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C.R.A. EXPLORATION PTY LTD

E.L. 36/79 - LOONGANA

Final Report on Exploration Completed to 1st May 1990

OPEN FILE

Authors : J.P. Randell
N. Hungerford

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DEPARTMENT OF MINES – TASMANIA
MINERAL INDUSTRY UNPUBLISHED REPORT
DATA SHEET

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AUTHOR(S): J. P. RANDELL
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Map sheet: BURNIE

Geographic: (not in title) BLACK BLUFF

MAPPING – GEOLOGICAL
☒ Surface – scale :
☐ Mine/ Underground

DRILLING
☒ Diamond
☐ Percussion
☒ Auger
☒ Logs
☐ Analysis
☐ Metallic Minerals
☐ Non–metallic Minerals

GEOPHYSICS
GND/AIR
☒ ☐ Magnetic
☒ ☐ Electromagnetic
☐ Radiometric
☐ A.P. ☐ S.P. ☐ E.P.
☐ E.I.P./M.I.P ☐ Resist.
☐ Gravity
☐ Seismic – Refraction
☐ Seismic –Reflection
☐ On – shore ☐ Off–shore
☐ Well–logging

GEOCHEMISTRY
☐ Stream Sediment
☐ Soil : _____
☐ Rock – chip
☐ Gossan
☐ Water : _____
☐ Biogeochemistry
☐ Cu ☐ Pb ☐ Zn
☐ Sn ☐ W ☐ Mo
☐ Rock: ☐ Maj. ☐ Tr.

☒ PETROLOGY
☐ ORE GENESIS
☐ ORE RESERVES
☐ FEASIBILITY STUDY
☐ MINERAL PROCESSING
☐ MINING
☐ ENVIRONMENT
☐ ENGINEER. GEOLOGY
☐ INDUST. MINERALS
☐ CONSTRUCT. MAT.
☐ FUELS : _____

MINERALS: Copper Lead Zinc

MINE / DEPOSIT NAME(S):

OTHER KEYWORDS: Cambrian Alteration UTEM

ANNOTATION: Ten years of exploration have concentrated on three prospect areas showing evidence of alteration, geochemical anomalism and favourable geological settings for volcanogenic base metal mineralisation. Follow up detailed surveys have modified this earlier interpretation and it is now considered that the licence area has a low potential to host significant VMS mineralisation

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1.0 INTRODUCTION

This report details the results of exploration completed during 1989-90 and also summarizes previous exploration completed during the life of the tenement.

2.0 LOCATION & ACCESS

The tenement is situated 35 kms south of Burnie and 15 kms ESE of St. Valentines Peak (Fig 1). Access is via APPM formed roads and logging tracks that transect much of the country. (Fig 2).

3.0 LAND TENURE

EL 36/79 of 277 km² was granted to The Shell Company of Australia Limited on the 1st May 1980 for a period of 10 years, renewable every 12 months. In accordance with Section 15C(7) of the Mining Act, the licence was reduced to 124 km² on 1st May 1985. At this time, partial relinquishment resulted in the tenement being broken into three parts (see Fig 2).

viz	Part I	66km²	Native Track Tier
	Part II	21km²	High Tor
	Part III	37km²	Two Hummocks - Cattley North

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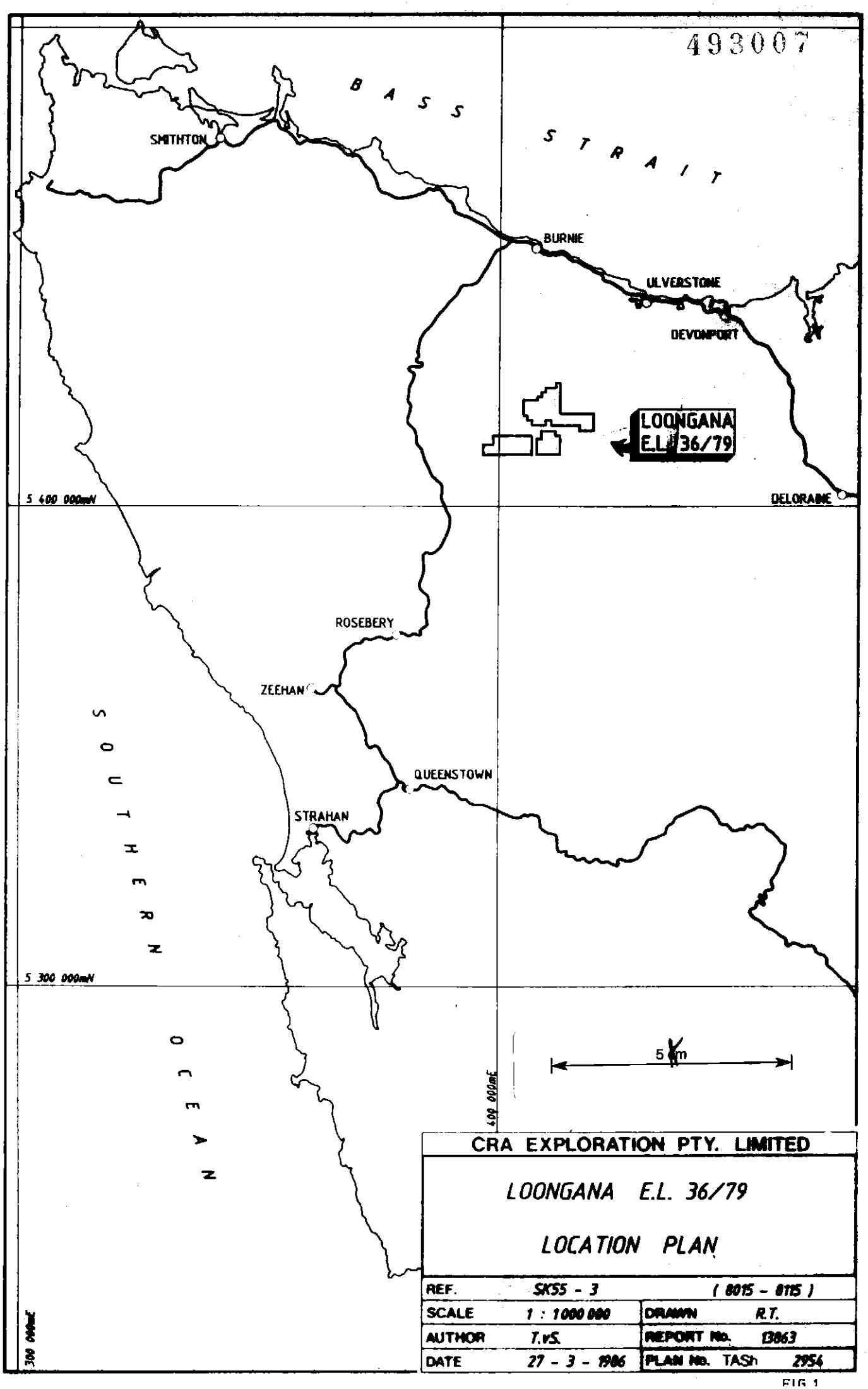


CRA EXPLORATION PTY. LIMITED			
LOONGANA E.L. 36/79 LOCATION PLAN			
REF.	SK55 - 3		(8015 - 8115)
SCALE	1 : 1000 000	DRAWN	R.T.
AUTHOR	T.vS.	REPORT No.	13863
DATE	27 - 3 - 1986	PLAN No. TASh	2954

FIG 1

The tenement currently comprises these same parts and prospect names but will expire on 1st May 1990.

Land ownership is divided between the Crown, APPM and private interests and a State Forest Reserve covers the Native Track area. Figure 2 shows the distribution of land ownership.

Exploration was carried out and funded solely by Shell during the initial five year term of the licence but a joint venture was formed with CRA Exploration from 1985 to 1988 whereby the latter partner funded the exploration. Billiton Australia resumed managerial control on 9th May 1988 but exploration programmes have been funded on a 50:50 basis with CRAE.

4.0 REGIONAL GEOLOGICAL SETTING

The licence is situated at the northern end of the Dundas Trough and western end of the Fossey Mountain Trough and is outside the main belt of Mt. Read Volcanics (see Fig 3). The Que-Hellyer Complex is located 27kms to the southwest while the Cethana alteration zone is 23kms to the east-south-east.

Regional strike changes from 030°AMG in the Cattley North area to 110°AMG at Native Track Tier reflecting the transition between the two major troughs. Indeed it is evident from a regional compilation that the Mt. Read Volcanic Arc is continuous during this strike change and that a later deformation may be at least in part responsible for the change in trend.

In terms of paleo environment, it seems likely that the licence area covers Cambrian stratigraphy that is dominantly volcaniclastic and sedimentary, not proximal volcanic as seen in the main arc (Queenstown-Que/Hellyer). Rocks seen consistently in the region are coarse epiclastics (debris flows), fine vitric ash, turbiditic sandstone-siltstone and minor shallow intrusives or lavas. The paleo-environment is therefore interpreted to be high energy, deep water and distal from any major volcanic edifice.

Alteration is widespread throughout the licence and characterised by sericitie-chlorite-carbonate-(pyrite) in variable proportions. However, field observations, petrological evidence and oxygen isotopic data from a neighbouring licence suggests that this alteration is regional in nature and more typical of a low temperature hydrothermal system, perhaps even due to burial metamorphism. The intense sericite-carbonate-silica-pyrite alteration characteristically observed around known VMS deposits has not been noted to date. The best developed alteration examples within the licence occur at Two Hummocks (AMG 414000N 401000E) and at Native Track Tier (AMG 421000N 410000E). Both areas display different styles of alteration but are nevertheless characteristic in a regional sense.

Post-Cambrian cover obscures 50-60% of the licence area making correlation between prospects extremely difficult. A generalized distribution of stratigraphy can be summarized as follows:

Two Hummocks-Cattley North	: 70% Tertiary basalts 10% Ordovician conglomerates, sandstones. 20% Cambrian volcaniclastics, lavas
High Tor	: 90% Ordovician conglomerate 10% Cambrian volcaniclastics
Native Track Tier	: 50% Ordovician quartzites, conglomerates 50% Cambrian volcaniclastics, sediments, lavas.

Thickness of cover is probably quite variable and although variations in the Ordovician have not been measured, electrical soundings over Tertiary basalt covered areas have indicated depths of up to 330 metres south of Two Hummocks.

5.0 PREVIOUS WORK

CRAE commenced exploration within the licence during 1985 and in the first year carried out a regional stream sediment survey that highlighted previously known prospects of Shell - Geopeko (viz Challenger I, II, III). At Two Hummocks, two percussion holes (PD TH1,2) tested weak UTEM anomalies from a previous Shell UTEM survey, but failed to intersect any significant mineralization. At Native Track Tier, two lines of Genie EM were run across a PB-Zn in soil anomaly identified previously by Shell. No significant anomaly was detected.

During 1986-87, work was carried out almost entirely within the Cattley North prospect. A total of 51kms gridding was completed, together with geological mapping, rock chip sampling and UTEM surveying (6 loops). Lithologically the sequence is dominated by fine to coarse epiclastics, shales, acid intrusives

and one large basic intrusive. Anomalous base metal values were recorded from several shale horizons and a quartz vein stockwork quartz feldspar porphyry contains anomalous gold (0.21ppm). Numerous UTEM anomalies were recorded but most were interpreted to be contact related.

Exploration during 1987-88 again focused on the Cattley North prospect. Additional mapping was carried out together with rock chip sampling to re-interpret the local setting. One drill hole (DD87 CN1) tested a weak UTEM and soil geochemical anomaly but did not intersect significant mineralization. Auger sampling was carried out over the south-western portion of the grid and resulted in delineation of several low order Pb-Zn anomalies. Additional stream sediment sampling was also completed in an area where regional evidence suggested the continuation of the Henty Fault.

The 1988-89 programme was divided into three prospect areas: Two Hummocks, Cattley North and Native Track Tier. At Two Hummocks, Sirotem depth soundings were carried out to determine the depth of Tertiary basalt overlying Cambrian stratigraphy. Fixed loop TEM was completed over a portion of this area and geological mapping, rock chip and soil sampling completed.

Soil geochemical anomalies at Cattley North were further evaluated and geological mapping/compilation completed.

Reconnaissance geological mapping at the Native Track Tier prospect established a geological base from which detailed exploration was carried out in 1989.

6.0 EXPLORATION COMPLETED 1989-90

Exploration focused on the Native Track Tier prospect where the following programmes were completed:

* the gridding survey of 37.4kms, commenced during the last reporting period, was completed and an additional 11.2kms cut for UTEM survey loop access (Fig 4).
* a ground magnetic survey was completed over the entire grid (24.3 line kms).
* the grid was geologically mapped and the grid recovered onto 1:5000 scale topographic base plans (Figs 5-10).
* a six loop 24 line km UTEM survey was completed over the grid (Fig 4).
* a total of 106 hand auger C-horizon soil samples were collected from two anomalous UTEM zones.
* a total of 196 metres of diamond drilling was completed and down hole EM surveying carried out. Both the drill access tracks and drill site were rehabilitated after completion of the programme.
* a total of 5 petrological samples were collected and despatched for thin section description.

The only other work completed was carried out over the Two Hummocks prospect where a fixed loop EM survey was repeated due to suspect earlier results (see 1988-89 Annual Report).

7.0 EXPLORATION RESULTS

7.1 Two Hummocks

A series of TEM surveys were carried out in the first half 1989 over the Two Hummocks prospect.

A UTEM survey (Billiton 1985) covers the major part of Cambrian outcrop between 9600E and 10400E. Subsequent TEM surveys have been designed to explore for massive sulphides beneath thin Tertiary basalt and Ordovician cover (see Fig 11). All used large fixed transmitter loops and measured the vertical component of the secondary EM field.

Loop 1, surveyed by Zonge, was laid out in order to explore along strike from known black shales, barytic units and minor sulphides in or near the gravel pits. The only conductors detected appear to be extensions of the black shale horizons defined from the UTEM survey. Strike is south-east, and they appear to disappear rapidly, probably due to increasing basalt cover south-east of Two Hummocks.

Loop 3 was surveyed by Zonge since it was felt that it was unwise to try to explore more than 1km from loop 2 (due to the decrease in primary EM field strength and thus depth of investigation). However no conductors were noted over this part of the grid to the north-east of Two Hummocks.

Loop 2 covers an area north-west of Two Hummocks where there is little known Tertiary Basalt cover, and this depth of exploration into the Cambrian should be greater. Anomalous responses occurred on two lines, 9200E and 9400E, approximately coincident with the loop wire along 10000N. No other conductors were apparent.

Results from Loops 1-3 have been presented in the 1988-89 Annual Report and indicated conductors are shown in Fig 12.

These possible conductors could have had a flat lying or shallow-dipping source within the Cambrian. In order to confirm the reality of these conductors a brief EM-37 survey was carried out with the loop layout (loop 4) designed for optimum coupling to a shallowly north-east dipping conductor (geological dips are to the north-east). Unfortunately the EM-37 survey indicates no conductor is present, suggesting the Zonge anomalies to be instrumental and possibly due to proximity of receiver to transmitter. (see Appendix 1).

Loop 1 lines were resurveyed with the EM-37 (see Appendix 1),since it was apparent after receipt of the Zonge TEM results that the latter were not reliable. This EM-37 survey did not however indicate any further conductors. Problems with the Zonge data appear to be due to a combination of: 1) mismatching of the Sirotem RVR with the Zonge GDP-12; 2) ringing of the RVR near the transmitter loop at early times due to high currents and high resistivities; 3) high noise levels at late delay times with the GDP-12; and 4) inexperienced operators.

As a result of the lack of conductors, it is recommended that no future work be carried out over this prospect.

7.3 Native Track Tier

7.3.1 Ground Magnetics

The entire grid was surveyed at 10 metre station intervals using two G856 Geometrics proton magnetometers. Data was downloaded onto a Toshiba 3200 PC and results plotted using the Infield software (see Appendix 2). Data has been reprocessed by Billiton and presented as a series of stacked profiles in Figure 13.

The profiles have been overlain with the geological mapping fact sheets (see Section 7.3.2) to attempt to correlate units along strike. This was thought to be a useful exercise as both magnetic and non-magnetic units

were identified during grid mapping. However, it is apparent that there is very little along strike continuity of magnetic units and indeed, many marked anomalies are single line responses only. The magnetic units are invariably rhyolitic to dacitic subvolcanic intrusives that are interpreted to have a nodular or pipe like form and often occupy topographic highs. They do not appear to be conformable with the Cambrian volcaniclastic sequence and although contact relationships have not been observed, their distribution, form and composition would suggest an intrusive origin.

7.3.2 Grid Mapping

Geological mapping has been completed over the grid and most logging tracks and is presented on figures 14-18 as a set of 1:5000 scale plans that overlie the topographic base plans. A geological interpretation map is shown in figure 19.

Outcrop is quite poor throughout the gridded area but the integration of ground magnetic data has aided the interpretation and extrapolation of certain volcanic units.

Lithologically, four general Cambrian subdivisions have been recognized within which local variations have been noted:

1. Massive blocky acid to intermediate weakly quartz and feldspar phyric subvolcanic intrusives or lavas crop out as topographic highs. They are variably magnet-ic, generally discontinuous in strike and occur as pipe like or podiform bodies. Petrological evidence (Appendix 2) suggests that these units are extrusive in nature as evidenced by their glassy nature but the field relationship indicate that an intrusive origin is possible. In outcrop the rocks are massive and relative relatively undeformed compared to the surrounding volcaniclastics and siltstones and do not display the extensive alteration as observed in the latter units. In addition their distribution as podiform discontinuous lenses may favour a near surface subvolcanic origin

2. Fine grained generally feldspar phyric dacitic volcaniclastics are invariably strongly sericitized and carbonatized. These units are strongly foliated and grade laterally into coarser grained epiclastic rocks.

3. Epiclastic units consist of well packed subrounded lithic fragments up to 3cm diameter in a matrix of fine volcaniclastic debris. Lithic composition is dominated by hematitic fine grained siltstones and volcaniclastics.

4. Fine grained massive siltstones and shales are interbedded with the fine volcaniclastics and coarse epiclastic units. They are brown to grey in colour, generally non laminated and unaltered.

Structural measurements are extremely limited throughout the gridded area and only a few bedding surfaces were observed. In these cases a consistent north-east dip was recorded.

The geological interpretation (Fig 19) suggests that the acid to intermediate lavas or intrusives occur as irregular pipes or pods in a "sea" of volcaniclastic debris and siltstones. There appear to be rapid facies variations between the latter three units with little along strike correlation suggesting a disruptive volcanic environment perhaps involving extensive debris flows.

Triggering of this instability may have arisen during intrusion/extrusion of the acid to intermediate volcanics.

7.3.3 UTEM Surveying

UTEM surveys were carried out during second half 1989 in two stages.

Fig. 20 shows the layout of the first six transmitter loops, all of which were 1200 metres in long dimension. The Z-component of the magnetic field was measured at 50 metre intervals along line. The loops were positioned to enable EM coverage of the stratigraphy of interest in such a way as to minimise situations of poor EM coupling between transmitter and possible conductors. Data quality was generally good so that economic sized massive sulphide conductors within 200 metres of the surface should have been detected. All profiles are attached in Appendix 4.

Few UTEM anomalies are evident. These are described below:

LOOP 6 - At the extreme eastern ends of lines 10800N and 10400N a moderately conductive anomaly was detected on Channels 9 to 4 (Figs 21, 22 and Appendix 4). As a result infill lines 10200N and 10600N were cut and surveyed using Loop 7 which was placed closer to the anomaly. This later survey confirmed the conductor over a strike of 800 metres, open to the south but best developed on line 10200N (Fig 23). On this line the anomaly is evident on channels 9 to 6 at 11560E. There also appear to be later responses on channels 5 to 3 but with cross-overs at 11530E. The displacement of anomaly position over the early to late channels may be due to two slightly separate conductors. The peak to peak distance (proportional to depth) of the later

channel anomaly is oddly shorter than the early channel anomaly. This would not be expected if the former conductor is deeper. Manual interpretation of this anomaly indicates a top depth of about 50 metres and a conductivity-thickness of about 1 Siemen, which would be low for sulphides. There is the possibility that small sulphide lenses occur here, as at Que River, but a stronger EM response would be expected. A bedrock soil sampling programme should indicate whether base-metal mineralization is present, prior to making a decision on drilling. Local geology indicates sediments and altered volcanics with minor pyrite in places. There is no distinct magnetic correlation with the conductor.

Loop 2 - On lines 8400N a subtle late-channel anomaly is evident (Fig 24 and Appendix 4). Although it is at noise level the response is sufficiently unusual to warrant further attention. The cross-over occurs on channels 5 to 3 at 10550E with an apparent reversal in polarity on channel 2 (due to migration of the decaying induced current?). Loop 8 was laid and lines surveyed in the opposite direction on the assumption that poor EM coupling may have decreased the response from Loop 2. A similar anomaly is again apparent on line 8400N (Fig 25) but displaced to the east (cross-over at 10425E). This displacement is commonly apparent when surveying on either side of a deep source. The

contradiction however is that the anomalies themselves are not indicative of a deep source since the peak to trough distance is short (50-100 metres).

The UTEM anomaly occurs in the vicinity of IP, gravity and geochem anomalies which themselves are not exactly coincident. The IP anomaly (high chargeability and high resistivity) was drilled by Billiton in 1981 (Fig 26) with drill hole CD-1. Tuffs were intersected with a 15m thick sheared, chloritic, schist zone at 130 metres depth. The chargeability anomaly was explained by disseminated magnetite in the tuffs after IP logging of the hole. No source was found for the adjacent gravity anomaly.

The magnetic field is active on line 8400N (Fig 24) but there is no discrete magnetic anomaly associated with the UTEM anomaly.

Geological mapping and geochemical sampling is warranted along this line before making any decision on further drilling. At present the geophysical anomalies do not correlate in such a way as to indicate a discrete massive sulphide source at this location.

7.3.4 Auger Sampling

A total of 106 C horizon hand auger samples were collected from the vicinity of the two identified anomalies. Samples were analysed for Cu Pb Zn Ag As Ba Au (see Appendix 5).

The following lines were sampled.

Loop 2	8400N	10100E - 10700E	25 samples
Anomaly	8800N	10200E - 10800E	25 samples
	9200N	10300E - 10600E	13 samples
	10000N	11550E - 11750E	9 samples
	10200N	11500E - 11700E	9 samples
	10400N	11450E - 11650E	8 samples
	10600N	11350E - 11550E	8 samples
	10800N	11200E - 11400E	9 samples

Generally only background geochemical values were returned with maxima of 410ppm Pb 455ppm Zn 0.02ppm Au. No consistent geochemical zonation was noted at either anomaly position.

7.3.5 Diamond Drilling

Diamond drill hole LND 90-1 was sited to test the source of the UTEM anomaly on line 10200N (see Figure 27). An attempt was made to geologically map the area in detail but outcrop was exceedingly poor. The anomaly position appears to coincide with the contact between a sequence of fine grained volcaniclastics and coarse epiclastics and is also coincident with a marked drain-

age. At the time of mapping it was considered that this observation may reflect a possible fault zone at the contact of the two units.

Details of the drill hole are as follows:

Collar : 10200N 11666E
Inclination: -55°
Azimuth : 220°
Depth : 196m

Log:

0- 6	Rock Roller
6- 13.2	Weathered massive epiclastic sandstone
13.2- 57.3	Pebble-cobble volcaniclastic conglomerate
57.3-104.2	Sericitic coarse epiclastic
104.2-114.0	Fine sericitic vitric ash and siltstone
114.0-118.1	Laminated black shale and vitric ash
118.1-159.6	Fine sericitic chlorite spotted crystal tuff
159.6-160.3	Laminated graphitic black shale
160.3-166.7	Fine sericitic ash, puggy and broken
166.7-170.5	Coarse sericitic ash, strongly broken
170.5-175.6	Fine sericitic ash, strongly broken
175.6-177.4	Massive chloritic volcaniclastic with trace blebs of pyrite + ?sphalerite
177.4-180.8	Fine chloritic ash, puggy
180.8-195.5	Sericitic epiclastic, strongly broken

EOH

A detailed geological log is presented in Appendix 6 while figure 28 shows the drill section at line 10200N.

The drill hole basically confirmed the surface mapping interpretation in that a wide zone of strongly broken core was intersected at the contact zone of coarser epiclastics and fine volcaniclastics.

Split core and chip sampling of LND 90-1 was carried out selectively over intervals considered to be altered and/or weakly mineralized. Base and precious metal assays are decidedly non anomalous except for one interval (13.2-15.0m: 1.8m @ 0.23% Zn, 3ppm Ag).

7.3.6 Down Hole EM

The visual source of the EM anomaly appears to be the broad zone of puggy broken core from 159.6 to EOH and down hole EM was carried out to confirm this.

Hole LND 90-1 was surveyed using transmitter loops (100 x 100m) either side (N-S) of the collar.

The results do not indicate any conductors of interest. (see Appendix 7). The mid-channels show a weak conductor at about 110m drill-depth on loop 2. This correlates with a logged black-shale unit and fits with the updip position of the weak UTEM conductor.

The shear zone at the base of the hole does not appear to be conductive.

The hole was surveyed with the probe going down (A1, A2) for both transmitter loops, and then up the hole (B1,B2). Repeatability at late channels is not very good, but this should not have prevented the recognition of any significant anomalies.

9.0 CONCLUSIONS

At the Native Track Tier prospect, geological mapping has suggested that the paleo environment during the Cambrian was dominated by high energy irregular sedimentation from a distal volcanic source. Mass debris flows and fine volcanic ash were interspersed with fine silty sediments and minor reduced shales. Acid to intermediate subvolcanic intrusives (or lavas) are a reflection of this instability and may have been intruded as thin sills. Widespread regional low grade alteration (sericite, carbonate) is typical of the Loongana licence area and is not considered indicative of a high temperature VMS producing hydrothermal system. Rather it is interpreted that the alteration is local and in part related to the intrusive activity.

Geophysical surveying over the gridded area located two UTEM responses of which one was drilled and apparently sourced by a fault zone containing thin graphitic conductive interbeds. No significant mineralization was recorded in this drill hole.

It is concluded that the potential for volcanogenic style base metal mineralization within the Native Track Tier prospect is low.

9.0 EXPLORATION PHILOSOPHY SUMMARY

Exploration licence 36/79 has been explored intermittently by both Shell and CRA for 10 years in the search for volcanogenic base metal mineralization. During this time a variety of geochemical and geophysical techniques have been employed but only five drill holes have tested identified targets. The area was primarily attractive because of three prospects identified by Geopeko during the late 1970's (Challenger 1, 2, 3) as a result of regional stream sediment survey. These projects became known as Cattley North, Native Track Tier and Two Hummocks, respectively.

At Cattley North geochemically base metal anomalous shales were recorded within a sequence of fine volcaniclastic detritus, siltstones and minor quartz porphyries. Mineralization is interpreted to be local only and concentrated at the contacts between the porphyries and sediments. Alteration is not intense and only minor lava sequences are apparent. All in all, the distal nature of the volcano-sedimentary sequence, lack of alteration, absence of bi modal volcanism and localized nature of the weak mineralization are interpreted as indicating a low potential for significant volcanogenic base metal mineralization.

The Two Hummocks prospect is interesting geologically for several reasons:

- intense sericite (+ silica + carbonate) alteration
- hiatus in volcanism recognized
- presence of remobilized barite veins and minor disseminated galena.

The window of Cambrian here ia quite small being masked by Tertiary basalt cover to the south and south east and Ordovician cover to the north. However, there was sufficient geological interest to warrant exploration beneath this cover at least locally. EM surveying was carried out to identify specific conductors at or near the volcanic hiatus (marked by a black shale horizon) both within the Cambrian window and along strike under cover. Although the black shale horizon was identified it was considered that the EM responses were lithological only and not indicative of significant massive sulphide mineralization. Nevertheless, the horizon has not been drill tested and still remains a prospective target on geological grounds. (NB There is little geochemical anomalism in the area apart from trace galena observed in the black shale).

The Native Track Tier prospect has been discussed at length in this report and no further mention is deemed necessary

The remaining tenement block, High Tor, has had virtually no exploration carried out within the window of Cambrian volcanics. The Mines Department record the presence of both lavas and volcaniclastic sequences with strong silicification noted. The prospectivity of this window remains virtually untested.

10.0 RECOMMENDATIONS

The natural expiry date of EL 36/79 is 1st May 1990 and it is recommeded that the licence be allowed to terminate without application for extension of tenure. It has been concluded in this report that several possibilities for future exploration are apparent. However, it is also concluded that the opportunity for successfully locating a significant body of mineralization does not match the risk of continued exploration.

Further exploration is therefore not recommended.

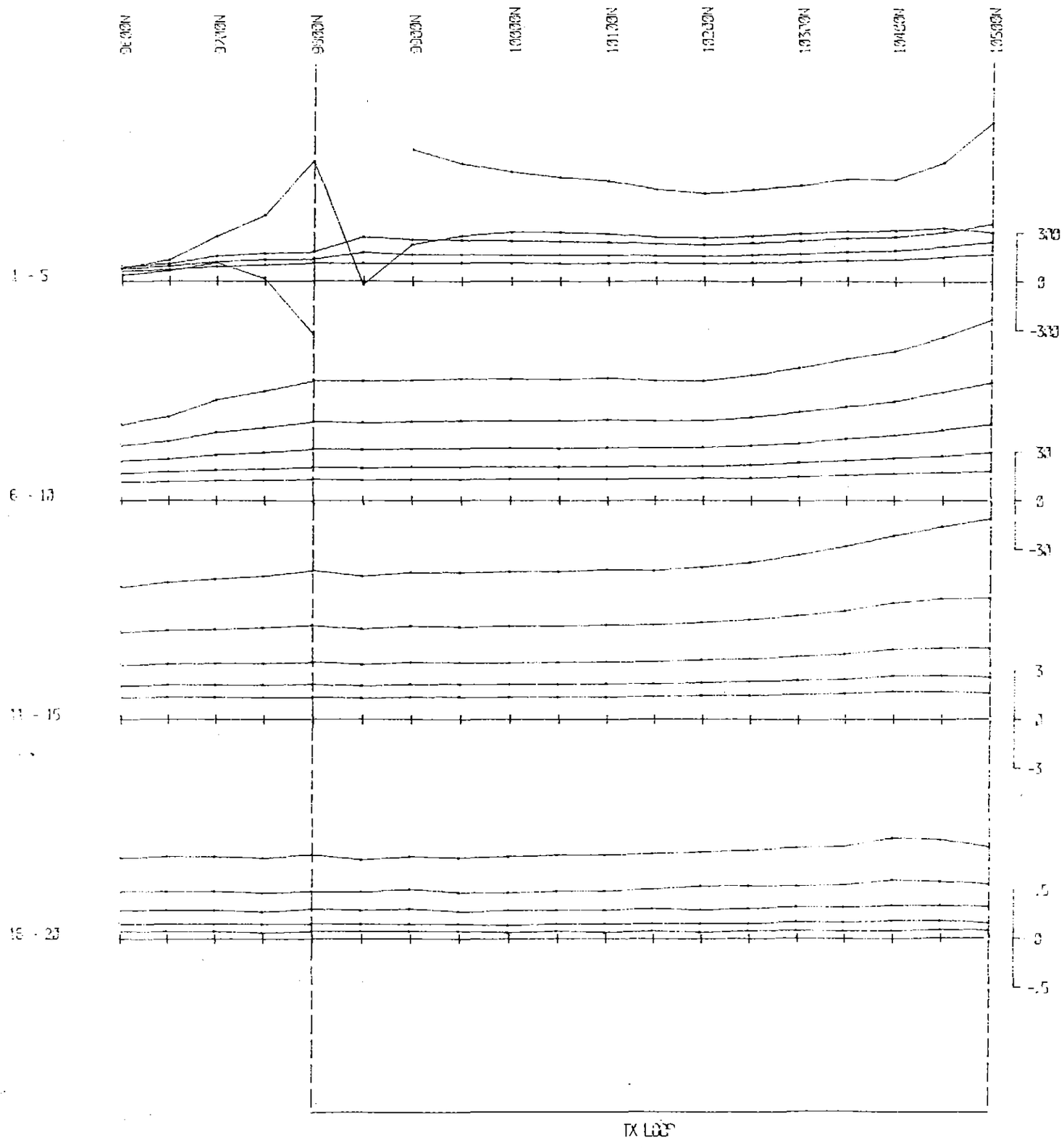
APPENDIX 1

TWO HUMMOCKS

Loop 4 EM 37 results lines 9200E, 9400E
Loop 1 EM 37 results lines 10600E, 10800E, 11000E

493030
031

VERTICAL COMPONENT B (Z)



nanovolts per amp metre squared

EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)

5 cm

TX LOOP SIDES	:	09600N 096000E
	:	13500N 096000E
TX LOOP SIZE	:	700 m X 600 m
TX TURN OFF TIME	:	250 micro-secs.
FIRST GATE TIME	:	88.5 micro-secs.
CURRENT	:	8.50 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	
HORIZONTAL SCALE	:	1:5000
SURVEYED BY	:	GMRL
DATE	:	21/08/1988

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. A-134

CLIENT : BILLITON AUSTRALIA

PROJECT : TWO-HUMMOCKS

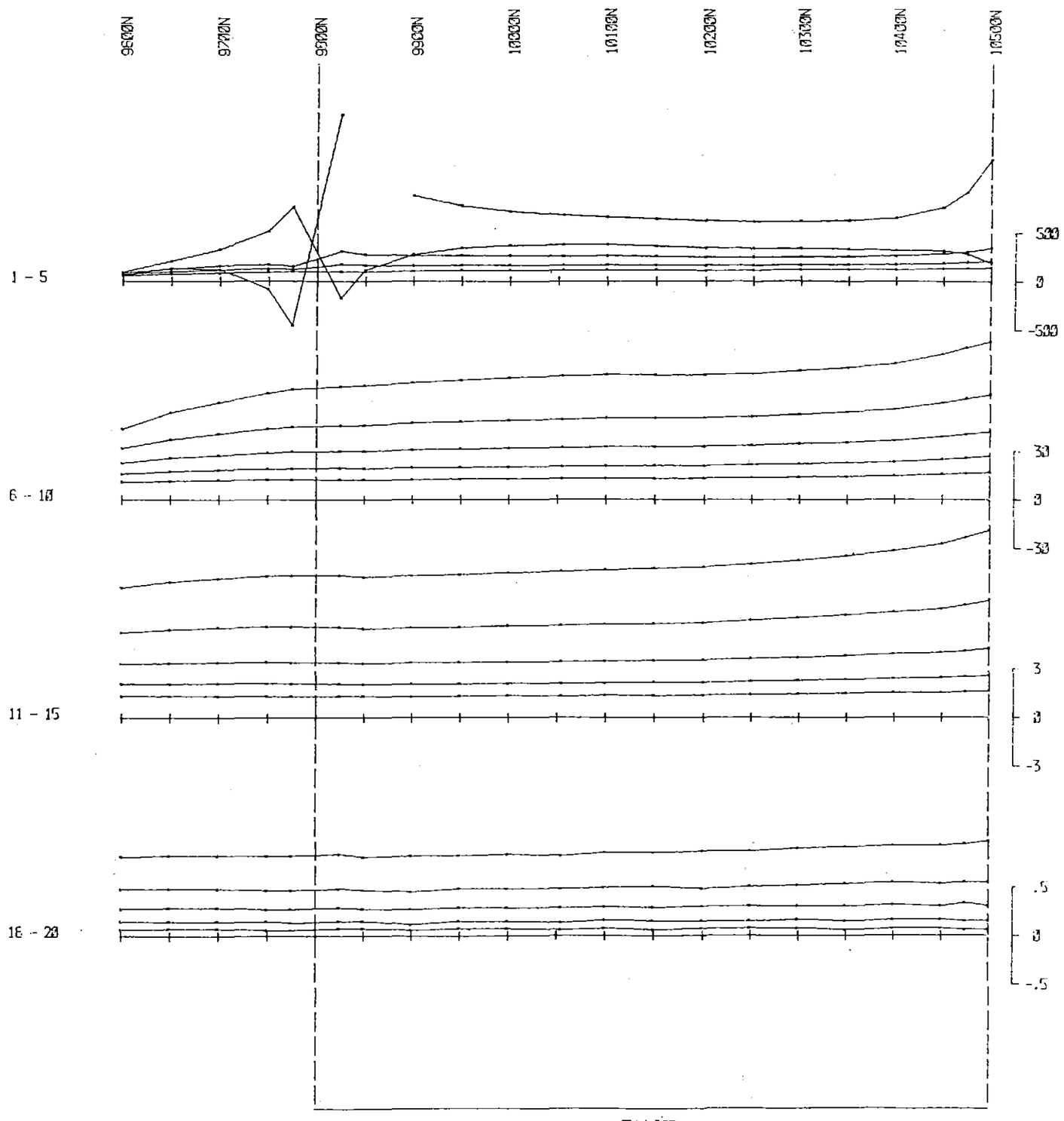
AREA : ~~CENTRAL BLOCKS~~

LINE : 09200E Z

TX LOOP : TH4

032

VERTICAL COMPONENT B (Z)



nanovolts per amp metre squared

493031

EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)

5 cm

TX LOOP SIDES	:	09600N 09000E
	:	10500N 09600E
TX LOOP SIZE	:	700 m X 600 m
TX TURN OFF TIME	:	250 microsecs.
FIRST GATE TIME	:	88.5 microsecs.
CURRENT	:	9.90 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	
HORIZONTAL SCALE	:	1:5000
SURVEYED BY	:	SMRL
DATE	:	21/06/1989

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD. | PROJECT NO. 4-104

CLIENT	:	BILLITON AUSTRALIA
PROJECT	:	TWO-HUMMOCKS
AREA	:	~~GEOTEM EL33/85~~
LINE	:	09400E Z
TX LOOP	:	TX4

033

493032

RESPONSE (uV/A)

100000.
10000.
1000.
100.
10.
1.
0.
-1.
-10.
-100.
-1000.
-10000.
-100000.

10000. 10100. 10200. 10300. 10400. 10500. 10600. 10700. 10800. 10900. 11000. 11100. 11200. 11300. 11400.

NORTHING (m)

TRANSIENT EM PROFILE

Line: 10600E

PEBLE TEM file details

Loop config. = TURAM
Device type = EM-37
Rx Component = Z
Ramp turn-off = 0.3 ms
Tx size = 800.m x 800.m
Tx loop rotn. = 0 deg
Tx loop orig. = 10400., 9200.
Eff. Rx area = 5208. sq.m

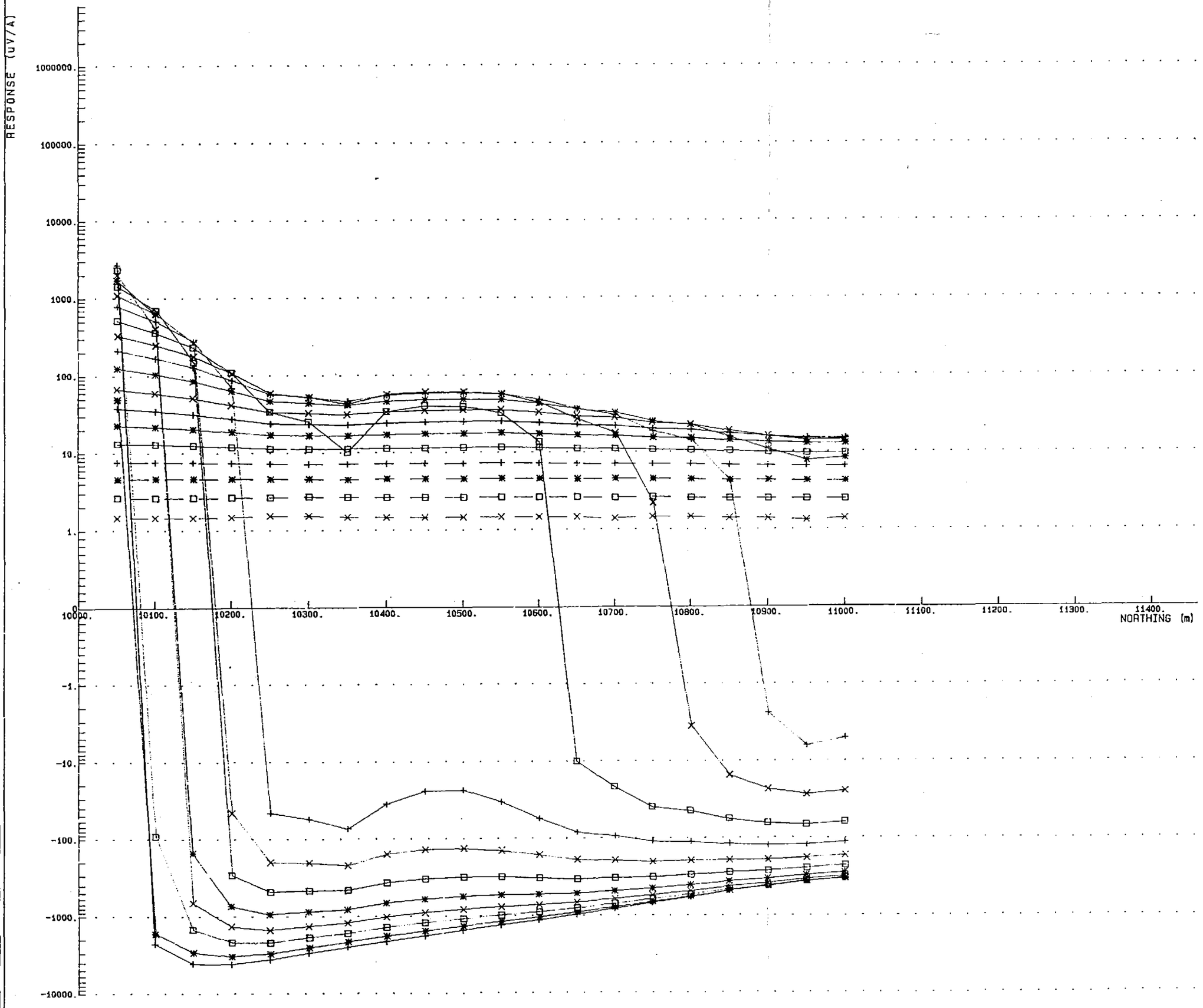
Legend

Channel 1: 0.3885ms
Channel 2: 0.4080ms
Channel 3: 0.4400ms
Channel 4: 0.4770ms
Channel 5: 0.5200ms
Channel 6: 0.5800ms
Channel 7: 0.6550ms
Channel 8: 0.7430ms
Channel 9: 0.8630ms
Channel 10: 1.0120ms
Channel 11: 1.1760ms
Channel 12: 1.3870ms
Channel 13: 1.7000ms
Channel 14: 2.0720ms
Channel 15: 2.5100ms
Channel 16: 3.1200ms
Channel 17: 3.8700ms
Channel 18: 4.7600ms
Channel 19: 5.9670ms
Channel 20: 7.4600ms

BILLITON AUSTRALIA

LOONGANA, TAS
TWO HUMMOCKS
LINE 10600E
EM-37, Z COMP

FIG.NO:	REPT.NO:
ENCL.NO:	DRG.NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:



TRANSIENT EM PROFILE

Line: 10800E

PEBLE TEM file details

Loop config. = TURAM
Device type = EM-37
Rx Component = Z
Ramp turn-off = 0.3 ms
Tx size = 800.m x 800.m
Tx loop rotn. = 0 deg
Tx loop orig. = 10400., 9200.
Eff. Rx area = 5208. sq.m

Legend

Channel 1: 0.3885ms
Channel 2: 0.4090ms
Channel 3: 0.4400ms
Channel 4: 0.4770ms
Channel 5: 0.5200ms
Channel 6: 0.5800ms
Channel 7: 0.6550ms
Channel 8: 0.7430ms
Channel 9: 0.8630ms
Channel 10: 1.0120ms
Channel 11: 1.1760ms
Channel 12: 1.3670ms
Channel 13: 1.7000ms
Channel 14: 2.0720ms
Channel 15: 2.5100ms
Channel 16: 3.1200ms
Channel 17: 3.8700ms
Channel 18: 4.7600ms
Channel 19: 5.9670ms
Channel 20: 7.4600ms

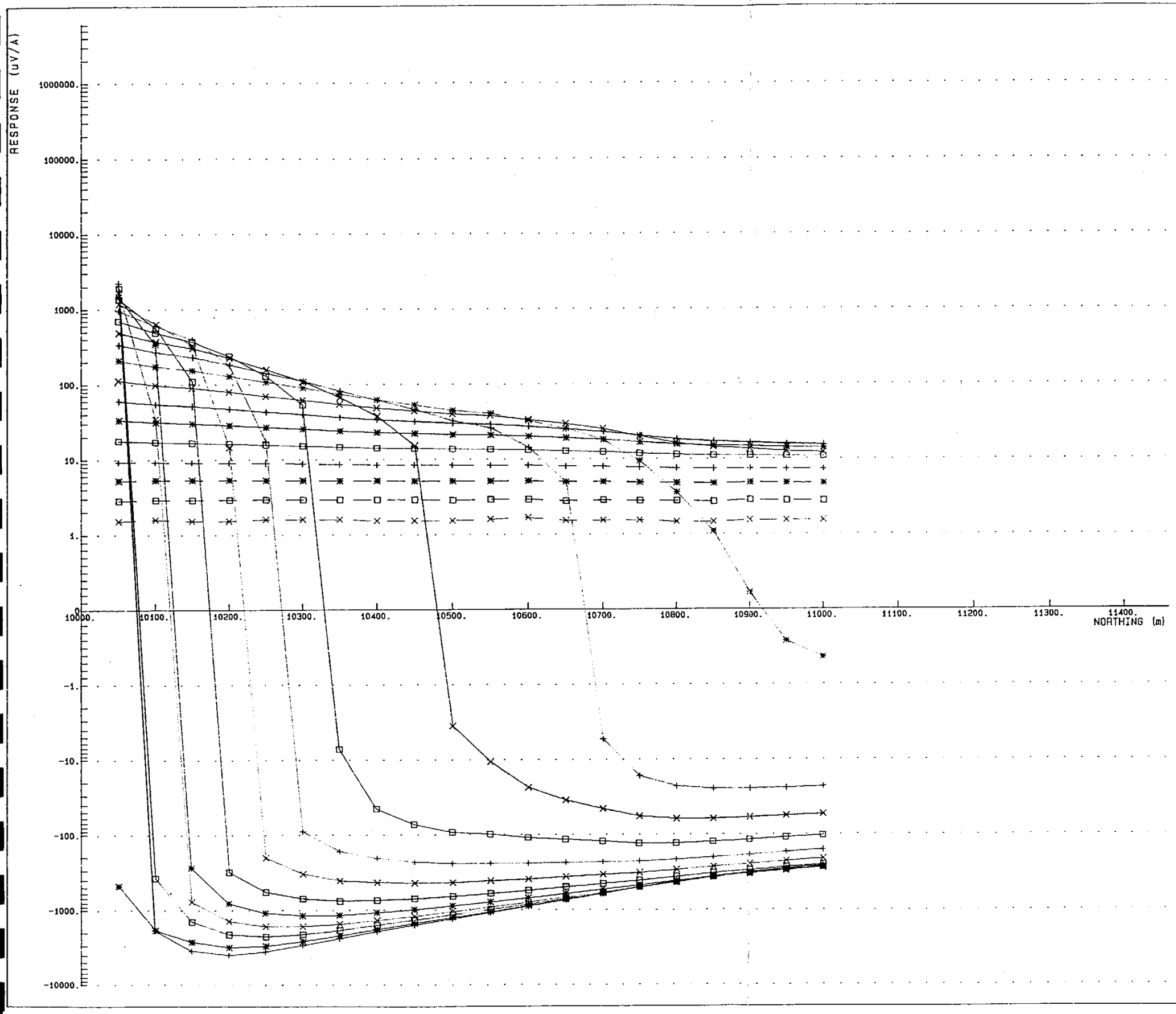
BILLITON AUSTRALIA

LOONGANA, TAS
TWO HUMMOCKS
LINE 10800E
EM-37, Z COMP

FIG.NO:	REPT.NO:
ENCL.NO:	DRG.NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:

9427

493034



TRANSIENT EM PROFILE

Line: 11000E

PEBLE TEM file details

Loop config. = TURAM
Device type = EM-37
Rx Component = Z
Ramp turn-off = 0.3 ms
Tx size = 800.m x 800.m
Tx loop rotn. = 0 deg
Tx loop orig. = 10400., 9200.
Eff. Rx area = 5208. sq.m

Legend

Channel 1: 0.3885ms
Channel 2: 0.4090ms
Channel 3: 0.4400ms
Channel 4: 0.4770ms
Channel 5: 0.5200ms
Channel 6: 0.5800ms
Channel 7: 0.6550ms
Channel 8: 0.7430ms
Channel 9: 0.8630ms
Channel 10: 1.0120ms
Channel 11: 1.1760ms
Channel 12: 1.3870ms
Channel 13: 1.7000ms
Channel 14: 2.0720ms
Channel 15: 2.5100ms
Channel 16: 3.1200ms
Channel 17: 3.8700ms
Channel 18: 4.7600ms
Channel 19: 5.9670ms
Channel 20: 7.4600ms

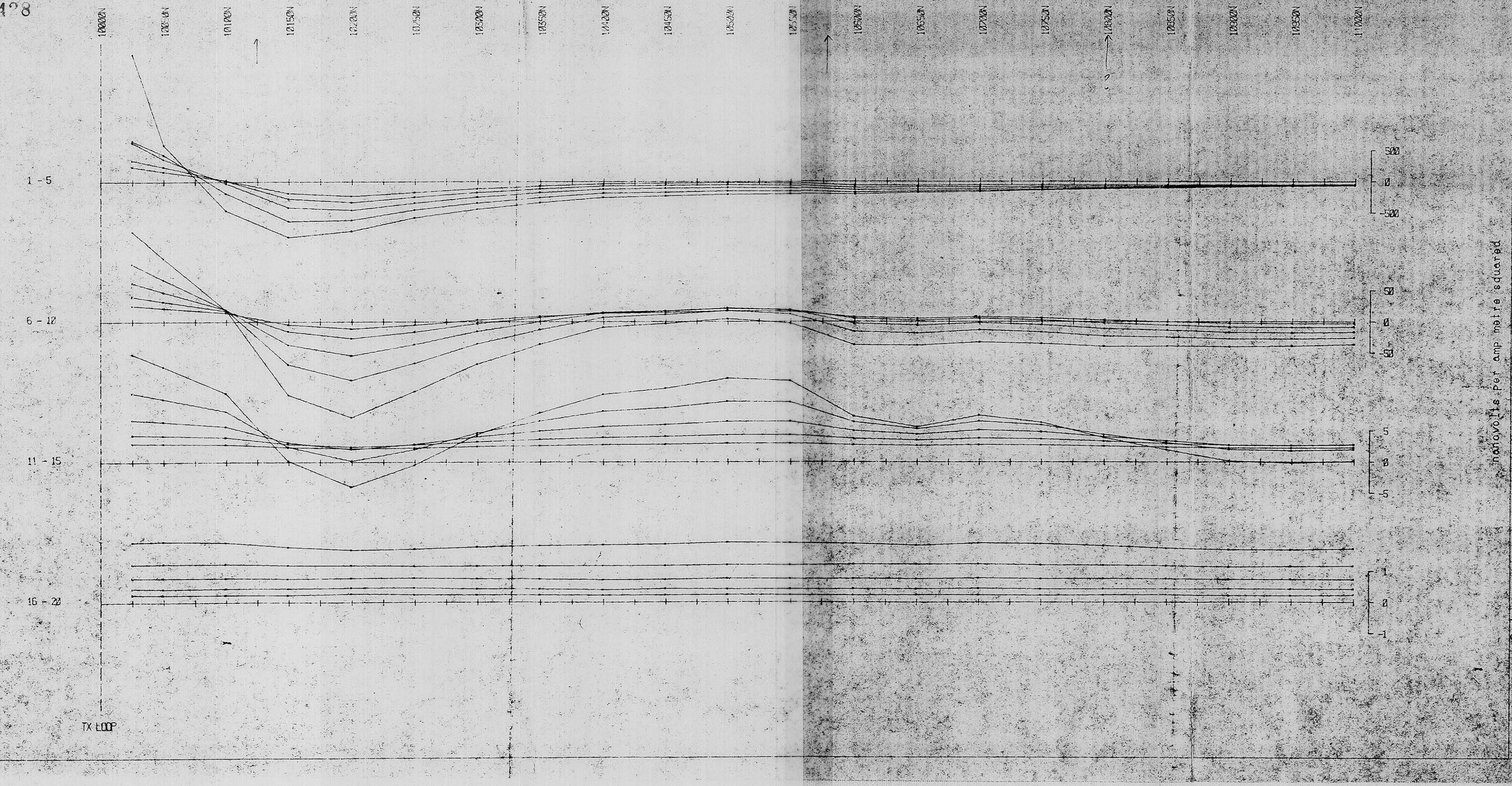
BILLITON AUSTRALIA

LOONGANA, TAS
TWO HUMMOCKS
LINE 11000E
EM37, Z COMP

FIG.NO:	REPT.NO:
ENCL.NO:	DRG.NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:

9428

VERTICAL COMPONENT - B (Z)



Nanovolts Per Amp Metre Squared

EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)

5 cm

TX LOOP SIDES	: 8S200N 10400E
	10000N 11200E
TX LOOP SIZE	: 800 m X 800 m
TX TURN OFF TIME	: 300 microsecs.
FIRST GATE TIME	: 88.5 microsecs.
CURRENT	: 10.9 amps
FREQUENCY	: 25 Hz.
INTEGRATION TIME	: 1024 cycles
SYNC MODE	: CRYSTAL
HORIZONTAL SCALE	: 1:2500
SURVEYED BY	: SMDA
DATE	: 21/04/1983

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-128

CLIENT : BILLITON AUSTRALIA

PROJECT : TWO HUMMOCKS

AREA : LOONGANA, TASMANIA

LINE : 10600E Z

TX LOOP

493035

9439

EM-37
FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)

15 - 20 | 11 - 15 | 6 - 10 | 1 - 5

TX LOOP

10000N
10050N
10100N
10150N
10200N
10250N
10300N
10350N
10400N
10450N
10500N
10550N
10600N
10650N
10700N
10750N
10800N
10850N
10900N
10950N
11000N

-1 | 0 | 1
-20 | 0 | 20
-100 | 0 | 100
-200 | 0 | 200

nanovolts per amp metre squared

5 cm

TX LOOP SIDES	: 39200N 10400E
	: 10000N 11200E
TX LOOP SIZE	: 800 m X 800 m
TX TURN OFF TIME	: 300 microsecs.
FIRST GATE TIME	: 88.5 microsecs.
CURRENT	: 10.9 amps
FREQUENCY	: 25 Hz.
INTEGRATION TIME	: 1024 cycles
SYNC MODE	:
HORIZONTAL SCALE	: 1:2500
SURVEYED BY	: SMDA
DATE	: 21/04/1989

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

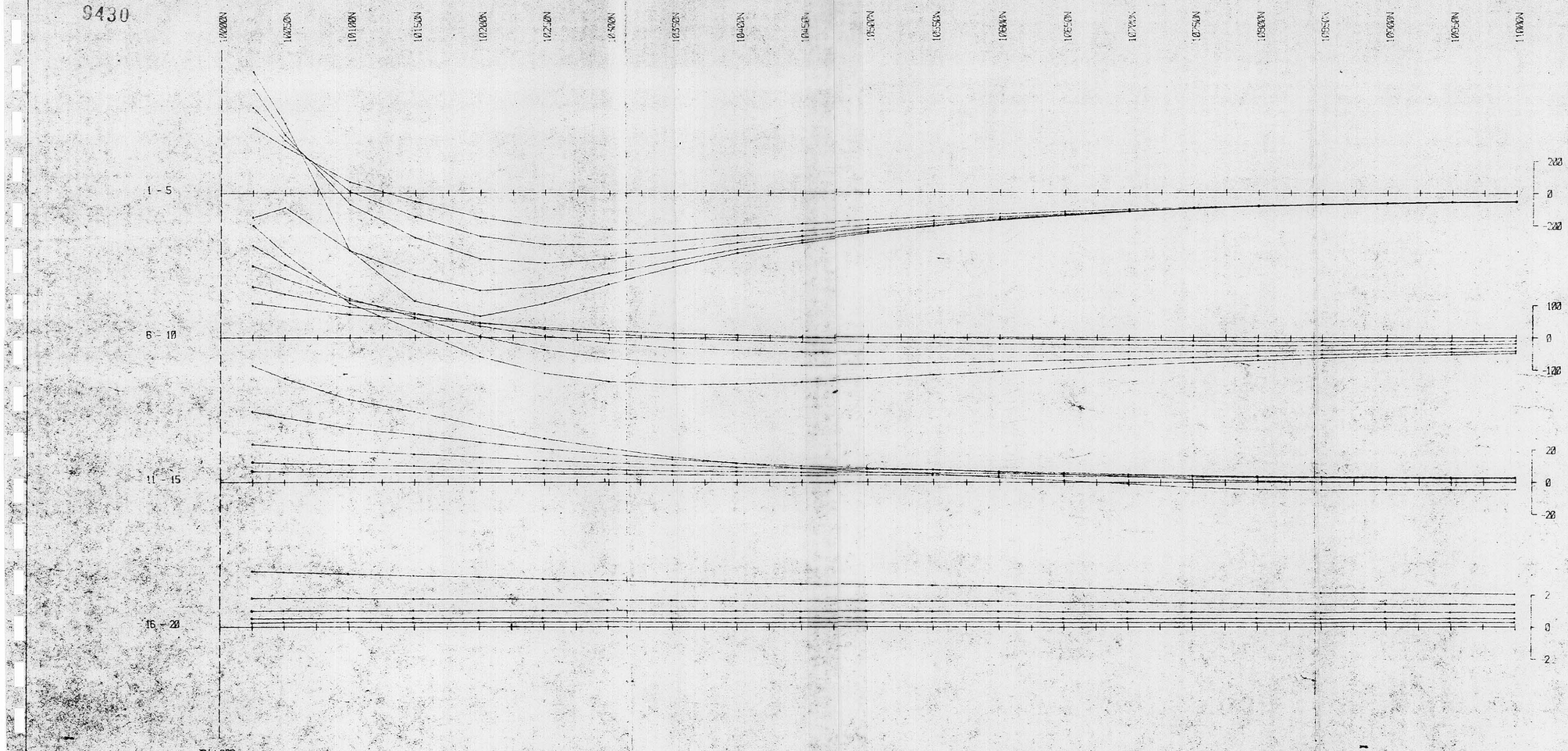
PROJECT NO. 4-108

CLIENT	: BILLITON AUSTRALIA
PROJECT	: TWO HUMMOCKS
AREA	: LOONGANA TASMANIA
LINE	: 10800E Z
TX LOOP	: 1

49036

9430

VERTICAL COMPONENT B (Z)



EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)

5 cm

TX LOOP SIDES	:	09200N 10400E
	:	10000N 11200E
TX LOOP SIZE	:	800 m X 800 m
TX TURN OFF TIME	:	500 microsecs.
FIRST GATE TIME	:	99.5 microsecs.
CURRENT	:	10.9 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	CRYSTAL
HORIZONTAL SCALE	:	1:2500
SURVEYED BY	:	SMDA
DATE	:	21/04/1989

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD. | PROJECT NO. 4-108

CLIENT	:	BILLITON AUSTRALIA
PROJECT	:	TWO HUMMOCKS
AREA	:	LOONGANA TASMANIA
LINE	:	11000E Z
TX LOOP	:	1

493037

APPENDIX 2

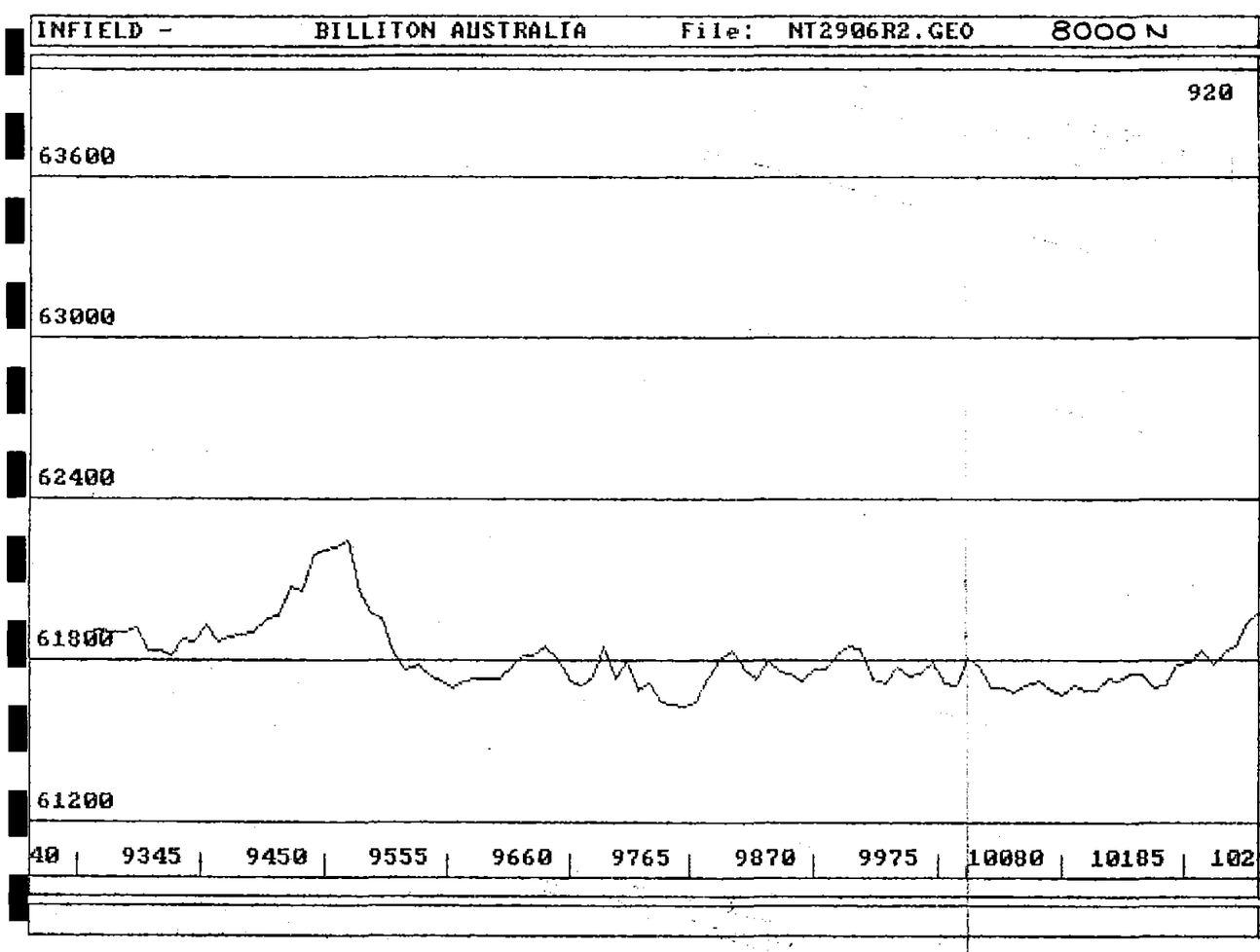
NATIVE TRACK TIER

Ground Magnetic Profiles (Field Plots)

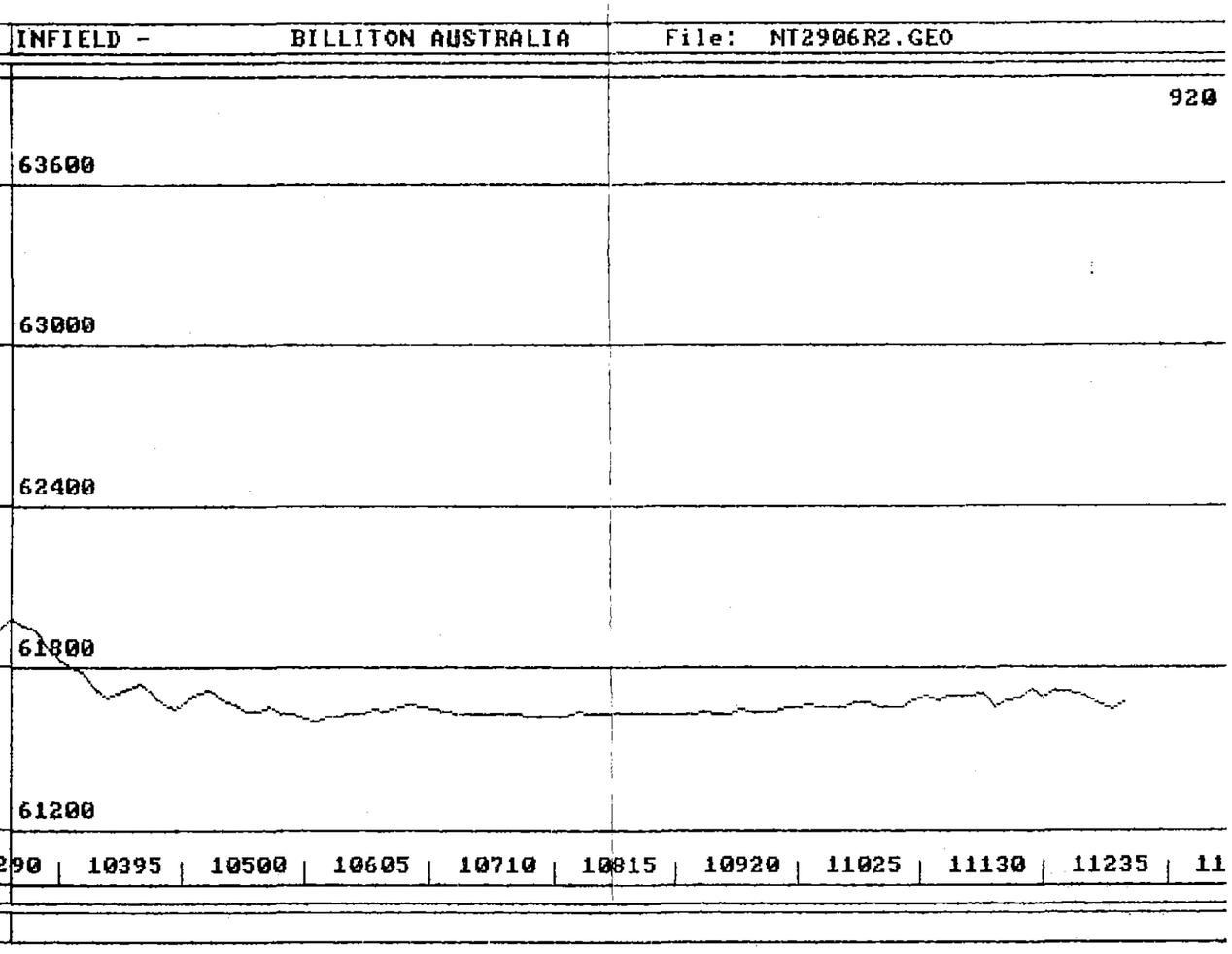
035

493039

INFIELD - BILLITON AUSTRALIA File: NT2906R2.GEO 8000 N



INFIELD - BILLITON AUSTRALIA File: NT2906R2.GEO

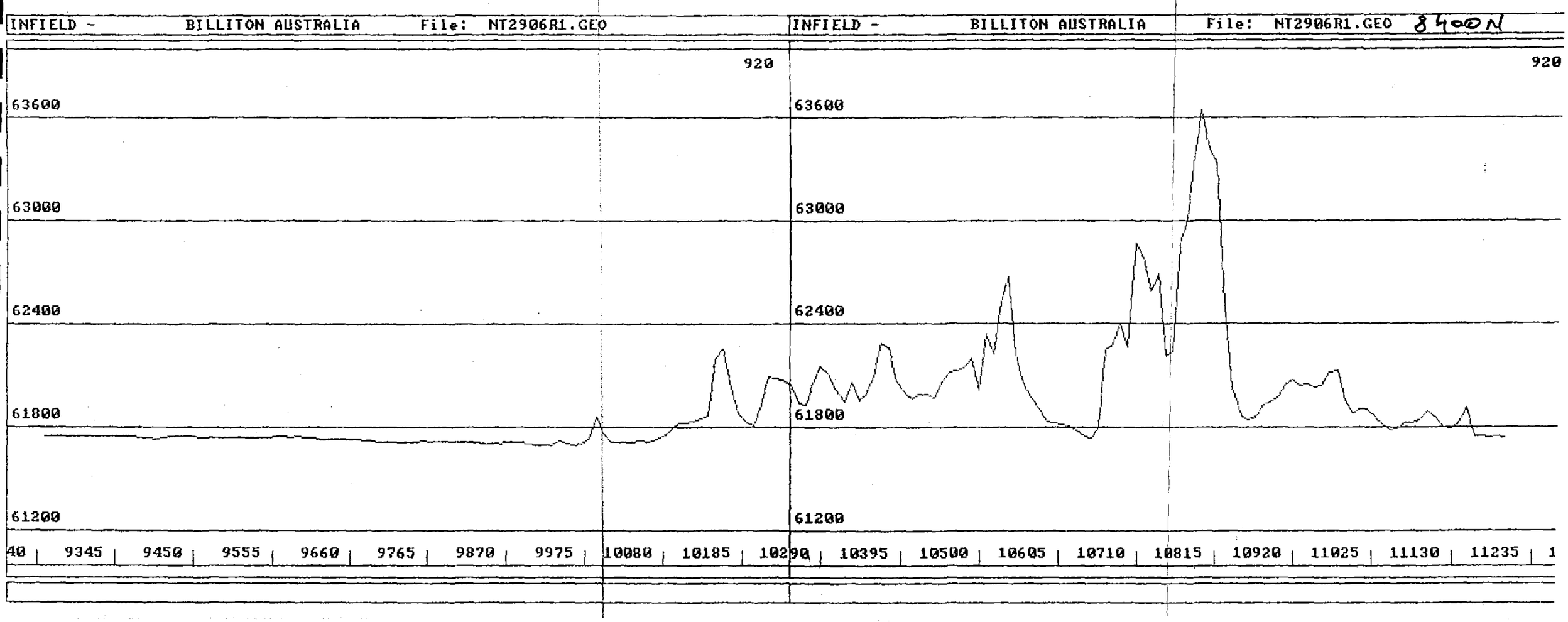


036

493040

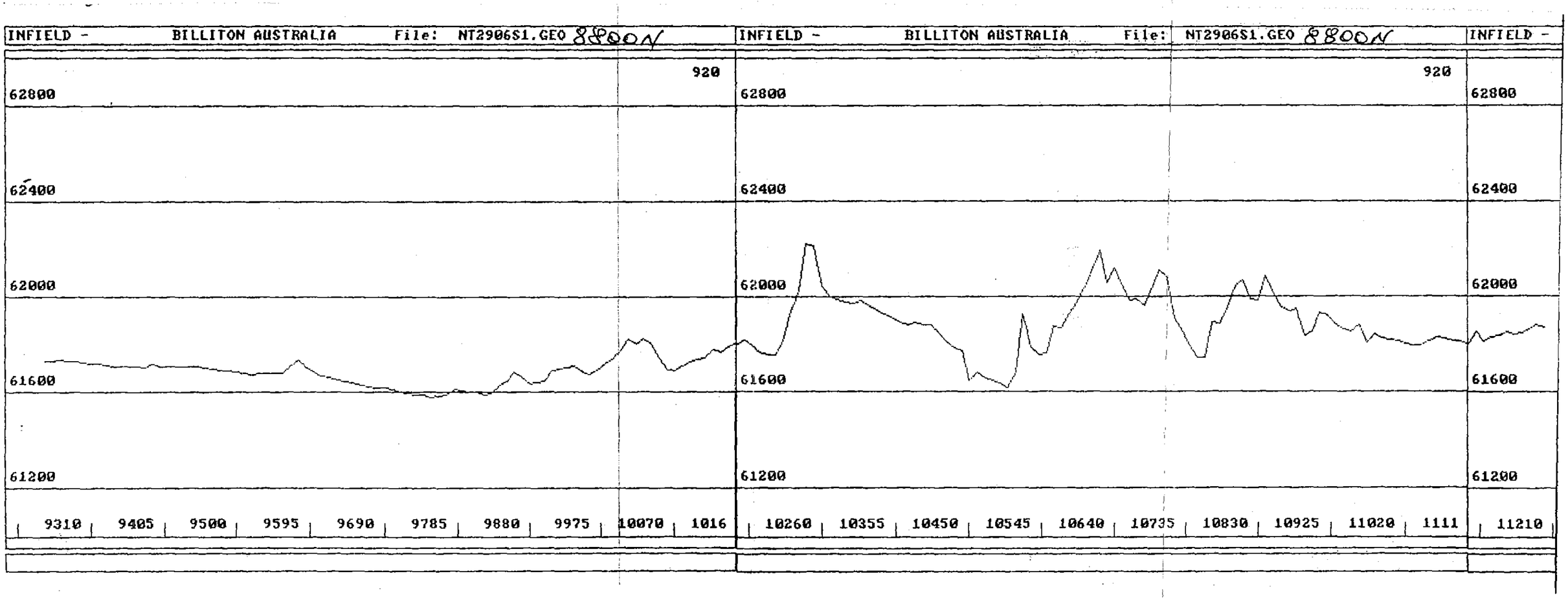
INFIELD - BILLITON AUSTRALIA File: NT2906R1.GEO

INFIELD - BILLITON AUSTRALIA File: NT2906R1.GEO 8400N



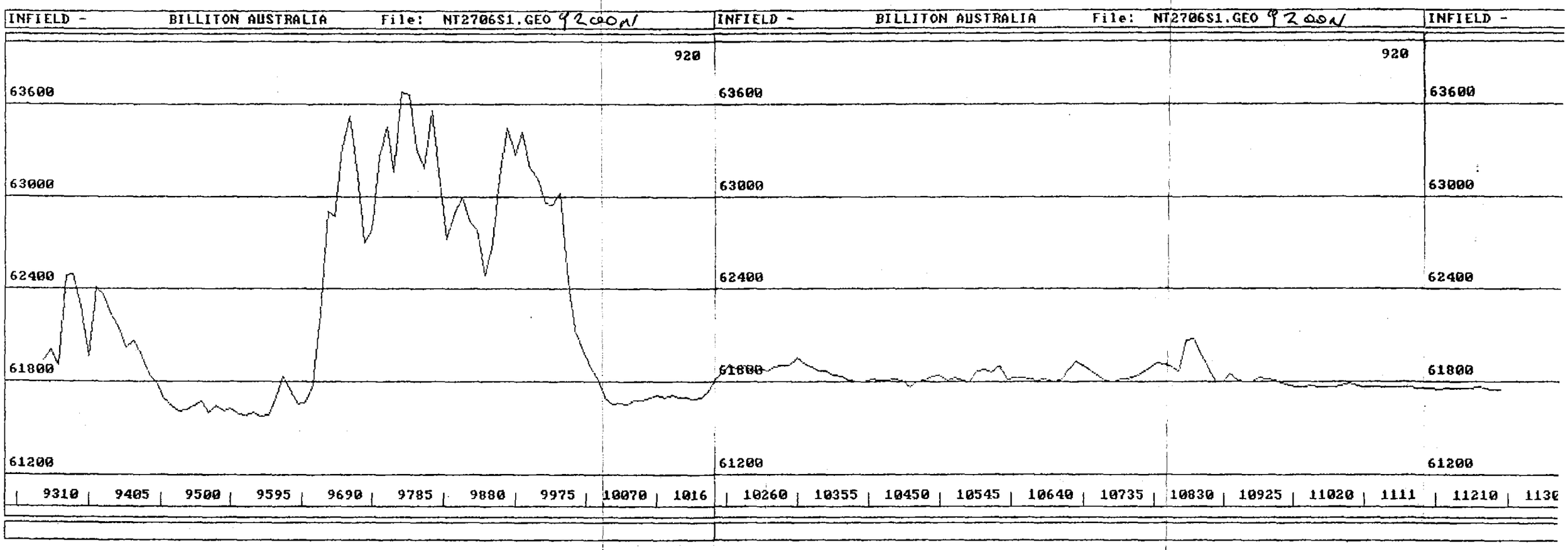
037

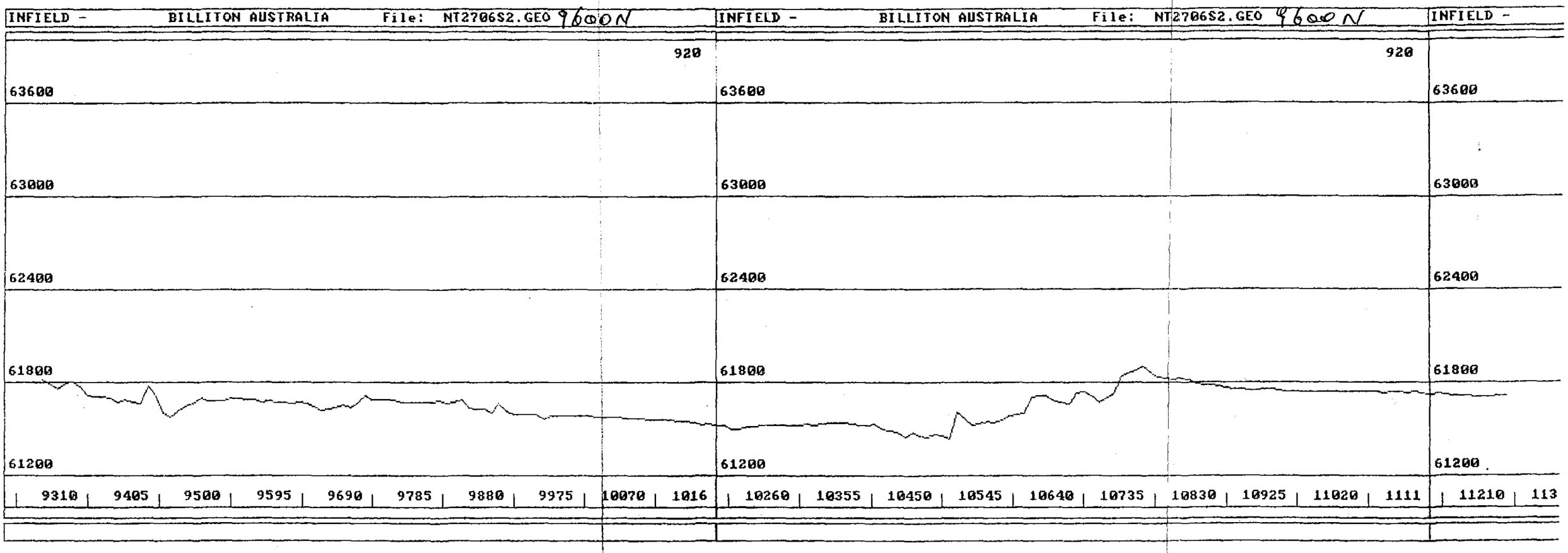
493041

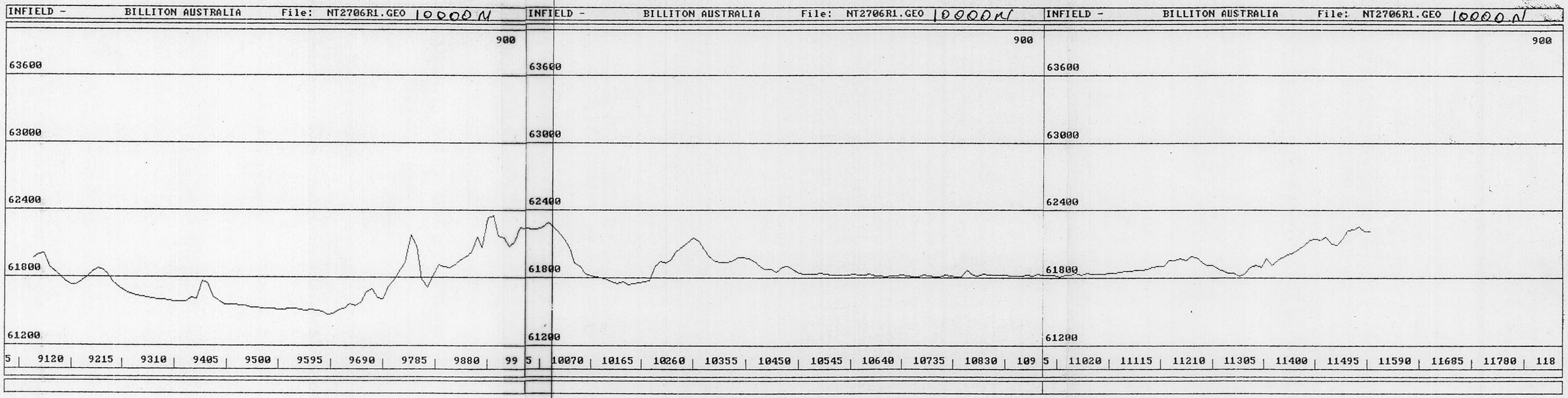

INFIELD - BILLITON AUSTRALIA File: NT2906S1.GEO 8800N
920
62800
62400
62000
61600
61200
9310
9405
9500
9595
9690
9785
9880
9975
10070
1016
INFIELD - BILLITON AUSTRALIA File: NT2906S1.GEO 8800N
920
62800
62400
62000
61600
61200
10260
10355
10450
10545
10640
10735
10830
10925
11020
1111
11210

9421

493042

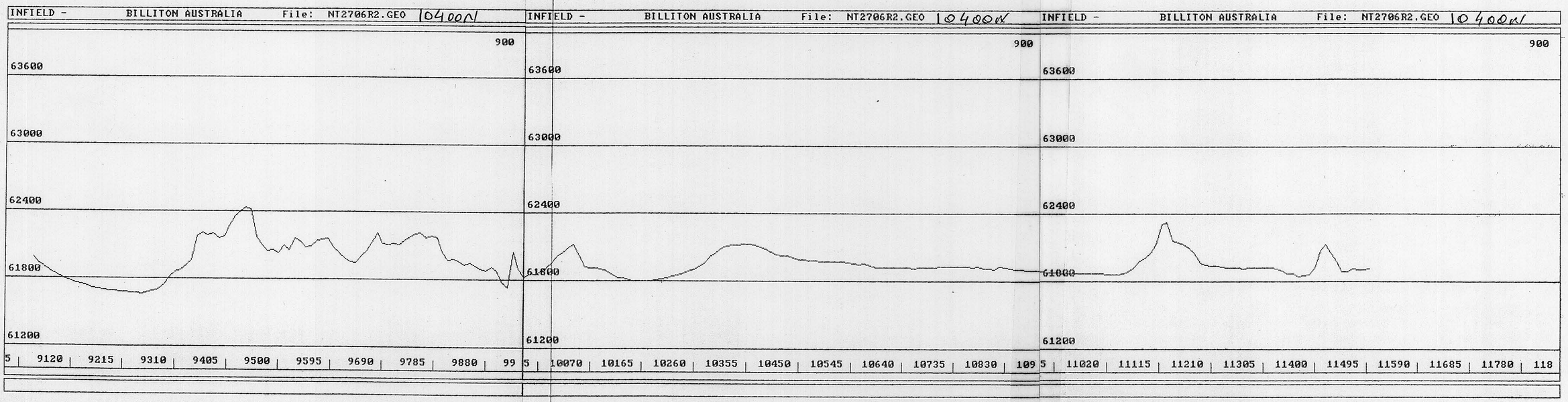

INFIELD - BILLITON AUSTRALIA File: NT2706S1.GEO 9200N
INFIELD - BILLITON AUSTRALIA File: NT2706S1.GEO 9200N
INFIELD -
920
63600
63000
62400
61800
61200
9310
9405
9500
9595
9690
9785
9880
9975
10070
1016
10260
10355
10450
10545
10640
10735
10830
10925
11020
1111
11210
1130


INFIELD - BILLITON AUSTRALIA File: NT2706S2.GEO 9600N
920
63600
63000
62400
61800
61200
9310 9405 9500 9595 9690 9785 9880 9975 10070 1016
INFIELD - BILLITON AUSTRALIA File: NT2706S2.GEO 9600N
920
63600
63000
62400
61800
61200
10260 10355 10450 10545 10640 10735 10830 10925 11020 1111
INFIELD -
63600
63000
62400
61800
61200
11210 113


INFIELD - BILLITON AUSTRALIA File: NT2706R1.GEO 10000N
900
63600
63000
62400
61800
61200
5 9120 9215 9310 9405 9500 9595 9690 9785 9880 99
INFIELD - BILLITON AUSTRALIA File: NT2706R1.GEO 10000N
900
63600
63000
62400
61800
61200
5 10070 10165 10260 10355 10450 10545 10640 10735 10830 109
INFIELD - BILLITON AUSTRALIA File: NT2706R1.GEO 10000N
900
63600
63000
62400
61800
61200
5 11020 11115 11210 11305 11400 11495 11590 11685 11780 118

9434

493045

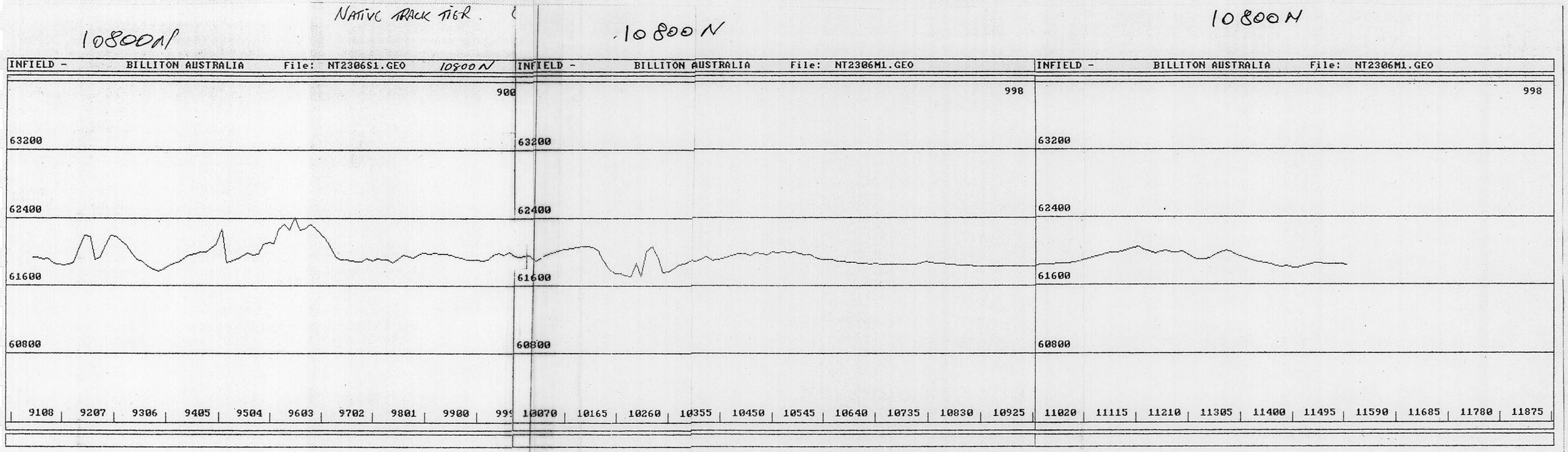

INFIELD - BILLITON AUSTRALIA File: NT2706R2.GEO 10400N
900
63600
63000
62400
61800
61200
9120 9215 9310 9405 9500 9595 9690 9785 9880
INFIELD - BILLITON AUSTRALIA File: NT2706R2.GEO 10400N
900
63600
63000
62400
61800
61200
10070 10165 10260 10355 10450 10545 10640 10735 10830
INFIELD - BILLITON AUSTRALIA File: NT2706R2.GEO 10400N
900
63600
63000
62400
61800
61200
11020 11115 11210 11305 11400 11495 11590 11685 11780

NATIVE TRACK TIGR.

10800N

10800N

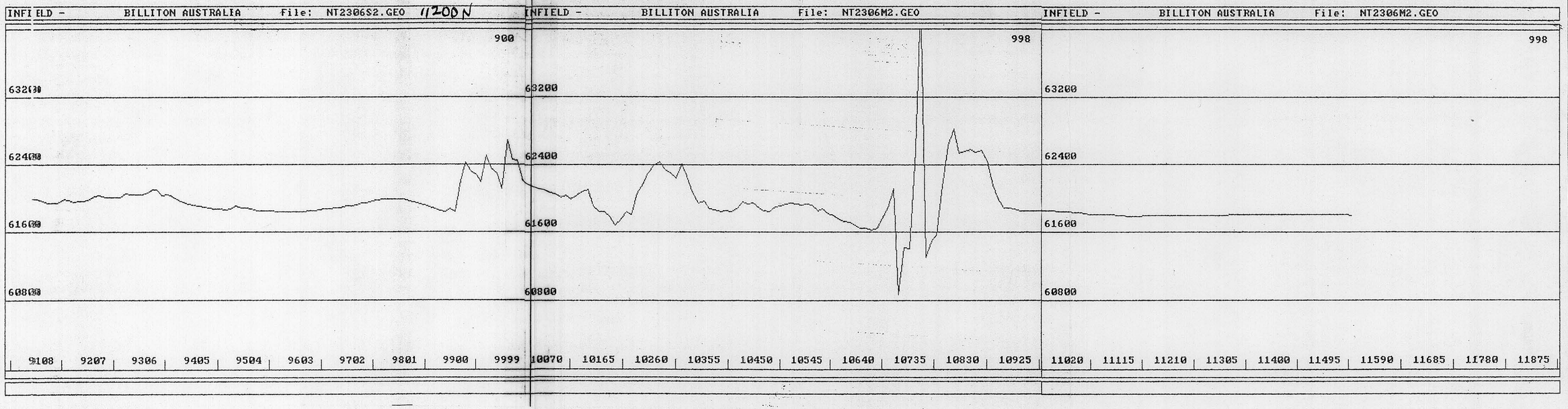
10800N



NATIVE TRACK TIER

11200N

11200N

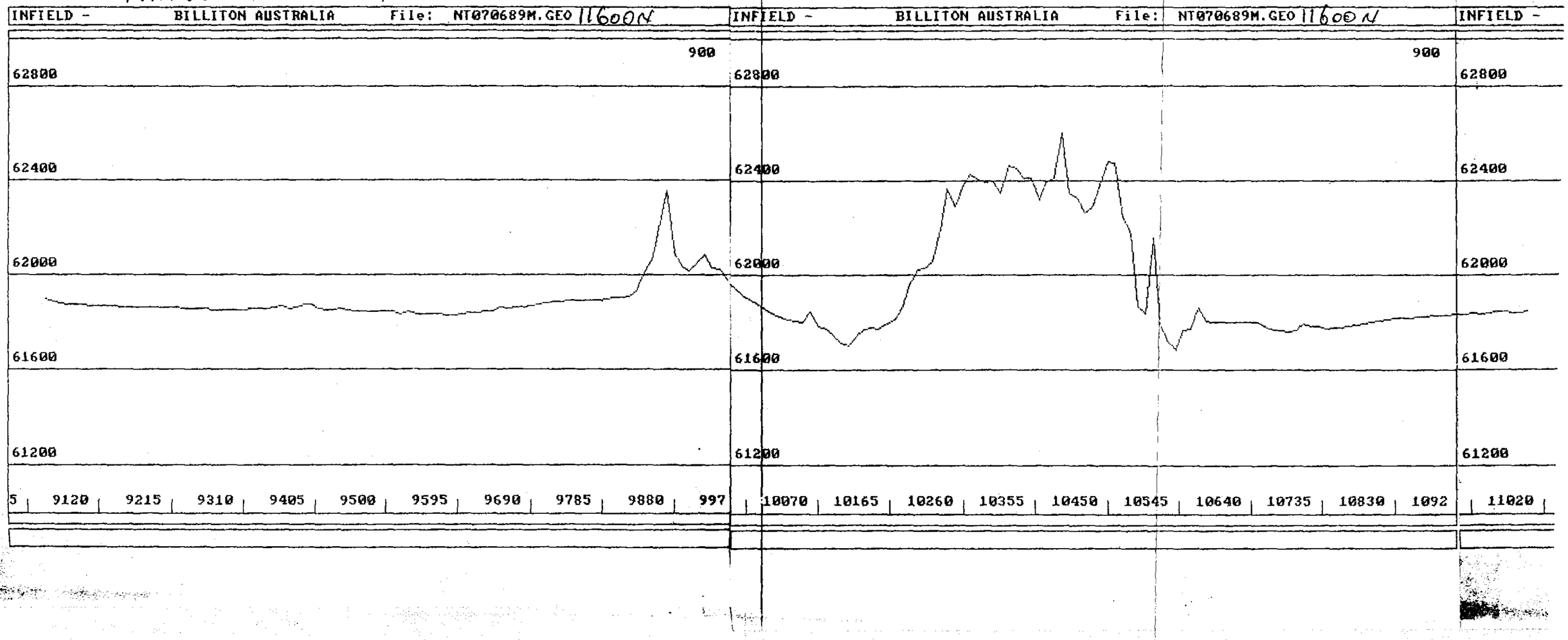


038

493048

NATIVE TRACK TIER

INFIELD - BILLITON AUSTRALIA File: NT070689M.GEO 11600N



030

493049

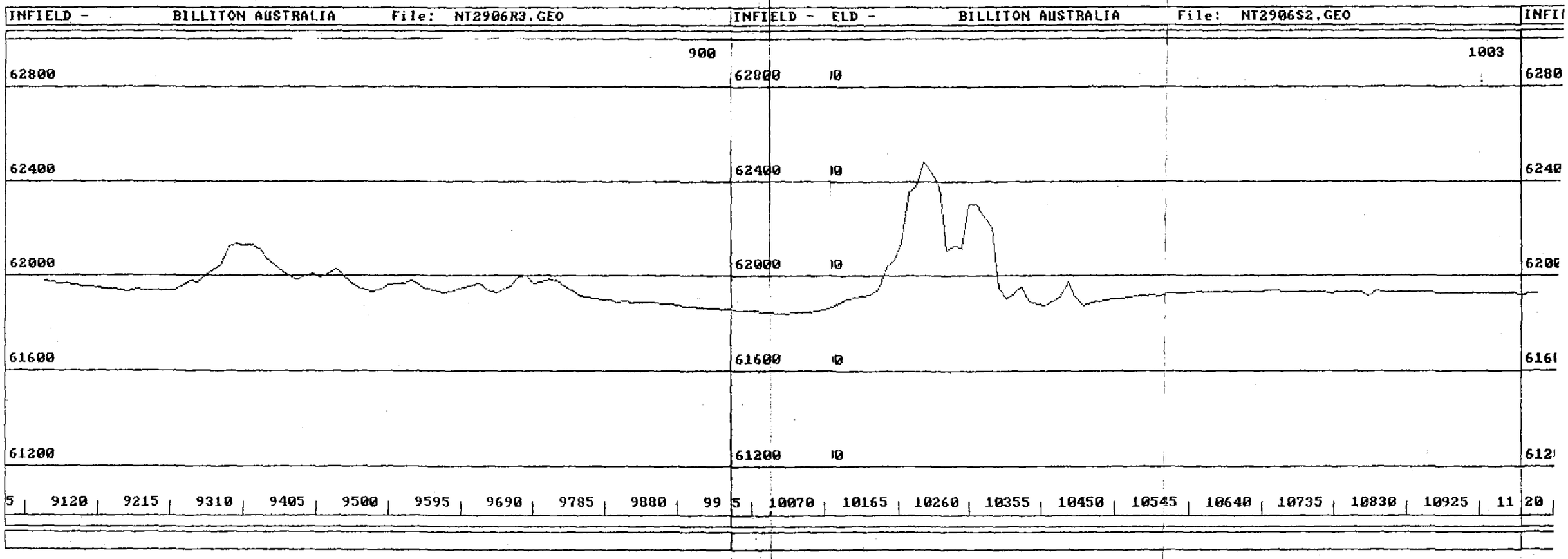
NATIVE TRACK TIGER

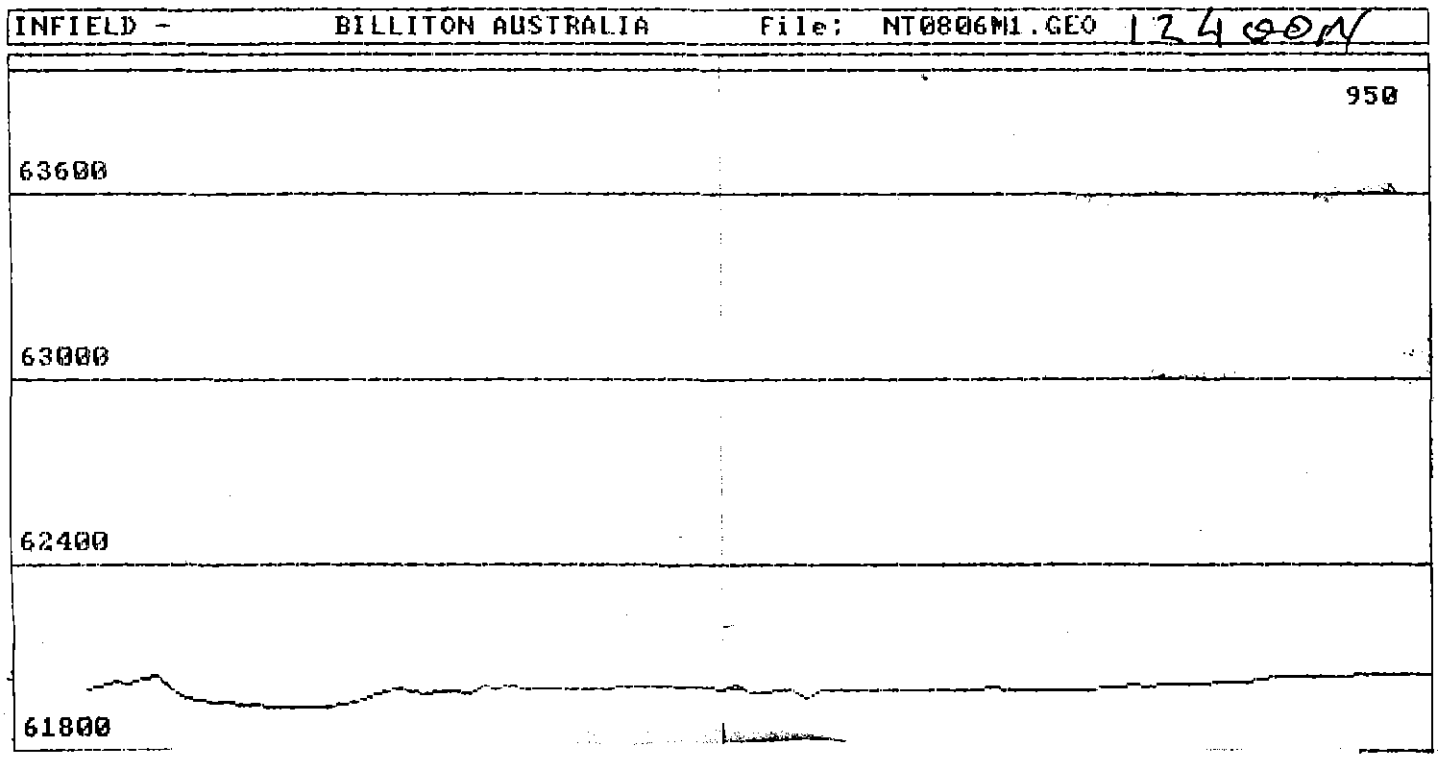
12000N

12000 N

INFIELD - BILLITON AUSTRALIA File: NT2906R3.GEO

INFIELD - ELD - BILLITON AUSTRALIA File: NT2906S2.GEO




INFIELD - BILLITON AUSTRALIA File: NT0806M1.GEO 12400N
950
63600
63000
62400
61800
12400N

493051

APPENDIX 3

NATIVE TRACK TIER

Petrographic Reports

042

493052

PETROGRAPHIC REPORT

FOR BILLITON (Aust.)

11705/MZ02/JPR.

Rocks from the Native Track Tier area (attn. Jeff Randell)

by
Anthony J. Crawford
Geology Dept
University of Tasmania
22/10/89

SAMPLE NUMBER: 15967

SUMMARY:

This is a formerly glassy plagioclase-phyric meta-dacite lava with a dominant albite-sericite alteration assemblage of regional burial metamorphic origin.

HAND SPECIMEN:

This is an unusual grey feldspar-phyric felsic lava with common white altered plagioclase phenocrysts and less abundant grey-black pseudomorphs after a mafic phenocryst phase (?).

THIN SECTION:

This is a plagioclase-phenocryst dominated felsic lava containing around 10-15 modal % of albitized plagioclase phenocrysts and a few chloritized former mafic phenocrysts in a devitrified and (re)crystallized groundmass. The plagioclase phenocrysts are generally less than 1mm long, and are blocky to somewhat elongate prismatic crystals totally replaced by either a very fine-grained pale yellowish sericite intergrowth, or secondary albite. The former tend to lose their outlines in the sericite-altered groundmass, and are the greyish pseudomorphed crystals evident in the hand specimen. Former plagioclase phenocrysts replaced by secondary albite are much less common than the sericitized plagioclase phenocrysts, and show a most unusual habit. Whereas albite replacing plagioclase in other Mt Read Volcanics lavas invariably simply pseudomorphs the original crystal, so that a former andesine-labradorite crystal is made over to a single albite crystal, in this rock the albite crystallizes as many small euhedral crystals intergrown in the site of the former calcic plagioclase phenocryst. Several former plagioclase phenocrysts were noticed in which the albite euhedra described above are clearly growing into sericite that fills the cores of many such crystals.

A few crystals now composed of colourless chlorite and Fe oxide dust have shapes reminiscent of former augite phenocrysts (<<1mm long) Altered microphenocrysts of FeTi oxide are quite common, and are now composed of magnetite or hematite rims filled by sericite or an exceptionally fine-grained chlorite-epidote (leucoxene?) intergrowth.

The groundmass of this sample is very weakly foliated, and is composed of a quartz-albite mosaic of intimately intergrown granular crystals; this texture is typical of a fine-grained 'snowflake' texture following crystallization of a uniform devitrified glass. Foliation is

defined by streaks of intergrown albite crystals similar to those replacing plagioclase phenocrysts, and discontinuous streaks of pale coloured sericite. The latter mineral occurs abundantly throughout the groundmass, as speckles in albite, along with Fe oxide dust.

This sample has suffered mild burial metamorphic degradation, with sericite-albite replacing former plagioclase feldspar phenocrysts, and glass devitrifying and (re)crystallizing as a quartz-albite-sericite mosaic. The grade of metamorphism is probably prehnite-pumpellyite facies, and there is no notable hydrothermal alteration.

I am the first to admit that it is extremely difficult (even in modern settings like Japan and Indonesia) to differentiate *in thin section* between lavas, and shallow dykes, plugs and domes of dacite. This sample was certainly highly glassy, and on that basis alone I would suggest that it was extrusive. It was a plagioclase-phyric felsic lava, probably dacitic in composition judging by the paucity of mafic phenocrysts, the scarce chlorite in the groundmass, and the generally blocky shapes of former plagioclase phenocrysts.

'045

SAMPLE NUMBER: 16620

SUMMARY:

This is a weathered plagioclase+quartz-phyric formerly glassy rhyolitic lava.

HAND SPECIMEN:

This is a weathered pink-brown quartz+feldspar-phyric felsic lava or crystal tuff.

THIN SECTION:

This sample is composed of approximately 20-25modal% of former plagioclase phenocrysts and around 5-10 modal% of quartz phenocrysts in a devitrified glassy groundmass. Plagioclase phenocrysts are up to 2mm long, but are mainly around 0.5-1mm long; they have been partially to entirely sericitized. Euhedral crystals are less abundant than broken and resorbed crystals. Quartz phenocrysts are mainly broken grains 1-2mm across that show strong internal strain features and occasionally subgrain recrystallization. They almost all show strong resorption and tunneling by melt fingers; many of the latter, when cut across their length, appear as small rounded former melt inclusions now composed of a quartz-albite-dominated fine-grained holocrystalline intergrowth. A few phenocrysts of biotite pseudomorphed by green chlorite and Fe oxide and sphene granules are present, as are abundant small former FeTi oxide microphenocrysts that are replaced by leucoxene.

The groundmass of this sample was originally glassy; it has devitrified, then partially recrystallized to a very fine-grained quartz-albite-(Kspar?) intergrowth with a strong pinkish colour. The groundmass is transected by sets of narrow quartz and quartz-albite veinlets that branch and reunite across the slide. The 'dirty pinkish' groundmass adjacent to these quartz veinlets has 'cleaned up', due to more thorough recrystallization, and irrgular patches not obviously associated with quartz veinlets have also recrystallized to a more coarse-grained intergrowth of quartz and albite much cleaner looking than the dominant groundmass. Areas of groundmass up to a few mm across have been replaced by calcite as intergrown rhombic crystals that have subsequently been pseudomorphed by Fe-stained clay or limonite.

This is a meta-rhyolitic lava. The abundant broken phenocrysts are often more characteristic of crystal tuffs, but the essentially uniform groundmass, free of glassy shard material or welding features, argues against crystal tuff origin for this sample. It is not intrusive.

SAMPLE NUMBER: 15968

SUMMARY:

This is a sparsely plagioclase+biotite-phyric formerly glassy dacitic lava with a false lava breccia texture being imparted by alteration associated with veining and devitrification. Minor pyrite has been altered to hematite.

HAND SPECIMEN:

This is a pale grey to pinkish rather autobrecciated felsic lava with altered feldspar phenocrysts. Many of the fragments, mostly less than 1cm across, show 'jigsaw fit' margins with adjacent fragments.

THIN SECTION:

In thin section, this sample is seen to be sparsley plagioclase + biotite-phyric felsic lava,with probably around 5 modal% of small euhedral former plagioclase phenocrysts phenocrysts (now albitized and sericitized), set in a very fine-grained devitrified glassy groundmass. The former plagioclase phenocrysts are mainly less than 0.5mm long, and are well-formed, blocky prisms, often showing albite twinning, and with intense yellowish sericite alteration, especially in crystal cores. Albite replaces the margins of many sericitized crystals. This style of alteration is identical to that noted in sample 15967. The very few former biotite phenocrysts are replaced by pale green chlorite, tiny Fe oxide granules, and sphene crystals. Microphenocrysts of FeTi oxide occur as uncommon small euhedra replaced by leucoxene.

The groundmass of this sample was clearly glassy. The glass has completely devitrified to a dull, almost isotropic microcrystalline material, and random small patches and streaks have recrystallized to more coarse-grained, granular mosaic-textured quartz-albite intergrowths. Sparse, subparallel veinlets of sericite cut the sample, as do narrow veinlets in which the dirty brown devitrified glass has cleaned up and recrystallized to a very fine-grained quartz-albite mixture. A few relatively large (to 1.5mm) altered (hematite) pyrite euhedra are dispersed through the sample.

This sample was a sparsely plagioclase+biotite-phyric dacitic lava with a glassy groundmass. The style of alteration and devitrification are quite similar to that described for sample 15967, although these two samples are probably not from the same flow unit, due to the more abundant plagioclase phenocrysts in the latter. This sample (15968) shows less intense sericitization of the groundmass than15967.

The autobrecciation apparent in hand specimen is evident (barely) in

thin section as angular zones of 'cleaned-up' groundmass that grade laterally into narrow seams and veinlets of the same material. I suggest that this is a false pyroclastic texture imposed on a massive glassy dacitic lava by volume changes associated with devitrification, recrystalliztion and veining, and that it is unlikely to be a primary lava breccia texture. Although similar autobrecciated textures (and similar looking false pyroclastic textures) are common in intrusive plugs and domes in the Mount Read Volcanics (eg on Anthony Rd and the Crown Hill intrusive hbd andesites), the amount of former glass in such samples is minimal. In contrast, this sample was unambiguously highly glassy, and again, I believe that it was extrusive.

048

SAMPLE NUMBER: 15966

SUMMARY:

This is a polymict lava breccia composed of burial metamorphosed strongly plagioclase-phyric dacitic to acid andesite lava fragments.

HAND SPECIMEN:

This is a contact rock between a dark red, and a dark grey, pitted, very strongly weathered feldspar-phyric felsic lava fragments.

THIN SECTION:

This section is made up of at least two major lava fragments and several smaller ones are also obvious. Both larger fragments are composed of abundant (20-25 modal%) phenocrysts of plagioclase and sparse altered former mafic phenocrysts in heterogeneous but formerly largely glassy groundmasses. The dominantly grey coloured lava fragment itself contains common small (<2mm) quench-textured, glassy felsic lava fragments. These pinkish formerly obsidian or pumice fragments may simply be flakes and chips of the glassy margin of the same flow spalled off and incorporated in the flow during eruption and convective overturn. The abundant former plagioclase phenocrysts, which in this rock are slightly sericite-altered blocky to elongate euhedra, are commonly broken. FeTi oxide phenocrysts and microphenocrysts were not uncommon, but have altered to leucoxene aggregates in which sphene and epidote are occasionally identifiable. The groundmass of this fragment is devitrified glass, dominated by a very fine-grained chlorite-albite-quartz intergrowth. The abundance of groundmass chlorite in this sample contrasts with the chlorite-poor samples described above. The fragment was almost certainly a dacitic to acid andesite lava.

The reddish large lava fragment in this section is a vesicular abundantly plagioclase-phyric evolved andesitic lava with a vitrophyric groundmass. Plagioclase phenocrysts to 2mm are slightly sericitized mainly tabular prisms that often occur aggregated in multi-crystal clots. Several small euhedral former mafic phenocryst sites now filled by green chlorite and quartz, have shapes suggestive of augite precursors. Magnetite or hematite rims around extremely fine-grained quartz-albite mixtures outline former FeTi oxide microphenocrysts. The groundmass of this fragment is more crystalline than the adjacent grey fragment, being dominated by tiny microlites of albitized plagioclase set in a devitrified glassy matrix that has crystallized to fine-grained quartz, pinkish albite

and common Fe oxide dust.

This sample is clearly a polymict lava breccia with fragments of dacitic to acid andesite lava showing prehnite-pumpellyite facies regional (burial) metamorphic mineral assemblages, and no sign of local hydrothermal alteration.

SAMPLE NUMBER: 515115

SUMMARY:

This is an autobrecciated lava composed of quenched fragments of plagioclase+augite-phyric andesite.

HAND SPECIMEN:

This is a dark green lava breccia containing aphyric to porphyritic very fine-grained lava fragments to at least 3cm across set in a strongly chloritic groundmass.

THIN SECTION:

Most of this sample is composed of all or parts of about four different lava fragments, all set in a more heterogeneously textured matrix. The largest lava fragment is a sparsely plagioclase+augite-phyric quenched glassy mafic andesite. It contains elongate euhedral prisms of strongly sericitized albitized plagioclase (about 2 modal%), and somewhat less of smaller phenocrysts of fresh augite, often gathered in glomeroporphyritic clots. These are all set in an almost isotropic groundmass of devitrified glass containing abundant tiny acicular albite crystals showing flow orientation. Other lava fragments differ from the above only in the grainsize (former 'glassiness') of the groundmass, and are probably from different parts of the same explosive flow. One small lava fragment is notably vesicular, with the vesicles (<<0.5mm across) being filled by pale green chlorite.

The matrix of this sample forms only a small modal percentage of the rock, and is generally lighter coloured and more crystal-rich than the lava fragments. It is composed largely of crystal fragments and spalled-off tiny fragments of devitrified glass, with abundant interstitial secondary quartz, albite and chlorite. A few narrow epidote-quartz veins cut the sample.

The metamorphic assemblage is albite-chlorite-epidote-leucoxene (after tiny FeTi oxides in matrix)-quartz-sericite, and is prehnite-pumpellite facies(since cpxis fresh and actinolite absent. The sample is an autobrecciated andesitic lava. The absence of olivine suggests that the lava was more likely to be andesite or basaltic andesite than basalt.

051

SAMPLE NUMBER: 16618

SUMMARY:

This is a well-preserved plagioclase-phyric meta-dacite lava with occasional quartz-filled vesicles, and distinctive streaks of chlorite along dilation fractures probably parallel to the margins of the flow unit.

HAND SPECIMEN:

This is a dark brown relatively well-preserved massive lava with common feldspar phenocrysts and elongate streaks of black chlorite and glassy quartz.

THIN SECTION:

Thin section examination shows this sample to be a texturally very well preserved sparsely plagioclase-phyric (~5 modal% plagioclase phenocrysts) dacitic lava. Plagioclase phenocrysts are blocky to tabular idiomorphic prisms of albite mainly less than 2mm across. They are partially replaced by very fine-grained sericite, and occasionally contain chloritized melt inlusions. They show a weak flow alignment. Former mafic phenocrysts are rare, and are totally replaced by yellow-green chlorite. They occur as small (to 0.4mm long) euhedral prisms with outlines strongly suggestive of augite precursors. A few small FeTi oxide microphenocrysts are replaced by leucoxene.

The groundmass texture of this sample varies from microporphyritic to vitrophyric, and consists of microlitic to lath-like albite crystals set in a matrix dominated by anhedral plates of albite and interstitial quartz, with common very fine-grained chlorite and sericite. Patchy calcite overprints about 10-20 modal% of the groundmass, and is itself occasionally replaced by dirty brown Fe-stained clay or limonite.

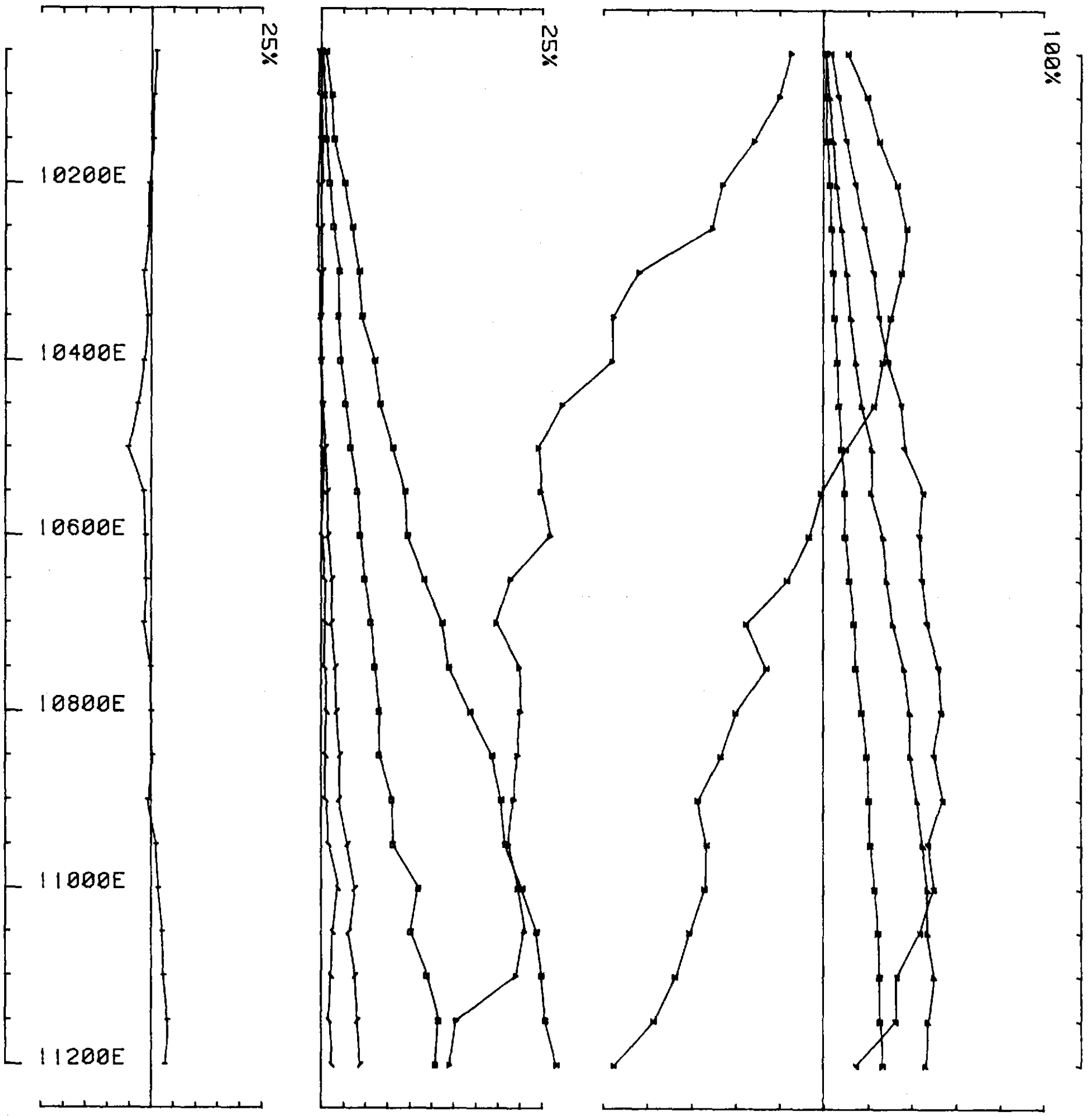
A striking feature of this sample is the presence of rather elongate streaks and patches of deep green chlorite, and more rounded, but still flattened former vesicles now filled by polycrystalline quartz and chalcedony. The chlorite streaks reach about 8mm long by 2-3mm wide, and retain no internal texture such as they might if they were replacing former pumice clasts. I think they are filling small dilation fractures parallel to the former flow surface, and note that they are parallel to the weak alignment of long axes of plagioclase phenocrysts. The quartz-chalcedony blebs are almost certainly slightly elongate, flattened vesicle fillings, with granular quartz cores rimmed by extremely fine-grained chacedony rims.

This is a slightly vesicular plagioclase-phyric dacitic *lava.*

052

APPENDIX 4

Native Track Tier - UTEM Profiles



UTEM SURVEY at NATIVE TRACK TIER for BILLITON AUSTRALIA

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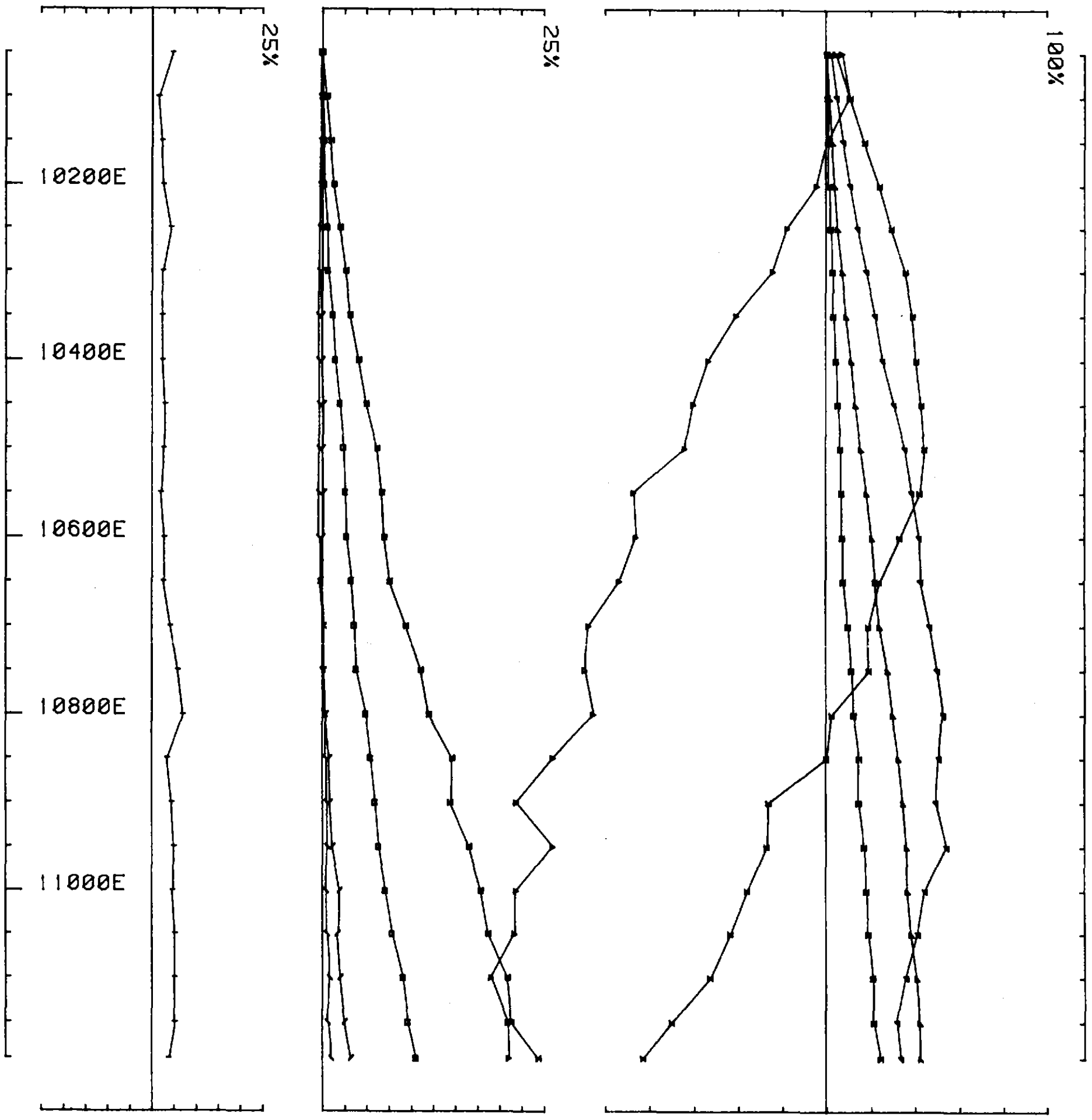
493063



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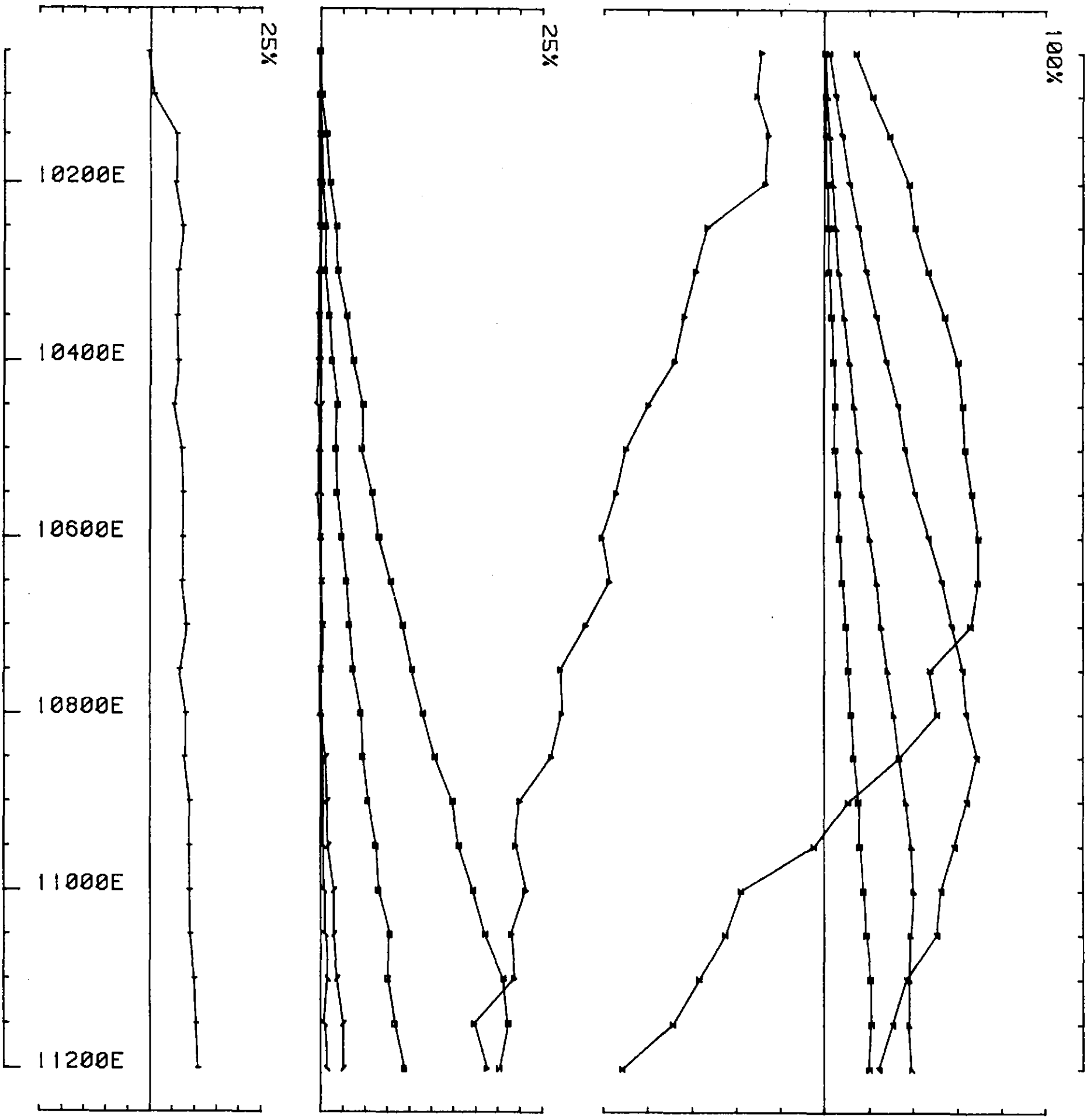
3428



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49306

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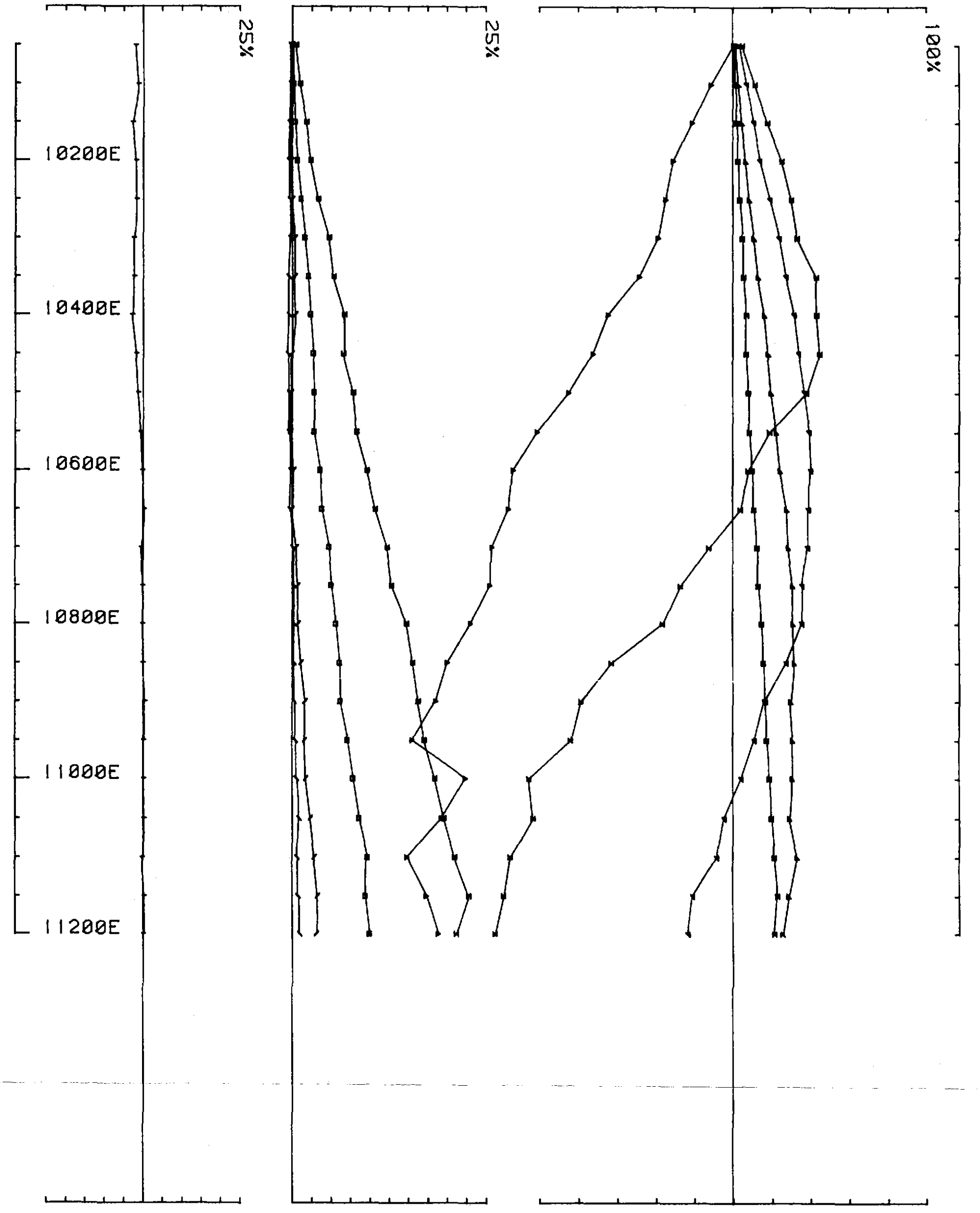

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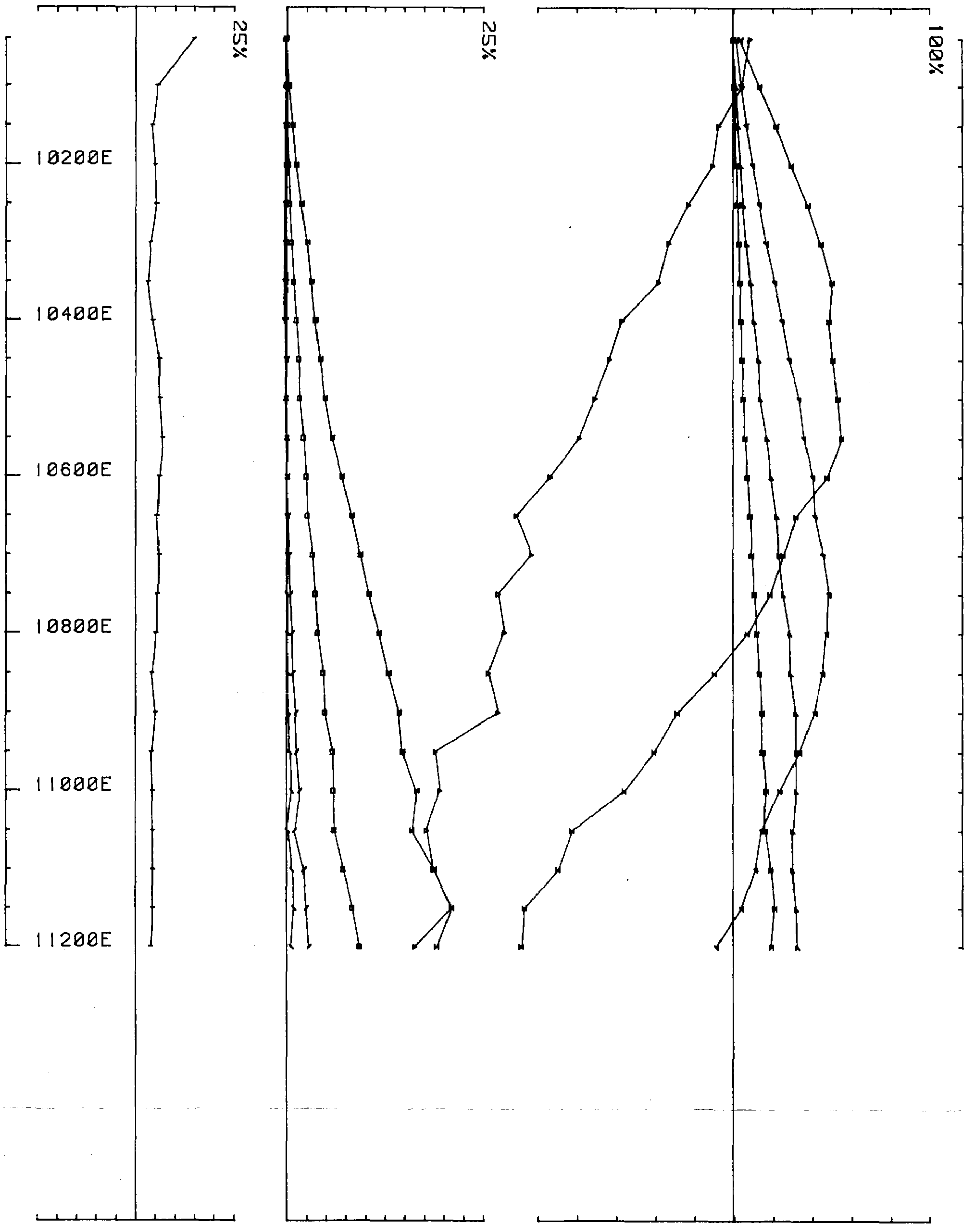
493066

C4410



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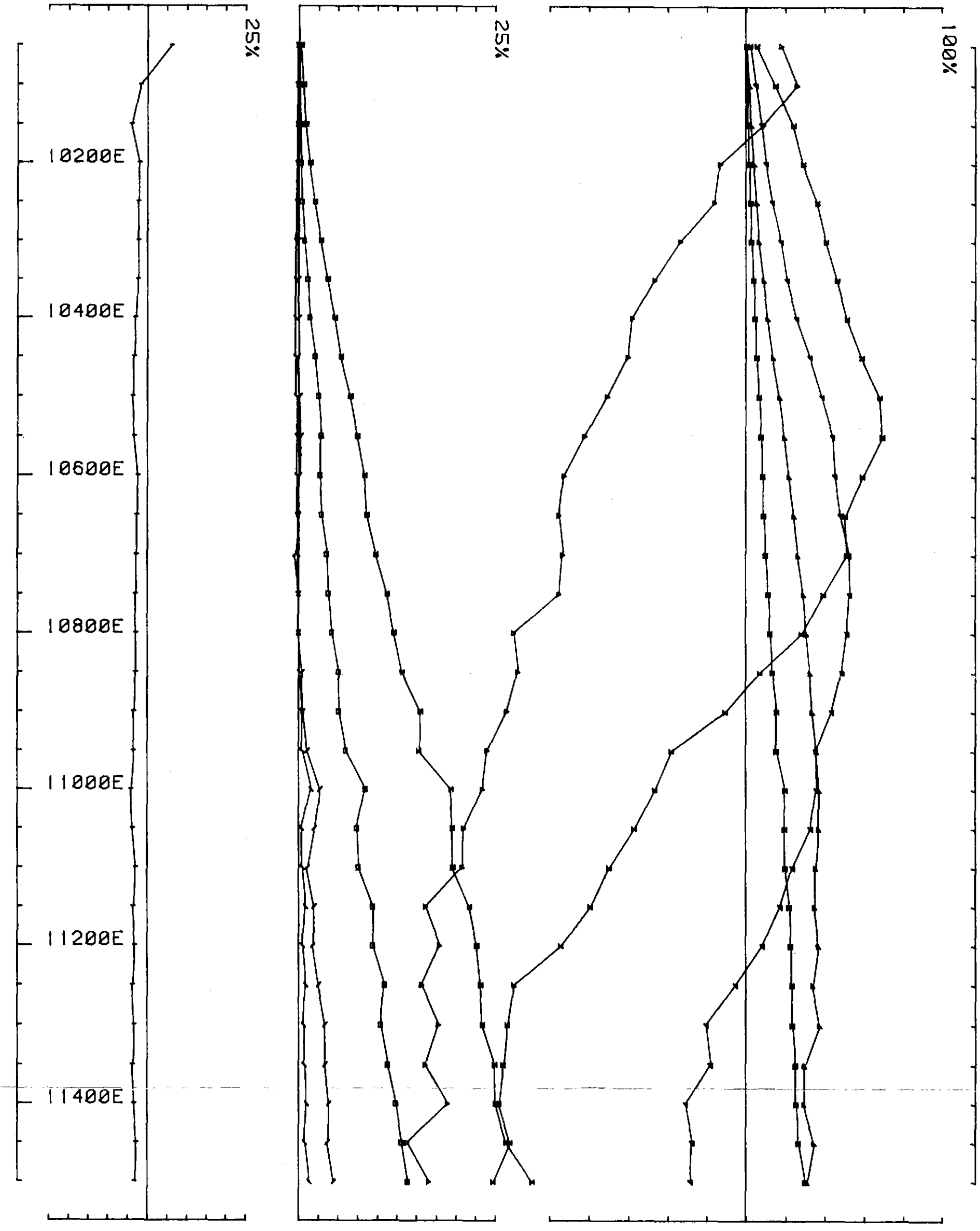

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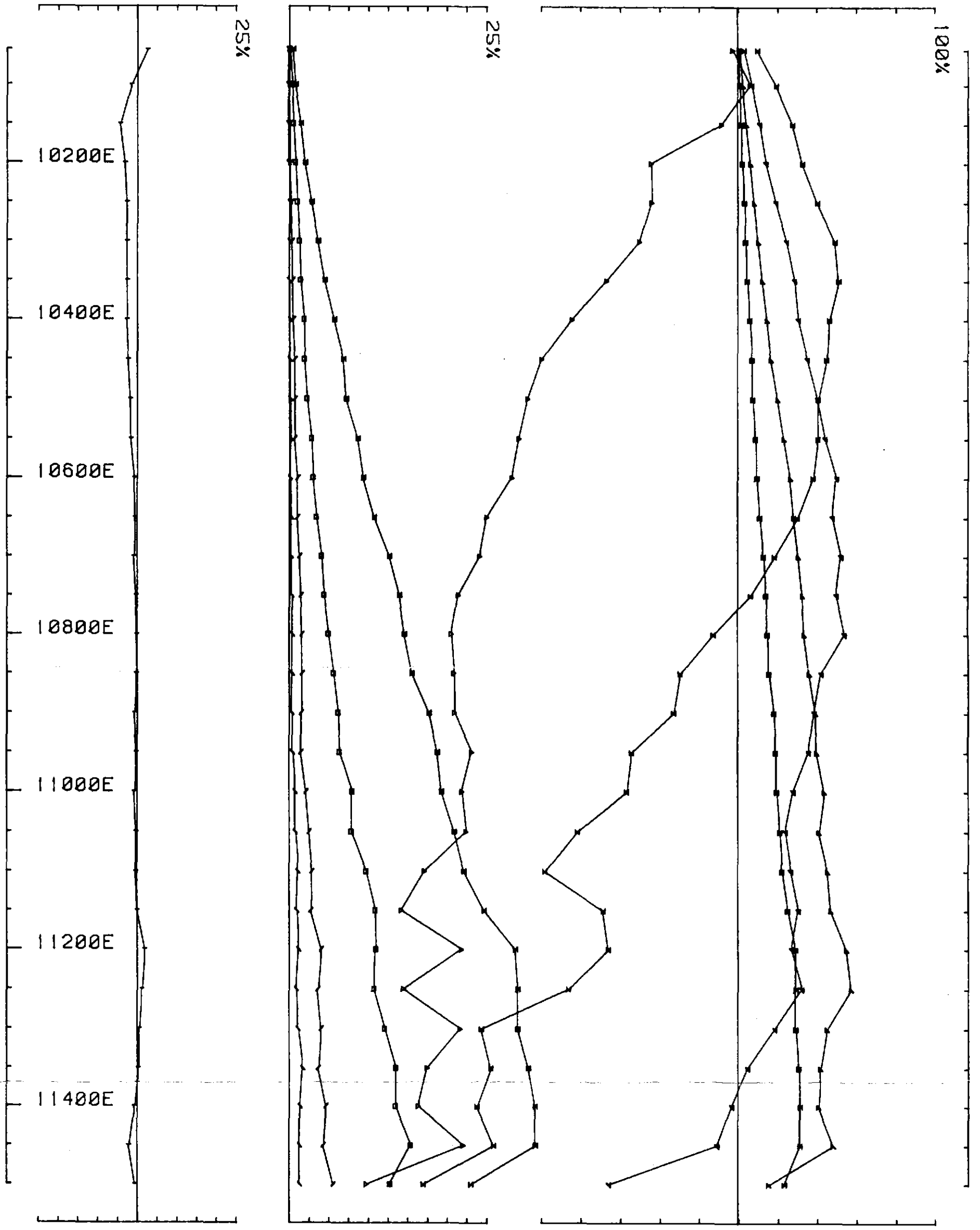

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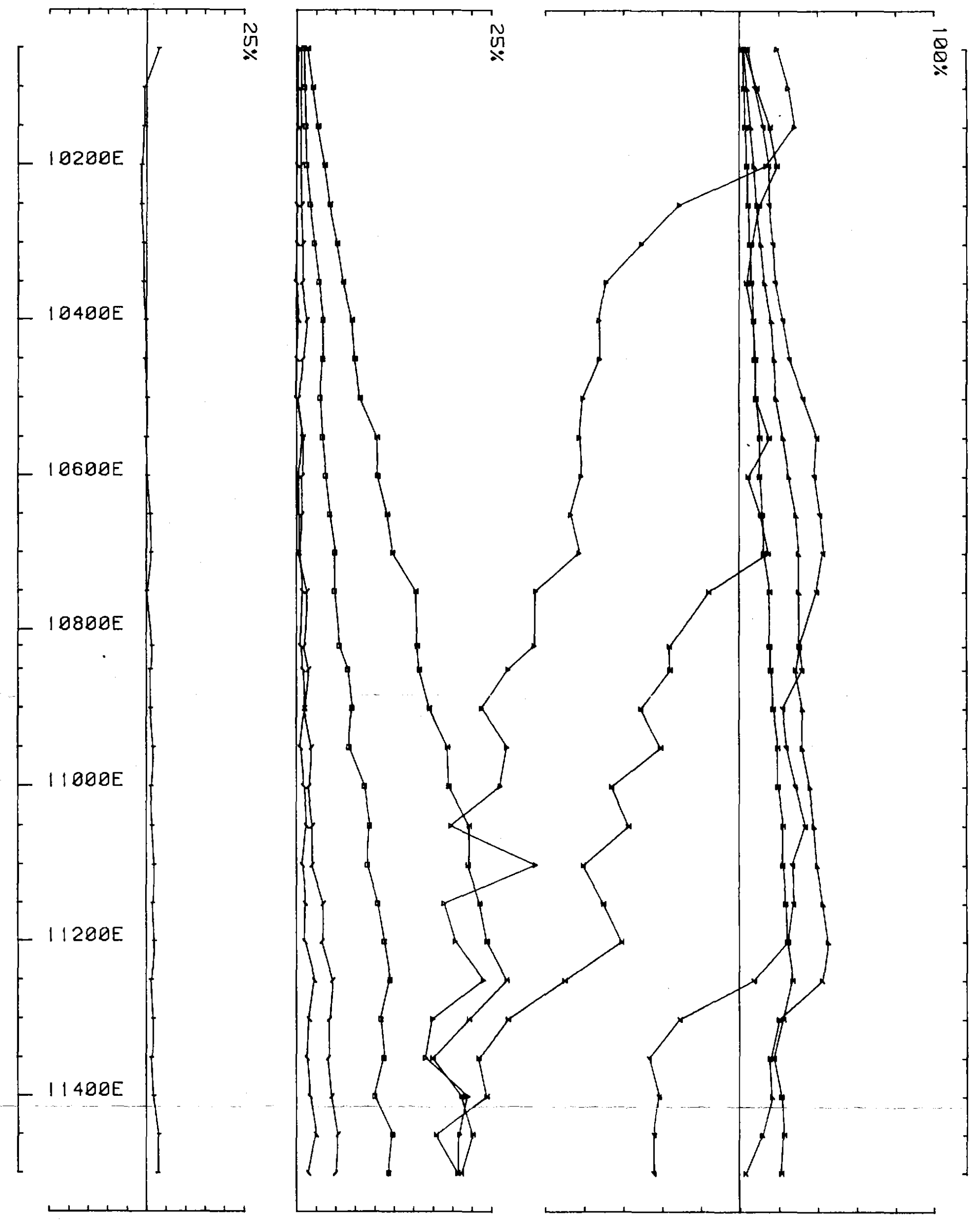

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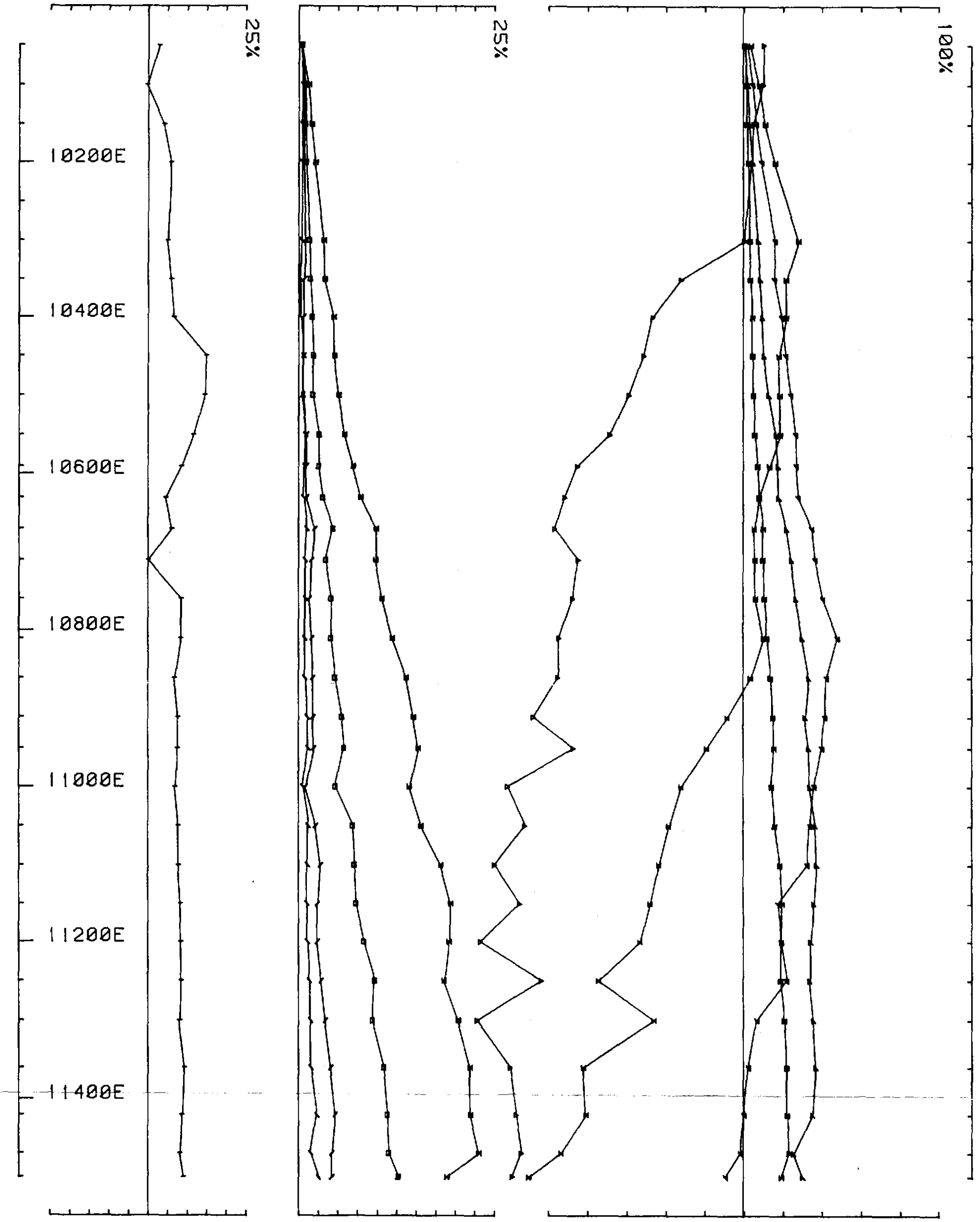

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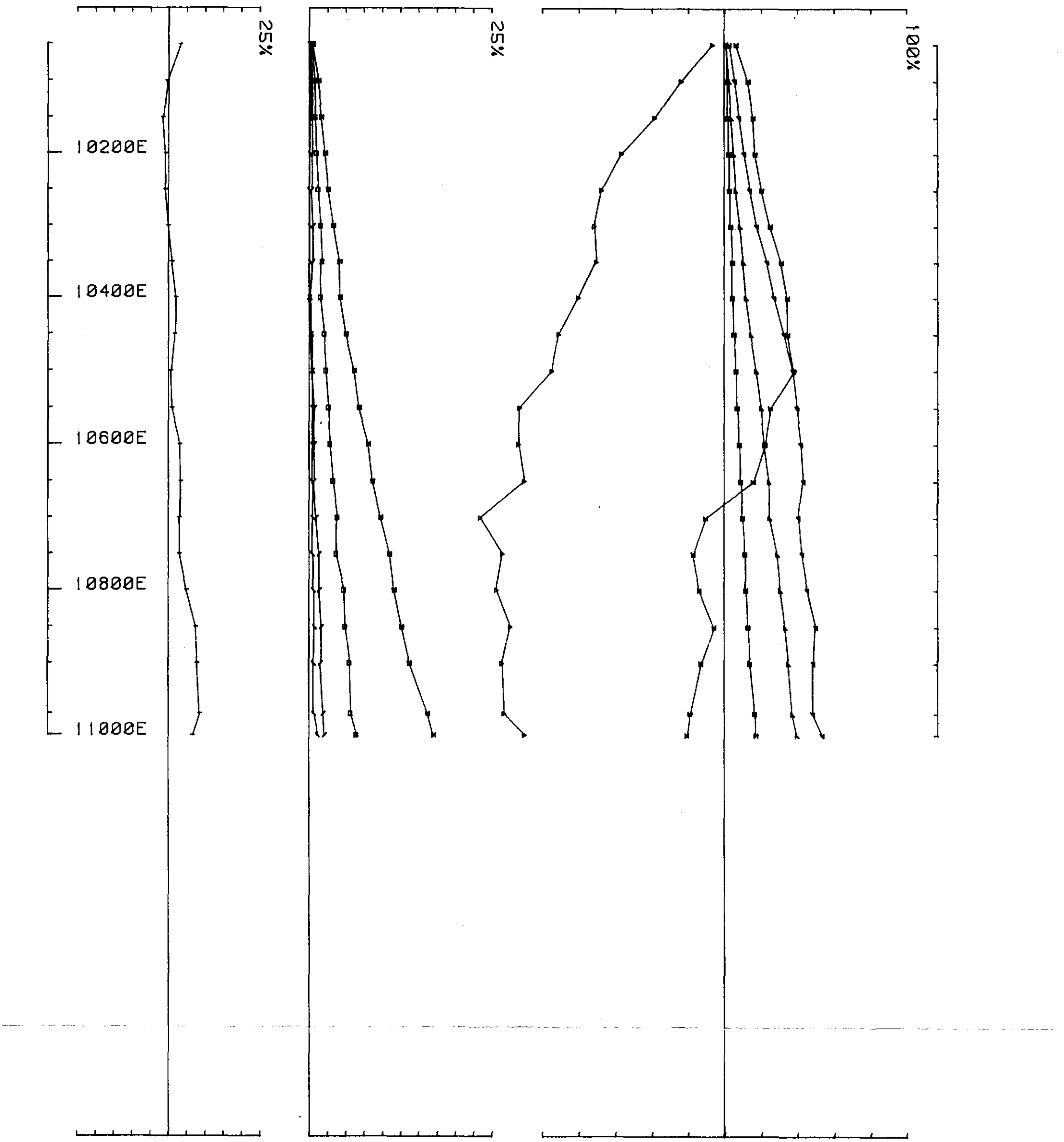

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loop no 6 line 11600N component Hz secondary field Ch 1 contin. norm.

49307?

C446

25%

25%

100%

10200E

10400E

10600E

10800E

11000E

UTEM SURVEY at NATIVE TRACK TIER for BILLITON AUSTRALIA

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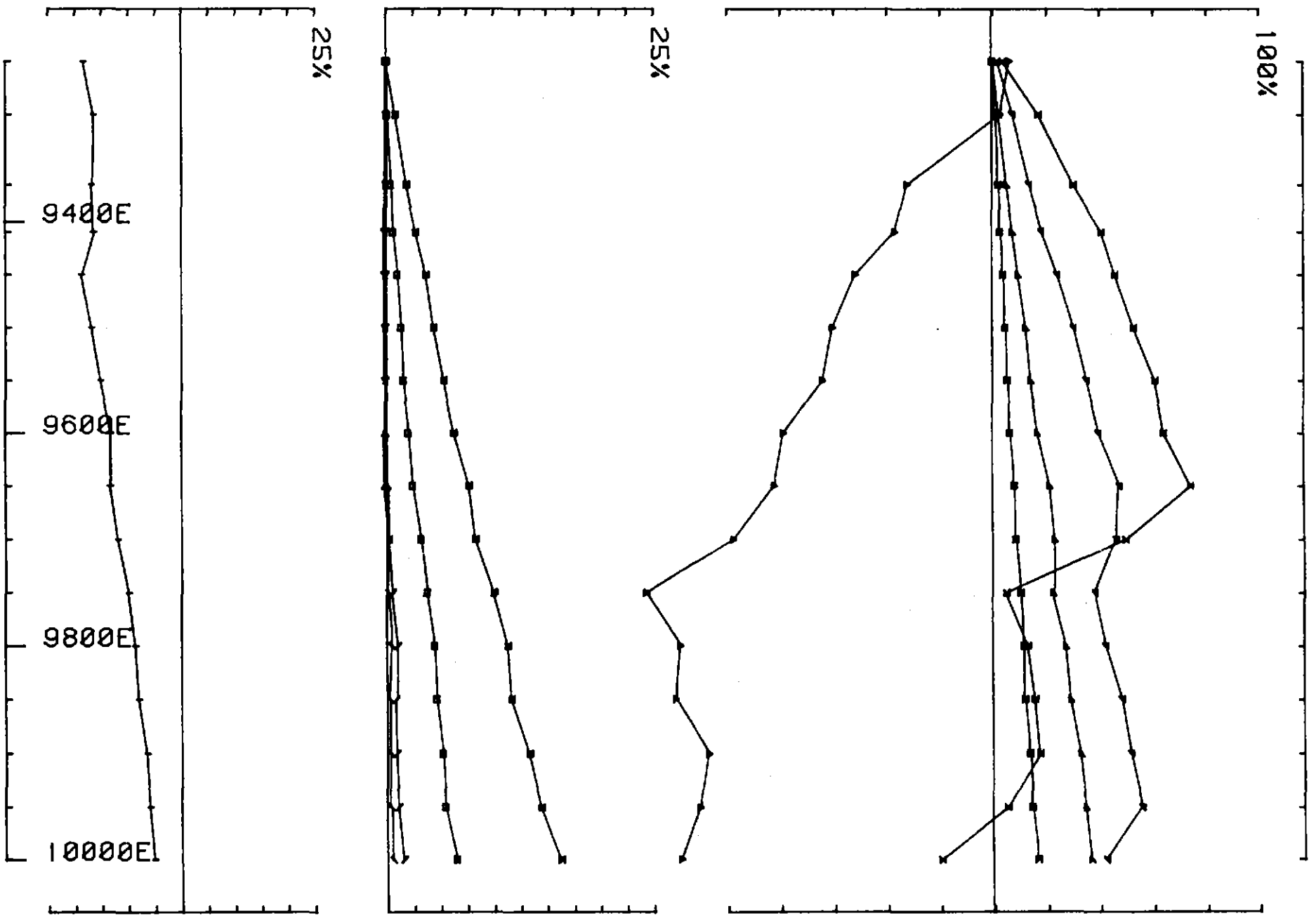

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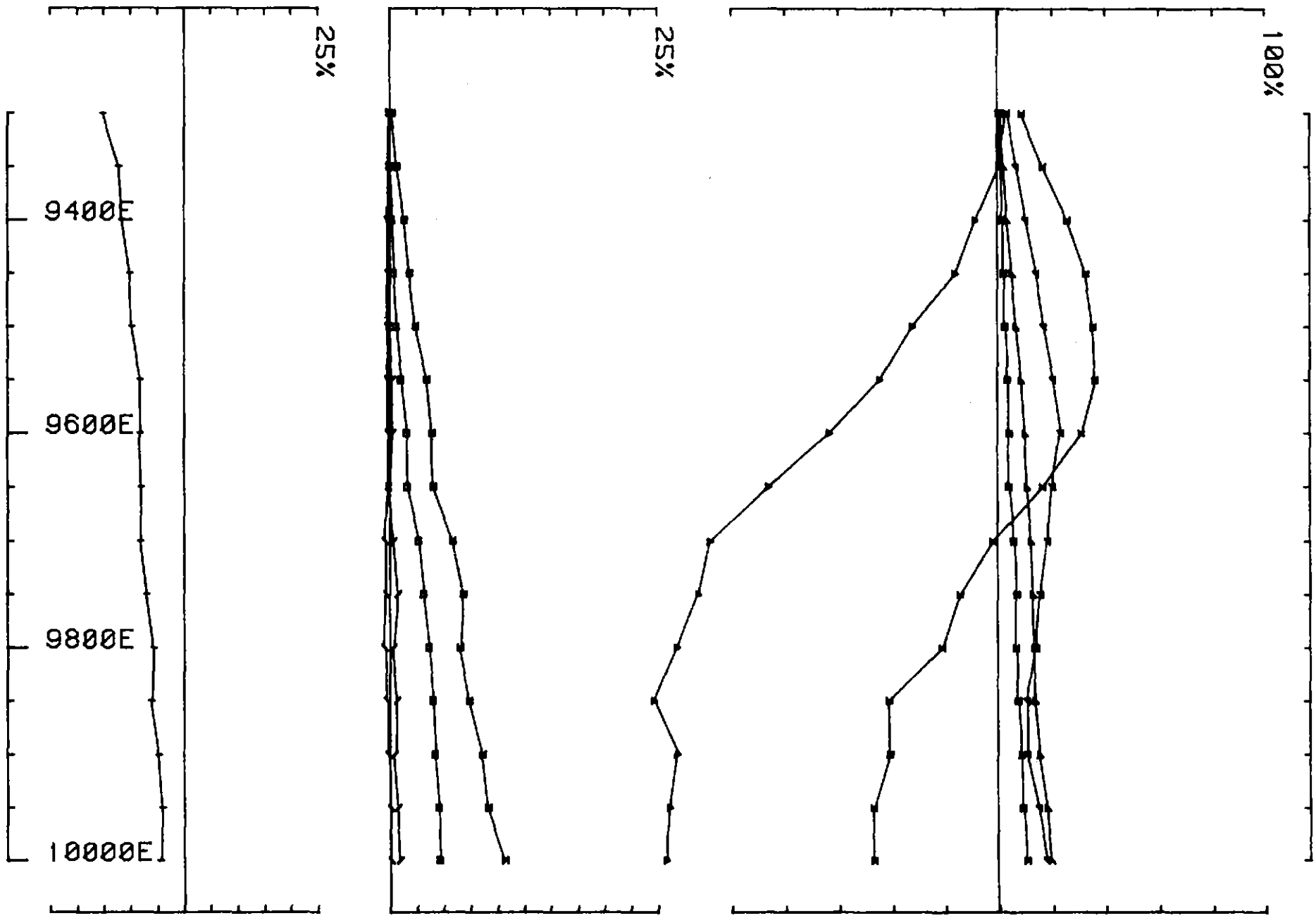

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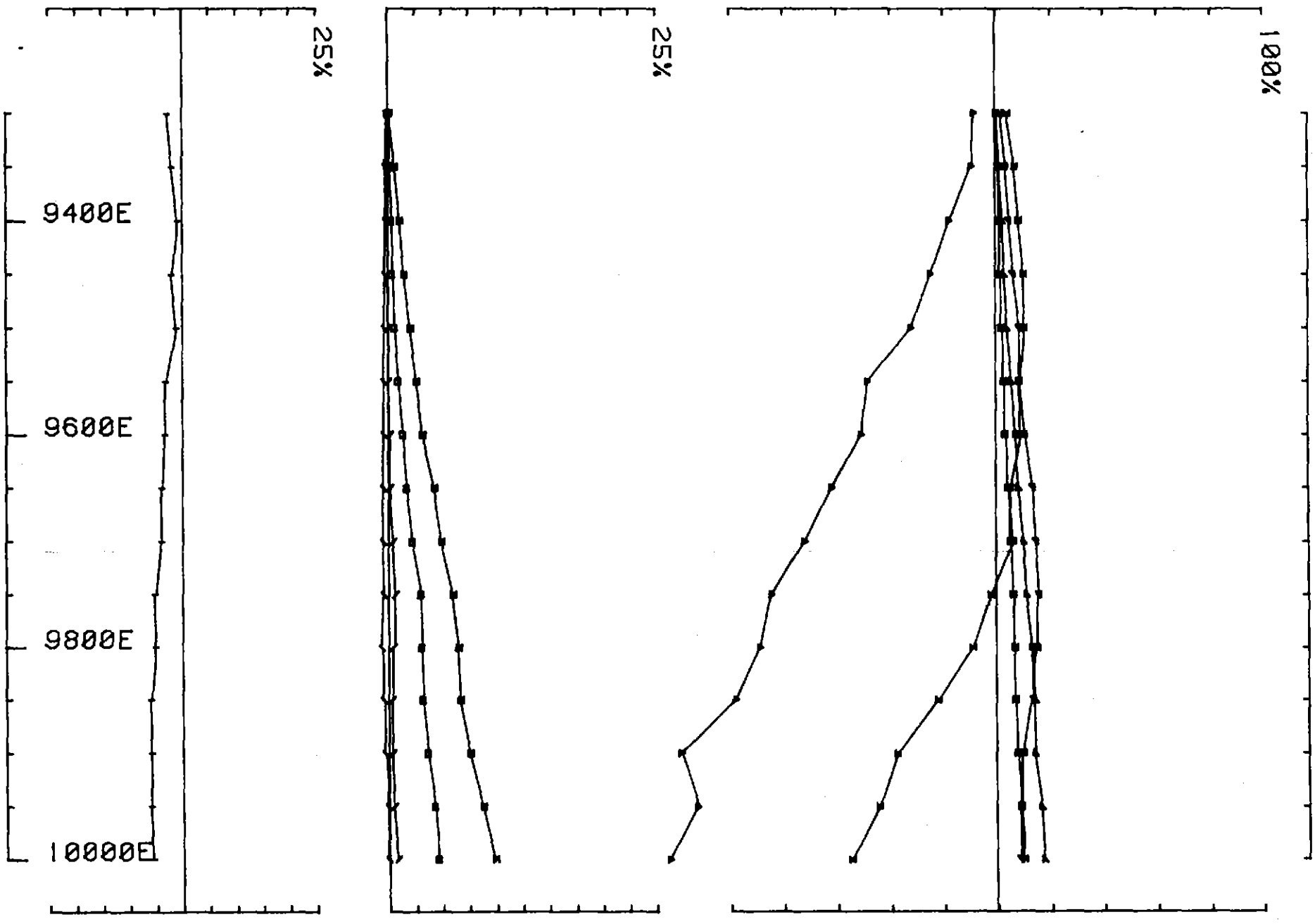
9440



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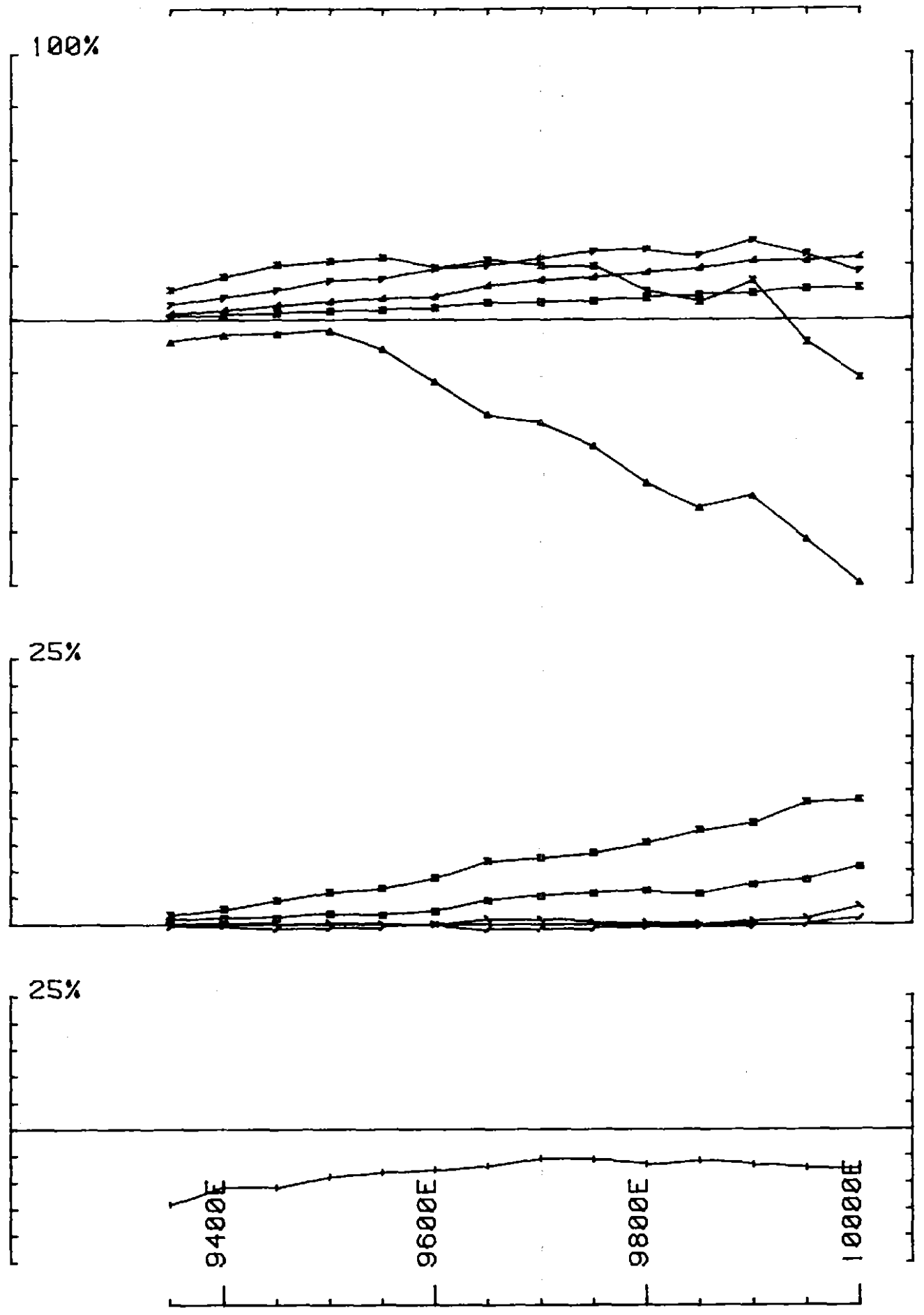
9450

493077



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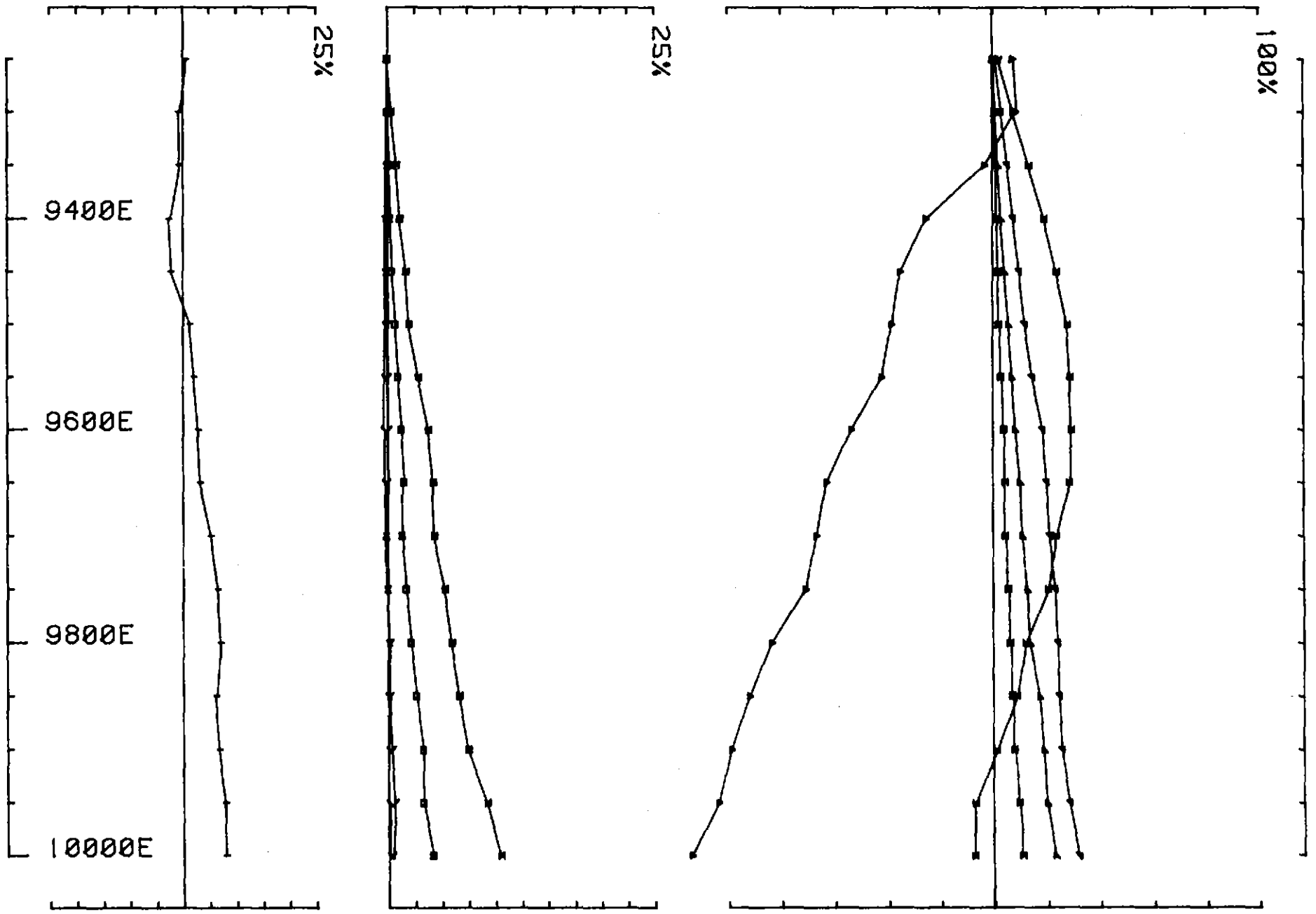

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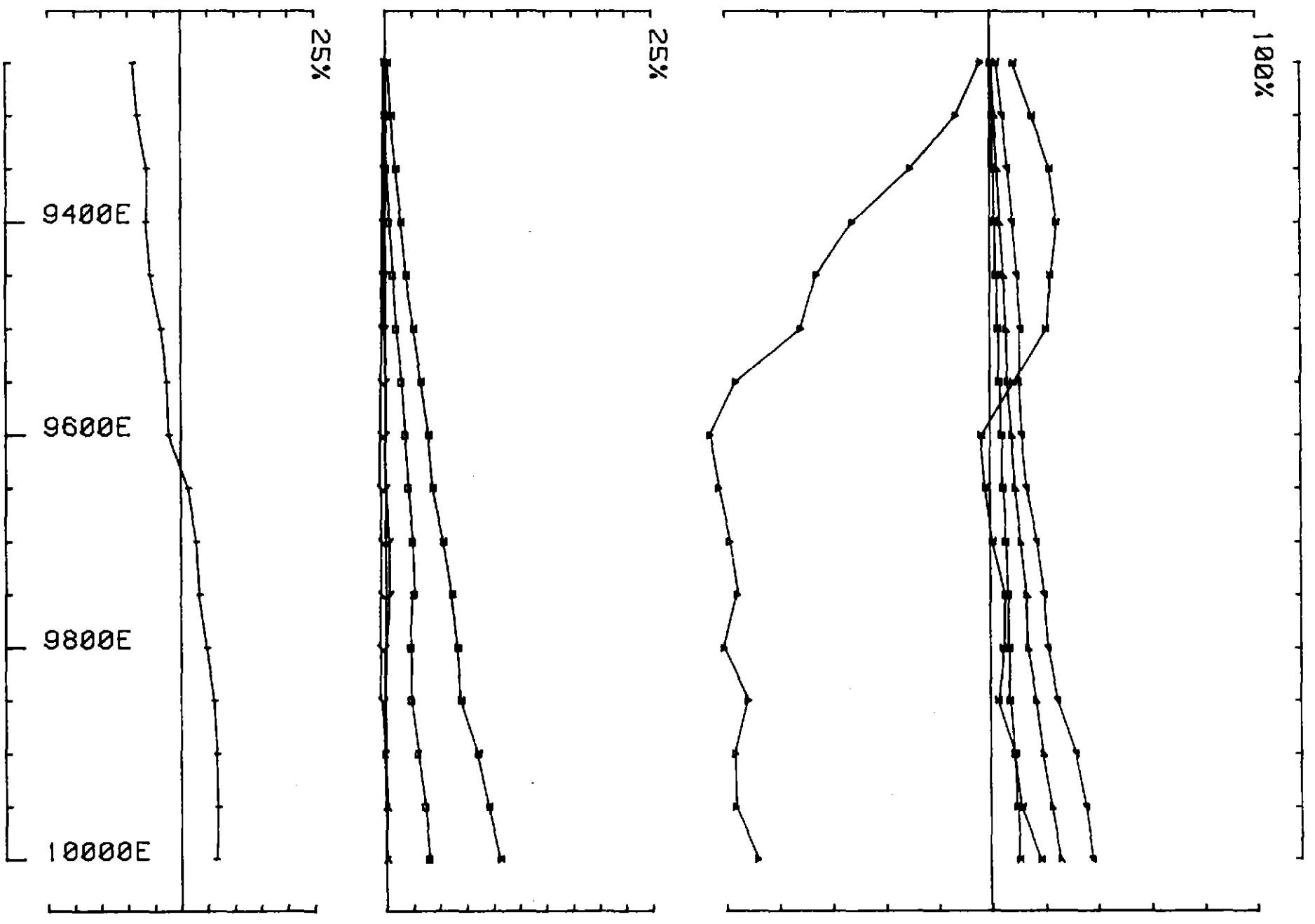

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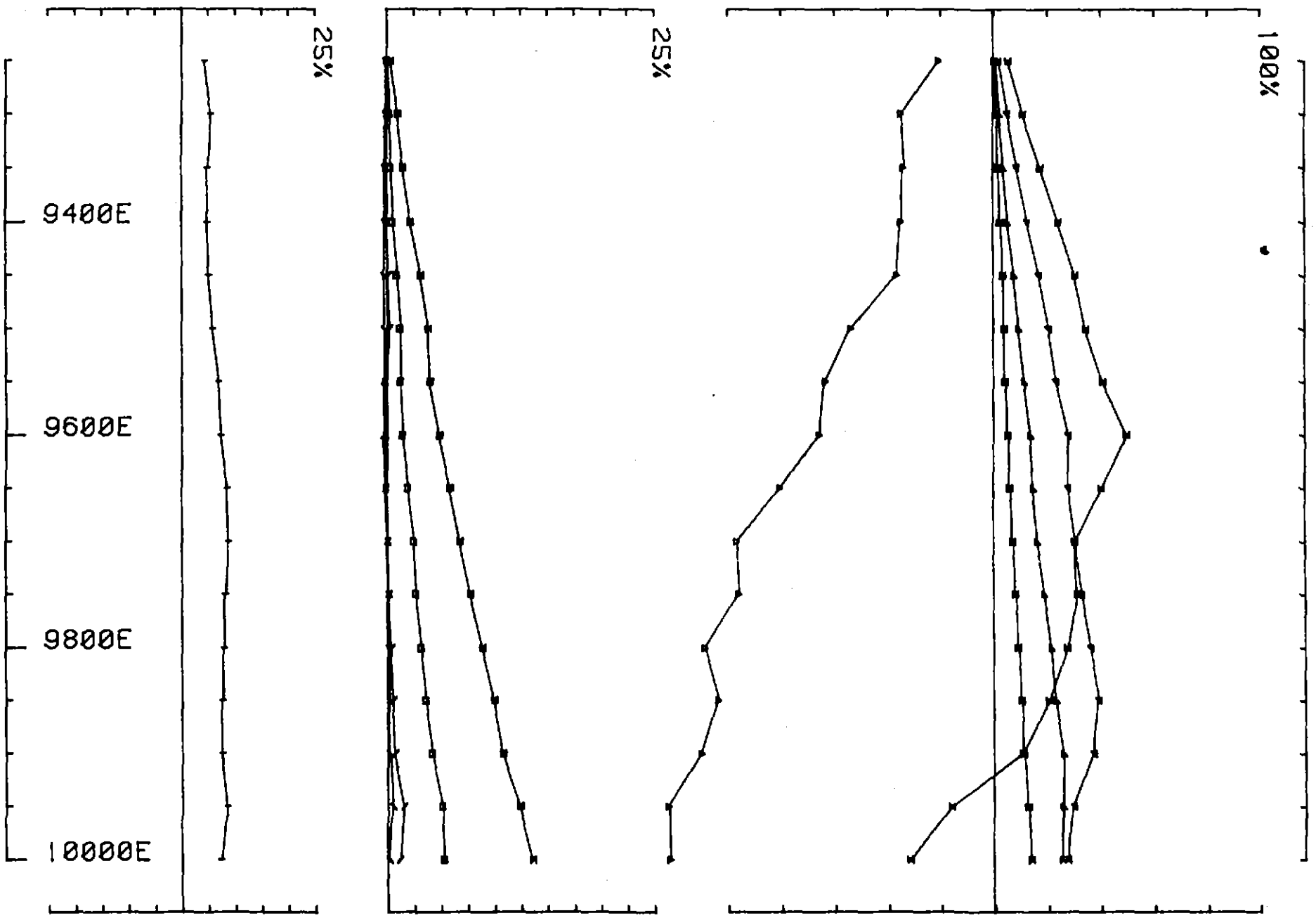

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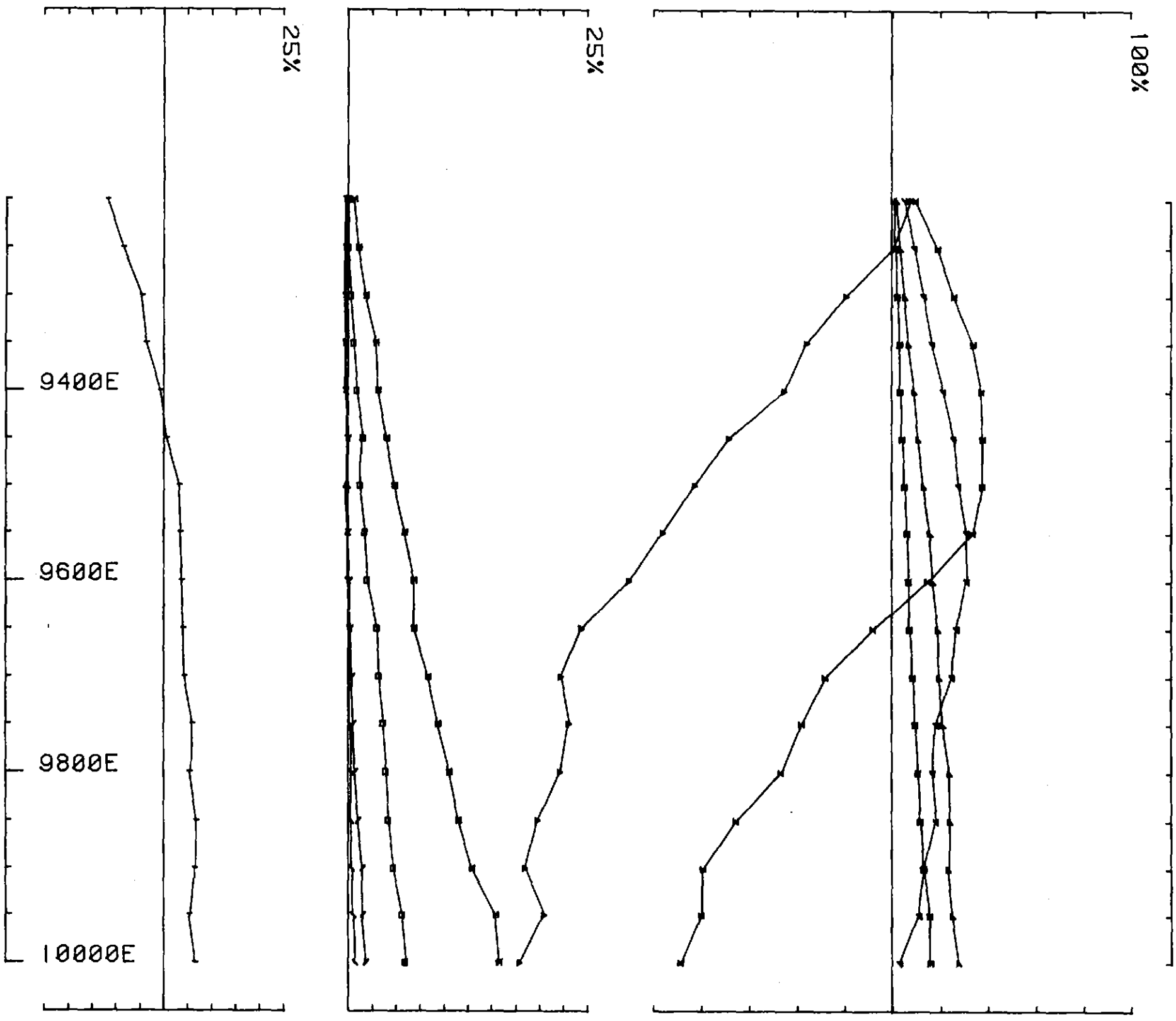

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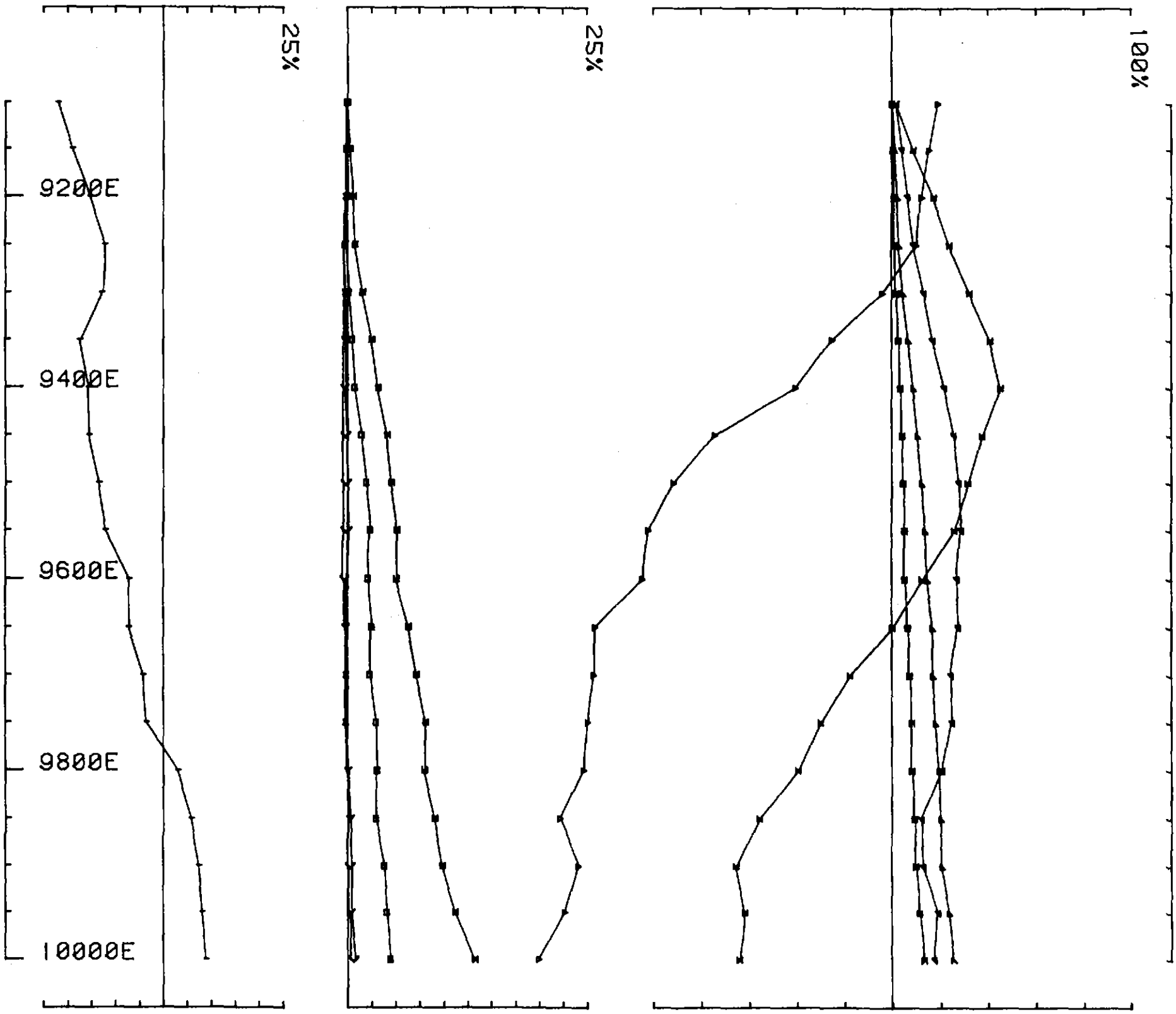

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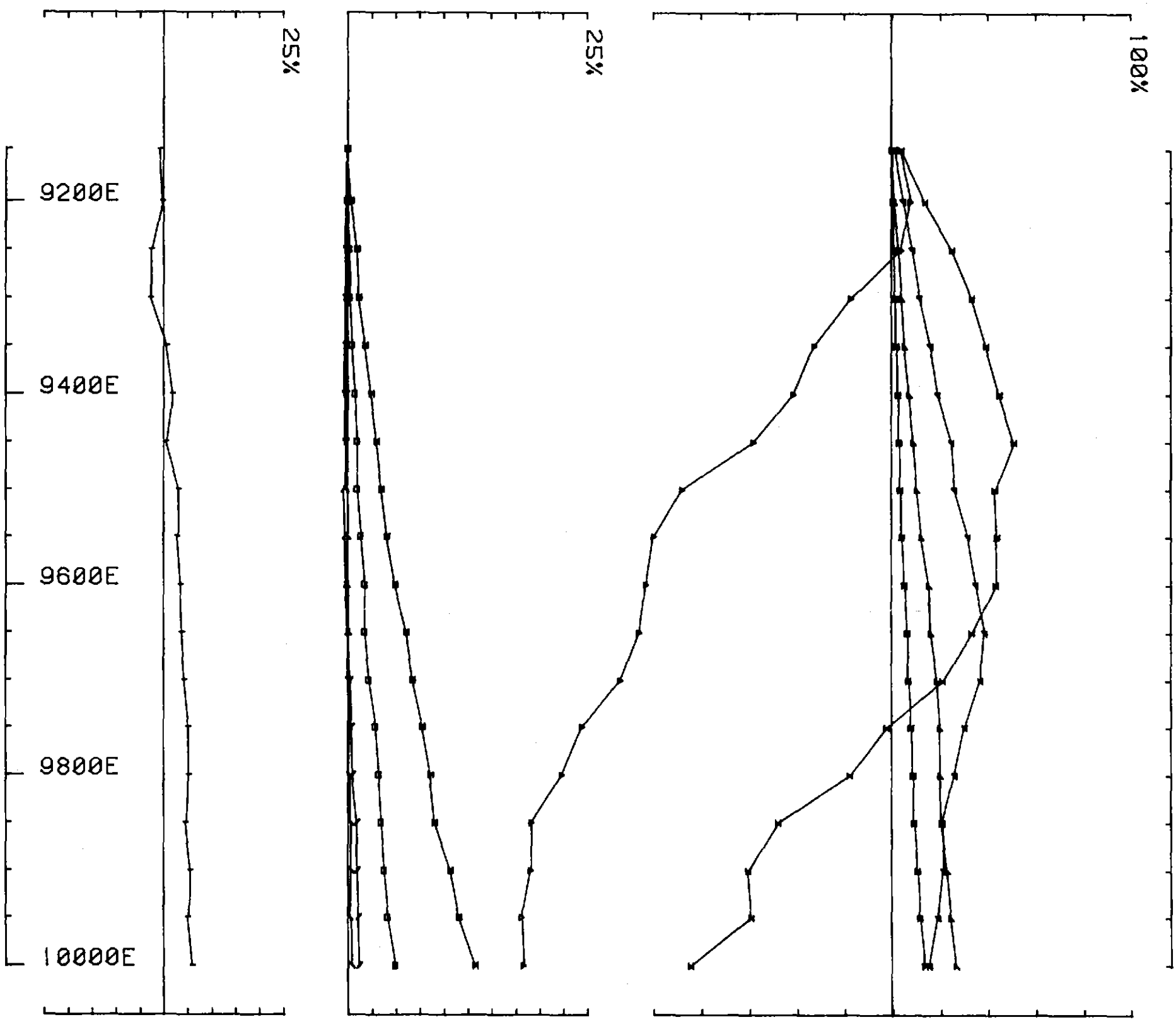

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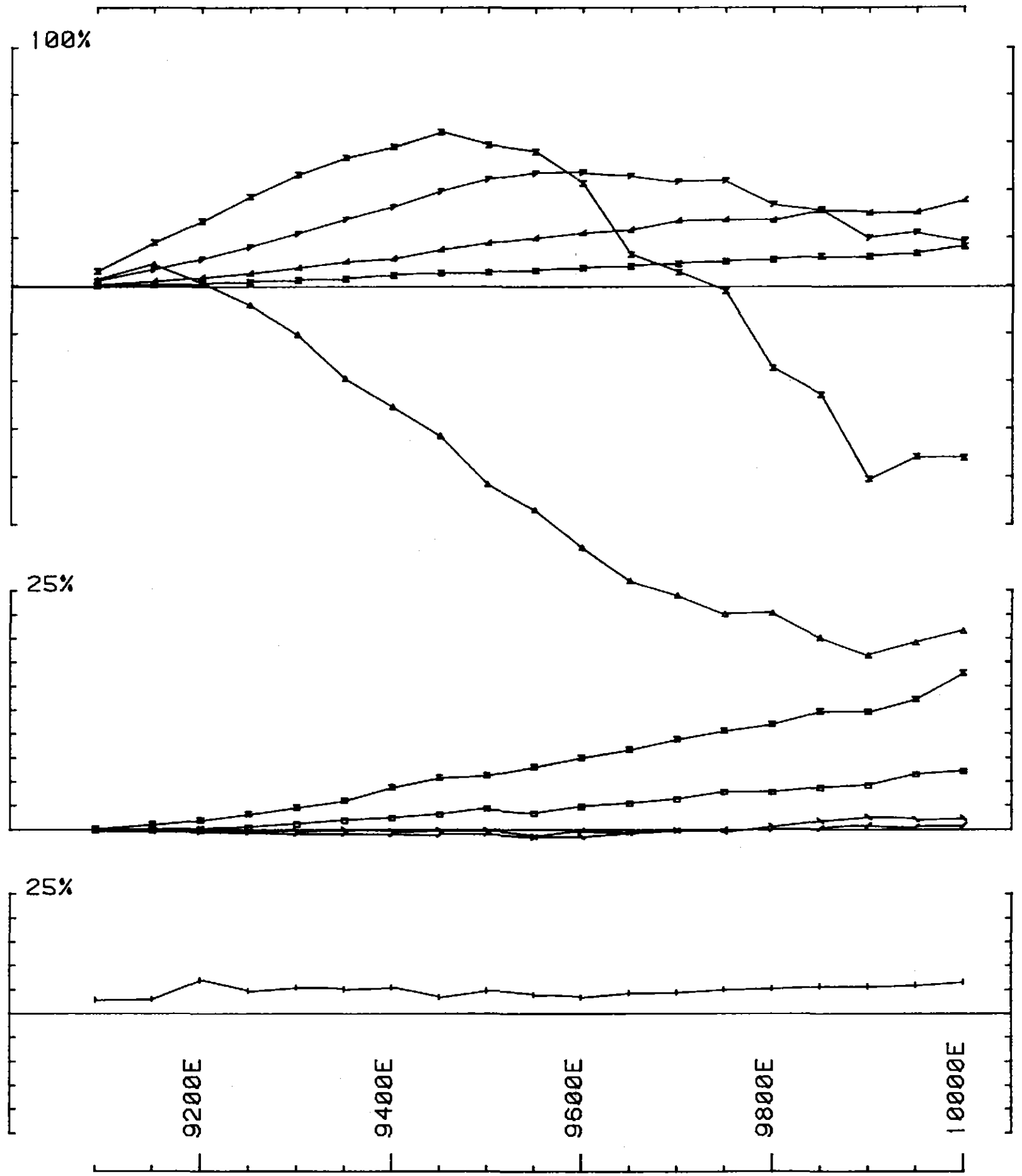

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loop no 5 line 12000N component Hz secondary field Ch 1 contin. norm.

APPENDIX 5

Native Track Tier - Auger Sample Analytical Results

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
ABN 004 51 8890

193086

ANALYTICAL REPORT No. 204.0.08.06819

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

ORDER No.	PROJECT
11718	

DATE RECEIVED	RESULTS REQUIRED
31/01/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
5	16/02/90	1	106

STATE OF SAMPLES	PRE-TREATMENT								ANALYSIS			
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER / SEE REMARKS	NONE		REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	Various	SO	Prep: 002,016						Cu,Pb,Zn,Ag/101			
	Various	SO							As,Ba/401			
	Various	SO							Au,AuChk/313			
	Various	SO	Prep: 002,016						Cu,Pb,Zn,Ag/101			
	Various	SO							As,Ba/401			

RESULTS TO

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

RESULTS TO

REMARKS

M202
Auger Samples.

STATE OF SAMPLES		
whole core	WC	
split core	SC	
cutting	CU	
rock	Ro	
soil	SO	
pulp	PU	
water	WA	
tissue	TI	
stream sediment	SS	
heavy mineral	HM	

ANALYSIS — PREPARATION			
perchloric acid	A1	cold acid	CA
hydrochloric acid	A2	specific sulphide	SS
nitric acid	A3	other mixed acids	Ma
aqua regia	A4	alkaline attack	AA
nitric-perchloric	A5	volatilization	VO
HF mixture	A6	ignition	IG
HF under pressure	A7	pressed powder (XRF)	PP
fusion	A8	glass fusion (XRF)	GF

ANALYSIS — METHOD	
atomic absorbtion	AAS
x-ray fluorescence	XRF
spectrophotometry	SPEC
colorimetry	COL
chromatography	CHR
titration	TTN
other chemicals means	CHEM
miscellaneous	MISC
fluorescence	FLUOR
inductively coupled plasma	ICP

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493087

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.06819	16/02/90	11718	1 OF 5

TUBE No.	SAMPLE No.	Au	Au	Au	AuChk	Cu	Pb	Zn	Ag
1	8400N 10100 E	<0.008	-	-	<0.008	40	20	245	<0.5
2	8400N 10125 E	<0.008	-	-	-	30	115	45	0.5
3	8400N 10150 E	<0.008	-	-	-	20	90	175	0.5
4	8400N 10175 E	<0.008	-	-	-	20	15	180	<0.5
5	8400N 10200 E	<0.008	-	-	-	20	25	180	<0.5
6	8400N 10225 E	<0.008	-	-	-	75	25	165	<0.5
7	8400N 10250 E	<0.008	-	-	-	120	125	210	<0.5
8	8400N 10275 E	<0.008	-	-	-	35	100	215	<0.5
9	8400N 10300 E	<0.008	-	-	-	20	15	225	<0.5
10	8400N 10325 E	<0.008	-	-	-	65	30	160	<0.5
11	8400N 10350 E	<0.008	-	-	-	25	155	120	<0.5
12	8400N 10375 E	<0.008	-	-	-	20	160	135	<0.5
13	8400N 10400 E	<0.008	-	-	-	40	160	185	<0.5
14	8400N 10425 E	<0.008	-	-	-	35	95	140	<0.5
15	8400N 10450 E	<0.008	-	-	-	35	105	165	<0.5
16	8400N 10475 E	<0.008	-	-	<0.008	15	30	80	<0.5
17	8400N 10500 E	<0.008	-	-	<0.008	10	25	105	<0.5
18	8400N 10525 E	<0.008	-	-	-	15	25	125	<0.5
19	8400N 10550 E	0.025	-	-	-	15	30	100	<0.5
20	8400N 10575 E	<0.008	-	-	-	15	20	60	<0.5
21	8400N 10600 E	<0.008	-	-	-	30	25	85	<0.5
22	8400N 10625 E	<0.008	-	-	-	40	10	75	<0.5
23	8400N 10650 E	0.014	-	-	-	25	25	165	<0.5
24	8400N 10675 E	<0.008	-	-	-	15	55	495	<0.5
25	8400N 10700 E	0.012	-	-	-	20	30	115	<0.5

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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493088

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No	PAGE
	204.0.08.06819	16/02/90	11713	2 OF 5

TUBE No.	SAMPLE No.	Au	Au	Au	AuChk	Cu	Pb	Zn	Ag
1	8800N 10200 E	0.011	–	–	–	35	130	200	<0.5
2	8800N 10225 E	<0.008	–	–	–	40	145	305	<0.5
3	8800N 10250 E	<0.008	–	–	–	25	180	355	<0.5
4	8800N 10275 E	<0.008	–	–	–	15	105	170	<0.5
5	8800N 10300 E	<0.008	–	–	–	15	220	230	<0.5
6	8800N 10325 E	<0.008	–	–	–	15	180	230	<0.5
7	8800N 10350 E	<0.008	–	–	<0.008	20	205	330	<0.5
8	8800N 10375 E	<0.008	–	–	–	20	205	390	<0.5
9	8800N 10400 E	<0.008	–	–	–	20	200	545	<0.5
10	8800N 10425 E	<0.008	–	–	–	20	135	320	<0.5
11	8800N 10450 E	<0.008	–	–	–	15	140	225	<0.5
12	8800N 10475 E	0.014	–	–	–	20	195	330	<0.5
13	8800N 10500 E	0.015	–	–	<0.008	20	175	400	<0.5
14	8800N 10525 E	0.010	–	–	–	35	190	300	<0.5
15	8800N 10550 E	<0.008	–	–	–	30	215	395	<0.5
16	8800N 10575 E	<0.008	–	–	<0.008	25	400	485	<0.5
17	8800N 10600 E	0.010	–	–	–	20	280	335	<0.5
18	8800N 10625 E	0.011	–	–	–	25	200	340	<0.5
19	8800N 10650 E	0.010	–	–	–	30	350	315	<0.5
20	8800N 10675 E	0.010	–	–	–	30	235	250	<0.5
21	8800N 10700 E	0.010	–	–	–	30	305	302	<0.5
22	8800N 10725 E	0.010	–	–	–	30	250	275	<0.5
23	8800N 10750 E	<0.008	–	–	<0.008	35	285	265	<0.5
24	8800N 10775 E	0.009	–	–	–	5	110	445	<0.5
25	8800N 10800 E	0.009	–	–	–	5	150	435	<0.5

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

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493089

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.06819	16/02/90	11718	OF 3 5

TUBE No.	SAMPLE No.	Au	Au	Au	AuChk	Cu	Pb	Zn	Ag
1	9200N 10300 E	0.010	–	–	–	5	145	310	<0.5
2	9200N 10325 E	0.011	–	–	–	5	90	460	<0.5
3	9200N 10350 E	0.011	–	–	–	10	185	245	<0.5
4	9200N 10375 E	0.011	–	–	–	5	290	345	<0.5
5	9200N 10400 E	0.010	–	–	–	5	240	340	<0.5
6	9200N 10425 E	<0.008	–	–	–	10	305	360	<0.5
7	9200N 10450 E	<0.008	–	–	–	5	195	380	<0.5
8	9200N 10475 E	<0.008	–	–	–	10	180	220	<0.5
9	9200N 10500 E	<0.008	–	–	–	10	175	300	<0.5
10	9200N 10525 E	0.009	–	–	–	10	165	240	<0.5
11	9200N 10550 E	<0.008	–	–	–	20	105	225	<0.5
12	9200N 10575 E	<0.008	–	–	–	25	80	305	<0.5
13	9200N 10600 E	<0.008	–	–	–	30	130	300	<0.5
14	10800N 11200 E	<0.008	–	–	<0.008	20	35	120	<0.5
15	10800N 11225 E	<0.008	–	–	–	5	15	40	<0.5
16	10800N 11250 E	<0.008	–	–	–	5	50	35	<0.5
17	10800N 11275 E	<0.008	–	–	–	5	15	30	<0.5
18	10800N 11300 E	<0.008	–	–	–	5	65	50	<0.5
19	10800N 11325 E	<0.008	–	–	–	5	25	40	<0.5
20	10800N 11350 E	<0.008	–	–	–	5	115	120	<0.5
21	10800N 11375 E	<0.008	–	–	–	<5	65	50	<0.5
22	10800N 11400 E	<0.008	–	–	–	<5	120	70	<0.5
23	10600N 11350 E	<0.008	–	–	–	<5	35	40	<0.5
24	10600N 11375 E	<0.008	–	–	–	10	410	115	<0.5
25	10600N 11400 E	SNR	–	–	SNR	SNR	SNR	SNR	SNR

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.06819	16/02/90	11718	4 OF 5

TUBE No.	SAMPLE No.		Au	Au	Au	AuChk	Cu	Pb	Zn	Ag
1	10600N	11450 E	<0.008	—	—	0.011	5	65	70	<0.5
2	10600N	11475 E	<0.008	—	—	<0.008	<5	85	65	<0.5
3	10600N	11500 E	<0.008	—	—	—	<5	40	70	<0.5
4	10600N	11525 E	<0.008	—	—	—	<5	15	50	<0.5
5	10600N	11550 E	0.021	—	—	—	<5	25	32	<0.5
6	10400N	11450 E	<0.008	—	—	—	15	10	60	<0.5
7	10400N	11500 E	0.010	—	—	—	20	40	105	<0.5
8	10400N	11525 E	<0.008	—	—	—	25	30	220	<0.5
9	10400N	11550 E	0.014	—	—	<0.008	15	25	80	<0.5
10	10400N	11575 E	<0.008	—	—	—	20	25	95	<0.5
11	10400N	11600 E	<0.008	—	—	—	20	20	145	<0.5
12	10400N	11625 E	<0.008	—	—	—	10	20	95	<0.5
13	10400N	11650 E	<0.008	—	—	—	15	35	120	<0.5
14	10200N	11500 E	<0.008	—	—	—	25	45	175	<0.5
15	10200N	11525 E	<0.008	—	—	—	25	35	140	<0.5
16	10200N	11550 E	<0.008	—	—	—	20	30	110	<0.5
17	10200N	11575 E	<0.008	—	—	—	15	35	100	<0.5
18	10200N	11600 E	<0.008	—	—	<0.008	20	35	115	<0.5
19	10200N	11625 E	<0.008	—	—	—	15	30	125	<0.5
20	10200N	11650 E	<0.008	—	—	—	20	20	85	<0.5
21	10200N	11675 E	<0.008	—	—	—	20	40	120	<0.5
22	10200N	11700 E	<0.008	—	—	—	25	40	145	<0.5
23	10000N	11550 E	<0.008	—	—	—	25	105	265	<0.5
24	10000N	11575 E	<0.008	—	—	—	40	245	220	<0.5
25	10000N	11600 E	<0.008	—	—	—	40	150	305	<0.5

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.02.06819	16/02/90	11718	3 OF 5

TUBE No.	SAMPLE No.		Au	Au	Au	AuChk	Cu	Pb	Zn	Ag
1	10000N 11625 E		<0.008	–	–	–	45	160	185	<0.5
2	10000N 11650 E		<0.008	–	–	–	65	120	195	<0.5
3	10000N 11675 E		<0.008	–	–	–	20	50	180	<0.5
4	10000N 11700 E		<0.008	–	–	–	15	30	335	<0.5
5	10000N 11725 E		<0.008	–	–	<0.008	25	50	225	<0.5
6	10000N 11750 E		<0.008	–	–	–	25	20	455	<0.5
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22	SNR = Sample not received									
23	DETECTION		0.008	0.005	0.008	0.008	5	5	5	0.5
24	UNITS		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD		309	313	3309	309	101	101	101	101

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

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493092

064

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.04319	15/02/90	11718	1 OF 5

TUBE No.	SAMPLE No.	As	Ba						
1	8400N 10100 E	2	420						
2	8400N 10125 E	8	450						
3	8400N 10150 E	<2	460						
4	8400N 10175 E	4	220						
5	8400N 10200 E	<2	240						
6	8400N 10225 E	<2	210						
7	8400N 10250 E	<2	140						
8	8400N 10275 E	<2	370						
9	8400N 10300 E	<2	220						
10	8400N 10325 E	4	270						
11	8400N 10350 E	20	390						
12	8400N 10375 E	5	250						
13	8400N 10400 E	7	340						
14	8400N 10425 E	2	340						
15	8400N 10450 E	5	280						
	8400N 10475 E	<2	360						
17	8400N 10500 E	<2	370						
18	8400N 10525 E	2	410						
19	8400N 10550 E	7	510						
20	8400N 10575 E	2	580						
21	8400N 10600 E	<2	380						
22	8400N 10625 E	<2	670						
23	8400N 10650 E	<2	240						
24	8400N 10675 E	<2	870						
25	8400N 10700 E	2	410						

Results in ppm unless otherwise specified
T = *element present, but concentration too low to measure*
X = element concentration is below detection limit
— = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
065	204.0.03.06817	16/02/90	11718	2 OF 5

TUBE No.	SAMPLE No.	As	Ba						
1	8800N 10200 E	2	380						
2	8800N 10225 E	<2	320						
3	8800N 10250 E	<2	170						
4	8800N 10275 E	<2	210						
5	8800N 10300 E	<2	290						
6	8800N 10325 E	<2	290						
	8800N 10350 E	<2	400						
8	8800N 10375 E	<2	360						
9	8800N 10400 E	<2	480						
10	8800N 10425 E	2	320						
11	8800N 10450 E	<2	350						
12	8800N 10475 E	<2	260						
13	8800N 10500 E	<2	540						
14	8800N 10525 E	<2	440						
15	8800N 10550 E	<2	340						
16	8800N 10575 E	<2	430						
17	8800N 10600 E	<2	420						
18	8800N 10625 E	<2	340						
19	8800N 10650 E	<2	280						
20	8800N 10675 E	2	70						
21	8800N 10700 E	3	180						
22	8800N 10725 E	<2	230						
23	8800N 10750 E	4	320						
24	8800N 10775 E	2	940						
25	8800N 10800 E	2	1100						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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493094

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.03.06819	16/02/90	11718	3 OF 5

TUBE No.	SAMPLE No.	As	Ba						
1	9200N 10300 E	<2	290						
2	9200N 10325 E	<2	230						
3	9200N 10350 E	<2	220						
4	9200N 10375 E	<2	260						
5	9200N 10400 E	<2	270						
6	9200N 10425 E	<2	220						
	9200N 10450 E	<2	280						
8	9200N 10475 E	<2	140						
9	9200N 10500 E	<2	160						
10	9200N 10525 E	<2	190						
11	9200N 10550 E	3	140						
12	9200N 10575 E	<2	150						
13	9200N 10600 E	<2	210						
14	10800N 11200 E	3	140						
15	10800N 11225 E	<2	50						
16	10800N 11250 E	<2	330						
17	10800N 11275 E	<2	160						
18	10800N 11300 E	<2	560						
19	10800N 11325 E	<2	340						
20	10800N 11350 E	4	390						
21	10800N 11375 E	<2	540						
22	10800N 11400 E	<2	970						
23	10600N 11350 E	5	65						
24	10600N 11375 E	3	80						
25	10600N 11400 E	SNR	SNR						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
057	204.0.08.06819	16/02/90	11718	4 OF 5

493095

TUBE No	SAMPLE No.	As	Ba						
1	10600N 11450 E	3	450						
2	10600N 11475 E	<2	470						
3	10600N 11500 E	3	520						
4	10600N 11525 E	<2	500						
5	10600N 11550 E	<2	540						
6	10400N 11450 E	<2	730						
	10400N 11500 E	3	410						
8	10400N 11525 E	6	520						
9	10400N 11550 E	3	400						
10	10400N 11575 E	<2	410						
11	10400N 11600 E	6	510						
12	10400N 11625 E	<2	340						
13	10400N 11650 E	2	220						
14	10200N 11500 E	5	35						
15	10200N 11525 E	4	100						
16	10200N 11550 E	2	180						
17	10200N 11575 E	2	80						
18	10200N 11600 E	5	95						
19	10200N 11625 E	<2	240						
20	10200N 11650 E	<2	290						
21	10200N 11675 E	<2	420						
22	10200N 11700 E	4	510						
23	10000N 11550 E	<2	85						
24	10000N 11575 E	5	300						
25	10000N 11600 E	5	430						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.06819	16/02/90	11718	5 OF 5

TUBE No.	SAMPLE No.	As	Ba
1	10000N 11625 E	10	290
2	10000N 11650 E	4	240
3	10000N 11675 E	2	390
4	10000N 11700 E	3	350
5	10000N 11725 E	<2	480
6	10000N 11750 E	<2	1050
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22	SNR = Sample not received		
23	DETECTION	2	10
24	UNITS	ppm	ppm
25	METHOD	401	401

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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APPENDIX 6

NATIVE TRACK TIER

Diamond Drill Log LND 90-1
and Split Core/Chip Assays

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
		11668	10200		220	55	LND90-1	195			

PROJECT NATIVE TRACK TIER	HOLE NAME LND 90-1
LOGGED BY J. RANDELL	TOTAL DEPTH 195.5m
CONTRACTOR DIAMOND DRILLING TAS	RIG LY 44
CREW	DATE STARTED 12/3 FINISHED 19/3
CORE STORAGE: Nº OF TRAYS / LOCATION: DEVONPORT	SAMPLE STORAGE: DEVONPORT
M&P LAB	ASSAY LAB ANALABS

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	6	6	
CORE	HQ	6	30	24	
	NQ	30	195.5	165.5	
	BQ				
CASING					
CASING LEFT	PVC	0	195m		(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
0		220	55	
50		220	55	
100		223	55	
150		225	54	
195		224	54	

PLOTTING KEY

SYMBOL DES. CODE	G/LOG	INTERVAL FROM	TO	SYMBOL DES. CODE	G/LOG	INTERVAL FROM	TO

ASSAY INFORMATION

	DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Cu AAS	Pb XRF	Zn AAS	Ag AAS	Au FA	As XRF	Ba XRF	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
SP	13.2	15.0								17321					
	15.0	17.0								17322					
	17.0	19.0								17323					
▽	19.0	21.0								17324					
SP	40.0	41.2								17325					

DESCRIPTIVE LOG

6.0 – 13.2 // WEATHERED MASSIVE EPICLASTIC SANDSTONE.

Orange brown quartz and carbonate grits with minor fragments of shale. Lower contact obscured.

13.2 – 57.3 // PEBBLE – COBBLE VOLCANICLASTIC CONGLOMERATE.

13.2 – 25.2. Moderately weathered.

Polymict gravel size to cobble (>7cm) size, usually well rounded, often hematitic volcanic debris, vein quartz and fine siltstone. Poorly sorted. Minor carbonate veining.

Becoming pebble sized down hole.

40 – 41.2. Moderately weathered and broken.
44.5 – 46.6. 60% fine grained sericitic ash – siltstone in bands.

DRILLING OBJECTIVES / SUMMARY: To test source of UTEM anomaly observed on four grid lines to north and south. The source is assumed to be a wide zone of puggy sheared sericitised epiclastics with minor graphitic shales.

REPORT REFERENCE:

SHEET 1 OF 4

071

493098

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	NATIVE TRACK TIER	HOLE NAME	LND 90-1
LOGGED BY	J. RANDELL	TOTAL DEPTH	195.5m

ASSAY INFORMATION

	DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	CHAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
SP	54.8	56.0	173326						46.6 - 54.8. Mixed pebble and cobble sized well rounded. often purple.
SP	56.0	57.3	173327						50.6 - 50.9. Band of fine grained red laminated siltstone. 15°LCA.
	57.3								54.8 - 57.3. Very weathered core of ferruginous ox-carbonated epiclastic breccia.
									57.3 - 104.2 // SERICITIC COARSE EPICLASTIC
									Subrounded to sub angular fragments siltstone and chloritized pumice. Generally fragments <0.7cm.
									63.9 - 66.6. Pale red brown in colour.
									66.6 - 71.5. Mixed sequence fine grained green sericitic siltstone and coarse <0.5cm epiclastic. Strong red hematite alteration.
SP	71.5	73.5	173328						
SP	73.5	75.0	173329						71.5 - 76.5. Very broken and weathered, strongly carbonated.
SP	75.0	76.5	173330						
									76.5 - 104.2. Clast dominant mainly pebble size, some cobbles hematitic generally random orientation, fine grain size and probably fine sediments.
									104.2 - 114 // FINE GRAINED MASSIVE SERICITIC VITRIC ASH AND SILTSTONE.
									Pale purple and green minor weathered carbonate veinlets, some broken core.
									Becoming strongly sericitic at bottom.
									110.4 - 110.9. Massive quartz carbonate vein 112.4. 2cm quartz carbonate vein. 113.6. 4cm " " " .
SP	114.0	116.0	173331						114.0 - 118.1 // LAMINATED BLACK SHALE AND SERICITIC VITRIC ASH.
SP	116.0	118.0	173332						
SP	118.0	120.0	173333						
SP	120.0	122.0	173334						Mixed laminated shale and green sericitic volcaniclastic. Generally quite well laminated 50°LCA, some contorted beds. Strongly broken core.
SP	122.0	124.0	173335						
SP	124.0	126.0	173336						
SP	126.0	128.0	173337						

270
493009

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	NATIVE TRACK TIER	HOLE NAME	LND 90-1
LOGGED BY	J. RANDELL	TOTAL DEPTH	195.5m

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
								Rare pyrite clots. Strong sericite veining.
								118.1 – 159.6 // FINE GRAINED SERICITIC CHLORITIC SPOTTED CRYSTAL TUFF.
								Vague layering at 55° LCA.
								118.1 – 121.5. Irregular pyrite veinlets up to 7%. Some carbonate veinlets.
								121.5 – 127.3. Trace irregular pyrite clots and veinlets.
								Generally massive chlorite spotted ex. feldspar sericitic vetric ash. Irregular distribution of subrounded silicified volcanic detritus.
								Trace pyrite 149 – 149.1.
								155.3 – 159.6. Layered sericitic ash – coarse grained epiclastic, graded beds imply an uphole facing. Layering at 65° LCA. Trace pyrite at 157.3m in quartz carbonate vein. From 158.5. very fine grained ash.
								Lower contacts 40° LCA.
159.6	161.0	17338						159.6 – 160.3 // FINE LAMINATED GRAPHITIC BLACK SHALE.
161.0	163.0	17339						
163.0	165.0	17340						
165.0	167.0	17341						Very broken and graphitic, almost puggy. Laminations at 40° LCA.
								Lower contact obscure.
								160.3 – 166.7 // FINE GRAINED SERICITIC ASH.
								Feldspar phyric and chloritic, massive very puggy, broken core.
								163.5 – 164.6. Stgly chloritic.
								Moderate low angle carbonate veining from 165m.

ASSAY INFORMATION

493100

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	NATIVE TRACK TIER	HOLE NAME	LND 90-1
LOGGED BY	J. RANDELL	TOTAL DEPTH	195.5m

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
167.0	169.0	17342					
169.0	171.0	17343					
171.0	173.0	17344					
173.0	175.0	17345					
175.0	177.0	17346					
177.0	179.0	17347					
179.0	181.0	17348					
181.0	183.0	17349					
183.0	185.0	17350					
185.0	187.0	17351					
187.0	189.0	17352					
189.0	191.0	17353					
191.0	193.0	17354					
193.0	195.5	17355					

CORE RECOVERY

ALL 100% EXCEPT

FROM	TO	INT	REC	%
10.5	13.2	2.7	2.2	81
13.2	16.5	3.3	2.5	76
22.5	25.2	2.7	2.5	93
30.0	31.5	1.5	1.3	87
55.0	58.3	3.3	3.0	91

ASSAY INFORMATION

DESCRIPTIVE LOG

166.7 - 170.5 // COARSE SERICITIC EPICLASTIC

Sericitic strongly broken sub angular fragments to 1.5cm, quite puggy.

170.5 - 175.6 // FINE GRAINED SERICITIC ASH

Generally fine grained non laminated creamy ash unit. Strongly broken

Lower contact sharp but obscure.

175.6 - 177.4 // MASSIVE GREEN CHLORITIC VOLCANICLASTIC.

Minor feldspar phyric, some carbonate veining. Possibly an intrusive but is not magnetic. Trace blebs pyr? sph.

177.4 - 180.8 // CHLORITIC FINE ASH.

Very strongly broken core, puggy in places

180.8 - 195.5 // SERICITIC EPICLASTIC.

Pale pink and green sericitic epiclastic with fragments (<0.5cm). Strongly broken core especially 181.4 - 183 and 188.2 - 195.5.

193.4. Rare stringer pyrite.

E.O.H. 195.5m.

SHEET 4 OF 4.

074

493101

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

Phone (09) 458 7999 52 Murray Road, Welshpool, W.A. 6106 Telex AA92560
FAX 004 11 9899

ANALYTICAL REPORT No. 204.0.05.06607

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

ORDER No.	PROJECT
11720	M202

DATE RECEIVED	RESULTS REQUIRED
02/04/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	30/04/90	1	35

STATE OF SAMPLES REFER BELOW	SAMPLE NUMBERS	PRE-TREATMENT DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	ANALYSIS REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	<173,21/55	SC	Prep: 008,010,011,012,013,016						Cu,Zn,Ag/140		
	<173,21/55	SC							Au,AuChk/313		
	<173,21/55	SC							Pb,As,Ba/401		
	<173,21/55	SC							Ba/404		

RESULTS TO

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorption	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

076

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd

493103

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.06987	30/04/90	11720	1 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	Ba	Ba
1	17321	80	175	2300	3.0	<0.008	<0.008	26	915	–
2	17322	30	10	695	0.5	<0.008	0.012	14	763	–
3	17323	20	<5	160	<0.5	<0.008	–	<2	1280	–
4	17324	20	5	60	0.5	<0.008	–	<2	1090	–
5	17325	25	<5	130	0.5	<0.008	–	4	1130	–
6	17326	15	<5	70	0.5	<0.008	–	<2	1420	–
7	17327	15	<5	70	<0.5	<0.008	–	<2	1210	–
8	17328	20	30	80	<0.3	<0.008	–	<2	1200	–
9	17329	25	10	60	<0.5	0.013	–	<2	1360	–
10	17330	15	<5	75	<0.5	<0.008	–	<2	1570	–
11	17331	45	5	30	<0.5	<0.008	–	10	1730	–
12	17332	15	<5	30	<0.5	<0.008	–	<2	938	–
13	17333	20	5	25	<0.5	0.031	–	37	2770	–
14	17334	15	<5	45	<0.5	<0.008	–	19	–	4.77
15	17335	15	<5	15	<0.5	0.039	–	19	1140	–
16	17336	10	<5	15	<0.5	<0.008	–	36	1440	–
17	17337	10	<5	25	<0.5	<0.008	<0.008	<2	–	1.32
18	17338	90	55	75	0.5	<0.008	–	34	787	–
19	17339	60	5	65	<0.5	<0.008	–	2	599	–
20	17340	40	35	460	<0.5	0.010	–	<2	454	–
21	17341	50	65	420	<0.5	<0.008	–	2	676	–
22	17342	15	10	150	0.5	<0.008	<0.008	<2	610	–
23	17343	20	10	140	0.5	<0.008	–	<2	710	–
24	17344	20	10	100	0.5	<0.008	–	<2	807	–
25	17345	20	5	115	0.5	<0.008	–	<2	469	–

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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077

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

493104

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.06987	30/04/90	11720	2 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	Ba	Ba
1	17346	70	35	225	0.5	0.015	–	5	584	–
2	17347	95	175	335	0.5	0.013	–	<2	321	–
3	17348	90	55	260	<0.5	0.013	–	<2	855	–
4	17349	30	15	210	<0.5	0.014	–	<2	1660	–
5	17350	20	5	140	0.5	<0.008	–	<2	754	–
6	17351	10	5	140	<0.5	0.014	–	<2	1970	–
7	17352	20	5	100	<0.5	0.011	–	<2	–	1.74
8	17353	30	5	90	0.5	0.011	–	<2	605	–
9	17354	20	<5	55	0.5	<0.008	–	4	532	–
10	17355	35	20	85	0.5	0.010	–	<2	469	–
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	0.008	0.008	2	10	0.01
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%
25	METHOD	101	101	101	101	309	309	401	401	404

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

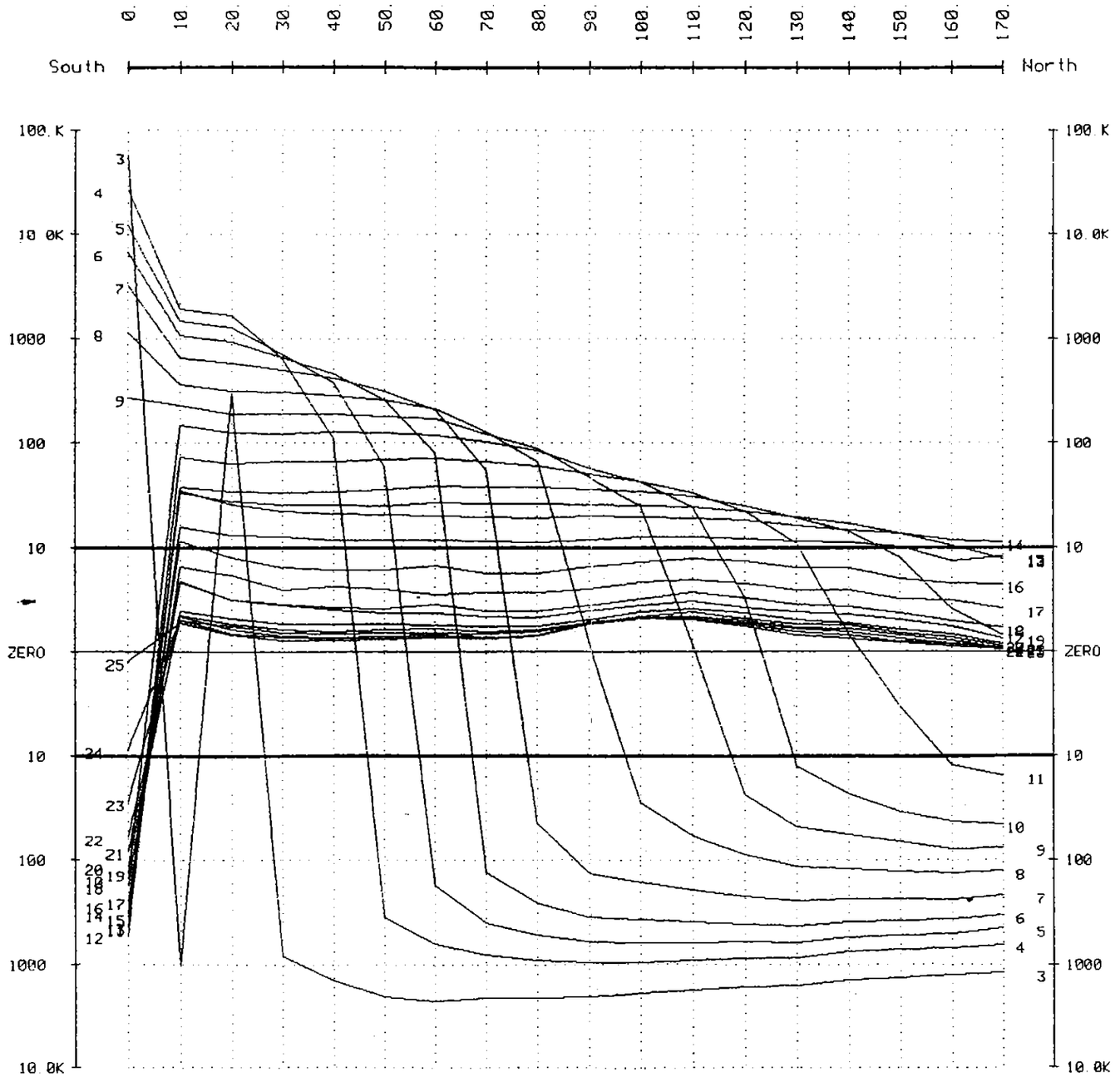
AUTHORISED OFFICER

APPENDIX 7

Native Track Tier - Down Hole EM Profiles, LND 90-1

TRANSIENT EM SURVEY DATA
Window MAGNITUDE

Line LND901
NATIVE TRACK/A1
for
BILLITON AUSTRALIA

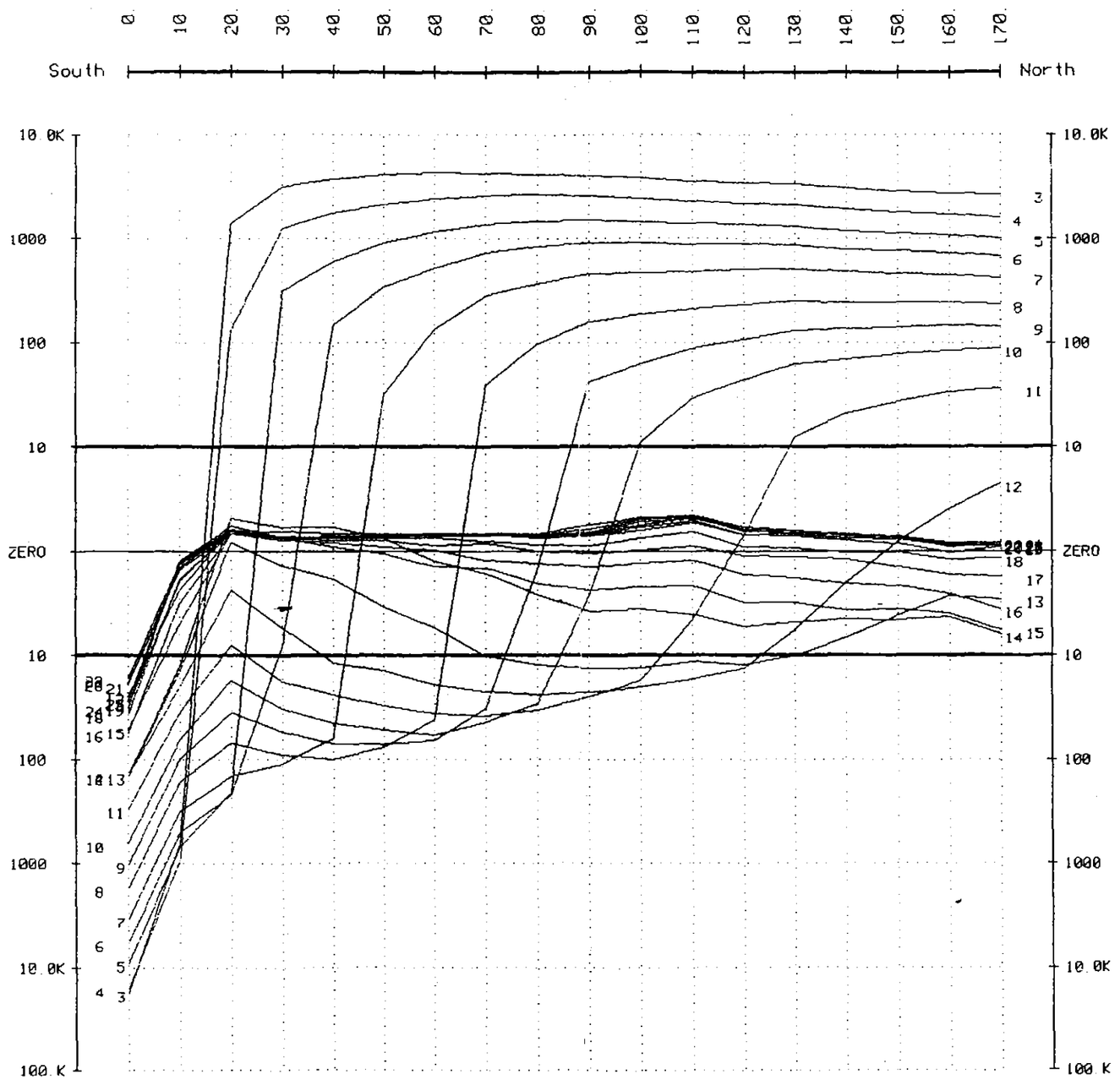


Window MAGNITUDE
values in microV/amPere
ComPonent "CH1 Z", Rxno= 10000
Downhole ZEROTEM
logged toP to bottom
LocP 1, 100m by 200m
6 amPs at 16 Hz
DOWN-HOLE

9456

TRANSIENT EM SURVEY DATA
Window MAGNITUDE

Line LND901
NATIVE TRACK/A2
for
BILLITON AUSTRALIA

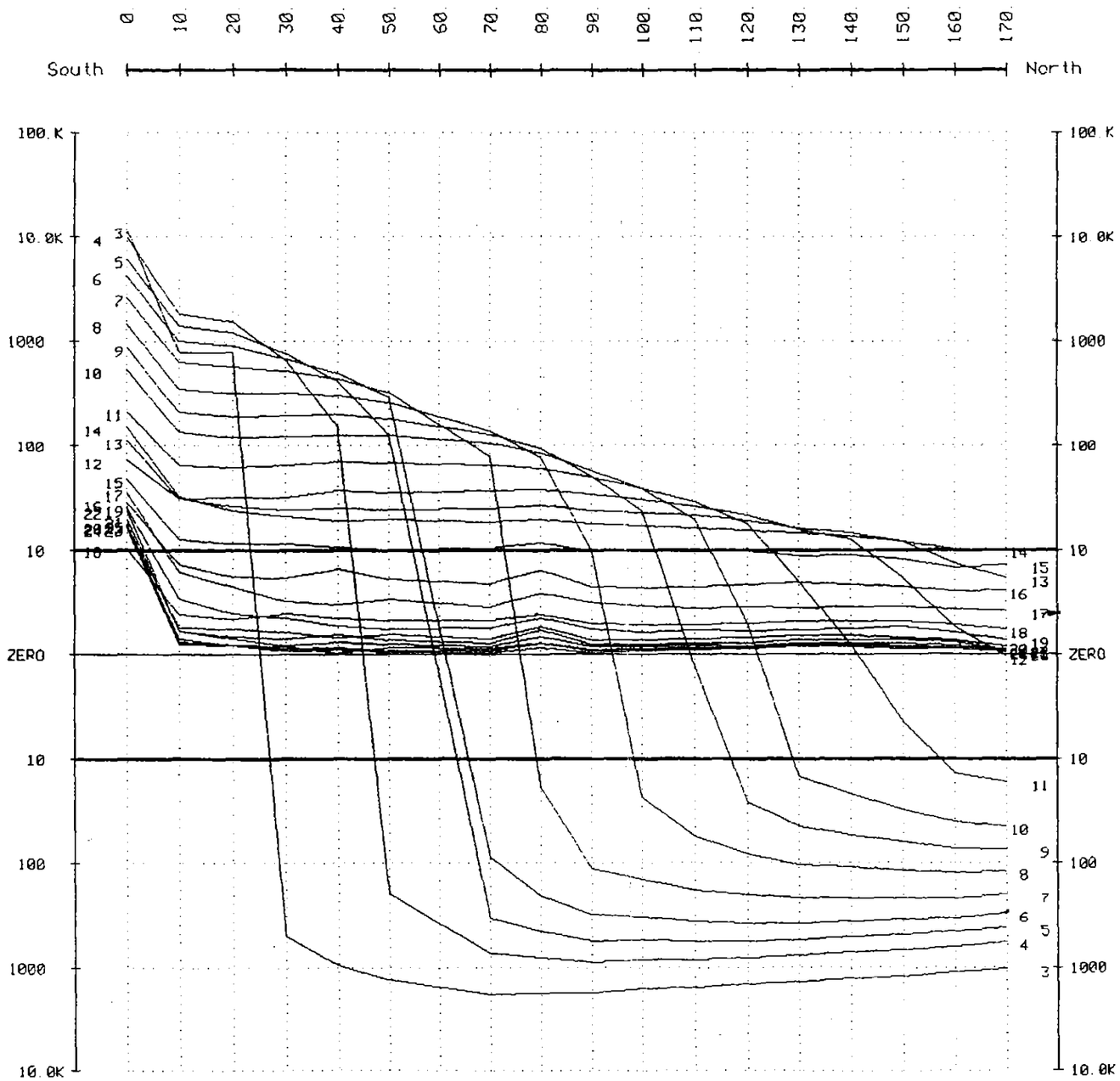


Window MAGNITUDE
values in microV/amPere
Component "CH1 Z , Rxno= 10000
Downhole ZEROTEM
logged top to bottom
Loop 2, 200m by 100m
6 amps at 15 Hz
DOWN-HOLE

493108

Window MAGNITUDE

Line LND901
NATIVE TRACK/B1
for
BILLITON AUSTRALIA

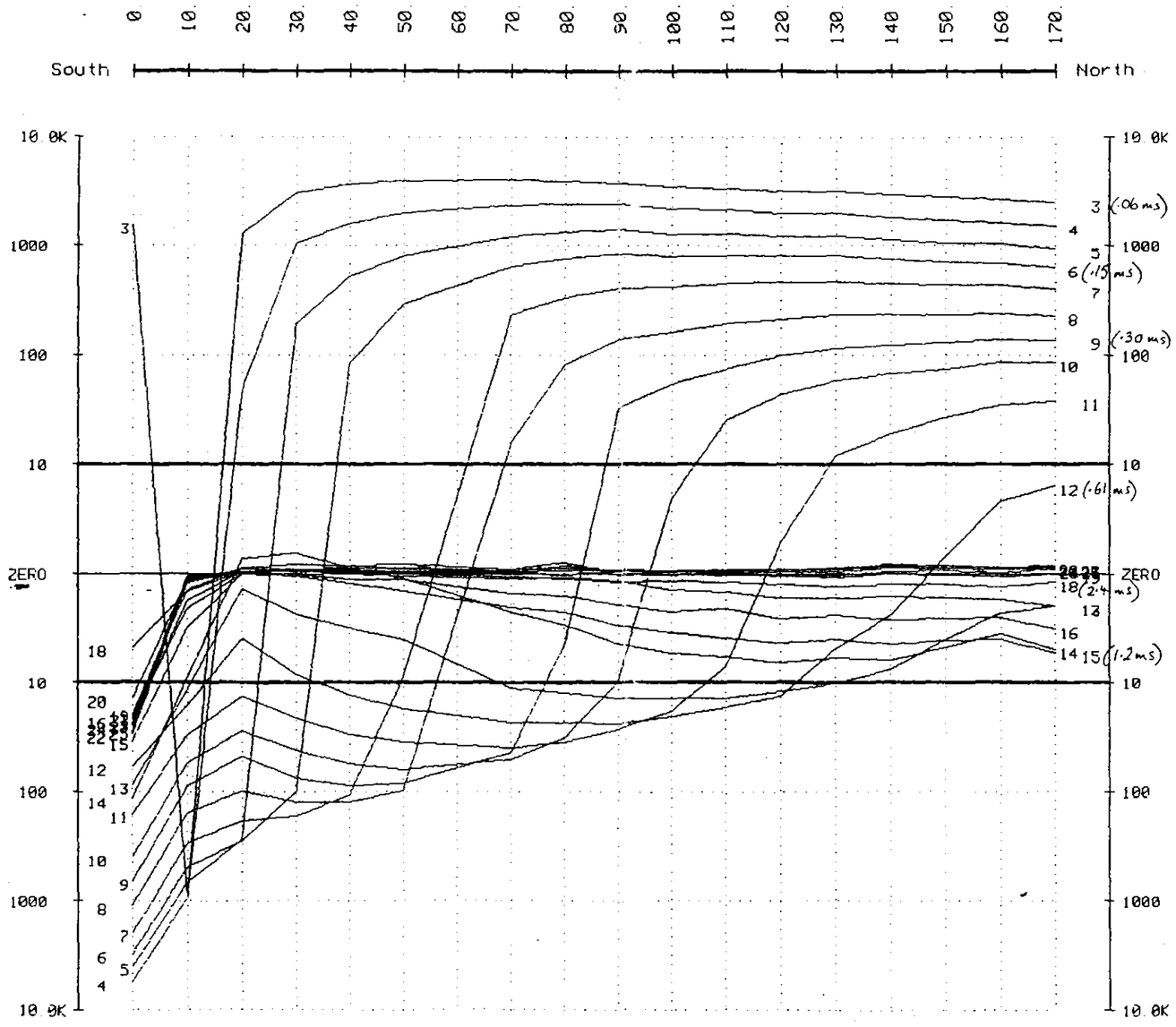


Window MAGNITUDE
values in microV/amPere
ComPonent "CH1 Z , Rxno= 10000
Downhole ZEROTEM
logged 29 March 1990
Loop 1, 100m by 200m
6 amPs at 16 Hz
UP-HoLE

9458

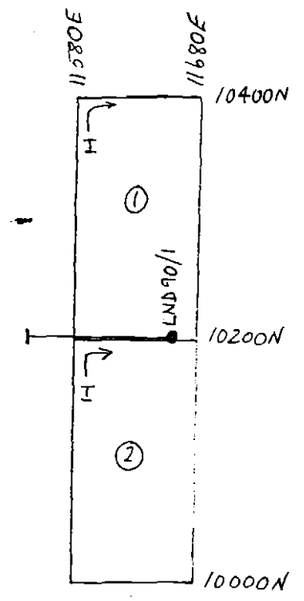
TRANSIENT EM SURVEY DATA
Window MAGNITUDE

Line LND901
NATIVE TRACK/B2
for
BILLITON AUSTRALIA



Window MAGNITUDE
values in microV/amPere
ComPonent "CH1 Z", Rxna= 10000
Downhole ZEROTEM
logged 29 March 1990
Loop 1. 100m by 200m
6 amPs at 5 Hz

UP-HOLE



493109

079

LOYETEA

St.Valentines Peak

NATIVE TRACK TIER ALTERATION

TWO HUMMOCKS ALTERATION ZONE

EL 36/79

Talbots Lagoon

HIGH TOR

Black Bluff

CATTLEY ANDESITE VOLCANIC COMPLEX

POSTULATED CATTLEY FAULT

Lake Leo

Murchison Highway

Cradle Mountain Link Road

HELLYER

QUE RIVER

QUE HELLYER COMPLEX

HENTY FAULT ZONE

MT.CRIPPS TRANSFER FAULT

410000N

400000N

390000N

395000E

400000E

405000E

0 5 10km

SCALE 1:100,000

5 cm

T	TERTIARY	Vesicular basalt
S-D	SILURO-DEVONIAN	Quartzite shales
Θ	ORDOVICIAN	Siliciclastics
Cvv	CATTLEY/LOONGANA	Mixed volcaniclastics, minor porphyry, lava andesitic lavas
Cvla		andesitic lavas
Cvlr		acid volcanics, probably lava
Css		Micaceous greywacke
Ct	CAMBRIAN QUE/HELLYER	Fine to coarse epiclastics
Cps		Intrusive porphyry epiclastics
Cdt		Mixed volcaniclastics
Cds		Sediments, shales, silts
Cdb		Basaltic lavas
Cdm		Mixed epiclastic, breccias, mineralized horison
Cdal		Andesitic lavas
Cbdal		Mixed basalt-andesite volcaniclastics
+	CAMBRIAN	Intrusive granitoid
PC	PRE-CAMBRIAN	Tyennan basement
O	EM SOUNDING	

493109

90-3122.

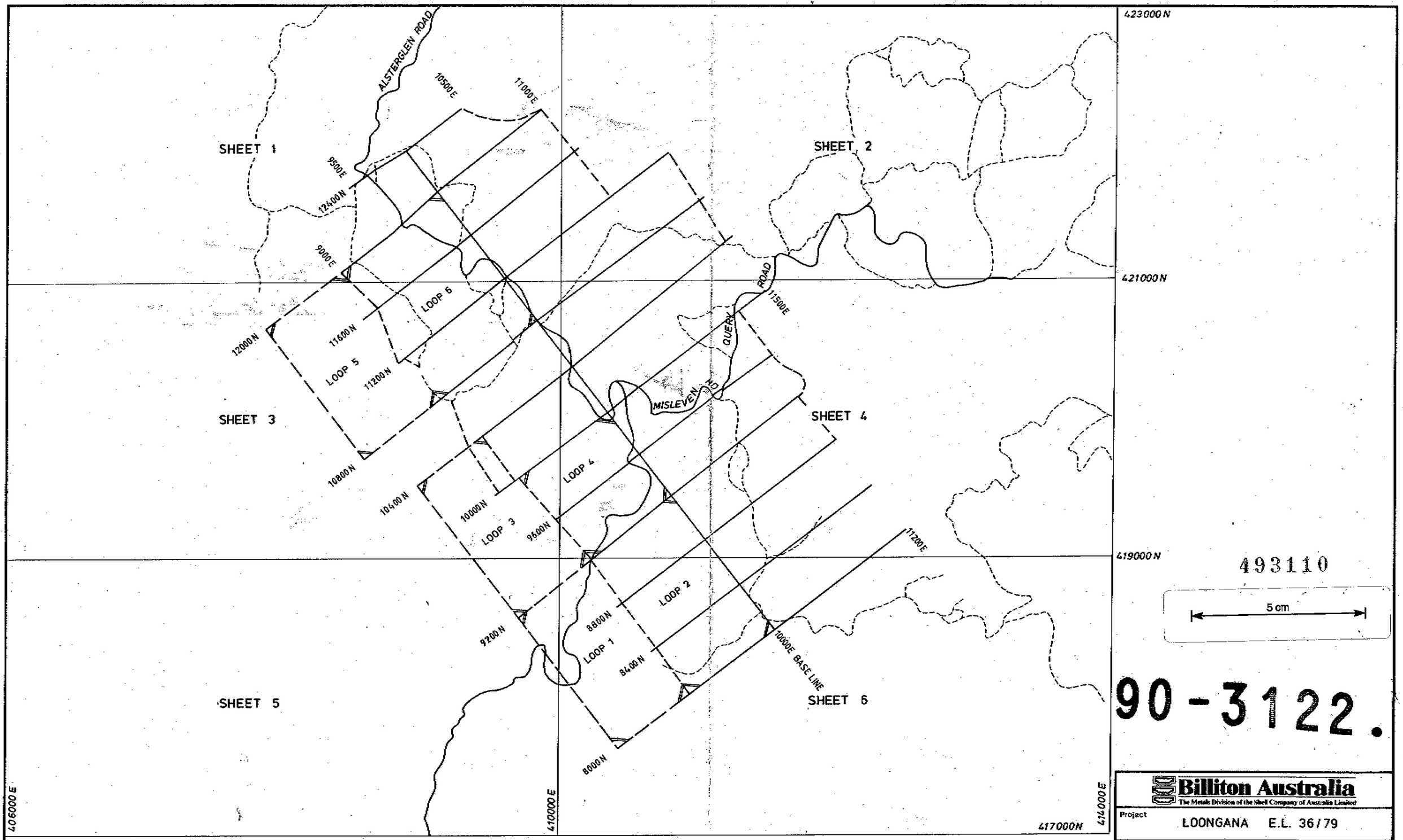
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: LOONGANA EL 36/79

Title: REGIONAL GEOLOGICAL SETTING

Author JPR	Dept. DEV	Scale 1:100,000	
Drawn HS	Date 3/89	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG.3		Drawing No. MZ02/1051	

080



493110

5 cm

90-3122.

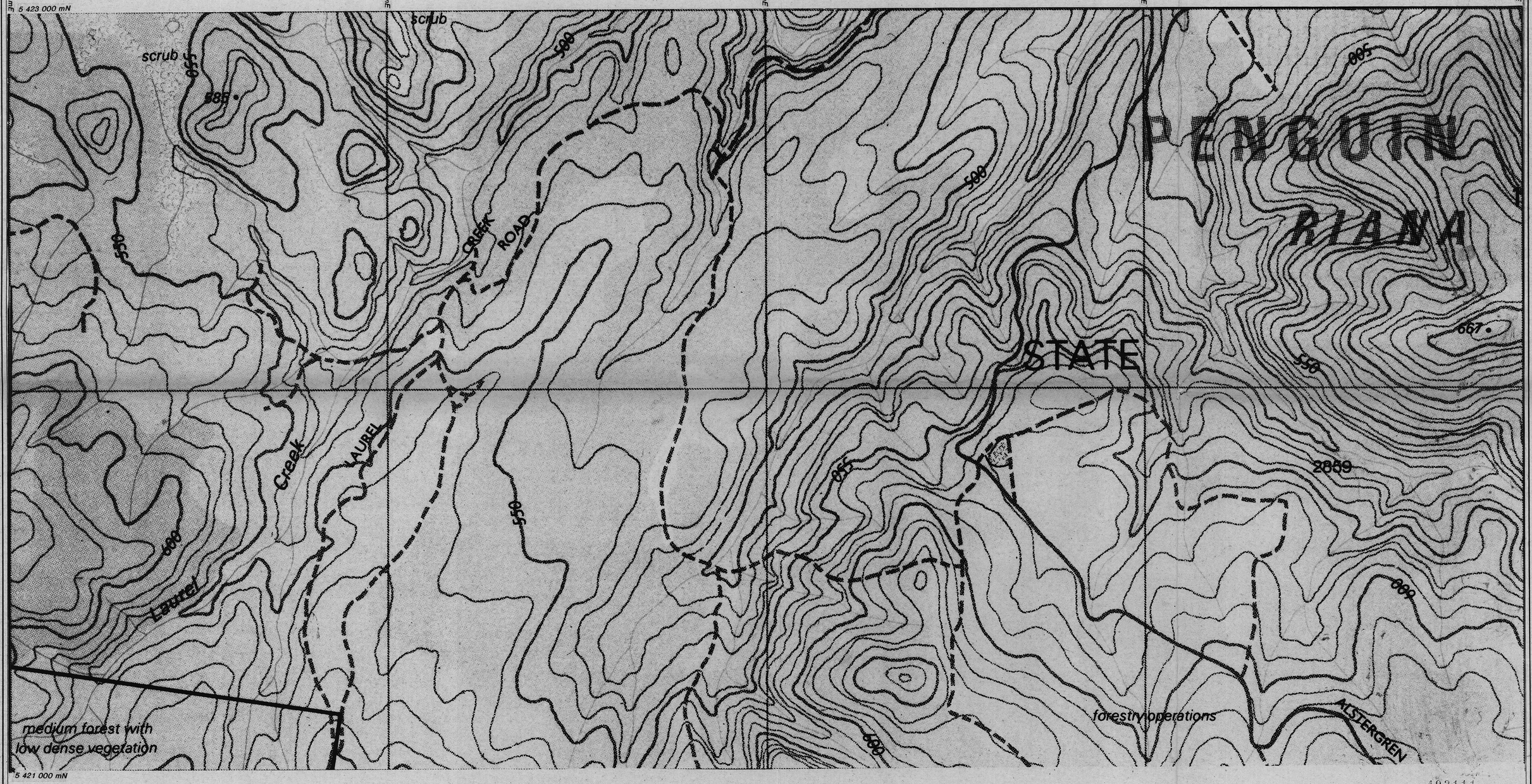
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: LOONGANA E.L. 36/79

Title: NATIVE TRACK TIER RECOVERED GRID & UTEM LOOP POSITIONS

Author JPR	Date 9/89	Scale 1:2500	
Drawn OH	Office TAS	Revised	Date
Drawing No. D/MZ 02/004			Fig. No. 4

9459



493111

SHEET INDEX

5 423 000 mN	1	2
	3	4
5 417 000 mN	5	6
	406 000 mE	414 000 mE

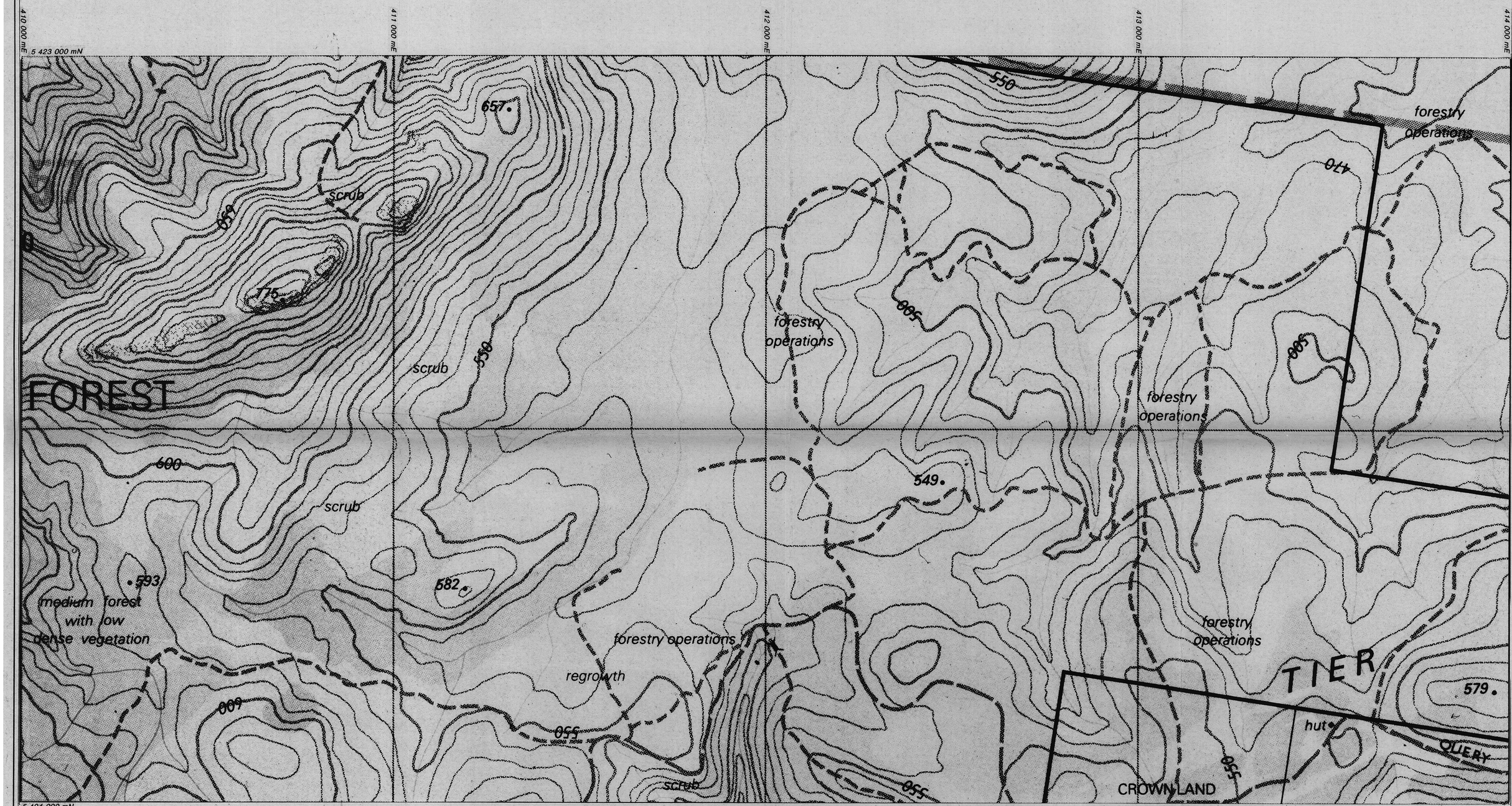
5 cm

90-3122

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

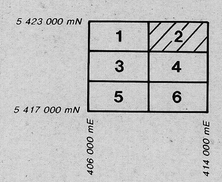
Project	LOONGANA, TAS. EL 36/79
Title	**Native Track Tier** TOPOGRAPHIC BASE MAP SHEET 1
Author J.R. Dept. DEV.	Scale 1:5 000
Drawn Date 8/89	Revised Date
Checked Date	S'ceded Date
Sheet No. 5	Drawing No. MZ02

9460



493112

SHEET INDEX



5 cm

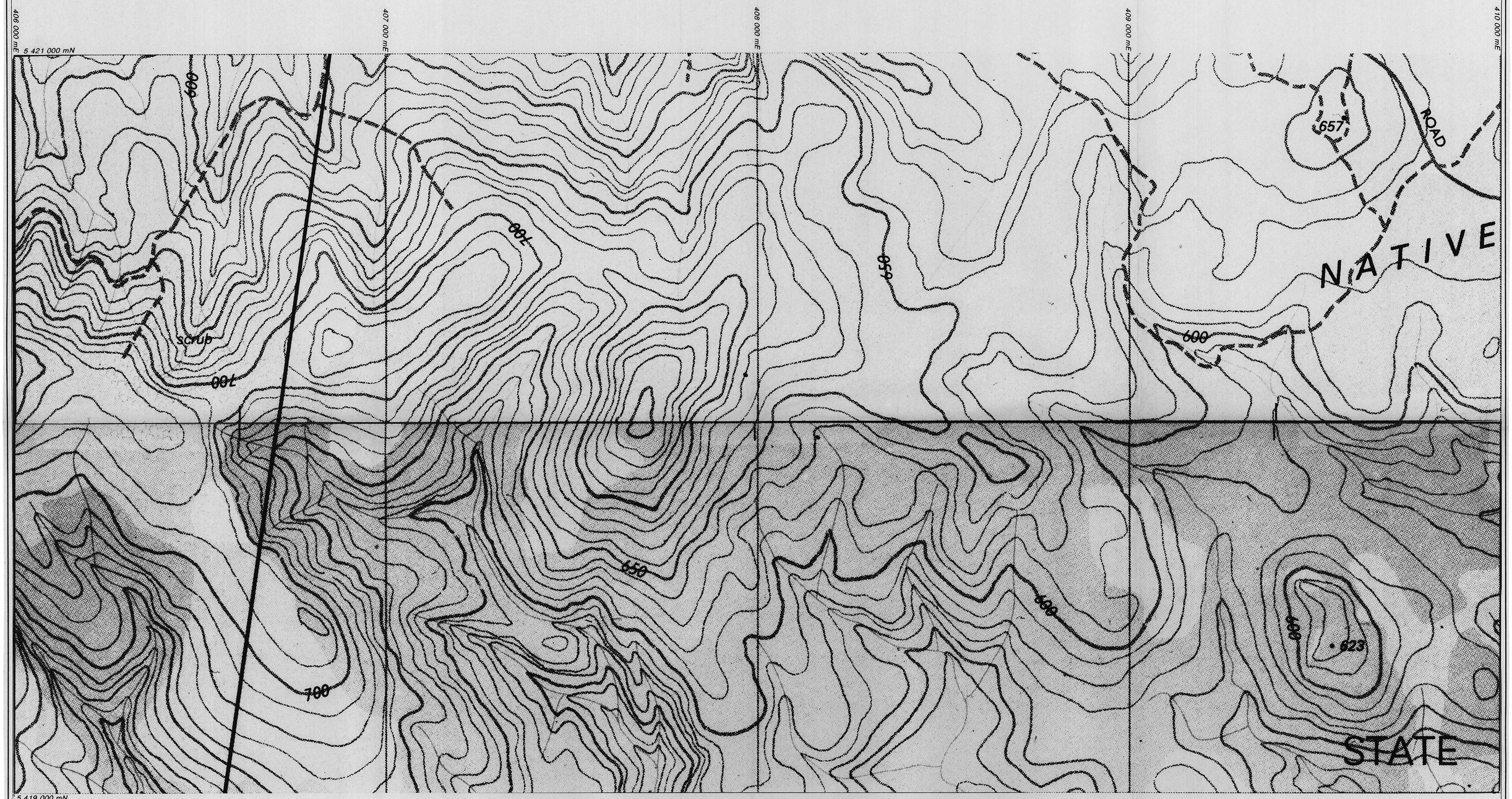
90-3122

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

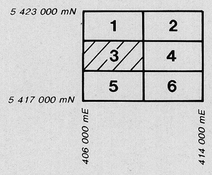
Project	LOONGANA, TAS. EL 36/79
Title	**Native Track Tier** TOPOGRAPHIC BASE MAP SHEET 2

Author J.R.	Dept. DEV.	Scale 1:5 000	
Drawn	Date 8/89	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. 6		Drawing No. MZ02	

9461



SHEET INDEX



5 cm

493113

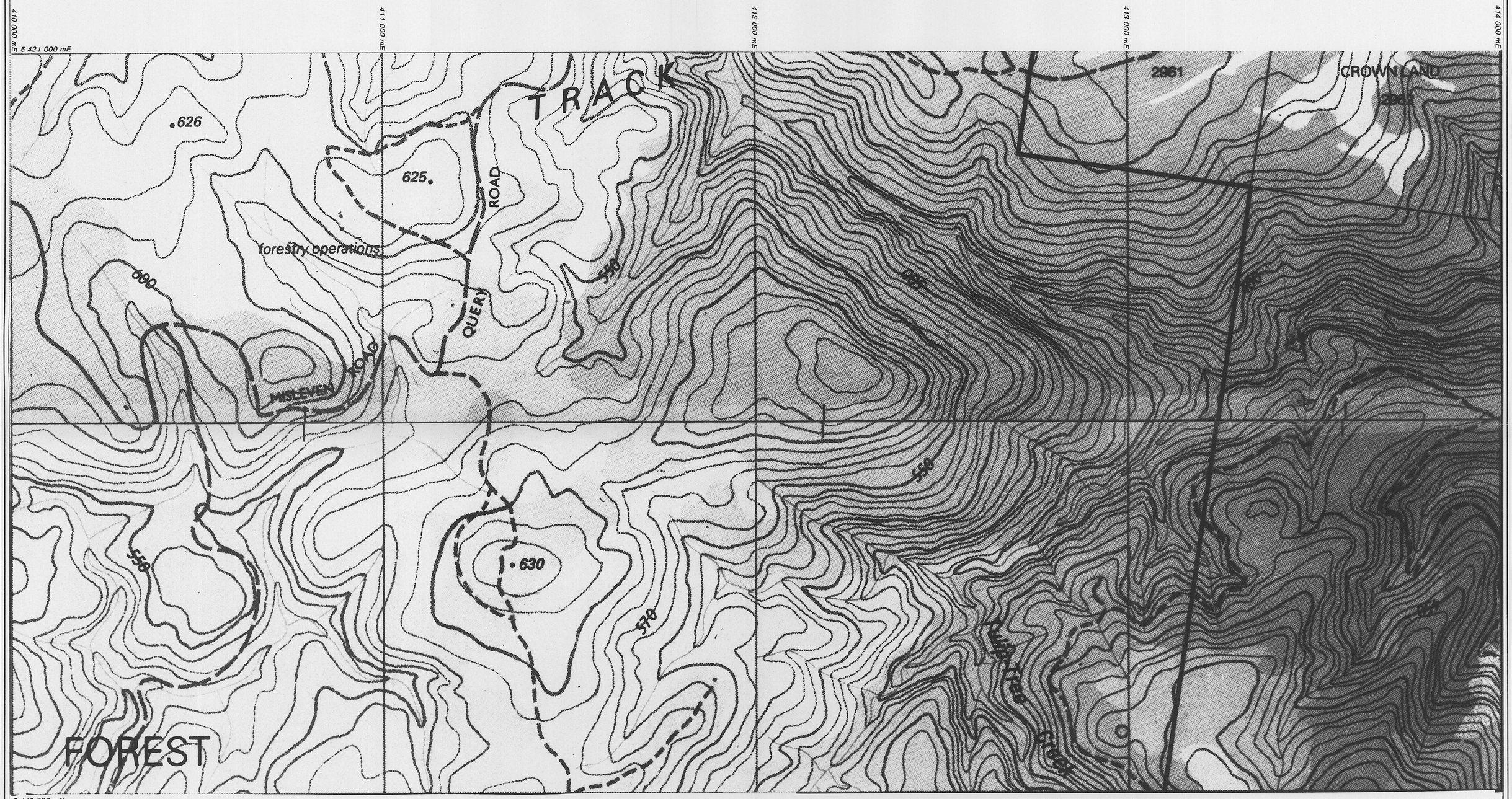
90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

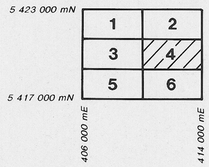
Project	LOONGANA, TAS. EL 36/79
Title	**Native Track Tier** TOPOGRAPHIC BASE MAP SHEET 3

Author	J.R.	Dept.	DEV.	Scale	1:5 000
Drawn		Date	8/89	Revised	Date
Checked		Date		S'ceded	Date
Sheet No.	7			Drawing No.	MZ02

~~9461~~
9462



SHEET INDEX



493114

5 cm

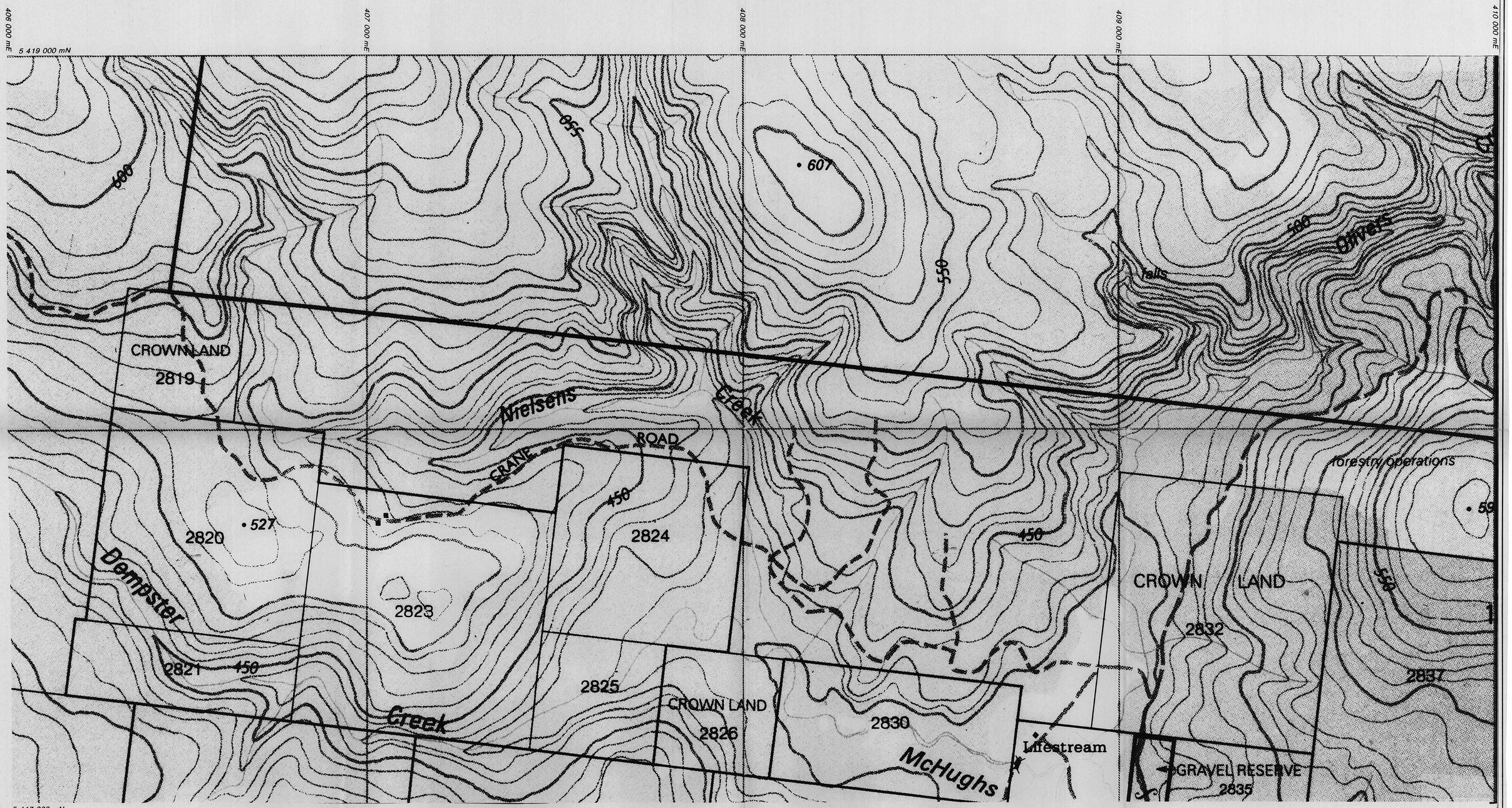
90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	LOONGANA, TAS. EL 36/79
Title	**Native Track Tier** TOPOGRAPHIC BASE MAP SHEET 4

Author J.R.	Dept. DEV.	Scale 1:5 000	
Drawn	Date 8/89	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. 8		Drawing No. MZ02	

9463



SHEET INDEX

1	2
3	4
5	6

5 423 000 mN
5 417 000 mN
406 000 mE
414 000 mE

493115

5 cm

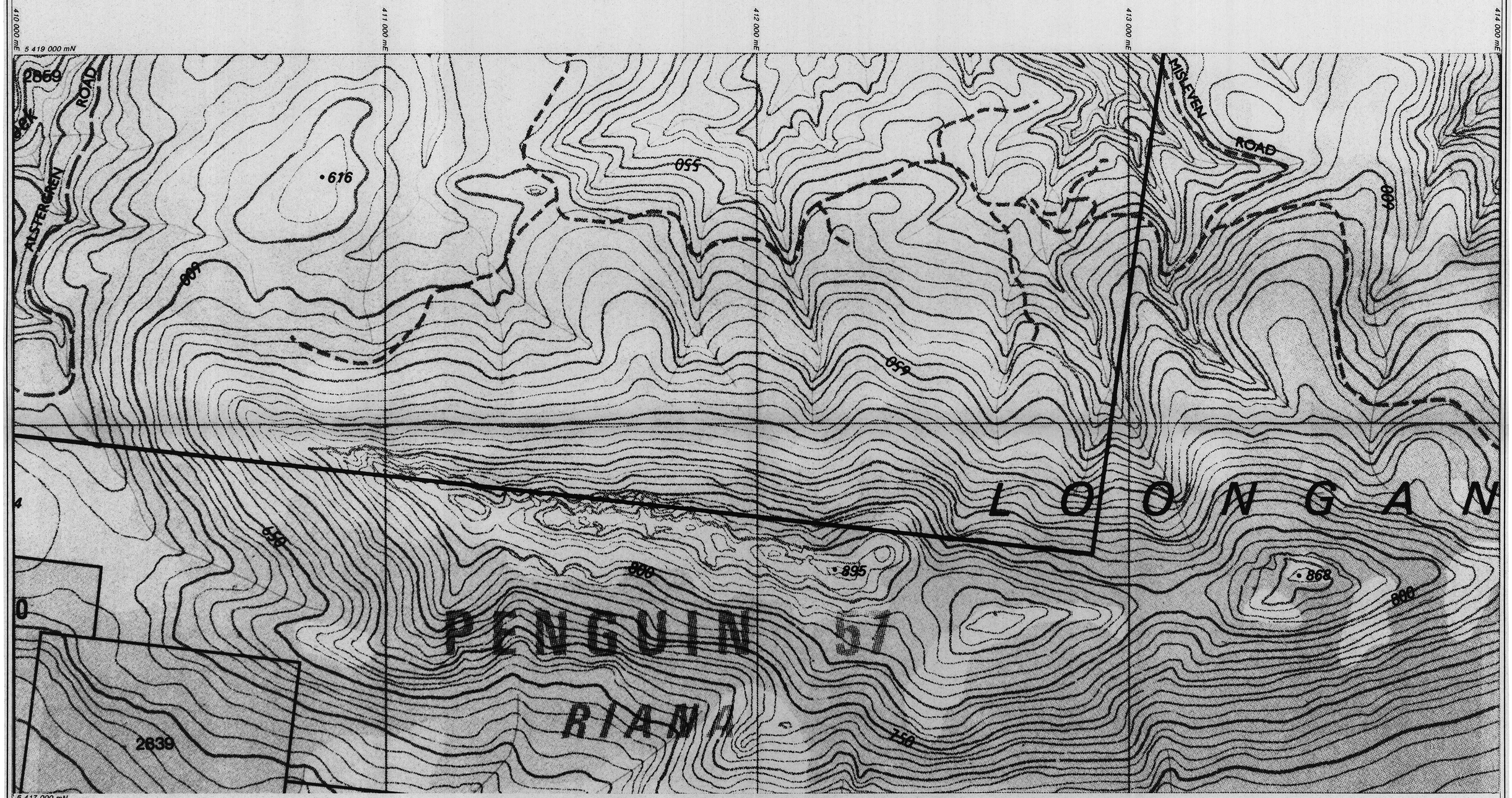
90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

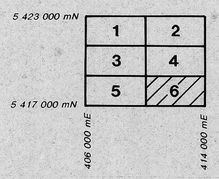
Project	LOONGANA, TAS. EL 36/79
Title	**Native Track Tier** TOPOGRAPHIC BASE MAP SHEET 5

Author J.R.	Dept. DEV.	Scale 1:5 000	
Drawn	Date 8/89	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. 9		Drawing No. MZ02	

9464



SHEET INDEX



493116

90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	LOONGANA,TAS. EL 36/79
Title	**Native Track Tier** TOPOGRAPHIC BASE MAP SHEET 6

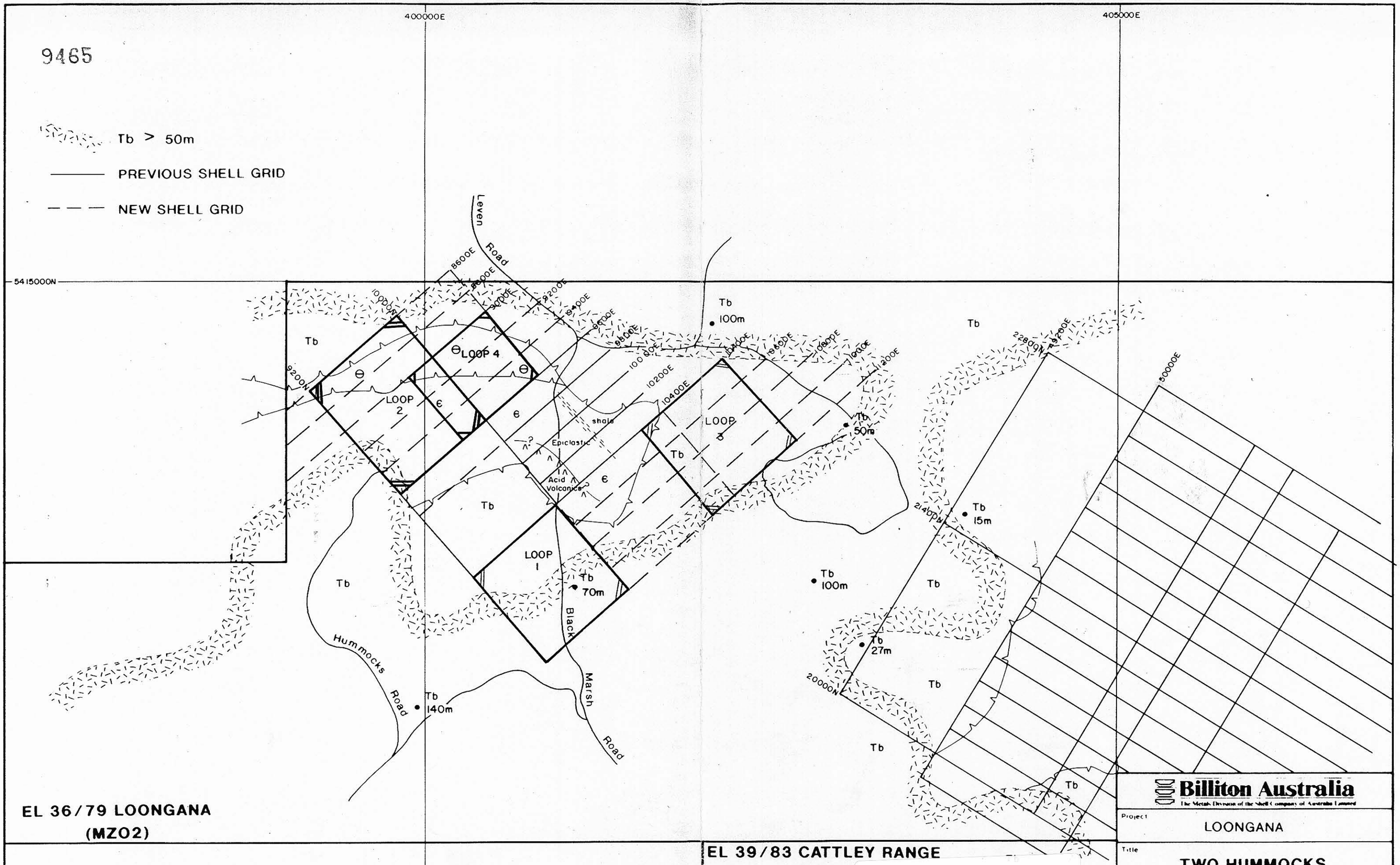
Author J.R.	Dept. DEV.	Scale 1:5 000	
Drawn	Date 8/89	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. 10		Drawing No. MZ02	

9465

Tb > 50m

PREVIOUS SHELL GRID

NEW SHELL GRID



EL 36/79 LOONGANA
(MZ02)

EL 39/83 CATTLEY RANGE
(LD51)

0 1km

5 cm

90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: LOONGANA

Title: TWO HUMMOCKS NEW GRID AND TEM COVERAGE

Author	JPR	Date	2/89	Scale	1:25,000
Drawn	HS	Office	AHO	Revised	Date
Drawing No	MZ02/1050			Fig No	11

493117

E.L. 36/79 BOUNDARY

8600E
8800E
9000E
9200E
9400E
10000N
9800N
9200N
10200N
ZONGE
ZONGE LOOP 2 (1989) (800 x 1000m)
EM-37 LOOP 4 (600 x 600m)
UTEM
UTEM LOOP (1984) (800 x 800m)
PD 85 TH 1
PD 85 TH 2
Edge of Basalt?
Black Shale
BASALT?
EDGE
ZONGE EM-37
ZONGE EM-37 LOOP (1989) (900 x 800m)
BLACK MARSH ROAD
LEVEN ROAD
10400E
10600E
10800E
11000E
11200E
11400N
11200N
11000N
10800N
10600N
10400N
10000N
9800N
9600N
9400N
9200N
(800 x 800m)
ZONGE LOOP 3 (1989)
(12200N)
(10000N)
LOOP 2
LOOP 3
TD 100m
TD 90m
HUMMOCKS
PEKO GRID
CRAE SHELL GRID
401000E
402000E
399000E
400000E
E.L. 36/79 BOUNDARY

LEGEND

TERTIARY	Tb	Fine grained vesicular basalt lava
ORDOVICIAN	Osd	Mixed siliciclastic, predominantly pebble to cobble conglomerate
	Cvfd	Feldspar phyric dacitic lava
	Csbs	Pink grained laminated siltstone with strong graphitic content at base. Non pyritic
	Cvv ser	Pale green strongly sericitized fine grained felsic volcaniclastic. Strongly siliceous types (Cvv ser chalc) and some chlorite (chl) + carbonate (cb) alteration
CAMBRIAN	Cvvd ser	Dark green chloritic medium grained feldspar phyric dacitic volcaniclastic. More siliceous types (Cvvrd ser)
	Cvlr	Massive rhyolitic volcanic, probably lava, moderately sericitic
	Cvlrdq	Massive orange-pink quartz phyric rhyodacitic volcanic ?lava

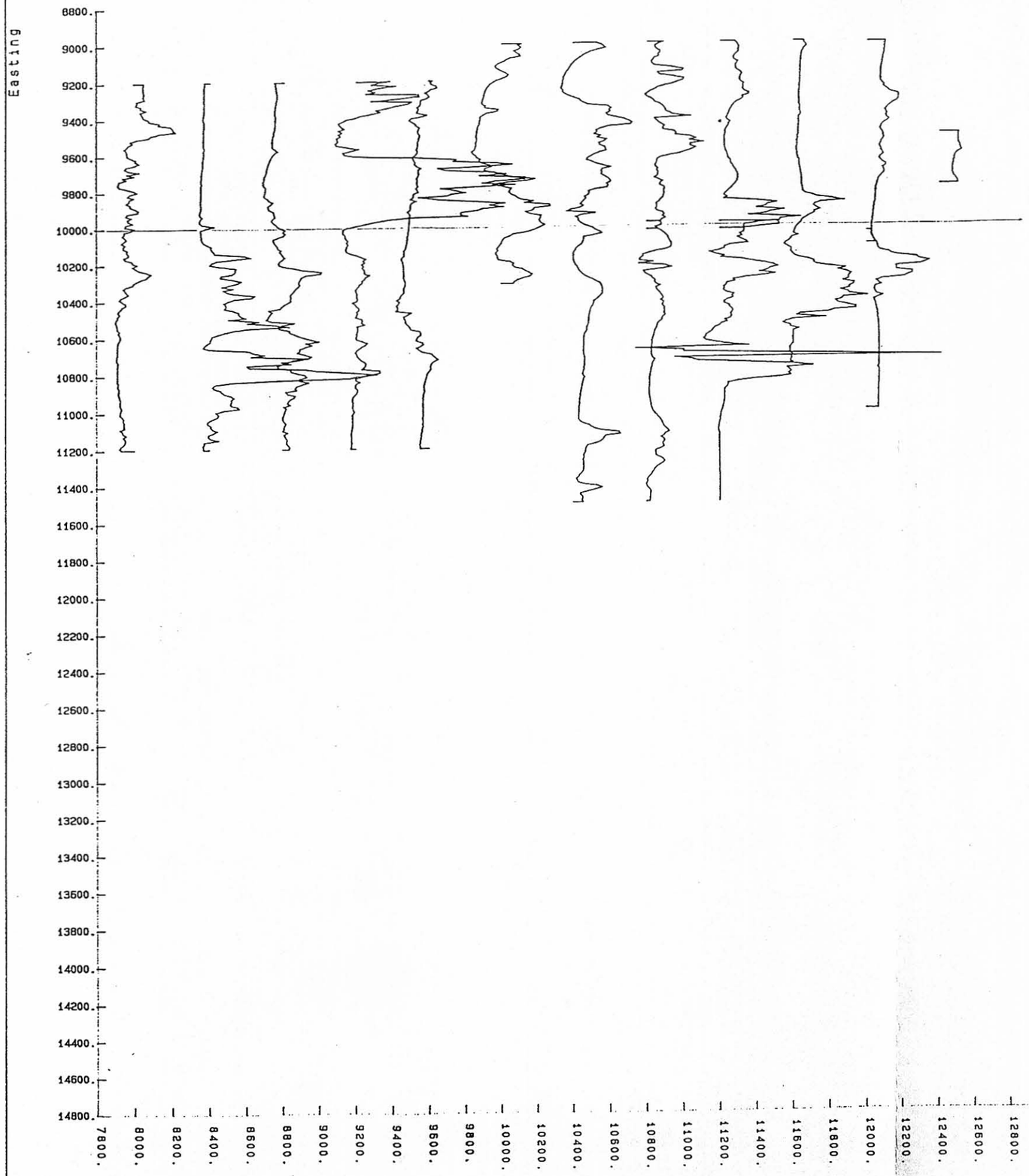
Main access track
Track
Creek
Button grass bog
Costean
Drill hole collar
UTEM Anomaly
RRMIP Anomaly positron
TEM Sounding
EM-37 Zonge Anomalies

5 cm

493118
90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	LOONGANA EL 36/79
Title	GEOLOGICAL GEOPHYSICAL COMPILATION
	SHEET 2
Author J P R Dept. TAS	Scale 1:5000
Drawn O H Date 7/88	Revised N H Date 3/7/89
Checked Date	S'ceded Date
Sheet No. FIG 12	Drawing No. O/MZ 02/002



90-3122

NATIVE TRACK TIER
GROUND MAGNETICS
STACKED PROFILES
BASE61800, 500nT/cm

FIB.NO: 13	REPT.NO:
ENCL.NO:	DRG.NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:

493119

9488

406000 E
407000 E
408000 E
409000 E
410000 E
423000 N
422000 N
421000 N


Bss/slt
75/170
Bsc/Bss
10000E
12400N
9500E
12000N
8000E
11600N
11200N
10500E
11000E
Bsc
Bsc(tuff)
Bsc(tcb tuff)
Bsc(tcb cgl)
Bsc(tcb sltst)
Bsltf ser cb
Bsltf
Bsltf q
Bsltf lam
Bsltf mic
Bsltf mic cb
Evvrdm 16047
Evvrcbser 16046
Evvr 16045
Evvser cb
Evvser ch/cb
Evvser ch
Evvser ch/cb 16051
Evvser cb 16052
Evvser cb 16053
Evvser ch/cb rmm
Evvser ch/cb (slt/cb)
Evvser sltst
Evvser lam
Evvser sltst
Evvser hem (chl)
Evvf/sltst ser 16049
Evvf hem mic
Evvf hem xl mm
Evvf hem mm
Evvf hem sm
Evvf/sltst ser (chl) hem mm
Evvf/sltst ser (chl) amyg mm
Evvf/sltst ser (chl) amyg sm
Evvf/sltst ser (chl) hem sm
Evvf/sltst ser (chl) hem
Evvf/sltst ser (chl)
Evvf/sltst ser
Evvf ser
Evvf hem
Evvf ser sltst
Evvf ser cb
Evvf hem ser
Evvf
Evvf mm
Evvf f mm
Evvf f sm
Evvf f am
Evvf f hem mm
Evvf f hem sm
Evvf f hem am
Evvf f cbl
Evvf f cbl hem
Evvf f cbl hem mm
Evvf f cbl hem sm
Evvf f cbl hem am
Evvf f cbl amyg
Evvf f cbl amyg mm
Evvf f cbl amyg sm
Evvf f cbl amyg am
Evvf f cbl mm
Evvf f cbl sm
Evvf f cbl am
Evvf f cbl/sltst
Evvf f cbl/sltst mm
Evvf f cbl/sltst sm
Evvf f cbl/sltst am
Evvf f cbl/sltst hem
Evvf f cbl/sltst hem mm
Evvf f cbl/sltst hem sm
Evvf f cbl/sltst hem am
Evvf f cbl/sltst amyg
Evvf f cbl/sltst amyg mm
Evvf f cbl/sltst amyg sm
Evvf f cbl/sltst amyg am
Evvf f cbl/sltst mm
Evvf f cbl/sltst sm
Evvf f cbl/sltst am
Evvf f tbd
Evvf f tbd mm
Evvf f tbd sm
Evvf f tbd am
Evvf f tbd hem
Evvf f tbd hem mm
Evvf f tbd hem sm
Evvf f tbd hem am
Evvf f tbd amyg
Evvf f tbd amyg mm
Evvf f tbd amyg sm
Evvf f tbd amyg am
Evvf f tbd/sltst
Evvf f tbd/sltst mm
Evvf f tbd/sltst sm
Evvf f tbd/sltst am
Evvf f tbd/sltst hem
Evvf f tbd/sltst hem mm
Evvf f tbd/sltst hem sm
Evvf f tbd/sltst hem am
Evvf f tbd/sltst amyg
Evvf f tbd/sltst amyg mm
Evvf f tbd/sltst amyg sm
Evvf f tbd/sltst amyg am
Evvf f tbd/sltst mm
Evvf f tbd/sltst sm
Evvf f tbd/sltst am
Evvf/sltst ser 16048
Evvf/sltst ser (chl)
Evvf/sltst ser (chl) hem
Evvf/sltst ser (chl) hem mm
Evvf/sltst ser (chl) hem sm
Evvf/sltst ser (chl) hem am
Evvf/sltst ser (chl) amyg
Evvf/sltst ser (chl) amyg mm
Evvf/sltst ser (chl) amyg sm
Evvf/sltst ser (chl) amyg am
Evvf/sltst ser (chl) mm
Evvf/sltst ser (chl) sm
Evvf/sltst ser (chl) am
Evvf/sltst ser hem
Evvf/sltst ser hem mm
Evvf/sltst ser hem sm
Evvf/sltst ser hem am
Evvf/sltst ser amyg
Evvf/sltst ser amyg mm
Evvf/sltst ser amyg sm
Evvf/sltst ser amyg am
Evvf/sltst ser mm
Evvf/sltst ser sm
Evvf/sltst ser am
Evvf/sltst
Evvf/sltst mm
Evvf/sltst sm
Evvf/sltst am
Evvf/sltst hem
Evvf/sltst hem mm
Evvf/sltst hem sm
Evvf/sltst hem am
Evvf/sltst amyg
Evvf/sltst amyg mm
Evvf/sltst amyg sm
Evvf/sltst amyg am
Evvf/sltst mm
Evvf/sltst sm
Evvf/sltst am
Evvf/sltst ser 16050
Evvf/sltst ser (chl) 16051
Evvf/sltst ser (chl) hem
Evvf/sltst ser (chl) hem mm
Evvf/sltst ser (chl) hem sm
Evvf/sltst ser (chl) hem am
Evvf/sltst ser (chl) amyg
Evvf/sltst ser (chl) amyg mm
Evvf/sltst ser (chl) amyg sm
Evvf/sltst ser (chl) amyg am
Evvf/sltst ser (chl) mm
Evvf/sltst ser (chl) sm
Evvf/sltst ser (chl) am
Evvf/sltst ser hem
Evvf/sltst ser hem mm
Evvf/sltst ser hem sm
Evvf/sltst ser hem am
Evvf/sltst ser amyg
Evvf/sltst ser amyg mm
Evvf/sltst ser amyg sm
Evvf/sltst ser amyg am
Evvf/sltst ser mm
Evvf/sltst ser sm
Evvf/sltst ser am
Evvf/sltst
Evvf/sltst mm
Evvf/sltst sm
Evvf/sltst am
Evvf/sltst hem
Evvf/sltst hem mm
Evvf/sltst hem sm
Evvf/sltst hem am
Evvf/sltst amyg
Evvf/sltst amyg mm
Evvf/sltst amyg sm
Evvf/sltst amyg am
Evvf/sltst mm
Evvf/sltst sm
Evvf/sltst am
Evvf/sltst ser 16050
Evvf/sltst ser (chl) 16051
Evvf/sltst ser (chl) hem
Evvf/sltst ser (chl) hem mm
Evvf/sltst ser (chl) hem sm
Evvf/sltst ser (chl) hem am
Evvf/sltst ser (chl) amyg
Evvf/sltst ser (chl) amyg mm
Evvf/sltst ser (chl) amyg sm
Evvf/sltst ser (chl) amyg am
Evvf/sltst ser (chl) mm
Evvf/sltst ser (chl) sm
Evvf/sltst ser (chl) am
Evvf/sltst ser hem
Evvf/sltst ser hem mm
Evvf/sltst ser hem sm
Evvf/sltst ser hem am
Evvf/sltst ser amyg
Evvf/sltst ser amyg mm
Evvf/sltst ser amyg sm
Evvf/sltst ser amyg am
Evvf/sltst ser mm
Evvf/sltst ser sm
Evvf/sltst ser am
Evvf/sltst
Evvf/sltst mm
Evvf/sltst sm
Evvf/sltst am
Evvf/sltst hem
Evvf/sltst hem mm
Evvf/sltst hem sm
Evvf/sltst hem am
Evvf/sltst amyg
Evvf/sltst amyg mm
Evvf/sltst amyg sm
Evvf/sltst amyg am
Evvf/sltst mm
Evvf/sltst sm
Evvf/sltst am
Evvf ser
Evvf hem
Evvf ser sltst
Evvf ser cb
Evvf hem ser
Evvf
Evvf mm
Evvf f mm
Evvf f sm
Evvf f am
Evvf f hem mm
Evvf f hem sm
Evvf f hem am
Evvf f cbl
Evvf f cbl hem
Evvf f cbl hem mm
Evvf f cbl hem sm
Evvf f cbl hem am
Evvf f cbl amyg
Evvf f cbl amyg mm
Evvf f cbl amyg sm
Evvf f cbl amyg am
Evvf f cbl mm
Evvf f cbl sm
Evvf f cbl am
Evvf f cbl/sltst
Evvf f cbl/sltst mm
Evvf f cbl/sltst sm
Evvf f cbl/sltst am
Evvf f cbl/sltst hem
Evvf f cbl/sltst hem mm
Evvf f cbl/sltst hem sm
Evvf f cbl/sltst hem am
Evvf f cbl/sltst amyg
Evvf f cbl/sltst amyg mm
Evvf f cbl/sltst amyg sm
Evvf f cbl/sltst amyg am
Evvf f cbl/sltst mm
Evvf f cbl/sltst sm
Evvf f cbl/sltst am
Evvf f tbd
Evvf f tbd mm
Evvf f tbd sm
Evvf f tbd am
Evvf f tbd hem
Evvf f tbd hem mm
Evvf f tbd hem sm
Evvf f tbd hem am
Evvf f tbd amyg
Evvf f tbd amyg mm
Evvf f tbd amyg sm
Evvf f tbd amyg am
Evvf f tbd/sltst
Evvf f tbd/sltst mm
Evvf f tbd/sltst sm
Evvf f tbd/sltst am
Evvf f tbd/sltst hem
Evvf f tbd/sltst hem mm
Evvf f tbd/sltst hem sm
Evvf f tbd/sltst hem am
Evvf f tbd/sltst amyg
Evvf f tbd/sltst amyg mm
Evvf f tbd/sltst amyg sm
Evvf f tbd/sltst amyg am
Evvf f tbd/sltst mm
Evvf f tbd/sltst sm
Evvf f tbd/sltst am
Evvf/sltst ser 16048
Evvf/sltst ser (chl)

410000 E

411000 E

412000 E

413000 E

423000 N

422000 N

421000 N

11000 E

11600 N

11500 E

11200 N

10800 N

10400 N

Cvcer

Cvsilt

Cvid

Cvlo

Cvsf 15923

Cvcer

Cssilter

Cvcer

Cvlo

Cvlo

Cvcer

Cvlo

Cvlo

Cvlo

9470

406000 E
407000 E
408000 E
409000 E
410000 E
421000 N
420000 N
419000 N
9000 E
10000 E
11600 N
11200 N
10800 N
10400 N
10000 N
9600 N

Evird
Evird sm
Evird fwbd
Eve chl ser
Eve f chl ser hem
Evif ser (hem)
Eved ser
Evv ser chl
Evv ser cb
Evv f ch
Eve chl hem
Eve ser cb 16049
Evird chl mm sil
Evird chl mm
Evird chl sil mm
Evird chl mm
Eve chl cb mm 16053
Eve chl lat 16050-52
Essit
Evird sil mm
Evird P sil mm
Evird chl sil mm
Evird chl mm
Evird chl
Evird fwbd
Evird chl mm
Evird fwbd
Eve chl 16046
Evwchl ser
Evv ser cb
Evv ash
Evird sil
Eve chl mm
Eve chl med
Eve chl
Essit
Evv ash cherty
Eve ser ser/sm 16048
Evird (al)
Evird (al) wm
Essit
Evir

493122

ORDOVICIAN	Osc	Pebble to cobble siliciclastic conglomerate often hematitic	Outcrop	cb	carbonate
	Ossit	Fine grained siliceous siltstone, often interbedded with Osc.	Subcrop	chl	chlorite
CAMBRIAN	Cvla	Massive lava of andesitic composition. Relatively undeformed, blocky often flow banded	Float	ser	sericite
	Cvlr	As above but rhyolitic.	Track	hem	hematite
	Cvlrd	As above but rhyodacitic.	Creek	sil	silica
	Cvv	Fine grained strongly foliated feldspar phyric volcaniclastic often ashy. Strongly carbonatised and sericitised.	Access line	f	feldspar phyric
	Cve(d)	Coarse grained epiclastic with pebble size subrounded fragments. Often dacitic(d)	Bedding	q	quartz phyric
	Cssit	Fine grained volcaniclastic siltstone. Non-laminated	Cleavage	qvn	quartz veining
			Cleavage - vertical	wm	weakly magnetic
				mm	moderately magnetic
				sm	strongly magnetic
				mic	micaceous
				amygd	amygdaloidal
				fw bd	flow banded

5 cm

90-3122.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	LOONGANA		
Title	NATIVE TRACK TIER GEOLOGICAL FACT MAP SHEET 3		
Author	J P R	Dept. TAS	Scale 1:5000
Drawn	O H	Date 9/89	Revised Date
Checked		Date	S'ceded Date
Sheet No.	FIG 16		Drawing No. D/M Z 02/006

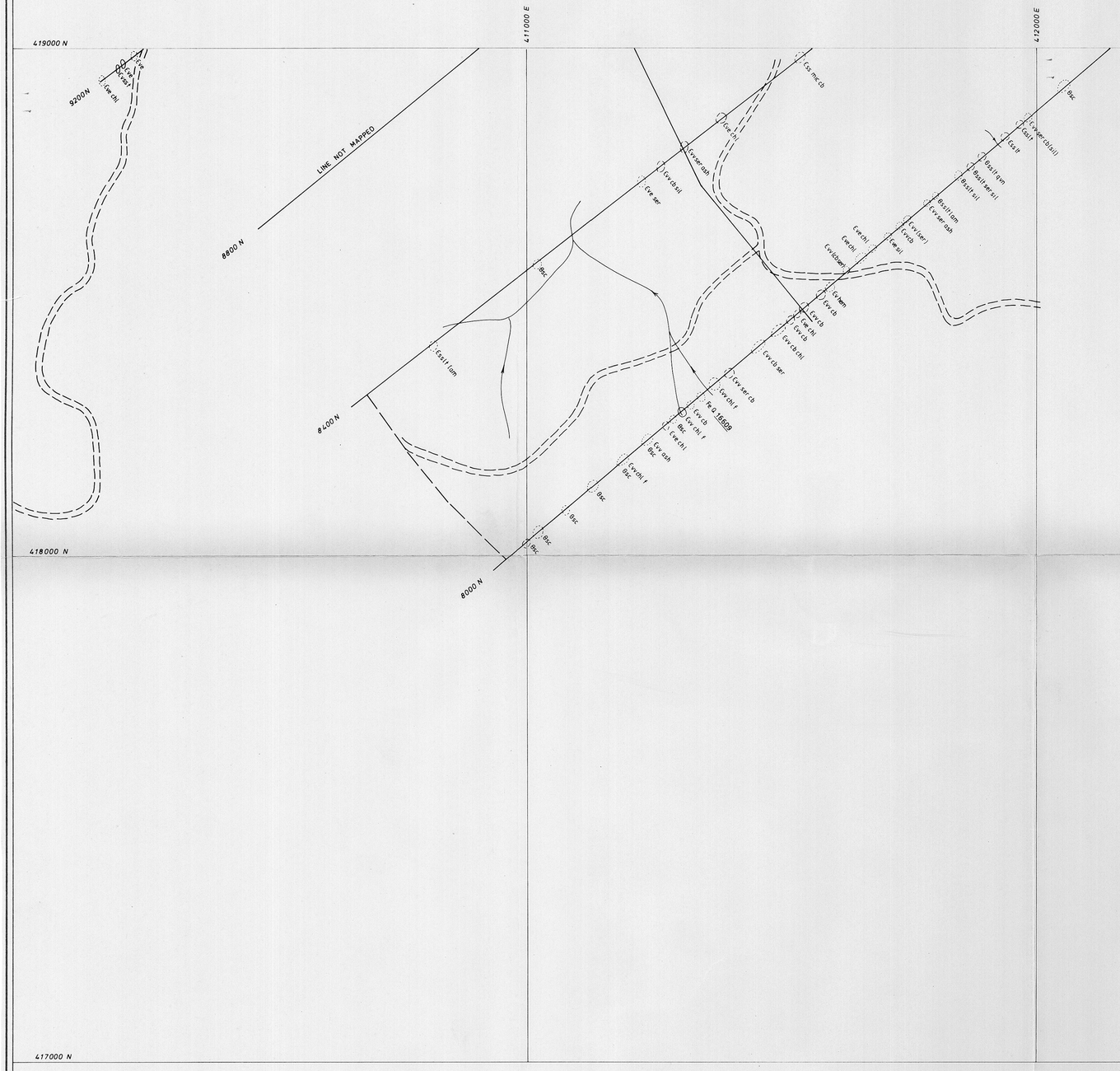
9471

410000 E
411000 E
412000 N
413000 E
421000 N
420000 N
419000 N
10800 N
10400 N
10000 N
9600 N
9200 N
8800 N
8400 N
8000 N
12000 E

Peg 19450N 410800E
Peg 419700N 411850E
Peg 417200N 417950E
CD - 1
Hut
16605
16607
16064
16608
16619
16620
16621

Cvv/sslt
Cvv/ssltf
Cvv
Cvv sil
Cvv ser
Cvv ser ash
Cvv ser sil
Cvv ser chl
Cvv ser chl mic sm
Cvv ser ch
Cvv ser cb
Cvv ser cb 16607
Cvv cb ser
Cvv cb ser ash
Cvv ch
Cvv ch sil
Cvv ch sil (ch)
Cvv ch sil mm
Cvv ch mm
Cvv ch ser
Cvv ch qf
Cvv cb freq 16621
Cvv q
Cvv q cb
Cvv q ser
Cvv q ser cb
Cvv sil 16620
Cvv sil qtn 16619
Cvv sil chl mf
Cvv sil chl (k)
Cvv sil mm
Cvv ash
Cvv cb
Cvv chl
Cvv chl sil
Cvv chl sil mm
Cvv chl sil (k)
Cvv chl mic sm
Cvv chl ser
Cvv chl ser cb
Cvv chl ser ash
Cvv chl cb ser
Cvv chl cb mm
Cvv chl cb sm
Cvv chl mm
Cvv chl mm amygd
Cvv chl amygd
Cvv chl/mmed
Cvv chl/mmed amygd
Cvv chl/mmed ser cb
Cvv chl/mmed ser cb 16605
Cvv chl/mmed cb
Cvv chl/mmed cb ser
Cvv chl/mmed ser ch
Cvv chl/mmed ser ch cb
Cvv chl/mmed ser ch cb 16605
Cvv chl/mmed ser ch cb ser
Cvv chl/mmed ser ch cb ser 16605
Cvv chl/mmed ser ch cb ser 16607
Cvv chl/mmed ser ch cb ser 16608
Cvv chl/mmed ser ch cb ser 16619
Cvv chl/mmed ser ch cb ser 16620
Cvv chl/mmed ser ch cb ser 16621
Cvv chl/mmed ser ch cb ser 16064

9472


419000 N
418000 N
417000 N
411000 E
412000 E
413000 E
9200 N
8800 N
8400 N
8000 N
LINE NOT MAPPED
Csv mic sb
Csv chl
Csv ser sb
Csv ab sil
Csv ser
Csv ser sb
Csv ab sil
Csv ser
Csv chl
Csv ab sil
Csv ser
Csv chl
Csv ser sb
Csv ab sil
Csv ser
Csv chl
Csv ab sil
Csv ser
Csv chl
Csv ab sil
Csv ser
Csv chl

9473

409000 E
410000 E
411000 E
5422000 N
5421000 N
5420000 N
5419000 N
10200 E
12400 N
12000 N
11600 N
11200 N
10800 N
10400 N
10000 N
9600 N
9200 N
8800 N
8400 N
8000 N
10000 E
SER
CB
CHL
SS
DDH CD-1

LEGEND

- Rhyolitic to Dacitic (Quartz + feldspar Phyric) Intrusive / Lava.
- Fine grained strongly carbonatised and sericitized foliated volcaniclastic
- Coarse grained well rounded epiclastic debris flow
- Fine grained volcaniclastic siltstone

Alteration: CB carbonate; CHL chlorite; SER sericite

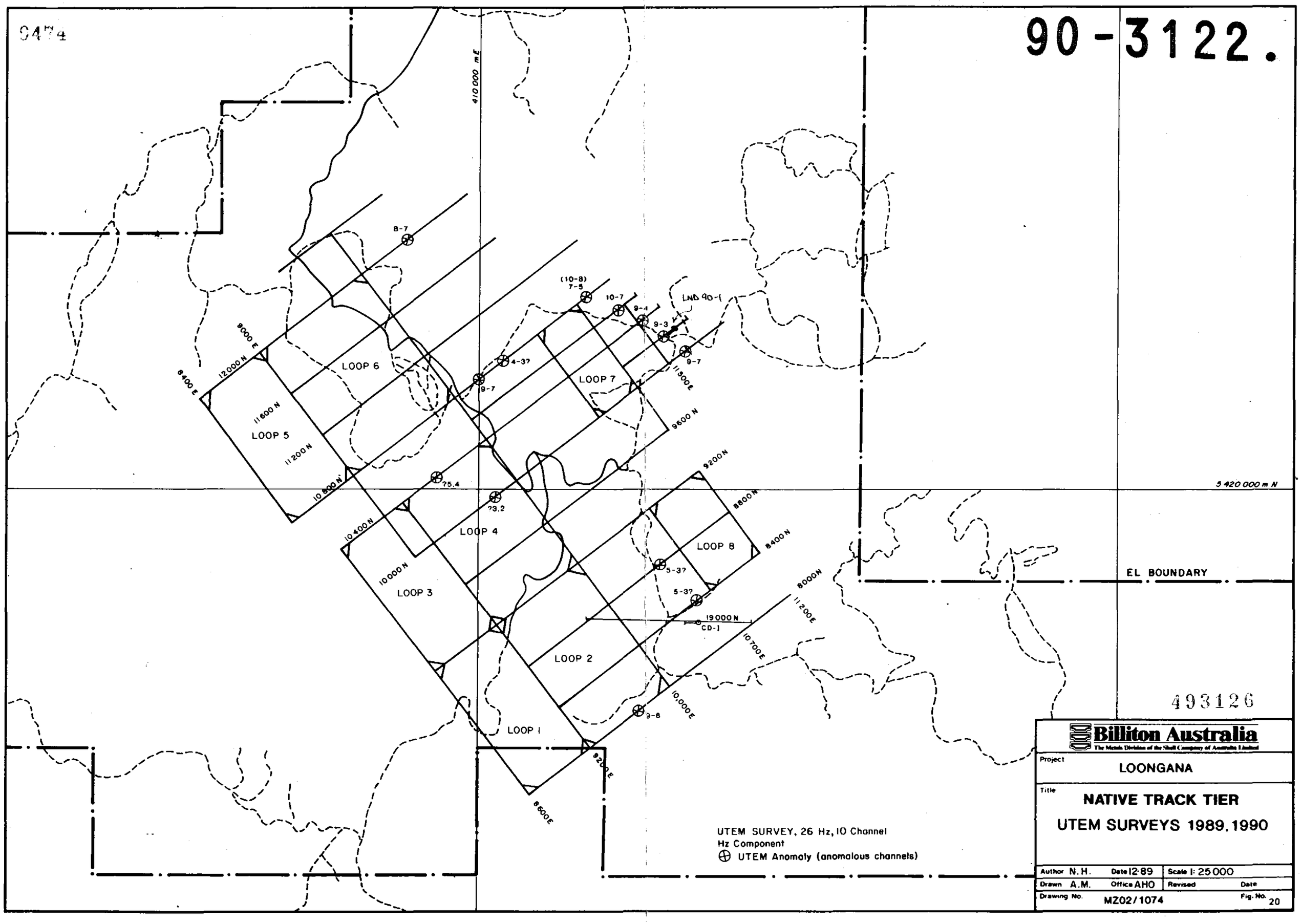
5 cm

493125

90-3122.1

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	E.L. 36/79		
Title	LOONGANA NATIVE TRACK TIER GEOLOGICAL INTERPRETATION		
Author JPR	Dept.	Scale 1:5000	
Drawn OH	Date 4/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 19		Drawing No. D/MZ 02/011	



0474
90-3122.
410 000 mE
5 420 000 m N
EL BOUNDARY
LOOP 1
LOOP 2
LOOP 3
LOOP 4
LOOP 5
LOOP 6
LOOP 7
LOOP 8
LND 90-1
CD-1
8-7
(10-8)
7-5
10-7
9-4
9-3
9-7
4-3?
9-7
?5.4
?3.2
5-3?
5-3?
9-8
9000 E
8400 E
12000 N
11600 N
11200 N
10800 N
10400 N
10000 N
9600 N
9200 N
8800 N
8400 N
8000 N
19000 N
11500 E
11200 E
10700 E
10,000 E
9200 E
8600 E
UTEM SURVEY, 26 Hz, 10 Channel
Hz Component
UTEM Anomaly (anomalous channels)
493126
Billiton Australia
The Metals Division of the Shell Company of Australia Limited
Project
LOONGANA
Title
NATIVE TRACK TIER
UTEM SURVEYS 1989, 1990
Author N.H.
Date 12-89
Scale 1: 25 000
Drawn A.M.
Office AHO
Revised
Date
Drawing No. MZ02/1074
Fig. No. 20

9475

90-3122.

RESPONSE (%)

60.
40.
20.
0
-20.
-40.
-60.

100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. 1100. 1200. 1300. 1400.
POSITION (m)

TRANSIENT EM PROFILE

Line: 10800N

PEBLE TEM file details

Loop config. = TURAM
Device type = UTEM
Rx Component = Z
Ramp turn-off = 0.14 ms
Tx size = 1000.m x 1000.m
Tx loop rotn. = 0 deg
Tx loop orig. = 9000., 10800.
Eff. Rx area = 5200. sq.m

Legend for graph no: 1

Channel 7: 0.2307ms
Channel 6: 0.4615ms
Channel 5: 0.9230ms
Channel 4: 1.8462ms

Legend for graph no: 2

Channel 4: 1.8462ms
Channel 3: 3.6923ms
Channel 2: 7.3846ms

62000nT

GROUND MAGNETICS nT

61700nT

RESPONSE (%)

12.5
10.
7.5
5.
2.5
0
-2.5

100. 200. 300. 400. 500. 600. 700. 800. 900. 1000.. 1100. 1200. 1300. 1400.
POSITION (m)

10 000 E 10 500 E 11 000 E

493127

BILLITON AUSTRALIA

NATIVE TRACK, TAS
LINE 10800N
UTEM
Z COMP, CONT NORM

FIG.NO: 21	REPT.NO:
ENCL.NO:	DRG.NO:
DATE: 11/89	AUTHOR: NH
DRAWN:	OFFICE:

9476

90-3122.

RESPONSE (%)

45.
25.
5.
-15.
-35.
-55.
-75.

100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. 1100. 1200. 1300. 1400.
POSITION (m)

TRANSIENT EM PROFILE

Line: 10400N

PEBLE TEM file details

Loop config. = TURAM
Device type = UTEM
Rx Component = Z
Ramp turn-off = 0.14 ms
Tx size = 800.m x 1000.m
Tx loop rotn. = 0 deg
Tx loop orig. = 9200., 9400.
Eff. Rx area = 5200. sq.m

Legend for graph no: 1

Channel 7: 0.2307ms
Channel 6: 0.4615ms
Channel 5: 0.9230ms
Channel 4: 1.8462ms

Legend for graph no: 2

Channel 4: 1.8462ms
Channel 3: 3.6923ms
Channel 2: 7.3846ms

62 500

GROUND MAGNETICS
nT

62 000

RESPONSE (%)

20.
16.
12.
8.
4.
-4.

100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. 1100. 1200. 1300. 1400.
POSITION (m)

10 000 E 10 500 E 11 000 E

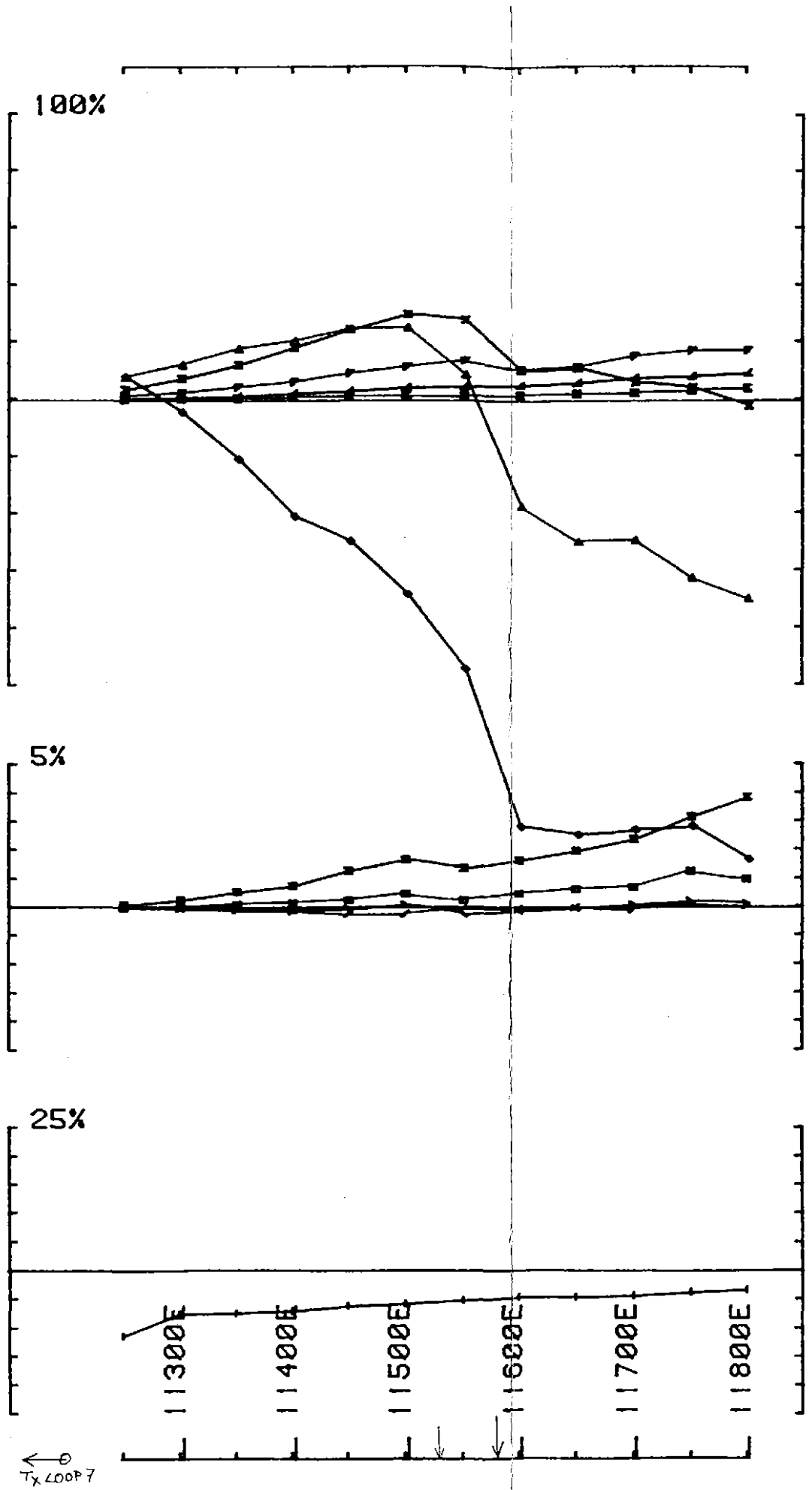
493128

BILLITON AUSTRALIA

NATIVE TRACK, TAS
LINE 10400N
UTEM
Z COMP, CONT NORM

FIG.NO: 22	REPT.NO:
ENCL.NO:	DRG.NO:
DATE: 11/89	AUTHOR: NH
DRAWN:	OFFICE:

9477



UTEM SURVEY at NATIVE TRACK for BILLITON AUSTRALIA
conducted by TM RL job 8973 base freq (hz) 26.230 Nov 1989
loop no 7307 line 10200N component Hz secondary field Ch 1 contin. norm.

90-3122.
493129

FIG 23

9478

RESPONSE (%)

100.
80.
60.
40.
20.
-20.

100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. 1100. 1200. 1300. 1400.
POSITION (m)

TRANSIENT EM PROFILE

Line: 8400N

PEBLE TEM file details

Loop config. = TURAM
Device type = UTEM
Rx Component = Z
Ramp turn-off = 0.14 ms
Tx size = 800.m x 1000.m
Tx loop rotn. = 0 deg
Tx loop orig. = 9200., 8000.
Eff. Rx area = 5200. sq.m

Legend for graph no: 1

Channel 7: 0.2307ms
Channel 6: 0.4615ms
Channel 5: 0.9230ms
Channel 4: 1.8462ms

Legend for graph no: 2

Channel 4: 1.8462ms
Channel 3: 3.6923ms
Channel 2: 7.3846ms

RESPONSE (%)

12.5
10.
7.5
5.
2.5
-2.5

100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. 1100. 1200. 1300. 1400.
POSITION (m)

10000N
10500N
11000N

DDH CD-1 (1981) drilled to West.

62500nT
62000nT

GROUND MAGNETICS nT

90-3122.1

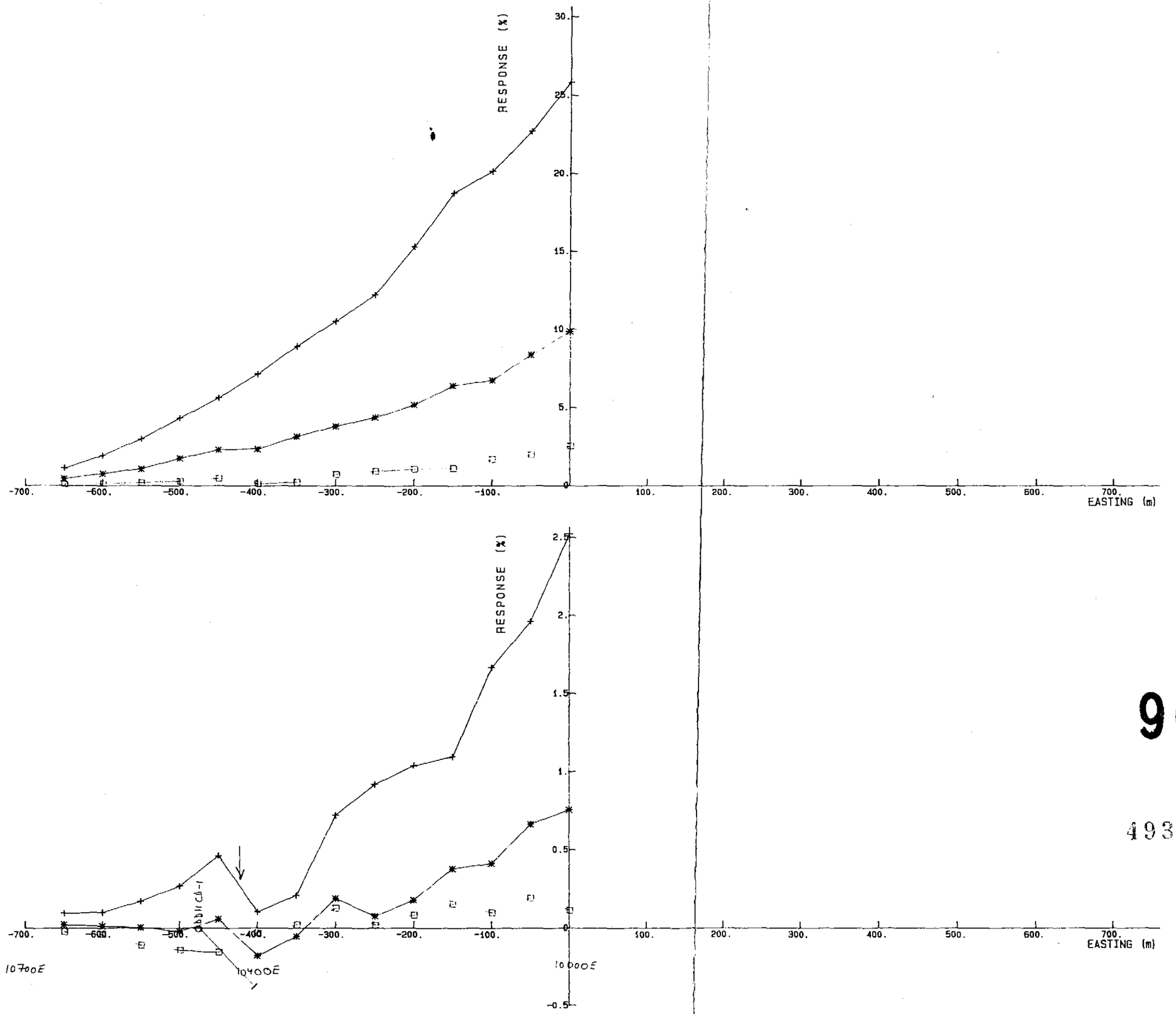
493130

BILLITON AUSTRALIA

NATIVE TRACK TIER
LINE 8400N
UTEM
Z COMP, CONT NORM

FIG.NO: 24	REPT.NO:
ENCL.NO:	DRG.NO:
DATE: 11/89	AUTHOR: NH
DRAWN:	OFFICE:

9479



TRANSIENT EM PROFILE

Line: 8400N

PEBLE TEM file details

Loop config. = TURAM
Device type = UTEM
Rx Component = Z
Ramp turn-off = 0.14 ms
Tx size = 400.m x 800.m
Tx loop rotn. = 0 deg
Tx loop orig. = 10800.. 8400.
Eff. Rx area = 10000. sq.m

Legend for graph no: 1

Channel 6: 0.4515ms
Channel 5: 0.9230ms
Channel 4: 1.8462ms

Legend for graph no: 2

Channel 4: 1.8462ms
Channel 3: 3.6923ms
Channel 2: 7.3846ms

90-3122.1

493131

BILLITON AUSTRALIA

MOINA JV, TAS
NATIVE TRACK TIER
LINE 8400N, LOOP8
UTEM

FIG.NO: 6 25	REPT.NO:
ENCL.NO: 1:5000	DRG.NO:
DATE: 12/89	AUTHOR: NH
DRAWN:	OFFICE:

9480

GEOLOGY
& TOPOGRAPHY

GRAVITY

GRAVITY MODEL
@ ~90m DEPTH

411300E 411400E 411500E 411600E 411700E 411800E

CD-1 (1981)

60°

APPARENT CHARGEABILITY.

n

1- 8.8 9.0 17.5 11.1 22.3 12.0 15.4 8.5 12.3 21.0 31.5 26.0 13.2

2- 3.5 7.3 11.3 7.6 7.4 9.2 7.3 10.2 7.3 22.5 25.5 25.5 16.1 24.0 10.3

3- 5.1 6.4 10.7 7.5 2.31 2.4 7.8 5.6 7.4 23.0 23.5 27.3 12.1 15.0 25.0 11.9

4- 5.6 10 6.5 5.2 0.6 2.8 7.4 7.7 31.0 16.4 21.0 11.1 10.9 15.3 29.0 11.0

5- 7.1 4.5 7.9 5.3 3.1 11.4 26.0 20.0 22.8 7.5 10.1 10.4 17.2 27.3 9.6

6- 4.0 7.2 8.3 5.8 5.9 28.3 14.8 18.3 11.0 8.4 9.1 12.5 16.7 26.8 7.4

APPARENT RESISTIVITY.

n

1- 848 1243 952 1187 915 1371 1000 791 1011 1202 1936 1127 1266 1099 1260

2- 1248 735 833 1278 1546 843 725 1282 1483 1150 1118 1217 1010 1112 1000

3- 777 874 837 2157 983 848 792 1655 1500 1178 1172 1550 1149 1068 753

4- 956 905 1621 1451 1030 959 1024 1364 1439 1639 1426 1287 792 770

5- 1000 1781 1145 1451 1140 1076 804 801 1990 1418 1649 977 847 788 1000

6- 1500 1953 1271 1190 1558 1214 897 910 1000 1066 1717 1721 1267 1061 839 1108 1500

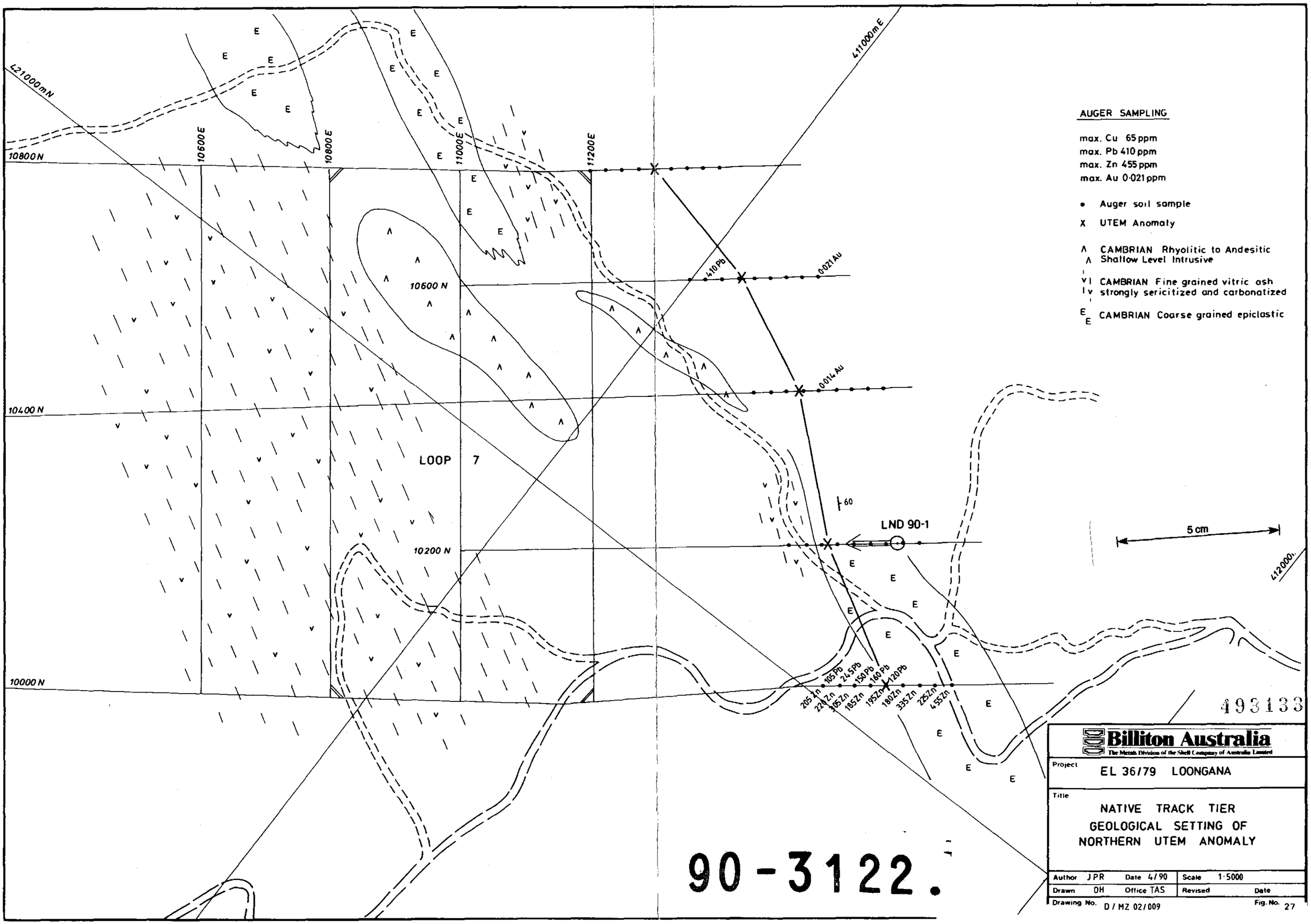
Contractor : SCINTREX
Date : 1981
Timing : 2 sec
Transmitter : IPTA/A
Receiver : IPR8
Integration time : M3
Array : DIPOLE-DIPOLE
Dipole length : 50m

5 cm

493132

90-3122.

The Shell Company of Australia Limited METALS DIVISION		
IP / RESISTIVITY SURVEY LOONGANA EL 36/79 CHALLENGER TWO Line 19000N Scale 1:5000		
FIG No	26	REPORT No
ENCL No		DRG No M202/100
DATE		AUTHOR



421000mN
10800N
10600E
10800E
11000E
11200E
411000mE
10600 N
10400 N
10200 N
10000 N
LOOP 7
410Pb
0·021Au
0·014Au
60
LND 90-1
5 cm
412000
205Zn
105Pb
220Zn
245Pb
305Zn
150Pb
185Zn
160Pb
195Zn
120Pb
180Zn
335Zn
225Zn
455Zn
AUGER SAMPLING
max. Cu 65 ppm
max. Pb 410 ppm
max. Zn 455 ppm
max. Au 0·021 ppm
Auger soil sample
UTEM Anomaly
CAMBRIAN Rhyolitic to Andesitic Shallow Level Intrusive
CAMBRIAN Fine grained vitric ash strongly sericitized and carbonatized
CAMBRIAN Coarse grained epiclastic
493133
Billiton Australia
The Metals Division of the Shell Company of Australia Limited
Project
EL 36/79 LOONGANA
Title
NATIVE TRACK TIER
GEOLOGICAL SETTING OF
NORTHERN UTEM ANOMALY
Author JPR
Date 4/90
Scale 1:5000
Drawn DH
Office TAS
Revised
Date
Drawing No. D/MZ 02/009
Fig. No. 27
90-3122.

9492

11400E 11450E 11500E 11550E 11600E 11650E 11700E

GRID W

GRID E

0

50m

100m

150m

LND 90-1
-55°
220° AZIM.

weathered
weathered
NO CORE
WEATHERED EPICLASTIC SANDSTONE
weathered and broken 60% sericitic ash
PEBBLE TO COBBLE VOLCANICLASTIC CONGLOMERATE
weathered ferruginous
mixed sericitic siltstone and epiclastic broken, weathered and carbonated
SERICITIC COARSE EPICLASTIC
Bedding
Quartz carbonate veining
CONDUCTOR TOP
100m
60°
Trace irreg. py
FINE GRAINED VITRIC ASH AND SILTSTONE
LAMINATED BLACK SHALE AND SERICITIC VITRIC ASH
Layering
Uphole facing
SERICITIC AND CHLORITIC SPOTTED CRYSTAL TUFF
Strongly broken core very pugay
40
LAMINATED GRAPHITIC SHALE
SERICITIC ASH
SERICITIC EPICLASTIC
SERICITIC ASH
CHLORITIC ASH
SERICITIC EPICLASTIC

5 cm

493134

90-3122

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	EL 36/79 LOONGANA
Title	NATIVE TRACK TIER DIAMOND DRILL SECTION AT 10200 N
Author JPR	Date 3/90 — Scale 1:1000
Drawn OH	Office TAS — Revised — Date
Drawing No.	Fig. No. 28