818

SOUTHWEST POTASH CORPORATION

1966 (Preliminary Report)

KITIMAT RIVER PROPERTY

Skeena Mining Division
103-I-1
54° 128° SE

Vancouver Office
August 1966

A.C. Gambardella and
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SUMMARY AND CONCLUSIONS

Sufficient molybdenum mineralization was discovered in 1965 to warrant an extensive program of geological mapping and geochemical sampling in 1966. The work done during the first half of the 1966 season has consisted mostly of establishing good control for the geological and geochemical surveys. However, considerable geological mapping has been done and numerous samples collected. The bulk of this work is yet to be completed during August and September.

This preliminary report summarizes the work done in 1965 and in 1966 to August 1st. It includes a summary of costs and a proposal for the distribution of the assessment work. A report on the full season's work will be prepared in the Autumn.

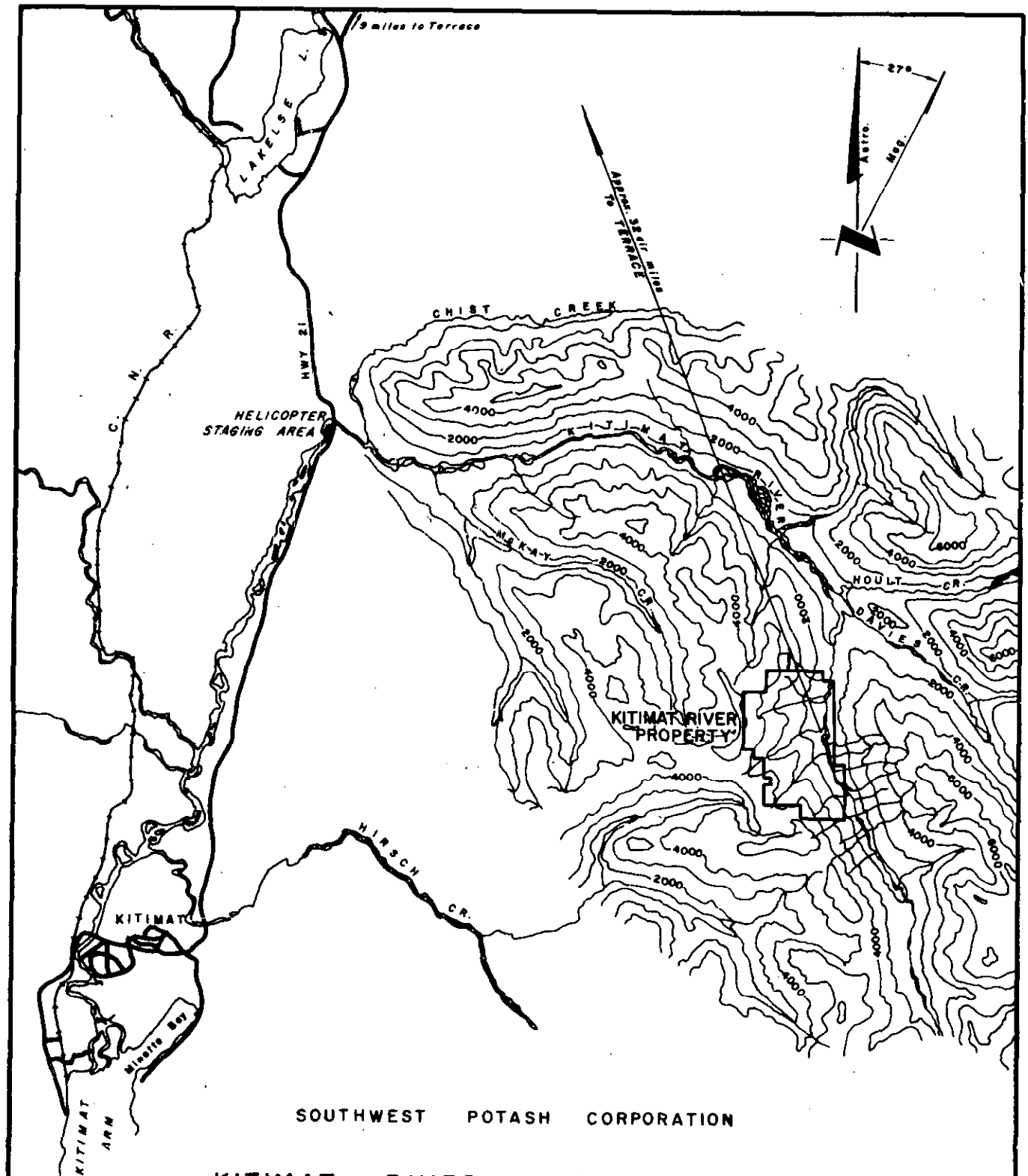
At this time it is apparent that the widely distributed low grade molybdenum mineralization is of some interest, and the program should be completed as planned.

INTRODUCTION

Molybdenum mineralization on the Kitimat River property was discovered in 1965 by the Amax Central B.C. Prospecting Program. The property is on the west side of the Kitimat River valley, 32 miles southeast of Terrace. A total of 256 claims was staked to protect the various areas of molybdenum mineralization. Preliminary evaluation work in 1965 consisted of prospecting, reconnaissance geological and geochemical surveys, and a limited induced polarization program. This work is described in detail by J.N. Schindler in, "1965 Final Report, Kitimat River MoS_2 Property".

The present report deals mostly with the work done on the property during the 1966 field season up to the 1st of August. The report is preliminary in nature and is written as a basis for submitting assessment work on claims with anniversary dates on August 27th, August 30th, and September 3rd and additional assessment work on those claims which were renewed in June.

A report covering the results of the entire field season will be prepared in the Autumn. Proportionately more geological and geochemical data will be available at that time because the large amount of snow early in the season limited the outcrop in Gossan and Mantle Creek Valleys and on the upper levels, and because a large part of the work early in the season was concerned with establishing accurate control on the extremely rugged terrain.



SOUTHWEST POTASH CORPORATION

KITIMAT RIVER MoS_2 PROPERTY

SKEENA MINING DIVISION — BRITISH COLUMBIA

LOCATION AND ACCESS MAP

SCALE 1 : 250,000

APPROXIMATELY 1" = 4 MILES

Vancouver —

P. W. Richardson

H. P.

103 I I FIG. 1

As a result, most of the geological and geochemical work was scheduled for the second half of the field season.

REGIONAL GEOLOGY

The regional geology is summarized in J.N. Schindler's 1965 Report and is presented here verbatim, as follows:

General Statement

"The property lies on the eastern margin of the Coast Range Batholithic Complex one mile inside the contact with the Hazelton Group. The regional setting of the property is shown in Figure 5, modified from G.S.C. Map 1136 A-(1).

"Paleozoic crystalline limestone associated with a sequence of Triassic sedimentary rocks has been mapped by the G.S.C. in a roof pendant on the upper reaches of Hirsch and McKay Creeks, just west of the property.

Intrusive Rocks

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

i) a gabbro facies
ii) green granodiorite
iii-a) white granodiorite
iii-b) a hornblende biotite facies.

The bulk of these rocks are of Cretaceous Age.

"One small mass of gabbro (olivine gabbro, pyroxene gabbro and diorite) has been noted on the headwaters of Davies Creek.

"Green granodiorite occurs in two areas south and east of the property. It differs little in composition from the white, biotite granodiorite, which is the most common igneous rock in the area, and is intruded by it.

"Hornblende, hornblende biotite granodiorite, hornblende diorite, quartz diorite and migmatite constitute a hornblende biotite facies ranging in age from that of the green granodiorite to that of the white biotite granodiorite.

"The property is underlain predominantly by medium to coarse grained soda granite, hydrothermally altered in part. The exact relationship between this grey granite and the white, biotite granodiorite of regional extent is not known.

"No exposures of quartz eye porphyry similar to that in Gossan Creek have been observed in the immediate vicinity of the property. Narrow, acid porphyritic dykes and basic dykes from two to twenty feet wide have been noted on the divide between Gossan and McKay Creeks.

Structure

"In the area west of Gossan Creek and east of McKay Creek, dykes, shear zones, and barren quartz veins trend either due north or due east, but overburden and vegetation preclude the possibility of tracing the regional extent, if any, of the wide variety of dykes exposed on the property.

"A twenty foot wide shear zone which is silicified, and pyritized in part, extends southwest from Davies Creek into the northeast corner of the property."

REVIEW OF 1965 WORK

Staking began in June 1965. Additional claims were staked and some of the earlier claims were restaked 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 - 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. Similarly, the widely spaced reconnaissance soil sampling on the areas covered by overburden gave widely scattered anomalous results. 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.

1966 WORK

The extent, ruggedness, and heavy forest cover of the area made the establishment of control lines essential for geochemical sampling and detailed geological mapping.

Before the beginning of the field season a 1" = 500' contour map was made by Lockwood Survey Corporation Limited from existing air photo coverage of the area. This map, although uncontrolled, has been a great aid to geological and geochemical mapping. 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 molybdenum mineralization. The plane table stations served as primary control for the geological mapping and for the rock chip sampling program which is getting under way at present. Where plane table mapping was not possible, accurate control stations were established along Mantle and Gossan Creeks by the tape and compass method.

In the area between the creeks accurate east-west compass and chain lines have been established at 400 foot intervals, and pickets have been placed at intervals of 200 horizontal feet along each line. On the hillsides facing Kitimat River, the

slopes average 45°, and some sections are between 55° and 60°. Establishing these lines was, therefore, very laborious and costly, but the presence of molybdenum in the water of springs along the base of the slopes necessitated good control for a careful investigation of the soils and rocks on the slopes. Twenty line miles of grid have been completed, and soil samples have been collected every 200 feet. The geological mapping is being done at present.

GEOLOGY OF THE MINERALIZED AREA

General Statement

Molybdenite mineralization occurs in Gossan and Mantle Creeks associated with at least two phases of acid intrusives and related aphanitic differentiates. The areas of mineralization are separated by a "greenstone" roof pendant and are approximately 8,500 feet apart. Weak iron staining generally accompanies molybdenite mineralization, and is most intense along the north wall of Gossan Creek, between 2,000 and 4,000 feet above sea level for a horizontal distance of 5,000 feet.

Hazelton Group (Taken from 1965 Kitimat River Report - P.15)

A large mass of "greenstones", composed mainly of altered intermediate volcanic rocks, underlies most of the north and west-central portion of the property. They are intruded by a wide variety of dykes ranging in composition from granite to basalt.

Intrusive Rocks

The intrusive rocks on the property show considerable variation, both in texture and composition, and differ significantly from the rocks of the surrounding batholith.

A large portion of the southern half of the property is underlain by a pinkish-grey "soda" granite which becomes more silicic towards the north-central portion of the property. Quartz "eye" feldspar porphyry, felsitic apophyses and a pink, medium-grained leucogranite constitute most of the igneous rocks outcropping in Gossan Creek. These are probably late differentiates of the grey "soda" granite.

A wide variety of post-sulphide mineralization dykes have been mapped on the property. They are genetically unrelated to the main intrusive body and are probably of regional extent.

A detailed description of rock types is given on the 1965 Kitimat River MoS_2 - Report by J.N. Schindler, p. 15-17.

Structure

General Statement

Preliminary results from (i) detailed geological mapping to date (ii) a study of lineaments from air photos and (iii) attitude of dykes in the area, indicate that the property lies at the intersection of three structural planes of weakness which may have a considerable regional extent. They are -

a) Due north b) N 40° W c) N 20° - 40° E

All three planar features are reflected on the property by the attitudes of sulphide bearing quartz veins and fractures. Therefore a more complete study of the structure will be extremely useful in determining the extent and distribution of molybdenite.

Dykes, Faults and Shears

Numerous steeply dipping dykes, faults and minor shears cut across the valleys of Gossan and Mantle Creeks. Most of the dykes are intruded along pre-existing fault zones. The faults and shears are characterized by zones of intense alteration which weather easily in comparison with the adjacent rocks, leaving deep gullies along the walls of Mantle and Gossan Creeks.

Quartz-vein Stockwork

Quartz-vein stockworks have been mapped over a wide area between Mantle and Gossan Creeks. They are best developed in the quartz-feldspar porphyry, where they average 4 - 8 veins per square foot. In Mantle Creek, three separate stockworks about 150 feet wide occur over a distance of 2,000 feet. The intensity of veining averages 4 - 6 veins per square foot.

SULPHIDE MINERALIZATION (Taken from 1965 Kitimat River Project)

The following sulphides, in order of decreasing abundance, have been observed: pyrite, molybdenite and chalcopyrite.

Pyrite

Pyrite is generally present in relatively small quantities, but is very widespread. It occurs alone or associated with

other sulphides in quartz veins and dry fractures and also as fine-grained disseminations in all rock types.

Molybdenite

Molybdenite occurs in Mantle and Gossan Creeks between the 2,000 - 3,500 foot elevations. It is generally fine-grained and occurs i) in quartz veins ranging in width from < 1/16" to 1/2" and ii) as smears or fine grained disseminations along dry fracture planes. Pyrite is almost invariably associated with it and, to a minor extent, chalcopyrite.

In Mantle Creek, molybdenite occurs sporadically over a horizontal distance of 2,000 feet, in "soda" granite and "leucogranite".

In Gossan Creek, molybdenite mineralization has been noted over a distance of 2,500 feet horizontally and 1,000 feet vertically. It is localized in quartz-feldspar porphyry, a medium grained leucogranite, and "soda" granite. Sporadic molybdenite-bearing quartz veins also occur in the "greenstones" close to the intrusive rocks contact.

Chalcopyrite

Minor amounts of chalcopyrite associated with molybdenite and pyrite have been recorded in quartz veins and dry fractures.

ALTERATION

Silicification, K-feldspathization, argillization,

sericitization, chloritization, carbonitization and hematitization have been noted in varying degrees on the property.

Molybdenite mineralization is most commonly associated with silicification, K-feldspathization and sericitization and, less commonly with chloritization.

Argillization, carbonitization and hematitization are intensely developed along shears and faults.

DETAILS FOR ASSESSMENT WORK

A total of $30,278.76 is herewith shown to be applicable as assessment work made up as follows -

	1965	1966 (Costs to August 1)
Helicopter Expenses	$ 5,600.00	$ 9,509.00
Salaries	3,355.00	7,367.00
Cost of Lockwood Contour Map	--	1,051.76
Cost of Sample Analysis	632.00	982.00
Cost of Board	570.00	1,212.00
	$10,157.00	$20,121.76

Grand Total $30,278.76

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. In 1965, the helicopter time from September 9th-October 7th, totalled 68 hours 50 minutes. Of this time, 18 hours and 45 minutes have already been applied as assessment work in support of an induced polarization survey submitted earlier. As a result, 50 hours are being applied for at present and the cost

being 50 hours @ $112.00/hr. totalling $5600.00. Please see the following -

1965 Helicopters

The helicopter costs for September 9 to October 7th less costs for I.P. Survey from September 9 to 24th. (I.P. helicopter costs 18 hours 45 minutes @ $112.00/hr. totalling $2100.00)

September-9	6	hours 55	minutes
10	6	15	
11	2	00	
12	2	25	
13	3	15	
15	2	35	
16	1	10	
17		45	
17		30	
18	1	25	
19	1	35	
20	1	35	
21	2	05	
21		30	
22	1	20	
23	2	25	
24	5	35	
25	5	15	
26	1	10	
27	3	05	
28	1	45	
30	1	00	
October - 1	1	55	
2	2	25	
3	1	05	
4	3	05	
5	1	25	
6	4	20	
Total	68	hours 50	minutes
Less	18	45	(I.P. Survey time)
	50	hours 05	minutes @ $112.00/hr. totalling $5600.00

1966 Helicopters

The 1966 applicable helicopter costs are as follows -

May -	20	1 hour	15 minutes	@ $130.00/hr.	$ 910.00
	21	5	45		
	22	5	20	130.00/hr.	693.00
	23	3	20	130.00/hr.	574.00
	27	1	05		
	26	3	50	130.00/hr.	498.00
June -	1		55	130.00/hr.	672.00
	2	4	15		
	5	1	20	130.00/hr.	173.00
	8	2	15	130.00/hr.	520.00
	9	1	45		
	11	1	00	140.00/hr.	140.00
	15	1	40	140.00/hr.	735.00
	18	3	35		
	21	1	35	140.00/hr.	548.00
	25	2	20		
	28	2	00	140.00/hr.	280.00
July -	1	3	20	140.00/hr.	467.00
	4	1	00	140.00/hr.	420.00
	6	1	00		
	7	1	00		
	10	1	50	140.00/hr.	1645.00
	12	4	20		
	13	4	05		
	15	1	30		
	20	1	40	103.00/hr.	172.00
	21		55	103.00/hr.	94.00
	23	1	10	140.00/hr.	490.00
	27	2	20		
	31	3	25	140.00/hr.	478.00
Total		70 hours	50 minutes		$9509.00

Salaries - 1965

NAME AND ADDRESSES	DATES WORKED	DAYS	SALARY	AMOUNT
S. Carryer, Box 396, Wawera, N.Z.	Sept. 9-Oct.7	29	$525.	$ 507.00
R.McMillan, 733 Moffatt Rd. Richmond, B.C.	Sept. 9-Oct.7	29	600.	580.00
J.D.Scott, 88 Albany Ave., Toronto, Ontario	Sept. 9-17	9	500.	150.00
I.M.Hedley, 1542 Prospect Place, Victoria, B.C.	Sept. 9-15	7	400.	93.00
Wayne Henze, 772 #4 Rd., Richmond, B.C.	Sept. 9-14	6	375.	75.00
E.Muldoe, Houston, B.C.	Sept. 9-27	19	400.	253.00
H.Lund, Houston, B.C.	Sept. 9-Oct.7	29	400.	387.00
B.Wulff, Houston, B.C.	Sept. 9-Oct.7	29	400.	387.00
H.Hertel, Terrace, B.C.	Sept.22-Oct.7	15	400.	200.00
P.Marshall, Hazelton, B.C.	Sept. 9-Oct.6	28	375.	350.00
L.Zwienka, Mundare, Alta.	Sept. 9-Oct.6	28	400.	373.00
				$3355.00

Salaries - 1966

I.Church, 11755-18th Ave., Haney, B.C.	July 20-July 31	12	385.	149.00
A.Gambardella, 259 Lanark St., Winnipeg, Man.	May 27-July 3 July 8-July 31	62	650.	1300.00
A.Gates, 10812-130 St., Edmonton, Alta.	June 20-July 15	26	475.	412.00
T.Jack, Box 307, Hazelton, B.C.	June 20-July 31	42	425.	595.00
S.Louie, Telegraph Creek, B.C.	May 22-June 14 June 19-July 19 July 25-July 31	61	425.	836.00
B.Munday, General Delivery Smithers, B.C.	May 22-June 14 June 19-July 19 July 25-July 31	61	450.	885.00
I.Murray, Smithers, B.C.	June 25-July 4 July 20-July 31	22	425.	312.00
J.Phillips, 808-103 Ave. Dawson Creek, B.C.	May 22-June 20 June 25-July 31	67	400.	864.00
D.Sloan, 1291 Devonshire Cres. Vancouver, B.C.	May 22-June 20 June 25-July 31	67	350.	756.00
A.Wenban-Smith, Lymington, Hants, England	May 26-July 7 July 10-July 31	65	600.	1258.00
				$7367.00

Contour Map

The Costs of the maps from Lockwood Surveys were as follows -

Original Contour Map 1" = 1000'	= $ 965.51
Blowing above up to 500 scale	86.25
	$1051.76

Samples

The costs of sample analyses were as follows -

1965 - 316 samples @ $2.00	= $ 632.00
1966 (to July 31) - 491 samples @ $2.00	982.00
	$1614.00

Board

1965 - 228 man-days @ $2.50/day	= $ 570.00
1966 - 485 man-days @ $2.50/day	1212.00
	$1782.00

DISTRIBUTION OF ASSESSMENT WORK

Claims	Record Numbers	Recorded	No. of Claims	Need Work
Barb #13,14	26231-26232	June 16/65	2	-
Be #13,14	26161-26162	June 16/65	2	-
El #15,16	26298-26299	June 16/65	2	-
Frankie #3-10	26330-26337	June 16/65	8	-
Liz #1,2	26171-26172	June 16/65	2	-
Liz #13,14	26183-26184	June 16/65	2	-
Mel #1,2	26193-26194	June 16/65	2	-
Mel #13,14	26205-26206	June 16/65	2	-
Pen #14	26271	June 16/65	1	-
Barbs #1-18	27293-27310	Aug. 27/65	18	6
Bee #1-15	27342-27356	Aug. 27/65	15	9
Hony #1-16	27277-27292	Sept. 3/65	16	12
Ell #1-15	27327-27341	Aug. 30/65	15	6
Liza #1-16	27311-27326	Aug. 27/65	16	12
Melo #1-16	27357-27372	Aug. 30/65	16	16
Penny #1-12	27265-27276	Sept. 3/65	12	12
			131	73

The following claims already have one year's work applied on them -

Hony #1,9,10,12	4 claims
Ell #1,3,5,6,7,8,9,10,12	9
Bee #1,2,3,4,5,6	6
Liza #2,7,9,11	4
Barbs #1,2,3,4,5,7,8,9,10,11,12,13	12
Barb #13,14	2
Be #13,14	2
El #15,16	2
Frankie #3,4,5,6,7,8,9,10	8
Liz #1,2,13,14	4
Mel #1,2,13,14	4
Pen #14	1
	58 claims

It is proposed to apply the assessment work to only those claims with an anniversary date on August 27th, August 30th, and September 3rd because work done during August cannot be submitted in time on these claims. Work in August will show on the final report and will be submitted on claims with an anniversary date in June.

Vancouver Office
August 1966

A.C. Gambardella and

P.W. Richardson

P.W. Richardson, P.Eng.(BC)

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) Put the sample bags on an aluminum foil tray and place on top of an oil stove. Time required is usually eight hours.

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 scoop (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 exactly 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:

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

= 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.

ADDENDA TO GEOLOGICAL AND GEOCHEMICAL REPORT ON KITIMAT RIVER PROPERTY

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 samples sites, only organic material of the A horizon could be collected. In some aplite 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.

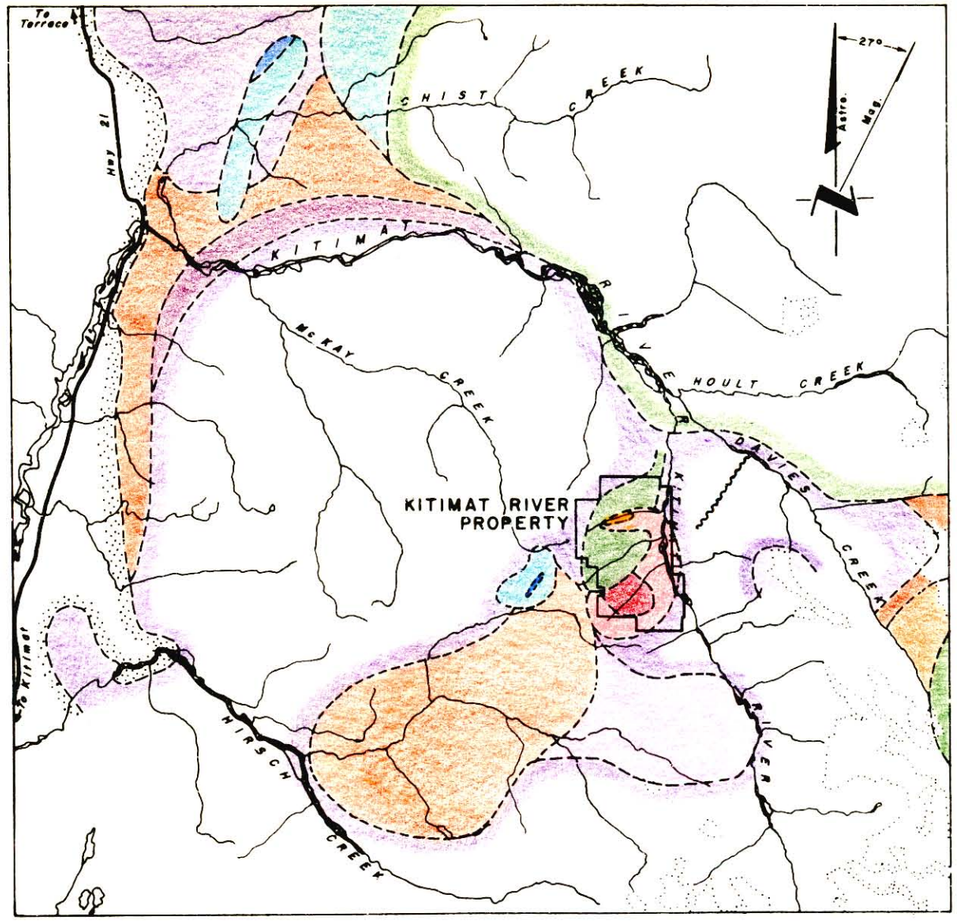
WATER SAMPLES: Water samples were collected in clean, 100 ml. screw top, polyethylene bottles. Great care was taken to minimize the amount of sediment in the water samples.

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.



NOTE —
Geology after Duffell and Souther, 1964 - modified.

S Y M B O L S

------ Geological contact.

~~~~ Shear zone.

L E G E N D

PLEISTOCENE AND RECENT
- Sand, gravel, clay.

POST-CRETACEOUS ?
- Quartz feldspar porphyry.
- Grey, soda granite.
- "Leucocratic / altered" 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.

SOUTHWEST POTASH CORPORATION

KITIMAT RIVER MoS_2 PROPERTY

SKEENA MINING DIVISION — BRITISH COLUMBIA

REGIONAL GEOLOGY MAP

818

SCALE APPROXIMATELY 1 : 250,000
1" = 4 MILES

D. Richardson

Vancouver — H.P.

818 FIG. 2
~~~~

Films

DOMINION OF CANADA:

PROVINCE OF BRITISH COLUMBIA.

TO WIT:

In the Matter of itemized breakdown of Assessment Work Costs at Kitimat River MoS_2 Property, British Columbia

I, P.W. Richardson

of Suite 601-535 Thurlow Street, Vancouver 5,

in the Province of British Columbia, do solemnly declare that

I - I am agent for Southwest Potash Corporation, and as such am duly authorized to make this declaration.

II - The detailed account of expenditures on the Kitimat River MoS_2 Property between September 9, 1965 and August 1, 1966 are as follows:

	1965	1966 (Costs to August 1)
Helicopter Expenses	$ 5,600.00	$ 9,509.00
Salaries	3,355.00	7,367.00
Cost of Lockwood Contour Map	--	1,051.76
Cost of Sample Analysis	632.00	982.00
Cost of Board	570.00	1,212.00
	10,157.00	20,121.76

Grand Total $30,278.75

Contour Map 1"= 1000' = $965.51 + Blowing up to 500 scale $86 = $1051.76

Samples 1965 - 316 samples @ $2.00 = $632.00
1966 - 491 samples @ $2.00 = 982.00 (to July 31) 1614.00

Board 1965 - 228 man-days @ $2.50/day = 570.00
1966 - 485 man-days @ $2.50/day 1212.00 1782.00

Salaries - 1965

Name & Address	DATES WORKED	DAYS	SALARY	Amount
S.Carryer,Box 396,Wawera,New Zealand	Sept. 9-Oct.7	29	$525.	$ 507.00
R.McMillan,733 Moffatt Rd.,Richmond,B.C.	Sept. 9-Oct.7	29	600.	580.00
J.D.Scott,88 Albany Ave.,Toronto,Ont.	Sept. 9-17	9	500.	150.00
I.M.Hedley,1542 Prospect Place,Victoria,B.C.	Sept. 9-15	7	400.	93.00
Wayne Henze,772 #4 Rd.,Richmond,B.C.	Sept. 9-14	6	375.	75.00
E.Muldoe,Houston,B.C.	Sept. 9-27	19	400.	253.00
H.Lund,Houston,B.C.	Sept. 9-Oct.7	29	400	387.00
B.Wulff,Houston,B.C.	Sept. 9-Oct.7	29	400	387.00

Cont'd Page 2

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA.
TO WIT:

In the Matter of itemized breakdown of Assessment Work Costs at Kitimat River MoS_2 Property, British Columbia

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of Suite 601-535 Thurlow St.,Vancouver 5,

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I - I am agent for Southwest Potash Corporation, and as such am duly authorized to make this declaration.

II - The detailed account of expenditures on the Kitimat River MoS_2 Property between September 9, 1965 and August 1,1966 are as follows:

Salaries - 1965 (Cont'd)

Name & Address	Dates Worked	Days	Salary	Amount
H.Hertel, Terrace,B.C.	Sept.22-Oct.7	15	$400.	$ 200.00
P.Marshall,Hazelton,B.C.	Sept. 9-Oct.6	28	375.	350.00
L.Zwienka,Mundare,Alta.	Sept. 9-Oct.6	28	400	373.00
				$3355.00

Salaries - 1966

Name & Address	Dates Worked	Days	Salary	Amount
I.Church,11755-18th Ave.,Haney,B.C.	July 20-July 31	12	$385.	$ 149.00
A.Gambardella,259 Lanark St. Winnipeg,Man.	May 27-July 3			
	July 8-July 31	62	650.	1300.00
A.Gates,10812-130 St.,Edmonton,Alta.	June 20-July 15	26	475.	412.00
T.Jack, Box 307,Houston,B.C.	June 20-July 31	42	425.	595.00
S.Louie,Telegraph Creek,B.C.	May 22-June 14			
	June 19-July 19			
	July 25-July 31	61	425.	836.00
B.Munday,General Delivery,Smithers,B.C.	May 22-June 14			
	June 19-July 19			
	July 25-July 31	61	450.	885.00
I.Murray,Smithers,B.C.	June 25-July 4			
	July 20-July 31	22	425.	312.00
J.Phillips,808-103 Ave.,Dawson Creek,B.C.	May 22-June 20			
	June 25-July 31	67	400.	864.00
D.Sloan,1291 Devonshire Cresc. Vancouver,B.C.	May 22-June 20			
	June 25-July 31	67	350.	756.00
A.Wenban-Smith,Lymington,Hants,England	May 26-July 7			
	July 10-July 31	65	600	1258.00
				$8367.00

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the VANCOUVER, B.C.
of AUG 26 1966, in the Province of British Columbia, this
day of , A.D.

P. W. Richardson

Sub-Mining Recorder

A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.

★o

Melo 3 | Melo 1 | Mel 1 | Melo 4 | Melo 2 | Mel 2

I.P. Melo 5 & 6
F.P. Melo 3 & 4

I.P. Melo 3 & 4
F.P. Melo 1 & 2

I.P. Melo 1 & 2
F.P. Mel 1 & 2

Ka, lim — 20' wide zone strongly sheared

Ka, lim Strongly sheared

lim, chl

Py, lim

K, Ep

lim

Ep, chl, Py

Ep, Py — lim, Ep

Contact 60/205

Py, Mo

Ka, ser Alteration decreases to South

Granite over greenstone
Flat-lying contact

Barbs 5 | Barbs 3 | Barbs 1

I.P. Barbs 5 & 6
F.P. Barbs 3 & 4

SYMBOLS

- Geological contact.
- Limit of outcrop.
- Attitude.
- Dry fractures with MoS_2.
- Joints.
- Shear, shear with MoS_2.
- Fault (defined, assumed, with MoS_2).
- Quartz vein stockwork (mineralization specified).
- Alteration (type specified).
- Quartz vein (barren, mineralized).
- Chip sample site.
- Control station.
- Creek, stream.

LEGEND

- Hazelton Group: mainly basic volcanic rocks.
- Late basic dyke.
- Coast Intrusions: quartz muscovite porphyry and hybrid greenstone grading into normal granite.
- Acid aphanitic or quartz porphyry dykes.
- Granodiorite dykes.
- Grey soda granite.

AMAX EXPLORATION INC.

KITIMAT RIVER PROPERTY

SKEENA MINING DIVISION — BRITISH COLUMBIA

GOSSAN CREEK
GEOLOGICAL MAP

818 (M1)

SCALE 1" = 100'

To accompany: "PRELIMINARY REPORT ON KITIMAT RIVER PROPERTY" by: A. Gambardella.
P.W. Richardson.

Geology by A. K. Wenban-Smith

Vancouver: — August 15th, 1966.

MAP 1

BEE 4 | BEE 2 | BEE 14

ELL 5 | ELL 3 | ELL 1

ELL 4 | ELL 2

F.P. ELL 3&4
I.P. ELL 5&6

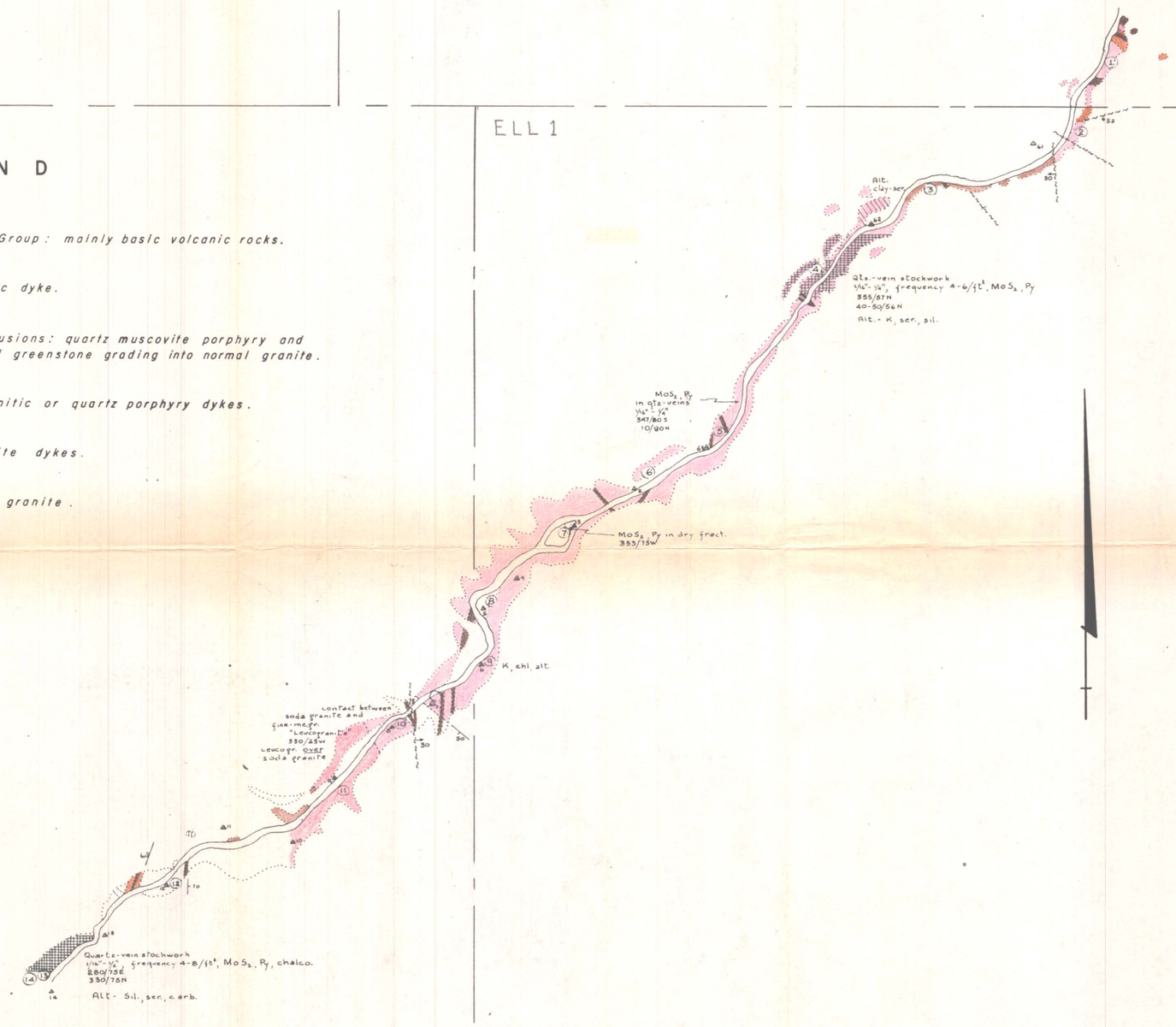
F.P. ELL 1&2
I.P. ELL 3&4

SYMBOLS

- Geological contact.
- Limit of outcrop.
- Attitude.
- Dry fractures with MoS_2.
- Joints.
- Shear, shear with MoS_2.
- Fault (defined, assumed, with MoS_2).
- Quartz vein stockwork (mineralization specified).
- Alteration (type specified).
- Quartz vein (barren, mineralized).
- ⑤ Chip sample site.
- Control station.
- Creek, stream.

LEGEND

- Hazelton Group: mainly basic volcanic rocks.
- Late basic dyke.
- Coast Intrusions: quartz muscovite porphyry and hybrid greenstone grading into normal granite.
- Acid aphanitic or quartz porphyry dykes.
- Granodiorite dykes.
- Grey soda granite.



Geology by A. Gambardella.

AMAX EXPLORATION INC.

KITIMAT RIVER PROPERTY

SKEENA MINING DIVISION — BRITISH COLUMBIA

MANTLE CREEK
GEOLOGICAL MAP

SCALE 1" = 100'

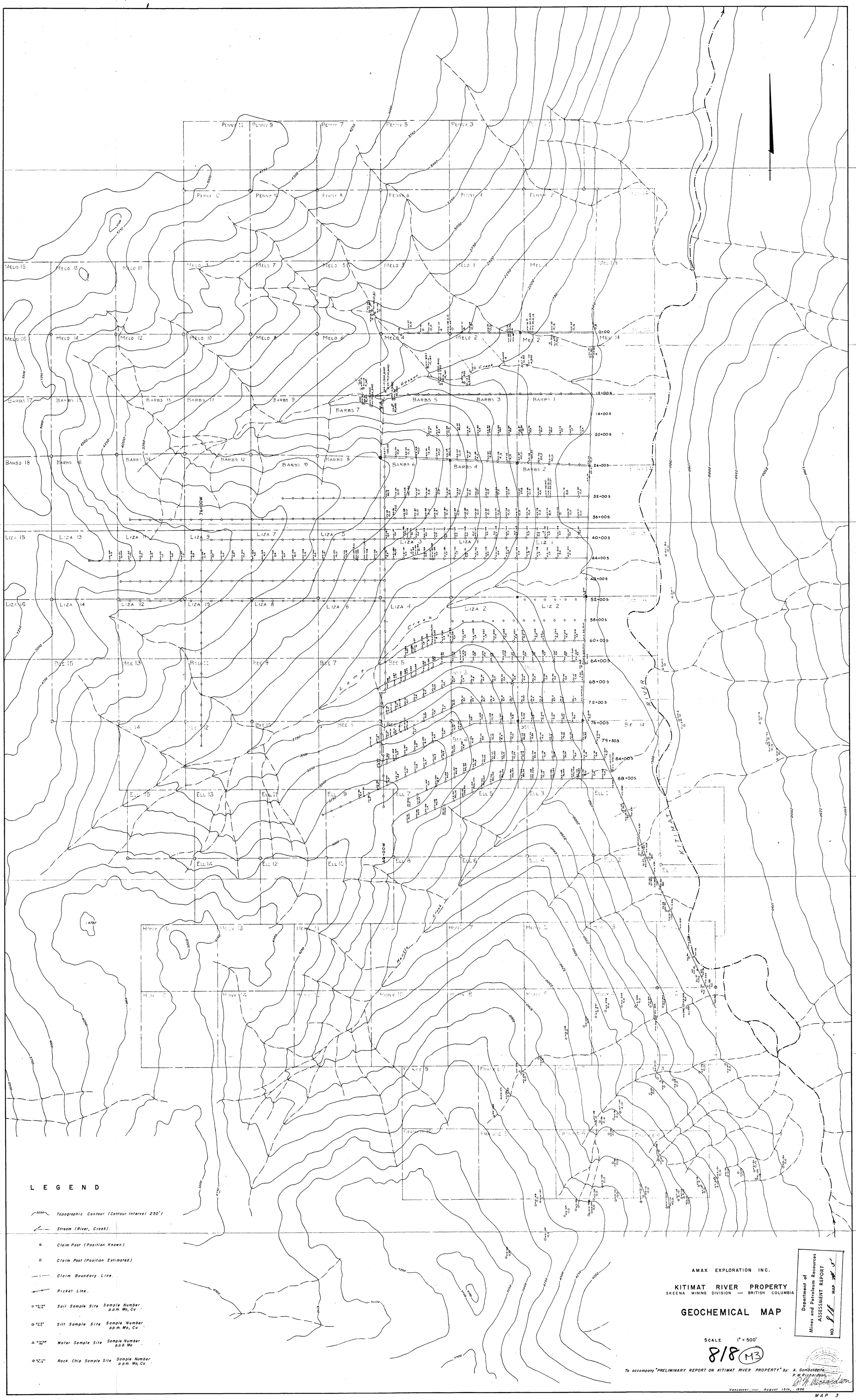
818 (M2)

To accompany: "PRELIMINARY REPORT ON KITIMAT RIVER PROPERTY" by: A. Gambardella.
P.W. Richardson.

P.W. Richardson

Vancouver: — August 15th, 1966.

MAP 2



LEGEND

- Topographic Contour (Contour Interval 250')
- Stream (River, Creek).
- Claim Post (Position Known)
- Claim Post (Position Estimated)
- Claim Boundary Line.
- Picket Line.
- Soil Sample Site — Sample Number, p.p.m. Mo, Cu.
- Silt Sample Site — Sample Number, p.p.m. Mo, Cu.
- Water Sample Site — Sample Number, p.p.b. Mo.
- Rock Chip Sample Site — Sample Number, p.p.m. Mo, Cu.

AMAX EXPLORATION INC.

KITIMAT RIVER PROPERTY

SKEENA MINING DIVISION — BRITISH COLUMBIA

GEOCHEMICAL MAP

SCALE 1" = 500'

8/8 (M3)

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 818 MAP 3

To accompany "PRELIMINARY REPORT ON KITIMAT RIVER PROPERTY" by: A. Gambardella
P.W. Richardson

P.W. Richardson

Vancouver: — August 15th, 1966.

MAP 3