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REPORT NO. 757

GEOCHEMICAL AND GEOPHYSICAL EXPLORATION FOR MOLYBDENUM AND TUNGSTEN IN THE LAKSAADALEN AND SPILDERDALEN AREAS OF NORTHERN NORWAY

by

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C O N T E N T S

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I

INTRODUCTION

During October and November, 1971 a reconnaissance geochemical exploration programme for molybdenum (Mo) and tungsten (W) was carried out in the Laksaadalen and Spilderdalen area of Northern Norway (Enclosure 1) on behalf of British Oxygen Minerals. On the basis of this work, which was reported in Robertson Research Company Limited Report No. 681, two sub-areas were delineated which warranted more detailed investigation as potential sources of large scale molybdenum-tungsten mineralisation. The results of this subsequent work are the subject of the present report.

The programme was planned in consultation with British Oxygen Minerals, and was carried out in accordance with our quotation No. 649/339. It consisted of two distinct parts:

i. a combined Very Low Frequency-Electromagnetic (VLF-EM) and magnetometer survey over an area of three to four square kilometres east of Laksaadals Vatn; and

ii. further geochemical rock-chip and stream sediment sampling over part of the Glomfjord granite-gneiss and its northern contact zone in the area south of Spilderdalen.

In addition to this scheduled programme, a few VLF-EM traverses were carried out in the area south of Spilderdalen to corroborate the geochemical results.

The geology and known mineralisation of the survey area have been discussed in some detail in our previous report (No. 681) and are not considered further here.

II

GEOCHEMICAL SAMPLING SURVEY

2.1 INTRODUCTION

The results of the 1971 reconnaissance stream sediment revealed a zone of geochemical anomalies in molybdenum and tungsten between Spilder Vatn and Spilderdals Vatn close to the contact of the Glomfjord granite-gneiss and the overlying schists, in a geologically analogous situation to the molybdenum mineralisation of Laksaadalen. In order to assess the significance of these anomalies more geochemical sampling was undertaken and involved -

i. rock-chip sampling along the poorly exposed granite-gneiss/schist contact between Spilder Vatn and Spilderdals Vatn;

ii. rock chip sampling of the granite-gneiss on the southern flanks of Spilderhesten, and

iii. stream sediment sampling in the Rismaalsaaen stream system which drains the latter area.

This geochemical programme was supplemented by VLF-EM work which is reported in Chapter III.

2.2 ANALYTICAL METHODS

The stream sediment samples were dried and separated into +80 and -80 B.S. sieve fractions using a nylon screen. Representative sub-samples of the -80 mesh fraction were analysed colorimetrically for Mo and W by the methods of Stanton (1966). The rock chip samples were crushed to pass 14 mesh B.S. sieve and then representative sub-samples were ground to -80 mesh and analysed in the same way as the stream sediments.

TABLE 1

COLORIMETRIC ANALYSES OF STREAM SEDIMENT SAMPLES

Sediment Sample No.	W (ppm)	Mo (ppm)
(25000) 00	< 4	< 2
01)	< 4)	< 2)
02)	< 4)	< 2)
03	< 4	< 2
04	< 4	< 2
05	4	< 2
06	< 4	< 2
07	< 4	< 2
08	< 4	< 2
09	< 4	< 2)
10	< 4	< 2)
11	< 4	< 2
12	< 4	3
13	< 4	3
14	< 4	< 2
15	< 4	< 2
16	< 4	< 2
17	< 4	2
18	< 4	< 2
19	< 4	< 2
20)	4)	< 2)
21)	4)	< 2)
22	4	5
23	4	2
24	4	9
25	6	10
26	4	7
27	4	10
28	4	8
29	20	8
30	4	3
31)	6)	6)
32)	6)	8)
33	4	6
34	12	30
35	< 4	8

Brackets indicate duplicate field samples.

2.3 STREAM SEDIMENT SURVEY

2.3.1 General

Stream sediment samples were collected at approximately 250 metre intervals and major tributary intersections on the Rismaalsaaen stream system, the catchment area of which lies entirely within the Glomfjord granite-gneiss south of Spilderhesten.

A total of 35 stream sediment samples were collected including approximately 10% duplicates. Thick snow cover in the upper course of the river prevented sampling northeast of G.R. 495160.

2.3.2 Discussion of Results

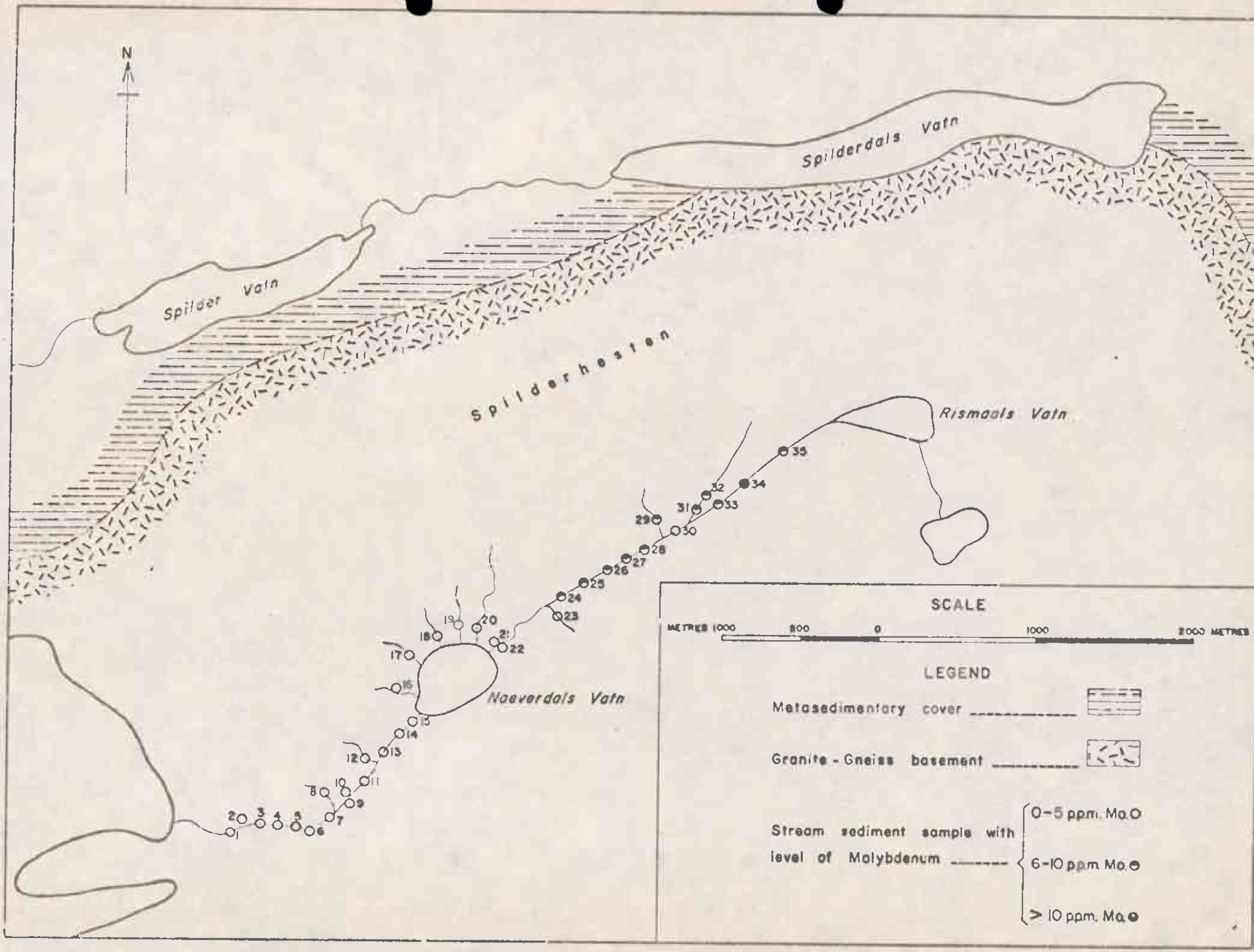
The stream sediment sample positions are shown on Figure 1, and the analytical results are given in Table 1. The results show a similar range of values to those obtained during the 1971 reconnaissance and as they are numerically too few for meaningful statistical processing the threshold values determined in 1971 are used again. These are shown in Table 2.

TABLE 2

ANOMALOUS LEVELS IN STREAM SEDIMENT SAMPLES

	Background	Possibly Anomalous	Probably Anomalous
Mo ppm	0-5	6-10	>10
W ppm	0-10	11-15	>15

Stream sediment samples 01 to 23, collected from the lower course of the Rismaalsaaen stream system below the moraine ridge at G.R. 483152, contain uniformly low levels of molybdenum and tungsten (generally <2 ppm Mo, < 4 ppm W). Upstream from the ridge where generally exposure is better and the valley is, at least in part, fault controlled all the samples (24 to 35), with the exception of sample 30, contain anomalous levels of



STREAM SEDIMENT SAMPLE LOCATIONS - SPILDERDALEN molybdenum; samples 29 and 34 are co-anomalous with tungsten. There is therefore, a very marked increase in the molybdenum and tungsten content of stream sediment samples from the upper part of the valley. However, there is no corresponding general increase in molybdenum and tungsten levels in the rock chip samples from the upper part of the valley (see 2.4) although spasmodically high rock-chip values have been detected (up to 7 ppm Mo and 80 ppm W) here.

The cause of the stream sediment anomalies in the upper part of the valley therefore, is possibly threefold:

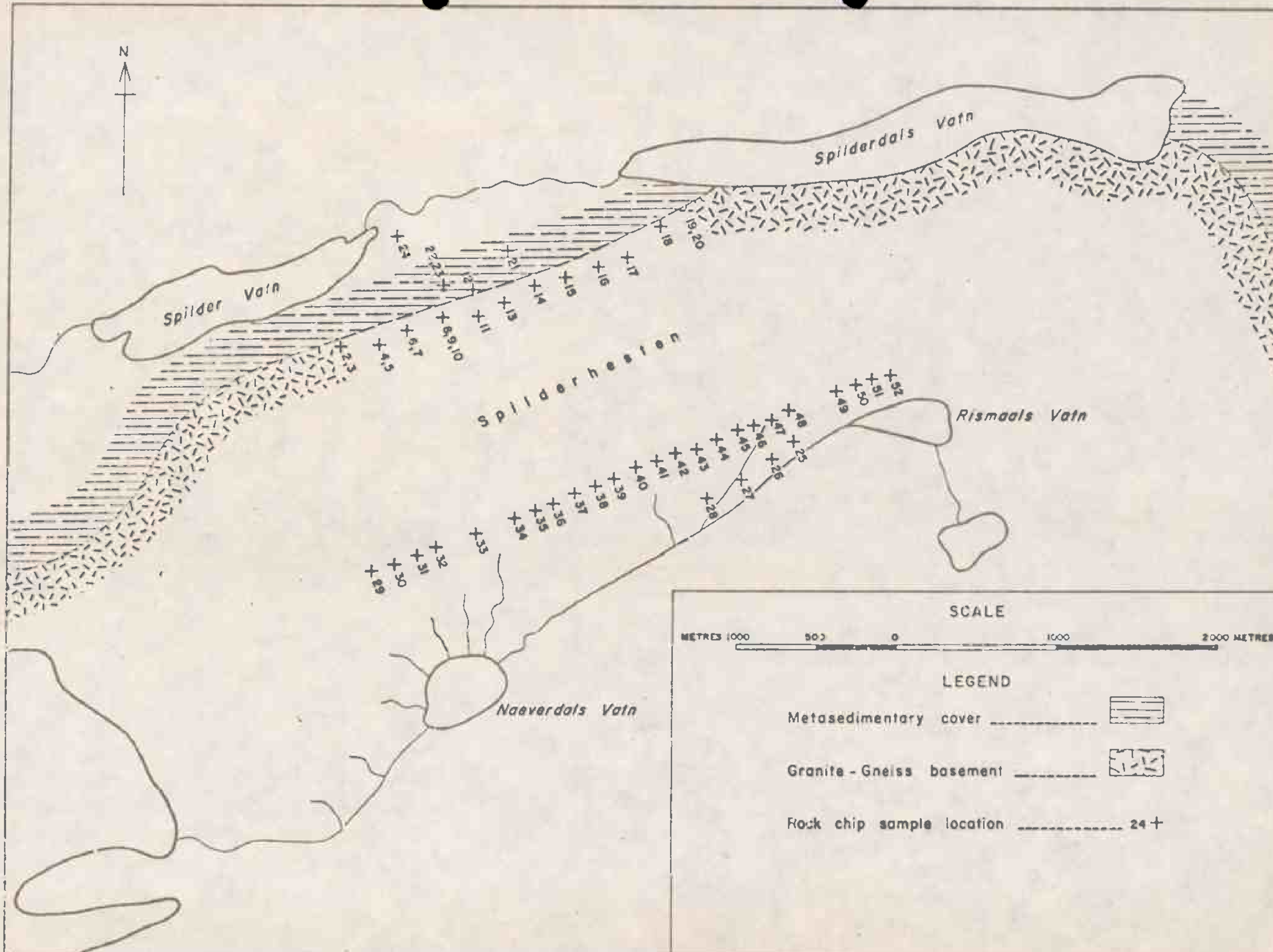
1. better rock exposures;
2. spasmodic, minor local Mo and W enrichment in the country rock north of the stream system;
3. Mo/W mineralisation along a fault zone controlling the upper, gorge section of the valley.

Of these three, only the last could be of potential economic significance and it is unlikely that fault-controlled mineralisation would provide reserves of the order required by British Oxygen Minerals.

2.4 ROCK CHIP SURVEY

2.4.1 General

Two rock chip sample traverses were carried out in the area south of Spilderdalen. The sample positions are shown on Figure 2. In the first traverse 23 samples (BOC 72/2 to BOC 72/24) were collected along the northern contact of the Glomfjord granite-gneiss between G.R. 470170 and G.R. 490176. Here, in the nose of a recumbent fold, the schists dip beneath the younger granite-gneiss at angles of 50°-60°. The actual contact is poorly exposed and is generally obscured by granitic scree. The schists, which occupy the area to the north of the granite-gneiss, are very poorly exposed and are largely obscured by glacial deposits and, in places, peat bog. The majority of the samples



ROCK CHIP SAMPLE LOCATIONS - SPILDERDALEN

FIGURE 2

collected on this traverse therefore, are of granite-gneiss from the crags a short distance south of the probable contact position. The granite-gneiss in this zone frequently contains small lenticular masses of pegmatitic material which have been sampled separately. Although the granite-gneiss here is magnetite rich, no evidence of sulphide mineralisation was observed in the field.

The second sample traverse was carried out along the southern flanks of Spilderhesten between G.R. 472155 and G.R. 504167 within the granite-gneiss mass, where the exposure is moderately good. A total of 28 samples (BOC/72/25-BOC/72/52) was collected from this area, all of essentially similar pinkish, rather melanocratic magnetite-rich granite-gneiss. Again no sulphide mineralisation was observed in the field.

2.4.2 Discussion of Results

The analyses of the rock chip samples are given in Table 3, and generally show very low levels of tungsten and molybdenum.

In the contact zone north of Spilderhesten (Samples 2-24) a maximum value of 20 ppm molybdenum was detected, in a sample of granite, although most samples contain less than 2 ppm. All the samples from this area contain less than the 4 ppm detection limit for tungsten. There is no detectable difference in the molybdenum and tungsten levels in the granite-gneiss, pegmatite lenses, or the overlying schists. The results provide no support for the concept of a contact-controlled Mo/W mineralisation.

Samples 25 to 52 were collected at intervals of approximately 125 metres (exposure permitting) along a single traverse line on the southern flanks of Spilderhestern. The molybdenum and tungsten levels are generally below the detection limits (2 ppm Mo, 4 ppm W). The rare higher values (up to 7 ppm Mo, 80 ppm W) are present at the northeastern end of the traverse, (i.e. in the upper part of the valley) although there is no discernible overall trend. The results do not indicate the presence of significant disseminated mineralisation within the part of the Glomfjord granite-gneiss examined.

TABLE 3

COLORIMETRIC ANALYSES OF ROCK CHIP SAMPLES

Rock Chip Sample No.	W (ppm)	Mo (ppm)	Lithology
(BOC/72/) 1	< 4	< 2	S
" 2	< 4	< 2	G
" 3	< 4	4	P
" 4	< 4	< 2	G
" 5	< 4	< 2	P
" 6	< 4	8	G
" 7	< 4	< 2	P
" 8	< 4	< 2	G
" 9	< 4	< 2	P
" 10	< 4	< 2	G
" 11	< 4	< 2	G
" 12	< 4	< 2	S
" 13	< 4	< 2	G
" 14	< 4	< 2	G
" 15	< 4	< 2	G
" 16	< 4	< 2	G
" 17	< 4	< 2	G
" 18	< 4	20	G
" 19	< 4	< 2	G
" 20	< 4	< 2	P
" 21	< 4	< 2	S
" 22	< 4	2	S
" 23	< 4	6	P
" 24	< 4	< 2	D
" 25	< 4	< 2	G
" 26	< 4	3	G
" 27	4	2	G
" 28	4	2	G
" 29	< 4	2	G
" 30	< 4	< 2	G
" 31	< 4	< 2	G
" 32	< 4	< 2	G
" 33	< 4	< 2	G
" 34	< 4	< 2	G
" 35	< 4	< 2	G
" 36	< 4	< 2	G
" 37	< 4	3	G
" 38	< 4	< 2	G
" 39	< 4	< 2	G
" 40	< 4	< 2	G
" 41	< 4	< 2	G
" 42	< 4	< 2	G
" 43	< 4	< 2	G

Continued ....

TABLE 3 Continued

Rock Chip Sample No.		W (ppm)	Mo (ppm)	Lithology
(BOC/72/)	44	< 4	< 2	G
"	45	80	< 2	G
"	46	< 4	2	G
"	47	< 4	< 2	G
"	48	< 4	< 2	G
"	49	< 4	4	G
"	50	< 4	< 2	G
"	51	< 4	7	G
"	52	< 4	7	G

Footnote:

Lithology coding: S = Schist G = Granite-Gneiss

D = Dioritic Gneiss

P = Pegmatite

Sample location: Sample 1 - Laksaadalen

Samples 2-24 - Spilderdalen

Samples 25-52 - Spilderhesten

III

V.L.F.-E.M. SURVEY

3.1 INTRODUCTION

The survey was carried out using a Geonics E.M.16 V. L.F. Electro-magnetic Unit. This is a recently developed instrument and technique, which utilises very low frequency military and time standard radio transmissions as the primary electro-magnetic field. The receiver unit measures secondary fields radiating from local conductive bodies. Such secondary fields may, of course, be generated by a variety of conductive sources including metallic ore-bodies, conductive overburden (peat and certain types of clay), fault zones, pipe lines and electrical power lines. By detailed evaluation of the results, particularly in conjunction with other geological data,it is possible in most cases to distinguish these causes. In practice anomalies possibly caused by subsurface conductive ore-bodies are distinguished by characteristic inflexions in the profiled data.

3.2. SELECTION OF TRAVERSES

3.2.1. GENERAL

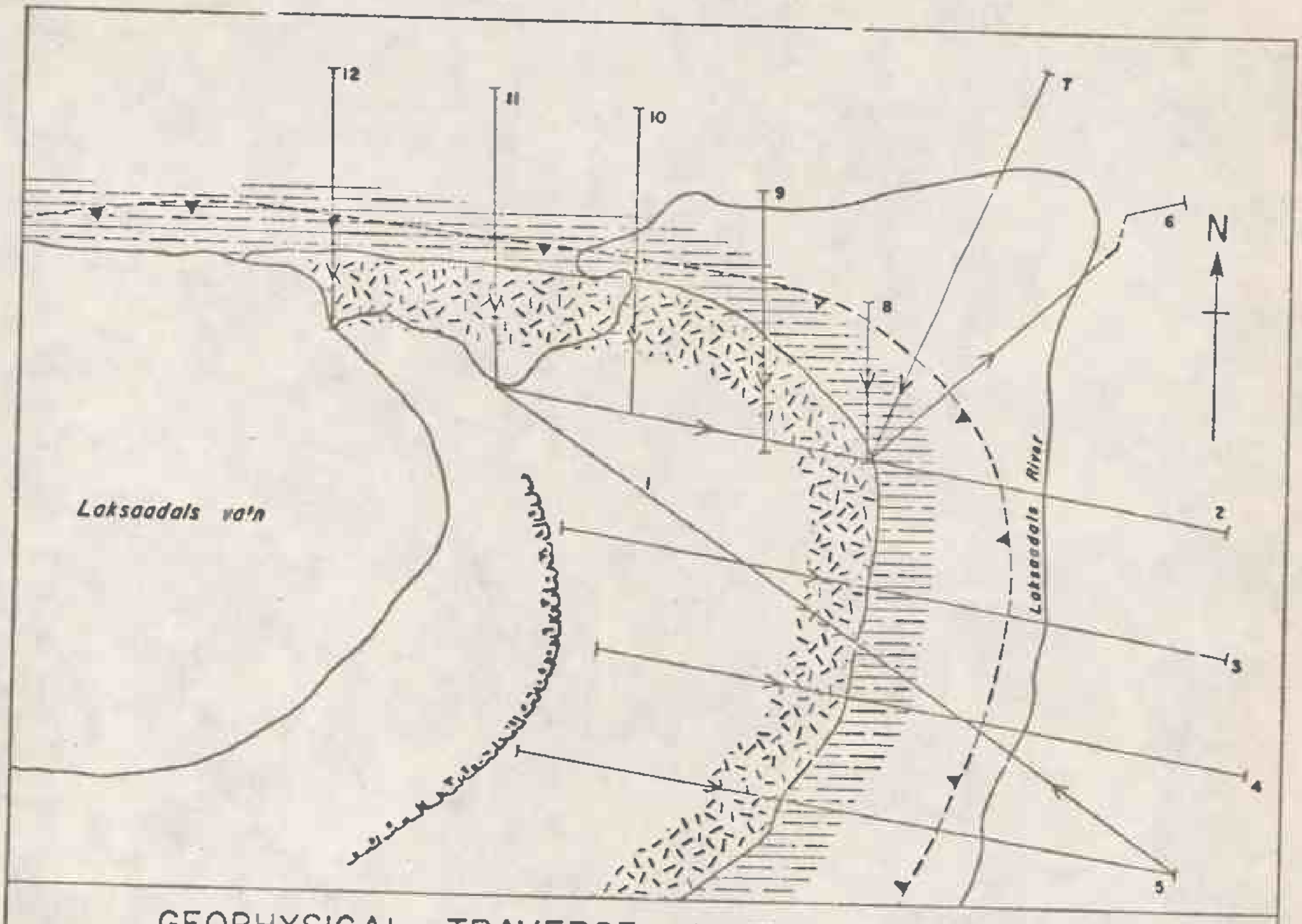
The two principal factors which affect the selection of V.L.F.-E.M traverse directions are, (i) the strike of the geology and (ii) the direction of the V.L.F. transmitting station being utilised. Ideally the traverses are aligned at right angles to the strike of the relevant geological features in order to increase the chance of intersecting any mineralised zones and to maximise the electro-magnetic contrast. Because of theoretical considerations of the geometry of the magnetic field produced by V.L.F. waves, it is also necessary to align the traverses approximately at right angles to the direction of the V.L.F. station utilised. By selection of suitable V.L.F. stations it is normally possible, with some degrees of compromise, to orient traverses reasonably compatibly with both requirements.

3.2.2. LAKSAADALEN AREA

In the survey area east of Laksaadals Vatn twelve V.L.F.-E.M. traverses were conducted as shown on Figure 3. The lines are approximately 250 metres apart with readings taken at 25 metre intervals giving a total of over 400 stations. Traverses 2 to 5 have an azimuth of 100°. These traverses intersect the eastern contact of the granite-gneiss and the overlying schists approximately at right angles and are oriented at approximately 60° to the V.L.F. station utilised (Oswestry, Great Britain). Traverse 1, with an azimuth of 125° acts as a tie-line on traverses 2 and 5, and is oriented at approximately 85° to the V.L.F. station (Oswestry). Traverse 6 has an azimuth of 50°, approximately at right angles to the granite contact and at 85° to the Moscow V.L.F. station. The northeastern end of this traverse is offset northwards for topographic reasons. Traverses 7 - 12 all utilise Maine (U.S.A.) as the V.L.F. station. Traverse 7 has an azimuth of 25° and the remainder an azimuth of 0° (due north). The latter traverses are approximately at right angles to the transmitter.

3.2.3. SPILDERDALEN AREA

Seven V.L.F.-E.M. traverses (14-20) were conducted in the Spilderdalen area as shown on Figure 4. Traverses 14-19 have an azimuth of 150° at right angles to the contact of the granite-gneiss and at approximately 70° to the transmitter (Oswestry), readings being taken at 25 metre intervals. For the most part the traverses occupy unexposed boggy ground presumed to be underlain by schists, but intersect the granite-gneiss at the southeastern end.



GEOPHYSICAL TRAVERSE LINES, LAKSAADALEN

SCALE

METRES 200 0 400 800 METRES

LEGEND

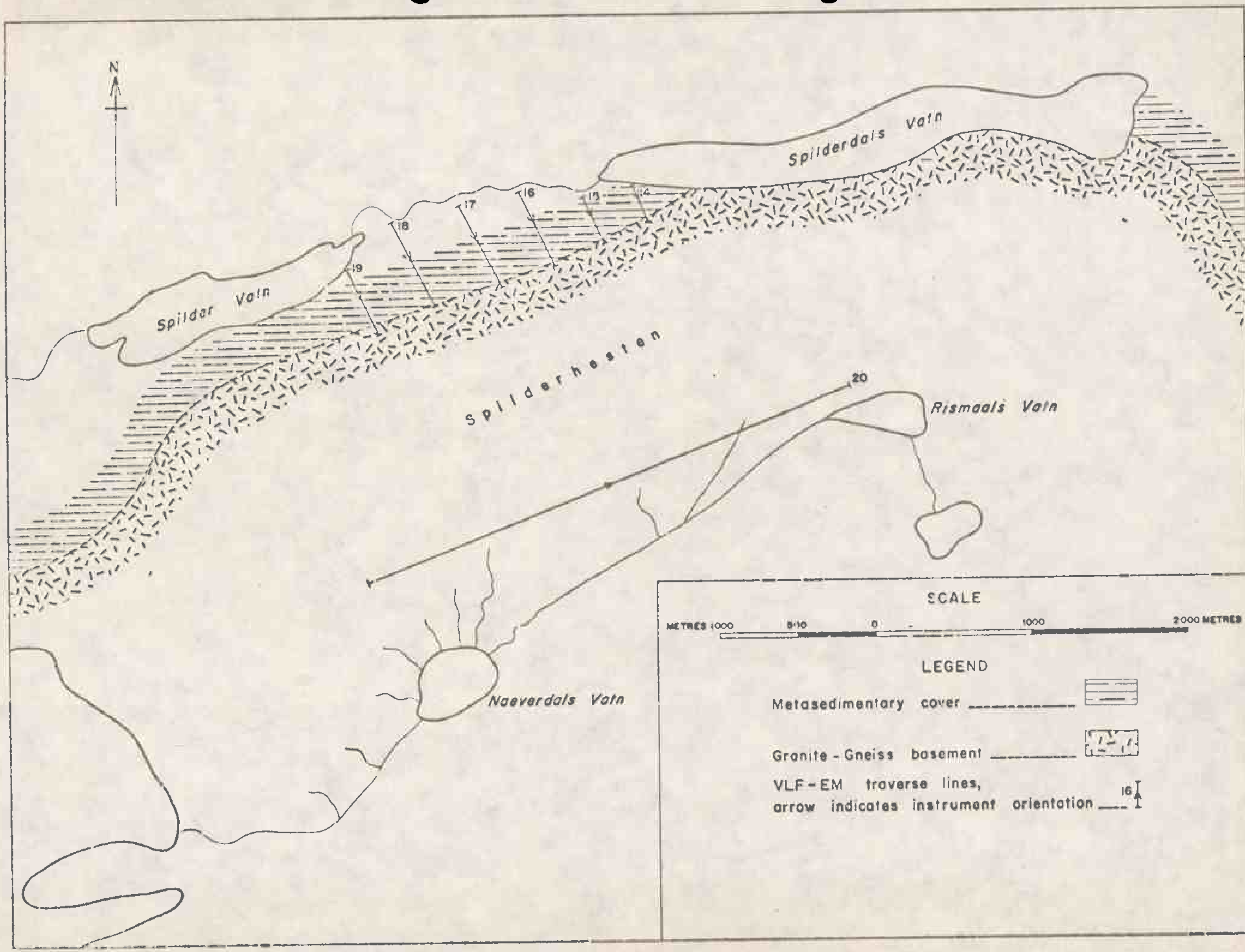
Metasedimentary cover

Granite-Gneiss basement

Tectonic slide or dislocation

Geophysical traverse lines, arrow indicates instrument orientation

FIGURE 3



VLF-EM TRAVERSE LINES - SPILDERDALEN

Traverse 20, with an azimuth of 65° is entirely within the granite and is oriented at approximately 70° to the transmitter (Moscow), the line being selected by topographic as much as geological considerations. Readings were taken on this traverse at 125 to 150 metre intervals.

3.3 DISCUSSION OF RESULTS

The profiles of the V.L.F.-E.M. results for the two areas are presented in Enclosures 2 and 3 and discussed below.

3.3.1 LAKSAADALEN

The profiles of traverses 1 to 5 have an essentially similar form. They consist of a broad, gentle variation of the in-phase and quadrature components the wave length of which is comparable to the traverse length. This pattern reflects regional topographic variation due to the mountainous terrain over which the traverses were conducted. Superimposed on this regional trend, however, there are small second order anomalies, the significance of which are discussed below. Two moderately strong anomalies occur on traverse 1. The first is located approximately 1,350 metres east of the origin and has a maximum in-phase amplitude of 20% (this is the separation between maximum and minimum expressed on the percentage scale). The quadrature component also has a similar trend (a positive quadrature response). This anomaly corresponds to a small depression west of the Laksaadal River close to the Lysvatn tectonic slide and is probably caused by increased conductivity associated with this fault-like feature either as a result of ground-water, or conductive clay. Because of the positive quadrature response it is unlikely that the conductivity is associated with significant sulphide mineralisation along the slide.

The second of the anomalies occurs approximately 200 metres from the southeastern end of the traverse and has identical characteristics to the first anomaly. The maximum amplitude of the in-phase component is 20% and of the quadrature 15%. Although no slide has been mapped in this area the similarity of the characteristics suggests that the anomaly may be due to a planar discontinuity having a higher conductivity than the surrounding rocks. Again ground-water or conductive clay along the discontinuity is the most probable explanation. A number of other very weak anomalies occur along the traverse with an in-phase amplitude of 10% or less, associated with positive or negative quadrature response. These almost certainly indicate near-surface conductive bodies such as minor discontinuities or areas of peat and are unlikely to be associated with significant mineralisation. Three second-order anomalies occur in traverse 2. The first occurs approximately 1,125 metres east of the origin. It has an in-phase amplitude of 30% and a positive quadrature response of 7%. This anomaly lies in a topographic depression close to the Lysvatn slide. The second anomaly lies approximately 150 metres further east straddling the Laksaadal River. It has an in-phase amplitude of 15% and a positive quadrature response of approximately 8%. Its characteristics are broadly similar to the anomalies produced by the Lysvatn slide. It may be due to a similar feature probably modified by the effect of the river. The third anomaly at the eastern end of the traverse is clearly caused by the powerline.

Many second-order anomalies can be detected on traverse 3, but only three are moderately strong. The first occurs approximately 925 metres east of the origin. It has an in-phase amplitude of 20% with a negligible quadrature response. This anomaly lies close to the Lysvatn slide. The second anomaly occurs 1,100 metres east of the origin on the boggy flood plain of the Laksaadal River and has a very sharp in-phase amplitude of 25% with a small negative quadrature response. The VLF characteristics indicate a near surface conductor, and as there are no significant magnetic results, it suggests that the anomaly is due to the peat cover. The third anomaly occurs at the eastern end of the traverse. It has a steep in-phase amplitude of 15% and a zero quadrature response indicating a near surface target. It is associated with a slight magnetic anomaly of approximately 200 gammas and straddles a stream in which possibly anomalous levels of W (and low background levels of Mo) were detected during the 1971 reconnaisance. This anomaly is discussed again later.

Four second-order anomalies with amplitudes greater than 10% occur on traverse 4. The first of these is approximately 825 metres east of the origin and is characterised by an in-phase amplitude of 15% with a positive quadrature response of 10%. It plots out close to the Lysvatn slide. The second anomaly occurs approximately 925 metres east of the origin straddling the Ladsaadal River. It has an in-phase amplitude of 20% and a variable but slight quadrature response. The anomaly is due, at least in part, to the river. The third anomaly occurs at approximately 1,100 metres east of the origin and again has an in-phase amplitude of 20% and very slight variable quadrature response. There are no morphological surface features to explain the anomaly. However it shows no positive correlation with the magnetic data and it is unlikely to be associated with significant mineralisation. The fourth anomaly has a very steep in-phase amplitude of 35% and a variable quadrature response. It occurs near the end of the traverse by a small lake and is associated with a slight magnetic anomaly of 100 gamma, although stream sediment samples from this vicinity are not anomalous with regard to Mo and W. Only one major second-order anomaly occurs on traverse 5. This is approximately 925 metres east of the origin. It has an in-phase amplitude of 25%, but the quadrature response is uncertain due to poor signal transmission. When plotted the anomaly falls close to the Lysvatn slide. The remaining traverses (6-12), on the northern flank of the granite-gneiss all unavoidably intersect the 22Kv powerline which runs along the lower part of Laksaadalen. The effect of this powerline can clearly be seen on all these traverses as a sharp dip in the in-phase profile. No other significant anomalies are evident on traverses 6-12 although there is a slight possibility that real anomalies are masked by the powerline, the effect of which may spread over several hundred metres.

3.3.2. SPILDERDALEN

Traverses 14 to 19, conducted over the northern contact of the Glomfjord granite-gneiss show negligible regional variation and very few anomalies. No anomalies are present on traverses 14, 15 and 19. On traverse 16 the large in-phase inflection at the northeastern end of the traverse is probably caused by the Spilderdalen River and the powerline lying to the north. A similar effect can also be seen at the northeastern end of the traverses 18 and 19.

A weak anomaly occurs on traverse 16 300 metres southeast of the origin. It has an in-phase amplitude of 15% and a negative quadrature response of similar magnitude. The anomaly is suggestive of conductive overburden (peat) possibly overlying a weak bedrock conductor. On traverse 17 an anomaly occurs 375 metres southeast of the origin. It has an in-phase amplitude of 10% and a positive quadrature response of similar magnitude. An anomaly of similar form but greater amplitude (in-phase amplitude 30%, positive quadrature response of 20%) occurs approximately 300 metres southeast of the origin on traverse 18. The anomaly on traverse 17 corresponds with a knoll of mica-schist and may partly be due to topographic effects.

However, its similarity with the anomaly on traverse 18, which has no marked topographic features, other than a patch of bog, suggests other factors may be involved. These two anomalies are possibly derived therefore from weak sub-surface conductors.

Traverse 20, on the southern flanks of Spilderhesten is not shown in profile as no significant features are present. A single small 'anomaly' at the northeastern end of the traverse is attributable to the proximity of Rismaaln Vatn.

IV

MAGNETOMETER SURVEY

4.1 INTRODUCTION

An Elsec Proton magnetometer, capable of measuring the total magnetic field to within ± 1 gamma, was utilised for the magnetometer survey. Although a disseminated Mo-W mineralisation alone would be unlikely to produce strong magnetic anomalies the technique was employed to aid the interpretation of the V.L.F.-E.M. data.

The magnetometer survey was carried out in the area east of Laksaadal Vatn using the same traverse lines and station separation as the V.L.F.-E.M. survey, except for traverse 1, which was not magnetically surveyed.

4.2 DISCUSSION OF RESULTS

The Elsec Proton magnetometer gives readings in 'proton-counts', which over the range of values involved have an inverse, approximately linear relationship to the total magnetic field. The observed diurnal magnetic variation measured at the base station was 29 proton counts and as this is less than the background variation in the granite-gneiss (typically about 50 counts) and considerably less than the overall variation (typically 200-300 counts except for variations due to the powerline which may be 500 or more) the data has not been corrected for diurnal variation. The magnetic profiles, which are presented on enclosure 2 with the V.L.F.-E.M. data are therefore uncorrected proton-counts, and consequently minima on these profiles represent magnetic 'highs'.

Other than the effect of the powerline which shows up clearly on traverses 6-12 no major magnetic anomalies are present. The general features which can be seen on these profiles however are discussed below.

With minor exceptions there is an increase in magnetic intensity over the granite-gneiss. This can be seen on all the traverses as a distinct reduction in proton counts on approaching the granite contact from the schists. In addition the background variation within the granite-gneiss is generally much greater than in the schists. This increased and variable magnetic intensity over the granite-gneiss is largely attributable to the irregular development of magnetite. It can also be seen that the magnetic intensity over the southern part of the granite-gneiss is greater than over the northern part. On the northern traverses (2 & 6-12) for example the proton count over the granite-gneiss ranges from 46,600-46,800, whilst on traverses 3, 4 and 5 further south, the count drops progressively to about 46,250-46,350. The magnitude of this regional variation is much greater than any observed background noise or diurnal variation.

Excepting the effects of the powerline there are no magnetic anomalies within the schists on traverse 2. On traverse 3 an anomaly of 150 counts (approximately 150 gamma) occurs approximately 75 metres from the eastern end of the traverse. This anomaly correlates with a small V.L.F.-E.M. anomaly across a stream in which geochemically anomalous levels of tungsten were detected during the 1971 reconnaissance. On traverse 4 a small magnetic anomaly of 74 counts occurs slightly to the west of the moderately large second-order V.L.F.-E.M. anomaly previously described and close to a much smaller V.L.F.-E.M. anomaly with an in-phase amplitude of 10%. On traverse 5 a very sharp magnetic anomaly of approximately 250 counts occurs 1,150 metres east of the origin approximately centred over the Laksaadal River. It shows no strong correlation with the V.L.F.-E.M. data. No significant magnetic anomalies occur on traverses 6-12 other than those caused by the powerline.

V

CONCLUSIONS

5.1 LAKSAADALEN

The V.L.F.-E.M. survey has detected a number of anomalies in the Laksaadalen area. Virtually all the anomalies when considered in conjunction with the magnetometer data and known geology of the area can be related to topographic and geological features such as hill slopes, conductive overburden and geological discontinuities. A few anomalies cannot be accounted for by such phenomena. Of these, two are of particular interest and occur close to the eastern end of traverses 3 and 4 respectively. Both can be correlated with small magnetic anomalies and the former is also associated with a geochemical tungsten anomaly.

Considering all the available geological, geochemical and geophysical evidence it is concluded that minor Mo/W mineralisation is widespread in the Laksaadalen area in the form of pegmatites, local disseminations in the granite-gneiss basement and overlying schists and possibly also in shears or discontinuities within the schists. No evidence has been observed however for the existence of massive, or extensive disseminated Mo/W mineralisation which would yield the 10-20 million ton reserves of approximately 1% ore required by British Oxygen Minerals Limited. As stated at the outset of this project however the V.L.F.-E.M. technique might not detect low grade disseminations, and the much more expensive induced-polarisation (I.P.) geophysical technique would have provided more definitive results for this type of mineralisation. However, the current evidence for major Mo/W mineralisation in Laksaadalen is not considered to be sufficiently strong to warrant further, necessarily expensive exploration.

5.2 SPILDERDALEN

The rock chip sampling along the northern contact of the Glomfjord granite-gneiss in Spilderdalen has revealed no significant concentrations of Mo and W despite the many geochemical stream sediment anomalies which were detected in this region during 1971. Thus there is no strong geochemical evidence for a contact controlled Mo/W mineralisation. In the largely unexposed schists lying north of the granite-gneiss there are no V.L.F.-E.M. anomalies on traverse 14, 15 and 19 where several stream sediment anomalies were identified in 1971. This suggests that the geochemical anomalies may have been caused by precipitation in the acidic environment of the peat bog. Minor V.L.F.-E.M. anomalies occur on traverses 16, 17 and 18 over a peat bog on which stream sediment sampling was impractical. These anomalies could be associated with sub-surface conductive bodies, but the low level of the anomalies and limited areal extent are not indicative, within the accepted limitation of the V.L.F.-E.M. technique, of a major zone of mineralisation.

On the southern flanks of Spilderhesten stream sediment and rock chip sampling, and a reconnaissance V.L.F.-E.M. traverse have been undertaken within the Glomfjord granite-gneiss. The rock chip and V.L.F.-E.M. traverse, north of the Rismaalsaaen stream, do not indicate significant Mo/W mineralisation. The current geochemical stream sediment survey however has revealed a zone of molybdenum, and to a lesser extent tungsten anomalies in the upper part of the Rismaalsaaen stream system. In the absence of evidence of such mineralisation in the granite-gneiss north of the stream it is tentatively concluded that the anomalies may be derived from a mineralised fault or shear zone controlling the upper part of the valley. The significance of such possible mineralisation would require further evaluation, but it is considered unlikely to provide the ore reserves required by British Oxygen Minerals Limited.

VI

RECOMMENDATIONS

The currently available information does not indicate the existence of large scale Mo/W mineralisation within the survey area. Whilst some V.L.F.-E.M. and geochemical anomalies ideally require further evaluation the evidence is insufficiently strong to warrant additional, and necessarily expensive exploration techniques. Consequently it is recommended that future exploration for large scale Mo/W mineralisation is directed to other areas.

VII

SELECTED BIBLIOGRAPHY

Only those references directly quoted in the present report are given here. A more comprehensive bibliography, including references on the geology and mineralisation of the area, is given in Robertson Research Company Limited Report No. 681.

Robertson Research Company Limited Report No. 681, 1972. Reconnaissance Exploration for Molybdenum and Tungsten in the Laksaadalen and Spilderdalen Areas of Northern Norway.

STANTON, R.E., 1966. Rapid Methods of Trace Analysis for Geochemical Application. Edward Arnold, London.