



## 4. TECHNICAL PROPOSAL

### 4.1 Evaluation of Offset Well Data

#### Surface Hole :

The surface hole on Megascollides # 1 was drilled with a basic gel based spud mud. Gel was used for viscosity and native clays and solids increased the mud weight to 9.0 ppg by casing point. No problems worth noting in relation to the mud system were experienced in drilling or casing the surface hole.

Generally, surface holes throughout the Gippsland Basin are fairly benign and only require the most basic of spud muds.

#### Production Hole :

Wells in the Gippsland Basin have traditionally required little in the way of inhibition. However, in more recent times, KCl – PHPA based muds have been the most common, certainly on deeper wells such as those proposed by Karoon. This has primarily been due to the fact that PHPA based fluids are not significantly more expensive to run than conventional "Gel" or "Gel – Polymer" based fluids and that PHPA offers better solids control due to cuttings retaining their integrity far more prior to reaching the shale shakers and are more readily disposed, meaning mud weight control is more effective. KCl has often been added at low concentrations (2 – 3%) mainly as a precaution, but it has often been found that the Potassium ion does not deplete significantly, indicating that formations are un-reactive.

Many wells have been drilled with a fully mudded up system from the casing shoe, as many of these wells intersect coal seams which do require elevated mud weights. Other wells we have been involved with have started with more relaxed properties and while drilling ahead fluid properties would be refined. The yield point would be increased to 12 – 18 lb/100ft<sup>2</sup>, and the fluid loss would be reduced to around 5 – 7 cc's.

Few hole problems are usually found in this section. Mud losses are always a likelihood, but unless losses are substantial, the loss of mud and subsequent extra volume that has to be built simply aids in maintaining mud weights as low as practical.

Tight hole is also a likelihood, especially through in gauge sections of hole. Generally though, once the tight sections are wiped, they rarely give rise to ongoing problems.

On the Megascollides # 1 Well, a KCl PHPA based fluid was programmed. However, well conditions at the time allowed the continuation of the non-inhibitive gel based system that had been used on surface hole. This also meant that less volume was required to be mixed, and as importantly, less volume had to be dumped and disposed of.

It was obvious on this well that inhibition was not an over riding concern. Comment was made on the slightly mud making formations in the upper section of hole, but again, these did not require inhibiting, although thinners were required.

The casing shoe and cement were drilled out using the gel mud and the high pH was treated back with citric acid. Considerable defoaming was also noted throughout this hole section – this could have been due to the earlier cement contamination.



#### 4.2 Recommended Mud Program – Conventional Well

The following is the basis for the mud program that is recommended in this area. A more detailed program will be submitted in consultation with Upstream if we are the successful tenderer.

##### Surface Hole :

A Gel based spud mud should be used to spud the well and drill to casing point. Bentonite should be added in sufficient amount to maintain good yield points (16 – 24 lb/100ft<sup>2</sup>) to ensure good hole cleaning.

##### Production Hole :

A PHPA Polymer mud (no KCl) is recommended. As stated in the previous section, PHPA is not strictly required for inhibition, but rather due to its property of encapsulating solids and minimising their dispersion, meaning thinners should not be required and mud weight control will be far more efficient. Additionally, PHPA works synergistically with Pac-R/Ausdex and Xanthan Gum to reduce those product concentrations when building and / or maintaining fluid loss and rheological properties.

A combination of Pac-R and Ausdex will be used to control fluid loss properties to around 5 – 7 cc's. Dependent on the yield point at the time, more Pac-R may be used if the yield point is at the lower end of its parameters.

Xanthan Gum (Xan-Bore) should be used to help maintain the yield point at around 10 – 18 lb/100ft<sup>2</sup> and to improve the 6 RPM reading where required.

Properties should start off at the lower end of parameters and can be built up gradually. Although a reasonable yield point is required from the outset (~ 6 – 8 lb/100ft<sup>2</sup>), fluid loss properties are not required to be aggressively lowered from the outset. These will fall gradually simply with PHPA additions, and later in the well (1300 – 1400 m) Ausdex / Pac-R can be further added to reduce the fluid loss to round 6 cc's.

The non-dispersive nature of PHPA based fluids leads to huge reductions in overall sump volumes and disposal costs, as considerable amounts of fluid can be recycled back from the sump for use as a basis for ongoing volume requirements.

Mud weight levels should be started at the lower end of the spectrum (i.e. 8.8 – 9.2 ppg) and increased only if hole conditions dictate. If increases in mud weight are required, barite should be added.

The main consideration early in this interval will be how to build the PHPA mud if it is desired that old spud mud be used as a basis. Given that far less volume will be required to be dumped if using a PHPA based system, the economics of dumping the majority of spud mud at the time is probably warranted. It would be expected that some extra dumping and consequent disposal costs incurred earlier in the well will have economic benefits later in the section.

(A strong alternative to consider here would be the addition of Alum to the majority of spud mud just before it is dumped. This will lead to considerable separation of solids and the water phase would soon become available for recycling.)

Caustic Soda should be added to maintain a pH of 9.0 – 9.5 throughout this section. Sodium Sulphite should also be added as a corrosion inhibitor. Biocide should be added from the outset as fluid will continue to be recycled back from the sump and as a consequence, protection from bacteria is required.