831227

1974 PROPERTY REPORT

TITLE	BRO Copper Prospect
AUTHOR	D. A. Silversides
DATE	March, 1975
COMMODITIES	Cu
LOCATION - Area	Babine Lake, North Central B.C.
- Mining Division	- Omineca
- Coordinates	- Lat. 54°53'N, Long. 126°25'W.
- NTS	- 93L 16 E
OWNERSHIP	CITIES SERVICE MINERALS CORPORATION by claim staking.
WORK DESCRIBED	Preliminary geological mapping, core logging, soil sampling.

CITIES SERVICE MINERALS CORPORATION

VANCOUVER OFFICE

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SUMMARY

The BRO Copper Prospect is situated in north central B. C., at lat. 54°53'N, long. 126°25' W, within the Babine Lake area.

A total of 99 claims (BRO 1-99) was staked in the fall of 1974. The prospect was originally located by Amoco.

Preliminary work indicates the property contains several small stocks and dykes of Eocene biotite-feldspar porphyry which intrude Jurassic andesite tuff and argillite. Oligocene post-mineral basalts are present.

Amoco concentrated diamond drilling in an area containing 3-10% pyrite by volume, with minor and sporadic amounts of chalcopyrite. This area is characterized by numerous biotite-feldspar porphyry dykes. It is suggested that these form a dyke swarm extending from a main stock situated southeast of the drilled area.

The preliminary log of drill core suggests that a zonation of sulphides and alteration mineralogy is present. This zonation is a progression to the southeast from a high pyrite area with chlorite-epidote-calcite alteration, to a pyrite-chalcopyrite zone with associated hydrothermal biotite. This pattern is characteristic of the Babine Lake Area porphyry copper deposits. The presence of post mineral volcanics in an area of hydrothermal biotite alteration adds considerable romance to the property since the basalts may have preserved any enrichment, and may also have masked any I.P. readings taken during the Amoco work.

CONCLUSIONS

The BRO Prospect contains the types and amounts of sulphide and alteration minerals characteristic of the Babine Lake Area porphyry copper deposits. An area southeast of the area drilled by Amoco appears to be untested.

RECOMMENDATIONS

Amoco has refused to let Cities have the data on the property, except if we allow them to have an interest position. It is recommended that we do not obtain the data in this manner.

It is recommended that a more detailed survey of the property be carried out to determine if further drilling is warranted. This work should include:

(a) 25 line miles of I.P./resistivity survey.

(b) A ground magnetic survey.

(c) Geological mapping.

(d) Assaying drill core from 4 holes on the property.

The cost of this work is estimated to be $12,000.

INTRODUCTION

Location & Access (See figure 1)

The BRO Copper Prospect is situated in north-central B.C., at lat. 54°53'N, long. 126°25'W. The property is situated in the Babine Lake area and lies 9 miles west of Granisle, the nearest town. Smithers, the nearest supply center, is situated 30 miles to the southwest.

The property is accessible via road to its northern extremities, by way of the Smithers landing road and the connecting road to Granisle. To reach the main area of interest however, helicopter must be used.

A tote road suitable for only winter conditions was built by Amoco in 1973. This road connects to the Smithers landing - Granisle road.

History

The property was originally discovered by Amoco Petroleum Company Ltd., whose attention was drawn to the area by a relatively subtle aeromagnetic "low" as depicted on the government aeromagnetic maps. Their ground examination indicated the presence of pyritized biotite-feldspar porphyry similar to that of the Granisle and Newman copper deposits situated 12 miles to the northeast. Consequently, Amoco proceeded to carry out the following work during 1972 and 1973:

(i) Staked a total of 436 claims generally referred to as the Saturday Lake property.

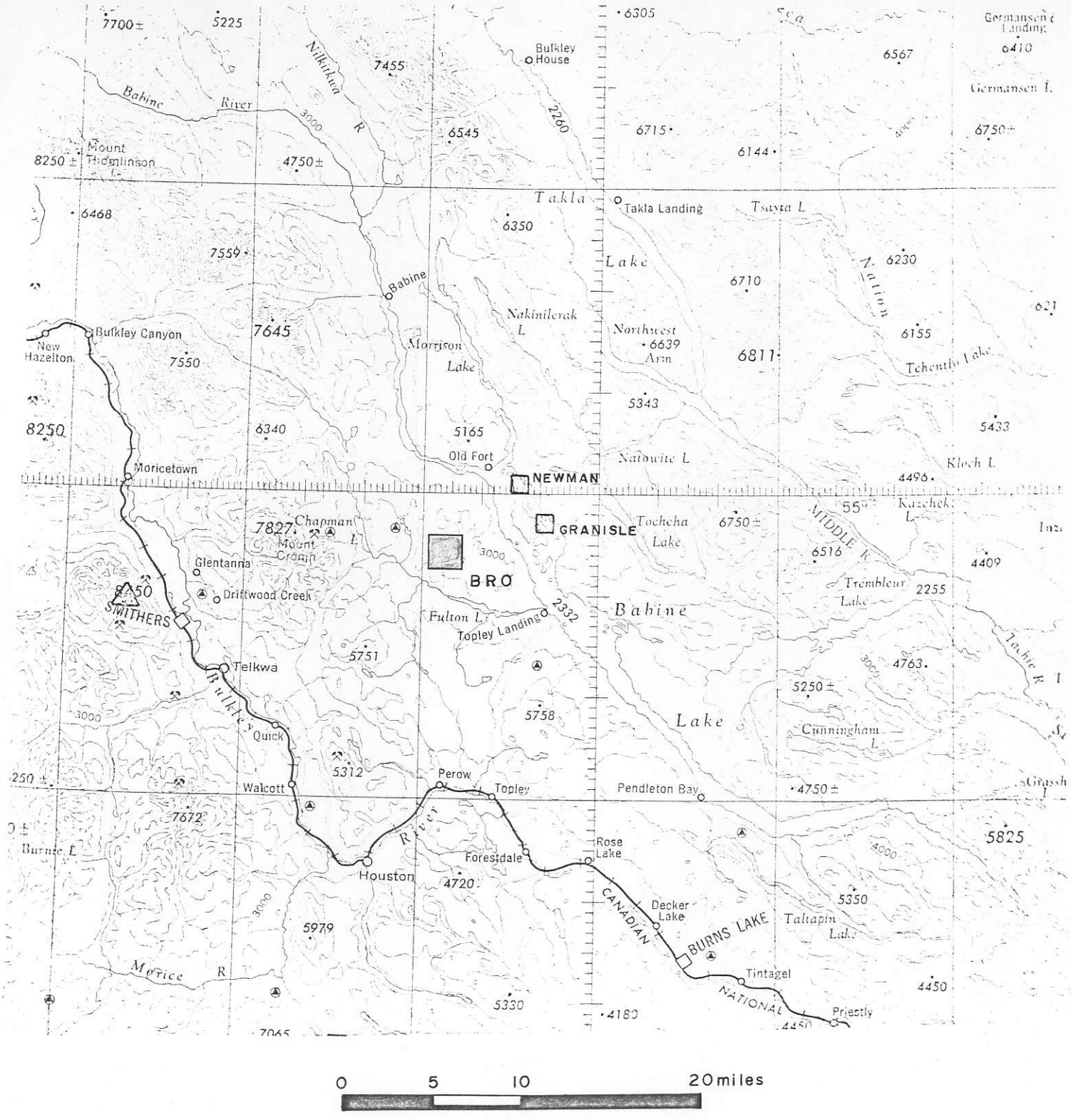
(ii) 54.3 line miles of I. P. survey.

(iii) 54.3 line miles of ground magnetometer survey.

(iv) 1435 soil, silt, water, and rock geochemical samples.

(v) 19 diamond drill holes totalling 6,606 feet.*

*Three of these holes were drilled north of the area staked by Cities. They encountered only argillite.



Location of the BRO Copper Prospect

Fig. 1.

(vi) Geological mapping on a scale of 1"=500 feet.

Amoco put in a large plywood and 2 x 4 frame tent camp on the property. All drill-core is stored in racks at the camp site.

In the early summer of 1974, Amoco closed their exploration operations in B.C. They allowed their claims to lapse in August and October, 1974.

In the summer of 1974, Cities carried out exploration work in the vicinity of the property. As part of this work, outcrops on the prospect were examined, and 30 soil samples were obtained for a case history. The drill core was quickly logged, and representative specimens were obtained. A few specimens were analyzed for Cu, Mo, Zn, and Ag in geochemical amounts.

Upon completion of this work, it was the writer's opinion that the property did indeed resemble the Granisle and Newman deposits in terms of rock types, alteration and pyrite content. When the Amoco claims lapsed in Aug., 69 BRO claims were staked by Cities personnel. A further 30 claims were added in November, to bring the total number to 99.

The BRO claims were staked in the hope that Amoco's sudden termination of exploration activities left some untested (by drilling) areas on the property. An effort was made to obtain the data from Amoco through their Toronto Office. However, Amoco's representative refused to accept any trade of information or cash payment for data. The only way Cities would be able to get this data is by allowing Amoco to have an interest position in the property. The writer has recommended that Cities should not purchase the data in this manner, but instead, re-survey the property.

A chance of obtaining some information remains, since Amoco is obligated to submit all reports of work on the property to the government upon abandoning mineral claims.

Claim Situation (See figure 2)

The property consists of 99 claims (BRO #1-#99), recorded in the name of Cities Service Minerals Corporation. Location of the claims is given in figure 2, the list of claims in table I.

Work Done by Cities

Cities has carried out very little work on the prospect. This included the brief outcrop examinations, the quick logging of drill core, and the soil sampling. Additional data which is available at this time includes a sketch map showing the area of greater than 15% frequency effect from Amoco's I.P. survey, and data published in the B.C. Department of Mines' annual report. This data is summarized in the following sections.

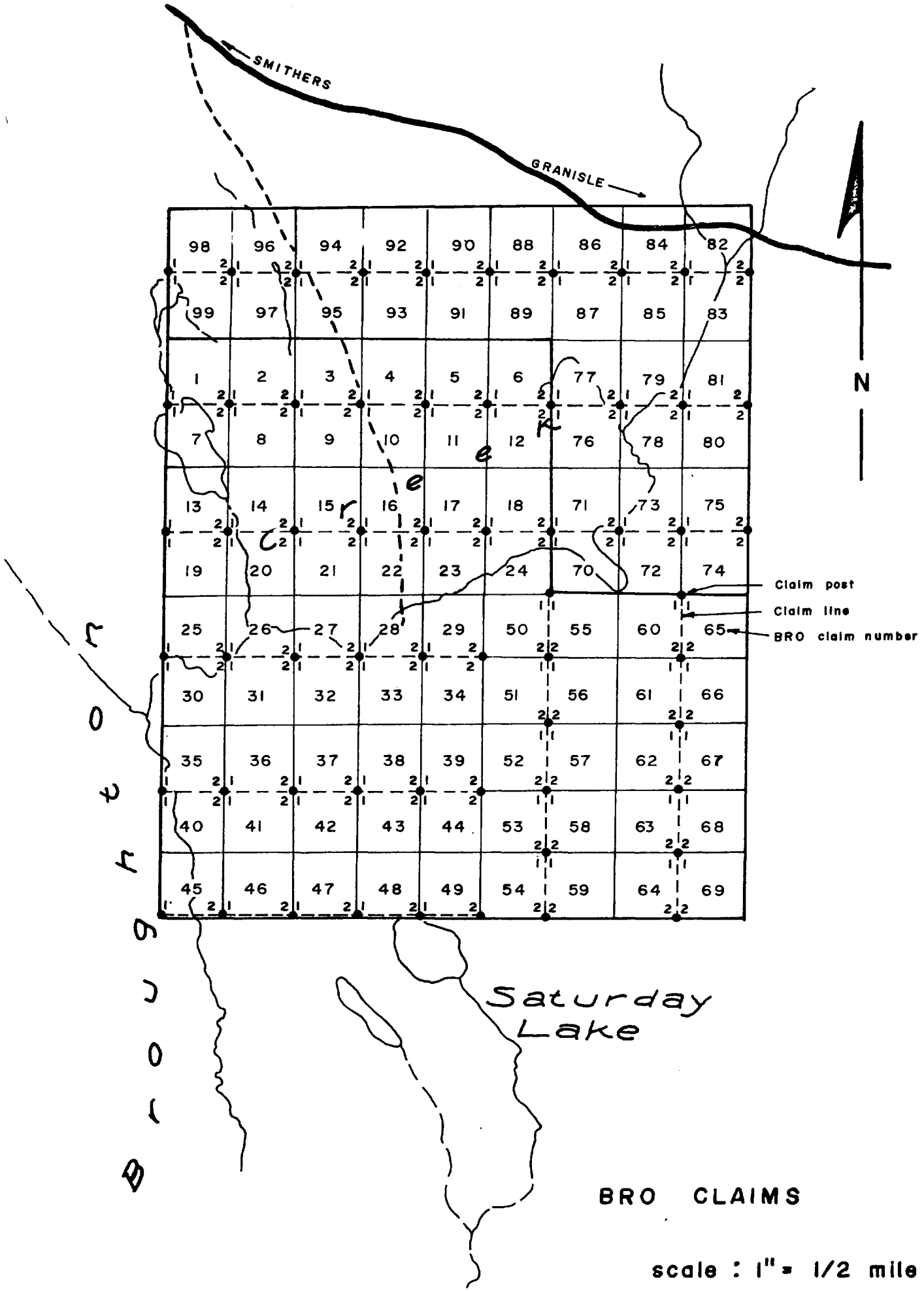

SMITHERS
GRANISLE
N
Claim post
Claim line
BRO claim number
Saturday Lake
Bronson Creek
BRO CLAIMS
scale : 1" = 1/2 mile

Fig. 2

TABLE I

List of BRO Claims

Claim	Date Staked	Staked By	Tag Number	Date Recorded	Record Number	Date Claims Lapse
BRO 1	Sept 1/74	C.R.Hallwood	474101 M	Sept 5/74	132003	Sept 5/75
2	"	"	2 M	"	4	"
3	"	"	3 M	"	5	"
4	"	"	4 M	"	6	"
5	"	"	5 M	"	7	"
6	"	"	6 M	"	8	"
7	"	"	7 M	"	9	"
8	"	"	8 M	"	10	"
9	"	"	9 M	"	11	"
10	"	"	10 M	"	12	"
11	"	"	11 M	"	13	"
12	"	"	12 M	"	14	"
13	"	"	13 M	"	15	"
14	"	"	14 M	"	16	"
15	"	"	15 M	"	17	"
16	"	"	16 M	"	18	"
17	"	"	17 M	"	19	"
18	"	"	18 M	"	20	"
19	"	"	19 M	"	21	"
20	"	"	20 M	"	22	"
21	"	"	21 M	"	23	"
22	"	"	22 M	"	24	"
23	"	"	23 M	"	25	"
24	"	"	24 M	"	26	"
25	Sept 2/74	"	25 M	"	27	"
26	"	"	26 M	"	28	"
27	"	"	27 M	"	29	"
28	"	"	28 M	"	30	"
29	"	"	29 M	"	31	"
30	"	"	30 M	"	32	"
31	"	"	31 M	"	33	"
32	"	"	32 M	"	34	"
33	"	"	33 M	"	35	"
34	"	"	34 M	"	36	"
35	Sept 1/74	I. Flanagan	35 M	"	37	"
36	"	"	36 M	"	38	"
37	"	"	37 M	"	39	"
38	"	"	38 M	"	40	"
39	"	"	39 M	"	41	"
40	"	"	40 M	"	42	"
41	"	"	41 M	"	43	"
42	"	"	42 M	"	44	"
43	"	"	43 M	"	45	"
44	"	"	44 M	"	46	"
45	"	"	45 M	"	47	"

Claim	Date Staked	Staked By	Tag Number	Date Recorded	Record Number	Date Claims Lapse
BRO 46	Sept 1/74	I. Flanagan	474146 M	Sept 5/74	132048	Sept 5/75
47	"	"	47 M	"	49	"
48	"	"	48 M	"	50	"
49	"	"	49 M	"	51	"
50	"	"	50 M	"	52	"
51	"	"	51 M	"	53	"
52	"	"	52 M	"	54	"
53	"	"	53 M	"	55	"
54	"	"	54 M	"	56	"
55	"	"	55 M	"	57	"
56	"	"	56 M	"	58	"
57	"	"	57 M	"	59	"
58	"	"	58 M	"	60	"
59	"	"	59 M	"	61	"
60	Sept 2/74	"	60 M	"	62	"
61	"	"	61 M	"	63	"
62	"	"	62 M	"	64	"
63	"	"	63 M	"	65	"
64	"	"	64 M	"	66	"
65	"	"	65 M	"	67	"
66	"	"	66 M	"	68	"
67	"	"	67 M	"	69	"
68	"	"	68 M	"	70	"
69	"	"	69 M	"	71	"
70	Nov 25/74	D.A.Silversides	70 M	Dec 13/74	133503	Dec 13/75
71	"	"	71 M	"	04	"
72	"	"	72 M	"	05	"
73	"	"	73 M	"	06	"
74	"	"	74 M	"	07	"
75	"	"	75 M	"	08	"
76	"	"	76 M	"	09	"
77	"	"	77 M	"	10	"
78	"	"	78 M	"	11	"
79	"	"	79 M	"	12	"
80	"	"	80 M	"	13	"
81	"	"	81 M	"	14	"
82	Nov 23/74	N. Jorgensen	82 M	"	15	"
83	"	"	83 M	"	16	"
84	"	"	84 M	"	17	"
85	"	"	85 M	"	18	"
86	"	"	86 M	"	19	"
87	"	"	87 M	"	20	"
88	"	"	88 M	"	21	"
89	"	"	89 M	"	22	"
90	"	"	90 M	"	23	"
91	"	"	91 M	"	24	"
92	"	"	92 M	"	25	"
93	"	"	93 M	"	26	"
94	"	"	94 M	"	27	"
95	"	"	95 M	"	28	"
96	"	"	96 M	"	29	"
97	"	"	97 M	"	30	"
98	"	"	98 M	"	31	"
99	"	"	99 M	"	133532	"

References

(1) Geology of the Northern Babine Lake Area, B.C.D.M. Preliminary Map No. 12, August, 1973.

(2) Mineralogy, Zonal Relationships, and Economic Significance of Hydrothermal Alteration at Porphyry Copper Deposits, Babine Lake Area, British Columbia, D.J.T. Carson and J. L. Jambor, CIM Bulletin, February, 1974.

(3) Trace Element Variations in Porphyry Copper Deposits, Babine Lake, B.C., G.S.C. Paper 74-9, J. L. Jambor, 1974.

(4) Overburden Profile Studies in Glaciated Terrain as an aid to the Geochemical Exploration for Base Metals in the Babine Lake Area, B.C., by Edem Effiong Okon, M.Sc. Thesis, University of Alberta, Calgary, 1974.

BRO PROSPECT

Regional Setting (Refer to figure 3)

The geology of the Babine Lake area (ref. 1), the mineralogy, hydrothermal alteration, and zonal relationships of the porphyry copper deposits (ref. 2), the trace element variations in rock (ref. 3), and the secondary geochemical dispersion of the deposits (ref. 4) have all been recently described.

Jambor (ref. 3) has summarized the geological setting of the Babine Lake area copper deposits as follows:

> "All the porphyry copper deposits and prospects in the area are related to small biotite-plagioclase porphyry intrusions of early Eocene age (51.2±2 million years; Carter, 1972). This type of porphyry is known locally and informally as "BFP" (biotite-feldspar porphyry). Host rocks for the biotite-feldspar porphyry intrusions are mainly Jurassic Hazelton Group andesitic, dacitic, and rhyolitic flows, plugs (?), and fragmentals, and marine siltstones, sandstones, and conglomerates that are mainly of volcanic derivation. Late Triassic sedimentary and volcanic rocks have been identified in the southwestern part of the map area, and continental sediments believed to belong to the Cretaceous Sustut Group have been preserved within two linear grabens in the northeast.
>
> Major faults trending north-northwest appear to have been the loci of emplacement of the Tertiary intrusions. Subsidiary northeast-trending faults may also be present. The rocks are gently to moderately folded along north-northwesterly axes.
>
> The form of the biotite-feldspar porphyry intrusions varies - stocks, dykes, and possibly sills being present. They have a distinctive light to dark grey and white speckled appearance and are characterized by ½-5 mm phenocrysts of biotite, plagioclase, and hornblende in a fine-grained to aphanitic matrix of the same minerals plus quartz and K-feldspar.

> Extensive differences in the appearance of the porphyry result from highly variable grain sizes and phenocryst contents, and the effects of several types of hydrothermal alteration. The compositions of fresh specimens straddle the boundary between quartz diorite and granodiorite. Many of the intrusions, including those at Granisle (Kirkham, 1971) are multi-phase. Breccias, believed by Carson and Jambor (1974) to include both intrusive varieties and diatremes, are known to be present at Granisle, Bell Copper and Dorothy.
>
> The copper-bearing zones range from a few hundred to a few thousand feet in diameter. They are centrally located within much larger elliptical or circular areas of hydrothermal silicate alteration, and are also encircled by annular pyrite haloes. The main copper mineral, chalcopyrite, occurs both disseminated and as fracture-fillings in biotite-feldspar porphyry, and to a lesser extent, in the adjacent country rocks. Bornite is important in the central portions of the higher-grade deposits. Limited supergene enrichment, with the formation of secondary chalcocite and covellite, has occurred only at Bell Copper. However, the commercial exploitation of this deposit, as well as Granisle, is dependent on hypogene sulphides."

The geology of the Babine Lake Area, and locations of its most significant copper deposits is shown in figure 3. Only the Eocene intrusions and volcanic equivalents are colored to emphasize their distribution.

Reference to the northwest alignment of stocks by Jambor is readily apparent on figure 3. It is proposed in this report that these stocks and associated copper deposits fall in to 4 belts, referred to as the Fulton Lake Belt, the Granisle - Old Fort Belt, the Morrison - Fort Babine Belt, and the Nakinilerak - Trail Peak Belt. The geology of the BRO prospect as currently known is described in the following section.

Geology of the BRO Prospect (Figure 4)

Knowledge of the geology of the BRO prospect is very sketchy, being based on the quick field examination of outcrops and drill-core in 1974, and references in the B.C. Dept. of Mines annual reports for 1972 and 1973. Geology as presently known within the claims is shown in fig. 4.

Outcrops consist of hornblende and biotite-feldspar porphyry dykes and small stocks, the extrusive equivalent of these porphyries, and andesite tuffs and argillite. The andesite tuffs and argillites are assigned to the Hazelton Group of Jurassic age. The porphyries are equivalent to the Eocene intrusions which are significant in the Babine Lake porphyry copper deposits.

The principal area of interest on the property has been the area between Saturday Lake and Broughton Creek. Outcrops in this area, particularly those in the general area of the diamond drill-holes contain pyrite up to estimated quantities of 10% by volume.

A brief drill log for each hole in figure 4 is given in Appendix I. Several features of interest are deduced from the examination of drill-core.

(i) Most of the area drilled is underlain by a dyke swarm of hornblende and biotite-feldspar porphyries cutting argillite and andesite tuff. It is tentatively suggested that the main porphyry mass lies southeast of the drilled area, as shown in figure 4.

(ii) Pyrite is ubiquitous to the area drilled, and in some holes averages 5-10% by volume. One hole, #4, is anomalous in that it contains considerably more pyrrhotite than pyrite.

On figure 4, the outline of the area containing greater than 15% frequency effect values is shown. As a general "rule of thumb", 3% frequency effect is indicative of 1% total sulphides by volume. Amoco has apparently concentrated all of their drilling within the main zone of sulphides (mostly pyrite).

(iii) The most intriguing hole on the property is Hole #6. The The top of this hole (29'-114') penetrated basaltic tuff with no pyrite. The basalt is very similar to Oligocene basalts known to occur immediately east of the property. The bottom section of the hole intersected (114'-239') altered biotite-feldspar porphyry. The porphyry is cut by a quartz-vein stockworks with pyrite and chalcopyrite in the veining. Fine-grained hydrothermal biotite occurs in veinlets. Unfortunately no samples were obtained for analyses from this hole.

The presence of post mineralization volcanics is significant for several reasons:

(a) Post-mineralization volcanics have been suggested as occuring at Newman and may have preserved the secondary enrichment present in this deposit during glaciation.

(b) The basalts may effectively block electrical currents, thus making the I.P. data ineffectual in the area of hole #6.

In effect, the basalt could possibly mask significant copper mineralization.

According to T. Schroeder* (personal communication) hole #6 caved while drilling. Plans were made to go back and drill another hole in the vicinity, but were never carried out.

A few samples of drill-core were analyzed in geochemical amounts (ppm) for Cu, Mo, Zn, and Ag. Results are given in Table II. Not enough samples were obtained to determine if there is a trend to copper values towards a higher grade portion. However, Schroeder states that grades of copper increase to the south, but he is reluctant to state the amounts because of ethical reasons.

Results of soil sampling are shown on figure 5. Only 3 samples contain copper values in excess of 100 ppm. Erratic single sample anomalies are characteristic of the Babine Lake area, because of the thick glacial-fluvial overburden (note that Hole #14 penetrated 172' of overburden).

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* Amoco geologist who worked on the property, now district geologist for B. C. Department of Mines in Smithers.

DISCUSSION

Our preliminary work to date indicates that the BRO prospect contains rock types, amounts of sulphides, and alteration mineralogy characteristic to the Babine Lake porphyry copper deposits such as Granisle and Newman. Carson and Jambor (ref. 2) have concluded that the ore-grade copper deposits of the Babine area are associated with the following features:

(i) altered intrusions of biotite-plagioclase porphyry.

(ii) a circular or elliptical area at least 7000 to 8000 ft. in diameter in which all the rocks are visibly altered and most contain abnormal quantities of pyrite.

(iii) a large zone, several thousand feet in diameter, in which hydrothermal biotite is persistent.

(iv) an annular pyrite halo, at least 1000 ft. wide, that overlaps the outer edge of the biotite zone and contains in excess of 5-10% pyrite (average).

Figure 6 is a hypothetical cross-section through holes 9, 8, 7, and 6 on the BRO prospect. The amount and distribution of sulphides, and the alteration minerology observed in the quick logging of drill core from these holes is indicative of a zonation typical of the Babine porphyry coppers. This zonation is a progression from a high pyrite halo, with chlorite-epidote-calcite alteration, to a pyrite-chalcopyrite zone with hydrothermal biotite alteration. From this interpretation, it would appear that Amoco did not extend their drilling to the most interesting area; that portion in the vicinity of hole #6. The presenee of post-mineral volcanics adds considerable "romance" to this area. It is therefore the writer's opinion

that further work should be carried out on the prospect. The initial work should involve:

(a) 25 miles of I.P. survey, centered over the area between Broughton Creek and Saturday Lake.

(b) A ground magnetic survey over the same area.

(c) Geological mapping of the same area.

(d) Assaying the drill core for holes 9, 8, 7, and 6.

The costs of this program are estimated to be approximately $12,000. Diamond drilling would be dependent on the results of the above work.

D. A. Silversides

APPENDIX I

DESCRIPTION OF DRILL-CORE, BRO PROSPECT

TABLE II - Geochemical Analyses of Drill Core

Sample #	le #	Footage	ROCK TYPE	RESULTS (ppm) Cu	Mo	Zn	Ag
4BDR-31	#2	245'	Andesite tuff, 10% pyrite in fractures	348	2	56	.2
4BDR-32	#3	182'-183'	Chloritic andesite tuff, 10% pyrite in fractures, minor chalcopyrite.	1200	10	106	.2
4BDR-33	#3	254'-257'	Chloritic andesite tuff, 10% pyrite in fractures, minor chalcopyrite.	3900	4	80	.4
4BDR-34	#4	127'-133'	Fine-grained, biotite-feldspar porphyry	220	2	38	.2
4BDR-35	#4	151'	Chloritic andesite tuff, 10% pyrrohotite - pyrite in fractures, minor chalcopyrite.	400	4	80	.2
4BDR-36	#4	194'-199'	Chloritic andesite tuff, 10% pyrrohotite - pyrite in fractures, minor chalcopyrite.	1080	4	196	.2
4BDR-37	#4	203'-213'	Chloritic andesite tuff, 10% pyrrohotite - pyrite in fractures, minor chalcopyrite.	1980	10	52	.2
4BDR-38	#4	253'-254'	Chloritic andesite tuff, 10-15%, pyrrhotite - pyrite in fractures.	500	2	36	.2

Sample #	ole #	footage	Rock Type	RESULTS (ppm)			
				Cu	Mo	Zn	Ag
4BDR-39	#4	273'-274'	Chloritic andesite tuff, 10-15% pyrrhotite - pyrite in fractures.	376	1	30	.2
4BDR-40	#4	296'-297'	"	760	2	50	.2
4BDR-41	#4	301'-303'	"	800	4	86	.2
4BDR-42	#4	317'-318'	"	328	1	44	.2
4BDR-43	#4	326'-328'	"	600	2	50	.2
4BDR-44	#4	383'-386'	"	840	2	42	.4
4BDR-45	#4	414'-425'	"	440	54	44	.2
4BDR-46	#4	537'-538'	"	324	5	56	.2

Sample #	Hole #	Footage	Rock Types	RESULTS (ppm)			
				Cu	Mo	Zn	Ag
4BDR-47	#4	630'-631'	Chloritic andesite tuff, 10-15% pyrrhotite-pyrite in fractures.	264	4	50	.2
4BDR-385	7	251'-262'	Fine-grained, chloritic andesite tuff, 5% pyrite, trace of chalcopyrite	1100	36	92	.4
4BDR-386	7	335'	Chloritic argillite, 5% pyrite, trace of chalcopyrite	1420	42	28	.2
4BDR-387	11	239'-241'	Gabbro	174	2	140	.2

Drill Hole 1

Length 267'

Bearing 0°

Dip -90°

Footage	Description
0 - 25'	Overburden
25' - 42'	feldspar porphyry, dark gray, trace of disseminated pyrite-volcanic equivalent of feldspar-biotite porphyry
42' - 157'	feldspar-biotite porphyry tuff or breccia - 1/2 inch fragments of feldspar-biotite porphyr, dark gray argillite, maroon and green andesite (Hazelton), light cream colored rhyolite. Breccia contains 2-3% disseminated pyrite: 77.5 - 79.1 - Bladed feldspar porphyry dyke, dark grey color.
157' - 267'	Andesite tuff (Hazelton Group), dark green, 3-5% pyrite, cut by epidote-calcite-pyrite stringers.

Handspecimens

S-1 - at 35'
S-2 - at 55'
S-3 - at 65'
S-4 - at 78'
S-5 - at 185'
S-6 - at 205'

Drill Hole 2

Length 289'

Bearing ____

Dip -90°

Footage	Description
0 - 16'	Overburden
16' - 289'	andesite tuff, strongly weathered in top part, contains up to 10% pyrite in fractures, contains 5-15% pyrite in fractures and as disseminations. Cut by biotite-feldspar porphyry dykes @ 141'-146', 150-159.

Handspecimens

S-7 - at 145'

S-8 - at 147'

4BDR-31 - at 245'

Drill Hole 3

Length 439'

Bearing ____

Dip -90°

Footage		Description
0 - 23'	-	Overburden
23' - 234'	-	andesite tuff, 2%-5% pyrite in disseminations and fractures.
234' - 254'	-	unaltered biotite-feldspar porphry, trace amounts of pyrite
254' - 259'	-	andesite tuff, 5% pyrite, chalcopyrite in fractures.
259' - 439'	-	biotite-feldspar porphyry, chloritized from 292'-335', remainder unaltered.

Handspecimens

S-9 - at 150'
S-10 - at 180'
4BDR-32 at 183'
S-11 - at 240'
S-12 - at 340'

Drill Hole 4

Length 631'

Bearing due South

Dip -45°

Footage	Description
0 - 34'	- overburden
34' - 46'	- andesite tuff, 2-7% pyrite in calcite filled fractures.
46' - 51'	- biotite-feldspar porphyry, pyritized on contacts.
51' - 74'	- andesite tuff, highly fractured, pyrrhotite-pyrite-chalcopyrite, total sulphides (80% pyrrhotite) estimated to be 7% - 10%.
74' - 80'	- biotite-feldspar porphyry
80' - 111'	- andesite tuff, same as 51'-74'
111' - 113'	- biotite-feldspar porphyry
113' - 127'	- andesite tuff, same as above
127' - 133'	- biotite-feldspar porphyry
133' - 200'	- andesite tuff - same as above
200' - 202'	- biotite-feldspar porphyry
202' - 631'	- andesite tuff, highly fractured, 7-10% pyrrhotite, with minor pyrite and chalcopyrite, rock altered to a biotite hornfels.

Specimens

S-13 at 49'
S-14 at 51'
S-15 at 65'
4BDR-34 at 128'
4BDR-35 at 151'
4BDR-36 at 195'
4BDR-37 at 210'
4BDR-38 at 253'
4BDR-39 at 273'
4BDR-40 at 296'
4BDR-41 at 30'
4BDR-42 at 318'
4BDR-43 at 326'
4BDR-44 at 308'
S-16 at 308'
4BDR-45 at 420'
4BDR-46 at 537'
S-17 at 540'
S-18 at 528'
4BDR-47 at630'

Hole 5

Length 219'

Bearing _____

Dip -90°

Footage		Description
0 - 14'	-	overburden
14' - 219'	-	feldspar porphyry (volcanic equivalent of biotite-feldspar porphyry?), 3-7% pyrrhotite-pyrite in fractures and disseminations, calcite stringers common.

No Specimens

Hole 6

Length 239'

Bearing ____

Dip -90°

Footage	Description
0 - 29'	- overburden
29' - 70'	- porphyritic basalt, with rounded fragments of argillite, no sulphides-oligocene?
70' - 114'	- basalt, chloritic, calcite alteration, no sulphides.
114' - 239'	- feldspar-biotite porphyry, 3-5% very fine grained wisps of hydrothermal biotite, feldspar altered to Kaolinite.

Specimens

S-22 at 50'

S-23 at 90'

S-24 at 100'

S-25 at 127'

Hole 7

Length 407'

Bearing _____

Dip -90°

Footage		Description
0 - 14'	-	overburden
14' - 125'	-	andesite tuff, 1-5% pyrite, in fractures, trace amounts of chalcopyrite at 100 ft.
125' - 140'	-	dark grey, feldspar-biotite porphyry, up to 10% pyrite, hydrothermal biotite in porphyry matrix?
140' - 298'	-	andesite tuff, up to 10% pyrite, chlorite-epidote-calcite on fractures.
298' - 335'	-	fine-grained, foliated feldspar-biotite porphyry, 2-3% pyrite, trace of chalcopyrite.
335' - 407'	-	Dark grey, hornfelsed argillite, 3-5% pyrite, with chlorite-epidote-calcite in fractures, trace of chalcopyrite.

Specimens

S-26 at 125'
4BDR-385 at 260'
S-27 at 300'
4BDR-386 at 335'

Hole 8

Length 265'

Dip -90°

Footage	Description
0 - 71'	- overburden
71' - 185'	- andesite tuff, 7-15% pyrite in fractures, trace of chalcopyrite.
185' - 265'	- altered, fine-grained feldspar-biotite porphyry, cut by white calcite veinlets, up to 3-5% pyrite in chloritic fractures.

Specimens

S-28 at 260'

Hole 9

Length 250'

Dip -90°

Footage	Description
0 - 120'	- overburden
120' - 135'	- altered andesite tuff
135' - 235'	- sheared argillite, with abundant calcite stringers, 1-2% pyrite.
235' - 250'	- andesite

Hole 10

Length 279'

Dip -90°

Footage	Description
0 - 120'	- overburden
120' - 279'	- feldspar-biotite porphyry, abundant carbonate, pervasive chloritic alteration, sheared, volcanic equivalent? Rocks contain 2-3% pyrite.

Specimen

S-29 at 150'

Hole 11

Length 439'

Dip -90°

Footage	Description
0 - 8'	- overburden
8' - 139'	- brecciated argillite, abundant calcite, 5-15% pyrite, trace of chalcopyrite.
139' - 319'	- dark green, argite gabbro, 2-3% disseminated and fracture filled pyrite.
319' - 321'	- Fine-grained, feldspar-biotite porphyry dykes, 1-2% pyrite.
321' - 388'	- gabbro, trace of pyrite
388' - 439'	- bleached argillite, highly fractured, up to 10% pyrite.

Specimens

S-30 at 150'
S-31 at 200'
4BDR-387 at 240'
S-32 at 320'

Hole 12

Length 548'

Bearing NE

Dip 45°

Footage	Description
0 - 22'	- overburden
22' - 195'	- Hack argillite; abundant carbonate, 2% pyrite.
195' - 256'	- bleached argillite, 5-7% pyrite, trace of chalcopyrite.
256' - 259'	- hornblende-feldspar porphyry 2-3% disseminated pyrite
259' - 278'	- bleached argillite, trace of chalcopyrite, 5-7% pyrite.
278' - 344'	- hornblende-feldspar porhyry, 2-3% pyrite.
344' - 447'	- bleached argillite, 5-7% pyrite, trace of chalcopyrite.
447' - 465'	- fine-grained hornblende-biotite feldspar porphyry-sericitized, 3-5% disseminated pyrite, trace of chalcopyrite.
465' - 485'	- feldspar-biotite breccia - up to 1" fragments of bleached argillite, feldspar-biotite porphyry, up to 10% disseminated pyrite.
485' - 530'	- Sericitized feldspar-biotite porphyry - 2-3% pyrite.
530' - 548'	- feldspar-biotite breccia, same as above or tuff - same as from hole #1.

Specimens

S-33 at 180'
S-34 at 200'
S-35 at 257'
S-36 at 460'
S-37 at 480'

Hole 13

Length 209'

Dip -90°

Footage		Description
0 - 6'	-	overburden
6' - 134'	-	sericitized feldspar-biotite porphyry
134' - 140'	-	black argillite.
140' - 209'	-	feldspar-biotite porphyry breccia or tuff same as hole 12.

Hole 14

Length 209'

Dip -90°

Footage		Description
0 - 172'	-	overburden
172' - 209'	-	black argillite

location of Hole # 14 unknown, is suspected of lying 400-800 feet north of Hole #10.

Hole 73-3

Length 505'

Bearing East

Dip -45°

Footage	Description
0 - 28'	- overburden
28' - 342'	- hornblende-biotite-feldspar porphyry, 2-4% pyrite in fractures, dissemination.
342' - 439'	- Andesite tuff, 2-5% pyrite.
439' - 442'	- biotite feldspar porphyry
442' - 447'	- andesite tuff, 7% pyrite
447' - 505'	- dark black, andesite tuff, 2% pyrite.

Hole 73-4

Length 500'

Bearing Due West

Dip -45°

Footage	Description
0 - 46'	- overburden
46' - 500'	- biotite-feldspar porphyry, 2-3% pyrite in fract:

Specimens

S-19 at 260'

Hole 73-3

Length 505'

Bearing

Dip

Footage

0 - 28'

28' - 342

342' - 439

439' - 44

442' - 44

447' - 5

Hole

Length

Bear

Dip

Foot

0 -

46'

Hole 73-5

Length 226'

Dip -90°

Footage		Description
0 - 16'	-	overburden
16' - 101'	-	Biotite-feldspar porphyry, 5% pyrite in fractures, disseminations, occasionally cut by calcite veinlets.
101' - 226'	-	andesite tuff, chloritic, 5-7% pyrite.

CITIES SERVICE MINERALS CORPORATION

1976 REPORT BRO COPPER PROSPECT

54°53'N 126°25'W

93L 16W

Vancouver Office
October, 1976

D.A. SILVERSIDES

TABLE OF CONTENTS

FIGURES

GENERAL STATEMENT

The BRO copper prospect is situated in west-central British Columbia, at lat 54°53'N, long. 126° 25'W (see fig. 1). It lies within the general area of the Babine Lake porphyry copper deposits.

The property was previously held by Amoco. Cities acquired the prospect by staking in the fall of 1974. The prospect presently consists of 20 claims (see figure 2).

Amoco refused to allow Cities to examine any of their data. Consequently, the 1975 program was carried out to determine if Amoco had left some untested drill targets.

In 1975, a substantial field program of geological, geochemical, an d geophysical surveys was carried out on the BRO Copper Prospect. Geological mapping indicated the prospect contains a complex dyke swarm-multiple stock of Eocene biotite-hornblende-feldspar porphyries which intrude argillite, andesite flows, tuffs and amygdaloidal basalt. The volcanic and sedimentary rocks are Jurassic, Eocene and possibly Miocene in age.

A very large area of pyritization occurs within and adjacent to the central northwest side of the porphyry complex. Pyrite in amounts of 1 to 10% are present over an area 4000 x 2000 feet in diameter. Rocks show a moderate to intense chlorite-epidote-calcite alteration assemblage.

Fine-grained, disseminated and fracture-filling chalcopyrite occurs sporadically throughout the pyritized area, but appears to be concentrated

in the center. Diamond drill-core assays suggest a zone of .05 to .10% Cu approximately 1200 x 1000 feet in size is situated within the central part of the pyrite zone. Incipient hydrothermal biotite occurs with the higher copper zone.

Geochemical soil sampling results are difficult to interpret because of the depth and nature of the overburden. Clay-boulder till, with depths of up to at least 170 feet, covers most of the area. Most of the anomalous values of copper (70ppm to a maximum of 280) occur within the pyritic area.

The I. P. survey outlined and confirmed the high pyrite area. It also indicated two other anomalous areas. A north-south trending anomaly situated west of the main sulphide zone is most likely caused by graphitic argillite. A northeast trending anomaly situated north of the main sulphide zone was considered to be a significant drill target. It has corresponding weakly anomalous copper values in soil samples and nearby outcrops with malachite on fractures. It was not tested by Amoco's drilling.

The magnetic survey is difficult to interpret. It has in part helped to determine the extent of particular rock types.

The following conclusions were reached following the 1975 work:

(i) The density of drill holes within the main sulphide zone eliminates the possibility of an open pit deposit in this locality. The presently determined .05 to .10% near surface copper zone and its incipient hydrothermal biotite may represent the upper portion of a better grade zone not intersected by the present drill-holes.

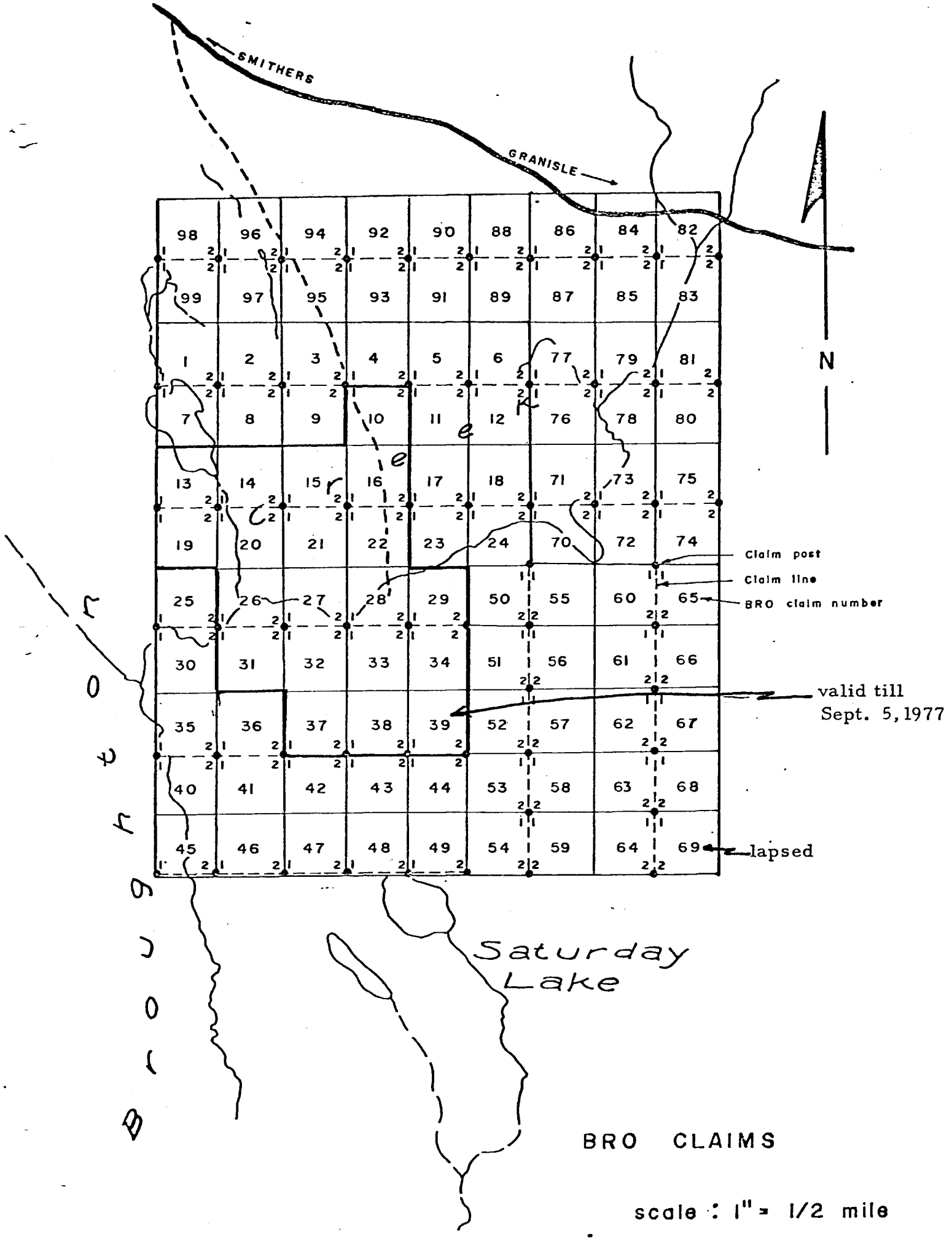
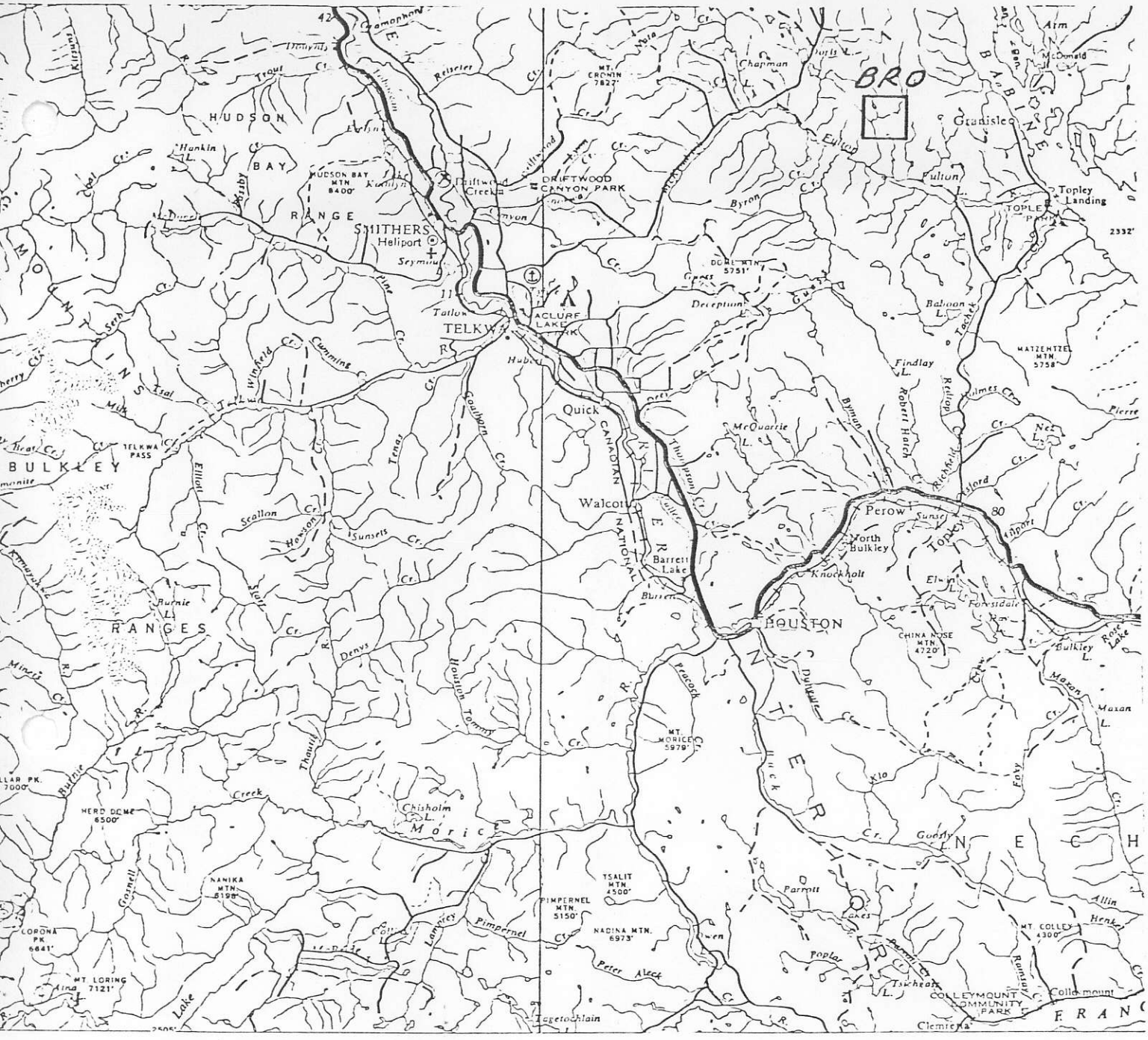

SMITHERS
GRANISLE
N
98 96 94 92 90 88 86 84 82
99 97 95 93 91 89 87 85 83
1 2 3 4 5 6 77 79 81
7 8 9 10 11 12 76 78 80
13 14 15 16 17 18 71 73 75
19 20 21 22 23 24 70 72 74
25 26 27 28 29 50 55 60 65
30 31 32 33 34 51 56 61 66
35 36 37 38 39 52 57 62 67
40 41 42 43 44 53 58 63 68
45 46 47 48 49 54 59 64 69
Claim post
Claim line
BRO claim number
valid till
Sept. 5, 1977
lapsed
Saturday
Lake
BROUGHTON
BRO CLAIMS
scale : 1" = 1/2 mile

Fig. 2



1" = 10 miles

LOCATION MAP

BRO COPPER PROSPECT

fig. 1

(ii) The northeast trending I. P. anomaly presents an attractive drill target.

(iii) Several other areas warrant a closer inspection of outcrops. These include outcrops of chalcocite-malachite bearing amygdaloidal basalts in the south part of the property, and malachite-stained outcrops of andesite tuff in the north part of the property.

The following program was recommended for 1976:

(i) drill a vertical hole 500 feet in length in the northeast trending I. P. anomaly.

(ii) drill a 1000 to 1500 ft. vertical hole in the main sulphide zone to test for ore grade material at depth.

(iii) carry out a more thorough examination of the copper bearing basalt and andesite outcrops.

(iv) carry out limited I. P. measurements over the area of chalcocite-bearing basalt in the south part of the property.

(v) complete the magnetic survey coverage to as far north as 15ON on the grid lines.

In 1976, only recommendations (iii) and (v) were carried out. Only a few lines were surveyed with a magnetometer, due to a magnetic storm. It was felt that a more thorough search and sampling of outcrops was in order in the area of the northeast trending I. P. anomaly, before any committment to diamond drill was made.

The 1976 field work was carried out during June 28th - July 7th by one two man-field crew. The writer examined outcrops between lines 48E and 88E after the field crew finished sampling and mapping. The cost of the 1975 program was:

Helicopter	$536.00
Salaries	
G. Malnis - 10 days @ $32.85/day	$328.50
L. Lyskiewicz - 10 days @ $40.60/day	$406.60
Room and Board	
20 man day @ $12.00/day	$240.00
Geochemical Analysis	
25 rock samples @ $3.33/sample	$83.25
TOTAL	$1594.35

The following section describes the 1976 work.

Results of the 1976 Work

Work carried out in 1976 is shown in figure 3, back pocket. A thorough search was made for outcrops between 90N and 150N along lines 48E to 120E. Rock chips for geochemical analysis were taken for each outcrop. Lines 100E to 120E were surveyed with a Scintrex MF-2 magnetometer.

Figure 3 is a composite geological, geochemical and geophysical map showing:

a. outcrops

b. Results of 1975 and 1976 rock chip samples

c. Location of slightly anomalous (copper) soil samples within the northeast trending I. P. anomaly.

d. contoured plan PFE values for n=1, a=300ft. from the 1975 I. P. survey.

e. the 200 γ contour line taken from the 1975 and partially completed 1976 ground magnetic survey.

Four rock units were recognized:

i. Jurassic andesite tuff, flows

ii. Eocene calcareous argillite, andesite flows, flow breccia

iii. Biotite-feldspar porphyry

iv. Miocene? or Eocene amygdaloidal basalt.

These rock units are described in the 1975 report. The major objective of the 1976 work was to locate outcrops in the northeast trending I. P. anomaly. The only outcrops located are on the north and south fringes of the anomaly. These are highly sheared, chloritic calcareous argillite, with minor porphyritic andesite. Pyrite is present in trace amounts. They are believed to be part of the Eocene assemblage intersected to the south in drill-holes.

No graphitic argillites of Jurassic age, which are believed to be the cause of the north-south I. P. trending anomaly, and which are present in

drill-hole 72-14, are found in the area of the northeast trending I. P . anomaly.

Biotite-feldspar porphyry was found in two locations; on the north side of Broughton Creek between lines 116E and 120E, and between lines 48E and 52E, between 100N and 106N. The porphyry north of the creek is unaltered. The porphyry between lines 116E and 120E is highly shattered, chloritic and contains abundant manganese oxide on fracture surfaces.

Malachite has been observed in outcrops of andesite tuff along Line 48E and on Line 72E at 118N.

Copper values in rock chips have been divided into three groups:

70 ppm - background

70 - 200 ppm - anomalous

+ 200 - very anomalous

Anomalous and very anomalous copper values are situated in three general areas:

(i) In outcrops between lines 48E and 52E

(ii) In shattered Eocene clacareous argillite between 110N and 114N on lines 76E and 80E.

(iii) In outcrops of amygdaloidal basalt in the northeast corner or figure 1.

The 200 gamma isomagnetic contour line derived from the 1975 and 1976 surveys represent the general area of magnetic low which trends northeast, coincident with the northeast I. P. anomaly.

Three slightly anomalous soil samples are present on lines 80E

and 84E, and lie within the central part of the I. P. anomaly.

Outcrops of basalt in the south part of the property (not in figure 3) which in 1975 were found to contain malachite and chalcopyrite were briefly examined, but no new outcrops were found to expand the area of mineralization.

CONCLUSIONS

The north part of the BRO prospect contains two areas of interest:

(i) The malachite-stained outcrops of andesite tuff and biotite-feldspar porphyry between lines 48E and 52E.

(ii) The northeast trending I. P. anomaly. It is the writer's conclusion that this anomaly does not represent graphitic argillite. It may possibly represent sulphides, which in part may be copper bearing, as suggested by anomalous values of copper in rock chip samples on its fringes.

This anomaly is likely fault controlled, as it terminates the north-south trend of graphitic argillites and their coincident I. P. anomaly. Jurassic greywackes and argillites are known to outcrop immediately 2000 feet west of the lake north of Line 48E. They have northwest strikes with dips of 30 to 60° west. They may be the faulted-off segment of the north trending belt of graphitic argillites causing the north-south I. P. anomaly.

RECOMMENDATIONS

The following program is recommended for 1976.

(i) Thoroughly search for, map and sample outcrops in the vicinity of Lines 48E and 52E.

(ii) Run two I. P. survey lines, one on 52E, the other along 11ON to determine if any significant concentrations of sulphides are present.

(iii) Determine the northeast extent of the NE trending I. P. anomaly by surveying with I. P. lines 104E, 112E, and 120E over the general area of the magnetic low. If an anomaly is located, this ground will have to be re-staked as it lies outside the current claim boundaries.

(iv) Drill a vertical 500 foot diamond drill hole in the center of the I. P. anomaly at 105N on Line 80E. The position of this hole with respect to the I. P. pseudo-section for line 80 is given in figure 4. Provision should be made to drill a second 500 foot deep hole to the north east, if I. P. results of (iii) warrant it.

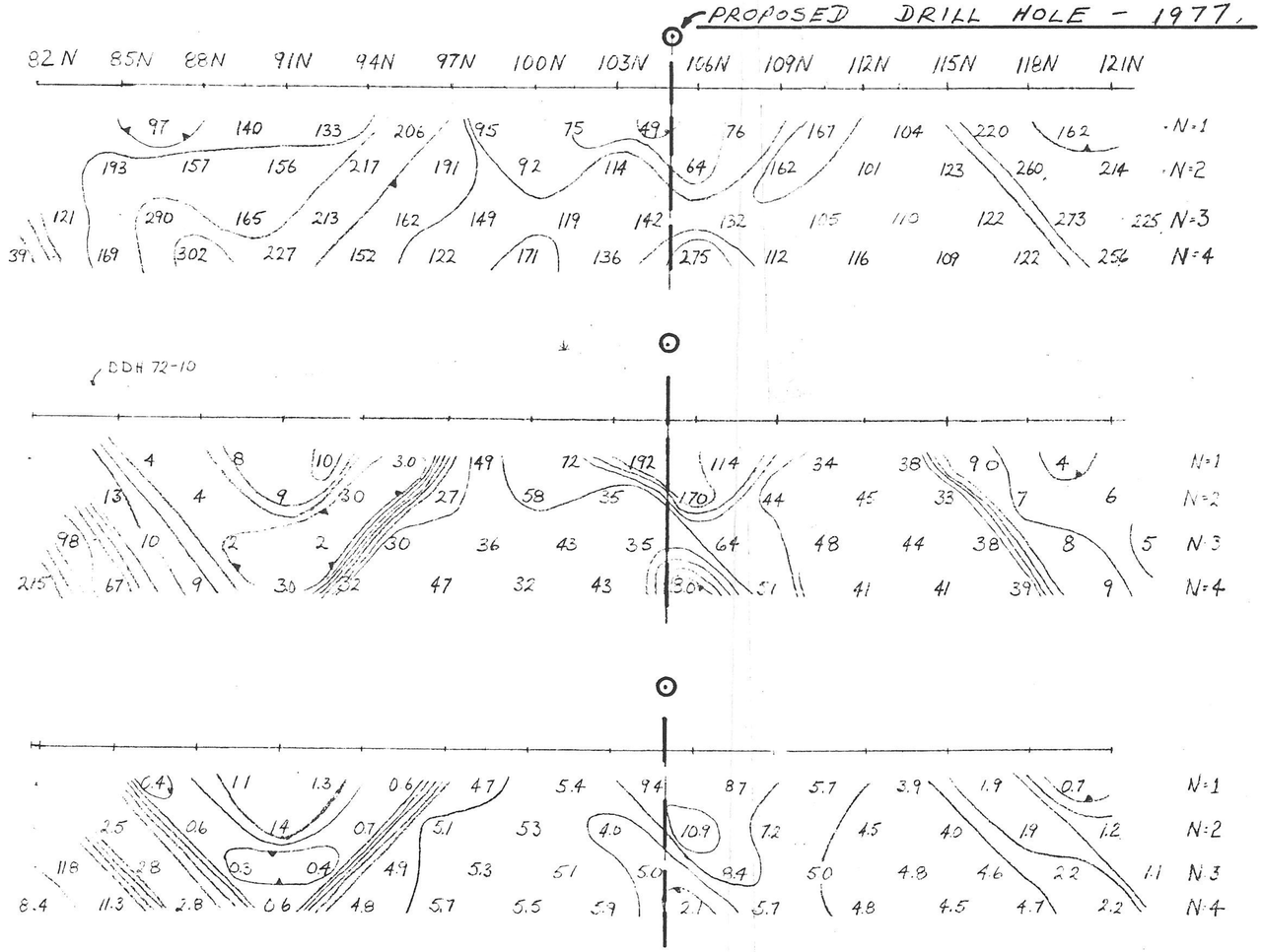
It is estimated this program will cost $22,000:

Drilling - 1000 ft. @ $15.00/ft.	$15,000
I. P. Survey	$2,000
Salaries - field crew	$1,500
Room and Board	$800
Assay	$700
Helicopter	$1,500
Miscellaneous	$500
	$22,000

D. A. Silversides.

Vancouver Office

D. A. Silversides



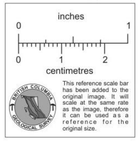
$f_{(a)}/2\pi$
OHM FEET

MF

F.E.

CITIES SERVICE MINERALS CORP.
BRO PROPERTY
FULTON LAKE AREA

P-660 FREQUENCY DOMAIN I.P.
DIPOLE - DIPOLE ARRAY
0.3 AND 5.0 HTZ
OPERATORS: MORRISON & DEPOLI



SCALE 1" = 400'
DATE JUNE 27, 28, 1975

LINE 80+00E

fig. 4

PROPOSED DRILL HOLE WITH RESPECT TO I.P. PSEUDOSECTION ON LINE 80 E