

483  
DEPT. NAT. RES & ENV  
PE903980

HEATHFIELD No 1  
COMPLETION  
REPORT  
(W483)

See also: "Lithofacies Data Sheet (B)" prepared by  
Cundill Meyers & Assoc. for Shell Development  
(Aust.) Pty. Ltd. 1967.

PLANET EXPLORATION COMPANY  
SYDNEY

W483

PLANET HEATHFIELD NO. 1

COMPLETION REPORT

for

PLANET EXPLORATION COMPANY  
PTY.LTD.

by

J. R. Cundill of

Cundill, Meyers and Associates.

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## I SUMMARY

Planet Exploration Company's Heathfield No. 1 well is located about ten miles west south west of Casterton, Victoria, and was drilled to a depth of 7500' by an Australian Drilling Company T32 rig.

The well was located on a seismic structure on the downthrown side of the Kanawinka Fault, in an area known either as the Gambier Sunklands of the Murray Basin or as the Gambier Portland sub basin of the Otway Basin.

The well was spudded in recent sands within a Crown forest reserve. It encountered 70' of Pleistocene sands at a depth of 80' underlain by 780' of Eocene Knight Group sands and clays. The Palaeocene Bahgallah Formation was encountered at 931' and was 111' thick. Underlying the Bahgallah Formation, between 1042' and 1217', is a 175' thick unit with possible Bahgallah affinities. Beneath this unit, from 1217' to 1678', is a 461' thick section dominantly of sands which are believed to be possibly of Upper Cretaceous age. The Lower Cretaceous Merino Group was encountered at 1678'.

At 4115' a 29' section of dominantly well sorted angular unconsolidated sand was encountered which yielded a large recovery of gassy salt water on drill stem test. Net porosity totals 25' and permeability and porosity is excellent. see p 29

Cores taken below this sand to total depth showed dips of between 5 and 20 degrees. The cores of this dipping section showed abundant evidence of depositional slumping and cross bedding.

The well remained in siltstone, mudstones, sandstones, and shales, believed to be Merino Group, to the total depth of 7500'.

Technical control at the well site was provided by J. Cundill of Cundill, Meyers and Associates, assisted by G. Brown, of Planet Exploration Company Pty. Ltd. Electric logging was carried out by Schlumberger SEACO Inc., drill stem testing by Halliburton Ltd., and Core Laboratories Australia Ltd. provided a gas detector.

## II INTRODUCTION

The Planet Heathfield No. 1 well was planned to test the apparent crest of a closed anticlinal structure, located and defined by seismic methods and which was expected to have an estimated closure in excess of 300' on a reflector approximately 2000 feet deep at the location. The well was planned to a depth of 6000' with the proviso that deeper drilling would be considered if it appeared warranted when that depth had been reached. At 6000' the 4½" drill pipe being used was replaced by 3½" pipe and the well was drilled ahead to 7500' without reaching basement.

The well was spudded in at 9.30 pm. on March 6th., 1964 after running and cementing 38' of conductor pipe. A 17½" hole was drilled to 635' at which depth 635' of 13⅜" casing was run and cemented to surface. An 8¾"

hole was drilled ahead to 3921' and reamed out to 12 $\frac{1}{4}$ " to a depth of 2020'. A string of 9 $\frac{7}{8}$ " 36lb. J55 casing was run and cemented at this depth with 250 sacks, to case off the unconsolidated Knight Group and Upper Cretaceous? sands. An 8 $\frac{3}{4}$ " hole was drilled ahead to the total depth of 7500', which was reached on April 21, 1964.

Electric, Microlog-Caliper and Sonic-Gamma Ray logs were run between the shoe of the surface casing and the bottom of the hole. In addition, the Gamma Ray was run through the surface casing to within 100' of the surface. A dipmeter survey was run from the shoe of the intermediate string (2020') to total depth.

A total of 19 cores was cut between 960' and 7500' using a 15' Reed barrel and 7 $\frac{7}{8}$ " conventional hard formation core heads. Core cuts were distributed to the Bureau of Mineral Resources, the remainder of the cores being shipped to the Mines Department of Victoria. Cuttings were collected at 10' intervals from 14' to total depth. Sets of cuttings were distributed to the Bureau of Mineral Resources, the Mines Department of Victoria and Planet Exploration Company.

A Core Lab. gas detector, employing a hot wire Johnson Williams type filament, was used throughout. Very minor readings were obtained between 3460' and 3470' and were associated with a coal seam. Further very minor readings were obtained after running D.S.T. No. 2 4078' to 4144'.

Three drill stem tests were run in the hole. The only fluid recovery was obtained from D.S.T. No. 2, 4078' to 4144', where 400' of muddy, gassy salt water and 3560' of gassy salt water was obtained.

The well was abandoned on April 23, 1964 by running plugs 3900'-4000', 1985'-2070' and 0-50'.

### III WELL HISTORY

#### (1) General Data

- (a) Well Name and Number: Planet Heathfield No. 1 well
- (b) Location: Latitude 37 $^{\circ}$  37' 38" S.,  
Longitude 141 $^{\circ}$  11' 08" E.  
County of Follett, State of Victoria.
- (c) Tenement Holder: Planet Exploration Company Pty.  
Ltd.,  
196 Grey Street,  
South Brisbane, Queensland.
- (d) Details of Petroleum Tenement:  
Petroleum Exploration Permit No. 26  
State of Victoria, expiring on  
December 31, 1964.
- (e) District: Casterton
- (f) Total Depth: 7500'
- (g) Date Drilling Commenced March 6, 1964.

- (h) Date Drilling Completed: April 21, 1964.
- (i) Date Well Abandoned: April 23, 1964
- (j) Date Rig Released: April 24, 1964
- (k) Drilling time in days to total depth: 45
- (l) Kelly Bushing Elevation (Datum for drilling depths): 244' A.S.L.  
Ground Elevation: 230' A.S.L.
- (m) Status: Dry and Abandoned.

(2) Drilling Data

- (a) Drilling Contractor: Australian Drilling Company Pty. Ltd.  
11th floor, Wynyard House,  
291 George St., Sydney N.S.W.
- (b) Drilling Plant: Make: National  
Type: T32  
Rated Capacity: 6000' with 4½" Drill Pipe  
7500' with 3½" Drill Pipe  
Motors: Caterpillar DV8-364  
275HP diesel
- (c) Mast: Make: Lee C. Moore  
Type: 126' Cantilever  
Capacity: 450,000 lbs.
- (d) Pumps: 

	<u>Make</u>	<u>Type</u>	<u>Size</u>	<u>Motors</u>
	Emsco	MM600	7¾" x 16"	Superior PTDS-6
	Ideco	D175	6¾" x 12"	GMC Twin 4 471
- (e) Blowout Preventor Equipment:

<u>Make</u>	<u>Type</u>	<u>Size</u>	<u>Working Pressure</u>
Schaffer	B Double Gate	10"	3000 psi.
Hydril	G.K.	10"	3000 psi.
- (f) Hole Sizes and Depths: 

29"	to	38'
17½"	to	635'
12¼"	to	2020'
8¾"	to	7500'
- (g) Casing Details: 

Size:	24"	13⅜"	9⅝"
Weight:	-	48lb.	361b.
Grade:	-	H40	J55
Setting Depth:	38'	635'	2020'
- (h) Casing Cementing Details:

Casing Size:	24"	13⅜"	9⅝"
Setting depth:	38'	635'	2020'
Sacks Cement:	282	450	250
Rise of Cement behind casing:	To	To	Not to
	surface	surface	surface

	24"	13 <sup>3</sup> / <sub>8</sub> "	9 5/8"
Method used:	Dumped	Pumped	Set 60 sack cement plug at 2100'. Pumped off plug around shoe.

- (i) Drilling fluid: Fresh water bentonite mud. For average daily properties see Appendix E.
- (j) Water Supply: A water well was drilled several hundred feet from the location to a depth of 60'. Water was produced from this well at a rate of about 1200 gallons/hour using a National Pump Jack and a 3HP electric motor.

(k) Perforating and shooting record: Nil

(1) Plugging back and squeeze cementation jobs:

A 60 sack plug was set at 2100' for the purpose of setting the 9<sup>5</sup>/<sub>8</sub>" casing. This plug was subsequently drilled out. The only other plugs run were those for the abandonment programme.

<u>Interval</u>	<u>Length</u>	<u>Sacks of Cement</u>
3900'-4000'	100'	60
1985'-2070'	85'	60
0'-50'	50'	25

(m) Fishing jobs: Nil

(n) Side tracked hole: Nil

(3) Logging and Testing

(a) Cuttings: Samples were collected at 10' intervals and at closer intervals where the lithology warranted it. Cuts were distributed to the Bureau of Mineral Resources, the Mines Department of Victoria and Planet Exploration Company. Examination of the cuttings as they were collected over the shaker was maintained on a 24 hour a day basis. Drilling breaks were circulated up and bottom hole circulation samples obtained before tripping.

(b) Coring: A total of 19 cores were cut as follows:

<u>Core No.</u>	<u>Interval</u>	<u>Recovery</u>	<u>%Recovery</u>	<u>Type of Core Head</u>
1	960-975	13'6"	90%	Conventional HF
2	1378-1393'	12'0"	66%	" "
3	1858-1863'	0'5"	8%	" "
4	1863-1873'	10'0"	100%	" "
5	2365-2373'	0'6"	}	" "
6	2373-2381'	13'4" (Includes 5'4" left in hole from Core 5.)		" "



Core No.	Interval	Recovery	%Recovery	Type of Core Head
7	2874-2884'	4' 10"	48%	Conventional HF
8	3377-3387'	1' 6"	15%	" "
9	3754-3764'	9' 3"	92%	" "
10	4144-4154'	10' 0"	100%	" "
11	4614-4620'	nil		" "
12	4620-4626'	12' 0" (Includes 6' left in hole from Core 11)		" "
13	5026-5036'	8' 6"	85%	" "
14	5406-5416'	10' 0"	100%	" "
15	5693-5703'	10' 0"	100%	" "
16	5990-6000'	9' 0"	90%	" "
17	6380-6390'	10' 0"	100%	" "
18	6890-6900'	7' 0"	70%	" "
19	7487-7500'	12' 0"	92%	" "

Samples from the cores were distributed to the Bureau of Mineral Resources and the remainder were shipped to the Mines Department of Victoria.

(c) Side wall sampling: Nil

(d) Electric and other logs: The hole was logged by Schlumberger SEACO as follows:

Electric Logs: Run 1 - 636-1370'  
Run 2 - 1270-3592'  
Run 3 - 3472-6119'  
Run 4 - 6019-7504'

Microlog-Caliper: Run 1 - 636-1370'  
Run 2 - 1270-3576'  
Run 3 - 3476-6118'  
Run 4 - 6018-7504'

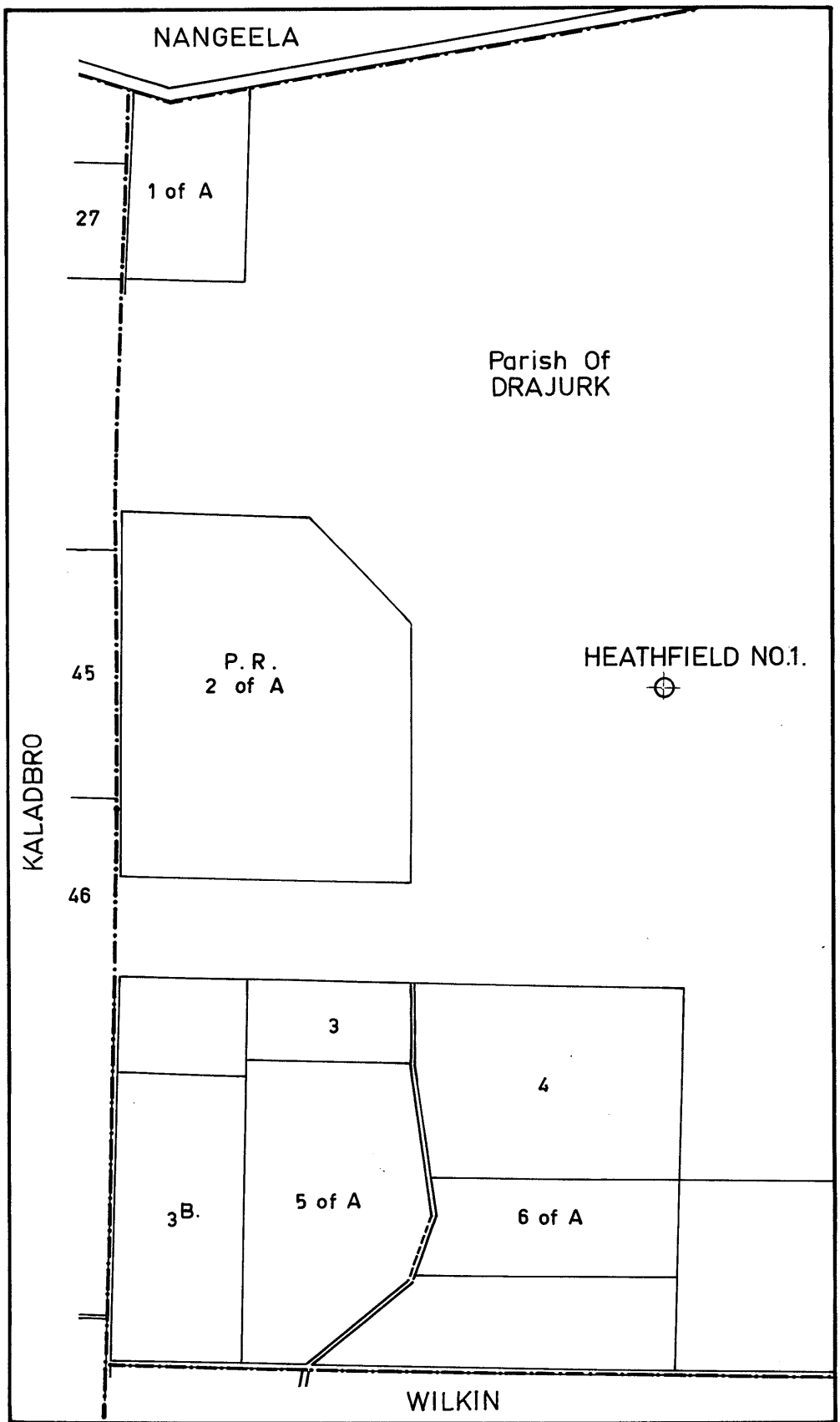
Sonic Gamma Ray: Run 1 - 635-1365' Gamma alone  
100-635' (cased)  
Run 2 - 1265-3910'  
Run 3 - 3810-6110'  
Run 4 - 6010-7494'

Dipmeter Survey: Run 1 - 2020-7500'

Velocity Survey: A velocity survey was conducted on the hole by Namco International in conjunction with Schlumberger SEACO, see Appendix No. F

(e) Drilling time and Gas Log:

An Eastman Oilwell Survey Co. Ltd. Star recorder was used to record the drilling rate. A Core Laboratories Australia (Q'land) Ltd. hot wire type gas detector, using a Johnson Williams filament was used on the well. The gas log appears on the composite log and is discussed under "Occurrence of Hydrocarbons".



LOCALITY MAP  
HEATHFIELD NO.1.  
 DRAJURK COUNTY OF FOLLET  
 SCALE: 1"=40 Chns.

FEBRUARY 1964

MAP NO. E-251

ENCLOSURE 1.

(f) Formation Testing:

Three drill stem tests were run during the drilling of the well. All tests were run using a Halliburton Hydrospring single packer tester using a 5/8" bottom hole choke. Two pressure bombs were used in each test. These were both Amerada (BT) type devices, one of which was run inside the tester 10' above the packer and one run at the base of the tail pipe.

There were no misruns or packer seat failures.

D.S.T. No. 1 Interval: 3658-3754'  
Initial shut in period 15 mins.  
Valve open 30 mins.  
Final shut in period 15 mins.  
Bottom hole choke 5/8"  
Weak initial air puff, followed by weak air blow for duration of test.  
Recovered 80' of drilling mud.  
Pressures: Initial hydrostatic 1890 psi.  
Initial shut in 1439 psi.  
Initial flow 75 psi.  
Final flow 89 psi.  
Final shut in 1064 psi.  
Final hydrostatic 1876 psi.

D.S.T. No. 2 Interval: 4078-4144'  
Initial shut in period 20 mins.  
Valve open 30 mins.  
Final shut in period 20 mins.  
Strong initial air puff, followed by strong air blow gradually decreasing.  
Bottom hole choke 5/8".  
Recovered 3960' of fluid consisting of 400' of muddy gassy salt water and 3560' of gassy salt water.  
Pressures: Initial hydrostatic 2062 psi.  
Initial shut in 1766 psi.  
Initial flow 1616 psi.  
Final flow 1753 psi.  
Final shut in 1759 psi.  
Final hydrostatic 2042 psi.

D.S.T. No. 3 Interval: 5608-5643'  
Initial shut in period 20 mins.  
Valve open 40 mins.  
Final shut in period 20 mins.  
Bottom hole choke 5/8".  
Weak initial air puff, followed by a very weak air blow dying after 35 minutes.  
Recovered 10' of drilling mud.  
Pressures: Initial hydrostatic 2917 psi.  
Initial shut in 54 psi.  
Initial flow 6 psi.

Final flow 7 psi.  
 Final shut in 16 psi.  
 Final hydrostatic 2895 psi.

(g) Deviation Surveys:

The following deviation surveys were run:

<u>Depth</u>	<u>Deviation from vertical</u>
540'	$\frac{1}{4}^{\circ}$
635'	$\frac{3}{4}^{\circ}$
960'	$\frac{1}{2}^{\circ}$
1850'	$1\frac{1}{8}^{\circ}$
2365'	$\frac{3}{4}^{\circ}$
3377'	$\frac{1}{2}^{\circ}$
3921'	$\frac{3}{4}^{\circ}$
4404'	$\frac{1}{4}^{\circ}$
5026'	$2^{\circ}$
5210'	$2\frac{1}{2}^{\circ}$
5406'	$2^{\circ}$
5604'	$4\frac{1}{4}^{\circ}$
5643'	$4^{\circ}$
5693'	$4^{\circ} 3\frac{3}{4}^{\circ}$
5990'	$4^{\circ}$
6116'	$4^{\circ}$
6380'	$4\frac{1}{2}^{\circ}$
6666'	$3^{\circ} 3\frac{1}{2}^{\circ}$
6890'	$3^{\circ}$
7096'	$3^{\circ}$
7307'	$3^{\circ}$

(h) Temperature Surveys:

Bottom hole temperatures taken in the course of logging by Schlumberger SEACO, were as follows:

<u>Depth</u>	<u>Temperature</u>
1370'	$85^{\circ}\text{F}$
3593'	$112^{\circ}\text{F}$
6120'	$140^{\circ}\text{F}$
7500'	$174^{\circ}\text{F}$

These figures indicate a geothermal gradient of  $1.2^{\circ}\text{F}$  per 100' between 1370' and 3593',  $1.1^{\circ}\text{F}$  per 100' between 3593' and 6120', and a rise to  $2.4^{\circ}\text{F}$  per 100' between 6120' and 7500'.

IV GEOLOGY

(1) Summary of Previous Work.

Petroleum Exploration Permit No. 26 of Planet Exploration Company adjoins the Victoria-South Australia border and consequently has enjoyed the advantages of attention from both Victorian and South Australian geologists. The area is considered by some workers to be a portion of the Murray Basin and by others to be a part of the Otway Basin of Victoria.

Early workers on the Victorian side of the border included Caldwell (1937-1941) and Kenny and McEachern (1937) who were involved with the reconnaissance mapping of the parishes of Killara, Bahgallah, Dergholm

Roseneath and Myaring, between about 1927 and 1932.

It was during this period that the Kanawinka Fault was recognized.

In 1945 the Nelson Bore, about 30 miles to the south of the Heathfield No. 1 well was drilled to a depth of 7305'.

A regional airborne magnetometer survey was carried out in 1949 and Boutakoff (1952) published a paper discussing the structural pattern of the area. An important contribution was made by Kenley (1954), who recognized Cretaceous rocks in the area. In 1961 a paper on the sediments of the Nelson Bore was published by G. Baker. Since 1957 Frome-Broken Hill Company has carried out regional ground gravity surveys, which included work at the western end of the Otway Basin. During 1962 the same company conducted seismic surveys in the area of Orford and Bessiebelle, north-east of Port Fairy, and towards the close of 1962 and early 1963 drilled two wells in the area. The first of these wells, which were located about 60 miles south-east of the Planet Heathfield No. 1 well, was Frome-Broken Hill Pretty Hill No. 1, which penetrated Cambrian basement at 7874'. The second well was Eumeralla No. 1 which was taken to a depth of 10,308'.

Seismic work on Planet's P.E.P. No. 26 was carried out by Geoseismic and Namco in 1962, and by Austral Geo Prospectors in 1963. A review of the seismic work by E.A. Krieg in 1963 resulted in the selection of the site for the Planet Heathfield No. 1 well.

In the meantime, across the border in South Australia, the Murray Basin had been under geological investigation for a great number of years. A large amount of information on the Recent Pleistocene and Tertiary sequence was accumulating from surface work and the numerous water wells drilled in the area. In 1952 R.C. Sprigg published a bulletin on the Geology of the South Eastern Province of South Australia, and in 1953 R.C. Sprigg and N. Boutakoff published a summary report on the petroleum possibilities of the Gambier Sunlands. In 1960 E.P.D. O'Driscoll published a bulletin on the Hydrology of the Murray Basin Province in South Australia. The area has been the subject of a number of aeromagnetic and seismic surveys. A few deep wells have added greatly to the knowledge of the pre-Tertiary on the South Australian side of the border. The first of these was the O.D.N.L. Penola No. 1 well which was drilled in 1961 to a depth of 4985' and which was located about 24 miles north-west of Heathfield No. 1. This well was followed in 1961-62 by the South East Oil Syndicate Beachport No. 1 well which was taken to a depth of 3963'. In 1962 the O.D.N.L. Mount Salt No. 1 well (about 31 miles to the south-west of Planet Heathfield No. 1) was drilled to a depth of 10,004'. In the same year R.C. Sprigg was the author of a paper on the oil and gas prospects of the Gambier-Portland Basin. (A.P.E.A. Conference Papers 1962)

In 1963 the Beach Petroleum Geltwood No. 1 well was drilled to a depth of 12,300'. A great deal of palynological work has been carried out on these wells in the area by officers of the South Australian Mines Department, (N.H. Ludbrook), the Bureau of Mineral Resources (P.R.Evans and E.A.Hodgson) and the Victorian Mines Department (J. Douglas). In the absence of much in the way of marine fossils in the area, this palynological work has contributed much in the way of establishing age divisions.

Reflection seismic work on the South Australian side of the border has not met with notable success, and at the time of drilling Heathfield No. 1, refraction seismic surveys were in progress in the Penola-Millicent-Mt. Gambier areas.

## (2) Summary of Regional Geology

The area of the Heathfield well is related geologically to the Murray Basin, which occupies a huge land area extending to Narrandera, N.S.W. in the north-east, near Broken Hill in the north and to the ocean in the Mt. Gambier area to the south-west. Over most of the area the basin is very shallow and the sediments are mostly of Tertiary age. Approaching the Southern Ocean to the south-west, the Murray Basin is constricted by the Mt. Lofty range and the Padthaway granite ridge to the west and the "Dundas Peninsula" to the east. From this area of constriction to the Southern Ocean the sediments thicken at a most remarkable rate to give what may be one of the thickest Mesozoic sections in Australia.

This thickening is probably related to a system of faults downthrown on the seaward side and which were probably active prior to and during sedimentation. As well as a thick Tertiary section both Upper and Lower Cretaceous is present. The total maximum thickness has not yet been established but the maximum Mesozoic section must be considerably in excess of 16,000 feet. The section underlying the Mesozoic in the deeper part of the area is unknown. This part of the Murray Basin is known as the "Gambier Sunlands" or the "Gambier Portland Sub Basin" of the Otway Basin.

Heathfield No. 1 is located on the downthrown side of one of the major faults (Kanawinka Fault) which mark the margin of the Gambier Sunlands. Although it is close to the margin, a total of 7500' of sediments was penetrated without encountering basement. The well was located on a structure believed to be part of a high structural ridge paralleling the Kanawinka Fault on the downthrown side.

(3) Stratigraphic Table (Note: KB 244' ASL)  
(Ground 230' ASL)

Age	Formation	Lithology	Top Below KB	Subsea	Thick-ness
			<i>Pipmeter.</i>		
Recent		Sand and clay	At surface	+230'	66'
Pleistocene	Whaler's Bluff	Shelly sand	80'	+164'	70'
Eocene	Dartmoor (Knight Group)	Sand and clay	150'	+94'	525'
Eocene	Dartmoor (Knight Group)	Clay	675'	-431'	256'
Palaeocene	Bahgallah (Knight Group)	Greensands and glauconitic clay	931'	-687'	111'
Palaeocene?	Bahgallah	Sand and clay (Clay is glauconitic at base)	1042'	-798'	175'
Upper Cretaceous	Unnamed (M.R.)	Sand and minor clays	1217'	-973'	461'
Lower Cretaceous	Merino Group		1678'	-1434'	5822' +
		Siltstone with interbeds of sandstone and mudstone (Unit i)	1678'	-1434'	822'
		Mudstones, clays, siltstones and sandstones. (Unit ii)	2500'	-2256'	683'
		Mudstones and siltstones with increased sandstone interbeds. Sandstones commonly very calcareous (Unit iii)	3183'	-2939'	932'
		Poorly consolidated quartz sand. (Unit iv)	4115'	-3871'	29'
		Siltstones, sandstones, mudstones, very minor shale and coal seams. (Unit v)	4144'	-3900'	892'

ca 2045  
av dip 11 1/2° S

ca 2940  
av dip 10 1/2° NW

ca 2010  
av dip 16° NE

ca 4290  
av dip 19° S.W.

Dips in cores 7°-20°

Age	Formation	Lithology	Top Below KB	Thick- ness Subsea
	<i>Dipmeter</i>			
		Siltstones, mudstones, sandstones and shales. (Unit vi)	5036'	-4792' 568'
				<i>Mdts are rarely basalitic A. soft shale contact dips 20°</i>
<i>Doubtful</i>	<i>ca 6500'</i>	Siltstones, sandstones, shales and mudstones. (Unit vii)	5604'	-5360' 1896'+
	<i>Av dip 17° N.W.</i>			<i>TP. 7500'</i>

(4) Stratigraphy

(a) Recent - 14' - 80' sand and clay - thickness 66'.  
Lithology: Sand, light grey, fine to medium grained, occasionally coarse grained, consisting of unconsolidated, sub-angular to well rounded, occasionally polished, poorly sorted, grey, white, occasionally pink and yellow quartz with some feldspars, lithic fragments and trace mica. The clay is light grey, light brown, dark grey or black, soft, and contains traces of mica.

Electrical Characteristics: No logs were run over this interval.

(b) Pleistocene - Whaler's Bluff Formation - 80' - 150' shelly sand - thickness 70'

Lithology: Sand, light grey, light brown, coarse to fine grained, consisting of unconsolidated, light grey, light brown, occasionally pink, well rounded to sub-angular, polished to frosted quartz and between 20% and 50% of worn shell fragments including bryozoa. A few small whole gastropods and pelecypods are present.

Electrical Characteristics: No electrical logs were run over this unit, but a gamma ray log was run through the surface casing. The unit showed a fairly consistent reading of 12 API units.

(c) Eocene - Knight Group - Dartmoor Formation is divided into three informal rock units:

- (i) Sand, clay and conglomerate unit - 150'-276' (126')
- (ii) Sand and clay unit - 276'-675' (399')
- (iii) Clay unit - 675'-931' (256')

Lithology: (i) Sand, clay and conglomerate unit  
150'-276' (126')

The sand is white, coarse grained, and varies in places to a fine pebble conglomerate. It consists of unconsolidated well rounded to sub-angular quartz grains varying from well sorted near the top to poorly sorted near the base. Some yellow and pink quartz is present as well as traces of feldspar and lithic grains including grains of quartzite and shale. Pyrite traces are present, particularly towards the base. The clay is grey, brown, silty in places and either soft or sticky. It is difficult to separate from the drilling mud.



(ii) Sand and clay unit - 276'-675' (399')

The sand is white, light grey, medium to coarse grained and unconsolidated. It consists of fairly well sorted, sub-rounded, commonly polished, clear, milky, smoky and grey quartz. Traces of pink quartz, mica, pyrite, feldspars and lithic grains are also present, as well as traces of shell fragments. The clay is present only as very minor amounts in the cuttings, most of it being apparently lost in the drilling mud. It appears to be brown, grey, soft and silty. Also present are minor amounts of brown, ferruginous calcareous claystone, and traces of black, pyritic shale, calcareous siltstone, and black, carbonaceous clay.

(iii) Clay unit - 675'-931' (256')

The clay is brown to dark grey in colour, soft, lignitic, silty, finely micaceous, and contains traces of shell fragments. Some limonite nodules, pyrite, small quartz pebbles and glauconite are present in the basal 30'.

Electrical Characteristics: Unit (i) and nearly all of Unit (ii) of the Dartmoor Formation were cased off with the 13 $\frac{3}{8}$ " surface casing prior to electric logs being run. The Gamma Ray log, however, was run through the casing and was useful in delineating sand-clay boundaries in a section where clays were being lost in the drilling mud and the unconsolidated sands were caving badly. The sand intervals read about 12 API units and the clay intervals read between 24 and 38 API units. Electrical, Microlog-Caliper and Gamma Ray Sonic logs were run over Unit (iii) and also a small portion at the base of Unit (ii). Due to the very fresh formation water the SP curve is reversed and there is a negative deflection of about 25 millivolts over the clay section of Unit (iii) relative to the sand section at the base of Unit (ii). The 16" normal resistivity curve reads about 20 ohms M<sup>2</sup>M over the sand logged at the base of Unit (ii). Except for a few thin sand interbeds the resistivity declines over the clay section of Unit (iii) to a minimum of about 5 ohms near the base. The Caliper log indicated the sand at the base of Unit (ii) had washed out to an average of about 10 $\frac{1}{2}$ " from the bit size of 8 $\frac{3}{4}$ ". The Gamma Ray curve reads an average of about 55 API units, over the clay section of Unit (iii) with a few thin sand interbeds reading back to about 36 units. The unit as a whole is distinctly more radio active than units (i) and (ii)

(d) Palaeocene - Knight Group - Bahgallah Formation - 931'-1042' (111')

Lithology: Greensand and glauconitic clay. The greensand consists of medium grained pellets of partly limonitized glauconite showing oolitic structure along with medium and coarse grained angular and rounded quartz in a green, silty, glauconitic, clay matrix. Common traces of pyrite glauconite and limonite pellets occur loose in the cuttings. The clay matrix along with much of some probably marly interbeds has been lost in the drilling mud. Abundant cavings from the Dartmoor Formation are present in the cuttings. The Bahgallah Formation is richly fossiliferous in places, and Core No. 1, which was cut in the unit (960 - 975') contained a rich fauna of bivalves.

Electrical Characteristics: The SP curve is reversed as in the Dartmoor Formation, and the high clay content results in a negative deflection of about 25 millivolts with respect to an underlying sand. Several high resistivity peaks up to 30 ohms M<sup>2</sup>M on the 16" normal probably reflect lime content associated with richly fossiliferous beds. The caliper indicates a washout of the 8 $\frac{3}{4}$ " hole to 13". The high microinverse and micronormal readings of the Microlog probably reflect lime content. The Gamma Ray curve shows an average value of about 54 API units.

(e) Palaeocene ? - Knight Group ? - Bahgallah Formation ?  
1042' - 1217' (175')

Lithology: This unit has some lithological affinities to the Bahgallah Formation, particularly near the base. It consists of sand with clay interbeds, which are glauconitic near the base. The sand is comprized of white to clear quartz and some pink and orange quartz. The quartz is angular to rounded, fairly well sorted, medium to coarse grained and occasionally small pebble size. A trace of pyrite is present. The nature of the clay interbeds is not known as the clay washes out in the drilling mud and was not generally seen as cuttings. Some cuttings were obtained near the base, and the basal 27' probably consists of fossiliferous glauconitic clay and greensand. It should be emphasised that due to a combination of caving of sand and washing out of clay, the lithology of this unit is not certain.

Electrical Characteristics: As in the Dartmoor Formation, the SP curve is reversed due to the drilling mud being more saline than the formation water. There is a 10 to 20 millivolt variation between clay and sand sections. The sand interbeds show high resistivities (40 ohms M<sup>2</sup>M on the 16" normal curve) due to fresh water content. The resistivity drops to a maximum of 20 ohms over the clayey sections, but over the basal section, discussed above under lithology, the resistivity again rises to 40 ohms M<sup>2</sup>M, possibly due to the fossil content. The caliper log shows an uneven hole size over this interbedded section ranging from 9 $\frac{3}{4}$ " to 15" from the bit size of 8 $\frac{3}{4}$ ". The unit appears fairly distinctive on the Gamma Ray log and supports the lithologic interpretation suggested by the Electric log. The sand interbeds have a relatively low natural radioactivity of about 24 API units while the clay interbeds read up to a maximum of 84 API units. The Sonic log also differentiates the sand and clay interbeds. The clay interbeds have the slow travel time of about 145 microseconds per foot, while the sand interbeds read up to 110 microseconds per foot. It is of interest that the basal unit, probably partly consisting of fossiliferous greensand, has a travel time of up to 108 microseconds per foot.

(f) Upper Cretaceous ? 1217' - 1678' (461')

Lithology: Sand and minor clay. Sand generally consists of white, well-sorted fine to medium grained angular to well rounded quartz. Clear, yellow, red, orange and pink quartz, are also present as well as traces of mica, coal, woody fragments, and glauconite pellets. Cavings probably were very abundant. Nature of clay is not certain as it tends

to wash out in the drilling mud. It is probably dark brown, soft, silty, micaceous and may vary to a micaceous silt. A six foot seam of dull, black, slightly pyritic, impure coal is present at 1245'. The logs suggest a fairly distinct break at 1568', below which clays are dominant.

Core No. 2, 1378' - 1393', was cut in the unit, and a 12' recovery was obtained of dark brown, soft, silty clay and coarse grained quartz sand.

Electrical Characteristics: Run 1 of the logs was terminated and Run 2 was commenced within this unit. In the Run 1 portion the SP curve is reversed as in the Dartmoor Formation, due to the Rmf being less than Rw. By the time Run 2 was made, Rmf was higher and, in addition, Rw, particularly near the base of the unit, was lower. Sand interbeds at the base have a fluctuation of -30mv relative to the clay section. The resistivity curves indicate a drop from about 30 ohms M<sup>2</sup>M in sand sections near the top of the unit to about 6 ohms M<sup>2</sup>M near the base, due probably mainly to increased salinity of the formation water. Clay interbeds near the base read as low as 3½ ohms M<sup>2</sup>M on the 16" normal curve.

The Caliper log indicates that the unconsolidated sand of this unit is badly washed out, commonly to in excess of 13" from a bit size of 8¾". One 35' section at 1395' had washed out beyond the limit of the Caliper tool (17"). It is apparent that under these conditions the micro inverse and micro normal curves of the Microlog are not reading useful values.

The Gamma Ray curve indicates that the unconsolidated sand sections have a fairly low level of natural radioactivity averaging about 18 API units. The clay sections read out to a maximum of 84 API units. The Sonic log indicates an average interval transit time of about 140 microseconds per foot.

(g) Lower Cretaceous - Merino Group Units

- (i) 1678'-2500' (822')
- (ii) 2500'-3183' (683')
- (iii) 3183'-4115' (932')
- (iv) 4115'-4144' (29')
- (v) 4144'-5036' (892')
- (vi) 5036'-5604' (568')
- (vii) 5604'-7500' (1896'+)

- (i) 1678' - 2500' (822')

Lithology: Unit consisting of siltstone with interbeds of sandstone and minor mudstones.

The siltstones are green, brown, greenish grey, light grey, micaceous, argillaceous and contain common carbonaceous flecks and laminations as well as traces of poorly preserved plant fragments.

The sandstones are light grey, green and white, fine grained, varying from soft, feldspathic, kaolinitic to slightly harder, calcareous. The sandstone consists generally of angular to sub-angular,

occasionally sub-rounded light grey quartz with some dark grey quartz and chert as well as partly kaolinised white feldspars, minor reworked black coaly grains, carbonaceous flecks, trace mica, and occasional trace glauconite in kaolinitic and calcareous matrix.

The mudstones vary in colour from green, pale green to occasionally brown and grey, and contain in places fine scattered carbonaceous material.

Occasional traces are present of coal and pyrite. Brown silty fine grained limestone and very calcareous dense sandstone interbeds are present between 2052 and 2054' (2'), 2069 and 2071' (2'), 2111 and 2113' (2') and 2432 and 2434' (2').

Cores cut in this unit illustrate the thinly interbedded and laminated nature of the section, and the presence of slump features and plant fragments.

Electrical Characteristics: The SP curve shows a great deal of character and is distinctive from that in the overlying Upper Cretaceous? section. The mudstone base line has moved 15 millivolts to the right with respect to the clay base line of the overlying unit. Fluctuations of up to 45 millivolts are present between sandstone and mudstone beds. These fluctuations are due largely to the marked salinity differences between the mud filtrate and the saline formation water of the Merino Group.

The resistivity curves read low, generally between  $1\frac{1}{2}$  and 2 ohms  $M^2M$ . A few sandstone interbeds read out to 4 ohms  $M^2M$  on the 16" normal curve although the 64" curve reads less than 2 ohms  $M^2M$ . One very dense calcareous interbed at 2432' reads out to 11 ohms  $M^2M$ . The low resistivity readings in the sandstone section elsewhere are due to saline formation water.

The Caliper log indicates that the hole was generally in reasonably good condition except for a few thin zones which had caved out to between 10" and 13". Much of the hole was not caved beyond 9" from a bit size of  $8\frac{3}{4}$ ". A few very thin resistive dense, (calcareous) streaks are indicated by the Microlog. This log does not indicate that any significant porosity is present.

The Gamma Ray curve reads values on the average markedly higher than those of the overlying Upper Cretaceous ? unit. Readings range from about 45 API units in sand sections to a maximum of 72 units in mudstone sections. The Sonic log indicates a slight increase in velocity to an average value of about 130 microseconds per foot compared to about 140 microseconds in the overlying unit.

Unit (ii) 2500' - 3183' (683')

Lithology: Unit consisting of interbedded mudstones, clays, siltstones and sandstones.

The mudstones are green, greenish grey, silty, micaceous, and contain traces of carbonaceous flecks and plant fragments. The clays are grey, greenish grey, soft, silty, micaceous and sandy.

The presence of clay in the cuttings may be due to the bit action on the mudstones. The siltstones are grey to greenish grey, micaceous, argillaceous in places and contain common coaly and carbonaceous flecks. The sandstones are grey, light grey, fine grained to very fine grained, feldspathic, calcareous and consist of sub-angular quartz, minor feldspars, coaly flecks, reworked coaly grains, and traces of mica in a kaolinitic, calcareous, and in places swelling clay matrix. Traces are present of coal, pyrite as well as minor traces of silty, sandy limestone.

The core cut in this unit illustrated the thinly interbedded nature of the unit, and recovered plant fragments.

Electrical Characteristics: The SP curve shows a similar pattern to that in unit (i) with variations between sandstone and mudstone or clay sections amounting to about 40 millivolts.

The resistivity curves are again generally low, rarely exceeding 2 ohms M<sup>2</sup>M. Little caving is indicated by the Caliper log and the hole size is generally not in excess of 9" except for a few thin zones out to a maximum of 11". A few thin resistive, dense, calcareous streaks are indicated by the Microlog. Some very slight positive separation between the micro-inverse and the micro-normal curves is indicated in a few places on the Microlog. The porosity, however, is not effective.

The Gamma Ray curve reads generally slightly higher values than the overlying unit, probably reflecting the higher mudstone and clay content, and the decrease in siltstone. Below 2700' these readings range from about 60 API units up to 84 API units. There is no significant velocity change indicated by the Sonic log, relative to unit (i).

Unit (iii) 3183' - 4115' (932')

Lithology: Unit consisting of mudstones, siltstones with an increased proportion of sandstone interbeds, many of which are calcareous.

The mudstones are green, light grey, light greenish grey, occasionally brown silty, micaceous, containing carbonaceous flecks and plant fragments. The siltstones are greenish grey and light grey, argillaceous, micaceous and contain fine carbonaceous specks and flecks, with an occasional trace of pyrite and some feldspars. The sandstones are light greenish grey to light grey, very fine grained to fine grained, and vary from fairly soft, kaolinitic, feldspathic to fairly hard, very calcareous. They consist of fairly sorted, sub-angular, light grey to grey quartz, minor white feldspars, coaly grains, mica and occasional traces of pyrite, in a kaolinitic to very calcareous matrix.

Traces are present of coal, pyrite, carbonaceous shale, brown, very fine crystalline limestone, sandy limestone, and a trace of gypsum below 4040'.

The cores of this unit illustrate the thinly interbedded and laminated nature of the section, and also indicate the presence of cross laminations and plant fragments.

Electrical Characteristics: The mudstone base line of the SP curve has moved 10 millivolts to the right with respect to that of unit (ii). The shift continues to take place downwards so that at the base of the unit the shift totals 20 millivolts. There is a fluctuation of up to -35 millivolts in sandstone beds near the top of the unit. These amplitude variations decrease downwards, this being probably due to the very dense nature of much of the sandstone. It should be noted that Run 2 of the logs was terminated and Run 3 of the logs was commenced within this unit. The resistivity curves indicate that numerous thin resistive streaks reading up to a maximum of 14 ohms M<sup>2</sup>M on the 16" normal are a feature of this unit. These resistive peaks also appear on the 18'8" lateral curve as well as on the Microlog curves. They are a distinctive feature of unit (iii) and are due to numerous interbeds of electrically resistive calcareous sandstones which vary in places to sandy limestones. The Caliper log indicates some minor washing out in this section but only rarely does the hole size exceed 10" and even then it is not in excess of 11". The Microlog indicates some minor positive separation between the micro inverse and the micro normal curves and the caliper indicates some apparent filtercake build up decreasing the hole size from 8 $\frac{3}{4}$ " to 8". Over the best of these zones some very slight traces of poor porosity were evident in the cuttings. Although it was suspected that the porosity would prove ineffective, a drill stem test was run (Drill Stem Test No. 1 3658'-3754'). Only 80' of mud was recovered on this test indicating that the positive separation and the apparent filtercake build up was not due to effective porosity being present.

The Gamma Ray curve shows a greater range of readings than in unit (ii). The sandstone beds read as little as 38 API units while the mudstones commonly read as much as 84 API units. One distinctive radio-active marker is present between 3274' and 3296', and between 3877' and 3880', have readings between 98 and 108 API units.

There is a slight but clear velocity contract between this unit and the overlying units (i) and (ii), according to the Sonic log. Units (i) and (ii) have an average velocity of about 130 microseconds per foot with a very slight indistinct increase in velocity downwards. At the top of unit (iii) there is a slight but distinct increase in velocity to 115 microseconds per foot. The velocity generally increases to 105 microseconds towards the base of the unit, where between 4045' and 4115' the velocity again increases to about 92 microseconds per foot. The drilling time log also shows a change over unit (iii). Whereas above unit (iii) the drilling rate was generally less than one minute per foot, a slowing of the penetration rate to an average of about 2 minutes per foot is evident through unit (iii).

Unit (iv) 4115' - 4144' (20')

Lithology: Poorly consolidated quartz sand. The

sand is white, coarse grained and consists of fairly well sorted angular quartz varying to very coarse grained and pebbly near the base. The grains occur loose in the cuttings. A trace of feldspar is also present.

Electrical Characteristics: The SP curve shows a very strong fluctuation of -70 millivolts over the main part of this sand (4123'-4144'). Between 4115' and 4119' the SP curve reads -40 millivolts above the mudstone base line. The 16" normal curve reads a maximum of 7 ohms M<sup>2</sup>M. The 64" normal, however, reads as low as about 2½ ohms indicating salt water content. The Caliper log indicates a filtercake build up reducing the hole size from 8¾" to 8". Good positive separation is evident between the micro-inverse and the micro-normal curves. See "Porosity and Permeability of Section Penetrated" for further details.

The Gamma Ray curve shows the sand has a low reading of 18 API units. The Sonic log shows a variation between 97 microseconds per foot in the most porous part of the sand to 80 microseconds per foot in the least porous.

A drill stem test of this sand (Drill Stem Test No. 2 4078'-4144') yielded 3960' of fluid consisting of 400' of muddy gassy salt water and 3560' of gassy salt water. Final flow pressures and shut-in pressures of 1795 psi. were obtained, and the pressure curve indicated the presence of excellent permeability. Samples of gas breaking out of the recovered water at the surface were collected. These samples contained about 73% hydrocarbon gas. The analyses are included under Appendix D.

Unit (v) 4144'-5036' (892')

Lithology: Siltstones, sandstones, mudstones with very minor shale and a few thin coal seams.

The siltstone is light to medium grey, occasionally greenish grey, argillaceous, micaceous and contains carbonaceous and coaly flecks and plant fragments. The siltstone is slightly feldspathic in places. The sandstone is very light grey to light brown, fine grained, varying occasionally to very fine grained or to medium grained, feldspathic (grades to arkose), calcareous, moderately hard (where calcareous), elsewhere fairly soft. It consists of fairly to poorly sorted, sub-angular to sub-rounded, light grey, grey and clear quartz, minor white feldspars, with biotite, muscovite, carbonaceous flecks and coaly grains, and occasional traces of chlorite in kaolinitic to calcareous matrix. Below about 4340' the sandstone in places also contains reworked green and occasionally brown mudstone grains and pellets, as well as occasional pink, yellow and green quartz, vari-coloured lithic fragments, some fine indeterminate green and red specks as well as common carbonaceous and coaly grains. The matrix tends to be more argillaceous and rarely is slightly siliceous. The mudstone is green, grey and varies to medium grey downwards. It is silty, micaceous and contains carbonaceous flecks and plant fragments in places.

The shale occurs as very minor interbeds or as traces. It is dark grey to black, carbonaceous, finely micaceous, silty in places and soft. The coal occurs generally as traces but impure seams are present between 4192' and 4197' (5'), 4322' and 4324' (2'), 4327' and 4331' (4'), 4354' and 4356' (2'), 4370' and 4372' (2'), and 4770' and 4774' (4'). Traces of gypsum are present throughout.

Cores of this unit indicate the presence of dips ranging from 7° to 30°. Although current bedding, cross bedding and slumping is present, this appears to be subordinate to an overall true dip.

Electrical Characteristics: The SP curve shows a fluctuation of up to -50 millivolts over sandstone sections relative to the mudstone and shale baseline. Generally, however, the fluctuations are of the order of 10 to 20 millivolts. The SP readings are an indication of dissimilarity in the salinity of the mud filtrate ~~the~~ the formation fluid and do not indicate effective porosity. The sandstone showing the highest SP curve reading was cored. No effective porosity was present. Resistivities are generally higher in unit (v) than in the overlying units. In the mudstone, shale and siltstone section, readings rarely are present below 3 ohms M<sup>2</sup>M and sandstone interbeds commonly read out to 8 ohms M<sup>2</sup>M on the 16" normal with some thin beds reading to a maximum of 18 ohms M<sup>2</sup>M. The 64" normal curve reads considerably lower reflecting the salt water content of the sandstones. The Caliper log indicates some washing out of the hole but this is rarely in excess of 10". The Microlog shows a positive separation of the micro-inverse and micro-normal curves in places coincident with an apparent filtercake. However, the cores and cuttings do not indicate that any effective porosity is present. The Gamma Ray curve shows a variation between about 84 - 96 API units for mudstones, to up to a minimum of 36 API units for sandstone sections. A distinctly high reading of 120 API units is obtained from a coal seam between 4192' and 4197'. The Sonic log shows a fair amount of character with velocities ranging from 65 microseconds per foot in the harder, calcareous portions of the sandstones, to as slow as a 105 microseconds per foot in some mudstone sections. Coal seams read somewhat lower velocities and the coal seam from 4192'-4197' reads as low as 135 microseconds per foot.

Unit (vi) 5036' - 5604' (568')

Lithology: Siltstones, mudstones, sandstones and shales.

The siltstones are dominantly medium grey, but vary in a number of places to light grey and dark grey, as well as to light brown, medium brown and dark brown. Carbonaceous flecks are very common in the siltstones, which are also micaceous, generally quite argillaceous, and slightly feldspathic in places. Very minor traces are present of gypsum, pyrite and mudstone pellets and pebbles. The mudstones vary in colour from medium grey, medium brown, to greenish grey, green and light grey. They are generally silty, micaceous and contain



minor carbonaceous material in the form of fine specks and flecks. The mudstone is rarely bentonitic. Sandstones are light grey to very light grey in colour; are generally fine grained, varying occasionally to very fine grained. They are commonly slightly to moderately calcareous, kaolinitic, occasionally feldspathic, and consist of fairly sorted, sub angular to occasionally well rounded, light grey quartz, minor, white, partly decomposed feldspars, green and brown reworked mudstone grains and pellets, and other lithic grains. Also present are very minor dark grey, carbonaceous shale fragments, common coaly and carbonaceous grains and flecks, common traces of biotite and muscovite, trace chlorite, light brown clay inclusions, dark grey chert grains, and rare green quartzite grains. These above constituents are present in a kaolinitic to calcareous matrix.

The shale is generally black or dark brown, but may vary locally to dark grey or medium brown. It is characteristically carbonaceous and contains coaly inclusions, and fairly common, poorly preserved, macerated plant fragments. The shales are silty in a few places and only slightly fissile.

A coal seam is present at 5430' consisting of impure black shaly coal, varying in places to bright, with a conchoidal fracture. Gross thickness is about 5'. Traces of coal and gypsum are present throughout, and a few traces are present of pyrite and calcite. Between 5290 and 5400' traces are present of ferruginous, calcareous siltstone, and ferruginous, slightly sideritic claystone.

A core cut in this unit shows a great deal of slumping and depositional disturbance in the sandstone, with dips of some carbonaceous laminations in the sandstone reaching  $60^{\circ}$ . The contact between a sandstone and shale bed dips at  $20^{\circ}$ , and this is probably near the true value, as the average between 4317' and 6483' is  $19^{\circ}$ . (See page 27).

**Electrical Characteristics:** The self potential curve shows good character, the sandstones reading up to a maximum of 27 millivolts above the shale base line. The resistivity curves show numerous high reading peaks, in contrast to the underlying unit. The 16" normal curve reads up to a maximum of 18 ohms M<sup>2</sup>M. The high readings are due to the calcareous nature of much of the sandstone.

The caliper indicated that the hole generally averaged about 9" in diameter (bit size  $8\frac{3}{4}$ " ) and nowhere was caved out beyond 10". The sandstones generally held up best, and some apparent filtercake reduced the hole size, in places, to a minimum of 8". The Microlog shows some positive separation over some of the sandstones but an examination of the cores and cuttings indicated that effective porosity was not present. The numerous high resistivity peaks are again clearly evident on the Microlog. The Gamma Ray curve has a similar character to that of the overlying unit (v), with sandstones reading to a minimum of 34 API units and mudstone and shale reading generally not more than 84 API units. The Sonic log shows a great deal of fluctuation in the sound velocities through different beds, ranging from as fast as 65 microseconds per foot in calcareous sandstone, to as slow as

113 microseconds per foot in shale and mudstone. Velocities as low as 124 microseconds per foot were recorded between 5463 and 5467'. It should be noted that this unit was slower drilling (generally 6-12 MN/ft) than the overlying unit (v) (generally 3-6 MN/ft).

Unit (vii) - 5604 - 7500' (1896+')

Lithology: Siltstones, sandstones, shales and mudstones.

The siltstones are generally medium grey in colour, but vary locally to light grey, brown or dark brown, or greenish grey. Common carbonaceous material is present in the form of flecks and specks, and laminations. Siltstones are argillaceous, micaceous and occasionally sandy. Rare traces are present of gypsum and calcite.

The sandstones are generally light grey in colour, but vary occasionally to very light grey, whitish grey, medium grey or light brown. They are commonly fine grained, grading to very fine and medium grained, and very rarely to coarse grained. They may be hard or moderately soft. The harder varieties are generally very calcareous although the softer kaolinitic variety is commonly also somewhat calcareous. In places the sandstone is brittle and friable and the constituent grains in these cases are recovered loose in the cuttings. In these instances grains commonly up to and including granule size of clear, fresh angular quartz as well as rounded, frosted quartz, are commonly present, together with a few small pebbles of light grey and clear quartz, and very rare pink and white feldspars. Where consolidated, the sandstone is seen to consist of fairly to occasionally poorly sorted, in places frosted, sub angular to at times, sub rounded quartz, which is light grey, white, clear or occasionally pink in colour. Also present are minor white feldspars, black coaly grains, carbonaceous flecks and grains, fairly common coarse muscovite and biotite flakes, very minor dark grey, light grey shale grains, a few brown ferruginous shale grains, and green and brown lithic fragments. There are also traces of red and bright orange specks, trace chlorite, trace quartzite grains, rare phyllite grains, rare pyrite and siderite, traces of plant resin, brown clay inclusions and very rare garnets. These constituents are in a kaolinitic to calcareous matrix. Below 7200' the sandstones are silicified in a few places.

The shale is generally dark grey, dark brown or black in colour, and is commonly carbonaceous, particularly the black variety, and may contain coaly laminations. As the mudstone grades into shale near the base of the unit, the shale varies in colour to medium grey in places. It is commonly slightly micaceous, contains some plant fragments, and is silty in a few places, particularly the medium grey variety.

The mudstones may vary between medium grey, brown, greenish grey and green in colour. They are silty and finely micaceous in places. Minor amounts of carbonaceous material may be present in the form of fine specks and flecks. Towards the base of the unit, the mudstone tends to develop a shaly habit and grades to shale in a few places. Minor inclusions of gypsum are present in places.

Impure seams of black, shaly, dull coal, with minor bright

coal with conchoidal fracture are present between 6280-83', (3'), 6692-95', (3') and 6715-18', (3').

Traces are present throughout of gypsum and coal, although the amount of gypsum appears to decrease towards the bottom of the hole. A few traces of white crystalline calcite are present, possibly from fracture filling. Some rare traces of pyrite, siderite, dark brown ferruginous shale, and brown ferruginous, calcareous siltstones are also present.

Cores cut in this unit show common depositional features such as slumping, swirls, and cross bedding. Overall dip, however, appears to be about  $10^{\circ}$ . Plant fragments are present, and the cores illustrate the thinly interbedded and interlaminated nature of parts of the section.

Electrical Characteristics: Run 3 of logs was terminated and Run 4 commenced within this unit. The self potential curve shows less character than previously, many sandstones reading only a fluctuation of -5 millivolts above the adjoining shale-mudstone base-line. The base line shows a creep of 40 millivolts between the top of the unit and the bottom of the hole.

The resistivity curves reflect the interbedded nature of the section, the 16" normal reading up to a maximum of 4 ohms M<sup>2</sup>M for calcareous sandstones and 4 ohms M<sup>2</sup>M for mudstone and shale.

The caliper curve shows some minor washing out to an occasional maximum of 11", except within the interval covered by D.S.T. No.3, 5608 - 5643', where washing out to 12" occurs, and is probably due to opening the formation to atmospheric pressure during the course of the test. Some of the washing out occurs over intervals where loose quartz grains were obtained in the cuttings. Generally, however, the hole reads less than  $9\frac{1}{2}$ " in diameter. (Bit size  $8\frac{3}{4}$ "). Except for the upper part of the unit, the Microlog shows marked variation in resistivity readings, reflecting the thin bedded nature of the section. The only significant positive separation is associated with caved zones where the tool is partly reading mud values.

The Gamma Ray log shows some increase in the general level of natural radioactivity of unit (vii) with respect to the overlying unit (vi). The average readings between 5745 and 6540' are about 96 API units, and below 6540', the average readings are about 106 API units. The sandstone reading has a minimum of 54 units and rises to a maximum of 116 units between 6345 - 6565'. A low reading of 32 units was obtained between 6910 and 6914'.

The Sonic log shows less interbedded effect than in the overlying unit, most of the velocities being between 83 and 93 microseconds per foot, above about 6320'. Below 6320' there appears to be a greater variation in velocity with values reaching 75 microseconds per foot in a large number of interbeds.

#### (5) Structure

The Planet Heathfield No. 1 well lies on the downthrown

side of the Kanawinka Fault, a major structural feature in South Australia and Victoria.

The seismic work suggested a north-east dip in the area towards this fault, from a high structural ridge on which the Heathfield No. 1 structure is located. Geophysical studies indicated that an anticlinal structure was present with an area of about 6 square miles, and a vertical closure exceeding 300'.

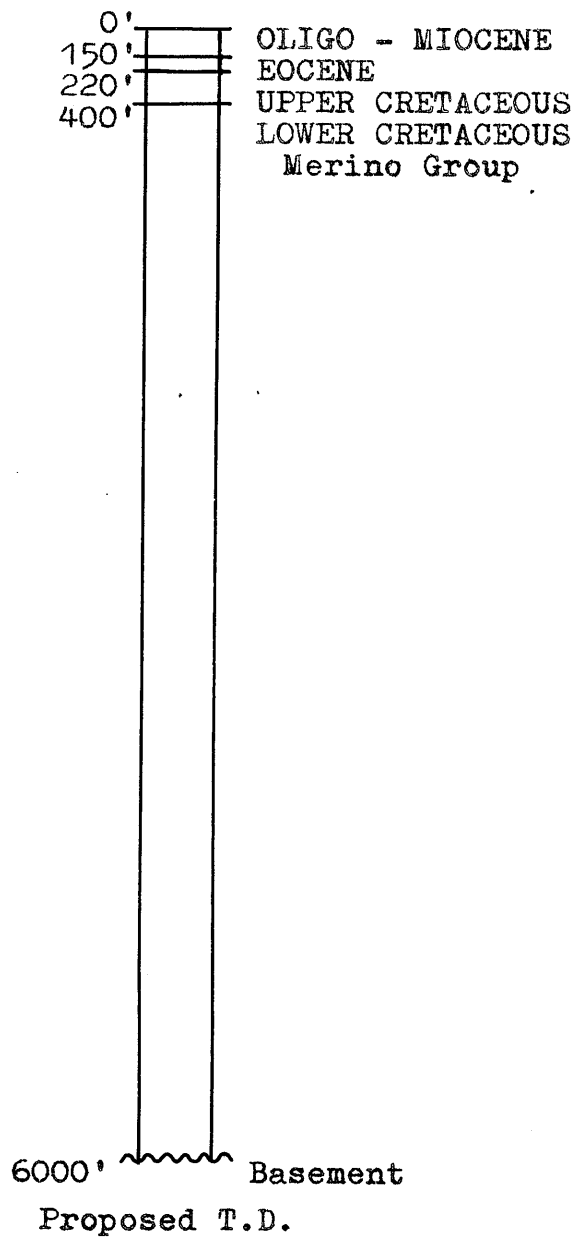
The cores cut in Planet Heathfield well represented only about 2% of the total section drilled, and in addition, a great deal of cross bedding and depositional slumping was present. The dip information obtained from the cores, therefore, cannot be regarded as a very reliable indication of true dip. However, in the cores cut below 4144' dips ranging from 5° to 30° (generally about 10° - 15°) are evident.

The continuous dip meter survey indicated at least 3 and possibly 5 distinct structural units. These units and their dips are tabulated below:-

Interval Structural Unit	Interval	Dip	Direction of Dip
1	2043'-2818'	11½° (crossbedded)	South
2	2861'-4009'	10½° (crossbedded)	N.W.
3	4016'-4267'	16°	N.E.
4	4317'-6483'	19°	S.S.W.
5	6516'-7495'	17°	N.W.

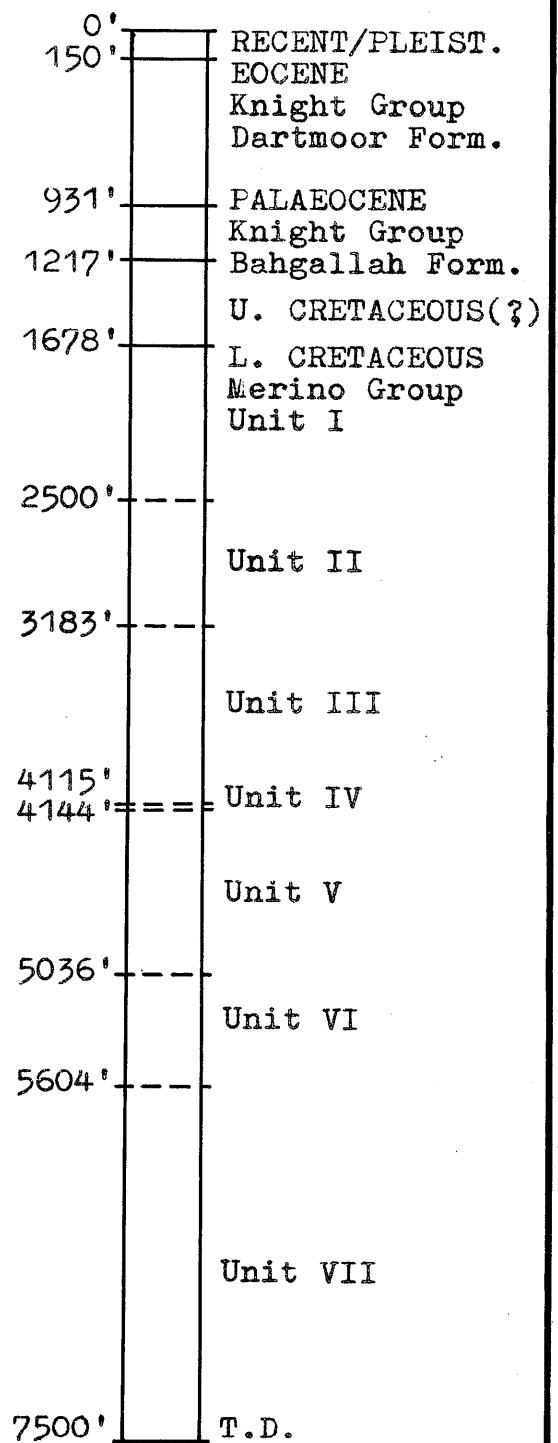
It is possible that units 1, 2 and 3 are in fact only one structural unit, but units 4 and 5 are undoubtedly distinct from each other and the upper units. The dipmeter results have been plotted on rosettes, which are included on the following pages.

BEFORE DRILLING  
(Approximate Depths)



AFTER DRILLING

K.B.244' ASL.  
Gr. 230' ASL.



PLANET EXPLORATION COMPANY PTY. LIMITED

H E A T H F I E L D N O . 1 .

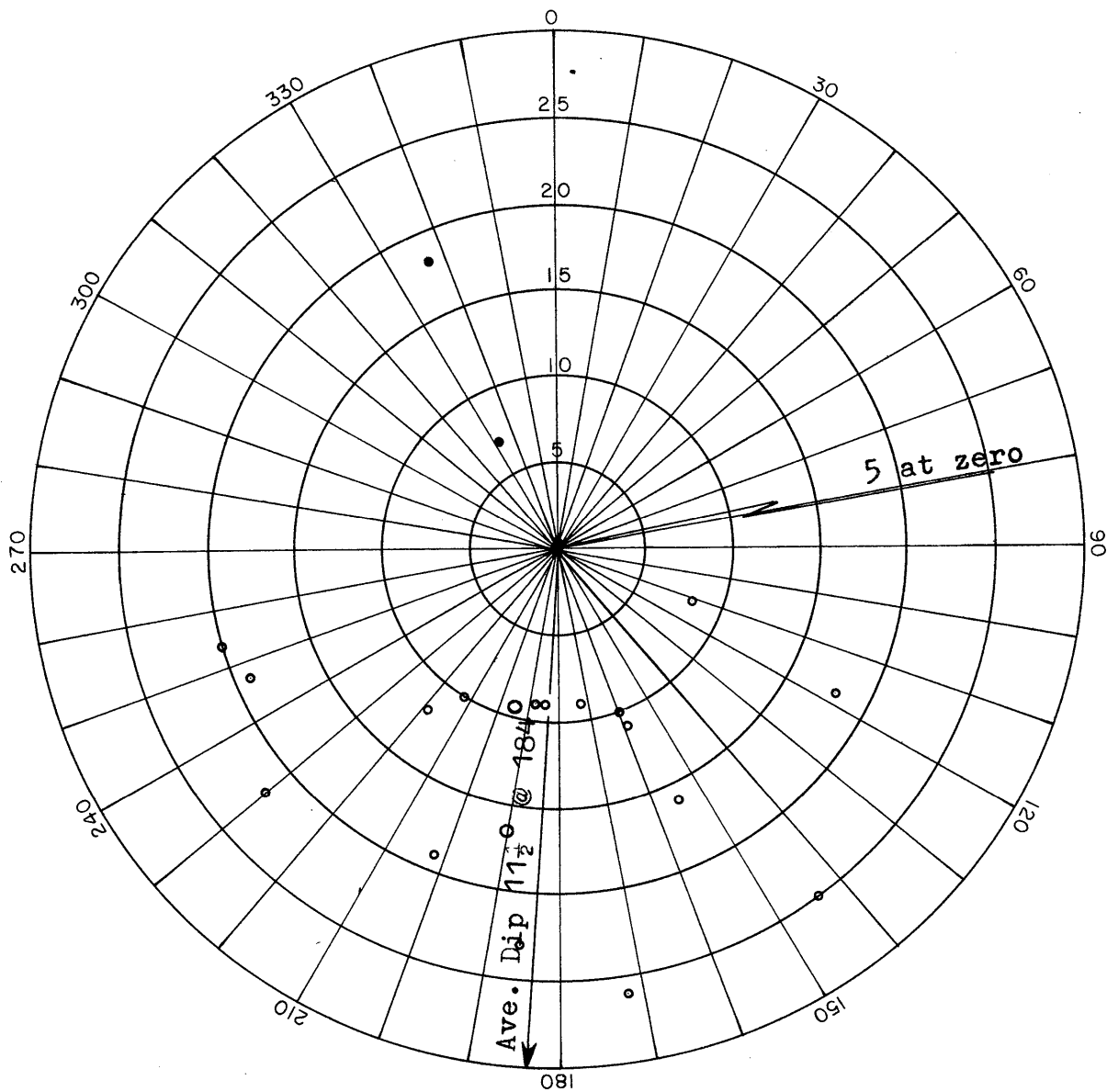
CROSS SECTIONS

BEFORE AND AFTER DRILLING

Scale : 1" = 1000' (Vert.).

Date : August 1964

ENCLOSURE 4.



HEATHFIELD NO. 1

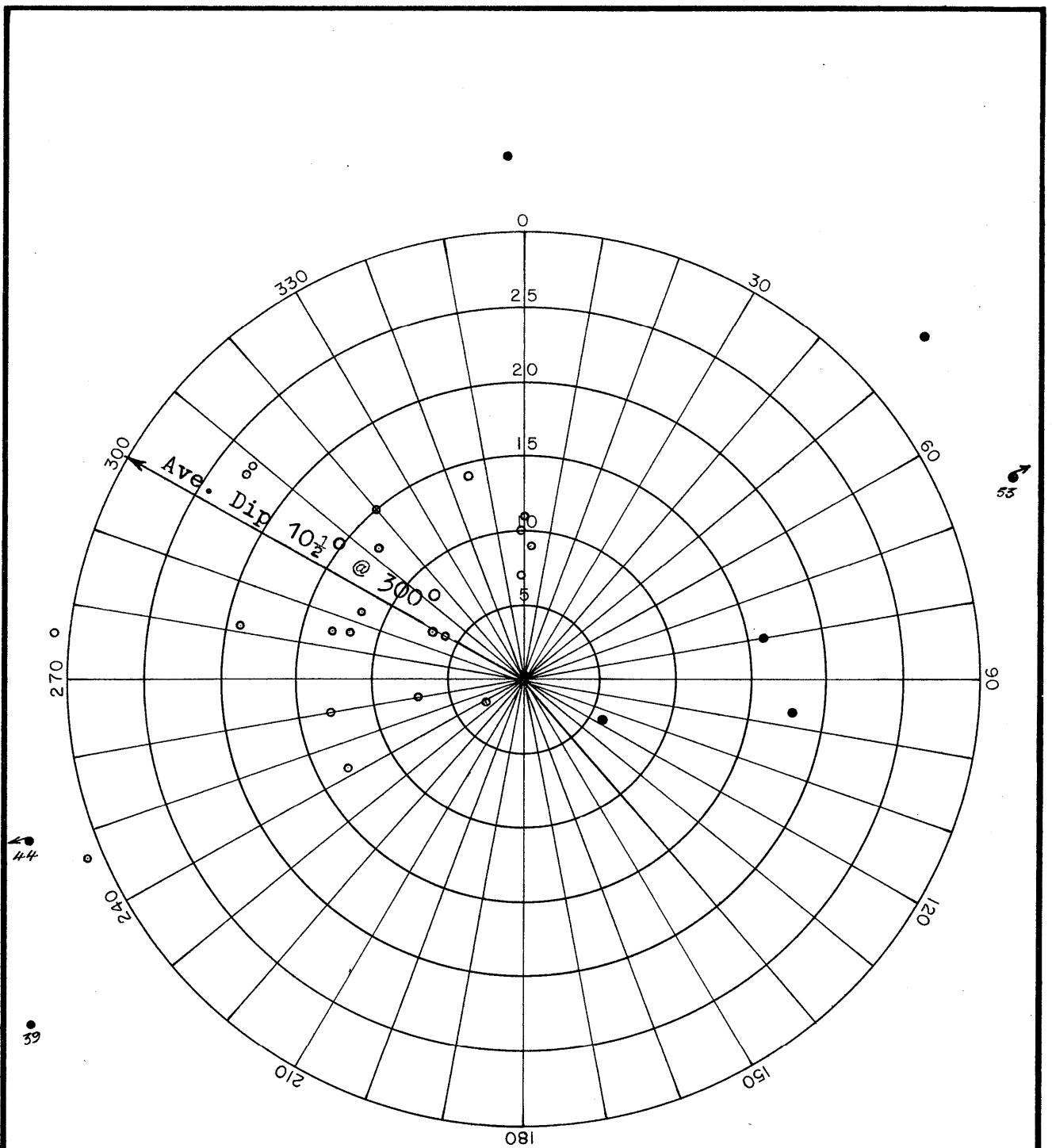
2043' - 2818'

24 readings

22 used ..... °

2 rejected ..... •

Average Dip  $11\frac{1}{2}^{\circ}$  South



HEATHFIELD NO. 1

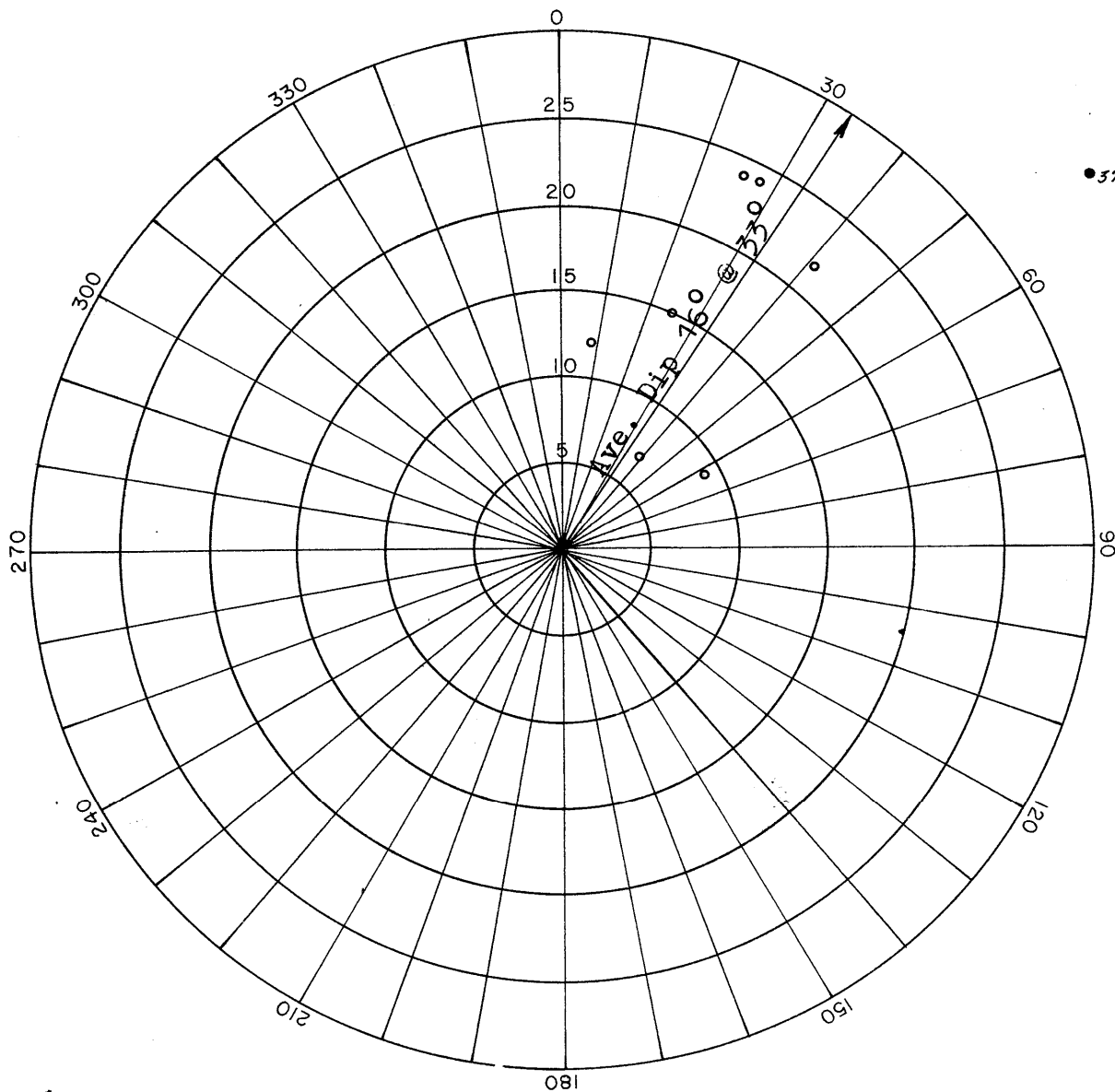
2861' - 4009'

37 readings.

28 used .....

9 rejected .....

Average Dip  $10\frac{1}{2}^{\circ}$  N.W.



HEATHFIELD NO. 1

4016' - 4267'

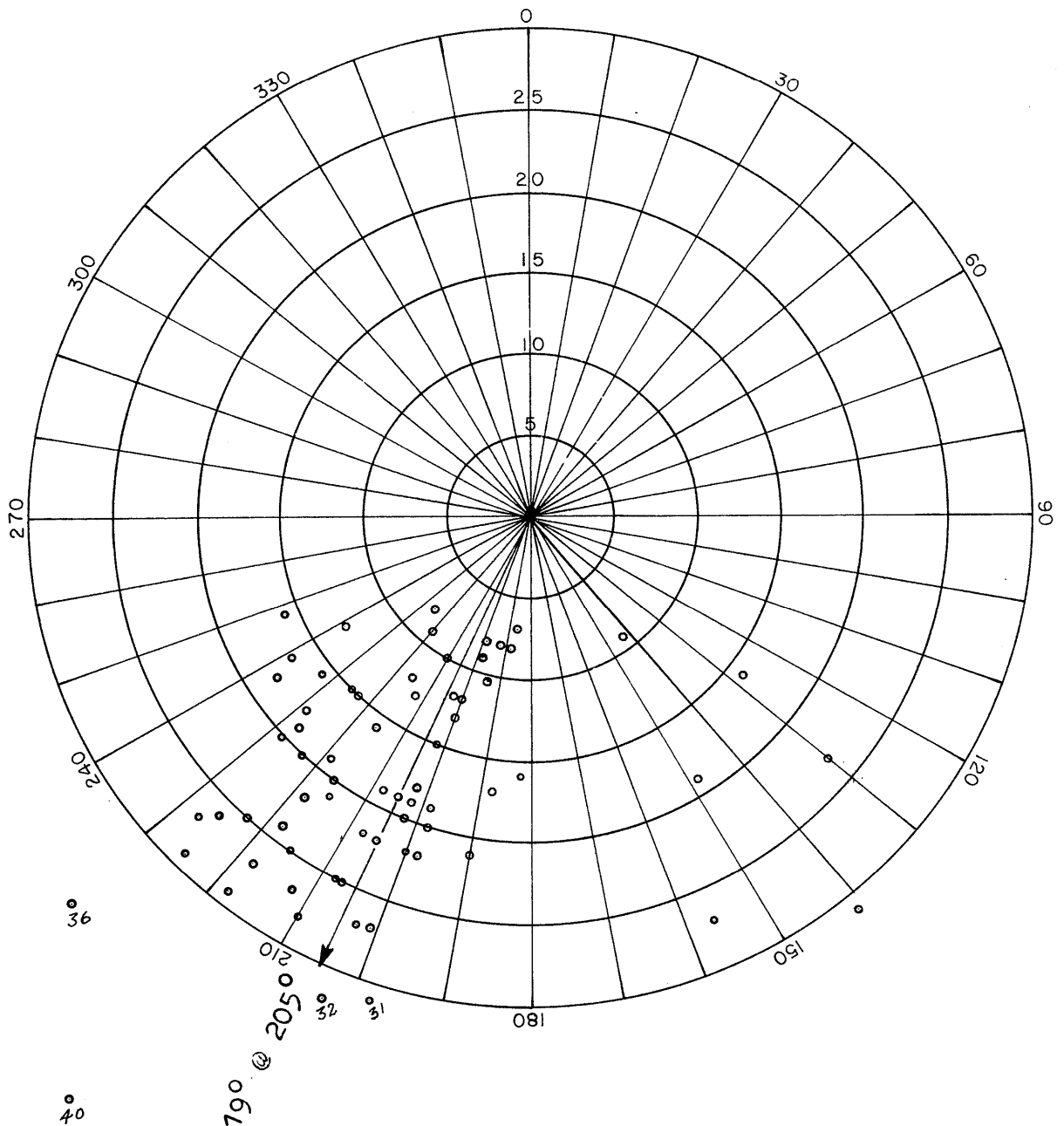
10 Readings

7 Used .....

3 Rejected .....

Average Dip 16° N.E.





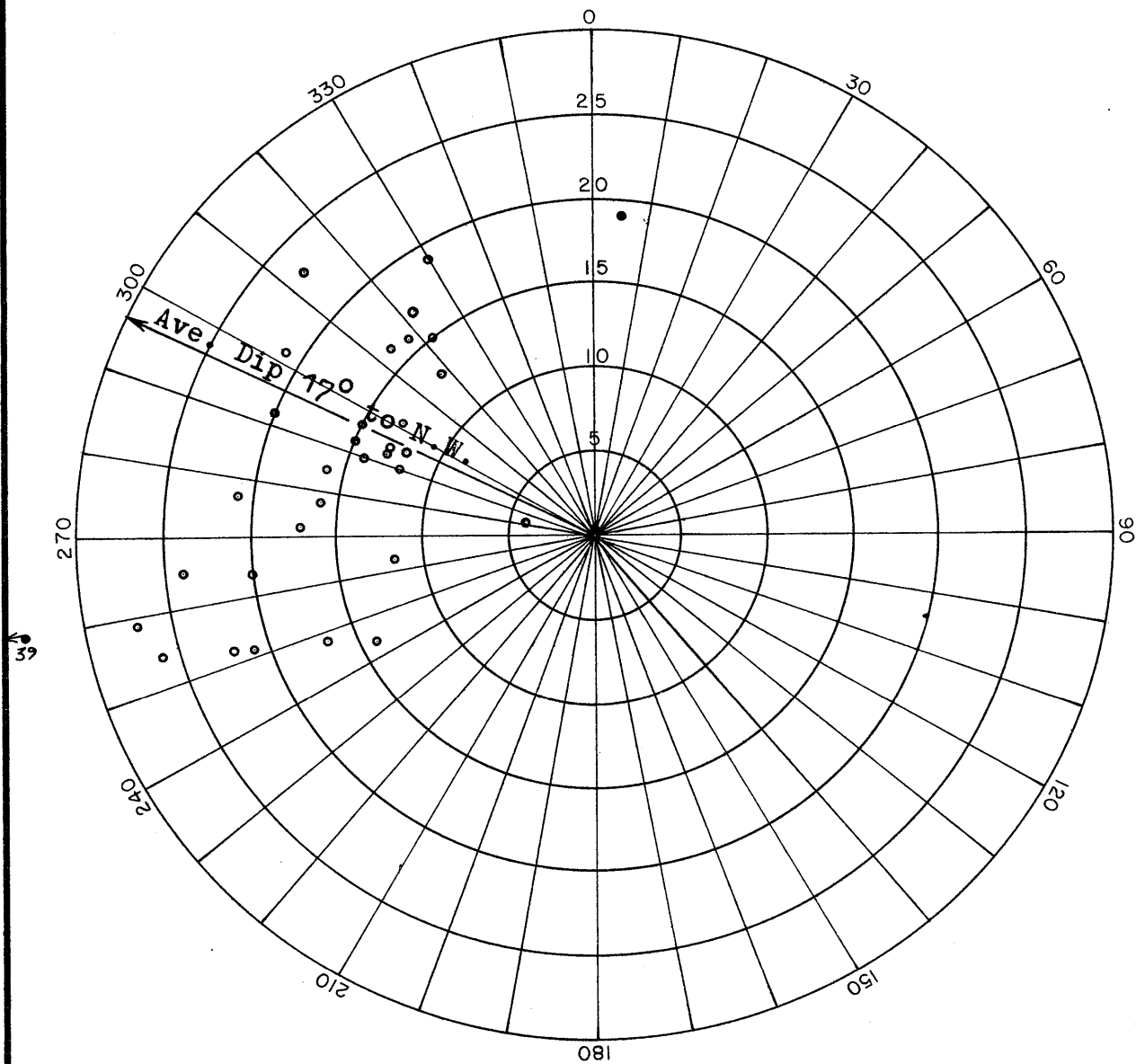
Ave. Dip 19° @ 205°

HEATHFIELD NO. 1

4317' - 6483'

70 Readings ◦  
 0 Rejected •

Average Dip 19° SSW



HEATHFIELD NO. 1

6516' - 7495'

33 readings

31 used .....

2 rejected .....

Average Dip  $17^{\circ}$  to N.W.

(6) Occurrence of Hydrocarbons

The best indication of hydrocarbons was obtained from D.S.T. No. 2, 4078 - 4144', from which 400' of muddy, gassy, salt water and 3560' of gassy salt water was obtained.

As the pipe was being pulled, gas bubbles were observed breaking out of the salt water in the pipe as each stand was broken. These were collected by holding inverted water filled bottles in the top of the drill pipe, until the water was displaced by gas bubbles. The bottles were left with a water seal, corked and wired, sealed with melted paraffin and shipped for analysis in an inverted position.

The gas in the bottles was found to consist of 73% combustible gas (dominantly methane) with small amounts of ethane, propane, isobutane, normal butane, neopentane, isopentane, normal pentane and hexane.

The detailed analysis is given in Appendix D

A very slight reading (5 units of methane) was obtained on the gas detector between 3460' and 3470' and was associated with the presence of coal in the section.

When the sand of D.S.T. No. 2 was encountered, a leak in the float chamber of the gas trap was being soldered and the gas detector was inoperative.

After the D.S.T. a very slight reading (4 units of methane) was obtained of trip gas, when circulation off bottom was resumed.

(7) Porosity and Permeability

The porosity and permeability of the unconsolidated Recent, Pleistocene and Knight Group type sands down to the top of the Merino Group, is probably very high. The sands appear to be lacking almost entirely in cement material, cave badly and are recovered in the cuttings entirely as loose constituent grains.

Effective porosity in the Merino Group is restricted to the sand between 4115' and 4144'. There is a total of 25' of net porosity in two zones of this sand, 4115' - 4119' (4') and 4123' - 4123' - 4144' (21'). The sand is apparently very loosely consolidated, and was recovered in the cuttings, entirely as loose constituent grains. The porosity is very high, calculating out on the Microlog at 27%.

The porosity is incalculable on the Sonic log due to the unconsolidated low velocity nature of the sand. The shut in pressure curves of the drill stem test of the sand indicated excellent permeability.

Elsewhere in the Merino Group, no effective porosity is present. The SP curve shows a marked fluctuation, relative to the shale base line, but this is due to the dissimilarity of the salinity of the fresh mud filtrate, and the salty formation water, and is not a measure of effective porosity.

Positive separation is evident in the Microlog over a number of sandstones, but it is evident, from cores of

some of these sandstones, and from cuttings, that no effective porosity is present. A test of a number of these sandstones showing positive separation on the Microlog, was conducted in D.S.T. No. 1, 3658 - 3754'. Only a mud recovery was obtained, confirming the tight nature of the sandstone.

Unit (vii) of the Merino Group (5604' - 7500') included a number of zones where abundant loose quartz grains were obtained in the cuttings. A drill stem test of the first of these zones was carried out between 5608' and 5643', and indicated that the matrix was washing out during drilling, and that the section was tight. The logs confirmed the tight nature of the remainder of these zones encountered to the bottom of the hole.

(8) Contributions to Geological Knowledge.

The Planet Heathfield No. 1 well has added greatly to the lithologic knowledge, and also contributed to the structural knowledge, of an area in which drilling to date has been very sparse.

In particular, the following contributions have been made.

(i) The existence of a thick section (7500' +) of sediments in a location close to the Kanawinka Fault, has been proved.

(ii) The presence of a sand with excellent reservoir characteristics has been established between 4115' and 4144'. Good porosity and permeability were evident in this sand, from which a large gassy salt water recovery was obtained on a D.S.T.

(iii) The existence of hydrocarbons, although in very small quantities was proved by the analysis of gas samples obtained from the above sand.

(iv) The Heathfield No. 1 well provides a useful link in the correlation between the Pretty Hill No. 1 and Eumeralla No. 1 wells to the south and the Penola No. 1 well to the north-east.

(v) The continuous dip meter survey demonstrated the presence of at least 3 and possibly 5 distinct structural units with the Merino Group.

(vi) The water recovered in D.S.T. No. 2 will be useful for log interpretation in future wells in the area.

(vii) Palynological information was obtained from cores cut in the well. These studies indicated that with exception of core No. 19 (7490' - 7500') which may be uppermost Jurassic, the centre Merino Group is Lower Cretaceous in age. It was also possible to correlate microfloral assemblages to Penola No. 1 and Eumeralla No. 1.

(viii) A top of the Merino Group was established, as well as tops and thicknesses for the Pleistocene Whalers Bluff Formation, the Eocent Knight Group Dartmoor Formation, the Palaeocene Bahgallah Formation and a possible Upper Cretaceous section.

V ACKNOWLEDGEMENTS

Acknowledgements are due to the various authorities and individuals whose reports appear as appendices to this report, and for the assistance rendered by officers of the Mines Department of Victoria and the Bureau of Mineral Resources.

This report was prepared by J. R. Cundill of Cundill, Meyers and Associates.

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**APPENDIX A**

**CORE DESCRIPTIONS**

CORE NO. 1 960' - 975' Recovered 13'6"

The core consists of a pellet greensand, containing a large number of fossils (mainly pelecypods and brachiopods) particularly above 967'.

The pellets consist of glauconite, are medium grained, well sorted, show oolitic structure and are partly limonitized. They are generally ovoid in shape. The colour varies from green to brown. White and yellow angular to rounded, coarse quartz grains are present. Mole shells (bivalves) and shell fragments are common in the core. The pellets etc. occur in a matrix of green silty glauconitic clay with common pyrite stringers. Some possible authigenic feldspar or apatite is present with a white, waxy lustre and good blocky cleavage. Some coarse grained inclusions are present of yellow resin. Fine sand and silt size quartz grains are common in the clay matrix.

The pellets comprise about 45% of the rock, quartz about 15% and the matrix about 40%.

No oil or gas shows.

CORE NO. 2 1378' - 1393' Cut 15' Recovered 12"

Bottom 7" Dark brown soft silty clay, with fine quartz silt and fine mica in matrix. Laminations of fine grained quartz are present, cemented with pyrite.

Top 5" Coarse grained, well rounded, well sorted quartz sand, consisting of clear quartz, opaque white vein quartz and trace of yellow quartz. A little brownish smoky quartz and chert is also present. Possibly a small amount of silty clay binding between the grains is present in places.

No oil or gas shows.

CORE NO. 3 1858' - 1863' (core jammed) Recovered 4'.

Poor core, consisting of broken core fragments and caved fragments in a matrix of soft clay, sand cavings and mud cake. Which of the recovered portion is actually cored formation is difficult to determine, but fragments of the following rock types are present and may be indigenous. Siltstone, light medium grey, light brown, fine grained, finely micaceous, slightly argillaceous, containing fine black carbonaceous specks. Fairly friable. Finely laminated with dark laminations due to argillaceous and fine carbonaceous material.

Sandstone, light green, glauconitic, fine to medium grained, friable. Consists of glauconitic pellets, sub-angular, sub-rounded, quartz grains in glauconitic clay and kaolinitic? Matrix. Trace feldspars?

Sand, loose grains of medium to very coarse grained quartz, sub-angular to rounded, polished to frosted, poorly sorted, generally clear to pale brown in colour, occasionally opaque. A few scattered fairly well rounded pebbles up to  $\frac{3}{8}$ " diameter are present.

No oil or gas shows.

The validity of this core is open to doubt. There is some

CORE NO. 4 1863' - 1873' Recovered 10'

The core consists of silty mudstone with minor gradational interbeds of siltstone and fine grained sandstone. The mudstone is greyish-green, finely silty, with macerated plant material and woody fragments up to a maximum of 1" across. Swartz and small inclusions of light grey to light brown silt and a dark grey to black carbonaceous and argillaceous material (commonly zoned) are present as well as worm borings. Rare possible shell fragments are also present as well as a few fine lenticular inclusions of pyrite.

In places the silty mudstone grades into siltstone containing pellets of mudstone up to 3/4" in diameter.

A few thin interbeds are present of greenish-grey fine-grained-friable, slightly feldspathic sandstone, consisting of well-sorted sub-angular quartz, trace glauconite pellets, feldspars, fine carbonaceous grains, mica, and indeterminate red specks, in a mineralogical kaolin matrix.

No obviously reliable bedding is apparent in the core, but vague depositional slump and swirl features are evident when the core is wet. The general impression is gained of overall flat bedding.

No oil or gas shows.

CORE NO. 5 2365' - 2373' Recovered 0' 6" (core jammed)

Macrodescription

Finely interlaminated, interlensed and interfingering siltstone, mudstone and sandstone, showing small-scale cross laminae, scour-and-fill structures and slumping. Laminae approximately 1/4" thick.

Microdescription

Sandstone, very fine grained, green-grey, with quartz, feldspar, (biotite) mica and glauconite pellets.

CORE NO. 6 2373' - 2381' Cut 8' Recovered 13' 4" (includes part of Core No. 5 which was left in hole).

Bottom unit of core

2' 2" Mudstone, green-grey, trace quartz, silt, no sand sized material, some biotite, plant impressions. Authigenic crystals, (minute feldspars?), structureless, massive.

4' 0" Siltstone, pale grey, common carbonaceous flecks and carbonised plant remains. Rare quartz, sand. Trace pyrite. Occasional mottling due to mudstone areas in silty groundmass. Varies to silty mudstone.

0' 4" Sandstone, brown, with numerous coal particles and soft clay pellets in a fine grained sandy matrix containing quartz, feldspar, mica and pyrite filled cavities. (trace) Clay pellets are pale buff, finely laminated, deformed. Evidence of burrowing organisms present as paler, fine grained elongate features perpendicular to bedding. Clay pellets may be fecal (?) and are present in burrows.



CORE NO. 6 (continued)

- 0'3" Sandstone, green-grey, with quartz, feldspar, glauconite (?), biotite. Fine-grained, argillaceous matrix. Carbon flecks. Trace.
- 1'8" Mudstone, grey, silty, with irregular paler sinuous inclusions. Trace plant remains, animal burrows of finer grained material. Silt deposited around outside of burrows. Contorted and slumped silt laminae are also present, sandy laminae present at top along with plant remains and intraformational pellets of green mudstone. Pebbles continue up into base of overlying sandstone.
- 0'4" Siltstone, green, with numerous burrows, some filled with darker clay, some with paler silt. Siltstone is evengrained, structureless, argillaceous.

Top unit of core

- 4'8" Sandstone, fine grained, green-grey, consisting of quartz, feldspar in argillaceous matrix. Contains common plant remains and coaly specks. Also present are flakes of anhydrous bright green chlorite, dark brown biotite or chlorite, and pellets of pure white clay. Several small concentric structures in sandstone show no variation of grain size etc., and are probably caused by staining from a centre. Silty and clay layers and lenses and some pebbles present. Laminae show slump structures and pressure contortion.

No oil or gas shows.

CORE NO. 7 2374' to 2384' Recovered 4'10"

Top 10" limestone, light grey-green, soft, with plant remains and slickensides.  
Next 10" Siltstone, light grey-green, argillaceous, soft very finely laminated.  
Next 1'2" limestone, light grey-green, silty, soft with numerous slickensides.  
Next 7" Siltstone, light grey, argillaceous soft with some very fine grained white mica. Feldspathic. Very thinly laminated with carbonaceous flecks.  
Bottom 1'4" limestone, light grey-green, soft with slickensides and plant remains.

Bedding is flat.

No oil or gas shows.

CORE NO. 8 3377' to 3387' Recovered 1'0"

Top 7" Siltstone, grey, fairly soft, argillaceous with plant remains carbonaceous specks, trace of biotite and abundant slickensides.  
Next 2" Coal, black, dull, dirty.  
Bottom 9" limestone, light to medium grey, carbonaceous, hard & soft, with abundant plant remains and numerous slickensides.

Core is poorly bedded and flat.

No oil or gas shows.

CORE NO. 9 3754' to 3764' Recovered 9'3"

Top 3" Sandstone, tight, with thin irregular laminae and cross laminations.  
Next 1'1" Sandstone, pale grey, and brown, with slight irregularity of porosity, calcareous, irregular laminae, and cross laminae, arkosic, carbonaceous, with authigenic chlorite.  
Next 1'9" Sandstone, grey, tight, fine grained, small scale cross laminations, some carbonaceous specks, one large carbonised plant stem (1" x 1/8"). Shaley partings in places.  
Next 5'11" limestone, dark grey, even grained, structureless carbonaceous, a few flat lying thin layers of carbonaceous concentrations.  
Bottom 3" Sandstone, grey, cross laminated (small scale). Irregular top surface with scour-and-fill structure. Consists of fine grained angular quartz, with minor feldspar, chert, and glauconite? (pellets stain with potassium ferricyanide), authigenic chlorite and small concentrations of pyrite cement, carbonaceous streaks, in a clay matrix. Tight.

No hydrocarbon shows.

CORE NO. 10 4144'-4154' Recovered 10'0"

- Top 1'7" Green-grey even grained mudstone, with some fine mica and carbonaceous flecks. Bedding 2" to 3".
- Next 11" Green-grey mudstone with lenses and slump rolls of silty mudstone.
- Next 2" Dark green siltstone, with irregular laminations of white sand. Siltstone has dark mica flakes, carbonaceous plant remains and green sand sized mudstone particles.
- Next 3" Sandstone, grey, fine grained, tight, very arkosic and argillaceous. Contains mica, mudstone pellets and plant remains.
- Fault with 1" displacement, dipping 45°, slickensides with white clay on surface.
- Next 2" Siltstone, green, laminated as above.
- Next 3" Sandstone, grey, fine grained, as above, top surface shows evidence of scour.
- Fault, as above.
- Next 6" Sandstone, grey, fine grained, with dark irregular laminations of carbonaceous matter.
- Next 2" Siltstone, green, with sandy laminations, dipping 20° in opposite direction to the faults.
- Next 1'1" Sandstone, as above.
- Next 2" Siltstone, dark green, laminated, dipping 20°.
- Next 3" Sandstone, fine grained, grey, as above.
- Next 1" Siltstone, green, as above.
- Next 3" Sandstone, fine grained, as above.
- Next 1" Siltstone, as above.
- Next 9" Sandstone, fine grained, as above.
- Next 1" Siltstone, green, laminated
- Next 9" Sandstone, grey, calcareous, arkosic, with clay matrix, fine green angular mud pellets. Tight. Common dark mica and carbon flecks.
- Next 4" Interlaminated slightly calcareous green siltstone and grey calcareous sandstone.
- Bottom 2'2" Sandstone, grey, arkosic as above.
- No hydrocarbon shows.

CORE NO. 11 No recovery. (4614' to ?)

Top 7'4"

Sandstone, light grey, fine to medium grained, moderately hard, contains minor black, irregular, undulating laminae and fine lenses of macerated plant fragments and carbonaceous material. The sandstone is very feldspathic, calcareous in places and consists of fairly sorted, sub-angular grey and clear quartz, common white to pale brown partly decomposed feldspars, some coarse flakes of muscovite, biotite and chlorite, coaly grains and flecks, reworked green grey mudstone grains, and traces of pink quartz, indeterminate red and green specks, and lithic grains in a kaolinitic to calcareous matrix. The sandstone tends to be slightly harder, and more calcareous, towards the top of the core.

Associated with the laminations of plant fragments and carbonaceous material are common traces of coal and abundant soft greenish brown mudstone pellets with a soapy texture, as well as a few white specks of gypsum. The mudstone pellets are generally between 2 and 4mm. in diameter. In the basal 1'3" they occur at random throughout.

The sandstone are occasionally angular in outline and range up to  $\frac{1}{2}$ " in diameter. They are slightly micaceous and contain a few specks of carbonaceous material.

Bedding: The dip of the laminations is irregular, but in places where bedding is well defined, a dip of about  $12^{\circ}$  is evident. Some current bedding or cross bedding is evident, but appears to be subordinate to the overall dip within the limits of the length of the core. Some minor traces of poor porosity are evident in the sandstone.

Next 5"

Siltstone interlaminated dark grey and light grey. The dark grey variety is dominant and is moderately soft, argillaceous, slightly feldspathic, and contains abundant fine plant fragments and carbonaceous specks. The lighter coloured siltstone laminations are more feldspathic, slightly coarser grained, and contain less carbonaceous and argillaceous material.

Bedding: Although some slight current bedding is evident, dip is fairly constant at about  $10^{\circ}$ .

Next 1'10"

Sandstone, as described in top 7'6" of core, except that it is medium grained, non calcareous, and contains laminations of dark grey argillaceous sandstone with only minor included plant fragments. Fairly soft and friable. Occasionally varies to coarse grained. A few traces of poor porosity are present.

Bedding: Fairly consistent at about  $30^{\circ}$ .

Next 5"

Sandstone, as above, with a large rounded inclusion about 3" x  $1\frac{1}{2}$ " of soft brown mudstone, containing abundant white specks of gypsum of the order of 1mm. across. The long axis of the inclusion roughly parallels the bedding, but laminations of brown and black carbonaceous material underlying it have been contorted by it. The material of the laminations occur as crudely aligned fine lenses and inclusions, and includes dirty, impure, soft coal; some black, bright, coal with a conchoidal fracture and trace of red brown resinous material as well as abundant plant fragments.

CORE NO. 12 Bedding: Depositional slumping, as well as cross bedding is present and no reliable dip can be obtained.

Bottom 2'0" Sandstone, as above, varying to coarse grained in places. Contains dark grey to black laminations and very thin beds containing abundant finely macerated partly coalified plant fragments. Associated with these laminations are irregular pellets and fragments of green brown mudstone, and traces of white specks of gypsum.  
Bedding: The dip of the laminations is variable, ranging from 10° to 33°. Some cross bedding as well as depositional slumping is evident.

No oil or gas shows in this core.

CORE NO. 13 5026' - 5036' Recovered 8'6"

Top 5' Sandstone, light grey, fine grained, containing numerous dark grey to black laminations of finely macerated plant fragments, carbonaceous material, coaly flecks, brownish red plant resin, and, in places, abundant coarse flakes of biotite and muscovite. The sandstone itself is fine grained, slightly calcareous, feldspathic, and consists of sub-angular fairly sorted light grey and clear quartz, minor white feldspars, scattered coarse biotite and muscovite, common black coaly grains and flecks, some green reworked mudstone? grains, common trace light brown clay inclusions, and trace dark brown fine mudstone pellets in kaolinitic and calcareous matrix.

The contact with the underlying mudstone unit is overlain by a one inch band containing pellets and pebbles of this mudstone in the sandstone. The mudstone pellets average about  $\frac{1}{2}$ " thick and are about  $\frac{1}{4}$ " long and are generally lying with their long axes parallel to the bedding. One large pebble is 2 $\frac{1}{2}$ " long by  $\frac{1}{2}$ " wide.

Bedding: The laminations of carbonaceous material in the sandstone show evidence of depositional slumping and some current bedding. The average dip however appears to be at about 5 degrees. The contact with the underlying mudstone, which is reasonably sharp, dips at 7°.

Bottom 3'6" Mudstone, medium to dark grey and green grey, fairly soft, finely micaceous, with scattered poorly preserved plant fragments ranging up to several inches long. Fine carbonaceous and coaly flecks are fairly common.

The mudstone is blocky and breaks up readily into rubble due partly to the presence of unfilled sub-vertical fractures, and high angle slickensided surfaces.

Bedding: No bedding is apparent.

No oil or gas shows in this core.

CORE NO. 14 5406' - 5416' Recovered 10' 0"

Top 8' 8"

Sandstone, pale grey, fine to medium grained, fairly hard, very calcareous to non calcareous, with numerous dark grey laminations of carbonaceous material and carbonised plant remains. Consists of fine to medium grained well rounded to sub angular white and grey quartz and partly decomposed feldspar, with minor to common, green, white and brown mud pellets, bright orange-red resin (?), muscovite, biotite and/or chlorite, carbonaceous streaks, specks and fragments; in a matrix of white to pale brown clay with common to rare calcite cement, trace pyrite cement.

Bedding: The dark laminations of carbonaceous material commonly show contortion due to marked depositional slumping. No reliable dip could therefore be obtained from the laminations, which show a range of dips from 60° near the top to 30° near the base.

The dip of the contact between the sandstone and the underlying shale unit is 15°.

Bottom 1' 4" Black carbonaceous shale, even grained, with very fine grained mica and finely divided to coarse fragments of carbonaceous material. Includes a 2" band of dark brown laminated mudstone.

Bedding: Contact between black shale and brown mudstone is undulose (ripple marked?). Dip 20°.

CORE NO. 15 5693' - 5703' Recovered 10'.

Top 3'

Sandstone, with laminations and thin interbeds of siltstone, mudstone and laminations of carbonaceous material.

The Sandstone is very light grey to white, fine grained, kaolinitic, calcareous, fairly friable in places, and consists of fairly sorted sub-angular light grey quartz, minor white feldspars, common ragged flecks and rounded grains of yellow brown and dark brown soft clay material, traces black coaly grains and flecks, coarse mica flakes, rare grains of indeterminate soft green mineral, and rare red specks, in kaolinitic to calcareous cement. Tight.

The Siltstone is medium grey, sandy, very micaceous, slightly feldspathic and contains common carbonaceous flecks and plant fragments.

The Mudstone is medium grey, micaceous, with common floating quartz grains and occasional feldspars. The mudstone contains carbonaceous specks and minor green grey mudstone pellets in places.

Dark grey to black laminations are common in this unit of the core, and are comprised of dark brown, dark grey, black carbonaceous material, abundant poorly preserved plant fragments, coaly flecks, abundant very coarse flakes of biotite and muscovite, and rare chlorite. Associated with the dark laminations are fine white laminations consisting of kaolin, slightly bentonitic clay and gypsum as well as light grey laminations consisting largely of green grey mudstone pellets in kaolinitic cement. The latter are commonly sandy and grade into sandstone. A few lenses of coal, up to 1/8" thick are also present.

Bedding: Although current bedding and small scale depositional slumping is common, overall dip is a fairly consistent 10 degrees.

CORE NO. 15 (continued)

Next 1'6" Interlaminated siltstone and minor sandstone.

The siltstone and sandstone are similar in lithology to the overlying 3'. The siltstone, however, is dominant. Laminations of carbonaceous material, plant fragments etc., are again common.

Bedding: Current bedding, and small scale depositional slumping is common, but overall dip is about 10 degrees.

Next 1'6" Mudstone, which is medium grey to slightly greenish grey, finely micaceous, silty and contains very fine carbonaceous specks. It is fairly soft and contains numerous irregularly cylindrical (occasionally tapered) inclusions of yellowish grey to greenish grey, very soft, soapy textured non silty mudstone up to a maximum length of 1½ inches. The inclusions occur in any orientation, although there is some preference for positions normal to the bedding or parallel to the bedding. Some inclusions appear to have been flattened and contorted during depositional slumping. Some of the inclusions may be the infillings of organic burrowings. Finely disseminated pyrite occurs in minor amounts in and around the inclusions. No reliable dips obtainable.

Next 3'6" Interlaminated sandstone and siltstone as in the second interval described in this core, except that sandstone is dominant.

Bedding: Current bedding and depositional slumping is very common. In a few places swirls, slumps and balled features up to 6" in diameter are present in the core. Elsewhere, an overall dip of about 10 degrees is evident.

Bottom 6" Sandstone, as in the first interval of this core, very kaolinitic, white in colour.

Bedding: Depositional slumping is very common and no reliable dips can be obtained.

Core No. 16 .. 5990-6000 .. Recovered 9'.

Top 0'11" Mudstone, grey; cross laminated with laminations of silt, sand, carbonaceous specks, streaks and plant fragments present. Micaceous.

Next 3'7" Siltstone, grey, with sandy laminations and cross laminations. Scour and fill features present. Carbonaceous, micaceous.

Next 1'3" Mudstone, grey, even grained, weakly laminated, micaceous, carbonaceous specks, streaks and plant fragments present.

Bedding plane at base of this unit dips at 10°.

Next 1'11" Siltstone, grey, laminations absent. Leaf impressions common in places. Even grained, very finely micaceous, very argillaceous, carbonaceous specks and streaks rare.

Bottom 1'4" Sandstone, light grey, laminated and cross laminated, very micaceous, argillaceous, carbonaceous fragments common. Scour and small slump features common. Tight.



6380-6390 .. Core No. 17 .. Recovered 10'

Top 8'9"  
(6380-6388'9") Interlaminated Siltstone, sandstone and shale.

Siltstone is medium grey, very argillaceous, finely micaceous, with traces of fine carbonaceous specks and with laminations consisting of abundant coarse biotite and muscovite flakes aligned along the bedding. Generally sandy, and contains scattered white feldspars.

The sand stone is light grey, very fine grained, moderately hard, consisting of sub-angular to sub-rounded, fairly sorted, light grey to whitish grey quartz, minor white feldspars, scattered biotite, muscovite, and trace carbonaceous and coaly flecks in kaolinitic to occasionally calcareous matrix. Tight.

The mudstone is medium grey, brownish grey, very silty, with fine and coarse flakes of biotite and muscovite and rare chlorite. Some laminations are present containing abundant poorly preserved plant fragments. Shaley habit in places.

Small scale cross bedding very common. Some depositional slumping and scouring observed. Overall dip is about  $10^{\circ}$ .

Bottom 1'3"  
(6388'9"-6390') Sandstone, with minor laminations of mudstone, siltstone and shale.

The sandstone is very light grey, fine grained, occasionally medium grained, calcareous, moderately soft, consisting of sub-angular to sub-rounded fairly to poorly sorted very light grey to clear quartz, minor white feldspars, scattered yellow brown ragged clay inclusions, coaly and carbonaceous grains, and biotite and muscovite in a kaolinitic to calcareous matrix. The sandstone is tight.

The mudstone and siltstone of the laminations are similar to those described in the overlying unit of the core. The shale is very minor. It is dark grey, slightly carbonaceous, silty, micaceous. Some coarser grained lithic sandstone laminations are also present. These contain abundant pellets and ragged fragments of yellow brown and dark brown clays, greenish grey and green mudstone, shale fragments and very coarse biotite and muscovite in addition to the constituents of the finer grained variety of sandstone. The coarser grained variety is also tight.

Cross bedding and depositional slump features present. Overall dip is about  $10^{\circ}$ .

APPENDIX B

GAS ANALYSES

JCK:SH  
Phone: 630521

Anal. G. & F. 13/4

16th April, 1964

Report on Sample No. 411/64

Sample : Bore-hole Gas  
Locality : Parish : Drajurk  
District: Casterton  
Sender : The Manager,  
Planet Oil Co. N.L.,  
2 O'Connell Street,  
Sydney,  
New South Wales.

Samples of bore-hole gas were received for analysis. The gas was obtained during the drilling of the oil-well, Heathfield Well No.1, at a point some miles west of Casterton.

Particulars of Sample

Drilling Company Planet Oil Co. N.L.  
Name of Well Heathfield No.1  
Depth (feet) 4078 - 4144  
Drill Stem Test No.2

Condition of Sample

The gas was received in three one-pint glass milk bottles, corked, waxed and containing water, so that when inverted the stored gas was also water-sealed.

Results:

As the Mines Department had made its gas chromatograph available to another Department shortly before the gas from Planet Oil was received, the hydrocarbon analysis was kindly made on this occasion by the Gas and Fuel Corporation of Victoria using the flame ionization technique.

	<u>% V/V</u>
Methane	72
Ethane	0.51
Propane	0.10
Isobutane	0.035
n-Butane	0.0092
neo Pentane ?	0.00096
Isopentane	0.0054
n-Pentane	0.0004
Hexane	0.0015
Oxygen	2.3
Carbon Dioxide	0.8
	<hr/>
	75.76246
Nitrogen (by diff.)	<u>24.24</u>
	100.00246

NOTE 1

Relating to the hydrocarbons, Gas and Fuel state that absolute concentrations could be in error by  $\pm 5\%$  of their respective values.

NOTE 2

The difference between the sum of the above components and one hundred, is considered to be nitrogen.

Comment

Although small in amount, the presence of hydrocarbons up to at least C<sub>6</sub>, points to the gas being of petroliferous origin.



Senior Chemist,  
Mines Department.

APPENDIX C

MUD DATA

DAILY MUD PROPERTIES

Date	Weight <u>lbs/gal.</u>	Viscosity <u>Sec/qt.</u>	Water Loss <u>cc/30min</u>	pH	Filter Cake <u>Inches/32"</u>
6. 3.64	8.5	77	19.4	6	
7. 3.64	11.5	50	23.2	6	1/8
8. 3.64	Running and cementing 13 <sup>3</sup> / <sub>8</sub> Surface String				
9. 3.64	9.2	43	25	10	2/32
10. 3.64	9.45	87.5	17	9.5	2/32
11. 3.64	9.2	36.5	11.5	9.5	2/32
12. 3.64	9.3	53.5	10.3	10	2/32
13. 3.64	9.5	78	11	8	2/32
14. 3.64	9.5	50	10.5	9	2/32
15. 3.64	9.7	50	8	9.5	2/32
16. 3.64	9.5	55	9.5	9	2/32
17. 3.64	9.7	100	12.5	8	1/8
18. 3.64	9.7	53	9.7	9.5	2/32
19. 3.64	Running and cementing 9 <sup>5</sup> / <sub>8</sub> casing. Flanging up casing.				
20. 3.64	9.2	40.5	10.6	9.5	3/32
21. 3.64	9.5	63	7.8	9	3/32
22. 3.64	9.5	51	7	9.5	3/32
23. 3.64	9.7	53	7	9.5	2/32
24. 3.64	9.8	53	6.8	9.5	2/32
25. 3.64	9.7	55	7.2	9	2/32
26. 3.64	9.7	55	8	9	2/32
27. 3.64	9.8	58	7	9	2/32
28. 3.64	9.8	58	8	9	2/32
29. 3.64	9.8	50	6.4	10	2/32
30. 3.64	10	57	6.4	9.5	2/32
31. 3.64	10	57	6.2	9.5	2/32
1. 4.64	10	58	6	9	2/32
2. 4.64	10	59	6	9.5	2/32
3. 4.64	10	58	5.8	9.5	2/32
4. 4.64	10.3	60	6	9.5	2/32
4. 4.64	10.3	73	6	9.5	2/32
6. 4.64	10.1	78	6	9.5	2/32
7. 4.64	10.1	78	6.8	9	2/32
8. 4.64	9.7	75	6.2	8.5	2/32
9. 4.64	10.1	75	6.6	8	2/32
10. 4.64	10	52	7	8	2/32
11. 4.64	10.2	65	6.8	7	2/32
12. 4.64	10.2	76	6.4	8	2/32
13. 4.64	10.2	64	6	8	2/32
14. 4.64	10.2	72	6.8	8	2/32

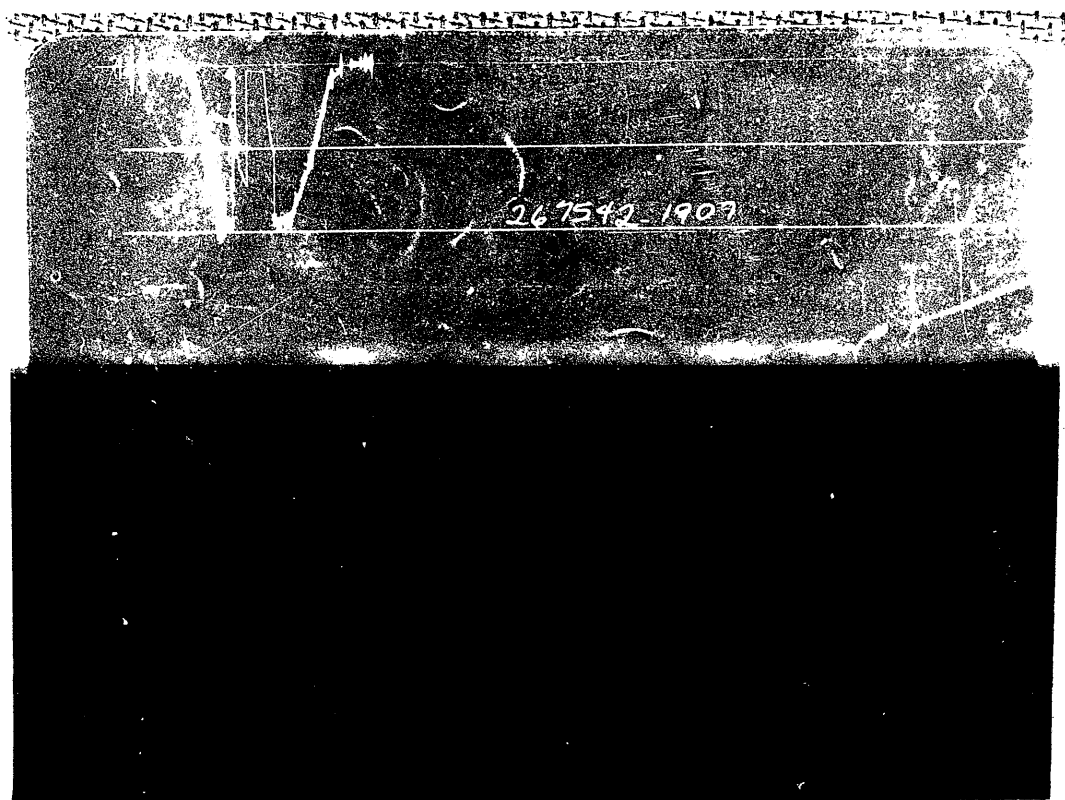
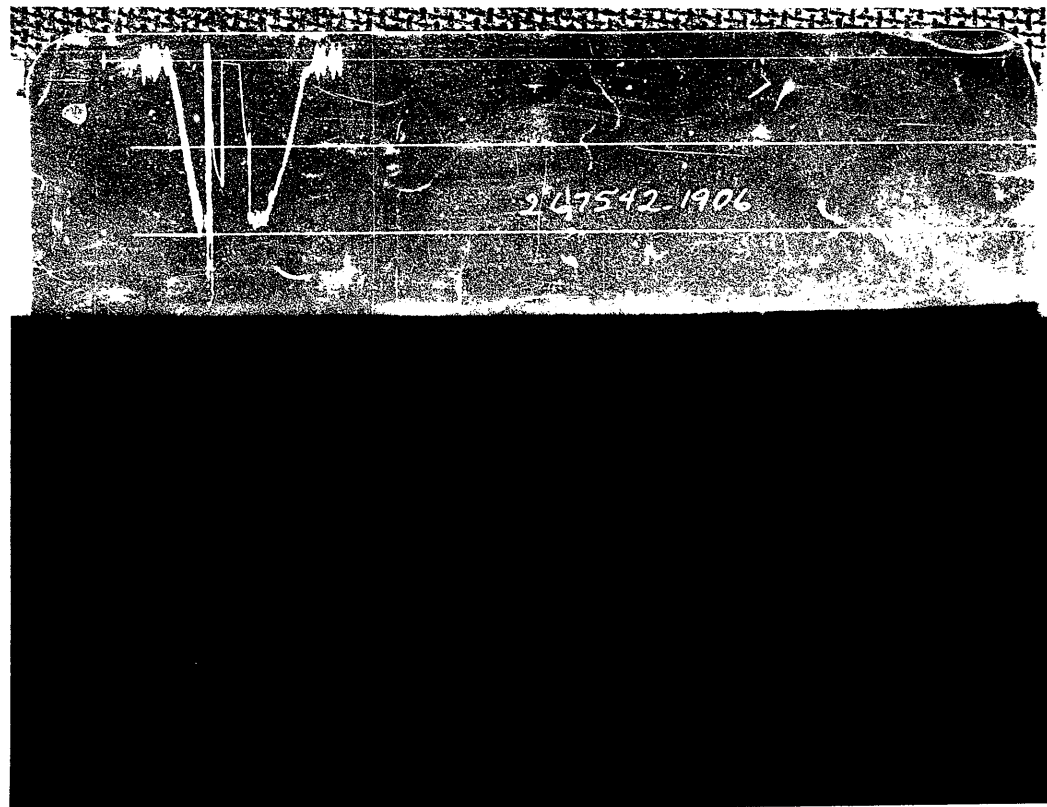
DAILY MUD PROPERTIES (Continued)

Date	<u>Weight</u> <u>lbs/gal.</u>	<u>Viscosity</u> <u>Sec/qt.</u>	<u>Water Loss</u> <u>cc/30 min</u>	pH	<u>Filter Cake</u> <u>Inches/32"</u>
15. 4.64	10.1	88	6.8	8	2/32
16. 4.64	10.2	65	6.6	8	2/32
17. 4.64	10.2	74	6.8	8	2/32
18. 4.64	10.3	57	6.7	9	2/32
19. 4.64	10.5	74	6.6	8.5	2/32
20. 4.64	10.5	74	6.8	8.5	2/32
21. 4.64	10.5	80	6.8	8.5	2/32

APPENDIX D

REPORTS ON DRILL STEM TESTS





Flow Time	1st	Min.	2nd	Min.	Date	Ticket Number	267542 S	
Closed In Press. Time	1st	Min.	2nd	Min.	Kind of Job	Halliburton District	BRISBANE	
Pressure Readings	Field		Office Corrected		Tester	MR. PAYTON Witness -		
Depth Top Gauge	3643 Ft.		NO Blanked Off		Drilling Contractor AUSTRALIAN DRILLING COMPANY			
BT. P.R.D. No.	1906		24 Hour Clock		Elevation	244' K.B. Top Packer -		
Initial Hydro Mud Pressure	1878		1845		Total Depth	3754' Bottom Packer 3660'		
Initial Closed in Pres.	1455		1411		Interval Tested	3660' - 3754' Formation Tested MERINO		
Initial Flow Pres.	-		1 15		Casing or Hole Size	8 3/4" Casing { Top Perf. {		
	22		2 24					
Final Flow Pres.	-		1 17		Surface Choke	Bottom Choke 5/8"		
	43		2 47					
Final Closed in Pres.	990		1021		Size & Kind Drill Pipe	4 1/2" F.H. Drill Collars Above Tester 2 7/8" x 197' I.D. - LENGTH		
Final Hydro Mud Pressure	1835		1830		Mud Weight	9.7 Mud Viscosity 53		
Depth Cen. Gauge	-		-		Temperature	100 °F Est. °F Actual Anchor Size ID 2 7/8" x 1 3/8" OD 6 1/8" x 5 1/2" x 57'		
BT. P.R.D. No.	-		-		Depths Meas. From	KELLY BUSHINGS Depth of Tester Valve 3641' Ft.		
Initial Hydro Mud Pres.	-		-		Cushion	TYPE AMOUNT Depth Back Pres. Valve - Ft.		
Initial Closed in Pres.	-		-		Recovered	80 Feet of Drilling fluid Meas. From Tester Valve		
Initial Flow Pres.	-		-		Recovered	Feet of Meas. From Tester Valve		
Final Flow Pres.	-		-		Recovered	Feet of Meas. From Tester Valve		
Final Closed in Pres.	-		-		Recovered	Feet of Meas. From Tester Valve		
Final Hydro Mud Pres.	-		-		Oil A.P.I. Gravity	Water Spec. Gravity -		
Depth Bot. Gauge	3750 Ft.		YES Blanked Off		Gas Gravity	Surface Pressure - psi		
BT. P.R.D. No.	1907		24 Hour Clock		Tool Opened	3:39 PM A.M. P.M.		Tool Closed
Initial Hydro Mud Pres.	1945		1890		Remarks Opened tool for 6 minute 1st flow with			
Initial Closed in Pres.	1485		1439		weak blow. Closed tool for 15 minute initial			
Initial Flow Pres.	-		1 60		closed in pressure. Reopened tool for 30 minute			
Final Flow Pres.	-		1 62		2nd flow with weak blow throughout test. No oil			
Final Closed in Pres.	1045		1064		or gas to surface. Closed tool for 15 minute			
Final Hydro Mud Pres.	1905		1876		final closed in pressure.			

FORMATION TEST DATA

3

HEATHFIELD  
 Lease Name  
 Well No. 1  
 Test No. 1  
 FIELD AREA  
 WILD CAT  
 County  
 State VICTORIA  
 OWNER'S DISTRICT  
 PLANET EXPLORATION COMPANY PTY. LIMITED  
 Lease Owner/Company Name

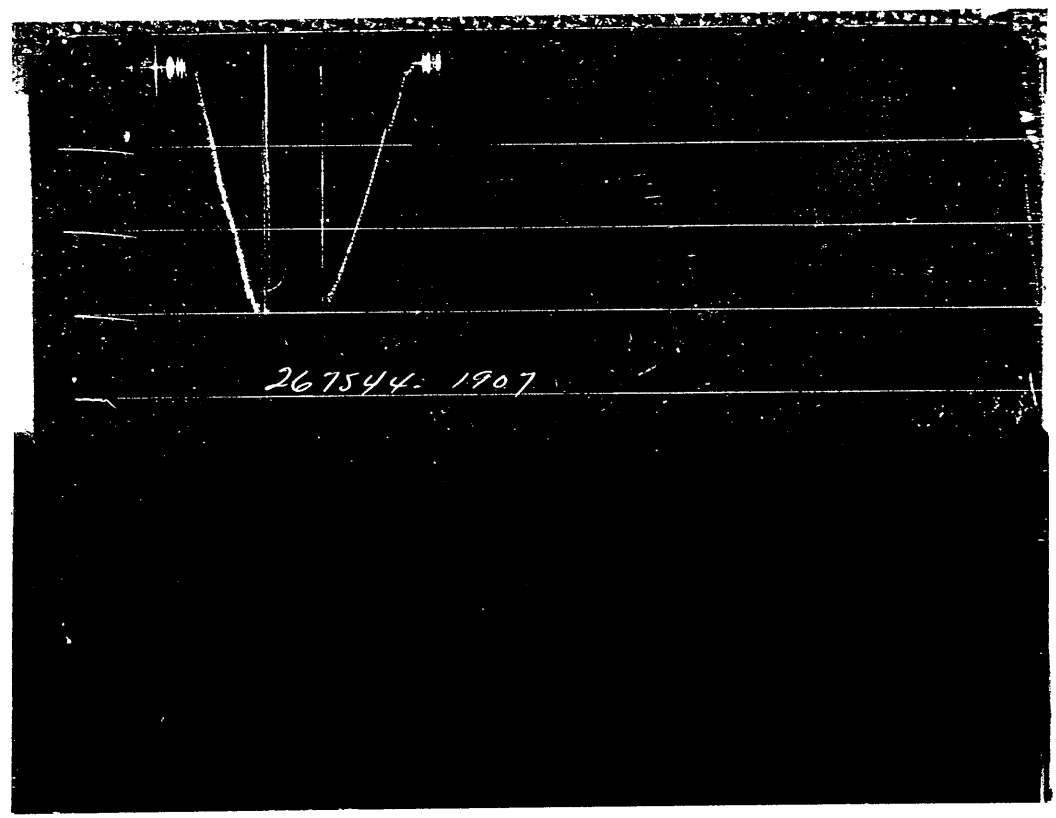
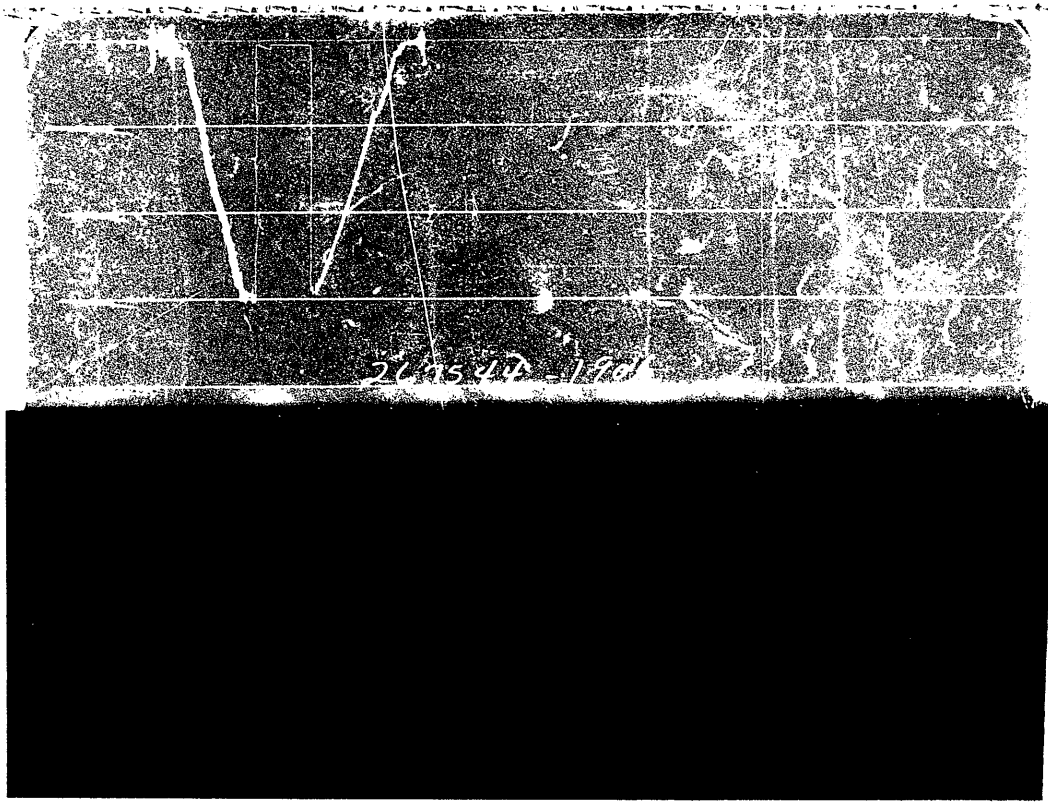
Gauge No. 1906		Depth 3613'			Clock 2 1/2 hour		Ticket No. 267542			
First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure			
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\phi}{\phi}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\phi}{\phi}$	PSIG Temp. Corr.
P <sub>0</sub>	.000	15	.000		17	.000	24	.000		47
P <sub>1</sub>	.008	17	.0058		702	.018	30	.0044		176
P <sub>2</sub>			.0116		968	.036	34	.0088		351
P <sub>3</sub>			.0174		1121	.054	39	.0132		507
P <sub>4</sub>			.0232		1210	.072	43	.0176		640
P <sub>5</sub>			.0290		1273	.090	47	.0220		747
P <sub>6</sub>			.0348		1314			.0264		833
P <sub>7</sub>			.0406		1352			.0308		884
P <sub>8</sub>			.0464		1375			.0352		946
P <sub>9</sub>			.0522		1396			.0396		987
P <sub>10</sub>			.0580		1411			.0440		1021

Gauge No. 1907		Depth 3750'			Clock 2 1/2 hour					
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\phi}{\phi}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\phi}{\phi}$	PSIG Temp. Corr.
P <sub>0</sub>	.000	60	.000		62	.000	75	.000		89
P <sub>1</sub>	.009	62	.006		812	.0182	75	.0048		231
P <sub>2</sub>			.012		1126	.0364	80	.0096		401
P <sub>3</sub>			.018		1126	.0546	82	.0144		552
P <sub>4</sub>			.024		1263	.0728	84	.0192		670
P <sub>5</sub>			.030		1269	.0910	89	.0240		772
P <sub>6</sub>			.036		1327			.0288		845
P <sub>7</sub>			.042		1366			.0336		920
P <sub>8</sub>			.048		1397			.0384		982
P <sub>9</sub>			.054		1424			.0432		1026
P <sub>10</sub>			.060		1439			.0480		1064

Reading Interval 1.5 6 1.5 Minutes

REMARKS:

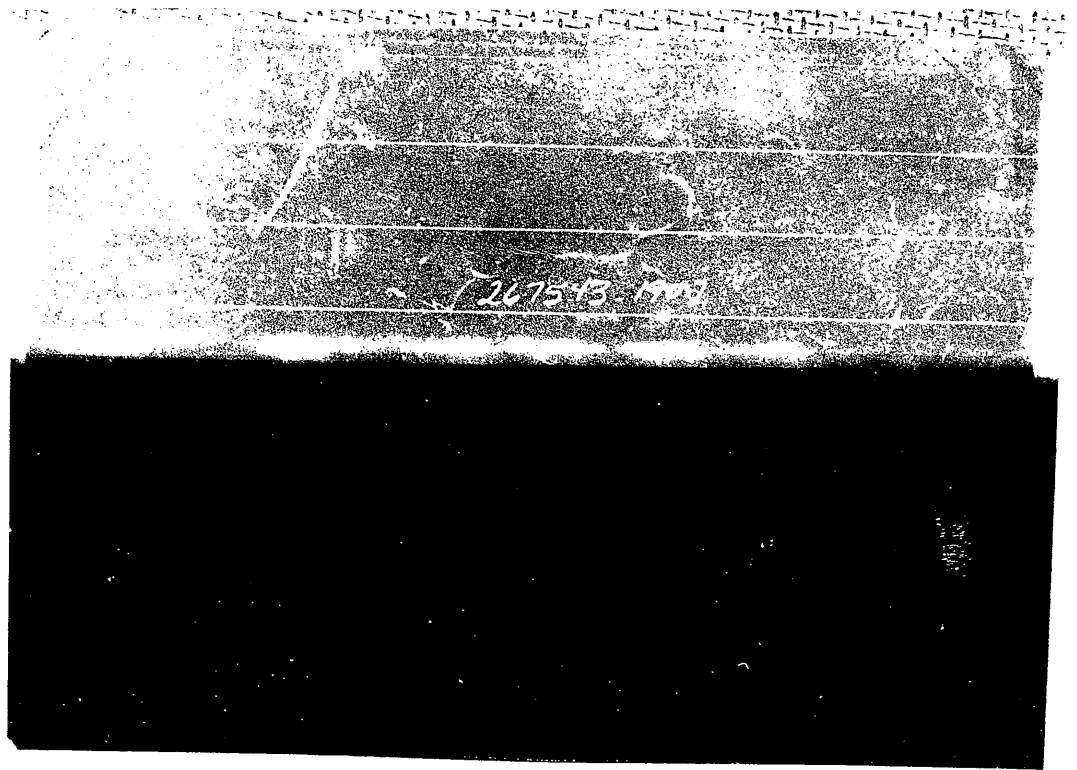
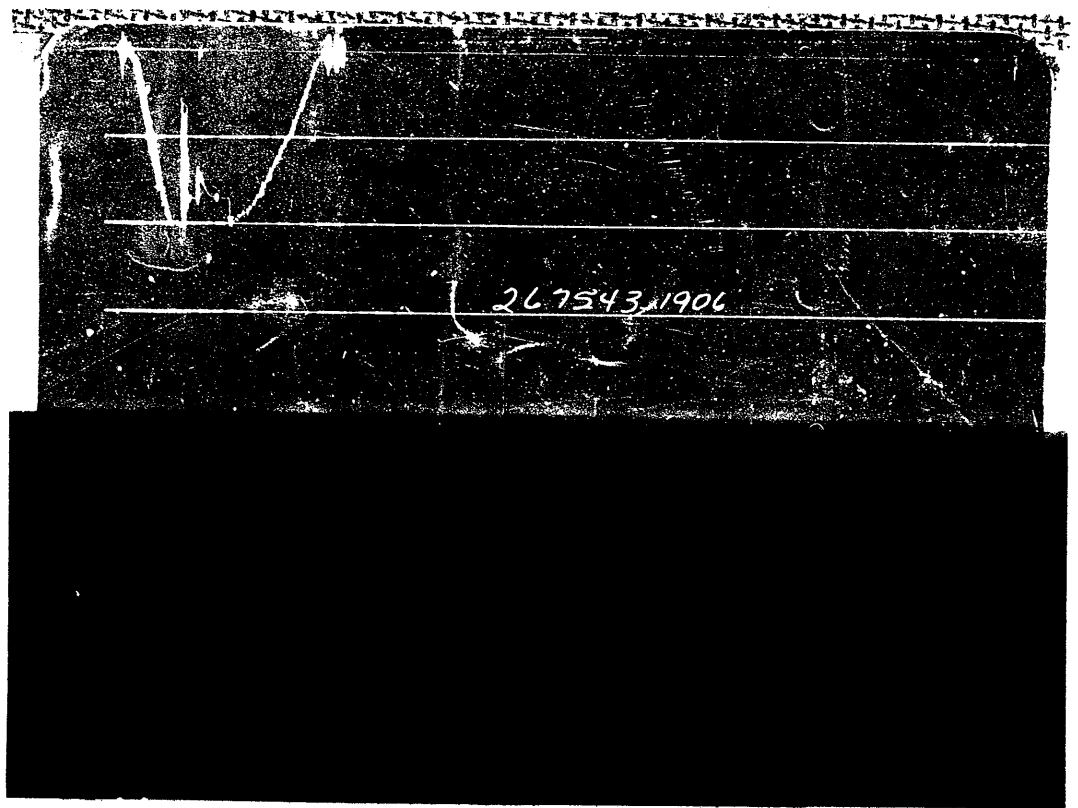
SPECIAL PRESSURE DATA



Flow Time	1st 5	Min.	2nd 40	Min.	Date	1-4-64	Ticket Number	267544	Legal Location Sec. - Twp. - Rng.	Lease Name	Well No.	Test No.	Field Area	WILDCAT	County	State	Owner's District
Closed In Press. Time	1st 20	Min.	2nd 21	Min.	Kind of Job	OPEN HOLE	Halliburton District	BRISBANE									
Pressure Readings	Field		Office Corrected		Tester	D. C. PAYTON	Witness										
Depth Top Gauge	5591	Ft.	No	Blanked Off	Drilling Contractor	AUSTRALIAN DRLG. CO.											
BT. P.R.D. No.	1907		24	Hour Clock	Elevation	244' KB	Top Packer -										
Initial Hydro Mud Pressure	2915		2917		Total Depth	5643'	Bottom Packer 5608'										
Initial Closed in Pres.	45		54		Interval Tested	5608-5643'											
Initial Flow Pres.	1		2 6		Casing or Hole Size	3 3/4"											
Final Flow Pres.	1		2 7		Surface Choke	1/8"		Bottom Choke 5/8"									
Final Closed in Pres.	1		16		Size & Kind Drill Pipe	4 1/2" FH		Drill Collars Above Tester 2 7/8"-251'									
Final Hydro Mud Pressure	2895		2895		Mud Weight	10	Mud Viscosity 78										
Depth Cen. Gauge		Ft.		Blanked Off	Temperature	135	°F Est. °F Actual										
BT. P.R.D. No.				Hour Clock	Depths Mca. From	KB	Depth of Tester Valve 5589' Ft.										
Initial Hydro Mud Pres.					TYPE AMOUNT		Depth Back Pres. Valve Ft.										
Initial Closed in Pres.					Recovered	10	Feet of Drilling Mud										
Initial Flow Pres.	1		2		Recovered	Feet of											
Final Flow Pres.	1		2		Recovered	Feet of											
Final Closed in Pres.					Recovered	Feet of											
Final Hydro Mud Pres.					Oil A.P.I. Gravity	Water Spec. Gravity											
Depth Bot. Gauge	5639	Ft.	Yes	Blanked Off	Gas Gravity	Surface Pressure psi											
BT. P.R.D. No.	1906		24	Hour Clock	Tool Opened	12:30 AM	A.M. P.M.	Tool Closed 1:56 AM A.M. P.M.									
Initial Hydro Mud Pres.	2935		2950		Remarks	Tool opened with a weak blow for a 5 min.											
Initial Closed in Pres.	108		98		first flow. Closed tool for a 20 minute initial												
Initial Flow Pres.	43	1	47		closed in pressure. Reopened tool with a weak												
Final Flow Pres.	65	2	47		blow, died in 35 minutes, No gas or fluid to the												
Final Closed in Pres.	65		58		surface. No special reading adaptable.												
Final Hydro Mud Pres.	2915		2915														

FORMATION TEST DATA

3



Gauge No. 1906		Depth 11061'			Clock 21 hour		Ticket No. 267543		
First Flow Period		Initial Closed In Pressure			Second Flow Period		Final Closed In Pressure		
Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\phi}{\phi}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\phi}{\phi}$	PSIG Temp. Corr.
UNABLE TO READ		.000		*	.000	1432	.000		1712
P <sub>1</sub>		.067		1725	.0196	1498	.065		1718
P <sub>2</sub>					.0392	1614			
P <sub>3</sub>					.0588	1680			
P <sub>4</sub>					.0784	1705			
P <sub>5</sub>					.0980	1712			
P <sub>6</sub>									
P <sub>7</sub>									
P <sub>8</sub>									
P <sub>9</sub>									
P <sub>10</sub>									

Gauge No. 1907		Depth 11140'			Clock 21 hour				
P <sub>0</sub>	.000	1627	.000	1561	.000	1616	.000		1753
P <sub>1</sub>	.006	1561	.0066	1733	.020	1616	.062		1759
P <sub>2</sub>			.0132	1751	.040	1673			
P <sub>3</sub>			.0198	1757	.060	1722			
P <sub>4</sub>			.0264	1762	.080	1746			
P <sub>5</sub>			.0330	1764	.100	1753			
P <sub>6</sub>			.0396	1766					
P <sub>7</sub>			.0462	1766					
P <sub>8</sub>			.0528	1766					
P <sub>9</sub>			.0594	1766					
P <sub>10</sub>			.0660	1766					
Reading Interval			2		6		Minutes		

REMARKS:

SPECIAL PRESSURE DATA

Flow Time	1st 2	Min.	2nd 30	Min.	Date	3-21-64	Ticket Number	267543 S
Closed In Press. Time	1st 20	Min.	2nd 20	Min.	Kind of Job	OPEN HOLE TEST	Halliburton District	BRISBANE
Pressure Readings	Field		Office Corrected		Tester	MR. PAYTON	Witness	---
Depth Top Gauge	4061 Ft.		NO Blanked Off		Drilling Contractor	AUSTRALIAN DRILLING COMPANY		
BT. P.R.D. No.	1906	24		Hour Clock	Elevation	244' K.B.	Top Packer	-
Initial Hydro Mud Pressure	2025	2008			Total Depth	4114'	Bottom Packer	4078'
Initial Closed in Pres.	1708	1725			Interval Tested	4078' - 4114'	Formation Tested	-
Initial Flow Pres.	-	1	*		Casing or Hole Size	8 3/4"	Casing } Top	
Final Flow Pres.	-	1	*		Surface Choke	1"	Casing } Bot.	-
Final Closed in Pres.	1708	1718			Size & Kind Drill Pipe	4 1/2" F.H.	Drill Collars Above Tester	I.D. - LENGTH 2 7/8" x 223'
Final Hydro Mud Pressure	2005	2000			Mud Weight	9.2	Mud Viscosity	60
Depth Cen. Gauge	Ft.		Blanked Off		Temperature	115	Anchor Size & Length	ID 2 7/8" x 3 3/8" OD 6 1/2" x 5" x 28' - 38'
BT. P.R.D. No.				Hour Clock	Depths Acc. From	KELLY BUSHINGS	Depth of Tester Valve	1050' Ft.
Initial Hydro Mud Pres.					TYPE	AMOUNT	Depth Back Pres. Valve	Ft.
Initial Closed in Pres.					Cushion	-		Ft.
Initial Flow Pres.					Recovered	400	Feet of Muddy saltwater, slightly	
Final Flow Pres.					Recovered		Feet of gas cut	
Initial Flow Pres.					Recovered	3560	Feet of Saltwater, slightly gas	
Final Closed in Pres.					Recovered		Feet of cut	
Final Hydro Mud Pres.					Oil A.P.I. Gravity	-	Water Spec. Gravity	-
Depth Bot. Gauge	4110 Ft.	YES		Blanked Off	Gas Gravity	-	Surface Pressure	- psi
BT. P.R.D. No.	1907	24		Hour Clock	Tool Opened	4:40 PM	A.M. Tool Closed	5:52 PM
Initial Hydro Mud Pres.	2100	2062			Remarks	Opened tool for 2 minute 1st flow with		
Initial Closed in Pres.	1795	1766				strong blow. Closed tool for 20 minute initial		
Initial Flow Pres.	1595	1	1627			closed in pressure. Reopened tool for 30 minute		
Final Flow Pres.	1615	1	1561			2nd flow with strong blow decreasing to weak in		
Final Closed in Pres.	1795	2	1753			30 minutes. No gas or fluid to surface. Closed		
Final Hydro Mud Pres.	2080	2042				tool for 20 minute final closed in pressure.		

Legal Location Sec. - Twp. - Rng.  
 Lease Name  
 Well No.  
 Test No.  
 Field Area  
 WILDGAP  
 County  
 State  
 VICTORIA  
 Owner's District

FORMATION TEST DATA \*Unable to read 3



APPENDIX E

PALYNOLOGICAL REPORT

Top 5'9"

Thinly interlaminated siltstone, mudstone, sandstone and shale.

The siltstone is medium grey, firm, argillaceous, micaceous and contains fine scattered carbonaceous flecks, common carbonized plant fragments, occasional feldspars, red brown plant resin, and occasional inclusions of mudstone and red brown ferruginous clay. The mudstone is firm, medium grey, finely micaceous, and is shaley in habit in places.

The sandstone is light grey, fine grained, moderately hard, slightly calcareous in places and consists of sub-angular poorly sorted grey quartz, minor feldspars, abundant carbonaceous and coaly flecks, grains, plant fragments, and very coarse white and brown micas, in a dirty, argillaceous, kaolinitic to occasionally calcareous matrix. Tight.

The shale is dark grey to black, very carbonaceous, consisting largely of carbonized and coaly poorly preserved plant fragments with red brown plant resin inclusions and coarse brown and white mica flakes. Occasional coarse flakes (up to 1") across are present of light greenish-white chlorite?

The laminations of this unit appear to be regular, well defined, and may be rhythmic. Some cross lamination is present, but dip is fairly consistent at about 5°.

Bottom 1'3"

Mudstone, medium grey, fairly firm, with a sub-conchoidal fracture near the top. Downward the mudstone becomes silty, grading to a siltstone, as described above, near the base of the core. Inclusions of granules and coarse grains of quartz are present over a 1" zone at the top of this unit. The inclusions are about 1" in diameter and are possibly crudely hexagonal when viewed from above. One inclusion appears to taper downward to a cylinder about 1/2" in diameter; the inclusions consist of very coarse angular grains of fresh clear quartz, some opaque milky quartz and dark grey translucent quartz, some very coarse pellets of red brown claystone, rare trace of garnets? vague grains and pellets of mudstone, in a mudstone matrix which appears to be slightly calcareous in a few places.

No well defined bedding is apparent in this unit.

CORE NO. 19 7487' to 7500' Recovered 12'0"

Top 5'9"

Sandstone, light grey, with occasional dark grey micaceous laminations. Core has cut through one balled structure at least 18" in diameter. Elsewhere dips range from 20° to 45°. Cross bedding and small scale slump features fairly common. The sandstones consist of generally sub-angular to rarely rounded, fine grained with occasional medium grained, moderately sorted, clear, white and grey quartz, rare feldspars, mud pellets, lithic fragments and carbonaceous specks, with rare to dominant micas, in a kaolinitic slightly calcareous matrix, with rare pyrite cement. Bedding planes are defined by a concentration of mica lying parallel to the bedding. Mica is mostly detrital muscovite and biotite, partly authigenic muscovite and a brownish mica.

Next 2'6"

Sandstone, very light grey, with numerous thin interbeds, laminations and pellets and irregular sub-angular fragments of dark grey to black shale, (containing a few plant fragments) up to several inches across. Strongly cross-bedded. Dips range from 20° to 40°. The sandstone consists of very fine grained grey and white angular quartz, decomposed feldspars, mud pellets, carbonaceous grains and common micas in a siliceous kaolin matrix. The shales contain common detrital and authigenic micas, carbonaceous fragments and carbonised plant remains.

Bottom 3'9"

Shale, medium to dark grey, and Mudstone, with laminations and thin interbeds of Sandstone and Siltstone. Some partings show very abundant fairly preserved leaf fragments. Dip: bedding poorly developed, appears to be at a low angle ranging up to 10°. The siltstones are very feldspathic and contain fine mica flakes and carbonaceous specks, and large coaly fragments.

A PALYNOLOGICAL REPORT ON  
PLANET HEATHFIELD NO.1 WELL

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by

E.A. Hodgson

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Records 1954/74

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COMPARISON WITH OUTCROP SAMPLES FROM THE MERINO GROUP.	4
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TABLE 1: Distribution of spores, pollens and  
microplankten in Planet Heathfield No.1 Well.

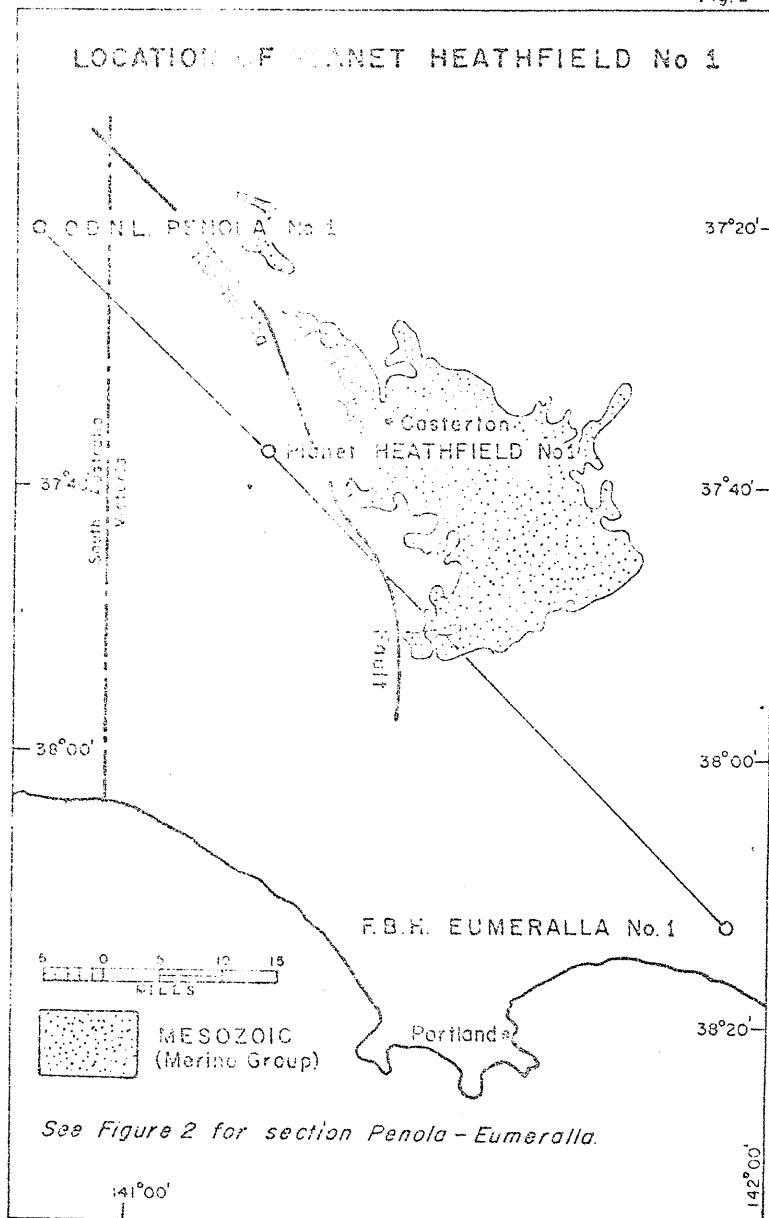
FIGURE 1: Location of Planet Heathfield No.1 Well.

FIGURE 2: A Palynological correlation of O.D.N.L. Penola  
No.1 Planet Heathfield No.1 and F.B.H. Eumeralla  
No.1 Wells, Otway Basin.

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Fig. 1



Bureau of Mineral Resources, Geology and Geophysics. May 1964.  
To Accompany Record 1954/74

J54/1

A PALYNOLOGICAL REPORT ON  
PLANET HEATHFIELD NO.1 WELL.

by

E.A. Hodgson

Records 1964/74

SUMMARY

Samples of thirteen cores from the Merino Group in Planet Heathfield No.1 Well have been examined for their content of spores and pollens. The microfloral assemblages between Core 6, 2374 feet, to Core 18, 6893 feet, are of Lower Cretaceous age. Core 19 (7499 feet) could be of lowermost Cretaceous age but its microfloral content, although lacking diagnostic Jurassic forms, suggests that it is possibly of uppermost Jurassic age. Microplankton were observed only in Core 6 (2374 feet) and indicate a marine or brackish water origin for this sample.

INTRODUCTION

Planet Heathfield No.1 Well was drilled during March and April 1964 at Latitude 37°37'38" south, Longitude 141°11'08" east in the Otway Basin, Victoria, to a total depth of 7,500 feet.

The well was sited on the culmination of a seismically delineated, closed anticline and was drilled to determine the section to the base of the Mesozoic. The limitations of the rig prevented the well from being deepened beyond 7,500 feet even though it was still in Upper Mesozoic rocks at this depth.

OBSERVATIONS AND COMMENTS

Table 1 shows the observed distribution of spores, pollens and microplankton in Planet Heathfield No.1 Well.

O.D.N.L. Penola No.1 which is approximately twenty-seven miles north-west of Heathfield No.1 has been palynologically examined by Dettmann (1963) and Evans (in O.D.N.L., 1963a). Penola No.1 therefore provides a suitable section to which the Heathfield stratigraphy can be referred (see Fig.1).

Dettmann investigated microfloral successions in the Great Artesian Basin (Oodnadatta Bore No.1 and Cootabarlow Bore No.2) and the Otway Basin (Penola Bore No.1 and Robe Bore No.1) and delineated three microfloral assemblages based on the restricted vertical distribution of distinctive species. The microfloral assemblages are named from their most consistently occurring diagnostic species which in stratigraphic order of appearance are Crybelosporites stylosus \* , Dictyotosporites speciosus and Coptospora paradoxa.

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\* For authorship of this and subsequent species mentioned see Dettmann 1963.

Heathfield Cores 16 (3990 feet) to 19 (7499 feet), i.e. below the lowest recorded occurrence of D. speciosus, contain members of Dettmann's stylosus assemblage (recorded by Dettmann in Penola between 4766 and 4776 feet) including Cyclosporites hughesi and Coronatispora perforata. Because the stylosus assemblage of Dettmann and the Neocomian - Aptian Microflora 11B of Balme (1957), which are closely comparable, contain supposedly diagnostic Lower Cretaceous forms including Cicatricosisporites australiensis, they were assigned a Lower Cretaceous rather than Jurassic age. Heathfield Cores 16 - 18 contain C. australiensis, Cicatricosisporites ludbrooki and Microcachyridites antarcticus and are accordingly assigned the same age. Core 19, although lacking key Jurassic forms, does not contain C. australiensis or C. ludbrooki and is therefore possibly of uppermost Jurassic age.

Dictyotosporites speciosus occurs in Heathfield Cores 12 (4621 feet) to 15 (5693 feet) where it is associated with Schizosporis reticulatus and Pilosporites notensis, both members of Dettmann's speciosus assemblage. (At Penola, Dettmann reported the speciosus assemblage between 2990 and 4618 feet). The validity of species assemblages and the usefulness of comparing such units from different wells must be questioned since the coincidence of life ranges of perhaps unrelated spores and pollens which constitute the "assemblage" may be fortuitous. This is indicated by variation in the "assemblage" associated with a particular species in various well sections. At Heathfield, Cicatricosisporites ludbrooki first appears in Core 18, Cicatricosisporites australiensis in Core 17 and Dictyotosporites speciosus in Core 15. Dettmann (1963) however, found that D. speciosus occurred below the first appearance of C. australiensis which in turn preceded C. ludbrooki, except at Penola where both C. australiensis and C. ludbrooki begin their life ranges together in Core 14 (3715-21 feet). However, the life range of D. speciosus has been observed in Penola No.1, Heathfield No.1 and Eumeralla No.1 (Evans, 1963). It is a distinctive feature of the well sections and as such provides a means of correlating them (see Fig. 2).

Ludbrook (1963) suggested that a slight angular unconformity at 4200 feet in Penola No.1 corresponded "to the disconformity between the Runnymede Formation and the Mocambo Member exposed at Killara Bluff (Kenley, 1954)". This level is within the range of Dictyotosporites speciosus (2990-4618 feet) and neither Dettmann nor Evans, report microfungal changes which might support the existence of such an unconformity. The presence at Heathfield of the subsurface correlate of the post-Mocambo disconformity cannot be identified by this means until there is palynological evidence of its age at outcrop.

Foraminisporis asymmetricus and Foraminisporis wonthaggiensis are included in Dettmann's speciosus assemblage and range up into the paradoxa assemblage. These species have not been observed at Heathfield in samples containing D. speciosus but they are confined to Core 10 and above. Over this interval F. asymmetricus and F. wonthaggiensis (both very abundant in Core 9 (3763 feet)) and other species which begin their life ranges in Core 10 (including Cingutritetes clavus) define a distinctive microfungal unit which is very different from the microflora of Cores 12-15. The life range of F. wonthaggiensis in Heathfield (Cores 6 (2374 feet) to 10 (4145 feet)), defines a microfungal unit younger than that characterized by the presence of D. speciosus and older than Dettmann's paradoxa assemblage (reported from 1200-2790 feet in Penola) since neither Coptospora paradoxa nor any of its associates were observed at Heathfield.

PALYNOLOGICAL CORRELATION WITH NEIGHBOURING WELLS

Figure 2 shows a palynological correlation of Penola, Heathfield and Eumeralla wells based on the life ranges of Coronatispora perforata, Dictyotosporites speciosus and Balmeisporites holodictyus. The life range of C. perforata at Penola, as shown in Figure 2, is not in agreement with Dettmann's observations of it in other wells where it is usually found below and within the lower part of the life range of D. speciosus. At Heathfield C. perforata ends its life range before the first appearance of D. speciosus. The correlation lines in Figure 2 join the centres of intervals between observation points and within which the floral changes apparently take place.

D. speciosus was present at total depth (10,308 feet) in Eumeralla whereas Penola and Heathfield were completed below the first appearance of D. speciosus in apparently older rocks containing members of Dettmann's stylosus assemblage.

The life ranges of D. speciosus and B. holodictyus at Penola overlap slightly but B. holodictyus was not observed at Heathfield although it could be present above Core 6 (2374 feet), the highest fossiliferous sample. The Heathfield section between Cores 6 (2374 feet) and 10 (4145 feet) is a distinctive unit characterized by the presence of Foraminisporis asymmetricus and Foraminisporis wonthaggiensis and lacking both D. speciosus and B. holodictyus. A correlate of this unit is present at Eumeralla but not at Penola. S.E.O.S. Beachport No. 1 drilled approximately 25 miles west of Penola, but not included on the correlation chart, also apparently lacks this unit since Core 9 (3665-3675 feet) from that well contains Coptospora paradoxa and Core 10 (3938-48 feet) D. speciosus (on the basis of data recorded shortly after the well was drilled in 1962).

The presence of this unit in the eastern wells and its apparent absence in Penola and Beachport suggests either that an hiatus exists in the west or that deposition of the unit did not extend as far west as Penola.

Core 34 (10,037 feet) of O.D.N.L. Mount Salt No. 1 (T.D. 10,044 feet) contained microplankton and the spores Aequitriradites tilchaensis and Laevigatosporites ovatus (al. "Polypodiaceasporites" sp. of Evans in O.D.N.L. 1963b) which were recorded in Penola Core 12 (3363-73 feet). It is therefore possible that Mount Salt No. 1 bottomed in sediments as old as the Lower Cretaceous Heathfield No. 1. Core 10. This would be in contrast to the suggestion by O.D.N.L. (1963b) that Mount Salt No. 1 bottomed in either "Equivalents of the Paaratte Formation", "Equivalents of the Belfast Mudstone" or "Equivalents of the upper part of the Waarre Formation", as the Belfast Mudstone of the Port Campbell embayment is Upper Cretaceous in age (e.g. Cookson and Eisenack, 1961., Bain, 1962). It is not clear what is meant by "Equivalents of the upper part of the Waarre Formation", especially as no mention is made of the unit above, the Flaxmans Beds, although the bottom of Mount Salt, as a correlate of Heathfield Core 10, could still be older than this third alternative. However, it is in general agreement with the observations in Mount Salt No. 1, about 3000 feet above the base of the hole, of D. belfastensis which is associated with the Belfast Mudstone in the Port Campbell area.



COMPARISON WITH OUTCROP SAMPLES FROM THE MERINO GROUP

Evans (1961) examined nine samples from outcrops of the Merino Group of south-western Victoria (see Fig. 1). Two were barren, three were fossiliferous but lacked diagnostic species and four contained sufficient spores to determine their Lower Cretaceous (?Albian) age. The latter group has been considered in relation to the microfloral succession of Heathfield. One sample, W 37, can be directly compared with Heathfield Core 9 (3763 feet) since it contains a number of key forms found in this core, including relatively common Foraminisporis asymmetricus, Foraminisporis wonthaggiensis and Filosporites notensis. Merino outcrop sample W12 contains Cingulatisporites euskirkensoides, Trilobosporites trioreticulatus and Coptospora paradoxa none of which have been observed at Heathfield, but which characterize Dettmann's paradoxa assemblage. W12 is therefore younger than any of the samples which have been studied from Heathfield. The Merino samples W55 and W 139 contain no diagnostic species which would permit comparison with the Heathfield well section.

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Subs. Act. Publ. 42.

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(unpubl.).

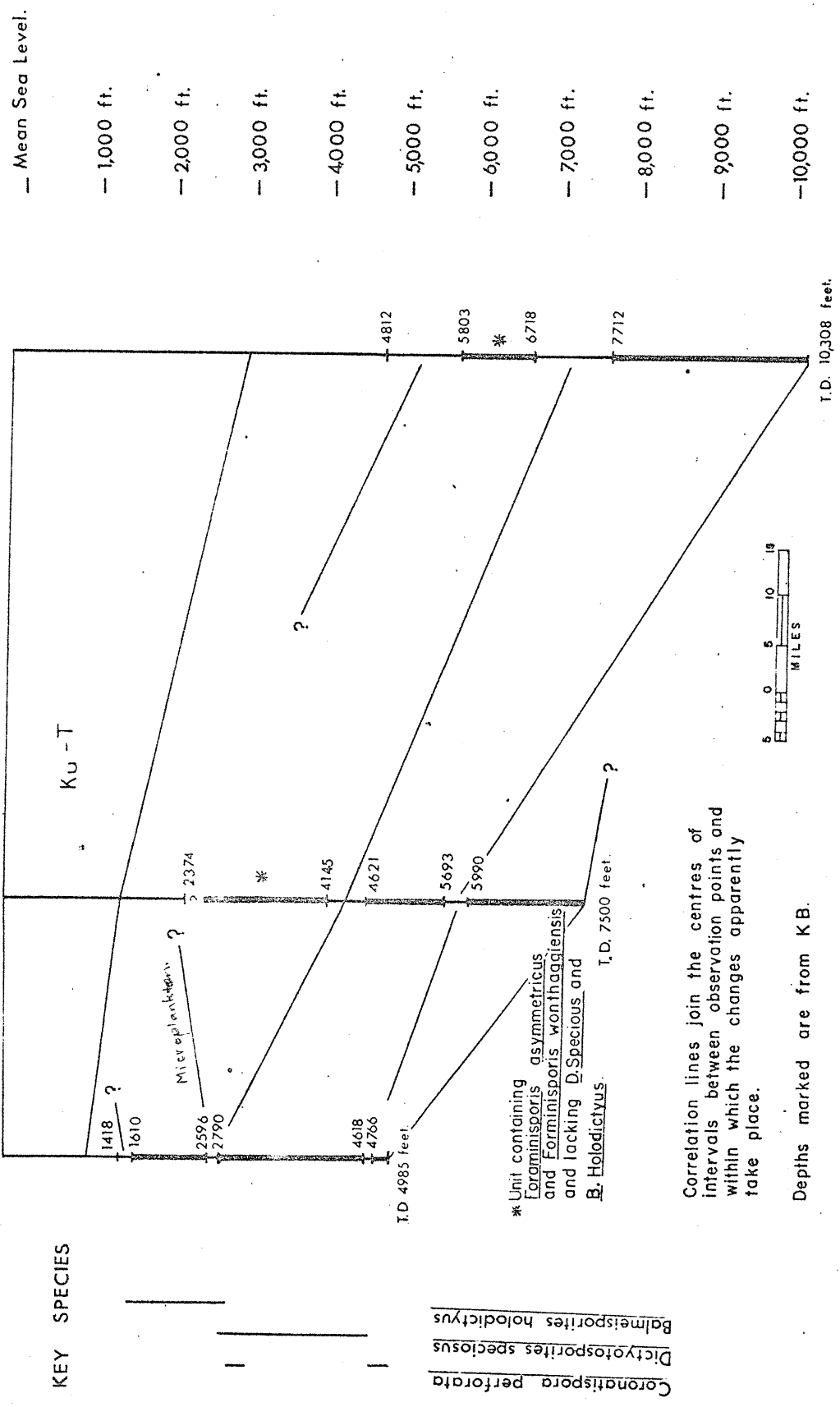
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Fig. 2

**PALYNOLOGICAL CORRELATION OF  
O.D.N.L. PENOLA No.1 PLANET HEATHFIELD No.1 AND F.B.H. EUMERALLA No.1 WELLS;  
OTWAY BASIN**

*in 12  
Part of  
Assembly  
in 1969*

O.D.N.L. PENOLA No.1      Planet HEATHFIELD No.1      F.B.H. EUMERALLA No.1  
0      0      0  
Ground Level.      Ground Level.      0



Correlation lines join the centres of intervals between observation points and within which the changes apparently take place.

Depths marked are from KB.

PE905826

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    BASIN = OTWAY BASIN  
    PERMIT = PEP/26  
    TYPE = WELL  
    SUBTYPE = DIAGRAM  
    DESCRIPTION = Spore/Pollen and Microplankton  
                  Distribution Chart (from appendix E of  
                  WCR--Palynological report) for  
                  Heathfeild-1  
    REMARKS =  
    DATE\_CREATED =  
    DATE\_RECEIVED =  
        W\_NO = W483  
        WELL\_NAME = HEATHFEILD-1  
    CONTRACTOR =  
    CLIENT\_OP\_CO =

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX F

WATER ANALYSES

Comments :

Several notes on this analysis are appended below:

- (1) The figure for the total solids in solution is an evaporation figure and therefore subject to some errors. However it does give a fair indication of the level of soluble material. Where chemically-complex mud conditioners are added during deep drilling, the calculation of a hypothetical combination is not justified.
- (2) There is an imbalance between the anion and cation totals although in view of the very high figures involved, the difference is not excessive. A contributing factor in the difference in totals may be the presence of chemically-complex mud conditioners mentioned in Note (1). If it can be obtained within a reasonable time, it is intended to have a spectrographic analysis made, to indicate any unusual radicle that may have been missed.

*John C. Kennedy*  
Senior Chemist,  
Mines Department.

12th May,

1964

An. MS/PG/14/4

Report on Sample No. 412/64

U.W.R.S. 3279

Sample : Water from Oil Well  
 Locality : Parish: Drajurk  
 District: Casterton  
 Sender : Planet Oil Company,  
 2 O'Connell Street,  
SYDNEY. N.S.W.

Particulars:

No. 412  
 U.W.R.S. 3279  
 Bore Heathfield No.1  
 Sample D.S.T. No.2  
 Depth (feet) 4078 - 4144 (Partly Heathfield Str.)  
 Date 28.3.64  
 Remarks: Recovery consisted of 3960' of fluid,  
 of which 400' was muddy, gassy, salt  
 water and 3560' was gassy salt water.

<u>Results :</u>	<u>Parts per million</u>	<u>Me. per litre</u>	
Total solids in solution (by evaporation)	26,840		
Chloride (Cl)	15,340	432.6	anions
Carbonate (CO <sub>3</sub> )	7	0.23	
Bicarbonate (HCO <sub>3</sub> )	103	1.68	
Sulphate (SO <sub>4</sub> )	20	0.42	
Nitrate (NO <sub>3</sub> )	Nil	Nil	434.93
Calcium (Ca)	1,678	83.7	
Magnesium (Mg)	37	3.0 <sub>4</sub>	
Zinc (Zn)	7.7	0.24	
Iron (Fe)	0.6	0.02	
Sodium (Na)	7,800	339.1	} 320.1
Potassium (K)	43	1.09	
Silica (SiO <sub>2</sub> )	3	0.10	427.19
.....			
Total hardness (as CaCO <sub>3</sub> )	4,343		

pH 8.0

Chloride Residue							Class	..2. Chloride	Alkalinity	Sub-class
Na+K	Ca	Mg	HCO <sub>3</sub>	CO <sub>3</sub>	SO <sub>4</sub>	epm per 100 epm				
79	19.4	0.7	0.4	0.05	0.1	F	433	1.9	tk	

Suspect mud additives influencing analysis.  
 See over page. PKK 26/1/67

PE602053

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    BASIN = OTWAY  
    PERMIT = PEP 26  
    TYPE = WELL  
    SUBTYPE = COMPOSITE\_LOG  
    DESCRIPTION = Composite Well Log Heathfield-1 sheet  
                  1of 3  
    REMARKS =  
    DATE\_CREATED = 24/04/64  
    DATE\_RECEIVED =  
        W\_NO = W483  
        WELL\_NAME = Heathfield-1  
    CONTRACTOR = Planet Exploration Co P/L  
    CLIENT\_OP\_CO = Planet Exploration Co P/L

(Inserted by DNRE - Vic Govt Mines Dept)



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- CONTAINER\_BARCODE = PE903980
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  - BASIN = OTWAY
  - PERMIT = PEP26
  - TYPE = WELL
  - SUBTYPE = COMPOSITE\_LOG
- DESCRIPTION = Heathfield 1 Composite well log sheet 2  
of 3 (enclosure from WCR)
- REMARKS =
- DATE\_CREATED = 24/04/64
- DATE\_RECEIVED =
  - W\_NO = W483
  - WELL\_NAME = Heathfield-1
- CONTRACTOR =
- CLIENT\_OP\_CO = Planet Exploration Company Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE602054

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    DESCRIPTION = Composite Well Log Heathfield-1 sheet 3  
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    REMARKS =  
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    DATE\_RECEIVED =  
        W\_NO = W483  
    WELL\_NAME = Heathfield-1  
    CONTRACTOR = Planet Exploration Co P/L  
    CLIENT\_OP\_CO = Planet Exploration Co P/L

(Inserted by DNRE - Vic Govt Mines Dept)

PE903981

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BASIN = OTWAY  
PERMIT = PEP 26  
TYPE = WELL  
SUBTYPE = GEOL\_MAP  
DESCRIPTION = Geological Map showing Heathfeild-1,  
Otway Basin, PEP 26, (enclosure from  
WCR) for Heathfeild-1  
REMARKS =  
DATE\_CREATED = 10/02/64  
DATE\_RECEIVED =  
W\_NO = W483  
WELL\_NAME = Heathfield-1  
CONTRACTOR = Planet Exploration Co P/L  
CLIENT\_OP\_CO = Planet Exploration Co P/L

(Inserted by DNRE - Vic Govt Mines Dept)

PE604457

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  - BASIN = OTWAY BASIN
  - PERMIT = PEP/26
  - TYPE = WELL
  - SUBTYPE = WELL\_LOG
- DESCRIPTION = Electric log, 1:100, (enclosure 5 of  
WCR) for Heathfeild-1
- REMARKS =
- DATE\_CREATED = 10/03/64
- DATE\_RECEIVED =
  - W\_NO = W483
  - WELL\_NAME = HEATHFEILD-1
  - CONTRACTOR = SCHLUMBERGER
  - CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

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  - PERMIT = PEP/26
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  - SUBTYPE = WELL\_LOG
- DESCRIPTION = Electric log, 5:100, (enclosure 5 of  
WCR) for Heathfeild-1
- REMARKS =
- DATE\_CREATED = 10/03/64
- DATE\_RECEIVED =
  - W\_NO = W483
  - WELL\_NAME = HEATHFEILD-1
- CONTRACTOR = SCHLUMBERGER
- CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

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  - BASIN = OTWAY BASIN
  - PERMIT = PEP/26
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  - SUBTYPE = WELL\_LOG
- DESCRIPTION = Microlog, 1:100, (enclosure 5 of WCR)  
for Heathfeild-1
- REMARKS =
- DATE\_CREATED = 10/03/63
- DATE\_RECEIVED =
  - W\_NO = W483
  - WELL\_NAME = HEATHFEILD-1
  - CONTRACTOR = SCHLUMBERGER
  - CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)

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                  for Heathfeild-1  
    REMARKS =  
    DATE\_CREATED = 10/03/63  
    DATE\_RECEIVED =  
        W\_NO = W483  
        WELL\_NAME = HEATHFEILD-1  
    CONTRACTOR = SCHLUMBERGER  
    CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

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Heathfeild-1
  - BASIN = OTWAY BASIN
  - PERMIT = PEP/26
  - TYPE = WELL
  - SUBTYPE = WELL\_LOG
- DESCRIPTION = Continuous Dipmeter, 1:100, (enclosure  
5 of WCR) for Heathfeild-1
- REMARKS =
- DATE\_CREATED = 22/04/64
- DATE\_RECEIVED =
  - W\_NO = W483
  - WELL\_NAME = HEATHFEILD-1
  - CONTRACTOR = SCHLUMBERGER
  - CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

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- BASIN = OTWAY BASIN
- PERMIT = PEP 26
- TYPE = WELL
- SUBTYPE = WELL\_LOG
- DESCRIPTION = Sonic Gamma Ray Log, 1:100, (enclosure  
5 of WCR) for Heathfeild-1
- REMARKS =
- DATE\_CREATED = 10/03/64
- DATE\_RECEIVED =
- W\_NO = W483
- WELL\_NAME = HEATHFEILD-1
- CONTRACTOR = SCHLUMBERGER
- CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)

PE604456

This is an enclosure indicator page.  
The enclosure PE604456 is enclosed within the  
container PE903980 at this location in this  
document.

The enclosure PE604456 has the following characteristics:

ITEM\_BARCODE = PE604456  
CONTAINER\_BARCODE = PE903980  
    NAME = Sonic Gamma Ray Log(5:100) for  
          Heathfeild-1  
    BASIN = OTWAY BASIN  
    PERMIT = PEP 26  
    TYPE = WELL  
    SUBTYPE = WELL\_LOG  
    DESCRIPTION = Sonic Gamma Ray Log, 5:100, (enclosure  
                  5 of WCR) for Heathfeild-1  
    REMARKS =  
    DATE\_CREATED = 10/03/64  
    DATE\_RECEIVED =  
        W\_NO = W483  
    WELL\_NAME = HEATHFEILD-1  
    CONTRACTOR = SCHLUMBERGER  
    CLIENT\_OP\_CO = PLANET EXPLORATION CO. PTY. LTD.

(Inserted by DNRE - Vic Govt Mines Dept)

PE905824

This is an enclosure indicator page.  
The enclosure PE905824 is enclosed within the  
container PE903980 at this location in this  
document.

The enclosure PE905824 has the following characteristics:

ITEM\_BARCODE = PE905824  
CONTAINER\_BARCODE = PE903980  
    NAME = Generalized Stratigraphic Sequence for  
          Heathfeild-1  
    BASIN = OTWAY BASIN  
    PERMIT = PEP/26  
    TYPE = WELL  
    SUBTYPE = STRAT\_COLUMN  
    DESCRIPTION = Generalized Stratigraphic Section  
                  (enclosure 8 of WCR) for Heathfeild-1  
    REMARKS = also includes descriptions of strata  
    DATE\_CREATED = 31/05/65  
    DATE\_RECEIVED =  
        W\_NO = W483  
        WELL\_NAME = HEATHFEILD-1  
    CONTRACTOR = BUREAU OF MINERAL RESOURCES, GEOLOGY  
                  AND GEOPHYSICS  
    CLIENT\_OP\_CO =

(Inserted by DNRE - Vic Govt Mines Dept)

PE905825

This is an enclosure indicator page.  
The enclosure PE905825 is enclosed within the  
container PE903980 at this location in this  
document.

The enclosure PE905825 has the following characteristics:

ITEM\_BARCODE = PE905825  
CONTAINER\_BARCODE = PE903980  
    NAME = Detailed Stratigraphic Section for  
          Heathfeild-1  
    BASIN = OTWAY BASIN  
    PERMIT = PEP/26  
    TYPE = WELL  
    SUBTYPE = STRAT\_COLUMN  
DESCRIPTION = Detailed Stratigraphic Section  
              (enclosure 9 of WCR) for Heathfeild-1  
REMARKS = also includes detailed descriptions of  
          strata  
DATE\_CREATED = 30/06/65  
DATE\_RECEIVED =  
    W\_NO = W483  
    WELL\_NAME = HEATHFEILD-1  
CONTRACTOR = BUREAU OF MINERAL RESOURCES, GEOLOGY  
              AND GEOPHYSICS  
CLIENT\_OP\_CO =

(Inserted by DNRE - Vic Govt Mines Dept)