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Tittel

Report of mapping done in the Kvënangen window near Badderen, N.Troms.

Forfatter	Dato	Bedrift
LAUX S.J.	1972	Sulitjelma Gruber A/S

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad

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Sammendrag

Generell geologisk undersokelse av Alta - Kvënangen -vinduet i Nord-Troms. Dette er et omrade av prekambriske grunnfjell som er omgitt av overskjovne kaledonske bergarter. Grunnfjellsvinduet bestar av Raipas-formasjonen, med lavaer, doleritter, vulkanoklastitter og dolomittiske konglomerater, og skiferlag. Petrografi, metamorfose og strukturer kort omtalt. Ingen mineraliseringer av betydning observert.

REPORT OF MAPPING DONE IN THE KVAENANGEN WINDOW, NEAR BADDEREN. N. TROMS

10th July - 16th August 1972

by

S. J. Laux, B. A. (Oxon)

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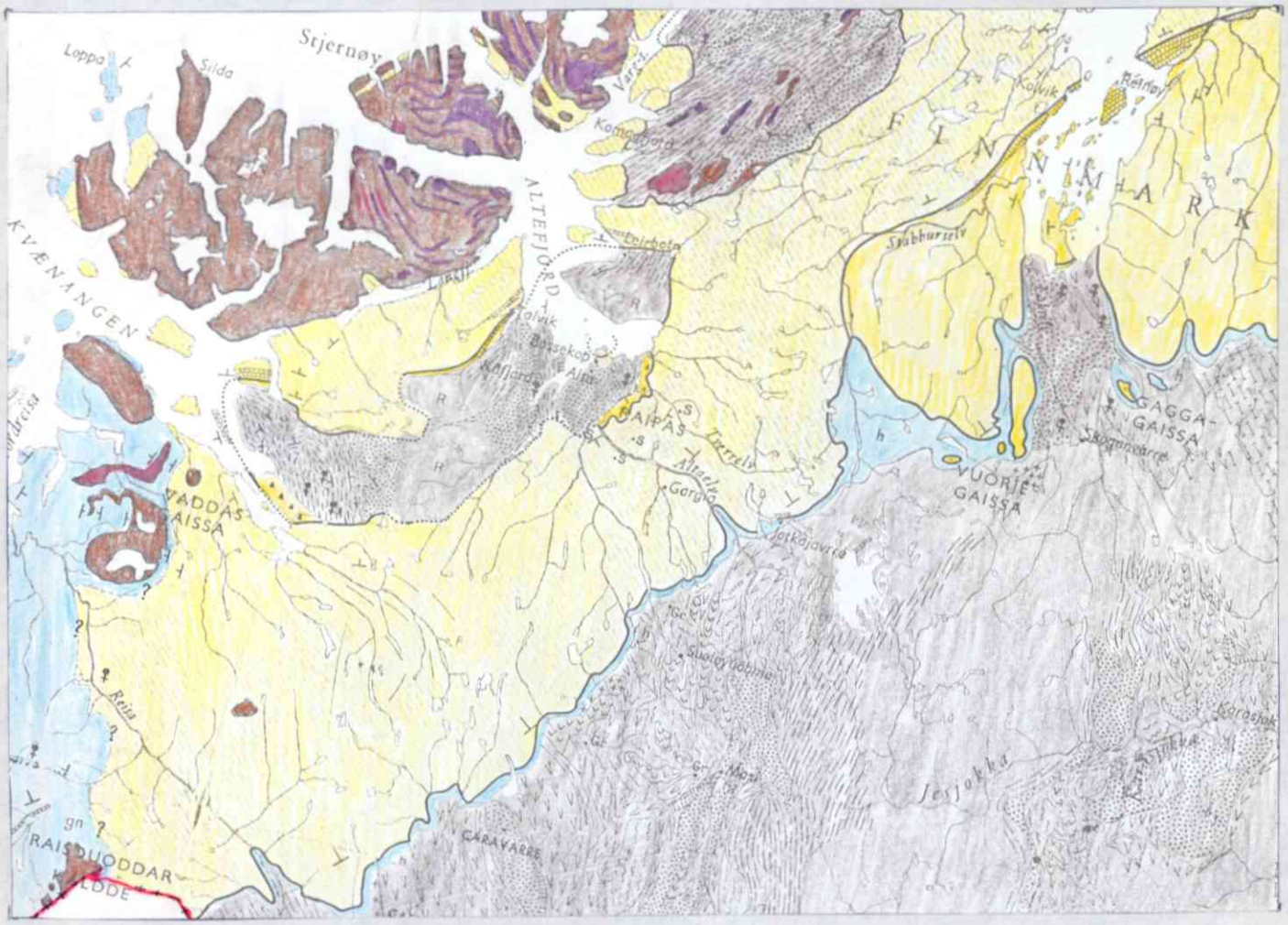
INTRODUCTION

Location and working area

The Alta-Kvaenangen window extends from Finnmark into N. Troms. The area investigated was one of approximately 35 sq. km situated east of Badderen, N. Troms.

Precambrian (Raipas) windows in caledonide complex.



Map to show location of the area.

Revidert utgave av
Revised edition of „Berggrunnskart over Norge" N.G.U. Nr. 164, 1953

Oslo 1960

Målestokk
Scale 1 : 1 000 000

0 10 20 30 40 50 60 70 km

Physical features

The dominant feature in the area is the valley of the river Badderelva running approximately east-west before turning north to reach the coast at Badderen. Most of the other rivers drain in a nort-south direction into the Badderelva. On both sides of the main river valley the ground rises steeply, especially on the north side, to give the mountains nedre Hoanka and øvre Hoanka. Most of the rivers have their source in one of the many mountain lakes.

Geology is often related to topography, the general trend being in a north south direction, and many of the rivers and lakes mark geological boundaries for some way along their length.

General geology

The Alta-Kvaenangen tectonic window is an area of Precambrian rocks surrounded by overthrust Caledonides.
The are two formations outcropping in this window.
The Raipas Formation is a series of lavas, pillow lavas, dolerites, volcaniclastics, and dolomitic conglomerates which have been metamorphosed only up to greenschist grade. Mineralisation occurs in these rocks but is much more pronounced in the old mining areas to the east around the Bergmark anti-cline.

The Bossekop Formation lies with marked unconfomity on the Raipas Formation, and is thought to be Eocambrian in age. It consists of interbedded quartzite and shale beds up to 30 m, and bears a marked resemblence to some of the Formations of the Tanafjord Group in East Finnmark, but this is only speculative.

The existence of a tillite in the area is questionable. Very local patches of conglomerate occur near the base of the Bossekop Formation, but are unlikely to be of glacial origin. However a poorly sorted angular conglomerate of possible glacial origin was found in the extreme south of the area, although its strucural position was investigated.

These two formations have been overthust by a Caledonide schist which outcrops to the north and south of the area.

Previous work

The area was originally mapped by Zenzén in 1915 on a scale of 1:100 000, and much later by the N.G.U. in 1965, on a scale of 1:50 000. However the latter map was found to be of very little use.
An Indian geologist has mapped the Bergmark area for A/S Bleikvassli Gruber in 1970, and futher east in the Kåfjord-Alta-area a Swiss geologist, Mr. André Gautier, has made a geological map for Christiania Spigerverk.

General details

Lodging was in an old house in Badderen and in a tent to map the more remote areas. Three field assistants worked with the author as stream sediment samplers for a period of three weeks. They took samples from all of the major streams in the area and also from those further to the west.

STRATIGRAPHY

The Raipas Formation is Precambrian in age, and according to Reitan, of Karelian age. Some stromatolitic dolomite was found and hand specimen number 50 may contain a primitive coral or sponge although this is by no means certain.

The list of rock-types described on the map are not in stratigraphical order and can occur in different horizons.
However the grey-black graphitic siltstone seems to represent one stratigraphical horizon, although other thin black siltstone bands occur throughout the formation, but not on a mappable scale.
Within the Raipas Formation further to the east, two series have been recognised by Zenzén (1915); a lower greenstone series overlain by a grey quartzite. However in the area mapped, only the former was found to be present.

The Bossekop Formation is of presumed Eocambrian age (Reitan 1960) although no fossils have ever been found to give a precise age.

PETROGRAPHY AND METAMORPHISM

Rocks of the Raipas Formation are of low metamorphic grade (greenschist to albite-epidote facies) which often enables original depositional features such as cross-bedding, graded bedding, ripple marks and pillow structures to be seen.

The Bossekop Formation has suffered very little metamorphism.

In the Raipas Formation ten different rock types were found to occur. These are:

1. Basaltic lavas which very from fine-grained till they grade into dolerites.

2. Pillow lavas of basaltic composition.

3. Massive dolerites of darkish green colour, weathering brown-green.

4. A grey-black graphitic siltstone outcropping in the central part of the area and of about 20 - 30 m, thickness. This forms the only good marker horizon which can be followed for any distance, faint laminations were seen occasionally, and this rock type probably represents a relatively long period of volcanic quiescence during which only pelagic material was deposited in the sea. The percentage of graphite is probably only small.

5. Massive tuffs of lightish green colour and containing small fragments. There are numerous tuff beds occuring in between lava flows but most are too small to be marked on the map. The boundaries between tuff, lava and dolerite proved a major problem in the field, and for greater accuracy thin sections would have to be made.

6. Greenish-grey horzontally laminated mudstones. These are tuffites in that they are of the same composition as most of the basaltic lavas. In most cases they are just horizontally laminated in beds of about 1 cm, but occasional ripples are found. Each bed probably represents the fall-out from a volcanic eruption.

7. Greenish-grey or grey-black tuff breccias. They are unbedded and contain angular clasts, set in a very fine-grained matrix.
Most of the clasts are small, < 5 cm, but the tuff breccia outcropping in the Badderelva contains clasts up to 75 cm of mainly dolomite sillstone and igneous composition. These clasts probably representsaccidental volcanic ejecta and seismic activity bringing material into a quiet water environment.

8. Grey and greenish volcanic turbidites outcropping in extreme east of the area. The Bouma sequence can be observed in a few rases with a sequence of

pelagic unit
horizontally laminated unit
ripple cross-lamination
horizontally laminated unit
graded unit

North of the Badderelva intra-formational conglomerates occur at the base of the graded unit, suggesting tearing up of the bed beneath by the turbidity current. The fact that a complete Bouma sequence is seen indicates a distal turbidite.

9. Conglomeratic and dolomitic sandstones, medium-grained and of a light greenish colour. These are sometimes cross-bedded with shallow channels. Clasts are mainly of dolomite (stromatolitic) and green siltstone, the siltstone clasts often being elongated. The conglomerates can be very poorly sorted with clast of up to ½ metre occurring with much smaller clasts < 2 cm in a sandy matrix. Complete beds of dolomite up to 3 m thick occasionall, are seen, but seem to be very lenticular.
This unit was probably deposited in a very shallow marine environment with fluvial influence.

10. Dolomitic limestone, buff weathering and outcropping only in the extreme west of the area.

The rocks of the Bossekop Formation consist of crossbedded quartzites and shales indicating a shallow marine environment.

STRUCTURE

Raipas Formation:

The dominant structure is one of north-south trending folds. The area south of the Badderelva around Lausfjellet is of great conplexity consisting of isoclinal folds leaning to the west which have been bent and refolded. Thrusting has also occured in this region.
However in the north-east of the area the fold pattern seems to be different. Apart from the north-south trend there is also a dominant east-west or north-west - south-east trend, suggesting that there are two main interfering phases in the region.

Bossekop Formation

Here the main trend is N.W.-S.E. changing to East-West in the extreme south as one approaches the overthrust Caledonides. A second phase of folding has also affected the formation, making the quartzite and shale beds die out and reappear again when followed along strike.

It is not known how the folds in the Bossekop Formation relate to those in the underlying Raipas Formation.

ECONOMIC GEOLOGY

Mineralisation has affected the rocks of the Raipas Formation but not the Bossekop Formation, indicating that the mineralisation is of Precambrian age.
The main areas of mineralisation are in the Bergmark anticline just to the east and sout-east of the area investigated, and also at Middavarre to the north east. The main purpose of the mapping was to see if this mineralisation continued into the author's area.
Small areas of mineralisation were found, but are unlitely to be of any economic interest:

a. In the conglomeratic and dolomitic sandstone an area of dissemination-type mineralisation was found, but this consisted mainly of small scattered pyrite crystals.

b. The grey-black graphitic siltstone outcropping in the Badderelva is intensely deformed and has veins of calcite containing a very little pyrite and chalcopyrite. The veins however are less than 20 cm thick and not of economic importance.

c. The area of greatest deformation around Lausfjellet and continuing south has many quartz veins up to 2 metres thick running through the rocks, but no accompanying metallic deposits were found.

d. South of the Badderelva a talc vein was found in a dolerite, sandwiched between two graphitic sillstone beds. The vein was up to a metre thick and ran in a north-south direction along strike for about 1 km before dying out. It also carried a little malachite.

e. Other small areas of dissemination type mineralisation are shown on the map, but are considered to be of no economic interest.

It is of the author's opinion that the mineralisation is associatred not with areas of maximum deformation but with areas of updoming caused by the interference of the two major fold axes (a N-S axis and an E-W to S.E.-N.W. axis) of the area. This could account for the mineralisation in the Bergmark anticline and at Middavarre. The North-South trend is dominant in the west and the East-West trend in the east.
In the middle where both have approximately equal influence the mineralisation seems to have occurred. Updoming favours the formation of many tension cracks through which the mineralisation veins can run.

Geophysical work using Geiger counters failed to detect any radioaktive deposits in the ares.

The results of analysis of the stream sediment samples were not known at the time of writing this report.

SUMMARY AND GEOLOGICAL HISTORY

A very brief geological history is an follows.

1. Deposition of a series of basaltic lavas, pillow lavas, dolerites and volcaniclastic rocks in a probable oceanic environment. Conglomerates and stromatolitic dolomites formed in a very shallow marine enviroment surrounding volcanic islands. Probable minor unconformities within the series.

2. Folding and low-grade regional metamorphism with associated mineralisation. Probably three phases of folding.

3. Erosion and deposition of shallow marine sands of Bassekop Formation.

4. Caledonide Folding of both formations and overthrusting of Caledonide schist.

5. Arching of the Caledonides to form the present tectonic window.
To summarize; the Raipas Formation is a typical greenstone succession of volcanics & volcaniclastics that have undergone a certain degree of mineralisation in Pre Cambrian times. The mineralisation in the area mapped is not considered to be of economic importance.

COMMENTS

The provision of a moped in the fourth week greatly enhanced the efficiency of the mapping, and it is suggested that the company might invest in more of these machines to save time spent walking into areas of difficult access.

References

Zenzen, N., 1915 : Rapport öfver en geologiskuundersökning af Altens koppargrufvors område i Kvänagen.

Holtedahl, Olaf 1960; editor : Geology of Norway: N.G.U. nr. 208.

Reitan P.H. 1960 : Geology of Norway: N.G.U. nr. 208.

Reitan P.H. 1963 : Geology of the Komagfjord tectonic window of the Raipas suite, Finnmark, Norway, N.G.U. nr. 221.

LIST OF SAMPLES

S.J.L. 172/ 1a Conglomeratic and dolomitic sandstone.

/ 1b Pyrite mineralisation in sandstone.

172/ 5 Dolerite with some large green amphibole crystals, a pyrite mineralisation.

/ 6 Iron ore body consisting mainly of magnetite.

/ 7 Volcanic breccia. Small siltstone clasts in green tuffitic matrix. Small amount of pyrite mineralisation.

/18 Green and grey-green horizontally laminated mudstone or tuffite. A little pyrite and chalcopyrite.

/22a Grey-black graphitic siltstone with large metamorphic amphibole crystals.

/22b Calcite vein in grey-black graphitic siltstone.

/23 Volcanic breccia in tuffitic matrix.

/25a Igneous rock with elongated Feldspar, needles.

/29a Laminated dolomitic sandstone.

/29b Interbedded basaltic lava.

/34 Fine-grained lava with dissemination-type mineralisation.

Small magnetite crystals and a little malachite and chalcopyrite.

/37 Volcanic turbidite with pyrite mineralisation (dissemination-type).

/39 Poorly sorted grey siltstone with pyrite mineralisation (dissemination). Probably a tuff.

/45a Dolerite with some amphibolisation.

b Talc vein (2 specimens).

c Calcite and talc vein.

Summer 1972

Badderen

a

Diary

Steve Laux

522300 006/008

Summer 1972

Baddaren

Diary

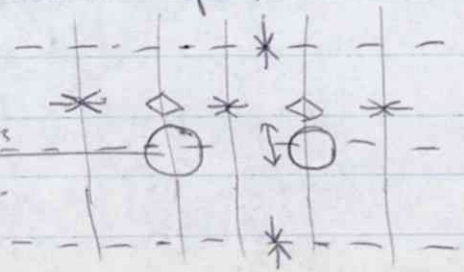
Steve Laux.

Tuesday July 11th.

Move from Burfjord to Baddecan.
Make preparations for mapping.
Study of aerial photographs.
Possible reveals 2 main phases of folding in Raipas formation:

1) N-S to N.N.W.-S.S.E. trend
2) E-W to ~~E.S.E.-S.S.~~ E.S.E.-W.N.W. trend.

Bergmarks anticline may be position at which two anticlines meet, ie. a dome-shape.



Wednesday July 12th.

Geological reconnaissance of area. Confirms suspicions that much of previous map is wrong!
Rock seen are :-

1) Massive lavas some probably containing olivine a all have feldspar.

2) Pillow lavas. These often weather brown, sometimes have flow banding. They are greenish and quite brittle.

3) Dolerite dykes or sills. Evidence confirming dykes and/or sills is chilled margins to both ~~dyg~~ ends and esp. baking of country rock at both ends. Medium-grained rocks, greenish in colour may contain olivine.

4) X-laminated grey siltstones and lighter-coloured fine-med. sandstones. Sharp bases to beds which are thin about 3cm. Possible turbidite mode of deposition. Deformed as a cleavage is present, and would call them schist because of this. (Preferred terminology). Especially found in area around grid. ref. 402487.

5) Black schist. Often occurs in thin beds between lava flows or tuff bands. Also thicker beds (not measured yet). Probably sedimentary origin as pelagics on sea floor. Not much sign of bedding, mostly cleavage.

6) Massive tuffs. These are fairly brittle and can be bedded. Usually

lightish green and containing some glassy fragments.

7) Tuffitic schists. Same except with a schistose texture.

8) Ignimbrites. Rather rare and not easy to see. Very brittle, layered and badly sorted with volcanic and glassy fragments in a fine-grained matrix. Again a greenish colour.

9) Well-banded rocks consisting of light green & whitish bands about 2 cm. max that are usually highly deformed. Probably original sediments of pelagics and cherts.

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10) Tillite: This was found around locality 422460 where on previous

map the quartzite should be. Greyish matrix fine-med grained, a few clasts of dolomite a maybe others. Could not see the exact contact between this and some black schists underneath. But black schists were fantastically contorted a sheared and I suspect the contact may be faulted.
Tillite also folded, maybe folded thrust plane, but area needs further investigation.
11) Quartzites.

Structure.

Structure very complicated. Most beds striking N.N.W - S.S.E. but not more than 15° west of north.

Many small folds and shear planes in Raipas formation giving many slickenslides.

No radioactive deposits found with detector.

No ores found except very brown weathering patches around locality 402487.

Thursday July 13th

Thinking that mineralisation might be associated with last major phase of folding e.g. if mineralisation around Beggnadk anticline may be due to it being right of undoming & therefore develops more tension fractures than other parts of area. If this is so then area around Middaverre is also a possible place of mineralisation.

More reconaissance geology of the area looking for best sections. Probable best section is ned Hoanka - öv Hoanka, but could prove rather difficult mountain climbing!

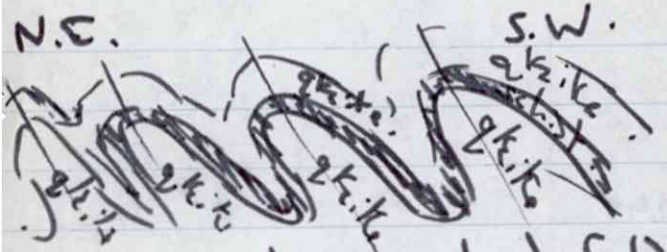
Friday July 14th.

Dips and strikes in Boddekop quartzite.

Strike.	Dip
60	85
60	90°
320	55
140	50

must be at least 2 phases of folding in quartzites.

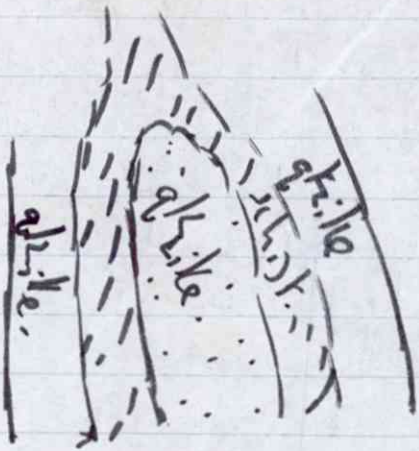
1 phase



Large prob. recumbent folds leaning N.E. These are main folds and there are good traceable quartzite bands up to 20 m. thick.

2) In addition to this are folds with a vertical dipping axis. This is prob. cause of qtzite beds lensing out

along strike



Monday July 17th.
Can't begin proper mapping until I get the areal photo overlays.
Planning the mapping for the next 4 weeks. Shall have to map about 4km a day to get it finished.
~~Shall start~~ 1st assistant arrived this morning, other 2 come tonight.
Weather rainy whole time.

Tuesday July 8th

South Africa.

Rocks extended dong strike is N-S.
Sharp anticlines + synclines, many of them recumbent + bearing to north.

N S.

Plunging at about 40° to west.

Wednesday.

① V. interesting conglomeratic bed.
Med-coarse greenish sst. with
clasts of dolomite, siltst and fine-grained
green lava. Congl. in discreet beds
5–50 cm. thick. X-bedded. Contorted
but generally beds inverted.
Dip 27° at 270 ie. West.
Also small deposits of acquite prob.
of sedimentary origin. Also beds of
dolomite and dol. silt. intraformational
conglom's. Also silty beds
Going uphill becomes less congl. com
& also less conglom going north.
Dip of foliation 63° at 200

Going uphill into massive tuffs 15 m.
Then black schist 4 m.
" massive tuff again.
Dip of joint 90° at 15°.
Then series of massive tuffs, lam. tuffs or thin dark schists. bands.
Dip of foliation 40° at 270°

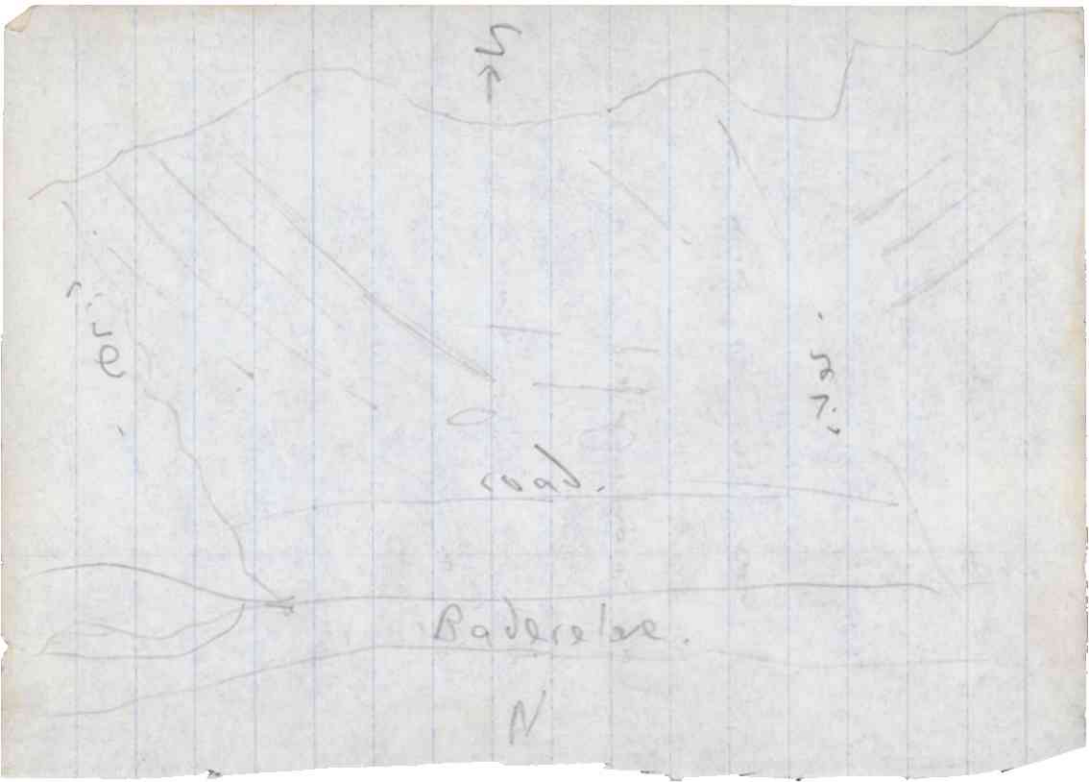
(2) Then back into conglom of (1) again
Then into thick black schist.

July 20th Thursday.

(5) Pillow lava.
Dip of foliation 20° at 310°

(4) Turbidites.
~~Limestone, tuff, schist??~~

Below is conglom band about 1m with small unsorted clasts maybe agglom. But lam. tuff schist has X-lam showing beds right way up. Also beds up to ½m with clasts of silt. That are elongated in direction of bedding. Suggests tearing up of sediments of bed beneath. Have graded or sharp bases and I think they are turbidites. 20m. thick.


S
road
Baddesley
N

(5) Overlain by Dolerite with large green weathering patch. See specimen.

(6) Good iron ore body in dolerite.

Dip around place 75° at 334° i.e. N.N.W.

68° at 0° i.e. North.
73° at 10°
90° at 0°
25° at 14°

7) Something funny happening around here. Black schist above a dolerite below. In between is zone of deformed grey and brown schists. Looks like amphibolite metam. Some grey schists contain clasts of dolerite.

Also much brown weathering but no good ore body found.

Also above black schist is conglom. body containing dolerite silt clasts, See spec. 7.

Friday July 21st.

Storm all day. Look at areal photos etc.

July 22nd. Saturday.

(8) Massive med-grained brittle unit by road. Some slickensides.

(9) Massive tuff.

(10) Lam. tuff. schist.

(11) Fine-grained flow-banded lava.

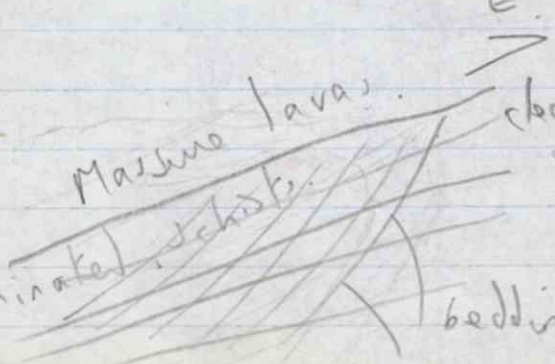
Dip 23° at ~~24~~ 204° i.e. S.W. On second thoughts banding is more likely to be lamination of this unit is a fine-grained metasediment ie a schist. Many qtz veins and in places blasted metamorphic mineral formed. See specimen.

90° at ~~34~~ 349° ~~00~~ is N.

~~40~~ 40° at ~~74~~ 254° about W. cleavage.

bedding cleavage

bedding steeper than cleavage.
∴ Beds wrong way up.
Thrust



Thrust dips 15° at 264° to W.

Bedding in schists dips 34° at 264°

Cleavage " " " 15° " 264

(12) Tuffitic schist.
Dip of foliation 80° at 346° i.e. N.
Underneath is black schist.

(13) Cleavage 60° at 348° i.e. N-ish.
Conglomeratic? siltstone. Look like weathered out clasts of dolomite, but no bedding.

Monday J. J 24th.

(15) Above black schist is massive ~~kff~~ lava

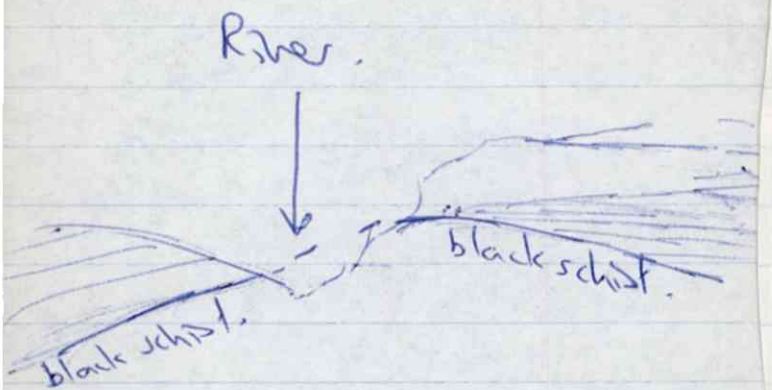
Dip of bedding re. contact with black schist 20° at 160° ie S.E.
D.p of cleavage 87° at 160°

(16) D.p of contact between black-schist a massive ~~kff~~ lava
22° at 194 ie. South.

Cleavage 90° at 344°
" 82° " 56° ie. N.E.

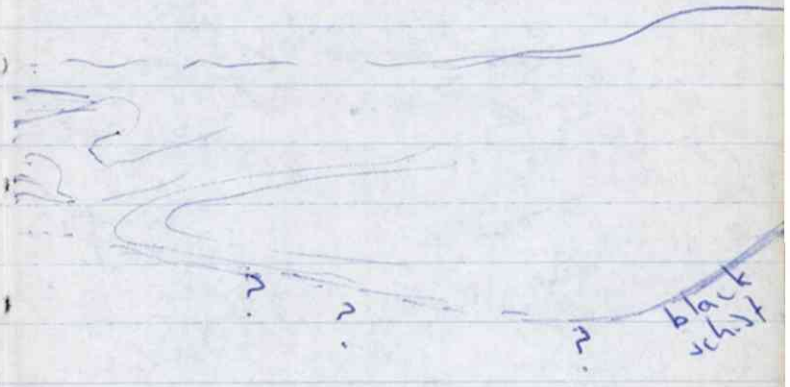
Many darker jilly bands in the ~~kff~~ lava.

W. Area around



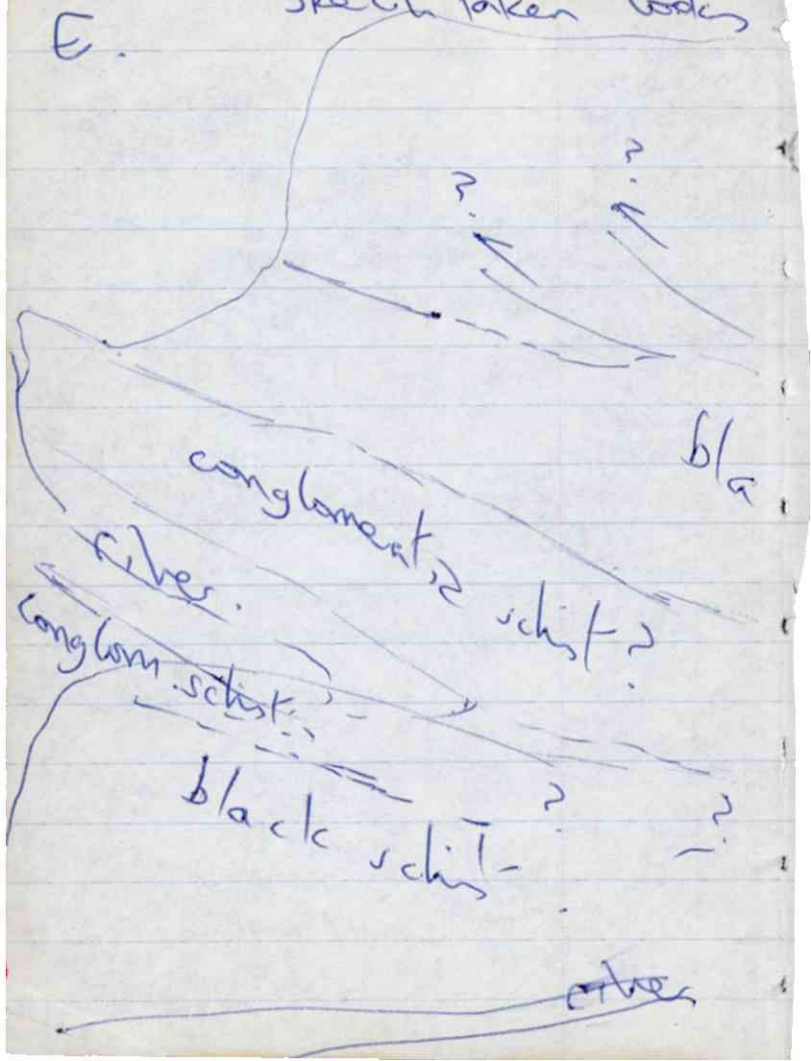
Hoanka

E.

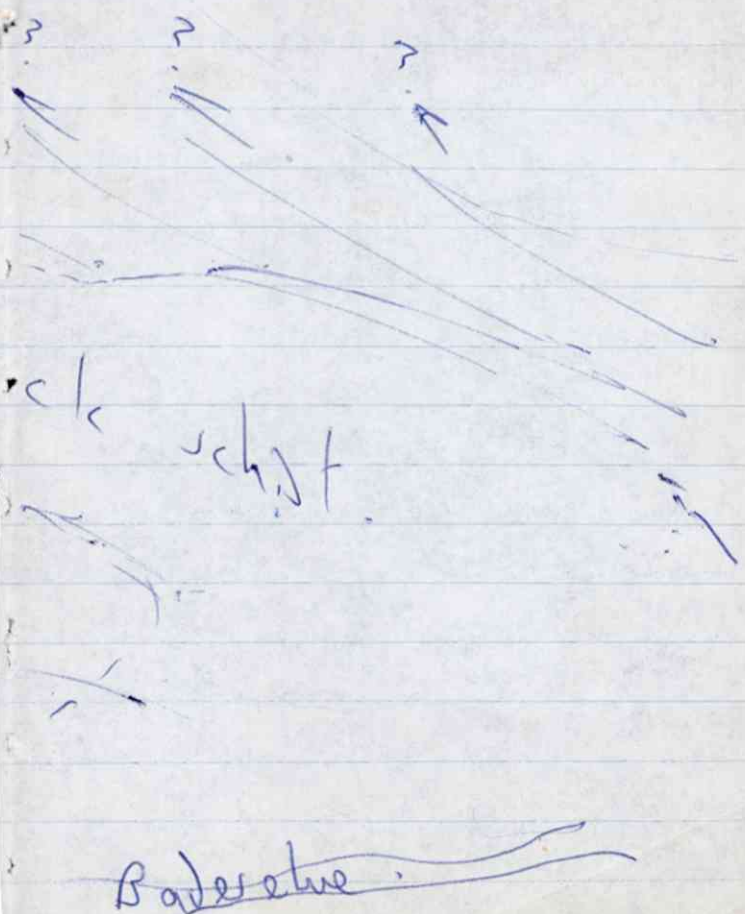


E.

Sketch taken loose



South across Rue W
Baderelue.



(17) Dip of cleavage in dolerite bed. Can't understand tectonics here.
75° at 170° i.e. S.
70° " 0° " N.

(18) Dip of cleavage in v. well laminated green & black silt. lore
30° at ~~25~~ 254° i.e. W.

(19) Banded coarse lava occurs below blackschist.

Thursday July 25th

Mapping down to Bardsche.

(20) Mostly massive dolerite with some intercalated grey lam. schists & a few pillow lavas. The latter are too small to put on photo.

Dip of cleavage & joint 70° at 120°
46° at 110°

(21) Lava (fine-med grained).

Dip of cleavage. 48° at 64°
90° at 152°

10 m. thick with thin lam. schist bands. Weathers v. brown & contains some Cu. Then into dolerite. Dip of cleavage & foliation

48° at 134°
59° " 338° i.e. N sh.

22) In river gorge is zone of intensely deformed black-schist. Black schist prob. lies above dolerite.
Amphibolitisation into radiating crystals of amphibole. See specimen 22a.
Also veins of prob. calcite (v. good cleavage) but may be baryte. Specimen 22b.
Much of blackschist is v. calc, & also weathers v. brown & contains pyrite.
But no good veins found.

(23) Where most spectacular waterfall outcrops above the blackschist a peculiar breccia. Clasts of different size, no bedding. Looks like a fault breccia or mélange

Above this is again a blackschist for a short distance.

Then just before last outcrop of blackschist clasts are found to occur in it. Look like clasts of mainly siltst. & sst.

Then above blackschist is a lighter coloured breccia with clasts of dolomite, siltstone & igneous. Specimen (23).

Dip of what appears to be bedding in breccia is 45° at 54° i.e. S.W. 234°
of locality 7.

Then above is massive dolerite like locality (5).

Dip of joint plane 45° at 334°
ie. North.
65° at 344° "
68° at 348° "

Can't see contact between dolerite & breccia. But dolerite I think is above. Maybe thrust? or fault.

Wednesday July 26th.

Move camp! But terrible weather actually snowing.

Thursday 27th

(24)

Lava above blackschist.

Dip of foliation 75° at 348° i.N

85° at 74° i.e. E.

75° at 150° i.e. S.E.

65° at 162° i.e. S.S.E.

47° at 145° i.e. S.E.

57° at 58° i.e. N.E.

45° at 125° i.e. S.E.

62° at 54° i.e. N.E.

34° at 245° to. W.J.W.

At junction between lava below a blackschist above is a v. dolomitic bed.
Also blackschist has been amphibolitised? Lila localities 22.
Weather still fucking terrible below 5°C. Can't work as it is too cold so go down to Baddeon.

Friday 20th.

Monday 31st.

Mapping round Middavarra.

(25) Abandoned mine.
Copper mineralisation in dolerite rock. Mineralisation associated with qtz & feldspar veins. Seem to be running in a N.E.-S.W. direction.
Also by road is rock of large feldspar phenocrysts. See specimen 25a.

(26) Pillow lava.

(27) Dolerite.

Joint Dip 30° at 98° ie. E.

Cleavage 86° at 16° ie. N.

a trend. 32° at 103 ie. E.

"

(27). Copper vein, trends in N.W. -S.E. direction at 302°.

In dolerite.

Malachite also present.

(28) Dip of cleavage in dolerite by road 67° at 346° ie. N.

86° at 22° ie N.

68° at 10° ie. N.

85° at 11° ie N.

Tuesday 1st August.
Studying paper, air photos etc.

Wed. 2nd.

Mapping in Boddelop Okehe.
By road. Okehe band but not the quality. 15 m. thick.
Dip 58° at 248°. i.e. W.S.W.

Thursday 3rd.

Boddelop Okehe.

Friday 4th.

Mappers - N, C, Wood.

(29) Contorted laminated fine-grained greenish (talc weathers) buff, Laminations are prob. dolomite and green mafic tuff or lava.

2 specimens.

Lamnat - 78° at 210°

Dolomite beds conglom. in places

<f. (1) S.W.

(30) Interbedded thin black/grey silts. & tuffs.
Dip of beds 20° at 40° ie N.E.

(31) Dip in dolomite. Prob joint or cleavage 20° at 16° ie N.N.E.

(32) Dark fine grained brittle lava. ie glassy.
Dip of beds ?
Dip of cleavage. 76° at 326° ie S.E.
47° at 76° ie E.

(33) Bedded sst with tuffs.
Dip 10° at 283° to W.

Monday 7th. a Tuesday 8th.

(34) Mapping around Hoanka ...
Fine grained lava with discernable
layers. See specimen.
Dip of cleavage 43° at 269 i.e W

(35) Dip of bedding in tuff
38° at 260° to W.

(36) Dip of bedding in thin grey siltst
of lava unit.
50° at 275° i.e. W.

Wednesday 9th.

(36) Rapps south of Badevatne.

(37) In Badevatne. Fine-grained, green v. well lam. lava?

Dip of beds 50° at 235° i.e. S.W.
" " cleavage 41° at 336° i.e. N.N.W.

(38) Copper mineralisation along cleavage. Finely disseminated.

See specimen.

On second thoughts laminations are ripple x-lam., small scours graded beds show these are turbidites. Beds are right way up.

(38) Contact between dolerit. below & conglom? silt/sa above.

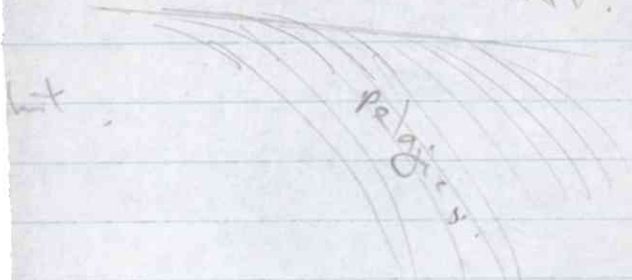
(39) Poorly sorted grey silst. Dr. the weathg boundl. some Cu. Below black
Dip of beddg
" " cleavage. 42° at 59° to N.E
See specimen.

(40) Dk grey fel fine lam mudstone.
No X-lam. Prob. pelagic.
Dip of beddg 60° at 260° to W.

(41) Dip of pelagic 63° at 254° to W.
" " strong cleavage 90° at 160 to S.S

(42) Deformation of thrusts in pelagic

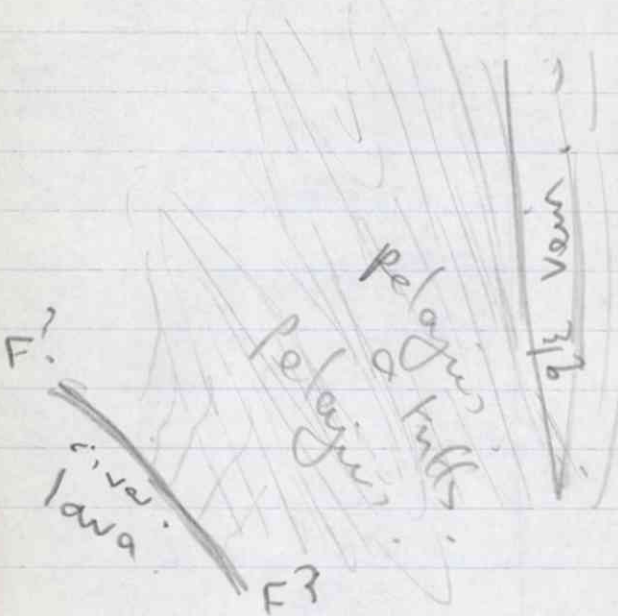
← pelagic? or turbs?



Dip of beds of pelagics - 50° at 271° W,
... thrust. 69° at 270° W
24° at 272° W

(43) Dip of cleavage in turbs by wave.
Dip. 87° at 350° to N

E. (44) W.



Sketch of locality 45
looking south.

Thursday 10th

Magpie South of Ladysmith.

(45) Sandwiched between 2 blackish Dolerite? with metamorphic band of fibrous platy mineral maybe talc. About 1 metre wide.

See specimens.

(46) Dip of contact between dolerite & kulk (Diambase?) 87° at 256° to W.

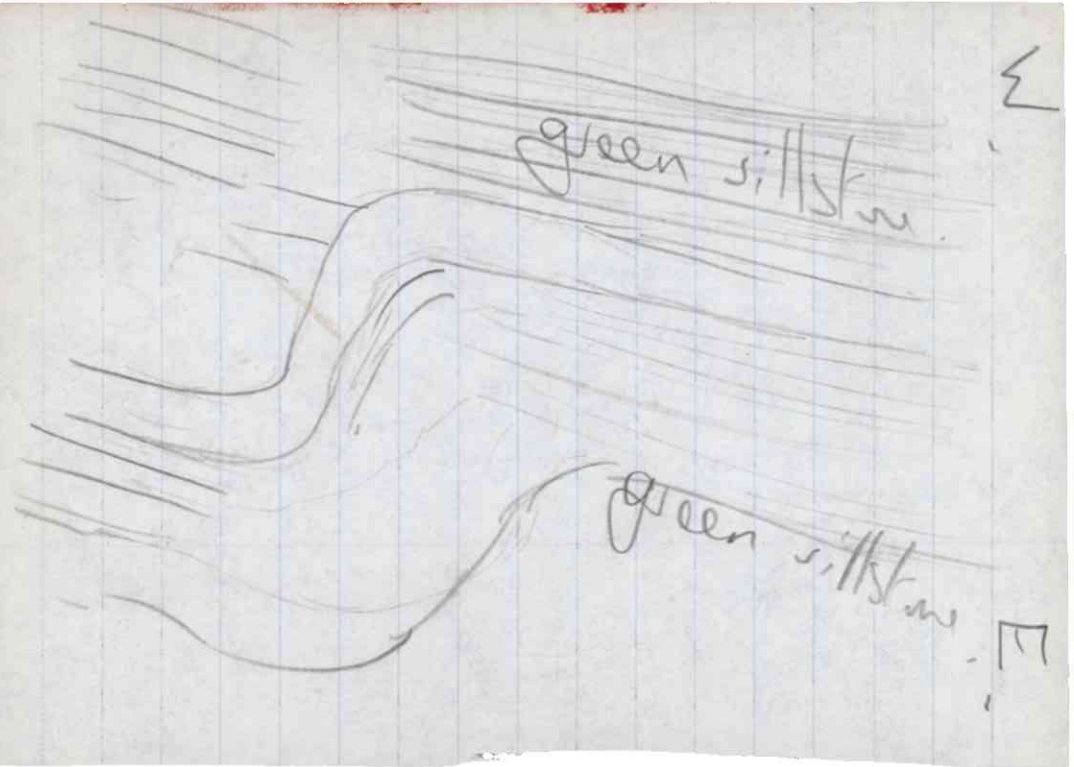
Friday 11th.

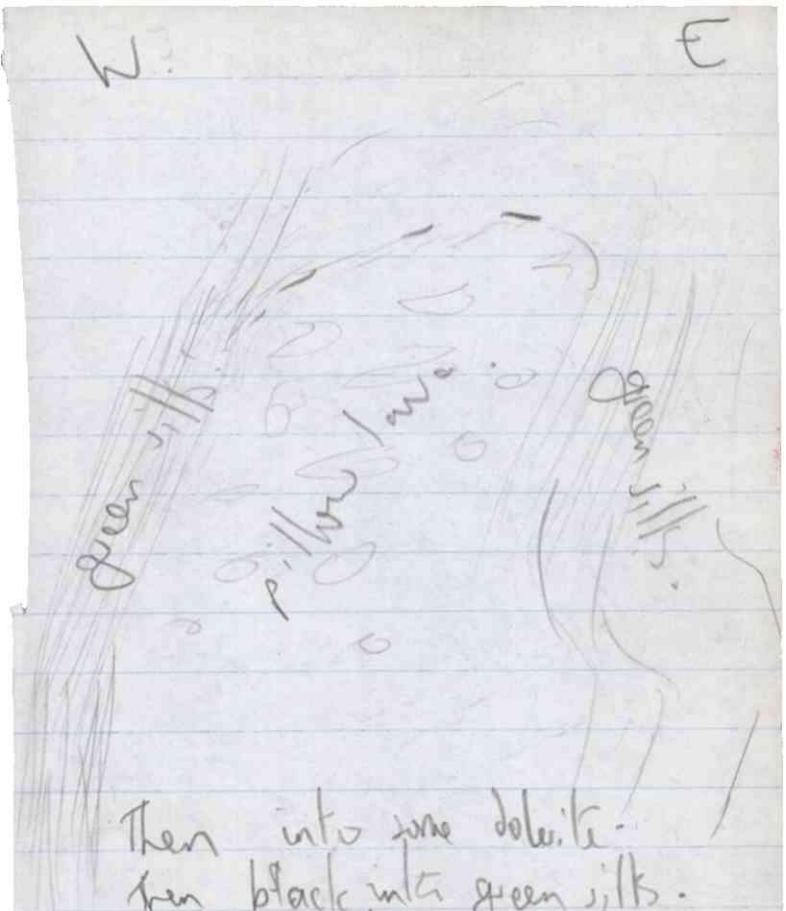
Mapping round Lanrigillot.

(47) Dip in v. fine hard lam green silt/stone.
68° at 246° i.e. W.S.W.
Downstream of Tadcaster a into amphibolites & dolerite. Large deformation & qtz veins.

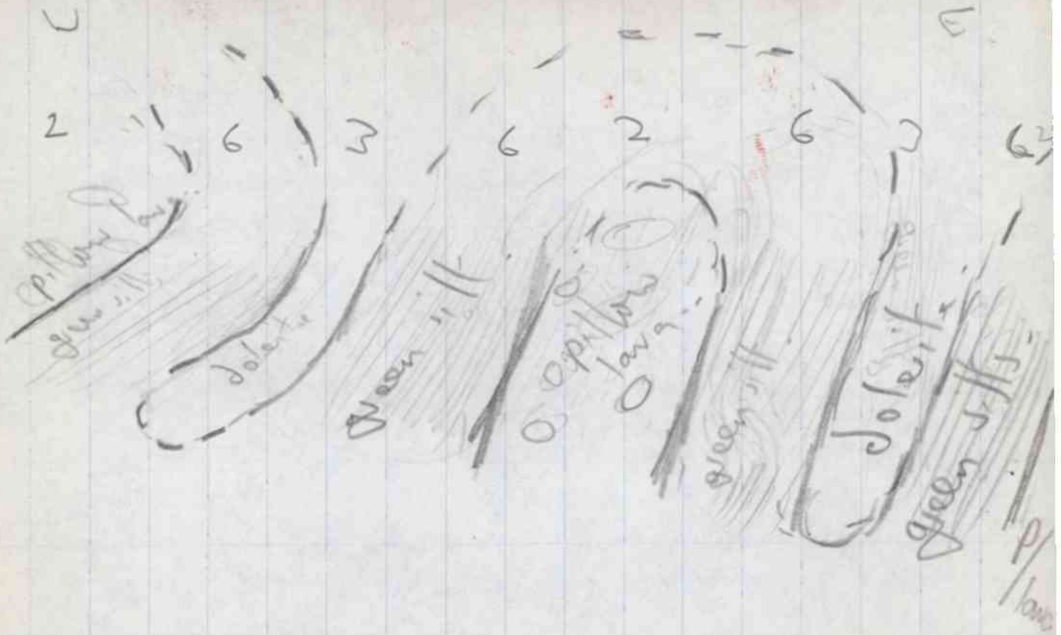
(48) In gorge back into green lam. silt/stone. Fantastic deformation. See next page.

Then into pillow lavas and dip of rocks gets less about 50°!
Back into green lam. silts. Dip nearly vert again -


E
green siltstone
green siltstone
F



Then into some dolerite.
Then black into green silts.
Then pillow lava above. D.p
about 45° - W.



W
E
2
6
3
6
2
6
3
6
pillow lava
green sills
dolerite
green sills
pillow lava
green sills
dolerite
green sills
p/lava

Monday - 11th

Quartzites

Dip D_1 53° at 236°. S.W.

Sketch profile D_1 -

$D_1 - D_5$ all very good quality.

D_6 prob. some feldspar.

No schist bands.

D_8 very good quality.

D_9 10_{10} good.

$D_{11} - D_{13}$ Some fine grained ~~type~~ to green, thin schist beds up to 5cm. See Spec. 13.

D_{14} Rusty spots of ilmenite.
Also green schists bands 5cm.
Bad quality.

D_{15} Good quartz bands but
still thin green schists

D_{16} Intim med. quality quartzite
But some feldspar & maybe
little Fe.

D_{17} Med-good quality Dip 62° at 242°
to S.W.

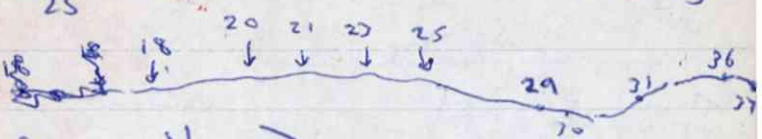
D_{18} Med-poor quality. Some thin
green schist bands.

D_{19} Poor. Fe-contaminated.

D_{20} Poor. Thin green chlorite
bands & Fe-stains?

D_{21} – D_{24} Good. No chlorite bands.

D_{25} Good but little Fe? stains.



D_{26} V. good.

D_{27}-D_{29} Good.

Then into schist bands near fault.

D_{30}. Poor. Thin quartzite & chloritic bands. Dip. 67° at 240 S.W.

D_{31} Good, but a little Fe-stains.

Dip. 70° at 258 N.W.

D_{32} Good but a few very soft thin chloritic bands < 1mm.

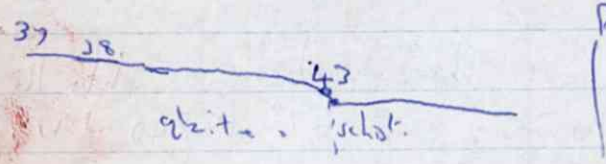
D_{33}* Good.

D_{34}-D_{36} Very Good.

D_{37}. Good but little Feldspar.

Then into schist.

D_{38} Good. Dip 85° at 252° W.



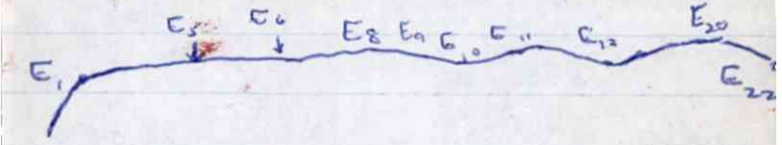
D_{39} – D_{43} V. Good Dip 70° at 254°

Schist.

Fault.

End of profile.

Profile E.



E_1 rather poor quality. Thin chloritic bands.
Dip 85° at 254° W.

E_2-E_5. Moderate. Good epidote bands but chloritic bands.

E_6 Good.

E_7-E_9 Very Good.

E_{10} Good but thin epidote bands. 1mm.

Zone of poor quality epidotised qualzites.

E_{11} Moderate quality. Epidote.
Thin schist bed.

E_{12} Good quality

E_{13}-E_{14} Medium quality some Felspar a epidote.

E_{15} Good.

Thin schist bed.

E_{16}. Good.

E_{17}-E_{19} V. good.

E_{20} - Medium Low empirical

E_{21} - Good

E_{22} - Good.

End of profile.

Tuesday 15th.

Glaciated.

Profile F.

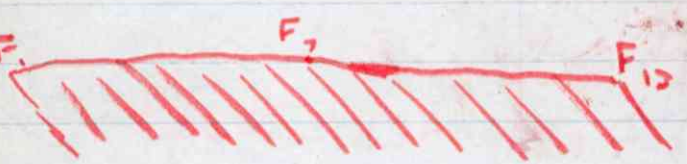
F_1. Dip of contact with schist.
V. good glaciation. 70° at 252 W.

F_2-F_{13} V. good quality.
Dip of F_{13} 59° at 240° W.

schist bed.

F_{14}. V. good. Dip 47° at 244° W.
F_{15}. Good. Grey, some fold.
F_{16}-F_{21}. Good. Some fold.
Dip of F_{21} 46° at 241° W.

E. W



schist bed.

F_{22}. Dip of 54° at 240° W.

$F_{23,24}$ V. good.

F_{25}. Mid with little schist beds.

F_{26-30} V. good.

Dip F_{30}. 60° at 240°.

Strike Red.

End of profile.

Wed. 16th

Pack to go to St. John's

Thurs 17th

Mapping in ore belt.

1) Strike and dip of contacts.
2) How big is ore body?
4) Minerals present.
5) Host rock.
3) Is mineralisation disseminated or in veins etc?
6) Topography.
7) 3 samples 1) Host rock.
2) Best ore.
3) Most common ore.

A Best ore
B Common ore.
C Host rock.

(1) Strike about 26° to N.N.E-S.S.W.

Dip of rocks near vertical of ore body v. difficult to tell but looks about 10° to East.

Exposure very poor, 30 cm of ore body exposed. Prob. continuous over length of 10-20 m.

Mineralisation occurs in veins of calcite.

Minerals present are pyrite chalcopyrite malachite, calcite. Most of sulphide is chalcopyrite

Host rock is coarse lava or probable dolerite. Very near contact with dolomite bed to west.

Body exists in pond exposed area.
Also many small veins of calcite (chalcopyrite etc) probable offshoots from main vein. These small veins usually about .3-1 cm thick & may give rise to disseminated type of mineralisation.

(2) Strike & dip impossible to tell. Contacts with host rock not seen. Just a small hole in the ground. Hole strikes at 20° N-S Estimated 1 metre thickness of ore body.

Mineralisation of calcite. Minerals are chalcopyrite, pyrite malachite, calcite. Also green fibrous mineral see specimen.

Very much known weathering.
Host rock is same lava as (1).
Exposure v. poor.

(3) A little south is another hole. c. 20 metres North.
Continuation of (2).
Calcite vein of about 1 metre can be seen in water.
But no chalcopyrite etc.

(4) Dip & strike can't be seen.
Just hole in the ground (explosion)
Mineralisation occurs in very many small veins and the minerals are fine-grained.
Minerals are pyrite, chalcopyrite, a little malachite magnetite & lead, calcite. Pyrite chalcopyrite most common.
Host rock is lava but on other side of dolomite.
Very poor exposure.

(5) Dip of rock nearly vertical
Strike is 128° i.e. N.W.-S.E.
Max. dimension 2½ metre
~~Rock~~: Mineralisation consists
of very thin calcite veins
(½ cm) that have
impregnated the rock
More body
Minerals are calcite 95%
pyrite, chalcopyrite (about 5-10%
in ore body), magnetite 1-2%)
Host rock is dolerite very
near contact with dolomite to
east.
Good exposure
flows from calcite. The host rock
is impregnated with small pyrite
crystals, but about 2 → 3 m

away from main ore body the impregnation die out.

(6) Little pocket of mineralisation in dolerite. Strike of dolerite is 10° W N-S. Dip unobtainable. Ore body is about ½ m. wide and 2m. long before it completely dies out.

Not so much mineralisation! Mostly just a brown weathering colour. Probably impregnation type. Pyrite in prob. any mineral. Very poor exposure.

(7) Dip of rock about 70°
Strike 11° to N-S.
Ore body of 30 cm width and
3m lateral extent.
Mostly just a brown weathering
~~stone~~ patch on the ground.
No actual crystals seen.
Mineralisation probably of
impregnation type. Analysis
of host rock ~~[illegible]~~
(specimens 7B & 7C) may reveal
some heavy minerals. Probably
pyrite & some calcite.
Also magnetite.
Host rock is dolerite.
Very poor exposure.
Impression that ~~dolerite~~

~~has impregnated~~ whole of rock has been impregnated as a very small amount of that this patch has a slightly higher concentration of Cu, Fe etc. & so weathers brown. Same conclusion also for (6).

(8) Strike of rock 10° N-S. Dip about 70°.
Mineralisation is along strike of rock. White patches on hillside due to much talc. Outcrop can be followed for 40 m. along strike before disappears beneath bog. Bog has very

much brown staining.
Width of ore body about 10 m.
Type of mineralisation difficult to tell. Very much talc and some calcite that have impregnated the host rock.
No clear cut veins.
Minerals ~~are talc~~ in ore body are talc 70% calcite 25% and mainly pyrite and a little malachite.
Host rock is difficult to tell. Very fine-grained, grey prob. a lava.
Exposure [redacted] in explosion hole.

(9) By main river
Dip ? Strike 10° N-S.
Ore body of impregnation type.
Implegnated to a width of about
10 m. Cannot see lateral extent.
No brown weathering, just a
little rusty red.
Minerals are a little chalcopyrite,
pyrite, magnetite, haematite and
lead (PbS). They are very fine
grained and scattered throughout
the rock, although no large
concentrations are seen.
Host rock is a dolerite.
Good exposure but very difficult
to see mineralisation (took
me nearly an hour to find it!)

(10) Strike of rock 30° NE SW.
Dip About 80° to N. Westerd.
One body consists of many
calcite veins running in
all directions through rock.

Veins up to 20cm.
Outcrop in big explosion hole
4m x 4m. Mineralisation
in all of this hole.

10 m away is outcrop of host rock that has very small grains of chalcopyrite & calcite that have impregnated the rock.

Minerals of are veins; are calcite 70%, talc 10-20%, chalcopyrite ~10% and small amounts of pyrite.

Host rock is a dolerite. a weathers to many holes.

(11) Bearing of strike 45° at 41° N.
Dip 60° strike 300° N.W.

Ore body in hillside.

Mineralisation of many small scattered calcite veins which contain up to 30% of mafic minerals.

The samples were collected over the whole width of the hillside ie width about 40 m. Mineralisation greatest on east slope of hill.

Mineral ~~ore~~ in veins are calcite 70%, chalcopyrite 10%, pyrite 10% talc (esp in dolomite lens) 5%. Small amounts of malachite & galena

Host rock is a dolerite and often weathers to many holes like specimen (10) C
Also impregnation type mineralisation
Ore body is laterally continuous in both directions.
Grain size of ore minerals usually small $\leq$ 2 mm but can reach 1 cm.

(12) Same ~~rock~~ host rock as (11) continued along strike. Very small hole in the ground of 1½ sq. metre, but mineralisation on whole hillside like (11). Calc-type mineralisation.

Veins up to 30 cm and are very numerous around small hole. On rest of hillside only a few thin veins or mineralisation of impregnation type.
Minerals in veins are galena 20-70%, calcite, 70-20%, a little brown cassiterite? pyrite chalcopyrite and Malachite (=10%).
Host rock is holey dolerite. Poor exposure.

(14) . Dip of rocks and of main ore body 63° at 110° E.S.E
Large ore body with 4 m. of concentrated ore and mineralisation of impregnation-type away from main seam
Main seam can be traced laterally for 30 m before going underground
Area has been mined before.
Mineralisation is massive although some calcite veins can be seen.
Most common mineral in main seam is galena PbS (80-90%)
Malachite, chalcopyrite, pyrite 5% each little amount of talc, Calcite at least 5%. Also magnetite with galena.

Very near contact between 2 different rock types. a) dolerite like 11a/12 a there main mineralisation is in. b) laminated pelagics of volcanic composition. These have also been affected a smaller amount by mineralisation. See specimen 14D.
Good exposure.

(15). Probable continuation of main seam. But only ½ m thick here.
Dissemination a calc.-type mineralisation. Host rock dolerite? Minerals chalcopy., pyr., malachite, some lead

and magnetite ~~y~~ aligned mineral (15A) may be haematite.

in

(16) and (17).

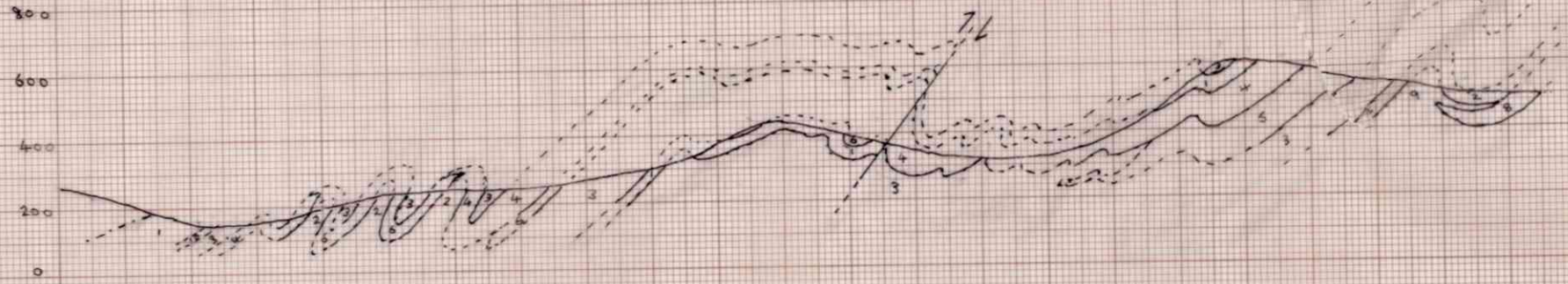
Mineralisation at and between (16) and (17). Mineralisation at border between a black schist and dolerite. This border is folded but 'razor sharp' and could be a thrust. This is possible cause of mineralisation which is mainly in dolerite.

One ~~bedding~~ bodies are very patchy and mineralisation is in small calcite vein, max 5cm extent of mineralisation never more

than 2m width.
Minerals ~~in~~ in veins are
calcite 80%, pyrite chalco(18)
malachite 5%. Also some
feldspar at (16) & haematite at (17).
Specimen 17D is blackish.
Poor exposure.
Mineralisation cannot be traced
further than between outcrops
(16) & (17)
Dip of joints 70° at 70° to NE

(18) Exploration hole on top of lake. Old mine.
Main ore body in thin seams of red mineral rock, haematite (5 cm) that have been folded // to bedd.
Dip of bedd is 77° at 126° = S.E.
Also calcite veins through rock (< 5 cm.
Minerals present are haematite 100%. calcite malachite and very small amount of pyrite & chalco.
Host rock is volcanic basic (lava) and dolerite.
Lateral extension for 20 m.

(19) Old mine. Calcite type mineralisation of 20 m width but only in patches.
Minerals are chalco, pyrite, malachite, little haematite & magnetite, calcite.
Host rock dolerite.


800
600
400
200
0

N

Babberan

Babbercelva

DRIFT

W.S.W. E.N.E

800 m
600
400
200
0

BOSSEKOP FORMATION

- BOSSEKOP QUARTZITE "Derwent" nr. 9

EOCAMBRIAN / PRECAMBRIAN — UNCONFORMITY

Drift is collor "Derwent" nr 1.

- BASALTIC LAVAS "Derwent" nr 42
- PILLOW LAVAS "Derwent" nr 51
- DOLERITE "Derwent" nr 25
- GREY-BLACK, GRAPHITIC SILTSTONE "Derwent" nr 53
- MASSIVE TUFF "Derwent" nr 63
- HORIZONTALLY LAMINATED MUDSTONES (TUFFITES) "Derwent" nr 69
- TUFF BRECCIA "Derwent" nr 8
- VOLCANIC TURBIDITES "Derwent" nr 70
- CONGLOMERATIC and DOLOMITIC SANDSTONES "Derwent" nr 33
- DOLOMITIC LIMESTONE. "Derwent" nr 37

RAIPAS FORMATION

(not in stratigraphical order)

- Unconformity
- anticline, recumbent
- syncline, recumbent.
- Strike and dip
- certain / inferred geological boundaries
- Fault
- Thrust fault (arrows point toward the overthrust bail).
- Fe, Cu Mineralisation
- Path

Geological Map of part of the Kvaenangen Window, N. Troms.

Målestokk 1:20,000 (Air photograph)

Tegn. Laux - 72

Trac.

Kfr.

Erstatning for:

Erstattet av:

A.S Tanum A1