GEOLOGICAL, GEOPHYSICAL, GEOCHEMICAL REPORT
ON THE
ABBA 1 - 8 MINERAL CLAIMS
YA 68502 - 509
WATSON LAKE MINING DIVISION
NTS 105C/9

Latitude 60°31'   Longitude 132°12'W

by J.C. Stephen

Work Done: July 30 - August 5,1982   November 25, 1982
By   J.C. Stephen Explorations Ltd.
Funded by   D.C. Syndicate

This report has been examined by the Geological Evaluation Unit under Section 53 (4) Yukon Quartz Mining Act and is allowed as representation work in the amount of $ 1,600-

PWatson

for Regional Manager, Exploration and Geological Services for Commissioner of Yukon Territory.

Department of Indian Affairs and Northern Development

YUKON QUARTZ MINING ACT

FORM "C" - APPLICATION FOR A CERTIFICATE OF WORK

(This form required in duplicate with sketch showing location of work.)

RECEIVED
MINING RECORDER
WATSON LAKE, Y.T.
I.A. & N.D.

OFFICE DATE STAMP

I (Name) J.C. STEPHEN   Occupation PROSPECTOR

(Postal Address) c/o J.C. STEPHEN EXPLORATIONS LTD.
1458 RUPERT STREET
NORTH VANCOUVER, B.C. V7J 1G1

MAKE OATH AND SAY, THAT:-

1. I am the owner, or agent of the owner, of the mineral claim(s) to which reference is made herein.

2. I have done, or caused to be done, wotk on the following mineral claim(s):
(Here list claims on which work was actually done by number and name)

YA 68502 - 509   ABBA 1 - 8

situated at 46 km Northeast of Teslin, 3 km south of Wolf River Claim Sheet No. 105C/9
in the WATSON LAKE Mining District, to the value of at least $1600
dollars, since the 14th day of JUNE 19 82,
to represent the following mineral claims under the authority of Grouping Certificate No. ______
(Here list claims to be renewed in numerical order, by grant number and claim name, showing renewal period requested).

YA 68502 - 509   ABBA 1 - 8   Two years renewal requested on each claim. 14 June 83

3. The following is a detailed statement of such work: (Set out full particulars of the work done indicating dates work commenced and ended in the twelve months in which such work is required to be done as shown by Section 53.)

Work conducted between July 30 and August 5 1982, consisting of geological mapping, tape and compass grid, soil sampling and magnetometer survey. Total expenditure of $2163.

Sworn before me at North Vancouver, B.C.
this 17th day of March 1983

Notary Public

A Notary Public in and for the Province of British Columbia

Applicant.

091448

TABLE OF CONTENTS

	PAGE
SUMMARY AND CONCLUSIONS	1
LOCATION AND ACCESS	2
CLAIM REGISTER	4
REGIONAL GEOLOGY	6
PROPERTY GEOLOGY	9
ROCK TYPES	9
MINERALIZATION	12
STRUCTURE	13
MAGNETOMETER SURVEY	15
GEOCHEMICAL SURVEY	18
CONCLUSIONS AND RECOMMENDATIONS	19
STATEMENT OF EXPENDITURES	20

APPENDIX I CRAELIUS MAGNETOMETER
APPENDIX II SAMPLE DATA SHEETS
APPENDIX III STAEMENT OF QUALIFICATIONS

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	LOCATION MAP	3
2	GROUP SKETCH	5
3	REGIONAL GEOLOGY	8
4	AIR PHOTO LINEARS	14
5	MAGNETIC AND TOPOGRAPHIC PROFILES	16

MAP		
I	GEOLOGY 1:2400	IN POCKETS OF REPORT
II	GEOLOGY 1:1200	" "
III	MAGNETIC SURVEY 1:1200	" "
IV	GEOCHEMISTRY 1:1200	" "

SUMMARY AND CONCLUSIONS

Eight claims were staked on the west contact of the Hake Batholith where a magnetite skarn had been discovered in 1980. An assay of that skarn returned 0.30% tin.

Reconnaissance mapping was carried out over the claim group without locating other skarn zones.

Tape and compass lines were established on which geological mapping, a magnetometer survey, soil sampling and determination of elevations were carried out.

A magnetic body is indicated to be about 120 metres long and possibly 10 metres or more thick. It appears to have down dip extension. Tin assays so far obtained are quite low but trenching and further magnetometer surveying and mapping should be done to fully explore the potential of the zone.

LOCATION AND ACCESS

The ABBA claims were staked at the headwaters of a small stream which flows north into Wolf River. The claims lie a short distance east of the BAR group and straddle the west contact of the Hake batholith.

Location of the claim group as shown by Figure 1 is 46 kilometres northeast of Teslin and 3 km south of a bend in Wolf River. Elevation is approximately 1067 metres.

Topography is relatively rugged in the northwest portion of the claims but the remainder of the group is occupied by a central swampy creek valley with rounded hills and ridges on either side.

Access to the claim group has been entirely by helicopter from Teslin. A tractor road exists from the Alaska Highway at Hayes creek crossing about 20 kilometres south of Teslin north to Wolf River and along the east and south side of Wolf River approximately 3 kilometres west or north of the property.

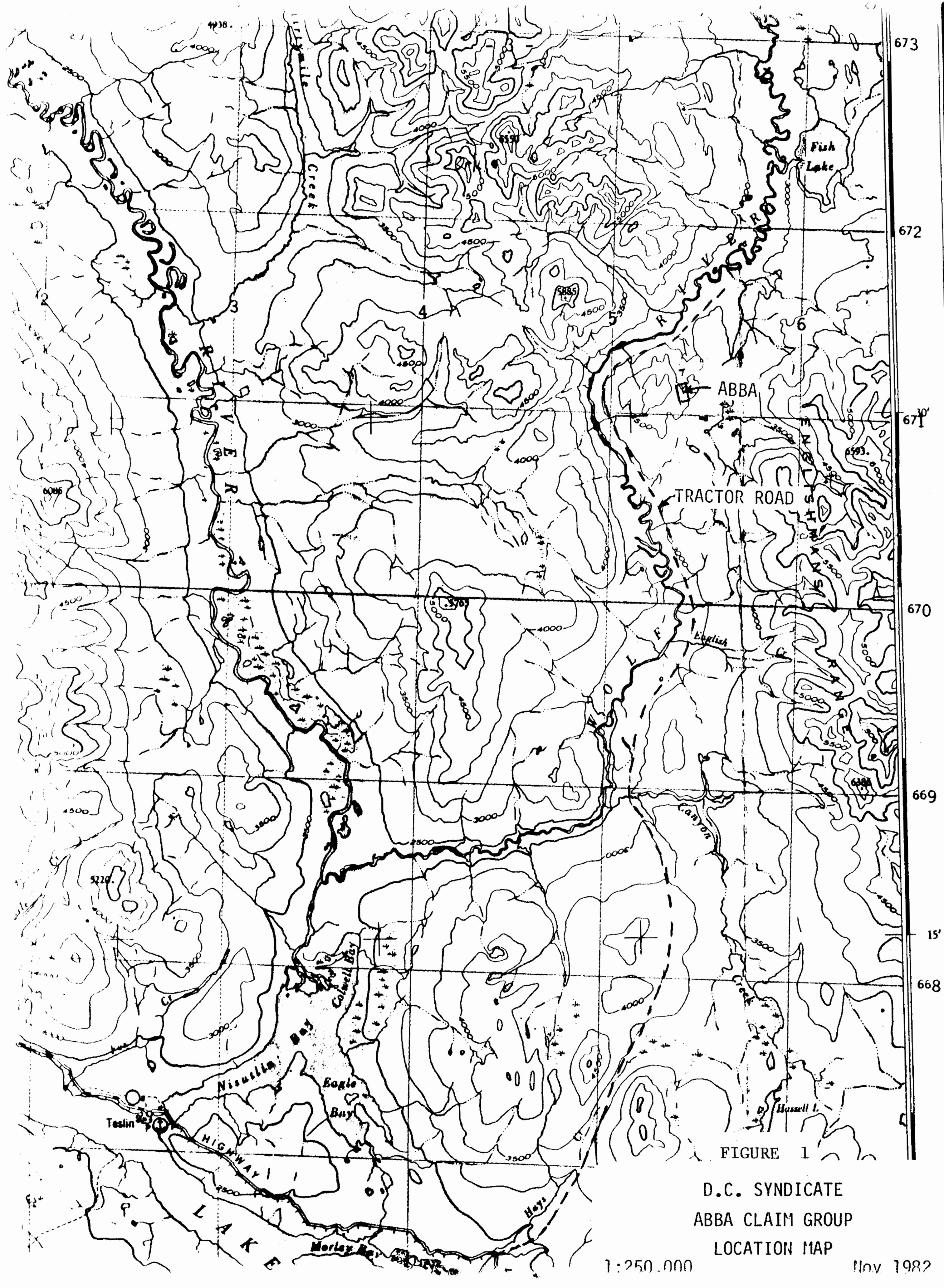


FIGURE 1

D.C. SYNDICATE

ABBA CLAIM GROUP

LOCATION MAP

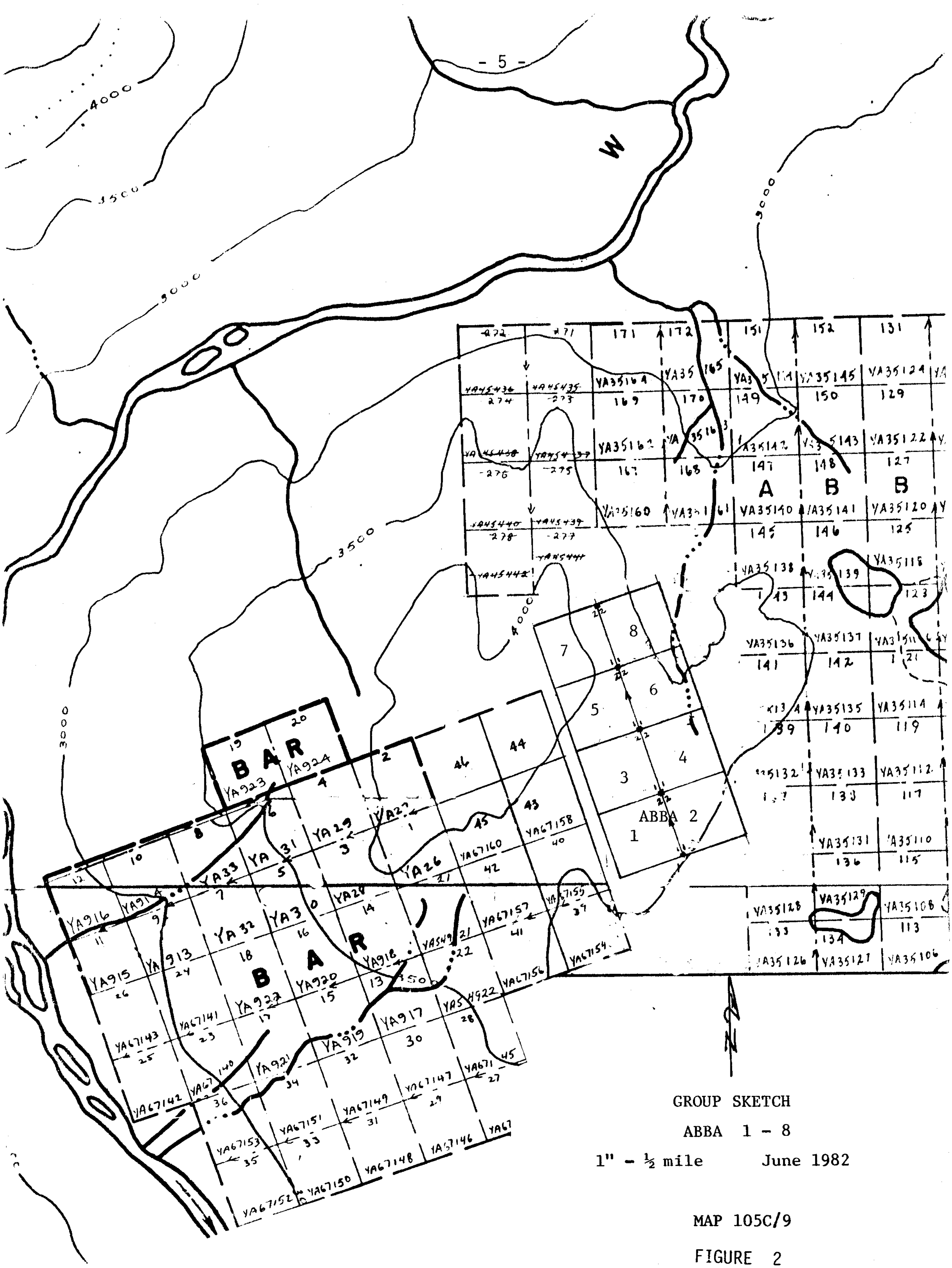
1:250,000 Nov 1982

CLAIM REGISTER

See Figure 2

The claim group consists of the ABBA 1 - 8 mineral claims as listed below. They were staked subsequent to lapsing of a larger ABBA claim group previously held by Urangasellschaft and explored for uranium.

Name	Record No.	Record Date	Registered Owner
ABBA 1 - 8	YA 68502 - 509	June 14, 1982	J.C. Stephen



GROUP SKETCH

ABBA 1 - 8

1" - ½ mile June 1982

MAP 105C/9

FIGURE 2

GEOLOGY

Regional Geology

Geology of the region is described in Memoir 326 by Robert Mulligan, 1963. Figure 3 is copied from the map accompanying that memoir and illustrates the geology in the vicinity of the ABBA group. Pertinent portions of rock descriptions are reproduced below.

Description of Formations and Map-Units

Unit 1—Big Salmon Complex

. . . . .

General Description

The Big Salmon Complex comprises various rocks of sedimentary and volcanic origin, whose metamorphosed condition in general distinguishes them from those of other units. In this respect the unit corresponds to the Yukon Group of areas to north and west. However, it locally underlies Mississippian limestone of unit 2 with apparent conformity, and is believed to be mainly equivalent to Mississippian and earlier Palæozoic formations in Wolf Lake and McDame areas to the southeast. The age of the metamorphism, as indicated by the potassium-argon ratio of muscovite from the schists, has been determined as 214 million years (*see* p. 25).

Part of the complex may be the metamorphosed equivalent of units 2 and 3. On the other hand, a part near the western border of the outcrop area is of apparently relatively low metamorphic grade, and is not certainly distinguishable from nearby similar rocks of unit 9. The structure is generally highly complex and reliable stratigraphic subdivision is not feasible. In some places subdivison according to predominant lithological type is possible, however, and this has been attempted on the map.

Lithology

Probably the most abundant rocks are micaceous quartzites, and quartz-mica schists and gneisses (1a) in which biotite is the characteristic if not the chief micaceous mineral. These rocks are mainly light to dark grey, occasionally shades of brown or purple, and commonly thin bedded or finely banded. Some sections consist chiefly of nearly pure quartzite; these are white, buff, or pale green, and coarsely bedded. Some very fine grained or cryptocrystalline cherty quartz is in vein-like bands closely spaced among the quartzite beds from which it is apparently derived by solution and reprecipitation. These rocks are best developed along the central ridges of Big Salmon Range. They are also prominent just east of the upper and lower parts of Nisutlin River, near Morley River, and flanking the limestone band in the southeast corner.

. . . .

Green, generally schistose chlorite, biotite, and epidote-rich rocks and amphibolite (1d) make up a substantial part of the unit; these, and albite-rich gneiss and albite-epidote amphibolite (1c) are believed to be largely of volcanic origin. The greenstones vary from unsheared, relatively unaltered rocks in which porphyritic, amygdaloidal, and fragmental structures definitely indicate a volcanic origin to banded quartzose rocks of evidently sedimentary origin. Augite, almost entirely pseudomorphed by uralitic hornblende, actinolite, and chlorite, is prominent as phenocrysts in meta-lavas and flow breccias in many places, especially north and east of Mount Morley, and on the flanks of Englishmans Range near latitude 60°22′, longitude 132°08′. Accompanying original feldspar is everywhere replaced by sodic plagioclase and zoisite-epidote saussuritization assemblages. Elsewhere, more highly deformed and altered rocks of presumably similar original nature have been reduced to albite-epidote-amphibole schists and amphibolite. Rocks banded in various shades of green and containing more or less granular quartz, along with epidote, chlorite, biotite, and secondary green amphibole, are widely distributed through the outcrop area. Some of these appear to be tuffaceous quartzites or meta-greywackes derived in all probability from a volcanic terrain. Biotite spangles on the surface are a conspicuous feature of the greenstones in many places.

. . . .

The limestone (1e) is nearly all white or light grey and moderately to strongly recrystallized. Most is massive but some is banded in shades of white or bluish grey. A thick, buff-coloured band in the northern part of Big Salmon Range was reported by Lees but no buff-coloured or apparently dolomitized limestone was seen by the writer. No fossil remains or structures of recognizably organic derivation were found in place but some obscurely fossiliferous float (*see* p. 24) was found near a unique occurrence of black limestone bands at latitude 60°37′, longitude 133°14′. Limestone is closely associated with greenstone in the valley of Sidney Creek, and thence northwestward towards the northwest map-boundary. Near the southeast corner at latitude 60°13′, longitude 132°05′ limestone and greenstone definitely interfinger in numerous bands. The major limestone band east of Mount Morley may similarly grade into volcanic rocks along strike. Limestone occurs as lenses elsewhere in thick volcanic sections and is associated with greenstone in a number of places. In some it appears to overlie, in others to underlie, greenstone and many bands are unrelated to greenstones. Skarn, composed chiefly of coarsely crystalline epidote and garnet, locally pyrite-bearing, occurs in several places along granite contacts in Big Salmon Range, notably at latitude 60°41′, longitude 133°14′; latitude 60°30′, longitude 132°53′; and latitude 60°27′, longitude 132°50′.

. . . .

Similar limestone is interbedded with greenstone at latitude 60°12′, longitude 132°04′. It is overlain by biotite-muscovite quartzite and gneiss, greenish chlorite-mica schist and feldspathic gneiss which in turn apparently underlie the limestone of unit 3 near the point where it crosses the eastern map-boundary at latitude 60°15′.

Farther north along the flank of Englishmans Range, at latitude 60°25′, longitude 132°08′, chloritic schist and green augen gneiss outcrop near limestone of unit 3, which there carries diagnostic Mississippian fossils. These rocks and the slate, quartzite, and chert to the east dip westward and are assumed to be overturned, but the contacts are covered and this assumed simple relationship is open to question for reasons discussed in connection with units 2 and 3.

. . . .

CRETACEOUS

COAST AND CASSIAR INTRUSIONS

13	*Granite, granodiorite; diorite;* **13a**, *gabbro, diorite; hornblendite, pyroxenite; granodiorite;* **13b**, *syenite, monzonite, gabbro; granodiorite, diorite*

PALÆOZOIC

MISSISSIPPIAN

ENGLISHMANS GROUP (2,3)

3	3. *Argillaceous quartzite, slate; phyllite, chert;* **3a**, *arkosic grit;* **3b**, *conglomerate;* **3c**, *limestone;* **3d**, *greenstone* **3A**, *Quartzose and argillaceous schist and phyllite; minor limestone; mainly equivalent to 2 and 3, but in part to 1, and in part of uncertain age* 2. *Limestone*

MISSISSIPPIAN OR EARLIER (MAINLY)

BIG SALMON COMPLEX

1	*Schist, gneiss, quartzite, greenstone, limestone; may be in part equivalent to younger units;* **1a**, *chiefly quartzite and quartz-mica schist and gneiss;* **1b**, *chiefly dark argillaceous slate, schist, quartzite;* **1c**, *limestone;* **1d**, *chiefly green, chloritic and epidotic rocks, biotite schist, amphibolite;* **1e**, *albite gneiss, chlorite-epidote amphibolite;* **1f**, *quartz-biotite-amphibole-epidote-plagioclase-garnet gneiss*

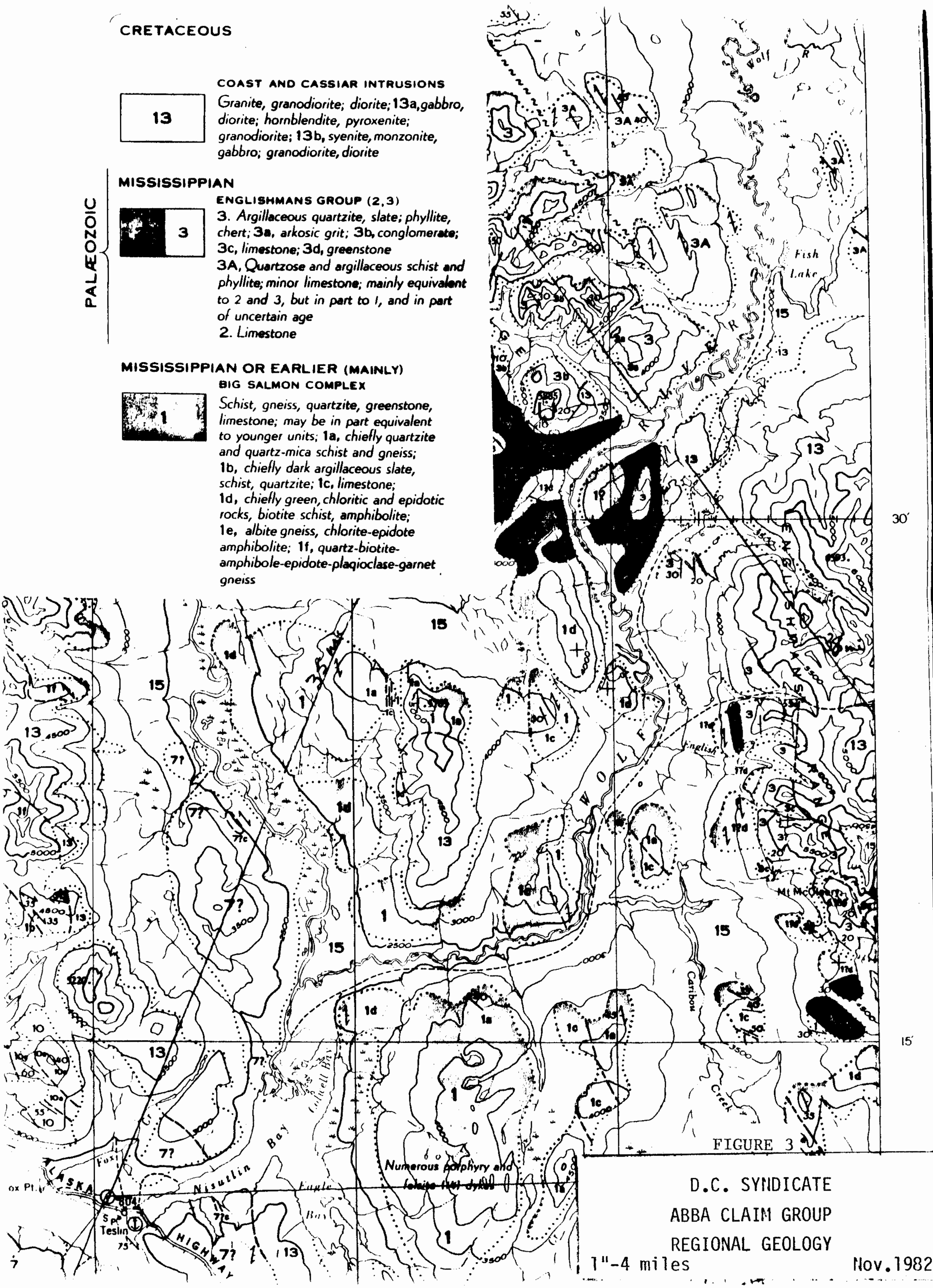


FIGURE 3

D.C. SYNDICATE
ABBA CLAIM GROUP
REGIONAL GEOLOGY

1"-4 miles Nov.1982

PROPERTY GEOLOGY

ROCK UNITS

The following is the list of rock units shown on Map I.

7. Porphyritic granite, pegmatite
6. Hake Batholith, coarse grained biotite granite
5. Skarn
4. Argillaceous quartzite, tuff, volcanic breccia, andesite
3. Limestone
   - 3a Altered graphitic sediment
2. Massive chert
   - 2a Thin bedded chert
   - 2b Chert pebble conglomerate
1. Siltstone

1. Siltstone

Near the south boundary of the claim group black thin bedded fine grained siltstone outcrops in a southeast facing ridge.

Outcrops of similar rock have been noted underlying limestone approximately one kilometre to the southwest but mapping has not been done in sufficient detail to correlate these rocks.

2 Cherts

2b Chert pebble conglomerate lies above the black siltstone. Fragments are of creamy colored chert and are angular to moderately rounded. They vary up to about 8 cm in diameter in the small area examined.

2a. Thin bedded chert occurs topographically above the chert pebble conglomerate. This would also be stratigraphically above the conglomerate providing the formations have not been overturned. Beds are relatively distinct and vary from about 2 cm to about 15 cm in thickness.

2. Above and to the west of the thin bedded chert fairly large outcrops of massive creamy white to grey and reddish chert occur. These cherts are generally similar to those on the BAR group although less hematite has been noted here than on BAR group.

Smaller outcrops of similar chert occur near the location line on ABBA 1 and 3.

3. Limestone.

Large outcrops of massive white to grey limestone occur near the west boundary of the group. No structural information was obtained and no contact relationships observed during brief examination of these larger outcrops. The most southerly outcrop area exhibits small calcite fossil remains which have not been identified. On ABBA 4 two small outcrop areas of limestone occur but relationships to other rock types are obscure.

4. Argillaceous Quartzite, Tuff, Volcanic breccia, Andesite

A large ridge of outcrop in the northwest portion of the claim group has not been completely traversed. Minor outcrop and much coarse talus was seen along the location line between ABBA 7 and 8 and brief examination was made of the south end of the ridge.

Beds of black argillaceous material and massive dark grey to brown argillaceous quartzite were observed. Much of the talus however is of massive dark green tuff, some of it with small chert fragments. This talus is similar in some respects to the tuffs, volcanic breccias and andesites on the FF group to the southeast.

5. Skarn

Several types of skarn occur as small exposures on the east slope of a small hill on ABBA 4. The best exposures, partly due to hand trenching, are of massive magnetite, mixed magnetite and green garnets and green garnet skarn. Other small exposures exhibit red and green garnet skarn and wollastonite skarn.

Outcrop distribution in this area is shown in more detail on Map II.

6. Hake Batholith

Large outcrops of coarse grained grey to buff to slightly pink biotite granite occur in the east half of the property. The rock ridges are rounded to some extent by glaciation but show many large abrupt outcrop areas. The rock is generally extremely massive, with widely spaced joints and little evidence of fracturing, alteration or zoning. Some areas weather easily to coarse crumbly feldspar and quartz sand but in general the rock is hard and resistant and consists of feldspar, quartz and fairly prominent books of biotite.

7. Porphyritic Granite, Pegmatite

As shown on Maps I and II small exposures of a coarse pink porphyritic granite and of pegmatitic dyke like bodies occur on the west side of the swampy creek valley in the vicinity of the skarn exposures. These rocks are primarily of pink feldspar and quartz with relatively little mafic component.

No Hake batholith material was noted on the west side of the creek and no pegmatite or porphyritic granite was found on the east side so that no contact relationships between the intrusive rocks have been observed.

MINERALIZATION

As a result of a 0.30% tin assay obtained from a magnetite skarn specimen found in 1980 it was expected tin mineralization similar to JC group would be found. Examination of the wollastonite and garnet skarns reveals no sulphide, magnetite or other notable mineralization in those phases although a few beryl crystals were found. Geochemical analysis of character samples gave tin values from 1 to 50 ppm. Zinc values of 38 to 60 ppm were also obtained from these rock types. No scheelite mineralization was found in any of the samples taken.

Magnetite skarn is exposed in two closely associated outcrops at about 27N, 17+25E. A chip sample, generally along strike for a distance of 20 feet, gave 0.28% Sn and a second chip sample over a distance of 12 feet along a parallel outcrop 25 feet to the east returned 0.19% Sn. A sample from massive magnetite float at 26N, 18E assayed 0.16% Sn. The first two samples contained numerous small green garnets but no sulphides. The float sample is entirely magnetite.

At 28N, 21E a narrow vein, generally about 3 to 5 inches wide contains quartz, limonitic boxwork and some galena mineralization. A sample of the best material assayed 0.97% Pb; 1.40 oz. Ag.

STRUCTURE

The preliminary mapping done in 1982 did not succeed in outlining rock structure in a satisfactory manner.

The siltstones and cherts at the south end of the property appear to dip generally northwest or west. The apparent strikes in the vicinity of the magnetite skarn however are in an east-west direction dipping about 60° north. This is contrary to the trend of the magnetic anomaly however which trends to southeast and dips southwest.

Due to the lack of outcrop generally these conflicting results have not been resolved.

Figure 4 is a copy of airphoto A11536-130. It indicates the general location of the skarn zone and some of the airphoto linears apparent on the photo. No definite evidence of faulting was observed during mapping but it is likely that significant movement has occurred on at least some of these linears.

▬ ▬ ▬ Air Photo Linear
Skarn

D.C. SYNDICATE
ABBA CLAIM GROUP
AIR PHOTO LINEARS
1:31,680

FIGURE 4

MAGNETOMETER SURVEY

Purpose and Method

A magnetometer survey was conducted on tape and compass lines in the vicinity of the magnetite skarn outcrop.

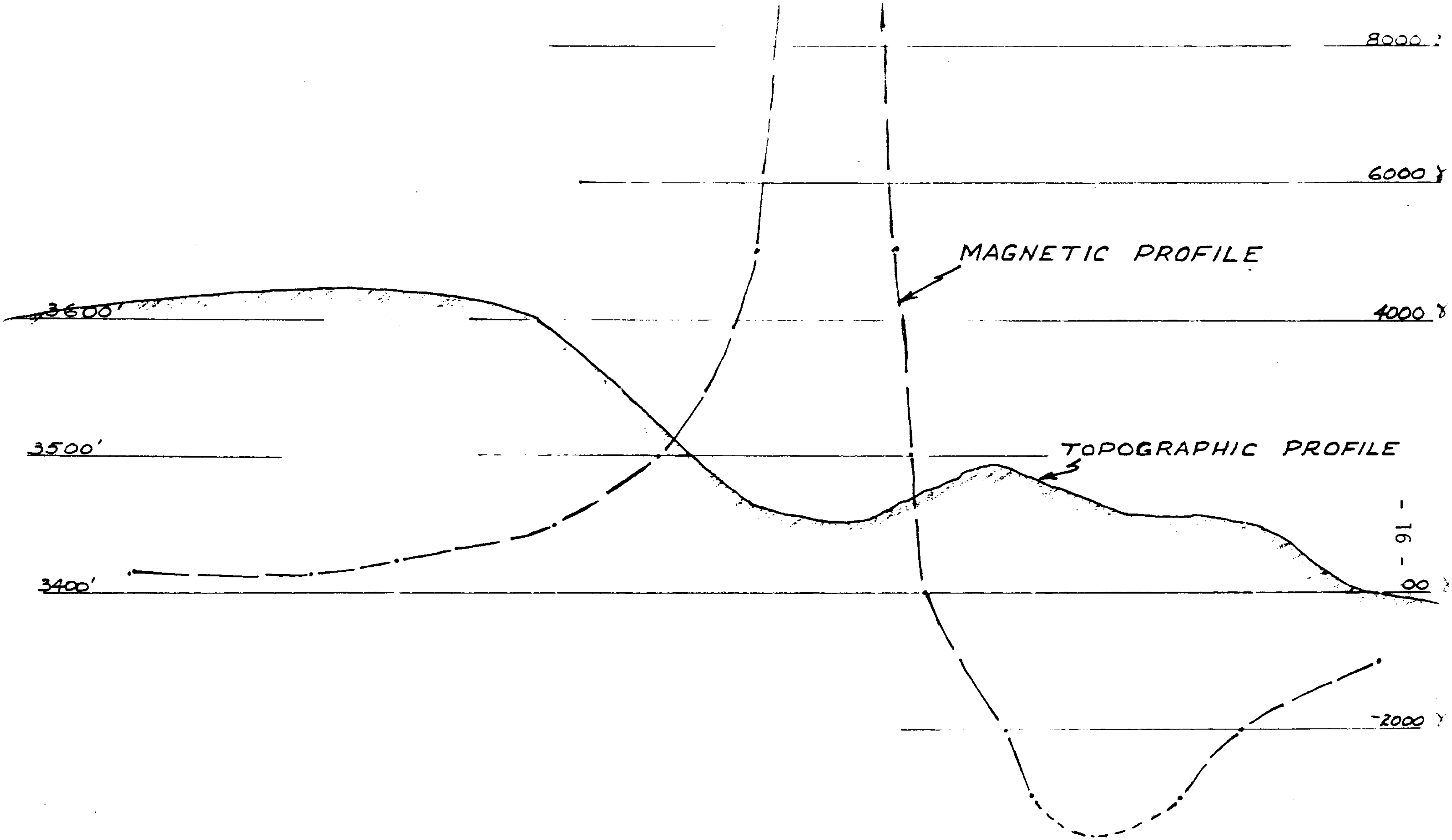
Five lines were run at right angles to the claim location line which was used as a base line. The lines are marked by flagging and chainage points are marked by double flagging with the appropriate chainage figures.

A Craelius pocket magnetometer was used to take readings at 15 metre (50 foot) intervals on lines approximately 60 metres (200 feet) apart. Elevations were taken by altimeter at each station during geological mapping.

Data regarding the Craelius instrument is provided as Appendix I with this report.

Observations

As shown on Map III an intensely magnetic anomaly occurs over the magnetite outcrops and into the local gully to the south. Low positive readings occur to the southwest at the top of the hill. Relatively negative readings of very moderate intensity occur to the southeast on the southeast flank of the hill while much more intense negative readings occur to the northeast on the downhill spur of the hill in the vicinity of a porphyritic granite outcrop and minor galena mineralization.



SCALE 1" - 100' Hor.
1" - 100' Vert.
1" - 2000γ Vert.

FIGURE 5
ABBA CLAIM GROUP
MAGNETIC & TOPOGRAPHIC
PROFILES

November 1982

Interpretation

Figure 5 depicts magnetic and topographic profiles through the anomaly along line A - A', Map III. The anomaly is presumed to be due to a relatively tabular magnetite body approximately 120 metres long dipping about 60° to the southwest.

The strong negative readings in the northeast part of the survey area are probably due to being northeast of, and below, the magnetite body and are not due to the, presumably, underlying porphyritic granite.

GEOCHEMICAL SURVEY

Results of soil sampling on the tape and compass lines are plotted on Map IV. Results for several samples are missing, these samples were apparently lost. Samples were taken from shallow holes dug with a prospectors pick. The raw samples were submitted to Chemex Labs Ltd., North Vancouver for preparation and analysis.

Numerically the geochemical results for tin and tungsten are extremely disappointing.

The arsenic results indicate little or no arsenopyrite mineralization is present and the association of arsenopyrite and cassiterite probably does not exist.

Determinations for lead were made because of finding a small galena bearing vein at 28°N 21'E. The soil sample there ran 35 ppm Pb but a much stronger "kick" occurs at 27°N 19'E which might indicate further mineralization.

Sample data sheets are supplied with this report as Appendix II.

CONCLUSIONS AND RECOMMENDATIONS

The original magnetite skarn zone is indicated by magnetometer survey to be approximately 120 metres in length. The magnetic contours suggest some significant down dip extension. Thickness of the magnetite zone is uncertain but the width of the anomaly and extent of the two outcrops suggests about 10 metres. The samples assayed are low grade, 0.16% to 30%, and no accompanying arsenopyrite or chalcopyrite has been seen. In spite of these relatively poor indications the zone should be trenched to expose the full width for chip sampling purposes. Blasting out of overburden further down slope might well expose more blocks of magnetite float or possibly some outcrop.

It is recommended first that a modest trenching program be carried out to provide assay results across the full width of the zone for at least one intersection. Secondly since the skarn occurrence is exposed on an isolated knoll extension of the tape and compass grid to cover a larger area, is recommended. This would allow for an extended magnetometer survey in search of other skarn occurrences.

Respectfully submitted,
J.C. Stephen Explorations Ltd.

J.C. Stephen

JCS/ms

STATEMENT OF EXPENDITURES

SALARIES AND BENEFITS

R. Campbell	July 30 - Aug 2,4,5	$1800+15%/m	$ 400
M. Webster	July 30 - Aug 2,4,5,	$1800+15%/m	400
J.C. Stephen	July 30,31	$150/day	300
			$1100

FOOD AND CAMP SUPPLIES

14 days @ $14/day	196

GEOCHEMISTRY AND ASSAYS

33 soil samples for Sn,W,Pb,As @ $12.65 ea	417

HELICOPTER

DATE	FLIGHT TICKET	ABBA PORTION	
July 30/82	3884	0.9 hrs	
	0.9 hrs @ $500/hr		450
		TOTAL	$2163

TO APPLY TO ASSESSMENT WORK

8 Claims x 2 years x $100 = $1600

APPENDIX I

CRAELIUS MAGNETOMETER

THE MINIMAG IS DISTRIBUTED BY

[illegible] Ltd.
[illegible]315 - 77 [illegible].,
Toronto [illegible], [illegible].

CRAELIUS MAKES AND MARKETS A WIDE RANGE OF GEOPHYSICAL & INDUSTRIAL INSTRUMENTS, DIAMOND CORE DRILLS, DRILL BITS, DRILLING ACCESSORIES & DEEP WELL PUMPS. WRITE TODAY FOR FULL DETAILS AND GET DOWN TO IT WITH

Craelius

SVENSKA DIAMANT
BERGBORRNINGS AB

FACK - STOCKHOLM 1 - SWEDEN
TELEGRAMS ADAMANTE STOCKHOLM
TELEX 14 59 - TELEPHONE 98 05 20

A company in the Atlas Copco group

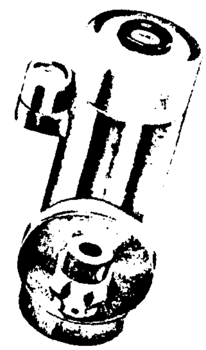
Kugelbergs Boktr. Sthlm

Craelius

GEOPHYSICAL INSTRUMENTS

MINIMAG

cuts magnetic survey time



three measuring ranges

± 2 500 γ
± 12 500 γ
± 50 000 γ

Measures horizontal and vertical field components

OVERALL ACCURACY

handheld	**± 50 γ**
tripodmounted	**± 20 γ**

The Minimag, made by the Norwegian Geological Survey, is sold throughout the world by Craelius. The Minimag principle is protected by patents in Australia, Canada, Denmark, Finland, Germany, Great Britain, Norway, Sweden, and the USA.

E 5811

Simple zeroing speeds surveying

Always zero the MINIMAG for each survey area by adjusting the fixed compensation magnet (15). Select a site believed to be free from strong magnetic disturbances. Set the range selector at position 2 000 and the scale at 0. Unscrew the milled base section (18) and remove the unclamping ring (17). Hold the magnetometer in the left hand, and unclamp the magnet system by depressing the clamping button. Loosen the locking nut of the fixed magnet holder (16). Turn the holder left or right until the moving index coincides with the fixed index. Hold the magnetometer level, using the bubble level visible through the ocular. Fine adjust with range selector at position 100. Tighten the locking nut, taking care to avoid turning the magnet holder, and replace the clamping ring and base sections. Since the control station for zeroing is generally selected at random, it is seldom necessary to zero the magnetometer with any great accuracy.

- If several magnetometers are in use for the same survey, data reduction will be simplified if all instruments are similarly zeroed. The milled bottom section has a screw (19) that holds a small magnet. With the magnetometers on their tripods make the final zero adjustment by turning this screw to achieve coincidence of moving and fixed indices.

A few words about accuracy

Measuring accuracy depends on a number of factors. Greatest accuracy is obtained when the MINIMAG is orientated so that the magnetic axis of the needle is at right angles to the magnetic meridian. A slight tilt of the magnetometer in easterly or westerly directions does not significantly affect measuring accuracy since the suspension wire passes through the centre of gravity of the needle. A levelling error of about 1/10° in the plane of the magnetic meridian causes an error of about 50 γ. This is the average error that occurs when taking measurements without using the tripod.

- Tripod measurements give increased accuracy. If the MINIMAG is tripod-levelled using the external level, levelling errors are insignificant and the setting may be made with an accuracy of the order 10–15 γ. A reading accuracy of one tenth of a scale division is easily achieved; this is equivalent to 10 γ on the most sensitive range. Overall accuracy is therefore about ± 20 γ, when the magnetometer is tripod mounted, when it is levelled with the external bubble, and when readings are taken on the most sensitive range. The magnetometer is temperature compensated: coefficient ± 2 γ/°C. Under normal survey conditions no allowance for temperature drift need be made.

- Each MINIMAG has its own scale constants. If necessary, scale divisions may be converted to exact gamma anomalies by using the scale constants. For example position 100, scale constant + 2 400, means that each positive scale division must be corrected by a factor of
2 500 ÷ 2 400 = 1.04
to get the exact anomaly value.

- It is easy to check the MINIMAG from time to time, by taking readings at a permanent checkpoint. The magnetometer should be in the identical position and attitude. No variations in reading, other than that caused by natural variations in the earth's vertical magnetic field, should be apparent.

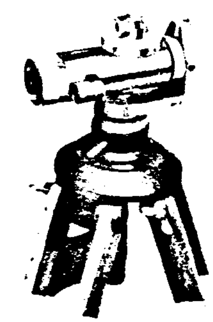
- The MINIMAG may be used for magnetic surveying anywhere in the world. The standard fixed compensation magnet is suitable for measurements in areas where the vertical field component varies from 35 000–65 000 γ. If the normal vertical field component is less than 35 000 γ, the standard magnet is exchanged for one that gives a lower compensating field, suitable for measurement for example in areas where the vertical field component varies between + 7 500 γ to – 3 000 γ.

Measuring horizontal field anomalies

With the tripod and a special angle-holder, the MINIMAG measures anomalies in the horizontal field. Screw the angle-holder to the tripod. Fix the magnetometer to the angle-holder so that the anomaly scale drum is approximately horizontal when levelled. During a survey do not alter the relative positions magnetometer angle-holder.

- Using a compass, held at least 0.5 m (2 ft) away, orient the MINIMAG so that the axis of the magnetic needle is perpendicular to the magnetic meridian. The ocular may point North or South. Orientation is not critical.

- Set range selector to 2 000 and anomaly scale at 0. Unclamp the needle and zero the MINIMAG by screwing the angle-holder compensation magnet until coincidence is achieved. Fine zero on the 100 range. Take readings on the anomaly scale as for vertical field observations. If the ocular points North the sign of the horizontal field anomaly is the sign shown on the anomaly scale. If the ocular points South, signs are reversed.



How to get the best out of your MINIMAG

Your MINIMAG is a precision instrument. Treat it well and it will give long trouble-free service. Always clamp the magnet needle before moving the magnetometer. When unclamped take care to avoid shock or damage.

A quick look inside

- A magnetic needle (1) is suspended on a fine horizontal wire (2) and is free to turn about the wire's axis in the vertical plane. A clamping arm (7) locks the magnet system. Rotating the milled ring section (17) clockwise presses up the clamping lever (14) and frees the system. When clamped, letter A on the ring section is against the index mark on the housing.

- In a given survey area the downward force exerted on the magnetic needle by the vertical component of the earth's magnetic field is compensated by a fixed magnet (15). The local variations that occur in the vertical component are compensated by two movable compensation magnets (3) and (4) attached to a graduated scale (8). The scale has 50 divisions from + 25 to − 25, and shows magnetic anomalies direct in γ. When the internal and opposing force created by the compensation magnets is equal to the deflecting force, the moving index (9) will coincide with the fixed index (10). Increased coincidence accuracy is obtained by observing the index lines through a × 10 magnifying ocular (12).

- The MINIMAG is levelled with the help of an external bubble level (13). An internal level (11) is seen through the ocular. Bubble levels are adjusted so that the magnetic needle and the suspension wire are both horizontal when the bubble is inside the ring and when the index lines coincide. In this condition the horizontal component of the earth's magnetic field does not influence readings. For normal surveys the MINIMAG does not need to be orientated with respect to the magnetic meridian.

- The milled base (18) acts as a tripod fitting and is centre threaded to receive the tripod top screw. The base may be unscrewed and withdrawn, so that the unclamping section with the milled ring (17) may be removed. This gives access to the unclamping button, an extension of the clamping lever (14), in the base of the magnetometer. Depressing this springloaded button unclamps the magnetic needle.

- The MINIMAG measuring range is altered by turning the range selector. The operation is easiest understood in the special case when the movable scale (8) is set to zero. The magnetic axis of the needle (1) and the magnetic axis of the compensation magnets (3) and (4) then lie in the same plane. The compensation magnets will then exert no force on the magnetic needle. If the range compensation magnet (4) is turned by turning the range selector the deflecting force will still be zero. On the other hand, if the scale reading is not 0 the force exerted on the needle by the range compensation magnet (4) will be varied when the range selector is turned. The three different range selector positions, 100, 500 and 2 000, correspond to three different ranges with scale values 100 γ, 500 γ, and 2 000 γ per scale division. This gives measuring ranges of ± 2 500 γ, ± 12 500 γ, and ± 50 000 γ respectively. Selected range is shown against the index mark (6) on the scale drum.

1. Magnetic needle
2. Suspension wire
3. Anomaly compensation magnet
4. Range compensation magnet
5. Range selector
6. Range indicator
7. Clamping arm
8. Anomaly scale
9. Moving index
10. Fixed index
11. Internal level
12. x10 ocular
13. External level
14. Clamping button
15. Fixed magnet
16. Fixed magnet holder
17. Clamping ring
18. Base
19. Zero adjust screw

Scale Constants

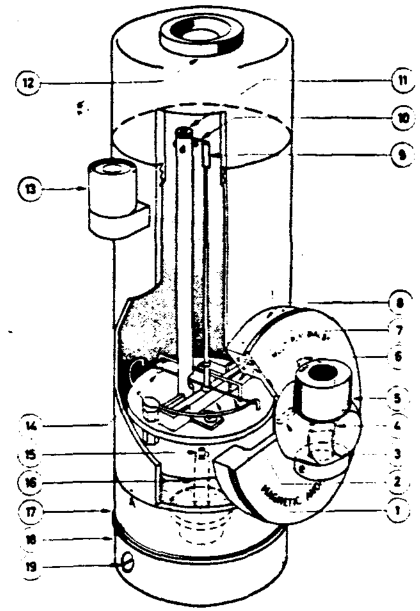
Serial No. ....

Position 100 ....

500 ....

2 000 ....

Date .... Sign. ....



Weight only	0.37 kg	13 oz
Height	119 mm	4 3 4 in
Max. width	57 mm	2 1 4 in

Packed for air freight complete with wooden tripod, gross weight about 3.3 kg (7 1 4 lb)

A P P E N D I X II

SAMPLE DATA SHEETS

J.C. S' PHEN EXPLORATIONS LTD.

GEOCHEMICAL DATA S ET – SOIL SAMPLING

NTS 105C

LINE A11536

AIR PHOTO NO. 130

SAMPLER MWebster/RCampbell

PROJECT DC Syndicate ABBA

SAMPLE NO.	LOCATION	Depth	Horiz	DESCRIPTION Colour	Part Size	% ORG.	Ph	SLOPE	VEG.	ADDITIONAL OBSERVATIONS OR REMARKS	ASSAYS Pb	As	W.	Sn
82 DC ABBA [redacted]	20N 15E	6"	B	Brown	med	15		none	Alders marsh	Pebbly near dry creek	10	9	1	3
↓	21N 15E	8"	B	Lgt Brown	med.	15		Slight	Poplars Alders	Granite Boulders around Pebbly	19	19	1	10
	22N 15E	8"	B	Red Brown	med.	15		~~Slight~~	Spruce Alders	very pebbly	7	4	4	1
	23N 15E	6"	B	Red Brown	med.	15		Slight	spruce Alders	Granite Boulders Pebbles	8	5	1	1
	23N 14E	6"	B	"	"	"		No Slope	"	"	6	3	1	1
	23N 13E	6"	B	"	"	"		"	"	"	9	4	1	1
	23N 16E	8"	B	"	fine - med	"		mode	"	"	8	10	1	1
	23N 17E	8"	B	Rusty	med	"		High	"	"	9	4	5	3
	23N 18E	6"	B	Rusty	"	"		High	"	skarn rock fragments	17	7	15	8
	23N 19E	8-10"	B	Grey	"	50		Base of slope	"	Granite Boulders	16	11	7	2
	25N 19E	8"	B	"	"	50		No slope	"	just higher than marsh	19	11	1	2
	25N 16E	6"	B	"	Course	15		Top of slope	"	Rock Frag Granite	11	4	1	1
	25N 14E	6"-8"	B	Red Brown	med	15		No Slope	"	Granite Boulders	6	5	1	1
	25N 13E	6"	B	Grey	fine	15		No Slope	"	Granite Boulders	6	3	3	1
	24N 15E	6"	B	Red Brown	med	15		No Slope	"	" Pebbly	8	3	1	1
	26N 15E	6-8"	B	Brown	"	"		"	"	"	12	4	1	1
	27N 15E	6"-8"	B	Brown	"	"		"	"	Sandstone RF + Boulders	9	6	1	1
	28N 15E	6-8"	B	Brown	"	"		"	"	Leached Grey A Horiz. Granite Boulders	16	7	1	1
	28N 14E	6"	B	Grey	"	"		"	"	"	8	4	1	1
	28N 13E	6"-8"	B	Red Brown	"	"		Slight	"	Granite Boulders	7	6	1	1

J.C. ST[illegible]PHEN EXPLORATIONS LTD.

GEOCHEMICAL DATA S[illegible]ET – SOIL SAMPLING

SAMPLER RCampbell/MWebster

PROJECT DC Syndicate ABBA

NTS 105G

LINE A11536

AIR PHOTO NO. 130

SAMPLE NO.	LOCATION	Depth	Horiz	Colour	Part Size	% ORG.	Ph	SLOPE	VEG.	ADDITIONAL OBSERVATIONS OR REMARKS	Pb	As	W	Sn
	28N18E	6-8"	B	Red Brown	med	15		slight	Alders Spruce	Granite Boulders	8	6	1	1
	28N19E	6-8"	B	"	"	15		mod	"	Below metasandstone OC	12	7	1	1
	28N20E	6-8"	B	Grey Brown	"	15		mod	"	Granite Boulder	7	9	1	1
	28N21E	6"	B	Dark Brown	"	15		base of Steep Slope	"	Near Galena Showing	35	22	7	1
26N17E	27N16E	6"	~~B~~	~~Light Brown~~	"	15		mod	"	1" humus sandy + small pebbles WHITE VOL ASH Poor Sample	8	3	1	1
	27N17E	6"	B	Redish Brown	"	15		slight	"	Before Mag Skn	7	4	1	1
	27N18E	6"	B	Light Brown	"	"		Steep	"	Gravelly	17	9	1	1
	27N19E	6"	B	"	"	"		"	"	"	760	29	17	1
	27N20E	6"	B	Grey	clay	"		no	"	Thick Humus Some pebbles near marsh	13	11	2	1
	21N16E	6"	B	Light Brown	med	"		Mod	"	gravel debris 1/2-1" humus	12	12	3	1
	21N17E	"	"	"	"	"		"	"	"	6	5	2	1
	21N18E	"	"	"	"	"		"	open	just Below Granite OC gravel + boulders Humus 1/2-1"	12	6	4	1
	21N19E	"	"	"	"	"		"	"	at base of Granite Bluff gravelly	12	11	1	1

C. STE EN EXPLORATIONS LTD.

GEOCHEMICAL DATA SH T — ROCK GEOCHEM SAMPLING [redacted]

NTS 105C

SAMPLER M. Webster/R Campbell

PROJECT DC Syndicate ABBA

LINE A 11536

AIR PHOTO No. 130

SAMPLE NUMBER	LOCATION	ROCK TYPE	ALTERATION	MINERALIZATION	STRIKE / DIP	ADDITIONAL REMARKS	APPARENT WIDTH	TRUE WIDTH	ASSAYS Au/W	Ag	Sn	Zn	Pb
96706B	ABBA 5	Skarn	ASSAY	Graphite		Assay Lamped Nothing			<0.003 oz	0.01g			
96707B	ABBA 6	Meta Sandstone				Float very rusty Lamped Nothing					1		
96708B	ABBA 4 28N 21+40E	Skarn	ASSAY	Galena		Float Assay Lamped Nothing				1.4g		/0.41	
96709B	ABBA 4	Skarn				Epidote Garnet Skarn Rock Green in Colour Lamped Nothing				0.2	12	60/	
96710B	ABBA4	Skarn				[illegible] running through sample possibly Axenite	Lamped Nothing			0.1	24	46/	
96711B	ABBA4	Mag Skarn		Magnetite		Outcrop Lamped Nothing					255		
96712B	ABBA4	Skarn		Garnet Green		Lamped Nothing					8		
80701B	ABBA6 BL 21+50N	Skarn		Red Garnet		has great wieght Lamped Nothing					3		
80702B		Epidote Diopside Skarn		Black Shiny non metallic mineral		Qtz Viening Lamped Nothing					7	38/	
80703B	ABBA 20' N of 27N 18E	Skn Green Gnt				at Contact of Pegmatite + Sandstone Lamped Nothing					50		
80704B	ABBA 18+15E 26+15N	mag Skn	ASSAY	Green Gnt Epidote mag		Mag Float Lamped possible Schelite			0.012 oz		0.16%		
96713B	ABBA 27N 17N	mag Skn	ASSAY	mag Green Gnt Florite	Chip Sample	20ft Lamped Floresent Florite					0.19%		
96714B	ABBA 27N 17N	mag Skn	ASSAY	mag Green Gnt Florite	Chip Sample	12ft Lamped Floresent Florite					0.28%		
96715B	ABBA 23N 18+85E	Skn GrGnt		Green Gnt Florite		Soft white crystals lamped orange					8		

A P P E N D I X III

STATEMENTS OF QUALIFICATIONS

STATEMENT OF QUALIFICATIONS

J.C. STEPHEN

Academic

1950	Associate Member	British Institute Engineering Technology
1950-1951	One year Geology	University of Alberta

Experience Summary

1947-1955 Development and production experience in engineering and geology at Central Patricia Gold Mines, Eldorado Mining and Refining, Madsen Gold Mines, Hasaga Gold Mines, Pickle Crow Gold Mines as Surveyor, Assistant to the Engineer, Geologist.

1955-1959 Regional exploration experience with Pickle Crow Gold Mines, Combined Developments Ltd., R.G. Crosby and Associates, Jay-Kay Syndicate as Field Geologist.

1959-1961 Municipal construction including monolithic concrete tunnels as Senior Inspector.

1962-1968 Regional exploration with Mastodon Highland Bell Mines as field geologist.

1968-1976 Regional exploration with Bacon and Crowhurst Ltd., as supervisor of exploration syndicates.

1977-Present	President	J.C. Stephen Explorations Ltd.	
	Manager	D.C. Syndicate	(Dome, Cominco)
	Manager	Target Project	(Dome Exploration)
	Manager	B.C. Gold Syndicate	(Newmont, McIntyre, Canada Tungsten)
	Manager	Newex Syndicate	(Newmont, Lornex)

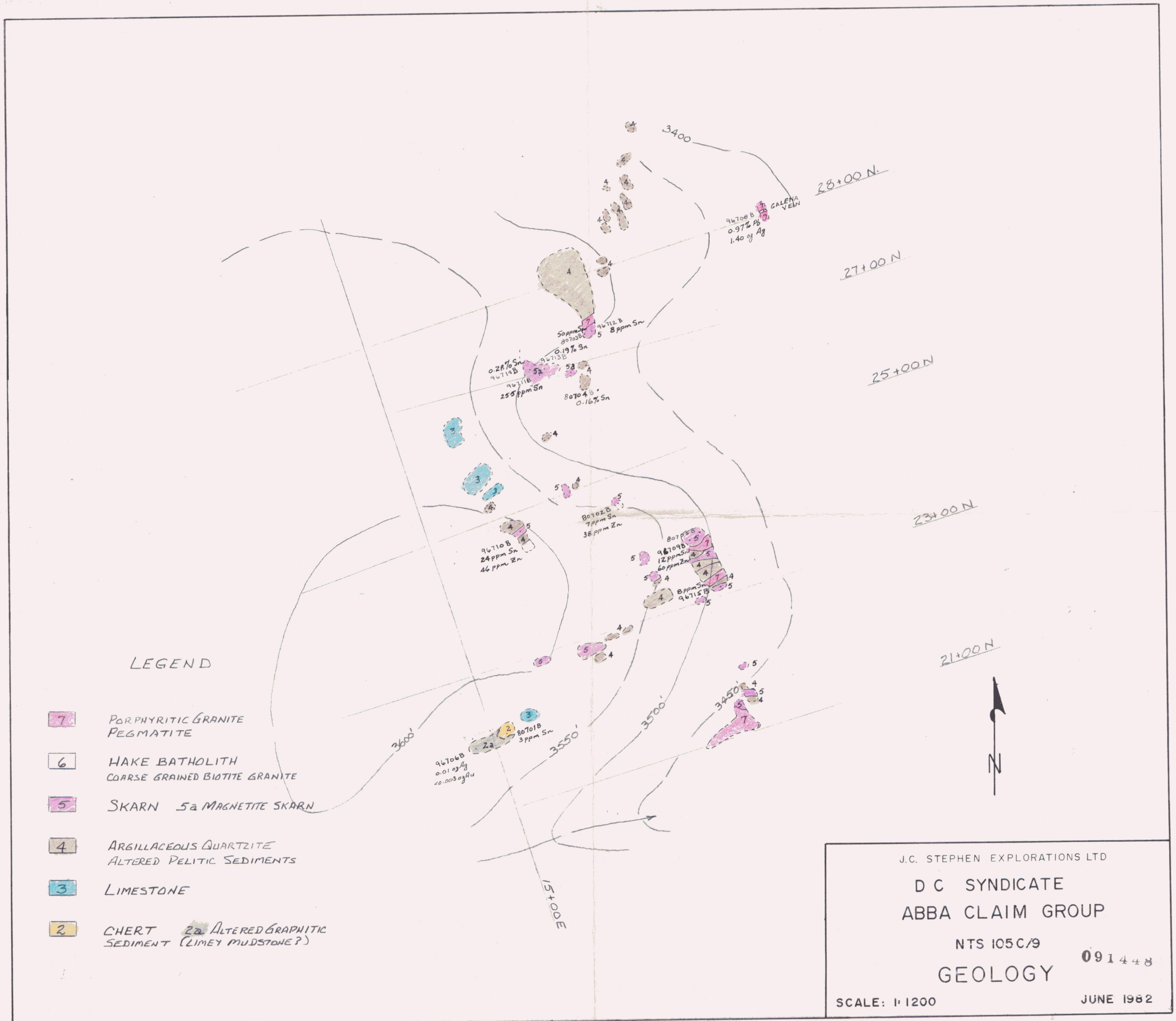
During July 1981 I did supervise work on the ABBA claim group and in November 1982 prepared the attached report from data collected.

J.C. Stephen Explorations Ltd.

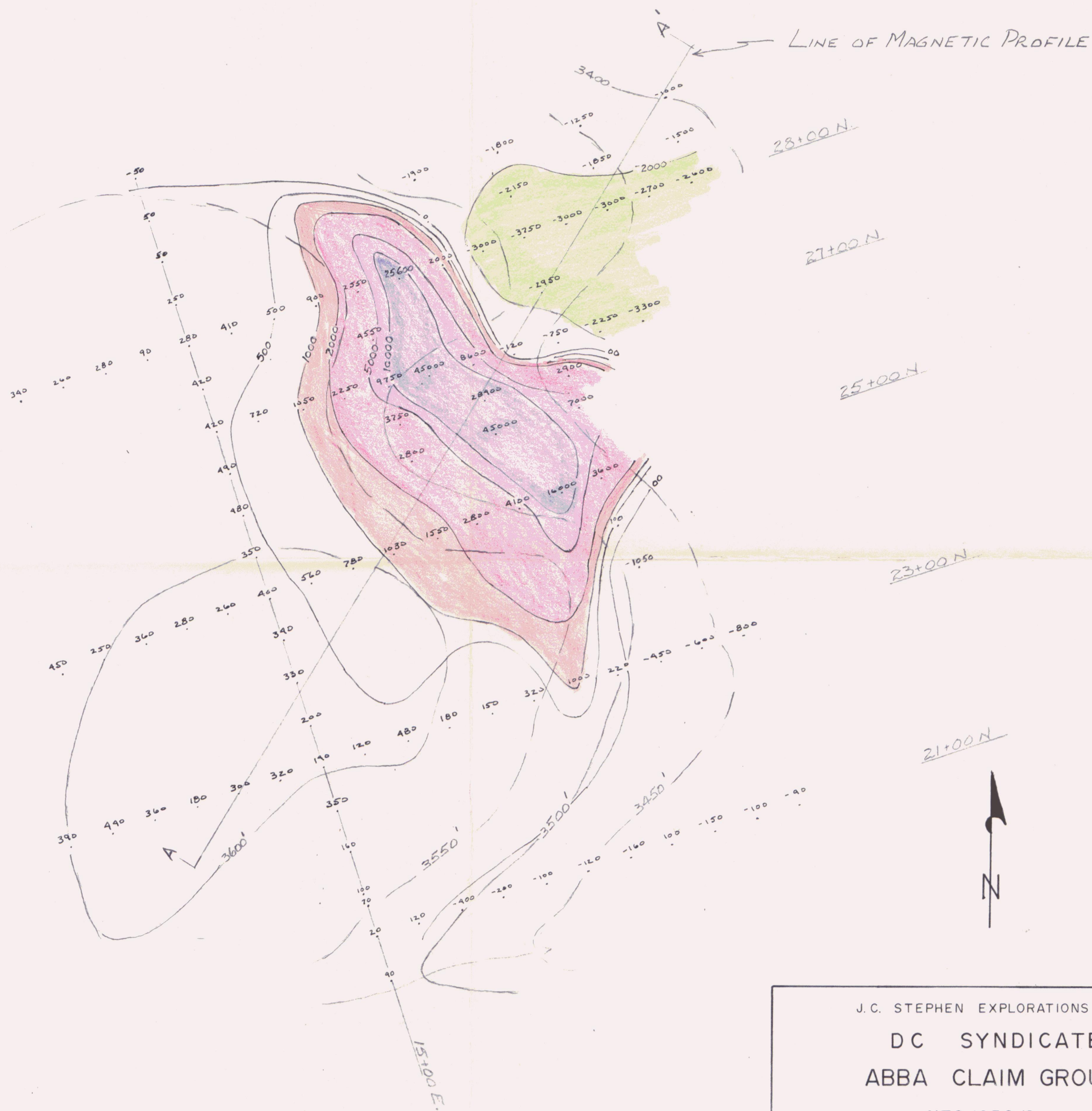
J.C. Stephen

JCS/ms


AIR PHOTO LINEAR
ABBA 8
ABBA 7
ABBA 6
ABBA 5
ABBA 4
ABBA 3
ABBA 2
ABBA 1
AIR PHOTO LINEAR
28N
27N
25N
23N
21N
BL 0+00E
LEGEND
7 PORPHYRITIC GRANITE PEGMATITE
6 HAKE BATHOLITH COARSE GRAINED BIOTITE GRANITE
5 SKARN
4 ARGILLACEOUS QUARTZITE TUFF, VOLCANIC BRECCIA, ANDESITE
3 LIMESTONE 3a ALTERED GRAPHITIC SEDIMENT (LIMEY MUDSTONE ?)
2 CHERT 2a THIN BEDDED CHERT 2b CHERT PEBBLE CONGLOMERATE
1 SILTSTONE
N
J.C. STEPHEN EXPLORATIONS LTD
DC SYNDICATE
ABBA CLAIM GROUP
NTS 105C/9
GEOLOGY
091448
SCALE 1:2400
JUNE 1982
MAP I


28+00 N.
27+00 N
25+00 N
23+00 N
21+00 N
15+00E
3400
3450'
3500'
3550'
3600'
GALENA VEIN
96708 B
0.97% Pb
1.40 oz Ag
50ppm Sn
80703B
96712 B
8 ppm Sn
0.19% Sn
0.28% Sn
96714B
96713B
96711B
255 ppm Sn
80704 B
0.16% Sn
80702 B
7 ppm Sn
38 ppm Zn
96710 B
24 ppm Sn
46 ppm Zn
96709B
12 ppm Sn
60 ppm Zn
8 ppm Sn
96715 B
96706B
0.01 oz Ag
<0.003 oz Au
80701B
3 ppm Sn
N
LEGEND
7 PORPHYRITIC GRANITE PEGMATITE
6 HAKE BATHOLITH COARSE GRAINED BIOTITE GRANITE
5 SKARN 5a MAGNETITE SKARN
4 ARGILLACEOUS QUARTZITE ALTERED PELITIC SEDIMENTS
3 LIMESTONE
2 CHERT 2a ALTERED GRAPHITIC SEDIMENT (LIMEY MUDSTONE?)
J.C. STEPHEN EXPLORATIONS LTD
D C SYNDICATE
ABBA CLAIM GROUP
NTS 105C/9
GEOLOGY
091448
SCALE: 1:1200
JUNE 1982

MAP II



J.C. STEPHEN EXPLORATIONS LTD

DC SYNDICATE

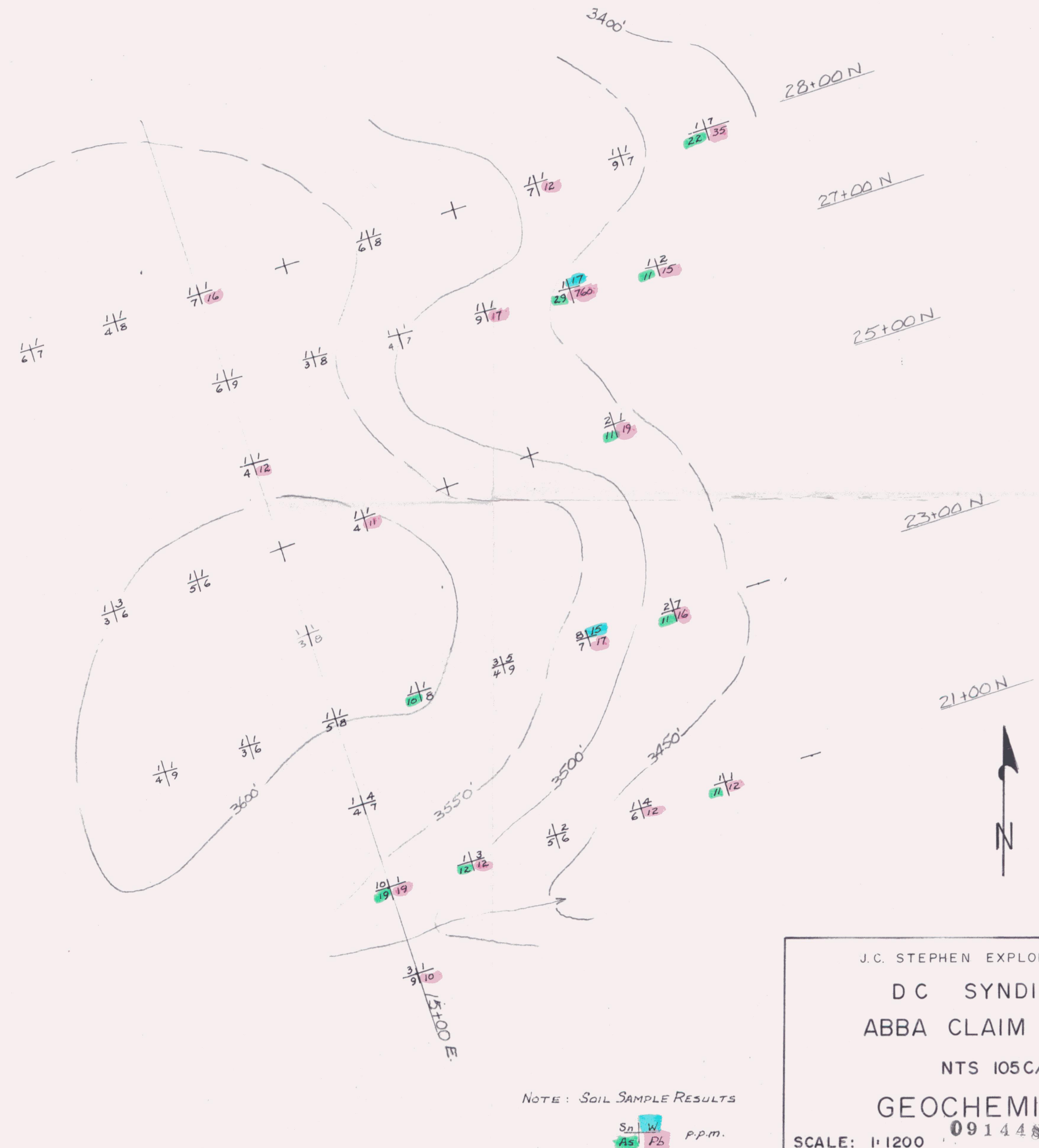
ABBA CLAIM GROUP

NTS 105C/9

MAGNETOMETER SURVEY

SCALE 1:1200 091448 JUNE 1982

MAP III



J.C. STEPHEN EXPLORATIONS LTD

D C SYNDICATE
ABBA CLAIM GROUP

NTS 105C/9

GEOCHEMISTRY

091448

SCALE: 1:1200 JUNE 1982

MAP IV