COMINCO LTD.

EXPLORATION
NTS 92 I/11W

WESTERN DISTRICT
October 4, 1978

ASSESSMENT REPORT

on the

LOFAR, HIFAR AND SOFAR CLAIMS

GEOLOGY REPORT

Latitude: 50°34'50" Longitude: 121°18'50"

Kamloops Mining District

Report by: M.J. Casselman

Period of Work

May 23, 1978 August 24, 1978

Part 1 of 3

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COMINCO LTD.

EXPLORATION

WESTERN DISTRICT
28 SEPTEMBER 1978

ASSESSMENT REPORT

LOFAR PROPERTY

SUMMARY

The Lofar property is situated on the west margin of the Quesnel Trough Structural Province in what is now interpreted to be Triassic rocks. The property, comprising the Lofar, Hifar, and Sofar claims, was staked in September 1977. It has been mapped on a scale of 1 inch = 450 feet.

The property covers metavolcanics of the calc-alkaline andesite to rhyolite association and their related chemical and clastic metasediments. The volcanic and sedimentary units have been intruded locally by diorite, dacite and rhyolite plugs and dykes. Most of the intrusives are thought to be subvolcanic equivalents of the volcanic units. The volcanic and sedimentary units occur as a north to north northwest striking, west dipping monoclinal sequence that has been metamorphosed to the mid greenschist facies.

The property is being investigated for rhyolite associated stratiform massive sulphide deposits of the Kuroko-type (Py-Zn-Pb-Cu-Ag-Au). The most significant mineralization located to date occurs in the central part of the Lofar claim where the rhyolite and locally the dacite units have been variably leached, silicified and pyritized and empregnated with gypsum, locally talc, and more rarily trace barite, chalcopyrite and sphalerite. The alteration zones, because of the abundance of gypsum, are interpreted to represent a facies which commonly develops adjacent to many base metal bearing Kuroko-type massive sulphide deposits. It is felt that base metal bearing massive sulphide concentrations may exist along strike or down dip under the overburden covered areas adjacent to these alteration zones. The only other mineralization observed on the property includes minor disseminated pyrite which occurs locally in the rhyolite units found on the Hifar claim and throughout most of the rhyolite units found on the Sofar claim. No base metals were found on these claim groups. The Hifar claim is not regarded as an attractive area to search for base metal massive sulphide deposits, however, the Sofar claim, because of the extensive areas covered by overburden, is still considered to have some potential.

A soil sampling survey was conducted over part of the Lofar and Sofar claims. The soil samples were analysed for Cu-Zn-Pb and Hg. The results of this program are covered in a separate report.

Part of the Lofar claim was covered by IP, VLF and Magnetometer surveys. The results of these surveys are covered in a separate report.

INTRODUCTION

This report describes the results of a geological mapping project on the Lofar property, situated 20 km south of Cache Creek, B.C. The work was conducted by M.J. Casselman and D.J. Andrews variously during the period May 22 to June 3 and August 22 to August 24, 1978. Data is presented at a scale of 1 inch equals 450 feet.

LOCATION AND ACCESS

The Lofar property comprises the Lofar, Hifar and Sofar claims(42 units). It is situated approximately 20 km south of Cache Creek, B.C. along the Trans Canada Highway in the area just south of Red Hill. The Thompson River cuts through the east side of the Lofar claim and closely borders the east side of the Hifar and Sofar claims. The Lofar and Hifar claims are situated immediately north of this reserve. All three claim groups are readily accessible from the Trans Canada Highway. The Lofar and Hifar claims are also accessible from the Venables Lake Road.

TOPOGRAPHY AND VEGETATION

The property lies between 300 and 600 meters above sea level with the greatest elevation occurring on the Hifar claims. The area along the Thompson River is largely boulder and gravel covered. Most of the Lofar and Sofar claims are sage brush and grass covered with pine trees occuring locally. The west half of the Hifar claim is largely pine tree covered while on the east half sage brush and grass abound. Outcrop is most common in the central and western parts of the Lofar claim and the west side of the Hifar claim. It occurs sporatically throughout most of the Sofar claim. Outcrop averages about 2-3% on the Lofar claim, 10-20% on the Hifar claim and 5-10% on the Sofar claim. The outcrops are generally lichen covered.

PREVIOUS WORK

This property has undergone several stages of previous work. The first recorded work on the property occurs in Assessment Report 3680. This work, conducted by the El Paso Mining and Milling Company, comprised geological mapping, a soil Cu-Mo geochemical survey and 1200 feet of percussion drilling. Although there is evidence of other older work on the property there are no records of this work. The older work is indicated by the existence of two shafts on the Lofar claim and a short adit on the Sofar claim. The shafts on the Lofar claim appear to be fairly shallow and since they are situated in gypsum rich sections of the gossan zones, they are thought to have been developed with the intention of recovering gypsum. The adit on the Sofar claim follows a network of quartz veins and is presumed to have been tests of these veins for precious metals.

CLAIMS

The Lofar property comprises the Lofar claim (18 units), the Hifar claim (9 units) and the Sofar claim (12 units). The Lofar and Hifar claims are contiguous and the Sofar claim is situated 2.0 km to the north. The record number on the Lofar, Hifar and Sofar claims are numbers 1066, 1048 and 1049.

GEOLOGY

General

The Lofar property is located on the west margin of the Quesnel Trough Structural Province in what is mapped as Paleozoic Cache Creek Group rocks (greenstone, chert, argillite, minor limestone and quartzite; chlorite and quartz-mica schist) by S. Duffel and K.C. McTaggart 1945-1947 (Map 1010A). Recent mapping by the BCDM now interprets these units to be Triassic (Bill MacMillan; personnel communication, 1977). The Lofar property was mapped at a scale of 1 inch = 450 feet. Mapping control was provided by 1 inch = ½ mile airphotographs

and by 1 inch = 450 foot enlargements of the airphotographs. A baseline and grid were also constructed on the Lofar claim.

The property comprises a north to north northwest striking and west dipping monoclinal sequence of metavolcanics with minor metasediments. These units have been locally cut by diorite, dacite and granite dykes and plugs. The metavolcanics include primarily andesite, dacite and rhyolite pyroclastics although locally flows were noted and the metasediments consist of thin limestone and chert beds. It should be noted that although the metavolcanics have been compositionally grouped into andesite, dacite and rhyolite units each of these units spans a slightly larger compositional range. The andesite units includes basaltic andesite and dacitic andesite phases and the rhyolite units also include dacitic rhyolite phases. The groupings are felt to still represent an acceptible presentation of the rock types on the property. The groupings were necessitated because of mapping inconsistencies which led to units disappearing or re-appearing unexpectedly and because of outcrop deficiencies which resulted in difficulties in correlating units between areas.

Diorite, dacite and granite intrusives occur locally on the property. There are two types of diorite intrusives which can be distinguished by texture and composition. One of the diorite types (7A) is considered to be coeval with the development of the volcanic pile and is the subvolcanic equivalent of the andesite units. The other diorite unit (7B) is thought to have been emplaced much later than the first diorite and probably post-dates the tectonic event which deformed the volcanic-sedimentary pile. The dacite and granite intrusives occur locally throughout the three claim groups and are thought to also be coeval with the development of the volcanic pile and to represent subvolcanic equivalents of the dacite and rhyolite volcanic units repsectively.

The rock types have been defined primarily on the basis of field observations with colour index and quartz-eye phenocryst concentrations being the most useful compositional determinent. However, twelve rock specimens representative of most of the volcanic and intrusive rock types present on the property were also analysed for major elements and this information was used to confirm the rock types defined by the field mapping.

The most significant mineralization found to date occurs in the central part of the Lofar claims where the metavolcanics, especially the rhyolites, have been variably hydrothermally leached, silicified, and pyritized and empregnated with gypsum, locally talc, and more rarely trace barite, chalcopyrite and spahlerite. These mineralized and altered areas are being investigated both for stratiform base metal bearing massive sulphide mineralization or as possibly representing the lateral facies transition of base metal mineralization which may occur either down dip or along strike from these zones.

The only other mineralization observed on the property includes minor disseminated pyrite with occurs locally in the rhyolite units on the Hifar claim and throughout the rhyolite units in the Sofar claim.

STRATIGRAPHY

Andesite Units

The andesite units as indicated also include basaltic and dacitic andesites.

The andesite units are dark green, fine to medium grained to porphyritic and weak to strongly foliated (generally moderately foliated). The andesites generally contain 15 to 30% feldspar grains and 20 to 40% pyroxene grains.

The porphyritic varieties contain feldspar and/or pyroxene phenocrysts in a fine-grained matrix. The pyroxenes are often epidotized. Locally in the dacitic andesites 1-2% quartz-eyes are observed. The very sheared andesites are commonly quite chloritic and few textures remain. The basaltic andesite phases are similar to the andesite phases except that they are slightly darker coloured and usually more massive and chloritic. The dacitic andesites differ from the andesite phases in that they are slightly less green (mid to dark green) and often contain 1-2% quartz-eyes. For composition of the andesite and basaltic andesite units see Appendix A.

The andesite units are largely pyroclastic with flow phases only occurring locally. The pyroclastics are mainly lapilli tuff sized although tuff and breccia phases are common. The fragments are commonly elongated parallel to foliation due to tectonic over printing. Minor ash flows were observed in the andesite units on the Lofar and Hifar claims. The fragments in the ash flows range from tuff to breccia size and vary from subrounded to rounded. The andesite ash flows usually contain some dacite and rhyolite fragments. Thin andesite tuff bands occur locally in the andesite ash flows and pyroclastics phases. The rare andesite flows noted are usually more massive than the pyroclastics, locally porphyritic (feldspar and pyroxene phenocyrsts) and occasionally contain amygdules, vesicles and even some pillow structures. The pillows are stretched and flattened and commonly epidotized on the margins.

Dacite Units

The dacite units are mid green, fine to medium grained to porphyritic and weakly to moderately foliated. They contain 10 to 20% feldspar grains and 2 to 8% quartz-eye grains in a fine grained matrix. Tiny evenly disseminated mid green mafic minerals (5-10%) also are noted and are suspected to be amphiboles. Locally the mafic minerals are quite epidotized. For composition of the dacite pyroclastics see Appendix A.

The dacite units are commonly pyroclastic although locally flow phases were noted. The pyroclastic phases are mainly lapilli tuffs although tuff and breccia phases are locally common. Breccia phases comprise large parts of the eastern and central Sofar claim. The fragments are elongated parallel to foliation due to tectonic overprinting. The tuff phases appear to be mainly crystal tuffs with quartz-eye and feldspar grains dominating over lithic fragments. The tuffs commonly appear to be weakly bedded, however, shearing has disrupted or often obliterated these structures. The dacite flows noted are usually more massive than the pyroclastics and commonly porphyritic with feldspar and quartz-eye phenocrysts occuring in a fine-grained mid green matrix. The flow phases are very irregular in distribution and there is some possiblity that these flows may in fact be dykes or sills.

Rhyolite Unit

There are two rhyolite units designated 3 and 3a. Unit 3 is the most common and occurs thoughout all three claim groups. This unit also includes dacitic rhyolites. Unit 3a was only observed on the Hifar claim. The Unit 3 rhyolites are white to light green, fine to medium grained, often porphyritic,

and usually weakly to moderately foliated. They contain 5 to 15% feldspar grains, 5 to 15% quartz-eyes and tiny evenly disseminated mid green mafic minerals, probably amphiboles, in a very fine grained matrix. The rhyolites commonly contain 1 to 3% pyrite. The dacitic rhyolites are similar to the rhyolites except that they are light green instead of white and contain slightly fewer quartz-eye grains (5 to 10%). The rhyolite unit 3a is light to mid green, massive to very weakly foliated and aphanitic to fine grained to weakly porphyritic. This unit commonly breaks in a concoidal fracture and is quite similar to chert in texture except for the tiny green mafic grains. These tiny evenly disseminated mid green mafic minerals (5 to 10%) were the only identified in this unit. For composition of the unit 3 rhyolite pyroclastics and the unit 3a rhyolites see Appendix A.

The rhyolite unit 3 is mainly pyroclastic with lapilli tuff phases dominating, although breccia and tuff phases are common. The fragments are elongated parallel to foliation due to tectonic overprinting. The rhyolite tuffs are generally crystal tuffs with quartz and feldspar grains dominating over lithic fragments. The tuffs are locally bedded, however, shearing has commonly disrupted or obliterated these structures. Rhyolite flows may occur, but are felt to be minor components and are difficult to distinguish from the tuff phases.

The rhyolite unit 3a is generally thought to be a fine grained tuff or flow rather than an intrusive as no coarse grained phases were noted even in the thicker occurrences of the unit. Also it was locally observed intercalated with other units. However, the origin of the unit 3a is still questionable.

Limestone Unit

The limestone unit was observed in three areas in the southeast corner of the Lofar claim. It could not be traced laterally between the three exposures due to limited outcrop exposure. However, all three limestone occurrences appear to be located at the same stratigraphic interval which occurs within the mineralized and hydrothermally altered rhyolite units. This unit may represent a chemical sediment or "exhalite" unit which developed in conjunction with the hotspring-fumarolic mineralizing processes. The limestone unit is white to buff brown, varies from bedded and massive to strongly foliated and fine to medium grained depending on its purity. Its composition ranges from nearly pure carbonate to calcareous tuffites. The tuff component is usually rhyolite although intermixed andesite material was also observed. The limestone unit varies in thickness from 1.5 to 3 meters and usually grades vertically into rhyolite or less commonly, andesite pyroclastics.

Chert Units

The chert units occur as thin horizons throughout the property. Chert was also observed as a common fragment in the rhyolite pyroclastics and locally in the dacite and andesite pyroclastics which indicates that chert horizons probably formed periodically throughout the history of the volcanic pile. The chert units observed are grey, very fine grained to aphanitic, massive and locally finely laminated. The best exposed chert horizon was observed on the Hifar claim (about 1 meter thick). Some of the andesite, dacite and rhyolite tuffs also have a cherty component within them.

INTRUSIVES

Diorite

There are two diorite intrusives designated units 6 and 6a. Although both intrusives are dioritic in composition, they are considerably different in texture. Unit 6 is the most common unit. It occurs in the southwest corner and north central part of the Lofar claim and just west of Hifar claim. This unit is dark black green, medium to coarse grained to almost porphyritic, and moderately to strongly foliated. It consists of pyroxene (25 to 40%) and feldspar grains. Unit 6a occurs in the north central part of the Lofar claim. It is dark green, fine grained, usually porphyritic and massive to only weakly foliated. Unit 6a contains 15 to 20% pyroxene phenocrysts and 0 to 15% feldspar phenocrysts. This unit is often columnar jointed on the margins and is much more massive and unfoliated than unit 6. Unit 6a cuts unit 6 and is possibly post deformation. Unit 6 is thought to be a subvolcanic equivlaent to the andesite volcanic units while unit 6a may be genetically unrelated to the development of the volcanic pile.

Dacite

The dacite intrusives occur as irregular shaped bodies thoughout the three claim groups with the largest exposures located just south of the Lofar claim and on the east side of the Sofar claim. The dacites are mid green, fine to medium grained and usually porphyritic and massive to weakly foliated. They contain 5 to 20% feldspar phenocrysts, 3 to 10% quartz-eye phenocrysts and usually evenly disseminated tiny green mafic minerals, probably amphiboles, all enclosed in a fine grained mid green matrix. The dacite intrusives resemble the dacite crystal tuffs except that they are more massive and cross-cut the stratigraphy. Locally coarse grained equigranular phases were also noted in most of the more extensive dacite intrusive exposures. The dacite intrusives are probably the subvolcanic equivalent to the dacite volcanic units.

Granite

The granite intrusives are fairly rare and occur on the claim groups as dykes or sills. These intrusives are white, medium to coarse grained, and massive. They contain primarily quartz and feldspar grains. The quartz grains vary from 5 to 20%. The granites also usually contain disseminated pyrite (1 to 3%) which gives them a reddish weathering appearance. Anostimozing systems of quartz veins are also commonly associated with the granites. The granites are quite similar to the rhyolite units except they are coarse equigranular while the rhyolite units tend to be porphyritic. They are also more massive and unfoliated. The granites are thought to be the subvolcanic equivalent to the rhyolite units.

STRUCTURE

The rocks on the Lofar property comprise part of a monoclinal package which stikes north north-northwest and dips west (310 to 360^{o}/20-90^{o}W). Primary textures although disrupted to varying degrees by deformation are generally recognizable in most outcrops. Only in the most strongly deformed areas

could primary textures not be found. Primary textures most commonly observed include pyroclastic fragments and porphyry textures and more rarely ash flows, amygduls, vesicles, pillows and bedding planes. Bedding was most commonly observed in the tuffs, cherts and limestones. Foliation which was observed in almost all the outcrops on the three claim groups varies from weakly to strongly developed. There is no obvious pattern to the intensity of the foliation developed. It varies from outcrop to outcrop. Bedding planes conform with the foliation planes noted in the volcanic and sedimentary rocks. The strike projection of the volcanic and sedimentary units in most cases also parallels the foliation directions. From these observations it is assumed that in most instances foliation parallels bedding. The foliation is indicated by the stretching of the lithic fragments and by local thin beds of chlorite and/or sericite development (depends on the rock type affected). Schistosity is generally more strongly developed in the volcanic tuffs, than in the lapilli tuffs and breccias.

Although the rock units on the three claim groups have been subjected to varying degrees of deformation the metamorphic grade has not exceeded the mid greenschist facies.

MINERALIZATION

The Lofar property is being investigated primarily for rhyolite associated stratiform massive sulphide deposits (Cu-Zn-Pb-Ag-Au) of the Kuroko-type. The most significant mineralization located to date occurs in the central part of the Lofar claim in association with altered rhyolite pyroclastics, cherty rhyolite pyroclastics and limestone units. Limestone, although not actually exposed within the mineralized and altered areas, was noted along strike on both sides of a "gossan" zone. The mineralization found in this area includes coincident pyrite, gypsum, minor talc and trace chalcopyrite, sphalerite and barite. The mineralized zones are hosted by moderately to strongly leached and silicified rhyolite pyroclastics. These zones appear to lie in one stratigraphic interval although each zone is surrounded by overburden. The zones extend in a north to south direction dipping 20 to 70° west. The stratigraphic thickness of the mineralized and altered zones is difficult to estimate due to poor outcrop exposure, but appears to average about 10 to 20 meters in thickness. The mineralized and altered zones are heavily gossanized and constitute obvious colour anomalies. The pyrite concentration in these zones is difficult to estimate due to the intense surface weathering and leaching which has transpired. Although only trace chalcopyrite and sphalerite were noted in these zones this is not unexpected in light of the previous intense surface weathering and leaching. Gypsum occurs in significant concentrations in some of the zones where it exists as massive and/or disseminated clots commonly distributed throughout the altered rhyolite pyroclastics. Due to poor outcrop exposure, no estimate of the gypsum concentrations could be made. Talc was only found locally within the altered rhyolite pyroclastics and never in any great concentrations. Minor barite was found in two places within the altered and mineralized zone located just south of the Orion claim. Other minor pyrite concentrations (1 to 5%) were found elsewhere on the Lofar claim usually in other rhyolite units, but none of these other pyrite occurrences were felt to be of economic significance.

On the Lofar claim the host rocks, mineralization and alteration observed are similar to those found with other Phanerozoic volcanogenic base metal bearing massive sulphide deposits including the Kuroko deposits in Japan.

This mineralization and alteration are thought to have developed in conjunction with hotspring-fumarolic activity that was active during the waning stages of the rhyolite volcanic activity and is genetically related to that activity. In many of the Kuroko deposits where both base metals and gypsum concentrations exist these mineral suites commonly occur laterally adjacent to each other with the gypsum occurring furthest from the source vent. This concept when applied to the Lofar claim where significant gypsum concentrations occur lends support to the concept that base metal occurrences exist laterally along strike or down dip to the west from the gypsum showings. This possibility is currently being investigated.

The Hifar claim contains only minor concentrations of disseminated pyrite (1 to 4%) mostly in the rhyolite units, but also locally in the dacite units. This claim does not seem to be attractive for hosting volcanogenic deposits as it contains primarily andesite units with only minor thin rhyolite units. Although rhyolite unit 3a occurs in significant concentrations on this claim it is not considered to be an attractive host rock for massive sulphide formation.

The Sofar claim contains significant concentrations of rhyolite and dacite pyroclastics which are interpreted to be the lateral equivalent to the rhyolite units which host the mineralization on the Lofar claim. Although these rhyolites are only weakly pyritized (1 to 5%) and contain no exposed base metals or alteration, this claim is still considered to have some potential for hosting volcanogenic massive sulphide deposits as large areas of it are covered by overburden.

CONCLUSIONS

The Lofar property appears to have some potential for hosting Kuroko-type volcanogenic massive sulphide deposits. The best potential exists on the Lofar claim either along strike or down dip from the alteration zones outlined and on the Sofar claim in the overburden covered areas along projected pyroclastic stratigraphy.

Report by: M.J. Casselman
Project Geologist

Approved for Release by: G. Harden
Manager, Exploration
Western District

MJC:gk

APPENDIX A

		SIO2	AL203	FE203	MGO	CAO	NA20	K20	TIO2	LOI	TOTAL
1.	Rhyolite Pyroclastic	74.14	13.39	2.73	1.10	3.51	2.16	1.24	.26	1.86	100.39
2.	Rhyolite Pyroclastic	76.67	10.71	2.24	1.32	.96	4.54	.11	.30	2.29	99.14
3.	Rhyolite Pyroclastic	77.77	11.87	1.46	.40	.98	6.22	.01	.21	1.36	100.28
4.	Rhyolite Pyroclastic	79.38	11.57	.97	.06	.92	6.27	.03	.22	1.11	100.53
5.	Rhyolite Pyroclastic	77.92	11.92	2.02	1.43	.38	4.68	.03	.22	2.11	100.71
6.	Dacite Pyroclastic	67.95	13.86	5.58	2.39	1.01	5.31	.11	.58	2.50	99.29
7.	Dacite Pyroclastic	66.87	14.93	4.98	2.40	1.00	6.29	.38	.48	2.22	99.55
8.	Andesite Pyroclastic	61.72	15.46	7.96	2.92	1.53	5.95	.14	.69	3.38	99.75
9.	Basalt Flow	50.69	16.06	10.79	4.25	6.41	4.34	.08	.76	7.65	101.03
10.	Basalt Flow	50.02	17.25	11.35	7.16	5.92	5.02	.05	.98	3.18	100.93
11.	Rhyolite - Unit 3A	75.76	12.39	2.35	.50	1.01	5.55	.12	.15	1.44	99.27
12.	Rhyolite - Unit 3A	76.41	12.49	2.58	.40	.69	5.74	.03	.17	1.15	99.66

Note; Analysis by XRF

APPENDIX "B"

EXHIBIT "A"

STATEMENT OF EXPENDITURES FOR A GEOLOGICAL SURVEY ON THE LOFAR AND HIFAR MINERAL CLAIMS 1978

GEOLOGY		
Salaries		
M.J. Casselman	May 23 to May 30 and Aug. 22 to Aug. 24, 1978 (11 days at $156/day)	$1,716.00
	Report writing and drafting (3 days at $147/day)	441.00
D.J. Andrews	May 23 to May 30 and Aug. 22 to Aug. 24, 1978 (11 days at $96/day)	1,056.00
DOMICILE		
	Accomodation and food in Cache Creek (11 days at $14/person/day)	308.00
TRANSPORTATION		
	Truck for 12 days plus gas	250.00
ASSAYS		
	8 rock samples @ $15/sample (major element petrochemistry)	120.00
	TOTAL EXPENDITURES	$3,891.00

APPENDIX "C"

EXHIBIT "A"

STATEMENT OF EXPENDITURES FOR A GEOLOGICAL SURVEY ON THE SOFAR MINERAL CLAIMS 1978

GEOLOGY		
Salaries		
M.J. Casselman	May 31 to June 3, 1978 (4 days at $156/day)	$ 624.00
	Report writing and drafting (2 days at $147/day)	294.00
D.J. Andrews	May 31 to June 3, 1978 (4 days at $96/day)	384.00
DOMICILE		
	Accomodation and food in Cache Creek (4 days at $14/person/day)	112.00
TRANSPORTATION		
	Truck for 4 days plus gas	92.00
ASSAYS		
	4 rock samples @ $15/sample (major element petrochemistry)	60.00
	TOTAL EXPENDITURES:	$1,566.00

A P P E N D I X "D"

IN THE MATTER OF THE

B.C. MINERAL ACT

AND

IN THE MATTER OF A GEOLOGICAL PROGRAM CARRIED

OUT ON THE LOFAR, HIFAR AND SOFAR MINERAL CLAIMS

LOCATED IN THE KAMLOOPS MINING DIVISION

OF THE PROVINCE OF BRITISH COLUMBIA

More Particularly N.T.S. 92I/11W

A F F I D A V I T

I, Michael J. Casselman, of the City of Vancouver, in the Province of British Columbia, make oath and say:

1. THAT I am employed as a Project Geologist by Cominco Ltd., and as such have a personal knowledge of the facts to which I hereinafter depose:

2. THAT annexed hereto and marked as "Exhibit A" to this our affidavit is a true copy of expenditures of a geological program carried out on the Lofar, Hifar and Sofar mineral claims;

3. THAT the said expenditures were incurred between the 23rd day of May 1978 and the 24th day of August 1978 for the purpose of mineral exploration on the above noted claims.

Michael J. Casselman

COMINCO LTD.

EXPLORATION

WESTERN DISTRICT
29 SEPTEMBER 1978

APPENDIX "E"

STATEMENT OF QUALIFICATIONS

I, Michael J. Casselman, of the City of Vancouver, British Columbia, hereby certify:

1. THAT I am a Geologist, residing at 1993 Dunrobin Crescent, North Vancouver, British Columbia with a business address at 700-409 Granville Street, Vancouver, British Columbia.

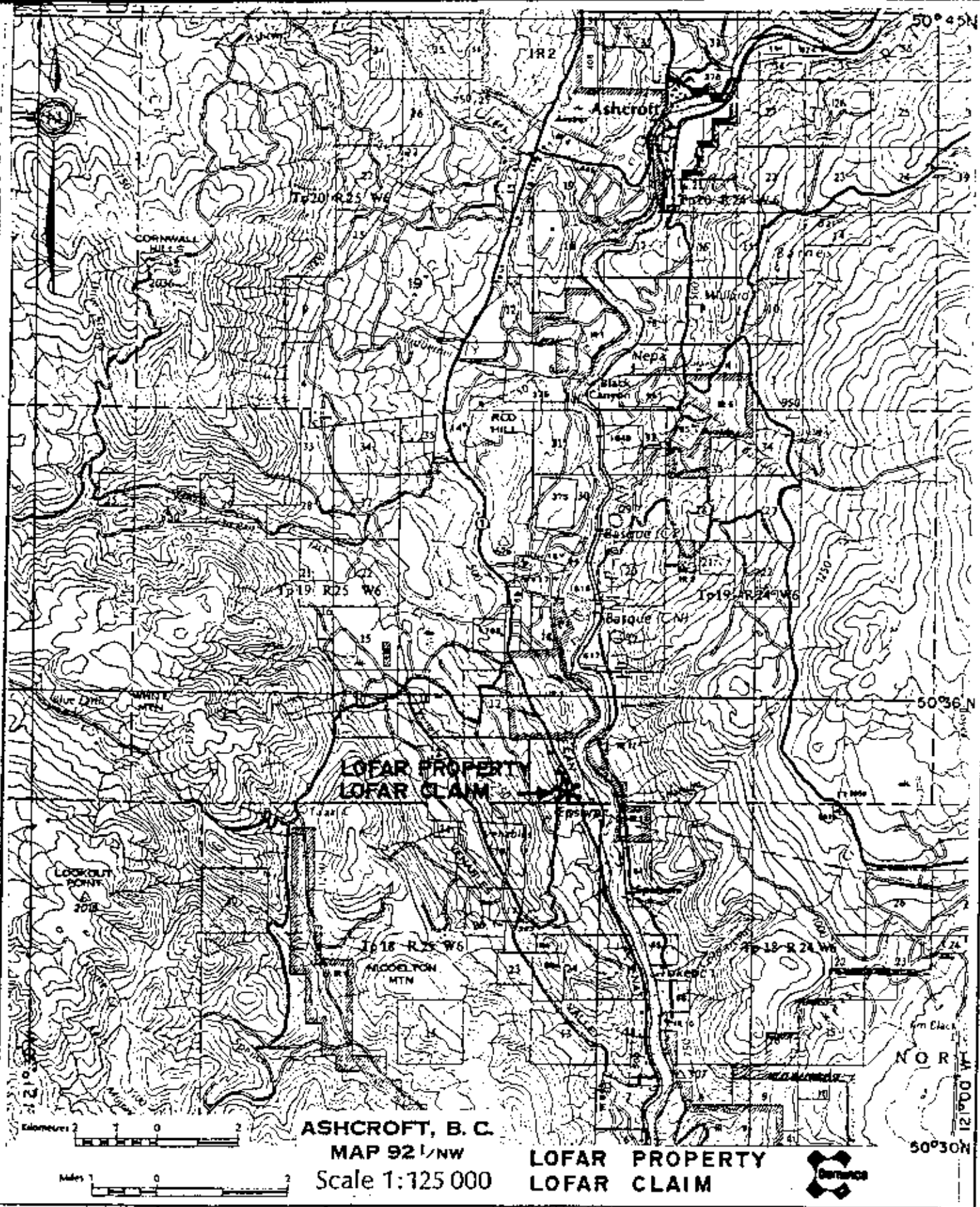
2. THAT I graduated with B.Sc. degree in geology from the University of British Columbia in 1969 and a M.Sc. degree in geology from Carleton University in 1977.

3. THAT I have practised geology with Cominco Ltd. from 1969 to 1978.

DATED THIS DAY OF OCTOBER, 1978, AT VANCOUVER, BRITISH COLUMBIA.

SIGNED: Michael J. Casselman

Michael J. Casselman, M.Sc.

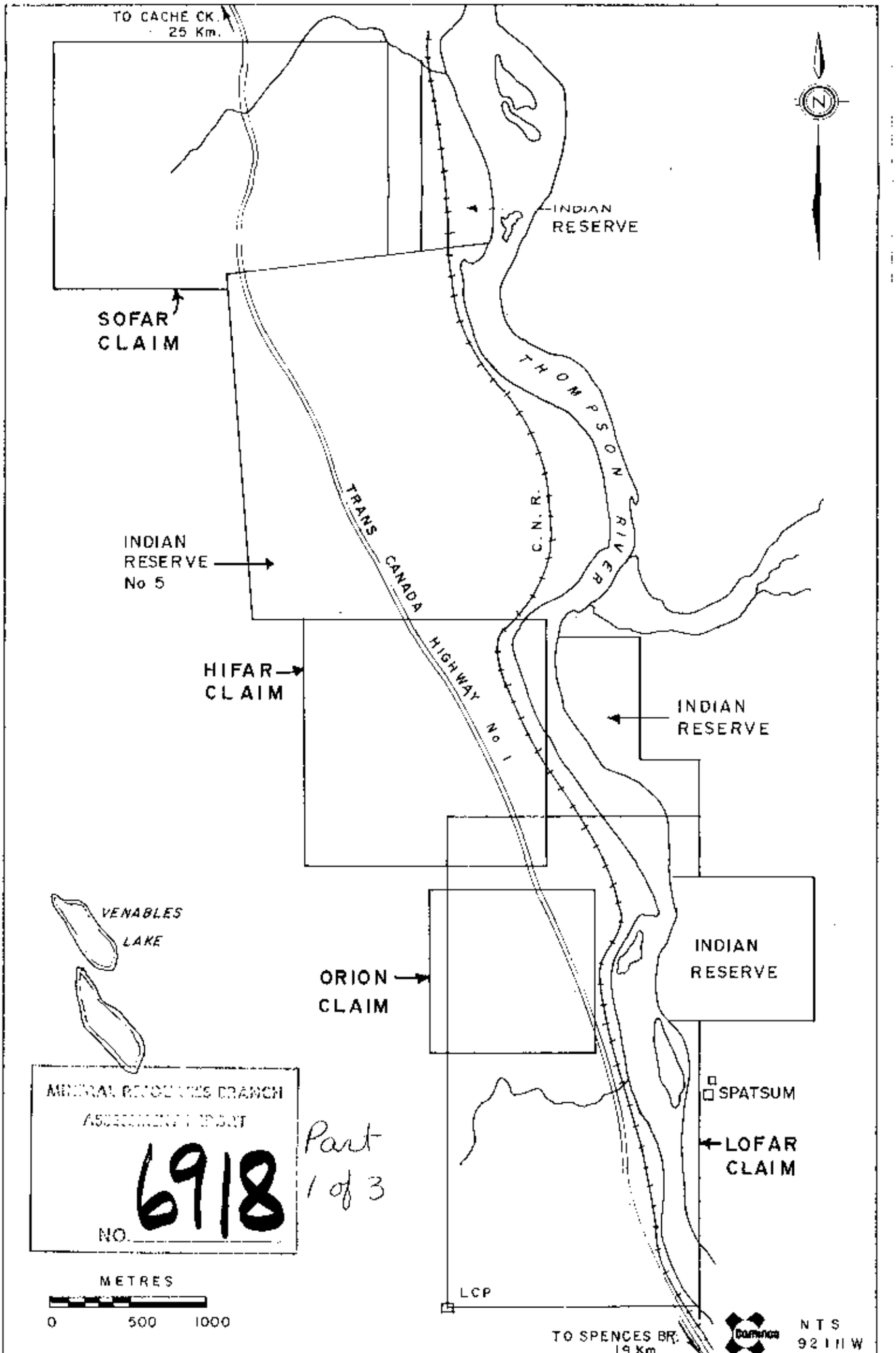


Drawn by:		Traced by:	
Revised by	Date	Revised by	Date

LOCATION MAP

KAMLOOPS M.D., B.C.

Scale:	1:125,000	Date:	SEPT., 1978	Plate:	78-1



Drawn by:		Traced by:	
Revised by	Date	Revised by	Date

LOFAR PROPERTY
CLAIM MAP
KAMLOOPS M.D., B.C.

Scale: 1cm = 300 m	Date: SEPT 1978	Plate 144-78-2.

BCIL 2187 C

LOFAR CLAIM

HIFAR CLAIM

ORION CLAIM

THOMPSON RIVER

Gosson A

Gosson B

LCP

LCP

9+00N
8+00N
7+00N
6+00N
5+00N
4+00N
3+00N
2+00N
1+00N
0+00
1+00E
2+00E

0 500 1000 1500 FEET

0 200 400 600 METRES

LEGEND

TRIASSIC

9 Granite - dykes, sills and plugs.

8 Dacite - dykes, sills and plugs.

7 Diorite - plugs: A/medium to coarse grained, weakly to strongly foliated; B/fine grained to porphyritic, massive and unfoliated, local columnar jointing.

6 Limestone - varies from pure carbonate to calcareous tuffites.

5 Chert - massive, fine grained to aphanitic, locally bedded.

4 Altered rhyolite pyroclastics - gossan zone; quartz, sericite rock; leached, silicified and pyritized; gypsum bearing, locally calcitic; barite,native sulphur; trace chalcopyrite and sphalerite.

3 Rhyolite pyroclastics - includes rhyodacite pyroclastics: mainly lapilli tuff and tuff breccia; minor flows; A/undifferentiated flows, tuffs and cherts; very fine grained to aphanitic, massive.

2 Dacite pyroclastics - mainly lapilli tuff and tuff breccia, minor flows.

1 Andesite pyroclastics and flows - includes basaltic andesites and dacitic andesites; A/mainly lapilli tuff and tuff breccia, minor flows; B/mainly flows, minor pyroclastics.

SYMBOLS

- outcrop
- geologic contact; observed, inferred
- foliation, strike/dip
- bedding, strike/dip
- gossan zone
- trench
- adit
- pyrite, gypsum, talc, barite, sphalerite, chalcopyrite
- percussion drill hole
- legal corner post
- claim boundary
- roads
- (8) location petrochem sample

Part 1 of 3

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6918

LOFAR PROPERTY

92I/11

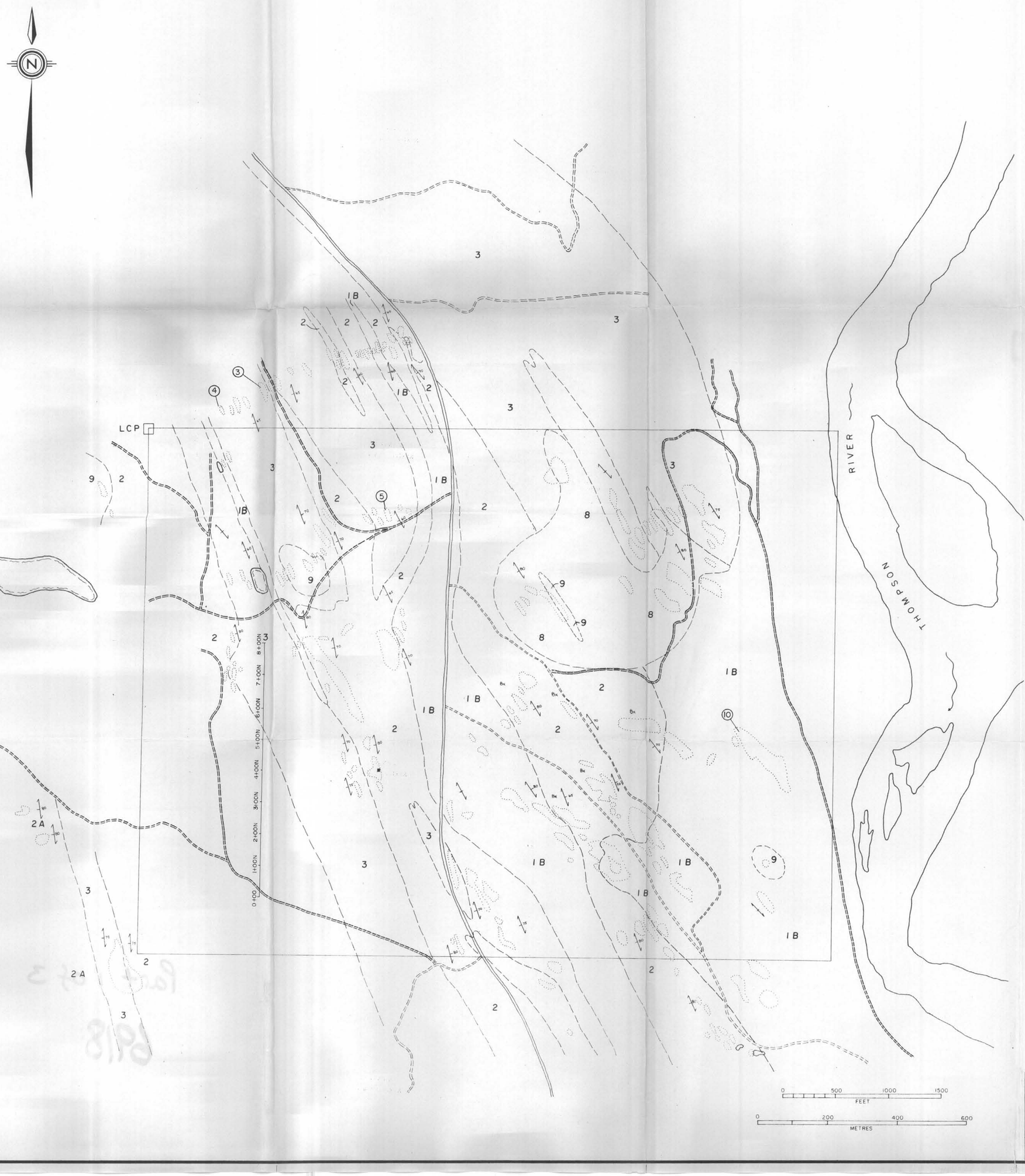
GEOLOGY
LOFAR and HIFAR CLAIMS

Drawn by:
Revised by | Date

Traced by:
Revised by | Date

Scale: 1" = 450'
Date: AUGUST, 1978
Plate: 78-3

NCI - 118 - C.L.



LEGEND

TRIASSIC

- 9 Granite - dykes, sills and plugs.
- 8 Dacite - dykes, sills and plugs.
- 7 Diorite - plugs; A/medium to coarse grained, weakly to strongly foliated; B/fine grained to porphyritic, massive and unfoliated, local columnar jointing.
- 6 Limestone - varies from pure carbonate to calcareous tuffites.
- 5 Chert - massive, fine grained to aphanitic, locally bedded.
- 4 Altered rhyolite pyroclastics - gossan zone; quartz, sericite rock; leached, silicified and pyritized; gypsum bearing; locally talc; barite, native sulphur; trace chalcopyrite and sphalerite.
- 3 Rhyolite pyroclastics - includes rhyodacite pyroclastics; mainly lapilli tuff and tuff breccia; minor flows; A/undifferentiated flows, tuffs and cherts; very fine grained to aphanitic, massive.
- 2 Dacite pyroclastics - mainly lapilli tuff and tuff breccia, minor flows.
- 1 Andesite pyroclastics and flows - includes basaltic andesites and dacitic andesites; A/mainly lapilli tuff and tuff breccia, minor flows; B/mainly flows, minor pyroclastics.

SYMBOLS

- outcrop
- geologic contact; observed, inferred
- foliation, strike/dip
- bedding, strike/dip
- gossan zone
- trench
- adit
- Py, Spy, S, Ba, Sph, Cpy — pyrite, gypsum, talc, barite, sphalerite, chalcopyrite
- percussion drill hole
- legal corner post
- claim boundary
- roads
- (10) location petrochem sample

Part 1 of 3

MINERAL RESOURCES BRANCH
ASSESS... NO. 6918

LOFAR PROPERTY

N.T.S. 92 I/11

Drawn by: MJC	Traced by:
Revised by / Date	Revised by / Date

SOFAR CLAIM
GEOLOGY

Scale: 1" = 450' | Date: AUGUST, 1978 | Plate: 78-4

NCI - 117 - C.L.

FORM 210 6660