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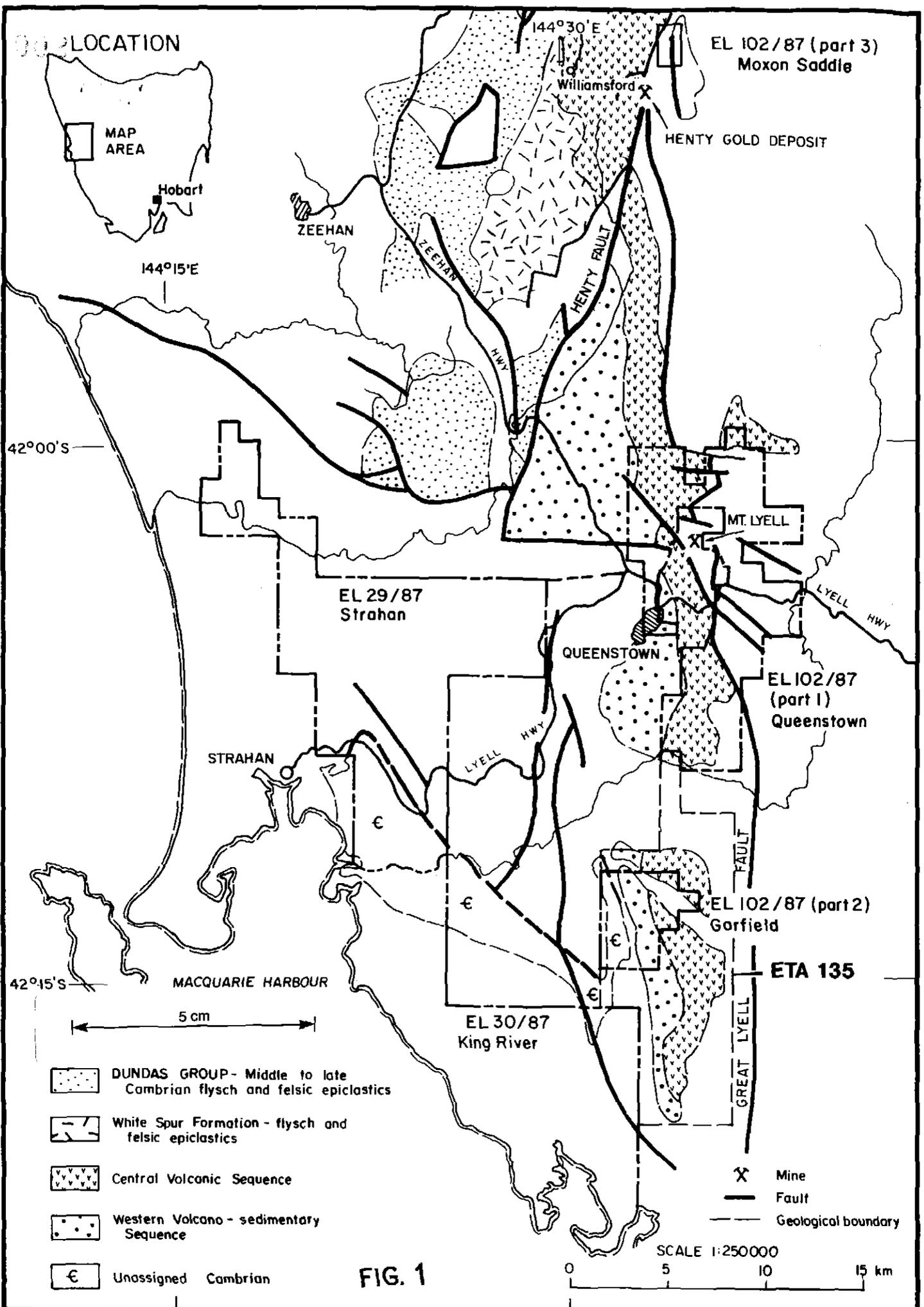
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Centre Melbourne	436003	THE BROKEN HILL PROPRIETARY CO. LTD.	Project N <sup>o</sup> B57
Date 20.11.89		QUEENSTOWN REGION, TAS.	Drawing N <sup>o</sup> A4 3001
		<b>EXPLORATION TENEMENTS &amp; REGIONAL GEOLOGY</b>	

1. INTRODUCTION

EL 30/87 "King River" comprising 127 km<sup>2</sup> (figure 1) was granted to New Holland Mining N.L. on the 15th January 1988. The bulk of the EL is within the South West Conservation Area which is listed on the National Estate Register. An option agreement between BHP-Utah Minerals International and New Holland Mining, covering EL 30/87 and the adjacent 29/87, was signed in June 1988. BHP-Utah withdrew from the option to joint venture on the 9th April 1990. While the option agreement was current BHP-Utah was manager of exploration on EL 30/87.

This report presents the results of an airborne Geotem survey flown over EL 30/87 and results of follow-up geological investigations. The Geotem survey was flown in a contiguous block which covered the adjacent EL 29/87 (see BHP-Utah Company Report 7118).

2. PREVIOUS WORK

The primary target explored for within EL 30/87 was volcanogenic massive sulfides occurring within Cambrian rocks. A secondary target was Irish-style carbonate hosted mineralisation potentially occurring within the Ordovician Gordon Limestone which crops out south of the EL but may occur within the southern section of the licence (Wilde et al, 1990).

The exploration program developed for EL 30/87 was constrained by the fact that there is no vehicle access into the area. Originally it was intended to extend the stream sediment coverage of the adjacent EL 29/87 into the area by cutting grid lines and conducting a helicopter supported program. With the commissioning of the Geotem digital airborne TEM system by the geophysical contracting firm Geotrex Pty Ltd., a decision was made to cover the entire EL with Geotem data without completing the stream sediment survey. The Geotem survey was possible over EL 30/87 due to the flat topography of the area.

Given the resistive nature of the Cambrian volcanics it was envisaged that Geotem would be capable of detecting conductive sulfide mineralization at depths up to 400 m. The Geotem survey also provided detailed aeromagnetic data at a total survey cost comparable to the cost of the planned stream sediment survey.

Prior to the flying of the Geotem survey image processing of the 1981 West Coast Tasmania aeromagnetic survey, flown by Geoex for the Tas Mines Dept., was undertaken. A preliminary interpretation of this data aided the production of a geological map of the tenement (Wilde et al, 1989) (figure 2). Within the area three Cambrian units are present, although their stratigraphic relationships are ambiguous due to poorly exposed contacts. The main unit of interest is the Pine Cove Creek Volcanics (informal name), several hundred metres of which are exposed in Gravelly Creek. This unit varies from andesitic to basaltic composition, although both sequences are dominated by a feldspar, pyroxene and glass assemblage. Aeromagnetic data suggests these rocks continue south into the Noddy Creek Volcanics (White, 1975) and hence are possible equivalents of the Dundas Group. Consequently the Pine Cove Creek Volcanics could be of similar age to the sequence hosting the Hellyer and Que River base metal mines (Wilde et al, 1989).

Leaman (1988) reviewed the gravity and aeromagnetic data covering EL 30/87. A detailed assessment of Leaman's review is presented in Chapter 3 of Wilde et al. (1989).

### 3. BHP-UTAH GEOTEM SURVEY

The Geotem survey flown to explore EL 30/87 for conductive sulfide mineralization, was conducted between the 8th and 16th of March 1989. The survey was conducted to the following specifications:

Contractor:	Geoterrex Pty Ltd
Survey Type:	Geotem II
Survey Configurations:	Airborne - transmitter height 120 m - receiver height 54 m - transmitter/receiver separation 115 m

436000

Transmitter Frequency: 125 Hz  
Transmitter Loop Dipole Moment:  $4.15 \times 10^5 \text{ Am}^2$   
Receiver Coil Axis: Horizontal  
Survey Size: 498 km (total combined with EL 29/87)  
Line Direction:  $90^\circ/270^\circ$  (true)  
Line Spacing: 250 m  
Nominal Aircraft Speed: 60 m/s

A full description of the Geotem II system is given in Appendix 1. The Geotem data profiles collected over the King River EL are presented in Appendix 3. A computer tape of the digital Geotem data is held by the Tasmania Mines Dept. The format of this data tape is given in Appendix 4.

#### 4. INTERPRETATION OF THE GEOTEM DATA

A preliminary interpretation of the Geotem data was completed by BHP-Utah Chief Geophysicist Tom Whiting using the unprocessed flight path records. The geological follow-up described in the next section was instigated as a result of this interpretation. Following the processing of the survey Geotem data, Geotem were contracted to complete a thorough interpretation of the Geotem data using the data profiles presented in Appendix 3.

The Geotem data revealed the survey area to be generally resistive with a conductive zone following the coast. The majority of the Geotem anomalies display early time responses of broad character and low amplitude, suggestive of structural or lithological conductors. Seven anomalies were identified as exhibiting a slower decay, higher amplitude and smaller spatial wavelength, suggesting a source separate to the lithological/structural conductors. Predominantly these conductors (see figure 4) occur on one or two lines indicating short strike lengths. Conductors MH11, MH13, MH14, MH15 and MH16 were ranked as low priority conductors. This ranking is assigned to conductors with only one of the characteristics of bedrock conductors. Conductors MH12 and MH10 exhibited some bedrock characteristics that graded into surficial conductor characteristics and consequently were graded as medium priority conductors. No Geotem conductors were located that could

unequivocally be interpreted as having a bedrock source. Consequently all interpreted conductors needed to be upgraded on geological grounds before follow-up ground EM could be conducted.

Detailed descriptions of the conductors are given in Appendix 2.

#### 5. FOLLOW-UP GEOLOGICAL INVESTIGATIONS

A preliminary appraisal of the unprocessed Geotem data by BHP-Utah geophysicists outlined several mid to late-time anomalies that were continuous across 2 to 3 flight lines. Anomalies MH11, MH13 and MH14 occur near old Forestry Department logging tracks south of the Tepookana bridge. Geological reconnaissance conducted over these anomalies identified minor fine grained diagenetic pyrite occurring along bedding planes and as minor veinlets in shale. Creek traversing upstream and downstream of the anomaly positions defined no strike continuity to the mineralization. Non-mineralized interbedded to massive, coarse to fine grained, quartz-feldspar-phyric-epiclastics and shale were also observed at the anomaly positions (Gregory pers. comm.).

The geological traversing of Geotem anomalies revealed no volcanic units occur at the anomaly positions. Consequently it is interpreted that anomalies MH11, MH13 and MH14 are due to massive shale units occurring within an epiclastic pile of quartz-feldspar phyric shaly units.

Geotem anomalies MH10, MH12 and MH15 occur within, or close to, an andesitic unit in the western section of EL 30/87. Geological reconnaissance conducted in this area was accessed by jet boat from Strahan. Non mineralized cleaved chloritic andesite was recognized at two anomaly positions. Overlying the andesite where Tertiary sediments (mainly siltstone). The Geotem anomalies are interpreted as due to contact effects between the conductive Tertiary sediments and the resistive Cambrian andesites.

Seven samples of chloritic andesite were submitted for geochemical analysis. Rock sample locations are given in figure 5 within the geochemical results presented in Appendix 5. These samples are weakly anomalous in Zn and Cu, while one sample, DC 86, recorded 0.216 ppm Au.

6. CONCLUSIONS

A Geotem airborne EM survey conducted over EL 30/87 did not detect any responses that could be attributed to bedrock conductors, such as sulfide mineralization. Consequently no volcanogenic massive sulfide mineralization is interpreted to occur within a depth range of 0-300 m.

Geological investigations revealed that the low to medium priority Geotem conductors identified with EL 30/87 were sourced by shale units or conductive Tertiary sediments.

Due to the negative result of the Geotem survey BHP-Utah withdrew from the joint venture with New Holland Mining covering EL 29/87 and EL 30/87.

REFERENCES

Leaman, D.E., 1988: EL 30/87 King River Regional Geophysical Review for New Holland Mining N.L., Unpublished report to New Holland Mining N.L.

White, N.C., 1975: Cambrian Volcanism and Mineralization, South-West Tasmania. PhD Thesis, Univ. of Tasmania.

Wilde, A.R., 1990, Exploration Licence 30/87 King River N.W. Tasmania, Report For The Year Ended 15th January 1990, Unpublished BHP-Utah report.

APPENDIX 1

Geotem System Description

## 3. GEOTEM ELECTROMAGNETIC SYSTEM

## 3.1 EQUIPMENT AND SPECIFICATIONS

Model: GEOTEM II

## Geometry

Transmitter height (agl): 120 metres  
 Receiver height (agl): 54 metres  
 Tx - Rx horizontal separation: 115 metres  
 (agl - above ground level)

## Transmitter

Coil axis: vertical  
 Signal: half sine wave current pulse  
 Base frequency: 125 Hertz  
 Repetition rate: 250 pulses per second  
 Pulse width: 1020 microseconds  
 Loop area: 231 square metres  
 Number of turns: 3  
 Peak Current: 600 amps  
 Tx loop dipole moment:  $4.15 \times 10^5 \text{ Am}^2$

## Receiver

Coil axis: horizontal, parallel to flight direction  
 Digitising rate: 32,000 samples/second  
 Pulses per reading: 31  
 Stored readings/second: 7  
 Gate distribution: Combined Linear  
 Gate times: Expressed below in microseconds after transmitter shut-off

Channel positions for 125 Hz

TABLE 2

CHANNEL NUMBER	CENTRE ( secs)
1	369
2	587
3	806
4	1025
5	1244
6	1463
7	1681
8	1900
9	2119
10	2338
11	2556
12	2775

### 3.2 SYSTEM DESCRIPTION

GEOTEM is a time domain towed bird electromagnetic system incorporating a high speed EM receiver. The primary electromagnetic pulses are created by a series of discontinuous sinusoidal current pulses fed into a three turn shielded transmitting loop surrounding the aircraft and fixed to the nose, tail and wing tips. The pulse repetition rate is typically 125 Hz (250 bipolar pulses per second) or 75 Hz (150 pulses/second). Each transmitted current pulse lasts 1020 microseconds, followed by 2980 microseconds off time for 125 Hz (5646 microseconds for 75 Hz). Peak current through the loop is 600 Amps, resulting in a primary magnetic dipole moment of  $4.15 \times 10^5 \text{Am}^2$ .

The EM sensor is a wire coil wound around a ferrite core mounted horizontally in a "bird", towed by the aircraft on a 135 metre long cable. The cable is demagnetised to reduce noise levels. Mean terrain clearance for the aircraft is about 120 metres with the bird being situated 66 m below and 115 metres behind the aircraft. The geometry of the system is displayed in Figure 2A.

For each primary pulse a secondary magnetic field is produced by decaying eddy currents in the ground. These in turn induce a voltage in the receiver coil which is a measure of the electromagnetic field over 20 time gates whose centres and widths are software selectable and which may be placed anywhere within or outside the transmitter pulse.

The signals received from each sample pass through anti-aliasing filters and are then digitised with an A/D converter at sampling rates of up to 100 khz (see Figure 2B). The digital data stream from the A/D converter passes into an array processor where all the numerically intensive processing tasks are carried out. The array processor is under control of a multi-tasking minicomputer.

The on-board processing sequence is as follows:

Transient Analysis. Wide-band frequency analysis enables the separation of noise from signal in real time;

Digital Stacking. The stacking of 31 transients ( 125 Hz) to produce 1 recorded reading, of which 7 are recorded every second;

Windowing of Transient Data. The transient is initially sampled over 256 channels which are then amalgamated to form 12 channels.

At a normal survey altitude of 120 metres terrain clearance, the typical effective penetration depth of the system is estimated to be 200-300 metres, dependent on conductivity contrast between the target and host rock, target size and attitude and overburden conductivity.

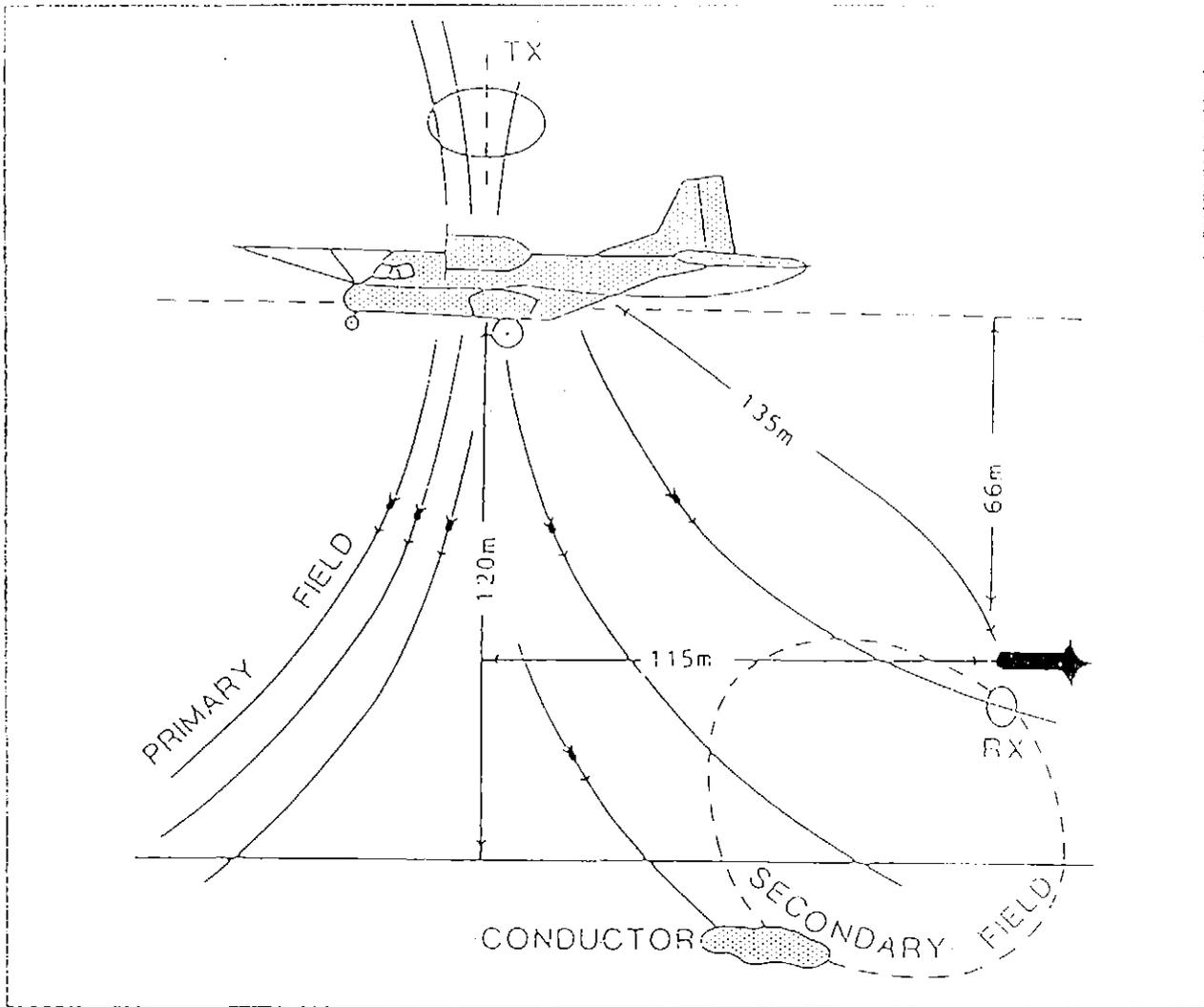


Figure 2A System Geometry

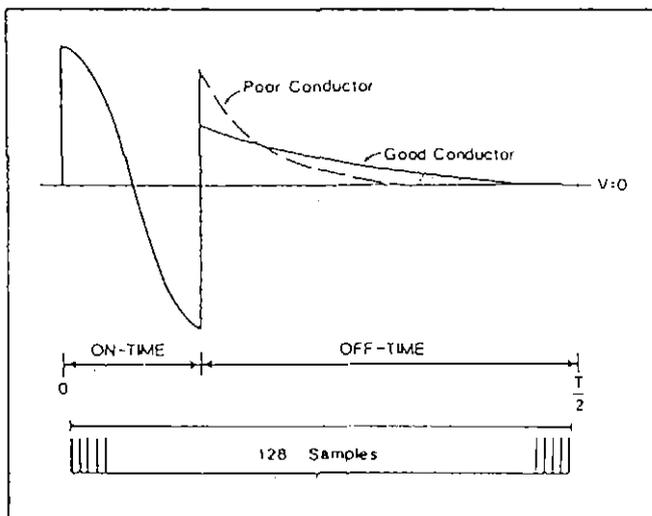
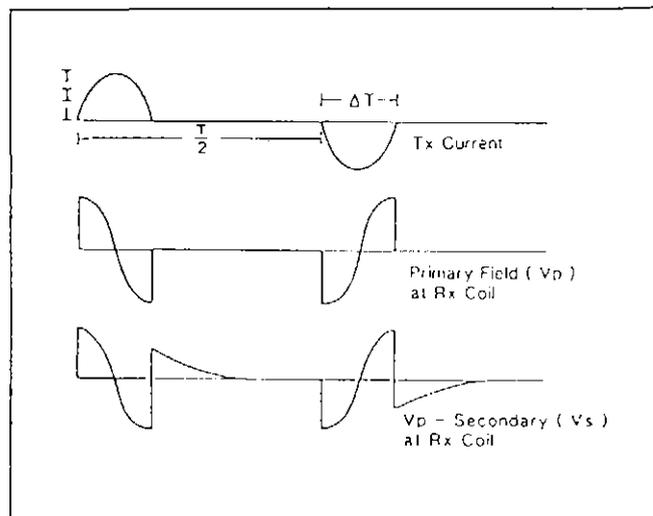


Figure 2B SAMPLING



GEOTEM WAVE FORM

### 3.3 SYSTEM CALIBRATION

All checks and adjustments are performed at high altitude at the start of each flight to allow for automatic compensation and calibration at survey altitude.

Compensation. During the flight, the transmitter creates eddy currents within the structure of the aircraft that have measurable effects at the receiver coil. Compensation for this signal is effected numerically within the receiver by a statistical analysis of the signal at the bird in the absence of ground response (by flying at an altitude in excess of 600 m above ground level). The observed signal is used to define a compensation signal which is subtracted from the observed to produce a null and thus effectively buck out any response due to changing geometry between receiver and transmitter.

Normalisation. All EM response channels are automatically calibrated and reduced to parts per million of the primary field in the receiver. This is achieved by dividing the measured voltage by the voltage induced by the primary field at the bird.

### 3.4 DATA PROCESSING

#### Levelling

GEOTEM is a very low drift and self calibrating system, with little necessity for data levelling.

#### Synchronisation Lag

A 4.3 second lag correction is applied to the digital GEOTEM values to synchronise them with the flight path.

#### Spheric Removal

Individual spheric events are removed by the application of statistical analysis procedures along each channel of data. The software prevents the removal of more than 3 consecutive readings (0.4 seconds of data) to minimize data distortion of true ground response.

#### Filtering

The GEOTEM data is filtered to optimise signal/noise ratio but with due regard to causing the minimal effect to the narrowest possible real anomalies (wavelength of about 4 seconds).

#### 4. MAGNETOMETER SYSTEM

##### 4.1 SPECIFICATIONS

Model: Scintrex caesium vapour optical absorption magnetometer  
Mounting: Tail stinger  
Sample interval: 140 milliseconds, once per second  
Sensitivity: 0.10 nT

\* To operate both the GEOTEM system and the magnetometer system simultaneously, the GEOTEM transmitter is switched off for a period of 140 milliseconds every second to allow for a noise free magnetometer reading.

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## 5. AUXILIARY EQUIPMENT

### 5.1 DATA ACQUISITION SYSTEM

Model: Geoterrex Pty Ltd MADACS

Program: EM25

The MADACS is a computer based software system using an Interdata 6/16 processor. This processor is linked to a Digi-Data Model 1600 magnetic tape drive. This tape drive has a feature which allows checking of the recording process as many times as the particular application permits. The checking procedure includes elimination of errors due to bad tape spots. Multiple buffers permit recording, processing and acquisition of data to be carried out simultaneously with no dead time. The system uses an IBM compatible laptop for operator-system communication.

The key feature of this system is that all data collection, verification, buffering, and recording is software-controlled. Therefore, the acquisition system may be economically altered to fit almost any requirement. Critical parameters are automatically monitored during flight, with visual and aural alarms provided for the operator.

Survey parameters are displayed during flight in their correct physical units, making operator comparisons simple. The survey program operates on a request-response basis, with the system pre-empting the operator and rejecting all illegal responses.

The MADACS is used to control and command the operations of all the ancillary equipment. This includes the GEOTEM receiver, magnetometer, camera, altimeter, tape drive and analogue chart recorder.

The system is based on a precision clock. Time is digitally recorded as a six-figure number called a "fiducial". A fiducial number equals the real time in tenths of seconds after midnight, for example, 000000 corresponds to midnight and 360000 corresponds to 10.00am. The fiducial numbers do not increment by units, they are calculated from the clock time by the computer. This system does not require digital recording of line numbers, part numbers and line direction, thus avoiding a source of digital recording errors. These are recorded on the flight log by the operator.

The MADACS data acquisition system has the following specifications and features :

**Precision clock:** The system is controlled by a precision clock which allows data to be collected at any multiple of 0.1 seconds.

**Computer:** The system is based on an Interdata 6/16 mini-computer. The computer has the following interfaces:

- **Digital Input/Output Bus**  
This bus is capable of recording from, writing to, testing and controlling 16 external digital devices.
- **Analogue Input Module**  
This module has 16 analogue inputs with 12 bit resolution.
- **Analogue Output Module**  
This module has 12 analogue outputs with 12 bit resolution.
- **Magnetic Tape Controller**  
This interface/controller is capable of handling four 9-track NRZ1 tape transports. Tapes are written in an IBM compatible binary format with full parity, cyclic redundancy and longitudinal check characteristics.
- **Magnetometer Interface**  
This interface converts the signal from the high sensitivity caesium vapour magnetometer into a format acceptable to the MADACS.
- **Camera Controller**  
The interface allows the MADACS to control and monitor all aspects of the tracking camera's operation.
- **Operator's Console**  
This is an IBM compatible laptop computer, via which the operator communicates with the system. While on line during survey, all parameters are continuously displayed on the monitor unless the system senses an abnormal condition in which case a diagnostic message and the time sensed are displayed. The message remains until acknowledged by the operator.

#### Recorded Digital Data

Each second:	Flight number
	Time
	Altitude
	Total magnetic field
Each 0.14 seconds:	20 EM gates
	Transmitter primary field
	50 Hertz monitor

## 5.2 TRACKING CAMERA

Model: Sony DXC101P Video Camera

The tracking camera is equipped with a 14 mm wide-angle lens. The video tape is synchronised with the geophysical record by a digital fiducial display that increments every tenth of a second. These fiducials are recorded on the video tape and displayed on the bottom left of the video screen. Times are recorded from the digital information provided by the MADACS system.

## 5.3 ALTIMETER

Model: Sperry Stars AA200 radio altimeter system

Sample interval: 1.0 second

Accuracy: +/- 1.5% of indicated altitude.

Synchronisation: The average of the output of the altimeter over each second is calculated and assigned to the time recorded at the end of each sample.

The Sperry radio altimeter is a high quality instrument whose output is factory calibrated. It is fitted with a test function which checks the calibration of a terrain clearance of 100 feet and altitudes which are multiples of 100 feet.

## 5.4 DIGITAL PRINTER

Model: HMS GR33 Thermal Dot Matrix Printer

Chart speed: 11 cm/minute; time increases from left to right

Chart width: 30.5 cm

Event marks: 20 second marks are recorded on the bottom of the chart with the associated fiducial numbers being printed at the base of the chart.

## AUXILIARY EQUIPMENT

## Channels recorded &amp; Scales

Barometer	-	33 mB/cm
Chan 3 noise monitor	-	500 ppm/cm
Primary field monitor	-	0.25 volts/cm
Chan 12 noise monitor	-	500 ppm/cm
Magnetic field fourth difference	-	10 nT/cm
Total magnetic field		
Fine scale	-	5 nT/cm
Coarse scale	-	50 nT/cm
Terrain clearance	-	15 metres/cm
Geotem ch 1 - 12	-	200 ppm/cm
50 Hz monitor	-	0.1 volts/cm

A sample analogue record is shown in Figure 3.

**Zero Positions:** These zero positions are annotated on the analogue sample.

**Synchronisation:** A lag of 5.0 seconds occurs between the Geotem channels and the magnetometer, altimeter traces.

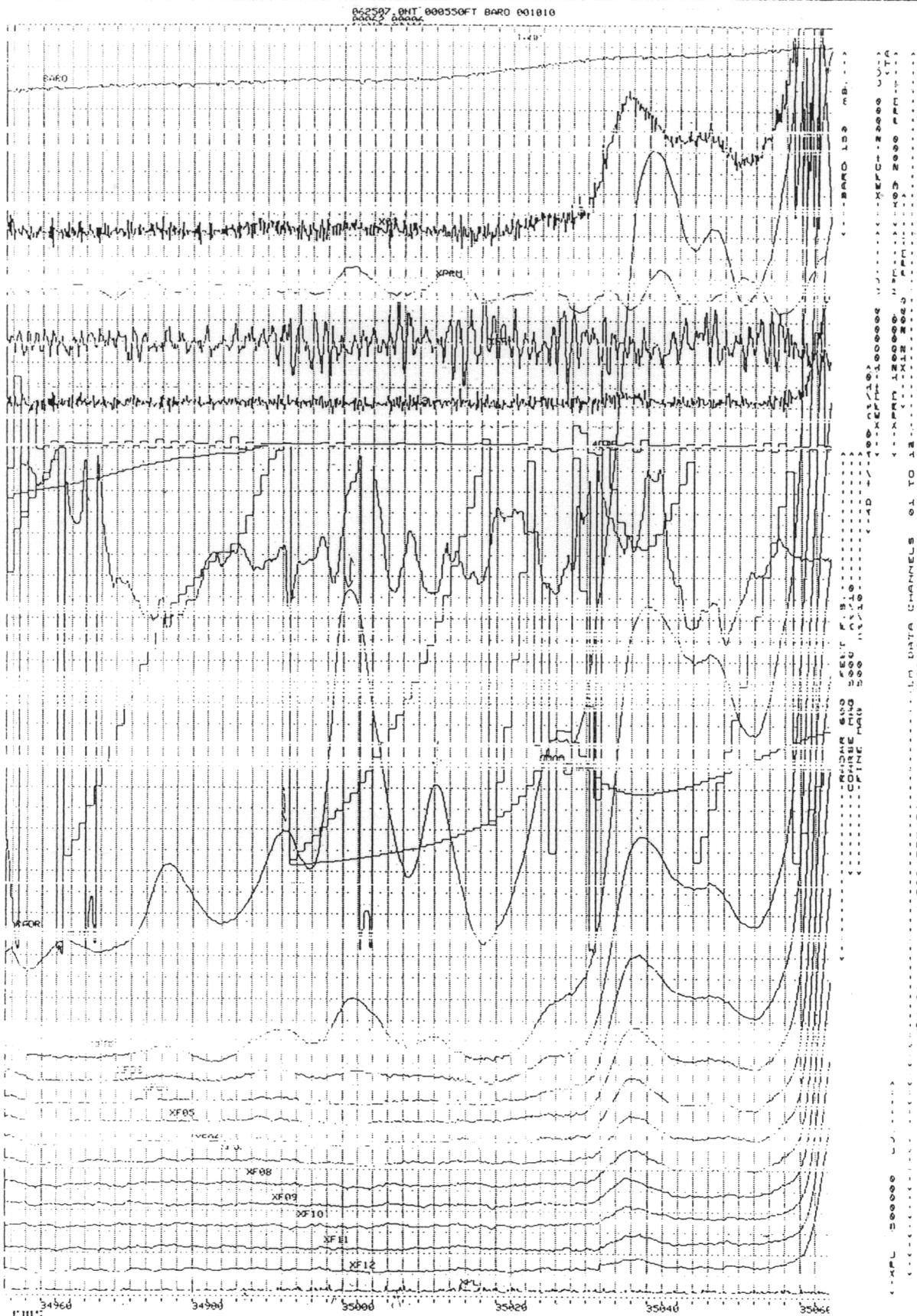


FIGURE 3 Sample Analogue Record

## 6. SURVEY PRODUCTS

### 6.1 DELIVERABLE ITEMS

1 x Final Flight Path Map at 1:25,000 scale (ink on plastic)  
 Interpretation map at 1:25,000 scale (ink on plastic)  
 Multi-parameter Profile plots at 1:25,000 scale  
 Located data tape  
 Located data tape summary  
 Recovered line listing  
 Mileage list  
 Flight logs  
 All recovery photography  
 Flight path video tape  
 Flight strips  
 Logistics/Interpretation report

### 6.2 MULTI-PARAMETER PLOTS

The final GEOTEM data is presented as multi-parameter profiles plotted at suitable scales on a fiducially annotated X-axis as listed below, from top to bottom. The horizontal scale is 1:25,000. The GEOTEM channels are plotted over four separate scales to optimise the high dynamic range of the EM signal.

#### Basic Data Plots

	<u>Channel</u>	<u>Trace Colour</u>	<u>Scale</u>
AXIS 1	Coarse Magnetics	Red	200 nT/cm
	Fine Magnetics	Green	50 nT/cm
	Aircraft Altitude	Black	20 m/cm
AXIS 2	GEOTEM Channel 1	Black	200 ppm/cm
	GEOTEM Channel 2-6	Blue	200 ppm/cm
	GEOTEM Channel 7-9	Green	200 ppm/cm
	GEOTEM Channel 10-12	Red	200 ppm/cm
	50 Hz Monitor	Black	0.1 volts/cm

### 6.3 DATA TAPES AND FORMAT

A located data tape for the survey area was produced in a format described overleaf.

APPENDIX 2

Geotem Interpretation Report

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH10

Priority - 2-3

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel	Amp	Ch 2	Depth	CTP	Comment
120/1W	58138	12	1000		Shallow 15		High amplitude and moderate width
121/2E	36513	5	650		Shallow 6.5		Very broad anomaly, lower priority than Line 120

## INTERPRETATION :

Strike	156° / 336°
Length	300 metres
Depth	Shallow
Dip	Near vertical for response on line 120/1
Plunge	Possibly southeast
Width	50 - 100 metres
Magnetics assoc	No obvious association
Photo Assoc	Near edge of cleared zone.

COMMENT : The response is part of a linear conductive trend. The anomaly on Line 120/1 shows a narrower character and slower decay rate than the adjacent lines, this could indicate a separate source, possibly bedrock.

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH11

Priority - 3

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel	Amp	Ch 2	Depth	CTP	Comment
120/1W	58096	10	200		Medium	5	

## INTERPRETATION :

Strike	Part of a 140° / 320° trend
Length	200 metres
Depth	Medium
Dip	Appears vertical
Plunge	Single line response
Width	30-50 metres
Magnetics assoc	Magnetic maximum is coincident with northern part of trend - however it does not extend to this response
Photo Assoc	No obvious association

COMMENT : This conductive zone is part of a structural trend, however the slower anomaly decay on Line 120/1 suggests a possible bedrock source.

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH12

Priority - 2

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel	Amp	Ch 2	Depth	CTP	Comment
118/5W	35032	12	1600		Medium	21	Late channel response on the edge of a broad high - a broad anomaly

## INTERPRETATION :

Strike	N-S trend inferred by coincidence with structural trend
Length	200 metres
Depth	Medium
Dip	Possibly horizontal
Plunge	Single line response
Width	100-120 metres
Magnetics assoc	Lies along magnetic trend at edge of a part of inflection
Photo Assoc	No obvious association

COMMENT : This selected EM response shows a slower decay rate than others in the vicinity. The strong late channel response and broadness of the anomaly infers a horizontal or tabular source.

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH13

Priority - 3

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel	Amp	Ch 2	Depth	CTP	Comment
117/1E	57168	8	275		Shallow	4.5	

## INTERPRETATION :

Strike	Probably NW-SE - inferred by trend
Length	250 metres
Depth	Shallow
Dip	Possibly dipping to west
Plunge	Single line response
Width	50-100 metres
Magnetics assoc	No obvious association
Photo Assoc	No obvious association

COMMENT : The selected conductor appears as part of a trend of anomalies that extends to adjacent lines. The response on Line 117 shows evidence of slower decay than the other anomalies in the trend, and has a higher amplitude, although it is broad and is subsequently downgraded.

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH14

Priority - 3

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel	Amp	Ch 2	Depth	CTP	Comment
115/2E	56726	9	400		Medium	6	Broad anomaly
116/1W	56420	4	350		Medium	20	

## INTERPRETATION :

Strike	N-S
Length	250 metres
Depth	Medium
Dip	Possible vertical conductor
Plunge	None apparent
Width	80 - 100 metres
Magnetics assoc	No obvious association
Photo Assoc	No obvious association

COMMENT : Part of a long structural trend which broadens northwards. This particular anomaly shows evidence of a slower decay rate than adjacent lines.

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH15

Priority - 3

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel	Amp	Ch 2	Depth	CTP	Comment
113/2E	55716	11	1000		Shallow	11	Broad anomaly
114/1W	55966	12	2500		Shallow	11	Slightly narrower

## INTERPRETATION :

Strike	N - S
Length	200 metres
Depth	Shallow
Dip	Possibly flat lying
Plunge	
Width	130-150 metres
Magnetics assoc	Coincident with magnetic high trend (slightly displaced at line 114)
Photo Assoc	No obvious association

COMMENT : The anomaly is characterised by a high amplitude and late channel response, however its width is suggestive of a flat lying feature. The conductor was selected primarily due to its coincidence with the magnetic response.

## CONDUCTOR DESCRIPTION

CONDUCTOR - MH16

Priority - 3

LOCATION : Map 1 of 1 - Macquarie Harbour

Line	Fiducial	Channel Amp	Ch 2	Depth	CTP	Comment
102/1W	42743	12	850	Shallow	11	Broad anomaly

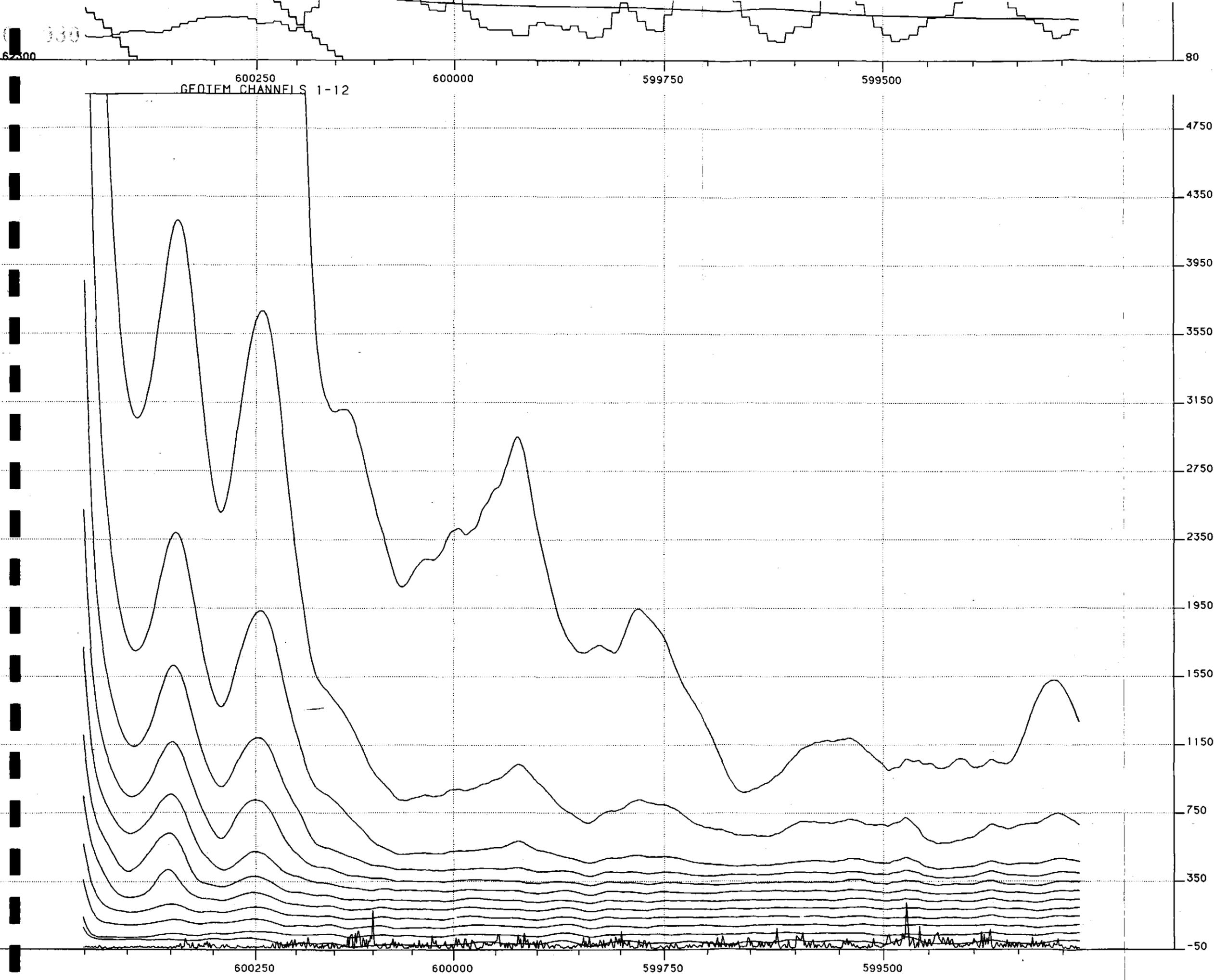
## INTERPRETATION :

Strike	Single line response
Length	< 200 metres
Depth	Shallow / Medium
Dip	Possibly flat lying
Plunge	Single line response
Width	175 metres
Magnetics assoc	No obvious association
Photo Assoc	No obvious association

COMMENT : This shows a late channel response of high amplitude. It is broad in width and so it was only considered as a Priority 3.

APPENDIX 3

Geotem Data Profiles



330

600250  
GEOTEM CHANNELS 1-12

600000

599750

599500

80

4750

4350

3950

3550

3150

2750

2350

1950

1550

1150

750

350

-50

ppm

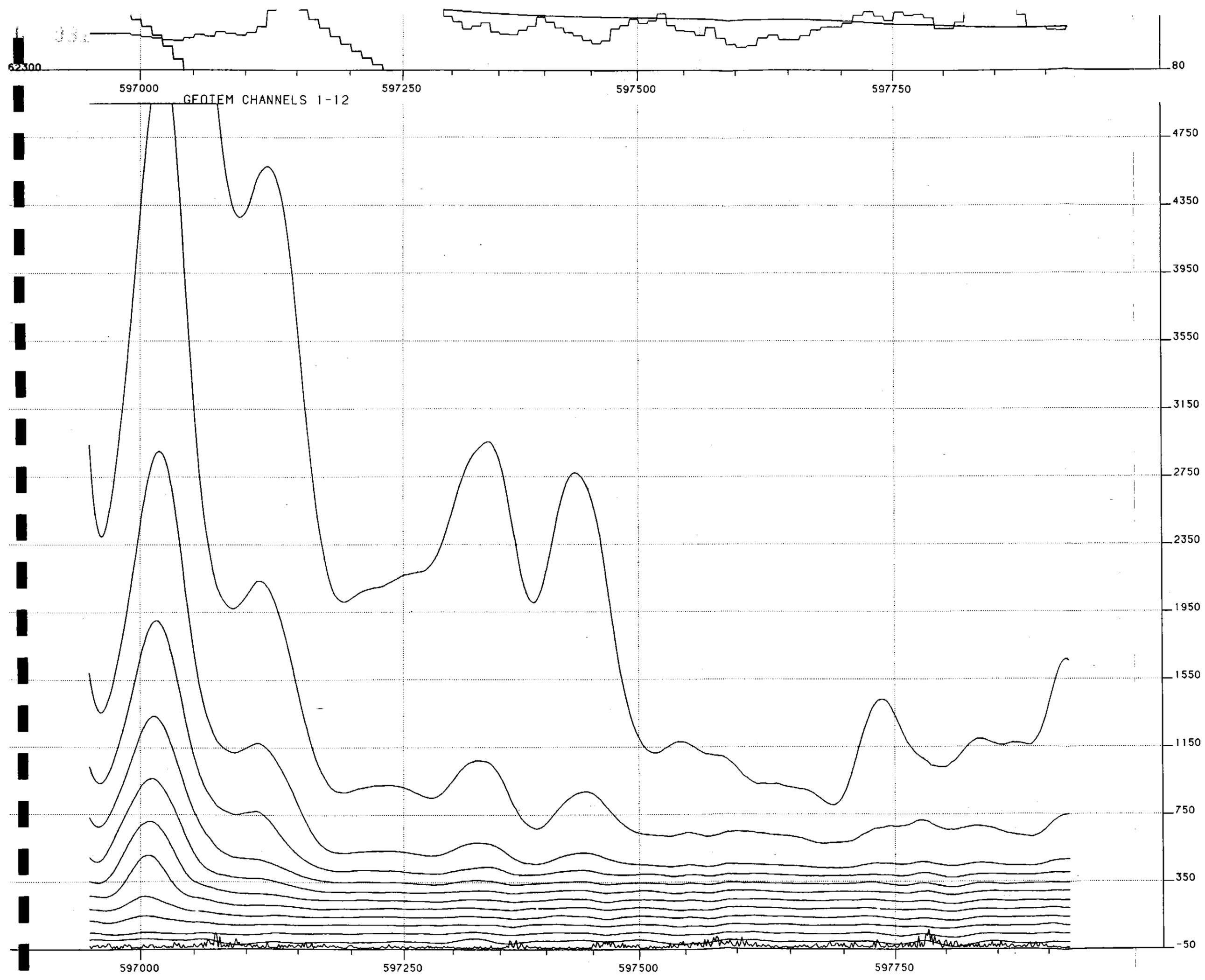
LINE 126/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

436031

BHP-UTAH MINERALS INTERNATIONAL

5 cm

00 5 1 05 0



LINE 125/1

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

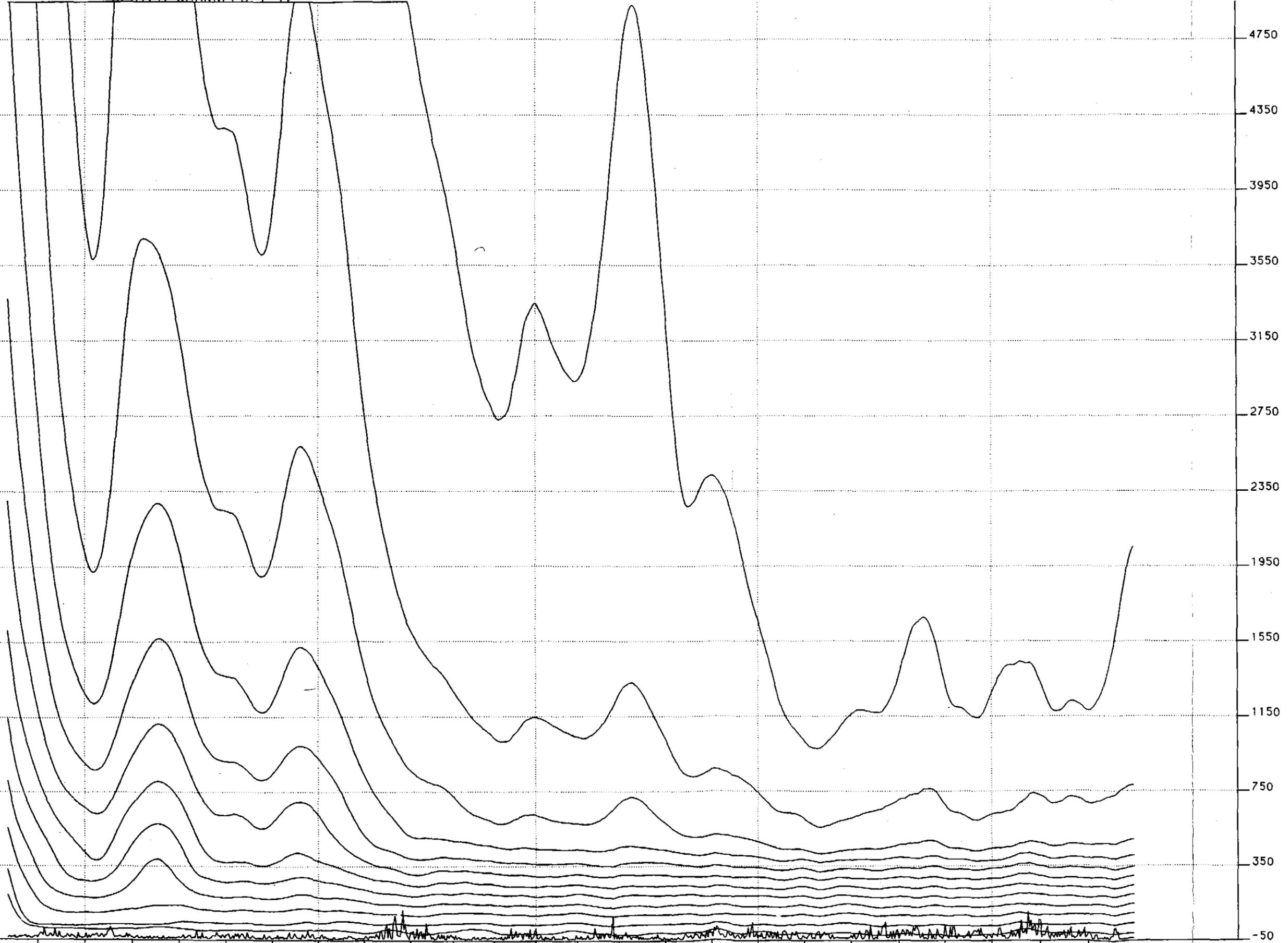
436032

BHP-UTAH MINERALS INTERNATIONAL



595500 595250 595000 594750 594500

GEOTEM CHANNELS 1-12



595500 595250 595000 594750 594500

GEOTEM BY LTD

SCALE 1:25,000

2-626 MACQUARIE HARBOUR 125Hz GEOTEI

436033

BHP-UTAH MINERALS INTERNATIONAL

LINE 124/1



9873

592250  
GEOTEM CHANNELS 1-12

592500

592750

593000

80

4750

4350

3950

3550

3150

2750

2350

1950

1550

1150

750

350

-50

ppm

LINE 123/2

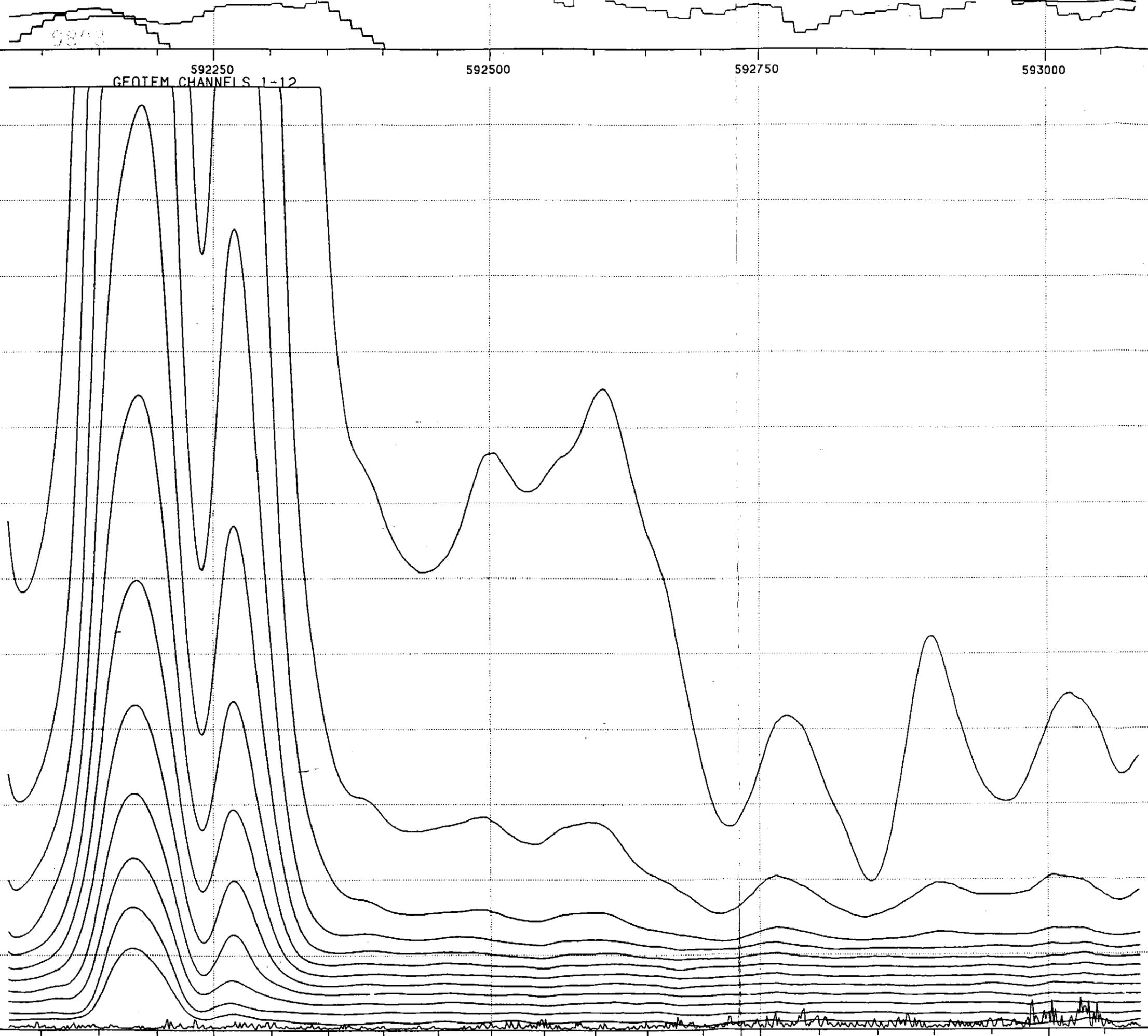
2-626 MACQUARIE HARBOUR 125Hz GEOTEM

5 cm



436034

BHP-UTAH MINERALS INTERNATIONAL



804

587000 586750 586500 586250 586000

GEOTEM CHANNELS 1-12

80 4750 4350 3950 3550 3150 2750 2350 1950 1550 1150 750 350 -50

ppm

LINE 122/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

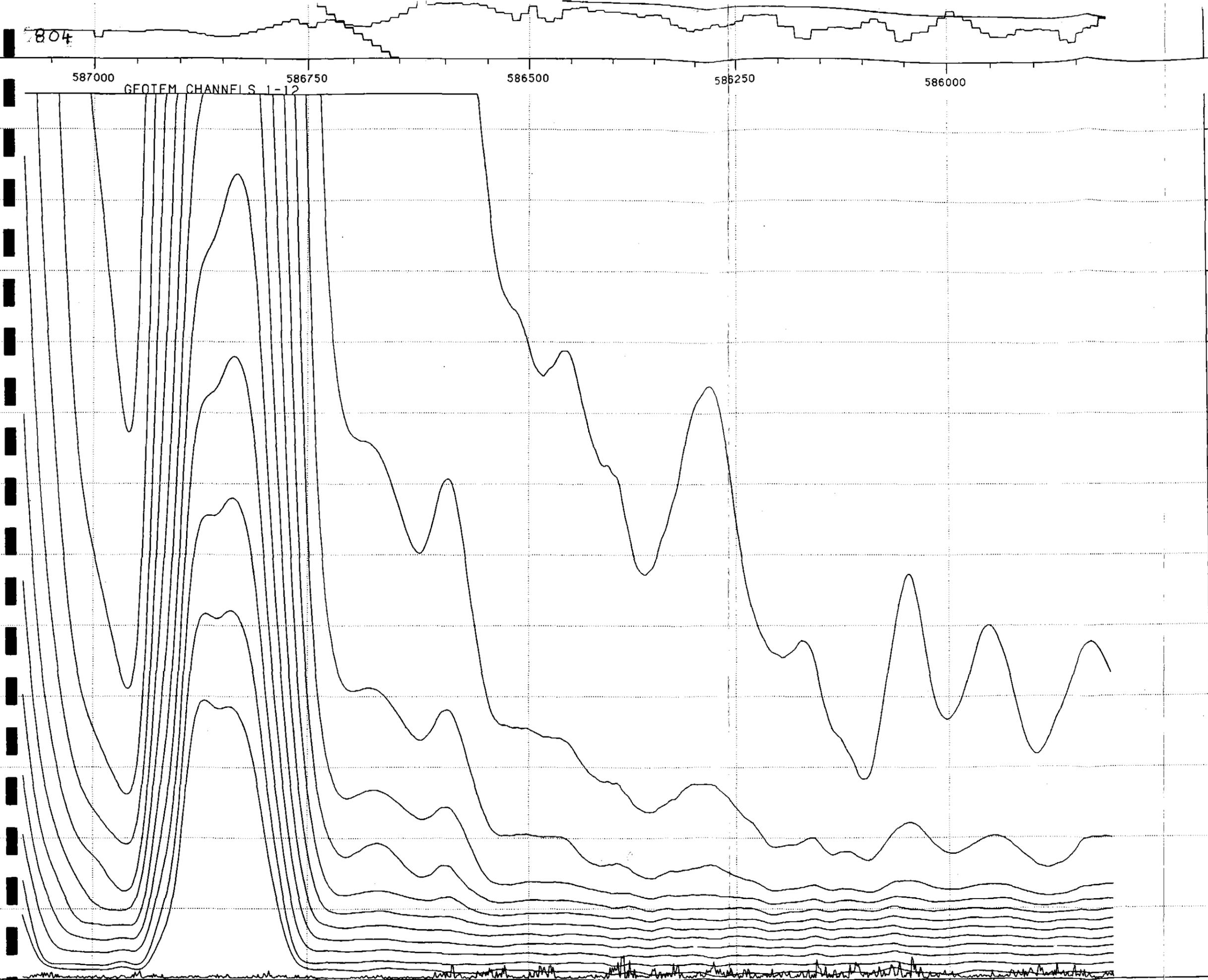
436035

BHP-UTAH MINERALS INTERNATIONAL

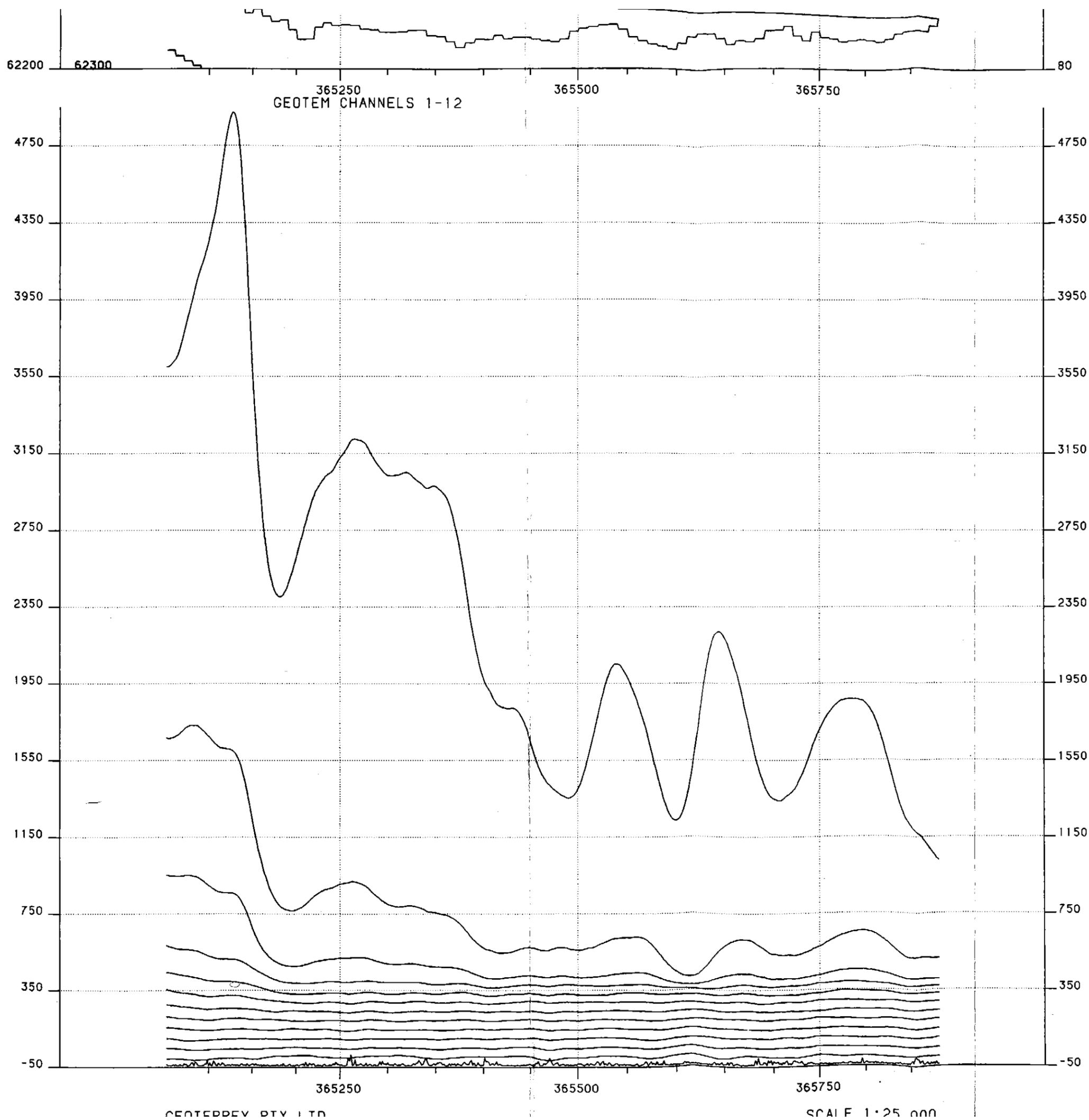
5 cm

SCALE 1 OF 200

587000 586750 586500 586250 586000



9806



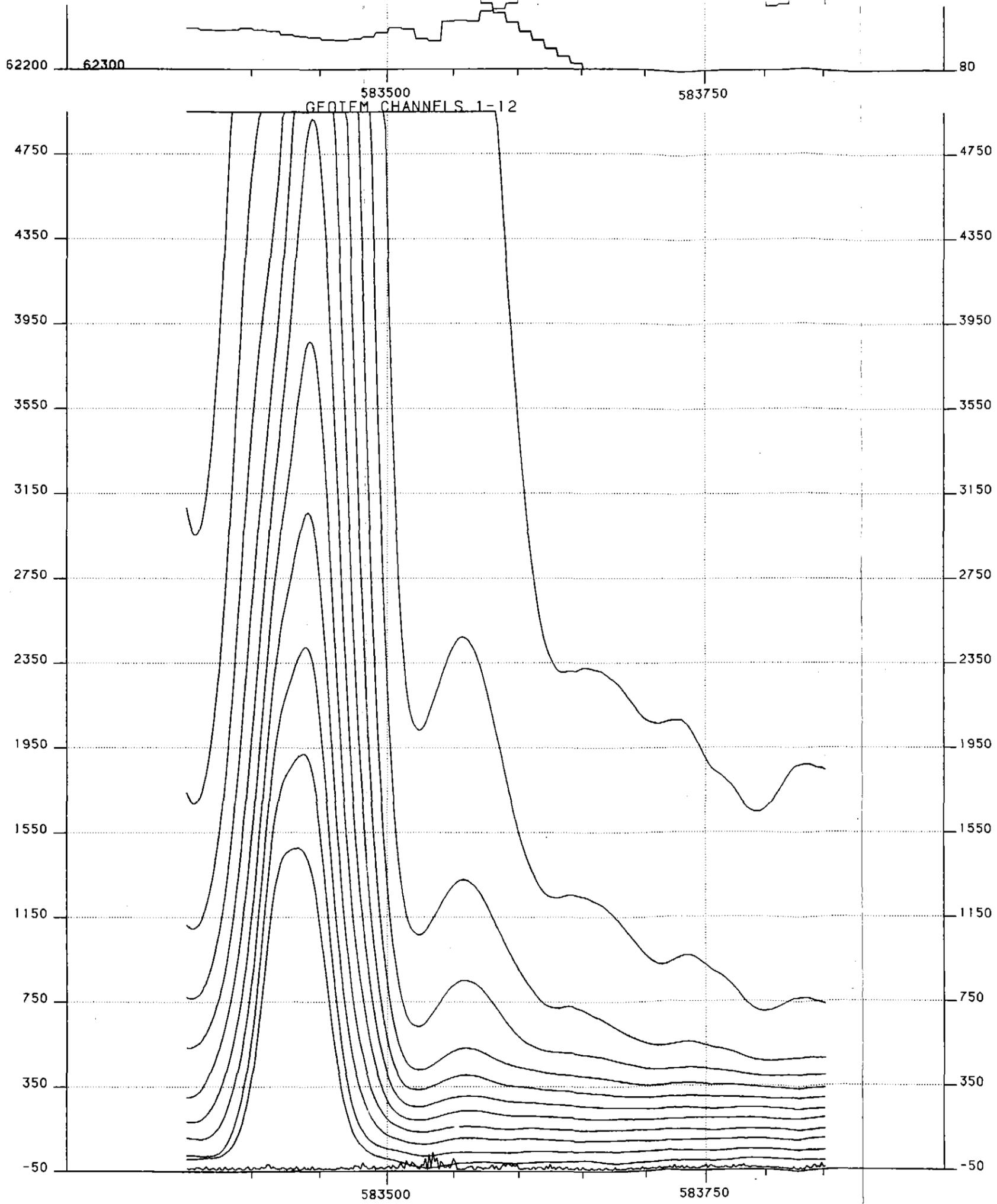
LINE 121/2

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

436036

BHP-UTAH MINERALS INTERNATIONAL

5800



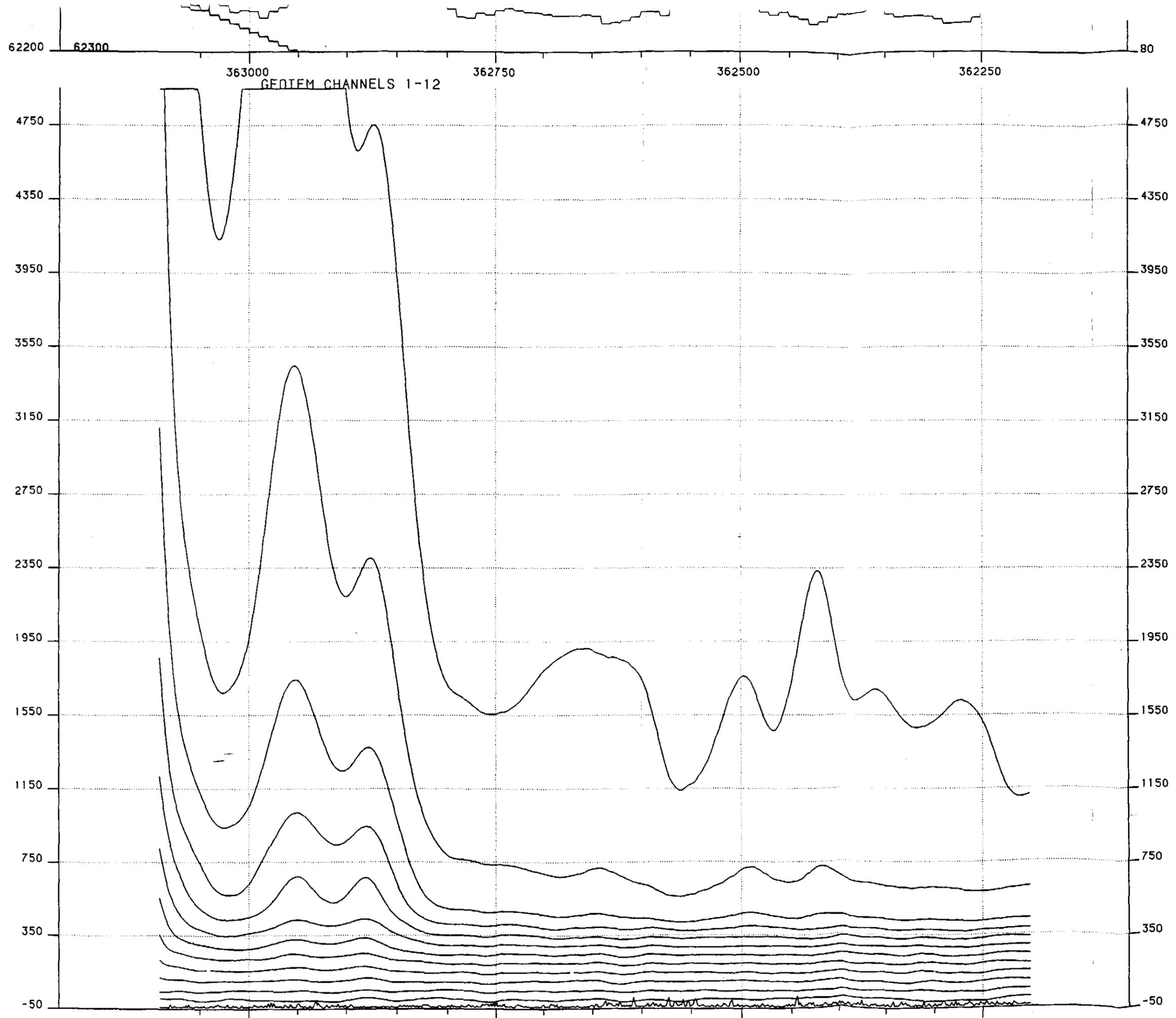
LINE 121/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

436037

BHP-UTAH MINERALS INTERNATIONAL

5 cm

3807



2-626 MACQUARIE HARBOUR 125Hz GEOTE

436038

BHP-UTAH MINERALS INTERNATIONAL

LINE 120/3

SCALE 1:25 000

5870

62200

62300

80

581500  
GEOTEM CHANNELS 1-12

581250

581000

580750

ppm

4750

4750

4350

4350

3950

3950

3550

3550

3150

3150

2750

2750

2350

2350

1950

1950

1550

1550

1150

1150

750

750

350

350

-50

-50

581500

581250

581000

580750

LINE 120/1

2-626 MACQUARIE HARBOUR 125Hz GEOTEI

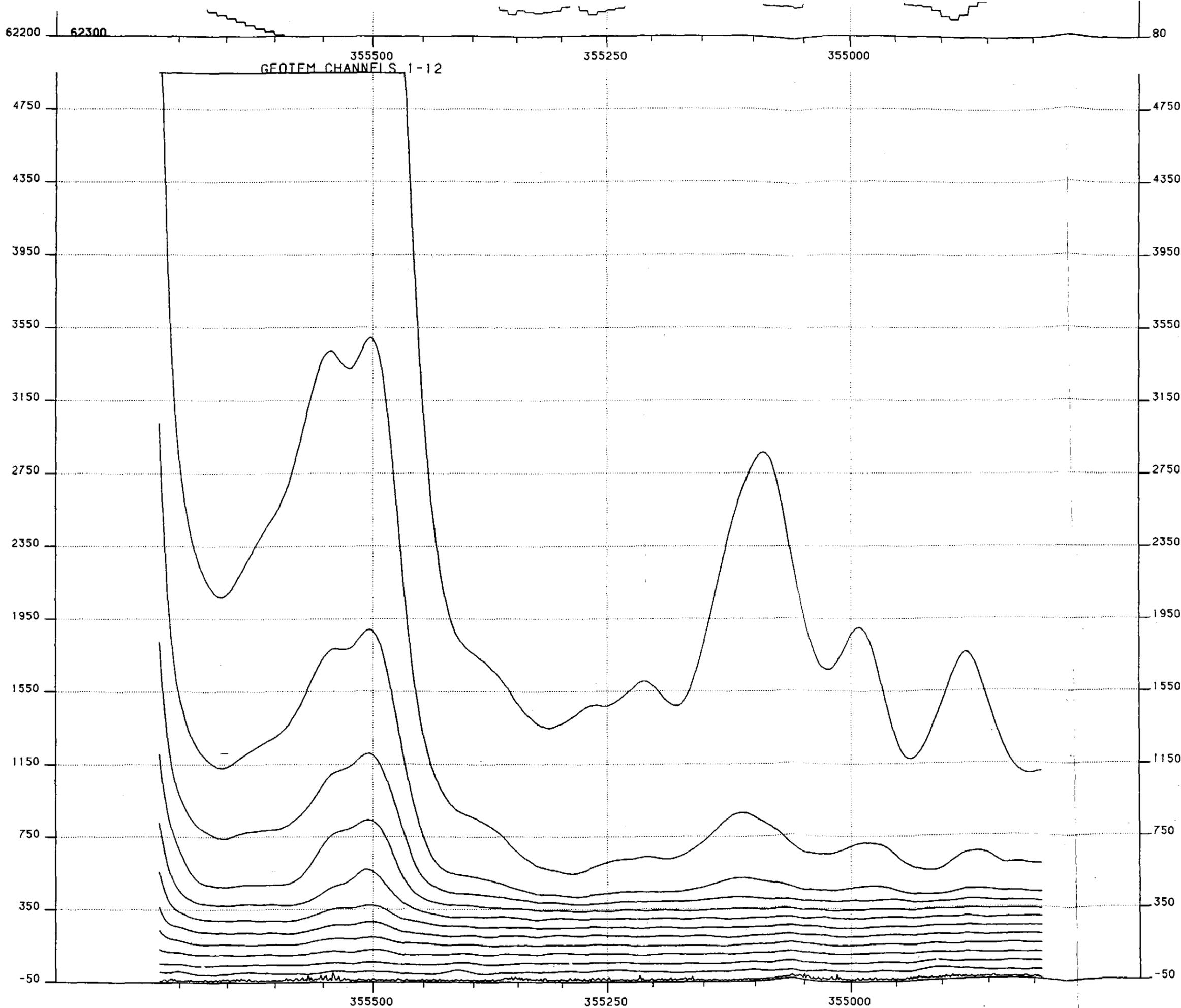
436039

BHP-UTAH MINERALS INTERNATIONAL

5 cm



9843



GEOTERREX PTY LTD

SCALE 1:25,000

LINE 119/3

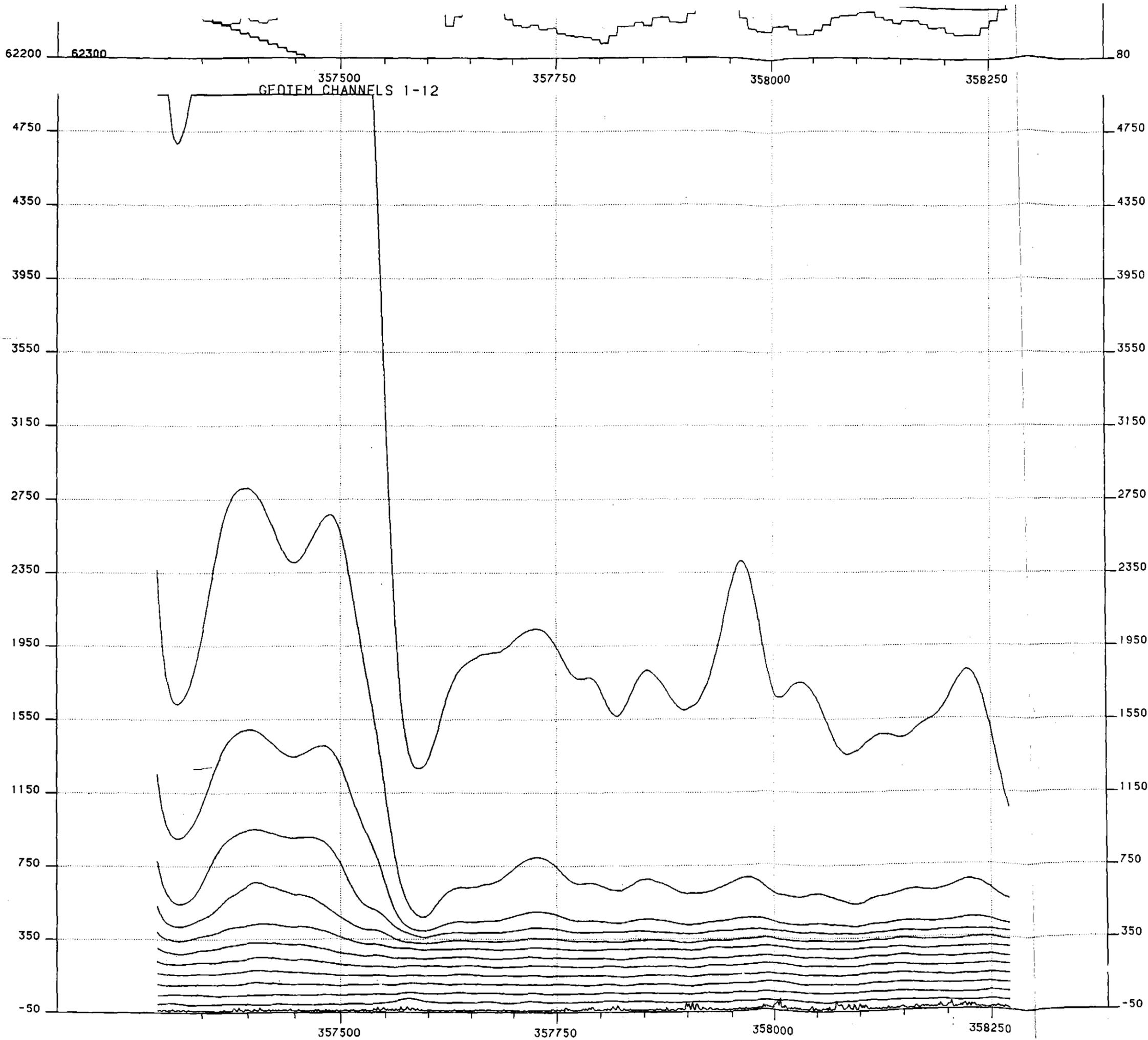
2-626 MACQUARIE HARBOUR 125HZ GEOTE

BHP-UTAH MINERALS INTERNATIONAL

436040

5 cm

9810



GEOTFRFX PTY LTD

LINE 119/2

5 cm

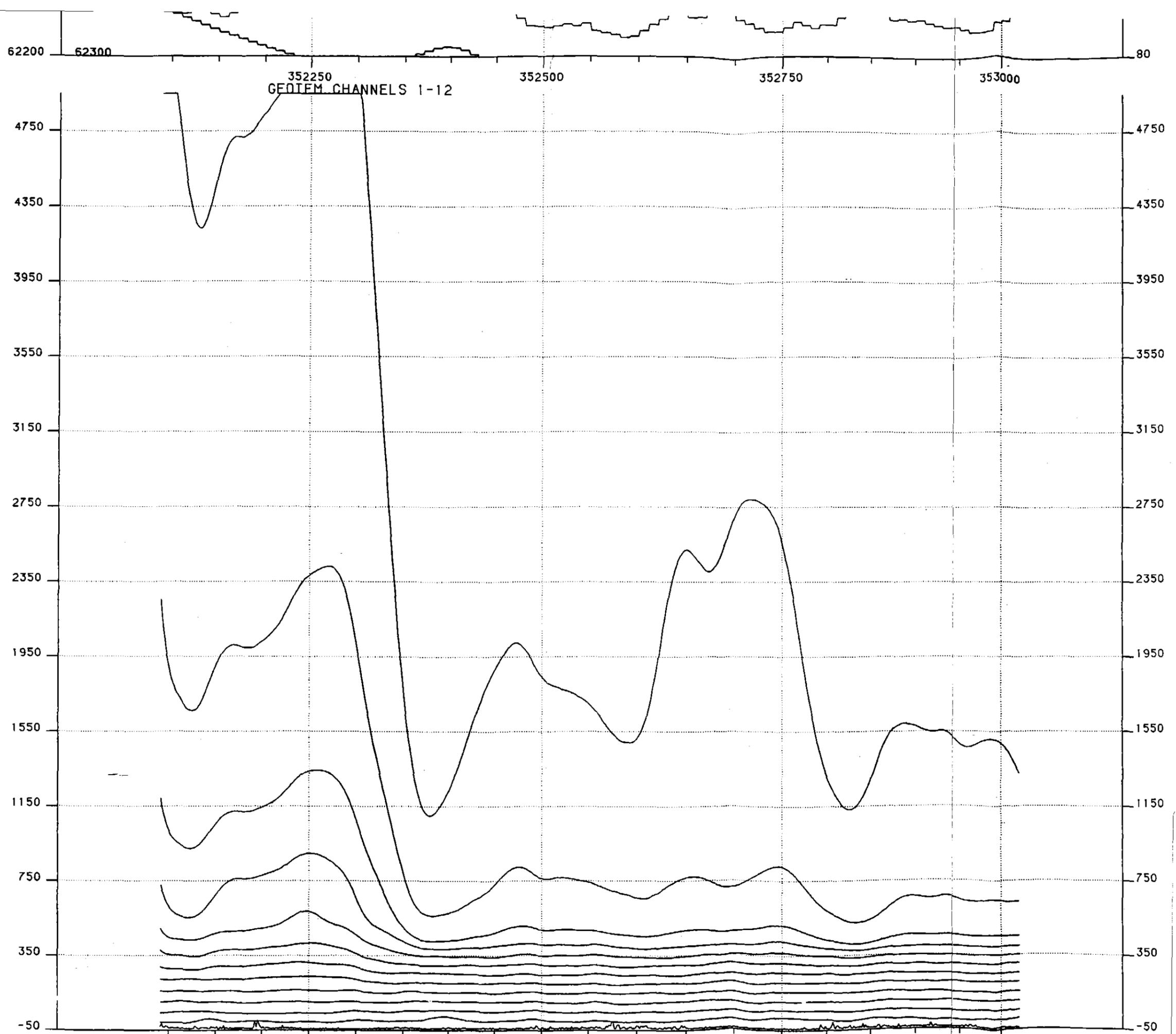
2-626 MACQUARIE HARBOUR 125Hz GEOTEM

436041

BHP-UTAH MINERALS INTERNATIONAL

1181

436042

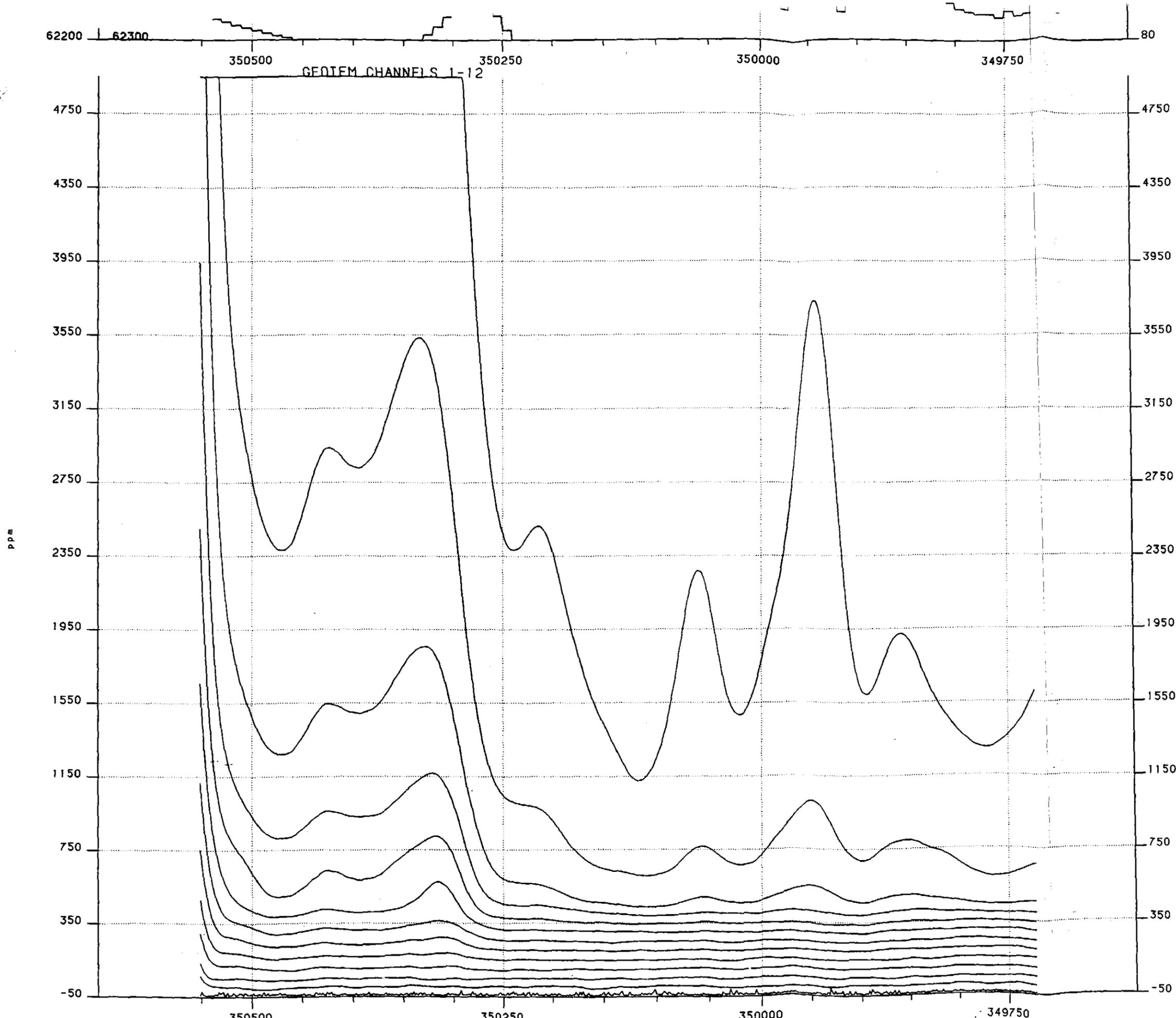


GEOTEM PTY LTD

SCALE 1:25,000

LINE 118/6 2-626 MACQUARIE HARBOUR 125Hz GEOTE

0817



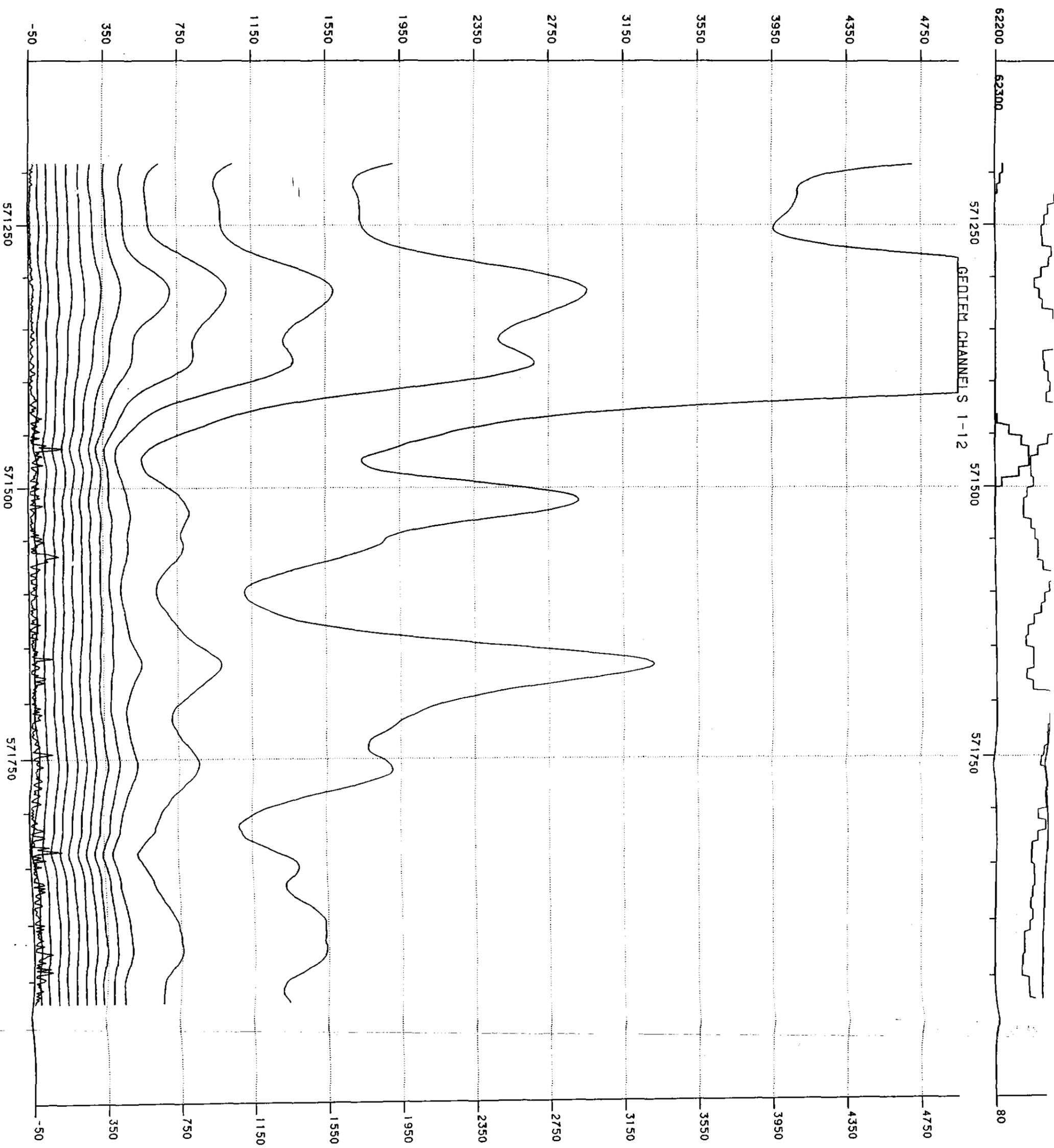
GEOTERREX PTY LTD

SCALE 1:25,000

LINE 118/5 2-626 MACQUARIE HARBOUR 125Hz GEOTE

436043 BHP-UTAH MINERALS INTERNATIONAL

0810



ppm

ppm

LINE 117/1

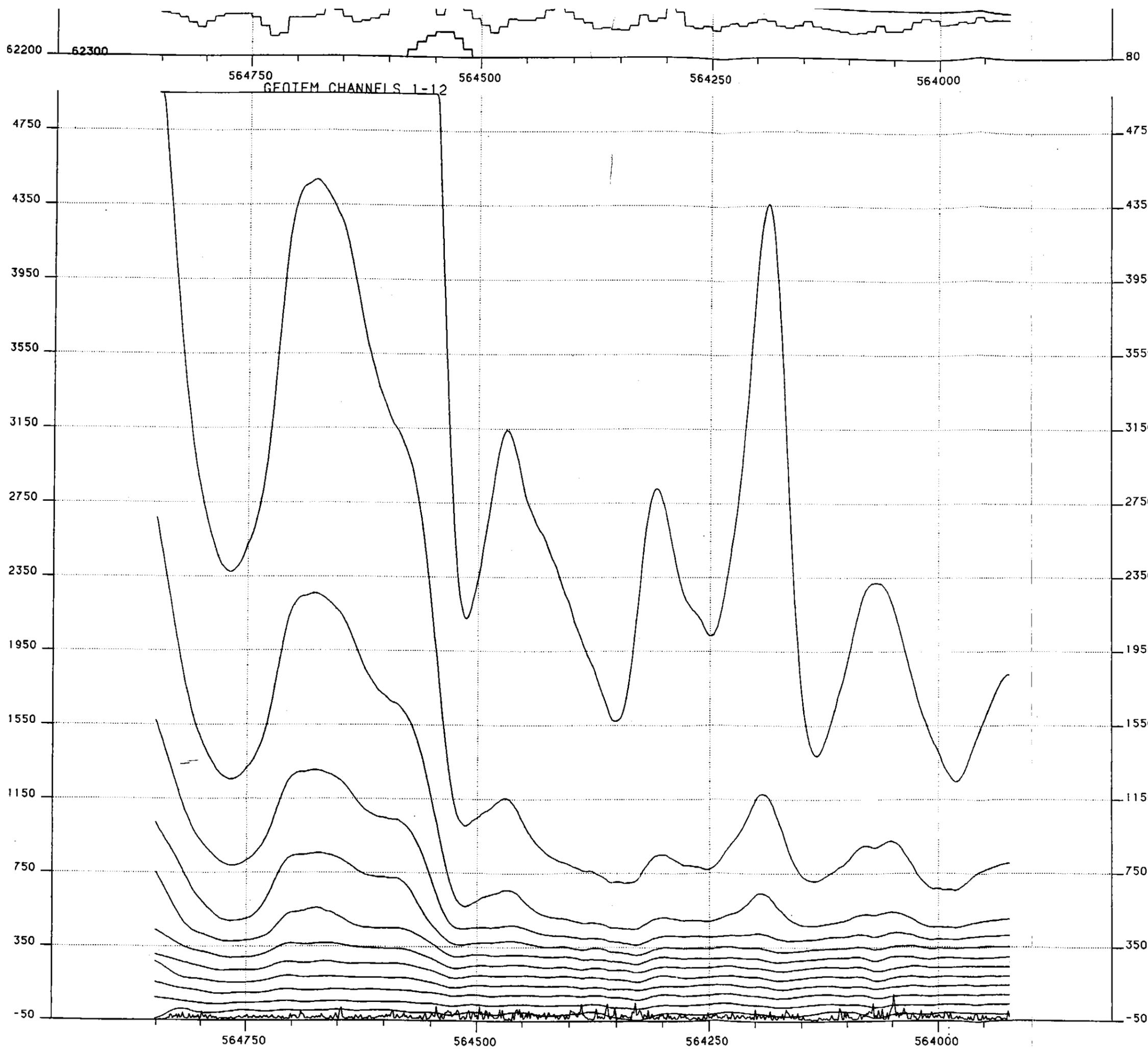
2-626 MACQUARIE HARBOUR 125Hz GEOTEI

BHP-UTAH MINERALS INTERNATIONAL

436044

5 cm

0814



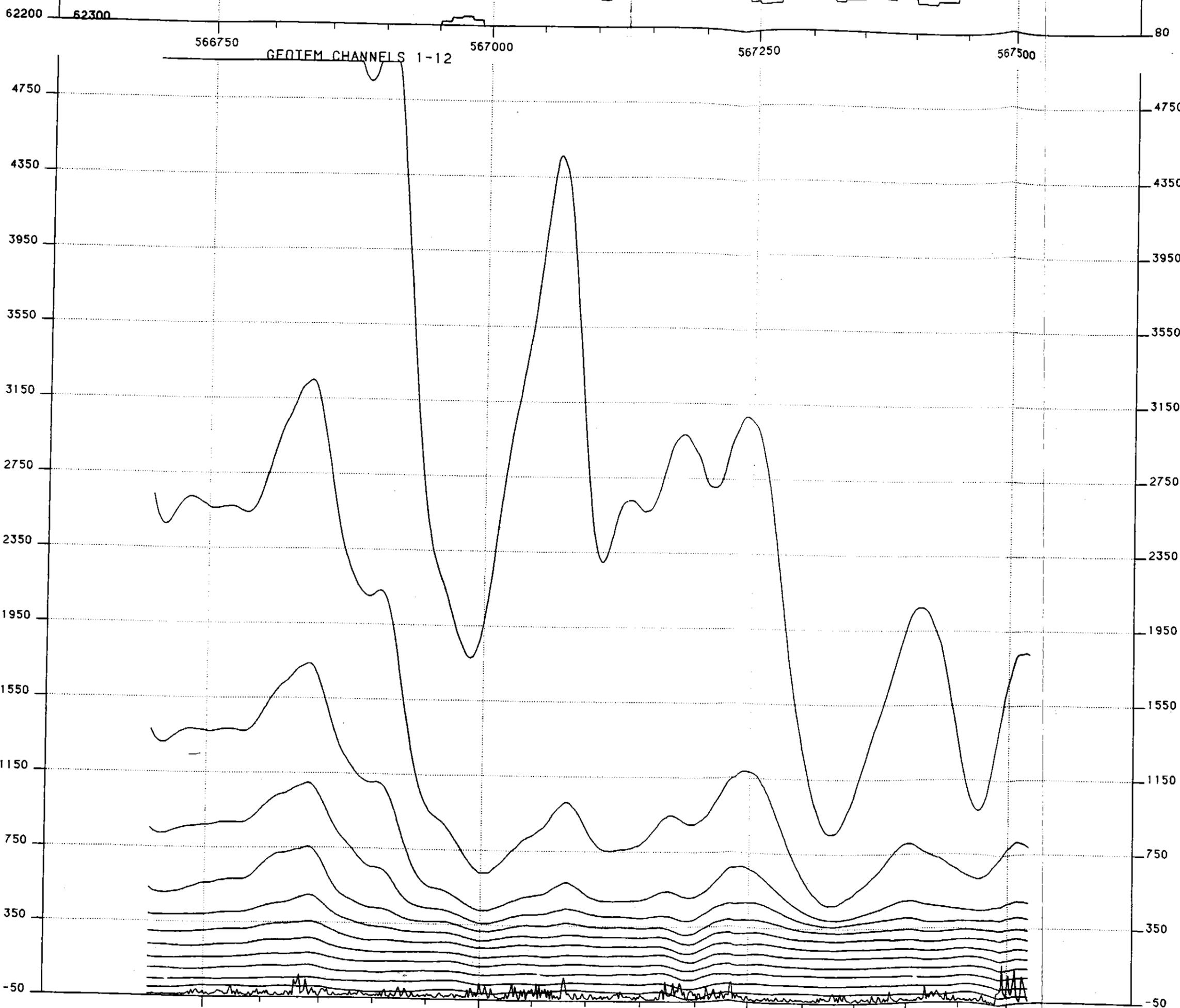
↑ LINE 116/1

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

436045

BHP-UTAH MINERALS INTERNATIONAL

0818



GEOTERREX PTY LTD

SCALE 1:25,000

LINE 115/2

2-626 MACQUARIE HARBOUR 125Hz GEOTE

BHP-UTAH MINERALS INTERNATIONAL

436046

9816

62200

62300

80

559750  
GEOTEM CHANNELS 1-12

559500

559250

ppm

4750

4350

3950

3550

3150

2750

2350

1950

1550

1150

750

350

-50

ppm

4750

4350

3950

3550

3150

2750

2350

1950

1550

1150

750

350

-50

559750

559500

559250

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

LINE 114/1

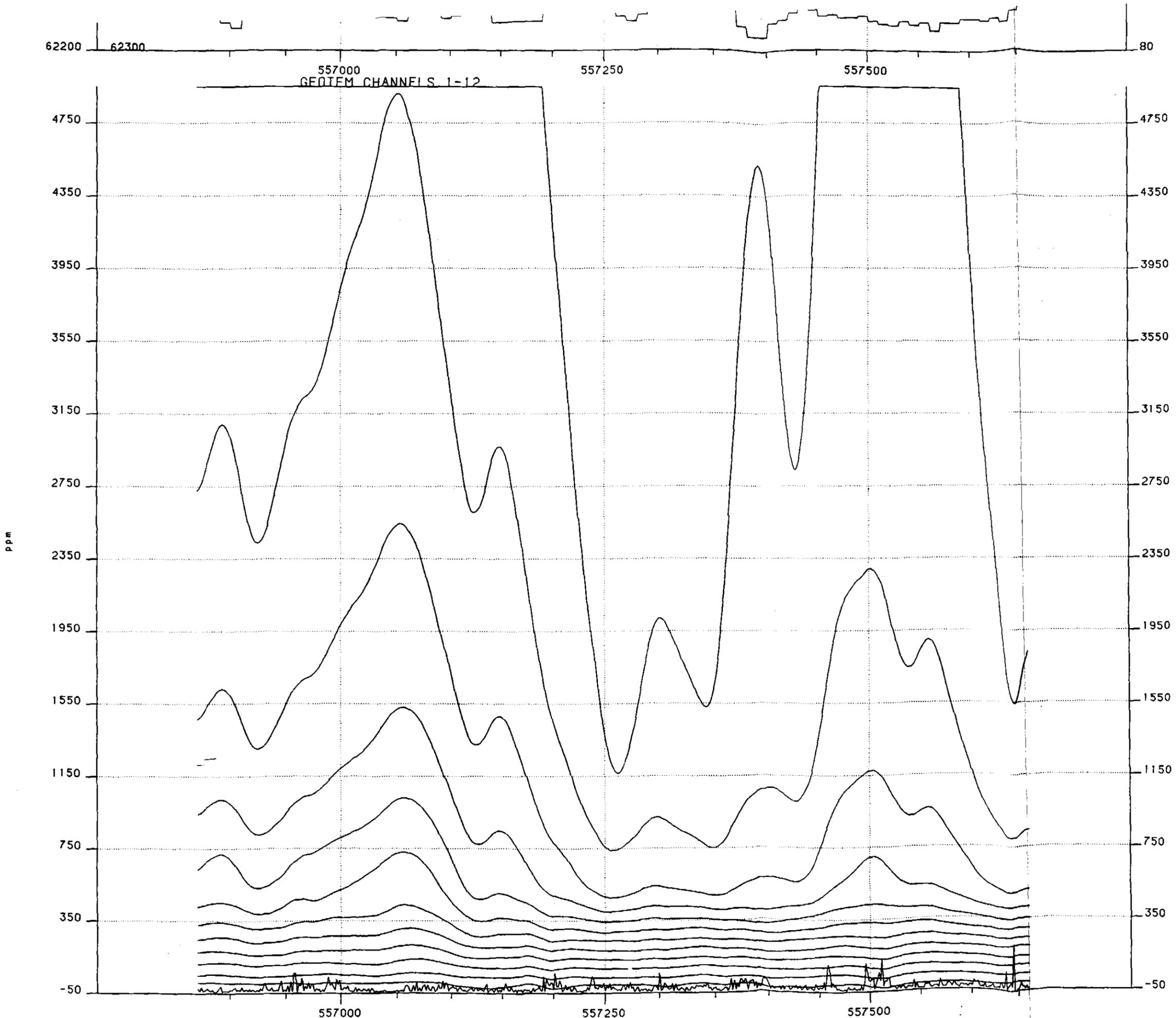
5 cm



436047

BHP-UTAH MINERALS INTERNATIONAL

981



GEOTERREX PTY LTD

SCALE 1:25 000

LINE 113/2

2-626 MACQUARIE HARBOUR 125Hz GEOTEI

5 cm

433048

BHP-UTAH MINERALS INTERNATIONAL

9810

436049

62200

62300

80

469000

468750

468500

468250

GEOTECH CHANNELS 1-12

ppm

4750

4350

3950

3550

3150

2750

2350

1950

1550

1150

750

350

-50

ppm

4750

4350

3950

3550

3150

2750

2350

1950

1550

1150

750

350

-50

469000

468750

468500

468250

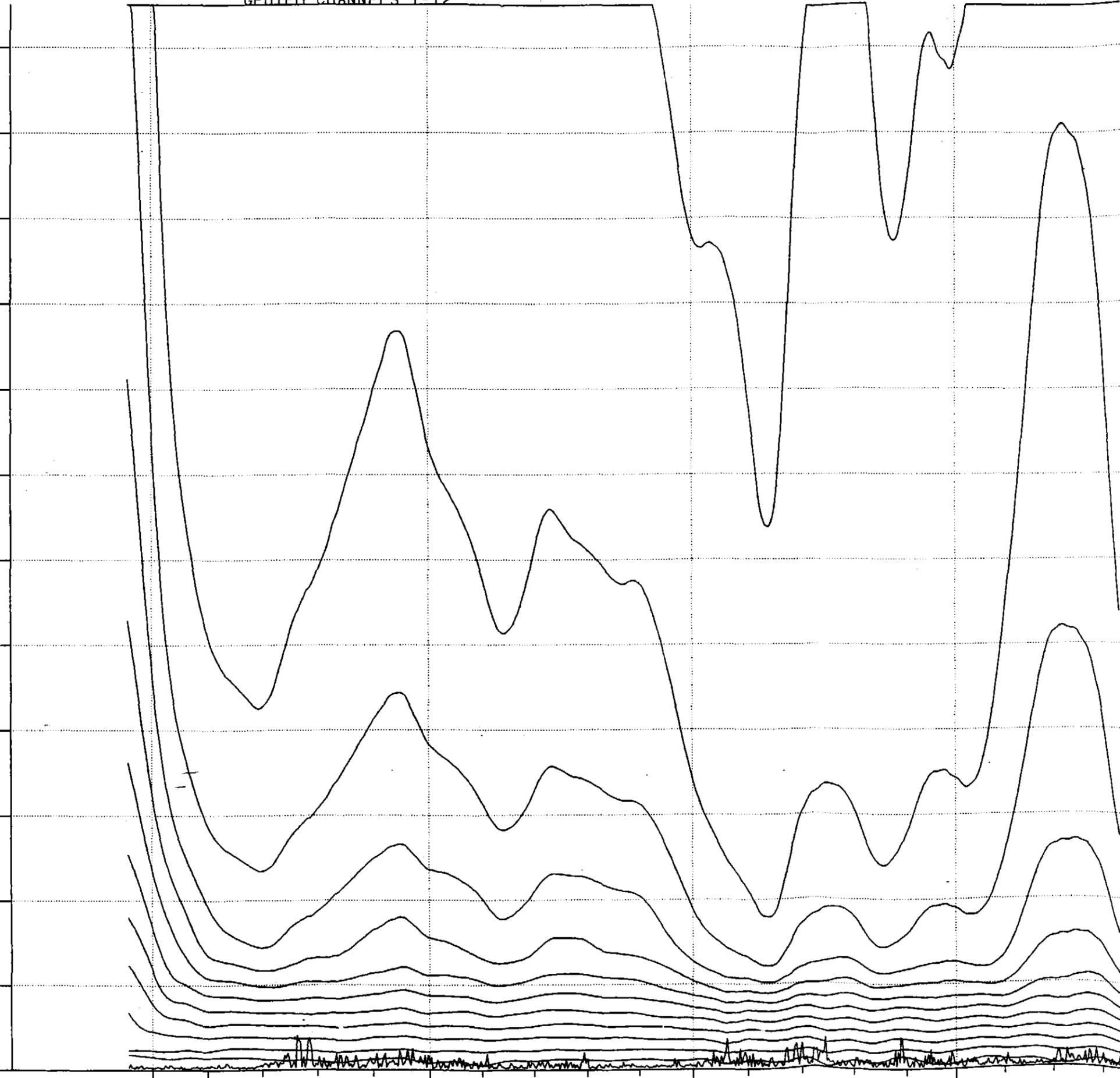
SCALE 1:25,000

LINE 112/1

2-626 MACQUARIE HARBOUR 125Hz GEOTE

BHP-UTAH MINERALS INTERNATIONAL

5 cm



9810

52200 62300

466250  
GEOTEM CHANNELS 1-12

466500

466750

ppm

4750  
4350  
3950  
3550  
3150  
2750  
2350  
1950  
1550  
1150  
750  
350  
-50

80

ppm

4750  
4350  
3950  
3550  
3150  
2750  
2350  
1950  
1550  
1150  
750  
350  
-50

466250

466500

466750

GEOTERREX PTY LTD

LINE 1111/2 2-626 MACQUARIE HARBOUR 125Hz GEOTEI

5 cm

436050

BHP-UTAH MINERALS INTERNATIONAL

9820  
62200

62300

80

462000  
GEOTEM CHANNELS 1-12

461750

461500

461250

4750

4750

4350

4350

3950

3950

3550

3550

3150

3150

2750

2750

2350

2350

1950

1950

1550

1550

1150

1150

750

750

350

350

-50

-50

462000

461750

461500

461250

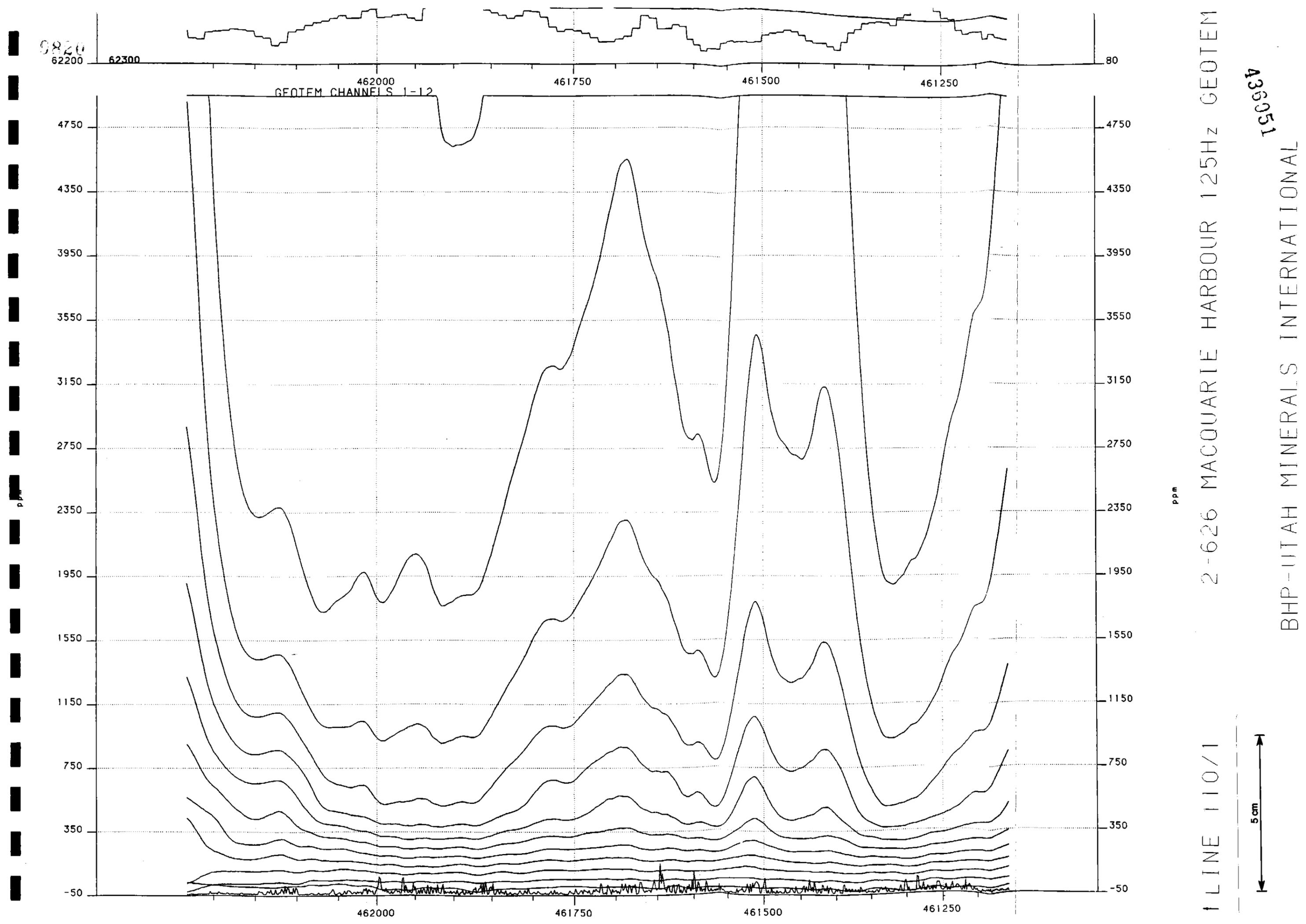
ppm

LINE 110/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

15098A

BHP-UTAH MINERALS INTERNATIONAL

5 cm



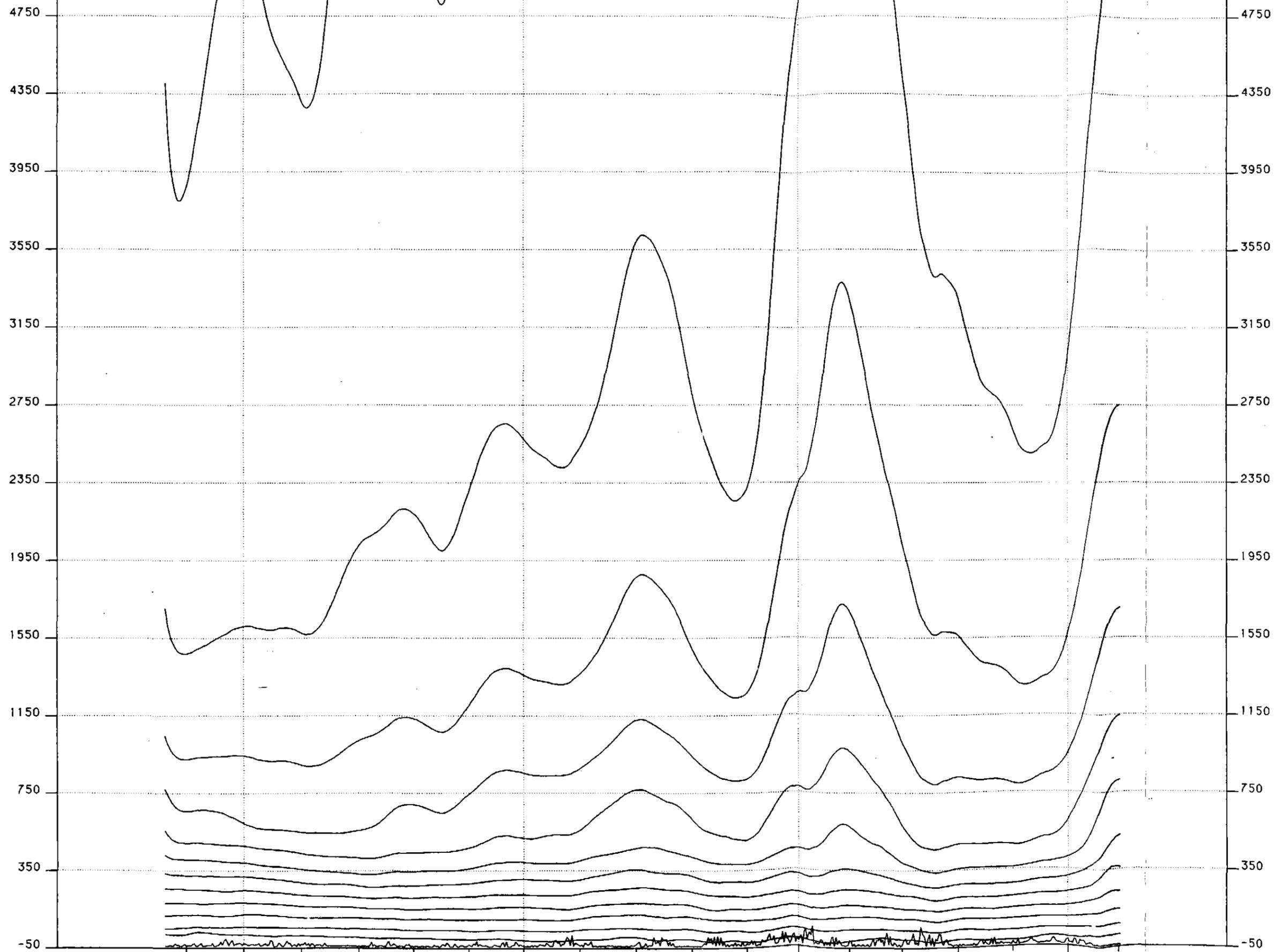
0801

62200 62300 80

459000 459250 459500 459750

GEOTEM CHANNELS 1-12

ppm



ppm

LINE 109/2 2-626 MACQUARIE HARBOUR 125Hz GEOTEI

5 cm

A36052

BHP-UTAH MINERALS INTERNATIONAL

9892

62200 62300

454500  
GEOTEM CHANNELS 1-12

454250

454000

453750

80

PPM

4750  
4350  
3950  
3550  
3150  
2750  
2350  
1950  
1550  
1150  
750  
350  
-50

PPM

4750  
4350  
3950  
3550  
3150  
2750  
2350  
1950  
1550  
1150  
750  
350  
-50

454500

454250

454000

453750

GEOTEM DIV. LTD

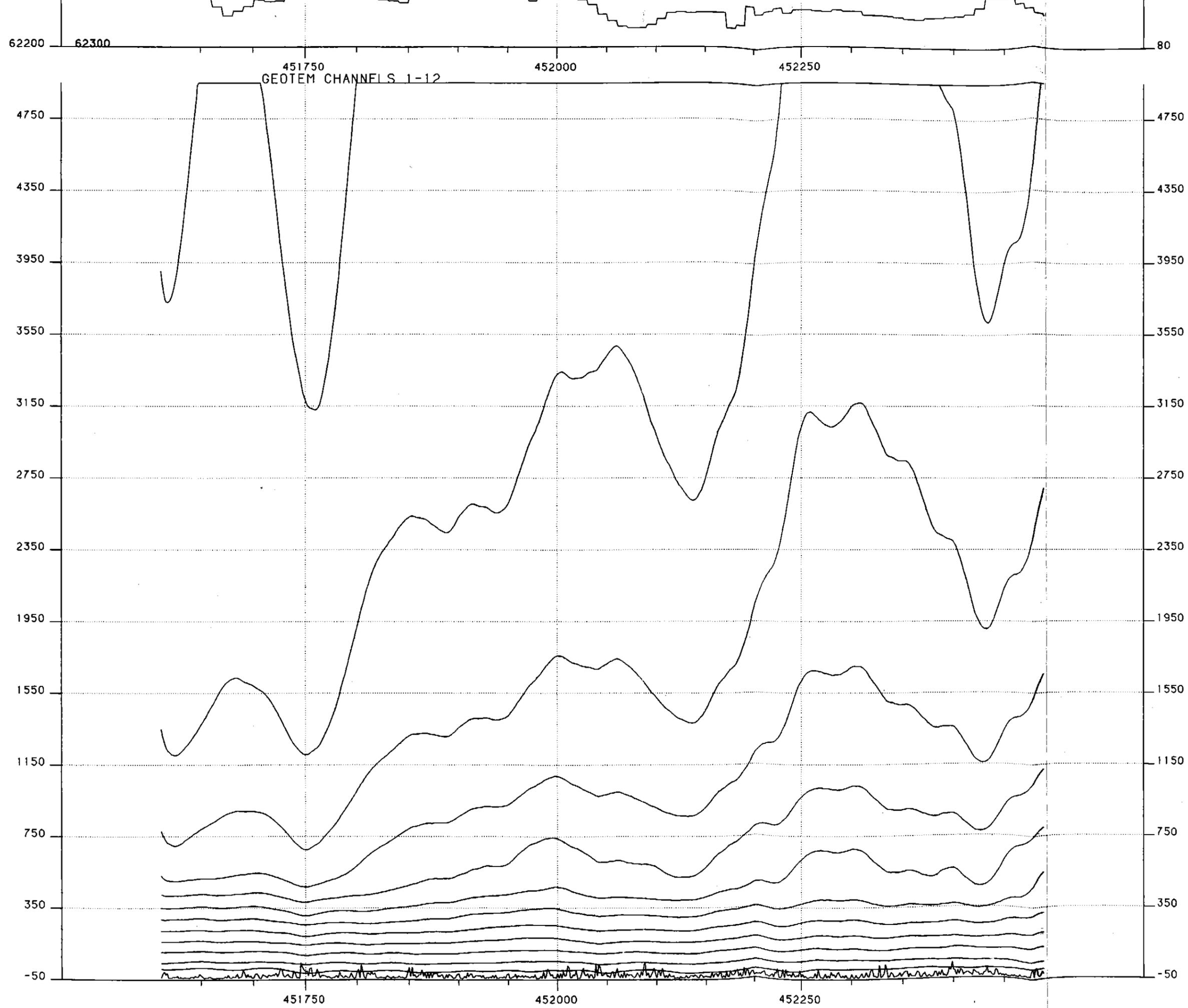
LINE 108/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

5 cm

BHP-UTAH MINERALS INTERNATIONAL

436053

0802



GEOTERREX PTY LTD

LINE 107/1

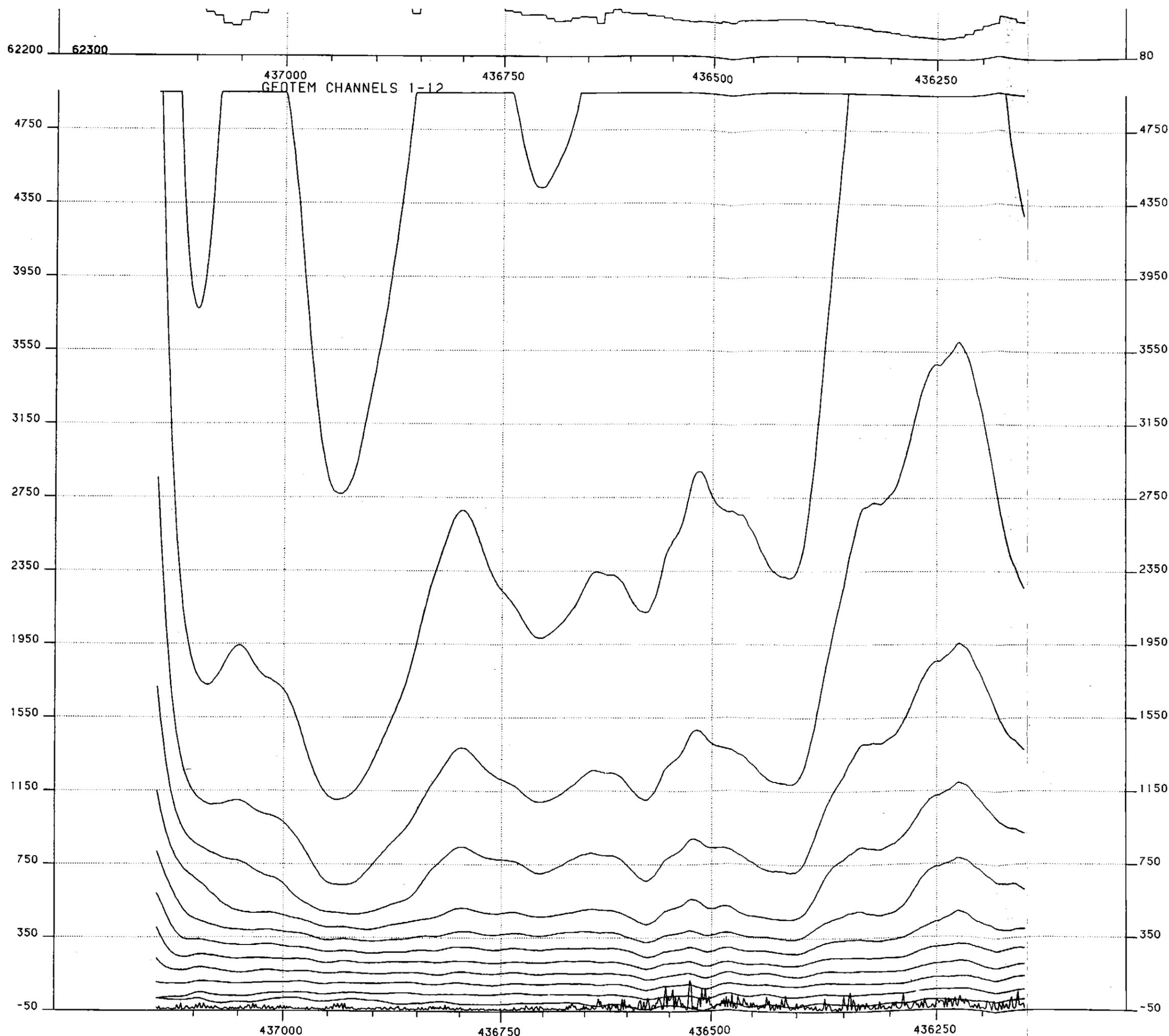
2-626 MACQUARIE HARBOUR 125Hz GEOTEM

5 cm

436054

BHP-UTAH MINERALS INTERNATIONAL

0884



GEOTERREX PTY LTD

SCALE 1:25,000

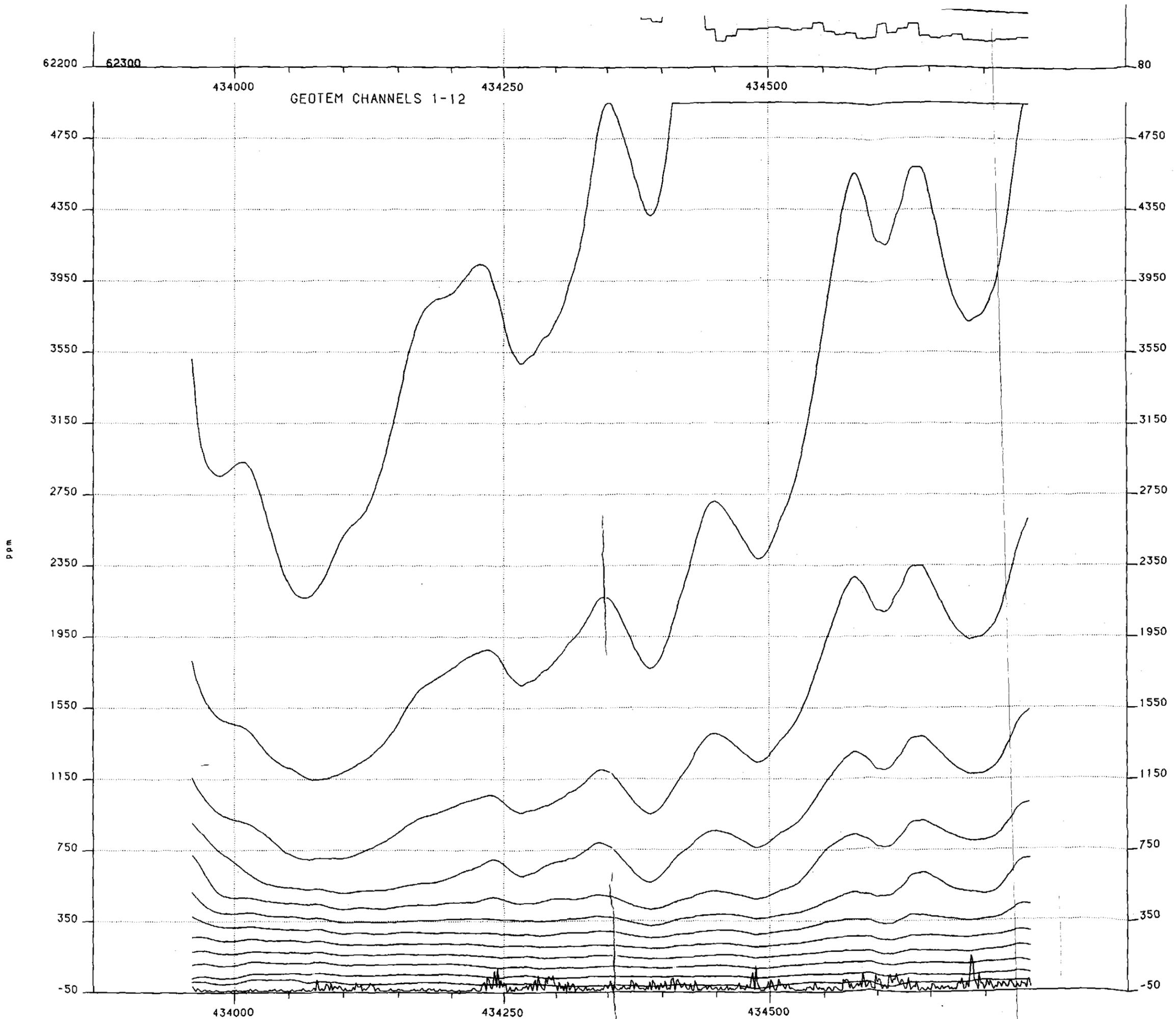
↑ LINE 106/1

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

436055

RHP-IITAH MINFRAIS INTERNATIONAL

0896



GEOTERREX PTY LTD

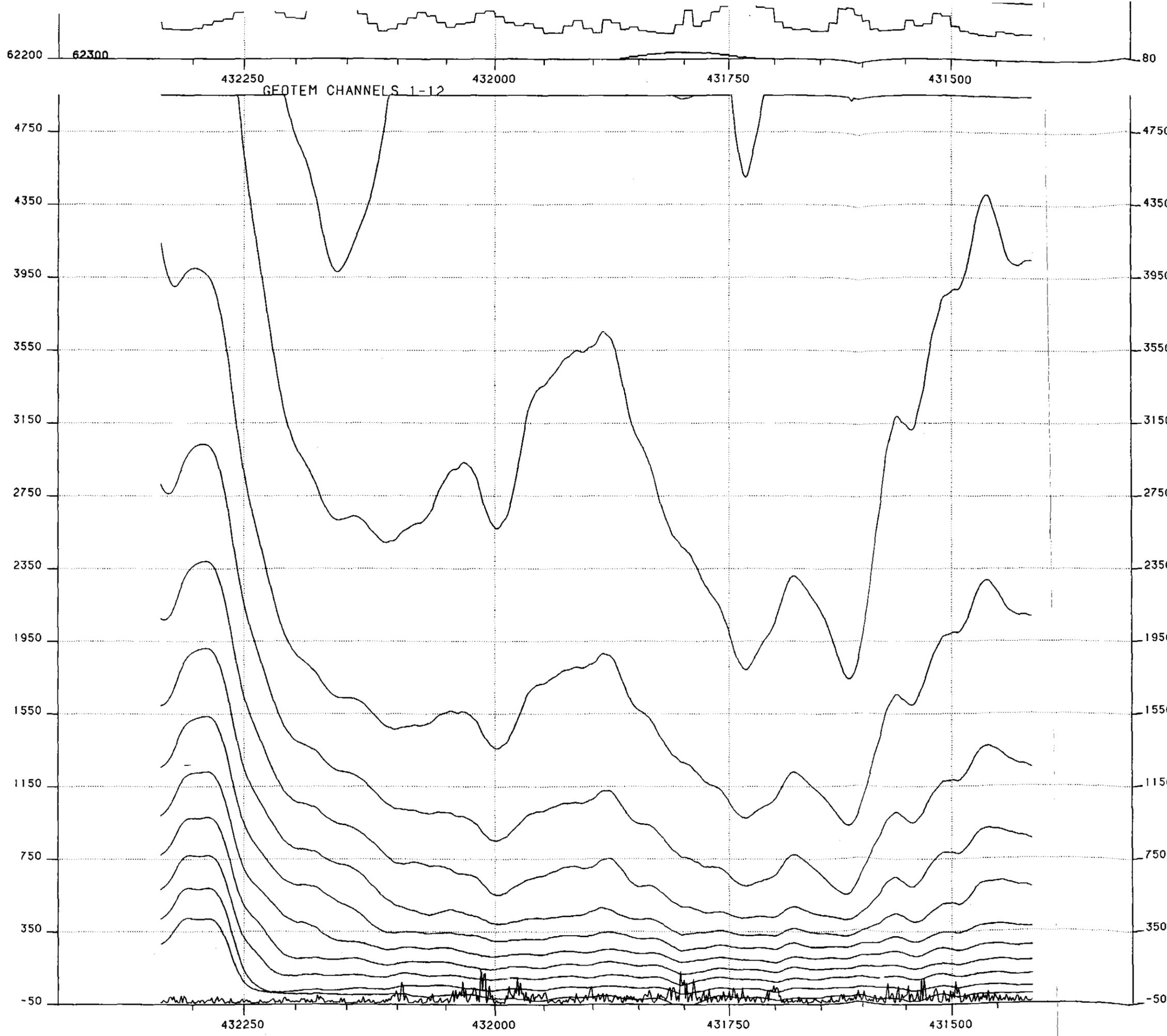
LINE 105/1

5 cm

436056

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

9896



LINE 104/1

2-626 MACQUARIE HARBOUR 125Hz GEOTEM

5cm

RHP-ITAH MINERAL S INTERNATIONAL

A35057

0822

62200

62300

429250

GEOTEM CHANNELS 1-12

429500

429750

430000

80

ppm

4750  
4350  
3950  
3550  
3150  
2750  
2350  
1950  
1550  
1150  
750  
350  
-50

ppm

4750  
4350  
3950  
3550  
3150  
2750  
2350  
1950  
1550  
1150  
750  
350  
-50

429250

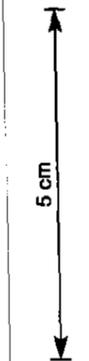
429500

429750

430000

GEOTERREY PTY LTD

LINE 103/1

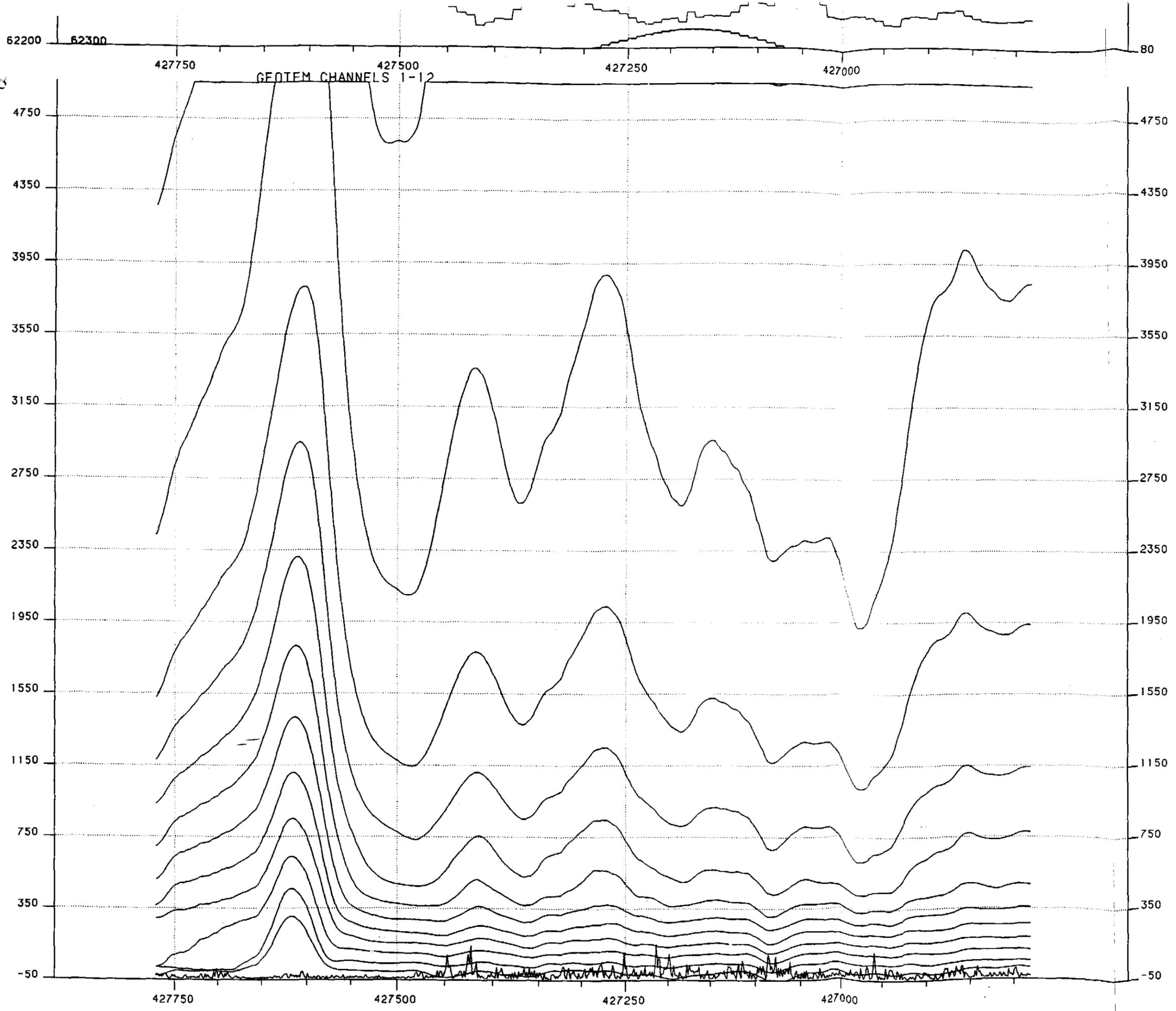


2-626 MACQUARIE HARBOUR 125Hz GEOTEM

433058

BHP-UTAH MINERALS INTERNATIONAL

5898



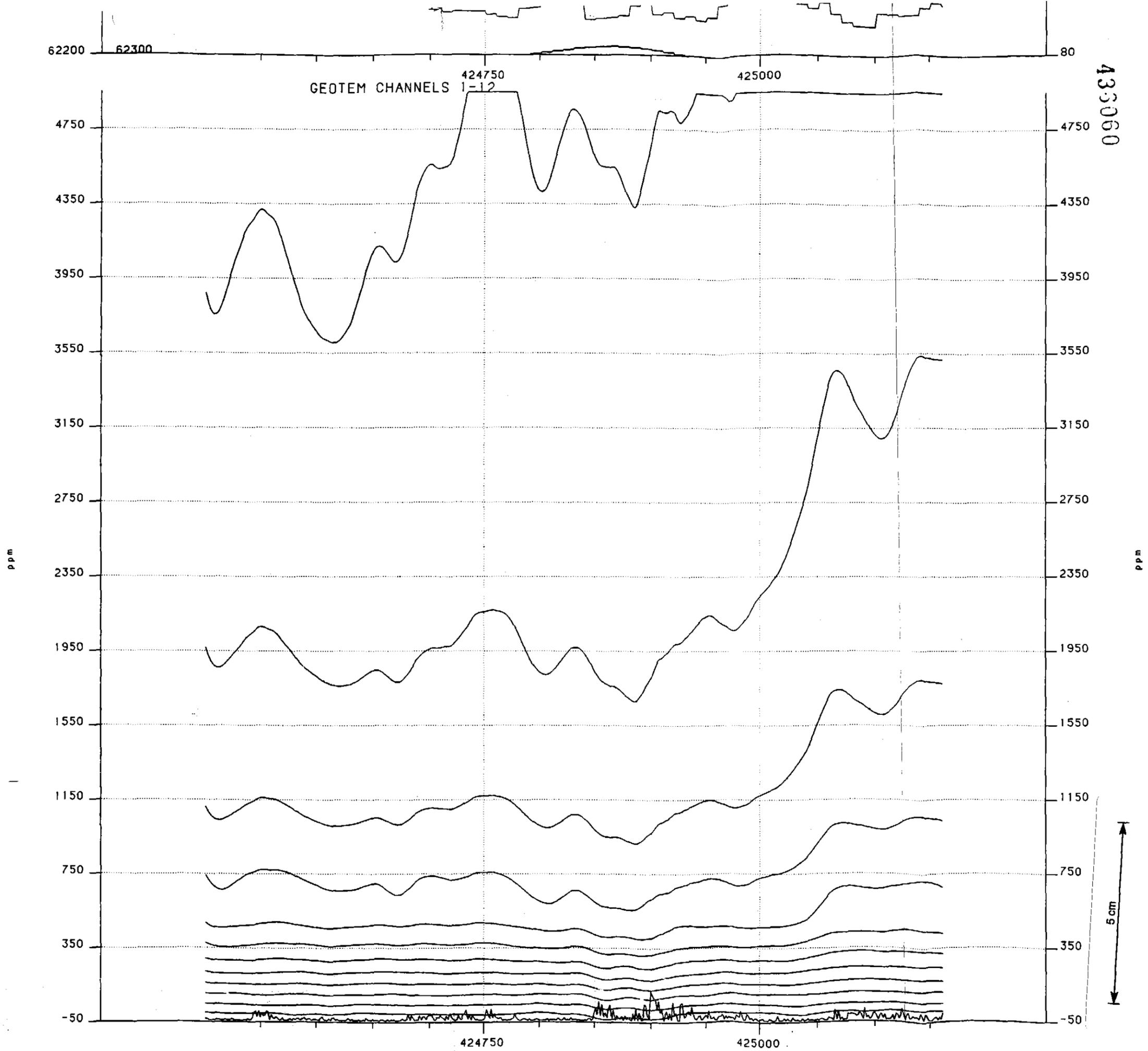
427750 427500 427250 427000

GEOTEM DIV. LTD

LINE 102/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

BHP-UTAH MINERALS INTERNATIONAL 690987

9899



GEOTEM BY LTD

LINE 101/1 2-626 MACQUARIE HARBOUR 125Hz GEOTEM

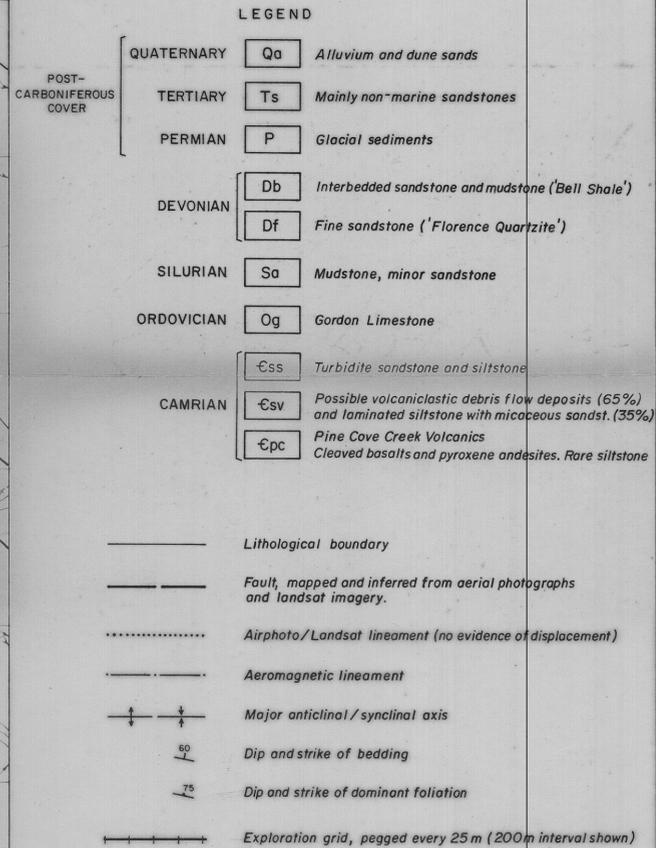
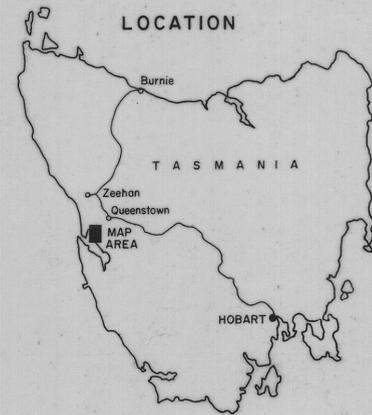
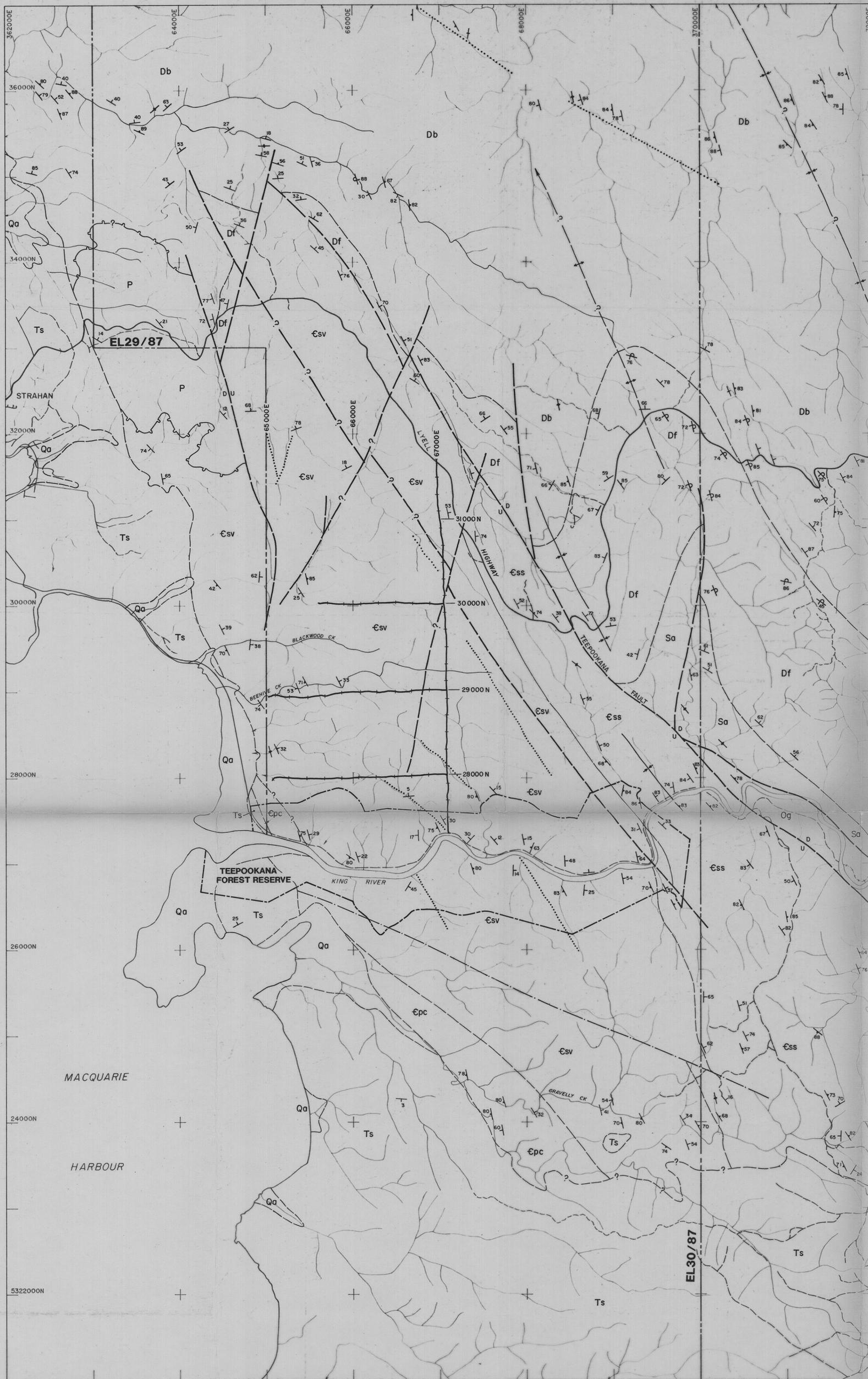
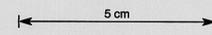
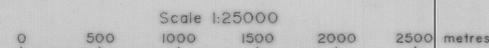


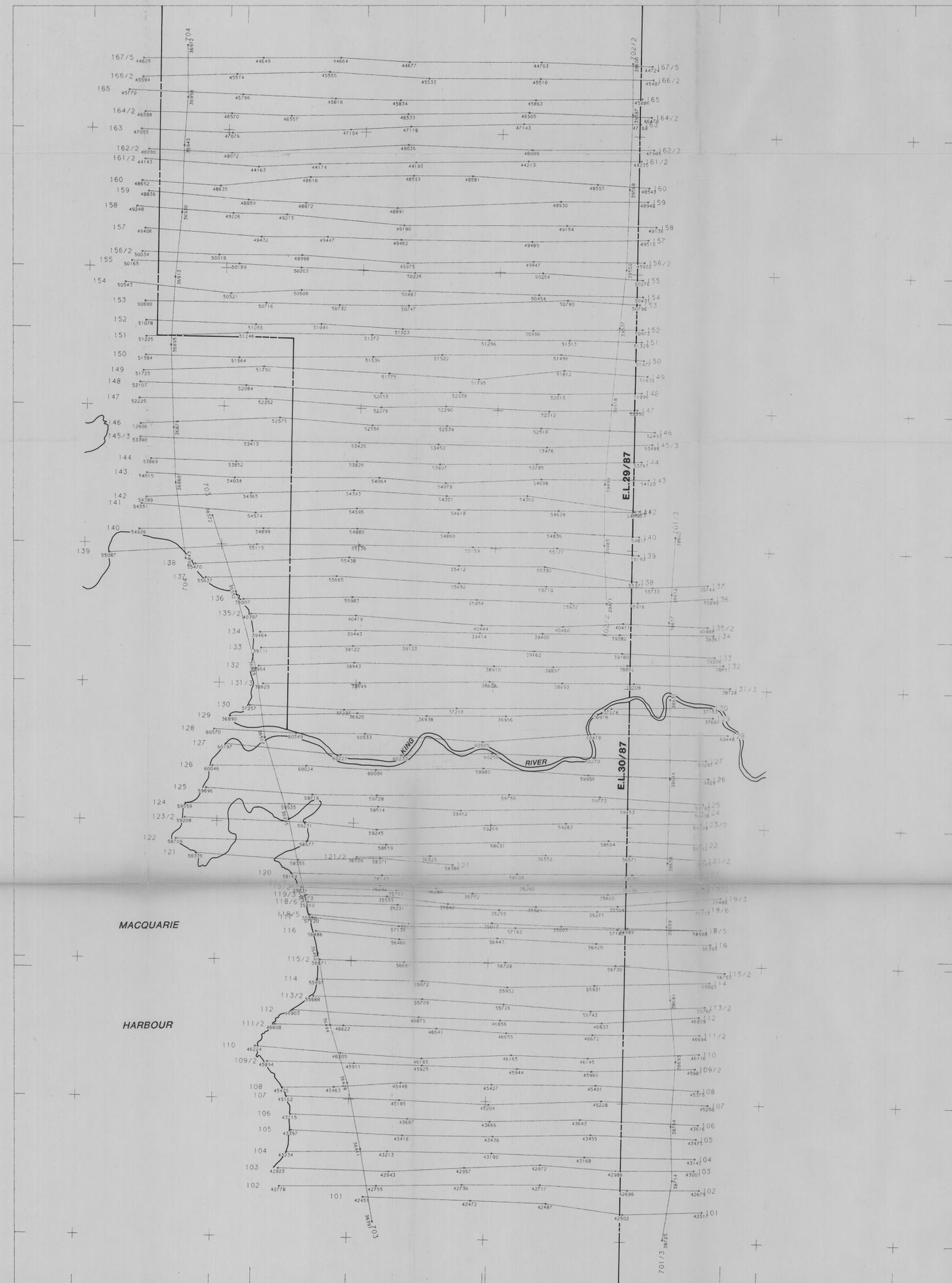
FIG. 2

90-3186.



436061

<b>BHP-Utah Minerals International</b> Asia Pacific Division - Exploration Department		
<b>EL 29/87, STRAHAN &amp; EL 30/87, KING R, TAS</b> <b>GEOLOGY &amp; LOCATION OF</b> <b>EXPLORATION GRID</b>		
Prepared: A. Wilde	Date: Dec 89	Centre: Melbourne
Drawn: M. Rosker	Project No.: B48/B49	Fig 2
Checked: A. Wilde	Drawing No.: AI-2346	



**AIRBORNE SURVEY SPECIFICATIONS**

EM SYSTEM : GEOTEM II 125 Hz  
 Channel centre 309, 587, 806, 1025, 1244, 1463, 1681, 1900, 2119, 2338, 2556 and 2775 microwatts after transmitter turn off.  
 1/7 sec (approx 3m sampling) at mean ground speed of 235 km/hour  
 Caesium Vapour optical absorption - Sensitivity 0.1 nT  
 1.0 sec (approx 55m sampling) at mean ground speed of 235 km/hour  
 Geotrex RADACS acquisition system  
 Digital to magnetic tape  
 MAGNETOMETER : Magnetometer sensor in aircraft at 120m  
 ER transmitter in aircraft at 120m  
 EM receiver in towed bird at 54m  
 Traverse lines 250m

RECORDING INTERVAL :  
 DATA RECORDING :  
 NOMINAL TERRAIN CLEARANCE :  
 NOMINAL LINE SPACING :  
 FLIGHT PATH NAVIGATION :  
 FLIGHT PATH RECORD :  
 FLIGHT PATH RECOVERY :

**GEOTEM FLIGHT PATH MAP**

Grid notation refers to Australian Map Grid Zone 55  
 Recovered Fiducial 32768

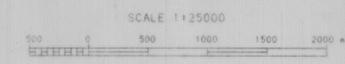
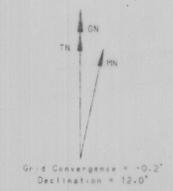
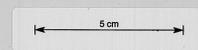


FIG. 3

90-3186.



JOB NO : 2-626  
 Flown by GEOTERREX PTY LTD : Mar 1990  
 Compiled by GEOTERREX PTY LTD, SYDNEY  
 Processed by GEOTERREX PTY LTD, SYDNEY

**BHP - UTAH**  
**MINERALS INTERNATIONAL**  
 E.L.29/87 STRAHAN, E.L.30/87 KING RIVER, TASMANIA  
**GEOTEM SURVEY**  
 436052 **FLIGHT PATHS**  
 (Flown March 1989)

DRAWING NO: A1-2434 DATE : 16-AUG-1990

APPENDIX 4

Data Tape Specifications

BHP-UTAH MINERALS INTERNATIONAL  
 MACQUARIE HARBOUR, TASMANIA  
 ELECTROMAGNETIC SURVEY  
 LOCATED DATA TAPE FORMAT

COLUMN	DESCRIPTION
1 - 4	FLIGHT NUMBER
5 - 12	LINE
13 - 20	FIDUCIAL
21 - 28	AMG EASTING
29 - 36	AMG NORTHING
37 - 44	TOTAL MAGNETIC FIELD
45 - 48	RADAR ALTIMETER
49 - 54	GEOTEM CHANNEL 1
55 - 60	GEOTEM CHANNEL 2
61 - 66	GEOTEM CHANNEL 3
67 - 72	GEOTEM CHANNEL 4
73 - 78	GEOTEM CHANNEL 5
79 - 84	GEOTEM CHANNEL 6
85 - 90	GEOTEM CHANNEL 7
91 - 96	GEOTEM CHANNEL 8
97 - 102	GEOTEM CHANNEL 9
103 - 108	GEOTEM CHANNEL 10
109 - 114	GEOTEM CHANNEL 11
115 - 120	GEOTEM CHANNEL 12
121 - 126	GEOTEM 50 HZ MONITOR

RECORD LENGTH = 126 Bytes  
 BLOCK SIZE = 8064 Bytes  
 CODE = 9-TRACK ASCII  
 DENSITY = 1600 bpi

APPENDIX 5

Rock Sample Descriptions and Geochemical Results

Sample NumberDescription

DC 78	Fine grained shale-siltstone with fine grained diagenetic pyrite along bedding planes and minor crosscutting veinlets of the same.
DC 80	Weathered fine grained shaley epiclastic.
DC 81	Fine grained quartz-phyric schistose epiclastic.
DC 82	Schistose quartz-phyric epiclastic.
DC 83	Schistose vesicular andesite float at U bend in creek.
DC 84	Outcrop of schistose andesite 100 m to N of DC 83 in creek bank.
DC 85	Outcrop 50 m further on from DC 84 of andesite in bank of creek.
DC 86	Outcrop near DC 85 of cleaved chloritic andesite.

Sample No.	Cu	Pb	Zn	Ag	Au
DC 78	60	45	80	<0.5	<0.008
DC 80	35	25	60	<0.5	<0.008
DC 81	15	<5	30	<0.5	<0.008
DC 82	10	<5	65	<0.5	<0.008
DC 84	10	<5	295	<0.5	<0.008
DC 86	770	10	370	<0.5	0.216

Detection	5	5	5	0.5	0.008
Units	ppm	ppm	ppm	ppm	ppm
Method	101	101	101	101	309

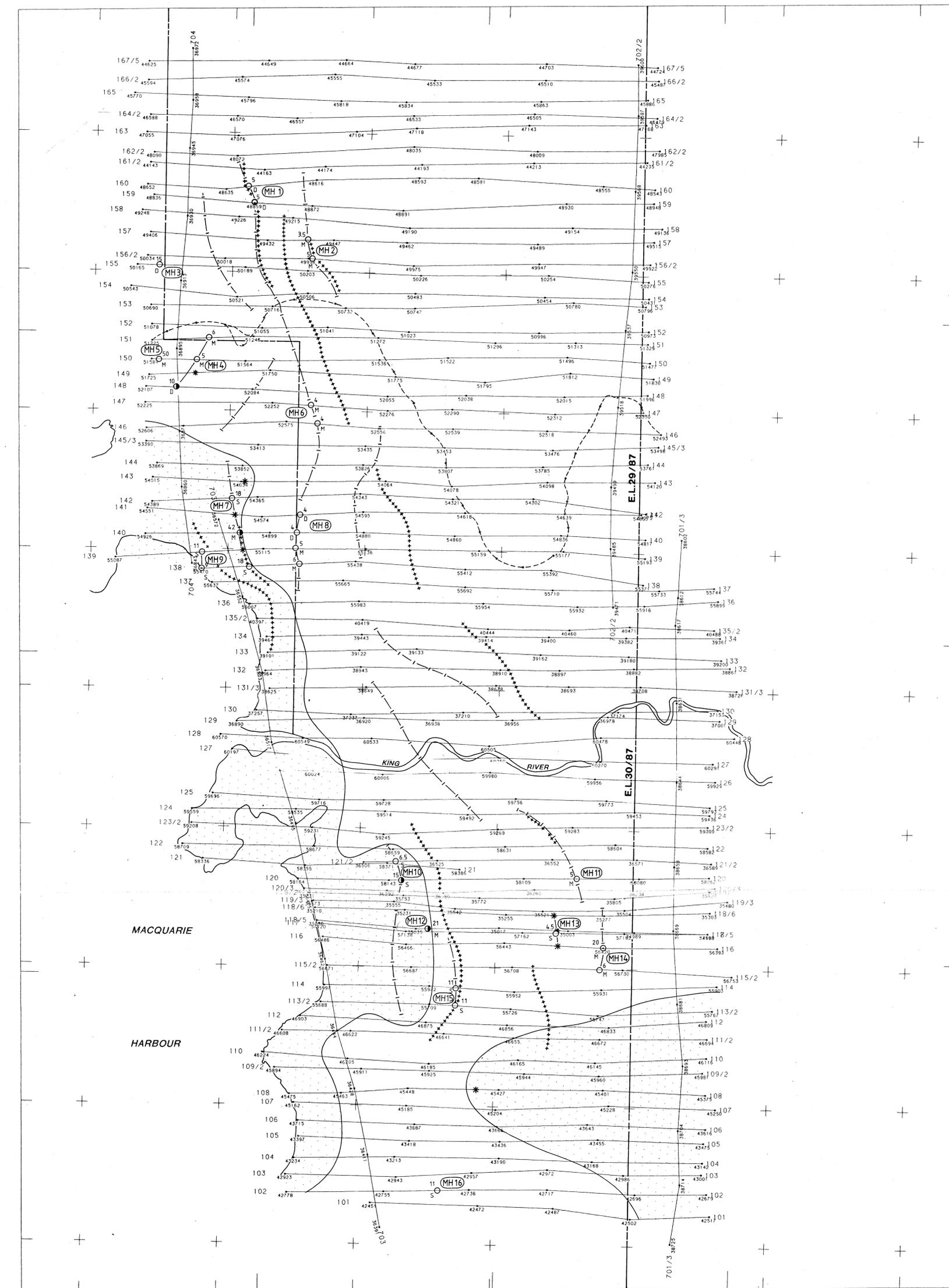
Company: Analabs  
Report No: 14.4.08.070140.  
Date: 20/04/90

APPENDIX 6

Expenditure Statement

King River EL 30/87 Expenditure Total15/1/90 to 9/4/90

Wages and Salaries	4,911
Field Support	410
Equipment	305
Geophysics	21,488
Surveys	1,270
Office Expenses	1,471
Consultants	107
Other	3,827
In-House Services	3,265
Administration	3,188
	<hr/>
TOTAL	40,242



AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM : GEOTEM II 125 Hz  
 Channel centre: 368,540, 671,806, 1025, 1244, 1462, 1681, 1900, 2119, 2338 and 2556  
 microseconds after transmitter turn off.  
 1/7 sec (approx 9s sweep time)  
 at mean ground speed of 235 km/hour  
 Geotem MADAS acquisition system  
 Geotem Vapour optical observation.  
 SENSITIVITY : 0.1 nT  
 1.0 sec (approx 65s sampling)  
 at mean ground speed of 235 km/hour  
 Geotem MADAS acquisition system  
 Digital to magnetic tape.  
 Magnetometer sensor in aircraft at 120m  
 EM transmitter in aircraft at 120m  
 EM receiver in towed bird at 54m  
 Traverse lines 250m

RECORDING INTERVAL :  
 MAGNETOMETER :  
 RECORDING INTERVAL :  
 DATA RECORDING :  
 NOMINAL TERRAIN CLEARANCE :  
 FLIGHT PATH NAVIGATION :  
 FLIGHT PATH RECORD :  
 FLIGHT PATH RECOVERY :

GEOITEM INTERPRETATION MAP

Grid notation refers to Australian Map Grid Zone 55  
 Recovered Fiducial 32768

- Conductive Surficial
- High Priority Conductor
- Medium Priority Conductor
- Low Priority Conductor
- Anomaly Trend
- Conductor Number
- CTP Estimate
- Depth (Shallow Medium Deep)
- Magnetic Trend
- Trend of Anomaly
- Power Line

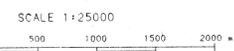
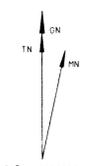


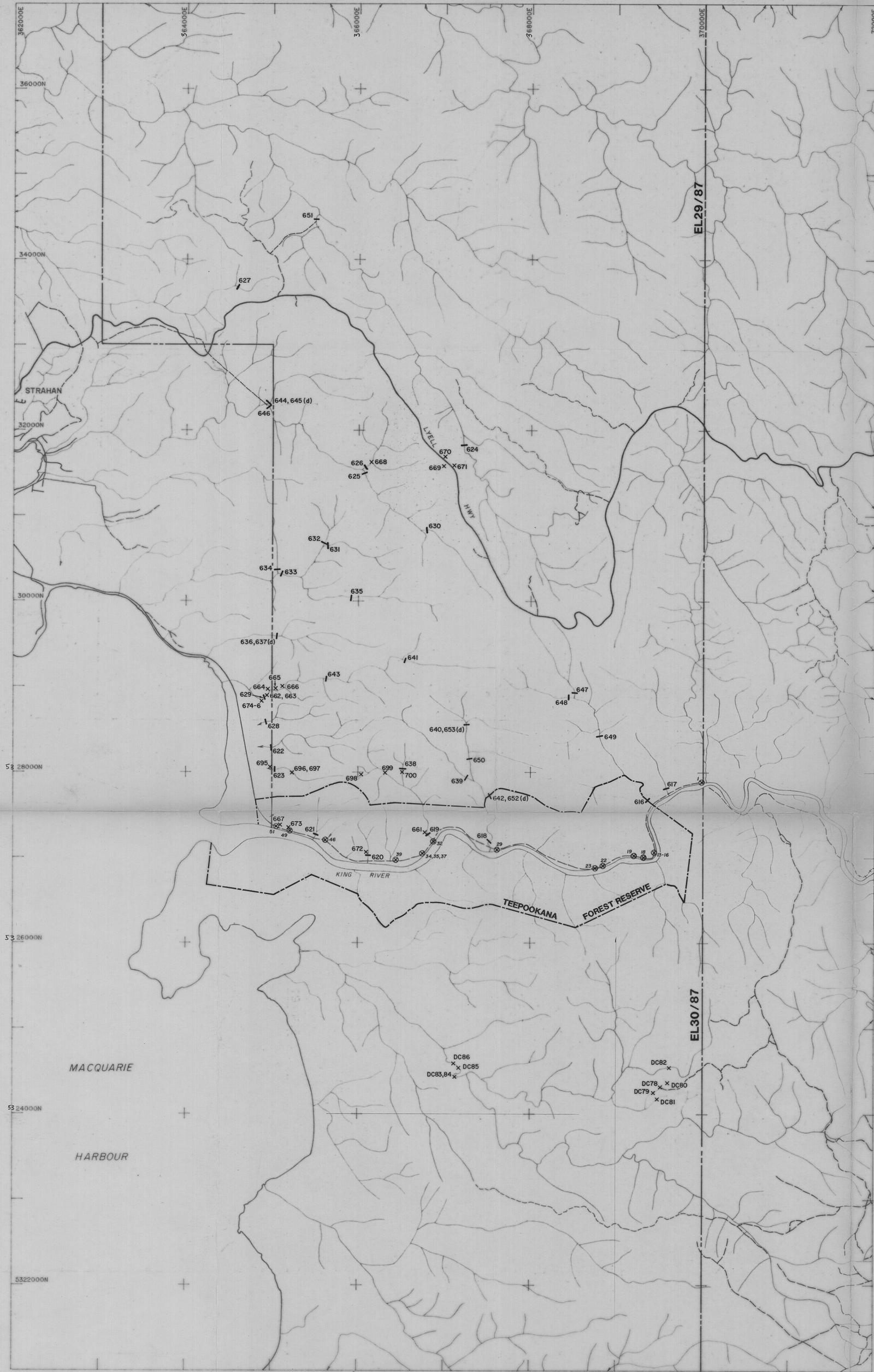
FIG. 4 90-3186.

JOB NO : 2-626  
 Flown by GEOTERREX PTY LTD : Mar 1990  
 Compiled by GEOTERREX PTY LTD, SYDNEY  
 Processed by GEOTERREX PTY LTD, SYDNEY

BHP - UTAH  
 MINERALS INTERNATIONAL

E.L.29/87 STRAHAN, E.L.30/87 KING RIVER, TASMANIA  
 GEOTEM SURVEY  
 436070 INTERPRETATION  
 (Flown March 1989)

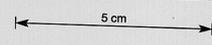
DRAWING NO: A1-2433 DATE: 24-JUL-1990



-  654 Stream sediment (-80#) sample location  
(prefixed BX 4, (d) = duplicate sample)
-  672 Rock chip sample location (prefixed BX 4)
-  39 Rock chip sample location  
(Cromer 1988, prefixed NHS-)

90-3186

Scale 1:25000  
0 500 1000 1500 2000 2500 metres



**BHP-Utah Minerals International**  
Asia Pacific Division - Exploration Department

**EL 29/87, STRAHAN & EL 30/87, KING R, TAS**  
**STREAM SEDIMENT (-80#) AND**  
**ROCK CHIP SAMPLE LOCATIONS**

Prepared: A. Wilde	Date: Sept 90	Centre: Melbourne
Drawn: M. Rosker	Project No.: B48/B49	Fig 5
Checked: A. Wilde	Drawing No.: AI-2345	

436071