019023

# ESKAY CREEK (104B 008)

(Fig. B1, No. 14)

By J.M. Britton, J.D. Blackwell[1]
and T.G. Schroeter

| | | | |
|---|---|---|---|
| LOCATION: | Lat. 56°38′ | Long. 130°27′ | (104B/9W) |
| | SKEENA MINING DIVISION. The property is located 84 kilometres north-northwest of Stewart and 4 kilometres east of Tom Mackay Lake on the Prout Plateau between the Unuk and Iskut rivers. | | |
| CLAIMS: | TOK 1-22, KAY 11-18. | | |
| ACCESS: | By fixed-wing aircraft to gravel strips at Bronson Creek or Johnny Mountain and thence by helicopter to the property, or by helicopter from bases at Bell-Irving River or Bob Quinn Lake on Highway 37. | | |
| OWNERS: | Stikine Resources Limited and Prime Resources Group Incorporated. | | |
| OPERATOR: | PRIME EXPLORATIONS LIMITED. | | |
| COMMODITIES: | Gold, silver, zinc, lead, copper, arsenic, antimony, mercury. | | |

# #21 ZONE DEPOSITS, ESKAY CREEK, NORTHWESTERN BRITISH COLUMBIA

## SUMMARY

Exploration in northwestern British Columbia has received international attention as a result of the #21 zone gold, silver and base metal discoveries at Eskay Creek, 80 kilometres north of Stewart. Geological reserves total 5 023 000 tonnes grading 15.6 grams per tonne gold and 441 grams per tonne silver at a cut-off grade of 1.4 grams per tonne gold. Included in this is a high-grade core of 1 223 000 tonnes averaging 49.4 grams per tonne gold, 1392 grams per tonne silver, 5.5 per cent zinc and 2.2 per cent lead.

The discovery area lies within a well-known belt of base and precious metal showings that has been explored intermittently since the 1930s. These prospects are contained in felsic volcanic rocks near the top of the Lower to Middle Jurassic Hazelton Group. Hostrock stratigraphy is: a lower sequence of interbedded dacitic tuffs and wackes; a middle sequence of rhyolitic tuffs and breccias; and an upper sequence of andesitic pillow breccias and flows, intercalated with mudstones.

The recent discoveries result from drill-testing the subsurface extensions of an old prospect, the #21 open cut, a low-grade, base and precious-metal stockwork that occurs in the rhyolite sequence. Drilling has traced exceptionally high-grade gold and silver-bearing sulphide mineralization more than 1400 metres along strike and 250 metres down dip.

Two deposits, the 21A and 21B, have so far been delineated. Both comprise stratabound massive sulphide lenses within a tuffaceous mudstone unit at the rhyolite-andesite contact. Disseminated and stockwork mineralization is also present in immediately underlying rhyolite. The northern part of the 21B deposit has two massive sulphide lenses within interflow mudstones of the upper sequence. The deposits have distinctively different mineralogies. The 21A is rich in stibnite and realgar with only minor pyrite and base metal sulphides. The 21B lacks stibnite and realgar but contains abundant sphalerite, tetrahedrite, boulangerite, bournonite, galena and pyrite.

Current work includes definition drilling and development of the 21B deposit as well as outlining additional discoveries such as the 21C and Pumphouse zones.

The Eskay Creek project is an exploration and development joint venture between Prime Resources Group Incorporated and Stikine Resources Limited, with Prime Explorations Limited as project operator.

## INTRODUCTION

This report describes the geology and mineral deposits of Eskay Creek highlighting the exciting discoveries made since September, 1988. It is necessarily a snapshot since aggressive exploration continues to bring fresh facts to light.

It is also a collaborative paper with contributions as follows: regional and property geology (JMB) are based on reconnaissance mapping conducted in the Iskut-Sulphurets gold belt since 1987 and property visits in July and August, 1989. Property history, stratigraphy and mineralization (JDB) stem from an association with the project since December, 1988. Photography, deposit sampling and geology (TGS) come from a property visit in September, 1989.

1 Consulting geologist to Prime Explorations Limited.

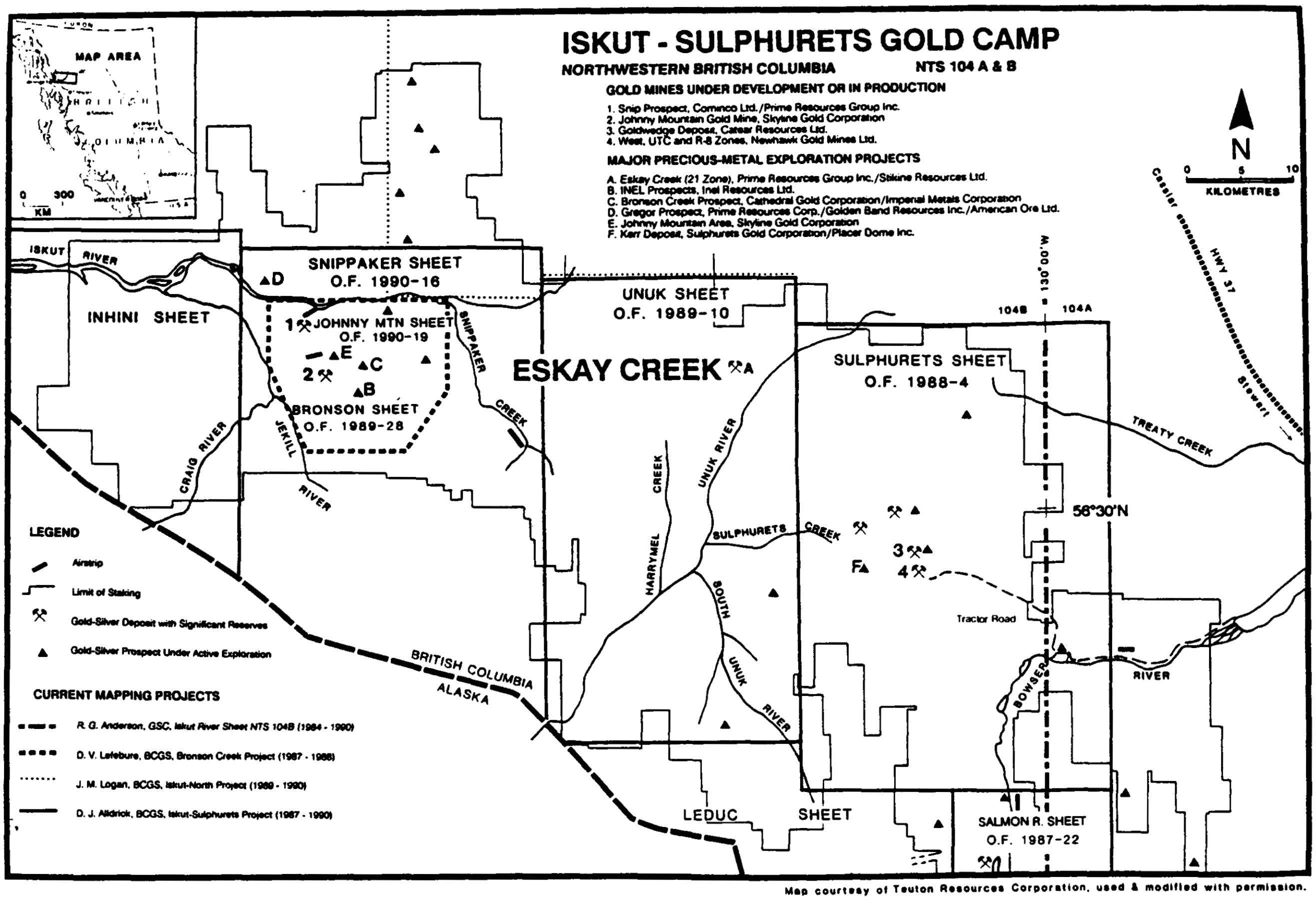



Figure B-14-1. Eskay Creek and the Iskut-Sulphurets gold camp: precious metal deposits and current mapping projects.

## LOCATION AND ACCESS

The Eskay Creek property is located 84 kilometres north-northwest of Stewart and 4 kilometres east of Tom Mackay Lake, in the upper Unuk River valley (Figures B-14-1, 2). Present access is by helicopter but transportation infrastructure is good. Stewart has the nearest paved air strip. Gravel air strips at Bronson Creek and Johnny Mountain, 40 kilometres west, receive scheduled fixed-wing service from Smithers and Terrace, B.C. and Wrangell, Alaska, and can handle aircraft up to the freight capacity of a Hercules transport. Helicopter bases at Bell-Irving River crossing, 42 kilometres east, and Bob Quinn Lake, 34 kilometres northeast, provide links with Highway 37.

Tom Mackay Lake was used by the first prospecting parties for float-plane support. Now-overgrown tote roads from the lake and a 425-metre air strip on Coulter Creek were built by early prospectors.

The recently completed Iskut River road access study (Smith and Gerath, 1989) proposed routes that would pass within 20 kilometres of the property.

## PHYSIOGRAPHY, VEGETATION AND CLIMATE

The property is located on the Prout Plateau, a rolling subalpine upland on the eastern flank of the Boundary Ranges of the Coast Mountains. Plateau elevation averages about 1100 metres. The property straddles a northeast-trending ridge that is flanked by Argillite Creek to the west and Eskay Creek to the east. These and other locally named creeks (Mackay and Ketchum) descend as deeply incised tributaries to the Unuk River canyon (elevation 300 metres) 3 kilometres to the east.

Below treeline (1050 metres) vegetation is typical of coastal rain forest. Mature stands of sub-alpine conifers have a locally dense understorey of flowers, bushes and slide alder. Precipitation is heavy, more than 100 centimetres a year, much of it falling as snow from November to March.

## CLAIMS AND OWNERSHIP

The TOK 1-22 and KAY 11-18 two-post claims cover the mineralized areas described in this report. Some surrounding mineral claims are being contested for irregularities in staking (The Northern Miner, February 12, 1990). The TOK and KAY blocks are jointly owned by Stikine Resources Limited and Prime Resources Group Incorporated (formerly Calpine Resources Incorporated). Prime Explorations Limited manage the exploration programs on these claims.

## Property History

The Eskay Creek area has a long history of intermittent exploration since its discovery and first staking in 1932 by T.S. Mackay, A.H. Melville and W.A. Prout (*B.C. Minister of Mines*, 1932 *et seq.*; Panteleyev, 1983; Harris, 1985, 1987; Blackwell, 1989). Early prospectors were attracted by a line of gossanous bluffs that extends more than 7 kilometres beside Eskay and Coulter creeks. Most exploration has been aimed at delineating high-grade precious metal mineralization, especially silver. Base metal deposits have been secondary targets.

The early work of Premier Gold Mining Company Limited (1935-1938) identified more than 30 distinct mineralized zones in upper Coulter and Eskay creeks and established a numerical labelling scheme (*e.g.* #5, #13, #21, #22). Earliest exploration efforts focused on the southern part of this area, subsequently shifting to the north. In 1939 an 84-metre adit (the Mackay adit) was driven on the "North End workings" which lie 3 kilometres southwest of the #21 zone.

Since World War II the #5, #6 (Emma), #21, #22 and #28 zones have been the main exploration targets. The period 1946-1976 saw the extension of the Mackay adit to 110 metres, 180 metres of drifting and crosscuts on the Emma adit, several thousand metres of diamond drilling, plus sampling of numerous trenches, pits and open cuts by Canadian Exploration Limited, American Standard Mines Limited, Western Resources Limited, Canex Aerial Exploration Limited, Mount Washington Copper Company, Kalco Valley Mines Limited and Texasgulf Inc. (*B.C. Department of Mines and Petroleum Resources*, 1970-1973; *B.C. Ministry of Mines and Petroleum Resources*, 1975, 1976; Gasteiger and Peatfield, 1975; Schink and Peatfield, 1976).

Between options Stikine Silver Limited continued surface work. In 1971 it extracted a 1.5-tonne sample of high-grade ore that yielded 9.3 grams of gold, 7435 grams of silver, 29 kilograms of lead and 42.7 kilograms of zinc from trenches on the #22 zone. In 1979 May-Ralph Industries Limited mined these trenches to produce 8.75 tonnes of hand-cobbed ore yielding 1263 grams of gold, 25 490 grams of silver, 412 kilograms of lead and 1008 kilograms of zinc.

In the early 1980s Ryan Exploration Limited (a subsidiary of U.S. Borax) completed a geochemical survey followed by shallow diamond drilling near the Emma and Mackay adits (George, 1983a, b). In 1985 Kerrisdale Resources Limited drilled four holes near the #21 open cut to test the extent of mineralization beneath Premier's earlier trenches and drilling (Kuran, 1985). This drilling identified a new zone of spotty gold and silver values hosted in altered felsic volcanics. The best intersection was 5 metres of 1342 grams per tonne silver and 3.4 grams per tonne gold.

## Discovery and Current Work

Calpine Resources Incorporated announced its discovery in November, 1988, during the initial ($300 000) phase of a $900 000 program to earn a 50 per cent interest in the TOK and KAY claims. It had optioned the property in May, 1988, commencing soil sampling and geological mapping in early August and a six-hole diamond drilling program in mid-September. Five holes were planned to test the #21 open cut and its possible extensions. Three holes (CA88-2, 4 and 5) encountered stockwork mineralization in rhyolite. Two 50-metre step-out holes (CA88-3 and 6) intersected a massive sulphide body, above target depths, at the contact between rhyolite and overlying andesite. These are considered the discovery holes, with hole CA88-6 cutting over 29 metres of stibnite and realgar-rich core grading 26 grams gold and 38 grams silver per tonne, including 16 metres of 46 grams gold and 68 grams silver (George Cross News Letter No. 213/1988). Follow-up drilling during November and December 1988 established the orientation and continuity of this blind discovery. Ten addditional holes (CA88-7 to 16) totalling 2 099 metres were completed.

In January 1989 the Joint Venture started a winter program of definition and step-out diamond drilling (Mallo, 1989b). A total of 13 368 metres in 54 holes (CA89-17 to 70) was completed by early May, 1989. The work outlined the 21A deposit, then called the South zone, and suggested the presence of more blind mineralization farther to the north. During this period a geophysical survey was flown over the Prout Plateau (Mallo, 1989a; Mallo and Dvorak, 1989).

Drilling resumed in June. On August 22 results from step-out drilling 1 kilometre north of CA88-6 were announced. Hole CA89-109 had intersected 61 metres that assayed 99 grams gold and 29 grams silver, including 19 metres of 266 grams gold and 46 grams silver per tonne (George Cross News Letter No. 161/1989). The news galvanized the Vancouver Stock Exchange, and new trading records were set. Speculative euphoria was such that just two weeks later hole CA89-126, which cut 43 metres of 18 grams gold and 378 grams silver per tonne was considered "low grade" and caused a dip in share prices (The Northern Miner, September 18, 1989).

By December, 1989, a total of 29 550 metres had been completed in 125 holes (CA89-71 to 205). This work identified the most important area of mineralization discovered so far, the 21B deposit (initially termed the Central and North zones) and further defined the 21A deposit. Other exploration work included establishing a survey grid over the entire property, geochemical and ground geophysical surveys, prospecting, geological mapping of selected areas and legal surveys of the TOK and KAY claims. Seven diamond-drill holes were completed on the #22 zone totalling 1321 metres. Initial environ-

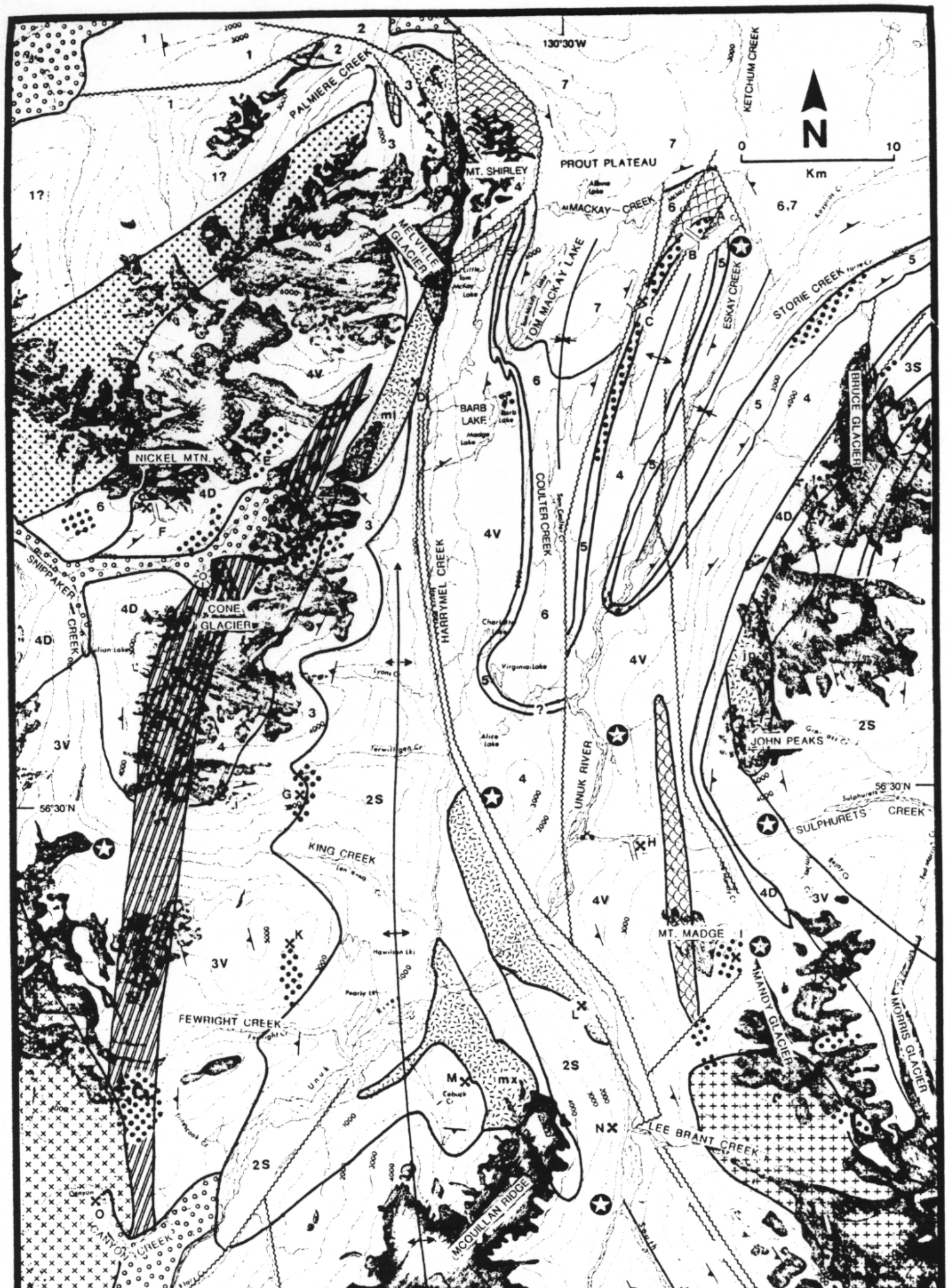



Figure B-14-2. Regional geology , Unuk map area.

# LEGEND

## INTRUSIVE ROCKS

| | |
| --- | --- |
| Eocene | King Creek dike swarm |
| | Coast plutonic complex |
| | Lee Brant stock |
| Jurassic | Lehto batholith |
| M. Jurassic to U. Triassic | Diorite and Gabbro:<br>Nickel Mountain (nm)<br>John Peaks (jp)<br>Melville (mv)<br>Max (mx) |
| U. Triassic | Meta-quartz-diorite<br>Bucke Glacier stock |

## STRATIFIED ROCKS

| | | |
| --- | --- | --- |
| Recent to Pleistocene | | Basalt flows and tephra |
| M. Jurassic | 7 | Bowser Lake Group: shale, conglomerate |
| | 6 | Salmon River formation: turbidite, pillow lava |
| | 5 | Mount Dilworth formation: felsic pyroclastics |
| L. Jurassic | 4 D V S | Betty Creek formation: epiclastic and pyroclastic rocks |
| | 3 V S | Unuk River formation: andesitic tuff, wacke, siltstone |
| U. Triassic | 2 V S | Stuhini Group: basaltic tuff, wacke, limestone |
| Permian and older | 1 | Stikine assemblage: phyllite, meta-volcanics, limestone |

D = Dacite
V = Andesitic volcanics (with <40% sediments)
S = Sediments (with <40% volcanics)

## SYMBOLS

Compositional layering (bedding; foliation)
Contact
Anticline; syncline
Fault; lineament
Pillow lavas
Recent volcanic vent
Gossan
Adit
Stream sediment gold values >90th percentile
Mineral occurrence
Placer occurrence

## MINERAL OCCURENCES

| | NAME | COMMODITY |
| --- | --- | --- |
| A | Eskay | Au,Ag,Pb,Zn,Cu,As,Sb,Hg |
| B | Emma | Au,Ag,Pb,Zn,Cu |
| C | Mackay | Au,Ag,Pb,Zn,Cu |
| D | Copper King | Cu,Fe |
| E | Colagh | Cu |
| F | E&L Nickel | Ni,Cu |
| G | Cole | Cu,Au,Ag |
| H | Cumberland/Daly | Au,Ag |
| I | Mt. Madge (C-10) | Au,Ag,Zn |
| J | Mt. Madge (GFJ) | Au,Ag,Cu,Zn |
| K | VV | Cu,Mo,Au,Ag |
| L | Chris & Anne | Cu,Fe |
| M | Max | Fe,Cu |
| N | Unuk Jumbo | Fe,Cu |
| O | Black Bear | Au,Pb,Zn |
| P | Boulder Creek | Pb,Zn,Au,Cu |
| Q | Doc | Au,Ag,Pb,Cu |
| R | Globe | Au,Ag,Pb,Cu |
| S | Alf | Au,Ag |

## TABLE B-14-1
## PUBLISHED RESERVE ESTIMATES, ESKAY CREEK

### COMBINED #21 ZONE DEPOSITS

| | Geological Reserve Category | Tonnes[a] | Gold g/tonne | Silver g/tonne |
|---|---|---|---|---|
| 1[b] | Cut-off grade = 1.4 grams per tonne gold | | | |
| 21A & B DEPOSITS | Probable | 3 343 000 | 19.2 | 521.1 |
| | Possible | 1 680 000 | 8.6 | 281.1 |
| | TOTAL | 5 023 000 | 15.6 | 440.8 |
| 2[c] | Cut-off grade = 1.7 grams per tonne gold equivalent | | | |
| SOUTH & NORTH AREAS | Indicated | 4 157 890 | 17.8 | 453.6 |
| | Inferred | 3 033 990 | 16.7 | 357.9 |
| | TOTAL | 7 190 890 | 17.4 | 413.1 |

### RESERVE ESTIMATES BY DEPOSIT AND GRADE

| Deposit | Geological Reserve Category | Tonnes | Gold g/tonne | Silver g/tonne | Lead[d] % | Zinc[d] % |
|---|---|---|---|---|---|---|
| 1[c] | Cut-off grade = 1.7 grams per tonne gold equivalent | | | | | |
| SOUTH AREA | Indicated | 1 036 920 | 8.9 | 127.5 | | |
| | Inferred | 434 610 | 7.7 | 117.6 | | |
| | SOUTH TOTAL | 1 471 530 | 8.6 | 124.5 | | |
| NORTH AREA | Indicated | 3 119 980 | 20.8 | 561.9 | | |
| | Inferred | 2 599 380 | 18.2 | 388.1 | | |
| | NORTH TOTAL | 5 719 360 | 19.6 | 487.5 | | |
| 2[b] | Cut-off grade = 1.4 grams per tonne gold | | | | | |
| 21A | Probable | 1 058 000 | 8.2 | 96.0 | | |
| | Possible Geological | 355 000 | 4.1 | 181.7 | | |
| | 21A TOTAL | 1 412 000 | 7.2 | 116.6 | | |
| 21B | Probable | 2 285 000 | 24.3 | 716.6 | | |
| | Possible | 1 325 000 | 9.9 | 5.1 | | |
| | 21B TOTAL | 3 610 000 | 19.2 | 565.7 | | |
| 3[b] | Cut-off grade = 3.4 grams per tonne gold | | | | | |
| 21A | Probable | 751 000 | 11.0 | 109.7 | | |
| | Possible | 215 000 | 5.1 | 188.6 | | |
| | 21A TOTAL | 966 000 | 9.6 | 126.9 | | |
| 21B | Probable | 1 317 000 | 39.4 | 1422.9 | | |
| | Possible | 593 000 | 17.8 | 562.3 | | |
| | 21B TOTAL | 1 910 000 | 33.6 | 1155.4 | | |
| 4[b] | Cut-off grade = 8.6 grams per tonne gold | | | | | |
| 21A | Probable | 156 000 | 24.7 | 236.6 | | |
| | Possible | 28 000 | 11.7 | 202.3 | | |
| | 21A TOTAL | 184 000 | 22.6 | 229.7 | | |
| 21B | Probable | 875 000 | 58.6 | 1604.6 | 2.2 | 5.4 |
| | Possible | 347 000 | 26.4 | 857.2 | 2.1 | 5.6 |
| | 21B TOTAL | 1 223 000 | 49.4 | 1392.0 | 2.2 | 5.5 |

NOTES:
a) Tonnage and grade figures are converted from imperial measurements reported in George Cross News Letter No. 72/1990 and include drill-hole data to the end of December, 1989 (hole CA89-205). Conversion factors are: 1 troy ounce per short ton = 34.286 grams per tonne; 1 short ton = 0.90718 tonne; numbers are rounded off. Cut-off grades are stated on each table.
b) Calculated by Roscoe Postle Associates Incorporated on behalf of Calpine Resources Incorporated. Reserves are undiluted and uncut. The calculation uses 2 metres minimum thickness and a specific gravity of 2.76.
c) Calculated by Orcan Mineral Associates Limited on behalf of Stikine Resources Limited. The calculation includes all mineralization down to 0.050 ounce per ton (1.714 grams per tonne) gold equivalent over 3.0 metres of core length (80 ounces silver = 1 ounce gold). Reserves are undiluted. Gold assays greater than 20.0 ounces per ton (685.7 grams per tonne) were cut to that figure. The calculations use a minimum block thickness of 3.0 metres and a specific gravity of 2.8.
d) blank = not calculated.

mental and engineering studies commenced, including an assessment of possible surface routes to Highway 37.

Since early January, 1990, six diamond drills have been at work on the 21B deposit defining it on 25-metre centres and testing for extensions beyond the currently outlined reserve. To the end of March 44 970 metres have been drilled in 235 holes (CA90-206 to 440).

Ore reserve estimates have been calculated utilizing drill results to the end of December, 1989 (Table B-14-1). Advanced engineering studies have been started to evaluate deposit metallurgy, and underground exploration and mine planning requirements. This program is ongoing.

It is one of the ironies of exploration history that these deposits were not discovered years earlier. Orpiment and realgar rich-boulders were found in the most northerly of the trenches on the #21 open cut in the 1930s (G.A. Dirom Sr., personal communication, 1990). These returned high gold and silver assays, but were not followed up. Premier drilled beneath the southern trenches and intersected spotty, lower grade mineralization. The float boulder analyses were omitted from all but the earliest versions of assay plans and soon slipped into obscurity.

## REGIONAL GEOLOGY

### GEOLOGIC SETTING

The Eskay Creek deposits sit in the centre of the Iskut-Sulphurets gold camp (Figure B-14-1) which has been a focus of recent geological mapping by the B.C. Geological Survey Branch (Alldrick and Britton, 1988; Alldrick *et al.*, 1989, 1990a; Britton, 1988; Britton and Alldrick, 1988; Britton *et al.*, 1989, 1990) and the Geological Survey of Canada (Anderson, 1989; Anderson and Thorkelson, 1990; Read *et al.*, 1989). Earlier work by Grove (1969, 1971, 1986) incorporating the unpublished geological maps of Newmont Mines Limited (1959-1962) has also contributed to a modern understanding of the geology of the area.

The Unuk valley lies along the western margin of the Intermontane tectonic belt and, according to terrane concepts, is entirely within Stikinia (Wheeler *et al.*, 1988). Anderson (1989) has defined the regional stratigraphic framework of this part of Stikinia to consist of four tectonostratigraphic assemblages bounded by unconformities:

- Paleozoic Stikine assemblage.
- Triassic to Jurassic volcanic-plutonic arc complexes;
- Middle and Upper Jurassic Bowser overlap assemblage;
- Tertiary Coast plutonic complex;

Stratigraphic nomenclature in this part of the Intermontane Belt is in a state of flux. For this reason local formation names used in this report are informal. Resolution awaits advances in mapping. Terms shown in brackets refer to previously published maps and reports (Alldrick *et al.*, 1989; Britton *et al.*, 1989; Grove, 1986).

Stratigraphic reconstruction of the Unuk area has proved an intractable task due to a lack of good markers and way-up structures, particularly in volcanic successions, paucity of fossils and faults. A reasonably well-defined lithostratigraphic succession extends from Stewart through the Sulphurets area to the Unuk valley (Alldrick and Britton, 1988; Alldrick *et al.*, 1989; Anderson and Thorkelson, 1990). Correlation across the Unuk is complicated by north-striking faults that are part of a major structural break that extends from the South Unuk River along Harrymel Creek to Forrest Kerr and More creeks in the north (Alldrick *et al.*, 1989; Read *et al.*, 1989).

Sufficient fossil, radiometric and lithostratigraphic data exist to permit broad correlation with the main Mesozoic groups: Stuhini (Takla)[2], Hazelton and Bowser Lake. Correlation with formations, members or facies of these groups is more conjectural. Lithostratigraphic similarities alone are an uncertain basis for correlation.

### STRATIGRAPHY

Bedrock in the Unuk map area consists of a thick (more than 5000 metres) succession of Upper Triassic to Middle Jurassic volcano-sedimentary arc-complex lithologies underlain by Permian and older arc and shelf sequences and overlain by Middle and Upper Jurassic marine-basin sediments (Figure B-14-2). Rocks have been folded, faulted and weakly metamorphosed, mainly during Cretaceous time. Dioritic to granitic rocks that crop out east and west of the Prout Plateau represent at least four intrusive episodes spanning Triassic to Tertiary time. Remnants of Pleistocene to Recent basaltic eruptions are preserved locally.

2 Prior to the early 1980s Takla was the usual name for Triassic strata (Grove, 1986). Since then the term Stuhini has become more common. The Stuhini Group was first defined by Kerr (1948); the Takla by Armstrong (1949). The groups comprise Upper Triassic strata that fringe the Bowser Basin. As terrane concepts emerged and became entrenched in the literature a new convention has developed. Stuhini is now the preferred term for Triassic strata west of the Cache Creek Terrane (*e.g.* in Stikinia); Takla for similar strata east of the Cache Creek Terrane (*e.g.* in Quesnellia). Otherwise there is little difference in lithology, chemistry, rock associations, and age between Stuhini and Takla groups.

## PALEOZOIC

### PERMIAN AND OLDER STIKINE ASSEMBLAGE

Stikine assemblage rocks crop out along the Iskut River (Read *et al.*, 1989), 15 kilometres northwest of Eskay Creek. They consist of phyllite, siliceous siltstone, ribbon chert, tuffaceous wacke and foliated plagioclase porphyry. Thick limestones, felsic tuffs and basaltic pillow lavas occur farther west (Anderson, 1989; Logan *et al.*, 1990a, b). The assemblage presumably forms the basement to Mesozoic strata in the Unuk area.

## MESOZOIC

Mesozoic strata form an apparently conformable, but discontinuous succession spanning Carnian to Bathonian time. Five lithostratigraphic packages are recognized.

### UPPER TRIASSIC STUHINI GROUP

The oldest rocks consist of immature clastic sediments with volcaniclastic interbeds. Pyroxene-phyric breccias form distinct markers east of Unuk valley between Bruce and Jack glaciers. Limestone lenses and beds, locally quite coarsely crystalline, crop out to the south and west along the South Unuk River and Harrymel Creek. The upper strata of this unit may be marked by a distinctive granite-cobble conglomerate exposed locally around John Peaks (Anderson and Thorkelson, 1990; Britton *et al.*, 1989). Rare occurrences of Carnian and Norian index fossils (Grove, 1986; Gunning, 1986) such as *Halobia*, found on McQuillan Ridge, and *Monotis*, found north of Bruce Glacier, and radiometric dating of intrusive rocks (Anderson and Bevier, 1990) establish a Late Triassic age. On the basis of age and lithology these rocks can be assigned to the Stuhini Group. The group includes parts of the Lower Volcanosedimentary and Andesite sequences of Alldrick *et al.* (1989). They appear to pass conformably upwards into Lower Jurassic Hazelton Group strata between Storie and Treaty creeks but elsewhere there is a marked unconformity (Anderson, 1989; Anderson and Thorkelson, 1990).

### LOWER TO MIDDLE JURASSIC HAZELTON GROUP

Most of the upper Unuk valley is underlain by rocks of the Hazelton Group. Four lithostratigraphic sequences ("formations") have been distinguished (Alldrick *et al.*, 1989; Britton *et al.*, 1989).

#### Unuk River Formation (Andesite Sequence)

The lowest is a thick, monotonous sequence of fine-grained andesitic pyroclastics and flows with tuffaceous turbidite, wacke and conglomerate interbeds. Andesite tuffs are feldspar and hornblende phyric. There are few useful markers in this sequence. The uppermost strata, particularly around Brucejack Lake, are distinguished by the appearance of coarse potassium-feldspar phenocrysts in plagioclase-hornblende-phyric andesite ("Premier porphyry"). East of the Unuk River and north of John Peaks, sedimentary rocks increase in the section, probably representing the distal facies of an island arc.

Rocks of this formation have not yet been identified at Eskay Creek. Age of this formation is poorly constrained by fossils.

#### Betty Creek Formation (Pyroclastic-Epiclastic Sequence)

Overlying the Unuk River formation is a heterogeneous sequence of varicoloured andesitic to dacitic tuffs and flows, interbedded with volcanic-derived sedimentary rocks and columnar-jointed dacites. Epiclastic and volcaniclastic members are locally hematitic. Thin beds of fine-grained purple tuff that crop out in the headwaters of Eskay Creek (Whiting, 1946) are probably members of this formation (Figure B-14-4). There is evidence for both subaerial and submarine deposition: airfall pyroclastic textures on the one hand; marine fossils and pillow lavas on the other. In the Unuk area thick sequences of pillow lavas, mostly andesite to basaltic andesite, crop out near Divelbliss Creek, Mount Madge and Mount Shirley. Anderson and Thorkelson (1990) correlate some of these with the Bajocian Salmon River formation.

Early Jurassic, probably Sinemurian or Pliensbachian, fossils have been identified near the base of this formation near Atkins Glacier (T.P. Poulton, personal communication, 1988). Late Pliensbachian fossils have been found near its top, at Eskay Creek (Smith and Carter, 1990). Its upper age may be early Toarcian.

#### Mount Dilworth Formation (Felsic Volcanic Sequence)

The Betty Creek formation is overlain by a thin but widespread sequence of felsic pyroclastic rocks, including welded tuffs. Rocks are typically white weathering, or rusty where pyritiferous, waxy grey to white, dacitic ash and lapilli tuffs with centimetre-scale bedding. No radiometric dates have been obtained from this formation despite several attempts (Alldrick *et al.*, 1987a; Brown, 1987). On the basis of fossil evidence elsewhere (Alldrick, 1987; Brown, 1987) its age is Toarcian. The sequence represents the terminal stages of widespread volcanism in the Stewart complex. The unit is traceable from Kitsault to the Prout Plateau, where it is host to many base and precious metal showings (Figure B-14-4), but it has not been found west of the South Unuk - Harrymel fault (Hancock, 1990; MacLean, 1990).

#### Salmon River Formation (Siltstone Sequence)

The uppermost formation of the Hazelton Group is a thick sequence of mainly turbiditic siltstones and fine sandstones with rare conglomeratic, tuffaceous or volcanic interbeds.

Alldrick *et al.* (1989) did not separate the Salmon River formation and the overlying Bowser Lake Group because of their lithologic similarity. Contacts between Salmon River and Bowser Lake strata are locally conformable and even gradational (Anderson and Thorkelson, 1990). Strata are best distinguished by their fossil fauna.

The Salmon River formation (Toarcian to Bajocian) reflects the transition between the last vestiges of arc volcanism and the onset of entirely marine sedimentation represented by the Bathonian and younger Bowser Lake Group.

On the basis of fossil assemblages Anderson and Thorkelson (1990) divide the Salmon River formation into two unnamed members: a lower, Toarcian member and an upper, Bajocian member.

**The lower member of the Salmon River formation** is a coarse, pyritiferous, fossil-bearing, calcareous wacke, typically less than 2 metres thick. Although generally too thin to map it is richly fossiliferous. Overlap of belemnites and the pelecypod *Weyla* confines this member to the lower to middle Toarcian.

It is best exposed from Stewart north along the Bowser River. This unit has been identified in fault-bounded slices on the east and west sides of the Bruce Glacier but has not been recognized in the Unuk valley. Anderson and Thorkelson (1990) correlate it with folded and faulted siltstones near Storie Creek and a 1500-metre thick sequence of Toarcian basinal sediments located 40 kilometres north of Eskay Creek (Read *et al.*, 1989). It may also correlate with the richly mineralized "contact unit" of the Eskay Creek deposit (Figure B-14-4).

The **upper, Bajocian member of the Salmon River formation** is divided into three major facies: an eastern facies in the Stewart-Sulphurets area ("Troy Ridge"); a medial facies in the Unuk area ("Eskay Creek"); and a western, speculative facies in the Snippaker area.

The eastern (Troy Ridge) facies extends north from Stewart along the Bowser River into the Sulphurets area. It comprises "black, cherty, radiolarian-bearing shale and white-weathering, reworked felsic tuffs" (Anderson and Thorkelson, 1990). The striped appearance of these rocks has given rise to the name "pyjama beds" (Brown, 1987; Anderson and Thorkelson, 1990).

The Eskay Creek facies is stratigraphically equivalent to these pyjama beds. It consists of "limestone, limy or cherty siltstone and shale [that] interfinger with, and overlie thick pillow lava and pillow lava breccia" (Anderson and Thorkelson, 1990). Its age is middle Toarcian to Bajocian based on fossil data from Eskay Creek (Smith and Carter, 1990). On the basis of age and lithology Anderson and Thorkelson include pillow lava sequences that extend up to 65 kilometres north of Eskay Creek.

Thick pillow volcanic sequences form marker units up to 5 kilometres long east of the South Unuk River near Divelbliss Creek and from Mount Madge to John Peaks (Figure B-14-2; Grove, 1986; Alldrick *et al.*, 1989). Pillow lavas are also exposed at two stratigraphic levels on Mount Shirley (Read *et al.*, 1989; B.C. Geological Survey Branch unpublished data). These sequences are poorly constrained by fossils. Alldrick *et al.* (1989) assigned them to the Betty Creek formation on the basis of stratigraphic position and correlation with similar rocks in the Sulphurets area (Alldrick and Britton, 1988). Anderson and Thorkelson (1990) correlate them with the Eskay Creek facies on the basis of lithology.

### MIDDLE TO UPPER JURASSIC BOWSER LAKE GROUP

#### Ashman Formation

Much of the northern Prout Plateau is underlain by sedimentary strata that can be assigned to the Bowser Lake Group on the basis of lithology and age. The rocks comprise thick sequences of thinly bedded siltstone, shale and sandstone with thin lenses and sheets of chert-pebble conglomerate that represent both shoreline and river-channel facies. The conglomerates permit correlation the Ashman Formation, the widespread basal unit of the Bowser Lake Group (Tipper and Richards, 1976). The provenance of the chert is generally considered to be the Cache Creek Group. The Bathonian ammonite *Inniskinites* occurs in shale overlying conglomerate, near the southern end of Tom Mackay Lake, indicating that Bowser Lake Group rocks extend this far southwest (Gunning, 1986; Smith and Carter, 1990).

### PLEISTOCENE AND RECENT

Pleistocene and Recent basaltic flows and tephra are preserved west of the Harrymel-Unuk drainage and in the Iskut valley (Grove, 1986; Read *et al.*, 1989; Stasiuk and Russell, 1990). None have been reported on the Prout Plateau. They consist of coarsely porphyritic feldspar and olivine-bearing basalts. Most flows occupy valley bottoms and many display columnar jointing. Some are poorly preserved and may have erupted onto or under ice. Radiocarbon ages from sediments in the Iskut valley indicate eruption as recently as $2610 \pm 70$ years B.P. (Read *et al.*, 1989).

## INTRUSIVE ROCKS

Stratified rocks in the Unuk area have been intruded by a series of plutons, sills, dikes and dike swarms that range in age from Late Triassic to Oligocene (Alldrick *et al.*, 1989).

The oldest dated plutons are the McQuillan Ridge diorite and Bucke Glacier gneissic quartz diorite which yielded Late Triassic ages (Anderson and Bevier, 1990).

Jurassic stocks nearest the Eskay property are the Melville and John Peaks diorites. The large diorite stock mapped on the southern part of Mount Shirley (Grove, 1986; Read *et al.*, 1989) is a small dioritic sheet that appears to be conformable with the volcanic stratigraphy. It may represent a synvolcanic sill similar to the Barb

Lake intrusions, southwest of Tom Mackay Lake. These form a discontinuous line of fine to medium-grained hornblende diorite dikes, sills or plugs intruding mixed sedimentary and volcaniclastic rocks. They may be feeders to pillow lavas seen on Mount Shirley. Apart from these, intrusions are rare on the Prout Plateau.

Tertiary magmatism is mainly represented by Eocene granitic rocks of the Coast plutonic complex which crops out 30 kilometres southwest of Eskay Creek and also forms a large satellitic pluton (the Lee Brant stock) south of Mount Madge (Figure B-14-2). The Tertiary (Eocene) King Creek dike swarm which forms a north-trending belt west of Harrymel Creek may record the youngest major intrusive event in the map area. Rare lamprophyre dikes are products of Oligocene-Miocene ultrapotassic magmatism (Brown, 1987; Alldrick *et al.*, 1987a; Anderson and Bevier, 1990).

## STRUCTURE

### FOLDS

Regional folds are interpreted on the basis of lithologic correlation. The Mount Dilworth formation and overlying sediments form a tight anticine-syncline pair between Unuk River and Harrymel Creek (Figure B-14-2). Felsic strata form dip slopes on both sides of the Unuk valley. They also form a traceable unit extending along the east side of Coulter Creek from its confluence with the Unuk almost to Mackay Creek. Felsic tuffs that crop out near Little Tom Mackay Lake are interpreted to be the western limb of this regional fold but they have not been traced north beyond the base of Mount Shirley. The unit has not been traced around the nose of the anticline at Eskay Creek nor the keel of the synclines in Coulter and Unuk valleys.

### FAULTS

Along the eastern slopes of the South Unuk River valley schistose rock fabrics define a northwest-trending, northeast-dipping belt of shearing and faulting. It is interpreted as a major northeast-side-down normal fault. This structure passes along strike into the subvertical Harrymel Creek fault which juxtaposes Triassic strata to the west against Jurassic rocks to the east (Alldrick *et al.*, 1989; Britton *et al.*, 1989). This fault extends, with offsets, into Forrest Kerr and More creeks where a subvertical, east-side-down normal fault has been mapped (Read *et al.*, 1989; Logan *et al.*, 1990a,b). It is a zone of recent faulting that may represent a long-lived crustal break.

Splays off the South Unuk - Harrymel fault strike northwards up the Unuk valley, Coulter Creek and across the Prout Plateau. The pattern visible in both air photos and synthetic aperture radar images (Webster and McMillan, 1990) is that of a festoon of arcuate splays or horsetails characteristic of strike-slip fault complexes. These splays are truncated by a younger east-west structure along the Iskut valley.

Strike-slip faulting may have modified regional folds. Volcanic rocks of Eskay Creek may be a "pop-up" or positive flower structure (Woodcock and Fischer, 1986) in a strike-slip complex. The siltstone sequence may be tectonically draped over more competent blocks of volcanic strata.

Low-angle reverse, thrust or décollement faults with small displacements are common in the Iskut-Sulphurets area (Britton and Alldrick, 1988; Britton *et al.*, 1989, 1990). They are not easily recognized unless there is duplication of a distinctive lithostratigraphic sequence. Repetition is commonly in the order of 10 to 100 metres of section. Regional-scale reverse faults may also be present (Alldrick and Britton, 1988; Britton and Alldrick, 1988).

The patterns of folds and faults suggest changes in the regional stress field through time. Folds and thrust faults may result from early east-west compression. Later strike-slip deformation could result from north-south compression. More work is required to resolve the structural geology of the Prout Plateau.

## METAMORPHISM

Regional metamorphic grade is lower greenschist facies characterized by saussuritized plagioclase, chloritized mafic minerals and conversion of clay constituents to white mica. Rare, relict porphyroblasts of prehnite occur in mudstones at Eskay Creek. Within a kilometre of the Coast plutonic complex metamorphic grade rises to lower amphibolite facies. Narrow contact metamorphic aureoles occur near the margins of the larger plutons.

Based on resetting of K-Ar ages in the Stewart and Sulphurets areas regional metamorphism peaked in mid-Cretaceous time (Alldrick *et al.*, 1987a).

# PROPERTY GEOLOGY

## STRATIGRAPHY

Detailed descriptions of property geology stem from work by Premier Gold Mining Company (Whiting, 1946), Texasgulf Inc. (Donnelly, 1976; Peatfield, 1975, 1976; and summarized by Panteleyev, 1983) and Calpine Resources Incorporated (Blackwell *et al.*, 1989). They have concentrated on mineralized areas between the Mackay adit and the #21 zone (Figure B-14-3).

The TOK and KAY claims are underlain by a northwest-facing sequence of interbedded volcaniclastic rocks, flows and sediments. Strata strike north-northeasterly and dip moderately to the northwest. The presence of fossils, pillow lavas and hyaloclastites suggests that many of the rocks were deposited in a subaqueous environment. No lithogeochemistry has been

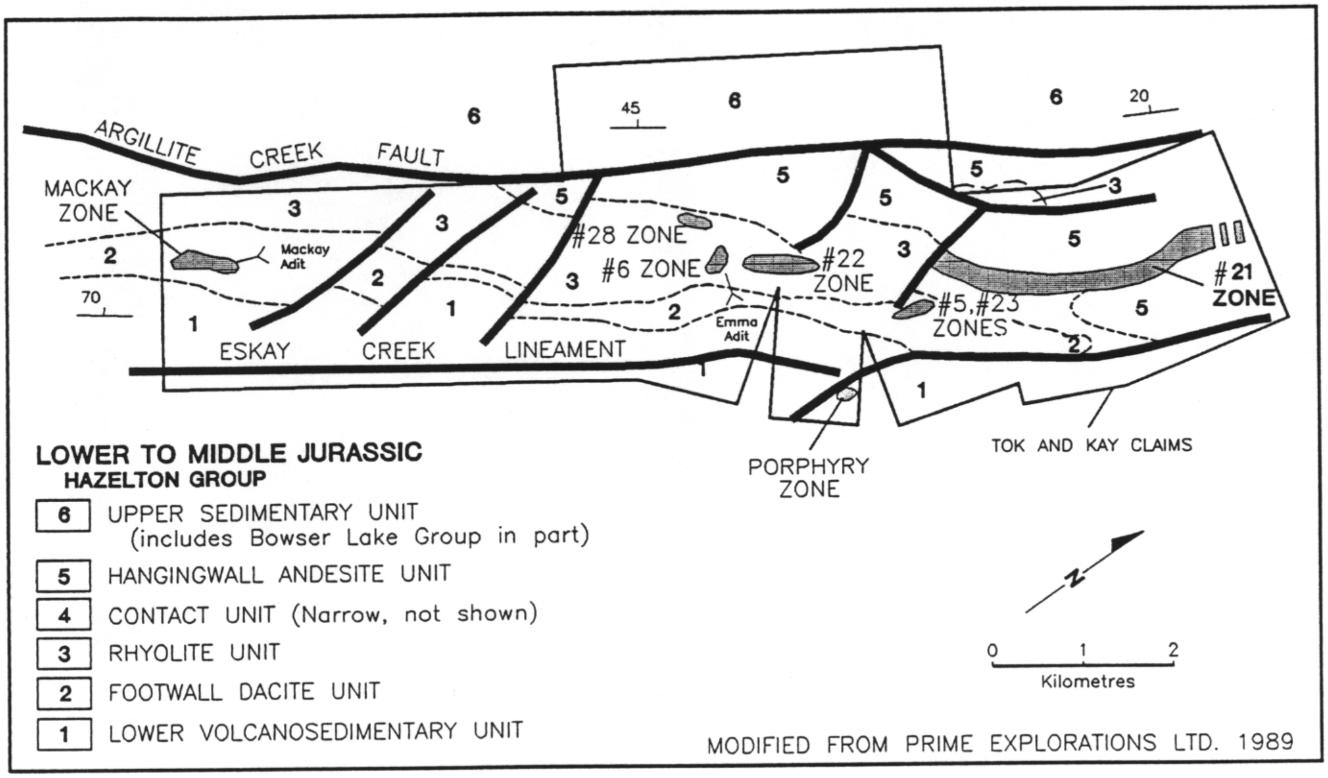



**Figure B-14-3. Surface geology and mineral zones, Eskay Creek.**

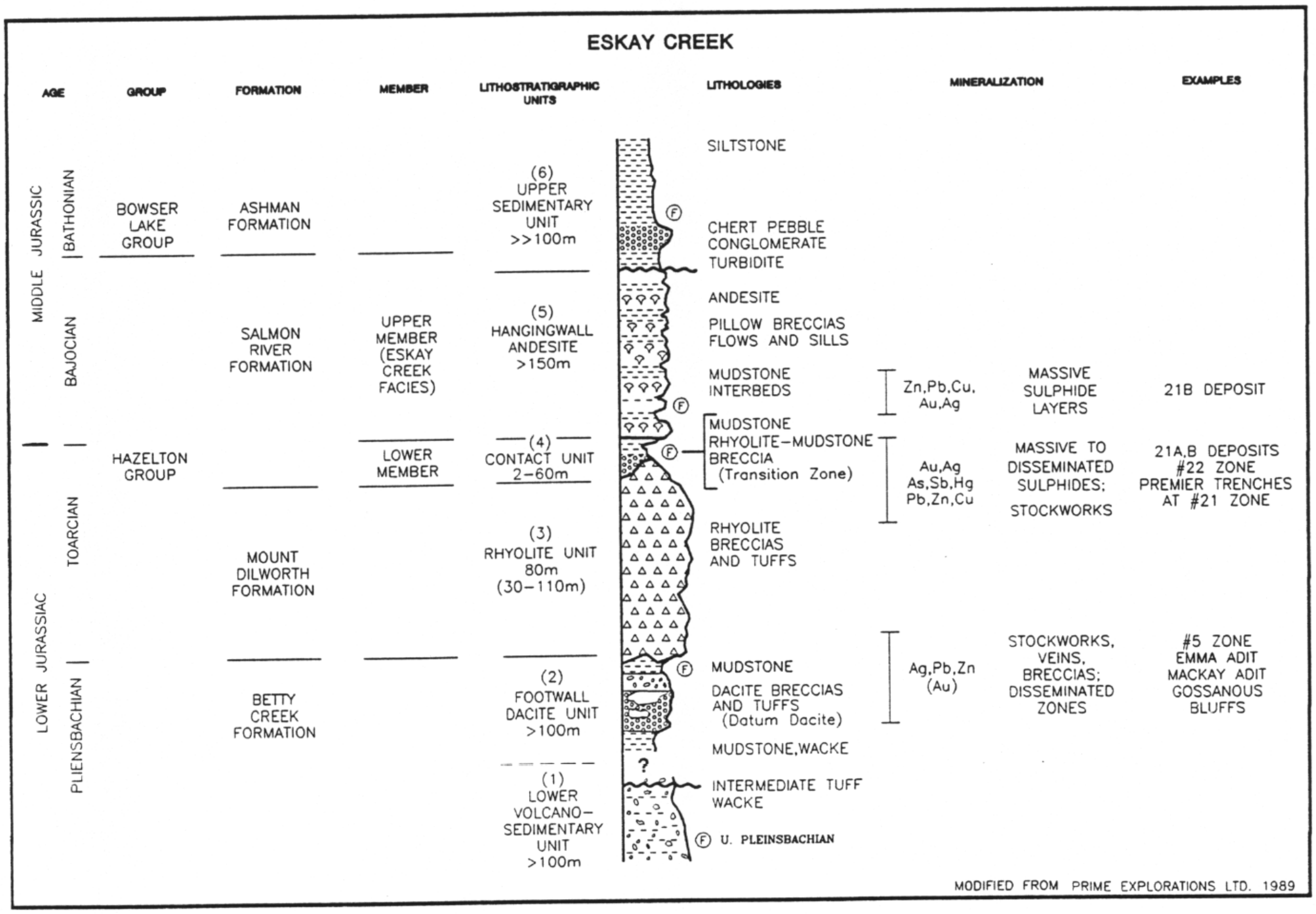



**Figure B-14-4. Stratigraphy and mineralization, Eskay Creek.**

completed on the volcanic rocks; classification is based on field identification alone.

Donnelly (1976) divided a 1100-metre thick section straddling Eskay Creek into four lithostratigraphic sequences, from oldest to youngest:

(1) an undivided unit, more than 500 metres thick, of volcanic fragmental rocks, the upper part of which consists of crystal tuff, lapilli tuff and agglomerate. The base is not seen;
(2) a sedimentary unit, 130 metres thick, of well-bedded, black argillite with some tuffaceous sandstone and pebble conglomerate interbeds. These contain the Lower Jurassic pelecypod *Weyla* and ammonite *Paltarpites*. Contained in the argillite is a 60-metre thick body of rhyolite;
(3) a felsic volcanic unit, approximately 400 metres thick, consisting of rhyolitic breccia, flows or domes. At its base are lithic tuffs and tuffaceous wacke;
(4) basaltic pillow lavas and pillow breccias with minor, thin mudstone units containing the Middle Jurassic ammonite *Stephanoceras*; the top is not seen.

Prime geologists have modified this sequence (Blackwell, 1990; Idziszek *et al.*, 1990a,b). Donnelly's felsic volcanic unit (3) is now subdivided into a lower dacite unit and an upper rhyolite unit. Between the rhyolite and overlying pillow lavas a contact unit is distinguished. This report adds an older volcano-sedimentary unit and a younger sedimentary unit (including strata of the Salmon River and Ashman formations) to the previously published stratigraphy of the #21 zone. The revised stratigraphic sequence at Eskay Creek (Figure B-14-4) is, from oldest to youngest:

(1) lower volcano-sedimentary unit: inferred basement to the footwall dacite unit including the oldest rocks on the property.
(2) footwall dacite unit: dacite lapilli, crystal and lithic tuffs interbedded with black mudstone and waterlain tuff (includes the "datum dacite" member);
(3) rhyolite unit: rhyolite breccia and tuff; minor mudstone;
(4) contact unit: basal rhyolite-mudstone breccia ("transition zone") grading upwards into carbonaceous mudstone;
(5) hangingwall andesite unit: pillowed andesite flows and breccias with thin carbonaceous mudstone interbeds;
(6) upper sedimentary unit: thin-bedded siltstone and fine sandstone with minor arenite-conglomerate beds.

Recent exploration success has been predicated on drilling through the contact unit (4). Most drill holes are collared in the hangingwall andesite (5) and stopped when they encounter recognizable members of the footwall dacite (2). Mapping has lagged far behind core logging so the surface extent of these units is not well known (Figure B-14-3).

#### LOWER VOLCANO-SEDIMENTARY UNIT

This is a sequence of unknown thickness that underlies the footwall dacite unit. Information comes mainly from surface exposures. Mixed andesitic to dacitic volcaniclastic rocks and immature fine to medium-grained sedimentary rocks underlie much of the area east and south of upper Eskay Creek. These rocks include parts of Donnelly's unit 2 which locally contains the Lower Jurassic pelecypod *Weyla*. They appear to be the oldest rocks on the claims.

The deepest holes bottomed in medium to coarse, medium green, feldspar-phyric, andesitic to dacitic lapilli tuff overlain by volcanic conglomerate with porphyritic felsic clasts. These are lithologically similar to some of the rocks that crop out east of Eskay Creek and may be tentatively correlated with this unit.

#### FOOTWALL DACITE UNIT

This unit comprises in excess of 100 metres of drab grey to white dacite tuff, tuffaceous wacke and mudstone. Dacitic volcanics are predominantly tuff and ash-flow tuff, with lesser volumes of lithic tuff and breccia. Clasts are angular and commonly strongly compressed. Fragmental rocks are locally heterolithic with clasts of dacite, porphyritic felsite and mudstone. Clasts are matrix supported. Volcanic members are extensively altered and commonly pyrite-bearing.

An important marker, the datum dacite member, comprises pink to green, fine-grained, feldspar phyric tuff and lapilli-breccia. It occurs near the top of the unit. Its most diagnostic feature is the presence of abundant quartz-filled vesicles up to 1 centimetre in diameter.

Intercalated epiclastic rocks comprise thick to thin-bedded, grey to black, tuffaceous wacke and mudstone. These are commonly pyritic. The presence of belemnite fossils is taken to indicate a subaqueous depositional environment for the entire unit. Its top exhibits considerable relief and may represent an unconformity.

#### RHYOLITE UNIT

This consists of grey to white aphyric breccia, tuff-breccia, lapilli tuff, tuff and subordinate massive rhyolite. Thin intercalations of mudstone and waterlain tuff occur locally and provide markers to correlate between closely spaced drill holes. Rhyolite fragments are massive to flow banded; matrix is tuffaceous. Perlitic and lithophysal textures are locally preserved but on the whole the unit is remarkably thick-bedded and monotonous. Within mineralized zones it is altered to an assemblage of quartz, muscovite and chlorite which obscures primary textures. The base of the unit is commonly massive, aphanitic and weakly brecciated. The top is fine grained and may be foliated. Thickness ranges from 30 to 110 metres, averaging 80 metres.

### CONTACT UNIT

The contact unit consists of an areally restricted basal member of rhyolite-mudstone breccia (the "transition zone") that grades into a widespread upper member of carbonaceous mudstone. The entire contact unit ranges from less than 1 to more than 60 metres thick.

The basal member comprises angular to subrounded fragments of rhyolite, chert, mudstone and mineralized and altered fragments set in an argillaceous matrix. Clasts exhibit a wide range of sizes and are commonly matrix supported. Clasts appear to be derived from the subjacent rhyolite unit. The matrix consists of very fine grained chalcedonic quartz, muscovite, chlorite, pyrobitumen and graphite. It is variably mineralized.

The upper member is carbonaceous, pyritic and locally tuffaceous, laminated black mudstone. In thin section it is seen to contain numerous quartz eyes, highly altered tuff particles, rare calcareous clasts (limestone?) in a matrix of exceedingly fine grained quartz, possibly primary chert. An opaque hydrocarbon residue, possibly pyrobitumen, is ubiquitous. Near sulphide lenses rocks are strongly altered to chlorite, muscovite and calcite.

The contact unit is belemnite-bearing and radiolarian tests have been seen in thin section. Its lower contact is gradational; its upper contact is sharp. Contact unit mudstones are sedimentologically indistinguishable from interflow mudstone beds of the hangingwall andesite. It is thus defined as the mudstone between the upper surface of the rhyolite unit and the lowest andesite flow. The presence or absence of mineralization is not an essential parameter.

### HANGINGWALL ANDESITE UNIT

This is a flow and sill complex in excess of 150 metres thick. It consists of rusty brown weathering, light grey to dark green pillow breccias with subordinate massive flows, dikes or sills, and hyaloclastite horizons. The andesite ranges from aphanitic to medium grained and locally carries fine feldspar phenocrysts. It is locally amygdaloidal. Matrix to the breccias is a mix of volcanic fragments, grey calcite, black chert and limy mudstone. Thin mudstone units occur as interflow sediments. Locally these are distinguished by radiating clusters of calcite, quartz, plagioclase, barite and prehnite. Mudstone interbeds appear to increase in both abundance and thickness to the northeast. Some fossiliferous and calcareous beds form local markers.

The andesite unit is truncated to the southwest by the Argillite Creek fault. It crops out in Mackay Creek but disappears to the northeast under a thick sequence of siltstones.

Northwest of the 21A deposit, within the andesite, is an isolated lens of massive white dacite or rhyolite first mapped by Whiting (1946). Rhyolite-andesite contacts are occupied by small gullies that may be the surface trace of faults.

### UPPER SEDIMENTARY UNIT

This unit consists of a thick sequence of thin-bedded (turbiditic) siltstone, shale and fine sandstone. It includes strata of the lithologically similar Salmon River and Ashman formations. The unit has not been mapped in detail.

The only good stratigraphic markers in this monotonous sequence are sheets or lenses, up to 10 metres thick, of chert-pebble conglomerate and compositionally similar fine to coarse arenite. These crop out near the south end of the TOK claims, around the summit cairn on the Prout Plateau and between Tom Mackay and Little Tom Mackay lakes (Figure B-14-2). On lithologic grounds these markers can be assigned to the Ashman Formation of the Bowser Lake Group.

The Salmon River formation sediments are distinguished by the presence of volcanic material. For example, siltstones exposed in Mackay Creek have rare zones of andesitic debris apparently derived from the underlying hangingwall andesite unit.

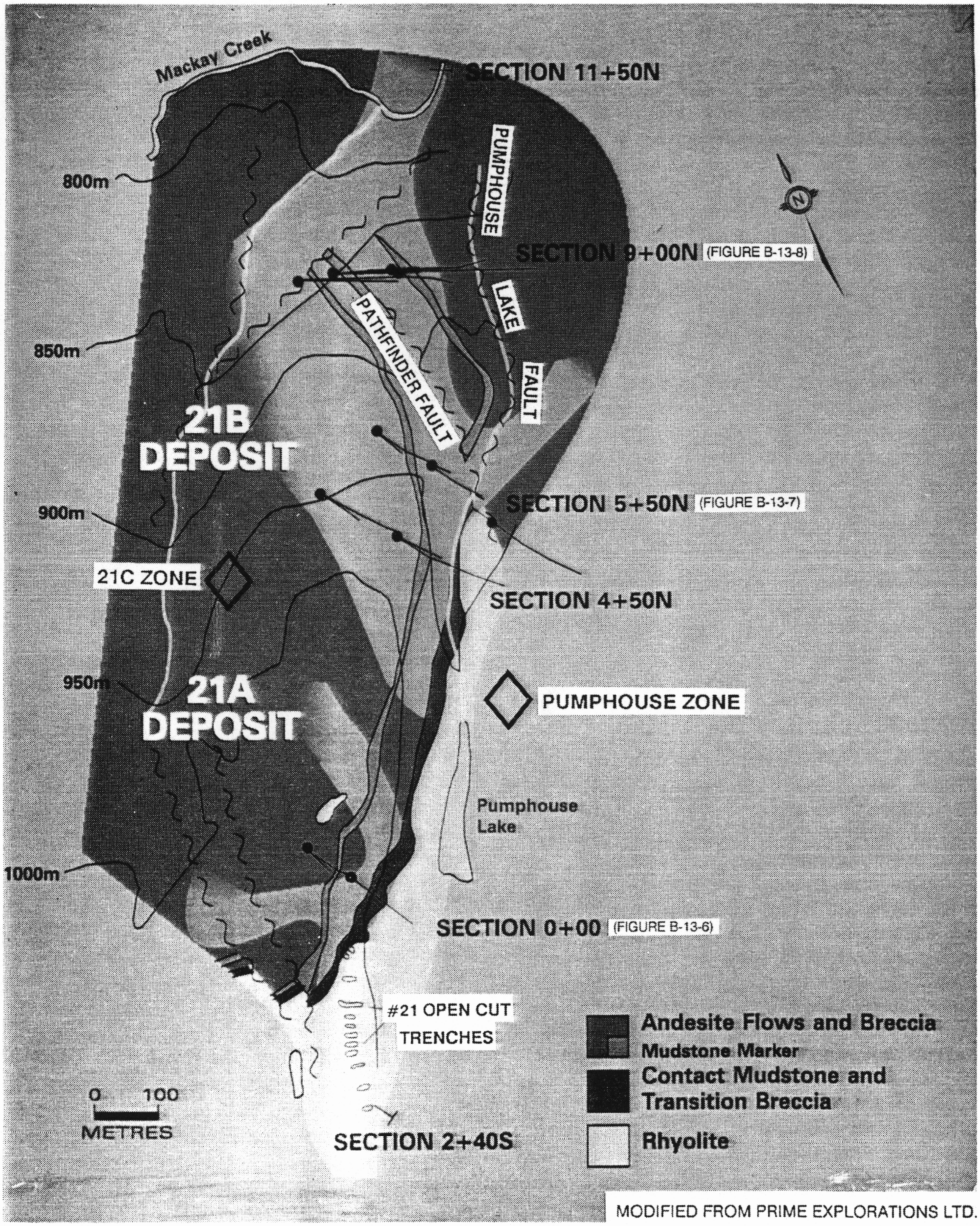
From Mackay Creek south to Coulter Creek the basal contact of the upper sedimentary unit is the Argillite Creek fault.

### AGE AND CORRELATION

Micro and macrofossils have been reported from many stratigraphic levels at Eskay Creek. The span of time indicated by them is Early to Middle Jurassic. The fossils may yield very precise biostratigraphic ages due to the overlap of ammonites and radiolaria (Smith and Carter, 1990). Drill-core samples are being processed. Figure B-14-4 shows a provisional correlation between lithologies, formations and ages

Smith and Carter found index fossils of the uppermost Pliensbachian (Carlottense Zone) immediately east of Calpine's camp. The fossils lie east of the Eskay Creek lineament and are thought to be stratigraphically below the "Calpine camp gossan" (*i.e.* #3 bluff of the footwall dacite unit). Hostrocks are assigned to the lower volcano-sedimentary unit which also contains the Early Jurassic bivalve *Weyla* (Donnelly, 1976). These rocks are correlated with the Betty Creek formation.

No index fossils have been observed in the footwall dacite unit although its upper horizons locally contain belemnites. Previous regional mapping (Alldrick *et. al.*, 1989) assigned this unit to the Mount Dilworth formation (Felsic Volcanic sequence). Recent drilling has shown that tuffs of this unit are intercalated with much sedimentary material. This is uncharacteristic of Mount Dilworth type sections (Alldrick, 1985). Also, there appears to be



MODIFIED FROM PRIME EXPLORATIONS LTD.

Figure B-14-5. Deposit plan, #21 zone, Eskay Creek.

considerable relief on the unit's upper contact suggesting that it may be a disconformity. It thus seems probable that the footwall dacite unit is instead a member of the Betty Creek formation.

The rhyolite unit is unfossiliferous. On the basis of stratigraphic position and lithology it can be correlated with the Toarcian Mount Dilworth formation (Alldrick, 1985). It differs from type sections in having minor siltstone interbeds and hyaloclastic and perlitic textures. These suggest a subaqueous environment of deposition for some or all of this unit.

The contact unit represents renewed sedimentation following cessation of felsic volcanism. It is fossiliferous (belemnites) but no diagnostic fauna have been reported. On the basis of stratigraphic position, if not lithology, it can be correlated with the unnamed lower member of the Salmon River formation (Anderson and Thorkelson, 1990). Present information suggests its age is Toarcian.

Fossils occur in areas underlain by the hangingwall andesite unit but so far have not been found in place. Radiolaria from limestone clasts in a conglomerate stratigraphically above the #21 zone but east of the Argillite Creek fault indicate a "late middle Toarcian to Early Bajocian age" (Smith and Carter, 1990). The sample was not found in place but is probably from the hangingwall andesite unit (P.L. Smith, personal communication, 1990). The middle Bajocian ammonite *Stephanoceras* reported by Donnelly (1976) was collected by R.J. Goldie in 1974. Anderson and Thorkelson (1990) do not consider the fossil sufficiently well located to be reliably tied to the hangingwall andesite unit.

The upper sedimentary unit matches lithologies of the Salmon River and Ashman formations. Belemnites (Toarcian to late Bathonian age) occur in chert-bearing arenite near the south end of Tom Mackay Lake (Gunning, 1986). Shales overlying these sandstones contain the Bathonian ammonite *Iniskinites* (Gunning, 1986) which provides good fossil correlation with the Bowser Lake Group (Smith and Carter, 1990). Closer to the Eskay property ammonites resembling *Monomorella* have been found along Mackay and Argillite creeks (Whiting, 1946) in areas underlain by the upper sedimentary unit. These sites have not been relocated.

## Intrusive Rocks

Intrusive rocks are rare on the property.

Early workers interpreted resistant, weakly gossanous rocks at Battleship Knoll, 1 kilometre southwest of the Mackay adit, to be altered diorite (Mandy, 1934). Re-examination suggests these are altered andesite (tuff?).

One kilometre east of the #21 zone a small body of feldspar porphyry is weakly mineralized along its contact with lapilli tuff. This fairly massive unit crops out over an area 1000 metres long and 200 metres wide (Whiting, 1946). Donnelly (1976) named the rock granodiorite porphyry and gave this description: subhedral phenocrysts of oligoclase, up to 1 millimetre long, (36%), anhedral quartz, 0.3 millimetre diameter, (11%) and 1-millimetre, subhedral grains of orthoclase (8%), are set in a fine-grained quartz-feldspar matrix. Plagioclase is extensively replaced with chlorite and sericite. Its bulk composition is similar to dacitic pyroclastics seen higher in the section. It may represent a synvolcanic plug or a thick dacitic flow. Its age is not known.

Andesitic dikes and sills occur locally and are interpreted to be feeders to the hangingwall andesite unit.

## Structure

### Folds

The major structure on the property is interpreted to be an assymetric anticline which plunges gently to the northeast. Interbedded volcanic and sedimentary strata form its northwest limb and dip from 70° to 20°. The fold closes around the north end of the property near Mackay Creek.

Apart from the major anticline no other folds have been recognized. Soft-sediment deformation structures such as slumps are common in some siltstone layers.

### Faults

The anticline is broken by a series of high-angle faults (Figures B-14-2, 3). Major faults strike north-northeast; minor ones north-northwest. Several northerly to northeasterly trending lineaments also traverse the property. Some of these are faults, some only fractures. Because they roughly parallel the strike of stratified rocks displacement on them is difficult to prove.

Displacement is demonstrable along the Argillite Creek fault which juxtaposes differing levels of the upper sedimentary unit against underlying volcanic units (Figures B-14-2 and 3). West of the #21 zone, hangingwall andesite is in fault contact with thinly bedded siltstone (Salmon River formation?). West of the Mackay adit felsic rocks (footwall dacite unit?) are in contact with conglomerate (Ashman Formation). The Argillite Creek fault continues south into the headwaters of Coulter Creek where an estimated 300 metres of siltstone stratigraphy is missing.

Another northeasterly fault, perhaps a splay off the Argillite - Coulter Creek structure, may be located along Eskay Creek and its headwaters. Bedrock along the creek is strongly foliated but similar lithologies crop out on both sides. Mapping has not demonstrated displacement.

Drilling has identified faults that have offset unit contacts and mineralized horizons (*e.g.* Pumphouse Lake and Pathfinder faults; Blackwell, 1990; Figure B-14-5). Some of these may be northerly extensions of the inferred Eskay Creek structure.

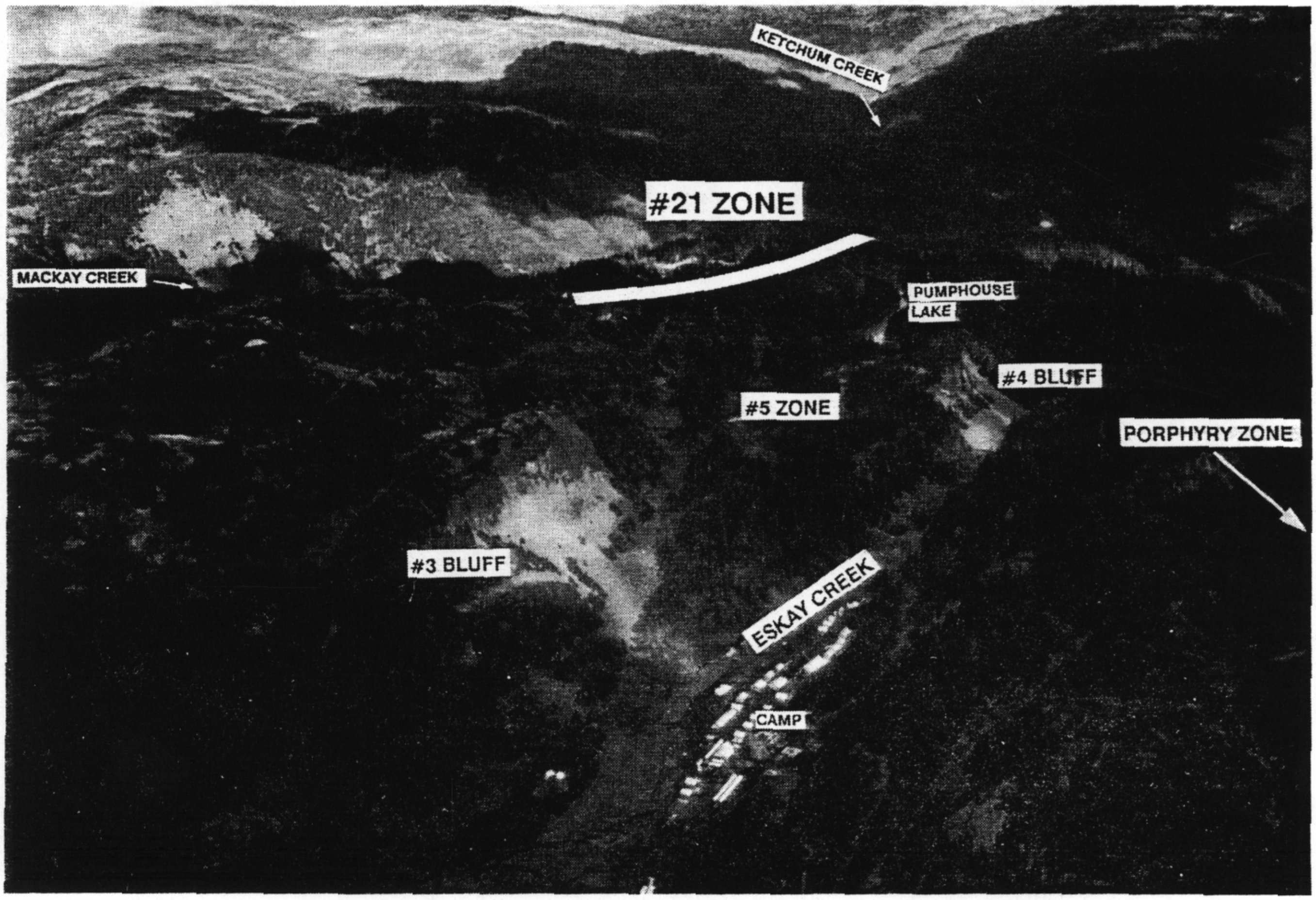



Plate B-14-1. Aerial view of Eskay Creek property, looking north-northwest (September, 1989).

North-northwesterly striking cross-faults have been recognized since the earliest exploration work (Whiting, 1946). They typically have left-lateral displacements in the order of 10 to 100 metres and are best illustrated by offsets on the basal contact of the hangingwall andesite. Several occur in the Emma adit area. Similar faults may form the presently defined southern boundary of the #21 zone.

Whiting (1946) named an easterly-trending structure that traverses the main grain of the property, from north of the #22 zone to the north end of the #3 bluff, the Mackenzie fault.

## MINERALIZATION AND ALTERATION

Many zones of mineralization have been recognized on the TOK and KAY claims. These include the #5, #6, #10, #21, #22, #23, #28, and Porphyry zones; Mackay and Emma adit areas; and the #1 to #5 bluffs (Figures B-14-3, 4; Plate B-14-1). These prospects can be classified into seven general deposit types based primarily on geometry, secondarily on chemistry, mineralogy and texture.

#### STRATABOUND MINERALIZATION

(1) Stratabound gold and silver with antimony, arsenic and mercury minerals associated with intense hydrothermal alteration within the contact unit.
Example: 21A deposit.

(2) Stratabound sphalerite-rich mineralization with high-grade gold and silver in a tuffaceous facies of the contact unit.
Example: southern 21B deposit.

(3) Stratabound, gold and silver-rich base metal sulphide lenses within interflow mudstone beds of the hangingwall andesite unit.
Example: northern 21B deposit.

#### CROSSCUTTING MINERALIZATION

(4) Disseminated and fissure-vein gold-silver-lead-zinc mineralization, with minor antimony and arsenic, associated with variable muscovite and silica alteration within the rhyolite unit.
Examples: #6 and #22 zones (Emma adit); #21 open cut trenches; stockworks beneath stratabound mineralization of the 21A and 21B deposits.

(5) Disseminated to massive sulphides with low-grade gold and silver in veins and shears within the footwall dacite. Sphalerite, galena and iron sulphides are as-

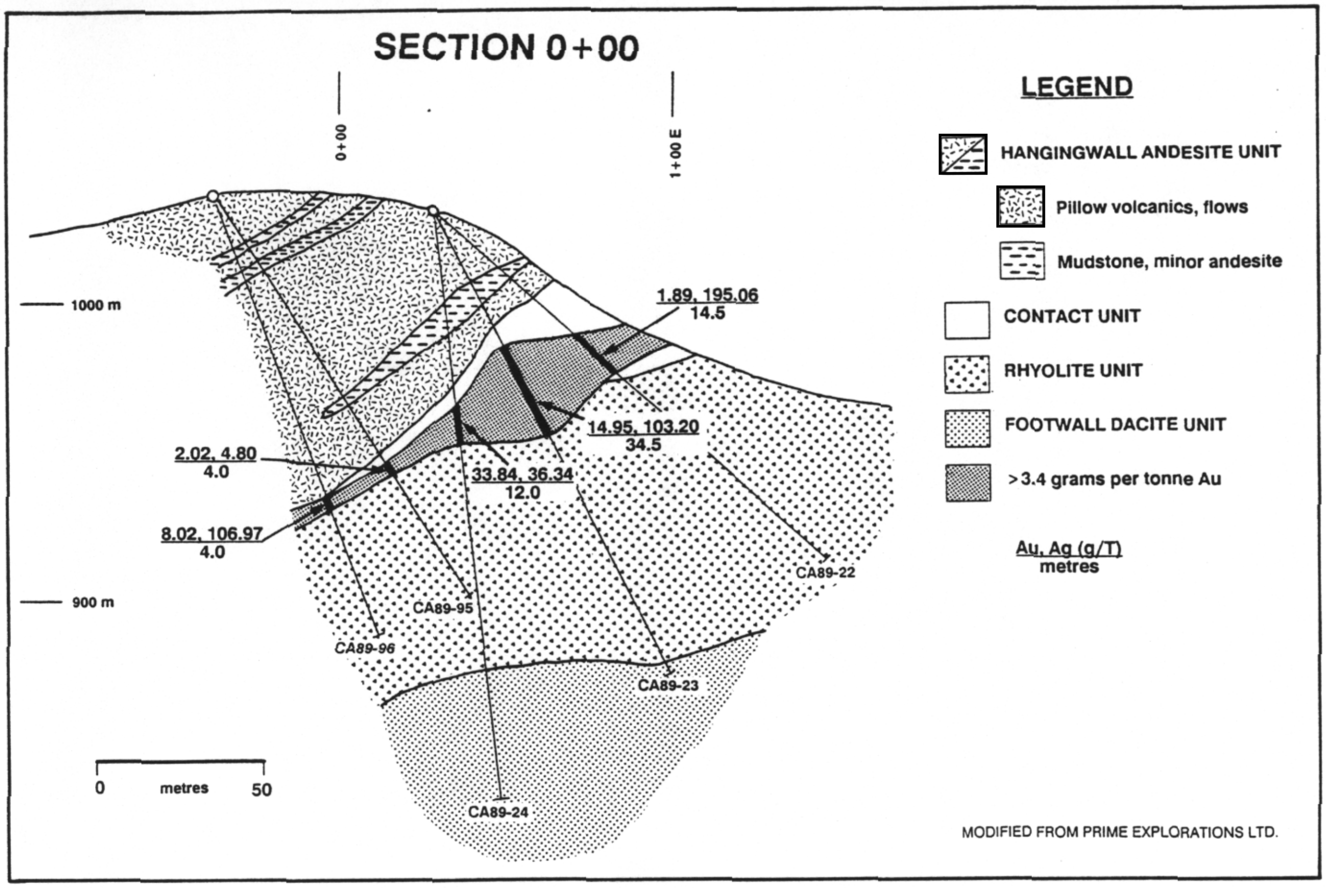



Figure B-14-6. Section 0+00, 21 A deposit, Eskay Creek.

sociated with moderate chlorite, muscovite and silica alteration.
Example: Mackay adit ("North End workings").

(6) Disseminated, geochemically anomalous gold and silver associated with iron sulphides in silicified zones in the footwall dacite.
Examples: #1 to #5 bluffs.

(7) Low-grade gold and silver associated with minor base metal (zinc, lead, iron) sulphides, chlorite and quartz in shears along the contact of a feldspar porphyry plug.
Example: Porphyry showing.

The #21 zone is the current focus of exploration, but other zones continue to be attractive targets.

## #21 Zone

Preliminary descriptions of #21 zone mineralization include Blackwell *et al.* (1989), Blackwell and Idziszek (1989), Blackwell (1990), Idziszek *et al.* (1990a, b), Barnett (1989a, b) and McMillan (1990).

The bulk of mineralization occurs as a stratabound sheet within carbonaceous mudstones of the contact unit and underlying rhyolite breccia, beneath mostly barren andesite flows. In the north sulphide layers also occur in the hangingwall andesite unit. As traced by diamond drilling the entire zone extends 1400 metres along strike, 250 metres down dip and is from 5 to 45 metres thick. It is open to the northeast and down dip.

Mineralization displays both lateral and vertical zoning. Antimony, arsenic and mercury-rich mineral assemblages in the south change to zinc, lead and copper-rich assemblages in the north. Vertical zoning is expressed as a systematic increase in gold, silver and base metal content up-section.

Based on mineral associations and continuity of grade the #21 zone has been divided into two deposits: the 21A (formerly called the South zone) and the 21B (which includes the former Central and North zones, now linked by drilling). The deposits are separated by 140 metres of weak mineralization. Figure B-14-4 shows the stratigraphic distribution of mineralization; figure B-14-5 is a generalized plan of the deposits; figures B-14-6 to 8 are schematic drill sections.

Ore reserves for the #21 zone have been estimated by Roscoe Postle Associates Incorporated on behalf of the Joint Venture and by Orcan Mineral Associates Limited on behalf of Stikine Resources Incorporated (Table B-14-1). Differences between the estimates stem from differing assumptions, methodology and the use of gold-equivalent assays by Orcan (George Cross News Letter No. 72/1990).

Two new mineral zones, the 21C and Pumphouse, have recently been announced (George Cross News Let-

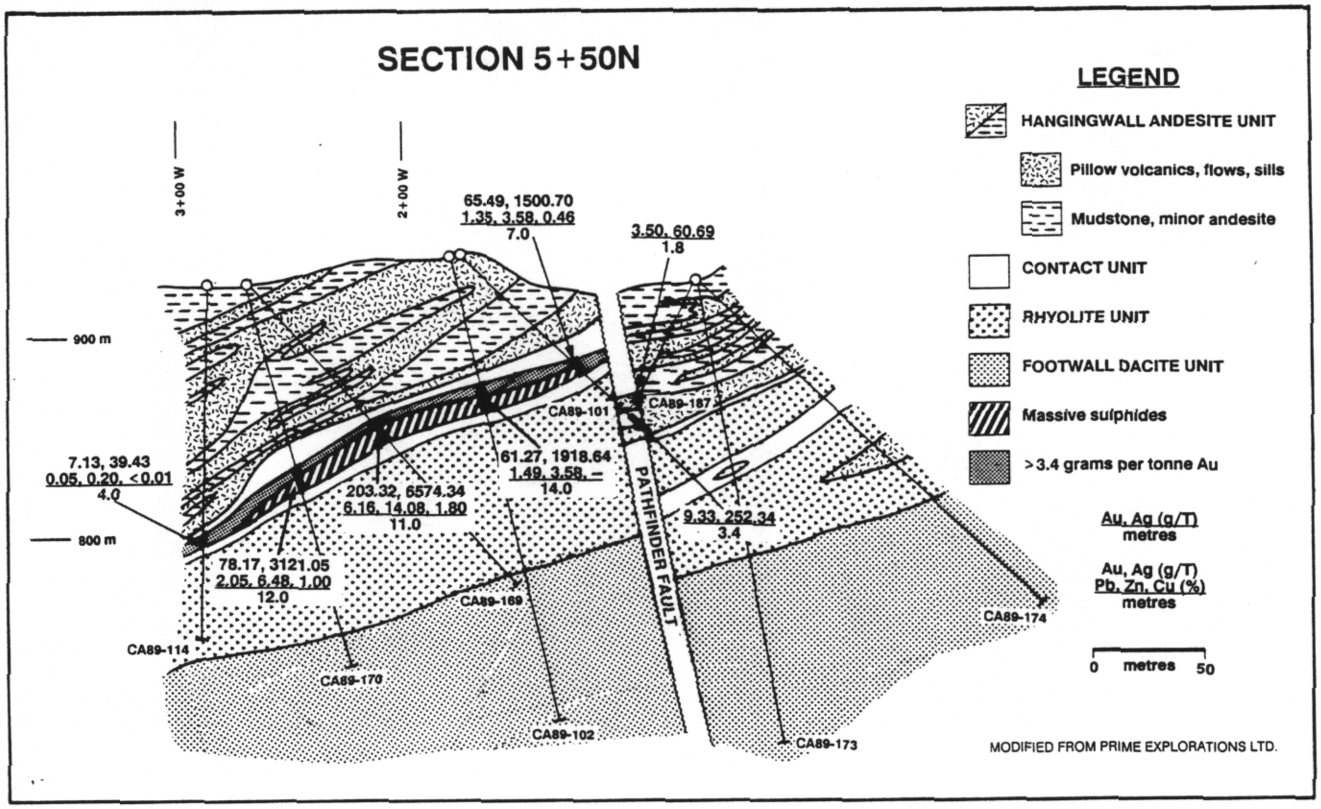



Figure B-14-7. Section 5+50, 21 B deposit, Eskay Creek.

ter No. 94/1990). They lie outside of the presently defined reserve. The 21C is centred about 450 metres due north of the 21A deposit. It is a discrete mineral zone 100 metres down dip from the 21B deposit and subparallel to it. The Pumphouse zone is located immediately northeast of Pumphouse Lake, east of the southern end of the 21B deposit. Both discoveries are currently being outlined by drilling.

## 21A Deposit

Initial drilling in the 21A area has outlined a mineralized zone approximately 280 metres long and up to 100 metres wide. Thickness is variable, averaging about 10 metres (Figure B-14-6). Locally much greater thicknesses are indicated. For example, drill hole CA89-23 returned a core length of 34.5 metres grading 14.9 grams per tonne gold and 103.1 grams per tonne silver.

The deposit is contained within the contact unit and underlying rhyolite unit. The upper limit of mineralization is sharp and generally coincides with the basal contact of the barren hangingwall andesite unit, the bottom 50 centimetres of which may show weak alteration. The lower assay wall is not defined by a lithologic contact. Instead it corresponds to a marked decrease in sulphide content and alteration intensity.

The deposit can be subdivided into an upper, stratabound zone of disseminated to near-massive stibnite and realgar within the contact unit, and a lower, stockwork zone of disseminated sphalerite, tetrahedrite and pyrite within the rhyolite unit.

Deeper in the section, in the footwall dacite unit, is a third style of mineralization that is not included as part of the 21A deposit.

### Contact Unit Mineralization and Alteration

High-grade (>15 grams per tonne) gold and silver mineralization occurs in variably sheared, carbonaceous mudstone and mudstone-rhyolite breccia. A diverse suite of metallic minerals has been identified (Table B-14-2).

Zones of nearly massive stibnite, realgar and orpiment pass along strike and down dip into disseminated domains where sulphides occur in veinlets, as feathery masses, or as heavy impregnations along shears or in the mudstone matrix. The breccia matrix is variably pyritic. Both breccia matrix and clasts contain needles of stibnite and arsenopyrite. Gold occurs as native gold, amalgam and possibly in mercurian wurtzite. Silver occur as native silver, amalgam, tetrahedrite, and unnamed Ag-Pb-As-S minerals (Blackwell *et al.*, 1989).

Mineralization is associated with areas of intense alteration. Both members of the contact unit are overprinted with varying amounts of magnesian chlorite, muscovite, chalcedonic silica, calcite and dolomite;

**TABLE B-14-2**

**METALLIC MINERALS OF THE 21A DEPOSIT**

| | | | |
|---|---|---|---|
| Stibnite | $Sb_2S_3$ | Realgar | AsS |
| Native Gold | Au | Amalgam | Hg-Ag-(Au) |
| Native Silver | Ag | Aktashite | $Cu_6Hg_3As_5S_{12}$ |
| Native Arsenic | As | Orpiment | $As_2S_3$ |
| Hg-Wurtzite | (Hg,Zn,)S | Sphalerite | ZnS |
| Cinnabar | HgS | Galena | PbS |
| Arsenopyrite | FeAsS | Pyrite | $FeS_2$ |
| Tetrahedrite | $(Cu, Ag, Fe)_{12}(Sb, As)_4S_{13}$ | | |

Mineral determinations by R.L. Barnett (1989a, b), the University of Western Ontario.

pyrobitumen is ubiquitous. The magnesian chlorite is locally rich in fluorine; the muscovite in barium.

Mineralized samples show a remarkable variety of textures. Thin sections commonly have co-existing zones of both high and low strain, despite a uniform mineralogy. Muscovite, chlorite and sulphides display schistose fabrics, with pressure shadows and rotated grains, as well as delicate, randomly oriented intergrowths. The zones mutually interfere. These textures suggest that mineral deposition spanned repeated episodes of shearing and alteration (Barnett, 1989a, b).

#### RHYOLITE UNIT MINERALIZATION AND ALTERATION

Disseminated to microfracture-filling mineralization in the rhyolite unit is characterized by low to moderate-tenor gold (1 to 15 grams per tonne) and locally high silver, associated with base metal sulphides and minor to trace antimony, arsenic and mercury minerals. Tetrahedrite, pyrite, sphalerite and galena predominate, with minor aktashite and chalcopyrite. Realgar and orpiment are rare to nonexistent. Carbon and graphite are absent.

Beneath stratabound mineralization of the contact unit, the rhyolite unit is highly fractured and intensely altered. Fracturing, alteration intensity and metal tenor appear to increase toward the upper contact. Within 3 to 4 metres of the upper contact, rhyolite-hosted mineralization is characterized either by massive chlorite-gypsum-barite rock or by quartz-muscovite-sulphide breccia. Both associations may be strongly foliated and sheared, passing rapidly to open space filling vein-breccia textures. Beneath this zone three changes occur: fracturing in the rhyolite decreases dramatically; all alteration minerals are restricted to open joints and fractures; and sulphide minerals occur as crystalline aggregates on fracture surfaces.

#### FOOTWALL DACITE UNIT MINERALIZATION AND ALTERATION

Mineralization at this stratigraphic position does not contribute to currently stated reserves because drill penetrations are too widely-spaced to permit reliable estimates.

Mineralization commonly occurs in the datum dacite member. It consists of semimassive to disseminated, crystalline pyrite, sphalerite, tetrahedrite, galena and chalcopyrite in a pink to buff, feldspathized rock cut by chlorite and pyrite-filled fractures. Lodes carry geochemically anomalous to modest tenor gold and silver values.

The five gossanous bluffs, Mackay adit and the #5 and #23 zones all occur in the footwall dacite (Figure B-14-3; Plate B-14-1).

### 21B DEPOSIT

The 21B deposit is approximately 900 metres long, from 60 to 200 metres wide and locally in excess of 40 metres thick. It is displaced on the east by the northeast-trending Pumphouse Creek fault and related north-trending splays (Figure B-14-5). The deposit is open to the northeast along strike, to the immediate east on fault-offset segments, and is partially open to the west at depth. It displays varied styles of mineralization and alteration.

The southernmost 600 metres of the 21B deposit (the former Central zone) is characterized by stratabound and stratiform high-grade gold and silver-bearing base metal sulphide layers. A drill cross-section (Figure B-14-7) through this portion of the deposit illustrates the distribution and richness of mineralization. Of note is hole CA89-169 which intercepted 11 metres grading 203.3 grams per tonne gold and 6574 grams per tonne silver, 14.08 per cent zinc, 6.16 per cent lead and 1.80 per cent copper.

Banded sulphide mineralization occurs in carbonaceous and tuffaceous mudstones of the contact unit. Sulphides form disseminated, semi-massive and massive laminae and bands, up to 12 metres thick, that appear to parallel bedding in the mudstones (Plates B-14-3, 4). Sulphide beds show an abundance of slump structures, grading and contain tuffaceous debris (Plate B-14-5).

In approximate order of abundance sulphide minerals include amber sphalerite, tetrahedrite, boulangerite and bournonite with minor pyrite and

Plate B-14-2. Tom Mackay's cabin built in 1936 (September, 1989).

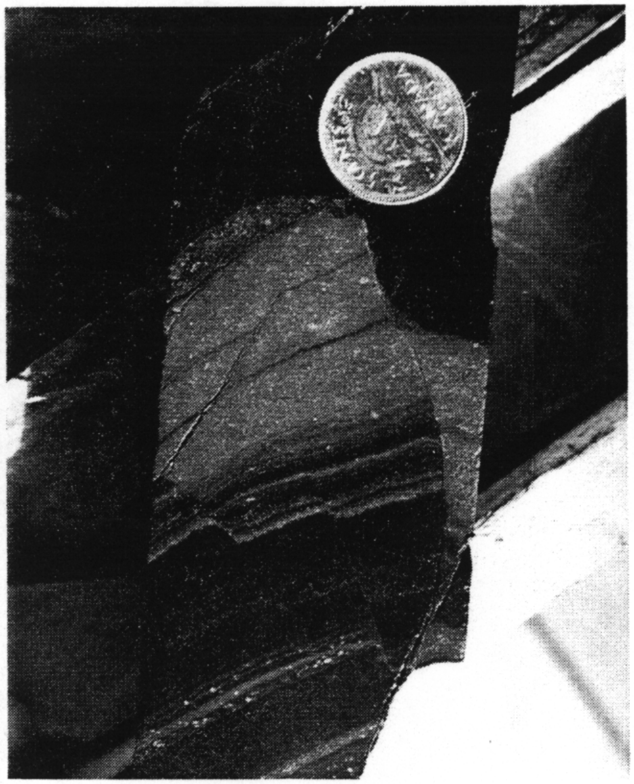


Plate B-14-3. Sulphide layers in contact unit mudstone, southern 21B deposit, Eskay Creek (DDH CA89-68: 101 m).

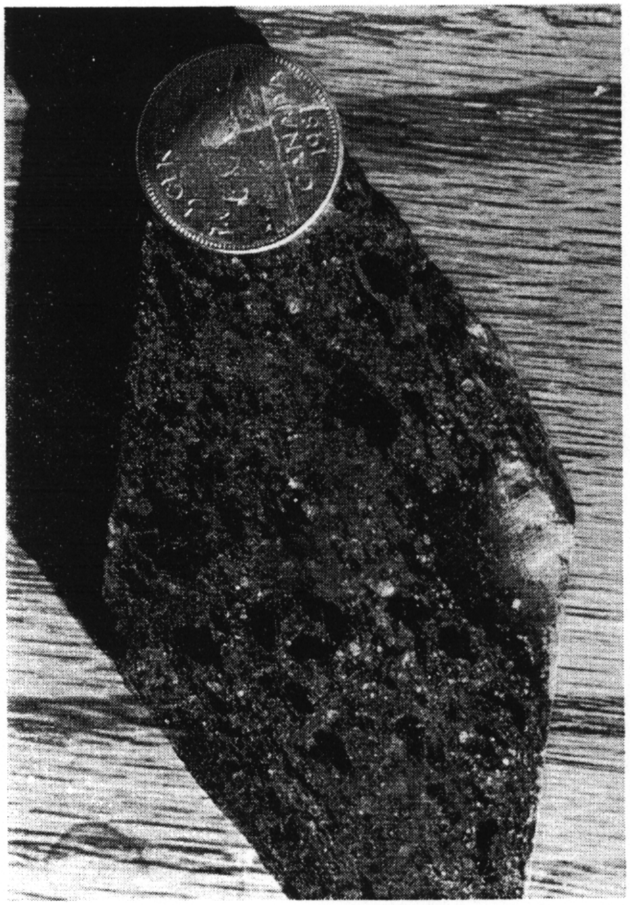


Plate B-14-4. Banded sphalerite, tetrahedrite, boulangerite and bournonite in contact unit pyritic mudstone, southern 21B deposit, Eskay Creek (DDH CA89-87: 97 m).

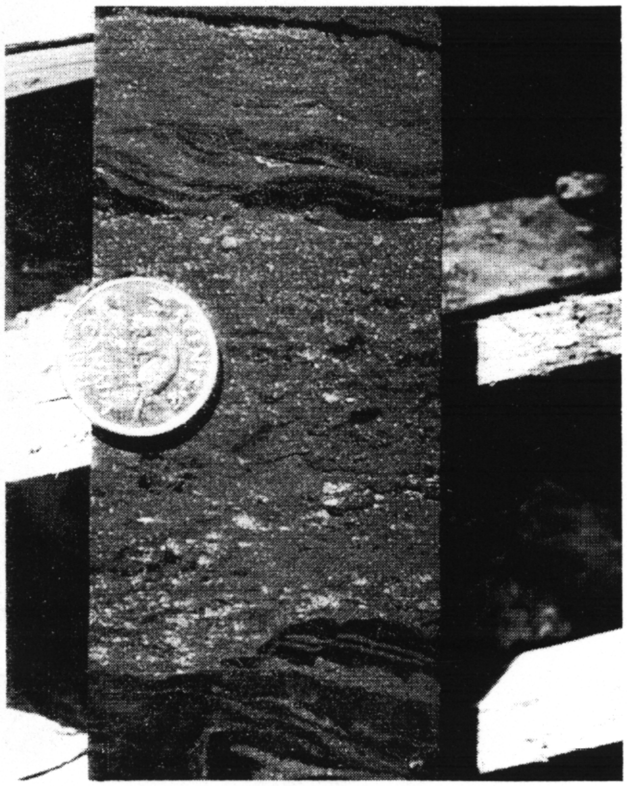


Plate B-14-5. Mudstone fragments in massive sulphide layer of the contact unit, southern 21B deposit, Eskay Creek (DDH CA89-87: 97 m).

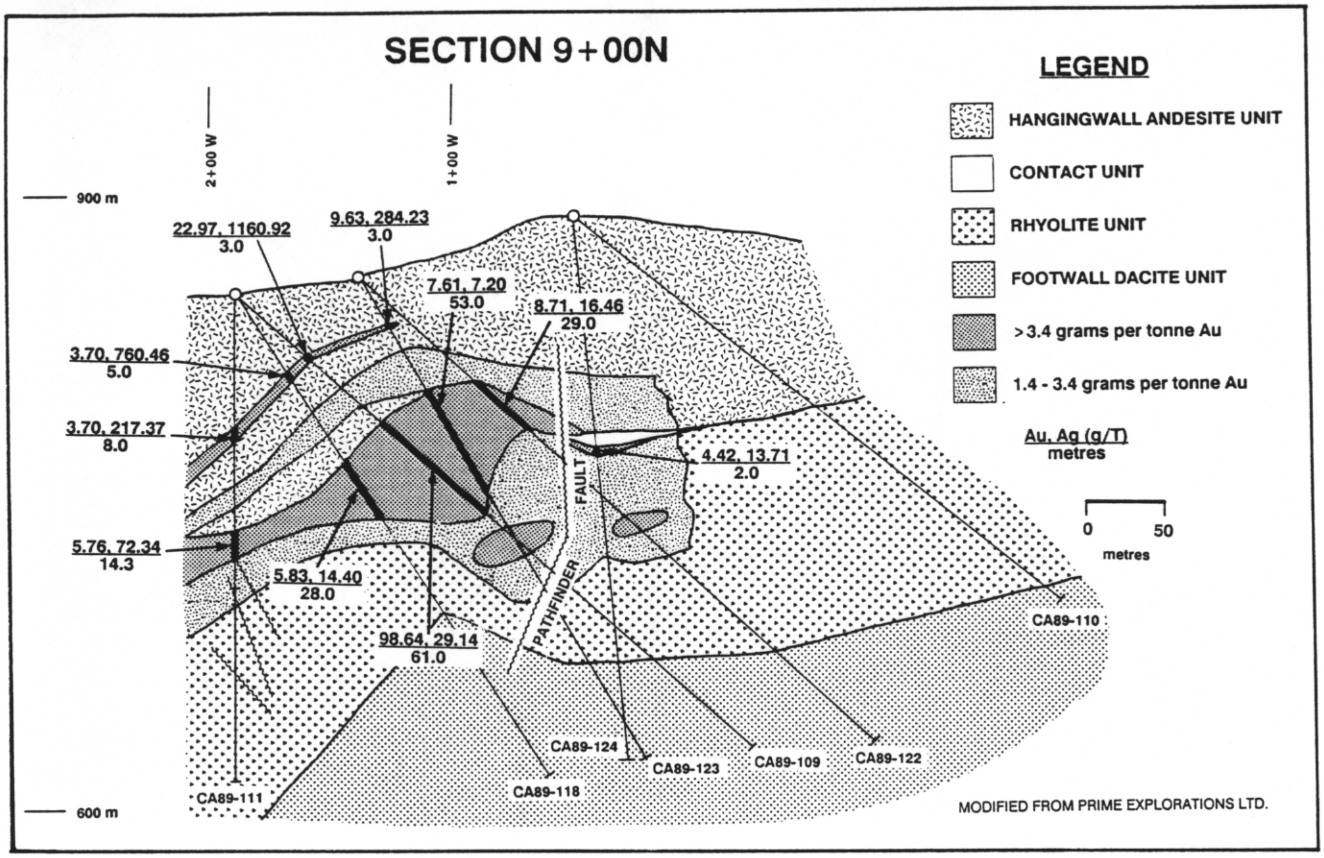



Figure B-14-8. Section 9+00, 21 B deposit, Eskay Creek.

galena. Gold and silver occur as 5 to 80-micron grains of electrum within fractured sphalerite, commonly in contact with galena. Realgar and stibnite are absent. Gangue minerals include magnesian chlorite, muscovite and quartz with lesser amounts of dolomite and calcite.

Peripheral to and beneath banded sulphide mineralization are areas of microfracture veinlets and disseminations of tetrahedrite, pyrite and minor boulangerite. Gangue minerals include magnesian chlorite, muscovite, potassium feldspar and calcite. Footwall, rhyolite-hosted stockwork mineralization is volumetrically insignificant in comparison with either the 21A deposit or the northern 21B deposit.

This portion of the 21B deposit has the most predictable geology, grade and best-defined, contact-controlled, assay boundaries. The bulk of published mineral reserves come from here.

In contrast, the northern 300 metres of the 21B deposit (the former North zone) exhibits considerable geological and structural complexity. Although hostrock stratigraphy is similar to that found to the south, mineralization occurs at several different stratigraphic levels (Figure B-14-8). Gold, silver and base metal rich lenses occur in hangingwall unit interflow mudstones as well as in the contact unit mudstone and underlying rhyolite unit breccias. Very high grade mineralization occurs deeper in the rhyolite unit in association with crosscutting zones of fracture-related alteration. The mineralized zone is thick (Figure B-14-8) and cut by zones of strong shearing.

Hangingwall mineralization is hosted by two mudstone beds near the base of the hangingwall andesite unit. Two partially stacked lenses have been intersected in widely spaced drill holes, and are characteristically composed of near-massive dark sphalerite, galena, and tetrahedrite with lesser amounts of pyrite and chalcopyrite. Mineralization is associated with pervasive chlorite alteration and locally heavy barite. Mineralized intervals vary from sulphide breccias to banded sulphide to sulphide mylonite.

Mineralization in the contact unit is similar to that encountered further south. Sphalerite, tetrahedrite and possibly boulangerite are the dominant sulphide species, plus varying amounts of galena and chalcopyrite. Alteration minerals are again chlorite, muscovite, quartz and calcite. Mineralized textures vary from crudely banded massive sulphides to thick and thin sulphide bands intercalated with mudstone, displaying a wide variety of clastic to laminated textures.

Crosscutting mineralization in the contact and rhyolite units occurs as siliceous (quartz-healed) and carbonate-rich breccias with anastomosing, crustiform veinlets and disseminations of coarse-grained iron-rich sphalerite, fine-grained pyrite, with minor galena, chal-

Plate B-14-6. Sulphide-rich vein with coarse-grained galena and zoned sphalerite, northern 21B deposit, Eskay Creek (DDH CA89-109: 90.5 m).

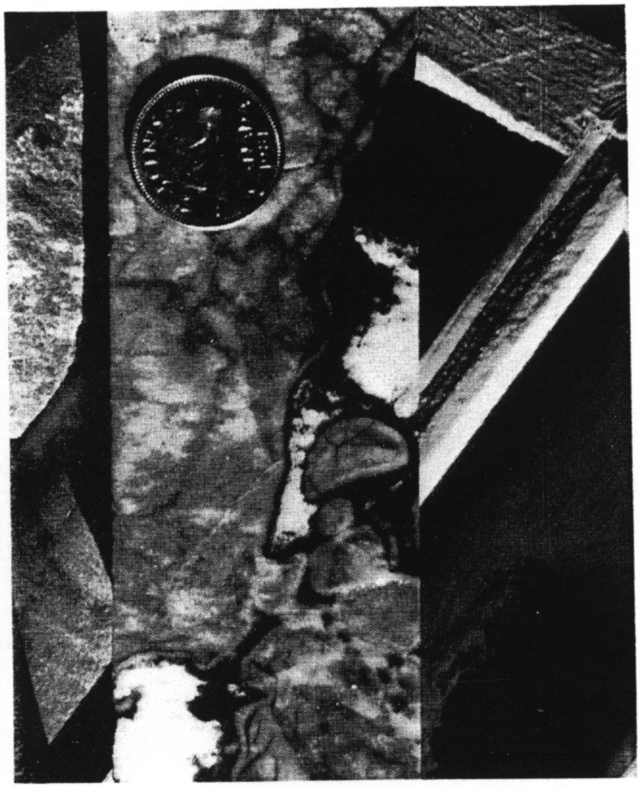


Plate B-14-7. Sulphide-silica-pyrobitumen(?) mineralization in rhyolite unit hostrock, northern 21B deposit, Eskay Creek (DDH CA89-109: 130.1 m)

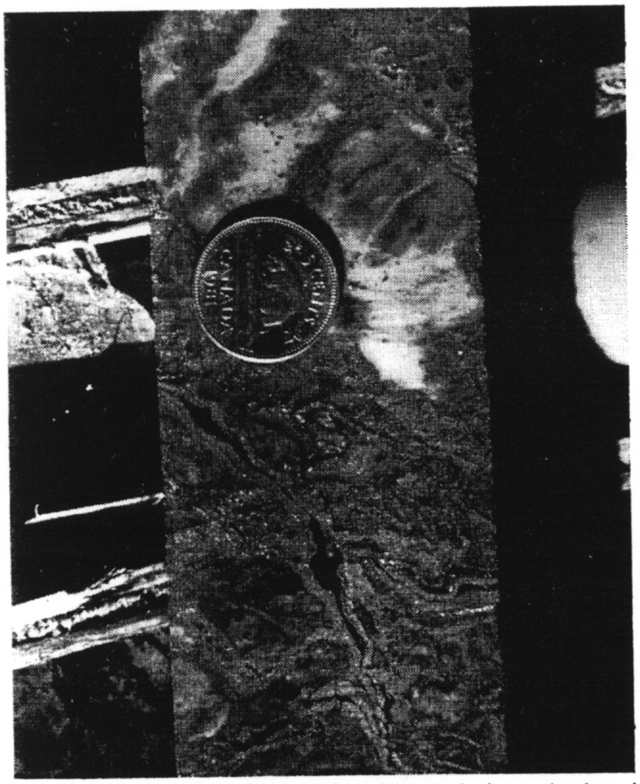


Plate B-14-8. Colloform pyrite with sphalerite and galena in quartz vein below massive sulphide horizon. Rhyolite unit, northern 21B deposit, Eskay Creek (DDH CA89-123: 172 m).

copyrite and tetrahedrite group minerals (Plates B-14-6, 7, 8). Gold occurs as spectacular films, wires or blebs associated with fractured sphalerite.

The different stratigraphic levels of mineralization are illustrated by hole CA89-109 (Figure B-14-8) which intersected a cumulative core length of 208 metres grading 29.96 grams per tonne gold, 33.2 grams per tonne silver, 2.26 per cent zinc, and 1.12 per cent lead. Within this interval is a hangingwall unit intercept of 3.0 metres grading 22.97 grams per tonne gold, 1160.92 grams per tonne silver, 16.13 per cent zinc, 5.99 per cent lead and a combined contact unit - upper rhyolite unit intercept of 61 metres of 98.60 grams per tonne gold, 29.14 grams per tonne silver, 3.44 per cent zinc and 1.86 per cent lead.

A zone of shearing and fracturing up to 60 metres wide (the Pathfinder fault zone) transects the northern 21B deposit. It is marked by intense silica and carbonate alteration that obliterates most original rock textures. Mineralization in hangingwall, contact and rhyolite units is spatially, and perhaps temporally related to this structure.

### AGE OF MINERALIZATION

The contact unit is host to most of the mineralization in the #21 zone. On paleontological grounds the age of this unit is late Early to early Middle Jurassic (probably Toarcian). If textures such as slumped, graded and bedding-parallel massive sulphide seams reflect synsedimentary mineralization, then this is also the age of the deposit.

Lead isotope analyses of galena samples collected from Eskay Creek veins and massive sulphide lenses coincide with early Jurassic lead ratios from the Kitsault, Stewart, Sulphurets and Iskut mining camps (Alldrick *et al.*, 1987b, 1990b). Isotopic data are taken to indicate a widespread, early Jurassic mineralizing event. The Eskay Creek deposits are also products of this event.

### DISCUSSION

The discoveries at Eskay Creek add a new and exciting dimension to the Stewart-Iskut camp. Previous exploration has concentrated upon structurally controlled lode gold and silver (Snip, Johnny Mountain, Brucejack Lake) or large porphyry copper systems (Kerr, Galore Creek). The 21A and B deposits demonstrate the potential for large-tonnage, high-grade polymetallic sulphide deposits with exceptional gold and silver tenor. The nature of the mineralization, an essentially stratabound sheet occurring in a restricted stratigraphic interval (the transition between the regionally extensive Mount Dilworth and Salmon River formations), offers useful guidelines for further exploration.

Sophisticated scientific study of these deposits has yet to be undertaken. In the absence of fluid inclusion data and deposit chemistry much about the nature of the hydrothermal system (or systems) that produced them remains conjecture. The following comments are based on field observations of drill cores and a limited amount of advanced petrology (Barnett, 1989a, b).

#21 zone mineralization is unusual. There is a close spatial, and apparently temporal, relationship between what conventional models describe as low-temperature epithermal and volcanogenic massive sulphide deposit types. Epithermal mineralization, characterized by gold, silver, arsenic, antimony and mercury mineral suites, forms massive and stratabound lodes as well as more usual crosscutting veins and disseminations. Massive sulphide mineralization shows typical "syngenetic" ore textures but atypical mineralogy and precious metal enrichment. The deposits thus resist easy classification. Explanations of ore genesis must account for the complex textural, paragenetic and compositional features displayed in these rocks.

One hypothesis is that the deposits are the product of a single, complex, evolving, shallow hydrothermal system initiated during the last stages of felsic volcanism and continuing through subsequent sedimentation and the early stages of intermediate (andesitic) volcanism. Such a system could be thermally driven by synvolcanic felsic plutons, perhaps akin to the feldspar porphyry plug located east of the #21 zone. Metals could be scavanged from the volcanic pile by deeply circulating seawater or derived from the intrusion. In this scenario possible geologic settings for ore deposition are a small rift basin within a mature island arc or a submarine felsic caldera undergoing cauldron subsidence following the cessation of volcanism. Either interpretation is compatible with current understanding of the geology of the Hazelton Group.

If this model is valid it is tempting to suggest that mineralization observed in the northern part of the 21B deposit is related to a vent area. High-grade, intensely silicified zones could represent stockworks in the underlying rhyolite pile. Layered sulphides in the southern part of the 21B would thus represent more distal accumulations of clastic material vented onto the sea floor. If 21A deposit mineralization was also exhalative it could be deposited by the coolest, farthest-travelled fluids or else be the product of a separate vent.

The 21A deposit might alternatively be the result of a separate, epithermal mineralizing system. Fluids would have risen through the rhyolite and encountered an anoxic, carbonaceous sediment (the contact unit), which served as both a chemical and hydrologic barrier, trapping and precipitating the volatile-element-rich mineral suite characteristic of this deposit.

The 21A and B deposits occur in a simple, apparently undisturbed stratigraphic sequence. There is, however, some evidence that this sequence has been tectonically thickened by early, low-angle thrust or décollement faults. Evidence includes a lens of rhyolite in the hangingwall andesite unit; gouge and foliation fabrics along unit contacts, especially between lithologies with high competency contrast; and low-angle (relative to bedding) foliations in sedimentary strata. Local duplication of stratigraphy is fairly common elsewhere in the Iskut-Sulphurets area with repetition in the order of 10 to 100 metres of section. Similar faulting at Eskay Creek may account for massive sulphide lenses in the hangingwall unit, which otherwise imply a diachronous mineralizing event.

Other genetic hypotheses can be proposed. The deposits may represent separate but contemporaneous hydrothermal systems. In this model the 21A deposit would result from a lower temperature, shorter-lived system; the 21B deposit from a higher temperature, longer-lived system. Another possibility is that epithermal mineralization has been superimposed on earlier syngenetic mineralization. Alternatively, the deposits are entirely epigenetic, perhaps telescoped epithermal veins that have selectively replaced favourable stratigraphic horizons.

It is anticipated that future studies at Eskay Creek will resolve and clarify the nature and ultimate origin of the #21 zone deposits.

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# Johnny Mountain: Mine's future uncertain

The loss of $30 million by Skyline Gold Corporation on its Johnny Mountain mine in the Iskut River Valley, northwestern B.C., was the result of the company's having exhausted all proven mineral reserves.

In the last six months, the drilling that was done has failed to be able to upgrade inferred and possible categories to the proven category.

Skyline's president, Bill Price, says that in retrospect, the mine was put together prematurely, without sufficient work being done to get enough prudent reserves ahead to see four or five years of ore that the company could be relatively confident in.

"The mine only had two years of proven ore. At the time, people were confident, gold prices looked favourable and a production decision was made," Price says.

In hindsight, he says, if one were to do the whole thing over again, management would have taken more time (Price was not prepared to comment on the original management) and a broader look at the property, rather than focusing as quickly as they did on the Stonehouse area.

Skyline has been milling more ore than they have been finding, to the point that in August, they will not have any mill feed left. They started producing 200 tons a day but they were not producing any gold. Their recoveries were not very good because the circuit that had been installed — a cyanide process — was not suitable to the type of ore that was there. This was when Bill Price came in.

Formerly with Blackdome, in the Cariboo, Price came along following a change in management at Skyline and reduced the ore reserves, as the company did not believe in the estimates that had been done. Even the company's own estimates were unable to stand up to the test of time, as it turned out.

A lot of changes were made to the method of milling, and there were other changes made in the organization.

They got the production up from 500 oz. a month to about 5,000, by getting the metallurgy sorted out. Their next problem was to increase tonnage to cope with the fact that the grades were not what Skyline had expected.

They brought the tonnage up from 200 tons a day to about 350 a day on average, sometimes hitting peaks of 400 tons. They have been pushing tonnage to make up for the deficiency in grade. The original promoters had bandied about figures of 900,000 tons of .73 oz. per ton, which never materialized.

The proven ore that is there will be mined out at the end of August. The other categories were disappointing, and the more drilling the company did, the less they found.

Up to the start of production, Skyline had spent about $30 million. The company is now concentrating its efforts elsewhere on the Reg Claim property, which is about 15,000 acres, and the company's land holding is about double that.

Sklyine spent more than $2 million on exploration last year and came up with a number of very interesting showings, mostly at the north end of the property, which adjoins the Cominco/Snip project.

One of the possibilities is to find an extension of the Snip, which, if there is one, would go on to the Skyline property. The company has optioned out about 11 per cent of the north end of the Reg claims property to Placer Dome Inc.

Of the original crew of 130, there are about 58 left. By September, this will have dropped to four. There is no road into the site. A charter plane flies in every Wednesday from Vancouver — subject to good weather. All aspects of the operation are extremely weather-dependent. North coastal weather is subject to heavy snows, rains and clouds.

Price says these are the toughest mining conditions he has ever seen and the most difficult in which to operate a mine.

"You have from about the middle of July to the end of September that's snow-free. The rest of the time you are under 40 feet of snow," he says.

Price has great hopes for the future of the company. He says the property as a whole claim has great potential, even though there isn't a mine any more at that particular location.

He feels that the potential to find something really big is very real, and that excellent prospects exist in the C3, the Mike showing, Bonanza and Bronson areas.

Skyline has a certain amount of preliminary evidence that is encouraging. There are drill hole results that have gone out in previous news releases that are promising.

The company is going to focus its attention on these areas and leave the Johnny Mountain mill in a mothballed state for the time being. □

*— Vivian J. Hartnett*