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ANNUAL REPORT, YEAR 1, T20P

OTWAY BASIN, TASMANIA

FOR

VAN DIEMEN'S LAND RESOURCES N.L. CONSORTIUM.

SEPTEMBER, 1982.

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1. SEISMIC LINE            OMQ82A - 3
2. SEISMIC LINE            OMQ82A - 12
3. SEISMIC LINE            OMQ82A - 14
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INTRODUCTION

This report relates to work carried out by Van Diemen's Resources N.L. as operator for the Consortium which hold title to T20P for the period 11th June, 1982 to 10th September, 1982. This is the final quarterly report for the First Permit Year.

GEOLOGICAL PROGRAMMES.

Van Diemen's Land Resources N.L. in association with Bass Strait Oil & Gas (Holdings) N.L. conducted a burial and thermal geohistory study in the central Otway Basin region and encompassing the Whelk -1 well in T20P. Samples were collected and submitted to Keiraville Consultants (Prof.A.Cook, Woolongong University) for vitrinite reflectance determination and Paltech Pty Ltd. (Dr.I.Deighton) for geohistory studies.

The report is included as Appendix -1.

The most important conclusion of the report is that the Belfast Mudstone is only transitionally mature. Although Paltech attributed this to "shallow depth of burial", Petrecon feels that the unit was deposited during or even after, the first appearance of oceanic crust (according to the latest model of Cande et al., 1982) there being insufficient heat for hydrocarbon generation since then. This is particularly important and will be studied in more detail in the second permit year.

GEOPHYSICAL PROGRAMMES

During the first quarter of 1981, Bass Strait Oil and Gas N.L. and Van Diemen's Land Resources N.L. shot 506 kms and 137 kms of 48 fold seismic data in permits Vic P16 and T17P respectively. On the basis of their interpretation a significant closed anticlinal structure at or near the top of the Otway Group was mapped. This structure was shown to overlap onto permit T20P. From March 1st to May 3rd, 1982 the permit holders of Vic P16, together with the Consortium in Tasmanian Permits T17P and T20P, conducted a seismic survey to provide further information over this structure.

Fifteen line kilometers of 48 fold data were collected on T20P, 22.5 line kilometers on T17P and 88 line kilometers over the structure were gathered in Vic P16. These data were processed by G.S.I. at their Sydney processing centre. Interpretation should be complete during the next permit year.

Paper prints of lines OMQ82-3, OMQ82-12, OMQ82-14 and OMQ82-16 which extend onto T20P are enclosed.

VAN DIEMEN'S LAND RESOURCES N.L.EXPENDITURE REQUIREMENTS - T20P

First Year	\$100,000	Data Review
Second Year	\$200,000	Seismic Survey

ACTUAL EXPENDITURE - T20P

First Year	\$18,809
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The first year expenditure has been calculated to 31st August, 1982.

WORK PROGRAMME FOR YEAR TWO.

The geological and geophysical data search and collation which was programmed for the first year has been accomplished. These data will be interpreted during the first quarter, year 2, prior to the collection and processing of 460 km of seismic data during that year.

Further delineation and interpretation of the lead which overlaps the permits T17P, T20P and Vic P16 will be completed during the first half of the second permit year.

REPORTS SUBMITTED DURING THE SECOND  
PERMIT YEAR.

First Quarter Report, Year 1, T20P.

Second Quarter Report, Year 1, T20P.

Third Quarter Report, Year 1, T20P.

APPENDIX 1.

BURIAL AND THERMAL  
GEOHISTORY ANALYSIS

OF

FLAXMANS - 1  
MUSSEL - 1  
NAUTILUS A-1  
NERITA - 1  
PECTEN 1-A  
PORT CAMPBELL -1  
PRAWN A-1  
SHERBROOK - 1  
SNAIL - 1  
WHELK - 1

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OTWAY BASIN  
VICTORIA.

For: GENERAL GEOLOGICAL SERVICES

August 20th, 1982.

Paltech Report  
1982/27



PALTECH PTY  
LTD

MARINE MICROPALAEONTOLOGISTS  
SYDNEY NEW SOUTH WALES  
MIDLAND WESTERN AUSTRALIA

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1 Age vs Biostratigraphic Datums and Conventional Stages. Pages 7 & 8.

FIGURES

1 to 10 BURIAL AND THERMAL GEOHISTORY DIAGRAMS:-

Scale	1:10 000	1:30 000
Location	(map roll or back pocket)	after page 16.

	<u>FIGURE</u>	<u>WELL</u>
1A	1B	FLAXMANS-1
2A	2B	MUSSEL-1
3A	3B	NAUTILUS A-1
4A	4B	NERITA-1
5A	5B	PECTEN 1-A
6A	6B	PORT CAMPBELL-1
7A	7B	PRAWN A-1
8A	8B	SHERBROOK-1
9A	9B	SNAIL-1
10A	10B	WHELK-1

11 BASEMENT SUBSIDENCE CURVES

before page 17

## SECTION I - INTRODUCTION.

### PREVIOUS WORK.

Useful syntheses of the geology and petroleum prospectivity of the Otway Basin have been presented by Denham & Brown (1976), and Wopfner et al (1971).

The primary conclusions have been that:-

- \*The prime source in the Otway Basin for fluid hydrocarbons is the Belfast Mudstone.
- \*Other stratigraphic units including the Otway Group are fair to good source rocks for gas.

### AIMS OF THIS STUDY.

The aim of this study is to determine the timing of maturation of prospective source rocks in 10 wells in the Otway Basin:-

FLAXMANS - 1  
MUSSEL - 1  
NAUTILUS A-1  
NERITA - 1  
PECTEN 1-A  
PORT CAMPBELL - 1  
PRAWN A-1  
SHERBROOK - 1  
SNAIL - 1  
WHELK - 1

### BURY II

The computer program BURY II (copyright D.A. Falvey, 1982) constructs a burial history diagram by successively stripping off sedimentary layers according to age. It then calculates the thermal maturation of each sedimentary layer through time in terms of vitrinite reflectance.

A full discussion of the theory of burial and thermal geohistory analysis is contained in Falvey & Deighton (1982).

Using BURY II, geohistory diagrams have been constructed for 10 wells drilled in the Otway Basin (including the Torquay Embayment). Discussion of the factors used in the construction of the diagrams (Section II), a discussion of each well diagram (Section III) and general conclusions (Section IV) follow.

SECTION II - CONSTRUCTION OF BURIAL AND THERMAL GEOHISTORY  
DIAGRAMS FOR THE OTWAY BASIN.

DATA INPUT

The data required for BURY II is as follows:-

- \*Basement depth - BMT
- \*Bottom hole temperature - BHT
- \*Sea bottom temperature - SBT
- \*Depth-age-paleowater depth data for biostratigraphic or stratigraphic datums.
- \*Depth - Observed Thermal Maturation Indices.

A list of the input data for each well is given in Appendix 1. A brief discussion of the source and quality of this data follows.

Basement Depth - BMT

Apart from WHELK - 1 which terminated in basement, all other basement depths are interpreted from general basin configuration as discussed by Deighton et al (1976). In their view and those of later authors, the Otway Group depocentre is north of the Sherbrook Group depocentre, see Boeuf & Doust (1975).

Bottom Hole Temperature.

Where possible, the bottom hole temperature was estimated from the empirical observation method of Dowdle & Cobb (1975). In many cases this resulted in unrealistically low values of heatflow for which the regional average is about 1.3 to 1.4. BHT's were generally raised to bring the heatflow between these values except for WHELK - 1 (higher conductivity due to shallow basement)

Discussion later shows the basic similarities between the basement subsidence histories of all wells in this study. This coupled with the fact that most of the wells are from the one embayment in the Otway Basin, indicates that heatflows for the wells should be fairly similar.

Sea Bottom Temperature.

Sea bottom temperature has been assumed constant at 15°C.

### Depth - Age - Paleowater Depth

This information has been gleaned from various sources. In general, foraminifera provide control in the marine sequence. These are supplemented by palynologic data for the Belfast Mudstone. Palynologic data provides the control for the terrestrial parts of the sequence.

The sources for all data are presented in Appendix 1.

The biostratigraphy and palynostratigraphic vs age correlations are shown as Table 1.

### Depth - Observed Thermal Maturation Indices.

A comprehensive study of vitrinite reflectances in the wells was specifically undertaken by A. Cook (Keiraville Konsultants) to provide data for geohistory analysis.

These are supplemented by some data from Middleton and Falvey (in press).

No thermal alteration index measurements were available for this study.

### MODELLING PROCEDURE.

Because of the lack of comparable information for all wells, porosity changes and thermal conductivities were generally modelled identically for all wells except NAUTILUS A-1 (lower conductivity for Oligocene marl deposition) and WHELK - 1 (higher conductivities due to shallow basement).

Thus the variables which can cause differential thermal maturation between wells were restricted to:-

\*Basement subsidence

\*Paleo-heatflow

#### \*Basement Subsidence.

Basement subsidence is quantified by the depth-age-paleowater depth data for all levels intersected by drilling. For levels deeper than T.D., a subsidence pattern was modelled according to the subsidence pattern for Fergusons Hill No.1, based on palynologic data presented by Evans (1966). Fergusons Hill No.1 penetrated basement below Otway Group and should be a fair indication of Otway Group subsidence.

\*Paleo-heatflow.

Basement subsidence patterns for all wells are essentially exponential from 85-90 m.y. to present (Figure 11). This suggests that breakup in the eastern part of the Otway Basin occurred at about 85-90 m.y. This is supported by a recent re-identification of sea-floor spreading anomalies between Australia and Antarctica by Cande & Mutter (1982). Cande & Mutter (l.c.) found that a very slow period of spreading may have occurred from about 85 m.y. (possibly as early as 110 m.y. in the Great Australian Bight Basin) to about 45 m.y. when rapid spreading to form the Southern Ocean commenced.

Accordingly, paleo-heatflows were modelled as increasing from slightly less than the present day value at 131 m.y. to a maximum (during 80 to about 50 m.y.) then declining to the present day value. Paleo-heatflow increments were generally modelled as higher to the southwest (closer to the spreading ocean) during the 80-50 m.y. period.

TABLE 1(a) - AGE (M.Y.) VERSUS BIOSTRATIGRAPHIC DATUMS AND CONVENTIONAL STAGES - PLEISTOCENE TO EOCENE.

<u>Boundary Age</u> (m.y.)	<u>Stage</u>	<u>Foram Zone</u>	<u>Boundary Age</u> (m.y.)*
5.2	PLIO/PLEISTOCENE	A	4.5
10.4	LATE MIOCENE	B	10.4
	MID MIOCENE	C	12.0
		D	14.5
15.0		E-1	15.0
		E-2	15.5-16.0
	EARLY MIOCENE	F	17.5-18.0
		G	22.5
24.0		H-1	24.0
	LATE OLIGOCENE	H-2	25.0
		I-1	28.0
		I-2	30.0
32.0		J-1	34.5
	EARLY OLIGOCENE	J-2	37.0
37.0		LATE EOCENE	K

\*This column used for Data Input

from Taylor (in prep).

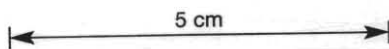


TABLE 1(b) - AGE (M.Y.) VERSUS BIOSTRATIGRAPHIC DATUMS AND CONVENTIONAL STAGES - EOCENE TO CRETACEOUS.

Boundary Age (m.y.)	Stage	Forams Zones/Datums	Boundary Age* (m.y.)	Spore/Pollen Zones	Dinoflagellate Zones	
37.0	L. Eocene	Base L	40.0			
40.0						
	Middle Eocene		45.0	early <i>P.pachypolus</i>		
			48.0	=early <i>N.asperus</i>		
49.0	Early Eocene	Top R	50.0			
			52.0	<i>D.orthoteichus</i>		
			53.0			
53.5	Paleocene	Top S-T	53.5			
			55.0-55.5	<i>L.balmei</i> , <i>G.edwardsii</i>		
65.0	Maastrichtian		65.0			
			69.0	<i>T.longus</i>		
70.0	Campanian		72.5	<i>T.lillei</i>		
			73.0			
			76.0	<i>N.senectus</i>		
			78.0			
78.0	Santonian		78.0		<i>X.australis</i>	
82.0	Coniacian	XA-1	80.0	<i>T.pachyexinus</i>	<i>N.aceras</i>	
				84.0		<i>D.cretaceum</i>
86.0	Turonian	XA-2	86.0			
				87.0	<i>C.triplex</i>	?
			XB	91.0		
		-- ? --	92.0			
92.0	Cenomanian		92.0	<i>A.distocarinus</i>	<i>A.parvum</i>	
				99.0	<i>P.pannosus</i>	
100.0	Albian		100.0			
				104.0	K2b	
				106.0	K2a	<i>C.paradoxa</i>
				107.0	<i>C.striatus</i>	
108.0	Aptian/Neocomian		109.0			
				131.0	Assumed base of E.Otway Basin deposition	
135.0						

\*This column used for Data Input

© Paltech 1981, Modified from Partridge (1976), McGowran et al (1971), Douglas et al (1976, Table 7.12).

5 cm

SECTION III - BURIAL AND THERMAL GEOHISTORY DIAGRAMS FOR THE OTWAY BASIN.

For each well two Burial and Thermal Geohistory Diagrams have been provided. One at 1: 10,000 scale may be used for measuring, plotting and comparing with standard 1: 10,000 scale summary well logs produced by most oil exploration companies. A summary lithostratigraphic log has been provided. The source of the litholog is given in the discussion of each well. Hydrocarbon shows are after Wopfner et al (1971).

The other, at 1: 30,000 scale is in A-4 fold-out format and shows, in addition, the computer predicted vitrinite reflectance/depth curve and the observed values (log scale above horizontal axis, linear scale below). Assuming the observed values are accurate, this diagram is an indication of the validity of the thermal modelling.

This section of the report discusses the Burial and Thermal Geohistory diagrams for each well. The following points are emphasised:-

- \*Temperature models for BHT
- \*Tectonic development where different from normal Otway Basin development (see Section IV for a discussion of general Otway Basin tectonic vs stratigraphic development).
- \*Thermal maturation discussing the predicted vs observed maturation levels, hydrocarbon shows (if any) and general significance as far as hydrocarbon generation.
- \*Lithostratigraphic comments.

### FLAXMANS - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 1A & 1B)

#### BHT Model.

A nominal 10% has been added to the observed BHT to compensate for mud circulation effects and bring the heatflow to 1.31 H.F.U.

#### Tectonic Development.

The basement subsidence curve for FLAXMANS - 1 is typical for the eastern Otway Basin (See Section IV).

#### Thermal Maturation.

A good fit between observed and predicted reflectance has been obtained, especially at depth (Figure 1B).

The reflectance lines indicate that the Otway Group is mature ( $R_0 = 0.7$  to  $0.9$ ) below 2600 metres. The base of the Belfast Mudstone is only transitionally mature ( $R_0 = 0.5$  to  $0.7$ ). This is consistent with hydrocarbon shows in the well.

#### Lithostratigraphy.

after Glenie (1971).

### MUSSEL - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figure 2A & 2B)

#### BHT Model.

A nominal 12% has been added to the observed BHT to compensate for mud circulation effects and bring the heatflow to 1.23 H.F.U. This may be a little low but produces a fair fit with the observed vitrinite reflectance.

#### Tectonic Development.

Subsidence during Waarre deposition is more rapid than normal for the Otway Basin (Figure 11).

### Thermal Maturation.

A good fit is observed between observed and predicted reflectance (Figure 2B). Some reworked vitrinite appears to be present at several levels in the well.

The reflectance lines indicate that the Otway Group is transitionally mature ( $R_o = 0.5$  to  $0.7$ ) above 3000 metres and mature below that. No hydrocarbon shows were observed in Mussel - 1.

### Lithostratigraphy.

After ESSO (Well Completion Report) except no Belfast Mudstone has been interpreted on the basis of foraminiferal evidence and young age at 1400 metres.

### NAUTILUS A-1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 3A & 3B)

### BHT Model.

A rather large 35% has been added to the observed BHT to compensate for mud circulation effects and bring the heatflow to 1.29 H.F.U. See comments below.

### Tectonic Development.

Normal development is suggested to about 55 m.y. At this time slumping and/or erosion by bottom currents removed pre-existing sediment above the Belfast Mudstone (Taylor, Well Completion Report Appendix & Deighton, 1974). Deposition recommenced in the late Eocene in very deep water (refs. cited).

The anomalous basement subsidence curve is the result of unloading during erosion/slumping and subsequent loading during progradation of the shelf edge.

It is worth noting that the erosion/slumping took place at about the time Cande & Mutter (1982) indicate an increase in spreading rate for the Southern Ocean.

### Thermal Maturation.

The predicted maturation levels are unfortunately a little low. However the Belfast Mudstone is still only transitionally mature ( $R_o = 0.5$  to  $0.7$ ) according to the observed reflectances.

The Otway Group would be mature ( $R_o > 0.7$ ) below about 3000 metres.

Lithostratigraphy.

After ESSO (Well Completion Report).

NERITA - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 4A & 4B).

BHT Model.

A nominal 18% has been added to the observed BHT to compensate for mud circulation effects and bring the heatflow to 1.24 H.F.U.

Tectonic Development.

A period of uplift has been modelled during breakup (90-80 m.y.). Otherwise the basement subsidence curve is normal.

Thermal Maturation.

The observed maturation levels show a fairly wide spread. The predicted curve shows good correspondence value at depth.

The reflectance lines indicate the Otway Group is mostly transitionally mature ( $R_0 = 0.5$  to  $0.7$ ) becoming mature near the base.

Lithostratigraphy.

After SHELL (Well Completion Report).

PECTEN 1-A BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 5A & 5B).

BHT Model.

A nominal 4% has been added to observed BHT to compensate for mud circulation effects and bring the heatflow to 1.29 H.F.U.

Tectonic Development.

Fairly normal for the Otway Basin (see Section IV).

Thermal Maturation.

A fair match between predicted and observed reflectances is noted (Figure 5B).

The reflectance lines indicate that the Otway Group is transitionally mature ( $R_0 = 0.5$  to  $0.7$ ) to about 2700 metres and mature below that. A gas show in the Waare Sandstone is consistent with the predicted maturation.

Lithostratigraphy.

After SHELL (Well Completion Report).

PORT CAMPBELL - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 6A & 6B).

BHT Model.

A nominal 2% was added to the observed BHT to bring the heatflow to 1.30 H.F.U.

Tectonic Development.

Normal for the eastern Otway Basin - some late Tertiary uplift.

Thermal Maturation.

A good fit at depth is observed between the predicted and observed vitrinite reflectance values.

The reflectance lines indicate the Belfast Mudstone is only just transitionally mature, while the Otway Group is transitionally mature to 2400 metres and mature below that. A gas and condensate show in the Waarre Sandstone is consistent with these observations.

McPhee et al (1981) suggest the most likely source for the gas in the Port Campbell area is from the Otway Group.

Lithostratigraphy.

After Glenie (1971).

PRAWN A-1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 7A & 7B).

BHT Model.

A nominal 6% was added to the observed BHT which brought the heatflow to 1.36 H.F.U.

Tectonic Development.

Abnormally high subsidence rates are indicated for Prawn A-1 during Waarre & Flaxmans deposition (Figure 11) and also a comparatively thin Belfast Mudstone. This pattern may be related to Mussel - 1 (Figure 2A). Subsequent tectonic development is normal for the basin area.

Thermal Maturation.

A good fit was obtained between predicted and observed reflectance values.

The reflectance lines indicate the Belfast Mudstone is transitionally mature while the Otway Group is mature below ~2750 metres.

No hydrocarbon shows were recorded during drilling.

Lithostratigraphy.

After ESSO (Well Completion Report) except the Belfast Mudstone is indicated to be thinner by foraminiferal data.

SHERBROOK - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 8A & 8B).

BHT Model.

Observed BHT was used.

Tectonic Development.

Normal for basin area with minor late Tertiary uplift.

Thermal Maturation.

A good fit was achieved with the only usable observed reflectance value.

The reflectance lines indicate the Otway Group is transitionally mature from 1300 metres to 2000 metres and mature below that.

Oil staining, odour and solvent cut at ~1490m is consistent with the predicted curve.

Lithostratigraphy.

Modified after F-BH (Well Completion Report) down to Pebble Point Formation, then after G.G.S. (1980) to T.D.

SNAIL - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 9A & 9B).

BHT Model.

Observed BHT used.

Tectonic Development.

Minor uplift inferred at top of Otway Group, followed by very slow subsidence to 50 m.y.

Thermal Maturation.

A fair fit observed with single observed reflectance value.

Reflectance lines suggest the Otway Group may be transitionally mature below ~1700 metres.

Lithostratigraphy.

After Hematite (Well Completion Report).

WHELK - 1 BURIAL AND THERMAL GEOHISTORY DIAGRAM.

(Figures 10A & 10B).

BHT Model.

A nominal 5% has been added to the observed BHT. The heatflow is high because basement is very shallow.

Tectonic Development.

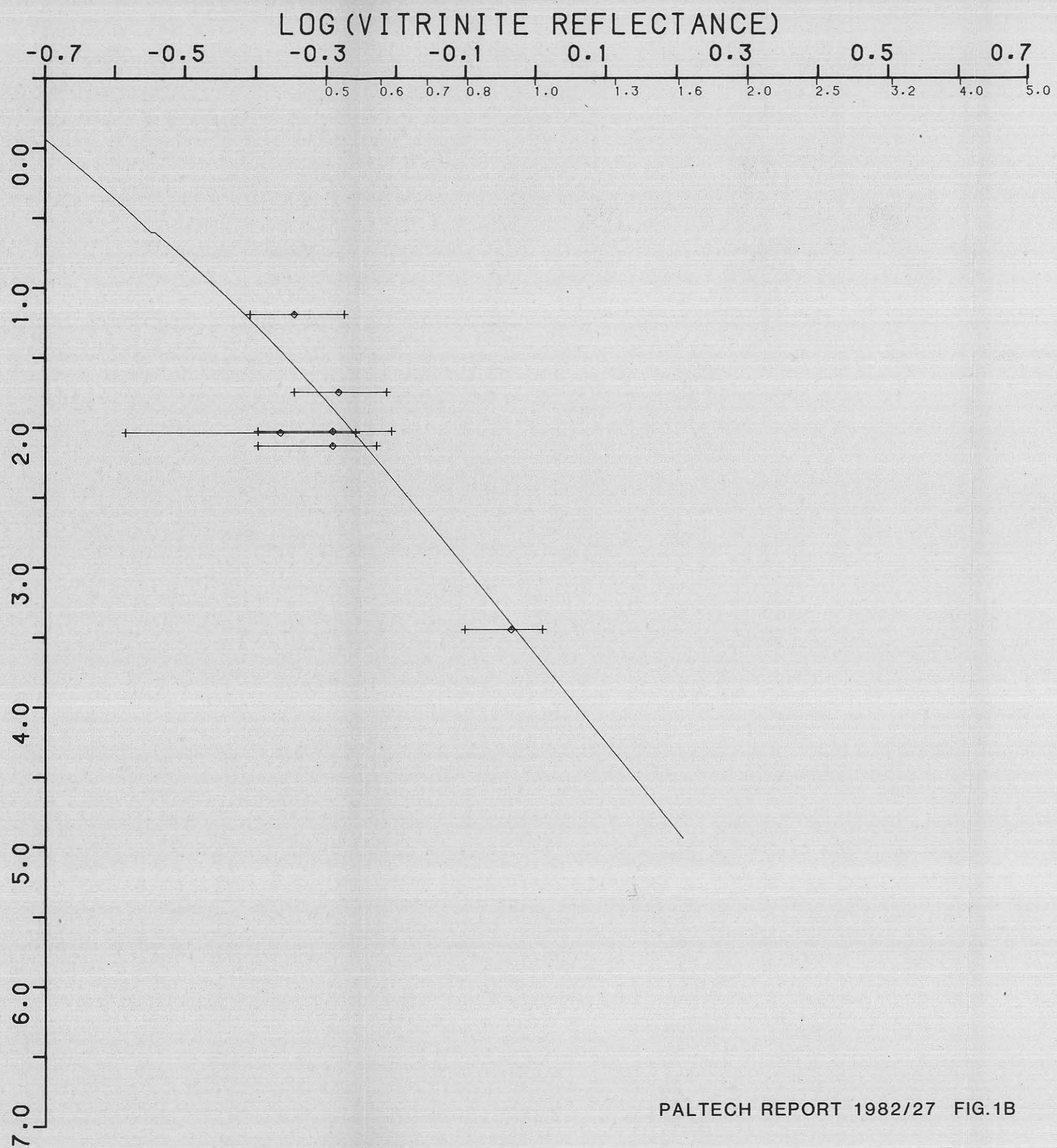
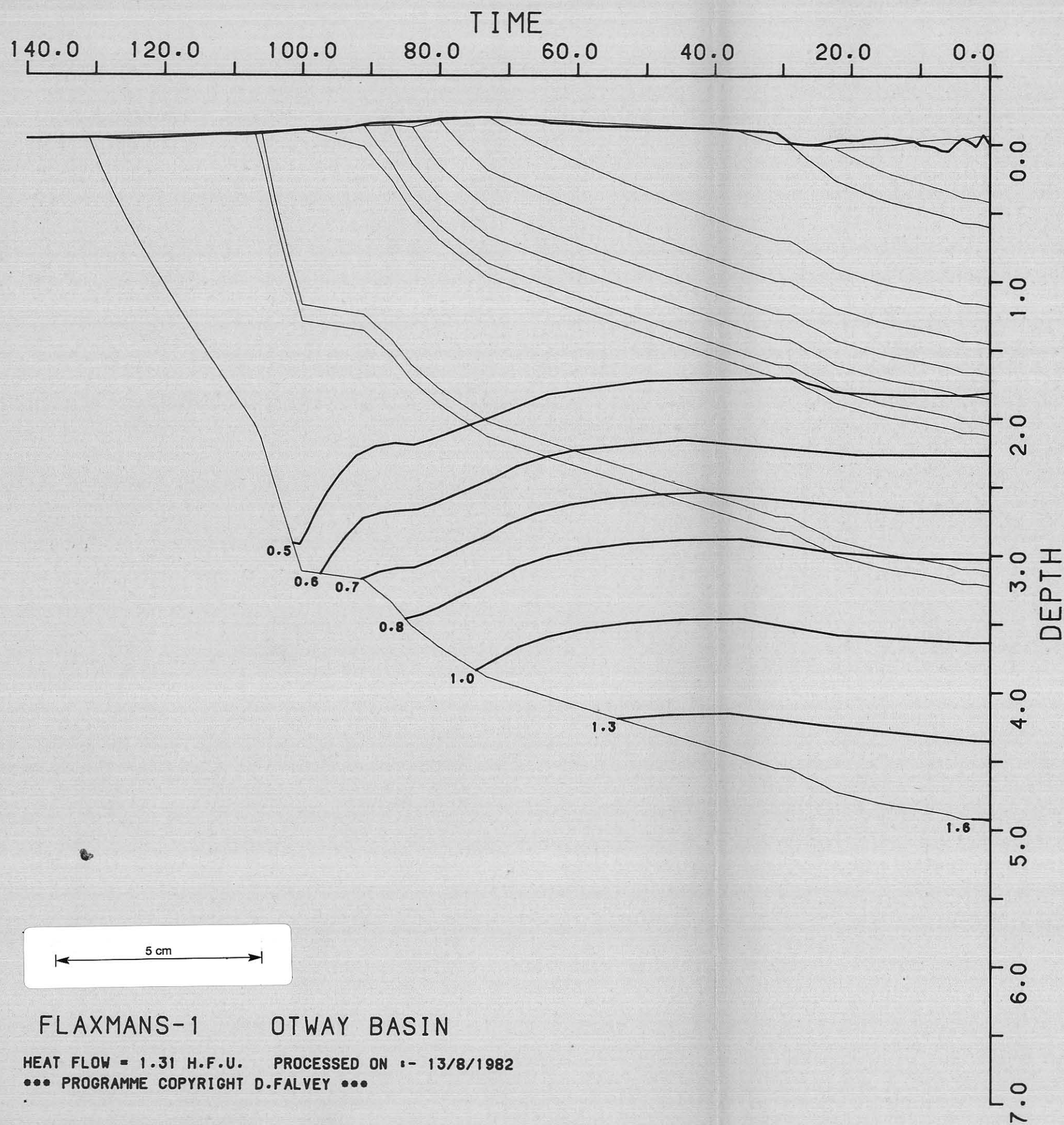
A fairly normal basement subsidence curve is observed, apart from an increased subsidence rate at 60 m.y.

Thermal Maturation.

Whelk - 1 was designed to test an updip pinchout of Waarre Formation on basement. It is not surprising that the predicted and observed reflectances are less than 0.5.

Lithostratigraphy.

After ESSO (Well Completion Report) but no Belfast Mudstone indicated by foraminiferal study.



5 cm

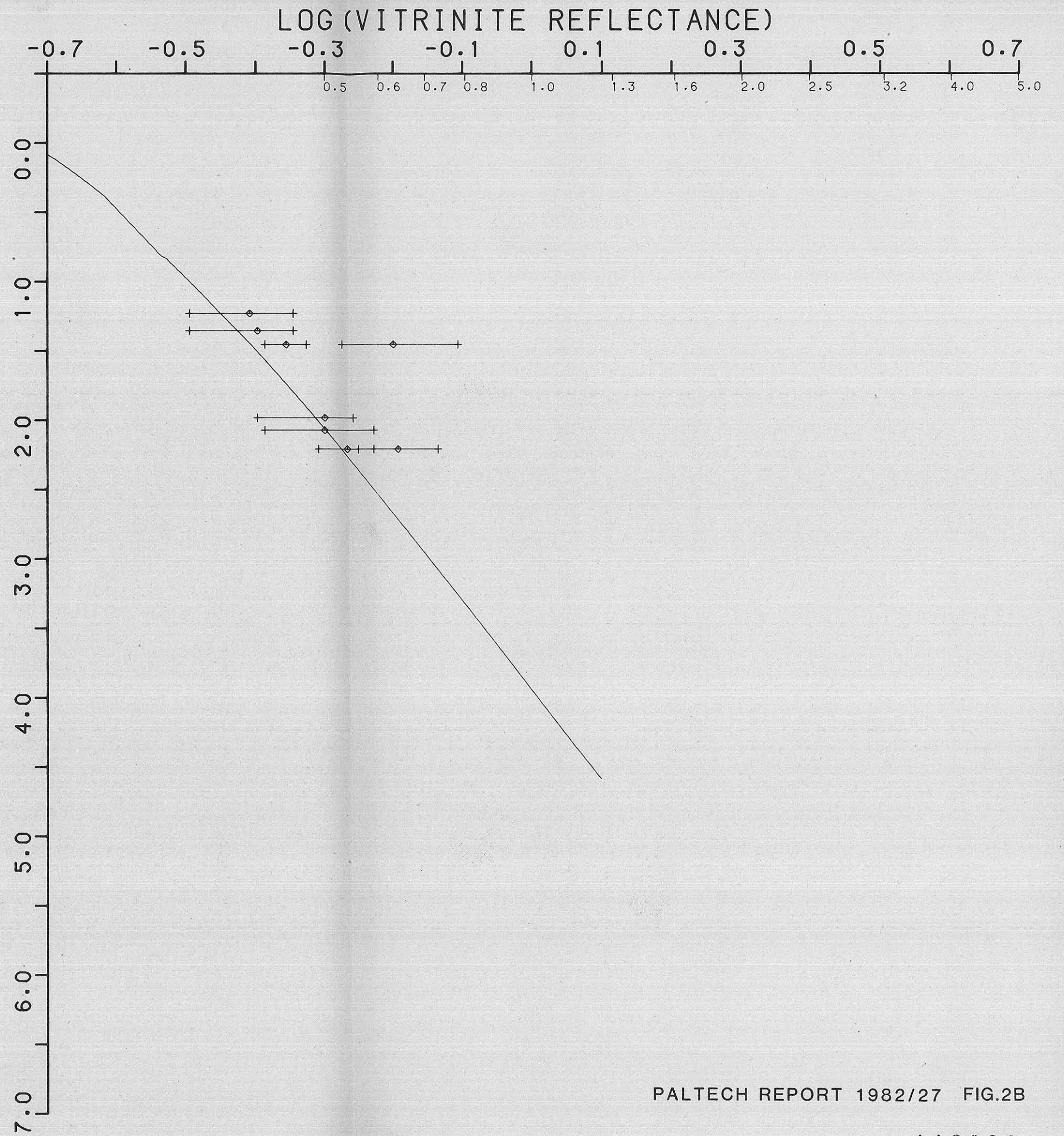
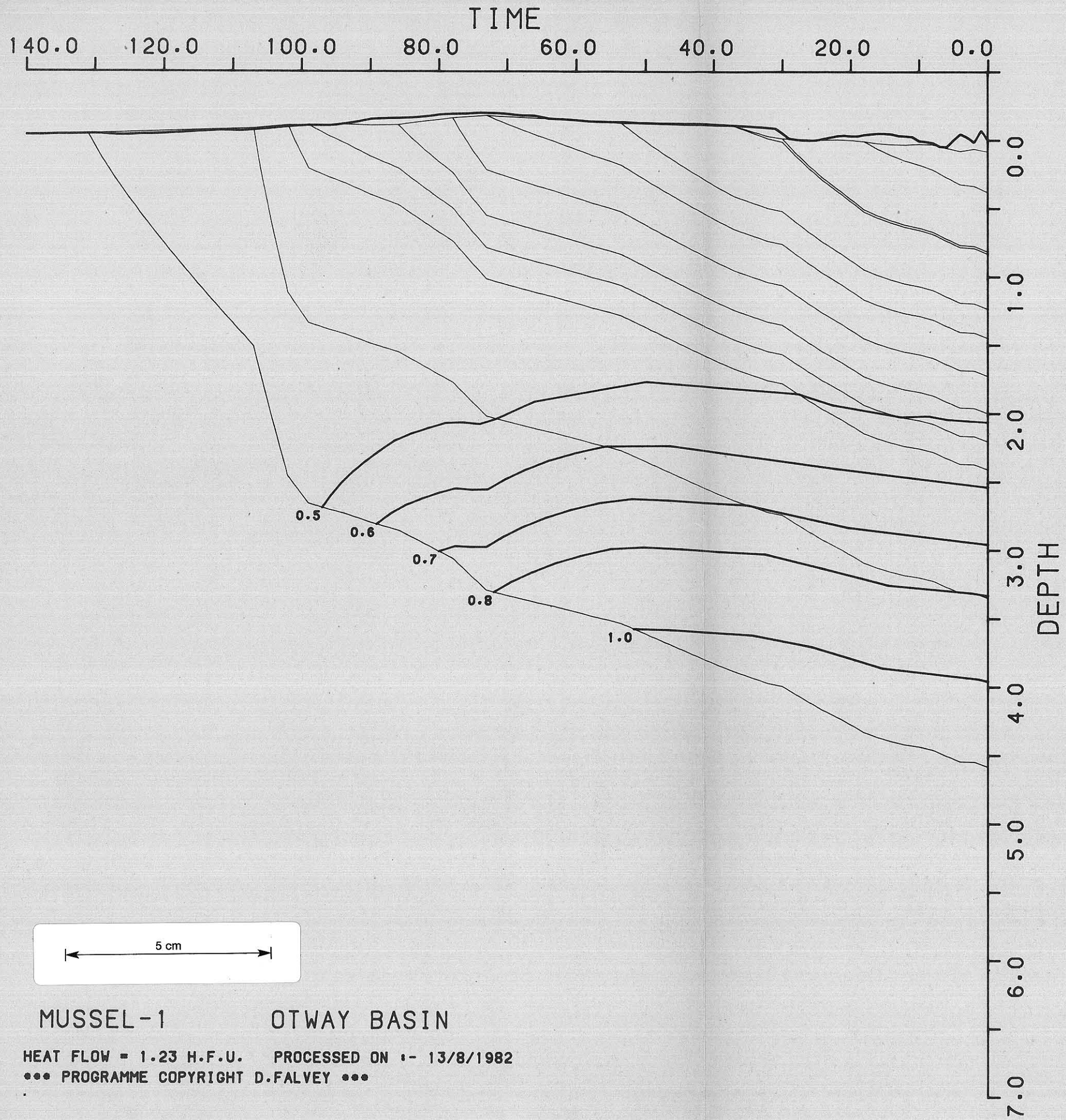
FLAXMANS-1 OTWAY BASIN

HEAT FLOW = 1.31 H.F.U. PROCESSED ON 13/8/1982

\*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

PALTECH REPORT 1982/27 FIG.1B

118028



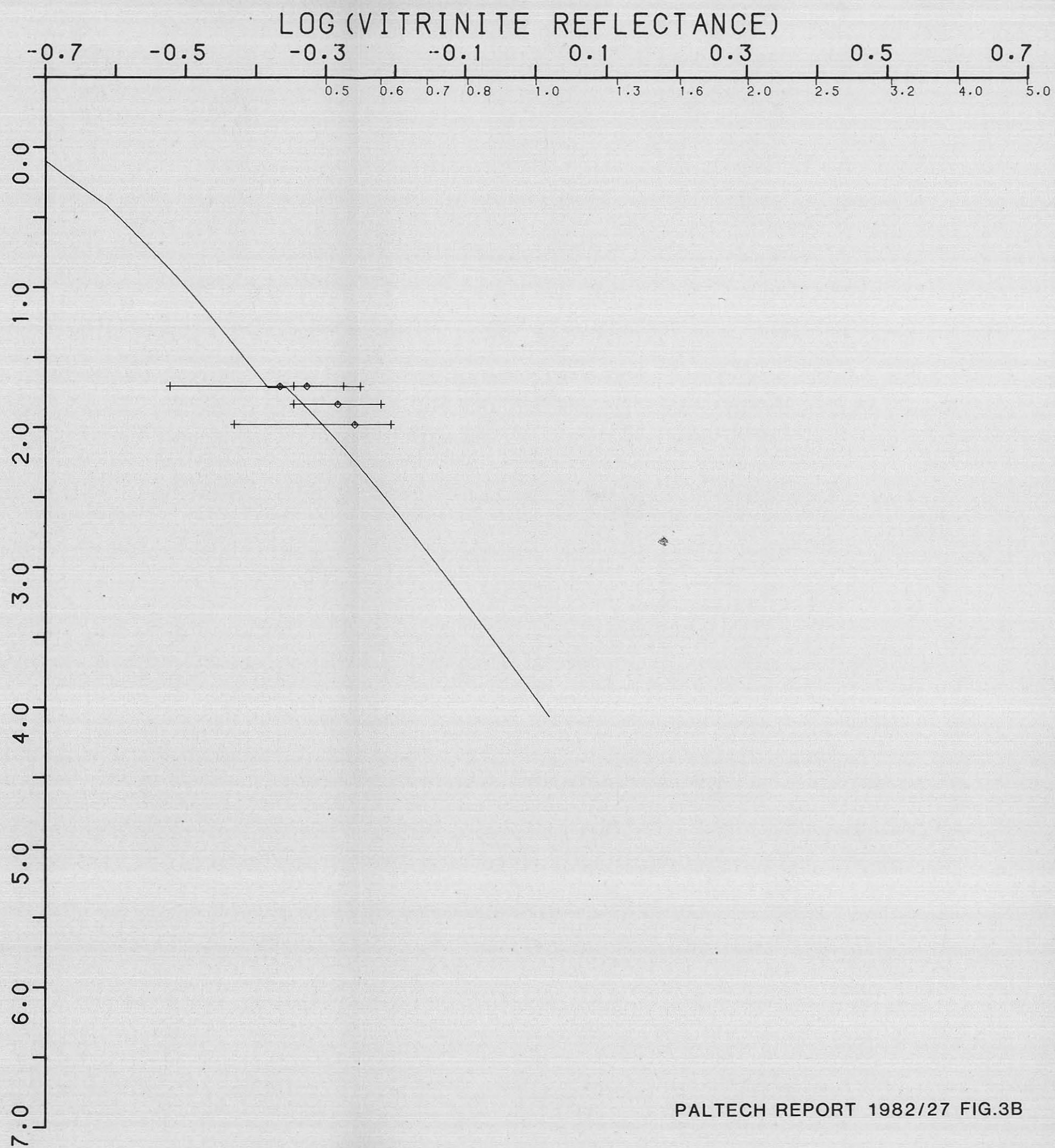
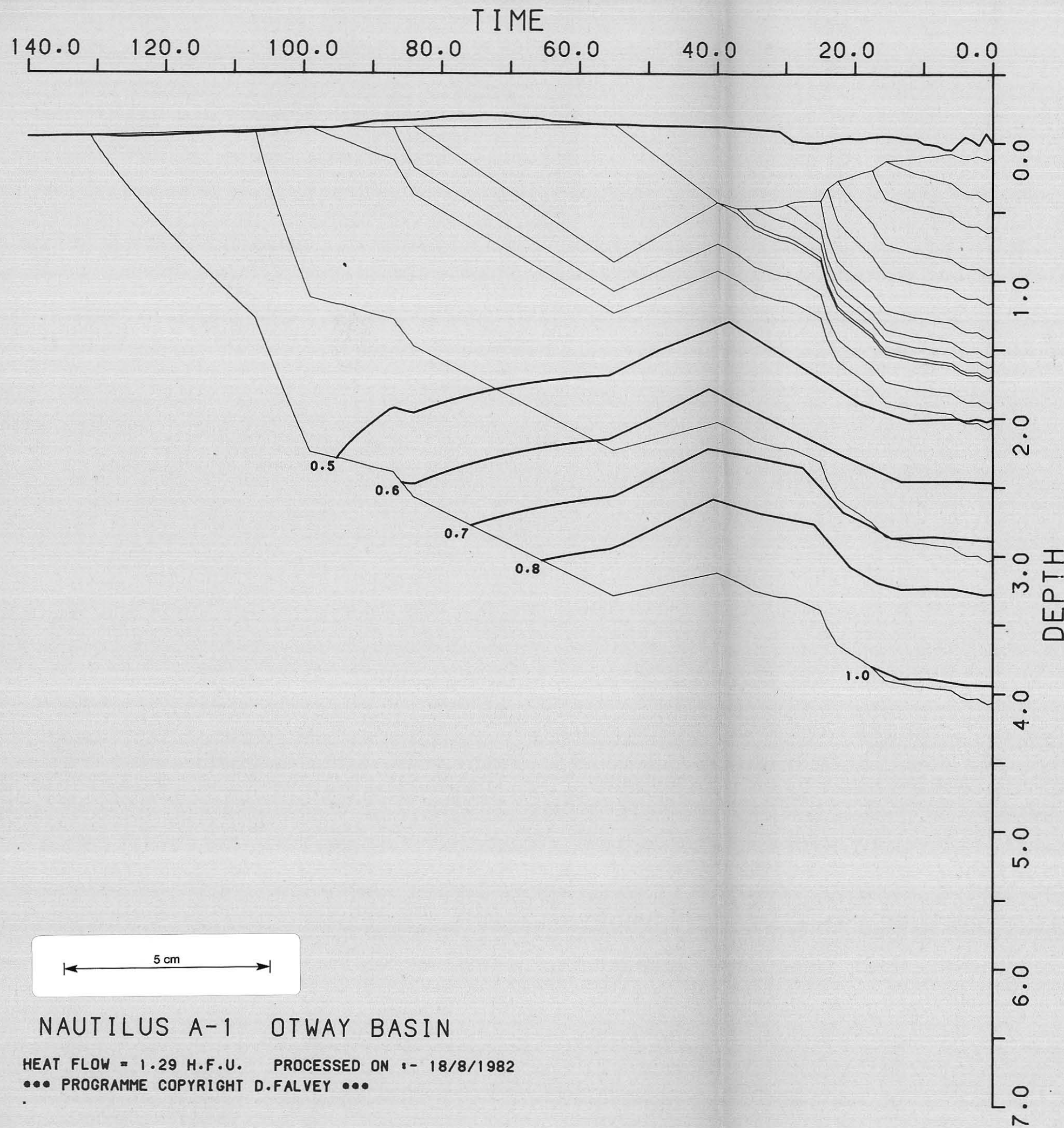
MUSSEL-1 OTWAY BASIN

HEAT FLOW = 1.23 H.F.U. PROCESSED ON 1- 13/8/1982

\*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

PALTECH REPORT 1982/27 FIG.2B

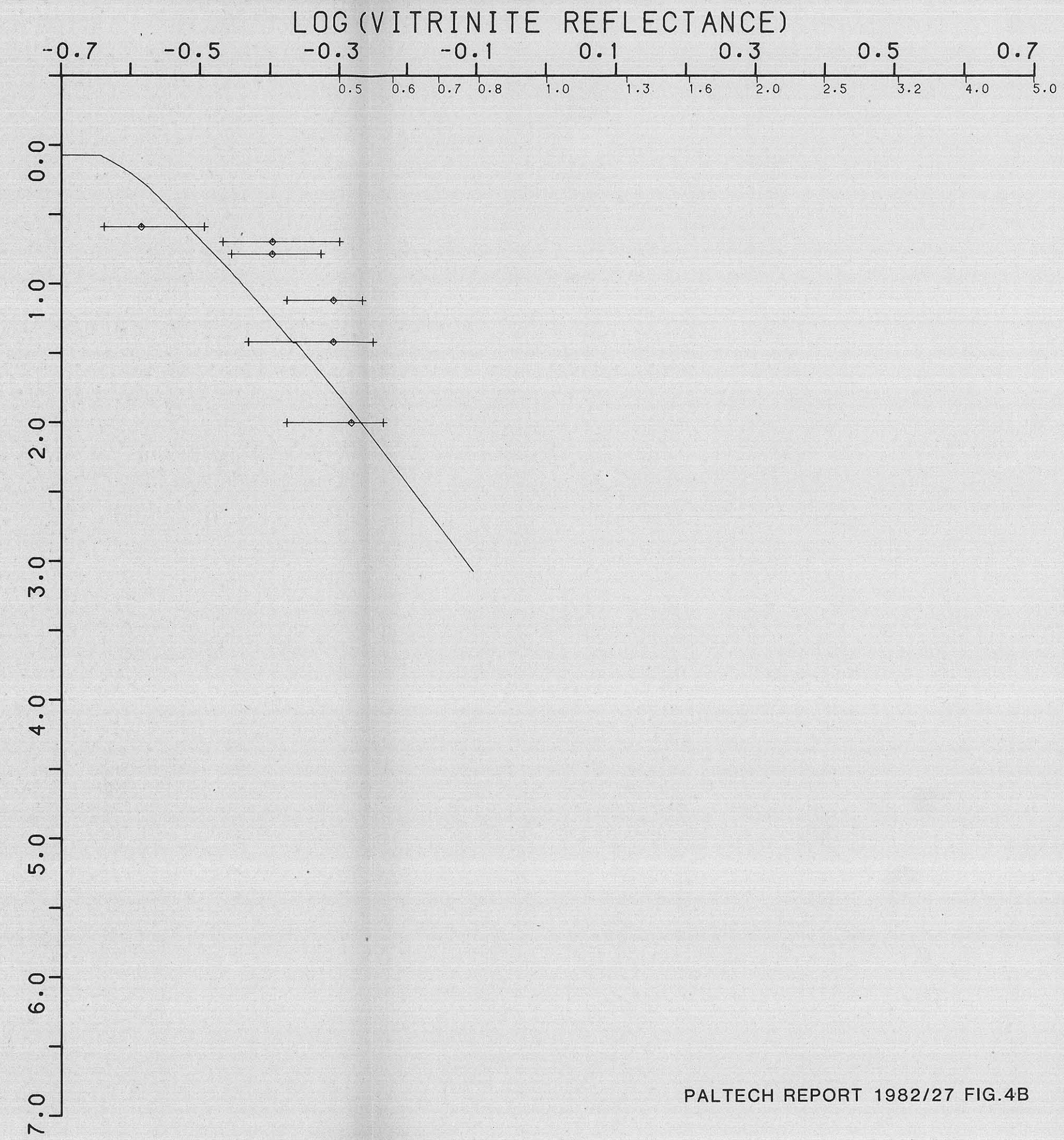
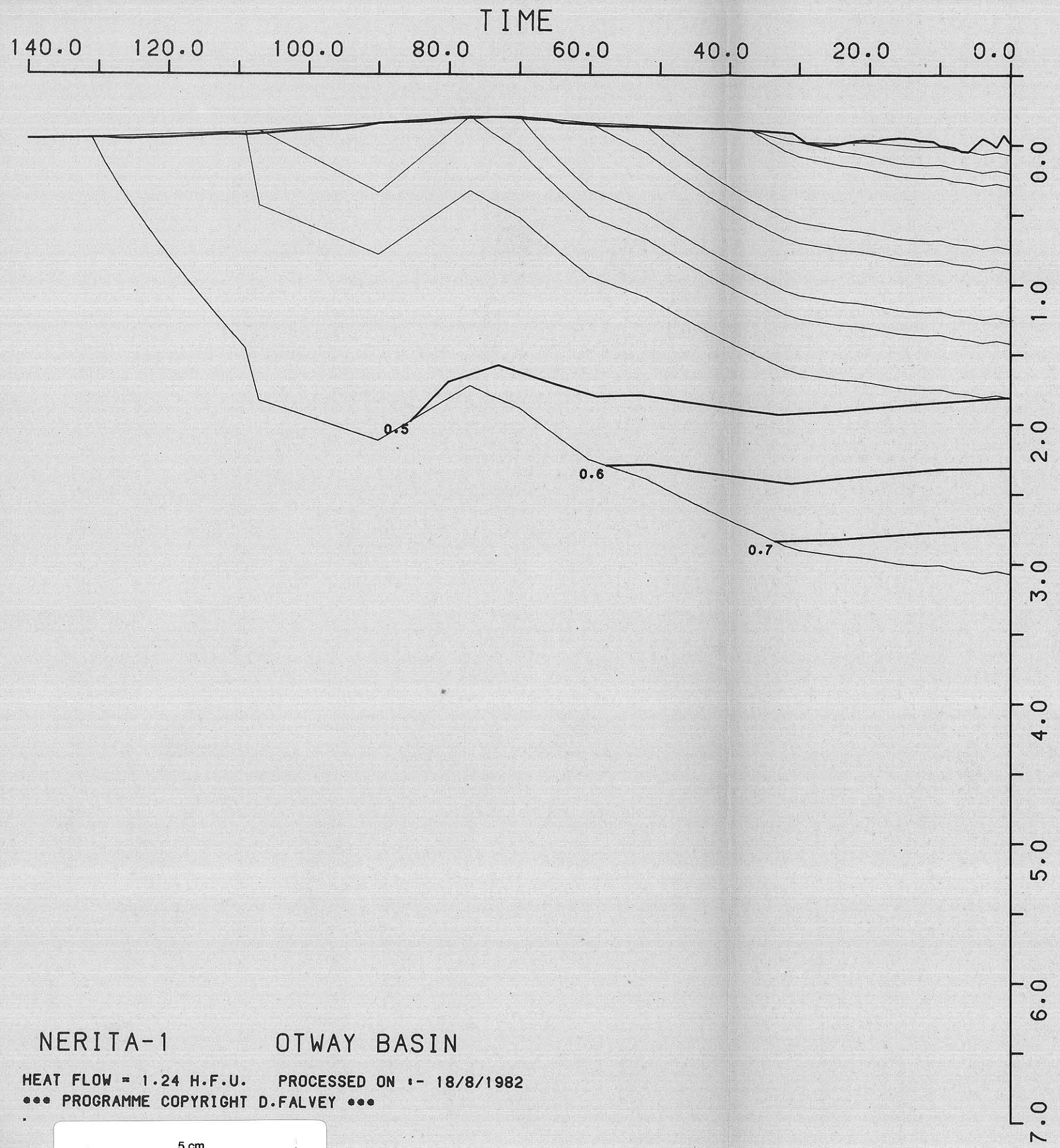
118029



NAUTILUS A-1 OTWAY BASIN

HEAT FLOW = 1.29 H.F.U. PROCESSED ON -- 18/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

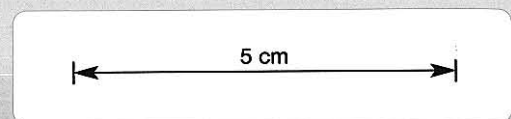
PALTECH REPORT 1982/27 FIG.3B



NERITA-1 OTWAY BASIN

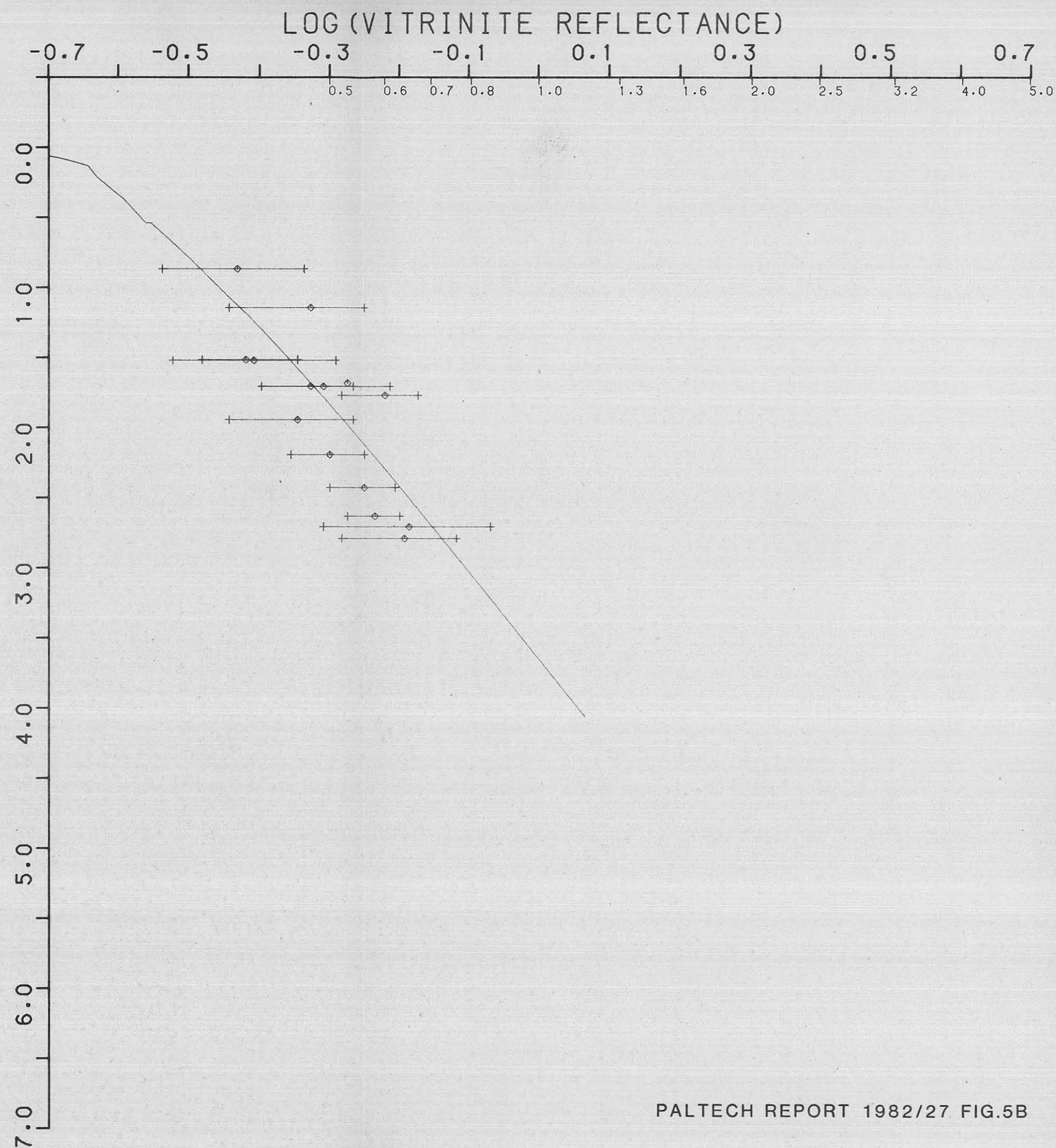
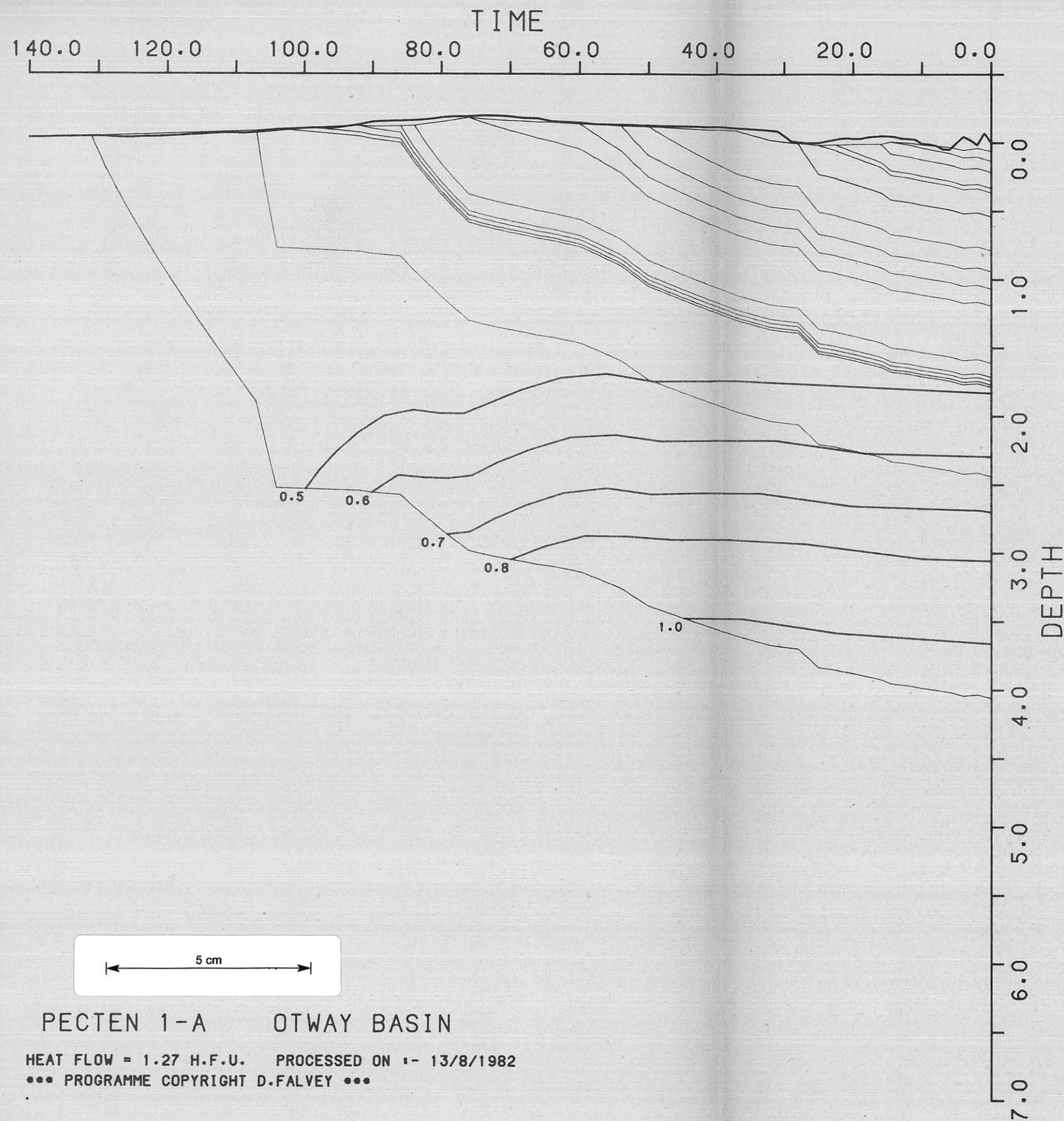
HEAT FLOW = 1.24 H.F.U. PROCESSED ON 18/8/1982

\*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*



PALTECH REPORT 1982/27 FIG.4B

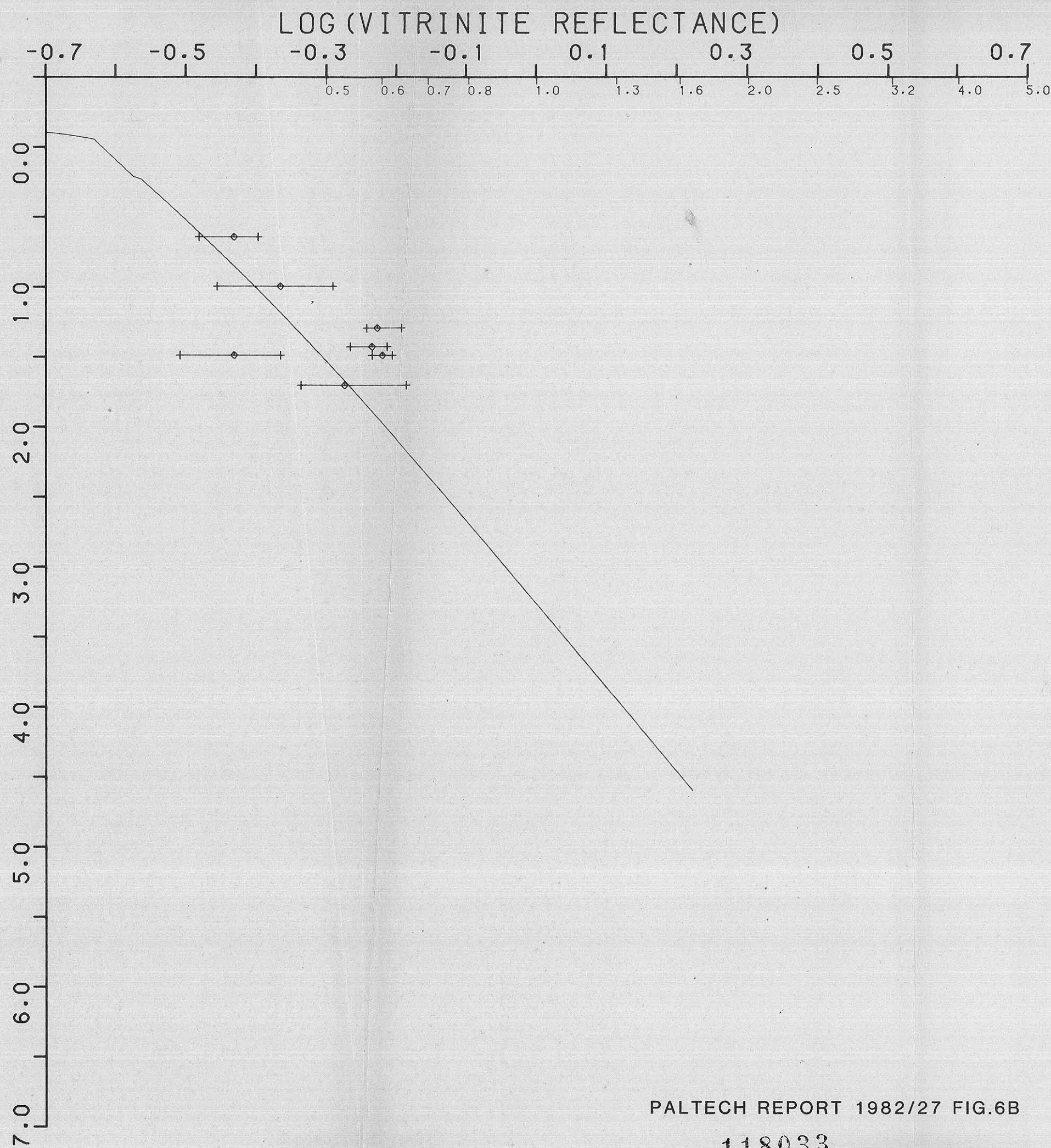
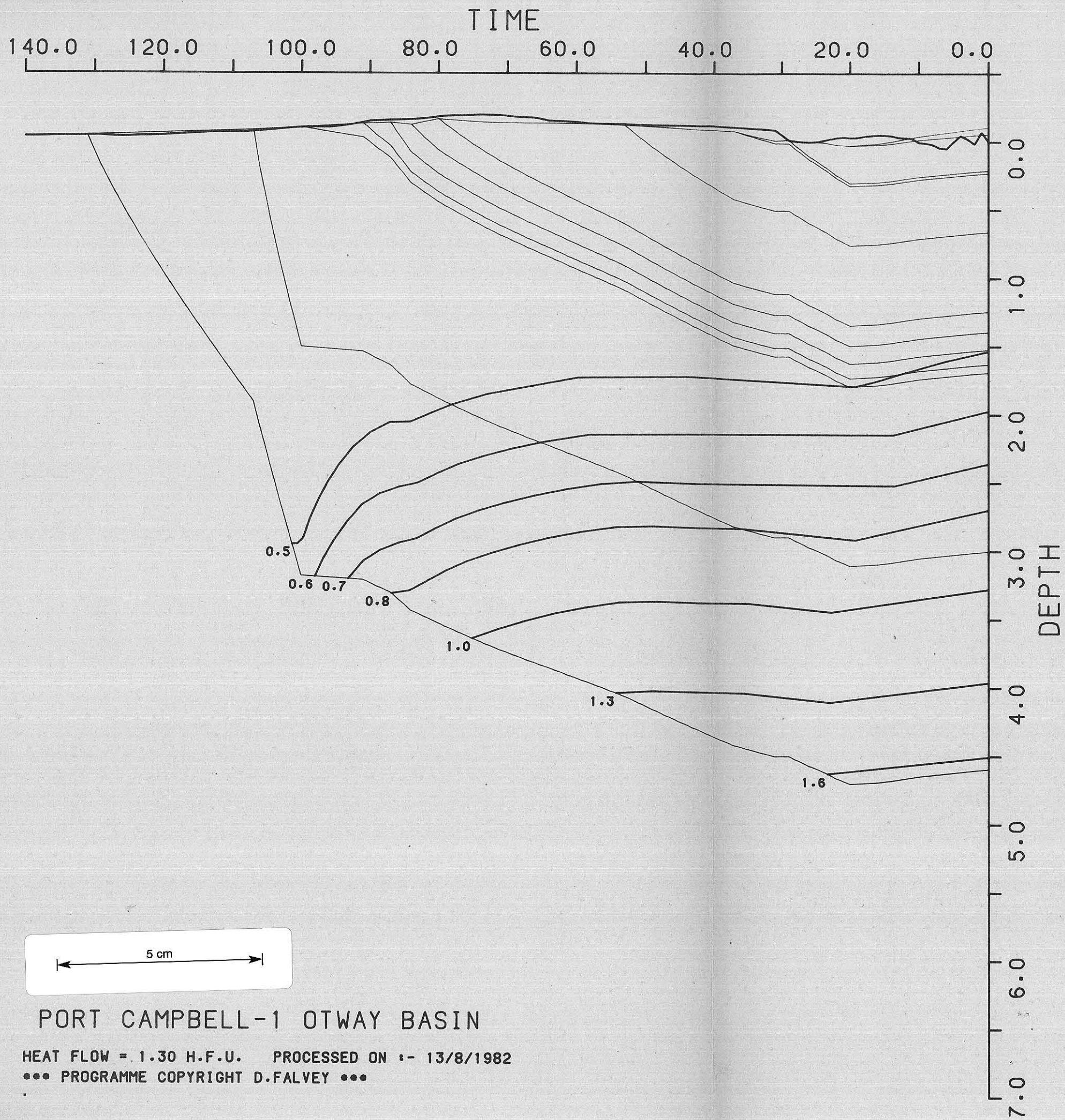
118031



PECTEN 1-A OTWAY BASIN

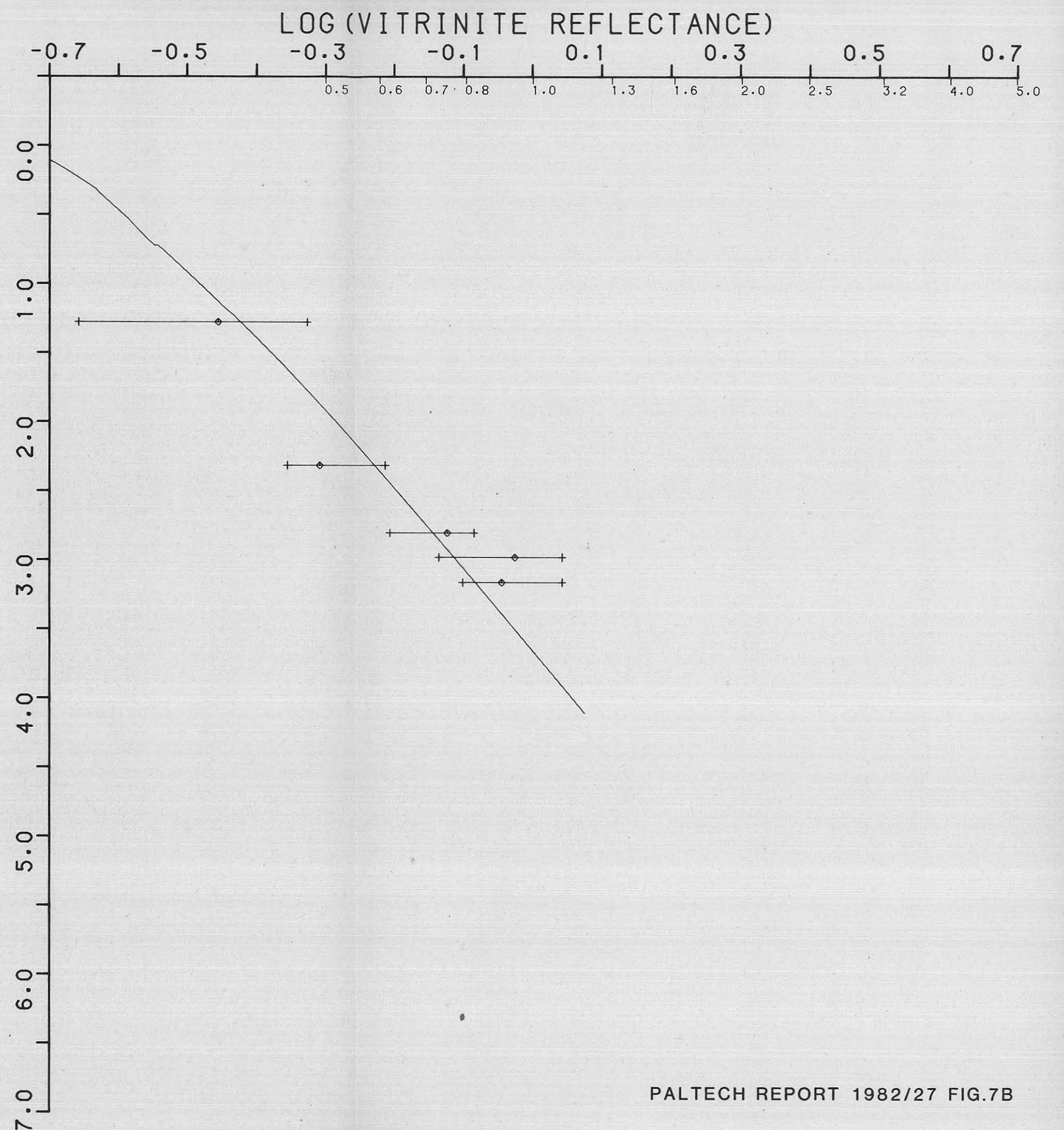
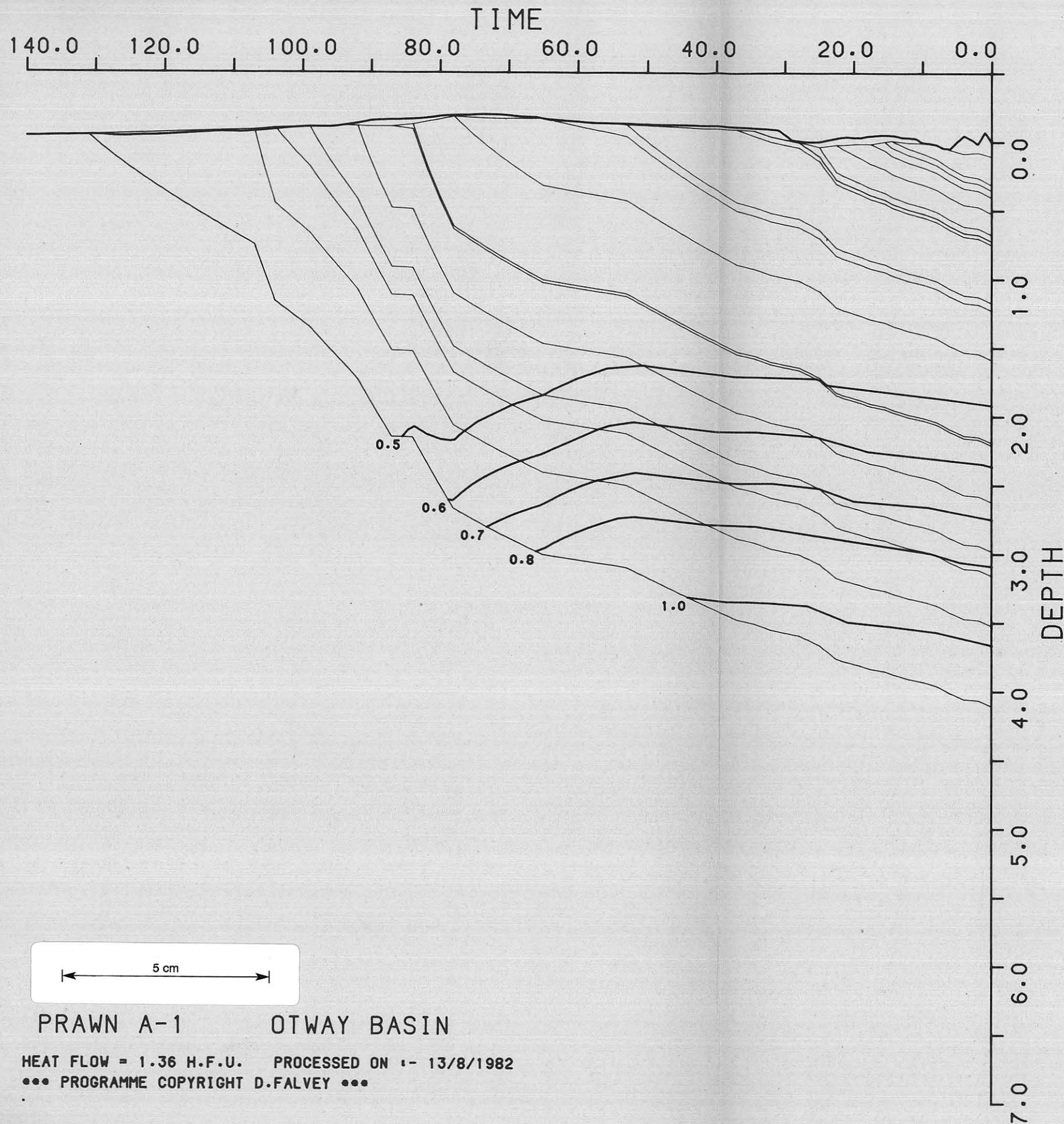
HEAT FLOW = 1.27 H.F.U. PROCESSED ON :- 13/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

PALTECH REPORT 1982/27 FIG.5B



5 cm

PORT CAMPBELL-1 OTWAY BASIN  
 HEAT FLOW = 1.30 H.F.U. PROCESSED ON :- 13/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

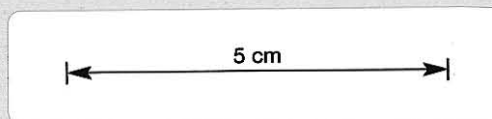
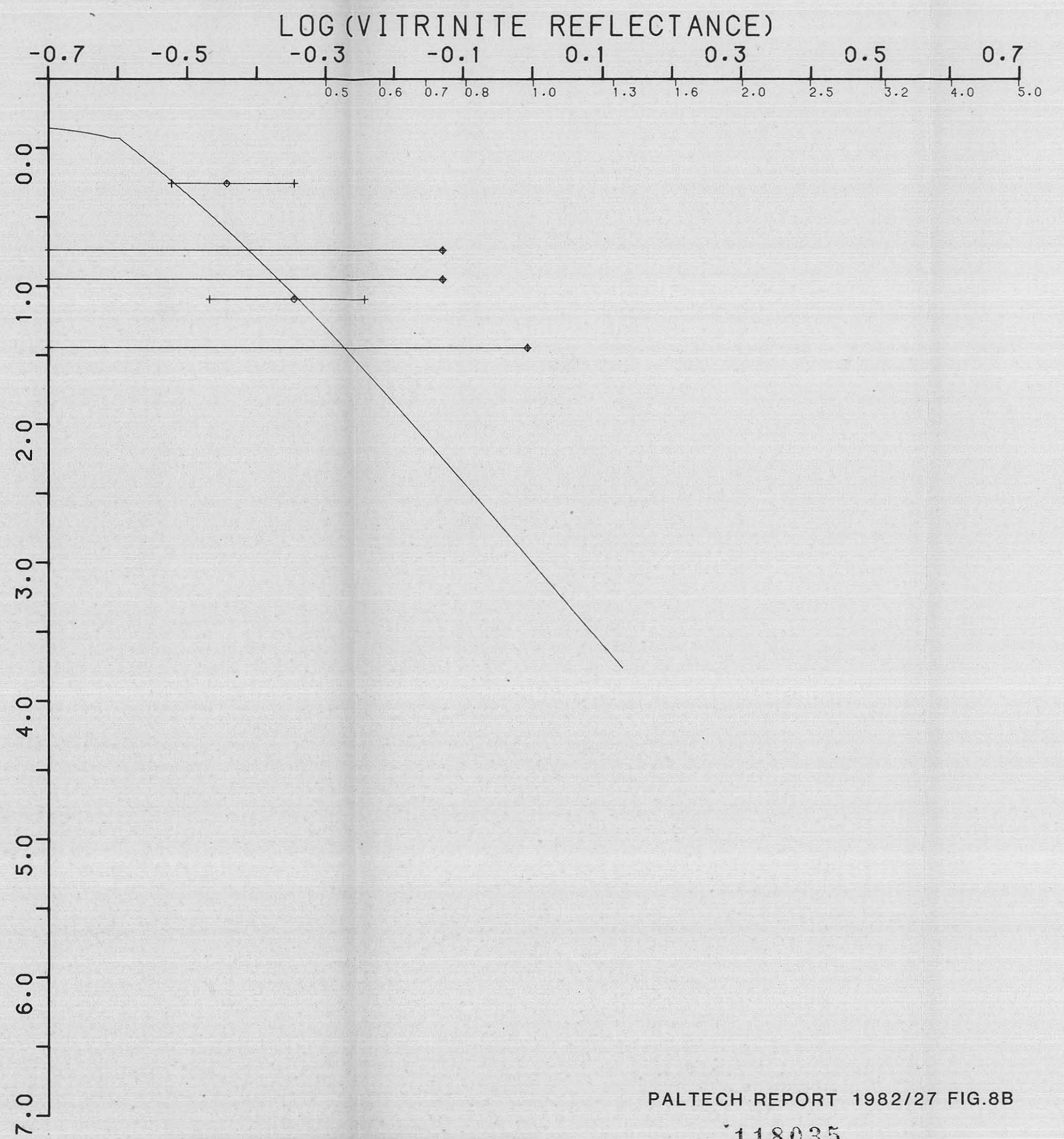
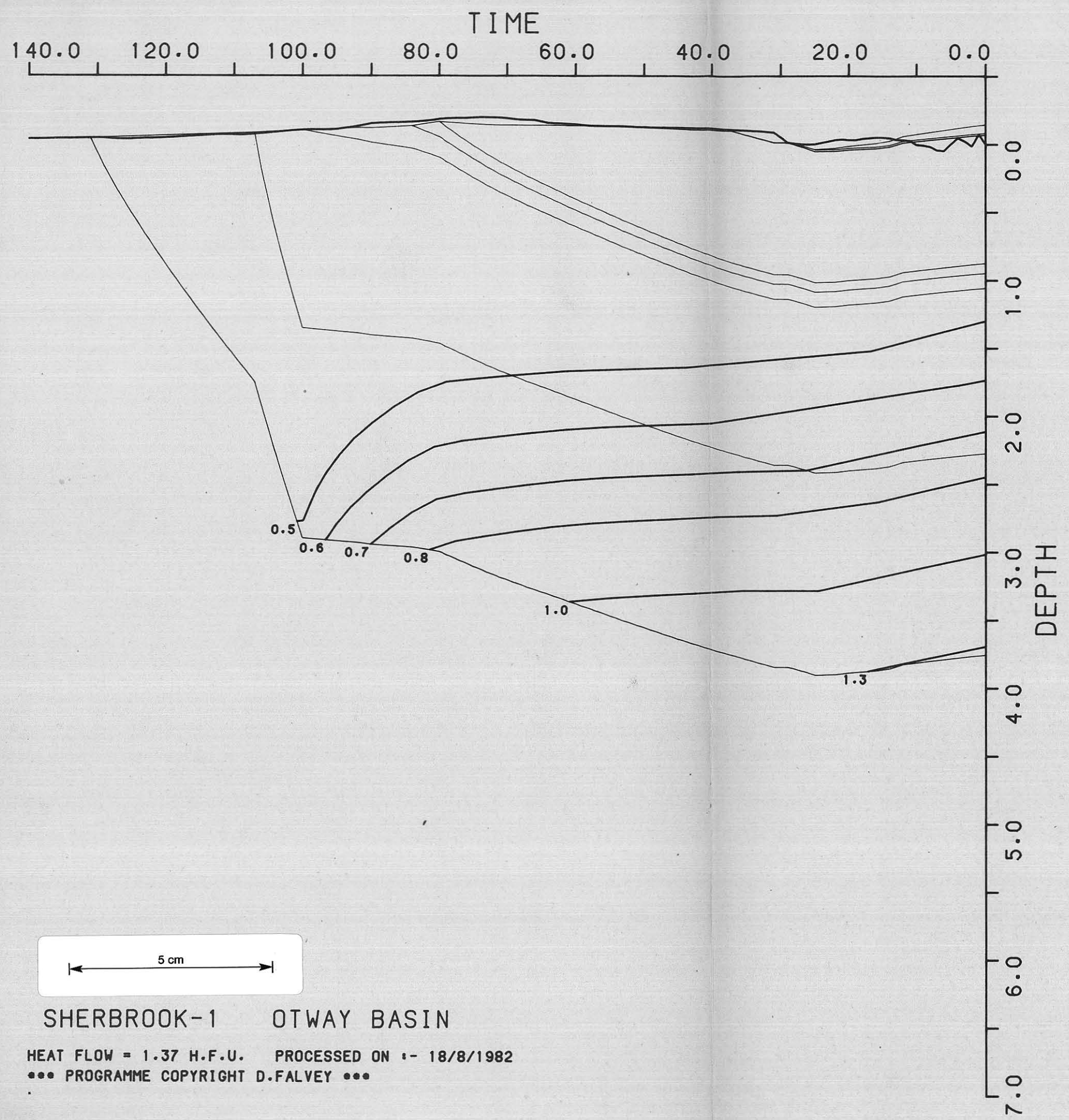


PRAWN A-1 OTWAY BASIN

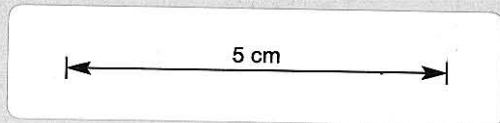
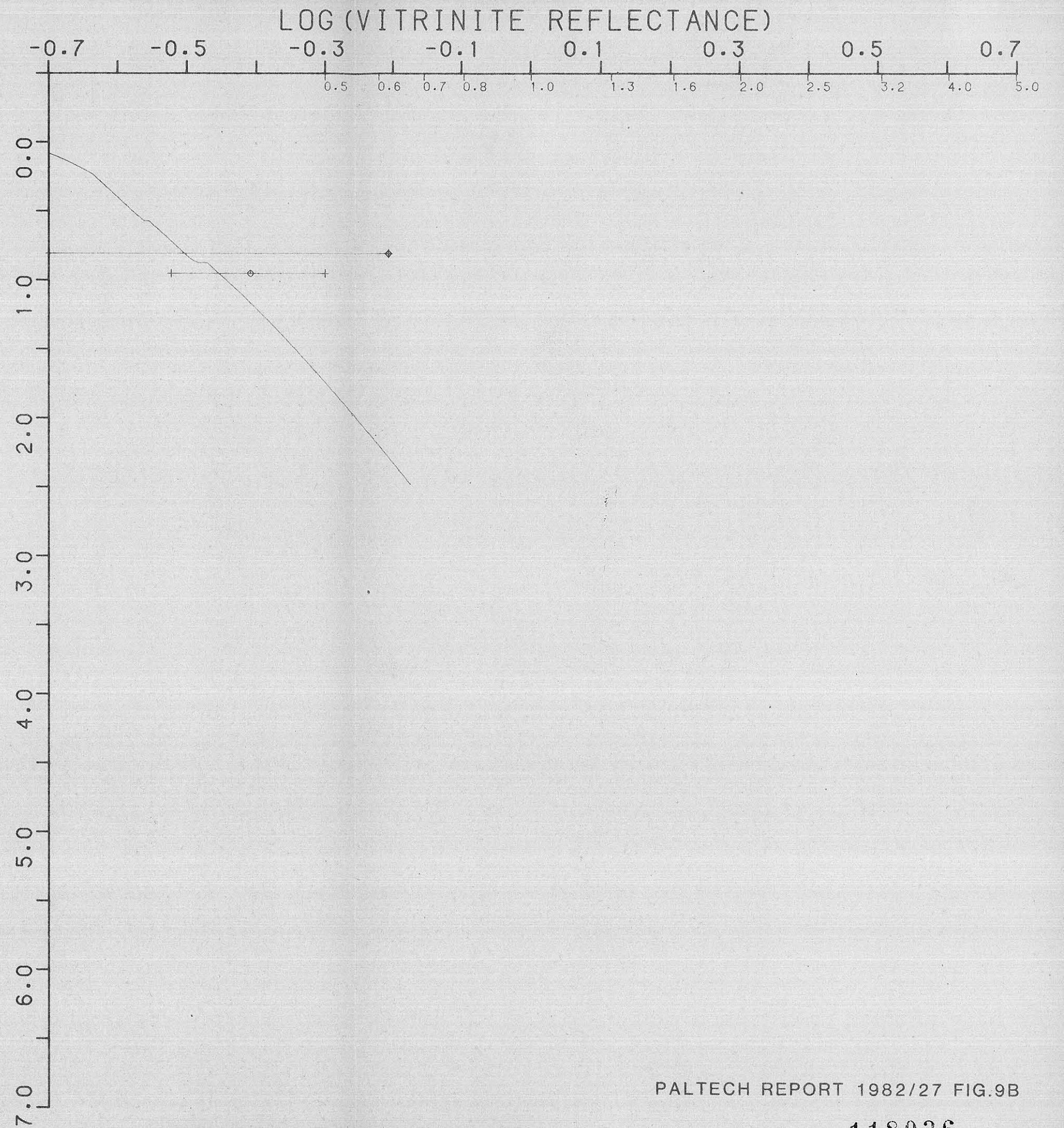
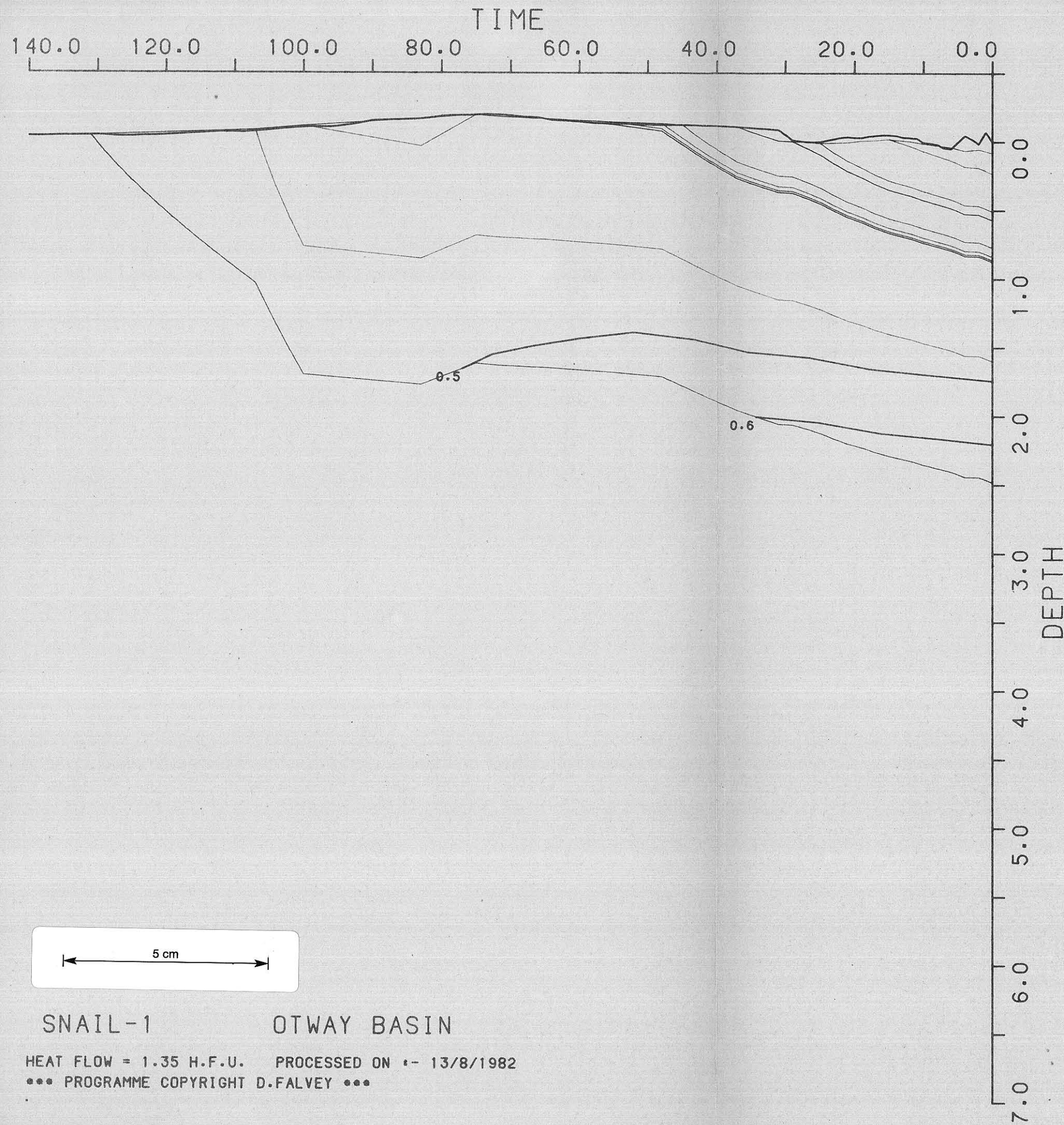
HEAT FLOW = 1.36 H.F.U. PROCESSED ON 13/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

PALTECH REPORT 1982/27 FIG.7B

118034



SHERBROOK-1 OTWAY BASIN  
 HEAT FLOW = 1.37 H.F.U. PROCESSED ON 18/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

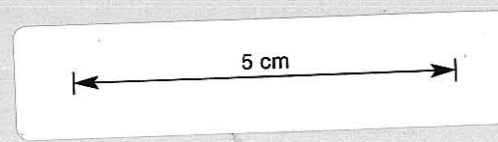
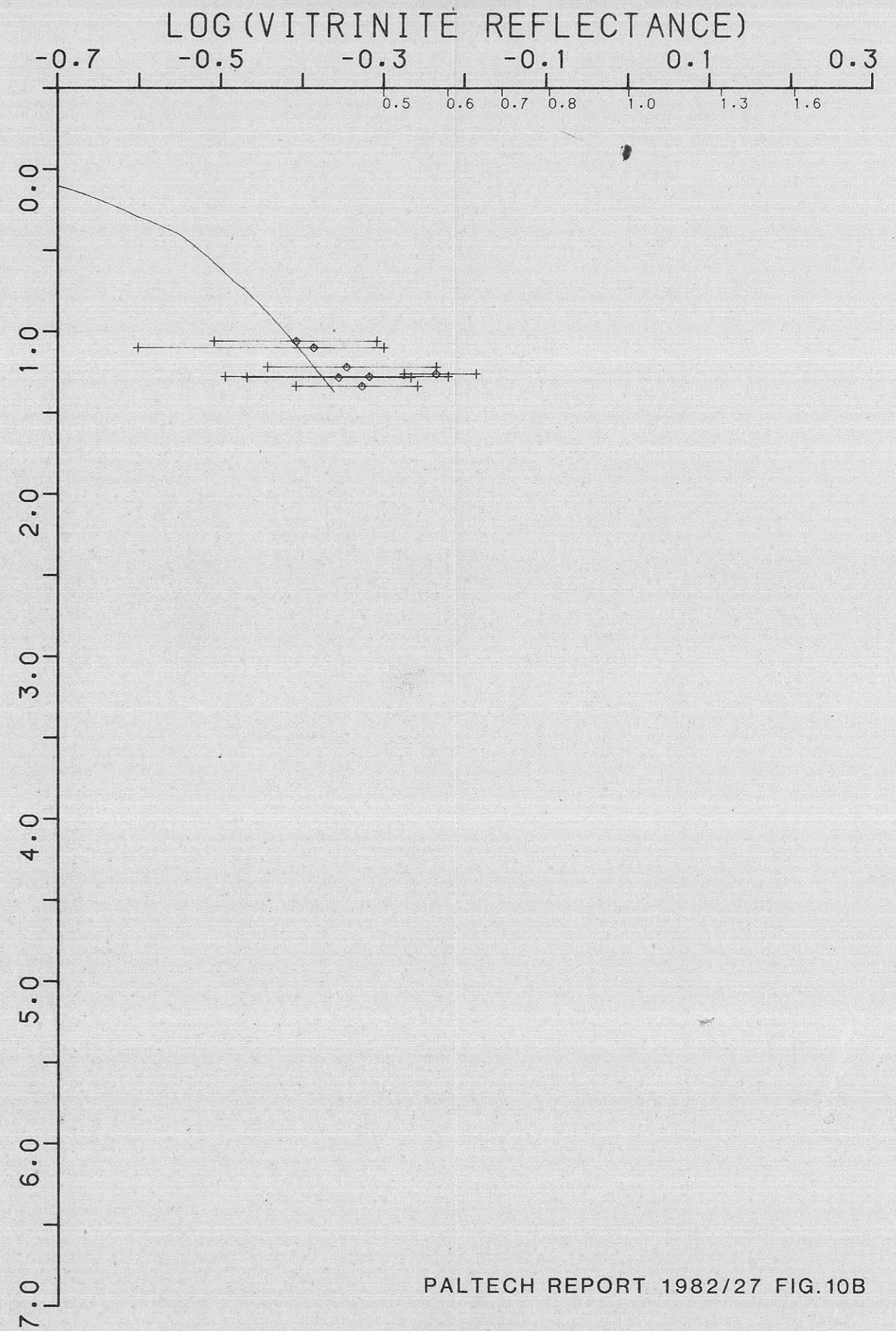
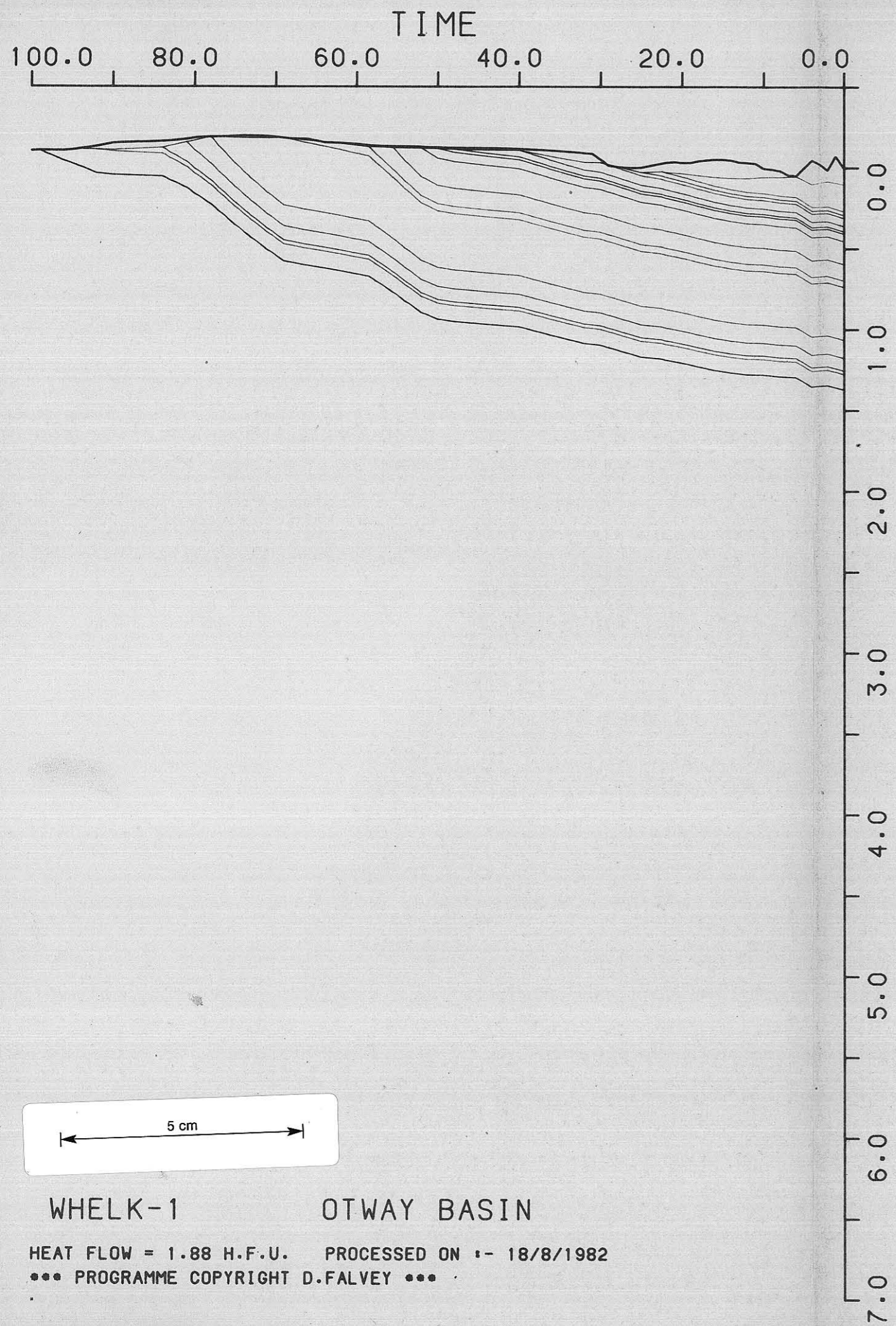


SNAIL-1 OTWAY BASIN

HEAT FLOW = 1.35 H.F.U. PROCESSED ON 13/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

PALTECH REPORT 1982/27 FIG.9B

118036



WHELK-1 OTWAY BASIN

HEAT FLOW = 1.88 H.F.U. PROCESSED ON :- 18/8/1982  
 \*\*\* PROGRAMME COPYRIGHT D.FALVEY \*\*\*

PALTECH REPORT 1982/27 FIG.10B

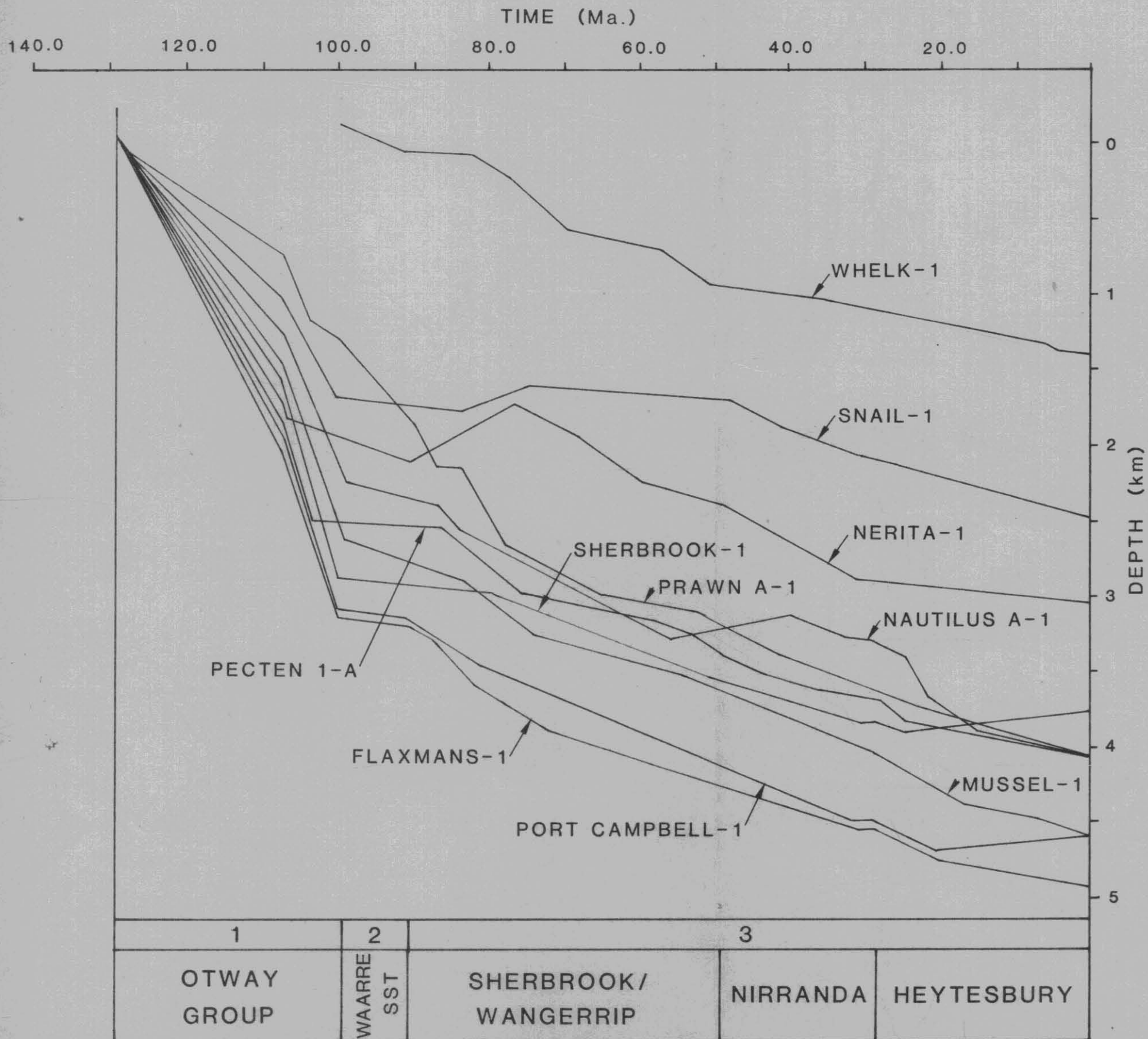
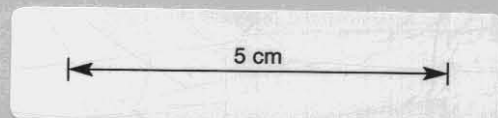


FIGURE 11 BASEMENT SUBSIDENCE CURVES

PALTECH REPORT 1982/27



## SECTION IV - GENERAL CONCLUSIONS.

### BASIN DEVELOPMENT.

FIGURE 11 shows a plot of Basement Subsidence curve for all wells in this study, compared with the rock stratigraphy observed in the Otway Basin. A correspondence between subsidence pattern and stratigraphy is apparent.

#### 1. Otway Group. (131 to 100 m.y.).

Subsidence during Otway Group deposition was very rapid, characteristic of rift valley deposition. Sediments are poorly sorted, dominantly arkosic in character.

#### 2. Waarre Sandstone (100 to 90 m.y.).

Subsidence during Waarre Sandstone deposition was very slow - a complete change in tectonic character from the previous Otway Group style. This slow subsidence is related to incipient spreading of the Southern Ocean and may thus be the expression of break-up. (Now considered to be somewhere between 110 and 85 m.y. by Cande & Mutter (1982)).

#### 3. Post Waarre Sandstone (90 m.y. to Present).

This period is characterised by exponentially decreasing rates of subsidence. A minor increase in subsidence rates at about 55 to 45 m.y. may reflect a contemporaneous increase in spreading rates in the Southern Ocean (Cande & Mutter, 1982). A minor inflection at about 30 m.y. is due to unloading of the shelf during the Oligocene sea level low (see Vail et al, 1977). Uplift at the margins in the late Tertiary (20 m.y. to present) may be seen in the curves for PORT CAMPBELL - 1 and SHERBROOK - 1.

Stratigraphic development during this time may be primarily determined by sea level fluctuations. However the minor tectonic influences mentioned in the preceding paragraph may be responsible for the breaks between the Wangerrip and Nirranda Groups (increase in subsidence at 55 to 45 m.y.), between the Nirranda and Heytesbury Groups (Oligocene sea level drop ~30 m.y.).

The break between the Sherbrook and Wangerrip Groups may be due to a combination of "moderate structural deformation" (Boeuf & Doust, 1975) and a sea level low in the Paleocene (Vail et al, 1977). The lack of change in

sedimentological character at the Sherbrook/Wangerrip contact has been pointed out by many authors (refer Glenie, 1971 for discussion).

Major faulting during this time is generally stated not to continue into the Tertiary. However, McPhee et al (1981), while making this statement, show the major Timboon Fault as extending into Nirranda levels (l.c., Fig.7).

#### Discussion.

The observation that the subsidence curves for all wells are very similar means that enhanced reliability is available for plotting paleo-migration potential between wells. This may be coupled with seismic stratigraphy to determine migration directions throughout the basin.

#### MATURATION OF SOURCE ROCKS.

##### Belfast Mudstone.

In all wells in this study, the prime Otway Basin source rock for liquid hydrocarbons, the Belfast Mudstone, is only transitionally mature. This is primarily because of its shallow depth of burial. Greater maturation levels for the Belfast Mudstone may obtain in the area south of NAUTILUS A-1 and west of WHELK -1 *if the Belfast Mudstone thickens in this direction.* Previous workers in the Otway Basin differ in their opinions on this matter.

Falyey (1974), Boeuf & Doust (1975) and Deighton et al (1976) all inferred that the Belfast Mudstone would thin to the south since, during the rift valley phase axial uplift should take place. This interpretation was strongly dependant on the assumption that sea-floor spreading commenced in the late Paleocene.

The geohistory curves presented herein suggest however that spreading first occurs in the Southern Ocean in the eastern Otway Basin area between 90 and 80 m.y. The revised spreading model of Cande & Mutter (1982) opens the possibility of rapid post-breakup subsidence at the continental margin during Belfast Mudstone deposition.

In this respect, it is notable that Denham & Brown (1976) show marked thickening

of the Belfast Mudstone south of NAUTILUS A-1 in their "Voluta Trough". If this is the case, then primary generation of liquid hydrocarbons could take place in the "Voluta Trough" with subsequent migration towards the margins.

A synthetic geohistory diagram for a theoretical well site in the "Voluta Trough" would ascertain the timing of likely generation. Subsequent migration and entrapment models would need to take account of seismically determined structuring coupled with the paleodepths to migration horizons as quantified by the geohistory diagrams in this study.

#### Otway Group.

In most wells in this study the Otway Group is in the mature phase of hydrocarbon generation. Source rock analysis and observed shows indicate gas generation from the Otway Group has and is currently taking place.

Plays for gas discoveries may be generated throughout the Otway Basin, though it should be remembered that the thickest Otway Group sequences are probably to be found in the onshore and inner offshore areas.

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APPENDIX ISources of Input Data.

The following pages give the data lists for each well used as input for BURY II. The sources are coded according to the following:-

<u>SOURCE</u>	<u>CODE</u>
WELL COMPLETION REPORT (including Appendices)	WCR
SPECIFIC REPORTS/PAPERS	
Evans (1961)	E1
Evans (1962)	E2
Evans (1966)	E3
Cook (1982)	C
Middleton & Falvey (in press)	M & F
Deighton (1974)	D
Taylor (1971)	T
OTHER	
Interpretation of this report	Interp.

FLAXMANS - 1.

Depth to Basement: 5000 metres

K.B.: 67.4 metres

Bottom Hole Temperature: 119.7°C at 3510.9 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
4.6	0.0	-62.8	
488.0	22.5	50.0	WCR
670.0	29.0	10.0	
671.0	37.0	0.0	_____
1249.0	73.0	0.0	E2
1524.0	80.0	10.0	_____
1750.0	84.0	40.0	T
1925.0	87.0	20.0	_____
2103.0	91.0	10.0	
2194.0	100.0	0.0	E2
3185.0	106.0	-10.0	
3292.0	107.0	-10.0	_____
5003.6	131.0	0.0	Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>Ro</u>	
		<u>Min.</u>	<u>Max.</u>
1258.0	0.45	0.39	0.53
1815.0	0.52	0.45	0.61
2095.0	0.51	0.40	0.62
2105.0	0.43	0.26	0.55
2199.0	0.51	0.40	0.59
3513.0	0.92	0.79	1.02

C

MUSSEL - 1

Depth to Basement: 4500 metres

K.B.: 30.2 metres

Bottom Hole Temperature: 83.0°C at 2286.0 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
115.5	0.0	85.3	
412.0	18.0	50.0	
847.0	30.0	40.0	Interp.
863.0	37.0	5.0	_____
1265.5	53.5	10.0	
1479.0	73.0	20.0	
1757.0	78.0	30.0	
2030.0	86.0	50.0	WCR
2236.0	99.0	0.0	
2441.0	102.0	-10.0	_____
3381.0	107.0	-10.0	
4614.5	131.0	0.0	Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>o</sub></u>		
		<u>Min.</u>	<u>Max.</u>	
2238.0	0.54	0.49	0.59	M & F _____
1260.0	0.39	0.32	0.45	
1385.0	0.40	0.32	0.45	
1483.0	0.63	0.53	0.78	
1485.0	0.44	0.41	0.47	C
2013.0	0.50	0.40	0.55	
2102.0	0.50	0.41	0.59	
2238.0	0.64	0.56	0.73	

NAUTILUS A-1.

Depth to Basement: 3965 metres

K.B.: 28.3 metres

Bottom Hole Temperature: 80.0°C at 2010.0 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA.

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
128.0	0.0	99.7	
442.0	15.5	180.0	
671.0	17.5	240.0	
975.0	22.5	300.0	
1189.0	24.0	340.0	D
1433.0	25.0	420.0	
1570.0	30.0	500.0	
1646.0	34.5	575.0	
1722.0	37.0	585.0	
1743.0	40.0	550.0	
1744.0	84.0	50.0	_____
1942.0	87.0	50.0	WCR
2092.0	99.0	0.0	_____
3055.0	107.0	-10.0	
4092.0	131.0	0.0	Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>o</sub></u>		<u>Source</u>
		<u>Min.</u>	<u>Max.</u>	
1735.0	0.43	0.30	0.56	_____
1734.0	0.47	0.45	0.53	
1862.0	0.52	0.45	0.60	
2007.0	0.55	0.37	0.62	C

NERITA - 1.

Depth to Basement: 3000 metres

K.B.: 34.1 metres

Bottom Hole Temperature: 77.0°C at 2042 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
109.0	0.0	74.9	
110.0	16.0	50.0	
241.0	30.0	30.0	
335.0	37.0	0.0	
783.0	52.0	-10.0	WCR
926.0	60.0	-10.0	
1294.0	70.0	-10.0	
1460.0	77.0	-10.0	
1461.0	107.0	-20.0	
1849.0	109.0	-20.0	
3108.0	131.0	0.0	<u>Interp.</u>

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>o</sub></u>	
		<u>Min.</u>	<u>Max.</u>
626.0	0.26	0.23	0.32
733.0	0.40	0.34	0.50
821.0	0.40	0.35	0.47
1155.0	0.49	0.42	0.54
1455.0	0.49	0.37	0.56
2037.0	0.52	0.42	0.58

C

PECTEN 1-A

Depth to Basement: 4000 metres

K.B.: 34.1 metres

Bottom Hole Temperature: 100.0°C at 2850 metres

Sea Bottom Temperature: 15.0°C

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
96.0	0.0	61.9	
168.0	14.5	40.0	
250.0	16.0	60.0	
366.0	22.5	40.0	
399.0	25.0	20.0	
573.0	28.0	10.0	
574.0	37.0	20.0	
823.0	50.0	10.0	
975.0	54.0	10.0	WCR
1102.0	60.0	10.0	
1226.0	76.0	10.0	
1645.0	84.0	40.0	
1748.0	86.0	40.0	
1776.0	92.0	10.0	
1804.0	99.0	0.0	
1822.0	104.0	-10.0	
2475.0	107.0	-10.0	
4095.0	131.0	0.0	<hr/> Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>o</sub></u>		
		<u>Min.</u>	<u>Max.</u>	
901.0	0.37	0.29	0.46	
1178.0	0.47	0.36	0.56	
1550.0	0.38	0.33	0.45	C
1554.0	0.39	0.30	0.51	
1717.0	0.53			
1741.0	0.49	0.40	0.61	
1805.0	0.60	0.52	0.67	
2742.0	0.65	0.49	0.85	
1740.0	0.47	0.40	0.54	<hr/>
1978.0	0.45	0.36	0.54	M & F

PECTEN 1-A (continued)

<u>Depth</u>	<u>Mean</u>	<u>R<sub>0</sub></u> <u>Min.</u>	<u>Max.</u>	<u>Source</u>
2228.0	0.50	0.44	0.56	
2463.0	0.56	0.50	0.62	M & F
2667.0	0.58	0.53	0.63	
2826.0	0.64	0.52	0.76	

PORT CAMPBELL - 1.

Depth to Basement: 4700 metres

K.B.: 105.5 metres

Bottom Hole Temperature: 71.0°C at 1716.0 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
2.8	0.0	-102.7	
51.8	20.0	60.0	
317.0	29.0	0.0	Interp.
337.0	37.0	30.0	
768.0	53.0	10.0	
1350.0	80.0	20.0	
1500.0	84.0	40.0	E1
1630.0	87.0	20.0	T
1737.0	91.0	10.0	
1798.0	100.0	0.0	E1
3107.5	107.0	-10.0	
4701.8	131.0	0.0	Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>0</sub></u>	
		<u>Min.</u>	<u>Max.</u>
748.0	0.37	0.33	0.40
1100.0	0.43	0.35	0.51
1398.0	0.59	0.57	0.64
1532.0	0.58	0.54	0.61
1593.0	0.37	0.31	0.43
1594.0	0.60	0.58	0.62
1808.0	0.53	0.46	0.65

C

SHERBROOK - 1.

Depth to Basement: 3900 metres

K.B.: 146.0 metres

Bottom Hole Temperature: 72.0°C at 1650 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
4.0	0.0	-142.0	
64.0	25.0	40.0	
76.0	29.0	0.0	T
77.0	37.0	10.0	_____
1021.0	80.0	20.0	
1094.0	84.0	30.0	
1204.0	100.0	0.0	E3
2421.0	107.0	-10.0	_____
3903.0	131.0	0.0	Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>o</sub></u>		
		<u>Min.</u>	<u>Max.</u>	
402.0	0.36	0.30	0.45	
885.0	0.74	0.20	0.74	
1096.0	0.74	0.20	0.74	C
1239.0	0.45	0.34	0.57	
1590.0	0.98	0.20	0.98	

SNAIL - 1

Depth to Basement: 2400 metres

K.B.: 9.8 metres

Bottom Hole Temperature: 58.8°C at 1232 metres

Sea Bottom Temperature: 15.0°C.

STRATIGRAPHIC DATA

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
91.0	0.0	81.2	
243.0	15.0	30.0	
518.0	25.0	10.0	
581.0	29.0	10.0	
582.0	37.0	0.0	WCR
782.0	45.0	0.0	
848.0	48.0	-10.0	
873.0	55.0	-10.0	
885.0	65.0	0.0	
886.0	100.0	-10.0	—
1609.0	107.0	-10.0	
2490.0	131.0	0.0	Interp.

THERMAL MATURATION DATA

<u>Depth</u>	<u>Mean</u>	<u>R<sub>o</sub></u>		
		<u>Min.</u>	<u>Max.</u>	
818.0	0.62	0.20	0.62	C
963.0	0.39	0.30	0.50	

WHELK - 1.

Depth to Basement: 1270 metres

K.B.: 30.5 metres

Bottom Hole Temperature: 62.0°C at 1466 metres

Sea Bottom Temperature: 15.0° C.

STRATIGRAPHIC DATA.

<u>Depth (K.B.)</u>	<u>Age</u>	<u>Paleowater Depth</u>	<u>Source</u>
134.0	0.0	103.5	
302.0	22.5	50.0	
325.0	25.0	30.0	
343.0	30.0	20.0	
393.0	40.0	10.0	
425.0	48.0	10.0	
440.0	50.0	10.0	WCR
486.0	52.0	10.0	
628.0	55.5	10.0	
729.0	58.5	10.0	
769.0	69.0	0.0	
1096.0	78.0	0.0	
1208.0	81.0	20.0	
1286.0	84.0	40.0	
1308.0	92.0	20.0	
1403.0	99.0	0.0	<hr/> Interp.

THERMAL MATURATION DATA.

<u>Depth</u>	<u>Mean</u>	<u>R<sub>0</sub></u>		<u>Max.</u>	
		<u>Min.</u>			
1091.0	0.39	0.31		0.49	
1131.0	0.41	0.25		0.50	
1250.0	0.45	0.36		0.58	C
1292.0	0.58	0.53		0.65	
1309.0	0.48	0.32		0.60	
1314.0	0.44	0.34		0.54	
1368.0	0.47	0.39		0.55	

118055

# LINE OMQ82A-03 S.P. 1 TO 540

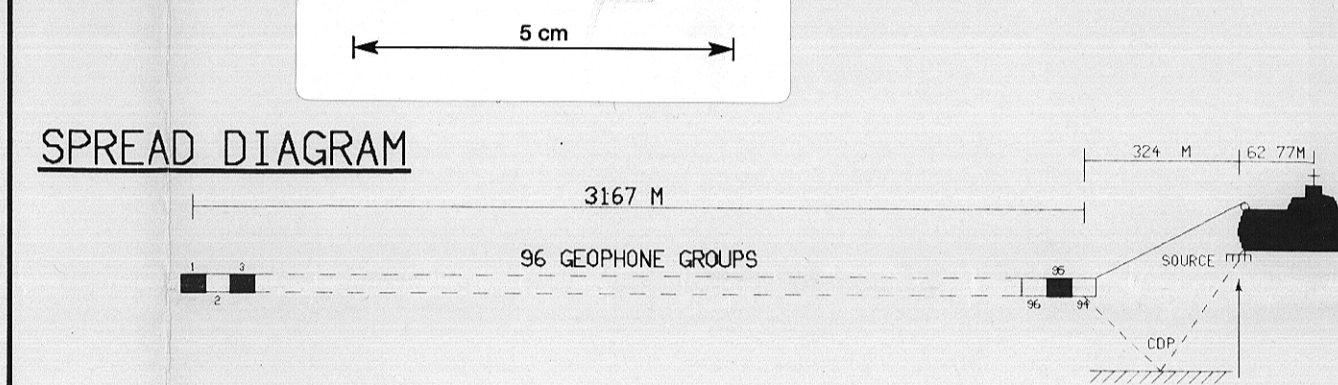
## BASS STRAIT OIL, GAS (HOLDINGS) N.L. PROSPECT (VIC P16) SYDNEY PROCESSING CENTRE

125 DEGREES      DIRECTION SHOT

### STACK DAS/TVF/TVS

#### FIELD DATA

DATA SHOT BY - GSI PARTY 2993 M.V. LADY VILMA  
 DATE SHOT - APRIL 1982  
 RECORDING INSTRUMENTS - DFS V  
 RECORDING FILTERS - HIGH FILTER AND SLOPE 128 HZ 72 DB/OCT  
 LOW FILTER AND SLOPE 8 HZ 18 DB/OCT  
 RECORDING POLARITY - A POSITIVE PRESSURE AT THE GEOPHONE PRODUCES A NEGATIVE NUMBER ON TAPE AND A DOWNWARD DEFLECTION ON THE FIELD MONITOR RECORD.  
 DIGITAL TAPE FORMAT - SEG 8 1600 BPI PHASE ENCODED  
 RECORD LENGTH / SAMPLE RATE - 5.0 SECONDS AT 2 MILLISECOND SAMPLE RATE  
 ENERGY SOURCE - 4075 CU. IN. AIRGUN ARRAY OPERATING AT 2000 PSI  
 GUN DELAY - 51.2 MILLISECONDS  
 SOURCE DEPTH - 6 METRES AVERAGE  
 SOURCE TO ANTENNA DISTANCE - 62.77 METRES  
 SHOTPOINT INTERVAL - 33.3 METRES 1 POP PER SHOTPOINT  
 SHOTPOINT ANNOTATION - SHOTPOINTS ANNOTATED AT SOURCE POSITION  
 CABLE LENGTH - 3500 METRES 96 GROUPS  
 CABLE DEPTH - 13 METRES AVERAGE  
 GEOPHONES - 20 PER GROUP  
 COVERAGE - 48 FOLD, 96 TRACE  
 PRIMARY NAVIGATION SYSTEM - MAXIRAN  
 BACKUP NAVIGATION SYSTEM - GEONAV



#### DIGITAL PROCESSING

POLARITY CONVENTION - THE POLARITY OF THE FIELD RECORDING WAS MAINTAINED THROUGHOUT THE PROCESSING AND DISPLAY  
 PROCESSING RECORD LENGTH - 5.0 SECONDS  
 RESAMPLE - MINIMUM PHASE RESAMPLE FROM 2 TO 4 MSEC  
 PROCESSING SAMPLE RATE - 4 MILLISECONDS  
 STATIC CORRECTIONS - SHOT AND STREAMER STATIC 13 MILLISECONDS  
 AIRGUN DELAY - 51.2 MILLISECONDS  
 TRUE AMPLITUDE RECOVERY - 7.0 DB PER SECOND FROM 0 TO 5.0 SECONDS  
 SPHERICAL DIVERGENCE CORRECTIONS APPLIED  
 PRE DECONVOLUTION MUTE - RAMP LENGTH - 96 MSEC

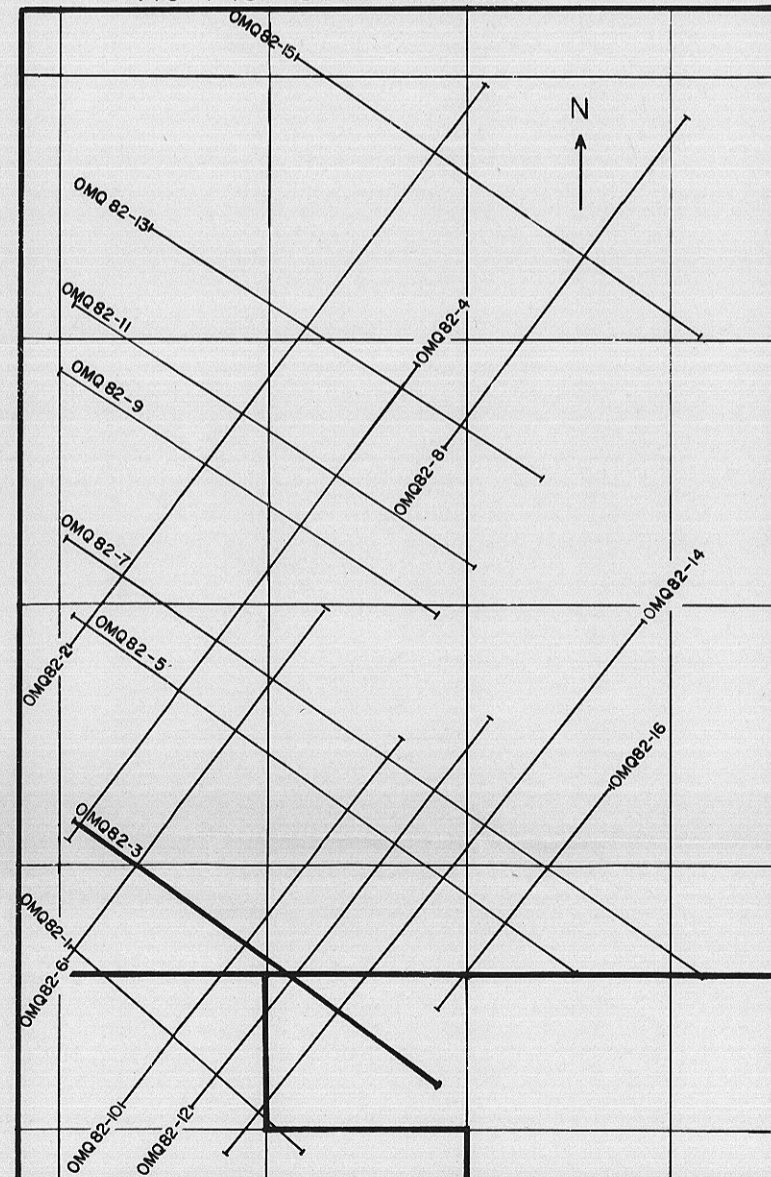
OFFSET(M)	START TIME(MSEC)
427	0
160	350
1694	1500
3493	3000

VELOCITY FILTERING - DIPS - 11/4 MS/TRACE  
 DESIGNATURE - V4  
 DESIGNATION - A STRAIGHT DESIGNATION TO 48 TRACE 48 FOLD DATA  
 VELOCITY ANALYSIS - USING 5 DEPTH POINT VELSCAN ANALYSES  
 NORMAL MOVEOUT CORRECTION - USING ANNOTATED VELOCITIES (CHOSEN BY CLIENT)  
 FIRST BREAK SUPPRESSION - START TR 2 AT 0 MSEC  
 START TR 7 AT 600 MSEC  
 START TR 38 AT 3000 MSEC  
 START TR 48 AT 3400 MSEC  
 COMMON DEPTH POINT STACK - 48 FOLD CDP STACK  
 DECONVOLUTION - 2 X 236 MSEC ACTIVE FILTER LENGTH  
 DESIGN GATE 125 PERCENT OVERLAP  
 GAP = 24 MSEC

FREQUENCY (HZ)	TIME (MSEC)
15	60
15	50
10	45
10	40
10	35
10	30
10	25
10	20
10	15
10	10
10	5
10	0

TIME VARIANT SCALING - USING 2 X 200, 2 X 2000 MSEC GATES  
 START TIME - 100 MSEC

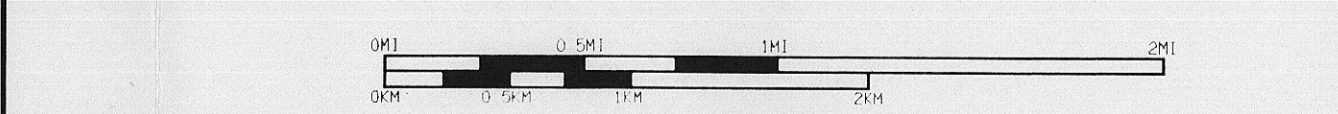
#### VIC P16 OTWAY BASIN



#### DISPLAY

HORIZONTAL SCALE - 24.0 TR/IN. 30.003006 TR/KM  
 VERTICAL SCALE - 10.0 CM / SEC  
 POLARITY - NORMAL  
 TRACE TYPE - BIAS 10.0 PERCENT  
 DATUM - SEA LEVEL  
 DISPLAY UNIT - 0.677333 CM

CDP	LINE	TIME	GAIN	DEPTH
ALL	ALL	ALL	ALL	ALL

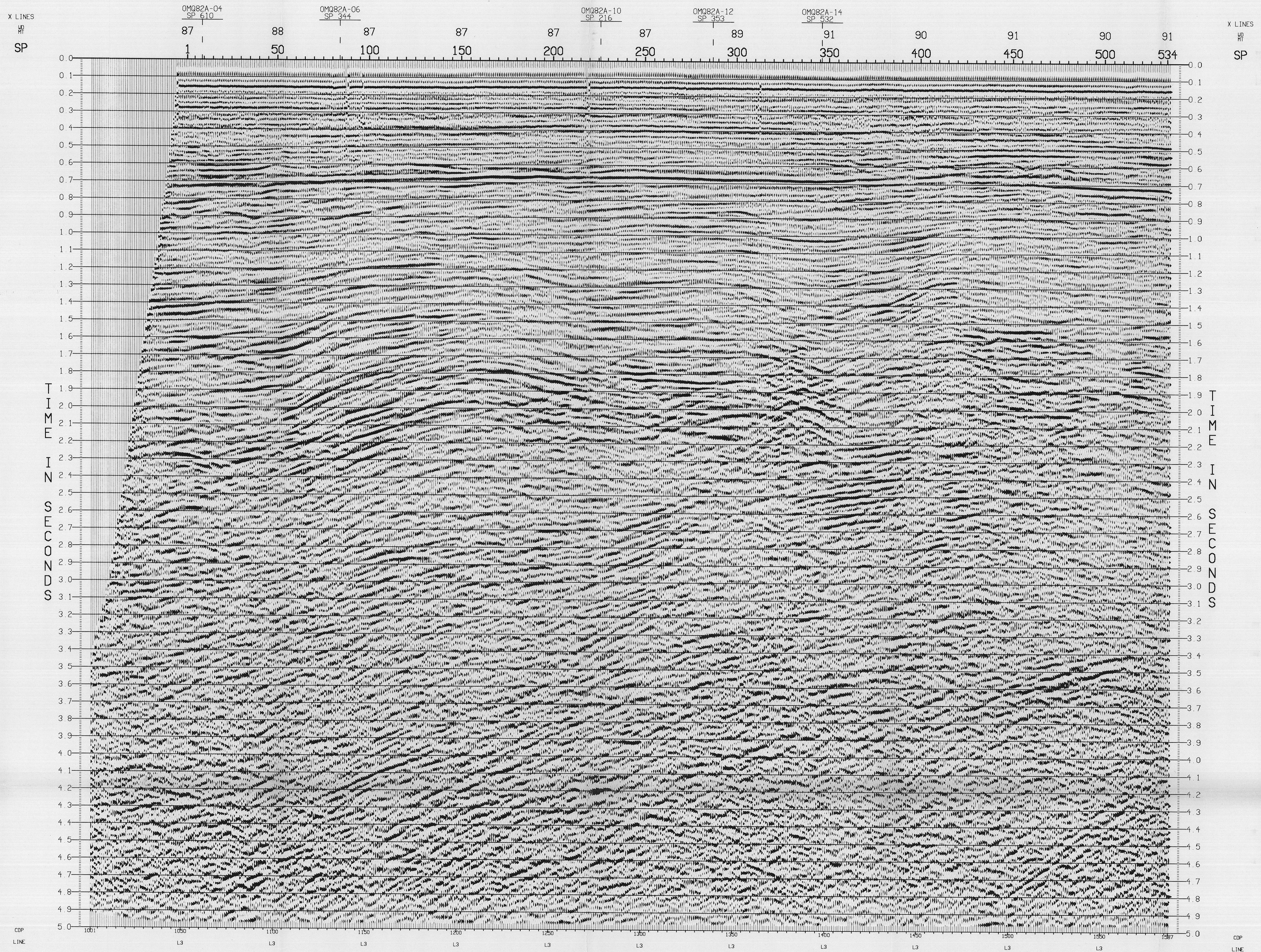


24 JUL 1982 00:38:55

PARTY 6860

**GEOPHYSICAL SERVICE INTERNATIONAL**  
 (A DIVISION OF TEXAS INSTRUMENTS LTD.)

PROCESSING CHECKED BY - D. Mc...



STACK DAS/TVF/TVS

LINE OMQ82A-03  
S.P. 1 TO 540

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE

STACK DAS/TVF/TVS

LINE OMQ82A-03  
S.P. 1 TO 540

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE

118056

# LINE OMQ82A-12 S.P. 1 TO 585

## BASS STRAIT OIL, GAS (HOLDINGS) N.L. PROSPECT (VIC P16) SYDNEY PROCESSING CENTRE

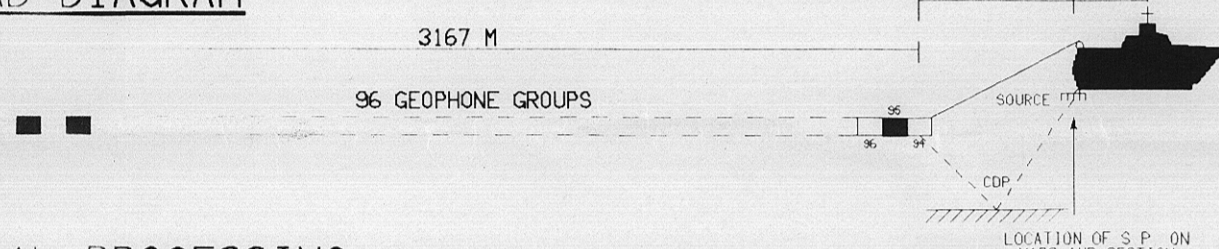
37 DEGREES      DIRECTION SHOT

### STACK DAS/TVF/TVS

#### FIELD DATA

DATA SHOT BY: GSI PARTY 2993 M.V. LADY VILMA  
 DATE SHOT: APRIL 1982  
 RECORDING INSTRUMENTS: DFS V  
 RECORDING FILTERS: HIGH FILTER AND SLOPE 128 HZ 72 DB/OCT  
 LOW FILTER AND SLOPE 8 HZ 18 DB/OCT  
 RECORDING POLARITY: POSITIVE PRESSURE AT THE GEOPHONE PRODUCES A NEGATIVE NUMBER ON TAPE AND A DOWNWARD DEFLECTION ON THE FIELD MONITOR RECORD  
 DIGITAL TAPE FORMAT: 4075 CM IN AIRGUN ARRAY OPERATING AT 2000 PSI  
 RECORD LENGTH / SAMPLE RATE: 5.0 SECONDS AT 2 MILLISECOND SAMPLE RATE  
 ENERGY SOURCE: SIG B 1600 DBI PHASE ENCODED  
 GUN DELAY: 51.2 MILLISECONDS  
 SOURCE DEPTH: 6 METRES AVERAGE  
 SOURCE TO ANTENNA DISTANCE: 62.77 METRES  
 SHOTPOINT INTERVAL: 33.3 METRES 1 POP PER SHOTPOINT  
 SHOTPOINTS ANNOTATED AT SOURCE POSITION  
 CABLE LENGTH: 3200 METRES 96 GROUPS  
 CABLE DEPTH: 13 METRES AVERAGE  
 GEOPHONES: 20 PER GROUP  
 COVERAGE: 48 FOLD 96 TRACE  
 PRIMARY NAVIGATION SYSTEM: MAXTRON  
 BACKUP NAVIGATION SYSTEM: GEONAV

#### SPREAD DIAGRAM



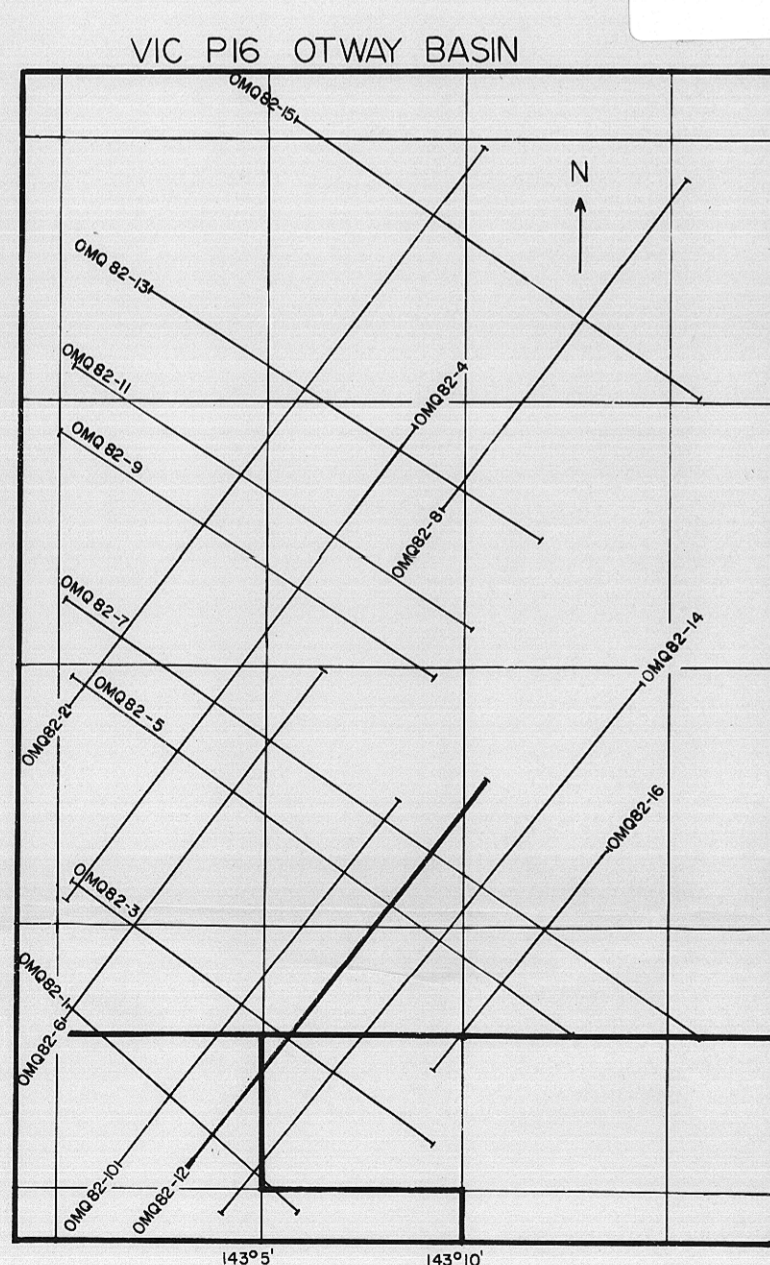
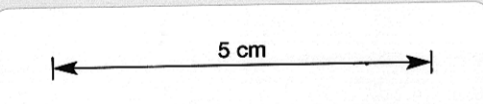
#### ORIGINAL PROCESSING

POLARITY CONVENTION: THE POLARITY OF THE FIELD RECORDING WAS MAINTAINED THROUGHOUT THE PROCESSING AND DISPLAY  
 PROCESS RECORD LENGTH: 5.0 SECONDS  
 RESAMPLE RATE: MINIMUM PHASE RESAMPLE FROM 2 TO 4 MSEC  
 CORRECTIONS: SHOT AND STREAMER STATIC 13 MILLISECONDS  
 AIRGUN DELAY: 51.2 MILLISECONDS  
 SHERICAL DIVERGENCE CORRECTIONS APPLIED  
 SHERICAL DIVERGENCE CORRECTIONS APPLIED  
 RAMP LENGTH: 96 MSEC  
 OFFSET(M)      START TIME(MSEC)  
 427      0  
 460      390  
 1694      1000  
 3453      3000

VELOCITY FILTERING: DIPS -11/4 MS/TRACE  
 STANDARD MARINE WAVELET  
 A STRAIGHT DECLINATION TO 48 TRACE 48 FOLD DATA  
 USING 5 DEPTH POINT VELSCAN ANALYSES  
 LOCATED 1 EVERY 3 KMS  
 USING ANNOTATED VELOCITIES (CHOSEN BY CLIENT)  
 START TR 7 AT 0 MSEC  
 START TR 7 AT 600 MSEC  
 START TR 39 AT 3000 MSEC  
 START TR 48 AT 3400 MSEC

COMMON DEPTH POINT STACK  
 DECONVOLUTION: 48 FOLD CDP STACK  
 2 X 226 MSEC ACTIVE FILTER LENGTH  
 DESIGN GATE (25 PERCENT OVERLAP)  
 GAP: 24 MSEC  
 FREQUENCY (HZ)      TIME (MSEC)  
 15 - 60      0  
 15 - 60      600  
 12 - 50      1000  
 10 - 40      2000  
 10 - 35      3000  
 10 - 35      5000

TIME VARIANT SCALING: USING 2 X 200. 2 X 2000 MSEC GATES  
 START TIME = 100 MSEC



#### DISPLAY

HORIZONTAL SCALE: 24.0 TR/IN 30.003006 TR/KM  
 VERTICAL SCALE: 10.0 CM / SEC  
 POLARITY: NORMAL  
 TRACE TYPE - BIAS: QTVAR 10.0 PERCENT  
 DATUM: SEA LEVEL  
 DISPLAY UNIT: 0.677333 CM

#### DISPLAY GAIN

100%  
 50%  
 25%

24 JUL 1982  
03.02.47

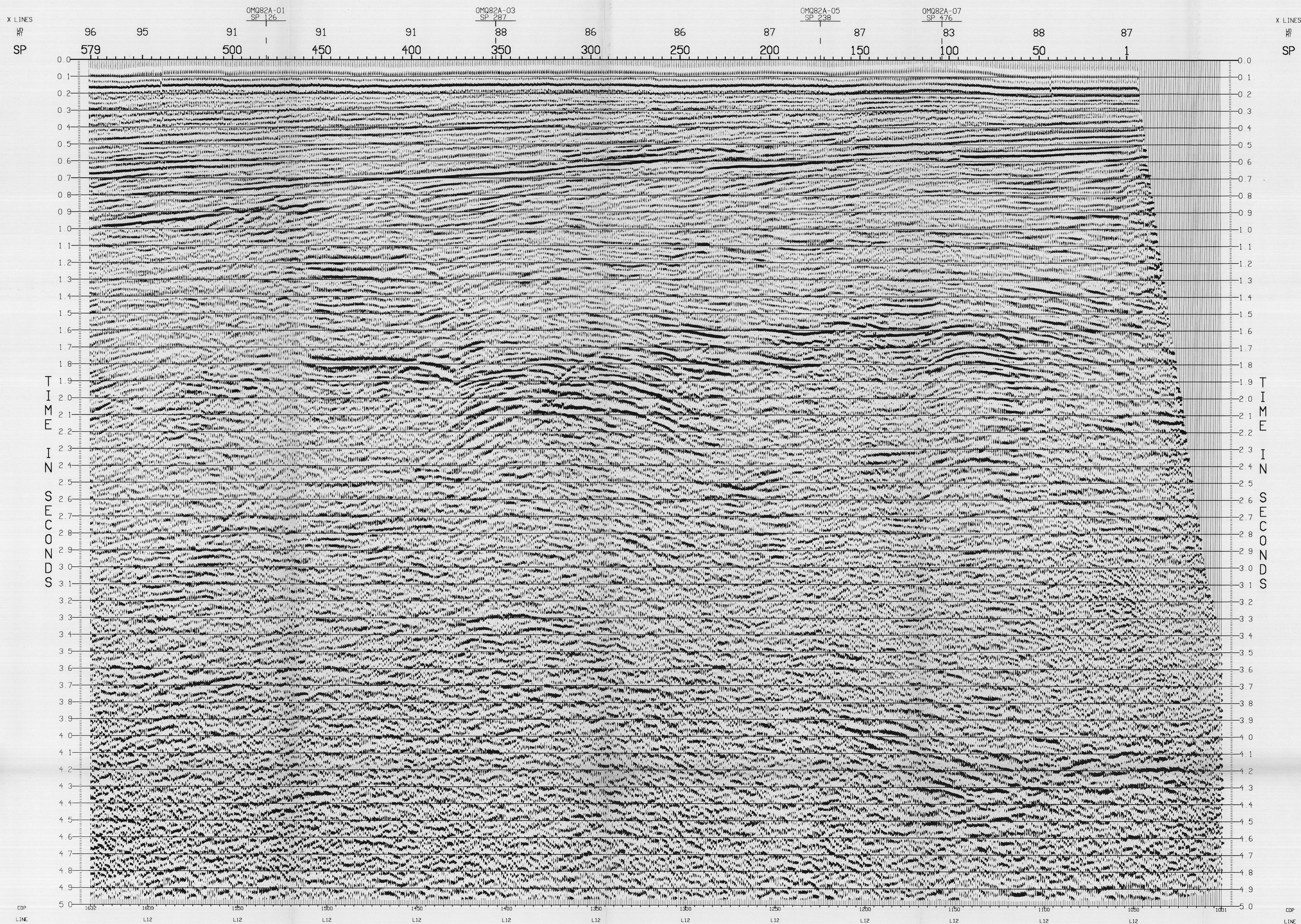


PARTY 6860

### GEOPHYSICAL SERVICE INTERNATIONAL

(A DIVISION OF TEXACO INDEPENDENTS LTD)

PROCESSING CHECKED BY -



STACK DAS/TVF/TVS

LINE OMQ82A-12  
S.P. 1 TO 585

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE

STACK DAS/TVF/TVS

LINE OMQ82A-12  
S.P. 1 TO 585

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE

118057

# LINE OMQ82A-14 S.P. 1 TO 780

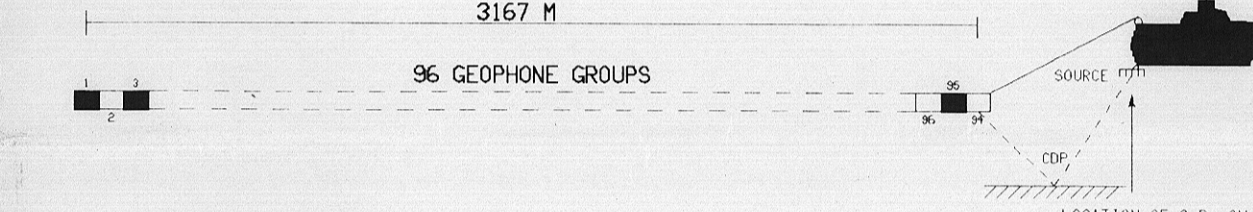
## BASS STRAIT OIL, GAS (HOLDINGS) N.L. PROSPECT (VIC P16) SYDNEY PROCESSING CENTRE



### FIELD DATA

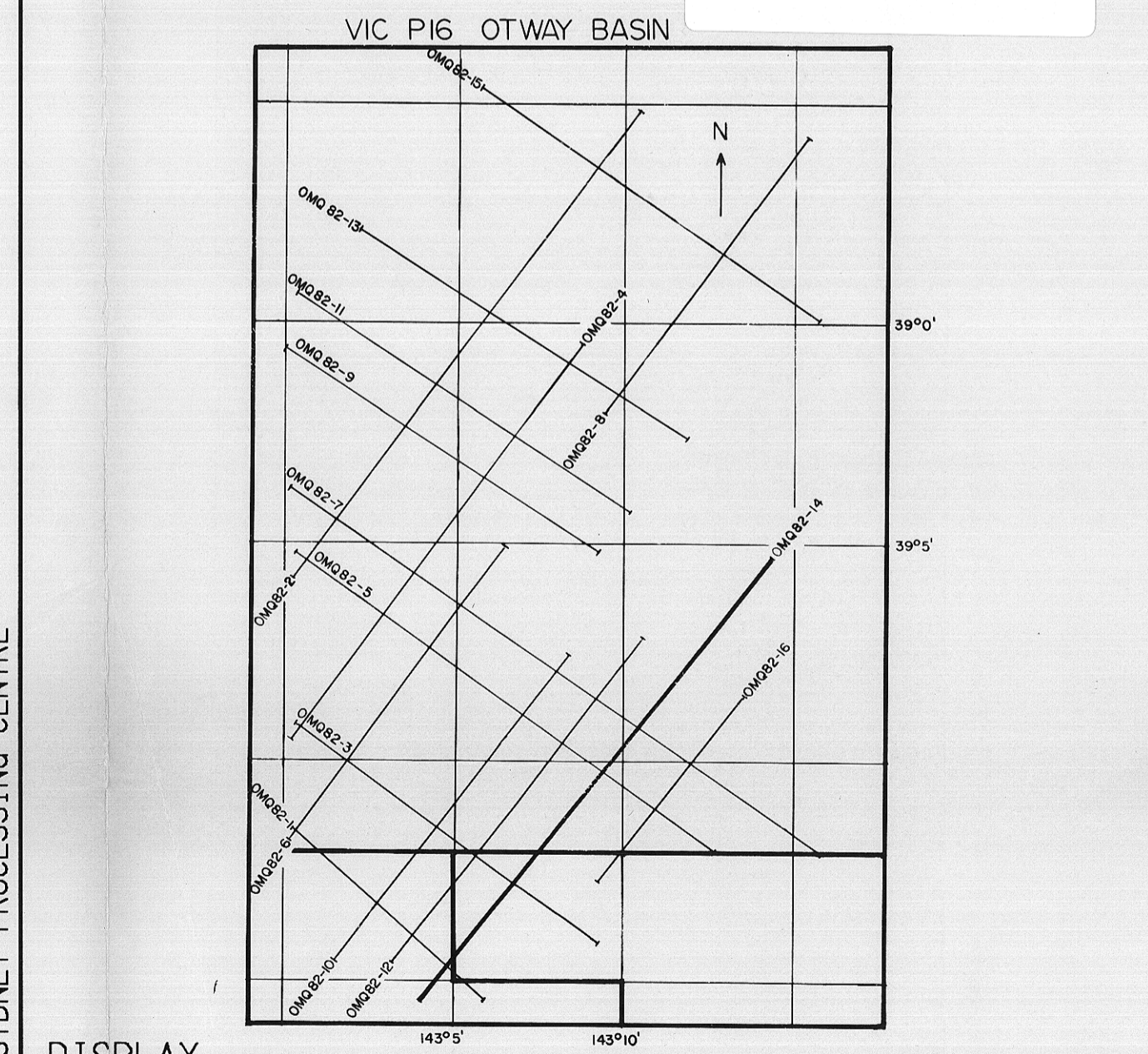
DATA SHOT BY - GSI PARTY 2993 M.V. LADY VILMA  
 DATE SHOT - APRIL 1982  
 RECORDING INSTRUMENTS - DPS V  
 RECORDING FILTERS - HIGH FILTER AND SLOPE 128 HZ 72 DB/OCT  
 LOW FILTER AND SLOPE 8 HZ 18 DB/OCT  
 RECORDING POLARITY - POSITIVE PRESSURE AT THE GEOPHONE PRODUCES A NEGATIVE NUMBER ON TAPE AND A DOWNWARD DEFLECTION ON THE FIELD MONITOR RECORD  
 DIGITAL TAPE FORMAT - SEG B 1600 BPI PHASE ENCODED  
 RECORD LENGTH / SAMPLE RATE - 5.0 SECONDS AT 2 HILLISECOND SAMPLE RATE  
 ENERGY SOURCE - 4070 CU IN AIRGUN ARRAY OPERATING AT 2000 PSI  
 GUN DELAY - 51.2 MILLISEC  
 SOURCE DEPTH - 6 METRES AVERAGE  
 SOURCE TO ANTENNA DISTANCE - 42.77 METRES  
 SHOTPOINT INTERVAL - 23.2 METRES POP PER SHOTPOINT  
 SHOTPOINT ANNOTATION - SHOTPOINTS ANNOTATED AT SOURCE POSITION  
 CABLE LENGTH - 3000 METRES 36 GROUPS  
 CABLE DEPTH - 13 METRES AVERAGE  
 GEOPHONES - 24 PER GROUP  
 COVERAGE - 48 FOLD 96 TRACE  
 PRIMARY NAVIGATION SYSTEM - MAXIRAN  
 BACKUP NAVIGATION SYSTEM - GEONAV

### SPREAD DIAGRAM

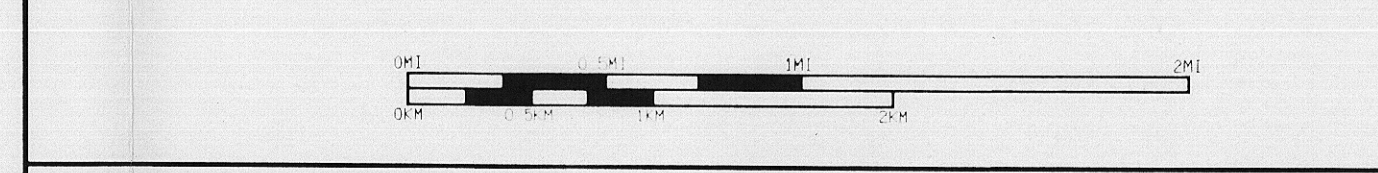


### DIGITAL PROCESSING

POLARITY CONVENTION - THE POLARITY OF THE FIELD RECORDING WAS MAINTAINED THROUGHOUT THE PROCESSING AND DISPLAY  
 PROCESSING RECORD LENGTH - 5.0 SECONDS  
 RESAMPLE - MINIMUM PHASE RESAMPLE FROM 2 TO 4 MSEC  
 PROCESSING SAMPLE RATE - 4 MILLISECOND  
 STATIC CORRECTIONS - SHOT AND STREAMER STATIC 13 MILLISECOND AIRGUN DELAY 51.2 MILLISECOND  
 TRUE AMPLITUDE RECOVERY - 7.0 DB PER SECOND FROM 0 TO 5.0 SECONDS  
 SPHERICAL DIVERGENCE CORRECTIONS APPLIED  
 RAMP LENGTH - 36 MSEC  
 VELOCITY FILTERING - DIPS -11/-4 PER TRACE  
 DESIGNATOR - V4  
 DECIMATION - A STRAIGHT DECIMATION TO 48 TRACE 48 FOLD DATA  
 VELOCITY ANALYSIS - LOCATED 1 EVERY 3 KMS  
 USING ANNOTATED VELOCITIES (CHOSEN BY CLIENT)  
 NORMAL MOVEOUT CORRECTION - START TR 2 AT 600 MSEC  
 FIRST BREAK SUPPRESSION - START TR 28 AT 3000 MSEC  
 START TR 48 AT 3400 MSEC  
 COMMON DEPTH POINT STACK - 48 FOLD CUP STACK  
 DECONVOLUTION - 7 X 236 MSEC ACTIVE FILTER LENGTH  
 DESIGN GATE (25 PERCENT OVERLAP)  
 TIME VARIANT FILTERING - CAI 54 MSEC  
 FREQUENCY (HZ) TIME (MSEC)  
 10 - 60 600  
 12 - 50 1000  
 10 - 45 2000  
 10 - 40 3000  
 10 - 35 5000  
 TIME VARIANT SCALING - USING 2 X 200 2 X 2000 MSEC GATES  
 START TIME 100 MSEC



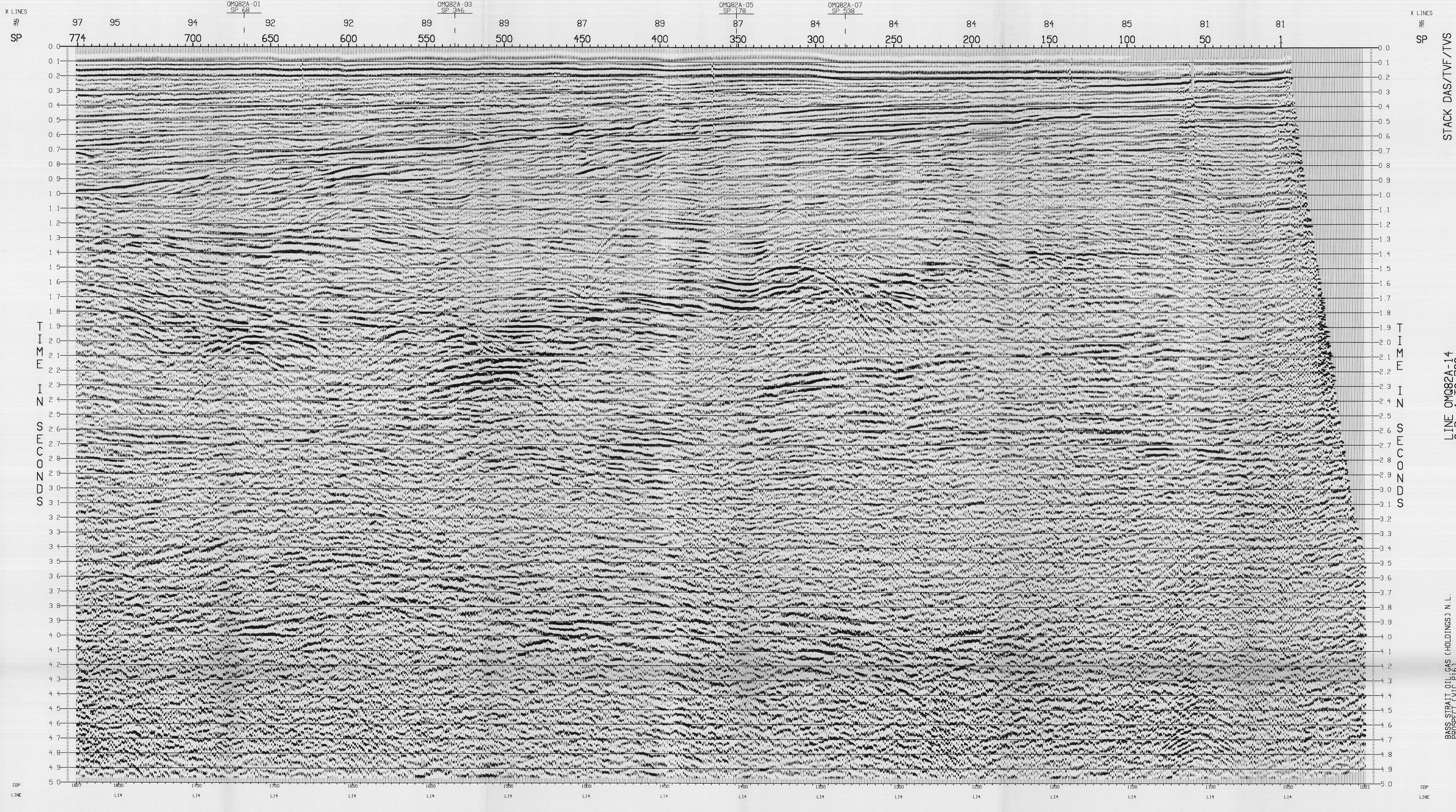
DISPLAY  
 HORIZONTAL SCALE - 24.0 TR/IN 30.003006 TR/KM  
 VERTICAL SCALE - 10.0 CM / SEC  
 POLARITY - NORMAL  
 TRACE TYPE - BIAS UNVAR 10.0 PERCENT  
 DATUM - SEA LEVEL  
 DISPLAY UNIT - 0.677333 CH



24 JUL 1982  
 03:43:40  
 PARTY 6660

GEOPHYSICAL SERVICE INTERNATIONAL  
 (A DIVISION OF TEXAS INSTRUMENTS LTD)

PROCESSING CHECKED BY D. M. ...



LINE OMQ82A-14  
S.P. 1 TO 780

LINE OMQ82A-14  
S.P. 1 TO 780

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE

OR-0123

118058

# LINE OMQ82A-16 S.P. 1 TO 360

## BASS STRAIT OIL, GAS (HOLDINGS) N.L. PROSPECT (VIC P16) SYDNEY PROCESSING CENTRE

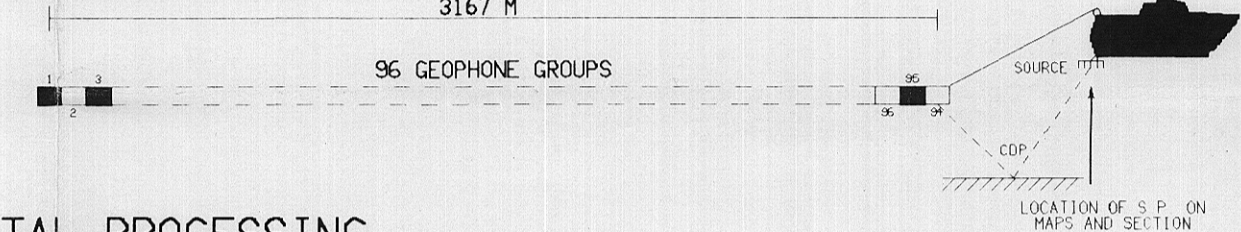


### STACK DAS/TVF/TVS

#### FIELD DATA

DATA SHOT BY - GSI PARTY 2993 M.V. LADY VILMA  
 DATE SHOT - APRIL 1982  
 RECORDING INSTRUMENTS - DFS V  
 RECORDING FILTERS - HIGH FILTER AND SLOPE 128 HZ 72 DB/OCT  
 LOW FILTER AND SLOPE 8 HZ 18 DB/OCT  
 RECORDING POLARITY - A POSITIVE PRESSURE AT THE GEOPHONE PRODUCES A NEGATIVE NUMBER ON TAPE AND A DOWNWARD DEFLECTION ON THE FIELD MONITOR RECORD.  
 SEC B 1500 BPI PHASE ENCODED  
 DIGITAL TAPE FORMAT - 5.0 SECONDS AT 2 MILLISECOND SAMPLE RATE  
 RECORD LENGTH / SAMPLE RATE - 4079 CM 1M AIRGUN ARRAY OPERATING AT 2000 PSI  
 ENERGY SOURCE - 51.2 MILLISECONDS  
 GUN DELAY - 6 METRES AVERAGE  
 SOURCE DEPTH - 62.77 METRES  
 SOURCE TO ANTENNA DISTANCE - 33.3 METRES, 1 POP PER SHOTPOINT  
 SHOTPOINT INTERVAL - SHOTPOINTS ANNOTATED AT SOURCE POSITION  
 CABLE LENGTH - 3200 METRES, 36 GROUPS  
 CABLE DEPTH - 13 METRES AVERAGE  
 GEOPHONES - 20 PER GROUP  
 COVERAGE - 48 FOLD, 96 TRACE  
 PRIMARY NAVIGATION SYSTEM - MACKAN  
 BACKUP NAVIGATION SYSTEM - GEONAV

#### SPREAD DIAGRAM



#### DIGITAL PROCESSING

POLARITY CONVENTION - THE POLARITY OF THE FIELD RECORDING WAS MAINTAINED THROUGHOUT THE PROCESSING AND DISPLAY  
 PROCESSING RECORD LENGTH - 5.0 SECONDS  
 RESAMPLE - MINIMUM PHASE RESAMPLE FROM 2 TO 4 MSEC  
 PROCESSING SAMPLE RATE - 4 MILLISECONDS  
 STATIC CORRECTIONS - SHOT AND STREAMER STATIC, 13 MILLISECONDS  
 TRUE AMPLITUDE RECOVERY - AIRGUN DELAY, 51.2 MILLISECONDS  
 7.0 DB PER SECOND FROM 0 TO 5.0 SECONDS  
 SPHERICAL DIVERGENCE CORRECTIONS APPLIED  
 PRE DECONVOLUTION MUTE - RAMP LENGTH = 96 MSEC

OFFSET(M)	START TIME(MSECS)
427	0
460	350
1694	1500
3493	3000

VELOCITY FILTERING - DIPS -41/-4 MS/TRACE  
 DESIGNATURE -V4  
 DECIMATION - A STRAIGHT DECIMATION TO 48 TRACE 48 FOLD DATA  
 VELOCITY ANALYSIS - USING 5 DEPTH POINT VELSCAN ANALYSES  
 NORMAL MOVEOUT CORRECTION - LOCATED 1 EVERY 3 KMS  
 USING ANNOTATED VELOCITIES (CHOSEN BY CLIENT)  
 FIRST BREAK SUPPRESSION - START TR 2 : AT 0 MSEC  
 START TR 7 : AT 600 MSEC  
 START TR 93 : AT 3000 MSEC  
 START TR 48 : AT 3400 MSEC

COMMON DEPTH POINT STACK DECONVOLUTION - 48 FOLD CDP STACK  
 2 X 236 MSEC ACTIVE FILTER LENGTH  
 DESIGN GATE (25 PERCENT OVERLAP)  
 GAP = 24 MSEC

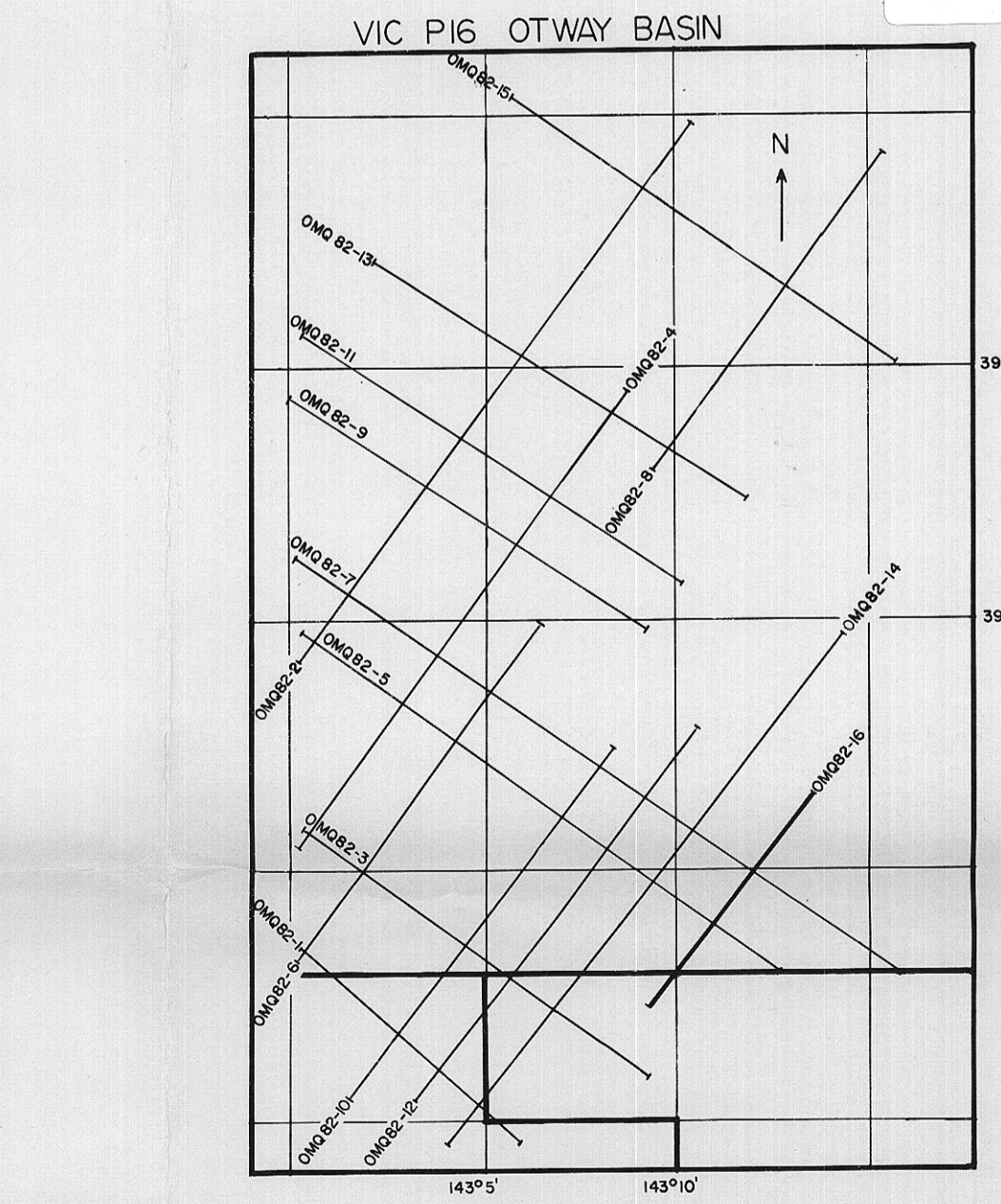
TIME VARIANT FILTERING	FREQUENCY (HZ)	TIME (MSEC)
15	60	0
15	60	600
12	50	1000
10	45	2000
10	40	3000
10	35	5000

TIME VARIANT SCALING - USING 2 X 200, 2 X 2000 MSEC GATES  
 START TIME - 100 MSEC

STACK DAS/TVF/TVS

LINE OMQ82A-16  
S.P. 1 TO 360

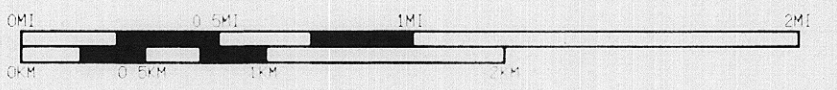
BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE



#### DISPLAY

HORIZONTAL SCALE - 24.0 TR/IN 30.003006 TR/KM  
 VERTICAL SCALE - 10.0 CM / SEC  
 POLARITY - NORMAL  
 TRACE TYPE, BIAS - U/VAR 10.0 PERCENT  
 DATUM - SEA LEVEL  
 DISPLAY UNIT - 0.677333 CM

DISPLAY GAIN	
CDP	ALL
GAIN	TIME
50.0	5.0



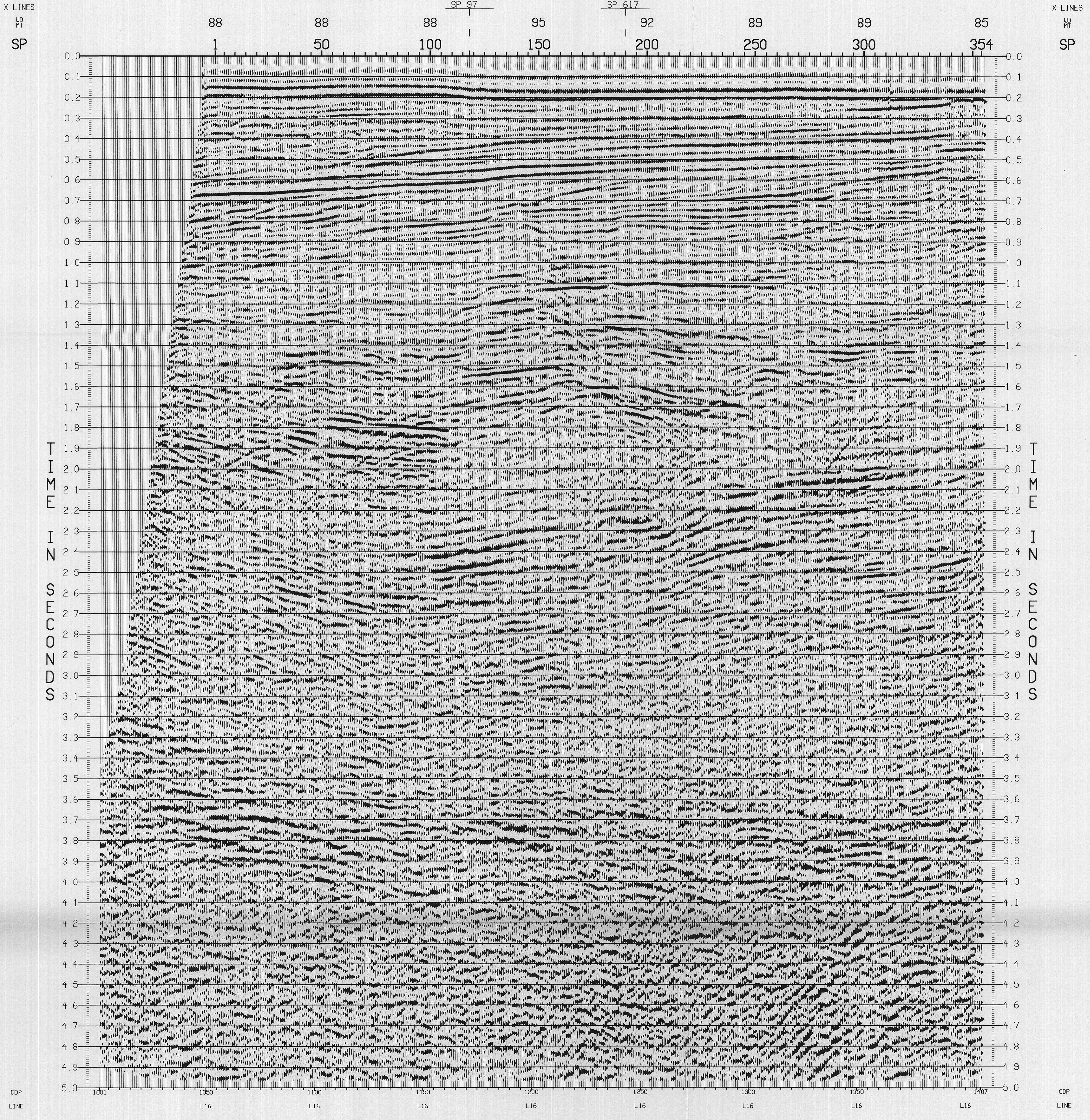
24 JUL 1982 03.07.27 PARTY 6850



### GEOPHYSICAL SERVICE INTERNATIONAL

(A DIVISION OF TEXAS INSTRUMENTS LTD)

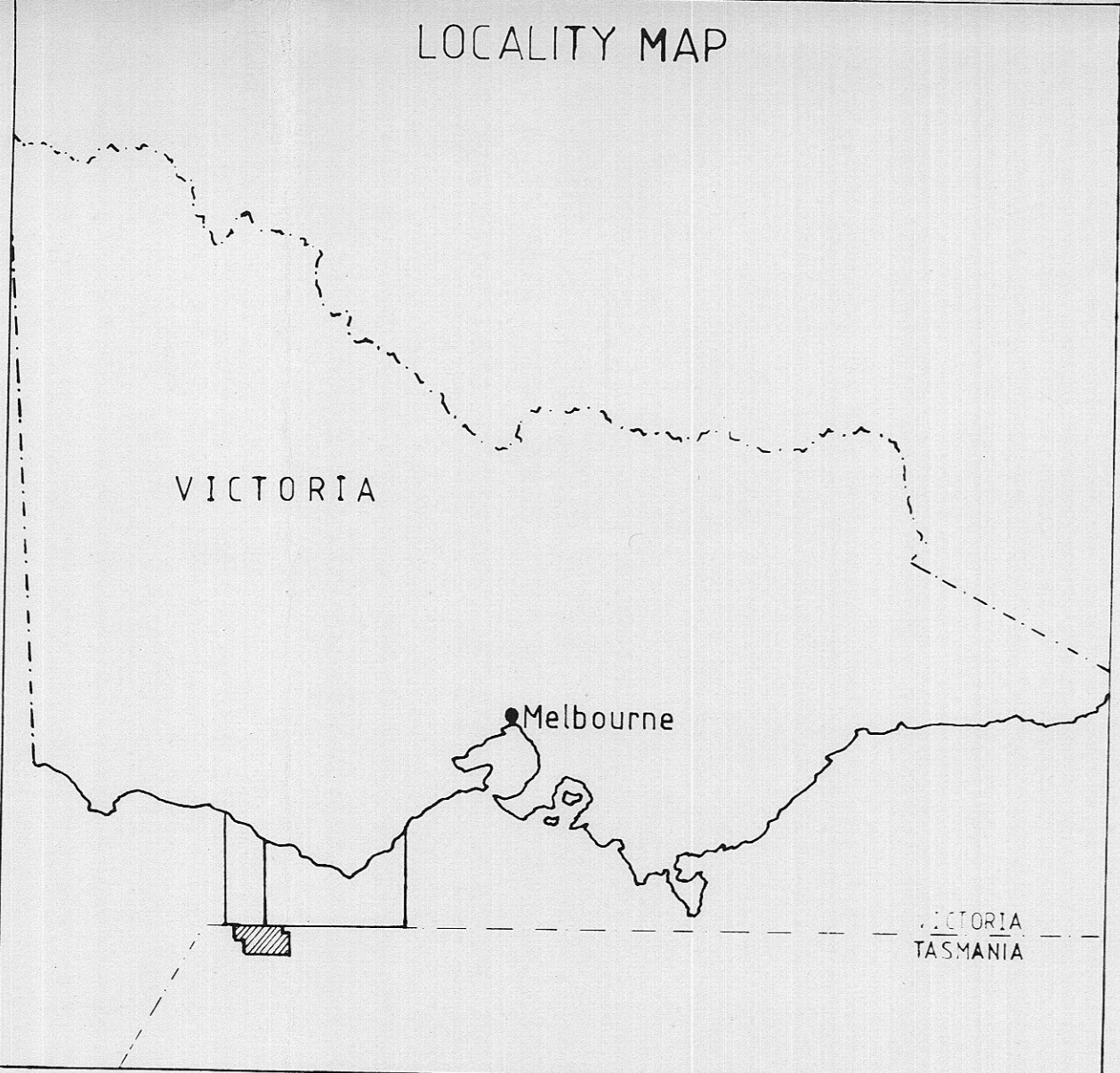
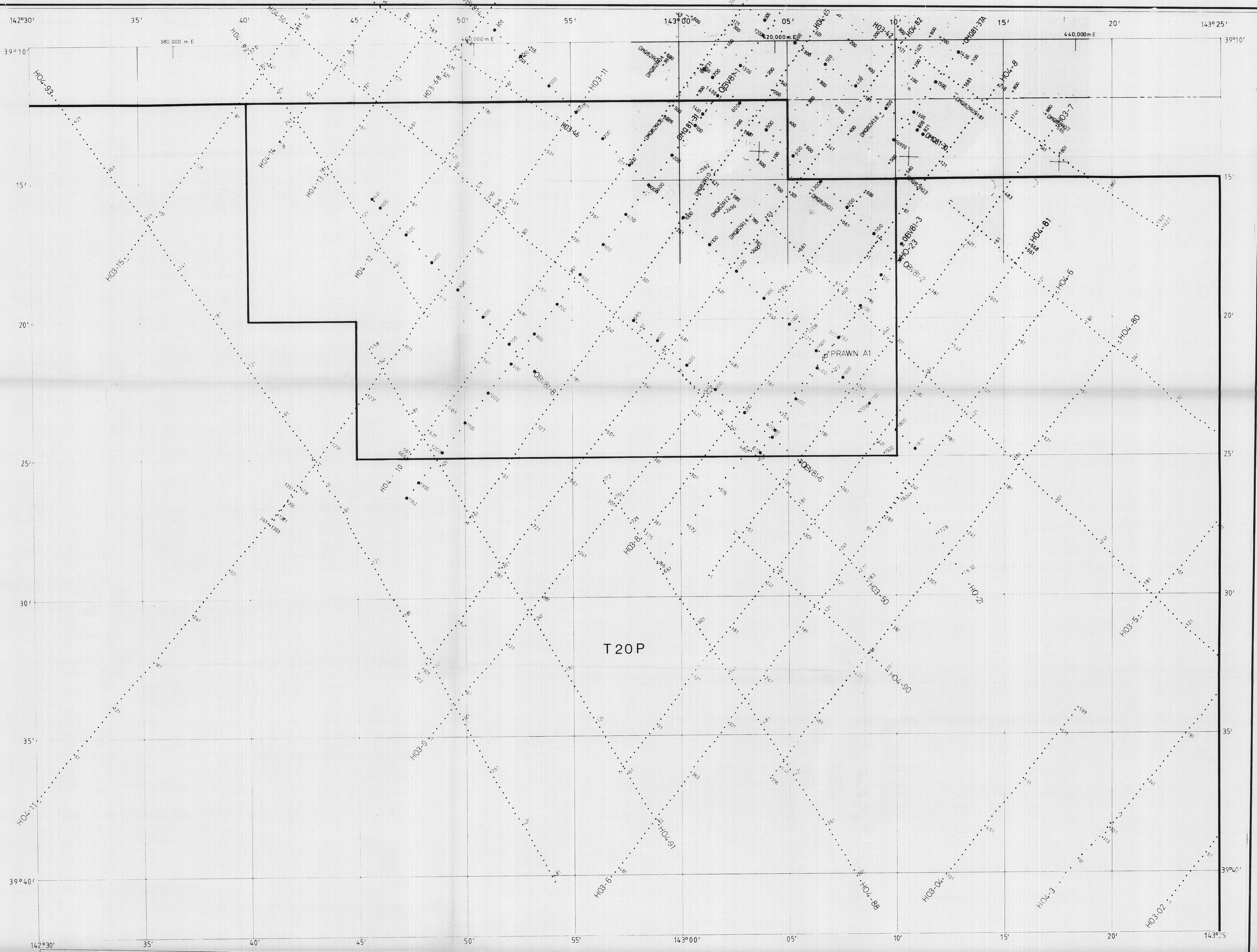
PROCESSING CHECKED BY - D. Murray



STACK DAS/TVF/TVS

LINE OMQ82A-16  
S.P. 1 TO 360

BASS STRAIT OIL, GAS (HOLDINGS) N.L.  
PROSPECT (VIC P16)  
SYDNEY PROCESSING CENTRE



VAN DIEMEN'S LAND RESOURCES NL

T 20P  
OTWAY BASIN

SHOT POINT LOCATION

Datum: Sea Level      Contour Int.:  
Scale 1:100,000

Author:      Date:      Enclosure: