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INTERMEDIATE ECONOMIC GEOLOGY REPORT

on the

ATAN LAKE PROPERTY

Adair, Ski, August and Atan Mineral Claims
centered in and around Atan Lake
and just east of the abandoned settlement
of
McDame Post on the Dease River, Cassiar District

LIARD MINING DIVISION

Northern British Columbia

Latitude 59°15'N Longitude 129°15'W

N.T.S. 104 P/3

and owned by TOURNIGAN MINING EXPLORATIONS LTD.
of Vancouver, B.C.

(Silver - Lead - Zinc - Copper - Barite)

Report by:

"D.R. Cochrane"

D.R. Cochrane, P. Eng.,
July 20, 1971,
Delta, B.C.

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PART A

A-1 INTRODUCTION:

This report describes the geology, mineralization and previous exploration work on the Atan Property of Tournigan Mining Explorations Ltd. It contains recommendations and a cost estimate for additional work. It is based on the author's associations with the property since 1968, and recent personal visits in April and July, 1971.

A-2 SUMMARY AND CONCLUSIONS:

(a) Tournigan Mining Explorations Ltd., owns outright title to a total of 43 located, contiguous, full sized claims, and 3 fractions, situated in and around Atan Lake, near McDame Post, in the Liard Mining Division of northern British Columbia. The Pacific Great Eastern Railway right-of-way over the Atan property is presumably for feasibility surveys on the extension of the railway northerly from Dease Lake.

(b) The claims cover a favourable limestone-dolomite horizon which trends northwesterly through the claims for just over one mile in length. The band is approximately 400 feet wide. Several lenses within this horizon contain abundant barite, and knots and clusters of medium to coarse-grained galena. Trace amounts of chalcopyrite, tetrahedrite and chalcocite occur in shears and brecciated zones, and is sometimes associated with barite and galena mineralization.

(c) The host rock is the younger (upper) Atan subgroup, a lower Cambrian sequence which is situated on the west flank of the McDame synclorium. Between McDame Post, and Mount Haskin (a distance of 16 miles), the Atan Group is host to five mineral occurrences. These occurrences are characterized by similar mineral assemblages, including sphalerite, galena, pyrite, pyrrothite and chalcopyrite. The southern two occurrences, the Bill Group (owned by Dresser Industries) and the Atan Property of Tournigan Mining Explorations Ltd., contain patches of abundant barite.

(d) Previous exploration work on the Atan Lake property covering just under half the claims area has included induced polarization, geochemical soil sampling, geological mapping, and a gravity test survey. The IP survey outlined 3 strong chargeability anomalies. Anomaly No. 1 was tested by drilling and Anomaly No. 3 by bulldozer trenching. The gravity test indicated an excess mass estimated at 4½ million tons on IP Anomaly No. 3. Trenches on the anomaly expose lenses and pods of massive barite, knots of galena, scattered chalcopyrite and fine grained tetrahedrite.

(e) Gravity surveying appears to be a most informative tool, but must be conducted in conjunction with levelling and hammer seismic surveys in order to accurately interpret data.

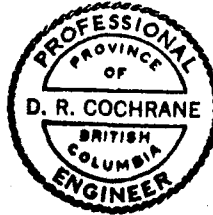
(f) Geochemical soil sampling is of limited use because of the calcareous nature of the bedrock and overlying soil.

(g) An exploration program is recommended in order to:

(i) explore the remainder of the claims area;

(ii) estimate the grade and tonnage of the barite-galena bearing zones.

(h) The estimated cost of the program is \$60,000.00.



Respectfully submitted,

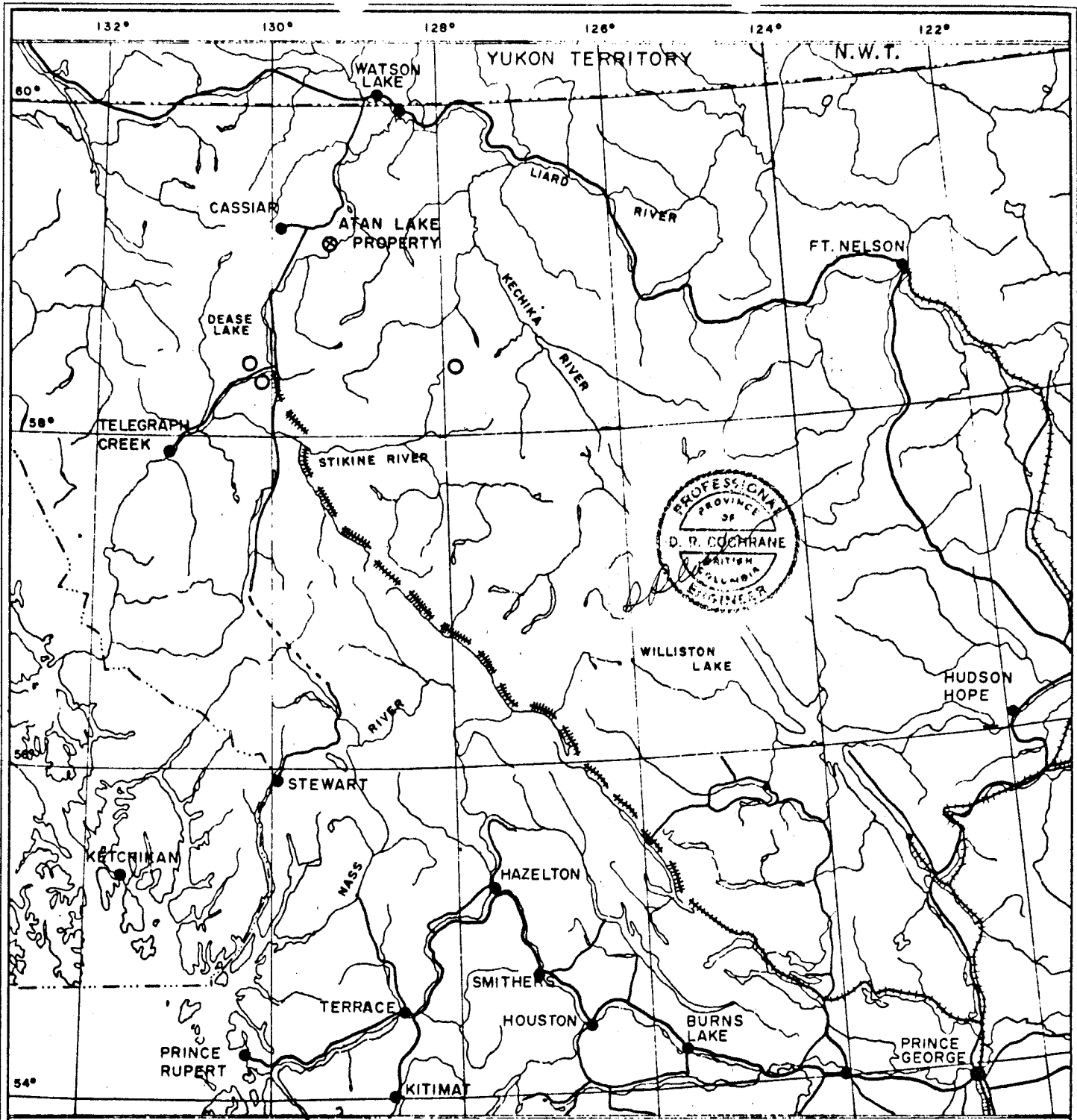
"D. R. Cochrane"

D. R. Cochrane, P. Eng.,
July 20, 1971,
Delta, B.C.

PART B

B-1 LOCATION AND ACCESS:

The Atan Lake property is situated immediately east of the now abandoned settlement of McDame Post on the Dease River, in Northern British Columbia. Normal access is by 4 x 4 truck, as follows: west from the town of Watson Lake, Yukon, to Mile 650 of the Alaska Highway; south from this point on the Cassiar road, and past Good Hope Lake to the McDame Post Road (a distance of approximately 60 miles); thence southeast on the McDame Post Road to Dease River and east one mile to the camp. The Alaska Highway and Cassiar Roads are all-weather gravel roads; however, some washouts do occasionally occur during the spring run-off. The McDame Post Road is a narrow dirt track often impassable after a heavy rain. A network of cat roads has been constructed from camp and provide facile access to most parts of the claim group. Atan Lake and the Dease River are sufficiently large to accommodate a float equipped light aircraft. The nearest air base is in Watson Lake, approximately 70 miles north of McDame Post. (See Figure 1)



LEGEND

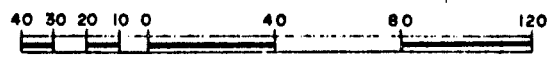
- ##### P.G.E. Riwy.
- ## ## P.G.E. (proposed)
- Highways
- Cities and Towns
- ⊗ Properties

FIGURE 1

**TOURNIGAN MINING EXPLORATIONS LTD.
LOCATION MAP
ATAN LAKE PROPERTY**

To accompany report by
D. R. Cochrane, P. Eng.
on the Atan Lake
Property in the Liard M.D.
located 58 miles N.E.
from Dease Lake, B.C.
Dated July 20, 1971 at
Delta, B.C.

Scale of miles



There has been a restriction placed on staking mineral claims along the Dease River, as this area is reserved for the Pacific Great Eastern Railway, (reference 7). Presumably the reserve is a right-of-way for the proposed northerly rail extension from Dease Lake. The latitude is 59°10'N, the longitude 129°15'W and N.T.S. code 104 P/3.

B-2 CLAIMS AND OWNERSHIP:

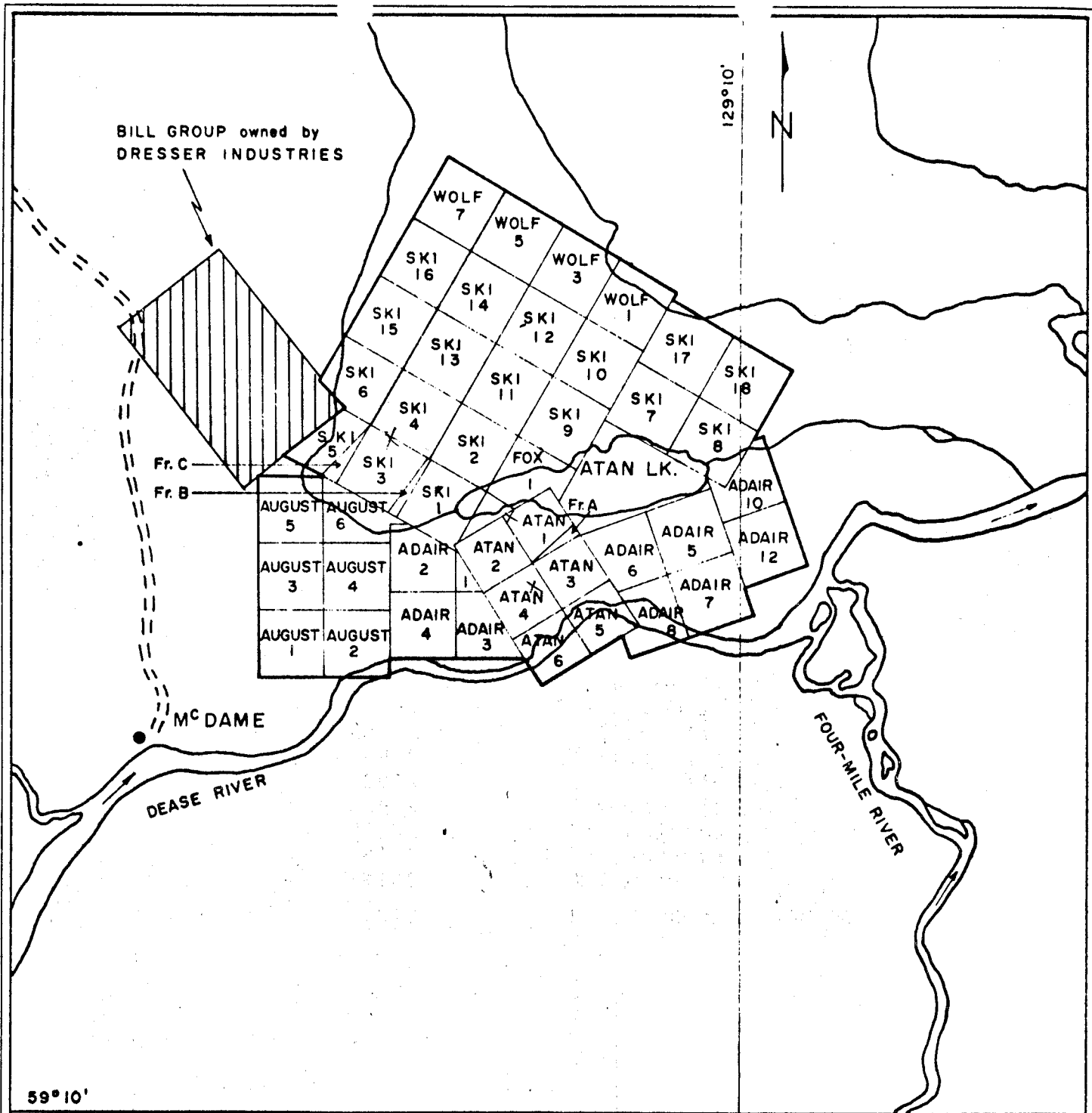
Tournigan Mining Explorations Ltd., registered Office 1177 West Hastings Street, Vancouver, B.C., owns outright 43 located contiguous, full-sized claims and 3 fractions in the Liard Mining Division. The claims are grouped, and the record numbers are as follows:

	<u>Claim Name</u>	<u>Record Numbers</u>
<u>(a) ATAN GROUP</u>	Atan No. 1 - 4	28358 - 361
	Atan No. 5 - 6	28362 - 363
	Fox No. 1	26935
	Adair No. 1 - 8	26936 - 943
	Ski No. 1 - 2	26948 - 949
	Ski No. 3	26950
	Ski No. 4	26951
	Ski No. 5 - 18	26952 - 965
	Wolf No. 1	26927
	Wolf No. 3	26929
	Wolf No. 5	26931
	Wolf No. 7	26933
	Fraction "A" Fr.	38159
	Fraction "B" Fr.	38160
Fraction "C" Fr.	38161	
<u>(b) AUGUST GROUP</u>	August No. 1 - 6	31212 - 31217

Several claim posts were inspected by the author, and claims appear to be staked in accordance with the regulations set out in the Mineral Act of the Province of British Columbia. Some slight overlap of the Ski No. 5 claim occurs in the west property sector, with the Bill claims owned by Dresser Magcobar Industries Ltd.

B-3 GENERAL SETTING:

The Atan claim group is situated close to the east boundary of the Stikine Range of the Cassiar Mountain Physiographic Division of British Columbia; and immediately west of the Liard Plain. The immediate area is a reasonably rugged mountainous region exhibiting many features characteristic of a complex geologic history and alpine glaciation. The highest peak in the vicinity is Black-fox Mountain, rising to 7,022 feet above mean sea level. The Dease

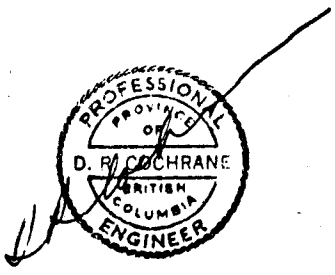


59°10'

TOURNIGAN MINING EXPLORATIONS LTD.

**ATAN LAKE PROPERTY
CLAIMS MAP**

FIGURE 2



To accompany report by D.R. Cochrane, P. Eng on the Atan Lake Property dated July 20, 1971 at Delta, B.C.

River flows northeasterly through the mountains within a broad "U" shaped valley (elevation just less than 2,500 feet above mean sea level). The property is situated within this valley, at the foot of an unnamed peak which rises to over 6,000 feet to the north of the area surveyed. Geological mapping by H. Gabrielse (2) shows that the claims lie on the west flank of an anticlinorium, composed of a lower Paleozoic and upper Proterozoic miogeosynclinal rock sequences. The area close to the claims was mapped as Upper Atan Group, consisting mainly of limestones and dolomites with minor interbedded shales.

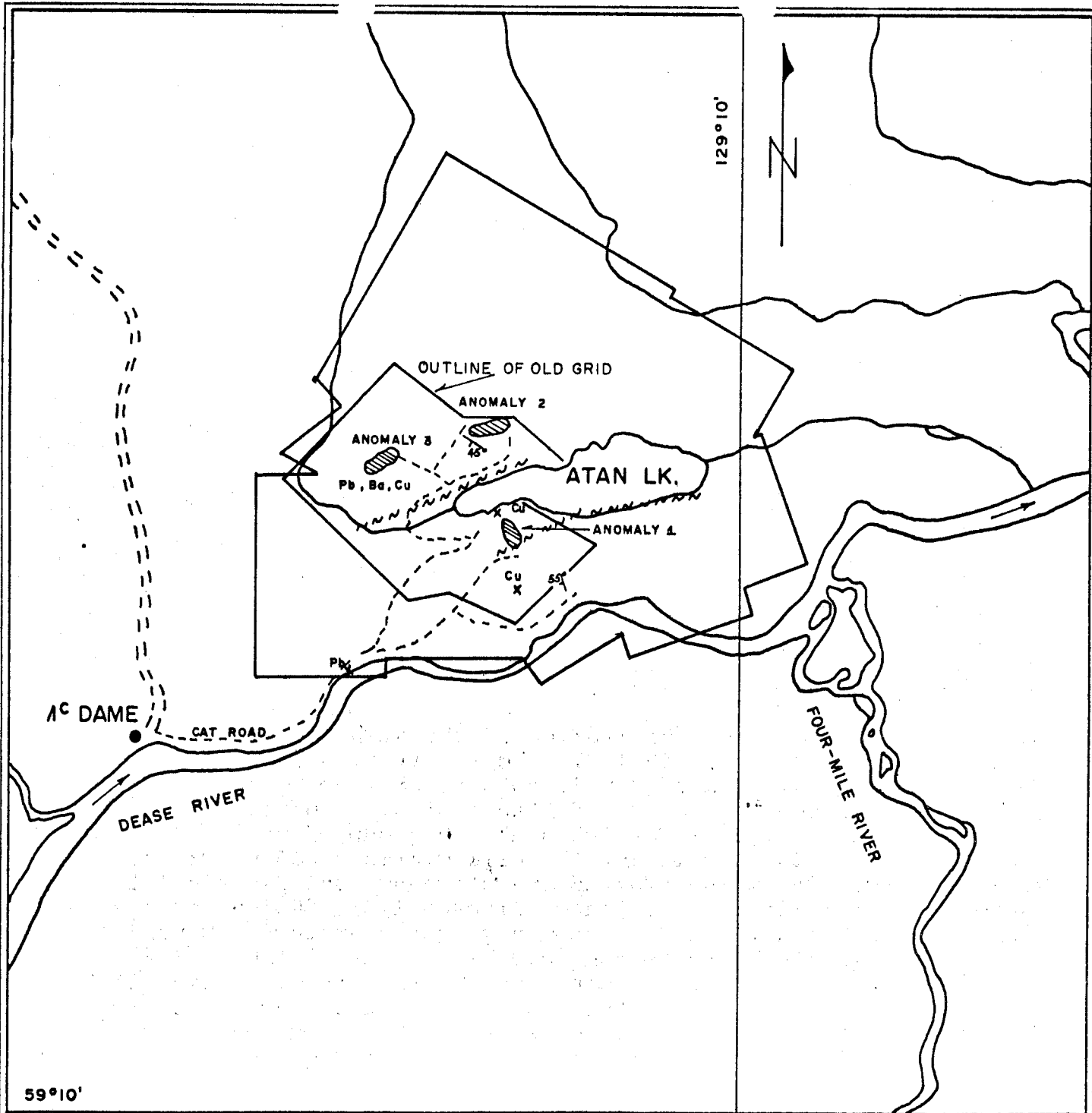
Exploration interest is centered primarily on a fairly narrow dolomite limestone member which, in places, is quite oolitic and sometimes brecciated. It is similar in many respects to a "reef type" limestone. This member, between McDame and Mt. Haskin (a distance of 16 miles) is host to five mineral occurrences (including Tournigan Mining's), (2, pages 113-116). These prospects are characterized by similar mineral assemblages, and include galena, sphalerite, pyrite, chalcopyrite and pyrrhotite. In the case of the most southerly two prospects (Carlick Group or the Bill claims, and the Tournigan Mining showings) barite is abundant and occurs with minor siderite.

B-4 PREVIOUS WORK:








The first recorded observation of the Atan Lake occurrence was by G. M. Dawson (1)* in 1887. He reported an "argentiferous lead occurrence", situated a mile down river from McDame Post, and on what is now the Adair and Atan claims. Gabrielse (2) reports that in 1949, Beal Carlick staked a group of claims 2 miles north of McDame on what is now the Bill Claims owned by Dresser-Magcobar Ltd. Gabrielse visited the showings, and described the occurrence as follows: (reference (1) page 113), "Galena is the chief metallic mineral and is commonly coarse grained. Minor pyrite, sphalerite, azurite and malachite occur in the deposit. Coarse-grained barite is abundant and occurs with minor siderite". A few claims were staked in the Atan Lake area by local prospectors in the 60's, but allowed to lapse in 1967. During the same year, Tournigan Mining Explorations Ltd. located claims in the Atan Lake area, and added a few claims and fractions in subsequent years.

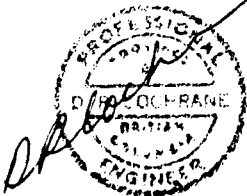
In August, 1968, a field crew employed by Geo-X Surveys Ltd., and supervised by the author, completed a total of 12 line miles of an induced polarization and geochemical soil sampling survey over the southwest half of the property, (3). Several strong chargeability anomalies were discovered and some of these correlated with weak Zn, Cu and Pb geochemical soil anomalies. Computer processing of this data is described in a paper presented at a Symposium on Decision Making, (reference 5).

* References tabulated in Appendix II



LEGEND

-  Assumed Fault
-  Copper
-  Barite
-  Lead
-  Strike and Dip of ATAN GROUP
-  IP Anomalies
-  Cat Road



TOURNIGAN MINING EXPLORATIONS LTD.

**ATAN LAKE PROPERTY
ECONOMIC
GEOLOGY MAP**

FIGURE 3



To accompany report by D.R. Cochrane, P. Eng on the Atan Lake Property dated July 20, 1971 at Delta, B.C.

In the summer of 1969, a program of trenching, geological mapping and diamond drilling was carried out on two of the three chargeability anomalies, (reference 4). The three drill holes, which tested the southern IP anomaly, immediately south of Atan Lake, encountered minor barite, pyrite, magnesite and scattered trace amounts of malachite, chalcopyrite and pyrrhotite in a dolomite-limestone sequence. Bulldozer trenching on IP Anomaly No. 3, situated just over 3,000 feet northwest of IP Anomaly No. 1 exposed lenses and patches of barite, in an impure limestone member, with knots of galena, and traces of chalcocite, tetrahedrite and chalcopyrite. Trenching on chargeability Anomaly No. 2 was attempted but bedrock was not exposed.

In the fall of 1970, New Jersey Zinc Exploration Company (Canada) Ltd. optioned the claims and conducted a gravity test survey over a portion of the grid area, (6). The results showed a residual gravity peak of 2.17 milligals coinciding with the high chargeability anomaly designated No. 3. H. E. Swanson, (Geophysicist with New Jersey Zinc Co.) estimated 4½ million tons of excess mass in the IP anomaly No. 3 area, assuming that there is no overburden correction (that is, the overburden is only a few feet thick throughout).

PART C

C-1 GEOLOGY:

(a) Local Stratigraphy and Structure

The geophysical surveying, and subsequent computer data processing of the information suggested that the chargeability anomalies were lithologically controlled. Subsequent geological mapping, after trenching to bedrock, has shown that this is most likely the case. Therefore, the stratigraphy and structure are most important to exploration. Mr. H. Naylor (4) divided the local series into a Younger Atan Group, composed chiefly of limestone and dolomite with minor interbedded argillite, sandstone and quartzite, and an Older Atan Group composed of quartzite and shale.

The strike of the bedding varies from 300 to 315° (azimuth), and dips vary between 45° to 60° to the southwest. The local structure is complex, and with the addition of such variables as facies changes, swelling and pinching of limestone members, selective dolomitization of some of the bands, and paucity of outcrops, further complicate the overall picture. Faulting is common, and predominantly southwesterly directed. It dissects the sedimentary sequence into a number of blocks, in some cases, with considerable strike separation. Faulting parallel to the bedding has also been reported.

(b) Mineralization

Naylor (4) describes the mineralization as "exposed in four main areas along a favourable horizon about 1 3/4 miles long and 400 feet wide, in small lenses and patches. The exposures are separated by large covered areas. Three of these exposures are on the Atan Group of claims, and the other is on the Bill Claims which cover the west end of the favourable horizon and are owned by Dresser Industries." The mineralization may be categorized into two main groups:

1. Knots of medium to coarse-grained galena (sometimes quite massive and up to 6 inches in diameter) associated with barite lenses. Barite occurs in veins and veinlets parallel to bedding and in cross faults almost at 90 degrees to the bedding.
2. Copper metallization, (including chalcopyrite, chalcocite, tetrahedrite, and associated secondary minerals, in fractures, breccia and shears,) is not particularly confined to one single lithologic unit.

There is considerable overlap of the two classes, as for example in the northwest trench area (anomaly #3), lenses of barite with knots of galena often contain traces of fine grained tetrahedrite and specks of chalcopyrite.

C-2 REVIEW OF THE GEOPHYSICS TO DATE:

In 1968 a test line of magnetometer surveying was conducted across IP Anomaly No. 2, but magnetic susceptibility contrast between the various lithologic units was insufficient for mapping purposes. The induced polarization survey was successful in that the trenching of Number 3 Anomaly exposed barite, lead and copper mineralization. However, the host rock is a "dirty" dolomitic member which is quite graphitic. Thus, an unknown portion of the chargeability is due to graphite. Thus, additional IP work on the remainder of the claims area may in fact simply be identifying graphitic evaporite lenses. Resistivity surveying, however, appears to be a fair guide to overall structure.

On the other hand, the gravity test survey conducted by New Jersey Zinc Company, was successful in outlining the northern (No. 3) anomaly. Gravity data has additional value in that tonnage estimates of any excess mass anomaly may be made. Accurate interpretation, however, requires quite precise levelling (elevation control on stations) and a reasonably accurate idea of the overburden depth. Thus, the most accurate method of outlining barite-galena mineralization is by gravity surveys, with levelling and hammer seismic surveys as necessary interpretational aids.

C-3 REVIEW OF GEOCHEMISTRY TO DATE:

The geochemical soil sampling survey conducted by Geo-X Surveys Ltd. was not overly successful. This is believed to be due to the fact that calcareous bedrock "fixes" the metals and consequently only minor amounts of these metals are available for migration and redeposition into the upper B soil horizon. The best example occurs over the No. 3 anomaly where the following peak metal contents occur and are compared with the "mean" (background) values:

<u>Metal</u>	<u>Peak over No. 3 anomaly (p.p.m.)</u>	<u>Background (arithmetic mean, p.p.m.)</u>
Cu (Copper)	20	13
Zn (Zinc)	320	84
Pb (Lead)	48	14
Ag (Silver)	0.5	approx. 0.5

Thus, it is clear that with respect to Cu, Pb and Ag at least, geochemical soil sampling surveys are quite limited in value in the Atan Lake area.

C-4 RECOMMENDATIONS:

To date, about 50 percent of the Atan-August claim groups have been explored. Previous work has indicated scattered barite, lead and copper mineralization over a favourable belt over one mile long and approximately 400 feet wide. It is not known if parallel bands exist to the east, or if the horizon continues southeast across the Dease River.

Barite appears to be the most abundant mineral present, and the possible extension of the Pacific Great Eastern Railway from Dease Lake north may alter considerably the economics of the occurrence. It would be advisable to estimate the tonnage, by gravity methods, and the grade by drilling and trenching in order that an overall economic view of the situation may be obtained.

The following exploration program is recommended on Tournigan Mining's Atan Lake property:

- A. Establish camp and rechain old lines (if necessary). Extend the grid to the outside claims boundaries. Approximately 15 additional line miles should adequately cover the property, with cross lines spaced 500 feet apart. The grid lines should be well cleared to facilitate recommendations B and C below.
- B. Establish the elevations of the base line stations, and all 100 foot stations on the cross lines (to within a few 10th's of a foot).

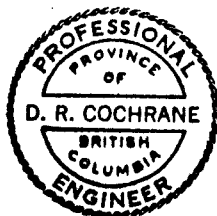
- C. Conduct a gravity survey of the old and new grid with meter readings at 100 feet intervals along all cross lines and base lines.
- D. Conduct a hammer seismic survey over anomalously high gravity zones to permit the accurate interpretation of the gravity data.
- E. Construct drill access roads to areas of deep overburden, and bulldozer trench anomalous areas with shallow overburden (as determined by overburden seismic work).
- F. Diamond drill IP anomalies No. 2 (a) and 3, and any anomalous gravity highs.

C-5 COST ESTIMATE:

The estimated cost of the above recommended program is as follows:

1.	15 line miles of additional linecutting @ \$100/line mile	\$ 1,500.00
2.	30 line miles of levelling @ \$75/line mile	2,025.00
3.	30 line miles of gravity survey @ \$250/line mile	7,500.00
4.	15 line miles of seismic @ \$400/line mile	6,000.00
5.	Trenching, road building (est. 150 hrs. @ \$35/hour)	5,250.00
6.	Consulting, supervision	2,500.00
7.	Diamond Drilling: 1500 feet @ \$15/foot	22,500.00
8.	Transportation, communications	2,500.00
9.	Camp and supplies	2,200.00
10.	Assaying, chemical analysis, testing, etc.	2,000.00
		\$ 53,975.00
11.	Contingencies @ 10 percent	5,397.50
		<u>5,397.50</u>
	TOTAL	\$ 59,372.50
	SAY	\$ <u>60,000.00</u>

If, after completion of the above-described program, the results are sufficiently encouraging, additional funds will be required to conduct fill in drilling.



Respectfully submitted,

"D. R. Cochrane"

D. R. Cochrane, P. Eng.,
Delta, B.C.
July 20, 1971.

APPENDIX I

Certificate

I, D. R. Cochrane, of the Municipality of Delta, Province of British Columbia, hereby certify that:

1. I am a geological engineer with an office at 4952 8A Avenue, Delta, B.C.
2. I am a graduate of the University of Toronto (B.A.Sc.) in 1962, and a graduate of Queen's University (M.Sc. Eng.) in 1964.
3. I have practiced my profession since 1962 while employed with U.S. Steel, Noranda Explorations and Meridian Syndicate.
4. I am a member of the Association of Professional Engineers of British Columbia and also the Association of Professional Engineers of Ontario and Saskatchewan.
5. I have no interest, direct or indirect, in the property or securities of Tournigan Mining Explorations Ltd., nor do I expect to receive any such interest.
6. The foregoing report is based on my association with the Atan Property since 1968, and recent personal visits in April and July, 1971.
7. I hereby consent to have the information contained herein published in a Prospectus of Tournigan Mining Explorations Ltd., or in any official or unofficial communications of Tournigan Mining Explorations Ltd.

"D. R. Cochrane"

D. R. Cochrane, P. Eng.

4952 8A Avenue,
Delta, B.C.

July 20, 1971.

APPENDIX II

Bibliography

- (1) DAWSON, G.M., (1889), Report on an Exploration in the Yukon District, NWT, and Adjacent Northern Portion of B.C., Geol. Survey of Canada, Annual Report, 1887, Vol. 3, Part B, pages 1 - 183.
- (2) GABRIELSE, H., (1963), McDame Map Area, Cassiar District, B.C., G.S.C. Memoir 319.
- (3) COCHRANE, D.R., (1968), Geophysical and Geochemical Report on portions of the Adair, Ski, August and Atan Claims. B.C. Department of Mines Assessment Report No. 1813.
- (4) NAYLOR, H. (1969) Tournigan Mining Explorations Ltd. Report on Exploration, Atan Group (Private Report).
- (5) COCHRANE, D.R., (1969) An Example of Trend Surface Analysis Applied to Exploration Data, A paper delivered at Symposium on Decision Making in Mineral Explorations II, held in Vancouver, Feb. 6-7, 1969.
- (6) New Jersey Zinc Company, Research Dept., Report No. 2762, dated Nov. 7, 1970, by H.E. Swanson (Private Report).
- (7) B.C. Department of Mines Mineral Claims Map No. 123M-1.