

IODP EXP 358 Daily Geomechanics Report

Report #027 20181206 Final 5208

RTG Team

RTG Supervisor(s)	David Castillo / Thomas Finkbeiner / Demian Saffer
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RTG Watch Lead (12:00-24:00)	Emily Wisbey

Well Status (as of 06:00 Dec.7 2018)

Site Name:	C0002	Hole Name:	Q
Water Depth:	1,939.0 m	RT-MSL:	28.5 m
Current Depth:	5208.0 mBRT (5206.0) 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:	1.41 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 drilling and reaming down with 8-1/2" x 12-1/4" BHA with Z-reamer opened from 5,160mBRT to 5,197mBRT. Drilling continued with slower progress at 2 to 3 m/hr. Occasional unstable surface RPM associated with high torques though frequency is decreasing. No TDS stalls. Notable drilling break experienced at 5177~5179 mBRT which caused severe shock and vibration on BHA. Surveys 5,148.93m / 5.60° / 57.81° 5,190.781m / 5.31° / 57.61° The bit depth at 0600 on the 7 th Dec 5,208mBRT.		

Geomechanics Alert

GREEN	<p>Green = Projected model remains accurate</p> <p>White = Unanticipated deviation from model which <i>should not</i> affect drilling</p> <p>Yellow = Unanticipated deviation from model which <i>may</i> affect drilling</p> <p>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%.

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Wellbore Breakout	N/A
Tensile Failure	N/A
Drilling Parameters	<p>Steady ECD of 1.41 sg with slight short cycle fluctuations at NSD connections. DTOR 1.3~2.5 kNm while STOR 15~33 kNm. DWOB 10~80 kN while SWOB 70~130 kN. 625gpm and 160 rpm. Average ROP over 24hrs 1.5m/h.</p> <p>Decrease in SWOB, fluctuations in DWOB and increases in ROP were experienced at 5200, 5201~5202, 5203~5204, 5208 mBRT (bit depth).</p>
Other	No seepage losses have been observed in last 24hrs.

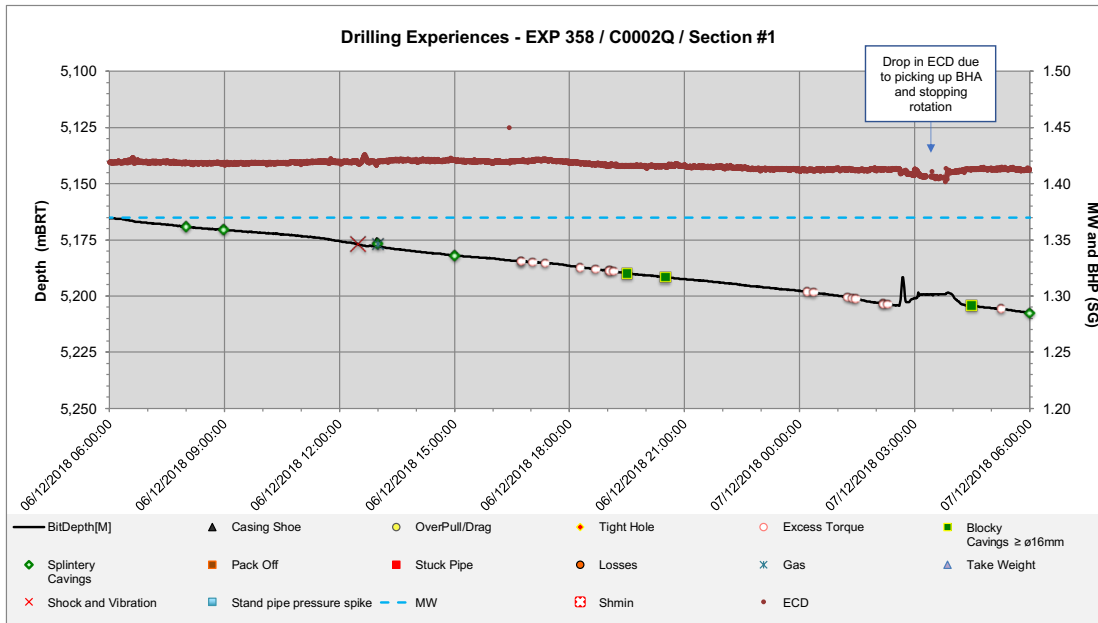


Figure 1 Drilling experiences over last 24hrs

Analysis

Drilling Experience Analysis

Figure 1 shows the time series variations of the bit depth and ECD while the drilling and underreaming with the 8-1/2" x 12-1/4" LWD BHA during last 24 hrs.

There was one ECD decrease due to picking the BHA off bottom for surveys.

ECD remained steady at 1.41sg, flow rate has remained steady at 625gpm.

Experienced notable five drilling break events associated with SWOP drop, DWOP fluctuation, DTOR drop and high ROP at 5177~5179 mBRT (bit depth) at 12:30~13:30,

Severe shock and vibration occurred at 12:30on the 6th December when both surface and downhole weight on bit decreased due to high ROP. A minor increase in gas (0.2% to 0.4%) was observed at bottoms up, with no changes in formation resistivity or GR.

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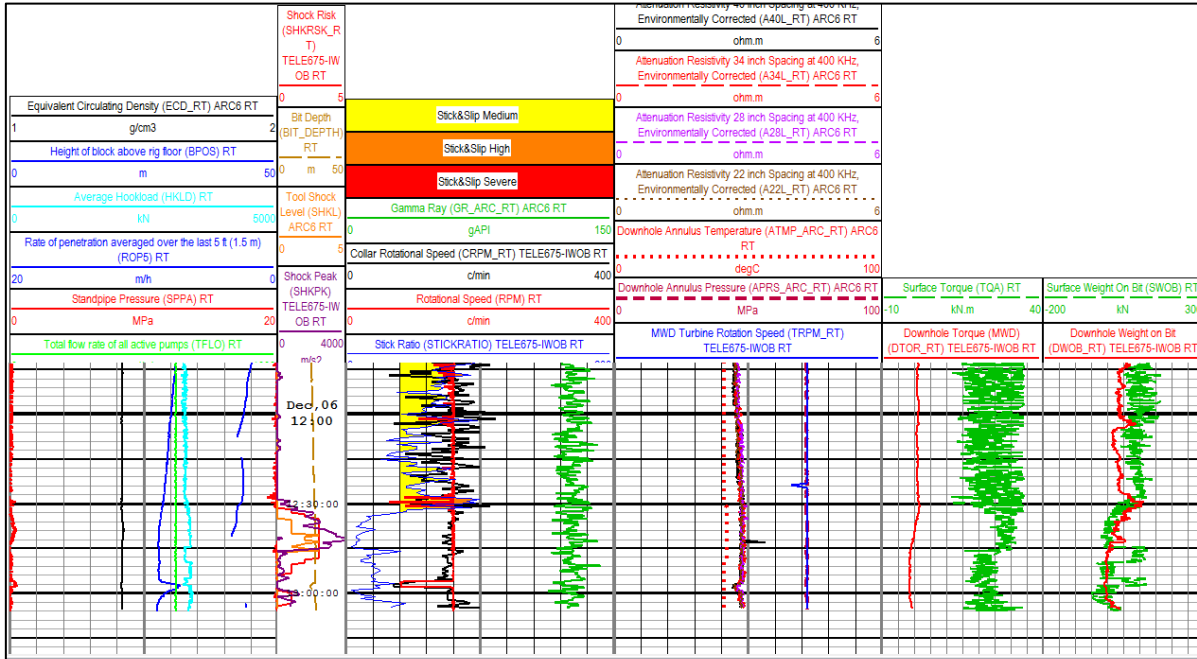


Figure 2 Shock and Vibration experienced at 12:30 December 6th.

Cuttings Analysis

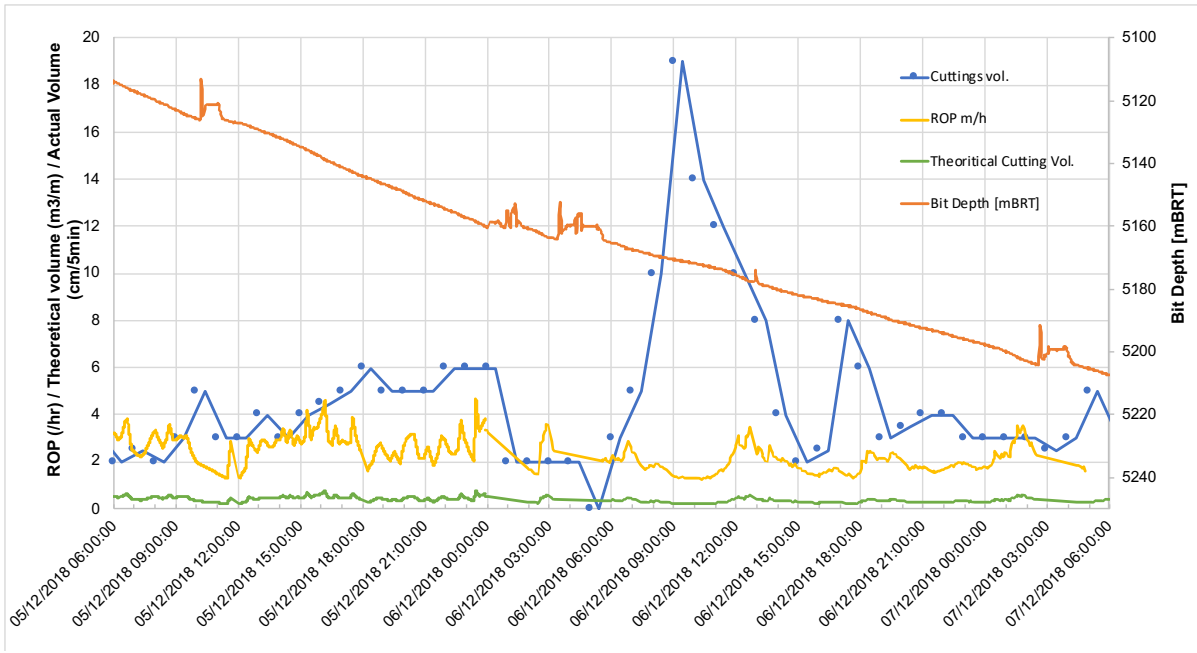


Figure 3 Cuttings volume analysis

Formation lithology remains claystone, with the percentage of sandstone in cuttings reducing to trace. From 09:30 on the 6th of December, the majority of cuttings changed from rounded blocky (reworked) to angular blocky (fresh). There was no change in parameters (flow rate/ rpm / sweeps) which explain this jump in cuttings.

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Cavings Analysis

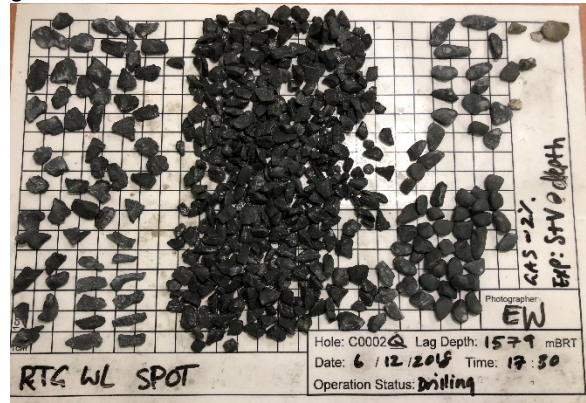
The amount of cuttings/cavings $> \phi 4\text{mm}$ per unit volume of all solids varied from 10~35% until 18:00, where the volume remaining increased to 50% to midnight

The percentage of cuttings/cavings with rounded edges was steady at 60%, reducing to ~10-20% from 09:00 to 18:00, then increasing to 30-50% till midnight.

Grains $< \phi 1\text{cm}$ continued to make up 90~100 %.

Cement fragments made up a small amount of cuttings, but appeared continuously throughout the samples in volumes $< 5\%$.

Platy or tabular cavings, $\sim \phi 1.5\text{ cm}$ in size are also found, likely formed by being chipped- off from the foliated formation bedding. These platy/tabular cavings are both fresh and re-worked.



LWD Data Analysis

The 4x resistivity curves with shallow to deep depths of investigation continue to overlay each other perfectly, indicating there is no mud invasion.

GR and resistivity remain constant, with resistivity increasing very slightly from $\sim 5,145\text{mBRT}$.

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.

