Optimum Well Trajectory Design In A Planned Well In Blacktip Field, Australia: A case study

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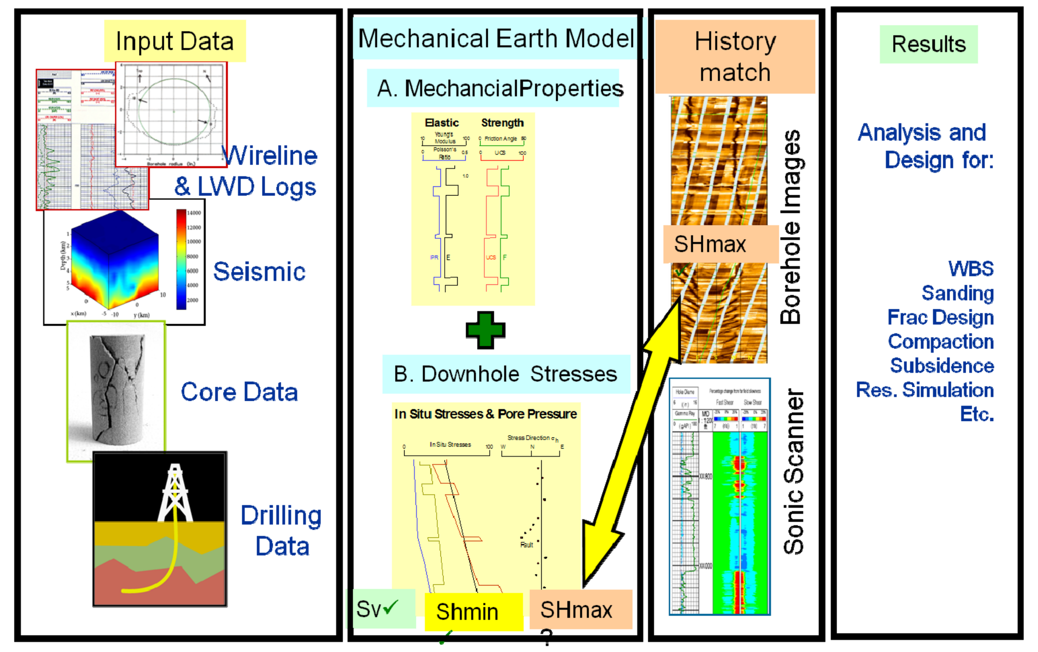
1. Objectives

A geomechanics study carried out in the Blacktip field, offshore Australia led to optimum wellbore deviation and azimuth to minimise drilling-associated instability problems near a major fault in the field.

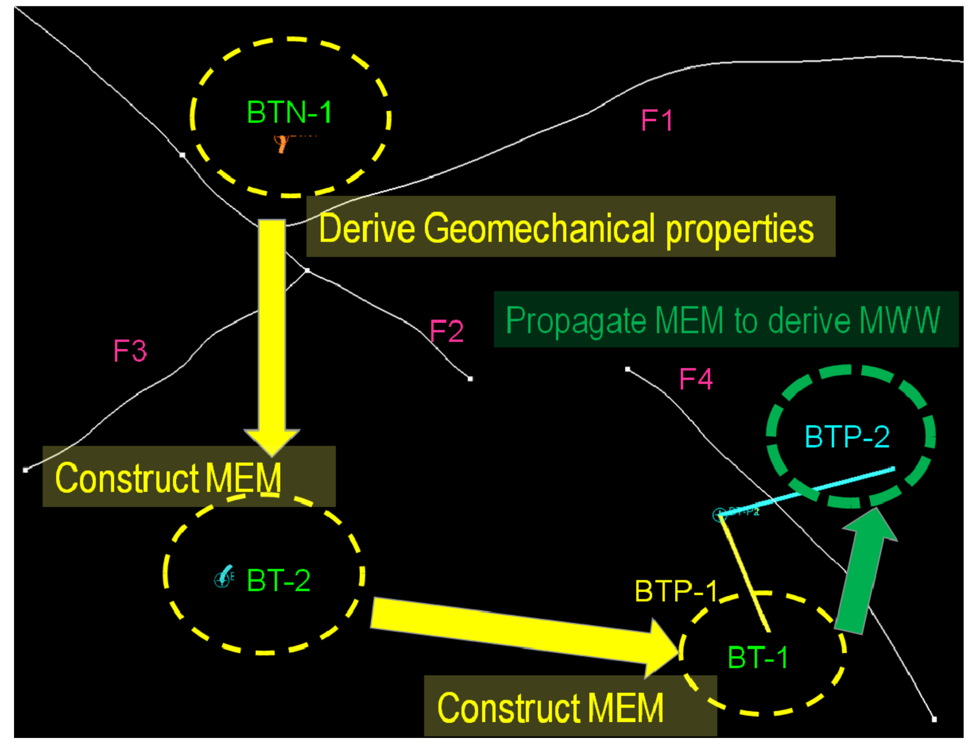
Elastic and strength properties of the formations and magnitude of principal stresses in the field were estimated from a mechanical earth model (MEM) based on offset well data.

The data from offset well was mapped into the planned trajectory, and the optimum trajectory and the stable mud weight window estimated led to successful drilling of the deviated well.

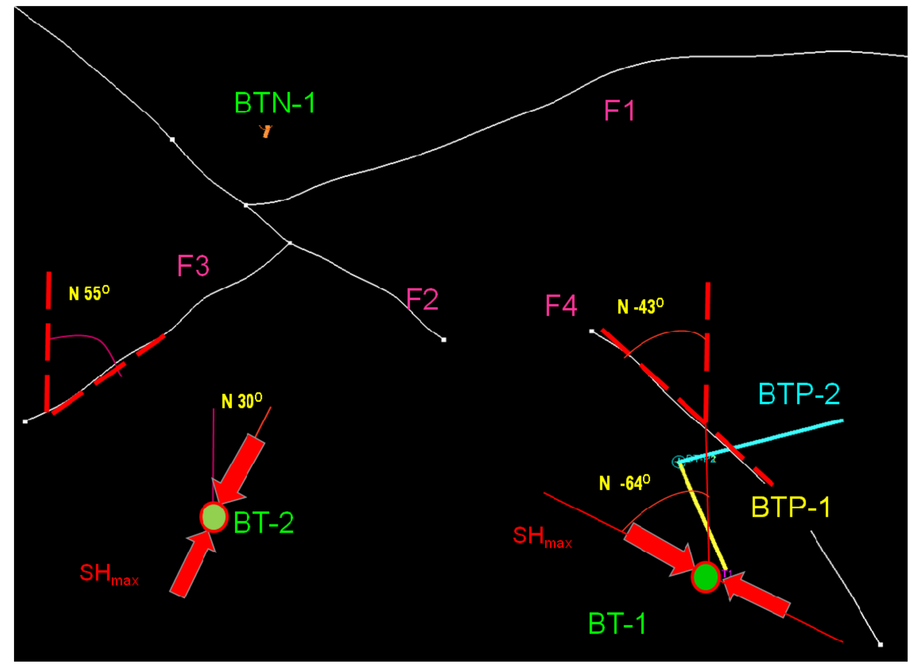
1D MEM



2. Study Workflow

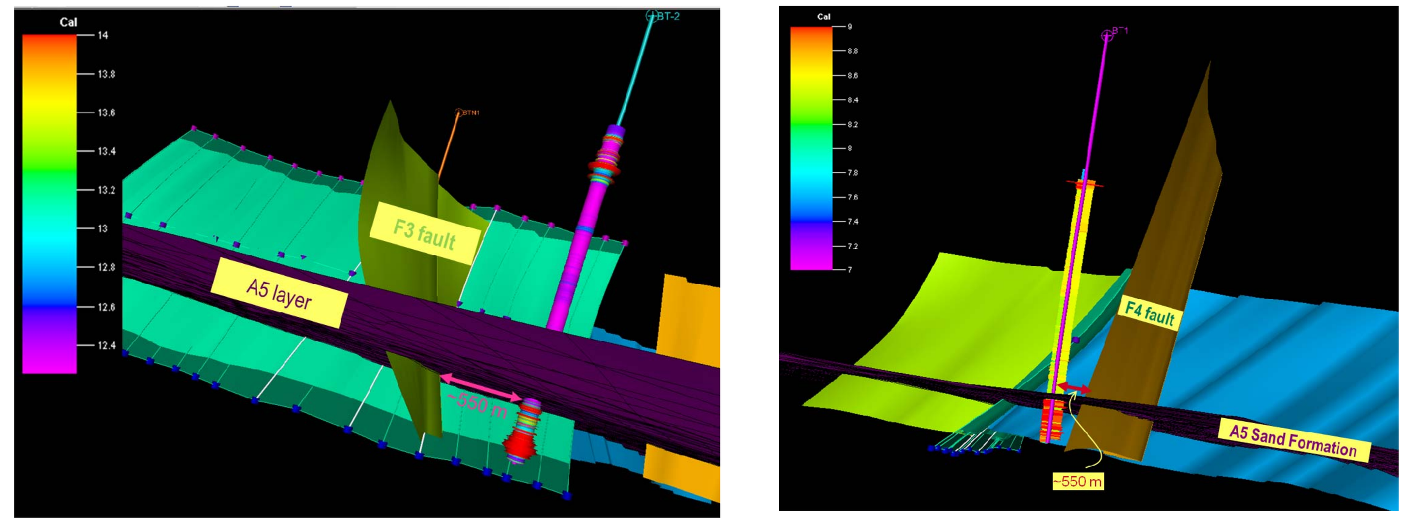


Principal Stress Directions



Stress direction changes from Well BT-1 to Well BT-2

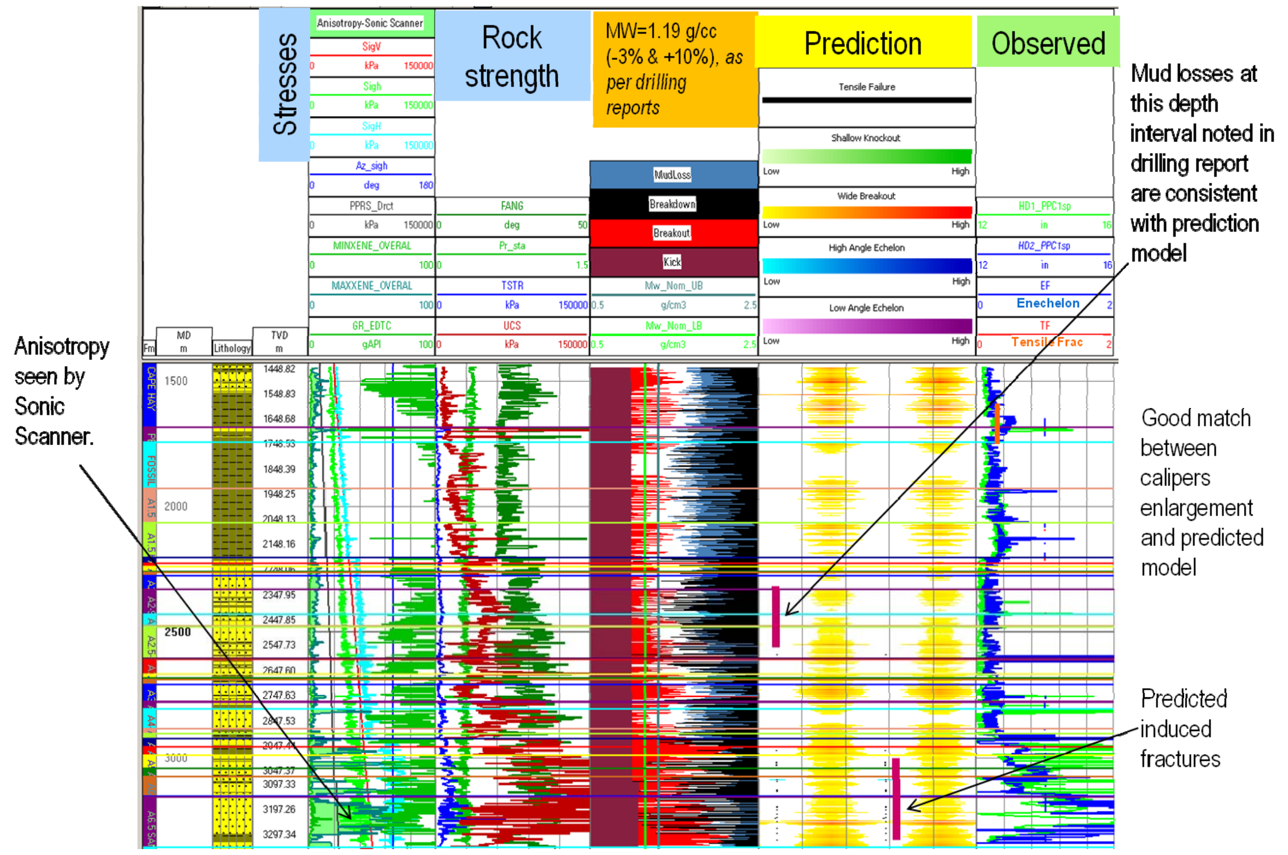
3. Fault and wellbore geometries



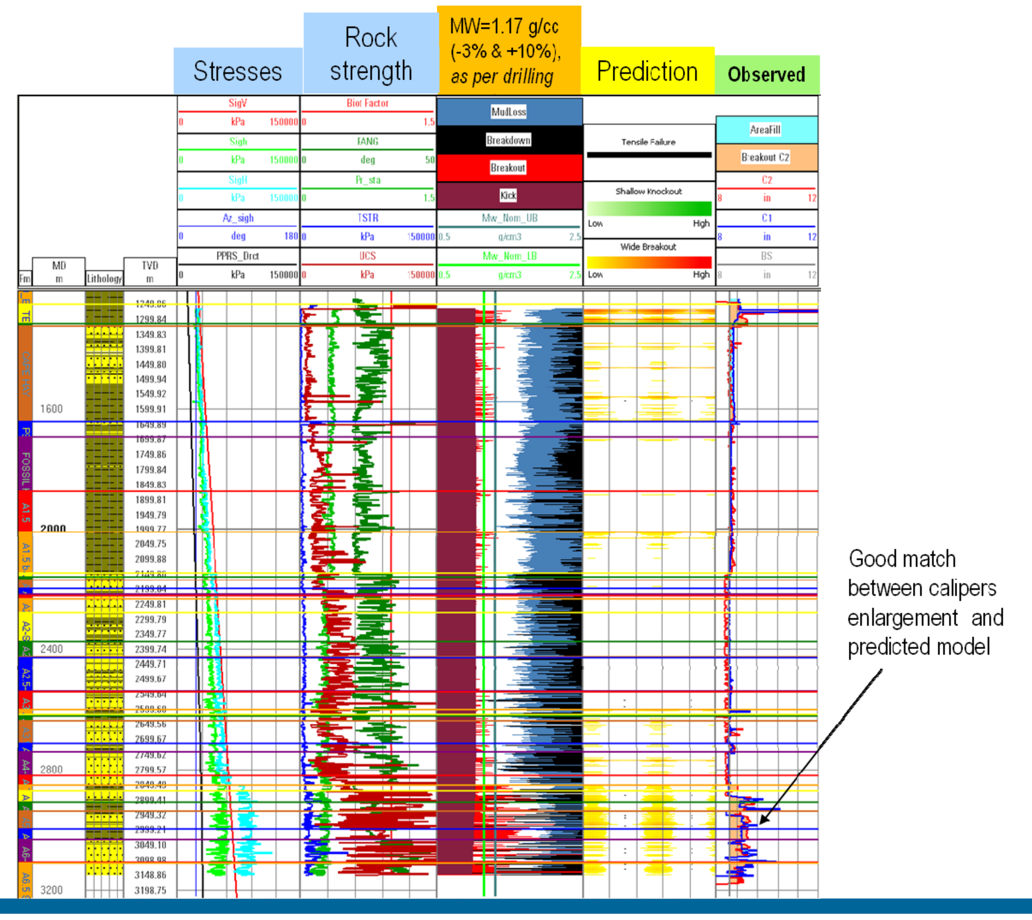
BT-1 and BT-2 get closer to existing Faults (F4 & F3, respectively) at lower depth. This could influence the stresses at the lower intervals. At lower depths caliper shows hole enlargement.

Rock strength of A5 sand being high, larger stress anisotropy is possibly expected at depths below A5-Sand due to the existence of Faults.

Wellbore Stability for Well BT-2



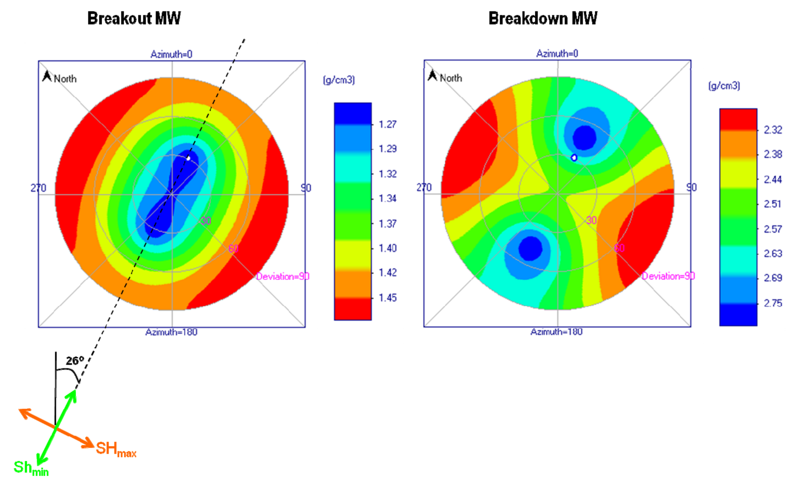
4. Wellbore Stability for Well BT-1

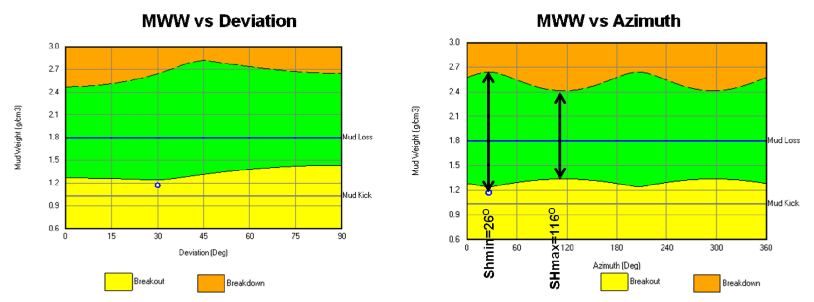


Sensitivity Analysis for Well BT-1

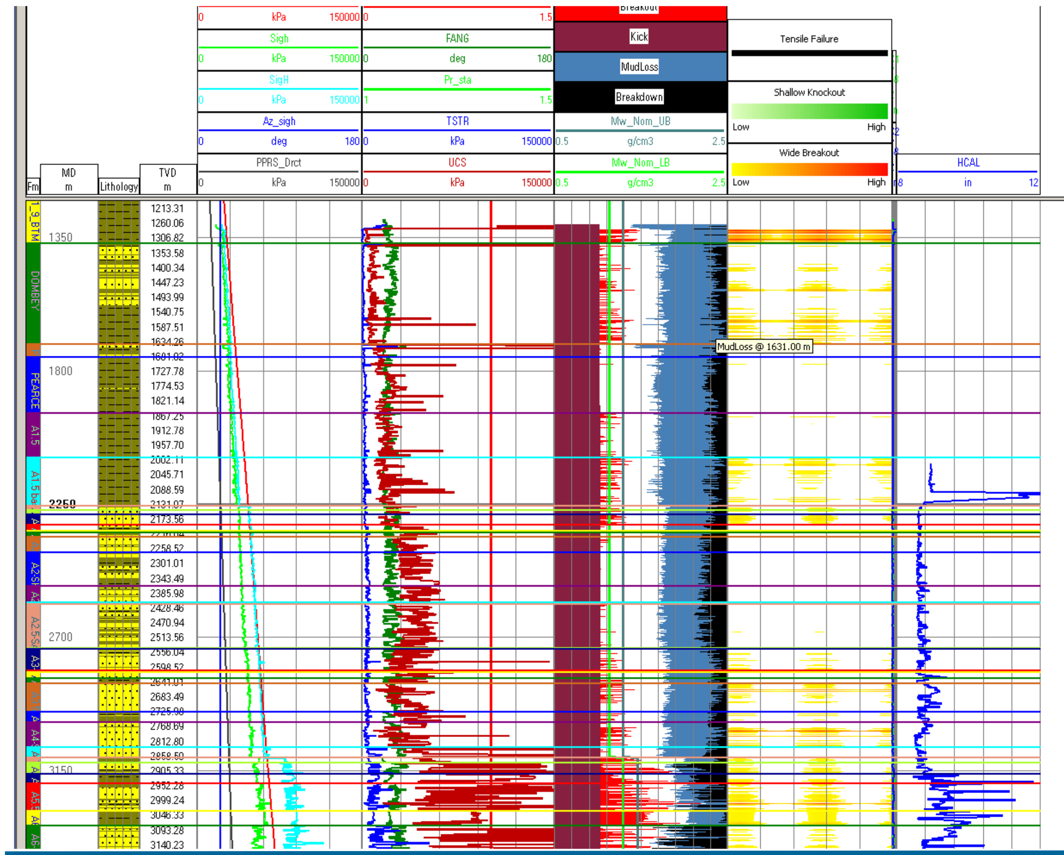
Depth 1600 m, Well Az=26°
(along Shmin)- Normal Stress Regime

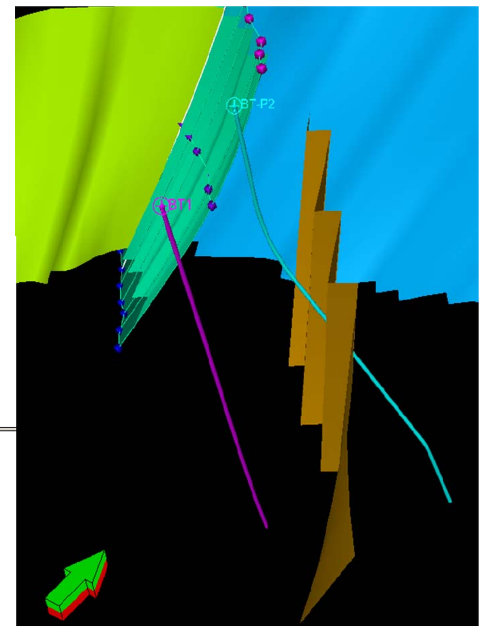
- *The narrowest breakout and breakdown MWW is along SHmax, most risky direction to drill*
- *IN general, at this specific orientation, the more deviated the wellbore, the larger the stable MWW*
- *The lowest breakdown mud weight is along SHmax azimuth*





5. BT1-P2 Planned Well Trajectory





The elastic and strength logs were propagated from BT-1 to this planned trajectory and optimum MWW was estimated.

6. Conclusions

The MEM is a useful workflow to estimate the mechanical properties as well as stress magnitudes and directions using data from offset wells. The MEM output could be used to conduct wellbore stability analysis and also determine the optimum mud weigh windows for drilling a planned well.

The results of this study also showed how the existence of faults near to a well being drilled could cause a large stress anisotropy. In drilling wells in Blacktip area this resulted in wellbore instability across the intervals where the formation is very strong.