REINTERPRETATION OF 1981 CAMEL FLAT AND PILLAR RANGE SEISMIC SURVEY O.P. 189

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REINTERPRETATION OF 1981 CAMEL FLAT & PILLAR RANGE SEISMIC SURVEY

O.P. 189 AMADEUS BASIN

PREPARED BY

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NORTHERN TERRITORY
GEOLOGICAL SURVEY

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PLATES

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1. INTRODUCTION

A reinterpretation of the 1981 seismic survey in the Camel Flat and Pillar Range area of O.P. 189 has resulted in confirmation of some previously defined structures and redefinition of other structures within the limits imposed by the survey.

With additional geological input and the drilling of the Bluebush No. 1 well, the extent of Arumbera subcrop within O.P. 189 has been diminished. It seems likely that the northern half of the Camel Flat syncline has the most potential with regard to reservoir and seal.

2. GEOLOGY

2.1 Structure

Sediments in O.P. 189 were affected by three episodes of structural deformation. The first event formed the Central Ridge, an east-west trending structural high, which separated a rapidly subsiding sub-basin in the north from a relatively inactive sub-basin in the south. The Central Ridge was later over-run by thrust sheets mobilized during the Alice Springs Orogeny. The area was next affected by westward tilting during the Silurian Rodingan Movement. During this time, as much as 3,000 metres of Cambro-Ordovician section was removed from the area. The final stage of deformation was the Late Devonian Alice Springs Orogeny. Deformation in this orogeny led to the development of folds, thrust sheets, and accelerated flowage of haliferous sediments in the Chandler Formation.

Throughout this time, O.P. 189 was also affected by halokinesis within the Bitter Springs and Chandler formations. Migration of salt in the Bitter Springs Formation began in the Late Proterozoic, and continued thereafter at different rates until the Devonian. The timing of Chandler salt movement is less certain.

2.2 Reservoir Rocks, Source Rocks, Seals

The primary reservoir target in O.P. 189 is the Arumbera Sandstone. The Arumbera was absent at Bluebush No. 1 well, and is now known to subcrop only along the north flank of the Camel Flat syncline. The Arumbera underlies the Chandler Formation, a proven source and reservoir horizon in the eastern Amadeus Basin. The Pertatataka Formation separates the Arumbera from the Bitter Springs Formation, the probable source for hydrocarbons reservoired in the Arumbera at Dingo No.'s 1 and 2. Evaporites in the Chandler Formation should effectively seal hydrocarbons reservoired in underlying horizons.

3. INTERPRETATION

A reinterpretation of the Camel Flat and Pillar Range seismic data has come up with the following results:

1. An isochron map of the Chandler (Enclosure 2) shows a general trend of thickening to the north and east with localised highs along the southern flank of the syncline. Of interest, in relation to possible Arumbera structure, is the thick cover over Steele Gap Anticline (line 04) and the thick cover at the north end of lines 07 and 05.

2. Attempts to delineate the pinchout of the Arumbera have proved difficult as Arumbera does not outcrop in the syncline south of the north bounding fault and was absent at the Bluebush No. 1 well. Hence, positive identification of an Arumbera seismic horizon could not be made, however, pinchouts within the sub-Chandler can be recognised and those have been mapped out (Enclosure 1). These follow a general NE-SW line as indicated on the map with one isolated pocket to the south of this line.

   * It must be stressed that this is not a positive identification of the Arumbera pinchout.

3. Structural interpretation of the Camel Flat area shows several interesting features:

(a) Pre-supposing the zone of pinchout is correct, then the most promising Arumbera structures are:

(i) A high (#5) extending from shot points 1600-1630 on line 81-07 (Enclosure 6) to 1230-1350 on line 05 (Enclosure 5) with Bitter Springs salt swell below it;

(ii) A high (#6) extending from shot points 1670-1720 on line 81-07 and terminating against the north bounding fault;

(iii) Steele Gap Anticline (#1, line 81-04 (Enclosure 4) shot points 1150-1230).

(b) Three other structures numbered 2, 3 and 4 exist in the SW of Camel Flat. These have fairly thin Chandler cover and are close to the projected pinchout zone (also having low amplitude).

(c) The presence of a north bounding fault trending ESE-WSW, reflecting thrusting from the north to the south.

(d) The south-westerly region of the Camel Flat and the Pillar Range area is characterised by complex structural elements compounded by the activity of the Bitter Springs Salt. The isochron of Bitter Springs Salt (Enclosure 3) shows that the majority of upward movement occurred in this area with only isolated swellings further to the north.

Unfortunately Bluebush No. 1 failed to intercept Arumbera sandstone and this decreased the prospectivity of any structures south of Camel Flat syncline itself. Only Proterozoic formations such as the Areyonga and Bitter Springs would be viable targets in this area.

4. CONCLUSION

Reinterpretation of the 1981 seismic survey in the Camel Flat and Pillar Range area of O.P. 189 has confirmed that:

(a) The Chandler Formation thickens to the north and east of the permit with localized highs along the southern flank of the syncline.

(b) Although positive identification of an Arumbera seismic horizon cannot be made, mapping of sub-Chandler units show a general NE-SW line of pinchout north of Bluebush No. 1.

(c) Six structural highs exist at a base Chandler/Top Arumbera? level.

5. RECOMMENDATIONS

Of the six indicated structural highs, those that are most prospective (No.'s 1, 5, 6) lie in the northeastern part of O.P. 189. For further definition of these highs it is recommended that more seismic coverage be obtained in the north and eastern parts of Camel Flat, especially in the area bounded by line 08 to the west, 01 to the south, and the syncline rim fault to the north. Particular attention should be paid to increasing seismic control between lines 07 and 05 and confirming strike closure of prospect 1.

APPENDIX A

PROSPECT RISK ANALYSES FOR ARUMBERA LEADS - GAS

Input parameters for these analyses originate from a combined effort by geophysicists, geologists, and reservoir engineers from Magellan Petroleum Australia Limited:

- Areas are those measured at a near base Chandler level.

- Net pay is derived from "known total thickness of Arumbera: pay zone" at Dingo.

- Porosity is derived from known values at Dingo. This gives a minimum porosity value below which gas is non-prospective. The most likely porosity is an average applied across the permit. The maximum is derived from geological observation at surface and from interpolation across the basin.

- Water Saturation (SW) is an arbitrary set of figures based on observed figures from producing fields.

- The Gas Recovery Factor (RGF) is derived from known figures at Dingo. A most likely figure of 0.95 is applied with maximum and minimum being arbitrary figures derived by the reservoir engineer.

- The figures for Reservoir Pressure and Reservoir Temperature are calculated by multiplying the depth in feet by a conversion factor.

  Reservoir Pressure (PA) = (Depth in ft x 0.465) + Atmospheric Pressure

  Reservoir Temperature (RTEMP) = (Depth in ft x 0.028 + 460 - 80^{O})

  The temperature factor is derived from known temperature and depth at Dingo and is in degrees absolute.

- Potential values are derived from geophysical and geological knowledge and interpretation of the areas.

enc 1 twt near base chandler top arumbera?

enc 2 isochron twt chandler salt/ evaporite sequence

enc 3 isochron twt bitter springs sequence - conjectural

enc 4 line mcf 81-04 vp 1000-1440

enc 5 linr mcf 81-05 vp 940-1428

enc 6 line mcf 81-07 vp 1000-1818