

IODP EXP 358 Daily Geomechanics Report

Report #025 20181204 Final 5114.5

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:	5114.5 mBRT (5112.5) 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:	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 6 x 8-1/2" Drill Collar + Jar: 163.309~227.254 m 12 x 5.68" HWDP: 227.839~339.338 m Top of BHA: 340.338 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 5 m/hr. Took surveys at 5060.9, 5065.2 and 5080.3 mBRT (TeleScope depth) and obtained inclinations of 5.00°, 4.99° and 5.09° respectively. Bit depth at 5114.5 mBRT as of 06:00 Dec.5.		

Geomechanics 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 17~34 kNm. DWOB 20~80 kN while SWOB 95~140 kN. 600gpm and 150-160 rpm. Ave.ROP 3.4 m/h (2~5 m/h).

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<p>Other</p>	<p>No seepage losses have been observed in last 24hrs.</p> <p>MW was changed from 1.37 sg to 1.36 sg for about 3.5 hours between 16:30 and 20:00. However, no obvious drop in ECD suspected of being linked to this MW change was observed.</p>
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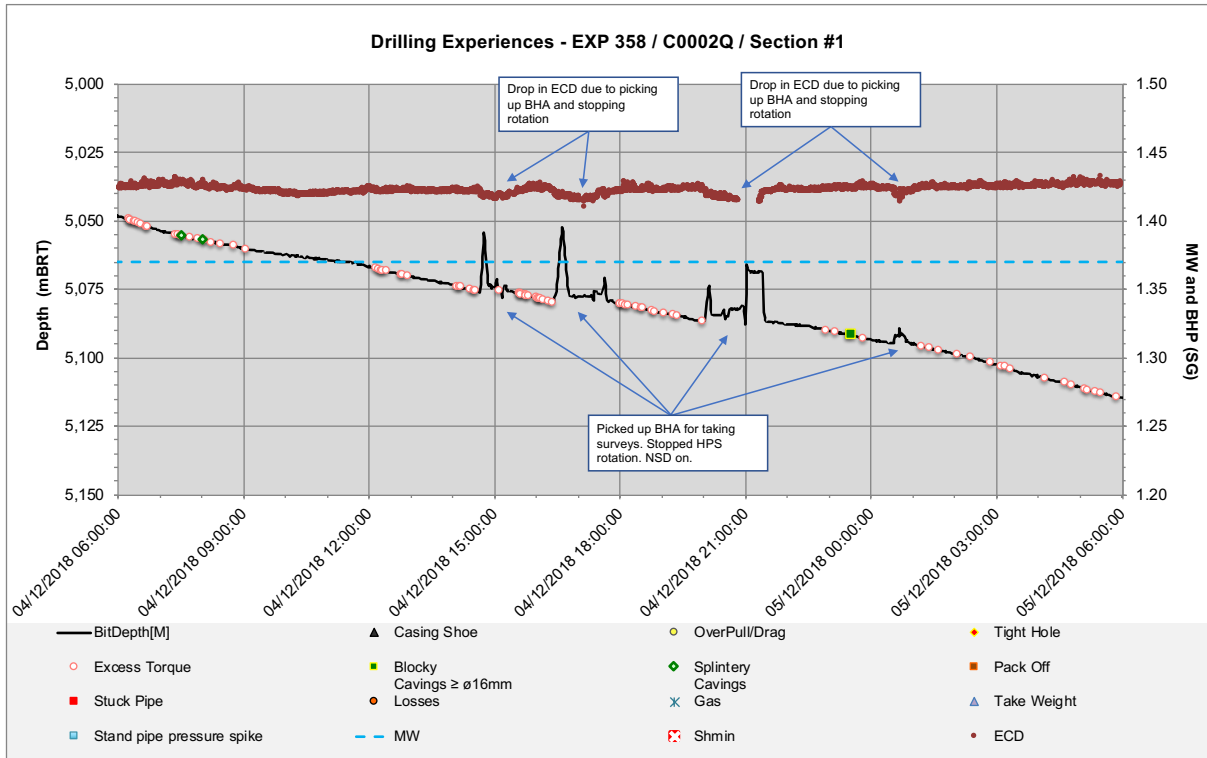


Figure 1. Drilling experiences in Section 1 of the C0002Q well between 4th Dec 2018 06:00 and 5th Dec 2018 06:00.

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Analyses

Drilling Experience Analysis

Figure 1. shows the time series variations of the bit depth and ECD while the drilling and underreaming operations with the 8-1/2" x 12-1/4" LWD BHA during last 24 hrs. There were four ECD drop events that relate to picking the BHA off bottom to take surveys around 15:00, 17:00, 21:00 on Dec 4th and 00:40 on Dec 5th. 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. At around 19:00 on Dec. 4th, the last 8-1/2" Drill Collar passed through the window, however, no obvious change in ROP was observed.

Cuttings Analysis

No updated data of cuttings volume measurement has provided from Geoservices as of this report. Cuttings < ϕ 4mm consist of soft clay aggregates and hard shale chips. The ratio between aggregates and hard chips is roughly equal to 60~70% for the former component.

Cavings Analysis

The amount of cuttings/cavings > ϕ 4mm per unit volume of all solids varied 10~50 % in the last 24 hours (06:00 Dec.4 ~ 06:00 Dec.5). For solids > ϕ 4mm, populations of cuttings/cavings with rounded edges increased with time and became to dominate 80~90% of the > ϕ 4mm grains in the latter half of the last 24 hours. Grains < ϕ 1cm made up 90~100 % of cuttings/cavings > ϕ 4mm. Many of them show rounded and flattened shapes. Cement fragments were rare in general; however, increase of cement fragments ~5 % 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, ~ ϕ 2.5 cm in size are also found (~1~3% in residues), likely formed by being chipped-off from the foliated formation bedding.



Residues of a 400-cc cuttings/cavings sample after washing with 4-mm mesh sieve. Brownish light grey grains are cement fragments (right side). Rounded tubular ~ blocky cuttings/cavings \leq ϕ 1cm comprise approximately 80%. 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.

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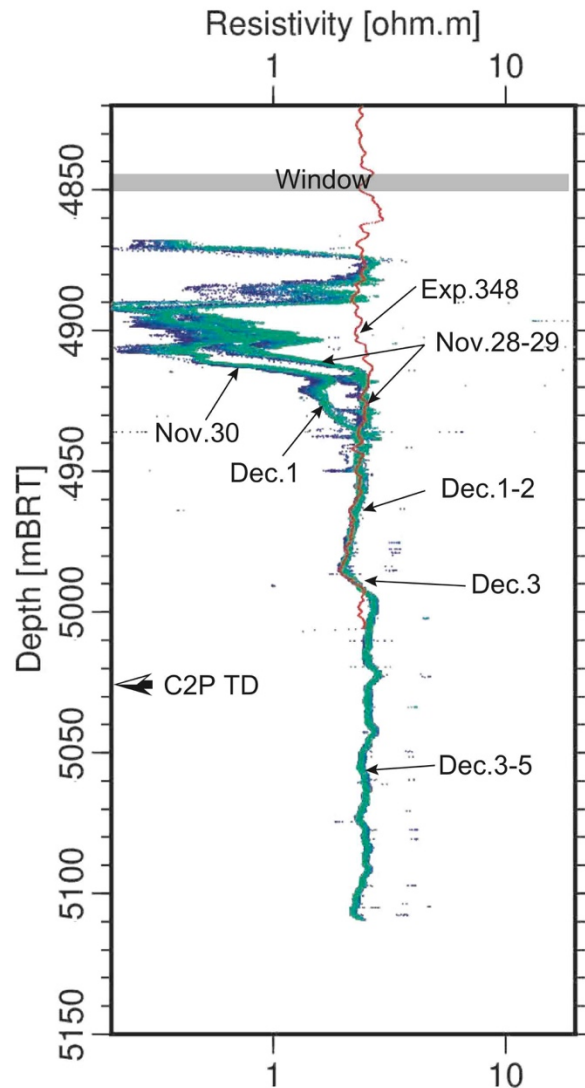
Residues of the same 400-cc cuttings sample as above after washing with 4-mm (left) and 125 µm (right) mesh sieves. Light grey grains are fragmented soft clayey cuttings, comprising approximately 70% of finer grains.

LWD Data Analysis (updated from DGEM #023)

The figure below is showing LWD resistivity comparisons between (arcVISION) collected from 28th Nov to Dec 5th 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 and keeps the same trend even below the TD of C2Q (5026 mBRT), suggesting (at least on Dec 1st) that little to no hole enlargement has occurred.

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SFIB Analysis

N/A

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 S_3 or Sh_{min} 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 S_3 , while the latter would require further information such as bedding plane orientation.

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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.

