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No. 2346

EL 91

LAKE FROME

PROGRESS REPORTS FOR THE PERIOD 7/8/73 TO 6/8/75

Submitted by

Techmin Pty Ltd and BP Minerals Australia Pty Ltd
1975

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**PRIMARY INDUSTRIES
AND RESOURCES SA**

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TECHMIN PTY. LTD.

7th FLOOR, 27-35 TURBOT ST., BRISBANE, Q. 4000

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Management Company for—
OILMIN N.L. (Formerly EXOIL N.L.)
TRANSOIL N.L.
PETROMIN N.L.

T263/73

DHH:JA

17th December, 1973

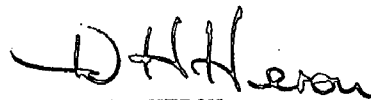
The Director of Mines,
Department of Mines,
Box 38,
Rundle Street Post Office,
ADELAIDE. S.A. 5000

Dear Sir,

Quarterly Report - Exploration Licence No. 91
Period ending 6th November, 1973

There was no exploratory work carried out on the area held under Exploration Licence No. 91 during the quarter under review and no expenditure has been allocated against the area to this time.

Yours faithfully,
TECHMIN PTY. LIMITED


D. H. HERON
General Manager



TECHMIN PTY. LTD.

7th FLOOR, 27-35 TURBOT ST., BRISBANE, Q. 4000
POSTAL ADDRESS: P.O. BOX 232, NORTH QUAY, Q. 4000
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"Techmin", Brisbane
Telex: AA41040

Management Company for—
OILMIN N.L.
TRANSOIL N.L.
PETROMIN N.L.

T347/74

DHH:ja

4th March, 1974

The Director of Mines,
Department of Mines,
Box 38,
Rundle Street Post Office,
ADELAIDE. S.A. 5000

Dear Sir,

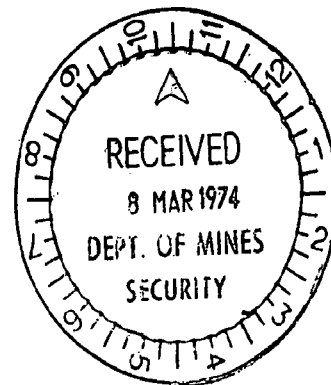
Quarterly Report - Exploration License Number 91 period
ending 6th February, 1974

There was no exploratory work carried out on the area held under
Exploration License No. 91 during the quarter under review and no
expenditure has been incurred.

Yours sincerely,
TECHMIN PTY. LTD.

D H Heron

D. H. HERON
General Manager



TECHMIN PTY. LTD.

7th FLOOR, 27-35 TURBOT ST., BRISBANE, Q. 4000
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Management Company for—
OILMIN N.L.
TRANSOIL N.L.
PETROMIN N.L.

T485/74

DHH:ja

6th June, 1974

Director of Mines,
Department of Mines,
Box 38,
Rundle Street Post Office,
ADELAIDE, S.A. 5000

→ Sup. Genl. / Min. En.
→ Sec

Dear Sir,

Quarterly Report - Exploration License No. 91
Period ending 6th May, 1974

There was no exploratory activity on the area held under Exploration License No. 91 during the quarter under review and no expenditure has been incurred.

Discussions have taken place with Minad Teton and BP Minerals Australia Limited with a view to entering into a joint venture with the Oilmin Group over EL-91 and other areas at Lake Frome.

A primary agreement relating to this joint venture is being finalized and it is hoped that it can be submitted to you for consideration and for the approval of the Honourable the Minister of Development and Mines in the near future.

Under the agreement it is envisaged that B.P. as incoming party will spend a minimum of \$25,000 in exploration on the License Area during the first 12 months of the joint venture. Ultimately it is foreseen that B.P. and Minad-Teton will each hold a 25% interest in the area with the Oilmin Group retaining the remaining 50% interest.

Yours sincerely,
TECHMIN PTY. LTD.

D H H
D. H. HERON
General Manager

→ Sec. *admission*
On basis of the Commonwealth report
on "Foreign ownership," what would
the ownership Australian: Foreign
be in this event?
By



OILMIN N.L.

TRANSOIL N.L.

0006

PETROMIN N.L.

MINES ADMINISTRATION PTY LTD

TETON EXPLORATION DRILLING COMPANY PTY LTD

BP MINERALS AUSTRALIA PROPRIETARY LIMITED

PRIMARY AGREEMENT

EXPLORATION LICENCES 68, 77 AND 91 SOUTH AUSTRALIA

QUARTERLY EXPENDITURE REPORT

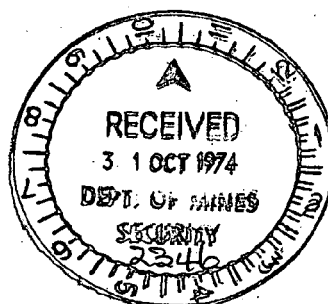
In accordance with Clause 8 of the above agreement, BP hereby reports
on the expenditure for the quarter : - - - - - July to September, 1974. - - - - -

	Total	EL 68	EL 77	EL 91 ✓
-Overheads:				
Plant and Tools	906	302	302	302
-Exploration				
Geological Services	190	63	64	63
Geochem. Services	377	94	189	94
Drilling Services	23,278	-	23,278	-
Drill-hole logging	5,904	-	5,904	-
Resistivity Survey	5,884	-	4,119	1,765
Access Roads	66	-	66	-
Consumable Stores	1,646	240	1,166	240
Consultants	310	103	104	103
-Operations				
Vehicle Operating	327	-	309	18
Charter Aircraft	1,007	148	609	250
Freight & Cartage	29	-	29	-
Travelling Expenses	247	-	235	12
Personnel Services and Trade	2,319	-	2,148	171
-Salaries & Wages	7,005	66	6,582	357
-Lease Fees	1,370	1	404	965
TOTAL	50,865	1,017	45,508	4,340

Certified Correct

.....*J.H.M.*.....

Senior Geologist (Uranium)



TECHMIN PTY. LTD.

7th FLOOR, 27-35 TURBOT ST., BRISBANE, Q. 4000
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Management Company for—
OILMIN N.L.
TRANSOIL N.L.
PETROMIN N.L.

T581/74

DHH:ja

3rd September, 1974

The Director of Mines,
Department of Mines,
Box 38,
Rundle Street Post Office,
ADELAIDE. S.A. 5001

Dear Sir,

Quarterly Report - Exploration Licence No. 91
Period ending 6th August 1974

There has been no exploratory activity on Exploration Licence No. 91 during the quarter under report.

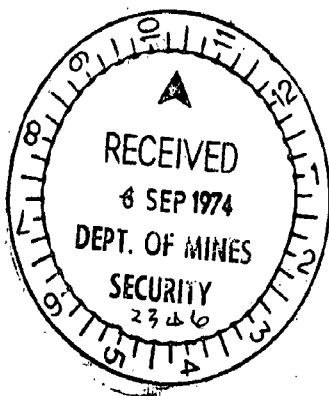
However, as you are aware, Ministerial consent has now been granted to an agreement between the Oilmin group, Minad-Teton, and B.P. Minerals Australia Pty. Ltd. over Exploration Licence No. 91 and adjacent licence areas.

Under the terms of this agreement, B.P. are committed to spend a minimum of \$25,000 on exploration on Exploration Licence No. 91 before July 1975.

B.P. have commenced their general exploratory programme in the Lake Frome area with resistivity surveys in the EL-77 area and now plan to commence drilling in that area.

Their programme for exploratory work on Exploration Licence No. 91 will depend upon results obtained in this preliminary drilling programme, and will be advised to you in due course.

No major expenditure has been incurred on the licence area during the quarter.



Yours sincerely,
TECHMIN PTY. LTD.

D. H. Heron

D. H. HERON

General Manager

BP Minerals Australia Proprietary Limited

Incorporated in Victoria

0008



1 Albert Road, Melbourne

Postal Address: G.P.O. Box 5222BB, Melbourne, 3001

Telephone: 26-6911 Telex: 30166 Telegraphic Address: "Austbeepae", Melbourne

The Director of Mines
Department of Mines
Box 38, Rundle Street, Post Office
ADELAIDE S.A. 5000

Our Reference

AG/27/16/14/1

Your Reference

Telephone Extn

Date

22nd October, 1974.

Dear Sir,

QUARTERLY REPORT FOR PERIOD ENDING SEPTEMBER 1974 - EL 91

The Honourable Minister for Development and Mines approved the farm-in agreement between the Oilmin Group, Minad-Teton and BP Minerals Australia Pty. Ltd. for Exploration Licence 91 (and adjacent Licence areas). Under the terms of the agreement BP Minerals Australia Pty. Ltd., as operator, will in future submit the quarterly report.

Exploration

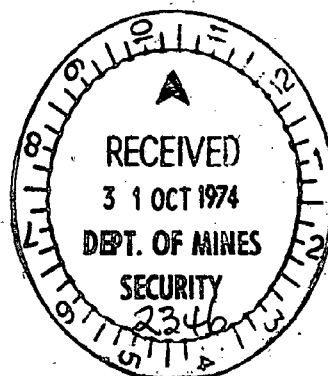
During the quarter of July - August - September water sampling and resistivity survey was done on EL 91.

Water Sampling:

Nine water bores were sampled in the lease area. However, assay results of these are not yet available.

Resistivity:

A surface resistivity survey was carried out over the west side of the lease area by Murdoch Geology & Geophysics Pty. Ltd. Two lines were surveyed for a total of 46 kilometres.



.. / 2

BP Personnel:

M.S. Bell - Project Geologist
D. Hurburgh - Assistant Geologist
R. Milner - Field Assistant
D. Brown - Field Assistant.

Murdoch Personnel:

R. Murdoch - Geophysicist
B. Copps - Assistant Geophysicist
2 Field Assistants.

Future Exploration:

In the fourth quarter of the year more resistivity work will be done, as well as a rotary drilling programme of approximately 10,000 feet.

Enclosures:

Plan I E.L. Location Map
Appendix I Report on Resistivity Survey

Yours faithfully,



Dr. J. H. Hills
Senior Geologist (Uranium)

0010

A RESISTIVITY SURVEY OVER EL 91, LAKE FROME, SOUTH AUSTRALIA
FOR BP MINERALS AUSTRALIA PTY. LTD.

EL 91

Relevant data on EL 91 taken from
Resistivity survey report.

R. Murdoch, B.A. (Earth Sciences)
Murdoch Geology & Geophysics P/L,
310 Grey Street,
GLEN INNES N.S.W. 2370.

July 1974

CONCLUSIONS

A reconnaissance resistivity survey has been carried out over parts of two exploration licences located immediately west and north-west of Lake Frome in North Eastern South Australia. The areas occur near the Beverley sedimentary uranium deposit and are considered prospective for sedimentary uranium. The Beverley Deposit occurs within Lower Tertiary fluvial sands deposited within a channel incised into Cretaceous sediments and thought to have drained eastwards from the Flinders Ranges. The aim of the survey conducted was to locate basement channelling and faulting on several reconnaissance traverse lines conducted within the two EL's.

Additional reconnaissance resistivity is required over a greater part of EL 91 before more than one preliminary hole can be recommended in that area. Successful holes should be followed by step-out drilling designed to adequately define the channel segment located.

Additional resistivity work is recommended either coinciding with or immediately following the preliminary drilling programme.

INTRODUCTION

A resistivity survey has been carried out by Murdoch Geology and Geophysics Pty. Ltd. over E.L. 91 near Lake Frome, South Australia.

The field work associated with the survey was carried out over a period of 16 days from the 7th to 22nd July, 1974. The survey was carried out by a three man crew lead by Mr. B. Copps (geophysicist). The crew was supervised and assisted on 10 of the 16 days by the author (senior geophysicist). A camp was established at Western Nuclear's base camp, situated 10 kilometres west of North Mulga Outstation for the period of the survey.

North Mulga Outstation is situated on the Copley - Moolawatana road, 40 kilometres NE of Wooltana Station and 160 kilometres ENE of the Village of Copley in north eastern South Australia. (See Plate 1. - Location plan). The area is immediately east of the Flinders Ranges and immediately west of Lake Frome.

The area surveyed comprises parts of two explorations licences:
namely: EL 77 & EL 91

The location of both EL's and all the resistivity lines conducted during the survey are shown on Plate 1, a 1:250,000 location plan of the area west and north-west of Lake Frome.

The survey comprised 158.5 kilometres of Schlumberger Array profiling and 15 detailed Schlumberger Array soundings.

GEOLOGY

The area surveyed comprises part of the Lake Frome Embayment of the Great Artesian Basin. Sands deposited within Tertiary channels incised into Cretaceous basement rocks are considered prospective for sedimentary uranium deposits. The channels are thought to have meandered generally eastwards from the foothills of the Flinders Ranges, where Proterozoic and Lower Palaeozoic rocks of the Adelaidean Series crop out. These rocks have relatively high background concentrations of uranium, and are thought to be the source area for the Beverley Deposit.

The Beverley Deposit was located by Western Nuclear⁷ and its position is shown on Plate 1. The ore-body occurs within Lower Tertiary fluvial sands at depths between 160-200 metres.

Evidence from deep drillholes and water bores suggest that Cretaceous shales form the basement rocks throughout the area surveyed. The Lower Tertiary channels have been incised into the basement rock and have been overlain by blanket deposits of Upper Tertiary and Quaternary alluvium in excess of 150 metres thick.

Channelling in the vicinity of the Beverley Deposit is thought to have been controlled by faulting associated with the up-lifting of the Flinders Ranges. Movement is thought to have been progressive from the Cretaceous continuing possibly as late as the Upper Tertiary.

The aim of the survey described in this report was to determine whether the electrical resistivity method could be used successfully to delineate channelling and faulting within the Cretaceous bedrock. If successful, then the aim was to use the method to attempt to reconstruct as much basement geology of the EL's as time permitted.

THE RESISTIVITY METHOD

Details of the principles of the electrical resistivity method are not

included in this report. The reader is either referred to a simple geophysical text on resistivity or additional information could be supplied by the author upon request.

EQUIPMENT

The equipment used for this survey comprises a DC Voltage Source with a maximum output of 540 volts. The current electrodes comprised 3 foot brass rods connected to the E.M.F. by insulated cables. The current flowing through this circuit was measured on a Yew Milliammeter capable of reading accuracies of 0.3 milliamps. Facilities were available to reverse the direction of Current output to check anisotropy. No aids to conduction such as salt and water etc. were necessary during this survey.

The potential drop across a part of the electrical field established above was recorded on high impedance Comark Microvoltmeter connected to conventional porous pots. A simple bucking circuit was connected to the microvoltmeter to enable cancellation of SP currents.

FIELD PROCEDURES

The resistivity survey was conducted along 6 traverse lines with a constant reading interval of 0.5 kilometres. Each reading station was marked with a 25mm x 25mm survey peg projected at least 0.5 metres above the ground. The respective line and position number were recorded on each peg. The distance between each reading station was measured by a wire 500 metres long. Surface landmarks (fences, tanks etc.) intersected on each line are marked at their respective positions on the profile graphs (Plate 3). The position of all lines conducted is shown on Plate 1.

The traverses comprised resistivity profiling with a current electrode separation of 1 kilometre and potential electrode separation of 200 metres. Profiling was parallel to the traverse direction. A short profile using a current electrode separation of 2 kilometres with the 200 metre potential electrode separation was tried from Line 1 5000S - 9000S to determine whether any extra information could be obtained by using a wider electrode separation. This method of profiling has been recommended for future use on Line 3 (EL 91).

Detailed Schlumberger Array soundings were conducted in several places to assist the interpretation. However, generally the conducting of soundings was ignored because of the very homogeneous electrical properties of the Cretaceous basement. The position of each detailed sounding conducted is given in Table 1; within the Interpretation Section below.

All soundings were expanded parallel to the traverse line on a predetermined logarithmic formulae. Generally they were expanded to a maximum current electrode separation from the centre of configuration of 500 metres, but some were expanded as far as 1 kilometre from the centre of configuration. On most soundings 14-15 individual readings were taken.

RESULTS

All the detailed soundings have been plotted as standard log-log graphs of apparent resistivity (vertical axis) against current electrode separation from the centre of the configuration (horizontal axis). The plotting of the data in this manner allows the sounding graphs to be compared with standards 2 & 3 layer computer-derived interpretation curves.

The sounding curves are presented as Plates 16 to 18 accompanying this report.

The profiles conducted during the survey are plotted on Plate 3. They are plotted as graphs of apparent resistivity (vertical axis) against line position (horizontal axis). The vertical scale used is 1cm = 1ohm metres. The horizontal scale used is 1cm = 500 metres.

INTERPRETATION

(a) Detailed Soundings

The detailed soundings have been interpreted by partial curves matching techniques using essentially 2 layer and auxiliary curves. This method of interpretation integrates the sounding curve into a number of layers of different resistivity and thickness. An expected lithology is assigned to each layer depending upon the known geology of the area, its resistivity value, position and thickness.

The detailed soundings have been interpreted as follows:

Table 1.

DETAILED SOUNDING INTERPRETATION

	<u>Layer</u>	<u>Resistivity (ohm metres)</u>	<u>Depth Interval (metres)</u>	<u>Expected Lithology</u>
Line 3.008	1	110	0-14	Quaternary Surface layer.
Plate 16	2	11	14-210	Quaternary & Tertiary

	<u>Layer</u>	<u>Resistivity (ohm metres)</u>	<u>Depth Interval (metres)</u>	<u>Expected Lithology</u>
	3	3.3	210-500+	Tertiary sediments
	4	?	500+	Cretaceous
Line 3 10000S	1	6	0-22	Surface layer
Plate 17	2	12	22-77	Quaternary
	3	5.4	77+	Tertiary, thence Cretaceous?
Line 3 21000S	1	25	0-12	Surface layer
Plate 18	2	10	12-144	Quaternary-Tertiary
	3	6	144+	Tertiary, thence Cretaceous

In the above interpretation the following resistivity ranges have been interpreted as representing the following formations:

- 3 - 5 Tertiary sediments
- 6 - 12 Cretaceous sediments
- 13 - 20 Cretaceous or Adelaidean

Some minor exceptions occur;

Namely:

Line 3 10000, Line 3 21000S.

On these soundings the Tertiary layer has a resistivity between 5 and 6 and no separate Cretaceous layer has been penetrated to a depth of 500 metres. There may be virtually no electrical contrast between a relatively resistive Tertiary section (5-6ohm metres) and a relatively conductive Cretaceous section. (6ohm metres).

In interpreting the sounding data the surface layer can be ignored as the resistivity and thickness of this layer is largely dependent upon near-surface moisture conditions at the time of the survey and the current electrode separation of the first reading taken. This layer has been loosely termed Quaternary, but it is likely that the Quaternary section in most cases will continue downwards into the second layer, particularly where an additional layer can be interpreted between the surface layer and the Tertiary layer. The additional layer, where it occurs, has been loosely termed Quaternary-Tertiary.

Most soundings were not expanded beyond 500 metres, as it was considered that profiling was of more value than sounding in attempting to reconstruct the geology of the area, considering the time available. Additional soundings, expanded to maximum current electrode separations from the centre of configuration of 1 km, are required during any subsequent survey to provide more accurate information of the depth to the Cretaceous layer.

Experimental profiling with a current electrode separation of 2 kms is required along parts of line 3 to confirm that optimum profiling interval has been used in all areas.

It is considered likely that the proposed experiments with wider separations will reveal that 2 km separations need only be used in isolated very deep areas, which have to be initially located using 1 km separations.

(b) Profiles

During the survey the main emphasis was placed on obtaining as much profile data as possible, at a uniform separation, to allow a preliminary reconstruction of the geology of the area. Over the area surveyed apparent resistivity values at the 1km separation generally vary from 4 to 7ohm metres indicating very little variation in the electrical properties of the layers present. In some areas values drop below 4 (deep basement and channelling). Sudden variations in apparent resistivity value of about 1ohm metre along the profiles have been interpreted as faults. Channels have been interpreted where lower values occur over an interval comprising several readings.

Channelling and faulting have been interpreted to occur as follows:

Table 2
PROFILE INTERPRETATION

(a) Channelling

EL 91 Line 3 10250S - 13250S

(b) Faulting

EL 91 Line 3	24250S - Downthrow south.
Line 6	14250E - Downthrow east.
Line 6	15750E - Downthrow east.

Interpreted Geological Sections

0017

Interpreted geological sections have been constructed for each line beneath their respective profile. They have been constructed using both the qualitative interpretation of profiles and the quantitative interpretation of the soundings. They have been plotted on the same horizontal scale as the profiles, but on a vertical scale of 1cm = 100metres.

The interpreted geological sections are schematic rather than absolute due to the lack of sufficient fully expanded detailed soundings. They show the likely positioning of channelling, faulting and the approximate depth to basement as indicated by those soundings conducted.

EL 91

The geological reconstruction of that part of EL 91 covered during this survey is shown on Plate 1. One or two parallel faults appear to occur on Line 6. Faulting is also possible near the southern end of Line 1. Channelling is possible near the centre of Line 3 and should be followed up prior to drilling.

RECOMMENDATIONS

(a) Preliminary Drilling Programme

EL - 91

Line 3

11500S (May defer until other sites are available)

Step-out holes should be drilled at intervals of $\frac{1}{2}$ km either side of the preliminary holes until channel intervals located have been adequately defined and some preliminary information on radio-activity present in the channel segments has been obtained.

(b) Additional Resistivity Programme

Additional resistivity work either coinciding with, or immediately following, the preliminary drilling programme, should be aimed at.

(a) Providing more accurate information on depth to Cretaceous sediments, short 2km current electrode separation traverses should be conducted in deeper parts of the area to determine whether the optimum profiling separation has been selected for use in all parts of the Lake Frome Prospects.

(b) Additional reconnaissance work in the following areas.

EL 91 (1) North-south line east of Line 3 to confirm possible channelling located on Line 3.

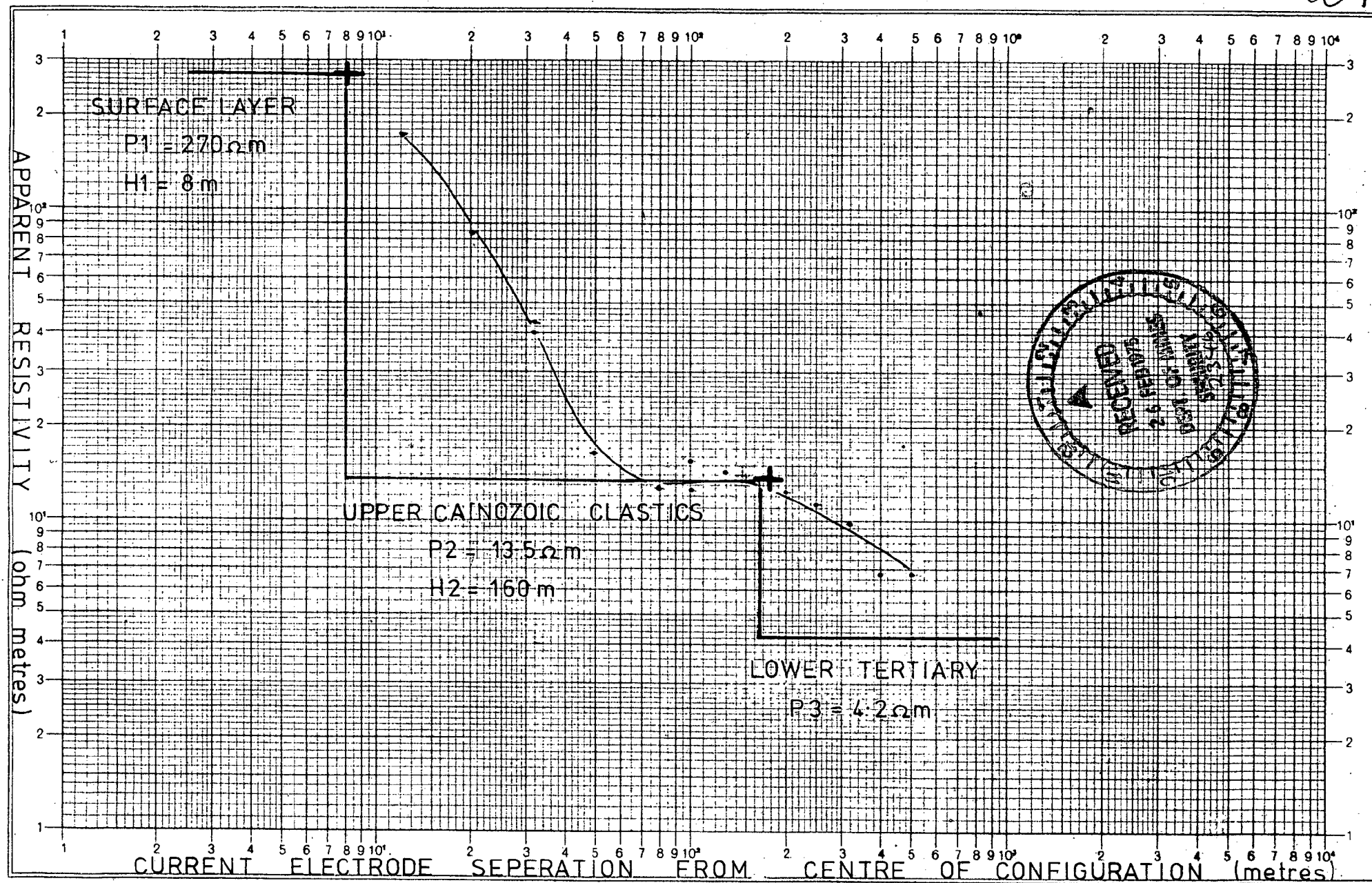
(2) Continue Line 3 southwards to southern end of EL91.
There may be an ancient equivalent to Big John Creek.

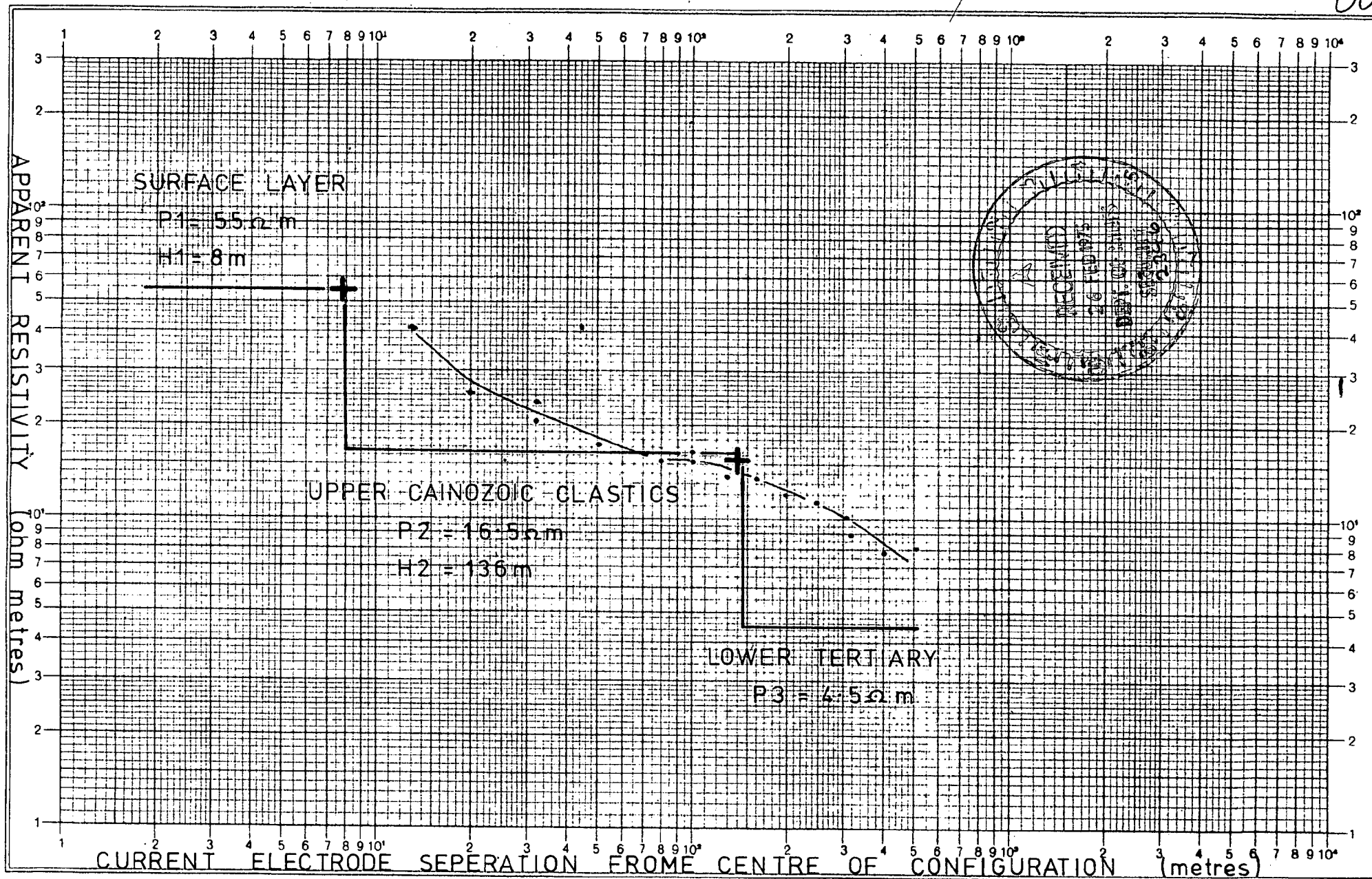
(c) More detailed work in areas found to be of interest from the preliminary drilling to determine channel paths on parallel lines 2 kilometres apart oriented perpendicular to the expected channel path. On these lines the reading separation should be reduced to 0.25 kilometres to provide slightly more data over channel segments.

(d) Resistivity has been used in other sedimentary uranium areas to locate suitable environments for uranium deposition along channel segments. Such work indicates the position of ponding, channel bends etc., and has been successful in locating pyrite zones often associated with sedimentary uranium deposits.

Filtering of Results.

A Gaussian Filter was applied to attenuate noise from the resistivity results. This technique has an overall smoothing effect on the resistivity profiles and tends to minimise spurious anomalies. The filtered profiles together with the original profiles are shown in Fig. 6. This is part of a report "Gaussian Filtering of The Lake Frome Resistivity Survey Results" which has been included in Appendix 1 of the report on EL 77.





APPARENT RESISTIVITY (OHM METRES)

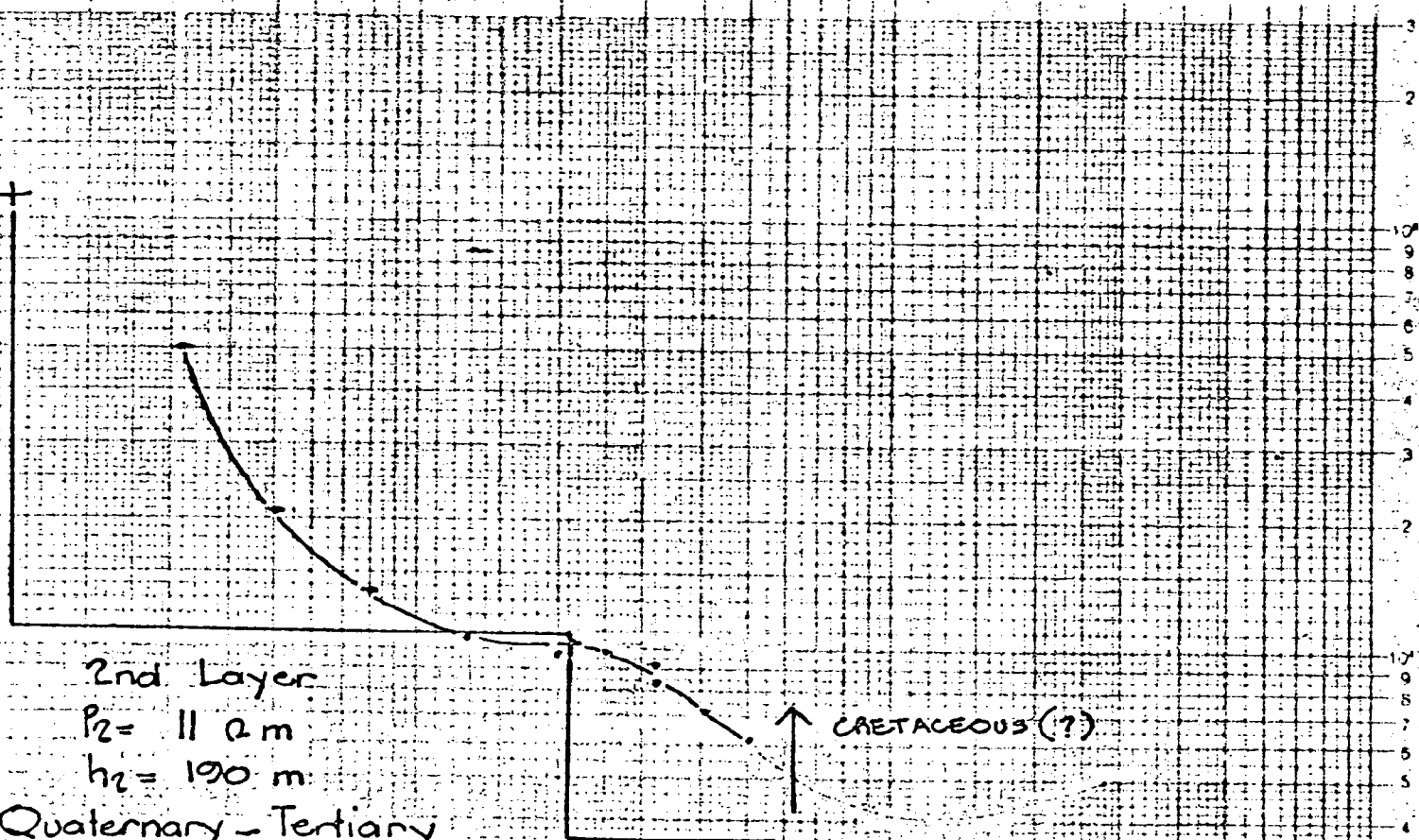
1st Layer
 $\rho_1 = 110 \Omega m$
 $h_1 = 14 m$
Surface Layer

2nd Layer
 $\rho_2 = 11 \Omega m$
 $h_2 = 190 m$
Quaternary - Tertiary

3rd Layer
 $\rho_3 = 3.3 \Omega m$
 $h_3 = 300 m$
Tertiary

CRETACEOUS (?)

CURRENT ELECTRODE SEPARATION (METRES)



LAKE FROME

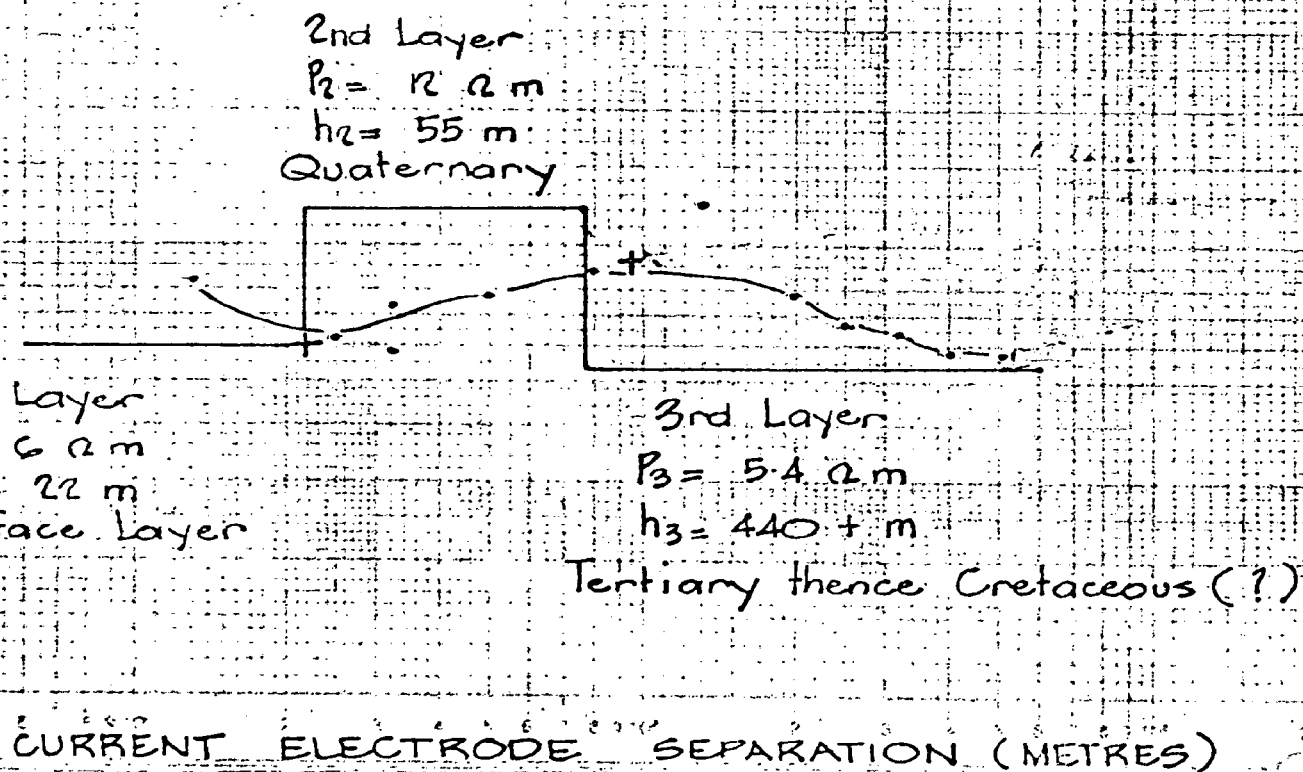
LINE 3 10000 S

PLATE 17

REPORT 83

0022

APPARENT RESISTIVITY (OHM METRES)

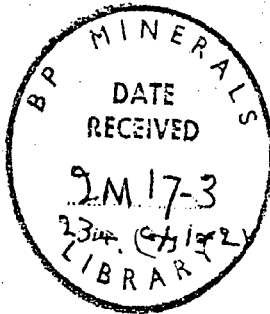


1st Layer
 $\rho_1 = 25 \Omega \cdot m$
 $h_1 = 12 \text{ m}$
 Surface Layer

2nd Layer
 $\rho_2 = 10 \Omega \cdot m$
 $h_2 = 130 \text{ m}$
 Quaternary-Tertiary

3rd Layer
 $\rho_3 = 6 \Omega \cdot m$
 $h_3 = 350 + \text{m}$
 Tertiary, thence Cretaceous

CURRENT ELECTRODE SEPARATION (METRES)



0024

A RECONNAISSANCE RESISTIVITY SURVEY OVER EL 91
LAKE FROME - SOUTH AUSTRALIA
FOR B.P. MINERALS AUSTRALIA.

By: R. Murdoch, B.A. (Earth Sciences)
Murdoch Geology & Geophysics P/L,
310 Grey Street,
GLEN INNES. N.S.W. 2370

November, 1974.

Report No. 92



The aim of the reconnaissance resistivity survey conducted over EL 91 - South Australia was to provide further reconnaissance data on the Tertiary geology in the NW corner of the licence area. In particular to locate faulting and possible channel paths.

The work has indicated a major NNE-SSW fault on EL 91. This one is in the western part of the survey area. It has also indicated two possible channels. A third possible channel is expected to enter the area from adjoining EL 68.

Two areas of interest have been delineated and it is recommended that a more detailed resistivity survey be carried out in these areas of interest to delineate optimum targets prior to drilling.

The main aim of the follow-up work should be to locate possible stratigraphic traps for uranium salts in deltaic sands east of the fault zone..

Further reconnaissance resistivity surveying is recommended south along the major faults located at the eastern end of Line 6, during an early resistivity survey on EL 91.



INTRODUCTION

0026

Under instruction from Dr. J. Hills and Mr. M. Bell of B.P. Minerals Australia, Murdoch Geology & Geophysics Pty. Ltd. have carried out a resistivity survey over part of EL 91 west of Lake Frome, South Australia.

The field work was carried out over part of a 4 day period from 7th to 10th November, 1974. The survey was conducted by a 4 man crew lead by Mr. B. Coppa (geologist). It was carried out in conjunction with a survey over adjoining EL 68.

The area surveyed is situated south-east of Wooltana Station 160 kilometres east of the Village of Copley in N.E. South Australia. The area is east of the Flinders Ranges and west of Lake Frome. The position of EL 91 is shown on Plate 1, a 1 : 250,000 location plan.

This survey is a follow-up to a similar survey previously conducted on EL 91 and described in Murdoch Geology & Geophysics Pty. Ltd. Report No.83. The results of the first survey have been incorporated in this report.

The second survey comprised 21.5 kilometres of Schlumberger Array profiling and two detailed Schlumberger Array soundings.

GEOLOGY

On EL 91 several hundred metres of unconsolidated Cainozoic sediments overlie Cretaceous mudstones deposited in the Lake Frome Embayment of the Great Artesian Basin. Fluvial sands deposited within Tertiary channels are considered prospective for sedimentary uranium deposits. The channels are thought to have meandered generally eastwards from the foothills of the Flinders Ranges, where Proterozoic and Lower Palaeozoic rocks of the Adelaidean Series crop out. These rocks have relatively high background concentrations of uranium, and are thought to be the source area for the Beverley



Uranium Ore-body, which occurs within Lower Tertiary fluvial sands at depths of 160 to 200 metres some 50 kilometres north of the survey area. The Beverley deposit is thought to occur within deltaic sands deposited where Tertiary channels entered ancient equivalents of Lake Frome. The present and ancient shore lines of Lake Frome appear to be controlled by NNE-SSW faults. Movements along the faults have been progressive into the Tertiary. Such movements may have caused plastic flexure of the deltaic sands proving ideal environments for roll-fronts to occur.

The aim of the survey described in this report was to determine whether any channelling or basement faulting occur within the area surveyed and to generally reconstruct as much basement geology of the EL's as time permitted.

THE RESISTIVITY METHOD

Neither details of the principles of the electrical resistivity method nor the equipment used are included in this report. The reader is either referred to a simple geophysical text on resistivity or additional information could be supplied by the author upon request.

FIELD PROCEDURES

The position of the 2 lines conducted during the survey and the two lines conducted during the first survey are shown on Plate 1. Lines 3 and 6 were conducted during the first survey and Lines 11 and 13 were conducted during this survey. On all lines the reading interval was 0.5 kilometres. Each reading station was marked with a 25 x 25 mm peg projecting at least 0.5 m above the ground. The respective line and position number were recorded on each peg. The distance between each reading station was measured by a wire 500 metres long.

The traverse lines comprised Schlumberger Array profiling with current electrode separation of 500 metres and potential electrode



separation from the centre of the configuration of 100 metres. The profiling was conducted parallel to the traverse direction.

During the survey described in this report detailed Schlumberger Array soundings were conducted at 2 positions on Line 11. At both these positions the soundings were expanded to the following logarithmic formula:

TABLE 1. - Detailed Sounding Readings

r (current electrode separation from centre of the configuration in metres)	m (potential electrode separation from the centre of the configuration in metres)
13	2
20	2
32	2
32	5
50	5
80	5
100	5
100	40
130	40
160	40
200	40
250	40
320	40
320	100
400	100
500	100

RESULTS

The profiles conducted during the second survey have been plotted on Plate 2. They have been plotted as graphs of apparent resistivity (vertical axis) against line position (horizontal axis). The vertical scale used was 1 cm equals 1 ohm metres and the horizontal scale used was 1 cm equals 500 metres.



The apparent resistivity values recorded in EL 91 and part of adjoining EL 68 during both surveys have been plotted on Plate 3, a 1 : 50,000 plan of the area. The results have been manually filtered by the weighted averaging of each reading with the two readings either side. The filtered results have been contoured using a contour interval of 0.2 ohm metres.

The detailed soundings have been plotted as standard log-log graphs of apparent resistivity (vertical axis) against current electrode separation from the centre of the configuration (horizontal axis). The plotting of the data in this manner allows comparison of the sounding curve with standard interpretation curves. The soundings are presented as Plates 4 and 5 accompanying this report.

INTERPRETATION

(a) Detailed Soundings

The detailed soundings have been interpreted by partial curve matching techniques using essentially 2-layer and auxiliary interpretation curves. This method of interpretation integrates the sounding curve into a number of layers of different resistivity and thickness. An expected lithology can then be assigned to each layer depending upon the known geology of the area, its resistivity value, position and thickness.

The detailed soundings have been interpreted as follows:

TABLE 2. - Detailed Sounding Interpretation

	<u>Layer</u>	<u>Resistivity</u> (ohm metres)	<u>Depth Interval</u>	<u>Expected Geology</u>
Line 11	1	270	0 - 8	Surface layer
00E	2	13.5	8 - 168	Upper Cainozoic clastics
Plate 4	3	4.2	168 +	Tertiary clays
Line 11	1	55	0 - 8	Surface layer
8000E	2	16.5	8 - 144	Upper Cainozoic clastics
Plate 5	3	4.5	144 +	Tertiary clay



In the above interpretation the following resistivity ranges have been taken to represent the following formations.

Upper Cainozoic clastics	13.5 - 16.5 ohm metres
Tertiary clay (in part sandy)	4.2 - 4.5 ohm metres

In interpreting the sounding data the surface layer can be ignored as its resistivity and thickness is dependent upon near-surface moisture conditions at the time of the survey and the current electrode separation of the first reading taken.

The second layer on each sounding has been loosely labelled Upper Cainozoic clastics. The clastics form a blanket deposit covering the prospective lower Tertiary sediments. This layer may not entirely represent clastics and may in part reflect oxidized Lower Tertiary sediments. The third layer may reflect reduced Lower Tertiary sediments. The resistivity of the lower Tertiary sediments varies from 4.2 to 4.5 ohm metres indicating a clay section generally, with perhaps some minor sand content. The Cretaceous basement does not seem to have been fully intersected on either sounding, but there is some suggesting of it occurring from depths of about 350 metres.

(b) Profiles

Over the area surveyed the apparent resistivity values on the profiles vary from 5 to 8 ohm metres. The values have been manually filtered by the weighted averaging of each reading with the two readings adjoining either side. The filtered profiles have been included as dotted lines on Plate 2.

Generally the profiles appear to be mapping the Lower Tertiary section. Therefore resistive anomalies would reflect sandy oxidized sections in the Lower Tertiary. However, broad highs will probably be reflecting shallow Cretaceous basement. Conductive anomalies should reflect clays, reduced zones and possible channel paths.



Faulting has been interpreted as occurring as follows:

TABLE 3. - Faulting

Line 11	13750E	Downthrow east
Line 13	3250E	Downthrow east
Line 13	on EL 68 near border with EL 91	Downthrow east

Reduced zones or channel anomalies occur as follows:

TABLE 4. - Channel Anomalies (Reduced zones)

Line 11	7250E - 9250E
Line 13	3250E - 5250E

The edge of these zones may be fault controlled.

Possible oxidized zones that occur near faults and inferred channels occur on Line 13 and are centred at 3000E&6000E. These anomalies may represent edges of deltaic sand deposits. A similar target on Line 11 may be 15000E.

THE INTERPRETED GEOLOGICAL SECTIONS

Interpreted geological sections have been constructed for both lines beneath their respective profile on Plate 2. They have been constructed essentially from the profile data controlled by the quantitative sounding interpretation where soundings occur. They have been plotted on the same horizontal scale as the profiles, but at a vertical scale of 1 cm = 100 m. The interpreted sections are schematic rather than absolute due to the lack of sufficient detailed soundings.

Discussion on Plate 3.

The manually filtered profile data from both this survey and the



previous one have been plotted on Plate 3. Also included is Line 12 conducted on EL 68, near the edge of that licence with EL 91. Plate 3 has been contoured at an interval of 0.2 ohm metres.

Major faulting striking NNE-SSW has been inferred in the western part of the EL and at the eastern end of Line 3.

The proposed Munyallina Channel is interpreted to occur over the interval Line 11 7250E - 9250E in the NW corner of EL 91, and flow eastwards possibly crossing Line 3 north of Line 11.

The proposed Tommy's Bore Channel is expected to enter EL 91 from EL 68 and may have combined with the proposed Mulga Bore Channel (Line 13 3250E - 5250E) and flow eastwards crossing Line 3 north of Line 13.

The remaining feature of interest on EL 91 is a resistivity ridge located on Line 12 in EL 68 and inferred as continuing eastwards to Woodlawoodlana Bore (Line 11). This ridge is probably a basement high to the south of the proposed Munyallina Channel.

Areas Prospective for Sedimentary Uranium

The key target areas for sedimentary uranium in the Lake Frome area are deltaic sands deposited where ancient channels intersect the old shore-line of Lake Frome. The ancient shore lines appear to be controlled by major NNE-SSW faults having progressive movement upwards into the Tertiary.

Areas worthy of future exploration effort on EL 91 therefore are as follows:

1. Proposed Munyallina Channel - north and east of Woodlawoodlana Bore. (Area of interest A marked on Plate 3).
2. Proposed Tommy's Bore and Mulga Bore Channels NW of the intersections of Lines 3 and 13. (Area of interest B marked on Plate 3)



0033

3. South along the projected paths of faults located at the eastern end of Line 3. Further reconnaissance work is required in this area initially.

RECOMMENDATIONS

A drilling programme on EL 91 is not recommended at this stage as no precise targets have been outlined. Further resistivity traversing on east-west lines 1 km apart is recommended in areas of interest A & B. The traversing should include profiling at current electrode separations from the centre of the configuration of 200 and 500 metres with detailed soundings every 2 kilometres. Further reconnaissance traversing of the type described in this report is recommended along the interpreted fault south of the eastern end of Line 6.

However, should it be considered desirable to conduct a short drilling programme as the next stage of exploration, the following targets are recommended.

- | | |
|-------------|------------------------------|
| (a) Line 11 | 7000E, 8000E, 14000E, 15000E |
| (b) Line 13 | 3000E, 4000E, 6000E |
| (c) Line 6 | 15500E, 16500E |



OILMIN N.L.

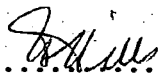
0034

TRANSOIL N.L.PETROMIN N.L.MINES ADMINISTRATION PTY LTDTETON EXPLORATION DRILLING COMPANY PTY LTDBP MINERALS AUSTRALIA PROPRIETARY LIMITEDPRIMARY AGREEMENTEXPLORATION LICENCES 68, 77 AND 91 SOUTH AUSTRALIAQUARTERLY EXPENDITURE REPORT

In accordance with Clause 8 of the above agreement, BP hereby reports
on the expenditure for the quarter ending.....December, 1974.....
The expenditure for quarter October to December is shown in brackets.

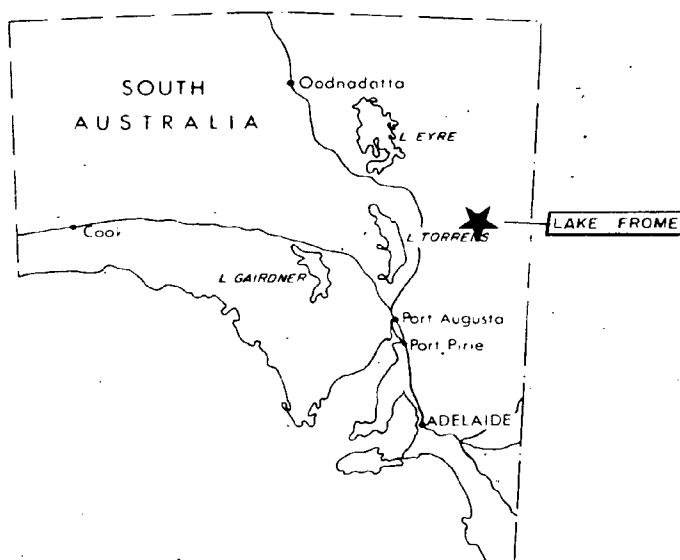
	Total	EL 68 (2nd)	EL 77 (2nd)	EL 91 (2nd)
- Overheads	2,610	870 (568)	870 (568)	870 (568)
Plant and Tools:				
- Exploration				
Geological Services	1,764	720 (657)	79 (15)	965 (902)
Geochem. Services	631	175 (81)	280 (91)	176 (82)
Drilling Services	46,026	9,554 (9,554)	23,278 -	13,194 (13,194)
Drill-hole logging	12,804	2,898 (2,898)	5,904 -	4,002 (4,002)
Resistivity Survey	10,092	1,362 (1,362)	5,760 (1,641)	2,970 (1,205)
Access Roads	66	-	66 -	-
Consumable Stores	2,072	453 (213)	1,166 -	453 (213)
Exploration Tenement Fees	2,001	212 (211)	614 (210)	1,175 (210)
- Investigations				
Consultant Services	310	103 -	104 -	103 -
- Operations				
Vehicle Operating	1,427	462 (462)	309 -	656 (638)
Rental of Equipment	882	370 (370)	- -	512 (262)
Aircraft Charter *	786	* 115 -	* 476 -	195 (195)
Freight & Cartage	89	25 (25)	29 -	35 (35)
Travelling Expenses	1,030	329 (329)	235 -	466 (454)
Personnel Services	5,824	1,472 (1,472)	2,148 -	2,204 (2,033)
- Salaries & Wages	14,118	3,053 (2,987)	6,582 -	4,483 (4,126)
TOTAL	102,532	22,173 (21,189)	47,900 (2,525)	32,459 (28,119)

Certified Correct



* Figures adjusted from
1st. Quarterly Report.

Senior Geologist (Uranium)



LOCATION MAP

1974 DRILLING PROGRAMME

EL-91

**LAKE FROME EMBAYMENT
SOUTH AUSTRALIA**

BP MINERALS AUSTRALIA PTY LTD

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1974 DRILLING PROGRAMME

EL 91

LAKE FROME EMBAYMENT, SOUTH AUSTRALIA

M.S. BELL
MELBOURNE, VICTORIA
March, 1975

C O N T E N T S

0036

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S U M M A R Y

0038

Exploration Licence 91 is located in the Lake Frome Embayment of South Australia, and approximately 400 miles north of Adelaide. The embayment is an extension of the Great Artesian Basin, and is bounded on the west, south, and east by hills and mountains of older Proterozoic Rocks.

Uranium mineralization is found in the Proterozoic rocks, and in the Tertiary sediments within the embayment.

The first exploration work done on the licence was by Petromin and Western Nuclear. Work by BP Minerals Australia Pty Ltd commenced in November with resistivity surveying and water sampling, which was followed by a rotary drilling programme of 17 holes.

No outstanding radiometric anomalies were detected, but several of the holes along the northern boundary of the licence were much more radioactive than holes further south.

0039

1. INTRODUCTION

EL 91 (S.M.L. 503) is located in the Lake Frome Embayment of South Australia and covers the central part of the lake itself and ground to the west of the lake.

It is bounded on the north by EL 176 and partly on the west by EL 68. On the remainder of the west to the south, and to the east, the ground is open.

Accessibility to the EL is by road, from Copley 100 kilometers to the west or Yunta 350 kilometers to the south, to Wooltana Homestead, and from there about 10 kilometers by station tracks. It is also accessible by charter aircraft to Wooltana Homestead. Exploration work started in November with resistivity surveying, water-sampling and rotary drilling, and was completed by the middle of December.

2. PREVIOUS EXPLORATION

On EL 91 a total of 91 holes were previously drilled by other companies for a total footage of 44,128 feet. The hole numbers are 243-1 to 243-45 (23,450 feet). Numbers 16A, 16B, 17A, 18A, and 34A were cored. The second series is from 589-1 to 589-41 (20,678 feet). Number 589-18 and 589-28 were assayed. Number 509-10 was sampled from 516.5' to 518.5' and assayed 0.017% U_{308} , and 589-28 was sampled from 422.5 to 433.5' and assayed 0.0199% U_{308} .

Petromin drilled the number 243 series and Western Nuclear drilled the number 589 series.

3. GEOLOGY

Prior to Mesozoic deposition, the Lake Frome area was occupied by gently folded Middle and possibly Lower Cambrian red-beds and limestones. These rested on a thin Proterozoic sequence over crystalline basement. To the west were Cambrian and Precambrian deposits of the Adelaide Geosyncline and to the south and east, Precambrian crystalline basement of the Olary and Barrier Ranges blocks with a cover of metamorphosed Adelaidean sediments.

During Lower Jurassic time epeirogenic movements were initiated, resulting in the formation of the Great Artesian Basin and permitting a marine transgression during the Lower Cretaceous. The Frome Embayment is part of the Great Artesian Basin and owes its present aspect partly to Late Tertiary and Quaternary tectonic events.

3.1 Stratigraphy

The general lithology of the section penetrated by drilling is summarised as follows (Brunt, 1971) :

Upper Clastics Unit

The upper clastics mainly consist of reddish-brown silty sandy mudstones, sands, coarse sands, and gravel; minor clay, gypcrete and calcrete. These sediments form piedmont deposits that developed eastwards from the foot of the Flinders Ranges.

Upper Clay Unit

The upper clays consist of bluish-grey to greenish-grey and yellowish silts, clayey sands, and coarse sands, which grade downwards into pale olive grey or olive clay.

Lower Clay Unit

The lower clays consist of dark grey to black clay, commonly lignitic and gypsiferous, with minor interbeds of white dolomitic variegated clays. Hematitic mottling is frequently present. Several sand horizons are present and consist of very fine to medium grained, sub-rounded quartzose, well sorted sands.

Below this and not penetrated in the drilling programme are the following formations:

Eyre Formation (Lower Eocene)

This is a relatively thin unit and made up of gravel and sand at the top, and below this well-sorted white sands.

Upper Cretaceous

Dark brown lignite clay and green clay, and lower down some gravels, coarse sand, sandstones, and sandy shales.

Lower Cretaceous

Pyritic blue shales.

3.2 Structural Interpretation

There are no major known geological features in the area of this licence.

The resistivity work shows north-south trending faults near Tommy Corner Bore and Cockatoo Bore, and a west-east channel through Woodlawoodlana Bore and two channels near Tommy Corner Bore. It is quite possible that these are Lower Tertiary Channels. (Murdoch, R., 1974).

4. 1974 EXPLORATION PROGRAMME

The latest exploration on the lease included water sampling, resistivity surveying, and open-hole rotary drilling. The drilling programme took place in November and December.

The drilling was done by Thompson Drilling Company Pty Ltd of Millicent, S.A. The downhole logging was done by Geoscience Associates (Aust.) Pty Ltd of Adelaide, South Australia, and the resistivity surveying was done by Murdoch Geology and Geophysics Pty Ltd of Glen Innes, N.S.W.

4.1 Drilling Results

On EL 91 seventeen holes were drilled for a total meterage of 2,870.70 meters. No coring and assaying was done. All the holes were logged for gamma, self-potential, and resistivity response. The lithological and geophysical logs are in Appendix 1.

On EL 91, hole 91-4 along the north side gave a response of 200 c/s against a background of 20 c/s (10 x BKG). The drill information is summarized on Table 1.

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T A B L E 1

EL 91

(Drilling Data)

<u>Hole numbers</u>	<u>Depth Probed</u>	<u>High Counts</u>
91 - 1	162.80 m	134 c/s (6.7xBKG)
2	213.50	
3	170.80	155 c/s (7.7xBKG)
4	152.70	201 c/s (10 x BKG)
5	171.00	
6	170.90	
7	168.70	
8	198.70	158 c/s (7.9 x BKG)
9	162.40	
10	162.40	
11	161.80	
12	171.50	
13	174.60	
14	153.10	
15	169.80	
16	153.50	
17	152.60	

4.2 Interpretation of Drilling and Logging Results

On the whole the lithology of licence 91 is quite uniform except for along the north side.

The electric logs were poor, and so making interpretation and correlation difficult.

On EL 91 in holes 91-1, 17, 2, 3 and 4 the lithology changes somewhat, with the clastics thinning out and the anomaly, which extends over from EL 68, varies in depth from 130 meters^{re} to 150 meters. Anomalies are located, as follows : 91-1, at 150 meters^{re} at the bottom of a sandy section; 91-17, at 128 meters; 91-2, at 131 meters and 138 meters, which is at the top and bottom of a sandy section; 91-3, at 130 meters^{re} at the bottom of a sandy section; and 91-4 at 130 meters at the bottom of sands.

More holes were drilled further east of 91-4 on that section, and the anomalies continued to decrease in intensity until they disappeared.

Elsewhere on the licence very minor sandy sections were found in an occasional hole with light radiometric response.

5. CONCLUSIONS AND RECOMMENDATIONS

To the end of 1974 a total of 108 holes have been drilled and 635 kilometers^{re} of resistivity surveying carried out.

The drilling indicates an anomalous area along the north side of the licence in the general vicinity of Number One Bore.

The resistivity indicates the following: a fault near Cockatoo Bore ; a deep channel just north of Woodlawoodlana Bore; and a deep channel and a shallow channel to the east of Tommy Corner Bore. (Murdoch, R., 1974)

Drilling is recommended in each of the three resistivity targets, and more drilling on the target near Number One Bore.

More resistivity surveying should be done to the south and east of these targets.

0044

6. REFERENCES

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(Wertaloonna) Unpublished Quarterly Report to
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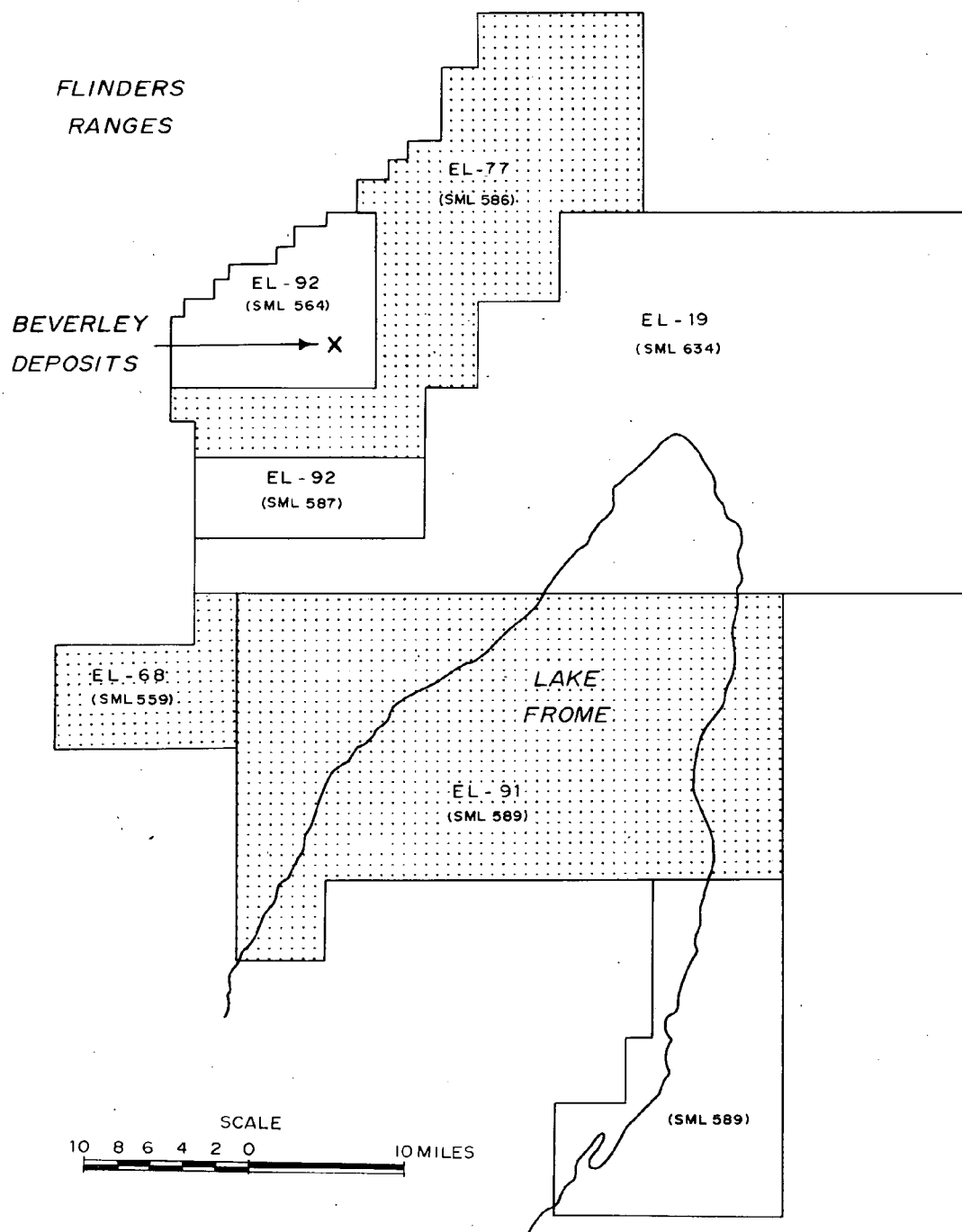
MURDOCH, R., 1974 : Report No. 83 - A Resistivity Survey near
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Pty Ltd.

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EL 91; Lake Frome, South Australia, for BP Minerals
Australia Pty Ltd.

7. APPENDICES

Appendix I. Drill Logs (Lithological and Geophysical)

0045



EXPLORATION LEASES ON NORTH WEST SIDE OF LAKE FROME EMBAYMENT.

FIGURE 1

BP MINERALS AUST. PTY LTD	
Area:	LAKE FROME
SOUTH AUSTRALIA	
Ref:	
FEB, 1975	M. S. BELL

DRILL HOLE LOG

0046

HOLE No.	91-1	DATE DRILLED	14/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	14/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Pootana	DATE LOGGED	14/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	161.5m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	162.8m	LOGGING SPEED	9 m/m	FLUID LEVEL	17.5m
GEOLOGIST	M. BELL	ELEVATION	57.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☒ Sand ☒ Silt ☒ Clay ☒ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 6.1	CLASTICS: reddish-brown; pebbles to 4cm; top 2m somewhat more sandy; more pebbles in lower section; pebbles of meta-sediments; some carbonate fragments.
				6.1- 22.1	CLASTICS: pebbles to 5cm; reddish-brown; more pebbly at top and more clayey at base; pebbles of meta-sediments; clay red-brown with grey clasts.
				22.1- 33.6	CLASTICS: pale olive brown; some dark grey clay; pebbles of sediments to 5cm.
				33.6- 38.1	SILTY CLAY: reddish-brown with grey clay clasts; sandy at base.
				38.1- 51.8	CLASTICS: reddish-brown; pebbles to 2cm; sand to 3mm; lithic and quartz fragments; traces of chalky, massive carbonate.
				51.8- 56.3	SILTY CLAY: reddish-brown; pebbles to 1cm; sand mainly angular to sub-rounded quartz up to 4mm.
				56.3- 58.7	CLASTICS: reddish-brown; pebbles to 1cm; mostly coarse lithic and quartz; sand up to 4mm; some feldspar grains; sand grains angular to sub-rounded.
				58.7- 63.0	SILTY CLAY: reddish-brown; pebbles to 1cm; sand mainly angular to sub-rounded; quartz up to 4mm.
				63.0- 65.5	LIMY CLASTICS: reddish-brown; carbonate chips with inclusions of sub-rounded quartz grains and lithic sand up to 2mm; pebbles to 1cm.
				65.5- 67.8	SILTY CLAY: pale brown; limy with sand and silt inclusions; also red-brown and grey clay; pebbles to 1cm.
				67.8- 93.0	SILTY CLAY: reddish-brown; pebbles to 4cm; mixed meta-sediments and some granitic; some carbonate at top; mica fairly common.
				93.0- 99.9	Reddish-brown; pebbles to 1.5cm; sand to 4mm; quartzose and lithic fragments; more clayey at bottom of section.
				99.9-106.8	SILTY CLAY: reddish-brown; pebbles to 2cm; grey clay clasts; chalky carbonate in middle of section; mica common.
				106.8-115.9	LIMY CLAY: reddish-brown with grey clasts; massive carbonate chips; pebbles to 1cm; sand lithic and quartz fragments; more clay at bottom.
				115.9-120.7	CLASTICS: pale brown, with some grey locally; sand and silt quartzose and lithic; carbonate massive.
				120.7-129.5	CLASTICS: olive brown clays; some red-brown and grey; more sandy at base.
				129.5-132.0	SAND: pale brown; mainly angular to sub-rounded quartz sand; coarse grained to 3mm, not under 1mm.
				132.0-134.5	SILTY SAND: pale brown; poorly sorted 1 to 2mm in size.
				134.5-141.2	CLAY: purplish grey, some grey and red-brown; sub-rounded quartz grains; hematitic lithic fragments up to 4mm, some carbonate.
				141.2-148.0	CLAY: grey to dark grey with minor purplish clay; minor lithic and quartz sand.
				148.0-161.5	CLAY: grey to dark grey; sand up to 2mm; mainly quartz and lithic hematitic fragments; minor carbonate.
					End of hole.

DRILL HOLE LOG

0047

HOLE No.	91-2	DATE DRILLED	14/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	16/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Pootana	DATE LOGGED	16/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	216.5m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	213.5m	LOGGING SPEED	9 m/m	FLUID LEVEL	15.6m
GEOLOGIST	M. BELL	ELEVATION	41.0m	BACK GROUND	8 a/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 8.4	CLASTICS: Light red-brown; pebbles to 3cm; pebble mixed meta-sediments.
				8.4- 19.8	CLASTICS: khaki gravel; pebbles to 4cm; rock fragments, meta-sediments and quartz, CO ₂ chips ? calcareous similar to that seen in 91-1 (215-222).
				19.8- 33.6	CLASTICS: red-brown; CO ₂ chips as above; numerous quartz grains included; patches of grey clay and silt occur together.
				33.6- 56.4	CLASTICS: red-brown; pebbles to 3cm; variable meta-sediments ? Mn oxide present; more gravelly around 44m.
				56.4- 63.4	CLASTICS: red-brown; pebbles and chips 3cm; variable meta-sediments and quartz fragments.
				63.4- 86.0	CLAY: pale red-brown coarse quartz to 4mm; CO ₂ chips to 2cm with quartz inclusions.
				86.0- 88.5	CLAY: red-brown and grey with silt sand to 4mm, CO ₂ ? from above.
				88.5- 90.75	Medium grained quartz and lithic sands 2mm; red-brown clay and grey clay.
				90.75- 99.9	CLAY: mainly grey with red-brown and yellow clay fractions; khaki colour; sand coarse to 4mm quartz and lithic.
				99.9-102.2	Massive and clayey white CO ₂ overall colour reddish-white quartz and lithic sand to 4mm; clay red-brown and grey.
				102.2-118.1	CLAY: khaki with yellow and reddish coatings; sand mainly hematitic nodules; CO ₂ occurs as chips.
				118.1-122.8	CLAY: purplish and grey with some silt and CO ₂ chips.
				122.8-216.55	CLAY: grey yellow gravel to 4cm; scattered CO ₂ and gypsum chips; sand 2.5% for 2m from 144m approximately.
					47A.
					End of hole

47A

DRILL HOLE LOG

0048

HOLE No.	91-3	DATE DRILLED	17/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	17/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Pootana	DATE LOGGED	17/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	170.8m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	170.8m	LOGGING SPEED	9 m/m	FLUID LEVEL	8.0m
GEOLOGIST	M. BELL	ELEVATION	38.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-3}		

LITHOLOGY: ☒ Gravel ☒ Sand ☒ Silt ☒ Clay ☒ Carbonate ☒ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 3.66	MIXED META-SEDIMENTS: red-brown; pebbles to 3cm; sand to 2mm.
				3.66- 24.4	MIXED META-SEDIMENTS with granitic and quartz fragments; pebbles to 5cm; sand quartz and lithic to 4mm; clay pale brown.
				24.4- 65.5	MIXED META-SEDIMENTS: red-brown quartz fragments; sand lithic and quartz to 4mm; minor CO ₂ chips. Patches of grey clay.
				65.5- 70.1	CLAY: red-brown, some grey; sand to 2mm; quartz and lithic; minor CO ₂ chips.
				70.1- 86.1	CLAY: red-brown with grey increasing with depth; minor CO ₂ chips
				86.1- 93.0	CLAY: red-brown and grey sand to 2mm; minor CO ₂ chips.
				93.0-113.5	CLAY: mainly grey with yellow and brown.
				113.5-127.5	CLAY: dark grey, grey and purplish, some minor yellow; some minor hematitic concretions to 4mm.
				127.5-141.2	CLAY: grey yellow with minor purple; trace CO ₂
				141.2-170.80	CLAY: mainly grey and yellow, some purple aggregate gypsum occurs crystal fragment ? Lignitic clayey black material; trace of CO ₂ chalky and massive increasing to approx. 5% at 161.80-163.80. Minor gypsum below 152m.
End of hole.					

DRILL HOLE LOG

0049

HOLE No.	91-4	DATE DRILLED	18/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	18/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Poontana	DATE LOGGED	18/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	152.5m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	152.7m	LOGGING SPEED	9 m/m	FLUID LEVEL	15.2m
GEOLOGIST	M. BELL	ELEVATION	36.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES	100%	INTERVAL	DESCRIPTION
				0- 8.4	MIXED META-SEDIMENTS: red-brown; sand to 4mm; CO ₃ massive ? chips of calcrete pebble less than 2cm.
				8.4- 12.85	MIXED META-SEDIMENTS and quartz fragments; pale brown; pebbles to 3cm; sand quartz and lithic to 4mm.
				12.85- 17.5	CLAY: red-brown; pebbles to 2cm; Trace of CO ₃
				17.5- 47.25	MIXED LITHIC SEDIMENTS and quartz; red-brown; pebbles to 2cm; Trace of CO ₃
				47.25- 51.8	CLAY: red-brown; gravel to 5mm; sand with the clay.
				51.8- 58.7	CLAY: red-brown; quartz and lithic sand; gravel to 1cm; mainly coarse (4mm).
				58.7- 72.4	CLAY: red-brown with patches of grey; CO ₃ at base; pebbles up to 1cm.
				72.4- 81.5	CLAY: red-brown and grey; pebbles up to 1cm; CO ₃ more defined.
				81.5- 86.1	CLAY: red-brown and grey; quartz and lithic pebbles to 2cm. sand to 4mm.
				86.1-111.5	CLAY: mainly grey with red-brown and yellow coatings; sandy at 90.5m-92.5m and 94.5m-96.5m.
				111.5-124.3	CLAY: dark grey, grey and purple with a trace of CO ₃
				124.3-152.5	CLAY: dark grey, grey and yellow; minor hematitic nodules throughout.
					End of hole.

DRILL HOLE LOG

0050

HOLE No.	91-5	DATE DRILLED	18/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	19/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Pootana	DATE LOGGED	19/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	170.8m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	171.0m	LOGGING SPEED	9 m/m	FLUID LEVEL	13.4m
GEOLOGIST	M. BELL	ELEVATION	34.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		
LITHOLOGY:	☒ Gravel	☒ Sand	☒ Silt	☒ Clay	☒ Carbonate	☐ Carbonaceous	

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 6.1	MIXED META-SEDIMENTS: red-brown; pebbles to 2cm; minor CO ₂ at base.
				6.1- 15.2	Chips of CO ₂ up to 2cm; minor clay; red-brown.
				15.2- 47.3	CLAY: red-brown with patches of grey; CO ₂ chips to 2cm.
				47.3- 70.2	CLAY: red-brown, patches of grey; trace of CO ₂ sand to 2mm.
				70.2- 86.0	CLAY: red-brown and grey patches; sand to 2mm; minor pebbles to 2cm.
				86.0- 93.0	CLAY: grey, yellow and red-brown, some hematitic nodules at 300'-305'
				93.0- 97.5	CLAY: grey mainly, with yellow, red and brown coatings; hematitic nodules 5-10% trace of CO ₂
				97.5-116.0	CLAY: mainly grey with yellow, red and brown patches; chips of chalky CO ₂
				116.0-170.8	CLAY: dark grey and yellow with chips of chalky CO ₂ black clay ? lignite below 462.5' traces between 380' & 455' sand 30% between 450' & 455'
					End of hole.

DRILL HOLE LOG

0051

HOLE No.	<u>91-6</u>	DATE DRILLED	<u>19/11/74</u>	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	<u>91</u>	DATE COMPLETED	<u>19/11/74</u>	RANGE	<u>200</u>	RESIST. SCALE	<u>High</u>
PROJECT	<u>Pootana</u>	DATE LOGGED	<u>19/11/74</u>	TIME CONSTANT	<u>2 sec</u>	SP. SCALE	<u>110</u>
LOCATION	<u>L. Frome</u>	DRILLED DEPTH	<u>170.8m</u>	PAPER SPEED	<u>1 cm/m</u>	BIAS	<u>290</u>
STATE	<u>S.A.</u>	LOGGED DEPTH	<u>170.8m</u>	LOGGING SPEED	<u>9 m/m</u>	FLUID LEVEL	<u>10.7m</u>
GEOLOGIST	<u>M. BELL</u>	ELEVATION	<u>48.0m</u>	BACK GROUND	<u>8 g/s</u>		
DRILLER	<u>R. Brown</u>	CO-ORDS		TIME BASE	<u>1 sec</u>		
LOGGER	<u>R. McGurk</u>			K-FACTOR	<u>2.64×10^{-5}</u>		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

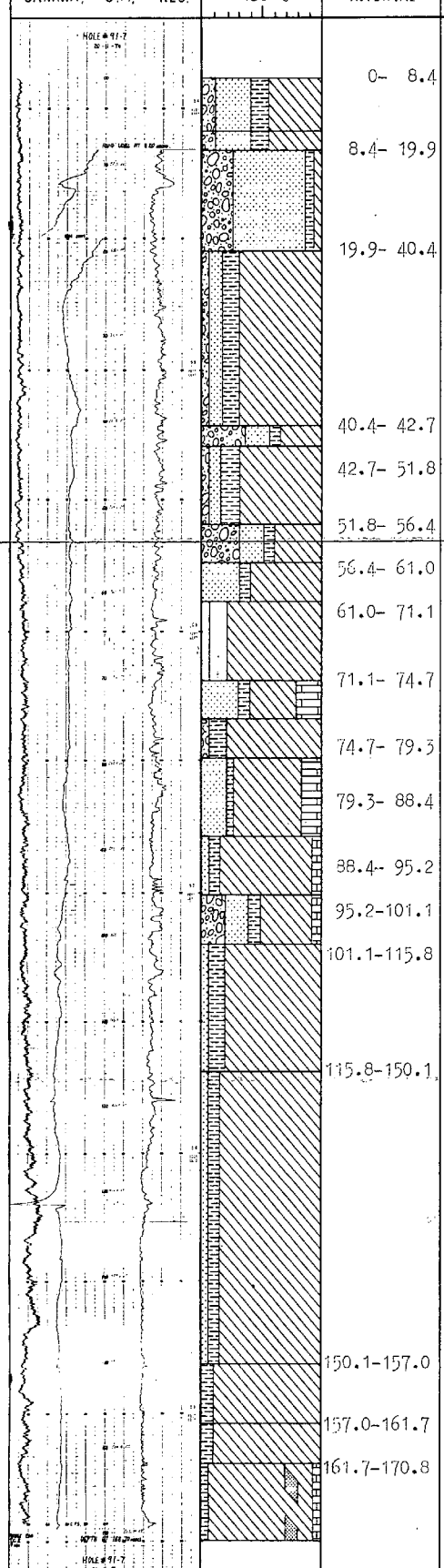
GAMMA, S P, RES.	100%	INTERVAL	DESCRIPTION
		0- 8.4	MIXED CLASTICS: red-brown; pebbles to 2cm generally to $\frac{1}{2}$ cm; sand to 4mm; traces of CO ₂
		8.4- 17.5	CLAY: red-brown; pebbles to 2cm; chips of reddish (?) CO ₂ to 2cm.
		17.5- 19.9	Chips of CO ₂ to 3cm with red-brown clay.
		19.9- 45.0	CLAY: red-brown with patches of grey; chips of CO ₂ up to 3cm dispersed.
		45.0- 67.8	CLAY: red-brown with chips of reddish CO ₂ to 2cm; sand to 4mm; quartz and lithic rounded to sub-rounded.
		67.8- 70.1	CLAY: red-brown with chips of CO ₂ to 2cm.
		70.1- 72.3	QUARTZ SAND: sub-rounded to angular with red-brown lithic clays and CO ₂ chips to 2cm.
		72.3- 77.0	SAND and GRAVEL to 2cm; red-brown clay with patches of grey.
		77.0- 86.0	MIXED CLASTICS: red-brown clay with pebbles and sand up to 2cm; traces of CO ₂
		86.0- 99.9	SAND and GRAVEL to 2cm; clay red-brown with patches of grey.
		99.9-102.1	SAND to 2mm; quartz and lithic red-brown clay.
		102.1-127.3	Dominantly grey clay with red-brown and yellow patches; some hematitic nodules in the last 5m; traces of CO ₂ still occur in the clay.
		127.3-155.0	Dominantly grey clay with yellow patches, black clay is sparse; first occurs at 134.25m; increasing downward; also brown grey clay; trace of CO ₂ 142-155m.
		155.0-170.8	CLAYS are dark grey, black white and grey; gypsum occurs up to 5% CO ₂ up to 5% from 165m - 168m approx.
			End of hole.

DRILL HOLE LOG

0052

HOLE No.	91-7	DATE DRILLED	20/11/74	GAMMA LOG	ELECTRIC LOG
EXPL. LICENCE No.	91	DATE COMPLETED	20/11/74	RANGE	200
PROJECT	Pootana	DATE LOGGED	20/11/74	TIME CONSTANT	2 sec
LOCATION	L. Frome	DRILLED DEPTH	170.8m	PAPER SPEED	1 cm/m
STATE	S.A.	LOGGED DEPTH	168.7m	LOGGING SPEED	9 m/m
GEOLOGIST	M. BELL	ELEVATION	51.0m	BACK GROUND	8 c/s
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}

LITHOLOGY: ☒ Gravel ☒ Sand ☒ Silt ☒ Clay ☒ Carbonate ☒ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
					
				0- 8.4	MIXED META-SEDIMENTS and quartz fragments; sand to 4mm, red brown, pebbles to 2cm.
				8.4- 19.9	MIXED META-SEDIMENTS: pebbles up to 4cm, sand to 4mm; variable proportions of silt, sand and clay increasing to red brown clay towards base.
				19.9- 40.4	CLAY: red-brown with patches of grey; pebbles to 3cm.
				40.4- 42.7	MIXED META-SEDIMENTS and quartz; red-brown clay with quartz and lithic sand to 4mm; pebble to 3cm.
				42.7- 51.8	CLAY: red-brown with patches of grey; pebbles to 3cm.
				51.8- 56.4	CLAY: red-brown with grey patches; quartz and lithic sand to 4mm; pebbles to 2cm.
				56.4- 61.0	QUARTZ and LITHIC: coarse sand to 3mm; red-brown and grey clays.
				61.0- 71.1	CLAY: red-brown with patches of grey; gravel below 5%
				71.1- 74.7	CLAY: red-brown with grey particles; quartz and lithic sand sub-rounded to sub-angular; reddish chips of CO ₂ (effervesces in HCl)
				74.7- 79.3	CLAY: red-brown with patches of grey; gravel under 5% trace of CO ₂
				79.3- 88.4	CLAY: red-brown with grey particles; quartz and lithic sand sub-rounded to sub-angular; reddish chips of CO ₂ (effervesces in HCl)
				88.4- 95.2	CLAY: red-brown with some grey patches; quartz and lithic sand to 5mm; chips of white and red CO ₂
				95.2-101.1	CLAY: red-brown and grey; pebbles of mixed meta-sediments and quarts to 2cm; red and white CO ₂ chips.
				101.1-115.8	CLAY: red-brown with minor yellow and grey; silt is within the clay.
				115.8-150.1	Dominantly grey CLAY with yellow and red-brown coatings; hematitic nodules in top 10m; hematitic colouration towards base; upper clays, trace of CO ₂ white throughout.
				150.1-157.0	CLAYS: dark grey, black and purplish with trace of CO ₂
				157.0-161.7	CLAYS: grey yellow and white; traces of CO ₂ and hematitic nodules.
				161.7-170.8	CLAYS: black, dark grey and grey; possible lignite; some yellow clay chips of gypsum to 1cm.
					End of hole.

DRILL HOLE LOG

0053

HOLE No.	91-9	DATE DRILLED	27/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	28/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Poontana	DATE LOGGED	28/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	161.7m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	162.4m	LOGGING SPEED	9 m/m	FLUID LEVEL	6.0m
GEOLOGIST	M. BELL	ELEVATION	32.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☒ Sand ☒ Silt ☒ Clay ☐ Carbonate ☐ Carbonaceous

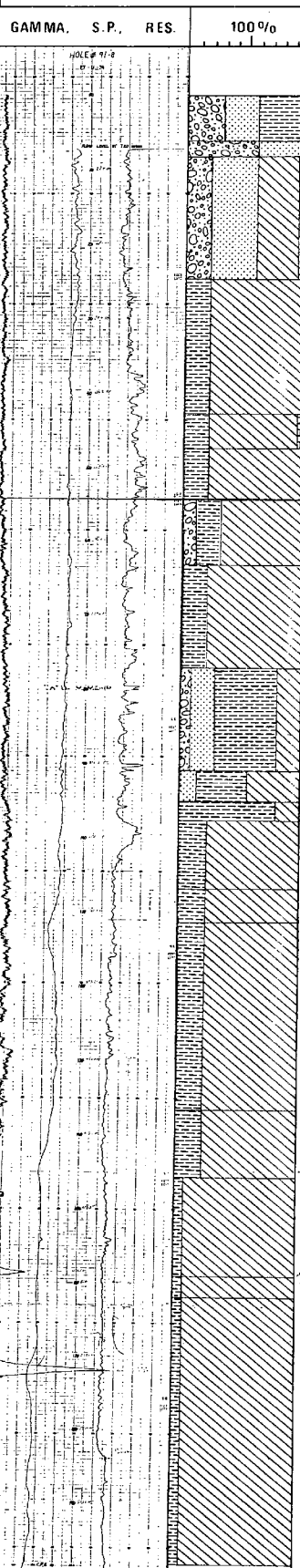
GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 6.1	Reddish-brown SANDS with sub-rounded pebbles to 3cm; coarse sand to 3mm; clay increases with depth.
				6.1- 8.4	Reddish-brown SILTY CLAY.
				8.4- 15.2	Reddish-brown CLAY with grey clasts; calcareous sub-rounded pebbles to 4cm.
				15.2- 38.1	SILTY CLAY: reddish-brown with grey clasts, also mica.
				38.1- 42.7	CLAY: reddish-brown with grey clasts; pebbles to 2cm.
				42.7- 58.8	SILTY CLAY: reddish-brown with grey clasts.
				58.8- 65.6	CLASTICS: reddish-brown with grey clay; clasts also; quartzite and meta-sediments; pebbles from 0.25 to 2cm., and mica.
				65.6- 75.0	SILTY CLAY: reddish-brown with grey clay clasts, also mica and dark minerals.
				75.0- 83.0	CLASTICS: mostly grey and reddish-brown silts; pebbles of quartzite to 5cm; sand to 0.5cm.
				83.0-104.5	Grey SILT with some yellow limonite staining.
				104.5-107.0	50% grey waxy CLAY and 50% white limy clay.
				107.0-109.0	Medium grey CLAYS with reddish-brown and limonite stains.
				109.0-140.5	Medium grey with limonite throughout; some lignite between 123.5m - 125.5m.
				140.5-161.7	CLAY: medium grey with narrow bands of very light grey to white; some very dark clay between 140.5m - 144.5m; also some reddish-brown clay at about 157.0m.
					End of hole.

DRILL HOLE LOG

0053A

HOLE No.	91-8	DATE DRILLED	26/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	27/11/74	RANGE	200	RESIST. SCALE	high
PROJECT	Pootana	DATE LOGGED	27/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	198.2m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	198.7m	LOGGING SPEED	9 m/m	FLUID LEVEL	7.2m
GEOLOGIST	M. BELL	ELEVATION	44.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
					
				0- 6.1	Pebbles of quartzite to 5cm; rounded to sub-rounded; brownish colour.
				6.1- 8.4	Coarse sand and pebbles to 5cm; sub-rounded and brownish.
				8.4- 24.4	Red-brown pebbles to 3cm., sub-rounded; limestone at the top becoming more clayey towards the bottom.
				24.4- 42.7	Reddish-brown with grey clasts.
				42.7- 47.25	Reddish-brown with chips of calcrete.
				47.25- 54.2	Reddish-brown with grey clasts.
				54.2- 63.2	Reddish-brown pebbles mainly quartzite, sub-rounded up to 3cm.
				63.2- 77.0	Reddish-brown with grey clasts.
				77.0- 90.8	Reddish-brown with grey clasts; pebbles sub-rounded to 3cm.
				90.8- 95.0	Reddish-brown and grey clasts.
				95.0- 97.6	Grey-green with minor yellow, due to limonite, abundance of mica and dark minerals.
				97.6-106.8	Reddish-brown and grey-green; limonite is becoming hematized.
				106.8-111.3	Reddish-brown and grey-green with abundant hematite and some hematite nodules.
				111.3-145.6	Light grey silty upper clays with hematite and hematite nodules; there is a trace of CO ₂ in white clay at 129.5 - 136.5m; there is also minor limonite staining.
				145.6-160.0	Grey-green silty upper clay with some limonite staining.
				160.0-198.25	Medium grey clay with limonite stain; black and lignitic clay between 160.0m - 167.5m.
					End of hole.

DRILL HOLE LOG

0054

HOLE No.	91-10	DATE DRILLED	28/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	28/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Pootana	DATE LOGGED	28/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	161.7m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	162.4m	LOGGING SPEED	9 m/m	FLUID LEVEL	4.0m
GEOLOGIST	M. BEILL	ELEVATION	24.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		
LITHOLOGY:	☒ Gravel	☒ Sand	☒ Silt	☒ Clay	☒ Carbonate	☒ Carbonaceous	

GAMMA, S.P., RES.	100%	INTERVAL	DESCRIPTION
		0- 6.1	SAND is 100% for first 2m and reddish-brown up to 2m; silty clay grey brown in colour; chips to 3cm.
		6.1- 10.7	LIMY SILCRETE chips to 3cm; white.
		10.7- 15.25	LIMY SILCRETE chips to 3cm but more reddish than before.
		15.25- 19.8	CLASTICS: reddish-brown with grey clay clasts; some silcrete and quartzite chips to 3cm.
		19.8- 32.75	SILTY CLAY: reddish-brown with some grey clasts.
		32.75- 37.3	MIXED CLASTICS: reddish-brown with sub-rounded pebbles to 1 - 5cm.
		37.3- 49.5	SILTY CLAY: reddish-brown with grey silt clasts, also some mica and black minerals.
		49.5- 51.8	MIXED CLASTICS: red-brown with abundant grey silt clasts, also some minor limonite staining at base.
		51.8- 65.5	CLAYEY SILT: red-brown with abundant grey clasts and minor lignite staining at base.
		65.5- 74.75	Grey SILT with limonite staining also some red-brown clayey silt
		74.75- 86.0	Red-brown with some grey clasts.
		86.0- 95.0	Waxy grey-green and minor white clay (upper).
		95.0- 97.5	Light grey and white calcareous clay.
		97.5- 99.9	Black with minor white clay also some limonite staining.
		99.9-104.5	CLAY: light grey with minor yellow limonite staining.
		104.5-107.0	CLAY: 50% black lignitic clay and 50% dark brown and grey.
		107.0-113.5	CLAY: mainly dark grey brown with minor light grey.
		113.5-125.0	Mainly red - dark grey clay with some limonite staining and calcareous material.
		125.0-140.5	Mostly black lignitic clay with minor medium grey clay.
		140.5-142.5	70% is light grey with minor red; the other 30% is black lignitic clay.
		142.5-143.5	CLAY is all medium grey.
		143.5-145.5	70% is light grey with minor red; the other 30% is black lignitic clay.
		145.5-154.5	Mainly light to medium grey with occasionally very small red bands of calcareous matter.
		154.5-161.7	70% is light grey with minor red bands of calcareous matter; the other 30% is black lignitic clay End of hole.

DRILL HOLE LOG

0055

HOLE No.	91-11	DATE DRILLED	28/11/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	29/11/74	RANGE	200	RESIST. SCALE	High
PROJECT	Poontana	DATE LOGGED	29/11/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	161.7m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	161.8m	LOGGING SPEED	9 m/m	FLUID LEVEL	6.7m
GEOLOGIST	M. BELL	ELEVATION	29.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION				
				0- 10.7	QUARTZITE chips and pebbles to 4cm; brownish and sub-rounded; calcareous ?				
				10.7- 15.25	SILTY CLAY: reddish -brown.				
				10.7- 15.25	SILTY CLAY: reddish-brown.				
				15.25- 19.8	SILTY CLAY: reddish-brown with chips of ferricrete slightly calcareous.				
				19.8- 67.8	Reddish-brown SILTY CLAY.				
								67.8- 81.5	SILTY CLAY: reddish-brown with grey clasts and yellow limonite stains; slightly waxy in texture in places; also mica.
								81.5- 87.0	CLASTICS: red-brown with grey clasts and yellow limonite stains; waxy in texture in places; also mica and dark minerals and sub-rounded pebbles to 6cm.
								87.0-104.5	SILTY CLAY: reddish brown with grey green towards bottom; some calcareous material.
								104.5-113.5	Light to medium grey; slightly calcareous
								113.5-120.75	Dark olive/black lignite clay with minor calcareous white-clay.
120.75-125.0	Light grey - medium grey CLAY with some yellow limonite staining								
125.0-129.5	Medium grey CLAY.								
129.5-139.0	Medium to dark grey CLAY with minor calcrete.								
139.0-143.5	Creamy to light grey CLAY with limonite stains; hematite stains and minor reddish-brown clay.								
143.5-161.7	Mostly medium to black CLAY with occasional red section and minor light grey clay and gypsum and limestone.								
					End of hole.				

DRILL HOLE LOG

0056

HOLE No.	<u>91-12</u>	DATE DRILLED	<u>29/11/74</u>	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	<u>91</u>	DATE COMPLETED	<u>29/11/74</u>	RANGE	<u>200</u>	RESIST. SCALE	<u>High</u>
PROJECT	<u>Pootana</u>	DATE LOGGED	<u>29/11/74</u>	TIME CONSTANT	<u>2 sec</u>	SP. SCALE	<u>110</u>
LOCATION	<u>L. Frome</u>	DRILLED DEPTH	<u>170.8m</u>	PAPER SPEED	<u>1 cm/m</u>	BIAS	<u>290</u>
STATE	<u>S.A.</u>	LOGGED DEPTH	<u>171.5m</u>	LOGGING SPEED	<u>9 m/m</u>	FLUID LEVEL	<u>3.0m</u>
GEOLOGIST	<u>M. BELL</u>	ELEVATION	<u>38.0m</u>	BACK GROUND	<u>8 c/s</u>		
DRILLER	<u>R. Brown</u>	CO-ORDS		TIME BASE	<u>1 sec</u>		
LOGGER	<u>R. McGurk</u>			K-FACTOR	<u>2.64×10^{-5}</u>		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 2.13	SANDY SILT: reddish-brown.
				2.13- 6.1	Sub-rounded QUARTZITE pebbles to 3cm; reddish-brown.
				6.1- 10.7	Sub-rounded QUARTZITE pebbles to 3cm; reddish-brown.
				10.7- 17.5	MIXED CLASTICS: light brown, slightly calcareous.
				17.5- 24.4	CLASTICS: brownish clay with silcrete sand to 2mm.
				24.4- 74.8	CLASTICS: reddish-brown with grey clay clasts.
				74.8- 77.0	CLASTICS: reddish-brown with grey clay clasts; sand to 2mm.
				77.0- 83.8	CLASTICS: reddish-brown with grey clasts;
				83.8- 88.5	CLASTICS: reddish-brown with grey clay clasts; pebbles to 2cm
				88.5- 99.9	SILTY CLAY: reddish-brown with grey clasts.
				99.9-107.0	SILTY CLAY: reddish-brown and grey-green clay with some yellow.
				107.0-116.0	CLAY: grey-green with lignite staining.
				116.0-125.0	Yellowish grey green CLAY with lignite and brown stains.
				125.0-139.0	CLAY: light grey green with limonite staining; some white to cream clay between 125m - 130m.
				139.0-143.5	CLAY: light yellowish-grey with abundant yellowish limonite stain.
				143.5-161.7	CLAY: light grey with minor limonite stains; also some very minor red-brown clay.
				161.7-166.0	CLAY: medium-grey with minor limonite stains; also some very minor red-brown clay.
				166.0-170.8	CLAY: medium to dark grey with minor creamy white clay.
					End of hole.

DRILL HOLE LOG

0057

HOLE No.	91-13	DATE DRILLED	6/12/74	GAMMA LOG		ELECTRIC LOG
EXPL. LICENCE No.	91	DATE COMPLETED	6/12/74	RANGE	200	RESIST. SCALE
PROJECT	Poontana	DATE LOGGED	6/12/74	TIME CONSTANT	2 sec	SP. SCALE
LOCATION	L. Frome	DRILLED DEPTH	175.4m	PAPER SPEED	1 cm/m	BIAS
STATE	S.A.	LOGGED DEPTH	174.6m	LOGGING SPEED	9 m/m	FLUID LEVEL
GEOLOGIST	M. BELL	ELEVATION	41.0m	BACK GROUND	8 c/s	
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec	
LOGGER	R. McGurk			K-FACTOR	2.64x10 ⁻⁵	

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 2.13	SANDY SILT: brownish in colour.
				2.13- 6.1	Greyish GRAVELS: pebbles, rounded to sub-rounded, up to 3cm; sand up to 3mm.
				6.1- 33.6	SILTY CLASTICS: brownish-with grey clasts; calcareous.
				33.6- 67.8	SILTY CLAY: reddish-brown.
				67.8- 79.2	CLASTICS: reddish-brown clay; pebbles are rounded - sub-rounded up to 1.5cm.
				79.2- 81.5	SILTY CLAY: reddish-brown.
				81.5- 83.6	MIXED CLASTICS: reddish-brown sand to 1.5cm; sub-rounded to angular; also some mica.
				83.6- 85.9	MIXED CLASTICS: very coarse sand to 3mm; rounded to sub-rounded pebbles to 3cm.
				85.9- 90.5	CLASTICS: reddish-brown with grey green clasts; also some fine mica.
				90.5- 95.1	MIXED CLASTICS: reddish-brown; rounded sand to 2mm with grey green clasts.
				95.1- 97.6	SILTY CLAY: grey green with yellow and red iron stains.
				97.6-102.2	CLAY: light grey green with abundant red hematite stains; also remnant hematite nodules.
				102.2-111.3	SANDY CLAY
				111.3-116.0	CLAY: light grey green with abundant red hematite stains; also remnants of hematite nodules.
				116.0-157.1	Grey green and creamy grey CLAYS; some white clay and small hematite nodules; also with red grey clay and yellow limonite
				157.1-175.40	Light grey CLAY with occasional yellow and reddish-brown section.
					End of hole.

DRILL HOLE LOG

0058

HOLE No.	91-14	DATE DRILLED	6/12/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	6/12/74	RANGE	200	RESIST. SCALE	High
PROJECT	Pootana	DATE LOGGED	6/12/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	152.5m	PAPER SPEED	1 cm/m	BIAS	290
STATE	S.A.	LOGGED DEPTH	153.1m	LOGGING SPEED	9 m/m	FLUID LEVEL	9.2m
GEOLOGIST	M. BEILL	ELEVATION	34.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☒ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

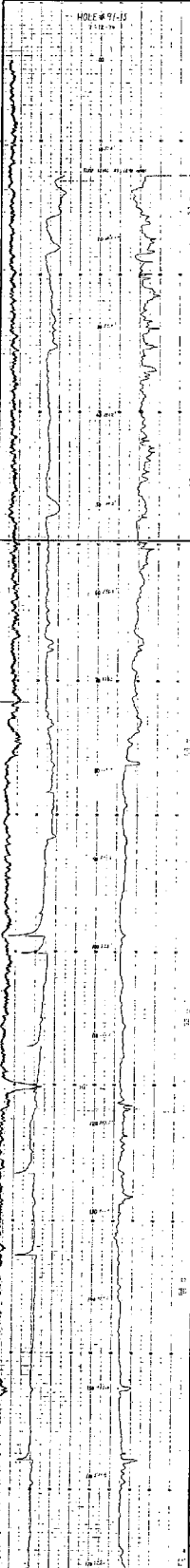
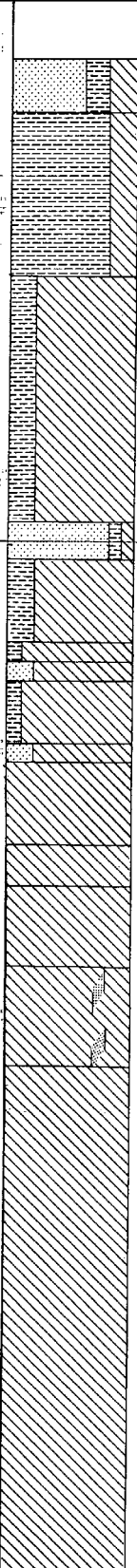
GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 2.13	Brown SANDS 1mm in size.
				2.13- 6.1	Grey GRAVELS: rounded to sub-rounded to 3cm; sand brown to 1mm; slightly calcareous.
				6.1- 13.0	White SILCRETE chips to 2cm; also some pebbles.
				13.0- 38.1	CLASTICS: reddish-brown clay with grey clay clasts.
				38.1- 42.7	MIXED CLASTICS: reddish-brown; sand to 1mm.
				42.7- 47.5	CLASTICS: reddish-brown clays with grey clay clasts.
				47.5- 51.8	SILTY SAND: brownish to 1mm.
				51.8- 74.75	CLASTICS: reddish-brown clay with occasional grey clay clasts.
				74.75- 83.7	CLASTICS: red and light grey clays.
				83.7- 97.5	CLAYS: creamy green grey, limonite stains and occasional hematite.
				97.5-113.5	CLAY: light grey with occasional white clay and limonite.
				113.5-118.0	CLAY: medium grey with minor light grey and green colouring.
				118.0-127.1	CLAYS: light grey green clays with occasional reddish-brown clay and limonite, also a trace of gypsum.
				127.1-152.5	CLAY: light - medium grey with a trace of gypsum; also occasional white, green and reddish-brown clay and limonite.
End of hole.					

DRILL HOLE LOG

0059

HOLE No.	91-15	DATE DRILLED	7/12/74	GAMMA LOG	ELECTRIC LOG
EXPL. LICENCE No.	91	DATE COMPLETED	7/12/74	RANGE	200
PROJECT	Poontana	DATE LOGGED	7/12/74	TIME CONSTANT	2 sec
LOCATION	L. Frome	DRILLED DEPTH	170.8m	PAPER SPEED	1 cm/m
STATE	S.A.	LOGGED DEPTH	169.8m	LOGGING SPEED	9 m/m
GEOLOGIST	M. BELL	ELEVATION	32.0m	BACK GROUND	8 c/s
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA, S.P., RES.	100%	INTERVAL	DESCRIPTION
		0- 6.1	MIXED CLASTICS: brown calcareous sands.
		6.1- 24.4	CLASTICS: brown calcareous silts.
		24.4- 51.8	CLASTICS: reddish-brown with occasional grey clasts and pebbles.
		51.8- 56.4	Brown QUARTZITE SANDS to 1mm.
		56.4- 65.5	CLASTICS: reddish-brown with occasional grey clasts; also occasional pebbles.
		65.5- 67.8	SILTY CLAY: red and grey.
		67.8- 70.1	SANDY CLAY: red and brown quartz sand to 2mm.
		70.1- 76.9	SILTY CLAY: red grey.
		76.9- 79.2	CLASTICS: creamy red and yellow clays and quartz sand.
		79.2- 88.4	CLAY: light grey green and minor white in colour.
		88.4- 93.0	CLAY: grey green to medium grey.
		93.0-102.1	CLAY: light grey colour.
		102.1-113.4	CLAY: medium grey with black lignite.
		113.4-170.7	CLAYS: light to medium grey with occasional dark grey, white, gypsum, hematite and limonite.
End of hole.			

DRILL HOLE LOG

0060

HOLE No.	<u>91-16</u>	DATE DRILLED	<u>7/12/74</u>	GAMMA LOG	ELECTRIC LOG
EXPL. LICENCE No.	<u>91</u>	DATE COMPLETED	<u>8/12/74</u>	RANGE	RESIST. SCALE <u>290</u>
PROJECT	<u>Pootana</u>	DATE LOGGED	<u>8/12/74</u>	TIME CONSTANT	SP. SCALE <u>110</u>
LOCATION	<u>L. Frome</u>	DRILLED DEPTH	<u>152.5m</u>	PAPER SPEED	BIAS
STATE	<u>S.A.</u>	LOGGED DEPTH	<u>153.5m</u>	LOGGING SPEED	FLUID LEVEL <u>9.7m</u>
GEOLOGIST	<u>M. BELL</u>	ELEVATION	<u>30.0m</u>	BACK GROUND	
DRILLER	<u>R. Brown</u>	CO-ORDS		TIME BASE	
LOGGER	<u>R. McGurk</u>			K-FACTOR	<u>2.64×10^{-5}</u>

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 4.26	Brownish SANDS and SILTS under 0.5mm.
				4.26- 6.1	MIXED CLASTICS: reddish-brown sand to 1mm.
				6.1- 8.4	Brownish SANDS and SILTS under 0.5mm.
				8.4-15.25	CLASTICS: brownish silts with occasional pebbles.
				15.25- 24.4	Brown SANDS with chips of silcrete to 2cm.
				24.4- 29.0	Brownish SAND and SILT up to 0.5mm.
				29.0- 54.1	CLASTICS: reddish-brown with occasional grey clasts.
				54.1- 58.7	CLASTICS: reddish-brown with quartz sand to 2mm.
				58.7- 61.0	CLASTICS: reddish-brown with occasional grey clasts.
				61.0- 65.5	MIXED CLASTICS: reddish-brown with chips of quartz to 2cm.
				65.5- 81.4	SILTY CLAY: reddish-brown with grey green clasts.
				81.4- 88.4	CLASTICS: reddish-brown with grey green clasts.
				88.4- 90.7	Red hematitic and grey green CLAY.
				90.7- 92.9	CLAY: reddish-brown with abundant hematite and some grey green clay.
				92.9-102.1	Reddish brown SAND; sub-rounded, approximately 1mm.
				102.1-120.4	CLAY: yellow and grey green with some white clay.
				120.4-134.1	CLAY: light to medium grey with occasional limonite and hematite.
				134.1-143.2	CLAYS: medium grey and lignitic; also a trace of gypsum.
				143.2-152.4	CLAYS: light to dark grey; also some limonite staining and lignite.
					End of hole.

DRILL HOLE LOG

0061

HOLE No.	91-17	DATE DRILLED	8/12/74	GAMMA LOG		ELECTRIC LOG	
EXPL. LICENCE No.	91	DATE COMPLETED	8/12/74	RANGE	200	RESIST. SCALE	290
PROJECT	Pootana	DATE LOGGED	8/12/74	TIME CONSTANT	2 sec	SP. SCALE	110
LOCATION	L. Frome	DRILLED DEPTH	152.5m	PAPER SPEED	1 cm/m	BIAS	
STATE	S.A.	LOGGED DEPTH	152.6m	LOGGING SPEED	9 m/m	FLUID LEVEL	11.9m
GEOLOGIST	M. BELL	ELEVATION	44.0m	BACK GROUND	8 c/s		
DRILLER	R. Brown	CO-ORDS		TIME BASE	1 sec		
LOGGER	R. McGurk			K-FACTOR	2.64×10^{-5}		

LITHOLOGY: ☒ Gravel ☐ Sand ☐ Silt ☐ Clay ☐ Carbonate ☐ Carbonaceous

GAMMA	S.P.	RES.	100%	INTERVAL	DESCRIPTION
				0- 6.1	SANDY SILT: reddish-brown to 1mm.
				6.1- 8.4	SANDY SILTS with chips of silcrete up to 1cm.
				8.4- 17.5	GRAVELS: rounded to sub-rounded, grey and up to 3cm.
				17.5- 26.7	CLASTICS: brownish grey with some red and grey clasts.
				26.7- 47.2	CLASTICS: reddish brown with occasional grey clasts.
				47.2- 51.8	Pebble SANDS; subrounded to 2cm.
				51.8- 58.5	CLASTICS: reddish-brown with occasional grey clasts.
				58.5- 61.0	Coarse GRAVEL to 3cm.
				61.0- 88.4	CLASTICS: reddish-brown with occasional grey clasts.
				88.4- 93.0	CLAY: brownish grey green and reddish in colour.
				93.0- 97.5	CLAYS: red grey green colour.
				97.5-115.8	Brownish grey green CLAYS; hematite nodules between 107m-111.3m
				115.8-124.9	CLAY: bluish grey.
				124.9-134.1	CLAY: medium grey.
				134.1-143.2	Medium grey CLAYS with gypsum.
				143.2-152.5	CLAYS: dark lignitic with gypsum; also some yellow limonitic and occasional brown clay.
					End of hole.

0062

SCHEMATIC STRATIGRAPHIC COLUMN

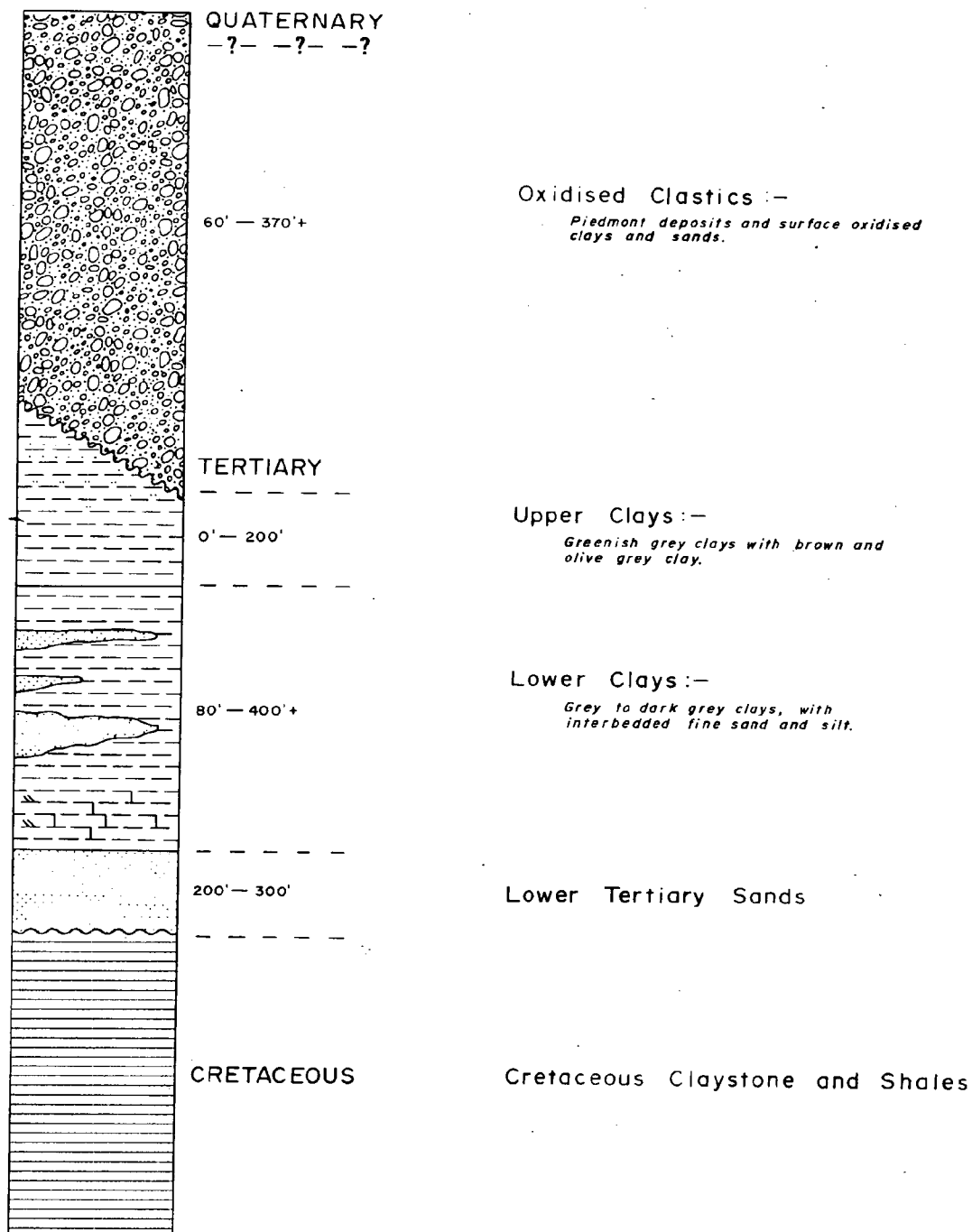


FIGURE 3

BP MINERALS AUST. PTY LTD	
Area:	LAKE FROME
SOUTH AUSTRALIA	
Ref:	
FEB. 1975	M. S. BELL



1 Albert Road, Melbourne

Postal Address: G.P.O. Box 5222BB, Melbourne, 3001

Telephone: 26-6911 Telex: 30166 Telegraphic Address: "Austbeepee", Melbourne

The Director of Mines
Department of Mines
Box 38, Rundle Street Post Office,
Adelaide S.A. 5000

Our Reference

Your Reference

Telephone Ext'n

Date

AG/27/16/14/1

4th February, 1975.

Dear Sir,

Exploration Licence 91 - Quarterly Report for Period

Ended December 1974.

Resistivity Survey

A further reconnaissance resistivity survey was conducted over EL 91 to locate structural and lithological features in the Tertiary sediments. A total of 21 km of line survey were carried out along two lines as a continuation of the survey lines from the adjacent EL 68.

The D.C. resistivity survey was carried out by Murdoch Geology and Geophysics Pty Ltd and their report is appended.

Drilling and Logging

An open-hole rotary drilling programme was carried out in November/December by Thompson Drilling Pty Ltd and the holes logged for gamma, SP and resistivity response by Geoscience Associates (Australia) Pty Ltd.



Seventeen holes ranging from 500 to 710 feet in depth were drilled and the total drilling footage was 9,400 feet.

Weak anomalous gamma activity was encountered in 12 holes but no well developed sand channels were intersected. The location of the drill holes are shown on the accompanying map (Figure 1) and the drilling data summarized in Table 1.

A report on the drilling results which will include the lithological, gamma and electric logs, is in preparation.

Perforated plastic casing was run down to between 80 - 100 feet in three holes to enable water sampling at a later date when waters in the holes have re-equilibrated.

Water Sampling

The results of uranium analysis by delayed neutron activation on ten bore waters from or near EL 91 are shown in Table 2. The values range from 3 (2) to 103 ppb. (The bores may be located from the bore reference on Figure 1).

Personnel

BP Personnel

M.S. Bell	-	Project Geologist
E. Ambler	-	Contract Geologist
R. Penn	-	Field Assistant
D. Brown	-	Cook.

Thompson Drilling Pty Ltd:

C. Stratford	-	Tool Pusher
	-	1 driller
	-	2 assistants.

Geoscience Associates (Australia) Pty Ltd :

B. McGurk	-	Logger
-----------	---	--------

Murdoch Geology and Geophysics Pty Ltd :

R. Murdoch	-	Geophysicist
B. Copps	-	Assistant Geophysicist
R. Vinycomb	-	Assistant Geophysicist
	-	2 Field Assistants.

Future Exploration

No field exploration is planned for the current quarter.

Enclosures

Figure I - Drill Hole Location Map

Table I - Poontana Drilling - November / December 1974.

Table II - Uranium content of bore waters on EL 91

Appendix I

Murdoch Geology and Geophysics Pty Ltd.

- A reconnaissance survey over EL 91, Lake Frome - South Australia, for BP Minerals Australia Pty Ltd by R. Murdoch.

Yours faithfully,



Dr. J. H. Hills
Senior Geologist (Uranium)

TABLE I

0066

POONTANA DRILLING - NOVEMBER - DECEMBER 1974.

Hole No.	Drilled Depth	Probed Depth	Date Started	Date completed	Gamma Activity (Back Ground 15-20 cps)
68-1	710'	213.40m	12.11	13.11	150 cps @ 157.5 m.
68-2	560'	172.30m	13.11	13.11	150 cps @ 162.5 m.
* 91-1	530'	162.80	14.11	14.11	134 cps @ 149.3 m.
91-2	710'	213.50	14.11	15.11	82 cps @ 137.9 m.
* 91-3	560'	170.80	17.11	17.11	155 cps @ 131.1 m.
91-4	500'	152.70	18.11	18.11	201 cps @ 128.9 m.
* 91-5	560'	171.00	18.11	19.11	NIL
91-6	560'	170.80	19.11	19.11	NIL
91-7	560'	168.70	20.11	20.11	NIL
68-3	530'	161.20	20.11	21.11	NIL
68-4	560'	170.30	21.11	21.11	NIL
68-5	530'	162.50	22.11	23.11	NIL
68-6	560'	171.50	23.11	23.11	NIL
* 68-7	590'	180.60	24.11	24.11	71 cps @ 162.3 m.
68-8	530'	162.00	24.11	25.11	NIL
68-9	530'	162.20	25.11	26.11	NIL
91-8	650'	198.70	27.11	27.11	158 cps @ 171.7 m.
91-9	530'	162.40	27.11	28.11	62 cps @ 150.1 m.
91-10	530'	162.40	28.11	28.11	43 cps @ 152.3 m.
91-11	530'	161.80	28.11	29.11	71 cps @ 160.3 m.
91-12	560'	171.50	29.11	29.11	NIL
68-10	650'	198.50	30.11	30.11	83 cps @ 162.7 m.
68-11	560'	171.50	3.12	4.12	51 cps @ 158.1 m.
68-12	560'	171.30	4.12	5.12	NIL
91-13	575'	174.60	5.12	6.12	48 cps @ 165.1 m.
91-14	500'	153.10	6.12	6.12	71 cps @ 165.9 m.
91-15	560'	169.80	7.12	7.12	53 cps @ 115.7 m.
91-16	500'	153.50	8.12	8.12	NIL
91-17	500'	152.60	8.12	8.12	79 cps @ 127.5 m.

68 - refers to holes drilled on EL 68
 91 - refers to holes drilled on EL 91

* holes in which plastic casing was run to about 100'

T A B L E II

0067

Uranium content of Bore waters on EL 91

BORE REFERENCE	U in ppb.
New Caldina Bore	3
	2
Ewaroona Well	32
Cockatoo Bore	103
White Dam Bore (Brooks Bore)	24
Acacia Park Well (Bore)	50
Lake Well	25
Mulga Bore	6
Woodlawoodlana Well	19
No. 1 Bore	10
No. 12 Bore	18

Bore reference refers to
the location of the bores on the 1:250,000 series topographic
Frome Sheet SH 54-10, (also see Figure 1.)

BP Minerals Australia Proprietary Limited

Incorporated in Victoria



1 Albert Road, Melbourne

Postal Address: G.P.O. Box 5222BB, Melbourne, 3001

Telephone: 26-6911 Telex: 30166 Telegraphic Address: "Austbeepee", Melbourne

The Director of Mines
Department of Mines
Box 38,
Rundle Street Post Office
Adelaide S.A. 5000

Our Reference

Your Reference

Telephone Extn

Date

AG/27/16/14/1

14th May, 1975.

Dear Sir,

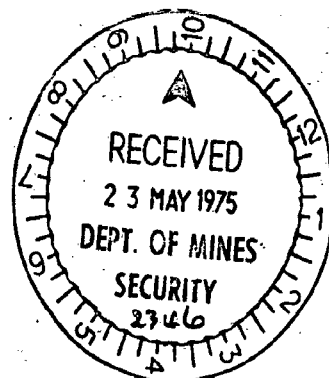
EXPLORATION LICENCE 91 - QUARTERLY REPORT FOR PERIOD
ENDED MARCH 1975

The preparation of a report on the drilling carried out in the second quarter is still in hand. No further field work was carried out during the Quarter.

Quarterly Expenditure Statements have been forwarded under separate cover.

Yours faithfully,

Dr. J. H. Hills
Senior Geologist (Uranium)



OILMIN N.L.

TRANSOIL N.L.

PETROMIN N.L.

MINES ADMINISTRATION PTY LTD

TETON EXPLORATION DRILLING COMPANY PTY LTD

BP MINERALS AUSTRALIA PROPRIETARY LIMITED

AG/27/16/14/1

14.5.1975

PRIMARY AGREEMENT

EXPLORATION LICENCES 68, 77 AND 91 SOUTH AUSTRALIA

QUARTERLY EXPENDITURE REPORT

In accordance with Clause 8 of the above agreement, BP hereby reports
on the expenditure for the quarter ending..... March and total expenditure
for the first three quarters of the Project Year.

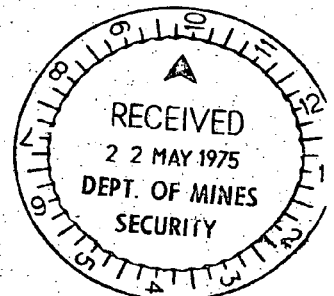
	Total	EL 68	EL 77	EL 91
- Overheads				
Plant and Tools:				
- Exploration				
Geological Services	22	11		11
Geochem. Services	71		71	
Drilling Services				
Drill-hole logging				
Resistivity Survey				
Access Roads				
Consumable Stores				
Exploration Tenement Fees				
- Investigations				
Consultant Services	92	30	31	31
- Operations				
Vehicle Operating	159	79	-	80
Rental of Equipment				
Aircraft Charter				
Freight & Cartage				
Travelling Expenses				
Personnel Services				
- Salaries & Wages	4,445	1,481	1,482	1,482
TOTAL	4,789	1,601	1,584	1,604

Certified Correct

JHH
.....

Senior Geologist (Uranium)

JHH/YT



28.7.1975.

70

BP MINERALS AUSTRALIA PROPRIETARY LIMITED

EXPENDITURE	JULY 1974	-	JUNE 1975	
	Total	EL 68	EL 77	EL 91
- Overheads				
Plant and Tools :	2,893	964	965	964
- Exploration				
Geological Services	2,090	832	181	1,077
Geochem. Services	702	175	351	176
Drilling Services	67,950	9,554	45,202	13,194
Drill-hole logging	16,081	2,898	9,181	4,002
Resistivity Survey	10,092	1,362	5,760	2,970
Access Roads	86	-	86	-
Consumable Stores	3,380	551	2,278	551
Exploration Tenement Fees	2,159	320	639	1,200
- Investigations				
Consultant Services	402	133	135	134
- Operations				
Vehicle Operating	3,354	673	1,813	868
Rental of Equipment	984	370	102	512
Aircraft Charter	1,064	136	712	216
Freight & Cartage	220	25	160	35
Travelling Expenses	1,148	329	353	466
Personnel Services	8,574	1,609	4,624	2,341
- Salaries & Wages.	23,874	5,184	12,075	6,615
TOTAL	145,053	25,115	84,617	35,321

Certified Correct

.....*T. Miller*.....

Senior Geologist (Uranium)

JHH/YT

EXPENDITURE JULY 1974 - MARCH 1975

	Total	EL 68	EL 77	EL 91
- Overheads	2,610	870	870	870
Plant and Tools :				
- Exploration				
Geological Services	1,786	731	79	976
Geochem. Services	702	175	351	176
Drilling Services	46,026	9,554	23,278	13,194
Drill-hole logging	12,804	2,898	5,904	4,002
Resistivity Survey	10,092	1,362	5,760	2,970
Access Roads	66		66	
Consumable Stores	2,072	453	1,166	453
Exploration Tenement Fees	2,001	212	614	1,175
- Investigations				
Consultant Services	402	133	135	134
- Operations				
Vehicle Operating	1,586	541	309	736
Rental of Equipment	882	370	-	512
Aircraft Charter	786	115	476	195
Freight & Cartage	89	25	29	35
Travelling Expenses	1,030	329	235	466
Personnel Services	5,824	1,472	2,148	2,204
- Salaries & Wages.	18,563	4,534	8,064	5,965
TOTAL	107,321	23,774	49,484	34,063

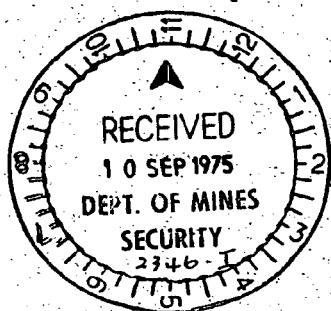
Certified Correct



.....

Senior Geologist (Uranium)

JHH/YT



CILMIN N.L.

TRANSOIL N.L.

PETROMIN N.L.

MINES ADMINISTRATION PTY LTD

TETON EXPLORATION DRILLING COMPANY PTY LTD

BP MINERALS AUSTRALIA PROPRIETARY LIMITED

AG/27/16/14/1

28.7.1975.

PRIMARY AGREEMENT

EXPLORATION LICENCES 68, 77 AND 91 SOUTH AUSTRALIA

QUARTERLY EXPENDITURE REPORT

In accordance with Clause 8 of the above agreement, BP hereby reports on the expenditure for the quarter ending June and total expenditure for the first Project Year.

	Total QUARTER	EL 68 APRIL - 1975	EL 77 TO JUNE	EL 91 1975.
- Overheads				
Plant and Tools:	283	94	95	94
- Exploration				
Geological Services	304	101	102	101
Geochem. Services	-	-	-	-
Drilling Services	21,924	-	21,924	-
Drill-hole logging	3,277	-	3,277	-
Resistivity Survey	-	-	-	-
Access Roads	20	-	20	-
Consumable Stores	1,308	98	1,112	98
Exploration Tenement Fees	158	108	25	25
- Investigations				
Consultant Services	-	-	-	-
- Operations				
Vehicle Operating	1,768	132	1,504	132
Rental of Equipment	102	-	102	-
Aircraft Charter	278	21	236	21
Freight & Cartage	131	-	131	-
Travelling Expenses	118	-	118	-
Personnel Services	2,750	137	2,476	137
- Salaries & Wages	5,311	650	4,011	650
TOTAL	37,732	1,341	35,133	1,258

Certified Correct

Senior Geologist (Uranium)
JHH/YT

BP Minerals Australia Proprietary Limited

Incorporated in Victoria



0073

1 Albert Road, Melbourne

Postal Address: G.P.O. Box 5222BB, Melbourne, 3001

Telephone: 26-6911 Telex: 30166 Telegraphic Address: "Austbaepae", Melbourne

The Director of Mines,
Department of Mines,
Box 38, Rundle Str. Post Office,
ADELAIDE S.A. 5000

Our Reference

Your Reference

Telephone Extn

Date

AG/27/16/14/1

16th September, 1975.

Dear Sir,

EXPLORATION LICENCE 91 - QUARTERLY REPORT FOR THE
PERIOD ENDED JUNE 1975.

An application was lodged to reapply for the area covered by Exploration Licence No. 91, which was due to expire on the 5th. August 1975.

Work continued on the preparation of a report on the drilling operations carried out in November / December 1974.

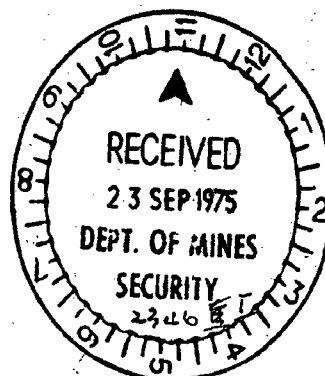
No exploration was carried out during the period under review other than to collect water samples from the holes drilled in 1974.

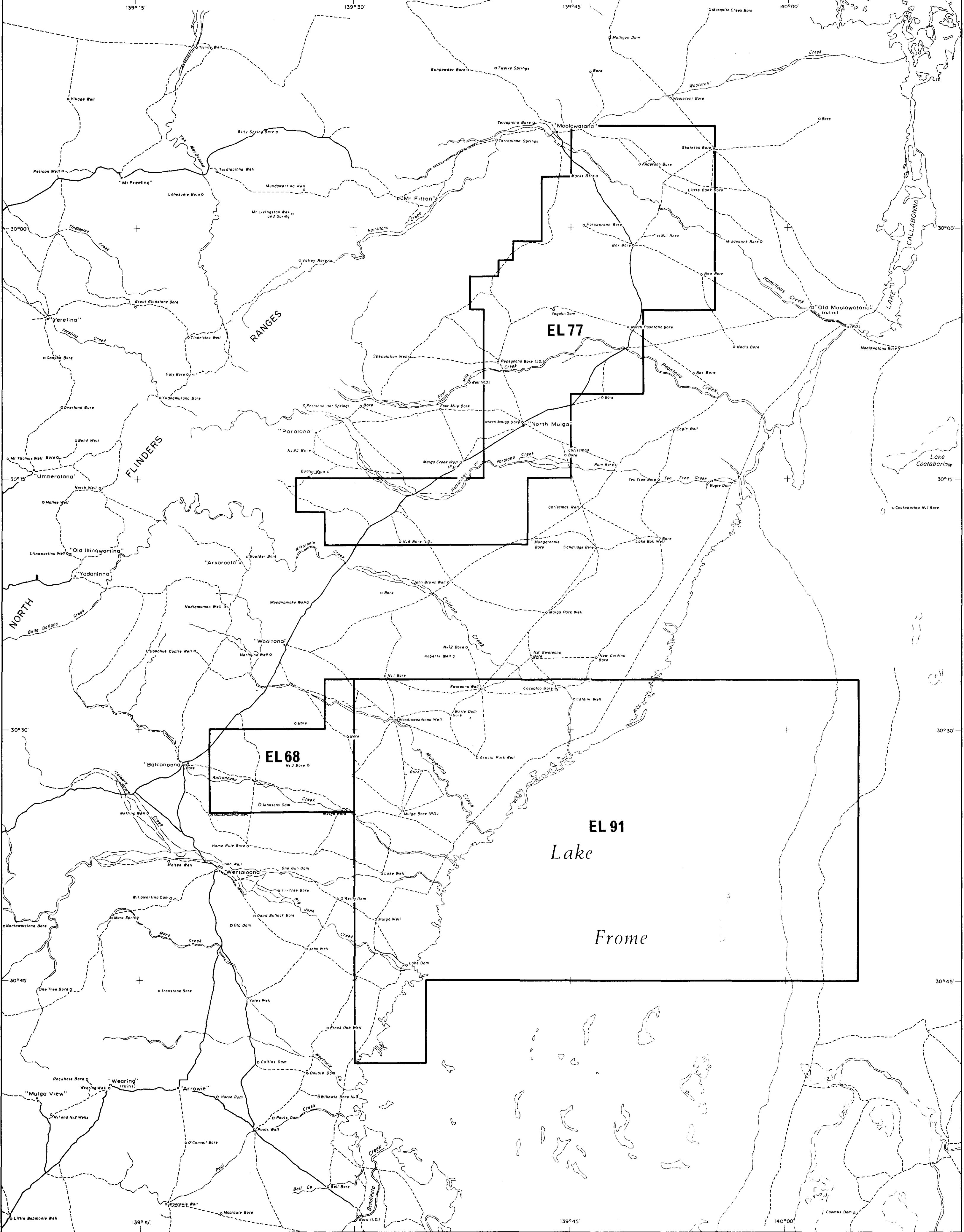
Quarterly expenditure statements have been forwarded to the department and receipt thereof acknowledged.

We regret the delay in lodging the quarterly report and hope that you have not been inconvenienced.

Yours faithfully,

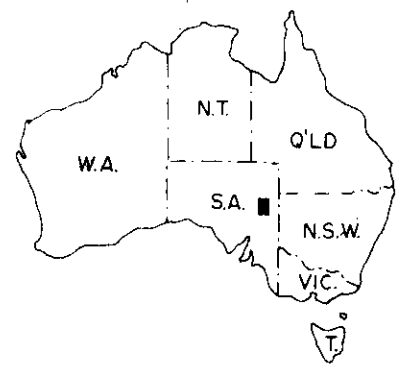
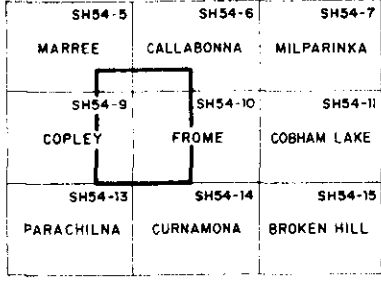
Dr. J.H. Hills
Senior Geologist (Uranium)





LOCATION DIAGRAM

REFERENCE TO AUSTRALIA
STANDARD MAP SERIES



LEGEND

- Road, loose surface all weather second class
- - - Road, unimproved earth
- ~ Lake, river or stream intermittent
- ▬ Participation area

SCALE 1:250,000



2346-1

PLAN I

BP MINERALS AUST. PTY. LTD.	
Area: LAKE FROME	
EL. 91	
REF:	
SEPT, 1974	M.BELL

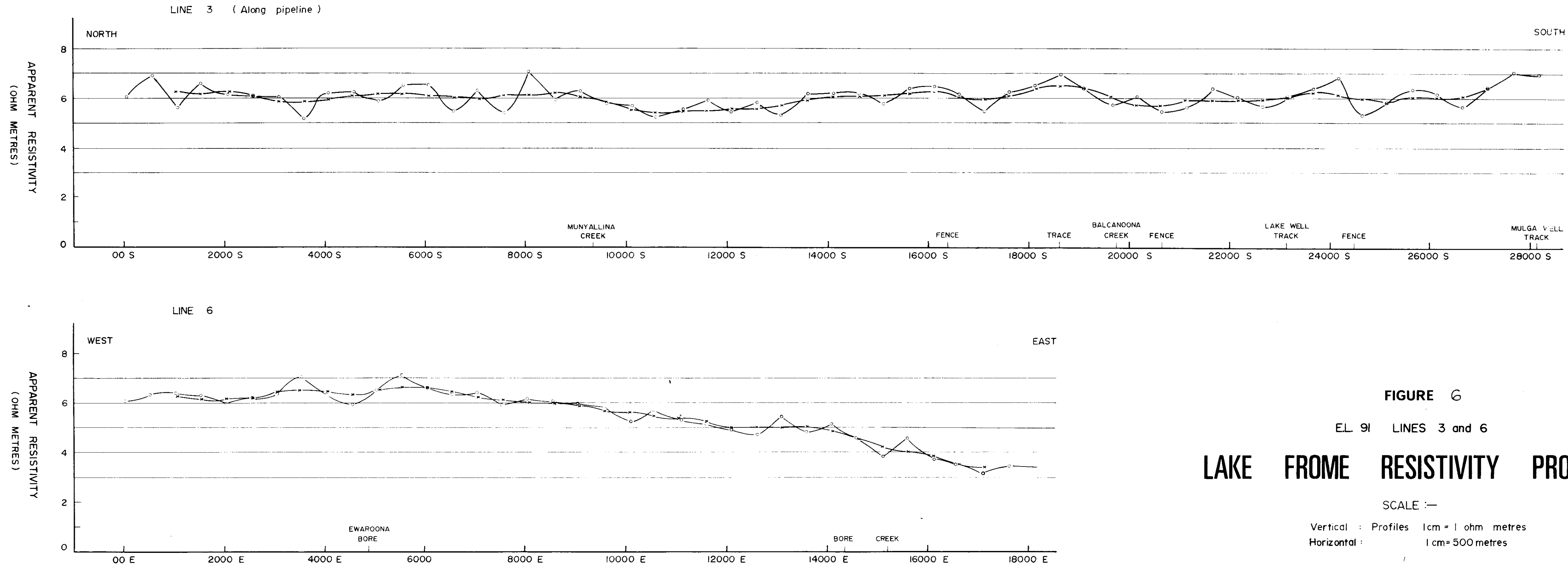


FIGURE 6

EL. 91 LINES 3 and 6

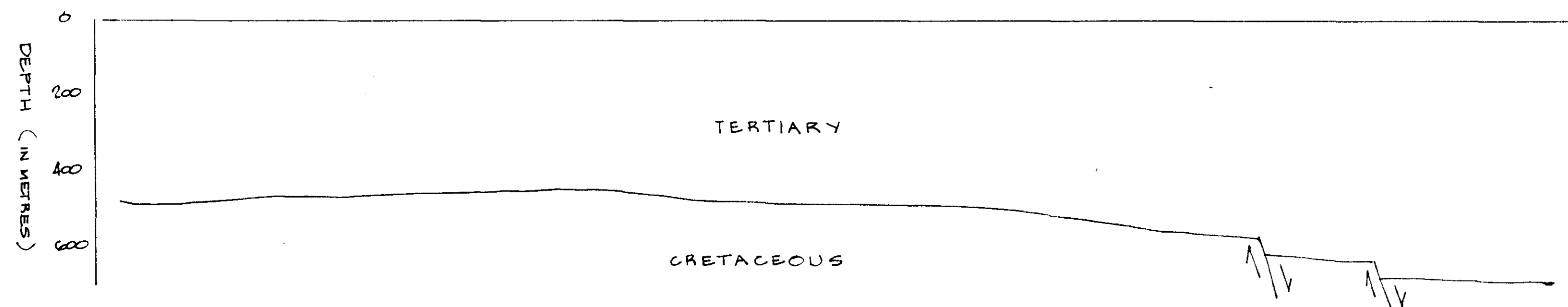
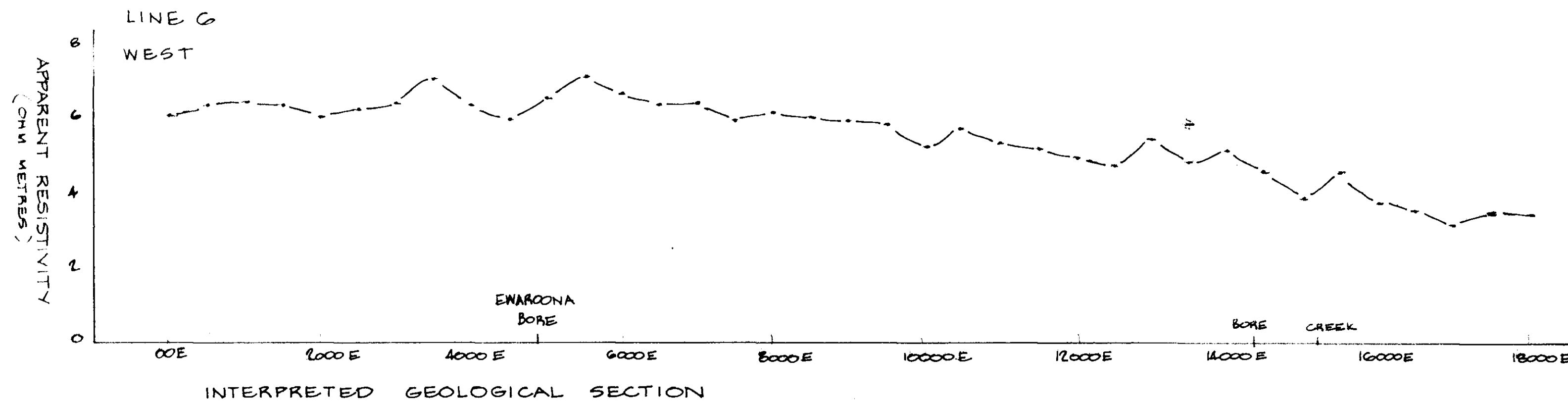
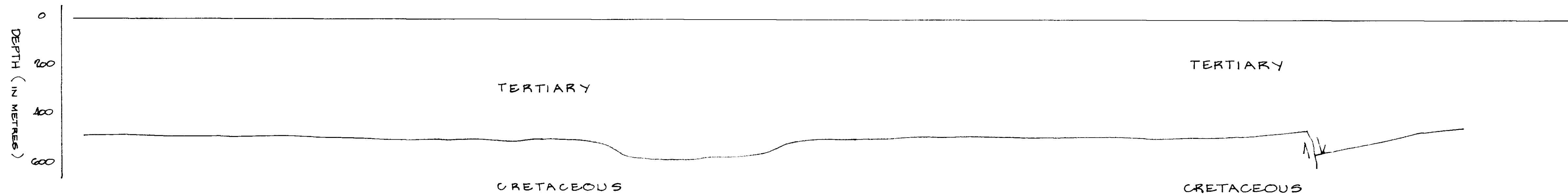
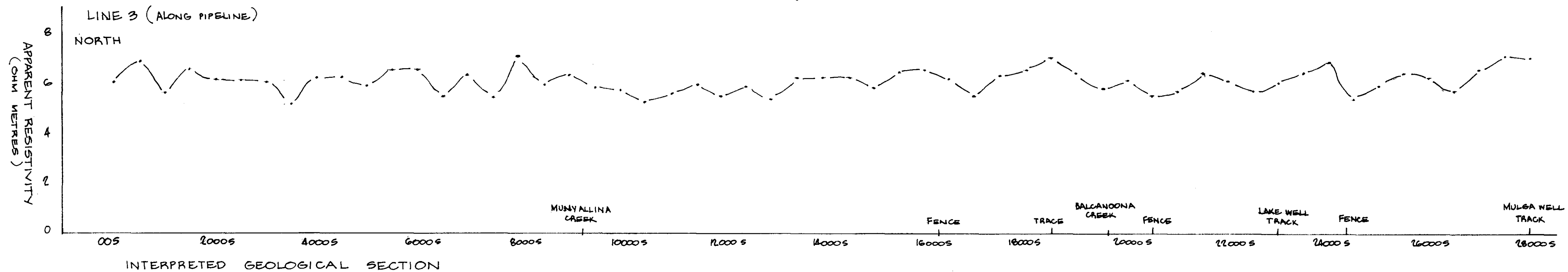
LAKE FROME RESISTIVITY PROFILES

SCALE :-

Vertical : Profiles 1cm = 1 ohm metres

Horizontal : 1cm = 500 metres

- Raw Data
 × Gaussian Filtered Results



B. P. AUSTRALIA - MINERALS DEPT.
LAKE FROME RESISTIVITY SURVEY

E.L. 91 LINES 3 & 6

SCALES :-

VERTICAL - PROFILES 1 CM = 1 OHM METRE

INTERPRETED SECTIONS 1 CM = 100 METRES

HORIZONTAL - 1 CM. = 500 METRES

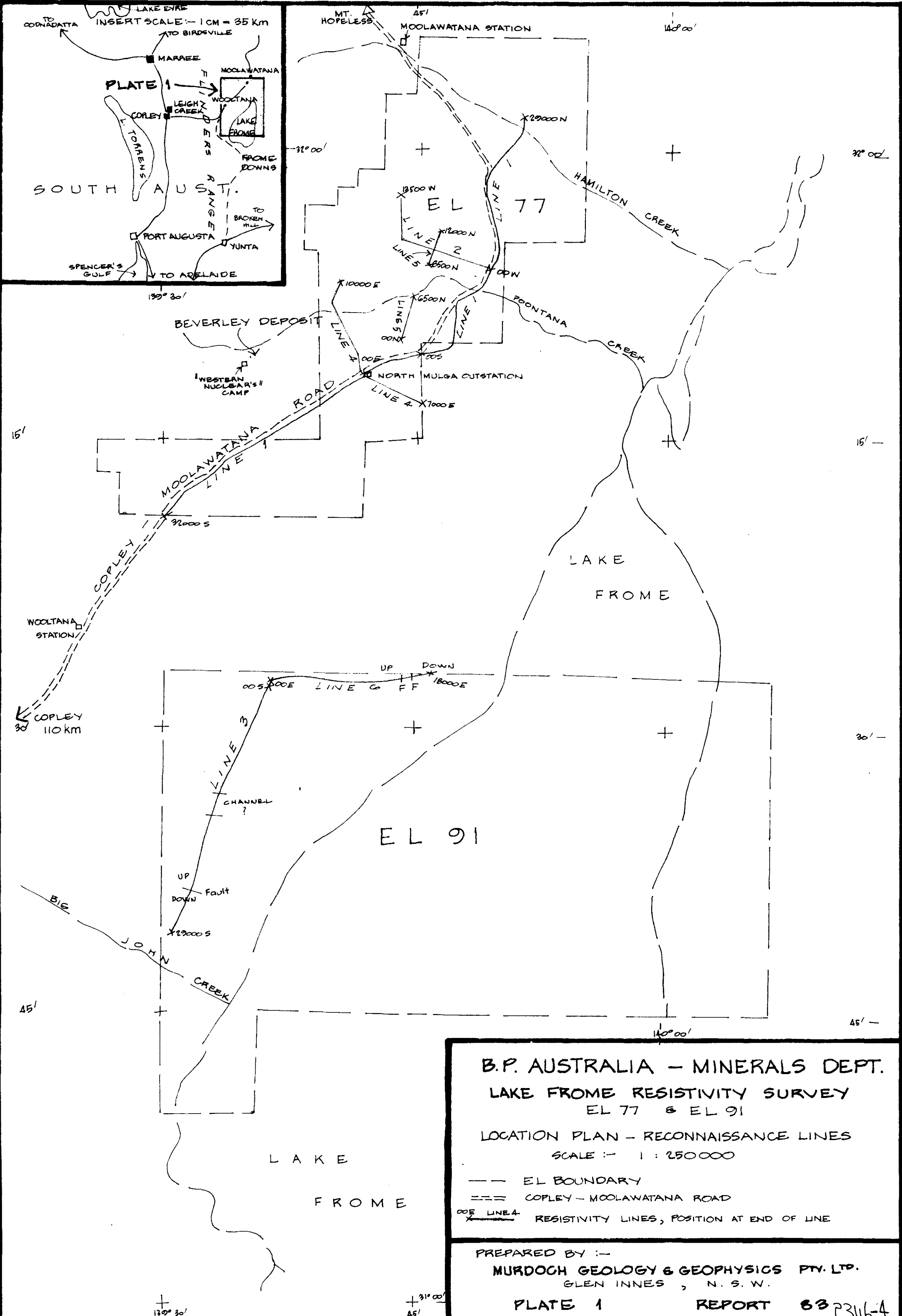
PREPARED BY :-

MURDOCH GEOLOGY & GEOPHYSICS PTY. LTD.

GLEN INNES, N. S. W.

PLATE 3

REPORT 83

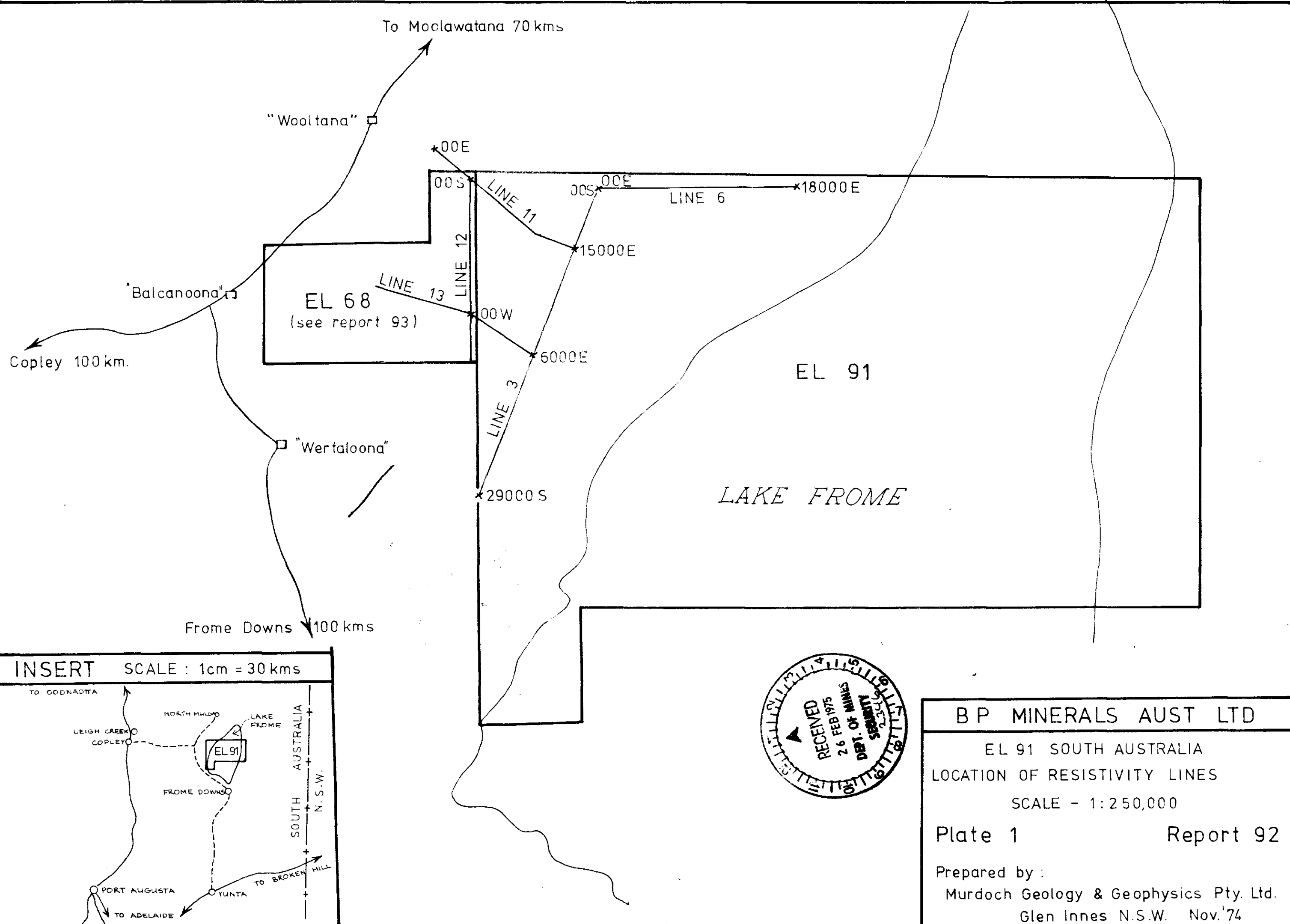


B.P. AUSTRALIA - MINERALS DEPT.
LAKE FROME RESISTIVITY SURVEY
EL 77 & EL 91

LOCATION PLAN - RECONNAISSANCE LINES
SCALE :- 1 : 250 000

- EL BOUNDARY
- === COPLEY - MOOLAWATANA ROAD
- LINE 4
- X RESISTIVITY LINES, POSITION AT END OF LINE

PREPARED BY :-
MURDOCH GEOLOGY & GEOPHYSICS PTY. LTD.
GLEN INNES, N. S. W.



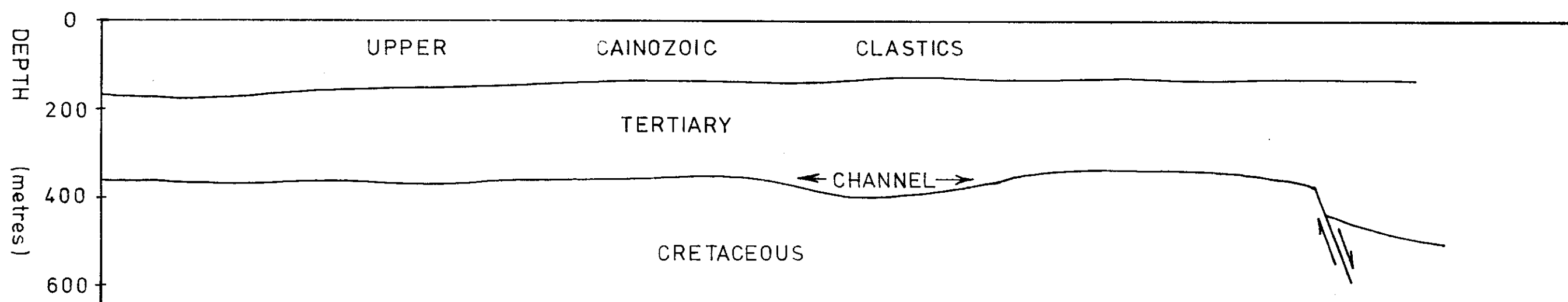
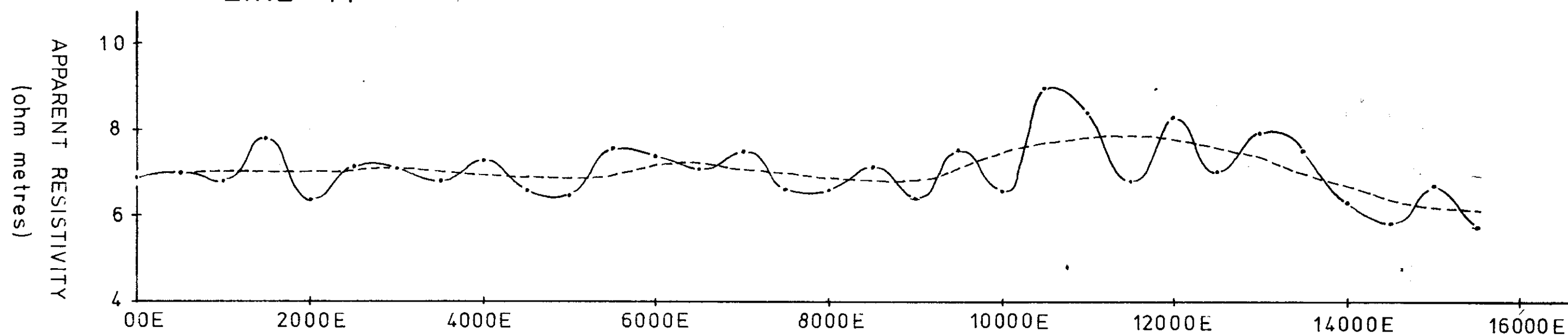
B P MINERALS AUST LTD

EL 91 SOUTH AUSTRALIA
LOCATION OF RESISTIVITY LINES
SCALE - 1:250,000

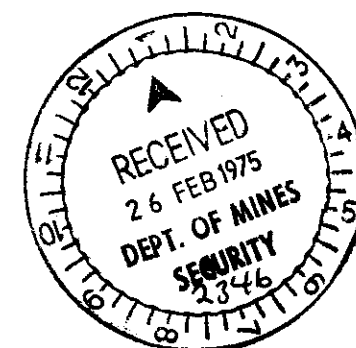
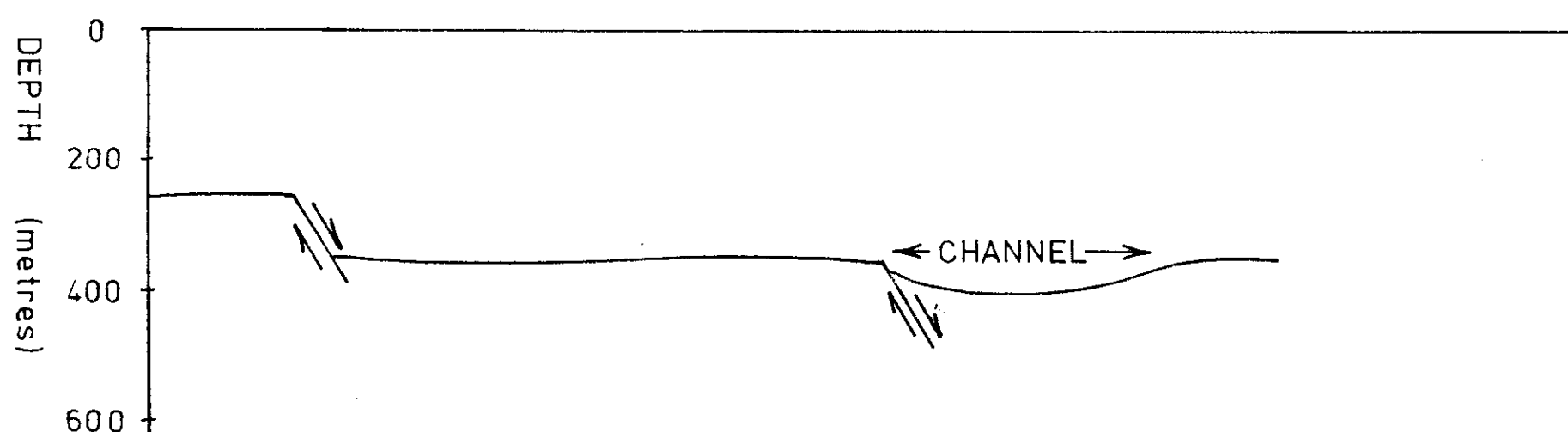
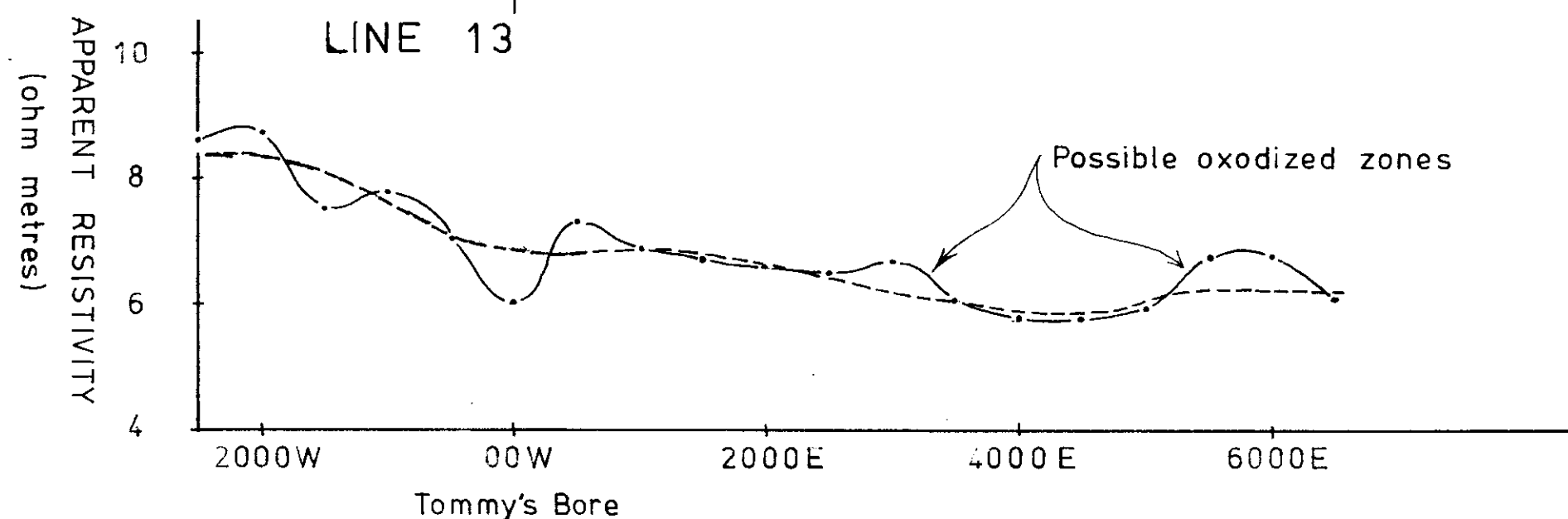
Plate 1 Report 92

Prepared by :
Murdoch Geology & Geophysics Pty. Ltd.
Glen Innes N.S.W. Nov. '74

LINE 11



EL 68 | EL 91 LINE 13



BP MINERALS AUST LTD

EL 91

Resistivity Profiles 11 & 13

Scales - vert: profile: 1cm=1ohm metre

section 1cm=100 metres

horz: 1cm=250 metres

Plate 2

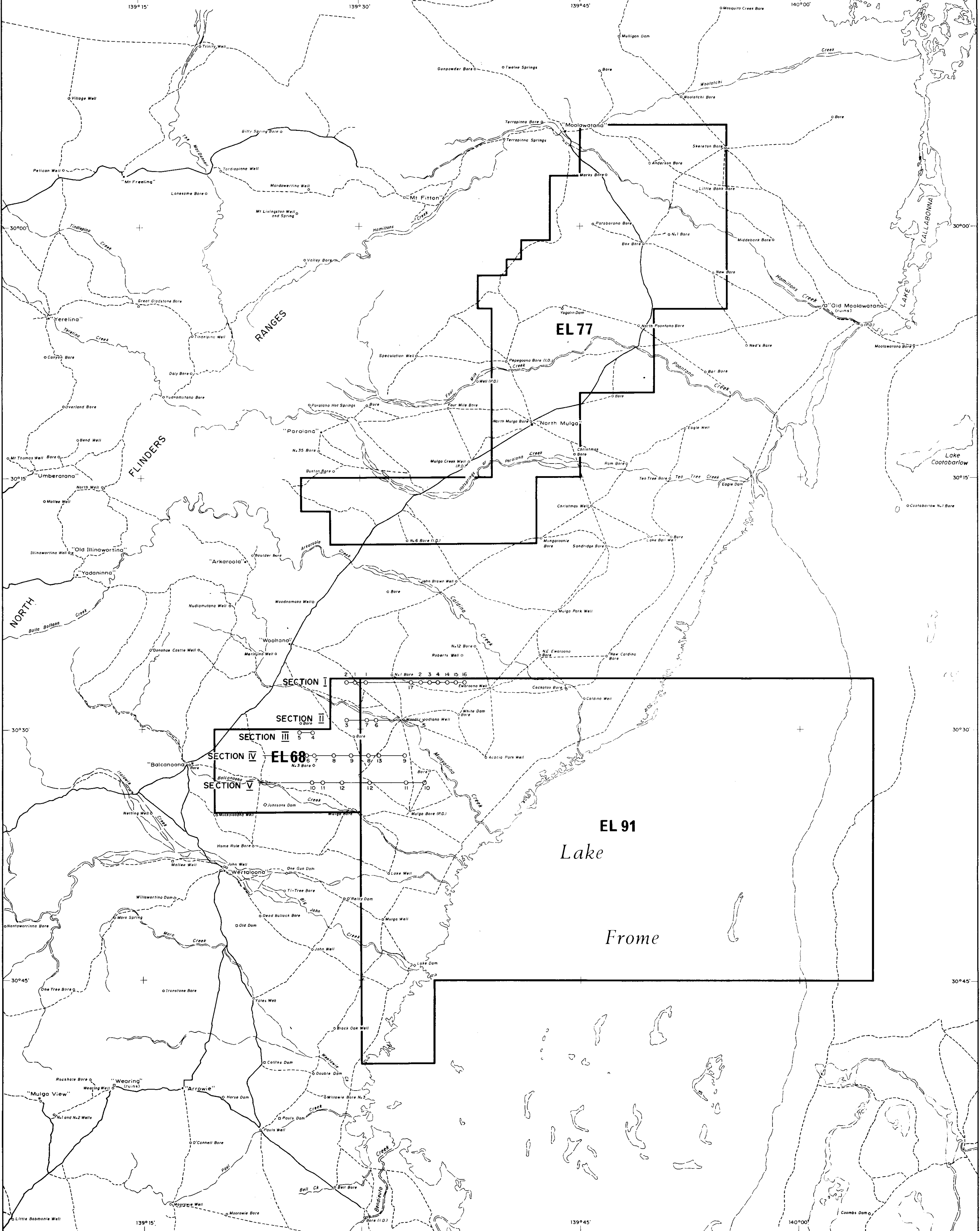
Report 92

Prepared by:

Murdoch Geology & Geophysics P/L

Glen Innes N.S.W. Nov. '74

2346-6



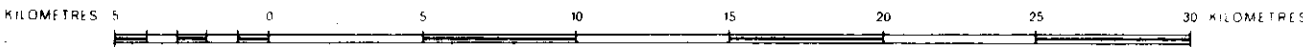
LOCATION DIAGRAM

REFERENCE TO AUSTRALIA
STANDARD MAP SERIES

SH54-5 MARREE	SH54-6 CALLABONNA	SH54-7 MILPARINKA
SH54-9 COPLEY	SH54-10 FROME	SH54-11 COBHAM LAKE
SH54-13 PARACHILNA	SH54-14 CURNAMONA	SH54-15 BROKEN HILL

POONTANA PROJECT - 1974
DRILL HOLE LOCATIONS & SECTIONS

SCALE 1:250,000



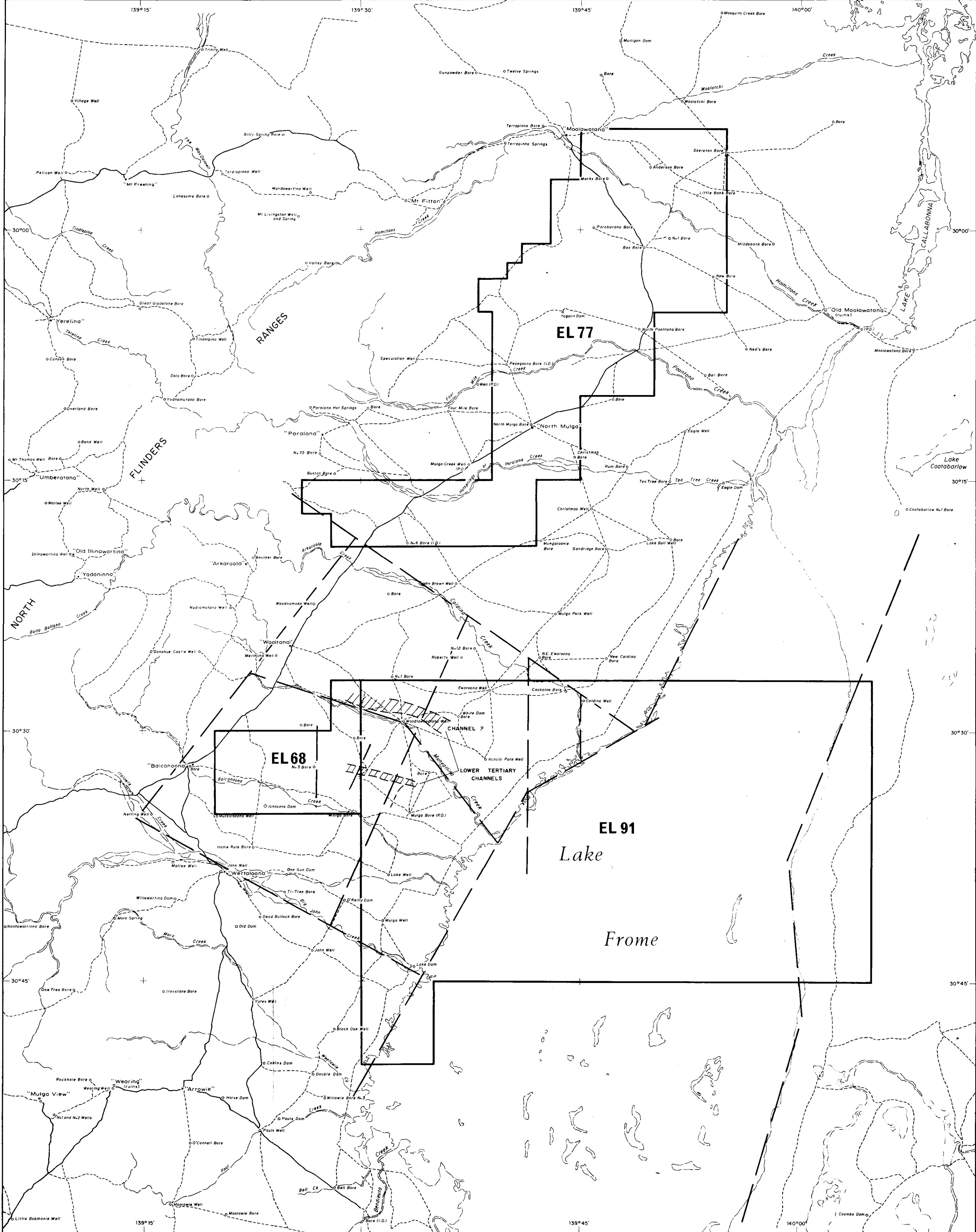
LEGEND

- Road, loose surface all weather second class
- - - Road, unimproved earth
- ~ Lake, river or stream intermittent
- ▭ Participation area

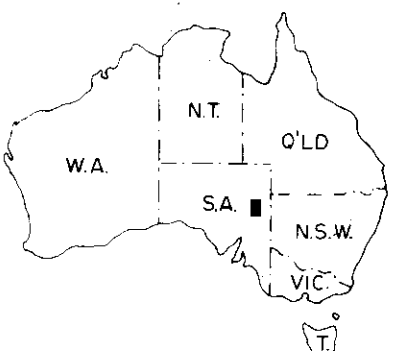
FIGURE 2

BP MINERALS AUST. PTY LTD	
Area: LAKE FROME	
EL-68 & EL-91	
REF:	
MARCH 1975	M.S. BELL

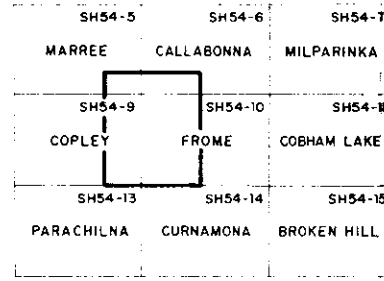
234(-8



LOCATION DIAGRAM

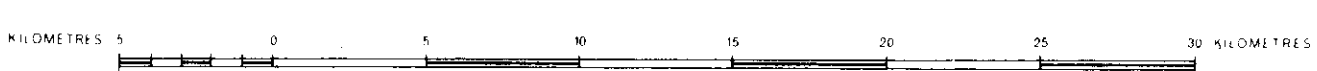


REFERENCE TO AUSTRALIA STANDARD MAP SERIES



POONTANA PROJECT - 1974
STRUCTURAL INTERPRETATION SHOWING
POSSIBLE FAULTS & CHANNELS

SCALE 1:250,000



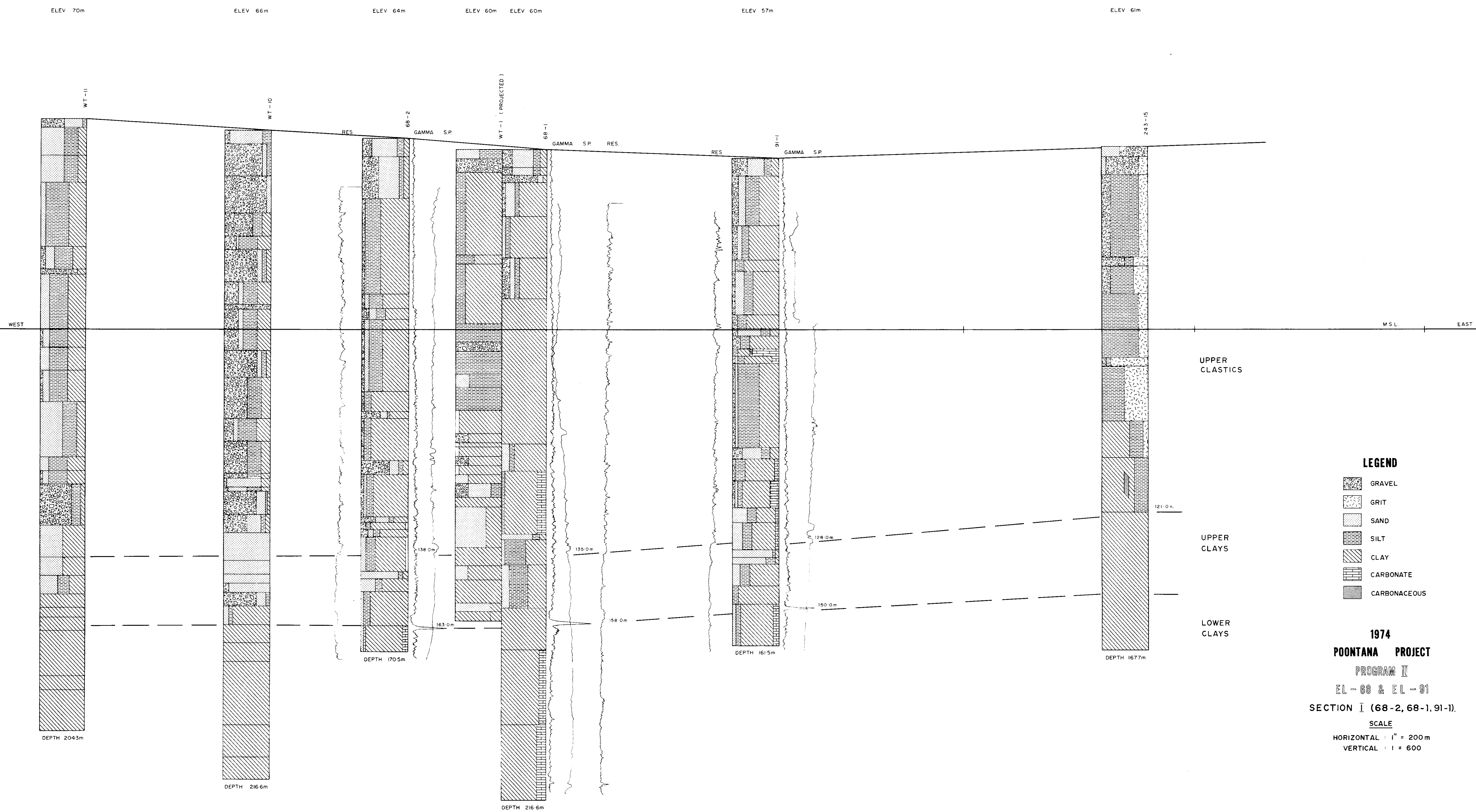
LEGEND

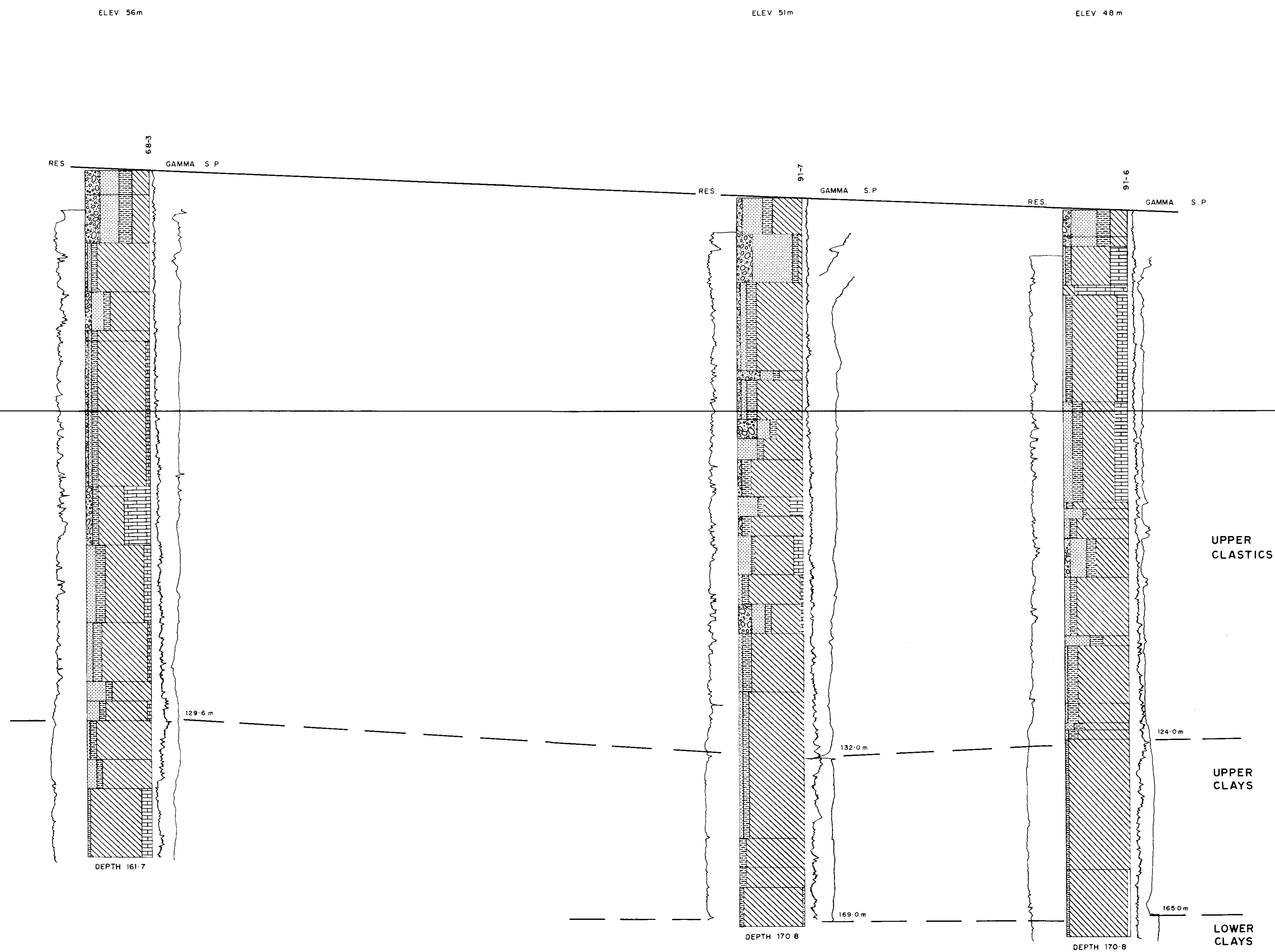
- Road, loose surface all weather second class
- - - Road, unimproved earth
- ~ Lake, river or stream intermittent
- ▬ Participation area
- ▬ Faults

2346-9

FIGURE 4

BP MINERALS AUSTRALIA PTY LTD	
Area: LAKE FROME	
EL-68 & EL-91	
REF:	
MARCH 1975	M.S. BELL





LEGEND

- GRAVEL
- SAND
- SILT
- CLAY
- CARBONATE
- CARBONACEOUS

1974

POONTANA PROJECT

PROGRAM II

EL - 68 & EL - 91

SECTION II (68-3, 91-7, 91-6).

SCALE

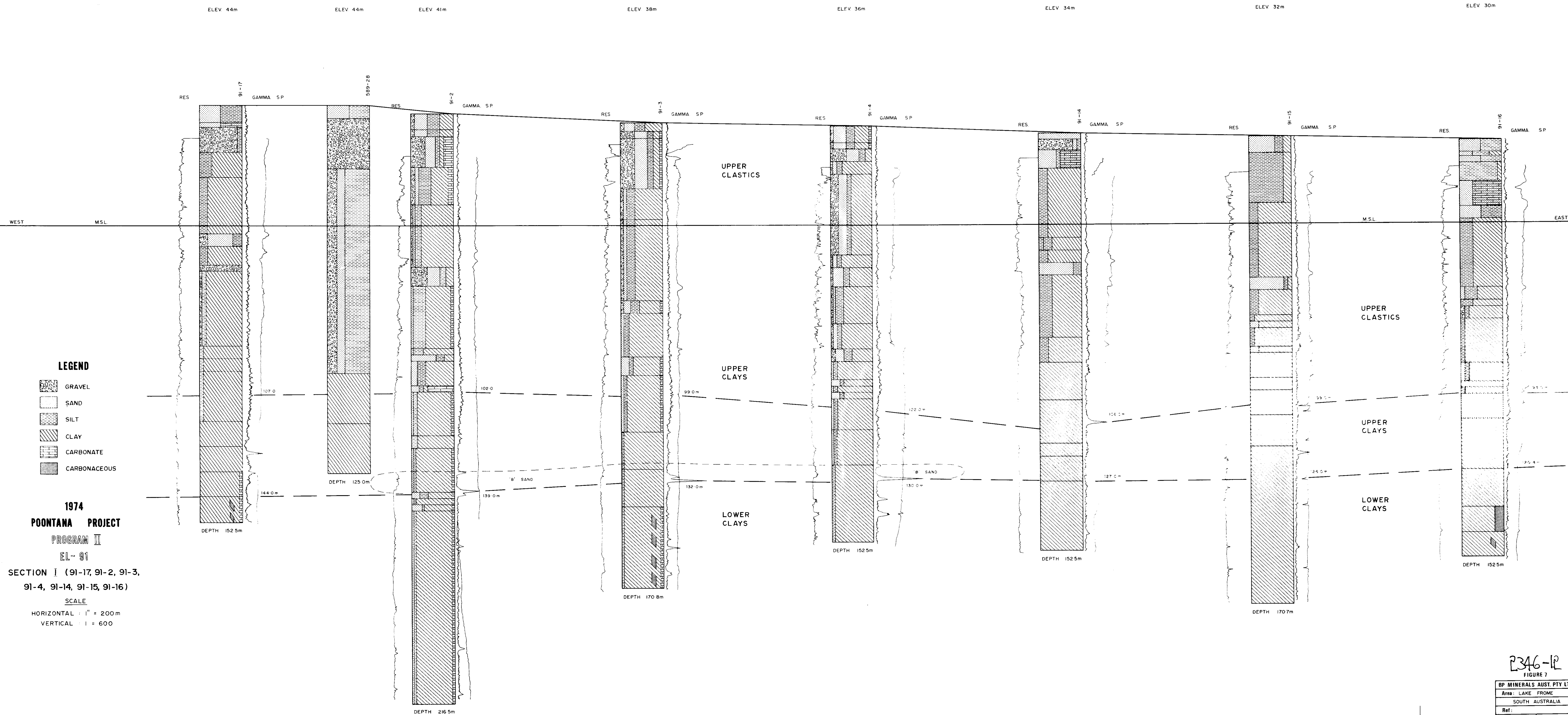
HORIZONTAL : 1" = 200m

VERTICAL : 1" = 600

2346-11

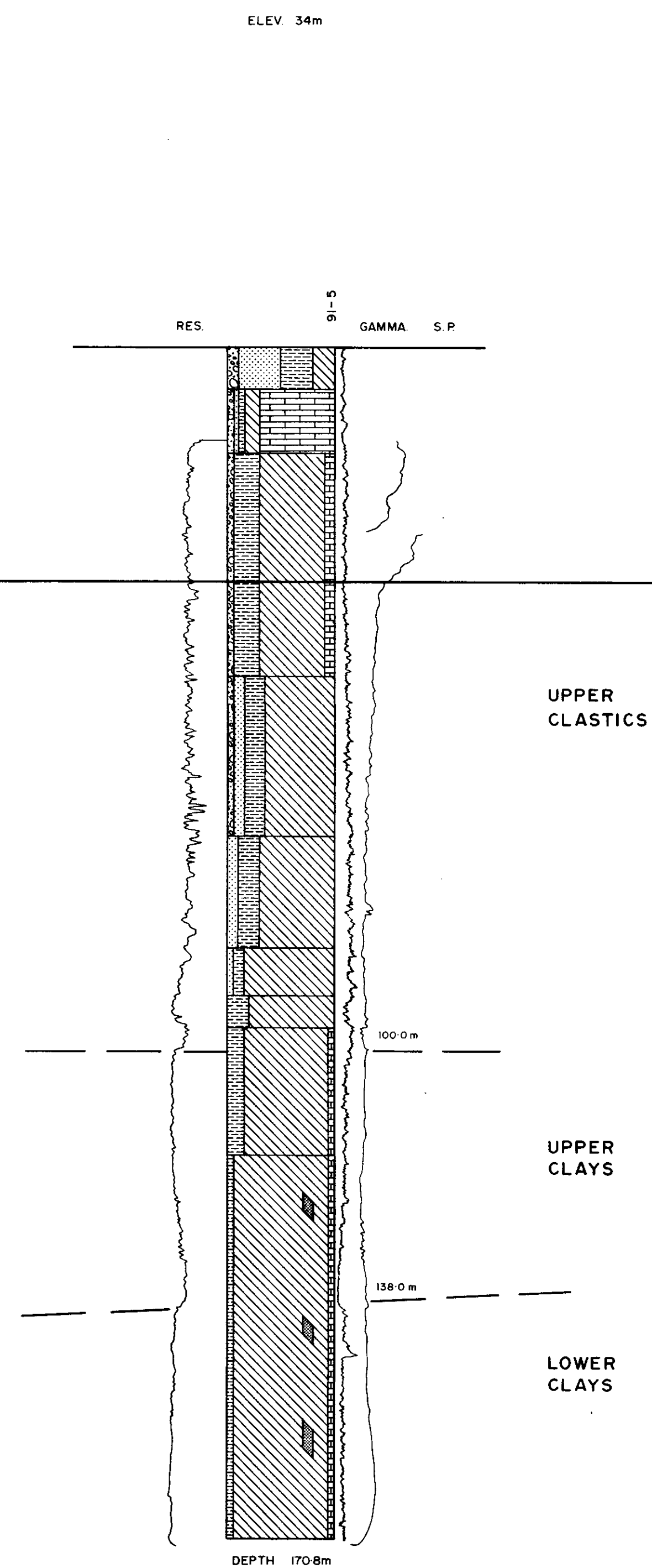
FIGURE 6

BP MINERALS AUSTRALIA LTD	
Area: LAKE FROME	
SOUTH AUSTRALIA	
Ref:	
MARCH, 1975	M. S. BELL



2346-12
FIGURE 7

BP MINERALS AUST PTY LTD	
Area: LAKE FROME	
SOUTH AUSTRALIA	
Ref:	
FEBRUARY 1975	M.S. BELL



LEGEND

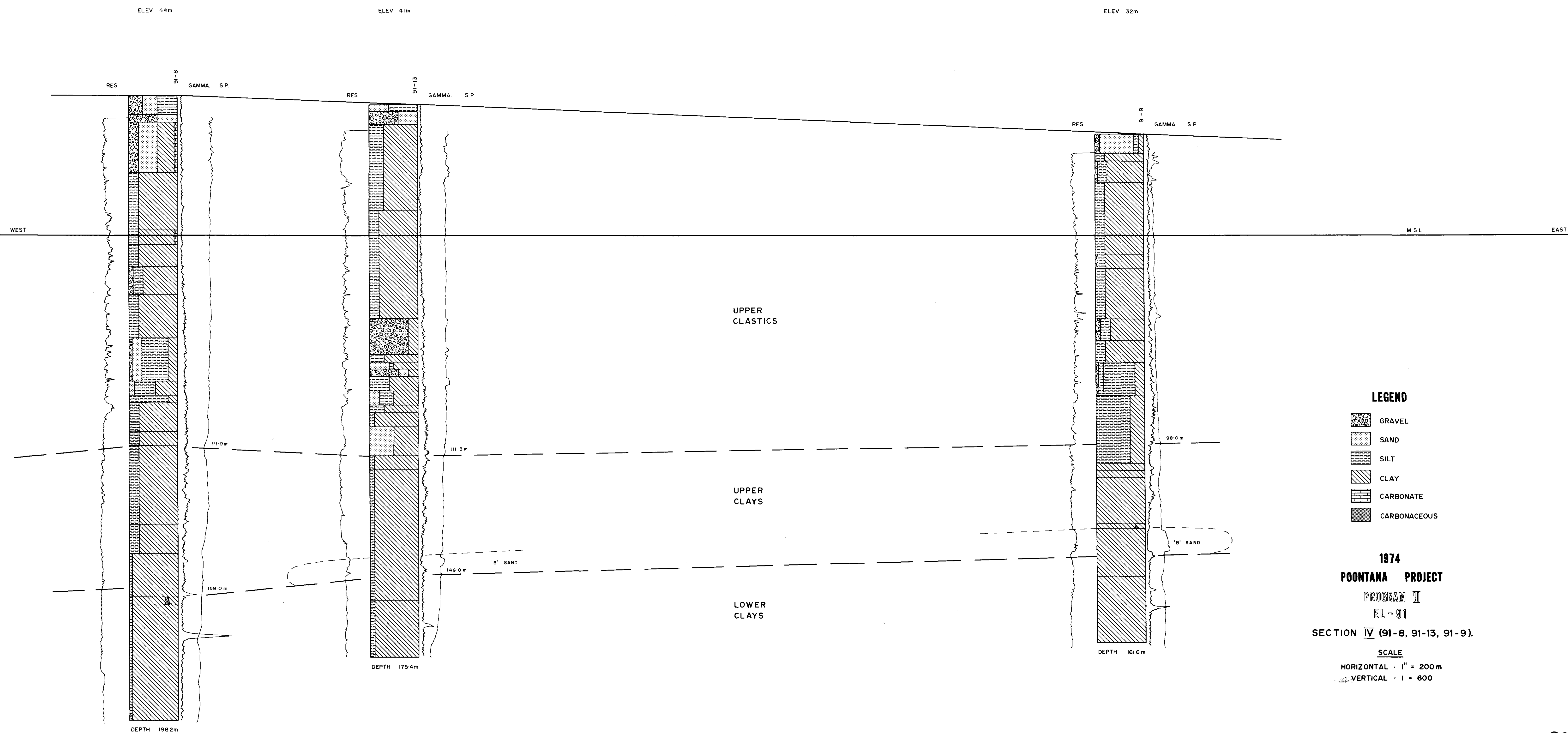
	GRAVEL
	SAND
	SILT
	CLAY
	CARBONATE
	CARBONACEOUS

1974
POONTANA PROJECT
PROGRAM II
EL-91

SECTION II (91-5).

SCALE
HORIZONTAL : 1" = 200m
VERTICAL : 1" = 600

2346-13



LEGEND

- GRAVEL
- SAND
- SILT
- CLAY
- CARBONATE
- CARBONACEOUS

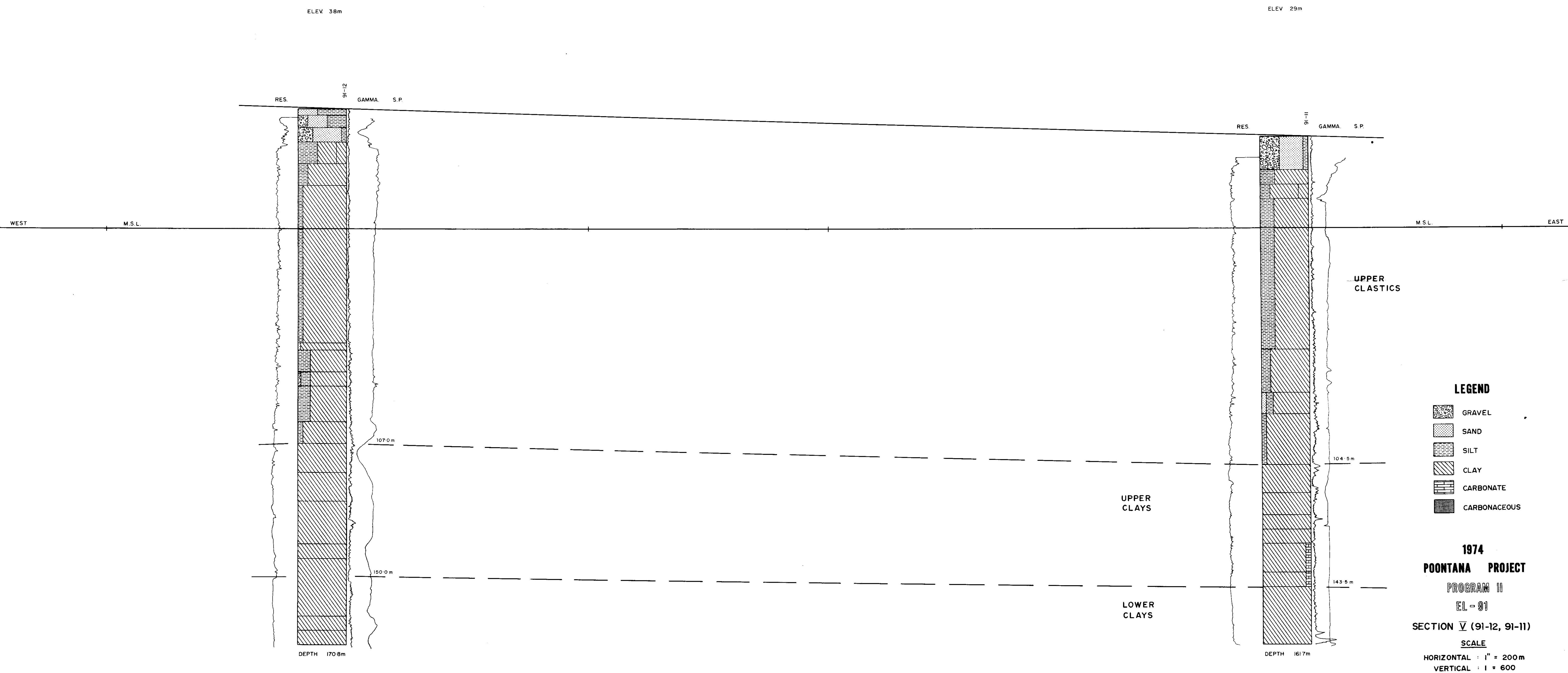
1974
POONTANA PROJECT
PROGRAM II
EL-91
SECTION IV (91-8, 91-13, 91-9).

SCALE

HORIZONTAL : 1" = 200m
 VERTICAL : 1" = 600

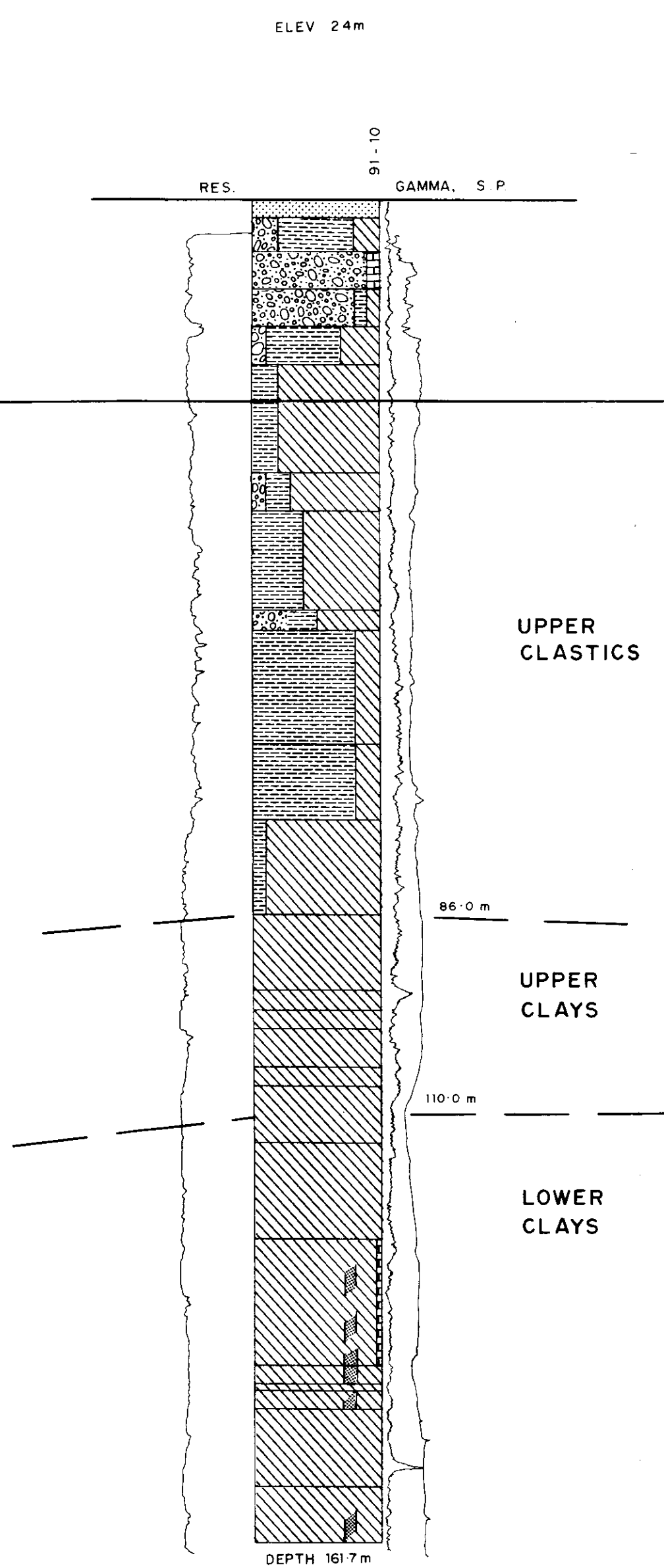
2346-14
 FIGURE 9

BP MINERALS AUSTRALIA LTD	
Area:	LAKE FROME
	SOUTH AUSTRALIA
Ref:	
FEBRUARY 1975	M.S. BELL



2346-15
FIGURE 10

BP MINERALS AUST. PTY LTD	
Area: LAKE FROME	
SOUTH AUSTRALIA	
Ref:	
FEBRUARY 1975	M S BELL

**LEGEND**

-  GRAVEL
-  SAND
-  SILT
-  CLAY
-  CARBONATE
-  CARBONACEOUS

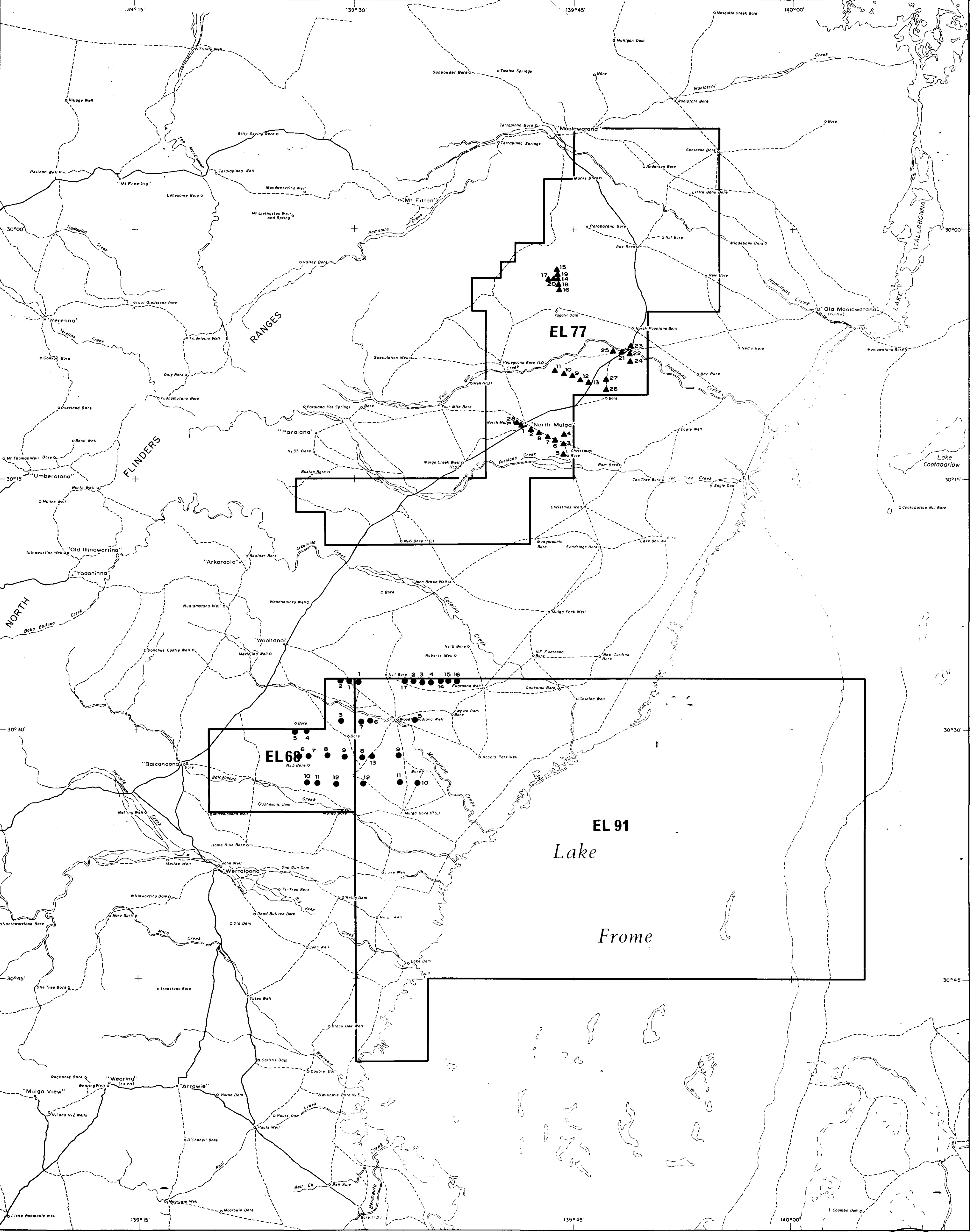
1974
POONTANA PROJECT
PROGRAM II
EL-91
SECTION V (91-10)

SCALE

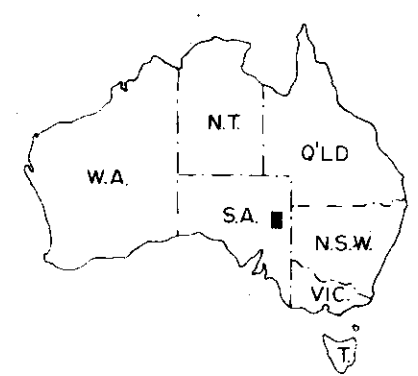
HORIZONTAL : 1" = 200 m
 VERTICAL : 1" = 600

2346-16
 FIGURE 11

BP MINERALS AUSTRALIA PTY LTD	
Area:	LAKE FROME
	SOUTH AUSTRALIA
Ref:	
FEB. 1975	M. S. BELL



LOCATION DIAGRAM



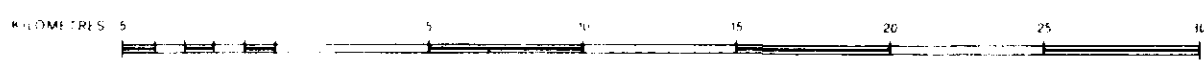
REFERENCE TO AUSTRALIA
STANDARD MAP SERIES

SH54-5	SH54-6	SH54-7
MARREE	CALLABONNA	MILPARINKA
SH54-9	SH54-10	SH54-11
COPLEY	FROME	COBHAM LAKE
SH54-13	SH54-14	SH54-15
PARACHILNA	CURNAMONA	BROKEN HILL

DRILL HOLE LOCATIONS

- NOV-DEC 1974 PROGRAMME
- ▲ SEPT 1974 PROGRAMME

SCALE 1:250,000



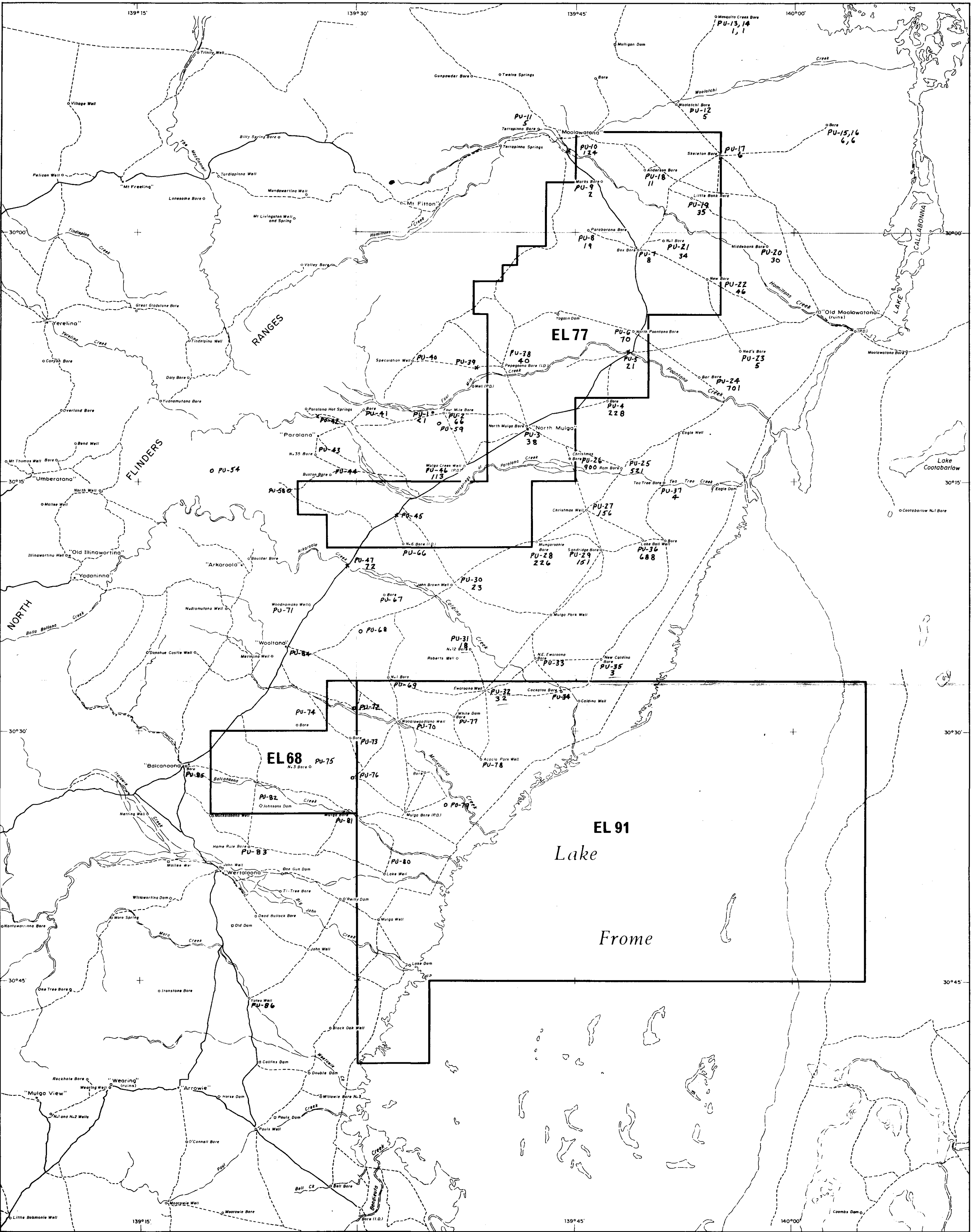
LEGEND

- Road, loose surface all weather second class
- - - Road, unimproved earth
- ~ Lake, river or stream intermittent
- ▭ Participation area

2346
RECEIVED
26 FEB 1975
DEPT. OF MINES
SECURITY

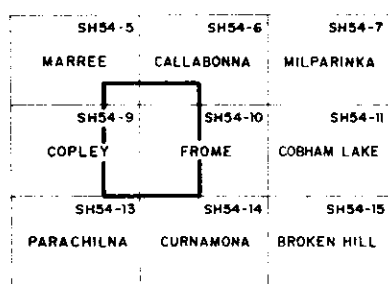
BP MINERALS AUSTRALIA LTD
Area: LAKE FROME
SOUTH AUSTRALIA
REF: QUARTERLY REPORT
FEB. 1975

2346-17



LOCATION DIAGRAM

REFERENCE TO AUSTRALIA
STANDARD MAP SERIES



LEGEND

- Road, loose surface all weather second class
- - - Road, unimproved earth
- Lake, river or stream intermittent
- ▭ Participation area
- PU-1 Water sample number
- <1 Microgram per litre uranium (ppb)

PLAN II

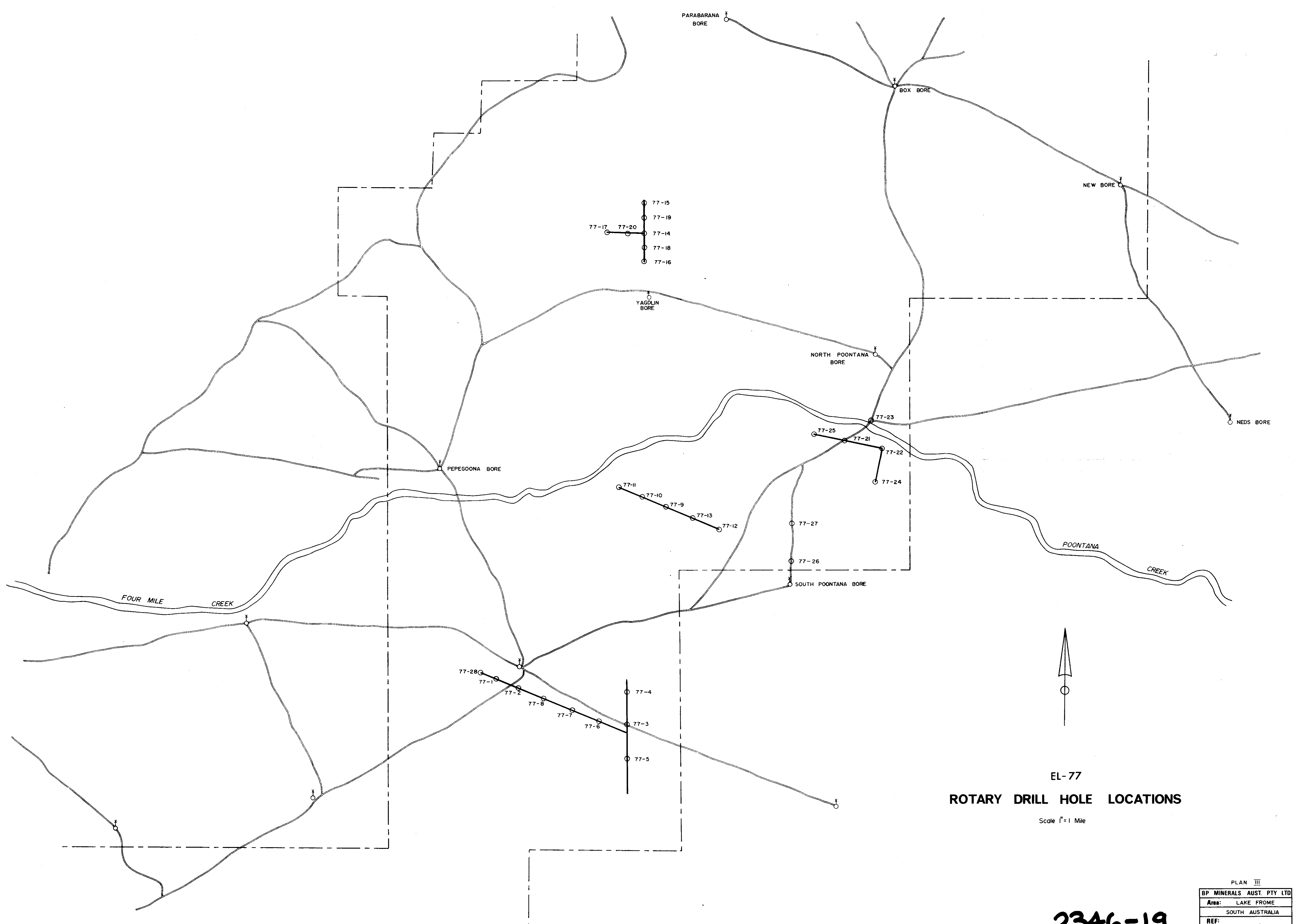
BP MINERALS AUSTRALIA PTY LTD	
Area: LAKE FROME	
WATER BORE SURVEY	
REF:	
SEPT, 1974	M. BELL

SCALE 1:250,000



2346-18

2328(I)-10

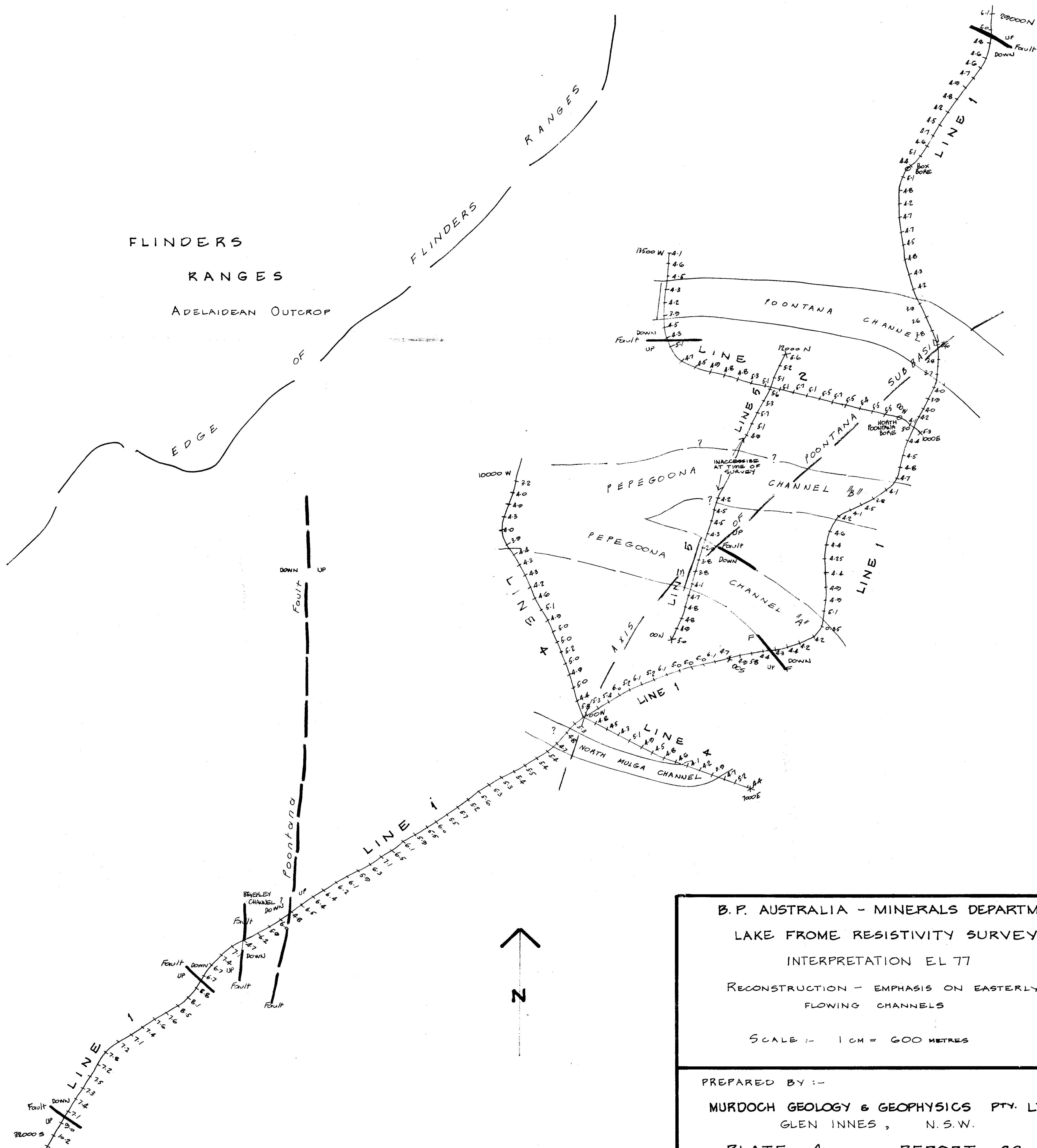


EL-77
ROTARY DRILL HOLE LOCATIONS
Scale 1"=1 Mile

2346-19

PLAN III	
BP MINERALS AUST. PTY LTD	
Area:	LAKE FROME
	SOUTH AUSTRALIA
REF:	
OCT 1974	M. BELL

2328(I) -11



B.P. AUSTRALIA - MINERALS DEPARTMENT
LAKE FROME RESISTIVITY SURVEY
INTERPRETATION EL 77

RECONSTRUCTION - EMPHASIS ON EASTERLY
FLOWING CHANNELS

SCALE :- 1 CM = 600 METRES

PREPARED BY :-

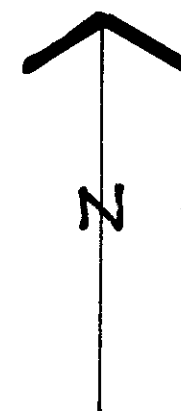
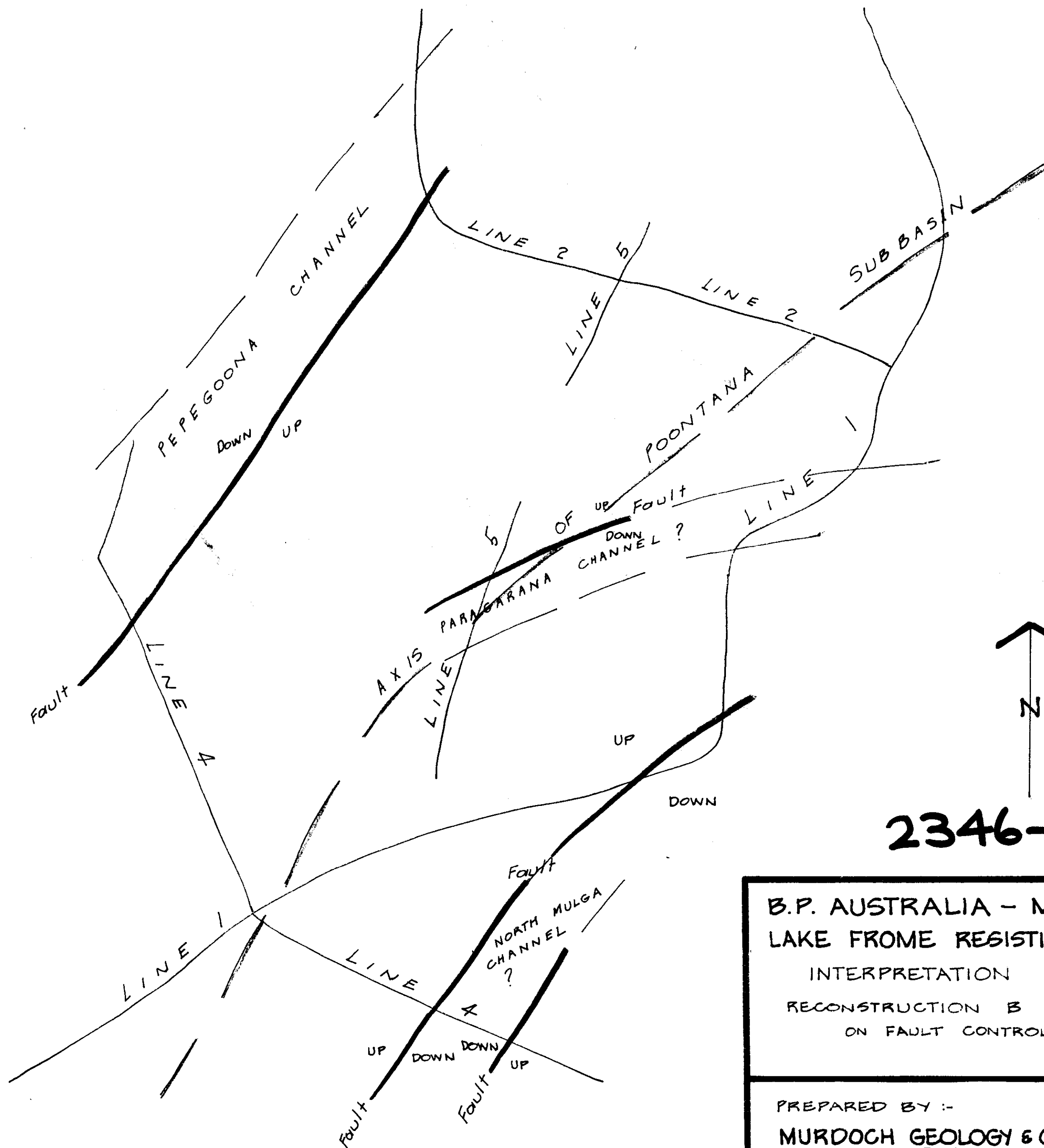
MURDOCH GEOLOGY & GEOPHYSICS PTY. LTD.
GLEN INNES, N.S.W.

PLATE 4

REPORT 83

2346-20

2328(I)-12



2346-21

B.P. AUSTRALIA - MINERALS DEPT.
LAKE FROME RESISTIVITY SURVEY
INTERPRETATION EL 77
RECONSTRUCTION B - EMPHASIS
ON FAULT CONTROLLED CHANNELS

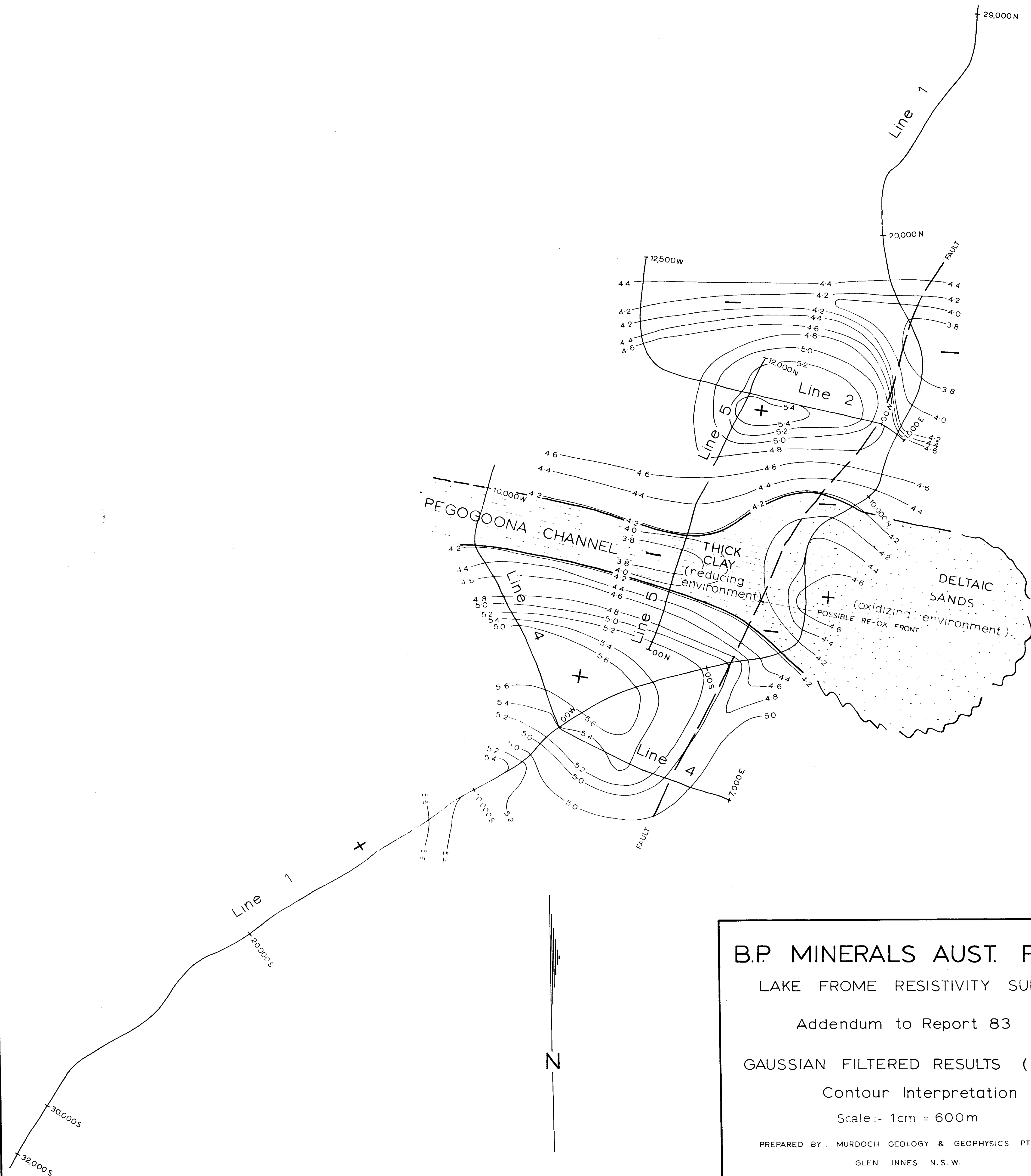
PREPARED BY :-

MURDOCH GEOLOGY & GEOPHYSICS
PTY. LTD.

GLEN INNES, N. S. W.

PLATE 4A REPORT 83

2328(I)-13



B.P. MINERALS AUST. PTY LTD LAKE FROME RESISTIVITY SURVEY

Addendum to Report 83

GAUSSIAN FILTERED RESULTS (DIRECTIONALLY CORRECTED)

Contour Interpretation

Scale:- 1cm = 600m

PREPARED BY: MURDOCH GEOLOGY & GEOPHYSICS PTY LTD

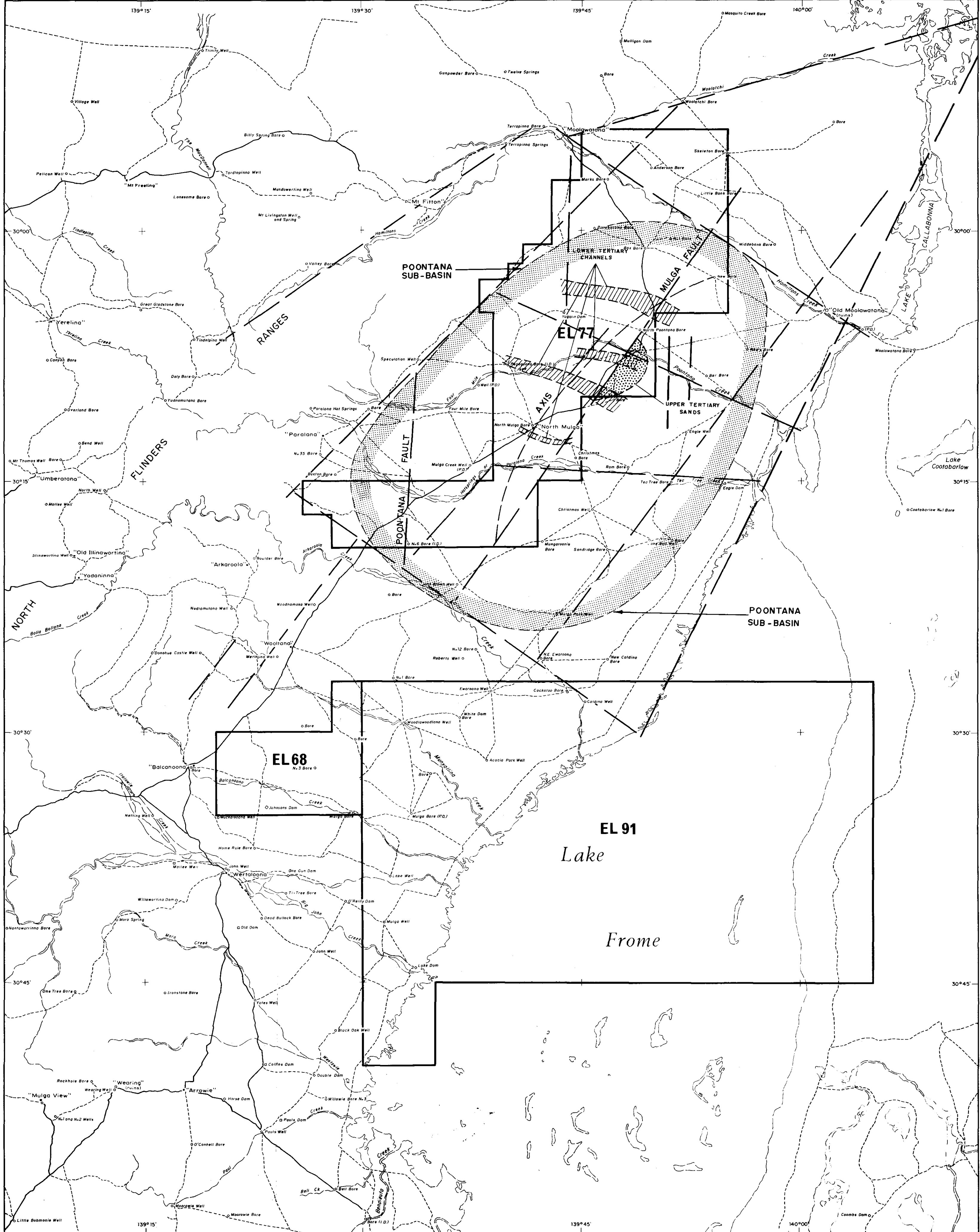
GLEN INNES N.S.W.

OCT. 1974

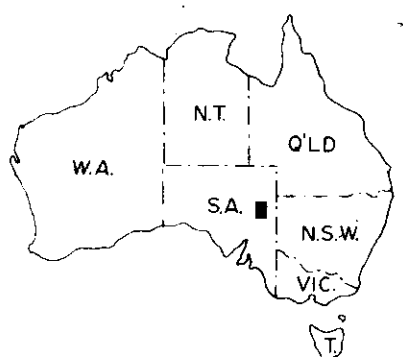


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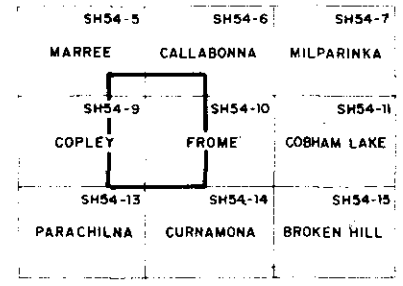
2346-22



LOCATION DIAGRAM

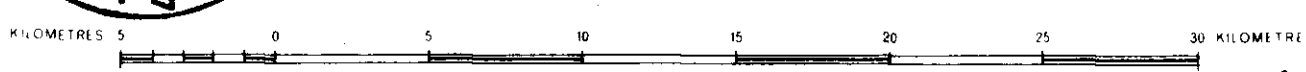


REFERENCE TO AUSTRALIA STANDARD MAP SERIES



POONTANA PROJECT - 1974
STRUCTURAL INTERPRETATION SHOWING
POSSIBLE FAULTS & CHANNELS

SCALE 1:250,000



LEGEND

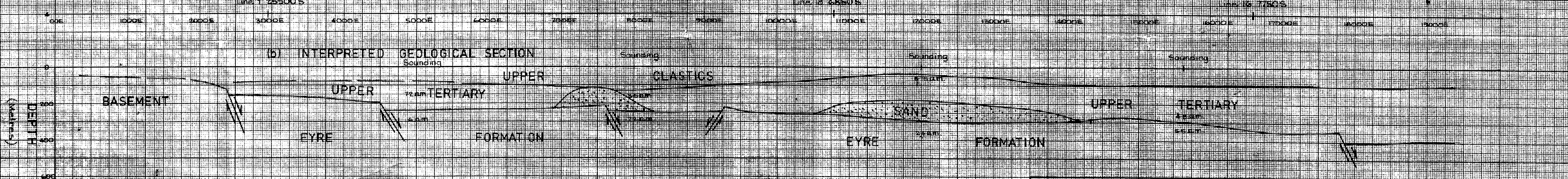
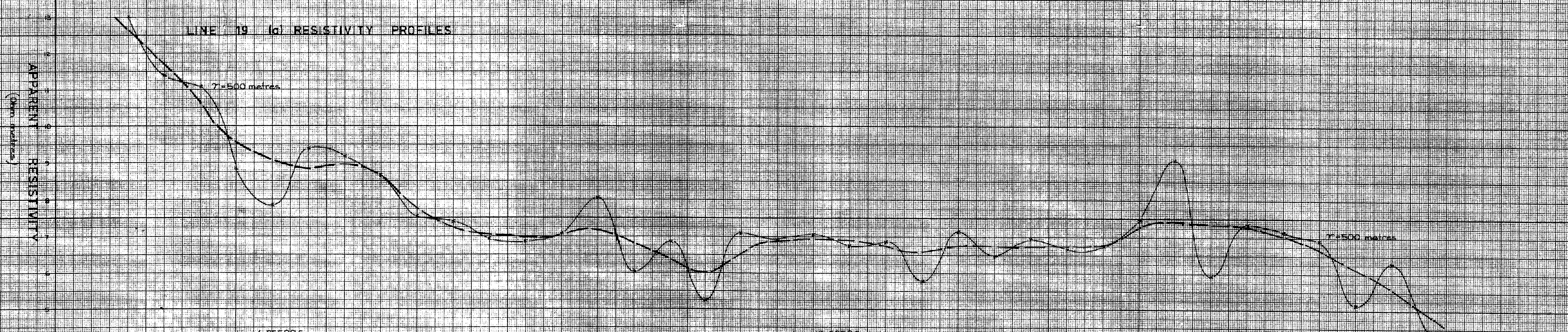
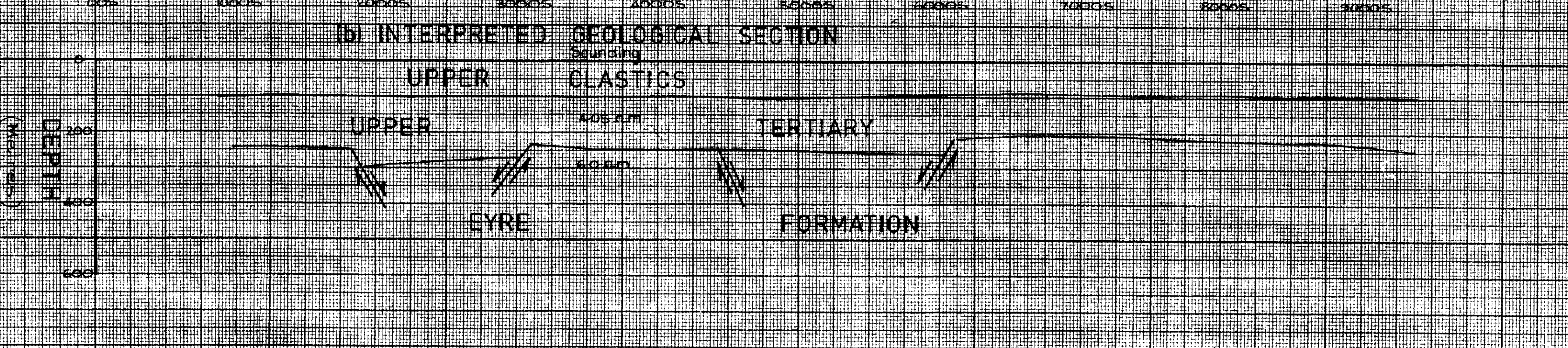
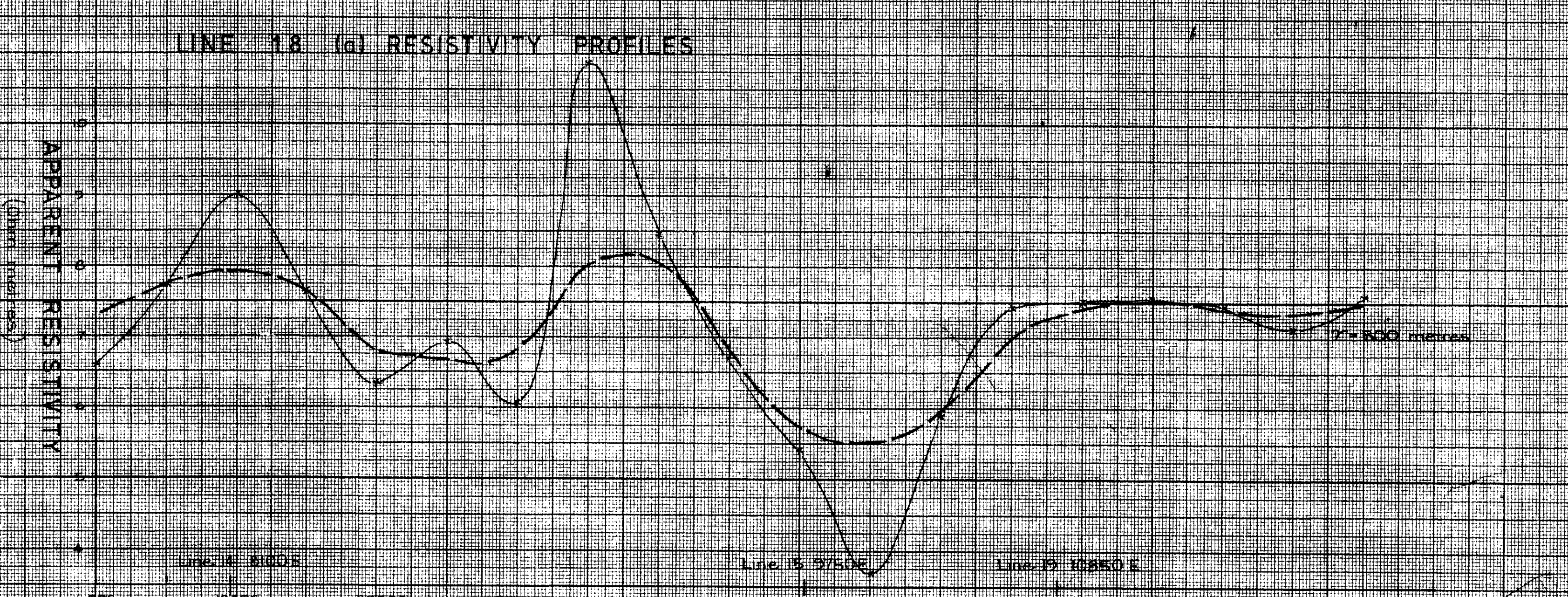
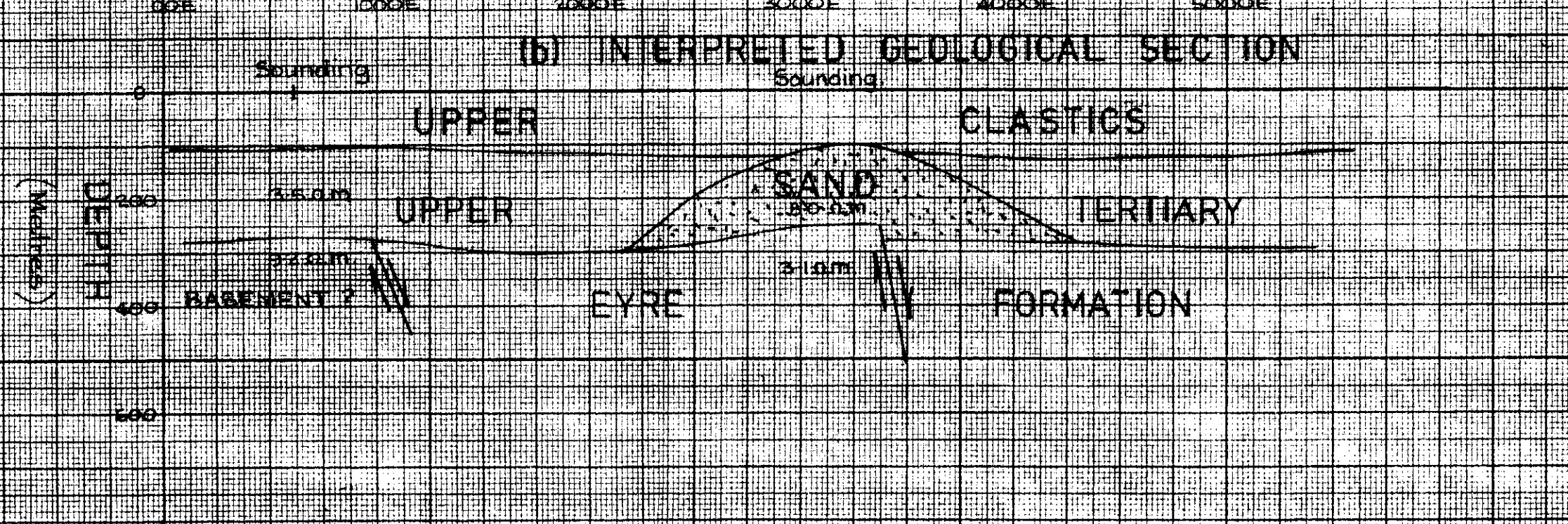
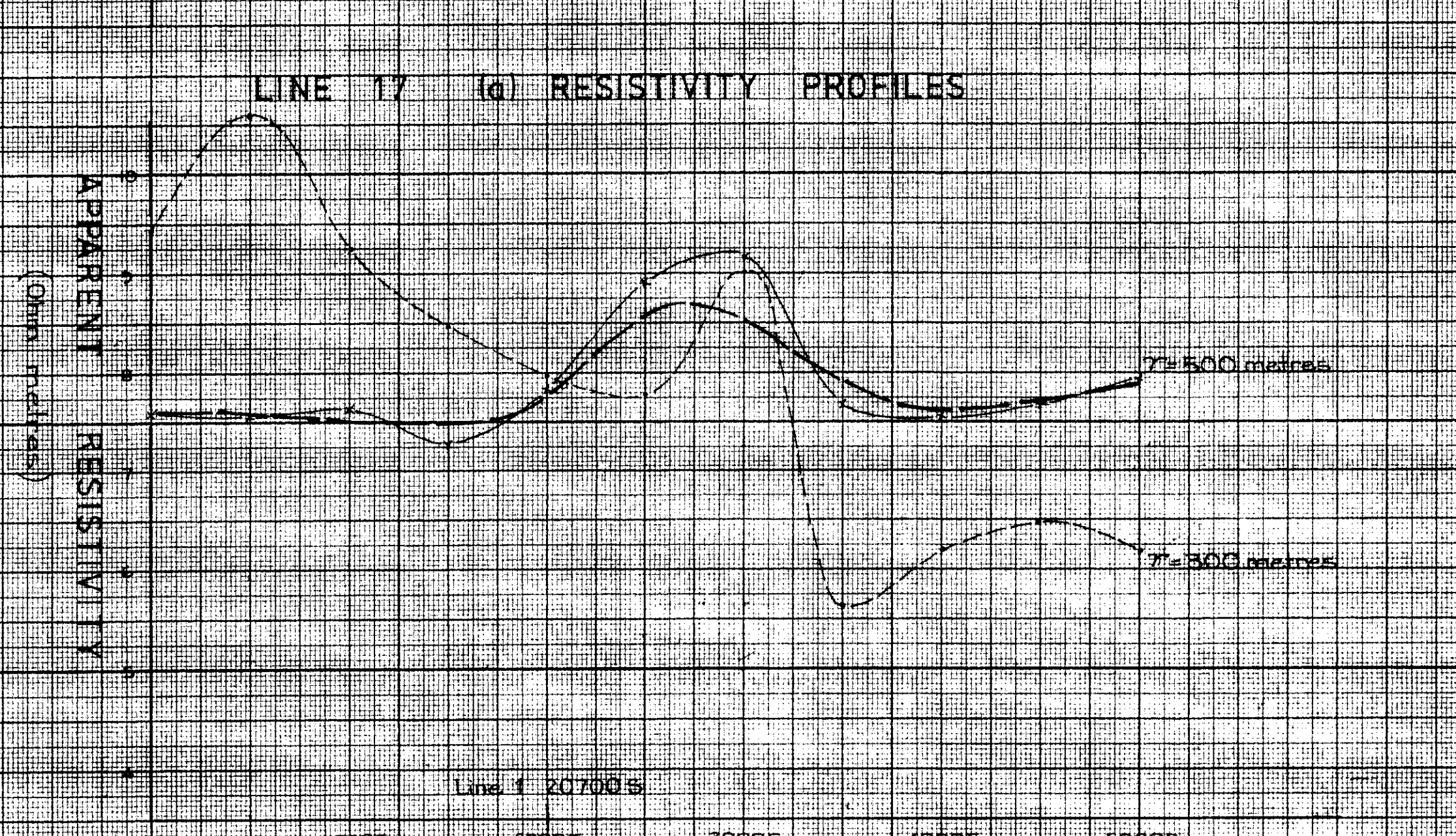
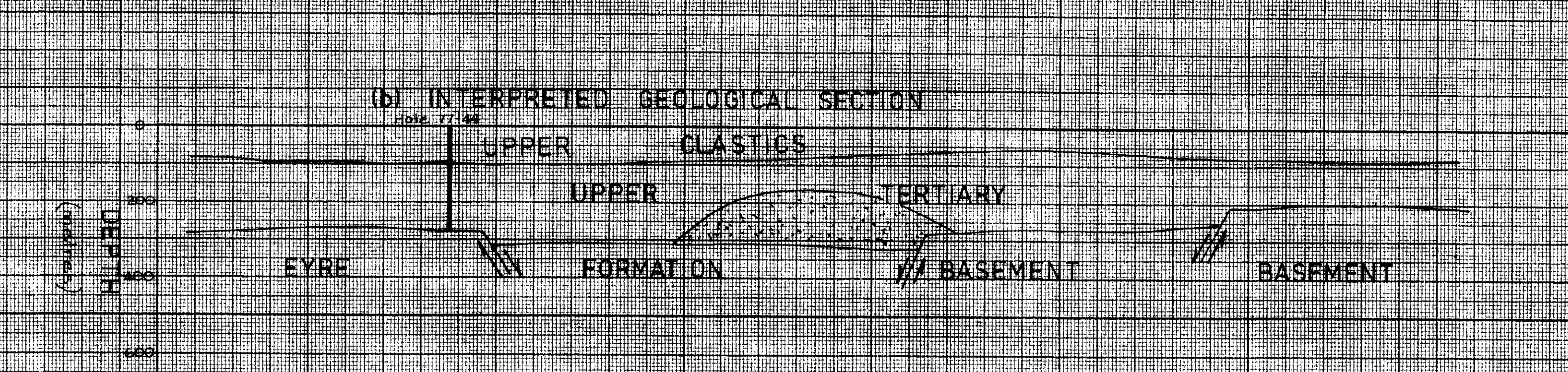
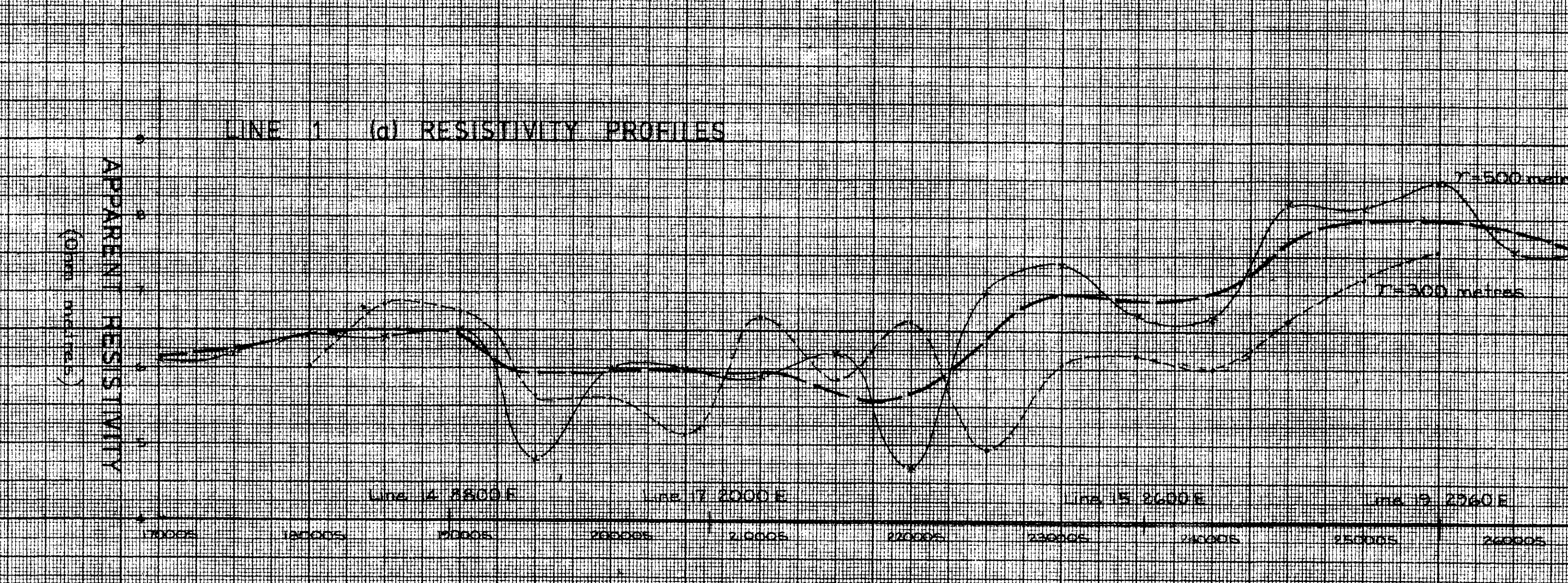
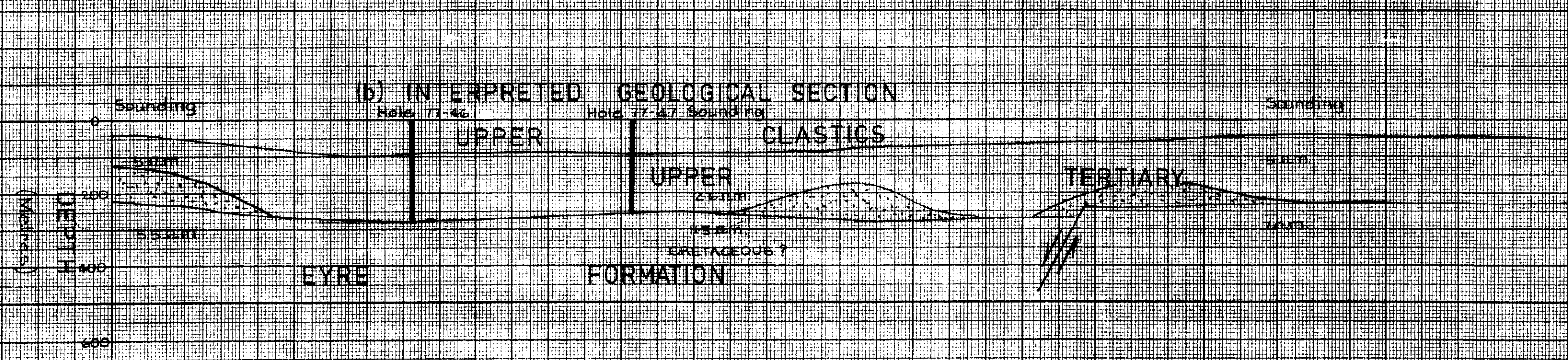
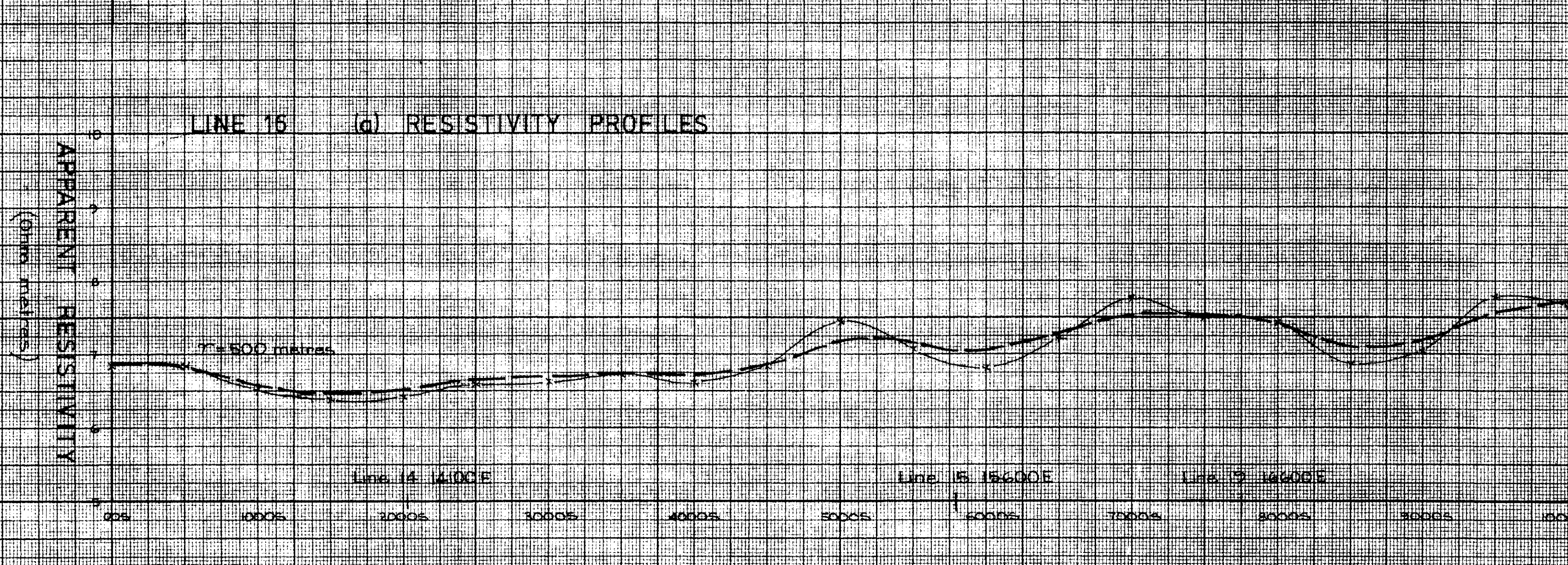
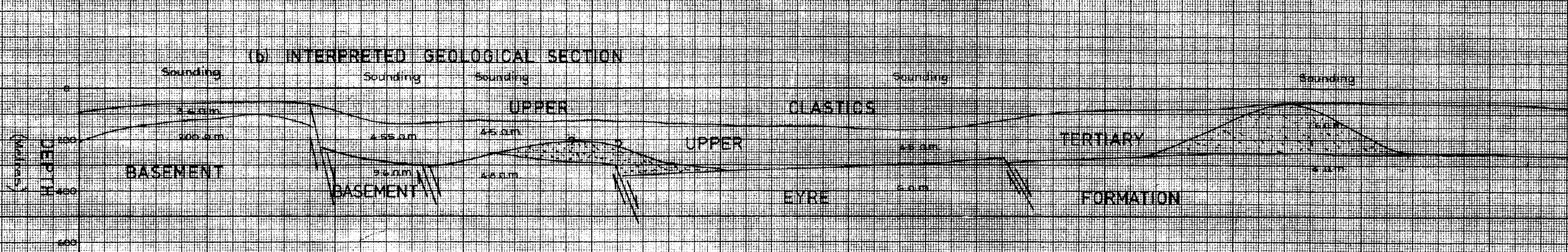
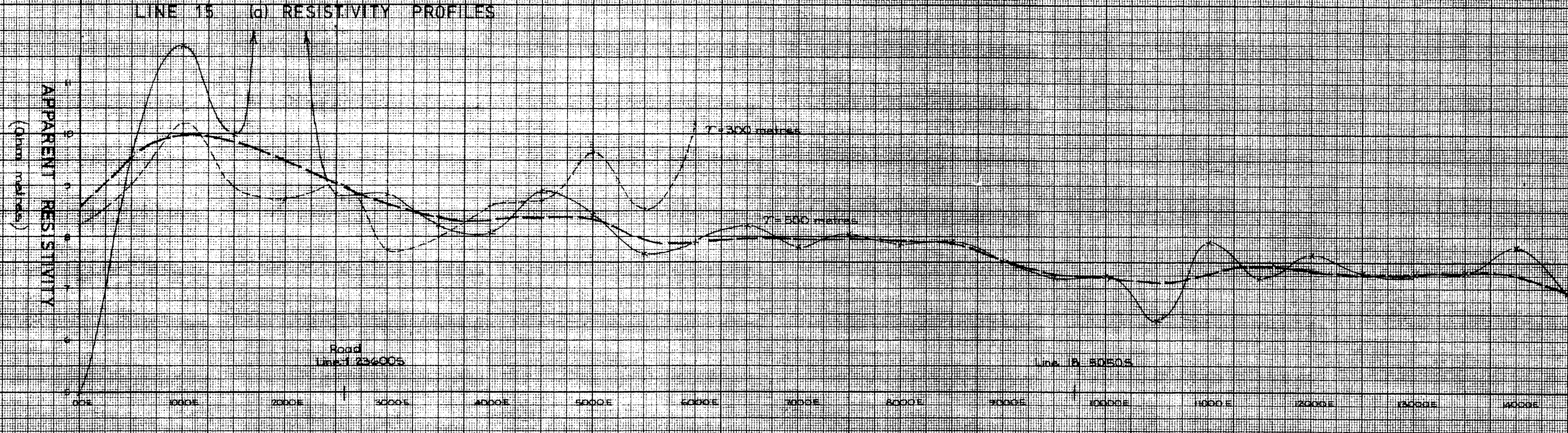
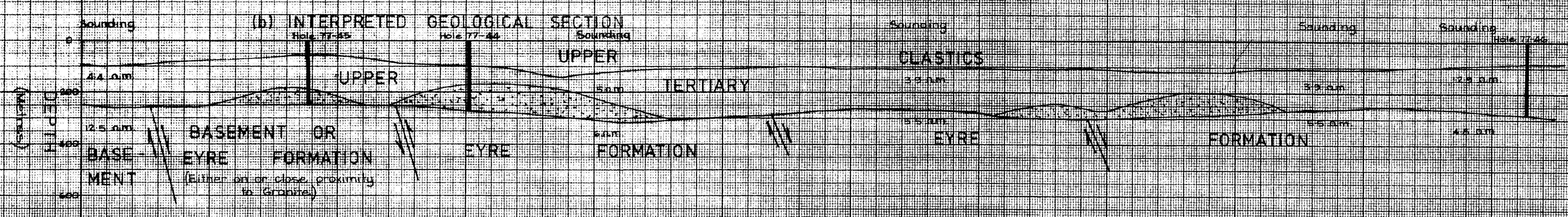
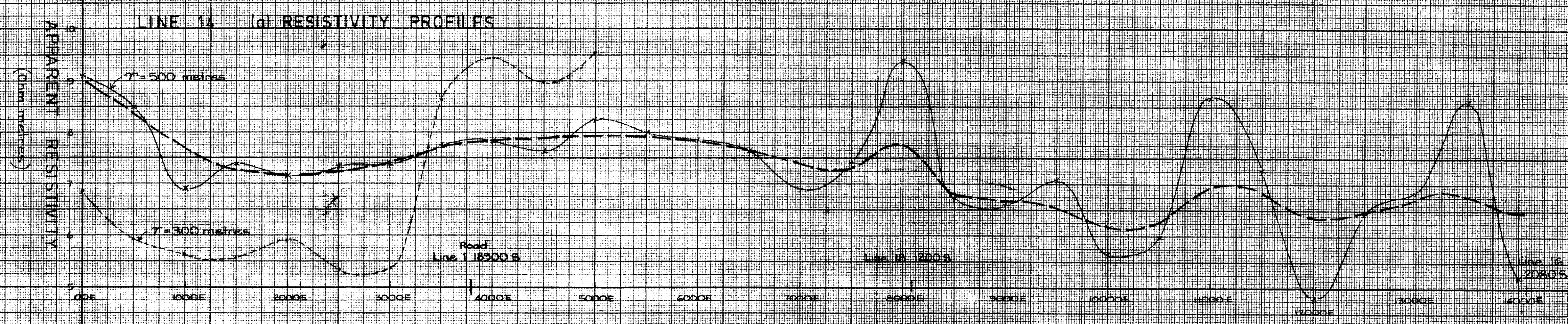
- Road, loose surface all weather second class
- - - Road, unimproved earth
- ~ Lake, river or stream intermittent
- Participation area
- Faults

PLATE IV

BP MINERALS AUST. PTY LTD
Area: LAKE FROME
EL-77
REF:
MARCH, 1975 M. S. BELL

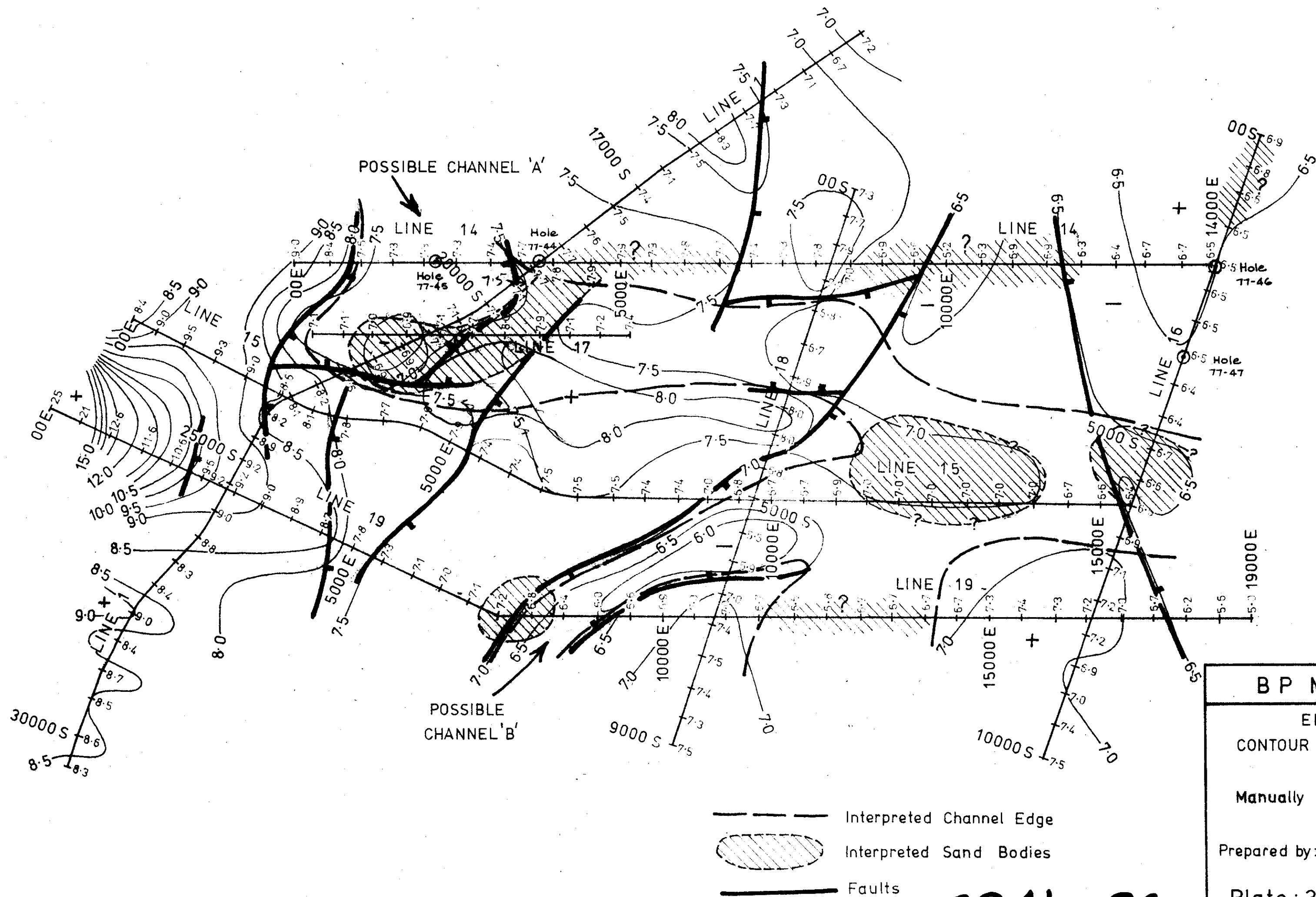
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PROFILE LEGEND
7=500 metres
7=300 metres
7=500 metres

BP MINERALS AUSTRALIA - EL 77 SOUTH AUSTRALIA
RESISTIVITY PROFILES AND INTERPRETED SECTIONS LINES 14-19
7=300m & 7=500m
Vertical Profiles 1cm=0.5 km metres
Sections 1cm=100 metres
Horizontal 1cm=250 metres
Prepared By: Minerals Geophysics (Australia) Pty Ltd. Glen Innes NSW
Page: 2 Report: 204



B P MINERALS AUSTRALIA

EL 77 SOUTH AUSTRALIA
CONTOUR PLAN APPARENT RESISTIVITY

$\gamma = 500\text{m. DATA}$

Manually Smoothed & Directionally Corrected

Scale: 1cm. = 500m.

Prepared by: Murdoch Geophysics (Aust) P/L
Glen Innes N.S.W.

Plate: 3

Report: 204

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