

Geological Report - 1 January to 31 December 1972

During the period geochemical and geophysical surveys were carried out in the area, leading to pitting and trenching over the most promising anomalies. This work formed the logical extension of the surveys previously undertaken during the 1971 period.

1. GEOCHEMISTRY

1.1. During 1972, access was gained to the Monymusk Estate, adjacent to the Pitfichie Forest area that was investigated in 1971. Monymusk warranted, and was given, detailed soil sampling on a 1000' by 200' grid pattern; the 1033 samples collected were analysed for total Cu, Ni by the atomic absorption method. A short line of infill soil sampling was used to check the previous results for Cu, Ni, & Mo. (It was largely due to this Monymusk work that expenditure on assays (£1,559) exceeded the amount that had been estimated (£500)).

1.2. At Balquhain a detailed soil sampling and trenching programme with a J.C.B. attempted to pinpoint the source of the molybdenum-bearing float which had previously been located in this area. Profile sampling of trenches was used in conjunction with counts of float types. Although high molybdenum soil values were encountered, the metal source was not located. Further float sampling, trenching and geochemistry is being considered.

2. GEOPHYSICS

2.1. Induced Polarisation

Reconnaissance surveying of the Balquhain area was completed, using Scintrex 25 watt time domain equipment and dipole-dipole arrays. Several anomalous zones were outlined, a number of which were followed up with detailed gradient array surveys, thereby greatly improving anomaly definition. However, subsequent investigations showed that all anomalies appeared to be accounted for by man-made features.

3. SPECIAL PROJECTS

3.1. Soil Research Project

Statistical studies were carried out on the data previously collected, prior to preparation of a final report.

Enclosures

Monymusk Estate

- 1. Soil geochemistry values for Cu & Ni - (NJ613) ✓
- 2. Soil geochemistry values for Cu, Ni, Mo. - (NJ614) ✓

Balquhain

- 3. Apparent resistivity values in ohm metres - (NJ723) ✓
- 4. Apparent chargeability values in milliseconds - (NJ723) ✓
- 5. Apparent resistivity values in ohm metres - detail (NJ723) ✓
- 6. Apparent chargeability values in milliseconds - detail (NJ723) ✓
- ✓ 7. Detailed soil geochemistry values for molybdenum at Balquhain (NJ723)
- ✓ 8. Trenching results from Balquhain - scale 1 : 50 (NJ723)

## KEMNAY DISTRICT - AE17

### Technical Report for the Period 1st January - 31st December, 1973

During the period geochemical surveys together with a programme of pitting were carried out in this district. The data relating to the Soils Research Project were collated and a final report prepared.

#### 1. Geochemistry

##### 1.1. Multi-Element Analyses (Figs. 13-17 Ruthven, Figs. 1-3 Marnoch)

Samples of stream sediment material were collected on the basis of approximately one per square kilometre, prepared to -80 mesh fraction and then analysed for fifteen elements spectrographically:- Bi, Co, Cr, Cu, Pb, Mo, Ni, Ag, Sn, W, V, Zn, Zr, Ti and Mn. All samples were also analysed for arsenic content by atomic absorption methods. The work constituted part of a regional investigation covering much of the western half of E.V.L. Its aim was to check for possible concentrations of unusual elements or to establish the presence of significant pathfinder elements. In the event, none were indicated for the Kemnay District. The relevant plans and data are included under the submission for Ruthven and Morven.

##### 1.2. Molybdenum Follow-up - Balquhain Pitting (Figs. 1-3)

The further define to extent and significance of anomalous molybdenum values in soils located by previous surveys, a programme of pitting and geochemical sampling was carried out near Upper Middleton farm, Balquhain. A series of pits were excavated using a J.C.B. back-hole, and these were profile sampled. Rock samples were collected whenever bedrock was exposed. Soil samples were prepared to -80 mesh and analysed for Cu, Ni & Pb by atomic absorption methods. Analyses for the same samples for Mo were undertaken colorimetrically. The rock samples were analysed spectrographically for 16 elements:- Bi, Co, Cu, Cr, Pb, Mo, Ni, Ag, Sn, V, W, Zn, Zr, Ti, Mn & Be. The rocks were also analysed for Au by atomic absorption. Results are plotted in profile form with only the more significant multi-element values being shown on Fig. 1. The whole of the spectrographic scan values are shown on Fig. 2.

The results of the survey combined with the information obtained during previous investigations suggest that minor molybdenite and possibly powellite mineralisation have given rise to a strong hydromorphic geochemical anomaly in soils immediately south of Upper Middleton farm. It appears to have no economic significance.

#### 2. Soils Research Project

Statistical studies were made on material collected previously. Data were collated and results then written up. These results can be found in the final report submitted in October, 1973, which applies to most E.V.L. areas and time periods, including Kemnay, 1973.

Enclosures

Fig. 1 Trench and Pit Profiles ) Balquhain

Fig. 2 Tabulation of Multi-Element Rock Analyses - Balquhain

Fig. 3 Tabulation of Rock Gold Analyses - Balquhain

(Figs. 13-17 Ruthven and 1-3 Morven also refer)

A 5 17/2

Reference Number:	ppm Bi	ppm Co	ppm Cu	ppm Cr	ppm Pb	ppm Mo	ppm Ni	ppm Ag	ppm Sn	ppm V	ppm W	ppm Zn	% Zr	% Ti	% Mn	ppm Fe
XR35/40	<10	30	100	200	10	3	50	<1	7	150	<50	60	0.02	0.4	0.15	<5
M1/A/R	15	10	85	80	60	30	25	1	20	60	50	130	0.05	0.3	0.1	25
M1/B/R	<10	7	15	70	60	7	15	1	5	25	<50	90	0.03	0.3	0.07	10
M1/C/R	80	20	210	100	60	50	30	4	130	80	400	220	0.06	0.4	0.3	40
M1/D/R	<10	5	50	70	60	20	70	2	10	30	<50	140	0.02	0.2	0.1	60
M1/E/R	<10	<5	7	40	60	5	10	2	20	10	<50	10	<0.01	0.1	0.07	15
M1/F/R	<10	15	45	120	50	30	30	<1	10	180	<50	130	0.05	0.5	0.1	20
M1/G/R	60	10	60	80	40	25	40	4	55	55	300	160	0.04	0.3	0.2	30
M2/A/R	<10	20	50	100	30	40	50	<1	10	110	<50	200	0.08	0.4	0.08	15
M2/B/R	<10	7	40	80	20	15	30	<1	7	50	400	200	0.05	0.3	0.07	15
M2/C/R	80	40	45	100	60	20	60	3	120	160	600	220	0.06	0.4	0.25	10
M2/D/R	<10	10	50	100	30	25	35	<1	10	55	<50	130	0.04	0.3	0.1	20
M2/E/R	<10	7	50	100	25	50	20	<1	15	50	<50	90	0.06	0.4	0.1	30
M3/C/R	20	15	65	80	30	20	30	<1	10	50	50	220	0.04	0.3	0.07	10
M3/D/R	<10	10	35	80	20	10	20	<1	10	40	<50	90	0.06	0.3	0.08	20
M3/E/R	<10	7	65	80	30	15	20	<1	40	50	70	400	0.02	0.3	0.1	20
T1/1/R	<10	20	50	100	80	20	40	<1	25	75	100	150	0.06	0.4	0.15	20
T1/2/R	<10	5	90	100	30	40	25	<1	25	80	<50	70	0.1	0.4	0.07	20
T1/3/R	<10	<5	70	70	100	15	15	4	60	30	<50	50	0.06	0.2	0.1	15
T1/4/R	10	10	95	100	60	45	25	<1	70	80	100	250	0.04	0.4	0.15	30
T1/5/R	30	7	65	80	50	20	30	<1	30	70	100	180	0.08	0.4	0.1	30
T1/6/R	10	5	25	80	20	4	25	<1	7	30	<50	70	0.05	0.3	0.1	5
T1/7/R	<10	10	50	80	60	8	20	<1	10	40	<50	100	0.05	0.4	0.08	40
T1/8/R	<10	15	100	100	30	40	40	<1	10	50	<50	160	0.02	0.4	0.07	20
T1/9/R	<10	<5	40	70	60	5	40	<1	5	20	<50	110	0.1	0.3	0.1	5
T1/10/F	70	7	65	100	70	10	30	4	50	25	70	240	0.06	0.3	0.1	25
T1/11/F	<10	10	50	120	30	25	40	<1	5	100	<50	140	0.07	0.4	0.07	<5
T1/12/F	20	20	80	100	20	12	20	<1	10	40	<50	130	0.06	0.4	0.08	15
T1/13/F	<10	7	45	60	100	10	30	<1	15	20	<50	70	0.06	0.3	0.1	20
T1/14/F	<10	7	70	80	50	5	20	2	15	50	<50	90	0.04	0.4	0.1	25
T1/15/F	<10	5	65	80	30	4	30	<1	7	10	<50	80	0.3	0.3	0.08	7
T2/1/R	<10	20	40	120	20	20	70	<1	90	100	300	160	0.03	0.4	0.5	15
T2/2/R	10	15	80	120	130	50	50	2	60	60	<50	140	0.07	0.4	0.15	20
T2/3/R	100	5	45	50	600	100	10	15	110	<10	50	40	0.01	0.2	0.2	15
T2/4/R	<10	5	75	70	40	30	40	2	30	30	50	220	0.03	0.3	0.1	10
T2/5/R	<10	10	65	250	25	25	40	<1	10	180	<50	250	0.08	0.5	0.15	20
T2/6/R	<10	5	45	80	30	15	10	<1	5	40	<50	80	0.06	0.4	0.08	15
T2/7/R	100	10	40	100	40	25	20	<1	10	40	<50	60	0.02	0.3	0.07	10
T2/8/R	<10	30	120	150	20	120	80	<1	7	140	100	150	0.04	0.4	0.2	7
T2/9/R	<10	15	60	80	30	10	40	<1	10	40	100	230	0.07	0.4	0.08	15

Reference Number	ppm Bi	ppm Co	ppm Cu	ppm Cr	ppm Pb	ppm Mo	ppm Ni	ppm Ag	ppm Sn	ppm V	ppm W	ppm Zn	% Zr	% Ti	% Mn	ppm Fe
T3/2/R	20	20	75	80	30	130	30	<1	5	60	<50	150	0.07	0.4	0.1	10
T3/3/R	<10	5	30	70	30	12	40	<1	5	30	<50	70	0.15	0.4	0.06	20
T3/4/R	10	<10	40	60	100	35	10	3	65	30	<50	60	0.05	0.4	0.1	15
T3/5/R	<10	15	85	150	20	90	60	<1	10	80	<50	150	0.08	0.5	0.1	30
T3/6/R	<10	10	60	100	25	10	40	<1	5	50	<50	130	0.06	0.4	0.07	10
T3/7/R	<10	20	45	120	20	25	70	<1	5	60	<50	60	0.2	m	0.1	5
T3/8/R	<10	15	70	100	20	30	50	<1	7	70	<50	100	0.08	0.5	0.1	15
T3/9/R	<10	5	40	50	20	15	15	<1	10	15	<50	50	0.02	0.3	0.07	10
T3/10/R	15	15	45	80	20	15	40	<1	<5	40	<50	100	0.06	0.4	0.08	20
T3/11/R	<10	<5	35	40	140	30	10	2	20	15	<50	60	0.04	0.3	0.15	15
T3/12/R	60	20	120	100	90	70	50	2	100	80	400	250	0.04	0.4	0.3	30
T4/1/R	<10	10	25	100	20	70	40	<1	15	80	50	130	0.03	0.4	0.1	15
T4/2/R	<10	20	20	150	20	200	50	<1	25	200	50	80	0.06	0.5	0.2	15
T4/3/R	<10	20	30	130	10	3	40	<1	<5	250	<50	65	0.04	m	0.1	<5
T4/4/R	<10	25	15	130	<10	<2	30	<1	<5	150	<50	25	0.01	0.5	0.2	<5
T4/5/R	<10	25	20	120	20	2	40	<1	<5	150	<50	25	0.01	0.5	0.1	<5
T4/6/R	<10	30	20	170	<10	3	40	<1	<5	200	<50	50	0.02	m	0.2	<5
T4/7/R	<10	20	20	150	40	2	50	1	7	80	<50	30	0.04	0.4	0.1	<5

<u>SAMPLE NO</u>	<u>Au ppm</u>
T1/1/R	<0.01
2/R	<0.01
3/R	<0.01
4/R	<0.01
5/R	<0.01
6/R	<0.01
7/R	<0.01
8/R	<0.01
9/R	<0.01
10/R	<0.01
11/R	<0.01
12/R	<0.01
13/R	<0.01
14/R	<0.01
15/R	<0.01
T2/1/R	<0.01
2/R	<0.01
3/R	<0.01
4/R	<0.01
5/R	<0.01
6/R	<0.01
7/R	<0.01
8/R	<0.01
T3/1/R	<0.01
2/R	<0.01
3/R	<0.01
4/R	<0.01
5/R	<0.01
6/R	<0.01
7/R	<0.01
8/R	<0.01
9/R	<0.01
10/R	<0.01
11/R	<0.01
12/R	<0.01
T4/1/R	0.01
2/R	0.02
3/R	0.01
4/R	<0.01
5/R	0.01
6/R	<0.01
7/R	<0.01
8/R	<0.01

<u>SAMPLE NO</u>	<u>Au ppm</u>
M1/A/R	<0.01
B/R	<0.01
C/R	0.01
D/R	0.01
E/R	<0.01
F/R	<0.01
G/R	<0.01
M2/A/R	<0.01
B/R	<0.01
C/R	0.01
D/R	0.01
E/R	<0.01
M3/C/R	<0.01
D/R	<0.01
E/R	<0.01

SCAN RESULTS TO FOLLOW

FINANCIAL ASSISTANCE FOR MINERAL EXPLORATION (M.E.I.G.A.)

COMPANY: EXPLORATION VENTURES LTD

REF: AE 17

MRD 84/5/12

PROJECT: KEMNAY

MRD 144/5/12

The following Open File material is held by B.G.S. in London, Keyworth and Edinburgh. Available for public inspection from 16.10.80.

- Extract from application 6.8.71 "outline of proposed project .... geological considerations .... work programme ...." with accompanying plan, 1" : 4 miles, OS sheet 5.
- Geological report 9th August to 31st December 1971, with 6 enclosures all 6" : 1 mile. (Submitted with form MEG 1, 6.8.71)
  1. Geological float and outcrop map NJ72SW, November 1971
  2. (+ neg) soil geochemical values, Cu, Ni, Mo, NJ61NW+NE, November 1971
  3. (+ neg) soil geochemical values, Cu, Ni, Mo, NJ62,SW+SE, December 1971
  4. Soil geochemical values, Cu, Ni, Mo, NJ72SW September 1971
  5. \*Apparent chargeability NJ72SW December 1971
  6. \*Apparent resistivity NJ72SW December 1971
- Technical report 1st January - 31st December 1973 excluding expenditure. (Submitted with MEG1, 2nd March 1973) with the following enclosures:
  1. Trench and pit profiles Cu, Ni, Pb, Mo, NJ722S+7322 (refers to 1:2,500 location plan) scale 1:250 horizontal, 1:50 vertical, April 1974
  2. Tabulation of multi-element rock analyses
  3. Tabulation of rock gold analyses
- Geological report 1st January to 31st December 1972 (submitted with MEG1, 6th January 1972) with 8 enclosures
  1. Soil geochemistry values Cu, Ni, Mo, NJ61S, 1:10,560 July, September, October 1971. Balquahain
  2. Soil geochemistry values Cu, Ni, Mo, NJ61N, 1:10,560 1971. PITFITCHIE
  3. Resistivity NJ72S January 1972, 1:10,560
  4. Chargeability " " " "

. . . . (continued)

5. \* Resistivity NJ7223 February 1972 1 : 2,500
  6. Chargeability " " " "
  7. Detailed soil geochemistry Mo values. NJ7223 1 : 2,500,  
March 1972
  8. Trenching at Balquhain (section) NJ72S 1 : 50, May 1972
- \* Letter from EVL 26th October 1973, RE "special projects"
  - ELV soil research project, summary of results
  - ELV summary of metallurgical testworks. April 1971 to February 1973

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\* Not at Keyworth

AE 17 is related to AE 22



MINERAL EXPLORATION INCENTIVE SCHEME

APPLICATION  
for assistance

1. Applicant Exploration Ventures Limited  
Address 49 Moorgate, London EC2R 6BQ  
Telephone No. 01-606-1020  
Contact Mr. R.B. Riley or Mr. M.J. Lynch
  
2. Project title Kemnay
  
3. Applicants' organisation & financial structure  
Please see this Company's letter dated 6th August, 1971.
  
4. Outline of proposed project, including geological considerations (see plan attached)  
This area includes the Bennahie granite south of the Inch Ness. It is a distinctive environment and will be prospected primarily for molybdenum, wolfram and tin. There is a strong magnetic lineament cutting across the granite and an aeromagnetic high in the Pitfichie Forest. This could be caused by basic rocks in which case Cu and Ni will also be sought.
  
5. Work programme and costs of project  
Already reconnaissance stream sediment geochemistry has revealed several strong anomalous Mo values. These have been followed up by further stream geochemistry and a limited amount of soil sampling, which indicated Cu and Mo values significantly above threshold in the Balquhain area. The forward programme includes further soil geochemistry to better define this anomaly. Induced polarisation in conjunction with intensive geological investigation will test the significance. Ground magnetic's and induced polarisation will also be done over the aeromagnetic high in the Pitfichie Forest.

Application for contributions under the Mineral  
Exploration and Investment Grants Act 1972

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Geological Report : Kemnay AE17

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During the period 9th August to 31st December, 1971, geological, geochemical and geophysical surveys were carried out.

(i) Geology

Float and outcrop mapping was conducted over areas of high molybdenum soil values in the Balquhain area. The work confirmed the presence of Mo-bearing float at Middleton Farm and concentrations of quartz vein material over most Mo anomalies.

(ii) Geochemistry

Systematic soil sampling covered parts of the Pitifichie, Balquhain and Kemnay areas. Samples were analysed for copper, nickel and also molybdenum in areas of suspected acid rocks. Results received indicate only background values for Cu and Ni with occasional sporadic highs for Mo.

(iii) Geophysics

Reconnaissance dipole-dipole traversing using Scintrex 25 watt time domain equipment covered the molybdenum geochemical anomaly at Balquhain. Several zones of moderate chargeability values were outlined over the area of general interest.

Enclosures

1. Geological float and outcrop map - Balquhain (NJ72SW)
2. Geochemical soil values for Cu, Ni & Mo p.p.m. - Pitifichie Forest (NJ61N)
3. Geochemical soil values for Cu, Ni, Mo in p.p.m. - Balquhain (NJ62S)
4. Geochemical soil values for Cu, Ni & Mo in p.p.m.- Balquhain (NJ72SW)
5. Apparent chargeability values in milliseconds - Balquhain (NJ72SW)
6. Apparent resistivity in ohm metres - Balquhain (NJ72SW)

MEIGA FOLLOW UP      ABERDEENSHIRE MOLYBDENUM

EVL KEMNAY PROJECT AE17      CHAPEL OF GARIOCH AREA

RECONNAISSANCE VISIT JUNE 29-JULY 3 1981

T. Colman      Project 66  
M. Shaw      Project 63

Following a review of EVL data held at Keyworth and Mick McCormac's interest in the area prior to his transfer to Edinburgh a reconnaissance visit was arranged with the following objectives:-

1. To obtain access from landowners.
2. To take additional water samples for fluoride analysis.
3. To obtain samples of the molybdenum mineralisation investigated by EVL.
4. To observe the local drainage pattern.
5. To test overburden depth by Cobra drilling.

All these objectives were achieved in  $2\frac{1}{2}$  days.

Access - No problems were encountered with access. All landowners were most cooperative and M. Shaw has drawn up an ownership plan.

Water sampling - About 24 additional water samples were taken by M. Shaw. Fluoride levels were again high with up to 1.7 ppm. These form part of the 63 project.

Molybdenum mineralisation - About 4 km of wall were prospected and 4 areas of molybdenite mineralised boulders found as shown on the enclosed plan 1. The mineralisation is always associated with greisen blocks, mostly with coarse grained (2 cm), white quartz veins up to 10 cm wide (seen). The greisen extends up to 10 cm (seen) from the quartz veining. One sample CGR 13 shows molybdenite within greisen quartz feldspar porphyry - the only sample which shows recognisable wall rock.

2 styles of molybdenite are present a) scattered coarser grained rosettes up to 3 mm across generally associated with the margins of the coarse grained quartz veins, and b) much finer grained disseminations and veinlets associated with finer grained quartz and greisen. Some of these samples could contain over 1%  $\text{MoS}_2$ .

Some yellow molybdate? minerals were associated with the disseminated molybdenite. One sample CGR5 showed a quartz vein with purple fluorite and the greisen contains muscovite and possibly other micas but no other economic minerals were seen.

Prospecting has proved valuable in relocating a mineralised area and providing samples of the mineralisation. It has also extended the EVL area about 1 km to the west across a watershed to the Hill of Whitecross - albeit on only one sample CGR13 - but this has provided a source for the strong Mo soil anomaly near Mains of Balquhain which is almost certainly hydromorphic but could not have come from the Strathnatterick Burn drainage.

More prospecting is warranted in the area to close off the greisen areas and determine if more molybdenite is present.

Drainage - The area is undulating with low rounded hills up to 240 m at Knockinglaws. Drainage patterns are shown on the enclosed plan 2.

The anomaly at Mains of Balquhain, of hydromorphic which seems likely in view of the flat, poorly drained ground, must have received its Mo from the Hill of Whitecross area, an idea supported by the discovery of one greisenized molybdenite bearing rock CGR13.

Overburden - The anomalous area at Mains of Balquhain and the valley of Strathnatterick Burn, south of Hill of Blairboure were tested with the Cobra drill. Maximum depth attained was  $3\frac{1}{2}$  m and it seems likely that most of the area will have less soil depth than this with the possible exception of the Mains of Balquhain area which could conceal a former watercourse with greater thickness of overburden.

T. Colman

17 July, 1981

Nether-ton  
of Bulquhain

Gravel Pit  
mostly sch.  
C.G. gran.  
v. h. l. qz.

Muddiel

Dubston

Alton

Neubigging

Woodhill

Easter  
Aqahorthies

Poline  
Dam

Spring  
Nessoci

Braeside  
Dam

Alton Farm  
Dam

Hill of Manar

22

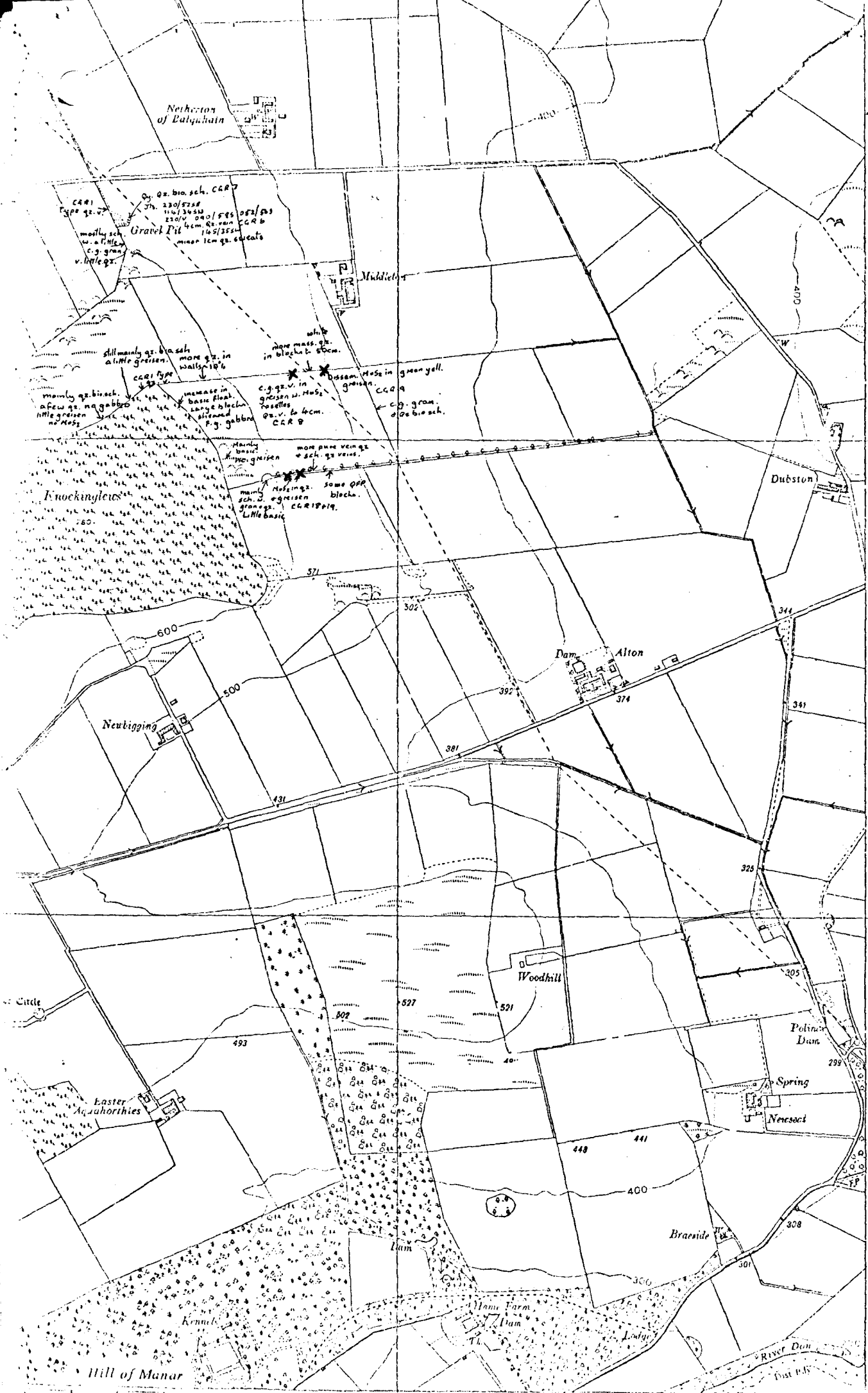
LAT  
57° 17'

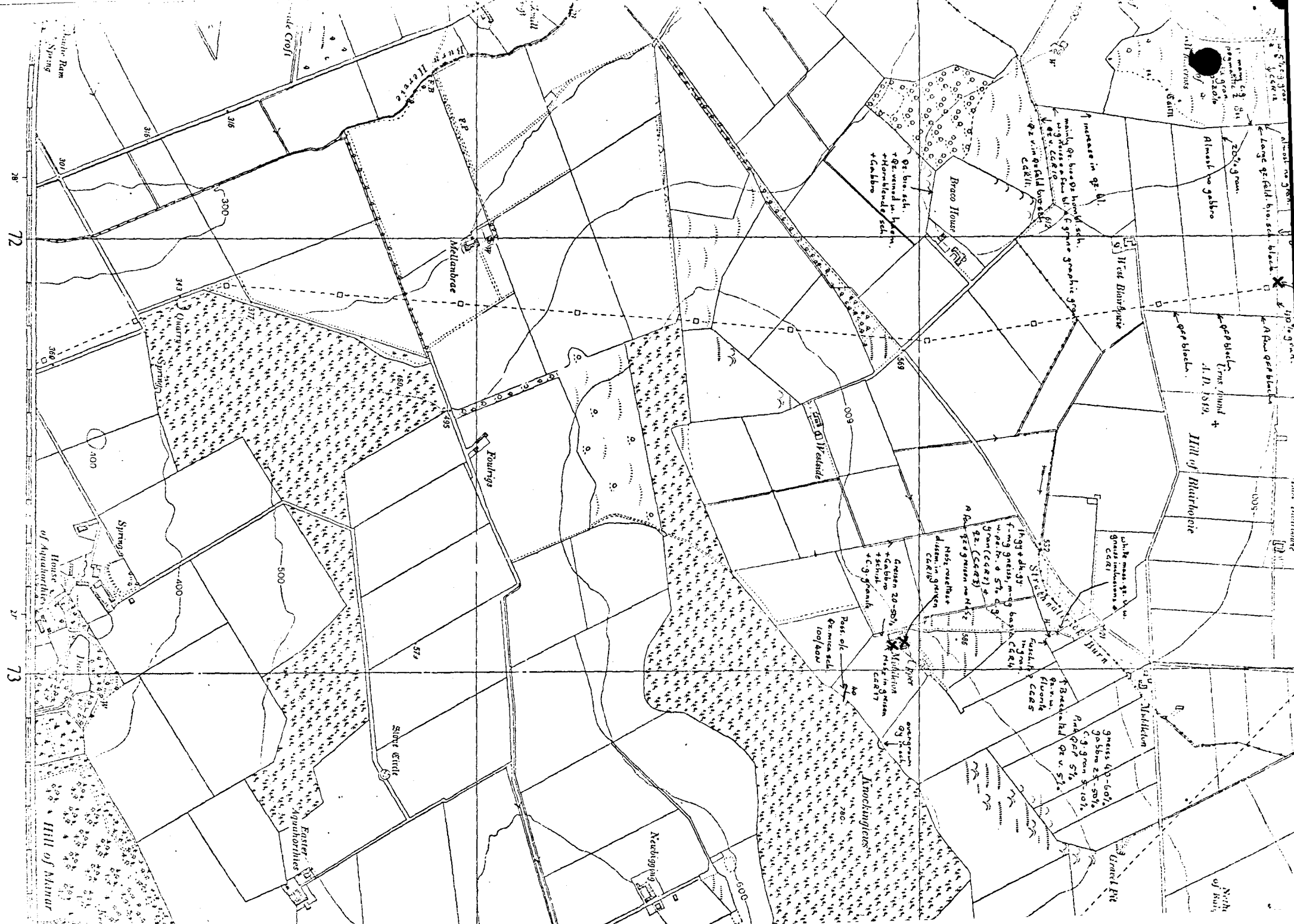
21

10 Metres

20000

Furlongs 8





20' g. m.  
Almost no gabbro

increase in qt. bl.  
mainly Qt. bio. sch. hornbl. sch.  
+ gabbro + some of gneiss  
+ Qt. sch. + some gabbro  
+ Qt. sch. + some gabbro

Qt. bio. sch.  
+ Qt. hornbl. sch.  
+ Hornblende sch.  
+ Gabbro

Braco House

West Blauhoop

A few gabbro  
Qtz. sch. +  
gabbro  
J. D. 1850

Hill of Blauhoop

white mass of  
gneiss inclusions  
of  
Gabbro

fine gr. dk. g.  
fine gr. gneiss, m. g. gabbro  
w. Qt. sch. + 5% g.  
gran. (C&G) =  
Qt. sch. + gneiss m. H. 5%  
dissem. in gneiss  
C&G

gneiss 20-50%  
+ Gabbro  
+ schist  
+ Qt. g. granite

Rest of  
Qtz. mica sch.  
lool. low

Knockington

gneiss 40-60%  
gabbro 2-5%  
Qt. g. m. 5-10%  
R. g. Qt. 5%  
or w. 5%

Knockington

Knockington

Knockington

26 72

27 73

Spring Dam

Spring

Spring

Spring

Spring

Spring

Hill of Maar

Hill of Maar

Hill of Maar

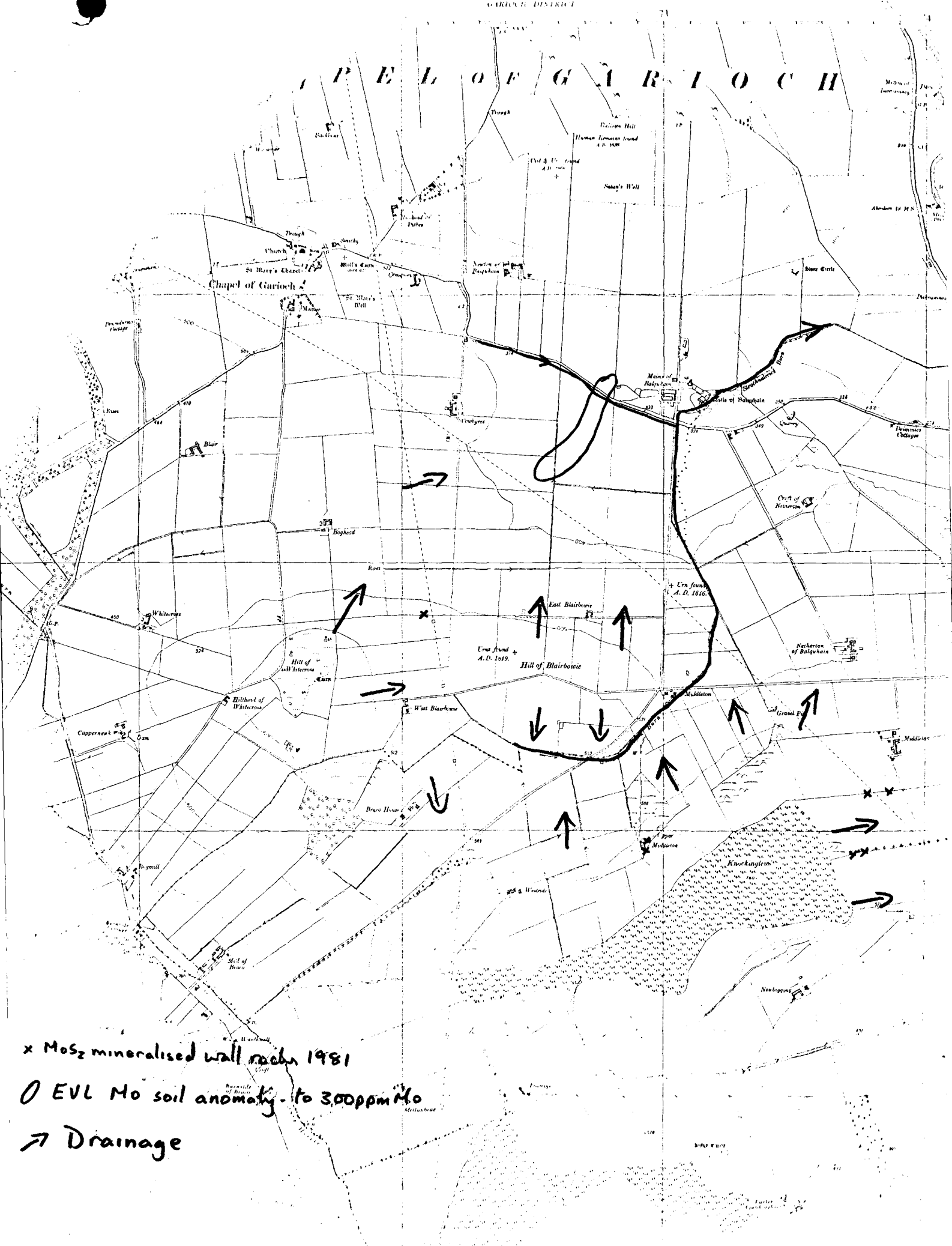
Hill of Maar

Hill of Maar

Plan 2.

ARREKELINSHIRI  
GEN. ARREKELINSHIRI CO. CONST.  
GARROCH DISTRICT

# P E L O F G A R R O C H



x  $MoS_2$  mineralised wall rocks 1981  
o EVL Mo soil anomaly - to 300ppm Mo  
→ Drainage

Added to MEIRA file AE/7 (14)  
from London IAS office files KEMNAY PROJECT  
July 2022 Tim Colman.

WORK DONE  
PRE -1971.

EXPLORATION VENTURES LIMITED

A REPORT ON EXPLORATION FOR  
MOLYBDENUM IN EAST ABERDEENSHIRE

MARCH 1973



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## SUMMARY AND GENERAL CONCLUSIONS

Reported molybdenum toxicity affecting cattle in the Ellon area led to the discovery that metal appeared to be related to a sulphide source which made the company aware that the North East might have Mo potential in addition to copper and nickel. During the course of exploration in Aberdeenshire further Molybdenum occurrences were discovered which point to there have been a phase or phases of relative molybdenum enrichment in certain areas. Despite detailed investigations no obvious economic potential has been indicated and in all cases a weakly mineralised source of no great significance can explain the presence of molybdenum. Typically the sort of occurrence which might give rise to anomalies developed at Balquhindachy, Quiquox and Balquhain is seen on the coast at Souter Head south of Aberdeen. Here a thin quartz vein mostly barren but containing sporadic molybdenite mineralisation cuts through brecciated metamorphics. If this is the case in the above areas further work is unlikely to yield anything of promise.

## 1. BACKGROUND INFORMATION

In a section devoted to trace elements published in the 1963 Macaulay Institute Memoir on "Soils Round Aberdeen, Inverurie and Fraserburgh" reference is made to molybdenum toxicity affecting cattle:- "In the soils examined, the highest total Mo contents of 20-30 ppm, occur in soils of the Foudland and Tarves Associations (soil classification based on till parentage) in the Ythan Valley. Several instances of Black Scour in cattle attributable to excess molybdenum occur here on localised areas of poorly drained soils that have probably been influenced by organic matter accumulation. In such areas ammonium acetate extractable molybdenum in the surface horizons may rise to nearly 1 ppm. and clover in pasture herbage may contain more than 50 ppm."

The writer visited the Institute in mid November 1967 to find out more about the 'anomalous' areas. Two localities were mentioned viz. Balquhindachy and Quilquox (see figure 1). It was stressed that excess metals were confined to areas of poorly drained soils i.e. wet peaty gleys and peat which are generally developed in hollows. No comment was made on provenance of metal and apparently the copper content in the soils of these areas was well in the background range (less than 30ppm) giving rise to copper deficiency. The Mo excess in herbage, due to the lack of copper, upsets the animal's metabolism causing Black Scour (diarrhoea) which if left untreated leads to eventual death. Apparently before the condition (this in Somerset is referred to as the Teart Condition) had been diagnosed cows had died in the immediate post 2nd world war period at Balquhindachy and sheep were said to have died at Quilquox. In both areas the Institute had been called in by farmers to diagnose cause of the trouble. It has been found that the average normal content in soils is around 0.3 ppm., where this rises in excess of 0.6 ppm. problems with cattle may be experienced. In such areas timing of soils can make things worse as it leads to an increased concentration of Mo in the herbage. In order to combat the 'Mo-poisoning', cattle are generally dosed with copper.

The anomalous areas were check sampled by the writer in November 1967 and revealed Molybdenum values ranging from 3 to 30 ppm.; ensuing surveys (1968 onwards) indicated that the metal appeared to be originating from molybdenite-bearing vein quartz. During the course of the exploration programme in Aberdeenshire, Riofinex became aware of the presence of other occurrences of molybdenum (fig. 1.) at (i) Balquhain west of Inverurie following a visit to a mineralised locality mentioned in a Geological Survey memoir (ii) Kinmundy discovered during the course of float mapping. (iii) Rathen from analysis of soils over a magnetic target and (iv) A thin molybdenite - bearing quartz vein at Souter Head on the coast south of Aberdeen located by a research student at Aberdeen University during the course of geological mapping.

## 2. BALQUHINDACHY- QUILLOUX

### (i) LAND OWNERSHIP

In order to permit ground surveys in these areas short term exploration missives were initially negotiated with landowners; eventually these were replaced

by mineral agreements. The present state of land acquisition is shown on figure 2.

(ii) GEOLOGY

Geologically the Balquhindachy area is underlain by metamorphics (andalusite schists and associated rocks) whereas the Quilquox area encompasses part of the Haddo gabbro/norite complex and adjacent metamorphic country rocks. Both areas are drift covered and outcrops are scarce, but mapping of float in walls gives a reasonable guide as to the probable range of bedrock types present. The aeromagnetic map (figure 3.) reveals no marked trends in the Balquhindachy region as distinct from the high gradients and positive closures arising from basic rocks and related types in and about the Quilquox region. The strong anomaly north-east of Balquhindachy is related to the southern part of the Maud basic complex and the linear anomalies present in the north west corner plus the south west corner of the sheet are due to dolerite dykes.

(iii) SURVEYS

Geochemical, geophysical and geological surveys have been completed in both areas.

a. Geochemical soil sampling has defined weak, somewhat patchy molybdenum anomalies in both areas (figure 4) with non significant amounts of copper (and nickel). At Quilquox some of the higher values do coincide with poorly drained soils and this applies to a certain extent at Balquhindachy, but in both areas anomalies are also present in reasonably well drained areas. Whilst most of the stream anomalies tie in with the known anomalous soil areas (compare figures 4 and 5) it would appear as though sources of metal are present outwith of the areas soil sampled, witness the anomalies in parts of the Cessnae Burn and tributaries, though some of the metal in these probably originates from soil anomalies east of Balquhindachy and west of Quilquox that have not been closed off. Soil samples from two short lines in each area have been tested for Arsenic and those samples with values containing 5 ppm. and above were analysed for Gold. (see figures 6 & 7). Gold values range from approx. .03 to .30 ppm. (1.4 ppm. = 1 dwt) with the highest value occurring at Balquhindachy. As and Au 'highs' correlate with highest molybdenum values.

b. Geophysics. Induced polarisation surveys were carried out at Balquhindachy and Quilquox to determine whether any conductors coincided with the soil anomalies. The extent of IP surveys in this region are shown on figure 3. Other than responses related to man-made conductors, no significant anomalies which might reflect the presence of sulphide concentration were detected. It should be noted that whilst the survey at Quilquox was aimed at assessing the molybdenum area, it was also intended to evaluate the potential of the basic rocks. (Details of both surveys are given in a report by Beckman of RioCanex dated July 1969).

c. Geology Apart from dominant schist float patterns developed at Balquhindachy and basic float at Quilquox there is a large amount of white vuggy vein quartz. This is spread over a fairly large area, vide figure 5, and in walls of fields outwith of the arbitrary outer boundary one generally finds a few blocks. Vein quartz float is noticeably very abundant in walls around Quilquox and in a zone stretching south and east of Balquhindachy, areas where

molybdenum soil anomalies have been delimited (compare figures 4 & 5) During the course of float mapping a few mineralised blocks were discovered in each area comprising some with pyrite, a few with specks of galena and sphalerite + pyrite and several weakly mineralised with molybdenite which was confined to hair thin microfractures. Several samples of the molybdenite-bearing float were assayed and showed values ranging from 200 to 1500 ppm. Mo. and from 0.4 to 1 dwt of gold. Overall the bulk of vein quartz float in the region appears to be barren.

(iv) CONCLUSIONS On the basis of float it is apparent that an unknown number of quartz veins have been injected into the region and possibly cut both basic and metamorphic rock types. Nothing is known about the frequency distribution, precise location, width or orientation of these but survey results have shown that at least one system appears to be weakly mineralised. The widespread distribution of vein quartz float may reflect a large number of veins but in the same way that 'a little blood goes a long way' it is conceivable that only a few are present, the debris of which has been strewn over a wide area by fluvio-glacial transport mechanisms.

No conclusive proof is available to show that there is no economic Mo/Au potential but it is considered that the evidence to hand suggests the presence of weak, insignificant mineralisation with no obvious potential. If further evaluation is thought to be necessary it is suggested that further geochemical work be undertaken to close off the soil anomalies followed by pitting on the highest value closures outwith of the poorly drained areas in an attempt to locate the source and determine nature, extent etc. of mineralisation. It is conceivable that some detailed resistivity work may be of assistance plus possibly shallow-hole drilling at a final stage using the university rig on selected targets. One area where it may be possible to gain further information on the nature of mineralisation relatively easily is situated 1 mile east of Balquindachy farm (figure 4) on the linear anomaly peaking above 20 ppm. (which is not closed off to the south east). This occurs where bedrock is probably close to surface, but any work in this area would require acquisition of short term exploration missives.

### 3 RATHEN (see figure 1 for location)

Geochemical and geophysical work in the area was aimed at assessing an anomalous magnetic closure thought to relate to a small basic body. There is a sizeable quarry exposure in siliceous grit north of the magnetic zone, and float in the area is mostly of metamorphic types interspersed with a few basic blocks and some rusty vein quartz containing pyrite. It was the presence of the latter which led to soil samples being tested for molybdenum since initially only copper and nickel was run. As can be seen from figure 8 a rather irregular-shaped molybdenum anomaly has been defined with values ranging from 5 to 50 ppm. On the northernmost closure, samples running 35, 49 and 16 ppm., molybdenum contained respectively 146, 260 and 82 ppm. copper, whilst all the rest had this metal in the background range. An IP

survey to test the magnetic anomaly failed to locate any significant conductor. A weak response was located but appeared to be manmade.

The cause of the molybdenum anomaly is uncertain but from the few blocks of vein material present a similar source to that proposed at Balquhindachy-Quilquox is considered likely. No further work is recommended in this area.

#### 4. KINMUNDY (see figure 1 for location)

This area borders on an intense magnetic anomaly in part related to magnetite-bearing granite but also in part thought to be due to basics. Most of the area in question appears to be underlain by relatively unaltered undisturbed granite as shown by float and outcrop. The presence of molybdenite-bearing float was discovered during the course of geological mapping and a number of granite blocks were located containing this mineral as joint coatings and associated with minor quartz/mica filled fractures. In some samples a few specks of chalcopyrite were also noted. A detailed geochemical soil sampling programme revealed the presence of several separate molybdenum anomalies with coincident weak anomalous copper values (vide figures 9 and 10). Geophysical surveys (magnetics and IP) failed to indicate any worthwhile target but in order to fully assess the area a pitting programme was carried out on the main geochemically anomalous closures. No mineralisation was located in bedrock and it was finally concluded that the area had no obvious mineral potential. The geochemical zones could be explained away by weak, sporadic sulphide mineralisation in the granite of no economic significance.

#### 5. INVERURIE (see figure 1 for location)

In an old geological survey memoir mention was made of a discovery of molybdenite mineralisation on Balquhain farm just west of Inverurie. Following a visit there by the writer a block of vein quartz containing fairly abundant molybdenite plus Mo-oxide was located and the area (which appeared to be mostly underlain by metamorphics) was considered to be sufficiently interesting to merit further investigations. Prior to the area being ceded to Goldfields soil sampling by Riofinex revealed patchy but encouraging amounts of molybdenum in soils which justified further work. (see figure 11) This in due course was covered by Goldfields and additional mineralised float was discovered within a fairly extensive Mo-anomalous soil area. IP failed to locate any conductor and pitting carried out on the geochemical zones failed to reveal a source. It seems likely that the geochemical anomalous centres could be displaced hydromorphically from the source (communication from G. Riddler CGF). The mineralised float is mostly quartz with rosettes and blades of molybdenite. One grab sample assayed 0.35 Mo with 4 dwt. of Au. Goldfields have not finalised an assessment on this area and propose doing further work but are not optimistic over its potential.

## 6. OTHER AREAS

A stream reconnaissance survey over an area of granite south west of Aberdeen (Cairn-mon-earn) revealed a number of Mo anomalies in streams. Follow-up work failed to give any encouragement and it was concluded that the metal either originated from weak, insignificant mineralisation in the granite or a high trace metal content.

On the coast 3 miles south east of Aberdeen city centre at Souter Head (OS grid reference 962018) a research student from the Geology Department of Aberdeen University located a molybdenite-bearing quartz vein during the course of mapping. This has a general N-S strike and ranges in width from 1' up to 2'. It cuts a zone of brecciated schist flanking a granite intrusion. Sporadic finely disseminated mineralisation has been located in the quartz vein and traces have been noted in part of the breccia. Mostly the vein appears to be barren.

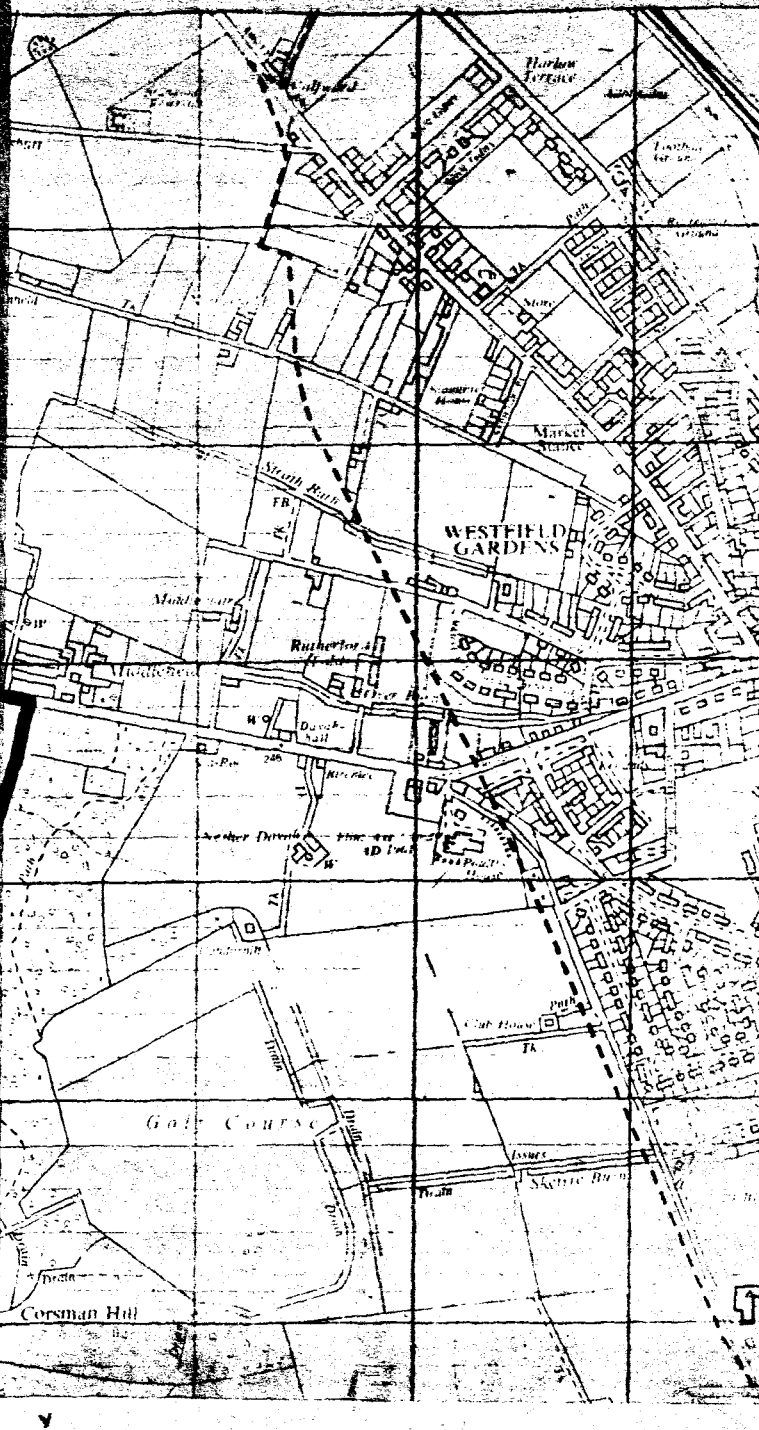
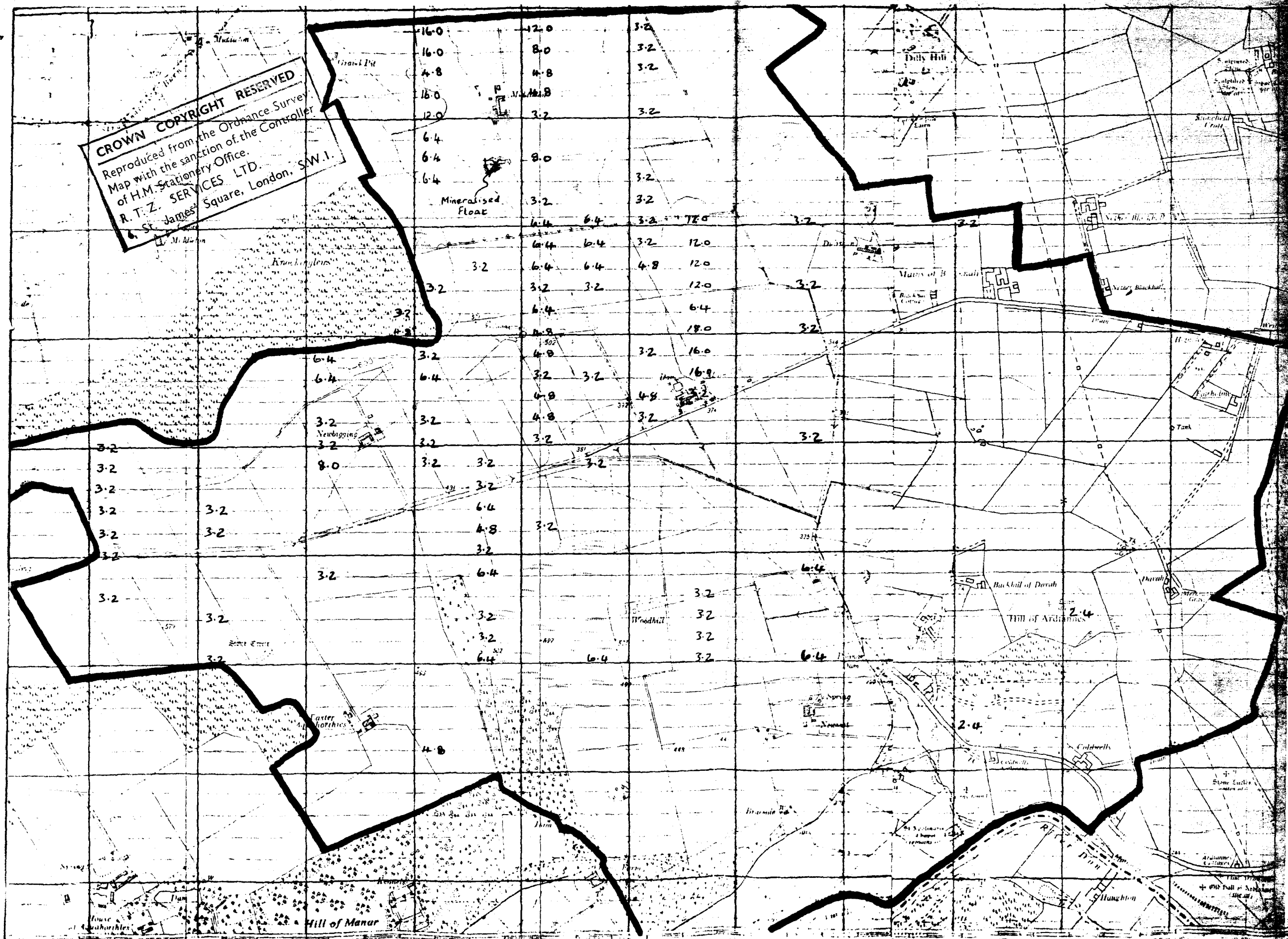
In Goldfields EVL region high molybdenum values have been located in streams and soils of the Cushnie area (values up to 120 ppm.) but despite a detailed search no obvious sulphide source has been located. Blocks of chuggy aplite/quartz containing hematite and limonite have been discovered which may reflect the presence of former weak sulphide mineralisation.







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**EXPLORATION VENTURES LTD.**

TITLE **MOLYBDENUM IN SOILS AT INVER**  
 (This is now in Goldfields' area and  
 values in ppm. been sampled in greater detail elsewhere)

Scale 6" to 1 mile	Prepared 10-6-70	Drawn MS.	FIG. No. 11
OS Sheet No. PART of NS 73 SE + SW.	Revised MAR 73	Date 10-6-70	

71

72

73

74 22

Mo anomaly Here

M5717 .7.20-32	M5700	M5747 .10.20-48	M5748 .7.25-10						
.17.20-16		.10.20-16	.7.20-24						
.30.20-24	M5718 .12.20-40	.12.20-48	.7.20-24						
.17.20-8	.17.20-48	.30.20-32	.12.20-32	M700	M5777 .10.25-8	M5804 .7.20-8	M5805 .15.20-8		
.15.20-8	.12.20-32	.7.20-24	.12.20-32	M5776 .10.20-24	.10.25-16	.17.20-16	.12.20-16		
.15.20-8	.15.20-32	.15.20-32	.7.20-16	.12.20-32	.12.20-16	.17.25-16	.10.20-16	M4.	
.30.20-16	.17.20-32	.10.20-32	.10.25-32	.7.20-32	.12.20-16	.15.25-16	.12.25-16	M5823 .15.20-24	
M5709 .12.20-8	.10.20-16	.12.20-16	.17.20-32	.7.20-16	.12.20-8	.12.25-32	.15.20-32	.17.25-32	
	.45.20-24	.12.20-16	.15.20-48	.7.20-8	.12.20-32	.12.20-16	.15.20-24	.15.20-32	
	.12.20-16	.12.20-8	.17.20-48	.12.20-16	.5.20-24	.17.20-8	.17.20-16	.37.20-8	
	.17.20-16	.17.20-16	.12.20-32	.5.20-16	.12.20-40	.10.20-8	.17.20-8	.17.25-8	
	M5728 .20.20-24	.15.20-16	.12.20-32	.12.20-16	.7.20-8	.7.20-8	M5814 .7.20-16	.27.45-16	
		.10.20-24	.10.20-48	.17.20-16	.7.25-8	.10.20-24		.17.20-16	
		.10.25-16	.10.20-16	.7.20-16	.5.20-8	M5793 .7.20-16		M5815 .10.25-8	
		.12.20-16	.15.20-16	.12.20-16	.12.20-16				
		.10.25-16	M5763 .15.25-22	.12.20-16	.12.20-8				
		M5729 .10.20-8		M5764 .7.20-8	M5792 .5.20-16				

22

21

<b>EXPLORATION VENTURES LIMITED</b>		4 Drg. No
Area: <b>KEMNAY</b>		
Title: <b>SOIL GEOCHEMICAL VALUES FOR Cu, Ni, Mo in ppm. BLOUGHAN.</b>		
OS. Map No: <b>N2 72 SW</b>		
Scale: <b>6" = 1 MILE</b>	Date: <b>SEPT 1971</b>	
Prepared by: <b>S.M</b>	Drawn by: <b>S.M</b>	

Values shown thus: Cu, Ni, Mo

20

72

2340	1220	875	420	2525	1320	490	745	735	455	757
1940	1280	710	454	955	922	1100	730	685	7	1900
810	1280	560	460	1630	775	770	540	715	349	1397
600	910	560	642	890	2000	600	620	515	336	1040
770	645	500	798	1165	1920	835	700	780	330	1028
530	640	575	970	1070	880	870	490	658	578	1210
375	1180	755	1170 1215	970	713	520	681	541	541	1170
643	965	535	679	1530	713	940	370	570	545	
560	1070	390	522	575	460	400	374	932	68	
	720	300	776	335	752	299	833	594	1740	
	420	316	448	377	510	1550	690	673	913	
	385	314	712	562 645	90	730	1365	842	985	
	1420	540	730	485	560	785	1070	1420		1730
	1280	540	779	434	?	1660	650			1198
	1700	985	1021	619	499	1080	1005			1302
	1750	965	760	474	920	1145	695			2001
	1660	820	1159	720	180	1590	1195	?	1350	1715 1330
	1840	915	810	843	765	1000	897	1475	1330	2650 1085
	1060	905	1210	538	255	945	1065	1610	867	875 869
	1720	635	1730	520	649	1410	895	1140	722	790 760
	1780	620	1270	483	485	1160	1110	768	470	649 411
		930	1360	820	530	905	790	1090	680	665 684
			1608	850	306	505	510	740	600	619 916
			1700	1000	455	458	807	725	453	973 1120
			1130	1155	455	350	655	1010	694	2030 1525
			1200	1000	505	162	337	1090	1300	2760
			852	1255	50	298	570	1270	1480	2001
			415	679	025	276	675		1320	2050
			603	826	1060	352			2060	1640
				785	705	444			2160	1103
				250	1700	571			1440	1740
				1101	305	786			1400	1450
				930					570	5190
				1480						
				1179						
				815						
				305						

EXPLORATION VENTURES LIMITED		6
Area	KEMNAY	
Title	Balquhain Apparent Resistivity (2m)	Drg. No
OS Map No	NS 72 SW	
Scale	6 inches to 1 mile	DATE
Project	GP2.	DECEMBER 1971

22

21

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71

72

73

	.1620	.1002	709	.615	.444	.990	10
	.700	.998	768	.620	.640	.982	1
	.474	.925	.523	.520	.472	.652	6
	-	.815	.370	.450	.222	1277	4
	.386	.597	.370	.632	.565	2627	1
	.450	.800	.859	.276	.947	.236	.
	.635	.828	.615	.740	.1570	1	1
	.703	.975	.556	.1140	.1810	.1170	1
	.522	.1185	.1265	.1720	.1580	.1000	1
.830	.426	.1640	.1750			.632	2
.1530	.1480	2062	.1820			.1575	1
.1280	.1350	.1170	250			.2340	1
.2140	.1770	.1420	.1530			.1220	1
.2200	.1755	.1580	.1165			.1865	1
.1050	.1200	.1055	.1545			.1920	1
.1040	.1460	.1120	.1075			.1200	.
.1670	.1265	.975	.1150			.880	1
.1620	.1650	.1010	.825			.1160	8
.1500	.1500	.618	.859			.965	820.7
.900	.1090	1165	.660				592.8
.765	.1375	.720	.495			.710	.9
.1050	.317	.665	443.457				10
.374	.1500	.810	470.480			.1140	12
.715	.835	.743	.570			.700	11
.694	.955	.790	.550	.865		.980	11
.1170	.1205	.715	.765	.913		.850	4
.1320	.430	.711	.822	.520		.820	9
.785	.795	.785	.621	.765		.1270	13
.880	.1050	.588	.745	.915		.1220	7
.1020	.602	.2680	.705	.724		.1000	7
.1140	.850	.878	.708	.778		.1780	1
.965	.850	.890	.585	.476		.780	24
.890	.770	.970	.660	.530		.670	51
.1085	.760	.1020	.745	.418		.1040	9
.1150	.844	.775	.1410	.630		.750	6
.970	.1200	370.845	.890	.830		.465	8
.650	.1175	.1230	.970	.535		.860	10
.756	.980	.760	.1140	.1078		.1260	11
.825	.920	.690	.690	.1002		.1000	11
.510	.960	.1100	.1490	.1180		.410	16
.710	.915	.1150	.1270	1650.11240		.380	4
.830	.1350	.1105	.1010	.891		.700	10
.1090	.810	.655	.755	.1205		.570	10
.1650	.1000	.650	.730	.1470		.600	56
.2340	.1220	.875	.420	2525		.745	73
.1940	.1280	.710	.454	.955		.730	68
.810	.1280	.560	.460	.1630		.440	716
.606	.910	.560	.648	.890		.620	815
.770	.645	.500	.798	.1165		.700	78
.530	.640	.575	.970	.1030		.490	65
.375	.1180	.755	1110.1215	.970		.681	54
.643	.965	.535	.679	.1530		.370	57
.560	.1070	.390	.522	.875		.374	93
	.720	.300	.776	.335		.833	69
	.420	.316	.448	.377		.690	67
	.385	.316	.712	562.445		.1365	84
	.1420	.540	.730	.485		.1070	141
	.1280	.540	.779	.434		.650	
	.1700	.985	.1021	.619		.1005	
	.1750	.965	.710	.474		.695	
	.1660	.820	.1159	.720			

4

3

2

1000	51	220	1340	1900			
1380	1035	1360	2010	1595			
520	1150	2001	1475	2560	1009		
1020	1835	1720	1190	1790	720		
1119	2007	1600	2480	2760	1780		
1640	1820	2000	1890	2240	160		
1665	1360	1920	1745	1350	445		
1780	1175	1860	1590	3240	890		
1562	2009	2960	1380	-	615		
2001	1450	1065	1445	-	440		
1922	1045	849	1355	-	710		
1420	1340	1100	1460	-	572		
1645	1420	1260	1285	-	318		
1270	1480	430	1090	285	721		
1795	1425	770	1125	852	195		
930	2290	1215	1540	1125	540		
1299	1340	840	1120	1165	1470		
864	2310	550	1270	1545	813		
820 768	970	1145	1910	945	1340		
592 870	925	595	1535	1950	2670		
949	1220	915	915	3200			
1040		1560	1560	1150		438	
1280	615	-	-	1770 2880		1100	
1170	475	1810	1810	1444		1480	
1120	581	899	899	770		876	
473	853	690	2810	735	498	355	
980	700	970	2870	1535	1630	737	
1850	940	645	891	880	1535	1631	
730	531	491	1125	950	562	2230	
712	1220	434	1060	3460	2066	2170	
1161	628	490	452	1625	2300	2060	1425
562	698	538	474	1070	2145	2550	1517
512	335	445	591	1610	985	2150	900
930	930	509	386	2070	1380	2170	670
650	497	507	509	708	2260	5000	1420
861	1117	401	504	875	1770	3460	1150
1205	776	535	457	1070	2340	1560	769
1135	943	530	570	1200	1060	1360	1455
1110	710	460	690	1109	2070	900	1680
1660	869	290	679	982	2020	500	1510
497	1270	345	620	3100	1360 1715	580	1260
1045	1650	431	1102	1770	1790	875	1260
1095	420	775	1003	1700	2150	555	1380
562	470	1165	1090	1580	1270	160	1325
735	455	989	1880	780	1680	855	990
685	?	1900	1260	940	1670	450	839
715	349	1397	1700	2150	1400	705	711
515	336	1040	-	1240	1320	1055	665
780	330	1028	-	720	1370	1520	778
658	578	1210	-	610	1000	835	1101
541	541	1170	-	355	1670	4200	500
570	545	-	-	420	710	1730	500
932	45	-	-	990	1185	1370	788
594	1740	-	-	?	3400	500	1375
673	913	-	-	1000	1000	980	905
842	985	-	-	?	1300	500	768
1620	-	-	1730	?	1330	1470	740
			1198	1270	975	712	817
			1302	400	1230	747	907
			2001	1060	1460	1380	580
			1330	1160	485	538	381
	1200	1715	1330	1160	485	538	381

922	775	2000	1920	880	773	713	460	752	510	910	560	?	699	920	1180	765	1255	609	485	530	306	455	455	805	511	695	1060	905	1760	905							
1100	770	600	835	850	520	960	400	299	1550	730	785	1660	1080	445	1530	1000	945	1410	160	905	505	455	350	162	298	276	352	444	571	786							
730	640	620	700	490	681	370	374	833	690	1365	1070	650	1005	695	1195	897	1065	895	1110	790	510	897	655	337	570	675											
785	715	515	710	658	541	570	932	594	673	842	1620					1475	1610	1460	768	1090	740	725	1010	1090	1270												
495	?	349	336	578	541	546	648	1740	913	985						1350	1330	867	722	470	680	600	453	694	1300	1481	1320	2060	2160	1440	1450	570					
989	1950	1397	1040	1028	1210	1170										1715	2650	875	790	649	665	619	973	2030													
1880	1260	1700														1730	1198	1302	200L	1330	1085	869	760	411	684	916	1120	1525	2760	2001	2250	11640	1103	1740	1420	5190	
780	740	2750	1240	720	610	355	620	990	?	1000	?	?	1270	400	1060	1160	700	265	466	400	685	860	1130	1380	1055	835	925	555	1045	1470							
1680	1670	1400	1380	1370	1000	670	710	1085	3400	1000	1300	1330	975	1230	1460	485	425	538	455	290	75	1065	620	1500	2170	1560	1590	1200	1150	385							
855	450	745	855	1320	825	460	1730	1370	500	920	500	1470	712	704	1380																						
990	829	799	665	778	1101	500	500	785	1376	905	968	740	817	903	811	629	348	250	412	428	378	415	766	680	945	1125	1407	1130	1035	796	1065	658	1415				

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10.0	10.0	30.0	10.0	11.0	10.5	10.5	10.5
10.5	8.0	22.5	7.5	8.5	12.0	11.5	11.5
10.0	7.5	9.0	7.5	9.0	14.0	14.0	12.5
11.0	8.5	3.6	6.0	9.5	8.0	24.5	13.5
8.5	7.5	6.25	7.5	6.5	7.0	32.5	7.0
8.5	8.5	6.0	10.0	10.5	12.0	34.5	20.0
8.0	6.0	11.0	9.5	6.0	10.5	0.0	15.0
5.0	8.0	14.5	13.0	8.0	9.5	9.5	14.0
3.5	8.0	11.0	13.5	7.0	12.5	12.5	12.5
36.5	5.0 9.0	10.5 9.0	15.5	7.0	30.0	23.0	7.0
35.0	13.0	12.0	10.0	10.5	33.0	0.0	10.5
21.5	11.0	11.5	9.0	18.0	28.5	18.5	22.5
3.0	11.5	9.0	17.0	21.5	32.0	13.0	7.0
7.5	13.5	14.0	16.0	20.0	16.0	9.0	3.0
10.0	14.5	15.0	12.5	20.0	24.0	8.5	16.0
10.5	13.5	17.0	15.0	26.0	12.0	9.0	13.5
10.5	13.5	17.5	17.5	17.0	17.5	12.5	10.5
14.0	8.0	14.0	14.5	21.0	30.0	8.5	3.5
14.0	9.0	9.0	6.0	20.0	16.5	24.0	6.5
15.5	6.5	7.5	11.0	23.5	23.5	28.5	7.0
14.0	6.0	9.5	14.0	15.0	34.0	20.0	7.0
7.0	11.5	14.0	16.0	16.5	32.0	15.5	9.0
7.5	19.0	17.0	9.5	16.5	24.0	14.5	10.5
8.0	15.0	13.0	7.0	10.0	24.5	21.0	10.0
6.5	8.5	8.5	8.5	12.0	13.0	22.0	12.0
6.5	7.5	7.5	19.0	12.5	11.0	27.5	16.5
4.0	11.5	6.0	10.5	14.5	20.0	19.5	17.0
	18.5	6.5	12.0	15.0	15.5	18.0	19.0
	4.5	7.5	12.0	15.5	12.5	12.5	18.0
	4.0	7.5	10.5	8.5 7.0	9.5	11.5	16.5
	12.0	6.5	11.0	9.0	10.0	12.0	14.5
	21.5	8.5	11.0	7.5	?	16.0	33.0
	20.5	10.0	12.0	11.5	12.0	16.5	15.0
	18.0	10.0	11.0	10.5	13.0	18.0	15.0
	52.1	10.0	14.5	10.5	12.0	19.0	16.0
	32.0	11.5	13.0	12.0	12.5	15.5	9.0
	37.0	10.0	10.5	8.0	10.0	15.5	7.0
	18.5	9.5	13.5	11.0	10.5	13.0	7.0
	8.0	8.0	13.0	11.5	10.0	13.5	7.0
		10.0	11.0	11.0	11.5	13.5	8.0
			10.0	8.25	12.0	10.0	8.0
			12.0	10.0	7.5	10.5	9.0
			11.0	10.0	10.0	18.0	5.5
			9.0	12.5	10.0	12.0	28.0
			11.0	14.5	17.0	16.5	23.0
			8.0	10.5	10.0	9.0	18.5
			8.0	8.5	14.5	12.75	
				9.0	16.5	10.0	
				7.5	10.0	7.0	
				7.5	14.0	7.5	
				10.0			
				11.5			
				11.5			
				10.0			
				14.25			

EXPLORATION VENTURES LIMITED	
Area: <b>KEMNAY</b>	Drg. No <b>5</b>
Title: <b>Balquhain</b>	
Apparent Chargeability msec	
O.S. Map No <b>N5 72 SW</b>	Date: <b>DECEMBER 1971</b>
Scale: <b>6 inches to 1 mile</b>	
Prepared by: <b>CR2</b>	Drawn by:

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		.25.5	6.5	.5.5	.9.5	.12.0	.16.0
		.40.5	.8.0	.7.5	.10.5	.7.0	.11.5
		.60.75	.10.0	.8.0	.13.0	.7.0	.14.0
			.25.5	10.0	.13.5	.18.5	.10.5
		.22.5	.19.0	.12.0	.11.5	.22.0	.41.0
	.4.5	.8.25	.5.5	.18.0	.14.0	.26.0	.47.0
	.8.5	.6.0	.19.5	.13.0	.10.5	.17.5	.?
	.14.5	.10.5	.3.0	.11.0	.15.0	.18.0	.13.5
	.20.0	.10.0	.6.0	.16.0	.11.0	.16.5	.70.0
.13.0	.23.5	.2.5	.12.5	.10.5			.11.5
.14.0	.15.0	.23.0	.10.0	.13.0			.11.5
.70.0	.16.0	.18.5	.16.0	.13.5			.10.0
.8.0	.16.5	.18.0	.21.0	.16.0			.14.5
.-2.0	.20.0	.20.0	.28.0	.15.0			.18.0
.39.0	.21.5	.17.0	.25.0	.11.0			.16.5
.19.0	.19.5	.14.0	.22.5	.14.5			.12.0
.23.0	.17.5	.11.0	.20.0	.14.0			.13.5
.20.0	.16.5	.13.5	.27.5	.16.5			.8.5
.13.5	.17.0	.12.5	.23.0	.18.5			.12.5
.28.0	.15.0	.17.0	.22.5	.11.0			
.12.5	.17.5	.16.5	.20.5				.30.0
.-10.0	.13.5	.12.0	6.0.7.0				
.29.0	.31.5	.13.5	7.0.8.0				.20.5
.11.0	.11.0	.16.5	.6.0		.9.0		.11.0
.5.0	.16.0	.11.5	.9.5	.8.5	.13.5	.14.0	.22.5
.10.0	.10.0	.30.0	10.0	.1.0	.16.5	.11.5	.16.0
.10.5	.8.0	.22.5	7.5	.8.5	.12.0	.11.5	.18.0
.10.0	.7.5	.9.0	.6.5	.8.5	.14.0	.9.0	.12.0
.14.0	.8.5	.3.5	.7.5	.9.0	8.0	.15.0	.12.5
.8.5	.7.5	.5.25	.6.0	.9.5	.7.0	.26.5	.13.5
.8.0	.8.5	.6.0	.7.5	.5.5	.20.0	.32.5	.7.0
.8.0	.6.0	.11.0	.10.0	.10.5	.12.0	.31.5	.20.0
.5.0	.8.0	.14.5	.9.5	.6.0	.10.5	.0.0	.15.0
.3.5	.8.0	.11.0	.13.0	.8.0	.9.5	.9.5	.14.0
.36.5	.5.0.9.0	.10.5.9.0	.13.5	.7.0	.18.5	.12.5	.12.5
.25.0	.13.0	.12.0	.15.5	.7.0	.30.0	.23.0	.7.0
.21.5	.11.0	.11.5	.10.0	.10.5	.33.0	.2.5	.10.5
.3.0	.11.5	.9.0	.9.0	.18.5	.28.5	.18.5	.12.5
.7.5	.13.5	.14.0	.17.0	.21.5	.32.0	.13.0	.10.0
.10.0	.14.5	.15.0	.15.0	.20.0	.16.0	.9.0	.3.0
.10.5	.13.5	.17.0	.12.5	20.0.18.0	.24.0	.8.5	.16.0
.10.5	.13.5	.17.5	.15.0	.25.0	.12.0	.9.0	.13.5
.14.0	.8.0	.14.0	.17.5	.17.0	.17.5	.12.5	.10.5
.14.0	.9.0	.9.0	.14.5	.21.0	.30.0	.8.5	.2.5
.15.5	.6.5	.7.5	.6.0	.20.0	.16.5	.24.0	.6.0
.14.0	.6.0	.9.5	.1.0	.23.5	.23.5	.28.5	.7.0
.7.0	.11.5	.14.0	.14.0	.15.0	.34.0	.20.0	.7.0
.7.5	.19.0	.17.0	.16.0	.16.5	.30.0	.15.5	.9.0
.8.0	.15.0	.13.0	.9.5	.16.5	.24.0	.14.5	.10.5
.6.5	.8.5	.8.5	6.5.7.0	.10.0	.24.5	.21.0	.10.0
.6.5	.7.5	.7.5	.8.5	.12.0	.18.0	.22.0	.12.0
.4.0	.11.5	.6.0	.19.0	.12.5	.11.0	.27.5	.16.5
	.18.5	.6.5	.10.5	.14.5	.20.0	.19.5	.17.0
	.4.5	.7.5	.12.0	.15.0	.15.5	.13.0	.19.0
	.4.0	.7.5	.12.0	.15.5	.12.5	.12.5	.18.0
	.12.0	.6.5	.10.5	8.5.7.0	.9.5	.11.5	.16.5
	.21.5	.8.5	.11.0	.9.0	.10.0	.12.0	.14.5
	.20.5	.10.0	.11.0	.7.5	.?	.16.0	.33.0
			.12.0	.11.5	.12.0	.16.5	.15.0



<b>EXPLORATION VENTURES LIMITED</b>		2
Area: <b>MEMRAY</b>	Drg. No.	
Title: <b>Soil Sampling Results On Ni, Hoop, Pitche Forest</b>		
Q.S. Map No: <b>NS 61 NW NE</b>		
Scale: <b>6 inches to 1 mile</b>	Date: <b>NOV. 1977</b>	
Prepared by: <b>GR</b>	Drawn by: <b>S.H.</b>	

268 x 35  
177 x 27

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M7078 21-40	M7079 16-30	M7194 8-10	M7195 8-10	M7196 14-30	M7197 10-20	M7198 6-20	M7199 14-25	M7200 13-15	M7201 12-15	M7202 12-15	M7203 12-15	M7204 12-15	M7205 12-15	M7206 12-15	M7207 12-15	M7208 12-15	M7209 12-15	M7210 12-15	M7211 12-15	M7212 12-15	M7213 12-15	M7214 12-15	M7215 12-15	M7216 12-15	M7217 12-15	M7218 12-15	M7219 12-15	M7220 12-15	M7221 12-15	M7222 12-15	M7223 12-15	M7224 12-15	M7225 12-15	M7226 12-15	M7227 12-15	M7228 12-15	M7229 12-15	M7230 12-15	M7231 12-15	M7232 12-15	M7233 12-15	M7234 12-15	M7235 12-15	M7236 12-15	M7237 12-15	M7238 12-15	M7239 12-15	M7240 12-15	M7241 12-15	M7242 12-15	M7243 12-15	M7244 12-15	M7245 12-15	M7246 12-15	M7247 12-15	M7248 12-15	M7249 12-15	M7250 12-15	M7251 12-15	M7252 12-15	M7253 12-15	M7254 12-15	M7255 12-15	M7256 12-15	M7257 12-15	M7258 12-15	M7259 12-15	M7260 12-15	M7261 12-15	M7262 12-15	M7263 12-15	M7264 12-15	M7265 12-15	M7266 12-15	M7267 12-15	M7268 12-15	M7269 12-15	M7270 12-15	M7271 12-15	M7272 12-15	M7273 12-15	M7274 12-15	M7275 12-15	M7276 12-15	M7277 12-15	M7278 12-15	M7279 12-15	M7280 12-15	M7281 12-15	M7282 12-15	M7283 12-15	M7284 12-15	M7285 12-15	M7286 12-15	M7287 12-15	M7288 12-15	M7289 12-15	M7290 12-15	M7291 12-15	M7292 12-15	M7293 12-15	M7294 12-15	M7295 12-15	M7296 12-15	M7297 12-15	M7298 12-15	M7299 12-15	M7300 12-15
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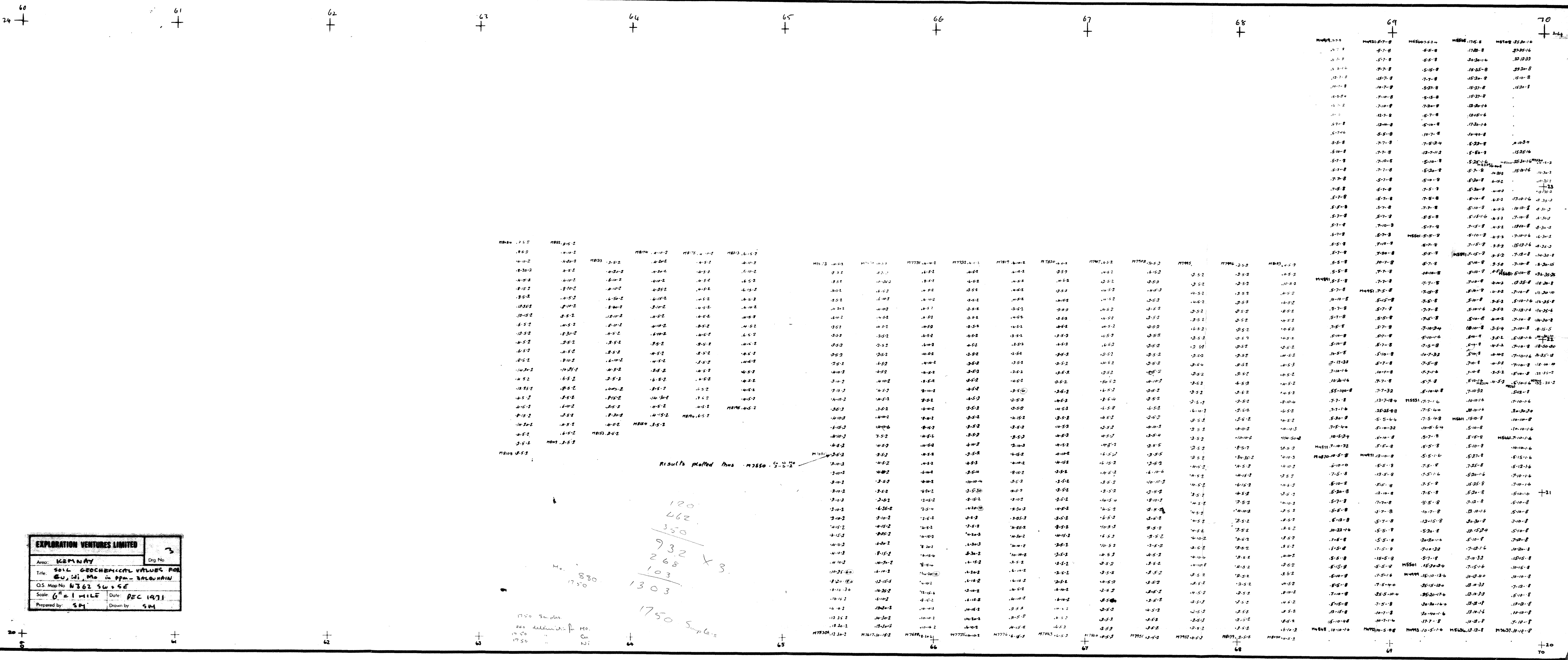
M3012 15-25	M3013 10-30	M3014 7-15	M3015 7-15	M3016 7-15	M3017 7-15	M3018 7-15	M3019 7-15	M3020 7-15	M3021 7-15	M3022 7-15	M3023 7-15	M3024 7-15	M3025 7-15	M3026 7-15	M3027 7-15	M3028 7-15	M3029 7-15	M3030 7-15	M3031 7-15	M3032 7-15	M3033 7-15	M3034 7-15	M3035 7-15	M3036 7-15	M3037 7-15	M3038 7-15	M3039 7-15	M3040 7-15	M3041 7-15	M3042 7-15	M3043 7-15	M3044 7-15	M3045 7-15	M3046 7-15	M3047 7-15	M3048 7-15	M3049 7-15	M3050 7-15	M3051 7-15	M3052 7-15	M3053 7-15	M3054 7-15	M3055 7-15	M3056 7-15	M3057 7-15	M3058 7-15	M3059 7-15	M3060 7-15	M3061 7-15	M3062 7-15	M3063 7-15	M3064 7-15	M3065 7-15	M3066 7-15	M3067 7-15	M3068 7-15	M3069 7-15	M3070 7-15	M3071 7-15	M3072 7-15	M3073 7-15	M3074 7-15	M3075 7-15	M3076 7-15	M3077 7-15	M3078 7-15	M3079 7-15	M3080 7-15	M3081 7-15	M3082 7-15	M3083 7-15	M3084 7-15	M3085 7-15	M3086 7-15	M3087 7-15	M3088 7-15	M3089 7-15	M3090 7-15	M3091 7-15	M3092 7-15	M3093 7-15	M3094 7-15	M3095 7-15	M3096 7-15	M3097 7-15	M3098 7-15	M3099 7-15	M3100 7-15
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Values shown thus - Cu, Ni, Mo.  
SUPERCEDED BY 1972 PLAN.

<b>EXPLORATION VENTURES LIMITED</b>		Drg No. <b>3</b>
Area: <b>KEMNAY</b>		
Title: <b>SOIL GEOCHEMICAL VALUES FOR CU, NI, MO in ppm - BALUBRAIN</b>		
Q.S. Map No. <b>N362 SW + SE</b>		
Scale: <b>6" = 1 MILE</b>	Date: <b>DEC 1971</b>	
Prepared by: <b>SM</b>	Drawn by: <b>SM</b>	

Results plotted Mrs. M7550 Cu Ni Mo 2-5-2

Sample No.	Cu	Ni	Mo
M7550-1	120	462	350
M7550-2	932	268	103
M7550-3	1303		
M7550-4	1750		
M7550-5			
M7550-6			
M7550-7			
M7550-8			
M7550-9			
M7550-10			
M7550-11			
M7550-12			
M7550-13			
M7550-14			
M7550-15			
M7550-16			
M7550-17			
M7550-18			
M7550-19			
M7550-20			
M7550-21			
M7550-22			
M7550-23			
M7550-24			
M7550-25			
M7550-26			
M7550-27			
M7550-28			
M7550-29			
M7550-30			
M7550-31			
M7550-32			
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M7550-35			
M7550-36			
M7550-37			
M7550-38			
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M7550-92			
M7550-93			
M7550-94			
M7550-95			
M7550-96			
M7550-97			
M7550-98			
M7550-99			
M7550-100			







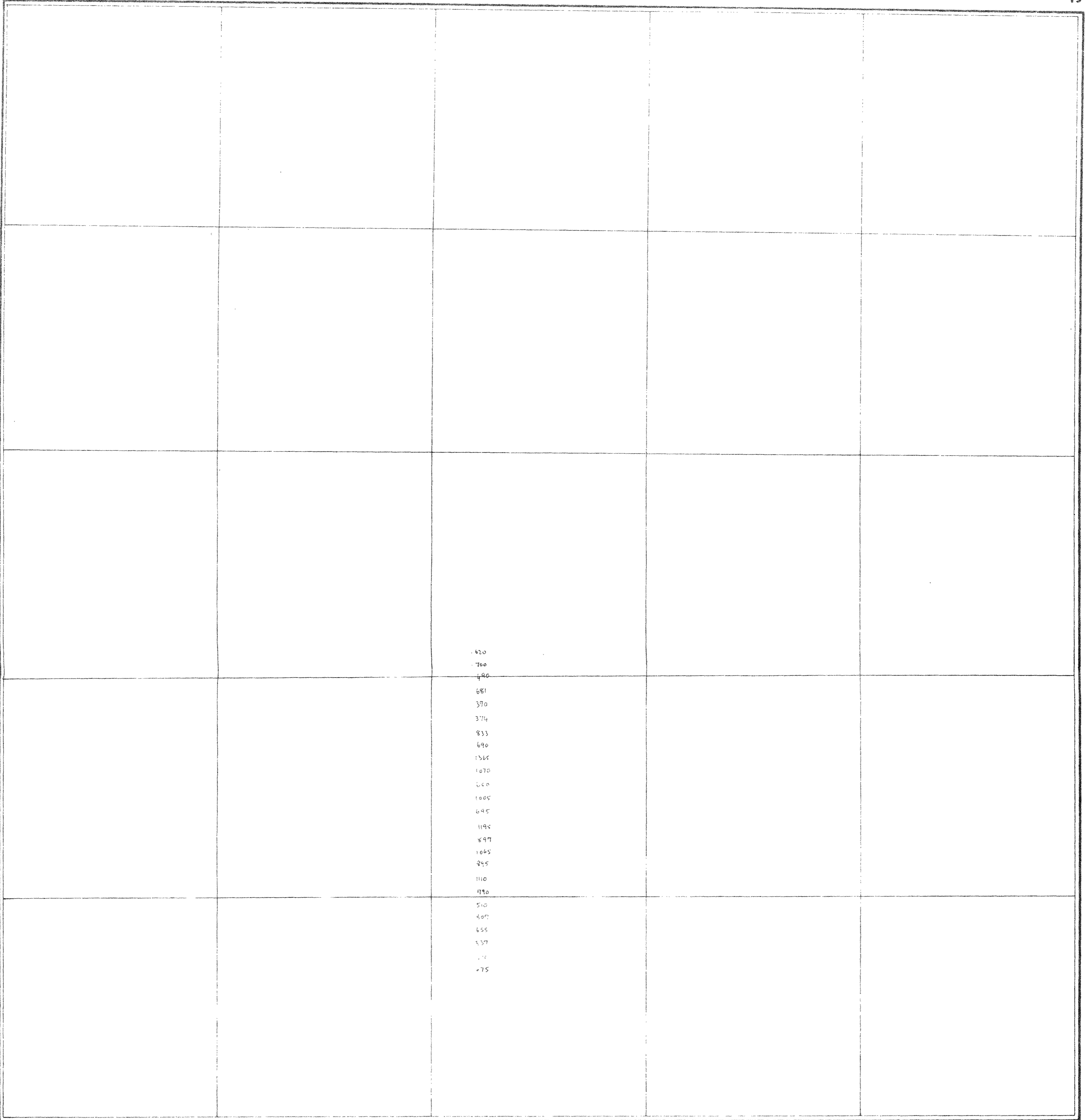


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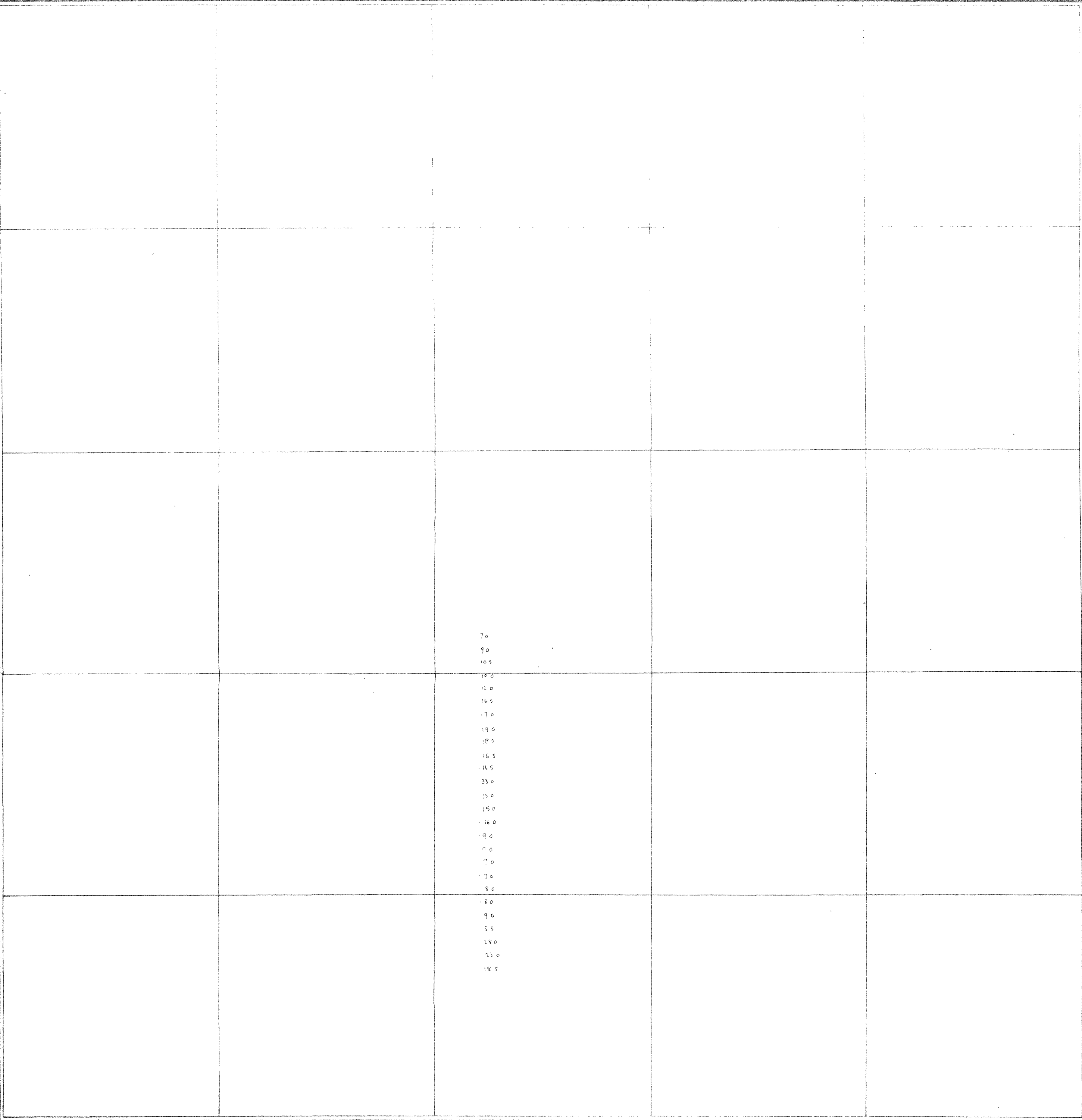
70

75

<b>EXPLORATION VENTURES LIMITED</b>		Dist. No.	<b>3</b>
Area <b>KEMNAY</b>			
Title <b>Apparent resistivity values in OHM metres</b>			
OS. Map No. <b>NS 725</b>			
Scale <b>1:10560</b>	Date <b>JAN 72</b>		
Prepared by <b>GW</b>	Drawn by <b>GW</b>		

25

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<b>EXPLORATION VENTURES LIMITED</b>		Drg No	
		4	
Area <b>KEMINAY</b>			
Title <b>Apparent chargeability values in MILLISECONDS</b>			
O.S. Map No <b>NJ 725</b>			
Scale <b>1:10560</b>		Date <b>JAN 1972</b>	
Prepared by <b>G.W.</b>		Drawn by <b>G.W.</b>	







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725

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735

737



<b>EXPLORATION VENTURES LIMITED</b>		Drg No. <b>7</b>
Area		
Prepared by	Date	
Drawn by		

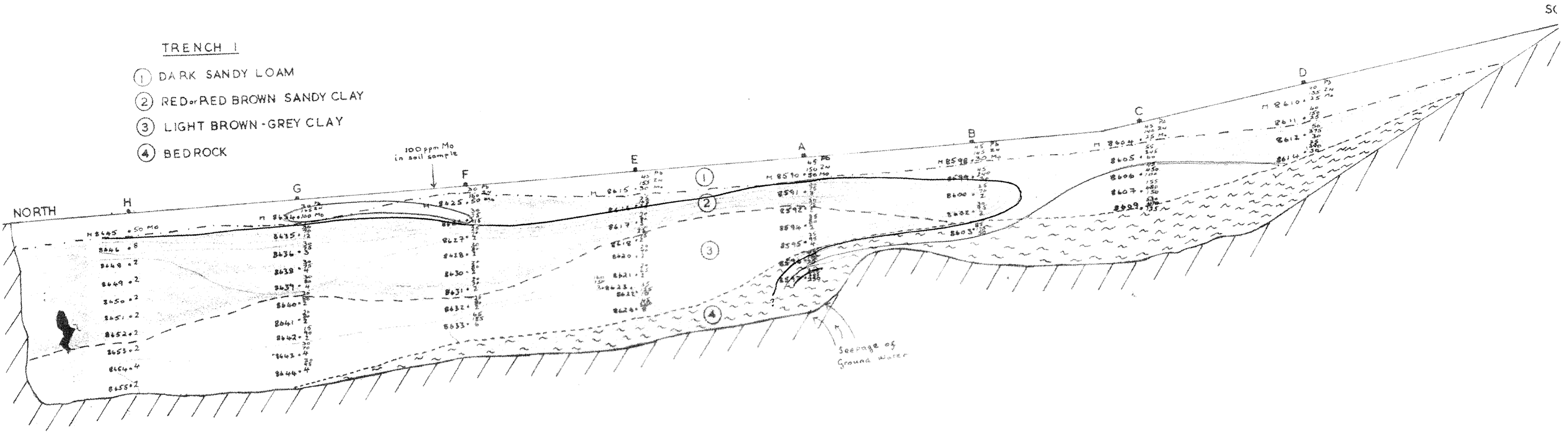
235

250

GROUNDWATER TRENCH SECTIONS  
SCALE: 1" = 50'

TRENCH 1

- ① DARK SANDY LOAM
- ② RED-RED BROWN SANDY CLAY
- ③ LIGHT BROWN-GREY CLAY
- ④ BEDROCK

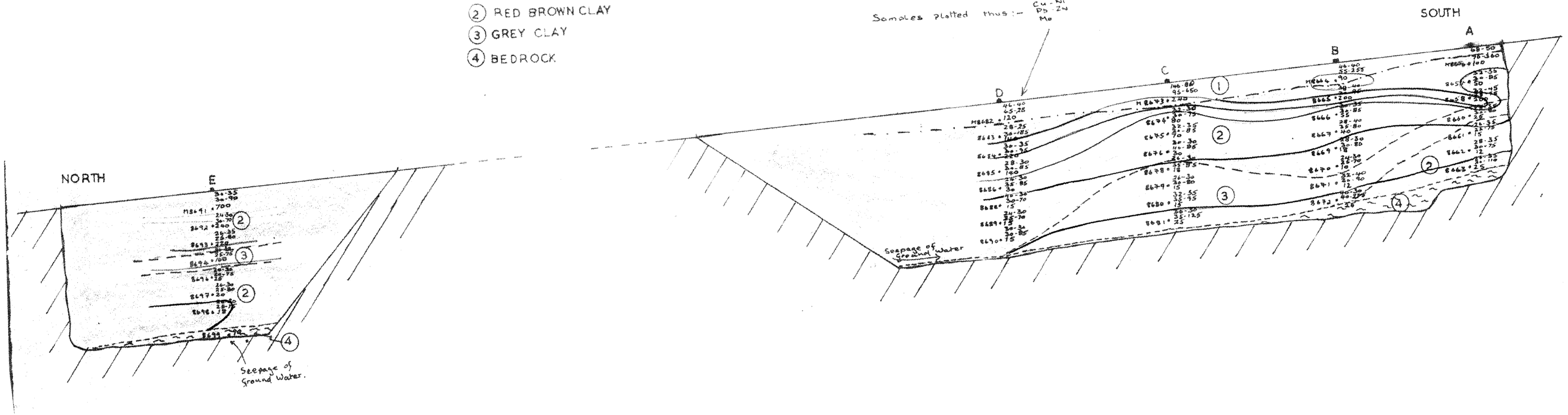


TRENCH 2 (Section 2)

- ① DARK BROWN SOIL
- ② RED BROWN CLAY
- ③ GREY CLAY
- ④ BEDROCK

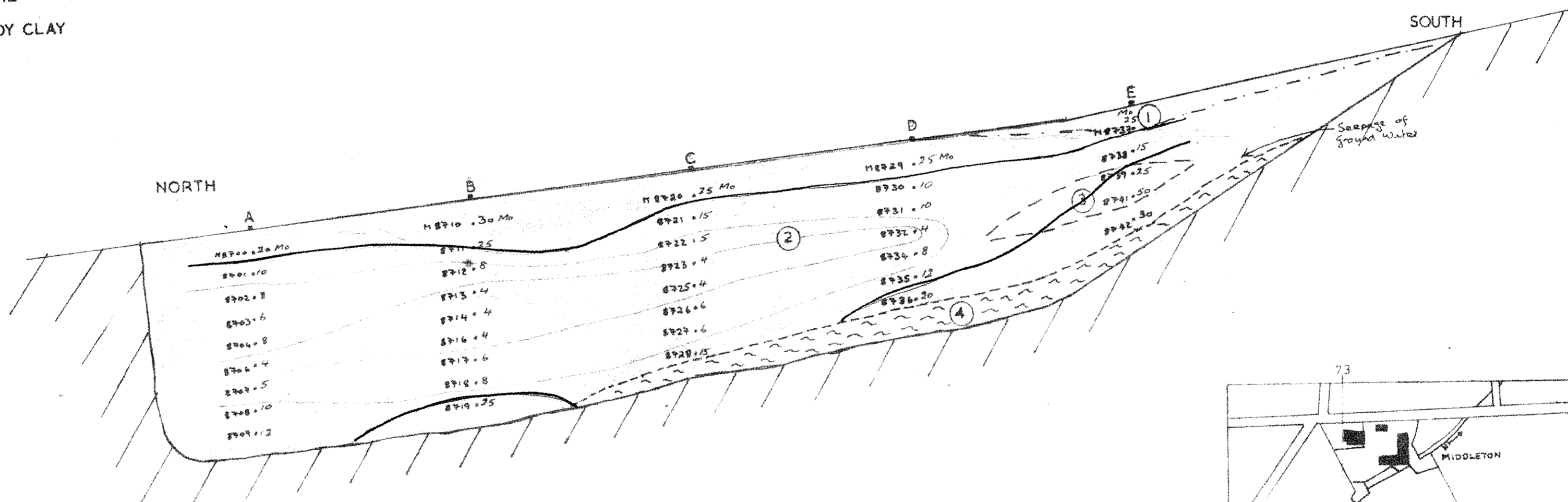
TRENCH 2 (Section 1)

Samples plotted thus: Cu-Ni Pb-Zn Mo



TRENCH 3

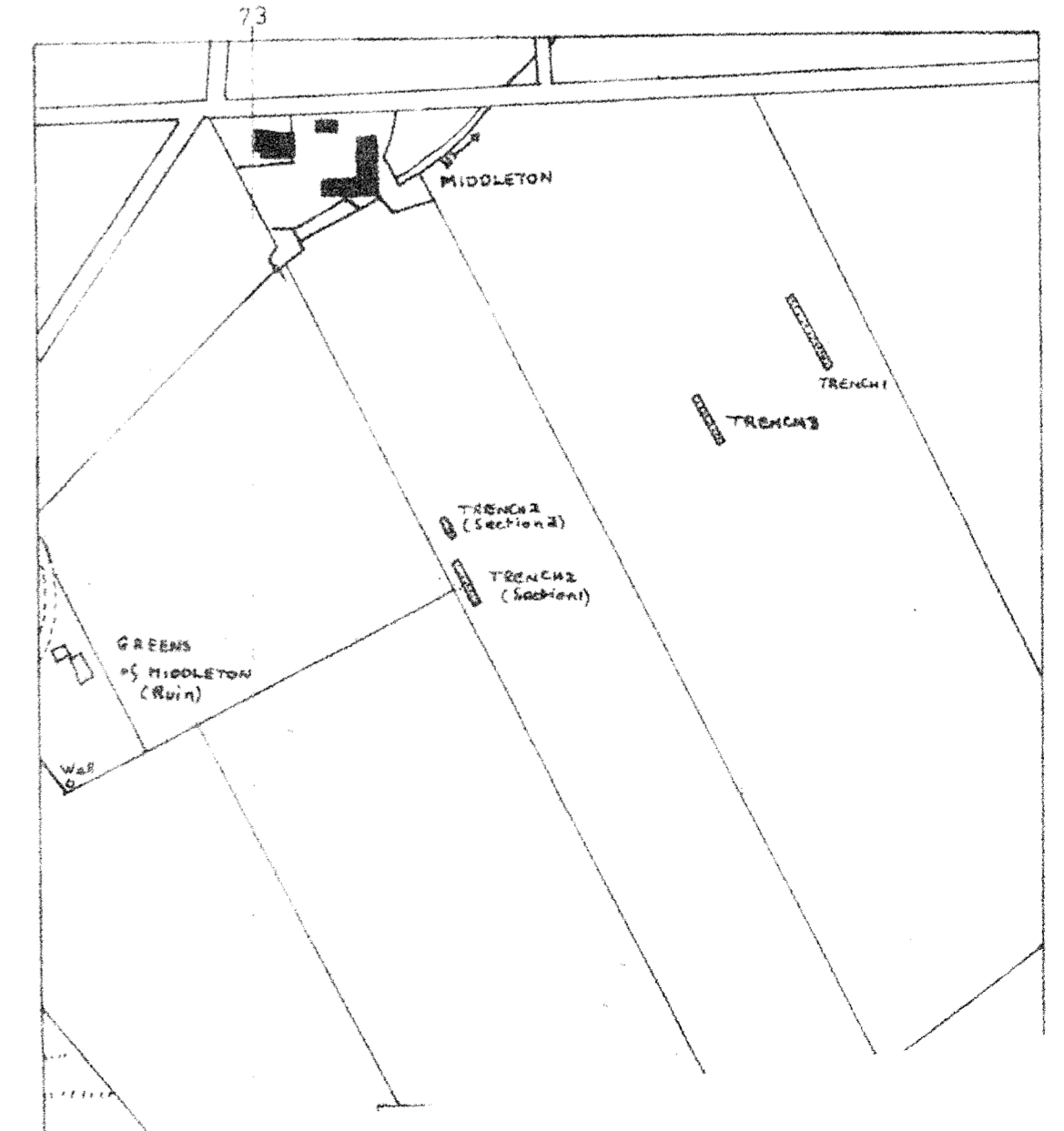
- ① DARK BROWN SOIL
- ② RED BROWN SANDY CLAY
- ③ GREY CLAY
- ④ BEDROCK



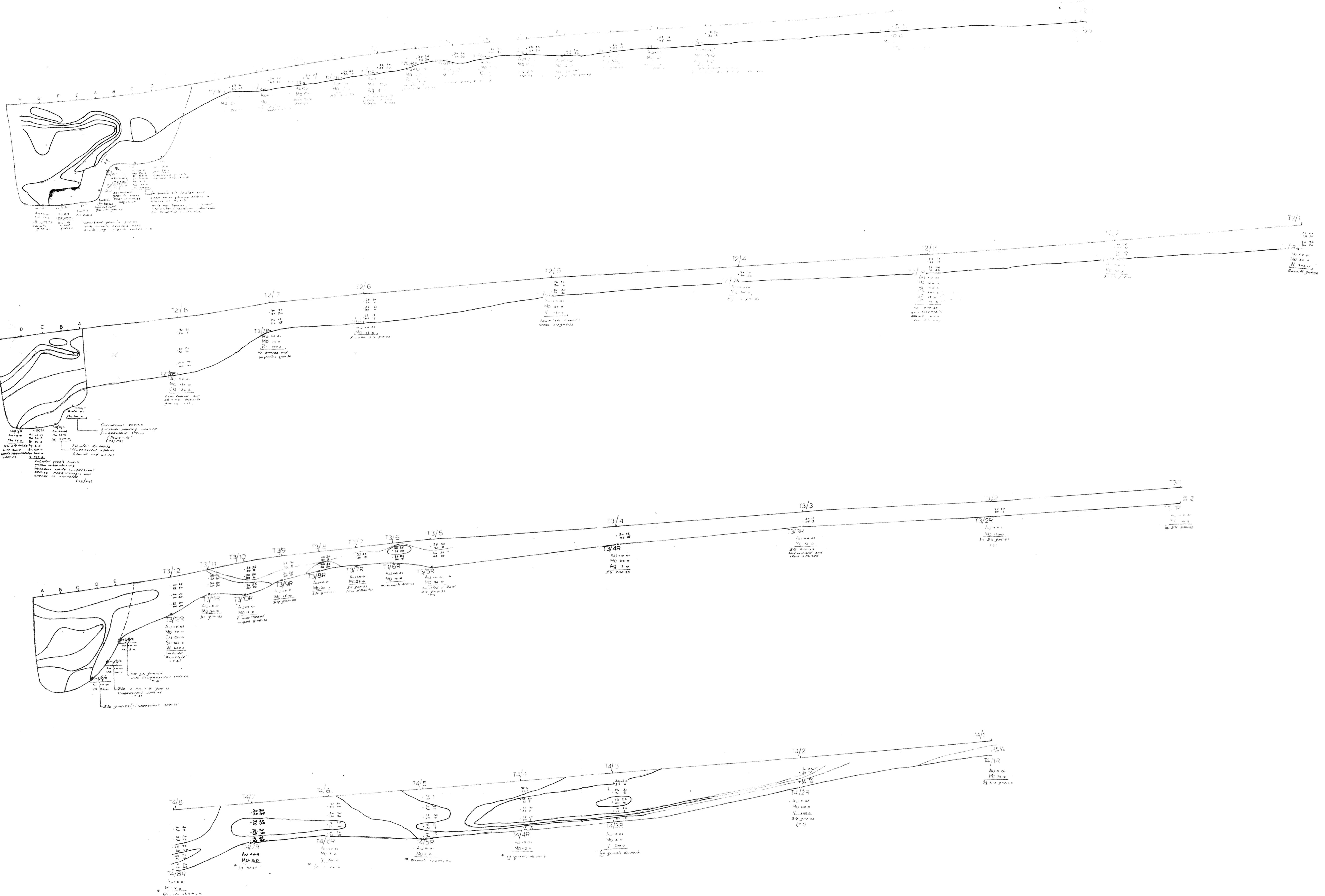
EXPLORATION VENTURES LIMITED	
AND KEMNAY	Dist. 8
The Trenching at Middleton (Ruins)	
OS Map No. NJ 72	
Scale 1" = 50'	Date 10/27/1972
Prepared by GDR	Drawn by MUI

- Mo ppm
- 16 - 29
  - 3 - 4.9
  - 5 - 9.9
  - 10 - 19.9
  - 20 - 99.9
  - 100 - 199.9
  - 200 - 299.9
  - 300 - 399.9
  - >400

National Grid Ref. for Middleton on location plan is NJ 730 225







**Consolidated Gold Fields Ltd.**  
EXPLORATION

Project: E.V.L.  
Area: BALQUHAIN, INVERURIE

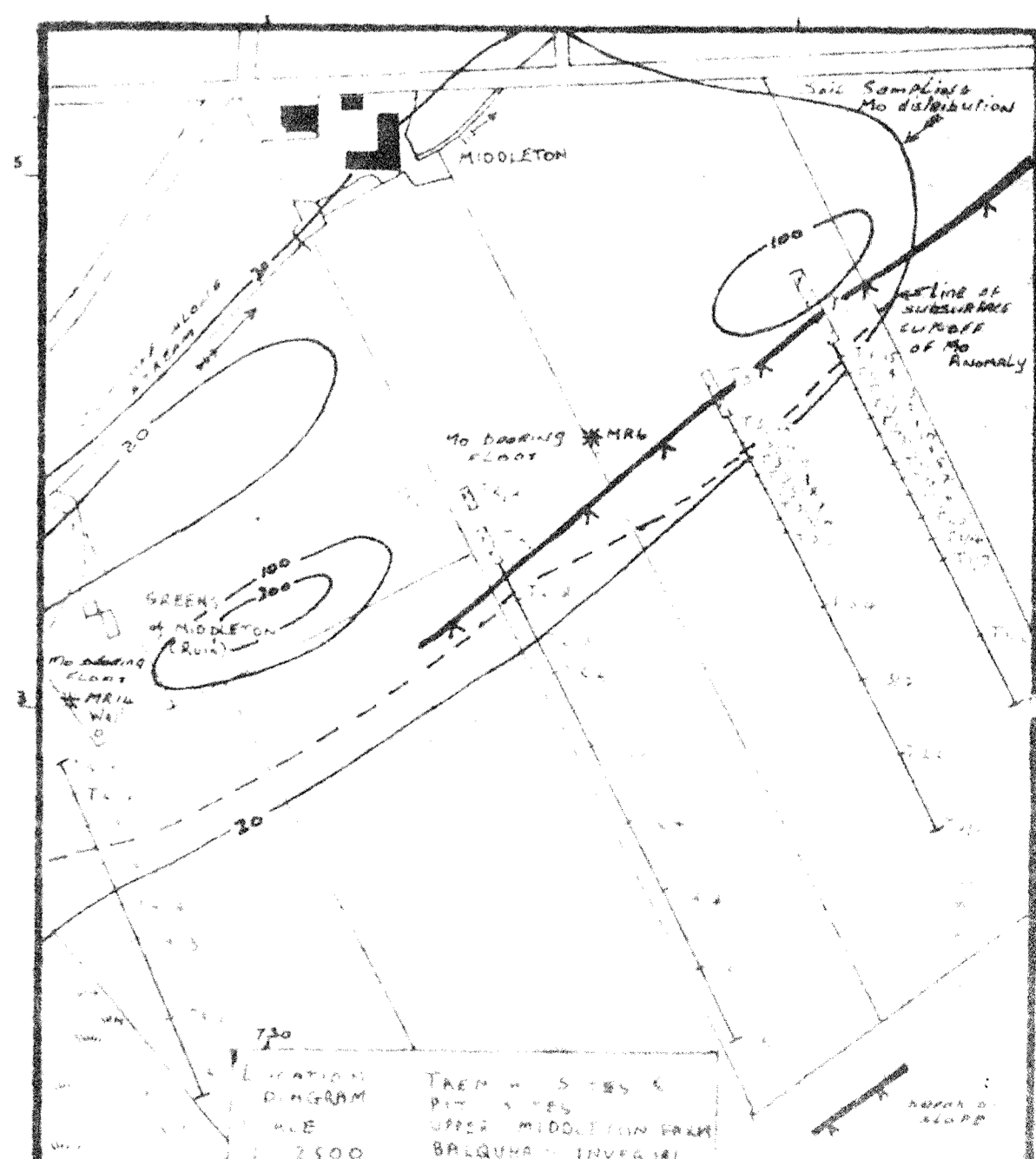
Title: TRENCH & PIT PROFILES  
Cu Ni  
COLOURED FOR Mo Pb Mo

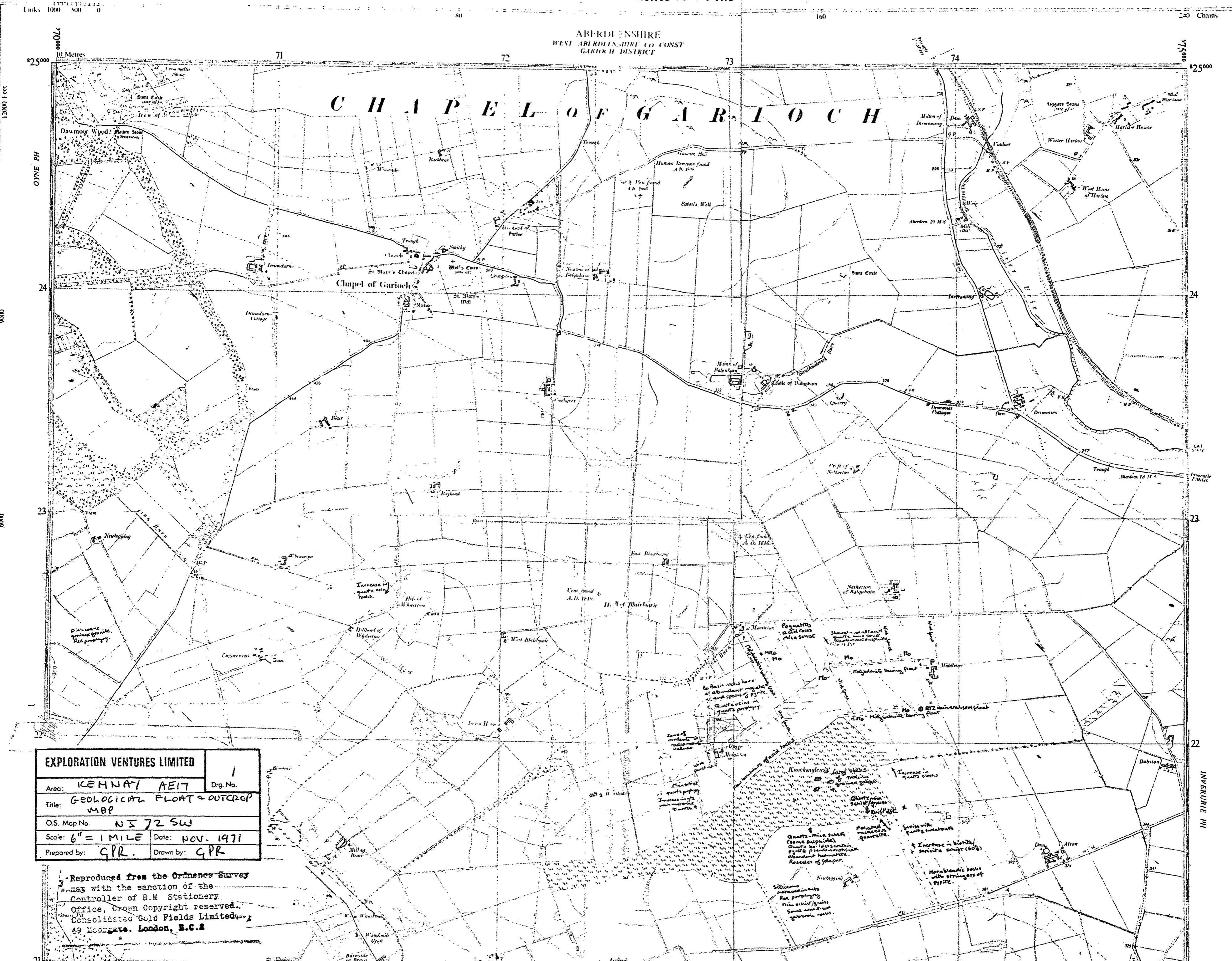
Drawing No: O.S. Map No. NJ 7222, 7322 REFERS TO 1:2500 LOCATION PLAN  
Scale: 1:250 HORIZONTAL, 1:50 VERTICAL  
Date: APRIL 1974  
Prepared by: G.P.R.  
Drawn by: S.A.M.

**COLOUR CODE**  
Mo ppm

○ 16 - 29
○ 3 - 19
○ 5 - 9.9
○ 10 - 19.9
○ 20 - 99.9
○ 100 - 199.9
○ 200 - 299.9
○ 300 - 399.9
○ 400

National Grid Ref: (Refer on location plan to NJ 720 295)





<b>EXPLORATION VENTURES LIMITED</b>		1 Drg. No.
Area:	ICEMNAT AE17	
Title:	GEOLOGICAL FLOAT & OUTCROP MAP	
O.S. Map No.	N 5 72 SW	
Scale:	6" = 1 MILE	Date: NOV. 1971
Prepared by:	G.P.R.	Drawn by: G.P.R.

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Consolidated Gold Fields Limited,  
49 Moorgate, London, E.C.2