South Australia South Australia South Australia South Australia

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## NUMBER 2544

**EPP 6, EPP 10 AND EPP 11**

**EUCLA BASIN, DUNTROON BASIN AND BIGHT BASIN**

1974 R 8 AND R 9 MARINE SEISMIC SURVEYS

JOINT INTERPRETATION REPORTS FOR THE PERIOD MAY TO NOVEMBER 1975

Submitted by

Shell Development (Aust.) Pty Ltd
1975



MINES and ENERGY RESOURCES SOUTH AUSTRALIA



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# ENVELOPE 2544

**TENEMENT:** EPPs 6, 10 and 11; Eucla, Duntroon and Bight Basins

**TENEMENT HOLDER:** Shell Development (Aust.) Pty Ltd

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# SHELL DEVELOPMENT

(AUSTRALIA)

PTY. LTD.

# INTERPRETATION REPORT
# R-8 AND R-9 SURVEYS
# OFFSHORE SOUTH AUSTRALIA
# PERMITS SA-10 AND SA-11

BY

SOUTH AUSTRALIAN TEAM

SDA 193.

MELBOURNE

MAY, 1975.

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## 1. INTRODUCTION

Two seismic surveys, the R-8 and the R-9, were conducted in permits SA-10 and SA-11 during 1974.

The purpose of these surveys was to define more clearly structural leads that had been mapped after previous surveys and to provide a closer grid in areas of insufficient coverage.

A total of 2362 km were recorded in SA-10 and SA-11 during the two surveys. In addition 49 km of seismic was recorded in SA-7 and 337 km in SA-6 during the R-8 and R-9 surveys respectively. The results of the R-8 survey in SA-7 were discussed in the half yearly report to the Designated Authority dated 6th August, 1974, on the activities in that permit. Interpretation of the data obtained in SA-6 is not yet complete.

This report deals with the results of the two seismic surveys in the deep water acreage. A revised interpretation is presented herein which reflects a new model of the strucutral style in the Great Australian Bight Basin.

## 2. SEISMIC DATA ACQUISITION AND PROCESSING

The data acquisition for both the R-8 and R-9 surveys was performed by Geophysical Service International (G.S.I.) who used their vessel "Eugene McDermott II" for the field recording. The shooting configuration was 24 fold, 48 trace with a 3200 m streamer. Six seconds of data below the seabottom was recorded at a sample period of 4 milliseconds.

As energy source a tuned airgun array of 20 litre capacity was used. The recording instrument was a DSF III.

An XR Shoran radiopositioning system was employed to provide horizontal control for the survey. The system was supplied and operated by Offshore Navigation Inc. The following onshore base stations were occupied :

- Cape de Couedic
- Streaky Bay
- Eucla-Koonalda
- Cape Adieu
- Point Avoid

The R-8 survey was conducted during the period 28th January - 19th February 1974. A total of 1767 km was recorded of which 898 were in SA-10 and 820 in SA-11.

The recording of the R-9 survey started on the 22nd October 1974 and was completed on 6th November 1974. In SA-10 130 km were surveyed and in SA-11 514 km (encl.1).

Processing of the field data of both surveys was carried out by GSI in their Sydney processing centre.

After a number of experiments had been conducted on the R-8 data at representative locations, it was decided to adopt the following processing sequence for both surveys :

1. True Amplitude Recovery
2. 'Dewater' (deconvolution designed to attenuate the first waterbottom multiple in deep water)
3. Mini 700 Velocity Analysis, at an average density of 3 per 10 km
4. Normal Moveout Correction
5. Stack
6. Time Variant Deconvolution
7. Time Variant Filtering, referenced to the waterbottom.

The quality of the 1974 data is generally good with little variation between the lines. Due to more accurate velocity determination and a wider filter passband, resolution in the upper half of the section on the 1974 data is considerably improved compared with that of previous surveys. A slight improvement in the signal to noise ratio is also noted, in the deeper part of the record sections.

<u>Magnetometer Recording</u>

Magnetometer recordings were made during the R-8 survey only. The results were not intended to be used for an updating of the existing total intensity map or for depth to basement calculations because the existing maps were considered adequate. The data will be used however for a study of the magnetic response of a very strong, shallow reflector in the eastern part of SA-10, which screens the penetration of seismic signals into the underlying section.

3. STRUCTURE

The purpose of the R-8 and R-9 surveys was to provide detailed control over structural leads previously mapped and to provide a closer grid in areas of insufficient coverage.

From the denser seismic grid which became locally available in the northwestern part of SA-11 as a result of the 1974 surveys it became apparent that the structural style was different to that previously assumed and it was necessary to adopt a new model as a basis for interpretation. As a consequence the whole of the two permits, with the exception of the extreme eastern part of SA-10 and the southernmost part of SA-11, have been remapped, and the revised interpretation is presented herein.

The two levels previously used as a basis for mapping, the 'A' horizon and an intra-Cretaceous horizon, have been retained in the revised interpretation.

The 'A' horizon occurs at the base of the Tertiary carbonate section and is a clear seismic event throughout the acreage (encl.3). With some very minor exceptions it is unfaulted and shows only a monoclinal dip, the result of regional subsidence of the continental margin after the break-up of Australian - Antarctic continent.

The intra-Cretaceous horizon is an obvious choice for mapping within the Cretaceous section since it has sufficient character in the northern parts of SA-10 and -11 to be correlated across faults (encl. 4). Towards the south this character is lost and correlation from one side of a fault to the other becomes uncertain. From a long-range comparison with the Duntroon Embayment this intra-Cretaceous horizon is believed to occur at the boundary between Upper Cretaceous mudstones and the Lower Cretaceous 'Platypus sands' which constitute the primary exploration objective in that area. In the extreme south of the permit area the intra-Cretaceous horizon is too deep for mapping and there a shallower horizon within a thickened clastic section of presumed Tertiary age beneath the superficial carbonate unit, is chosen.

The structural picture at the level of the intra-Cretaceous horizon is relatively simple. The deformation in the area covered by SA-10 and and -11 consists essentially of a regional tilt with a WNW-ESE strike and a large number of normal faults.

The strike of the faults is on the average NW-SE and makes a small angle with the strike of the monoclinal tilt. Practically all faults hade towards the southwest and only a small number of minor antithetic faults dipping in the opposite direction are observed. Almost all faults die out well before reaching the 'A' horizon level, so that there is a considerable thickness of unfaulted section below the Tertiary carbonates.

The faults are the key element in the revised model of structural style, and the following features are essential to an understanding of this model :

a. The faults are generally less than 45 km long and die out at either end. A maxima of throw is reached at some point along the fault, giving rise to a local depression in front of the fault. Local minima in throw are rare and are only observed on the longer faults.
b. The faults are synsedimentary and the magnitude of the throw increases with depth.
c. The regional dip of the strata and the dip of the fault plane are in approximately the same direction, and at depth the throw of the fault becomes sufficiently great to cause a local reversal of the regional dip. On the seismic dip lines the bedding planes at depth are observed to dip towards the fault plane, giving the impression of dip closure of a rollover nature. Viewed from a strike line a synclinal perspective is seen. This phenonemon of dip reversal on the dip lines in conjunction with a depression on the strike lines due to a local maxima in throw, is known as a rollover syncline or a fault angle depression. In itself this structural feature does not lead to closure on the downthrown side of the fault.
d. The map trace of the faults is straight rather than arcuate.

The rollover characteristics were recognised in the previous structural model.

The most important feature of the revised model is the last mentioned; since several leads appearing on the previous interpretation depended for closure on strongly curved fault traces, the new model has led to a reduction in the number of leads.

In the Rosella - Jabiru area of SA-10 the faults are so closely spaced and have such a large throw that only the reversed rollover dip is seen within individual fault blocks. Since the normal regional dip prevails in the surrounding area it is difficult to ascribe this apparent reversal of regional dip to anticlinal uplift. However in the Jabiru area strong, shallow reflectors hamper the mapping of the deeper horizon and the structural picture that can be obtained is at present a very imperfect one.

On the whole the structural picture of the two permits shows a surprising uniformity in style. The main variables seem to be the magnitude of the monoclinal dip and the strike, throw and spacing of the normal faults.

## 4. STRATIGRAPHY

A palynological review of the wells Platypus-1 and Echidna-1 in the Duntroon Embayment, which currently provide the stratigraphic information most relevant to the Great Australian Bight Basin, is currently in progress. Preliminary results indicate that the prospective sequence encountered in Platypus-1 between 9420' and 11077' is of Lower Cretaceous rather than Upper Cretaceous age. The intra-Cretaceous horizon mapped in SA-10 and-11 is believed to represent the top of this sequence and if so represents the boundary between the Upper and Lower Cretaceous.

The results of the current well Potoroo-1 will provide the first directly correlatable stratigraphic control in the Great Australian Bight Basin.

## 5. STRUCTURAL LEADS

Since the principal structural elements of fault-induced rollover synclines superimposed on a regional dip do not in themselves lead to closure, we must rely on more exceptional conditions for structural closure.

Compared with the previous interpretation the number of leads has been reduced because such exceptional conditions are not common.

Four types of exceptional structural conditions giving rise to leads have been distinguished:

a. Branching and intersecting faults. Leads due to these phenonema are Galah (130° 37' E - 33° 53' S) and two leads in the northwestern corners of SA-10 (131° 10' E - 34° 15' S and at 131° 20' E - 34° 22' S).

b. Local minima in the throw of longer faults. Lead of this type have been mapped at 131° 47' E - 34° 08' S, 132° 20' E - 34° 29'S and at 130° 20' E - 34° 55' S

c. A combination of a long fault and a marked change in the regional dip. This type is represented by only one example in the extreme southwest of SA-10 at 131° 25' E - 35° 00' S.

d. In Rosella and Jabiru we have more complicated structures where large, closely spaced synsedimentary faults give rise to large rollover features. The vertical closure in Rosella appears to be quite small but there are indications that it could be considerable in Jabiru. Unfortunately the new data do not allow a better definition of the latter lead due to a strong shallow reflector which to a large extent shields information from the deeper part of the section.

An important point in the evaluation of all structural leads is the fact that closure only exists in the deeper part of the section. It is estimated that it is confined to the lower part of the Upper Cretaceous, and to the Lower Cretaceous. The only exception is the lead in the extreme southwest of SA-10 (131° 35' E - 35° 00' S) where the relevant fault extends well into the presumed Tertiary part of the section and closure is thus observed at a higher level.

## 6. CONCLUSIONS

The 1974 surveys have provided sufficiently dense coverage to allow an improved model of the structural style to be developed leading to a revised interpretation of all seismic data in the permits, and to ensure that no significant structural leads have been overlooked.

The attempt to obtain a more detailed map of several of the more promising leads has been less successful. Several structures with likely closure could not be confirmed while others proved to be more complicated than originally presumed. Further seismic coverage will be required before drillable prospects can be selected.




2544-1

Kilometres

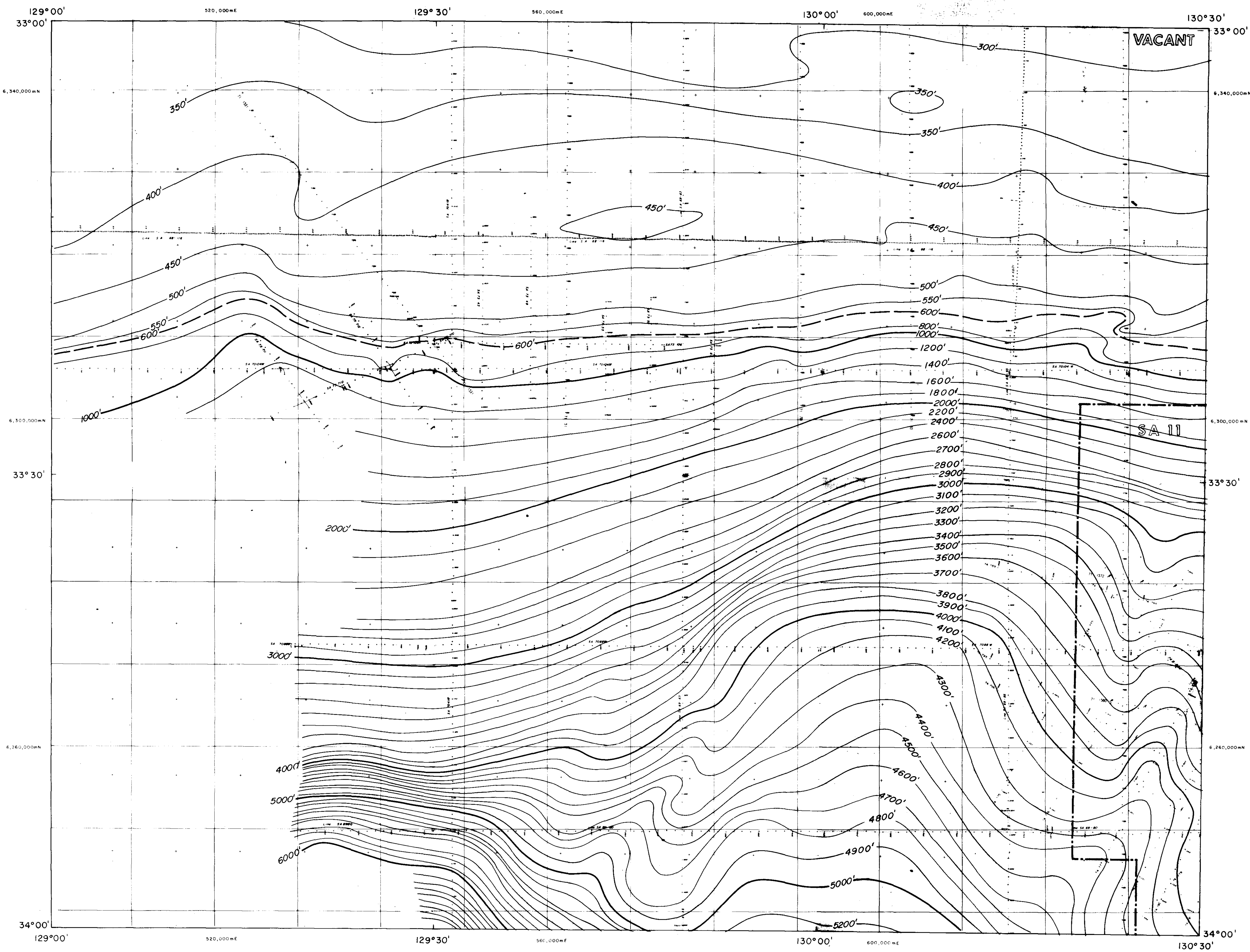
**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

SOUTH AUSTRALIA

EXPLORATION DENSITY MAP
S.A.10 & S.A.11

Scale 1:500 000

| | | |
|---|---|---|
| Author: South Aust Team | Date: March 1975 | Encl. 1 |
| Report No: S.D.A 193 | Drawing No: 8651 | |



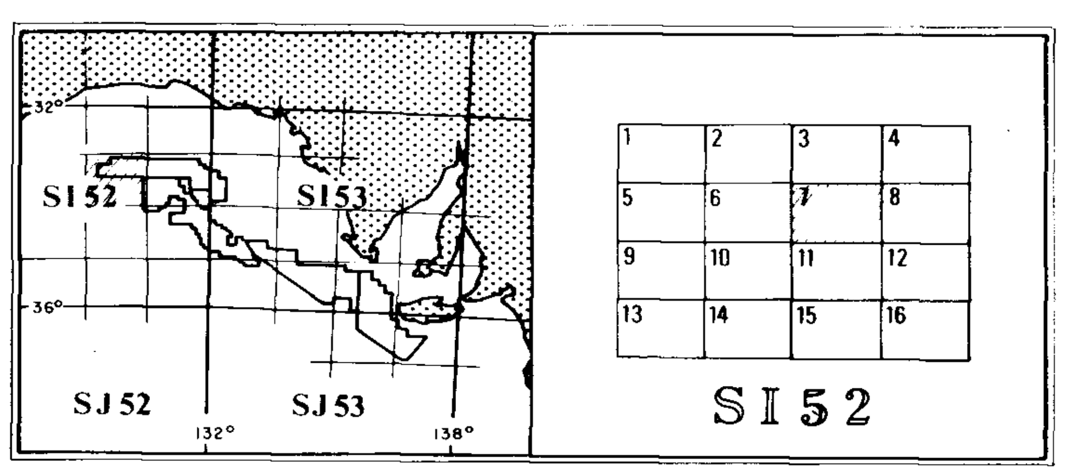

2544-5

Scale

5 0 5 10 miles

5 0 5 10 15km

UTM Projection (Australian Map Grid) Zone 52 C.M. 129°00'




Location Diagram

*Note:*
CONTOUR INTERVAL 100 & 200 feet
COMPILED FROM SEISMIC SURVEY DATA 66-748



**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

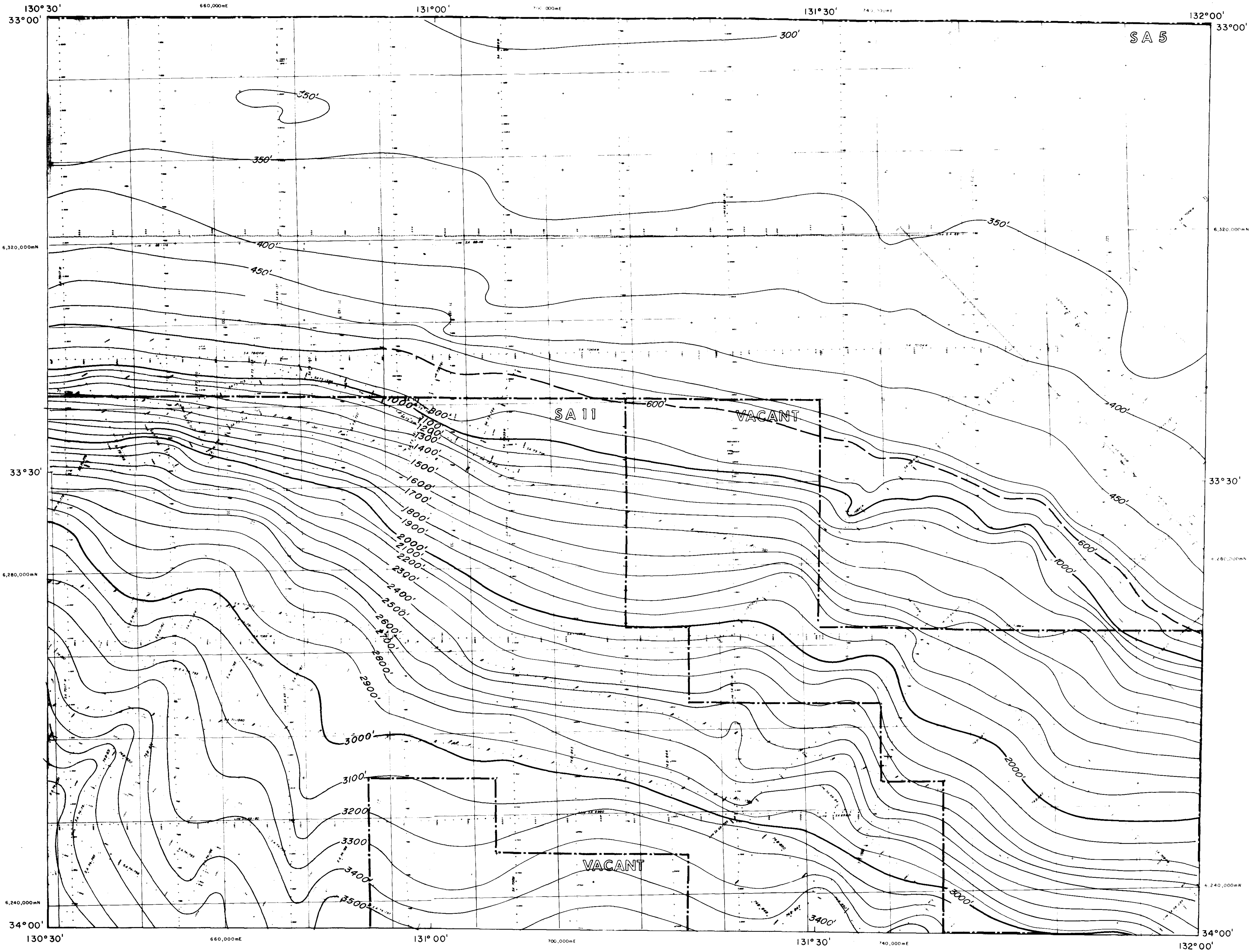
SOUTH AUSTRALIA OFFSHORE

BATHYMETRY

Scale 1: 250,000

| | | |
|---|---|---|
| Author: South Aust. Team. | Date: March 1975 | Encl. 2D |
| Report No: S.D.A. 193 | Drawing No: 7043-1 | |

Sheet No. SI-52-7



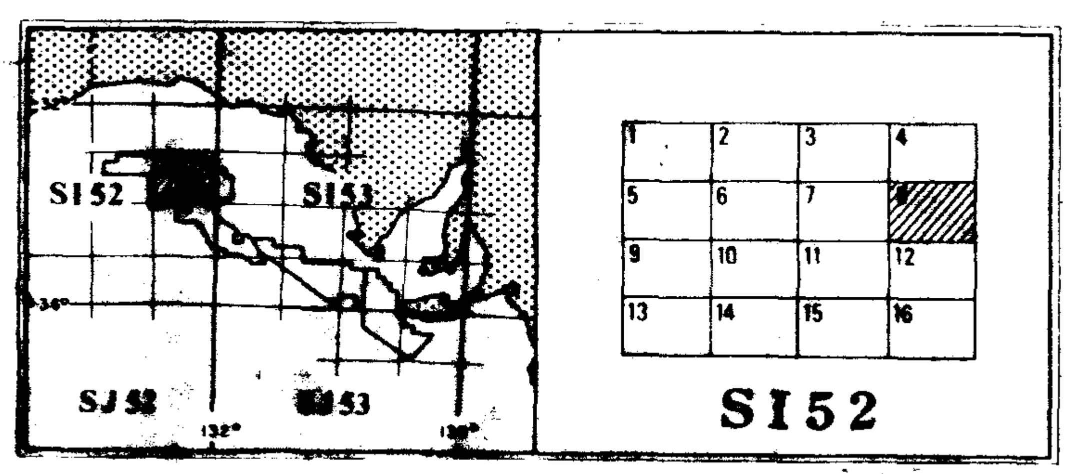

2544-3

Scale

5 0 5 10 m

5 0 5 10 15 km

UTM Projection (Australian Map Grid) Zone 52 C.M.129°00'




Location Diagram

Note:

CONTOUR INTERVAL 100 & 200 feet

COMPILED FROM SEISMIC SURVEY DATA 66-74B

RECEIVED
17 JUN 1975
DEPT. OF MINES
SECURITY
2544

**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

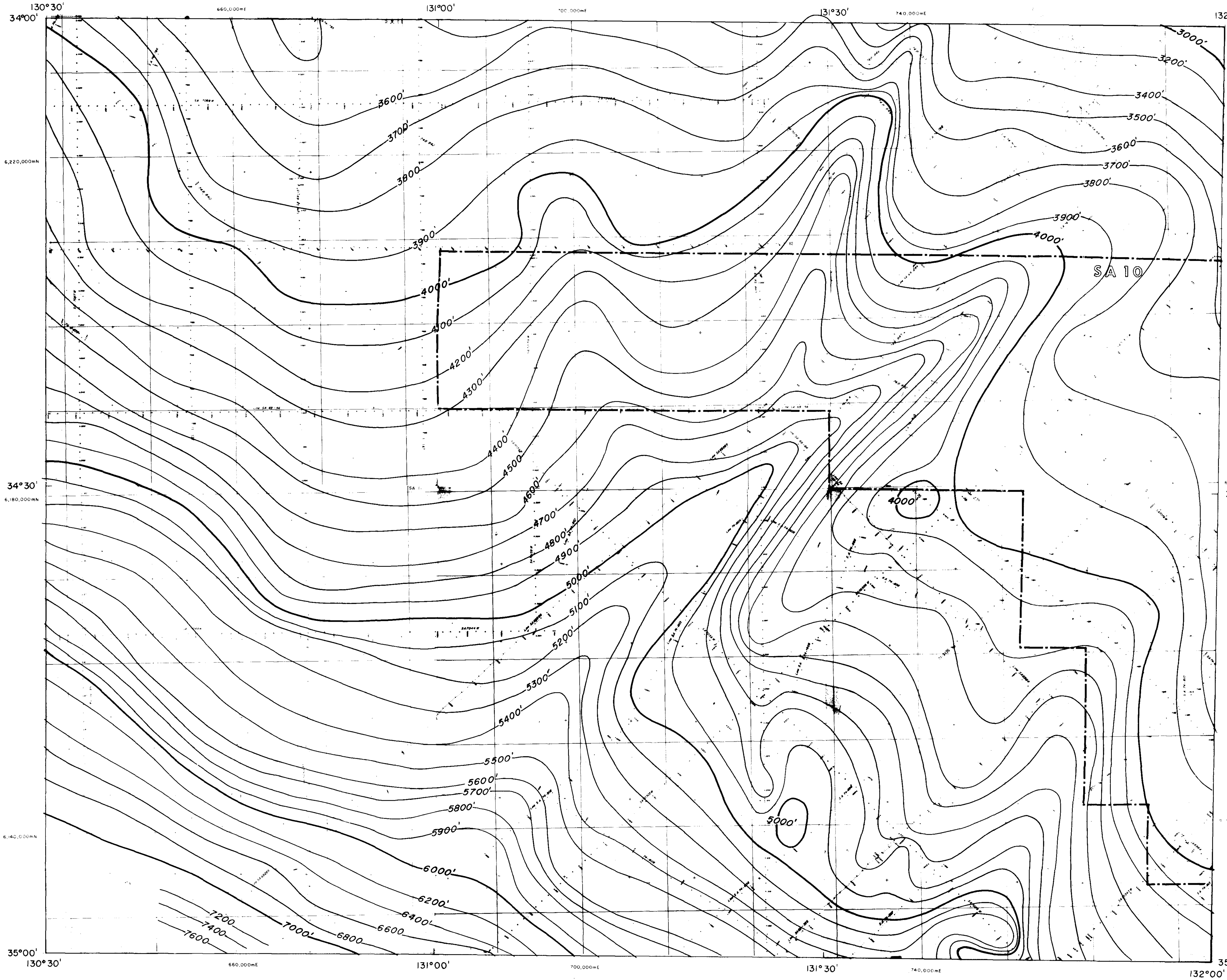
SOUTH AUSTRALIA OFFSHORE

BATHYMETRY

Scale 1 : 250,000

| | | |
|---|---|---|
| Author South Aust Team | Date: March 1975 | Encl.2B |
| Report No. S.D.A. 193 | Drawing No: 7042-1 | |

Sheet No. SI-52-8



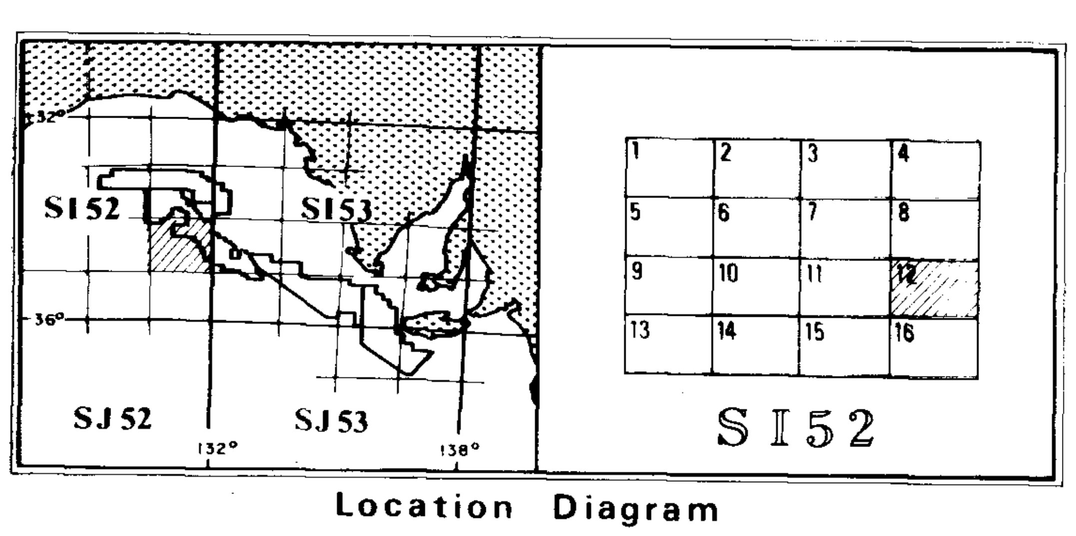

2544-4

Scale

5 0 5 10 m

5 0 5 10 15 km

UTM Projection (Australian Map Grid) Zone 52 C.M. 129°00'




Location Diagram

Note:

CONTOUR INTERVAL 100 & 200 feet

COMPILED FROM SEISMIC SURVEY DATA 66-74B

RECEIVED 17 JUN 1975 DEPT. OF MINES SECURITY

**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

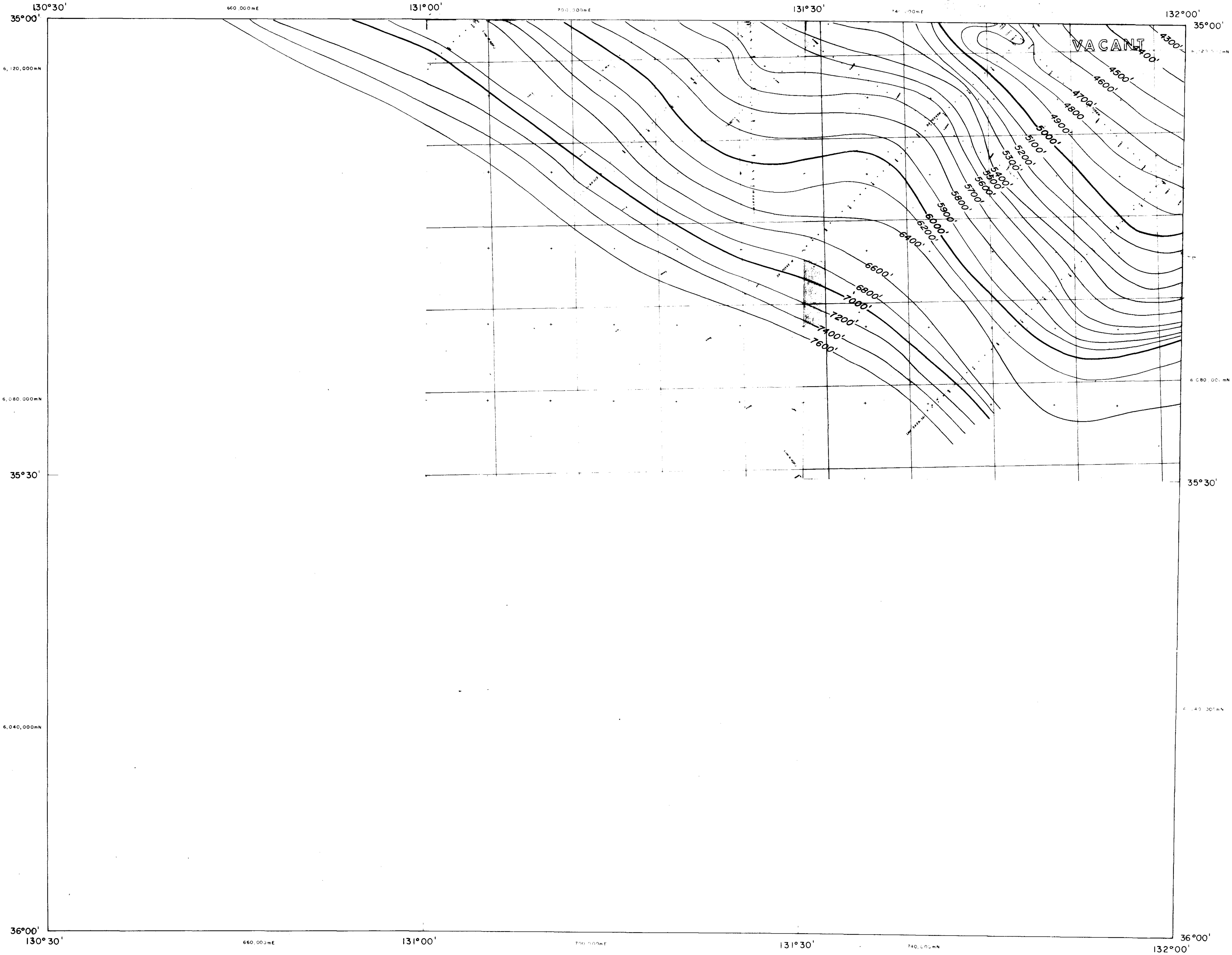
SOUTH AUSTRALIA OFFSHORE

BATHYMETRY

Scale 1:250,000

| | | |
|---|---|---|
| Author: South Aust Team | Date: March 1975 | Encl. 2C |
| Report No. S.D.A. 193 | Drawing No. 7045-1 | |

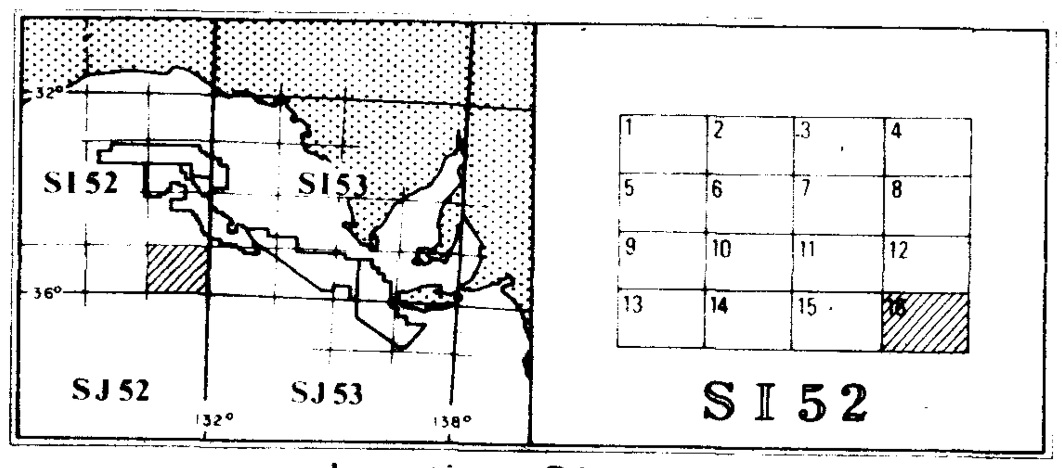
Sheet No. SI-52-12




2544-6

Scale

UTM Projection (Australian Map Grid) Zone 52 C.M.129°00'




Location Diagram

*Note*

CONTOUR INTERVAL 100 & 200 feet.

COMPILED FROM SEISMIC SURVEY DATA 66-74B



**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

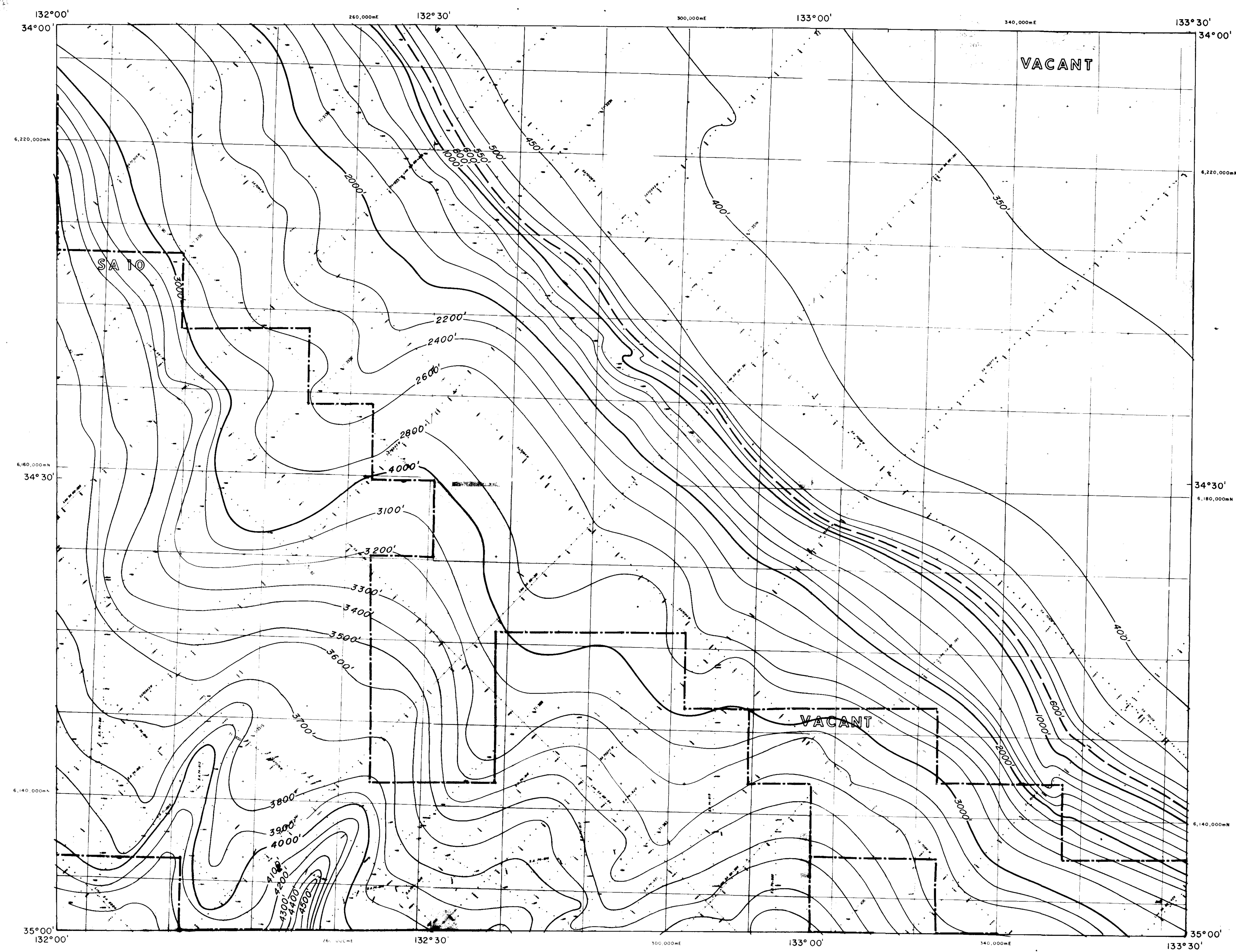
SOUTH AUSTRALIA OFFSHORE

BATHYMETRY

Scale 1: 250,000

| | | |
|---|---|---|
| Author: South Aust Team | Date: March 1975 | Encl.2E |
| Report No: S.D.A 193 | Drawing No: 7048-1 | |

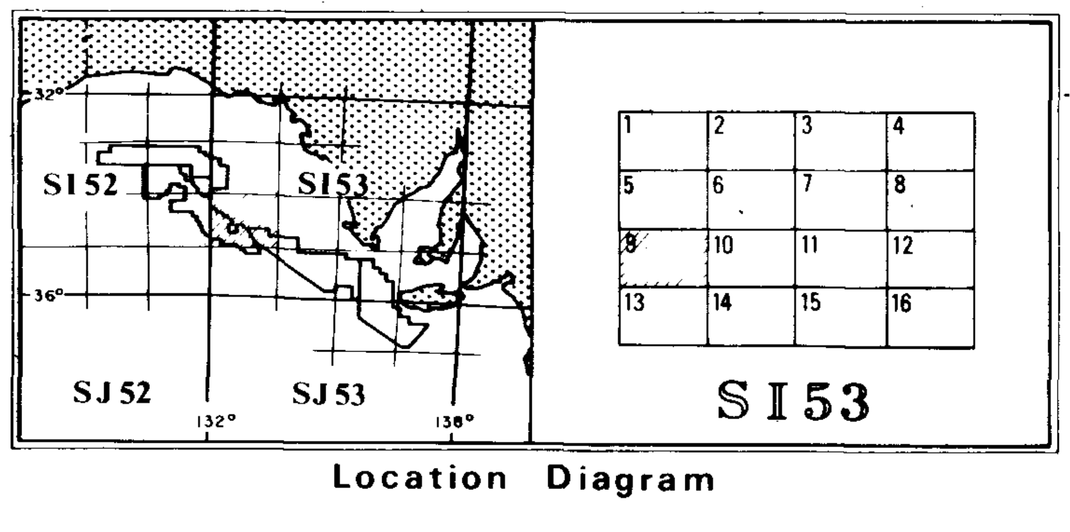
Sheet No. SI-52-16




2544-7

Scale

UTM Projection (Australian Map Grid) Zone 52 C.M. 129°00'




Location Diagram

*Note:*
CONTOUR INTERVAL 100 & 200 feet
COMPILED FROM SEISMIC SURVEY DATA 66-74 B



**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

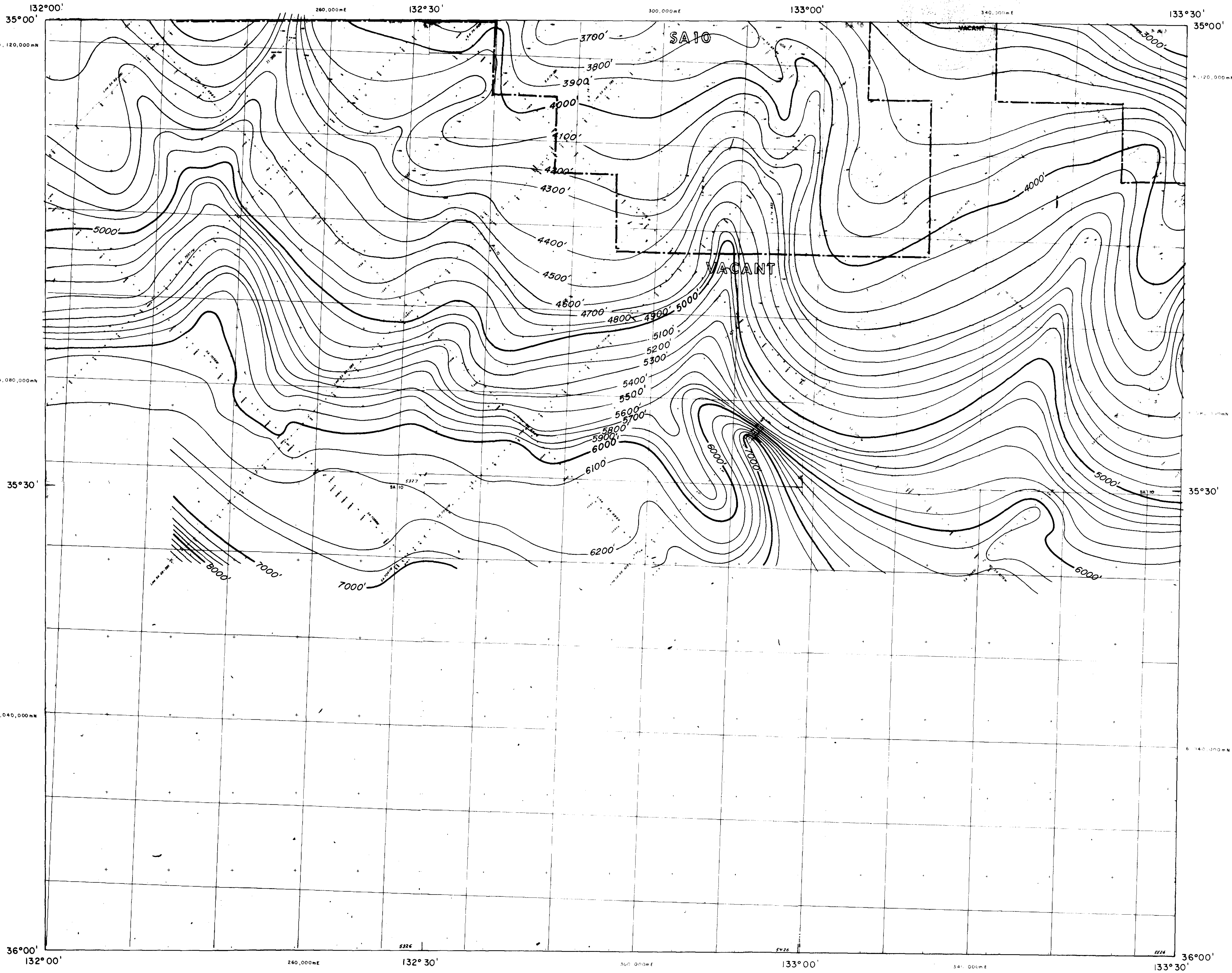
SOUTH AUSTRALIA OFFSHORE

BATHYMETRY

Scale 1 : 250,000

| | | |
|---|---|---|
| Author: South Aust Team | Date: March 1975 | Encl. 2F |
| Report No: S.D.A. 193 | Drawing No: 7046-1 | |

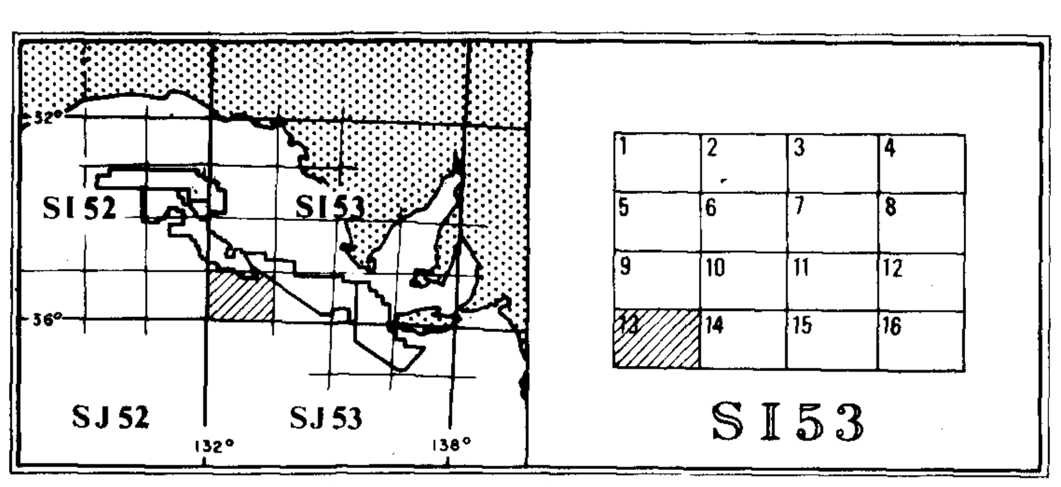
Sheet No. SI-53-9




2544-2

Scale

UTM Projection (Australian Map Grid) Zone 52 C.M. 129°00'




Location Diagram

Note:

CONTOUR INTERVAL 100 & 200 feet.

COMPILED FROM SEISMIC SURVEY DATA 66-748



**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

SOUTH AUSTRALIA OFFSHORE

**BATHYMETRY**

Scale 1 : 250,000

| | | |
|---|---|---|
| Author: South. Aust. Team | Date: March 1974 | Encl. 2A |
| Report No: S.D.A. 193. | Drawing No: 7049-1 | |

Sheet No. SI-53-13

LOCALITY MAP
S.A.
GREAT AUSTRALIAN BIGHT
ADELAIDE
S.A. 5
S.A. 11
S.A. 10
S.A. 6
Potoroo 1
ONLAP ON BASEMENT
FAULT
ELLISTON TROUGH
OUTCROP AGAINST SEA FLOOR
ENCLOSURE 5
2S44-8
N
Scale. 1:500·000
20 0 20 40 60 80 miles
20 0 20 40 60 80 100 kilometres
LEGEND
Zone of no data tentatively interpreted as carbonate reefs
Tentatively interpreted as magmatic intrusions
Note: Contour interval 100 and 50 msec.
SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.
SOUTH AUSTRALIA OFFSHORE
GREAT AUSTRALIAN BIGHT BASIN
SEISMIC TIME CONTOUR MAP
HORIZON 'A'
Scale 1 : 500,000
Author: South Aust Team
Date: March, 1975
Report No: SDA 193
Drawing No: 5175-2
Encl.3
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17 JUN 1975
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SECURITY


2544-9



LEGEND

Strong shallow reflection acting as screen for deeper data.

NOTE: Contour interval 100,50 msecs.

0 kilometres 15

**SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.**

SOUTH AUSTRALIA OFFSHORE
PERMITS SA10, SA11

REFLECTION TIME CONTOURS

**INTRA CRETACEOUS HORIZON**
**(LOCALLY TERTIARY)**

Scale 1:250,000

| | | |
|---|---|---|
| Author: South Aust Team | Date: January, 1975 | Encl. 4 |
| Report No: SDA 193 | Drawing No: 8517-1 | |

000013

OPEN FILE

# INTERPRETATION REPORT

# SOUTH AUSTRALIA OFFSHORE PERMIT SA-6

# R - 9 SURVEY

BY

SOUTHERN AUSTRALIA TEAM

SHELL DEVELOPMENT (AUSTRALIA) PTY.LTD.



SDA 206

NOVEMBER 1975

CONTENTS

ENCLOSURES

| | | SCALE | SHEET NO | DRAWING NO |
|---|---|---|---|---|
| 1. | Exploration Density Map, Permits SA-5, 6, 7, 10 and 11. | 1:1,000,000 | - | 8736 |
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| 3. | Structural Time Contours, 'A' Horizon | 1:100,000 | 5627,5727 | 8867 |
| 4. | Structural Time Contours, Upper Cretaceous Horizon | 1:100,000 | 5627,5727 | 8868 |
| 5. | Structural Time Contours, Mid Cretaceous Horizon | 1:100,000 | 5627,5727 | 8869 |
| 6. | Line 74B-459, Geological Cross-Section and Structural Evolution | 1:250,000 | - | 9020 |

## 1. INTRODUCTION

This report deals with the interpretation of 337 km of seismic data recorded in EPP No. SA-6 during the R-9 survey conducted in the Great Australian Bight in October and November 1974. The interpretation of the remaining 644 km of seismic data recorded in SA-10 and SA-11 during this survey has been presented in our report SDA 193,'Interpretation Report R-8 and R-9 Surveys, Offshore South Australia Permits SA-10 and SA-11' (May, 1975) which was forwarded to the Designated Authority on 10.6.75.

The survey in SA-6 was conducted in the western portion of the permit (Encl. 1) in water depths ranging from 850 to 1650m. 10 lines were shot in an area 30 x 40 km giving a grid density of 5 km. The shooting configuration was 24 fold, 48 trace with a 3200m streamer. Between 5 and 6 seconds of data below the sea bottom was recorded at a sample rate of 4 milliseconds. Recording and processing parameters were the same as for the remainder of the R-9 survey and are discussed in our report SDA 193 (op.cit.). The data quality in SA-6 was generally good.

The survey area in SA-6 extends over a major zone of dense, basement-controlled faulting marginal to the stable craton. Over the area the objective Cenomanian-Albian section is rapidly down thrown to great depths. The objective of the survey was to establish a sufficiently dense grid to enable the structural style in the Cretaceous section to be studied in detail in this area.

A bathymetric contour map (Encl. 2) and structural time contour maps of 3 horizons (Encl. 3, 4, and 5) were produced, at scale 1:100,000.

## 2. INTERPRETATION

The bathymetric contours (Encl. 2) reveal one major and several minor channels with a north-south trend. The vertical relief of the major channel is up to 250m. These channels modify the structural time contours but do not in themselves give rise to any apparent closures.

The uppermost horizon mapped, horizon 'A' (Encl. 3), occurs just below the base of the Tertiary carbonate section and is a strong seismic event of regional significance. In several places the event is a clear angular unconformity. The 'A' horizon is gently dipping to the south and is intersected by minor east-west trending faults of up to 200m throw. This movement is residual movement along much larger faults in the underlying section which were active in late Cretaceous time. Many of the latter faults have no expression at the 'A' horizon level. In the south of the interpreted area a time structural low is due to the influence of a seafloor channel.

The lowermost horizon mapped, horizon 'D' (Encl. 5), is believed to represent the boundary between Upper Cretaceous mudstones and the mid-Cretaceous 'Platypus sand' unit. The latter unit constitutes the primary exploration objective in the Duntroon Embayment and in Platypus-1, some 90 km to the east of the area mapped, consists of 500 m of interbedded sandstones, siltstones, clays and coals. It is not possible to make a direct correlation at any level in the Cretaceous section either to the east across the steep shelf edge to Platypus-1 or to the west into permit SA-10, however if the 'D' horizon is considered as a boundary between two major litho-units, each of which has a distinctive seismic expression in the regional sense, the correlation is quite acceptable in general terms.

Detailed correlation of the 'D' horizon in the northern half of the area mapped is relatively sound due to the strong seismic character of the event in this area. Further to the south this character is lost when the horizon is downfaulted to extreme depths and it is necessary to choose for mapping a shallower horizon within the overlying mudstone unit. This change of datum is indicated on Encl. 5. Correlation of the 'D' horizon over the dominant east-west faults is often critical as these faults cut diagonally across the northwest-southeast oriented square seismic grid. Small faults sometimes disappear and even large ones lose their character. Also the close spacing of the faults does not permit a round correlation within a single fault block without having to correlate across a fault.

Except for some small dip reversals and associated fault closures there is no evidence of a viable structural lead at this the objective level, even without considering the extreme water depth range of 900-1500m.

In the overlying Cretaceous section (between horizons 'A' and 'D') dip reversals were noted on several seismic lines. To illustrate these, one of the most consistent reflectors in this interval has been mapped (Encl. 4). This 'Upper Cretaceous' (Senonian) horizon is believed to represent the top of the Upper Cretaceous mudstone unit, from consideration of the gross seismic character of the overlying and underlying units. To the south across the major southern faults the character of this event is no longer distinguishable and it is necessary to choose new datums from within the mudstone unit. Although the fault displacements at this level are generally small (200-300m) with the exception of one major fault in the north (displacement up to 800m) and another in the south (displacement uncertain), character changes across all faults are common and correlation is always rather unreliable.

In order to determine the magnitude of the distortion of the time structure by the variation in sea floor topography, replacement of the water layer with material of velocity 2000 m/sec was carried out manually using the picked reflection times of the mapped 'Upper Cretaceous' level. This approach was considered justifiable as the sea floor is an erosional surface on the Tertiary limestones (see geological cross-section, Encl. 6). The velocity of 2000m/sec for the upper part of the limestones was determined from the mini-700 velocity analyses. The result of this exercise was that the structural picture remained essentially unchanged, i.e. the highs stayed high and the lows stayed low. As all the leads are small and the water depth ranges from 900m to 1500m, a full depth conversion was therefore deemed unnecessary.

3. STRUCTURAL EVOLUTION

As has been previously mentioned, it is not presently possible to establish a direct correlation at any level within the Cretaceous section, either east to Platypus-1 or west to SA-10/Potoroo-1. However the Cretaceous section in the survey area can be subdivided into major units on the basis of gross seismic character; these units show some similarity to the Cretaceous seismic units in the adjacent permits SA-10 and SA-11, and can be correlated in general terms with the major lithostratigraphic units in Potoroo-1 and Platypus-1. It is thus possible to predict the stratigraphy in the survey area, which has been done on the geological cross-section (Encl. 6) constructed from line 74B-459.

As may be seen from Encl. 6, the dominant structural feature is the zone of densely spaced, normal, down-to-the-basin faults adjacent to the craton. This zone extends across and beyond the survey area. The majority of these faults appear to be almost linear in depth cross-section, or even become steeper at depth, and are presumed to be the expression of differential movement between basement blocks. The timing of the movement on these faults appears to have been variable through Upper Cretaceous time; some faults became dormant in Cenomanian time; some faults became dormant in the Cenomanian/Turonian and others had ceased to move by the early Senonian. Most such basement controlled faults however show considerable late Cretaceous-? Paleocene movement in the normal sense and some show residual normal movement subsequent to the Lower Tertiary hiatus. The movement on all faults in this class appears to have been fairly abrupt and often appears to have taken place in several phases. The dips in the fault blocks controlled by these faults are either gently seaward dipping resulting from the regional thickening in that direction, or gently landward dipping as a result of tilting of the fault blocks.

A second, subordinate class of faults, exemplified on the cross-section by faults F1, F2 and F3, has a curved trace in cross-section which becomes less steep with depth. These faults appear to exhibit fairly continuous growth and at depth give rise to rollover dip in a landward direction. The growth ratios associated with these faults are low, e.g. for fault F1, 1.1.

The density of faulting is such that the branching and merging of faults is common. The throw of some of the smaller faults may be seen to decrease laterally, and faults may die out altogether. The map trace of all faults is non-linear as distinct from the linear fault traces of the fault angle depressions prevalent in permits SA-10 and SA-11.

A further complication to the structural picture is the anticlinal feature on the left hand side of the cross-section. This feature is believed to have arisen during the regional uplift in late Cretaceous-Paleocene time that caused the stripping of varying amounts of section and gave rise to the 'A' horizon unconformity. This latter unconformity has previously been termed the breakup unconformity due to its association with the separation of the Australian and Antarctic continental plates. In parts of the Duntroon Embayment it has been estimated that up to 3000m of sediment have been removed during this stripping phase. In the survey area however, little section appears to have been removed; the rapid, fault-controlled thinning towards the craton appears to be largely depositional as it occurs over the entire Upper Cretaceous section.

In the survey area the anticlinal feature is associated with small antithetic faults. As may be seen from the Eocene and Senonian cross-sections, the age of this feature is most likely late Senonian-Paleocene. The Senonian section also best illustrates the two main styles of faulting, viz.basement-controlled and growth-type. On this latter section the small antithetic faults associated with the anticlinal structure have disappeared.

## 4. CONCLUSIONS

The results of this survey have enabled new models for the structural style and basin setting to be postulated for this part of the Great Australian Bight Basin. Two distinct styles of faulting, basement-controlled and growth-type, have been recognised, and a late Cretaceous phase of anticlinal deformation has been established. By comparison of the character of the major seismic units the stratigraphic position of these units has been predicted, albeit in general terms, with some confidence. Finally from the rapid thinning of the Upper Cretaceous section observed in a landward direction it is postulated that this area occupied a position marginal to the stable craton, throughout Upper Cretaceous time.


2S44-10

SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.

SOUTH AUSTRALIA OFFSHORE

LINE LOCATION MAP

Scale 1: 1,000000

| | | |
|---|---|---|
| Author: S.A. Team | Date: Nov. 1975 | Encl. 1 |
| Report No: SDA 206 | Drawing No: 8735 | |


2544-11

SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.

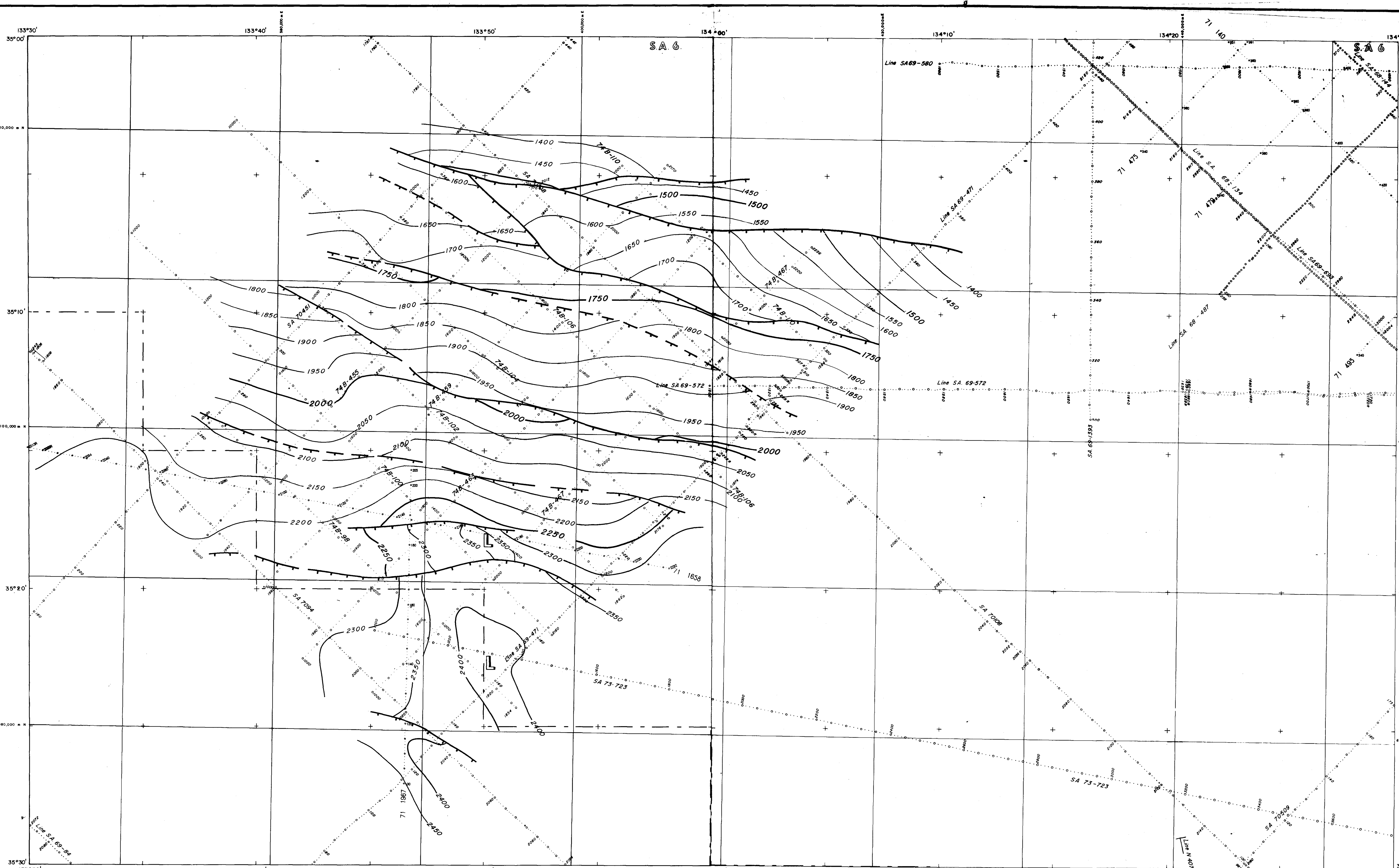
SOUTH AUSTRALIA OFFSHORE

# BATHYMETRIC CONTOURS

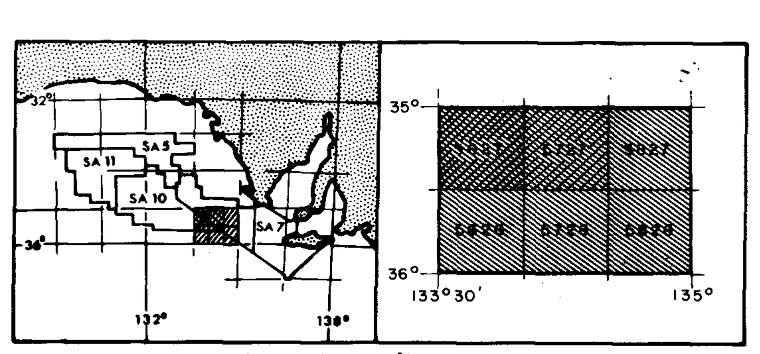
Contour interval : 50 m

Scale 1:100,000

| Author : South Aust Team | Date November 1975 | | Sheet Nº 5627 5727 |
|---|---|---|---|
| Report: SDA 206 | Encl 2 | Drawing No. 9366 | |




2544-12




Scale 2 0 2 4 miles

2 0 2 4 6 kilometres

Universal Transverse Mercator projection (Clarke 1858)

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REFLECTION TIME CONTOURS

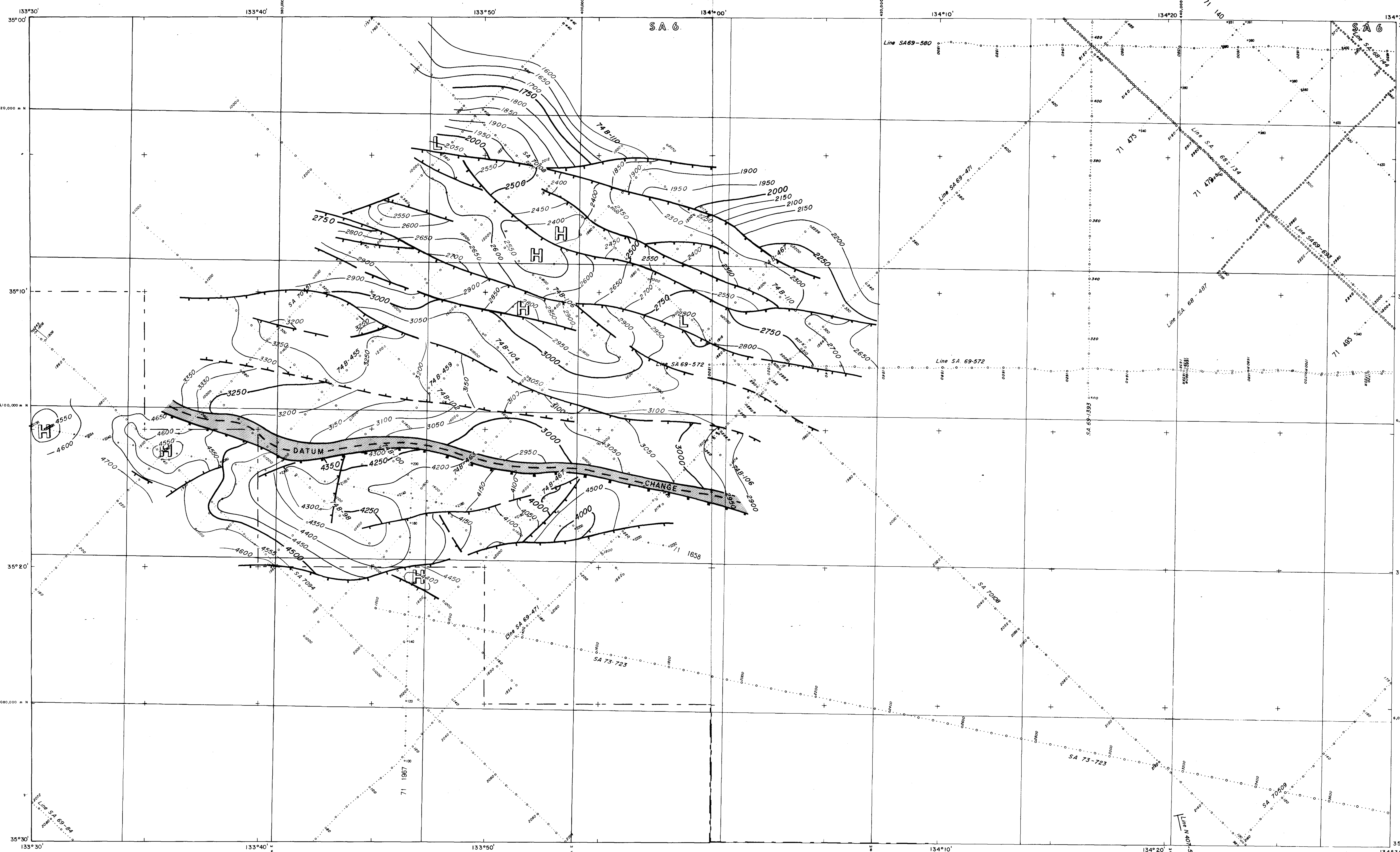
# HORIZON A

Contour interval : 50 m.sec.

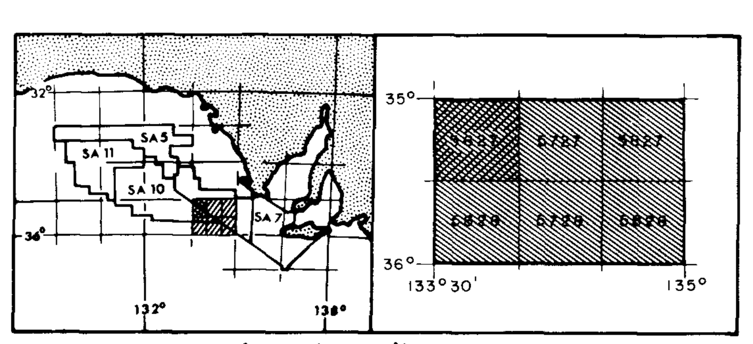
Scale 1:100,000

| | | |
|---|---|---|
| Author : South Aust Team | Date November 1975 | Sheet N° 5627 5727 |
| Report SDA 206 Encl 3 | Drawing No. 8867 | |

June, 1973




2544-13




Location diagram

Scale
2 0 2 4 miles
2 0 2 4 6 kilometres
Universal Transverse Mercator projection (Clarke 1858)



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REFLECTION TIME CONTOURS

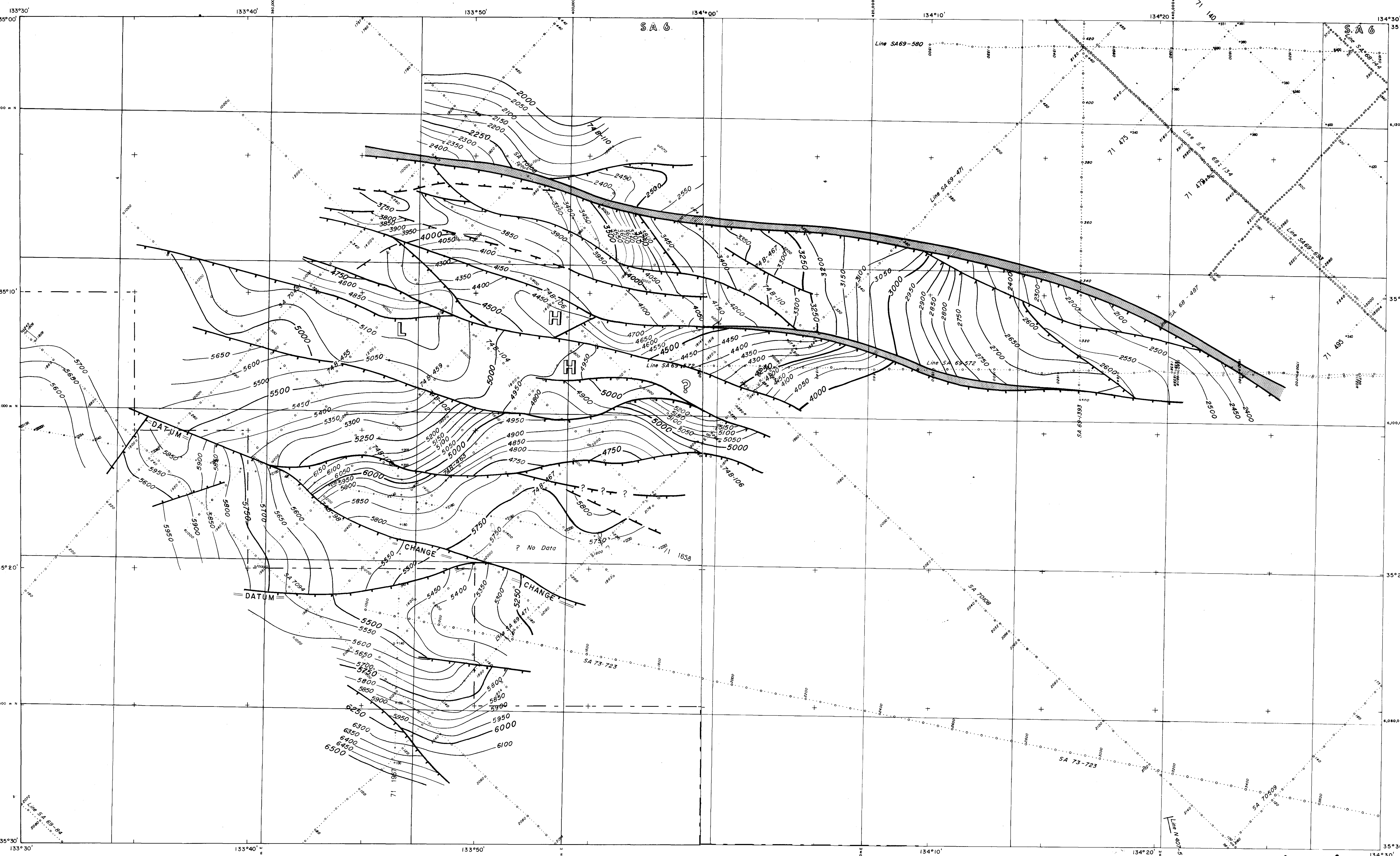
# UPPER CRETACEOUS HORIZON

Contour interval : 50 m.sec.

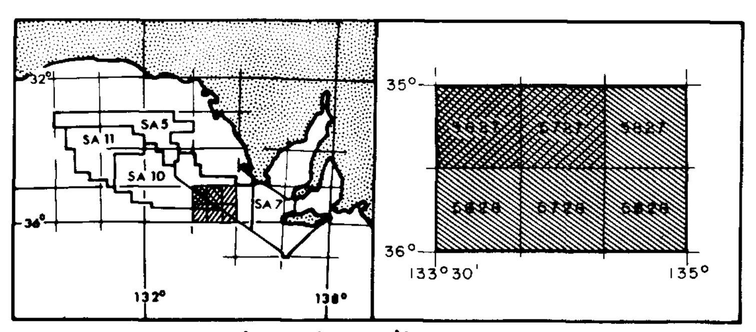
Scale 1:100,000

June, 1973

| Author : South Aust Team | Date November 1975 | Sheet Nº 5627 5727 |
|---|---|---|
| Report: S.DA 206 · Encl 4 | Drawing No. 8868 | |




2S44-14


Location diagram

Scale
2 0 2 4 miles
2 0 2 4 6 kilometres
Universal Transverse Mercator projection (Clarke 1858)

June, 1973

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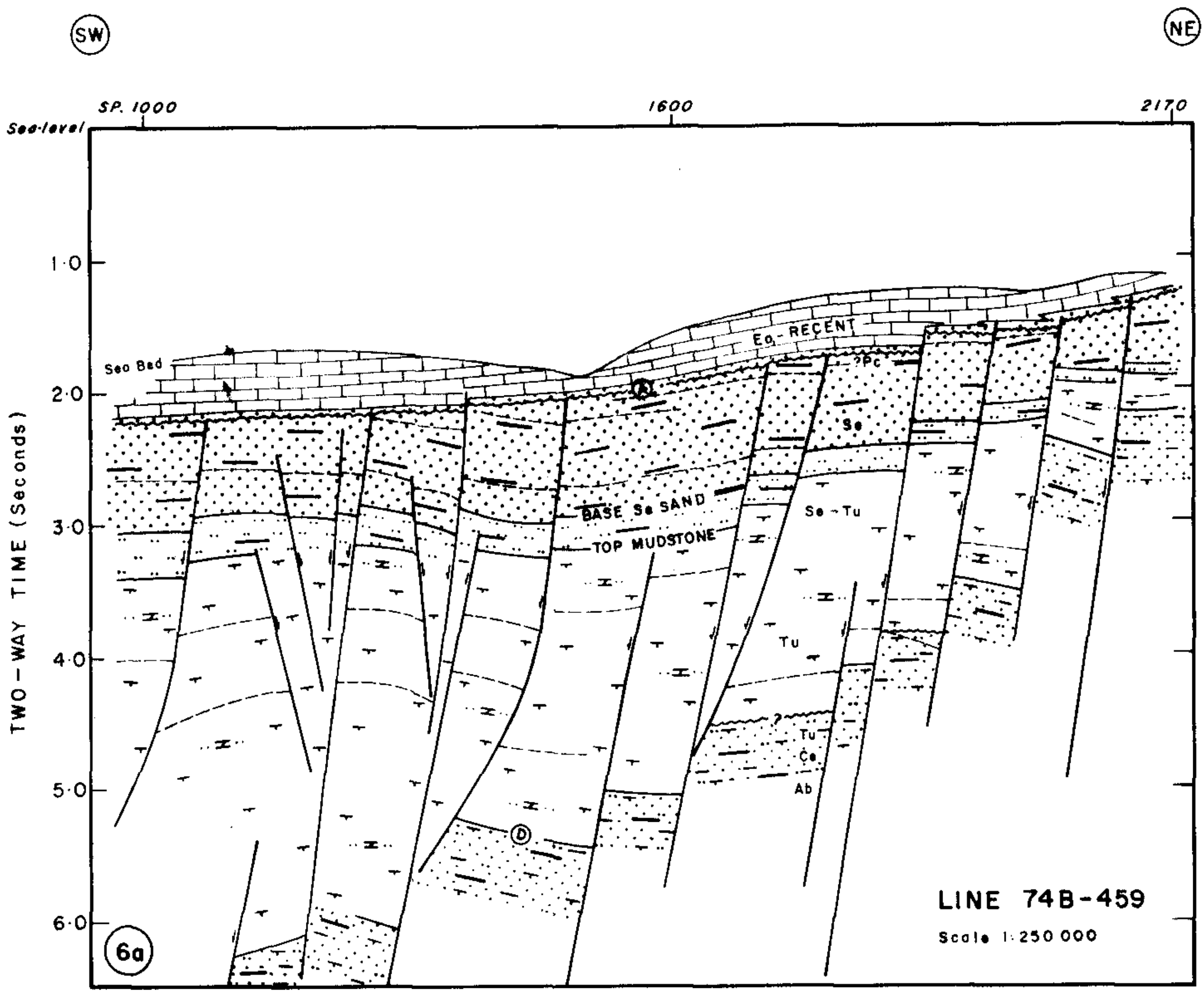
REFLECTION TIME CONTOURS

# MIDDLE CRETACEOUS HORIZON

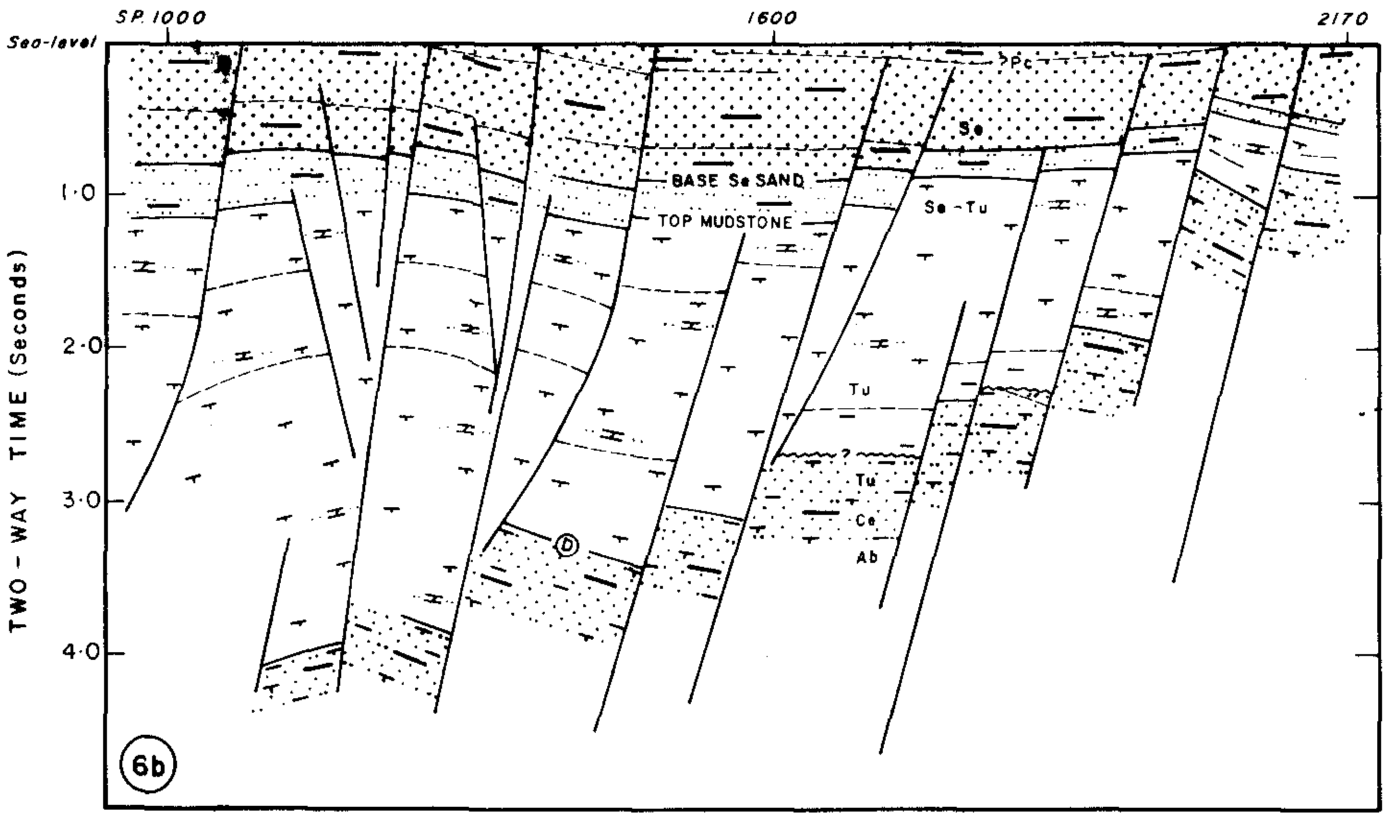
Contour interval: 50 m.sec.

Scale 1:100,000

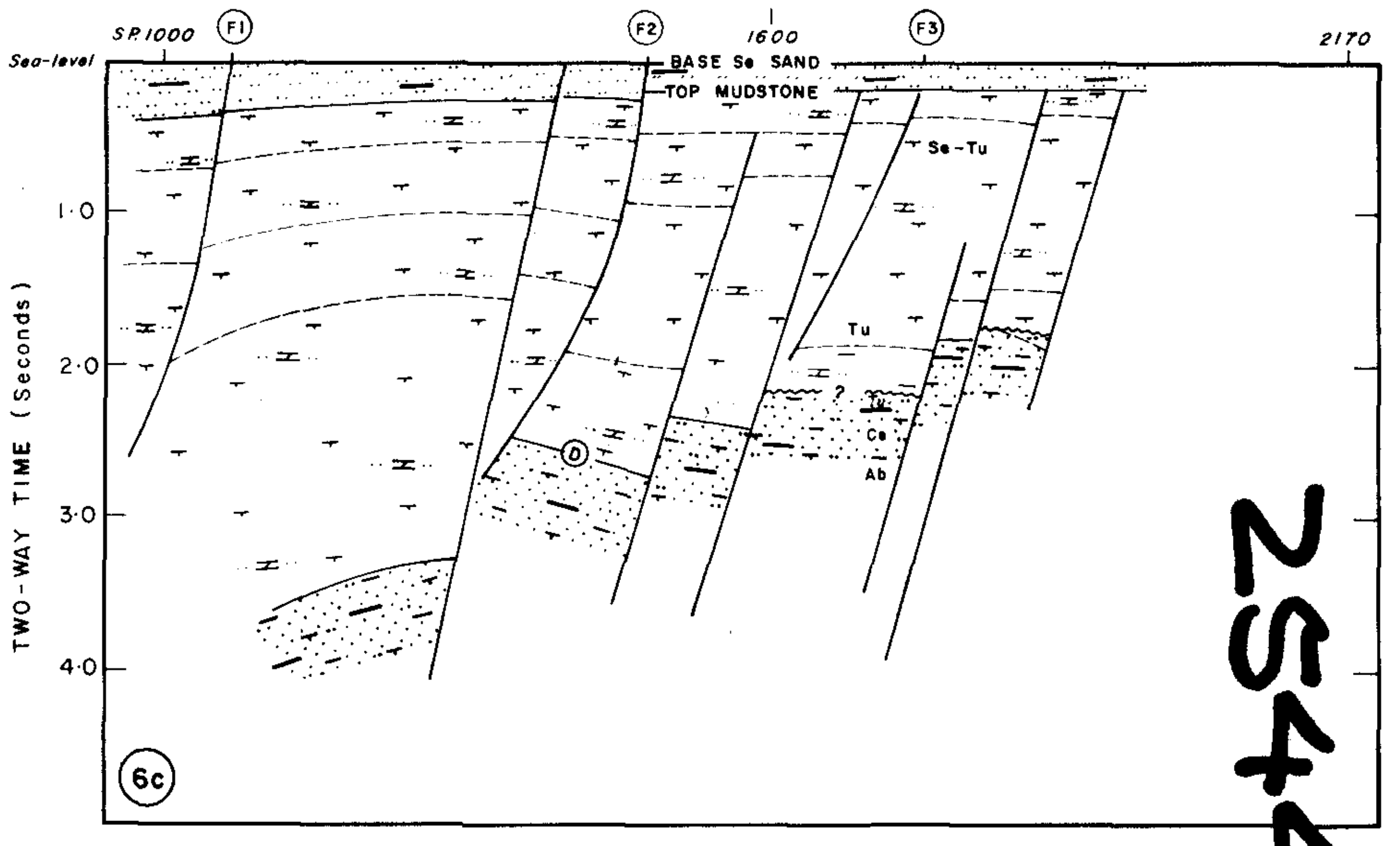
| | | | |
|---|---|---|---|
| Author: South Aust. Team | | Date November 1975 | Sheet No 5627 5727 |
| Report: SDA 206 | Encl 5 | Drawing No. 8869 | |




WATER TOP REFERENCE (PRESENT)




'A' HORIZON REFERENCE (MIDDLE EOCENE)




'BASE Se SAND' REFERENCE (SENONIAN)

2S4-15



SOUTH AUSTRALIA OFFSHORE

PERMIT SA-6 (DEEP WATER)

LINE 74B-459 GEOLOGICAL CROSS-SECTION AND STRUCTURAL EVOLUTION

| | | |
|---|---|---|
| Author: S.Aust. Team | Date: November, 1975 | Encl. 6 |
| Report No: SDA 206 | Drawing No: 9020 | |