

# IODP EXP 358 Daily Geomechanics Report

Report #028 20181207 Final 5230

## 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)	Emily Wisbey

## Well Status (as of 06:00 Dec.8 2018)

Site Name:	C0002	Hole Name:	Q
Water Depth:	1,939.0 m	RT-MSL:	28.5 m
Current Depth:	5230.0 mBRT (5227.0) mTVD	Section TD:	5,667.5 mBRT (5,664.5) 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 open from 5,197mBRT to run TD at 5,230mBRT. ROP steady at 2 to 3 m/hr. Occasional unstable surface RPM associated with high torques were experienced (no TDS stalls). Frac Seal sweep was circulated prior to POOH to replace the bit. POOH 8-1/2" x 12/1/4" BHA 5,145mBRT with 200-500kN drag. Decision to pump out of hole to 5,047mBRT, POOH to 4,927mBRT. Took MWD surveys to confirm well trajectory; MD (mBRT) / Inclination (°) / Azimuth (°) 4912.5 / 3.48 / 75.20 4907.110 / 3.56 / 75.37 4902.921 / 3.15 / 78.82. Continued POOH 8-1/2" x 12-1/4" BHA to 4,371mBRT at 0600.		

## Geomechanics Alert

<b>GREEN</b>	<p><b>Green</b> = 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

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## Observations Summary

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

<b>Fracture Gradient</b>	N/A
<b>Pore Pressure</b>	Total gas < 1%.
<b>Wellbore Breakout</b>	N/A
<b>Tensile Failure</b>	N/A
<b>Drilling Parameters</b>	Steady ECD of 1.41 sg with slight short cycle fluctuations when picking up off bottom. DTOR 0.0~1.2 kNm while STOR 15~33 kNm. DWOB 12~75 kN while SWOB 60~130 kN. 625gpm and 160 rpm. Average ROP over 24hrs 2.2m/h. Note: Pumps were shut down to flow check prior to POOH BHA on the 7 <sup>th</sup> Decemebr 2018. Lowest EMW seen by formation to 5230mBRT is 1.37sg.
<b>Other</b>	No seepage losses have been observed in last 24hrs.

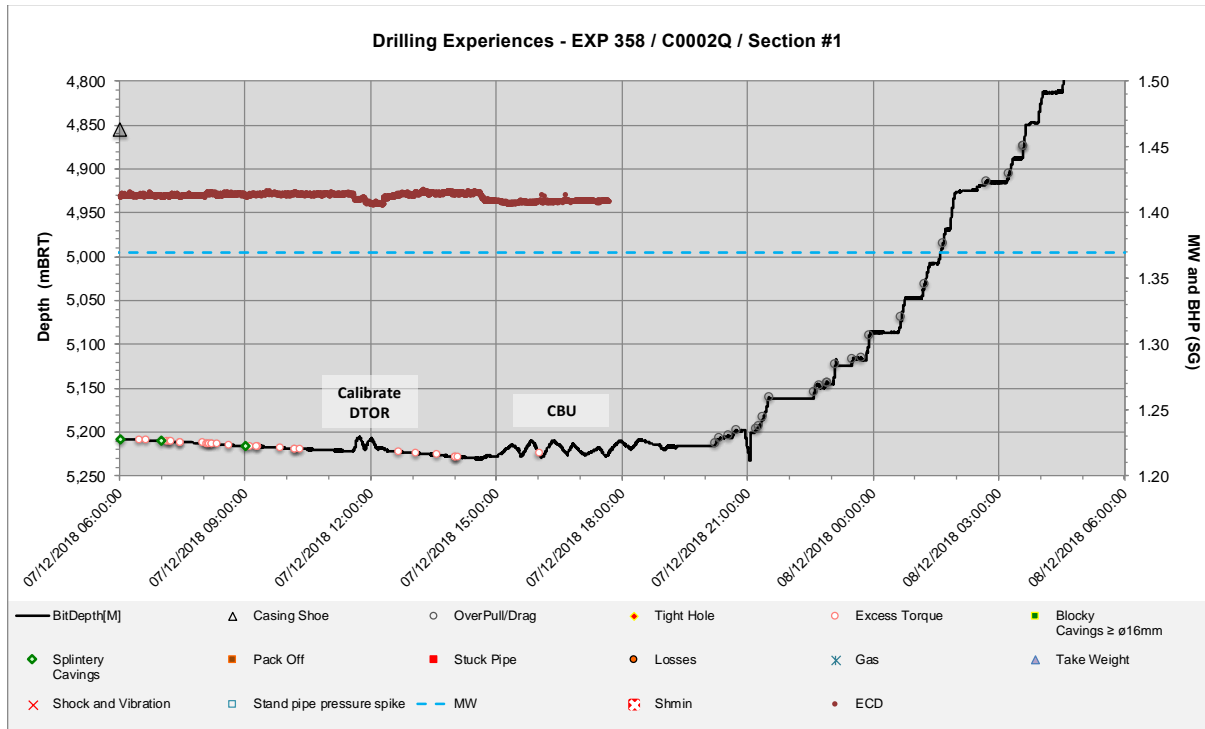


Figure 1 Drilling experiences over last 24hrs

## Analysis

### Drilling Experience Analysis

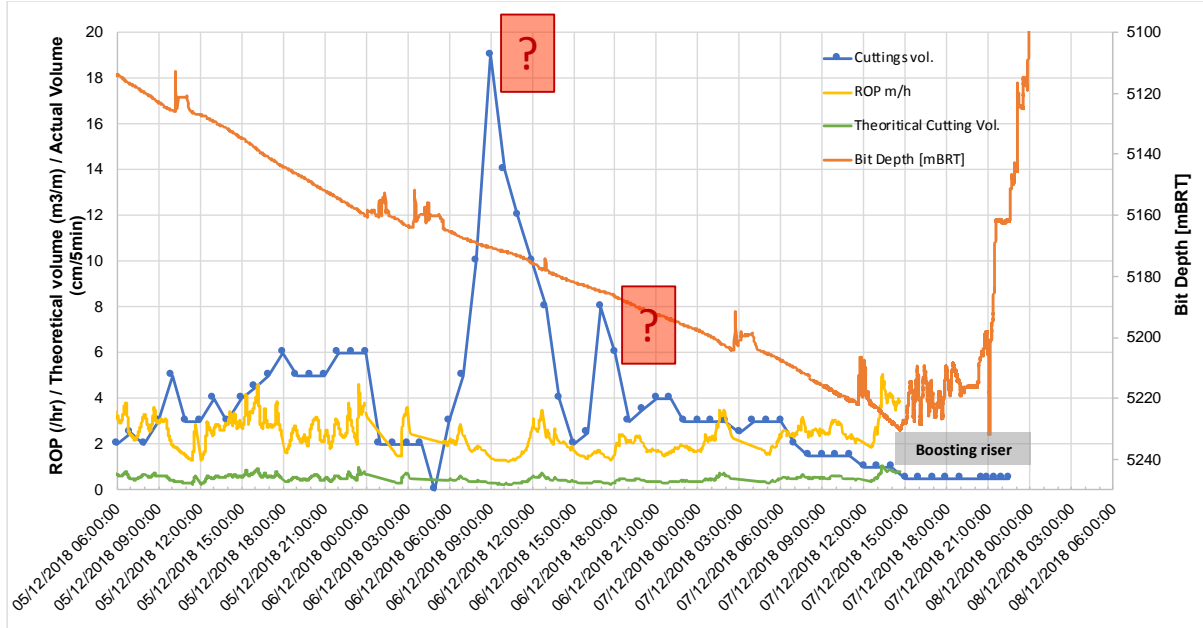
Figure 1 shows the time series variations of the bit depth and ECD while the drilling and underreaming with the 8-1/2" x 12-1/4" LWD BHA during last 24 hrs.

ECD remained steady at 1.41sg, decreasing slightly when off bottom. Flow rate has remained steady at 625gpm.

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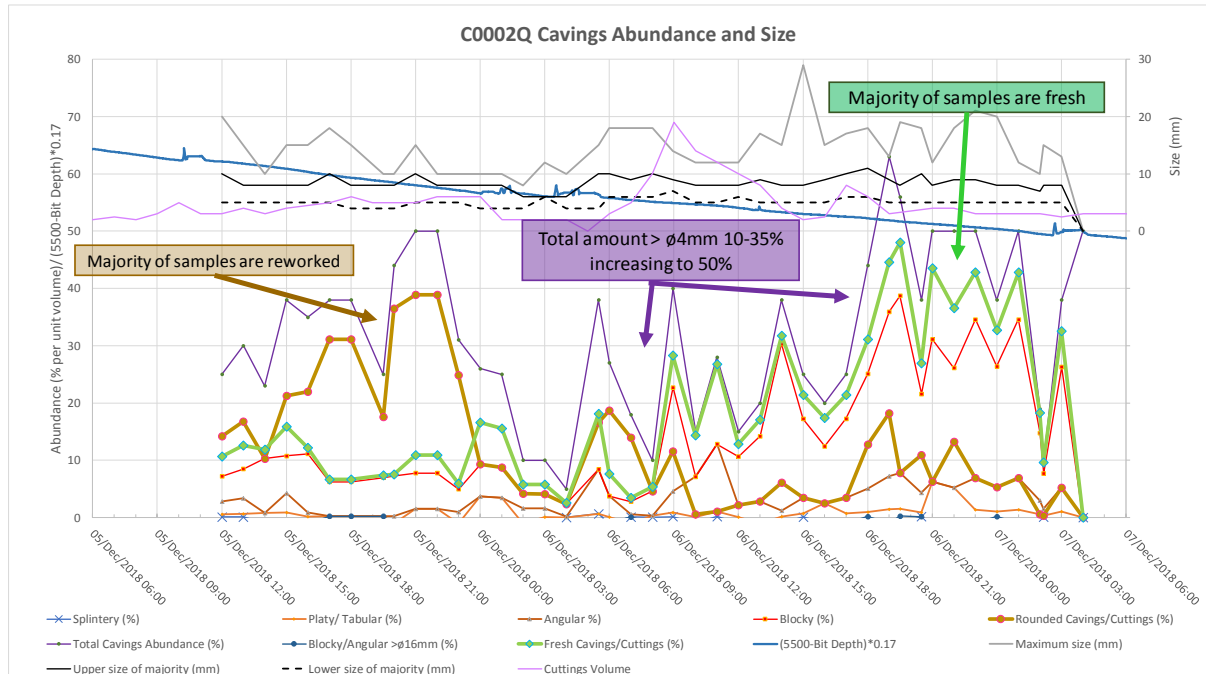
### Cuttings Analysis



**Figure 2 Cuttings volume analysis (Cuttings volume is measured over 5min interval at shakers)**

Formation lithology remains claystone, with trace sandstone. There was no change in parameters (flowrate / rpm / sweeps) which explain the sudden increase in cuttings volume at 0900 on the 6th December. The cuttings volume decreased after drilling indicating the hole has been efficiently cleaned while drilling.

### Cavings Analysis



**Figure 3 Analysis of cuttings/cavings > 4mm (taken from 400cc RTG Samples)**

The amount of cuttings/cavings > 4mm per unit volume of all solids varied from 10–35% until 1800 where it increased consistently to ~50%. The majority of cuttings/cavings were fresh block/angular, with reworked blocky angular consisting of ~5-15%. Grains < 10mm continued to make up 90–100 % of samples.

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## **LWD Data Analysis**

The 4x resistivity curves with shallow to deep depths of investigation continue to overlay each other perfectly, suggesting that mud invasion is unlikely or minimal. No significant change in GR and resistivity.

## **SFIB Analysis**

Anisotropic breakout modeling was performed to determine the position of potential bedding/fracture plane failure for a hole inclination of ~ 5 degrees and a hole azimuth of ~60 degN. A SHmax azimuth of 50 degN was used and a bedding plane orientation similar to what was observed near TD in the C0002P hole. Results indicated that if bedding/fracture plane failure were to occur, the position of the failure would be near the sides of the borehole. This anisotropic breakout position reduces the risk of pipe interactions with the breakouts that could exacerbate additional rock failure and pose a further risk to hole cleaning.

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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.

