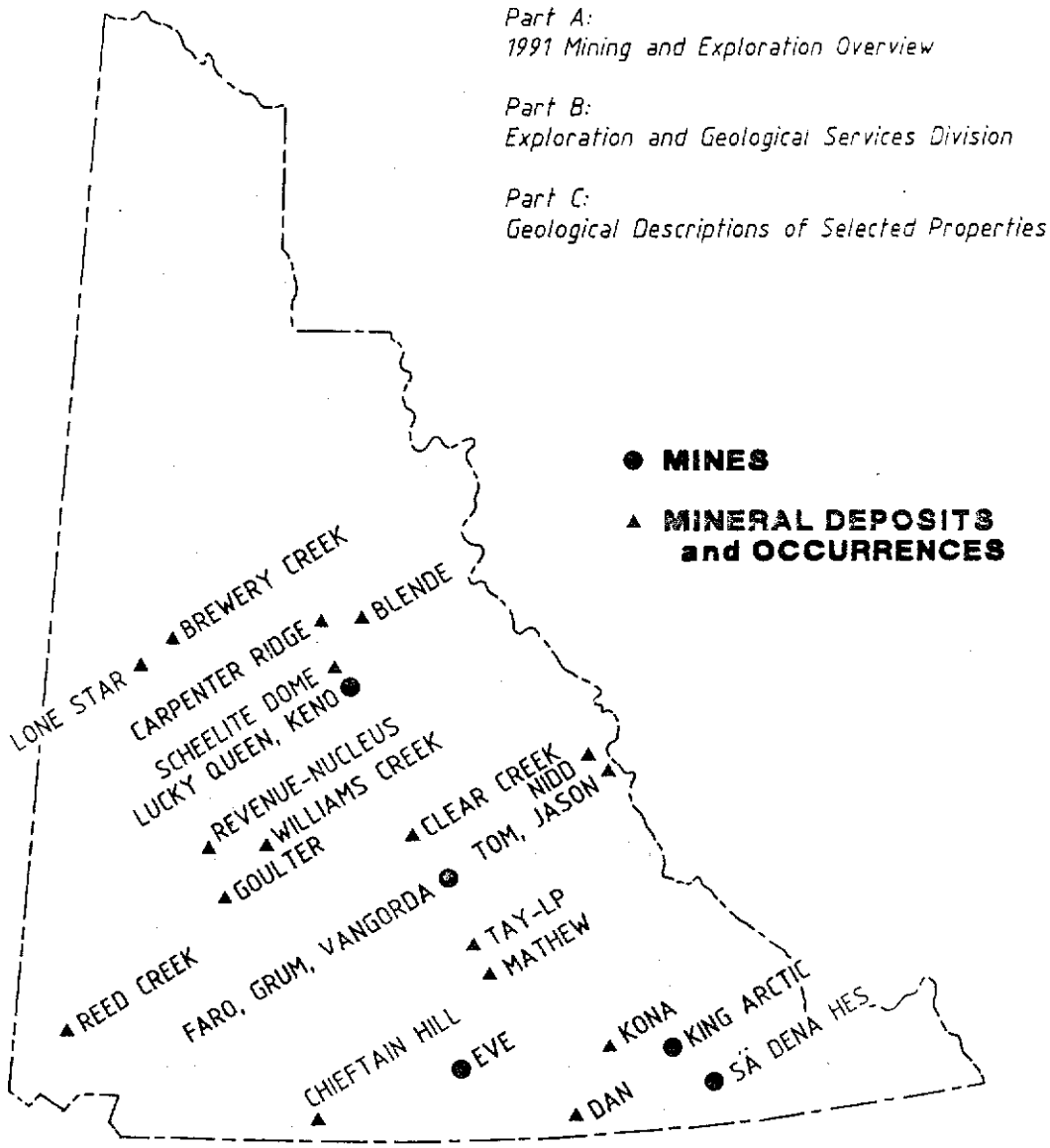
Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

Exploration and Geological Services Division, Yukon Region

YUKON EXPLORATION 1991



Canada

TABLE OF CONTENTS

Exploration and Geological Services Division
Mineral Resources Directorate
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Yukon, Indian and Northern Affairs Canada.

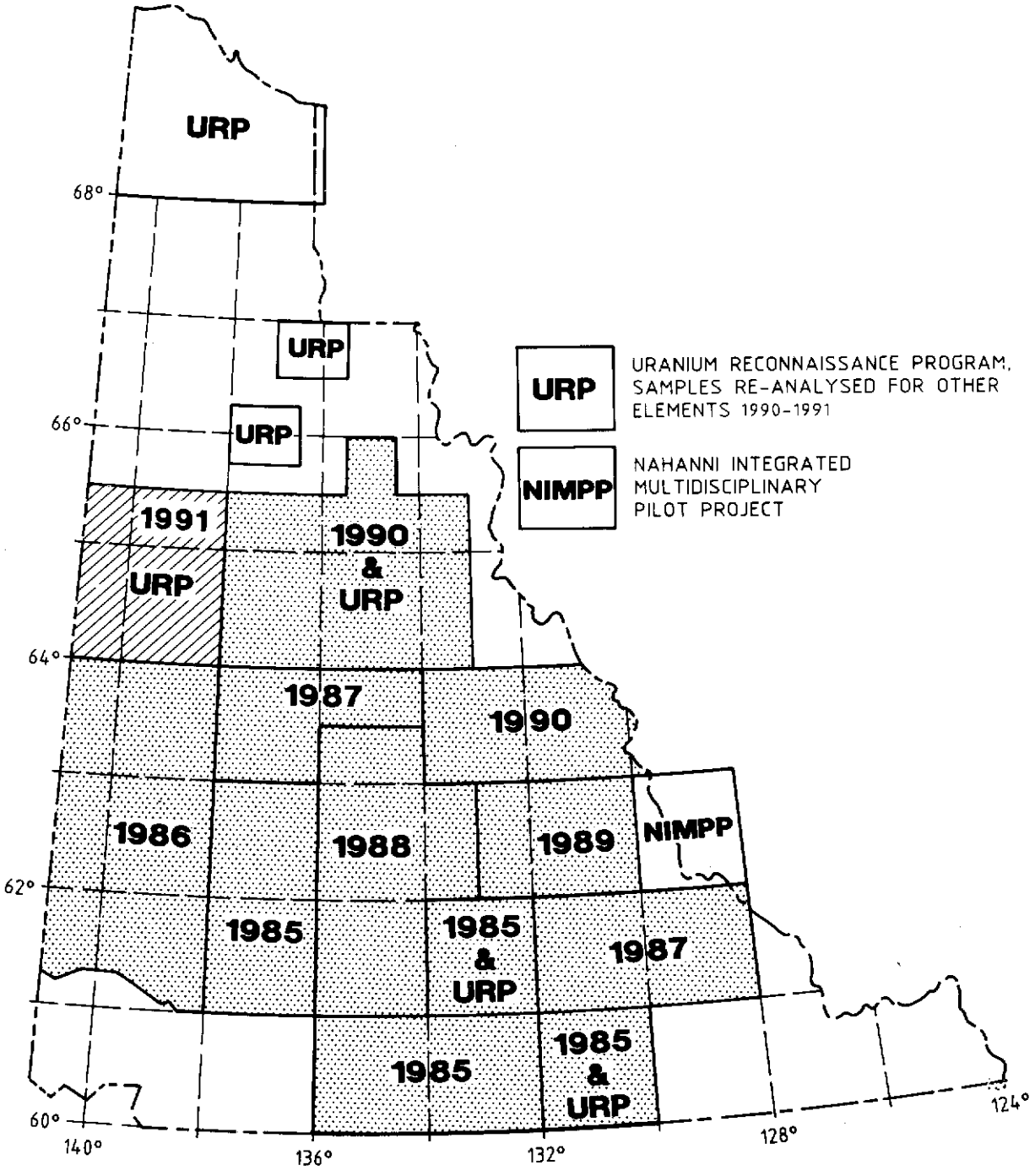
PREFACE

The familiar 'Yukon Exploration' (YEX) series, which began in 1981, was significantly revised in 1990 as a result of the purchase of the Northern Cordillera Mineral Inventory from Archer, Cathro and Associates (1981) Limited. The inventory was purchased by Exploration and Geological Services Division (EGSD) through the Canada-Yukon Economic Development Program. Previous Yukon Exploration volumes included a comprehensive overview of mining, development and exploration in the Yukon and detailed listings of current exploration projects based on assessment reports and property visits by staff geologists. The detailed listings and assessment report summaries are now incorporated into the Yukon Minfile which is available for purchase through EGSD as a complete 1500 page, 38 map set or by individual 1:250 000 scale NTS map sheets. Yukon Minfile is updated annually. Updates will be available in late spring.

The new Yukon Exploration series includes three parts: Part A is a comprehensive overview of mining and exploration activity; Part B summarizes activities of Exploration and Geological Services Division; and Part C documents significant new or previously unpublished information based on property visits by EGSD staff and affiliated geoscientists. Much of the information contained in this volume and in the YUKON MINFILE comes from prospectors, industry geologists and mining companies who are willing to share information for the collective benefit of the mining industry. This assistance is gratefully acknowledged and always appreciated.

S.R. Morison
Chief Geologist
Exploration and Geological Services Division
Northern Affairs Program
Yukon Region

CANADA – YUKON ECONOMIC DEVELOPMENT AGREEMENT AND OTHERS



1991 YUKON MINING AND EXPLORATION

Exploration expenditures rose slightly in 1991 to about $16 million. This represents a slight increase over last year's expenditure of $12 million, the worst year in the last twenty. Figure 1 illustrates exploration expenditures converted to 1991 dollars, using Department of Finance change in consumer price index figures published in 1991. The graph illustrates the decline in the value of the exploration dollar when inflation is taken into account. It also shows the strong exploration history the Yukon enjoyed during the 1970's as copper porphyry and sedex targets were actively sought. The peak in 1988 represents the end of the flow through share program, a time of active gold exploration. A number of today's advanced programs are focused on targets discovered during these earlier years of substantial expenditures.

Projects by seven major corporations accounted for 75% of this year's total expenditure. With the exception of Brewery Creek, a gold property in the Dawson area, these projects involved extensive diamond drilling on advanced base metal properties. There were about 60 individual projects in 1991, about the same number as the previous year.

Quartz claims in good standing to the end of December, 1991 totalled 42,268, a drop of 2,972 from last year. A total of 4,767 new quartz claims were staked in 1991, down 1,356 from last year's total of 6,123. Significant changes to Yukon mineral claim records include the lapsing of over 800 claims in the Whitehorse Mining District in October and a flurry of staking activity in the Mayo Mining District during the late summer.

1991 EXPLORATION PROJECTS
YUKON

COMPANY	PROJECT	MINING DISTRICT	MINFILE NUMBER	WORK TYPE	COMMODITY
Azimuth Geol.	GREW CR	Whitehorse	105F	T	Au
Anooraq Res.	EVE	Whitehorse	105C 017	T	rhodonite
Arbor Resources	DAWSON	Dawson	115N & O	T,GP,GC	Au
Aurchem Exp.	GOULTER	Whitehorse	115I 093	GP	Au,Ag
Aurora Gold	BEST CHANCE	Whitehorse	105D 053	GP	Cu
Big Creek Res.	CARPENTER	Mayo	106D 042	DD	Pb,Zn,Ag
Big Creek Res.	NUCLEUS REVENUE	Whitehorse	115I 107 115I 042	DD	Au,Cu
Cominco Res.	TOM	Watson Lake	105O 001	DD	Zn,Pb,Ag
Cominco Res.	NIDD VARIOUS	Mayo ----------	105O 024 ----------	DD,PE GC,R	Zn,Pb,Ag var
Curragh Res.	VARIOUS	----------	----------	PE	Various
Falconbridge Ltd NDU Res. Pak-Man/2001	NICK	Mayo	106D 092	G,T	Ni,Zn
Falconbridge Ltd NDU Res.	FALCON JET	Watson Lake Mayo	105I (12) 105O (3)	G,GC	Ni,Zn
First Yukon Silver	BAR	Watson Lake	105B 027	T,G	Zn
Gagan Gold	GOLDSTAR	Whitehorse	115I 053	DD	Au,Ag

1991 EXPLORATION PROJECTS
YUKON

COMPANY	PROJECT	MINING DISTRICT	MINFILE NUMBER	WORK TYPE	COMMODITY
Granges Inc.	MATTHEW			T,G,GC,GP	Au,Pb,Zn
H-6000 Amax	DUBLIN GULCH	Mayo	106D 021-029	G,DD,GC,T	Au
NDU Res. Billiton	BLENDE	Mayo	106D 064	DD	Pb,Zn,Ag
Noranda Exp. Loki Gold	BREWERY CR.	Dawson	116B 160	G,GC,DD, PD,T	Au
Noranda Exp.	VARIOUS	----------	---------	T,DD,G,GC GP	Various
Pacific Comox	TAY-LP	Watson Lake	105F 121	GP,PD	Au
Phelps Dodge	JASON	Mayo	105O 019	DD	Pb,Zn
Phelps Dodge	VARIOUS	----------	---------	R	Pb,Zn
Placer Dome	KONA (FYRE)	Watson Lake	105G 034	AG,GP,G, GC	Zn,Ag,Au,Cu
Placer Dome	LORRIE	Dawson 116A 021	116A 012, 013	G,GC,GP	Au
Placer Dome	VARIOUS	----------	---------	G	VARIOUS
Pulse Resources	BARB	Watson Lake	105H 021	DD	Pb,Zn,Ag
Reed Cr. Mining	TREMBLAY	Whitehorse	115G 102	T,GC	Au
Rinsey Mines & Yukon Spirit	STODDART	Whitehorse	115I 121	T	Au
Rinsey Mines & Yukon Spirit	LILYPAD	Whitehorse	115I 034	T	Ag
Total Energold Mitsui	CLEAR LAKE	Whitehorse	105L 045	DD,GC,GP	Zn,Pb,Ag
Various Econ Development	VARIOUS	----------	----------	Various	Various
Western Copper Thermal Exp.	WILLIAMS CR	Whitehorse	115I 008	T,PD	Cu,Au
Wheaton River Resources	CHIEFTAIN HILL	Whitehorse	105D 053	DD	Au
YGC Resources	VARIOUS	----------	----------	T,GC	Various

T Trenching; DD Diamond Drilling; PD Percussion Drilling; G Geology GC Geochemistry; GP Geophysics; AG Airborne Geophysics; R Reconnaissance; PE Property Evaluation

OPERATING MINES

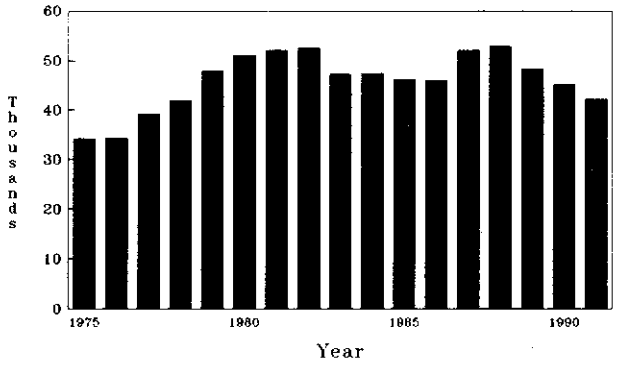
In July, 1991, 80:20 joint venture partners Curragh Resources Inc. and Hillsborough Resources Ltd began underground mining of the **SÄ DENA HES** (Mt. Hundere, MINFILE # 105A 13) deposit, two months ahead of schedule. This is a high grade Zn/Pb/Ag skarn/replacement deposit in Lower Cambrian limestone, near Watson Lake. Initial milling capacity is 1,500 tonnes per day but this can be increased to 2,500 tonnes per day. The mine will produce 120,000 to 150,000 tonnes of zinc and lead concentrates per year. The mine has a projected life of nine years with current reserves of 4.9 million tonnes grading 4% lead, 12.7% zinc and 59.9 grams silver per tonne.

Curragh also continued production from the **VANGORDA** open pit and **FARO** (MINFILE # 105K 61) underground operations in the Anvil District. As soon as funding is in place, stripping of the **GRUM** deposit should commence, ensuring many more years of production. Total production from the Vangorda and Faro deposits in 1991 totalled 95,876,497 kg of lead and 142,113,820 kg of zinc from 3,232,118 tonnes mined. These operations represent the only hardrock metal mines in operation in the territory in 1991.

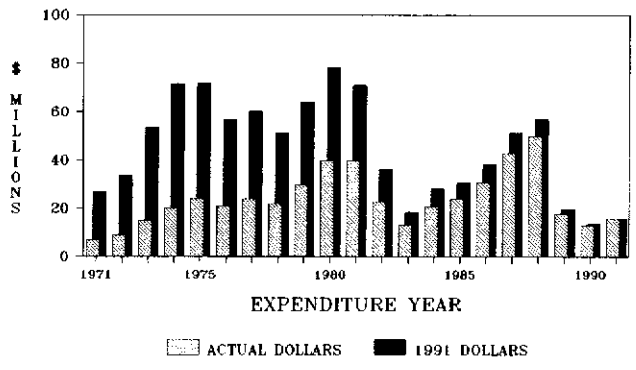
The **KING ARCTIC JADE** (Minfile #105H 16) property continued to produce jade for southern and overseas markets. The property is located in the Frances Lake area north of Watson Lake. Exploration for the resource continues on a seasonal basis.

Another producer of carving stone was Anooraq Resources Ltd, producing rhodonite from the **MARLIN** (MINFILE # 105C 17) property located at the head of Evelynn Creek, south of Quiet Lake. Anooraq produced 40 tonnes of medium to high quality, dark pink to raspberry- coloured, gem quality material. The deposit is lenticular in shape and is hosted in quartzite and black siltstone of the Big Salmon Metamorphic Complex. It is believed be a stratabound deposit, formed by metamorphism of manganese-rich chert.

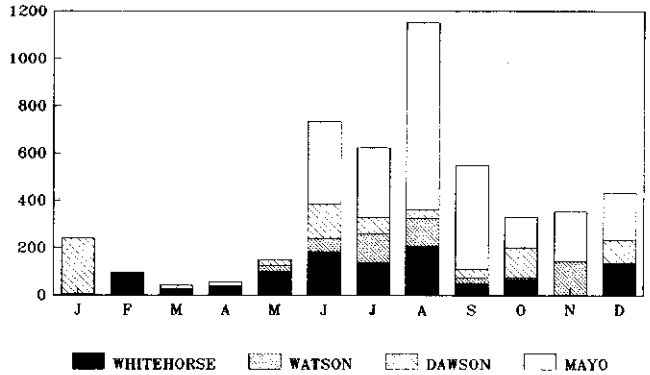
CLAIMS IN GOOD STANDING
QUARTZ 1975 – 1991



EXPLORATION EXPENDITURES
1971–1991



CLAIMS STAKED
QUARTZ 1991

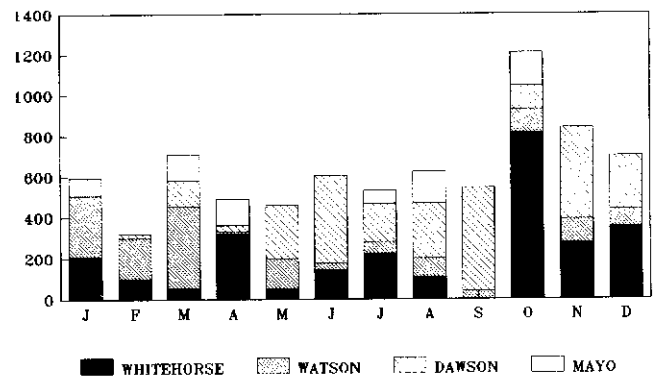


DEVELOPMENT &EXPLORATION

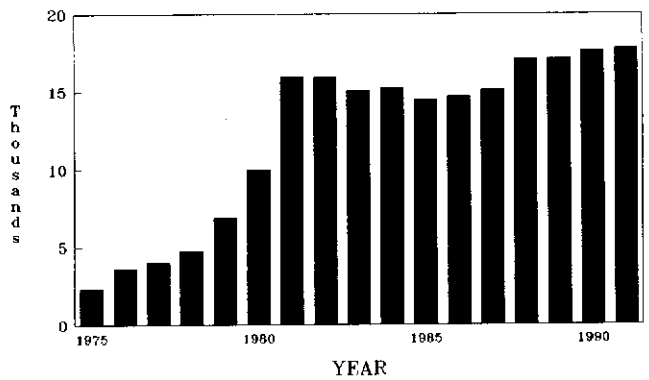
ADVANCED DEVELOPMENT

Western Copper Holdings and Thermal Exploration Company increased both grade and tonnage of the **WILLIAMS CREEK** (MINFILE # 115I 10) oxide copper gold deposit northwest of Carmacks with a 55 hole, 3,890 meter diamond drill program. The tabular deposit is oxidized to a depth of 240 meters along its 395 meter strike length. New reserves in the main zone, the largest of 13 zones on the property, are 13 million tonnes grading 1.06% Cu, of which 85% are in the oxide category. Baseline environmental studies are in progress, and a pre-feasibility study is expected to begin shortly. The open pit operation would use a heap leach/solvent extraction process followed by electrowinning to produce 90 kilogram copper ingots.

CLAIMS LAPSED
QUARTZ 1991



CLAIMS IN GOOD STANDING
PLACER 1975 – 1991



Wheaton River Minerals could begin production on its wholly owned **MOUNT SKUKUM** (MINFILE # 105D 158) gold project in the Wheaton River area, 56 kilometres south of Whitehorse, as early as September, 1992. The property includes the recently acquired Skukum Creek deposit, purchased from Omni Resources Inc., and the adjacent Mount Skukum mine purchased from Total Energold Corp. Proven, probable and possible reserves are 522,627 tonnes grading 10.53 g/t Au and 273.94 g/t Ag in three zones. In 1991, three drill holes were completed, totalling 1,050 metres.

PLACER MINING SUMMARY

The number of operating placer mines remained about the same as last year. Total production to the end of December was 111,970 crude ounces. This figure represents a decline of 15% from last year. The decrease is partly attributable to depletion of reserves in traditional placer mining districts. Placer claims in good standing showed an increase over last year (Lower Chart).

BASE METAL EXPLORATION

The largest of the diamond drilling programs in the territory this year was funded by Billiton Metals Canada on NDU Resource's **BLENDE** (MINFILE # 106D 64) zinc-lead-silver deposit property northeast of Mayo. The project involved geochemical and geophysical surveys, and diamond drilling over a 3.3 km strike length. Most of the mineralization is structurally controlled, forming tabular stockwork and breccia zones in Middle Proterozoic Gillespie Group dolomite, along the southern margin of the Mackenzie Platform. It has a lead isotopic age of approximately 1.54 Ga and is believed to be of the Mississippi Valley type. Drilling in 1991 totalled 11 525 m in 62 holes, including 15 holes in the west zone, 34 holes in the east zone and 13 holes in the centre, between the east and west zones. It was found that the east and west zones are separate. Drilling determined that the west zone mineralization is regular and extends more than 400 m downdip, while the east zone mineralization, which is confined to the base of the Gillespie Group, is more irregular, but extends at least 200 m downdip. The 1991 work significantly increased last year's reserves, to approximately 19.4 million tonnes grading 2.81% Pb, 3.04% Zn and 55.88 grams Ag per tonne. These reserves are accessible by open pit mining, with a stripping ratio of 2.1:1.

Total Energold Corp. and Mitsui Kinzoku Resources of Canada Ltd explored the **CLEAR LAKE** (MINFILE # 105L 45) shale-hosted Pb-Zn deposit located 80 kilometres northwest of Faro. The property was extensively explored with geophysics, geochemistry and diamond drilling. The deposit is hosted by carbonaceous argillite of the Devono-Mississippian Earn Group, bounded on the east by the Tintina Fault and to the west by

Mid-Devonian Askin Group shallow water clastic and carbonate rocks. Claims were first staked in the area in 1965 following the discovery of the Vangorda deposit to the southeast. A gravity anomaly with coincident magnetometer and EM anomalies was drilled in 1978 resulting in the first significant mineralized drill intersection. Sporadic drilling since then has outlined approximately 30 million tonnes of massive sulphides, mostly pyrite, including 5.53 million tonnes grading 11.34% Zn, 1.99% Pb and 40.8 g/t Ag. More recent work has determined that the 1,000 metre long by up to 120 metre wide sigmoidal shaped sulphide body is folded, faulted and overturned. Evidence of exhalative activity includes silicified hanging wall and footwall rocks, pyritized worm tubes, and a separate tuff and barite horizon in the stratigraphic footwall.

Exploration in 1991 consisted of gravity, IP and magnetometer surveys, followed by 19 diamond drillholes totalling 4,500 meters. Results of the program have not yet been released.

Since optioning the **TOM** (MINFILE # 105O 01) deposit from Hudson Bay Mining and Smelting in 1988, Cominco Ltd has conducted extensive mapping and diamond drill programs designed to test the depth extensions of the West and Southeast zones. Three zones, Tom East, Tom West and Tom Southeast, have so far been delineated on the property. The stratiform lead-zinc deposits consist of galena, sphalerite and barite in fine-grained black clastic rocks of the Mid Devonian to Mississippian Portrait Lake Formation, which developed in a sub basin within Earn Group rocks of the Selwyn Basin. Published mineable reserves for the Tom East and West zones are 9 283 700 tonnes grading 69.4 g/t Ag, 7.5% Pb and 6.2% Zn. In 1991, Cominco drilled eight holes on peripheral geochemical and geological targets, for a total of 2,883 metres.

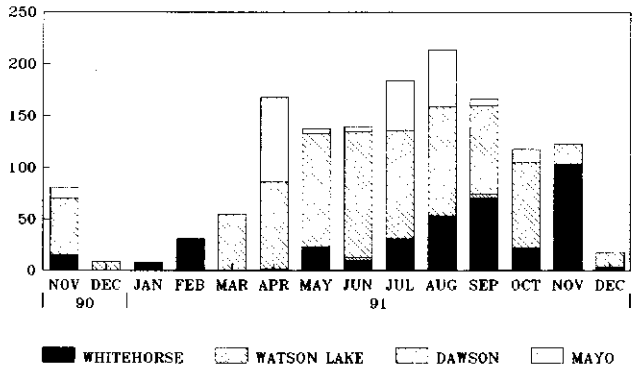
Cominco also continued drilling its wholly owned **NIDD** (MINFILE # 105O 24) epigenetic zinc prospect located 20 kilometres west of the TOM. The NIDD drilling involved six holes totalling 1,768 metres on the main Boundary Creek mineralized centre and its western extension.

Phelps Dodge continued its option on the **JASON** (MINFILE # 105O 19) deposit this year. The JASON Deposit, southeast of the TOM, also occurs in the Portrait Lake Formation. A total of 2,556 metres of diamond drilling in eight holes tested favourable stratigraphy south and east of the Main and South zones. Results of the program will be released in the new year. The three known zones of the Jason deposit have geological reserves of 14.1 million tonnes grading 7.09% lead, 6.57% zinc and 79.9 grams silver per tonne.

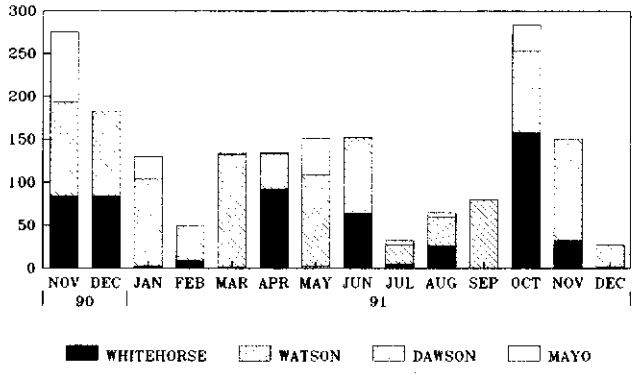
Big Creek Resources conducted a diamond drill program on the **REVENUE-NUCLEUS** (MINFILE # 115I 42, 115I 107) copper porphyry properties this year. These properties were first discovered in the 1950's and have been explored intermittently since. Bulldozer trenching and diamond drilling has identified two centres of porphyry mineralization associated with sub-volcanic feldspar porphyry dikes and related breccia and stockwork zones. Both contain well developed leached caps with elevated gold values. Supergene and hypogene mineralization encountered in one hole returned 0.36% copper and 0.58 grams gold per tonne over 73.2 m. A second hole 106.7 m away averaged 0.28% copper and 0.41 grams Au per tonne over 31.4 m. Both holes bottomed in mineralization.

First Yukon Silver Resources continued trenching on the **DAN** (formerly BAR)(Minfile #105B 27) showing near Swift River. Sheared, thrust-faulted calc-silicate rocks contain massive black sphalerite with pyrite, pyrrhotite and magnetite in irregular layers up to 1.5 metres wide. Trenching has exposed continuous but variably mineralized rock for more than 200 metres. Further exposures along strike indicate potential for a significant extension of the occurrence. The **CRESCENT** showing, a two metre skarn band traceable for 800 metres along strike, is located three kilometres northwest of the DAN showing. It exhibits similar characteristics in both host rock and mineralization. The **GOSSAN** Zone, located between the DAN and CRESCENT

PLACER CLAIMS STAKED
NOVEMBER 1990 – DECEMBER 1991



PLACER CLAIMS LAPSED
NOVEMBER 1990 – DECEMBER 1991



showings, was trenched in 1991. Trenching exposed large boulders of grey to green meta-tuff containing variable amounts of sphalerite and chalcopyrite. The boulders are situated immediately below outcroppings of magnetite-diopside-calcite skarn. The lack of sorting, the angularity of the clasts and the oligomictic nature of the boulder train indicate a proximal source.

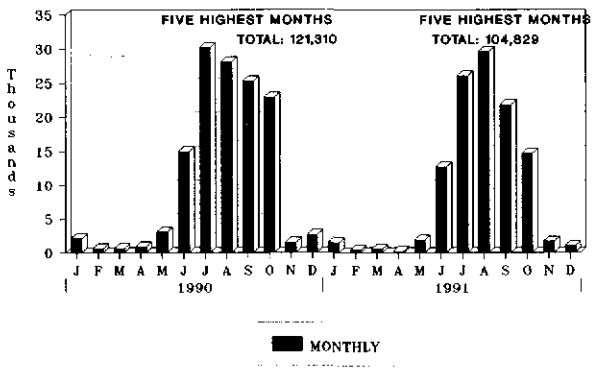
Placer Dome Inc. conducted geological, geochemical and ground geophysical surveys on its **KONA** (formerly FYRE LAKE, Minfile #105G 34) copper-zinc-silver property north of Watson Lake. The company optioned the property from Welcome North Resources Limited. Only a small portion of the 6 kilometre long target area has been previously drilled. The deposit is a flat-lying volcanogenic massive sulphide occurrence. Geological reserves are 1.5 million tonnes grading 1% Cu and 1% Zn with low gold and silver values.

Big Creek Resources explored the **CARPENTER RIDGE** property located 25 km west of the Blende. This year's program consisted of five diamond drill holes totalling 610 metres. Galena and sphalerite occur in moderately dipping veins and breccia zones adjacent to Cretaceous or older diorite dikes, which cut Proterozoic Gillespie Lake Group dolomite. Trenching in 1990 yielded 39% Pb-Zn with 64 g/t Ag over 7.5 metres. This season's drilling intersected several veins including one of five metres grading 9.5% combined Pb-Zn, and another of 9.3 metres grading 4.5% Pb-Zn.

Noranda Exploration worked on the **AZ** property, which is located on the southwest flank of Hump mountain North of the White River. Copper-gold skarn mineralization occurs in limestone and calcareous volcanic rocks of Late Triassic age which overlie Nikolai Greenstone amygdaloidal basalts in a setting similar to the Kennecott deposits in Alaska. The mineralization occurs as skarn within the Chitistone Limestone and as disseminations within Nikolai Greenstone. Work in 1991 included mapping, soil sampling and geophysical surveys. Areas with coincident anomalies were trenched with a helicopter transportable Kubota backhoe. Results are pending. The occurrence, optioned by Noranda from a local prospector, represents an entirely new discovery.

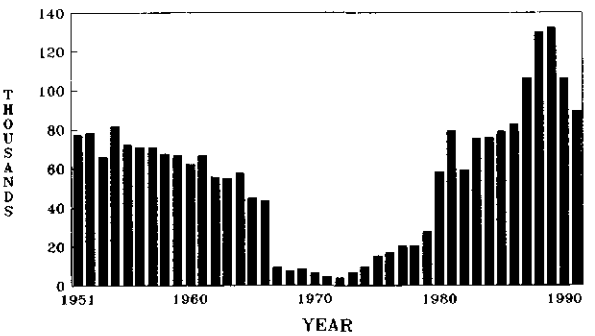
Pulse Resources funded a drill program on Barytex Resources Corporation's **MATT BERRY** (MINFILE # 105H 21) property located on the East Arm of Frances Lake, 160 kilometres north of Watson Lake. The property, also known as the **BARB**, is a stratabound, sediment hosted Pb-Zn-Ag deposit with drill inferred reserves of 530 000 tonnes grading 102.85 g/t Ag and 10% combined Pb-Zn. The deposit occurs in deformed phyllite of the Devono-Mississippian Earn Group, and is located less than 2 km from the contact with the Cretaceous Mt Billings Batholith. Drilling in 1991 was concentrated on the Money Zone, located 1.5 kilometers northwest of the deposit.

GOLD ON WHICH ROYALTIES WERE PAID
JANUARY 1990 – DECEMBER 1991



crude ounces

PLACER PRODUCTION
1951 – 1991



FINE OUNCES

GOLD EXPLORATION

In the Dawson area, Loki Gold Corp. and Hemlo Gold continued percussion and diamond drilling and trenching on the **BREWERY CREEK** (MINFILE # 116B 160) bulk tonnage oxide gold deposit, increasing the reserves to 15 million tonnes grading 1.7 grams Au per tonne in nine zones. The gold mineralization is related to low angle faults separating a sill-like Cretaceous latite porphyry from underlying graphitic argillite, and to high angle shears cutting both units.

Amax Gold began an extensive drilling and trenching program this season in the Mayo Mining District near **SCHEELITE DOME** and **HAGGART CREEK** (MINFILE # **106D 21-29**). The area consists of Jurassic and Cretaceous granite and granodiorite stocks intruding Proterozoic to Cambrian sedimentary rocks. Tungsten bearing skarns and gold bearing sulphide-quartz veins and shear zones have been extensively explored in the area in the past. The new initiative follows the purchase of the Fort Knox 'porphyry' gold deposit in Alaska by

Northeast of Mayo, Billiton Metals Canada Inc., and NDU Resources Ltd continue exploration on the Blende property. Looking east, trenches in the distance above camp mark the East Zone. The West Zone is out of the piture.

Amax Gold. Amax completed 2,500 metres of diamond drilling and 2.3 kilometres of trenching in 1991.

Aurchem Exploration continued exploration on its **GOULTER** (Minfile #115I 93) option situated adjacent to BYG Natural Resources Inc.'s Mt Nansen property, 50 km west of Carmacks. Gold and silver-bearing veins occur along two major north-trending structures, the WILLOW CREEK zone and the ELIZA CREEK zone. The veins cut Paleozoic metasedimentary rocks and Cretaceous granodiorite and diorite. Work in 1991 consisted of grid expansion followed by property wide IP and VLF-EM coverage. Magnetometer surveys were conducted over target specific zones.

On the **ITSI** (MINFILE # 105J 16) property, south of Macmillan Pass, Noranda Exploration Co. Ltd trenched and diamond drilled in 1991. Noranda also trenched on the **PUTZ-BENNETT** (Minfile #105O 04) property north of Macmillan Pass. Targets consist of gold-bearing quartz veins which form ladder structures in dykes up to five metres wide, which occur along the margins of Cretaceous intrusions.

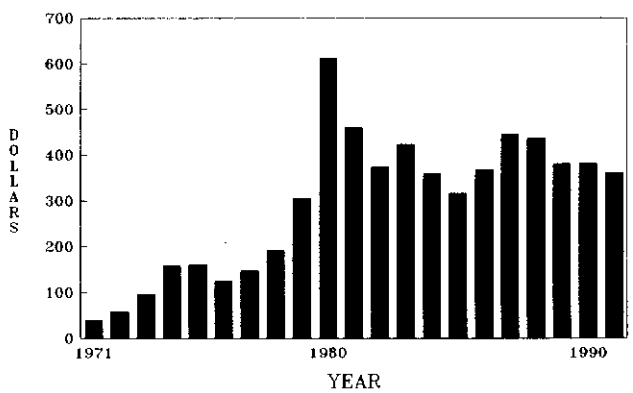
Pacific Comox Resources Ltd explored the **SEAGULL CREEK (TAY-LP)** property (MINFILE # 105F 121) this summer with an initial geophysical program consisting of 615 line kilometres of airborne electromagnetics and high resolution magnetics, followed by 941 metres of percussion drilling. The airborne survey is reported to have outlined 60 line kilometres of electromagnetic anomalies, many of which have coincident magnetic anomalies. Targets consited of gold bearing quartz-pyrrhotite veins cutting Lower Paleozoic marble, calc-silicate and biotite schist. The extensive vein system occurs along the inferred trace of the northwest striking Seagull Creek fault. Forty showings with anomalous values in gold, silver copper, lead or zinc have been located on the property. The recent drilling program located three zones of significant gold mineralization on the WEST zone. Hole 91-24 intersected 21.3 metres grading 3.77 g/t Au, including 4.6 metres grading 7.7 grams Au per tonne. The property was optioned from Cominco Ltd, which retains the right to back-in to a 30% joint venture.

The **JOSEPHINE** (MINFILE # 115P 11) property in the Clear Creek area was optioned by Noranda Exploration Co. Ltd in 1991. The property was originally staked in 1902. Noranda's 1991 work included prospecting, geochemical sampling, magnetic and IP surveys, and trenching. The property is underlain by Proterozoic to Lower Cambrian hornfelsed quartzite and argillite intruded by a Cretaceous quartz monzonite. Gold and arsenopyrite occur in veins within a 300 by 2 700 meter shear zone cutting both the intrusive and the metasedimentary rocks.

The **BEAR** (MINFILE #116A 032) property was staked by Noranda Exploration Co. Ltd in 1990. This property, located south of Antimony Mountain, is underlain by a Cretaceous syenite stock which intrudes hornfelsed sedimentary rocks of the Proterozoic to Lower Cambrian Hyland Group and limestone and calcareous phyllite of the Cambro-Ordivician Kechika Group. A shear zone cutting stratigraphy hosts a 0.6 meter wide arsenopyrite-chalcopyrite vein which has been traced intermittently for 75 meters. Work in 1991 consisted of geological, geochemical, and geophysical surveys followed by Kubota trenching.

Arbor Resources Inc. continued to explore its substantial holdings in the Klondike district near Dawson. Exploration in 1991 consisted of reconnaissance work on recently staked ground and more detailed work near the **LONESTAR** (MINFILE # 116B 72) occurrence. The detailed work was designed to follow up geochemical anomalies previously outlined on Eldorado Creek between Gay Gulch and 27 Pup. Trenching revealed a shear zone which parallels Eldorado Creek. The near vertical, four meter wide shear zone has a strike of 114°. The zone has been traced continuously for 350 metres, and similar mineralization has been

AVERAGE YEARLY GOLD PRICE
U.S. DOLLARS



traced intermittently for a further kilometre along strike. The shear zone passes through the Buckland Showing, discovered in 1961, which returned values of 96.0 g/t over 0.7 metres. Recent chip sampling along the structure returned values ranging from 1.37 g/t to 4.52 g/t Au over widths up to 4 metres. Grab samples assayed much higher.

DRILLING STATISTICS: 1991

	DIAMOND DRILLING		PERCUSSION DRILLING	
Project	**meters**	**# holes**	**meters**	**# holes**
TOM Cominco	2,882.7	8	--------	----------
NIDD Cominco	1,768.2	6	--------	----------
JASON Phelps Dodge	2,556	8	--------	----------
BLENDE NDU/Billiton	11,525	62	--------	----------
BREWERY CREEK Noranda/Loki	1,645	34	18,040 502	348 exploration 27 metallurgical
WILLIAMS CREEK WHC/Thermal	3,810	55	--------	----------
CARPENTER RIDGE Big Creek Res.	610	5	--------	----------
NUCLEUS/REVENUE Big Creek Res.	~1,770	16	--------	----------
GOLDSTAR Gagan Gold	-------	-------	?	4
HAGGART CREEK H-6000	2,500	16	--------	----------
ITSI Noranda	427	7	--------	----------
TAY-LP Pacific Comox	------	------	941	33
BARB Pulse Resources	303	4	--------	----------
CLEAR LAKE Total Energold/Mitsui	4,500	19	--------	----------
CHIEFTAIN HILL Wheaton River Minerals	1,050.39	3	--------	----------
CASH Big Creek Resources	396	2	--------	----------

Exploration and Geological Services Division
Northern Affairs Program, Yukon Region

The Government of Canada manages mineral resources in the Yukon Territory through the Northern Affairs Program of Indian and Northern Affairs Canada. The Mineral Resources Directorate of the Northern Affairs Program consists of Mineral Rights, Mineral Development, and the Exploration and Geological Services Division.

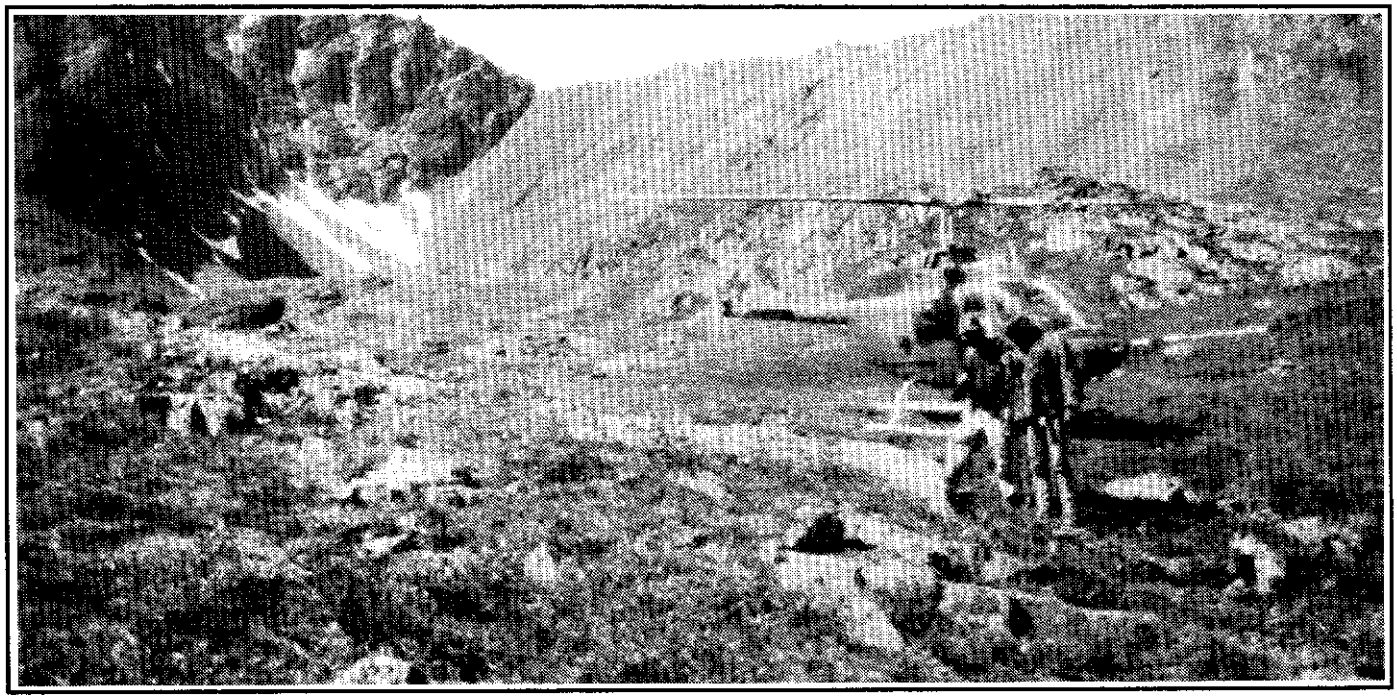
EXPLORATION AND GEOLOGICAL SERVICES DIVISION (EGSD)

Exploration and Geological Services Division staff presently includes S.R. Morison (Regional Manager/Chief Geologist), J.G. Abbott (Senior Geologist), T.J. Bremner (Geologist), R. Deklerk and D.J. Oullette (Staff Geologists), M. Burke (Geotechnician and Core Librarian), A. Wagner (Office Manager), and E. Phillips (Map Sales Manager). R. Deklerk replaces W.P LeBarge for an 18 month period while the latter completes an MSc degree at the University of Calgary.

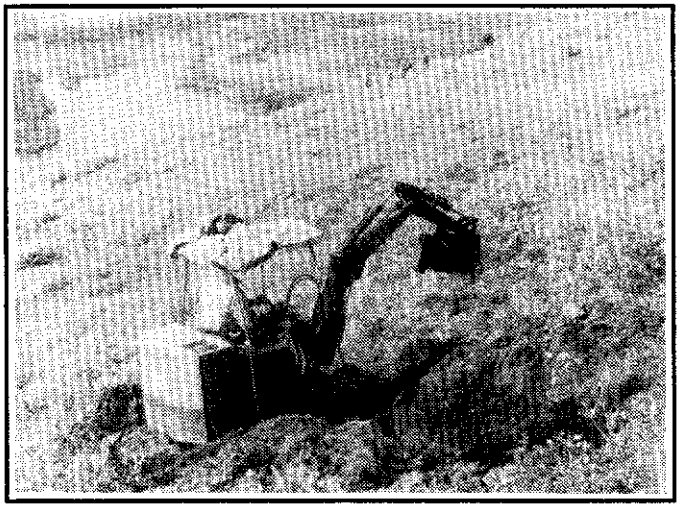
STAFF ACTIVITIES

Stephen Morison (Chief Geologist) is currently involved in the planning of the Cooperative Agreement of the new Mineral Resources Subagreement of the Canada/Yukon Economic Development Agreement, and he continues to use his placer sedimentology expertise to advise client groups and support related geological studies. Grant Abbott (Senior Geologist) is chiefly responsible for 1:50 000 scale mapping projects and this year worked in the Nash Creek and Larsen Creek map areas near the Hart River and BLENDE mineral deposits. Trevor Bremner (Mineral Deposit Geologist) updated YUKON MINFILE in 1991 and carried out fieldwork in the Brewery Creek and Wellgreen areas. William LeBarge (Staff Geologist) is responsible for approving placer and quartz assessment reports and visiting active mining properties in the Dawson and Mayo Mining Districts. Robert Deklerk assumed these responsibilities in September, 1991. Dennis Ouellette (Staff Geologist) is responsible for visiting mining properties and approving Quartz assessment reports in the Whitehorse and Watson Lake Mining Districts.

YUKON MINFILE, formerly the Northern Cordillera Mineral Inventory of Archer, Cathro and Associates (1981) Ltd, was purchased in 1990 through the Canada/Yukon Economic Development Program. This text and map-based file is currently available from EGSD by individual 1:250 000 NTS map sheet or as an entire 1500 page, 38 map file. In 1991, YUKON MINFILE was entered into a computer database, similar to Minfile PC of the British Columbia Geological Survey. Reports generated by the



In the Ogilvie Mountains east of Brewery Creek, Placer Dome Exploration and Noranda Exploration Company Ltd., explored gold-arsenopyrite veins related to cretaceous syenite intrusions on the ajoining LORRIE and BEAR mountian properties.



A helicopter-transportable kubota backhoe was used to test coincident geochemical and geophysical anomalies on Noranda's AZ copper-gold skarn property on Hump Mountain north of the White River.

computer are more extensive than the capsule summaries found in the paper Minfile release. Please contact Mike Burke (403-667-3202) for further information or to set up an appointment. The entire database will be available in diskette form in the near future.

The Division publishes several scientific reports including the annual Yukon Exploration report and the Yukon Geology Series. Yukon Geology Volumes 1 and 2 (Volume 3 is in press) are compilations of recent geological papers from studies which were supported or assisted by the Exploration and Geological Services Division. Yukon Exploration, previously a compilation of assessment report summaries, has taken on a new look with current statistics and descriptions of actively explored mineral properties, as well as detailed geological descriptions of properties visited by EGSD staff and affiliated geoscientists.

The Division also maintains the Yukon outlet of the Canada Map Office and sells topographic, geological (surficial and bedrock), aeromagnetic, aeronautical and land use maps. Geological Survey of Canada publications related to Yukon and northern British Columbia are also available. A library of geological texts and journals and selected air photos covering the Yukon from latitude 60° to 65°N are available for viewing.

AFFILIATED ACTIVITIES

Craig Hart - MSc Study of the metallogeny of the Coast Plutonic Complex southwest of Whitehorse.

Dennis Brown - PhD detailed structural analysis of the Vangorda deposit.

John Knight - Study of the trace element chemistry and morphology of placer gold.

RECENT PUBLICATIONS

Yukon Minfile Updates - 26 of the 38 sheets available required updates in 1991. Nine maps were also updated.

95D	105G*	105O*	115J
105A	105H	106D	115N&O*
105B*	105I	115A	115P
105C	105J	115B	116A*
105D*	105K	115F&G*	116B&C
105E*	105L	115H*	
105F	105M	115I	

* *DENOTES UPDATED MAPS*

INAC, (1991). **Yukon Exploration 1990**; Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada.

Placer Mining Section 1991. **Yukon Placer Industry 1989 to 1990**; Mineral Resources Directorate, Yukon, Indian and Northern Affairs Canada.

CANADA\YUKON ECONOMIC DEVELOPMENT AGREEMENT

Regional Stream Sediment and Water Geochemical Surveys Administered by Geological Survey of Canada

MAPS RELEASED IN 1991
GSC Open File 2363 105 N
GSC Open File 2364 105 O; PARTS OF 105 P
GSC Open File 2365 116 B, PARTS OF 116 C, 116 F, 116 G

EGSD FIELDWORK IN 1991

Nash Creek 106 D
Larsen Creek 116 A
Kluane Lake 115 G

DRILL CORE INDEX: H.S. BOSTOCK CORE LIBRARY

The H.S. Bostock Core Library houses approximately 112 000 metres of diamond drill core from 172 Yukon properties. The facility is located across the street from the Northern Affairs building at 200 Range Road. The core is stored in its original boxes, with no sample reduction. Confidentiality is maintained on the same basis as mineral claim assessment reports; a letter of release from the company owning the property must accompany a request to view confidential core. Status of specific core can be checked and arrangements to view or submit new core can be made by contacting the core librarian at 667-3202. Diamond saws, a core splitter and microscopes are available for use in heated examination rooms. On the following pages is a list of the properties now represented in the library:

N.T.S.	PROPERTY AND/OR CLAIM NAME	COMPANY
94K,L	DRIFTPILE CREEK	Archer Cathro (Gataga Joint Venture)
95D 5,12	MCMILLAN (QUARTZ LAKE)	Noranda Exploration Company Limited
95D 12	MCMILLAN (QUARTZ LAKE)	Asarco Exploration of Canada
95D 6	MEL	Sovereign Metals Limited
95D 6	MEL	Novamin Resources Limited
95D 5,12	PORKER	Archer Cathro (Hyland Joint Venture)
104G 1	MULE CREEK	Noranda Exploration Company Limited
104M 1	HOBOE	Noranda Exploration Company Limited
105A 2,3,6	LIARD COAL	Placer Dome Inc.
105A 7,10	MT HUNDERE	Canadian Mine Services, CIMA Resources
105B 1	LUCK	Serem Inc., Goldex Resources Inc.
105B 1	FIDDLER	Amax Gold Inc.
105B 1	LORD	Butler Mountain Minerals Corp.
105B 4	BARB	A.M.P. Exploration and Mining Co. Ltd.
105B 4	CAN	Cominco Mining Limited
105B 4	MC, DU	DuPont of Canada Exploration Ltd.
105B 4,5	SWIFT RIVER	DuPont of Canada Exploration Ltd.
105B 7	NITE	Archer Cathro (Wolf Lake Joint Venture)
105B 11	IRVINE	Hudson Bay Exploration and Development
105B 14	SHOOTAMOOK	Total Erickson Resources Ltd.
105C 5	TOG	Dunvegan Exploration Ltd.
105C 8, 9	BAR	Comox Resources Ltd.(J.C.Stephen Exp.Ltd.)
105C 9	MINDY	Newmont Exploration of Canada Ltd.
105C 13	RED MOUNTAIN	Boswell River Mines Ltd.
105C 14	LINDSAY	Joe Lindsay
105D 1	JUBILEE	Golden Slipper Resources, Logan Mines Limited
105D 2	VENUS	Venus Mines Limited
105D 2	PEERLESS, BIG THING	International Mine Services Ltd.
105D 2	BIG THING (ARCTIC)	Arctic Gold and Silver Mines Ltd.
105D 2	JEAN	Univex Mining Corporation
105D 2,3	MIDNIGHT GULCH	Island Mining & Exploration Co. Ltd.
105D 3	MT ANDERSON	Noranda Exploration Company Limited
105D 3	DICKSON HILL	Shakwak Exploration Company Limited
105D 3,4	CHARLESTON	Island Mining & Exploration Co. Ltd.
105D 3, 6	TALLY-HO MOUNTAIN	Tally-Ho Exploration Company Limited
105D 3, 6	TALLY-HO GULCH	Tally-Ho Exploration Company Limited
105D 4	RAM	Inco Metals Company
105D 6	VESUVIUS MTN	Shakwak Exploration Company Limited
105D 8	BUG	Dunvegan Exploration Ltd.
105D 10	WHITEHORSE COPPER	Hudson Bay Exploration and Development
105D 10, 11	WHITEHORSE COPPER	Whitehorse Copper Mines Ltd.
105D 11	POLAR	Mike Nichiporick
105D 11	ARCTIC CHIEF	Whitehorse Copper Mines Ltd.
105D 11	BEST CHANCE NORTH	Whitehorse Copper Mines Ltd.
105D 11	GRAFTER, KODIAK CUB	Whitehorse Copper Mines Ltd.
105D 11	LAST CHANCE, WAR EAGLE	Hudson Bay Exploration and Development
105D 11	GROUSE (JACKSON CREEK)	Whitehorse Copper Mines Ltd.

N.T.S.	PROPERTY AND/OR CLAIM NAME	COMPANY
105D 11	WAR EAGLE	Whitehorse Copper Mines Ltd.
105D 11	TURBINE #4 NCPC	Whitehorse Power Corporation
105D 11	NORTH STAR	Whitehorse Copper Mines Ltd.
105D 11,14	RABBITS FOOT	Whitehorse Copper Mines Ltd.
105D 14	BEE	Silver Sabre Resources Inc.
105D 14	SUITS	United Keno Hill Mines Ltd.
105E 11	MIDAS	Midas Exploration Ltd.
105F 3	QUIET LAKE	Joe Lindsay
105F 6	HIDDEN, AYDUCK	Archer Cathro (CUB Joint Venture)
105F 7,10	STORMY MOUNTAIN	Rio Alto Exploration Ltd.
105F 7,10	GULL	Dupont of Canada Exploration
105F 9,10	PELMAC	Curragh Resources Ltd. (Cyprus Anvil)
105F 9,10	BNOB	Curragh Resources Ltd. (Cyprus Anvil)
105F 14	RISBY TUNGSTEN	Hudson Bay Exploration and Development
105G 2	FYRE	Cassiar Asbestos Mining Corporation Ltd.
105G 2	FYRE (DUB)	Atlas Exploration Ltd.
105G 3	TINTINA	Tintina Silver (Rio Tinto)
105G 6	SANDERS	Archer Cathro (Chevron Canada Ltd.)
105G 6	BOOT	Archer Cathro (Chevron Canada Ltd.)
105G 6	CYR	Newmont Exploration Limited
105G 7	PACK	Conwest Exploration Limited
105G 8	FETISH	Archer Cathro (Finlayson Joint Venture)
105G 11	EAGLE (BEV)	Hudson Bay Exploration and Development
105G 11	BEV	Hudson Bay Exploration and Development
105G 14	DWONK (ANMAK PROJECT)	Curragh Resources Ltd. (Cyprus Anvil)
105G 14	PELLY BANKS	Hudson Bay Exploration and Development
105G 14	ELECTRIC	Pelly Banks Syndicate
105G 14	LEACH, FAULT, CZAR	Dupont of Canada Exploration
105H 5	JULIA	Esso Minerals Canada Limited
105H 8	SUSAN	Union Carbide
105H 10	TOY (REA)	Union Carbide
105I 6	HOWARD'S PASS	Placer Dome Inc.
105I 12	ABBEY	Archer Cathro (Itsi Joint Venture)
105I 15	OMO	Hudson Bay Exploration and Development
105K 1	TENAS	Dupont of Canada Exploration
105K 2	GREW CREEK	Hudson Bay Exploration and Development
105K 3	LYN	J. Graham
105K 3	LYN	Cyprus Exploration Ltd.
105K 3	SUNSET (LYN)	Welcome North Mines Limited
105K 6	ROSE CREEK	Cyprus Anvil Mining Company Ltd.
105K 11	HAL	Northern Homestake Mines Ltd.
105L 8	FELIX	Union Carbide
105L 14	TUM	Cominco Mining Limited
105L 15	ONE HUMP	Anaconda Canada Exploration Ltd.
105M 13	WAYNE	Island Mining & Exploration Co. Ltd.
105M 14	EAGLE	Archer Cathro, Brameda Res. Ltd. & Teck Corp.
105O 1	TOM	Hudson Bay Exploration and Development

N.T.S.	PROPERTY AND/OR CLAIM NAME	COMPANY
105O 1	FETCH	Inco Metals Company
105O 1	ESS	Archer Cathro (Itsi Joint Venture)
105O 2	TEA	Eisenman Enterprises Limited
106B 4	BIRKLAND	McIntyre Mines Limited
106B 15, 16	GAYNA RIVER	Rio Tinto Mines Ltd.
106C 7	HARRISON	Great Plains Development Inc.
106C 7	GOZ CREEK	(Bonnet Plume River) Barrier Reef Resources Ltd.
106C 13	FAIRCHILD	Magni Mana Cement Company Limited
106C 14	MAMMOTH	Bonnet Plume River Mines
106C 14	PTERD	Archer Cathro (Ogilvie Joint Venture)
106C 15	CAB	Welcome North Mines Limited
106D 1, 2	MARG	Archer Cathro & Associates (1981) Ltd.
106D 7	BLENDE	Archer Cathro & Associates (1981) Ltd.
106D 10	BOND	Eldorado Nuclear Ltd.
106D 10	BOND	Archer Cathro (Wernecke Joint Venture)
106D 11	NICK	Archer Cathro & Assoc., NDU Resources
106D 16	PAGISTEEL	Pacific Giant Steel Ltd.
106E 1	IGOR	Archer Cathro and Associates (1981) Ltd.
106E 1	OTIS, IGOR	Archer Cathro (Ogilvie Joint Venture)
106E 2	FLUNK	Archer Cathro (Ogilvie Joint Venture)
106E 3	FORSTER	Archer Cathro (Ogilvie Joint Venture)
106E 6	BONNET PLUME COAL	Pan Ocean Oil Ltd.
114P 8	MT. HENRY CLAY	Stryker Resources Ltd.
114P 15	CANDY MOUNTAIN	Noranda Exploration Company Limited
114P 15	PANTHER	Canex Placer Ltd.
114P 15	PARTON RIVER	Noranda Exploration Company Limited
115A 3	JACKPOT	Jackpot Copper Ltd.
115A 8	DEVILS' HOLE	Phelps Dodge Ltd.
115F 15	CANALASK	Versluce Mines Ltd.
115F 15,16	CANALASK	Canalask Nickel Syndicate
115G 5	WELLGREEN	Archer Cathro and Associates (1981) Ltd.
115G 5	WELLGREEN	Hudson Bay Exploration and Development
115G 5	QUILL CREEK	Hudson Bay Exploration and Development
115G 6	CORK	Imperial Oil Ltd.
115H 2	AISHIHIK	Hudson Bay Exploration and Development
115H 5, 12	SEKULMUN	Mike Nichiporick
115H 8	TESLIN	Teslin Exploration Limited
115H 8	LION	Archer Cathro and Associates (1981) Ltd.
115H 8, 105 E	DIVISION MTN	Arjay Kirker Resources Ltd.- Archer Cathro
115H 9	MACK'S COPPER	Arsenault/Versluce Mines Ltd.
115H 15	BUFFALO	Noranda Exploration Company Limited
115I 3	MT NANSEN	Kangaroo Exploration
115I 3	CYPRUS, MT NANSEN	Cyprus Exploration, Area Explorations Ltd.
115I 5	CASH	Archer Cathro (Klotassin J.V., Carmacks synd)
115I 5	FROG	Archer Cathro (CUB Joint Venture)
115I 6	DART	Noranda Exploration Company Limited
115I 6	LAFORMA	Rayrock Mines Limited

N.T.S.	PROPERTY AND/OR CLAIM NAME	COMPANY
115I 6	LAFORMA	Tally-Ho Exploration Ltd.
115I 6	REVENUE CREEK	Shakwak Exploration Co. Ltd.
115I 6	REVENUE, NUCLEUS	Archer Cathro (Nat Joint Venture)
115I 6	CARIBOU CREEK	Doron Exploration Ltd.
115I 6,7	TINTA HILL	Mill City Gold Ltd.
115I 7	WILLIAMS CREEK	Dawson Range Joint Venture
115I 7	WILLIAMS CREEK	Archer Cathro (Dawson Range Joint Venture)
115I 7	GRANITE MOUNTAIN	Dawson Range J V (Canex Aerial Expl. Ltd)
115I 11	MINTO	United Keno Hill Mines Ltd.
115I 13	KERR	Kerr Addison Mines Ltd.
115I 14	PELLY	Occidental Petroleum Inc.
115J 9	KOE	Kerr Addison Mines Ltd.
115O 1	TANTALUS BUTTE	Tantalus Butte Mines (Cyprus Anvil Mining Co. Ltd.)
115O 11	MCKINNON	McKinnon Rand Resources
115O 11	MCKINNON	Volcano Resources Ltd.
115O 14	DAWSYND	Dawsynd Exploration Ltd.
115O 14	LONE STAR	Arbor Resources Inc.
115O 14	DAWSON	Dawson Syndicate Exploration Ltd.
115O 14, 15	TEMPERANCE HILL	United Keno Hill Mines Ltd.
115P 13	URA	Beach Gold Mines Ltd.
115P 14	ZETA	Noranda Exploration Company Limited
116B 2,3	UNEXPECTED	Archer Cathro (Ukon Joint Venture)
116B 7	MAIDEN	Archer Cathro (Ukon Joint Venture)
116B 7	MARN	Noranda Exploration Company Limited
116B 8	THOR	Anaconda Canada Exploration Ltd.
116B 9, 10	TAK	Noranda Exploration Company Limited
116B 11	COMBINATION	Chevron Standard Limited
116B 13	OD, DASH	Union Miniere Exploration
116B 13	OD, LALA	Union Miniere Exploration
116C 7	CLINTON CREEK	Cassiar Asbestos Mining Corporation Ltd.
116C 8	CASSIAR CREEK	Noranda Exploration Company Limited
116G 1	MILCH	Milchem Canada Inc.
116K 8, 9	RUSTY SPRINGS	Kenton Natural Resources Limited

GODDELL

Craig J.R. Hart
NTS map sheet: 105 D/3
Coordinates: 60°11'25"N 135°16'50"W
Area: Wheaton River Valley
Access: 1.5 km 4WD access road from Skukum Road
MINFILE #:25 (YEX # 24)
Company: Berglynn Resources Inc.
Commodities: Antimony, gold, (zinc)

INTRODUCTION

Quartz-stibnite veins at Goddell Gully represent only a few of the several antimony occurrences on Carbon Hill. Strong east-trending structures contain the showings over at least five kilometres of strike length. Deep drilling on the Goddell Shear Zone has encountered significant gold grades over wide intersections. The gold however is not in quartz-stibnite veins, but instead is associated with porphyry copper style alteration and densely disseminated pyrite and arsenopyrite. This report introduces and documents this previously unrecognized and potentially significant style of mineralization.

HISTORY

The Goddell veins outcrop on the steep, barren, northwest-facing slopes of Carbon Hill and were probably among the first mineral occurences discovered in the Wheaton River area in 1893 (Cairnes 1912). Charles Goddell staked the first known mineral claims around 1906 and explored the occurrence with trenches and a short adit (Yukon Minfile). The property saw very little activity in the early years, and despite exploration attempts by Prospectors Airways in 1958, Yukon Antimony Corp. in 1965 and ConAm Res. Ltd. in 1976 (Yukon Minfile), it returned low gold values.

Berglynn Resources Ltd. staked the ground in 1984. Work completed before 1987 included geological mapping, rock and soil sampling, trenching, road building, and VLF-EM surveys. The property was first diamond drilled in 1987

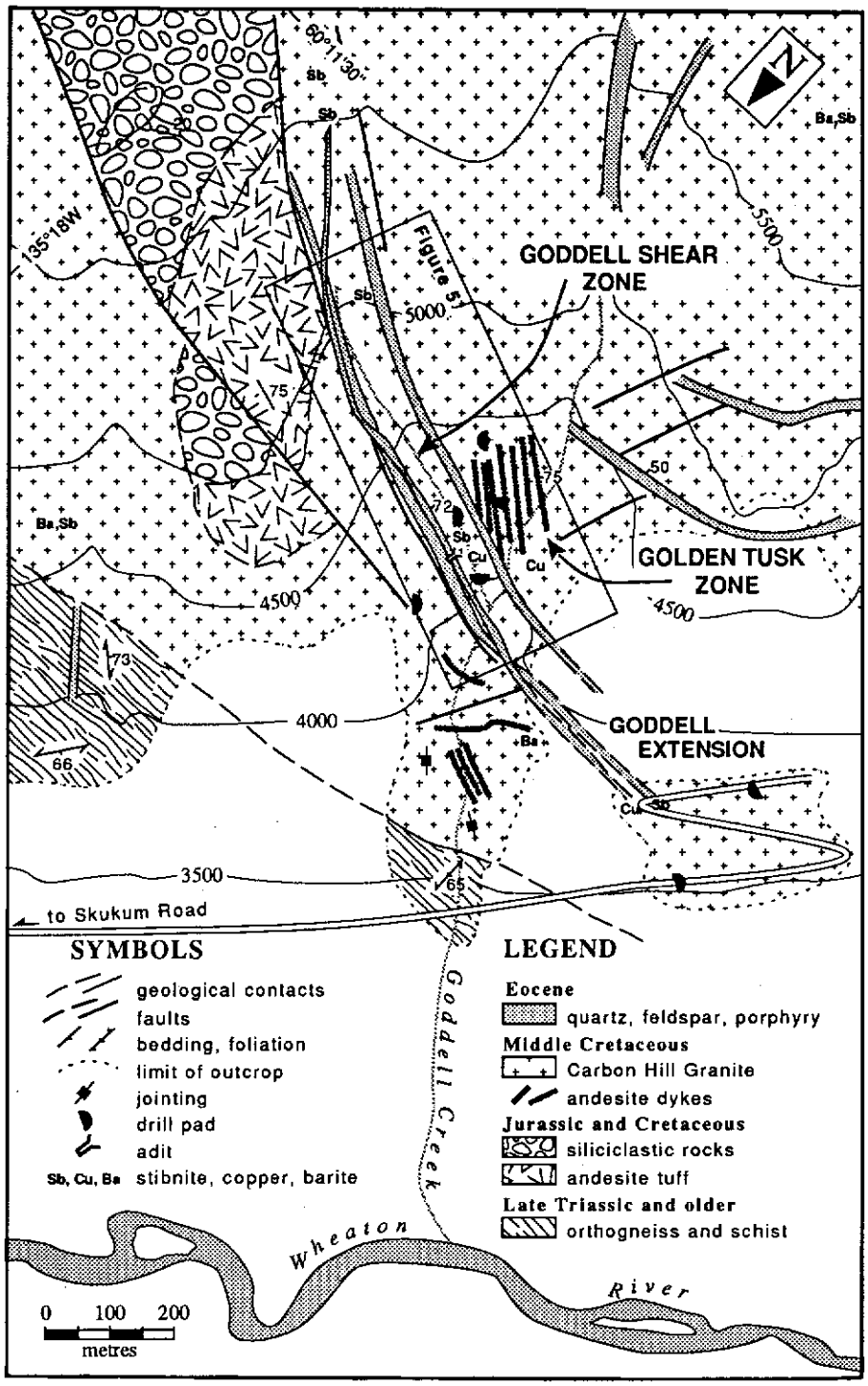


Figure 1. General geology of the Goddell Gully region on the northwest-facing slope of Carbon Hill.

Figure 2. Photomosaic of Goddell Gully looking east near the 4200' level. The shear zone is delineated by the North and South rhyolite dykes. Note the swarm of andesite dykes to the right (south) of the gully. The distance between the two dykes is approximately 35 metres.

with nine holes near the original adit in the main gully, and two holes in the Goddell Extension Zone (total 2859 metres).

The recognition of this prospect as a high level epithermal system pointed to the possibility of higher gold grades at depth and prompted a deep drilling program. In 1988, two of four deep holes (total 1976 metres) intersected wide auriferous zones in what Berglynn geologists call the Golden Tusk Zone. Reported values include 3.94 g/t (0.115 opt) Au over 34.4 m (113'), including 6.45 m (21') of 13.37 g/t (0.394 opt) Au, and 4.56 g/t (0.133 opt) Au over 63.7 m (209'), including 11.24 m (37') of 20.9 g/t (0.61 opt) Au and 4.20 m (13.78') of 44.40 g/t (1.295 opt) Au (Danielson 1988; Annual Report 1989; various company reports).

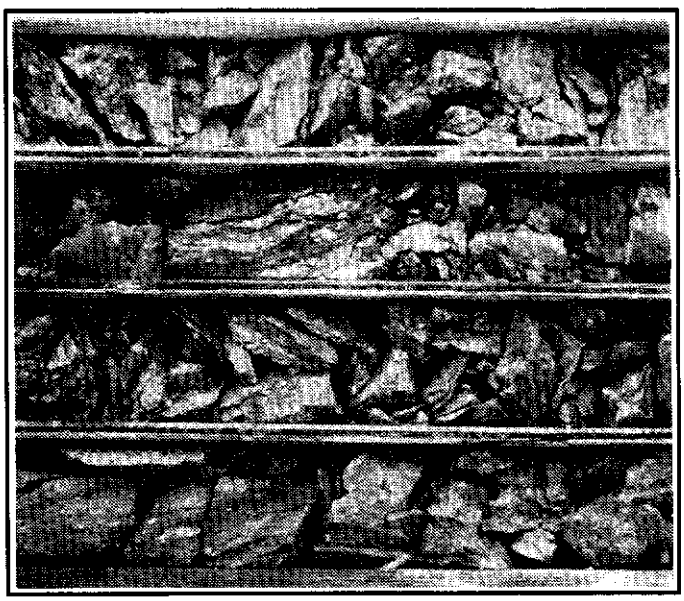


Figure 3. Heterolithic augen cataclasite as seen in drill core from the Goddell Shear Zone. The black matrix is composed of milled bits of granite, rhyolite and andesite.

A 14 hole diamond drill project in 1989 (total 2396 m), and a seven hole project in 1990 (total 1540 m) attempted to intersect the auriferous zone at shallower depths. Results have not been released.

REGIONAL GEOLOGY

The region is underlain by erratically distributed pendants and erosional remnants of upper Mesozoic volcanic and sedimentary rocks and an older metamorphic (Nisling) terrane among mid-Cretaceous and Early Tertiary plutonic rocks of the Coast Plutonic Complex. To the west of the property, the Early Eocene Mount Skukum volcanic complex forms a caldera among the plutonic and metamorphic rocks. A series of east trending structures which traverse the region are commonly cut by normal faults associated with the Early Eocene magmatic event.

More detailed descriptions of the regional geology can be found in Hart and Radloff (1990) and Wheeler (1961).

PROPERTY GEOLOGY

Most of the Goddell property is underlain by variably altered mid-Cretaceous Carbon Hill granite, and small exposures of siliciclastic rocks of the Tantalus Formation and andesite tuff (Figure 1: see Hart and Radloff 1990 for detailed rock descriptions). The Goddell Shear Zone is a major east-trending shear and dyke zone that is continuous for the entire length of the property and underlies the Goddell Gully (Figure 2).

The shear zone is up to 35m wide and contains two or three 1 to 5-metre wide zones of heterolithic black augen cataclasite in brecciated and faulted granite (Figure 3). Two thick (2-5 m), resistant, unbrecciated, pale yellow quartz-feldspar porphyry (QFP) dykes cut and delineate the margins of the shear zone. Younger, pale green to light purple and white rhyolite dykes (0.5-1.5 m) intrude the brecciated zone between the QFP dykes. The rhyolite is friable, recessive and exhibits strong flow-banding.

Immediately south of the Goddell shear zone, andesite dykes form a steep, southerly-dipping, anastomosing swarm 65 m wide (Figure 2). The dykes are between 0.2 and 5 metres wide, trend 120°, and appear to be cut by the Goddell shear zone and felsic dykes. Fresh dykes are black and microlitic, however most are olive green and brown as a result of varying degrees of hydrothermal alteration.

Figure 4. View looking east toward Goddell Gully. Top of mountain is at approximately 5800'. Note the extent of alteration in the Goddell Gully as shown by the light coloration. The drill is on the Golden Tusk Zone near 4300' and the roads and drill pads in the foreground marks the Goddell Extension Zone.

Quartz-stibnite veins occur in the breccia zones adjacent to the north and south QFP dykes.

Structure

Absolute motion on the shear zone is difficult to determine. At

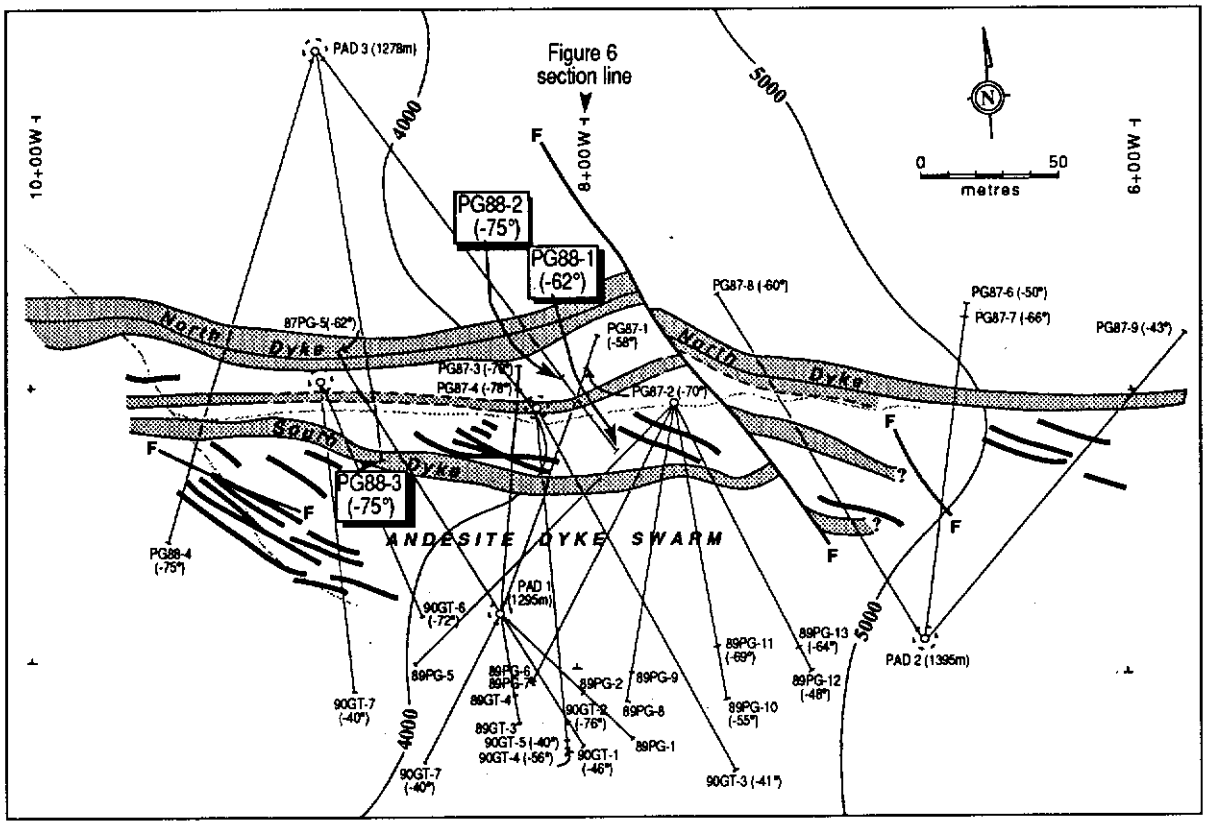


Figure 5. Detailed geology of Goddell Gully showing the general geological elements and the location of diamond drill holes. The letter F designates a fault.

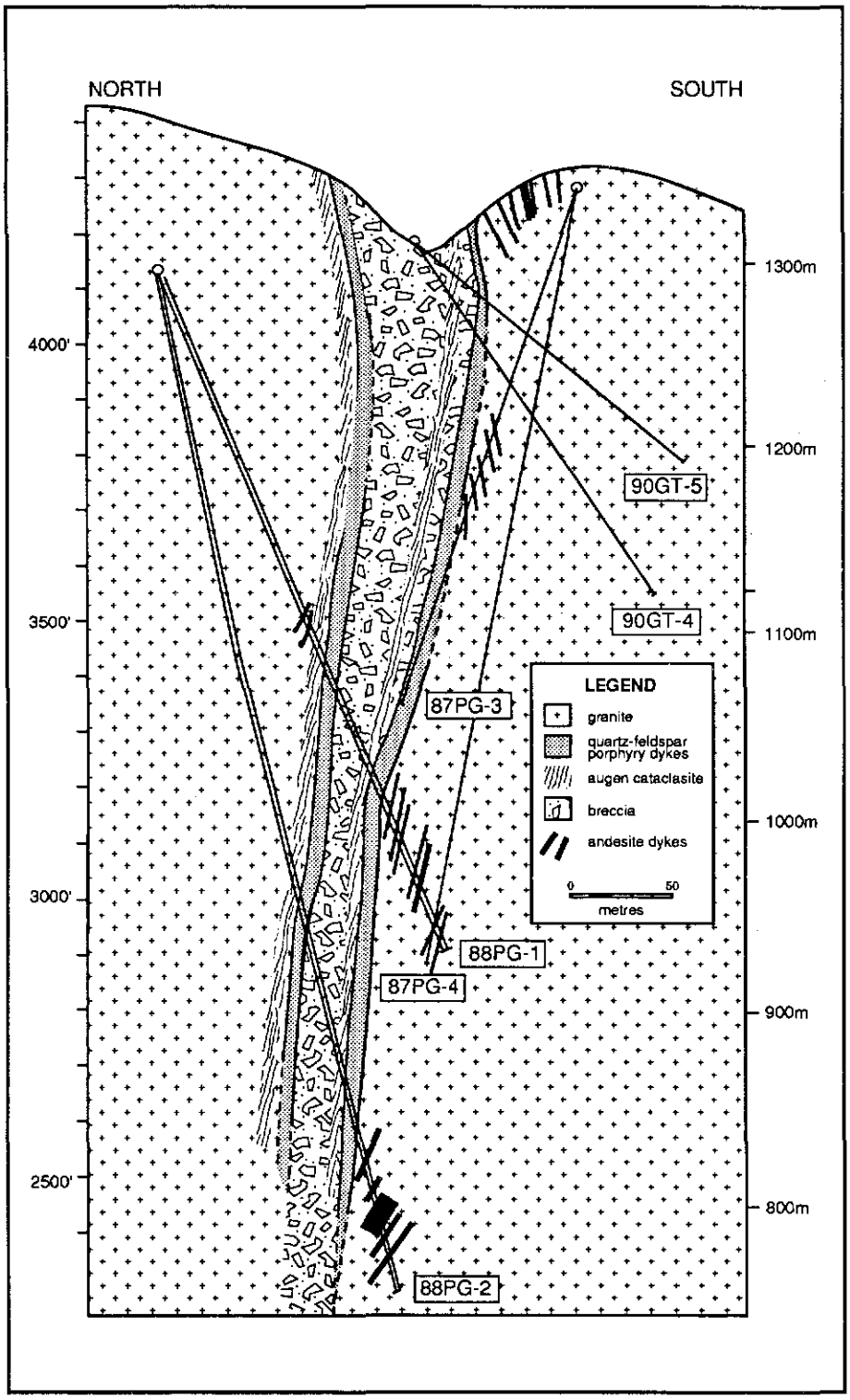


Figure 6. Vertical section through DDH's PG88 1&2 (location on Figure 5) looking east up Goddell Gully. The section shows the general character of the shear zone and the location of the Golden Tusk zone. Geology has been taken only from holes 88PG-1 and 2. The locations of other drill holes are shown for interest. The andesite dyke swarm probably continues along the entire footwall region.

least 350 m (1125') of north-side down movement is suggested by juxtaposition of Carbon Hill volcanic rocks and Tantalus Formation rocks against Cretaceous Granite. The intense brecciation and cataclasis, however, suggests greater amounts of motion. The andesite dykes in the swarm south of the shear zone occupy 23 metres of the total 65 metre width, indicating an original granite width of 42 m and approximately 50% extension. The extension may relate to movement on the Goddell shear.

MINERALIZATION

Four types of mineralization identified on the Goddell property are; quartz-stibnite veins (Goddell veins), disseminated gold-pyrite-arsenopyrite (Golden Tusk Zone), disseminated copper, and quartz-hematite-(galena) veins. Diamond drilling has focussed on the Golden Tusk Zone and nearby Goddell veins(Figure 5).

Goddell Veins

The Goddell quartz-stibnite occurence includes several discontinous veins in shear zone exposures on the west slopes of Carbon Hill(Figure 1). They outcrop from near the top of the gully at 5700' to the original adit at 4150'. The vein has also been intersected in drill holes near the level of the adit, as deep as 2745' asl, and in the Goddell Extension Zone to the west. The veins therefore have a minimum vertical and horizontal extent of 915 m (3000') and 1400 m (4592') respectively.

Observable vein width varies from 0.2 to 1.3 m, though Cairnes (1912), with the benefit of early workings, mentions widths to 1.8 m (6'). The veins strike between 083° and 110° and dip steeply to the north.

The veins are dominated by fine-grained, white and blue to dark grey quartz with variable percentages (0-25%) of fine disseminations of stibnite and pyrite (marcasite?). Locally the vein is crudely banded with the centre composed of either dense fine-grained crystalline masses or large radiating crystals of stibnite (up to 4 cm) which form up to 80% of the vein. Pyrite and light brown sphalerite are common minor constituents. Kermesite

TABLE I

ELEVATION (feet asl)	AVERAGE Ag:Au	AVERAGE Au(g/t)	AVERAGE Ag(g/t)	AVERAGE Sb (ppm)	NO. OF samples
5700	2.75	1.77	4.87	4 125	2
5000	2.26	2.70	6.1	217	2
4300	2.94	4.07	18.8	7 102	5
4150	7.08	9.18	69.4	22 775	3
4000	17.20	3.58	50.9	30 326	2
3800	15.48	2.39	13.58	8 102	3

and stibiconite (ochres of antimony) are locally present, and both Cairnes (1912) and Bostock (1941) report jamesonite and arsenopyrite.

Much of the vein material and the host granite is weakly to moderately brecciated. Propylitic and weak phyllic alteration are pervasive throughout the shear zone (Figure 4), and an envelope of white clay alteration is associated with the veins.

Published and company reports indicate maximum, but erratic gold grades up to 13.7 g/t (0.40 opt) and silver grades up to 132 g/t (3.85 opt). Most samples return one to two grams per tonne (0.03-0.06 opt) gold. Most elevated gold values (5 g/t) are in stibnite-rich quartz-sulphide samples (up to 10%). Arsenic values are typically very low (%) and appear to have little relationship to elevated precious metal values. Mercury content (5000 ppb) appears to be elevated. Massive stibnite samples contain up to 40% antimony with several percent zinc and 10-100 grams per tonne silver. Gold grades are erratic.

Gold grades in the vein appear to be highest near the 4150' level (Table I). Limited sampling suggests that silver:gold ratios increase with depth.

The data set includes all quartz-stibnite vein samples which yielded greater than 1.0 g/t Au. Data from Doherty (1986), Coster (1988), and Hart and Radloff (1990).

Golden Tusk Zone

The Golden Tusk Zone was intersected in two drill holes, approximately 60 m (197') apart, and at 460 m (1500') below surface and 150 m (500') below the Wheaton River valley bottom (Figure 6). Gold-bearing pyrite and arsenopyrite occur in highly altered granite and andesite dykes south of the South QFP dyke in the Goddell Shear.

Zones of densely disseminated, but patchy pyrite with variable amounts (0.1-10%) of very fine-grained acicular arsenopyrite are hosted in quartz-carbonate altered andesite dykes and intensely seriticized and moderately fractured granite. A hand lens is needed to see the arsenopyrite needles which occur in greater density in the andesite dykes. Thin veinlets (1-5 cm) of white quartz with stibnite and light brown sphalerite are thinly distributed in the mineralized zone, but only in the granite (Figure 7). Thin quartz stringers (+/- py) with ankerite selvages and networks of erratic, late stage ankerite are pervasive in the andesite dykes and less common in the granite (Figure 8).

Alteration zoning in granite is as follows:

1) Fresh granite.
2) Alteration of mafic minerals to orange- weathering ferromagnesian calcite.
3) Significant sericite development on joint and fracture surfaces.
4) Saussuritization of plagioclase and potassium feldspar
5) Saussuritization of potassium feldspar.
6) Disseminated pyrite.
7) Patchy pyrite, intense phyllic alteration, and weak, local quartz flooding.

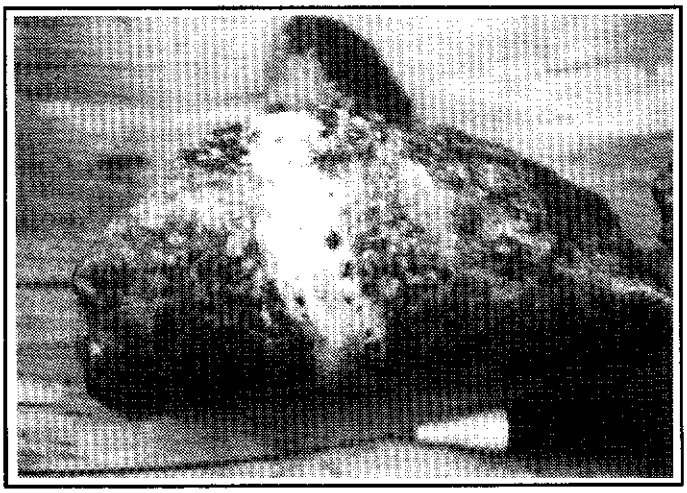


Figure 7. Quartz-stibnite-sphalerite veinlet in rock shown in Figure 9. Veinlets like these are typically thin (1-4 cm), are essentially flat lying (perpendicular to the core axis in steep drill holes) and have only been intersected in deep (1500') drill holes.

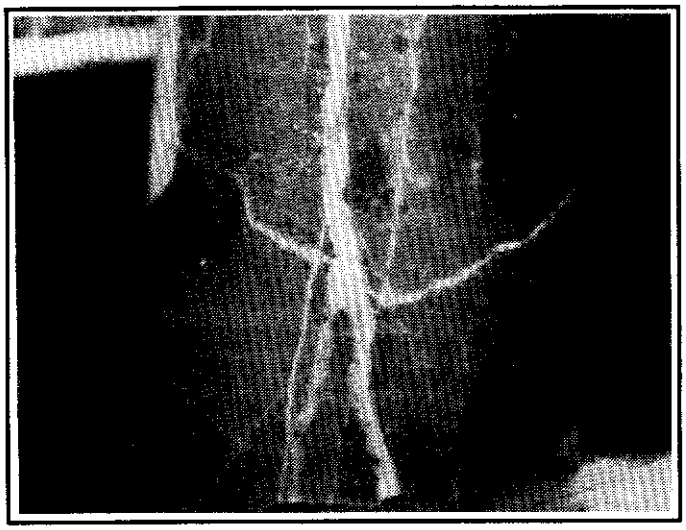


Figure 8. Diamond drill core (DDH 88PG-2) showing the multiple generations of veining in a quartz-carbonate-sulphide altered andesite dyke. Sulphides are dominated by pyrite and arsenopyrite.

8) Disseminated acicular arsenopyrite and quartz-stibnite-sphalerite veinlets in zones of intense pyrite replacement (30%) (Figure 9).

Andesite dykes in granite with level three alteration are pervasively saussuritized and plagioclase phenocrysts are altered to a bright green sericite. Sulphidization of levels five and six is more intense in the andesite dykes than in the granite. The most intensely altered and mineralized andesite dykes are associated with networks of quartz and carbonate stringers.

The highest gold grades are associated with: 1) acicular arsenopyrite in the altered andesite dykes; and 2) increased density

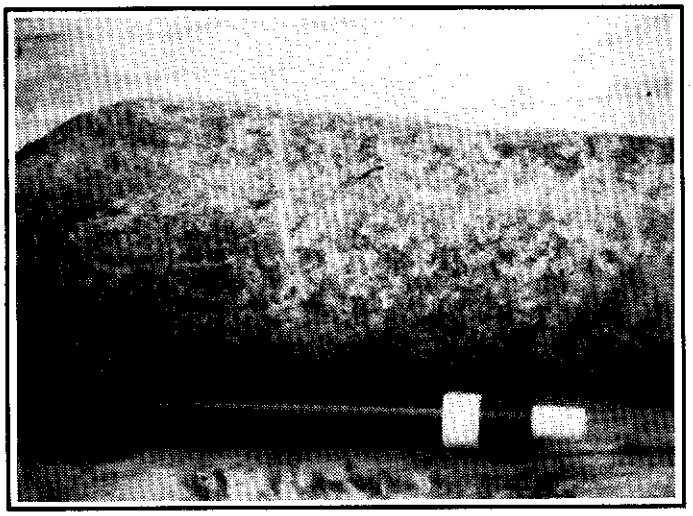


Figure 9. Intense sericite-sulphide alteration in Carbon Hill granite as intersected in DDH 88PG-2. Dark portions of rock are sulphides, white is quartz and grey is sericite. This section of rock contains 20.9 g/t (0.610 opt) Au, 4200 ppm As and 4200 ppm Sb over 1.2 m (5.0').

of quartz-stibnite veinlets in the granite (Figure 10). Gold values are up to 69.6 g/t (2.030 opt) Au and 7.5 g/t (0.22 opt) Ag over 1.22 m (4.0') in andesite, and 11.59 g/t (0.338 opt) Au and 1.7 g/t (0.05 opt) Ag over 0.82 m (2.6') in granite. A selected sample of several thin quartz-stibnite-sphalerite veinlets in the granite returned gold and silver values of 24.8 g/t (0.724 opt) and 1.7 g/t (0.05 opt) respectively. Gold-rich zones have arsenic values in the range of 1-12%, antimony 0.1-2%, and anomalous mercury values. Silver values are negligable and even with the highest gold values, generally less than 5 g/t.

Fractures in the ore zone are typically steep and probably associated with shearing in the adjacent Goddell Shear Zone, but the quartz-stibnite stringers are essentially flat lying and may have resulted from extension.

Although the andesite dyke swarm has been encountered in several drill holes, high arsenopyrite contents with economic gold grades have only been intersected below 850 m (2790') asl. As such, and with limited information, the ore zone may be tabular and flat-lying. This may be supported by the fact that the gold-rich quartz-stibnite veinlets are also flat-lying.

Free gold was not observed in the Golden Tusk Zone, and the absence of high assays suggests that most is tied up in the sulphide minerals.

Disseminated Copper

At least three zones of malachite and azurite stained, altered granite are known near Goddell Gully, (see Figure 1). The granite is phyllically altered with saussuritization of the plagioclase feldspars and a few percent of disseminated pyrite. Thin (3 mm), clear, quartz-pyrite-chalcopyrite-chalcocite stringers typically cut the altered rock. None of the three occurences have been traced for any distance, but all are adjacent to rhyolite(?) dykes to which they are presumed to be related.

The significance of the copper zones is uncertain, as no relationship with the quartz-stibnite veins is apparent. However, a relationship to the pervasive porphyry copper-style alteration seems likely.

Quartz-Hematite-Galena Veins

White and less often clear, cockade and vuggy quartz with selvages of specular hematite (often altered to limonite) occur in steep (and less commonly flat) veins hosted in the Carbon Hill granite. They are up to 0.5 m wide (or form one metre wide stockworks) but are generally thin (5 cm) and anastamosing. They are typically adjacent to, and parallel to the andesite dykes throughout Carbon Hill. Rarely, they contain sparse galena.

Company reports indicate rare, but erratically high gold values from these veins (ie. 10-17 g/t). The veins are interpreted to have been emplaced in tensional fractures and gashes associated with the extensional regime which allowed the invasion of the andesite dykes.

CONCLUSIONS

Gold-bearing quartz-antimony veins are continuously exposed over considerable vertical and lateral distances in a strong structure on the Goddell Gully property. To date inadequate widths and erratic gold values preclude their economic viability, but the persistence of the veining and the degree of alteration suggest that additional discoveries are probable.

The similarity of Goddell Gully geology and vein character with occurrences on Chieftain Hill (elsewhere in this volume) and near Becker Creek, suggests that the occurrences are genetically related and probably linked by the Goddell shear zone.

A gold-bearing, sulphide-rich zone encountered in deep drilling exhibits some similarities with porphyry copper-style mineral deposits, but contains arsenopyrite (and stibnite), and no copper minerals. Gold, pyrite, and arsenopyrite are more highly concentrated in iron-rich andesite than the granite. This style of mineral occurrence has not been previously recognized in the Wheaton River valley.

Although some of the mineralization in the Golden Tusk Zone is significantly different from the quartz-stibnite veins, the presence of gold-rich quartz-stibnite veinlets in this zone cannot be ignored. Both deposit types are interpreted to be cogenetic. Gold and iron sulphides were deposited by fluids percolating through the altered granite, while other fluids cooled while ascending through the conduit provided by the shear zone and deposited vein quartz-stibnite and only erratic gold.

ACKNOWLEDGEMENTS

Evaluation of the Goddell property was suggested by Grant Abbott and supported by Exploration and Geological Services Division of INAC. Berglynn Resources allowed access to the property and company documents. The information and ideas presented here benefited from conversations with Al Doherty, Roger Hulstein (Aurum Geological Consultants, Inc.), and Colin Godwin (University of British Columbia) who spent several days with the author. Kelly Olson drafted the figures. Grant Abbott provided thought provoking questions and edited the manuscript.

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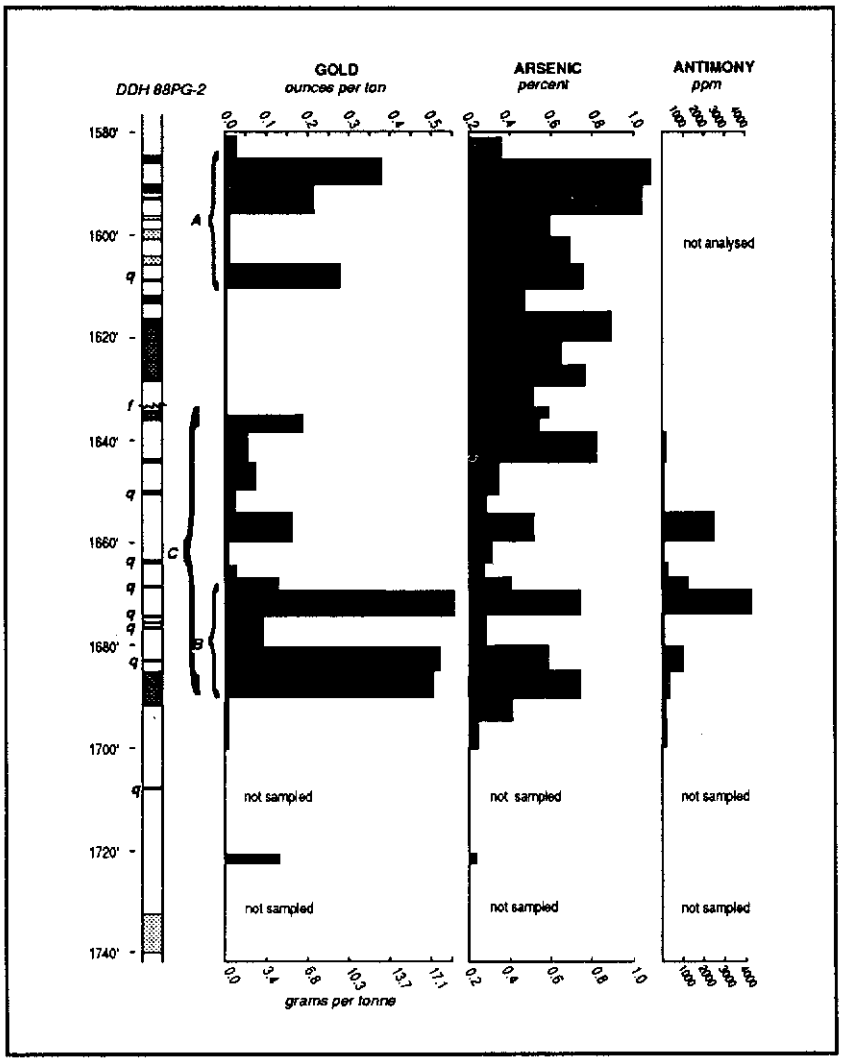

Figure 10. Gold versus arsenic versus antimony values for the gold-bearing portion of DDH 88PG-2 to show relationships between metal values and lithology. Graphical representation of diamond drill hole includes granite (white), andesite dykes (dark), rhyolite (light grey), q=quartz-stibnite veinlet and f=fault. A = 4.2 g/t (0.122 opt) Au over 7.5 m (25'); B = 13.5 g/t (0.395 opt) Au over 6.4 m (21.2'); C = 7.0 g/t (0.203 opt) Au over 16.8 m (55').

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YUKON MINFILE. Exploration and Geological Services Division, Yukon, Indian And Northern Affairs Canada.

SKUKUM CREEK (Mt. Reid, Berney)

Craig J.R. Hart
NTS: 105 D 3
Coordinates: 60°10'40"N, 135°24'40"W
Access: 8 km 2WD access road
MINFILE #: 22
Company: Omni Resources Inc.
Commodities: Gold, silver. zinc, lead

INTRODUCTION

The Skukum Creek deposit is located 62 kilometres southwest of Whitehorse in the Wheaton River valley. It is the largest vein gold deposit so far discovered in the Yukon Territory. Drill indicated and proven reserves are 867,890 tonnes grading 7.6 g/t Au and 275 g/t Ag. Mineable reserves are 461,700 tonnes (Davidson 1991) including 111,930 tonnes grading 13.0 g/t Au and 443 g/t Ag (Northern Miner 1989).

Despite an extensive exploration history and the property's advanced stage of development, very little is known about the geology of the deposit. This report describes the general geology and character of the deposit based on fieldwork undertaken during the summer of 1991. Numerical data presented here have been obtained from various reports written at different times during the development of the Skukum Creek property. Consequently, slight discrepancies may be encountered.

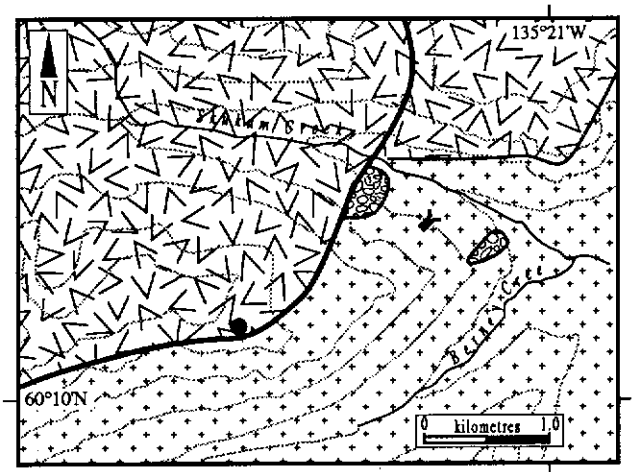

Figure 1. Generalized geological map of the region around the Skukum Creek property. The adit is shown between the two exposures of Tantalus Formation conglomerate.

HISTORY

The property was originally staked about 1922. Two veins on the property were explored with several trenches and shafts and, in 1937, by two short adits (12 and 40 metres). The property was examined several times prior to 1950 by Geological Survey of Canada geologists (Cockfield 1923; Cockfield and Bell 1926, 1944; Bostock 1938; Wheeler 1961). Interest in the region was renewed in the mid-1960's by Yukon Antimony Corp., which constructed road access to the main showing and explored the vein with several bulldozer trenches. The property was staked again in 1973 and explored intermittently prior to its transfer to Omni Resources Inc. in 1984. Wheaton River Minerals Ltd currently holds an option to purchase the property.

Exploration and development proceeded quickly from 1985 to 1988, the last two of these years with joint venture partner Skukum Ventures Inc. (later Skukum Gold Inc.). The program, financed largely through flow-through share funding, included more than 24,000 m of surface and underground diamond drilling and 2200 m of underground development on the 1300 and 1350 levels. Underground workings included two main haulage tunnels, several drifts, ore passes and stopes, raises to the 1375 and 1400 levels, and a decline to the 1275 and 1250 levels.

In 1988, an agreement was reached with United Keno Hill Mines for the lease of its 350 tpd mill, located approximately 110 road kilometres from the mine site. Transportation costs were calculated at approximately $35 per tonne (1988). Rehabilitation and retrofitting of the mill began that summer. With the sudden exhaustion of the Mt Skukum ore bodies in July 1988, the Mt Skukum Mining Corp. mill (only 8.5 km away) became idle, and negotiations resulted in a new lease agreement for its use in November 1988. Construction of a flotation circuit began in early 1989, but regulatory, legal and financial difficulties forced cancellation of the project. During the spring of 1990 Placer Dome Inc. negotiated a deal to purchase the Mt Reid property and the adjoining Goddell property, and to spend $12.5 million dollars on exploration and development, but the contract was never finalized. In June 1991, Omni announced that Skukum Gold failed to uphold its portion of the joint venture agreement to put the property into production, and the property reverted entirely to Omni. In August 1991, Wheaton River Minerals purchased the assets of Mt Skukum Gold Mining Corp., and later acquired the Skukum Creek property.

REGIONAL GEOLOGY

The Mt Reid property lies on the southeastern margin of the Early Eocene Mt Skukum Volcanic Complex (MSVC) (Figure 1), largely surrounded by middle Cretaceous granitic rocks of the Coast Plutonic Complex (CPC). Older metamorphic rocks of the Nisling Terrane, and unconformably overlying chert pebble conglomerate of the Jura-Cretaceous Tantalus Formation form

pendants and erosional remnants in the granitic rocks which unconformably underlie much of the Eocene volcanic strata.

Felsic dykes, intermediate dykes and normal faults associated with the MSVC are ubiquitous. However, several lines of evidence suggest that the Skukum Creek deposit formed before the MSVC.

A more comprehensive regional perspective is provided by Hart and Radloff (1990) and Wheeler (1961).

PROPERTY GEOLOGY

The Skukum Creek deposit occurs in medium to coarse-grained, euhedral hornblende granodiorite. The granodiorite yielded a middle Cretaceous U-Pb zircon age of 111 Ma (R.L. Armstrong, in Hart and Radloff, 1990) and is considered to be part of the Whitehorse plutonic suite. The granodiorite is largely homogeneous but contains a distinctive dark grey hornblendite phase, a light grey, fine-grained to granophyric, xenolithic phase above approximately 1500 metres, and a granular, quartz-rich granite phase with biotite and hornblende in the eastern portion of the property. The phases are generally gradational, but their distinctiveness is often accentuated by juxtaposition along faults.

The host granodiorite is weakly to moderately propylitized with nearly ubiquitous chloritization of hornblende. Chlorite is also common on fracture and shear surfaces. Adjacent to the ore zone, chloritization is pervasive, feldspars are weakly saussuritized, and epidote is sparsely disseminated. Epidote also forms thin veins (max. 2 cm wide) adjacent to the ore zone. Dolomite or ferroan calcite stringers are locally common and post-date the chlorite and epidote veins.

Tantalus Formation siliciclastic rocks overlie Nisling assemblage metamorphic rocks in the eastern portion of the property and underlie MSVC rocks in the west.

Dark green, aphanitic to sparsely porphyritic, slightly magnetic to non-magnetic dykes of basaltic andesite are erratically distributed throughout the property, and are notably adjacent and parallel to the footwall of the ore zone. The dykes include up to 10% altered plagioclase phenocrysts, microcrysts of hornblende, and aggregates of dark green chlorite. Widths average one metre, but reach a maximum of three.

Two types of felsic dykes were observed. The first type is resistant, prominent and traceable for several tens and locally hundreds of metres. The pale green to beige, aphanitic, and siliceous rocks weather to a pale orange. Some weathered surfaces are stained black with manganese oxides. Fresh faces appear cherty. The second type of felsic dyke is commonly parallel to but intrudes the first type. It typically weathers a conspicuous rusty orange colour, contains obvious feldspar and quartz phenocrysts and has flow banded to chalcedonic margins. These dykes of the second group, though more visible due to their

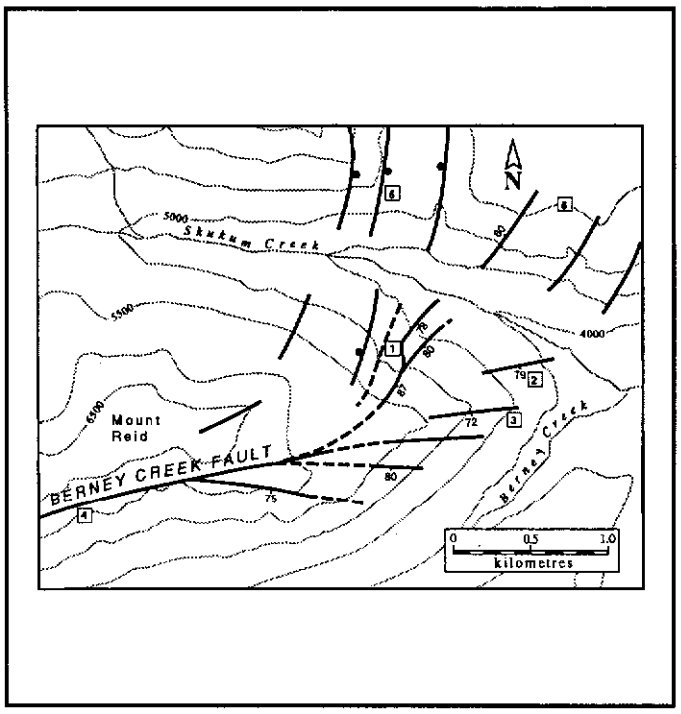

Figure 2. Map of major structures and location of mineral showings. Note the "splay-effect" at the eastern end of the Berney Creek Fault. Mineral occurences: 1-Skukum Creek; 2-Hidden ; 3-Ernie, VG, Bonanza; 4-Tap, Polywog, Toad, Jig; 5-Goat; 6-Raca.

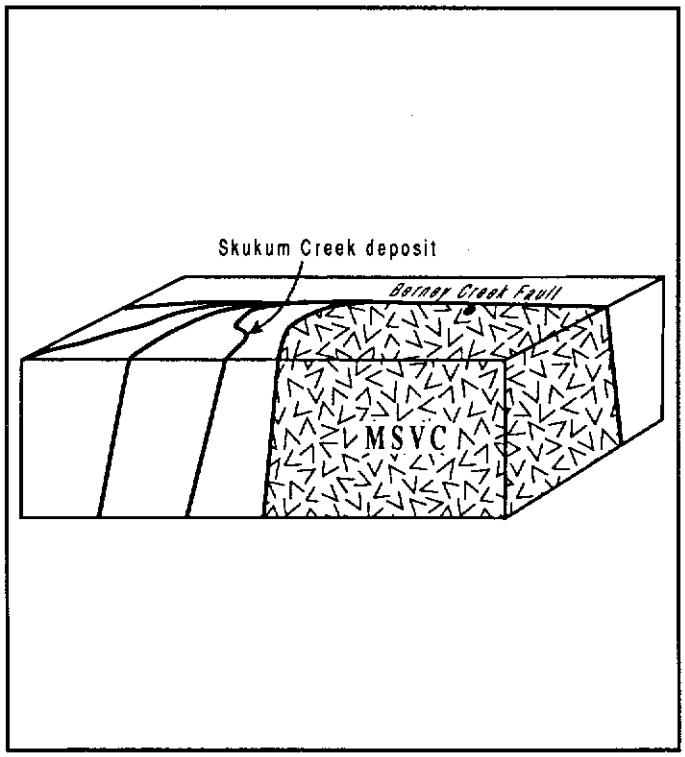

Figure 3. Block diagram showing the regional geometry of the structures in the Skukum Creek area.

weathering colour, are less resistant, less fractured, and less continuous (more likely to anastomose) than the slightly older set. Both sets of rhyolite dykes occur along fault zones, including the ore zone.

Dykes of the first set are locally brecciated and are cut by, and host most of the Skukum Creek ore deposit. Dykes of the second set are similar to most rhyolite dykes of the MSVC as described by McDonald (1990) and Doherty and Hart (1988). Their relationship to the Skukum Creek deposit is uncertain.

Table I: Extent and Size of Rainbow and Kuhn Zones

	VERTICAL (metres)	HORIZONTAL (metres)	TONNAGE (tonnes)
Rainbow Zone	385	444	
Ore Zone	284	297	447 138
Kuhn Zone	618	660	
Ore Zone	350	240	373 537
TOTAL			**820 675**

Structure

Numerous northeast-striking, southeast-side down normal faults traverse the property. The faults appear as splays off the larger caldera bounding Berney Creek Fault (Figure 2). The Berney Creek Fault strikes 078° and includes a zone of brittle fractures and rhyolite dykes up to 25 m wide, with dips ranging from 70°S to 80°N. Volcanic rocks of the MSVC north of the Berney Creek Fault are down-dropped against Mount Reid granodiorite and Nisling assemblage metamorphic rocks (Figure 3). Vertical throw on the fault is at least equal to the one kilometre stratigraphic thickness of volcanic rocks. Movement indicators observed on post-ore faults in underground exposures corroborate this sense of movement.

The intense fracturing in the Berney Creek Fault zone is greater than that expected by a simple normal fault, and pre-caldera dykes and veins show a dextral offset, suggesting that the Berney Creek Fault and its associated splays existed prior to the formation of the Mount Skukum Volcanic Complex (Hart and Radloff 1990). Although much of the kinematic evidence associated with the initial faulting has subsequently been obscured by the invasion of

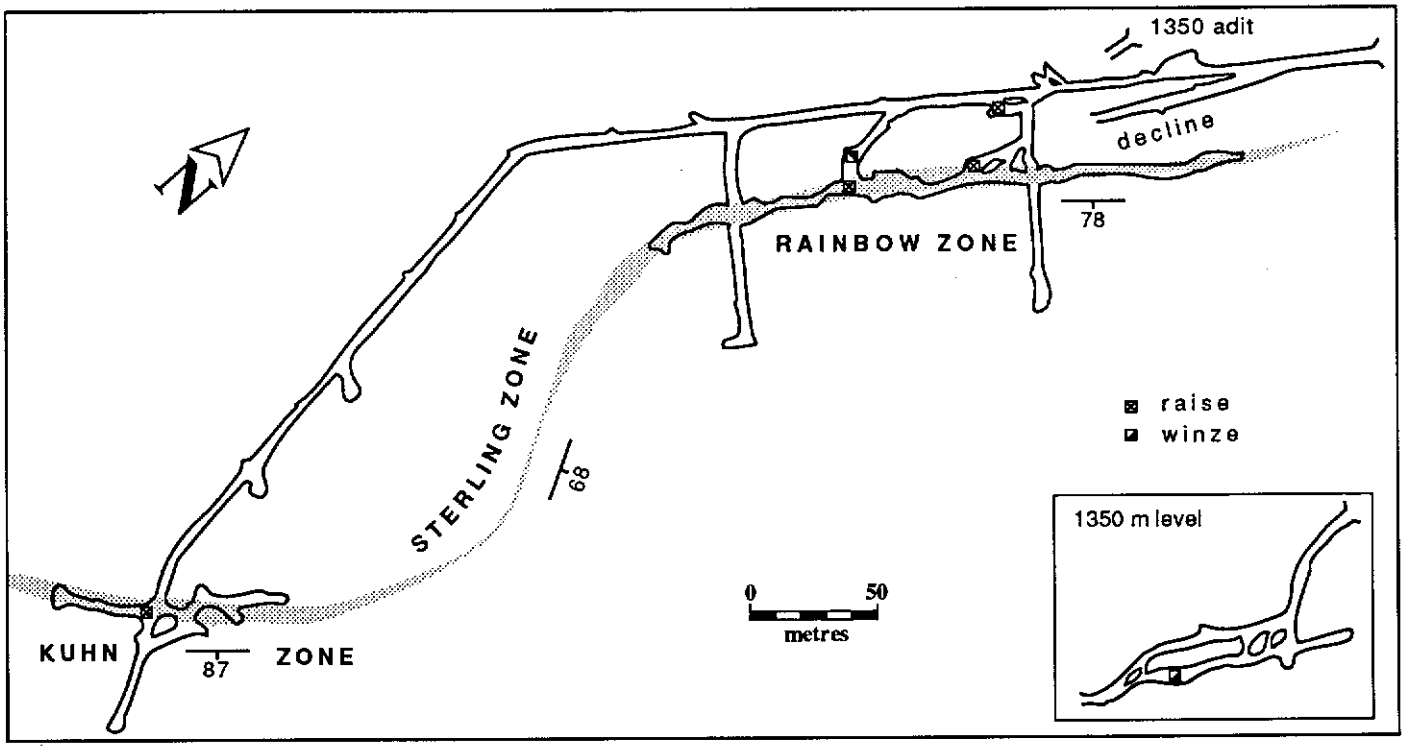

Figure 4. Plan view of the 1300 and 1350 metre level, underground workings and the geometry of the ore zones.

dykes or younger reactivation, the Berney Creek Fault and associated splays are considered to have formed by dextral shearing along the fault.

MINERALIZATION

Several mineralized quartz veins are exposed in faults on the property (Figure 2). The Skukum Creek ore body includes the Rainbow and Kuhn veins (previously known as the north and south veins). The Sterling zone separates the Rainbow and Kuhn zones, and the Road zone is the northeasterly extension of the Rainbow zone. At least four other small veins (Toad, Polywog, Jig, Tap) have been found in, or adjacent to the Berney Creek Fault. The Ernie, VG, Bonanza and Hidden showings are small sulphide-rich veins found on the eastern part of the property.

Vein Geometry

The Rainbow and Kuhn zones are located along the main splay off the Berney Creek Fault, in two northeast-trending dilatant zones (Figure 4) separated by a narrow north-trending zone of intense shearing (Sterling). This configuration suggests dextral motion along the BCF (Figure 5).

The Kuhn zone strikes between 065° and 080° and dips steeply south. The Rainbow zone strikes between 052° and 057° and dips 78° south. Between the two veins (Sterling Zone), the structure strikes north and dips about 68° east below 1300m, and more steeply at higher levels. The dimensions of the Rainbow and Kuhn zones are shown in Figure 6 and Table I. The ore zones have a

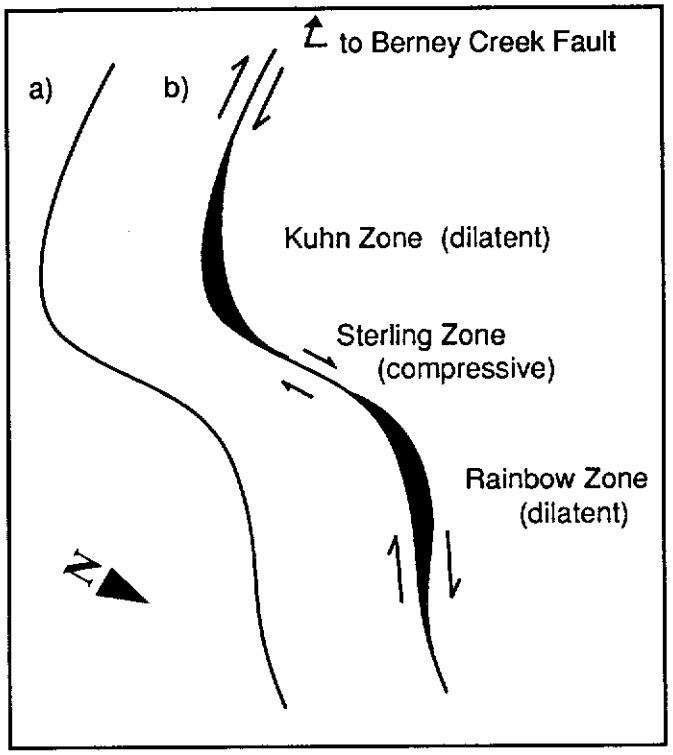

Figure 5. Schematic diagram showing the development of dilatent and compressive zones during dextral motion on the Berney Creek Fault and their relationship to the Skukum Creek deposit.

Figure 7. (a) The hanging wall fault/gouge zone is 0.2 to 3.0 metres wide. Slickensides in the zone indicate strike-slip motion. Similar, but thinner gouge zones appear to repeat the ore zone and also occur in the footwall. (b) Photo of ore zone showing change from granodiorite (left) to rhyolite to rhyolite breccia to mineralized rhyolite/quartz vein breccia.

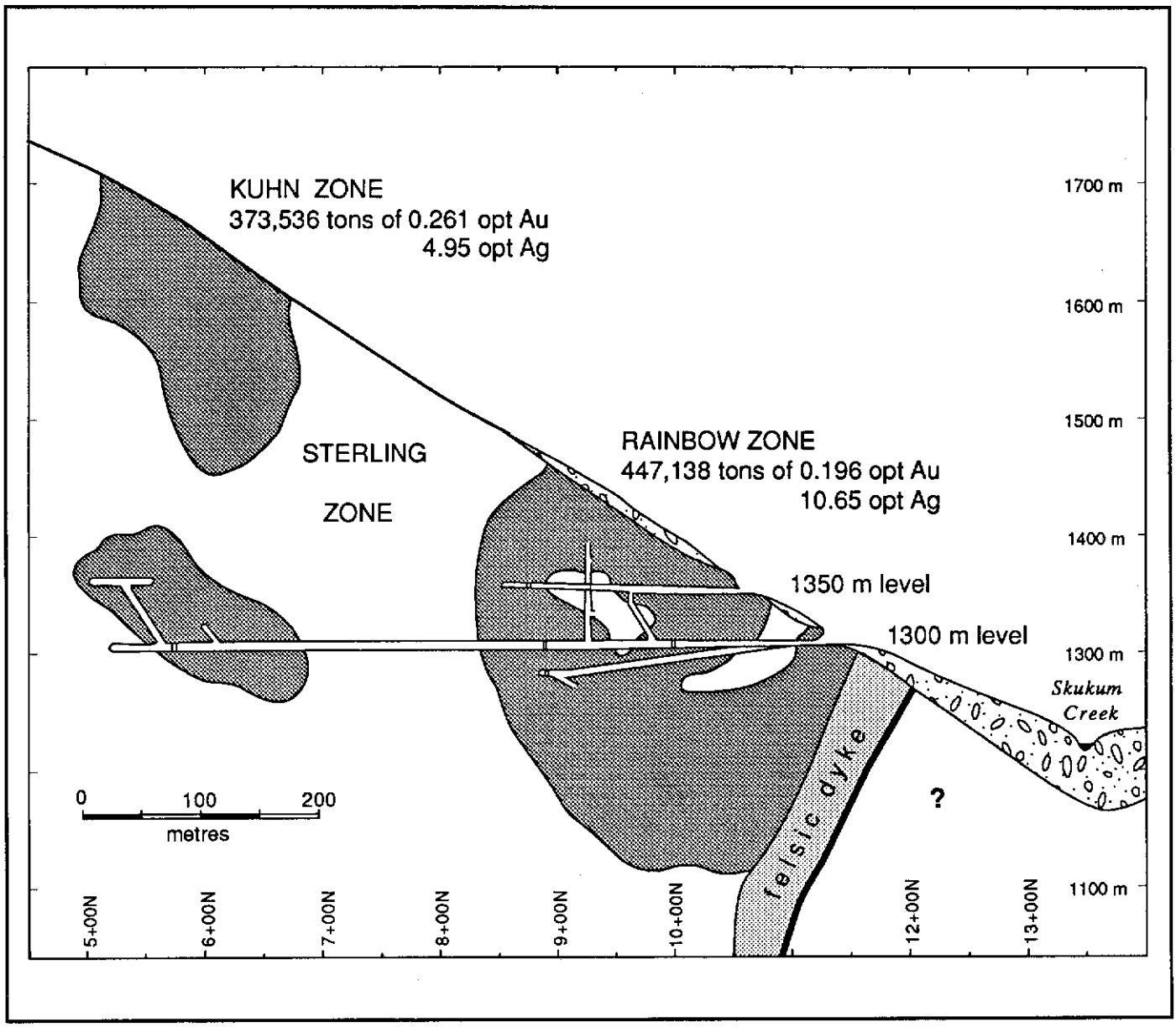

Figure 6. Longitudinal section of the Skukum Creek deposit and underground workings, looking northwest. The Rainbow Zone is projected onto a 055° plane and the Kuhn Zone along a 072° plane. The shaded areas contain more than 0.1 opt Au and are more than 1.0 metre thick.

minimum width of 1.0 m and grade of 0.1 opt Au. Tonnage is characterized as drill defined.

A thick felsic dyke truncates the northeast extension of the Rainbow Zone (Figure 6). At least one drill hole has intersected the continuation of the zone north of the dyke, across Skukum Creek. The Kuhn Zone narrows to the southwest as the fault splay changes direction and merges with the Berney Creek Fault proper.

The ore zones are characterized, hanging wall to footwall, by hanging wall gouge, granodiorite breccia, rhyolite breccia, quartz and quartz sulphide vein and vein breccia, rhyolite and andesite dykes, and less often, footwall hydrothermal breccia and gouge (Figure 7). Widths vary from one to 22 metres. The Rainbow zone averages 1.2 m, but one large, moderately inclined, northeasterly raking ore shoot was reported to be up to 7.5 m in width.

Three sets of post-ore faults have been recognized (Figure b). The first (oldest) set is a series of steep normal faults oriented approximately perpendicular to the veins (140/90). Stepped and fibrous slickensides indicate the dominant movement is northeast-side down. Faults of the second set are strong

Table II:

	Rainbow	Kuhn
Au (opt)	0.235	0.302
Ag (opt)	16.588	4.083
Pb (%)	1.47	0.712
Ag:Au (Au=1)	71	13

gouge-filled shears which form much of the hanging wall and locally cut and displace the veins. Motion indicators in the gouge are poorly developed but indicate sinistral offset. Faults forming the third and youngest set are flat, with northeast lineations and kinematic indicators which suggest that the tops were transported to the northeast (Figure 8). Displacement on the post-ore faults is typically less than 5 metres, but up to 15 metres on the second set. Duplexes associated with the second set locally double the thickness of the mineralized zone, but also add unwanted clay.

Figure 8. Photo of post-mineralization fault offsets (from the 1300 m level. Displacement along flat faults is tops to the south. Extreme right of photo is an east-striking sinistral fault. Hammer in centre for scale.

Vein Mineralogy

The Skukum Creek veins consist of 20-40% sulphide minerals in quartz, and quartz and rhyolite breccia. The sulphide mineral assemblage is dominated by pyrite, arsenopyrite, sphalerite and galena, with minor amounts of chalcopyrite, pyrargyrite, pyrrhotite and bornite, and traces of argentite, tetrahedrite, electrum and native gold. Stibnite has also been reported (Cockfield 1923, p.8), and company geologists have observed rare barite in the gangue. Carbonate and clay are subordinate but locally abundant constituents of the gangue.

At least three phases of mineralization are evident. Massive, barren white quartz forms the first phase. The quartz cuts brecciated granodiorite, andesite and rhyolite, but in the Rainbow zone, occurs primarily in a rhyolite dyke. A second phase of quartz and fine to medium grained pyrite forms the matrix to brecciated first phase quartz and rhyolite. The pyrite forms crude bands along the vein walls and in breccia fragments. Ore minerals belong to the third phase and have a complex paragenesis. Bands of fine-grained arsenopyrite are followed by blocky lath-like arsenopyrite overprinting crudely cockade quartz. Galena, sphalerite, and pyrite followed after minor brecciation. Post-sulphide phases include white and grey-blue chalcedonic quartz (+/- barite?) which concordantly cuts the sulphide-rich zones, while late stage ankerite and dolomite stringers form irregular discordant networks in the ore zone.

The Rainbow and Kuhn zones have similar mineralogy, but the Kuhn zone has notably less galena and more arsenopyrite. Gold grade is slightly higher in the Kuhn zone, but the lower silver values give it a significantly higher Au:Ag ratio (Table II). In the Rainbow zone, gold grade increases and silver:gold ratios decrease with increasing elevation (Figure 9). Gold-rich zones (0.5 opt) are associated with 4-12 % combined lead and zinc and 4-10% arsenic, and are typically greater than two metres wide. It is not known if the gold is genetically associated with arsenopyrite or galena.

Limited fluid inclusion data on the Skukum Creek veins indicate a mineralizing system rich in CO_2. Homogenization temperatures were difficult to obtain because of the poor quality of the available inclusions. Secondary, two and three phase inclusions are dominant, and primary inclusions are rare. Carbon dioxide inclusions are typical of mesothermal veins which generally equilibrate at approximately 350 $\pm$ 50°C. Thermal decrepitation of CO_2-rich inclusions took place at temperatures in excess of 300°C, providing supporting evidence for the higher homogenization temperatures.

AGE OF MINERALIZATION

Dr. R.L. Armstrong of the University of British Columbia sampled pre- and syn-ore rhyolite dykes identified by company geologists in drill core and obtained a whole rock K-Ar age of 58 Ma. Rocks of the MSVC have returned isotopic ages of 51 to 53 Ma (Pride and Clark 1985; McDonald and Godwin 1986). The

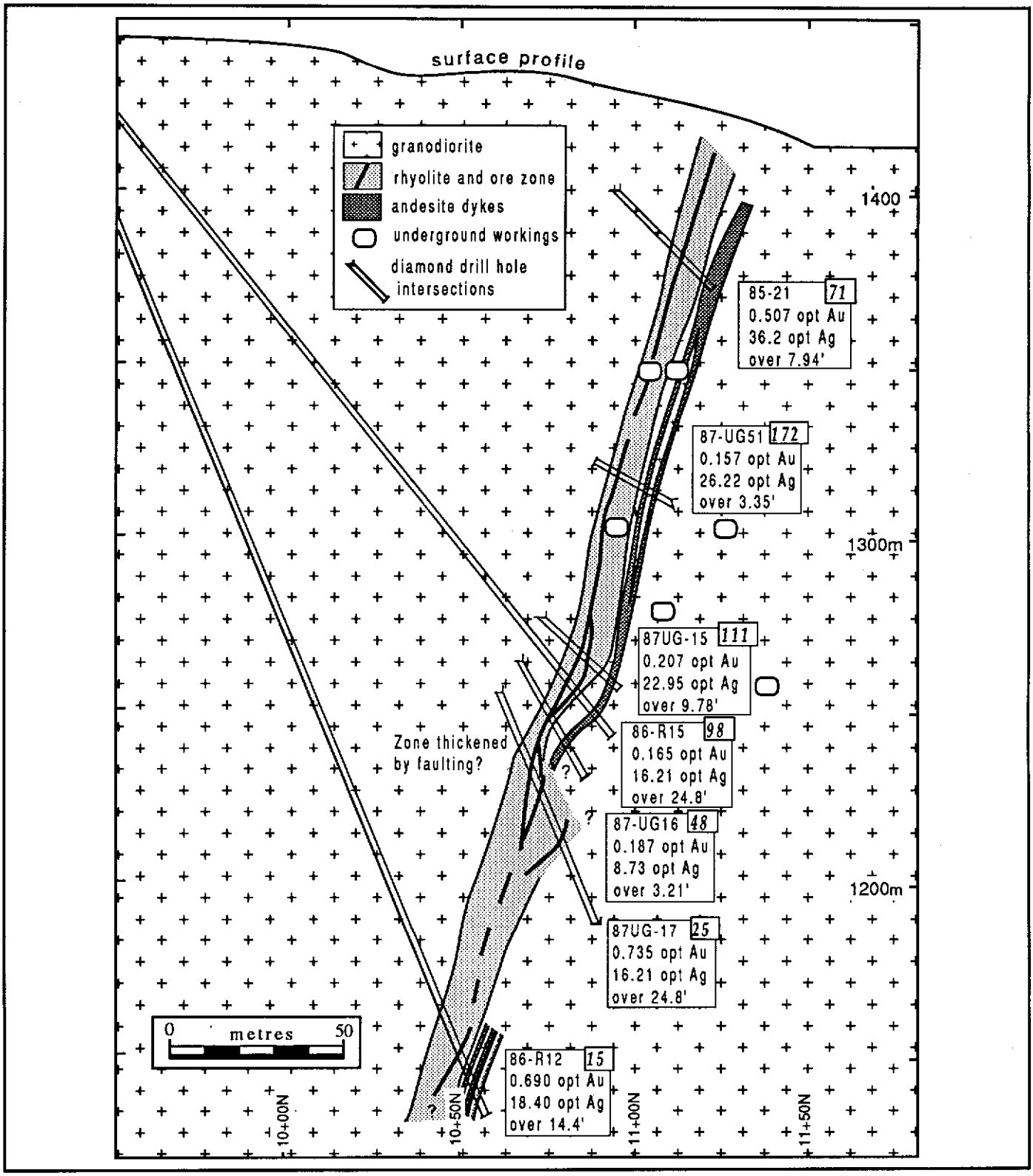

Figure 9. Vertical section looking northwest through the Rainbow Zone at 9+25 N showing general geology and changing precious metal grades with depth. Note the decrease in Ag:Au ratios (Au=1) with increasing elevation, as shown in the small boxes.

mineralization therefore appears to predate the MSVC, but might be related to initial, as yet unidentified stages of the volcanic complex.

CONCLUSIONS

The Skukum Creek deposit is a sulphide-rich, polymetallic, mesothermal vein deposit with moderate gold and significant silver values. The deposit occurs in two zones along a single splay of the Berney Creek Fault and appears to be related to early sinistral motion on the fault. Three or more nearly contemporaneous mineral phases appear to be related to a magmatic event which preceded the MSVC. Three sets of post-ore faults, presumably related to subsidence of the Mount Skukum caldera, have modified the character and geometry of the ore zone.

ACKNOWLEDGEMENTS

Roger Hulstein (Aurum Geological Consultants Inc.) contributed many valuable ideas. Colin Godwin (University of British Columbia) accompanied the author for several days during the evaluation of this property and provided insight. Access to the property was given by Omni Resources Incorporated. Kelly Olson drafted most of the figures. Exploration and Geological Services Division of Indian and Northern Affairs Canada supported the author's fieldwork. Grant Abbott suggested and guided the project, and edited the report.

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CHIEFTAIN HILL (Morning, Evening, Ocean)

Craig Hart
NTS: 105 D 3
Coordinates: 60°11'30"N, 135°21'00"W
Area: Wheaton River valley
Access: 2 km 4WD road from Skukum Creek road
MINFILE #: 24 (YEX #23)
Company: Wheaton River Minerals
Commodities: Antimony, silver, gold

INTRODUCTION

Chieftain Hill, located near the Mount Skukum and Skukum Creek gold deposits (Figure 1), is underlain by numerous spectacular orange, yellow and red gossans. Stibnite-quartz veins discovered on Chieftain Hill (Morning, Evening) are small and were originally considered to be unrelated to the extensive gossans, but exploration in the mid-1980's led to the discovery of the Better B., Pristine, Johnny B., Ebony and Ocean quartz-sulphide veins on the lower part of the hill, and indicated that the gossanous alteration zones may indeed be related to the mineralization.

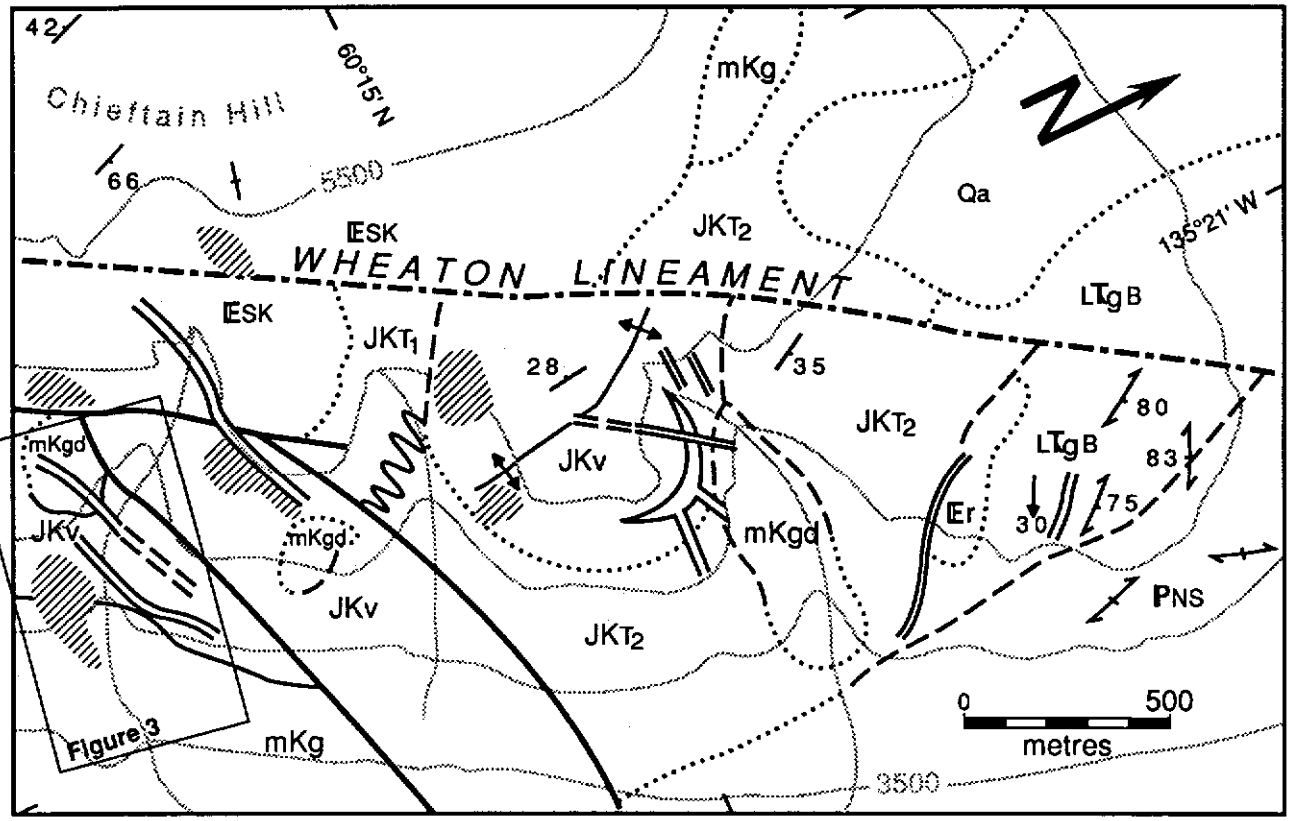
Despite considerable exploration efforts, very little is known about the geology of the deposit. This report describes the general geology and character of the property, and is based on fieldwork undertaken during the summer of 1991.

HISTORY

The Morning and Evening veins were probably discovered in 1893 (Bostock 1941, p. 34), but the first official staking in the area appears to be 14 claims which were recorded in 1906. The veins were initially explored by hand trenching, and remained dormant until 1964-65, when Yukon Antimony Corp. explored with road building and additional trenching.

The discovery of epithermal gold veins in the adjacent Mount Skukum volcanic complex encouraged Agip Canada Ltd to restake the occurences in 1981. A subsequent joint venture with Total Erickson Ltd formed the Mount Skukum Mining Corp. (MSMC), which explored the region with mapping, magnetometer surveys and road construction in 1986. Continued exploration and mapping by MSMC uncovered at least four quartz-sulphide veins which were explored with trenching, soil

Figure 1. Looking east towards Chieftain Hill. The light coloured regions are areas of alteration and gossans. The Ocean Vein is located in the area below the drill pads at the left of the photo. Note Mt Skukum in the distance (centre) and the Skukum Creek deposit (left).



LEGEND

Quaternary

Qa — alluvium

Early Eocene

ESK — Skukum Group volcanic rocks

Er — rhyolite

rhyolite dykes

Middle Cretaceous

mKg — quartz-rich granite

mKgd — hornblende granodiorite

Jurassic and Cretaceous

JKv — basalt and andesite flows

Tantalus Formation

JKT_1 — chert pebble conglomerate

JKT_2 — polymictic conglomerate

Paleozoic to Triassic

PNS — orthogneiss

LTgB — foliated granite (Bennett Batholith)

SYMBOLS

geological contacts

faults

Gossan

bedding, foliation, lineation

Figure 2. Geological map of eastern Chieftain Hill. The veins occur in the area marked "Figure 3."

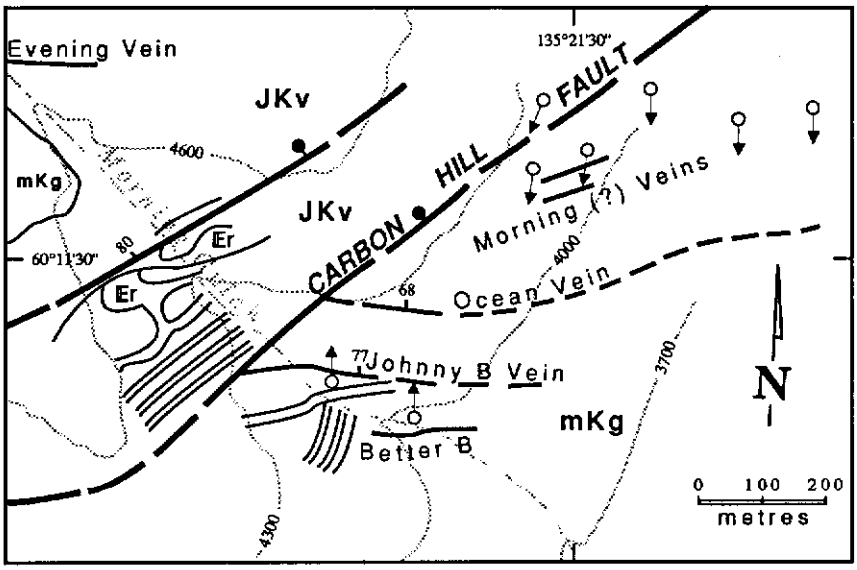


Figure 3 Location and extent of veins on Chieftain Hill. Note the dominant easterly strikes of the veins and the dykes. Symbols are the same as in Figure 2.

geochemistry, magnetometer, VLF-EM, HLEM and IP surveys. Seven diamond drill holes totalling 894 metres were drilled to test the Evening, Pristine, Better B. and Ocean veins in 1987.

Significant gold-rich drill intersections from the deep extensions of antimony veins on the east side of the Wheaton Valley in 1988 encouraged further exploration and drilling on the Chieftain Hill veins. In 1988, a total of eight diamond drill holes (902 m) were drilled on the Ocean and Morning veins. In 1989, the Ocean vein was explored with 1804 metres of diamond drilling in seven holes.

In 1991 the claims were purchased by Wheaton River Minerals Inc. which explored the Ocean vein with three deep drill holes (1033.5 m), and additional HLEM surveys.

REGIONAL GEOLOGY

Although Chieftain Hill sits among largely mid-Cretaceous hornblende granodiorite plutons of the eastern Coast Plutonic Complex, its geology is complex (Figure 2). Devonian? (Nisling Terrane) and Late Triassic orthogneiss are overlain by late Jurassic to mid-Cretaceous siliciclastic strata (Tantalus Fm.) interbedded with intermediate volcanic flows. Rhyolite and andesite dykes and associated extrusive volcanic rocks belong to the Eocene Mount Skukum Volcanic Complex (MSVC). Several normal faults juxtapose Eocene volcanics against the older Mesozoic assemblage and are presumably related to post volcanic subsidence and/or caldera collapse. A late swarm of rhyolite dykes may indicate resurgence of the MSVC.

The Wheaton Lineament is a large through-going feature which in places shows fault offset. Movement probably occured during Eocene time, and may also have been earlier.

The geology of the region is more thoroughly described by Wheeler (1961), Doherty and Hart (1988) and Hart and Radloff (1990).

PROPERTY GEOLOGY

The Chieftain Hill property can be separated into three geologically distinct regions juxtaposed by caldera bounding faults: (1) The downdropped side west of the faults is dominated by complexly distributed andesite flows and rhyolite tuffs of the MSVC unconformably overlying older Mesozoic andesite flows and conglomerate; (2) The centre region is a fault block composed of older Mesozoic andesite flows and conglomerate with some unconformably overlying Mt Skukum volcanic rocks; (3) East of the faults, mid-Cretaceous granitic rocks dominate and host most of the vein deposits.

The mineralized veins occur in a zone of thin, discrete, and continuous east-trending brittle shears cutting granite and granodiorite (Figure 3). The shears are up to three meters wide and are spaced 10-100 metres apart. Associated with the shears are several strong east-trending rhyolite dykes, 1-3 metres wide, and a few small quartz-feldspar porphyry

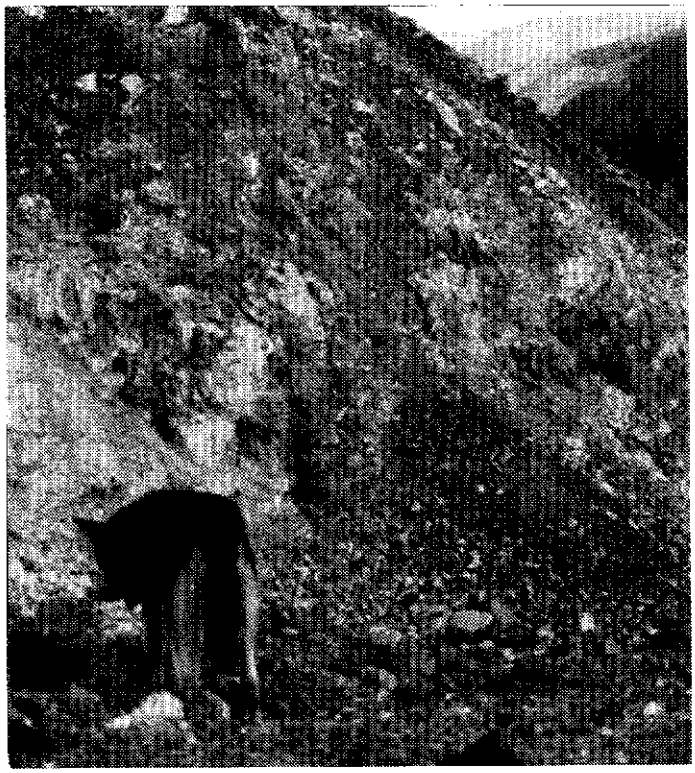


Figure 4. Argillically altered envelope (white) around brecciated Ocean vein as exposed in trench above Morning Gulch.

plugs. Many dykes are hosted or cut by the shears. Andesite dykes are thinner than, and pre-date the rhyolite dykes, but also have a strong easterly trend.

Rocks near the caldera bounding faults are variably altered and have given rise to several gossans. The east-trending veins, dykes and shears are cut by the caldera bounding faults. Only the Evening vein is located west of the fault.

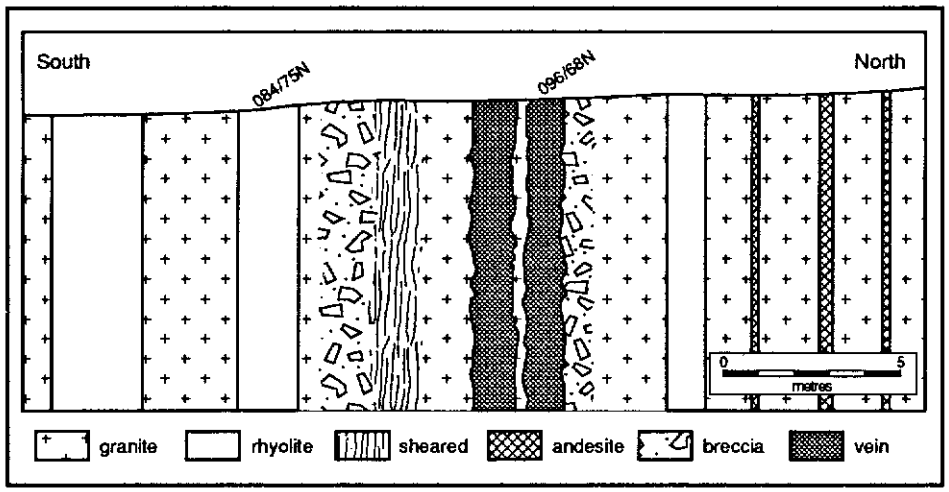


Figure 5. Sketch of measured section through Ocean vein as exposed in trench in Figure 4. Intense alteration affects the rocks for approximately three metres away from the vein. The most intense alteration is on the footwall (south) side.

MINERALIZATION

Three types of veins are present on Chieftain Hill.

(1) The Evening vein occurs in a 10 m wide fracture zone of phyllically altered Mesozoic andesitic volcanic rocks. It trends 090°, dips steeply, has been traced on surface for approximately 35 m, and has a maximum and average thickness of 1.4 and 0.4 m respectively. The vein is composed entirely of quartz, stibnite and minor sphalerite. Quartz dominates and is moderately brecciated, but where the vein is thickest, a 0.6 m portion in the centre consists almost entirely of radiating stibnite crystals. A drill hole intersected 0.04 opt Au and 3.41 opt Ag over a true width of 0.15 m. A selected sample of nearly massive stibnite collected by Bostock (1941) yielded 49.09% antimony.

(2) The Pristine, Better B, Ebony and Johnny B veins cut variably sheared granite or rhyolite dykes, and are east-trending and vertical to steeply north-dipping. All consist mostly of quartz, with medium to coarse-grained pyrite, arsenopyrite and lesser galena and spalerite. Sulphide minerals comprise 10-20% of the veins. The vein gangue is consists of early grey coarse-grained quartz and later clear, vuggy cockade quartz. Significant amounts of stibnite typical of the Evening vein are not found in any of the lower veins. Doherty and Hart (1988, p. 76), however, reported high Bi (508 ppm) from the Johnny B vein.

Rhyolite dykes encountered in drill core at Chieftain Hill have very siliceous flow banded margins which are locally oversaturated in silica and form banded chalcedony. Within these dykes, and in the adjacent host granite, are thin (1-6 cm wide) clear grey quartz veins with coarse-grained pyrite, black sphalerite and galena forming up to 20% of the vein. These veins resemble those described above, but are thinner. Grades of 0.910 opt Au and 100 opt Ag over 0.3 m have been obtained from these veins.

(3) The Ocean vein is the largest discovered on Chieftain Hill. It has a drill-tested strike length of 580 m and a vertical extent of 400 m. The vein strikes 096° and dips steeply to the north (65°-80°). It is up to 2.6 m wide but tapers eastward to 0.20 m. The Chieftain Hill fault truncatest the vein at its west end. Quartz-sulphide veins and quartz lithic breccia occur along a 4.5 m wide shear zone in quartz-rich granite. Around the shear zone is a 20-30 m argillic alteration envelope (Figure 4). Much of the wallrock adjacent to the vein is brecciated, gouge filled or riddled with sericite-altered rhyolite dykes (Figure 5). Since much of the vein is brecciated, some faulting must be syn- or post-emplacement. The Ocean vein is composed of variably brecciated, fine-grained, waxy white quartz with a dark grey matrix of fine-grained sulphide minerals and chlorite. The sulphide minerals are difficult to identify.

Precious metal values obtained in drill core have ranged as high as 0.275 opt Au and 2.56 opt Ag over 1.42 m, but are typically less than 0.05 opt gold and a few ounces per ton silver. A sample collected by Hart and Radloff (1990, p. 104) from the trench in Figure 4, yielded elevated Pb (5680 ppm), As (2250 ppm) and Ag (5.94 opt) values, and slightly elevated Sb (1900 ppm) and gold (1370 ppb) values.

DISCUSSION AND CONCLUSIONS

The Ocean vein strongly resembles the Skukum Creek and Becker-Cochran veins in texture and mineralogy, but so far lacks significant gold, silver or stibnite. The characteristics of this vein suggest it is: (1) mesothermal; (2) related to nearby antimony veins; and (3) genetically unrelated to the other veins on Chieftain Hill. The Evening antimony vein (elev. 4700') may represent the topographically higher part of a vein like the Ocean vein, and is preserved due to normal faulting.

The dominance of east-trending shears, dykes and veins and the similarity of the mineralization and alteration at Chieftain Hill to that at Goddell Gully on Carbon Hill suggests that mineralization at both locations resulted from the mineralizing event. The

similarity in geology at both locations further suggests that the two mineral-rich zones may be localized along a single strong structure which traverses the Wheaton River Valley.

Other veins on Chieftain Hill, with clear coxcomb quartz, weak or no alteration envelopes, are epithermal in nature. There is a strong suggestion that at least one phase of rhyolite dykes is genetically associated with this type of mineralization.

ACKNOWLEDGEMENTS

Roger Hulstein and Al Doherty (Aurum Geological Consultants Ltd on behalf of Wheaton River Minerals Inc.) generously gave the author access to the property, data, drill core and participated in discussions about the region. Kelly Olson (Geographix) is thanked for drafting the figures. Grant Abbott is acknowledged for editing this report. The Exploration and Geological Services Division of INAC supported this study as part of the author's thesis requirements at the University of British Columbia.

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YUKON MINFILE. Whitehorse map area (105 D). Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada.

RACA (FAWLEY)

Craig Hart
NTS: 105 D/3
Coordinates: 60°11'N, 135°32'W
Area: Wheaton River Valley
Access: Skukum Creek road
MINFILE #: 23 (YEX# 22)
Company: Westmount Resources Ltd
Comodities: Copper, gold

INTRODUCTION

Vivid gossans associated with the RACA occurrence on the south flank of Chieftain Hill have attracted the attention of prospectors and geologists for nearly a hundred years. This copper occurrence has been categorized as a porphyry, a vein, a breccia, and as native copper associated with basic lava. Recent exploration has focused on its precious metal potential. The Skukum Creek Rainbow Zone (Minfile #21) strikes northeast towards the RACA claims.

HISTORY

Claims were first staked on the occurence prior to July 1907 (Dickson 1907; NCMI 1983), but were not extensively explored until 1966, when Yukon Antimony Corp. covered the ground as part of its Mt Reid property and in 1967, conducted an IP survey, built roads, and drilled two holes (total approx. 277m). Mapping and sampling have been conducted several times since 1967 by various companies, including Archer Cathro and Associates Ltd (1972, 1973), Westmount Resources Ltd (1985), Mt Skukum Gold Mining Corp. (1986), most recently in 1987 by Omni Resources Limited.

REGIONAL GEOLOGY

The RACA property is on the fault-bounded, southeast margin of the Mount Skukum volcanic complex. Mid-Cretaceous granodiorite and Early Eocene granitic plutons of the eastern Coast Plutonic Complex underlie much of the surrounding area. More detailed descriptions of the regonal geology are given elsewhere in this volume, or by Wheeler (1961) and Hart and Radloff (1990).

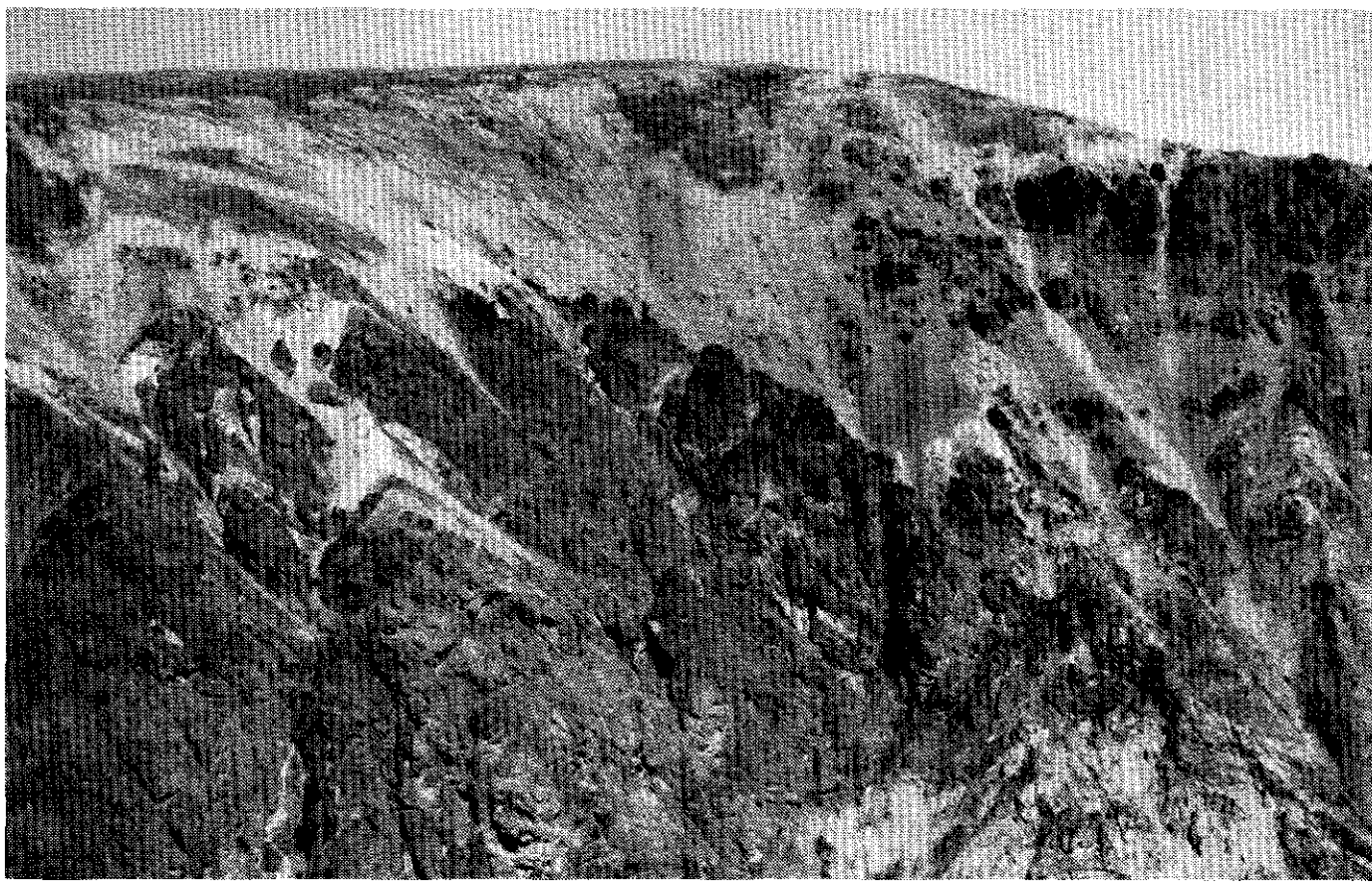

Figure 2. Looking north towards the south end of Chieftain Hill from the Skukum Creek property. The Main Showing (left) is characterized by intense malachite staining. The West Gossan is at the right of the photograph.

PROPERTY GEOLOGY

The property is underlain primarily by basal members of the Early Eocene Mt Skukum volcanic complex (Figure 1), including basal conglomerate of the Mount Reid Formation and epiclastic rocks, andesite breccias, flows and pyroclastics of the Butte Creek Formation (Hart and Radloff 1990). These rocks unconformably overlie the mid-Cretaceous Mt McNeil granodiorite. The clast-supported conglomerate is immature and dominated by sub-rounded cobbles of hornblende granodiorite and Nisling Terrane metamorphic rocks in a hematitic matrix.

At least two generations of variably oriented rhyolite and andesite dykes cut all of the above units. Many of the dykes intrude northeast-trending normal faults, which are probably related to the collapse of the Mount Skukum caldera.

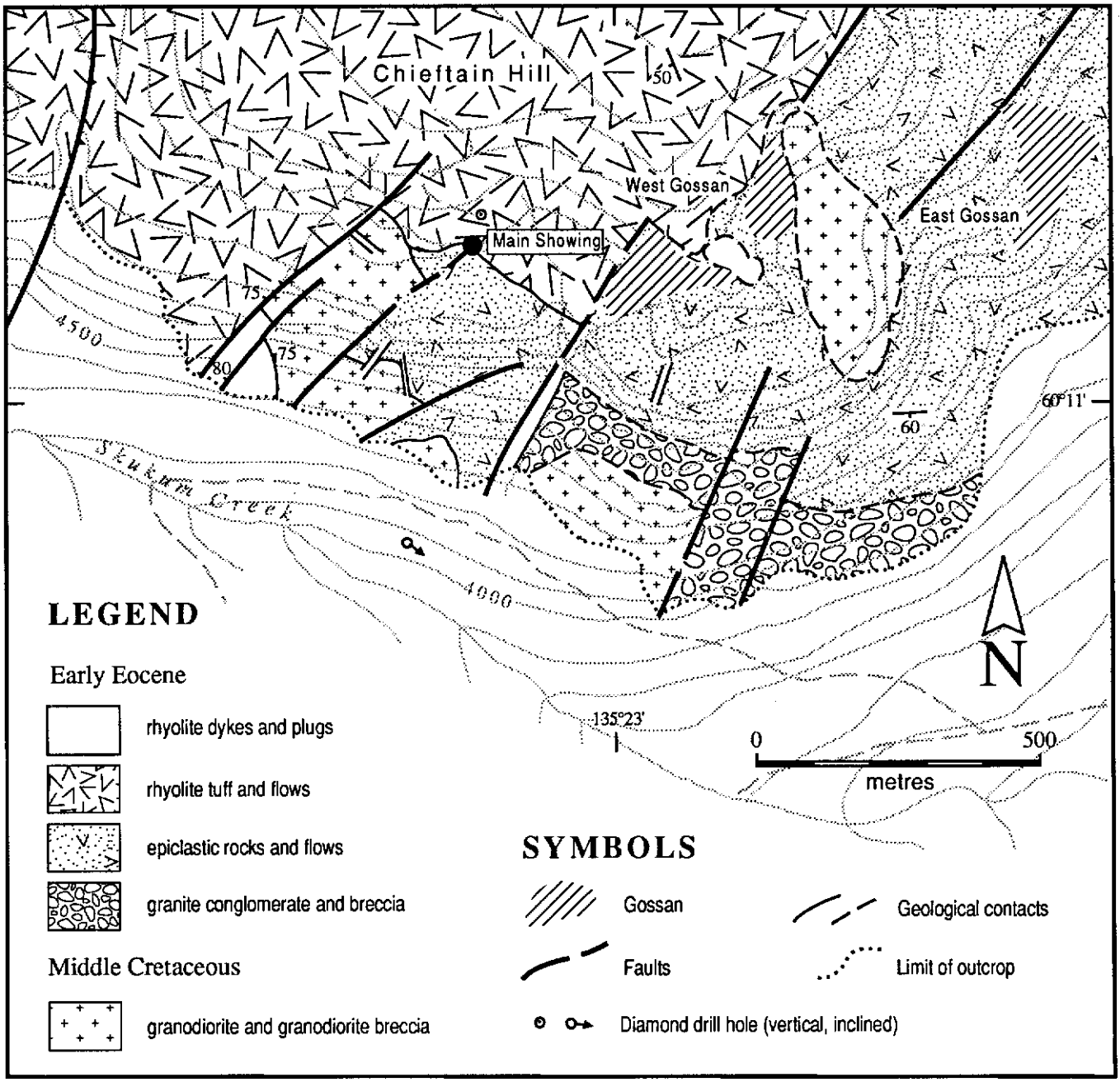

Figure 1. Geological map of the south end of Chieftain Hill. Of note are the locations of the East and West Gossans and the Main Showing.

MINERALIZATION

Intense orange gossan and bright green malachite staining cover much of the south end of Chieftain Hill (Figure 2). The gossans reflect weathering of a pyritiferous quartz-eye rhyolite plug and brecciated pyritiferous andesite. In 1988, Mount Skukum Gold Mining Corp. determined that anomalous gold values occur in the brecciated margins of the rhyolite plug near the East Gossan.

Exploration has focused on the West and East Gossans, and the Main Showing (Figure 1). In the Main Showing, malachite and lesser azurite are exposed on a cliff face over a width of about 1200' and a vertical extent of about 500' (Fawley 1967). Host rocks consist of granodiorite, brecciated granodiorite, hematitic granodioritic conglomerate and minor felsic tuff.

Copper staining on fracture surfaces in the Main Showing and elsewhere result from one of three types of mineralization:

(1) Disseminated copper in granodiorite. Pyrite, chalcopyrite and chalcocite occur as disseminations or in thin quartz stringers cutting granodiorite, or in brecciated granodiorite near rhyolite dykes and plugs. A mineralized envelope about three metres wide was seen around a one metre wide flow-banded rhyolite dyke. Phyllic and weak potassic alteration are evident in much of the granodiorite at the south end of Chieftain Hill. Calcite veinlets are common in fractures.

(2) Native copper in basic lavas. Wheeler (1961) reported "appreciable amounts of native copper" from the andesite breccias at the south end of Chieftain Hill. This mode of occurrence is similar to deposits in Chile described as "manto-type" by Sillitoe (1977). He suggested they formed as a result of hypogene alteration of subaerial (or shallow submarine) andesite flow tops, or in epiclastic breccia or sandstone.

(3) Unconformity related copper. Malachite is common in the matrix of the basal conglomerate and associated hematized epiclastic rocks. Copper is presumed to have been enriched through oxidation and during thermal events associated with Skukum volcanic activity.

An IP survey indicated a 1200 m long, north-trending anomalous zone coincident with copper staining (Fawley 1967). A 229 m diamond drill hole (collared above the Main Showing at 5800') tested the anomaly and intersected 150 m of pyritiferous andesite. Copper values obtained from sampling by Yukon Antimony Corp. were as high as 1.12% but averaged 0.42% (Fawley 1967). Westmount Resources reported a chip sample assay of 4.45 g/t Au and 21.9 g/t Ag across 20 metres. Selected samples reportedly graded up to 5% copper (INAC 1987, p. 157).

Other modes of mineralization on the property consist of: (1) quartz-rich, locally pyritiferous rhyolite dykes and plugs; and (2) bladed calcite veins similar to those hosting the Mt. Skukum gold deposit.

DISCUSSION

The RACA property has potential for both a porphyry copper deposit in granodiorite and altered andesite, and for gold in fault-controlled veins. The Skukum Creek Rainbow Zone strikes northeast into the RACA property, and at least one diamond drill hole drilled by OMNI Resources Inc. has intersected the Rainbow Zone on the north side of Skukum Creek. Structures on the RACA property resemble those on the Skukum Creek property, and the extension of the Rainbow Zone or other similar occurences could be present on the property. The Skukum Creek veins probably predate the Mount Skukum volcanic complex, and exploration for the extension of the Rainbow zone should be limited to the granodiorite exposures.

ACKNOWLEDGEMENTS

Evaluation of this property was sponsored by the Exploration and Geological Services of INAC as part of the author's thesis research. Conversations with Roger Hulstein (Aurum Geological Consultants Inc.) contributed to information presented here. Kelly Olson (Geographix) drafted the figure. Grant Abbott is thanked for editing this report.

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