

IODP EXP 358 Daily Geomechanics Report

Report #024 20181203 Final 5048.5

RTG Team

RTG Supervisor(s)	David Castillo / Thomas Finkbeiner / Demian Saffer
RTG Watch Lead (00:00-12:00)	Kan Aoike
RTG Watch Lead (12:00-24:00)	Adam Wspanialy

Well Status (as of 06:00 Dec.4 2018)

Site Name:	C0002	Hole Name:	Q
Water Depth:	1,939.0 m	RT-MSL:	28.5 m
Current Depth:	5048.5 mBRT (5046.5) mTVD	Section TD:	5,667.5 mBRT (5,665.5) mTVD
Section #:	1	CSG Depth / Size:	(4855.0) mBRT 11-3/4 "
Static MW:	1.37 sg	Current ECD:	1.43 sg
FIT/LOT/XLOT:	FIT maximum pressure = 1.45 sg, Possible "LOP" = 1.43 sg @4855 mBRT		
Current formation/ lithology:	Shale		
Sensor Offsets from the Bit:	PDC Bit: 0 m arcVISION 675: (APWD: 3.59 m, Resistivity: 4.30 m, GR: 4.35 m) TeleScope 675: (IWOB: 8.47 m, Direction + Inclination: 11.84 m)		
Other BHA Offsets from the Bit	8-1/4" Stabiliser: 17.463~19.051 m 8-1/2" x 12-1/4" Z-reamer: 28.475~29.823 m 11 x 6-3/4" Drill Collar: 30.629~133.833 m Jar: 190.654~200.229 m		
Current Operations:	Continued reaming down with 8-1/2" x 12-1/4" BHA with Z-reamer opened. Experienced a few high torques but no stall. Slow and steady progress with ROPs 2 to 4 m/hr. Took surveys at 4994.5 and 5032.5 mBRT (TeleScope depth) and obtained inclinations of 4.33° and 4.82° respectively. Bit depth at 5048.5 mBRT as of 06:00 Dec.4.		

2Geomechanics Alert

GREEN	<p>Green = Projected model remains accurate White = Unanticipated deviation from model which <i>should not</i> affect drilling Yellow = Unanticipated deviation from model which <i>may</i> affect drilling Red = Imminent requirement to stop drilling</p>
Basis for Alert Level + Recommendations	No issue with 1.37 sg MW for Section 1

Principal Findings

N/A

Observations Summary

Use this space to discuss any observations while drilling, running casing etc.

Fracture Gradient	N/A
Pore Pressure	Total gas < 1%.
Wellbore Breakout	N/A
Tensile Failure	N/A
Drilling Parameters	Steady ECD of 1.42~1.43 sg with slight short cycle fluctuation. DTOR 1.5~2.5 kNm while STOR 15~34 kNm. DWOB 20~70 kN while SWOB 100~145 kN. 600gpm and 110-150 rpm.

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Other

No seepage losses have been observed in last 24hrs.

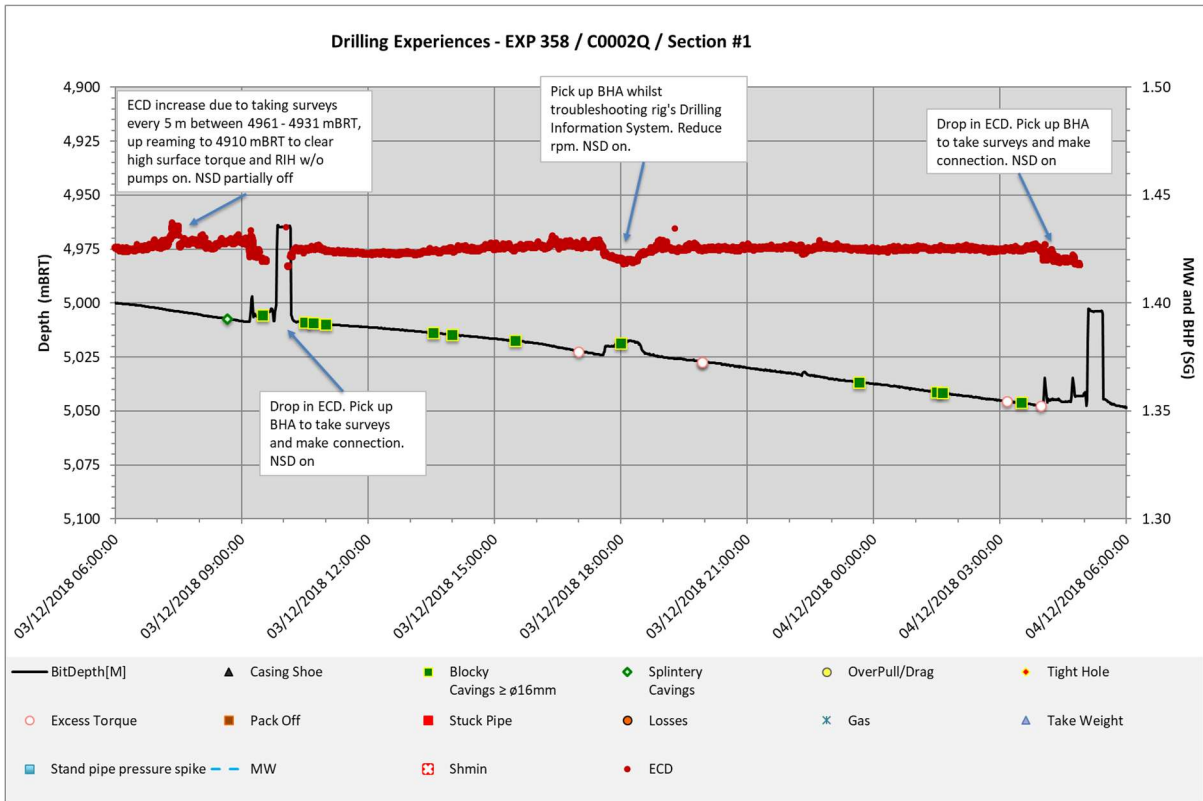


Figure 1. Drilling experiences in Section 1 of the C0002Q well between 3rd Dec 2018 06:00 and 4th Dec 2018 06:00.

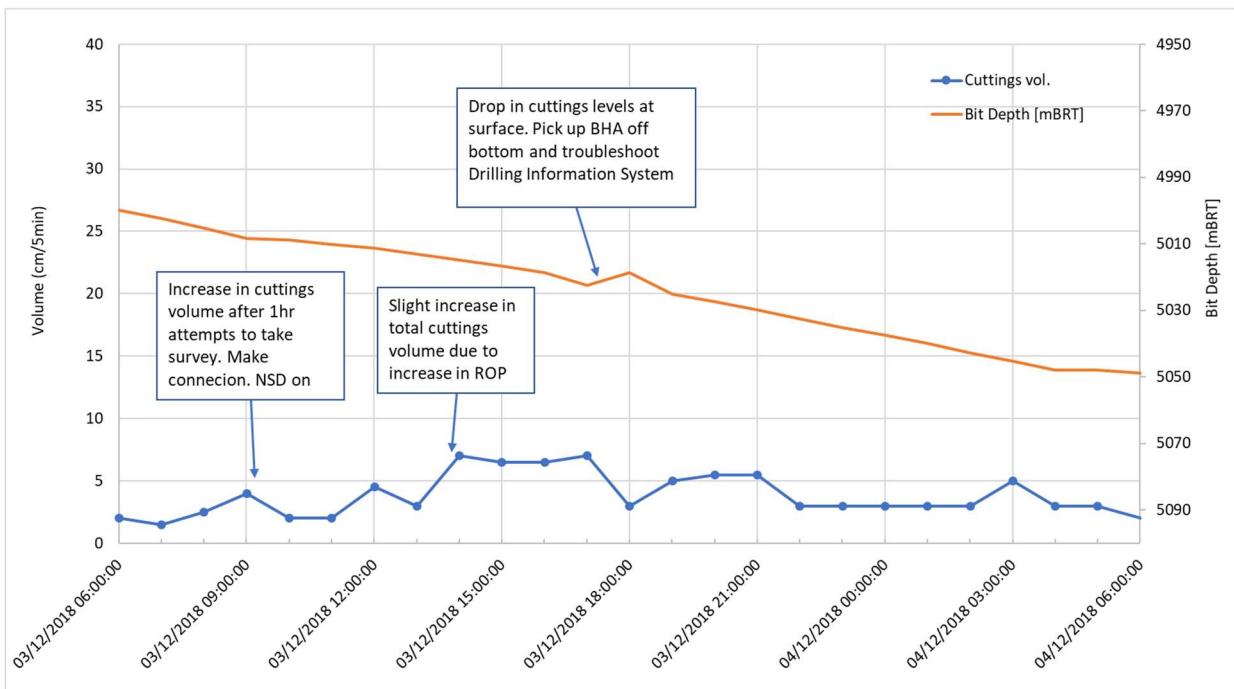


Figure 2. Cuttings/Cavings vs time and drill bit position between 3rd Dec 2018 06:00 and 4th Dec 2018 06:00.

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Analyses

Drilling Experience Analysis

Figure 1. shows under reaming and drilling operations during last 24 hrs. At 07:28 Dec 3rd, increase in ECD up to 1.436 SG EMW was observed which is likely related to prolonged period of taking surveys every 5 m from 4961 mBRT to 4931 mBRT and high torque events whilst rotating at 60 rpm for surveys. Decision was made to ream up to 4910m BRT to clear high torque. No excessive drag was observed on the way up to 4910 mBRT. Observed excess drag whilst RIH w/o pumps on to 4995m BRT. Start pumps from 4995 mBRT to prevent bit nozzles from plugging. There were three ECD drop events that relate to picking the BHA off bottom to take surveys around 9:30 on Dec 3rd and 04:30 on Dec 4th, and for troubleshooting rig's Drilling Information System at 17:40 on Dec 3rd. Generally, the ECD data is steady between 1.42 and 1.43 SG EMW and responds well to changes in the borehole applied by pipe movement and drilling mud flow rate. Short lived increase in ROP was observed between 16:10 to 17:36 on Dec 3rd accompanied with high rotation speed at 150 rpm.

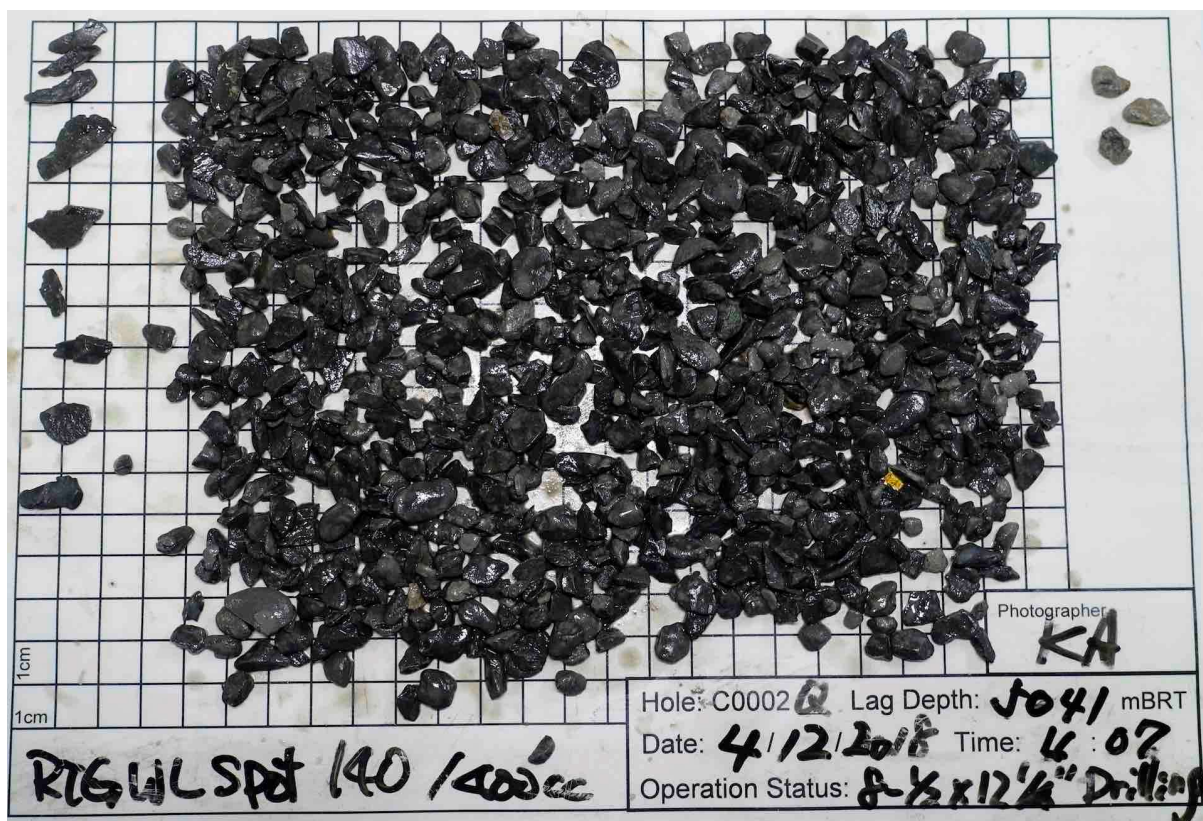
Cuttings Analysis

Variations of cuttings volume with time are plotted in Fig.2. The blue dots show cuttings accumulation amounts (cm / 5 min) generally every 30 minutes. The orange line shows the bit depth in mBRT. Slight increment is recognisable from between 11:00 and 14:00 on Dec.3rd, related to starting rotation after making connection at 9:10 Dec 3rd. During connection NSD was on. Cuttings volume dipped again around 18:00 as the BHA was picked up off bottom for rig's Drilling Information System failure. The NSD was on but HPS rpm was reduced to 40 c/min. Once the system became operational drilling continued with slightly decreased volumes. Cuttings < ø4mm consist of soft clay aggregates and hard shale chips. The ratio between aggregates and hard chips is roughly equal.

Cavings Analysis

Amounts of cuttings/cavings >ø4mm per unit volume of all solids varied 10~45 % in the last 24 hours (06:00 Dec.3 ~ 06:00 Dec.4). Within the solids >ø4mm, populations of cuttings/cavings with sharp edges and those with rounded edges varied with time. Grains < ø1cm made up 90~100 % of cuttings/cavings >ø 4mm. Cement fragments were rare in general, however, increase of cement fragments ~10 % was observed in some intervals. Some of the observed cuttings show scratches on their surface or splintery shapes. These are most likely mechanically derived from either bit/under reamer impact during under reaming operations or other parts of rotating BHA. Platy or tabular cavings, ~ø2.5 cm in size are also found (~10% in residues). These are likely related to be peeled off from the foliated formation bedding.

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Residues of a 400-cc cuttings sample after washing with 4-mm mesh sieve. Light grey grains are soft clayey cuttings aggregates, which remained after sieving (right side). A few splintery cavings (on upper left side) are visible but they are likely to be a product of mechanical action of the BHA rather than pore pressure increase.



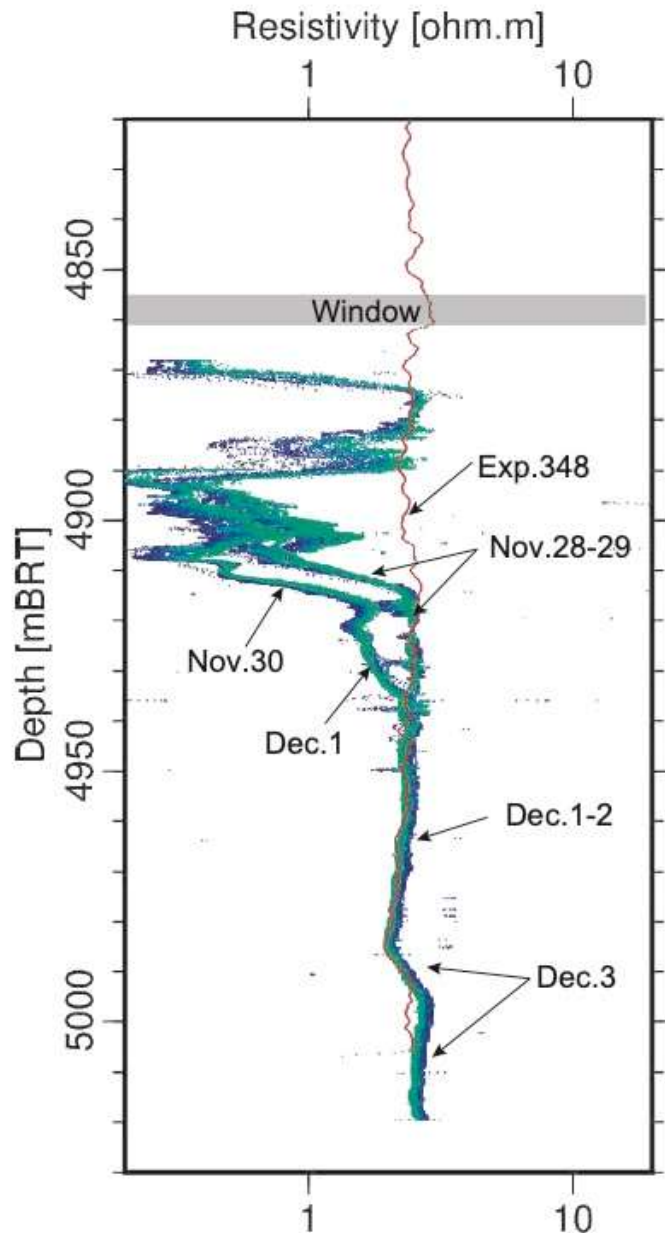
Residues of the same 400-cc cuttings sample as above after washing with 4-mm (left) and 125 µm (right) mesh sieves. Light grey grains are fragmented soft clayey cuttings, comprising approximately 60% of finer grains.

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LWD Data Analysis (updated from DGEM #022)

The figure below is showing LWD resistivity comparisons between (arcVISION) collected from 28th Nov to Dec 4th in this hole (green to blue dots, representing shallow to deep resistivities) and that resistivity collected in 2013 during Exp.348 (red line) (after Yabe, Logging Scientist). Resistivities between 4875~4880 mBRT and below 4915 mBRT in the current expedition indicate similar resistivities as observed during Exp.348, which may imply reasonably good hole conditions in C2Q, at least on the 29th of November 2018. In contrast, the resistivities between 4910 and 4890 mBRT indicate low values and appears to have become less resistive on Nov 30th compared to the Nov 28th-29th. This significant reduction in resistivity suggests that hole enlargement has occurred over this 3-day period. During underreaming operations on Dec 1st, a less significant decrease in resistivities and also less separation among shallow to deep resistivities over the interval between 4915~4935 mBRT. Below 4935 mBRT, the LWD resistivity data is markedly identical with the Exp 348 data, suggesting (at least on Dec 1st) that little to no hole enlargement has occurred.



SFIB Analysis

N/A

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Geomechanical Model Review (a review of the FIT results)

Potentially no changes to the pre-drill geomechanical model because FIT (Formation Integrity Test) does not directly contribute sufficient information for constraining or refining subsurface earth stresses. By design, FIT is intended to determine whether the planned mud weight can be supported by the formation.

The planned mud weight of 1.37 sg with an operational safety upper margin of +0.06 sg (surge pressure), required a formation pressure integrity up to 1.43 sg. The FIT in the C0002Q rat-hole achieved that objective. It is possible that a leak-off pressure of 1.43 sg may have occurred, but a maximum pressure of 1.45 sg was achieved before the pumps were shut-in. If a leak-off pressure of 1.43 sg did occur, this implies a leak-off-test (LOT) had occurred (no longer a FIT). A leak-off-pressure of 1.43 sg may be interpreted as a possible approximation of S3 or Shmin stress magnitudes.

This interpretation would require a pass of the LWD image log across the rat-hole section to identify whether a new tensile was created, or drilling fluids leaked into a pre-existing bedding plane or natural fracture. The former would have direct implications of S3, while the latter would require further information such as bedding plane orientation.

However, since no LWD data acquisition is planned for the rat hole section, we will have no chance to confirm which case occurred. Therefore, we continue to call this test a FIT.

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