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REPORT ON URANIUM POTENTIAL OF HORSETHIEF CREEK BATHOLITH, B. C.

by

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I INTRODUCTION

Radioactive minerals have been reported in streams draining Bugaboo and Horsethief Creek stocks by various authors since 1953. The most recent public report of the area, GSC paper 75-1C, describes uraninite and pyrochlore in black sand deposits in Horsethief and Forster Creeks.

A reconnaissance of the area was made in May, 1976 to locate the source of uraninite. Using the truck-mounted GAM-1- GSA 61 scintillometer, highly readioactive white sand was discovered. Additional prospecting was successful in identifying source rocks of these sands which are radioactive granite boulders. In order to quickly evaluate what portions of the stock (rather than intruded rocks) deserved further prospecting an airborne scintillometer survey was conducted. Several geochemical samples were also taken.

After this initial stage of field work, a detailed literature study was undertaken which showed that considerable prospecting had already been done, particularly by Johns-Manville.

A second trip was made to the area on June 1 but this was not conclusive due to malfunction of the helicopter.

II SUMMARY

Horsethief batholith is primarily a body of porphyritic biotite quartz monzonite with coarse euhedral K-spars up to 5 cm. long. The western 10% of the exposed portion of the intrusive is a very distinctive coarse grained granite with zoned K-spars and large

shiny black biotite "books". Precambrian Windermere and Upper Purcell metasediments form the host rocks.

Isotopic ages from the two granitic phases are 108 my and 205 my. There is no geological evidence to support this wide variation but there is no clear explanation of what these dates represent. Similar batholiths in the Purcells including Bugaboo and Fry Creek are thought to have been emplaced in lower Cretaceous. Subsequently thermal "events" have reset the isotope clocks.

Uraninite, pyrochlore, euxenite, allanite, fluorite, molybdenite and zircon have been identified in the common quartz monzonite porphyry. A cold acid leach was done on four anomalously high rock samples and it was found that about 50% of the uranium was extracted in 24 hours.

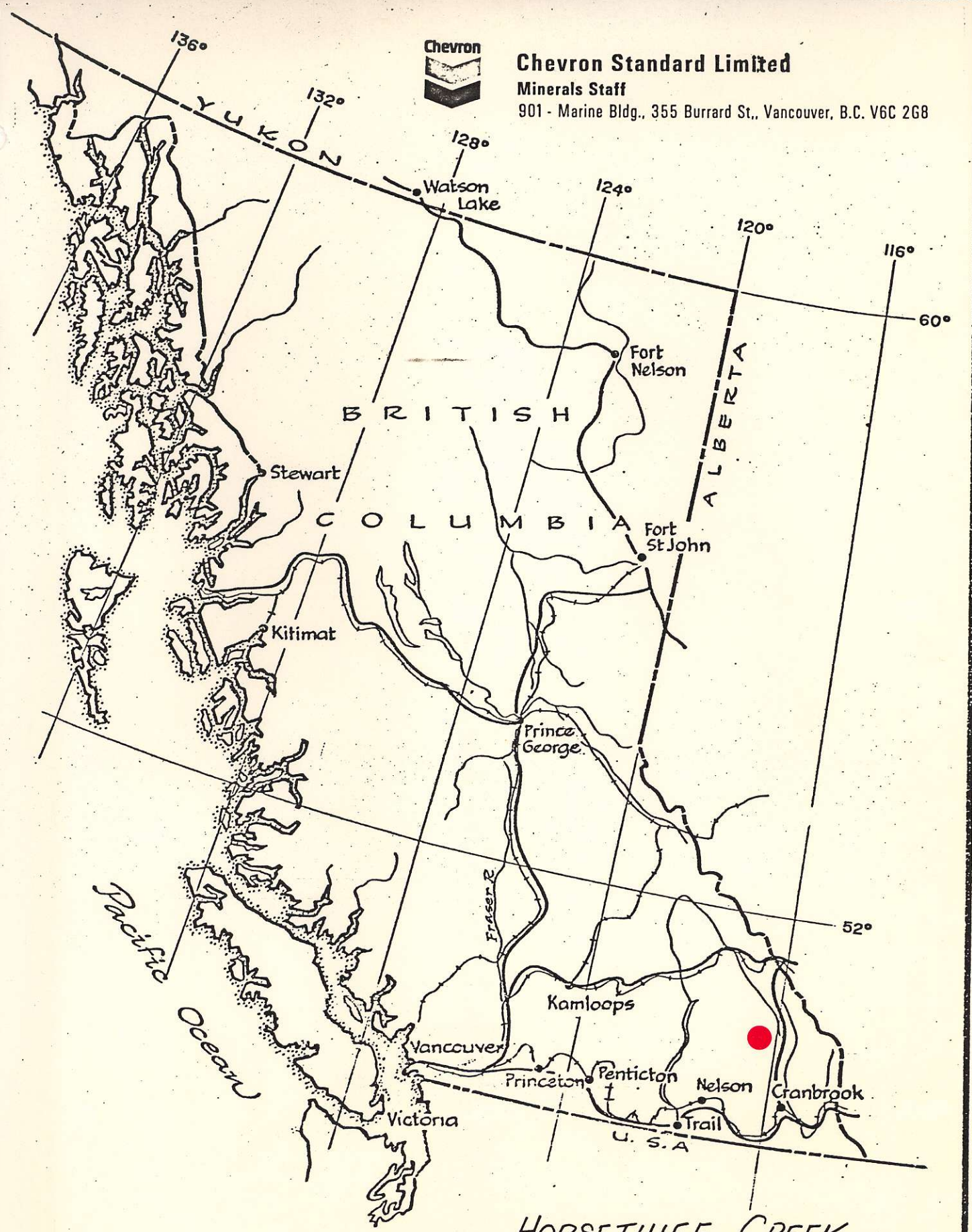
Samples of talus fines taken by Johns-Manville indicate several areas with uranium values in the 200 - 500 ppm range. A few values over 700 ppm have also been reported along with very high vanadium and rare earth concentrations.

An analogy is drawn to the initial stages of exploration for porphyry copper deposits in B.C. which indicates the potential of Horsethief Batholith.

III CONCLUSIONS

The batholith contains an unusually high "background" of radioactive minerals. A literature survey and limited airborne scintillometry has shown that high concentrations of these minerals occur in several areas within the 60 square mile surface exposure of the intrusive. Prospecting has been done primarily by one company and has been entirely surface oriented to date.

Chevron Standard Limited
Minerals Staff
901 - Marine Bldg., 355 Burrard St,, Vancouver, B.C. V6C 2G8



HORSETHIEF CREEK

BRITISH COLUMBIA

100 0 100 200
MILES

C-445

FIG 1.

The above three facts suggest that Horsethief batholith is an excellent place to explore for "porphyry" type uranium mineralization. The environment here is not similar to Rossing, the only large, low grade hard rock mine at present but this is not considered a disadvantage.

IV RECOMMENDATIONS

Acquire as much ground as possible in areas that have higher than average scintillometer values as well as good geochemical values. A detailed exploration program including deep trenching or "pack sack" drilling could then be designed. An early stage of work should be simple metallurgical tests on fresh rock from the trenches. Cost of this project is dependant on the area staked but approximately $50,000 would be necessary for the first year's work.

V LOCATION AND ACCESS

Horsethief batholith is situated approximately 20 miles due west of Radium, B.C. Logging roads up Forster Creek and Horsethief Creek give access to the north and south portions, respectively, of the intrusive but there is no road access to the central portion.

Topography is extremely rough with relief of the order 6000'. Two large permanent glaciers cover about 30% of the intrusive in the central part. Snowfall is moderate to heavy and snowcover would persist through June over substantial areas.

VI HISTORY OF EXPLORATION

Johns-Manville were attracted to the area in 1969 by reports of detrital uraninite in Horsethief Creek black sands. Initial discoveries of rare earth, uranium, molybdenum and copper inspired

the company to undertake geological mapping and prospecting of the entire batholith. Silt geochemistry, prospecting and mapping were successful in locating additional showings through 1972. In 1973 rock flour was collected along contour lines in areas where showings existed primarily in an attempt to define Mo targets. One area was noted with above average uranium potential and this was restaked in 1975. No competitor activity was noted during the two visits made in 1976 but no doubt some work on the claims was done at some stage this year.

An orientation survey of stream silt geochemistry was to have been published by the GSC in early summer 1976 but was cancelled 1 week before the announced date with no explanation.

VII CLAIMS

An attached map (Fig.2) shows the most recent claim status. Johns-Manville holds 40 claims and units in a high uranium background area. In addition they hold claims on the north rim with copper potential.

Union Carbide owns the Zen claims at the west margin for their tungsten potential.

Moderate staking along the south rim was done for Cu-Mo potential.

One placer lease on Forster Creek is held for uranium.

VIII GEOLOGY

A brief summary of geology was given previously. Unfortunately, Johns-Manville have not published their geological report but some indication of their work was obtained from assessment reports.

An enclosed map (Fig.3) shows 4 phases of granite as defined by K. Schryver in 1971. The basis for subdivision of these rocks

is unknown but a strong concentric zoning is apparent. In general, the central portion is medium-coarse white granodiorite which grades out to coarse grained porphyritic pink quartz monzonite. These observations are not entirely consistent with those of Reesor (1973) but no doubt he had less opportunity to study the intrusives than did Schryver.

Contacts with the Precambrian metasediments are high grade hornfels containing cordierite and staurolite.

IX GEOCHEMISTRY

The enclosed map, Fig. 4, shows location of silt and rock chip samples taken on the initial prospecting trip.

Background values for uranium are about 8 ppm and 19 ppm in the -80 and -200 mesh respectively. All of the anomalous values in the -200 mesh are anomalous in the -80 fraction. Thus, at first glance, it appears the -80 mesh fraction is suitable for further work in the area. On the other hand, several background values in -80 mesh fraction were brought to threshold in -200 fraction. Importance of these second order anomalies is unknown but the fine fraction analysis seems to give a broader spectrum of values from which follow up targets can be more easily identified.

Two samples were strongly anomalous in uranium and these are colored red in Fig. 4.

Tungsten values in silt were generally very high with several values in the 30 to 60 ppm range. No bias in values depending on grain size was observed with the exception that all non

detectable values in -80 mesh gave background, or better, in -200 mesh. The highest value of 60 ppm was in the -80 fraction while the -200 fraction for this sample gave only 10 ppm.

One silt sample was anomalous in Mo - this is marked in red on Fig. 4.

In view of the complicated mineralogy, an attempt was made to determine how much uranium could be removed from rock samples by leaching. The following table shows results of room temperature leaching in 50% H_2SO_4 for 24 hours. There was total immersion but no agitation.

	Sample	U ppm Total Extraction	U ppm Cold Leach Liquor	% Extractable U
S-18/5/76	12A	68	38	56%
	12B	82	20	25%
	12C	42	31	75%
	12D	61	24	40%

On average, 50% of the uranium was recovered in the leach liquor.

X GEOPHYSICS

Figure 4 shows the survey path and fiducial points. Survey charts are stored in the C-445 project file. Areas of anomalous radioactivity are shaded yellow.

Average background readings from the air over large clean outcrops

were about 2500 - 3500 cps. The anomalous areas are numbered and discussed in order of importance.

1. Stockdale Creek - center

Several peaks between 6000 and 7000 cps. were obtained. Rock samples from talus below the cliffs contained minor MoS_2 and moderately anomalous rock samples. These were analyzed geochemically and gave the following results.

Sample #	Description	cps (spp2)	U (ppm)
12a	Float hornfels with abundant biotite	700	68
12b	Float fine grained granite	1500	82
12c	Float deeply weathered coarse granite with MoS_2	500	42
12d	Outcrop medium grained granite	700	61

Approximately three hours were spent prospecting the talus slopes but no time on the cliffs. Rock climbing equipment would be necessary to ensure safety.

2. Horsethief Creek

The north slope of this creek for 3 miles south of the confluence with Stockdale Creek is very strongly radioactive. The area shaded in yellow is above the average background and shows some peaks over 6000 cps.

More detailed scintillometry is necessary to define prospecting targets.

3. Mt. Sally Serena

A small peak here of 4800 cps. is interesting because of Johns-Manville geochemical work 2000' NE. Four samples of rock flour gave 86, 210, 430 and 515 ppm U.

More detailed scintillometry and prospecting is required.

4. Stockdale Creek - Mouth

Peaks of 4700 and 4800 cps. were recorded on two flight lines. These are distinctive, narrow, but more than 1000 cps. above the background values. Prospecting is required here.

5. Forster Creek

Background counts are much lower in this area compared to Horsethief Creek and Stockdale Creek. However, two zones have substantial peaks above this background. Counts between 3500 and 4400 cps. were recorded.

The W end of the area north of Forster Creek has a geochemical anomaly of 98 ppm. in a silt sample. More detailed geochamistry and prospecting is required.

XI ANALOGY TO PORPHYRY COPPER IN B.C.

Large low grade copper deposits in B.C. were developed and put into production in the face of considerable skepticism. Average grades of the order 0.5% Cu were not considered "economic" largely because such deposits had never been mined in B.C. prior to Bethlehem.

Only one large low grade hard rock uranium deposit, in the world, is presently nearing production and none are in full production. When considering this type of operation for B.C., there are no comparisons thus a "pre Bethlehem" situation exists.

From first principles a deposit of 200,000,000 tons grading 150 ppm (0.3 lbs/ton) recoverable U_3O_8 should be economic in B.C. provided operation at the rate of 25,000 T.P.D. could be established. In a general way this deposit would be equivalent to a similar size body of copper ore grading 1% Cu (recoverable). assuming $30.00 U_3O_8 and 75¢ Cu. The high cost of smelting copper reduces the NSR value of the copper to about 45¢.

The Horsethief Creek batholith has potential for discovery of large tonnage low grade uranium deposit in a way that the Guichon had potential for copper mineralization in the late 1950's. Several companies had explored there for copper and terminated work when no mineralization similar to operating mines was discovered.

I believe a little pioneering is necessary before uranium potential at Horsethief can be written off.

J.W. Simpson

J.W. Simpson

XII References

1) Reesor, J.E.: "Lardeau map-area E ½", GSC mem. 369, 1973.

2) B.C. Dept. of Mines, Assessment reports: # 3222, 3305, 3390, 3391, 3754, 3755, 3806, 4240, 4485, 4559, 4613, 4614

3) Ballantyne, S.B. and Bottriell, K.: "Geochemical Orientation Surveys for Uranium in S.E. B.C." GSC paper 75-1C, pp. 311-312

4) Geology, Exploration and Mining
1970 p. 469
1971 p. 426
1972 p. 73
1972 p. 92

NON-HYDROCARBON MINERALS
WORK PROJECT FORM CORP-966

PROJECT NO. C-455
Company Geographical Numerical Sequence

DATE: January 27, 1977

TITLE: Horsethief Project

Chevron
OPERATING COMPANY

NEW PROJECT ☐

EXPENDITURES BY QUARTERS

	1st	2nd	3rd	4th	Total
Year 1977		5	15	5	25
Year 197__					

EST. COSTS $ 25,000

APPROVED BY

DESCRIPTION:
Uranium in granite stock

GEOGRAPHICAL AREA:

Canada	B. C.	Invermere Area	
COUNTRY	STATE OR PROVINCE	REGION	COUNTY

CLASSIFICATION:

PRODUCT	EXPENSE TYPE PROJECT	CAPITAL TYPE PROJECT
	REGIONAL ☐	GENERAL AREA ☐
	GENERAL KNOWLEDGE ☐	AREA OF INTEREST ☒

PLETE THIS PART OF FORM IF PROJECT IS TO BE CLOSED OR SUB-DIVIDED INTO AREAS OF INTEREST

DATE PROJECT WAS COMPLETED: _____

RESULTS OF PROJECT:

in house	25,000
out house	25,000
	$50,000

DISPOSITION OF COSTS:

☐ EXPENSE - PROJECT--DID NOT OR WILL NOT LEAD TO ACQUISITION OF PROPERTIES

☐ SUB-DIVIDE INTO NEW PROJECTS (FURNISH LIST OF NEW PROJECTS BELOW)

☐ DEFER UNTIL ACREAGE IS ACQUIRED (SUBMIT ANOTHER FORM AND FURNISH DISPOSITION OF COSTS WHEN ACREAGE IS ACQUIRED)

☐ CAPITALIZE TO PROPERTIES (FURNISH LIST OF PROPERTIES AND ACREAGE BELOW)

CORP-966 (5C-CD-4-71)
Printed in U.S.A.

SUMMARY OF HORSETHIEF

PROJECT (C-455) - 1977

I LOCATION

The area of interest is situated 25 miles W of Radium in SE B. C.

II CONCEPT OF EXPLORATION

Uranium mineralization was reported in silts from streams draining the Horsethief Stock area. Based on genetic theories this mineralization could be related to the contacts between the granite and PreCambrian sediments which are cut by the stock. Primary mineralization could occur in the granites or uranium, remobilized during intrusive from PreCambrian deposition sites, might be reprecipitated at the intrusive margins.

III HISTORY OF WORK

Geochemical and radiometric surveys were undertaken in spring 1976. Strong anomalies were defined. This led to a detailed literature study including examination of assessment files in Victoria. Two claim groups were staked in December 1976 just prior to a government geochemical open file release.

IV PLANNED WORK

Anomalies, other than those now held, will be prospected early in the year to ensure that the best areas have been staked. Detailed follow-up on the claim groups will then be undertaken. Knowledge of uranium mineralogy, location of these minerals in the host rock, amenability to leaching and of course size and grade is sought in 1977. Locations for diamond drill holes will be determined.

V BUDGET ESTIMATE - $50,000

(Detail attached)

VI 1976 REPORT - enclosed

J.W. Simpson

J. W. SIMPSON
January, 1977

HORSETHIEF - C-445

1977 BUDGET ESTIMATE

PROGRAM

I	Recc. of Airborne Targets		
	Stockdale Creek fly camps (helicopter)	(1 (A), W½ 1(B))	3 days
		(4, E½ 1(B))	3 "
	Horsethief fly camp (truck plus bridge)	(2)	3 "
	Forster Creek fly camp (truck)	(5)	4 "
	moving, organization		4 "
			17 days
II	Serena claims - airphoto helicopter support scint., rock geochem., mapping, blasting		7 "
III	Star claims - truck support (as above) 2 man crew plus 2 drillers for 2 weeks		21 "
	Mob. and demob. of main camp		5 "
			50 days

COSTS

MANPOWER

2 man crew 2 months @ 2500/mo.	5,000.00
Simpson - 3 months @ 2500/mo.	7,500.00

TRANSPORTATION

- 1 4 x 4 3/4 T. P/U with canopy - winch for 2 months including fuel	1,600.00
- helicopter - 31 hrs. includes 16 hrs. @ 200.00 15 hrs. @ 350.00	7,500.00

ROOM AND BOARD

- motels and meals for 15 days (crew plus Simpson) @ 100.00/day	1,500.00
- misc. supervision expenses	1,500.00
- camp supplies for 35 days @ 45.00/day (food, fuel, consumables)	1,600.00
- camp equipment	1,500.00

ANALYTICAL

400 geochem. rock samples @ 4.00 50 assays @ 10.00	2,000.00

ROCK SAMPLING (Drilling, Blastings)

2 men for 2 weeks plus supplies @ 200.00/day		
plus drill bits	300.00	
cobra rental	500.00	
blasting supplies	200.00	3,800.00

COSTS (Cont'd)

METALLURGICAL	
20 samples - controlled leach tests 3 grinds, 2 temperatures 3 times	2,000.00
STAKING	
40 claims @ 125.00 (tie on)	5,000.00
OFFICE WORK	
maps, reports, preparation permits to blast	3,000.00
BASE MAP	3,000.00
	46,500.00
CONTINGENCIES	
possible additional staking, outside recce. work on Bugaboo Stock, minor regional work to NW	3,500.00
	$50,000.00

J.W. SIMPSON
January 26, 1977

M82K/10E

TO NORTH SEE MAP 82K/15E

TO NORTH SEE MAP 82K/16W

TO WEST SEE MAP 82K/10W

TO EAST SEE MAP 82K/9E

TO SOUTH SEE MAP 82K/7E

TO SOUTH SEE MAP 82K/8W

GOLDEN MINING DIVISION

DEPARTMENT OF MINES AND PETROLEUM RESOURCES

VICTORIA, B.C.

DEPARTMENT OF MINES AND PETROLEUM RESOURCES

DATE OF MICROFILM MAY 5 '77

82K

HORSETHIEF CREEK

PROJECT C445

FIG 2

CHEVRON STANDARD LIMITED

CLAIM MAP

SCALE

1 2 miles

0 1000 2000 3000 metres

STAR CLAIM DEC 20 1976

SERENA CLAIM DEC 12 1976

TO SOUTH SEE MAP 82K/8W

TO SOUTH SEE MAP 82K/7E

116°30' 116°30'

GOLDEN MINING DIVISION

PURCELL
MOUNTAINS
PURCELL
MOUNTAINS
STARBIRD RIDGE
STEAMBOAT MOUNTAIN
COLUMBIA
RIVER
ROCKY MOUNTAINS
KOOTENAY
NATIONAL
PARK
HORSETHIEF
CREEK
SHUSWAP
Radiometric fiducial point
Silt sample
Anomalous radioactivity
Anomalous silt (uranium)
inches
centimetres
BRITISH COLUMBIA GEOLOGICAL SURVEY
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.
FIG. 4
CHEVRON STANDARD LIMITED
HORSETHIEF CREEK
RADIOMETRIC-GEOCHEM. SURVEY
PURCELL PROJECT C445
SCALE 1:50,000
2 miles
To accompany report Nov, 1976