In-situ Stress and Fracture Controls on Permeability Distribution within Walloon Subgroup, Surat Basin

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Project: Understanding Faults and Fractures in the Surat Basin

BACKGROUND

Surat Basin Coal Seam Gas (CSG) is maturing from exploration to production to meet the targets for the Liquefied Natural Gas projects. This requires effective and predictable reservoir performance that is directly controlled by permeability, gas saturation and matching the well completion technique to the ground conditions. Permeability is a function of stress and fracture, and these will vary at the field scale with the development of larger regional scale faults and folds, and localised "keystone" features.

AIMS OF THE STUDY

The major aims of this study are

- To understand controls on the spatial and stratigraphic variability of stress and fracture orientation relative to permeability and their role in known "sweet" and "sour" production spots.

CONCEPTUAL MODEL

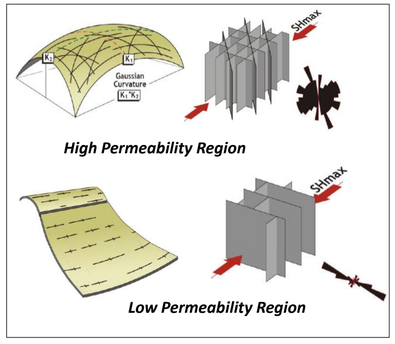

Figure 2 In situ stress and fracture orientation with permeability (Flottman et. al 2013)

REFERENCES

Flottman, T., Brooke-Barnett S., Trubshaw R., Naidu S. K., Kirk-burnnand E., Paul P. K., Busetti S., and Hennings P. (2013), Influence of in-situ stresses on fracture stimulations in the Surat Basin, southeast Queensland, paper SPE 167064 presented at the Unconventional Resources Conference and Exhibition-Asia Pacific, 14 pp., Soc. of Petrol. Engineers, Brisbane, Australia.

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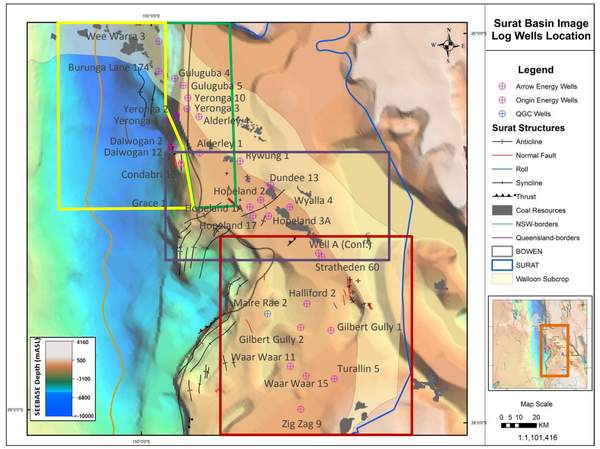

Figure 1 Map showing specific structural areas / domains [Mimosa syncline (1A), West of Leichhardt – Burunga Fault System (1B), Undulla Nose (2), Kogan anticline and SE of Moonie – Goondiwindi Fault system (3)]within study area, Eastern part of Surat Basin. Walloon subcrop Proterozoic depth to basement SEEBASE is an underlay; (Oz SEEBASE, 2005).

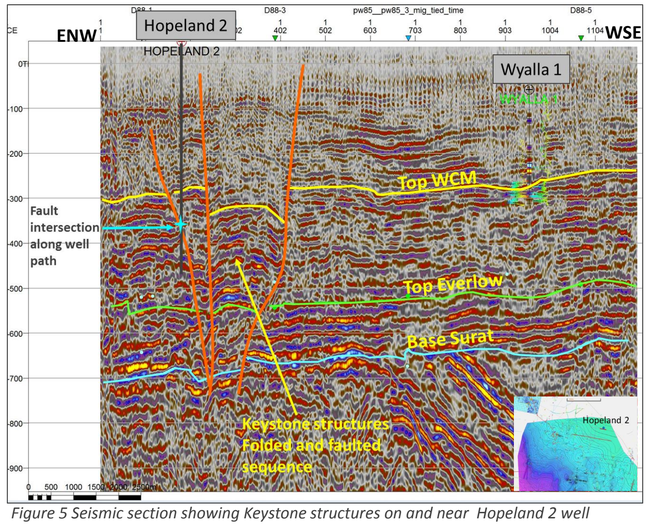

Figure 5 Seismic section showing Keystone structures on and near Hopeland 2 well

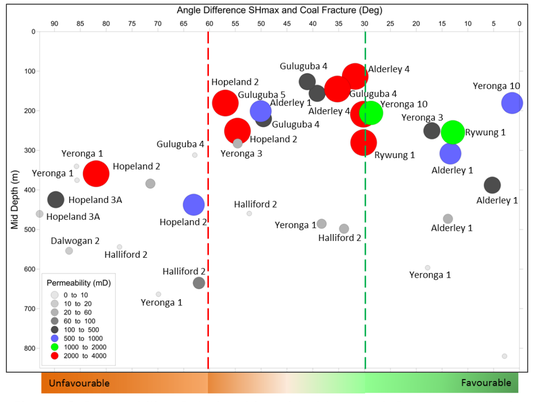

Figure 6 Permeability Relationship with Measured Depth and Angle between SHmax and Coal Fracture

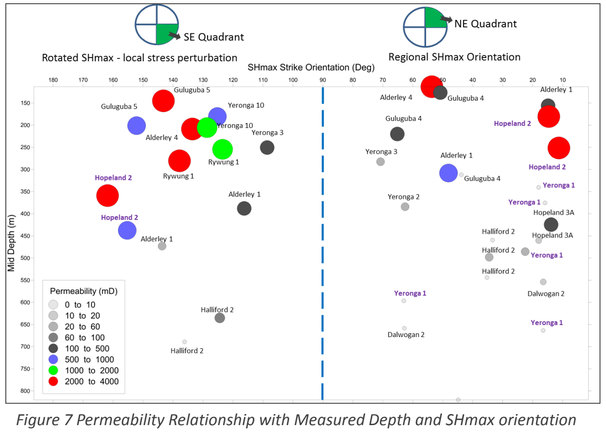

Figure 7 Permeability Relationship with Measured Depth and SHmax orientation

PRELIMINARY RESULTS

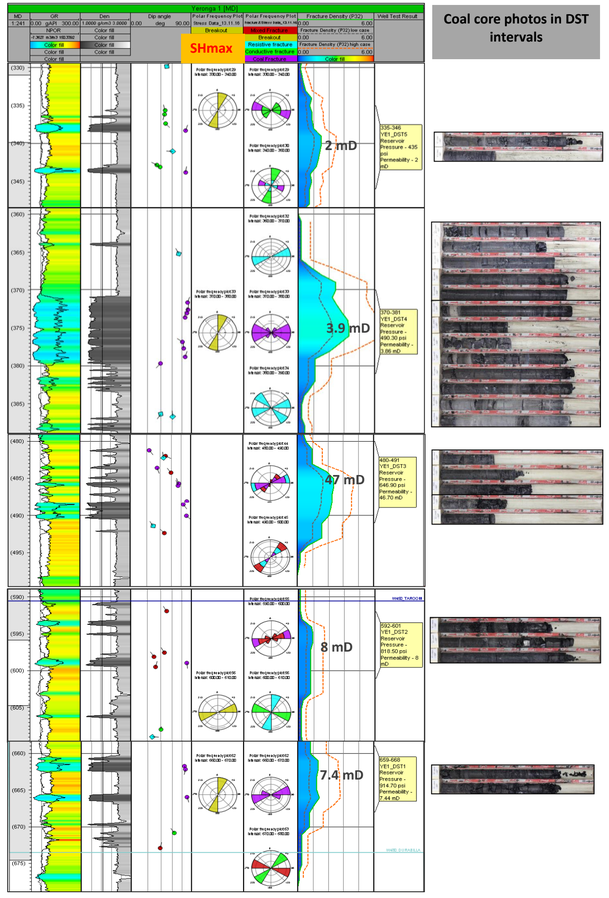

Figure 3 Yeronga 1 well Section showing present day in-situ stress, fracture orientations, fracture density (P32) and their influence in the permeability test intervals – Example from Mimosa Syncline domain

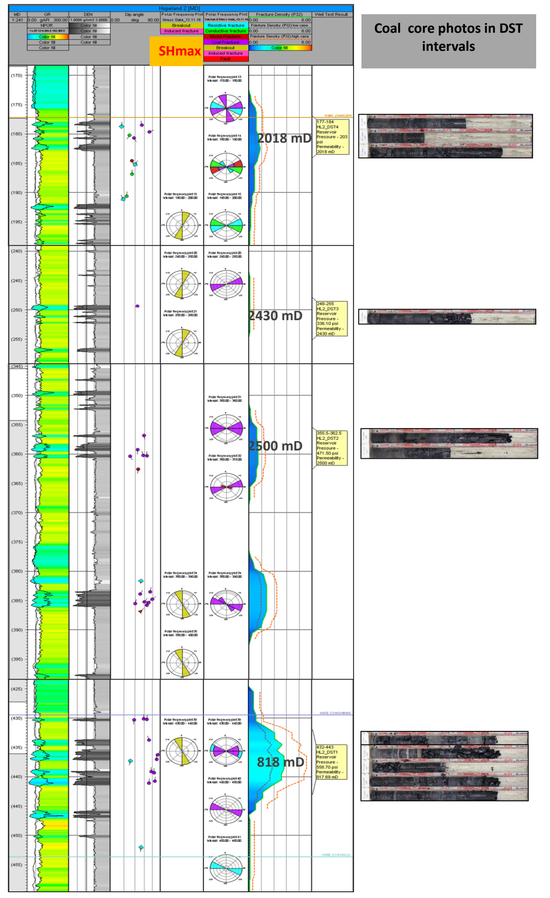

Figure 4 Hopeland 2 well Section showing present day in-situ stress, fracture orientations, fracture density (P32) and their influence in the permeability test intervals – Example from Undulla Nose domain

OBSERVATIONS

- Fracture density and orientation along with stress orientation significantly influence coal permeability within Walloon Sub-group. Most of the cases, coal fractures oriented parallel or sub-parallel indicate good permeability zone with some exceptions e.g. Hopeland 2 well (Figure 6).
- Hopeland 2, Hopeland 3A located near anticline within Surat Succession. Hopeland 2 well located in a structurally complex area with folded and faulted strata. Here structures within Surat succession plays greater role for higher permeability even though in-situ stress and coal fractures relationship not favourable (Figure 6).
- Local stress perturbations due to faults, lithological variation etc. causing SHmax rotation from the regional orientation and significantly influence Walloon coal permeability in the Eastern Surat (Figure 7)