IODP EXP 358 Daily Geomechanics Report

Report #091 20190208

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

Site Name:	C0002		**Hole Name:**	S	
Water Depth:	1,939.0	m	**RT-MSL:**	28.5	m
0600h Hole Depth:	4,901.4 (4,899.4)	mBRT (mTVD)	**Section TD:**	6,000.0 (5,998.0)	mBRT (mTVD)
Section #:	1		**CSG Depth/Size:**	4,769~4,775 11-3/4" ESET	mBRT inches
Static MW:	1.35	sg	**Current ECD:**	1.39	sg
FIT/LOT/ XLOT:	N/A *Note: 1.46sg FIT @ 4,757mBRT*				
Current formation/ lithology:	Shale				
Sensor Offsets from the Bit:	Xceed 675 (D+I: 4.159 m) MicroScope 675 (Resistivity: 26.710 m) ARC-6 (APWD: 31.197 m, Resistivity: 31.909 m, GR: 31.960 m) TeleScope 675 (IWOB: 36.072 m, D+I: 39.437 m) SonicScope 675 (Sonic: 49.627 m) seismicVISION 675 (Hydrophone: 55.890 m)				
Other BHA Offsets from the Bit:	8-1/2" PDC Bit (AxeBlade XZ716): 0~0.258 m Xceed675 8-3/8"Stabilizers: 0.258~8.027 m Lower C-Link 675: 8.027~10.971 m 675ERT7850 Motor: 12.797~21.163 m Upper C-Link 675: 21.871~24.413 m MicroScope 675: 24.413~29.572 m ARC-6: 29.572~35.243 m TeleScope 675: 35.243~43.795 m SonicScope 675: 43.795~53.745 m seismicVISION 675: 53.745~58.199 m 6.75" Collars + XOs: 59.112~198.355 m Drilling Jar: 198.355~208.090 m 6.75" Collars + XOs: 208.090~227.546 m				
Current Operations:	Continued kick off drilling to 4901 mBRT. Observed significant low bottom hole pressure and recognized malfunction of motor and C-Link. Decided to POOH.				

Geomechanics Alert

GREEN	Green = Projected model remains accurate White = Unanticipated deviation from model which *should not* affect drilling Yellow = Unanticipated deviation from model which *may* affect drilling Red = Imminent requirement to stop drilling
Basis for Alert Level + Recommendations	**1.35 sg** remains recommended MW for C2S. If we find earth stress gradients increases with depth (and UCS does not increase as quickly), RTG may recommend increasing the MW slightly (e.g., +0.01 SG increments) with Watch Leaders and Supervisors closely monitoring. This process could be repeated based on real-time learnings. Any subsequent increase in MW in C2S would not pose a serious risk of drilling fluid invasion in the shallower sections if FracSeal was applied generously.

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Principal Findings

N/A

Observations Summary

Fracture Gradient	N/A
Pore Pressure	No indication suggesting abnormal pressure has been observed.
Wellbore Breakout	Minor isotropic and/or anisotropic breakouts were identified below 4835 mBRT. Geomechanical analysis is ongoing and will later incorporate the image memory data.
Tensile Failure	N/A
Drilling Parameters	N/A
Other	N/A

Analysis

Drilling Experience Analysis

Prior to encountering the mechanical malfunction in the BHA, drilling progressed smoothly after passing the tight zone at 4801-4805 mBRT.

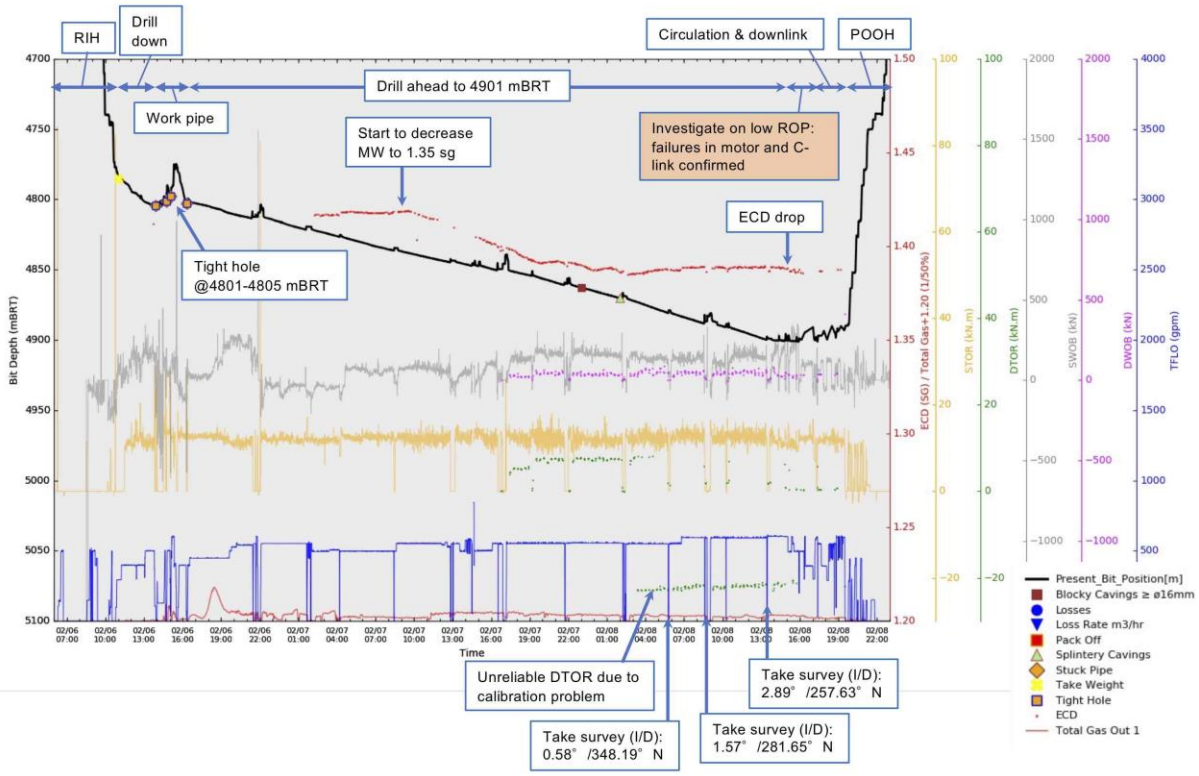

Figure 1 Drilling Experiences over last 63hrs
Note that DTOR and DWOB levels were generally 1/2 of STOR and 1/3 of SWOB, respectively.

Cuttings and Cavings Analysis

Fine cuttings comprised 70~90 % of shaker samples, in general. Rock fragments ≥ ø 4mm were fresh fragments decreased with time, whilst rounded fragments became common below 4852 mBRT in lag time. Assuming the rounded rock fragment were re-worked in the borehole, probably accumulating within the enlarged section near the C2S window, inferred entirely from the extreme low resisitivities in the upper sections of the C2S hole. This enlarged upper portion of the C2S hole will continue to be a potential problem for hole cleaning while drilling C2S. We are expecting good hole conditions as

C2S is deepened in rock formations that has not experienced significant rock fatigue during recent Exp 358 operations.

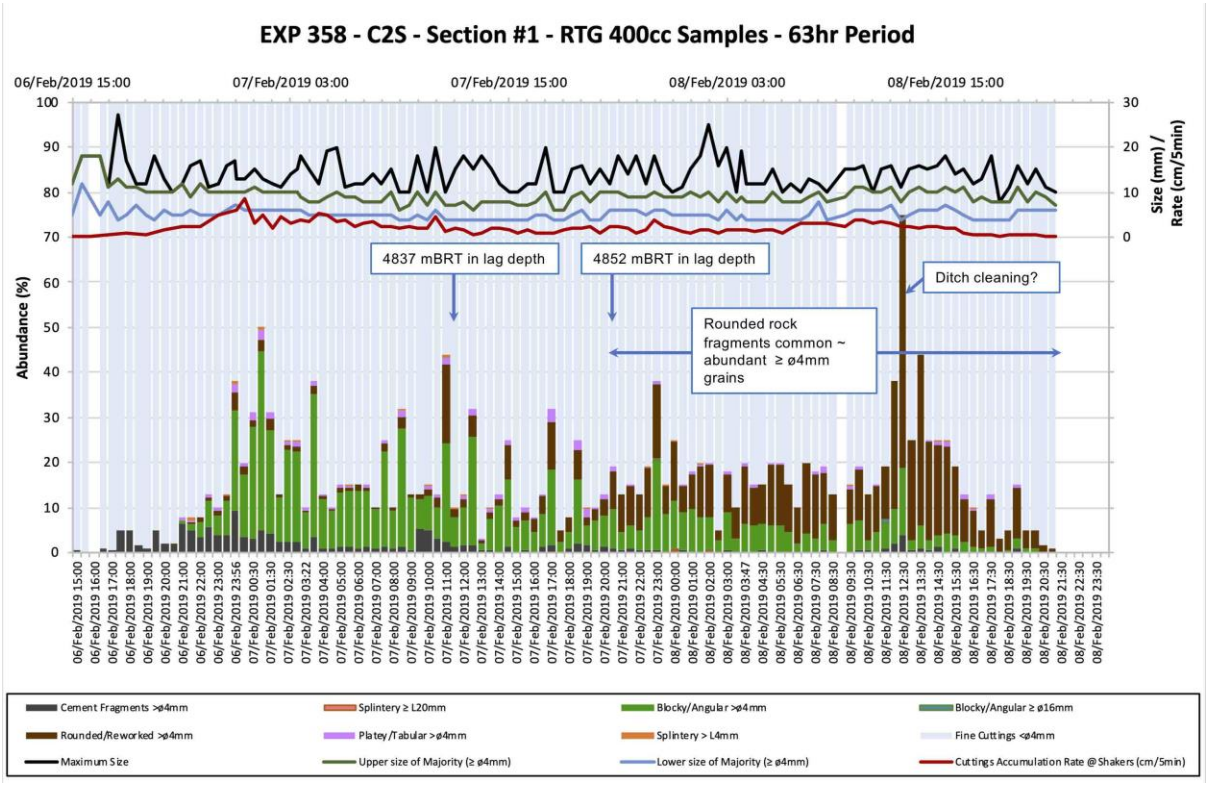

Figure 2 Occurrence of cuttings/cavings > ø 4mm (taken from 400cc RTG Samples) over last 63 hrs. *Not corrected for lag time.*

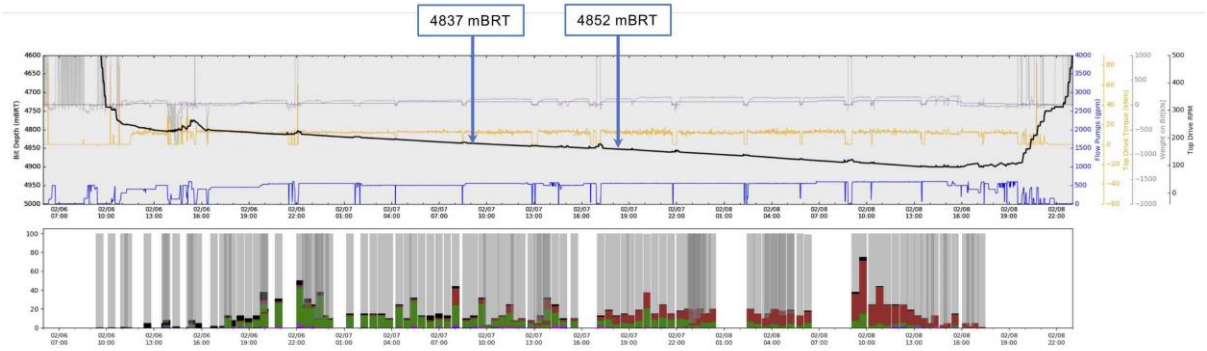

Figure 3 Lag corrected occurrence of cuttings/cavings > ø 4mm (taken from 400cc RTG Samples) over last 63 hrs.

LWD Data Analysis

Down to 4,837 mBRT, the real-time resistivity image data (Figure 4) indicates limited detail in formation structure. The associated low average resistivties down to 4,837 mBRT probably indicates an enlarged borehole. In contrast, below 4,837 mBRT an increase in strutural details are also associated with an increase in resistivities. This increase in resistivity suggest an increase in hole integrity below 4,852 mBRT. Above 4,870 mBRT, there are features in the real-time resistivity image data that appear to be borehole breakouts (isotropic and/or anisotropic breakouts). There are sections of the logged interval that appear to be artifacts related to tool face positions; namely, the image tool is not perfectly centred in the enlarged section. There may possibly be borehole breakouts between 4800 and 4837 mBRT.

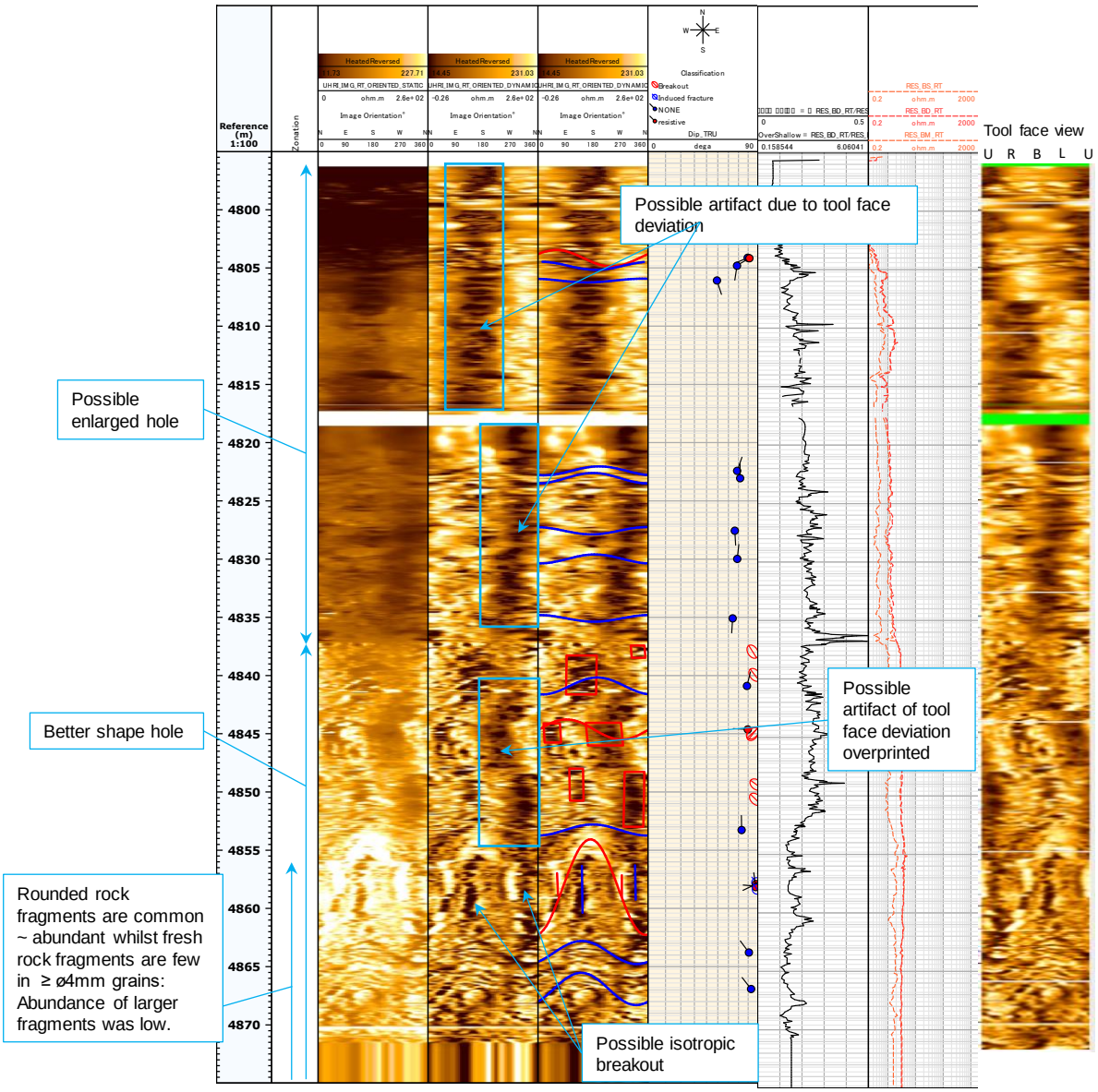

Figure 4 Realtime MicroScope images between 4800 to 4870 mBRT (modified from a figure by Doan, Logging Scientist).

SFIB Analysis

First-Pass SFIB modelling was applied to the interval of 4856-4862 mBRT where steep bedding is recognizable (Fig.5). Assuming 15 MPa as UCS without changing other parameters in our current geomechanical model, the breakouts seen in the interval can be explained as both isotropic and anisotropic breakouts. This first-pass modelling effort will be futher re-examined using image memory image data once it is retrived.

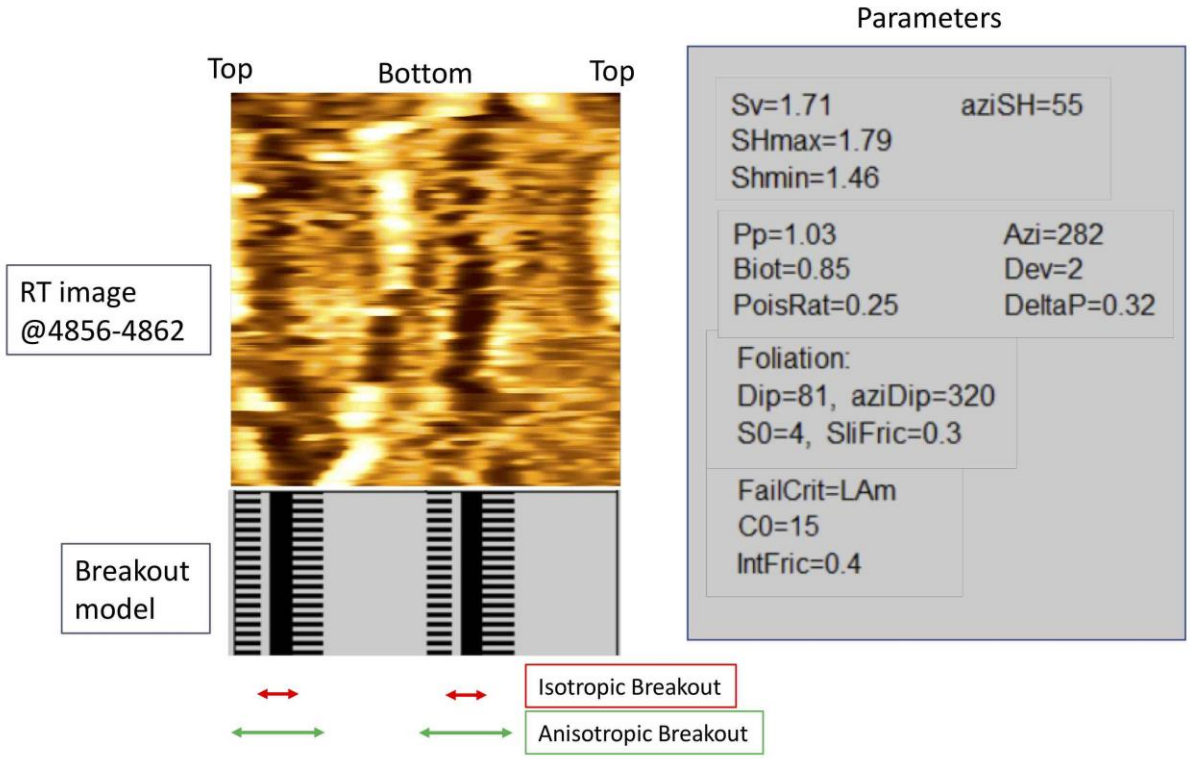

Figure 5 Comparison between MicroScope image and breakout modeling.

Geomechanical Model Review

No change in the current stress model. MW has been reduced to 1.35 sg.

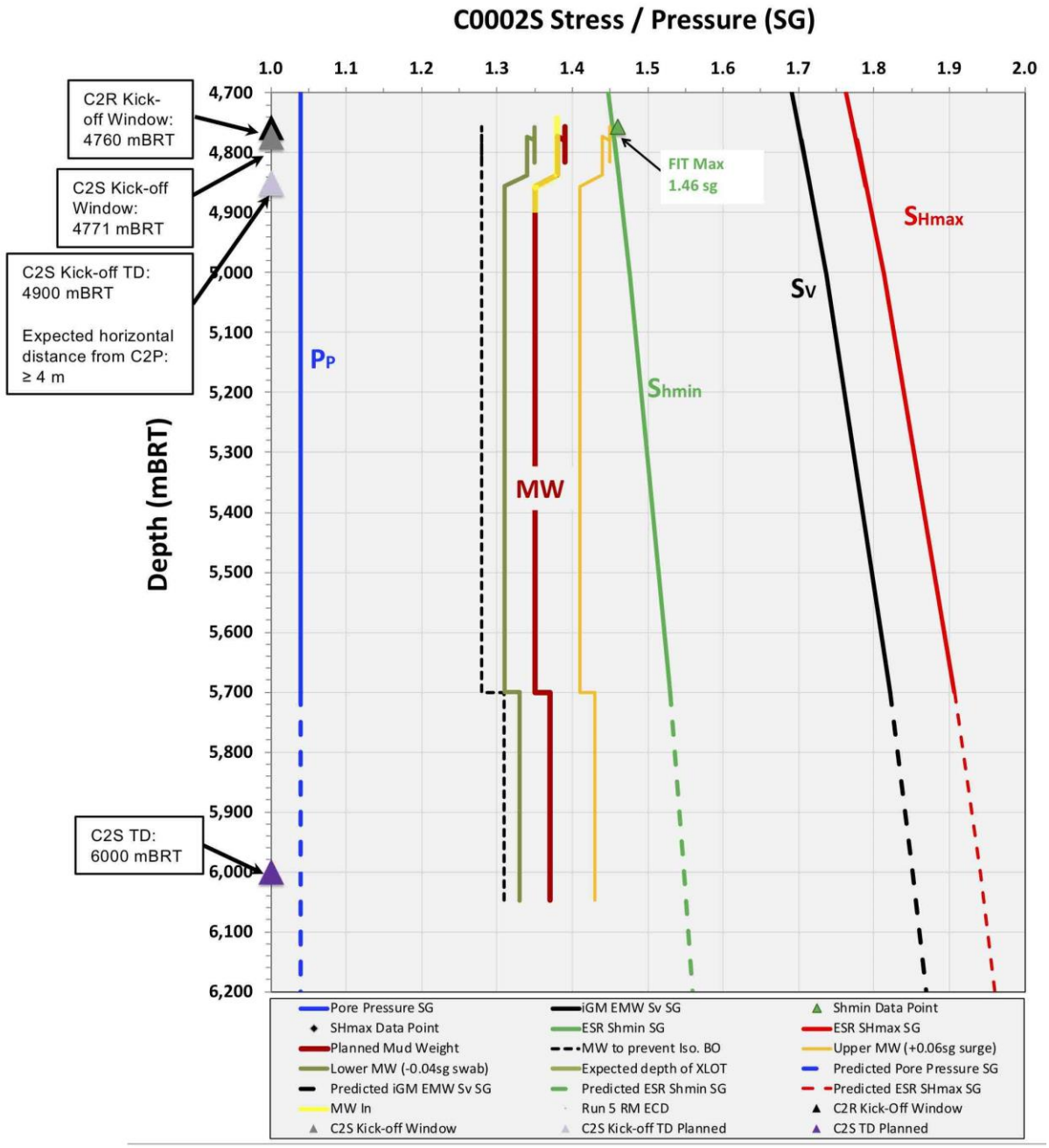

Figure 6 Current stress model for C2S