

Red Dog
924/12W
924200
886951

YOS

RED DOG PROJECT

PROSPECTUS

Submitted to:

**Mine Development Steering Committee
B.C. Ministry of Energy, Mines and
Petroleum Resources
Victoria, British Columbia**

Submitted by:



Crew Natural Resources Ltd.
Vancouver, British Columbia

April 1992



MAY 28 1992

Geological Survey of Canada
125 Montreal Street
Ottawa, Ontario
K1A 0S8

PROJECT FACT SHEET

CORPORATE DATA

Project Name: Red Dog Project

Company Name and Address: Crew Natural Resources Ltd.
615-800 West Pender Street
Vancouver, B.C.
V6C 2V6

Contact/Title: Dr. Gerald D. Wright, P.Eng., President
Robert B. Anderson, Vice-President
John M. Darch, Secretary

Telephone: (604) 662-3338
Fax: (604) 662-3180

PROJECT DETAILS

Project Location: 6 km NE of Holberg, B.C.
50° 42'N Latitude
127° 58'W Longitude

Exploration Cost to Date: In excess of \$2 million

Development Cost: Approximately \$5 to 6 million

Estimated Total Capital Cost:
A. If Purchased New Approximately \$30 million
B. If Contract Mined Approximately \$5 million

Minerals: Chalcopyrite, bornite (copper sulphide)

**Mining Method and
Production Rate:** Open pit
20,000 tpd

Process Plant/Mill: Use existing mill at Island Copper Mine

Ore Beneficiation Process: Froth flotation

Proposed Mine Life: 3 to 5 years

MINERAL RESERVES

Reserves: Drill Proven Geological: 31.2 x 10⁶ tonnes
Geological: 0.313% Cu, 0.013 oz/ton Au, 0.007% Mo (45g/t)

Cut-off Grade: 0.2% Cu

Potential for Additional Reserves: Over 60% of claims remain untested

ACCESS/TRANSPORTATION

Road: W.F.P. haul road NE 62 and NE Main to Holberg

Water: Holberg Inlet barge route

Air Access: Port Hardy is serviced by twice daily commercial flights

POWER SUPPLY: 38 kv transmission line (B.C. Hydro North Island grid)

WORKFORCE INFORMATION

Construction Workforce: 60 for 4 months
(Annual Average)

Operation Workforce: 110 permanent full time
(Annual Average)

Housing Options: 45 minutes to Port Hardy
15 minutes to Holberg
4 days in - 4 days out

Workforce Rotation/Schedule: Two 10 hour shifts per day
(Mine Only)

1.0 INTRODUCTION

1.1 Preamble

Crew Natural Resources Ltd. is a Canadian mining company, based in Vancouver, British Columbia. The company owns or has an interest in four mining properties, two of which are in British Columbia: Red Dog, a "porphyry" copper and gold deposit on northern Vancouver Island, and Kalder Lake, a copper-gold deposit north of Prince George. Crew Natural Resources Ltd. (CNRL) currently holds a 100% interest in the Red Dog property, which is located near the Town of Holberg and in close proximity to the Island Copper Mine. CNRL has undertaken advanced exploration of the Red Dog ore body to determine the feasibility of bringing it into production in the near future. This prospectus document describes the intent of CNRL to develop the Red Dog project as a quarry and, subject to ongoing discussions between Island Copper and CNRL, to supply crushed ore to the existing mill at Island Copper Mine.

The purpose of this prospectus is to detail the proposed Red Dog Project with respect to the geology and extent of the ore body and its host formation, the proposed development plan and related infrastructure, the environmental setting, existing land use, and the related environmental and socioeconomic assessments, on-going and proposed. The document concludes with a description of the proposed development schedule. This prospectus is intended to initiate a dialog with the regulatory agencies to establish the terms of reference for mine development approval and related permits.

The proposed Red Dog Project is essentially a hilltop quarry operation which would provide ore to the existing mill at Island Copper Mine. Sufficient geological information is available to initiate mine planning and permitting, and CNRL is committed to develop the deposit in a manner that does not cause significant environmental impact during operation or after mine closure. Moreover, the proposed project provides substantial socioeconomic benefits to both Holberg and Port Hardy.

1.2 Project Location and Setting

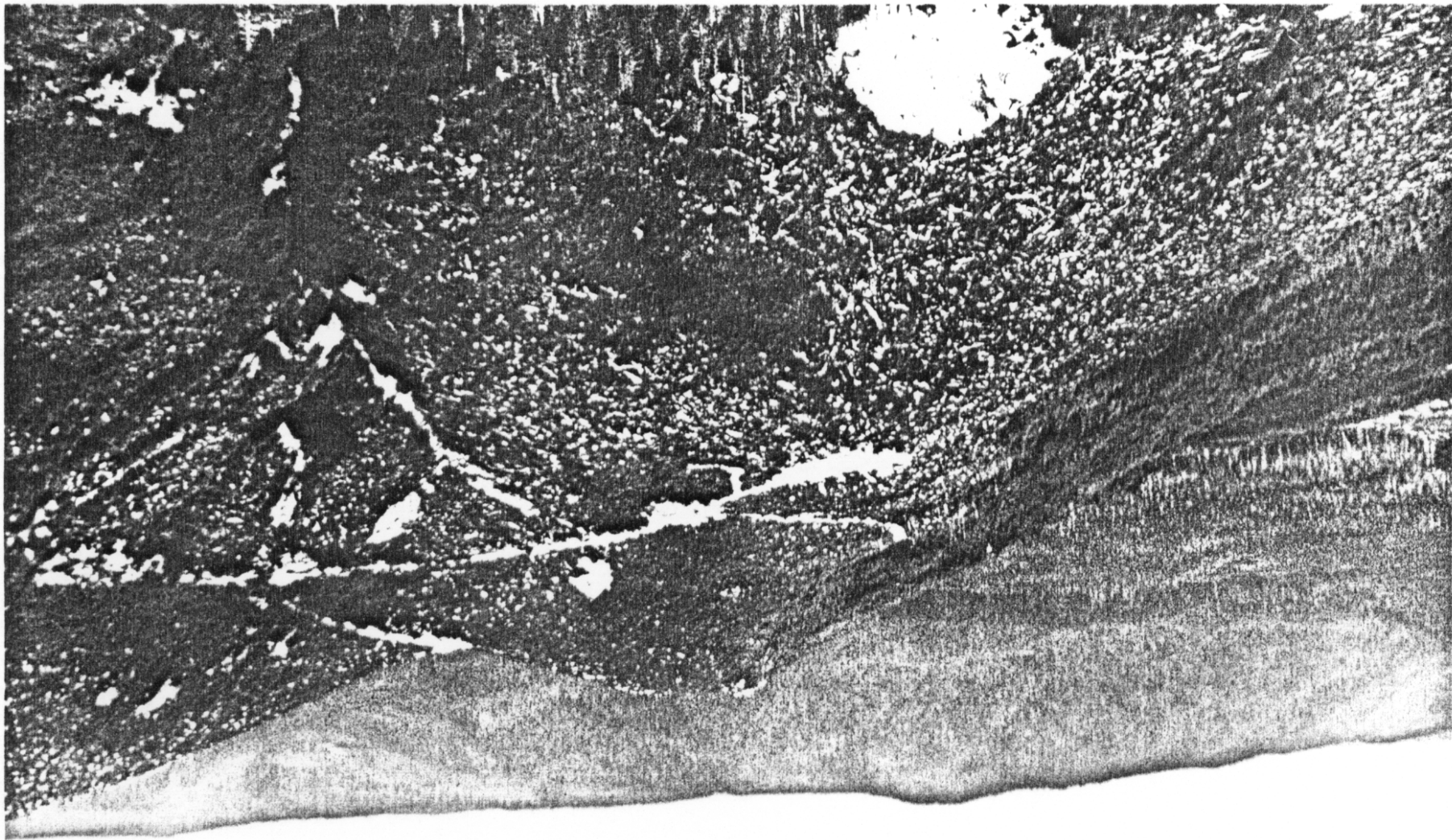
The Red Dog property is located on Northern Vancouver Island approximately 6 km (10 km by road) northeast of Holberg, at 50° 42'N and 127° 58' W (Figure 1-1). The claim block is accessed via 40 km of good gravel road from the Island Highway at Port Hardy, and approximately 2.5 km of Western Forest Products logging access road NE62. The Red Dog Hill ore deposit is situated at the summit of a small, clear-cut hill, at an elevation of about 470 m (1,500 feet) above sea level (Figure 1-2). The surrounding terrain is hilly and reaches maximum elevations of about 900 m (2,100 feet), though slopes rarely exceed 40 degrees. The site lies about 2.5 km (1.5 miles) from the Holberg-Port Hardy road which provides good access to tidewater at the head of Holberg Inlet. A 38 kv hydroelectric transmission line is also available along the Port Hardy Road.

1.3 Historical Perspective

The Red Dog property was first detected as a geochemical find by a regional program in 1962. An anomaly from the 1962 program was followed up in 1966, leading to the discovery of mineralization in a creek bed and the subsequent staking of the Red Dog claims. Three exploration holes were drilled in 1967 with a winkle drill, although core recovery was poor. In 1968, a two stage drilling program was carried out which included 1,722 metres in 20 holes. A soil geochemistry survey was conducted between the two stages.

Ground magnetic and very low frequency electromagnetic (VLF-EM) surveys were completed in 1970. Four anomalies located by the geophysical surveys were tested by four diamond drill holes totalling 453 m of core. The roads and creeks were geologically mapped in the same year. In 1972 the claims were optioned to Cities Services who remapped the property, relogged the previous drilling and drilled 903 m of core in three holes. Cities Services was joined by Westminex Development in 1973, and a program of rock geochemistry, an induced polarization survey (I.P.) (primarily for assessment purposes) and 7.7 km of road construction were completed. Three deep core drill holes and a line I.P. survey were recommended but were not carried out. In 1974 the three core holes recommended in 1973 were drilled (613 m) plus two winkle holes.

Figure 1-2. Photograph of Red Dog Hill, viewed from the south east.



Exploration then ceased until 1982 when the property was optioned by Utah Mines, who completed the line I.P. survey on Red Dog Hill and 664 m of core drilling in six holes, followed by 1059 m in six more holes plus the deepening of one earlier hole. In 1983, Utah Mines drilled 5 core holes totalling 779 m to test a number of I.P. anomalies on the south slope of Red Dog hill. The I.P. anomalies were found to be caused by a zone of advanced argillic alteration with associated pyrite.

In early 1988 the property was optioned by Crew Capital Corporation, a private company wholly owned by two directors of Crew Natural Resources Ltd., who drilled 1042 m in four holes to test a geologic model proposed by J.B. Engineering Ltd. This drilling demonstrated continuous mineralization over much greater lengths than previously believed. The property was then vended at cost into Crew Natural Resources in 1989. The drilling and testing that followed was conducted by Moraga Resources Ltd. under terms of an option agreement between the two companies. The objective of programs jointly conducted by the partners in 1990 and 1991 was to delineate the quartz-magnetite breccia zones of mineralization in the Red Dog Hill zone.

In April 1989, Crew Natural Resources Ltd. commissioned a preliminary environmental survey. This environmental program included preliminary stream flow measurements, water quality, and vegetation, fish and wildlife resources in the area of Red Dog Hill and tributaries of the Goodspeed and Nahwitti rivers.

Engineering and technical evaluation studies including preliminary mine design work based on geologically controlled block model studies, as well as both preliminary and detailed metallurgical evaluations were completed by Crew Natural Resources to assess the technical merits of the project.

In February, 1992, Moraga Resources Ltd. withdrew from the project and Crew Natural Resources assumed full interest in the property. A decision was made to pursue a program of advanced exploration and mine development planning. The current status of the project is described in the prospectus.

2.0 GEOLOGY AND RESERVES

2.1 Geology

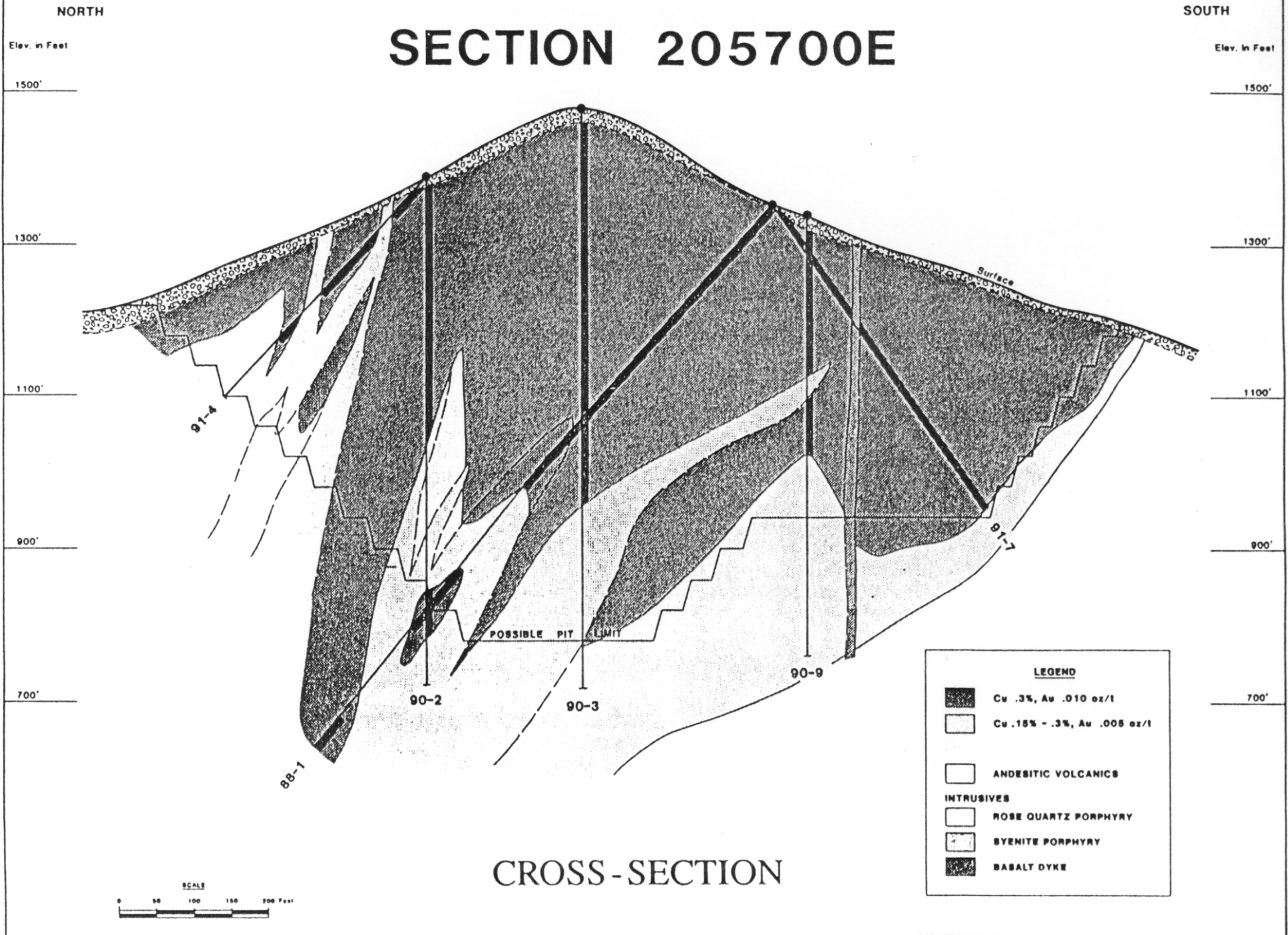
The Red Dog property is underlain by volcanic and sedimentary rocks of the Vancouver Group, the Bonanza Formation volcanics, and related tuffs and tuffaceous sediments of lower Jurassic age for the largest part. The volcanics have been intruded by Jurassic and later porphyry stocks and dikes. The regional 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 a part of a deep seated zone of structural weakness along which intrusive centers have been located. The Red Dog intrusive and related dikes are one of seven volcanic centers 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 southeast, Apple Bay, Pemberton Hills, Hushamu, Red Dog, and finally Knob Hill to the northwest. Block faulting has lifted the various volcanic centers 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.

The Red Dog Hill zone (Figure 2-1) is underlain by quartz-magnetite breccia or QMBX, an alteration facies superimposed on various Bonanza pyroclastic units. Andesitic volcanics have been intruded by a narrow, steeply dipping quartz feldspar porphyry dyke with distinct rose colored quartz phenocrysts, called the "rose quartz porphyry". This dyke flooded the surrounding volcanics with silica and feldspar, (the feldspar largely albite), brecciated and mineralized it, and flooded the recemented 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. The advanced argillic zone to the south is thought to be the alteration envelope of the periphery of the convection cell created by emplacement of the larger intrusive

Figure 2-1

CREW NATURAL RESOURCES LTD.

**RED DOG HILL
SECTION 205700E**



CROSS-SECTION

at first glance to be disseminated it is always seen to be strung out along a healed fracture.

East of Red Dog Hill, 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. Early investigators and 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 dike-like masses. Recent geological assessment tends to confirm the later interpretation.

The minerals of economic importance on Red Dog Hill and at Slide Creek 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 surface sample collected near the collar for drill hole EC-135.

Faulting is very extensive, and the amount of movement on any fault is not known. A strong northwest trending, southwest dipping fault, thought to begin in a creek on the north side of Red Dog Hill and extend across the saddle and into the next creek, 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, are now questioned, and the Red Dog Hill Zone is currently thought to be vertically in contact with the Red Dog Porphyry on its north edge.

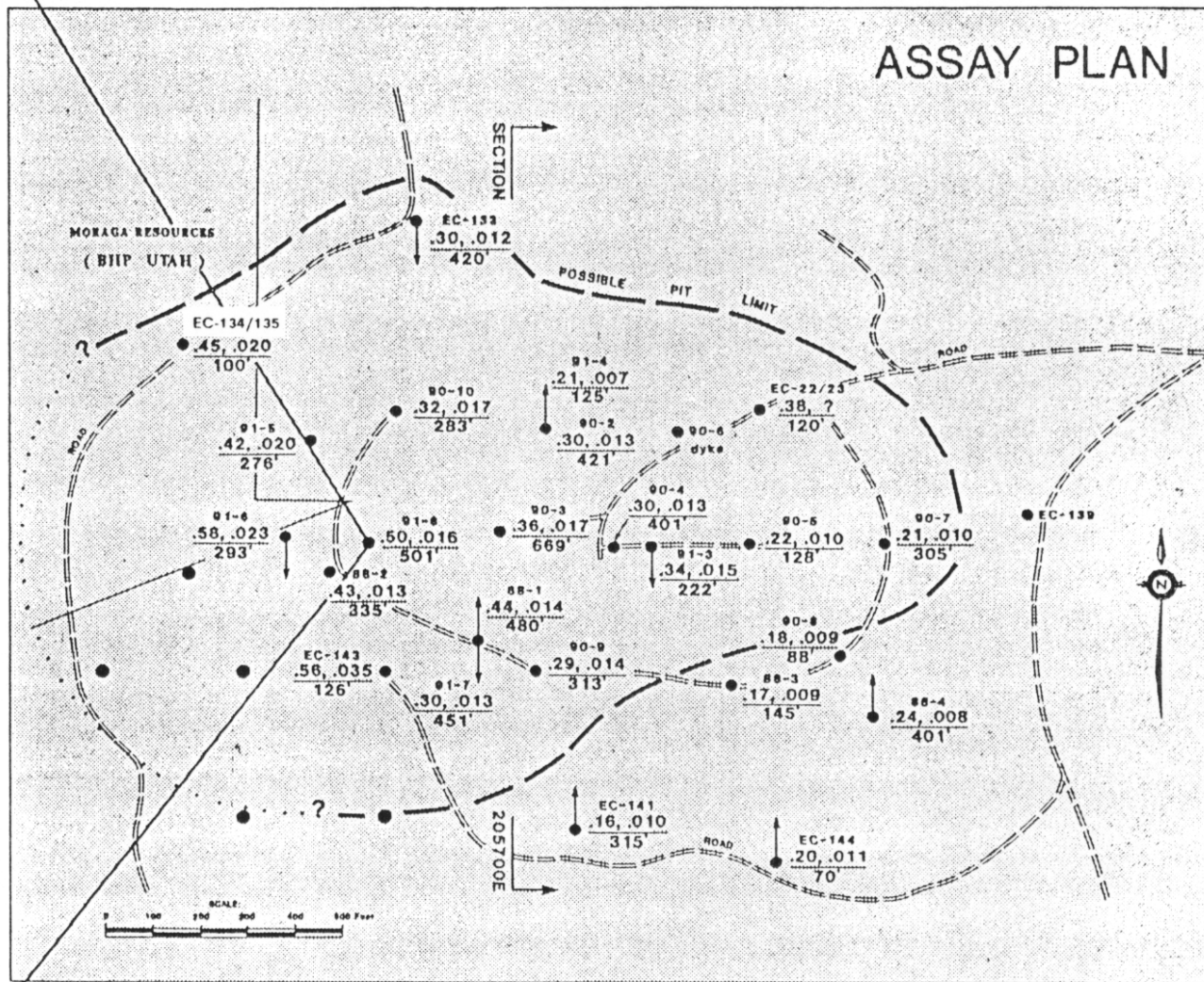
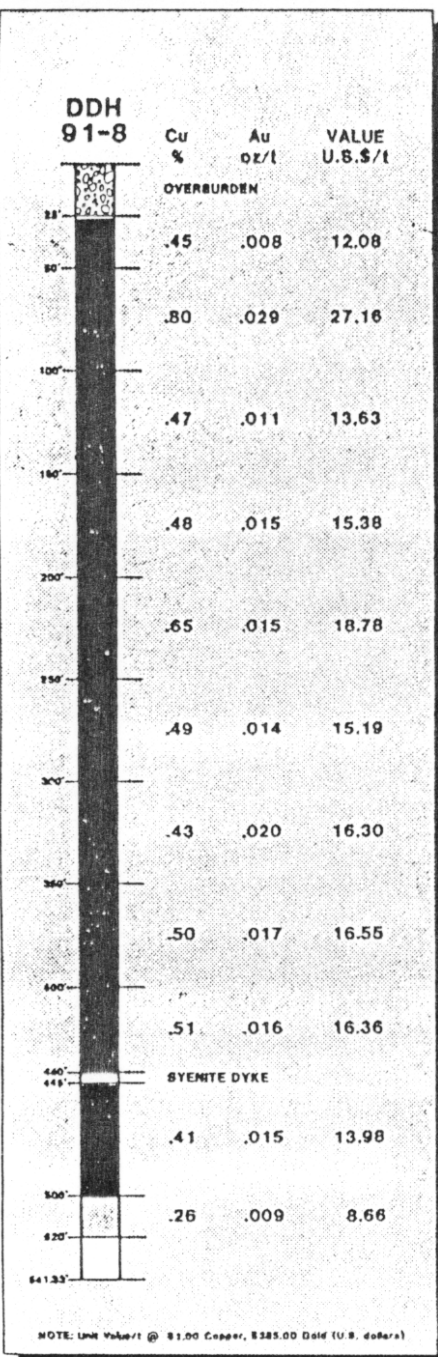
2.2 Ore Reserves

To date (March 1992), approximately 9,140 m (30,000 feet) of diamond drilling has been completed at the Red Dog site (see Figure 2-2). On the basis of all exploration work carried out, a block modelling study was completed by J.B. Engineering on behalf of Crew Natural Resources. The study concluded that an open pit mine could be developed, containing approximately 31 million tonnes of

Figure 2-2

CREW NATURAL RESOURCES LTD.

RED DOG PROJECT



LEGEND

- Andesitic Volcanics
- INTRUSIVES**
- Rose Quartz Prophyry
- Syenite Porphyry

- Diamond Drill Hole
- Proposed Drill Hole
- $\frac{.50, .016}{501'}$ Cu %, Au oz/t Interval ft

PLAN VIEW

ore. Preliminary economic studies have indicated that some 25 million tonnes of ore could be economically mined, transported and processed. Reserve estimates provided by the block modelling study for various cutoff grades are summarized in Table 2-1.

Table 2-1
Red Dog Reserve Estimates

Tonnage (x10⁶ t)	Average Grades Cu(%)	Au (g/t)
0 - 5	0.50	0.62
5 - 10	0.44	0.56
10 - 15	0.40	0.50
15 - 20	0.36	0.47
20 - 25	0.35	0.44

Figure 3-1 ARTIST IMPRESSION RED DOG PIT

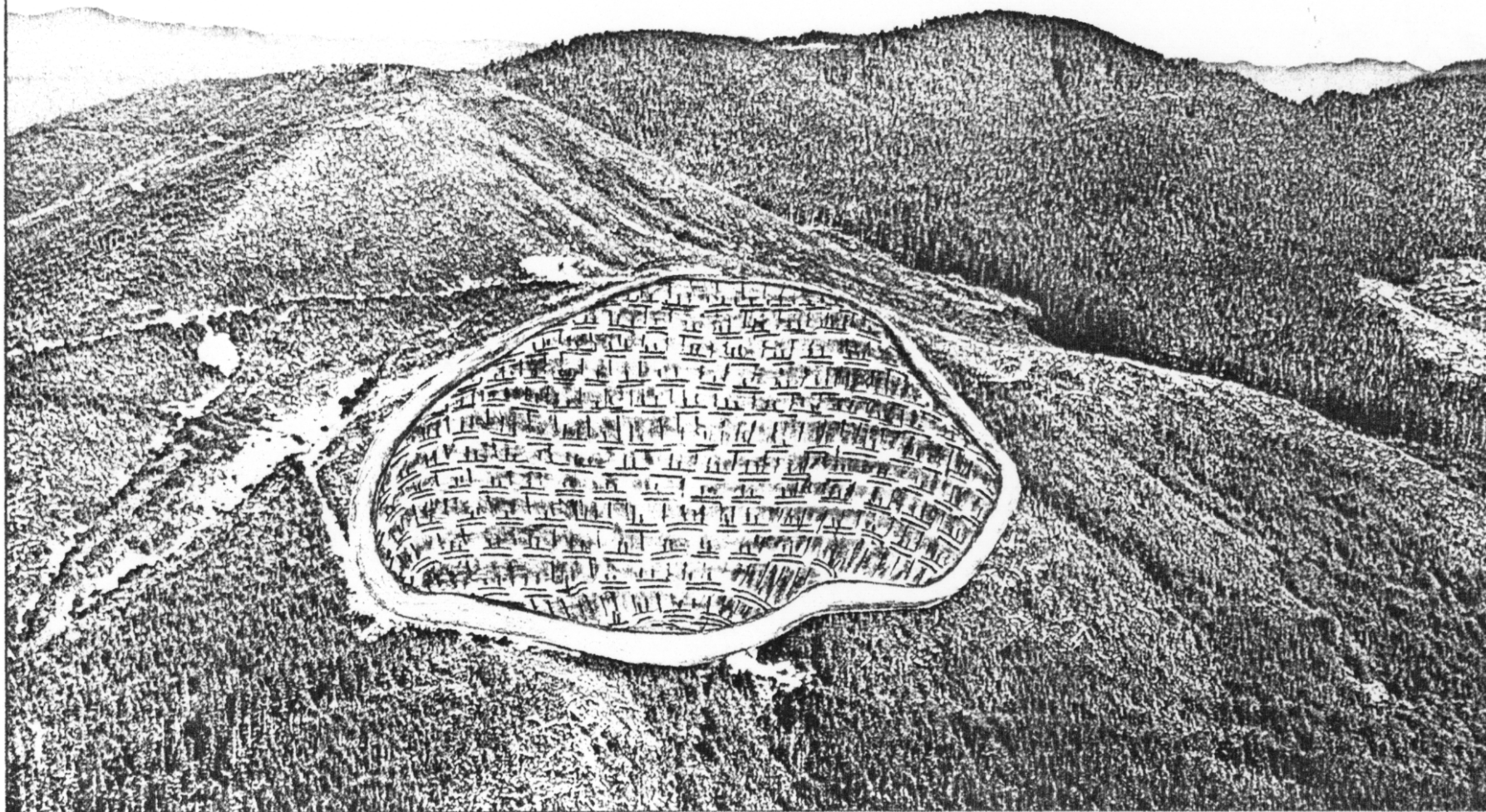


FIGURE 7-1
RED DOG PROJECT
EXPLORATION AND ENVIRONMENTAL SCHEDULE

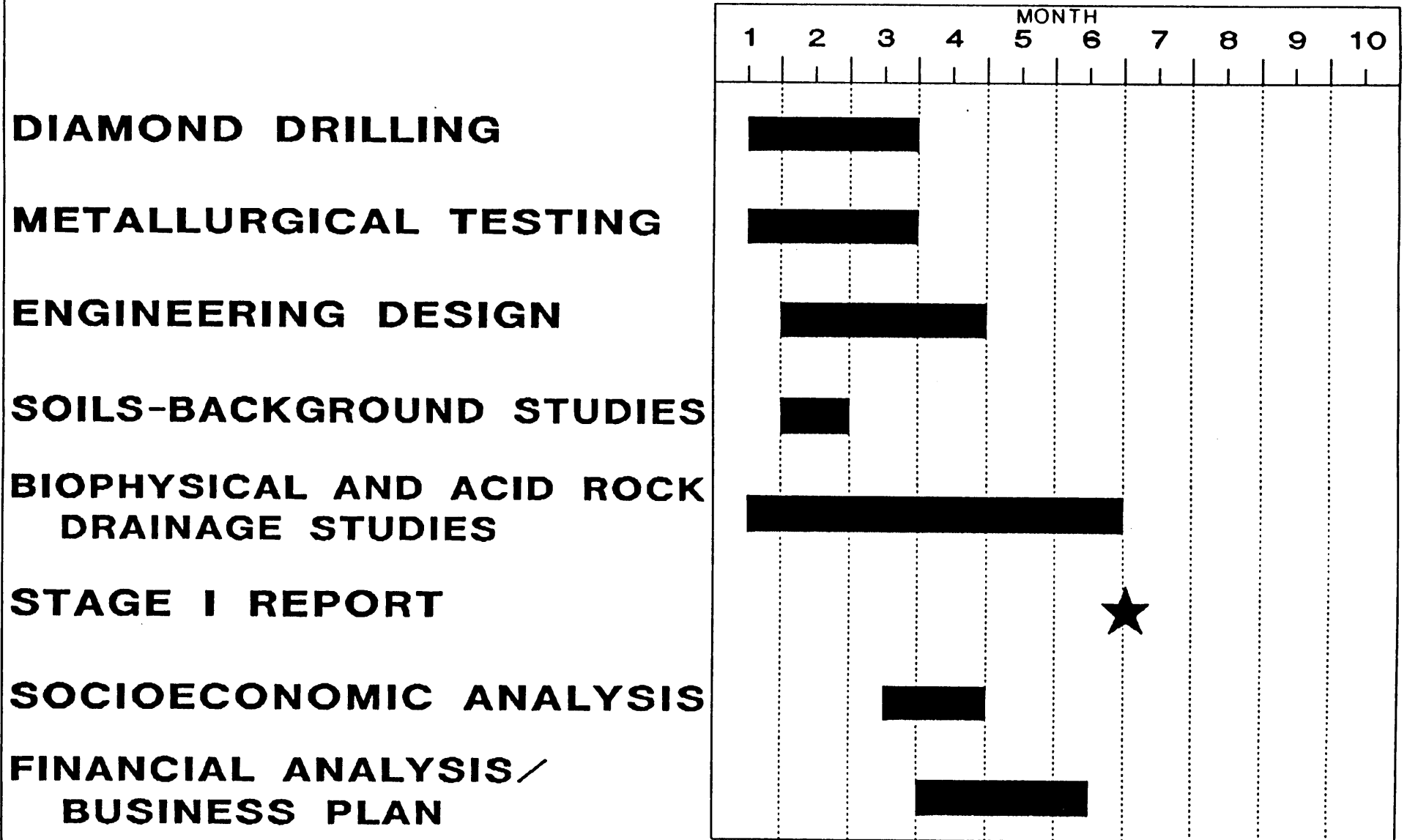


FIGURE 7-2 RED DOG PROJECT MINE DEVELOPMENT SCHEDULE

