4 Intermediate Casing Installation (0 to 66.6 mBGS)

Following borehole enlargement, the intermediate casing string, consisting of steel casing with a nominal OD of approximately 219 mm was installed at 66.41 mBGS on June 9, 2021.

The purpose of the intermediate casing string was to provide additional protection of the shallow bedrock aquifer(s) from deeper saline water that was reported by local water well contractors as a possibility below approximately 65 mBGS near the study area. The final casing depth was selected by Geofirma close to the target depth of 65mBGS and based on drilling properties and rock core analysis to ensure competent bedrock to allow an effective casing seal.

This casing was cemented to surface to ensure an effective seal. Cementing was completed by IPS, with Mike Dorland as the MRNF Class 1 Examiner. IPS provided a final report with volumes, pressures, and final cement composition of the cement job. Approximately 0.3 to 0.5 m^3 of cement returned to surface. In order to drive cement down into the casing, over 2.0 m^3 of water and 2.2 m^3 of cement was required. Three samples were taken of the cement as the cement job was being completed. In addition, two grout samples were taken of the grout returning to surface.

3.3.5 Production Casing– Cement Plug #2 (66.38 to 152.89 mBGS)

Prior to hanging the production casing string, the section of open borehole between the Intermediate Casing (~66.6 mBGS) and the target setting depth (~152.89 mBGS) was continuously cored and the borehole required enlargement to a diameter of 197 mm by Vital Drilling using air hammer drilling equipment and the coring rig. Similar to before, this interval was significantly fractured with high permeability which resulted in loss of circulation during coring which resulted in the decision to inject a cement plug in the entire open interval to seal off the fractures and reduce the permeability prior to using air hammer techniques. Based on drilling observations and core quality, the target interval for cement was between 75 to 123 mBGS

Cementing was completed by IPS on June 28, 2021 and an MRNF Class 1 Examiner was present to observe. IPS recorded volumes, pressures, and final cement composition associated with the cementing job. The cement design included 3 tonne of Class G cement without the use of loss circulation fibres with the intent of allowing the cement to flow further into the formation, based on the recent results during Cement Plug #1. IPS pumped 0.5 m^3 of water with no returns, followed by 2.0 m^3 of cement with no returns, followed by displacing the cement with water until the cement was measured at approximately 23 metres below the rig floor. Displacement was continued with 0.65 m^3 of water and the cement was measured at 40m below rig floor with the cement level continuing to drop.

Following a wait on cement for a minimum of 24 hours, it was apparent the cementing plug was not effective.

3.3.6 Production Casing – Cement Plug #3 (66.38 to 152.89 mBGS)

As the prior cement plug attempt was unsuccessful, IPS returned on June 29, 2021 to complete another attempt. IPS recorded volumes, pressures, and final cement composition associated with the cementing job. The cement design was Class G cement with the use of loss circulation fibres (similar to cement plug #1) and liquid antifoam additives to help the cement cure more quickly. IPS pumped 2.0 m^3 of water at a rate of 700 L/min with no returns, followed by 3.1 m^3 of cement with no returns, followed by displacing the cement with approximately 0.15 m^3 of water until the cement was measured at approximately 33 metres below the rig floor with the cement level continuing to drop.

The cement plug was allowed to cure for a minimum of 24 hours prior to attempting coring through the cement to create a pilot hole, followed by resuming air hammering drilling to enlarge the borehole. After air hammering to a depth of approximately 58.57 mBGS it became apparent that the cement plug was not effective enough and therefore another cement plug was planned.

3.3.7 Production Casing – Cement Plug #4 (66.38 to 152.89 mBGS)

As the prior cement plug attempt was unsuccessful, IPS returned on July 5, 2021 to complete another attempt and an MRNF Class 1 Examiner was present to observe. IPS recorded volumes, pressures, and final cement composition associated with the cementing job. The cement design included 2.5 tonnes of Class G cement with the use of loss circulation fibres (similar to cement plug #1 and plug#3) and liquid antifoam additives to help the cement cure more quickly. IPS pumped 1.0 m^3 of water at a rate of 500 L/min with no returns, followed by 1.8 m^3 of cement with no returns, followed by displacing the cement with approximately 0.15 m^3 of water until the cement was measured at approximately 40 metres below the rig floor with the cement level continuing to drop.

The cement plug was allowed to cure for a minimum of 24 hours prior to attempting coring through the cement to create a pilot hole, followed by resuming air hammering drilling to enlarge the borehole. Although similar observations during the cement plugging process with the level dropping, this plug was effective and allowed the air hammering process to enlarge the borehole.

3.3.8 Production Casing Installation (0 to 152.89 mBGS)

Following borehole enlargement, the production casing string, consisting of steel casing with a nominal OD of approximately 139 mm was installed to a depth of 152.82 mBGS, approximately 9 m below the interpreted top of the Salina Formation F-Unit shale. This casing was installed on July 10, 2021 and cemented on July 11, 2021.

The purpose of the production casing string was to provide additional protection of the shallow bedrock aquifer(s) from deeper saline water below the Salina Fm and to also provide adequate strength and protection to install BOP equipment for drilling the main section of the borehole. The final casing depth was selected by Geofirma based on drilling properties and rock core analysis to ensure installation in the Salina Fm F-Unit shale.

Cementing was completed by IPS, with Mike Dorland as the MRNF Class 1 Examiner onsite. A final report with volumes, pressures, and final cement composition was provided by IPS. In order to push cement into the casing, 1.0 m^3 of water followed by 5.2 m^3 of cement followed by 1.9 m^3 of water was used. Approximately 2.0 m^3 of cement was returned to surface, where two samples were taken. Throughout the cement job three samples were taken, at the beginning, middle and end of the process, to ensure adequate curing. The plug was set to 5 MPA (725.2 psi).

3.4 Details of Drilling Activities

3.4.1 Maintenance

Throughout drilling operations continuous maintenance was conducted on the drill rig and relevant drilling components. This included, but was not limited to, repairs and replacements on the reaming shell, turbo, oil change, swivel hose, chucks, hoisting cable, and splits. All maintenance was conducted to ensure a safe and productive work site.

The repair completed most frequently was associated with the wireline cable, occasionally this cable would break or be deemed unsafe or unreliable following an increase in wear on the line. Other rig maintenance issues that occurred include rig electrical breaker, rig head seal, pump manifold and chuck

not operating properly. Table 3 outlines the maintenance and repairs completed, although this is a fairly thorough list it may not include every repair or minor maintenance work conducted onsite.

Table 3: Maintenance and Repair Summary

Date	Equipment	General Description of Work
14-Jun-21	Camlock	Clean and Oil Camlock fittings
16-Jun-21	Camlock	Clean and Oil Camlock fittings
20-Jun-21	General	Rotation head and mud pump maintenance
29-Jun-21	General	Maintenance
08-Jul-21	Kelly hose	Repair leak
10-Jul-21	Hoisting Cable	Replace (Change out)
11-Jul-21	Rotation head	Change oil in rotation head
12-Jul-21	Hoisting Cable	Replace
19-Jul-21	Electrical issues	Troubleshoot and repair
20-Jul-21	Funnel and Swivel nose	Repair
05-Aug-21	Electrical issues	Troubleshoot and repair
05-Aug-21	Solenoid on Starter	Replace
11-Aug-21	Reaming Shell	Replace (Change out)
13-Aug-21	Turbo	Replace compressor elbow on turbo, make new bracket and put it back together
13-Aug-21	General	Rig Oil and Filter change
14-Aug-21	Swivel Hose	Replace 6m Swivel hose
14-Aug-21	Chucks	Adjustments to ensure safe
17-Aug-21	Crown	Crown inspection and preventative maintenance
17-Aug-21	General	Maintenance
19-Aug-21	General	Fuel rig and preventative maintenance
20-Aug-21	Locking Coupling	Replace (Change out) broke locking coupling sub and reaming shell
21-Aug-21	Chucks	Replace chuck
24-Aug-21	General	Preventative maintenance repairs, change out bit
24-Aug-21	Hoisting Cable	Replace (Change out)
28-Aug-21	Bit	Replace (Change out) bit, reaming shell, and gauge BHA
30-Aug-21	Splits	Change out split
04-Sep-21	Chucks	Replace
06-Sep-21	Cable	Repaired
07-Sep-21	Cable	Replace
09-Sep-21	Chucks	Replace
10-Sep-21	Cable	Repair

3.4.2 Drill Bit Changes

Due to varying rock properties and the loss of drill fluid returns, excess heat and pressure was applied to the drill bits. This resulted in coring bit replacements at varying stages on the drilling program. Total

depths drilled with a single bit ranged from 20 m to 265 m and was heavily influenced by the effectiveness of drilling fluid circulation. In total 19 different coring bits were used with only 7 bits used on more than 5 core runs (i.e. greater than 15m coring). The reason for some bits being used for such a short duration is mostly related to being damaged downhole due to coring overtop of a broken bit or taking advantage of the drill string being tripped out for other reason (i.e. broken wireline or core retrieval assembly). Figure 12 shows a variety of coring bits at various stages of wear during drilling at SB-BH01. Table 4 summarizes the bit replacements completed at SB_BH01.



Figure 12: PCD Coring Bits.

(*Left:* New bit installed on outer core barrel; *Middle:* Worn bit due to excessive heat; *Right:* Worn bit from excessive wear, compared to new bit)

Table 4: Bit Replacement Summary

Date On	Date Off	Manufacturer and Type		DHA#	DHA length	Approximate Depths Drilled (mBGS)		CR completed
30-May-21	30-Jul-21	Pilot	IMP	02	4.85	31.50	297.05	CR091B
30-Jul-21	05-Aug-21	Pilot	IMP	02	4.85	297.05	375.59	CR117
05-Aug-21	06-Aug-21	Fordia	HERO-7	03	4.86	375.59	385.13	CR121A
06-Aug-21	07-Aug-21	Atlas	HOBIC - 8E	04	4.85	385.13	399.74	CR125
07-Aug-21	08-Aug-21	--	--	05	4.86	399.74	405.74	CR128A
08-Aug-21	20-Aug-21	Atlas	8E IMP	04	4.85	405.74	588.76	CR188
20-Aug-21	23-Aug-21	N&N	PDC	05	4.86	588.76	594.86	CR191A
23-Aug-21	24-Aug-21	Boart	ReoBit	04	4.85	594.86	596.20	CR191D
24-Aug-21	28-Aug-21	Boart	LyBred	05	4.86	596.20	657.60	CR211
28-Aug-21	31-Aug-21	Fordia	HERO-7	05	4.86	657.60	714.62	CR230
31-Aug-21	03-Sep-21	Fordia	HERO-7	05	4.86	714.62	735.62	CR237
03-Sep-21	04-Sep-21	Atom	Azure	04	4.85	735.62	735.62	CR237
04-Sep-21	05-Sep-21	Atom	STD	05	4.86	735.62	735.62	CR237

Date On	Date Off	Manufacturer and Type		DHA#	DHA length	Approximate Depths Drilled (mBGS)		CR completed
05-Sep-21	06-Sep-21	Epiroc	Exfo 10	04	4.85	735.62	735.62	CR237
06-Sep-21	10-Sep-21	Fordia	HOBIC-11AC	04	4.85	735.62	762.61	CR246
10-Sep-21	11-Sep-21	Fordia	HERO-5	05	4.86	762.61	775.22	CR250
11-Sep-21	16-Sep-21	Atlas	6-8 Excore	06	4.84	775.22	867.36	CR281
16-Sep-21	17-Sep-21	Fordia	HOBIC-11AC	06	4.84	867.36	876.60	CR284
17-Sep-21	18-Sep-21	Fordia	HOBIC-11AC	06	4.84	876.60	880.84	CR286

3.4.3 Depth Control During Drilling Operations

The depth of the borehole was closely monitored by Geofirma throughout the drilling process. All depths of core runs and sub-sample locations were measured from a common elevation reference point which was selected prior to the start of drilling. For SB_BH01, the reference datum was ground surface, which was surveyed relative to a geodetic benchmark. The depth to the bottom of the drill rod was determined by adding up the lengths of all drill rods on the drill string, the down hole assembly (DHA) which comprises the core barrel, drill bit and any subs / stabilizers etc; then subtracting any length of drill rod above a fixed reference datum. The drill rig foot clamp in its lowest position was used as the fixed reference datum during drilling at SB_BH01 (Figure 13) and was measured to be approximately 2.59 m above ground surface.

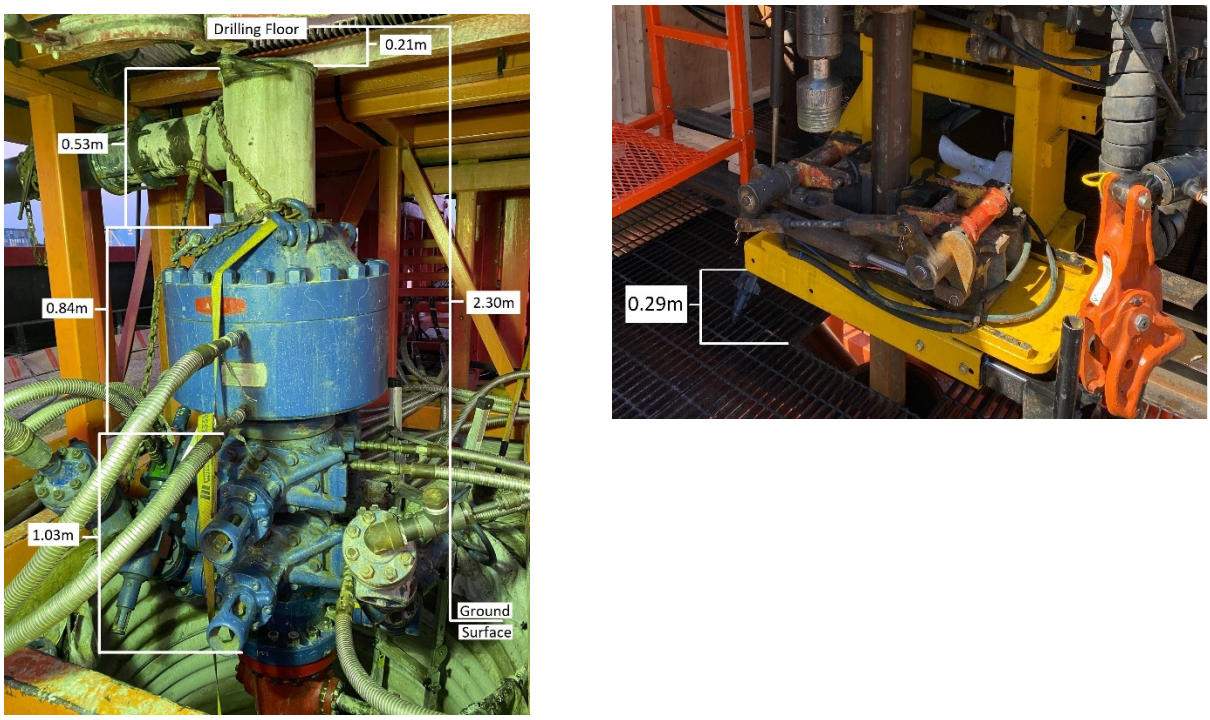


Figure 13: Depth Reference Datum (Foot Clamp) at SB_BH01.

Several quality control checks were completed during drilling to ensure depth accuracy, including:

- Re-measuring and recording any changes to the downhole assembly configuration (bits, stabilizers, subs, etc) in the Data Quality Confirmation (DQC) forms;
- A portion of the drill rods (10%) were measured to ensure a consistent length of 3.00 m. If the drilling rods were tripped out a count was completed on the rods removed from downhole to reconfirm the depth.

3.4.4 Drill Cuttings and Waste Liquid Management

All freshwater based drilling fluids and cuttings (including freshwater returns during drilling through cement) were removed from site using vacuum trucks and disposed of at Teeswater Concrete in their settling pond.

All brine-based drilling fluids and cuttings (including sulfurous water) were removed from site using Ontario Ministry of Environment, Conservation and Parks (MECP) licensed waste haulers following the Hazardous Waste Identification Network (HWIN) registration process. Geofirma has contracted with Revolution Environmental Solutions LP (Operating as TerraPure Environmental) with MECP Receiver License # A280285. TerraPure use a variety of Carrier/Transporters including Revolution Environmental Solutions LP (i.e. they truck for themselves) under MECP Carrier License # A820156, and has also used a 3rd party carrier (AMICUS – Terra HX Inc with Carrier PIN # 3136-BHMT4C).

Other liquid wastes, such as water collected in berms including rainwater and potential oily water, were disposed under HWIN manifest similar to the sulphurous water and trucked by TerraPure.

3.4.5 Monitoring Drilling Parameters

The Geofirma Drilling Monitor supervised the drilling operations and recorded a variety of drilling parameters during each core run. The drilling parameters recorded include: the rate of penetration, torque, weight on bit, holdback pressure, fluid injection pressure, and downhole flow rate. These values were recorded in the Data Quality Confirmation (DQC) workbook and are summarized in tabular form in Appendix A and plotted with depth in graphical form in Appendix B.

Drilling parameters were affected by a variety of factors including the formation type, bit condition, drilling fluid condition, and driller preferences. The rate of penetration had four major peaks, two of which were outside the established graphical limits, these values were 128.57 min/m at 405.60 mBGS and 179.17 min/m at 595 mBGS. These values were excluded from the graph to show the variation throughout the remaining hole, the values were labeled on the graph to ensure limited confusion. These values were associated with a short core run attempt (<0.15m), therefore the rate of penetration is not representative of the penetration rate of that formation.

3.5 Drilling Conditions

3.5.1 Lost Circulation Zones

As discussed in Section 3, the drilling conditions in SB-BH01 were considered to be very difficult due to a variety of reasons, including:

- Permeable shallow bedrock to approximately 155mBGS resulting in circulation loss during coring operations and the need to seal off the borehole using cement on several occasions prior to installation of surface and intermediate casing strings to ensure effective casing installations that provide the proper BOP control for drilling deeper depths;
- After installation of intermediate casings, complications with losing drilling fluid circulation while coring through an interpreted reef structure within the Guelph Fm (~290 to 340 mBGS) and the decision to continue drilling the entire borehole without circulation. This decision resulted in continually mixing fresh drilling fluid that was used to supply sufficient cooling of the coring but was lost to permeable formations and did not provide return circulation to remove cuttings from the borehole;

These unexpected and difficult drilling conditions resulted in loss of drilling fluid circulation for most of the borehole drilling program.

3.5.2 Evidence of Overpressures or Underpressures During Drilling

No significant overpressures or underpressures were observed during drilling operations.

3.5.3 Oil and Gas Occurrences

No direct evidence of commercial oil occurrence or any gas occurrence was observed during the drilling of SB_BH01. Minor oil was observed in the pore space of core collected within the Georgian Bay Fm and within the Coboconk and Gull River Formations. Petroliferous odours were reported for core collected from the Salina Fm A1-Unit carbonate, Guelph, Blue Mountain, Cobourg Fm – Collingwood Unit, Lower Cobourg, Kirkfield, Coboconk and Gull River formations.

3.6 Borehole Location and Orientation

3.6.1 Surveyed Location

Geofirma contracted with GM BluePlan to establish local temporary benchmarks onsite relative to nearby local benchmarks. Two site benchmarks were established using a Trimble R10 GPS unit with a Trimble S3 Total Station and Trimble TSC3 Data Collector on July 30, 2020, including:

- Local Elevation Benchmark #1 as the top of nail in hydro pole behind the house as shown in Figure #.
- Local Elevation Benchmark #2 as the top of nail on the southwest corner of the existing building (shed) as shown in Figure #.

These benchmarks were established by referencing the following coordinate systems and datums:

- Horizontal (northing and easting): referenced to Universal Transverse Mercator (UTM) North American Datum of 1983 (NAD83) with Canadian Spatial Referencing System (CSRS) version 6 (V6, epoch 2010.0) Zone 17N acquired via CanNet VRS. Horizontal position tied into the Ministry of Transportation of Ontario monument #00820040101.
- Vertical (elevation): referenced to the Canadian Geodetic Vertical Datum of 2013 (CGVD2013) acquired via CanNet VRS and CGG2013e geoid model. Elevations tied into the Ministry of Transportation of Ontario monument #MTO 65-303 and #MTO 65-300.

Using the local benchmarks establish by GM BluePlan, a survey of the borehole horizontal and vertical position on May 29, 2021 by Geofirma personnel using a Trimble Catalyst survey Unit. This location survey was completed after the cable tool drilling rig was demobilized from the borehole and the coring rig was setup on top of the substructure. Geofirma also completed elevation checks of borehole depth measurement reference points (i.e. the drilling rig foot clamp in lowest position) throughout the drilling and testing program.

Following drilling and testing activities a final survey was conducted on October 12, 2022 by GM BluePlan. The elevation surveys completed represent the borehole condition at the time of the survey. Due to drilling, testing, and mobilization/demobilization activities the ground surface elevation is likely to change, however for the purpose of reporting all refence to depth as metres below ground surface is relative to the pre-drilling survey elevation measured on May 29, 2021.

Table 5 summarizes the location and elevation surveys for SB_BH01.

Table 5: Summary of survey elevations at SB_BH01 Location

Parameter	July 30, 2020 (m) Original Survey	May 29, 2021 (m) Pre-Drilling Survey	October 12, 2022 (m) As-Built Survey
Local Benchmark #1	290.69	n/a	290.692
Local Benchmark #2	292.09	n/a	292.102
SB_BH01 Northing	n/a	4873187.043	4873186.863
SB_BH01 Easting	n/a	473712.096	473711.713
GS Elevation at SB_BH01	n/a	291.494	291.474
Coring Rig Foot Clamp (KB) Elevation (2.59mAGS)	n/a	294.084	n/a

Parameter	July 30, 2020 (m) Original Survey	May 29, 2021 (m) Pre-Drilling Survey	October 12, 2022 (m) As-Built Survey
Top of Flange	n/a	n/a	291.927
Top of Westbay Pup Joint Coupling Elevation	n/a	n/a	292.331



Figure 14: Survey Data Points

3.6.2 Borehole Orientation

The borehole was planned to be drilled vertically at an inclination of -90° without any azimuth. While the target is to keep the borehole as straight and vertical as practical, variations of inclination and azimuth while drilling vertical boreholes is common. No corrections were made for deviation during drilling operations, however reasonable care was taken in selection of drilling rates using weight on bit and selection of downhole stabilizers to keep the inclination close to vertical.

Borehole orientation was measured using a north-seeking gyroscopic tool (Axis Champ Gyro) to measure the azimuth and plunge of the borehole as it advanced. A calibration check was completed at ground surface prior to lowering the tool into the rods on a wireline inside of the drill rods to the targeted depth. The Axis Champ Gyro provides azimuth readings to within +/- 0.75° and dip to within +/- 0.15°.

Single-shot borehole orientation measurements were collected every 50 m as drilling progressed. The maximum reported borehole inclination over the entire borehole during any one measurement was 1.9 degrees at 40 mBGS and the maximum reported inclination below the deepest casing installation (~205

mBGS) was 1.3 degrees at 300 mBGS. The inclination near the bottom of the borehole was 1.1 degrees from vertical.

A final borehole orientation survey was conducted using the same Axis Champ Gyro on September 26, 2021 following the completion of drilling BH01. The final borehole survey was completed taking measurements at every 10 m. The final borehole orientation survey is comparable to the single shot measurements every 50 m and resulted in an average inclination over the entire borehole length of -88.9° degrees and an average azimuth of 323°. The total deviation from the original collar location was calculated as approximately 15.3 m at the bottom of the borehole. Figure 15 shows the borehole deviation in both polar diagram and a cross section. A copy of all borehole orientation survey data collected with gyroscopic tool is presented in Appendix C.

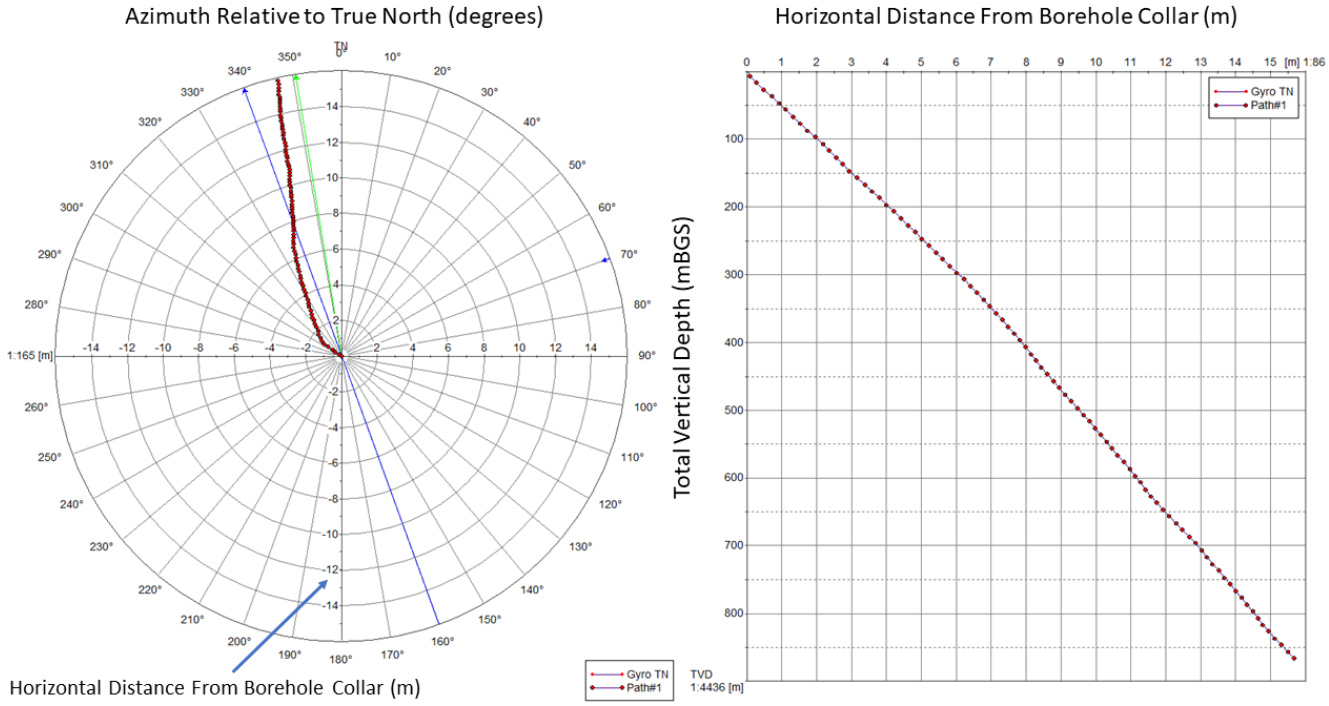


Figure 15: Measured Borehole Deviation in polar diagram (left) and cross section (right)

3.7 Borehole Flushing

Geofirma completed borehole flushing in SB_BH01 prior to completing geophysical logging in an effort to clean the borehole fluid and maximize the quality of subsequent geophysical surveys, particularly the optical televiewer surveys. Borehole flushing in SB_BH01 was completed on two occasions including prior to installation and cementing of the Production Casing (~150 mBGS), and at the completion of drilling.

During both occasions, no drilling fluid circulation was possible due to extremely high permeability and therefore all drilling fluids pumped into the borehole remained downhole.

Prior to Production Casing installation flushing was carried out on June 23, 2021, with the borehole at a depth of 152.89 mBGS with an approximate borehole water column volume of 1,800 L. Approximately 6,961 litres of clean brine-based drilling fluid (~3.8 borehole volumes) was flushed through the borehole with all of the water pushed into the permeable formation(s). Since there was no drilling fluid circulation it was not possible to monitor the field parameters on drilling fluid returns. Pumping from the borehole was completed on June 24, 2021 to allow measurement of field parameters which were mostly representative of the injected drilling fluid.

At the completion of drilling, flushing was completed on September 26, 2021 with the borehole at a depth of 880.84 mBGS and an approximate borehole water column volume of 10,394 L. Approximately 32,200 L of clean brine-based drilling fluid (~3 borehole volumes) was flushed through the borehole with all of the water pushed into the permeable formation(s). During this flushing event, only a couple of samples were collected from the drilling fluid prior to being pumped downhole.

After flushing during both occasions, the borehole was allowed to settle for a minimum of 12 hours prior to borehole geophysical logging.

4 DRILLING FLUID MANAGEMENT

Drilling fluids played a critical role during the drilling program; providing lubrication for the drilling rods, cooling the drill bit, stabilizing the borehole wall, and removing cuttings from the borehole. Drilling was completed using a combination of fresh water and brine-based drilling fluids, depending on the expected in-situ bedrock formation chemistry, to cool the bit and clean the cuttings from the borehole. Sodium fluorescein (NaFl), a fluorescent green dye, was added to the drilling fluid as a tracer to provide a quick field assessment of the percentage of drilling fluid within a groundwater sample during WP07 OGW sampling.

The Geofirma drilling fluid management program was designed, and adjusted throughout the drilling program, with the following objectives:

- Optimize core recovery and borehole stability through the use of drilling fluids;
- Flush drill cuttings from the borehole;
- Maintain pressure control of the borehole to prevent potential blowouts in accordance with the requirements of the MNRF's Oil, Gas and Salt Resources Act (OGSRA);
- Trace drilling fluids using a combination of stable water isotopes, tritium, sodium fluorescein and measured field parameters; and
- Monitor the flow in/out of the borehole to identify opportunities to collect opportunistic groundwater samples (WP07).

4.1 Freshwater Management and Characterization

All fresh water used for drilling fluids was obtained from the Kincardine municipal water plant near Lake Huron. Fresh water was transported to site by large volume tanker trucks which pumped into two large water tanks, each with a capacity of approximately 80,000 L. The water in the large holding tank(s) remained untraced fresh water so that it can be transferred to smaller tanks for mixing various salt and tracer concentrations.

As discussed in Section 3.1, all borehole drilling fluids and cuttings were diverted from the boreholes into storage tanks such that the cuttings could be settled out and the drilling fluid re-used for drilling operations.

Freshwater Source Samples were collected directly from the designated water storage tank using a foot valve and HDPE tubing. A total of 28 fresh water source samples were over the duration of the drilling operations at SB-BH01, labelled SB_BH01_WS001 through SB_BH01_WS028.

All samples were collected in laboratory-supplied bottles, in accordance with laboratory requirements, and stored in fridges. The samples were delivered to laboratories in rigid sided coolers on ice, either by hand or courier, following chain of custody procedures.

4.1.1 Freshwater Source – Field Parameters

For each sample set collected, field parameters (pH, temperature, EC, ORP, turbidity, DO, TDS) were measured using a Horiba U52 multiparameter probe, fluorescein was measured with a Turner Designs AquaFluor Fluorometer, Ferrous Iron and Sulfide were measured using a DR900 colorimeter, and Alkalinity was measured using a digital titrator. Each instrument was calibrated as required; all calibration records were recorded in the DQC workbook.

In-field geochemistry analyses methodologies are described in the WP07 Data Report – Opportunistic Groundwater Sampling for SB_BH01 (Geofirma, 2022a).

4.1.2 Freshwater Source - Laboratory Analysis

Laboratory analysis of the water source samples used for drilling fluid was completed by Bureau Veritas Laboratories and the University of Ottawa. A complete list of analytes analyzed by laboratories for water samples during this program are listed in Table 6 below. As discussed in Section 3.5, below a depth of approximately 350 mBGS while drilling through the Guelph Fm, drilling circulation was lost and without drilling fluid returns to surface to allow cleaning and recirculation downhole, FI-traced, brine-based drilling fluid was continuously required to be prepared and pumped downhole and into any permeable formations. This resulted in a significant increase in fresh water being trucked to site and therefore through discussions with NWMO it was decided to reduce the freshwater laboratory analysis program. The reduced suite of target laboratory analysis is shown in Table 6.

Bureau Veritas (formerly Maxxam Analytics Inc) completed laboratory analyses of the non-isotopic parameters listed, which included listed major elements and metals, trace elements, anions and nutrients. All isotope analyses were completed by the University of Ottawa. Lab reports associated with the freshwater analysis are included in the associated data delivery.

Table 6: Detailed List of Sample Analyses by Lab

Analytes	Volume	Analytical Lab or Storage	Full Suite above 350 mBGS	Reduced Suite below 350 mBGS
Major Elements and Metals (Na, K, Ca, Mg, Sr, Li, Si, Al, B)	120 mL	Bureau Veritas Labs	Y	Y
Dissolved Sulphur, Dissolved Iron			Y	Y
Ruthenium (Ru)	120 mL		Y	
Reactive Silica (SiO_2)	250 mL		Y	Y
Sulphide (S^{2-})	120 mL		Y	Y
Anions (Br, Cl, SO_4, PO_4, I, NO_2, NO_3)	500 mL		Y	Y
Fluoride (F)			Y	
HCO_3			Y	
Total Nitrogen	120 mL		Y	
Total Phosphorus			Y	
Total Organic Carbon (TOC)			Y	

Analytes	Volume	Analytical Lab or Storage	Full Suite above 350 mBGS	Reduced Suite below 350 mBGS
Dissolved Organic Carbon (DOC)	120 mL		Y	
Total Ammonia (NH_4+NH_3)	40 mL		Y	
Gross Alpha and Gross Beta	1000 mL		Y	
^{238}U, ^{234}U, ^{235}U	1000 mL		Y	
^{222}Rn	250 mL		Y	
$\delta^{18}O$, $\delta^{2}H$	100 mL	University of Ottawa	Y	Y
^{3}H	500 mL		Y	Y
$^{87}Sr/^{86}Sr$	500 mL		Y	
$\delta^{13}C$-DIC	40 mL x 3		Y	
^{14}C-DIC	500 mL		Y	
^{129}I, ^{36}Cl	1000 mL		Y	
$\delta^{37}Cl$	500 mL		Y	
Drill Fluid Archive	2 x 500 mL & 1 x 140 mL	NWMO South Bruce Storage Facility	Y	

4.1.3 Water Source Quality

Water quality results from the laboratory analysis and field parameter measurements were consistent throughout the drilling program with no unexpected or abnormal results associated with the water source samples. Appendix D includes a summary of these analyses. Full reporting of all freshwater source data (including in-field parameters, in-field analyses and laboratory results) are included in the Opportunistic Groundwater Sampling WP07 report for SB_BH01 (Geofirma, 2022a).

The most visually unusual infield measurement was related to SB_BH01_WS025, which had higher turbidity and TSS values. This was expected as the water source sample had been deposited directly into a secondary tank which contained a slight amount of previously used drilling fluid.

4.2 Preparation of Drilling Fluids and Use of Additives

In general, freshwater drilling fluids were used to drill the bedrock above the Salina Formation F-Unit shale (~150 mBGS) and brine-based drilling fluids were used to drill the bedrock formations below this depth.

4.2.1 Freshwater Based Drilling Fluid (0 to ~150 mBGS)

No drilling fluid additives were used when drilling with fresh water. The freshwater source from the large holding tanks were simply transferred to the half-round drilling fluid circulation and mixing tanks and pumped downhole.

4.2.2 Brine Drilling Fluid

Following the installation of the production casing in the Salina F-Unit Shale, brine-based drilling was used to ensure the drilling had a lower impact on the in-situ groundwater and porewater chemistry. Brine-based drilling fluids were prepared onsite by adding sodium chloride (NaCl) and calcium chloride ($CaCl_2$) salts to fresh water sourced from Lake Huron. The sodium chloride used was SIFTO Industrial Purity Salt and the calcium chloride was DOWFLAKE XTRA. The target density of this brine-based drilling fluid (~1100 kg/m3) will provide protection against possible artesian flows and minor gas flow zones during drilling, although these conditions are not expected.

This deep bedrock drilling fluid was mixed to have a Na:Ca:Cl ratio of target concentrations at about 35:16:84 g/L, respectively, for a total dissolved solids content of about 135 g/L. The target density of this brine-based drilling fluid was 1100 kg/m^3 which provided protection against possible artesian flows and minor gas flow zones during drilling. The density was measured using a pre-calibrated hydrometer and values measured were recorded in the WP02 Data Quality Confirmation Form.

4.2.3 Tracer – Fluorescein

Sodium fluorescein was added to all drilling fluids following the installation of the Intermediate Casingat a depth of approximately 65 mBGS. This tracer provides a quick field assessment to determine the percentage of drilling fluid in a water sample. Sodium fluorescein is a fluorescent tracer that was added to the drilling fluid using pre-mixed high concentration stock solutions. Geofirma prepared sodium fluorescein stock solutions in a controlled environment at three concentrations; 1g/L, 2g/L, and 10g/L. These concentrated stock solutions were refrigerated and out of direct sunlight until mixed into the drilling fluid.

While mixing the fluorescein into the drilling fluid, concentrations were regularly checked by Geofirma personnel using a handheld fluorometer (Turner Designs AquaFluor). A fluorescein concentration of 100 μg/L (100 ppb) ± 10 % was used during coring operations, borehole flushing, and downhole testing.

4.3 Drilling Fluid Returns and Volume Monitoring

During drilling, drilling fluid was pumped downhole to cool the bit and flush drill cuttings from the borehole. Generally during drilling this fluid returns up the borehole to the surface and is recirculated into the drilling fluid half round tank. A sample of these drilling fluid returns was collected at surface prior to discharging into the half round tank to be cleaned and recirculated. This sample was analyzed for a variety of field parameters as described in Section 4.4.

The total volume of drilling fluid in the drilling circulation and mixing tanks was determined at any given time by manually measuring the depth of fluids in each tank using fixed graduated measurement rods. To ensure accurate volume calculations the manual water level readings were completed at consistent points throughout each core run (ie. Initial water levels read at the very beginning of starting a core run). The total system volume was then calculated by adding the tank volume to the water volume within the drill rods. The change in drilling fluid volume during each core run was calculated and expressed as fluid loss or fluid gain. This was the primary method of calculating drilling fluid loss within a core run interval, all volume values are captured in the DQC forms.

Drilling fluid loss into formations while fluid circulation up the borehole was effective (i.e. ~150 to 290 mBGS) averaged approximately 80 L per 3 m core run, while average drilling fluid loss for the majority of the borehole without effective fluid circulation averaged approximately 4,500 L per 3m core run which was mostly a factor of duration of coring with a loss rate of approximately 100 L per hour (~1.6 Lpm).

Fluid loss was one of the parameters used to identify a zone for opportunistic groundwater sampling (WP07) as discussed in Section 5, however due to the fact that drilling fluid circulation was lost for the majority of the borehole this did not prove to be a reliable trigger.

4.4 Monitoring Drilling Fluid Field Parameters

4.4.1 Density

Density measurements were taken from the drilling fluid returns and periodically from the drilling fluid tank. Initial density values were expected, and shown to be, approximately 1.000 g/cc, this is due to the fresh drilling fluid and no formational salt impact. Following the installation of the production casing, at approximately 153 m, traced brine water was used as the primary drilling fluid. Therefore, density measurements of the tank were taken more regularly and prior to drilling to ensure a density of approximately 1.100 g/cc.

From the bottom of the production casing (152.82 mBGS) to CR089 (291.59 mBGS) the density associated with the drilling fluid returns fluctuates between 1.066 and 1.125. This fluctuation is not unexpected as while drilling, sediment and core dust is flushed out with the drilling fluid returns, therefore altering the density.

Following the loss of fluid returns at 291.59mBGS, density did not fluctuate a lot, generally staying between 1.088 and 1.106. This is most likely a result of no recirculation, therefore the drilling fluid returning to surface that was analysed would have similar properties to the injected drilling fluid.

A summary of the density values can be seen, along with pH, temperature, dissolved oxygen, turbidity, electrical conductivity, and ORP, in Appendix A.

4.4.2 Fluorescein

Fluorescein values for the half round tank and drilling fluid were measured near or at the end of each core run. Fluorescein fluctuated a lot due to the light and heat sensitivity, fluid returns, and the mixing constraints of the tank.

The tank fluorescein had an average concentration of 91.49 ppb and a standard deviation of 13.7 ppb; with a maximum concentration of 132.4 ppb and a minimum concentration of 45.96 ppb. When the concentration in the tank was extraordinarily high more water was added to the half round tank to ensure a fluorescein level between 90 and 110 ppb. If the tank had low concentrations of fluorescein, additional fluorescein tracer would be added and mixed into the half round tank immediately. Generally, when the fluorescein levels were outside the established concentration range the levels measured during the following core run would be within the acceptable range.

The fluorescein associated with the fluid returns averaged around 87 ppb with a standard deviation of 14.4 ppb; this included a maximum concentration of 127.8 ppb and a minimum of 45.67 ppb. Larger

variation of fluorescein levels was expected from the fluid returns due to impacts from the drilling and formation properties.

The fluctuations associated with the fluorescein concentrations are illustrated in Appendix B.

4.4.3 Turbidity

Turbidity values were measured for the drilling fluid returns near or at the end of each core run. Turbidity fluctuated in association with the sediment returns and frequency of drilling fluid turnover. The turbidity would decrease when the half round tank was refilled with fresh liquids, and as the water was recirculated through the system the turbidity would increase. Due to the high drilling fluid losses associated with SB_BH01 the half round tank was often refilled, and the fluid return turbidity was mainly associated with the single core run.

The turbidity associated with the fluid returns averaged around 4 445 NTU with a standard deviation of 16 185 NTU; this included a maximum value of 120 000 NTU and a minimum of 0 NTU. The high turbidity levels (>1 000 NTU) required dilution and therefore have a slightly higher margin of error than if no dilution was required.

4.4.4 Electrical Conductivity

Electrical Conductivity (EC) values were measured for the drilling fluid returns near or at the end of each core run. EC fluctuated due to the different formations, sediment returns, circulated drilling fluid parameters, and frequency of drilling fluid turnover. EC increased as the water was recirculated through the system due to the higher sediment, density, and turbidity levels. Due to the high drilling fluid losses associated with SB_BH01 the half round tank was often refilled, and the fluid returns were mainly associated with the specific core run.

The fluid return EC averaged around 522.6 mS/cm with a standard deviation of 341.8 mS/cm; this included a maximum value of 2 360 mS/cm and a minimum of 48 mS/cm. The high EC levels (>100 mS/cm) required dilution and therefore have a slightly higher margin of error than if no dilution was required.

4.4.5 Dissolved Oxygen

Dissolved Oxygen (DO) values were measured, with EC, temperature, and turbidity, for the drilling fluid returns near or at the end of each core run. The DO in the drilling fluid returns averaged around 3.37 mg/L with a standard deviation of 1.25 mg/L; this included a maximum value of 7.62 mg/L and a minimum of 0.55 mg/L. The DO values of groundwater are typically expected to be 0 mg/L, however as the original drilling fluid has high DO levels and is aerated throughout the drilling and circulation process, it is expected that the DO levels will be higher than 0 mg/L.

4.4.6 Temperature

Temperature values were measured along with EC, DO, and turbidity for the drilling fluid returns near or at the end of each core run. Temperatures did not widely vary; this is likely due to the large water volumes used, consistent atmospheric temperature, and low temperature fluctuations associated with

formation water. The temperatures averaged around 24.25°C with a standard deviation of 3.39°C; this included a maximum value of 31.57°C and a minimum of 14.44°C.

4.5 Drilling Fluid Sampling and Field Measurements

4.5.1 Drilling Fluids – Sampling

Archive samples representative of the returned drilling fluid were collected throughout the drilling program. The drilling fluid archive samples were taken every 50 m throughout the borehole. Under usual circumstances archive samples were collected from the drilling fluid circulation return stream, prior to remixing in the surface tanks. Below a depth of approximately 350 mBGS (Guelph Fm) when there were no drilling fluid circulation returns, archive samples were collected from the drilling fluid source tank (main half-round tank). In addition, when there were no fluid returns, if possible, the archive sample was taken from the fluid swabbed from the rods while the inner core barrel was tripped out of the borehole.

Table 7 summarizes the drilling fluid archive samples collected from SB_BH01. A total of 19 archive drilling fluid samples directly associated with WP02 were collected during drilling at SB_BH01. The WP02 archive drilling fluid samples summarized in Table 7 are not in direct sequential order as drilling fluid samples were also collected in association with WP03 and WP07. The samples associated with WP03 and WP07 are therefore reported within their respective data deliveries and reports.

Table 7: Drilling Fluid Archive Samples

Sample ID	Approximate Depth Range		Date Sampled	Comments
SB_BH01_DW001	57.59	60.59	02-Jun-21	Sample taken from half round tank
SB_BH01_DW012	120.59	120.59	20-Jun-21	Sample taken from half round tank
SB_BH01_DW015	162.59	165.59	16-Jul-21	Sample taken from drilling fluid returns during CR
SB_BH01_DW016	201.59	204.59	18-Jul-21	Sample taken from drilling fluid returns during CR
SB_BH01_DW017	252.59	255.59	20-Jul-21	Sample taken from drilling fluid returns during CR
SB_BH01_DW020	297.59	300.40	30-Jul-21	Sample taken from half round tank
SB_BH01_DW022	348.59	351.79	04-Aug-21	Sample taken from half round tank
SB_BH01_DW023	375.59	378.60	05-Aug-21	Sample taken from half round tank
SB_BH01_DW024	424.57	426.59	09-Aug-21	Sampled water returning during core recovery
SB_BH01_DW025	441.59	444.59	10-Aug-21	Sample taken from half round tank
SB_BH01_DW026	501.72	504.59	14-Aug-21	Sampled water returning during core recovery
SB_BH01_DW029	549.59	552.59	16-Aug-21	Sampled water returning during core recovery
SB_BH01_DW030	597.60	600.60	25-Aug-21	Sampled water returning during core recovery
SB_BH01_DW031	654.60	657.60	28-Aug-21	Sampled water returning during core recovery
SB_BH01_DW033	699.60	702.62	30-Aug-21	Sampled water returning during core recovery
SB_BH01_DW034	747.61	750.61	09-Sep-21	Sampled water returning during core recovery
SB_BH01_DW035	798.60	801.60	13-Sep-21	Sampled water returning during core recovery
SB_BH01_DW038	849.60	852.60	15-Sep-21	Sampled water returning during core recovery
SB_BH01_DW039	879.60	880.84	18-Sep-21	Bottom of Borehole

4.5.2 Drilling Fluids – Field Measurements

For each sample collected, field parameters (pH, temperature, EC, ORP, turbidity, DO) were measured using a Horiba U52 multiparameter probe, fluorescein was measured with a Turner Designs AquaFluor Fluorometer, Ferrous Iron and Sulfide were measured using a DR900 colorimeter, and Alkalinity was measured using a digital titrator. The instruments were calibrated as required and all calibration records were recorded in the DQC workbook.

Field parameters and in-field lab values assessed for each of the archive samples were inputted directly into acquire, along with the depth associated with the sample.

Each archived drill water sample was analyzed for a variety of parameters, included temperature, pH, EC, ORP, DO, turbidity, sulfide, ferrous iron, and alkalinity. Appendix E contains graphical plots with vertical profiles of these parameters.

4.5.3 Drilling Fluids - Quality

Most parameters were in the expected range with a few anomalous values. The anomalous values are associated with samples that also demonstrated high turbidity. Any visually abnormal values were noted and reviewed along with any previous records (ie. DQC and notes) to ensure values were accurate to what was measured in the field.

5 OPPORTUNISTIC GROUNDWATER EVENTS

Groundwater samples were collected from permeable zones with sufficient hydraulic conductivity to enable sample collection during drilling operations at SB_BH01. Such water samples are referred to as opportunistic groundwater samples and are collected in order to obtain accurate geochemical results from permeable zones. Details of opportunistic groundwater sampling and the results of analyses are presented in a separate Data Report associated with WP07 - Opportunistic Groundwater Sampling (Geofirma Engineering, 2022a).

WP02 contributed to the justification for each OGW event, this included assessing the changes associated with drilling parameters, drilling fluid properties, and volume changes/losses. Table 8 summarizes the seven OGW sampling events during drilling at SB_BH01, including dates completed and justification during drilling associated with the events.

Table 8: Summary of OGW Sampling Intervals in SB_BH01

Event	Formation	Depth (mBGS)	Start Date	End Date	Justification associated with WP02
OGW1	Amherstburg Fm	70.17 to 75.59	13-Jun-21	15-Jun-21	Drilling fluid losses: ~700 L for CR from 69.59 to 72.59 m ~2400 L for CR from 72.59 to 75.59 m
OGW2	Bois Blanc Fm	91.57 to 99.59	16-Jun-21	18-Jun-21	• Decrease in pump pressure while drilling. Drilling fluid losses: ~1100 L for CR from 90.59 to 93.59 m ~3700 L for CR from 93.59 to 96.59 m ~1200 L for CR from 96.59 to 99.59 m
OGW3	Bass Islands Fm	113.67 to 120.59	20-Jun-21	21-Jun-21	• No circulation while drilling, with low pump pressure. Drilling fluid losses: ~1300 L for CR from 114.59 to 117.59 m ~2900 L for CR from 117.59 to 120.59 m
OGW4	Salina Fm A2-Unit carbonate	267.19 to 273.59	20-Jul-21	27-Jul-21	• Comments from driller that the formation was producing water from 267.59 - 273.59 m. Drilling fluid losses: ~160 L for CR from 267.59 to 270.59 m ~900 L for CR from 270.59 to 273.59 m
OGW5	Salina Fm A1-Unit carbonate	280.57 to 285.59	27-Jul-21	29-Jul-21	Drilling fluid losses: ~0 L for CR from 276.59 to 279.59m ~1017L for CR from 279.59 to 282.59m ~446 L for CR from 282.59 to 285.59m
OGW6	Guelph Fm	316.57 to 321.59	31-Jul-21	02-Aug-21	Drilling fluid losses: ~1500L for CR from 315.59 to 318.59m ~3700L for CR from 318.59 to 321.59m
OGW7	Precambrian	859.88 to 880.84	18-Sep-21	24-Sep-21	Final OGW, bottom of hole

6 REFERENCES

Geofirma Engineering Ltd., 2020a. Initial Borehole Characterization Plan for SB_BH01, Phase 2 Initial Borehole Drilling and Testing, South Bruce Area, Revision 0, in progress.

Geofirma Engineering Ltd., 2020b. Health, Safety and Environment Plan – Phase 2 Initial Borehole Drilling and Testing, South Bruce Area, Revision 0, July 28.

Geofirma Engineering Ltd., 2020c. Project Quality Plan – Phase 2 Initial Borehole Drilling and Testing South Bruce Area, Revision 0, June 25.

Geofirma Engineering Ltd., 2021a. WP02 Test Plan: Borehole Drilling and Coring for SB_BH01, Phase 2 Initial Borehole Drilling and Testing, South Bruce Area, Revision 0, April 14, 2021.

Geofirma Engineering Ltd., 2022a. WP07 Data Report: Opportunistic Groundwater (OGW) Sampling at SB_BH01, Phase 2 Initial Borehole Drilling and Testing, South Bruce Area, Revision 0A, in preparation.

Appendix A

Data Quality Confirmation Workbook

Table A.1 – Drilling Parameters
Table A.2 – Fluorescein Tracer Tracking
Table A.3 – Sample Tracking

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling
Borehole Summary: DRILLING DEPTH AND DRILLING PARAMETERS

Borehole: SB_BH01

Core Run Information									Drilling Rig Parameters								Drilling Fluid Volume Changes					Drilling Fluid Parameters													Additives			Tank	
Date	Approx Start Time	Approx End Time	Approx Duration	Initials	Core Run #	Top Depth of Run	Bottom Depth of Run	Length of Core Run	Actual Duration of Core Run	Rate of Penetration (ROP)		Bit Rotation Speed (Head RPM)	Torque (Torque Pressure)	Injection Fluid Pressure (H2O Pressure In)	Down hole Fluid Flow Rate (H2O Flow In)	Weight On Bit	Holdback Pressure (Feed Pressure)	Tank #1 - Start of run (Volume)	Tank #1 - End of Run (Volume)	System - Start of run (Volume)	System - End of Run (Volume)	Total Volume Change During Run	Sample ID	Date	Time	Initials	Fluorescein Concentration	Density	Temperature	EC	pH	DO	ORP	Turbidity	Salt	Fluorescein	Freshwater	Fluorescein	Comments
-	-	-	min		-	mBGS	mBGS	m	min	min/m	m/hr	RPM	psi	psi	L/min	lbs	psi	L	L	L	L	L		dd-mmm-yy	hh:mm	--	ppb	g/cc	°C	mS/cm	-	mg/L	mV	NTU	Bags: Salt,Ca	L of Soln	m3	ppb	
1-Jun-21	3:15	3:38	23	AMSC	CR001	35.65	39.64	3.99	30.6	7.67	7.82	--	1500	100	70.5		400	20827	20827	--	--	--	--	1-Jun-21	3:15	AMSC	106.7	--	18.32	4.21	11.93	9.85	-38	200					
1-Jun-21	8:10	8:30	20	MEOR	CR002	39.64	42.59	2.95	29.0	9.84	6.10	--	2000	150	37.85	300	1500	20827	20032	--	--	-795	--	--	--	--	--	--	--	--	--	--	--					
1-Jun-21	10:10	10:36	26	MEOR	CR003	42.59	45.59	3.00	29.5	9.84	6.10	--	2000	150	37.85	300	1500	20032	19806	--	--	-226	--	1-Jun-21	11:06	MEOR	29.00	1.000	18.55	7.33	12.28	11.08	-93	>1000					
1-Jun-21	11:05	11:53	48	MEOR	CR004	45.59	48.59	3.00	29.5	9.84	6.10	--	2000	150	37.85	300	1500	19806	19806	--	--	0	--	1-Jun-21	11:50	MEOR	39.75	1.000	18.97	7.11	12.21	10.02	-32	>1000					
1-Jun-21	13:41	14:03	22	MEOR	CR005	48.59	51.59	3.00	29.5	9.84	6.10	--	1800	150	37.85	300	1500	19806	19355	--	--	-451	--	1-Jun-21	14:00	MEOR	83.53	1.000	19.14	7.3	12.21	9.5	-53	>1000					
1-Jun-21	14:26	14:53	27	MEOR	CR006	51.59	54.59	3.00	33.8	11.25	5.33	--	1800	150	37.85	300	1500	19806	17341	--	--	-2465	--	1-Jun-21	15:30	MEOR	75.7	--	--	--	--	--	--	--					Loss of water, no return
1-Jun-21	15:28	15:59	31	MEOR	CR007	54.59	57.59	3.00	33.8	11.25	5.33	--	2000	150	37.85	300	1500	17341	14500	--	--	-2841	--	1-Jun-21	16:15	MEOR	79.07	--	--	--	--	--	--	--					Loss of water, no return
1-Jun-21	16:25	16:59	34	MEOR	CR008	57.59	60.59	3.00	33.8	11.25	5.33	--	1900	100	37.85	300	1500	14500	11762	--	--	-2738	--	1-Jun-21	17:00	MEOR	51.28	--	--	--	--	--	--	--					Loss of water, no return
1-Jun-21	20:24	20:46	22	AMSC	CR009	60.59	63.59	3.00	21.9	7.3	8.22	--	2500	200	70	500	500	17136	15065	--	--	-2071	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return. Using freshwater drill fluid
1-Jun-21	21:15	21:35	20	AMSC	CR010	63.59	66.59	3.00	20.0	6.67	9.00	--	2500	100	70	500	500	15065	13566	--	--	-1499	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return. Using freshwater drill fluid
11-Jun-21	15:30	--	--		CR011	66.59	67.96	1.37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--					
13-Jun-21	9:35	10:00	25	KBT	CR012	67.96	69.59	1.63	24.5	15	4.00	--	1900	175	37.85	350	2500	22923	22781	--	--	-142	--	13-Jun-21	9:50	KBT	96.39	1.000	20.62	10.4	12.14	3.84	-39	479					
13-Jun-21	10:40	11:07	27	KBT	CR013	69.59	72.59	3.00	27.0	9	6.67	--	1900	175	37.85	350	2500	22781	22084	--	--	-697	--	13-Jun-21		KBT	79.28	--	22.62	2.83	11.57	6.35	-65	>1000					
13-Jun-21	11:30	11:50	20	KBT	CR014	72.59	75.59	3.00	18.0	6	10.00	--	2000	175	37.85	350	2500	22084	19693	--	--	-2391	--	13-Jun-21		KBT	73.14	--	23.67	1.78	11.35	9	-41	680					
15-Jun-21	20:06	20:27	21	MdK	CR015	75.59	78.59	3.00	21.0	7	8.57	--	2700	--	--	200	--	--	--	18733	17772	-961	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return (from previous fracture zone; ~108L/min)
15-Jun-21	20:48	21:09	21	MdK	CR016	78.59	81.59	3.00	20.9	6.97	8.61	--	2700	--	--	200	--	--	--	17772	16251	-1521	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
15-Jun-21	21:34	21:55	21	MdK	CR017	81.59	84.59	3.00	21.4	7.12	8.43	--	2650	--	--	200	--	--	--	16251	14082	-2169	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
15-Jun-21	23:49	0:07	18	MdK	CR018	84.59	87.59	3.00	17.9	5.96	10.07	--	2700	--	--	150	--	--	--	14082	11754	-2328	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
16-Jun-21	0:22	0:48	26	MdK	CR019	87.59	90.59	3.00	24.8	8.25	7.27	--	2500	--	--	150	--	--	--	11754	10774	-980	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
16-Jun-21	3:51	4:18	27	MdK	CR020	90.59	93.59	3.00	27.2	9.07	6.62	--	2500	--	70.6	200	--	--	--	10774	9651	-1123	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
16-Jun-21	8:22	8:57	35	KBT	CR021	93.59	96.59	3.00	33.0	11	5.45	--	2150	--	37.85	200	--	--	--	24091	20359	-3732	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return , driller reported loss of 1/2 water pressure in first 1m of run
16-Jun-21	9:29	9:54	25	KBT	CR022	96.59	99.59	3.00	24.0	8	7.50	--	2500	--	37.85	200	--	--	--	20359	19192	-1167	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
19-Jun-21	16:30	17:50	80	KBT	CR023	99.59	102.59	3.00	23.4	7.8	7.69	--	2600	--	37.85	200	--	--	--	23538	19927	-3611	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return, core run retreived in three parts due to blockage
19-Jun-21	18:25	20:00	95	MdK	CR024	102.50	105.59	3.09	39.4	12.75	4.71	--	2650	--	40.2	175	--	--	--	19927	19024	-903	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
19-Jun-21	20:11	20:35	24	MdK	CR025	105.59	108.59	3.00	24.3	8.11	7.40	--	2500	--	35	150	--	--	--	--	15051	--	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
19-Jun-21	21:00	2:13	313	MdK	CR026	108.59	111.59	3.00	36.2	12.07	4.97	--	2600	--	37.5	150	--	14532	13950	25309.7	24238	-1653.7	--	--	--	--	--	--	--	--	--	--	--	--					Core Run split into two due to blockage; Volume changes are associated with the different sections
20-Jun-21	2:23	2:47	24	MdK	CR027	111.59	114.59	3.00	23.0	7.67	7.82	--	2500	--	40	150	--	--	--	24238	22628	-1610	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
20-Jun-21	4:50	5:14	24	MdK	CR028	114.59	117.59	3.00	24.1	8.03	7.47	--	2500	--	40	150	--	--	--	22628	21358	-1270	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return
20-Jun-21	5:26	5:53	27	MdK	CR029	117.59	120.59	3.00	27.0	9.00	6.67	--	2500	--	40	150	--	--	--	22628	19769	-2859	--	--	--	--	--	--	--	--	--	--	--	--					Loss of water, no return, Higher fluid loss then previous few rounds
21-Jun-21	21:32	21:57	25	MdK	CR030	120.59	123.59	3.00	25.3	8.43	7.11	--	2500	--	40	150	--	--	--	21857	20724	-1133	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
21-Jun-21	22:06	22:39	33	MdK	CR031	123.59	126.59	3.00	23.5	7.83	7.66	--	2500	--	40	150	--	--	--	20724	19295	-1429	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
21-Jun-21	22:50	23:14	24	MdK	CR032	126.59	129.59	3.00	21.4	7.14	8.40	--	2700	--	40	200	--	--	--	19295	17990	-1305	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
21-Jun-21	23:24	23:46	22	MdK	CR033	129.59	132.59	3.00	19.0	6.33	9.47	--	2850	--	40	175	--	--	--	17990	16765	-1225	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	3:26	3:45	19	MdK	CR034	132.59	135.59	3.00	19.1	6.38	9.41	--	2700	--	40	200	--	--	--	16766	15455	-1311	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	4:00	4:32	32	MdK	CR035	135.59	138.59	3.00	30.6	10.21	5.88	--	2300	--	40	100	--	--	--	15455	13660	-1795	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	9:05	9:40	35	KBT	CR036	138.59	141.59	3.00	35.1	11.7	5.13	--	2600	--	37.85	100	--	--	--	22713	21334	-1379	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	10:00	10:40	40	KBT	CR037	141.59	144.59	3.00	40.0	13.33	4.50	--	2700	--	37.85	200	--	--	--	21334	18966	-2368	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	18:35	20:15	100	MdK	CR038	144.59	147.59	3.00	38.6	12.87	4.66	--	2700	--	41.43	175	--	--	--	18837	16521	-2316	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	20:45	21:14	29	MdK	CR039	147.59	150.59	3.00	28.9	9.62	6.24	--	3000	--	45	200	--	--	--	16521	14148	-2373	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
22-Jun-21	23:08	23:33	25	MdK	CR040	150.59	152.89	2.30	25.0	10.88	5.51	--	2700	--	40	150	--	--	--	14148	12756	-1392	--	--	--	--	--	--	--	--	--	--	--	--					No fluid return
2-Jul-21	--	7:30	--	MEOR	CR041	152.89	153.29	0.40	--	--	--	--	2000	--	40	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--					Short Core Run, No return
13-Jul-21	8:02	9:17	75	KBT	CR042	153.29	153.59	0.30	--	--	--	--	--	--	--	--	--	--	--	22545	22205	-340	--	--	--	--	--	--	--	--	--	--	--	--					Casing cement process: drilling out cement into formation, Drill water return.
13-Jul-21	9:49	10:06	17	KBT	CR043	153.59	154.02	0.43	--	--	--	--	--	--	--	--	--	--	--	22205	22064	-141	--	--	--	--	--	--	--	--	--	--	--	--					Casing cement process: drilling into formation for Formation Integrity Test
16-Jul-21	14:35	15:20	45	KBT	CR044	154.02	156.59	2.57	21.8	8.46	7.09	--	3000	--	40	300	--	--	--	21843	21865	22	--	16-Jul-21		KBT	3.253	1.001	22.78	10.8	12.95	6.86	-73	587					
16-Jul-21	17:58	18:17	19	KBT	CR045	156.59	159.59	3.00	19.8	6.59	9.10	--	3100	--	40	350	--	--	--	21865	21791	-74	--	16-Jul-21		KBT	29.87	1.085	20.97	70.5	12.33	7.92	-96	>1000					
16-Jul-21	21:10	22:00	50	MdK	CR046	159.59	162.59	3.00	39.0	13.00	4.62	--	2300	--	45.4	200	--	--	--	21791	21716	-75	--	16-Jul-21	21:50	MdK	3.5	1.11	22.1	>100	10.66	3.18	-73	>1000	--	--			
16-Jul-21	22:17	22:48	31	MdK	CR047	162.59	165.59	3.00	31.0	10.33	5.81	--	2600	--	45.4	225	--	--	--	21716	21708	-8	--	16-Jul-21	22:40	MdK	0.9	1.11	22.27	>100	10	3.62	-106	>1000	--	1.5			
17-Jul-21	0:07	0:37	30	MdK	CR048	165.59	168.59	3.00	30.0	10.00	6.00	--	2600	--	45.4	250	--	--	--	21708	21677	-31	--	17-Jul-21	0:30	MdK	4.3	1.115	22.12	>100	10.35	2.8	-19	>1000	--	1			
17-Jul-21	1:08	1:35	27	MdK	CR049	168.59	171.59	3.00	27.0	9.00	6.67	--	2500	--	45.4	200	--	--	--	21677	21603	-74	--	17-Jul-21	1:30	MdK	1.87	1.107	21.61	>100	10.44	7.04	-60	>1000	--	1.5			
17-Jul-21	3:16	3:46	30	MdK	CR050	171.59	174.59	3.00	30.0	10.00	6.00	--	2500	--	45.4	200	--	--	--	21603	21748	145	--	17-Jul-21	3:40	MdK	13.7	1.11	22.01	>100	10.26	2.53	-39	>1000	--	1.5			
17-Jul-21	4:10	4:38	28	MdK	CR051	174.59	177.59	3.00	30.0	10.00	6.00	--	2500	--	45.4	200	--	--	--	21748	21696	-52	--	17-Jul-21	4:30	MdK	1.8	1.112	21.52	>100	9.74	2.33	-46	>1000	--	2			
17-Jul-21	5:13	5:36	23	MdK	CR052	177.59	180.59	3.00	25.0	8.33	7.20	--	2500	--	45.4	200	--	--	--	21696	21666	-30	--	17-Jul-21	5:32	MdK	3.66	1.11	21.76	>100	9.78	2.85	33	>1000	--	1			
17-Jul-21	19:34	20:01	27	MdK	CR053	180.59	183.59	3.00	30.0	10.00	6.00	--	2500	--	45.4	250	--	--	--	21666	21625	58	--	17-Jul-21	19:53	MdK	59.06	1.11	25.48	>100	8.4	1.57	-147	>1000	--	--			
17-Jul-21	20:34	20:58	24	MdK	CR054	183.59	186.59	3.00	35.0	11.67	5.14	--	2400	--	45.4	200	--	--	--	25295	25286	-9	--	17-Jul-21	20:55	MdK	71.39	1.117	25.06	>100	8.44	4.27	-310	>1000	--	--			
17-Jul-21	21:29	21:57	28	MdK	CR055	186.59	189.59	3.00	28.0	9.33	6.43	--	2600	--	45.4	225	--	--	--	25286	25232	-54	--	17-Jul-21	21:54	MdK	70.72	1.151	23.55	>100	8.1	6.28	-533	>1000	--	--			
17-Jul-21	22:29	22:58	29	MdK	CR056	189.59	192.59	3.00	29.0	9.67	6.21	--	2400	--	45.4	200	--	--	--	25232	25245	13	--	17-Jul-21	22:51	MdK	84.09	1.117	23.66	>100	8.08	0.53	-584	>1000	--	--			
18-Jul-21	2:14	2:41	27	MdK	CR057	192.59	195.59	3.00	27.0	9.00	6.67	--	2500	--	45.4	200	--	--	--	25245	25348	103	--	18-Jul-21	2:37	MdK	65.35	1.122	22.64	>100	7.75	0.51	-647	>1000	--	--			
18-Jul-21	3:05	3:41	36	MdK	CR058	195.59	198.59	3.00	27.0	9.00	6.67	--	2400	--	45.4	200	--	--	--	25348	25161	-187	--	18-Jul-21	3:20	MdK	73.4	1.125	22.19	307	8.1	1.47	-165	41100	--	--			
18-Jul-21	4:10	4:37	27	MdK	CR059	198.59	201.59	3.00	28.0	9.33	6.43	--	2400	--	45.4	200	--	--	--	25161	25129	-32	--	18-Jul-21	4:32	MdK	69.9	1.125	21.19	304	7.56	6.1	-606	>100 000	--	--			
18-Jul-21	7:44	8:11	27	KBT	CR060	201.59	204.59	3.00	24.2	8.08	7.43	--	3000	--	40	250	--	--	--	25129	25165	36	--	18-Jul-21	7:49	KBT	81.8	1.077	21.79	347	8.25	5.25	-68	23500	--	--			collected archive sample, density using scale, EC and Turbidity based on 100x dilution
18-Jul-21	11:17	11:39	22	KBT	CR061	204.59	207.59	3.00	20.8	6.94	8.64	--	3200	--	45	300	--	--	--	25165	25022	-143	--	18-Jul-21	11:39	KBT	79.58	1.084	23.6	503	8.71	4.93	-74	68300	--	--			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
18-Jul-21	13:45	14:19	34	KBT	CR062	207.59	210.59	3.00	34.0	11.33	5.29	--	3000	--	37.85	300	--	--	--	25013	24924	-89	--	18-Jul-21	13:52	KBT	68.9	1.073	26.87	423	8.06	1.81	-93	28300	--	1			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
18-Jul-21	14:42	15:05	23	KBT	CR063	210.59	213.59	3.00	23.0	7.67	7.83	--	3250	--	45	200	--	--	--	24924	24871	-53	--	18-Jul-21	15:05	KBT	62.24	1.085	26.31	401	7.69	1.41	-398	54500	--	--			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
18-Jul-21	15:25	15:53	28	KBT	CR064	213.59	216.59	3.00	23.2	7.72	7.78	--	3200	--	45	300	--	--	--	24871	24773	-98	--	18-Jul-21	15:37	KBT	60.51	1.075	26.52	334	7.36	0.53	-624	64200	--	--			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
18-Jul-21	20:50	21:20	30	MdK	CR065	216.59	219.59	3.00	30.0	10.00	6.00	--	2700	--	45.4	200	--	--	--	24484	24453	-31	--	18-Jul-21	21:15	MdK	88.5	1.102	23.85	363	6.02	6.61	-288	68800	--	--			Fluorescein concentrations in tank were high, added fresh water to half round
19-Jul-21	0:43	1:11	28	MdK	CR066	219.59	222.59	3.00	28.0	9.33	6.43	--	2700	--	49.2	200	--	--	--	21953	22297	344	--	19-Jul-21	1:07	MdK	74.6	1.096	23.57	298	7.04	0.86	-605	69400	--	--			
19-Jul-21	2:40	3:08	28	MdK	CR067	222.59	225.59	3.00	28.0	9.33	6.43	--	2500	--	45.4	250	--	--	--	22297	21958	-339	--	19-Jul-21	2:58	MdK	86	1.096	22.6	345	7.41	0.39	-491	>100000	--	--			
19-Jul-21	3:49	4:12	23	MdK	CR068	225.59	228.59	3.00	23.0	7.67	7.83	--	2500	--	45.4	250	--	--	--	21958	22082	124	--	19-Jul-21	3:40	MdK	85.4	1.102	20.56	500	7.13	0.38	-453	82800	--	--			
19-Jul-21	10:30	15:12	282	KBT	CR069	228.59	231.59	3.00	31.6	10.54	5.69	--	3200	--	40	200	--	--	--	21972	21854	-118	--	19-Jul-21	10:38	KBT	63.39	1.067	24.36	885	6.01	4.2	-147	36500	--	--			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
19-Jul-21	15:32	15:52	20	KBT	CR070	231.59	234.59	3.00	19.9	6.62	9.07	--	3400	--	45	300	--	--	--	21744	21583	-161	--	19-Jul-21	15:42	KBT	60.66	1.099	24.56	398	7.22	1.94	-321	52200	--	--			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
19-Jul-21	18:26	18:49	23	KBT	CR071	234.59	237.59	3.00	22.1	7.38	8.13	--	3900	--	45	300	--	--	--	21561	21574	13	--	19-Jul-21	18:37	KBT	86.44	1.071	25.8	805	7.41	0.7	-408	53600	--	--			density using scale for mass of 100ml, EC and Turbidity based on 100x dilution
19-Jul-21	20:20	20:42	22	MdK	CR072	237.59	240.59	3.00	23.0	7.67	7.83	--	2800	--	45.4	250	--	--	--	21574	21588	14	--	19-Jul-21	20:37	MdK	89.17	1.076	23.56	407	6.6	0	91	25300	--	0.25			
19-Jul-21	21:07	21:28	21	MdK	CR073	240.59	243.59	3.00	20.0	6.67	9.00	--	2700	--	45.4	250	--	--	--	21588	21536	-52	--	19-Jul-21	21:25	MdK	63	1.098	23.42	344	6.76	0.73	-282	132400	--	--			
19-Jul-21	22:37	22:55	18	MdK	CR074	243.59	246.59	3.00	18.0	6.00	10.00	--	2800	--	45.4	250	--	--	--	21427	21506	79	--	19-Jul-21	22:53	MdK	104.3	1.071	23.3	303	7.26	0.77	-223	26400	--	--			
19-Jul-21	23:17	23:36	19	MdK	CR075	246.59	249.59	3.00	20.0	6.67	9.00	--	2800	--	45.4	250	--	--	--	21506	21498	-8	--	19-Jul-21	23:31	MdK	51	1.122	23.39	315	6.6	0.57	-311	164600	--	--			
20-Jul-21	1:23	1:45	22	MdK	CR076	249.59	252.59	3.00	23.0	7.67	7.83	--	2800	--	45.4	250	--	--	--	21498	21578	80	--	20-Jul-21	1:45	MdK	53.6	1.104	22.13	354	6.98	0.98	-183	57800	--	--			
20-Jul-21	2:13	2:32	19	MdK	CR077	252.59	255.59	3.00	20.0	6.67	9.00	--	2700	--	45.4	250	--	--	--	21578	21504	-74	--	20-Jul-21	2:31	MdK	80.34	1.099	22.35	352	7.08	0.45	-246	>100000	--	--			
20-Jul-21	4:15	4:34	19	MdK	CR078	255.59	258.59	3.00	18.0	6.00	10.00	--	2700	--	45.4	200	--	--	--	21504	21408	-96	--	20-Jul-21	4:30	MdK	88.8	1.087	21.46	350	6.85	0.17	-317	62700	--	--			
20-Jul-21	8:20	8:42	22	KBT	CR079	258.59	261.59	3.00	20.9	6.97	8.61	--	3400	--	50	200	--	--	--	21387	21357	-30	--	20-Jul-21	8:30	KBT	98.11	1.071	21.61	636	5.8	2.05	35	83500	--	0.1			
20-Jul-21	9:22	9:44	22	KBT	CR080	261.59	264.59	3.00	13.6	4.53	13.25	--	3500	--	50	150	--	--	--	21357	21349	-8	--	20-Jul-21	9:33	KBT	65.1	1.066	21.9	406	7.45	3.42	-162	89100	--	--			
20-Jul-21	11:17	11:33	16	KBT	CR081	264.59	267.59	3.00	15.1	5.03	11.93	--	3500	--	45	200	--	--	--	20935	20884	-51	--	20-Jul-21	11:21	KBT	66.4	1.085	23.02	335	7.46	7.15	140	83800	--	0.1			
20-Jul-21	12:31	12:52	21	KBT	CR082	267.59	270.59	3.00	12.4	4.13	14.52	--	3500	--	45	150	--	--	--	20884	20724	-160	--	20-Jul-21	12:47	KBT	39.42	1.092	24.22	348	7.43	4.13	-7	48500	--	0.2			new hydrometer used
20-Jul-21	17:19	17:33	14	KBT	CR083	270.59	273.59	3.00	12.5	4.17	14.40	--	3400	--	45	150	--	--	--	20724	19830	-894	--	20-Jul

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling
Borehole Summary: DRILLING DEPTH AND DRILLING PARAMETERS

Borehole: SB_BH01

Core Run Information									Drilling Rig Parameters								Drilling Fluid Volume Changes					Drilling Fluid Parameters												Additives			Tank	
Date	Approx Start Time	Approx End Time	Approx Duration	Initials	Core Run #	Top Depth of Run	Bottom Depth of Run	Length of Core Run	Actual Duration of Core Run	Rate of Penetration (ROP)		Bit Rotation Speed (Head RPM)	Torque (Torque Pressure)	Injection Fluid Pressure (H2O Pressure In)	Down hole Fluid Flow Rate (H2O Flow In)	Weight On Bit	Holdback Pressure (Feed Pressure)	Tank #1 - Start of run (Volume)	Tank #1 - End of Run (Volume)	System - Start of run (Volume)	System - End of Run (Volume)	Total Volume Change During Run	Sample ID	Date	Time	Initials	Fluorescein Concentration	Density	Temperature	EC	pH	DO	ORP	Turbidity	Salt	Fluorescein	Freshwater	Fluorescein	Comments
-	-	-	min		-	mBGS	mBGS	m	min	min/m	m/hr	RPM	psi	psi	L/min	lbs	psi	L	L	L	L	L		dd-mmm-yy	hh:mm	--	ppb	g/cc	°C	mS/cm	-	mg/L	mV	NTU	Bags: Salt,Ca	L of Soln	m3	ppb	
2-Aug-21	18:28	18:57	29	MEOR	CR103	330.59	333.59	3.00	28.7	9.55	6.28	--	3200	--	37.85	250	--	--	--	13433	11047	-2386	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	89.99	No fluid return.
2-Aug-21	22:30	23:01	31	AMSC	CR104	333.59	336.59	3.00	21.0	7.00	8.57	--	3200	--	37.85	250	--	--	--	17120	14285	-2835	--	--	--	--	--	--	--	--	--	--	--	--	0.3	--	--	90.09	No fluid return. Added fluorescein before run
2-Aug-21	23:32	23:58	26	AMSC	CR105	336.59	339.59	3.00	23.0	7.67	7.83	--	3200	--	37.85	250	--	--	--	14285	11762	-2523	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	91.64	No fluid return
3-Aug-21	0:20	0:28	8	AMSC	CR106A	339.59	340.10	0.51	6.0	11.76	5.10	--	3200	--	37.85	250	--	--	--	11762	11455	-307	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	91.54	No fluid return. Drill bit blocked
3-Aug-21	0:55	1:12	17	AMSC	CR106B	340.10	340.39	0.29	17.0	58.62	1.02	--	3200	--	37.85	250	--	--	--	11455	9945	-1510	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	90.82	No fluid return. Drill bit blocked due to clay.
3-Aug-21	1:50	2:20	30	AMSC	CR106C	340.39	342.59	2.20	20.0	9.09	6.60	--	3200	--	37.85	250	--	--	--	9945	5853	-4092	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	92.22	No fluid return. Circulated more fluid down hole to avoid getting drill bit caught on clay, so chang in volume not reliable.
3-Aug-21	5:40	6:15	35	AMSC	CR107	342.59	345.59	3.00	34.0	11.33	5.29	--	3300	--	37.85	250	--	--	--	16678	12801	-3877	--	--	--	--	--	--	--	--	--	--	--	--	1.4	--	--	95.95	No fluid return. Mixed more drill fluid and added fluoreseein before run
3-Aug-21	8:37	9:11	34	MEOR	CR108	345.59	348.59	3.00	37.1	12.38	4.85	--	3300	--	37.85	250	--	--	--	11969	8016	-3953	--	--	--	--	--	--	--	--	--	--	--	--	0.1	--	--	77.21	No fluid return. Added fluorescein before run
4-Aug-21	14:48	15:15	27	MEOR	CR109	348.59	351.79	3.20	31.4	9.82	6.11	--	3200	--	37.85	250	--	--	--	23342	20146	-3196	DW022	--	--	--	--	--	--	--	--	--	--	--	4	--	--	62.13	No fluid return. Added fluorescein before run. The driller had problems recovering the core from the borehole, hence he drilled extra 0.2m
4-Aug-21	17:44	18:10	26	MEOR	CR110	351.79	354.59	2.80	26.0	9.29	6.46	--	3000	--	37.85	300	--	--	--	17341	13539	-3802	--	--	--	--	--	--	--	--	--	--	--	--	0.8	--	--	92.52	No fluid return. Added fluorescein before run
4-Aug-21	19:25	19:58	33	AMSC	CR111	354.59	357.59	3.00	31.0	10.33	5.81	--	3100	--	37.85	300	--	--	--	13011	9649	-3362	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	106	No fluid return.
4-Aug-21	20:35	21:05	30	AMSC	CR112	357.59	360.59	3.00	29.0	9.67	6.21	--	3400	--	37.85	300	--	--	--	9649	6912	-2737	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	117.3	No fluid return.
5-Aug-21	0:27	1:00	33	AMSC	CR113	360.59	363.59	3.00	32.0	10.67	5.63	--	3000	--	45.42	200	--	--	--	25529	22196	-3333	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	89.97	No fluid return. Mixed more drill fluid and added fluoreseein before run
5-Aug-21	2:15	2:45	30	AMSC	CR114	363.59	366.41	2.82	34.0	12.06	4.98	--	3500	--	37.85	150	--	--	--	20940	17563	-3377	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	95.77	No fluid return. Added fluorescein before run
5-Aug-21	4:50	5:35	45	AMSC	CR115	366.41	369.54	3.13	41.0	13.10	4.58	--	3500	--	37.85	350	--	--	--	14931	10744	-4187	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	92.47	No fluid return. Issues retrieving core, had to circulate more water in between runs.
5-Aug-21	6:05	6:42	37	AMSC	CR116	369.54	372.59	3.05	35.0	11.48	5.23	--	3300	--	37.85	400	--	--	--	10744	7459	-3285	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	95.04	No fluid return
5-Aug-21	11:53	12:28	35	MEOR	CR117	372.59	375.59	3.00	35.0	11.67	5.14	--	2900	--	37.85	350	--	--	--	22998	17897	-5101	DW023	--	--	--	--	--	--	--	--	--	--	--	4.6	--	--	72.63	No fluid return. Mixed more drill fluid and added fluoreseein before run
5-Aug-21	21:00	21:44	44	MdK	CR118	375.59	378.60	3.01	44.0	14.62	4.10	--	3100	--	40	300	--	--	--	21906	17185	-4721	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	108.3	No fluid return
5-Aug-21	22:32	23:20	48	MdK	CR119	378.60	381.60	3.00	48.0	16.00	3.75	--	2750	--	40	300	--	--	--	17185	12443	-4742	--	--	--	--	--	--	--	--	--	--	--	--	1.75	--	--	114; 93	No fluid return; refill half round tank after CR
6-Aug-21	2:25	2:55	30	MdK	CR120	381.60	384.60	3.00	28.0	9.33	6.43	--	3500	--	40	350	--	--	--	29658	26881	-2777	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	90.9	No fluid return
6-Aug-21	3:23	3:30	7	MdK	CR121a	384.60	385.13	0.53	6.0	11.32	5.30	--	3500	--	40	350	--	--	--	26881	25703	-1178	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--	107	No fluid return
6-Aug-21	9:34	10:11	37	KBT	CR121b	385.13	387.59	2.46	29.0	11.79	5.09	--	2900	--	37.85	300	--	--	--	24244	20956	-3288	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	91.15	No fluid return
6-Aug-21	10:38	10:59	21	KBT	CR122	387.59	390.59	3.00	19.0	6.33	9.47	--	3000	--	37.85	300	--	--	--	20991	18090	-2901	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	77.74	No fluid return
6-Aug-21	13:07	13:25	18	KBT	CR123	390.59	393.59	3.00	19.0	6.33	9.47	--	3200	--	37.85	300	--	--	--	18173	14182	-3991	--	6-Aug-21	13:37	KBT	85.62	1.091	25.98	825	6.93	2.94	4	64 500	--	0.35		78.64	No fluid return, borehole water swabbed by inner core barrel measured, 100x dilution for EC, and Turbidity
6-Aug-21	14:25	14:59	34	KBT	CR124	393.59	396.59	3.00	30.0	10.00	6.00	--	3300	--	37.85	350	--	--	--	13366	10188	-3178	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	79.69	No fluid return, no swabbed water discharged
6-Aug-21	19:46	0:26	280	MdK	CR125	396.59	399.59	3.00	44.0	18.57	3.23	--	2250	--	44	400	1500	--	--	27201	16580	-10621	--	6-Aug-21	23:45	MdK	101.3	1.094	22.84	338	6.89	3.53	112	561	--	--		95.5	No fluid return, trouble drilling core = longer drill time = high water usage
7-Aug-21	10:42	10:47	5	KBT	CR126a	399.59	399.74	0.15	5.0	33.33	1.80	--	3200	--	57	350	--	--	--	29939	25970	-3969	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
7-Aug-21	19:15	20:15	60	MdK	CR126b	399.74	402.60	2.86	60.0	20.98	2.86	--	3000	--	30	300	1500	--	--	16540	10028	-6512	--	7-Aug-21	19:47	MdK	91.89	1.098	26.5	836	5.5	3.15	249	436	--	--		--	
8-Aug-21	0:27	1:46	79	MdK	CR127	402.60	405.60	3.00	80.0	26.67	2.25	--	3500	--	60	200	1500	--	--	27117	18165	-8952	--	8-Aug-21	1:20	MdK	94.5	1.1	22.4	884	6.98	6.21	139	0	--	--		101.1	
8-Aug-21	2:23	2:42	19	MdK	CR128a	405.60	405.74	0.14	18.0	128.57	0.47	--	3500	--	50	300	1500	--	--	16935	9658	-7277	--	8-Aug-21	4:15	MdK	105.4	1.101	21.6	807	7.07	3.34	10	0	--	--		103.5	No fluid return, assessed swab fluid return; Refill half round tank
8-Aug-21	16:30	16:56	26	KBT	CR128b	405.74	406.30	0.56	6.0	10.71	5.60	--	4000	--	56.8	250	--	--	--	29094	18532	-10562	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	73.65	No fluid return. Mixed more drill fluid and added fluoreseein
8-Aug-21	17:30	18:09	39	KBT	CR128c	406.30	408.59	2.29	43.0	18.78	3.20	--	2900	--	75.7	350	--	--	--	18532	12600	-5932	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	77.21	No fluid return
8-Aug-21	22:34	23:54	80	MdK	CR129	408.59	411.59	3.00	75.0	25.00	2.40	--	2700	--	50	200	1500	--	--	19390	11109	-8281	--	8-Aug-21	11:48	MdK	103.2	1.105	23.01	925	6.84	3.03	97	2 170	--	--		101.3	
9-Aug-21	13:31	14:03	32	KBT	CR130	411.59	414.59	3.00	30.0	10.00	6.00	--	3000	175	57	300	--	--	--	28205	23371	-4834	--	9-Aug-21	--	KBT	73.85	1.012	28.44	727	6.67	2.74	54	440	--	--		--	Tank refilled, no fluid return
9-Aug-21	15:00	15:30	30	KBT	CR131	414.59	417.59	3.00	24.0	8.00	7.50	--	3200	175	60.6	300	--	--	--	23481	19877	-3604	--	9-Aug-21	--	KBT	86.45	1.093	26.31	1010	6.91	2.7	50	426	--	0.5		101.1	FI added before CR,no fluid return
9-Aug-21	16:06	16:32	26	KBT	CR132	417.59	420.59	3.00	20.0	6.67	9.00	--	3300	175	68	300	--	--	--	20067	17602	-2465	--	9-Aug-21	--	KBT	89.44	1.093	29.9	1010	7.03	2.57	75	450	--	0.1		100.6	FI added before CR,no fluid return
9-Aug-21	17:15	17:40	25	KBT	CR133	420.59	423.59	3.00	20.0	6.67	9.00	--	3200	175	68	300	--	--	--	17602	13684	-3918	--	9-Aug-21	--	KBT	82.47	1.094	29.37	48	8.03	3.71	106	517	--	--		94.81	no fluid return
9-Aug-21	18:12	18:35	23	KBT	CR134a	423.59	424.57	0.98	5.0	5.10	11.76	--	3300	175	60.6	350	--	--	--	13684	10215	-3469	--	9-Aug-21	--	KBT	96.67	1.092	27.17	901	6.96	1.67	107	5900	--	--		96.97	no fluid return
9-Aug-21	22:31	23:11	40	MdK	CR134b	424.57	426.59	2.02	38.0	18.81	3.19	--	3500	--	65	300	1500	--	--	28861	23623	-5238	DW024	9-Aug-21	23:00	MdK	91.37	1.096	25.45	782	6.43	2.72	147	>800	--	0.5		88.84	Tank refilled before run, 0.5L FI added after run
10-Aug-21	0:24	1:15	51	MdK	CR135	426.59	429.59	3.00	50.0	16.67	3.60	--	3300	--	65	250	1500	--	--	22079	16214	-5865	--	10-Aug-21	1:00	MdK	104.2	1.096	24.49	705	6.96	1.59	84	>800	--	--		106.5	
10-Aug-21	2:06	3:15	69	MdK	CR136	429.59	432.59	3.00	65.0	21.67	2.77		3200	--	65	250	1500	--	--	16214	8229	-7985	--	10-Aug-21	3:00	MdK	107.8	1.099	23.59	793	6.96	2.04	88	>800	--	--		102.5	Refill tank after run
10-Aug-21	8:25	9:08	43	KBT	CR137	432.59	435.59	3.00	41.0	13.67	4.39	--	3000	100	53	350	--	--	--	30062	25489	-4573	--	10-Aug-21	9:30	KBT	78.37	1.094	20.31	1800	4.7	3.3	309	17800	--	0.55		85.46	No return, fluid parameters from tank near discharge of 'swabbed' water due to inner core barrel retreival
10-Aug-21	9:56	10:39	43	KBT	CR138	435.59	438.59	3.00	37.0	12.33	4.86	--	3300	75	45.4	350	--	--	--	25489	21791	-3698	--	10-Aug-21	10:56	KBT	84.35	1.096	24.34	801	6.27	3.53	141	43200	--	0.25		99.73	No return, fluid parameters from tank near discharge of 'swabbed' water due to inner core barrel retreival
10-Aug-21	12:52	13:47	55	KBT	CR139	438.59	441.59	3.00	46.0	15.33	3.91	--	3300	150	45.4	350	--	--	--	21791	19677	-2114	--	10-Aug-21	13:59	KBT	65.19	1.094	27.7	880	7.04	3.47	177	5010	--	0.35		91.98	Drillers pumped brine from sump into annulus durring run, true drilling fluid used expected to be (4000-5000L), No return, fluid parameters from tank near discharge of 'swabbed' water due to inner core barrel retreival,
10-Aug-21	14:22	15:11	49	KBT	CR140	441.59	444.59	3.00	48.0	16.00	3.75	--	3300	150	45.4	350	--	--	--	19677	14217	-5460	DW025	10-Aug-21	15:11	KBT	71.62	1.094	27.63	758	7.08	1.56	146	11300	--	--		71.62	Refill 1/2 Round after Run, No return, fluid paramaters from tank near discharge of 'swabbed' water due to inner core barrel retreival
10-Aug-21	20:39	21:22	43	MdK	CR141	444.59	447.59	3.00	42.0	14.00	4.29	--	3500	175	65	400	1500	--	--	29065	23262	-5803	--	10-Aug-21	21:15	MdK	101.1	1.101	25.47	812	6.77	2.27	165	>800	--	--		108.9	
10-Aug-21	22:37	23:37	60	MdK	CR142	447.59	450.59	3.00	60.0	20.00	3.00	--	3500	175	65	400	1500	--	--	22957	16186	-6771	--	10-Aug-21	23:24	MdK	113.8	1.1	24.43	820	7.42	2.3	168	>800	--	--		111.4	
11-Aug-21	10:56	11:40	44	KBT	CR143	450.59	453.47	2.88	45.0	15.62	3.84	--	3300	175	56.8	400	1300	--	--	15733	9703	-6030	--	11-Aug-21	12:06	KBT	70.18	1.098	24.67	67.4	5.74	3.31	180	3820	--	0.1		70.18	Blockage 12cm from bottom of run. Next run will be 3.12m. Refilling and Mixing tank after run, No return, fluid parameters from tank near discharge of 'swabbed' water due to inner core barrel retreival,
11-Aug-21	19:28	20:24	56	MdK	CR144	453.47	456.59	3.12	52.0	16.67	3.60		3200	175	70	400	1500	--	--	31094	20087	-11007	--	11-Aug-21	20:40	MdK	119.1	1.093	25.67	452	6.71	2.4	-22	796	--	--		123.3	Refill tank after run
11-Aug-21	23:34	0:32	58	MdK	CR145	456.59	459.59	3.00	58.0	19.33	3.10	--	3200	100	70	400	1500	--	--	29230	22818	-6412	--	12-Aug-21	0:54	MdK	90.5	1.092	23.33	730	6.77	2.8	42	>800	--	--		94.8	
12-Aug-21	1:18	2:16	58	MdK	CR146	459.59	462.59	3.00	57.0	19.00	3.16	--	3200	100	70	400	1500	--	--	21396	15250	-6146	--	12-Aug-21	2:27	MdK	99.34	1.092	23.41	925	6.97	3.2	38	>800	--	--		96.73	
12-Aug-21	3:06	3:47	41	MdK	CR147	462.59	465.59	3.00	51.0	17.00	3.53	--	3300	100	70	200	1500	--	--	15214	10842	-4372	--	12-Aug-21	4:09	MdK	100.2	1.093	23.37	750	7.05	2.6	29	>800	--	--		98.84	Refill tank after run
12-Aug-21	8:05	9:05	60	KBT	CR148	465.59	468.59	3.00	59.0	19.67	3.05		3000	175	56.8	350	1400	--	--	30611	24035	-6576	--	12-Aug-21	9:16	KBT	83.26	1.096	20.6	1200	5.73	3.69	172	7940	--	--		88.66	
12-Aug-21	10:08	10:54	46	KBT	CR149	468.59	471.59	3.00	41.0	13.67	4.39	--	3000	100	45.4	375	1400	--	--	24035	20561	-3474	--	12-Aug-21	11:05	KBT	81.56	1.096	22.04	55.4	6.58	5.88	83	11 500	--	0.3		90.41	FI added before CR
12-Aug-21	11:26	12:09	43	KBT	CR150	471.59	474.59	3.00	40.0	13.33	4.50	--	3000	175	45.4	375	1600	--	--	20561	17049	-3512	--	12-Aug-21	12:23	KBT	81.53	1.095	24.91	690	6.9	2.69	27	2 950	--	0.1		85.92	FI added before CR
12-Aug-21	13:01	13:42	41	KBT	CR151	474.59	477.59	3.00	41.0	13.67	4.39	--	3000	175	45.4	400	1500	--	--	17049	12015	-5034	--	12-Aug-21	13:52	KBT	77.1	1.096	28.11	819	7.01	3.55	85	5140	--	0.15		96.88	FI added before CR, Tank refilled after CR
13-Aug-21	1:34	2:24	50	MdK	CR152	477.59	480.59	3.00	47.0	15.67	3.83		3000	100	75	300	1500	--	--	28989	23371	-5618	--	13-Aug-21	2:40	MdK	102.1	1.095	23.45	1000	6.27	3.1	13	394	--	--		109.8	
13-Aug-21	3:46	4:38	52	MdK	CR153	480.59	483.59	3.00	54.0	18.00	3.33	--	3000	200	75	300	1500	--	--	22139	16420	-5719	--	13-Aug-21	4:52	MdK	114.6	1.096	26.28	760	7.01	3.25	-124	709	--	--		108.8	
13-Aug-21	5:25	5:54	29	MdK	CR154a	483.59	485.54	1.95	30.0	15.38	3.90	--	3000	100	75	200	1500	--	--	14965	11440	-3525	--	13-Aug-21	6:09	MdK	108.4	1.096	25.49	761	7.12	4.24	-137	452	--	--		110.9	Refill tank after run
13-Aug-21	18:18	18:35	17	KBT	CR154b	485.54	486.59	1.05	16.0	15.24	3.94	--	3200	175	68.1	250	1500	--	--	30190	27425	-2765	--	13-Aug-21	--	KBT	85.37	1.09	29.13	878	6.38	4.62	-46	617	--	--	--	101.6	
13-Aug-21	19:54	20:37	43	MdK	CR155	486.59	489.59	3.00	40.0	13.33	4.50		3500	125	75	250	1500	--	--	26826	22268	-4558	--	13-Aug-21	20:53	MdK	116.7	1.092	24.18	667	5.78	4.36	24	482	--	1	7.89	115.2	Refill tank after run, due to high fluorescein levels
13-Aug-21	23:22	0:09	47	MdK	CR156	489.59	492.65	3.06	42.0	13.73	4.37	--	3000	100	75	200	1500	--	--	30159	24977	-5182	--	14-Aug-21	0:22	MdK	103.8	1.096	22.24	694	7.2	4.53	-109	761	--	--	--	96.18	
14-Aug-21	0:48	1:37	49	MdK	CR157	492.65	495.59	2.94	48.0	16.33	3.68	--	3000	100	75	250	1500	--	--	24145	18924	-5221	--	14-Aug-21	1:50	MdK	98.22	1.096	21.56	694	7.26	5.04	-123	835				102.3	Refill tank after run
14-Aug-21	3:50	4:34	44	MdK	CR158	495.59	498.59	3.00	40.0	13.33	4.50	--	3000	100	75	300	1500	--	--	29984	25224	-4760	--	14-Aug-21	4:50	MdK	94.54	1.094	20.73	651	7.38	4.93	-126	789	--	--	--	91.55	
14-Aug-21	5:22	5:59	37	MdK	CR159	498.59	501.72	3.13	34.0	10.86	5.52	--	3200	100	75	250	1500	--	--	23476	19388	-4088	--	14-Aug-21	6:15	MdK	94.2	1.094	23.48	742	7.4	6.14	-137	543	--	--	--	93.05	
14-Aug-21	8:57	9:42	45	KBT	CR160	501.72	504.59	2.87	45.0	15.68	3.83	--	3000	175	75.7	200	1550	--	--	19160	13233	-5927	DW026	14-Aug-21	9:59	KBT	77.27	1.099	24.07	820	5.59	2.76	160	25200	--	0.3	--	101.7	FI added before CR
14-Aug-21	14:02	14:44	42	KBT	CR161	504.59	507.59	3.00	40.0	13.33	4.50	--	3000	175	68.1	300	1550	--	--	28797	24389	-4408	--	14-Aug-21	15:05	KBT	82.03	1.099	26.46	649	6.3	7.33	-4	13000	--	1.2	--	108	Refilled tank before run
14-Aug-21	15:49	16:32	43	KBT	CR162	507.59	510.59	3.00	45.0	15.00	4.00		3000	175	68.1	300	1550	--	--	23779	18835	-4944	--	14-Aug-21	16:48	KBT	80.61	1.1	28.03	772	5.7	2.42	-48	14900	--	0.1	--	95.48	FI added before CR
14-Aug-21	17:10	17:47	37	KBT	CR163	510.59	513.59	3.00	35.0	11.67	5.14	--	3000	175	68.1	300	1550	--	--	18060	14196	-3864	--	14-Aug-21	18:06	KBT	66.39	1.099	25.92	886	6.27	4.65	-86	12600	80;40	1.2	16.9	90.71	Refilled tank after run
14-Aug-21	22:24	23:17	53	MdK	CR164	513.59	516.59	3.00	50.0	16.67	3.60	--	3200	200	75	350	1500	--	--	28592	22760	-5832	--	14-Aug-21	23:31	MdK	92.03	1.097	22.92	716	6.8	5.84	-102	908	--	0.25	--	90.76	
15-Aug-21	0:08	1:01	53	MdK	CR165	516.59	519.59	3.00	48.0	16.00	3.75	--	3200	200	75	200	1500	--	--	22352	17006	-5346	--	15-Aug-21	1:18	MdK	101.5	1.098	21.37	794	6.8	5.75	-100	1820		0.15		97.53	Refilled tank after run
15-Aug-21	3:49	4:51	62	MdK	CR166a	519.59	522.03	2.44	53.0	21.72	2.76		3200	200	75	250	1500	--	--	31588	25553	-6035	--	15-Aug-21	5:14	MdK	107.9	1.088	20.58	705	7.07	6.5	-124	923				104.5	
15-Aug-21	5:19	5:41	22	MdK	CR166b	522.03	522.59	0.56	33.0	58.93	1.02		3200	200	75	400	1500	--	--	23761	21378	-2383		15-Aug-21	5:55	MdK	102.2	1.088	20.5	675	7.2	4.25	-138	878				97.01	Refilled tank after run
15-Aug-21	8:47	9:53	66	KBT	CR167	522.59	525.59	3.00	54.0	18.00	3.33	--	3300	200	75.7	350	1550	--	--	28632	22020	-6612	--	15-Aug-21	10:11	KBT	75.1	1.098	24.63	811	5.81	4.76	-36	996	--	0.9	--	93.05	
15-Aug-21	12:10	13:07	57	KBT	CR168	525.59	528.59	3.00	55.0	18.33	3.27	--	3200	200	75.7	200	1550	--	--	19902	13843	-6059	--	15-Aug-21	13:30	KBT	58.79	1.098	28.82	709	5.93	6.39	-89	702	--	0.3	--	90.17	
15-Aug-21	16:22	17:11	49	KBT	CR169	528.59	531.59	3.00	50.0

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling
Borehole Summary: DRILLING DEPTH AND DRILLING PARAMETERS

Borehole: SB_BH01

Core Run Information									Drilling Rig Parameters						Drilling Fluid Volume Changes					Drilling Fluid Parameters												Additives			Tank	
Date	Approx Start Time	Approx End Time	Approx Duration	Initials	Core Run #	Top Depth of Run	Bottom Depth of Run	Length of Core Run	Actual Duration of Core Run	Rate of Penetration (ROP)		Bit Rotation Speed (Head RPM)	Torque (Torque Pressure)	Injection Fluid Pressure (H2O Pressure In)	Down hole Fluid Flow Rate (H2O Flow In)	Weight On Bit	Holdback Pressure (Feed Pressure)	Tank #1 - Start of run (Volume)	Tank #1 - End of Run (Volume)	System - Start of run (Volume)	System - End of Run (Volume)	Total Volume Change During Run	Sample ID	Date	Time	Initials	Fluorescein Concentration	Density	Temperature	EC	pH	DO	ORP	Turbidity	Salt	Fluorescein	Freshwater	Fluorescein	Comments
-	-	-	min		-	mBGS	mBGS	m	min	min/m	m/hr	RPM	psi	psi	L/min	lbs	psi	L	L	L	L	L		dd-mmm-yy	hh:mm	--	ppb	g/cc	°C	mS/cm	-	mg/L	mV	NTU	Bags: Salt,Ca	L of Soln	m3	ppb	
22-Aug-21	14:22	17:42	200	AMSC	CR190	591.60	594.60	3.00	78.0	26.00	2.31		2500	300	72	175	1500	--	--	30803	19690	-11113	--	22-Aug-21	18:15	AMSC	85.27	1.094	30.35	273	5.65	2	4	378	74;37	0.85	12.8	65.31	Refilled tank before run.
22-Aug-21	22:57	23:15	18	MEOR	CR191A	594.60	594.86	0.26	16.0	61.54	0.97	--	2000-3600	200-800	75.7	300-500	1400	--	--	30803	28575	-2228	--	22-Aug-21	23:15	MEOR	97.63	1.1	25.99	276	6.87	1.53	60	471	70;35	0.35	11.36	100.3	Refilled tank before run. Short CR. Issues with core barrel and/or bit
23-Aug-21	16:15	16:58	43	AMSC	CR191B	594.86	595.10	0.24	43.0	179.17	0.33	--	2300	275	75.7	400	1500	--	--	25633	21132	-4501	--	23-Aug-21	17:20	AMSC	82.32	1.1	29.62	298	5.73	2.04	14	340				60.4	Refilled tank before run. Short CR. Attempting to retrieve broken bit
23-Aug-21	22:25	23:10	45	MEOR	CR191C	595.10	595.53	0.43	42.0	97.67	0.61	--	2700	150	75.7	500	1500	--	--	29501	24761	-4740	--	23-Aug-21	23:40	MEOR	83.2	1.092	24.84	255	6.43	3.62	67	585	50;25	0.95	10	94.79	Refilled tank before run. Short CR. Issues with broken bit at the bottom of the borehole
24-Aug-21	0:39	2:08	89	MEOR	CR191D	595.53	596.20	0.67	54.0	80.60	0.74	--	2500	150	75.7	500	1500	--	--	23143	17089	-6054	--	24-Aug-21	2:31	MEOR	80.78	1.092	24.79	250	6.47	4.05	18	441				86.23	Short CR. Issues with broken bit at the bottom of the borehole
25-Aug-21	4:48	5:13	25	MEOR	CR191E	596.20	597.60	1.40	21.0	15.00	4.00	--	3000	150	75.7	450	1400	--	--	29835	27724	-2111	--	25-Aug-21	5:37	MEOR	73.58	1.09	25.81	193	5.85	1.88	-16	539		0.35		94.17	Added fluorescein before run
25-Aug-21	10:15	11:05	50	AMSC	CR192	597.60	600.60	3.00	50.0	16.67	3.60	--	2900	195	60	500	1500	--	--	27760	21798	-5962	DW030	25-Aug-21	12:15	AMSC	75.96	1.094	25.03	282	5.52	1.03	-25	3570	28;15	0.5	7.35	93.37	Refilled tank before run.
25-Aug-21	12:49	13:38	49	AMSC	CR193	600.60	603.60	3.00	48.0	16.00	3.75		3000	220	75.7	350	1500	--	--	21335	17787	-3548	--	25-Aug-21	14:05	AMSC	81.45	1.094	27.37	254	5.94	1.94	26	788				83.2	
25-Aug-21	16:39	17:27	48	AMSC	CR194	603.60	606.60	3.00	52.0	17.33	3.46	--	3000	260	71.9	400	1500	--	--	29127	22674	-6453	--	25-Aug-21	18:05	AMSC	85.3	1.1	31.14	295	6.85	1.9	-18	785	65;30	0.95	13.15	72.87	Refilled tank before run
25-Aug-21	19:42	20:31	49	MEOR	CR195	606.60	609.60	3.00	50.0	16.67	3.60	--	3000	200	75.7	500	1400	--	--	21449	14843	-6606	--	25-Aug-21	21:00	MEOR	100.4	1.102	29.4	298	6.38	3.25	25	486	80;40	1	15.5	104.3	
26-Aug-21	0:23	1:28	65	MEOR	CR196	609.60	612.60	3.00	53.0	17.67	3.40	--	2500	150	75.7	500	1450	--	--	30312	22965	-7347	--	26-Aug-21	1:42	MEOR	88.49	1.1	27.12	300	6.91	4.18	17	701				90.55	Refilled tank before run
26-Aug-21	3:23	4:23	60	MEOR	CR197	612.60	615.60	3.00	59.0	19.67	3.05	--	3000	200	75.7	500	1450	--	--	22469	16593	-5876	--	26-Aug-21	5:00	MEOR	84.98	1.1	26.46	119	6.99	3.97	24	323				87.01	
26-Aug-21	8:38	9:55	77	AMSC	CR198	615.60	618.60	3.00	75.0	25.00	2.40	--	2600	200	75	450	1500	--	--	30798	21382	-9416	--	26-Aug-21	10:20	AMSC	96.12	1.098	26.76	239	6.3	2.04	4	665	75;30	0.7	14.5	74.33	Refilled tank before run
26-Aug-21	11:48	12:45	57	AMSC	CR199	618.60	621.60	3.00	57.0	19.00	3.16	--	2800	220	75	500	1500	--	--	31245	25141	-6104	--	26-Aug-21	13:00	AMSC	93.43	1.098	29.38	225	6.6	2.33	-1	491		0.35	10	80.14	Refilled tank before run
26-Aug-21	13:39	14:28	49	AMSC	CR200	621.60	624.60	3.00	49.0	16.33	3.67	--	2800	280	75	450	1500	--	--	24865	18951	-5914	--	26-Aug-21	14:50	AMSC	70.32	1.098	31.57	209	6.45	3.55	-16	446				59.63	
26-Aug-21	16:31	17:18	47	AMSC	CR201	624.60	627.60	3.00	48.0	16.00	3.75		2800	210	75	450	1500	--	--	30950	26867	-4083	--	26-Aug-21	21:05	MEOR	127.8	1.104	26.54	281	6.33	1.92	100	417				132.4	Refilled tank before run
27-Aug-21	1:10	2:49	99	MEOR	CR202	627.60	630.60	3.00	100.0	33.33	1.80	--	2700	200	75.7	500	1450	--	--	30361	19771	-10590	--	27-Aug-21	3:14	MEOR	96.78	1.096	25.44	202	6.63	3.75	-1	568	30;15	0.85	7.5	97.11	Refilled tank before run
27-Aug-21	5:52	6:48	56	MEOR	CR203	630.60	633.60	3.00	53.0	17.67	3.40	--	2700	200	75.7	550	1450	--	--	31512	26061	-5451	--	27-Aug-21	7:55	AMSC	74.87	1.092	24.73	255	6.37	2.65	311	668	60;30	0.9	12	90.7	Refilled tank before run
27-Aug-21	8:20	9:30	70	AMSC	CR204	633.60	636.60	3.00	48.0	16.00	3.75	--	3000	200	75	475	1700	--	--	30187	23414	-6773	--	27-Aug-21	9:50	AMSC	76.25	1.094	25.55	205	6.42	3.92	189	522	20;10	0.8	4.9	58.85	Refilled tank before run
27-Aug-21	10:51	11:49	58	AMSC	CR205	636.60	639.60	3.00	57.0	19.00	3.16	--	3100	220	75	450	1650	--	--	30245	24870	-5375	--	27-Aug-21	12:08	AMSC	87.49	1.094	26.65	265	6.49	3.05	30	623	30;15	1.2	7.46	75.33	Refilled tank before run
27-Aug-21	12:45	13:37	52	AMSC	CR206	639.60	642.60	3.00	52.0	17.33	3.46	--	3100	220	75	400	1600	--	--	23678	19005	-4673	--	27-Aug-21	13:53	AMSC	76.94	1.094	27.01	262	6.55	2.8	34	519		0.25		72.82	Added fluorescein before run
27-Aug-21	15:35	16:47	72	AMSC	CR207	642.60	645.60	3.00	55.0	18.33	3.27	--	3100	220	75	400	1650	--	--	31968	24460	-7508	--	27-Aug-21	17:52	AMSC	78.63	1.098	24.79	198	6.28	4.71	233	548	90;45	1.15	14.38	64.94	Refilled tank
27-Aug-21	18:18	19:05	47	AMSC	CR208	645.60	648.60	3.00	45.0	15.00	4.00	--	3100	220	75	400	1650	--	--	23073	17890	-5183	--	27-Aug-21	21:42	MEOR	87.06	1.098	24.07	201	6.33	3.92	90	620		0.3			Added fluorescein before run
27-Aug-21	22:42	23:27	45	MEOR	CR209	648.60	651.60	3.00	38.0	12.67	4.74	--	2700	200	75.7	450	1450	--	--	32106	28056	-4050	--	28-Aug-21	0:41	MEOR	105.2	1.1	23.59	189	6.65	1.47	26	765	80;40	0.9	14	111.8	Refilled tank before run
28-Aug-21	1:54	2:32	38	MEOR	CR210	651.60	654.60	3.00	32.0	10.67	5.63	--	2600	200	75.7	400	1500	--	--	27628	23842	-3786	--	28-Aug-21	3:05	MEOR	101.7	1.098	24.3	260	7.06	4	40	399				105.7	
28-Aug-21	3:23	3:59	36	MEOR	CR211	654.60	657.60	3.00	26.0	8.67	6.92	--	2600	200	75.7	400	1500	--	--	23322	20931	-2391	DW031	28-Aug-21	4:21	MEOR	100.3	1.1	24.07	344	7.18	3.07	34	587				103.6	
29-Aug-21	0:20	1:20	60	MEOR	CR212A	657.60	658.70	1.10	60.0	54.55	1.10	--	2700	200	75.7	700	1500	--	--	29027	20535	-8492	--	29-Aug-21	1:37	MEOR	110	1.1	24.01	222	6.82	4.09	31	542	44;22	0.4	8.5	118.1	Bit change. Refilled tank before run.
29-Aug-21	1:52	3:00	68	MEOR	CR212B	658.70	660.60	1.90	70.0	36.84	1.63	--	2700	200	75.7	700	1500	--	--	19772	14679	-5093	--	29-Aug-21	3:38	MEOR	106.6	1.102	23.83	225	6.4	1.38	54	238				109.4	
29-Aug-21	8:05	8:45	40	AMSC	CR213	660.60	663.45	2.85	37.0	12.98	4.62	--	3100	220	75	750	1720	--	--	31512	26943	-4569	--	29-Aug-21	9:10	AMSC	103.5	1.094	25.08	228	6.51	2.46	16	501	80;40	0.5	17.9	85.22	Refilled tank before run
29-Aug-21	10:45	11:11	26	AMSC	CR214	663.45	666.60	3.15	25.0	7.94	7.56	--	3250	220	75	720	1720	--	--	23005	20402	-2603	--	29-Aug-21	11:28	AMSC	69.59	1.094	27.83	226	6.36	2.84	33	239				73.26	
29-Aug-21	12:57	13:20	23	AMSC	CR215	666.60	669.60	3.00	22.0	7.33	8.18	--	3200	220	75	720	1720	--	--	30610	28765	-1845	--	29-Aug-21	13:35	AMSC	84.62	1.094	29.65	217	6.65	2.39	37	485	49;25	0.8	10.65	75.73	Refilled tank before run
29-Aug-21	14:04	14:22	18	AMSC	CR216	669.60	672.60	3.00	19.0	6.33	9.47		3300	220	75	720	1720	--	--	27842	26219	-1623	--	29-Aug-21	14:38	AMSC	78.32	1.094	29.95	223	6.54	3.18	31	514		0.2		80.18	Top up fluorescein before run
29-Aug-21	15:08	15:27	19	AMSC	CR217	672.60	675.60	3.00	19.0	6.33	9.47	--	3200	220	75	750	1750	--	--	25471	23324	-2147	--	29-Aug-21	15:49	AMSC	69.15	1.094	30.37	220	6.16	2.65	27	469				68.25	
29-Aug-21	16:18	16:38	20	AMSC	CR218	675.60	678.60	3.00	20.0	6.67	9.00	--	3200	220	75	750	1750	--	--	22795	21264	-1531	--	29-Aug-21	16:48	AMSC	77.33	1.094	30.61	238	6.13	2.84	40	415		0.2		75.68	Top up fluorescein before run
29-Aug-21	17:16	17:34	18	AMSC	CR219	678.60	681.60	3.00	18.0	6.00	10.00	--	3500	220	75	750	1750	--	--	20113	18165	-1948	--	29-Aug-21	17:50	AMSC	86.17	1.094	30.69	222	6.04	2.48	45	422		0.15		87.34	Top up fluorescein before run
30-Aug-21	0:11	0:45	34	MEOR	CR220	681.60	684.60	3.00	34.0	11.33	5.29	--	2700	150	75.7	500	1500	--	--	29622	25874	-3748	--	30-Aug-21	1:07	MEOR	92.75	1.094	25.33	241	6.47	2.16	67	431	70;35	1.2	12.55	93.73	Refilled tank before run
30-Aug-21	1:37	2:03	26	MEOR	CR221	684.60	687.60	3.00	25.0	8.33	7.20	--	2800	200	75.7	600	1500	--	--	25692	23216	-2476	--	30-Aug-21	2:46	MEOR	94.41	1.097	25.01	212	6.75	3.73	34	299				92.66	
30-Aug-21	3:13	3:37	24	MEOR	CR222	687.60	690.60	3.00	31.0	10.33	5.81	--	2900	200	75.7	600	1550	--	--	22762	20790	-1972	--	30-Aug-21	3:55	MEOR	93.39	1.098	25.61	259	6.99	3.77	27	259				94.83	
30-Aug-21	5:10	5:21	11	MEOR	CR223A	690.60	691.10	0.50	10.0	20.00	3.00	--	2800	350	75.7	600	1500	--	--	19811	19511	-300	--	30-Aug-21	5:36	MEOR	88.91	1.098	24.73	275	6.73	3.85	41	212				92.35	
30-Aug-21	10:43	11:15	32	AMSC	CR223B	691.10	693.60	2.50	26.0	10.40	5.77	--	3000	175	60.56	450	1550	--	--	33208	30396	-2812	--	30-Aug-21	11:25	AMSC	85.26	1.098	26.29	197	6.83	2.57	26	586	70;35	0.9	14.4	83.42	Refilled tank before run
30-Aug-21	12:00	12:21	21	AMSC	CR224	693.60	696.60	3.00	20.0	6.67	9.00	--	3200	100	53	500	1550	--	--	29454	27775	-1679	--	30-Aug-21	12:58	AMSC	74.57	1.098	27.26	211	6.96	2.34	18	483		0.2		62.96	Top up fluorescein before run
30-Aug-21	13:26	13:56	30	AMSC	CR225	696.60	699.60	3.00	24.0	8.00	7.50	--	3200	100	53	500	1050	--	--	27196	24463	-2733	--	30-Aug-21	15:01	AMSC	63.59	1.098	27.33	206	6.82	2.13	11	456		0.2		57.84	Top up fluorescein before run
30-Aug-21	15:37	15:37	0	AMSC	CR226	699.60	702.62	3.02	30.0	9.93	6.04	--	3200	125	53	500	1050	--	--	23687	20524	-3163	DW033	30-Aug-21	17:15	AMSC	52.43	1.098	25.66	193	6.46	1.66	26	721		0.2		61.85	Top up fluorescein before run
30-Aug-21	19:38	20:06	28	MEOR	CR227	702.62	705.62	3.00	26.0	8.67	6.92	--	3200	250	66	600	1500	--	--	31787	28897	-2890	--	30-Aug-21	20:13	MEOR	104.5	1.1	26.73	292	6.64	3.34	99	603		0.4	12	112.2	Refilled tank before run
30-Aug-21	20:50	21:15	25	MEOR	CR228	705.62	708.62	3.00	28.0	9.33	6.43	--	3000	250	66	600	1500	--	--	28491	26080	-2411	--	30-Aug-21	21:32	MEOR	109.7	1.1	26.53	198	6.97	4.72	38	545				113.7	
30-Aug-21	22:06	22:25	19	MEOR	CR229A	708.62	709.41	0.79	18.0	22.78	2.63	--	3000	750	66	600	1500	--	--	26007	25250	-757	--	30-Aug-21	22:40	MEOR	109.4	1.1	24.7	255	7.02	4.21	48	561				113.3	
31-Aug-21	0:30	0:57	27	MEOR	CR229B	709.41	711.62	2.21	18.0	8.14	7.37	--	2700	250	66	400	1500	--	--	23645	20733	-2912	--	31-Aug-21	1:44	MEOR	108	1.102	23.29	267	7.07	2.5	110	305				109.5	
31-Aug-21	2:25	2:56	31	MEOR	CR230	711.62	714.62	3.00	29.0	9.67	6.21	--	2700	250	66	400	1500	--	--	20061	17236	-2825	--	31-Aug-21	3:14	MEOR	110.6	1.102	23.7	185	7.16	3.08	82	265				114.2	
2-Sep-21	8:25	9:12	47	AMSC	CR231	714.62	717.62	3.00	50.0	16.67	3.60	--	3000	100	60.56	700	1050	--	--	26361	18032	-8329	--	2-Sep-21	9:26	AMSC	84.45	1.106	20.03	261	6.25	5.24	66	492		1.3		86.32	Top up fluorescein before run
2-Sep-21	14:11	14:57	46	MdK	CR232	717.62	720.33	2.71	45.0	16.61	3.61	--	2750	100	60.57	500	1050	--	--	32131	27511	-4620	--	2-Sep-21	15:19	MdK	85.22	1.099	25.69	641	5.41	4.52	74	449		0.9		94.26	
2-Sep-21	15:57	16:47	50	MdK	CR233	720.33	723.57	3.24	52.0	16.05	3.74	--	2750	175	60.57	500	1050	--	--	27204	22296	-4908	--	2-Sep-21	16:58	MdK	75.78	1.098	27.3	755	6.05	4.96	59	263		0.45		88.9	
2-Sep-21	17:59	18:35	36	MdK	CR234	723.57	726.62	3.05	40.0	13.11	4.57	--	3000	200	60.57	500	1050	--	--	22275	18043	-4232	--	2-Sep-21	18:47	MdK	90.81	1.097	25.45	822	5.95	5.06	65	267				112.2	
2-Sep-21	23:25	0:29	64	MEOR	CR235	726.62	729.41	2.79	46.0	16.49	3.64	--	2800	220	75	500	1650	--	--	26113	20239	-5874	--	3-Sep-21	0:45	MEOR	107.2	1.094	14.44	339	6.85	4.86	92	342				110.6	
3-Sep-21	4:32	5:19	47	MEOR	CR236	729.41	732.34	2.93	42.0	14.33	4.19	--	2800	200	75	500	1500	--	--	29218	25607	-3611	--	3-Sep-21	5:48	MEOR	106.5	1.092	16.83	285	7.4	4.44	63	889	30;15	0.15	9	107.2	Refilled tank before run
3-Sep-21	6:25	7:14	49	MdK	CR237	732.34	735.62	3.28	49.0	14.94	4.02	--	750	25	75.71	500	1050	--	--	22320	17959	-4361	--	3-Sep-21	7:34	MdK	66.04	1.09	16.36	252	5.56	3.55	252	303				84.3	
6-Sep-21	8:58	10:12	74	MdK	CR238	735.62	738.61	2.99	70.0	23.41	2.56	--	2750	100	75.71	500	1050	--	--	47655	39678	-7977	--	6-Sep-21	10:23	MdK	92.83	--	--	443	--	--	--	--	80;40			94.14	Refilled tank before run; not enough sample for full analysis
9-Sep-21	11:05	11:37	32	MdK	CR239	738.61	741.61	3.00	23.0	7.67	7.83	--	3000	150	75.71	450	2500	--	--	32849	29634	-3215	--	9-Sep-21	12:00	MdK	96.06	1.095	20.73	1060	6.1	2.86	74	199		0.25		71.08	Refilled tank before run
9-Sep-21	12:31	13:00	29	MdK	CR240	741.61	744.61	3.00	27.0	9.00	6.67	--	2000	150	75.71	450	2500	--	--	29170	26009	-3161	--	9-Sep-21	13:18	MdK	89.24	1.094	23.38	915	6.52	3.58	72	235		0.25		70.38	
9-Sep-21	13:53	14:20	27	MdK	CR241	744.61	747.61	3.00	26.0	8.67	6.92	--	3000	200	83.28	450	2500	--	--	25491	22602	-2889	--	9-Sep-21	14:40	MdK	81.52	1.094	23.3	859	6.47	2.96	114	268		0.1		89.28	
9-Sep-21	15:53	16:20	27	MdK	CR242	747.61	750.61	3.00	25.0	8.33	7.20	--	3100	200	75.71	600	2500	--	--	22001	19005	-2996	DW034	9-Sep-21	16:42	MdK	88.9	1.093	23.6	862	6.61	2.51	77	255				89.35	SB_BH01_DW034
9-Sep-21	22:47	23:25	38	KBT	CR243	750.61	753.61	3.00	35.0	11.67	5.14	--	2750	175	60.6	500	2350	--	--	30362	26637	-3725	--	10-Sep-21	0:18	KBT	65.46	1.12	17.54	1090	3.83	3.47	145	646		0.4		106.1	Refilled before run
10-Sep-21	1:12	1:49	37	KBT	CR244	753.61	756.61	3.00	36.0	12.00	5.00	--	3000	100	60.6	500	900	--	--	24357	20802	-3555	--	10-Sep-21	2:41	KBT	91.56	1.12	16.25	1160	6.48	4.4	128	324				94.24	
10-Sep-21	3:38	4:18	40	KBT	CR245	756.61	759.61	3.00	38.0	12.67	4.74	--	2800	175	60.6	400	950	--	--	23630	19779	-3851	--	10-Sep-21	4:33	KBT	81.62	1.098	16.93	924	6.59	3.49	28	571				109	
10-Sep-21	5:24	5:59	35	KBT	CR246	759.61	762.61	3.00	33.0	11.00	5.45	--	2750	100	60.6	400	950	--	--	31492	27944	-3548	--	10-Sep-21	6:15	KBT	99.02	1.098	17.5	845	7.15	3.72	12	649				98.24	Refilled before run
11-Sep-21	0:31	1:21	50	KBT	CR247	762.61	765.62	3.01	42.0	13.95	4.30	--	3000	175	60.6	500	950	--	--	33604	29212	-4392	--	11-Sep-21	1:38	KBT	97.91	1.098	18.22	723	6.52	3.28	627	70:35	0.4			109.7	Refilled before run
11-Sep-21	3:20	4:09	49	KBT	CR248	765.62	768.62	3.00	37.0	12.33	4.86	--	3000	100	60.6	400	950	--	--	27477	23060	-4417	--	11-Sep-21	4:21	KBT	100.3	1.096	18.87	787	6.62	3.41	43	515				107.6	
11-Sep-21	5:33	6:23	50	KBT	CR249	768.62	771.62	3.00	55.0	18.33	3.27	--	3000	75	75.7	300	900	--	--	31043	26179	-4864	--	11-Sep-21	6:36	KBT	96.75	1.094	18.7	812	6.93	3.88	34	632		0.4		97.19	Refilled before run
11-Sep-21	7:54	8:48	54	MdK	CR250	771.62	775.22	3.60	52.0	17.33	3.46	--	2900	200	75.71	450	900	--	--	26222	20553	-5669	--	11-Sep-21	9:11	MdK	89.3	1.097	19.43	888	6.65	3.24	63	451				82.77	Refill tank after core run, parameters are for the first 3m drilled
12-Sep-21	1:57	2:53	56	KBT	CR251	775.22	777.60	2.38	50.0	21.01	2.86	--	3000	75	45.4	700	900	--	--	24415	19835	-4580	--	12-Sep-21	3:05	KBT	90.36	1.092	22.43	1010	6.16	3.37	187	204		0.1		90.36	Logged depths for CR250 and CR251 are different than drilled depth
12-Sep-21	5:46	6:32	46	KBT	CR252	777.60	780.60	3.00	45.0	15.00	4.00	--	2750	200	75.7	350	900	--	--	32308	27480	-4828	--	12-Sep-21	8:10	MdK	84.94	1.095	19.98	873	5.78	2.63	104	418		0.9		96.23	Refilled before run
12-Sep-21	8:44	9:29	45	MdK	CR253	780.60	783.60	3.00	45.0	15.00	4.00	--	2800	200	75.71	400	900	--	--	24571	19866	-4705	--	12-Sep-21	10:05	MdK	81.76	1.094	21.25	885	6.55	5.19	143	286				71.75	
12-Sep-21	10:39	11:24	45	MdK	CR254	783.60	786.60	3.00	43.0	14.33	4.19	--	3000	200	75.71	450	900	--	--	41496	36988	-4508	--	12-Sep-21	11:50	MdK	90.02	1.094	21.93	811	6.57	2.71	89	608				83.29	Refill Tank during run
12-Sep-21	12:19	12:57	38	MdK	CR255	786.60	789.60	3.00	45.0	15.00	4.00	--	3000	200	75.71	450	900	--	--	29948	26048	-3900	--	12-Sep-21	13:20	MdK	96.08	1.094	25.95	754	6.39	2.56	88	403				74.23	
12-Sep

DRILLING RECORD FORM

Project Number: 20-211

Core Run Number: CR
Reference Point ID: SB_BH01_#
DHA ID: SB_BH01_#

	Depth (mBGS)	Date / Time (dd-mmm-yy / hh:mm)
Start		
End		
Run Length		

Drill Run Information

Length of DHA: _____ m

Number of Rods x Length of Rod = Total Length of Drill Rods

_____ x 3 m = _____ m

Driller's stickup of rods above RP = _____ m
Stickup of Reference Point (RP) = _____ m

RP Description: Top of Foot Clamp

RP Stickup + Rod Stickup = Stickup of Drill Rods

_____ + _____ = _____ m

Length DHA	+	Total Length of Drill Rods	-	Stickup	=	**Drilled Depth**
_____	+	_____	-	_____	=	_____ mBGS

Drill Parameters

Record the most representative value of the parameters in Table 1 *during drilling of the core run.*

Table 1: Recorded Drill Parameters

Drill Parameter	Recording	Units	Notes
Rate of Penetration (ROP)		minutes/m	
Torque		PSI	
Weight on Bit		lbs	
Holdback Pressure		PSI	
Fluid Injection Pressure		PSI	
Flow Rate		Liters / minute	

DRILLING RECORD FORM

Project Number: 20-211

Drill Fluid Monitoring

Core Run Number: CR

Record the measured value of every parameter and volume listed in Table 2 *and* Table 3 *after drilling of the core run.*

Table 2: Drill Fluid Monitoring Parameters

Parameter	Instrument	Measurement	Units	Trigger	Notes
Fluorescein Concentration	Aquafluor Fluorometer		ppb	20% change from previous drill fluid source	
Density	Hydrometer		API Gravity	N/A	
Temperature	Horiba U52-2 Multi-parameter Water Quality Meter		˚C	N/A	
pH			-	0.5 change from previous drill fluid source	
Electrical Conductivity			mS/cm	10% change from previous drill fluid source	
ORP			mV	N/A	
Dissolved Oxygen			mg/L	10% change from previous drill fluid source	
Turbidity			NTU	10% change from previous drill fluid source	

Table 3: Drill Fluid Volume Monitoring

	Half Tank WL (m)	Drill System volume (L)
Start of Run		
End of Run		
Change in Drill Fluid Volume =		

(-)ve change indicates loss of fluid volume to borehole; +ve change indicates gain of fluid volume from borehole unless otherwise specified as adjustments

Adjustments to Drill Fluid

All additions and/or adjustments made to the drill fluid must be documented on this form after the applicable run. Specify changes made: (include type of additive, product name, volume etc.)

Adjustments Made: ☐ Yes ☐ No

If Yes: ☐ Before CR ☐ After CR

Water Dilution: ☐ Yes ☐ No

Tank Fluorescein: _____ ppb

Notes:

Name: _____ Date: _____ Time: _____

Reviewer Sign Off

Reviewed by:

Signature _____ Date _____

Geofirma Engineering Ltd

DAILY QUALITY CONFIRMATION (QC) REPORT

Project Number: 20-211

DATE:	

Daily Quality Checks Completed by (WP02 Drilling Monitors): _____ (initial)

Tracking Drilled Depth:

Quality Acceptability Checks (OK? Y/N)

Depth From mbgs	Depth To mbgs	Selection of Rods measured and confirmed 3 m length	Number of Rods confirmed by driller and monitor	Comments

Drill Parameters:

Quality Acceptability Checks (OK? Y/N)

Core Run #	Most representative values recorded during drilling	Verified by (Initial)	Comments

Drill Fluid Parameters:

Quality Acceptability Checks (OK? Y/N)

Core Run #	Fluorescein within 20% of prev drill fluid source?	EC, DO, Turb within 10% of prev drill fluid source?	pH within 0.5 of prev drill fluid source?	Comments

DAILY QUALITY CONFIRMATION (QC) REPORT

Project Number: 20-211

Drill Fluid Volume Monitoring;

Quality Acceptability Checks (OK? Y/N)

Core Run #	Volume Calculations Checked	>100 L Volume Change?	Comments

Borehole Deviation:

Quality Acceptability Checks (OK? Y/N)

Measurement Depth	Calibration Check Completed and Passed	Comments

Fluid Sampling:

Quality Acceptability Checks (OK? Y/N)

Sample Type	# of Samples Collected	Deviation from Sample plan	Sampled according to procedures	Labelled according to procedures	Stored according to procedures	Comments
Drill Water (DW)						
Water Source (WS)						
Ground Water (GW)						
Purge Water (PR)						
Cuttings (TCLP)						

Reviewer Sign Off

Reviewed by:

Signature _____ Date _____

INSTRUMENT CALIBRATION CHECK FORM

Project Number: 20-211

Borehole	SB_BH01

Completed by: _____ Date and time: _____

Calibration Check Details

Instrument / Serial Number	Parameter	Units	Calibration Standard		Pre-Calibration Value (RFU)	Type of Calibration	Post-Calibration / Check Value (ppb)	Further Calibration Required?
			Exp. Date	Target Measurement				
AquaFluor	Fluorescein Concentration	ppb		0		4 Point		No
				10 ± 5%				
				100 ± 5%				
				400 ± 5%				
Horiba U52-2	pH	-		4.0 ± 0.02	--	Auto Calibration		No
	Conductivity	mS/cm		4.49 ± 1%	--			
	Turbidity	NTU		0.00 ± 1%	--			
DR900	Multiparameter Colorimeter	520 nm		Blank: 0.00 Std 1: 0.558 ± 0.05 Std 2: 1.141 ± 0.10 Std 3: 1.741 ± 0.15	--	Calibration Check	Blank: Std 1: Std 2: Std 3:	No
		610 nm		Blank: 0.00 Std 1: 0.566 ± 0.05 Std 2: 1.133 ± 0.10 Std 3: 1.730 ± 0.15	--		Blank: Std 1: Std 2: Std 3:	
Analytical Scale	Mass	kg	N/A	1 kg ± 0.1kg	--	Calibration Check	-	No
			N/A	3 kg ± 0.3kg	--			
			N/A	6kg ± 0.6kg	--			

Horiba requires manual calibration (Y/N)? N If yes and not performed under WP07, see WP02 Horiba Calibration Form.

Notes (include any additional instrument calibration checks):

Reviewer Sign Off

Reviewed by:

Signature _____ Date _____

Geofirma Engineering Ltd

HORIBA CALIBRATION FORM

Project Number: 20-211

Borehole	SB_BH01

Calibration by: _____

Calibration date and time: _____

Temperature Electrode Calibration							
Temp Meter Model	**Horiba U52-2 Water Quality Meter**						
Temp Probe Model							
Solution Type	**Temperature (˚C)**	**Standard Value**	**Measured Value (˚C)**	**Calibration Completed?**	**Post Cal Value (˚C)**	**Initial**	**Time**
DI at room temp	--	--	--	--	--	--	--
pH Electrode Calibration (2-point)							
pH Meter Model	**Horiba U52-2 Water Quality Meter**						
pH Probe Model	**pH sensor model 7112**						
Solution Type	**Temperature (˚C)**	**Standard Value**	**Measured Value**	**Calibration Completed?**	**Post Cal Value**	**Initial**	**Time**
pH 7.00 Buffer	--	--	--	--	--	--	--
pH 4.01 Buffer	--	--	--	--	--	--	--
ORP Electrode Calibration							
Eh Meter Model	**Horiba U52-2 Water Quality Meter**						
Eh Probe Model	**ORP sensor model 7313**						
Solution Type	**Temperature (˚C)**	**Standard Value (mV)**	**Measured Value (mV)**	**Calibration Completed?**	**Post Cal Value (mV)**	**Initial**	**Time**
240 mV Test Solution	--	--	--	--	--	--	--
Conductivity Electrode Calibration							
Cond. Meter Model	**Horiba U52-2 Water Quality Meter**						
Cond. Probe Model	**Four-AC-Electrode**						
Solution Type	**Temperature (˚C)**	**Standard Value (mS/cm)**	**Measured Value (mS/cm)**	**Calibration Completed?**	**Post Cal Value (mS/cm)**	**Initial**	**Time**
AutoCal							
DO Electrode Calibration (2-point)							

HORIBA CALIBRATION FORM

Project Number: 20-211

DO Meter Model	Horiba U52-2 Water Quality Meter						
DO Probe Model							
Solution Type	**Temperature (˚C)**	**Standard Value (mg/L)**	**Measured Value (mg/L)**	**Calibration Completed?**	**Post Cal Value (mg/L)**	**Initial**	**Time**
0.00 mg/L (Zero DO)	--	--	--	--	--	--	--
8.92 mg/L (Auto Cal)	--	--	--	--	--	--	--
Turbidity Electrode Calibration (2-point)							
Turb. Meter Model	**Horiba U52-2 Water Quality Meter**						
Turb. Probe Model							
Solution Type	**Temperature (˚C)**	**Standard Value (NTU)**	**Measured Value (NTU)**	**Calibration Completed?**	**Post Cal Value (NTU)**	**Initial**	**Time**
0 NTU	--	--	--	--	--	--	--
100 NTU	--	--	--	--	--	--	--

Notes:

Notes:

Geofirma DQC Form: WP02 Drilling DEVIATION TOOL CALIBRATION CHECK FORM	Borehole: SB_BH01

Calibration Check by: _____

Calibration date and time: _____

Tool Make: _____

Tool Model: _____

Serial Number: _____

Manufacturer's Calibration Date: _____

Manual Measurement		Tool Measurement		Check OK? (Y/N)
Azimuth (˚)	Dip (˚)	Azimuth (˚)	Dip (˚)	

Notes:

Geofirma DQC Form: WP02 Drilling	**Borehole: SB_BH01**

Planned Azimuth NA
Planned Dip 90˚

Criteria Observed	Confirmed by	
	Initial	*Date and time*
Rig mast aligned to planned azimuth using survey station?		
Rig mast aligned to planned dip using level?		
Photographs taken to document process?		

Notes:

Reviewer Sign-off

Reviewed by:

Signature

Date

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling
DRILLING RIG DEPTH REFERENCE MEASUREMENT POINT

Borehole: SB_BH01

Depth Reference ID
Date Measured
Initials

Height above ground surface: m
Description:

Drilling Rig Depth Reference Measurement Point

Note:

Reviewer Sign Off

Reviewed by:

Signature

Date

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling
DOWNHOLE ASSEMBLY (DHA) CONFIGURATION

Borehole: SB_BH01

DHA ID
Date Assembled
Initials

Downhole Assembly Tool Sketch

Component	Total Length (m)	Effective Length (m)	DHA Cumulative Length (m)	Notes / Comments
#1				
#2				
#3				
#4				
#5				

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling

RATIONALE FOR DETERMINATION TO CEMENT A PERMEABLE ZONE

Borehole: SB_BH01

Permeable Zone Name	Interval 2 :			
Permeable Zone Depth Range				
Key Criteria to Cement a Permeable Zone	**Criteria Observed?**	**Depth From (m)**	**Depth To (m)**	**Notes**
Core Logging Observations (fractures, staining, etc.)				
Drilling fluid volume measurements (fluid loss or gain), changes in drilling fluid parameters (pH, electrical conductivity, or tracer concentration)				
Drill pump pressure changes that may indicate loss of circulation or the presence of a water producing feature				
Drilling performance indicators, such as rod drops, changes in advance rates, or changes in drive head torque				
Other (explain)				

Completed By:

Name _____ Date _____

Reviewer & Approver Sign-off

Reviewed by:

Signature _____ Date _____

Approved by:

Signature _____ Date _____

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling

CASING CEMENTING CHECKLIST

Borehole: SB_BH01

Casing Details		Confirmed by	
Casing Size		*Initial*	*Date and time*
Inspected casing ends	*ensure not damaged*		
Planned installation Depth	Based on observed drilling conditions		
Actual installation depth (mbgs)	*Number of casing rods x Length each rod - Stickup above ground surface*		
Cement Grout Details			
Mix Recipe	*(confirm water : cement)*		
Sample collection	*Minimum three samples from mixing tank (beginning, middle, end)*		
	Minimum two samples from grout return to surface		
Grout return to surface	*Confirm good grout return to surface through annulus*		
MNRF Class 1 Examiner	*confirm MNRF Class 1 Examiner onsite during cementing*		

Notes:

Reviewer Sign-off

Reviewed by:

Signature Date

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling
BOREHOLE DEVELOPMENT

Borehole: SB_BH01

Borehole:	SB_BH01	Total Depth:	mBGS
Total Depth:			
Minimum Required Purge Volume (2 BH volumes) =		L	

Multiparameter Probe:

Fluorometer:

Comments

Notes: = calculated based on input values = requires input by user

Date	Time	Measured by (Initials)	Elapsed Time Since Start of Development (min)	Volume Removed (L)		Fluid Density (using hydrometer)	Multiparameter Probe							Fluorometer		Comments
				Since Last Measurement	Cumulative		Cali brat	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cali brat	Fluorescein (ppb)	

Reviewer Sign Off

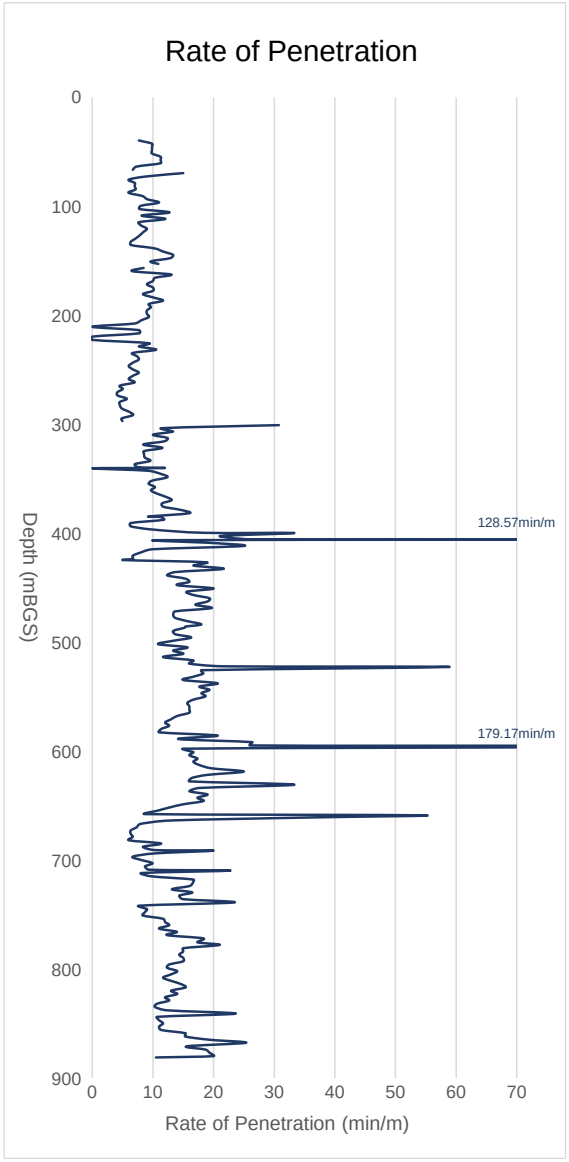
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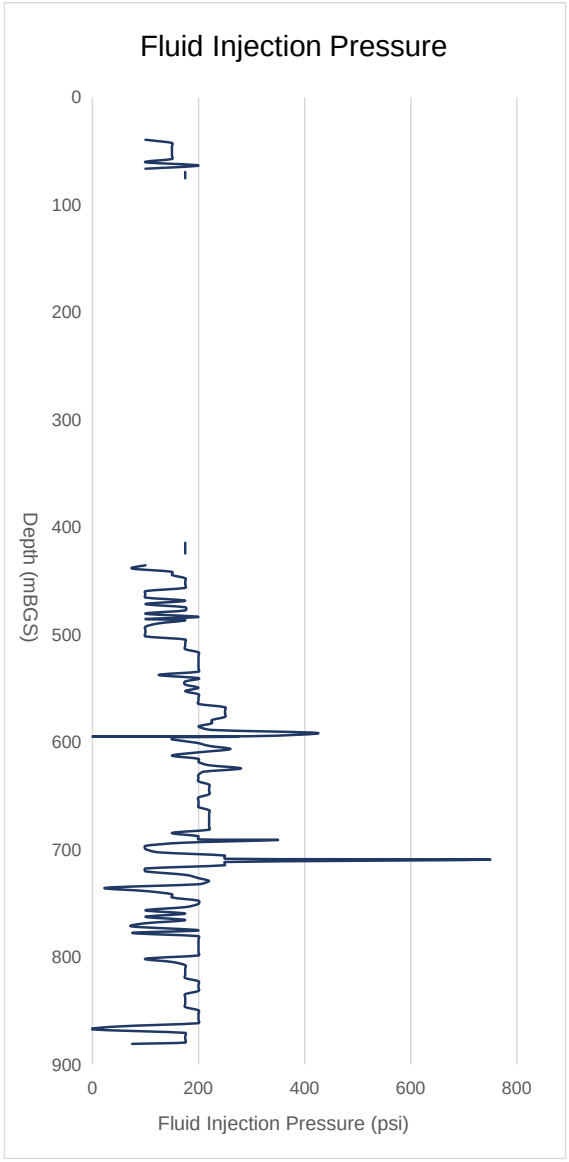
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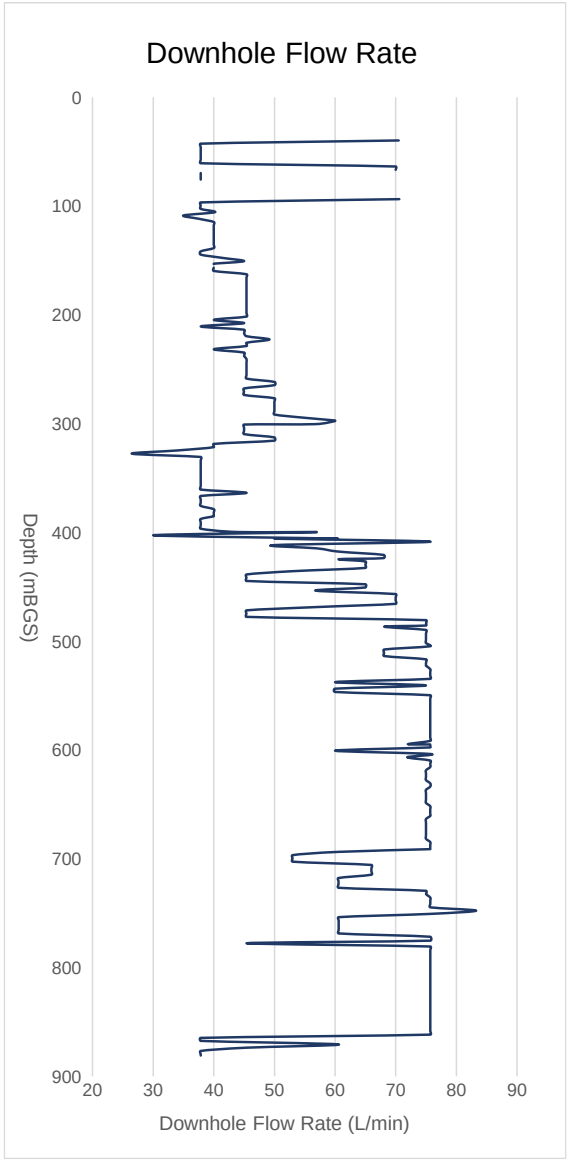
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Appendix B

Drilling Parameters





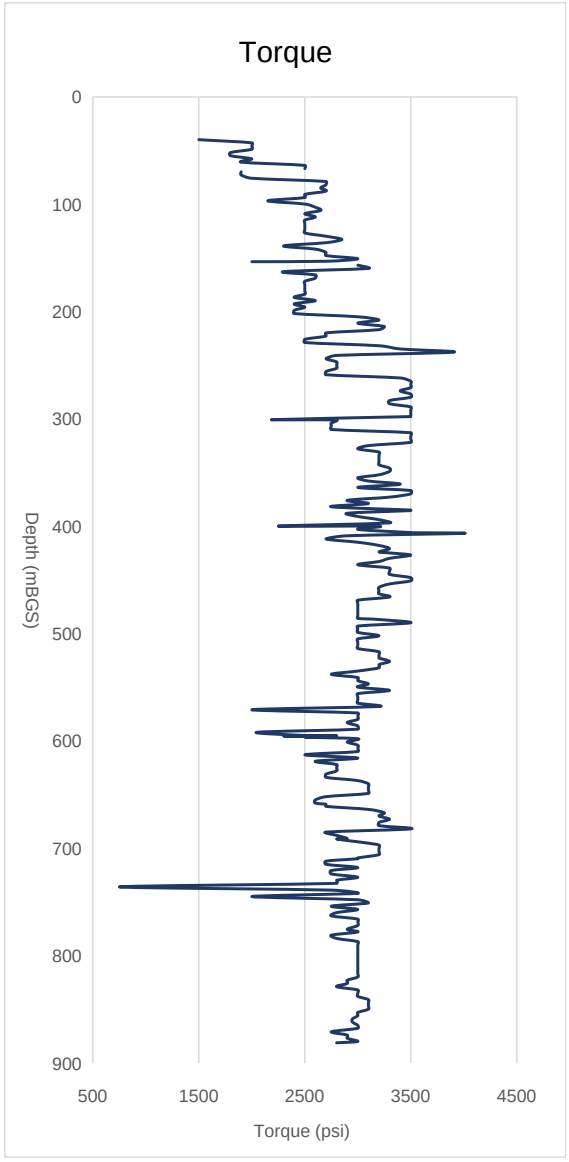


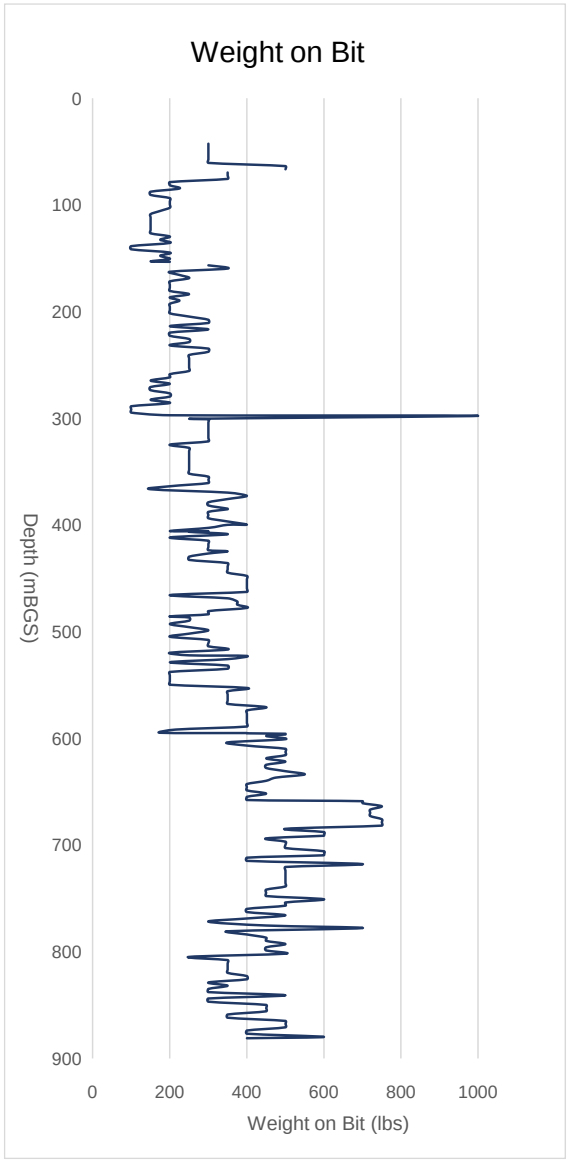
Drilling Parameters for SB_BH01

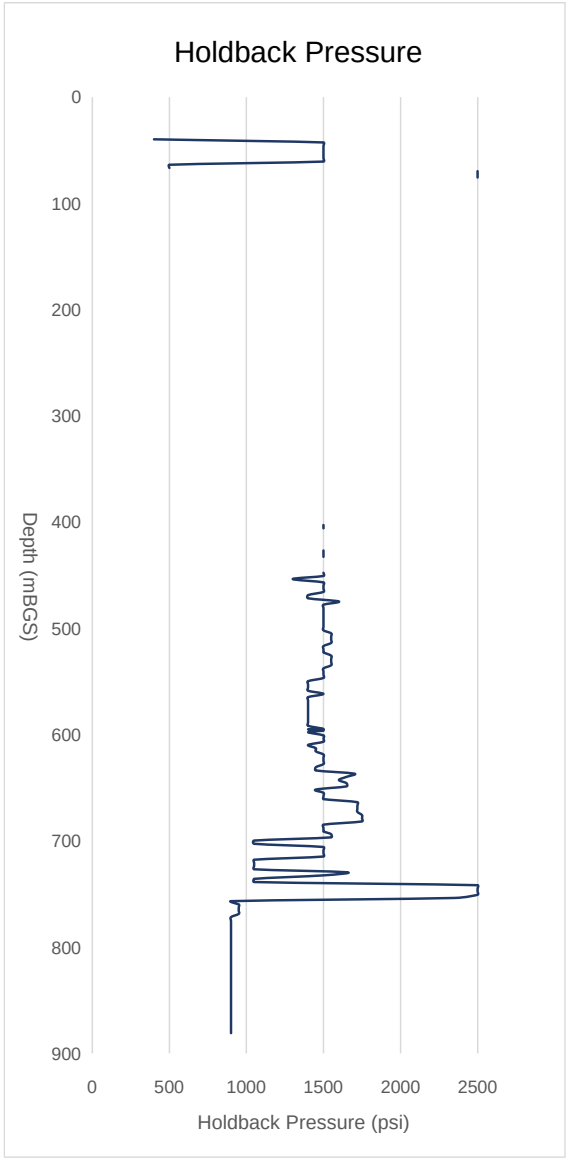
Project 20-211-1 Phase 2 Initial Borehole Drilling and Testing, South Bruce

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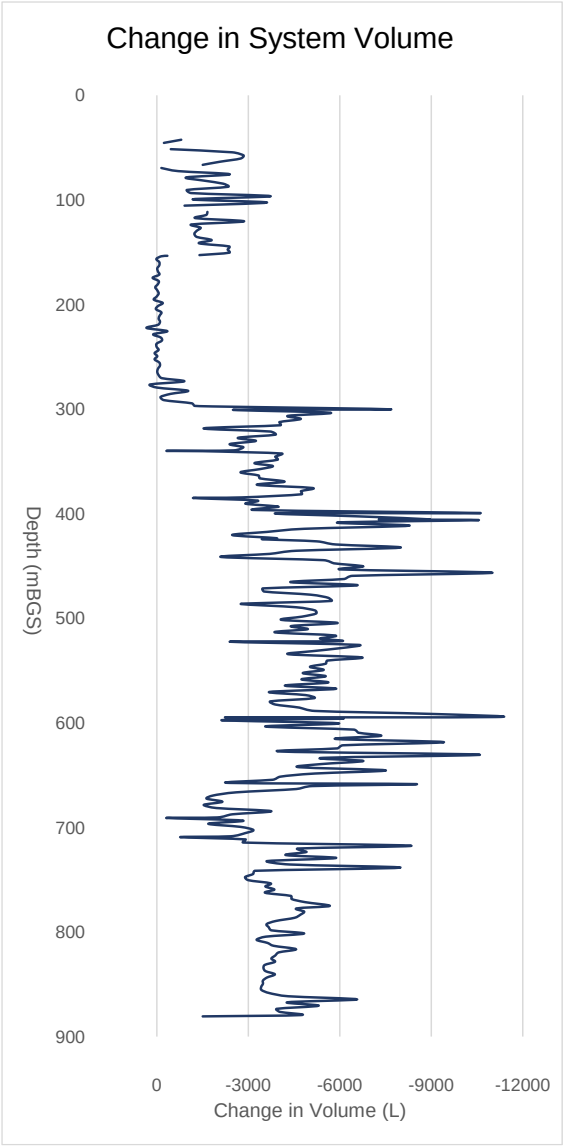


Drilling Parameters for SB_BH01

Project 20-211-1 Phase 2 Initial Borehole Drilling and Testing, South Bruce

Appendix B	Doc. No.:	Prepared by: MdK Reviewed by: SNS Date: 01-Dec-21

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Drilling Fluid Parameters for SB_BH01

Project 20-211-1 Phase 2 Initial Borehole Drilling and Testing, South Bruce

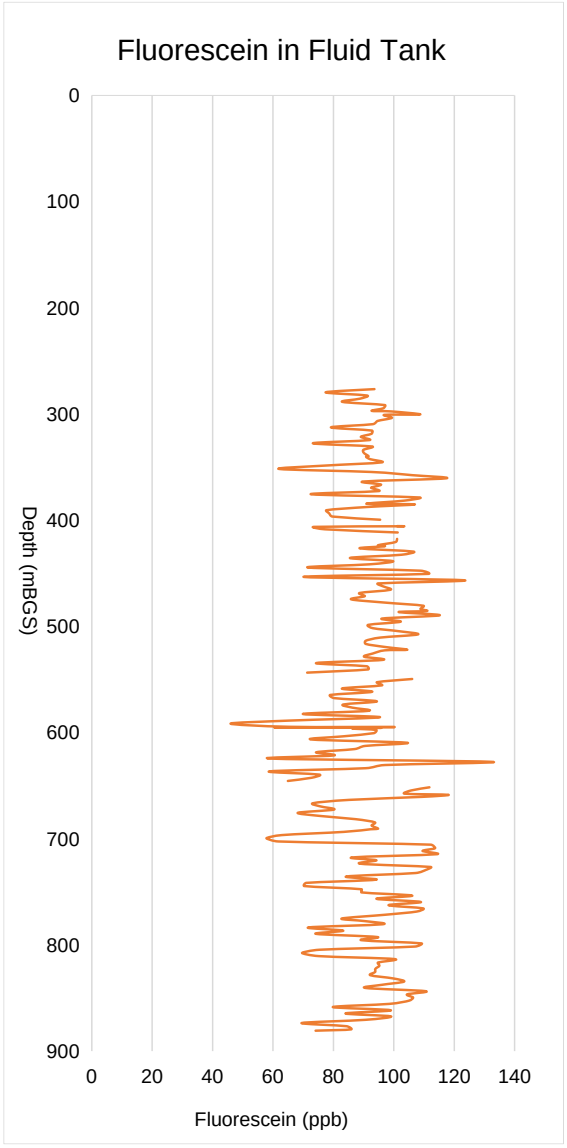
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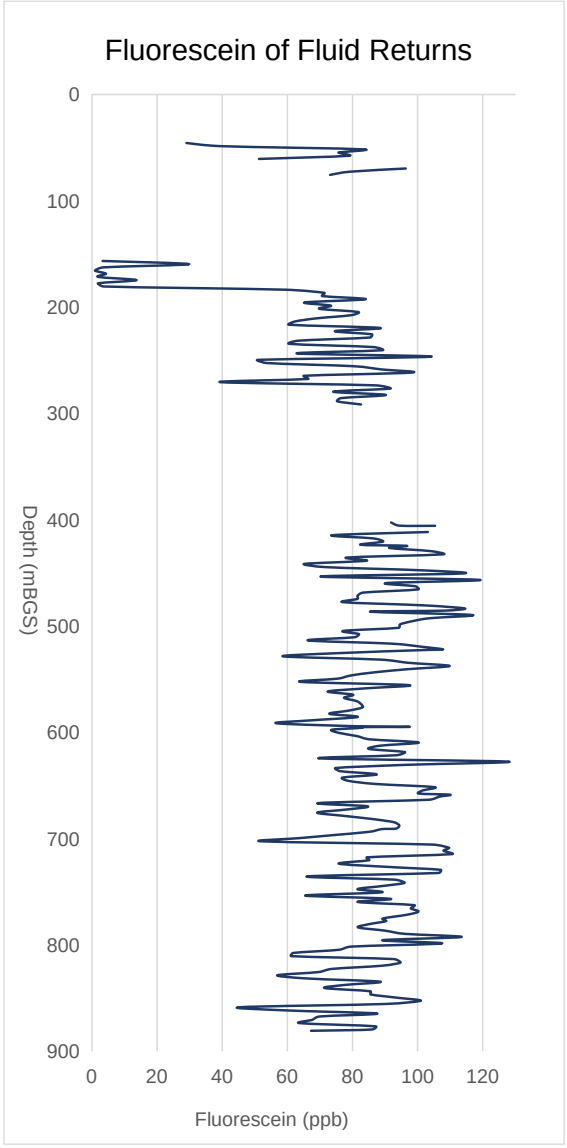
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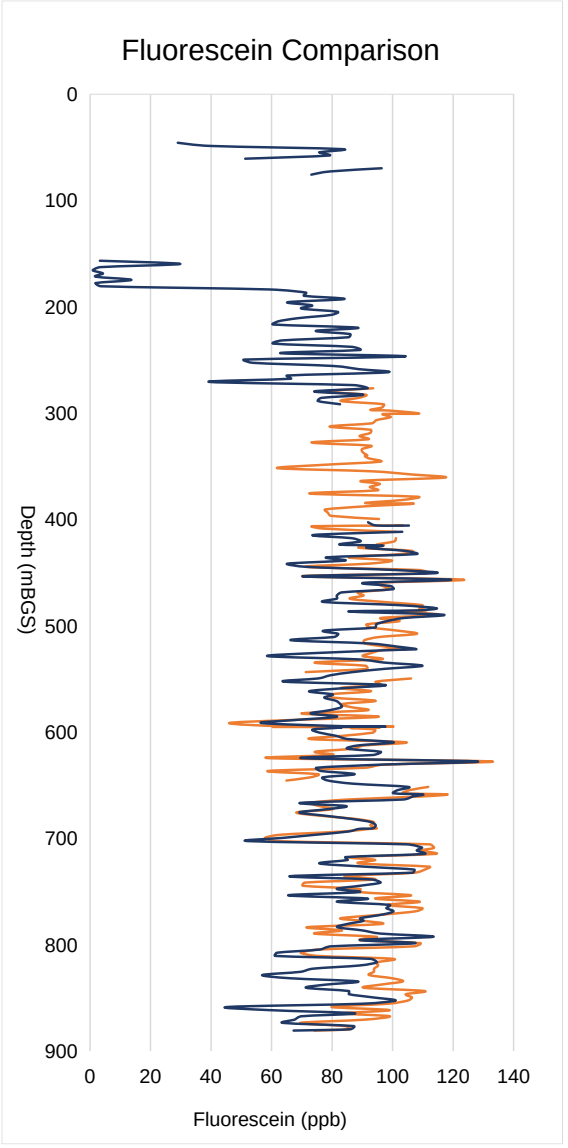
Reviewed by: SNS

Date: 01-Dec-21

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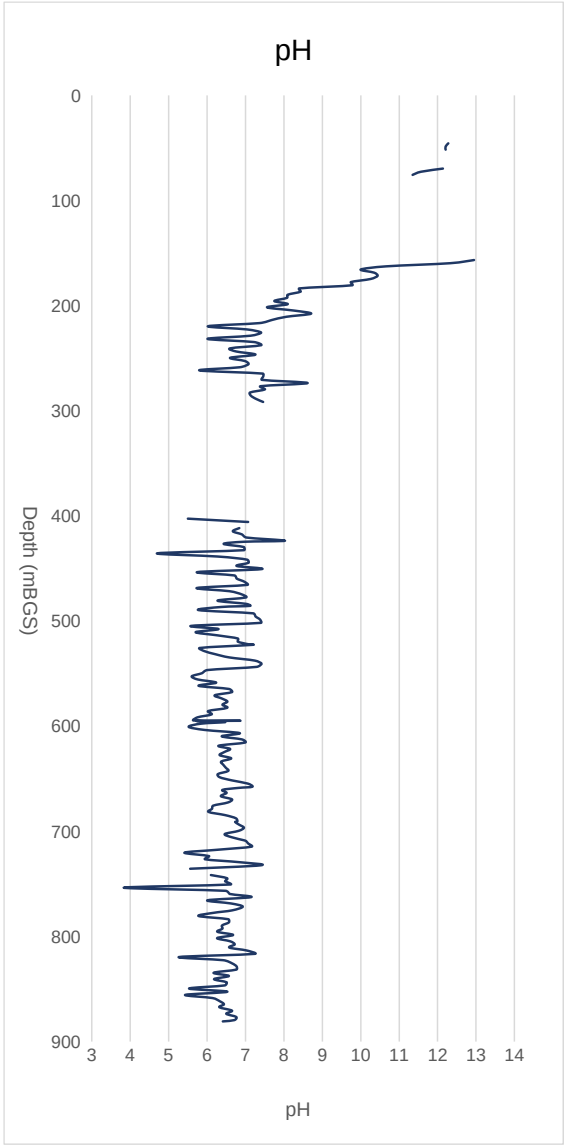


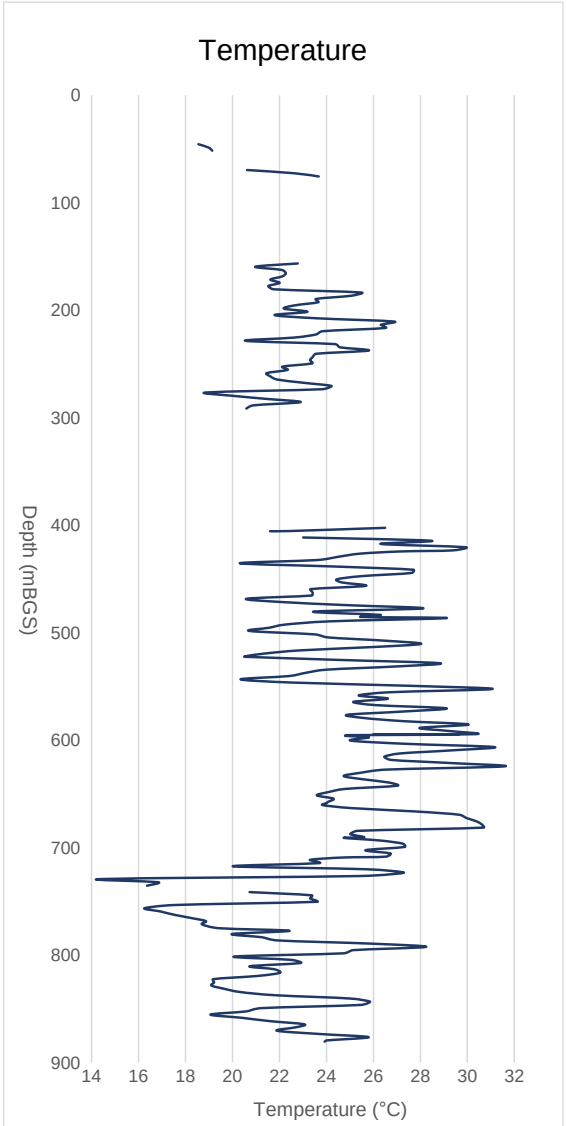


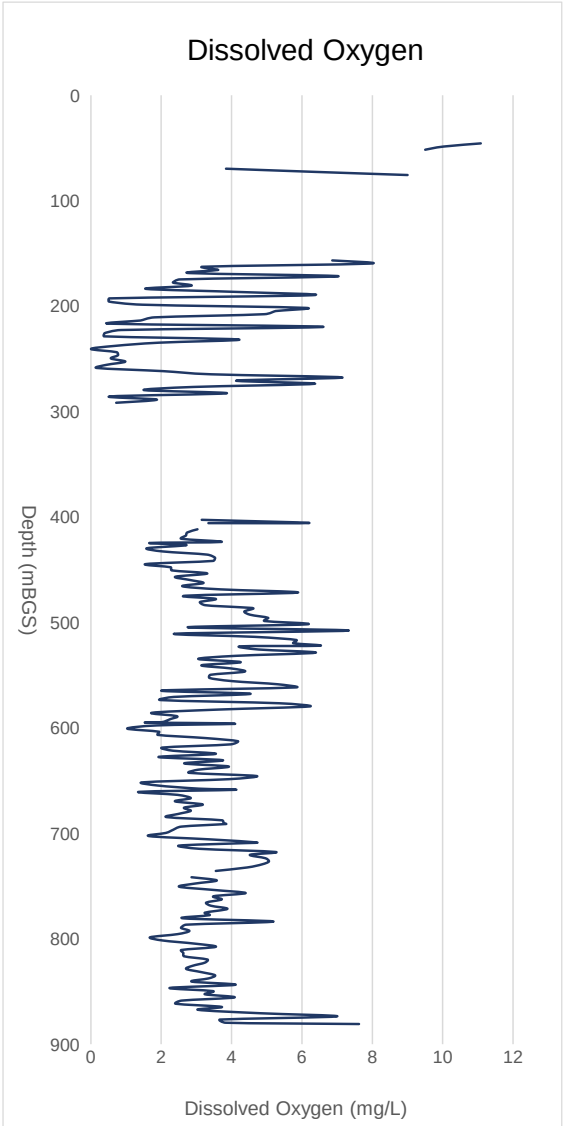


Drilling Fluid Parameters for SB_BH01 **Project 20-211-1 Phase 2 Initial Borehole Drilling and Testing, South Bruce**		Prepared by: MdK Reviewed by: SNS Date: 01-Dec-21
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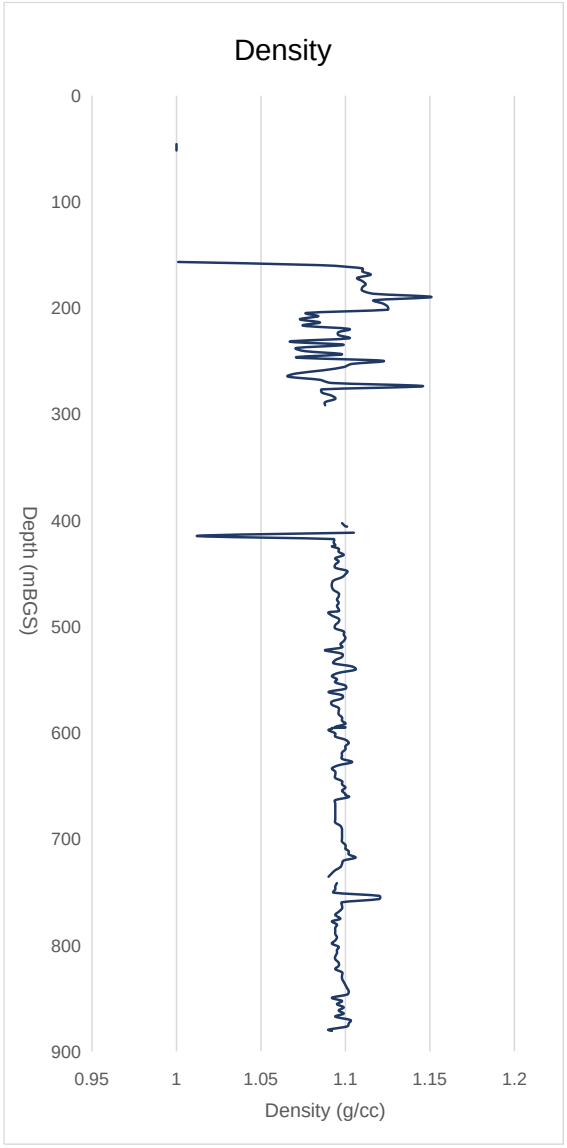


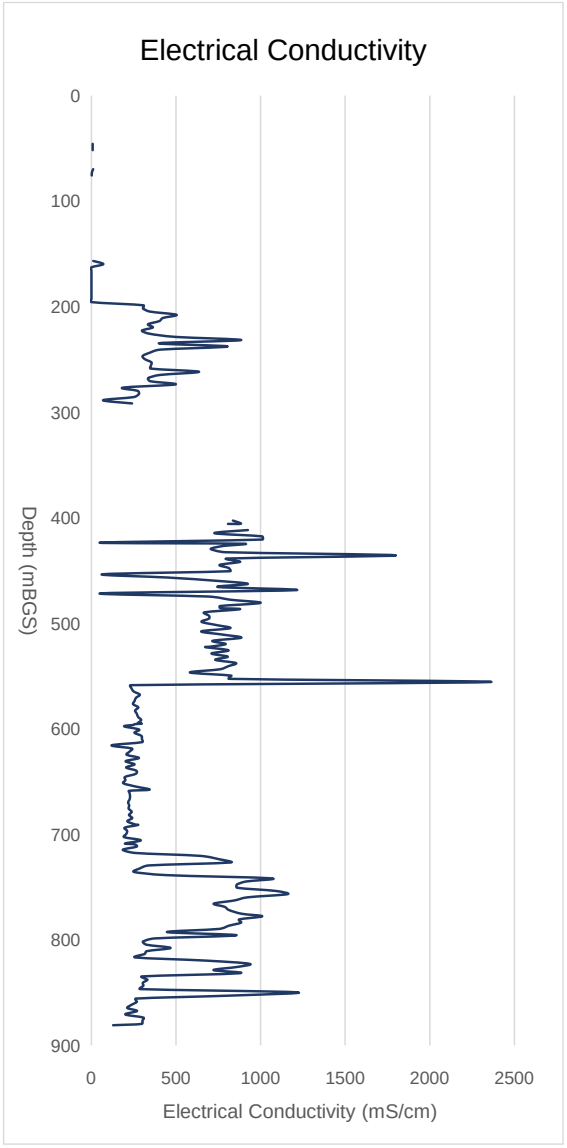
Drilling Fluid Parameters for SB_BH01

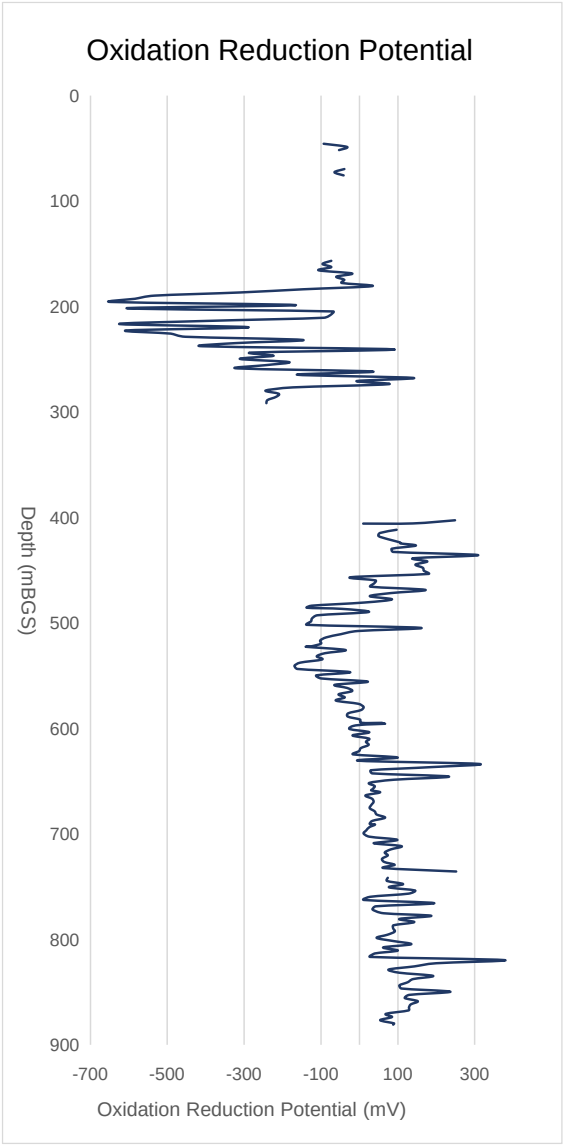
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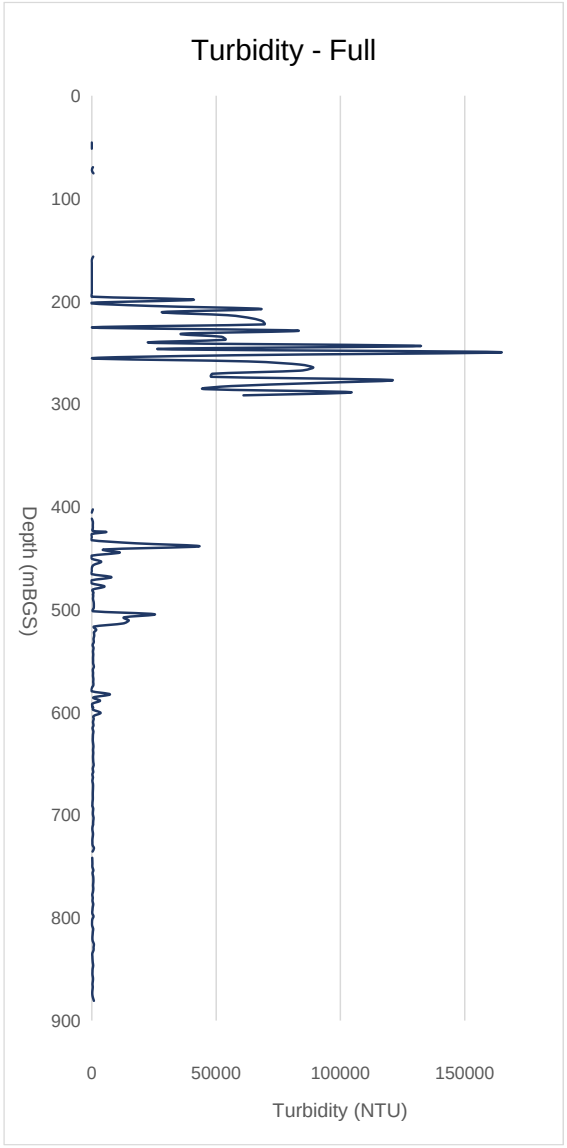


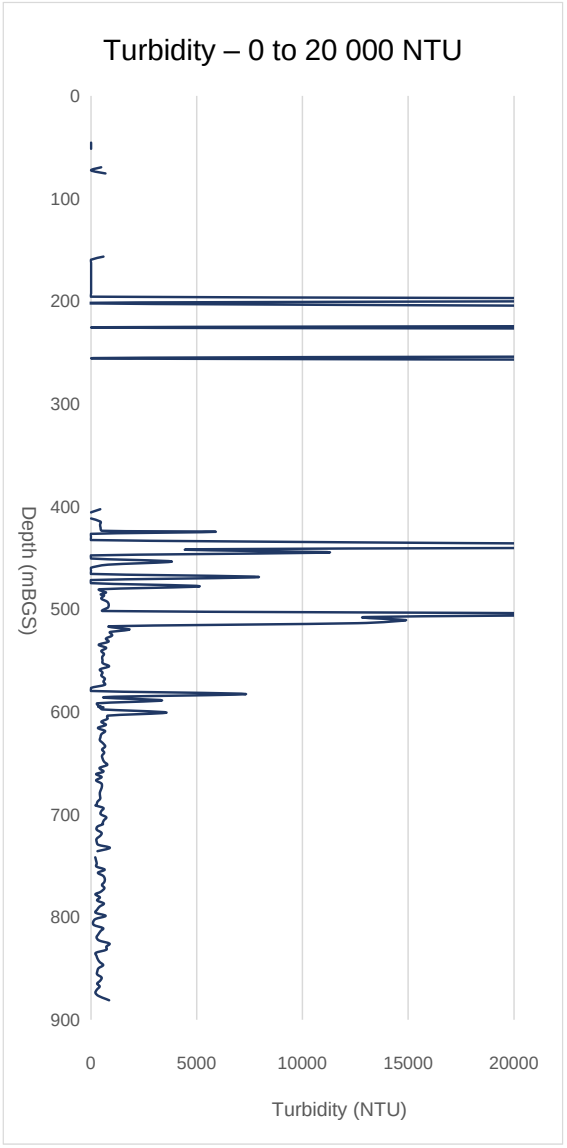
Drilling Fluid Parameters for SB_BH01

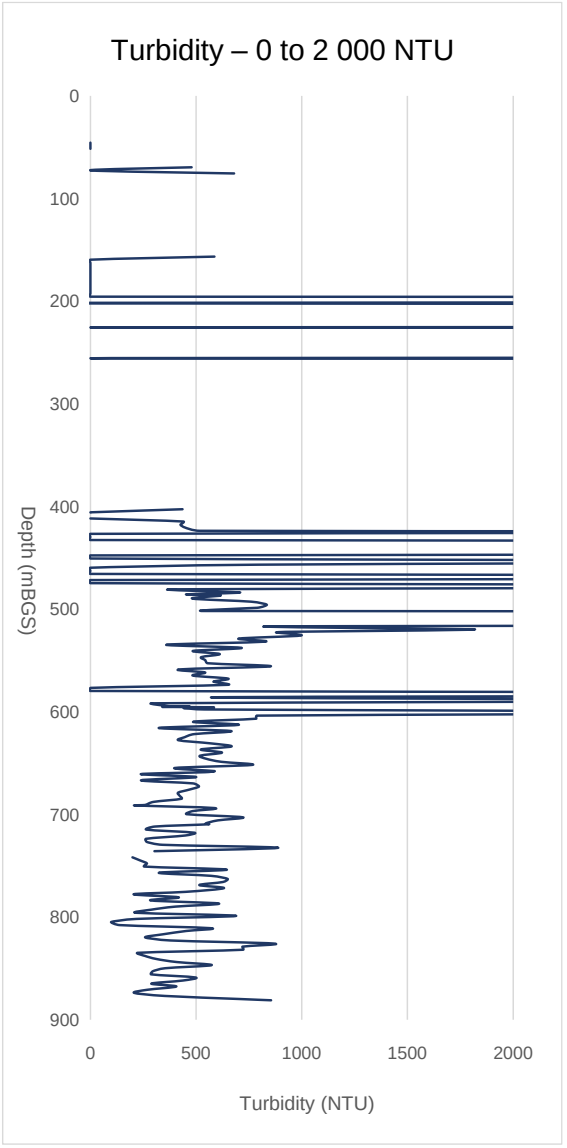
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Drilling Fluid Parameters for SB_BH01 - Turbidity **Project 20-211-1 Phase 2 Initial Borehole Drilling and Testing, South Bruce**		Prepared by: MdK Reviewed by: SNS Date: 01-Dec-21
Appendix B	Doc. No.:	

Geofirma Engineering Ltd

Appendix C

Borehole Orientation Data

SB_BH01

WP02: DRILLING - BOREHOLE DEVIATION

Geofirma Project Reference: 20-211
Completed: 25-Sep-2021

Equipment: Champ Gyro probe - #14680
Geofirma personnel onsite: KBT

Depth		Dip	Azimuth
mBKB	mBGS	(°)	(°)
2.59	0	-90.00	360.00
10	7.41	-88.92	305.15
20	17.41	-88.54	309.34
30	27.41	-88.56	305.07
40	37.41	-88.50	307.10
50	47.41	-88.50	307.51
60	57.41	-88.91	324.77
70	67.41	-88.90	338.69
80	77.41	-88.73	345.88
90	87.41	-88.76	338.82
100	97.41	-88.66	340.18
110	107.41	-88.87	340.21
120	117.41	-88.93	337.91
130	127.41	-88.92	345.95
140	137.41	-88.95	341.46
150	147.41	-88.81	338.79
160	157.41	-88.65	344.79
170	167.41	-88.79	345.41
180	177.41	-88.80	343.44
190	187.41	-88.74	338.34
200	197.41	-88.88	346.28
210	207.41	-88.75	343.37
220	217.41	-88.94	340.79
230	227.41	-88.79	342.13
240	237.41	-88.84	344.14
250	247.41	-88.89	349.52
260	257.41	-88.84	343.01
270	267.41	-88.83	348.84
280	277.41	-88.87	346.02
290	287.41	-88.85	342.24
300	297.41	-88.84	351.78
310	307.41	-88.84	342.68
320	317.41	-88.91	348.53
330	327.41	-88.94	354.86
340	337.41	-88.83	355.74
350	347.41	-88.98	357.54
360	357.41	-88.94	2.81
370	367.41	-88.83	1.25
380	377.41	-88.99	358.91
390	387.41	-89.06	356.20
400	397.41	-88.94	1.01
410	407.41	-89.03	3.14
420	417.41	-89.08	349.07
430	427.41	-89.11	352.62
440	437.41	-89.05	3.23
450	447.41	-88.98	359.05
460	457.41	-89.05	352.32
470	467.41	-89.01	357.70
480	477.41	-88.88	353.51
490	487.41	-89.00	353.36
500	497.41	-89.05	348.68
510	507.41	-88.99	355.17
520	517.41	-88.90	357.25
530	527.41	-89.11	356.78
540	537.41	-88.99	355.32
550	547.41	-88.97	358.65
560	557.41	-89.05	359.84
570	567.41	-88.98	359.90
580	577.41	-88.99	350.13
590	587.41	-89.03	348.13
600	597.41	-89.13	344.65
610	607.41	-89.09	349.27
620	617.41	-89.11	355.05
630	627.41	-89.08	349.95
640	637.41	-89.05	350.56
650	647.41	-88.90	354.40
660	657.41	-88.89	352.36
670	667.41	-88.99	351.33
680	677.41	-88.82	348.68
690	687.41	-88.96	349.83
700	697.41	-88.97	349.90
710	707.41	-89.02	350.42
720	717.41	-89.07	348.54
730	727.41	-89.01	353.00
740	737.41	-89.05	350.18
750	747.41	-89.10	351.44
760	757.41	-88.93	356.82
770	767.41	-89.05	354.16
780	777.41	-89.09	355.29
790	787.41	-89.02	356.01
800	797.41	-89.08	356.25
810	807.41	-89.14	359.08
820	817.41	-89.03	358.22
830	827.41	-88.99	356.06
840	837.41	-88.91	0.15
850	847.41	-88.91	359.18
860	857.41	-88.89	347.91
870	867.41	-88.89	346.86

* Parameters collected from final post-drilling 10m survey

Appendix D

Water Source Quality Data

Table C.1 – Measured In-Field Parameters

Table C.2 – Summary of Lab Results

SB_BH01 Field Parameters and Analysis for Water Source Samples

Sample ID	Borhole Depth (at time of sample)	Sample Date and Time	Sampled by	Multiparameter Probe Measurements							In-Field Lab Analysis						
				pH	Total Dissolved Solids	Temp	Dissolved Oxygen	Electrical Conductivity	ORP	Turbidity	Alkalinity (Total as CaCO3)	Sulfide	Ferrous Iron	Fluorescein	DO	Specific Gravity	Notes/Comments
	mBGS				g/L	°C	mg/L	mS/cm	mV	NTU	mg/L	mg/L	mg/L	ppb	mg/L		
SB_BH01_WS001	~10	2021-04-30 7:45	MdK	7	0.164	9.33	11.62	0.228	482	0	49	0	0	0.023	>1.10	1	Note: DO-Infield Analysis >1mg/L
SB_BH01_WS002	66.59	2021-06-02 18:10	MdK	6.79	0.148	15.17	10.26	0.227	677	0	70	0.01	0	0	>1.10	1	
SB_BH01_WS003	99.59	2021-06-16 22:40	LIM	6.7	0.158	16.55	11.1	0.244	657	0	65	0	0	--	>1.10	0.998	
SB_BH01_WS004	152.89	2021-07-01 21:00	LMB	6.61	0.155	19.38	7.44	0.238	589	0	55	0	0.027	0.0027	>1.10	0.996	
SB_BH01_WS005	237.59	2021-07-19 20:20	MdK	6.78	0.165	21.68	6.37	0.254	585	0	62	0.02	0.05	--	>1.10	0.998	
SB_BH01_WS006	345.59	2021-08-03 20:00	ASC	6.86	0.182	19.78	6.41	0.28	660	0	53	0.01	0.03	0	>1.10	1	
SB_BH01_WS007	396.59	2021-08-06 17:00	KBT	8.08	0.343	23.45	5.01	0.56	65	8.3	50	--	0.02	0.099	>1.10	1	
SB_BH01_WS008	399.74	2021-08-07 13:00	KBT	7.63	0.065	23.7	8.5	0.255	4.85	0	50	--	0.02	0	>1.10	1	
SB_BH01_WS009	405.74	2021-08-08 14:15	KAP	7.72	0.171	21.19	4.51	0.264	499	0	50	--	0	0	>1.10	--	
SB_BH01_WS010	411.59	2021-08-09 12:30	KBT	7.61	0.171	23.36	6.13	0.263	567	0	98	--	0.07	0.026	>1.10	--	
SB_BH01_WS011	444.59	2021-08-10 17:30	KBT	8.11	0.177	23.12	4.2	0.276	382	0	60	--	0.11	0.021	>1.10	--	
SB_BH01_WS012	456.59	2021-08-11 23:15	MdK	7.57	0.154	22.1	5.74	0.238	701	0	69	--	0.02	0	>1.10	0.997	
SB_BH01_WS013	477.59	2021-08-12 16:45	KBT	8.3	0.198	22.68	5.86	0.303	401	0	20	--	0	0	>1.10	--	
SB_BH01_WS014	485.54	2021-08-13 16:00	KBT	7.55	0.153	23.51	7.2	0.236	437	0	76	--	0.02	0.081	>1.10	1	
SB_BH01_WS015	552.59	2021-08-16 16:30	KBT	6.76	0.134	24.56	5.04	0.207	614	0	68	--	0.043	0	>1.10	1	
SB_BH01_WS016	558.59	2021-08-17 15:15	ASC	7.16	0.148	24.09	4.54	0.228	56	0	64	--	0.023	0	>1.10	0.98	
SB_BH01_WS017	588.76	2021-08-20 17:00	ASC	7.67	0.138	23.8	5.71	0.212	539	0	65	--	0.027	0	>1.10	--	
SB_BH01_WS018	588.76	2021-08-22 8:30	ASC	6.86	0.145	23.77	5.67	0.222	538	0	85	--	0.07	0	>1.10	--	
SB_BH01_WS019	594.86	2021-08-23 13:08	ACD	7.15	0.132	26	4.98	0.204	443	0	59	--	0.04	0	>1.10	0.99	
SB_BH01_WS020	630.6	2021-08-27 4:25	MOR	7.94	0.175	22.51	4.99	0.269	468	0	78	--	0	0	>1.10	1	
SB_BH01_WS021	645	2021-08-27 16:00	ASC	7.43	0.187	25.41	4.81	0.288	564	0	67	<0.020	0	0	>1.10	0.98	Sulphide analysis included in BVL report.
SB_BH01_WS022	705.62	2021-08-30 22:20	MOR	8.39	0.214	23.65	5.01	0.33	497	0	56	<0.020	0.23	0.015	>1.10	0.99	Sulphide analysis included in BVL report.
SB_BH01_WS023	714.62	2021-09-02 2:35	MOR	7.58	0.111	21.8	4.4	0.171	547	0	79	<0.020	0.03	0.032	>1.10	1	Sulphide analysis included in BVL report.
SB_BH01_WS024	735.62	2021-09-05 20:55	MOR	6.78	0.129	22.35	6.32	0.198	467	0	62	<0.020	0.03	0.007	>1.10	1	Sulphide analysis included in BVL report.
SB_BH01_WS025	738.61	2021-09-07 10:05	LIM	7.66	0.42	18.28	9.39	0.656	288	68.2	66	<0.020	0.22	0.08	>1.10	0.997	Sulphide analysis included in BVL report.
SB_BH01_WS026	794	2021-09-12 15:45	MdK	7.66	0.261	22.95	3	0.402	290	0	61	<0.020	0.113	--	>1.10	--	Sulphide analysis included in BVL report.
SB_BH01_WS027	819.6	2021-09-13 18:10	MdK	7.77	0.13	21.09	6.79	0.2	646	0	63	<0.020	0.02	0	>1.10	0.997	Sulphide analysis included in BVL report.
SB_BH01_WS028	880.84	2021-09-19 11:20	MOR	8.15	0.15	21.96	9.28	0.23	356	16	59	<0.020	0	0.039	>1.10	1.002	Sulphide analysis included in BVL report.

SB_BH01 Lab Analysis for Water Source Samples

Sample ID	pH-Lab	Alkalinity-Bicarbonate	Total Ammonia as N (NH4+NH3)	Bromide (Br)	Chloride (Cl)	Fluoride (F)	Iodide (I)	Nitrate (NO3)	Nitrite (NO2)	Nitrate + Nitrite	Total Kjeldahl Nitrogen	Total Nitrogen	OrthoPhosphate (PO4)	Total Phosphorus (Ptot)	Sulphate (SO4)	Sulphide as S	Dissolved Organic Carbon (DOC)	Total Organic Carbon (TOC)	Reactive Silica (SiO2)	Aluminum (Al) diss.	Boron (B) diss.	Calcium (Ca) diss.	Iron (Fe) diss.	Lithium (Li) diss.	Magnesium (Mg) diss.	Potassium (K) diss.	Ruthenium (Ru) diss.	Silicon (Si) diss	Sodium (Na) diss.	Strontium (Sr) diss.	Sulfur (S) diss	Cation/Anion Difference
	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
SB_BH01_WS001	7.77	66	0.081	<1.0	11	<0.10	<0.10	0.49	<0.010	0.49	0.53	1	<0.010	<0.004	28	<0.02	1.3	1.5	1.1	0.023	0.014	28	<0.02	<0.005	7.7	2.1	<0.002	0.65	5	0.12	9.3	7.63
SB_BH01_WS002	7.59	65	<0.05	<1.0	10	<0.10	<0.10	0.29	<0.010	0.29	<0.10	0.29	<0.010	<0.004	28	<0.02	1.5	1.5	1.7	0.031	0.015	27	<0.02	<0.005	7.8	1.1	<0.002	0.88	5	0.11	9.3	7.29
SB_BH01_WS003	7.53	65	<0.05	<1.0	9	<0.10	<0.10	0.27	<0.010	0.27	<0.10	0.27	<0.010	<0.004	29	<0.02	1.4	1.6	1.8	0.038	0.015	26	<0.02	<0.005	7.7	1.1	<0.002	0.84	5	0.11	9.2	6.17
SB_BH01_WS004	7.93	67	<0.05	<1.0	10	<0.10	<0.10	0.38	<0.010	0.38	<0.10	0.38	<0.010	<0.004	30	<0.02	1.6	1.6	1.6	0.046	0.02	26	<0.02	<0.005	7	0.96	<0.002	0.71	4.7	0.12	9.3	2.36
SB_BH01_WS005	7.69	65	<0.05	<1.0	12	<0.10	<0.10	0.26	<0.010	0.26	<0.10	0.26	<0.010	<0.004	28	<0.02	1.2	1.3	1.8	0.046	0.015	26	<0.02	<0.005	7.3	0.99	<0.002	0.78	6.1	0.12	9.2	4.82
SB_BH01_WS006	7.83	65	<0.05	<1.0	21	<0.10	<0.10	0.26	<0.010	0.26	0.13	0.39	<0.010	<0.004	28	<0.02	1.8	1.2	1.8	0.043	0.017	30	<0.02	<0.005	7.8	1.1	<0.002	0.85	9.7	0.16	9.4	7.2
SB_BH01_WS007	--	--	--	<1.0	15	<0.10	<0.10	--	--	--	--	--	<0.010	--	26	--	--	--	1.6	0.018	0.015	27	0.03	<0.005	7.3	1	--	0.69	7.4	0.14	9.3	5.93
SB_BH01_WS008	--	--	--	<1.0	12	<0.10	<0.10	--	--	--	--	--	<0.010	--	26	--	--	--	1.6	0.043	0.015	26	<0.02	<0.005	7.1	1.4	--	0.73	7.1	0.12	9.4	6.55
SB_BH01_WS009	--	--	--	<1.0	17	<0.10	<0.10	--	--	--	--	--	<0.010	--	26	--	--	--	1.6	0.046	0.015	28	0.02	<0.005	7.3	1.2	--	0.75	9.1	0.14	9.4	7.3
SB_BH01_WS010	--	--	--	<1.0	12	<0.10	0.35	--	--	--	--	--	<0.010	--	26	--	--	--	1.6	0.042	0.016	25	<0.02	<0.005	7.3	1.1	--	0.71	5.7	0.12	9.4	4.15
SB_BH01_WS011	--	--	--	<1.0	12	<0.10	<0.10	--	--	--	--	--	<0.010	--	26	--	--	--	1.6	0.026	0.015	27	<0.02	<0.005	7.2	1	--	0.67	6	0.12	9.3	6.59
SB_BH01_WS012	--	--	--	<1.0	10	<0.10	<0.10	0.22	<0.010	0.22	--	--	<0.010	--	27	--	--	--	1.7	0.069	0.014	27	<0.02	<0.005	7.7	1	--	0.8	5	0.12	9.4	7.42
SB_BH01_WS013	--	--	--	<1.0	13	0.25	<0.10	0.22	<0.010	0.22	--	--	<0.010	--	26	--	--	--	1.5	0.042	0.015	28	0.02	<0.005	7.6	1.2	--	0.76	7.4	0.13	9.3	9.04
SB_BH01_WS014	--	--	--	<1.0	11	0.15	<0.10	0.22	<0.010	0.22	--	--	<0.010	--	27	--	--	--	1.6	0.061	0.014	27	0.03	<0.005	7.5	1.1	--	0.75	5.8	0.12	9.4	7.14
SB_BH01_WS015	--	--	--	<1.0	10	<0.10	<0.10	0.3	<0.010	0.3	--	--	<0.010	--	27	--	--	--	--	0.056	0.013	25	<0.02	<0.005	7.2	0.92	--	0.73	4.7	0.12	9.3	3.77
SB_BH01_WS016	--	--	--	<1.0	10	<0.10	<0.10	0.3	<0.010	0.3	--	--	<0.010	--	27	--	--	--	--	0.06	0.012	25	<0.02	<0.005	7.1	0.92	--	0.73	4.6	0.12	9.1	3.47
SB_BH01_WS017	--	--	--	<1.0	9.3	<0.10	<0.10	0.26	<0.010	0.26	--	--	<0.010	--	26	--	--	--	--	0.052	0.014	24	<0.02	<0.005	7.2	0.93	--	0.75	4.7	0.11	9.4	3.64
SB_BH01_WS018	--	--	--	<1.0	9.7	<0.10	<0.10	0.25	<0.010	0.25	--	--	<0.010	--	27	--	--	--	--	0.063	0.014	25	<0.02	<0.005	7.3	0.94	--	0.76	4.9	0.11	9.4	4.42
SB_BH01_WS019	--	--	--	<1.0	9.8	<0.10	<0.10	0.27	<0.010	0.27	--	--	<0.010	--	27	--	--	--	--	0.062	0.014	25	<0.02	<0.005	7.2	0.93	--	0.77	4.8	0.11	9.4	4.04
SB_BH01_WS020	--	--	--	<1.0	9.9	--	<0.10	0.25	<0.010	0.25	--	--	<0.010	--	26	--	--	--	--	0.082	0.015	27	--	<0.005	7.6	0.97	--	0.8	5	0.11	--	7.82
SB_BH01_WS021	7.75	66	<0.05	<1.0	12	<0.10	<0.10	0.22	<0.010	0.22	<0.10	0.2	<0.010	0.005	28	<0.02	1.4	1.7	1.9	0.075	0.013	26	<0.02	<0.005	8.1	0.91	<0.002	0.83	5	0.1	9.2	4.77
SB_BH01_WS022	--	--	--	<1.0	9.8	--	<0.10	0.24	<0.010	0.24	--	--	<0.010	--	28	<0.02	--	--	1.8	0.073	0.014	25	--	<0.005	8	0.92	--	0.8	5	0.1	--	5.21
SB_BH01_WS023	--	--	--	<1.0	11	--	<0.10	0.24	<0.010	0.24	--	--	<0.010	--	28	<0.02	--	--	1.7	0.078	0.014	26	--	<0.005	7.7	0.95	--	0.77	4.9	0.11	--	4.84
SB_BH01_WS024	--	--	--	<1.0	10	--	<0.10	0.26	<0.010	0.26	--	--	<0.010	--	28	<0.02	--	--	1.7	0.088	0.015	27	--	<0.005	7.5	0.97	--	0.77	4.8	0.11	--	6.23
SB_BH01_WS025	--	--	--	<1.0	82	--	<0.10	0.27	<0.010	0.27	--	--	<0.010	--	130	<0.02	--	--	2.9	0.019	0.034	89	--	0.015	8.1	1.4	--	1.3	32	1.4	--	3.48
SB_BH01_WS026	--	--	--	<1.0	36	--	<0.10	0.24	<0.010	0.24	--	--	<0.010	--	78	<0.02	--	--	--	0.022	0.027	59	--	0.0078	8.3	1.2	--	1.4	17	1.3	27	8.4
SB_BH01_WS027	--	--	--	<1.0	9.9	--	<0.10	0.27	<0.010	0.27	--	--	<0.010	--	28	<0.02	--	--	--	0.045	0.016	29	--	<0.005	8	0.99	--	0.82	5.7	0.14	9.1	10.19
SB_BH01_WS028	--	--	--	<1.0	12	--	<0.10	0.3	<0.010	0.3	--	--	<0.010	--	28	<0.02	--	--	--	0.063	0.014	26	--	<0.005	7.6	1	--	0.82	5.3	0.12	--	4.36
SB_BH01_WS029	7.53	73	<0.05	<1.0	2200	<0.10	<0.10	0.44	<0.010	0.44	0.21	0.65	<0.010	0.007	58	<0.02	6.9	7.1	2.1	0.01	0.034	44	<0.02	0.011	11	1.7	<0.002	0.98	1300	0.37	19	-3.8
SB_BH01_WS030	7.79	85	<0.05	<1.0	16	<0.10	<0.10	0.77	<0.010	0.77	<0.10	0.77	<0.010	<0.004	37	<0.02	1.3	1.5	2.3	0.024	0.015	34	0.02	<0.005	9.6	1.1	<0.002	1	6.2	0.17	11	3.12
SB_BH01_WS031	7.44	72	<0.05	<1.0	130	<0.10	<0.10	0.35	<0.010	0.35	<0.10	0.35	<0.010	<0.004	30	,0.02	1.5	1.6	2	0.032	0.02	47	<0.02	0.017	7.6	1.6	<0.002	0.94	62	0.39	9.1	2.14

Appendix E

Drilling Fluid Water Quality Data

Table D.1 - Measured In-Field Parameters

SB_BH01 Field Parameters and Analysis for Drill Water Samples

Sample ID	Sample Depth Interval		Sample Date and Time	Sampled by	Multiparameter Probe Measurements							In-Field Lab Analysis						Notes/Comments
					pH	Total Dissolved Solids	Temp	Dissolved Oxygen	Electrical Conductivity	ORP	Turbidity	Alkalinity (Total as CaCO3)	Sulfide	Ferrous Iron	Fluorescein	DO	Specific Gravity	
	mBGS					g/L	°C	mg/L	mS/cm	mV	NTU	mg/L	mg/L	mg/L	ppb	mg/L		
SB_BH01_DW001	0	60.59	2021-06-02 0:30	ASC	11.85	3.63	22.11	4.54	5.75	-56	140	1240	0.02	1.15	105.8	>1.10	1	
SB_BH01_DW012	0	0	2021-06-20 9:53	KBT	6.46	0.157	20.44	8.06	0.242	329	0	88	0.01	0.05	60.18	>1.10	0.998	Archive sample from drill water in half round tank.
SB_BH01_DW015	162.59	165.59	2021-07-16 22:45	MdK	10	>60	22.27	3.62	>100	-106	>1000	--	--	0.15	0.9	>1.10	1.11	Fluorescein concentrations effected by high turbidity.
SB_BH01_DW016	201.59	204.59	2021-07-18 7:49	KBT	8.25	221	21.29	5.25	347	-68	23500	78	>DL	1.81	81.8	>1.10	1.077	Values exceeding detection limits may be attributed to the high turbidity levels, sulfide exceedance likely due to salt precipitation
SB_BH01_DW017	255.59	255.59	2021-07-20 2:50	MdK	7.05	248	21.64	1.97	387	54	51200	42	>DL	--	87.23	0.44	1.099	
SB_BH01_DW020	297.59	300.4	2021-07-30 21:35	ASC	7.25	145	22.7	3.53	234	137	>800	--	--	--	108.8	>1.10	1.086	
SB_BH01_DW022	348.59	351.59	2021-08-04 15:55	MOR	7.26	63.1	25.37	3.42	102	123	717	--	--	--	62.01	>1.10	1.092	Archive sample collected from the half round tank due to no return fluid from the borehole. Diluded EC and TDS 10x. Measurement EC 1.02: TDS 6.31
SB_BH01_DW023	372.59	375.59	2021-08-05 21:10	MdK	5.93	--	26.4	2.76	828	202	680	85	--	3.14	95.3	>1.10	1.09	Drill Water sample taken from half round tank, before CR 118 (375.59mBGS)
SB_BH01_DW024	426.59	426.59	2021-08-09 23:00	MdK	6.43	493	25.45	2.72	783	147	38800	17	--	0.58	91.37	>1.10	1.096	
SB_BH01_DW025	444.59	444.59	2021-08-10 16:40	KBT	7.11	--	22.57	2.46	900	162	49100	7	--	1.73	79.74	>1.10	1.094	Drill Fluid Return Archive, no circulation so sampled Drill fluid tank. EC, NTU, TDS over detection limit, dilution performed. values taken and multipled by 100.
SB_BH01_DW026	504.59	504.59	2021-08-14 9:59	KBT	5.59	500	24.07	2.76	820	160	25200	29	--	0.31	77.27	--	1.099	No drillwater return due to no circulation, fluid collected from tank, water discharged from drill rods as core is pulled to surface, 100x dilution for EC, Turbidity, TDS, Expecting delivery of Sulfide and DO - infield supplies.
SB_BH01_DW029	552.59	552.59	2021-08-16 14:27	KBT	5.6	515	31.07	3.67	813	-99	555	32	--	2.45	64.21	>1.10	1.094	No circulation, so no drill water return. Sample collected from water swabbed from drill rods when core barrel is pulled to surface.
SB_BH01_DW030	597.6	600.6	2021-08-25 12:15	ASC	5.52		25.03	1.03	282	-25	3570	--	--	--	75.96	>1.10	1.094	Sample diluted x10 for EC and Turbidity readings.
SB_BH01_DW031	654.6	657.6	2021-08-28 4:25	MOR	7.18	161	24.07	3.07	344	34	587	--	--	--	100.3	>1.10	1.1	EC and TDS 10x dilution.
SB_BH01_DW033	699.6	702.62	2021-08-30 17:15	ASC	6.46	--	25.66	1.66	193	26	721	18	<0.020	0.89	52.43	>1.10	1.098	Archive drill sample. Collected sulfide sample to be analysed by BVL.
SB_BH01_DW034	747.61	750.61	2021-09-09 16:42	MdK	6.61	543	23.6	2.51	862	77	255	11	<0.020	2.05	88.9	>1.10	1.093	
SB_BH01_DW035	798.6	801.6	2021-09-13 9:40	MdK	6.26	195	20.08	2.04	304	89	217	11	<0.020	1.43	79.66	>1.10	1.096	
SB_BH01_DW038	849.6	852.6	2021-09-15 4:59	KBT	6.53	536	20.6	3.24	853	130	295	28	<0.020	1.67	101	>1.10	1.098	Swab discharge, sulfide for external lab collected
SB_BH01_DW039	879.6	880.84	2021-09-18 21:08	KBT	6.77	592	18.65	3.47	938	-18	155	41	<0.020	5.2	136.4	>1.10	1.09	Sampled from drill rods after run CR286. End of hole. EC, TDS from 100x dilution. Sulphide sample collected for external lab analysis. Ferous Iron 2x dilution

Appendix F

Air Quality and Noise Monitoring

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling AIR MONITORING LOG

Borehole: SB_BH01

Date	Time	Initials	Air Monitor #	CO (ppm)		H_2S (ppm)		O_2 (%)	CH4 (LEL %) / COMB EX	Date of	Comments
				Peak	TWA	Peak	TWA	Peak	Peak	Last Calibration	
6-May-21	13:00	AMSC	SNo. 822050034RN	0.0	0.0	0.0	0.0	20.2	0.0	27/Apr/21	
1-Jun-21	1:32	AMSC	SNo. 822050034RN	0.0	0.0	0.0	0.0	20.8	0.0	27/Apr/21	
29-Jun-21	18:40	MEOR	SNo. 00195845	0	0	0	0	20.8	0	29-Jun-21 (Bump Test)	
30-Jun-21	5:00	AMSC	SNo.00195905	0	0	0	0	20.8	0	29-Jun-21 (Bump Test)	
30-Jun-21	21:55	AMSC	SNo. 00195845	0	0	0	0	20.8	0	30-Jun-21 (Bump Test)	
1-Jul-21	15:55	MEOR	SNo.00195854	0	0	0	0	20.8	0	01-Jul-21 (Bump Test)	
2-Jul-21	15:01	MEOR	Sno. 00195905	0	0	0	0	20.8	0	02-Jul-21 (Bump Test)	
2-Jul-21	23:20	AMSC	Sno. 00195854	0	0	0	0	20.8	0	02-Jul-21 (Bump Test)	
3-Jul-21	16:03	MEOR	Sno. 00195854	0	0	0	0	20.8	0	02-Jul-21 (Bump Test)	
5-Jul-21	19:40	AMSC	SNo. 00195854	0	0	0	0	20.8	0	05-Jul-21 (Bump Test)	
6-Jul-21	20:00	AMSC	SNo. 00195845	0	0	0	0	20.8	0	06-Jul-21 (Bump Test)	
7-Jul-21	11:05	MEOR	Sno. 00195854	0	0	0	0	20.8	0	07-Jul-21 (Bump Test)	
8-Jul-21	3:15	AMSC	SNo.00195905	0	0	0	0	20.8	0	07-Jul-21 (Bump Test)	
8-Jul-21	12:00	MEOR	Sno. 00195854	0	0	0	0	20.8	0	07-Jul-21 (Bump Test)	
9-Jul-21	0:30	AMSC	Sno. 00195854	0	0	0	0	20.8	0	07-Jul-21 (Bump Test)	
9-Jul-21	18:40	KBT	SNo.00195905	0	0	0	0	20.8	0	09-Jul-21 (Bump Test)	
10-Jul-21	2:30	AMSC	SNo.00195905	0	0	0	0	20.8	0	09-Jul-21 (Bump Test)	
10-Jul-21	16:17	KBT	Sno. 00195854	13	0	1	0	20.8	0	10-Jul-21 (Bump Test)	
10-Jul-21	23:15	AMSC	SNo. 00195845	1	0	0	0	20.8	0	10-Jul-21 (Bump Test)	
11-Jul-21	9:24	KBT	SNo. 00195845	3	0	1	0	20.8	0	10-Jul-21 (Bump Test)	
12-Jul-21	9:38	KBT	SNo. 00195845	1	0	1	0	20.8	0	10-Jul-21 (Bump Test)	
13-Jul-21	16:51	KBT	SNo.00195905	1	0	0	0	20.8	0	11-Jul-21 (Cal)	
14-Jul-21	18:36	KBT	SNo. 00195845	1	0	0	0	20.8	0	14-Jul-21 (Cal)	
15-Jul-21	14:28	KBT	Sno. 00195854	8	0	0	0	20.8	3	13-Jul-21 (Cal)	
16-Jul-21	6:20	MdK	SNo.00195854	--	0	--	0	20.8	--	15-Jul-21 (Bump)	
16-Jul-21	7:45	KBT	SNo.00195854	1	0	1	0	20.8	--	15-Jul-21 (Bump)	
17-Jul-21	7:00	MdK	Sno. 00195854	0	0	0	0	20.8		16-Jul-21 (Bump)	
17-Jul-21	10:22	KBT	Sno. 00195854	1	0	1	0	20.8	0	16-Jul-21 (Bump)	
17-Jul-21	21:20	MdK	Sno. 00195905	1	0	0	0	20.8		17-Jul-21 (Cal)	
18-Jul-21	14:38	KBT	Sno. 00195854	1	0	1	0	20.8	0	16-Jul-21 (Bump)	
19-Jul-21	6:25	MdK	Sno. 00195905	1	0	0	0	20.8	0	19-July-21 (Cal)	
19-Jul-21	12:06	MdK	Sno. 00195905	1	0	1	0	20.8	0	19-July-21 (Cal)	
20-Jul-21	1:07	MdK	Sno. 00195905	1	0	1	0	20.8	0	19-July-21 (Cal)	
20-Jul-21	10:38	KBT	Sno. 00195905	1	0	1	0	20.8	--	20-July-21 (Cal)	
21-Jul-21	7:40	MdK	Sno. 00195905	1	0	1	0	20.8	0	20-July-21 (Cal)	
21-Jul-21	19:05	KBT	SNo. 00195845	1	0	0	0	20.8	0	21-July-21 (Cal)	
22-Jul-21	5:15	MdK	SNo. 00195845	1	0	1	0	20.8	1	21-July-21 (Cal)	
22-Jul-21	16:00	MEOR	SNo.00195854	0	0	0	0	20.8	0	22-Jul-21 (Bump Test)	
22-Jul-21	21:00	MdK	SNo.00195854	20	0	6	0	20.8	10	22-Jul-21 (Bump Test)	Above tote
22-Jul-21	23:45	MdK	SNo.00195905	52	0	9	0	20.8	0	22-Jul-21 (Bump Test)	Above tote
23-Jul-21	5:15	MdK	Sno.00195845	1	0	1	0	20.8	0	23-Jul-21 (Bump Test)	
23-Jul-21	17:25	MEOR	SNo.00195845	1	0	1	0	20.8	0	23-Jul-21 (Bump Test)	
24-Jul-21	1:35	AMSC	Sno. 00195854	0	0	0	0	20.8	0	23-Jul-21 (Bump Test)	
25-Jul-25	1:15	AMSC	SNo. 00195854	1	0	0	0	20.8	0	25-Jul-21 (Bump Test)	At work station
25-Jul-21	5:15	AMSC	SNo. 00195854	2	0	1	0	20.8	0	25-Jul-21 (Bump Test)	At work station
25-Jul-21	6:25	AMSC	SNo. 00195854	0	0	0	0	20.8	0	25-Jul-21 (Bump Test)	At work station

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling AIR MONITORING LOG

Borehole: SB_BH01

Date	Time	Initials	Air Monitor #	CO (ppm)		H_2S (ppm)		O_2 (%)	CH4 (LEL %) / COMB EX	Date of Last Calibration	Comments
				Peak	TWA	Peak	TWA	Peak	Peak		
25-Jul-21	10:50	MEOR	SNo. 00195854	60	0	57	0	20.8	0	25-Jul-21 (Bump Test)	Tested in tote containing purge water
25-Jul-21	18:10	MEOR	SNo. 00195845	1	0	0	0	20.8	0	25-Jul-21 (Bump Test)	At work station
25-Jul-21	20:36	AMSC	SNo. 00195845	1	0	0	0	20.8	0	25-Jul-21 (Bump Test)	At work station
25-Jul-21	21:25	CAM	SNo. 00195845	13	0	5	0	20.8	0	25-Jul-21 (Bump Test)	Directly above tote
25-Jul-21	21:25	CAM	SNo. 00195845	10	0	2	0	20.8	0	25-Jul-21 (Bump Test)	Above halfround
25-Jul-21	23:30	AMSC	SNo. 00195845	10	0	1	0	20.8	0	25-Jul-21 (Bump Test)	At work station
26-Jul-21	2:30	AMSC	SNo. 00195845	20	0	1	0	20.8	0	25-Jul-21 (Bump Test)	At work station
26-Jul-21	5:30	AMSC	SNo. 00195845	16	0	1	0	20.8	0	25-Jul-21 (Bump Test)	At work station
26-Jul-21	10:45	MEOR	SNo. 00195845	16	0	2	0	21.3	0	25-Jul-21 (Bump Test)	At work station
26-Jul-21	16:40	MEOR	SNo. 00195854	2	0	20	0	20.8	0	25-Jul-21 (Bump Test)	Tested in tote containing purge water
26-Jul-21	21:30	AMSC	SNo. 00195854	2	0	10	0	20.8	0	25-Jul-21 (Bump Test)	At work station
27-Jul-21	16:50	MEOR	SNo.00195905	1	0	0	0	20.8	0	27-Jul-21 (Bump Test)	Half tank side
27-Jul-21	21:45	AMSC	SNo.00195905	6	0	0	0	20.8	0	27-Jul-21 (Bump Test)	At work station
28-Jul-21	3:30	AMSC	SNo.00195905	0	0	0	0	20.7	0	27-Jul-21 (Bump Test)	At work station
28-Jul-21	15:45	MEOR	SNo.00195892	0	0	15	0	20.8	0	28-Jul-21 (Bump Test)	At top of tote containing purge water
28-Jul-21	21:30	AMSC	SNo.00195892	1	0	20	0	20.8	0	28-Jul-21 (Bump Test)	At top of tote containing purge water
29-Jul-21	2:30	AMSC	Sno.00195905	1	0	1	0	20.8	0	28-Jul-21 (Bump Test)	At work station
29-Jul-21	17:50	MEOR	Sno.00195845	2	0	5	0	20.8	0	29-Jul-21 (Bump Test)	At work station
30-Jul-21	3:30	AMSC	Sno.00195905	0	0	0	0	20.8	0	29-Jul-21 (Bump Test)	At work station
30-Jul-21	15:35	MEOR	Sno.00195905	6	0	2	0	20.8	0	29-Jul-21 (Bump Test)	At work station
30-Jul-21	22:30	AMSC	SNo. 00195854	20	0	1	0	20.8	0	30-Jul-21 (Bump Tets)	Rig floor
31-Jul-21	4:00	AMSC	Sno.00195845	1	0	1	0	20.8	0	30-Jul-21 (Bump Tets)	Core Trailer
31-Jul-21	14:35	MEOR	SNo. 00195854	1	0	1	0	20.8	0	31-Jul-21 (Bump Tets)	Core Trailer
31-Jul-21	21:15	AMSC	Sno.00195845	3	0	1	0	20.8	0	31-Jul-21 (Bump Tets)	Rig floor
1-Aug-21	2:45	AMSC	SNo. 00195854	1	0	1	0	20.8	0	31-Jul-21 (Bump Test)	Top of tote during pump test
1-Aug-21	5:25	AMSC	Sno.00195905	28	0	10	0	20.8	0	01-Aug-21 (Bump Test)	Top of tote during purging for OGW6
1-Aug-21	6:15	AMSC	Sno.00195905	60	0	20	0	20.8	0	01-Aug-21 (Bump Test)	Top of tote during purging for OGW6
1-Aug-21	20:55	AMSC	SNo. 00195854	2	0	1	0	20.8	0	01-Aug-21 (Bump Test)	Top of tote
1-Aug-21	21:00	AMSC	Sno.00195845	1	0	1	0	20.8	0	01-Aug-21 (Bump Test)	At work station
1-Aug-21	22:43	AMSC	SNo. 00195854	6	0	23	0	20.8	0	01-Aug-21 (Bump Test)	Top of tote during purging for OGW6
2-Aug-21	18:40	MEOR	SNo. 00195892	3	0	1	0	20.8	0	02-Aug-21 (Bump Test)	Rig floor
3-Aug-21	21:30	AMSC	SNo. 00195854	1	0	0	0	20.8	0	03-Aug-21 (Bump Test)	Rig floor
3-Aug-21	18:40	MEOR	SNo. 00195892	1	0	0	0	20.8	0	04-Aug-21 (Bump Test)	Rig floor
4-Aug-21	21:05	AMSC	SNo. 00195892	1	0	0	0	20.8	0	04-Aug-21 (Bump Test)	Rig floor
5-Aug-21	4:00	AMSC	SNo. 00195854	20	0	1	0	20.8	0	04-Aug-21 (Bump Test)	Rig floor
5-Aug-21	18:20	KBT	SNo. 00195854	30	0	5	0	20.8	9	04-Aug-21 (Bump Test)	Rig floor
6-Aug-21	3:20	MdK	SNo.00195905	23	0	0	0	20.8	1	05-Aug-21 (Cal)	Rig floor
6-Aug-21	11:55	KBT	SNo. 00195845	15	0	1	0	20.8	0	06-Aug-21 (Cal)	Rig floor
7-Aug-21	2:00	MdK	SNo. 00195845	23	0	1	0	20.8	0	07-Aug-21 (Cal)	Rig floor
7-Aug-21	18:54	KBT	SNo. 00195845	28	0	0	0	20.8	0	07-Aug-21 (Cal)	Rig floor
8-Aug-21	5:00	MdK	SNo. 00195845	28	0	1	0	20.8	0	07-Aug-21 (Cal)	Rig floor
8-Aug-21	13:07	KBT	SNo.00195905	22	0	0	0	20.8	0	07-Aug-21 (Cal)	Rig floor
9-Aug-21	1:00	MdK	SNo. 00195845	1	0	1	0	20.8	1	08-Aug-21 (Cal)	Rig floor
9-Aug-21	10:54	KBT	SNo. 00195845	2	0	5	0	20.8	1	08-Aug-21 (Cal)	Rig floor
10-Aug-21	1:30	MdK	SNo. 00195854	12	0	1	0	20.8	0	09-Aug-21 (Cal)	Rig floor
10-Aug-21	18:15	KBT	SNo. 00195845	4	0	1	0	20.8	0	10-Aug-21 (Cal)	Rig floor

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling AIR MONITORING LOG

Borehole: SB_BH01

Date	Time	Initials	Air Monitor #	CO (ppm)		H_2S (ppm)		O_2 (%)	CH4 (LEL %) / COMB EX	Date of	Comments
				Peak	TWA	Peak	TWA	Peak	Peak	Last Calibration	
11-Aug-21	6:35	MdK	SNo. 00195845	46	0	1	0	20.8	0	10-Aug-21 (Cal)	Rig floor
11-Aug-21	15:41	KBT	SNo. 00195845	3	0	1	0	20.8	0	10-Aug-21 (Cal)	Rig floor
12-Aug-21	1:00	MdK	SNo. 00195854	19	0	1	0	20.8	0	11-Aug-21 (Cal)	Rig floor
12-Aug-21	18:50	KBT	SNo. 00195845	13	0	1	0	20.8	0	12-Aug-21 (Cal)	Rig floor
13-Aug-21	1:00	MdK	SNo.00195905	24	0	1	0	20.8	0	12-Aug-21 (Cal)	Rig floor
13-Aug-21	10:50	KBT	SNo. 00195845	24	0	1	0	20.8	0	13-Aug-21 (Cal)	Rig floor
14-Aug-21	2:45	MdK	SNo. 00195854	36	0	1	0	20.8	0	13-Aug-21 (Cal)	Rig floor
14-Aug-21	6:32	KBT	SNo. 00195845	19	0	1	0	20.8	0	14-Aug-21 (Cal)	Rig floor
15-Aug-21	1:30	MdK	SNo.00195905	29	0	1	0	20.8	0	14-Aug-21 (Cal)	Rig floor
15-Aug-21	15:31	KBT	SNo.00195905	30	0	1	0	20.8	0	14-Aug-21 (Cal)	Rig floor
16-Aug-21	2:45	MdK	SNo. 00195854	16	0	1	0	20.8	0	14-Aug-21 (Bump)	Rig floor
16-Aug-21	9:00	KBT	SNo. 00195854	20	0	1	0	20.8	0	14-Aug-21 (Bump)	Rig floor
17-Aug-21	1:15	MdK	SNo.00195905	1	0	1	0	20.8	0	16-Aug-21 (Cal)	Rig floor
17-Aug-21	13:40	AMSC	SNo. 00195845	1	0	1	0	20.8	0	16-Aug-21 (Bump)	Rig floor
17-Aug-21	23:15	MdK	SNo. 00195845	6	0	1	0	20.8	0	16-Aug-21 (Bump)	Rig floor
18-Aug-21	8:45	AMSC	SNo.00195905	20	0	0	0	20.8	0	17-Aug-21 (Cal)	Rig floor
18-Aug-21	17:00	AMSC	SNo.00195905	4	0	0	0	20.8	0	17-Aug-21 (Cal)	Rig floor
19-Aug-21	1:15	MdK	SNo. 00195845	2	0	1	0	20.8	0	18-Aug-21 (Cal)	Rig floor
19-Aug-21	10:05	AMSC	SNo. 00195845	32	0	1	0	20.8	0	18-Aug-21 (Cal)	Rig floor
20-Aug-21	1:35	MEOR	SNo. 00195845	37	0	1	0	20.8	1	19-Aug-21 (Cal)	Rig floor
20-Aug-21	22:45	MEOR	SNo.00195905	1	0	1	0	20.8	0	20-Aug-21 (Cal)	Rig floor
21-Aug-21	9:35	AMSC	SNo. 00195845	2	0	1	0	20.8	0	20-Aug-21 (Cal)	Rig floor
22-Aug-21	5:00	MEOR	SNo.00195892	0	0	0	0	20.8	0	22-Aug-21 (Cal)	Rig floor
22-Aug-21	17:00	AMSC	SNo. 00195845	1	0	0	0	20.8	0	22-Aug-21 (Cal)	Rig floor
23-Aug-21	3:00	MEOR	SNo. 00195845	1	0	0	0	20.8	0	22-Aug-21 (Cal)	Rig floor
23-Aug-21	17:30	AMSC	SNo. 00195845	3	0	1	0	20.8	0	22-Aug-21 (Cal)	Rig floor
23-Aug-21	23:35	MEOR	SNo. 00195845	6	0	1	0	20.8	0	23-Aug-21 (Cal)	Rig floor
24-Aug-21	9:00	AMSC	SNo. 00195845	4	0	1	0	20.8	11	24-Aug-21 (Cal)	Rig floor
25-Aug-21	4:40	MEOR	SNo.00195905	7	0	0	0	20.8	0	24-Aug-21 (Cal)	Rig floor
25-Aug-21	9:30	AMSC	SNo.00195905	2	0	0	0	20.8	0	24-Aug-21 (Cal)	Rig floor
26-Aug-21	4:30	MEOR	SNo.00195892	0	0	0	0	20.8	0	25-Aug-21 (Cal)	Rig floor
26-Aug-21	13:15	AMSC	SNo.00195892	29	0	1	0	20.8	0	26-Aug-21 (Cal)	Rig floor
27-Aug-21	5:35	MEOR	SNo. 00195845	17	0	1	0	20.8	0	26-Aug-21 (Bump)	Rig floor
27-Aug-21	12:20	AMSC	SNo.00195905	1	0	1	0	20.8	0	27-Aug-21 (Cal)	Rig floor
28-Aug-21	2:43	MEOR	SNo.00195905	1	0	1	0	20.8	1	27-Aug-21 (Cal)	Rig floor
28-Aug-21	19:45	MEOR	SNo.00195905	1	0	1	0	20.8	0	27-Aug-21 (Cal)	Rig floor
29-Aug-21	9:20	AMSC	SNo.00195905	18	0	2	0	20.8	0	27-Aug-21 (Cal)	Rig floor
30-Aug-21	1:13	MEOR	SNo.00195892	17	0	1	0	20.8	0	29-Aug-21 (Cal)	Rig floor
30-Aug-21	11:40	AMSC	SNo. 00195845	23	0	2	0	20.8	0	30-Aug-21 (Cal)	Rig floor
30-Aug-21	23:50	MEOR	SNo. 00195845	26	0	1	0	20.8	6	30-Aug-21 (Cal)	Rig floor
31-Aug-21	14:25	AMSC	SNo.00195905	23	0	1	0	20.8	2	31-Aug-21 (Cal)	Rig floor
1-Sep-21	11:00	AMSC	SNo. 00195845	1	0	1	0	20.8	0	31-Aug-21 (Cal)	Rig floor
2-Sep-21	3:05	MEOR	SNo.00195892	1	0	1	0	20.8	0	01-Sep-21 (Cal)	Rig floor
2-Sep-21	19:00	MdK	SNo.00195905	21	0	1	0	20.8	0	01-Sep-21 (Cal)	Rig floor
3-Sep-21	6:15	MEOR	SNo.00195892	11	0	1	0	20.8	0	02-Sep-21 (Cal)	Rig floor
3-Sep-21	13:20	MdK	SNo.00195892	4	0	1	0	20.8	0	02-Sep-21 (Cal)	Rig floor

Geofirma DATA QUALITY CONFIRMATION (DQC) Form: WP02 Drilling AIR MONITORING LOG

Borehole: SB_BH01

Date	Time	Initials	Air Monitor #	CO (ppm)		H_2S (ppm)		O_2 (%)	CH4 (LEL %) / COMB EX	Date of	Comments
				Peak	TWA	Peak	TWA	Peak	Peak	Last Calibration	
4-Sep-21	4:45	MEOR	SNo.00195892	1	0	1	0	20.8	0	03-Sep-21 (Cal)	Rig floor
4-Sep-21	18:45	MdK	SNo. 00195845	10	0	1	0	20.8	5	03-Sep-21 (Cal)	Rig floor
5-Sep-21	0:23	MEOR	SNo. 00195845	1	0	1	0	20.8	5	04-Sep-21 (Cal)	Rig floor
5-Sep-21	14:00	MdK	SNo.00195905	1	0	1	0	20.8	0	05-Sep-21 (Bump)	Rig floor
6-Sep-21	6:10	MEOR	SNo.00195892	1	0	1	0	20.8	0	05-Sep-21 (Bump)	Rig floor
6-Sep-21	4:00	MdK	SNo. 00195845	1	0	1	0	20.8	5	06-Sep-21 (Bump)	Rig floor
7-Sep-21	5:55	MEOR	SNo. 00195845	9	0	1	0	20.8	0	06-Sep-21 (Bump)	Rig floor
8-Sep-21	5:19	MEOR	SNo.00195892	1	0	2	0	20.8	0	07-Sep-21 (Bump)	Rig floor
8-Sep-21	15:00	MdK	SNo.00195892	1	0	1	0	20.8	2	07-Sep-21 (Bump)	Rig floor
9-Sep-21	3:30	MEOR	SNo. 00195845	1	0	1	0	20.8	0	08-Sep-21 (Bump)	Rig floor
9-Sep-21	18:40	MdK	SNo.00195892	1	0	1	0	20.8	0	09-Sep-21 (Cal)	Rig floor
10-Sep-21	22:35	KBT	SNo.00195892	2	0	1	0	20.8	0	09-Sep-21 (Cal)	Rig floor
10-Sep-21	15:00	MdK	SNo. 00195845	13	0	5	0	20.8	0	10-Sep-21 (Cal)	Rig floor - Pulling Rods
11-Sep-21	6:27	KBT	SNo.00195905	1	0	1	0	20.8	0	10-Sep-21 (Cal)	Rig floor
11-Sep-21	18:00	MdK	SNo. 00195845	12	0	1	0	20.8	0	11-Sep-21 (Cal)	Rig floor
11-Sep-21	22:47	KBT	SNo. 00195905	1	0	1	0	20.8	0	11-Sep-21 (Cal)	Rig floor
12-Sep-21	18:00	MdK	SNo. 00195845	12	0	1	0	20.8	1	11-Sep-21 (Cal)	Rig floor
12-Sep-21	19:10	KBT	SNo. 00195845	1	0	1	0	20.8	0	11-Sep-21 (Cal)	Rig floor - no N/S drilling
13-Sep-21	12:45	MdK	Sno. 00195854	2	0	1	0	20.8	0	12-Sep-21 (Cal)	Rig floor
14-Sep-21	3:41	KBT	SNo.00195892	1	0	1	0	20.8	0	13-Sep-21 (Cal)	Rig floor
14-Sep-21	13:59	CJS	SNo. 00195845	2	0	1	0	20.8	0	15-Sep-21 (Cal)	Rig floor
15-Sep-21	6:52	KBT	SNo. 00195905	1	0	0	0	20.8	0	14-Sep-21 (Cal)	Rig floor
15-Sep-21	13:25	CJS	SNo. 00195905	1	0	1	0	20.8	0	15-Sep-21 (Cal)	Rig floor
15-Sep-21	21:24	KBT	SNo. 00195905	1	0	1	0	20.8	5	15-Sep-21 (Cal)	Rig Floor
16-Sep-21	12:03	CJS	SNo. 00195905	1	0	1	0	20.8	6	15-Sep-21 (Cal)	Rig Floor
17-Sep-21	5:25	KBT	SNo.00195892	1	0	5	0	20.8	0	16-Sep-21 (Cal)	Rig Floor
17-Sep-21	15:25	MEOR	SNo. 00195905	2	0	1	0	20.8	0	17-Sep-21 (Cal)	Rig Floor
17-Sep-21	20:21	KBT	SNo. 00195845	1	0	1	0	20.8	8	17-Sep-21 (Cal)	Rig Floor
18-Sep-21	17:39	MEOR	SNo.00195892	1	0	2	0	20.8	4	17-Sep-21 (Cal)	Rig Floor
19-Sep-21	4:24	KBT	SNo. 00195845	16	0	5	0	20.8	7	18-Sep-21 (Cal)	Rig Floor
19-Sep-21	18:35	MEOR	SNo. 00195905	3	0	1	0	20.8	0	19-Sep-21 (Cal)	Rig Floor
20-Sep-21	1:37	KBT	SNo. 00195845	1	0	1	0	20.8	7	19-Sep-21 (Cal)	Rig Floor
20-Sep-21	18:51	MEOR	Sno. 00195854	2	0	1	0	20.8	0	20-Sep-21 (Cal)	Rig Floor
21-Sep-21	6:58	KBT	SNo. 00195845	1	0	1	0	20.8	8	20-Sep-21 (Cal)	Rig Floor
21-Sep-21	17:45	MEOR	SNo.00195892	1	0	1	0	20.8	7	21-Sep-21 (Cal)	Rig Floor
22-Sep-21	2:10	KBT	SNo. 00195845	1	0	1	0	20.8	5	21-Sep-21 (Cal)	Rig Floor
22-Sep-21	19:00	MEOR	Sno. 00195854	1	0	2	0	20.8	5	22-Sep-21 (Cal)	Rig Floor
23-Sep-21	5:41	KBT	Sno. 00195854	16	0	5	0	20.8	5	22-Sep-21 (Cal)	Rig Floor
23-Sep-21	18:50	MEOR	SNo. 00195905	3	0	1	0	20.8	0	23-Sep-21 (Cal)	Rig Floor
24-Sep-21	6:03	KBT	SNo. 00195905	8	0	1	0	20.8	0	23-Sep-21 (Cal)	Rig Floor
24-Sep-21	18:20	MEOR	SNo. 00195845	12	0	2	0	20.8	0	24-Sep-21 (Cal)	Rig Floor
25-Sep-21	6:43	KBT	SNo. 00195845	--	--	--	--	--	--	24-Sep-21 (Cal)	Rig Floor, battery died
26-Sep-21	18:00	MEOR	SNo. 00195845	13	0	2	0	20.8	0	25-Sep-21 (Cal)	Rig Floor

Noise Monitoring Record

SB_BH01

Monitoring Device:

Casella CEL-63X, Sound Level Meter
SN: 2382935

O Reg. 381/15

- No worker exposed to TWA over 85 dBA for an 8 hr shift
- No worker exposed to TWA over 83 dBA for a 12 hr shift
- No unprotected exposures over 115 dBA

Date	Time	Reading (dB)	Location	Activity
01-May-21	9:45	50	Core Logging Trailer Door	Background
01-May-21	9:45	45	East fence line	Background
01-May-21	9:45	40	South East fence line	Background
01-May-21	9:45	48	South west fence line	Background
01-May-21	9:45	45	West fence line	Background
05-May-21	10:05	71.8	Core Logging Trailer Door	Bailing (Marsh)
05-May-21	10:05	71.8	East fence line	Bailing (Marsh)
05-May-21	10:05	69.9	South East fence line	Bailing (Marsh)
05-May-21	10:05	64.2	South west fence line	Bailing (Marsh)
05-May-21	10:05	52	West fence line	Bailing (Marsh)
10-May-21	14:45	82.6	Core Logging Trailer Door	Driving Casing (marsh)
10-May-21	14:45	84.4	East fence line	Driving Casing (marsh)
10-May-21	14:45	98.6	South East fence line	Driving Casing (marsh)
10-May-21	14:45	78.9	South west fence line	Driving Casing (marsh)
10-May-21	14:45	62.4	West fence line	Driving Casing (marsh)
03-Jun-21	19:45	80.5	Core Logging Trailer Door	Air Hammering
03-Jun-21	19:45	80	Lab Trailer Door	Air Hammering
03-Jun-21	19:45	78.3	NWMO Trailer Door	Air Hammering
03-Jun-21	19:45	78.3	Office Trailer Door	Air Hammering
03-Jun-21	19:45	81	At drill rig	Air Hammering
03-Jun-21	19:45	79.6	East fence line	Air Hammering
03-Jun-21	19:45	78.6	West fence line	Air Hammering
03-Jun-21	19:45	79.2	South East fence line	Air Hammering
01-Jun-21	14:00	80.2	Core Logging Trailer Door	Coring
01-Jun-21	14:00	86	At drill rig	Coring
01-Jun-21	14:00	82	At drill rig	Coring
01-Jun-21	14:00	70.6	East fence line	Coring
01-Jun-21	14:00	75.6	South East fence line	Coring
01-Jun-21	14:00	68	South west fence line	Coring
01-Jun-21	14:00	62.5	West fence line	Coring
16-Jun-21	0:00	82	Core Logging Trailer Door	Coring
16-Jun-21	0:00	92	At drill rig	Coring

16-Jun-21	0:00	90	At drill rig	Coring
16-Jun-21	4:00	82	Core Logging Trailer Door	Coring
16-Jun-21	4:00	90	At drill rig	Coring
16-Jun-21	4:00	85	At drill rig	Coring
16-Jun-21	4:00	94	At drill rig	Coring
16-Jun-21	4:00	88	At drill rig	Coring
21-Jun-21	23:00	81	Core Logging Trailer Door	Coring
21-Jun-21	23:00	74	East fence line	Coring
21-Jun-21	23:00	80	South East fence line	Coring
21-Jun-21	23:00	71	South west fence line	Coring
21-Jun-21	23:00	66	West fence line	Coring
21-Jun-21	23:00	86	At drill rig	Coring
30-Jun-21	22:45	80.8	Core Logging Trailer Door	Coring
30-Jun-21	22:45	85.9	At drill rig	Coring
30-Jun-21	22:45	73.2	East fence line	Coring
30-Jun-21	22:45	82.2	South East fence line (behind rig)	Coring
30-Jun-21	22:45	71.5	West side (parking area)	Coring
08-Jul-21	13:20	96.1	At drill rig	Air Hammering
08-Jul-21	13:20	92.5	Core Logging Trailer Door	Air Hammering
08-Jul-21	13:20	83.5	Lab Trailer Door	Air Hammering
08-Jul-21	13:20	76.5	East fence line	Air Hammering
08-Jul-21	13:20	89.6	South East fence line (behind rig)	Air Hammering
08-Jul-21	13:20	73.6	West fence line	Air Hammering
09-Jul-21	9:03	91.4	Core Logging Trailer Door	Air Hammering
09-Jul-21	9:03	81.8	Lab Trailer Door	Air Hammering
09-Jul-21	9:03	75.6	East fence line	Air Hammering
09-Jul-21	9:03	80.6	South East fence line (behind rig)	Air Hammering
09-Jul-21	9:03	73.6	West fence line	Air Hammering
09-Jul-21	9:03	94.2	At drill rig	Air Hammering

Location	**Average Noise Level Reading (dB)**		
	Background	**All Drilling Activities**	**Coring**
Core Logging Trailer Door	50	82	81
East fence line	45	76	73
South East fence line	40	81	78
South west fence line	48	71	70
West fence line	45	67	64
At drill rig		88	88

NUCLEAR WASTE MANAGEMENT ORGANIZATION | SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

NWMO-FORM-AD-0004 R001

Document Transmittal for Records
QA/Classified

File Information: DTR for QA Records: File: 081 21 P
Originator retains copy until acknowledgement received.
Records retains for retention of QA Record.
NON QA: Do not file.

To **NWMO Records** Date: 2022-11-30

Submitted By: Martin Sykes

SECTION A: COMPLETE FOR EACH DOCUMENT OR COLLECTION OF DOCUMENTS

The following documents are being transmitted for the following purpose:

☐	Approval	☒	Revise, Issue and File	☐	As requested
☐	Acceptance	☐	QA Record	☐	File

File Information:

Property #	APM	Retention: P	CSI: 01332	Doc.Type/Subtype: REP
Area:		Aboriginal: No	Community: South Bruce, ON	

List of attached QA documents :

Doc. Number	No. of Pages (QA only)	Rev	Title	Security Classification
APM-REP-01332-0316	90	R000	Phase 2 Initial Borehole Drilling and Testing – South Bruce. WP02: Data Report for Borehole Drilling and Coring at SB_BH01	Internal

Section B: QA ACKNOWLEDGEMENT

Receipt Acknowledgement to be returned to the NWMO submitter within 15 working days of receipt of records into secure storage. NWMO Submitter to contact Records Clerk if acknowledgement not received within 15 days.

Document Custodian Name	Extension	Date

Associated with Records Management NWMO-PROC-AD-0002.