EAST BASS BASIN part 3 / 1

066001 427

Bass Basin part V

FINAL SUBSIDY REPORT

of

THE OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY, EC-67

Prepared for

THE BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

Submitted by

ESSO EXPLORATION AND PRODUCTION AUSTRALIA, INC.

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May 1968

066002

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ABSTRACT

The Offshore Gippsland Basin Marine Seismic Survey, EC-67, was conducted from September 1, 1967 to November 24, 1967. Purpose of the survey was to establish prospective areas on the southwestern margin of the basin. Approximately 465 miles of six-fold C.D.P. reflection seismic information was digitally recorded and digitally processed by Geophysical Services International. Previous surveys in the area consist of single-fold, analog data. All existing seismic data have been incorporated into interpretations covering the EC-67 survey.

Objectives of the EC-67 survey were to better define the southwestern margin of the Gippsland Basin and to extend seismic control grid into previously unexplored areas in the Basin. The quality of the data is considered good and reliable. Structure maps were made from reflections at the top of the Lakes Entrance Formation, top of the Latrobe Delta Topographic Surface, and top of Basement. Isopachous maps of the Lakes Entrance to Latrobe Delta and Latrobe Delta to Basement also accompany the report.

Results obtained from the EC-67 survey clearly defined Basement structural features and onlapping sediments of the Latrobe Delta and Lakes Entrance formations. Stratigraphic traps are indicated in the EC-67 survey area and will be pursued in future exploration efforts.

INTRODUCTION

The Offshore Gippsland Marine Seismic Survey EC-67, was conducted in the Bass Strait and Tasman Sea between September 1, 1967 and November 24, 1967. Approximately 1260 miles of six-fold C.D.P. reflection seismic data was recorded and processed digitally. The remaining area in Gippsland Basin qualifying for subsidy is defined by 40 mile radii drawn from Barracouta A-1 and B-1 gas wells and a 30 mile radius drawn from the Kingfish A-1 oil well. Approximately 465 miles of the EC-67 survey falls within the subsidy area of the Gippsland Basin. The exploration program covered in the report was done by Esso Exploration and Production Australia Inc. in connection with a farm-in agreement with Hematite Petroleum Pty. Ltd. that cover the following exploration licences: P.E.P. 38 in Victoria, P.E.P. 39 in Victoria, and E.L. 1/60 in Tasmania.

Field work and processing was done by Geophysical Services International, and supervision and interpretation was done by Esso. Field operations are covered in a comprehensive report by G.S.I. that is included in the appendix of this report.

Accompanying the report are subsurface structure maps and isopachous maps interpreted from seismic data obtained from previous surveys and the EC-67 survey.

GIPPSLAND BASIN - GENERAL

The Gippsland Basin is in southeastern Victoria, Australia with approximately two-thirds of the basin located offshore in the Tasman Sea. Water depths vary from 0 to greater than 600 feet, however most of the area falls inside the 300 feet water depth contour.

In general, the term Gippsland Basin refers to those rocks of Upper Cretaceous and Tertiary age. These sediments are underlain by some 20,000+ feet of Lower Cretaceous and several thousand feet of Paleozoic rocks. During the Paleozoic era, the present Gippsland Basin area was part of the broad north-south trending Tasman Geosyncline which extended along the entire east coast of Australia. In Lower Cretaceous time a thick section of sub-graywacke, siltstones and shales was deposited in an east-west trending regional graben or half-graben in contrast to the older depositional trend. The Gippsland Basin began to assume its present configuration at the beginning of Upper Cretaceous time.

The Gippsland Basin is wedge-shaped with the apex to the west and opening to the east. It is bounded on the north by a broad north-south trending mountain system where sedimentary, fine and coarse grained igneous, and some metamorphic Paleozoic rocks outcrop. Eastward the basin extends offshore at least as far as the present continental slope and probably beyond. The southern boundary of the Upper Cretaceous-Tertiary basin is marked by the large normal down-to-the-north east-west trending Foster Fault System, giving the basin a half-graben configuration. The Lower Cretaceous, Upper Cretaceous, Paleocene and most of the Eocene sediments are confined to the north down-side of this fault system. In Late Eocene the fault system stabilised and sediments began to onlap the low-lying granitic area to the south. Older units are progressively overstepped by the younger units. The stable area south of the fault system, the granitic Bassian Rise, extending from Wilsons Promontory to the northeastern corner of Tasmania, separated the Gippsland and Bass Basins. The northern boundary of the basin is a shelfal area with all sediments of the Gippsland Basin thinning by onlap and convergence. Younger sediments generally overstep the older units.

066006

SOURCE AND QUALITY OF DATA

The EC-67 marine seismic reflection survey was conducted by Geophysical Services International (G.S.I.) under contract to Esso Exploration and Production Australia, Inc. Field operations commenced on September 1, 1967 and finished November 24, 1967. In the area covered by this subsidy report, six-fold common depth point (C.D.P.) data was digitally recorded from Nitro-Carbo-Nitrate explosive derived signals. Shots were fired from the center of a 6900 foot streamer every 600 feet to obtain the C.D.P. coverage. Esso supervisory personnel were on board the recording boat throughout the field operations.

Digital field data was processed at the G.S.I. Digital Processing Center in Sydney, N.S.W., Australia with time varying deconvolution (TVD) applied. Final presentation is on V.D.F. sections using a 10 to 50 CPS filter range. In general, the quality of data ranged from good to very good. Esso process interpreters derived velocity functions and supervised all processing at the G.S.I. center.

OBJECTIVES OF SURVEY

On previous seismic surveys in the area covered by this report, indications of basin sediments onlapping shallow basement were observed. This onlapping sequence associated with irregular basement features would afford excellent stratigraphic trap possibilities. The EC-67 survey was programmed to better define the possibility of stratigraphic or structure traps on the southwestern margin of the Gippsland Basin. Through the efforts of this survey, a good grid of control has been established, and the presence of Eocene and younger sediments wedging out against the basement complex has been confirmed.

RESULTS OF SURVEY

A. Interpretation Parameters

An effort was made to tie known seismic events from the Dolphin A-1 well and the Kingfish wells into the area covered by this report. From these wells the reflections mapped for this report have been identified as follows:

1) Lakes Entrance Formation (Oligocene)
This event is recognized over the whole basin and is found in a rather massive mudstone sequence that ranges from a soft calcareous shale and marl at the top to a glauconitic sandstone at the base. Depositional environment of the Lakes Entrance formation was marine. Some difficulty was encountered in following the continuity of this reflection where faulting is present and where Miocene channel cuts have eroded away most of the formation.

2) Latrobe Delta Topographic Surface (Eocene-Paleocene-Upper Cretaceous).
The reflection mapped as the Top of the Latrobe Delta Topographic Surface was carried from well ties at Dolphin A-1 and Kingfish field into the area covered in this report. The Latrobe Delta event can be mapped with good continuity over the entire area to the point of truncation against the Basement complex.

3) Basement
The seismic event carried as Basement represents the top of the true basement complex in the area southeast of line EC-109, and the top of economic basement (Lower Cretaceous) northwest of line EC-109. In the case of true basement the reflection appears as a very strong low frequency reflection with an immediate decline in seismic energy below. Structure of the Basement complex is also complicated by a considerable amount of faulting.

Interpretation Parameters and quality of data over the area covered by this report are considered good and reliable.

B) Mapped Horizons

Horizons that have been mapped and included in this report are on a map scale of 1:100,000. The area is covered by Plate a (Northwest portion) and Plate b (Southeast portion).

Structure Contour maps enclosed are as follows:
1) Lakes Entrance Formation (Oligocene) Plates Ia and Ib
2) Latrobe Delta Topographic Surface (Eocene-Paleocene-Upper Cretaceous) Plates IIa and IIb.
3) Basement Complex Plates IIIa and IIIb.

Isopachous Contour maps enclosed are as follows:
1) Lakes Entrance to Latrobe Delta Plates IVa and IVb
2) Latrobe Delta to Basement Plates Va and Vb
In addition, a Water Depth map (Plate VII) at a scale of 1:250,000 covering the entire Basin, and Shotpoint Base maps, Plates VIa and VIb, are included.

Structure maps are contoured in depth with datum being sea level and static corrections applied for variations in water depth. The Time-Depth table used for depth conversions on structure maps is a composite of all velocity data available at this time. The following is a discussion of the significant features of each of the Mapped Horizons.

1) Lakes Entrance Formation (Oligocene)
Structure on the Top of the Lakes Entrance formation is primarily that of transgressive onlap sequence. The section is characterized by gradual thining to the west and a rather constant dip of approximately between one and two degrees per mile basinward to the northeast. The most significant structural feature is the anticlinal closure on Plate Ib immediately adjacent to the area where Miocene channel sediments have cut into the Lakes Entrance formation. This structure is probably a result of the Miocene Channel activity. Another structural feature is noted on Plate Ia on line EC-108 and can be related to a positive Basement feature associated with up-to-the-basin faulting.

The total thickness of the Lakes Entrance formation as shown on the Isopach maps on Plates IVa and b exhibits a general thickening into the Basin. This isopach shows little or no structural growth in Lakes Entrance time. Thinning in the area of the Miocene Channel cut is probably a result of channel erosion.

2) Latrobe Delta Topographic Surface structure is generally monoclinal dipping one to three degrees per mile into the Gippsland Basin. The significant feature of the Latrobe Delta is that onlapping sediments are truncated against the Basement Complex. Should the Latrobe Delta stratigraphy remain similar to that found deeper in the Basin, the areas where sediments onlap Basement depressions or between protrusions of the Basement complex extending basinward will form excellent stratigraphic traps. Two such areas are indicated on the Latrobe Delta structure and isopachous maps.

   Two structural anomalies warrant comment. Most prominent of these would be the faulted closure on the northwest portion of Plate a and on line EC-108. This anomaly as mentioned in the discussion of the Lakes Entrance occurs from a Basement feature. The second anomaly is the small closure associated with another Basement high on line EC-163 and EC-159. This event may be due to some type of extrusive rather than sedimentary build-up.

3) The Basement structure picture in this area is of primary importance because the Basement anomalies form the traps for Latrobe sediments. The structural features shown on the Basement maps (Plates IIIa and IIIb) are probably topographic remnants left from the erosion of the Bassian Rise ridge. The Bassian Rise was very likely peneplained early in Cretaceous time with most of the sediments being carried into the central part of the Basin. Thereafter, very few sediments were deposited until the close of the Eocene when the Latrobe Delta Complex had filled most of the Gippsland and had begun to onlap the Bassian Rise. Succeeding sediments continued to onlap the rise until middle Miocene time when sediments probably either spilled over or were joined with sediments from the Bass Basin.

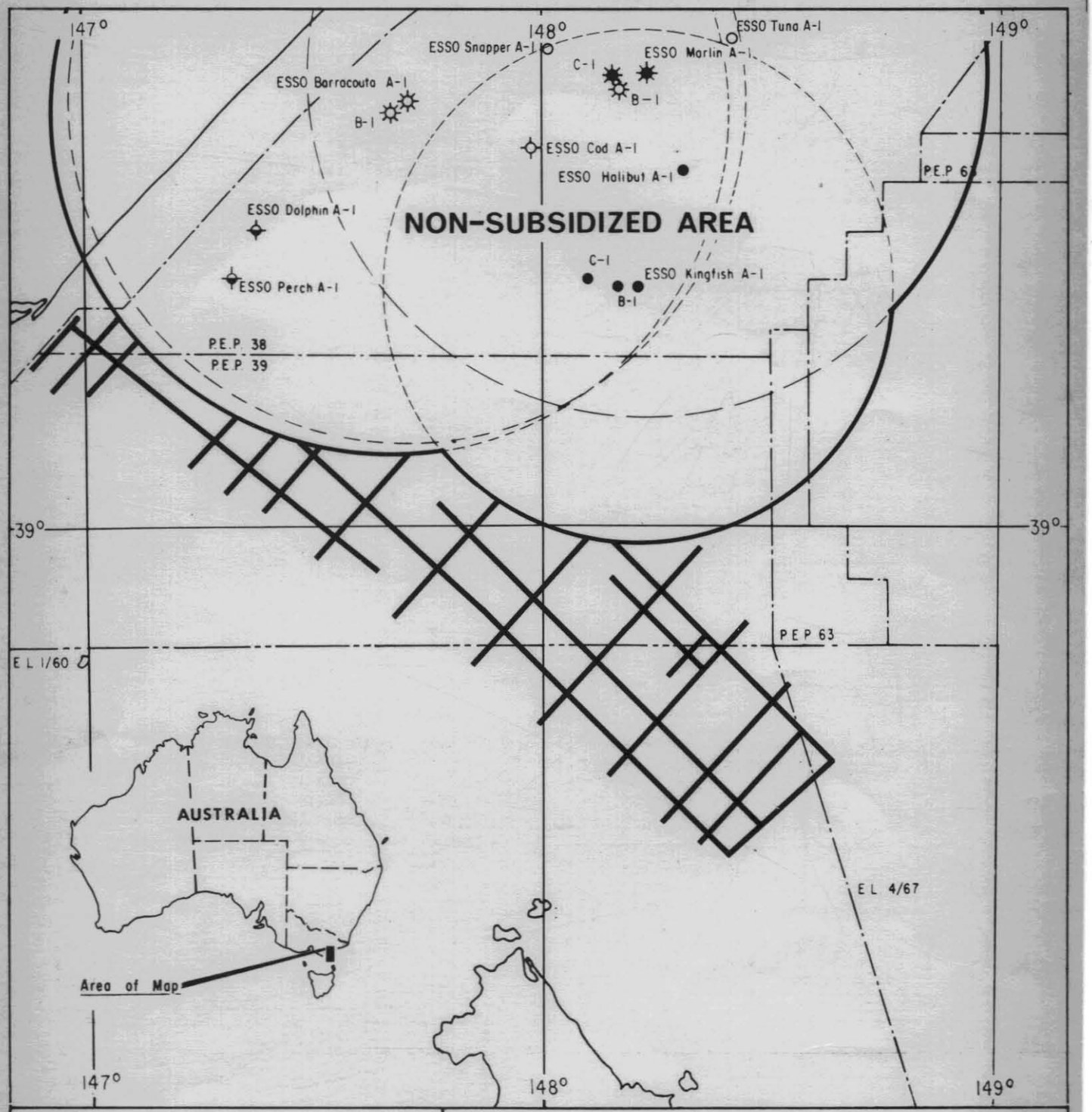
CONCLUSIONS AND RECOMMENDATIONS

The EC-67 Marine Seismic Survey was of very good quality. Results of interpretation of data received from the EC-67 and pre-existing surveys has shown the presence of good stratigraphic prospects along the southwestern margin of the Gippsland Basin. There are also one or two structural leads that may be of economic interest at a later time.

It is evident that the improved quality of the digital data of the EC-67 survey enabled detailed interpretation of the area covered by this report.

Additional digital shooting should be programmed to better define the truncation boundary between the Latrobe Delta and Basement, and to determine the areal extent of possible stratigraphic traps.

066009



EC-67 seismic survey lines

Oil well

Gas well

Well, abandoned with oil show

Well, dry and abandoned

Petroleum tenement boundary

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

LOCATION MAP

5 cm

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY, EC-67, MAY 1968

SCALE

20 10 0 20

Miles

FIGURE 1

1008/G/PI

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

GIPPSLAND BASIN

VICTORIA – TASMANIA

SCHEMATIC OF CONTOURED HORIZONS

A. FULL LINES REPRESENT CONTOURED HORIZONS AND THE GENERAL BASINWARD EXTENT TO WHICH THEY CAN BE RELIABLY FOLLOWED.

B. DASHED LINES REPRESENT INTERPRETATION OF GENERALIZED REGIONAL TRENDS WHICH ARE NOT CAPABLE OF SPECIFIC SEISMIC MAPPING.

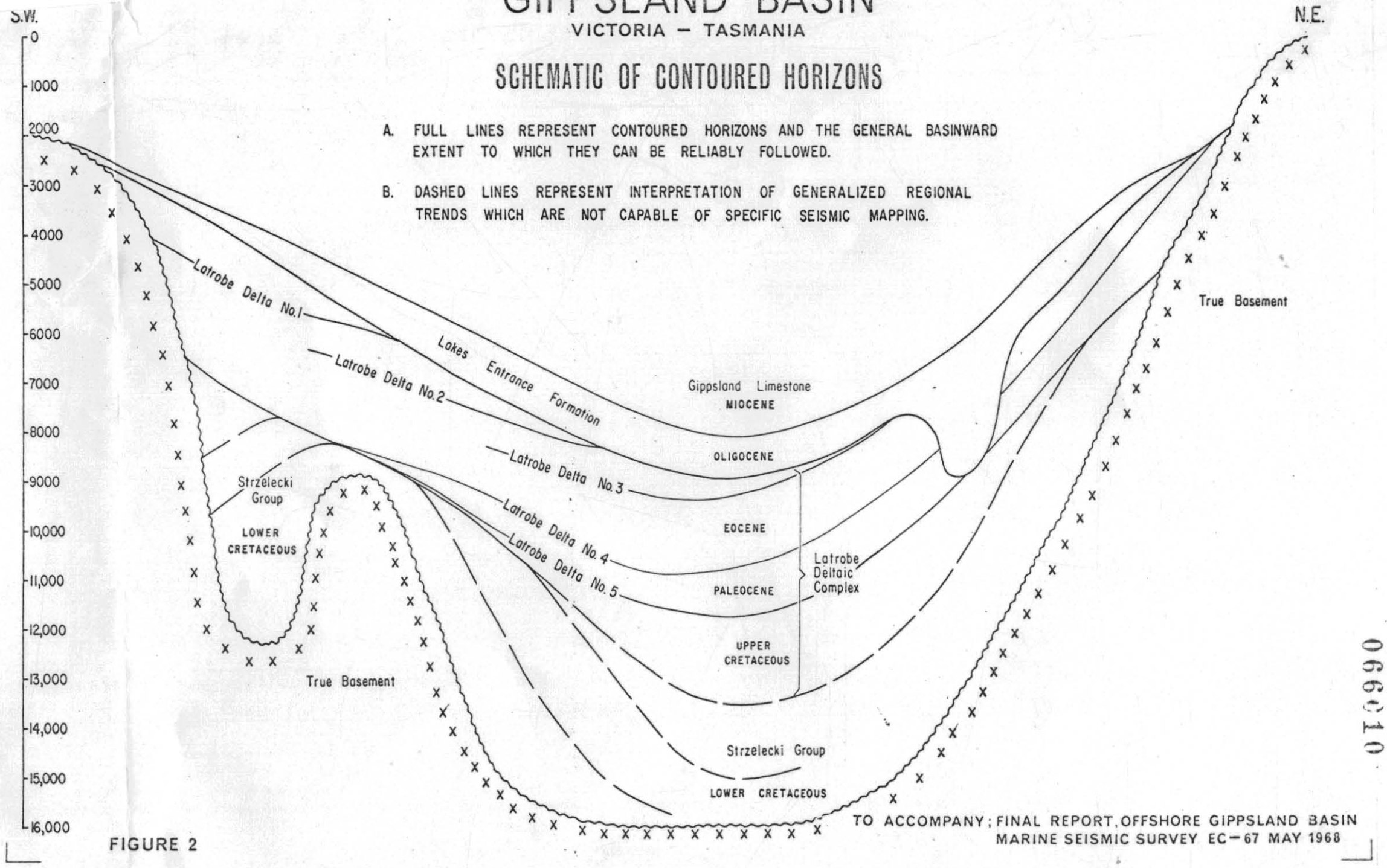


FIGURE 2

TO ACCOMPANY; FINAL REPORT, OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY EC–67 MAY 1968

8/G/P2

066010

AGE	FORMATION	GRAPHIC	FLUIDS	LITHOLOGIC DESCRIPTION	
Quaternary				Sand - Silt and Clay	Non-marine
U.Pliocene	Haunted Hill Gravels		Fresh water	Gravel - Sand and Clay	Non-marine
L.Pliocene	Jemmy Point Fm.		Fresh water (Artesian)	Friable fossiliferous sandstone, sandy marl with bryozoa	Marine
U. Miocene	Tambo River Fm.			.Interbeds marl and limestone, fossiliferous	Marine
Miocene	Gippsland Fm.		Rarely porous Local ss Dev. in EGS I & II - Saltwater	Soft, calcareous marl, and shale - with occ. streaks lt. grey, micritic, foss. ls. SS. White, fine-medium grained, with good porosity and permeability	Marine
Oligocene	Lakes Entrance Fm. Glauconitic member- Colquhoun Gravel member		Fresh water	Soft, calcareous shale and marl Glauconitic member-very shaly, very glauconitic sandstone with local pockets of Perm. Colquhoun Gravel-present along northeast rim of basin, conglomerate and sandstone with good porosity & perm. Changes facies to southeast to calcareous marl and shale	Marine
Eocene	Latrobe Valley Fm.		Fresh water 500 ppm to salt water (48,000 ppm)	Interbedded sandstone, coal and shale Sandstone, quartzose, Very fine to medium to coarse, poorly sorted to well sorted, sub-rounded to sub-angular, friable, carbonaceous. Coal - brown to black Shale - brown to grey, micaceous and carbonaceous	Non-marine
Paleocene-Upper Cretaceous Undiff.	Unnamed		Salt water 50,000 ppm	Interbedded sandstone, shale, coal and siltstone Sandstones, quartzose, fn. to medium to coarse, sub-rounded to sub-angular, well sorted to poorly sorted, carbonaceous, micaceous, cemented with white clay material Siltstones - are argillaceous, carbonaceous, and micaceous Shale - medium to brown, carbonaceous, micaceous Coal - black with conchoidal to sub-conchoidal fracture	Non-marine
Lower Cret. & Jurassic	Strzelecki Group		Salt water 18,000 ppm	Over 8,400' greywacke, feldspathic sandstone, siltstone, carbonaceous shales, black coal and fossil plants, dips to 30° common	Non-marine
Permian				Sandstone very fine to fine, friable to poorly indurated with white clay cement. Shale - dark brown to medium grey. Basaltic volcanics. - Present in Duck Bay-1 only	Non-marine ?
Lower Carbon. to Upper Dev.	Avon River Group			Redbeds, sandstone, conglomerate, siltstone & shale (present in one well) (S.W. Bairnsdale)	Non-marine
Basement					

FIGURE 3 TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY, EC-67 MAY 1968

096011

146°45' 147°00' 15' 30' 147°45'

38°30'

38°45'

39°00'

39°30'

WOODSIDE

ST. MARGARET ISLAND

WOODSIDE P.E.P/42

*ESSO "HEMATITE P.E.P.38

ESSO HEMATITE P.E.P 39

ESSO HEMATITE E.L. 1/60

ESSO Perch A-1
T.D. 9417'

VICTORIA
TASMANIA

HOGAN GROUP

KENT GROUP

B A S S S T R A I T

LINE - XII
LINE - X
LINE V-40
LINE V-13
LINE V-15
LINE V-11
LINE V-38
LINE V-16
LINE V-39
LINE V-30
LINE V-14
LINE V-17
LINE V-32
LINE V-35
LINE V-36
LINE V-37
LINE V-34
LINE V-33
LINE V-31
LINE V-29
LINE V-28
LINE V-27
LINE V-26
LINE V-25
LINE V-24
LINE V-23
LINE V-22
LINE V-21
LINE V-20
LINE V-19
LINE V-18
LINE V-41
LINE V-42
LINE V-43
LINE V-44
LINE V-45
LINE V-46
LINE V-47
LINE V-48
LINE V-49
LINE V-50
LINE V-51
LINE V-52
LINE V-53
LINE V-54
LINE V-55
LINE V-56
LINE V-57
LINE V-58
LINE V-59
LINE V-60
LINE

147°45' 148°00' 15' 30' 148°45'

38°45' 39°00' 15' 30' 39°45'

BASEMENT

BASEMENT

VICTORIA
TASMANIA

ESSO-HEMATITE P.E.P.39

MAGELLAN P.E.P.63 Area 'B'

MIOCENE CHANNEL CUT

U D

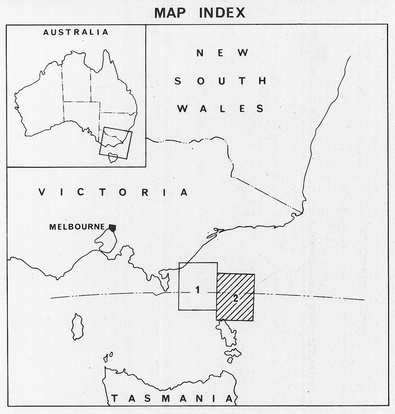
TASMAN SEA

ESSO-HEMATITE EL 1/60

Flinders Is.

MAGELLAN EL 4/67

MAP INDEX



LEGEND

—5000— Structure Contour in feet

Analog Seismic Shot Point

Digital Seismic Shot Point

Well, abandoned with Oil Show

Well, dry and abandoned

U / D Fault, 'D' downthrown side

Petroleum Tenement Boundary

Limit of Subsidy Area, 30 mile radius from ESSO Kingfish A-1

EAST BASS BASIN. Part 3/3

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

066013

STRUCTURE CONTOUR MAP OF LAKES ENTRANCE FORMATION (OLIGOCENE) AND PRE-MIOCENE PALEOGEOLOGIC MAP

5 cm

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4

MILES

AUTHOR: R.A. BROTHERTON, N.C. HIGGINS DRAFTED BY: M.R. CHÂTENAY

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET 2 PLATE I b

1008/G/5

OR-040

Bass Basin part V

2

146°45' 147°00' 15' 30' 147°45'

38°30'

38°45'

39°00'

39°30'

WOODSIDE

ST. MARGARET ISLAND

ESSO Perch A-1
T.D. 9417'

WOODSIDE P.E.P. 42

ESSO "HEMATITE P.E.P. 38

BASEMENT COMPLEX
(Latrobe not present)

ESSO HEMATITE P.E.P. 39

HOGAN GROUP

VICTORIA
TASMANIA

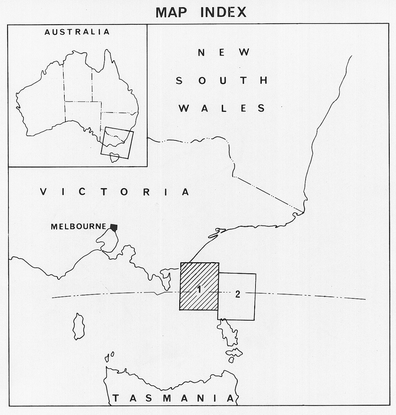
KENT GROUP

B A S S S T R A I T

ESSO HEMATITE E.L. 1/60

240,000 220,000 200,000 180,000 160,000 140,000

MAP INDEX



LEGEND

—5000— Structure Contour in feet

Analog Seismic Shot Point

Digital Seismic Shot Point

Well, abandoned with Oil Show

Well, dry and abandoned

U / D Fault, 'D' downthrown side

Petroleum Tenement Boundary

Limit of Subsidy Area, 40 mile radius from ESSO Barracouta B-1

EAST BASS BASIN.
- part 3/4

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

STRUCTURE CONTOUR MAP ON LATROBE DELTA TOPOGRAPHIC SURFACE

5 cm

066614

CONTOUR INTERVAL: 100 FEET

DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B. DEPEW

DRAFTED BY: K.H. REISS

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET I

PLATE IIa

1008/6/6

OR-040

Bass Basin part V

147°45' 148°00' 15' 30' 148°45'

38°45'

39°00'

15'

30'

39°45'

BASEMENT

BASEMENT

BASEMENT

BASEMENT COMPLEX
(Latrobe not present)

VICTORIA
TASMANIA

ESSO-HEMATITE P.E.P 39

MAGELLAN P.E.P 63 Area 'B'

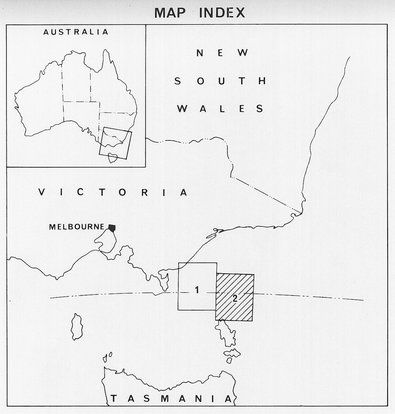
ESSO-HEMATITE EL 1/60

MAGELLAN EL 4/67

Flinders Is.

T A S M A N S E A

MAP INDEX



LEGEND

- —5000— Structure Contour in feet
- Analog Seismic Shot Point
- Digital Seismic Shot Point
- Well, abandoned with Oil Show
- Well, dry and abandoned
- U / D Fault, 'D' downthrown side
- Petroleum Tenement Boundary
- Limit of Subsidy Area, 30 mile radius from ESSO Kingfish A-1

EAST BASS BASIN
-Part 3/5

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

STRUCTURE CONTOUR MAP
ON LATROBE DELTA TOPOGRAPHIC SURFACE

5 cm

066015

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B.DEPEW DRAFTED BY: K.H.REISS

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC–67, MAY 1968

SHEET 2 PLATE II b

1008/G/7

OR-040

Bass Basin part V

146°45' 147°00' 15' 30' 147°45'

38°30'

38°45'

39°00'

39°30'

WOODSIDE

ST. MARGARET ISLAND

WOODSIDE P.E.P. 42

ESSO HEMATITE P.E.P. 38

ESSO HEMATITE P.E.P. 39

ESSO HEMATITE E.L. 1/60

ESSO Perch A-1
T.D. 9417'

HOGAN GROUP

KENT GROUP

VICTORIA
TASMANIA

B A S S S T R A I T

LINE - XII
LINE V-30
LINE V-13
LINE V-16
LINE V-38
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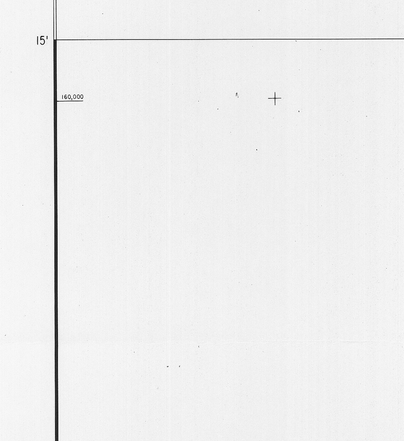
LINE V-14
LINE V-17
LINE V-32
LINE V-15
LINE V-40
LINE V-11
LINE V-34
MU-19
MU-20
MU-21
MU-22
MU-23
MU-24
MU-25
MU-26
MU-27
E.C. - 50
E.C. - 49
E.C. - 54
E.C. - 55
E.C. - 56
E.C. - 15
E.C. - 30
E.C. - 40
E.C. - 41
E.T. - 68
E.T. - 69
E.T. - 70
E.T. - 71
E.T. - 72
E.T. - 73
E.T. - 74
E.T. - 75
E.T. - 76
E.T. - 77
E.C. - 108
E.C. - 33
E.C. - 32
E.C. - 31
E.C. - 29
E.C. - 37
E.C. - 39
E.C. - 40

Gippsland-1A T.D. 1962
Gippsland-3 T.D. 4750
Gippsland-2 T.D. 1852
Wonodale South-1 T.D. 1686
Wonodale-1 T.D. 6008
Wonodale-3 T.D. 5935
Wonodale-2 T.D. 6982
St. Margaret Island-1 T.D. 4686
Wonodale-4 T.D. 2694

U
D

MAP INDEX



LEGEND

—5000— Structure Contour in feet

Analog Seismic Shot Point

Digital Seismic Shot Point

Well, abandoned with Oil Show

Well, dry and abandoned

U / D Fault, 'D' downthrown side

Petroleum Tenement Boundary

Limit of Subsidy Area, 40 mile radius from ESSO Barracouta B-1

EAST BASS BASIN
- part 3/6

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

STRUCTURE CONTOUR MAP ON TOP OF BASEMENT REFLECTION

5 cm

066016

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B. DEPEW DRAFTED BY: M.R. CHÂTENAY

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET I PLATE III a

OR-040 1008/G/8

Bass Basin part V

147°45' 148°00' 15' 30' 148°45'

38°45' 39°00' 15' 30' 39°45'

FSSO-HEMATITE PE.P.39

VICTORIA
TASMANIA

MACELLAN PE.P.63 Area 'B'

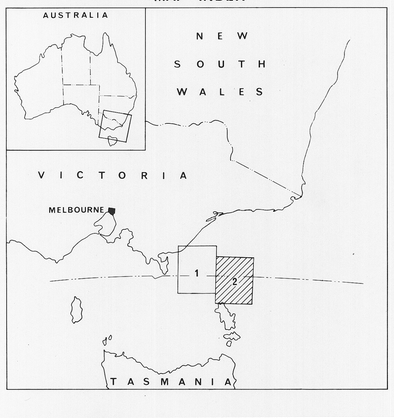
T A S M A N S E A

ESSO-HEMATITE EL.1/60

Flinders Is.

MACELLAN EL.4/67

MAP INDEX



LEGEND

—5000— Structure Contour in feet

Analog Seismic Shot Point

Digital Seismic Shot Point

Well, abandoned with Oil Show

Well, dry and abandoned

U / D Fault, 'D' downthrown side

Petroleum Tenement Boundary

Limit of Subsidy Area, 30 mile radius from ESSO Kingfish A-1

EAST BASS BASIN - part 317

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

STRUCTURE CONTOUR MAP ON TOP OF BASEMENT REFLECTION

5 cm

066017

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4

MILES

AUTHOR: D.B.DEPEW DRAFTED BY: M.R.CHÂTENAY

TO ACCOMPANY: FINAL REPORT OFFSHORE GIPPSLAND BASIN

MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET 2 PLATE IIIb

1008/G/9

OR-040

Bass Basin part V

Bass Basin part V 066018

EAST BASS BASIN - part 3.

FIELD OPERATIONS REPORT

MARINE SEISMIC SURVEY

GIPPSLAND (AUSTRALIA)

September 1, 1967 to November 21, 1967

for

ESSO EXPLORATION AUSTRALIA INC.

by

GEOPHYSICAL SERVICE INTERNATIONAL (G.S.I.)

A Division of Texas Instruments Australia Limited
Sydney, New South Wales, Australia.

G.S.I. Party 973

D.R. Bealer Operations Supervisor

December 1967.

Volume 2



ABSTRACT

A marine seismic survey was conducted by Geophysical Service International (G.S.I.) Party 973 (M/V Caribbean Seal) for ESSO EXPLORATION AUSTRALIA INC. from September 1, 1967 to November 21, 1967, Gippsland area, Australia. Predetermined shotpoint positions were IBM-computed.

Navigation was by Hifix operated by Amalgamated Decca Surveys Pty. Ltd. (DECCA) under contract to G.S.I. The shipboard survey equipment and the shore stations were operated by DECCA personnel.

Logs were maintained on all instrument settings, streamer depths, water depths, ship positions and shotpoint and streamer locations.

Field headquarters were established in St. Kilda, Victoria, Australia.

The seismic program, survey method, instrumentation operating techniques and operational results are presented in this report.

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A. THE SEISMIC PROGRAM X missing

B. SPREAD DIAGRAMS

(1) SHOOTING BETWEEN 12 & 13

(2) SHOOTING BETWEEN 18 & 19

(3) SHOOTING OFF No. 24

(4) SHOOTING OFF No. 1

C. CABLE DIAGRAM X missing

SECTION 1

AREA OF SURVEY

A. SEISMIC PROGRAM

The seismic program (Plate A) was in the Gippsland basin. Lines were shot for sixfold common depth point (C.D.P.) coverage. Shotpoints were numbered consecutively beginning with S.P.1. Additional program was added around the Halibut and Kingfish Wells and was shot at the end of the initial program.

B. PHYSICAL CONDITIONS

The survey was located in areas of relatively flat seabed except for line EC126F which extended over the continental slope to a depth of about 1400 fathoms at the end. Average water depth was about 35 fathoms. Recorded water depths ranged from approximately 8 fathoms to 40 fathoms.

Weather conditions varied significantly. Adverse weather and sea conditions were the major factor in preventing production work at various times throughout the project.

SECTION II

STREAMER

The neutrally buoyant 6900' streamer (Plate C) employed throughout the prospect has 24 equally spaced 100 ft. long live sections. Each live section has 20 crystal detectors spaced at 4'10.5" intervals, the outputs of which yield one trace. Adjacent live sections, including groups 12 and 13 were separated by two dead sections each 100' long.

Initially there were 5 stretch sections and 1 dead section preceding group 24. On November 9 one stretch section was removed. The stretch sections contained nylon stress members to attenuate noise generated by the towing vessel. One dead section and one stretch section followed the last live section (group 1) and a tail buoy was attached to the end of the streamer by a nylon rope.

The streamer was ballasted to ride horizontally below wave action. A variable length of non-buoyant lead-in cable connected the streamer to the towing vessel. Streamlined weights were attached to the end of the lead-in cable. Under continuous tow, the streamer became hydrodynamically stable at a depth which is a function of its speed through the water, the length of the lead-in cable and the relative buoyancy along the streamer's length.

Six pressure sensitive depth transducers, spaced along the streamers length, displayed streamer depth readings in the range 0 to 100 feet. Readings were taken from meters in the strument room. Average streamer depth was 50 feet.

Digital recording was done with group 24 at the head end of the streamer.

Infrequently, traces reversed in polarity were discovered

after the lead-in cable had been changed or serviced. These reversals were corrected and noted in quality control daily report.

SECTION III

RECORDING AND AMPLIFICATION SYSTEM

The output of each live streamer section was amplified by a Texas Instruments Model 10,000 Amplifier System, recorded by a Texas Instruments 10K Seismic Digital Field System, and a direct playback made on a SIE-VR06 photo-oscillograph simultaneously. A monitor record was made periodically.

Non filter recordings, amplifier parallel tests, dynamic range tests, and other periodic, quality-control instrument tests were performed prior to production work. Ambient noise level and straight-gain recordings were taken daily to determine signal to noise ratios. Dynamic range determination tests of the DFS, PGC calibration check, instrument noise tests, and GAGC oscillator test were performed daily.

Instrument settings for production work were established initially after consultation with the client representative.

SECTION IV

WATERBREAK SYSTEM

Direct path, shot to detector energy provided date for locating the shot relative to the streamer. First arrival signal was taken from selected streamer groups and fed to waterbreak amplifiers which respond to the frequency of water-borne acoustic energy. Waterbreaks appears on traces 26, 27, 28, 29 and 30 on monitors and playbacks. Waterbreaks were recorded in the appropriate tape channels by the D.F.S.

SECTION V

OPERATING TECHNIQUES

A. SURVEYING

DECCA was subcontracted to G.S.I. to provide positioning throughout the project. Hifix was the system used, and all equipment was operated by DECCA personnel.

The initial calibration, (see Appendix A), was carried out by crossing the base-line extensions at the master station and also at the two slave extensions. This was done by a fishing boat, "CAPELLA", which carried the calibration to the "CARIBBEAN SEAL". The "CARIBBEAN SEAL" then carried the calibration to strategically located buoys and islands which were then used for future calibrations.

The shooting boat "IMLAY" carried DECCA recording equipment and recordings of its position were made during the shooting of velocity profiles and resumed during production shooting after November 4.

The setback distance from antenna to shotpoint varied as did the shotpoint location, and these variations were noted with the post plot coordinates.

B. SHOOTING

1. DYNAMITE

The M/V "IMLAY" was used as a shooting boat throughout the project. The firing line was attached to the charge which was supported by an inflated plastic bag. The charge was fired about 100 feet behind the shooting boat and at a depth of approximately 6 feet. The blaster, controlled by the G.S.I. clock system, detonated the charges. At the instant the blaster fired, a signal was received at the D.F.S. which then designated the next clock pulse on tape as timing word zero. This is seen as a time break on trace 4 of the monitors or playbacks. Charges were fired every 600 feet for the sixfold C.D.P. coverage. The explosive used was Nitro-Carbo-Nitrate in 33-1/3 lb. and 50 lb. canisters. Charge size at a shotpoint is noted on the observer's logs.

2. AIRGUN

Two lines, E.C. 145 and 124 were shot using G.S.I. tuned array air guns as a seismic source of energy. One line had previously been shot using dynamite and a comparison was to be evaluated. The array consisted of 24 guns equivalent to 660 cu. in. of air with a pressure of 1800 to 2000 p.s.i. The air guns were placed on four "fish" towed from the back of the recording boat. The air guns were attached to the "fish" so that an equivalent of the following chamber size was used. Four air guns of forty cu. in. size were placed on the "fish" close enough for the bubbles to coalesce giving a 160 cu. in. gun, a 2-80 cu. in., 4-40 cu. in., 6-20 cu. in., 6-10 cu. in., air guns were thus arranged on the "fish" for the required frequency spectrum. The guns were towed at a depth of 20 feet with desired results.

C. RECORDING AND SHOOTING CYCLE

The recording and shooting cycle was determined by the ship's traverse between predetermined shotpoint intervals. This time interval was set into a master clock (an interval timer which zeros and resets automatically) which controlled the recording and shooting sequence. Changes in ship's speed were compensated for at the master clock. The master clock, set into a Time Co-ordinator Unit, controlled an interval timer in the instrument room, which transmitted a loading and a firing tone to the shooting boat. Hifix readings were taken at the shot instant. A relay controlled by the instrument room counter caused a mark to be placed on the fathogram at the shot instant.

Two continuously recording fathometers were available on the recording boat, one on the bridge and the other in the instrument room. The latter was used during all recording. Lead line checks were made periodically. Lines were identified on the fathogram and every tenth shotpoint numbered.

SECTION VI

CONCLUSION

Considerable problems with new Decca operators hampered initial start of programme. As operators acquired experience survey operations improved and down time was attributed to mostly skywaves, weather and some equipment problems.

Weather was a big factor in the first two months of operations, causing considerable down time. Operations were further hampered by the size of the shooting boat. It was necessary to make as many as three trips a month to Launceston for powder. This entailed as many as 11 to 15 days per month for powder loading.

Data obtained was satisfactory from an operational standpoint.

Co-operation between crew and client (Mr. Art Martins) was very helpful in the successful completion of this programme.

Appreciation for co-operation by the crew of the "Glomar III" and especially those employees of Esso at Barry's Beach radio shack is heartily expressed.

Respectfully submitted,
GEOPHYSICAL SERVICE INTERNATIONAL

By Donald R. Butler

APPENDIX A

SURVEY REPORT - GIPPSLAND BASIN FOR ESSO EXPLORATION AUSTRALIA

Land Survey

The Decca Hi-fix system was operated in the hyperbolic mode and the station sites selected were :

Slave I	(Cape Everard)	715566.2 E	332828.7 N
Master	(Lakes Entrance)	592114.7 E	326630.6 N
Slave II	(Woodside)	493117.1 E	247403.1 N

Co-ordinates on A.T.M. Projection Zone 7.

The station sites were surveyed by tellurometer traverses run from existing geodetic control. The surveys were carried out by Amalgamated Decca Surveys under contract to G.S.I.

Calibration

The Hi-fix chain was calibrated at positions close to each of the three stations. Theodolite intersections, from surveyed points were made of the fishing boat "Capella" which carried Hi-fix receivers. The results obtained were considered quite satisfactory and well within specifications.

Detailed reports by A.D.S. on the station surveys and the calibration are submitted separate to this report.

Mapping

Shotpoint location maps at a scale of 1:50,000 were drafted by G.S.I. Sydney office. Unfortunately, the failure by Amalgamated Decca Surveys to develop a computer program for shotpoint co-ordinates until January 1968 caused serious delays in this work.

Shotpoint locations were plotted from recording boat position by using a graphical analysis of streamer setback and water break times to determine the bearing and distance to the shotpoint.

M. P. Gale

CALIBRATION REPORT

10 October 1967.

Project:	ADS-203	
Location:	Gippsland	
Client:	G.S.I. / ESSO	
Personnel	N. SANDERSON	Senior Surveyor
	S. LUSBY	Surveyor
	H. MOLLEMA	Senior Engineer.

NARRATIVE

The survey party travelled from Sydney to Lakes Entrance, Victoria, arriving P.M. Friday, 25th August.

A fifty foot fishing boat "Capella" had been chartered at $150.00 a day for a minimum period of five days and had been fitted with a Hi-Fix receiver, antenna, associated power supplies, radios, etc.

The patterns were calibrated in three areas :

In the vicinity of :

(a) Master at Lakes Entrance
(b) Slave II at Woodside
(c) Slave I between Cape Everard and Bemm River.

Simultaneous theodolite observations by two surveyors ashore at previously surveyed marks intersected the whip antenna on the vessel. At the same time the Hi-Fix readings were recorded on board the vessel. The co-ordinated position of the vessel at each fix was computed and these co-ordinates converted to computed Hi-Fix readings which were then compared to the observed Hi-Fix readings taken at the relevant fix.

A mean of the fractional corrections so found were applied to the relevant patterns at the Slave Stations.

The final pattern settings and opposite slave readings were :-

At Slave I		At Slave II	
Patt. I	Patt. II	Patt. I	Patt. II
.48	.24	.24	.09

The calibration results showed that with the above settings applied, the residual corrections applicable will be :-

Area	Patt. I	Patt. II
Woodside	- .00	+ .00
Lakes Entrance	+ .02	+ .02
Cape Everard	- .01	- .03

This result is considered quite satisfactory and well within the specifications of the survey.

DIARY OF EVENTS

Friday,

25 August - Survey party travelled Sydney to Lakes Entrance.

Saturday, 26 - Calibration off Lakes Entrance. Severe gale forced boat to return to harbour before lane count could be carried out to buoys marking Marlin and Barracouta fields.

Sunday, 27 - Strong gale - bar at Lakes Entrance closed - computations of previous days calibration intersections.

Monday, 28	-	Gale Moderating - bar at Lakes Entrance closed. Buoys off Lakes Entrance fixed by intersection and Hi-Fix co-ordinates computed.
Tuesday, 29	-	Weather moderate - "Capella" proceeded to vicinity Woodside. Calibration in vicinity of Woodside completed.
Wednesday, 30	-	Weather moderate - check calibration in vicinity Master. Weather outlook poor and unsuitable for "Capella" to proceed to Cape Everard. P.M. "Capella" sheltering at Lakes Entrance.
Thursday, 31	-	Heavy swell - bar at Lakes Entrance closed until late P.M. when "Capella" proceeded to Cape Everard.
Friday, 1 September	-	Calibration observations at Cape Everard - Bemm River. Preliminary computations completed late P.M.
Saturday, 2	-	Survey party travelled Lakes Entrance to Sydney.

The calibration was prolonged by the generally adverse weather conditions prevailing. Attempts were made to carry the lane count to buoys in the vicinity of Glomar III but these were defeated by the weather conditions. A lane count was given to the "Caribbean Seal" on 31 August as were the Hi-Fix co-ordinates of the dredging buoy outside the bar at Lakes Entrance.

Hi-Fix co-ordinates of a reference point in Lakes Entrance and on the Slave I extension to the east of Cape Everard were established (see Appendix 'A').

Lane counts from each calibration area were carried back to the reference point at New Works Jetty in Lakes Entrance and confirmed the whole lane numbers in the patterns.

Raw readings and calibration computations are shown in Appendix 'B'.

The results obtained on 26 August in the area off Lakes Entrance were discarded as it was suspected that the very severe gale which followed and almost demolished Slave Station II at Woodside may have caused a change in Pattern II.

SUMMARY OF CALIBRATION RESULTS

Pattern I

(a)	Off Woodside - 29 August		
	Mean Fractional Correction	-.94	
	Pattern I setting during calibration	.42	
	Corrected Pattern Setting	.48	
(b)	Off Lakes Entrance - 30 August		
	Mean Fractional Correction	+.08	
	Pattern I setting during calibration	.42	
	Corrected Pattern Setting	.50	
(c)	Off Cape Everard - 31 August		
	Mean Fractional Correction	+.97	
	Pattern I setting during calibration	.50	
	Corrected Pattern Setting	.47	
	Accepted Pattern Setting		.48

Pattern II

(a)	Off Woodside - 29 August		
	Mean Fractional Correction	- .52	
	Pattern setting during calibration	.61	
	Corrected Pattern Setting	.09	
(b)	Off Lakes Entrance - 30 August		
	Mean Fractional Correction	+ .50	
	Pattern setting during calibration	.61	
	Corrected Pattern Setting	.11	
(c)	Off Cape Everard - 31 August		
	Mean Fractional Correction	- .05	
	Pattern setting during calibration	.11	
	Corrected Pattern Setting	.06	
	Accepted Pattern Setting		.09

APPENDIX 'A'

ADS-203 CALIBRATION REPORT

LAKES ENTRANCE - HI-FIX REFERENCE POINT "NEW WORKS" JETTY

New Works Jetty

South

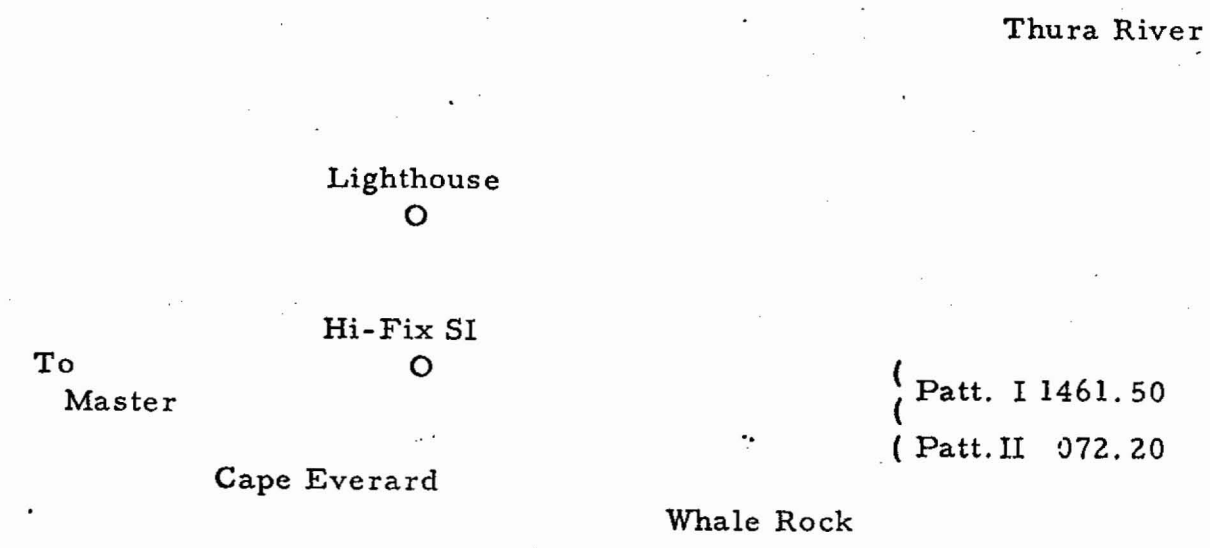
1	2	3	4	5	
0	0	0	0	0	North (approx)

Reference Point

Bollard No. 3, white with steel cap, cap painted red.

GSI-709

CAPE EVERARD - SLAVE I EXTENSION



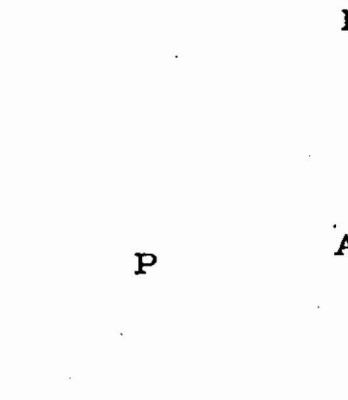
Hi-Fix readings on SI extension at point between Whale Rock and a small stream not shown on navigational chart. Depth of water is seven fathoms.

(a)

APPENDIX 'B'

ADS-203 CALIBRATION REPORT

OFF WOODSIDE - 29 AUGUST 1967



A and B - previously surveyed points.

P - Hi-Fix antenna on calibration boat.

ATM Co-ordinates

A	(493 618.1	East
	(247 309.2	North
B	(494 892.5	East
	(248 726.1	North

Fix	W 3	W 4	W 5
Time	1705	1710	1715
A	34° 20' 11"	59° 20' 24"	86° 08' 17"
B	82° 58' 12"	51° 06' 59"	38° 59' 31"
Computed Patt. I	073.39	074.23	074.80
Observed Patt. I	146.36	147.21	147.76
Monitor Correction	- .03	- .03	- .03
True Observed Patt. I	146.33	147.18	147.73
(C - O) Correction	-72.94	-72.95	-72.93
Computed Patt. II	1471.16	1479.59	1484.59
Observed Patt. II	1609.68	1618.10	1623.11
Monitor Correction	.00	.00	.00
True Observed Patt. II	1609.68	1618.10	1623.11
(C - O) Correction	-138.52	-138.51	-138.52

GSI-709

Mean Correction -	Patt. I	- 72.94
	Patt. II	- 138.52

Lane count was carried back to reference point on New Works Jetty.

Observed Hi-Fix at reference point :	Patt. I	073.18
	Patt. II	164.23
Correction :	Patt. I	-72.94
	Patt. II	-138.52
Corrected Hi-Fix at reference point:	Patt. I	00.24
	Patt. II	025.71

(b)

APPENDIX 'B'

ADS-203 CALIBRATION REPORT

OFF LAKES ENTRANCE - 30 AUGUST 1967

A B

A and B - previously surveyed points.

P - Hi-Fix antenna on calibration boat.

P

ATM Co-ordinates

A (589 062.1 East
(326 763.0 North

B (594 417.0 East
(328 295.3 North

Fix	G I	G 3	H I
Time	0942	0952	0957
/A	77° 03' 08"	71° 36' 01"	61° 39' 20"
/B	34° 12' 26"	37° 10' 34"	49° 00' 59"
Computed Patt. I	009.21	010.50	017.61
Observed Patt. I	009.12	010.42	017.54
Monitor Correction	.00	.00	.00
True Observed Patt. I	009.12	010.42	017.54
(C - O) Correction	+ 0.09	+ 0.08	+ 0.07
Computed Patt. II	035.58	032.82	029.08
Observed Patt. II	035.10	032.30	028.59
Monitor Correction	.00	.00	.00
True Observed Patt. II	035.10	032.30	028.59
(C - O) Correction	+ 0.48	+ 0.52	+ 0.49

Mean Correction	Patt. I	+ 0.08	Patt. II	+ 0.50

Lane readings on reference point New Works Jetty :

Time 0917	Patt. I	000.19	Patt. II	025.21
1033		000.19		025.21
Correction		+ .08		+ .50

Corrected readings reference point :

Patt. I.	000.27	Patt. II	025.71

(c)

APPENDIX 'B'

ADS-203 CALIBRATION REPORT

OFF CAPE EVERARD - 1 SEPTEMBER 1967

A B

A and B - previously surveyed points.

P - Hi-Fix antenna on calibration boat.

P

ATM Co-ordinates A (682 602.9 East
(336 629.7 North

B (715 568.8 East
(332 902.8 North

Fix	Ev AI	Ev BI	Ev CI
Time	1000	1035	1100
/A	22° 48' 20"	22° 21' 31"	26° 10' 11"
/B	29° 38' 39"	25° 08' 12"	30° 11' 51"
Computed Patt. I	1276.78	1263.71	1261.83
Observed Patt. I	1266.88	1253.80	1251.91
Monitor Correction	- .06	- .06	- .06
True Observed Patt. I	1266.82	1253.74	1251.85
(C - O) Correction	+ 9.96	+ 9.97	+ 9.98
Computed Patt. II	078.31	075.89	079.31
Observed Patt. II	079.43	077.00	080.40
Monitor Correction	- .06	- .06	- 1.03

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Mean Correction Patt. I + 9.97 Patt. II - 1.05

Lane count was carried back to Lakes Entrance and closed on both sides.

Hi-Fix readings -	Slave I extension at Slave I	1451.56
	Slave I extension at Master	990.02
	Reference point New Works Jetty:	
	Patt. I	990.27
	Patt. II	026.59

	Patt. I		Patt. II
Observed readings at reference point	990.27		026.59
Correction	+ 9.97		- 1.05
Corrected readings at reference point	000.24		025.54
Slave I extension at Master	990.02		
Correction	+ 9.97		
	999.99	or	- 0.01
Slave I extension at Slave I	1451.56		
Calibration Correction	+ 9.97		
	1461.53		
Master Correction	- 0.01		
Total number of Lanes in Patt. II observed	1461.52		
Total number of Lanes in Patt. II computed	1461.49		

GSI-709

AMALGAMATED DECCA SURVEYS PTY. LTD.

BASIC DATA

Chain Designation	GIPPSLAND		
Customer	G.S.I. /ESSO		
Contract Number	ADS-203		
Projection	A.T.M.		
Spheroid	CLARKE 1858		
Grid Zone	7		
Central Meridian	146° E		
Speed of Propagation	299 650 KM/SEC		
Frequency	1938.63 KC/SEC		
Wavelength	154.56791 METRES	169.038 YARDS	
Lane Width on Baseline	84.519 YARDS		
STATION	MASTER	SLAVE I	SLAVE II
Name	LAKES ENTRANCE	CAPE EVERARD	WOODSIDE
Latitude		37° 48' 15.853"	
Longitude		149° 16' 33.518"	
U.T.M. Easting -			
U.T.M. Northing			
A.T.M. Easting-Yards	592 114.7	715 566.21	493 117.1
A.T.M. Northing-Yards	326 630.6	332 828.70	247 403.1
Baseline - Yards	Grid	123 606.9	126 797.1
	True	123 523.4	126 769.5
Last Lane Number		1461.49	1499.89
f/v	.00591582		

Remarks:	Date : 2.9.67	Pattern I	Pattern II
	SLAVE I	.48	.24
	SLAVE II	.24	.09

GSI-709

APPENDIX B

SUMMARY OF RESULTS
GIPPSLAND CHAIN ADS. 203
FINAL CO-ORDINATES
TRAVERSE MERCATOR ZONE 7 (YARDS)
AUSTRALIAN BELTS

		Eastings	Northings
Slave I	(Cape Everard)	715 566.2	332 828.7
Master	(Lakes Entrance)	592 114.7	326 630.6
Slave II	(Woodside)	493 117.1	247 403.1
Woodside II	(Calibration Inter-	494 892.5	248 726.1
Woodside III	(Point) visible	493 618.1	247 309.2
Lakes Entrance I	(Calibration Point)	589 062.1	326 763.0
Lakes Entrance Trig.	(Calibration Point)		
(The reference object for both points is the Master Station)			
Bemm River	(Calibration Point)	682 602.9	336 629.7
Lighthouse Eccentric	(Calibration Point)	715 568.8	332 902.8
(Points Intervisible)			

NOTE: Slave I (Cape Everard) falls in Zone 8, Transverse mercator Australian Belt.

The land survey for Slave I and associated calibration points was calculated using Zone 8 T.M. co-ordinates. Such points as related to the G.S.I.-Esso seismic survey were then converted to T.M. Zone 7 co-ordinates.

T.M. Zone 8 Co-ords. (yards)

	Eastings	Northings
Slave I	233 945.9	336 830.3
Bemm River (Calibration Point)	200 845.8	338 861.9
Lighthouse Eccentric (Calibration Point)	233 944.5	336 904.4

NOTE: It is unreasonable to assume that calibration points set on the dunes will remain. These include: Bemm River, Woodside I, Woodside II. Re-location diagrams for the others are given.

CHAIN ADS-203 BASS STRAIT

MASTER ACCESS

Follow the Princes Highway south to the town of Lakes Entrance in Victoria.

On entering Lakes Entrance the road passes along the edge of the Lake. Across the water to the left, there is a line of sand dunes dividing the lake from the sea. There is a long footbridge from the mainland to the dunes. Access to the station is across this bridge. Turn left on the dunes through the surf club, the marker is situated on the top of a dune 252 ft. from the surf club.

The marker consists of 36 inches of galvanized iron pipe set in an 8 inch square of concrete. The above ground mark is 18 inches of $1\frac{1}{2}$ inch diameter galvanized iron pipe screwed into the lower section. The station mast may be set exactly over the marker by unscrewing the top 18 inches, but a good chain wrench is required. It is not possible to set the mast alongside the marker since the pipe will extend above the mast insulation.

Note: The station is sited in a marram grass reserve and permission to occupy the site is required from the Foreshore Committee of Lakes Entrance.

CHAIN ADS-203 BASS STRAIT

SLAVE I ACCESS

Follow Princes Highway south from Sydney to Eden and on across the Border to Cann River. Turn left in village to Cape Everard (signposted).

The road deteriorates progressively and 4-wheel drive may be required in wet weather.

8 miles from Cann River take right-hand fork.
10 miles from Cann River take left-hand fork.
19 miles from Cann River cross small river with a flow-gauge - continue
26 miles from Cann River cross wide river, sand dunes opposite, sea to left.
27 miles from Cann River enter light house property - follow twisting track along sea edge.
29 miles from Cann River arrive at light house. Permission to enter light house property should be sought from Department of Shipping and Transport, Rialto House, Melbourne beforehand.

The Hi-Fix station marker consists of 18 inches of $1\frac{1}{2}$ inch diameter galvanized iron pipe set in concrete 8 inches square. The above ground mark is a further 18 inches of galvanized iron pipe screwed into the lower. The station mast may be set exactly over the marker by upscrewing the top 18 inches, but a good chain wrench is required. It is not possible to set the mast alongside the marker since the pipe will extend above the mast insulation.

CHAIN ADS-203 BASS STRAIT

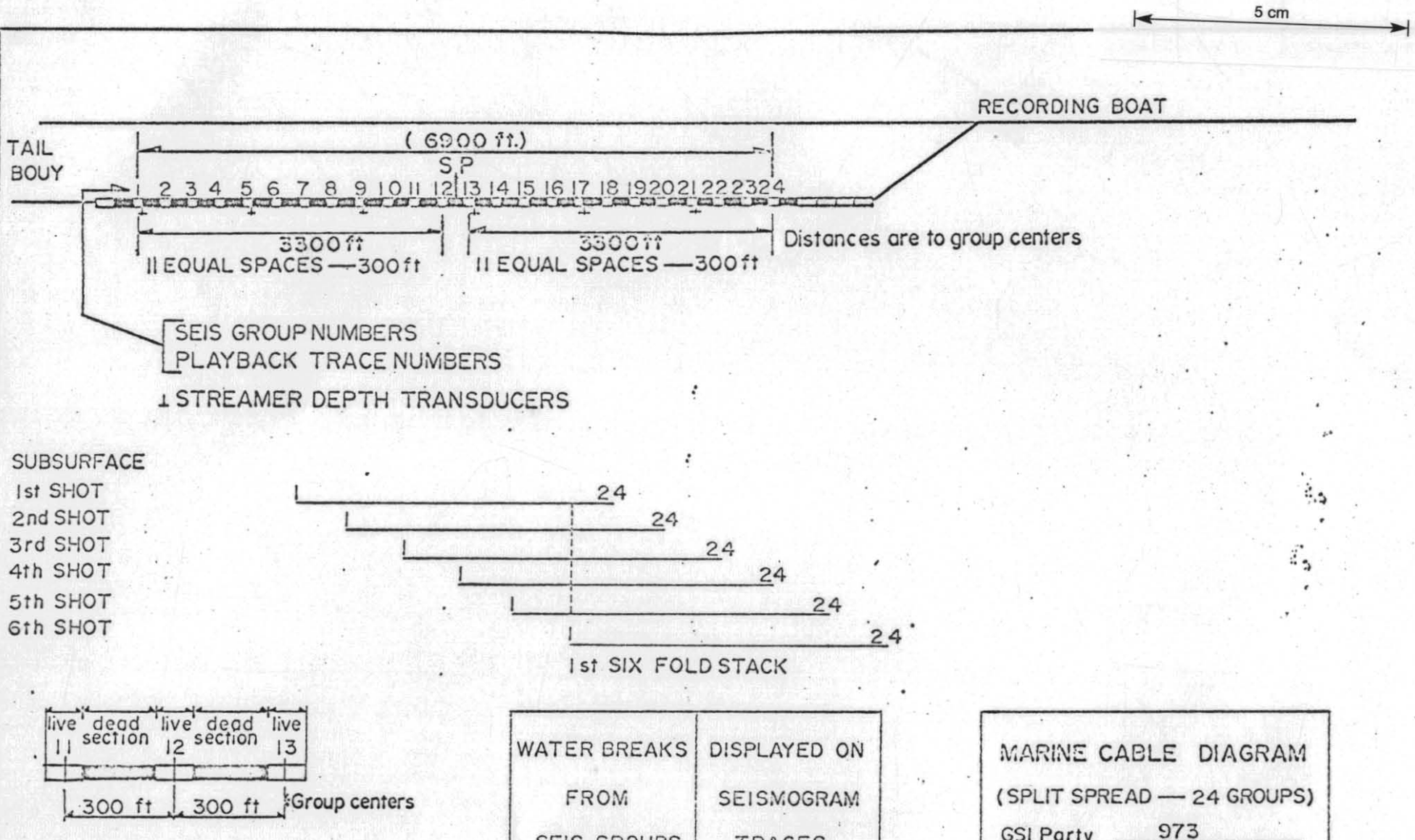
SLAVE II ACCESS

Follow the Princes Highway soth from Sydney to the town of Sale in Victoria. Turn left onto the South Gippsland Highway for 35 miles to the village of Woodside. Turn left before the Hotel. After a few hundred yards the road swings sharp right and then a few hundred yards further it turns sharp left.

Follow the straight road for $5\frac{1}{2}$ miles until just before the sand dunes. There is a cutting which permits access to a picnic reserve. Before this cutting there is a field gate and track to the left. Follow this track for a hundred yards and then turn off to the right onto a ridge.

The station marker consists of 36 inches of Galvanized iron pipe beneath ground level, set in an 8 inch square of concrete. The above ground mark is 18 inches of $1\frac{1}{2}$ inch diameter galvanized iron pipe screwed into the lower section. The station mast may be set exactly over the marker by unscrewing the top 18 inches, but a good chain wrench is required. It is not possible to set the mast alongside the marker since the pipe will extend above the mast insulation.

Note: The field in which the station is sited, belongs to Tom Foat of Woodside.



WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
1	30

MARINE CABLE DIAGRAM

(SPLIT SPREAD — 24 GROUPS)

GSI Party 973

Ship M/V CARIBBEAN SEAL

Client ESSO

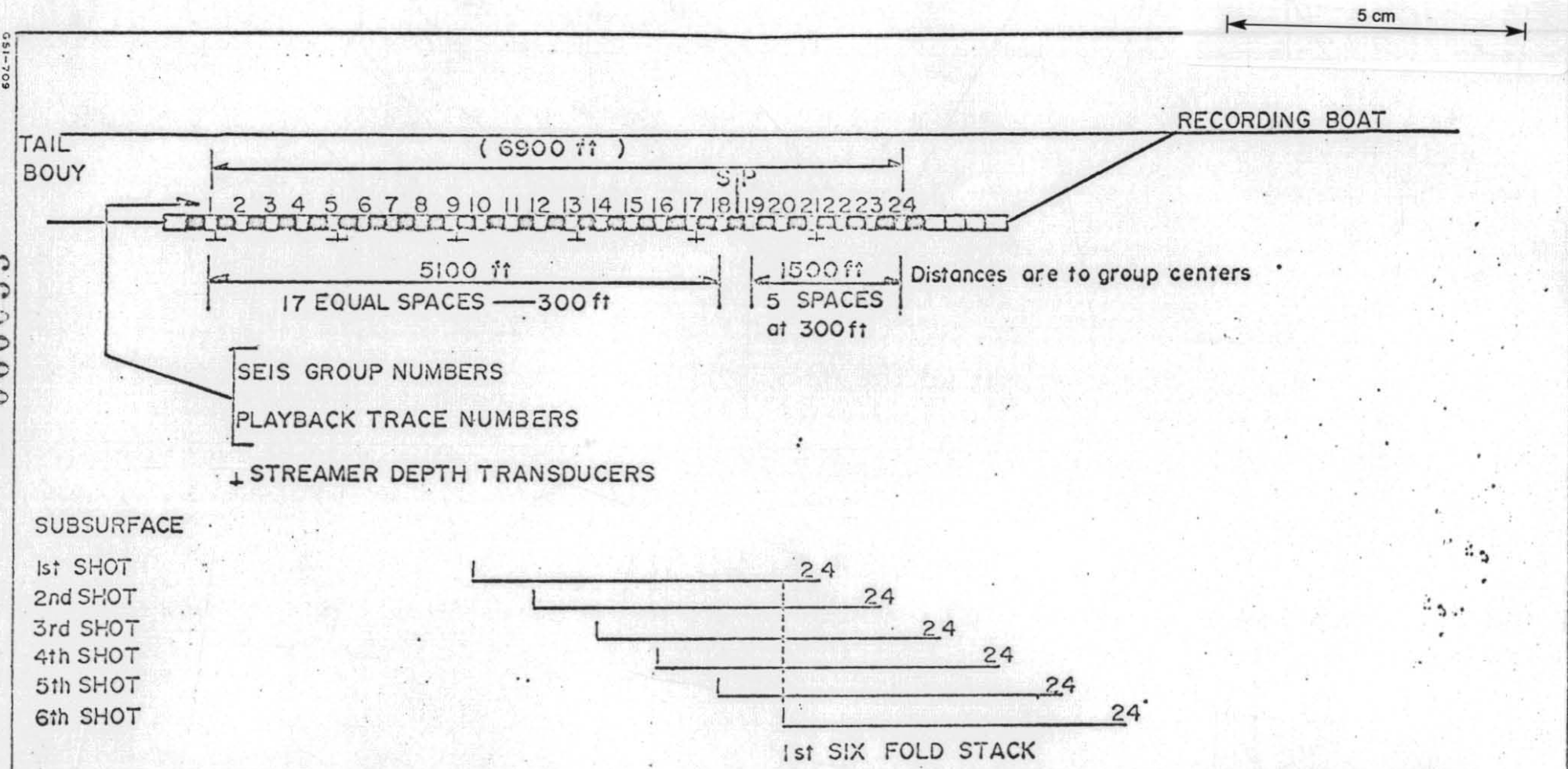
Area GIPPSLAND

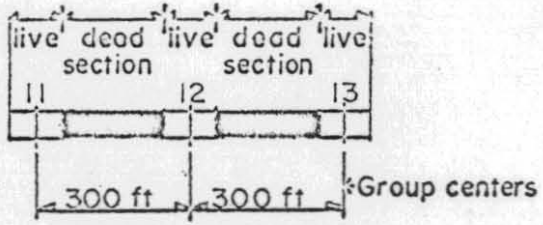
Date SEPT — NOV 1967

GSI-709

066052

PLATE B-1





Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
1	30

MARINE CABLE DIAGRAM

(S.P. BETWEEN GROUPS 18 and 19)

GSI Party 973

Ship M/V CARIBBEAN SEAL

Client ESSO

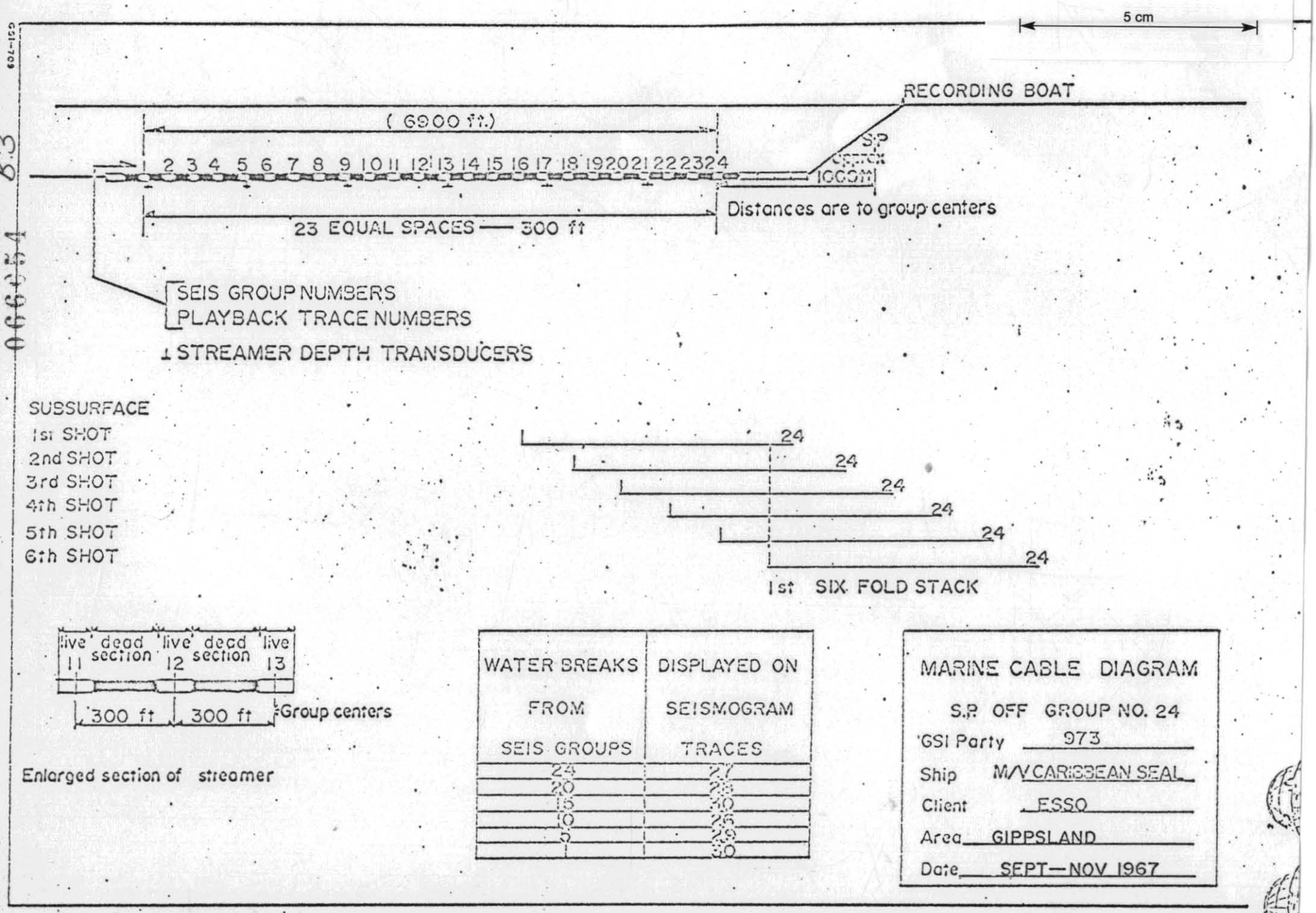
Area GIPPSLAND

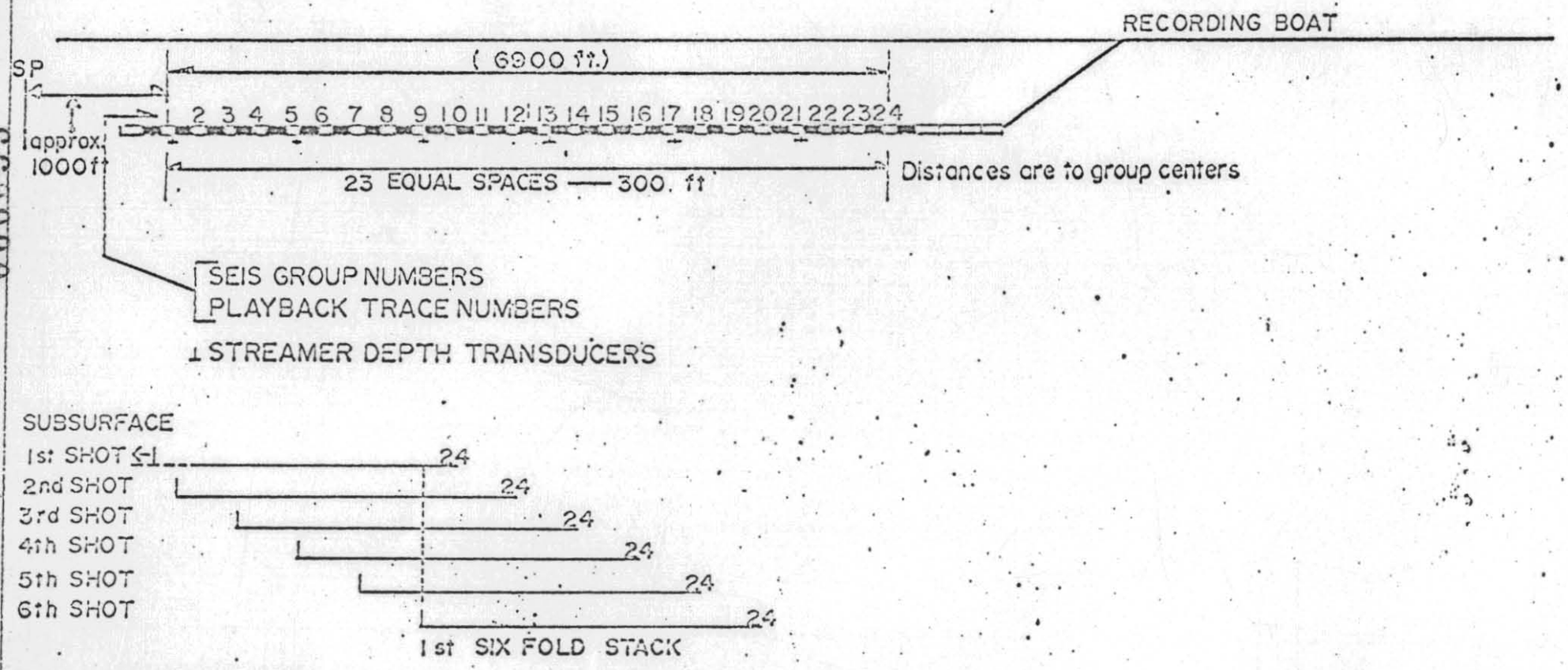
Date SEPT — NOV 1967

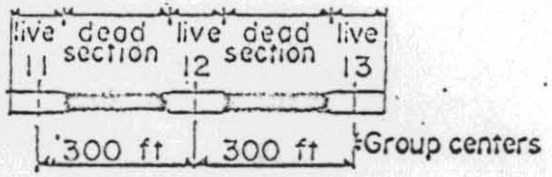
PLATE B-2

066053

GSI-709


5 cm
RECORDING BOAT
(6900 ft.)
S.P
approx
1000 ft
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Distances are to group centers
23 EQUAL SPACES — 300 ft
SEIS GROUP NUMBERS
PLAYBACK TRACE NUMBERS
STREAMER DEPTH TRANSDUCERS
SUBSURFACE
1st SHOT
2nd SHOT
3rd SHOT
4th SHOT
5th SHOT
6th SHOT
24
24
24
24
24
24
1st SIX FOLD STACK
live 11
dead section
live 12
dead section
live 13
300 ft
300 ft
Group centers
Enlarged section of streamer
WATER BREAKS FROM SEIS GROUPS
DISPLAYED ON SEISMOGRAM TRACES
24 27
20 28
15 30
10 26
5 29
1 30
MARINE CABLE DIAGRAM
S.P. OFF GROUP NO. 24
GSI Party 973
Ship M/V CARIBBEAN SEAL
Client ESSO
Area GIPPSLAND
Date SEPT—NOV 1967





Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
1	30

MARINE CABLE DIAGRAM

S.P. OFF GROUP NO. 1

GSI Party 973

Ship M/V CARIBBEAN SEAL

Client ESSO

Area GIPPSLAND

Date SEPT—NOV 1967

066055

APPENDIX "C"

GENERAL OPERATIONAL INFORMATION

Client:	Esso Exploration Australia Inc.
G.S.I. Party:	973
Area of Survey:	Gippsland Basin (Victoria and Tasmania)
Date Commenced:	Saturday, September 1, 1967
Date Finished:	Tuesday, November 21, 1967
Shotpoint Spacing:	Sixfold C.D.P. 600'

Totals

Elapsed days on project:	81 days
Production days:	55 days
Non-production days:	26 days

Total mileage	1259.66 miles
Total surcharge mileage	372.57 miles
Velocity profiles	9 hours chargeable

APPENDIX "D"

TYPICAL SPREAD DETAILS

Type	24-group, neutrally buoyant
Length	Centre group 1 to centre group 24 - 6900'
Group interval	300'
Interval between 12 and 13	300'
Length live section	100'
Length dead section	100'
Type detector	Crystal
Detectors per group	20
Detector Interval	4' $10\frac{1}{2}$"
Charge size	33-1/3 lb., 50 lb., 100 lb.
Average shot depth	6'
Average shot offset	500'
Average detector depth	40'

APPENDIX "E"

TYPICAL INSTRUMENT DETAILS

Texas Instruments Model 10,000 Amplifier System

(a) Recording Settings

Initial gain	40-43
Final gain	90-95
GAGC expansion	80 db/sec
AGC level	6-10

Filters	frequency	slope
High cut	70-92	24
Low cut	8	12

(b) Playbacks - direct

Texas Instruments 10 K S.D.F.S.

Channel 1-24	Seismic Trace 1-24
25	
26	WB 5
27	WB 20
28	WB 24
29	WB 10
30	Gain
31	WB 1, 15
0	Timing word

SIE - VR06 Photo-Oscilograph

Galvo	1-24	Seismic trace 1-24
	25	Channel 30 monitor
	26	WB
	27	WB
	28	WB
	29	WB
	30	WB
	31	100 cycles external fork
Paper width		6"
Paper speed		6.401"/sec.
Record length		4 and 5 sec.
Timing lines		Timing line generator

Waterbreak Amplifiers

Amplifier	Group No's	Trace
1	24	27
2	20	28
3	15	30
4	10	26
5	5	29
6	1	30

Timebreak — Monitor True TB in trace 4
Timing word Zero (TWO) trace 8

Playback - same

SIMRAD MODEL 515-47 fathometer

Scale A	0-120 fathoms
B	90-210
C	180-300

APPENDIX "F"

KEY PERSONNEL

Operation Supervisor	D. R. BEALER
Quality Control Engineer	T. M. NICHOLS
Party Manager	L. HELSTROM
Administrator	A. SMITH
Instrument Engineers	B. BLAKLEY
	L. WILLARD
	A. HORAK
Shooter	L. GIBSON

DECCA PERSONNEL

Supervisor	C. ROLFE
Operators	P. GREEN
	P. McKENNA
	M. BAILEY

Captain M. V. "CARIBBEAN SEAL"	R. HEGEBERGER
Captain M. V. "IMLAY"	P. WARREN

TIME-DEPTH TABLE

MARINE SEISMIC SURVEY EC-67

COMPOSITE OF GIPPSLAND WELL SURVEYS

Time	Depth	Time	Depth	Time	Depth
0	0	0.353	1200	0.695	2400
0.015	50	0.368	1250	0.708	2450
0.029	100	0.382	1300	0.722	2500
0.044	150	0.397	1350	0.734	2550
0.059	200	0.412	1400	0.747	2600
0.074	250	0.426	1450	0.759	2650
0.088	300	0.441	1500	0.772	2700
0.103	350	0.456	1550	0.784	2750
0.118	400	0.470	1600	0.796	2800
0.132	450	0.485	1650	0.809	2850
0.147	500	0.500	1700	0.821	2900
0.162	550	0.515	1750	0.834	2950
0.176	600	0.529	1800	0.846	3000
0.191	650	0.544	1850	0.869	3100
0.206	700	0.559	1900	0.892	3200
0.221	750	0.573	1950	0.914	3300
0.235	800	0.588	2000	0.937	3400
0.250	850	0.601	2050	0.960	3500
0.265	900	0.615	2100	0.980	3600
0.280	950	0.628	2150	1.001	3700
0.294	1000	0.642	2200	1.021	3800
0.309	1050	0.655	2250	1.042	3900
0.323	1100	0.668	2300	1.062	4000
0.338	1150	0.682	2350	1.081	4100

GROPER CURVE

Time	Depth
1.098	4200
1.113	4300
1.130	4400
1.148	4500
1.163	4600
1.180	4700
1.196	4800
1.212	4900
1.230	5000
1.247	5100
1.263	5200
1.281	5300
1.299	5400
1.317	5500
1.335	5600
1.353	5700
1.370	5800
1.385	5900
1.400	6000
1.417	6100
1.434	6200
1.450	6300
1.466	6400
1.482	6500
1.562	7000
1.640	7500

LIST OF SEISMIC SECTIONS

Two copies of the below listed C.D.P. six-fold V.D.F. seismic sections of the EC-67 survey are submitted with this report.

Section No.	Miles
EC-153	8.0
EC-108	12.0
EC-109	7.0
EC-25A	8.0
EC-75	9.1
EC-74	11.1
EC-113	73.5
EC-67	15.1
EC-155	17.5
EC-165	58.7
EC-156	20.1
EC-157	30.0
EC-163	40.6
EC-159	25.9
EC-164	16.2
EC-158	5.0
EC-160	23.6
EC-161	18.6
EC-162	16.6
EC-112	48.9
	465.5

146°45' 147°00' 15' 30' 147°45'

38°30'

39°00'

38°45'

39°30'

WOODSIDE

LINE - XII

LINE V-40

LINE V-30

LINE V-14

LINE V-17

LINE V-32

LINE V-13

LINE V-16

LINE V-39

LINE V-15

LINE V-11

LINE V-7

LINE V-1

Gippsland-1A T.D. 1962

Woodside South-1 T.D. 5846

Gippsland-3 T.D. 2870

Woodside-1 T.D. 6008

Woodside-3 T.D. 5965

Woodside-2 T.D. 5982

St. Margaret Island-1 T.D. 4666

Gippsland-2 T.D. 1952 T.D. 7900

Woodside-4 T.D. 2654

ST. MARGARET ISLAND

WOODSIDE P.E.P. 42

ESSO HEMATITE P.E.P. 38

ESSO Perch A-1 T.D. 9417'

THICK

THIN

U

D

MA-28

MA-29

MA-24

MA-27

MA-23

MA-22

EC-153

EC-118

EC-106

EC-259

EC-73

EC-33

EC-74

EC-113

EC-67

ET-50

ET-45

ET-98

ET-41

ET-26

ET-40

ET-76

ET-75

ET-77

ET-78

ET-79

ET-11

EG-34

EG-40

EG-29

EG-155

240,000

220,000

200,000

180,000

160,000

140,000

80,000

60,000

ESSO HEMATITE P.E.P. 39

HOGAN GROUP

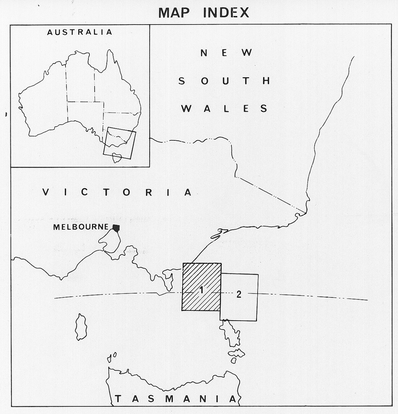
VICTORIA
TASMANIA

B A S S S T R A I T

KENT GROUP

ESSO HEMATITE E.L. 1/60

MAP INDEX



LEGEND

- —5000— Isopach contour in feet
- Analog Seismic Shot Point
- Digital Seismic Shot Point
- Well, abandoned with Oil Show
- Well, dry and abandoned
- U / D Fault, 'D' downthrown side
- Petroleum Tenement Boundary
- Limit of Subsidy Area; 40 mile radius from ESSO Barracouta B-1

EAST BASS BASIN - part 3/8

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

066065

ISOPACH CONTOUR MAP OF INTERVAL LAKES ENTRANCE FORMATION TO LATROBE DELTA TOPOGRAPHIC SURFACE

5 cm

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B.DEPEW DRAFTED BY: M.F.WEETMAN

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET I PLATE IVa

1008/6/10

OR-040

147°45' 148°00' 15' 30' 148°45'

38°45'

39°00'

15'

30'

39°45'

ESSO-HEMATITE P.E.P.39

MAGELLAN P.E.P.63 Area 'B'

ESSO-HEMATITE EL 1/60

THICK

THIN

VICTORIA TASMANIA

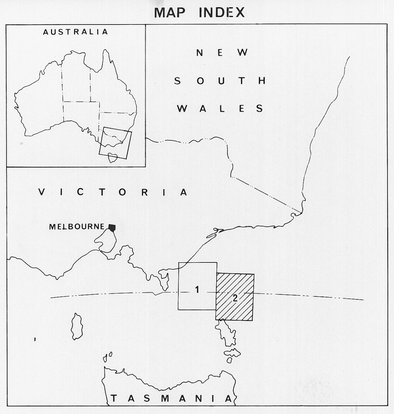
MIOCENE CHANNEL CUT

Flinders Is.

TASMAN SEA

MAGELLAN EL 4/67

MAP INDEX



LEGEND

- —5000— Isopach contour in feet
- Analog Seismic Shot Point
- Digital Seismic Shot Point
- Well, abandoned with Oil Show
- Well, dry and abandoned
- U / D Fault, 'D' downthrown side
- Petroleum Tenement Boundary
- Limit of Subsidy Area, 30 mile radius from ESSO Kingfish A-1

EAST BASS BASIN - Part 3/9

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA — TASMANIA

066066

ISOPACH CONTOUR MAP OF INTERVAL LAKES ENTRANCE FORMATION TO LATROBE DELTA TOPOGRAPHIC SURFACE

5 cm

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4 MILES

AUTHOR: D.B.DEPEW DRAFTED BY: M.F.WEETMAN

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET 2 PLATE IV b

1008/G/11

OR-040

Bass Basin part V

146°45' 147°00' 15' 30' 147°45'

38°30'

38°45'

39°00'

39°30'

ESSO Perch A-1
T.D. 9417'

WOODSIDE

WOODSIDE P.E.P. 42

ESSO "HEMATITE" P.E.P. 38

ESSO HEMATITE P.E.P. 39

ESSO HEMATITE E.L. 1/60

ST. MARGARET ISLAND

HOGAN GROUP

KENT GROUP

VICTORIA
TASMANIA

BASEMENT COMPLEX
(Latrobe not present)

THICK

THIN

THICK

THIN

THICK

THIN

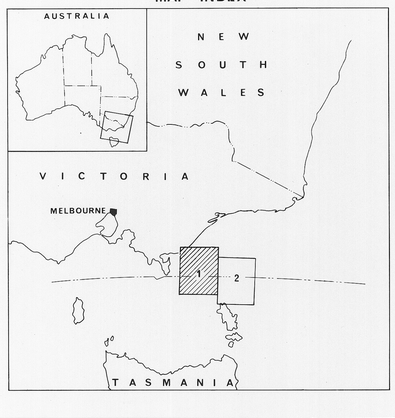
THICK

THIN

B A S S S T R A I T

240,000 220,000 200,000 180,000 160,000 140,000

MAP INDEX



LEGEND

—500— Isopach Contour in feet

Analog Seismic Shot Point

Digital Seismic Shot Point

Well, abandoned with Oil Show

Well, dry and abandoned

U / D Fault, 'D' downthrown side

Petroleum Tenement Boundary

Limit of Subsidy Area, 40 mile radius from ESSO Barracouta B-1

EAST BASS BASIN
- part 3/10

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

5 cm

ISOPACH CONTOUR MAP OF INTERVAL FROM TOP OF LATROBE DELTA TO BASEMENT

066c67

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B. DEPEW DRAFTED BY: M.F. WEETMAN

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET 1 PLATE Va

1008/G/12

OR-040

147°45' 148°00' 15' 30' 148°45'

38°45'

39°00'

15'

30'

39°45'

THICK

THIN

VICTORIA TASMANIA

BASEMENT COMPLEX
(Latrobe not present)

ESSO-HEMATITE P.E.P.39

MAGELLAN P.E.P.63 Area 'B'

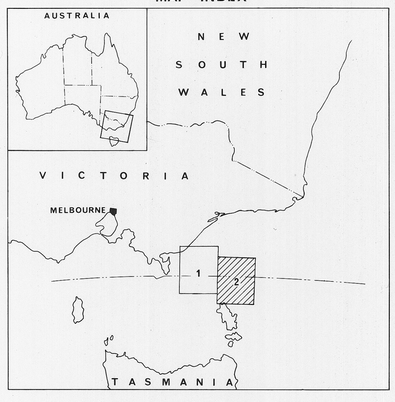
ESSO-HEMATITE EL.1/60

Flinders Is.

MAGELLAN EL.4/67

T A S M A N S E A

MAP INDEX



LEGEND

- —500— Isopach Contour in feet
- Analog Seismic Shot Point
- Digital Seismic Shot Point
- Well, abandoned with Oil Show
- Well, dry and abandoned
- U / D Fault, 'D' downthrown side
- Petroleum Tenement Boundary
- Limit of Subsidy Area, 30 mile radius from ESSO Kingfish A-1

EAST BASS BASIN - part 3/11

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

066068

ISOPACH CONTOUR MAP OF INTERVAL FROM TOP OF LATROBE DELTA TO BASEMENT

5 cm

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4

MILES

AUTHOR: D.B.DEPEW DRAFTED BY: K.H.REISS

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY EC–67, MAY 1968

SHEET 2 PLATE Vb

OR-040 1008/G/13

146°45' 147°00' 15' 30' 147°45'

38°30'

38°45'

39°00'

WOODSIDE

ST. MARGARET ISLAND

Woodside-1 T.D.6006
Woodside-2 T.D.6982
Woodside-3 T.D.5985
Woodside-4 T.D.2694
Woodside South-1 T.D.5866
Gippsland-1A T.D.1942
Gippsland-2 T.D.1952
Gippsland-3 at 14,976'
St. Margaret Island-1 at 4466

*WOODSIDE P.E.P. 42

*ESSO *HEMATITE P.E.P. 38

ESSO Perch A-1 T.D.9417'

ESSO HEMATITE P.E.P. 39

HOGAN GROUP

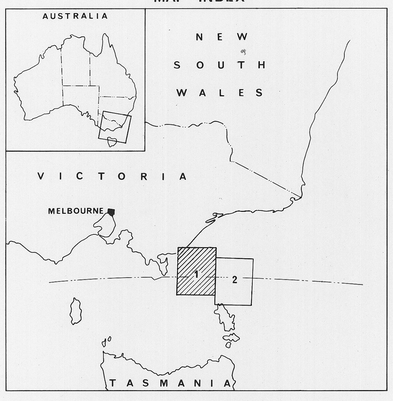
VICTORIA
TASMANIA

B A S S S T R A I T

KENT GROUP

ESSO HEMATITE E.L. 1/60

MAP INDEX



LEGEND

- Analog Seismic Shot Point
- Digital Seismic Shot Point
- Well, abandoned with Oil Show
- Well, dry and abandoned
- Limit of Subsidy Area, 40 mile radius from Esso Barracouta B-1
- Petroleum Tenement Boundary

EAST BASS BASIN -part 3/12

ESSO EXPLORATION AND PRODUCTION-AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

5 cm

066669

SHOT POINT MAP

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B.DEPEW DRAFTED BY:

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC-67, MAY 1968

SHEET I PLATE VI a

1008/G/14

OR-040

Bass Basin part V

11

147°45' 148°00' 15' 30' 148°45'

38°45' 39°00' 15' 30' 39°45'

EC – 67 ET – 67 ET – 16 EG – 41 EG – 42 ET – 72 ET – 71 ET – 73 ET – 43

EG – 40 EG – 29 EC – 135 EC – 165 EC – 113 EC – 156 ET – 84 R EC – 163 EC – 164 EC – 157 ET – 83 R

EC – 113A ET – 85 R EC – 158 EC – 159 ET – 86 R EC – 165 EC – 165 EC – 161 EC – 162

VICTORIA
TASMANIA

ESSO-HEMATITE PEP 39

MAGELLAN PEP 63 Area 'B'

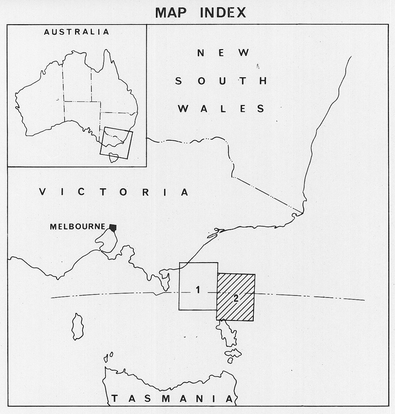
ESSO-HEMATITE EL 1/60

MAGELLAN EL 4/67

Flinders Is.

T A S M A N S E A

MAP INDEX



LEGEND

- Analog Seismic Shot Point
- Digital Seismic Shot Point
- Well, abandoned with Oil Show
- Well, dry and abandoned
- Limit of Subsidy Area, 40 mile radius from ESSO Barracouta B-1
- Petroleum Tenement Boundary

EAST BASS BASIN - Part 3/13

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

066670

SHOT POINT MAP

5 cm

CONTOUR INTERVAL: 100 FEET DATUM: SEA LEVEL

Scale 1 : 100,000

2 1 0 2 4
MILES

AUTHOR: D.B.DEPEW DRAFTED BY:

TO ACCOMPANY: FINAL REPORT, OFFSHORE GIPPSLAND BASIN
MARINE SEISMIC SURVEY EC–67, MAY 1968

SHEET 2 PLATE VI b

OR-040 1008/G/15

Bass Basin part V

12

146°00' 15' 30' 45' 147°00' 15' 30' 45' 148°00' 15' 30' 45' 149°00'

37°30' 45' 38°00' 15' 30' 39°00' 15' 30' 39°30'

REPRESENTATIVE LA ENTRANCE WELLS

1	L.E.G.-1 T.D. 10,118	6	Wrasse-2 T.D. 7400
2	Lakes Entrance-1 T.D. 10,000	7	Cobia-1 T.D. 6,500
3	Colquhoun-1 T.D.8,200	8	Colquhoun-4 T.D.800
4	Colquhoun-2 T.D. 10,000	9	Colquhoun-3 T.D. 10,114
5	Colquhoun-1B T.D.5,982	10	Dolphin-1 T.D.5,960

★ DISCOVERY WELL, 1924

Bairnsdale · Orbost · Cape Conran · Lakes Entrance · Maffra · Stratford · Sale · Traralgon · Morwell · Yarram · CORNER INLET · WARATAH BAY · GLENNIE GP. · MONCOEUR IS. · HOGAN GP. · DIRECTION IS. · KENT GP. · CURTIS GP.

ESSO-HEMATITE P.E.P.38 · ESSO-HEMATITE P.E.P.39 · WOODSIDE P.E.P.42 · ESSO-HEMATITE E.L.1/60 · ESSO-HEMATITE VIC/L1 · ESSO-HEMATITE VIC/L2 · ESSO-HEMATITE VIC/L3 · ESSO-HEMATITE VIC/L4 · ESSO-HEMATITE VIC/L5 · SHELL P.E.P.37 · MAGELLAN P.E.P.STA' · MAGELLAN P.E.P.43'B' · MAGELLAN E.L.4/67

T A S M A N S E A

V I C T O R I A T A S M A N I A

B A S S S T R A I T

MAP INDEX





LEGEND

- —500— Water depth contour in feet
- Seismic shot point
- Oil well
- Gas well
- Well abandoned with oil show
- Well abandoned with gas show
- Water supply well
- Well, dry and abandoned
- Producing licence boundary
- Petroleum tenement boundary

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE GIPPSLAND BASIN

VICTORIA – TASMANIA

066671

WATER DEPTH CONTOUR MAP

5 cm

CONTOUR INTERVAL 20 FT 100 FT 500 FT DATUM SEA LEVEL

Scale 1 : 250,000

4 2 0 4 8 MILES

AUTHOR N.C. HIGGINS DRAFTED BY K.H. REISS

TO ACCOMPANY FINAL REPORT OFFSHORE GIPPSLAND BASIN MARINE SEISMIC SURVEY EC-67. MAY 1968

PLATE VII

1008/6/16

EAST BASS BASIN part 3/14

OR-040