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PROJECT SUMMARY

to September 1989

RED DOG PROJECT

Located on Vancouver Island B.C.

50° 40'N, 127° 50'W

Owned by
CREW NATURAL RESOURCES LTD
Vancouver Canada



J. B. Richards P. Eng.
JB Engineering Ltd.

September, 1989
Vancouver, B.C.

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RED DOG PROPERTY, VANCOUVER ISLAND
Progress Report

SUMMARY

The Red Dog porphyry copper-gold property is located near Port Hardy on northern Vancouver Island in British Columbia, Canada. The property has been explored with 53 diamond drill holes totalling 23,922 feet, by four different operators and the present owners since discovery in 1966.

Lower Jurassic age andesitic volcanics of the Bonanza Formation of the Vancouver Group have been intruded by a complex system of calc-alkaline porphyry dikes and stocks. These volcanics have undergone extensive hydrothermal alteration and are mineralized with gold, copper and molybdenum plus minor silver values.

Work to date indicates that there is a reasonable expectation of an open pit minable reserve in the order of 50 million tons, at an approximate grade of .32 % copper, .012 ounce per ton gold, and .006% molybdenum. Geological studies in progress suggest that ground previously thought to be barren post-mineral intrusive may in fact be mineralized Bonanza volcanics and therefore be prospective ore. This could add about 25 million tons to the global reserves of the deposit, putting the prospective global reserve in the range of 100 million tons.

Preliminary economic analysis indicates that the drill indicated reserve could be mined at a profit, yielding a return on investment of at least 15%, at an average life-of-mine copper price of \$1.30 per lb. and that the cash flow would still be positive and the project financing paid back if the price of copper were as low as \$.90/lb in the first three years of mine life. There is potential for optimizing both the mining plan and the development method and hence enhancing the value of the property.

A staged program of research, testing, ore reserve definition, bulk sampling, metallurgical testing and environmental impact studies costing \$3 million are proposed for 1989 and 1990. Should this programme be successfully completed, there should be sufficient data for a full feasibility study.

RECOMMENDATIONS

The recommended program for the advancement of the Red Dog Project is detailed below in order of priority, with approximate costs.

1989 Activities

- A) Verify assumptions on smelter contracts and taxes (both income based

and operation based) used in cash flow analysis.

\$2,500.

B) Complete a short program of diagnostic test work to determine what proportion of the gold is locked in the silicate matrix, and what gold recoveries may be reasonably be expected on completion of the metallurgical research program.

\$2,000.

C) Determine the capital and operating costs for a 3,000 - 4000 tpd operation to determine the optimum size plant for the prospective reserve.

\$10,000.

D) Continue with baseline environmental studies and complete the prospectus to evaluate the feasibility of licencing a marine tailings disposal system. A requirement for land based disposal may make the project uneconomic

\$60,000.

E) Prove up sufficient ore to justify an option on the surplus mill at Kitsault. Drill 16 HQ core holes totalling 7,120 feet.

\$500,000.

Total

\$574,500.

1990 Activities

A) Complete the final feasibility drilling, approximately 32,600 feet.

\$1,630,000.

B) Complete environmental impact studies.

\$50,000.

C) Complete metallurgical studies to the pilot plant stage.

\$300,000.

D) Obtain a bulk sample for pilot plant study.

\$390,000.

Plus engineering supervision and reporting.

\$60,000.

Total

\$2,430,00.0

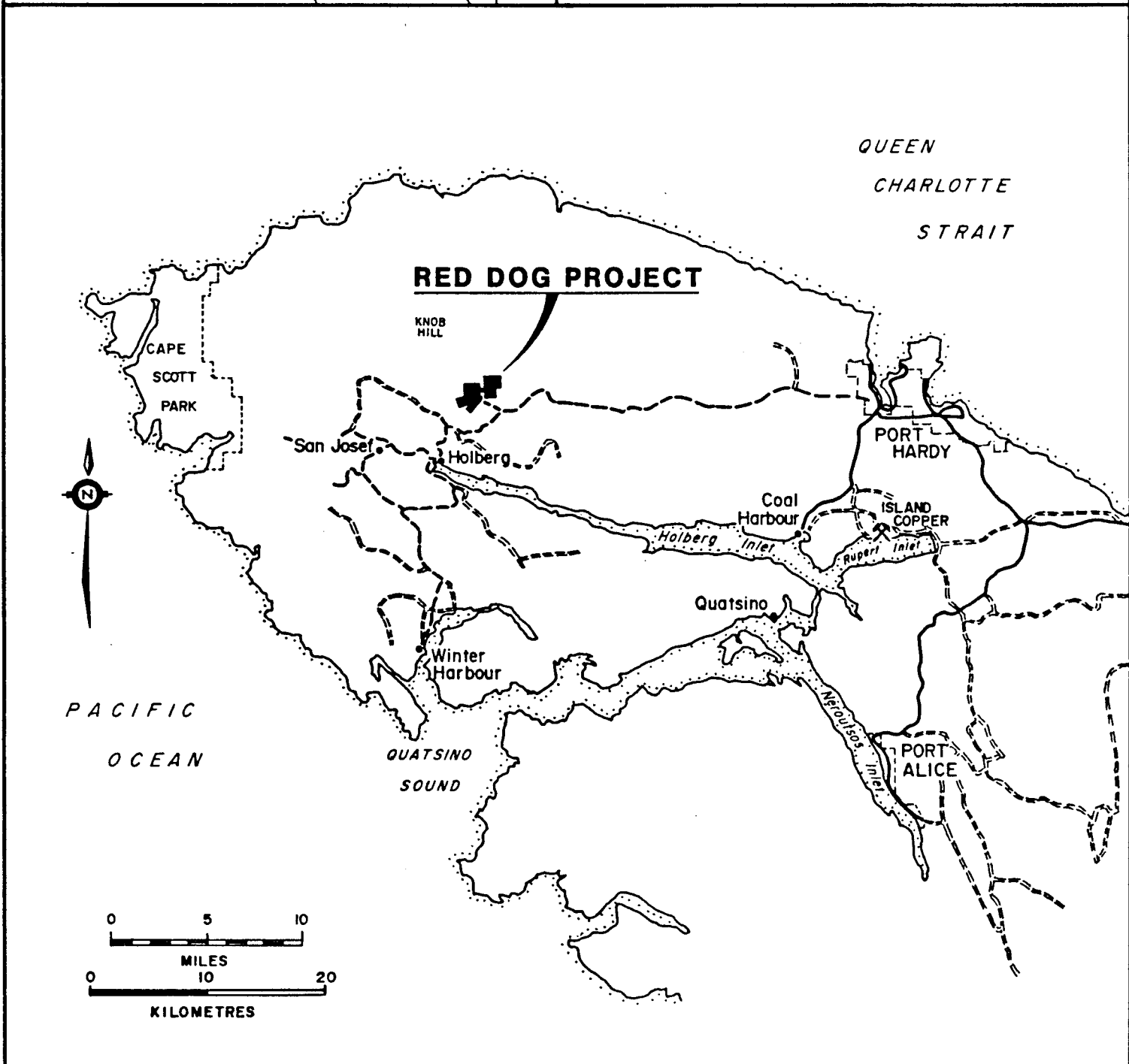
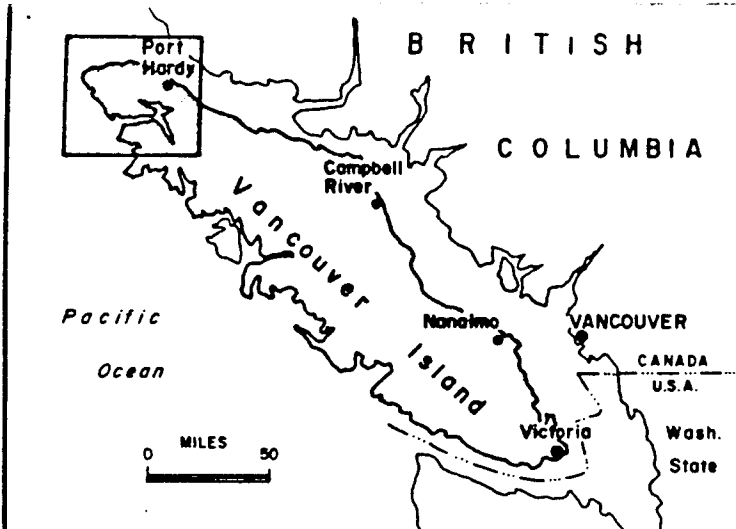


Figure 1

LOCATION MAP

INTRODUCTION

The Red Dog property is a copper-gold porphyry type deposit, located on northern Vancouver Island, British Columbia Canada. Crew Capital Corp. holds the claims under option from Mr Heinz Veerman of West Vancouver, B.C. In early 1988, JB Engineering was commissioned to review and provide an interpretation of all available data with a view to determining the potential for the existence of a significantly larger mineralized body on the claims than previous operators had thought, and to design an exploration program to test the model proposed.

On completion of this study, JB Engineering concluded that there was indeed a reasonable prospect of greatly increasing the known mineralization, and a short diamond drilling program was recommended to test the geologic model proposed. This program, while not totally proving the model proposed, did establish that the prime area of interest on the west slope of Red Dog Hill does contain very significant widths of ore with copper and gold grades that may support a viable mining operation. Other potentially economic mineralization occurs on the claims in the Slide Creek zone, and in the area between the two zones.

HISTORY

The Red Dog property is a geochemical find, having been first detected by a regional program in 1962. Follow-up during the 1966 field season led to the discovery of copper and molybdenum mineralization in the bed of Slide Creek and the subsequent staking of the Red Dog claims.

In the years from 1967 to 1983, West Coast Mining and Exploration Ltd., Cities Services Ltd., Westminex and Utah Mines Ltd. all worked the claims, with all but Utah concentrating on the Slide Creek Zone. The entire claim block was soil sampled, the western block surveyed by magnetometer and VLF-EM, and Induced polarization. The area was geologically mapped and the claim posts located by land surveyors. 20,323 feet of core drilling were completed in 47 drill holes, plus several "winkie" drill holes. Generally the core recovery was poor, and apart from the earliest drilling by Westcoast Mining, and the last drilling by Utah mines Ltd., assaying for copper was incomplete, and gold assaying often lacking.

The Slide Creek Zone was discovered in 1967 by West Coast Mining, and the Red Dog Hill Zone by Utah Mines, although previous operators had some indications of its presence.

Based on a model of the mineralization in both zones being limited in depth extent by "dish-shaped" relatively flat lying intrusive contacts, Utah Technical Services engineers concluded that the "Red Dog Hill" zone could

contain 12.2 Mt. of 0.387% Cu and 0.021 oz/t Au, and the "Slide Creek" zone 3.59 Mt. of 0.436% Cu and .008 oz/t Au, both zones being limited in depth to above 1000 feet elevation. This was considered to be a sufficiently valuable asset to hold, but as the holding costs were at the expense of the exploration budget, the claims were returned to the owners.

Crew Capital Corp. optioned the property in early 1988 and extended the data base by drilling, metallurgical testing, environmental base line work, geological mapping and petrographic studies. Expenditures by Crew Capital Corp. and Crew Natural Resources Ltd. to date have totaled \$360,000.

LOCATION AND ACCESS

The Red Dog property is located on northern Vancouver Island, in British Columbia Canada. Geographic coordinates are 50° 40' north latitude and 127° 50' west longitude.

The claims lie completely within Western Forest Products tree farm license #6, and are surrounded by BHP-Utah Mines Ltd "Expo" claim block. See Figure 1, LOCATION MAP and Figure 2, CLAIM MAP.

Access to the claim block is by way of 28 miles of good gravel road to the Island Highway at Port Hardy. Tide water is 10 miles away by road at Holberg. Western Forest Products logging access road NE62 provides access from the Port Hardy - Holberg road. Branches 62B and 62H cross all areas of interest.

Port Hardy is serviced by several flights of commercial airline service daily. Charter helicopter service is also available at Port Hardy.

TOPOGRAPHY, PHYSIOGRAPHY AND CLIMATE

The area is one of moderate relief, the hills rising to 1200 feet above the valley bottom at 600 feet above MSL. Slopes rarely exceed 40°.

The mineralized zone occupies a local prominence called Red Dog Hill, which rises to 1550 feet, on the flank of a long 1800 foot elevation ridge.

The soil in the area is for the most part a dense and almost impervious basal till. Where the roots of trees have penetrated deeply and oxidized the till the soil is very prone to slumping after periods of heavy rain-fall following extended dry periods. One such slide exposed the "Slide Creek" mineral zone. The normally waterlogged nature of the surface soil makes exploration road construction very expensive, in the order of \$80,000 to \$90,000/mile, as any road must be ballasted with 18 inches of quarried rock to

be strong enough to support the construction equipment.

The entire area of interest has been clear-cut logged and replanted in the years since the Red Dog claims were staked. Secondary growth is very dense, and movement through the bush away from cut lines or creek beds is difficult.

Climate is typical of the west coast marine climatic zone. Temperatures are moderate throughout the year, mean temperatures ranging from a few degrees C. above zero in winter to 14 above in July. Summers are usually fairly dry. Most of the 200 inch annual precipitation falls in the winter months, and while cumulative annual snowfall is in the order of 100 inches, snow does not usually stay on the ground all winter.

WATER AND SURFACE RIGHTS

The adjacent Goodspeed river should provide ample water for mining purposes.

Surface rights for a mill site and waste dumps on the claims would be part of the mining lease granted by the crown.

If a tailings pond were required, it would most likely have to be located on the adjacent Expo claims. Surface rights would have to be negotiated with the claim holder as well as the tree farm licensee.

As a small portion of the Red Dog ore body extends onto the Expo claims it would be most practical if the eventual operating entity included both ownerships.

POWER

A 25KV power distribution line follows the Port Hardy - Holberg road. This would be the logical route for a high-voltage transmission line from Port Hardy should the need arise. The existing distribution line has insufficient capacity to support a major project. The cost of upgrading the power line would be part of the project capital cost.

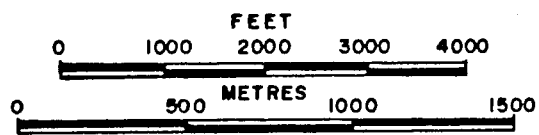
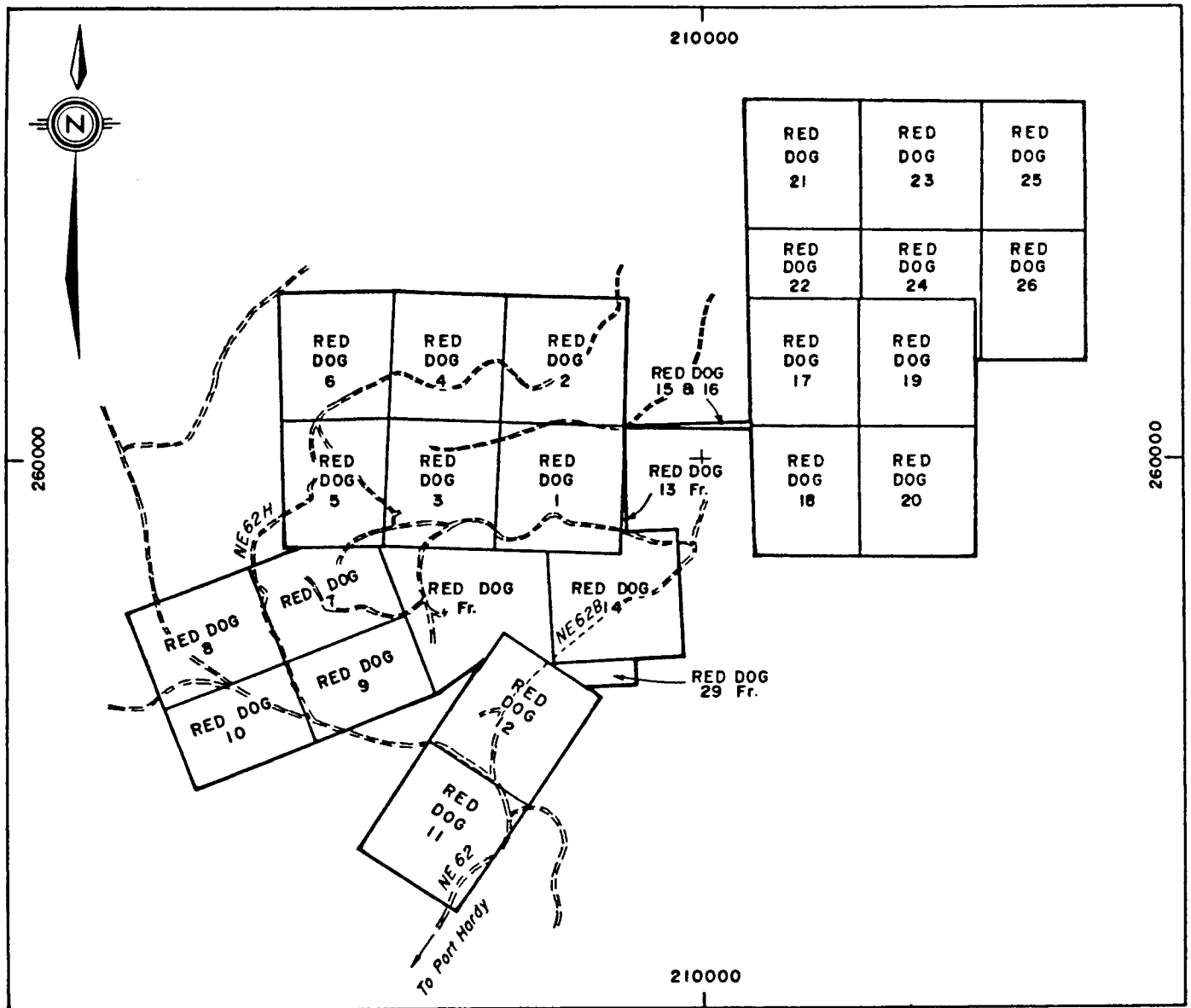


Figure 2

CLAIM MAP

CLAIM STATUS

The Red Dog property consists of 28 full size and fractional two post claims. Relevant data is tabulated below.

<u>Claim Name</u>	<u>Record No.</u>	<u>Record date</u>	<u>Expiry Date</u>
Red Dog 1 - 8	19134 - 19141	Dec. 13,1966	Dec.13,1998
Red Dog 9 - 10	19142 - 19143	Dec. 13,1966	Dec.13,1998
Red Dog 11 - 12	19144 - 19145	Dec. 13,1966	Dec.13,1998
Red Dog 13fr.	25147	June 17,1968	June17,1999
Red Dog 14	19409	May 23,1967	May 23,1999
Red Dog 15 - 26	21521 - 21532	Dec. 1,1967	Dec. 1,1998
Red Dog 29fr.	21535	Dec. 1,1967	Dec. 1,1998
Red Dog fr.	19410	May 23,1967	May 23,1999

The Red Dog 15 to 26 claims are referred to as the "eastern block" as they are more or less separated from the rest of the block by "Expo" claims owned by BHP-Utah Mines. For grouping purposes the claims may be grouped as a single group since Red Dog 15 & 16 form a small wedge-shaped area that touches the western block. See Figure 2. Claim Map.

GEOLOGY

A) Regional

See Figure 3. REGIONAL GEOLOGY.

The property is underlain by volcanic and sedimentary rocks of the Vancouver Group; the Bonanza Formation volcanics and related tuffs and tufaceous sediments of lower Jurassic age for the largest part. The volcanics have been intruded by Jurassic and later porphyry stocks and dikes. The regional trend of the volcanics is NW with moderate SW dips in the order of 20 to 35 degrees. The regional dip is related to a set of strong NW block faults which also cause the section to be repeated. The NW trending block faults appear to be part of a deep seated zone of structural weakness along which intrusive centres have been located. The Red Dog intrusive and related dikes are one of seven volcanic centres regularly spaced at 7 to 10 km intervals in a more or less straight line along the north side of Holberg and Rupert inlets starting with Island Copper on the south east, Apple Bay, Pemberton Hills, Hushamu, Red Dog, and finally Knob Hill to the north west. Block faulting has lifted the various volcanic centres so that different levels within the original systems are exposed at each location. Island Copper, Hushamu, and Red Dog are the only ones having sufficiently deep erosion to expose the copper porphyry zones.

B) Property

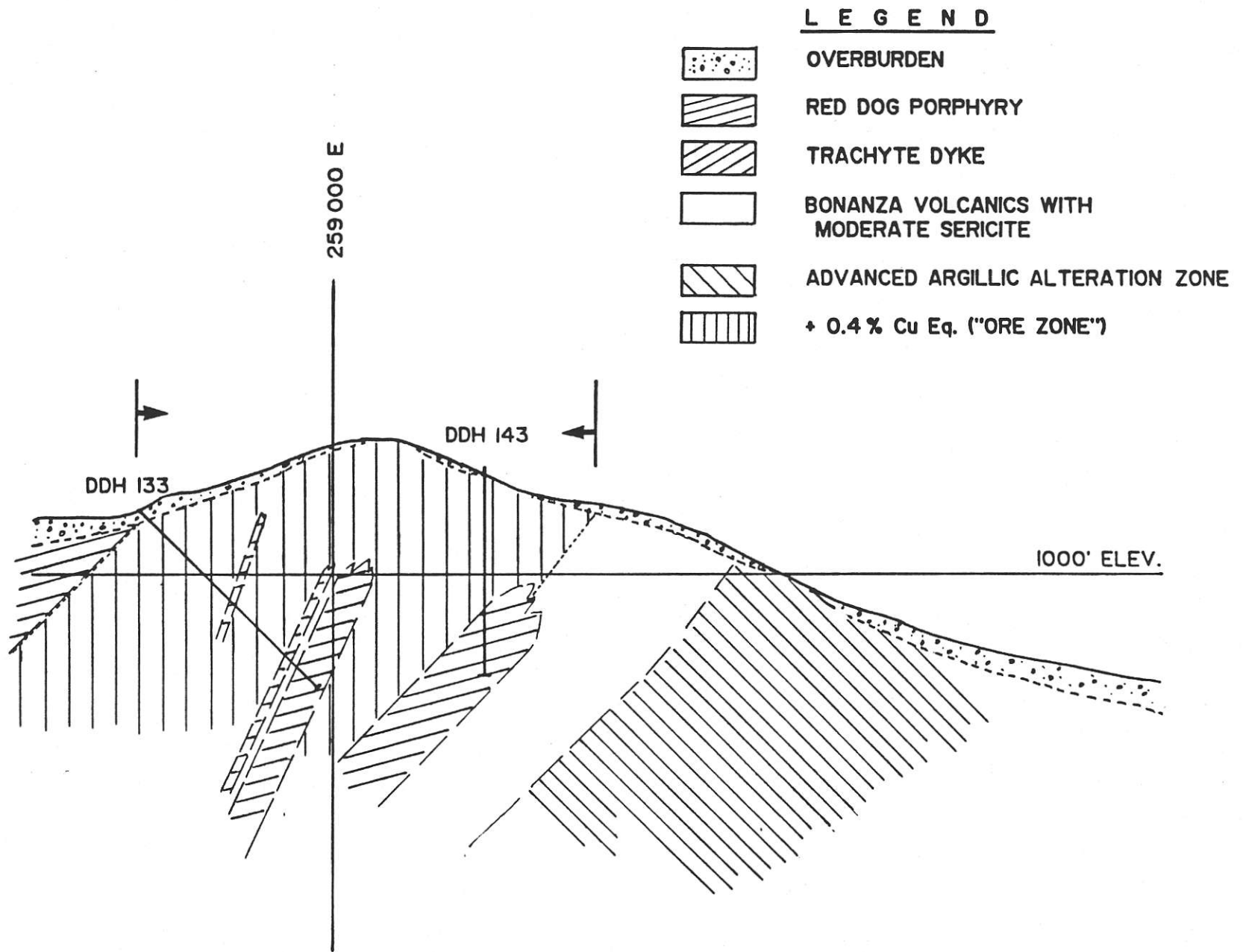
See Plate 1, Interpreted Geology on back cover.

The Red Dog Hill zone is underlain by a quartz-magnetite breccia or QMBX, an alteration facies superimposed on various Bonanza pyroclastic units. Andesitic volcanics have been intruded by a quartz feldspar porphyry dyke with distinct rose coloured quartz phenocrysts, called "the rose porphyry". This dyke flooded the surrounding volcanics with silica and feldspar, (the feldspar largely albite,) brecciated and mineralized it, and flooded the re-cemented breccia with additional silica plus or minus magnetite. This QMBX lies sandwiched between the Red Dog stock to the north, a complex porphyritic assemblage, generally little altered, and an east-west striking, steeply dipping zone of advanced argillic (sericite + pyrophyllite + quartz) alteration to the south. See Figure 4. The advanced argillic zone to the south is thought to be the alteration envelope on the periphery of the convection cell created by the emplacement of the larger intrusive units. Mineralization is invariably fracture controlled. Where chalcopyrite appears at first glance to be disseminated it will always be seen to be strung out along a healed fracture.

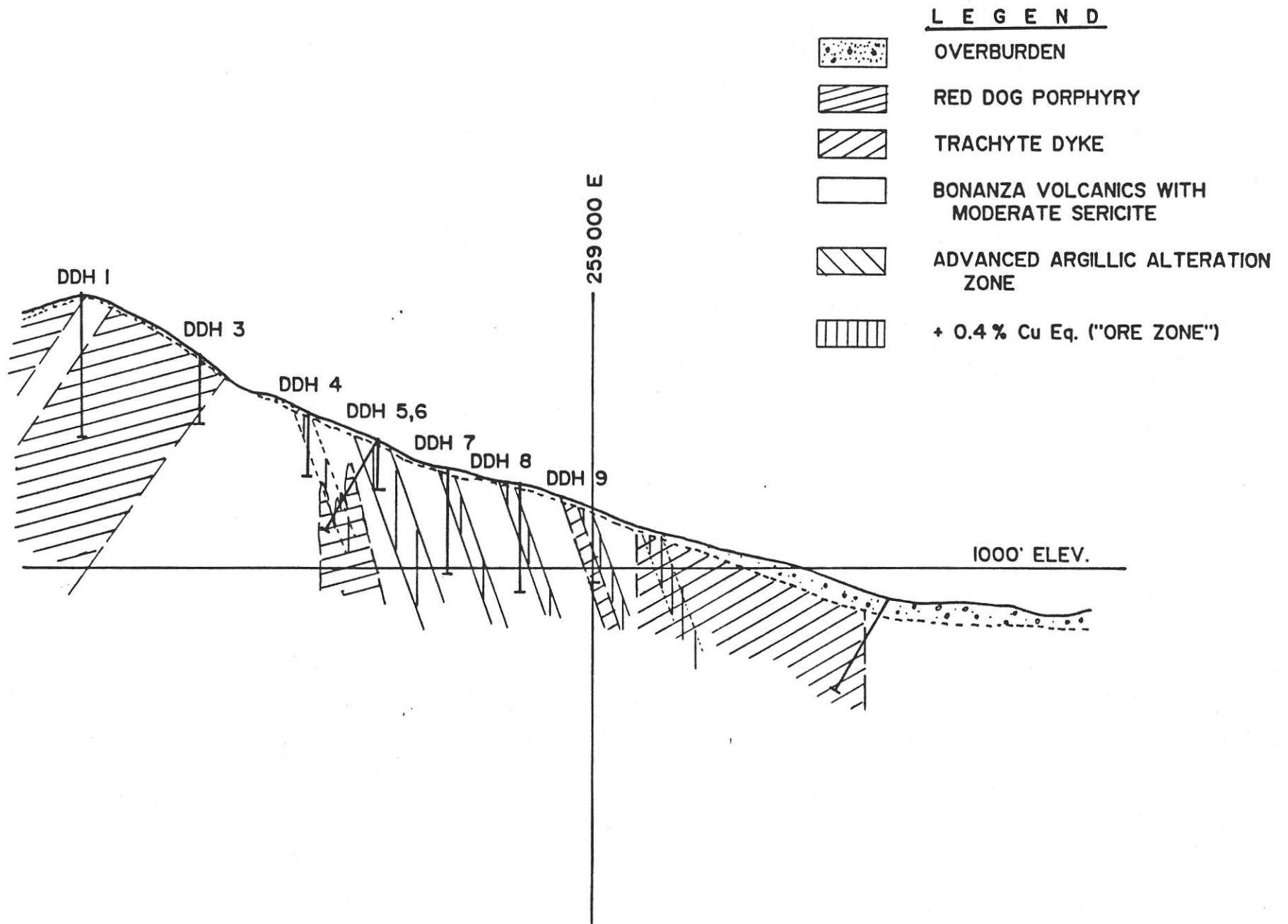
In the "Slide Creek" zone the mineralizer has been identified as a trachyte dike which is itself mineralized with pyrite and chalcopyrite. Alteration is commonly a strong retrograde sericite which has overprinted earliest alteration assemblages. While both West Coast Mining and Cities Service geologists interpreted the Slide Creek Zone as being a shallow south-dipping dish shaped body, they speculated that the apparent discontinuity of the ore may have been due to it being in steeply dipping narrow dike-like masses. This steeply dipping model seems most likely. See Figure 5. The potential of this zone does not appear to be as great as the Red Dog Hill zone, but it would be a mistake to write it off without fully testing and delimiting it.

The minerals of economic importance are chalcopyrite and molybdenite. Bornite and trace covellite have been observed as primary minerals, and bornite especially may be sufficiently abundant to be of economic significance. Bornite has been noted in DDH 88-2 for instance, in very fine disseminations not visible except under 20X magnification, and probably accounts for erratic high assays noted by early workers who could see no visible mineralization. Considerable bornite was also noted in a polished thin section prepared from a sample collected near hole EC-135. The mode of occurrence of the gold has not been studied. This zone contains the best mineralization, and the most coherent "ore" blocks.

The area between the two known zones, along fault NW1 is interesting. The mineralized trachyte dike is cut by DDH 17 on section 207400E, and so the "ore block" is postulated to extend this far from the Slide Creek zone, and may be more substantial than the relatively thin and discontinuous Slide creek "ore" bands. The trachyte is not known to extend west of this section, however short sections mineralized with copper were found in the top and



**TYPICAL RED DOG HILL ZONE
CROSS SECTION 205450 E**



TYPICAL SLIDE CREEK ZONE CROSS SECTION

FIGURE 5

bottom of holes EC 139, EC 140, and in the top of hole EC 145.

As the geological study is in progress, the sections and plans prepared with the 1988 Progress Report remain current. Apart from the attitude of the Red Dog Porphyry contact on the north side of the Red Dog Hill zone, which probably dips northerly rather than southerly as had been previously thought, the relative abundance of prospective mineral zone and barren post-mineral dyke as depicted on the 1988 sections is more or less accurate. Work in progress is lending confidence to the previous interpretation, and allowing individual intrusive phases to be identified.

Faulting is very extensive, the amount of movement on any fault is not known. A strong north-west trending, south-west dipping fault thought to begin in a creek on the north side of Red Dog Hill and extending across the saddle and into the next creek, labelled NW1 on Plate 1, was thought to be the break between the two mineral zones, and to cutoff the Red Dog Hill Zone against the Red Dog Porphyry. The attitude of the fault, and even its existence is now questioned, and the Red Dog Hill Zone is now thought to plunge to the north underneath the Red Dog porphyry. See Figure BBBB below. Fracturing is everywhere at least moderate and very often strong to extreme in its intensity.

MINERAL RESERVE POTENTIAL

A drill indicated reserve for the Red Dog Hill zone was calculated for, and included in the 1988 progress report. The numbers arrived at were: 51.84 million tons at .32% copper and .012 oz/ton gold which were contained within a pit with a .36:1 waste to ore stripping ratio. Should the Red Dog porphyry contact noted in the geology section be proven to be dipping north as is now thought, the prospective mineral zone is increased by some 25 million tons.

No reserve estimate was made on the Slide Creek zone, but a preliminary computer generated block model created for a potential joint venture partner in May of this year indicates that something in the order of 15 to 20 million tons may be available in the area east of the Red Dog Hill zone. Because of the scarcity of data in the area, this could not be regarded as even "drill indicated" reserves, but is mentioned in passing to indicate that the zone should not be overlooked.

1989 ACTIVITIES

Work completed to date in 1989 has consisted of:

A) Topographic data and drilling data was converted to metric units so that ongoing project work would be compatible with government requirements and modern practice. The claim survey was re-established by McElhaney Surveying

and Engineering Ltd., and all available drill collars were surveyed.

B) Environmental baseline studies were begun by Rescan Environmental Services Ltd. This included water analysis, and stream flow measurements.

C) Metallurgical research into the flotation characteristics of the Red Dog Hill Zone was begun by Bacon, Donaldson & Associates. Nine rougher flotation tests were completed on six composite samples taken from the 1988 drill core crusher rejects, indicating excellent recoveries of copper and good recoveries of molybdenum into a rougher concentrate. Gold recoveries were not as good as for copper and molybdenum, but gold was not the object of the test work.

D) A program of check assaying was completed to confirm the quality of the 1988 assaying. The results were acceptable.

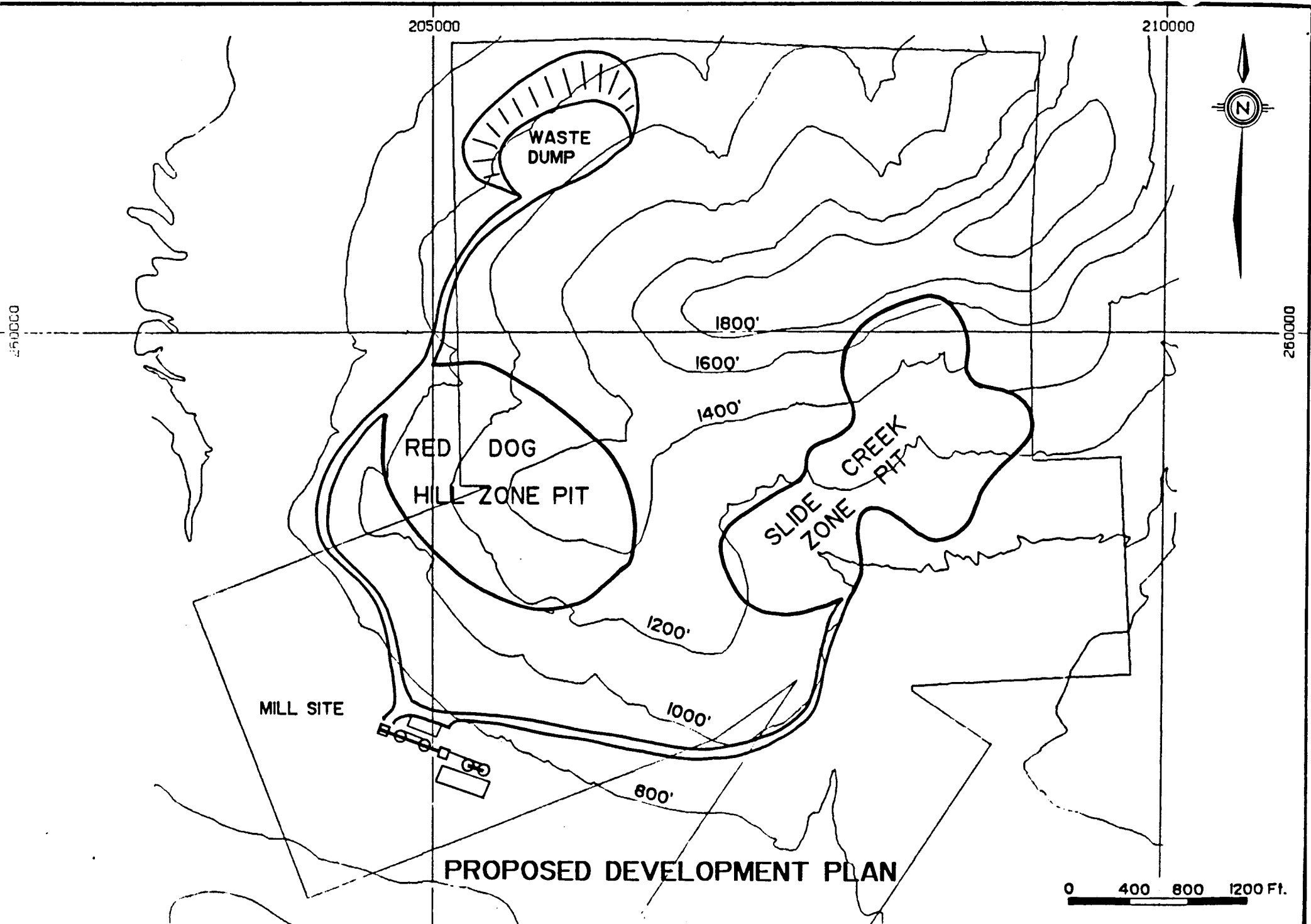
E) A geological study by K.E.Northcote and Associates and JB Engineering Ltd was begun, and is near completion. Most outcrops in the Red Dog Hill Zone and some in the Slide Creek Zone were visited and located on plans. Diamond drill core from the Utah and 1988 drilling was examined. Petrographic study completed on a suite of rocks taken from outcrop and the telescopes of the Utah and Crew drilling have been made into a library of rock types and alteration types. This will allow a more confident interpretation of geology in ongoing work.

F) The used 12,000 tpd concentrator belonging to Amax of Canada at Kitsault B.C. was visited and evaluated for possible use at Red Dog, from the standpoint of mechanical condition, suitability for the probable flow-sheet involved, and economics of moving and reconstructing at Holberg. Evaluations of the mill from a process suitability and mechanical condition were done by Bacon, Donaldson & Associates, and the economics of moving were evaluated by Crippen & Associates Ltd. Both studies concluded that the project may be economically attractive for the Red Dog Project.

G) Cash flow studies of the Red Dog Project development as it currently envisioned were updated to reflect the economics of acquiring the surplus mill from Kitsault.

PROJECTED DEVELOPMENT

The development envisioned for the Red Dog Project would entail the construction of an open pit mine and concentrator on the claims. The most likely mill site would be on the valley floor on the Red Dog 10 claim. See Figure 6. Waste rock would be dumped on the north side of Red Dog Hill, and tailings deposited in a marine disposal area. The product would be a gold bearing copper concentrate that would be shipped in bulk from Holberg in ocean going ships to overseas markets, and molybdenum disulphide shipped in drums by truck to roasting facilities in Canada.



PROPOSED DEVELOPMENT PLAN

Allowing eighteen months for exploration and development work to prove ore reserves, complete metallurgical test work, engineering and environmental permitting, mine construction could begin in 1991, and if it were possible and feasible to obtain the used plant at Kitsault, the mill would be operating one year later. Other used equipment would enable a similarly rapid development; an all new plant could involve delays due to the lead time involved in major component delivery. As the ore body is on the top of a hill, preproduction mine development expenses would be minimal, and require much less lead time than the mill.

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