

798

SOUTHWEST POTASH CORPORATION

KNAUSS MOUNTAIN CLAIMS

DUG GROUP

54°128° NE

Vancouver Office

August 15th, 1966

D.J. Murphy and  
P.W. Richardson, P.Eng.

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# 1

## SUMMARY

The Knauss Mountain group of claims are in the Hazelton Mountains 20 miles northeast of Terrace, B.C. They have been staked over an area of molybdenum mineralization, which occurs near the contact of the Coast Range Batholith and the Bowser group of sediments.

During July 1966 a two-man party mapped the property and collected silt, soil, water and rock chip samples. This work outlined an area of low grade molybdenum mineralization 1000' by 200' in silicified sediments and granites.

## CONCLUSIONS

The mineralization observed is low grade. However, further work may lead to the discovery of higher grade material.

## RECOMMENDATIONS

A further two days should be spent in the mineralized area collecting rock chip samples and close-spaced soil samples. Only claims Dug 5, 6, 7, 8, 9, 10, 15 and 22 should be retained.

## INTRODUCTION

The Knauss Mountain property is situated in the Hazelton Mountains 20 miles northeast of Terrace, B.C. It consists of 22 claims, Dug 1 - 22 inclusive, which extend about two miles down the south-facing slope of the eastern limit of Knauss Mountain. The altitude of the property ranges from 6200' at the northern boundary to less than 2000' in the valley of Carpenter Creek. The average southward slope is therefore almost 30 degrees.

The area is drained by a number of southeast-flowing streams, which in the lower part, in particular, have cut deep, steep-sided valleys that make traversing very difficult. Above 4500' the vegetation is mainly alpine; below that altitude the surface is thickly forested.

A two-man party worked on the property from the 17th to the 25th July 1966, mapping, prospecting and taking geochemical samples. A three-man party returned on the 28th of July and spent the day traversing the lower part of the property.

## LOCATION AND ACCESS

The property is located 20 miles N.E. of Terrace, B.C. and four miles south of Dorreen, B.C. near the crest of the east peak of Mt. Knauss. ( $54^{\circ}45' N$ ;  $128^{\circ}22' W$ ) The property is accessible only by helicopter at present. However a rough road extends three miles S.W. from Dorreen to the north base of Knauss Mountain.

GEOLOGY

The Knauss Mountain claims straddle part of the contact between the Coast Intrusions and the sediments of the Bowser Group.

The western third of the area is underlain by medium-to coarse-grained white biotite granodiorite (Souther, 1964). This rock varies little in appearance over large areas and, apart from some pyrite along quartz veins, appears to be barren of mineralization.

The eastern third of the property is underlain by rusty-weathering sediments and metasediments of the Bowser Group. These consist of medium-to fine-grained greywackes, argillites, slates and hornfelses, with some volcanics. The Bowser sediments have been extensively cut by dykes and sills, up to 50' in width, of medium to coarse-grained quartz diorite and of felsite. The unaltered sediments contain large amounts of disseminated pyrite, but no minerals of economic interest were found.

The area between the white granodiorite and the Bowers is more complex geologically. Two ridges of medium-grained, red-brown granite (probably the pink granodiorite of Souther) extend southward from the mountain. In many places where the granite would otherwise be in contact with sediments, it is surrounded by a narrow belt of more mafic rock. On the preliminary geological map this has been grouped with the granodiorite, though much of it appears to be a diorite or quartz diorite in composition.

The area of economic interest lies between the two granite ridges in the valley of Rosette Creek. Here the rocks have been extensively sheared and altered by solutions rising along the zones of weakness. The major shear appears to follow the strike of the valley. A series of less continuous shears strikes about  $140^{\circ}$ , producing a rapid alteration of rock types along the valley sides.

#### MINERALIZATION AND ALTERATION

Molybdenite has been found in outcrop over a total distance of 2000' along Rosette Creek. However, for much of this distance the occurrences are sporadic. Continuous mineralization is found over a distance of about 1000', with a maximum width of 200', in claims Dug 7 and Dug 8. Here the host rocks are a complex group of highly silicified sediments and granitic rocks, so intensely altered and sheared together that it is impossible to map them separately. They have been grouped together and called "quartz porphyry". The presence of a few thin bands of relatively unaltered greywacke in the middle of this group suggests that the majority of the rock was originally greywacke.

The quartz porphyry is made up almost entirely of fine- to medium-grained quartz and is a dense, very hard rock. Molybdenite occurs as thin films in "dry" fractures, along with pyrite and hematite. In places the fractures form a fine stockwork with two or three fractures per inch. The results of analysis of rock chip samples show that the deposit is generally low-grade. The

highest value was 0.064% Mo. A value of 700 ppm in soil was taken from over the mineralized area.

Copper stain is widespread throughout the quartz porphyry and chalcopyrite is particularly abundant in rock which appears to be silicified granodiorite. In this the chalcopyrite occurs as large blebs up to 1/2 cm in diameter bordering quartz veins. Analysis shows, however, that the copper-mineralization is not of ore grade.

The quartz porphyry can be traced over a distance of 1000' and reaches a maximum width of 200'. At its southern end it gradually pinches out between granodiorite and sediments. At the northern limit the relationships are uncertain, but the quartz porphyry is probably cut off by one of the numerous shears that strike at 140°.

Molybdenite also occurs along quartz veins in some of the less altered rocks bordering the quartz porphyry. In these, scattered mineralization can be traced over a distance of at least 2000' and is always associated with shearing and faulting. The maximum percentage of Mo in these rocks is only 0.03.

EXPENSESHelicopter

	<u>Hrs.</u>	<u>Mins.</u>
Fly in 17th July	1	30
Supplies 23rd July		30
Move out camp, 25th July	1	35
Fly in and out -		
Traverse 28th July	<u>2</u>	<u>55</u>
	<u>6</u>	<u>30</u>

Cost -  $6\frac{1}{2}$  hours @ \$140/hr. = \$ 910.00

Food

2 men x 10 days in fly camps @ \$2.50	50.00
1 man x 4 days at base (drafting) @ \$2.50	10.00

Salaries

Field-Senior 10 days @ \$575/month	192.00
-Junior 10 days @ \$350/month	117.00
Office Senior 4 days @ \$575/month	77.00

Geochemistry

48 samples @ \$2/sample	<u>96.00</u>
	<u>\$1452.00</u>

*P. W. Richardson*  
P.W. Richardson, P. Eng.

August 25, 1966

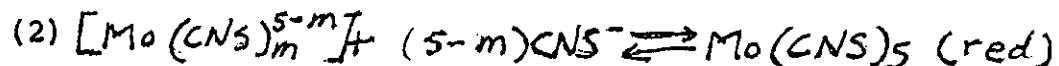
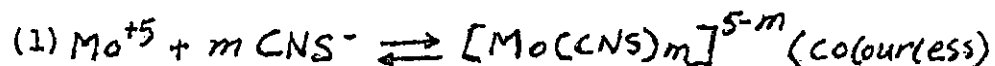


## INTRODUCTION

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 colorimetric 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:



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 (pulp) 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<sub>2</sub> solution. Shake to mix.

NOTE: If the iron content of the testing solution is high, a larger amount of SnCl<sub>2</sub> solution may be required, (SnCl<sub>2</sub> 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  $\text{MoO}_3$  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 1 <sup>∕</sup> 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 100 <sup>∕</sup> 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<sub>3</sub>: Dilute 750 ml of concentrated HNO<sub>3</sub> 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<sub>2</sub> solution: Dissolve 13 gm of SnCl<sub>2</sub> 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<sub>2</sub>. 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<sub>2</sub> 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)  $\text{SnCl}_2$  solution: Heat 30 gm of  $\text{SnCl}_2$  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.

Camp C Knauss Mountain Claims

GEOCHEMICAL REE SAMPLE DATA

Collector D.J. Murphy

Project Usk - #291

Area (lake, highway, etc.) \_\_\_\_\_

Date 18th to 25th July 1966

Plotted (map, photo) \_\_\_\_\_

Number	Type						Location		Environment		Sample Description		Analytical Results				Remarks (Geology, Geomorph., Culture)	
	Sample Code	No	Rock	Soil	Water	Silt	Veg.	General	Sample Site	Terrain	Drainage	Texture	Colour	Mo	Cu			
1	UD	291			x	a b c								8				
2	"	"				aX b c								0	0			
3		292			x	a b c								4				
4	"	"				aX b c								4	0			
5		293			x	a b c								20				
6	"	"				aX b c								0	12			
7		294			x	a b c								30				
8	"	"				aX b c								55	500			
9	"	"		x		a b c								0	600			
10		295			x	a b c								30				
11	"	"		x		a b c								0	2000			

General Remarks:

## GEOCHEMICAL REE SAMPLE DATA

Camp C Causs Mountain Claims - Page 2

Collector \_\_\_\_\_

Project \_\_\_\_\_

Area (lake, highway, etc.) \_\_\_\_\_

Date \_\_\_\_\_

Plotted (map, photo) \_\_\_\_\_

Sample Code	Number	Type					Location		Environment		Sample Description		Analytical Results				Remarks (Geology, Geomorph, Culture)
		ROCK	Soil	Water	Silt	Veg.	General	Sample Site	Terrain	Drainage	Texture	Colour	Mo	Cu			
1	UD 296			X	a b c							80					
2	"				aX b c							0	720				
3	297			X	a b c							40					
4	298			X	a b c							80					
5	299				aX b c							70	800				
6	300			X	a b c							20					
7	301			X	a b c							4					
8	302			X	a b c							10					
9	303		X		a b c							0	2				
10	304		X		a b c							0	30				
11	305		X		a b c							0	2				

General Remarks:

/3

Collector \_\_\_\_\_

Project \_\_\_\_\_

Area (lake, highway, etc.) \_\_\_\_\_

Date \_\_\_\_\_

Plotted (map, photo) \_\_\_\_\_

Number	Type						Location		Environment		Sample Description		Analytical Results				Remarks (Geology, Geomorph., Culture)	
	Sample Code	No.	Rock	Soil	Water	Silt	Veg.	General	Sample Site	Terrain	Drainage	Texture	Colour	Mo	Cu			
1	UD	306			X	a b c								0				
2		307			X	a b c								0				
3		308			X	a b c								0				
4		309			X	a b c								0				
5		310			X	a b c								0				
6		311			X	a b c								0				
7		312			X	a b c								0				
8		313			X	a b c								12				
9		314			X	a b c								0				
10		315		X		a b c								500	2000			
11		316	X			a b c								400	40			

General Remarks:

Collector \_\_\_\_\_

Project \_\_\_\_\_

Area (lake, highway, etc.) \_\_\_\_\_

Date \_\_\_\_\_

Plotted (map, photo) \_\_\_\_\_

Number	Type						Location		Environment		Sample Description		Analytical Results				Remarks (Geology, Geomorph, Culture)
	Sample Code	No.	Rock	Soil	Water	Silt	Veg.	General	Sample Site	Terrain	Drainage	Texture	Colour	Mo	Cu		
1	UD	317	x			a b c							250	160			
2		318	x			a b c							100	320			
3		319	x			a b c							12	60			
4		320	x			a b c							10	320			
5		321	x			a b c							640	320			
6		322	x			a b c							150	320			
7		323	x			a b c							550	320			
8		324	x			a b c							320	400			
9		325		x		a b c							80				
10		"				a <sup>x</sup> b c							400	800			
11		326	x			a b c							700	640			

General Remarks:



Collector \_\_\_\_\_

Project \_\_\_\_\_

Area (lake, highway, etc.) \_\_\_\_\_

Date \_\_\_\_\_

Plotted (map, photo) \_\_\_\_\_

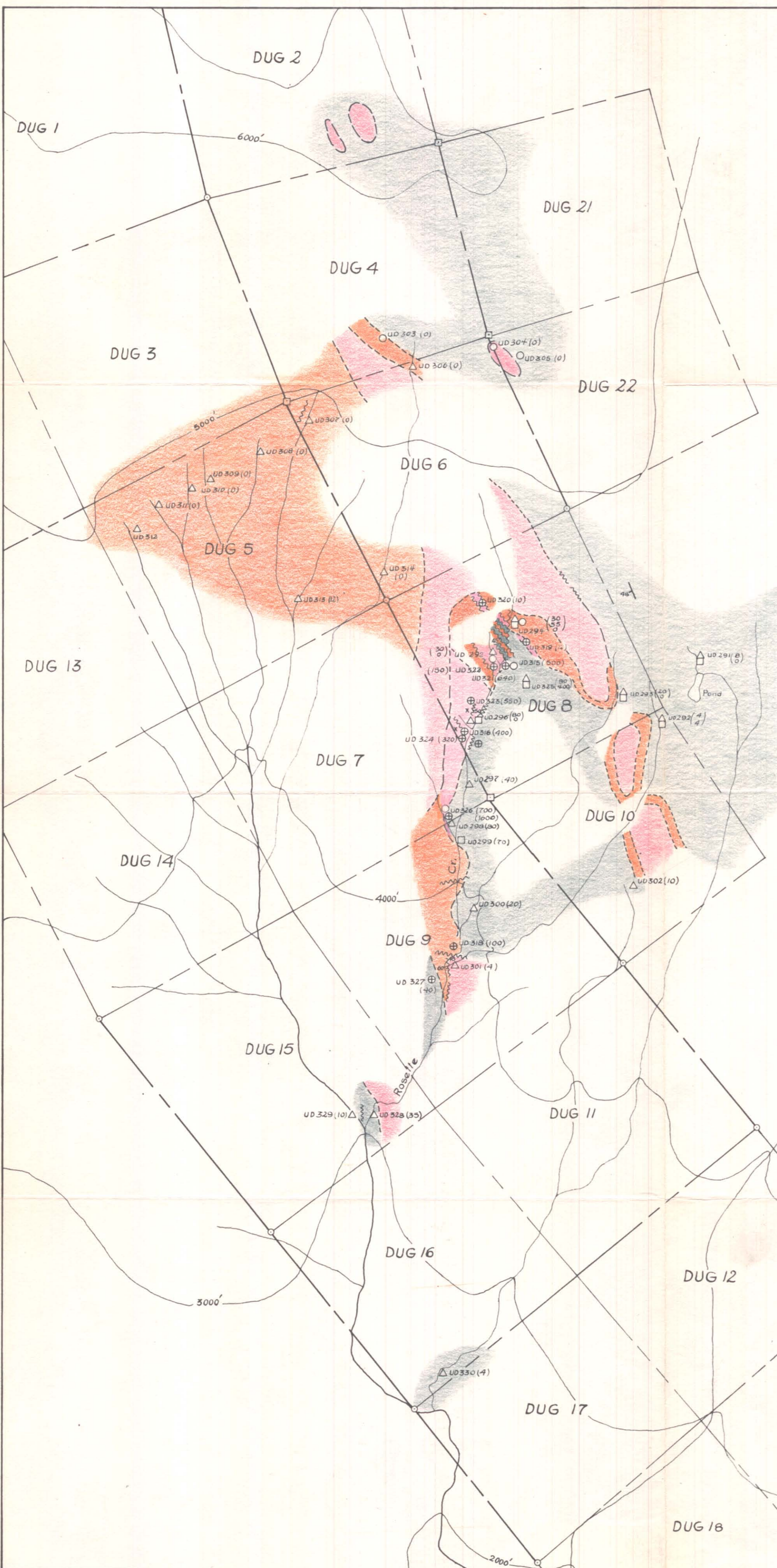
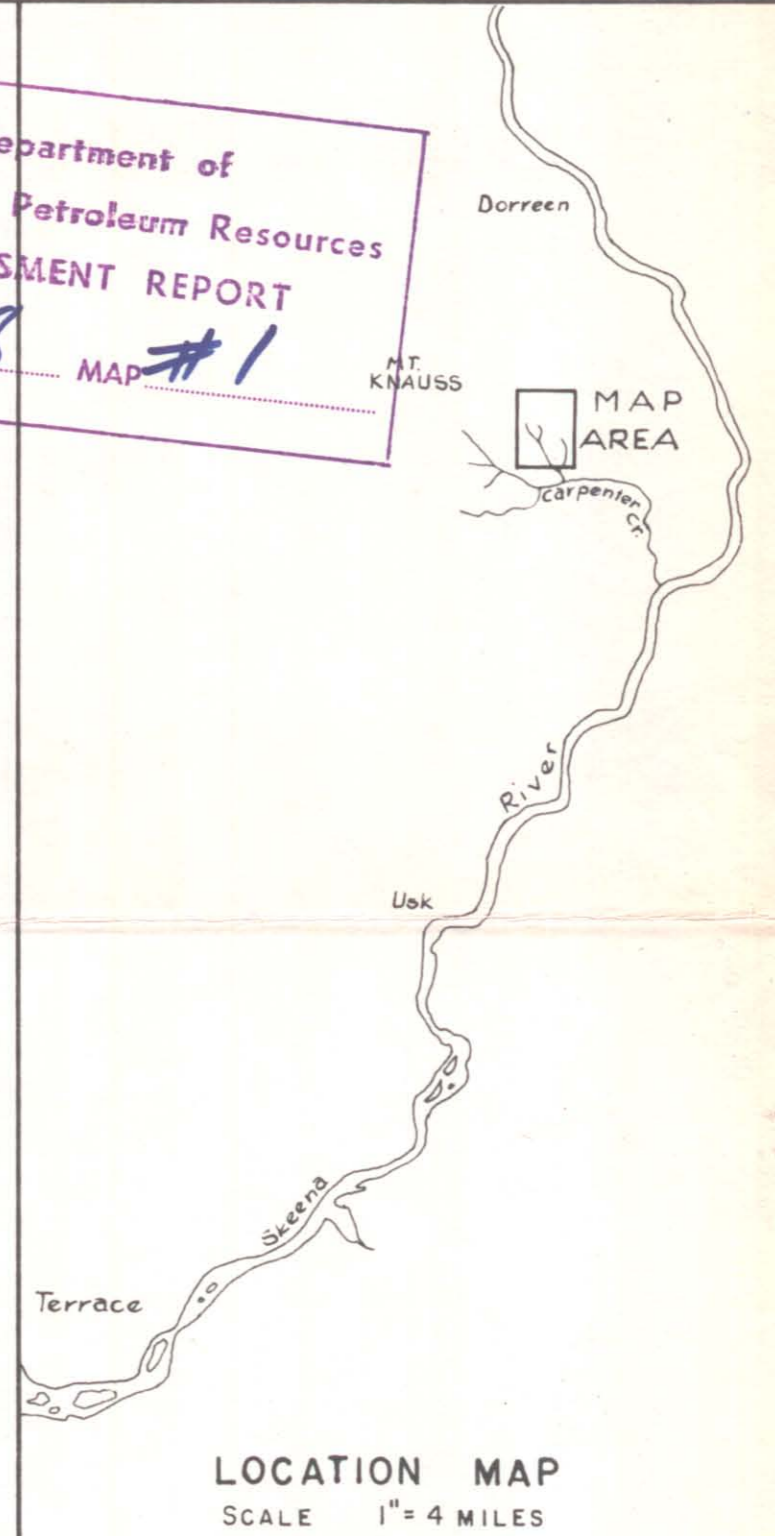
Number	Type						Location		Environment		Sample Description		Analytical Results				Remarks (Geology, Geomorph., Culture)
	Sample Code	No.	Rock	Soil	Water	Silt	Veg.	General	Sample Site	Terrain	Drainage	Texture	Colour	Mo	Cu		
1	UD	327	X			a b c							-	-			
2		328			X	a b c							35				
3		329			X	a b c							10				
4		330			X	a b c							4				
5						a b c											
6						a b c											
7						a b c											
8						a b c											
9						a b c											
10						a b c											
11						a b c											

General Remarks:

APPENDIX I

APPENDIX II

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. 798 MAP #1



LEGEND

- Granite.
- Granodiorite.
- Undifferentiated greywacke; metasedimentary and volcanic rocks.
- "Quartz porphyry".

SYMBOLS

- Fault or Shear Zone (defined, assumed).
- Geological contact (defined, assumed).
- Visible molybdenite.
- Claim location line.
- Claim boundary line.
- Claim post (position known, position estimated).
- Topographic contour.
- Stream.
- Soil sample site, sample number (p.p.m. Mo).
- Silt sample site, sample number (p.p.m. Mo).
- Water sample site, sample number (p.p.b. Mo).
- Rock chip sample site, sample number (p.p.m. Mo).

AMAX EXPLORATION INC  
KNAUSS MOUNTAIN PROPERTY  
SKEENA M.D. — B.C.

GEOLOGICAL AND GEOCHEMICAL MAP

**798** SCALE 1" = 500'

To accompany "REPORT ON KNAUSS MOUNTAIN PROPERTY" by D.J. Murphy, P.W. Richardson.  
*P.W. Richardson*  
Vancouver J.K.  
MAP I