885150

Tom Schroeter
Mar. 31/85
(from Dalton Dupasquier
+ Ross Blusson
- New Cantech)

LUCKY SHIP MoS_2 PROJECT

1966

Omineca Mining Division

93 L 3 & 4

~~AMAX VANCOUVER~~
~~OFFICE COPY~~

Vancouver Office

June 1967

T.J.R. Godfrey

TABLE OF CONTENTS

ILLUSTRATIONS

SUMMARY

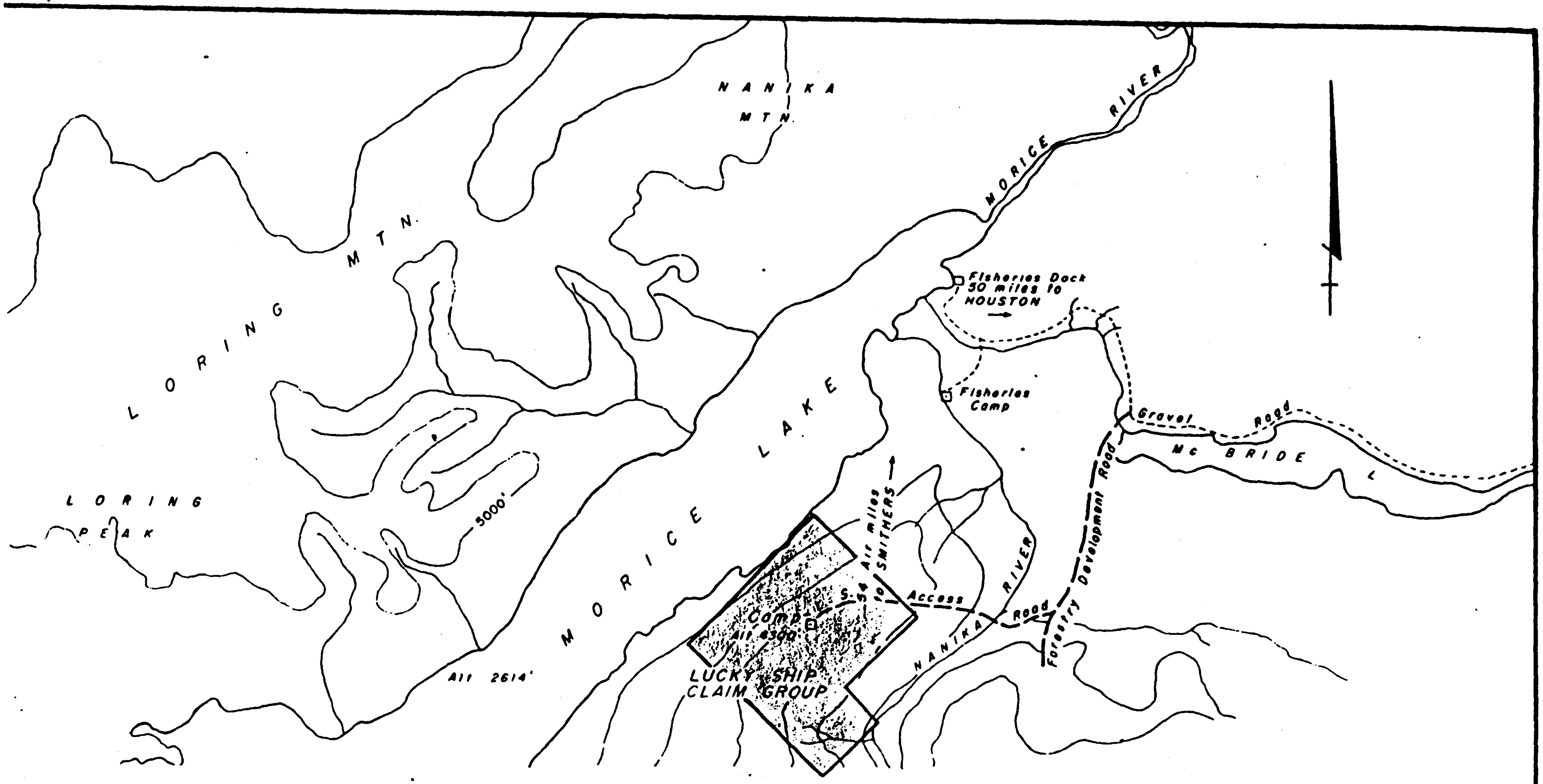
This report describes the results of the drilling program and the geochemical and geophysical surveying carried out from June 1st to September 30th, 1966, on the Lucky Ship MoS_2 Property. In addition the geology of the property is reviewed in some detail.

Four new drill holes and three deepened holes totalling 7,783 feet were drilled bringing the total drilled on the property to 28,890 feet.

Drilling of the main molybdenite zone in 1966 has greatly limited both it's lateral and depth potential. The cylindrical, near vertical structure which controls the molybdenite mineralization extends from surface to a depth of 600 feet on its southern or lower side and to a depth of 1,200 feet on its northwest or upper side. On the basis of the 1966 drilling the tonnage and grade of the main zone have been revised to 20 million tons averaging 0.16% MoS_2.

Drill Holes 12 and 16 were deepened to explore the possibility of a second favorable geological structure indicated by the 1965 drilling program at depth and to the north of the main zone. The extensions of these holes intersected alternating granite and quartz porphyry units which are locally heavily quartz veined and which contain sections assaying 0.05% molybdenite.

Hole #5, a vertical hole in the northern portion of the pluton, intersected 2,700 feet of complex intrusive quartz porphyry



AMAX EXPLORATION INC.

LUCKY SHIP PROJECT – 1966

OMINECA MINING DIVISION — BRITISH COLUMBIA

LOCATION MAP

SCALE 1" = 2 MILES

Vancouver, Revised 1967 Drawn 1963 H.P.

breccia containing scattered molybdenite bearing fragments throughout and later fine quartz molybdenite veins near the bottom of the hole.

Geochemical soil sampling, prospecting, geological mapping and I.P. surveys over the Morice Nanika Ridge failed to delineate any additional areas of economic interest.

CONCLUSIONS

1. The Lucky Ship Pluton presents one of the best geological environments for the occurrence of a viable deposit of molybdenite yet observed in British Columbia.

2. There is little potential either laterally or at depth for appreciably increasing either the grade or tonnage of the main molybdenite zone. The confining structural and geological controls and the molybdenite mineralization die out at a maximum depth of 1,200 feet from surface.

3. An excellent exploration target exists at depth beneath the central portion of the quartz porphyry pluton half way between the main zone and the northern breccia zone. Molybdenite bearing fragments throughout Hole 5 and the encouraging geological features at the bottom of Holes 12 and 16 appear to converge at depth in this region.

4. Further exploration on the Morice Nanika Ridge outside the immediate vicinity of the main quartz porphyry pluton is not warranted.

INTRODUCTION

The Lucky Ship Property was optioned from Plateau Metals in the fall of 1963 and aggressive exploration programs have been carried out on the property for the past three summers. The 1966 program was a continuation of the previous year's program to test and evaluate the quartz porphyry pluton and to further test the main molybdenite zone at it's southern contact as to lateral and depth potential.

This report describes and evaluates the data accumulated on the Lucky Ship Property during the 1966 field season. The geology of the property is described in considerable detail and theories on the emplacement of its plutonic complex, the controls for molybdenite mineralization and the exploration possibilities remaining on the property are also presented. The reader is referred to reports listed in the bibliography (Appendix I) for additional information on the property.

Property

The Lucky Ship MoS_2 Property is held under an option agreement dated August 19, 1963, between Southwest Potash Corporation and Plateau Metals Limited. During the fall of 1966 an amendment to the agreement was executed which reduced the payments due to the prospectors on December 14, 1966, January 14, 1967 and December 14, 1967. These reductions are added to the payments due December 14, 1968 and December 14, 1969.

In April 1967 that portion of the Lucky Ship Agreement concerning the payments payable to Plateau Metals Limited was renegotiated to keep the payments more in line with the amount of work contemplated during ensuing years should the results of the 1967 program be encouraging. The renegotiated schedule of payments together with the initial schedule may be summarized in table form as follows:

	Initial Schedule August 19/63	Revised Schedule Nov.7/66	Revised Schedule April 14/67
Paid to and including Payment			
June 14,1966	$35,500	$35,500	$35,500
		-------1966 Field Season-------	
Dec.14,1966	20,000	10,000	10,000
June 14,1967	20,000	10,000	20,000 Paid
		-------1967 Field Season-------	
Dec.14,1967	29,500	20,000	20,000
June 14,1968			5,000
		-------1968 Field Season-------	
Dec.14,1968	50,000	60,000	10,000
Dec.14,1969	75,000	94,500	40,000
Dec.14,1970	$ 100,000		50,000
Dec.14,1971	120,000		50,000
Dec.14,1972	500,000		50,000
Dec.14,1973	500,000		75,000
Dec.14,1974	500,000		134,500
Dec.14,1975	500,000		500,000
Dec.14,1976	500,000		1,000,000
Dec.14,1977	500,000		1,500,000
Dec.14,1978	1,550,000		1,500,000

The total purchase price of $5,000,000 remains the same.

The property consists of 105 claims staked by Southwest

Potash Corporation. All claims are in good standing until 1976 - 1978 (See Figure 2).

A schedule of claims is included in Appendix II.

1966 PROGRAM

The 1966 program was a continuation of the 1965 program designed to fully explore and test the quartz porphyry pluton and to prospect the Morice Nanika Ridge to determine if other highly favourable geological environments exist.

From June 23 to September 26, two Longyear "44" drills completed a total of 7,783 feet of BQ (1-7/16") core at an average direct cost* of $9.42 per foot.

Two drill holes (12 and 16) were deepened, and three new holes (19, 20 and 21) were drilled to further test the main molybdenite zone. Hole 18 tested the southern lobe of the pluton and Hole 5, in the northern portion of the pluton, was deepened to 2,727 feet. (See Figure 10).

Surface geological mapping was carried out as follows:

1) An area over the southern lobe was mapped at a scale of 1" = 200' to more accurately delineate this portion of the quartz porphyry pluton (See Figure 8).

2) An area bounded by lines 10W, 50W, Baseline #1 and Tieline 65S was mapped and prospected on a scale of 1" = 200' in an attempt to explain the broad anomalous I.P. zones west of the pluton (See Figure 4).

3) The northern portion of the main pluton was mapped on a

* Longyears invoice cost divided by footage drilled

SYMBOLS

- Claim Post.
- Witness Post.
- Claim Location Line.
- Claim Boundary Line.
- Base Line.
- Picket Line.
- Swamp, Swamp Boundary.
- Stream.

CLAIM GROUPING

- RED GROUP.
- BLUE GROUP.
- YELLOW GROUP.
- GREEN GROUP.

AMAX EXPLORATION INC.

LUCKY SHIP PROJECT – 1966

OMINECA MINING DIVISION — BRITISH COLUMBIA

CLAIM MAP

SCALE 1" = 2,000'

DATE REVISED	
DATE PRINTED	31/5/67
Drawn by	H C P
Date	30/5/67
N.T.S. File	93 L 3, 4

FIG. 2

To accompany "FINAL REPORT LUCKY SHIP PROJECT – 1966"
by: T. J. R. Godfrey Date–

scale of 1" = 100' in an attempt to unravel the complexities of the igneous breccias in this region (See Figure 8).

A further 8.9 miles of I.P. were run to extend the survey area and to check the continuity of several anomalies outlined in 1965 (See Figure 4).

Soil sampling was completed over the major grid and detailed sampling was extended northeast of the pluton (See Figure 6).

Trenching, soil sampling, and detailed mapping were carried out over the molybdenite bearing float of the West Showing (See Figure 5). In conjunction with this work extensive prospecting was carried out between the ridge and Red Slide Mountain in a search for a source of the mineralized float.

RESULTS OF THE 1966 PROGRAM

INTRODUCTION

During 1966 the emphasis was directed towards the complete exploration of the quartz porphyry pluton and its environs with minor work being carried out over the Morice Nanika Ridge. Nothing of economic interest was found beyond the immediate vicinity of the quartz porphyry pluton. The West Showing proved to be a large boulder of mineralized float presumably derived from the molybdenite zone in the quartz porphyry pluton.

Further drilling of the main molybdenite zone indicated that the tonnage and grade estimates (20 million tons of 0.163% MoS_2) from the 1965 report are still valid. This drilling, however greatly limited both the lateral and depth potential of this zone.

Sparse stockwork mineralization intersected in the southern lobe appears to be an apophysis of the main stockwork zone.

Deepening of Hole 5 has shown the existance of the intrusive quartz porphyry breccia carrying mineralized fragments through a vertical extent of 2,600 feet.

The results of the 1966 work over the Morice Nanika Ridge and the quartz porphyry pluton are described in the following sections of this report.

THE MORICE NANIKA RIDGE (See Figure 4)

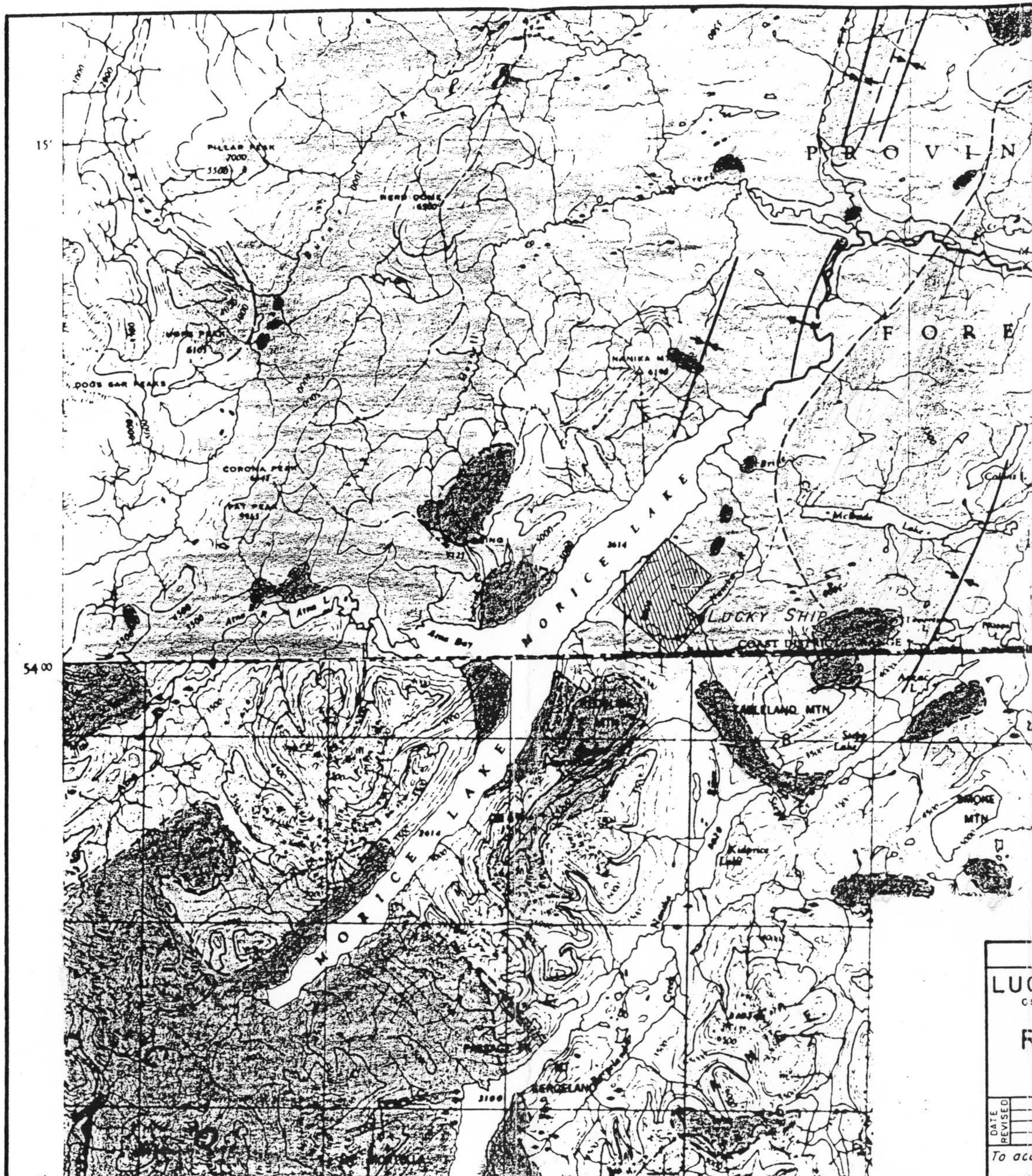
Introduction

The reader is referred to the 1964 Final Report on the Lucky Ship Property for a description of the regional geology as well as the geology of the Morice Nanika Ridge. During 1966 selected areas were remapped and prospected, however only minor changes and refinements were made in the interpretation of the geology of the ridge.

Geology

The predominant rock units on the ridge consist of a series of acid to basic volcanic rocks with minor conformable marine sedimentary units. Similar rocks north of Morice Lake (See Figure 3) have been paleontologically dated as Upper Jurassic to Lower Cretaceous in age and have been correlated with the Hazelton Group.

The majority of the volcanic sequence is composed of



L E G E N D

UPPER CRETACEOUS OR LATER

Coast Range Intrusions

JURASSIC AND CRETACEOUS

Undifferentiated

Volcanics

Sediments

TRIASSIC AND JURASSIC

Metamorphic Rocks

S Y M B O L S

Anticline

Syncline

Good gravel road

Lucky Ship access road

AMAX EXPLORATION INC.

LUCKY SHIP PROJECT – 1966

OMINECA MINING DIVISION — BRITISH COLUMBIA

REGIONAL GEOLOGY

SCALE 1: 250,000.

DATE REVISED	1967	DATE PRINTED	31/5/67	Drawn by H C P Date 1964 N T S File 93 L 3,4	FIG. 3

To accompany "FINAL REPORT LUCKY SHIP PROJECT – 1966". by T J R Godfrey Date –

intermediate to basic flows, breccias, tuffs and agglomerates which tend to pinch and swell along strike. The formations appear to form a conformable steeply dipping homoclinal sequence trending N30°E to N30°W and dipping 20° to 40°S (See Figure 4). Most of these units are described in greater detail in Appendix IV. For greater clarity on the geological maps many units exhibiting only subtle differences have been combined under one general rock unit. The lithology of the volcanic units does not appear to have had any influence either on the later intrusive activity or the molybdenite mineralization.

The volcanic sequence is intruded by the main quartz porphyry pluton and to a lesser extent by aplite, quartz porphyry, felsite, granite and diabase dykes of random orientation. The quartz porphyry pluton is described in detail in a succeeding section of this report.

The most obvious structural elements of the ridge are the linears and circular structures observed on aerial photographs. The most prominent are two regional fault linears; one cuts across the ridge in a northwest direction and the other trends northeast (parallel to the ridge) along part of the Nanika River. Field evidences of faulting are strong shearing along the linears, carbonate and magnetite veins in fault gouge and offsets of lithologic units.

The smaller linears which can be related topographically to straight vertical cliffs and lineal drainage patterns appear to represent bedrock fracture systems subsidiary to the major faults. Heavy shearing and wide fault gouge zones indicate that considerable activity took place along these fractures although, except for the major faults, there is little evidence of major lateral displacement.

These faults cut across the intrusive dykes and have been intersected by drilling in the quartz porphyry pluton suggesting that most of the regional fracturing post dates the intrusive activity and mineralization. It is possible that a northeast fracture linear controlled the emplacement of the quartz porphyry pluton and resulted in the pluton's elongate shape in this direction. This is the only suggestion of earlier fracturing. The structure and structural setting of the main pluton is described later.

Two circular structures observed on the aerial photographs are plotted on the geological maps (See Figures 4 and 8). They are unexplained by the known surface geology and do not appear to be spatially related to the molybdenite mineralization.

Mineralization

Virtually no molybdenite was found in situ on the ridge outside the immediate confines of the quartz porphyry pluton. Molybdenite bearing quartz porphyry float was discovered between lines 50W and 60W and is referred to as the "West Showing". The West Showing will be described in detail at the end of this section.

Quartz veining on the ridge tends to be very local in extent generally in proximity to the acid dykes. The quartz veins are coarse, white, crystalline and have sharp contacts with the country rock -- quite distinct from the sugary quartz and vague outlines of the silicification associated with the main pluton.

Pyrite occurs as fine disseminated grains and irregular blebs along most intrusive contacts although to a far greater extent around the quartz porphyry pluton than along the smaller acid dykes on the ridge. Pyrite is also found irregularly distributed through the volcanic series but rarely exceeds 1% to 2% by volume.

Magnetite occurs as an accessory mineral in the basalts causing this unit to be slightly magnetic. The most impressive occurrences of magnetite are associated with tectonic faults and breccias.

West Showing (See Figure 5)

The molybdenite bearing float of the West Showing consists of two angular fragments weighing a total of around 300 pounds lying on top of well rounded glacial boulders and clay. The trenching revealed other fragments of the white fresh porphyry-angular to rounded in shape -- some with minor MoS_2 and almost all having quartz veining.

The bedrock surface is highly glaciated and irregular making it impossible to expose bedrock over any distance. Detailed geology indicates a dyke of "crowded" porphyry about 100 - 150 feet wide and striking due north. The dyke consists of highly altered and calcareous acid rock containing subhedral grains of quartz to

10 mm. and angular fragments of dark brown rock with extensive manganese stain. It intrudes relatively fresh green-red andesites. Minor quartz veining, but no molybdenite, was seen in the andesite. The porphyry is distinctly different than the porphyry of the mineralized float which is megascopically identical to that of the main showing. It was concluded that the angular mineralized float was not derived from the immediate region, but was brought in by glaciation from the main showing.

Although more mineralized float was found in the vicinity of the West Showing than elsewhere in the ridge this is believed to be a function of the amount of work done in this area. Other similar mineralized float was observed along the access road to the West Showing and it would seem probable that an extensive glacial train emanates out from the main pluton.

Geophysical Results

Magnetics

Both ground and airborne magnetometer surveys have been carried out over the Morice-Nanika Ridge (See 1963 Report). The trend of the magnetic lows suggest that the quartz porphyry pluton has a shallow dip to the northwest and runs across the ridge towards Morice Lake. A similar more vague magnetic anomaly indicates that the intrusive may also continue beneath the overburden to the southeast toward the Nanika River.

Induced Polarization (See Figure 4)

Most of the defined near surface I.P. anomalies (See

Figure 4) may be explained by pyritization due to intrusive activity around the pluton; by faults containing disseminations and clusters of magnetite and pyrite; or by sporadic disseminated pyrite and magnetite occurring as accessory minerals in the volcanic units.

The weak anomalies on the tie line 65S between 4W and 23W and on lines 10W and 20W north of base line #1 suggest the presence of sparsely disseminated sulphide at depth.

Geochemical Results (See Figures 6 and 9)

Soil sampling during the 1966 field season was concentrated in the area between the pluton and the main access road into the property. Samples gave uniformly negative results which is surprising as some of this area drains the northern portion of the pluton and some positive values would be expected. Other soil sampling carried out in conjunction with the prospecting around the periphery of the ridge gave background values in Mo.

QUARTZ PORPHYRY PLUTON (See Figure 8)

Introduction

The gross outline of the quartz porphyry pluton has not been appreciably changed since the first mapping in 1964. However much additional information has been learned about the internal geological structure and setting of the pluton.

The pluton comprises an acid igneous complex, exhibiting features of shallow emplacement. A portion of the pluton was extrusive as evidenced by the presence in the subvolcanic breccia of flow lines and angular fragments having a heterogeneous composition suggesting it was formed in a late explosive gaseous medium which made its way to surface.

The pluton intrudes a sequence of marine volcanic tuffs at the south grading into intermediate to basic flow breccias towards the northern portion of the pluton. The tuffaceous sequence strikes N45°E and dips 30°SE.

Geology

For descriptive purposes the quartz porphyry pluton has been divided into four units as follows (See Figure 7).

1) Main Molybdenite Zone of the Massive Central Portion
2) Intrusive Breccia Complex
3) Subvolcanic Breccia Complex
4) The Southern Lobe

The Main Molybdenite Zone includes the massive central portion of the quartz porphyry pluton as well as the area around the south contact embracing the cylindrical, vertical granite plug and associated molybdenite mineralization. Most of the drilling has been carried out in this portion of the pluton.

The Intrusive Breccia Complex includes the former quartz porphyry breccia and pyrite zone and the northern portion of the pluton around the small lake. In 1966 further geological mapping was carried out and Hole 5 deepened to 2,727 feet.

The Subvolcanic Breccia Complex includes the extrusive breccias found predominantly on the hill immediately south of the camp. This was formerly mapped as felsite and quartz-feldspar porphyry breccia and was remapped in detail in 1966.

The Southern Lobe comprises the southern bulge of the quartz porphyry pluton. Mapping and drilling in 1966 indicates that this portion of the pluton feathers out to the south in a series of small parallel dykes.

These four units are described in the following section.

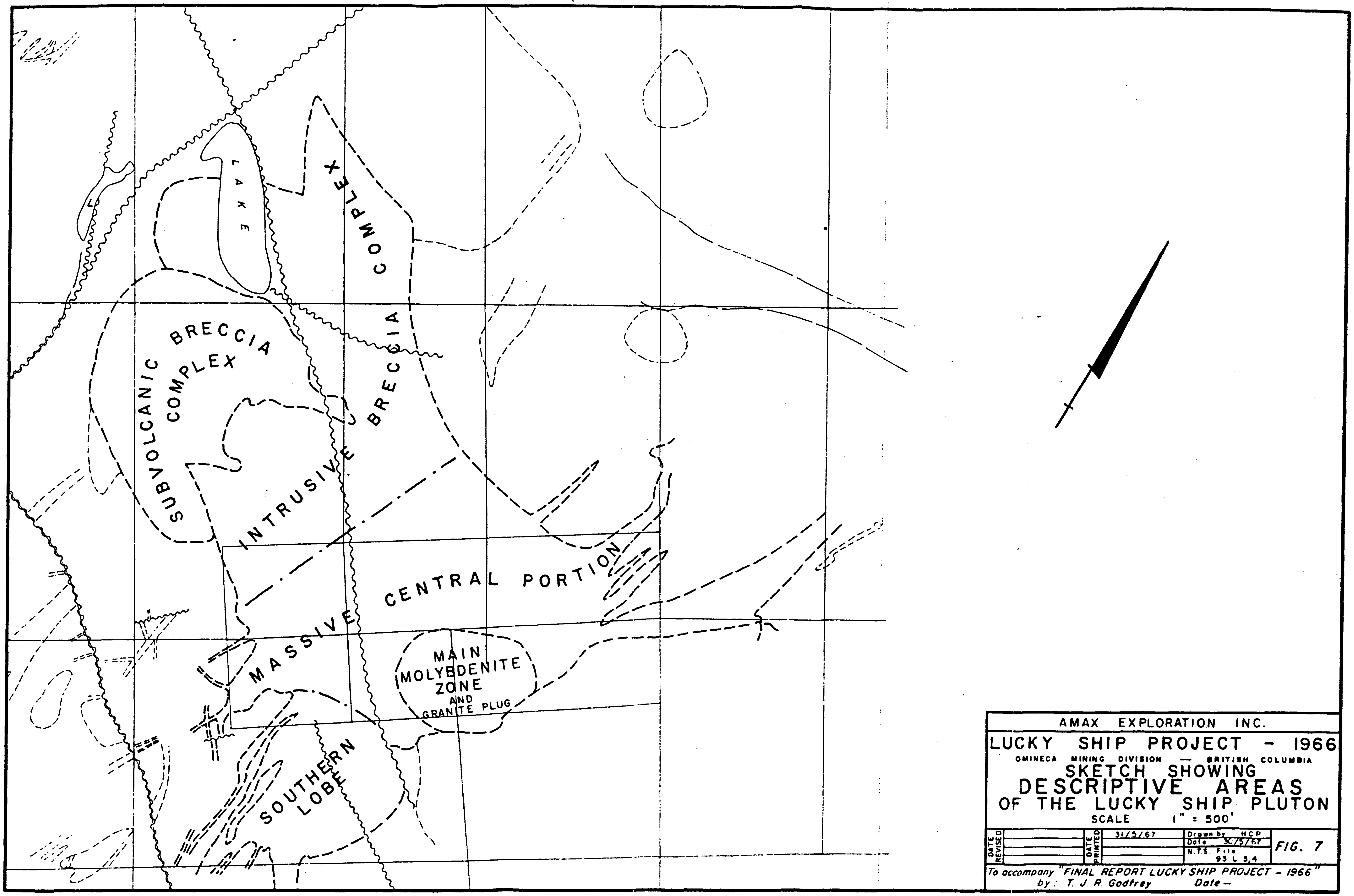
Main Molybdenite Zone

The primary control for the molybdenite mineralization is a cylindrical, vertical structure at the southern contact of the quartz porphyry pluton which extends from surface to a depth of 1,200 feet (See Figure 12). The core of the structure is a 400 x 600 foot granite plug surrounded by a 100 foot wide rind of highly (over 60%) silicified rocks. The silica zone grades outward into a highly brecciated and quartz veined volcanic unit which forms a 10 to 30 foot wide horseshoe shaped unit around the north, west and east sides of the granite plug and which is continuous with the main volcanic tuff sequence to the southeast. The silica zone straddles the granite-volcanic tuff contact and includes both rock types although the silicification has virtually obliterated the identity of the original rock. Outward from the volcanic band (to the north, west and east) is quartz-MoS_2 veined quartz porphyry and beyond this the massive quartz porphyry of the main pluton. The contact between the volcanic rind and the quartz porphyry has been obscured by heavy quartz stockwork.

The volcanic sequence to the south consists of three readily identifiable volcanic units striking N45E and dipping 30° SE. On the surface is a unit, about 300 feet thick, of finely laminated tuffs with laminae averaging 1/10". This is underlain by a distinctive black crystal tuff with white fragmented crystals of feldspar. This unit is 200 feet thick and has been traced from Holes 19 and 20 up along the drill access road where it outcrops. The black crystal tuff unit is in turn underlain by the more common massive to brecciated lapilli tuff to agglomerate which outcrops around the west and northern part of the pluton.

The deepening of Holes 12 and 16 and the drilling of two deep Holes 19 and 20, in 1966, indicate that the cylindrical structure, the rock preparation and the mineralization change radically below the 2,500 feet elevation (1,000 feet below the surface).

The granitic plug appears to plunge to the north and becomes more irregular in shape (See Figure 12). The granite intersections near the bottom of Holes 12 and 16 probably represent small apophyses or dykes emanating upward from the northern plunge of the main granite body. Holes 19 and 20 intersected the southern contact of the main granite mass at depth. In this area the granite has minor quartz and quartz molybdenite veining and relatively fresh biotite and feldspar contrasting with the altered plagioclase feldspars and chloritized biotite at higher



AMAX EXPLORATION INC.

LUCKY SHIP PROJECT - 1966

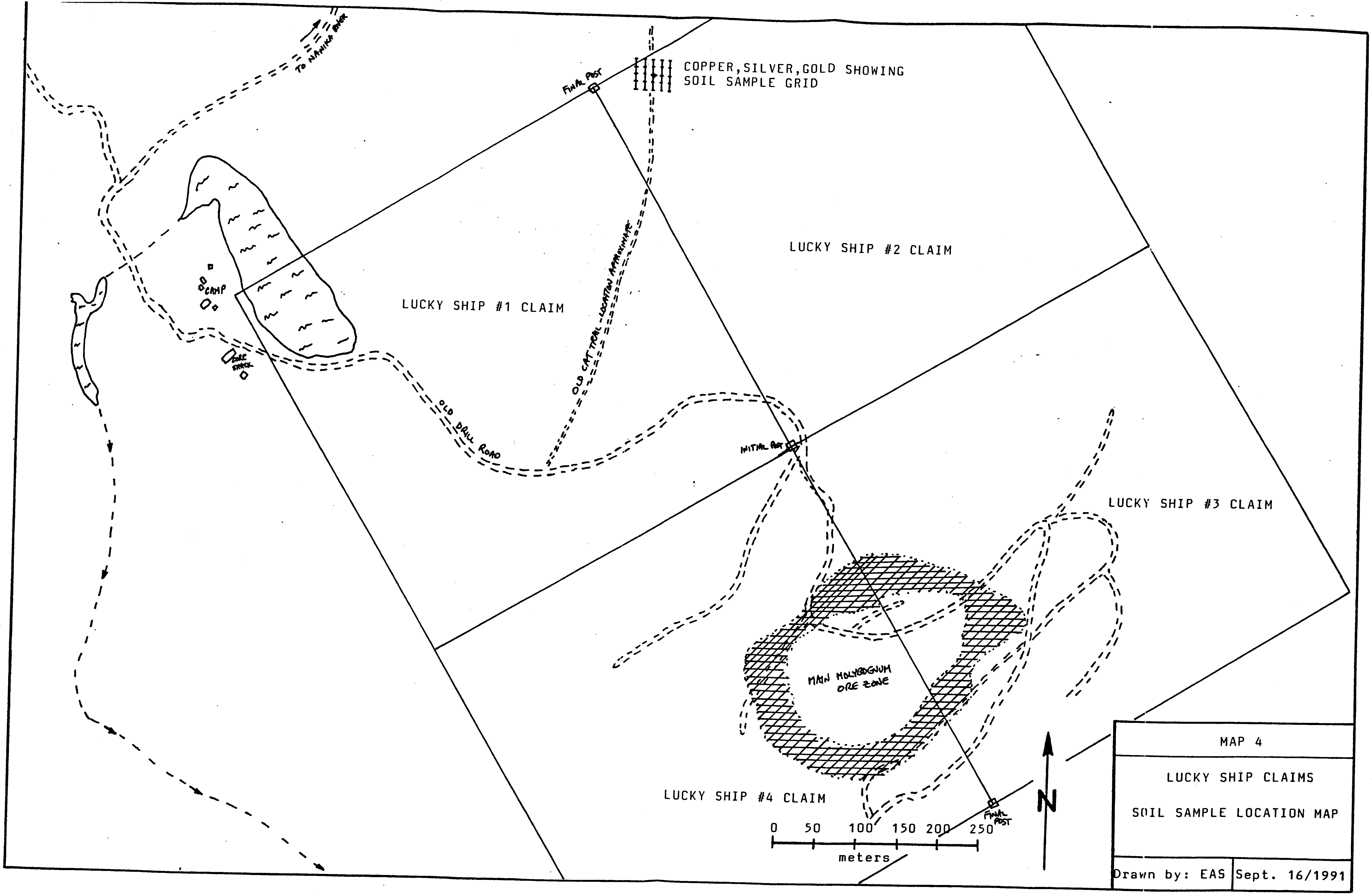
OMINECA MINING DIVISION — BRITISH COLUMBIA

SKETCH SHOWING DESCRIPTIVE AREAS OF THE LUCKY SHIP PLUTON

SCALE 1" = 500'

DATE REVISED		DATE PRINTED	31/5/67	Drawn by HCP Date 30/5/67 N.T.S. File 93 L 3,4	FIG. 7

To accompany "FINAL REPORT LUCKY SHIP PROJECT - 1966" by: T. J. R. Godfrey Date -


COPPER,SILVER,GOLD SHOWING
SOIL SAMPLE GRID
FINAL POST
CAMP
CORE SHACK
LUCKY SHIP #1 CLAIM
LUCKY SHIP #2 CLAIM
OLD DRILL ROAD
INITIAL POST
LUCKY SHIP #3 CLAIM
MAIN MOLYBDENUM ORE ZONE
LUCKY SHIP #4 CLAIM
FINAL POST
0 50 100 150 200 250
meters
N
MAP 4
LUCKY SHIP CLAIMS
SOIL SAMPLE LOCATION MAP
Drawn by: EAS
Sept. 16/1991

Significant Assay Results

TABLE I

Location With Respect To Granite Plug	Diamond Drill Hole No.	Core Length	Average MoS_2	Elevation of Intersection	Depth Below Surface
MAIN MOLYBDENITE ZONE					
North	LS-65-8	110'	0.22	3370'	290'
	LS-65-9	220'	0.14	3410'	290'
Northwest	LS-64-2	170'	0.19	2920'	710'
	LS-64-1	120'	0.29	2730'	840'
	LS-65-14	160'	0.16	2600'	1010'
	LS-65-16	280'	0.08	2200'	1500'
West	LS-65-10	120'	0.27	3350'	350'
	LS-65-6	260'	0.14	2760'	880'
	LS-65-12	260'	0.16	2320'	1230'
Southwest	LS-65-11	420'	0.13	3210'	350'
	LS-64-3	410'	0.11	2700'	840'
	LS-65-7	210'	0.22	2670'	750'
	LS-65-15	50'	0.15	2610'	850'
South	LS-65-15	120'	0.16	3050'	300'
	LS-64-1	197.5'	0.12	3280'	100'
	LS-64-3	183'	0.12	3280'	70'
	LS-65-7	90'	0.14		
Southeast	LS-65-12	180'	0.16	3120'	200'
	LS-65-14	130'	0.25	3310'	70'
	LS-65-16	200'	0.19	2880'	400'
Northeast	LS-65-17	200'	0.17	3320'	110'
	LS-64-4	40'	0.11	3360'	170'
		3760'			
SOUTHERN LOBE					
	LS-65-18	60'	0.13		
NORTH SHOWING					
	LS-65-5	50'	0.14	3000'	1100'

elevations in the plug.

The volcanic rind has a similar vertical change from intense brecciation and quartz veining at the higher elevations in the structure to massive, fresh, unveined volcanic intersections at greater depth in Holes 16 and 20 (See Figures 11p and 11t).

The southern granite-volcanic tuff contact below the 2,500 foot elevation is sharp with no silicification. Minor silica was intersected in Holes 19 and 20; however, the silica has a more "felsitic" appearance compared to the sugary, crypocrystalline pervasive silicification at higher elevations.

Intrusive Breccia Complex

The surface geology and geology from Hole 5 indicate that this portion of the pluton ranges from massive quartz porphyry to an intrusive quartz porphyry breccia complex containing up to 70% rounded fragments. The fragments vary in size from finely comminuted quartz porphyry to subrounded quartz porphyry and foreign fragments up to four inches in diameter. The foreign fragments are believed to have been derived from the wall rock at depth (See Figure 13). The quartz porphyry fragments in the breccia complex range in colour from white through dark green and deep pink. The cementing matrix varies from dark green to white.

There is evidence to suggest that the breccia complex is made up of a series of breccia units. In drill Hole 5 both sharp and gradational contacts have been observed in the matrix material of the breccia complex. Flow lines of apparent random

Crenula

orientation were observed in the quartz porphyry matrix both in diamond drill Hole 5 and on surface. The random orientation of the flow lines may indicate either great turbulence in the breccia series during emplacement or that the breccia consists of a randomly oriented series of breccia pipes. A very distinctive volcanic breccia consisting primarily of large fragments of both quartz veined volcanic material and quartz veined quartz porphyry cemented by a grey siliceous material was observed at the bottom of Hole 5. This breccia is unique and its significance is not known.

Subvolcanic Breccia Complex

Detailed surface geological mapping was carried out over the subvolcanic breccia complex on a scale of 1" = 100'; this information forms the basis of an MSc thesis currently being written by R.W. Bagshaw at the University of Manitoba.

This complex consists of four mapable breccias consisting of quartz porphyry and foreign fragments embedded in an acid (cream) to basic (dark green to brown) matrix. Distinction is made by the colour of the cementing matrix. This unit was formerly mapped as the felsite unit.

The four breccia units are listed below:

1) Sam leucocratic breccia
2) Brown to grey felsitic breccia
3) Dark green felsitic breccia
4) Magnetite rich andesitic breccia

These breccias form a crude circular pattern and are intruded by pale cream felsitic dyke-like masses which echo the structure. In foliated specimens of the breccias, fragments often show a preferred orientation which, in the immediate area, are vertical and serve to further substantiate the hypothesis of a cylindrical vertical structure. A minor feature of the breccias is the presence of an occasional barren quartz vein which itself is highly crackled indicating that sparse quartz veins were intruded prior to the last pulse of brecciation. It appears that this breccia complex was in part extrusive. Most of the extrusive material has been eroded away leaving the vertical cylindrical neck and small remnants overlying the higher portions of the quartz porphyry pluton.

Southern Lobe of the Pluton

The southern lobe of the quartz porphyry pluton was mapped on a scale of 1" = 200'. Drill Hole 18 was drilled across the lobe at -45° for 2,115 feet to determine if the strands of weak molybdenite mineralization encountered in Holes 7 and 11 represent a trend of the main molybdenite zone to the south. A secondary objective of this hole was to determine if possible, the effects of the major northwest fault (See Figure 10) on this portion of the porphyry pluton.

The interpretation from previous mapping appears to be an over simplification of this portion of the quartz porphyry pluton. Recent work indicates that the quartz porphyry dies out to the south and is interfingered with tectonic breccias and siliceous cherty units. The orientation of these units is nearly parallel to the attitude of the bedding in the tuffs. The fingers of quartz porphyry appear to be explosive dykes which have ruptured the host rock causing the breccias along the contacts. Hole 18 encountered quartz porphyry, quartz porphyry breccia and porcellaneous quartz porphyry to a depth of 1,550 feet where it entered a fractured quartz porphyry, brecciated volcanic tuff and silica sequence, similar to the units found on surface. The bottom 200 feet of the hole were in highly fractured fine tuffs. The grey cherty unit observed both in Hole 18 and on surface is believed to be an impure siliceous phase of the quartz porphyry.

The major fault immediately west of the southern lobe trends N50°W (See Figure 8) and appears to have a near vertical dip (See Figure 11r). The bottom of Hole 18 entered a fault gouge zone believed to be this main fault at depth. Although minor occurrences of quartz porphyry were observed on the west side of the fault, there is no evidence suggesting that there has been a major offset of the quartz porphyry pluton or associated molybdenite mineralization.

Structure of Quartz Porphyry Pluton

External Structural Relationships

The southern portion of the pluton comprising the massive core and the southern lobe is influenced by the strike of the volcanic sequence. In this area the contact of the quartz porphyry pluton, the porphyry offshoots to the northeast and south, and the acid dyke system immediately south of the pluton are all parallel to the strike of the volcanic tuffs. In contrast to this the northern portion of the pluton is composed of two breccia units which cut across the strike of the regional bedding. Limited dyke activity, in comparison with the southern half, cuts across the bedding in the volcanic sequence.

Major faulting in the vicinity appears to postdate the intrusion of the pluton although a fault running down the length of the pluton may have originally influenced the emplacement of the northern portion of the pluton.

Internal Structural Relationships

Since contacts between the units described above are diffuse, the relationship of various units of the pluton will be described under theoretical geology.

A number of larger fault zones cut the pluton but do not appear to substantially offset the contacts of the pluton. These fault zones have been the source of a number of drilling problems. Extensive gouge zones varying from one to forty feet have caused the abandonment of Holes 5, 8, 15 and 17. These zones consist of a clayey calcareous rock flour with competent rock fragments up to one inch in diameter. Upon contact with water the clay expands either closing the hole or seizing the rods if left in the hole. This often prevents further drilling.

A large fault trends northwesterly up the axis of the pluton (See Figure 8). The surface expression of this fault is a prominent linear composed of a small lake, a linear swamp between the two breccia complexes and a sheared gully along line 8W. Hole

5 intersected a major fault zone at 2,600 feet. If this fault zone and the fault exposed on surface are the same then this major fault must dip steeply to the northeast (See Figure 12).

In an attempt to understand the attitude and distribution of faulting in the pluton the gouge zones intersected in the drilling were plotted. The study was unsuccessful as it proved to be very difficult to correlate or project individual gouge zones from hole to hole.

In all cases there is no evidence of major displacement although the width of the fault gouge zones probably indicates periods of extensive oscillatory movement.

MINERALIZATION

Molybdenite

The molybdenite observed on the Lucky Ship Property is fine grained and is spatially related to the quartz porphyry pluton.

Six different types of molybdenite have been recognized as follows:

1) Molybdenite along dry fractures and crackle zones

2) Quartz - molybdenite veins

    a) Sets
    b) Stockworks

3) Banded quartz-molybdenite veins

4) Silica pigmented by finely disseminated molybdenite

5) Vague wispy disseminated molybdenite in porcellaneous quartz porphyry

6) Molybdenite bearing fragments containing types 2 and 4.

The following table shows the relative importance of these types of mineralization in each of the four portions of the quartz porphyry pluton.

	Main Zone	South Lobe	Ext.Bx	Int.Bx
Most important	2 a&b	2 a&b	-	4
	3	5	-	6
	1	1	-	1
Least important	6	-	-	2 a

Distribution

As mentioned under the mineralization of the Morice Nanika Ridge virtually no molybdenite has been found in situ outside the immediate area of the quartz porphyry pluton and thus this section is restricted to the distribution of molybdenite in and around the pluton. Quartz is closely associated with the molybdenite therefore its distribution will also be discussed in this section.

Main Molybdenite Zone

The primary control for the main molybdenite zone is the cylindrical vertical structure at the southern contact of the quartz porphyry pluton. The structure consists of a 400' x 600' granite core surrounded by thin rinds (10' - 100') of high silica rock and brecciated volcanic tuff. Quartz-molybdenite mineralization occurs in a crude concentric zone peripheral to the granite and extends outward from the silica zone into the quartz porphyry on the northwest and southwest sides of the structure and into the volcanic sequence on the southeast side.

On surface the molybdenite mineralization consists of wide (up to 2 feet) banded quartz-molybdenite veins separated by tens of feet of massive barren quartz porphyry (on the north, west and south sides) and volcanic tuffs (on the southeast side). These veins appear to have a radial orientation with respect to the granite plug and change laterally within 200 feet to an intense quartz and quartz molybdenite vein stockwork.

The vein stockwork zone intersected in the drill holes is located around the periphery of the granite plug and varies from a well defined zone (up to 200 feet) in massive quartz porphyry on the north and northwest sides, expanded to a broader (400 foot) patchy zone in a variety of rock types to the southwest and trending to a linear patchy stockwork zone of variable width (80 - 200 feet) in the volcanic sequence to the southeast. These three sections of the main zone are discussed below.

The best developed quartz and quartz-molybdenite vein stockwork occurs in the homogeneous massive quartz porphyry to the north and northwest of the granite plug. The barren quartz vein stockwork in this area is more extensive than the quartz molybdenite vein stockwork, thus the lateral boundaries of the mineralized zone within the stockwork are gradational and are based on assay values. At a depth of 1,200 feet this stockwork zone and the silicification pinches out. At this depth the granite flares out to the northwest and the granite-volcanic tuff-quartz porphyry contacts become sharp and unmineralized. The volcanic rind at this depth becomes fresh and massive with minor quartz veining as compared to the extensive stockwork and brecciation at higher elevations. Further along the plunge of the granite to the northwest the volcanic unit disappears and prominent quartz stockworks again appear around irregularities in the granite-quartz porphyry contact (See Figure 13).

To the south and west the mineralized zone is less well defined and expands up to 400 feet. Here the distribution of MoS_2 is complicated by the complexity of rock types and diversity in the occurrence of the molybdenite. The molybdenite occurs in patchy quartz-molybdenite stockworks, quartz-MoS_2 vein sets and in dry crackle zones in quartz porphyry, volcanic tuffs, granite, and diabase. A small apophysis of the stockwork type mineralization in quartz porphyry trends down the eastern contact of the southern lobe.

To the southeast in the volcanic sequence the quartz molybdenite stockwork in the volcanic sequence, although still primarily controlled by the cylindrical structure, has a strong secondary control imparted on it by the bedding in the volcanic tuffs. In this area the complete random stockwork as seen in the homogeneous quartz porphyry gives way to patchy stockworks, dry MoS_2 crackle zones, and some banded quartz-MoS_2 veins spatially related to conformable acid dykes in the volcanic tuffs. The crystal tuff unit is the preferred host for the molybdenite mineralization. Holes 19 and 20 were drilled beneath this section and intersected minor dykes only minor MoS_2 and a sharp volcanic-granite contact indicating that this portion of the main zone has a maximum vertical extent of 600 feet.

The quartz veining within the granite core has a similar vertical distribution varying from a high of up to 20 quartz veins per foot at surface to an average of two quartz veins per foot (Holes 19 and 20) at an approximate depth of 1,500 feet.

Southern Lobe

On surface the soil geochemical results over the southern lobe show an anomalous zone which is confined by the quartz porphyry-volcanic tuff contact on the east and a linear creek believed to be a fault on the west. Hole 18 was drilled across this anomaly. Wispy finely disseminated molybdenite in the porcellaneous quartz porphyry is cut by later fine quartz molybdenite veinlets and patchy stockwork zones from 70 feet to 350 feet in Hole 18 with a 60 foot section averaging 0.13% MoS_2. The wispy molybdenite appears to be an earlier period of molybdenite mineralization similar in age to the quartz porphyry. No molybdenite mineralization was observed on surface south of the trace of Hole 18.

Intrusive Breccia

Molybdenite occurs in the intrusive breccia as finely disseminated molybdenite in a cryptocrystalline silica gel, as fine molybdenite along later dry hairline fractures and as a variety of occurrences in mineralized quartz porphyry fragments.

The most prominent molybdenite mineralization in the intrusive breccia is the finely disseminated molybdenite in the silica gel. Only one small (2 by 5 foot) exposure of this material has been noted on the property. A grab sample from this material assayed 0.19% MoS_2. A similar occurrence averaging 0.14% MoS_2 was intersected in Hole 5 between 1,080 and 1,130 feet.

In both occurrences rounded fragments of white quartz porphyry are cemented by a dark silica containing extremely finely disseminated molybdenite and some finely comminuted rock material. The rounded white quartz porphyry fragments on either side of the mineralization appear identical to the fragments cemented by the molybdenite-silica gel. This molybdenite mineralization is thus considered to have been injected at the same time as the breccia. The above are the only known occurrences of this type yet observed in the breccia complex.

Molybdenite bearing fragments are found throughout Hole 5 from 82 feet to the bottom. Above the 3,050 foot elevation (ie. 1,100 foot depth) the mineralized fragments contain molybdenite bearing quartz veins and quartz vein stockworks. Below the 3,050 foot elevation two-thirds of the molybdenite bearing fragments contain fine molybdenite more representative of the silica-molybdenite mixture described above with the remainder being associated with quartz veining. The percentage of molybdenite bearing fragments to the total number of fragments rarely exceed one percent, however, their presence through this vertical distance has important economic implications.

Molybdenite is also observed with crushed pyrite along chloritic fractures in the more massive sections of quartz porphyry. This molybdenite is difficult to identify except in a few cases. Molybdenite also occurs associated with quartz veins (3 per foot) which are later than the brecciation and cut across the breccia fragments near the bottom of Hole 5.

Molybdenite occurs in the grey fault gouge zones in all portions of the pluton. It is not recognizable megascopically but has been indicated by assay results (.02 - .04% MoS_2).

Subvolcanic Breccia Complex

Geochemical soil sampling results over the volcanic breccia complex were negative. No molybdenite mineralization was observed. Pyrite is conspicuous by its absence (only a rare rusty fragment was observed in the breccia).

Structural Controls

The primary control for molybdenite mineralization is the fracture zone peripheral to the granite plug.

In the homogeneous competent quartz porphyry on the north and northwest sides the shattering was completely random and the rock was structurally well prepared for the mineralizing solutions resulting in a well developed stockwork. The wide banded veins on surface are believed due to less confining pressures near the top of the structure.

Stockwork development is not as complete around the rest of the granite plug and is complicated by the complexity of rock types and secondary structural controls.

In the volcanic sequence on the southeast side the most intense quartz-molybdenite stockwork has been developed in the homogeneous competent crystal tuff unit and conformable acid dykes. Elsewhere in the sequence the highly variable volcanic units have resulted in patchy stockwork development and the formation of wider quartz-molybdenite vein systems along weaker bedding planes.

On the south and southwest sides of the granite plug the fracture zone was less completely developed due to the variety and complexity of rock units. In this region molybdenite occurs in patchy quartz-molybdenite stockworks and in dry crackle zones. A moderate to light quartz-molybdenite stockwork in Hole 18 appears spatially connected to this patchy zone and trends in a southerly direction down the east side of the southern lobe.

Vague, wispy, disseminated molybdenite was observed only in the porcellaneous phase of the quartz porphyry in the southern lobe and does not appear to be fracture controlled. To the north and at depth of the main structure the quartz veining and mineralization appear related to fracturing around irregularities in the granite-quartz porphyry contact.

Molybdenite bearing fragments are found in small intrusive breccias developed along the southeastern contact of the pluton and to a greater extent within the intrusive breccia complex in the north portion of the pluton. The structural control in the first area would be the contact of the pluton. Due to limited information (only one hole) and the complexity of breccias it is impossible to postulate any structural controls over the distribution of fragments in the northern breccia complex.

The structural control over the silica-molybdenite occurrences in the northern breccia zone has not been recognized as only two occurrences of the type are known. Evidence suggests a steeply dipping channelway with very restricted lateral extent.

Assay Results

Drilling carried out in 1966 did not appreciably alter the configuration of the upper portions of the mineralized zone but did indicate the lower limits of the molybdenite mineralization around the granite plug. Table I is a revision of the table from the 1965 report listing the significant assay intersections.

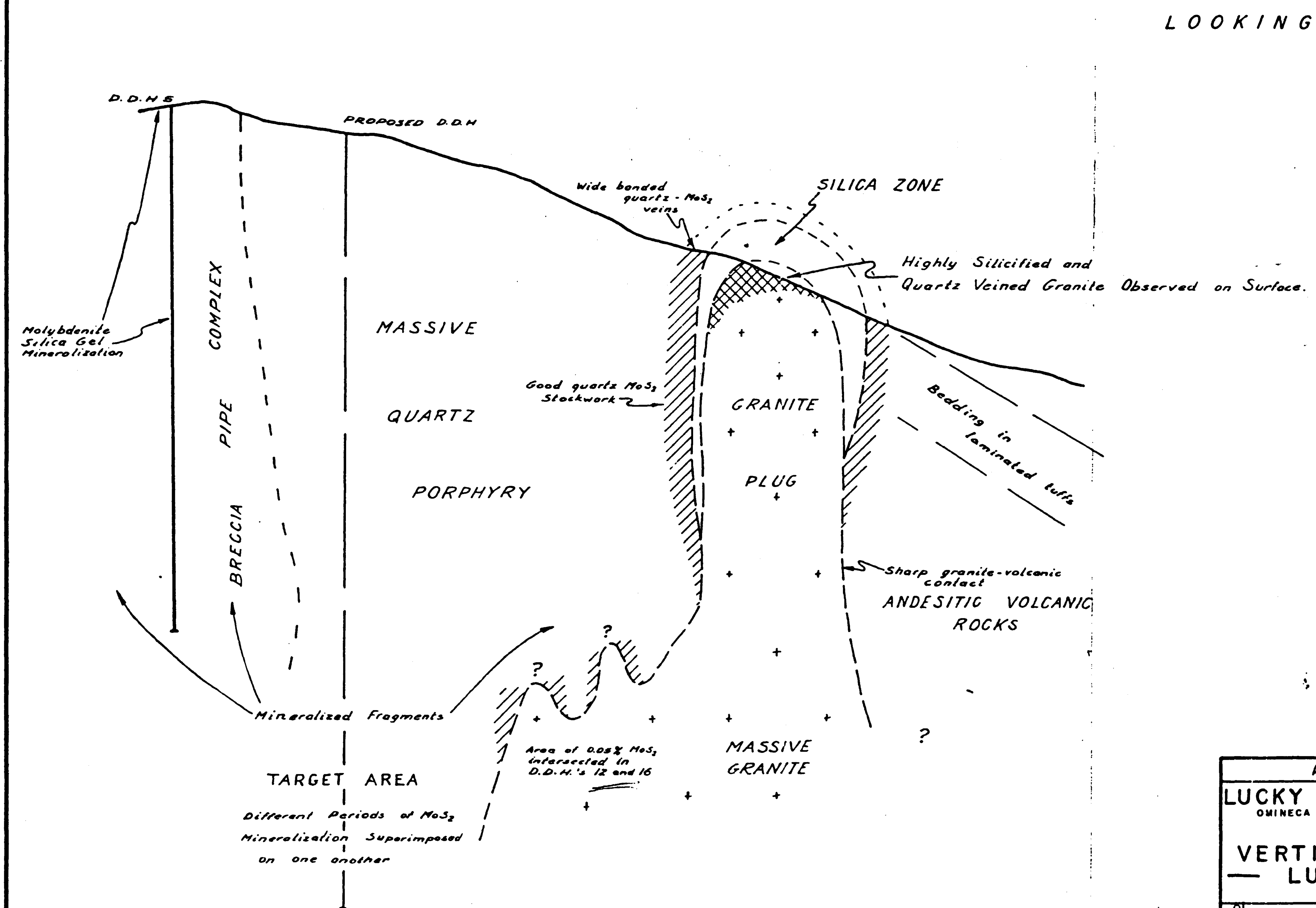
The tonnage and grade of the main zone was recalculated using two methods. Both gave similar results.

Method I

Assume a tabular body with a true width of 150 feet, an average depth of 900 feet and a strike length around 4/5 of the periphery of the granite plug of 1400 feet. Using a tonnage factor of 10 cu.ft. per ton:

$$\text{Indicated Tonnage} \quad \frac{1500 \times 900 \times 150}{10} = 20,250,000$$

= approximately 20 million tons averaging 0.163% MoS_2



AMAX EXPLORATION INC.

LUCKY SHIP PROJECT – 1966

OMINECA MINING DIVISION — BRITISH COLUMBIA

THEORETICAL VERTICAL CROSS SECTION

— LUCKY SHIP PLUTON —

NOT TO SCALE

DATE REVISED	DATE PRINTED			
		6/20/67	Drawn by H C P Date 6/19/67 N.T.S. File 93 L 3, 4	FIG. 13

To accompany "FINAL REPORT LUCKY SHIP PROJECT - 1966"
by: T. J. R. Godfrey Date–

Method II

Measure the area of the zone at the 3,000 foot elevation and multiply the northwest half by 1,200 (depth) and the southeast half by 600 (depth).

$$\frac{144,400 \times 1200}{10} + \frac{114,000 \times 600}{10} = 24,168,000$$

= approximately 24 million tons averaging 0.163% MoS_2

THEORETICAL GEOLOGY (See Figure 13)

This section will consider the theories developed concerning the sequence of geologic events and molybdenite mineralization in the Lucky Ship Pluton and the significance of these theories in discussing the potential for finding more molybdenite mineralization.

The following table summarizes the sequence of igneous and mineralizing events in the Lucky Ship Pluton. These events are explained following the table.

Decreasing Age ↓	IGNEOUS EVENT		ASSOCIATED MOLYBDENITE MINERALIZATION
	I	Main Massive quartz porphyry including southern lobe	Wispy molybdenite. Vein molybdenite - observed as fragments in intrusive breccia.
	II	Intrusive Breccia Complex	Molybdenite-silica type mineralization.
	III	Granite Plug	Quartz and quartz molybdenite vein stockwork peripheral to plug and along northerly plunge of granite at depth. Veins cut earlier rock units.
	IV	Subvolcanic Breccia Complex	None.

I The southern lobe and main massive portion of the quartz porphyry pluton appears to be the oldest intrusive phase of the Lucky Ship intrusive complex. It was emplaced into the Hazelton volcanic sequence at the junction of major northwest and northeast trending faults.

Associated genetically with the massive quartz porphyry is a wispy vague type of molybdenite mineralization which although not important economically serves to indicate that the first pulse of the pluton did contain molybdenite. Quartz molybdenite veined porphyry fragments in the later breccia complex indicate that vein type mineralization is also associated with the massive porphyry.

II The next stage was the forceful multiple intrusion of a series of quartz porphyry breccias which are now seen as the northern intrusive breccia complex and a small breccia zone along the southern contact of the pluton to the north of the granite plug. The porphyry fragments in the intrusive breccia are, in all likelihood, the earlier massive porphyry.

Associated with the series of breccia pulses is the molybdenite-silica gel type of mineralization which is observed on surface and in Hole 5. It is believed similar in age to the emplacement of the breccias. It is also found in mineralized fragments at depth indicating that this type of mineralization was emplaced with one of the breccia phases and then brecciated by a slightly later breccia pulse (ie. is intrabreccia). Some mineralized fragments also contain vein quartz-molybdenite mineralization.

The presence of these fragments suggests that a period of vein type quartz-molybdenite mineralization is related to the earlier massive quartz porphyry.

III The granite appears to be later than both the massive quartz porphyry and the intrusive breccia. The country rock around the periphery of the granite was intensely fractured during the emplacement of the granite plug. Quartz molybdenite mineralization, probably derived from the granite, was injected into this shatter zone. This period of mineralization resulted in what is termed the "main molybdenite zone". The quartz-molybdenite vein stockwork of this zone is limited laterally to within 300 feet of the granite plug. The vertical distribution of the silicification, molybdenite mineralization, and quartz veining varies from intense at the surface decreasing rapidly to minor amounts in the first 500 feet suggesting that the present erosional surface intersects the granite plug near its apex.

Molybdenite of this period also occurs in large low grade stockwork zones near the contact of small granite apophyses intruding massive quartz porphyry at depth and to the north of the main molybdenite zone.

The vein type molybdenite mineralization associated with the granite intrusion is observed cutting the volcanic tuffs, all phases of the porphyry and the intrusive breccias in the lower portion of Hole 5. Veins of this period also cut fragments in the breccia containing the earlier vein type molybdenite.

IV The sub-volcanic breccia complex appears to be the last igneous event related to the intrusive complex. This complex lies outside the mineralized area as it is not intersected by the vein type molybdenite and no molybdenite bearing fragments have been observed. It is assumed that erosion has removed most of the extrusive material associated with this breccia complex leaving the cylindrical breccia structure (ie. neck) southeast of the camp.

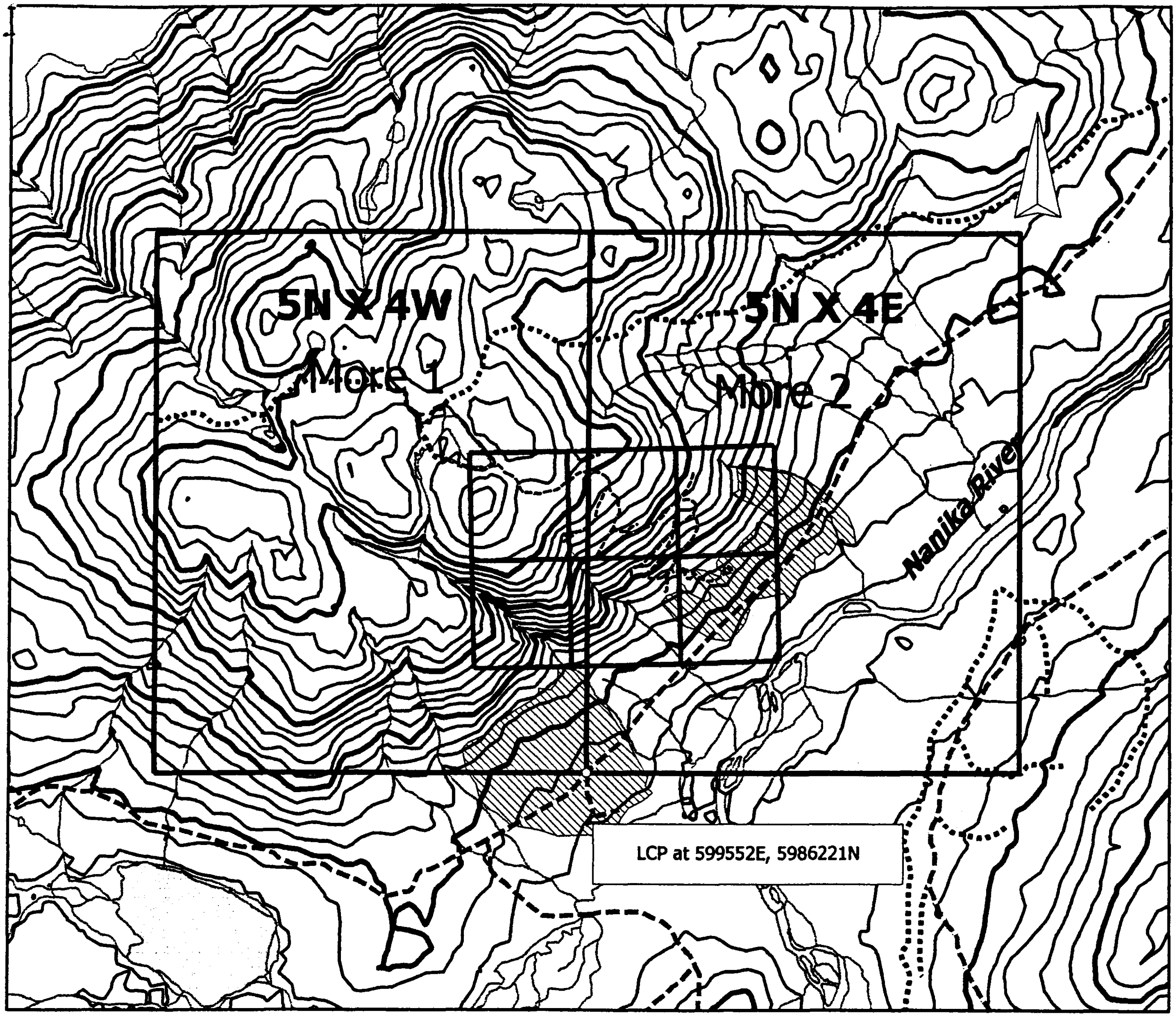
EXPLORATION POTENTIAL & PROPOSED 1967 EXPLORATION PROGRAM

The Lucky Ship Pluton represents an excellent environment for the deposition of molybdenite. The following features are of importance when considering the future economic potential within the pluton.

1) The intrusive rocks of the quartz porphyry pluton represent a complex sequence of acid igneous rock units - all of them potential source rocks for molybdenite mineralization.

2) At least four different ages of molybdenite mineralization have been observed. Within each period of mineralization there have been multiple pulses of molybdenite (ie. in the stockwork zone quartz molybdenite veins are occasionally rhythmically banded and often exhibit mutually offsetting relationships with one another).

3) Rock preparation in the area of the pluton drilled to date has been ideal. Deep drilling suggests that the igneous geology becomes more complex at depth thus increasing the possibilities of structurally well prepared rock below the current drilling.



5N X 4W
More 1
5N X 4E
More 2
Nanika River
LCP at 599552E, 5986221N

To be more specific we have concluded from an interpretation of the geological features observed to date that the superposition of two or more mineralizing pulses or periods is a necessary prerequisite to the occurrence of viable mineralization at depth on the Lucky Ship Property. We also feel that the superposition of two or more mineralizing periods is most likely to occur at depth vertically below the central portion of the pluton as the molybdenite bearing stockworks (Phase III) along the north plunging contact of the granite and the molybdenite bearing porphyry fragments with Phase I mineralization (as observed in Hole 5) appear to converge in this area (See Figure 13).

Results of the drilling to date has shown that the zone of interest is at a minimum depth of 2,500 feet below surface. Further we must assume that if the mineralization is to be viable at this depth it must have considerable lateral dimensions. Therefore we feel that one 3,500 foot vertical foot hole collared near the center of the pluton will intersect the target area and thus provide us with a reasonably good test of the remaining exploration potential on the Lucky Ship Property.

The estimated cost of the program is $122,500 Canadian ($113,000 U.S. Funds).

Drilling 3,500 feet x $16.00	= $56,000
Property Payments	40,000
Miscellaneous - Assaying, Camp Travel, Vehicles, Wages, etc.	26,500

Vancouver Office

June, 1967

T.J.R. Godfrey