# CONTENTS ENVELOPE 41

TENEMENT: O.E.L. 9 - Portland Area.

TENEMENT HOLDER: Frome Broken Hill Co. Pty. Ltd.

REPORT: Tertiary Structure Mt. Gambier - Portland Area. Pgs. 3-4

PLANS: Nil.

# FOR OFFICE USE ONLY

Envelope No 41

03

PRELIMINARY MEMORANDUM ON

## TERTIARY STRUCTURE OF MT. GAMBIER - PORTLAND AREA.

By H. J. Evans

INTRODUCTION:

The area under discussion extends from Robe in South Australia to Port Fairy in Victoria and covers a 40 mile strip of the western part of the coastal Tertiary basin.

In this memorandum the structural features of the area only are discussed and it is intended to incorporate the memorandum in a more detailed report later.

STRUCTURE:-

The main surface structural features in the area are the major faults which stand out in many places as prominent scarps and have a general north west - south east trend. Some gentle folds are visible in the Gambier limestone but these are assumed to be due to slumping or compaction within the limestone and are not considered to have any structural significance. The volcanic cones and plugs that are outstanding topographic features throughout the area particularly around Gambier appear to be closely associated with the major faulting. It is suggested that the basalt lavas have been injected along old fault planes and that the post Tertiary movement in faults around the Mt. Gambier area may be mainly due to fracturing and arching of the sediments as a result of the volcanic intrusives. This is suggested by the fact that around Mt. Gambier the faults appear to increase in throw radially from the centre of intrusion and in places are tilted sharply.

On the accompanying map structure contours have been compiled using available bore data and outcrop information. The structure contours are based on the top of the "Knights Sands Group" and values shown are plus or minus sea-level. Although accurate bore control is limited in places, sufficient control is possible over most areas to give a reasonable general picture of the Tertiary subsurface structure.

The deepest on-shore part of the basin appears to be southeast of Mt. Gambier in the Portland-Cape Bridge water area where a deep trough, possibly containing up to 10,000 ft. of Tertiary, extends southward from Nelson Bore towards Portland. A fault displaced continuation of this trough continues northward from the Nelson bore and is terminated to the north by the Kanawinka fault.

In the western part of the area a syncline is shown running almost east-west from Robe. There is little or no bore information to prove this feature but its existence is suggested by the gravity map of the area. It seems likely that this syncline which narrows at Robe widens again and includes the basin to the west.

The lack of deep bore information around Beachport leaves the south western edge of the basin contours incomplete but it is assumed that they may swing round sharply and rise towards the Mt. Burr fault north of Beachport. The Mt. Gambier high appears to be due to uplift of a fault block or horst rather than normal folding and the tilt of the Tertiary block has probably been accentuated by buckling due to intrusion of Tertiary basalts.

The northern margin of the basin is bounded by the Naracoorte and Kanawinka faults. The Tertiary displacement along these faults at least down to the top of the Knights Sand Group does not appear to be very great except on the southern extension of the Kanawinka fault where the influence of the Glenelg fault results in a combined total throw of about 900ft. The basinward faults namely the Glenelg, Mt. Burr and Nelson faults appear to be major structural features and in places indicate considerable displacement of the Tertiary sediments. The area of minimum displacement on these faults seems to be centered around the Mt. Burr and Mt. Gambier volcanics, suggesting that during the late Tertiary period of volcanic activity the intruding basalts have arched the Tertiary sediments and caused sharp tilting of the Tertiary around the margins of the zone of intrusion.

East of Portland the Tertiary sediments are covered by a mantle of basalt and volcanic ash and as no deep bore information is available little is known of the structural trends or thickness of this part of the basin. The nearest reliable structural information east of Portland is the fault and fold trends in the Otway Range. The striking point about this major structural feature is that the fold and fault lines develop a northeast - southwest trend which is an abrupt change to those on the west side of the basin.

Although an arc development in the central part of the basin may link the opposing trend lines it is thought that the meridional faulting in the Grampians together with the southward nosing of the basement ridge, at Chatworth, north of Warnambool suggests the possibility of major north-south faulting being present in the basin just east of Portland. Such a fault system would constitute a hinge line between the opposing eastern and western basin trend lines and may even give rise to a relatively shallow basement ridge separating the Gambier-Portland Basin from the eastern Port Fairy - Otway embayment.

On the above assumption a tentative fault called the Grampian fault is shown on the structure contour map east of Portland. The available bore information is not sufficient to conclusively prove this fault and its position or existence is mainly speculative.

CONCLUSIONS:-

It is concluded that the Gambier Portland Basin has been developed by a series of step faults and that the Tertiary may attain a thickness of up to 10,000 ft. in the deeper parts of the basin. Tilted and flexed fault blocks are thought to be the main structural feature of the basin and major fold developments are probably absent. Structural possibilities for oil are thought to be restricted to the deeper parts of the basin where differential uplift of fault blocks may result in deeply buried features similar to the exposed Otway Range and Casterton Jurassic structures.

The Mt. Gambier high is considered to be badly faulted and the structure, probably so complicated by volcanic intrusion that consideration of this feature as a potential oil structure is not warranted at this stage and that future work should be concentrated on the deeper parts of the basin particularly south of Gambier and around Portland.

Plan No L 54 - 61/1.
in Records Branch.

2