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- EVL soils research project
- EVL summary of metallurgical testworks
- * Extract from application 6.8.71, "... outline of proposed project geological considerations" with plan 1" : 4 miles.
- ‡ DDH Logs HQ1, ND1

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AE 33 is related to AE 22

EXPLORATION VENTURES LIMITED

A REPORT ON EXPLORATION FOR
MOLYBDENUM IN EAST ABERDEENSHIRE

MARCH 1973

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BACKGROUND INFORMATION

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

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

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

BALQUHINDACHY- QUILOUOX

LAND OWNERSHIP

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

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

(ii) GEOLOGY

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

(iii) SURVEYS

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

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

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

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

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

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

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

3 RATHEN (see figure 1 for location)

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

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

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

4. KINMUNDY (see figure 1 for location)

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

5. INVERURIE (see figure 1 for location)

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

6. OTHER AREAS

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

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

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

SUMMARY AND GENERAL CONCLUSIONS

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

10. W. BELLET
H.Q. 1.

DRILLED BY HOBHOUSE
 DATE STARTED 7-4-70
 DATE COMPLETED 29-4-70
 N.S. FROM TO
 S.S. FROM TO
 AX. FROM TO

GRID Ref. 8980E 3810N

RIOFINEX

Diamond Drill Core Record

D.D.H. NO. DDH. HQ. 1
 AREA Hanno-Quilicura
 LOCATION L. 40E / 09N
 COLLAR R.L.
 ORIENTATION 0° N
 INCLINATION 45°

Depth 348' 3" Core Recovery 65.6 % Logged by R. B. Berman

FOOTAGE			ANGLES	GEOLOGICAL LOG DESCRIPTION	ASSAY RECORD						
FROM	TO	REP			SAMPLE NO.	FROM	TO	CU %	NI %	ZN %	Ref
0'	13'	43'		Drift: unconsolidated sand and gravel.							
13'	82'	59'		Partially weathered dolerite dyke with chilled margin at lower contact. Trace content of sulphides and magnetite.							
82'	155' 4"	73' 1/2"		Coarse mafic biotite gabbro. Strongly weathered between 82' and 121' 7" shows probable shear zone. Trace of sulphides only.							
155' 4"	163' 8"	11' 1/2"		Strongly altered gabbro substituted by residual quartz and a few magnetite veins. The section is between 155' 4" and 163' 8" the unit contains traces of sulphides only.							
163' 8"	20' 0"			Dolerite dyke with chilled contacts.	1393	103	197.8				604.604

DRILLED BY	
DATE STARTED	
DATE COMPLETED	
NX. FROM TO	
BX. FROM TO	
AX. FROM TO	

RIOFINEX

Diamond Drill Core Record

D.D.H. No.	HQ-1
AREA	
LOCATION	
COLLAR R.L.	
ORIENTATION	
INCLINATION	

Depth _____ Core Recovery _____ % Logged by _____

FOOTAGE			ANGLES	GEOLOGICAL LOG	ASSAY RECORD						
FROM	TO	REP.		DESCRIPTION	SAMPLE No.	FROM	TO	CU %	AL %	ZN %	Rep Rec
				inclined at 40° and 50°. Traced of sulphides only	SC 1392	183-4	189-2				6-4 6-4
183'2"	200'9"	11'1"		Medium coarse biotite gabbro. Traced of sulphides only.	SC 1394	196-9	200-9				4-0 4-0
200'7"	205'11"	5'2"		Very fine grained diorite dyke with chilled contacts. 2-3% pyrite in very finely disseminated along numerous tubercle planes.	SC 1395	200-9	206-0				6-3 4-10
205'11"	210'7"	4'3"		Medium grained biotite gabbro. Very fine grained pyrite disseminated along fracture planes.	SC 1396	206-0	210-2				4-2 4-2
210'7"	211'3"	1'1"		Diorite vein same as betw. 200'9" and 205'11".	SC 1397	210-2	211-3				1-1 1-1
211'3"	214'1"			The same biotite gabbro as betw. 205'11" and 210'2".	SC 1398	211-3	214-0				2-9 2-9

DRILLED BY	Boyles Bros.	
DATE STARTED	3.9.69	
DATE COMPLETED	20.9.1969	
AX. FROM	TO	
AX. FROM	TO	
AX. FROM	TO	

87760 E 47778 N **RIOFINEX**

Diamond Drill Core Record

Depth 353' 5" Core Recovery 64% % Logged by B. Bognar

D.D.H. No.	ND 1
AREA	New Deer
LOCATION	L 10N O+180W
COLLAR R.L.	
ORIENTATION	W
INCLINATION	50° WSW

FOOTAGE			ANGLES	GEOLOGICAL LOG	ASSAY RECORD						
FROM	TO	REP.		DESCRIPTION	SAMPLE NO.	FROM	TO	CU %	PB %	Rep's	Rep's
0	c. 25	25		Drift with boulders of weathered schist.							
c. 25	118.7	93.7		Weathered spotted mica-schist, with strongly developed fractures at various angles, but mostly parallel to schistosity							
				schistosity at 35°. Oxidised to a reddish-brown colour. Thin films of limonite occur along fractures, cracks and partings. Narrow bands of white feldspar and of clear quartz are fairly common. There are no sulphides.							
118.7	132	13.5		Fresh spotted (andalusite?) mica-rich schist with occasional narrow fine grained quartz-feldspar bands that are conformable to the schistosity. Thin films of pyrite (and possibly pyrrhotite) occur along fractures and partings.							
132	144.1	12.1		Weathered, oxidised schist with short sections of fresh schist. Thin films of limonite and of sulphides along fractures.	1410	283'-0"	288'-0"			5.0	4.8
144.1	353.5	209.4		Alternate sections of fresh unspotted and spotted schist. In places the schist is banded, with the banding due to narrow quartz-feldspar-mica bands and lenticles. It is also cut by a few siliceous veins up to 1 foot thick.	1411	288'-0"	293'-0"			5.0	4.3
					1412	293'-0"	298'-0"			5.0	3.6
					1413	298'-0"	301'-10"			3.10	3.7
					1414	301'-10"	306'-10"			5.0	4.0

