GEOLOGY AND GEOCHEMISTRY

MOONLIGHT 1-37 CLAIMS

MAYO MINING DISTRICT

Claim Sheet 105-O/1

Lat. 63°03' N Long. 130°13' W

R. J. Cathro, P. Eng. January 15, 1977

WATSON LAKE M.D.

This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as representation work in the amount of $ 7800.00

Resident Geologist or
Resident Mining Engineer

Considered as representation work under Section 53 (4) Yukon Quartz Mining Act.

B. R. BAXTER
Supervising Mining Recorder

Commissioner of Yukon Territory

This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as representation work in the amount of $ 3600

D B Craig

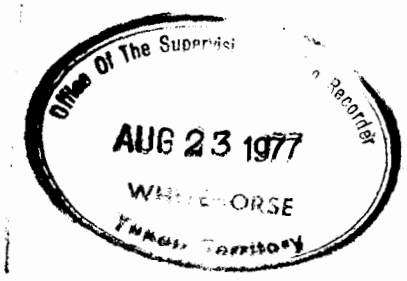
Resident Geologist or
~~Resident Mining Engineer~~

Considered as representation work under Section 53 (4) Yukon Quartz Mining Act.

B. R. BAXTER
Supervising Mining Recorder

Per Commissioner of Yukon Territory

MAYO DISTRICT



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CONSULTING GEOLOGICAL ENGINEERS

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REPORT ON

GEOLOGICAL MAPPING

AND

GEOCHEMICAL SURVEYS

MOONLIGHT 1-37 CLAIMS

MAYO MINING DISTRICT Y.T.

CLAIM SHEET 105-O/1

Latitude 63°03' N Longitude 130°13'W

ITSI JOINT VENTURE

R. J. Cathro, B.A.Sc., P.Eng. January 15, 1977

090342

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FIGURES IN POCKET

INTRODUCTION

The Moonlight claims were staked by Itsi Joint Venture (Union Oil Company of Canada Limited, Aquitaine Company of Canada Limited and St. Joseph Exploration Limited) in July and September 1976 to protect a hydro-geochemical anomaly derived from the lower portion of the Canol Formation Shale. Although no mineralization was found, the anomaly is considered promising because equivalent strata a few miles northeast contains the stratiform shale-hosted Tom and Jasen zinc-lead-barite deposits.

The anomaly was outlined and explored on behalf ot Itsi Joint Venture by an Archer, Cathro & Associates Limited crew under the direct supervision of the writer. Field work in 1976 consisted of preliminary geological mapping and prospecting and geochemical surveys between August 2 and September 18. Field personnel consisted of geologists M. P. Phillips, E. M. Jensen, T. J. Bremner and R. Dickin and assistants G. Lowey, J. Gibson and F. Gish.

PROPERTY, LOCATION AND ACCESS

The property consists of 37 contiguous claims which form a crudely triangular block with the longest (south) side following the Canol Road from mile 261.5 to about mile 264.5. The claims are registered in the name of Archer, Cathro & Associates Ltd. as follows:

MINING DISTRICT	CLAIM	TAG NUMBERS	EXPIRY DATE
MAYO	Moonlight 1-4	YA6148-YA6151	2 August 1977
	5-17	YA6352-YA6364	11 August 1977
	22-37	YA7172-YA7187	24 September 1977
WATSON LAKE	Moonlight 18-21	YA11200-YA11203	24 September 1977

The centre of the anomaly is on the northwest side of the Canol Road at approximately mile 264, which is 133 road miles from Ross River and 16 road miles from the Yukon-NWT border. Access is by road (summer only) and by aircraft to the MacMillan Pass airstrip, 11 road miles northeast, or to Jeff Lake, 5 road miles southwest.

GEOLOGY AND GEOMORPHOLOGY

The MacMillan Pass district has been only lightly scoured by Pleistocene glaciation except along main valleys. An ice sheet once extended over much of the region but it was part of a much older glacial period. In the late Pleistocene period, valley glaciers extended outwards as lobes from areas of higher elevation to the north and east, modifying the shape of main valleys to a u-shaped profile, truncating spurs below elevations of about 5500 feet and locally disrupting the drainage pattern. It is possible that ice accumulation was prevented from reaching to the present. Glacial deposits in the district tend to be rather thin and discontinuous in the mountains and are most common on the floor of the main valleys. In places where valley scouring has been weak, fissile rocks such as shale have been severely frost shattered into fine felsenmeer and talus, which tend to flow downhill under the action of solifluction and mass wasting. Permeable rocks in this district appear to be strongly weathered above the water table.

Glacial modification of the topography led to disruption of the former water table and either exposed unleached rock to surface through erosion or at least resulted in rejuvenation of the leaching cycle at a

deeper level. Where pyrite was present, goundwater became more acidic and carried a higher iron content which precipitated as a limonite cement in stream gravels (ferricrete) after the water reached surface at a spring. Numerous examples of ferricrete deposits are present in the district, one of which occurs near the head of Gary Creek. Ferricrete float was also seen near the head of Glow Creek, just above a small remnant of glacia till that occurs near the 4000 foot elevation. No recently formed ferricrete has been seen in the district and all examples visited are presently being actively eroded by streams. This is interpreted as evidence that the leac-cycle is approaching equilibrium once again.

The Moonlight claims are covered by talus with less than 5 percent outcrop above the 4000 foot elevation and by an extensive thin mixture of glacial and fluvial till and local talus below. The property has been mapped on a reconnaissance scale and the results are plotted on Figure IM-1 at a scale of 1:10,000 (in pocket). Because of the poor exposure and topographic control, the structure of the rocks is somewhat conjectural.

The property is underlain by the following sequence of fine clastics of Middle Devonian to Mississippian Age:

IMPERIAL FORMATION

Iss	Interbedded sandstone and siltstone, brown weathering
Iar	Transitional varicoloured siltstone and argillite; silver to grey weathering; contain a 20 foot bed of tuff and amygdaloidal flows near the top.

CANOL FORMATION

Cp	Phyllitic black shale with distinctive silver weathering; contains baritic zones near the base in MacMillan Pass District.
Ccgl	Chert pebble conglomerate of sharply variable thickness; massive; weathers to large blocky talus.

In the MacMillan Pass District, the Canol conglomerate and an underlying shale-turbidite sequence up to 200 feet thick rests unconformably on argillite of the Road River Formation. The Canol Formation was apparently derived by erosion of a land mass to the southwest, as opposed to the Road River Formation which was derived from the northeast. The conglomerate consists of angular to rounded clasts of medium grey to black to white chert and a few clasts of black shale and light brown argillite. Clasts are up to 10 cm long near the Moonlight claims and in most places the conglomerate is tightly cemented by pervasive light-grey chert which causes it to break through rather than around the clasts, forming talus blocks up to four feet in length. This unit often forms ridge crest pinnacles and cliffs and varies rapidly in thickness from 100 to 850 feet in the district. No evidence of bedding or other sedimentary features was seen and it is considered to be a density or tubidity flow. A small patch of conglomerate is rumoured to be present near the barite outcrops on the adjacent Gary claims but it was not seen in 1976. No conglomerate has been mapped on the Moonlight claims.

The Canol shale forms a distinctive, silver-grey weathering conformable blanket above the conglomerate. The shale is slightly siliceous and makes a characteristic clinking sound underfoot. It weathers in plates about 1/2 cm thick and forms a black soil. From a distance it has a distinctive lustrous sheen and a faint bluish tint. This unit is locally more than 1000 feet thick but thins rapidly away from the MacMillan Pass District to less than 200 feet in thickness. Bedding is badly obliterated by a poorly developed foliation and a well developed penetrative cleavage related to the axial trend of major folds that strike about 070°. Bedding is only seen as colour banding on weathered surfaces and these are seldom found in their true attitude due to

the recessive nature of the unit. The few attitude measured indicate that the unit is strongly folded. Float of tuffaceous and amygldaloidal volcanic rock has been found near the top of the ridge and further mapping might be successful in tracing this marker horizon. In this district, bedded barite, such as that found on the adjacent Gary claims, occurs near the base of the shale. The barite is sometimes accompanied by economically important amounts of galena and sphalerite, although none has been found in the Gary showing.

The Canol shale grades conformably upwards into a transitional unit at the base of the Imperial Foundation. This unit is dark grey, finely laminated and phyllitic at the base and becomes siltstone or argillite of highly variable colour near the top. On the Moonlight property it is usually grey. This colour variation is interpreted as rapid fluctuation from oxidizing to reducing deposition in shallow water. The argillite consists of fine, angular, silt-sized material composed mainly of quartz, feldspar and black chert or argillite fragments. The transitional unit changes upwards into several hundred feet of thick bedded, black silty santstone which weathers pale yellow-brown and forms talus blocks up to two feet in length. It consists of angular grains of quartz, feldspar dark rock fragments and biotite flakes in a black muddy matrix. It characteristically contains considerable cross bedding and was possibly derived from the erosion of an igneous rock, with deposition in a stream mouth-bar type of environment within a porgrading delta front. The source is thought to be from the northeast.

GEOCHEMISTRY

INTRODUCTION

The geochemical survey of the Moonlight Property included analysis of rock, soil, silt and spring and stream water for a wide variety of metals and ions. The majority of the analyses were performed at Chemex Labs Ltd., North Vancouver, B.C. while check assays were obtained on water samples at Barringer Research in Rexdale, Ontario and Bondar Clegg Lab in North Vancouver, B.C. A total of 105 rocks, soil, and silt samples and 101 water samples were collected from the claims and adjacent portions of the map area. The assays are plotted on Figure IM-7 (rock, soil and silt) and Figures IM-2 and IM-6 (water).

Early geochemical exploration in the MacMillan Pass District stressed stream sediment (silt) sampling because of its effectiveness in outlining a wide variety of mineral deposits throughout the Cordillera. However, the zinc-lead-barite mineralization in the Canol shale proved to be unsuited to this technique because the response from the mineralization was lower than the background levels of streams draining the shale.

ROCK, SOIL AND SILT SAMPLING

During 1976 a number of orientation lines were run over sulphide deposits near the Moonlight property and at random locations throughout the district. The orientation lines near MacMillian Pass have shown that leached Canol shale has background levels of about 15 Cu (rock and soil), 4 Mo (rock and soil), 50 Pb (rock and soil) 10 Zn in rock and 20 in soil, 0.5 Ag (rock and soil), 20 Mn in rock and 30 in soil, and 2000 Ba (rock and soil), all in ppm. Loss on Ignition (LOI) ranges from about 0.4 to 6.6%, with most results between 1.0 and 2.4%. The following are background ranges from several thousand samples collected regionally from Canol shale:

ASSAYS (ppm)

	Cu	Pb	Zn
Rock	4-100	4-50	5-200
Soil	1-100	2-40	5-200

Many of the regioanl samples were collected from unleached areas which accounts for the higher background ranges.

The samples collected from Canol shale on Moonlight claims during 1976 gave background assays in the following ranges:

ASSAYS (ppm)

	Cu	Pb	Zn
Rock	10-46	6-32	95-344
Soil	3-86	2-48	25-640
Silt	24-50	8-28	115-1160

All samples were screened to minus 80 mesh (after pulverizing in the case of rock samples) and analyzed for copper, lead and zinc using a nitric-perchloric acid digestion and atomic absorption spectrometry (AAS).

WATER SAMPLING

Water samples were collected on an experimental basis and were analyzed in a variety of ways to determine background levels for the main metals. Most samples were coarsely filterdd in the field to remove suspended organic and mineral particles and were shipped to the lab for pH measurement and assay. The first batch of water samples was acidified in the field with concentrated nitric acid in order to determine uranium content, thus precluding a pH measurement. In order to measure the levels of some of the more insoluble metals such as lead and copper, a sensitive and expensive preconcentration

technique, commonly used for environmental pollution studies, was adopted. This is referred to as the APDC/MIBK method, in which the element is chelated or complexed with ammonium pyrrolidine ditho-carbamate (APDC), extracted into the organic solvent methyl isobutyl ketone (MIBK), and then analyzed with AAS. Detection limits of 1 ppb Fe and Cu, 2 ppb Pb and Zn, 10 ppb Mn, 20 ppb F and 10 ppm SO_4 can be obtained in this manner.

Repeat samples were collected at the same sample site on several occasions in order to check the reproducibility of the analytical techniques and to determine what seasonal variations occur in the water assays. Some selected check assays are tabulated below:

TABLE I
(all assays at Chemex Labs; NA=not analyzed)

STREAM LOCATION ON CANOL ROAD	SAMPLE NO.	DATE SAMPLES	ASSAYS Zn	F	Mn	Fe	pH
MP 264.5	17813	June 3	80	220	60	500	NA
	22256	July 20	37	190	40	50	6.6
	M5	Aug. 24	50	160	10	280	6.6
MP 264.8	17818	June 3	1600	3050	5450	800	NA
	22262	July 20	2150	4100	8200	190	4.4
	M17	Aug. 24	2500	4750	8000	200	4.3
MP 265.1	17811	June 3	10	130	10	200	NA
	22268	July 20	17	200	40	25	6.7

These water samples check remarkably closely, considering the wide ranges that occur between individual streams and that the claims were more than 60 percent snow covered when the first samples were collected on June 3 Although rainfall was lower than normal between June 3 and August 24, there is no evidence that dilution by surface runoff has any significant effect on metal content.

The correlation between different laboratories was investigated on the batch of samples collected August 24 with the following results shown on Table II on the following pages. Although variance of up to 20 percent occurs between individual labs, these results are considered quite satisfactory because of the extremely high anomalous contrast that occurs in all metals. Barringers pH measurements were consistently from 0.5 to 1.0 pH interval higher than the other two labs in the weakly acidic range.

The test work performed in the lab has sown that a highly variable lead content is present in the streams but that it is partially removed by filtering through ordinary filter paper and is almost totally removed by filtering through a Whatman GF/C 0.45μ glassfibre filter. The following assays were obtained at Chemex Labs from an unfiltered portion of the samples listed in Table II.

TABLE III

SAMPLE NUMBER	Pb (ppb)		Fe (ppb)	
	NO FILTER	WHATMAN FILTER	NO FILTER	WHATMAN FILTER
T 2	40	2	160	3
4	200	2	180	5
5	40	2	280	3
6	80	2	160	3
7	440	2	240	70
8	40	2	180	4
9	180	2	220	1
10	40	2	220	4
11	60	2	760	9
12	40	2	160	4
13	40	2	260	7
14	520	2	340	10
15	600	2	200	13
16	40	2	200	7
17	560	2	200	32

The effect of the filtering on iron is also significant but more uniform and not as serious as for lead. Negligible amounts of zine and copper were removed by the Whatman filter.

TABLE II

(C=Chemex; B=Barringer; BC=Bondar Clegg)

Sample No.	Zn(ppb) C	Zn(ppb) B	Zn(ppb) BC	F(ppb) C	F(ppb) B	F(ppb) BC	pH C	pH B	pH BC	SO_4(ppm) C	SO_4(ppm) B	SO_4(ppm) BC	Pb(ppb) C*	Pb(ppb) B	Pb(ppb) BC	Fe(ppb) C*	Fe(ppb) B	Fe(ppb) BC	M(ppb) C+	M(ppb) B	M(ppb) BC	As(ppb) C	As(ppb) B	As(ppb) BC
T 2	110	100	110	90	120	340	6.10	7.2	5.8	40	70	38	<2	1	20	3	<20	<50	<10	<10	8	8	3	<2
4	530	570	570	310	330	460	6.48	7.6	6.8	120	10	94	<2	29	12	5	<20	<50	<10	<10	8	<8	3	<2
5	50	50	50	160	170	280	6.61	7.6	6.9	240	60	42	<2	9	10	3	<20	<50	<10	<10	12	20	3	<2
6	80	70	80	370	390	420	6.59	7.6	6.9	130	135	110	<2	<1	14	3	<20	<50	<10	<10	16	8	<1	<2
7	1350	1350	1320	1780	1500	1300	4.28	4.0	4.3	570	900	525	<2	19	18	70	100	<50	4900	5000	5500	8	3	<2
8	30	40	10	150	210	250	6.93	8.1	7.1	290	250	315	<2	13	12	4	20	<50	<10	<10	16	12	5	<2
9	300	280	300	300	NA	360	7.06	NA	7.2	330	440	300	<2	14	10	1	20	<50	20	10	50	<8	4	<2
10	90	60	60	190	330	230	7.04	7.5	6.9	70	60	39	<2	15	10	4	20	<50	<10	<10	12	24	3	<2
11	70	60	40	100	120	180	6.50	7.3	6.6	100	110	30	<2	<1	20	9	<20	<50	20	<10	18	24	3	<2
12	50	50	70	210	280	250	6.67	7.4	6.7	100	50	54	<2	<1	65	4	<20	<50	<10	<10	140	20	3	<2
13	50	70	60	260	320	290	6.70	7.5	6.7	100	130	58	<2	13	20	7	40	<50	<10	<10	28	<8	3	<2
14	2100	2100	2050	4950	4200	3500	4.58	4.3	4.6	840	700	775	<2	34	28	10	20	<50	6200	6500	7000	<8	<1	<2
15	2500	2450	2450	4600	3100	2800	4.34	4.1	4.4	1080	1350	980	<2	16	12	13	20	<50	7700	8500	8500	32	1	<2
16	60	60	30	260	310	350	6.60	7.6	6.5	80	160	54	<2	<1	22	7	<20	<50	<10	10	15	<8	11	<2
17	2500	2450	2500	4750	3500	3000	4.26	4.1	4.4	890	1050	950	<2	5	14	32	20	<50	8000	8500	8500	24	<1	<2

* - Whatman GF/c 0.45 m filter

+ - unfiltered

The water results from the Moonlight claims are plotted on Figure IM-2 to IM-6, inclusive (in pocket). Strongly anomalous contrast has been obtained in SO_4, Zn, Pb, Mn, F and Fe near Glow Creek with a weak suggestion of a possible northwest orientation. However, it must be stressed that this trend may be caused simply by the drainage pattern, the distribution of the available sampling sites, and the orientation of the mountain.

No significant contrast has been obtained for Cu (Figure IM-6). Assays for additional metals on the first batch of samples, which were collected on June 3 and filtered with normal paper, indicated low levels of the following:

Ba - less than detection limit of 100 ppb
As - " " " " " 10 ppb
U - " " " " " 0.25 ppb
V - " " " " " 50 ppb
Mo - " " " " " 10 ppb
Cd - " " " " " 10 ppb except for one assay of 20 ppb on a sample that was anomalous in the other main metals

The batch of samples collected August 24 was tested for several additional metal by Barringer Lab using direct aspiration and analysis by a Multi-element Radio Frequency Emission Spectrometer (MRFES) unit. This showed the following assay levels:

METAL	RANGE (ppb)		RANGE (ppb)	
Al	400	to	1800	
B	110	to	280	
Ba	110	to	910	
Ca	14.4	to	148	(ppm)
Cu	4	to	48	
K	13000	to	53000	
Mg	2.84	to	138	(ppm)
Na	700	to	2600	
Ni	600	to	1200	
P	400	to	1800	
Si	2750	to	8810	
Sr	50	to	665	
Ti	10	to	60	
V	50	to	220	

SUMMARY AND CONCLUSIONS

The water orientation surveys have produced anomalous assays from 10 to 100 times background (one to two orders of magnitude above background) in SO_4, Zn, Pb, Mn, F and Fe. Water is the only sampling medium that gives a strong Zn contrast from the Canol Formation. The water anomalies are not significantly affected by seasonal variations in stream flow and have been confirmed by different laboratories. Because anomalous contract is so high, satisfactory detection limits can be obtained with a relatively simple and inexpensive technique. The recommended procedure in exploring for shale hosted mineralization in the Canol Formation is (a) to measure pH and remove visible suspended particles from the water with crude filtering in the field, and (b) to partially pre-concentrate in the lab with partial evaporation and digestion in nitric perchloric acid prior to direct analysis with AAS.

Although no mineralization has been observed on the Moonlight claims, the anomaly centered on Glow Creek is considered to be a significant exploration target because of its resemblance in magnitude and metal association with response from known sphalerite-galena-barite showings that occur in the MacMillan Pass District. Although the lead response from the Moonlight claims can only be obtained by the special analytical technique outlined above, the results are considered to be valid and significant because of the broad range of values and because the highest lead assays correspond with anomalous assays in the order main metals and ions.

Very little information has been published on water response from shale-hosted zinc-lead-barite mineralization. However, a review of geochemical literature suggests that the following is a valid exploration

hypothesis. Anomalous water response in SO_4 and the other main metals is probably proof that surface oxidation and leaching has recently occurred, probably related to Pleistocene lowering of the water table. Threshold for SO_4 is about 50 ppm and values above that level probably indicate that baterial leaching of sulphide minerals is underway. Assays of 200 ppm SO_4 or greater are considered to be strongly anomalous. Values up to 1100 ppm SO_4 were obtained by Itsi Joint Venture in the MacMillan Pass District in 1976. Bacterial leaching and sulphide oxidation proceeds most quickly under low pH, a temperature of 30°C and the presence of oxygen, iron, sulphur and nutrients (N,CO_2). These reactions produce a lowering of the pH and low assays in other metals such as Zn, Pb, Mn, and F probably indicates the oxidation of pyrite only, whereas the same SO_4 and pH readings with anomalous levels of Zn, Pb, Mn and F probably indicates the presence of other sulfides as well. Low levels of SO_4 and other metals and neutral pH could indicate either the absence of sulfides in an oxidizing environment or merely the absence of an oxidizing environment. Water anomalies, like other types of geochemical anomalies (soil, silt) are probably a poor qualitiative guide to the quantity and grade of mineralization in most cases. However, it is of considerable exploration interest that the Moonlight water assays are of the same order of magnitude as orientation surveys conducted in 1976 of known mineralization nearby.

A statistical study of 125 water samples which were collected regionally in 1976 and analyzed for SO_4, Zn and pH indicates several relationships. Although the trends are not always strong, SO_4 and Zn assays tend to be highest when pH is low, although SO_4 values in particular, are also high with near-neutral pH readings. Zn assays of up to 3500 ppb were obtained

in 1976 but Zn assays were always below 500 ppb when SO_4 values were less then 40 ppm. A high statistical probability exists that assays associated with mineralization in the Canol shale will have Zn assays above 500 ppb, and SO_4 content of greater than 250 ppm, and a pH between 2.8 and 615. The general relationships are shown on Figure IM-7 on the following page, which is a plot of pH against an arbitrary factor of Zn assays in ppb divided by SO_4 assays in ppm. Samples containing over 250 ppb Zn have been shown with special symbols while samples collected from the Moonlight anomaly and from known mineralization are also identified.

The wide range of pH associated with anomalous Zn and SO_4 is possibly a reflection of local stratigraphic effects and shallow subsurface dilution of the leach water before it reaches surface. For example, a slight carbonate content in the shale unit at the headwaters of a stream would tend to neutralize the pH of acidic water. Similarly, the mixing of leach water with neutral ground water close to surface that was derived from melt-water or precipitation at a higher elevation, would tend to shift pH towards the neutral range. Another important factor is related to the escape of CO_2 from acid springwaters. This carbonic acid and related ions is believed to play a major role in reducing pH below about 4.5, which is the level of acidity expected from suphuric acid content alone. The ground water is in equilibrium when it reaches surface but the rapid loss in CO_2 raises the pH and precipitates Cu, Fe and Zn as it approaches neutral. Metals such as Pb and Ba, which are less soluble and which occur in the water in very low concentrations, are not affected to the same degree by the CO_2 loss. Barite is too insoluble under the natural conditions prevailing in the zone of oxidation to contribute any SO_4 to the waters. Any Ba released by the

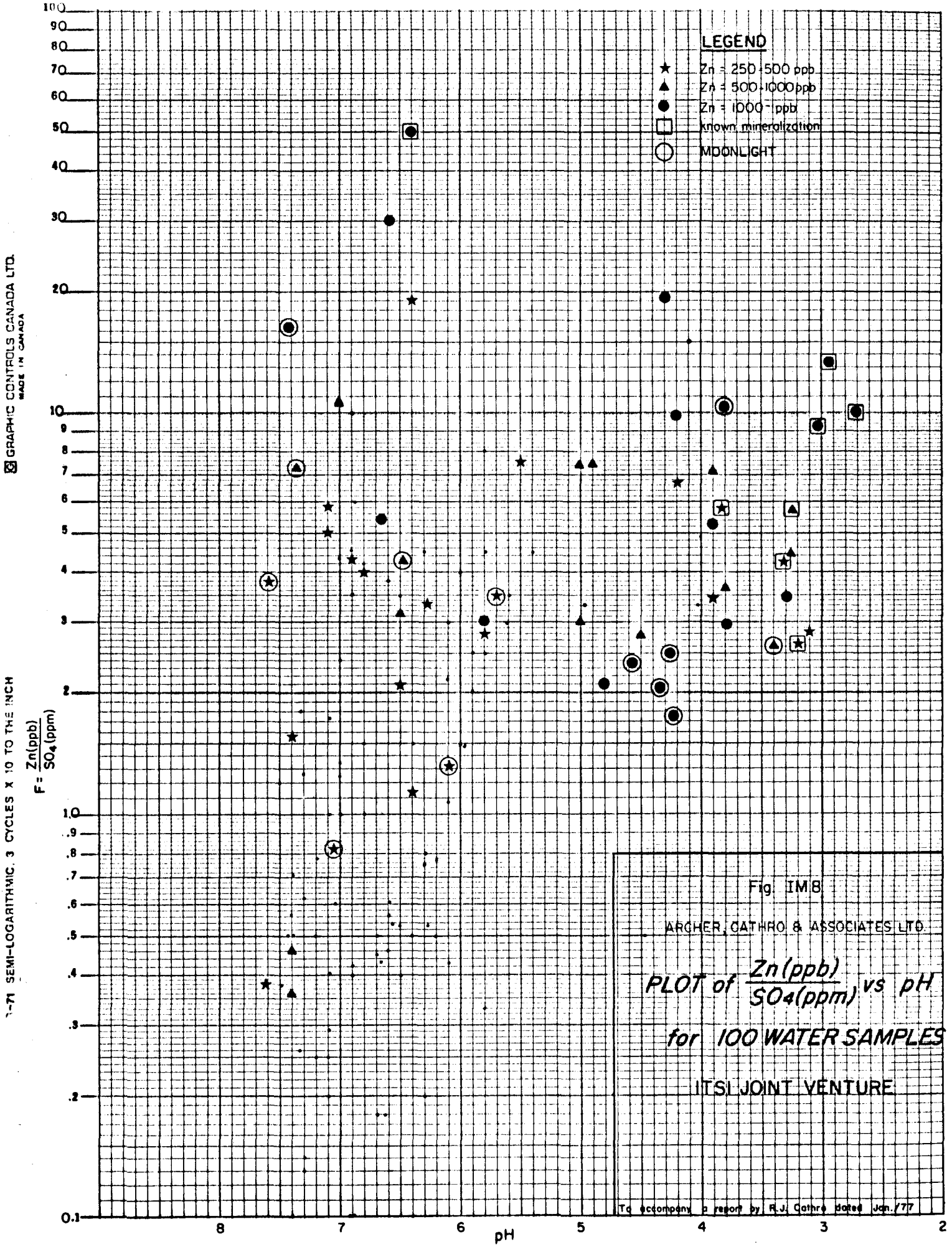

Fig. IM 8

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PLOT of $\frac{Zn(ppb)}{SO4(ppm)}$ vs pH

for 100 WATER SAMPLES

ITSI JOINT VENTURE

To accompany a report by R.J. Cathro dated Jan./77

leaching of witherite or other barium salts would precipitate as barite in the presence of surplus SO_4.

It appears that the Canol shale responds much better to water sampling than other shales in the region. The reasons for the excellent water reponse from the Canol shale are not presently understood and will not be determined without further study. The favourable response is certainly influenced by the deep oxidation and is perhaps aided by low carbonate content; high rock permeability; a satisfactory amount, type and mode of pyrite; and the presence of whatever nutrients are required by the bacteria for optimum leaching activity. The conditions that contribute to the strong water response are also responsible for the complications that have made silt sampling so unsuccessful in this region.

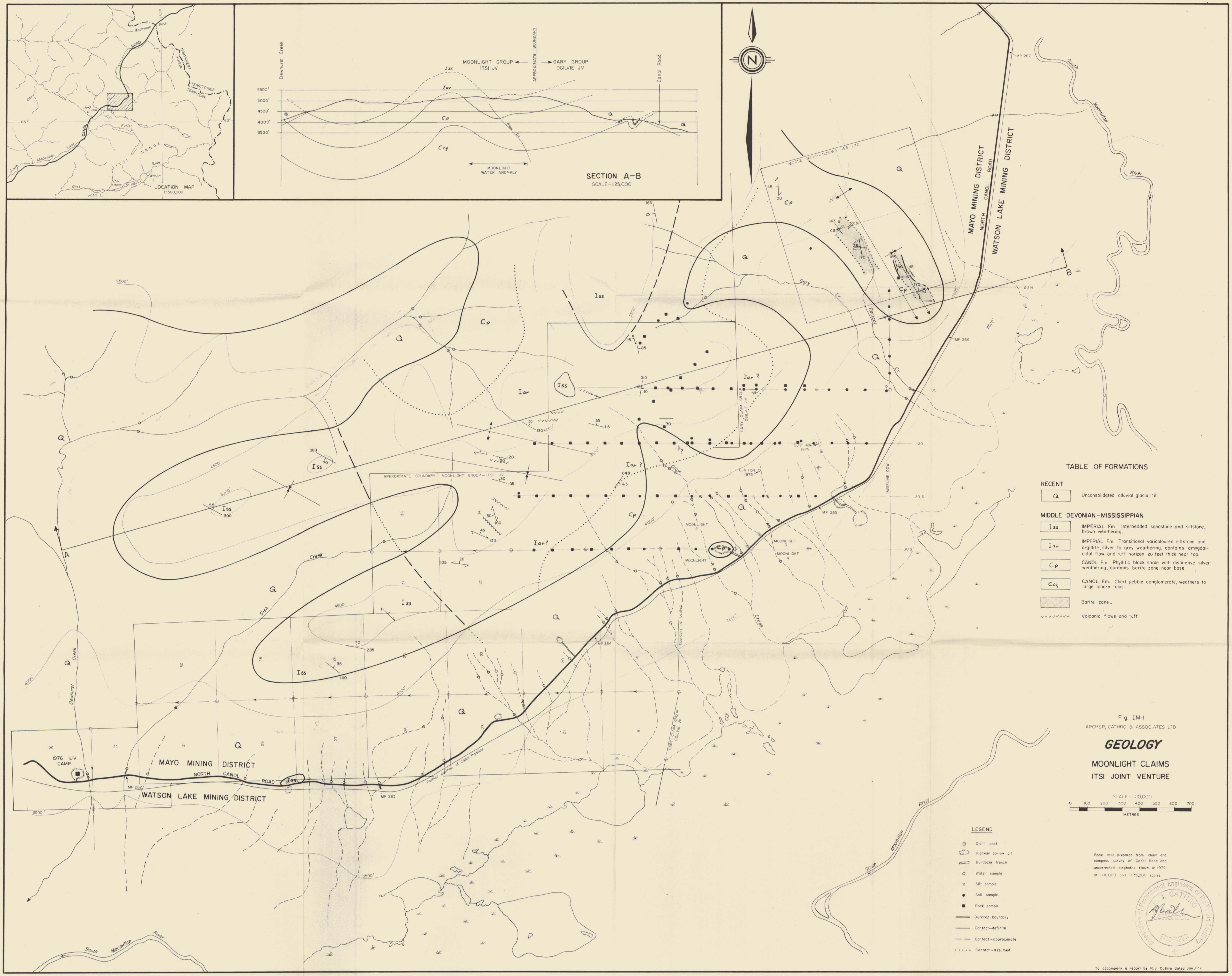
RECOMMENDATIONS

A complete water survey should be made of the Moonlight property and adjacent area, using the analytical technique described earlier, in order to obtain a complete picture of the dispersion patterns for Pb, SO_4 and Zn and the relations of these to pH. An orthophoto contour map of the property should also be prepared so that the geological mapping and water sampling can be plotted accurately and tied to elevations.

Preliminary mapping indicates that the favourable baritic horizon in the Canol shale underlies the Moonlight property at shallow to moderate depth. Since the barren barite showing on the adjacent Gary claims gives only background water response, the Moonlight water anomaly is interpreted as being derived from a bedded barite zone with a higher sphalerite and galena content.

Respectfully submitted
ARCHER, CATHRO & ASSOCIATES LTD.

R. J. Cathro, B.A.Sc., P.Eng.



LOCATION MAP
1:500,000
Macmillan Pass
ROAD
NORTHWEST TERRITORIES
YUKON TERRITORY
CANOL
ITSI RANGE
MOONLIGHT GROUP ITSI JV
GARY GROUP OGILVIE JV
APPROXIMATE BOUNDARY
Dewhurst Creek
Canol Road
MOONLIGHT WATER ANOMALY
SECTION A–B
SCALE – 1:25,000
MAYO MINING DISTRICT
NORTH CANOL ROAD
WATSON LAKE MINING DISTRICT
South Macmillan River
Gary Cr.
APPROXIMATE BOUNDARY MOONLIGHT GROUP – ITSI JV
GARY CLAIM GROUP OGILVIE JV
MOOSE GROUP – NUSPAR RES. LTD.
MOONLIGHT
DJV Hole 1975
Gish Creek
1976 IJV CAMP
Former position of Canol Pipeline
TABLE OF FORMATIONS
RECENT
Q
Unconsolidated alluvial glacial till
MIDDLE DEVONIAN – MISSISSIPPIAN
Iss
IMPERIAL Fm. Interbedded sandstone and siltstone, brown weathering.
Iar
IMPFRIAL Fm. Transitional varicoloured siltstone and argillite, silver to grey weathering, contains amygdaloidal flow and tuff horizon 20 feet thick near top.
Cp
CANOL Fm. Phyllitic black shale with distinctive silver weathering, contains barite zone near base.
Ccg
CANOL Fm. Chert pebble conglomerate, weathers to large blocky talus.
Barite zone.
Volcanic flows and tuff
Fig. IM-I
ARCHER, CATHRO & ASSOCIATES LTD
GEOLOGY
MOONLIGHT CLAIMS
ITSI JOINT VENTURE
SCALE – 1:10,000
0 100 200 300 400 500 600 700
METRES
LEGEND
Claim post
Highway borrow pit
Bulldozer trench
Water sample
Silt sample
Soil sample
Rock sample
Outcrop boundary
Contact – definite
Contact – approximate
Contact – assumed
Base map prepared from chain and compass survey of Canol Road and uncorrected airphotos flown in 1974 at 1:10,000 and 1:35,000 scales.
Association of Professional Engineers of the Yukon Territory
J. CATHRO
GEOLOGICAL ENGINEER
To accompany a report by R.J. Cathro dated Jan./77

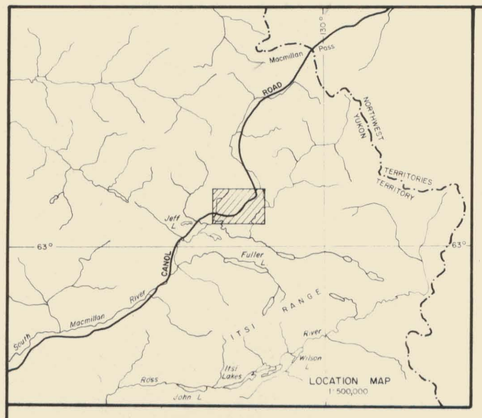


Fig. IM-2

ARCHER, CATHRO & ASSOCIATES LTD.

pH of STREAM WATERS

MOONLIGHT CLAIMS
ITSI JOINT VENTURE

SCALE – 1:10,000

0 100 200 300 400 500 600 700

METRES

Base map prepared from chain and compass survey of Canol Road and uncorrected airphotos flown in 1974 at 1:10,000 and 1:35,000 scales

To accompany a report by R.J. Cathro dated Jan./77

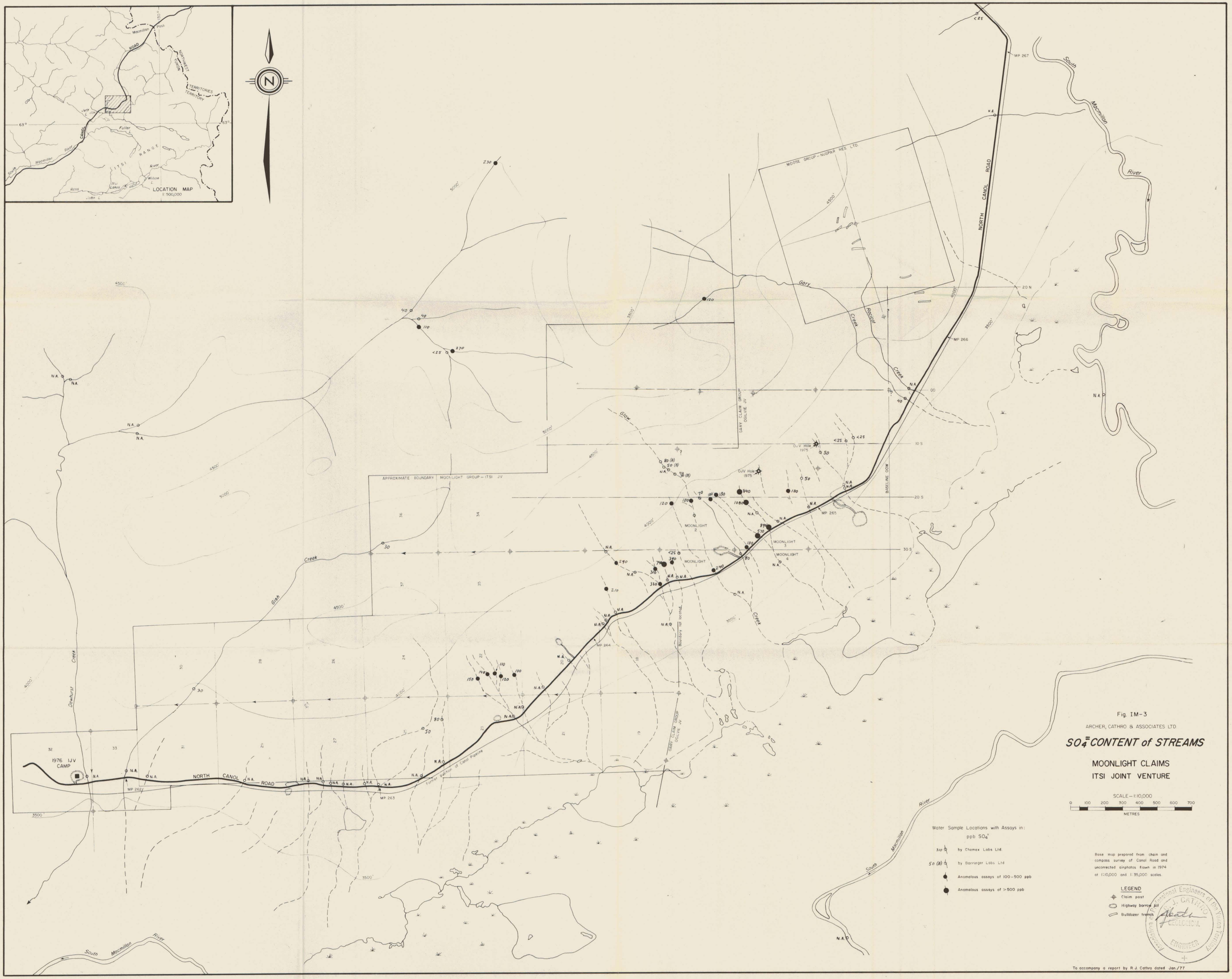


Fig. IM-3

ARCHER, CATHRO & ASSOCIATES LTD

$SO_4^=$ CONTENT of STREAMS

MOONLIGHT CLAIMS

ITSI JOINT VENTURE

To accompany a report by R.J. Cathro dated Jan./77

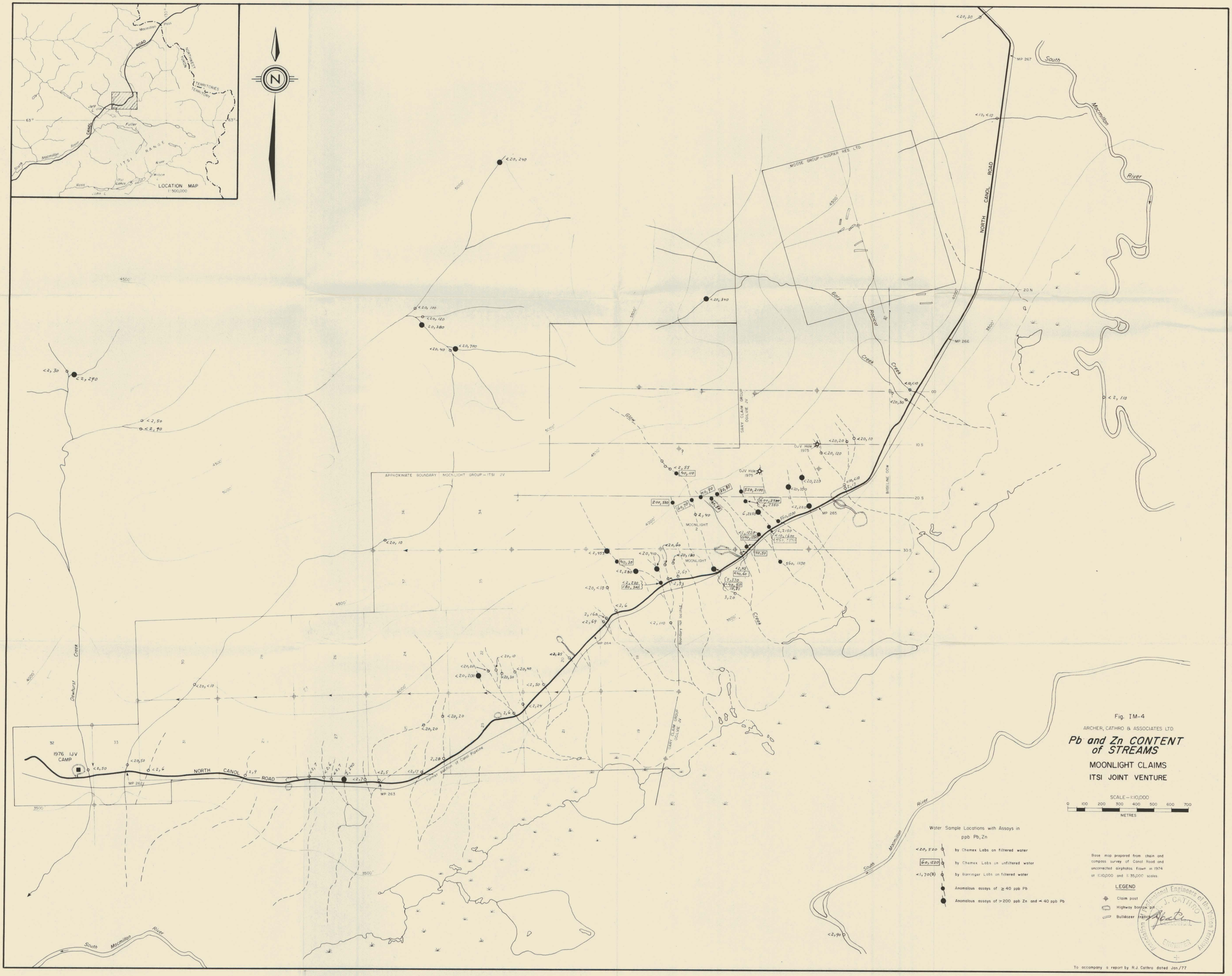
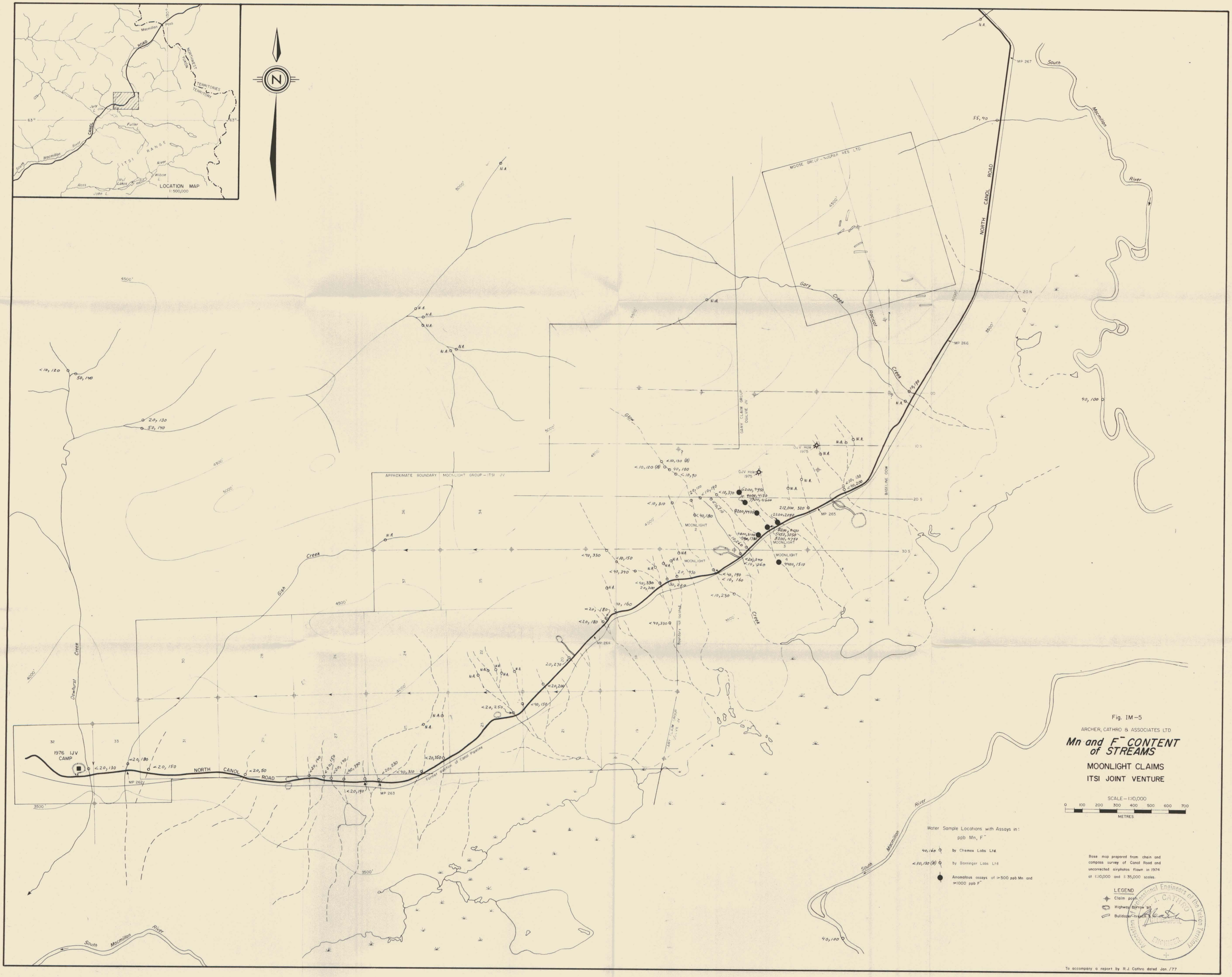
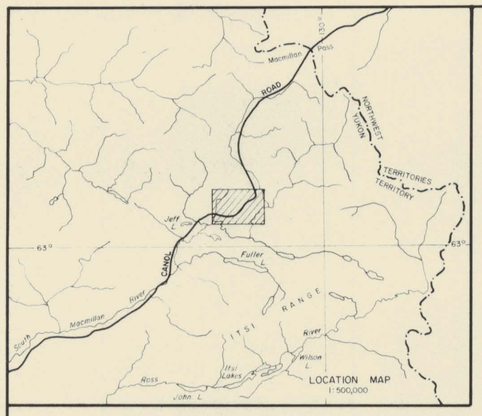


Fig. IM-4
ARCHER, CATHRO & ASSOCIATES LTD.
Pb and Zn CONTENT of STREAMS
MOONLIGHT CLAIMS
ITSI JOINT VENTURE
SCALE – 1:10,000
0 100 200 300 400 500 600 700
METRES
Water Sample Locations with Assays in ppb Pb, Zn
<20, 520 by Chemex Labs on filtered water
60, 1220 by Chemex Labs on unfiltered water
<1, 70(B) by Barringer Labs on filtered water
Anomalous assays of ≥ 40 ppb Pb
Anomalous assays of > 200 ppb Zn and < 40 ppb Pb
Base map prepared from chain and compass survey of Canol Road and uncorrected airphotos flown in 1974 at 1:10,000 and 1:35,000 scales.
LEGEND
Claim post
Highway borrow pit
Bulldozer trench
To accompany a report by R.J. Cathro dated Jan./77
LOCATION MAP
1:500,000
NORTH CANOL ROAD
South Macmillan River
Dewhurst Creek
Gary Creek
Raccoon Creek
1976 IJV CAMP
APPROXIMATE BOUNDARY MOONLIGHT GROUP – ITSI JV
MOOSE GROUP – NUSPAR RES. LTD.
GARY CLAIM GROUP OGILVIE JV
MOONLIGHT 1
MOONLIGHT 2
DJV Hole 1975
Former position of Canol Pipeline
MP 262
MP 263
MP 264
MP 265
MP 266
MP 267


LOCATION MAP
1:500,000
NORTH CANOL ROAD
1976 IJV CAMP
MOONLIGHT CLAIMS
APPROXIMATE BOUNDARY MOONLIGHT GROUP - ITSI JV
MOOSE GROUP - NUSPAR RES LTD
GARY CLAIM GROUP OGILVIE JV
South Macmillan River
Gary Creek
Rockcor Creek
Gish Creek
Dewhurst Creek
Former position of Canol Pipeline
Fig. IM-5
ARCHER, CATHRO & ASSOCIATES LTD
Mn and F⁻ CONTENT of STREAMS
MOONLIGHT CLAIMS
ITSI JOINT VENTURE
SCALE - 1:10,000
0 100 200 300 400 500 600 700
METRES
Water Sample Locations with Assays in:
ppb Mn, F⁻
40,160 by Chemex Labs Ltd.
<10,130 (B) by Barringer Labs Ltd
Anomalous assays of >500 ppb Mn and >1000 ppb F⁻
Base map prepared from chain and compass survey of Canol Road and uncorrected airphotos flown in 1974 at 1:10,000 and 1:35,000 scales.
LEGEND
Claim post
Highway borrow pit
Bulldozer trench
Association of Professional Engineers of the Yukon Territory
R. J. CATHRO
GEOLOGICAL
ENGINEER
To accompany a report by R.J. Cathro dated Jan./77



LOCATION MAP
1:500,000

Fig. IM-6

ARCHER, CATHRO & ASSOCIATES LTD.

Fe and Cu CONTENT of STREAMS

MOONLIGHT CLAIMS
ITSI JOINT VENTURE

SCALE – 1:10,000

0 100 200 300 400 500 600 700
METRES

Water Sample Locations with Assays in:
ppb Fe, Cu

48, 3 by Chemex Labs Ltd.

20, 2 (B) by Barringer Labs Ltd.

Anomalous assays of 150–490 ppb Fe

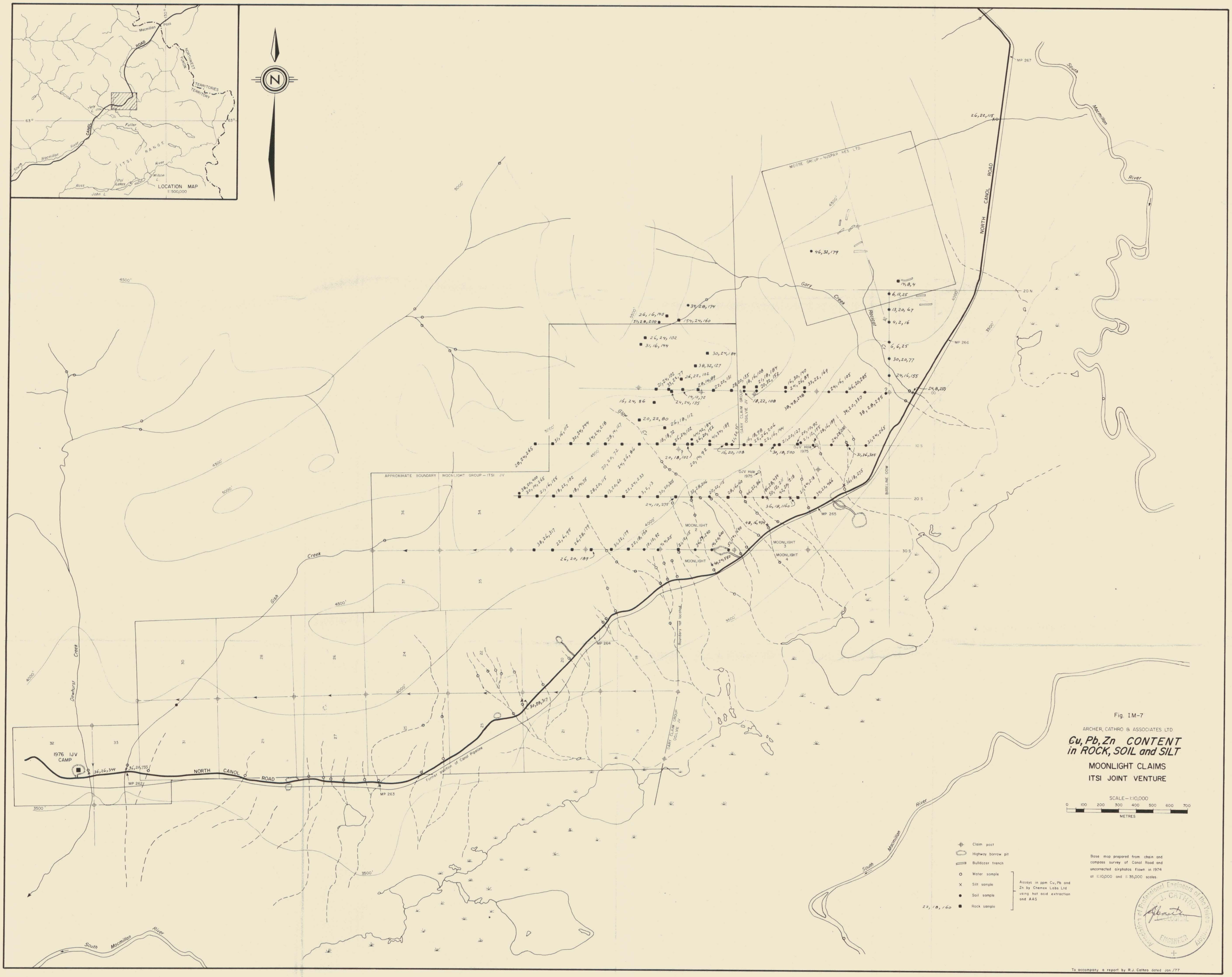
Anomalous assays of >490 ppb Fe

Base map prepared from chain and compass survey of Canol Road and uncorrected airphotos flown in 1974 at 1:10,000 and 1:35,000 scales.

LEGEND
- Claim post
- Highway borrow pit
- Bulldozer trench

Association of Professional Engineers of the Yukon Territory
R. J. CATHRO
ENGINEER

To accompany a report by R.J. Cathro dated Jan./77



LOCATION MAP
1:500,000
NORTH CANOL ROAD
South Macmillan River
Gary Creek
Glow Creek
Gish Creek
Dewhurst Creek
MOOSE GROUP - NUSPAR RES LTD
APPROXIMATE BOUNDARY MOONLIGHT GROUP - ITSI JV
1976 IJV CAMP
MP 262
MP 263
MP 264
MP 265
MP 266
MP 267
MOONLIGHT 1
MOONLIGHT 2
MOONLIGHT 3
MOONLIGHT 4
Former position of Canol Pipeline
Fig. IM-7
ARCHER, CATHRO & ASSOCIATES LTD
Cu, Pb, Zn CONTENT in ROCK, SOIL and SILT
MOONLIGHT CLAIMS
ITSI JOINT VENTURE
SCALE - 1:10,000
0 100 200 300 400 500 600 700
METRES
Claim post
Highway borrow pit
Bulldozer trench
Water sample
Silt sample
Soil sample
22, 18, 160 Rock sample
Assays in ppm Cu, Pb and Zn by Chemex Labs Ltd using hot acid extraction and AAS
Base map prepared from chain and compass survey of Canol Road and uncorrected airphotos flown in 1974 at 1:10,000 and 1:35,000 scales.
Association of Professional Engineers of the Yukon Territory
R. J. CATHRO
GEOLOGICAL
ENGINEER
To accompany a report by R.J. Cathro dated Jan./77

ARCHER, CATHRO ASSOCIATES LTD.

MOONLIGHT CLAIMS

ITSI JOINT VENTURE

SCALE: 1:5,000

500 0 500 1,000 1,500 FEET

100 0 100 200 300 400 METRES

CONTOUR INTERVAL 10 FEET

SCALE OF PHOTOGRAPHY: 1:40,000

DATE OF PHOTOGRAPHY: SEPTEMBER 1976

CONTROL BY: HOSFORD IMPEY WELTER LTD.
WHITEHORSE Y.T.

NORTH WEST SURVEY CORPORATION (YUKON) LTD.

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