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PENNZOIL OF AUSTRALIA LIMITED

REPORT ON EXPLORATION PROGRESS
PERIOD ENDING APRIL, 1978

MOUNT PEARSE - E.L. 10/77

J.R. Chapman
Project Geologist
APRIL, 1978

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Transparencis in Vertiplan

Vol. 2. Scintrose Report.

"Brief Comments on a rapid Reconnaissance
MIP Survey over the Mt Pearce Area near Waratah"

INTRODUCTION

In 1977 Pennzoil became financially involved in the development of a low noise magnetic I.P. system by Scintrex Pty. Ltd. called the R.R.M.I.P. (Rapid Reconnaissance Magnetic Induced Polarization). With access to this potential geophysical quantum jump Pennzoil reviewed areas that hold strong mineral potential but have been insufficiently explored due to adverse ground cover conditions. Mt Pearse was selected as the highly prospective Precambrian and Palaeozoic geology here was previously unexplored due to a plus 100 metre thick basalt cover. The R.R.M.I.P. system was to be used to attempt penetration of the basalt.

The project area is situated within the extremely productive west Tasmania portion of the Tasman Geosyncline and is located immediately east of two major tin occurrences, (i) Mt Bischoff, a worked out but once world famous tin mine, and (ii) the producing Cleveland mine. Other nearby mineral occurrences include the exhausted Magnet lead-silver-zinc mine and the recently discovered Que River massive lead-zinc-copper bodies.

Exploration Licence 10/77 was granted to Pennzoil in 1977. This report describes all exploration activity carried out since that date.

SUMMARY OF WORK COMPLETED

Phase 1 of the program involved a review of all published data and reconnaissance geology to estimate the basalt thickness within the E.L. and to identify prospective geology that trends beneath the basalt cover.

Phase 2 involved systematic wide spaced gridding (35 line kilometres) and an attempted R.R.M.I.P. survey. The R.R.M.I.P. was unsuccessful and the gridded lines were surveyed by proton magnetometer.

ACCESS AND PHYSIOGRAPHY

The area consists of a moderately flat plateau with deeply incised drainage occurring off the edge of the basalt capping. Excellent access is provided by the conveniently located Murchison Highway and Savage River Road. Logging tracks service most areas not traversed by the main roads. Vegetation within the E.L. includes dense myrtle forest with interspaced button grass plains and open and closed eucalypt forest.

PREVIOUS WORK

As the E.L. is adjacent to Mt Bischoff surface prospecting by the old timers would have been comprehensive. However the only remote sensing effort to date that would have penetrated the basalt cover was an Aero-magnetic survey flown by CRA in the 1950's. This was part of a regional survey and flight lines were too widely spaced to be of any detailed use.

GENERAL GEOLOGY (Refer Map No. 48194, 48178)

E.L. 10/77 is nearly entirely underlain by Tertiary deposits of basalt lava flows with minor basal and interflow sediments. Descriptions of the pre-Tertiary geology are derived from surrounding exposures and are extrapolated to represent the rocks immediately underlying the Tertiary sequence.

The oldest rocks are Precambrian slates and quartzites that form an east-west trending anticlinorial inlier penetrating a Cambrian sequence. The Precambrian also contains minor dolomites and limestones that have acted as hosts to the Mt Bischoff stanniferous pyrrhotite bodies.

The Cambrian sequence trends north east and consists predominantly of poorly sorted marine greywackes, siltstone and mudstone. Other lithologies include basic to ultra-basic intrusives, basic volcanics, chert and conglomerate. An atypical massive conglomerate containing prominent limestone clasts ~~out-~~ *cross out* crops to the immediate south of the E.L.

Overlying the Cambrian are well sorted Ordovician sedimentary rocks. These outcrop in the south east extremity of the E.L. forming the resistant Mt Pearse.

The Devonian Meredith granite intrudes the Cambrian sequence and is the source of the district's tin mineralization. Alluvial workings over the granite reflect mineralization within shears, intrusive phases and greisens. Related quartz feldspar porphyry dykes containing cassiterite occur at Mt Bischoff.

The only other pre-Tertiary rocks are Permian glacio-marine sediments occurring to the north of the E.L.

BASALT THICKNESS (Refer Maps No. 48195, 48179)

To determine the basalt thickness within the E.L. an understanding of the pre-basalt Tertiary topography was required. Elevations of the base of the basalt were obtained from published data and results of drilling by Tasmania Mines Department at Fooks Lode

Waratah, and by North Prospecting Pty. Ltd. to the east of E.L. 10/77. Field measurements were also made using an altimeter. Unfortunately the basal contact is usually masked by scree slopes.

From the available data it appears that the pre-basalt Tertiary drainage was principally to the north east with hills formed by porphyry intruded quartzites of Mt Bischoff, the Meredith granite and Mt Pearse acting as an arcuate water shed to the west and south. Relief and drainage slope within the central portion of E.L. 10/77 were probably relatively gentle.

The average thickness of the basalt within the subsequently gridded area is estimated to be approximately 100 metres.

GEOPHYSICS

1. Location

It was decided that the most prospective conceptual target that would be detectable is a tin bearing massive pyrrhotite replacement body after carbonates.

Within this concept, factors examined to determine the location of the first R.R.M.I.P. survey included the following:

- a) The easterly trend of the Precambrian inlier that contains dolomite.
- b) The porphyry dyke trend at Mt Bischoff.
- c) The trend connecting the Meredith granite and the Mt Housetop granite to the north east.
- d) The carbonate bearing potential of the Cambrian sequence.

The area chosen was to cover the extrapolated limits of the pre-Cambrian inlier (Refer Map No. 48194).

2. Gridding (Refer Map No. 48196)

Eleven 1 km arrays each incorporating three 1 km survey lines were planned. Grid preparation proceeded slower than anticipated due to dense undergrowth, resulting in 9 arrays being available at the start of the survey. With commencement of the survey the arrays had to be altered to allow for 500 metre survey lines.

3. R.R.M.I.P. Survey

Scintrex started the survey in early February. Initial progress was slow due to rain and variable magnetic noise. At the completion of three set ups increased magnetic noise prevented further surveying. Intense efforts were made to eliminate the noise, all to no avail, and so personnel and equipment were demobilised.

Scintrex are uncertain as to the cause of the problem but subsequent instrument performance has indicated that instrument malfunction could have played a substantial role.

The lines that were surveyed gave flat responses that are of little interest.

4. Soundings

A Schumberger expander was used to obtain vertical electrical property information.

Results indicate that a conductive zone (80 ohm-metre), probably representing the basalt, extends to a depth of at least 100 to 150 metres. Scintrex estimates that enough current penetrates this zone to justify the effectiveness of the R.R.M.I.P.

5. Magnetics (Refer Map No. 68196)

In the absence of R.R.M.I.P. coverage it was decided to survey the prepared lines with a proton magnetometer.

Results were predictably noisy and little useful information could be gleaned from the profiles. However magnetic property trends were identified in places, especially on the eastern lines traversing base line 18N. Two parallel magnetic high zones with associated lows are identifiable.

SUMMARY AND RECOMMENDATIONS

The initial attempt to penetrate the basalt with R.R.M.I.P. was unsuccessful. As instrument malfunction is suspected as being the probable cause of failure, it is recommended that a further trial be carried out during the next summer field season.

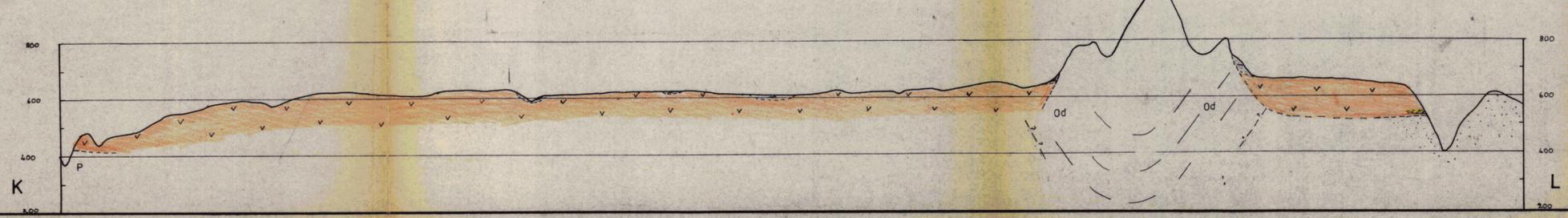
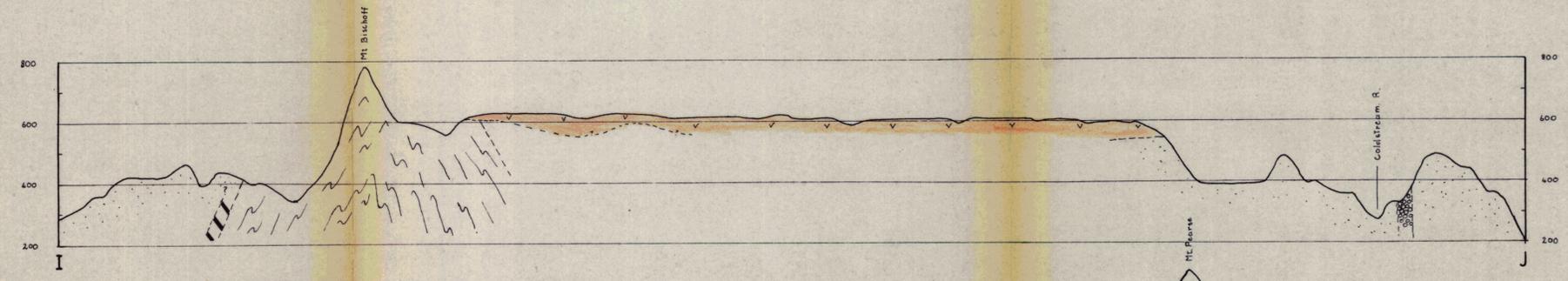
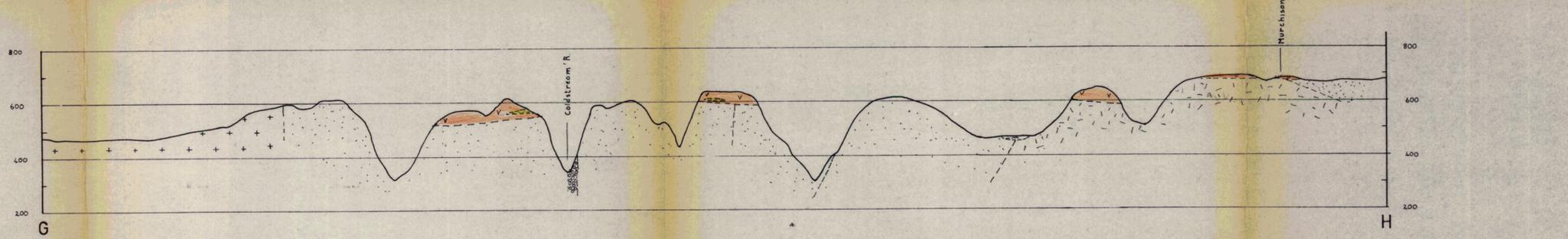
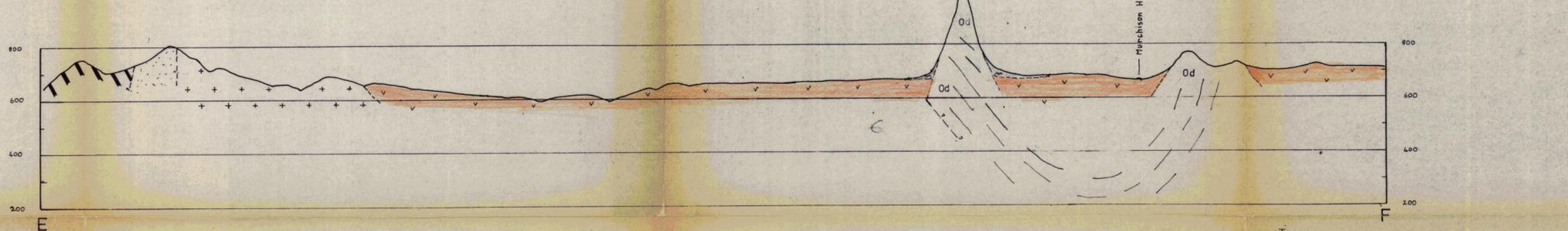
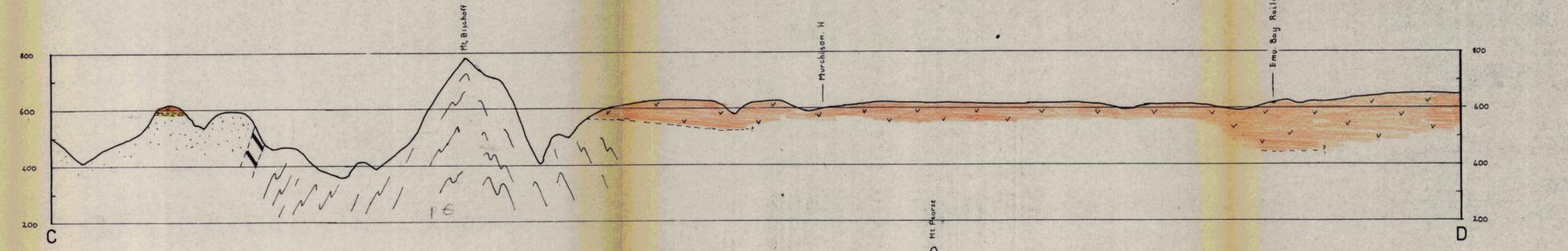
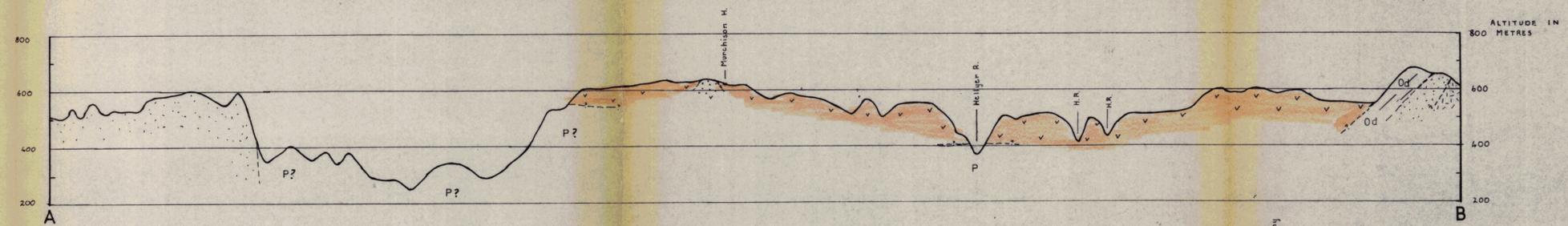
If progress is too slow to make the entire survey feasible, the magnetic high zone, identified by the proton magnetometer survey, should at least be tested.

ENCLOSURESMap No.

48179	Cross Section - Geology
48194	Geology - Scale 1:50000
48195	Postulated Pre-basalt Tertiary Topography - Scale 1:50000
48196	Geophysics - Scale 1:20000

Legend

- Quaternary  Talus + Alluvium
- Tertiary  Basalt
-  Gravel sand + clay
- Permian  Glacio-marine sediments
- Devonian  Granite
- Ordovician  Conglomerate sandstone
- Cambrian  Predominantly greywacke siltst. + mudst.
-  Acid volcanics
-  Limestone congl.
-  Basic/Ultrabasic igneous
- Pre-cambrian  Quartzite, slate + minor dolomite



5 cm

Horiz. scale 1: 50,000
Vert. scale 1: 10,000

For Section Location See Map No. 48195. 261009
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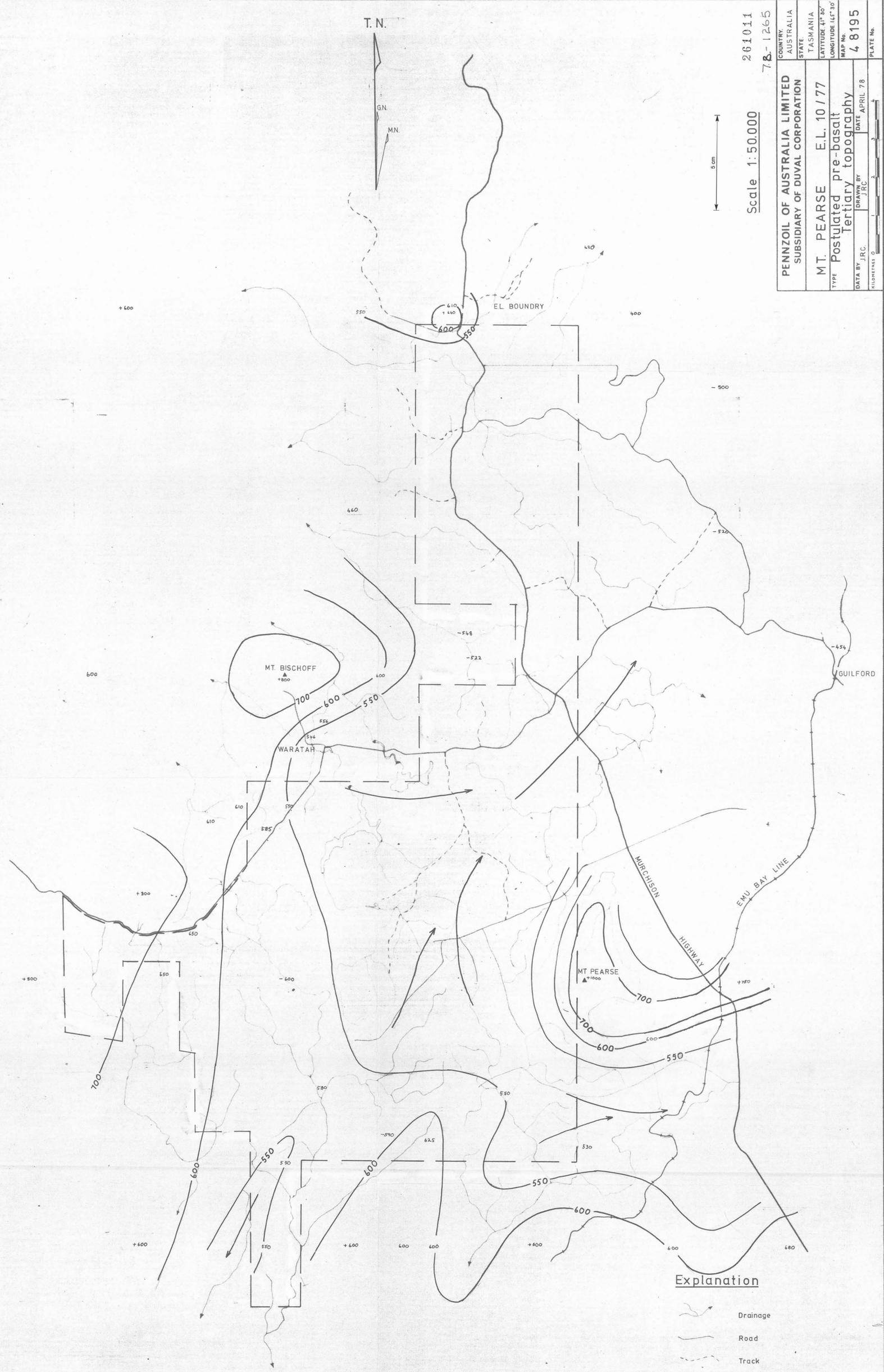
PENNZOIL OF AUSTRALIA LIMITED			COUNTRY.
SUBSIDIARY OF DUVAL CORPORATION			AUST.
MT. PEARSE E.L. 10/77			STATE.
			TASMANIA
TYPE			LATITUDE. 41° 30'
CROSS SECTIONS - GEOLOGY			LONGITUDE. 145° 30'
DATA BY	DRAWN BY	DATE	MAP No.
	J. R. C.	Nov. 1977	48179
meters 0 1000 2000 3000 4000			PLATE No.

261011
Scale 1:50,000
7B-1265

COUNTRY	AUSTRALIA
STATE	TASMANIA
LATITUDE 41° 30'	
LONGITUDE 147° 30'	
MAP No.	4 8195
DATE	APRIL 78
DRAWN BY	J.R.C.
PLATE No.	

PENNZOIL OF AUSTRALIA LIMITED
SUBSIDIARY OF DUVAL CORPORATION

MT. PEARSE E.L. 10/77
Postulated pre-basalt
Tertiary topography



Explanation

- Drainage
- Road
- Track
- 530 Elevation (metres above S.L.) of Tertiary basalt base.
- 400 Tertiary topographic contours
- Tertiary drainage



 Zone of high magnetic susceptibility with peak values in gammas.
 Zone of low magnetic susceptibility with minimum values in gammas.
 Possible magnetic property trend.

▲ MT. BISCHOFF

WARATAH

5 cm

SCALE 1:20000

261012

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PENNZOIL OF AUSTRALIA LIMITED SUBSIDIARY OF DUVAL INTERNATIONAL			COUNTRY AUST.
MT PEARSE E.L. 10/77			STATE TAS
TYPE GEOPHYSICS			LATITUDE 41° 30' LONGITUDE 145° 30' MAP No.
DATA BY J.R.C. JPS	DRAWN BY J.R.C.	DATE APRIL 78	48196 PLATE No.
Metres 0 200 400 600 800 1000			

008

MICALIMED

18-1265

261013

Q36/30

SCINTREX

BRIEF COMMENTS ON
A RAPID RECONNAISSANCE MIP SURVEY
OVER THE MT. PEARCE AREA
NEAR WARATAH, TASMANIA
ON BEHALF OF
PENNZOIL OF AUSTRALIA LIMITED

PRIVATE AND CONFIDENTIAL

BRIEF COMMENTS ON
A RAPID RECONNAISSANCE MAGNETIC INDUCED POLARIZATION SURVEY
OVER THE MT. PEARCE AREA
NEAR WARATAH, TASMANIA
ON BEHALF OF
PENNZOIL OF AUSTRALIA LIMITED

BY

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MSc, DIC, AMAus IMM, FGS.
GEOPHYSICIST

SYDNEY, N.S.W.

MAY, 1978

TAS-058

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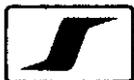
Discussion of Results

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Conclusions

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Data Profiles

**SCINTREX PTY. LTD.**

GEOPHYSICAL CONSULTANTS AND CONTRACTORS

SUMMARY

An RRMIP survey carried out at Mt. Pearce, near Waratah, Tasmania, was subject to apparent high noise levels. It now seems likely that the problem was predominantly an instrument one caused by an intermittent fault in the input section of the transmitter. It is now anticipated that the survey will be able to be successfully executed in November, 1978.

The limited survey data acquired, shows relatively conductive near surface conditions which are ideal for the execution of RRMIP. The lines surveyed did not produce any anomalous conditions.

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BRIEF COMMENTS ON
A RAPID RECONNAISSANCE MAGNETIC INDUCED POLARIZATION SURVEY
OVER THE MT, PEARCE AREA
NEAR WARATAH, TASMANIA
ON BEHALF OF
PENNZOIL OF AUSTRALIA LIMITED

INTRODUCTION

On about 7 production days between the 3rd and 17th February, 1978 an attempt was made to carry out the first rapid reconnaissance magnetic induced polarization (RRMIP) field survey over the Mt. Pearce prospect on behalf of Pennzoil of Australia Limited. The field work was carried out by Scintrex operator Mr. R. Lindberg assisted by Pennzoil operator Mr. J. Spring, and supervised by Pennzoil project geologist Mr. J. Chapman. The author paid a visit to the site on 6th February, 1978. The crew was supplied by Pennzoil of Australia Limited.

EQUIPMENT

The equipment consisted of a Scintrex TSQ-3000 frequency domain transmitter driven by a three phase 800Hz alternator powered by a Briggs & Stratton motor.

The measuring device consisted of two IPRF-2 frequency domain harmonic type receivers using two Scintrex MFM-3 horizontal fluxgate magnetometers. The electrical soundings were executed in the time

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domain using a Scintrex IPR-8 time domain receiver.

*DISCUSSION OF RESULTS**Comments on the noise problems:-*

From the outset the survey was plagued with noise problems. The noise observed looked as if it could be due to disturbances in the earth's magnetic field (which in fact did occur at various times during the survey).

In the conditions at Waratah, five separate sources of the observed noise were possible:-

- i) Disturbances in the earth's magnetic field which at the southerly latitudes would be more severe than those encountered further north.
- ii) The wet, humid conditions wetting equipment connections, causing electronic noise.
- iii) The proximity of a power line in the area, and a changing load on that powerline.
- iv) Electronic problems within the transmitter itself.
- v) Movement of the sensor due to wind in the trees moving the roots in the vicinity of the sensor.

An analysis of the problems suggest that at various times and positions

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all five "noise" sources contributed to the "noise" problem observed. The operational problem was to separate out the various "noise" components.

Disturbances within the earth's magnetic field (item i) were observed throughout the period of the Mt. Pearce survey. However, in view of the transmitter fault later detected, it is unlikely that they had the severe effects first thought.

Moisture problems within the equipment (item ii) probably also contributed at times, but again it probably was not as severe as thought at the time.

Proximity to the powerline (item iii) *may* have contributed to the noise at certain sites close to the powerline itself, but tests some 5 to 10 kilometres away from powerlines gave similar noise problems.

The subsequent Broken Hill surveys performed for Amdex revealed an intermittent fault in the power input section of the transmitter, which may have been the major (but not the whole) source of the noise.

It is the author's opinion that noise sources (i) to (iii) and (v) can be isolated and solved when they occur. Transmitter faults can be virtually eliminated by (i) spare parts, (ii) sufficient test equipment to trace faults, and (iii) a spare transmitter.

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THE DATA

The data is presented undrafted as it is anticipated that the survey will be resumed in November, 1978. The vertical scale for H_N is 1 centimetre = 10%, while RPS (Relative Phase Shift) and PFE (Percent Frequency Effect) is presented at a scale of 1 centimetre = 0.5° and 0.5% respectively. The horizontal scale is 1 centimetre = 25 metres (1:2500). The electrical sounding is presented on a 5 inch log log scale in ohm-metres against the spacing in metres, while the chargeability is shown on the scale of 1 centimetre = 4 millivolts/volt.

Electrical Sounding:

The electrical sounding shows a surface layer about 10 metres deep having resistivity of about 400 ohm-metres and a chargeability of about 30 millivolts/volt and a normal decay form. Beneath this, the resistivity falls to about 80 ohm-metres while chargeability falls to about 14 millivolts/volt.

Only for the 500 and 800 metres spacings is there any material increase in resistivity while chargeability rises to 44 millivolts/volt on M_5 . The depth to bedrock cannot be estimated from this sounding.

RRMIP Data:

The lines surveyed are as follows:

1200E 450N - 1000N

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1500E	450N - 1000N
1800E	450N - 1000N
2200E	00 - 1000N
2500E	450N - 1000N

On none of the above lines was any material change in either RPS or PFE seen. H_N remained within 20% of normal on all lines except 1800E, where east of 700N an increase to 170% was seen, and on 2200E an increase to 125% was noted at 950N + 50 metres east of 700N also.

The lines surveyed are considered valid and not subject to noise problems. The acquisition of the data was extremely slow.

CONCLUSIONS

- 1 - The noise problems encountered at Mt. Pearce were no doubt a combination of magnetic storm activity, moisture, ground movements, powerline and transmitter problems. However, the major problem was to isolate and solve each of these separately. Later developments lead to the detection of an intermittent fault which *could* and *most probably did* cause the majority of the noise problems at Mt. Pearce. It is concluded therefore that it is well worthwhile returning to Mt. Pearce to complete the work there.
- 2 - The electrical sounding at 1100N/1800E showed a near surface zone some 10 metres thick having a resistivity of about 400 ohm-metres and a chargeability of about 30 millivolts/volt. This

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is underlain by an 80 ohm-metres, 12- 14 millivolts/volt zone at least 100 to 150 metres thick.

It is considered that this relatively conductive zone will act to distribute the current in very similar fashion to the oxidation/overburden in areas like Cobar and Broken Hill.

As the underlying freshrock would be expected to have a resistivity of 1000 to 2000 ohm-metres and assuming a surface layer resistivity of 90 ohm-metres to (a) 100 metres and (b) 250 metres having conductivity width products, σt , of (a) 1.25 and (b) 1.9, the percentage of current flowing in the bedrock is calculated to be:

(a) 45% and (b) 35% for 1000 ohm-metres bedrock, and
(a) 30% and (b) 22% for 2000 ohm-metres bedrock
assuming a 2000 metre array.

- 3 - The RRMIP data over lines 1200E to 2800E was acquired with extreme care and did not show any significant responses. It is considered that this should be repeated using a 2000 metre array rather than the original 1000 metre array employed in the first survey, in order to increase the effective search depth. (see 2 above).

The author looks forward to returning to Mt. Pearce to complete

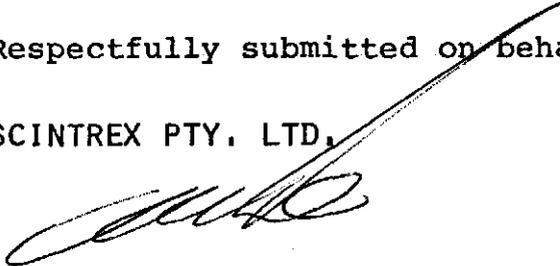
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this survey in November, 1978.

Respectfully submitted on behalf of:

SCINTREX PTY. LTD.



A.W. HOWLAND-ROSE, MSc, DIC, AMAusIMM, FGS.

GEOPHYSICIST

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261024

Schlumberger APD4
PLOT 1100N / 1000E
JOB NO. TMS-058
17-2-78

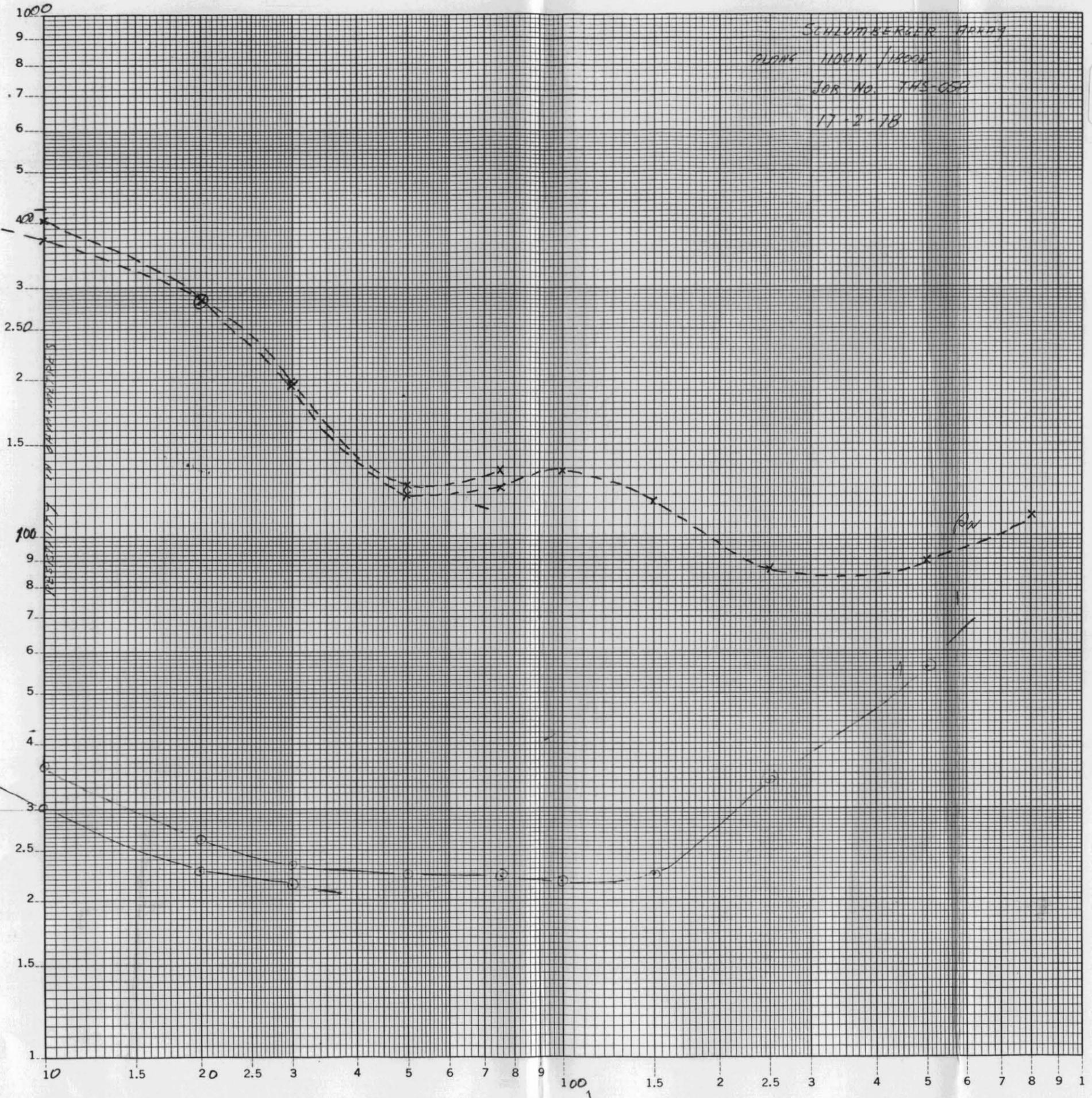
5 cm

47 7203

K&E LOGARITHMIC 2 X 2 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

2m 5m

chargeability in millivolt/volt



Line: 1200
Job No: F19058
Date: 28.02.09

H_N
PPE
RPS
.....

10
5

PPE %
RPS %

+2

H_N %
11 120

0 100

-1 80

-2

400N

600

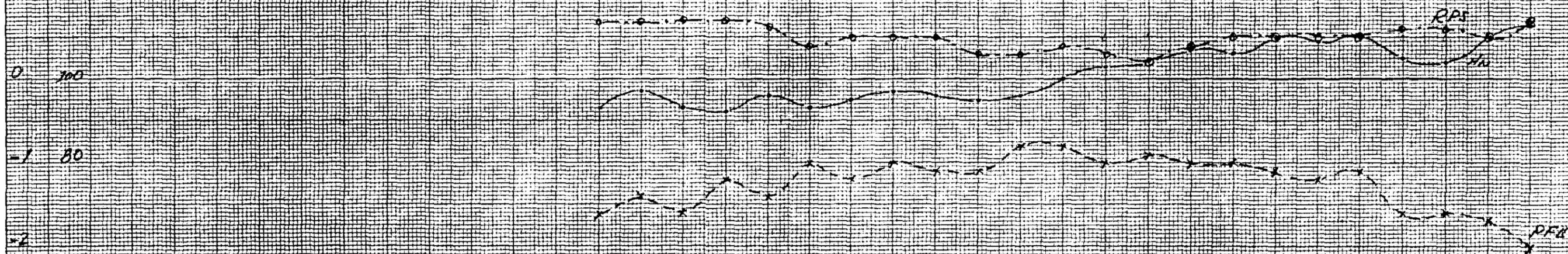
800

1000N

5 cm

K·E KEOH & ENGINE CO. MODEL NO. 021
10 X 10 IS THE CENTIMETER X 30 CM.

41 1211



LINE: 1500 E
JOB NO: TMS 058
DATE: 78.02.09

PPE %
RPS %

22 42%

14 120

0 100

1 00

2

50
50

400 N

600

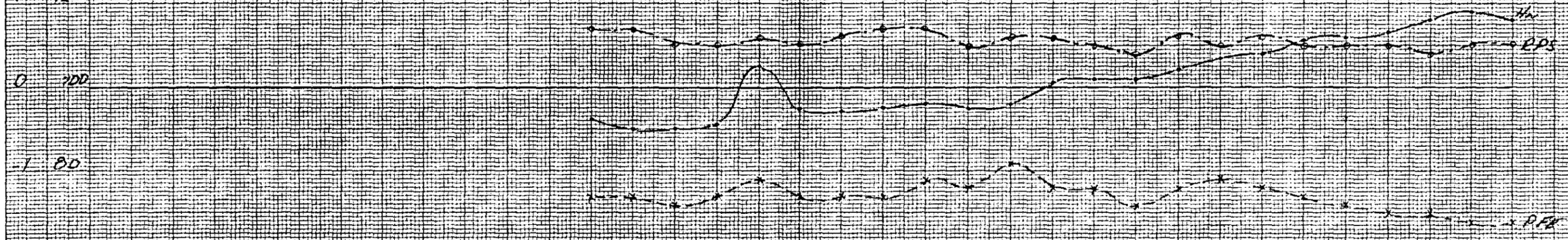
800

1000 N

K.E. KEIGHT & ESSEX CO. MIN. IN. DIA. X 30 CM.
10 X 10 IS THE CENTIMETER X 30 CM.

41 1211

5 cm



LWP: 1800 F
JOB NO: TAD 058
DATE: 78 02 09

PFE %
RPS

12 140
76

11 120

0 100

-1 80

-2

400 N

600

800

1000 N

25
50

HN

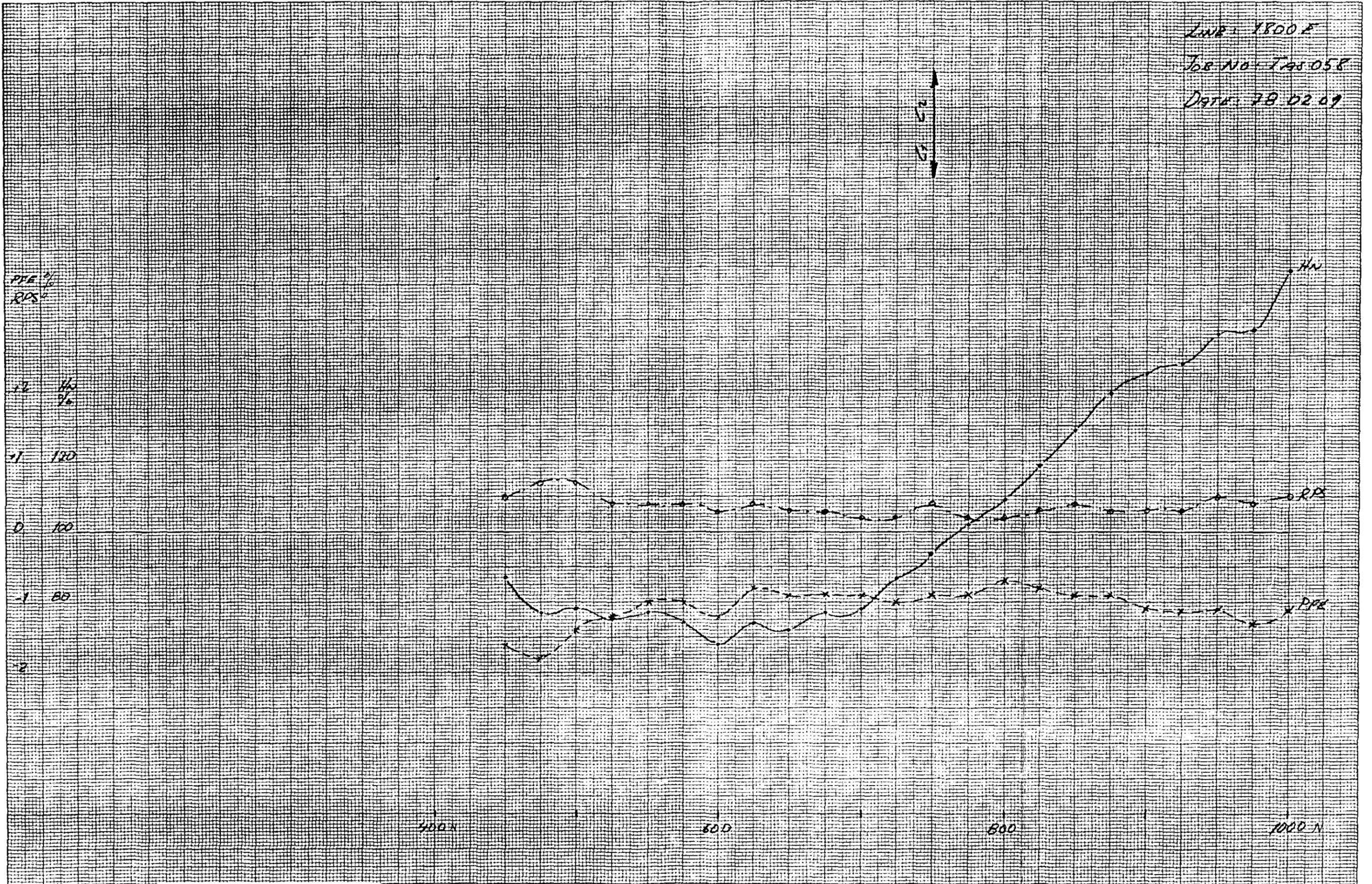
RRR

PFR

5 cm

K&E KEONIG & EISEN CO. MODEL NO. 107
10 X 18 TO THE CENTIMETER X 20 CM

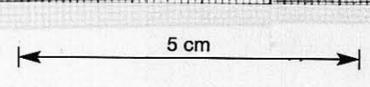
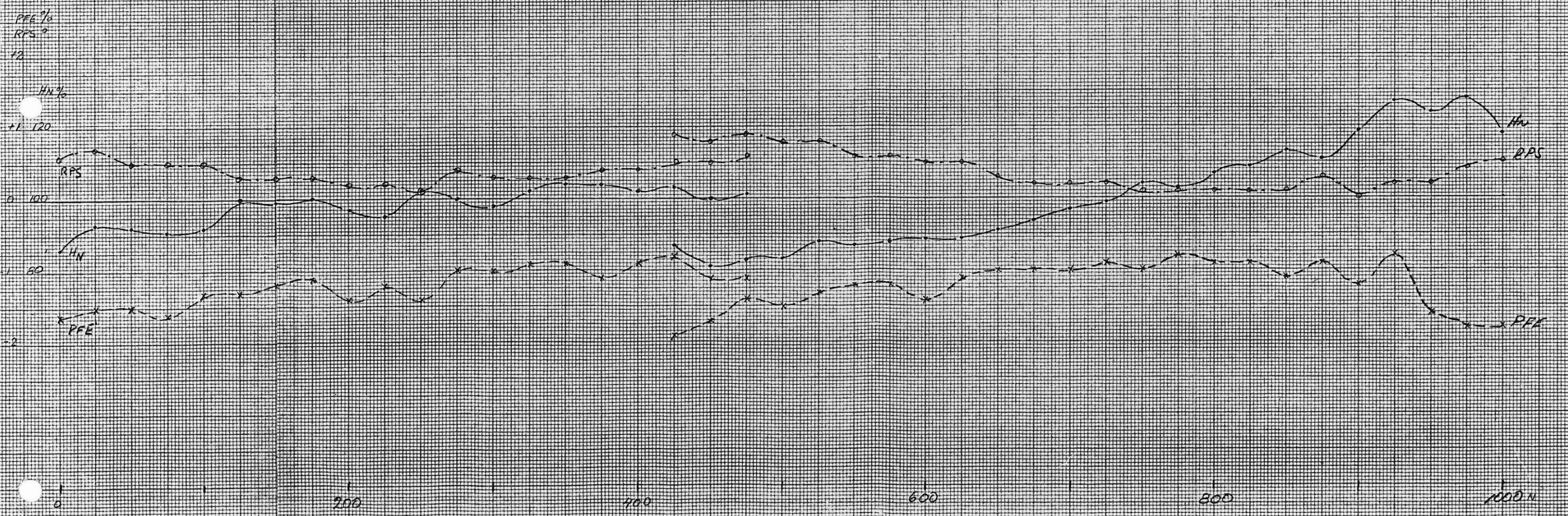
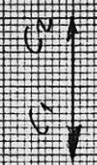
41 1217



Line: 2200E

Job No. TAC 058

DATE 780209



Line: 2500 E

Job No: T-058

Date: 78-02-09

PPR %
RPS %

+2 HN %

+1 120

0 100

-1 80

-2

2
1
0
-1
-2

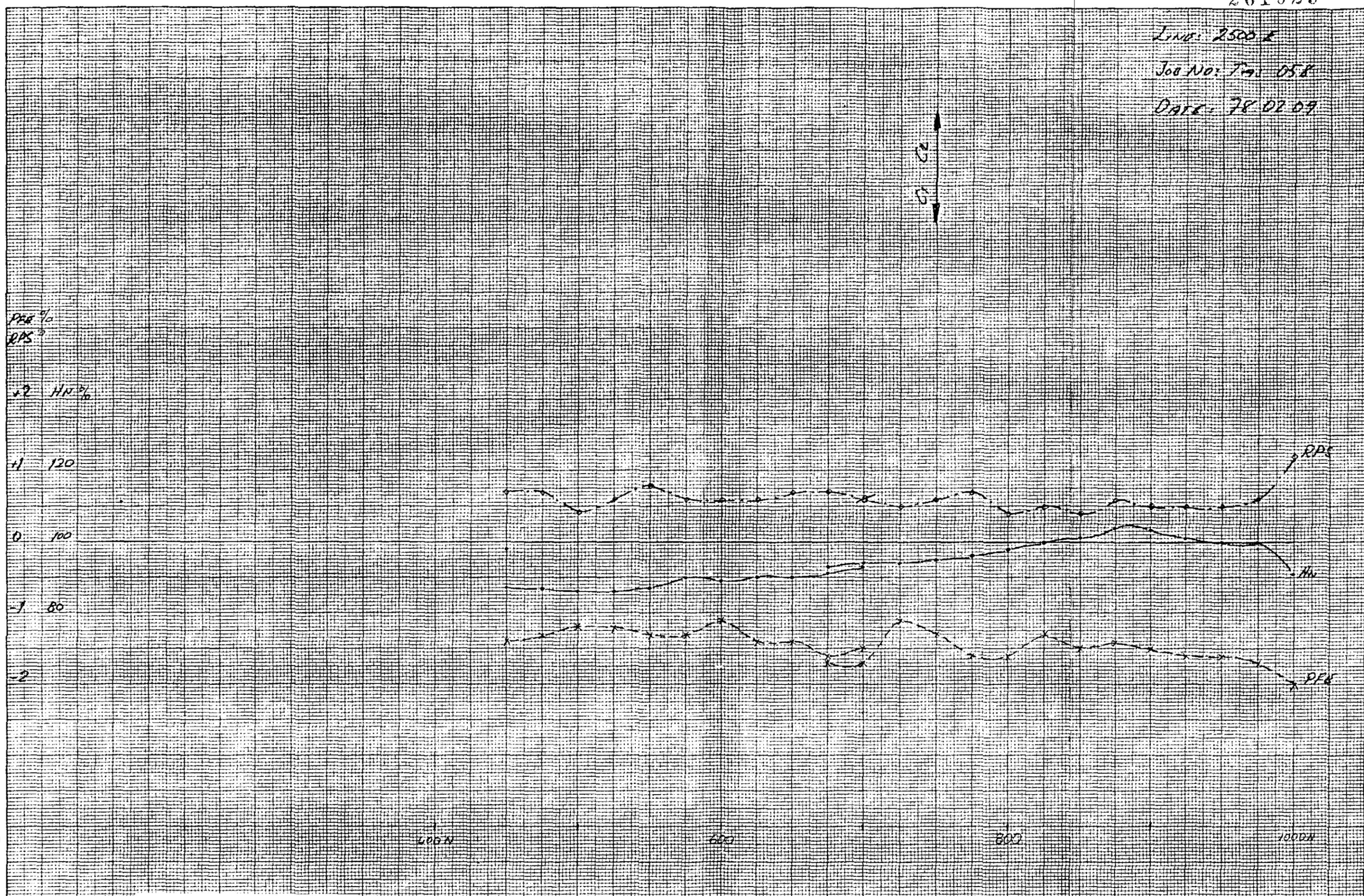
4000

6000

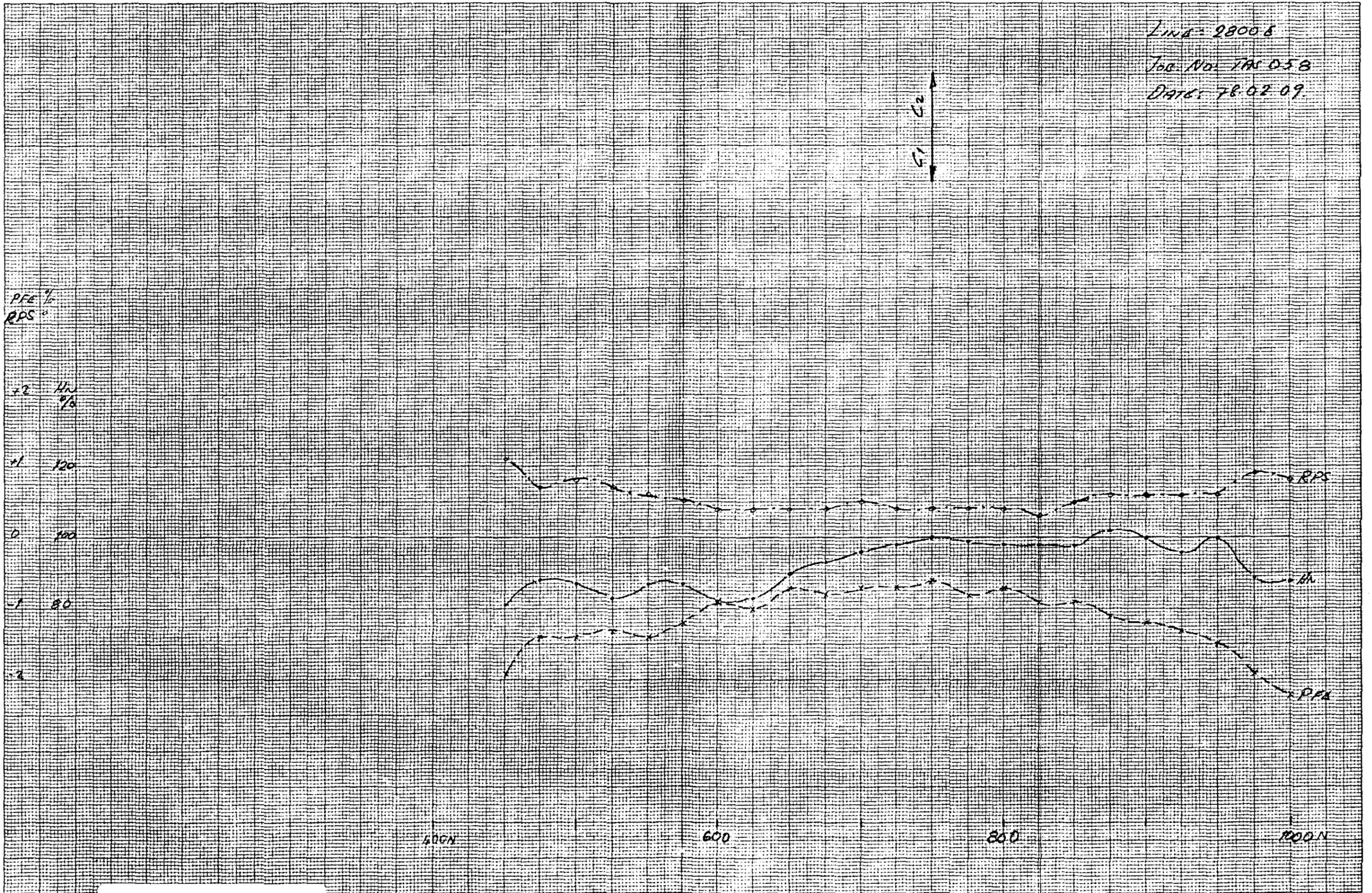
8000

10000

5 cm



LINE: 28008
JOB NO: TA 058
DATE: 78-02-09



K&E
KOHLEN & FESCH
10 X 10 TO THE CENTIMETER 25 X 30 CM

41 1211