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BOOBYALLA CORE STUDY AND ITS RELEVANCE TO ALLUVIAL FAN PLAYS

WITHIN T-15-P/T-16-P

Bridge Oil Limited,
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CONTENTS

1. Introduction
2. Conclusions
3. Palynology of Boobyalla Wells No. 1 and No. 2, Correlation to Durroon No. 1
4. Description of Boobyalla Cores, Interpretation and Depositional Setting
 - 4.1 Major Lithotypes
 - 4.2 Interpretation of Lithotypes
 - 4.3 Depositional Setting
5. Structural Setting of Boobyalla Plains Area Compared to T-15-P and T-16-P

List of Figures

1. Map of the southeastern margin of the Bass Basin showing the distribution of major faults which disrupt basement rocks.
2. Durroon No. 1 stratigraphy compared to Boobyalla No. 2 stratigraphy.

1. INTRODUCTION

To aid seismic and geological interpretation of the T-15-P and T-16-P permits, it was decided to study cores from the Boobyalla No. 1 and No. 2 wells, drilled in a small, onshore extension of the Bass Basin in north eastern Tasmania. (Figure 1)

Boobyalla No. 1 was drilled by the Tasmania Department of Mines (T.D.M.) in 1976, and reached a depth of 424m. The well was first drilled to 255m where it encountered drilling problems and a wedge was subsequently drilled from 204m to total depth.

Boobyalla No. 2 was drilled by the Shell Company of Australia in 1981 to a depth of 265m in search for cassiterite sands. In 1982, the well was re-entered by the T.D.M. and reached a total depth of 491m. The T.D.M. hole was wedged from the Shell hole at a depth of 114.4m.

Both Boobyalla No. 1 and No. 2 are fully cored. The cores were studied in the T.D.M.'s core storage facility in Hobart.

2. CONCLUSIONS

Alluvial fans exist on the downthrown side of a major fault in the Boobyalla Plains area of northern Tasmania. This fault continues offshore and is probably one of a series of rotational faults with large displacements recognised within the T-15-P, T-16-P permits. The alluvial fans in the Boobyalla area are palynologically dated and are of Late Cretaceous age. Likewise, seismic interpretation suggests that in these offshore permits faulting was initiated at the very beginning of the Late Cretaceous and continued intermittently until the Eocene.

The combination of seismic interpretation and basin development modelling resulted in the mapping of alluvial fans at different stratigraphic levels within the Late Cretaceous section. These fans were proposed as viable hydrocarbon plays. The Boobyalla core study has virtually confirmed the existence of Late Cretaceous alluvial fans on the downthrown side of rotational faults within T-15-P and T-16-P. The Boobyalla fans display considerable fluvial reworking. Considering that the provenance area for the T-15-P and T-16-P fans comprised unconsolidated Lower Cretaceous volcanoclastic sediments, reservoir quality sandstones are likely to be present within the fans.

3. PALYNOLOGY OF BOOBYALLA WELLS NO. 1 AND NO. 2,
CORRELATION TO DURROON NO. 1

The Boobyalla No. 2 sequence has been tentatively correlated to Durroon No. 1 (Figure 2). Although the data is not conclusive, it appears that the Boobyalla No. 2 sequence can be divided into three intervals :

1. 491 - 250m belonging to part of the A.distocarinatus, C.triplex and/or P.pachyexinus Zones;
2. 250 - 21m belonging to part of the N.senectus, T.lilliei and/or T.longus Zones, and
3. 21m - surface, belonging to the N.asperus Zone.

Intervals 2 and 3 are clearly separated by a hiatus spanning the Paleocene to Mid Eocene. A hiatus between interval 1 and 2 is inferred in analogy with the Durroon No. 1 well. Within the larger Boobyalla Plains area, the next youngest strata, that is, younger than N.asperus Zone of the Middle Eocene in Boobyalla No. 2, are marine to freshwater strata of P.tuberculatus age, located near Cape Portland. The N.asperus to P.tuberculatus hiatus is also found in the Durroon No. 1 well, which gives additional credence to the inferred hiatus between intervals 1 and 2 of the Late Cretaceous Boobyalla No. 2 section.

Due to coarser sediment, palynologic dating of the Boobyalla No. 1 sequence has to be a rather generalised Late Cretaceous. Correlation between the two Boobyalla wells is therefore difficult and lateral variations are not clear.

4. DESCRIPTION OF BOOBYALLA CORES, INTERPRETATION AND DEPOSITIONAL SETTING

4.1 Major Lithotypes

The Boobyalla cores present three major lithotypes :

- matrix supported conglomerate, lithotype 1
- poorly sorted sandstone, lithotype 2
- shaly siltstone, lithotype 3

Matrix supported conglomerate (photo's 1-4, 6)

The matrix is a poorly sorted association of either brown or grey to green clay, and silt-sized to pebble sized, predominantly lithic clasts. The pebbles and boulders are poorly sorted, angular and chaotically arranged in the matrix. The clasts consist primarily of Jurassic dolerite which either have a fresh appearance or show variable degrees of weathering. In some cases the dolerite has been weathered down to a "plastic clay with lithic grains" texture and provides part of the matrix.

Pebbles of Permian and Triassic sandstone, Devonian slate and granite occur in subordinate amounts. Dolerite boulders may be up to 3m in diameter and contribute all of the larger clasts.

Poorly sorted sandstone (photo's 5,7,8)

Sequences consisting of poorly sorted, angular, very fine to very coarse grained lithic sandstone occur locally over intervals 0.5 to less than 1.0 m thick. Both fining-upwards and coarsening-upwards sequences occur. Large scale cross bedding is clearly visible due to large differences in grain size and colour between subsequent laminae. Erosional contacts within sequences occur; the upper and lower boundaries of sandstone sequences are abrupt.

Shaly siltstone (photo's 10-14) The shaly siltstones are light grey and mottled. Carbonaceous matter is common but hardly ever abundant, except for a 2m thick coal layer in Boobyalla No. 2 (photo 14). Within the siltstones, pebbly horizons and floating pebbles occur. Pebbles attain sizes of up to 3cm in diameter. There is no significant stratification.

Matrix supported conglomerates and poorly sorted sandstones are interbedded with each other as are the conglomerates with shaly siltstone. Matrix supported conglomerates predominate within the cores with an increase in shaly siltstones vertically and also laterally between the two wells. The poorly sorted sandstones are least common.

4.2 Interpretation Of Lithotypes

The matrix supported conglomerates have been interpreted as debris flow deposits due to the chaotic arrangement of angular clasts exhibiting a large range of grain size embedded within a heterogeneous, finer grained matrix.

The poorly sorted sandstones are interpreted as braided stream deposits due to their fining upwards and coarsening upwards sequences, large scale cross bedding, erosional surfaces, the presence of floating pebbles and their association with debris flows.

The shaly siltstone has been interpreted as distal debris flow deposits due to the presence of floating pebbles, pebble horizons and their association with clearly defined debris flows. Plant remains and coal indicate that between debris flows, periods of tranquil sedimentation occurred.

4.3 Depositional Setting

The accumulation of debris flow and braided stream deposits on the downthrown side of a major fault (Section 5) leaves only one interpretation open as to their depositional setting, namely that of alluvial fans filling a fault bounded graben. The fans consist almost entirely of debris flow deposits. However, the occurrence of braided stream deposits indicate substantial fluvial reworking of the sediment. The proportion of fluvial facies would be expected to increase distally.

5. STRUCTURAL SETTING OF BOOBYALLA PLAINS AREA COMPARED TO T-15-P AND T-16-P

The Boobyalla No. 1 and No. 2 wells have been drilled in the flat Boobyalla Plains area of northeastern Tasmania for stratigraphic information. Data concerning the subsurface geology of the Boobyalla Plains area is confined to these Boobyalla wells and some seismic traverses (Moore, W.R. et al. 1984). The Boobyalla wells have been drilled on the downthrown side of a major fault (Figure 1). Seismic data suggests that the fault trough has been filled with over 800m of sediment. The first 400m or so is of Late Cretaceous to Middle Eocene age, the remainder has not been drilled to date, but is most probably of Cretaceous age.

At present this major fault separates over 400m of Cretaceous sediments on the downthrown side, from Paleozoic igneous and contact metamorphic sedimentary rocks on the upthrown side. Permo-Triassic sedimentary rocks and Jurassic dolerite has been eroded during the Cretaceous from the uplifted block.

Regional mapping indicates that this major fault continues offshore and is probably seen on seismic in the T-15-P area as a rotational fault with large displacement. This and similar faults within T-15-P and T-16-P show major growth in the Late Cretaceous and only minor displacement since that time. An important difference, however, is that offshore the eroded section of upthrown fault blocks were dominantly composed of volcanoclastic, unconsolidated sediment of the Lower Cretaceous Otway Group, while onshore the upthrown side consists of Paleozoic to Jurassic sediments and igneous rocks.

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The presence of alluvial fans on the downthrown side of a major fault in the Boobyalla Plains area leads to the conclusion that in the T-15-P and T-16-P area large accumulations of alluvial fan sediments occur on the downthrown side of similar faults, especially when considering the large fault displacements in the offshore area. However, offshore the alluvial fans consist predominantly of the erosional products of the then still unconsolidated Late Cretaceous Otway Group, while onshore the fans were derived from Paleozoic to Jurassic sediments and igneous rocks. Alluvial fans have been mapped within the T-15-P and T-16-P permits and form an exploration target, (see Geological Prognosis Spring Graben No. 1).

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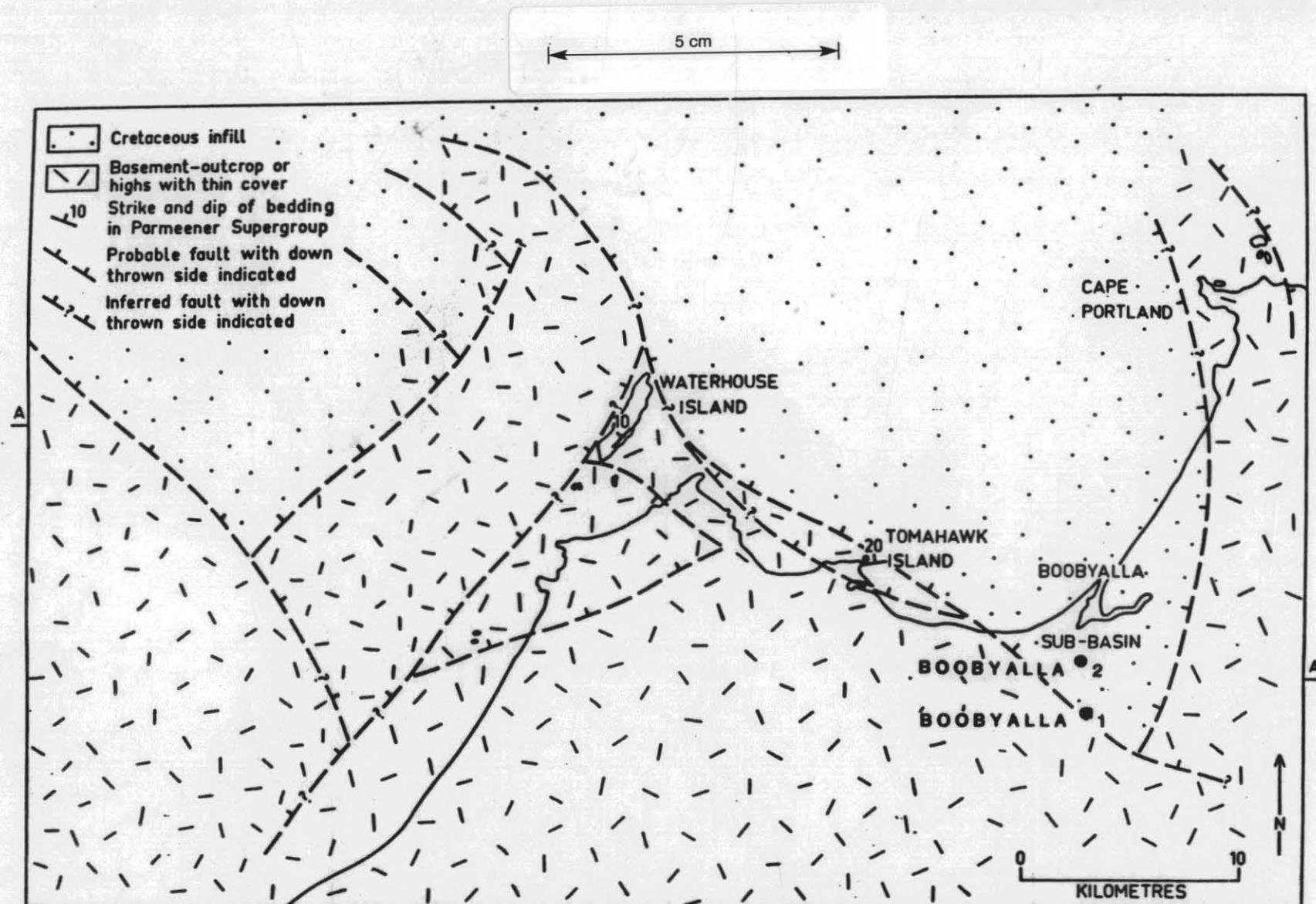
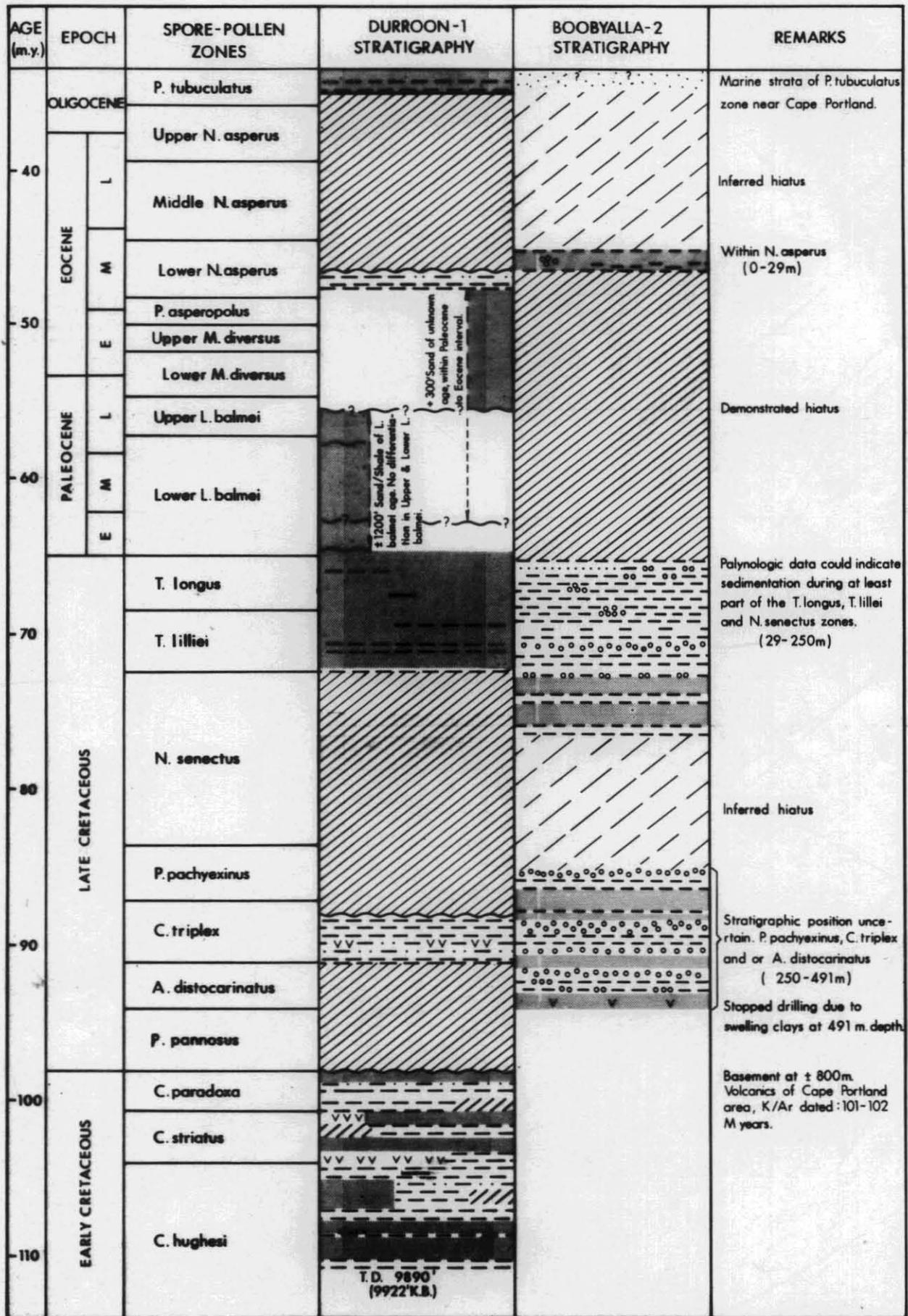


FIGURE 1 - MAP OF THE SOUTHEASTERN MARGIN OF THE BASS BASIN SHOWING THE DISTRIBUTION OF MAJOR FAULTS WHICH DISRUPT BASEMENT ROCKS.

BOOBYALLA NO.1 AND 2 WELL LOCATIONS ARE APPROXIMATE. (AFTER MOORE, W, R ET.AL. 1981)



5 cm

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**DURROON-1
VERSUS
BOOBYALLA-2
STRATIGRAPHY**

AUTHOR: H.H. DATE: AUGUST '85 FIG. N°: 2

Revised: Dec '85