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AMAX EXPLORATION, Inc.

1966 FINAL REPORT

KITIMAT RIVER PROPERTY

Skeena Mining Division

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Vancouver Office
May 30, 1967

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REFERENCE

S. Duffel and J.G. Souther, Geology of the Terrace Map-Area, B.C. Memoir 329, 1964

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SUMMARY

The Kitimat River molybdenite showing is near the upper reaches of Kitimat River, 32 air miles southeast of Terrace, B.C. The showing is marked by weakly developed iron staining discontinuously exposed in creek beds and steep cliffs over an area approximately 10,000 by 6,000 feet.

Work done in 1966 consisted of geochemical sampling, geological mapping, surface sampling, line-cutting, and prospecting. A crew varying in number from 7 to 12 men was employed.

The showing is on the east flank of the Coast Range Batholithic Complex within five miles of the main contact with the Hazelton Group. Most of the showing is underlain by two main intrusive rock types, a medium grained soda granite and a granitic quartz-feldspar porphyry. A roof pendant of massive, fine grained volcanic rocks of the Hazelton Group caps the intrusive rocks in the central and northwestern portion of the property. A swarm of post-mineralization dykes ranging in composition from diorite to quartz-monzonite intrudes all rock types in the area.

Molybdenite mineralization is exposed discontinuously in two of the three major creeks draining the property (Mantle and Gossan). The two zones are 8,500 feet apart. Molybdenite occurs in each zone for horizontal distances of 2,000 to 2,500 feet and through vertical distances of 1000 to 1500 feet, between elevations 2,000 and 3,500 feet. The MoS_2 mineralization is localized largely in the soda granite and the granitic quartz-

feldspar porphyry. In both zones, molybdenite is very fine grained and occurs mainly as fine flakes along the margins of narrow quartz-pyrite veins, either as discreet individual veins or in stockworks, and to a minor extent on dry fracture surfaces and as disseminations. Chalcopyrite, in minor amounts is frequently associated with both pyrite and molybdenite.

The structure of the property is relatively complex and dominated by three main sets of fractures as follows:

1. N30° - 40°W, dipping steeply to the southwest
2. Due north and vertical
3. N38°E and vertical

The first set, striking N42°W and dipping steeply to the southwest, is by far the predominant structure and is characterized by a number of shear zones which acted as loci for emplacement of the majority of post mineralization dykes.

Hydrothermal alteration occurs in widely separated areas. Silicification, feldspathization and sericitization are the main types, and are commonly associated with molybdenite mineralization. The alteration is structurally controlled, and is most intensely developed along faults and shear zones.

Although the grade of molybdenite mineralization is very low on the presently exposed surfaces, the property has several favorable features which should be considered carefully before deciding future work on the property. These features can be summarized as follows:

i) Molybdenite mineralization occurs over a large area in widely separated localities.

ii) The mineralized zones are associated with geochemical anomalies of even greater extent.

iii) Quartz-vein stockworks occur in two zones 8,500 feet apart.

iv) Hydrothermal alteration is widespread and is intense locally.

v) The area has a varied and prolonged igneous history.

vi) Molybdenite is very fine grained.

vii) The granitic quartz-feldspar porphyry, believed to be the source of molybdenite mineralization, may extend at depth from Gossan Creek to Mantle Creek.

CONCLUSIONS

Geological mapping and sampling along Gossan and Mantle Creeks and geochemical soil sampling over the heavily timbered hillsides between the two creeks has confirmed the presence of low grade molybdenite mineralization in two distinct zones exposed in Mantle and Gossan Creeks. Both zones are associated with relatively large geochemical anomalies.

Although the grade of mineralization is very low on presently exposed surfaces, large portions of the mineralized zones could not be tested because of inaccessibility. Therefore, the possibility of a better grade of mineralization in presently unexposed or inaccessible areas cannot be excluded.

Diamond drilling is the only method of further exploring the potential of the property.

RECOMMENDATIONS

Four thousand feet of diamond drilling are proposed to test the two mineralized zones in Gossan and Mantle Creeks. The costs of such a program are estimated at $115,000.

However, in view of (i) the low grade of mineralization and (ii) the fact that enough work has been done on the property in 1965 and 1966 to allow retention of the claims for periods varying from 3 to 5 years, it is proposed that no work be done on the property in 1967. The proposed program and the potential of the property should be reviewed at a later date. Future work would depend on the progress of exploration in the Terrace-Usk area.

INTRODUCTION

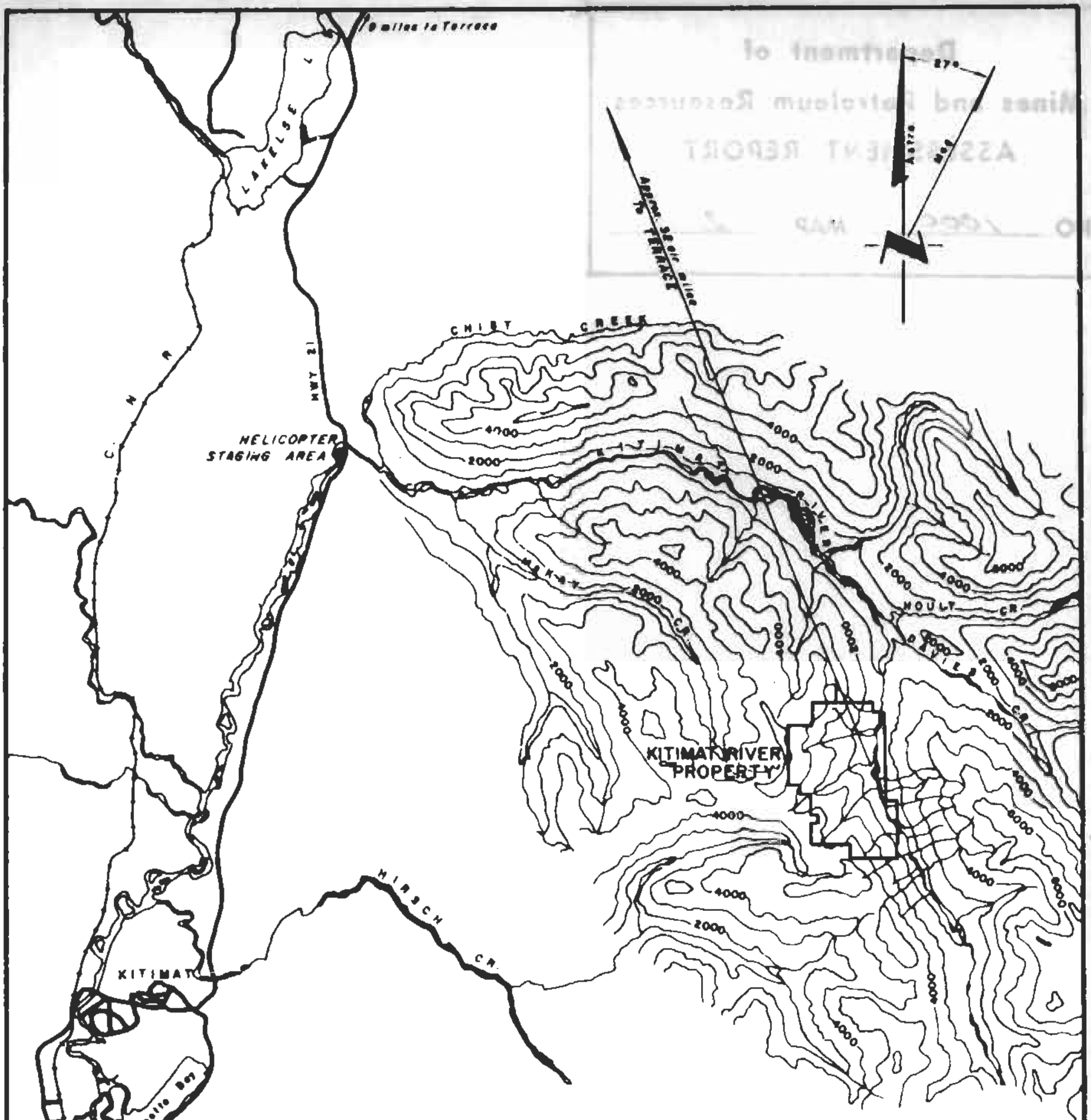
The Kitimat River molybdenite showing was discovered and staked by AMAX Exploration, Inc. personnel in the early part of the 1965 Central B.C. Prospecting Program. A preliminary evaluation program consisting of geological mapping, geochemical sampling, and an induced polarization survey was carried out in late summer and early fall of 1965. The results of the preliminary investigation, especially with regard to some highly anomalous Mo values in the water draining the property, were considered sufficiently encouraging to warrant a more detailed surface program in 1966.

The following report is concerned with the work carried out in 1966, the results obtained, the potential of the property, and the recommendations for future exploration.

Location and Access

The property is on the upper reaches of the Kitimat River, thirty-two air miles southeast of Terrace, and about twenty miles upstream from the intersection of the Kitimat River and Highway 25. This intersection, which was used as a helicopter landing site, is twenty-one miles from Terrace and fifteen miles from Kitimat, where a deep water harbour and docking facilities exist (See Figures 1 and 2).

For fourteen of the twenty miles between Highway 25 and the centre of the property, the Kitimat River valley is well braided, with an average width of one mile and a grade of one and



AMAX EXPLORATION INC.

KITIMAT RIVER MoS_2 PROPERTY 1966

SKEENA MINING DIVISION — BRITISH COLUMBIA

LOCATION AND ACCESS MAP

SCALE 1 : 250,000

APPROXIMATELY 1" = 4 MILES

P. W. Richardson

Vancouver — May 31, 1967, N.P.

103 I 1 FIG. 2

one half percent. For the remaining six miles the river traverses narrow canyons and the valley is severly constricted.

At the present time, the property is accessible only by helicopter.

Property

Initially the property comprised 256 claims staked during the summer of 1965 by personnel of the Central B.C. Prospecting Program acting as agents for Southwest Potash Corporation. A total of 131 claims of the original 256 have been retained. Work carried out on the property in 1965 and 1966 will allow retention of the claims for periods varying from 3 to 5 years. The relevant data for the 131 claims comprising the property are given in Table II(See also Figure 10).

PHYSIOGRAPHY

Topography

The property lies in mountainous terrain of the Coast Range Physiographic Province. The west boundary of the claim area is the Kitimat River which at this point flows approximately due north. The topography is generally rugged with steep slopes rising from the floor of the main valley (at elevation 1,400 feet) to elevations of 5,000 feet on the nearby ridges.

The property is deeply dissected by three westerly flowing tributaries of the Kitimat River. From north to south they are Gossan, Lamp, and Mantle Creeks. Characteristically, slopes on the walls of the V-shaped valleys are either very steep, as in

Mantle and Lamp Creeks, or precipitous, as on the south wall of Gossan Creek, where cliffs 1,500 feet high extend laterally for 2,500 feet. Two narrow plateaus between 3,500 and 4,500 feet in elevation separate the three V-shaped valleys.

The MoS_2 showings are located below timberline on Gossan and Mantle Creeks between elevations of 2,000 and 3,500 feet.

Weather

The annual precipitation at Kitimat River is about 80 inches. Heavy snowfalls occur during the winter months, and warm rainy weather is the rule during the summer. On occasions, as in 1966, the summers can be extremely wet.

With the exception of localized snow banks resulting from slides in both Gossan and Mantle Creeks, the property is free of snow by the first week in June below an elevation of 3,000 feet. Above 3,000 feet, snow persists until the end of June.

Evidence of heavy spring flooding was noted in the lower reaches of Mantle, Lamp, and Gossan Creeks.

Water

Abundant water is available from the Kitimat River and within the drainage systems of its tributaries on the property.

Timber

Below the 4,500 foot level, the property is blanketed by a thick forest cover characterized by large trees and an absence of undergrowth. Hemlock and fir are common, and are as much as four feet in diameter and 150 feet in height.

REVIEW OF WORK DONE IN 1965

Staking of the property began in June, 1965. Additional claims were staked and some of the earlier claims were re-staked in August and September.

Beginning in June, preliminary prospecting was done in the more remote areas of the property and along the three main creeks named Gossan, Lamp, and Mantle. Geological assessment of the property began in September when S.J. Carryer and R.H. McMillan mapped Mantle and Gossan Creeks and the claim location lines in the central area of the property. Some geochemical stream sediment and soil sampling were done concurrently with the geological mapping.

An induced polarization survey using the variable frequency method was done by McPhar Geophysics Limited along the location lines and accessible sections of the creeks. The survey totalled 8.5 line miles. No anomalies were found indicating that there is no appreciable amount of pyrite associated with the molybdenite mineralization.

A total of 61 feet of bedrock was tested by chip and channel sampling to establish the background of molybdenum in both mineralized and unmineralized areas.

The reconnaissance geochemical sampling was done to define the limits of molybdenum mineralization in Gossan and Mantle Creeks and to investigate the fringe areas of the claim group for other areas of significant mineralization. Soil samples were collected at 300 foot intervals along the location lines and the I.P. survey lines. Water and silt samples were collected in the drainage systems of Gossan, Lamp, and Mantle Creeks and from several creeks flowing into the east side of Kitimat River. The stream sediment and water sampling confirmed the wide distribution of molybdenum mineralization, but sufficient work to limit the areas of interest was not completed. The sample density was insufficient to outline specific anomalous areas.

The combination of the molybdenum-bearing float of altered quartz-veined acidic rock, scattered positive soil sampling results, and the highly anomalous molybdenum-bearing waters flowing into Gossan and Mantle Creeks was sufficiently encouraging to justify an extensive program of detailed geological mapping, soil sampling, and rock chip sampling in 1966.

WORK DONE IN 1966

General Statement

The objectives of the 1966 program were (i) to establish the extent and grade of molybdenite mineralization, (ii) to supplement and refine the geological data obtained during the 1965 program, (iii) to prospect for other areas of molybdenite mineralization, and (iv) to outline possible drill targets.

The work consisted of line cutting, plane table mapping, geological mapping, geochemical soil sampling, and rock chip sampling.

The personnel, under the supervision of P.W.Richardson, consisted of two geologists,A.C.Gambardella and A. Wenban-Smith, two junior assistants, one cook, and two to five laborers.

A chartered helicopter was used to supply the camp and to ferry crews within the property.

Field work was started on May 27 and ended on October 8th. The camp was closed and all personnel were moved out on October 9th.

Establishment of Control

The basic control for all phases of work on the property was provided by an uncontrolled 1" = 500' contour map made by Lockwood Survey Corporation Limited from existing air photo coverage of the area.

Plane table mapping was done along the base line between the mouths of Gossan and Mantle Creeks and was extended up the above creeks to the areas of molybdenite mineralization. The plane table stations served as primary control for the geological mapping and for the rock chip sampling along the creek valleys. Where plane table mapping was not possible, control stations were established along Mantle and Gossan Creeks by the tape and compass method.

In the heavily timbered hillsides between the creeks, accurate compass and chain lines were established at 400 foot intervals, and pickets were placed at intervals of 200 horizontal feet along each line. The slopes covered by the grid average 45°, and some sections are between 55° and 60°. Establishing these lines, was therefore, labourious and costly, but (i) the presence of highly anomalous Mo values in the water of springs along the base of the slope and (ii) the inaccuracy introduced by the simple compass and pace method along the very steep slopes justified the costs incurred in establishing the grid. A total of 27 line miles of grid was completed.

The grid was used as control for geological mapping and for the geochemical soil survey.

Geological Mapping

Geological mapping was carried out in both Mantle and Gossan Creeks on a scale of 1" = 100'. The area between the creeks was mapped on a scale of 1" = 200', using the grid lines as control. The rest of the property was mapped in reconnaissance fashion with the aid of the 1" = 500' contour map, aerial photos, and altimeter. In areas of no rock exposures, the underlying rock types were mapped by examining the rock rubble in geochemical sample holes.

Geochemical Sampling

Geochemical samples were collected along the grid lines at 200' intervals. The area tested in this fashion is approximately two and one half square miles. Reconnaissance geochemical sampling was done in the remainder of the property and in areas adjacent to the claim group.

Rock Chip Sampling

Rock chip sampling was done to test the grade of molybdenite mineralization in Mantle and Gossan Creeks. The samples, each weighing approximately 10 pounds, were taken in ten foot lengths, spaced at about 100' intervals. A total of 1088 linear feet of samples were collected. Of these, 771 were sent for assay to Coast Eldridge in Vancouver and 317 to the AMAX Exploration geochemical laboratory in Smithers.

REGIONAL GEOLOGY

General Statement

The property is on the eastern flank of the Coast Range Batholithic Complex, five miles inside the contact with the Hazelton Group of predominantly volcanic rocks. The bulk of the intrusive complex is believed to be of Cretaceous Age, and has been intruded into the Jurassic Hazelton sequence.

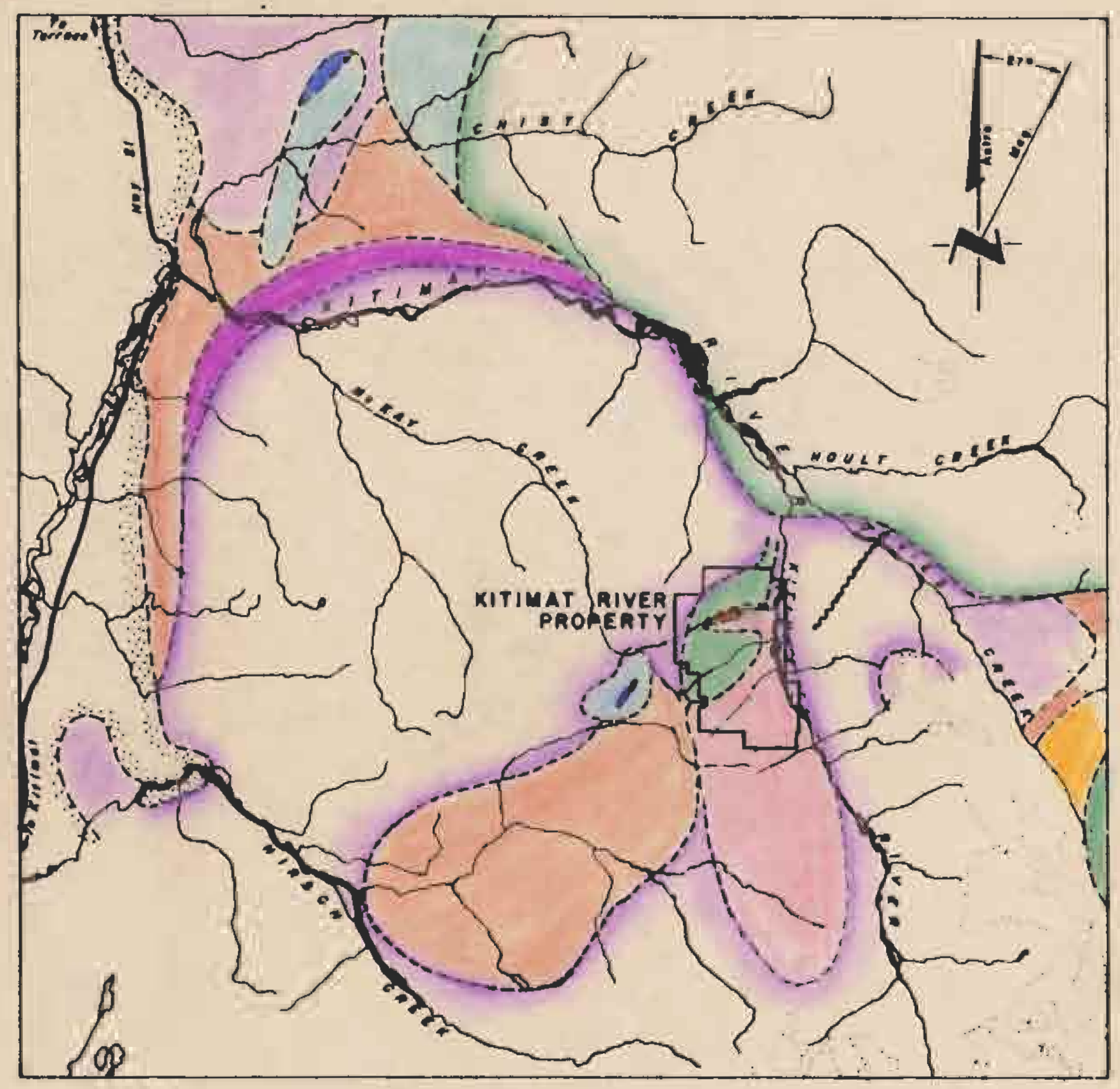
A roof pendant of massive, undifferentiated volcanic rocks of the Hazelton Group crops out partly within the property. A second roof pendant composed of Paleozoic crystalline limestone associated with a sequence of Triassic sedimentary rocks has been mapped by the G.S.C. on the upper reaches of Hirsch and McKay Creeks, just west of the property.

Numerous northwesterly trending dykes ranging in composition from diorite to quartz-monzonite cut the intrusive complex and the Hazelton volcanic rocks.

Intrusive Rocks

Several phases of the Coast Range Batholithic Complex have been mapped in the area. From oldest to youngest these phases are:

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1000 MAP 3



NOTE —
Geology after Duffell and Souther, 1964 - modified

LEGEND

PLEISTOCENE AND RECENT	⠿	Sand, gravel, clay.
POST-CRETACEOUS ?	🟧	Granitic quartz feldspar porphyry
	▨	Soda granite
UPPER CRETACEOUS OR LATER		COAST RANGE BATHOLITHIC COMPLEX
	🟪	Hornblende and hornblende biotite granodiorite.
	🟧	Hornblende diorite, quartz diorite.
	🟪	White granodiorite.
	▨	Green granodiorite
	🟨	Olivene gabbro, pyroxene gabbro, diorite.
JURASSIC	🟩	HAZELTON GROUP: basalt, andesite, dacite rhyolite and related pyroclastic rocks.
TRIASSIC?	🟦	Sedimentary Rocks (limestone, boulder conglomerate).
PERMIAN	🟦	White crystalline limestone.

SYMBOLS

- - - - - Geological contact.

~~~~~ Shear zone.

P.W. Richardson

AMAX EXPLORATION INC

KITIMAT RIVER MoS2 PROPERTY 1966
SKEENA MINING DIVISION - BRITISH COLUMBIA

REGIONAL GEOLOGY MAP

SCALE 1 = 250,000

DATE REVISED By NGB 26-4-67	DATE PRINTED	Drawn By H C P Date 26-4-67 N T S FILE 103 - I - 1	FIG 3

To Accompany Report "KITIMAT RIVER MoS2 PROPERTY 1966"
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i) a gabbro facies
ii) a hornblende-biotite diorite facies
iii) a white biotite granodiorite

The gabbro and the hornblende-biotite diorite are part of a complex heterogeneous suite of rocks forming the border facies of the Coast Range Batholith. The rocks of these facies are believed to be the product of interaction between the intrusive and the older sedimentary and volcanic rocks.

The white biotite granodiorite characteristic of the inner facies of the Coast Range intrusives is by far the most abundant and continuous rock type in the areas adjacent to the property. With the exception of local variation in the biotite content, the rock is remarkably uniform in both texture and composition.

The contact between the rocks of the border facies and those of the inner facies is generally gradational. In places, however, the border facies is missing and the white biotite granodiorite of the inner facies forms sharp intrusive contacts with the volcanic and sedimentary rocks.

The property is underlain predominatly by a medium grained soda granite. It varies sufficiently in texture and composition from the white biotite granodiorite to be mapped as a different unit, but its exact relationship with the latter has not been established.

Structure

A swarm of northwesterly trending dykes, which extend well beyond the limits of the map area, are the main structural feature. Their uniform northwesterly trend and the corresponding orientation of topographic linears obtained from air photos suggest that the property lies along a tectonic weakness of regional or subregional extent. The dykes are intruded along shear zones and major joint fractures.

A twenty foot wide shear zone extending from the head of Davies Creek into the northeast corner of the property and trending northwest is the most conspicuous structure mapped in the area.

GEOLOGY OF THE CLAIM GROUP

General Statement

Molybdenite mineralization is exposed in two V-shaped valleys containing Gossan and Mantle Creeks which flow northeasterly into the Kitimat River. The two areas are approximately 8,500 feet apart.

The mineralization in both zones is associated with acid igneous rocks and is accompanied by weak iron oxide staining. A roof pendant of undifferentiated volcanic rocks of the Hazelton Group separates the two zones.

The area has a complex geological history resulting from several periods of igneous activity and relatively intense structural deformation. Interpretation, however, is hindered considerably by the scarcity of rock exposure throughout most of the property and the inaccessibility of cliffs in both mineralized zones.

Hazelton Group

A roof pendant composed of medium to dark green, massive, undifferentiated volcanic rocks of the Hazelton Group crops out on the north and west-central portion of the property. The Hazelton Group is the oldest rock type in the property and is believed to be of Jurassic Age. The rock is uniformly fine grained and composed of feldspar, quartz, biotite, and hornblende. The grade of metamorphism is relatively low, and the main alteration products are epidote and chlorite. Along the contact with the granitic quartz-feldspar porphyry the volcanic rocks are finely brecciated and granitized.

Molybdenite mineralization is generally absent except near the contact with the granitic quartz-feldspar porphyry in Gossan Creek where sporadic MoS_2-bearing quartz veins were noted.

Intrusive Rocks

General Statement

The intrusive rocks underlying the property show considerable variation in texture and composition, and differ significantly from the rocks of the surrounding batholith. Two main intrusive facies, soda granite and granitic quartz-feldspar porphyry; two pre-mineral dykes, aplite and foliated feldspar; and a variety of post-mineral dykes ranging in composition from diorite to quartz-monzonite have been mapped on the property. Detailed descriptions of these rocks are given in subsequent sections of the report.

Molybdenite mineralization is localized largely in the soda granite and the granitic quartz-feldspar porphyry.

The age relationship between the various rock types is discussed in the section on Igneous History below. A tentative age sequence with respect to MoS_2 mineralization is given in Table I.

TABLE I

TABLE OF FORMATIONS

Youngest	Intermediate Dykes	Post-molybdenite mineralization in age
	Quartz-Monzonite Dykes	
	Diorite Dykes	
	Aplite Dykes	
	Granitic Quartz-Feldspar Porphyry	
	Foliated Feldspar-Porphyry Dyke (?)	
	Soda Granite	
Oldest	White Biotite Granodiorite	

White Biotite Granodiorite

White biotite granodiorite crops out on a ridge on the extreme northwestern margin of the property, and is the most abundant rock type in the areas adjacent to the property. The rock has a uniform medium-grained texture and is composed of white feldspar (70%), quartz (15-20%), biotite (5-10%) and hornblende (2%).

In thin section, euhedral crystals of plagioclase exhibit a strong to moderate normal zoning and range in composition from An_{20} to An_{36}. Potash feldspar (perthitic in part) constitutes 10% of the rock and occurs as anhedral, poikilitic grains interstitial to plagioclase. Strained quartz is interstitial to both feldspars and appears to be replacing them. Unaltered flakes of brown biotite and hornblende laths are the mafic constituents. Accessory amounts of sphene, magnetite and apatite are present.

With the exception of a slight sericitization of plagioclase cores, the rock is relatively free of alteration products.

Soda Granite

This rock constitutes the main intrusive body on the property. It underlies most of the eastern and south-central portions of the property. The color varies from light pink to light grey and the texture from medium grained hypidiomorphic granular to subporphyritic. The latter texture occurs only along the ridge tops, indicating that the current level of erosion is close to the original intrusive surface level. Irrespective of texture and color, the composition is essentially 50 - 60% plagioclase, 15 - 20% K-feldspar, 15 - 20% quartz, and 2 - 5% biotite.

Microscopic examination of a representative specimen from Mantle Creek gave the following results:

Plagioclase - euhedral to subhedral grains, with weak to moderate normal zoning and generally poor twinning. The composition varies from An_8 to An_{12}. The cores exhibit strong to moderate alteration to sericite and minor epidote.

K-feldspar - occurs as coarse anhedral grains of string perthite, interstitial to the plagioclase. Also as rims around the plagioclase. Frequently the perthite is closely associated with quartz, suggesting a simultaneous crystallization of the two minerals either as a late cotectic crystallization or as hydrothermal replacement.

Quartz - anhedral grains, with undulatory extinction.

Biotite - brown, medium-sized flakes, occurring singly or in clusters, slightly altered to chlorite.

Opaque Minerals - finely disseminated dust of iron oxides and minor amounts of euhedral pyrite.

A partial chemical analysis of one sample of soda granite gave the following results:

SiO_2	K_2O	Na_2O	CaO
71.7	3.0	4.48	0.825

Foliated Feldspar Porphyry Dyke

A dark grey, foliated feldspar porphyry crops out intermittently along a narrow zone on the north slope of Gossan Creek between elevations of 2,000 and 2,500 feet. The texture is porphyritic with phenocrysts of subhedral fedspar and rounded quartz "eyes" set in a dark grey, aphanitic matrix. The pronounced foliation results from the planar orientation of biotite laths.

Fracturing is generally weak except in areas of shearing.

Along its northern margin the feldspar porphyry exhibits a chilled contact against the Hazelton volcanics. The southern contact is, for the most part, covered by alluvium, but in one locality a contact with the granitic quartz-feldspar porphyry is exposed, and the latter rock type forms a chilled margin against the porphyry.

The exposure pattern and the texture indicate that the feldspar porphyry is a dyke, 20 to 50 feet wide, intruded parallel to the course of Gossan Creek.

Molybdenite mineralization is generally absent and it was recorded only at one locality near the contact with the granitic quartz-feldspar porphyry.

In thin section, the plagioclase phenocrysts show a pronounced oscillatory extinction, and a compositional range of An_{30} to An_{40}. They constitute 20% of the rock. Alkali feldspar (perthite) occurs as anhedral phenocrysts (less than 10%) and as fine grained graphic intergrowths with quartz in the groundmass. Quartz phenocrysts make up 10% of the rock. They have slightly resorbed borders and wavy extinction due to straining. Biotite which constitutes approximately 12% of the rock is the only mafic present.

Accessory amounts of magnetite, pyrite, apatite, and zircon are the remaining constituents.

Alteration of plagioclase to sericite and biotite to chlorite is widespread but generally weak.

Granitic Quartz-Feldspar Porphyry

A body of pink, granitic rock outcrops as a steep cliff on the south slope of Gossan Creek, between elevations of 2,000 and 3,500 feet. The geometric configuration, especially with regard to its southern extension, remains largely undetermined because only the lower portion of the cliff is accessible. The ridge overlooking the cliff contains little or not outcrop. The texture of the rock varies from medium-grained subporphyritic to fine grained porphyritic. Two facies have been recognized:

a) A porphyritic muscovite border facies

b) A subporphyritic biotite facies.

a) The porphyritic facies occurs at or near the contact with the older volcanic rocks and in dykes and apophyses. Megascopically the rock is composed of pink to buff subhedral feldspar phenocrysts (30%) and rounded quartz "eyes" (10-15%), set in a fine grained groundmass of quartz and feldspar. Muscovite in euhedral flakes (2%) is the only mafic constituent and is diagnostic of this facies.

In thin section, the feldspar phenocrysts consist of 20% sodic plagioclase (An_8-An_{10}) and 10% perthite. The plagioclase crystals generally show corroded edges and some are badly shattered and altered. The perthite occurs as subhedral phenocrysts and as reaction rims around the plagioclase, suggestive of a replacement origin. Quartz "eyes" (10-15%) are clear, with resorbed crystal edges and wavy extinctions. Some are distinctly ovoid in shape and have a crude alignment. Muscovite occurs as euhedral, inclusion-free flakes, and it appears to be of primary origin.

Alteration of plagioclase to sericite is widespread and locally very intense.

The groundmass is composed of a microcrystalline aggregate of quartz and feldspar (mainly alkali).

b) The subporphyritic biotite facies grades imperceptibly into the muscovite facies as the contact with the volcanic rocks is approached. The texture is medium grained and weakly porphyritic. The primary mineral constituents are: quartz (25%), feldspar (65%), and biotite (2%).

In thin section, the feldspars are composed of sodic plagioclase (An_8 - An_{12}), perthite and orthoclase. The plagioclase crystals occur as subhedral, cloudy grains with albite twinning. Some crystals show weakly oscillatory zoning. Orthoclase is distinguished from plagioclase by its clear appearance and lack of twinning. Perthite is largely intersticial and closely associated with quartz, forming coarse-grained, graphic intergrowths, suggestive of a late cotectic crystallization of the two minerals.

Biotite occurs as individual flakes with ragged edges, partly altered to chlorite and as unaltered, fine-grained aggregates of apparently secondary origin.

The similarity in the anorthite content of the plagioclases and the gradational contact between the two facies indicate that they are part of the same intrusion rather than two distinct intrusive phases. A partial chemical analysis of one sample of the subporphyritic facies indicates that the rock is compositionally equivalent to a leucogranite. The analysis is as follows:

SiO_2	K_2O	Na_2O	CaO
74.2	6.0	3.08	0.250

Aplite Dykes

Several aplite dykes ranging in width from 10 inches to 20 feet have been mapped throughout the property. Most of them occur in Gossan Creek, either within or peripheral to the granitic quartz-feldspar porphyry. They are typically pink in color, with a fine-grained sugary texture and composed of pink feldspar, quartz, and accessory amounts of euhedral pyrite crystals. Occasional molybdenite-bearing quartz veinlets indicate that they are of pre-molybdenum mineralization age. The close spacial relationship and the mineralogical similarity with the granitic quartz-feldspar porphyry strongly suggests that the aplite dykes are genetically related to the porphyry.

Diorite Dykes

Two diorite dykes, both approximately 40 feet wide, occur near the heads of Gossan and Mantle Creeks respectively.

The color is dark green and the texture is medium-grained hypidiomorphic granular. They are composed of 60% light grey feldspar, 35% mafics (hornblende, biotite, minor pyroxene), 5% quartz and accessory amounts of magnetite and pyrite. The massive, unfractured nature of the dykes and the lack of molybdenite mineralization indicate that they are post molybdenite mineralization in age.

Quartz-Monzonite Dykes

Quartz-monzonite dykes ranging in width from 5 to 30 feet are widely distributed throughout the property, but are especially abundant along the western margin of the map area. The dykes generally exhibit a well developed porphyritic texture, and they vary in color from light grey to medium grey. They are composed of phenocrysts of white to buff feldspar (10 - 15% of the rock) and quartz (5% of the rock) set in a fine grained matrix of feldspar, quartz, and biotite.

Intermediate Dykes

Intermediate dykes of andesitic composition ranging in width from 1 to 5 feet occur throughout the property. These dykes are light to medium green in color, aphanitic, and generally unfractured. They cut all other rock types on the property, and clearly represent the last stage of igneous activity in the area.

Structure

General Statement

The structure of the property is relatively complex and varied. The predominant structural feature is a swarm of post-mineralization dykes striking northwest and dipping steeply to the southwest.

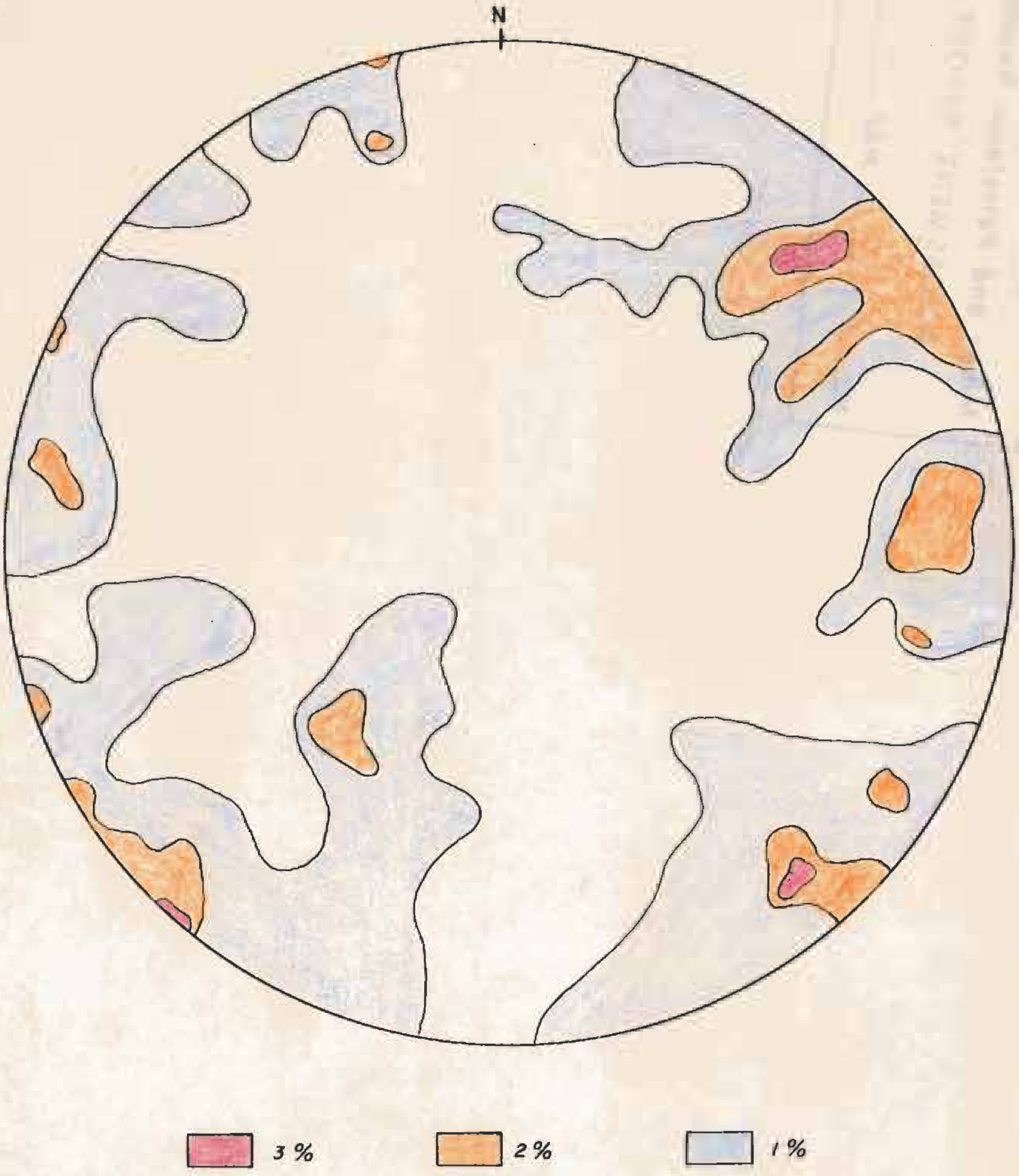
Shears, faults, quartz-vein stockworks, and locally intense fracturing occur throughout the map area, suggesting that the property lies within a structurally anomalous zone.

Faults and Shears

Numerous faults and shears cut diagonally across the valleys of Gossan and Mantle Creeks. Three shear directions have been recognized in the map area: (i) N30° - 40°W, dipping steeply to the southwest, (ii) north and (iii) N38°E, both with vertical dips. The first set, N30° - 40°W, is the predominant structure and is reflected by topographic linears which extend beyond the limits of the property. Most of the post-mineral dykes are intruded along this set.

All of the shears are characterized by zones of intense alteration and fracturing varying in width from a few inches to 15 feet. These zones weather easily by comparison with the adjacent rocks, leaving deeply incised gullies along the slopes of Mantle and Gossan Creeks.

The direction and magnitude of displacement of the faults and shears cannot be measured because they occur in the same rock type with no marker horizons. At several localities, fragments of volcanic rocks similar to those forming a roof pendant in the central and northern portion of the property were noted in the gouge zones of major shears trending N30°-40°W. Since no volcanic



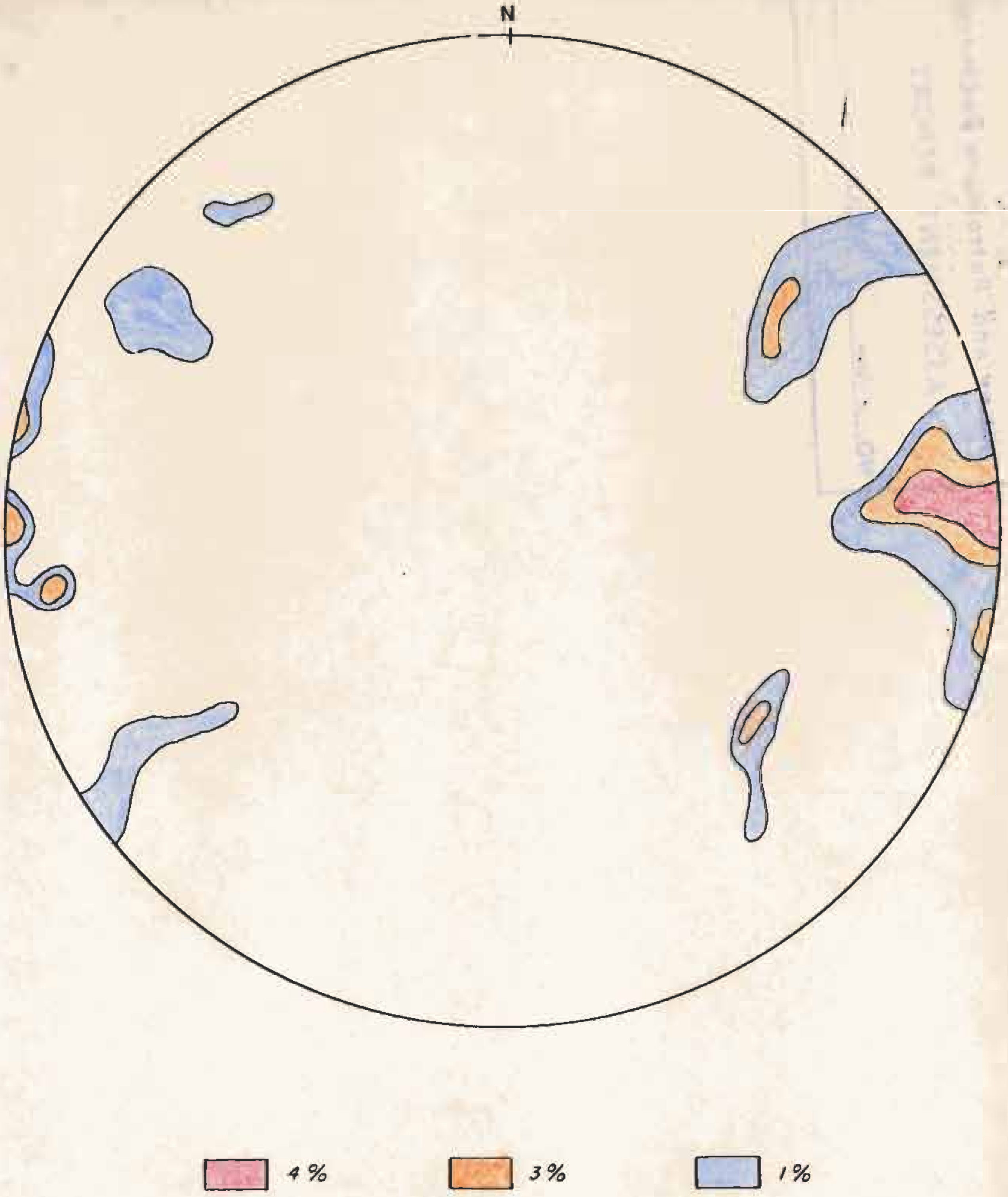
CONTOUR DIAGRAM OF JOINTS AND FRACTURES FOR THE ENTIRE KITIMAT RIVER PROPERTY

(172 POINTS)

P.W. Richardson

N.G.B

FIG. 4

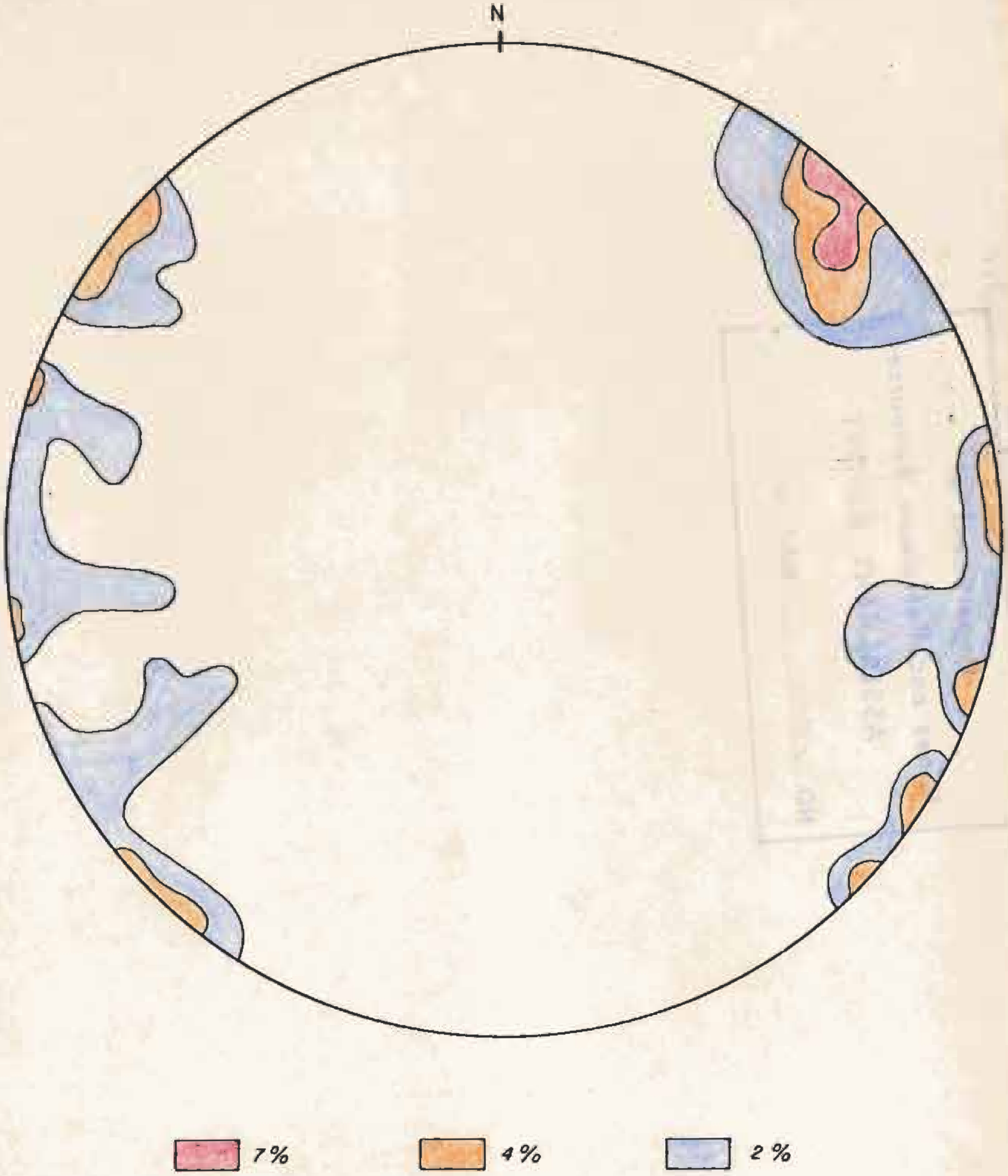


CONTOUR DIAGRAM OF MoS_2 MINERALIZED
QUARTZ VEINS AND FRACTURES
FOR THE ENTIRE KITIMAT RIVER PROPERTY
(90 POINTS)

P.W. Richardson

N.G.B.

FIG. 5



CONTOUR DIAGRAM OF SHEARS FAULTS AND DYKES FOR THE ENTIRE KITIMAT RIVER PROPERTY

(70 POINTS)

P.H. Richardson

N.G.B

FIG. 6

rock outcrops occur in the immediate vicinity of these faults, displacements of considerable magnitude must have taken place along this set of shears. Similar occurrences were not noted in the other two shear directions in the map area.

Quartz Vein Stockworks

Quartz vein stockworks occur in Mantle and Gossan Creeks where they are associated with sulphide mineralization. The stockworks are best developed in the granitic quartz-feldspar porphyry in Gossan Creek where they have been noted in areas 2,000 feet apart, averaging 8 veins per square foot.

Three separate stockworks 100 to 150 feet wide occur over a distance of 2,000 feet in Mantle Creek. The intensity of veining ranges from 4 to 8 veins per square foot.

Joints and Fractures

Fracturing is an important structural feature on the property because it has been largely responsible for the localization of most of the molybdenite mineralization in quartz veins and as smears on fracture planes.

Results of Stereonet Plots

A lower hemisphere plot of (i) joints and fractures, (ii) shears, faults, and dykes and (iii) mineralized quartz veins and fractures for the entire map area was made in order to determine the predominant structural trends and the relationship, if any, between structure and mineralization. The data are unequally distributed over the claim group and consequently the results are not statistically sound. However, the stereonet plots do provide a general indication of the structural trends.

The predominant attitudes of the plotted structural features are listed below under their respective headings in order of decreasing concentrations:

1) Joints and Fractures
    a) N42°W, dipping 74°SW
    b) N50°E, dipping 80°NW
    c) North, dipping 80°W

2) Shears, Faults, and Dykes
    a) N40°W, dipping 80°SW
    b) N38°E, vertical
    c) N4°W to N10°E, vertical

3) Mineralized Quartz Veins and Fractures
    a) N4°E, vertical
    b) N40°W, dipping 60°SW
    c) N38°E, dipping 55°NW

The above data show that the predominant attitude of joints and fractures is N42°W, dipping 74°SW. This coincides well with the dominant orientation of shears, faults, and dykes (N40°W, dipping 80°SW). The theory proposed is that most of the shearing occurred along pre-existing joint planes. These planes probably represent large tension fractures developed within the Coast Range Intrusive Complex as a result of cooling. These fractures were later intruded by swarms of post-mineralization dykes. The extension of dykes, shears, and faults beyond the limits of the property suggests that the above orientation is of regional rather than local nature.

The preferred orientation of mineralized quartz veins and fractures is N4°E with a vertical dip. This attitude agrees with a secondary but well defined attitude of joints and fractures (north/80°SW). Two other orientations of mineralized quartz veins and fractures (N40°W/60°SW and N37°E/55°NW) have the same strike as the two major orientations of faults, shears, and dykes (n40°W/80°SW and N38°E/90°), but less steep dips. The dip variations may be attributed to local rotation of pre-existing fractures by the intrusive processes associated with mineralization. In general it can be said that mineralization is structurally controlled, and that the controlling structure coincides roughly with the predominant structural features of the area, which are probably of regional extent.

Sulphide Mineralization

General Statement

The following sulphides in order of decreasing abundance have been observed: pyrite, molybdenite, chalcopyrite. All three minerals occur mainly in narrow quartz veins and to a minor extent along dry fractures and as fine disseminations.

Pyrite is generally present in amounts of less than 1% but is very widespread. It occurs either alone or in association with molybdenite and chalcopyrite in quartz veins, and is present in accessory amounts in most of the igneous rocks.

Chalcopyrite has been observed in quartz veins, commonly associated with molybdenite and pyrite.

Molybdenum Mineralization

Distribution

Known molybdenum mineralization is exposed in Gossan and Mantle Creeks, two of the three major creeks draining the property. In Gossan Creek, low grade MoS_2 is exposed over a horizontal distance of 2,500 feet and through a vertical distance of 1,500 feet. Surface mapping and geochemical sampling indicate that the northern boundary of the zone is defined by Gossan Creek. However, its east-west and southern extensions remain undefined because of the continuous overburden in those areas.

In Mantle Creek, molybdenite is exposed discontinuously over a horizontal distance of 2,000 feet along the narrow creek bed and through a height of 1,000 feet. The molybdenum mineralization is open in both directions at right angles to the creek.

Mode of Occurrence

Molybdenum mineralization occurs as the sulphide MoS_2. No molybdenum oxides were recognized on the property. The molybdenite is characteristically fine-grained and occurs as sporadic disseminations along the margins of quartz veins, and to a minor extent on dry fracture surfaces, and as fine disseminations.

Quartz-Veins and Quartz-Vein Stockworks

In both mineralized areas, molybdenite-bearing quartz-veins range from less than 1/16" to 1/4". MoS_2 is restricted almost entirely to the margins of the veins.

In Gossan Creek, three weakly mineralized stockworks, ranging in width from 50 to 150 feet, were defined. The stockworks are all contained within the granitic quartz-feldspar porphyry. The vein intensity ranges from 6 to 12 veins per square foot, but generally less than 50% of the veins are mineralized. Single, widely spaced quartz-MoS_2 veins occur in the intervening areas. In both stockwork and single veins, the distribution of MoS_2 along the strike is erratic, and, frequently, MoS_2-bearing veins become barren within a few inches. Occasional randomly oriented quartz-MoS_2 veins were noted in the volcanic rocks and in the grey feldspar porphyry where they come in contact with the granitic quartz-feldspar porphyry.

In Mantle Creek, three areas of quartz vein stockwork were outlined. Their dimensions vary from 100 to 150 feet, and they all occur in the soda granite. The vein intensity ranges from 4 to 12 veins per square foot. As in Gossan Creek, less than 50% of the veins are mineralized and each vein shows erratic MoS_2 content. The areas between the stockworks are characterized by barren stretches of up to 50 feet with occasional single, MoS_2-bearing quartz veins.

Dry Fractures

Molybdenite occurring as smears on dry fractures is relatively rare and of minor importance in both mineralized zones. Upon close inspection, many of the dry fractures reveal a thin coating of quartz. It is therefore, likely that many, if not all, of the so-called dry fractures are really fine molybdenite-bearing quartz veins.

Disseminations

Disseminated MoS_2 is generally absent in both mineralized zones. In Gossan Creek, finely disseminated MoS_2 was noted at one locality in the granitic quartz-feldspar porphyry, and in Mantle Creek, coarsely disseminated MoS_2 was found along a three inch wide zone of intensely K-feldspathized soda granite. A fragment of float of similar, highly K-feldspathized rock assayed 0.33% MoS_2. The source of this float was traced to an inaccessible cliff at the head of Gash Creek, a southerly flowing tributary of Mantle Creek.

Alteration

The effects of hydrothermal alteration are present throughout the map area. A variety of alteration types, which include silicification, feldspathization, sericitization, chloritization, hematitization, carbonitization, and epidotization have been noted in addition to sulphidization (pyrite, molybdenite, chalcopyrite) discussed in a previous section of this report.

All of the alteration types, with the exception of epidotization, occur within the mineralized zones. Silicification and feldspathization and to a lesser extent sericitization are the alteration types most consistently associated with molybdenite mineralization.

For the most part the alteration is structurally controlled and occurs along shear zones, faults, and fractures. Because of the scarsity of rock exposures, the zonal distribution of alteration types could not be firmly established beyond the following general observations.

1) Increase of silicification, largely as quartz fracture filling and to a lesser extent as pervasive silicification, in the mineralized zones in Mantle and Gossan Creeks.

2) Feldspathization, manifest as a pink coloration of the rock is restricted almost exclusively to areas of visible sulphide mineralization in both Mantle and Gossan Creeks. In the latter the feldspathization is generally pervasive, whereas in Mantle Creek it occurs exclusively along tight fractures.

3) Sericitization is best developed in areas of sulphide mineralization. However, it also occurs throughout the property and is generally very intense along all shears and fault zones.

Carbonitization, hematitization, chloritization, and epidotization occur in varying degrees throughout the map area and are unrelated to sulfide mineralization. Carbonitization, mainly as calcite and to a lesser extent as siderite, and hematitization generally occur together along shear zones. Epidotization occurs as fracture fillings in the volcanic rocks and chloritization occurs in varying degrees in all rock types as an alteration product of the mafic constituents.

Igneous History

General Statement

From a study of textural and mineralogical variations, contact features, and spatial relationships, some generalizations can be drawn concerning (i) the genetic relationships between the intrusive rock types, (ii) their mode of emplacement, (iii) the cronological sequence of events.

Sequence of Events

The white biotite granodiorite is the oldest rock type in the area. It is the most common and uniform member of the inner facies of the Coast Range Batholithic Complex, and is probably of late Mesozoic or early Cenozoic age.

The relationship between the white biotite granodiorite and the soda granite can not be determined by direct geological evidence, since contacts between the two rock types are not exposed within the property. The soda granite may represent a comtemporaneous, more acid phase of the white biotite granodiorite, or, more likely, a later and separate intrusive phase. The latter hypothesis is favoured by the writer on the basis of the similarity in composition and close spatial relationship that exist between the soda granite and the granitic quartz feldspar porphyry, which is definitely younger than the biotite granodiorite. The similarity in composition is shown by a partial chemical analysis of the two rocks (See Pages 18 and 22) and the composition of plagioclases in the An_8 to An_{12} range for both rocks. The similarity in composition and close spatial relationship to the younger rock type suggests that the soda granite is more closely related in time to the intrusion of the granitic quartz feldspar porphyry than to that of the biotite granodiorite and is therefore younger than the biotite granodiorite.

The position of the foliated feldspar porphyry in the sequence of events is not established. The rock is of pre-mineralization age and older than the granitic quartz feldspar porphyry, since it is intruded by the latter. Compositionally it is more closely related to the white biotite granodiorite and probably represents a late phase of the granodiorite.

The intrusion of the granitic quartz feldspar porphyry and related aplitic dykes and apophyses represents the last intrusive event in the property prior to molybdenite mineralization.

Mineralization (pyrite, molybdenite, chalcopyrite) occurred after the emplacement of the granitic quartz feldspar porphyry and is probably genetically related to the porphyry. This is suggested by the comparatively high Mo content in dykes and apophyses related to the granitic quartz feldspar porphyry relative to the Mo content of the older igneous rocks which they intrude.

Field evidence indicates that most of the faults and shears in the area were active after molybdenite mineralization. However, the rough correspondence of mineralized quartz veins with a main structural trend of shears and faults in the area suggests that the zones of weakness existed prior to the mineralization.

Hydrothermal alteration, chiefly feldspathization and silicification, became active in the area in conjunction with sulfide mineralization. Carbonate and hematite alteration remained active mainly along shear zones up to the intrusion of post mineralization dykes.

The intrusion of post mineralization dykes represents the last igneous event in the area. The dykes include diorite, quartz monzonite, and dykes of intermediate composition. They appear to be completely unrelated to the pre-mineralization rocks on the property and are probably of regional extent.

Significance of Contact Features

Geological contacts between the white biotite granodiorite and the Hazelton volcanic rocks were mapped on the northwest corner of the property. The contacts are sharp, with no appreciable granitization or brecciation of the volcanic rocks. Wall rock alteration is of low grade, with epidote being the only visible alteration product in the volcanics. The granodiorite does not exhibit any textural or mineralogical variations as the contact is approached.

The relatively low grade of metamorphism in the volcanic rocks, the lack of textural variations in the granodiorite, and the sharpness of the contacts indicate that at the time of emplacement the granodiorite magma had completely crystallized and was relatively free of fluids and volatiles.

The nature of the contacts between the granitic quartz feldspar porphyry and the Hazelton volcanics suggests that the conditions under which the granitic magma was intruded were considerably different from those of the regional biotite granodiorite and therefore the two intrusives represent distinct and separate phases in the igneous history of the area. At all observed contacts between the porphyry and the volcanic rocks the latter are finely brecciated and granitized and the quartz feldspar porphyry exhibits a wide range of textural variations. The abundance of quartz veining and the presence of muscovite along the border facies of the porphyry is characteristic of a magma rich in fluids and volatiles. These observations suggest that the granitic quartz feldspar porphyry was intruded in a semi-liquid state and probably at a shallow depth.

SURFACE SAMPLING

Surface sampling in the form of continuous chip samples* was conducted in Mantle and Gossan Creeks. A total of 119 samples (1088 linear feet) were collected. All samples were assayed for total Mo, and some of the samples were assayed for Cu and MoS_2. The assay results are tabulated in Appendix I, and the sample

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* A continuous chip sample constitutes a line of "continuous" chips 1 to 3 inches apart, taken along a line (generally 10 feet in length) and using a hammer and moil.

locations are shown in Figures 7 and 8.

The samples were generally taken in 10 foot sections, with the sample interval varying according to the available rock exposure, and accessibility. The average weight of each sample was approximately 15 lbs.

Areas of visible mineralization and/or deep weathering, were drilled to a depth of 2 to 4 feet with a gasoline operated plugger, and blasted open with 40% Forcite. Continuous chip samples were collected on the fresh surfaces.

The weighted average of all samples in Mantle Creek is 0.025% MoS_2 (0.017% Mo) and 0.026% Cu. The weighted average of samples from the mineralized zone in Gossan Creek is 0.019% MoS_2 (0.010% Mo) and 0.029% Cu.

Assays of surface samples were generally in accordance with the visual estimates.

Assay results of several samples collected from the same site before and after blasting were essentially the same, indicating that mechanical or chemical leaching of MoS_2 and Cu is negligible.

With regard to the low grade of assays obtained, it must be pointed out that large portions of the mineralized areas, especially in Gossan Creek, could not be sampled because of the rugged topography.

GEOCHEMISTRY

General Statement

A total of 1005 geochemical soil, silt, water, and rock chip samples were collected on the property. The analytical results are tabulated in Appendix II. Most of the soil samples were collected at 200' intervals along grid lines spaced at 400' intervals. Silt and water sampling was used primarily to test the drainage from inaccessible areas around the fringes of the grid and as a reconnaissance tool in areas adjacent to the property. Rock chip samples were taken to determine the background Mo and Cu content of the various rock types in the map area.

The samples were analyzed by the AMAX laboratory in Smithers. Soil and silt samples were analyzed for Mo, Cu and cold extractable heavy metals. Rock chip samples were analyzed for Mo and Cu, and water samples for Mo only. Determination of pH was done on all water samples and, generally, on every third soil and silt sample.

The analytical methods and laboratory procedures are outlined in detail in Appendix III.

Results of a Preliminary Soil Survey

Before the start of the soil sampling program on the grid, a test line was run early in the summer in order to determine (i) the depth and development of the soil profile (ii) the soil horizon most suitable for sampling, and (iii) the amount of soil creep on the steep slopes, which might give rise to transported anomalies. For this purpose, holes two feet in diameter and about two feet deep were dug along line 26+00W at 200 foot intervals, and samples were collected for each horizon (except A_o, A_1, A_2) wherever possible. The results obtained indicated that:

a) The nature of the soil was generally excellent for geochemical sampling. At each site tested, the soil profile was well developed, with each horizon clearly defined. Briefly, the soil profile consists of:

A_o - A layer of decayed timber and surface roots, 5 to 8 inches deep.

A_1 - Dark brown, granular mixture of decayed organics and soil 2 to 4 inches thick.

A_2 - Light grey, bleached horizon 1 to 4 inches thick.

B - Fine to sandy soil, light to reddish brown, 6 to 8 inches deep. The B_1 layer, underlying A_2 is at times missing. When present, it is dark brown, and less than 1 inch thick.

C - Light brown to orange mixture of sandy soil and angular fragments of bedrock. Generally found at a depth of 2 feet or greater.

An exception to the above profile development within the grid area was found on the ridge between Gossan and Lamp Creeks, above 3700 feet elevation. Here, the profile is poorly developed and high in organic content. As a result, several samples from this area were rendered void by organic interference during analysis.

b) Analytical results obtained at each test site showed a progressive increase in Mo content from the bleached horizon to the C horizon. The B horizon, at a depth of 10 to 16 inches was considered best for sampling because it was easily accessible and gave consistently anomalous results. The B_1 horizon, generally recommended for sampling, was found to be too thin and often missing and therefore inadequate for sampling.

c) Soil creep, even in the very steep slopes was found to be negligible. This was attributed to the heavy timber growth (up to 37oo' elevation) with a maze of near surface roots which tend to keep the soil firmly in place.

Analytical Results

Two anomalous areas were outlined on the property by geochemical sampling. One occurs on the ridge between Gossan and Lamp Creeks. It extends over an area 7,000 by 2,000 feet. Mo values range from 0 to 500 ppm and Cu from 0 to 120 ppm. The second anomaly occurs on the south facing slope of Mantle Creek and extends southward across the creek, for a distance of 1500'. The anomaly is roughly elliptical in shape and 4,500 by 4,000 feet in area. Mo values range from 6 to 500 ppm and Cu from 0 to 140 ppm.

Silt values for the entire property range from 0 to 160 ppm Mo and from 0 to 320 ppm Cu. Water values range from 0 to 700 ppm Mo. THM values in soils range from 0 to 25 ppm.

The pH of soils, silts, and waters from the entire property varies as follows:

		Average
Soils	- 4.3 - 6.9	5.0
Silts	- 6.0 - 7.6	7.0
Water	- 6.5 - 7.9	7.2

The effect of pH is described in more detail in the section below.

Discussions

One of the interesting aspects of the geochemical results on the property is the variation of Cu:Mo ratios in rock chips, soils and silts, shown below:

	Cu:Mo	Average pH
Rock Chips	3.3:1	-
Soils	0.9:1	5.0
Silts	2.5:1	7.0

The above data show that the high Cu:Mo ratio in rock chips is not reflected by a similar ratio in the soils. The discrepancy can be explained in terms of pH and its effect on the solubility of both metals. In an acid environment ($pH < 6$), Mo is precipitated as an acid molybdate, and rendered immobile. In the same environment, Cu does not form stable compounds and is more easily removed in solution. The low pH of the soils at Kitimat would therefore favour the removal of Cu, while Mo remains fixed in the soil.

In the silts, the Cu:Mo ratio is 2.5:1 and the pH is alkaline in comparison to the soils. In such an alkaline environment, Mo is soluble and Cu is precipitated.

The Cu:Mo ratios in silts and soils in the property largely substantiate the theoretical chemical behaviour of the two metals in terms of the pH conditions of the environment.

Another interesting aspect of the geochemistry of the property is the substantial difference between the pH of the soils (5.0) and that of the waters (7.2). A possible explanation for this discrepancy suggested by the writer is as follows:

i) All of the creeks tested flow along shear zones, partly suggested by air photo linears, or, in most cases, directly determined by geological mapping.

ii) The shear zones are characterized by relatively intense carbonate alteration.

iii) The pH of the waters is increased by solution of carbonates.

The control of drainage by shear zones can also furnish a two-fold explanation for the highly anomalous Mo values (up to 700 ppb) in several creeks in the property: (a) the high pH of the water increases the solubility of Mo present, and (b) the finely ground rock in the shear zones makes Mo more readily available to the dispersion medium. It must be stressed however that this explanation is only a possible one and does not exclude the possibility that the high Mo content of these waters is entirely due to a higher grade of mineralization from unexposed or inaccessible sources.

EXPLORATION POTENTIAL

Results of the surface sampling indicate that the grade of mineralization on currently exposed surfaces is very low. However, surface sampling alone cannot be considered a decisive factor in assessing the potential of the property, since the area tested represents a very small percentage of the property. Carefull consideration therefore, must be given to several favorable features in deciding future work on the property. These features can be summarized as follows:

1) Molybdenite mineralization occurs over a large area in widely separated localities.

2) The mineralized zones are associated with relatively large geochemical anomalies.

3) Quartz-vein stockworks occur in two zones 8,500 feet apart. In each zone, the stockworks extend, intermittently, over horizontal distances of 2,500 and 2,000 feet respectively.

4) Hydrothermal alteration is widespread and, locally, is intense.

5) The area has a varied and prolonged igneous history.

6) Molybdenite is very fine grained.

7) There are indications suggesting that the granitic quartz-feldspar porphyry exposed in Gossan Creek, is the source of the molybdenite. Aplitic dykes, believed to be related to the porphyry crop out within the geochemically anomalous area in Mantle Creek. These dykes may represent the surface expression of a rock type similar to the granitic quartz-feldspar porphyry

in Gossan Creek or a sub-surface extension of the same.

8) The highly anomalous molybdenum content in waters draining the inaccessible south slope of Gossan Creek may be indicative of a better grade of mineralization at higher elevations.

Because of the limited rock exposure and inaccessibility of steep cliffs within the mineralized zones, diamond drilling is the only method of adequately testing the potential of the property.

PROPOSED DIAMOND DRILLING

A program of four thousand feet of diamond drilling is proposed. The drill site locations, the objectives, and the justifications for drilling are as follows:

1) Two diamond drill holes, each one thousand feet in length are proposed to be drilled from a single drill site located on the ridge south of Gossan Creek at an elevation of 3,680 feet. The objective of these two holes is to test an area which is the source of highly anomalous waters and is completely inaccessible. The proposed site is located directly above the mineralized zone in Gossan Creek and is believed to be underlain by the granitic quartz-feldspar porphyry.

2) Two diamond drill holes, each one thousand feet in length are proposed to be drilled from a single site at the junction of Mantle and Gash Creeks. The proposed site is within a zone of quartz-vein stockwork and intense alteration. This zone shows the best grade of mineralization on the property (150 feet of 0.03% MoS_2). The object of these two holes is to test for a possible

improvement of grade with depth and also to test for the existence at depth of a rock similar to the granitic quartz-feldspar porphyry exposed in Gossan Creek or an extension of the same.

The proposed drill sites are plotted on Figure 7.

A. Gambardella

Vancouver Office
May 30, 1967

A.C. Gambardella

P.W. Richardson

P.W. Richardson, P.Eng. (B.C.)

TABLE II

CLAIM DATA

Claims	Record Numbers	Recorded	No. of Claims
Barb #13,14	26231-26232	June 16/65	2
Be #13,14	26161-26162	"	2
El #15,16	26298-26299	"	2
Frankie #3-10	26330-26337	"	8
Liz #1,2,	26171-26172	"	2
Liz #13,14	26183-26184	"	2
Mel #1,2,	26193-26194	"	2
Mel #13,14	26205-26206	"	2
Pen #14	26271	"	1
Barbs #1-18	27293-27310	Aug. 27/65	18
Bee #1-15	27342-27356	"	15
Hony #1-16	27277-27292	Sept. 3/65	16
Ell #1-15	27327-27341	Aug. 30/65	15
Liza #1-16	27311-27326	Aug. 27/65	16
Melo #1-16	27357-27372	Aug. 30/65	16
Penny #1-12	27265-27276	Sept. 3/65	12
		Total	131

APPENDIX I

SURFACE SAMPLING AND ASSAY DATA

SAMPLE LOCATION	SAMPLE NUMBER FIELD	SAMPLE NUMBER LABORATORY	SAMPLE LENGTH (Feet)	TOTAL Mo %	MoS_2 Equiv. %	% Cu
Mantle Creek	1	15851	10	0.005	0.008	0.02
	2	15852	10	0.01	0.02*	0.01
	3	15853	10	0.01	0.02*	0.01
	4	15854	10	0.02	0.03*	0.02
	5	15855	10	0.01	0.02*	0.01
	6	15856	10	0.01	0.02*	0.02
	7	15857	8	0.01	0.02*	0.03
	8	15858	10	0.01	0.02*	0.03
	9	15859	10	0.01	0.02*	0.02
	10	15860	10	0.01	0.02*	0.02
	11	15861	10	0.01	0.02*	0.01
	12	15862	10	0.03	0.05*	0.03
	13	15863	5	0.03	0.05*	0.05
	14	15864	6	0.02	0.03*	0.02
	15		10	0.008	0.013*	0.02
	16		10	0.02	0.03*	
	17		10	0.01	0.02*	
	18		10	0.01	0.02*	
	19		10	0.03	0.05*	
	20		10	0.01	0.02*	
	21		10	0.00	0.00*	
Gossan Creek	22		10	0.00	0.00*	
	23		10	0.00	0.00*	
	24		10	0.00	0.00*	
	25		10	0.00	0.00*	
	26		10	0.00	0.00*	
	27		10	0.00	0.00*	
	28		10	0.00	0.00*	
	29		10	0.00	0.00*	
	30		10	0.00	0.00*	
	31		10	0.00	0.00*	
	32		12	0.01	0.02*	
	33		10	0.00	0.00*	
	34		15	0.00	0.00*	
	35		10	0.00	0.00*	
	36		10	0.01	0.02*	
	37		10	0.01	0.02*	
	38		10	0.01	0.02*	
	39		10	0.02	0.03*	
	40		10	0.00	0.00*	
	41		10	0.02	0.03*	
	42		10	0.01	0.02*	

SAMPLE LOCATION	SAMPLE NUMBER FIELD	SAMPLE NUMBER LABORATORY	SAMPLE LENGTH (Feet)	TOTAL Mo %	MoS_2 EQUIV. %	% Cu
Gossan Creek	43		10	0.00	0.00*	
	44		10	0.03	0.05*	
	45		10	0.01	0.02*	
	46	17058	10	0.01	0.01	
	47	17059	10	0.01	0.02	
	48	17060	10	0.01	0.02	
	49	17061	10	0.01	0.01	
	50	17062	10	0.11	0.18	
	51	17063	10	0.01	0.01	
	52	17064	10	0.005	0.01	
	53	17065	10	0.01	0.01	
	54	17066	10	0.01	0.01	
	55	17067	10	0.005	0.01	
	56	17068	10	0.005	0.01	
	57	17051	10	0.01	0.02	
	58	17052	10	0.01	0.02	
	59	17053	10	0.005	0.01	
	60	17054	10	0.01	0.02	
	61	17055	10	0.02	0.03	
	62	17056	10	0.005	0.01	
	63	17057	10	0.01	0.01	
	64	17069	10	0.02	0.03	
	65	17070	10	0.005	0.01	
	66	17071	10	0.005	0.01	
	67	17072	10	0.005	0.01	
	68	17073	10	0.005	0.01	
	69	15887	10	0.01	0.02	0.02
	70	15888	10	0.005	0.005	0.02
	71	15889	10	0.005	0.005	0.03
	72	15890	10	0.005	0.005	0.02
Mantle Creek	73	15891	10	0.015	0.02	0.03
	74	15892	10	0.015	0.02	0.02
Gossan Creek	79	15873	10	0.01	0.01	0.03
	80	15872	6	0.015	0.02	0.12
	81	15874	12	0.01	0.01	0.07
	82	15875	7	0.005	0.01	0.03
	83	15876	10	0.015	0.01	0.04
	84	15877	10	0.01	0.01	0.03
	85	15878	10	0.015	0.02	0.03
	86	15879	10	0.015	0.02	0.03
	87	15880	10	0.01	0.01	0.02
	88	15882	10	0.015	0.02	0.02
	89	15883	10	0.015	0.02	0.02
	90	15884	12	0.02	0.02	0.03
	91	15885	12	0.005	0.01	0.02

SAMPLE LOCATION	SAMPLE NUMBER FIELD	SAMPLE NUMBER LABORATORY	SAMPLE LENGTH (Feet)	TOTAL Mo %	MoS_2 Equiv. %	% Cu
Gossan Creek	92	15886	5	0.005	0.01	0.04
Mantle Creek	93	15901	10	0.01	0.015	0.03
	94	15902	10	0.01	0.01	0.02
	95	15903	10	0.015	0.02	0.04
	96	15904	10	0.02	0.025	0.02
	97	15905	10	0.01	0.02	0.03
	98	15906	5	0.01	0.01	0.03
	99	15907	10	0.01	0.01	0.03
	100	15908	10	0.015	0.02	0.03
	101	15909	10	0.02	0.025	0.03
	102	15910	10	0.02	0.02	0.02
	103	15911	10	0.02	0.03	0.03
	104	15912	5	0.02	0.025	0.02
	105	15913	8	0.02	0.02	0.02
	106	15914	10	0.05	0.08	0.05
	107	15915	5	0.03	0.035	0.05
	108	15916	Grab sample	0.34	0.56	0.03
	110	15893	5	0.005	0.01	0.02
	111	15917	10	0.02	0.02	0.03
	112	15918	10	0.02	0.03	0.03
	113	15919	10	0.025	0.03	0.04
	114	15920	10	0.025	0.04	0.03
	115	15921	10	0.015	0.02	0.03
	116	15922	10	0.02	0.03	0.03
	117	15923	10	0.025	0.03	0.03
	118	15924	5	0.015	0.02	0.03
	119	15925	5	0.02	0.025	0.02

* denotes calculated

APPENDIX II

RESULTS OF GEOCHEMICAL SAMPLING

SOIL

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KGS-13	6	200	4	7.3
14	360	800	20	5.0
16	12	160	20	7.3
17	200	800	20	5.9
44	16	0	0	5.2
45	40	0	2	
46	20	0	0	
47	40	0	0	5.5
48	160	20	7	
49	20	0	0	
50	40	0	0	5.0
51	50	20	0	
52	60	4	0	
53	4	0	0	5.1
54	4	4	0	
55	4	0	0	
56	8	0	0	5.1
57	12	20	0	
58	4	0	0	
59	4	0	0	4.9
60	0	0	0	
61	0	0	0	
62	50	0	0	5.0
63	60	0	0	
64	40	0	0	
65	50	60	0	5.5
66	16	40	0	
67	0	0	0	
68	40	0	0	4.6
69	0	0	0	
70	0	0	0	
71	100	40	1	4.9
72	0	120	7	
74	6	4	0	4.3
75	1	0	0	
76	2	0	0	
77	50	12	0	4.7
78	30	4	0	
79	50	0	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KGS-81	60	4	0	4.2
82	60	0	0	
83	60	4	0	
84	200	40	0	4.0
85	6	8	0	4.5
86	8	4	0	
87	80	24	0	
88	10	0	0	3.4
90	0	4	0	
94	0	0	0	4.6
95	6	0	0	
96	8	4	0	
98	0	0	0	5.4
99	6	0	0	
100	4	0	0	
101	8	8	0	5.8
102	0	0	0	
103	12	8	0	
104	10	4	0	5.7
105	40	4	1	
106	30	8	0	
107	60	20	0	5.4
108	6	8	0	
109	6	16	0	
110	8	8	0	5.6
111	10	20	0	
112	8	4	0	
113	12	12	0	5.7
114	40	20	0	
115	6	80	0	
116	4	0	0	5.9
117	30	8	0	
118	20	20	0	
119	0	0	0	5.7
120	40	60	0	
121	20	12	0	
122	25	16	0	5.4
123	4	16	0	
124	25	40	0	
125	50	40	0	5.3
126	4	0	0	
127	6	4	0	
128	30	8	0	5.4
129	4	24	0	
130	1	0	0	
131	12	8	0	5.0
132	240	140	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KGS-135	200	80	7	
136	500	160	1	5.0
137	40	12	0	
138	60	8	0	
139	8	16	0	5.6
140	0	0	0	
141	2	0	0	
142	8	12	0	6.0
143	50	80	4	
144	100	100	2	
145	70	60	0	5.3
146	120	140	0	
147	15	12	0	
148	100	200	0	6.1
149	80	24	0	
150	100	60	0	
151	80	24	0	5.2
152	80	120	0	
153	320	60	0	
154	500	140	0	4.9
155	200	40	0	
156	90	24	0	
157	120	60	0	5.5
158	40	16	0	
159	1	4	0	
160	60	0	0	5.0
161	40	24	0	
162	20	0	0	
163	50	24	0	5.5
164	0	0	0	
165	8	8	0	
166	50	0	0	5.0
167	60	8	0	
168	50	30	0	
169	40	8	0	5.0
170	40	20	0	
171	60	60	0	
172	120	0	0	4.1
173	12	20	0	
174	60	16	0	
175	60	16	0	5.2
176	12	16	1	5.5
177	30	70	0	5.6
178	35	24	0	
179	0	0	0	
180	2	16	0	5.0
181	6	16	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KGS-182	180	80	0	
183	160	50	0	5.3
184	25	40	0	
185	150	50	0	
186	40	16	0	5.4
188	35	80	0	
189	60	20	0	
190	60	0	0	5.4
192	10	20	0	
193	10	60	4	4.9
198	0	80	0	5.9
206	0	60	5	5.8
211	*	0	1	
212	30	4	1	
213	*	40	1	5.4
214	*	0	0	
215	*	0	0	
216	12	4	1	5.4
217	8	0	0	
218	0	16	0	
219	30	0	0	4.7
220	8	4	1	
221	20	0	0	
222	0	40	2	5.6
223	*	0	0	
224	20	0	0	
225	30	0	0	4.8
226	160	24	0	
227	*	0	0	
228	20	20	3	5.1
229	30	30	2	
230	60	80	3	
231	80	120	1	5.8
232	60	120	2	
233	*	0	0	
234	6	4	0	5.4
235	0	30	0	
236	12	120	5	
237	40	120	0	5.5
238	60	30	2	
239	40	100	0	
240	40	16	0	5.1
241	20	40	0	
243	40	70	5	
244	*	12	0	5.3
245	12	50	0	
246	*	50	2	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KGS-247	0	4	0	5.6
248	0	0	0	
249	0	12	1	
250	*	16	0	4.8
251	*	0	0	4.9
252	*	0	0	
253	*	0	0	
254	*	8	0	4.9
255	*	0	1	
256	*	0	0	
257	10	16	1	5.4
258	*	8	0	
259	10	16	0	
260	10	12	0	5.4
261	8	0	1	
262	10	8	1	
263	10	20	1	5.2
264	*	12	1	
265	*	0	0	
266	0	8	0	5.7
267	8	20	0	
268	0	12	0	
269	10	8	1	5.2
270	30	70	1	
271	30	4	0	
272	30	16	1	5.0
273	30	50	1	
274	30	12	1	
275	12	4	0	5.0
276	8	4	0	
277	*	4	1	4.8
278	*	8	0	
279	12	0	0	
280	10	50	1	
283	10	40	2	5.0
285	16	0	0	
287	10	0	0	
289	*	0	0	4.9
293	40	240	*	6.8
296	80	40	1	
66-KWS-2	40	640	25	5.0
9	500	800	15	5.5
10	500	800	10	5.4
11	2000	1800	25	5.0
21	30	400	8	4.5
23	24	240	10	6.5

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-25	8	120	3	6.8
28	0	8	0	4.4
29	0	16	1	4.6
32	0	12	4	4.5
35	4	12	0	5.3
38	0	16	0	5.3
39	0	0	0	5.0
40	0	0	0	4.7
42	0	0	0	5.3
45	0	0	0	4.7
47	0	0	0	4.6
50	0	0	0	4.7
51	8	8	5	
53	8	12	14	
54	0	0	0	4.8
55	4	4	0	
56	0	12	0	
57	25	8	0	4.6
58	0	0	0	
59	0	2	0	
60	0	0	0	5.1
61	0	0	0	
62	0	0	0	
63	0	0	0	4.4
64	0	0	0	
65	0	0	0	
66	2	8	2	4.8
67	2	0	0	
68	150	120	2	
69	0	0	0	4.3
70	60	2	0	
71	0	0	0	
72	0	0	0	4.5
74	8	4	1	
75	0	2	0	
76	0	4	0	5.0
77	0	0	0	
78	0	0	0	
79	0	0	0	4.4
80	0	0	0	
81	0	0	0	
82	0	0	0	4.8
83	0	0	0	
84	0	0	0	
85	0	4	0	4.9
86	0	0	0	
87	0	0	0	
88	0	0	0	4.4

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-89	40	0	0	
90	0	0	0	
106	0	35	8	5.3
107	0	0	0	
109	0	0	1	
110	0	0	0	4.3
112	0	0	0	
117	0	0	0	4.9
119	0	0	0	
121	0	0	0	4.3
122	0	0	1	
123	0	0	0	
124	0	10	0	4.0
126	0	0	0	
128	0	0	0	
129	0	0	0	4.9
131	0	0	0	
132	0	0	0	
133	0	0	0	5.1
134	0	0	0	
141	0	0	0	6.4
142	0	0	1	
144	0	0	0	
145	0	0	0	5.3
146	0	0	0	
147	0	0	0	
156	0	0	0	4.3
157	0	0	0	
158	2	0	0	
160	2	8	1	6.1
161	0	0	0	
162	0	0	0	
163	0	0	0	4.5
164	0	0	2	
165	0	0	0	
166	0	0	0	4.0
167	0	12	0	
168	0	0	0	
169	0	0	0	4.1
170	0	0	0	
171	4	16	1	
172	0	0	1	4.0
173	0	0	3	
176	4	4	0	5.0
177	0	0	1	
178	0	0	3	
179	0	4	0	4.9

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-180	40	40	1	
181	0	0	0	
182	0	0	1	4.2
185	0	0	2	
188	0	0	1	
189	2	0	1	
190	1	0	0	4.8
191	0	4	2	
192	0	0	0	
193	0	0	0	4.4
194	0	0	0	5.0
195	4	0	8	
196	2	0	0	
197	1	8	1	5.3
198	1	0	0	
199	1	0	0	
200	0	0	0	4.2
201	2	4	0	
218	2	0	0	
219	4	0	1	5.9
220	0	0	0	5.7
221	0	0	2	
222	0	0	0	
223	0	0	0	6.3
224	2	8	0	
225	0	0	0	
226	0	0	0	4.6
227	1	8	0	
228	1	0	0	
229	1	0	0	4.4
231	2	0	0	
232	2	4	0	
234	4	24	0	4.5
236	1	8	0	
238	1	0	0	
239	4	60	4	4.4
240	3	8	0	
241	0	0	0	
242	0	0	0	4.6
243	5	40	0	
244	0	0	0	
245	0	0	0	4.6
246	0	0	0	
247	4	12	0	
249	4	0	0	5.1
250	0	0	0	
251	40	4	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-252	60	4	0	4.0
253	80	8	0	
254	40	0	0	
255	10	0	0	5.2
256	60	4	0	
257	10	0	0	
258	0	0	0	4.8
259	8	0	0	
260	4	0	0	
261	8	0	0	4.3
265	0	0	0	4.0
266	0	0	0	
267	0	0	0	
268	0	0	0	4.6
269	2	0	0	
270	0	0	0	
271	0	0	0	4.7
272	0	24	1	
273	0	0	0	
274	0	4	0	5.1
275	0	8	0	
276	0	12	0	
278	1	30	0	5.1
279	0	4	0	
280	0	0	0	
282	1	0	0	4.4
285	2	24	0	
287	1	40	0	5.0
288	1	20	0	
289	1	70	0	
290	0	20	0	
292	0	12	0	5.2
294	0	0	0	
295	0	0	0	
296	0	0	0	5.2
297	0	0	0	
298	0	0	0	
299	0	0	0	4.8
300	0	0	0	
301	20	0	0	
304	150	8	0	
305	8	0	0	
308	0	0	0	
309	0	8	0	
310	0	0	0	4.6
311	0	200	2	
312	0	0	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-313	1	20	0	5.0
314	0	0	0	
315	1	0	0	
316	0	0	0	5.1
317	1	0	0	
318	8	8	0	
319	2	16	0	5.3
320	0	0	0	
321	4	0	0	
322	0	0	0	5.0
323	0	0	0	
324	4	0	0	
325	4	2	0	4.9
326	2	16	0	
327	0	0	0	
328	8	12	0	5.0
329	2	12	0	
330	0	0	0	
331	1	0	0	5.2
332	10	12	0	
333	10	16	0	
334	8	2	0	5.1
337	12	16	0	
339	1	20	0	5.2
340	8	4	0	
341	30	0	0	
342	4	0	0	4.7
343	0	16	0	
344	0	0	0	
345	8	0	2	5.1
346	6	120	0	
347	8	8	0	
348	12	0	0	4.5
349	30	16	0	
350	0	0	0	
351	6	4	0	4.9
352	6	16	0	
353	2	0	0	
354	6	0	0	5.3
355	8	12	0	
356	0	0	0	4.3
357	0	0	0	
358	0	0	0	
360	10	0	0	4.7
361	8	0	0	
362	6	24	0	4.8
363	6	40	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-364	30	40	0	
365	60	80	0	4.6
366	12	0	0	
367	10	16	0	
368	6	16	0	5.1
369	200	12	0	
370	40	0	0	
371	0	0	0	5.0
372	0	24	0	
373	4	40	0	
374	6		0	4.8
375	8	12	0	
394	*	8	0	4.6
395	20	4	0	
396	12	0	0	
397	*	8	0	4.7
398	40	0	0	
399	*	8	0	
400	20	8	0	4.8
401	0	12	0	
402	20	4	0	
404	0	12	0	5.0
405	*	12	0	
406	0	8	0	
407	0	16	0	5.0
408	0	12	0	
409	0	0	0	
411	0	0	0	5.0
412	30	4	0	
414	*	8	0	
416	40	20	0	5.0
417	100	80	0	
418	0	0	0	
419	*	4	0	5.4
420	*	8	0	
421	*	12	0	
422	80	4	0	5.0
423	*	20	0	
425	30	0	0	
426	*	24	0	5.3
427	0	12	0	
428	*	8	0	
429	*	0	0	5.2
430	*	24	0	
431	*	8	1	
432	*	20	0	5.7
433	*	12	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-434	*	20	0	
435	*	4	0	5.0
436	*	0	0	
437	20	0	0	5.0
438	30	0	0	
439	60	2	0	
440	0	0	0	4.8
441	12	4	0	
442	12	0	0	
443	12	8	0	4.9
444	*	0	0	
445	0	0	0	
446	120	12	1	4.8
447	50	12	0	
448	60	8	3	
449	80	20	3	4.6
450	60	20	3	
451	60	12	1	
452	12	0	1	4.9
453	20	16	0	
454	*	0	0	
455	60	40	3	5.1
456	60	50	1	
457	*	0	0	
458	*	0	0	3.9
459	*	0	0	
460	*	0	0	
461	0	30	0	5.4
462	*	0	0	
463	*	12	0	
465	*	0	0	4.8
466	8	40	0	
468	*	0	0	
469	*	0	0	5.0
470	0	8	0	
471	*	0	0	
472	0	8	0	5.2
473	*	0	0	
474	*	0	0	
476	*	20	0	4.5
477	*	0	0	
479	20	0	0	
480	20	0	0	4.9
482	80	16	0	
483	*	0	0	
484	10	0	0	4.5
491	*	0	0	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-492	*	0	0	
494	*	8	0	4.9
496	*	40	3	
499	0	0	0	4.8
500	0	0	0	
503	0	8	0	5.2
504	20	16	0	5.0
506	*	0	0	
507	*	8	0	
510	*	12	0	4.9
511	12	60	0	
513	8	100	0	
514	20	0	0	5.0
515	20	60	3	
516	*	0	1	
517	0	0	0	4.9
518	0	20	0	
519	0	0	0	
520	80	30	1	7.0
521	160	20	2	
523	80	8	1	
524	20	8	2	
525	80	0	0	4.8
526	0	0	0	
527	8	16	1	5.2
528	8	12	0	
529	12	8	0	
530	180	200	3	6.2
531	80	60	3	
532	240	60	3	
533	40	8	0	
534	20	0	0	5.4
535	20	0	0	
536	20	0	0	
537	20	4	0	5.4
538	30	0	0	
540	80	40	2	
541	160	24	2	5.0
542	160	80	1	
543	160	40	1	
544	50	20	0	5.9
545	20	4	1	
546	*	0	0	
548	*	0	0	5.0
549	*	0	1	
551	*	0	0	
553	8	0	0	5.7

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWS-554	12	0	0	5.1
555	0	16	0	
556	*	0	0	
557	*	0	0	5.3
558	*	0	0	
559	*	0	0	
560	0	0	0	5.3
561	0	0	0	
562	0	0	0	
563	0	0	1	5.3
564	0	0	1	
565	0	0	0	
566	0	0	1	4.7
567	0	0	0	
568	0	0	0	
569	0	0	0	5.5
570	*	0	0	
571	0	16	3	
572	0	30	1	
573	0	8	0	5.5
574	0	0	1	
575	0	0	1	5.5
576	*	0	0	
577	6	8	0	
578	0	0	0	
579	0	0	1	
580	*	0	0	5.1
581	0	0	0	
582	0	0	1	
66-KJS-1	*	0	0	5.2
2	0	0	0	
3	*	0	0	
4	12	0	1	5.4
5	*	0	0	
6	12	0	0	
7	8	0	0	5.1
8	8	0	0	
9	12	4	0	
10	16	0	0	5.8
11	6	4	1	
12	80	0	0	
13	*	0	0	5.4
14	*	0	1	
15	20	0	1	
16	*	0	1	5.1

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KPS-1	1	0	0	4.9
2	2	0	0	
3	6	0	0	
4	8	4	0	5.5
5	10	4	0	
6	10	60	12	
7	4	8	0	4.2
8	6	4	0	4.2
9	2	0	0	
10	10	2	0	5.4
11	6	4	0	
12	4	12	0	
13	10	40	0	5.4
14	2	4	0	
15	5	8	0	
16	50	60	0	4.9
17	2	0	0	
19	1	0	0	
21	5	8	0	5.5
23	6	24	0	
24	1	12	0	
26	0	4	0	4.6
28	2	0	0	
30	6	2	0	
31	12	8	0	4.7
32	6	4	0	
33	20	20	0	
34	0	0	0	4.1
35	6	0	0	
36	2	4	0	
37	12	8	0	4.3
38	0	4	0	
39	12	4	0	
40	2	0	0	4.7
41	0	4	0	
42	0	0	0	
43	0	0	0	5.4
44	2	0	0	
45	0	0	0	
46	2	0	0	4.6
47	5	24	0	
49	*	0	0	5.0
50	*	0	0	
51	*	0	0	
52	*	0	0	5.2
53	*	0	0	
54	*	0	0	
55	*	0	1	5.5

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KPS-56	10	0	0	
57	*	0	0	
58	*	0	2	5.2
59	8	0	0	
60	8	0	0	
61	*	4	0	
62	*	0	0	4.9
63	*	0	0	
64	10	4	0	5.2
65	10	0	0	
66	10	0	0	
67	*	0	0	5.5
68	16	12	1	
69	80	24	1	
70	20	24	2	5.0
71	30	24	2	4.7
72	60	30	2	
73	20	12	0	
75	40	12	0	5.9
76	80	12	0	
77	40	0	0	
78	10	0	0	5.3
79	10	0	0	
80	8	0	0	
81	60	30	2	5.8
82	20	24	4	6.0
83	10	24	4	
85	20	0	4	
87	30	4	4	5.7
88	20	4	4	
66-KSS-1	10	16	0	5.4
2	0	0	0	
3	1	8	0	
4	1	0	0	5.1
5	2	2	0	
6	2	0	0	
7	2	16	0	4.9
8	4	8	0	
9	4	24	0	
10	12	8	0	5.4
11	0	8	0	
12	10	0	0	
13	0	0	0	5.2
15	*	4	0	4.6
16	*	40	5	
17	*	16	5	

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KSS-18	*	40	0	5.0
19	8	50	0	
20	*	0	0	
21	0	30	0	5.2
22	8	12	0	
23	*	50	0	
24	*	40	0	4.7
25	*	8	0	
26	*	8	0	4.6
27	*	0	0	
28	*	12	0	
29	*	0	0	4.6
30	*	16	0	
31	*	20	0	
32	*	40	0	
33	*	16	0	4.7
34	*	12	0	
35	6	12	0	
36	*	8	0	4.6
37	*	20	0	
38	*	8	0	
39	*	4	1	5.1
41	8	12	1	
42	*	0	0	
43	8	40	0	5.7
44	8	12	0	
45	12	30	1	
46	12	24	1	5.2
47	10	24	0	
48	60	8	0	
49	*	16	0	4.5
50	20	70	0	
51	60	50	0	
52	40	8	0	4.5
53	40	12	0	
54	40	0	0	
56	30	0	1	5.7
58	12	24	0	4.7
59	20	12	0	
60	0	16	0	
61	0	0	0	4.5
62	0	8	0	
63	20	16	0	
65	20	24	0	4.8
66	0	50	0	
67	12	80	0	
68	12	40	0	5.4

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KSS-69	80	120	1	
70	*	0	0	
71	*	16	0	5.3
72	*	8	0	
73	40	16	0	
74	40	16	0	4.6
75	12	0	0	
76	40	8	0	
77	60	24	0	4.7
78	60	8	0	
79	10	16	0	
80	10	16	0	5.0
81	*	0	0	
82	*	4	0	
83	12	4	0	4.7
84	10	20	0	
85	12	12	0	
86	16	0	0	4.3
87	*	4	0	
88	12	24	0	
89	8	8	0	5.0
90	*	0	0	
91	20	100	0	

* - organic contamination

RESULTS OF GEOCHEMICAL SAMPLING

SILT

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
KGL-3 a	0	0	0	5.8
5 c	0	12	0	5.4
8 b	0	0	1	6.3
23 a	30	12	8	7.6
25 a	160	20	0	7.4
27 a	60	16	4	7.3
29 a	30	24	2	7.7
32 a	35	24	9	7.4
34 a	16	0	10	7.5
37 a	0	0	4	7.1
39 a	4	0	3	7.4
288 a	0	40	5	6.8
290 a	8	60	4	6.7
301 a	30	140	5	7.3
66-KWL-6	10	160	12	6.2
13	4	60	0	6.0
20	50	320	25	7.0
27 a	4	80	0	7.0
31 a	0	50	0	7.0
34 a	0	40	0	7.0
37 a	0	40	0	6.5
114 a	40	0	1	6.2
136 a	0	12	2	
175 a	20	40	30	
184 a	30	40	30	
187 a	4	0	30	6.7
263 a	8	0	0	6.8
303 a	6	30	0	6.5
307 a	2	12	0	6.9
336 a	8	8	16	
498 a	12	100	4	
502 a	16	50	0	
509 a	4	50	0	6.1

RESULTS OF GEOCHEMICAL SAMPLING

ROCK CHIPS

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
KGT-19	6	80		
20	10	25		
21	4	25		
66-KWT-1	4	25		
4				
14	14	200		
17	16	500		
18	30	350		
49	4	300		
91	0	50		
92	40	200		
93	60	1000		
94	0	12		
95	0	20		
96	0	80		
97	40	320		
98	4	160		
99	4	60		
102	0	8		
103	14	60		
104	0	20		
105	6	160		
111	2	12		
115	2	10		
116	2	10		
120	2	10		
138	2	10		
139	0	4		
140	2	10		
148	0	24		
149	40	160		
150	4	100		
151	8	320		
152	8	500		
154	60	160		
155	70	60		
202	80	40		
203	6	40		
204	4	120		
205	700	350		

SAMPLE NUMBER	ppm Mo	ppm Cu	THM	pH
66-KWT-206	4	24		
207	120	60		
208	16	40		
209	4	320		
210	80	120		
211	160	120		
212	280	120		
214	6	40		
216	8	20		

RESULTS OF GEOCHEMICAL SAMPLING

WATER

SAMPLE NUMBER	ppb Mo	pH
66-KGW-1	0	6.9
2	0	6.9
4	0	6.8
6	0	6.7
7	0	7.0
9	0	7.0
10	0	7.6
11	0	7.6
12	300	7.6
15	250	7.7
18	250	7.8
22	150	7.7
24	120	7.7
26	80	7.5
28	120	7.6
30	80	7.4
31	100	7.7
33	40	7.6
35	40	7.6
36	40	7.8
38	50	7.9
40	10	7.5
41	40	7.2
42	30	7.1
73	100	6.9
80	50	6.5
91	4	7.3
92	0	7.1
93	4	6.6
97	0	6.7
133	300	7.2
134	20	6.8
187	80	7.1
194	80	7.4
195	120	7.2
196	40	7.2
197	0	6.6
199	0	7.7
200	0	7.5
201	16	7.5
202	280	7.7
66-KWG-203	280	7.9
204	700	7.7
205	0	7.0
207	0	6.8
208	0	6.7
210	0	6.9
242	280	7.4
281	0	6.9
282	0	6.9
284	0	6.8
286	0	6.9
291	0	6.9
292	0	6.6
294	4	6.8
295	20	6.7
297	70	6.8
298	50	6.9
299	40	6.9
300	50	7.1
66-KWW-3	300	7.5
4	4	7.3
5	4	7.3
7	10	7.1
8	8	7.2
12	20	7.3
15	300	7.7
19	250	7.6
22	400	7.8
24	200	7.8
26	4	7.5
30	4	7.3
33	4	7.5
36	4	7.6
41	6	7.7
43	0	7.6
44	4	7.5
46	0	7.4
52	40	7.7
73	0	7.3
100	0	7.1

SAMPLE NUMBER	ppb Mo	pH
66-KWW-101	0	7.3
108	0	7.2
113	0	6.9
118	0	7.0
125	16	7.6
127	0	7.6
130	0	7.1
135	0	6.9
137	0	6.8
143	0	6.8
153	150	7.0
159	8	7.1
174	35	7.1
183	35	6.9
186	20	7.1
213	150	7.6
215	140	7.7
230	10	7.2
233	8	7.3
235	8	7.1
237	10	7.0
248	12	7.1
262	16	7.2
264	16	7.5
277	4	7.6
281	4	7.3
283	4	6.9
286	4	7.1
289	0	7.0
291	0	6.9
293	0	6.8
302	4	7.4
306	4	7.3
335	4	7.1
338	4	6.7
359	0	6.9
376	250	7.3
377	180	7.4
378	150	7.5
390	70	7.5
391	60	7.4
392	50	7.5
403	2	7.3
410	2	7.1
413	2	7.1
415	2	7.2
424	10	7.2

SAMPLE NUMBER	ppb Mo	pH
66-KWW-464	0	6.7
467	0	6.5
475	2	6.8
478	2	7.0
481	0	6.5
490	2	7.2
493	2	7.2
495	2	7.5
497	4	7.3
501	0	7.2
505	0	7.1
508	0	7.0
512	0	6.9
522	10	7.6
526	20	7.5
547	0	7.3
550	0	7.4
552	4	7.6
66-KPW-18	0	7.2
20	4	7.1
22	0	7.1
25	4	7.2
27	0	7.2
29	0	7.2
48	0	7.4
74	500	7.8
84	20	7.0
86	4	7.5
66-KSW-40	4	6.9
55	10	7.7
57	10	7.1
64	0	6.8

APPENDIX III

SAMPLE COLLECTING TECHNIQUES

SOIL SAMPLES: If at all possible, soil samples were collected from the B horizon, which is the dark brown soil horizon of deposition. At some sample sites, only organic material of the A horizon could be collected. In some alpine areas where a normal soil profile has not been developed, it was necessary to collect C horizon samples of unaltered clay or rock flour. All samples were collected by digging a hole with a mattock or a shovel. The profile was examined and, as stated above, a sample of the B horizon was usually collected.

SEDIMENT SAMPLES: Fine-grained stream sediment samples with as low an organic content as possible were collected. It was often necessary to roll large rocks aside to get sufficient fine-grained material in steep drainage systems. Collectors were cautioned to avoid slumpage areas of clay from the banks. A shovel or large spoon was used to take the samples.

ROCK CHIP SAMPLES: Numerous small chips of rock were broken and collected in order to make the samples as representative as possible of the mass of rock.

WATER SAMPLES: Water samples were collected in clean, 100 ml. screw top, polyethylene bottles. Great care was taken to minimize the amount of sediment in the water samples.

Analytical Procedures

INTRODUCTION

This report is a detailed description of the geochemical analytical method used by the Southwest Potash Corporation field laboratory in the determination of trace molybdenum in soil, stream sediment, rock chips, and water samples.

The method used is a modification of the classical thiocyanate-stannous chloride colormetric technique. In acid solution in the presence of a suitable reducing agent, such as stannous chloride, thiocyanate reacts with molybdenum to form an amber colour. Such a thiocyanate complex of quinquevalent molybdenum ions is extracted in immiscible organic solvents such as ether or alcohol. The intensity of the coloured complex obeys Lambert-Beer's law and is proportional to the quantity or concentration of molybdenum present.

The reactions are given by the equations:

(1) $Mo^{+5} + m\,CNS^- \rightleftharpoons [Mo(CNS)_m]^{5-m}$ (colourless)

(2) $[Mo(CNS)_m^{5-m}] + (5-m)CNS^- \rightleftharpoons Mo(CNS)_5$ (red)

Only the quinquevalent molybdenum ion gives a coloured thiocyanate complex. According to Sandell, not all molybdenum is reduced to the quinquevalent form. It is estimated only about two-thirds of the total molybdenum present gives a colour reaction. However, because the standards are treated in the same manner as the unknowns, any error cancels itself out and has no effect on the reported result.

Following a description of the analytical methods, a summary of the 1963 field laboratory is given in the appendix plus some recommendations for improving future laboratory operations.

SAMPLE PREPARATIONS

(a) Soil and Silt

Soil and silt samples when received are commonly wet or moist and must be dried before sieving. Treat the samples in the following steps:

1) Hang the sample bags in a heated, ventilated cupboard overnight.

2) Sieve the dried samples with a minus 35-mesh screen onto a one foot square piece of heavy brown paper. Use a new piece of paper every day and clean the sieve with a paint brush between samples.

3) Using a volumetric scoope (calibrated to deliver a given weight of sample) 'weigh' out a known amount (usually 1 gram) of screened sample and transfer it into a marked test tube.

4) Return the remaining fines (pulps) of the sieved sample into its original sample bag.

5) Put the samples in storage boxes if available or string with a piece of twine in batches of about 30 for bulk storage in gunny sacks.

(b) Rock Chips

1) With the sample still in its bag, crush with a hammer into small pieces.

2) Transfer several pieces of crushed rock into a porcelain mortar and grind.

3) Sieve the ground sample through a minus 35-mesh screen and proceed through steps 2 to 5 as followed for soil and silt samples. If the original bag is badly damaged during crushing transfer the pulps to a new bag.

DIGESTION

Samples of soil, silt and rock chips are digested in a hot water bath. The heat is supplied by a three-burner Coleman stove. Digestion is best done outside the laboratory where the toxic nitric fumes can dissipate into the atmosphere away from both laboratory equipment and personnel.

Digestion is carried out as follows:

1) Measure out volumetrically with leucite scoop 1 gm of the sieved sample and place in a 15 x 125 rimmed test tube.

2) Using an automatic pipette, add 4 ml of diluted (3:1) nitric acid.

3) Digest the samples, a rack at a time for 2 hours.

4) Shake the tubes occasionally to aid digestion.

5) Remove the rack and allow to cool.

6) Using poly wash bottle, fill all tubes up to the 4 ml mark with water.

DETERMINATION

(a) Soil, Silt and Rock Chip

Samples are usually treated in batches of ten and in racks of forty.

1) Using an auto-pipette, transfer a 1 ml aliquot from each digested solution to a marked rimless test tube. Use a smaller aliquot if high molybdenum content is suspected.

NOTE: Clean the auto-pipette thoroughly between each sample by rinsing at least three times with de-mineralized water. Shake the pipette in the air to dry. Contamination could easily occur at this step without suitable rinsing.

2) To each test tube using an automatic pipette, add 2 ml of 10% HCl.

3) Using a spatula, add 0.2 gm of sodium tartrate.

4) Using a burette, add 1.5 ml of KSCN. Shake to mix.

5) Using a burette, add 0.5 ml of $SnCl_2$ solution. Shake to mix.

NOTE: If the iron content of the testing solution is high, a larger amount of $SnCl_2$ solution may be required, ($SnCl_2$ should be added to completely eliminate the blood red colour of the ferric thiocyanate).

6) Using a wash bottle, add water to bring the total volume of the solution up to the 10 ml mark.

7) Using a burette, add <u>exactly</u> 1 ml of ether.

8) Stopper the test tubes with corks and shake vigorously for 45 seconds. It is advisable to number the corks to avoid mixing up tubes.

9) Allow the phases to separate.

10) Compare the colour of the ether layer to that of the molybdenum standards. Colour intensities should be compared and matched against a white background.

CALCULATIONS

(a) Soil, Silt and Rock Chip

The concentration of molybdenum in parts per million (ppm) is calculated from the following factors:

1) The weight of sample used for digestion.
2) Volume of solution for digestion.
3) Volume of aliquot taken for determination.
4) Gamma content of the matched standard.

The concentration in ppm is given by the formula

$$\text{ppm} = \frac{\text{volume digested sample solution (ml)}}{\text{weight of sample (gm)}} \times \frac{\text{value of matched standard (gammas)}}{\text{aliquot of sample (ml)}}$$

= gammas per gram (which equals parts per million)

STANDARDS

(a) Molybdenum Standard Solutions

1) Stock standard concentrated:(100 gammas/ml). Dissolve 0.075 gm of MoO_3 in 20 ml of 10% NaOH. (10 gm of NaOH crystals in 100 ml of water). Dilute to 100 ml. Add diluted HCl until the solution is acid (use pH hydrion paper). Fill to 500 ml mark of the flask. Prepare this solution once a season.

2) Stock standard diluted:(1gamma/ml). Dilute 1 ml of stock standard to 100 ml mark of the volumetric flask. Prepare this diluted solution each time a new standard is made.

(b) Working Molybdenum Standard for Soil, Silt & Rock Chip

Two sets of working standards representing a low and a high range are prepared by diluting the working standard. The amount of standard solution diluted is outlined in the following tables.

Pipette from stock standard solutions the required volumes into a series of 7 test tubes. The amount and concentration of stock standard solution used is outlined in the following tables.

LOW RANGE

STANDARDS	A	B	C	D	E	F	G	H
ml of 1γ/ml standard	0	0.5	1.0	1.5	2.5	3.0	4.0	5.0
Gammas	0	0.5	1.0	1.5	2.5	3.0	4.0	5.0
ppm*	0	2.0	4.0	6.0	10.0	12.0	16.0	20.0

* Concentration based on aliquot representing one quarter of a gram as used in procedure given above.

HIGH RANGE

STANDARDS	I	J	K	L	M	N	O
ml of 100γ/ml standard	0.1	0.2	0.25	0.5	0.8	1.00	1.5
Gammas	10	20	25	50	80	100	150
ppm*	40	80	100	200	320	400	600

Treat the standards as outlined in the procedure given for the unknowns. It is important that the standards and unknowns undergo identical treatment. Cover the standards with a sheet of aluminum foil to shield them against any heat or light when not in use. Prepare new standards at least once every three weeks or sooner if fading is suspected.

PREPARATION OF REAGENTS

The following reagents are used in the test on soil, silt and rock chip samples.

1) 10% HCl: Add 100 ml of concentrated HCl into a 2 litre beaker and dilute to one litre. Store in a poly bottle.

2) Diluted HNO_3: Dilute 750 ml of concentrated HNO_3 to one litre. Store in a poly bottle.

3) Thiocyanate solution: Dissolve 5 gm of KSCN in 100 ml of water. Prepare fresh solution daily.

4) $SnCl_2$ solution: Dissolve 13 gm of $SnCl_2$ in 17 ml of concentrated HCl. Heat the mixture in a hot water bath. Make up to 100 ml with water when crystals have been completely dissolved. Add a piece of metallic tin to ensure stability of $SnCl_2$. Prepare a fresh solution daily.

5) Sodium tartrate - use directly as a solid.

6) Isopropyl ether - use directly but with caution as it is highly inflammable and explosive peroxides may form.

Use de-mineralized water for all reagents, preparations and analytical determinations.

pH DETERMINATION

A line-operated Beckman Model H-2 meter is used in making pH measurements. Following a warm-up period, the meter is calibrated with standard buffer solutions before using and rechecked between every 20 determinations, or every hour whichever comes first.

(a) Soil and Silt

Measurements are made as follows:

1) Pour approximately 15 gm of the sieved sample into a 30 ml poly beaker. Wet the sample with distilled water (use neutral stream water). Do not use de-mineralized water (water passed through a resin de-mineralizer is acidic). Swirl the beaker occasionally during the determination to ensure the sample is in a homogeneous state.

2) Gently insert the electrodes into the dampened sample.

3) Observe the pH reading when the needle reaches a steady state.

4) Discard the tested sample, clean the beaker and electrodes with water. Wipe the electrodes with a cleaning tissue. It is important that the electrodes be thoroughly cleaned after every determination.

(b) Rock Chips

pH determination is not required for rock chip.

WATER DETERMINATION

Water samples require no special preparation preceding the actual analysis . Samples are usually treated in sets of six.

(a) Determination

1) Pour water sample into a separatory funnel up to the 50 ml mark.

2) Using an automatic pipette, add 5 ml of diluted HCl.

3) Using an automatic pipette, add 1 ml of ferric ammonium sulphate solution. Tilt funnel to mix.

4) Using an automatic pipette, add 3 ml of KSCN solution. Tilt funnel to mix.

5) Using an automatic pipette, add 3 ml of $SnCl_2$ solution. Tilt funnel to mix.

6) Using a burette, add 2 ml of ether. Shake for 45 seconds. Release pressure every 10 seconds during shaking.

7) Allow phases to separate.

8) Discard the aqueous (water) layer into a beaker. Stop at 10 ml mark.

9) Drain off the remaining aqueous and the organic phases into a 16 x 150 rimless test tube.

10) Compare the colour of the organic layer to that of the molybdenum standards.

(b) Calculation

The concentration of molybdenum in water is expressed in parts per billion (ppb), i.e., 1/1000 gammas per gram or gammas per 1000 grams. The concentration is calculated using two factors.

1) The initial volume of sample used for determination.

2) The value of the matched standard x 1,000.

The concentration of molybdenum in water is given by the formula:

$$\text{ppb} = \frac{\text{value of the matched standard(gammas)}}{\text{volume of water used for determination(ml)}} \times 1{,}000$$

= gammas per 1000 millilitres(since density of water is equal to 1)

= gammas per 1000 grams, or ppb

(c) Standards

1) Pipette 0, 0.25, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0, 8.0 ml of the dilute (1 gamma/ml) stock standard solution into the separatory funnels.

2) Add water to 50 ml mark and proceed with step (2) to step (9) given above for water determinations.

(d) pH Determination

Measurements are taken as follows:

1) Approximately 25 ml of sample is transferred into a 30 ml poly beaker for measurement.

2) Insert the electrode and take a reading.

3) Discard the sample; wash down and dry the electrodes.

(e) Preparation of Reagents

In addition to some reagents already mentioned on the previous pages the following are needed in the water test.

1) Ammonium sulfate solution: Dissolve 1 gm of ferric ammonium sulfate crystals in 100 ml of water. Warm the mixture in a water bath. Prepare fresh solution once every five days.

2) KSCN solution: Dissolve 10 gm of KSCN crystals in 100 ml of water. KSCN dissolves in cold water. Prepare fresh solution daily.

3) $SnCl_2$ solution: Heat 30 gm of $SnCl_2$ in 50 ml of concentrated HCl in a water bath till a clear solution appears. Dilute the solution to 300 ml. Insert a piece of metallic tin to stabilize the solution. Prepare fresh solution daily.

4) Diluted HCl: Dilute 800 ml of concentrated to one litre.

APPENDIX IV - DETAILS FOR ASSESSMENT WORK

A total of $19,742.50 is herewith shown to be applicable as assessment work made up as follows:-

	August 1 to 27/66	August 28 to Sep. 3/66	Sep.4-Oct.9/66
Helicopter expenses	$ 3,225.00	$ 874.00	$ 4,870.00
Salaries	3,752.00	994.00	2,832.00
Cost of Board	630.00	167.50	450.00
Cost of Sample Analysis	668.00	-	400.00
Cost of Assays	230.00	-	650.00
	$ 8,505.00	$ 2,035.50	$ 9,202.00

GRAND TOTAL - $19,742.50

Helicopter Expenses

The helicopter costs consist of time spent supplying and transporting men to this camp, which has no other means of access, and of time spent ferrying men within the claim group. Helicopter time from August 1 to October 9, 1966 totalled 63 hours and 25 minutes, at a cost of $8,969.00. The details are tabulated below:

Date		Total Flying Time Hours:Minutes	Rate	Cost
Aug.	3	1:20	$ 140.00 p.h.	$ 187.00
"	4	1:50	"	257.00
"	8	1:40	"	233.00
"	10	0:55	170.00 p.h.	156.00
"	15	0.50	140.00 p.h.	117.00
"	17	1:20	"	187.00
"	19	1:35	"	222.00
"	22	3:10	"	444.00
"	23	3:20	"	467.00
"	24	1:25	"	198.00
"	25	1:50	103.00 p.h.	189.00
"	25	1:50	140.00 p.h.	257.00
"	25	2:15	"	316.00
"	28	1:30	"	210.00
"	31	1:20	"	186.00
Sep.	1	1:40	"	233.00
"	2	1:45	"	245.00
"	4	1:00	"	140.00
"	5	1:00	170.00 p.h.	170.00
"	6	1:40	140.00 p.h.	234.00
"	7	2:10	"	303.00
"	9	0:45	103.00 p.h.	78.00
"	10	2:10	140.00 p.h.	303.00
"	11	1:20	"	187.00
"	12	0:10	"	23.00
"	13	0:15	"	35.00
"	16	0:55	"	128.00

Date	Total Flying Time Hours:Minutes	Rate	Cost
Sep. 18	1:00	$ 140.00 p.h.	$ 140.00
" 20	1:10	"	173.00
" 21	2:20	"	327.00
" 23	0:55	"	128.00
" 24	1:00	"	140.00
" 25	0:45	"	105.00
" 29	1:30	"	210.00
Oct. 2	2:10	"	303.00
" 3	4:05	"	573.00
" 4	1:30	"	210.00
" 6	2:00	"	280.00
" 9	4:00	170.00 p.h.	680.00
	63:25		$8969.00

Total Amount on Property = $ 3,404.00
" " " Ferry = $ 5,573.00

Salaries

Names & Addresses	Dates Worked	Days	Salary	Amount
A. Gambardella - Sr. Asst. 259 Lanark St.Winnipeg,Man.	Aug. 1-Oct. 9	69	$650	$ 1,484.00
A.Wenban-Smith - Sr. Asst. Lymington Hants, England	Aug. 1-Sep. 3	34	600	680.00
T.Jack - Labourer Box 307, Houston,B.C.	Aug. 1-Aug.31	31	425	425.00
S. Louie, Labourer Telegraph Creek, B.C.	Aug. 1-Oct. 9	69	425	966.00
B. Munday, Labourer General Delivery,Smithers,B.C.	Aug. 1-Oct. 9	69	450	1035.00
G. Phillips, Jr. Asst. 808-103 Ave.Dawson Creek,B.C.	Aug. 1-Sep.30	61	400	783.00
I. Murray, Labourer Smithers, B.C.	Aug. 1-Sep. 9	40	425	560.00
D. Sloan, Jr. Asst. 1291 Devonshire Cres.Vancouver,B.C.	Aug. 1-Sep. 3	34	350	408.00
I. Church, Labourer 11755-18th Ave.,Haney,B.C.	Aug. 1-Sep. 3	34	385	460.00
J. Buttazoni, Labourer 218 Regent St. Sudbury, Ont.	Aug.19-Sep. 3	16	400	208.00
T. Howells, Labourer Topley, B.C.	Sep.19-Oct. 9	21	425	297.00
R. Kingsley, Labourer, Box 858, Vanderhoof, B.C.	Sep.19-Oct. 9	21	450	315.00

Board

August 1 - 27/66	- 252 man days @ $2.50/day	=	$ 630.00
August 28-Sept. 3/66	- 67 man days @ $2.50/day	=	167.50
Sept.4- Oct.9/66	- 180 man days @ $2.50/day	=	450.00
		Total	$1,247.00

Samples

The costs of sample analyses were as follows:

August 1 - 27/66	- 334 samples @ $2.00 each	=	668.00
Sept. 4 - Oct.9/66	- 200 samples @ $2.00 each	=	400.00
		Total	$1,068.00

Assays

August 1 - 27/66	- 23 samples @ $(\mathrm{Mo}=\$5.00;\mathrm{MoS_2}=\$5.00)$		230.00
Sept. 4 - Oct.9/66	- 51 samples @ $(\mathrm{Mo}=\$5.00;\mathrm{MoS_2}=\$5.00;\mathrm{Cu}=\$3.00)$	=	650.00
		Total	880.00

Department of
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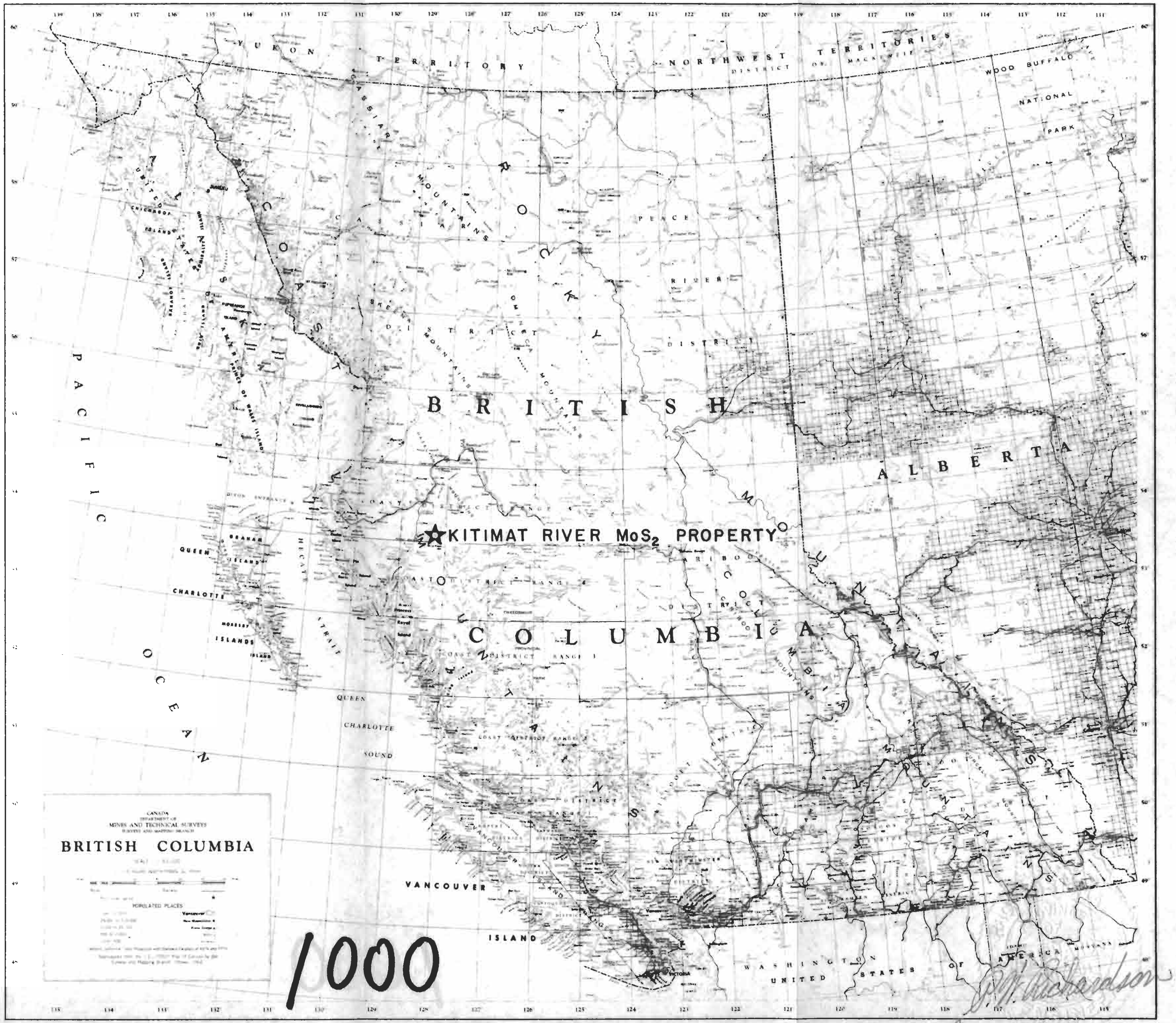
ASSESSMENT REPORT
NO. 1000 MAP 1



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P.W. Richardson

KEY MAP

May 31, 1967 FIG. 1

L E G E N D

9	Intermediate Dykes
8	Quartz Monzonite Dykes
7	Diorite Dykes
6	Aplite Dykes
5	Granitic Quartz - Feldspar porphyry
4	Foliated - Feldspar Porphyry Dyke
3	Soda Granite
2	White Biotite Granodiorite
1	Hazelton Group

S Y M B O L S

—3250—	Topographic Contour (Contour Interval 250')
	River (Stream Creek)
□ △	Claim Post (Position Known) Witness Post
○	Claim Post (Position Estimate)
+- —	Claim Boundary Line, Claim Location Line
• G-53 6	Hand Speciman Location And Number
	Geological Contact (Defined, — Assumed)
··········	Limit Of Geological Mapping And / Or Outcrop
70	Fault (Defined, — Assumed) Showing Dip Direction
~~+~~	Shear Zone Showing Dip Direction (Vertical)
80 70	Joints And Fractures Showing Dip Direction
40	Foliation Showing Dip Direction
▦	Quartz - Vein Stockworkwork
Py , Chal	Pyrite, Chalcopyrite
ALT.	Alteration
X- XX-XXX	Alteration Intensity (Weak, Medium, Intense)
Ser. - XX	Sericite (Showing Medium Intensity)
K -	K - Feldspar
Carb -	Carbonate
Chl -	Chlorite
Ep -	Epidote
O 72 -	Continuous Chip Samples Location And Number
O— - -	Location Of Proposed Diamond Drill Hole

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Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1000 MAP 4

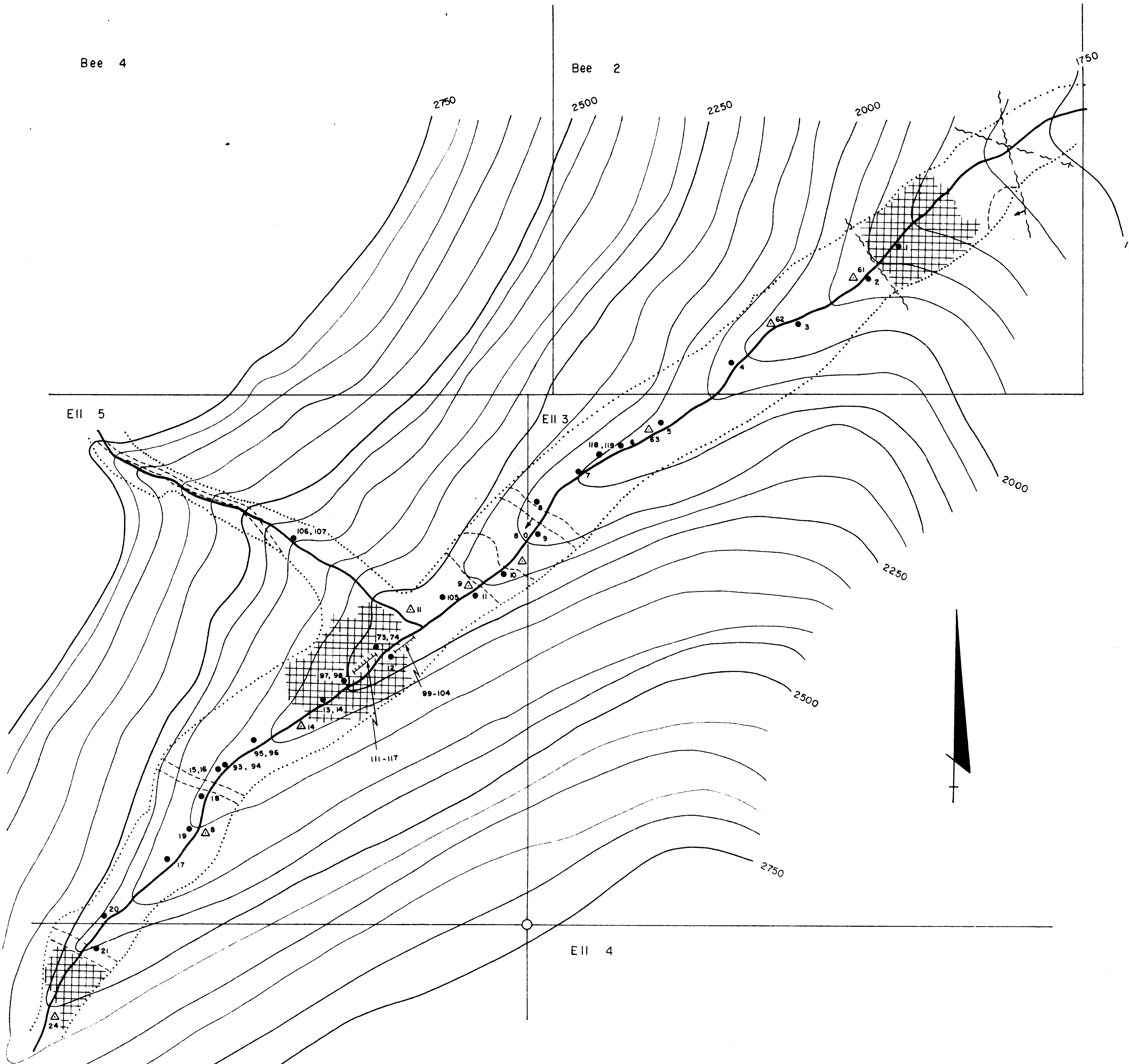
P.W. Richardson

AMAX EXPLORATION INC.

KITIMAT RIVER MoS_2 PROPERTY 1966
SKEENA MINING DIVISION - BRITISH COLUMBIA
GEOLOGICAL MAP
SCALE 1" = 500'

DATE REVISED	N.G.B. 18-5-67	DATE PRINTED	Drawn by A.C.G - N.G.B. Date N.T.S. File 103 - I - 1	FIG. 7

To Accompany Report " KITIMAT RIVER MoS_2 PROPERTY 1966 "
by A.C. Gambardella and P.W Richardson P. Eng. B.C. Date May 31, 1967



DETAILED AREA "A"
MANTLE CREEK

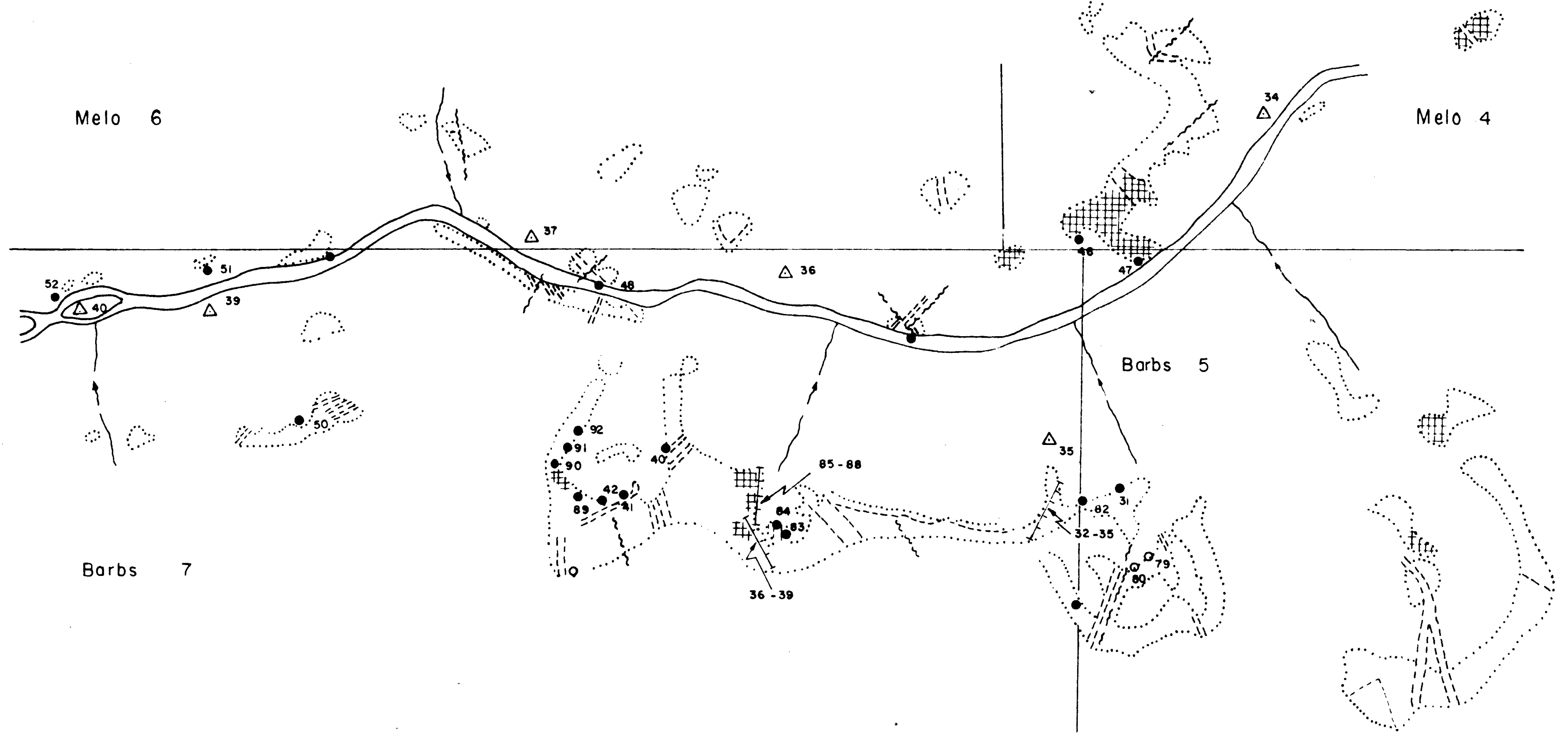
SCALE 1 Inch = 200 FEET

MANTLE CREEK

FIELD SAMPLE NUMBER	LENGTH (feet)	TOTAL Mo %	Mo S2 EQUIV. %	% Cu
1	10	0.005	0.008	0.02
2	10	0.01	0.02	0.01
3	10	0.01	0.02	0.01
4	10	0.02	0.03	0.02
5	10	0.01	0.02	0.01
6	10	0.01	0.02	0.02
7	8	0.01	0.02	0.03
8	10	0.01	0.02	0.03
9	10	0.01	0.02	0.02
10	10	0.01	0.02	0.02
11	10	0.01	0.02	0.01
12	10	0.03	0.05	0.03
13	5	0.03	0.05	0.05
14	6	0.02	0.03	0.02
15	10	0.008	0.013	0.02
16	10	0.02	0.03	
17	10	0.01	0.02	
18	10	0.01	0.02	
19	10	0.03	0.05	
20	10	0.01	0.02	
21	10	0.00	0.00	
73	10	0.015	0.02	0.03
74	10	0.015	0.02	0.02
93	10	0.01	0.015	0.03
94	10	0.01	0.01	0.02
95	10	0.015	0.02	0.04
96	10	0.02	0.025	0.02
97	10	0.01	0.02	0.03
98	5	0.01	0.01	0.03
99	10	0.01	0.01	0.03
100	10	0.015	0.02	0.03
101	10	0.02	0.025	0.03
102	10	0.02	0.02	0.02
103	10	0.02	0.03	0.03
104	5	0.02	0.25	0.02
105	8	0.02	0.02	0.02
106	10	0.05	0.08	0.05
107	5	0.03	0.035	0.05
108	Grab Sample	0.34	0.56	0.03
110	5	0.005	0.001	0.02
111	10	0.02	0.02	0.03
112	10	0.02	0.03	0.03
113	10	0.025	0.03	0.04
114	10	0.025	0.04	0.03
115	10	0.015	0.02	0.03
116	10	0.02	0.03	0.03
117	10	0.025	0.03	0.03
118	5	0.015	0.02	0.03
119	5	0.02	0.025	0.02

GOSSAN CREEK

FIELD SAMPLE NUMBER	LENGTH (feet)	TOTAL Mo %	Mo S2 EQUIV %	% Cu
31	10	0.00	0.00	
32	12	0.01	0.02	
33	10	0.00	0.00	
34	15	0.00	0.00	
35	10	0.00	0.00	
36	10	0.01	0.02	
37	10	0.01	0.02	
38	10	0.01	0.02	
39	10	0.02	0.03	
40	10	0.00	0.00	
41	10	0.02	0.03	
42	10	0.01	0.02	
45	10	0.01	0.02	
46	10	0.01	0.01	
47	10	0.01	0.02	
48	10	0.01	0.02	
49	10	0.01	0.01	
50	10	0.11	0.18	
51	10	0.01	0.01	
52	10	0.005	0.01	
79	10	0.01	0.01	0.03
80	6	0.015	0.02	0.12
81	12	0.01	0.01	0.07
82	7	0.005	0.01	0.03
83	10	0.015	0.01	0.04
84	10	0.01	0.01	0.03
85	10	0.015	0.02	0.03
86	10	0.015	0.02	0.03
87	10	0.01	0.01	0.02
88	10	0.015	0.02	0.02
89	10	0.015	0.02	0.02
90	12	0.02	0.02	0.03
91	12	0.005	0.01	0.02
92	5	0.005	0.01	0.04



DETAILED AREA "B"
GOSSAN CREEK

SCALE 1 Inch = 100 FEET

L E G E N D

〰	River (Stream, Creek)
⋯	Limit Of Outcrop
= =	Dykes
~ ~	Shear
—○—	Claim Boundary Line, Claim Post
99-104	Sample Location, And Numbers
● 51	Sample Location, And Number
△ 36	Control Station
▦	Quartz Vein Stockwork

Department of
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ASSESSMENT REPORT
NO. 1000 MAP 5

P.W. Richardson

SCALE AS SHOWN

AMAX EXPLORATION INC

KITIMAT RIVER Mo S2 PROPERTY 1966
SKEENA MINING DIVISION - BRITISH COLUMBIA

SURFACE SAMPLING MAP
SHOWING MANTLE CREEK AND GOSSAN CREEK

DATE REVISED		DATE PRINTED			
				Drawn by: N.G.B.	FIG. 8
				Date 29 - 5 - 67	
				N.T.S. File 103-i-1	

To Accompany Report " KITIMAT RIVER Mo S2 PROPERTY 1966 "
by: A.C Gambardella and P.W. Richardson P. Eng. (B.C.) 196__

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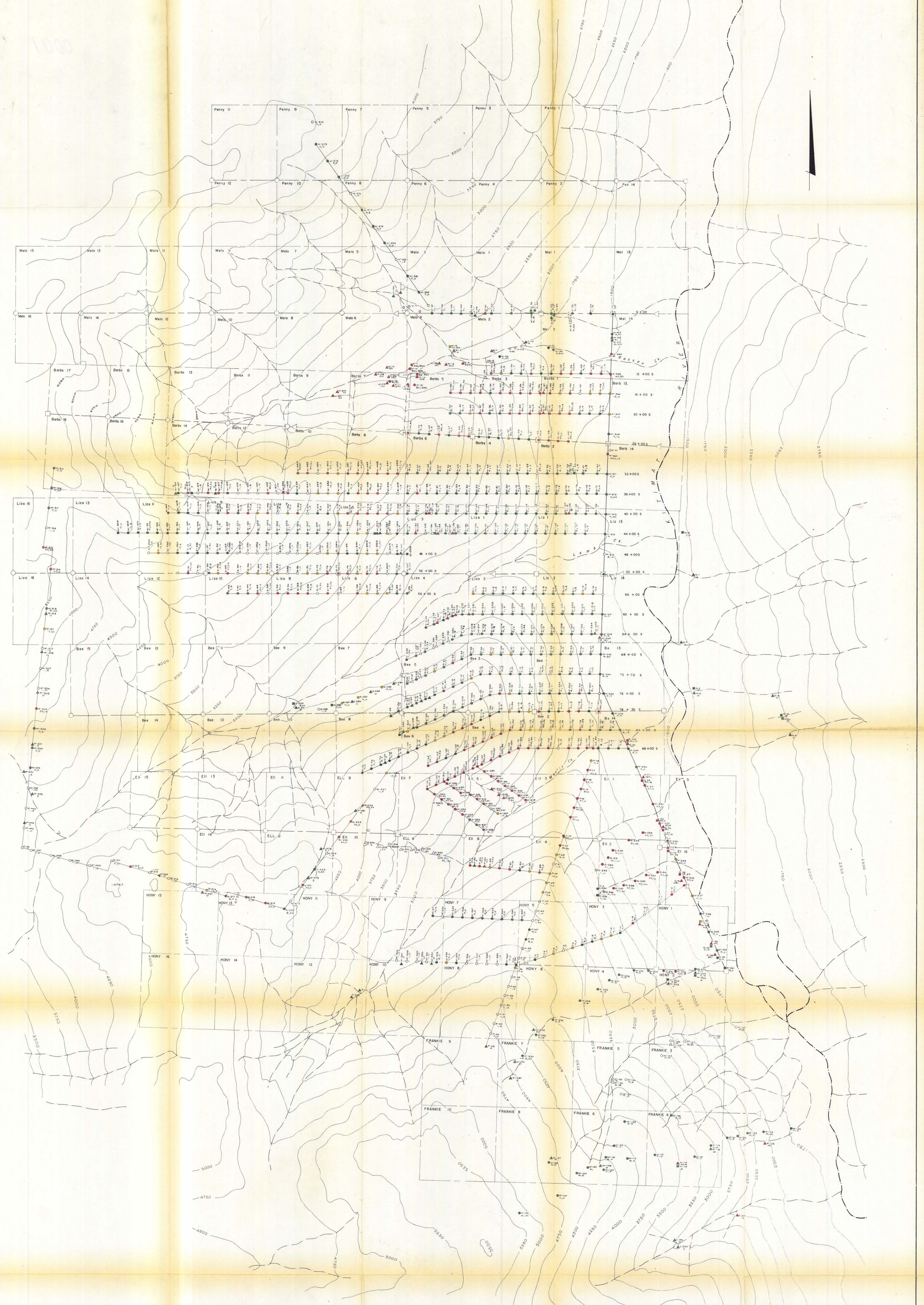
May 31, 1967



L E G E N D

3250	*Topographic Contour (Contour Interval 250')*
	Stream (River, Creek)
□ △	*Claim Post (Position Known), Witness Post*
○	*Claim Post (Position Estimated)*
+ - —	*Claim Boundary Line, Claim Location Line*
	Picket Line
○ W-145 0,0	*Soil Sample Site, Sample Number p.p.m Mo, Cu (Complete Code Number Reads 66-KWS-145)*
□ W-37 0, 0	*Silt Sample Site, Sample Number p.p.m. Mo, Cu (Complete Code Number Reads 66-KWL-37)*
△ W-36 40	*Water Sample Site, Sample Number p.p.b. Mo, (Complete Code Number Reads 66-KWW-36)*
⊕ T-111 2, 12	*Rock Chip Sample Site Sample Number p.p.m. Mo, Cu (Complete Code Number Reads 66-KWT-111)*

SOIL SAMPLE (p.p.m Mo)

●	0 - 9	*Background*
●	10 - 19	*Positive*
●	≥ 20	*Anomalous*

SILT SAMPLE (p.p.m. Mo)

■	0 9	*Background*
■	10 - 19	*Positive*
■	≥ 20	*Anomalous*

WATER SAMPLE (p.p.b. Mo)

▲	≤ 4	*Background*
▲	> 4	*Anomalous*

Note : *Uncoloured Sample Sites Denote Organic Interference*

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ASSESSMENT REPORT
NO. 1000 MAP 6

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AMAX EXPLORATION INC.

KITIMAT RIVER Mo S2 PROPERTY 1966

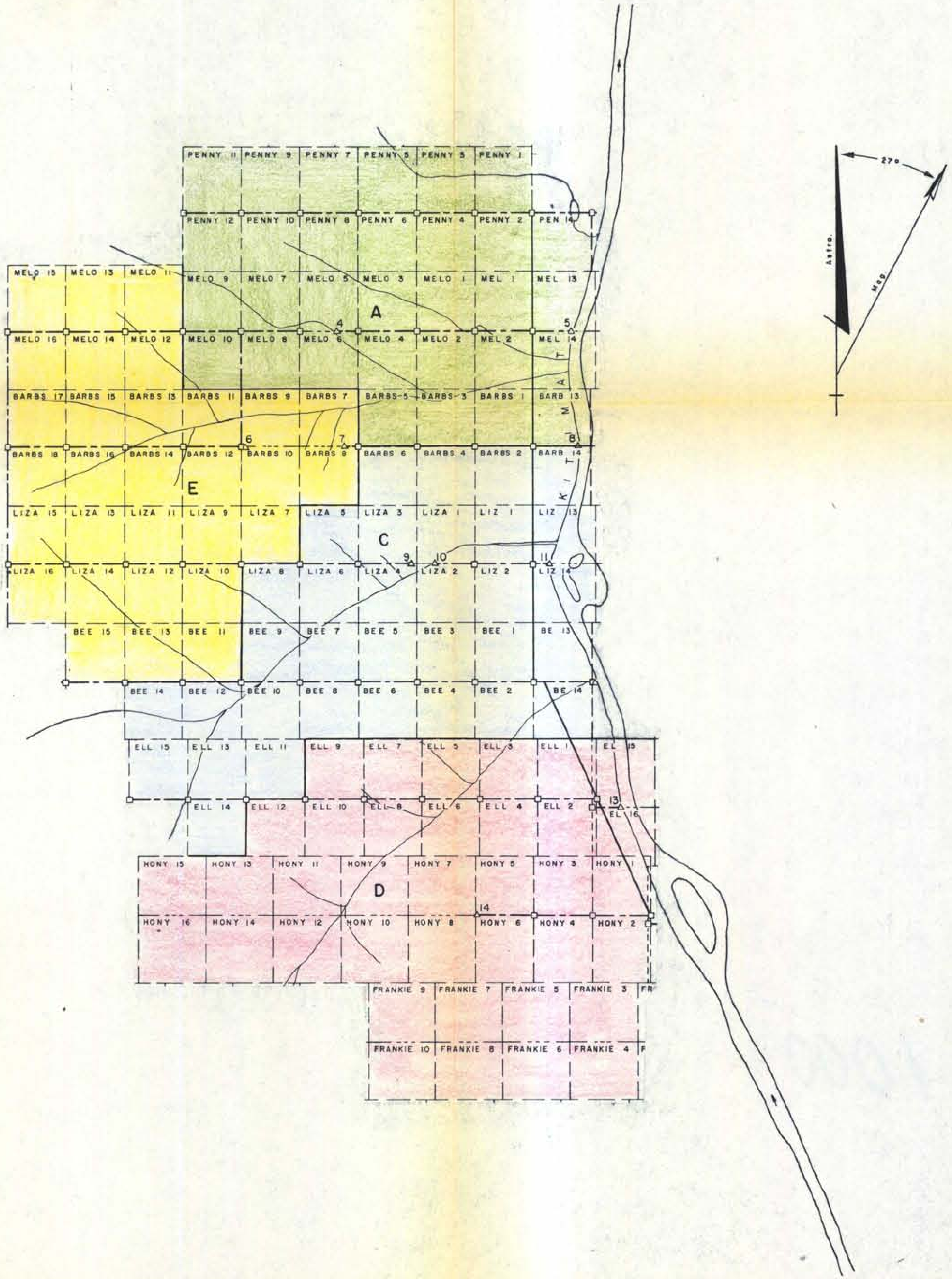
SKEENA MINING DIVISION — BRITISH COLUMBIA

GEOCHEMICAL MAP

SCALE 1" = 500'

DATE REVISED	DATE PRINTED		
N.G.B. 28-4-67		Drawn by A.G Date Dec. 1966 N.T.S. File 103 - I - 1	FIG. 9

To accompany final report on "KITIMAT RIVER Mo S2 PROPERTY 1966" by: A.C. Gambardella and P.W. Richardson P.Eng. B.C. Date — May 31, 1967



LEGEND

-·-□-·-	*Claim Post.*
-·-△	*Witness Post.*
— — —	*Claim Boundary Line.*
———	*Blazed and Chained Line.*
—·—	*Claim Location Line.*
—···—	*Witnessed Claim Location Line.*

CLAIM GROUP

🟩	A	Group
🟦	C	Group
🟥	D	Group
🟨	E	Group

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1000 MAP 7

1000 P.W. Richardson

AMAX EXPLORATION INC

KITIMAT RIVER MoS2 PROPERTY 1966
SKEENA MINING DIVISION - BRITISH COLUMBIA

CLAIM MAP

SCALE 1" = 2,000 FEET

DATE REVISED		DATE PRINTED			
				Drawn by: N.G.B.	FIG. 10
				Date 29 - 5 - 67	
				N.T.S. File 103-i-1	

To Accompany Report " KITIMAT RIVER Mo S2 PROPERTY 1966 "
*by: A.C. Gambardella and P.W. Richardson P. Eng. (B.C.) 196_*

May 31, 1967