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SEISMIC INTERPRETATION REPORT

INCORPORATING REPROCESSED 1966 AND 1967 DATA

OF

EXPLORATION PERMIT 3

BONAPARTE BASIN, NORTHERN TERRITORY

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MARCH 1988

CONTENTS

ENCLOSURES

1. SUMMARY

Seismic data from the Queen's Channel Survey in the area of EP 3 was obtained from the BMR, reprocessed and interpreted with the following results:

1. Seismc data generally confirmed structural trends established from onshore surface geology, drilling results, and the recently acquired aeromagnetic data.

2. A structure map of the Carboniferous Tanmurra Formation was produced which showed several structural leads, present in the northwest portion of the permit.

3. In addition to the structural leads, play concepts developed from the interpretation include:-

   1) Possible Devonian reef with overlying structural drape, indicated on line QC3, at shotpoint 446.

   2) Northeast continuation of the Pincombe Ridge into EP 3.

4. A seismic survey has been laid out based on the results of the aeromagnetic and seismic interpretations. The structural leads and play concepts identified will be investigated in the forth-coming seismic survey.

6. RECOMMENDATIONS

The work done to date justifies a seismic program to follow up the leads mapped and inferred by the mapping of reprocessed seismic data in EP 3. A programe of about 300 kms, has been laid out taking into consideration the water depth as well as the leads to be investigated. It is proposed that this seismic data be acquired during 1988 and form part of the Year 4 work commitment for the permit.

3. INTRODUCTION

Exploration Permit (EP) 3 is an onshore exploration licence area of approximately 4106 sq. km (or 1,014,346 acres) located in the northwestern Northern Territory. An estimated 40% of the area is located offshore, covering the shallow waters of the Queen's Channel in the southeastern Bonaparte Basin.

The only seismic data available within EP 3 occurs in the offshore area adjacent to NCP 1 and consists of analog data of the Queen's Channel Survey. Approximately 580 kilometres of data was recorded in 1966 (QC lines) and 1967 (QCA lines) by Australian Aquitaine Petroleum. This data has now been digitized and reprocessed using modern display techniques.

The following report details the seismic interpretation results using the reprocessed seismic data. Two maps have now been prepared based on the data and are included as Enclosures 1 and 2.

4. GEOLOGICAL SETTING

The Bonaparte Basin was initiated in Cambrian as a result of divergent left-lateral wrenching within the north-east trending Halls Creek Mobile Zone. Over 5,000 metres of sediments where deposited during the Late Devonian to Early Carboniferous in the onshore portion of the basin. Extensive outcrops around the basin margins demonstrate complex facies relationships and the continuance of wrench faulting during deposition.

A Late Devonian reef complex fringes the western basin margin. Shales and silts of the Bonaparte Beds form the basinal equivalent of the various facies outcropping on the flanks. A north-east trending basement high, the Pincombe Ridge, occurs in the eastern Bonaparte Basin. Keep River-1 intersected a barrier reef complex which caps the ridge. The area to the east of the ridge was dominated by lagoonal deposits with back-reef and intra-tidal facies.

The eastern margin of the Bonaparte Basin within EP 3 is controlled by the convergence of the Cockatoo Fault System and the Moyle Fault against Precambrian meta-sediments of the Sturt Block. EP 3 contains some 6,000 to 8,000 metres of Paleozoic sediments in the northwestern part of the block, reducing in thickness towards the basin margin in the central part of the block.

Late Devonian to Early Carboniferous sediments offer the greatest hydrocarbon potential. Reservoirs are predicted to be present in sandstones of the Bonaparte Beds - Keep River Group and also where secondary porosity is developed in the carbonates, especially those of the reef complex. Shallow core holes, drilled for mineral exploration, around the basin margin have encountered numerous oil shows. Source rock analyses of previous wells and coreholes drilled in the basin illustrated the potential of the basinal shales and lagoonal carbonates to produce hydrocarbons. Gas has flowed from thin sandstones within the Keep River Group in three of the wells drilled onshore (Keep River-1, Bonaparte-2, Weaber-1), with Weaber-1 being a sub-commercial gas discovery.

5. SEISMIC REPROCESSING

About 580 kms of seismic data in the area of EP 3 was obtained through the Northern Territory's Department of Mines from the BMR archives in Sydney. The data was received in the form of 2,781 analog techno tapes with no observer's reports available for either of the two surveys. The techno tapes were transcribed and digitized at Transcription Services in Sydney, then forwarded to Digicon, Singapore for reprocessing. The Northern Territory Department of Mines has a requirement that an extra copy of the digital tapes be produced at our cost for their files.

The lines prefixed by QC consisted of one fold data recorded by Australian Aquitaine Petroleum in 1966. The lines prefixed by QCA consisted of three fold data recorded by Aquitaine in 1967. An attempt to stack the QCA data without observer's reports was unsuccessful, and the data had to be displayed one fold. Problems such as changes in direction of recording and not - shot or missing records were resolved by using the best fitting solution and consecutively numbered records were considered continuous along the line. The reprocessed QC data showed considerable improvement on the original data. No original data was available on the QCA lines and the final product of the reprocessing was poor.

6. SEISMIC INTERPRETATION

Interpretation of the seismic data was made difficult due to the lack of continuous reflectors and generally poor data quality. A Tectonic Elements Map and a Top Tanmurra Map were produced. These maps incorporate the information available from the recent aeromagnetic survey and outcrop geology in the surrounding areas.

6.1 Tectonic Elements Map

The Tectonic Elements Map illustrates the main structural features in the area which can be continued into EP 3 using the aeromagnetic and seismic information. The convergence of the Cockatoo and Moyle Fault systems creates a steep magnetic gradient which defines the eastern margin of the prospective Phanerozoic Basin in EP 3.

A magnetic high defines the Pincombe Ridge which trends north-east from the Pincombe Inlier on the Western Australian border, through the centre of OP186 into the central offshore portion of EP 3. The Burt Range Syncline, a magnetic low, lies between the Cockatoo Fault and the Pincombe Ridge. The Pincombe Ridge and Burt River Syncline are located in the Carlton Sub-Basin, a shelf area on the south margin of the Bonaparte Basin. To the northwest of the Pincombe Ridge a steep magnetic gradient appears to indicate a listric fault interpreted from the seismic as the boundary between the deeper Petrel Sub-Basin and the Carlton Sub-Basin.

6.2 Top Tanmurra Map

Because of the lack of observer's reports, the reliability of the re-processing is questionable. Faults may have been introduced or eliminated in the alignment of the records. The map is meant to show the gross features such as the listric fault running north-south from northwest corner of EP 3. The strike of the minor faults and structures along the listric fault indicate possible involvement of wrench tectonics. The map shows the Tanmurra becoming shallower to the southeast onto the Pincombe Ridge and

possibly faulting into the Burt Range Syncline on the southeast end of Line QC3. The high at S.P. 446 on Line QC3 could be an indication of a deeper pinnacle reef of Devonian age or one of several structural highs developed along the faults.

7. CONCLUSIONS

This study has shown that key structural elements mapped from surface outcrops and drilling results in OP186 can be extended northeast into EP 3 using results from the aeromagnetic survey and the reprocessed seismic data. Where seismic lines occur the reprocessing has resulted in confirmation of the structural features interpreted from the aeromagnetic data.

The EP 3 area is structurally complex due to the wrench tectonics associated with the Hall's Creek Mobile Zone.

The faulting has created several structural highs which could have trapped hydrocarbons migrating towards the basin edge. Keep River-1 drilled a reef to back-reef build-up along the Pincombe Ridge which extends into EP 3. A circular feature at Shot Point 446 on line QC3 could be drape over a Devonian pinnacle reef associated with the reef build-up.