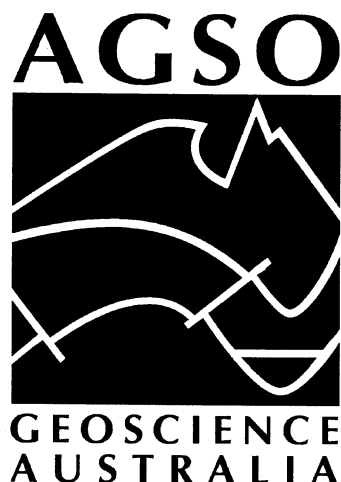


# Data Repository



## Well Completion Report Scanned Image File

Well Name	Aroo 1
UNO	W7740001
PLSA File Reference	74/208
Operator	Hematite Petroleum
Contractor	BHP
Date of Report	July 1974
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74208

Aug 24

AROO NO. 1

WELL COMPLETION REPORT

by

E.A. Hodgson

HEMATITE PETROLEUM PTY. LTD.

July 1974.

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I.

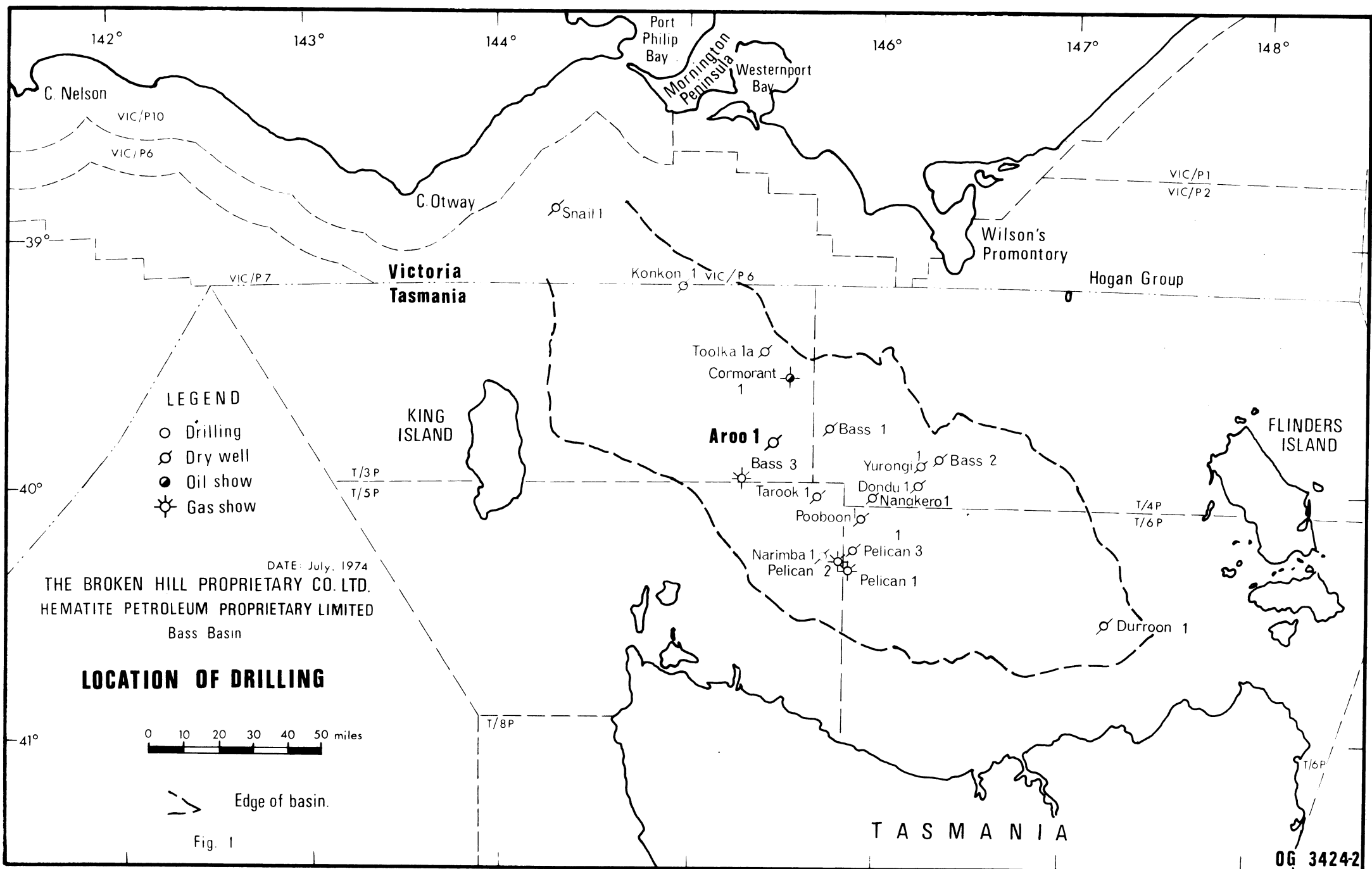
SUMMARY(1) Drilling

Aroo No. 1 was drilled with the "Glomar Conception" floating rig for the operator, Hematite Petroleum Pty. Ltd. The well was spudded on the 4th of March, 1974 at latitude  $39^{\circ} 47' 30.325''$  South, longitude  $145^{\circ} 26' 47.976''$  East in 250 feet of water. It was abandoned on the 23rd of April, 1974 after reaching a total depth of 12,112 feet below K.B. 20 inch casing was set at 704 feet,  $13\frac{3}{8}$  inch casing at 2979 feet and  $9\frac{5}{8}$  inch casing at 9635 feet. Cement plugs were placed over the intervals 9734 to 9200 feet, 2679 to 2397 feet and 590 to 354 feet. Total drilling time was 51 days.

(2) Geological

The well spudded in and drilled to 5950 feet K.B. through bioclastic calcirudite, fossiliferous marl and calcareous siltstone of the Oligocene to Miocene Torquay Group below which it penetrated the Eocene to Oligocene Demons Bluff Formation; a uniform, thinly bedded glauconitic, calcareous siltstone. The first sand in the well, at 6723 feet K.B., marks the top of the Eastern View Coal Measures (Paleocene to Eocene) which consist of interbedded sandstone, siltstone, shale and coal. At 10,327 feet the well encountered volcanics which together with minor interbedded sediments persisted to total depth at 12,112 feet K.B. The volcanics are interpreted as a succession of partially weathered basaltic flows of Paleocene or Pre-Paleocene age.

Indications of hydrocarbons were observed at several levels in Aroo-1, including the top of a sand within the volcanic sequence. Five formation interval tests were run. Three tests recovered very small amounts of gas. A fourth test was a mud run and FIT No. 5, though valid, achieved no recovery due to impermeability of the formation.



## II.

INTRODUCTION

Aroo No. 1, the sixteenth well in the Bass Basin, was drilled in T/3P (see Fig. 1) by the permit holder Hematite Petroleum Pty. Ltd. The costs of the operation were subsidised by the Commonwealth Government under the Petroleum Search Subsidy Act 1959-1969.

The well was located over a major basement ridge above which closure had been mapped at three levels interpreted to lie within the Eastern View Coal Measures. The lowest, and largest, of these mapped closures, that of the Blue horizon, believed to be an unconformity, was the primary target of the Aroo-1 well. The nature of the rocks below the horizon was unknown but amplitude character at this level was considered indicative of sandstone, possibly correlates of M. diversus and L. balmei zone sands which are hydrocarbon bearing elsewhere in the basin. However, Aroo-1 showed that the Blue horizon lies within a thick sequence of basaltic flows and minor interbedded sediments which occur between 10,327 and 12,112 feet (K.B.).

The Aroo-1 well was drilled outside of the highest mapped closure (Red horizon) but within the intermediate Brown horizon closure. The minor fluorescence and wet gas in the mud which were logged in the well between the Red and Brown horizons were not therefore expected. These indications were in M. diversus to N. asperus zone correlates of the Cormorant-1 gas and condensate bearing sands. The more important hydrocarbon indications were in sands of the lower L. balmei zone near the Brown horizon. Two cores cut in the best sand in the well showed fluorescence and fair to good porosity and low permeability, however a plug at 9530 feet had a permeability of 113 md. Formation interval tests of this and other sands containing hydrocarbon indications suggest very low permeabilities. Wet gas was logged in a sandstone within the volcanic sequence.

Apart from the volcanic sequence in the lower part of the well, the succession penetrated in Aroo-1 was as expected and the key horizons above the volcanics were close to their predicted positions. The well was spudded in and drilled through calcirudite, marl and siltstone of the Torquay Group underlain by siltstone of the Demons Bluff Formation. More than three and a half thousand feet of sandstone, siltstone, shale and coal of the Eastern View Coal Measures were penetrated in Aroo-1 above the volcanic sequence, which, in the absence of dating cannot either be included in or excluded from the formation. The volcanics are interpreted as a Paleocene or Pre-Paleocene succession of partially weathered basaltic flows and interbedded sandstone and siltstone. The well was plugged and abandoned in volcanics at 12,112 feet (K.B.).

Drilling data in the report was contributed by B.J.W. Wood, geophysical data and interpretation by J.I. Denham and M. McNicol. Other authors are listed in the relevant appendices.

## III.

WELL HISTORY1. General Data

(i)	Well Name & Number	Aroo No.1
(ii)	Name & Address of Operator	Hematite Petroleum Pty. Ltd., 140 William Street, MELBOURNE, VIC. 3000
(iii)	Name & Address of Titleholder	Hematite Petroleum Pty. Ltd., 140 William Street, MELBOURNE, VIC. 3000
(iv)	Petroleum Title	T/3P
(v)	District	King 1:250,000
(vi)	Location    Latitude : Longitude:	39° 47' 30.325" South 145° 26' 47.976" East
(vii)	Elevation    Seafloor : Kelly Bushing:	250 feet below sea level 32 feet above sea level
(viii)	Total Depth	12,112 ft. below K.B.
(ix)	Date Drilling Commenced	4th March, 1974.
(x)	Date Total Depth Reached	19th April, 1974.
(xi)	Date Well Abandoned	22nd April, 1974.
(xii)	Date Rig Released	23rd April, 1974.
(xiii)	Drilling time in days to Total Depth	47 days
(xiv)	Status	Dry- plugged and abandoned
(xv)	Total Cost	Not available at date of submission.

2. Drilling Data

- (i) Name & Address of Drilling Contractor  
Global Marine (A/Asia) Pty.Ltd.  
380 Lonsdale Street,  
MELBOURNE, VIC. 3000
- (ii) Drilling Plant:
- |                                     |   |
|-------------------------------------|---|
| Make                                | National 1625                                 |
| Type                                | Diesel Electric                               |
| Rated Capacity with drill pipe used | 25,000 feet with 5 inch drill pipe            |
| Motors                              |   |
| Make                                | General Electric (x 2)<br>Caterpillar (x 8)   |
| Type                                | Diesel Electric D 398<br>U12 Diesel           |
| B.H.P.                              | 752 D1x2 8720 Intermittent<br>6800 Continuous |
- (iii) Derrick:
- |                |  |
|----------------|--|
| Make           | Built by Continental EMSCO<br>using a Global Marine<br>design (142f) |
| Type           | Standard type with travelling<br>block guide rails                   |
| Rated Capacity | 1,000,000 lb.  |
- (iv) Pumps:
- |      |                |
|------|----------------|
| Make | National       |
| Type | N 1300         |
| Size | 1300 H.P. each |
- (v) Blowout Preventer
- |           |   |
|-----------|---|
| Equipment | Shaffer/Hydril/Cameron<br>combination sub-sea stack<br>connected to surface by<br>Vetco marine riser system |
|-----------|---|

## (v) Cont'd.

<u>Make</u>	<u>Type</u>	<u>Size</u>	<u>Series (API)</u>
Shaffer	1 x Spherical annular BOP	16 $\frac{3}{4}$ "	1500 5,000 psi MSP
Hydril	1 x annular (bag type) "	16 $\frac{3}{4}$ "	1500 5,000 psi MSP
Shaffer	1 x Shear/Blend Ram BOP	16 $\frac{3}{4}$ "	1500 5,000 psi MSP
Cameron	3 x Pipe Ram BOP	16 $\frac{3}{4}$ " x 5"	1500 5,000 psi MSP

## (vi) Hole Sizes &amp; Depths:

26 inch hole	Seabed to 772 ft.
15 inch hole	772 ft. to 3034 ft.
12 $\frac{1}{4}$ inch hole	3034 ft. to 9686 ft.
8 $\frac{1}{2}$ inch hole	9686 ft. to 12112 ft.

(vii) Casing Details

Size	Weight	Grade	Length	Setting Depth K.B.
20"	94 $\frac{\text{lbft}}{\text{ft}}$	X52	431 ft.	704 ft.
13 $\frac{3}{8}$ "	68 $\frac{\text{lbft}}{\text{ft}}$	J55	2701 ft.	2979 ft.
9-5/8"	47 $\frac{\text{lbft}}{\text{ft}}$	N80	9360 ft.	9635 ft.

	20 Inch	13 $\frac{3}{8}$ Inch	9-5/8 Inch
Position of Float Collar	-	2939 ft.	9595 ft.
Position of Float Shoe	704 ft.	2979 ft.	9635 ft.
Position of Centralizers	<p>1 centralizer at bottom and top of first joint. Position stop rings for 5' of centralizer movement between collar and stop ring.</p> <p>1 centralizer at top of 2nd joint with stop ring positioning as above.</p> <p>1 centralizer free to move on 4th, 6th and 8th joints.</p>	<p>1 centralizer at bottom and top of first joint. Position stop rings for 5' of centralizer movement.</p> <p>1 centralizer free to move on 3rd, 5th, 7th, 9th, 11th, 13th, 15th and 17th joints.</p>	<p>1 centralizer at bottom and top of first joint. Position stop rings for 5' of centralizer movement.</p> <p>1 centralizer free to move on 3rd, 5th and 7th joints.</p> <p>1 centralizer free to move every 3rd joint from 8th joint to 8200'.</p>
Quantity of Cement used	1000	1250	400
Grade of Cement	650 Sx of Aust "N" & 350 Sx of Aust "N" with 2% Cac/2	1250 Sx of Aust "N" with 1% Cac/2	400 Sx of Aust "N" with 0.9% 1+R-12
Top of Cement	Sea Floor	-	-



(viii) Drilling Fluid

Depth	Type	WT PPG	Visc. SEC	WL cc	FC in.	pH	Sand %
Sea Bed - 3034 ft.	Sea Water	8.8					
3034 - 12112	Ligno Sulph- onate	10.1	44	6.4	2/32	10.7	Tr

Treatment: Mud pumped over shale shaker and through de-sander and de-silter. Thinning was accomplished by addition of water, lignosulphonate. pH controlled by addition of Caustic Soda.

Materials and Chemicals Consumed:

Gel	(SX)	1634
Benex	(SX)	75
Soda Ash	(SX)	72
Caustic	(Drum)	107
Condet	(Gal)	95
CC-16	(SX)	468
Barite	(SX)	7075
Q'Broxin	(SX)	425
Al. Stearate	(SX)	8
CMC	(SX)	50
Nitrate	(SX)	4

(ix) Water Supply: Fresh Water transported by Workboat.

(x) Plugging back and Cementation Jobs:

Type: Abandonment Plug

	Plug No.1	Plug No.2	Plug No.3
Interval	9734 - 9200 ft.	2679 - 2397ft.	590 - 354'
Quantity of Cement	175 sacks	170 sacks	90 sacks
Details		Squeezed 14 bbls. in perforations between 2676 - 2679 ft.	

Perforation: at 2679 feet,  
4 shots/foot at 90° phasing.

(xii) Fishing Operations: Nil.

(xiii) Side-tracked Hole: Nil.

### 3. Location

(i) Site Investigations Carried Out: Nil.

(ii) Anchoring Methods: The "Glomar Conception has an advanced chain and LWT Moorfast 30,000 lb. anchor mooring system. The drillship arrived on location on the night of 3 March, 1974 and dropped anchor No.7. Following this anchors 2, 5 and 10 were located and tested to 250 Kipps. After landing the base plate and commencing drilling, the remaining anchors (3,4,8 and 9) were run and anchors 3, 4 and 8 were tested to 250 Kipps. Anchors 1 and 6 are Boss anchors run on 2 $\frac{3}{4}$ " steel cable. The anchor pattern used is a 40°/80° pattern. Total mooring time was 23 hours.

(iii) Transportation: Helicopters and Workboats from Barry Beach Marine Terminal near Port Welshpool, Vic.

4. Formation Sampling(i) Ditch Cuttings:

Below 772 feet, 5 sets of washed and dried samples every 30 feet interval; from 6160 feet every 20 feet interval; below 6920 feet every 10 feet interval.

All samples were bagged and caught from a standard shaker by Baroid mudlogging personnel under the supervision of the Hematite well site geologist.

A set of washed and dried samples was sent to the Bureau of Mineral Resources and to the Tasmanina Mines Department and a set retained by Hematite Petroleum at:

15 Lorimer Street,  
South Melbourne, Victoria.

(ii) Coring:

Core No.	Interval Cored (feet below K.B.)	Footage Cut	Recovery (feet)	Recovery (%)
1	9515-9545	30	30	100
2	9545-9570	25	25	100
3	11782-11812	30	30	100

Specific samples were waxed and sent to the Bureau of Mineral Resources for core analysis (see Appendix 4 for results). The remainder was slabbbed into thirds; one-third sent to the B.M.R., one third to the Tasmanian Mines Department and one third retained by Hematite Petroleum. For full descriptions see Appendix 3.

(iii) Sidewall Sampling:

90 Sidewall Cores were shot by Schlumberger of which 85 were recovered. The material was retained by Hematite for palynological and micropalaeontological processing. For full description see Appendix 3.

<u>Depth</u> <u>(feet)</u>	<u>Recovered</u> <u>(inches)</u>	<u>Depth</u> <u>(feet)</u>	<u>Recovered</u> <u>(inches)</u>
11902	$\frac{3}{4}$	8910	$1\frac{1}{8}$
11853	$\frac{3}{4}$	8897	$1\frac{1}{4}$
11761	$\frac{1}{2}$	8878	$1\frac{1}{4}$
11700	$\frac{3}{4}$	8794	1
11676	$\frac{1}{2}$	8748	1
11630	$1\frac{1}{2}$	8698	$\frac{3}{4}$
11565	1	8615	$\frac{3}{4}$
11523	1	8603	$1\frac{1}{4}$
11445	$\frac{1}{2}$	8553	$\frac{3}{4}$
11410 <del>10</del>	no recovery	8520	$1\frac{1}{2}$
11363	$1\frac{1}{2}$	8459	$1\frac{1}{4}$
11185	$\frac{3}{4}$	8384	$1\frac{1}{4}$
11133	$1\frac{1}{4}$	8290	$1\frac{1}{4}$
10977	$1\frac{1}{2}$	8265	$1\frac{1}{2}$
10897	$\frac{3}{4}$	8189	$1\frac{1}{2}$
10818	$\frac{3}{4}$	8114	5/8
10715 <del>17</del>	no recovery	7990	5/8
10605	1	7923	$1\frac{1}{2}$
10570	$\frac{3}{4}$	7868	$\frac{3}{4}$
10435	1	7844	1
10330	$\frac{1}{2}$	7723	$\frac{3}{4}$
10294	$1\frac{1}{4}$	7566	1
10250	$\frac{3}{4}$	7431	1
10194	$\frac{1}{2}$	7390	$\frac{3}{4}$
10147 <del>25</del>	no recovery	6944	$1\frac{1}{2}$
10057	$\frac{1}{4}$	6920	$1\frac{1}{2}$
9990	$\frac{1}{2}$	6840	1
9872	$\frac{1}{4}$		
9828 <del>29</del>	no recovery	6825	$1\frac{1}{2}$
9748 <del>-</del>	1	6730	$1\frac{1}{4}$
9651	1	6715	$\frac{1}{2}$
9621	1	6555	$1\frac{1}{4}$
9578	1	6394	$1\frac{1}{4}$
9494	1	6246	$1\frac{1}{4}$
9487	$1\frac{1}{4}$	6105	$1\frac{1}{2}$
9451	$1\frac{1}{4}$	5956	2
9447	$1\frac{1}{4}$	5824	$1\frac{1}{2}$
9350	$1\frac{1}{4}$	5700	2
9250	1	5612	2
9180	$\frac{3}{4}$	5466	2
9166	1	5317	2
9120	7/8	5244	2
9080	1	5055	2
8990	$1\frac{3}{4}$	4904	no recovery
8944	1	4794	2
		4624	2

5. Logging and Surveys(i) Electric Logging:

Log	Interval (feet)	Scale (Inches to 100 feet)
GR/SP/ISF/S	3030-704	2(SP/ISF only) and 5
SP/ISF/S	9688-2988	2(SP/ISF only) and 5
GR/SP/ISF/S	11257-10950	2(SP/ISF only) and 5
SP/ISF	11973-9638	2 and 5
GR/CAL/FDC/CNL	9693-2988— 10572-9638	2 and 5 2 and 5
GR/CAL/FDC	11982-10386	2 and 5
CAL	3034-704 11251-10700	5 5
HDT	9694-2988	Recorded 10":100' Interpreted logs 2 and 5 inch:100'
CAL/PML	9685-2988	2 and 5
CCL	2679-2676	5

Copies of all logs are in Enclosure 2.

- (ii) Penetration Rate and Gas Logs: Penetration rates, gas chromatographic analysis and total gas measurements were recorded from 772 feet to total depth.
- (iii) Deviation Surveys: The location and results of Totco surveys are shown on the complete well log.
- (iv) Temperature Surveys: None run. BHT recordings were taken on electrical logging runs.
- (v) Other Well Surveys: Velocity surveys were conducted prior to running 9<sup>5</sup>/<sub>8</sub> casing at 9635 feet and at total depth (12112 feet). See Appendix 6.

6. Testing(i) Formation Testing:

Details in Enclosure 2, summary in Appendix 5.

Test No.	Depth (feet)	Recovery		Final Shut in Pressure (psi)	Comment
		Gas (c.f.)	Water (c.c.)		
2	9133	1.9	9000	3966	
1	9530	1.4	1900	4444	
3	10318	1.9	8600	4750	
4	10708	-	-	-	Impermeable Formation
5	10890	-	-	-	Mud Run

(ii) Production Testing: Nil.

## IV. GEOLOGY

(1) Summary of Previous Work

Line B-14 of the 1963 Flinders Island - Kingston Area Seismic Survey was shot over Aroo, but lack of deep data at that time gave no indication of the structure. The B71A Lines 44 and 51 provided the first data deep enough for the reversal at Aroo to be identified and it was further delineated in the B72A Marine Seismic Survey (Lines 87-91). On the basis of this survey, three fault controlled culminations were mapped at Aroo. In 1973 several lines of the Flinders Seismic Survey were shot over Aroo, these gave much better deep data than had hitherto been recorded and enabled mapping of structural closure at the Blue, Brown and Red horizons in the Aroo area. The Blue closure was considered the most attractive drilling target and Aroo-1 was located on the crest of that structure. The location also lies within the mapped closure of the Brown horizon but outside that of the Red horizon.

Seismic mapping of the Red horizon within the main coal sequence, is relatively easy between Cormorant and Aroo, but neither the Blue nor Brown horizons can be positively traced across faults downthrown to the south in the vicinity of Aroo. Accordingly, although there was reasonable certainty about the structural configuration of these horizons at Aroo, the lithology of the interval below the Brown horizon was conjectural. The Brown to Blue interval was interpreted as shale, at the base of which, amplitude character was believed to indicate sandstone, possibly correlates of very coarse sands in the L. balmei zone in Poonboon-1 and Dondu-1 and T. longus zone sands in Bass-3. The Blue horizon was thought to be an unconformity surface of unknown time value over an interbedded sand-shale sequence, whose seismic character is different on the north and south sides of Aroo. It is not known whether this reflects genuine lithological differences or is due to masking of lower reflections on the south side by the more widespread overlying coals in that area.

(2) Summary of Regional Geology

Aroo-1 was drilled in the north western part of the Bass Basin on a structure which lies over a basement structural high of regional significance. This ridge runs north east to south west generally 2,000 to 10,000 feet below the top of the main coal sequence of the Eastern View Coal Measures. The deep basin proper lies to the south east of the ridge and there are a series of distinct, more isolated depressions in basement to the north west, on the other side, of the ridge. These depressions are elongated parallel to the ridge and are up to 9,000 feet deep. Data from the Flinders Seismic Survey suggests that the basement high may consist of Palaeozoic rocks and has been an important structural and topographic feature of the Bass Basin since the beginning of the Upper Cretaceous when the north western depocentres were established. These sub basins appear to be faulted on their southern margins and reflect structural growth of the ridge throughout the Upper Cretaceous. Subsequent growth, mainly in Paleocene and Eocene times, was relatively minor. However, preferential growth of the deep basin relative to the northern basinal area continued through the Tertiary. This growth may be demonstrated seismically and is reflected in the fact that the top of the Eastern View Coal Measures is about 2000 feet lower in Pelican-1 than in Cormorant-1. Aroo has no closure at this level. The highest mapped closure at Aroo being the Red horizon within the P. asperopolus or N. asperus zones (late Eocene) in this part of the basin. Closure at Aroo is also mapped at the Orange (M. diversus zone or younger) (Encl. 7) and Brown (L. balmei zone) horizons (Encl. 8).

In the Aroo area, the M. diversus zone is between 500 and 800 feet thick whereas it is more than two thousand feet thick to the north in Cormorant and to the south in Pelican where gas shows occurred in this interval in the Pelican-1 and -2 wells.

Basement of possible Palaeozoic age is thought to lie at approximately 17,000 feet at Aroo.

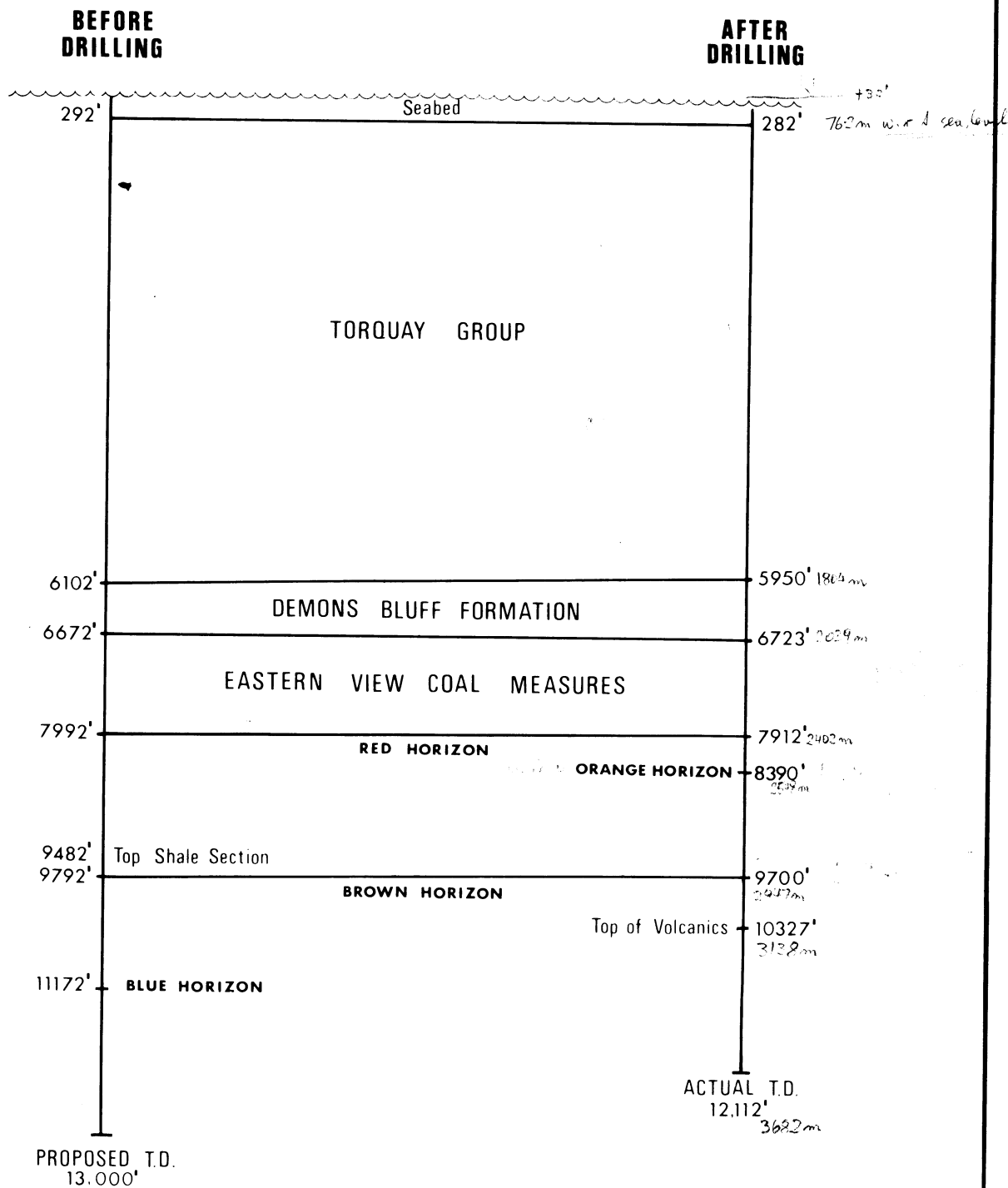
A major NW-SE fault to the east of the Aroo structure cuts through to the Red horizon. Thickening of the section on the downthrown (north east) side of the fault is interpreted to be of the order of 2000 feet of inter-bedded sediments. The orientation of the fault and several smaller ones in the Aroo area is parallel to the main basin-forming tensional faults which are believed to have developed during early stages of the Antarctic-Australia pull apart.



## (3) Stratigraphic Table:

Age	Formation	Top of Formation		Thickness (feet)	Lithology
		K.B. (feet)	Subsea (feet)		
Oligocene to Miocene	Torquay Group	282	250	5668	Bioclastic calcirudite, overlying fossiliferous marl, calcareous siltstone.
Eocene to Oligocene	Demons Bluff Formation	5950	5918	773	Glauconitic, calcareous siltstone.
Paleocene to Eocene	Eastern View Coal Measures	6723	6691	3604	Sandstone, siltstone, shale, mudstone, coal, dolomite.
Paleocene or Pre-Paleocene	Unnamed	10327	10295	1785+	Fresh and weathered volcanic rocks including amygdaloidal basalt; siltstone and sandstone.

DATE July, 1974  
 THE BROKEN HILL PROPRIETARY CO. LTD.  
 OIL AND GAS DIVISION  
 (HEMATITE PETROLEUM PROPRIETARY LIMITED)  
 Bass Basin



All depths are feet below K.B. (32 feet above Sea level).

AROO NO. 1

# STRATIGRAPHIC CHART

(4) Stratigraphy(a) General

The tops of the Demons Bluff Formation and Eastern View Coal Measures were intersected close to prediction being 152 feet higher and 51 feet lower respectively. However in the lower part of the coal measures an unpredicted sequence of interbedded volcanics and sediments was penetrated between 10,327 feet and total depth (12,112 feet).

(b) Stratigraphic Description

Oligocene to Miocene Torquay Group 282-595<sup>8</sup> feet  
(K.B.) (Thickness 5668 feet)

The formation was not sampled above 772 feet (K.B.) nor was it logged above the 20 inch casing shoe at 704 feet (K.B.) but it is presumed to extend to the sea floor (282 feet (K.B.) ).

No attempt has been made to subdivide the group as penetrated in this well into the formations recognised onshore but broad lithological variations are recognised. Above 2358 feet (K.B.) the dominant lithology is unconsolidated bioclastic calcirudite containing some complete, well preserved microfossils. A fossiliferous, glauconitic, calcarenite is interpreted to occur between 2358 and 2545 feet (K.B.) below which is a fossiliferous marl grading at about 4120 feet (K.B.) into glauconitic, calcareous siltstone and marl. The boundary with the underlying Demons Bluff Formation is gradational and lithologically very indistinct. An apparent increase in mica content below about 5600 feet continues into the underlying formation.

Log character correlation with nearby wells places the top of the Demons Bluff Formation at 5950 feet.

Eocene to Oligocene Demons Bluff Formation  
5950-6723 feet (K.B.) (Thickness 773 feet)

The Formation is a micaceous glauconitic, calcareous, siltstone which, on the basis of log character and samples, has overall uniformity despite its thinly bedded nature.

The boundary with the underlying Eastern View Coal Measures is placed at the top of the first sand in the well at 6723 feet (K.B.).

Paleocene to Eocene Eastern View Coal Measures  
6723-10,327 feet (H.B.) (Thickness 3604 feet)

Several thick sandstone units above 8100 feet give this part of the formation a much more sandy aspect than the lower part. The sandstones are very fine to medium grained and contain minor dolomitic streaks. They are interbedded with siltstone, shale and coal beds. From 8100 to the top of the volcanics at 10,327, the formation is much more shaly and less sandy. The total thickness of coal in the well is less than 80 feet.

Paleocene or Pre-Paleocene volcanic succession  
10,327-12,112 feet (T.D.) (K.B.) (Thickness 1785+ feet)

The volcanics in Aroo-1 are interpreted as a series of basaltic flows, some of which have weathered tops and which are interbedded with minor sandstone, siltstone and shale.

Lithological interpretation of the volcanics from the wireline logs is difficult and in addition attempts to obtain radiometric and palynological ages have been unsuccessful. Seismically, the volcanics appear conformable with the overlying coal measure succession but their areal extent cannot be mapped seismically and their relationships with the Eastern View Coal Measures remains conjectural.

An angular discordance and change of seismic character at around 11,000 feet, near the previously mapped position of the Blue horizon, is still recognised.

(5) Structure

Prior to drilling, closure at Aroo was mapped at the Blue, Brown and Red horizons. The main target was the Blue horizon and the well was located on the interpreted Blue horizon crest which placed it within the Brown closure but outside a small closure mapped at the Red level.

The Blue horizon, mapped with some difficulty prior to drilling, occurred within what the well proved to be a thick volcanic succession and the pre-drilling geological interpretation below the Brown horizon in the Aroo area must therefore be revised. However the structural interpretation remains valid. Events within the volcanic succession can still be mapped at around 11,000 feet sub-sea in the vicinity of what was previously mapped as the Blue horizon closure.

The well confirmed closure at the Brown level which has now been remapped (Enc. 8 ) but which is not interpreted as being significantly different from its pre-drilling configuration.

The encouraging indications of hydrocarbons in the Red to Brown interval in Aroo-1 led to an attempt to map just below the Red horizon a marker designated as the Orange horizon in rocks of M. diversus or younger age (Enc. 7).

(6) Relevance to Occurrence of Petroleum(i) Hydrocarbon Occurrences

There were intermittent indications of hydrocarbons in Aroo-1 below 6944 feet, the main zone of interest being in the interval 9100-10,320 feet in sands of Paleocene (upper and lower L. balmei) age. Details of the hydrocarbons are contained in appendices and enclosures dealing with cores, sidewall cores, FIT's and log interpretation.

The first hydrocarbon indication in the well, apart from background gas, was pale yellow fluorescence, and slow cut associated with a sandstone from 6935-6950 feet. Sands at 8286-8296 and 8874-8881 feet were associated with logged wet gas. A sidewall core in the lower sand, at 8878 feet, had dull bluish fluorescence and very slow cut. However a sidewall core at 8290 feet gave no indication of fluorescence, nor was fluorescence observed in the cuttings from these two sands.

A sandstone from 9174-9181 feet and several thin sands between 9400 and 10,320 showed dull fluorescence and gave slow cut in cuttings associated with wet gas on the mud log. The best hydrocarbon indication in the well was from the sandstone at 9512-9557 feet which was fluorescent throughout and produced varying degrees of cut in cores 1 and 2 (Appendices 4 and 5). FIT 1 at 9530 feet recovered 1.4 cubic feet of gas, and 1900 cc's of water, probably filtrate. Pressure data indicate that effective permeability of the sandstone is low.

A sandstone (11,848-11,920 feet) within the volcanic sequence, showed wet gas on the chromatograph, without associated fluorescence or cut. Log interpretation of the interval is not reliable due to the great enlargement of the hole.

(ii) Relevance to Occurrence of Petroleum

Aroo-1 confirmed the hydrocarbon potential of the Paleocene to middle Eocene (lower L. balmei to lower N. asperus zones) sediments in this part of the basin. The hydrocarbons in the upper part of this succession, i.e. in M. diversus to N. asperus correlates of the Cormorant-1 gas and condensate bearing sands, were not expected at Aroo because the highest closure mapped prior to drilling was the Brown horizon within the

lower L. balmei zone strata. Post-drill remapping has delineated structural closure at Aroo just below the Red horizon at a seismic marker designated the Orange horizon (Enc. 7) in rocks of the M. diversus or younger zones.

The upper limit of the M. diversus zone is poorly defined in Aroo-1 but the whole zone is less than 800 feet thick and possibly only 500 feet thick. In addition, the net sand ratio for the M. diversus zone strata in the well is very low and only very minor hydrocarbon indications were encountered in it. This contrasts with the Pelican 1 and 2 wells which encountered gas and condensate shows in a very thick M. diversus zone sequence. The results of Aroo-1 suggest that significant hydrocarbon accumulations are unlikely at this stratigraphic level in the Aroo area.

Strata in the L. balmei zone, especially the lower L. balmei zone, gave the best hydrocarbon indications in the well and, despite generally poor permeability, this interval is most worthy of any further attempts to define possible new drilling targets in the area.

(7) Contribution to Stratigraphical Concepts

Aroo-1 confirmed the existence of more than three and a half thousand feet of Eastern View Coal Measures in this part of the Bass Basin. It also drilled an unexpected sequence of volcanics and minor interbedded sediments at least 1785 feet thick. Log character and sidewall core samples indicate that the volcanics are a series of more than twelve successive basalt flows separated from each other by upper weathered (kaolinized) zones or by thin interbedded sediments or both. The volcanics are Paleocene or older. Attempts to date them more accurately by palynology and Potassium-Argon geochronology were unsuccessful (see Appendix 1).

The well encountered hydrocarbon indications in M. diversus to N. asperus zone correlates of the Cormorant-1 gas and condensate bearing strata and in strata of the lower L. balmei (Paleocene zone. However, only 500 to 800 feet of M. diversus (lower Eocene) zone strata were penetrated in Aroo-1, compared with several thousand feet elsewhere in the Basin. The apparently reduced thickness of the M. diversus zone may be due either to intermittent or reduced rate of deposition of these strata or to erosion. The latter being indicated by a weak seismically defined unconformity at about 8300 feet (K.B.) which may correspond with a possible break interpreted on the logs between 8300 and 8600 feet (K.B.). It is also likely that part of the M. diversus zone strata has been eliminated by movement on a small east dipping normal fault which is recognised on HB73A Line 143 as passing through the Aroo-1 well. Additional evidence of the presence of a fault in the well comes from the dipmeter interpretation which shows easterly dip below 8750 feet in contrast to the regional dip at this level as deduced from seismic data which is clearly to the west. The east dip is believed to be due to drag folding. In the well the fault zone is probably between 8750 and 9100 feet, the drag folding first encountered in the well being on the upper (downthrown) side. A marked shale density change at about 8765 feet may indicate the approximate position of the fault, though it possibly lies even deeper.

The microfloras found in Aroo-1 were poorly preserved, especially in the lower part of the well where there is severe carbonization due to post depositional effects. Marine dinoflagellate cysts throughout the Eastern View Coal Measure section reflect intermittent marine phases into what is dominantly a non-marine succession.



Reworked Permian and (?) lower Cretaceous palynomorphs indicate that the Eastern View Coal Measures at Aroo-1 are at least partly derived from rocks of this age. It was not possible to determine whether or not erosion of lower Tertiary strata had similarly contributed to the younger Tertiary sediments.

(8) Porosity and Permeability of Sediments Penetrated

Foot by foot porosity estimates for the interval from 8001 to 10,553 feet (K.B.) are listed in the computer processed interpretation (Enclosure 3). Appendices 3 and 4 contain visual porosity estimates and core analysis results (Cores 1 and 2) respectively.

The only potential reservoir rocks of interest in Aroo-1 are the sandstone bodies of the Eastern View Coal Measures. These fall into three broad groupings; those in the upper part of the formation (P. asperopolus to N. asperus palynological zones) above 8100, those lying between 8100 and 10,327 feet (lower L. balmei to M. diversus zones) and those below 10,327 feet (undated) which are interbedded with volcanics.

Above 8100 feet, although GR/SP development is poor, the Eastern View Coal Measures contain 0.5 net sand. The individual bodies are thick and very fine to medium grained and their average (corrected)  $\phi_D$  is within the range 0.15 to 0.17. In a few places maximum  $\phi_D$  (uncorrected) reaches 0.27. Minimum  $\phi_D$  is 0 on dolomite streaks within sands near the top of the upper sand sequence.

Between 8100 feet and the top of the volcanics (10,327 feet K.B.) there is 550 feet of sandstone (0.25 net sand) with maximum  $\phi_D$  (corrected) of 0.26 minimum  $\phi_D$  0.04 and weighted average  $\phi_D$  (corrected) 0.15. The best sand in this interval is from 9514 to 9546 feet. It has an average  $\phi_D$  (corrected) of 0.16 and maximum and minimum  $\phi_D$  (corrected) of 0.20 and 0.08 respectively. Cores 1 and 2 were cut in this interval and core plugs from 9516 and 9530 feet showed porosities of 0.176 and 0.208 respectively.) Corresponding permeabilities for the two samples were 0.89 md and 113 md. FIT No. 1 at 9530 feet recovered 1.4 cubic feet of gas and 1900 cc's of water. The pressure data and recoveries for this test were achieved only after a shape charge has been fired into the formation indicating the extremely low permeability of the formation at this point in the well. FIT 2 at 9133 feet in a 6 feet thick sand with average  $\phi_D$  (corrected) of 0.10 (0.14 at 9133 feet) also indicated very tight formation.

Within the volcanic sequence from 10,327 to total depth (12,112 feet) are interbedded sediments including an interpreted thickness of 148 feet of sandstone. Only sidewall cores were obtained from these units and lithology determination in this section is difficult and log derived porosities even more unreliable due to lack of knowledge of the mineralogy, clay choking, borehole enlargement and other factors. Porosity of

these sands is probably low and PIT No. 5, a valid test at 10,708 feet, failed to recover any formation fluids due to low permeability.

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APPENDIX NO. 1

Petrological Reports

(a) Petrological by C.E. Palethorpe

(b) Geochronology by AMLEL

Memo to: B.R. Brown

Subject: El/15: Petrological examination of  
basalts from Aroo-1, Bass Basin.

Date: 22.4.74  
Our Ref: CEP-LJT  
Your Ref:  
File: M207  
Date:

Aroo-1 has intersected a basaltic unit, four specimens of which have been submitted for petrological examination.

Specimen MRL 4883 Aroo 1 11,788'.

This rock is a dark grey fine grained amygdaloidal basalt.

Plagioclase laths ( $\approx 0.5$  mm long) marginally zoned from An 65 (labradorite) to An 40 (andesine) occupy 50% of the rock and occur subophitically intergrown with titanaugite (20%). Chlorite is an important constituent of the rock also and occurs in the following habits; intersertal to plagioclase and titanaugite with a colloform texture, 5-10%; as zoned colourless, violet, pink, green and yellow chlorite pseudomorphing euhedral stumpy prismatic crystals (100-150  $\mu$  in diameter) outlined by goethite, 3%; as an alteration product of plagioclase, 3%; as an alteration product of occasional larger (500  $\mu$ ) euhedral prismatic conchoidally fractured crystals, 3%; and rimming amygdales, 3%. Calcite also occurs as an alteration product in association with chlorite and fills amygdales, 5-10%. Interstitial opaque minerals (3%) altered to goethite make up the remainder of the rock.

Discussion. The rock is an amygdaloidal basalt. The presence of titanaugite indicates the rock has alkaline affinities. The small crystals altered to chlorite appear to have been nepheline and the large ones were almost certainly olivine. If nepheline was originally present the rock could be termed a basanite or if not an alkali olivine basalt.

Specimen MRL 4884 Aroo 1 11,799'.

This specimen is a dark grey fine-grained basalt and in thin section is an identical rock type to MRL 4883 except it is not amygdaloidal. It is an alkali olivine basalt.

Specimen MRL 4885 Aroo 1 11,801'.

This rock is a pale grey slightly schistose altered basalt. In thin section it has an identical texture to MRL 4883 however the primary mineralogy has been completely destroyed. Calcite has replaced the plagioclase and titanaugite is represented by an irresolvable sub-opaque leucoxene-carbonate mixture. Intergranular and amygdaloidal calcite and chlorite are also present. Original olivines are now serpentine and carbonate. It was originally an alkali olivine basalt.

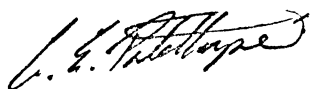
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Specimen MRL 4886 Aroo l 11,831'.

This is a medium grey altered basalt, containing large dark green chlorite-filled amygdales and calcite veins. In thin section the rock is strongly altered and has a similar texture and mineralogy to MRL 4885, with one important difference. Talc containing euhedral crystals of carbonate occupies about 20% of the rock and in some areas can be seen to be pseudomorphous after olivine.

The rock is more basic than the other three specimens and is an altered picrite basalt.

Discussion The specimens represent a partially altered basaltic flow derived from a magma undersaturated in silica. The presence of amygdales suggests it was a surface flow (rather than a sill) however there is evidence of crystal settling toward the base as signified by increased olivine pseudomorphs in MRL 4886.



C.E. Palethorpe  
Research Geologist.

c.c. Chief Geologist, Research & Planning  
Library.  
Ms. I. Mellins

GEOCHRONOLOGY REPORT: AROO-1

Plagioclase was separated from Aroo-1, 11,799' for K-Ar dating. The potassium determination of 0.004% indicated that there would not be any detectable radiogenic argon present and that at this level of concentration, the experimental uncertainty in any date calculated would be of the order of  $\pm 100\%$ .

Miss Mellins was advised by telephone on 4 June 1974 that there was no point in continuing with the argon determination on this sample and she authorised an attempt to separate and date plagioclase from the 11,788' sample. When the four thin sections were initially examined, the sample from this depth appeared to be suitable for mineral separation. However, the portion of the core that was sectioned could not have been representative of the rock as a whole for when the 11,788' sample was crushed, the major leucocratic mineral present was calcite. Plagioclase was present in only very minor amounts and could not be concentrated in sufficient quantity for analysis.



APPENDIX NO. 2

Palaeontological Reports

- (a) Micropalaeontology by David Taylor
- (b) Palynology by W.K. Harris
- (c) Palaeobotany by J.G.G. Douglas

## FORAMINIFERAL BIOSTRATIGRAPHY

### AROO-1 WELL

### BASS BASIN

by David Taylor.

Fourteen side wall cores and rotary cutting samples from 2000 feet to 6800 feet were examined for Foraminifera. No fauna was found in side wall core at 6246 feet and no new fauna was recognised below 6555 feet. A large fragment of Ammodiscus parri was submitted from a cutting sample between 9470 and 9500 feet. As A. parri is present in both the Demons Bluff Formation and the basal Jan Juk, this specimen was probably a down hole contaminant, especially as the species was recorded in the side wall core at 5824 feet (= early Oligocene). However large specimens of A. parri are common in the Dilwyn Formation of the Otway Basin (e.g. Wangoom-2, conventional core between 2500 and 2511), so that the possibility of early Eocene marginal marine conditions in Aroo-1 cannot be dismissed completely.

A distribution chart of planktonic foraminifera is submitted with this report together with an environmental analysis diagram. When the distribution chart and the environmental diagram are compared it is apparent why there are fluctuations in the degree of biostratigraphic control. There are only two small intervals, representing oceanic flooding or very high tides, within the tidal salt marsh environment between 6555 feet and 5700 feet. The interval at 6105 feet contains a Zone K fauna (= late Eocene) whilst that at 5700 feet contains a Zone J (= early Oligocene) fauna. More marine conditions exist above 5700 feet, but the deposition was on a very shallow shelf with poor oceanic circulation resulting in that no planktonic foraminifera were washed in and that arenaceous foraminifera were dominant due to poor oxygenation. Marine flooding at about 5000 feet introduced Zone I (late Oligocene) planktonics and oxygenation increased as is expressed by the absence of an arenaceous fauna.

In the early Miocene the environments reverts to one of a sheltered shallow continental shelf, without oceanic circulation reaching the depositional area and zonation is impossible due to absence of planktonic fauna between 5000 feet and 4300 feet. Above 4300 feet there is a gradual increase in the planktonic fauna culminating with a rich Zone E fauna (base of late Miocene). A rich planktonic fauna was characteristic of Zone E throughout the basin and marks the peak of the Miocene transgression.

Between 3100 feet and 2800 feet (Zone D) there is a decline in planktonic fauna which is absent completely above 2800, so that zonation is impossible. Richly bryozoal calcarenites are present above 2800 feet and this together with a dominance of miliolid and/or elphidid benthonic foraminifera indicates high energy conditions above the wave base.

The Aroo biostratigraphic sequence is similar to Bass-1 and the environmental trend is identical. However deposition is in much shallower water than Bass-1 and apart from at the peak of the Miocene transgression, the site was protected from open oceanic currents. Possibly Aroo was structurally higher than Bass-1 during the Oligo-Miocene.

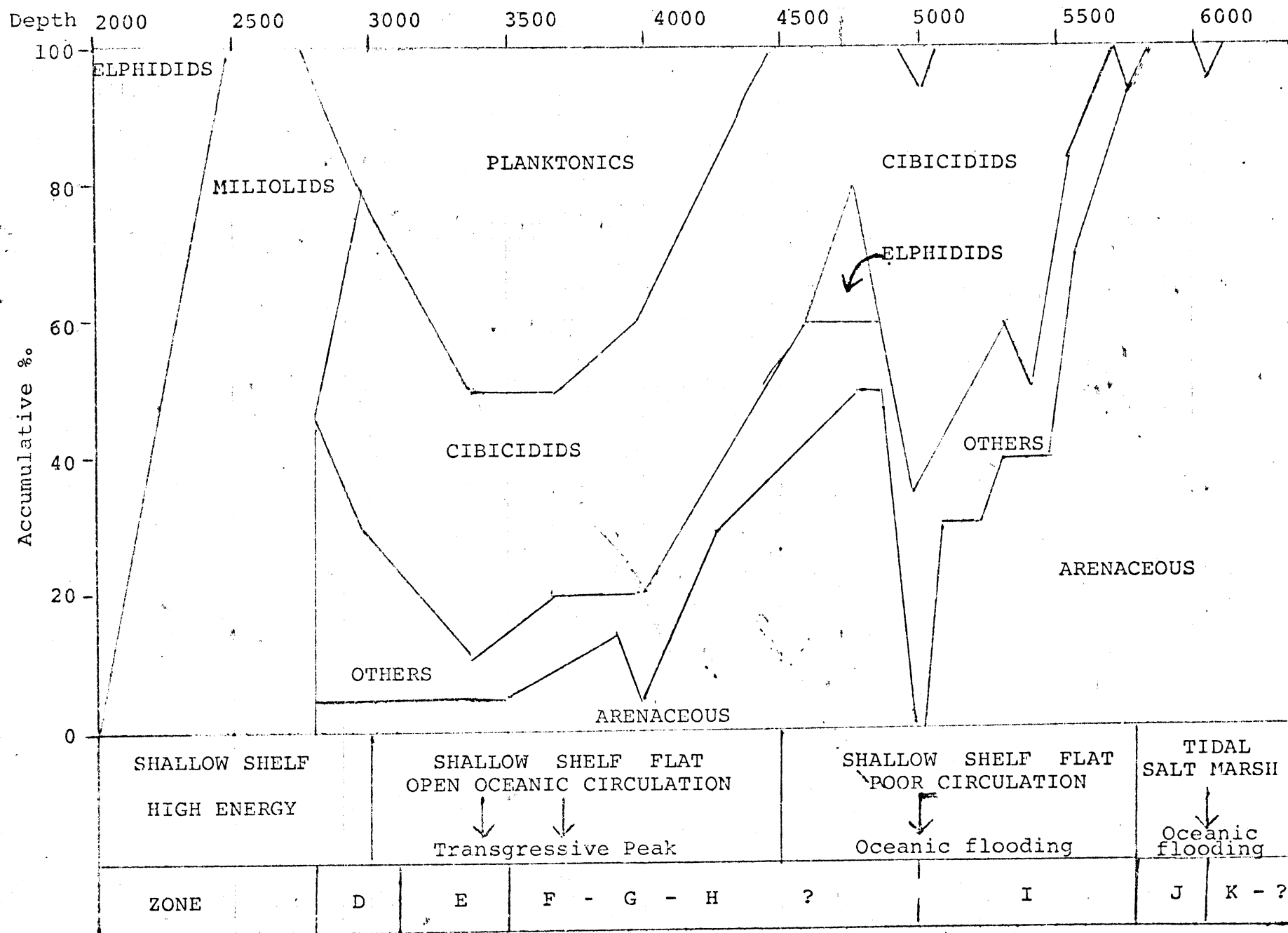
A R 0 0 - 1 PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY

. = 1 - 20 specimens

\* I = over 20 specimens \*

Depth	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
Side wall core						T T	T T T T	T T T T	T T T	T T
PLANKTONICS										
1. Orbulina univarsa	.	.	.	.	.	.	.	.	.	.
2. Globigerina apertura	.	I	I I I I I	I	I I I I	I	.	.	.	.
3. G. bulloides	.	I	I I I	.	.	.	.	.	.	.
4. G. woodi woodi	.	I	I I I I	.	.	.	.	.	.	.
5. Globigerinoides bisphericus	.	.	I . . . .	.	.	.	.	.	.	.
6. G. trilobus	.	.	I . . . .	.	.	.	.	.	.	.
7. Globorotalia conica	.	.	.	.	.	.	.	.	.	.
8. G. inflata	.	.	.	.	.	.	.	.	.	.
9. G. miocenica	.	.	.	.	.	.	.	.	.	.
10. Orbulina suturalis	.	.	.	.	.	.	.	.	.	.
11. Globigerinoides glomeratus curvus	.	.	.	.	.	.	.	.	.	.
12. Globoquadrina altispira	.	.	.	.	.	.	.	.	.	.
13. Globigerina woodi connecta	.	.	.	.	.	.	.	.	.	.
14. Globoquadrina dehiscens	.	.	.	.	.	.	.	.	.	.
15. Globigerina euapertura	.	.	.	.	.	.	.	.	.	.
16. G. praebulloides	.	.	.	.	.	.	.	.	.	.
17. G. sp.?	.	.	.	.	.	.	.	.	.	.
18. Globoquadrina prsdehiscens	.	.	.	.	.	.	.	.	.	.
19. Globigerina anglioporoides	.	.	.	.	.	.	.	.	.	.
20. G. ampliapertura	.	.	.	.	.	.	.	.	.	.
21. G. linaperta	.	.	.	.	.	.	.	.	.	.
Depth	2800	3100	3520	4990	5700	6105				
ZONE	D	E	? F	- G - H	? I	J	K	- ?		

# ENVIRONMENTAL SEQUENCE in AROO-1



BASIN BASSBY David Taylor

Form R 193 3/71

WELL NAME AROO-1DATE 10-6-74ELEV.         Foram Zonules

		Highest Data	Quality	2 Way Time		Lowest Data	Quality	2 Way Time
MIOCENE	A	Alternate						
	B	Alternate						
	C	Alternate						
	D	2800	3					
	D <sub>1</sub>	Alternate						
	D <sub>2</sub>	Alternate			2980	3		
	E	3100*	3		3400	3		
	E	Alternate						
	F	3520	3					
	F	Alternate						
	G	Alternate						
	H <sub>1</sub>	Alternate						
OLIGOCENE	H <sub>2</sub>	Alternate			4910	3		
	I <sub>1</sub>	4990	3					
	I <sub>1</sub>	Alternate 5055	1					
	I <sub>2</sub>	Alternate			5680	3		
	I <sub>2</sub>	Alternate			5612	1		
	J <sub>1</sub>	5700	2					
EOC.	J <sub>1</sub>	Alternate						
	J <sub>2</sub>	Alternate			5824	1		
	J <sub>2</sub>	Alternate						
EOC.	K	6105	2		6105	2		
	K	Alternate						
	Pre K							

\* Good incoming of E fauna.

## COMMENTS:

Note: If highest or lowest data is a 3 or 4, then an alternate 0, 1, 2 highest or lowest data will be filled in if control is available.

If a sample cannot be interpreted to be one zonule, as apart from the other, no entry should be made.

- 0 SWC or Core - Complete assemblage (very high confidence).
- 1 SWC or Core - Almost complete assemblage (high confidence).
- 2 SWC or Core - Close to zonule change but able to interpret (low confidence).
- 3 Cuttings - Complete assemblage (low confidence).
- 4 Cuttings - Incomplete assemblage, next to uninterpretable or SWC with depth suspicion (very low confidence).

Date Revised         By

DEPARTMENT OF MINES  
SOUTH AUSTRALIA

The Palynology of Hematite Aroo No. 1,  
Bass Basin, Tasmania

by

W.K. Harris  
Palynologist  
Biostratigraphy Division

6th June, 1974

Rept.Bk.No. 74/784  
D.M. No.155/73  
G.S. No. 5442  
Biostrat. 5/74

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Distribution of palynomorphs.



# SUMMARY

Depths in feet	Zones	Age
6715 - 6730	<i>N. asperus</i>	Middle to Late Eocene
6825 - 7431	Lower <i>N. asperus</i>	Middle Eocene
7566 - 7923	Indeterminate	
8189	<i>Proteacidites asperopolus</i>	Early to Middle Eocene
8384	Indeterminate	
8520 - 8944	<i>M. diversus</i>	Early Eocene
8990 - 9080	Upper <i>L. balmei</i>	Late Paleocene
9120	Indeterminate	
9166 - 9528	?Lower <i>L. balmei</i>	Paleocene
9559 - 9872	Indeterminate	
9990 - 10,294	Lower <i>L. balmei</i>	Paleocene
11,133 - 11,565	Indeterminate	

The above palynological zone assignments are based on 33 side wall core and 2 conventional core samples from Hematite Aroo No. 1, Bass Basin, Tasmania (Permit T/3P, Latitude 39°47'30.62" south, Longitude 145°26'51.08" east). Total depth of the well was 12,112 feet.

Assemblages between 6715 and 7431 feet yielded very sparse assemblages with fair to good preservation. From 7566 to 10,294 feet the assemblages were very poorly preserved and often carbonised. This feature imposes severe restraints on the interpretation of assemblages with very few specimens identifiable to specific level. Thus finer subdivisions of these zones is not possible.

The low confidence of many of the samples is further disadvantaged by mud invasion of fractured sidewall cores.

Rare to sparse microplankton are present sporadically in all zones except that of *P. asperopolus*.

## DISCUSSION

The biostratigraphic scheme of Stover & Partridge (1973) has been applied to the assemblages from this well. Table 1 summarises the palynological analyses.

*N. asperus* Zone - sidewall cores from 6715 to 7431 feet. The preservation of palynomorphs in this interval is generally fair, but the assemblages are not particularly diverse. Rare microplankton occur sporadically at 6730, 6825 and 6920 feet. Species recorded include *Spiniferites* spp., *Pterospermopsis* sp., *Cordosphaeridium* cf. *C. gracilis* and *Hystriosphæridium* cf. *tubiferum* and do not conflict with the assignment of the spore-pollen assemblages to the *N. asperus* Zone.

Based on the presence of *Intratropollenites notabilis* at 6825 feet the assemblage from this core is equated with the lower *N. asperus* Zone. Other significant species include *Proteacidites pachypolus*, *Tricolpites thomasi* and diverse and common *Nothofagidites* spp. Assemblages from 6920 and 7431 feet are assigned to this zone because of the predominance of *Nothofagidites* pollen over *Haloragacidites harrisii* rather than to the older *P. asperopolus* Zone.

*Proteacidites asperopolus* Zone - sidewall core at 8189 feet the assemblage although very poorly preserved and of very low diversity, is dominated by an abundance of *Haloragacidites harrisii*. Rare species include *Ephedripites* sp., *Proteacidites pachypolus*, *P. grandis* and *P. kopiensis*. The assemblage is assigned to this zone on very limited data, however the *H. harrisii* (*Nothofagidites* relationship is a useful regional guide, particularly in the lower sections of the zone.

*Malvacipollis diversus* Zone - sidewall cores at 8520 to 8944 feet. Further deterioration of preservation resulting in low diversity assemblages and four confident specific allocations, is most evident in this zone.

APPENDIX NO. 3

Description of Cores and Sidewall Cores

The lower boundary of this unit is determined by the first appearance of *Malvacipollis diversus*. It is associated with *Cyathidites gigantis* and *Proteacidites incurvatus*. Other species which make an apparent entry later include *Sapataceoidaepollenites rotundus* and *Periporopollenites demarctus*. Again the assemblages are so poorly preserved that no finer subdivisions are possible.

A low diversity but nevertheless characteristic suite of microplankton is present in the sidewall core at 8520 feet. The presence of *Diphyes colligerum*, *Wetzeliiella homomorpha*, ?*Deflandrea pachyceros*, *Operailodinium* sp. *Spiniferites* sp. and *Cordosphaeridium* sp. is strongly reminiscent of assemblage from this zone in the upper Dilwyn Formation of the Otway Basin. *Lygistepollenites balmei* Zone — sidewall cores from 8990 to 10,294 feet.

The recognition of this zone is based on the consistent occurrence of *Gambierina edwardsii* and *G. rudata* and the presence of *L. balmei* in most samples. Other significant species include *Cyathidites gigantis*, *Australopollis obscurus* and *Verrucosisporites kopukuensis*. The occurrence of *C. gigantis* and *V. kopukuensis* in the assemblage at 9080 feet would suggest that this is upper *L. balmei* but because of poor preservation and yields the boundary between upper and lower *L. balmei* cannot be resolved with any confidence. *Proteacidites incurvatus* occurs in the next sidewall core at 8990 feet. The first appearance of *C. gigantis* at 9528 feet is an alternative base to the upper *L. balmei* Zone.

Microplankton occur sporadically in most samples. At 8990 feet the assemblage of dinoflagellate cysts is characterised by ?*Kenleyia fimbriata*, *Cyclonephelium* sp. and *Wetzeliiella homomorpha*.

Reworked palynomorphs - Both Permian and Cretaceous spores and pollen are present throughout the section examined but it was not possible to determine the extent, if any, of any reworking of early Tertiary elements.

## CONCLUSIONS

Despite poor yields many barren samples and generally very poor preservation the microfloral assemblages do show trends which can be compared with well documented sequences elsewhere in southern Australia. Thus although an initial low confidence value was placed on individual assemblages this was strengthened when the whole sequence was considered.

The generally poor preservation is most probably <sup>due</sup> to post-depositional effects. The high degree of carbonication attests to this and in the lower sections of the well it is undoubtedly related to the emplacement of the interbedded volcanics.

Marine influence is marked by the presence of sparse and sporadic assemblages of marine dinoflagellate cysts and is reflected as a paralic sequence involving marginal marine and non-marine environments.

Both Permian and probably early Cretaceous reworked palynomorphs are readily recognised in several samples.

W.K. HARRIS

6th June, 1974

Palynologist

Biostratigraphy Division

## REFERENCE

- Stover, L.E. & Partridge, A.D. 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. *Proc. R. Soc. Vict.* 85: 237 - 286.

APPENDIX  
Distribution of Palynomorphs  
(Note: only productive samples listed here)

SPECIES	6715	6730	6825	6920	7431	8189	8520	8615	8794	8944	8990	9080	9120	9166	9250	9350	9528	9559	9990	10294
Nothofagidites emarcidus	X	X	X	X	X		X	X		X	X	X		X	X	X	X		X	
N. falcata	X	X		X																
Haloragacidites harrisii	X	X	X	X	X	X	X	X			X			X			X		X	X
Cyathidites australis	X		X	X	X		X	X				X		X						
Myrtacidites parvus	X					X					X					X	X			
Microcathyridites antarcticus	X				X		X								X		X			X
Proteacidites pachypolus	X		X			X														
P. parvus	X	X				X		X				X	X	X					X	X
P. adenanthoides	X			X																
Lycopodium sporites sp.	X											X				X			X	
Triletes tuberculiformis	X		X	X								X								
Dictyophyllidites sp.		X	X		X					X				X			X			
Nothofagidites vansteenisii		X	X																	
Lygistepollenites florinii		X	X	X	X	X	X								X		X			
Proteacidites annularis		X	X	X						X	X									
Cupanioidites orthotrichus		X	X	X				X												
Podocarpidites sp.		X		X			X	X		X				X	X		X	X	X	X
Nothofagidites flemingii		X	X	X	X		X	X				X		X	X					
*Pterospermopsis sp.		X																		
Santalumidites cainozoicus			X																	
Intratrilopollenites notabilis			X																	
*Cordosphaeridium cf. gracilis			X																	
*Spiniferites ramosus			X	X			X					X								
*Hystriochosphaeridium cf. tubiferum			X																	
Verrucosporites kopukuensis			X	X	X			X				X								
Proteacidites crassus			X		X									X						
Phyllocladites mawsonii			X		X			X				X	X	X	X	X	X		X	X
Malvacipollis diversus			X	X	X	X	X	X		X										
Tricolporites spp.			X	X	X	X	X					X		X			X		X	
Gleicheniidites circinidites			X				X			X	X			X	X	X	X			
Tricolpites thomasi			X																	
Triorites magnificus			X																	
Simplicipollis meridianus				X				X									X			
Polypodidites sp.				X	X		X			X		X		X	X		X			
Perinomonoletes sp.				X																
Sapotaceoidaeapollenites rotundus				X				X												
Stereisporites antiquasporites				X						X	X	X			X					
Periporopollenites demarcatus				X	X			X							X					
Laevigatosporites major					X		X							X		X				
**Parasaccites sp. (Permian)				X								X		X						
**Platysaccus sp. (Permian)																				
Proteacidites kopiensis				X		X						X			X					
P. recavus				X																
P. leightoni					X	X		X	X	X	X	X	X							
Eriopites sp.						X												X		
Tripolporopollenites ambiguus						X														
Osmundacidites sp.							X					X	X							
*Diphyes colligerum							X													
*Operculodinium sp.							X	X												
*Wetzeliella homomorpha							X					X	X							
*Gonyaulacysta sp.							X													
*?Cordosphaeridium sp.							X													
Dilwynites granulatus							X					X	X		X					
Clavifera triplex							X	X				X	X		X	X				
*?Deflandrea pachyceros								X	X						X					
Stereisporites (Tripunctisporis) sp.								X									X			
Cyathidites giganteus										X		X				X	X			
Proteacidites incurvatus										X	X									
*Kenleyia fimbriata																				
Lygistepollenites balsei												X		X		X	X			
Tricolpites gillii												X					X			
Ceratopollenites equalis												X	X		X					
Gambierina rudata												X	X	X	X	X	X		X	X
*?Achoemphaera sp.												X								
*Spiniferites cingulatus												X								
Cyclonephelium sp.												X		X						
*Australopollis obscurus												X	X		X		X			
?Bysanapollis emaciatus												X								
Cingutrilites clavus												X			X					
Krauselisporites papillatus												X								
Tricolpites philipsii												X			X		X			X
Gambierina edwardsii												X		X		X	X			
Cyathidites splendens												X		X		X	X	X	X	
**Aequitriradites verrucosus (Cretaceous)												X								
Podosporites microsaccatus												X					X		X	
Cammarozonosporites sp.												X						X		
Phyllocladites verrucosus																				
P. paleogenicus														X					X	
**Striate bisaccate (Permian)																			X	
**?Rouseisporites sp. (?Cretaceous)																				X

HEMATITE AR00-1

\* Denotes microplankton species  
\*\* Reworked species

Plant macrofossil from Arco-1 Core No. 2,

9546 feet (R.B.)

Comments by

J.G.G. Douglas

Victorian Mines Department

The leaf fragment is part of a palmate or chordate dicotyledonous angiosperm, possibly comparable with the sub-basaltic floras of the Bogong High Plains in Victoria. A lower Tertiary age and warm, humid palaeoclimate are indicated.

# CORE DESCRIPTION

Core No. 1

WELL: AROO - 1

Interval Cored 9515-9545 ft., Cut 30 ft., Recovered 30 ft., (100%) From Eastern View C.M.

Bit Type C 20, Bit Size 8 15/32 in., Desc. by E. A. Hodgson Date 24 March 1974

Depth & Coring Rate (Feet/hr)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
9515				
4 8 12 16 20				
		4	9515'-9518' SANDSTONE, white, fine to medium, well sorted, sub angular to rounded; quartz overgrowths. 1-10 mm coaly beds 1-100 mm ap.	
		3	9518'-9520' SANDSTONE as above with less interbedded coal	
9520		1	9520'-9524' SANDSTONE as above	
		7		
9525		2	9524'-9525' 3" SANDSTONE as above with minor thin coal stringers.	
			9525' 3"-9527 SANDSTONE as above, thin coal stringers cross bedded at top	
		2	9527'-9529' 4" COAL and SHALE, chocolate, v. carbonaceous, hard.	
9530		4	SANDSTONE in washout breccia at 9528' 6" has spotty fluorescence. Fractures in shale brilliant yellow-green fluorescence.	
		7	9529' 4"-9534' SANDSTONE, white, carbonaceous, firm, moderately well cemented, medium grained with minor 1/2 - 2mm coal beds	
9535		8	9534'-9539' 6" SANDSTONE, white, fine, clean, thinly interbedded with light to dark grey SILTSTONE, tight, some festoon cross bedding, carbonaceous, slightly micaceous	
9540		7	9539' 6"-9545' SANDSTONE fine to medium grading to very coarse (>1mm) at top, with minor siltstone and shale. Sandstone is white, firm, hard, sub to well rounded quartz grains, mainly clear, some milky, slightly micaceous. Minor festoon cross bedding towards top	
9545		5		

## KEY TO FLUORESCENCE and CUT

1. Bright yellow fluorescence, strong fast cut
2. Bright yellow-green fluorescence, fast cut
3. Yellow fluorescence, strong fast cut
4. Greenish-white fluorescence, good cut
5. Brilliant yellow-green fluorescence, good cut
6. Mottled yellow and golden fluorescence, good cut
7. Dull golden fluorescence, very slow weak cut
8. Dull red to golden fluorescence, no cut.

## REMARKS:

① - Sample for Palynology

## SAMPLES FOR CORE ANALYSIS

① 9515' 6" - 9516'

② 9520' 8" - 9521'

③ 9543' 8" - 9544'

 ④ 9520' 4" - 9520' 8" - To Baroid  $\phi = 15\%$   $S_{o1} = 3.015\%$   $S_w = 44.593\%$   $S_g = 52.331$   $K = 3.281 \text{ md}$ 

\* fluorescence in fractures only

To BMR.



## CORE DESCRIPTION

Core No. 2WELL: AR00-1Interval Cored 9545-9570 ft., Cut 25 ft., Recovered 25 ft., (100 %) Fr. Eastern View C.M.Bit Type C 20, Bit Size 8 15/32 in., Desc. by E. A. Hodgson Date 25 March 1974

Depth & Coring Rate (Feet/hd)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
9545			START	
9550			9545'-9551' SANDSTONE buff to light grey, firm, medium grained, slightly calcareous towards top. Quartz overgrowths but porosity visually estimated at 10-15%. Carbonaceous, micaceous (biotite and muscovite), especially on bedding planes where comminuted plant debris also occurs. Dull gold fluorescence, slow weak cut.	
9555			9551'-9555'6" SHALE, light grey, silty, hard, thinly bedded with minor, low angle cross bedding. Slow weak cut. Thin, fine sandstone interbeds have dull gold fluorescence.	
9560			9555'6"-9560' SHALE, medium grey colour. Very thinly bedded, hard. Slightly carbonaceous, slightly micaceous. Slow weak cut.	
9565			9560'-9570' MUDSTONE, shaly, grey to chocolate brown colour. massive, hard, conchoidally fractured. Slow weak cut.	
9570				
KEY TO FLUORESCENCE AND CUT				
1. Dull gold fluorescence, slow weak cut				
2. Minor, very dull golden fluorescence, slow weak cut throughout. Fluorescence confined to rare sandy interbeds.				

REMARKS: Minor, very dull golden fluorescence throughout the shale-siltstone-mudstone part of core

① Sample for Palynology

◀A Sample for Core Analysis by B.M.R. (9546' 8"-9547')

◀ Sample for Paleobotany

## CORE DESCRIPTION

Core No. 3

WELL: AROO-1

Interval Cored 11782 - 11812 ft., Cut 30 ft., Recovered 30 ft., (100 %) Fm. -

Bit Type C 20, Bit Size 8 <sup>15</sup>/<sub>32</sub> in., Desc. by D.R. Nicholls Date April 16, 1974

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 4 8 12 16 20			Sample	
11782'				
85			11782' 0" to 11804' 2"	
90				VOLCANICS: probable basic extrusive; dark grey with local white and light green vesicle infillings; white fracture outlines; and green-black angular fragments (1-10mm: Xenoliths? phenocrysts); hard; finely crystalline with groundmass dominated by feldspar laths; abundant calcite, mainly as vesicle and fracture infillings. Strong yellow mineral fluorescence with calcite - no cut.
95				
100			11804' 2" to 11811' 9"	
05				VOLCANICS: light grey; with local white and light green vesicle infillings and white fracture outlines as above; very firm to hard; groundmass variable between recognisably crystalline - weathered or hydrothermally altered and non crystalline claystone appearance. Yellow calcite fluorescence as above.
10			11811' 9" to 11812' 0"	
15				VOLCANICS: As for 11782' 0" to 11804' 2"

## REMARKS:

\* Petrologic Analysis

E. A. Houghton 21/3/54

AR00-1 Page 1 of 1  
Run 1 shot 60 recovered 59

\* Foraminiferal Determination

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
1	9651	1"	Sandstone	-	trace golden	slow,	poor	-	Soft clay choked, medium and
						very weak	.		dirty fine sandstone
2	9621	1"	"	-	bright light	slow	poor	-	Soft, clay choked, medium
					yellow streak				slightly carbonaceous
3	9578	1"	Siltstone	-	-	-	very poor		Soft, grey carbonaceous silt- stone
4	9494	1"	Sandstone	-	-	-	very poor	✓	Soft, dark grey, carbonaceous, clay choked
5	9487	1¼"	Sandstone	-	-	-	fair	-	Friable, slightly clay choked, medium, white
6	9451	1¼"	Sandstone	-	patchy bright	strong	fair	-	White, slightly friable, clay choked, medium bedded
7	9447	1¼"	Sandstone	-	bright greenish	strong	fair	-	White-light grey, slightly friable, clay choked
					white	blue white			
8	9350	1¼"	Mudstone	-	-	-	-	✓	Dark brown, soft, carbonaceous, fetid smell
9	9250	1"	Mudstone	-	-	-	-	✓	Dark brown-grey, soft, carbonaceous
10	9180	¾"	Sandstone	-	trace yellow	slow weak	poor	-	Clay choked, fine-medium, fluorescence adjacent to carbonaceous band

# SIDEWALL CORE REPORT

AR00-1 Page 2 of 6

Sample Submitted for ✓ Palynological Determination \* Foraminiferal Determination

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
11	9166	1"	Mudstone	-	-	-	-	✓	Dark brown, soft, carbonaceous, slightly sandy in parts
12	9120	7/8"	Mudstone	-	-	-	-	✓	Dark brown, soft, carbonaceous, micaceous
13	9080	1"	Shaly Mudstone	-	-	-	-	✓	Slightly fissile, dark brown, carbonaceous, soft
14	8990	1 3/4"	Mudstone	-	-	-	-	✓	Dark brown, slightly silty, carbonaceous
15	8944	1"	Silty Mudstone	-	-	-	-	✓	Dark brown, slightly calcareous, slightly micaceous, soft
16	8910	1 1/8"	Fine sandstone & Mudstone	-	-	-	-		Dark brown mudstone, light grey fine, thinly interbedded sand- stone, soft
17	8897	1 1/4"	Coal	-	-	-	-	✓	Black, friable, sooty
18	8878	1 1/4"	Sandstone	-	dull bluish	very slow	poor	-	White, friable, clay choked, thin bedded
19	8794	1"	Sandy siltstone	-	-	-	very poor	✓ marine?	Dark grey (Greenish), soft, sandy, non-calcareous, slightly micaceous
20	8748	1"	Sandstone	-	-	-	poor	✓ marine?	Grey-green, friable, glauconitic medium

# SIDEWALL CORE REPORT

AR00-1 Page 3 of 6

Sample Submitted for ✓ Palynological Determination \*Foraminiferal Determination

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON OCCUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
1	8698	3/4"	Mudstone	-	-	-	-	poor sample	Dark brown, soft, sticky
2	8615	3/4"	Silty Mudstone	-	-	-	-	✓	Dark grey, thin bedded, soft
3	8603	1 1/4"	Sandstone	-	-	-	good	-	White, friable, fine-medium, non-calcareous
4	8553	3/4"	Sandstone	-	-	-	fair	-	White, friable, fine, non- calcareous. Thin brown silt- stone interbeds
5	8520	1 1/2"	Shaly Mudstone	-	-	-	-	✓	Dark brown, fissile-soft, slightly micaceous
6	8459	1 1/4"	Shaly Mudstone	-	-	-	-	poor sample	Dark brown, slightly fissile- soft
7	8384	1 1/4"	Coal	-	yellow on resin	NO	-	✓	Black, sooty, friable, trace orange, tarry resin
8	8290	1 1/4"	Sandstone	-	-	-	poor	-	White, friable, fine
9	8265	1 1/2"	Mudstone	-	-	-	-	poor sample	Brown, soft, with fine sand lens (3 x 10 m)
10	8189	1 1/2"	Mudstone	-	-	-	-	✓	Shaly, dark brown, fissile, very carbonaceous
11	8114	5/8"	Sandstone	-	-	-	poor	-	Pale grey, fine-medium, friable, slightly clay choked, inter- bedded with thin mudstone

# SIDEWALL CORE REPORT

AR00-1 Page 4 of 6

Sample Submitted for ☒ Palynological Determination \*Foraminiferal Determination

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
32	7990	5/8"	Sandstone	-	-	-	poor	-	Light grey, fine-medium, friable, slightly clay choked
33	7923	1 1/4"	Coal	-	-	NO	-	✓	Black, hard, lustrous, brown bands
34	7868	2 1/4"	Mudstone	-	-	-	-	-	Yellowish brown, slightly fissile, silty, pyritic
35	7844	1"	Sandstone	-	-	-	poor	-	White, friable, slightly clay choked, medium sandstone
36	7723	3/4"	Siltstone	-	-	-	very poor	poor sample	Dark grey, friable, thinly bedded
37	7566	1"	Coal	-	-	NO	-	✓	Slightly friable, lustrous
38	7431	1"	Siltstone & Coal	-	-	NO	-	✓	Dark grey-brown siltstone with 3mm coal beds
39	7390	3/4"	Sandstone	-	-	-	-	-	Light grey-Light brown, very fine, 1/2mm coaly mudstone beds
40	6944	1 1/2"	Sandstone	-	trace pinpoint	-	fair	-	Light greenish grey, friable, medium well sorted
41	6920	1 1/2"	Siltstone/ Midstone	-	-	-	very poor	✓	Very thinly interbedded, white siltstone and brown mudstone
42	6840	1"	Sandstone	-	-	-	poor	-	Light grey, fine grained with coarse subrounded milky quartz up to 5mm.

# SIDEWALL CORE REPORT

AR00-1 Page 5 of 6

Sample Submitted for ✓ Palynological Determination \*Foraminiferal Determination

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
43	6825	1½"	Sandstone	-	-	-	poor	✓	Brown-greenish, micaceous, ?glauconitic, very fine
44	6730	1¼"	Sandstone	-	-	-	very poor	✓	Dark greenish grey, slightly carbonaceous, ?glauconitic
45	6715	½"	Siltstone	-	-	-	very poor	✓	Dark brown, soft, slightly micaceous
46	6555	1¼"	Siltstone	-	-	-	very poor	*	Chocolate brown, calcareous with minor sandstone
47	6394	1¼"	Siltstone	-	-	-	very poor	*	Chocolate brown, calcareous- firm
48	6246	1¼"	Siltstone	-	-	-	very poor	*	Chocolate brown calcareous - firm
49	6105	1½"	Siltstone	-	-	-	very poor	*	Chocolate brown calcareous - firm
50	5956	2"	Claystone	-	-	-	-	*	Chocolate brown, slightly micaceous, calcareous
51	5824	1½"	Claystone	-	-	-	-	*	Dark grey, firm, calcareous
52	5700	2"	Claystone	-	-	-	-	*	Dark brown, firm, very calcareous, glauconitic
53	5612	2"	Siltstone	-	-	-	-	*	Dark grey brown, firm, calcareous

# SIDEWALL CONE REPORT

AR00-1      Page 6 of 6

Sample Submitted for Palynological Determination \*Foraminiferal Determination

[illegible]



# SIDEWALL CORE REPORT

AR00-1

Run 2 shot 30 recovered 26 Page 1 of 2

E.A. Hodgson. 18/4/74.

✓ indicates Sample Submitted for Palynological Determination.

NO.	DEPTH	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
1	11909	$\frac{3}{4}$	SANDSTONE	_____	_____	_____	poor	poor ✓	clay choked, fine to medium, lithic, carbonaceous
2	11853	$\frac{3}{4}$	SANDSTONE	=====	_____	_____	poor	no	clay choked, fine to medium, lithic, carbonaceous, no gas in sample.
3	11761	$\frac{1}{2}$	SILTSTONE	_____	_____	_____	tight	no	light green, very clayey
4	11700	$\frac{3}{4}$	VOLCANIC	_____	_____	_____	_____	no	mottled green and brown, weathered, soft
5	11676	$\frac{1}{2}$	VOLCANIC	_____	_____	_____	_____	no	soft, light green, kaolinized
6	11630	$1\frac{1}{2}$	VOLCANIC	_____	_____	_____	_____	no	soft, mottled light green and brown weathered - kaolinized
7	11565	1	VOLCANIC	_____	_____	_____	_____	no	mottled brown-green, weathered with calcite veinlets
8	11525	1	CLAYSTONE	_____	_____	_____	_____	poor ✓	Chocolate brown, slightly silty
9	11445	$\frac{1}{2}$	SANDSTONE	_____	_____	_____	tight	no	light green to brown, very clay choked, medium - coarse
10	11410	0	_____	_____	_____	_____	_____	_____	_____
11	11363	$1\frac{1}{2}$	SILTSTONE	_____	_____	_____	_____	✓	dark grey to chocolate brown, very clayey, moderately soft
12	11185	$\frac{3}{4}$	VOLCANIC	_____	_____	_____	_____	_____	hard, dark green, kaolinized, slightly weathered, calcareous
13	11133	$1\frac{1}{4}$	SILTSTONE	_____	_____	_____	_____	✓	dark grey, soft, clayey

## AR00-1

Page 2 of 2

[illegible]

APPENDIX NO. 4

Core Analysis Results

by

Petroleum Technology Laboratory  
Bureau of Mineral Resources  
Geology and Geophysics, Canberra

CORE ANALYSIS RESULTS

NOTE: (i) Unless otherwise stated, porosities and permeabilities were determined on two plugs (V&H) cut vertically and horizontally to the axis of the core. Buska porosimeter and permeameter were used with air and dry nitrogen as the saturating and flowing media respectively. (ii) Oil and water saturations were determined using Soxhlet type apparatus. (iii) Acetone test precipitates are recorded as Neg., Trace, Fair, Strong or Very Strong.

WELL NAME AND NO. ARCO NO. 1

DATE ANALYSIS COMPLETED JUNE 10 1974

Core No.	Sample Depth		Lithology	Average Effective Porosity two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm/cc.)		Fluid Saturation (% pore space)		Core Water Salinity (p.p.m. NaCl)	Acetone Test	Fluorescence of freshly broken core	Sample "cut" in tetrachlorethylens
	From	To			V	H	Dry Bulk	Apparent Grain	Water	Oil				
1	9516'	*	Sst; f.gr. carb.	17.6	0.89	2.0	2.20	2.67	44	2.4	N.D.	NIL	Dull Yellow	Trace
1	9521'	*	as above	18.6	2.3	0.76	2.17	2.66	65	0.84	N.D.	NIL	Pale Blue - Yellow	Fair
1	9524'		Sst; m.gr. carb. lam.	21.2	11	14	2.09	2.67	2.6	5.9	N.D.	NIL	as above	Trace
1	9530'		Sst; m.gr. to c.c. carb.	20.8	113	53	2.08	2.54	47	3.8	N.D.	NIL	Trace Dull Yellow	Trace
1	9544'	*	Sst; f.gr. to c.c. carb.	17.3	0.55	0.78	2.22	2.69	51	Tr	N.D.	NIL	Trace Dull Yellow	NIL
2	9546'	*	Sst; v.f.gr. to f.gr. carb.	11.7	0.26	0.11	2.42	2.75	67	NIL	N.D.	NIL	Very Dull Yellow	NIL
2	9552'		as above	14.3	0.15	0.15	2.34	2.70	32	2.4	N.D.	NIL	NIL	NIL
2	9561'		Sh; black	1.1	<0.1	<0.1	2.59	2.62	N.D.	N.D.	N.D.	N.D.	NIL	NIL

Remarks: - \* - Samples preserved in wax.

General File No. ~~72/2914~~ 72/2914

Well File No. 74/208

## CORE ANALYSIS RESULTS

NOTE: (i) Unless otherwise stated, porosities and permeabilities were determined on two plugs (V&H) cut vertically and horizontally to the axis of the core. Ruska porosimeter and permeameter were used with air and dry nitrogen as the saturating and flowing media respectively. (ii) Oil and water saturations were determined using Soxhlet type apparatus. (iii) Acetone test precipitates are recorded as Neg., Trace, Fair, Strong or Very Strong.

VELL NAME AND NO. AF00 10.1

DATE ANALYSIS COMPLETED JUNE 10 1974

[illegible]

Remarks: -

General File No. ~~62-155~~ 72/2914

Well File No. 74/208

APPENDIX NO. 5

Summary of Formation Interval Tests

# FORMATION INTERVAL TESTS

AR00-1

Test No.	Depth (feet)	Recovery			Water Salinity (ppm)	Water Resistivity (ohm-m <sup>2</sup> /m)	Hydrostatic Pressure (psi)	Sampling Pressure (psi)	Final Shut-in Pressure (psi)	Surface Pressure (psi)	Comment
		Gas (c.f.)	Oil (cc.)	Water (cc.)							
2	9,133	1.9	-	2,000	5,000	0.67 @ 75° F	4720 *2	962 *2 (after shape charge fired)	3966 *2	700 *3	Second run at this depth, no seal on first run
1	9,530	1.4	trace	1,900	6,300	0.54 @ 75° F	4917 *2	42 *2 (after shape charge fired) Flowline plugged	4444 *2	1,500 *3	All pressures relate to segregator
3	10,318	1.9	-	8,600	3,600	0.65 @ 77° F	5400 *3	1,250 *3	4750 *3	280 *3	-
5	10,708	-	-	-	-	-	6084	-	-	-	Impermeable formation
4	10,890	-	-	-	-	-	6248 *2	-	-	-	Mud run. No seal due to enlarged hole condition

- \*1 Amerada 10,300 gauge
- \*2 Amerada 11,800 gauge
- \*3 Schlumberger

APPENDIX NO. 6

Well Velocity Survey

by Austral United Geophysical Pty. Ltd.





WELL VELOCITY SURVEY

of

AROO No.1

for

HEMATITE PETROLEUM PTY. LTD.

by

AUSTRAL UNITED GEOPHYSICAL PTY. LTD.

Party 86



## Table of Contents

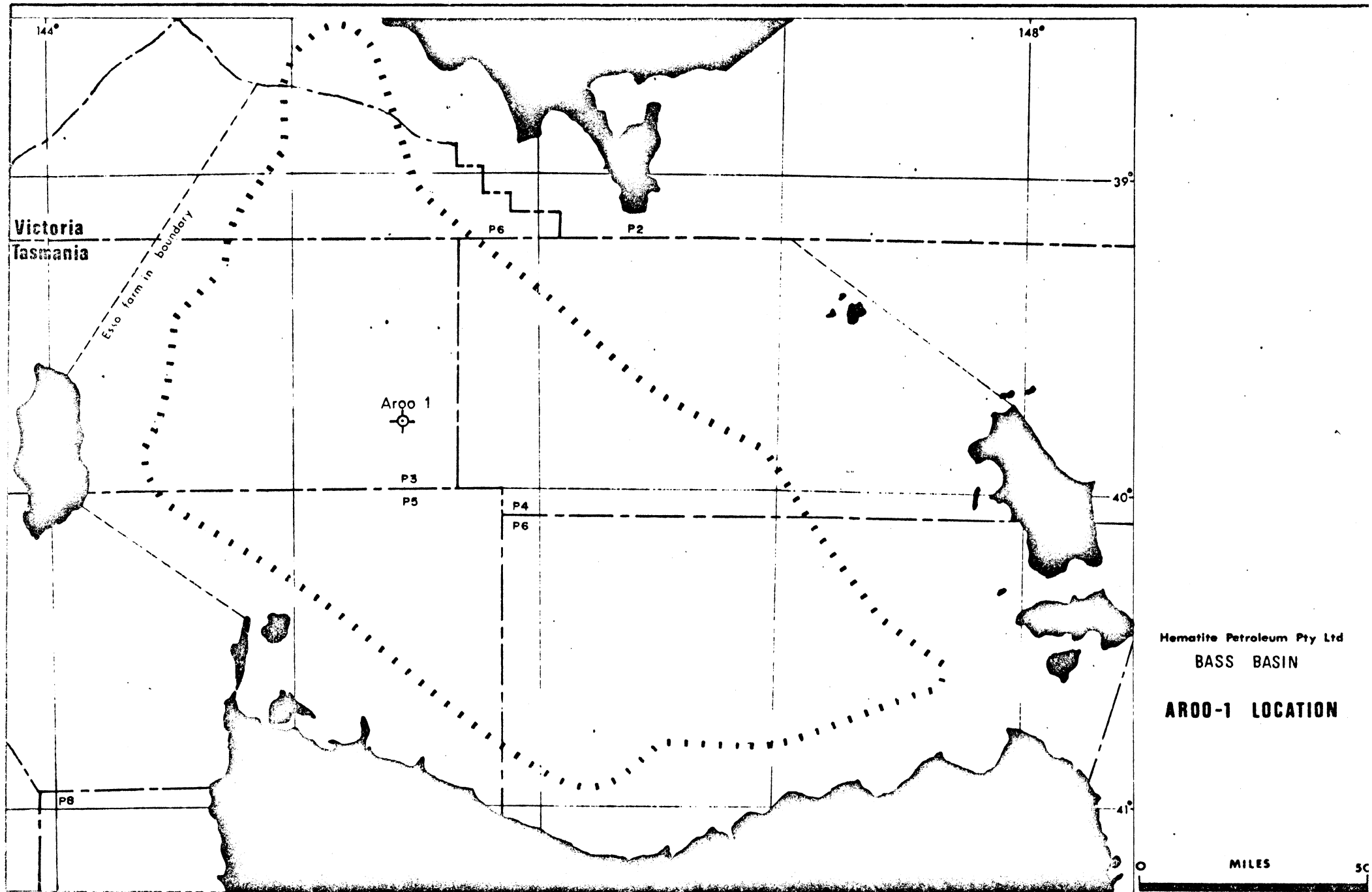
1. Well Information
2. Operations
3. Computing
4. Results of Velocity Survey

## Figures

1. Location Map
2. Amplifier Frequency Response Curves
3. Computation Diagram
- Reduced Records of Velocity Survey

## Appendix

- |   |                        |           |
|---|------------------------|-----------|
| A | Time-Depth Plot        | (Plate 1) |
| B | Velocity Function Plot | (Plate 2) |
| C | Computation Sheet      |           |



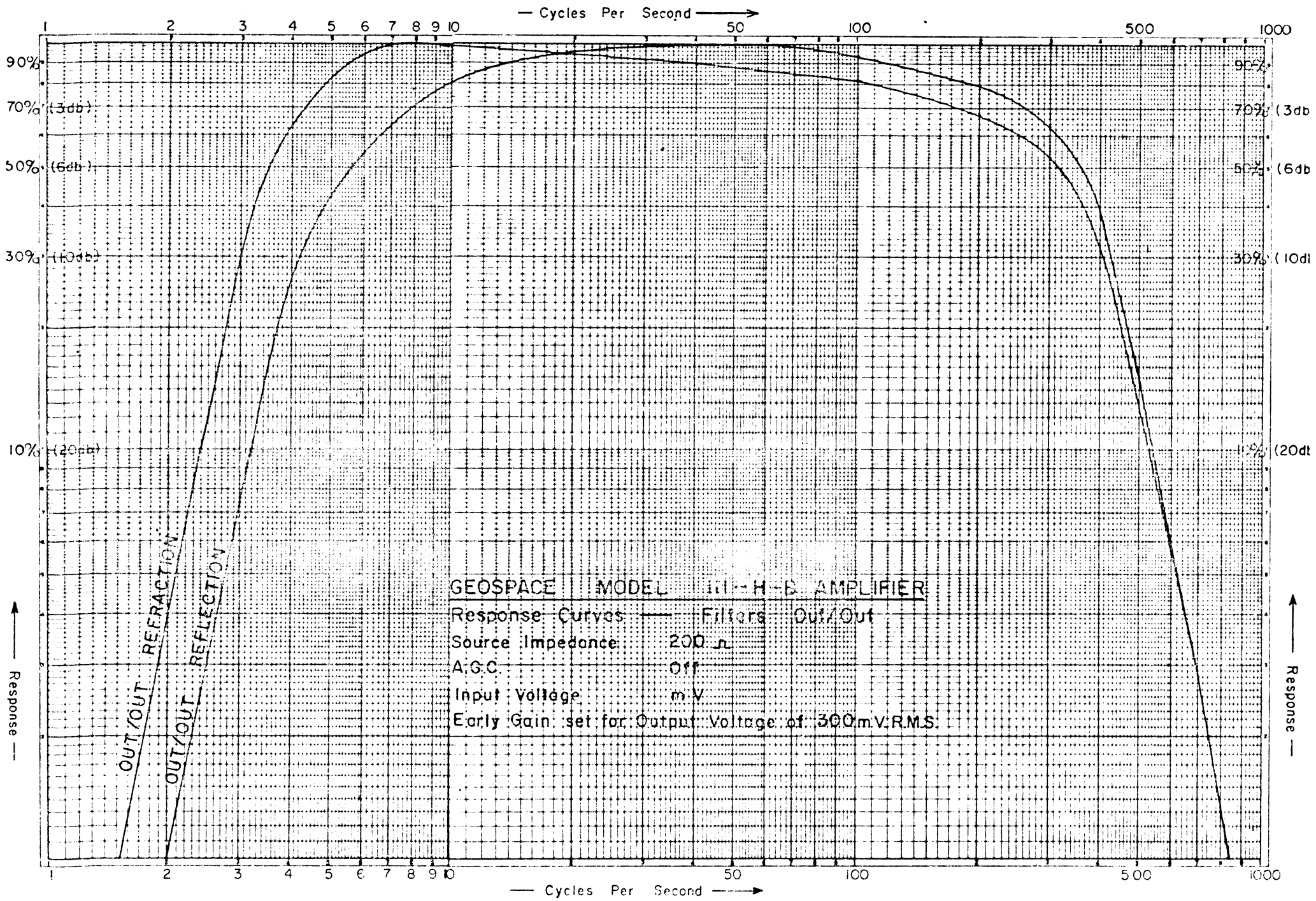
OG 3428



1. WELL INFORMATION

NAME OF WELL	Aroo No.1
DATES OF SURVEYS	27th March & 20th April, 1974
LOCATION	95 miles Southwest of Welshpool township, Victoria, in offshore permit Vic/P3.
CO-ORDINATES	Latitude 39° 47' 31" S. Longitude 145° 26' 51" E.
ELEVATION K.B.	+ 32.0 feet M.S.L.
ELEVATION G.L.	-250 feet M.S.L.
ELEVATION DATUM PLANE	0.0 feet M.S.L.
INTERVAL SURVEYED	2942 feet to 12100 feet below K.B.
SEISMOGRAPH PROFILE	Shotpoint 668. Line HB 73A/143
TOTAL DEPTH	12,112 below K.B.
CASING	20" @ 704 feet below K.B. 13 <sup>3</sup> / <sub>8</sub> " @ 2979 feet below K.B. 9 <sup>5</sup> / <sub>8</sub> " @ 9635 feet below K.B.
RIG	Glomar Conception

Fig. 2





## 2. OPERATIONS

### A. Recording Equipment

Well geophone	Geospace wall lock velocity geophone Model WLS-1000 (6 X 4.5 hertz detectors)
Cable	Schlumberger cable and reel
Reference and Time Break Hydrophones	Marsh Marine MP3
Camera	Electro Tech Model ER62
Amplifiers	Geospace Model III

### B. Amplifier Specifications

#### Geospace Model III

Frequency Response	:	Within 3db attenuation from 5 to 300 hertz
Input Signal Range	:	From 1 microvolt to 300 millivolts R.M.S.
Input Impedance	:	500 ohms
Noise	:	0.1 microvolts R.M.S. broad band from 10 to 300 hertz (200 ohms source impedance)

### C. Energy Source

Gas Gun	4.24 cubic feet capacity (Propane Oxygen mixture)
Ignition System	United Hi-voltage Detonator Panel
Gas Control System	United gas fill timer



D. Recording Procedure

Amplifier No. 1	Downhole geophone
Output :	Divided output to traces No.1, No.2 and No.3
Filters :	Hi-Cut 300 hertz Lo-Cut 5 hertz
Amplifier No. 2	Moonpool Reference Hydrophone
Output :	Single output to trace No.5
Filters :	Hi-Cut 300 hertz Lo-Cut 5 hertz
Amplifier No. 3	Time-Break Hydrophone
Output :	Single output to trace No.4
Filters :	Hi-Cut 300 hertz Lo-Cut 5 hertz

Time break to trace No.6 (not amplified)

E. Operational Statistics

Surveyed Interval	2942 feet to 12100 feet below K.B.
Number of horizons surveyed	Twelve
Number of shots per horizon	One to Three
Gun Offset	85 to 100 feet
Gun Depth	45 feet
Gas fill time	20 secs. (approx. 2 cubic feet)



E. Operational Statistics (Cont'd)

Intermediate Survey

Observer	W.J. Larsen
Shooter	G. Mathews

Final Survey

Observer	P. Bird
Shooter	R. Collins

- F. Recording instruments were set up in an air conditioning room one deck below the bridge of the "Glomar Conception".

Recording of shots, energy source firing and geophone locking functions were conducted from this location.

A 4.24 cubic feet gas gun was lowered over the port side, 45 feet below sea level and offset to a maximum of 85 to 100 feet from the well.

The gas gun was charged with a propane/oxygen mixture and remotely fired from the recorder by spark ignition.

Dual time breaks were recorded on two MP3 hydrophones adjacent to the gas gun.

Horizontal offsets were computed from recorded times to a reference hydrophone in the moonpool of the ship.

Depth measurements for all levels were relative to kelly bushing, and were set using the Schlumberger depth indicator.





### Comments

Two velocity surveys were conducted on the Aroo well.

The first survey on March 27th to 9670 feet was prior to running intermediate 9 <sup>5</sup>/<sub>8</sub>" casing.

The final survey on April 20th was at a total depth of 12,112 feet K.B.

All shots were in open hole, with one exception at 2942 feet where because of hole oversize below the first casing string the geophone was locked inside the 13 <sup>3</sup>/<sub>8</sub>" casing.



### 3. COMPUTING

#### A. Datum Plane

Well geophone arrival times were corrected to a sea level datum plane using a reduction velocity of 5000 feet per second.

Velocity survey times were processed in Brisbane by the Scientific & Technical Computing Centre from data supplied by Austral United Geophysical.

#### B. Record Quality

Record quality at all levels is good and arrival times are considered reliable. Record times from groups of shots at the same level are in close agreement.

#### C. Sonic Calibration

A cumulative correction plot is shown on Plate 1.

Seismic and sonic times were tied at 2942 feet K.B. and using seismic times as reference values the cumulative errors of sonic times were plotted against depth.

Correction to the sonic log at 5650 feet is  $-.039^5$  seconds, and at 9670 feet is  $-.040^5$  seconds.

The caliper log shows excessive washout between 2900 feet and 4200 feet K.B. and it is likely that the sonic log drift occurs across this section of hole.

Intermediate times taken from the sonic log between check shots at 2942 feet and 5650 feet are assumed to drift between 2942 feet and 4532 feet, but agree with seismic time between 4532 feet and 5650 feet.



#### D. Function Computation

The velocity function was computed by the Nash Miller method, using the following expressions and information from the plot of vertical time against depth.

$$a = \frac{4,605}{t_1} \log_{10} \left( \frac{z_1 - z_2}{z_2} \right)$$

$$Vd = \frac{az_1}{e^{at_1} - 1}$$

$z_1$  and  $t_1$  are corresponding depth and one way time at a deeper point in the section, and  $z_2$  is the depth corresponding to one way time of  $\frac{t_1}{2}$  secs.

This function was computed with respect to a sea level datum plane.



#### 4. RESULTS

##### A. Horizon arrival times

Average times were used to plot the time depth curve  
the arrival times to the principal horizons are as  
follows.

HORIZON	DEPTH BELOW DATUM (0 Feet M.S.L.)	ARRIVAL TIMES (One way Time)
---------	--------------------------------------	---------------------------------



B. Velocity Function

The following velocity functions were computed for AROO No.1.

General function	Datum to Total Depth	$V = 5730 + 0.74Z$
Detailed function	Datum to 3150'	$V = 5744 + 1.23Z$
	3150' to 4000'	$V = 6818'/\text{sec.}$ constant velocity
	4000' to 5820'	$V = 8438'/\text{sec.}$ constant velocity
	5820' to 12068'	$V = 5730 + 0.74Z$

A Plot of the velocity functions computed for AROO No.1 is included in the appendix of this report for comparison purposes.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "W. J. Larned", written above a horizontal line.

AUSTRAL UNITED GEOPHYSICAL PTY. LTD.  
Party 86.

A handwritten signature in cursive script, appearing to read "John D. ...", written above a horizontal line.

Supervisor.

APPENDIX NO. 7

Lithological Description

## Lithological Description

Based on cores, sidewall cores, log interpretation and cuttings descriptions. The latter were submitted to the B.M.R. as progress material during the drilling of the well.

(All depths in feet K.B.).

772 - 2358	post D	CALOTRUDITE, white to grey, cream, unconsolidated, bioclastic, mainly bryozoal fragments with some complete, well preserved foraminifera.
2358 - 2545	post D	CALCARENITE, light grey, fossiliferous, glauconitic, silty, with pelagic foraminiferal molds.
2545 - 4120	2200-3100 D 3100-3500 E	MARL, light to mid grey, very soft to firm, dense, abundantly flecked with microfossils, chiefly foraminifera. Minor dolomitic streaks.
4120 - 4177	5000-5500 D	MARL, light to mid grey, very soft to firm, dense, abundantly flecked with microfossils, chiefly foraminifera, silty.
4177 - 5617	5500-6000 D	SILTSTONE, dark grey to brown, soft to firm, slightly to very calcareous, grading to marl, glauconitic, pyritic in part, minor dolomitic streaks.
5617 - 6723	5500-6000 D 6723-6903 E	SILTSTONE, dark grey to brown, soft to firm, slightly to very calcareous, grading to marl, micaceous, glauconitic, pyritic in part, minor dolomitic streaks.
6723 - 6903	6723-6903 E	SANDSTONE, light grey to dark brown, greenish in part, firm to hard, mostly very fine to medium grained though very coarse in part, micaceous, variably glauconitic, in part calcareous and dolomitic minor COAL, black, silty.
6903 - 7148		Interbedded SANDSTONE, SILTSTONE and MUDSTONE. SANDSTONE, greenish grey to light brown, firm to friable, fine to medium grained, carbonaceous and dolomitic in part. Pale yellow fluorescence in sample from 6950 - 6960. SILTSTONE, white to light brown, firm to soft, in part thinly interbedded with MUDSTONE, brown, soft, silty.

7148 - 7569

SANDSTONE, light brown, hard, very fine, micaceous, silty, carbonaceous, in part dolomitic, DOLOMITE, tan, hard, coarsely crystalline, strong yellow mineral fluorescence.  
SAND, clear to milky quartz, coarse, subrounded to rounded.  
Minor SILTSTONE, white to light brown, firm to soft.  
Minor MUDSTONE, brown, soft, silty.  
Minor COAL.

7569 - 8340

8189 P. 25p-109

Interbedded SANDSTONE, SAND, SILTSTONE, MUDSTONE and COAL.  
SANDSTONE, white to light brown, firm to hard, very fine to medium, silty, micaceous, argillaceous.  
SAND, white, clear milky quartz, medium to coarse.  
SILTSTONE, white to dark brown, firm to hard, micaceous, variably carbonaceous, grading to coal in part.  
MUDSTONE, light to dark brown, soft, silty, variably carbonaceous.  
COAL, black, conchoidal fracture.

8340 - 8477

MUDSTONE, firm, slightly fissile, silty.  
Minor COAL, black, sooty, slightly fissile resinous.

8477 - 8919

8520-8944  
H. Oliver

Interbedded SANDSTONE, SILTSTONE, MUDSTONE and COAL.  
SANDSTONE, tan to light brown, firm to hard very fine to fine, silty, partly friable, partly well cemented. Glauconitic, pyritic and argillaceous (clay choked) in part. Dull bluish fluorescence in sandstone at 8878.  
SILTSTONE, dark brown, firm to hard, micaceous, variably carbonaceous, glauconitic in part.  
MUDSTONE, chocolate brown to grey, soft to firm, fissile in part, micaceous.  
COAL, black, friable sooty.

8919 - 9514

8996-9080  
B.L. Baker  
9166-9528  
Z. L. Baker

MUDSTONE, dark brown, soft to firm, slightly fissile in part, carbonaceous, micaceous.  
Minor interbedded SANDSTONE, white to light grey, firm to soft, calcareous in part, carbonaceous, slightly glauconitic in part, slightly micaceous, limonitic in part, fine to medium grained, well cemented in part, tight. Limonitic in part. Yellow fluorescence in sandstone at 9447, 9451 and 9180 feet (K.B.).



Minor interbedded SILTSTONE, grey to light brown, firm, slightly micaceous, slightly carbonaceous, rare pyrite filled burrow-like structures, some carbonaceous bedding planes.

9514 - 9918

Interbedded SANDSTONE, SILTSTONE, MUDSTONE and COAL.

SANDSTONE, cream to brown, soft to firm, medium to fine, carbonaceous in part, micaceous, clay choked in part, well cemented in part, slightly calcareous, pale blue to bright yellow fluorescence, weak to strong, fast cut.

SILTSTONE, grey to light brown, firm, slightly carbonaceous.

MUDSTONE, grey to chocolate brown, soft to hard (conchoidal fracture).

COAL, black, hard to friable, waxey, conchoidal fracture.

9918 - 10327

Interbedded SILTSTONE, SANDSTONE and SHALY MUDSTONE.

SILTSTONE, brown, soft, clayey, carbonaceous.

SANDSTONE, cream to brown, soft to firm, medium to fine, micaceous, argillaceous, well cemented in part.

SHALY MUDSTONE, chocolate brown, soft to firm, fissile in part.

9990 - 10244  
Lower L. bed

10327 - 10703

VOLCANICS, weathered and unweathered, green to grey, very soft to hard, chloritic kaolinitic, associated with coarsely crystalline calcite.

10703 - 10886

Interbedded SANDSTONE and SILTSTONE.

SANDSTONE, buff, silty, very fine to very coarse, calcareous, carbonaceous, micaceous, lithic, minor fluorescence and cut.

SILTSTONE, white, grey and brown, clayey.

10886 - 11361

VOLCANICS, weathered and unweathered, very soft to hard, green to grey, also mottled with cream and red, calcareous, kaolinitic.

11361 - 11397

SILTSTONE, dark grey to chocolate brown, very clayey, moderately soft.

11397 - 11441

VOLCANICS, weathered and unweathered, mottled green and grey green with minor red and brown, soft to hard, calcite veinlets.

11441 - 11471

SANDSTONE, light green to brown, medium to coarse, clay choked, silty.

11471 - 11848

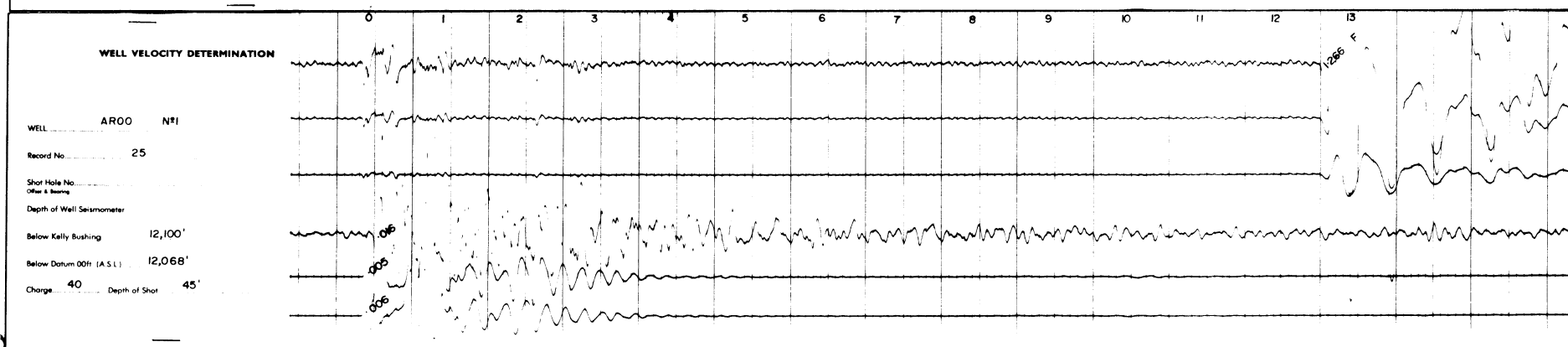
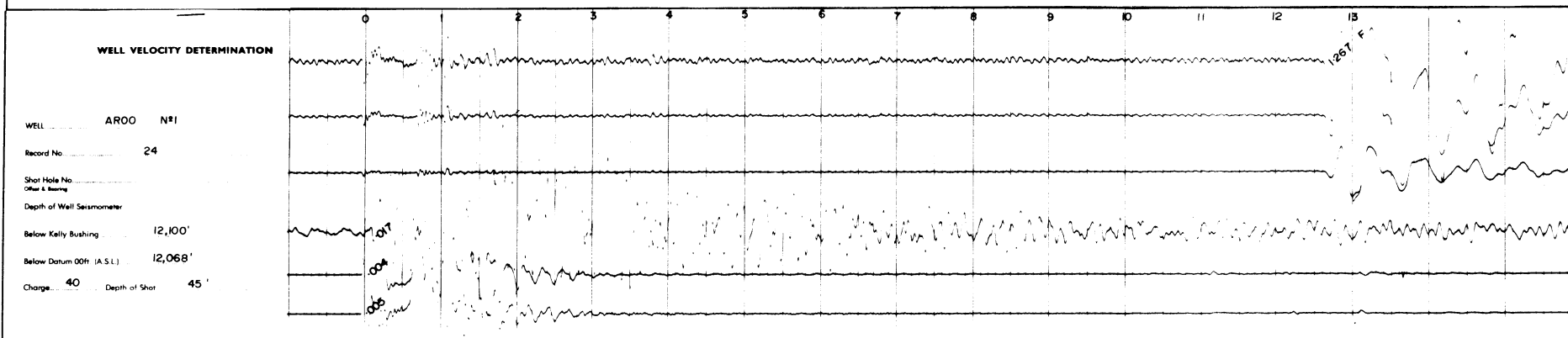
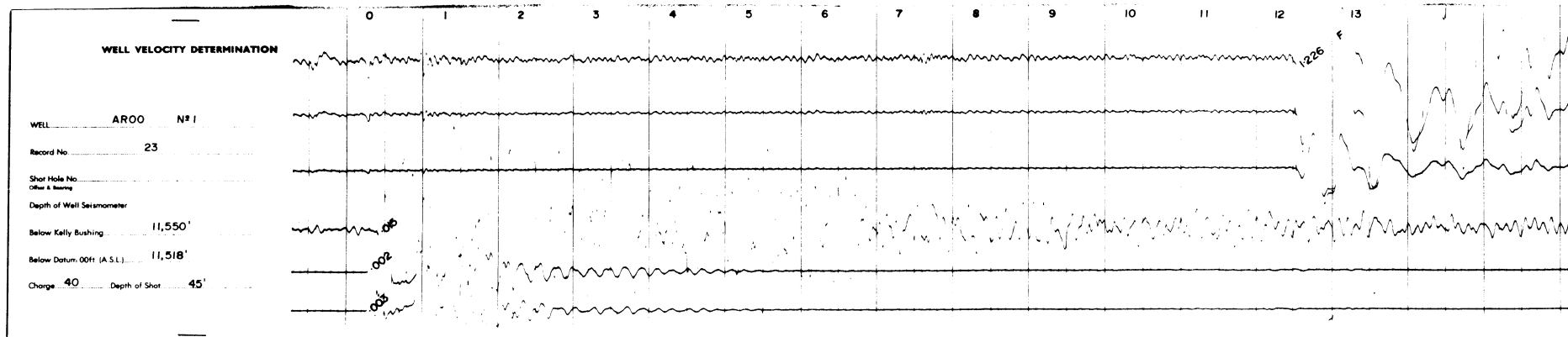
VOLCANICS, weathered and unweathered, dark grey to light green, calcite amygdules and veinlets. Weathered zones are soft, kaolinitic, calcareous.

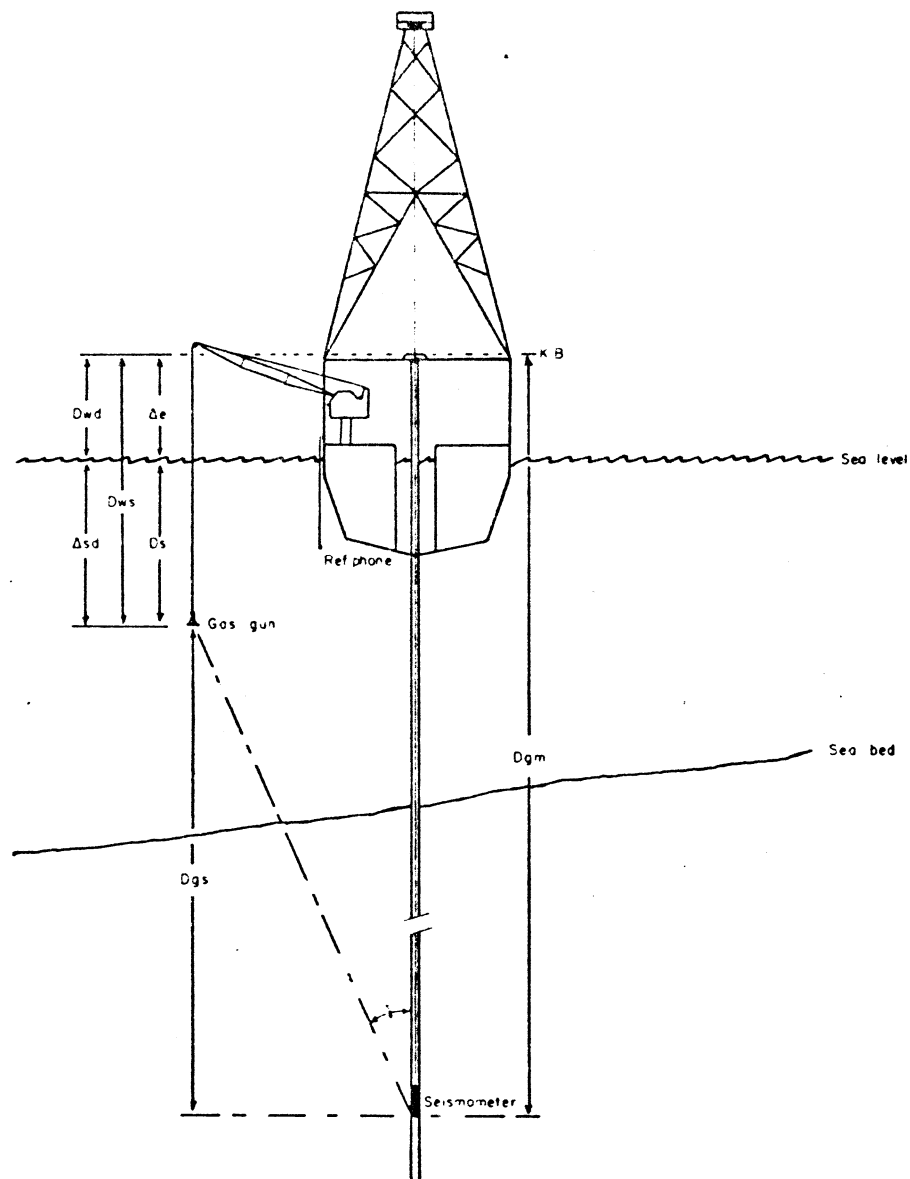
11848 - 11920

SANDSTONE, white to light brown, firm to soft, fine to coarse, clay choked, carbonaceous, lithic, in part well cemented, slightly calcareous and pyritic in part.

11920 - 12112

VOLCANICS, weathered and unweathered, dark grey to light green, kaolinitic in part, calcareous.





- $D_{wd}$  = Kelly - datum elevation  
 $R$  = Record number  
 $E_w$  = Elevation of sea level above M.S.L.  
 $D_{gm}$  = Depth below Kelly bushing  
 $T_c$  = Time correction  
 $D_s$  = Depth of shot (gas gun)  
 $\Delta e$  = Kelly - sea level elevation  
 $D_{ws}$  =  $D_s + \Delta e$   
 $\Delta s_d$  =  $D_{ws} - D_{wd}$   
 $D_{gs}$  =  $D_{gm} - D_{ws}$   
 $H$  = Gas gun offset from well  
 $\tan i$  =  $H / D_{gs}$   
 $T$  = Well seismometer time from time break  
 $T_{gs}$  =  $T \cos i$   
 $Q$  = Record quality  
 $T_{gd}$  =  $T_{gs} + \Delta s_d / V_d + T_c$  = (vertical travel time from datum to well seismometer)  
 $D_{gd}$  =  $D_{gm} - D_{wd}$  (vertical distance datum to seismometer)  
 $V_i$  =  $\Delta D_{gd} / \Delta T_{gd}$  = (Interval Velocity)  
 $V_d$  =  $D_{gd} / T_{gd}$  = (Average Velocity)  
 $V_d$  = Datum reduction velocity

## COMPUTATION DIAGRAM

HEMATITE PETROLEUM Pty. Ltd.

AROO Nº1

by

AUSTRAL UNITED GEOPHYSICAL

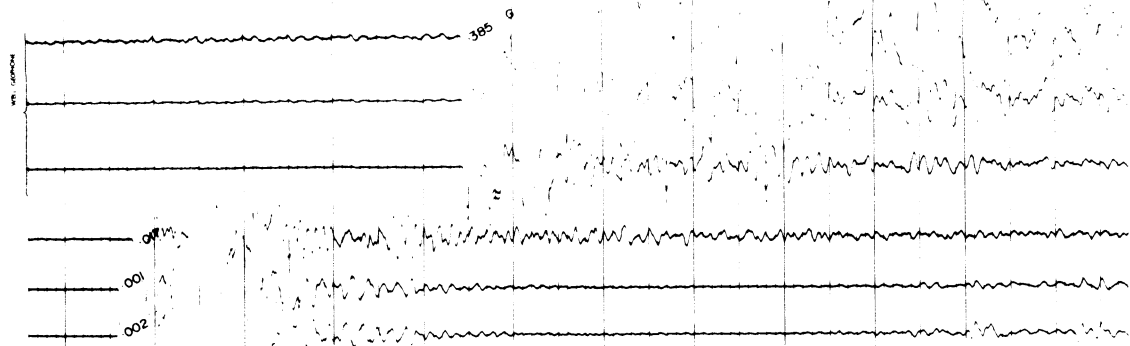
Party 86

27-03-74/20-04-74

Fig-3

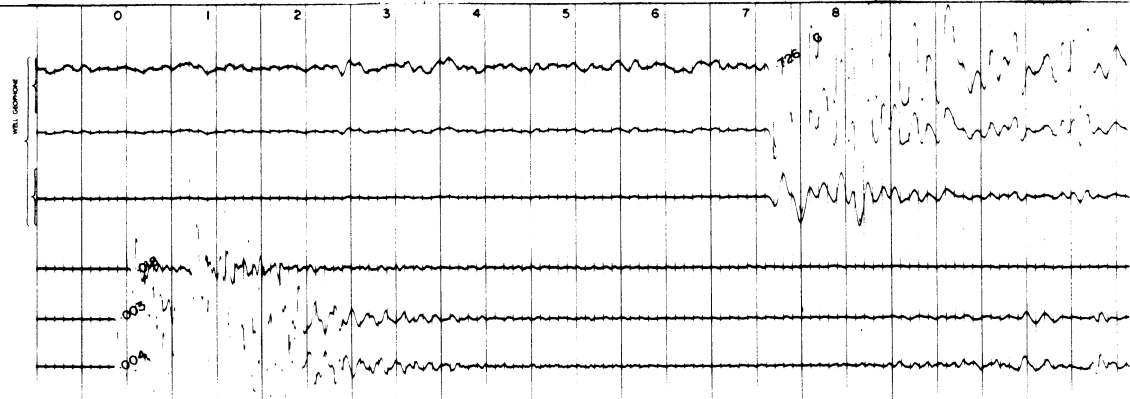
# WELL VELOCITY DETERMINATION

WELL AROO N#1  
 Record No 16  
 Shot Hole No  
 Offer & Bearing  
 Depth of Well Sismometer  
 Below Kelly Bushing 2942'  
 Below Datum 00ft (A.S.L.) 2910'  
 Charge 20 Depth of Shot 45'



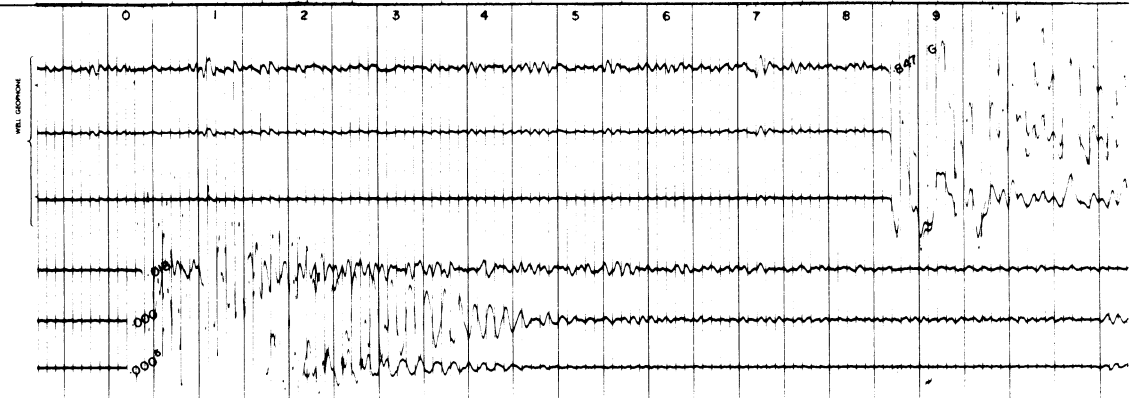
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 Record No 13  
 Shot Hole No  
 Offer & Bearing  
 Depth of Well Sismometer  
 Below Kelly Bushing 5650'  
 Below Datum 00ft (A.S.L.) 5618'  
 Charge 20 Depth of Shot 45'



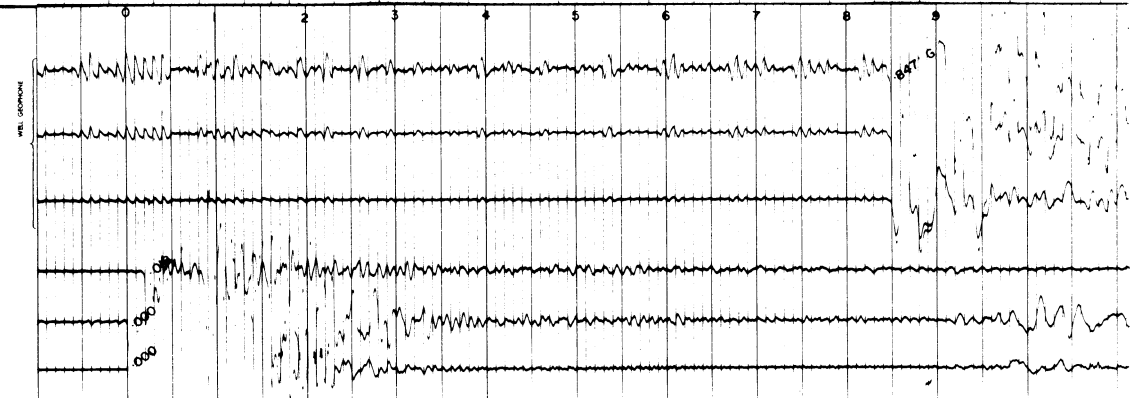
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WELL AROO N#1  
 Record No 10  
 Shot Hole No  
 Offer & Bearing  
 Depth of Well Sismometer  
 Below Kelly Bushing 6840'  
 Below Datum 00ft (A.S.L.) 6808'  
 Charge 20 Depth of Shot 45'



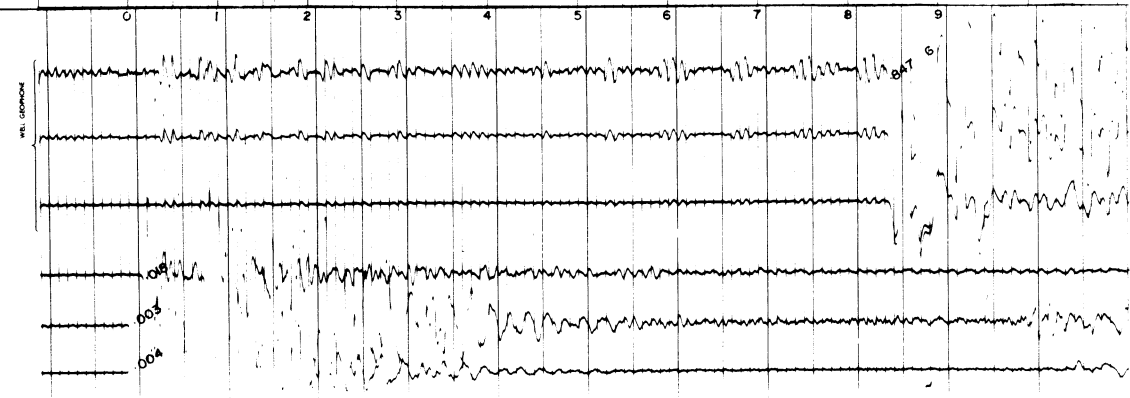
# WELL VELOCITY DETERMINATION

WELL AROO N#1  
 Record No 11  
 Shot Hole No  
 Offer & Bearing  
 Depth of Well Sismometer  
 Below Kelly Bushing 6840'  
 Below Datum 00ft (A.S.L.) 6808'  
 Charge 20 Depth of Shot 45'



# WELL VELOCITY DETERMINATION

WELL AROO N#1  
 Record No 12  
 Shot Hole No  
 Offer & Bearing  
 Depth of Well Sismometer  
 Below Kelly Bushing 6840'  
 Below Datum 00ft (A.S.L.) 6808'  
 Charge 20 Depth of Shot 45'



# WELL VELOCITY DETERMINATION

WELL AROO N°1

Record No 8

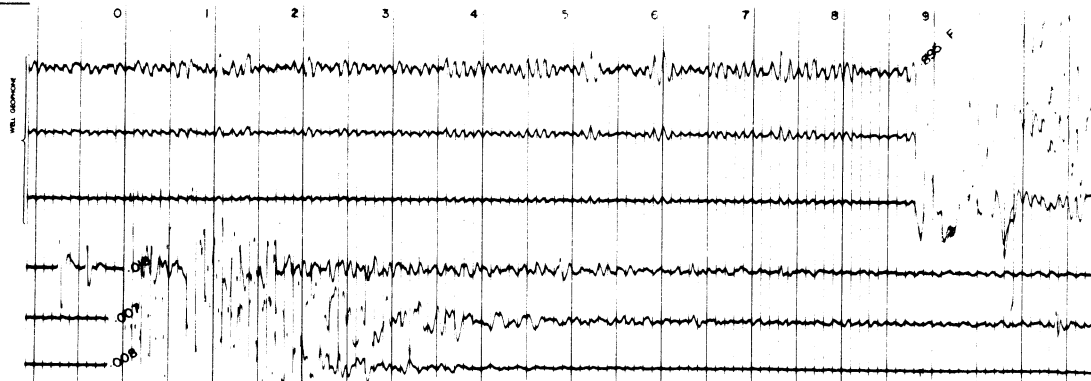
Shot Hole No

Depth of Well Seismometer

Below Kelly Bushing 7392'

Below Datum 00ft (A.S.L.) 7360'

Charge 20 Depth of Shot 45'



# WELL VELOCITY DETERMINATION

WELL AROO N°1

Record No 9

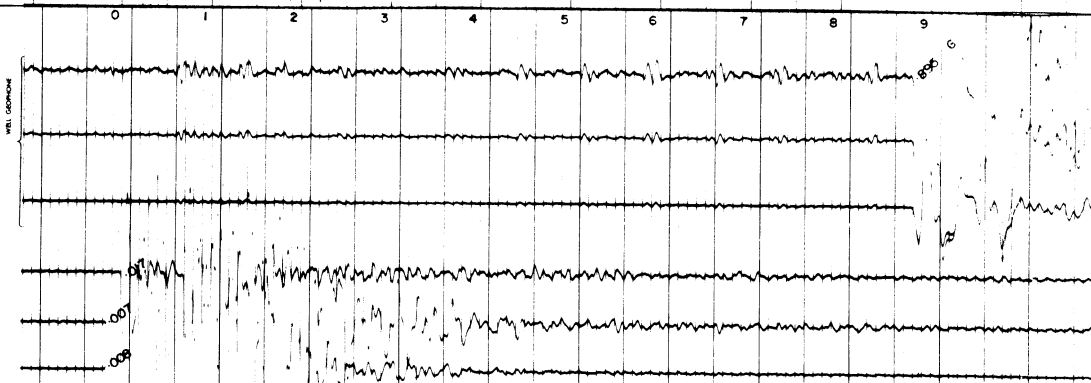
Shot Hole No

Depth of Well Seismometer

Below Kelly Bushing 7392'

Below Datum 00ft (A.S.L.) 7360'

Charge 20 Depth of Shot 45'



# WELL VELOCITY DETERMINATION

WELL AROO N°1

Record No 6

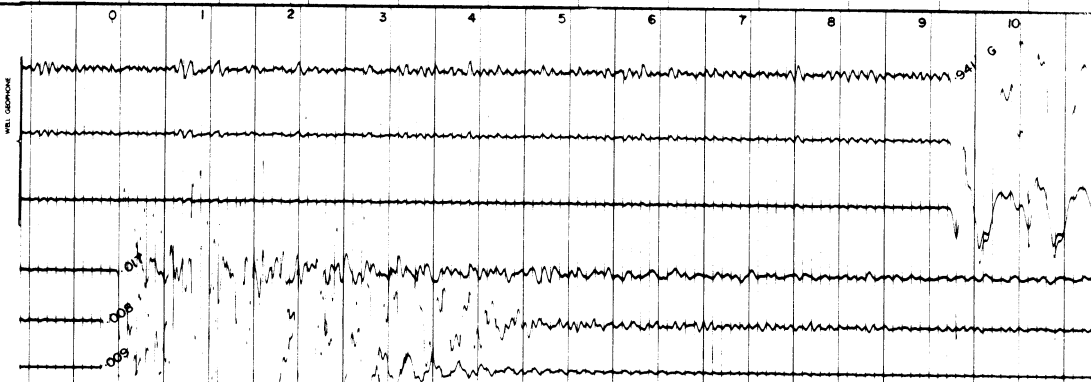
Shot Hole No

Depth of Well Seismometer

Below Kelly Bushing 7922'

Below Datum 00ft (A.S.L.) 7890'

Charge 30 Depth of Shot 45'



# WELL VELOCITY DETERMINATION

WELL AROO N°1

Record No 7

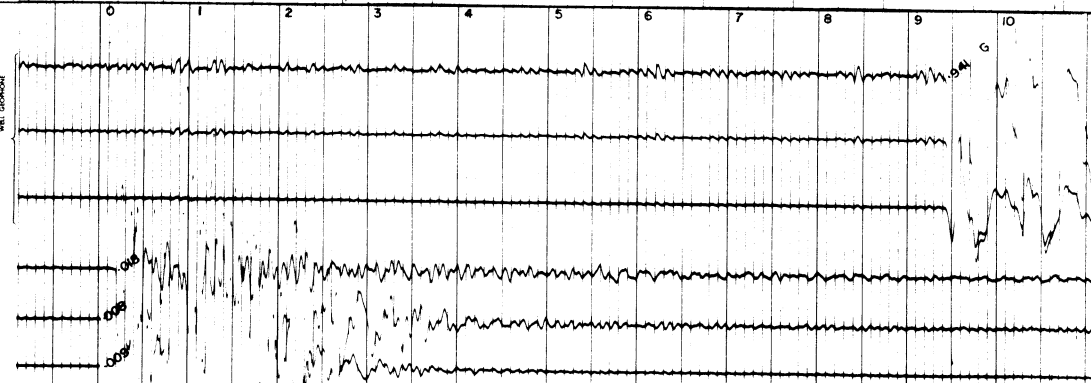
Shot Hole No

Depth of Well Seismometer

Below Kelly Bushing 7922'

Below Datum 00ft (A.S.L.) 7890'

Charge 30 Depth of Shot 45'



# WELL VELOCITY DETERMINATION

WELL AROO N°1

Record No 5

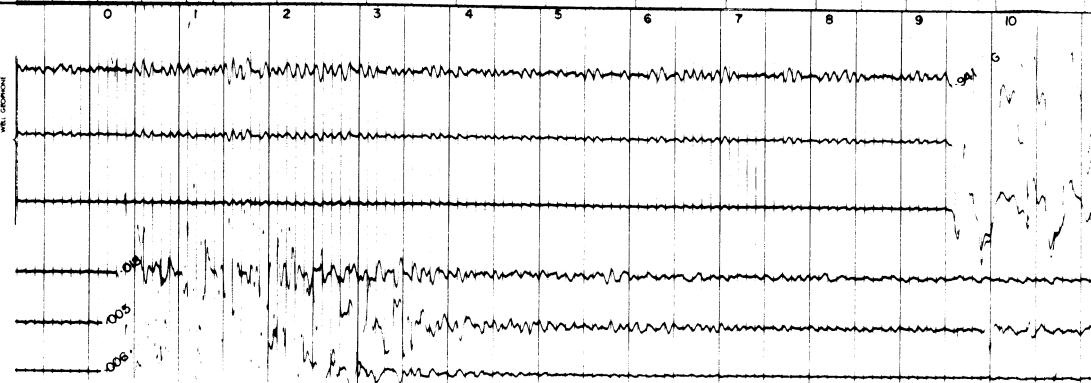
Shot Hole No

Depth of Well Seismometer

Below Kelly Bushing 7922'

Below Datum 00ft (A.S.L.) 7890'

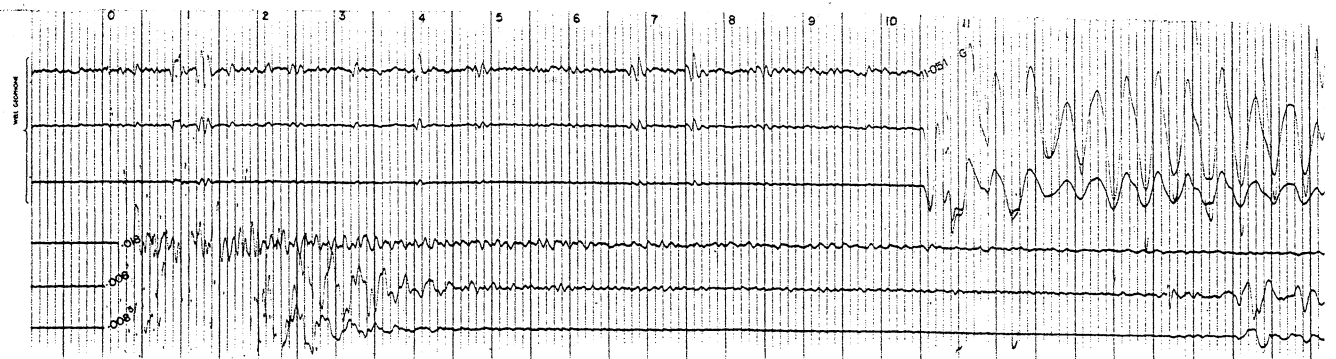
Charge 20 Depth of Shot 45'



WELL VELOCITY DETERMINATION

AROO N#1  
4

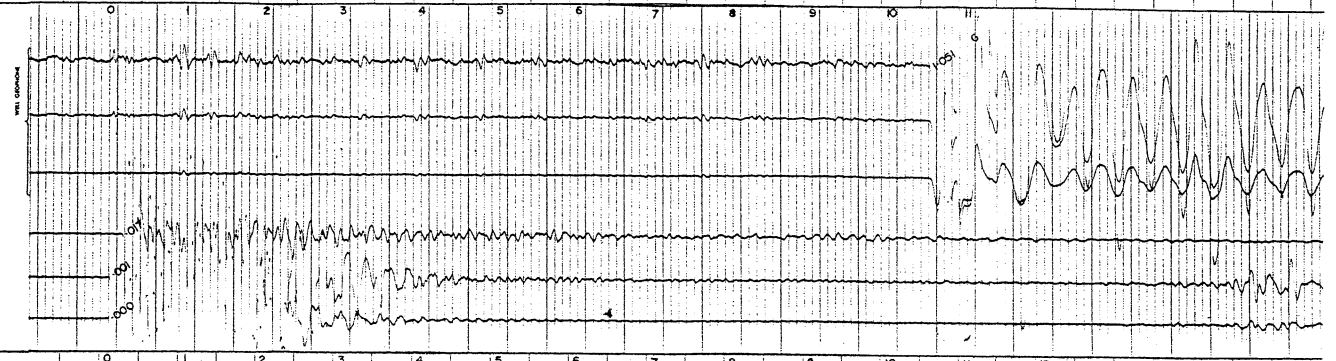
Seismometer  
ushing 9250'  
00ft. (A.S.L.) 9218'  
Depth of Shot 45'



WELL VELOCITY DETERMINATION

AROO N#1  
3

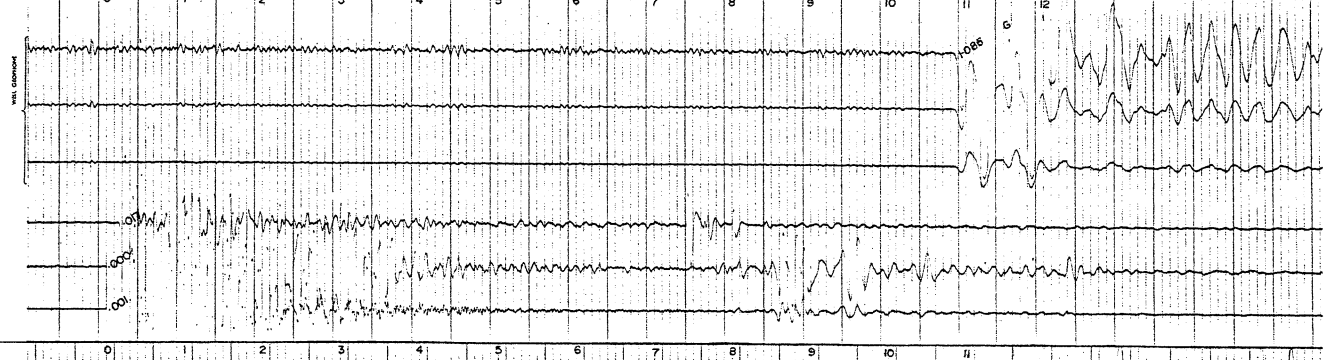
Seismometer  
ushing 9250'  
00ft. (A.S.L.) 9218'  
Depth of Shot 45'



WELL VELOCITY DETERMINATION

AROO N#1  
1

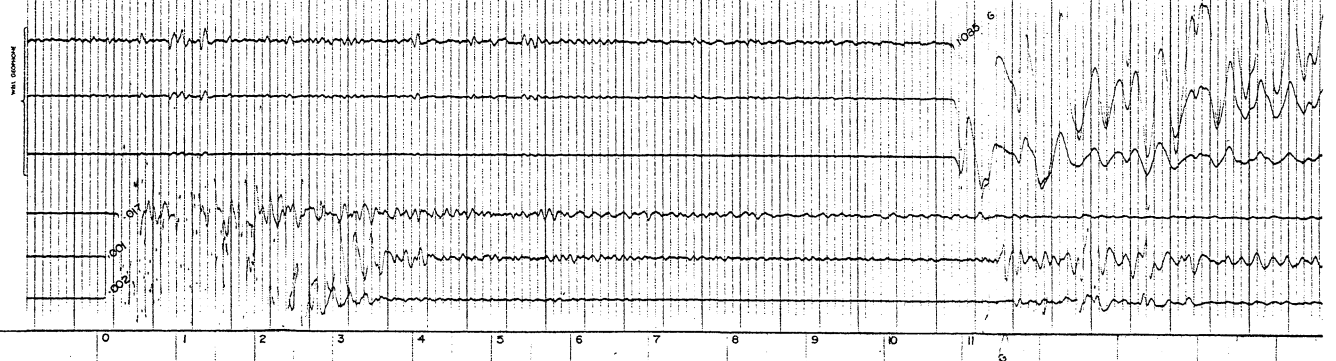
Seismometer  
ushing 9670'  
00ft. (A.S.L.) 9638'  
Depth of Shot 45'



WELL VELOCITY DETERMINATION

AROO N#1  
2

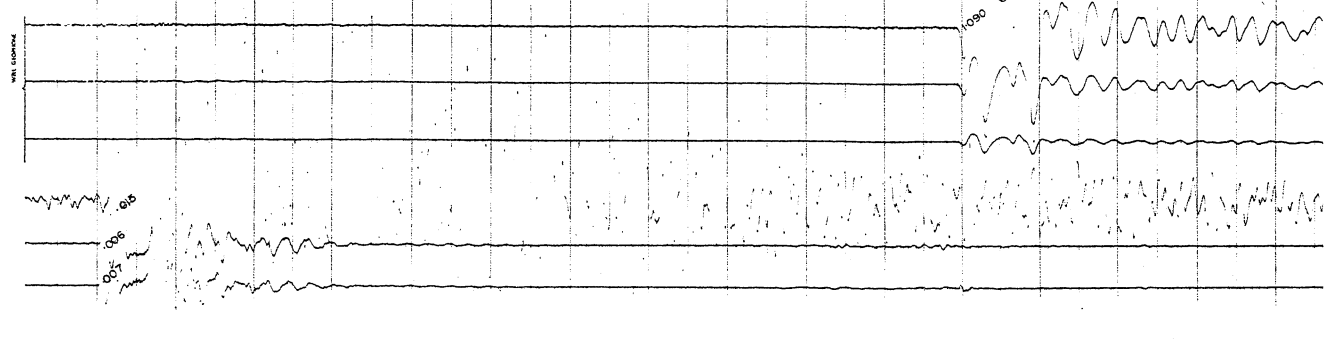
Seismometer  
ushing 9670'  
00ft. (A.S.L.) 9638'  
Depth of Shot 45'



WELL VELOCITY DETERMINATION

AROO N#1  
17

Seismometer  
ushing 9732'  
00ft. (A.S.L.) 9700'  
Depth of Shot 45'







SAMPLE AND DEPTH IN FEET	ZONE	AGE	PRESERVATION	DIVERSITY	REMARKS	SAMPLE NO.	
SNC 45	6 715	<u>L. asperum</u>	Middle to Late Eocene	Fair to good	Very low		
SNC 44	6 730	<u>L. asperum</u>	Middle to Late Eocene	Fair to good	Very low	Very rare microplankton	S3020
SNC 43	6 825	Lower <u>L. asperum</u>	Middle Eocene	Poor to fair	Low	Sparse microplankton	S3019
SNC 41	6 920	Lower <u>L. asperum</u>	Middle Eocene	Poor to fair	Low	Very rare microplankton, reworked Permian spores.	S3018
SNC 38	7 431	Lower <u>L. asperum</u>	Middle Eocene	Poor to fair	Low	Core fractured and mud invaded.	S3017
SNC 37	7 566	Indeterminate					S3016
SNC 33	7 923	Indeterminate					S3015
SNC 30	8 189	<u>Protocadites asperum</u>	Early to Middle Eocene	Very poor	Very low	Core fractured and mud invaded	S3014
SNC 27	8 384	Indeterminate					S3013
SNC 25	8 520	<u>L. diversum</u>	Early Eocene	Very poor	Low	Moderate yield of microplankton.	S3012
SNC 22	8 615	<u>L. diversum</u>	Early Eocene	Very poor	Very low		S3011
SNC 20	8 748	Indeterminate				Essentially barren	S3010
SNC 19	8 794	Indeterminate		Very poor	Very low	?Non-marine dinoflagellates	S3009
SNC 17	8 897	Indeterminate					S3008
SNC 15	8 944	<u>L. diversum</u>	Early Eocene	Very poor	Very low		S3007
SNC 14	8 990	Upper <u>L. balnei</u>	Late Paleocene	Very poor	Low	Moderate yield of microplankton	S3005
SNC 13	9 080	Upper <u>L. balnei</u>	Late Paleocene	Very poor	Low	Rare microplankton, reworked Cretaceous and Permian spores.	S3004
SNC 12	9 120	Indeterminate				Essentially barren.	S3003
SNC 11	9 166	?Lower <u>L. balnei</u>	Paleocene	Very poor	Very low	Rare microplankton, reworked Permian spores.	S3006
SNC 9	9 250	?Lower <u>L. balnei</u>	Paleocene	Very poor	Very low	Core badly fractured and mud invaded, rare microplankton.	S3002
SNC 8	9 350	?Lower <u>L. balnei</u>	Paleocene	Very poor	Very low	Core badly fractured and mud invaded.	S3001
SNC 4	9 494	Indeterminate				Essentially barren	S3000
Core 1	9 528	?Lower <u>L. balnei</u>	Paleocene	Poor	Low	First appearance of <u>C. gigantea</u>	S2999
Core 2	9 559	Indeterminate		Very poor	Very low	Forms barely identifiable.	S2998
SNC 30	9 747	Indeterminate					S2997
SNC 28	9 872	Indeterminate					S3031
SNC 27	9 990	Lower <u>L. balnei</u>	Paleocene	Very low	Very low	Virtually barren	S3030
SNC 26	10 057	Indeterminate				Very rare dinoflagellates, reworked Permian spores.	S3029
SNC 24	10 194	Indeterminate					S3028
SNC 23	10 250	Indeterminate					S3027
SNC 22	10 294	?Lower <u>L. balnei</u>	Paleocene	Very poor	Very low	A very small assemblages and possibly contaminated.	S3026
SNC 13	11 133	Indeterminate					S3025
SNC 8	11 525	Indeterminate					S3024
SNC 7	11 909	Indeterminate					S3022
SNC 1	11 565	Indeterminate					S3021
							S3023

Table I - Summary of palynological analyses, Hematite Area No. 1 Well, Bass Basin, Tasmania.

LATITUDE 39 47 31 S KELLY BUSHING 32 FEET WEATHERING VELOCITY 0 FEET/SEC

LONGITUDE 145 26 51 E SEABED ELEVATION -250 FEET REPLACEMENT VELOCITY 0 FEET/SEC

CASING DEPTH 13<sup>3</sup>/<sub>8</sub> - 2,979' DATUM ELEVATION MSL 0 FT DATUM VELOCITY 5000 FEET/SEC

9<sup>5</sup>/<sub>8</sub> - 9,635'

EW R		DGM	TC	DS	AE	DWS	ASD	DGS	H	TANI	COSI	T	Q	TGS	ASD/DV	TGD	0	DGDO	ADGD	ATGD	VI	VA
		732								SONIC	TIME					0.1125						
		1232								SONIC	TIME					0.1125	700	700	0.1125	6222.	6222.	
		1732								SONIC	TIME					0.1870	1200	500	0.0745	6711.	6415.	
		2232								SONIC	TIME					0.2525	1700	500	0.0655	7634.	6735.	
0	16	2942	0.0000	45	32	77	45	2865	90	0.0314	0.9995	0.385	G	0.3848	0.009	0.3938						
		3432								SONIC	TIME					0.3938	2910	710	0.0828	8574.	7385.	
		4032								SONIC	TIME					0.4550	3400	490	0.0612	8008.	7473.	
		4532								SONIC	TIME					0.5430	4000	600	0.0880	6818	7360	
		5032								SONIC	TIME					0.6025	4500	500	0.0595	8403	7465	
0	13	5650	0.0000	45	32	77	45	5573	100	0.0179	0.9998	0.726	G	0.7258	0.009	0.7348						
		6232								SONIC	TIME					0.6620	5000	500	0.0595	8403.	7553.	
		6840	0.0000	45	32	77	45	6763	100	0.0148	0.9999	0.847	G	0.8469	0.009	0.8559						
0	11	6840	0.0000	45	32	77	45	6763	100	0.0148	0.9999	0.847	G	0.8469	0.009	0.8559						
0	12	6840	0.0000	45	32	77	45	6763	100	0.0148	0.9999	0.847	G	0.8469	0.009	0.8559						
		7392	0.0000	45	32	77	45	7315	100	0.0137	0.9999	0.895	F	0.8949	0.009	0.9039						
0	9	7392	0.0000	45	32	77	45	7315	95	0.0130	0.9999	0.895	G	0.8949	0.009	0.9039						
		7922	0.0000	45	32	77	45	7845	95	0.0121	0.9999	0.941	G	0.9409	0.009	0.9499						
0	7	7922	0.0000	45	32	77	45	7845	100	0.0127	0.9999	0.941	G	0.9409	0.009	0.9499						
0	5	7922	0.0000	45	32	77	45	7845	100	0.0127	0.9999	0.941	G	0.9409	0.009	0.9499						
		8532								SONIC	TIME					0.9499	7890	530	0.0460	11520.	8306.	
		9250	0.0000	45	32	77	45	9173	100	0.0109	0.9999	1.051	G	1.0509	0.009	1.0599						
0	3	9250	0.0000	45	32	77	45	9173	95	0.0104	0.9999	1.051	G	1.0509	0.009	1.0599						
		9670	0.0000	45	32	77	45	9593	95	0.0099	1.0000	1.086	G	1.0859	0.009	1.0949						
0	2	9670	0.0000	45	32	77	45	9593	95	0.0099	1.0000	1.085	G	1.0849	0.009	1.0939						
		9732	0.0000	45	32	77	45	9655	85	0.0088	1.0000	1.090	G	1.0899	0.009	1.0989						
0	18	9732	0.0000	45	32	77	45	9655	90	0.0093	1.0000	1.091	G	1.0909	0.009	1.0999						
		10345	0.0000	45	32	77	45	10268	85	0.0083	1.0000	1.137	F	1.1369	0.009	1.1459						
0	20	10345	0.0000	45	32	77	45	10268	85	0.0083	1.0000	1.137	G	1.1369	0.009	1.1459						
		11172	0.0000	45	32	77	45	11095	90	0.0081	1.0000	1.197	F	1.1969	0.009	1.2059						
0	22	11172	0.0000	45	32	77	45	11095	90	0.0081	1.0000	1.197	F	1.1969	0.009	1.2059						
		11550	0.0000	45	32	77	45	11473	85	0.0074	1.0000	1.226	F	1.2259	0.009	1.2349						
0	24	12100	0.0000	45	32	77	45	12023	95	0.0079	1.0000	1.267	F	1.2669	0.009	1.2759						
0	25	12100	0.0000	45	32	77	45	12023	90	0.0075	1.0000	1.266	F	1.2659	0.009	1.2749						
		TD=12112 From KB														1.2754	12068	550	0.0405	13582.	9462.	

THE BROKEN HILL PROPRIETARY CO. LTD.

OIL AND GAS DIVISION

(HEMATITE PETROLEUM PTY LTD.)

74208

BUREAU OF MINERAL RESOURCES

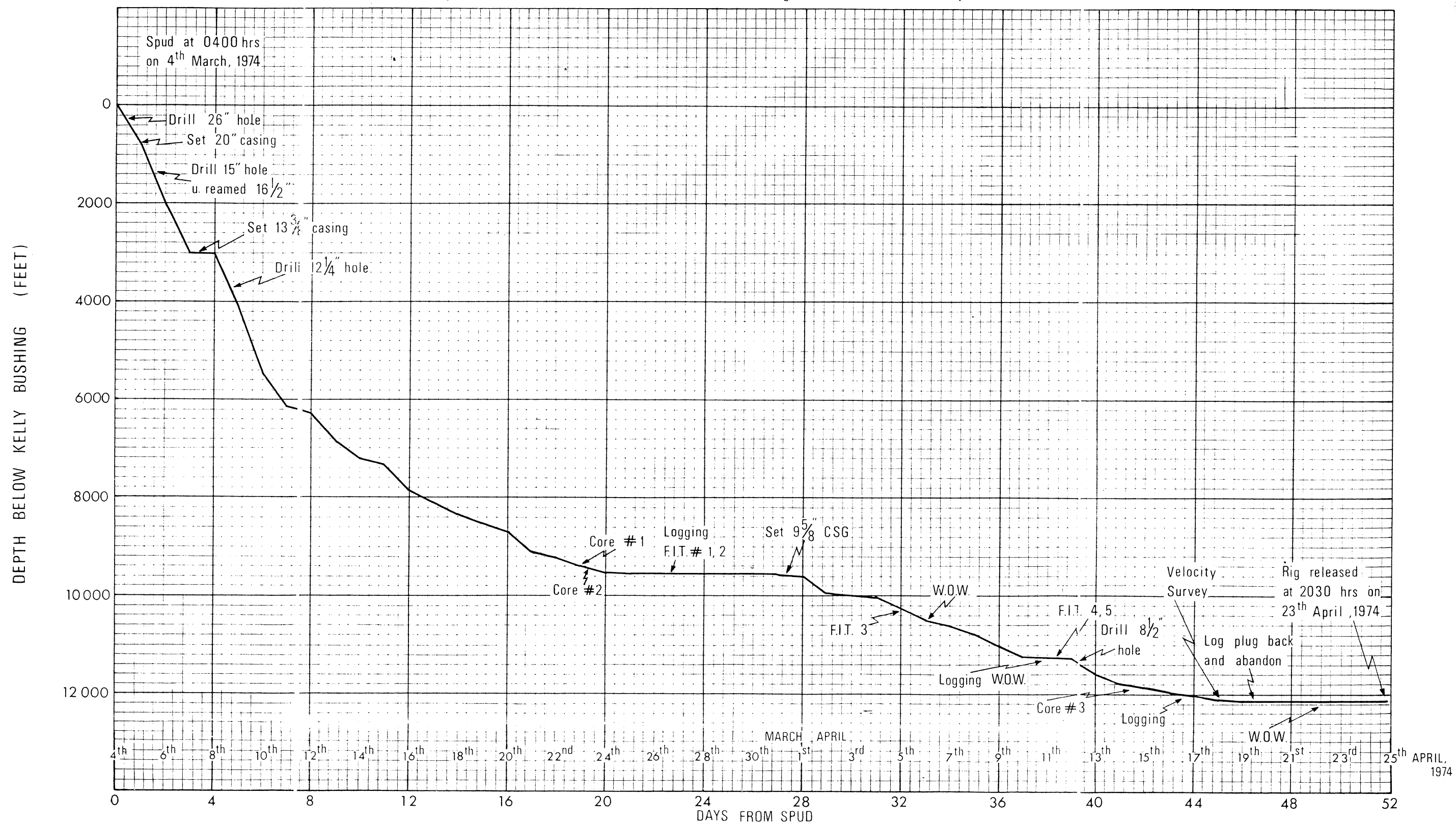
GEOLOGY AND GEOPHYSICS

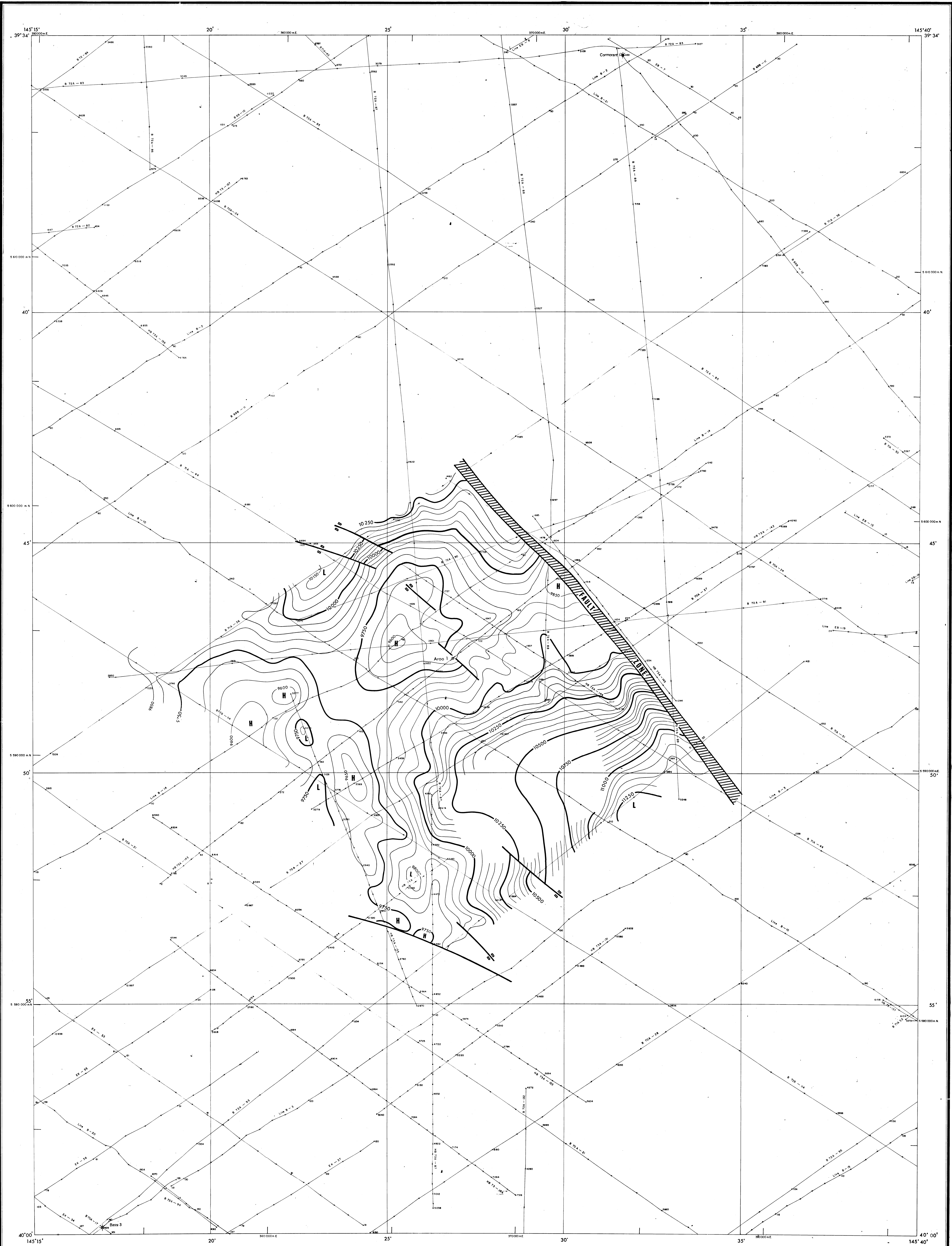
# DRILLING TIME CURVE

AR00 No.1

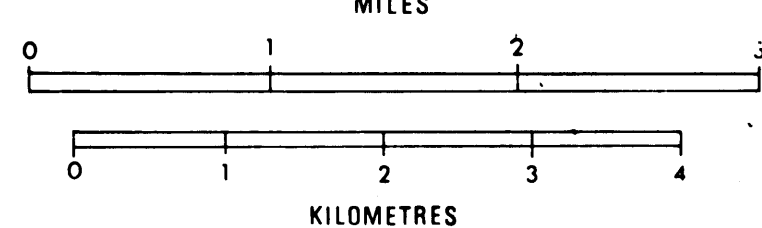
Area : Bass Basin  
Permit : T/3P  
Latitude : 39°47'30"  
Longitude : 145°26'48"  
Total Depth : 12112' (KB)

Rig : Glomar Conception  
Contractor : Global Marine  
Well Spudded : 4<sup>th</sup> March, 1974  
Rig Released : 23<sup>rd</sup> April, 1974





Scale 1: 50 000



Compiled by Hematite Petroleum Pty Ltd  
Projection UTM Zone 55 CM 142°E

LEGEND

- Oil Well
- ✱ Gas Well
- ✱ Oil & Gas Well
- Oil show
- ✱ Gas show
- ✱ Oil & Gas shows
- Drilling
- Dry hole (Abandoned)

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(HEMATITE PETROLEUM PROPRIETARY LIMITED)  
Bass Basin

AROOS STRUCTURE

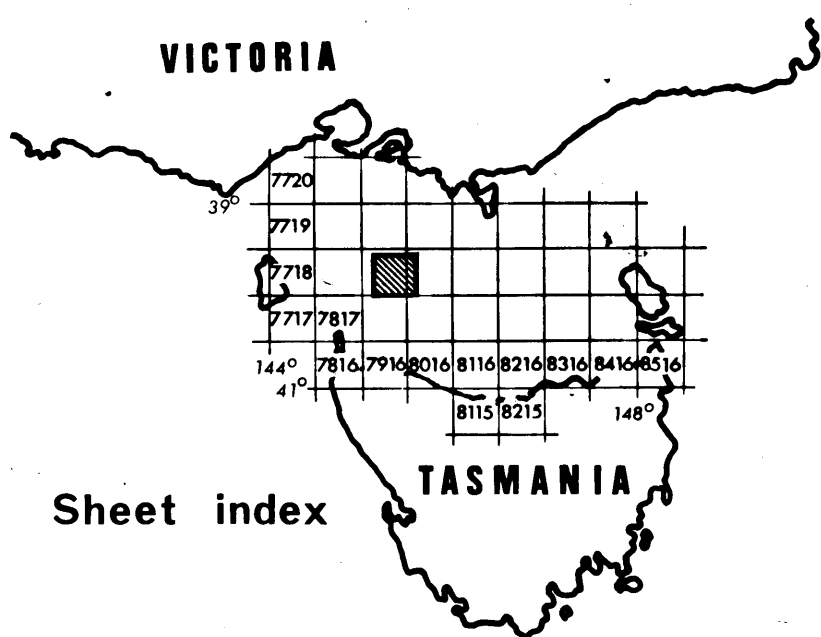
BROWN HORIZON

Contour Interval: 50' Datum: Sea level  
Author: M. McNicol Date: July 1974

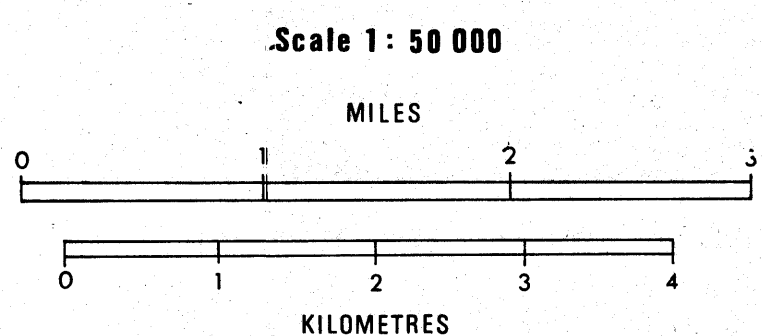
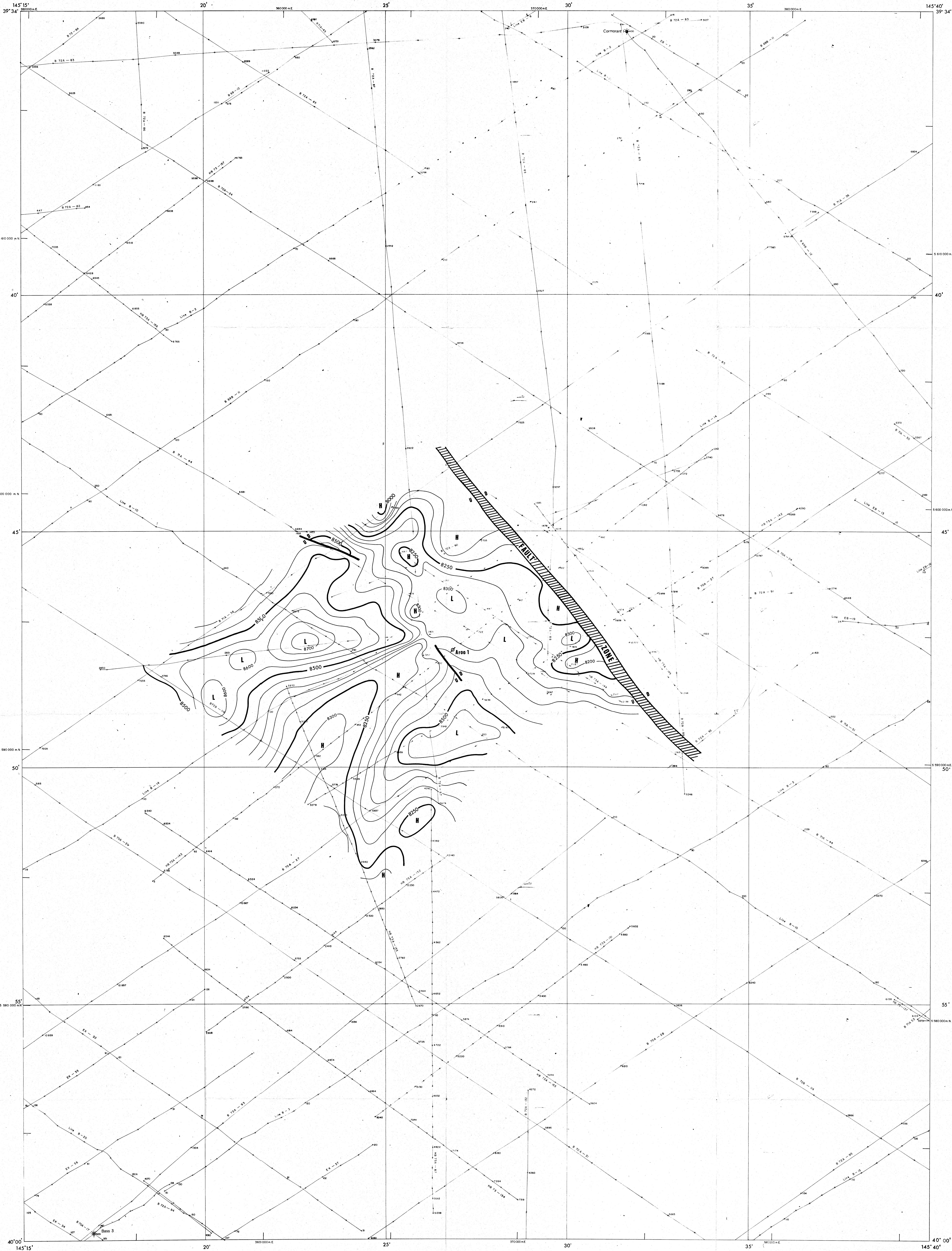
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Compiled by Hematite Petroleum Pty Ltd  
Projection UTM Zone 55 CM 142°E

LEGEND

- Oil Well
- Gas Well
- Oil & Gas Well
- Oil show
- Gas show
- Oil & Gas shows
- Drilling
- Dry hole (Abandoned)

THE BROKEN HILL PROPRIETARY CO. LTD.  
OIL AND GAS DIVISION  
(HEMATITE PETROLEUM PROPRIETARY LIMITED)  
Bass Basin

AROOS STRUCTURE

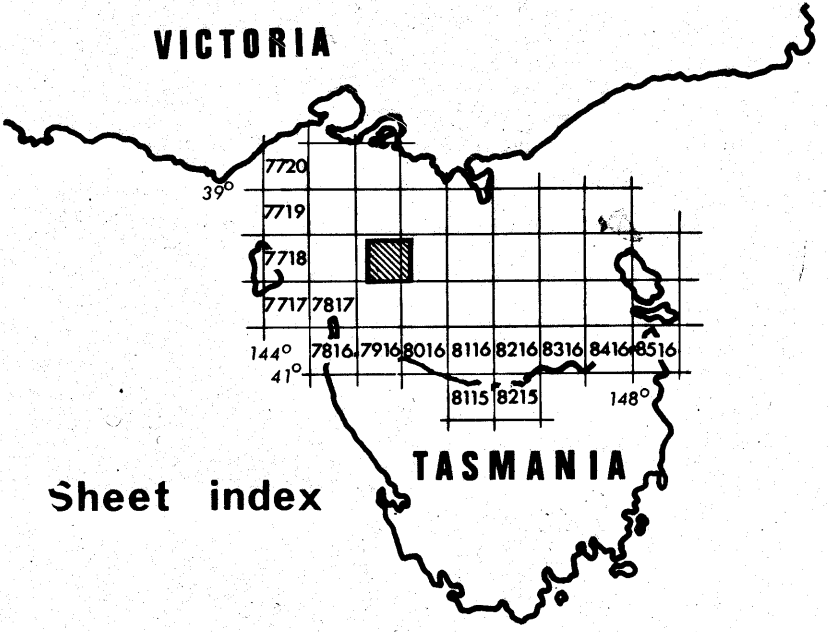
ORANGE HORIZON

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Author: M. McNicol Date: July, 1974

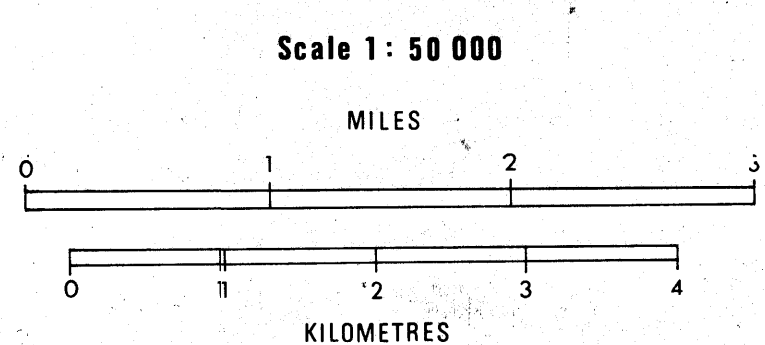
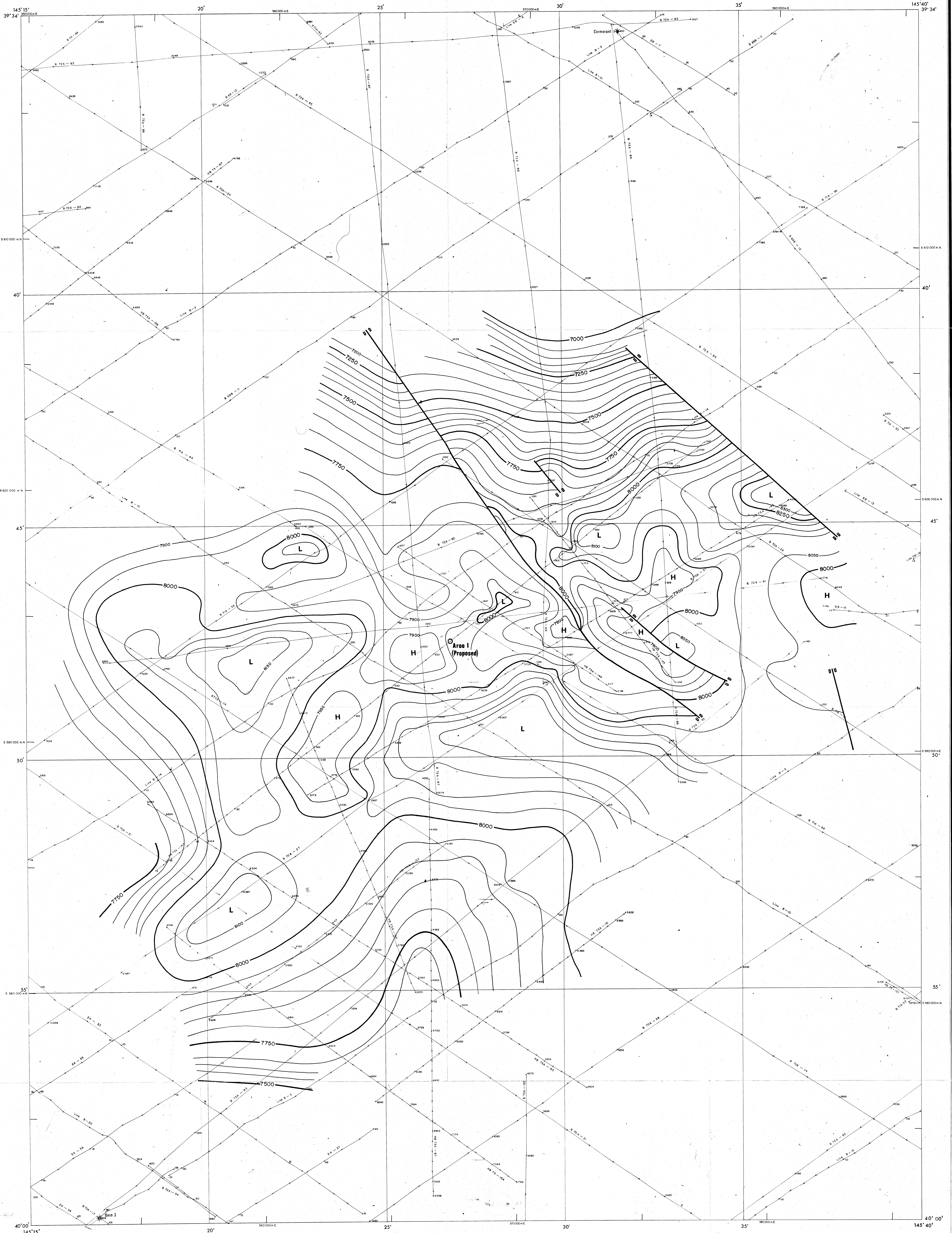
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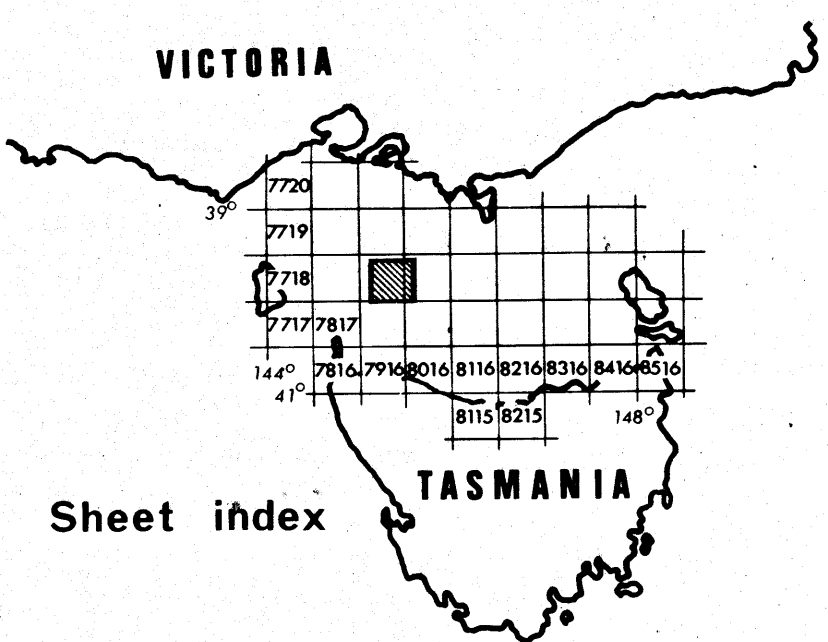






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Projection UTM Zone 55 C.M. 147°E

- LEGEND**
- Oil Well
  - Gas Well
  - Oil & Gas Well
  - Oil show
  - Gas show
  - Oil & Gas shows
  - Drilling
  - Dry hole (Abandoned)



Sheet index

HEMATITE PETROLEUM, PTY. LTD.  
BASS BASIN

AROO PROSPECT

RED HORIZON

Contours in feet below sea level Contour interval 50 feet  
Author E Urschel Date November 1973

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GEOLOGY AND GEOPHYSICS

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