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REPORT ON GRAVIMETER SURVEY

ELLIOTT BAY E.L. 27/76 TASMANIA

J. SUMPTON

August, 1982

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1. INTRODUCTION

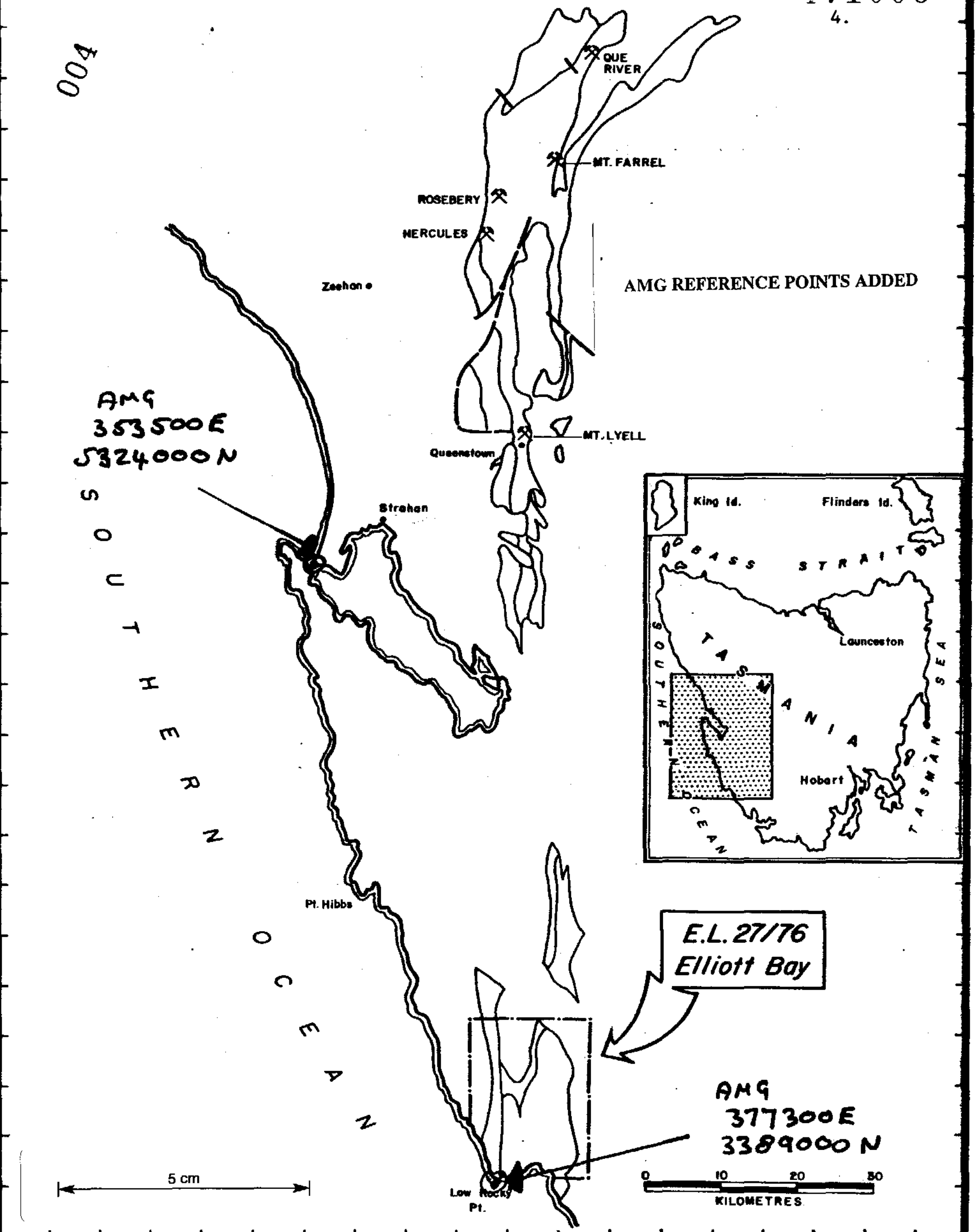
At the beginning of the 1981-1982 field season, three of the highest priority prospects in the Elliott Bay exploration licence were the subject of gravimetric surveys with the primary aim of locating any dense, large tonnage ore deposits within these prospects. For a description of the Elliott Bay area see Wilson et. al. (1981). For a detailed description of the geological setting of the three projects, Voyager 19, Voyager 9 and Voyager 29 see Wilson et. al. (1981, 1982).

Voyager 19

Geological mapping and geochemical sampling had lead to the discovery of two lenses of massive lead-zinc mienralization. Thus this area was considered to be of the highest potential and was covered in its entirety by a detailed gravity survey on a 25mx100m grid with closer spaced stations and infill lines being added as required. Previous geophysical surveys include gradient array IP/Resisitivity, with some follow up using the Dipole-Dipole array, magnetic coverage of the grid and selected Self Potential and Turam EM traverses (Wilson et.al. 1981, 1982). The results of these surveys were largely negative in terms of direct response to mineralization.

Voyager 9

Originally defined as a large aeromagnetic anomaly, Voyager 9 has subsequently been identified as an area of marked chloritic alteration. Bedrock geochemical sampling has also shown significant base metal anomalies. Previous geophysical surveys include magnetic intensity and gradient array IP/Resistivity, again with Dipole-Dipole array follow up. Mudge (1978), Wilson et. al. (1981).



LEGEND: MT. READ VOLCANICS

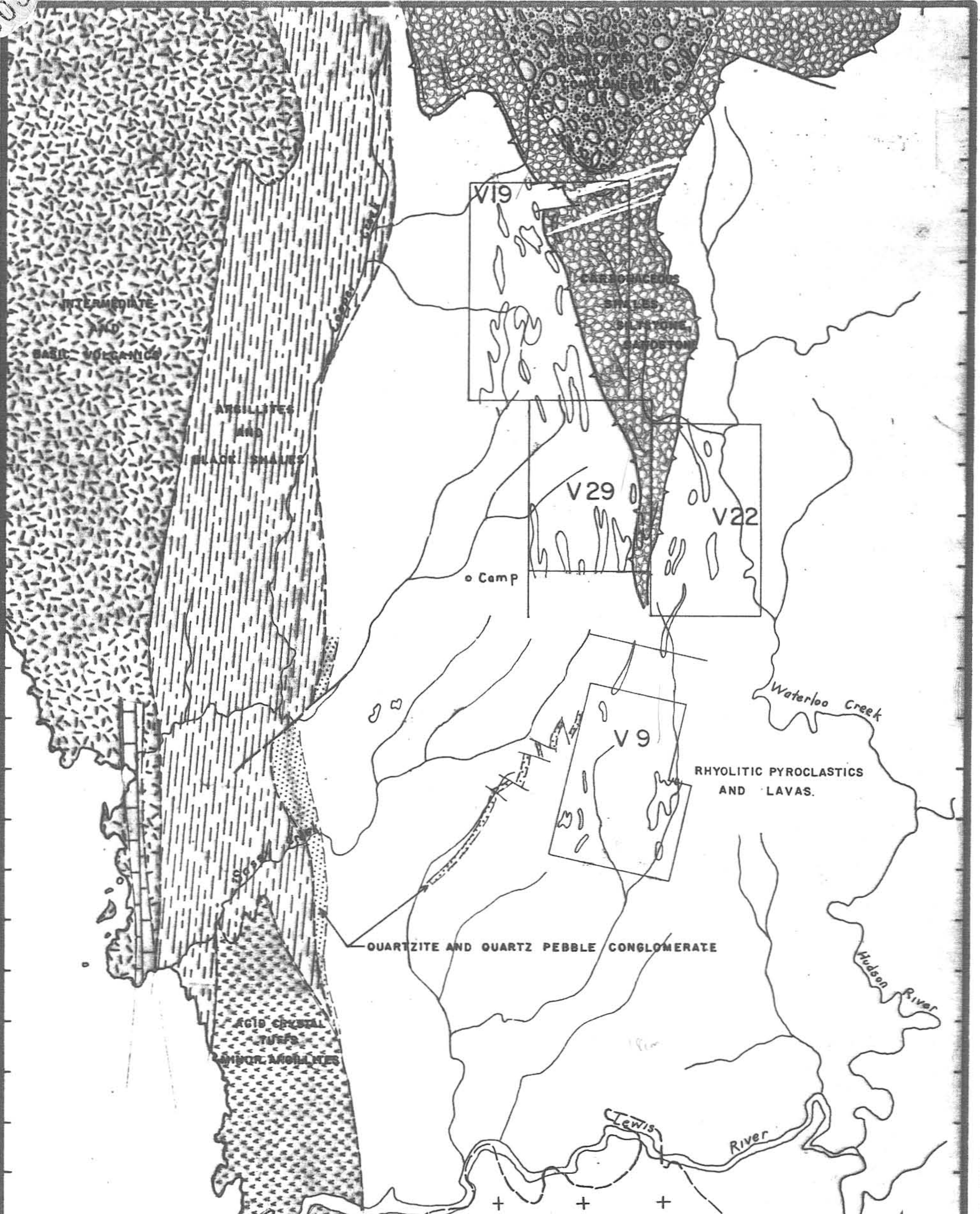
- Tyndal Group & Correlates
- Central Belt
- Western Sequence

GEOPEKO
A DIVISION OF PEKO-WALLSEND

Figure 1

DATE: 11/5/82
GEOL: R.R.L
DWN: R.J.Tbg
CHKD:

E.L.27/76 ELLIOTT BAY LOCALITY MAP



LEGEND:

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5 cm

DATE:

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GEOPEKO

Scale: 1:42 000

ATTACHMENT 4

ELLIOTT BAY

GRAVITY SURVEY LOCATION PLAN

The magnetic survey revealed a complicated picture with magnetic sources of different sizes distributed at varying depths. The IP detected a number of well defined anomalies. Up to the time of the gravity survey anomalies from these two surveys remained largely untested. The gravity survey itself was designed to cover a reduced area broadly encompassing the area of greatest geochemical interest which also included magnetic sources interpreted to lie at relatively shallow depths. The survey was conducted on a 25x100m grid with infill work and extensions if required to be planned on the results of the initial survey. One line, 10850N, was extended to 1.7km in length with stations at 100m centres to better assess the local regional field.

Voyager 29

The southern extension of Voyager 19, the area chosen for gravimetric coverage was once again an area of significantly anomalous geochemistry. This area was also covered by stations on a 25x100m grid with extensions and infill work planned taking into account the results of this survey and other exploration techniques.

Regional

In addition to the detailed grid surveys a helicopter supported regional traverse across the licence was undertaken. The regional gravity gradient in this area is strong, so it was considered desirable to gather this information to assist in reliable regional determinations on the individual prospects. The traverse was some 12km in length with stations at approximately 500m intervals. The traverse passed through Voyager 9 prospect and is therefore known as V9/R.

Theoretical Considerations

Prior to the commencement of field work numerical modelling of the gravity responses over some theoretical ore body shapes was carried out. The density contrasts used for these calculations were taken from measurements made by W. Herrmann of massive sulphide samples from Voyager 19 and host rocks from the same area. This work showed that single bodies of economic size would most likely be recognised from the gravity data provided a significant portion of the mass lay reasonably close to the surface. The size of the portion of the mass considered significant and the 'penetration' of the method in the final analysis depended on the geological and instrumental noise levels of the survey. Some examples of this modelling may be found in Appendix 1.

2. DATA AQUISITION AND PROCESSING

Field Procedures

Despite the survey being conducted very early in the limited South-West Tasmania summer field season, few production days were lost through bad weather. That time which was lost was mainly lost through the effects of wind as much of the survey area was very exposed. The only other significant adverse effect of the timing of the survey concerned the ground conditions, still swampy from winter rain. Initial data processing and profiling of the Voyager 19 data was carried out in the field base camp in order to facilitate the planning of follow up with a minimum of delay. All work was (with the exception of the helicopter regional traverse and base ties) carried out on foot.

Two gravimeters were used on the Voyager 19 survey, a Worden meter #592, operated by Mr. R. Goodwin, and a La Coste and Romberg instrument #G326 operated by Mr. T. Walbrun. Only the Worden was used for the Voyager 9, Voyager 29 and regional surveys. For the Voyager 19 survey the Worden was used for the northern part of the grid and the La Coste and Romberg instrument for the south. Line 12600N was read by both instruments as a crosscheck.

1100 stations were occupied during the Voyager 19 survey, including 290 stations on 50m spaced infill lines and detailing at 5m and 10m spacings. The Voyager 9 survey consisted of 310 stations including 20 stations at 100m spacing along line 10850N. 245 stations we occupied at Voyager 29 including 55 stations on lines extended to the west subsequent to the initial survey. There were 18 regional gravity stations.

Instrument drift was determined by closing loops to a base station within an elapsed time usually under two hours. Where this time restraint could not be adhered to for logistical reasons attempts were made to minimise drift correction error by taking into account the observed drift at repeat stations within the loops. Base stations for individual loops were generally established at the base stations or along the base lines.

Because of the variety of ground conditions, most of them unfavourable, a number of different gravimeter base plates and tripods were used of varying configurations and varying distances from the ground. The effects of the ground conditions and the base plates used to overcome them on the accuracy of the surveys will be discussed later.

Elevation control was by optical levelling on the grids, with Voyager 19 and Voyager 29 tied to the Australian Height Datum through the Trig. station situated on Mount Osmond using Electronic Distance Measuring equipment. The Voyager 9 levels are with respect to an arbitrary datum. Elevation control for the regional traverse was by anaroid barometers (Negretti and Zambra Nos. 451 & 585), with the base station tied to sea level and some stations checked using EDM equipment.

Establishment of Base Stations

The base station for all the gravity work within the licence is a steel picket adjacent to the base line peg at 10 000E, 13100N on the Voyager 19 grid (given the somewhat arbitrary co-ordinates 10 001E, 12 099N). This point, known simply as BASE was determined to have an observed gravity of 9804432.7 μms^{-2}. This value was obtained by calculation from the gravity station at Strahan Airport (B.M.R. 6491.9136) which has a value of 9803716.9 μms^{-2}, with an intermediate tie point at Moores Valley airstrip.

The Voyager 9 base station (10000E, 10850N) and the Voyager 29 base station (10000E, 10700N) were also permanently marked with steel pegs and tied to BASE.

3. CORRECTIONS AND ACCURACY

Lattitude Corrections

Lattitude corrections were applied from BASE for the Voyager 19 and Voyager 29 surveys, and from Voyager 9 base station for the survey on that grid and the V9/R regional line.. The lattitude correction at these points was determined using the International Gravity Formula (see Appendix 2). The error in lattitude from these points is not considered to exceed ± 15m which would lead to an error in Bouguer Gravity of ±0.12 μms^{-2}. For the regional traverse the error in lattitude is estimated at ±50m or ±0.4μms^{-2} in Bouguer Gravity.

Free Air and Bouguer Corrections

Errors in elevation for the bulk of the grids are considered to be less than 0.02m, which would give an error in calculated Bouguer Gravity of less than ±0.04μms^{-2}. More significant are deviations caused by undergrowth in forested areas on the eastern side of Voyager 19, where the distance between the height at which the gravity reading was taken and the survey height ascribed to it has been estimated to be up to ±0.2m. This is equivalent to an error in Bouguer Gravity of ± 0.04μms^{-2}.

As previously mentioned the height of the various tripod/base plate configurations used varied, and a seperate free air correction has been applied to correct for this. The error in this measurement is not expected to exceed an equivalent in calculated Bouguer Gravity of ± 0.02μms^{-2}.

The regional traverse was made using anaroid barometers for elevation control. Three of the stations were subsequently accurately located using EDM equipment and were found to deviate from the initial estimates by -0.64m, -2.70m and -0.11m corresponding to 1.3μms^{-2}, 5.4μms^{-2} and 0.2μms^{-2} variation in Bouguer Gravity respectively. It is considered that this is the major source of error in the regional gravity values.

A Bouguer density of 2.52 gm cm^{-3} was chosen for Bouguer corrections using the method due to Nettleton (1940).

Terrain Corections

Terrain corrections were performed only for the Voyager 19 survey. This was largely because the grid covered Wart Hill, a feature reaching a height above the local terrain of about 70m. Topography on, and adjacent to the other grids is much more subdued.

Two sets of terrain corrections were computed using two different approaches. The first approach used conventional terrain correction charts according to Hammer (1939). This work was done under contract by Leaman Geophysics, whose report is appended (Appendix 3). The second approach used a computer based in house technique based on the gravitational attraction of an accumulation of vertical prisms used to represent terrain. This method and the results therefrom are presented in a report by R.H. Duffin reprinted in Appendix 4. There is good agreement between the two methods.

In his report David Leaman estimates the error on the chart derived corrections (which were used in subsequent data reduction as they were chronologically first) as less than 0.1μms^{-2}.

Drift Corrections (Repeatability)

The accuracy of drift corrections was checked by the inclusion of repeat readings within loops. The repeatability of readings was also affected by random reading errors and instrument instability. For the La Coste and Romberg instrument it is estimated that 86% of repeats will show a deviation of less than 0.5μms^{-2} ($\pm$0.25μms^{-2}) in observed gravity. The smaller amount of information available for the Worden meter implies the same accuracy for that instrument. It is estimated that due to increased ground instability in forested areas this deviation would rise to $\pm$1.0μms^{-2}.

Earth Tide Corrections

No seperate correction was applied for changes in observed gravity attributable to earth tides. It was assumed that such variation would be compensated for in overall drift corrections.

Other Factors Affecting Accuracy

Errors introduced through linking to intermediate base stations. Drift corrections were applied through a correction to a 'sub-base' station established during a previous loop. Such a station was usually on the base line. The accuracy of the observed gravity stations within such a loop are obviously dependant on the accuracy of the determination of the base station. Errors introduced by this linking would not be expected to exceed the drift and random reading errors of $\pm 0.25 \mu ms^{-2}$ per link.

Errors introduced through the use of two meters. The Bouguer values for line 12600N which was read with both meters show a mean deviation between them of $1.2 \mu ms^{-2}$ with a standard deviation of $0.6 \mu ms^{-2}$. This standard deviation implies a distribution considerably less tight than one would expect if the line had been repeated with one meter (S $0.17 \mu ms^{-2}$), however it should be noted that, at least in the case of the La Coste and Romberg, the repeat data from this loop shows it to be much less accurate than one would normally expect. The departure of the mean value of $1.2 ums^{-2}$ from zero maybe attributable to link error(s) or possibly slight inaccuracy in the meter constants of either or both instruments.

Table 1 shows the total random error one might expect from various survey areas where

$$\text{Total Random Error} = \sqrt{\sum (\text{Individual sources of error})^2}$$

Note that while the lattitude error and the error in linking base stations, though they contribute to, and are included in, the total error, they will not usually have a great affect on individual profiles. The exception to this is the lattitude error on the regional traverse which will vary from station to station.

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TABLE 1

AREA	Lattitude Error	Elevation Error	"Tripod" Error	Terrain Error	Repeat Error	Link Error	Total Error
*VOYAGER 19 (PLAIN)	0.12	0.04	0.02	0.10	0.25	0.25	±0.4
*VOYAGER 19 (FOREST)	0.12	0.4	0.02	0.10	1.00	0.25	±1.1
VOYAGER 9 & 29	0.12	0.04	0.02	-	0.25	0.25	±0.4
VOYAGER 9/R REGIONAL	0.4	2.00	-	-	0.25	-	±2.0

Typical errors which would not normally be exceeded for various survey areas.

Values are Bouguer Gravity values in μms^{-2}. Bouguer Density 252gmcm^{-3}.

* TERRAIN CORRECTED

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4. REGIONAL FIELD

The regional gravity field in the survey area slopes strongly towards a gravity low in the centre of the island. The gradient is of the order of 30μms^{-2}/km. From the Bouguer gravity map of Tasmania and the data collected during the course of this survey the gradient is predominantly east-west with little north-south component.

The local regional field for each prospect was determined by passing each line of data through a two-dimensional low pass filter using a set of weights approximating a sinc function (y=sin x/x) (Lee 1976). For Voyager 19 an interpretation of the regional field was also constructed by hand smoothing the profiled data. Both constructions are presented.

In general this technique produced smoothly varying curved surfaces, which are likely to reliably reflect the regional field in these areas. The gradient intensities and directions of these fields are consistant with each other and the V9/R regional traverse. There are two inconsistancies, however, which may be mentioned here. The regional gravity contour map for Voyager 29 shows a 'herring-bone' pattern, largely caused through what appears to be a systematic offset in the values of line 10600N. This is most likely to be caused by an error in the determination of the value of the base station to which the values of this line are tied. The regional gravity contour map for Voyager 19 shows a pronounced flattening on the western side of the grid, especially on line 12800N. This flatting is to some extent enhanced by the use of the sinc function fitter, however it is also very much in evidence on the hand smoothed regional construction. The variation in this flattening and the lack of evidence for it in any other regional data implies that it is not a true regional feature in the sense meant here, but properly should be classified as a nearer surface residual effect. The effect of this on the calculated residual anomaly will be discussed later.

5. INTERPRETATION

5.1 Voyager 19

No residual gravity anomalies were detected which could be reliably attributed to a significant lens of massive sulphide material of the density expected. In general the profiles show low amplitude long wave length responses, most likely reflecting the primary density of the various rock types represented, and the weathering patterns characteristic of them. Three of the more discrete or significant responses are discussed below.

(i) 12700N, 9950E - 9750E

This is a 'bullseye' anomaly with a maximum residual amplitude of about 4μms^{-2}. This anomaly was detected on the original 100m x 25m coverage, and was subsequently infilled on 5m and 10m spacings between 9500E and 9700E inclusive. The infill work confirmed the anomaly, and the original data, infill work and residual anomaly determined using a synthesis of both data sets is presented in figure 1.

As this anomaly was considered a potential drill target, some preliminary quantitative modelling was done using two dimensional polygons. As subsequent contouring and consideration of the data has shown that the body is unlikely to be two dimensional, the parameters of such bodies are unreliable. Nevertheless two two dimensional bodies which gave rise to calculated profiles similiar to the observed profile are shown in figure 1. Both shapes shown are wide, shallow, truncated on their western edge, and require an excess mass to the east. These are the necessary limitations placed on a single body (of consistant density contrast) by the curve shape. Model A might represent a change in the depth of weathering in this area. Model B is not particulary geologically feasible in this context.

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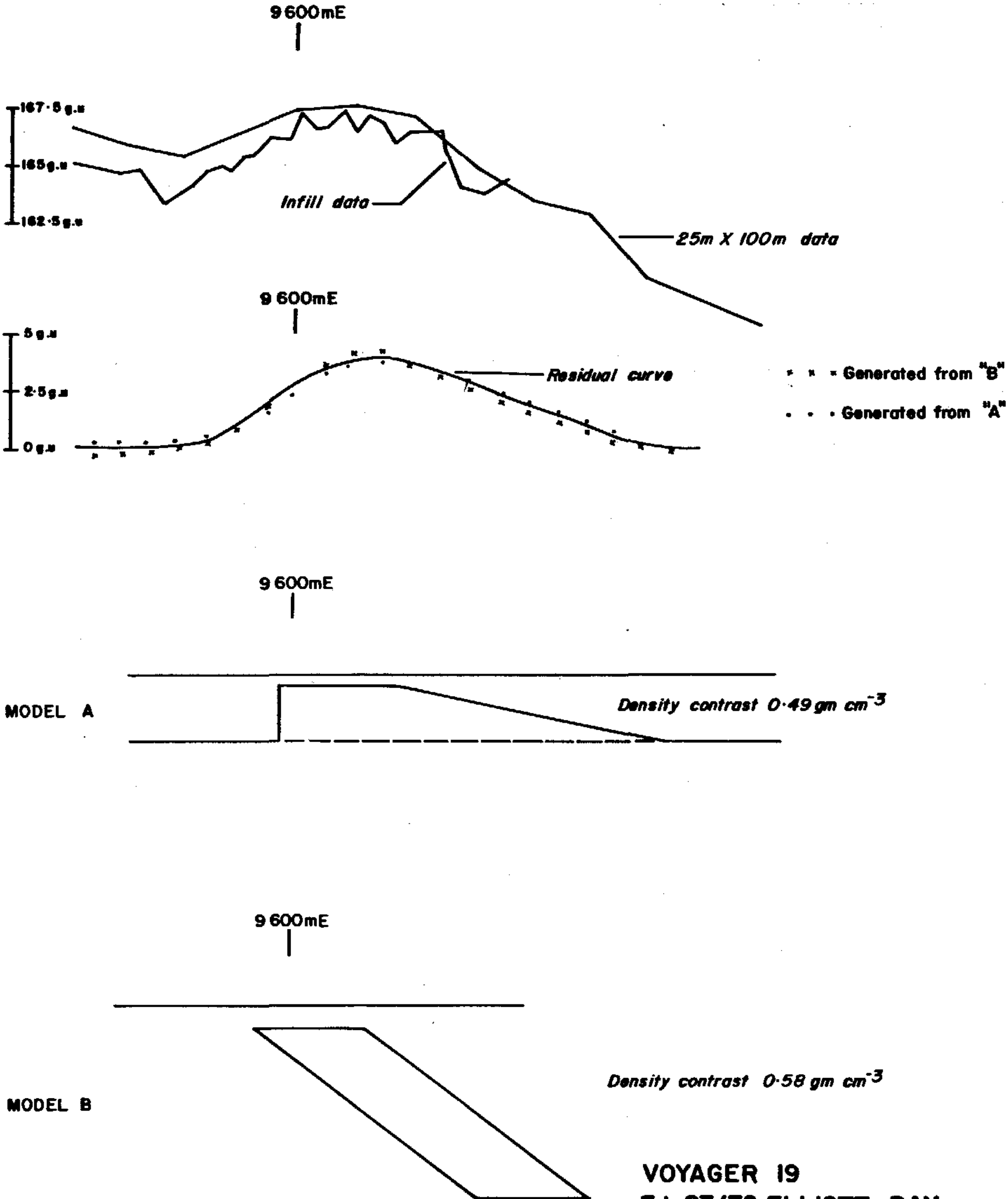
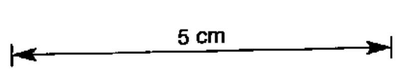
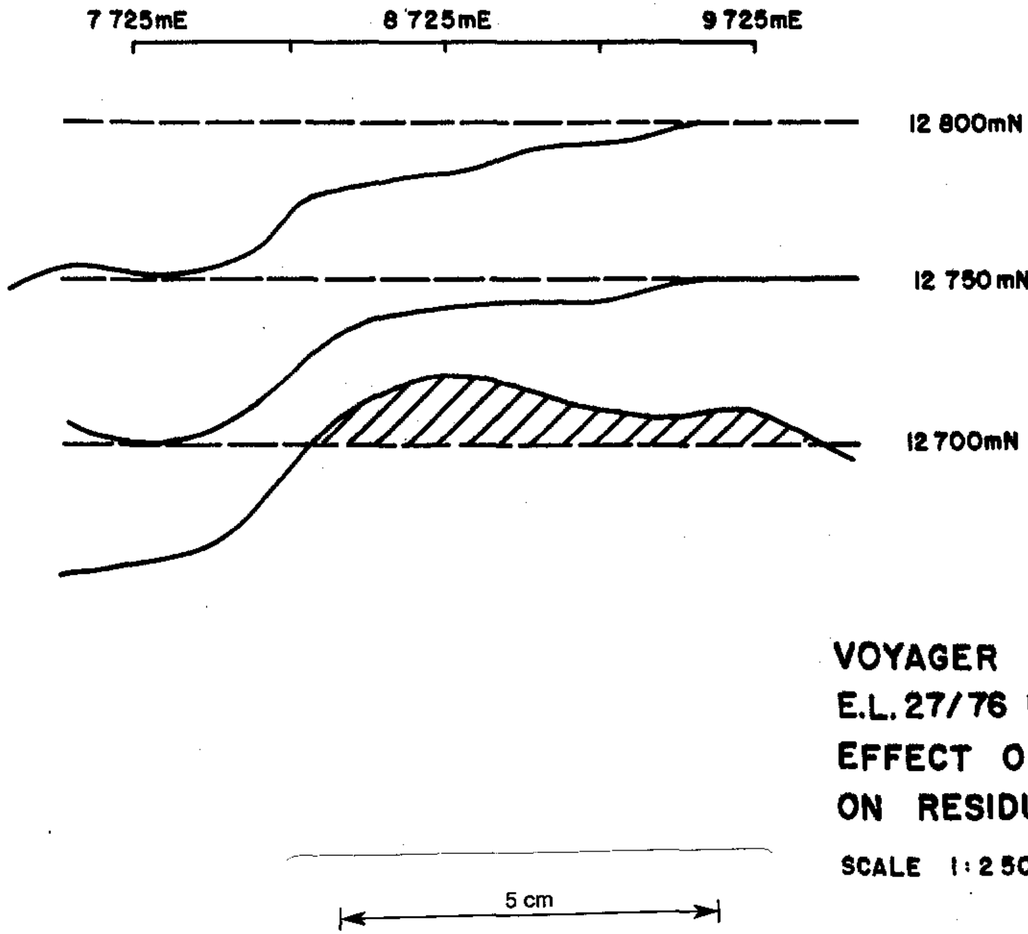




VOYAGER 19
E.L.27/76 ELLIOTT BAY
GRAVITY PROFILE &
INTERPRETATION
LINE 12 700mN
SCALE 1:2 500 VERT 1cm = 2·5g.u

FIGURE 1



VOYAGER 19
E.L. 27/76 ELLIOTT BAY, TASMANIA
EFFECT OF MORE LINEAR REGIONAL ON RESIDUAL ANOMALY, 12 700mN
SCALE 1:2 500 VERT 1cm = 2·5μms^{-2}

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FIGURE 2

The anomaly occurs on the western edge of the survey area, where information on the nature of the regional field is at its most inadequate. Accurate seperation of the regional/residual components is of course necessary for reliable interpretation of residual anomalies. As mentioned in the section on the regional field the regional gravity contour map shows a pronounced 'flattening' of the interpreted field especially in the area 12700N-12900N. If, however, a regional profile which does not flatten in this manner is used (the validity of either case cannot be positively established on present data) the positive anomaly is much reduced and sits on the edge of a gravity low which can be traced to the north through lines 12750N, 12800N, and 12900N (see figure 2). Because of the uncertainty of the regional determination it is not possible to reliably interpret the revised geometry of the causative body, however it is very likely that the density contrast with the rocks to the east required to produce such an anomaly would be small. If this is the case then it increases the likelyhood of the anomaly being casued by a weathering or rock contact feature.

Given the above considerations it is unlikely that this anomaly could be caused by a relatively narrow ore lens dipping steeply to the west. The surface geology was examined in some detail and found to contain little evidence that would point to a favourable source for the gravity anomaly.

(ii) <u>12600N - 12800N, 10100E - 10400E</u>

The above co-ordinates define a broad residual gravity high over the northern part of Wart Hill. Although somewhat diffuse and ill defined, it was considered possible that this high reflected an increase in the sulphide (pyrite) concentration in this general area. Drill hole V19/3 was drilled through the northern part of this area and intersected around 100m of chlorite rich sulphide bearing pyroclastics, which it was calculated would give a denisty contrast with the barren quartz rich lavas adjacent of 0.2gm cm^{-3} (Wilson et.al. 1982). This density contrast could well be adaquate, assuming enough anomalous material, to explain the observed gravity anomaly at surface.

(iii) 12200N - 10650E

This anomaly of $3\mu ms^{-2}$ is typical of many responses of similiar magnitude which cannot, on the evidence of gravity alone, be distinguished from geological and instrumental noise. This is especially true for anomalies such as this which lie within the forest on the east of the grid. Outside this area, anomalies of this magnitude were in general the subject of more detailed gravimetric coverage, however, though the first pass gravity response was in most cases confirmed, none of these anomalies are considered to warrant further attention at this time.

There is some correlation between the various lithologies within the area, with their characteristic weathering patterns, and the residual gravity expression over them. This is particularly so with the carbonaceous pyritic black shales in the east of the area, which stand out as an overall gravity high when compared to the more silica rich rocks to the west. In general however there is little direct relation between residual gravity and geology as mapped.

5.2 Voyager 9

As with Voyager 19, no significant discrete anomalies or trends were defined by the survey. The bulk of the variations in residual gravity are most likely the result of geological and instrumental noise, and local terrain effects.

It seems likely that a contribution to the gravity signature of the Voyager 9 area is the presence of significant concentrations of magnetic material (magnetite) which is responsible for the Voyager 9 magnetic anomalies. Diffuse gravity highs are present in proximity to near surface magnetic sources in the areas 10900N to 11150N, 10300E to 10450E and 11200N to 11350N, 10150E to 10250E. Also the magnetite concentration implied from modelling the deep sourced magnetic anomaly might be expected to affect the denisty contrast of the mass sufficient to give rise to a'sub-regional' gravity response in this area. Such a low amplitude 'buldge' can be seen on the total Bouguer Anomaly profiles,* but it is not necessarily attributable to such a deep magnetite body.

There seems little correlation between such minor trends as are developed and geochemical data and mapped geology. The bulk of these responses are well within the noise envelope.

* This is not evident in the residual gravity as the wavelength of this feature implies a depth greater than that for which the regional/residual seperation filter was designed.

5.3 Voyager 29

As with the previous two survey areas, the Voyager 29 data shows no reliably interprable direct response to a discrete dense ore body. However it does show a residual gravity high over an area shown to be of interest through other exploration techniques. This is a relatively narrow, elongate high with a maximum amplitude of about $3\mu ms^{-2}$ extending from line 10600N to the south (and open in that direction) centred on a easting of about 10050N. This area is associated with significantly anomalous iron and other base metal soil geochemistry, and a moderately weak but consistant zone of high chargeability. It was the detection of this response during the initial survey which lead to the extension of lines 10300N, 10500N and 10700N to the west.

The fundamental ambiguity attendant upon potential field data and the small amplitude of the anomaly make it impossible to reliably assess the source of the response. Nevertheless it seems likely that its source is either a significant increase in the density of the rock in this area (possibly due to sulphide concentrations), or a more discrete dense body at a depth of about 50m. The chargeability data tends to lend support to the former explanation, but the electrical anomalies are by no means well enough defined to rule out the latter.

The line spacing of 200m west of line 10000E is too coarse to ensure the detection of anomalies of the size expected, so the potential of near surface dense sulphide bodies in this area (known as Voyager 29 West) can not be said to have been totally evaluated. The residual low on the western ends of lines 10300N and 10500N may be a terrain affect, for which no corrections have been applied.

6. CONCLUSION

The survey in the three areas did not produce any gravity anomalies which would have provided drill hole targets in there own right, a principle aim of the survey. The broad residual high discussed earlier on Voyager 19 aided in the siting of drill hole V19/3, however this was not considered to be a response directly due to a discrete ore mass.

The only untested favourable indication resolved from the data is the anomalously high gravity zone adjacent to the baseline on Voyager 29, where the gravimetric data implies a density anomaly, possibly a concentrated source at depth.

The writer believes that those areas surveyed have been effectively screened for shallow, relatively large, massive sulphide accumulations, and that any further testing of these areas based on this style of target should not expect to interesect such material at a depth of less than 50m.

The foregoing does not preclude, of coarse, the presence of smaller, less massive or deeper sources whose gravity response cannot be reliably resolved from the noise. Although the survey was conducted in a efficient manner, and overall the quality of the data is good, the relatively small anomalous mass of the target bodies and the high geological and instrumental noise levels proved severe limitations on the effectiveness of the method. Futher use of the gravimetric method within the licence would more appropriately be the evaluation of pre-defined target areas within prospects. Such work would be facilitated by the network of permanant base stations and the regional gravity information thusfar gathered.

7. REFERENCES

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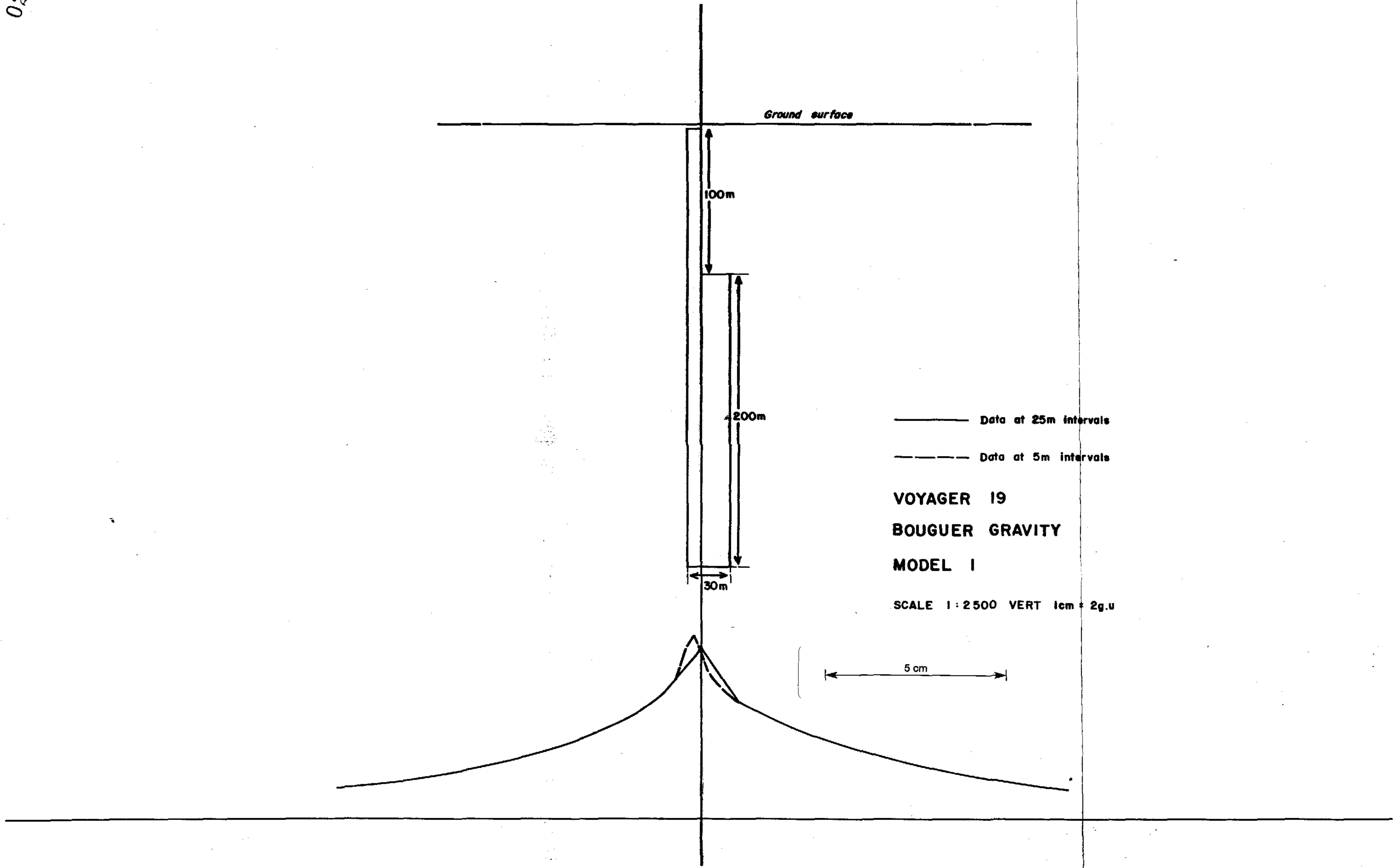
APPENDICES

Appendix 1:	Some modelling of expected gravity targets using two dimensional polygons.
Appendix 2:	The International Gravity Formula.
Appendix 3:	Terrain Corrections for Geopeko, Voyager 19 Gravity Survey by Leaman Geophysics.
Appendix 4:	Computer Assisted Computation of Terrain Corrections at Voyager 19, Elliott Bay, Tasmania by R.H. Duffin.

APPENDIX 1

There follows a set of theoretical profiles over shallow bodies of the style expected within the survey area. In each case a density of 1.1gm cm^{-3} has been used. The depth to the top is 1m in all cases except the last. Two dimensional (infinite strike extent) bodies have been used. The actual strike extent necessary to obtain an ore body of 12 million tonnes would be approximately 450m*. The assumption of a two dimensional body is fairly good, especially for the near surface bodies. The effect of limited strike extent would be to reduce the amplitude of the anomalies. Also included is the calculated response over a two dimensional block of unweathered material sitting above the general level of weathering.

* These calculations courtesy of Dr. R.R. Large.


Ground surface
100m
200m
30m
Data at 25m intervals
Data at 5m intervals
VOYAGER 19
BOUGUER GRAVITY
MODEL 1
SCALE 1:2500 VERT 1cm = 2g.u
5 cm

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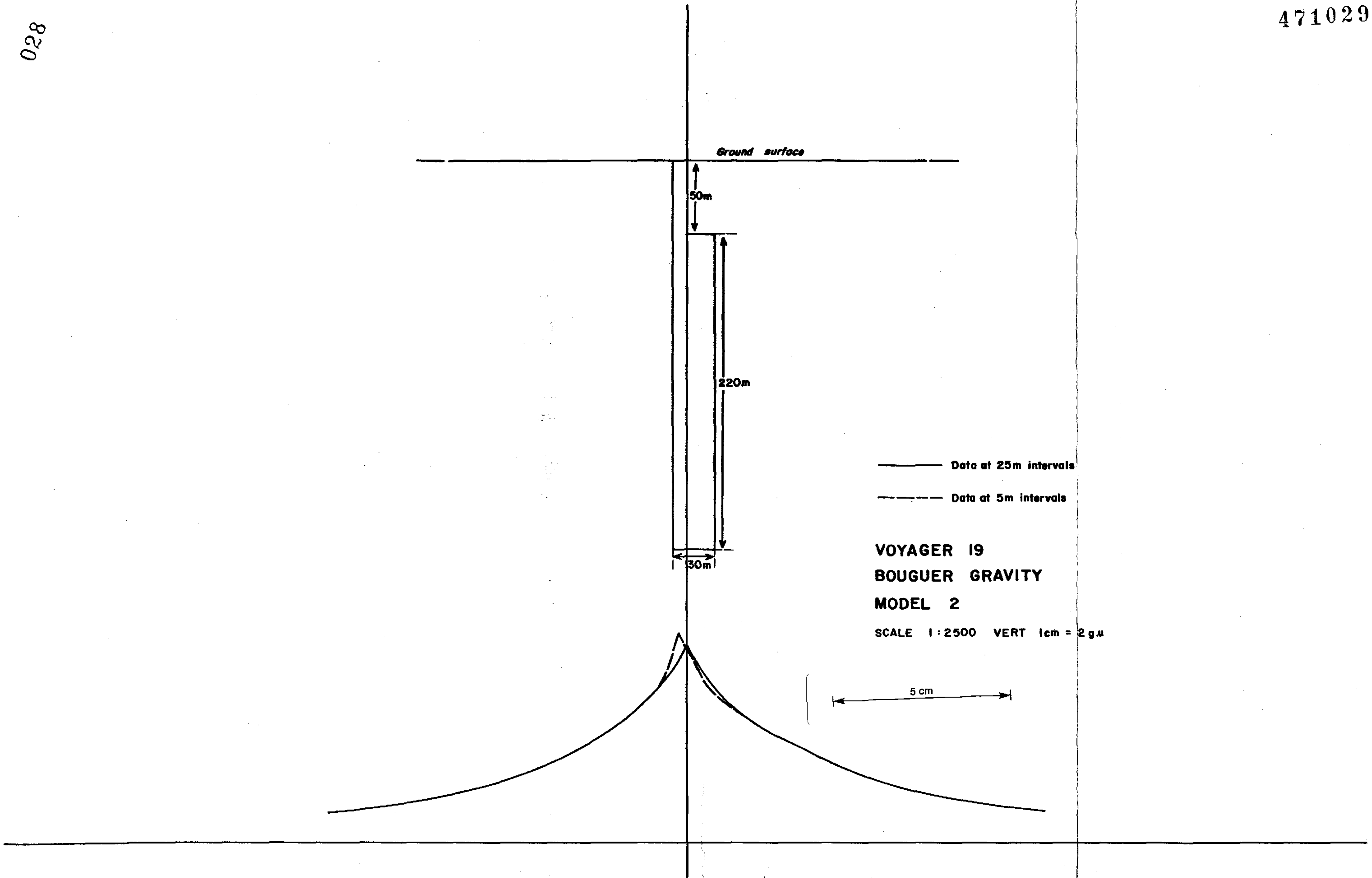
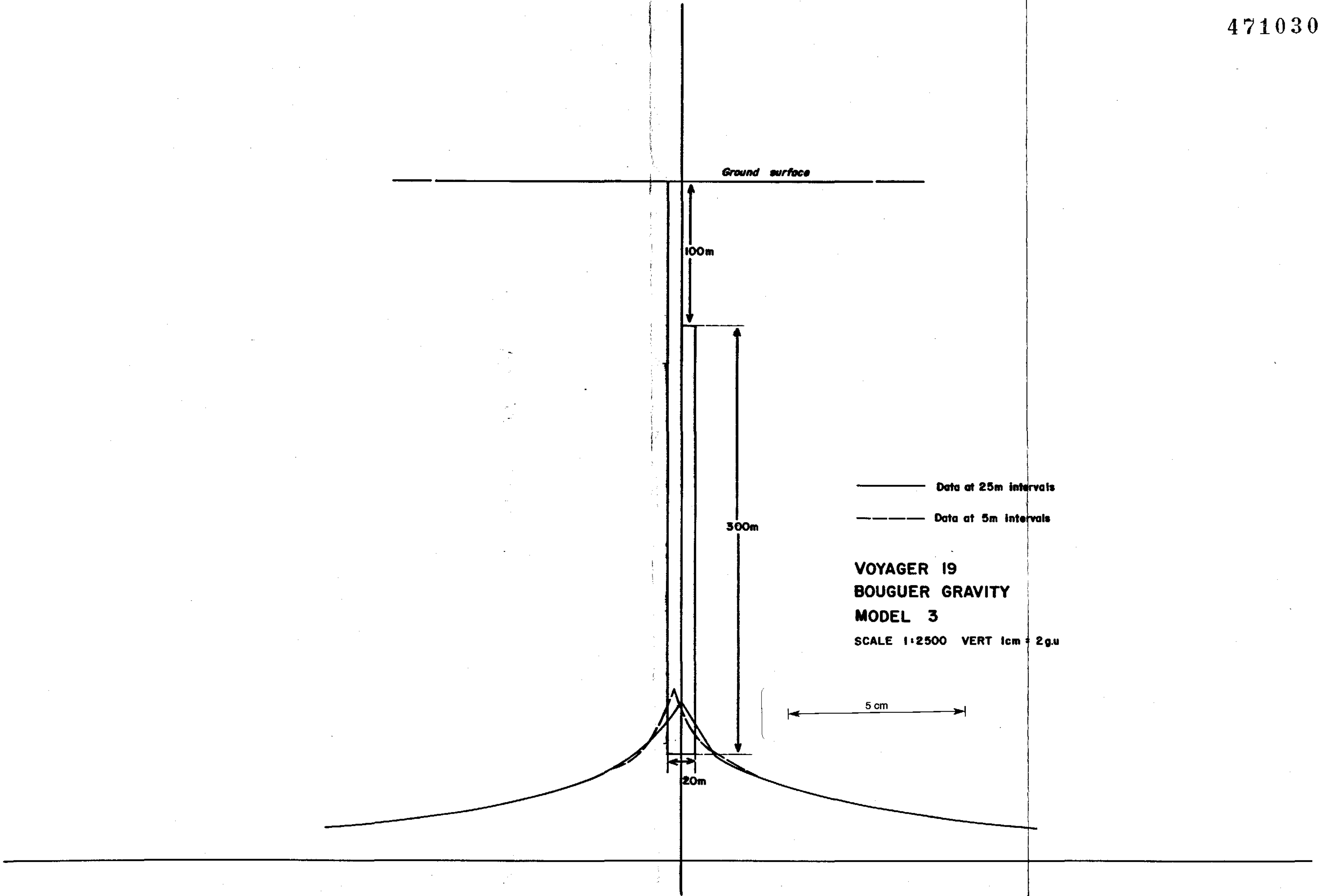


VOYAGER 19
BOUGUER GRAVITY
MODEL 2
SCALE 1:2500 VERT 1cm = 2 g.u



Ground surface
100m
300m
20m
Data at 25m intervals
Data at 5m intervals
VOYAGER 19
BOUGUER GRAVITY
MODEL 3
SCALE 1:2500 VERT 1cm = 2g.u
5 cm

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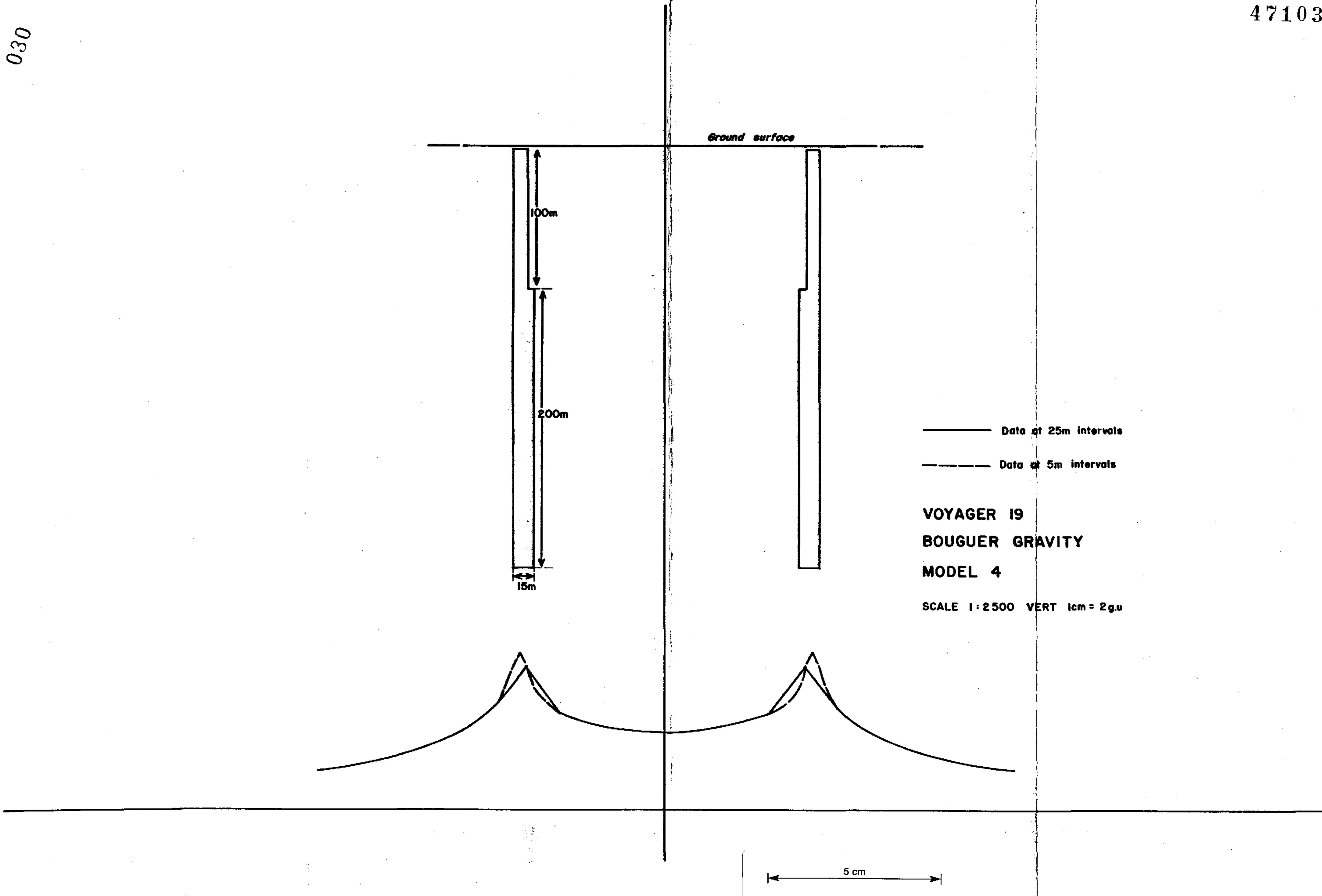
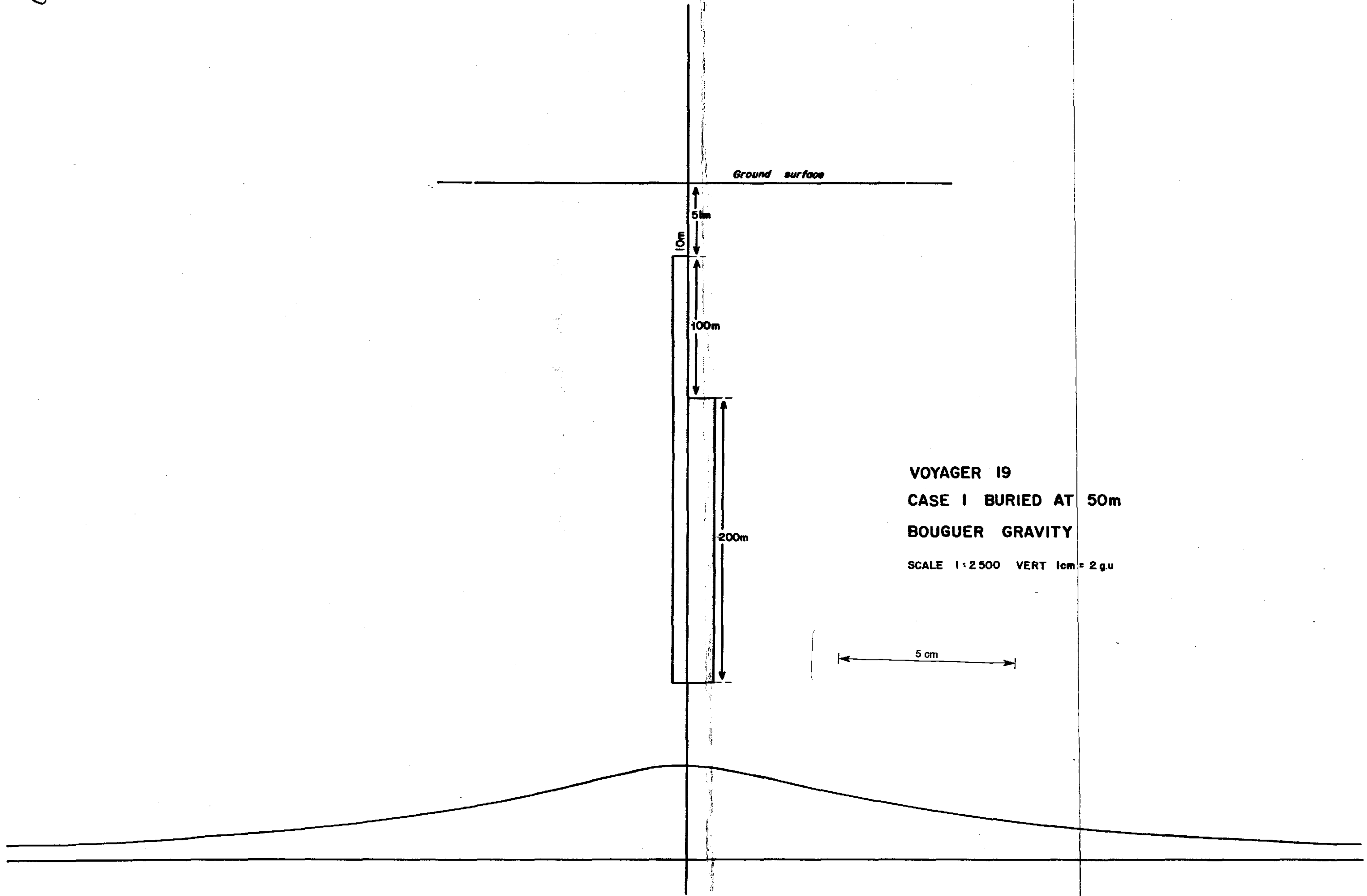
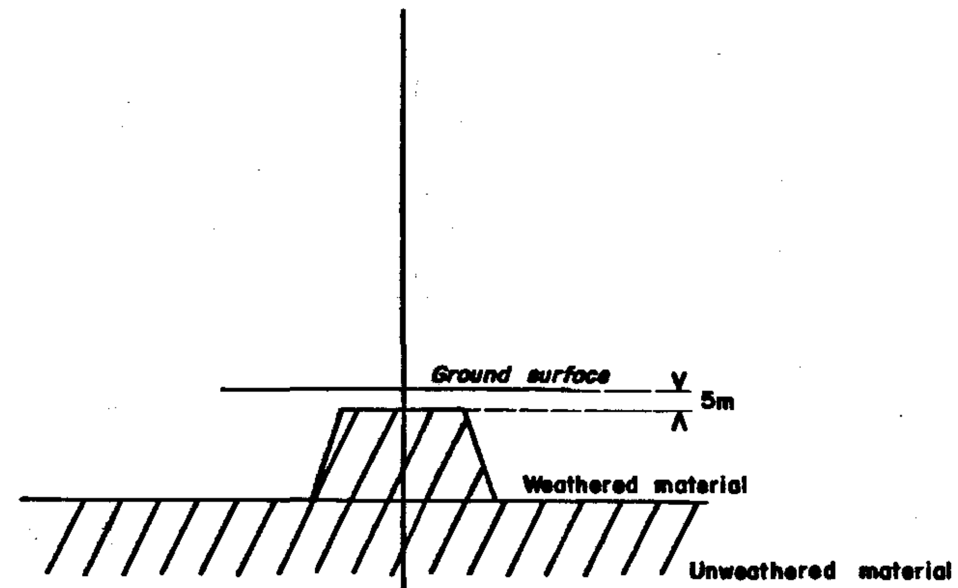


Ground surface
100m
200m
15m
Data at 25m intervals
Data at 5m intervals
VOYAGER 19
BOUGUER GRAVITY
MODEL 4
SCALE 1:2500 VERT 1cm = 2g.u
5 cm



VOYAGER 19
CASE I BURIED AT 50m
BOUGUER GRAVITY
SCALE 1:2500 VERT 1cm = 2 g.u

032



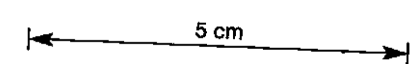
VOYAGER 19

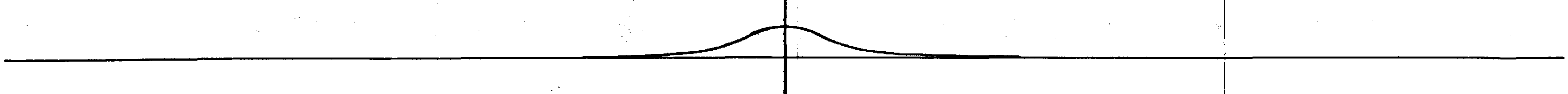
BOUGUER GRAVITY

EXAMPLE OF THE EFFECT OF

CHANGES IN THE DEPTH OF WEATHERING

SCALE 1:2500 VERT 1cm = 2g.u





APPENDIX 2

The International Gravity Formula adopted by the International Association of Geodosy in 1967 is

$$g = g_o \, (1 + \propto \sin^2 \phi + \beta \sin^2 \; 2 \phi)$$

Where g is the theoretical gravity

g_o is the equatorial gravity = 978.0318 gals

ϕ is the lattitude at which g is to be determined

$\propto$ (a constant) = 0.0053024

β (a constant) = 0.0000058

034

Appendix 3

471035

TERRAIN CORRECTIONS

for

GEOPEKO
VOYAGER 19 GRAVITY SURVEY

by
LEAMAN GEOPHYSICS

December 1981

Leaman Geophysics, G.P.O. Box 320D, Hobart -002)442239

An estimate of the terrain correction has been made for each station in the Voyager 19 gravity survey. The corrections are tabulated below and are quoted in units of $\mu m/s^2$ for a density of 1.0 t/m^3.

No allowance has been made for zone A (up to 15 m) and calculations for the important zone B are based on the topographic detail provided by the station level survey itself. Field note-books should be examined for any notes relating to minor topographic features near the station which might control the ultimate precision of the correction. While any errors introduced by such omissions may be small it should be noted that some lines do display some small erratic corrections which are related to minor, not always well defined, features.

Zones C, D, E, F have, for the most part, been calculated at a scale of 1:2500 and zones (F), G, H, I at 1:10000. Corrections beyond H are not needed for most of the stations given the small area covered by the survey and the nature of the regional terrain.

Precision of the correction is not easily evaluated. Internal consistency and random quality control spot checks suggest an accuracy of better than 5% in the correction estimates, or 0.01 to 0.05 $\mu m/s^2$ for a typical correction. Small deviations might be apparent if repeat calculations were undertaken with a 1:2500 photogrammetric contour map since there are many landforms which are not adequately described by the present line data and some assumptions have been made. The general error resulting from such possibly unjustified assumptions is unlikely to exceed 0.1 $\mu m/s^2$. Larger errors will be related to an absence of zone A, or undefined zone B, corrections - especially on the steeper slopes of Wart Hill where the exact position of slope changes may be critical. The above comments notwithstanding it is probable that the reliability of the corrections in this area of slight to moderate relief is comparable to that of the gravity values themselves given the usual meter problems in this environment.

Assumptions have also been made concerning the terrain, in detail, at the end of lines and these may not always be justified. Changes of scale and map units inevitably produce some problems where overlaps are restricted. The methods used and the terrain assumed have been applied consistently. Peripheral stations do not display significant deviations and the assumptions appear reasonably sound.

Two profiles are presented (12300, 12700) with corrections applied for a density of 2.52 t/m^3. The major topographic anomalies have been removed in each case.

In 12700 a clear regional trend is evident, the profile is generally smooth and an anomalous zone is evident from 9500-9700. The profile is, however, noisy across much of the section requiring the largest corrections. This could reflect inadequate corrections or original observation problems. The profile indicates that any correction errors are overstatements but this is a rare occurrence since zone A and specially notable features are usually neglected as has been the case here. It is possible that the bulge of Wart Hill has been improperly interpolated between the lines but this would also have led to understatement, on review, and it is concluded that the effect is either real or instrumental. If real, it will be understated.

Line 12300 is more erratic and the data is such that the position of the trend line is uncertain. Three have been suggested and review of other lines will be necessary in order to resolve this problem. As with line 12700 topographic correlations have been removed and many smooth profile segments may be observed. Station 10150 is either spurious or worthy of further attention.

Report submitted on behalf of
Leaman Geophysics
by

D. Leaman

Dr. D. E. Leaman B.Sc. Ph.D
M.Aus.I.M.M

037 Appendix 4.

471038

COMPUTER-ASSISTED COMPUTATION
OF GRAVITY TERRAIN CORRECTIONS
AT VOYAGER 19, ELLIOTT BAY,
TASMANIA

by

R.H. DUFFIN

March, 1982

1. INTRODUCTION.

A detailed gravity survey was conducted at the Voyager 19 base metal prospect in the Elliott Bay area in Tasmania in late 1981. The object of the survey was to map gravity anomalies which may be related to lenses of massive sulphide mineralisation.

The survey area covers a prominent topographic feature known as Wart Hill. A larger hill, Mount Osmond, lies about 3 km to the north of the survey area, and the coastline about 5 km to the south west. Simple rule-of-thumb techniques indicated that terrain effects from these topographic features would be significant when compared with the type of anomaly expected from small or medium tonneage mineral bodies. Terrain corrections would therefore be required.

Terrain corrections are rarely computed in gravity surveys for mineral exploration purposes. The corrections are slow and tedious to perform, and are generally fairly inaccurate. The higher frequency components in the terrain corrections are dominated by terrain effects close to the observation station. Most exploration grids are levelled on a 4 x 1 or 8 x 1 grid cell basis, and therefore elevations must be estimated between levelled survey lines to apply the correction. The higher frequency components contain, of course, the anomalies from shallow mineralisation.

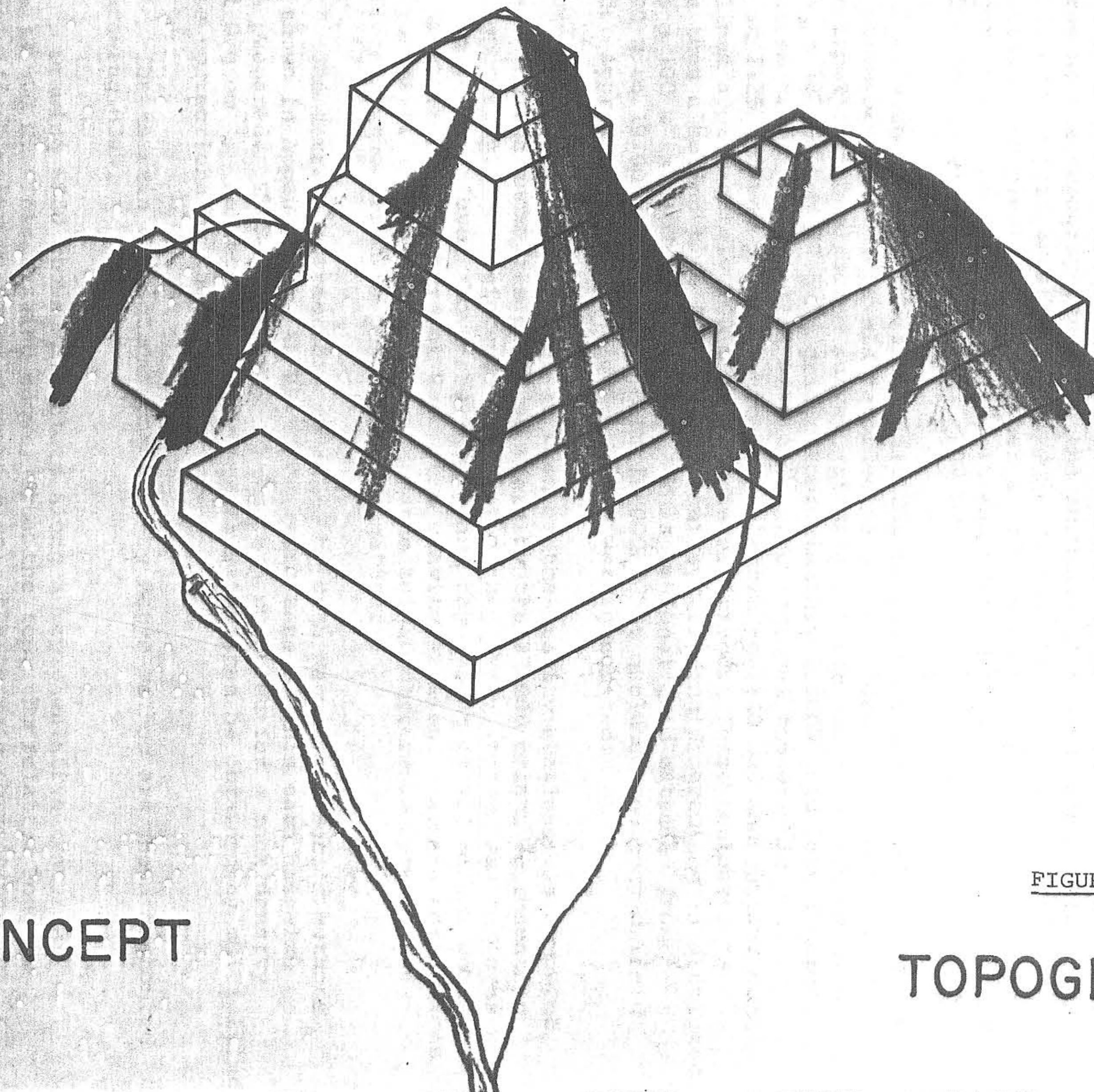
Terrain corrections were computed by conventional methods by a contract geophysicist. Optical levels were available on the surveyed field grid, and photogrammetrically determined levels were available from published 1:25 000 Tasmanian Lands Department topographic maps. The conventional corrections were made using Hammer's (1939) graticules for zones B through I. An outline of this method is provided in Appendix 1.

Hammer's (1939) technique is over four decades old. Modern computer technology allows for a more efficient, accurate and less subjective approach to the computation of terrain corrections. This report discusses the new technique which has been developed in response to a perceived need; it does not discuss the interpretation of the Voyager 19 gravity survey data.

2. PRISMATIC BLOCK TERRAIN CORRECTIONS.

Terrain can be represented by a series of right rectangular prismatic blocks of constant or variable base area whose height is adjusted to be equal to the average height within the base. This concept is illustrated in figure 1.

.... 2/



BLOCK CONCEPT

FIGURE 1

TOPOGRAPHY

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Formulae for computing the gravity anomaly due to a right rectangular prism have been published by Bott (1959) and Nagy (1966). Nagy's method is exact and requires considerably more computation time than Botts approximation. Nagys method was updated by Goodacre (1973).

The topography in the project area was examined by simple methods to determine the basal area of prisms which would be required to adequately represent the topography. Given the accuracy of the surveyed optical levels on the grid and the relative inaccuracy of the levels off it, and the physical principle that the further a body is from a gravity station the larger it must be to be recorded, it was decided to use prisms of 12.5 m x 12.5 m on the grid and 100 m x 100 m off it.

Figure 2 shows the flow chart for computing the terrain corrections. The surveyors optical levels recorded each 25 m along lines 100 m apart were input to the airborne survey gridding program and were interpolated onto a 12.5 m x 12.5 m grid. Approximately 15 000 grid points were produced here. In parallel with this, the regional topographic contour map at 1:25 000 was photographically enlarged to 1:10 000 and contour cuts on lines approximately 100 m apart were digitised. These contour cuts were then also input to the airborne survey gridding program and interpolated onto a 100 m x 100 m cell grid. This regional grid extended from 7 000 N to 19 000 N and 6 000 E to 16 000 E but excluded the pegged field grid. Approximately 12 000 grid points were generated.

The terrain correction at each of the gravity stations was computed by summing the anomalies produced there by the 27 000 prisms representing the topography. The reference level at each gravity station was taken as its own reduced level above sea level, and the height of all prisms were set as their height above or below the gravity station. Terrain corrections are positive, irrespective of whether the height difference between the station and the prism is positive or negative.

The terrain corrections computed by both Nagy's and Bott's methods are shown in Appendix 2. An HP-85 cassette tape of this data has also been prepared. These corrections have been computed for a rock density of 1.0 g cm^{-3}; corrections for other densities can be obtained by multiplying these corrections by the new density.

The terrain corrections computed by Nagys method are shown contoured in drawing 6349.

Drawing 6350 shows multiplots along a representative traverse, line 12 600 N. This drawing shows, from the top, the relative Bouguer anomaly (i.e. prior to terrain correction), the terrain corrections by the conventional Hammer method and by Nagys method, the terrain profile, the complete Bouguer anomaly after terrain correction by both methods, and the residual anomalies after subtraction of a linear background passing through the end points of each line. The curves have been produced for a rock density of 2.5 g cm^{-3}. The salient points to note are that:-

i) the two techniques have produced a generally similar terrain correction profile;

..... 3/

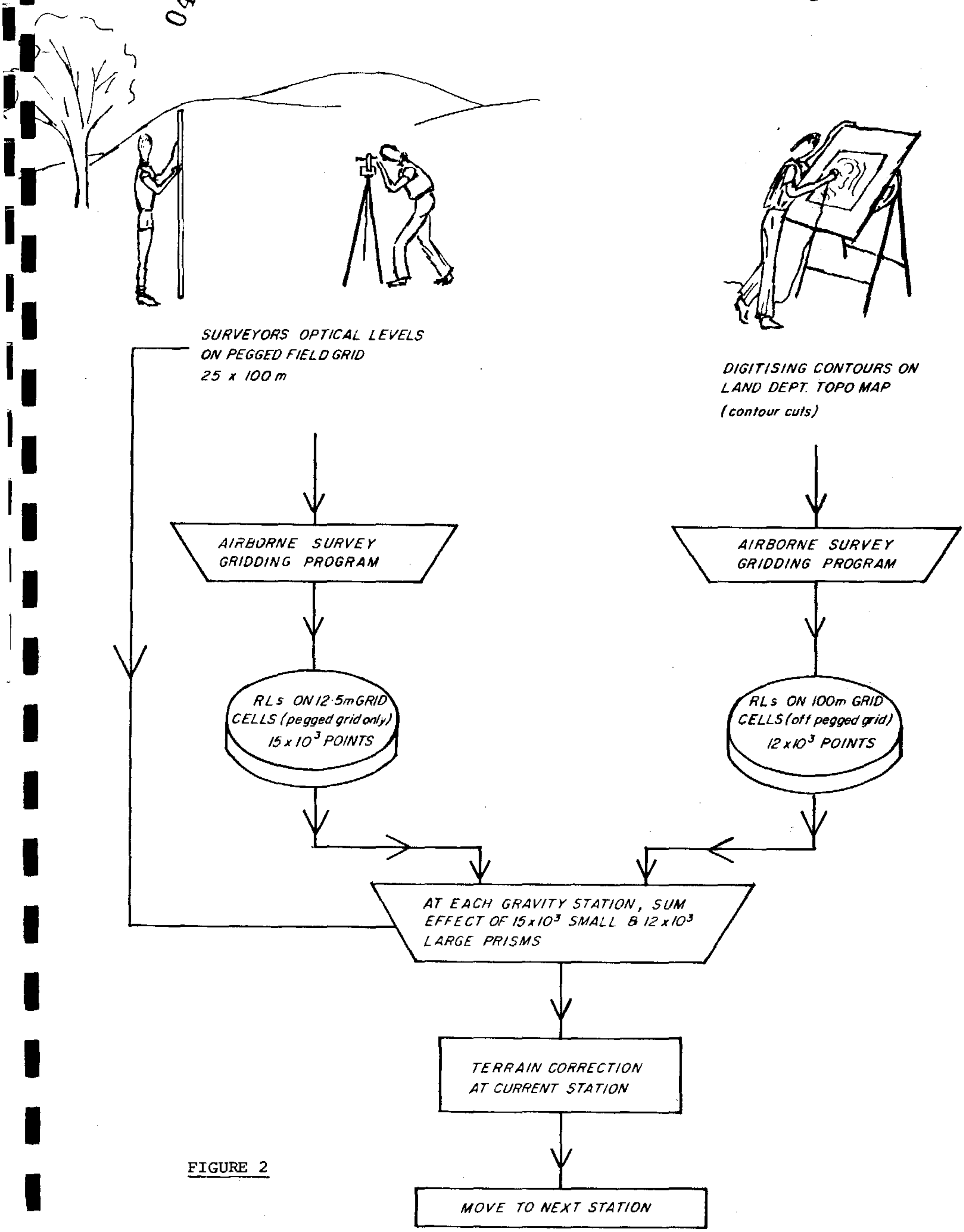
SURVEYORS OPTICAL LEVELS
ON PEGGED FIELD GRID
25 x 100 m
DIGITISING CONTOURS ON
LAND DEPT. TOPO MAP
(contour cuts)
AIRBORNE SURVEY
GRIDDING PROGRAM
AIRBORNE SURVEY
GRIDDING PROGRAM
RLs ON 12·5m GRID
CELLS (pegged grid only)
15 x 10³ POINTS
RLs ON 100m GRID
CELLS (off pegged grid)
12 x 10³ POINTS
AT EACH GRAVITY STATION, SUM
EFFECT OF 15 x 10³ SMALL & 12 x 10³
LARGE PRISMS
TERRAIN CORRECTION
AT CURRENT STATION
MOVE TO NEXT STATION

FIGURE 2

ii) The Hammer profile is slightly more noisy than the Nagy profile, reflecting the inherent inaccuracies in manually determining heights between survey lines in the conventional method;

iii) The eastern-most residual gravity anomaly near 10 350 E which is much better developed on the Nagy residual than on the Hammer residual.

3. ACCURACY OF THE TECHNIQUES

A series of model studies has been compiled to test the relative and absolute accuracies of the two techniques.

These tests are summarised in figure 3. A vertical cylinder of radius 100 m and depth 50 m has been embedded in a half space, and the terrain corrections have been computed for unit density contrast on a central traverse and one 200 m from the axis of the cylinder. The terrain corrections for the two traverses computed by each method are shown. The cylinder was approximated by a series of prisms of height 50 m and base 12.5 x 12.5 m for the Nagy calculations. The two methods produced similar results, but the Nagy curves are smoother than the Hammer curves. It should be remembered here that terrain effects within Hammers zone A (0-2 m) and within a square 12.5 m x 12.5 m centred on the observation point have been ignored in these calculations.

Analytical computations of the gravity anomaly produced by a vertical cylinder at off-axis stations involve elliptic integrals and are extremely difficult. However, the on-axis case is simple and the anomaly here can be shown to be 1.60 milligals. The Naggy algorithm returned an anomaly of 1.58 milligals, including the central 12.5 x 12.5 prism. The error here is less than 2%, which can probably be explained by inadequacies in approximating a circular section by a series of squares. It is difficult to fit square pegs into a round hole!

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4. REFERENCES

GOODACRE, A.K., 1973; Some comments on the calculation of the gravitational and magnetic attraction of a homogeneous rectangular prism. Geophys. Prosp. V. 21, No. 1, p.66-69.

HAMMER, S., 1939; Terrain corrections for gravimeter stations. Geophys., V4, No. 3, p.184-193.

NAGY, D., 1966; The gravitational attraction of a right rectangular prism. Geophys, V. 31, No. 2, p.362-371.

044.

EL 27/76 471045

GRAVITY SURVEY – ELLIOT RAY

J. SUMPTION.
GEOPEKO.

APPENDIX 4 (2)

Voyager 19 terrain corrections

for unit density contrast computed

by Nagy-Goodacre & Bott's techniques.

045

0 VOYAGER 19 GRID GRAVITY TERRAIN CORRECTIONS (MILLIGALS)

E'ING (M)	N'ING (M)	RL (M)	NAGYS METHOD REG	GRID	TOTAL	BOTTS METHOD REG	GRID	TOTAL
10000.0	11700.0	133.5	.06	.02	.07	.05	.02	.07
10000.0	11750.0	136.0	.05	.02	.07	.04	.02	.07
9600.0	11800.0	132.5	.05	.01	.06	.05	.01	.06
9625.0	11800.0	132.4	.04	.01	.06	.04	.01	.06
9650.0	11800.0	133.0	.04	.02	.06	.04	.02	.06
9675.0	11800.0	132.8	.04	.02	.06	.04	.02	.06
9700.0	11800.0	131.9	.04	.02	.06	.04	.02	.06
9725.0	11800.0	131.3	.03	.02	.06	.03	.02	.06
9750.0	11800.0	130.8	.03	.02	.06	.03	.02	.06
9775.0	11800.0	130.9	.03	.03	.06	.03	.03	.06
9800.0	11800.0	130.7	.03	.03	.06	.03	.03	.06
9825.0	11800.0	135.4	.04	.05	.09	.04	.05	.09
9850.0	11800.0	135.1	.04	.03	.07	.04	.03	.07
9875.0	11800.0	138.2	.05	.04	.09	.05	.04	.08
9900.0	11800.0	140.6	.05	.04	.09	.05	.04	.09
9900.0	11800.0	140.6	.05	.04	.09	.05	.04	.09
9925.0	11800.0	140.5	.05	.03	.08	.05	.03	.08
9950.0	11800.0	138.1	.04	.03	.07	.04	.03	.07
9950.0	11800.0	138.1	.04	.03	.07	.04	.03	.07
9975.0	11800.0	138.4	.04	.03	.07	.04	.02	.07
9975.0	11800.0	138.4	.04	.03	.07	.04	.02	.07
10000.0	11800.0	138.8	.04	.03	.07	.04	.02	.07
10000.0	11800.0	138.8	.04	.03	.07	.04	.02	.07
10000.0	11800.0	138.8	.04	.03	.07	.04	.02	.07
10000.0	11800.0	138.8	.04	.03	.07	.04	.02	.07
10000.0	11800.0	138.8	.04	.03	.07	.04	.02	.07
10025.0	11800.0	138.9	.04	.02	.07	.04	.02	.07
10025.0	11800.0	138.9	.04	.02	.07	.04	.02	.07
10050.0	11800.0	139.8	.04	.03	.07	.04	.03	.07
10050.0	11800.0	139.8	.04	.03	.07	.04	.03	.07
10075.0	11800.0	141.6	.05	.03	.08	.05	.03	.08
10100.0	11800.0	140.9	.05	.03	.07	.04	.02	.07
10100.0	11800.0	140.9	.05	.03	.07	.04	.02	.07
10125.0	11800.0	141.2	.05	.03	.07	.04	.03	.07
10150.0	11800.0	142.5	.05	.03	.08	.05	.03	.08
10175.0	11800.0	140.0	.04	.03	.07	.04	.03	.07
10200.0	11800.0	138.4	.04	.03	.07	.04	.03	.07
10225.0	11800.0	136.4	.03	.04	.07	.03	.04	.07
10250.0	11800.0	133.4	.03	.05	.07	.03	.04	.07
10275.0	11800.0	131.7	.02	.04	.07	.02	.04	.07
10300.0	11800.0	130.6	.02	.04	.07	.02	.04	.07
10325.0	11800.0	131.9	.02	.04	.07	.02	.04	.06
10350.0	11800.0	135.6	.03	.05	.08	.03	.05	.08
10375.0	11800.0	139.2	.03	.05	.09	.03	.05	.08
10400.0	11800.0	139.6	.03	.03	.06	.03	.03	.06
10425.0	11800.0	140.0	.03	.02	.06	.03	.02	.06
10450.0	11800.0	140.4	.04	.02	.06	.04	.02	.06
10475.0	11600.0	140.8	.04	.02	.06	.04	.02	.06
10500.0	11800.0	141.9	.04	.02	.06	.04	.02	.06
10525.0	11800.0	143.2	.04	.02	.06	.04	.02	.06
10550.0	11800.0	144.2	.04	.02	.06	.04	.02	.06
10575.0	11800.0	145.0	.05	.01	.06	.05	.01	.06

[redacted]	10600.0	11800.0	145.9	.05	.01	.07	.05	.01	.06
59	9850.0	11850.0	139.2	.04	.04	.08	.04	.03	.08
[redacted]	9875.0	11850.0	139.5	.04	.03	.07	.04	.03	.07
[redacted]	9900.0	11850.0	142.3	.05	.04	.09	.05	.03	.08
62	10100.0	11800.0	166.8	.55	.82	1.37	.47	.80	1.26
63	9925.0	11850.0	143.4	.05	.03	.08	.05	.03	.08
[redacted]	9950.0	11850.0	143.0	.05	.03	.08	.05	.03	.08
[redacted]	9975.0	11850.0	141.8	.04	.03	.07	.04	.03	.07
66	10000.0	11850.0	142.0	.04	.03	.07	.04	.03	.07
[redacted]	10000.0	11850.0	142.0	.04	.03	.07	.04	.03	.07
[redacted]	10025.0	11850.0	142.3	.04	.03	.07	.04	.03	.07
69	10050.0	11850.0	143.0	.05	.03	.08	.04	.03	.07
[redacted]	10075.0	11850.0	144.0	.05	.03	.08	.05	.03	.08
[redacted]	10100.0	11850.0	143.6	.05	.03	.07	.04	.03	.07
72	10125.0	11850.0	144.5	.05	.03	.08	.05	.03	.08
73	10150.0	11850.0	145.3	.05	.03	.08	.05	.03	.08
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76	10225.0	11850.0	142.7	.04	.04	.08	.04	.04	.08
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[redacted]	10275.0	11850.0	134.0	.02	.06	.08	.02	.06	.08
79	10300.0	11850.0	133.8	.02	.05	.07	.02	.05	.07
[redacted]	9600.0	11900.0	136.8	.05	.01	.07	.05	.01	.06
[redacted]	9625.0	11900.0	137.4	.05	.02	.07	.05	.02	.06
82	9650.0	11900.0	138.5	.05	.02	.07	.05	.02	.07
83	9675.0	11900.0	140.1	.05	.03	.08	.05	.03	.08
[redacted]	9700.0	11900.0	138.7	.04	.02	.06	.04	.02	.06
[redacted]	9725.0	11900.0	138.0	.04	.02	.06	.04	.02	.06
86	9750.0	11900.0	136.5	.04	.03	.07	.04	.03	.07
[redacted]	9775.0	11900.0	140.5	.04	.04	.08	.04	.03	.08
[redacted]	9800.0	11900.0	142.3	.05	.04	.09	.05	.04	.09
89	9825.0	11900.0	144.3	.05	.05	.10	.05	.05	.10
[redacted]	9850.0	11900.0	145.4	.05	.05	.10	.05	.04	.10
[redacted]	9875.0	11900.0	142.4	.04	.03	.07	.04	.03	.07
92	9900.0	11900.0	143.0	.04	.03	.07	.04	.03	.07
93	9925.0	11900.0	144.2	.05	.03	.07	.05	.03	.07
[redacted]	9950.0	11900.0	147.6	.05	.05	.10	.05	.04	.10
[redacted]	9975.0	11900.0	146.6	.05	.03	.08	.05	.03	.08
96	10000.0	11900.0	145.2	.05	.03	.08	.05	.03	.07
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[redacted]	10000.0	11900.0	145.2	.05	.03	.08	.05	.03	.07
99	10025.0	11900.0	146.2	.05	.03	.08	.05	.03	.08
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[redacted]	10075.0	11900.0	147.7	.05	.04	.09	.05	.03	.08
102	10100.0	11900.0	148.7	.05	.04	.09	.05	.04	.09
103	10125.0	11900.0	146.6	.05	.03	.08	.05	.03	.08
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[redacted]	10175.0	11900.0	145.7	.04	.03	.07	.04	.03	.07
106	10200.0	11900.0	144.2	.04	.04	.08	.04	.04	.08
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[redacted]	10250.0	11900.0	137.1	.03	.07	.09	.03	.06	.09
109	10275.0	11900.0	138.4	.03	.05	.08	.03	.05	.07
[redacted]	10300.0	11900.0	140.1	.03	.06	.09	.03	.05	.08
[redacted]	10325.0	11900.0	141.5	.03	.06	.09	.03	.05	.09
112	10350.0	11900.0	143.5	.04	.06	.10	.04	.05	.09
113	10375.0	11900.0	145.2	.04	.05	.09	.04	.05	.09
[redacted]	10400.0	11900.0	145.8	.04	.04	.08	.04	.04	.08

15	10425.0	11900.0	146.1	.04	.03	.07	.04	.03	.07
116	10450.0	11900.0	146.0	.04	.03	.07	.04	.03	.07
17	10475.0	11900.0	145.8	.04	.02	.07	.04	.02	.06
18	10500.0	11900.0	145.4	.04	.02	.06	.04	.02	.06
119	10525.0	11900.0	144.4	.04	.02	.06	.04	.02	.06
120	10550.0	11900.0	141.2	.04	.03	.07	.03	.03	.06
21	10575.0	11900.0	141.3	.04	.02	.06	.04	.02	.06
22	10600.0	11900.0	140.5	.04	.02	.06	.04	.02	.06
123	10000.0	11950.0	148.3	.05	.03	.08	.05	.03	.08
24	9600.0	12000.0	140.5	.06	.01	.07	.05	.01	.07
25	9625.0	12000.0	140.1	.05	.01	.06	.05	.01	.06
126	9650.0	12000.0	140.3	.05	.01	.06	.05	.01	.06
27	9675.0	12000.0	140.9	.04	.02	.06	.04	.02	.06
28	9700.0	12000.0	142.6	.05	.02	.07	.05	.02	.07
129	9725.0	12000.0	142.7	.04	.02	.06	.04	.02	.06
130	9750.0	12000.0	143.3	.04	.02	.06	.04	.02	.06
31	9775.0	12000.0	144.5	.05	.02	.07	.05	.02	.07
32	9800.0	12000.0	145.8	.05	.03	.07	.05	.02	.07
133	9825.0	12000.0	147.0	.05	.03	.08	.05	.03	.07
34	9850.0	12000.0	147.1	.05	.02	.07	.05	.02	.07
35	9875.0	12000.0	146.7	.05	.02	.07	.05	.02	.07
136	9900.0	12000.0	147.1	.05	.03	.07	.05	.03	.07
37	9925.0	12000.0	147.7	.05	.03	.07	.05	.03	.07
38	9950.0	12000.0	148.9	.05	.03	.08	.05	.03	.08
139	9975.0	12000.0	149.6	.05	.03	.08	.05	.03	.08
140	10000.0	12000.0	167.1	.09	.49	.58	.09	.47	.56
41	10000.0	12000.0	151.5	.05	.04	.09	.05	.04	.09
42	10000.0	12000.0	151.5	.05	.04	.09	.05	.04	.09
143	10000.0	12000.0	151.5	.05	.04	.09	.05	.04	.09
44	10025.0	12000.0	153.0	.05	.05	.10	.05	.04	.10
45	10050.0	12000.0	153.5	.05	.04	.10	.05	.04	.10
146	10075.0	12000.0	153.3	.05	.04	.09	.05	.04	.09
47	10100.0	12000.0	153.0	.05	.04	.09	.05	.04	.09
48	10125.0	12000.0	151.9	.05	.04	.09	.05	.04	.09
149	10150.0	12000.0	150.4	.05	.04	.09	.05	.04	.09
150	10175.0	12000.0	150.0	.04	.05	.09	.04	.04	.09
51	10200.0	12000.0	148.8	.04	.05	.09	.04	.05	.09
52	10225.0	12000.0	147.1	.04	.05	.09	.04	.05	.09
153	10250.0	12000.0	147.8	.04	.06	.10	.04	.06	.10
54	10275.0	12000.0	147.2	.04	.06	.10	.04	.05	.09
55	10300.0	12000.0	148.7	.04	.06	.10	.04	.06	.10
156	10325.0	12000.0	149.4	.04	.06	.10	.04	.05	.10
57	10350.0	12000.0	149.6	.04	.05	.09	.04	.05	.09
58	10375.0	12000.0	149.7	.04	.04	.09	.04	.04	.09
159	10400.0	12000.0	149.5	.04	.04	.08	.04	.04	.08
160	10425.0	12000.0	148.6	.04	.03	.08	.04	.03	.08
1	10450.0	12000.0	147.2	.04	.03	.08	.04	.03	.08
2	10475.0	12000.0	146.8	.04	.03	.07	.04	.03	.07
163	10500.0	12000.0	146.2	.04	.03	.07	.04	.03	.07
4	10525.0	12000.0	144.6	.04	.03	.07	.04	.03	.07
5	10550.0	12000.0	142.7	.04	.04	.07	.04	.04	.07
166	10575.0	12000.0	140.1	.03	.04	.08	.03	.04	.07
7	10000.0	12050.0	155.7	.06	.06	.12	.06	.06	.11
8	9600.0	12100.0	138.1	.04	.02	.06	.04	.02	.06
169	9625.0	12100.0	139.0	.04	.02	.06	.04	.02	.06
170	9650.0	12100.0	140.0	.04	.02	.06	.04	.02	.06
1	9675.0	12100.0	140.9	.04	.02	.06	.04	.02	.06

172	9700.0	12100.0	141.8	.04	.02	.06	.04	.02	.06
173	9725.0	12100.0	143.6	.04	.03	.07	.04	.02	.07
174	9750.0	12100.0	145.0	.04	.03	.07	.04	.03	.07
175	9775.0	12100.0	147.9	.05	.04	.08	.05	.03	.08
176	9800.0	12100.0	148.6	.05	.03	.08	.05	.03	.08
177	9825.0	12100.0	148.5	.05	.03	.07	.05	.03	.07
178	9850.0	12100.0	148.9	.05	.03	.07	.05	.03	.07
179	9875.0	12100.0	150.6	.05	.04	.08	.05	.03	.08
180	9900.0	12100.0	150.6	.05	.04	.08	.05	.04	.08
181	9925.0	12100.0	152.1	.05	.04	.09	.05	.04	.09
182	9950.0	12100.0	154.0	.05	.05	.10	.05	.05	.10
183	9975.0	12100.0	155.9	.06	.06	.11	.05	.05	.11
184	10000.0	12100.0	158.2	.06	.06	.12	.06	.06	.12
185	10000.0	12100.0	158.2	.06	.06	.12	.06	.06	.12
186	10000.0	12100.0	158.2	.06	.06	.12	.06	.06	.12
187	10025.0	12100.0	161.1	.07	.07	.14	.06	.07	.14
188	10050.0	12100.0	162.0	.07	.07	.13	.07	.07	.13
189	10075.0	12100.0	158.7	.06	.06	.12	.06	.06	.12
190	10100.0	12100.0	158.2	.06	.06	.12	.06	.06	.11
191	10125.0	12100.0	158.9	.06	.07	.12	.06	.06	.12
192	10150.0	12100.0	159.4	.06	.07	.13	.06	.07	.13
193	10175.0	12100.0	159.9	.06	.08	.14	.06	.08	.14
194	10200.0	12100.0	160.1	.06	.09	.15	.06	.08	.14
195	10225.0	12100.0	159.0	.06	.08	.14	.06	.08	.14
196	10250.0	12100.0	158.5	.06	.09	.14	.06	.08	.14
197	10275.0	12100.0	157.3	.05	.08	.14	.05	.08	.14
198	10300.0	12100.0	156.8	.05	.08	.14	.05	.08	.13
199	10325.0	12100.0	156.1	.05	.08	.13	.05	.08	.13
200	10350.0	12100.0	156.0	.05	.07	.13	.05	.07	.12
201	10375.0	12100.0	155.5	.05	.07	.12	.05	.07	.12
202	10400.0	12100.0	154.6	.05	.06	.12	.05	.06	.11
203	10425.0	12100.0	153.3	.05	.06	.11	.05	.06	.11
204	10450.0	12100.0	153.2	.05	.06	.11	.05	.06	.11
205	10475.0	12100.0	152.5	.05	.06	.11	.05	.06	.11
206	10500.0	12100.0	150.5	.05	.06	.11	.05	.06	.11
207	10525.0	12100.0	147.2	.05	.07	.12	.05	.07	.12
208	10550.0	12100.0	137.0	.03	.17	.20	.03	.16	.19
209	10000.0	12150.0	162.0	.06	.07	.14	.06	.07	.13
210	9600.0	12200.0	145.1	.05	.02	.08	.06	.02	.07
211	9625.0	12200.0	145.7	.05	.02	.08	.05	.02	.07
212	9650.0	12200.0	144.8	.05	.02	.07	.05	.02	.07
213	9675.0	12200.0	143.9	.04	.02	.07	.04	.02	.07
214	9700.0	12200.0	144.3	.04	.03	.07	.04	.03	.07
215	9725.0	12200.0	145.6	.04	.03	.07	.04	.03	.07
216	9750.0	12200.0	146.7	.04	.03	.07	.04	.03	.07
217	9775.0	12200.0	146.1	.04	.03	.07	.04	.03	.07
218	9800.0	12200.0	147.8	.04	.03	.08	.04	.03	.08
219	9825.0	12200.0	148.8	.04	.04	.08	.04	.04	.08
220	9850.0	12200.0	150.0	.04	.04	.09	.04	.04	.09
221	9875.0	12200.0	152.5	.05	.06	.10	.05	.05	.10
222	9900.0	12200.0	157.7	.06	.09	.14	.06	.08	.14
223	9925.0	12200.0	161.6	.06	.09	.16	.06	.09	.15
224	9950.0	12200.0	165.0	.07	.10	.17	.07	.10	.17
225	9975.0	12200.0	164.9	.07	.08	.15	.07	.07	.14
226	10000.0	12200.0	167.1	.07	.09	.16	.07	.08	.16
227	10000.0	12200.0	167.1	.07	.09	.16	.07	.08	.16
228	10025.0	12200.0	168.5	.08	.09	.17	.08	.09	.16

10050.0	12200.0	168.6	.08	.09	.16	.08	.08	.16
10075.0	12200.0	170.0	.08	.10	.18	.08	.10	.18
10100.0	12200.0	171.5	.08	.12	.20	.08	.11	.20
10125.0	12200.0	173.1	.09	.14	.22	.09	.13	.22
10150.0	12200.0	174.0	.09	.14	.23	.09	.14	.23
10175.0	12200.0	175.0	.09	.16	.25	.09	.15	.24
10200.0	12200.0	175.6	.09	.16	.26	.09	.16	.25
10225.0	12200.0	176.7	.10	.18	.28	.10	.17	.27
10250.0	12200.0	177.2	.10	.19	.29	.10	.18	.28
10275.0	12200.0	175.9	.10	.18	.28	.10	.17	.27
10300.0	12200.0	174.1	.09	.17	.27	.09	.17	.26
10325.0	12200.0	171.1	.09	.16	.25	.09	.16	.24
10350.0	12200.0	169.4	.08	.15	.24	.08	.15	.23
10375.0	12200.0	167.1	.08	.14	.22	.08	.14	.22
10400.0	12200.0	164.4	.08	.13	.20	.08	.12	.20
10425.0	12200.0	162.1	.07	.11	.19	.07	.11	.18
10450.0	12200.0	159.8	.07	.10	.17	.07	.10	.17
10475.0	12200.0	158.5	.07	.10	.17	.07	.10	.17
10500.0	12200.0	156.1	.07	.11	.18	.07	.11	.18
10525.0	12200.0	143.7	.04	.22	.26	.04	.21	.25
10550.0	12200.0	137.2	.03	.20	.23	.03	.19	.22
10575.0	12200.0	135.2	.03	.13	.15	.03	.12	.15
10600.0	12200.0	132.7	.02	.11	.13	.02	.11	.13
10000.0	12250.0	172.6	.09	.12	.20	.09	.11	.20
9600.0	12300.0	148.5	.07	.05	.13	.07	.05	.12
9625.0	12300.0	151.1	.07	.04	.11	.07	.04	.11
9650.0	12300.0	152.5	.07	.03	.10	.07	.03	.10
9675.0	12300.0	152.1	.06	.03	.09	.06	.03	.09
9700.0	12300.0	147.7	.05	.04	.09	.05	.04	.08
9725.0	12300.0	146.2	.04	.04	.08	.04	.04	.08
9750.0	12300.0	148.9	.05	.04	.08	.04	.04	.08
9775.0	12300.0	149.2	.04	.04	.08	.04	.04	.08
9800.0	12300.0	151.2	.05	.05	.09	.05	.05	.09
9825.0	12300.0	152.6	.05	.05	.10	.05	.05	.10
9850.0	12300.0	154.7	.05	.06	.11	.05	.06	.11
9875.0	12300.0	157.4	.05	.07	.12	.05	.07	.12
9900.0	12300.0	160.5	.06	.08	.14	.06	.08	.14
9925.0	12300.0	163.0	.06	.08	.14	.06	.08	.14
9950.0	12300.0	165.0	.07	.08	.15	.07	.08	.15
9975.0	12300.0	171.1	.08	.12	.20	.08	.12	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10025.0	12300.0	178.9	.10	.15	.24	.10	.14	.24
10050.0	12300.0	183.7	.11	.18	.29	.11	.17	.28
10075.0	12300.0	187.2	.12	.19	.32	.12	.19	.31
10100.0	12300.0	191.3	.14	.23	.36	.13	.22	.35
9950.0	12300.0	165.0	.07	.08	.15	.07	.08	.15
9975.0	12300.0	171.1	.08	.12	.20	.08	.12	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10000.0	12300.0	174.2	.09	.12	.21	.09	.11	.20
10025.0	12300.0	178.9	.10	.15	.24	.10	.14	.24
10050.0	12300.0	183.7	.11	.18	.29	.11	.17	.28
10075.0	12300.0	187.2	.12	.19	.32	.12	.19	.31

286	10100.0	12300.0	191.3	.14	.23	.36	.13	.22	.35
287	10125.0	12300.0	195.2	.15	.26	.41	.15	.25	.40
288	10150.0	12300.0	197.7	.16	.26	.42	.16	.26	.41
289	10175.0	12300.0	201.2	.17	.30	.47	.17	.29	.46
290	10200.0	12300.0	203.7	.18	.32	.50	.18	.31	.49
291	10225.0	12300.0	205.7	.19	.34	.53	.19	.33	.52
292	10250.0	12300.0	207.1	.20	.35	.56	.20	.35	.55
293	10275.0	12300.0	206.6	.21	.35	.56	.21	.34	.55
294	10300.0	12300.0	204.2	.20	.33	.53	.20	.32	.52
295	10325.0	12300.0	200.9	.19	.32	.51	.19	.31	.50
296	10350.0	12300.0	195.8	.18	.29	.47	.17	.28	.46
297	10375.0	12300.0	190.3	.16	.27	.43	.16	.26	.42
298	10400.0	12300.0	182.4	.13	.25	.38	.13	.24	.37
299	10425.0	12300.0	175.5	.11	.22	.34	.11	.22	.33
300	10450.0	12300.0	170.5	.10	.20	.30	.10	.19	.29
301	10475.0	12300.0	165.0	.09	.19	.28	.09	.19	.28
302	10500.0	12300.0	155.3	.06	.24	.30	.06	.23	.29
303	10525.0	12300.0	147.5	.05	.24	.28	.05	.23	.27
304	10550.0	12300.0	142.6	.04	.19	.23	.04	.18	.22
305	10575.0	12300.0	139.6	.04	.14	.18	.04	.14	.18
306	10600.0	12300.0	138.8	.04	.11	.15	.04	.11	.15
307	10000.0	12350.0	179.5	.10	.17	.27	.10	.16	.26
308	9600.0	12400.0	145.0	.06	.07	.13	.05	.06	.12
309	9625.0	12400.0	147.9	.06	.04	.10	.06	.04	.10
310	9650.0	12400.0	147.6	.05	.03	.08	.05	.03	.08
311	9675.0	12400.0	144.9	.04	.05	.09	.04	.05	.09
312	9700.0	12400.0	147.7	.05	.04	.08	.05	.04	.08
313	9725.0	12400.0	151.4	.05	.05	.10	.05	.05	.10
314	9750.0	12400.0	155.1	.06	.06	.12	.06	.06	.12
315	9775.0	12400.0	157.4	.06	.06	.12	.06	.06	.12
316	9800.0	12400.0	159.3	.06	.06	.12	.06	.06	.12
317	9825.0	12400.0	160.3	.06	.06	.12	.06	.06	.12
318	9850.0	12400.0	159.6	.06	.05	.11	.06	.05	.11
319	9875.0	12400.0	158.0	.05	.06	.12	.05	.06	.12
320	9900.0	12400.0	163.5	.06	.10	.16	.06	.09	.15
321	9925.0	12400.0	167.5	.07	.11	.18	.07	.10	.17
322	9950.0	12400.0	171.2	.08	.11	.19	.08	.11	.19
323	9975.0	12400.0	175.1	.09	.13	.21	.09	.12	.21
324	10000.0	12400.0	180.3	.10	.15	.25	.10	.15	.25
325	10000.0	12400.0	180.3	.10	.15	.25	.10	.15	.25
326	10000.0	12400.0	180.3	.10	.15	.25	.10	.15	.25
327	10025.0	12400.0	187.2	.12	.20	.32	.12	.19	.31
328	10050.0	12400.0	191.6	.13	.19	.33	.13	.19	.32
329	10075.0	12400.0	196.4	.15	.21	.36	.15	.20	.35
330	10100.0	12400.0	201.8	.17	.24	.41	.17	.23	.40
331	10125.0	12400.0	205.6	.18	.24	.42	.18	.24	.42
332	10150.0	12400.0	209.0	.19	.25	.44	.19	.25	.44
333	10175.0	12400.0	212.6	.21	.27	.48	.21	.27	.48
334	10200.0	12400.0	216.6	.23	.30	.53	.23	.30	.53
335	10225.0	12400.0	220.0	.25	.33	.58	.25	.32	.57
336	10250.0	12400.0	223.6	.27	.37	.64	.27	.37	.64
337	10275.0	12400.0	224.3	.28	.37	.65	.28	.36	.65
338	10300.0	12400.0	223.8	.29	.37	.66	.29	.37	.65
339	10325.0	12400.0	222.2	.29	.38	.67	.29	.38	.66
340	10350.0	12400.0	217.0	.27	.37	.64	.27	.37	.64
341	10375.0	12400.0	207.4	.23	.36	.59	.23	.35	.58
342	10400.0	12400.0	200.7	.21	.32	.54	.21	.32	.53

343	10000.0	12450.0	178.6	.09	.13	.22	.09	.12	.22
344	9600.0	12500.0	141.1	.05	.09	.14	.04	.08	.13
345	9625.0	12500.0	146.0	.06	.07	.13	.05	.07	.12
346	9650.0	12500.0	148.6	.06	.05	.11	.06	.05	.11
347	9675.0	12500.0	150.2	.06	.04	.10	.06	.04	.10
348	9700.0	12500.0	153.0	.06	.05	.11	.06	.05	.11
349	9725.0	12500.0	154.7	.06	.05	.11	.06	.04	.10
350	9750.0	12500.0	155.7	.06	.04	.10	.06	.04	.10
351	9775.0	12500.0	157.1	.06	.04	.10	.06	.04	.10
352	9800.0	12500.0	159.4	.06	.05	.11	.06	.05	.11
353	9825.0	12500.0	163.0	.07	.07	.13	.07	.06	.13
354	9850.0	12500.0	165.8	.07	.07	.14	.07	.07	.14
355	9875.0	12500.0	167.0	.07	.06	.14	.07	.06	.14
356	9900.0	12500.0	166.6	.07	.06	.13	.07	.06	.13
357	9925.0	12500.0	168.8	.07	.08	.15	.07	.07	.15
358	9950.0	12500.0	171.2	.08	.09	.16	.08	.09	.16
359	9975.0	12500.0	173.6	.08	.10	.18	.08	.10	.18
360	10000.0	12500.0	176.8	.09	.11	.20	.09	.11	.20
361	10000.0	12500.0	176.8	.09	.11	.20	.09	.11	.20
362	10000.0	12500.0	176.8	.09	.11	.20	.09	.11	.20
363	10025.0	12500.0	180.1	.09	.13	.22	.09	.13	.22
364	10050.0	12500.0	186.8	.11	.17	.28	.11	.16	.28
365	10075.0	12500.0	191.5	.13	.18	.30	.13	.18	.30
366	10100.0	12500.0	197.5	.14	.21	.35	.14	.20	.35
367	10125.0	12500.0	204.3	.17	.25	.42	.17	.24	.41
368	10150.0	12500.0	212.0	.20	.31	.51	.20	.30	.50
369	10175.0	12500.0	217.4	.22	.32	.55	.22	.32	.54
370	10200.0	12500.0	226.9	.27	.45	.72	.27	.44	.71
371	10225.0	12500.0	231.9	.30	.47	.77	.30	.46	.76
372	10250.0	12500.0	233.6	.32	.46	.77	.31	.46	.77
373	10275.0	12500.0	231.3	.31	.43	.74	.31	.43	.74
374	10300.0	12500.0	223.5	.28	.41	.69	.28	.40	.68
375	10325.0	12500.0	219.4	.26	.38	.65	.26	.37	.64
376	10350.0	12500.0	215.3	.25	.37	.63	.25	.36	.62
377	10375.0	12500.0	211.6	.25	.37	.62	.24	.36	.61
378	10400.0	12500.0	202.5	.21	.40	.61	.21	.38	.59
379	10000.0	12550.0	173.9	.08	.10	.18	.08	.10	.18
380	9625.0	12600.0	140.1	.04	.06	.10	.04	.06	.10
381	9650.0	12600.0	144.3	.05	.06	.11	.05	.06	.11
382	9675.0	12600.0	149.8	.06	.07	.13	.06	.07	.13
383	9700.0	12600.0	153.0	.06	.06	.12	.06	.06	.12
384	9725.0	12600.0	155.9	.06	.05	.12	.06	.05	.12
385	9750.0	12600.0	156.3	.06	.04	.11	.06	.04	.10
386	9775.0	12600.0	158.8	.06	.05	.11	.06	.05	.11
387	9800.0	12600.0	159.6	.06	.05	.11	.06	.05	.11
388	9825.0	12600.0	161.4	.06	.05	.12	.06	.05	.12
389	9850.0	12600.0	164.2	.07	.07	.13	.07	.06	.13
390	9875.0	12600.0	168.3	.07	.08	.16	.07	.08	.15
391	9900.0	12600.0	174.0	.09	.12	.20	.09	.11	.20
392	9925.0	12600.0	177.6	.09	.12	.21	.09	.11	.21
393	9950.0	12600.0	178.5	.09	.10	.19	.09	.10	.19
394	9950.0	12600.0	178.5	.09	.10	.19	.09	.10	.19
395	9975.0	12600.0	177.4	.09	.09	.18	.09	.09	.18
396	10000.0	12600.0	177.7	.09	.11	.20	.09	.11	.19
397	10000.0	12600.0	177.7	.09	.11	.20	.09	.11	.19
398	10000.0	12600.0	177.7	.09	.11	.20	.09	.11	.19
399	10000.0	12600.0	177.7	.09	.11	.20	.09	.11	.19

400	10025.0	12600.0	184.1	.10	.18	.28	.10	.17	.27
401	10025.0	12600.0	182.4	.10	.15	.25	.10	.15	.25
402	10050.0	12600.0	189.2	.12	.20	.32	.12	.19	.31
403	10050.0	12600.0	189.2	.12	.20	.32	.12	.19	.31
404	10075.0	12600.0	195.5	.13	.23	.37	.13	.22	.36
405	10075.0	12600.0	197.2	.14	.27	.41	.14	.26	.40
406	10100.0	12600.0	205.0	.17	.31	.48	.17	.30	.47
407	10100.0	12600.0	205.0	.17	.31	.48	.17	.30	.47
408	10125.0	12600.0	209.3	.18	.28	.47	.18	.28	.46
409	10150.0	12600.0	214.2	.20	.29	.50	.20	.29	.49
410	10150.0	12600.0	214.2	.20	.29	.50	.20	.29	.49
411	10175.0	12600.0	215.6	.21	.27	.48	.21	.27	.48
412	10200.0	12600.0	216.4	.22	.27	.49	.22	.27	.49
413	10225.0	12600.0	209.5	.19	.32	.50	.19	.30	.49
414	10250.0	12600.0	203.9	.17	.35	.52	.17	.33	.50
415	10275.0	12600.0	200.5	.16	.35	.51	.16	.33	.49
416	10300.0	12600.0	194.8	.14	.38	.52	.14	.37	.51
417	10325.0	12600.0	190.0	.13	.38	.51	.13	.36	.49
418	10350.0	12600.0	183.7	.11	.39	.51	.11	.38	.49
419	10375.0	12600.0	180.2	.11	.35	.46	.11	.34	.44
420	10400.0	12600.0	174.8	.09	.35	.45	.09	.34	.43
421	10425.0	12600.0	167.4	.08	.37	.44	.07	.35	.43
422	10450.0	12600.0	157.8	.05	.40	.46	.05	.39	.44
423	10475.0	12600.0	153.3	.05	.31	.36	.05	.30	.35
424	10500.0	12600.0	147.4	.04	.28	.32	.04	.27	.31
425	10525.0	12600.0	143.2	.03	.23	.26	.03	.23	.26
426	10550.0	12600.0	140.4	.03	.18	.21	.03	.18	.21
427	10575.0	12600.0	137.2	.03	.16	.18	.03	.16	.18
428	10600.0	12600.0	135.2	.02	.13	.15	.02	.13	.15
429	10000.0	12650.0	182.0	.10	.12	.22	.10	.12	.21
430	9600.0	12700.0	138.1	.05	.04	.09	.04	.04	.09
431	9600.0	12700.0	138.1	.05	.04	.09	.04	.04	.09
432	9625.0	12700.0	140.2	.05	.05	.09	.04	.05	.09
433	9625.0	12700.0	140.4	.05	.05	.09	.04	.05	.09
434	9650.0	12700.0	143.7	.05	.05	.10	.05	.05	.10
435	9650.0	12700.0	144.0	.05	.05	.10	.05	.05	.10
436	9675.0	12700.0	145.6	.05	.05	.09	.05	.04	.09
437	9700.0	12700.0	148.9	.05	.05	.10	.05	.05	.10
438	9700.0	12700.0	148.9	.05	.05	.10	.05	.05	.10
439	9725.0	12700.0	151.2	.05	.05	.10	.05	.05	.10
440	9750.0	12700.0	152.2	.05	.05	.10	.05	.05	.10
441	9775.0	12700.0	155.0	.05	.05	.10	.05	.05	.10
442	9800.0	12700.0	155.3	.05	.05	.10	.05	.05	.10
443	9825.0	12700.0	156.6	.05	.06	.11	.05	.06	.11
444	9850.0	12700.0	161.4	.06	.08	.14	.06	.07	.13
445	9875.0	12700.0	165.0	.07	.08	.15	.07	.08	.15
446	9900.0	12700.0	170.4	.08	.10	.18	.08	.10	.18
447	9925.0	12700.0	175.2	.09	.11	.20	.09	.11	.19
448	9950.0	12700.0	177.7	.09	.10	.19	.09	.10	.19
449	9975.0	12700.0	178.5	.09	.09	.18	.09	.09	.18
450	10000.0	12700.0	177.3	.08	.10	.19	.08	.10	.18
451	10000.0	12700.0	177.3	.08	.10	.19	.08	.10	.18
452	10000.0	12700.0	177.3	.08	.10	.19	.08	.10	.18
453	10025.0	12700.0	182.8	.10	.13	.23	.10	.13	.22
454	10050.0	12700.0	190.3	.12	.20	.31	.12	.19	.30
455	10075.0	12700.0	195.3	.13	.21	.34	.13	.20	.34
456	10100.0	12700.0	200.1	.15	.23	.38	.15	.23	.37

457	10125.0	12700.0	206.4	.17	.29	.46	.17	.28	.45
458	10150.0	12700.0	216.1	.21	.43	.64	.21	.42	.63
459	10175.0	12700.0	214.3	.20	.36	.56	.20	.35	.55
460	10200.0	12700.0	205.7	.17	.36	.53	.17	.34	.51
461	10225.0	12700.0	197.8	.14	.34	.48	.14	.33	.47
462	10250.0	12700.0	190.7	.12	.32	.44	.12	.30	.42
463	10275.0	12700.0	181.6	.09	.33	.42	.09	.31	.41
464	10300.0	12700.0	177.4	.08	.26	.35	.08	.25	.34
465	10325.0	12700.0	173.6	.08	.22	.30	.08	.21	.29
466	10350.0	12700.0	171.3	.07	.18	.26	.07	.18	.25
467	9600.0	12750.0	137.8	.05	.04	.09	.05	.04	.08
468	9625.0	12750.0	141.8	.05	.05	.10	.05	.05	.10
469	9650.0	12750.0	146.3	.06	.07	.12	.06	.06	.12
470	9675.0	12750.0	148.5	.06	.06	.11	.06	.05	.11
471	9700.0	12750.0	146.7	.05	.04	.09	.05	.04	.09
472	9725.0	12750.0	147.7	.05	.04	.09	.04	.04	.09
473	9750.0	12750.0	149.6	.05	.05	.09	.05	.05	.09
474	9775.0	12750.0	152.5	.05	.05	.10	.05	.05	.10
475	9800.0	12750.0	154.4	.05	.05	.10	.05	.05	.10
476	10000.0	12750.0	173.6	.07	.10	.17	.07	.10	.17
477	9600.0	12800.0	134.6	.04	.04	.08	.04	.04	.08
478	9600.0	12800.0	134.6	.04	.04	.08	.04	.04	.08
479	9625.0	12800.0	135.9	.04	.05	.09	.03	.05	.08
480	9625.0	12800.0	135.9	.04	.05	.09	.03	.05	.08
481	9650.0	12800.0	138.6	.04	.05	.09	.04	.05	.09
482	9650.0	12800.0	138.6	.04	.05	.09	.04	.05	.09
483	9675.0	12800.0	140.0	.04	.06	.10	.04	.06	.09
484	9700.0	12800.0	143.3	.04	.05	.09	.04	.05	.09
485	9700.0	12800.0	143.3	.04	.05	.09	.04	.05	.09
486	9725.0	12800.0	146.0	.04	.05	.09	.04	.05	.09
487	9750.0	12800.0	149.0	.05	.05	.10	.04	.05	.09
488	9775.0	12800.0	151.5	.05	.05	.10	.05	.05	.10
489	9800.0	12800.0	153.3	.05	.05	.10	.05	.05	.10
490	9825.0	12800.0	154.9	.05	.05	.10	.05	.05	.10
491	9850.0	12800.0	156.9	.05	.05	.10	.05	.05	.10
492	9875.0	12800.0	158.7	.05	.06	.11	.05	.06	.11
493	9900.0	12800.0	162.0	.06	.07	.13	.06	.07	.12
494	9925.0	12800.0	165.7	.06	.08	.14	.06	.08	.1
495	9950.0	12800.0	167.5	.06	.07	.14	.06	.07	.14
496	9975.0	12800.0	165.1	.06	.10	.16	.06	.10	.16
497	10000.0	12800.0	172.4	.07	.11	.18	.07	.11	.18
498	10000.0	12800.0	172.4	.07	.11	.18	.07	.11	.18
499	10000.0	12800.0	172.4	.07	.11	.18	.07	.11	.18
500	10025.0	12800.0	176.9	.08	.12	.20	.08	.12	.20
501	10050.0	12800.0	180.8	.09	.13	.22	.09	.12	.21
502	10075.0	12800.0	183.6	.09	.13	.23	.09	.13	.22
503	10100.0	12800.0	185.4	.10	.14	.24	.10	.14	.24
504	10125.0	12800.0	183.5	.09	.18	.27	.09	.17	.26
505	10150.0	12800.0	180.7	.09	.23	.31	.09	.22	.30
506	10175.0	12800.0	177.6	.08	.26	.34	.08	.25	.3
507	10200.0	12800.0	172.8	.07	.30	.36	.07	.28	.3
508	10225.0	12800.0	167.1	.06	.32	.37	.06	.30	.3
509	10250.0	12800.0	161.6	.05	.31	.36	.05	.30	.3
510	10275.0	12800.0	156.8	.04	.29	.33	.04	.28	.3
511	10300.0	12800.0	155.8	.04	.21	.25	.04	.20	.2
512	10325.0	12800.0	161.9	.05	.13	.18	.05	.12	.1
513	10350.0	12800.0	166.9	.06	.12	.18	.06	.12	.1

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514	10000.0	12850.0	168.6	.06	.10	.16	.06	.09	.16
515	9600.0	12900.0	135.8	.04	.03	.08	.04	.03	.07
516	9625.0	12900.0	136.8	.04	.03	.07	.04	.03	.07
517	9650.0	12900.0	138.6	.04	.04	.08	.04	.04	.07
518	9675.0	12900.0	141.1	.04	.05	.08	.04	.04	.08
519	9700.0	12900.0	144.6	.04	.05	.10	.04	.05	.09
520	9725.0	12900.0	147.2	.04	.05	.09	.04	.05	.09
521	9750.0	12900.0	148.8	.04	.04	.09	.04	.04	.09
522	9775.0	12900.0	149.9	.04	.04	.08	.04	.04	.08
523	9800.0	12900.0	151.5	.04	.04	.08	.04	.04	.08
524	9825.0	12900.0	153.9	.05	.04	.09	.05	.04	.09
525	9850.0	12900.0	154.8	.05	.04	.09	.05	.04	.09
526	9875.0	12900.0	155.8	.05	.04	.09	.05	.04	.09
527	9900.0	12900.0	156.7	.05	.04	.09	.05	.04	.09
528	9925.0	12900.0	156.7	.04	.05	.09	.04	.05	.09
529	9950.0	12900.0	157.8	.05	.06	.10	.05	.06	.10
530	9975.0	12900.0	160.2	.05	.07	.12	.05	.07	.11
531	10000.0	12900.0	165.7	.06	.09	.15	.06	.09	.15
532	10000.0	12900.0	165.7	.06	.09	.15	.06	.09	.15
533	10000.0	12900.0	165.7	.06	.09	.15	.06	.09	.15
534	10025.0	12900.0	172.7	.07	.14	.21	.07	.13	.20
535	10050.0	12900.0	179.7	.09	.18	.26	.08	.17	.2
536	10075.0	12900.0	177.1	.08	.11	.19	.08	.11	.1
537	10100.0	12900.0	173.2	.07	.12	.19	.07	.12	.1
538	10125.0	12900.0	172.5	.07	.10	.17	.07	.10	.1
539	10150.0	12900.0	168.1	.06	.13	.18	.06	.12	.17
540	10175.0	12900.0	163.9	.05	.13	.18	.05	.12	.17
541	10200.0	12900.0	159.1	.04	.14	.18	.04	.13	.17
542	10225.0	12900.0	156.6	.04	.11	.15	.04	.11	.1
543	10250.0	12900.0	154.9	.04	.09	.13	.04	.09	.1
544	10275.0	12900.0	155.7	.04	.07	.11	.04	.07	.11
545	10300.0	12900.0	159.8	.04	.09	.13	.04	.09	.1
546	10000.0	12950.0	159.1	.04	.07	.11	.04	.07	.11
547	9600.0	13000.0	131.2	.03	.04	.07	.03	.04	.0
548	9625.0	13000.0	135.2	.03	.04	.07	.03	.04	.0
549	9650.0	13000.0	135.9	.03	.04	.07	.03	.04	.07
550	9675.0	13000.0	139.9	.04	.05	.08	.04	.04	.0
551	9700.0	13000.0	142.6	.04	.04	.08	.04	.04	.0
552	9725.0	13000.0	145.5	.04	.04	.08	.04	.04	.0
553	9750.0	13000.0	146.1	.04	.03	.07	.04	.03	.0
554	9775.0	13000.0	146.7	.04	.03	.07	.04	.03	.0
555	9800.0	13000.0	147.0	.04	.03	.07	.04	.03	.0
556	9825.0	13000.0	147.5	.04	.04	.07	.04	.04	.0
557	9850.0	13000.0	150.3	.04	.04	.08	.04	.04	.0
558	9875.0	13000.0	153.3	.04	.04	.08	.04	.04	.0
559	9900.0	13000.0	154.1	.04	.03	.08	.04	.03	.0
560	9925.0	13000.0	154.7	.04	.03	.08	.04	.03	.0
561	9950.0	13000.0	155.5	.04	.04	.08	.04	.03	.0
562	9975.0	13000.0	156.0	.04	.04	.08	.04	.04	.0
563	10000.0	13000.0	156.9	.04	.04	.08	.04	.04	.0
564	10000.0	13000.0	156.9	.04	.04	.08	.04	.04	.0
565	10000.0	13000.0	156.9	.04	.04	.08	.04	.04	.0
566	10025.0	13000.0	157.1	.04	.05	.09	.04	.05	.0
567	10050.0	13000.0	157.2	.04	.07	.11	.04	.06	.1
568	10075.0	13000.0	156.6	.04	.08	.12	.04	.08	.1
569	10100.0	13000.0	157.0	.04	.07	.11	.04	.07	.1
570	10125.0	13000.0	157.0	.04	.07	.11	.04	.07	.1

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571	10150.0	13000.0	158.4	.04	.05	.09	.04	.05	.09
572	10175.0	13000.0	160.0	.04	.04	.09	.04	.04	.09
573	10200.0	13000.0	162.3	.05	.05	.09	.05	.05	.09
574	10225.0	13000.0	165.1	.05	.07	.12	.05	.07	.12
575	10250.0	13000.0	165.2	.05	.08	.13	.05	.08	.13
576	10275.0	13000.0	155.7	.04	.11	.15	.04	.10	.14
577	10300.0	13000.0	147.6	.03	.14	.17	.03	.13	.16
578	10325.0	13000.0	145.4	.03	.09	.12	.03	.09	.11
579	10350.0	13000.0	144.9	.03	.06	.09	.03	.06	.09
580	10375.0	13000.0	143.3	.03	.07	.09	.03	.07	.09
581	10400.0	13000.0	142.5	.03	.06	.09	.03	.06	.08
582	10425.0	13000.0	140.4	.02	.07	.09	.02	.07	.09
583	10450.0	13000.0	139.1	.02	.07	.09	.02	.07	.09
584	10475.0	13000.0	140.9	.03	.06	.08	.03	.06	.08
585	10500.0	13000.0	143.6	.03	.06	.09	.03	.06	.08
586	10525.0	13000.0	152.9	.04	.11	.15	.04	.10	.14
587	10550.0	13000.0	157.6	.06	.08	.14	.06	.08	.13
588	10575.0	13000.0	154.7	.06	.03	.09	.05	.03	.09
589	10600.0	13000.0	152.7	.06	.03	.09	.06	.02	.08
590	9900.0	13050.0	152.7	.04	.03	.07	.04	.03	.07
591	9925.0	13050.0	153.9	.04	.03	.07	.04	.03	.07
592	9950.0	13050.0	153.7	.04	.03	.07	.04	.03	.07
593	9975.0	13050.0	154.4	.04	.03	.07	.04	.03	.07
594	10000.0	13050.0	154.7	.04	.03	.07	.04	.03	.07
595	10000.0	13050.0	154.7	.04	.03	.07	.04	.03	.07
596	10025.0	13050.0	156.4	.04	.03	.07	.04	.03	.07
597	10050.0	13050.0	155.2	.04	.03	.07	.04	.03	.07
598	10075.0	13050.0	153.5	.04	.04	.08	.04	.04	.08
599	10100.0	13050.0	154.3	.04	.04	.07	.04	.04	.07
600	10125.0	13050.0	155.2	.04	.04	.07	.04	.04	.07
601	10150.0	13050.0	159.3	.04	.05	.09	.04	.05	.09
602	10175.0	13050.0	162.2	.05	.06	.11	.05	.06	.10
603	10200.0	13050.0	163.4	.05	.06	.10	.05	.05	.10
604	9600.0	13100.0	127.1	.02	.04	.07	.02	.04	.07
605	9625.0	13100.0	129.1	.02	.05	.07	.02	.05	.07
606	9650.0	13100.0	134.2	.03	.06	.09	.03	.06	.09
607	9675.0	13100.0	140.5	.04	.08	.12	.04	.08	.11
608	9700.0	13100.0	142.4	.04	.05	.09	.04	.05	.09
609	9725.0	13100.0	140.6	.03	.04	.07	.03	.04	.07
610	9750.0	13100.0	140.5	.03	.04	.07	.03	.04	.07
611	9775.0	13100.0	140.9	.03	.04	.07	.03	.04	.07
612	9800.0	13100.0	142.4	.03	.04	.07	.03	.04	.07
613	9825.0	13100.0	144.7	.03	.04	.07	.03	.04	.07
614	9850.0	13100.0	147.8	.04	.04	.08	.04	.04	.08
615	9875.0	13100.0	150.3	.04	.04	.08	.04	.04	.08
616	9900.0	13100.0	150.3	.04	.03	.07	.04	.03	.07
617	9925.0	13100.0	152.2	.04	.03	.07	.04	.03	.07
618	9950.0	13100.0	152.1	.04	.03	.06	.04	.03	.06
619	9975.0	13100.0	154.2	.04	.03	.07	.04	.03	.07
620	10000.0	13100.0	153.3	.04	.03	.06	.04	.03	.06
621	10000.0	13100.0	153.3	.04	.03	.06	.04	.03	.06
622	10000.0	13100.0	153.3	.04	.03	.06	.04	.03	.06
623	10025.0	13100.0	152.1	.04	.03	.07	.03	.03	.07
624	10050.0	13100.0	152.2	.03	.03	.06	.03	.03	.06
625	10075.0	13100.0	152.3	.03	.03	.06	.03	.03	.06
626	10100.0	13100.0	152.8	.03	.03	.06	.03	.03	.06
627	10125.0	13100.0	155.9	.04	.04	.07	.04	.04	.07

628	10150.0	13100.0	160.5	.04	.06	.11	.04	.06	.10
629	10150.0	13100.0	160.5	.04	.06	.11	.04	.06	.10
30	10175.0	13100.0	160.5	.04	.04	.08	.04	.04	.08
31	10200.0	13100.0	155.8	.04	.07	.11	.04	.06	.10
632	10200.0	13100.0	155.8	.04	.07	.11	.04	.06	.10
33	10225.0	13100.0	149.4	.03	.13	.16	.03	.12	.15
34	10225.0	13100.0	149.2	.03	.14	.17	.03	.13	.15
635	10250.0	13100.0	147.9	.03	.09	.12	.03	.08	.11
636	10250.0	13100.0	147.9	.03	.09	.12	.03	.08	.11
37	10275.0	13100.0	147.0	.03	.07	.09	.03	.06	.09
638	10275.0	13100.0	146.9	.03	.07	.09	.03	.06	.09
639	10300.0	13100.0	146.5	.03	.05	.07	.03	.05	.07
40	10300.0	13100.0	146.5	.03	.05	.07	.03	.05	.07
641	10325.0	13100.0	145.7	.03	.04	.07	.03	.04	.07
642	10350.0	13100.0	144.6	.03	.04	.06	.03	.04	.06
43	10350.0	13100.0	144.6	.03	.04	.06	.03	.04	.06
44	10375.0	13100.0	143.5	.03	.04	.06	.03	.04	.06
645	10400.0	13100.0	143.1	.03	.04	.06	.03	.04	.06
646	9900.0	13150.0	152.3	.04	.05	.09	.04	.05	.09
47	9925.0	13150.0	152.0	.04	.03	.07	.04	.03	.07
648	9950.0	13150.0	152.3	.04	.03	.06	.04	.02	.06
649	9975.0	13150.0	152.5	.04	.02	.06	.04	.02	.06
50	10000.0	13150.0	151.7	.04	.02	.06	.04	.02	.06
651	10000.0	13150.0	151.7	.04	.02	.06	.04	.02	.06
652	10025.0	13150.0	151.6	.03	.02	.06	.03	.02	.06
53	10050.0	13150.0	151.4	.03	.02	.06	.03	.02	.06
54	10075.0	13150.0	151.5	.03	.02	.06	.03	.02	.06
655	10100.0	13150.0	153.3	.04	.03	.06	.04	.03	.06
656	10125.0	13150.0	156.8	.04	.04	.08	.04	.04	.08
57	10150.0	13150.0	160.0	.04	.05	.09	.04	.05	.09
658	10175.0	13150.0	158.7	.04	.04	.08	.04	.04	.08
659	9600.0	13200.0	119.2	.03	.06	.09	.03	.06	.09
60	9625.0	13200.0	124.5	.03	.06	.09	.03	.06	.09
661	9650.0	13200.0	126.9	.02	.06	.08	.02	.05	.08
662	9675.0	13200.0	130.5	.03	.05	.08	.03	.05	.08
63	9700.0	13200.0	131.6	.03	.05	.07	.03	.05	.07
64	9725.0	13200.0	131.6	.03	.05	.07	.03	.05	.07
665	9750.0	13200.0	132.3	.03	.05	.07	.03	.05	.07
66	9775.0	13200.0	135.0	.03	.04	.07	.03	.04	.07
67	9800.0	13200.0	136.8	.03	.04	.07	.03	.04	.07
668	9825.0	13200.0	138.4	.03	.04	.07	.03	.04	.07
669	9850.0	13200.0	142.4	.03	.05	.08	.03	.05	.08
70	9875.0	13200.0	146.0	.03	.05	.08	.03	.05	.08
671	9900.0	13200.0	149.0	.04	.04	.08	.04	.04	.08
672	9925.0	13200.0	152.1	.04	.04	.08	.04	.04	.08
73	9950.0	13200.0	152.8	.04	.03	.07	.04	.03	.07
74	9975.0	13200.0	151.8	.04	.02	.06	.04	.02	.06
675	10000.0	13200.0	150.4	.03	.02	.06	.03	.02	.06
676	10000.0	13200.0	150.4	.03	.02	.06	.03	.02	.06
77	10000.0	13200.0	150.4	.03	.02	.06	.03	.02	.06
678	10025.0	13200.0	150.5	.03	.02	.05	.03	.02	.05
679	10050.0	13200.0	150.9	.03	.02	.05	.03	.02	.05
80	10075.0	13200.0	151.6	.03	.02	.05	.03	.02	.05
681	10100.0	13200.0	154.0	.04	.03	.06	.04	.02	.06
682	10125.0	13200.0	156.0	.04	.03	.07	.04	.03	.07
83	10150.0	13200.0	153.9	.04	.03	.07	.04	.03	.07
84	10175.0	13200.0	150.4	.03	.07	.10	.03	.06	.09

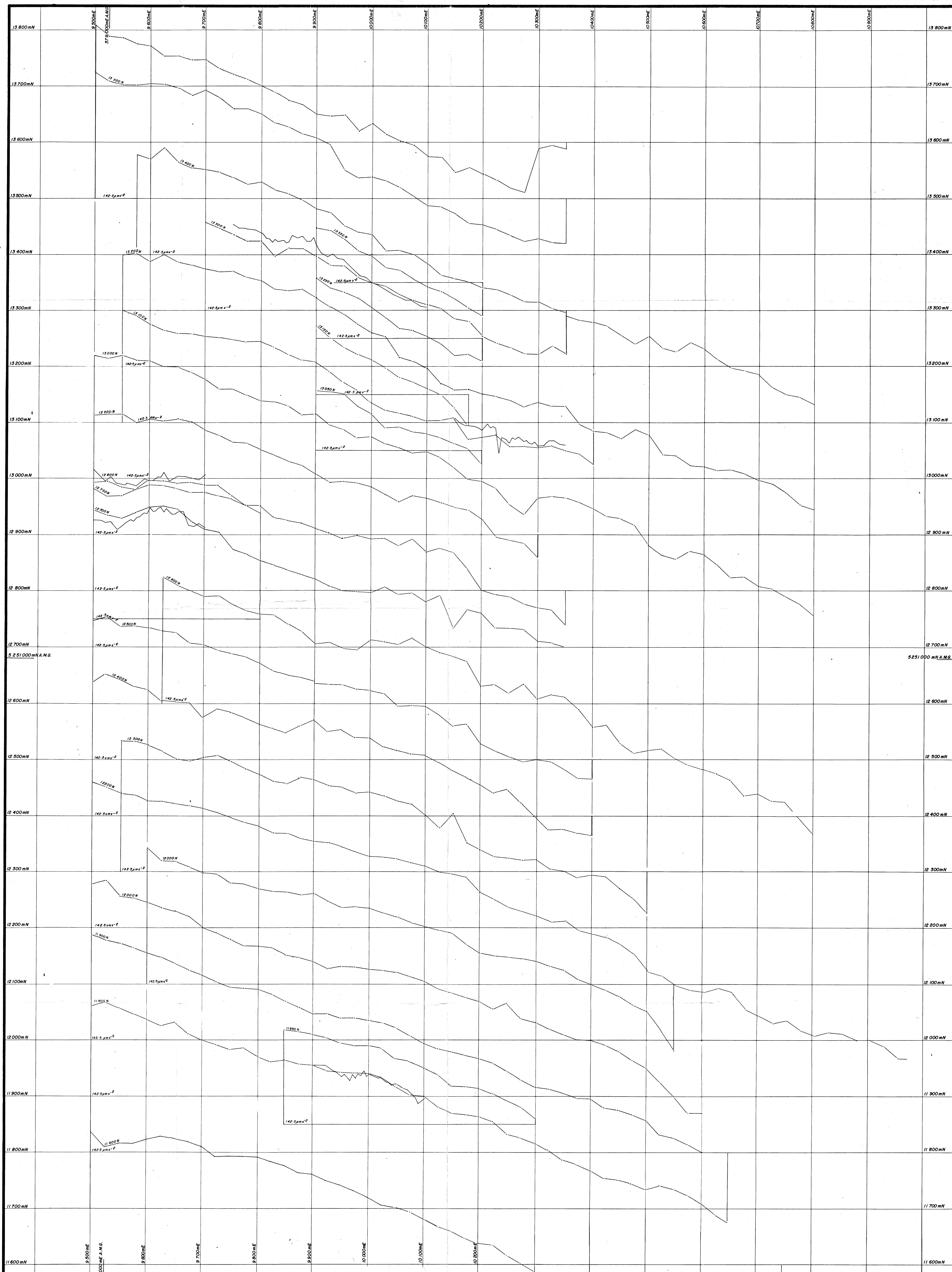
057

E 13 HEWLETT-PACKARD 32201A.7.09 EDIT/3000 WED, MAR 10, 1982, 8:01 AM (C)

85	10200.0	13200.0	149.2	.03	.05	.08	.03	.05	.08
686	10225.0	13200.0	148.6	.03	.03	.06	.03	.03	.06
87	10250.0	13200.0	148.2	.03	.02	.05	.03	.02	.05
88	10275.0	13200.0	148.2	.03	.02	.05	.03	.02	.05
689	10300.0	13200.0	148.7	.03	.02	.05	.03	.02	.05
690	10325.0	13200.0	146.6	.03	.02	.05	.03	.02	.05
91	10350.0	13200.0	146.6	.03	.02	.05	.03	.02	.05
92	10375.0	13200.0	146.2	.03	.03	.06	.03	.03	.06
693	10400.0	13200.0	152.7	.03	.08	.11	.03	.07	.10
94	10425.0	13200.0	161.4	.05	.16	.21	.05	.15	.20
95	10450.0	13200.0	162.7	.05	.09	.14	.05	.09	.14
696	10475.0	13200.0	161.0	.05	.05	.09	.05	.05	.09
97	10500.0	13200.0	158.1	.04	.03	.08	.04	.03	.07
98	10525.0	13200.0	156.6	.04	.02	.07	.04	.02	.06
699	10550.0	13200.0	154.3	.04	.02	.06	.04	.02	.06
700	10575.0	13200.0	149.2	.03	.04	.08	.03	.04	.07
01	10600.0	13200.0	148.8	.03	.02	.05	.03	.02	.05
02	9900.0	13250.0	146.0	.03	.04	.07	.03	.04	.07
703	9925.0	13250.0	146.9	.03	.03	.07	.03	.03	.07
04	9950.0	13250.0	148.8	.04	.03	.06	.04	.03	.06
05	9975.0	13250.0	148.9	.03	.02	.06	.03	.02	.06
706	10000.0	13250.0	149.6	.03	.02	.05	.03	.02	.05
707	10000.0	13250.0	149.6	.03	.02	.05	.03	.02	.05
08	10025.0	13250.0	151.0	.04	.02	.05	.04	.02	.05
709	10050.0	13250.0	153.1	.04	.03	.06	.04	.02	.06
710	10075.0	13250.0	151.9	.04	.02	.05	.04	.02	.05
11	10100.0	13250.0	151.1	.03	.02	.05	.03	.02	.05
12	10125.0	13250.0	151.5	.03	.02	.05	.03	.02	.05
713	10150.0	13250.0	150.1	.03	.03	.06	.03	.03	.06
14	10175.0	13250.0	149.6	.03	.02	.05	.03	.02	.05
15	10200.0	13250.0	149.4	.03	.02	.05	.03	.02	.05
716	9700.0	13300.0	125.7	.03	.05	.07	.03	.05	.07
717	9725.0	13300.0	128.4	.03	.05	.07	.03	.04	.07
18	9750.0	13300.0	130.2	.03	.04	.07	.03	.04	.07
19	9750.0	13300.0	130.2	.03	.04	.07	.03	.04	.07
720	9775.0	13300.0	132.7	.03	.04	.07	.03	.04	.07
21	9800.0	13300.0	134.3	.03	.04	.07	.03	.04	.07
22	9800.0	13300.0	134.3	.03	.04	.07	.03	.04	.07
723	9825.0	13300.0	136.8	.03	.04	.07	.03	.04	.07
24	9825.0	13300.0	136.8	.03	.04	.07	.03	.04	.07
25	9850.0	13300.0	138.8	.03	.04	.07	.03	.04	.07
726	9850.0	13300.0	138.8	.03	.04	.07	.03	.04	.07
27	9875.0	13300.0	142.3	.03	.04	.08	.03	.04	.07
28	9875.0	13300.0	142.9	.03	.05	.08	.03	.05	.08
29	9900.0	13300.0	145.9	.03	.04	.08	.03	.04	.08
730	9900.0	13300.0	145.9	.03	.04	.08	.03	.04	.08
31	9925.0	13300.0	149.1	.04	.04	.08	.04	.04	.08
32	9950.0	13300.0	149.0	.04	.02	.06	.04	.02	.06
733	9950.0	13300.0	149.0	.04	.02	.06	.04	.02	.06
34	9975.0	13300.0	149.4	.04	.02	.06	.04	.02	.05
35	10000.0	13300.0	150.7	.04	.02	.06	.04	.02	.06
736	10000.0	13300.0	150.7	.04	.02	.06	.04	.02	.06
37	10000.0	13300.0	150.7	.04	.02	.06	.04	.02	.06
38	10000.0	13300.0	150.7	.04	.02	.06	.04	.02	.06
39	10000.0	13300.0	150.7	.04	.02	.06	.04	.02	.06
740	10025.0	13300.0	150.6	.04	.02	.05	.04	.01	.05
41	10050.0	13300.0	150.2	.03	.01	.05	.03	.01	.05

742	10050.0	13300.0	150.2	.03	.01	.05	.03	.01	.05
743	10075.0	13300.0	149.2	.03	.02	.05	.03	.02	.05
744	10100.0	13300.0	149.8	.03	.01	.05	.03	.01	.05
745	10100.0	13300.0	149.8	.03	.01	.05	.03	.01	.05
746	10125.0	13300.0	150.0	.03	.01	.05	.03	.01	.05
747	10150.0	13300.0	150.1	.03	.01	.04	.03	.01	.04
748	10175.0	13300.0	150.0	.03	.01	.04	.03	.01	.04
749	10200.0	13300.0	149.8	.03	.01	.04	.03	.01	.04
750	10225.0	13300.0	151.0	.03	.01	.05	.03	.01	.05
751	10250.0	13300.0	151.6	.03	.01	.05	.03	.01	.05
752	10275.0	13300.0	153.6	.04	.02	.06	.04	.02	.06
753	10300.0	13300.0	153.1	.03	.01	.05	.03	.01	.05
754	10325.0	13300.0	151.7	.03	.01	.05	.03	.01	.05
755	10350.0	13300.0	151.1	.03	.01	.05	.03	.01	.04
756	10375.0	13300.0	149.8	.03	.02	.05	.03	.02	.05
757	10400.0	13300.0	151.5	.03	.02	.05	.03	.02	.05
758	9900.0	13350.0	145.3	.04	.03	.07	.04	.03	.07
759	9925.0	13350.0	147.6	.04	.03	.07	.04	.03	.07
760	9950.0	13350.0	149.2	.04	.02	.06	.04	.02	.06
761	9975.0	13350.0	150.7	.04	.02	.06	.04	.02	.06
762	10000.0	13350.0	151.5	.04	.02	.06	.04	.02	.06
763	10025.0	13350.0	149.5	.04	.02	.05	.04	.02	.05
764	10050.0	13350.0	148.5	.03	.02	.05	.03	.02	.05
765	10075.0	13350.0	148.1	.03	.01	.05	.03	.01	.05
766	10100.0	13350.0	148.1	.03	.01	.04	.03	.01	.04
767	10125.0	13350.0	148.0	.03	.01	.04	.03	.01	.04
768	10150.0	13350.0	148.5	.03	.01	.04	.03	.01	.04
769	10175.0	13350.0	148.9	.03	.01	.04	.03	.01	.04
770	10200.0	13350.0	149.4	.03	.01	.04	.03	.01	.04
771	9600.0	13400.0	114.0	.05	.04	.09	.04	.04	.09
772	9625.0	13400.0	117.3	.04	.05	.09	.03	.05	.08
773	9650.0	13400.0	120.5	.03	.05	.08	.03	.05	.08
774	9675.0	13400.0	123.3	.03	.05	.08	.03	.05	.08
775	9700.0	13400.0	127.9	.03	.06	.09	.03	.06	.09
776	9725.0	13400.0	130.4	.03	.05	.08	.03	.05	.08
777	9750.0	13400.0	133.3	.03	.05	.08	.03	.05	.08
778	9775.0	13400.0	136.7	.03	.05	.09	.03	.05	.08
779	9800.0	13400.0	141.0	.04	.07	.11	.04	.06	.10
780	9825.0	13400.0	142.7	.04	.05	.09	.04	.05	.08
781	9850.0	13400.0	143.9	.04	.04	.08	.04	.04	.07
782	9875.0	13400.0	145.9	.04	.04	.08	.04	.04	.08
783	9900.0	13400.0	147.9	.04	.04	.08	.04	.03	.08
784	9925.0	13400.0	149.7	.04	.03	.08	.04	.03	.07
785	9950.0	13400.0	151.8	.05	.03	.08	.04	.03	.08
786	9975.0	13400.0	152.5	.04	.02	.07	.04	.02	.07
787	10000.0	13400.0	151.8	.04	.02	.06	.04	.02	.06
788	10000.0	13400.0	151.8	.04	.02	.06	.04	.02	.06
789	10000.0	13400.0	151.8	.04	.02	.06	.04	.02	.06
790	10025.0	13400.0	149.0	.04	.02	.06	.04	.02	.06
791	10050.0	13400.0	147.5	.03	.02	.05	.03	.02	.05
792	10075.0	13400.0	146.9	.03	.01	.05	.03	.01	.05
793	10100.0	13400.0	147.1	.03	.01	.04	.03	.01	.04
794	10125.0	13400.0	147.9	.03	.01	.04	.03	.01	.04
795	10150.0	13400.0	148.4	.03	.01	.04	.03	.01	.04
796	10175.0	13400.0	149.0	.03	.01	.04	.03	.01	.04
797	10200.0	13400.0	149.7	.03	.01	.04	.03	.01	.04
798	10225.0	13400.0	150.4	.03	.01	.04	.03	.01	.04

799	10250.0	13400.0	150.9	.03	.01	.04	.03	.01	.04
800	10275.0	13400.0	151.5	.03	.01	.04	.03	.01	.04
801	10300.0	13400.0	152.0	.04	.01	.04	.04	.01	.04
802	10325.0	13400.0	152.9	.04	.01	.04	.04	.01	.04
803	10350.0	13400.0	153.6	.04	.01	.04	.04	.01	.04
804	10375.0	13400.0	154.4	.04	.01	.05	.04	.01	.05
805	10400.0	13400.0	154.8	.04	.01	.05	.04	.01	.05
806	10425.0	13400.0	153.5	.04	.01	.05	.04	.01	.05
807	10450.0	13400.0	156.7	.04	.02	.06	.04	.02	.06
808	10475.0	13400.0	156.4	.04	.01	.05	.04	.01	.05
809	10500.0	13400.0	153.2	.04	.02	.06	.04	.02	.06
810	10525.0	13400.0	147.5	.03	.06	.09	.03	.05	.09
811	10550.0	13400.0	146.9	.03	.02	.06	.03	.02	.06
812	10575.0	13400.0	145.9	.03	.02	.05	.03	.02	.05
813	10600.0	13400.0	147.5	.04	.01	.05	.03	.01	.05
814	10000.0	13450.0	149.5	.04	.02	.06	.04	.02	.06
815	9600.0	13500.0	113.8	.05	.04	.10	.05	.04	.09
816	9625.0	13500.0	117.6	.04	.05	.09	.04	.05	.09
817	9650.0	13500.0	120.2	.03	.05	.08	.03	.04	.08
818	9675.0	13500.0	123.8	.03	.05	.08	.03	.05	.08
819	9700.0	13500.0	125.9	.03	.04	.08	.03	.04	.07
820	9725.0	13500.0	129.8	.04	.05	.08	.04	.04	.08
821	9750.0	13500.0	133.2	.04	.04	.09	.04	.04	.08
822	9775.0	13500.0	136.1	.05	.04	.09	.04	.04	.08
823	9800.0	13500.0	139.0	.05	.04	.09	.05	.03	.08
824	9825.0	13500.0	141.0	.06	.03	.09	.05	.03	.08
825	9850.0	13500.0	144.4	.06	.03	.09	.05	.03	.09
826	9875.0	13500.0	146.9	.06	.03	.09	.06	.03	.09
827	9900.0	13500.0	148.6	.06	.02	.09	.06	.02	.08
828	9925.0	13500.0	149.1	.06	.02	.08	.05	.02	.07
829	9950.0	13500.0	146.9	.05	.02	.07	.05	.02	.06
830	9975.0	13500.0	146.0	.04	.02	.06	.04	.02	.06
831	10000.0	13500.0	145.6	.04	.02	.06	.04	.02	.06
832	10000.0	13500.0	145.6	.04	.02	.06	.04	.02	.06
833	10000.0	13500.0	145.6	.04	.02	.06	.04	.02	.06
834	10025.0	13500.0	145.3	.04	.02	.05	.04	.01	.05
835	10050.0	13500.0	144.4	.04	.02	.05	.04	.02	.05
836	10075.0	13500.0	145.6	.04	.01	.05	.04	.01	.05
837	10100.0	13500.0	146.9	.04	.01	.05	.04	.01	.05
838	10125.0	13500.0	149.0	.04	.01	.05	.04	.01	.05
839	10150.0	13500.0	150.7	.04	.01	.05	.04	.01	.05
840	10175.0	13500.0	152.0	.04	.01	.05	.04	.01	.05
841	10200.0	13500.0	152.8	.04	.01	.05	.04	.01	.05
842	10225.0	13500.0	153.7	.04	.01	.05	.04	.01	.05
843	10250.0	13500.0	153.5	.04	.01	.05	.04	.01	.05
844	10275.0	13500.0	153.6	.04	.01	.05	.04	.01	.05
845	10300.0	13500.0	152.7	.04	.01	.05	.04	.01	.05
846	10325.0	13500.0	153.3	.04	.01	.05	.04	.01	.05
847	10350.0	13500.0	153.3	.04	.01	.05	.04	.01	.05



LEGEND:

CONTOUR INTERVAL:

OBSERVER: R. GOODWIN, T. WALBRUN

INSTRUMENT: WORDEN No 592, La Coste + Romberg G326

BOUGER DENSITY: 2·52 gm cm^{-2}

VERT. SCALE: 1cm = 2·5 μms^{-2}

TERRAIN CORRECTION: 4·5 km

DATUM: 142·5 μms^{-2}

GN MN 13'-00°

SCALE: 1:2500

DATE: FEB 1982

DRAWN: M.vdS.

CHECKED: JDHS

84-2083

GEOPEKO

A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT

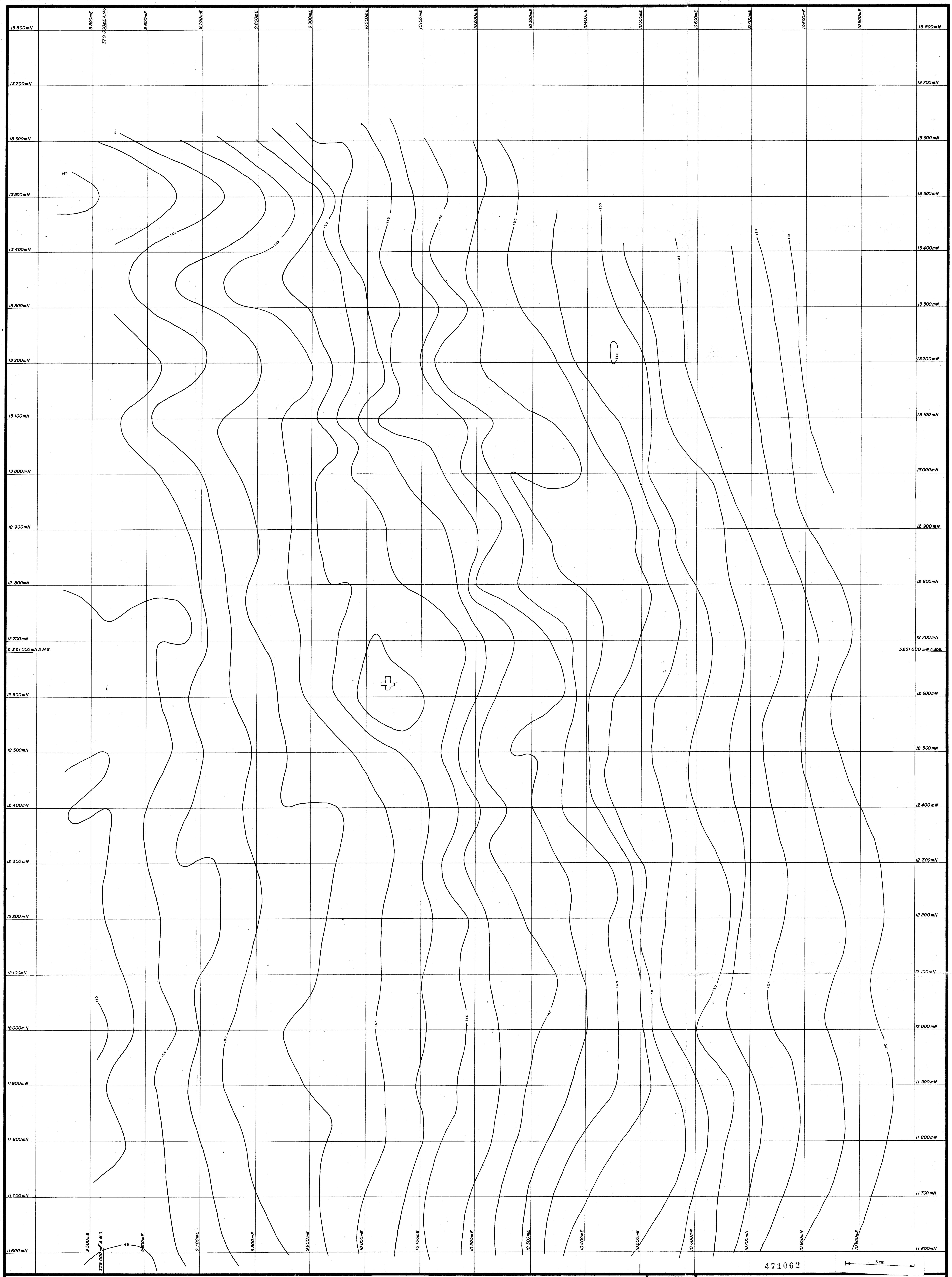
FILE No. TS 27/76-V19-11 | PLAN No.

E.L.27/76 ELLIOTT BAY, TASMANIA

VOYAGER 19

PROFILES OF BOUGER ANOMALY (TOTAL)

3258



LEGEND:

CONTOUR INTERVAL: 2·5μms²
OBSERVER: R. GOODWIN, T. WALBRUN
INSTRUMENT: WORDEN No. 592, La Coste and Romberg G326
BOUGER DENSITY: 2·52 gm cm⁻³

TERRAIN CORRECTED TO 4·5 km

GN MN
13°00'

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT 84-2083

PLAN No	TS 27/76-V19-12	REP. No	

SCALE: 1 : 2500
DATE: FEB 1982
DRAWN: M.vdS.
CHECKED: JDHS

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
CONTOURS OF BOUGUER ANOMALY

3259

471063

LEGEND:

CONTOUR INTERVAL: 2·5 μms^{-2}

OBSERVER: R. GOODWIN, T. WALBRUN

INSTRUMENT: WORDEN No592, La Coste & Romberg G 326

BOUGER DENSITY: 2·52gm cm^3

TERRAIN CORRECTED TO 4·5km

NOTE: REGIONAL DETERMINED USING HAND SMOOTHING TECHNIQUE.

SCALE: 1 : 2500

DATE: FEB 1982

DRAWN: M.vdS.

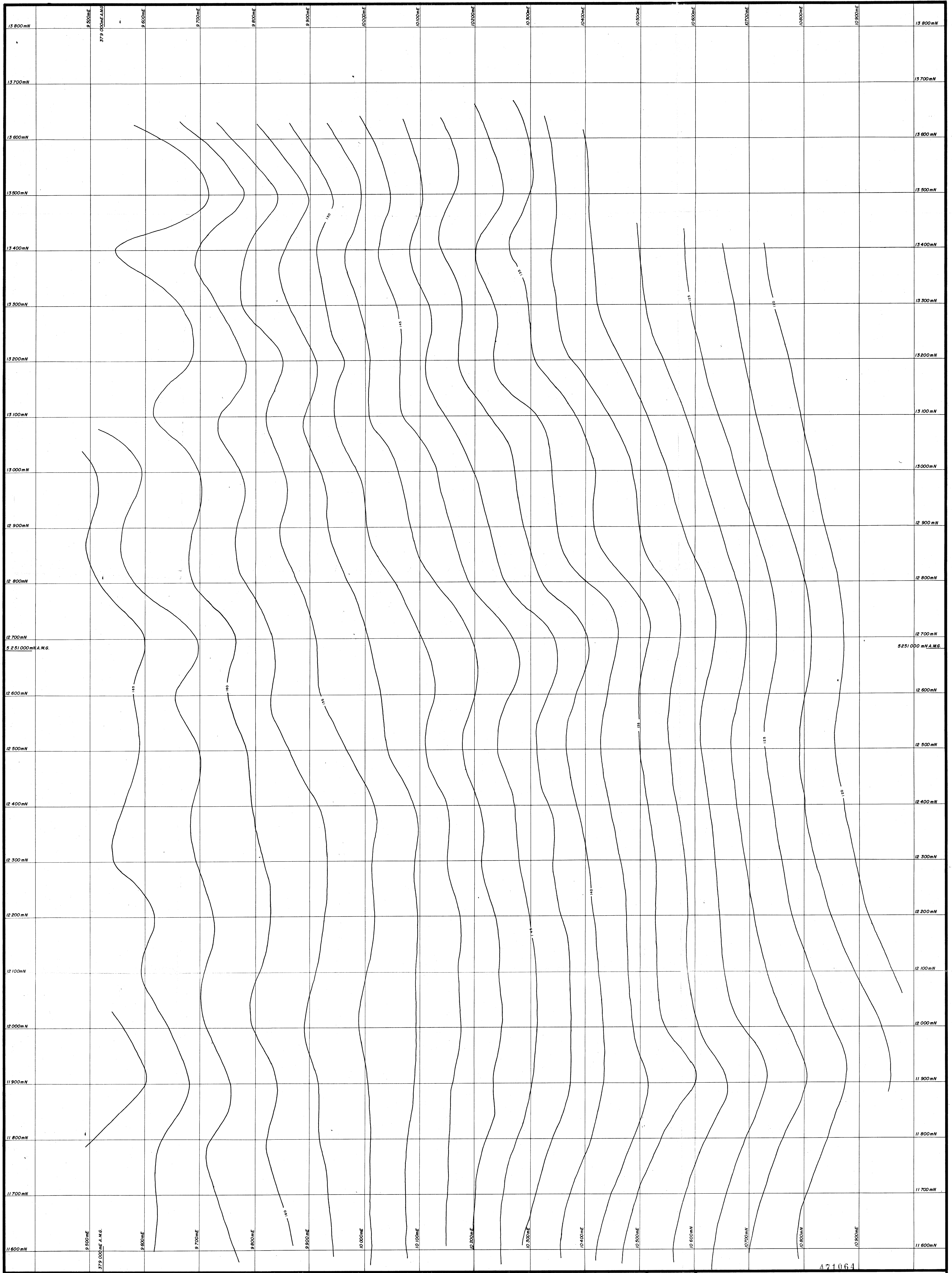
CHECKED: JDHS

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT

84-2083

FILE. No.	TS 27/76-V19-13	PLAN.No.	

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
REGIONAL BOUGUER ANOMALY
CONTOURS



LEGEND:

CONTOUR INTERVAL: $2{\cdot}5 \mu ms^{-2}$

OBSERVER: R.GOODWIN, T.WALBURN.

INSTRUMENT: WORDEN No 592, La Coste & Romberg.

BOUGER DENSITY: $2{\cdot}52$ gm cm^3

TERRAIN CORRECTED TO 4·5 km

NOTE: REGIONAL DETERMINED USING MODIFIED SINC FUNCTION FILTER.

GN MN

13°00'

5 cm

GEOPEKO

A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT

84-2083

FILE No	TS 27/76-V19-14	PLAN

SCALE: 1 : 2 500

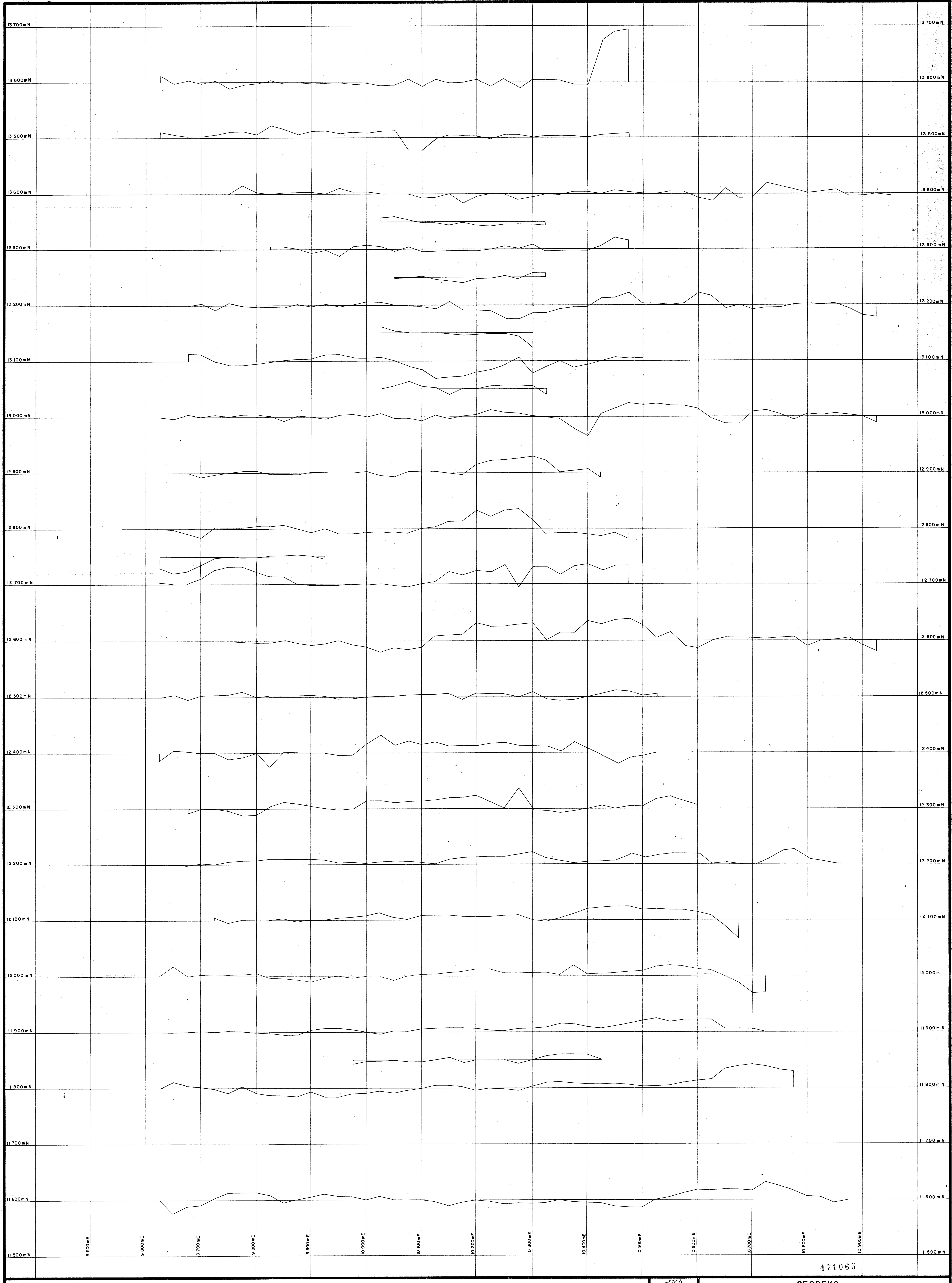
DATE: FEB 1982

DRAWN: M.vdS.

CHECKED: JDHS

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
CONTOURS OF REGIONAL BOUGUER ANOMALY

3261



471065

LEGEND: SCALE Hor :- 1:2500
Vert:- 2·5μms^{-2}
DATUM 0μms^{-2}
INSTRUMENTS :- Worden No 592 (Obs. R.GOODWIN)
:- LaCoste and Romberg G326 (Obs. T.WALBRUN)
BOUGUER DENSITY :- 2·52 gm cm^{-3}
TERRAIN CORRECTED TO 4·5km
REGIONAL DETERMINED USING HAND SMOOTHING TECHNIQUES.

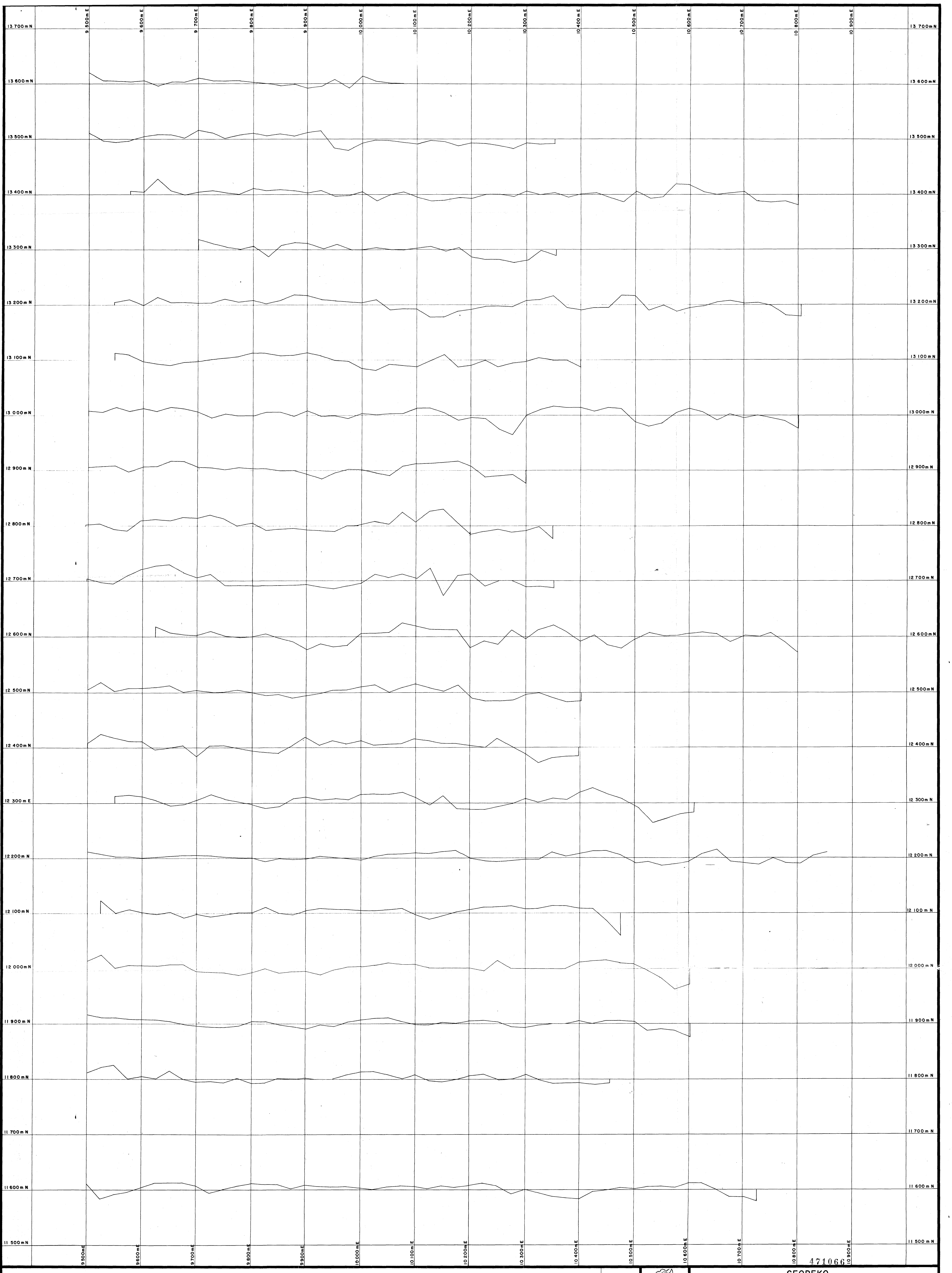
5 cm

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT 84-2083

FILE No.	TS 27/76-V31-15	PLAN No.	

SCALE: 1:2500
DATE: MAR. 82.
GEO: J.S
DRAWN: M.vdS.
CHECKED: JDHS

E.L.27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
PROFILES OF RESIDUAL BOUGUER ANOMALY



LEGEND:

Scale Hor:- 1:2500
Vert:- 1cm = 2·5 μms^{-2}
Datum 0 μms^{-2}
Instruments Worden No 592 (Obs R. Goodwin)
La Coste and Romberg G. 326 (Obs T. Walbrun)
Bouguer Density 2·52 $gm\,cm^{-3}$
Terrain Corrected to 4·5km
Note:- Regional Determined using modified sinc function filter.

GN MN 13°00'

5 cm

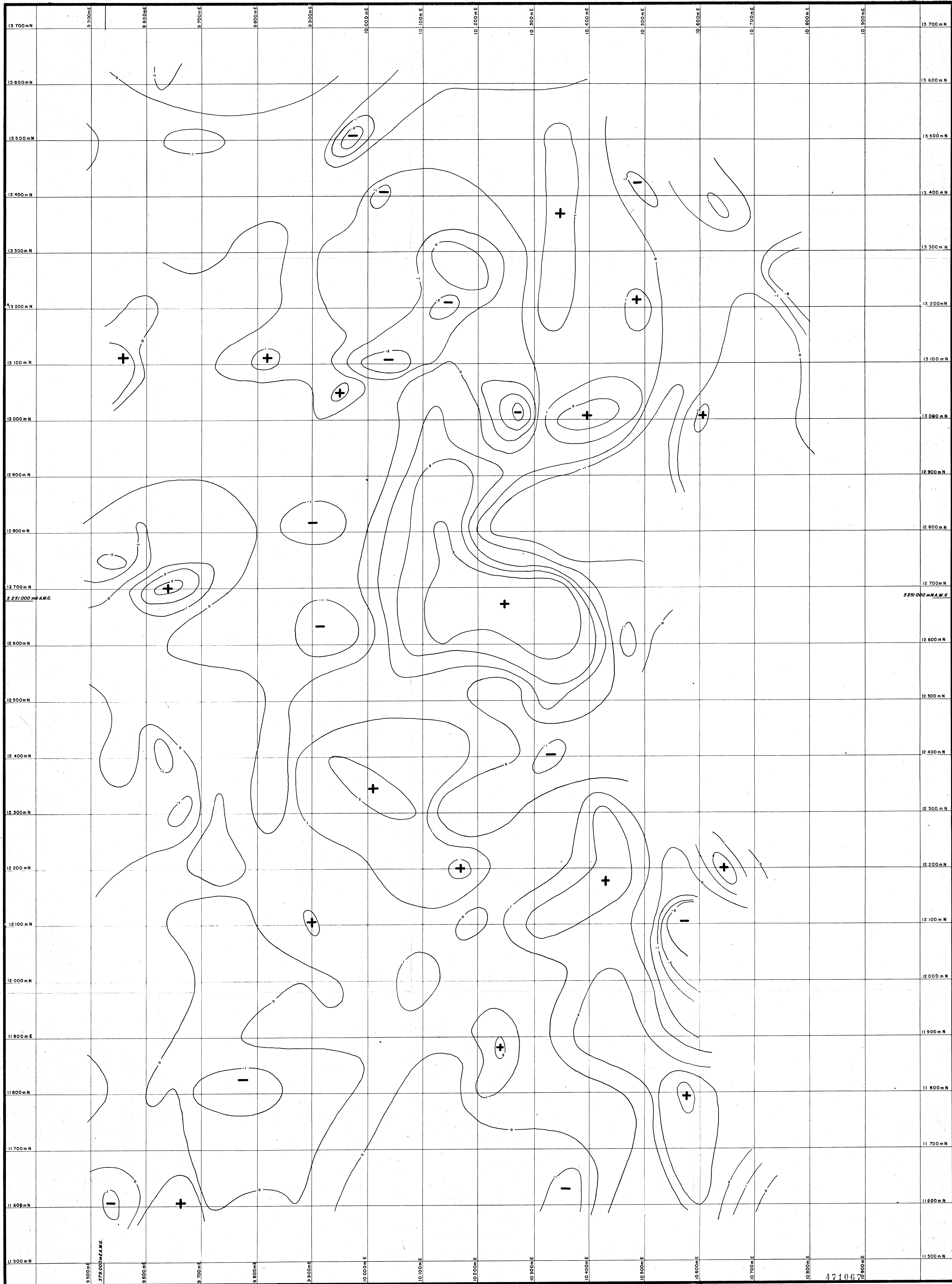
SCALE: 1:2500
DATE: MARCH 82
DRAWN: M.vdS.
CHECKED: JDHS

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT 84-2083

FILE No.	TS 27/76-V19-16	PLAN No:	

E.L.27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
PROFILES OF RESIDUAL BOUGUER ANOMALY

3263



471067

LEGEND:

Contour Interval $1 \mu ms^{-2}$

Bouguer Density $2{\cdot}52\ gm\ cm^{-3}$

Instruments:- Worden No. 592 (Obs. R. Goodwin)
LaCoste & Romberg G326 (Obs. T. Walbrun)

Terrain Corrected to 4·5 km

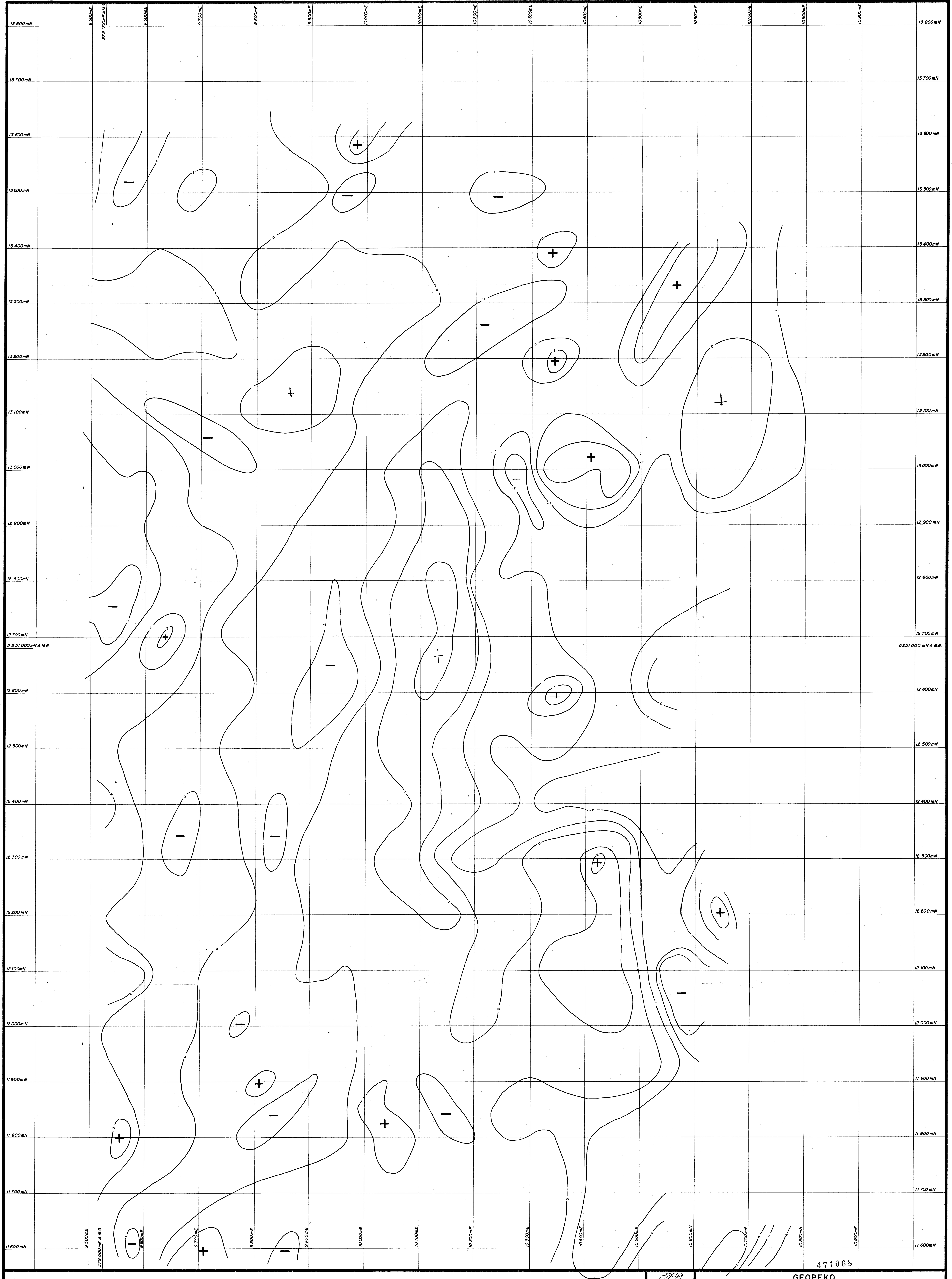
Note:- Regional Determined using hand smoothing techniques.

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT 84-2083

FILE No.	TS 27/76-V31-17	PLAN No.	

SCALE: 1:2500
DATE: MARCH 82
GEO: J.S
DRAWN: M.vdS.
CHECKED:

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
CONTOURS OF RESIDUAL BOUGUER ANOMALY



471068

LEGEND:

CONTOUR INTERVAL: 1 μms^{-2}

OBSERVER: R. Goodwin, T. Wolbrun.

INSTRUMENT: Worden No. 592, LaCoste & Romberg G.326

BOUGER DENSITY: 2·52 gm cm^{-3}

TERRAIN CORRECTED TO 4·5km

Regional determined using modified sinc function filter.

GEOPEKO

A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT 84-2083

FILE No.	TS 27/76-V19-18	PLAN No.	

SCALE: 1 : 2500

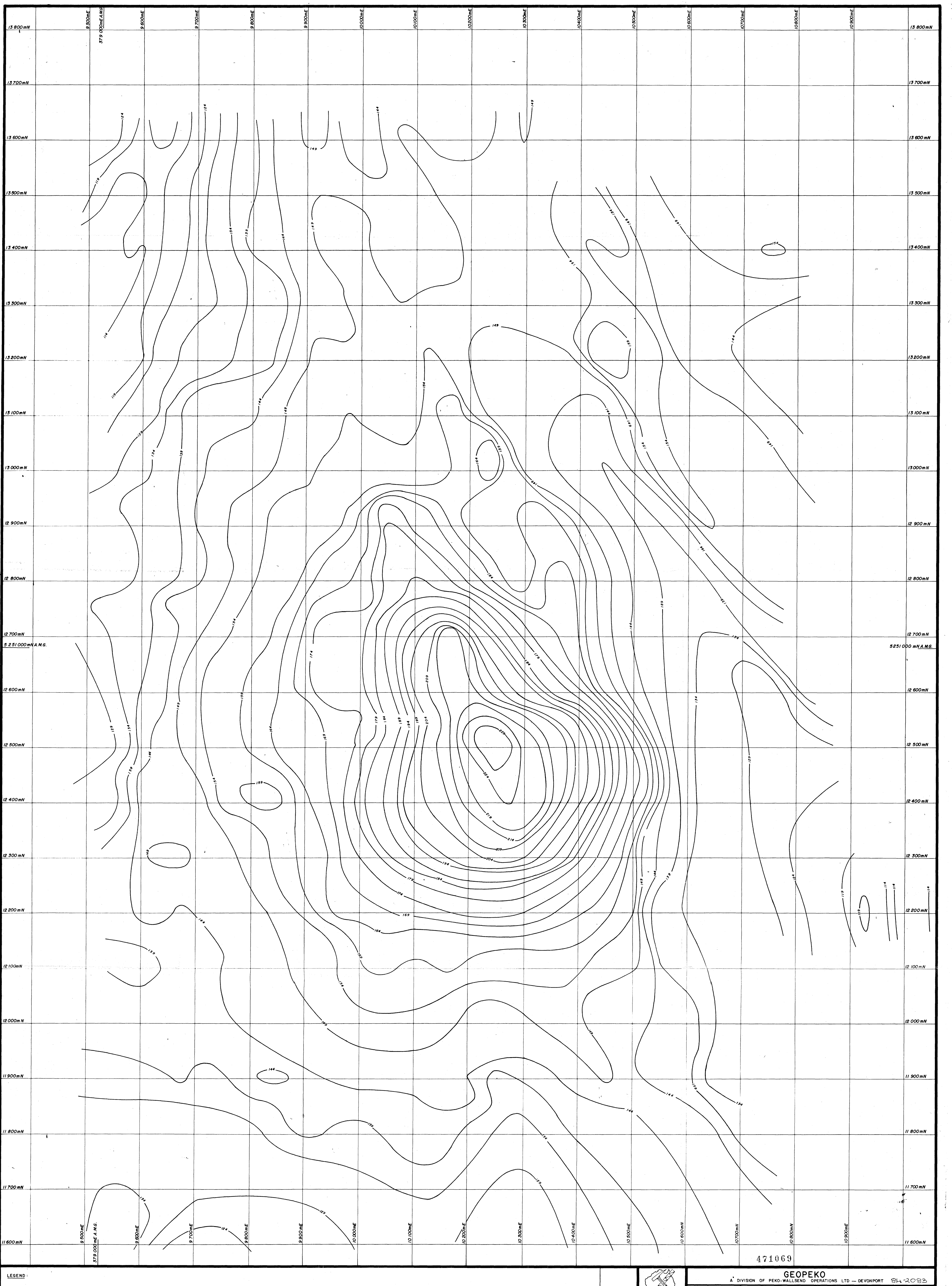
DATE: FEB 1982

DRAWN: M.vdS.

CHECKED: JDHB

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
CONTOURS OF RESIDUAL BOUGUER ANOMALY

3265



LEGEND:

CONTOUR INTERVAL: 5m

OBSERVER: W. Walmsley, B. Stedman.

DATUM: Aust. Height Datum

5 cm

GN MN 13°00'

SCALE: 1 : 2500

DATE: 12/2/82

DRAWN: R. Tog.

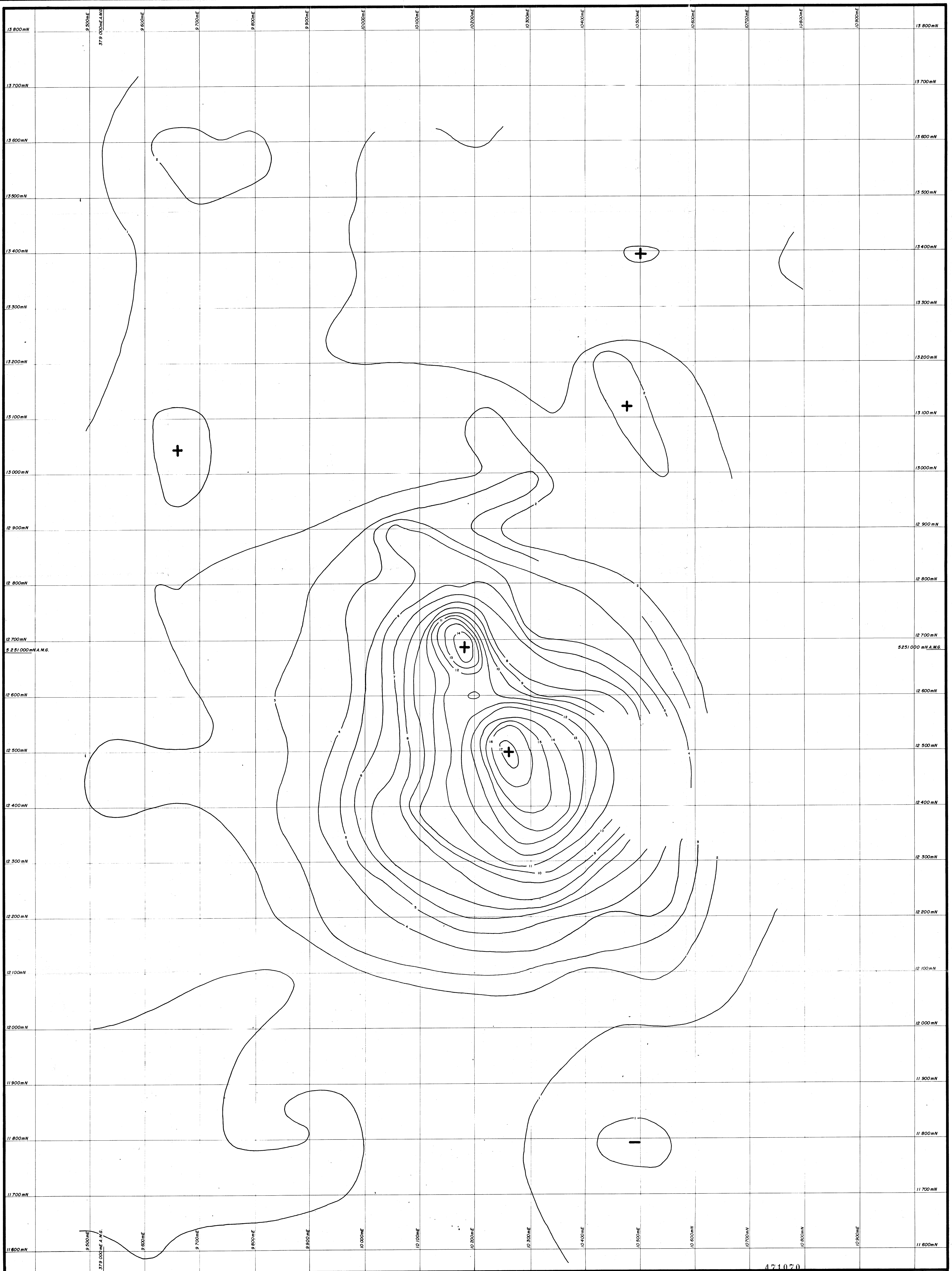
CHECKED: JDHS

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT 84-2083

PLAN No TS 27/76-V19-19 | REP. No

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
TOPOGRAPHIC CONTOURS

3266



471070

LEGEND:

CONTOUR INTERVAL: 2·5μms^{-2}

OBSERVER:

INSTRUMENT:

BOUGER DENSITY: 2·52gm cm^{-3}

5 cm

GN MN
13°00'

SCALE: 1 : 2 500

DATE: FEB 1982

DRAWN: M.vdS.

CHECKED: JDHS

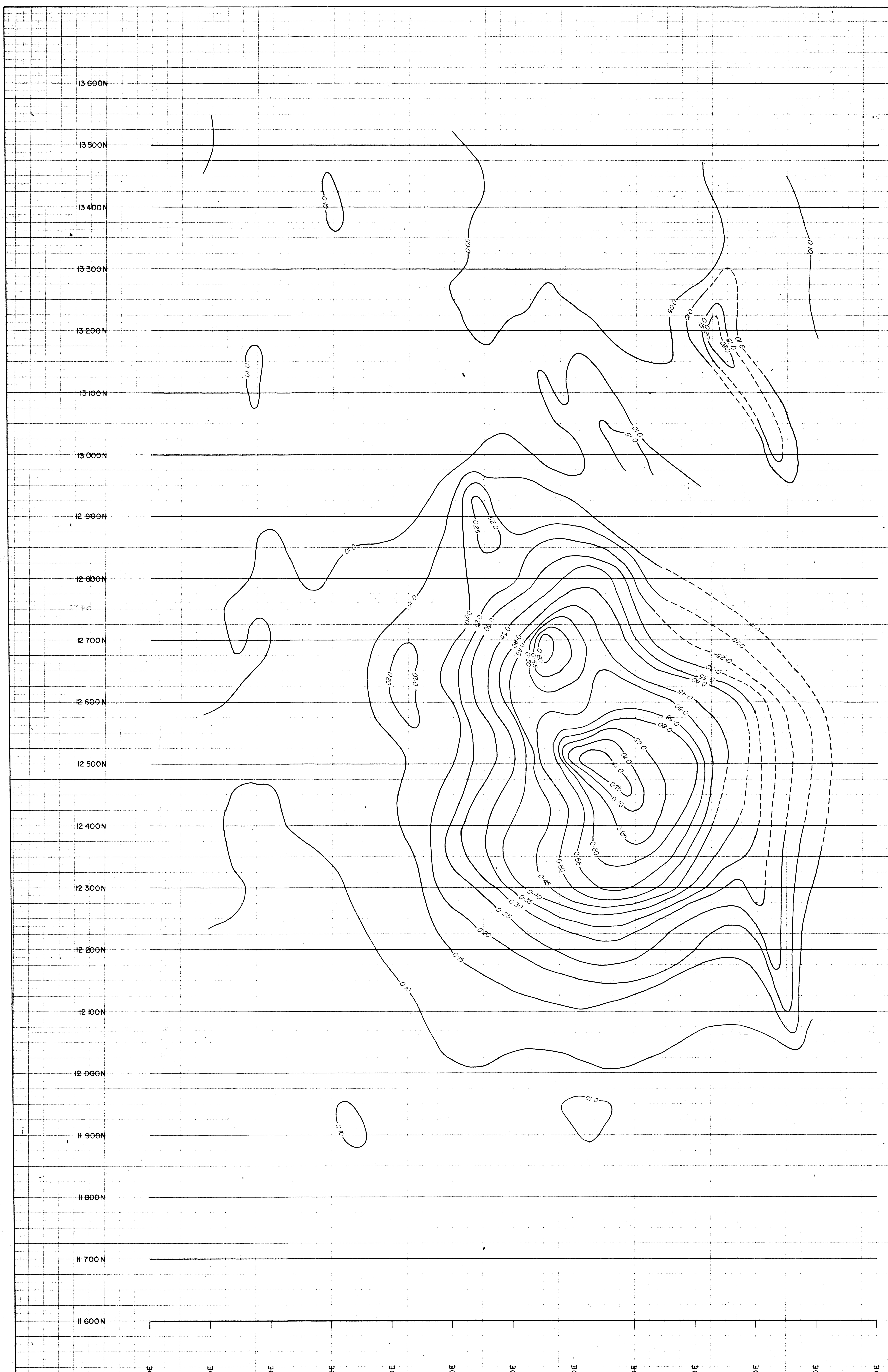
GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD — DEVONPORT

84-2083

FILE No.	TS 27/76-V19-20	PLAN

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 19
TERRAIN CORRECTIONS
DUE TO LEAMAN GEOPHYSICS

3267



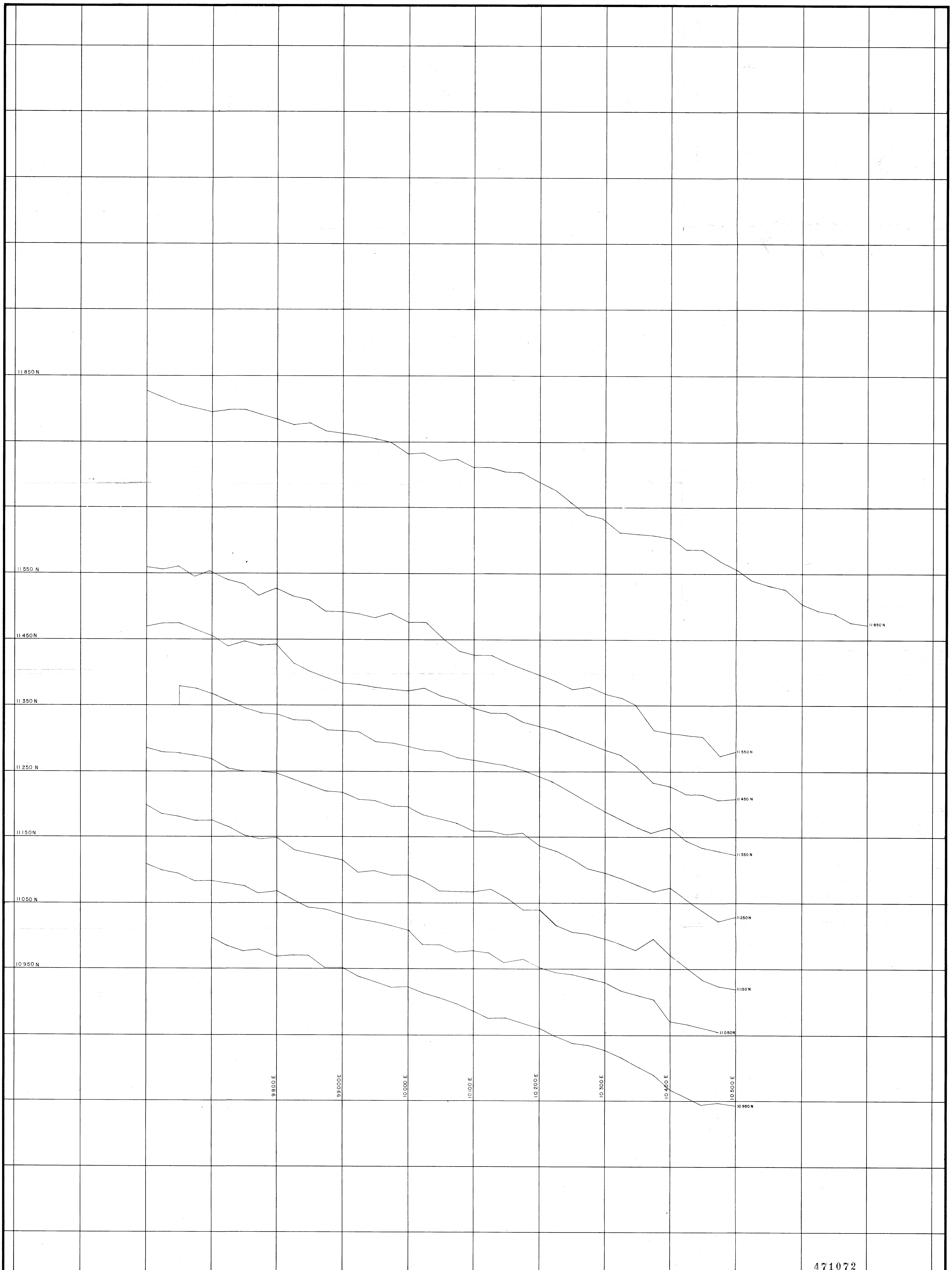
NOTE: Terrain corrections computed by Nagy - Goodacre method for density contrast of 1·0gcm^{-3}

NOTE: For densities other than unity, multiply terrain correction shown by new density.

Cellsize 12·5 x 12·5m between 9 550E & 10 650E and between 11 650 N & 13 550 N
and
100 x 100 m between 7000 E & 15000 E and between 8 000N & 17000N.

GEOPEKO		Instrument		Datum		Hor. Scale	1:2 500	AREA	Tasmania 471071 84-2083
Geophysical Survey	5 cm	Observer	R. DUFFIN	Base Line		Vert. Scale		PROSPECT	VOYAGER 19, ELLIOTT BAY
Plan no. 6349 S/B		Scale Fact		Date		Cont. Int.	0·05 milligals	PLAN SHOWS	Gravity Survey - Terrain corrections by Nagy - Goodacre method

3268



INSTRUMENT: Worden 592
OBSERVER: R Goodwin
DATE: November 1981

BOUGUER DENSITY: 2·52 gm cm^{-3}
DATUM: 252·5 μms^{-2}
VERT. SCALE: 1cm = 2·5 μms^{-2}

Not Terrain Corrected

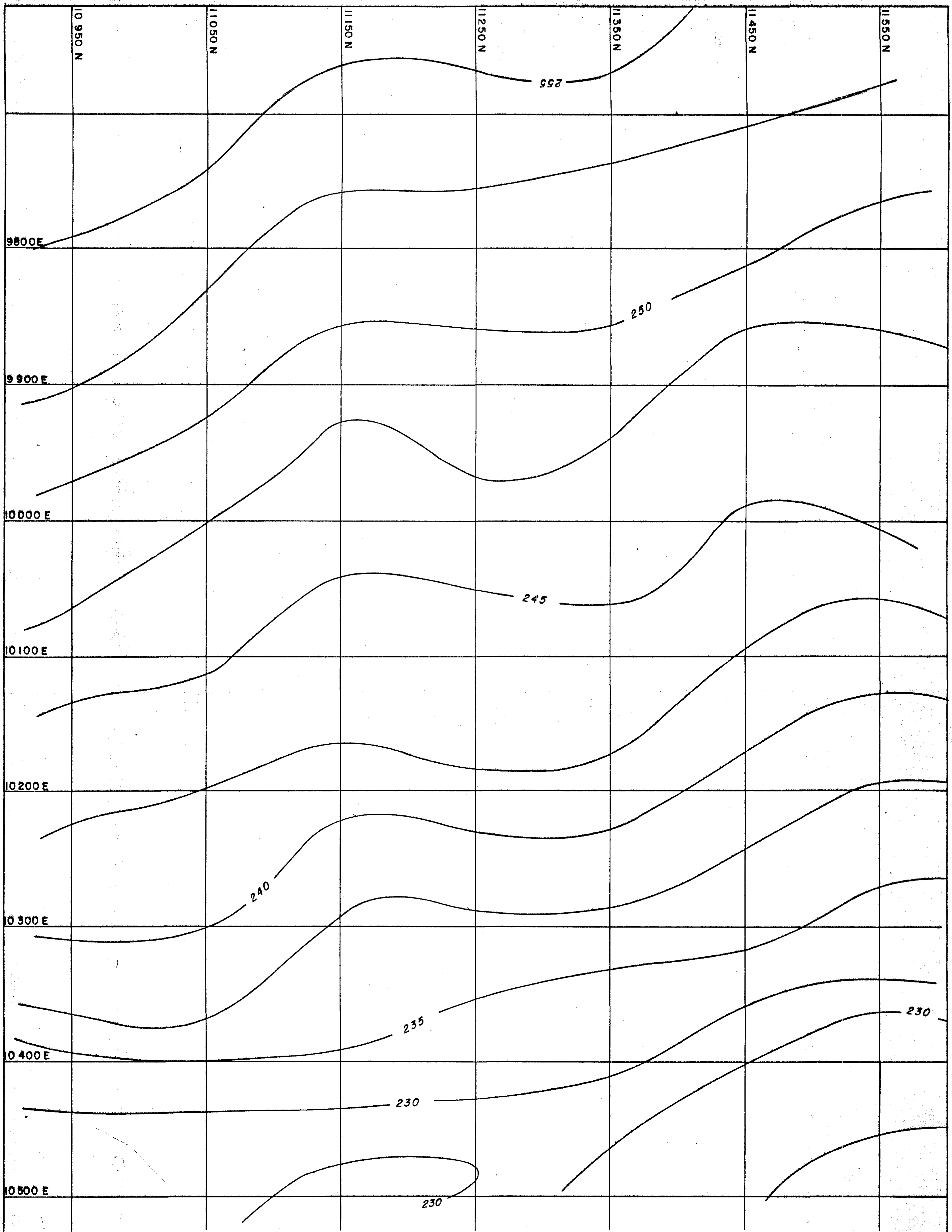
5 cm

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.
SH-2083

SCALE 1:2500	No. TS 27/76-V9-21	PLAN No.

DATE 26-8-82
GEO J.S
DRAWN M.vdS
CHECKED

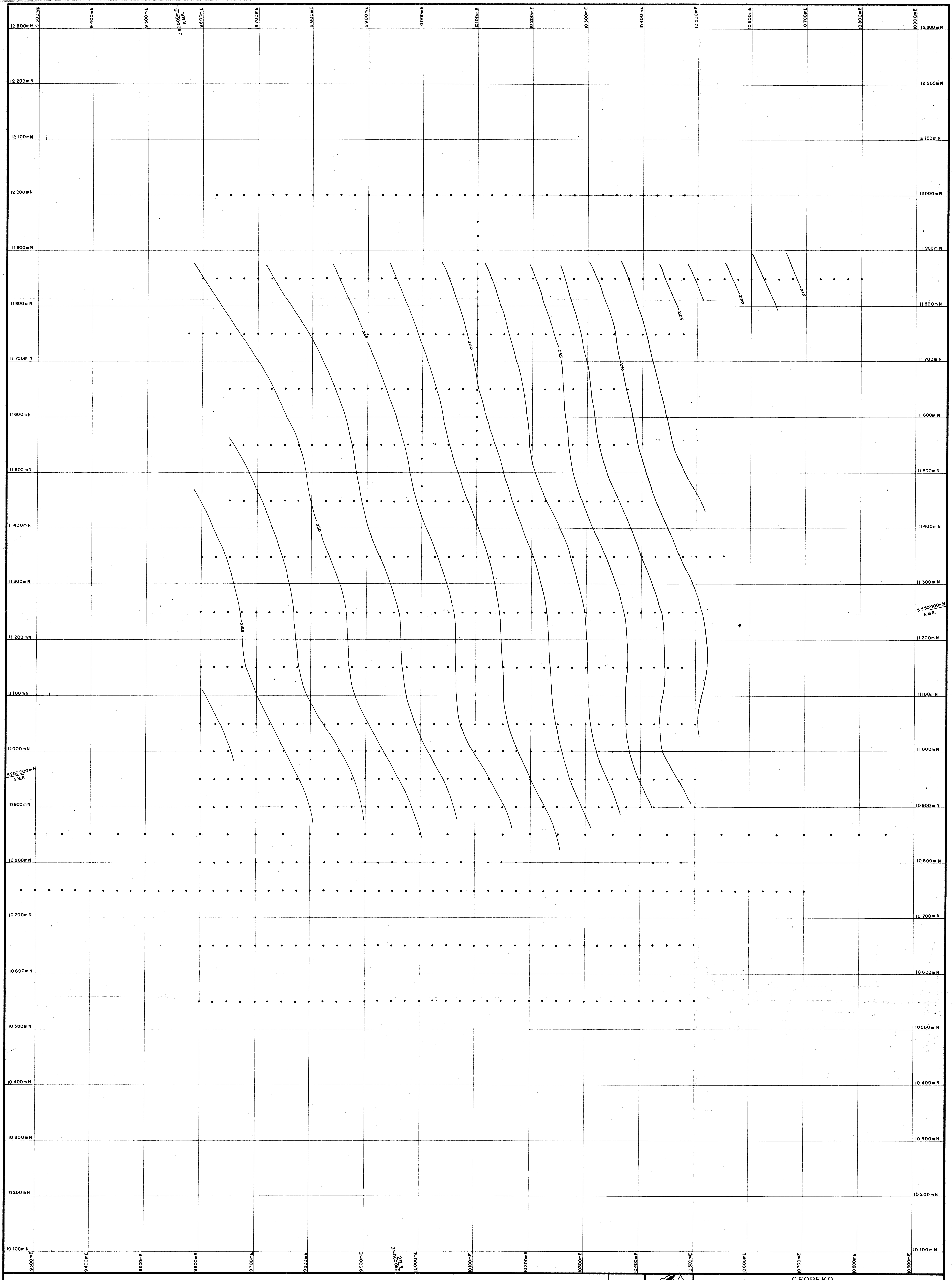
E.L. 27/76 ELLIOTT BAY, TAS
VOYAGER 9
PROFILES OF BOUGUER GRAVITY



HORZ SCALE 1:2500
CONT. INT. 2·5μms⁻²
INSTRUMENT Worden No 592
OBSERVER R. Goodwin
DATE November 1981
BOUGUER DENSITY 2·52 gm cm⁻³
NOT TERRAIN CORRECTED

471073 VOYAGER 9
EL 27/76 ELLIOTT BAY, TASMANIA
CONTOURS OF BOUGUER GRAVITY

84-20.83 TS 27/76-V9-22



LEGEND:

- • Grid position
- ● Power auger
- ○ Hand auger
- Power hand auger / mate

INSTRUMENT: Worden 592
OBSERVER: R. Goodwin
DATE: November 1981

BOUGUER DENSITY: 2·52 gm cm^{-3}
CONT. INTERVAL: 2·5 ums^{-2}

Not Terrain Corrected
Regional determined using modified sine function 20 filter

MN

5 cm

DATE: 1981

DRAWN: M.vdS.

CHECKED: JPHB

GEOPEKO

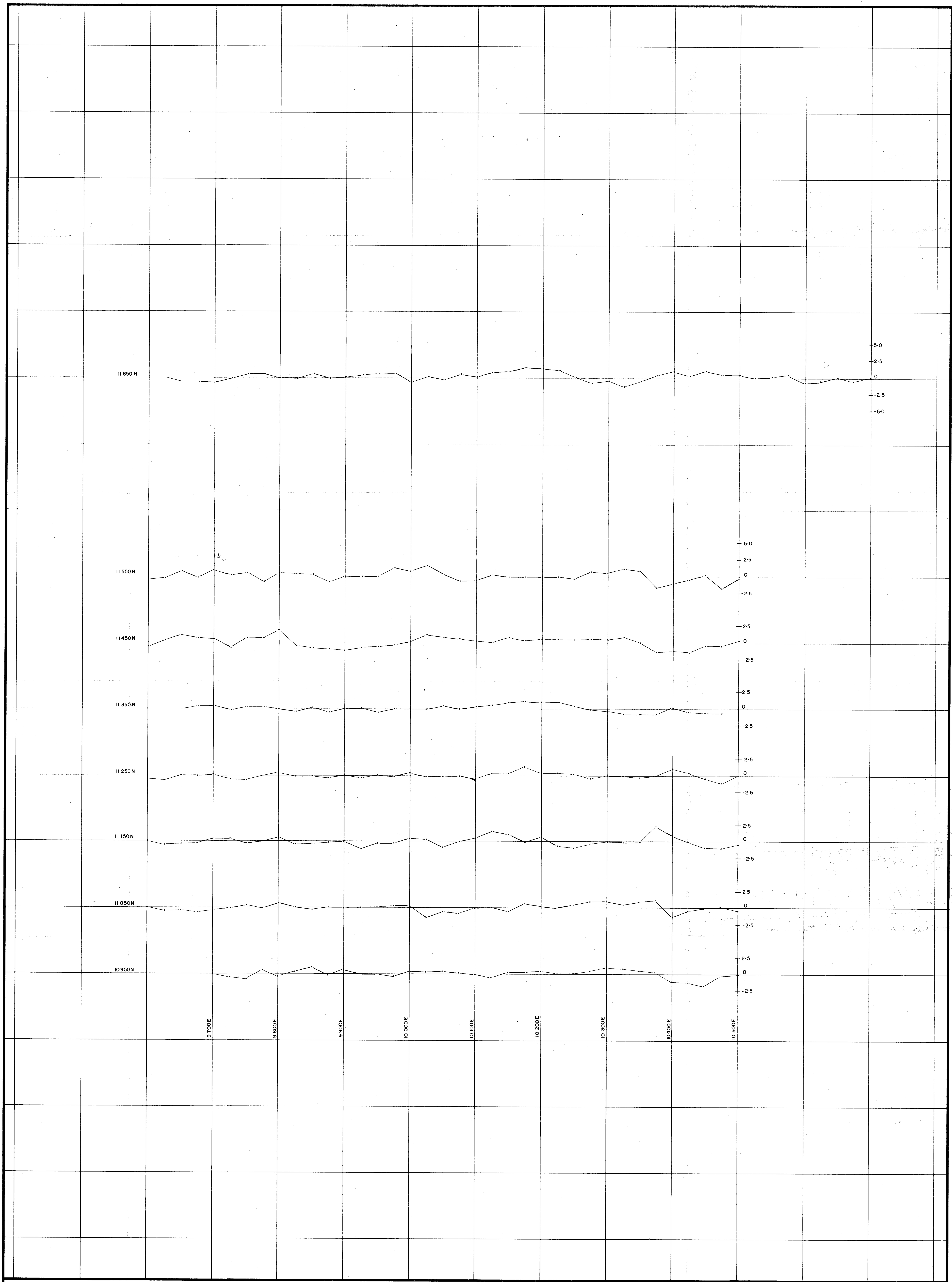
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD. 84-2083

SCALE: 1:2500

No. TS 27/76 V9-23

E.L. 27/76 ELLIOTT BAY, TASMANIA
VOYAGER 9
REGIONAL BOUGUER GRAVITY CONTOURS

471074 3271



INSTRUMENTS: Worden 592
OBSERVER: R. Goodwin
DATE: November 1981

BOUGUER DENSITY 2·52 gm cm^{-3}
DATUM: 0 μms^{-2}
VERT. SCALE: 1cm = 2·5 μms^{-2}

Not Terrain Corrected
Regional determined using modified sinc function 2D filter

5 cm

DATE OCT. 82
GEO J.S.
DRAWN R.Out.
CHECKED JDHS

GEOPEKO
A DIVISION OF PEKO-WALLSEND OPERATIONS LTD.

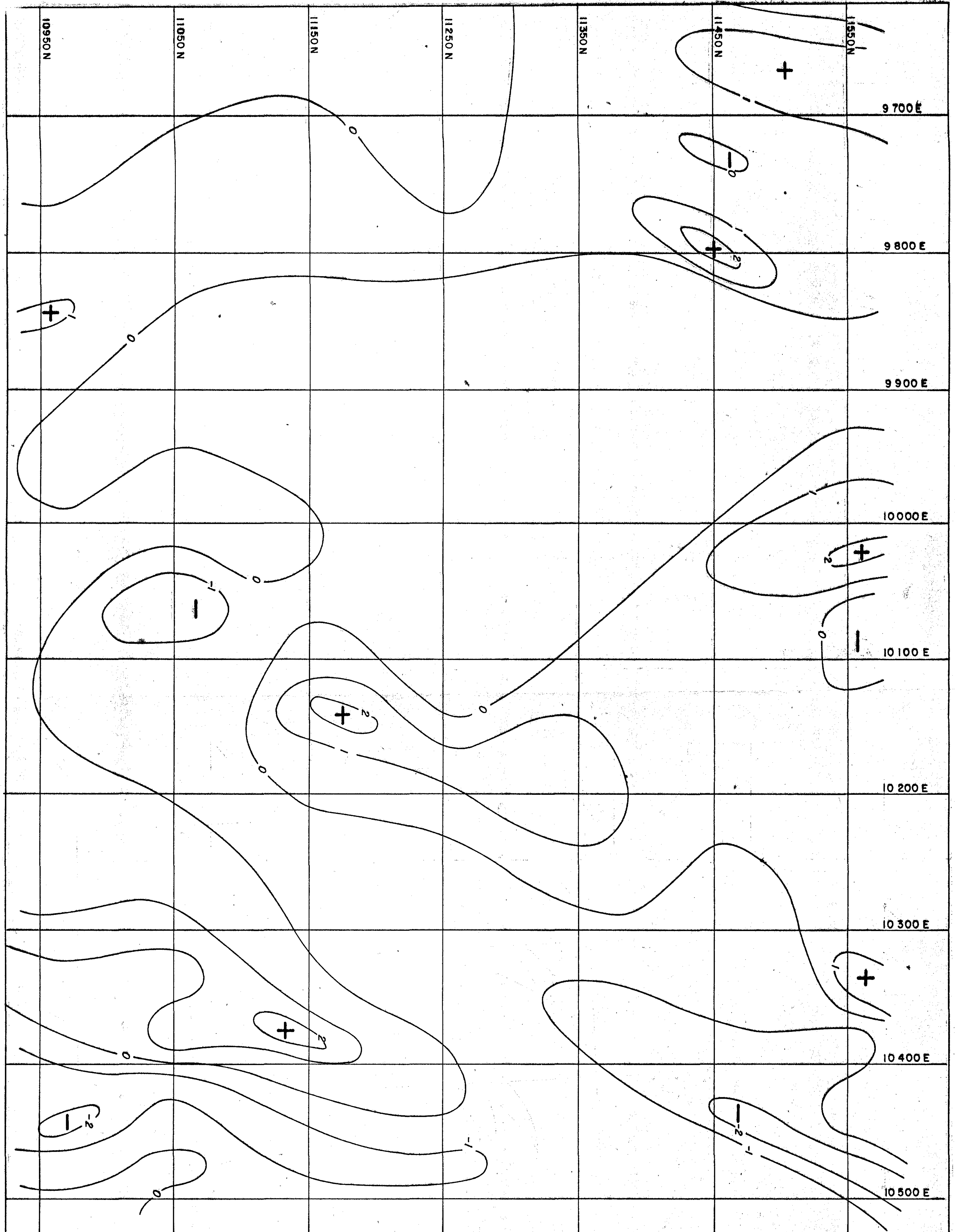
SCALE 1:2500	No. TS 27/76-V9-24	PLAN No.

E.L.27/76 ELLIOTT BAY, TAS.
VOYAGER 9
PROFILES OF RESIDUAL BOUGUER GRAVITY

471075

84-2083

3272



HORZ SCALE	1:2500	5 cm
CONT. INT.	1 μms^{-2}	
INSTRUMENT	Worden No 592	
OBSERVER	R.Goodwin	
DATE	November 1981	

BOUGUER DENSITY 2·52 gm cm^{-3}

REGIONAL DETERMINED USING MODIFIED SINC FUNCTION 2D FILTER

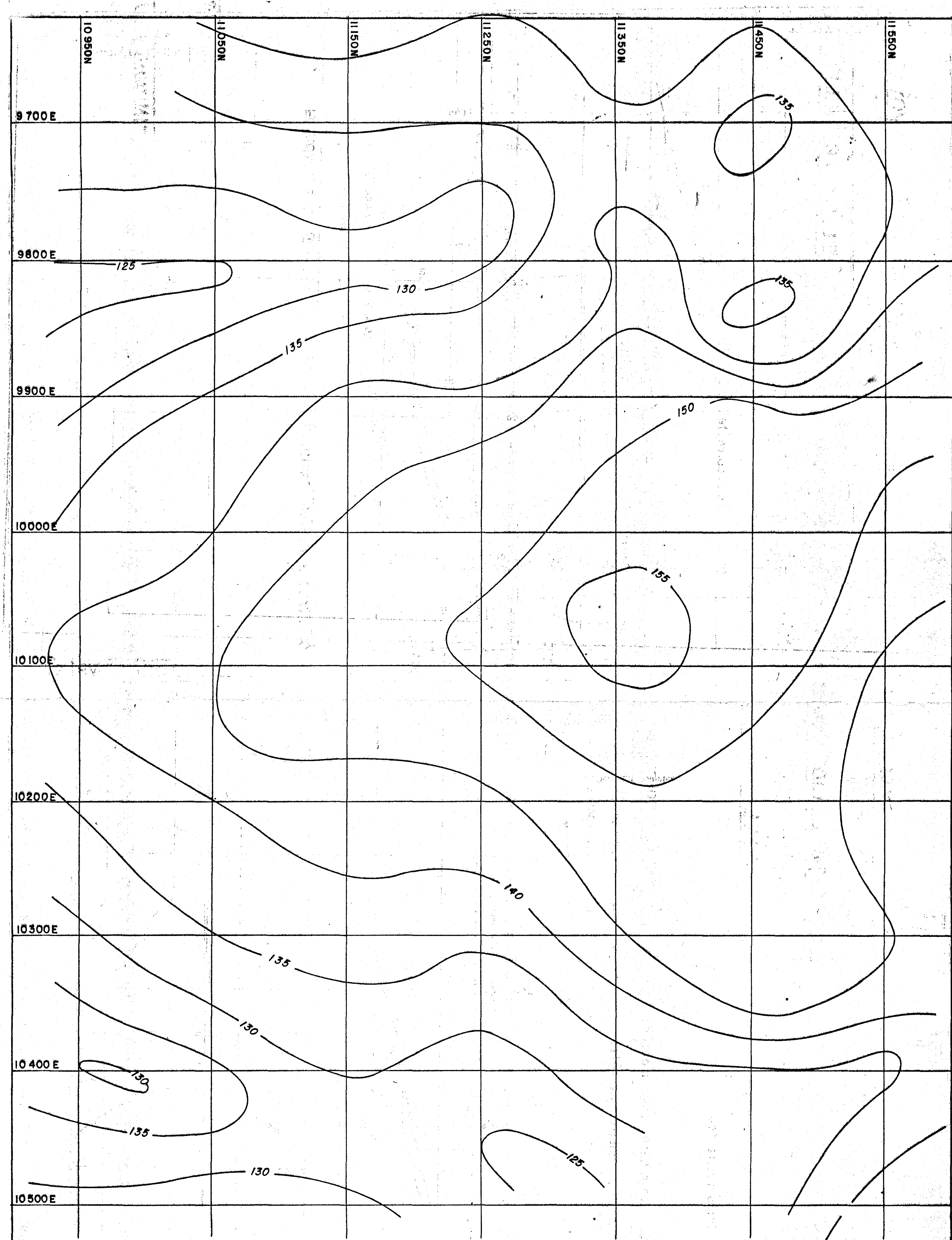
VOYAGER 9
EL 27/76 ELLIOTT BAY, TASMANIA
CONTOURS OF RESIDUAL BOUGUER GRAVITY

3273

471076

84-2083

TS 27/76-V9-25



HORZ SCALE 1:2500
CONT. INT. 5 m
OBSERVER B Steadman
DATE November 1981
DATUM ARBITARY 11350N, 10000E assumed = 150·000m.

5 cm

VOYAGER 9
EL 27/76 ELLIOTT BAY, TASMANIA
TOPOGRAPHIC CONTOURS

471077

84-2083

TS 27/76 - V9 - 26

3274

VOYAGER 9

E.L. 27/76 ELLIOTT BAY, TASMANIA

LINE 10 850 N

TS 27/76-V9-27

Not Terrain corrected

5 cm

REGIONAL Determined using modified sinc function 2D filter.

PROFILES OF BOUGUER GRAVITY, REGIONAL BOUGUER GRAVITY, RESIDUAL BOUGUER GRAVITY

HORZ SCALE 1 : 5000

VERT SCALE 1 cm = 5 μms^{-2}

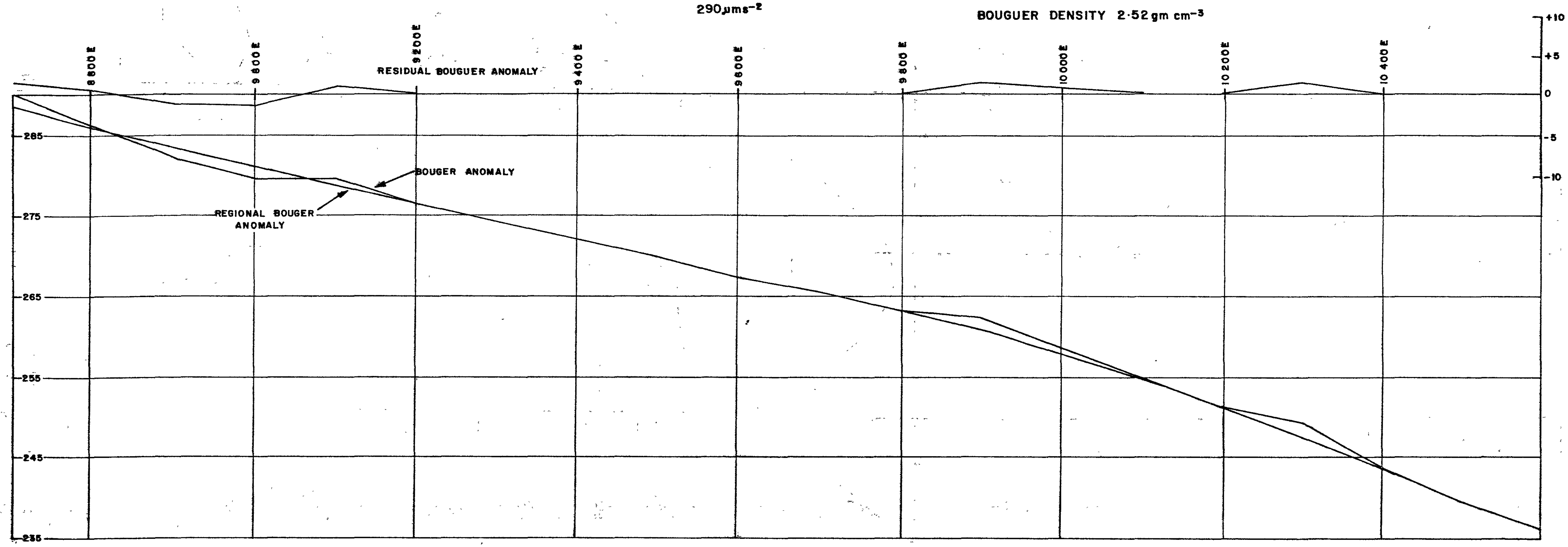
DATUM 0 μms^{-2}
290 μms^{-2}

INSTRUMENT Warden No 592

OBSERVER R. Goodwin

DATE November 1981

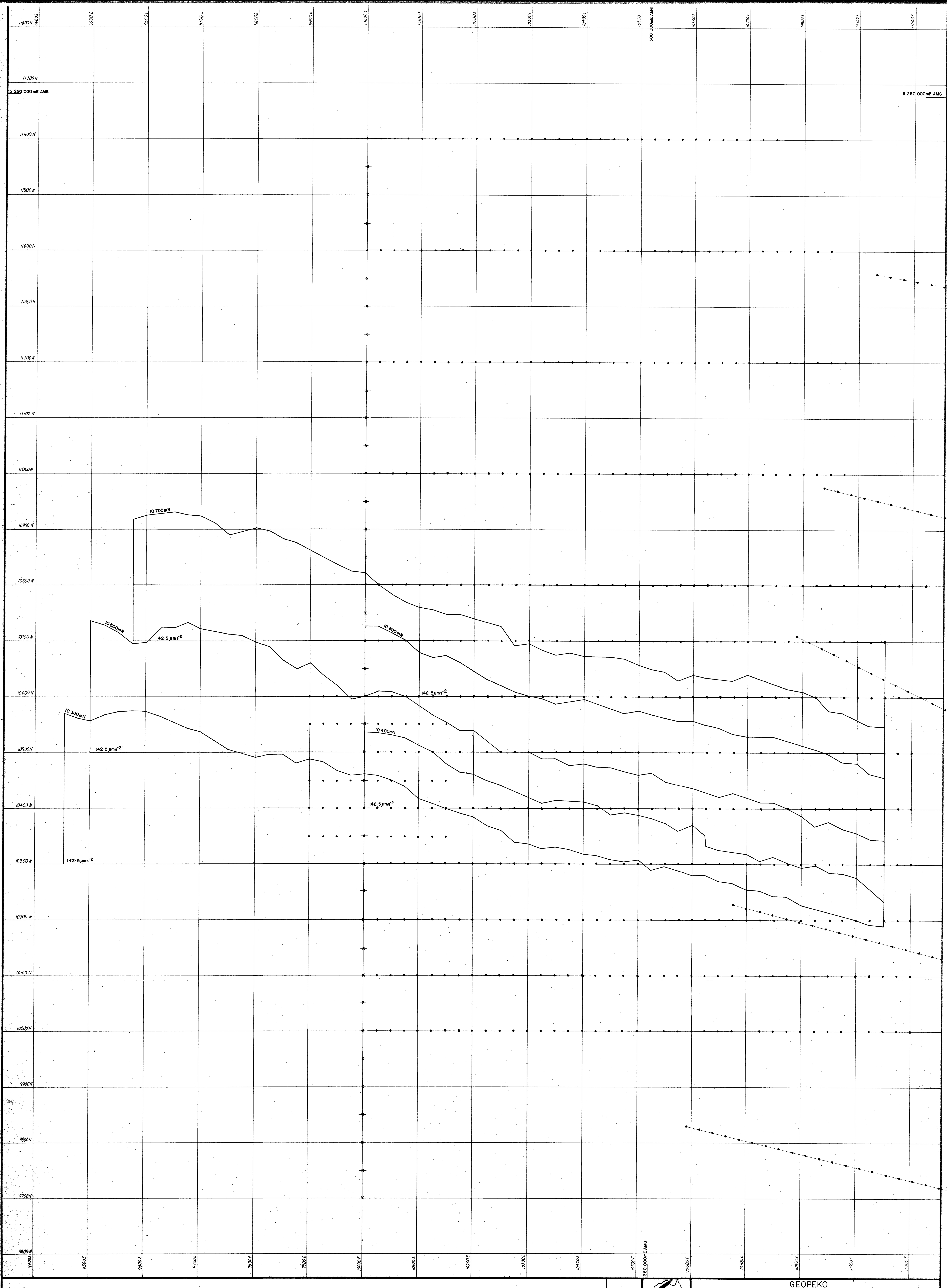
BOUGUER DENSITY 2·52 gm cm^{-3}



471078

84-2083

3275



LEGEND

- ✳ .... Grid Position
- • .... Power Auger Hole

INSTRUMENT : Worden 592
OBSERVER : R. Goodwin
BOUGUER DENSITY : 2·5 gm cm^{-3}
DATUM : 142·5 ums^{-2}
VERT. SCALE : 1cm = 2·5 ums^{-2}
DATE : Nov. 1981
Not Terrain Corrected

DATE: APRIL 1981
18/1/83

DRAWN: B. STEDMAN
R. Tog

CHECKED JDHS

GEOPEKO
DEVONPORT BASE, TASMANIA

84-2083

SCALE : 1:2 500 (0 50 100 150 200 250)

No. T.S 27/76-V29-12

E.L. 27/76 ELLIOTT BAY, TASMANIA

VOYAGER 29

471079

PROFILES OF BOUGUER ANOMALY

3276

471080

LEGEND

✶.......... Grid Position

●.......... Power Auger Hole

INSTRUMENT : Worden #592
OBSERVER : R. Goodwin
CONT. INT : 2·5 $\mu m\ s^{-2}$
BOUGUER DENSITY : 2·52 gm cm^{-3}

5 cm

GN MN
13°00'

DATE: APRIL 1981
12/1/83

DRAWN: B.STEDMAN
R. Tog

CHECKED JDHS

GEOPEKO
DEVONPORT BASE, TASMANIA

84-2083

0 50 100 150 200 250
SCALE 1:2 500

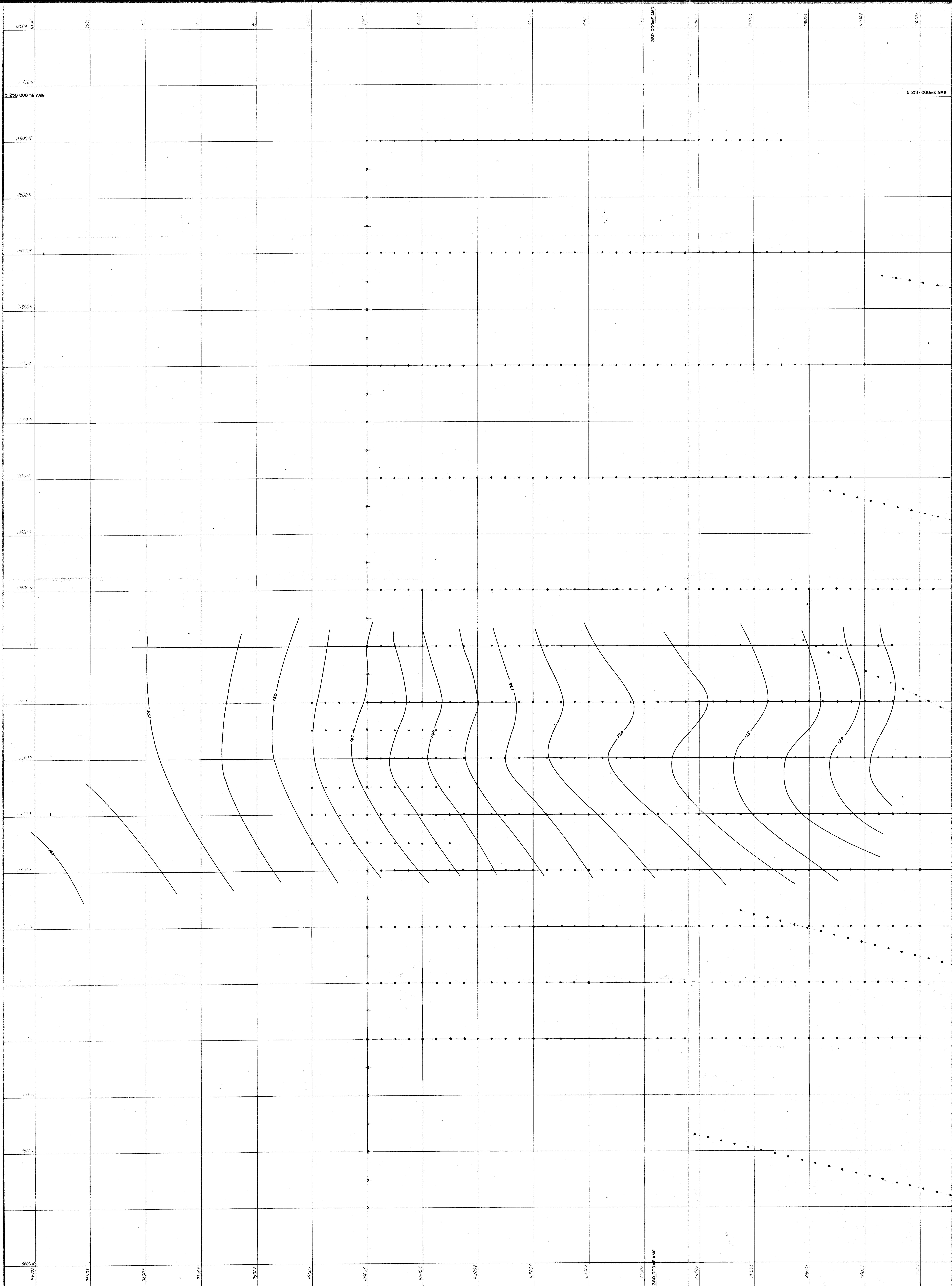
No T.S 27/76-V29-13

E.L. 27/76 ELLIOTT BAY, TASMANIA

VOYAGER 29

CONTOURS OF BOUGUER ANOMALY

3277



LEGEND

- ✳ Grid Position
- • Power Auger Hole

INSTRUMENT : Worden # 592
OBSERVER : R. Goodwin
CONT. INT : 2·5 ums⁻²
BOUGUER DENSITY : 2·52gm cm³

Not Terrain Corrected. Regional determined using modified sinc function 2-D filter.

5 cm

GN MN 13°00'

DATE APRIL 1981 11/1/83

DRAWN B.STEDMAN R.Tog

CHECKED DDHS

GEOPEKO
DEVONPORT BASE, TASMANIA

84-2083

SCALE 1:2500 (0 50 100 150 200 250)

No. T.S27/76-V29-14

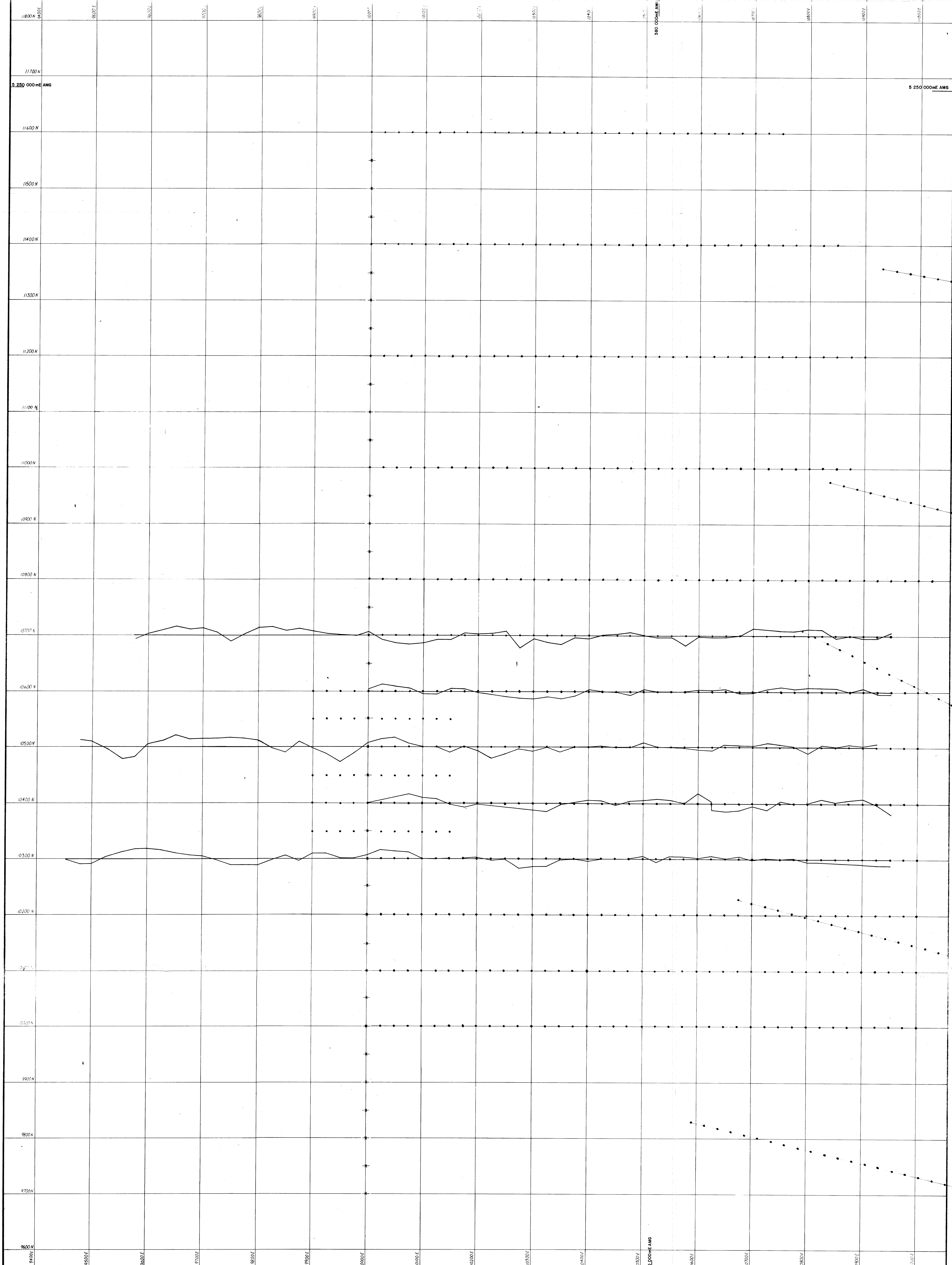
E.L. 27/76 ELLIOTT BAY, TASMANIA

VOYAGER 29

471081

CONTOURS OF REGIONAL BOUGUER ANOMALY

3278



LEGEND

*.......... Grid Position

•.......... Power Auger Hole

INSTRUMENT : Worden #592
OBSERVER : R.Goodwin
DATE : Nov 1981
VERT. SCALE : 2·5 μm s⁻²
DATUM : 0

BOUGUER DENSITY : 2·52 gm cm³
Not Terrain Corrected

5 cm

GN MN 13°00'

DATE APRIL 1981 14/1/83

DRAWN B.STEDMAN R.Tog

CHECKED JDHS

GEOPEKO
DEVONPORT BASE, TASMANIA

84-2083

SCALE 1:2500

No T.S27/76-V29-15

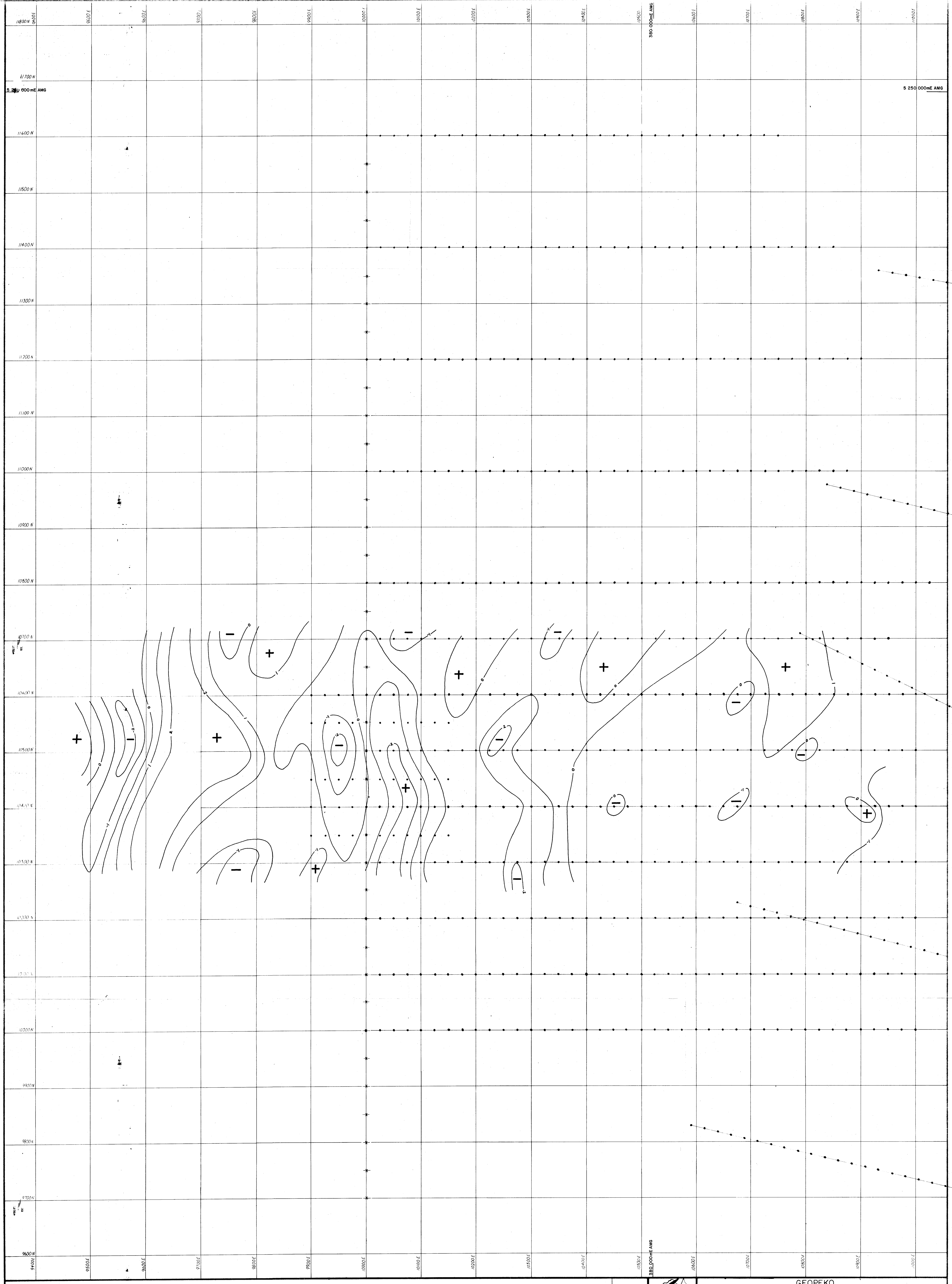
E.L.27/76 ELLIOTT BAY, TASMANIA

VOYAGER 29

471082

PROFILES OF RESIDUAL BOUGUER ANOMALY

3279



INSTRUMENT : Worden H 592
OBSERVER : R. Goodwin
DATE : Nov. 1981

BOUGUER DENSITY : 2·52 gm cm^{-3}
CONT. INTERVAL : 1 ums^{-2}

Not Terrain Corrected

5 cm

GN MN 13°00'

GEOPEKO
DEVONPORT BASE, TASMANIA

8h-2083

SCALE 1:2 500 (0 50 100 150 200 250)

No T.S 27/76-V29- 16

DATE APRIL 1981

DRAWN B. STEDMAN

CHECKED

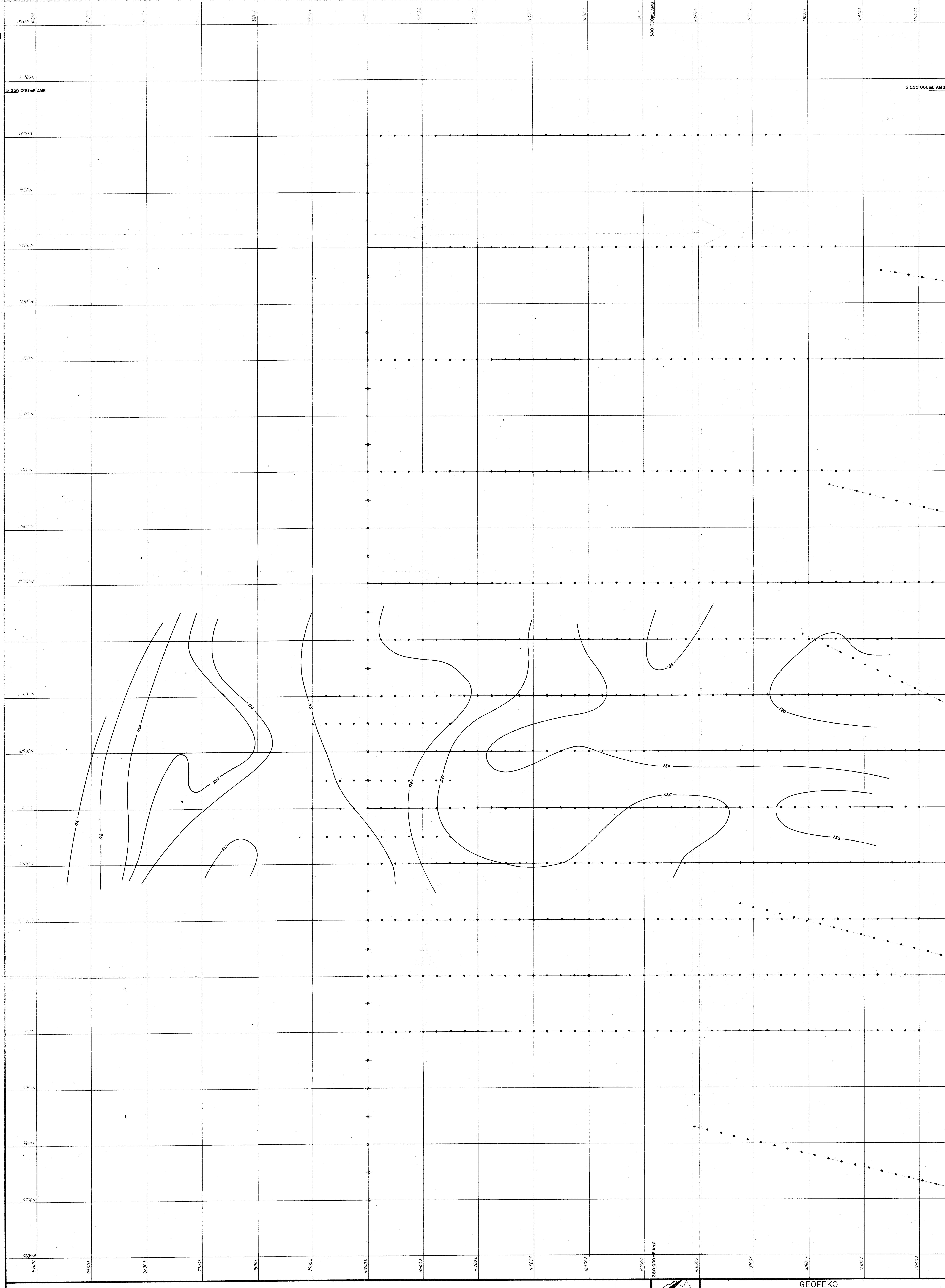
E.L. 27/76 ELLIOTT BAY, TASMANIA

VOYAGER 29

CONTOURS OF Residual Bouguer Anomaly

471083

3280



LEGEND

✳ .... Grid Position

● .... Power Auger Hole

OBSERVER : B. Stedman
CONT. INT : 5m
DATUM : Australian Height Datum

GEOPEKO
DEVONPORT BASE, TASMANIA

84-2083

0 50 100 150 200 250
SCALE 1:2 500

No T.S 27/76-V29- 17

E.L. 27/76 ELLIOTT BAY, TASMANIA

VOYAGER 29

TOPOGRAPHIC CONTOURS

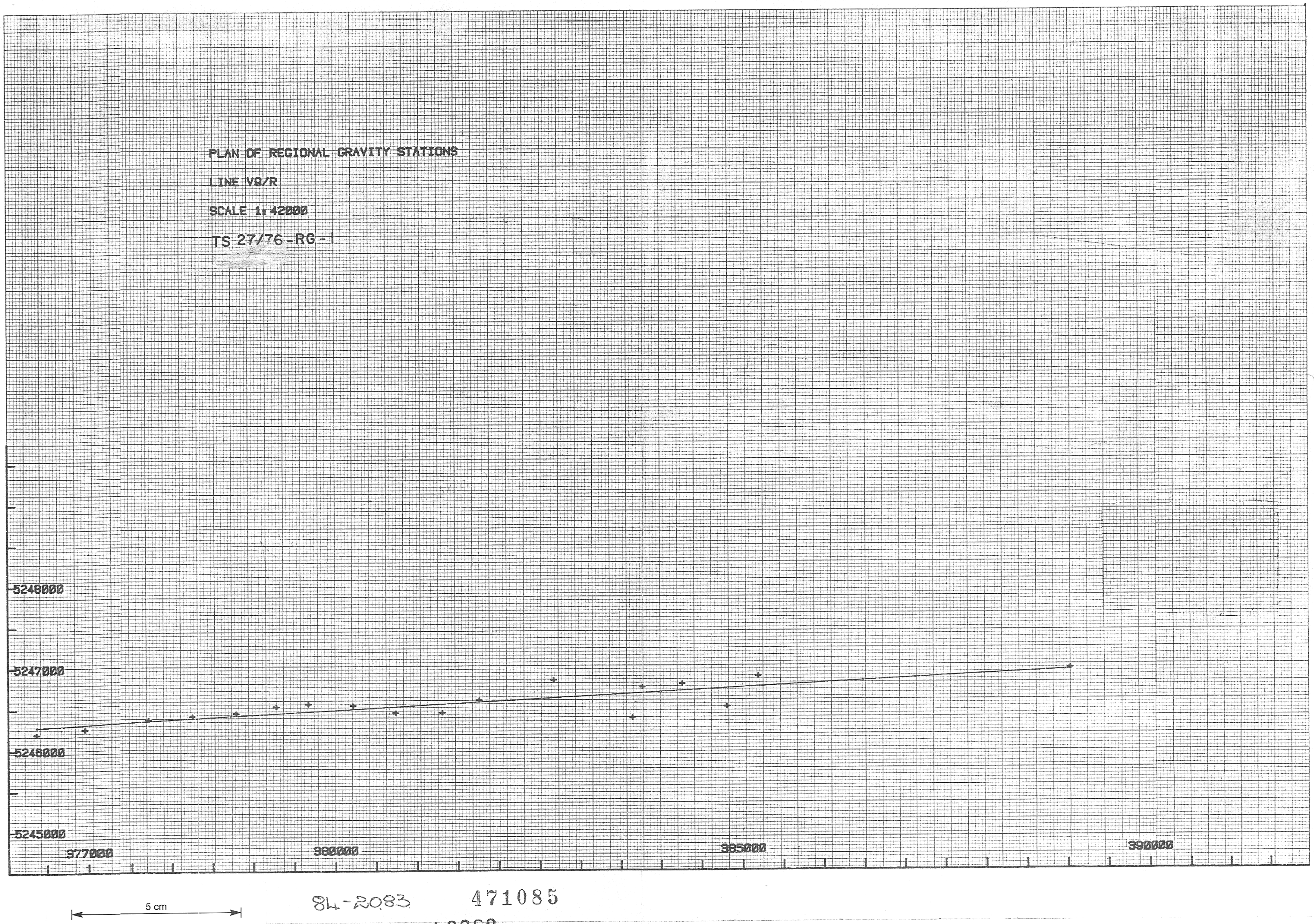
471084

3281

DATE APRIL 1981
12/1/82

DRAWN B.STEDMAN
R.Tog

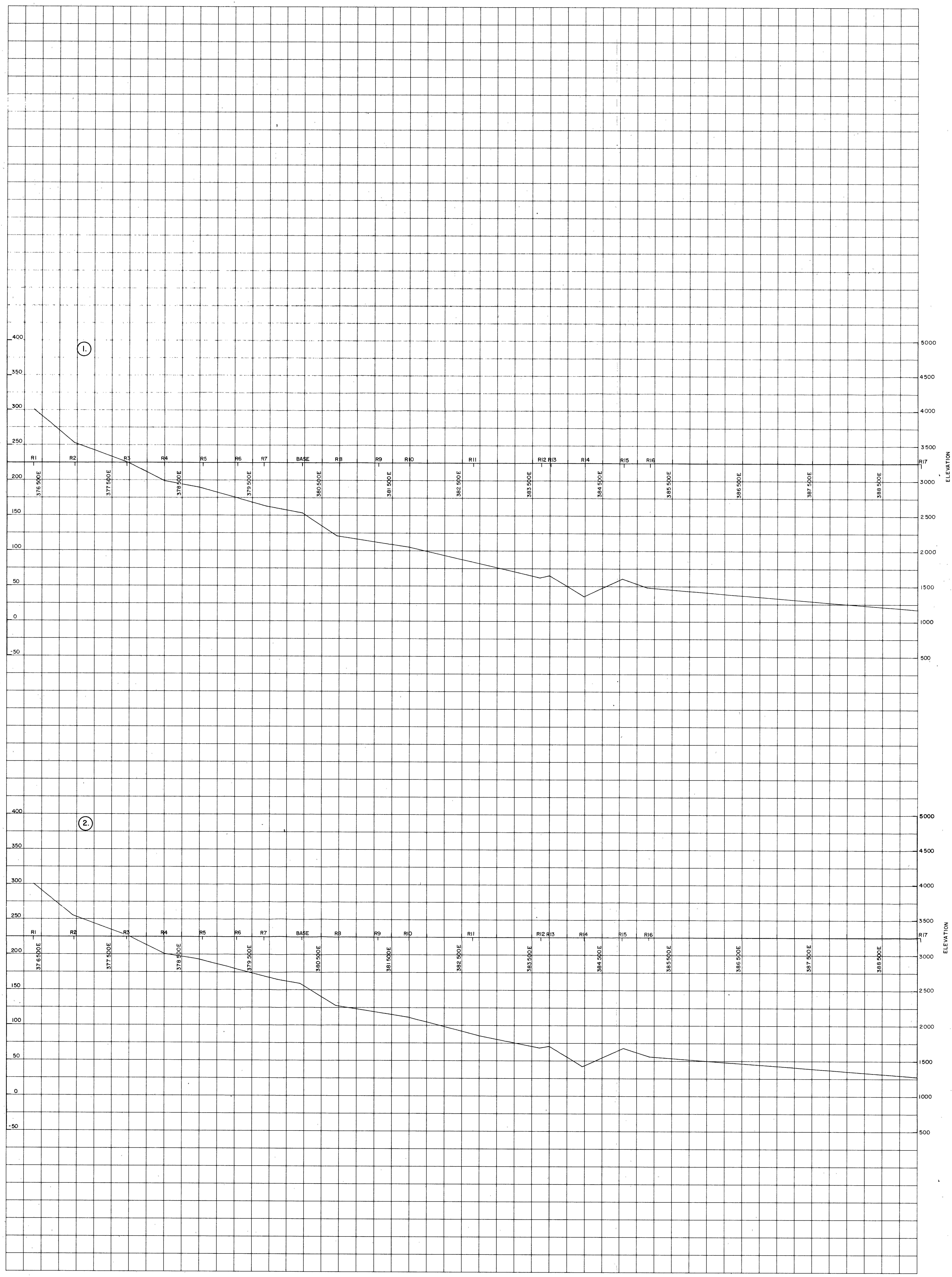
CHECKED JDHS



84-2083 471085

3282

FILE NO: TS 27/76 - RG - 2



471086

84-2083

5 cm

GEOPEKO

A DIVISION OF PEKO-WALLSEND OPERATIONS LTD - DEVONPORT

metres | Scale : 1 : 2500 | Plan No : TS 27/76-RG-2

VERT. SCALE: 1cm = 25 μms^{-2}

BOUGUER DENSITY (1) 2·67 gm cm^3

BOUGUER DENSITY (2) 2·52 gm cm^3

DATE : 17/1?/83

GEO : J.S

DRAWN : R Tog

CHECKED : DHS

E.L. 27/76 ELLIOTT BAY, TAS.

VOYAGER 9

PROFILES OF REGIONAL BOUGUER ANOMALY

LINE V9/R

3283