

NORANDA-KERR LIMITED

AC 75

PROJECT NO. 1690 - FFESTINIOG, N. WALES

Application for Financial Assistance : APPENDIX 1

Geology of the Area: The area is on the north-western side of the Harlech Dome, and is underlain by Upper Cambrian and Lower Ordovician shales and sandstones with associated greenstones. These rocks dip to the north-west and strike in a generally north-easterly direction. The Cambrian sedimentary rocks are intruded by the Tan-y-grisiau granite, around which a metamorphic aureole occurs.

Several old mines and prospects occur which were intermittently worked for chalcopyrite-bearing veins. The most noteworthy is the Pany-y-wrach mine (SH 630410)

The 1970 reconnaissance stream sampling survey located anomalous copper and lead values of up to 150 ppm and up to 500 ppm respectively. The higher lead values occur in a belt about 1½ miles wide coincident with the Cambrian/Ordovician boundary over a distance of 6 miles. High lead values are associated with the Pant-y-wrach mine. (NW 8; NW 20)

**COMMERCIAL-IN-CONFIDENCE**

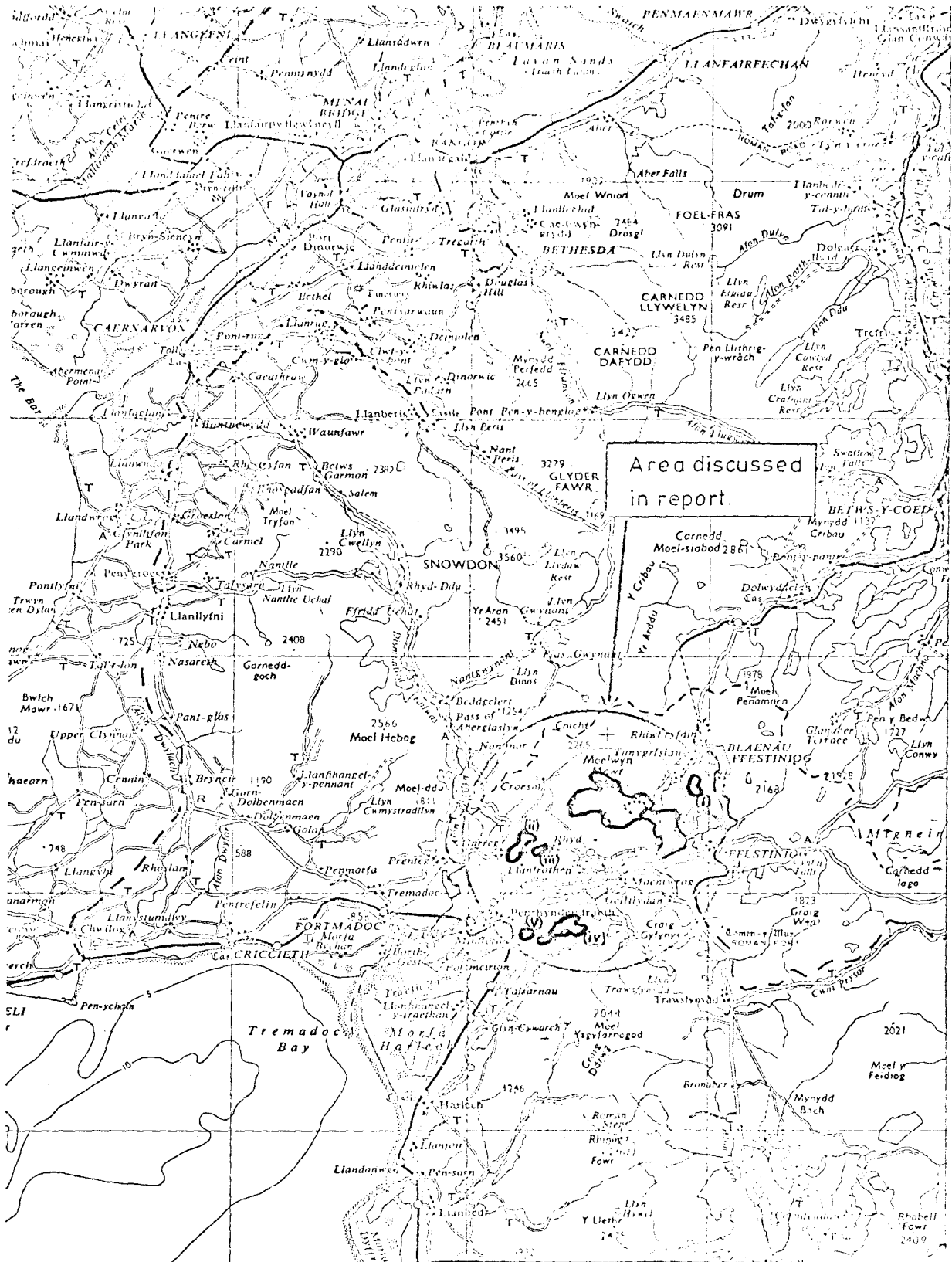
NORANDA EXPLORATION (U.K.) LIMITED

PROJECT 1690 - FFESTINIOG AREA

INCLUDING MOELWYNS

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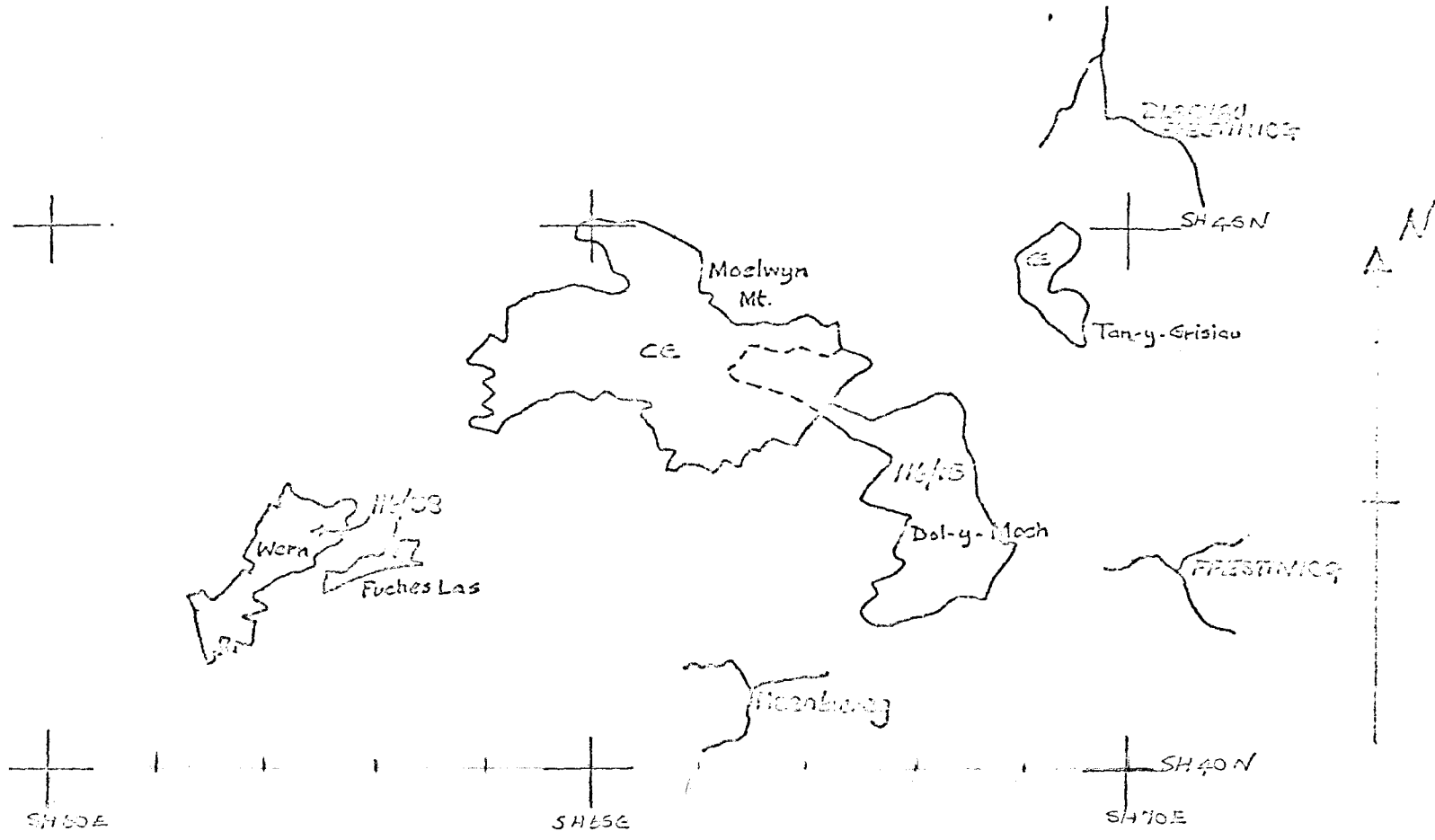
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Moelwyn Area shown:

NORANDA EXPLORATION (U.K.) LTD.	
FFESTINIOG	
Project 1690	
Location Plan 'A'	
Scale:	1 in = 4 miles
Sept. 1972.	

Barmouth



MAP  
1150/21/11

(Map on the right)

Location Plan 'B'

## PROJECT 1690 - FFESTINIOG

### 1. Introduction

*See location Plans 'A' & 'B'*

This area is situated mainly on the north side of the Vale of Ffestiniog in northern Merionethshire. Six blocks of property have been investigated lying between the towns of Port Madoc and Blaenau Ffestiniog. This report deals with exploration work carried out on the five smallest blocks of property. The largest property in this area is dealt with in the report on 1690/The Moelwyns, the properties covered in this report are peripheral to the Moelwyns and are distributed as follows -

To the east of the Moelwyns a small property near Tan-y-Grisiau has been investigated. This is bleak moorland, vegetated with grass and heather and grazed by sheep.

To the west of the Moelwyns two small areas of land have been prospected. These comprise the farm of Wern, situated near Llanfrothen village and a small detached section of this farm known as Fuches has been included with Wern in one prospecting agreement. Much of Wern farm is valley floor fields with thick drift cover and bog precluding sampling operations. The remainder of Wern and Fuches has been given over to sheep farming with small fields and woods separated by dry stone walls.

To the south two areas near Llandecwyn have been investigated. The larger area is rocky upland sheep grazing around Llyn Tecwyn Uchaf, whilst the smaller is a rocky hillock overlooking the Drwryd estuary, known as Y-Garth.

### 2. Geology

- (i) Tan-y-Grisiau - *Crown Estate* See Fig. 2  
This property is situated entirely on the Tan-y-Grisiau microgranite.
- (ii) Wern Farm (Wern Farm section) - *116/38*  
This farm lies on Glanrafon sediments intruded by dolerites to the east and with thin interbedded tuffs to the south west. To the north west are some intrusive rhyolites.
- (iii) Wern (Fuches Las section) - *116/38*  
This lies on the Glanrafon beds of middle Ordovician age and includes some thin interbedded tuffs.
- (iv) Llyn Tecwyn Uchaf - *Crown Estate*  
This property lies mainly on Penrhos shales with a small area of Vigra flags to the south east. They are of Upper Cambrian

(v) Y-Garth - *Crown Estate*

This small area is composed of Ffestiniog flags.

3. Old Workings

This area is characterised by a large number of old workings for base metal ores. In most of these cases outputs have been very small, only in a few cases do they exceed a few hundred tons of concentrates. The oldest and largest of these workings is the Bwlch-y-Plwm mine which lies immediately to the south west of Fuches Las. This mine is reputed to have been worked by the Romans and the extensive workings on a number of veins have probably yielded about 10,000 tons of galena concentrates, a few thousand tons of blende of varying grades, and a few tons of copper ore. Examination of the workings shows that most ore came from quartz and quartz/calcite veins, but in at least one place a rich stockwork of galena veinlets has been mined over a width of twenty feet.

About one mile south west of Bwlch-y-Plwm, the pant-y-Wrach mine has produced a small amount of copper ore. West of Bwlch-y-Plwm the Penrallt and Hafod-y-Mynydd mines have yielded small quantities of lead and zinc ore, and a few tons of copper ore has been produced at Clogwyn-y-Boeth. Near Penrallt a bed of sedimentary iron ore has been worked on a small scale. Several dozen other small workings for lead or copper have been located in this area.

Near Llyn Tecwyn Uchaf several quartz veins have been trialed for lead and copper but no economic production has resulted. No workings have been located in the Tan-y-Grisiau area.

4. Previous work

A reconnaissance stream sampling programme was carried out by Huntings in 1970. This revealed a large number of anomalous metal values within the area later designated 1690. Very high lead values abounded in the region of the Cambrian/Ordovician boundary between Llanfrothen and Blaenau Ffestiniog. The majority of this area is covered in the report 1690 - Moelwyns, but Wern and Fuches Las lie at the west end of this anomalous zone and the Tan-y-Grisiau property at the east end. Several high values near Wern and Fuches Las can be attributed to the contamination from old workings, but most of the anomalous samples are free from visible contamination. Many samples on and around the Tan-y-Grisiau granite have high lead values, however, most streams drain sediments and extrusive volcanics as well as the microgranite. A few high zinc values occur in

the areas of anomalous lead, but at least half of these can be attributed at least in part to contamination from tip material. Similarly many of the high copper values are related to tip contamination, but the remainder including most of those in the east are probably genuine.

In the area near Llyn Tecwyn Uchaf a few anomalous lead and copper values occur. These are considered to be due to weak vein mineralisation. No streams draining Garth were sampled.

Throughout the area manganese content of the streams is high, but generally low zinc values suggest that co-precipitation of base metals with Mn hydroxides has not occurred to any great extent.

#### Soil Sampling

*see figs 1 to 3*

Soil sampling was carried out during the winter of 1971/2. Samples were taken from the subsoil at 100' intervals on lines spaced 800' apart. Samples were analysed for Cu, Pb, Zn.

(i) Tan-y-Grisiau: No significant copper or lead values were obtained. One isolated high zinc value of 510 ppm was not considered to warrant further work.

(ii) Wern: Despite the prevalence of small lead zinc veins nearly no anomalous lead or zinc values were obtained. A single high copper value of 132 ppm was not deemed to warrant further work especially since it was located within the Glanrafon beds.

(iii) Fuches Las: No anomalous results were obtained. A few samples analysed for Mo. showed only background values.

(iv) Llyn Tecwyn Uchaf: No anomalous values were obtained in copper or lead or zinc.

(v) Y-Garth: No significant results were obtained.

#### 5. Conclusion

These five small areas do not offer any prospect of large scale mineralisation. In the region around the Llyn Tecwyn Uchaf and Y-Garth properties any mineralisation is probably restricted to thin quartz veins. In the Wern and Fuches Las area the Cambrian/Ordovician contact and its associated faults is the only area likely to prove of any interest in the future.

- 4 -

The Tan-y-Grisiau granite is of no further interest as a copper lead or zinc prospect.

These peripheral areas of Project 1690 are of considerably less interest than the Moelwyns area described in the accompanying report.

AUGUST 1972

I.W./P.D.D.



AREA 1690 - MOELWYNS

1. Introduction

See plan B.

The area covered in this report is the central part of the 1690 project area and is referred to as "The Moelwyns". The Moelwyns are a range of mountains rising to 2527 feet on which this property is situated.

The area prospected is mainly barren mountain sheepwalk with frequent crags and scree. Dol-y-Moch farm in the south east is wooded on its lower slopes. Some parts of the area have in the past been worked for slate. Most of these workings have been small, but a few are much larger.

Mineral Rights

Crown Estates	1,000 acres
116/5 Dol-y-Moch (A. Davies, Maentwrog)	750 acres

2. Geology

The oldest rocks on this property are the Dolgellau beds of Upper Cambrian Age, which are exposed in the south eastern half of Dol-y-Moch farm. These are blue and blue grey shales and slates, becoming pyritous in their higher parts forming the dark grey carbonaceous "black band" shales. The Dolgellau beds are overlain by the Tremadoc slates, a sequence of grey and blue mudstones, slates and shales.

The Tremadoc Slates represent the highest Cambrian rocks and are separated from the succeeding Ordovician rocks by the Tremadoc Thrust Zone. In the Moelwyn area this consists of a zone of crushed slates which merges gradually into undisturbed rock on either side. Short cross faults to this thrust zone have in the past often been proved to be mineralised.

The base of the Ordovician is usually the Garth Grit, but sometimes this is concealed by the Tremadoc thrust zone. The Garth grit is overlain by flags and shales of Arenig age. These are unconformably overlain by the Glanrafon Beds of lower Caradoc age. The shale of the Glanrafon Beds are intruded by quartz latite sills and interbedded with the Moelwyn volcanic series of acid lavas and tuffs.

South of the Tan-y-Grisiau reservoir the Tremadoc and Dolgellau beds are intruded by the Tan-y-Grisiau micro granite and a number of thin associated micro granite sills.

3. Old Workings

Only two mines are known to have worked metal ores on this property. At the Moelwyn Mine (SH 676 437) two lodes have been worked for zinc and lead ore. These lodes lie in the Tremadocian close to the Ton-y-Grisiau microgranite. Total production was probably of the order of several thousand tons of concentrates, primarily zinc.

On Dol-y-Moch farm (SH 681 422) small quartz veins carried traces of galena and possibly chalcopyrite have been trialed upon. The lodes occur in the "Black Band" of the Dolgellau Beds, and it is thought unlikely that any economic production occurred.

Examination of old mines to the west along the Tremadoc Thrust zone (described in Report 1690 Ffestiniog) shows that in the region of the thrust the Arenig Flags and shales are often a favourable host rock for mineralisation.

The presence of intercalated volcanics in the Glanrafor Beds appears to render them more suitable horizon for mineral deposition. Occurrences of disseminated mineralisation outside quartz veins have however been very small in the past.

4. Previous Work

A reconnaissance stream sediment survey carried out by Huntings in 1970 showed very high lead values in the area of the Cambrian Ordovician contact. Some copper and zinc values in the same area were anomalous to a lesser extent. In view of the fact that the majority of the high lead values were away from areas of known contamination, and mineralised faults were known to be associated with the thrust to the west it was felt that this area should be investigated by a soil sampling programme.

5. Present Work

During the winter of 1971/2 a soil sampling programme was carried out. Samples were taken from the subsoil and sieved -80 mesh being analysed by atomic absorption spectrometer for Cu, Pb, Zn. Some samples were also analysed for Mo. The results of these analyses are discussed in Section B, and illustrated in Fig 4.

A. Copper, Lead and Zinc.

*Figs. 1, 2 & 3*

The most significant results were obtained in the area west south west of Tan-y-Grisiau reservoir (SH 666 433). Here a large number of anomalous lead values were obtained, including seven in excess of 1000 ppm. The maximum lead value was 9600 ppm. The maximum zinc value was 2100 ppm, the maximum copper value was 200 ppm. The maximum combined Cu, Pb, Zn content of one sample was 1.07%. This area lies directly over the Tremadoc Thrust zone at a point where it is intersected by several faults. No workings for base metals are known to occur in this immediate area, and contamination from industrial, agricultural or domestic sources can be regarded as a highly unlikely explanation for the high metal values occurring in soil samples. Approximately  $\frac{3}{4}$  of a kilometer to the north east a fault has been worked for lead and zinc ore at the Moelwyn Mine (see Para.3). This mineralised fault strikes broadly towards the area of the anomaly, but further would be required before any relationship to the geochemical anomaly could be established.

The occurrence of stockworks of galena at a once economic grade at Bwlch-y-Plwm mine, several miles to the west along the thrust zone, albeit on a very small scale, suggest that if litho logical and structural factors are suitable this is potentially a promising environment for

large scale low grade lead deposits. To date the outlined anomalous area is quite small, 3000' x 1000' but the anomaly is open to the west and south. To the south lies the Tan-y-Grisiau granite, and although the Moelwyn Mine worked deposits close to the granite it is considered unlikely that the Tremadocian to the north of the granite will prove interesting away from the Tremadoc Thrust Zone. To the west however, the prospects are better. For over two kilometers the thrust zone is intersected by numerous cross faults, and stream sediment samples in this area have given higher values than those taken on the area of the soil sampling anomaly. This western area is not on Noranda's mineral leases but is open for negotiation. Owing to the curtailment of field operations it was not possible to complete detail sampling of this area. Two lines of soil samples were taken, but results of analysis have to date not been received. Detail soil sampling, geological surface investigation and geophysics would be necessary to complete evaluation of the anomalous area. At present it is a highly interesting area, but until the nature of the mineralisation, if any, is established, any speculation as to its extent and economic interest is hazardous.

A few other areas of interesting soil values occur on this area. At SH 656 447 a small number of anomalous lead values occur, mainly within the Glanrafon Beds. These lie uphill of any contamination from slate tips but the anomalous area appears to be small. Several above background lead values between Llyn Stwlan (Sh 665 445) and Tan-y-Grisiau reservoir are attributed to the Moelwyn No. 1 vein and tip contamination from the same vein.

In Dol-y-Moch farm (Around SH 682 422) a number of anomalous coppers and lead values occur with some high background zinc values. At least half of these values occur over or below outcrops of the "black band" shales at the top of the Dolgellau beds and can be attributed to somewhat enhanced base metal values within these rocks. Some of the few remaining anomalous values are believed to be due to thin quartz veins carrying a small quantity of galena and possibly other metal sulphides which are thought to be derived by hydrothermal leaching from the carbonaceous shales of the "black band".

#### B. Molybdenum

A number of samples from this area were analysed for Mo. with the exception of a few values just south of Tan-y-Grisiau reservoir all anomalous values occurred south of the Tan-y-Grisiau microgranite on Dol-y-Moch Farm.

At a time when only the first few results had been received from this area and the anomalous Mo. values were restricted to one line, the area was examined by Dave Carson, of Noranda Mines Limited. No molybdenum minerals were found in the sediments by visual examination and a thin microgranite sill intruding the base of the Tremadocian and carrying arsenic and iron sulphides was suggested by Mr. Carson as a possible source of molybdenum for the soil. Analysis of a specimen of the sill showed a Mo. content of 52 ppm. The maximum soil value is 41.1 ppm. It is now considered that another possible source of Molybdenum is the "black band" of the Dolgellau Beds, the outcrop of which corresponds reasonably well with the molybdenum anomaly as revealed by the full set of results. If both the "black band" and microgranite sill are accepted as having a high background value of molybdenum all anomalous values in this area can be adequately explained. The closure of field operations prevented the collection of samples of rock from the "black band" for analysis, thus to some extent the presumption of slightly increased Mo. values within this rock must remain conjectural. It is considered to be very unlikely however that the anomalous Mo. in the soil is related to any mineralisation of economic interest.

## 6. Conclusion

The most interesting area located on this property is the lead anomaly south of the Llyn Stwlan around GR SH 666 433. It is considered that the anomalous values are probably related to underlying mineralisation, but further work would be needed to determine the nature of this mineralisation. It is unlikely to be in the form of quartz veins outcropping at surface source since the "old men" would certainly have trialed on these. In view of the nature of known mineral occurrences in this area it is tempting to suggest mineralised breccia zones in faults sub-parallel or at right angles to the Tremadoc Thrust zone, possibly of considerable width. It is surprising that zinc values have been so much smaller than lead values in this area in view of the presence of blende with galena in most of the old workings of this area. Without further work these suggestions must remain speculative, and it suffices to say that the area remains of some interest. It is considered that no other area of this property except the above mentioned is of sufficient interest to warrant further work.

AUGUST 1972

PAUL DUNGATE/IAN WALLACE



NORANDA-KERR LIMITED

AE 75

Spore copy

PROJECT NO. 1690 - FFESTINIOG, N. WALES

Application for Financial Assistance : APPENDIX 1

Geology of the Area: The area is on the north-western side of the Harlech Dome, and is underlain by Upper Cambrian and Lower Ordovician shales and sandstones with associated greenstones. These rocks dip to the north-west and strike in a generally north-easterly direction. The Cambrian sedimentary rocks are intruded by the Tan-y-grisiau granite, around which a metamorphic aureole occurs.

Several old mines and prospects occur which were intermittently worked for chalcopyrite-bearing veins. The most noteworthy is the Pany-y-wrach mine (SH 630410)

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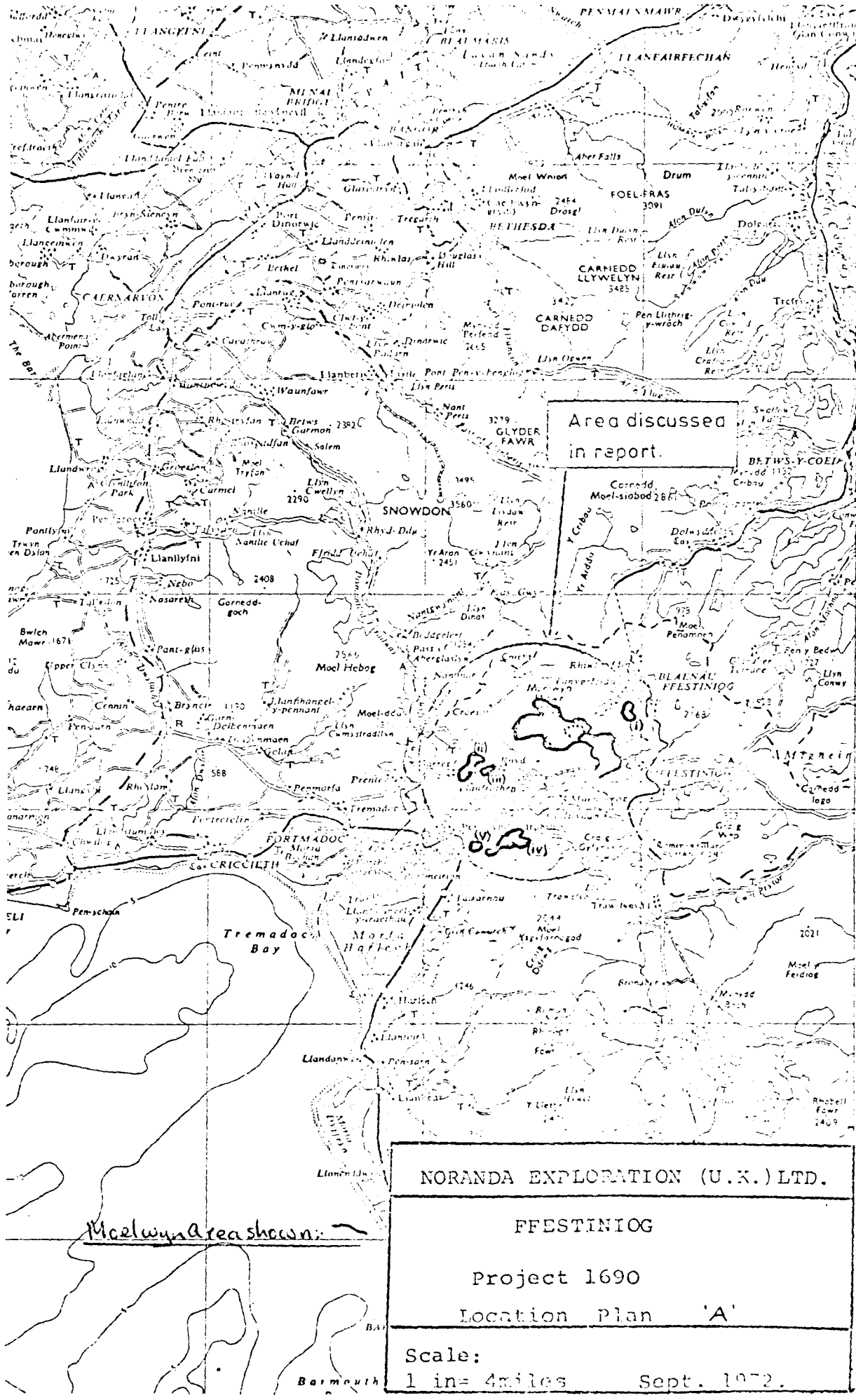
NORANDA EXPLORATION (U.K.) LIMITED

PROJECT 1690 - FFESTINIOG AREA

INCLUDING MOELWYNS

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(iv) Llyn Tecwyn		
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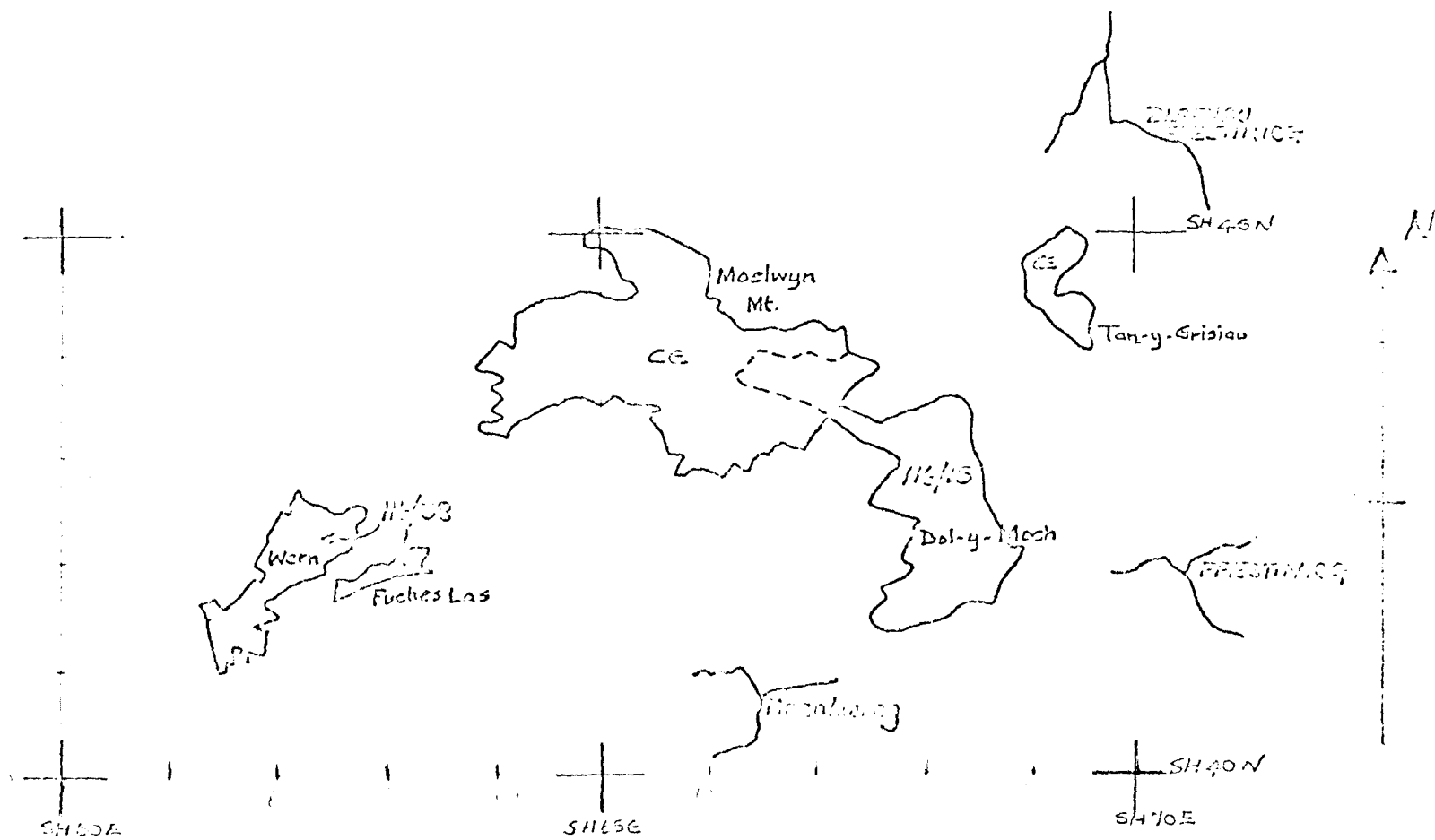


Area discussed  
in report.

NORANDA EXPLORATION (U.K.) LTD.  
 FFEStINIOG  
 Project 1690  
 Location Plan 'A'  
 Scale:  
 1 in = 4 miles      Sept. 1972.

Moelwyn area shown:





MAP  
1/10/10

(Not to scale)

Location Plan 'S'

## PROJECT 1690 - FFESTINIOG

### 1. Introduction

*See location Plans 'A' & 'B'*

This area is situated mainly on the north side of the Vale of Ffestiniog in northern Merionethshire. Six blocks of property have been investigated lying between the towns of Port Madoc and Blaenau Ffestiniog. This report deals with exploration work carried out on the five smallest blocks of property. The largest property in this area is dealt with in the report on 1690/The Moelwyns, the properties covered in this report are peripheral to the Moelwyns and are distributed as follows -

To the east of the Moelwyns a small property near Tan-y-Grisiau has been investigated. This is bleak moorland, vegetated with grass and heather and grazed by sheep.

To the west of the Moelwyns two small areas of land have been prospected. These comprise the farm of Wern, situated near Llanfrothen village and a small detached section of this farm known as Fuches has been included with Wern in one prospecting agreement. Much of Wern farm is valley floor fields with thick drift cover and bog precluding sampling operations. The remainder of Wern and Fuches has been given over to sheep farming with small fields and woods separated by dry stone walls.

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This property is situated entirely on the Tan-y-Grisiau microgranite.
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This farm lies on Glanrafon sediments intruded by dolerites to the east and with thin interbedded tuffs to the south west. To the north west are some intrusive rhyolites.
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This lies on the Glanrafon beds of middle Ordovician age and includes some thin interbedded tuffs.
- (iv) Llyn Tecwyn Uchaf - *Crown Estate*  
This property lies mainly on Penrhos shales with a small area of Vigra flags to the south east. They are of Upper Cambrian

(v) Y-Garth - *Crown Estate*

This small area is composed of Ffestiniog flags.

3. Old Workings

This area is characterised by a large number of old workings for base metal ores. In most of these cases outputs have been very small, only in a few cases do they exceed a few hundred tons of concentrates. The oldest and largest of these workings is the Bwlch-y-Plwm mine which lies immediately to the south west of Fuches Las. This mine is reputed to have been worked by the Romans and the extensive workings on a number of veins have probably yielded about 10,000 tons of galena concentrates, a few thousand tons of blende of varying grades, and a few tons of copper ore. Examination of the workings shows that most ore came from quartz and quartz/calcite veins, but in at least one place a rich stockwork of galena veinlets has been mined over a width of twenty feet.

About one mile south west of Bwlch-y-Plwm, the pant-y-Wrach mine has produced a small amount of copper ore. West of Bwlch-y-Plwm the Penrallt and Hafod-y-Mynydd mines have yielded small quantities of lead and zinc ore, and a few tons of copper ore has been produced at Clogwyn-y-Boeth. Near Penrallt a bed of sedimentary iron ore has been worked on a small scale. Several dozen other small workings for lead or copper have been located in this area.

Near Llyn Tecwyn Uchaf several quartz veins have been trialed for lead and copper but no economic production has resulted. No workings have been located in the Tan-y-Grisiau area.

Previous work

A reconnaissance stream sampling programme was carried out by Huntings in 1970. This revealed a large number of anomalous metal values within the area later designated 1690. Very high lead values abounded in the region of the Cambrian/Ordovician boundary between Llanfrothen and Blaenau Ffestiniog. The majority of this area is covered in the report 1690 - Moelwyns, but Wern and Fuches Las lie at the west end of this anomalous zone and the Tan-y-Grisiau property at the east end. Several high values near Wern and Fuches Las can be attributed to the contamination from old workings, but most of the anomalous samples are free from visible contamination. Many samples on and around the Tan-y-Grisiau granite have high lead values, however, most streams drain sediments and extrusive volcanics as well as the microgranite. A few high zinc values occur in

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Throughout the area manganese content of the streams is high, but generally low zinc values suggest that co-precipitation of base metals with Mn hydroxides has not occurred to any great extent.

#### Soil Sampling

*see figs 1 to 3*

Soil sampling was carried out during the winter of 1971/2. Samples were taken from the subsoil at 100' intervals on lines spaced 800' apart. Samples were analysed for Cu, Pb, Zn.

(i) Tan-y-Grisiau: No significant copper or lead values were obtained. One isolated high zinc value of 510 ppm was not considered to warrant further work.

(ii) Wern: Despite the prevalence of small lead zinc veins nearly no anomalous lead or zinc values were obtained. A single high copper value of 132 ppm was not deemed to warrant further work especially since it was located within the Glanrafon beds.

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#### 5. Conclusion

These five small areas do not offer any prospect of large scale mineralisation. In the region around the Llyn Tecwyn Uchaf and Y-Garth properties any mineralisation is probably restricted to thin quartz veins. In the Wern and Fuches Las area the Cambrian/Ordovician contact and its associated faults is the only area likely to prove of any interest in the future.

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The Tan-y-Grisiau granite is of no further interest as a copper lead or zinc prospect.

These peripheral areas of Project 1690 are of considerably less interest than the Moelwyns area described in the accompanying report.

AUGUST 1972

I.W./P.D.D.

AREA 1690 - MOELWYNS

1. Introduction

See plan B.

The area covered in this report is the central part of the 1690 project area and is referred to as "The Moelwyns". The Moelwyns are a range of mountains rising to 2527 feet on which this property is situated.

The area prospected is mainly barren mountain sheepwalk with frequent crags and scree. Dol-y-Moch farm in the south east is wooded on its lower slopes. Some parts of the area have in the past been worked for slate. Most of these workings have been small, but a few are much larger.

Mineral Rights

Crown Estates	1,000 acres
116/15 Dol-y-Moch (A. Davies, Maentwrog)	750 acres

2. Geology

The oldest rocks on this property are the Dolgellau beds of Upper Cambrian Age, which are exposed in the south eastern half of Dol-y-Moch farm. These are blue and blue grey shales and slates, becoming pyritous in their higher parts forming the dark grey carbonaceous "black band" shales. The Dolgellau beds are overlain by the Tremadoc slates, a sequence of grey and blue mudstones, slates and shales.

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The base of the Ordovician is usually the Garth Grit, but sometimes this is concealed by the Tremadoc thrust zone. The Garth grit is overlain by flags and shales of Arenig age. These are unconformably overlain by the Glanrafon Beds of lower Caradoc age. The shale of the Glanrafon Beds are intruded by quartz latite sills and interbedded with the Moelwyn volcanic series of acid lavas and tuffs.

South of the Tan-y-Grisiau reservoir the Tremadoc and Dolgellau beds are intruded by the Tan-y-Grisiau micro granite and a number of thin associated micro granite sills.

3. Old Workings

Only two mines are known to have worked metal ores on this property. At the Moelwyn Mine (SH 676 437) two lodes have been worked for zinc and lead ore. These lodes lie in the Tremadocian close to the Ton-y-Grisiau microgranite. Total production was probably of the order of several thousand tons of concentrates, primarily zinc.

On Dol-y-Moch farm (SH 681 422) small quartz veins carried traces of galena and possibly chalcopyrite have been trialed upon. The lodes occur in the "Black Band" of the Dolgellau Beds, and it is thought unlikely that any economic production occurred.

Examination of old mines to the west along the Tremadoc Thrust zone (described in Report 1690 Ffestiniog) shows that in the region of the thrust the Arenig Flags and shales are often a favourable host rock for mineralisation.

The presence of intercalated volcanics in the Glanrafon Beds appears to render them more suitable horizon for mineral deposition. Occurrences of disseminated mineralisation outside quartz veins have however been very small in the past.

4. Previous Work

A reconnaissance stream sediment survey carried out by Huntings in 1970 showed very high lead values in the area of the Cambrian Ordovician contact. Some copper and zinc values in the same area were anomalous to a lesser extent. In view of the fact that the majority of the high lead values were away from areas of known contamination, and mineralised faults were known to be associated with the thrust to the west it was felt that this area should be investigated by a soil sampling programme.

5. Present Work

During the winter of 1971/2 a soil sampling programme was carried out. Samples were taken from the subsoil and sieved -80 mesh being analysed by atomic absorption spectrometer for Cu, Pb, Zn. Some samples were also analysed for Mo. The results of these analyses are discussed in Section B, and illustrated in Fig 4.

A. Copper, Lead and Zinc.

Figs. 1, 2 & 3

The most significant results were obtained in the area west south west of Tan-y-Grisiau reservoir (SH 666 433). Here a large number of anomalous lead values were obtained, including seven in excess of 1000 ppm. The maximum lead value was 9600 ppm. The maximum zinc value was 2100 ppm, the maximum copper value was 200 ppm. The maximum combined Cu, Pb, Zn content of one sample was 1.07%. This area lies directly over the Tremadoc Thrust zone at a point where it is intersected by several faults. No workings for base metals are known to occur in this immediate area, and contamination from industrial, agricultural or domestic sources can be regarded as a highly unlikely explanation for the high metal values occurring in soil samples. Approximately  $\frac{3}{4}$  of a kilometer to the north east a fault has been worked for lead and zinc ore at the Moelwyn Mine (see Para.3). This mineralised fault strikes broadly towards the area of the anomaly, but further work would be required before any relationship to the geochemical anomaly could be established.

The occurrence of stockworks of galena at a once economic grade at Bwlch-y-Plwm mine, several miles to the west along the thrust zone, albeit on a very small scale, suggest that if litho logical and structural factors are suitable this is potentially a promising environment for



large scale low grade lead deposits. To date the outlined anomalous area is quite small, 3000' x 1000' but the anomaly is open to the west and south. To the south lies the Tan-y-Grisiau granite, and although the Moelwyn Mine worked deposits close to the granite it is considered unlikely that the Tremadocian to the north of the granite will prove interesting away from the Tremadoc Thrust Zone. To the west however, the prospects are better. For over two kilometers the thrust zone is intersected by numerous cross faults, and stream sediment samples in this area have given higher values than those taken on the area of the soil sampling anomaly. This western area is not on Noranda's mineral leases but is open for negotiation. Owing to the curtailment of field operations it was not possible to complete detail sampling of this area. Two lines of soil samples were taken, but results of analysis have to date not been received. Detail soil sampling, geological surface investigation and geophysics would be necessary to complete evaluation of the anomalous area. At present it is a highly interesting area, but until the nature of the mineralisation, if any, is established, any speculation as to its extent and economic interest is hazardous.

A few other areas of interesting soil values occur on this area. At SH 656 447 a small number of anomalous lead values occur, mainly within the Glanrafon Beds. These lie uphill of any contamination from slate tips but the anomalous area appears to be small. Several above background lead values between Llyn Stwlan (Sh 665 445) and Tan-y-Grisiau reservoir are attributed to the Moelwyn No. 1 vein and tip contamination from the same vein.

In Dol-y-Moch farm (Around SH 682 422) a number of anomalous coppers and lead values occur with some high background zinc values. At least half of these values occur over or below outcrops of the "black band" shales at the top of the Dolgellau beds and can be attributed to somewhat enhanced base metal values within these rocks. Some of the few remaining anomalous values are believed to be due to thin quartz veins carrying a small quantity of galena and possibly other metal sulphides which are thought to be derived by hydrothermal leaching from the carbonaceous shales of the "black band".

#### B. Molybdenum

A number of samples from this area were analysed for Mo. with the exception of a few values just south of Tan-y-Grisiau reservoir all anomalous values occurred south of the Tan-y-Grisiau microgranite on Dol-y-Moch Farm.

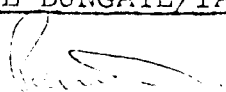
At a time when only the first few results had been received from this area and the anomalous Mo. values were restricted to one line, the area was examined by Dave Carson, of Noranda Mines Limited. No molybdenum minerals were found in the sediments by visual examination and a thin microgranite sill intruding the base of the Tremadocian and carrying arsenic and iron sulphides was suggested by Mr. Carson as a possible source of molybdenum for the soil. Analysis of a specimen of the sill showed a Mo. content of 52 ppm. The maximum soil value is 41.1 ppm. It is now considered that another possible source of Molybdenum is the "black band" of the Dolgellau Beds, the outcrop of which corresponds reasonably well with the molybdenum anomaly as revealed by the full set of results. If both the "black band" and microgranite sill are accepted as having a high background value of molybdenum all anomalous values in this area can be adequately explained. The closure of field operations prevented the collection of samples of rock from the "black band" for analysis, thus to some extent the presumption of slightly increased Mo. values within this rock must remain conjectural. It is considered to be very unlikely however that the anomalous Mo. in the soil is related to any mineralisation of economic interest.

## 6. Conclusion

The most interesting area located on this property is the lead anomaly south of the Llyn Stwlan around GR SH 666 433. It is considered that the anomalous values are probably related to underlying mineralisation, but further work would be needed to determine the nature of this mineralisation. It is unlikely to be in the form of quartz veins outcropping at surface source since the "old men" would certainly have trialed on these. In view of the nature of known mineral occurrences in this area it is tempting to suggest mineralised breccia zones in faults sub-parallel or at right angles to the Tremadoc Thrust zone, possibly of considerable width. It is surprising that zinc values have been so much smaller than lead values in this area in view of the presence of blende with galena in most of the old workings of this area. Without further work these suggestions must remain speculative, and it suffices to say that the area remains of some interest. It is considered that no other area of this property except the above mentioned is of sufficient interest to warrant further work.

AUGUST 1972

PAUL DUNGATE/IAN WALLACE



MERIONETHSHIRE  
MERIONETH CO CONST

FFESTINIOG UD & PH

160

Tanygrisiau

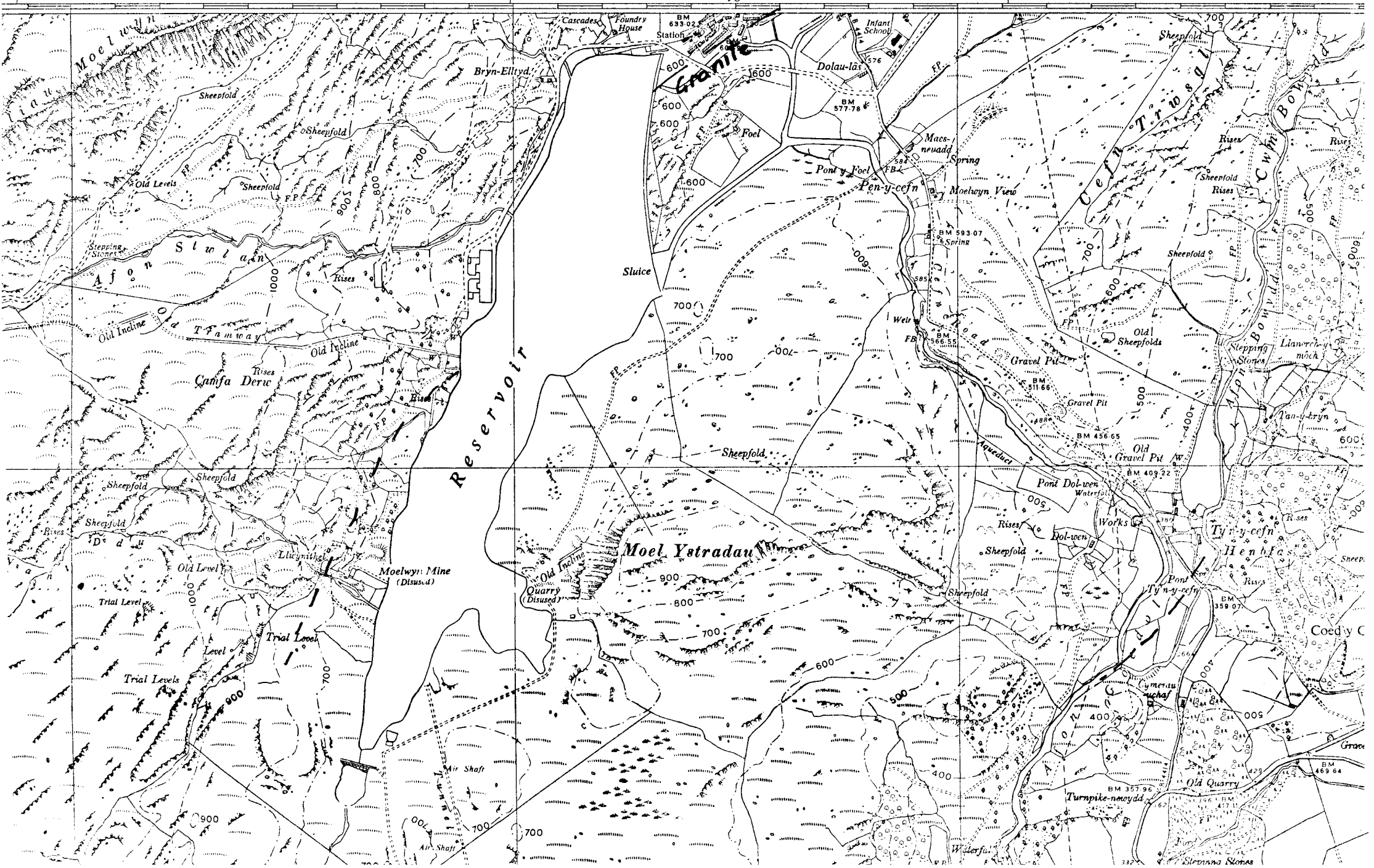
69

LONG  
3° 57' W

59

67

58  
68

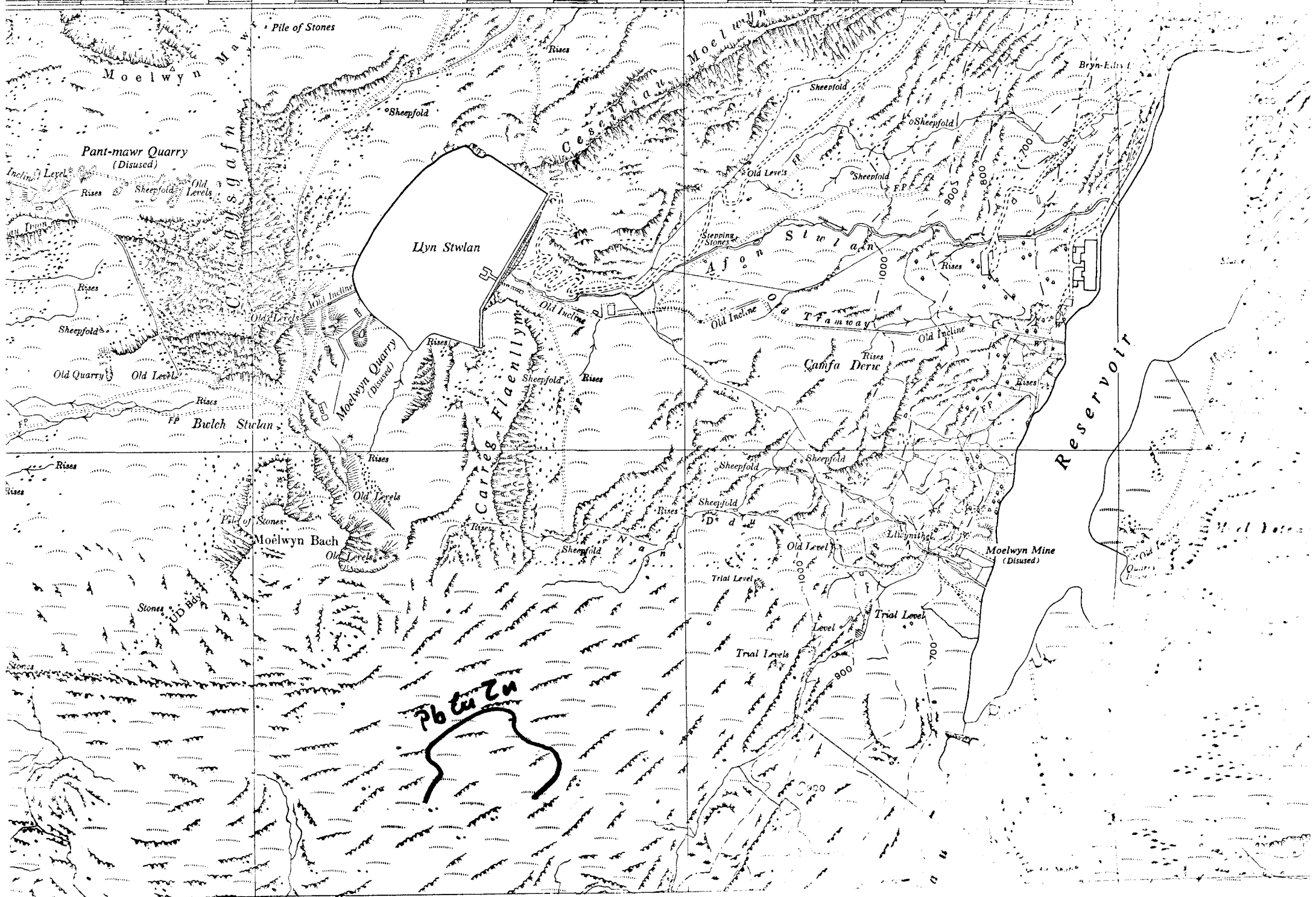


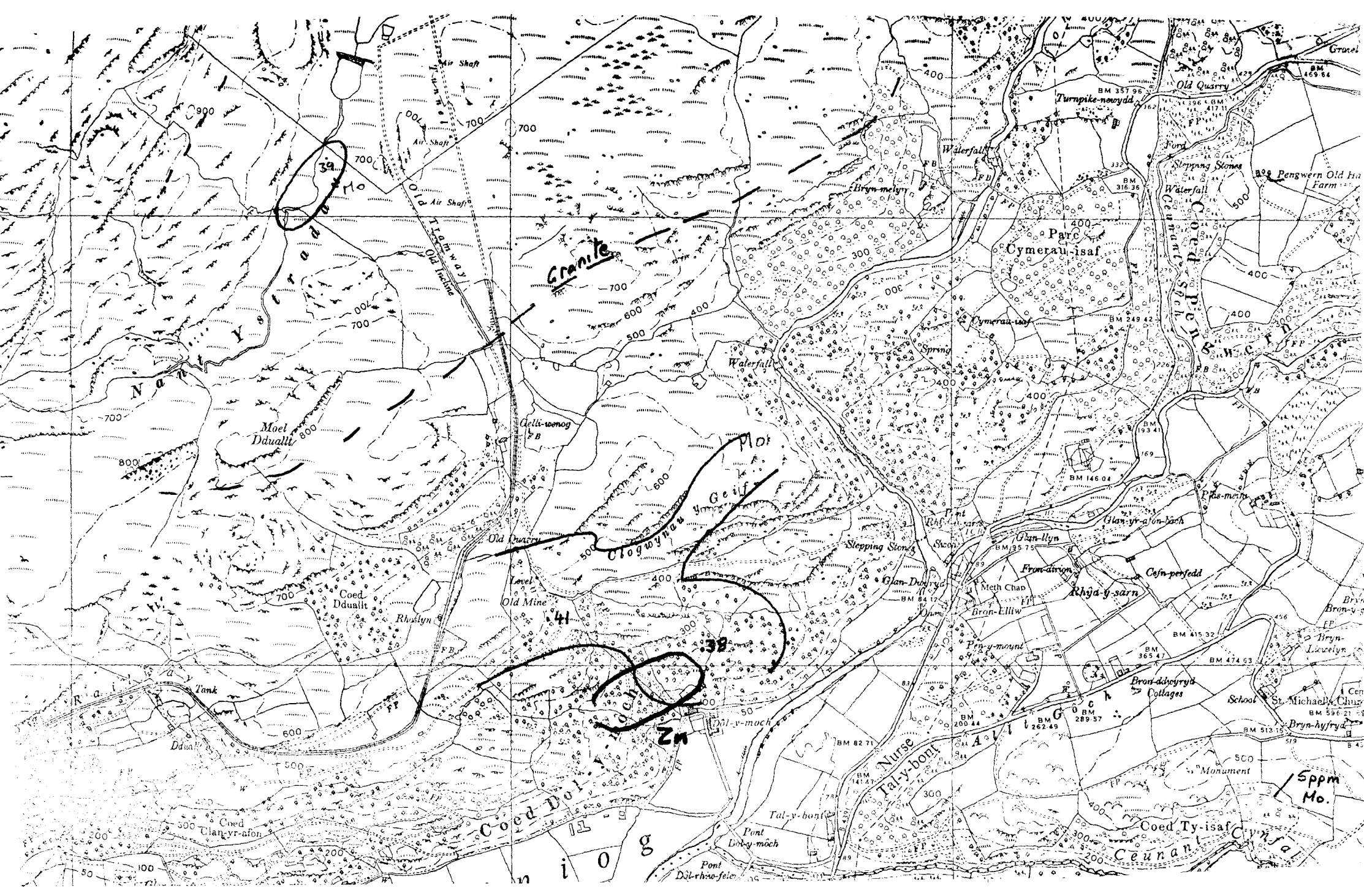
LONG  
4° 00' W

66

59'

67





39

Granite

Mo

38

Zn

Sppm Mo

Moel Dduallt

Old Mine

Coed Dol

Parc Cymerau-isaf

Coed Pen-y-bont

Nurse Taly-bont

Coed Ty-isaf

Old Lighthouse

Old Quarry

Waterfall

Waterfall

Waterfall

Waterfall

Waterfall

Waterfall

Waterfall

Waterfall

Waterfall

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Waterfall

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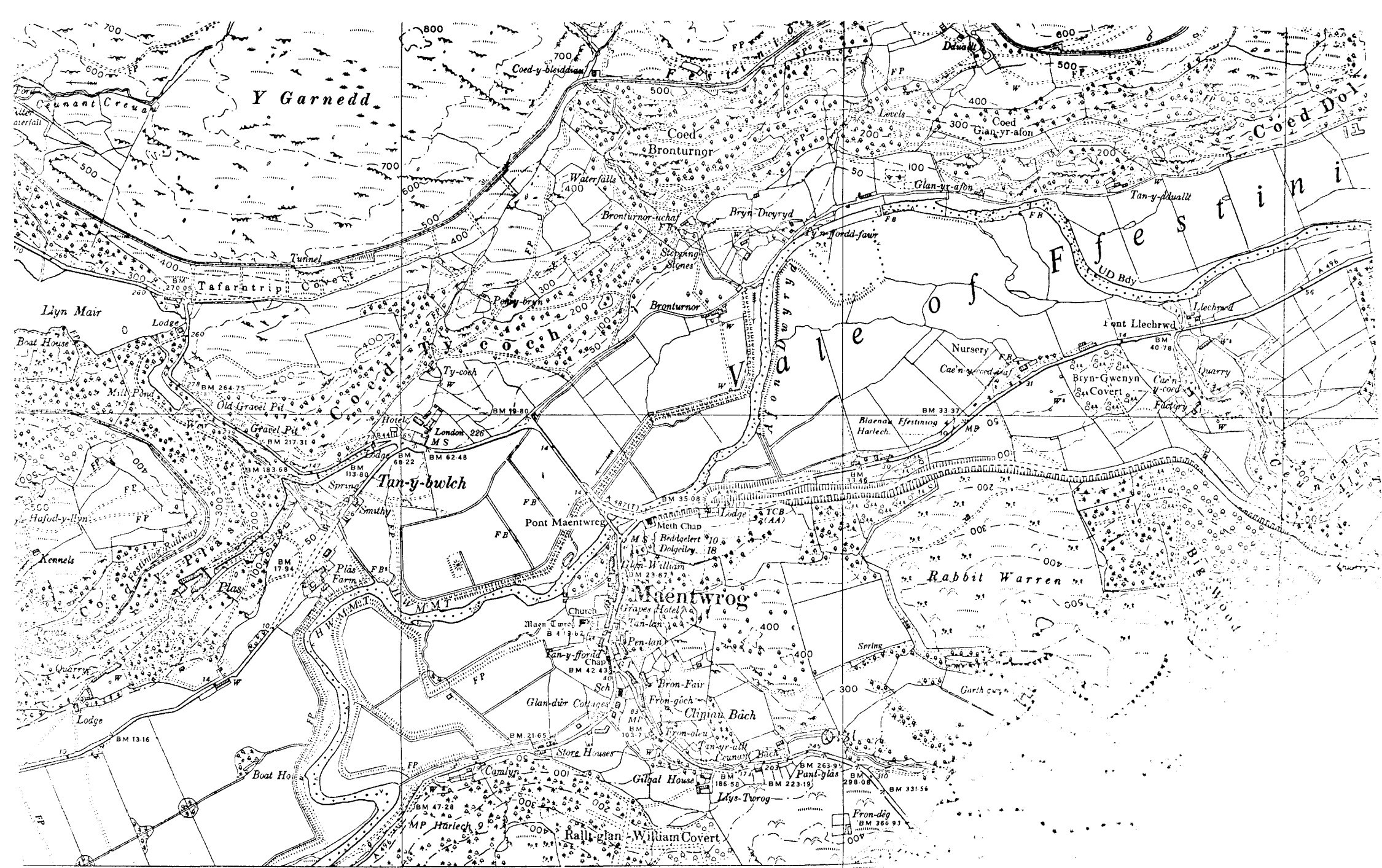
Waterfall

Waterfall

Waterfall

Waterfall

Waterfall



LONG 4° 00' W

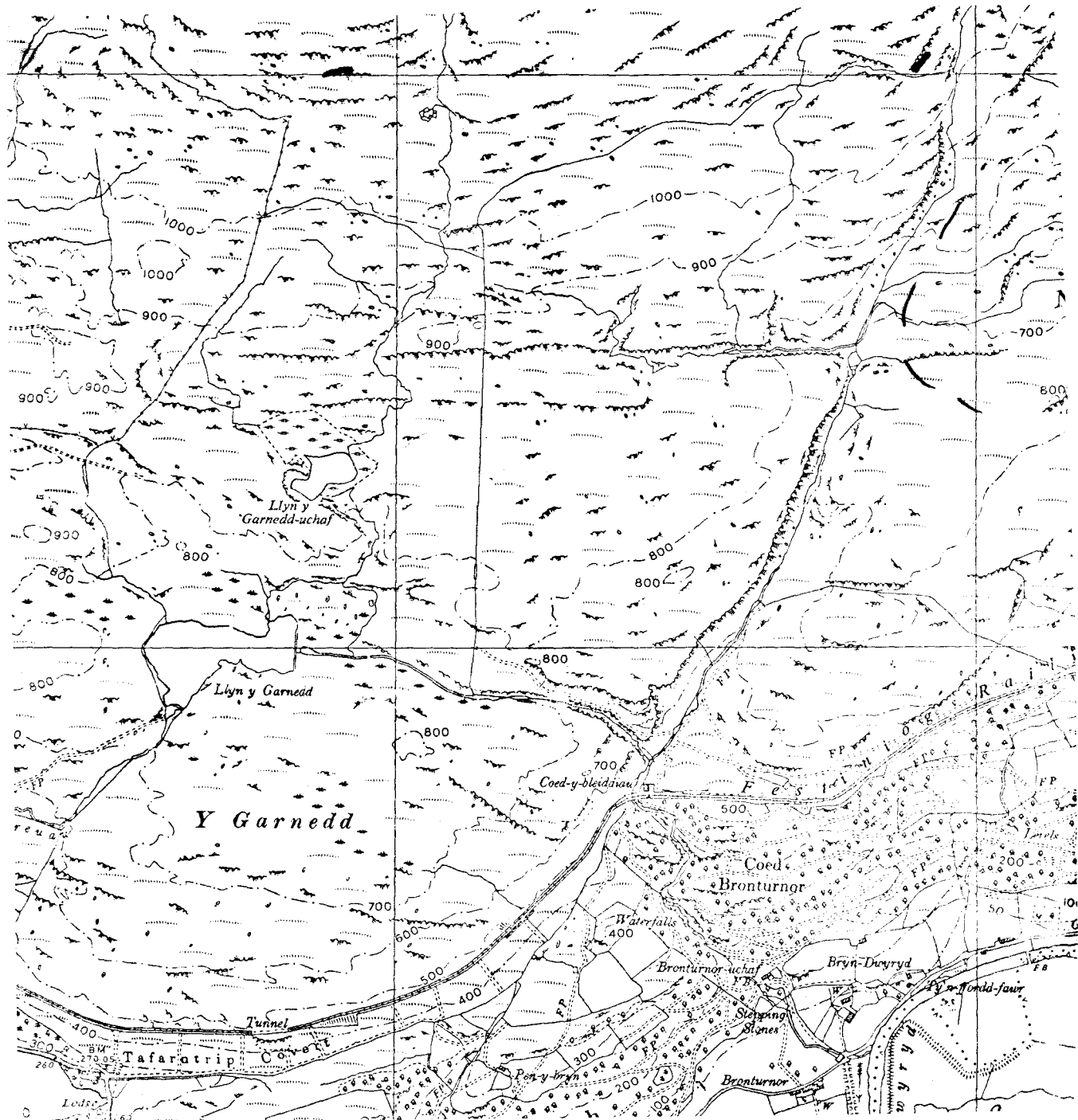
Township 4 Miles

66

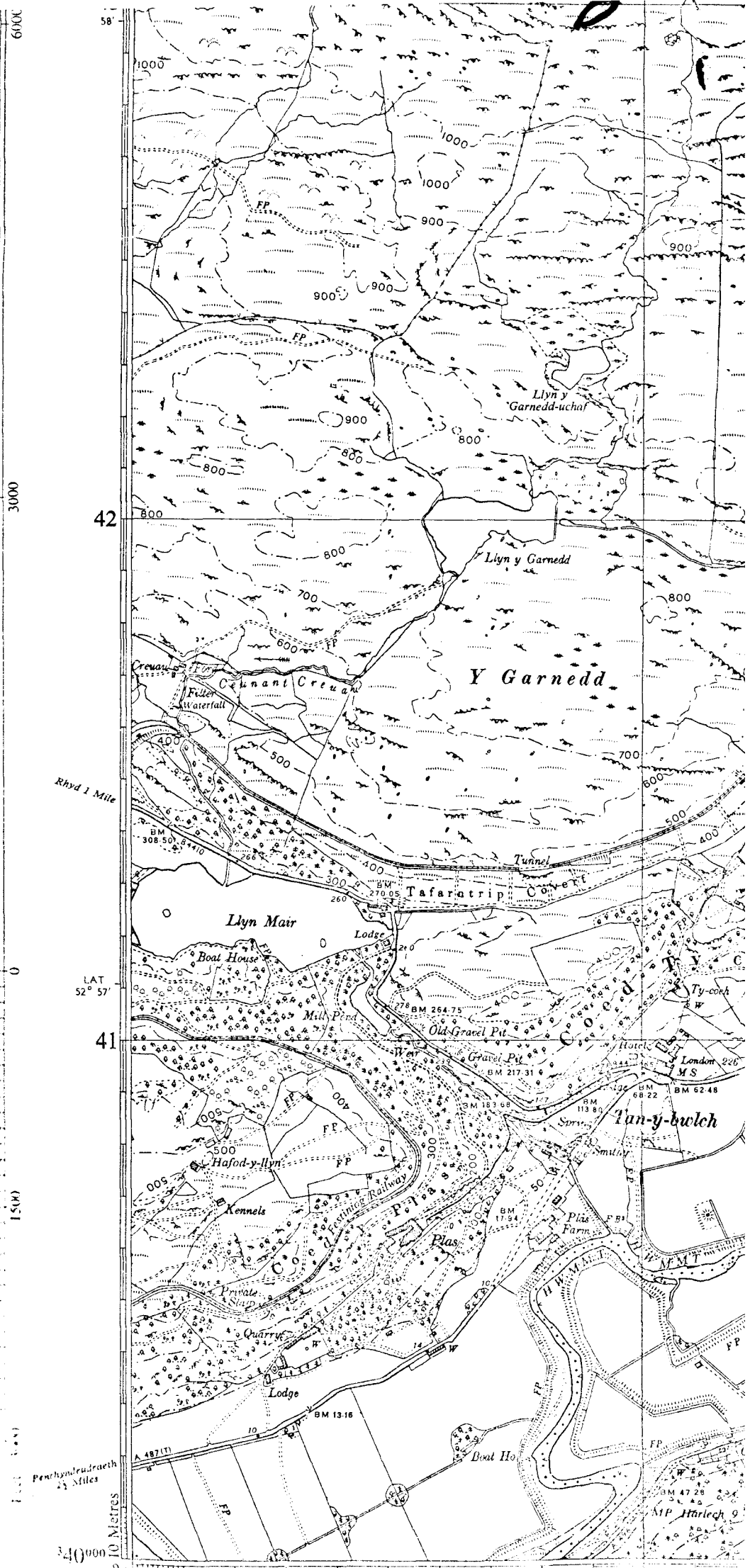
59'

67

DIETRAITH 33







6000

3000

0

1500

1000

58'

42

41

LAT 52° 57'

Rhyd 1 Mile

Pent-ynddraeth 4 Miles

10 Metres

10 Metres

LONG 4° 03' W

1000 4 Miles

66





FESTINOS 1690 Pg. 1.  
 GEOCHEMISTRY - Copper.

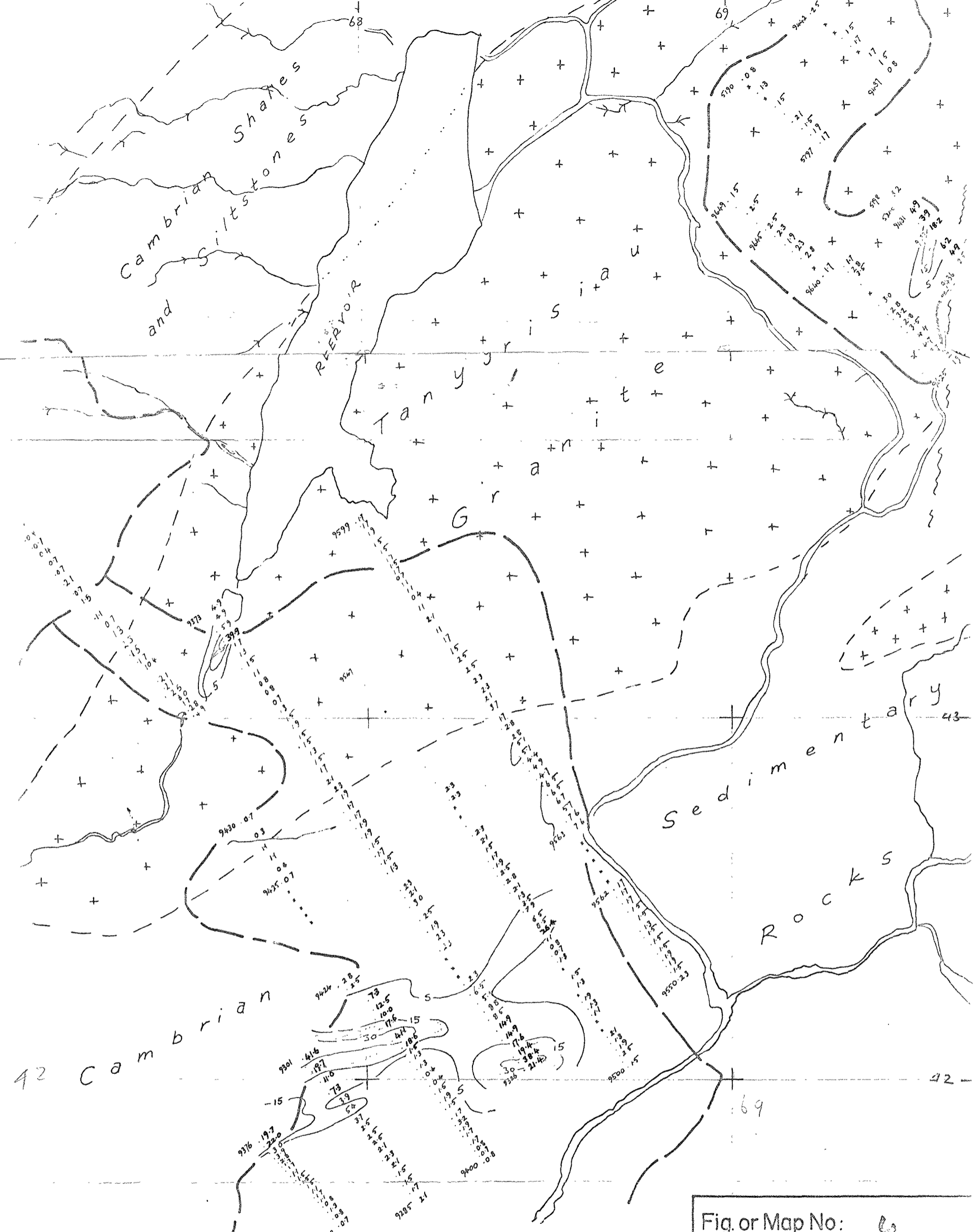


Fig. or Map No: 6

NORANDA EXPLORATION (UK) LIMITED

PROJECT 1690-FFESTINIOG  
Dol-y-Moch Farm Area - NORTH WALES

**SOIL GEOCHEMISTRY: Mo**

NORTH EAST SECTION : 116:15

Author: P. Dungate

Date of work: 1971

Drawn: P.D Date:

Scale: 6 inches - 1 mile

Revised:

COMMERCIAL: IN CONFIDENCE

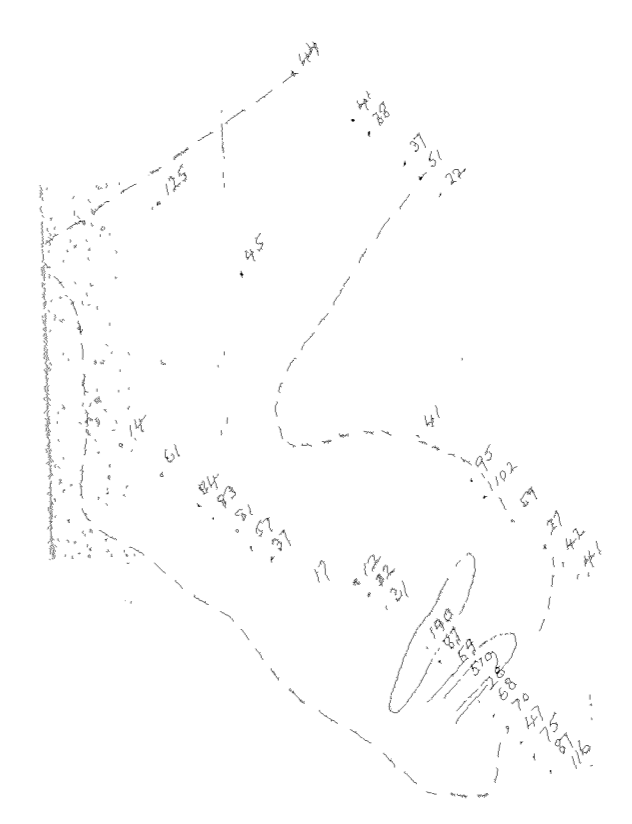
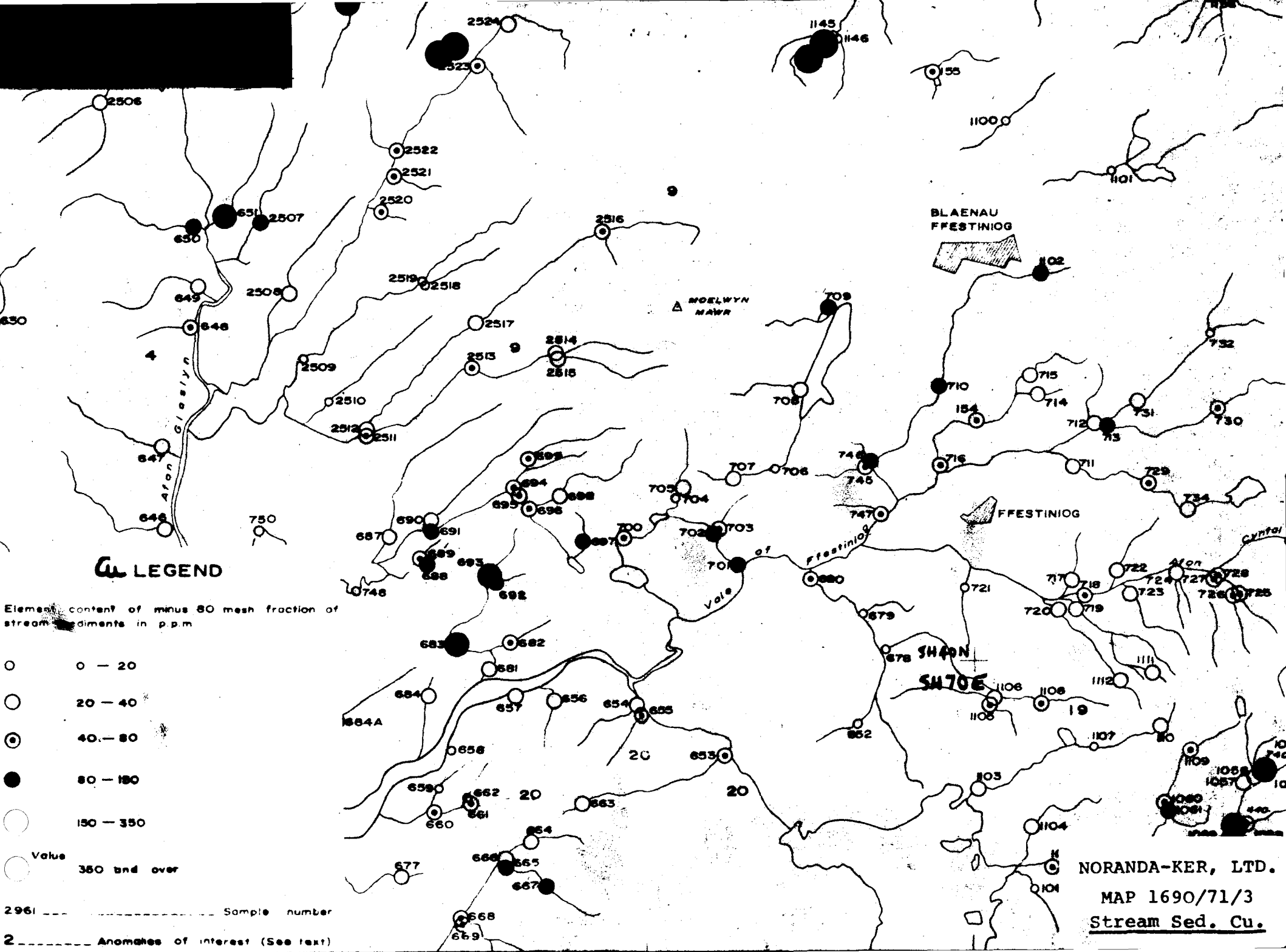


Fig. 3.

6" = 1 mile



NORANDA EXPLORATION (U.K.) LTD  
FFESTINIOG AREA 1690 MORLWY  
GEOCHEMISTRY LEAD  
SCALE: 6" = 1 MILE. Map Fig 2



**LEGEND**

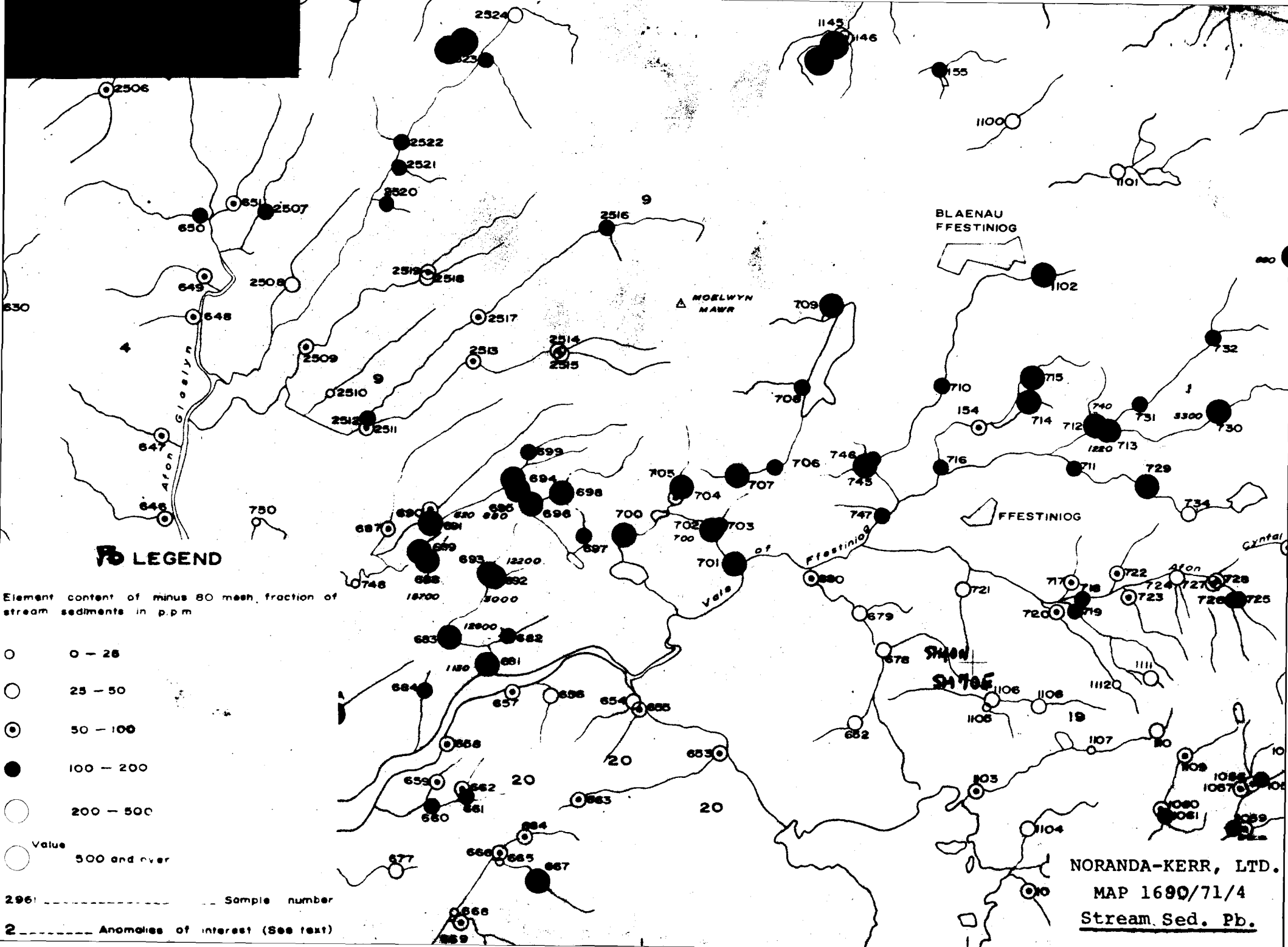
Element content of minus 80 mesh fraction of stream sediments in p.p.m

- 0 - 20
- 20 - 40
- ⊙ 40 - 80
- 80 - 150
- 150 - 350
- Value 350 and over

2961 - - - - - Sample number

2 - - - - - Anomalies of interest (See text)

NORANDA-KER, LTD.  
 MAP 1690/71/3  
 Stream Sed. Cu.



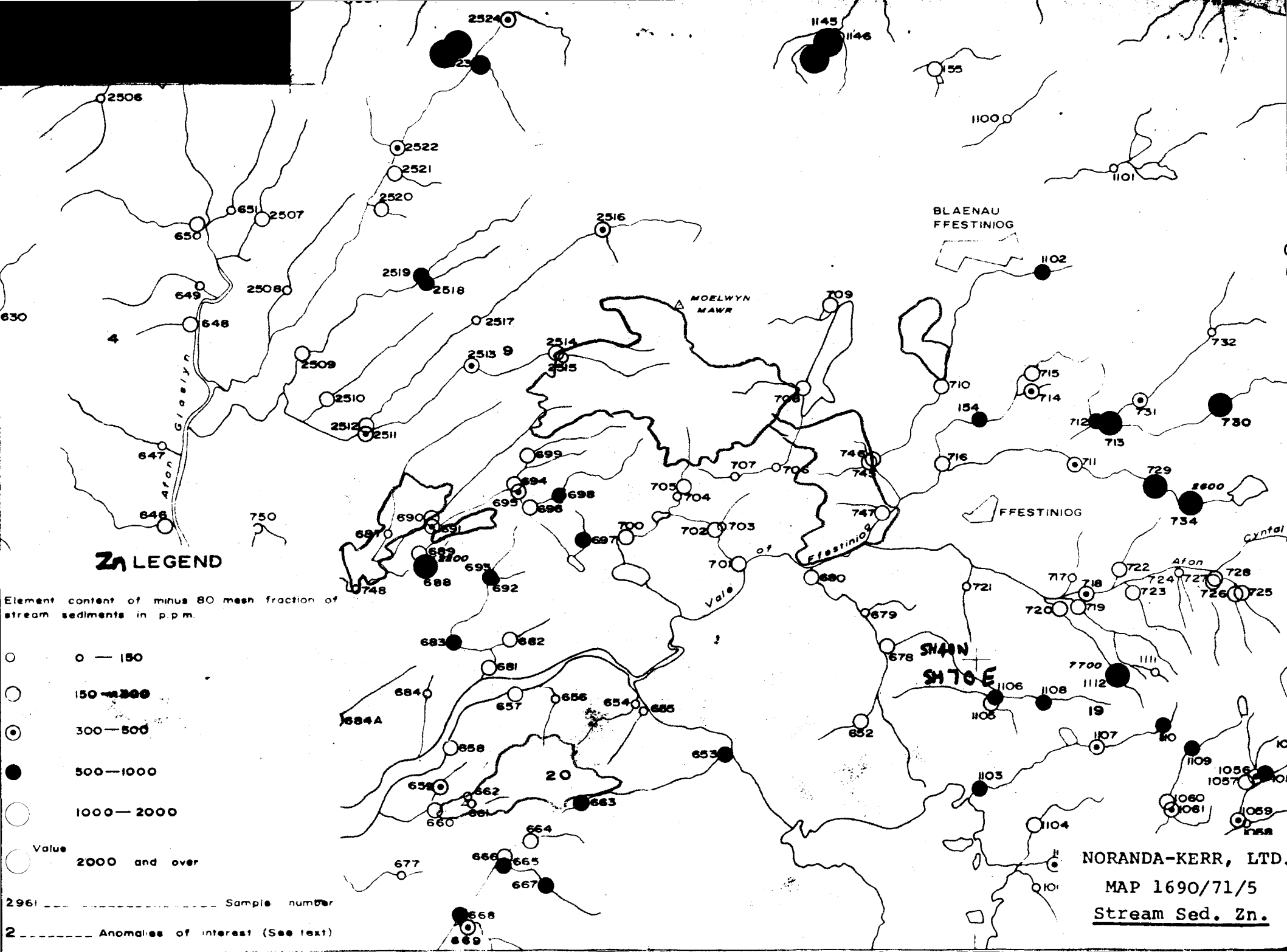
**Pb LEGEND**

Element content of minus 80 mesh fraction of stream sediments in p.p.m

- 0 - 25
- 25 - 50
- ⊙ 50 - 100
- 100 - 200
- 200 - 500
- Value 500 and over

296: ----- Sample number  
 2 ----- Anomalies of interest (See text)

NORANDA-KERR, LTD.  
 MAP 1690/71/4  
 Stream Sed. Pb.



**Zn LEGEND**

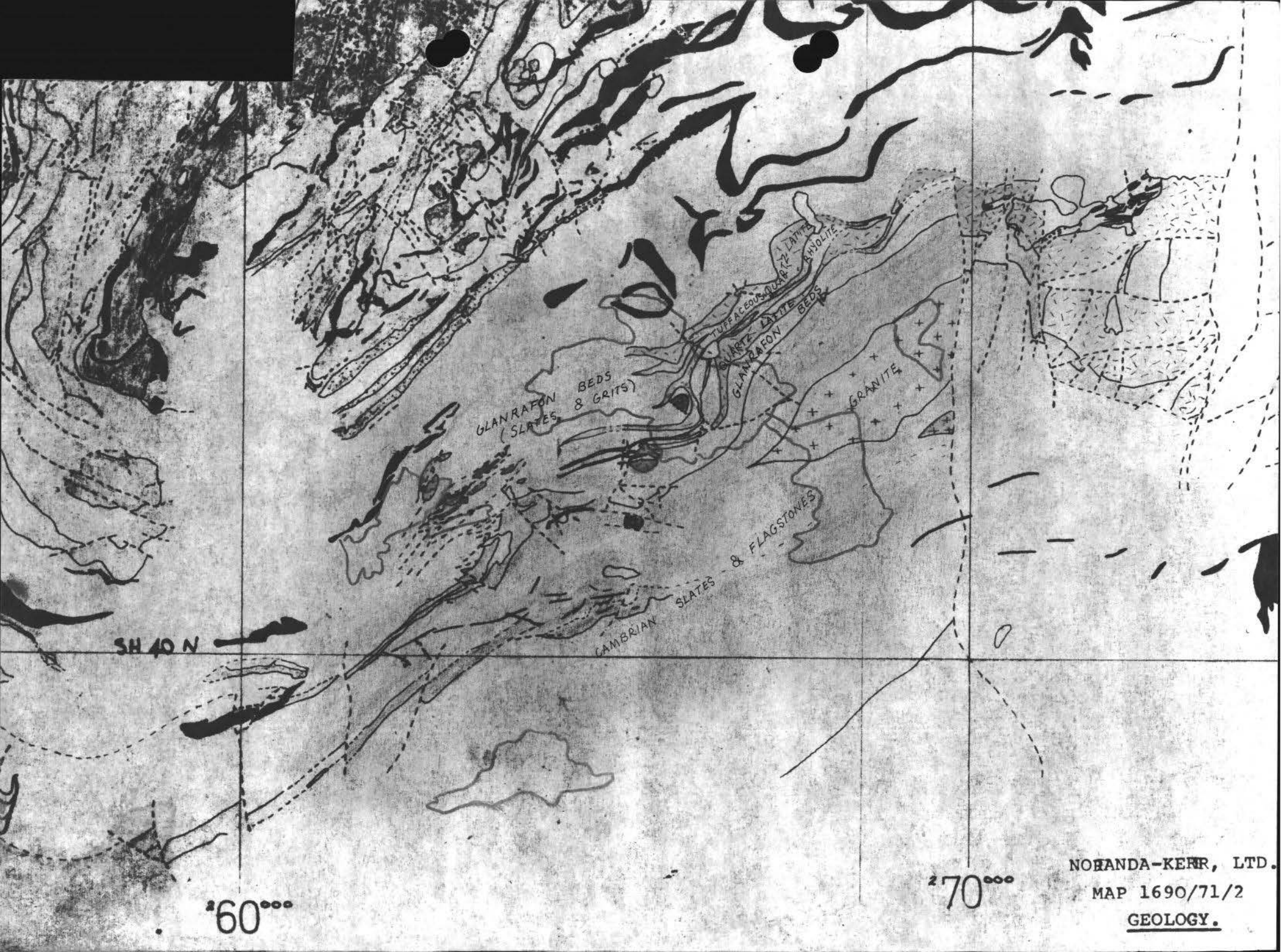
Element content of minus 80 mesh fraction of stream sediments in p.p.m.

- 0 — 150
- 150 — 300
- 300 — 500
- 500 — 1000
- 1000 — 2000
- Value 2000 and over

2961 ..... Sample number  
 2 ..... Anomalies of interest (See text)

NORANDA-KERR, LTD.  
 MAP 1690/71/5  
 Stream Sed. Zn.





SH 40 N

60°

70°

NOBANDA-KERR, LTD.  
MAP 1690/71/2  
GEOLOGY.



FF 1

NORANDA-KERR LIMITED

APPLICATION FOR FINANCIAL ASSISTANCE  
FOR MINERAL EXPLORATION

PROJECT 1690 - FFESTINIOG  
N. WALES

October, 1971

NORANDA-KERR LIMITED

APPLICATION FOR FINANCIAL ASSISTANCE  
FOR MINERAL EXPLORATION

SECTION I : DETAILS OF APPLICANT

1. a. Name: Noranda-Kerr Limited, 6 Curzon Place, London W1,  
(01-629-9919)
  - b. Registered Office: New Zealand House, Haymarket, London SW1.
  - c. Contact for further information: Dr. Barry Scott, or Mr.  
Hans R. Morris, 6 Curzon Place, London W1. (01-629-9919)
  - d. Bank: Bank of Nova Scotia, 10 Berkeley Square, London W1.
2. Work to be carried out by Noranda-Kerr Ltd. personnel, with  
contracts let out to geophysical and drilling contractors  
where appropriate.

SECTION II : FINANCIAL INFORMATION

3. a. Articles of Association of Noranda-Kerr Limited have been  
submitted under separate cover.
- b. Accounts: Noranda-Kerr Limited was registered as a U.K.  
company on 2nd January 1970; the First Annual Audit for  
the year 1970 is complete and will be adopted at the next  
board meeting; a copy of this Audit has been submitted  
under separate cover. Auditors are Arthur Young,  
McClelland Moores & Co., of Moor House, London Wall, EC2  
(01-628-4070); the partner concerned is Mr. Brian Walters.
- c. Parent Company: Noranda Mines Limited, 44 King Street West,  
Canada; a copy of whose Annual Report for 1970 has been sent  
under separate cover.
- d. Company and Directors are not associated with any business  
outside the Noranda Group, except that a Director, Mr.  
P.J. Gaynor, is a partner in the legal firm of McKenna &  
Co., 10 Whitehall, London SW1.
- e. Shares of Noranda Mines Limited are quoted on the Toronto  
Stock Exchange.



Department of Trade and Industry

Mineral Development Branch

Thames House South Millbank London SW1

Telegrams Advantage London SW1

Telephone 01-222 7000 ext 1389 or 2074

*Lead*

The Institute of Geological Sciences  
Exhibition Road  
London SW7

Your reference *MRO 84/17/3.*

Our reference *MMEI/FRMG 75*

Date *25 November 1971*

FINANCIAL ASSISTANCE FOR MINERAL EXPLORATION

I attach a copy of an application with associated maps and papers from  
*Noranda-Terr Ltd* for assistance towards  
the *F. Berlin* project. I would be  
grateful if you would consider the application and advise:

- (i) Whether the applicants have appropriate expertise and/or experience to undertake the programme or have access to it.
- (ii) Whether there is any reason why the project should not be supported.
- (iii) Whether the proposed work programme is sensible in the light of available information.
- (iv) If, in your view, there appear to be any abnormal features in the application which we should take into account in reaching a decision.

If the information provided is not adequate you should approach the applicant direct but we would be grateful if you keep us informed if anything significant arises from your discussions.

*Reddick*