

004921

ADVANCED EXPLORATION AND DEVELOPMENT OF THE DY UNDERGROUND MINE

PROJECT DESCRIPTION

Prepared for:



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Whitehorse, Yukon

Prepared by:

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Vancouver, British Columbia

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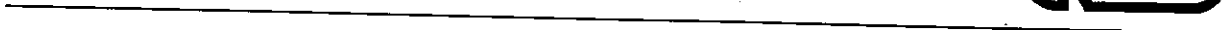
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Project Fact Sheet



PROJECT FACT SHEET

CORPORATE DATA

Project Name: Dy (Lead-Zinc-Silver) Project

Company Name and Address: Head Office:
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Direct most correspondence to Mr. Acott

PROJECT DETAILS

Project Location: 200 air-km northeast of Whitehorse, YT
12 km east of Faro, YT
62° 13'N Latitude
133° 08'W Longitude

Exploration Cost to Date: Approximately \$12 million

Development Cost for Advanced Exploration Programme: Approximately \$35 million

Estimated Total Capital Cost for Mine: Approximately \$75 million

PROJECT FACT SHEET

Minerals: Pyrite, sphalerite, galena, chalcopyrite, barite, quartz

Mining Method and Production Rate: Combination of room and pillar, longhole stope, cut and fill, maximum 7,500 tpd
Initially 1,500 tpd
Hoisting by shaft

Process Plant/Mill: Use existing mill at Faro, assumed truck haulage to concentrator on surface

Ore Beneficiation Process: Conventional differential flotation

Tailings Disposal: Pyritic tailings to be disposed of in Faro Pit under water cover

Proposed Mine Life: 15 years

MINERAL INVENTORY

Mineral Inventory: In-situ:

	x 10 ³				
	<u>tonnes</u>	<u>Pb(%)</u>	<u>Zn(%)</u>	<u>Ag g/t</u>	<u>Au g/t</u>
Probable	13.13	5.7	6.9	83	0.86
Possible	<u>8.22</u>	<u>5.3</u>	<u>8.1</u>	<u>78</u>	<u>0.87</u>
Total	21.35	5.5	7.3	81	0.87

Cut-off Grade: 9% Pb plus Zn

Potential for Additional Mineralization: Potential for significant (10 mt) extensions to Dy deposit; 5 million tonnes indicated at Swim Basin and good potential for additional discovery

Minable Reserve:

	x 10 ³				
	<u>tonnes</u>	<u>Pb(%)</u>	<u>Zn(%)</u>	<u>Ag g/t</u>	<u>Au g/t</u>
Probable	11.3	5.8	6.8	83	0.92

Cut-off Grade: 9% Pb plus Zn

ACCESS/TRANSPORTATION

Road: All weather Highway access to area.
Main Mine Access Road from Faro mill to Vangorda Plateau site and Blind Creek Road from town site

Air Access: Scheduled services to Whitehorse and Faro

POWER SUPPLY: Tie into power grid from Vangorda Area; 69 KV Service

WORKFORCE INFORMATION:

Construction Workforce: 10
(Annual Average)

Advanced Exploration Workforce: 45
(Annual Average)

Operational Workforce: Undetermined

Housing Options: Existing facilities in town of Faro, YT

Workforce Rotation/Schedule: Operational workforce based in Faro, YT
Construction and development workforces based in a camp in Faro with 6 weeks on and 2 weeks off

PRELIMINARY DEVELOPMENT SCHEDULE:

<u>Phase/Stage</u>	<u>Required Time</u>	<u>Cumulative Time</u>
Phase I - Advanced Exploration		
1. Shaft Collar and Surface Setup:	5 months	5 months
2. Upper Shaft Excavation: (in non-acid generating waste rock)	10 months	15 months

PROJECT FACT SHEET

3. Lower Shaft Excavation: (in acid generating waste rock)	6 months	21 months
4. Lateral Development and Diamond Drilling	7 months	28 months
5. Test Mining and Bulk Sample Extraction:	Concurrent with Stage 4	28 months
6. Final Feasibility Study and Production Decision:	4 months (2 concurrent with Stage 4)	30 months
Phase II - Mine Production	6 months	36 months

PRELIMINARY REGULATORY SCHEDULE:

EARP Screening of Advanced Exploration Project:	To be issued early in Phase I - Stage 2
Advanced Exploration Water License:	To be issued early in Phase I - Stage 2
Initial Environmental Evaluation:	Prior to commencement of production
EARP Screening:	Prior to commencement of production
Full Production Water License:	Prior to commencement of production
Surface Lease:	Application following positive production decision

1 - Introduction

1.0 INTRODUCTION

1.1 Preamble

Curragh Inc. (CI) is a Canadian-controlled company that owns and operates the lead-zinc-silver mining and concentrating operations located in the Anvil District near Faro, Yukon Territory (Figure 1-1). Five ore deposits with well defined reserves have been identified in the Anvil District: Faro, Vangorda, Grum, Dy and Swim. Pre-mining in-situ geological inventory for all five deposits totalled 120 million tonnes. To-date, only two of the deposits are being mined: the newly developed Vangorda and Grum deposits. Open pit mining of the Faro deposit was completed in August of 1992, and underground mining was completed in October 1992; a salvage of ore from the Zone I Faro pit walls and beneath haul ramps is ongoing at the time of writing. The Faro pit is currently being used for tailing disposal. CI is undertaking advanced exploration of other ore bodies in the area to determine the feasibility of bringing them into production at a later date. This document will detail the planned exploration and development of one of the two remaining unmined ore bodies, namely the Dy deposit.

The purpose of this document is to describe the proposed Dy Project with respect to the geology of the ore body and host formation, the plan for exploring the ore body and any related infrastructure development, the phased underground mining of the deposit and an overview of existing land use, environmental setting, and ongoing and proposed environmental and socioeconomic assessments related to the project. The document is intended to help place the project clearly into a regulatory and environmental screening framework with phased in approvals/permits which keep pace with the phased in nature of the project as go/no go feasibility decision points are reached. This document is also intended to provide all information needed to complete EARP screening of the exploration program which may require a water license in its later stages.

The Dy project is the first exclusively underground mine project in the Anvil Range. As such, it poses a new situation for the proponent and the regulatory regime who are both generally accustomed to dealing with large open pits. This deposit can readily be developed so that it does not cause significant environmental impact during mine operations or after mine closure. Curragh is

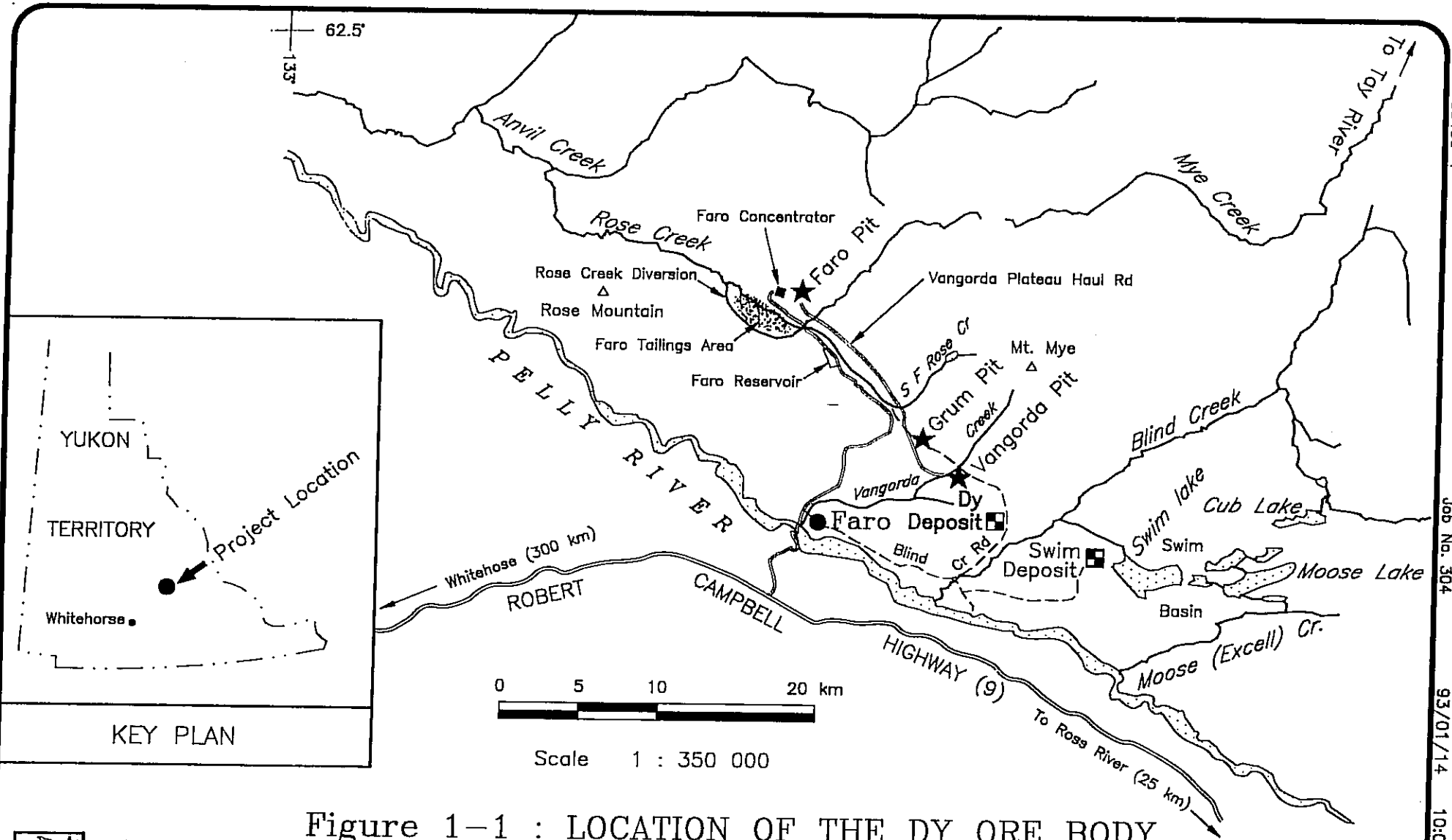
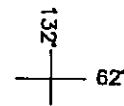


Figure 1-1 : LOCATION OF THE DY ORE BODY



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(D.S. Jennings & G.A. Jilson, 1984)



committed to develop the deposit in such a manner through devising progressive material handling and waste management procedures. The deposit is also unique in that the entire ore body is 100 m below the regional base water level. Thus, any potential post operational environmental impact will be eliminated as the workings flood with stagnant water.

1.2 Project Location and Setting

The Dy property is located in the Anvil Range lead-zinc-silver district 12 km east of Faro (approximately 200 km northeast of Whitehorse), Yukon Territory, with coordinates 62° 13' N and 133° 08' W (Figure 1-1). Specifically, it is situated 6 km southeast of the Grum Deposit on the Vangorda Plateau on the south slopes of Mt. Mye at an elevation of 1,140 m (3,740 ft).

Surface exploratory drilling to delineate the deposit was carried out at Dy from 1977 through 1981. Drill indicated mineral inventory for this property is estimated to be 21 million tonnes grading 5.8% lead, 6.8% zinc and 0.12% copper. In addition, the ore contains 83.0 g/t of silver and 0.94 g/t of gold. The deposit remains open to extension in several directions.

The proposed exploration site is located on morainal and on bedrock landforms. The terrain is relatively subdued with moderate slopes that are covered by a thin veneer of overburden. The soil texture ranges from sandy loam at the surface to slightly heavier textures (loam - silt loam) in the subsurface.

The predominant vegetation in the area (Plates 1-1) is shrub to forest-shrub consisting of willow (*Salix* spp.), scrub birch (*Betula glandulosa*), aspen poplar (*Populus tremuloides*), white spruce (*Picea glauca*), and lodgepole pine (*Pinus contorta* var. *latifolia*). Willow, scrub birch and small poplar dominate on open slopes. The area was subject to a forest fire in recent history and relatively dense, immature stands of lodgepole pine are common to many sites. White spruce tends to predominate at lower elevations giving way to jack pine at higher altitudes. The tree line is at approximately 1,476 m (4,800 ft).

Access to the property is from the northwest via a secondary road which is an extension of the main mine access road servicing the Faro, Grum and Vangorda



Plate 1-1: Typical Upland Forest in vicinity of proposed mine site.

open pits. Access can also be gained to the site from the southwest from the town of Faro via the Blind Creek Road (Figure 1-1).

1.3 Historical Perspective

The initial mineral discovery in the Anvil Range was that of the Vangorda deposit which was first drilled in 1953 through 1955 by a company called Prospector Airways. Systematic geological mapping of the Anvil District was not carried out until 1961 (Roddick and Green 1961; cited in Jennings and Jilson 1984). The locating of the Vangorda deposit was followed by the subsequent discoveries of the Faro (1964), Swim (1964), Grum (1973) and Dy (1976) deposits. Exploration in the area continues.

The Faro deposit was the first of these ore bodies to be developed and brought into production. Mining of the Faro deposit commenced in 1969 under the auspices of the Anvil Mining Corporation, later Cyprus Anvil Mining Corporation (CAMC). Under CAMC's management, production of ore reached rates of up to 10,000 tonnes per day. In the mid 1970s, CAMC embarked on a program of expansion which included both an aggressive exploration program, resulting in the Dy discovery, and the acquisition of mineral deposits and claims on the Vangorda Plateau held by Kerr Addison Mines Ltd. (successor to Prospector Airways), including the Grum, Vangorda, and Swim deposits. The objective of the acquisition was to bring other Vangorda Plateau deposits into production to supplement the Faro mill feed.

Depressed base metal prices coupled with low productivity and high operating costs at Faro, and the added burden of the debt load brought about by expansion, led to a major slowing of production at Faro and closure of the concentrator by CAMC in 1982. Some open pit waste stripping operations were carried out between June 1983 and October 1984 but production had ceased completely by the end of 1984.

In November 1985, Curragh Resources Inc. acquired the holdings of Cyprus Anvil Mining Corporation and reactivated the Faro operation in January 1986. Concentrator operations resumed in June 1986 and the first concentrates were shipped in July 1986. In 1989, development of the Vangorda Plateau was begun with stripping of the Vangorda and Grum deposits which have now supplemented

the Faro mill feed. Ore removal is currently under way at the Vangorda pit. Pre-production stripping is active but ore removal from the Grum pit is not expected to commence significantly until 1993. Ore reserves in the Faro Pit were exhausted in August of 1992. Salvage of remnant ore in the Zone I Faro pit walls and beneath the main haulage ramp is ongoing at the time of writing but will be complete in early 1993.

In early 1990 an underground operation was initiated just southwest of the Faro Pit from a portal in the pit. This operation closed in October 1992 after mining 1.8 million tonnes of ore. The mill at Faro is currently processing 13,000 tonnes of ore per day. The mine produces two concentrate products; a lead concentrate which includes payable quantities of gold and silver, and a zinc concentrate. The concentrate is hauled in custom-designed, sealed containers via road to Skagway, Alaska where they are loaded on ships for markets in Europe and Asia. The Faro operations are major producers supplying 3% of the western world's zinc and 5% of its lead concentrates in 1989. Curragh is the sixth largest zinc producer in the world. Once Faro mill feed is completely replaced by feed from the Vangorda and Grum deposits, the anticipated maximum milling rate will be 11,000 tonnes per day. However, milling rates comparable to the full production rate capacity of the Faro mill (13,000 tpd) are possible. Proven open pit mineable ore reserves indicate a project life of eight years. Development of the Dy deposit would increase this by five years.

2 - Geology

2.0 GEOLOGY

2.1 District Geology

The Anvil Range lead-zinc-silver district, in central Yukon Territory, lies in the Selwyn Basin metallogenic province and the Yukon Plateau physiographic province (Figure 2-1).

The ore deposits of the Anvil district formed in the shale-rich, outboard portion of the early Paleozoic-late Proterozoic North American miogeocline, and are located within the southwest portion of the Selwyn Basin sub-province of the Northern Canadian Cordillera (Jennings and Jilson 1984). This basin is bordered on the west and southwest by the Pelly Cassiar Platform and on the east, north, and northeast by the Mackenzie Platform (Figure 2-1).

Geologically, the district is a structurally complex, polydeformational terrane exposed in the Anvil Arch, a northwest trending structural uplift whose core is underlain by a Cretaceous granitic suite. Around the flanks of the Arch is a sequence of late Precambrian to upper Paleozoic metasedimentary and metavolcanic rocks which host the ore deposits.

The syn-sedimentary, exhalative massive sulphide orebodies in the Anvil camp show a distinct stratigraphic control. Specifically they are localized within an approximately 150 m thick transition zone between the Precambrian Mt. Mye and lower Paleozoic Vangorda Formations (Figure 2-2).

The Mt. Mye formation is essentially a monotonous sequence of metamorphosed shales. It is diagnostically non-calcareous. The formation ranges in thickness up to 2 kilometres and becomes more heterogeneous towards the top with the appearance of some calcareous and meta-volcanic members. The Mt Mye formation is only weakly pyritic and static ABA testing in Vangorda Plateau (CRI 1989) indicates the rocks comprising the formation show no, or at most weak, potential for acid generation.

The Vangorda Formation, characterized by calcareous phyllites (metamorphosed shales) and metamorphosed volcanic rocks, is separated from the underlying Mt. Mye by a complex transition zone. This transition zone is typified by regionally

(D.S. Jennings & G.A. Jilson, 1984)

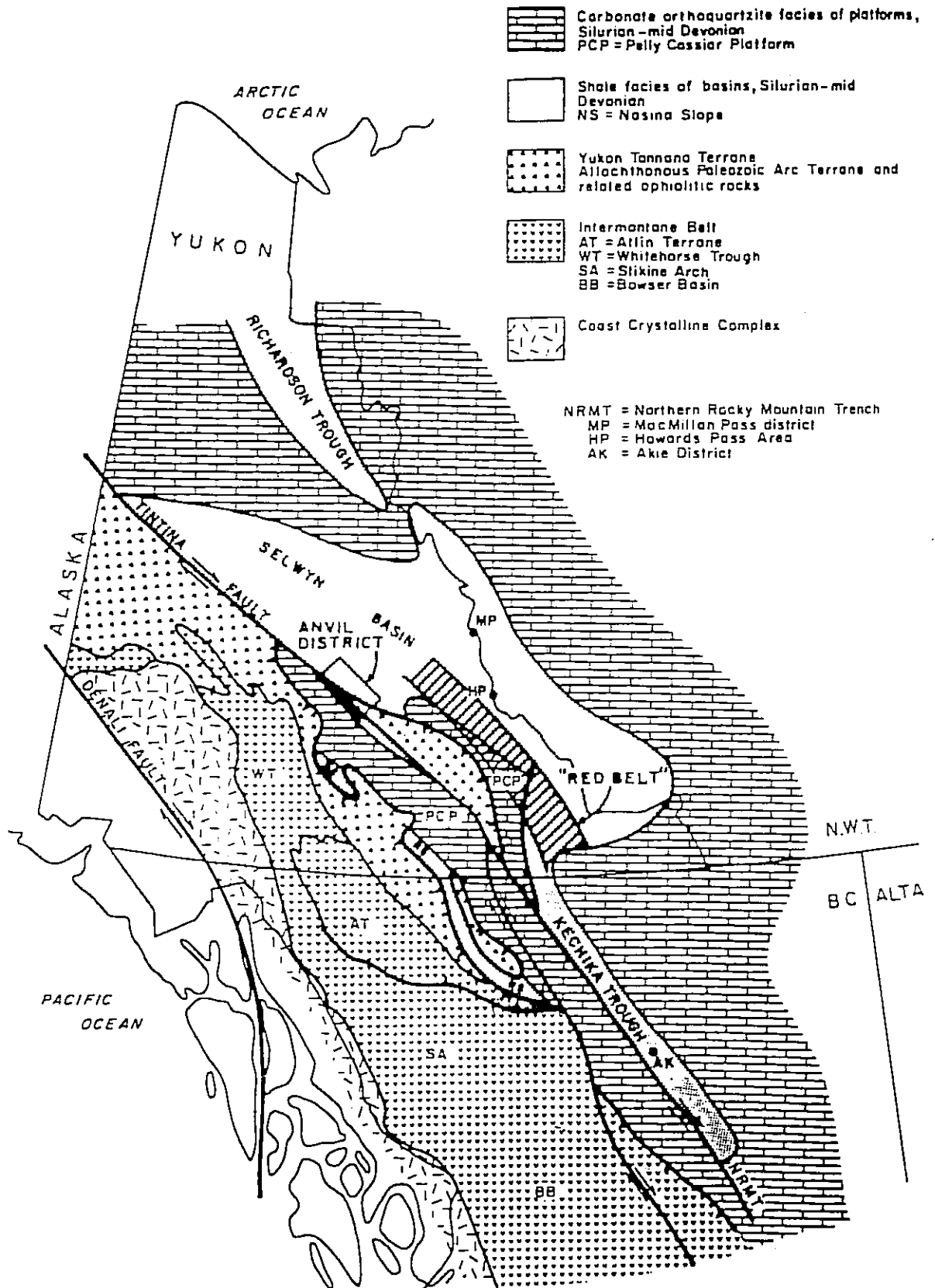
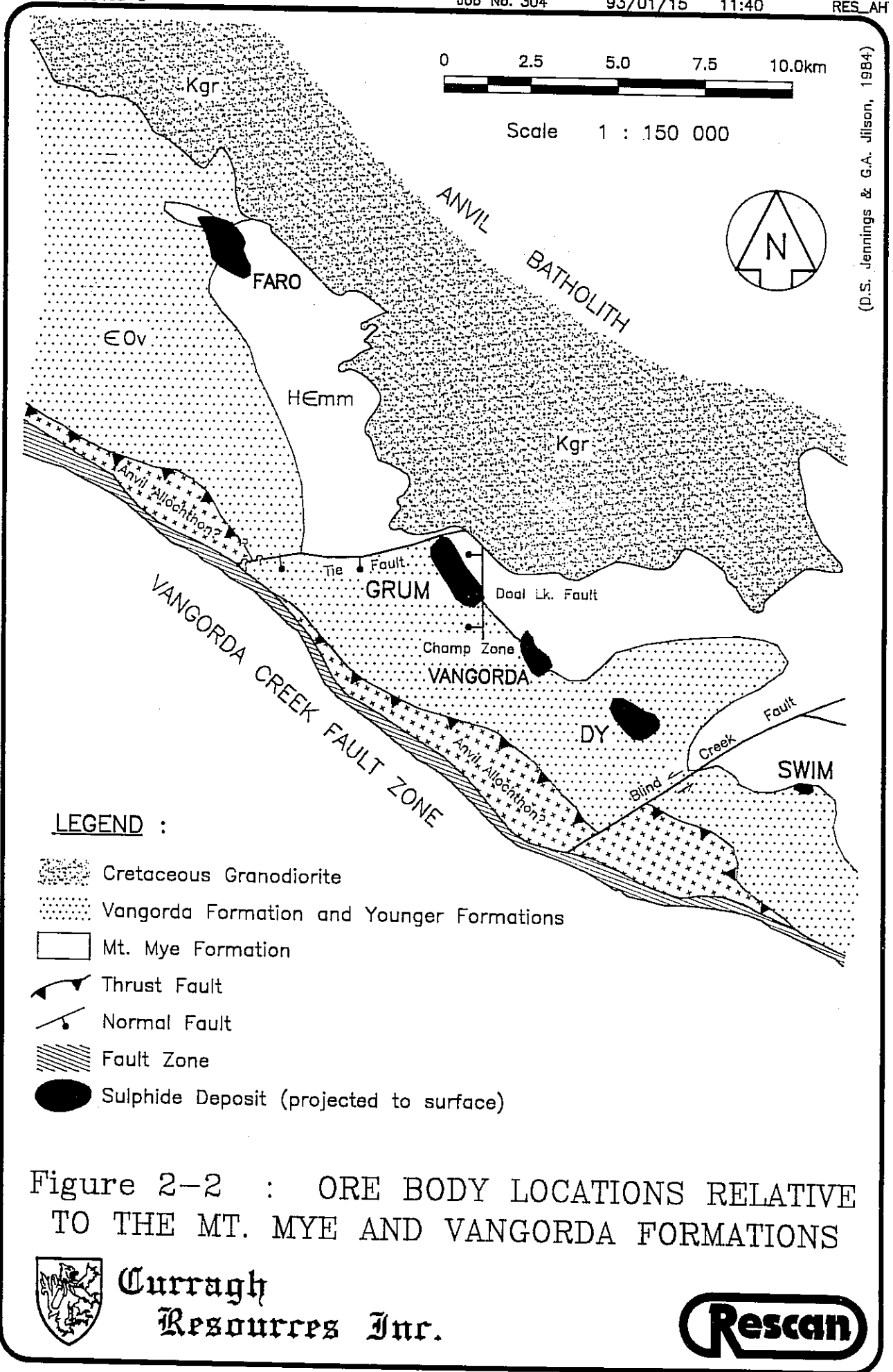


Figure 2-1 : ANVIL DISTRICT LOCATION IN RELATION TO THE REGIONAL GEOLOGY OF THE YUKON TERRITORY



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(D.S. Jennings & G.A. Jilson, 1984)

Figure 2-2 : ORE BODY LOCATIONS RELATIVE TO THE MT. MYE AND VANGORDA FORMATIONS



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extensive units of graphitic phyllite along with a mixture of non-calcareous and calcareous phyllites and some basaltic meta-volcanic and meta-intrusive units. Rocks of the formation are notable for their calcite content and consequent acid consuming nature. However, the basal unit of the formation may be slightly acid generating locally.

All of the known massive sulphide deposits to date in the Anvil camp are associated with the carbonaceous phyllites within the transition zone between the Mt. Mye and Vangorda Formations. There are five known deposits found along a prominent curvilinear trend in the district with a total pre-mining geological reserve of 120.1 million tonnes averaging 3.7% Pb and 5.6% Zn. They are from northwest to southeast, the Faro, Grum, Vangorda, Dy, and Swim. To date, the Faro, Grum, and Vangorda deposits which represent 95 million tonnes of the above geological reserves, have been developed by open pit.

The deposits are thought to have formed from hot metalliferous brines discharged from submarine fumaroles localized along a synsedimentary fault or hinge line which developed in response to late Hadrynian or lower Cambrian extensional tectonism. The sulphide ores in the Anvil Camp occur as massive, sheet-like to lenticular, predominantly pyritic bodies showing distinct lateral and vertical zonation. This zonation of sulphide ore types, the Anvil Cycle, is common to all Anvil sulphide deposits. A typified sequence would consist of a ribbon banded graphitic quartzite facies, overlain by a more massive pyritic sulphide facies in turn overlain by baritic facies. Laterally, the same zonation is commonly seen with the uppermost baritic facies occupying the more central area of the deposit. Each deposit has associated with it a white-mica dominant alteration (or bleaching) envelope in the surrounding phyllites which suggests a hot ore fluid/wallrock interaction at the time of sulphide deposition. All ore types and subeconomic sulphide rocks will potentially be acid generating. Some or all bleached or altered phyllite may be acid generating.

2.2 Deposit Geology

In the Dy deposit, there are three, possibly five horizons defined (Figures 2-3 and 2-4). The internal structure of the deposit is too poorly understood to allow for a reasonable evaluation of stratigraphy and thus the deposit ore type distribution. However, there does appear to be a predominance of more baritic ore type in the

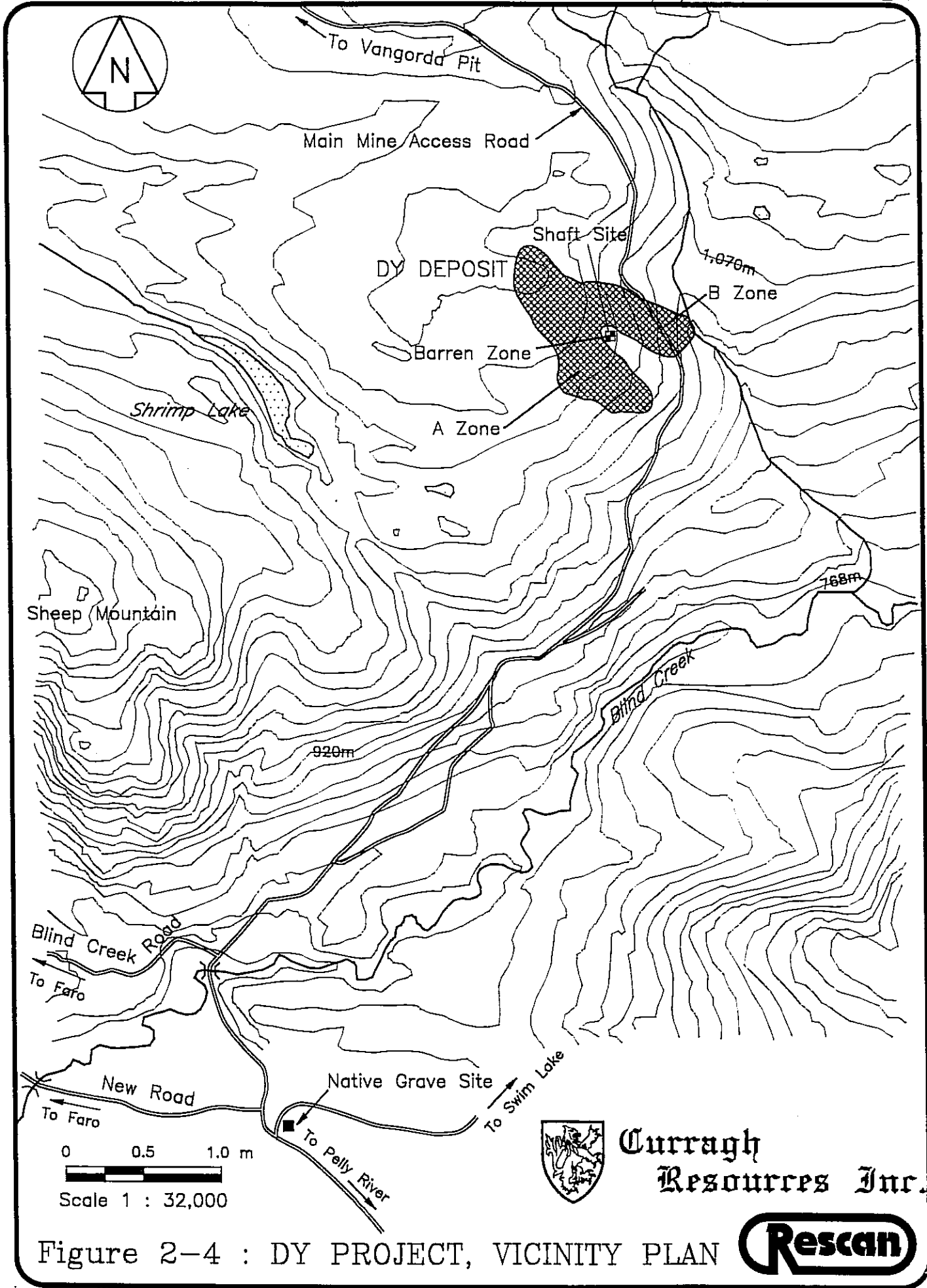


Figure 2-4 : DY PROJECT, VICINITY PLAN



southwest (A Zone) compared to a predominance of pyritic massive and of disseminated, variably graphitic, ores in the northeast (B Zone). The central part of the deposit consists of barren massive and semimassive sulphides. As the internal geometry of the deposit is presently understood, the deposit lies on upper Z symmetry (looking northwest) long limb of megascopic F1 antiform with local superimposition of moderate scale F2 folds. A major low angle extensional fault occurs beneath the deposit. There also appear to be numerous steep faults that cut the deposit but their orientation is not well known.

The proposed exploration program will provide for a more accurate definition of the structure and dimension of this ore body. Initial development will focus on the B Zone because of high overall grade and zinc predominance compared to lead predominance of the A Zone.

3 - Environmental Setting and Land Use

3.0 ENVIRONMENTAL SETTING AND LAND USE

3.1 Land Use Overview

Mining presently constitutes the single largest land use in the region. Less prominent land uses include trapping; commercial, subsistence and sport fishing; native food and sports hunting; and both native and non-native commercial woodcutting (firewood). There is very limited forestry and no agricultural activity in the region.

Trapping

Trapping is carried out by the Native peoples of the Kaska Dena Nation (Ross River Band), who hold the group trapping rights to the area. The species of prime interest to trappers are mink, marten, otter, lynx, fox (for furs) and the snowshoe hare (for food). Other less sought after species include wolf, beaver, muskrat, bear and wolverine. Few details on the number of animals taken during the winter harvest are available.

The Ross River Band suggests that the area in the vicinity of the proposed exploration activity is regularly trapped for marten and fox and that catches of marten (the most sought after species) have decreased noticeably since the inception of the original Faro mine in 1969 (Peter LeDue, pers. comm. 1990). A massive forest fire swept through the region in 1969. Forest fires are a serious menace to marten habitat since they are denizens of climax coniferous forest and avoid burned-over or logged areas. A significant portion of the area in the vicinity of the proposed mine was burned in 1969, whereas mining activity in the same area has been minimal.

Commercial, Subsistence and Sport Fishing

No commercial fishing licenses have been issued at Faro or Ross River in the last ten years (Mr. J. Burdek, pers. comm. 1990). However, there are several subsistence fisheries centered at both Pelly Crossing and Ross River which exploit chinook salmon populations in the Pelly River and Blind Creek systems. The subsistence fishery provides food for humans and dogs, and is important culturally in that it maintains a traditional lifestyle. This fishery predominantly harvests

ENVIRONMENTAL SETTING AND LAND USE

chinook salmon (*Oncorhynchus tshawytscha*), but other species such as whitefish (*Prosopium* spp.), northern pike (*Esox lucius*), inconnu (*Stenodus leucichthys*), and Arctic grayling (*Thymallus arcticus*) are also taken. No estimates of the numbers of these species taken are available.

Sports angling takes place in Vangorda and Blind Creeks, the Pelly River and in Blind and Swim Lakes. The predominant species angled for include Arctic grayling and chinook salmon. While it is anticipated that neither the advanced exploration program nor proposed mining activities will adversely impact Blind Creek, a detailed environmental assessment related to these activities will be undertaken to ensure the environmental integrity of Blind Creek is maintained coincident with project development.

Subsistence and Sport Hunting

There is little available information to quantify the level of subsistence hunting being conducted by native and/or resident hunters in the vicinity of the proposed exploration portal. However, it is known that hunting activity by local and non-resident hunters in the Faro region is restricted. The area encompassing Faro falls under Big Game Zone Subunit #4-51 (Figure 3-1). This area has been closed to hunting of all big game (Mr. N Barichello, pers. comm. 1990) to protect the local Fannin Sheep population from exploitation through hunting and poaching. Faro residents wishing to hunt must go farther afield to the Swim Lakes Big Game Zone (#4-47) or Mt. Mye Big Game Zone (#4-46).

3.2 Biophysical Environment

The Dy property lies within the Blind Creek drainage basin. Blind Creek flows in a southwesterly direction into the Pelly River. The Pelly River drains west into the Yukon River which flows northwest into Alaska to Ft. Yukon where it alters course and flows west, through Alaska, and discharges into the Bering Sea.

3.2.1 Regional Climate

The region in which the proposed mine will be located has no pronounced wet or dry season. The average number of days with some precipitation is generally in the order of 100 to 120. Snow can occur at any time of the year, but will generally

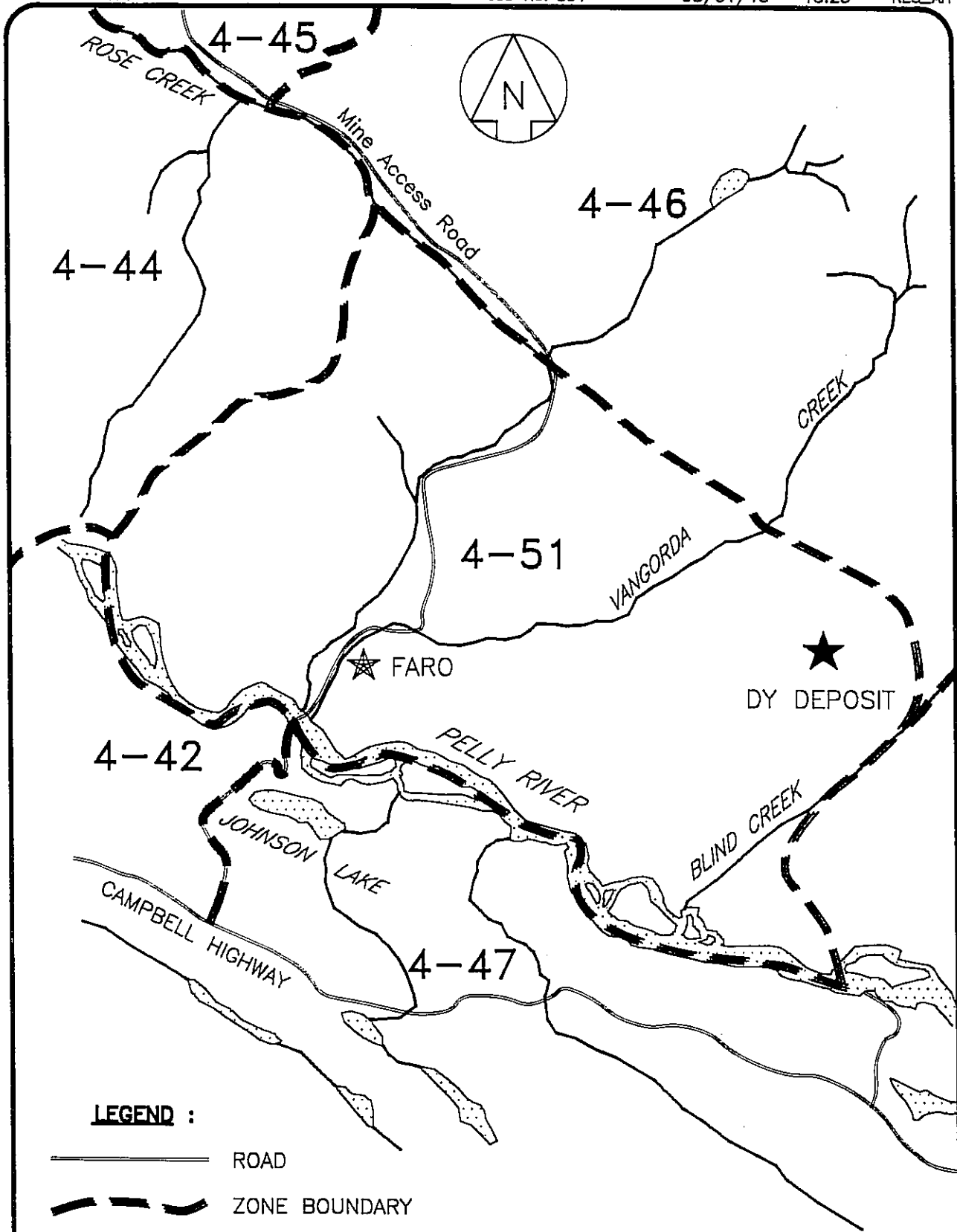


Figure 3-1
 YTG BIG GAME ZONES RELATIVE TO THE DY DEPOSIT



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ENVIRONMENTAL SETTING AND LAND USE

cover the ground in most years from October to May. Evaporation in the Yukon generally exceeds the total precipitation and ranges between 350 and 450 mm per annum.

The Atmospheric Environment Service (AES) established three meteorological stations near the proposed mine: in Faro in 1977, at the Anvil site in 1967, and at Grum Camp in 1983. Daily measurements of temperature and precipitation have been recorded.

Temperature

Based on the period of record for the Grum station, it is estimated that mean monthly temperatures in the area would range from a high of 11.7°C in July to a low of -13.4°C in December. Extreme cold temperatures have been recorded at Faro as low as -55°C, with extreme maximums in the order of 33°C. The extreme cold temperatures in the region make outside construction in the winter very difficult. The working season for surface construction will generally be from May to September.

The mean monthly temperature normals for Grum, Faro and Anvil are shown in Table 3-1 below.

Table 3-1

Regional Mean Monthly Temperatures in Degrees Celsius

Month	Faro	Anvil	Grum Camp
January	-24.5	-19.8	-10.8
February	-15.9	-13.9	-13.1
March	-10.1	-11.2	-9.3
April	-0.8	-3.2	-4.3
May	7.1	4.0	2.9
June	12.5	9.9	8.1
July	14.9	11.5	11.7
August	12.4	9.5	8.1
September	7.1	4.6	3.0
October	-0.4	-3.1	-2.9
November	-13.8	-11.6	-13.1
December	-21.7	-17.2	-13.4
Mean Monthly	-2.8	-3.4	-2.8
Elevation (m)	694	1158	1150
Years of Record	11	12	5

Source: Steffen, Robertson and Kirsten, 1989.

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The relatively high temperature in January and December at Grum Camp compared to the temperature recorded in Faro and at the Anvil station for the same month, is attributed to the uncommonly warm temperatures recorded for 1985 and 1986. Given the elevation of the proposed project area (1,140 m), temperatures at the Dy project site will likely approach those recorded at the Anvil and Grum stations.

Precipitation

The mean annual precipitation recorded at the Grum Camp station, based on 6 years of data collection, is 539 mm (21.2 inches). The maximum total monthly precipitation occurs in July as rainfall. The least amount of precipitation falls in November and generally consists of snowfall. There is no measurement available concerning the 24-hour maximum precipitation recorded at Grum. However, at Faro, according to Canadian climate normals published by Environment Canada, the greatest 24-hour rainfall recorded was 46.7 mm. The greatest 24-hour rainfall at Anvil is 36.8 mm. The mean monthly precipitation distribution based on data recorded at Grum Camp, Anvil and Faro is presented in Table 3-2.

3.2.2 Surface Water Hydrology

The proposed minesite is located on the western slopes of the Blind Creek watershed, which drains to the Pelly River. The southeast facing slopes of the plateau runoff directly to Blind Creek. The shaft will be located on a north westerly trending ridge which drains to Blind Creek; drainage from the shaft and the underground workings, however, will be pumped to Vangorda Creek. Surface site drainage will be redirected to Vangorda Creek after treatment if unsuitable for discharge directly.

Historic streamflow records for Blind Creek are limited (Table 3-3). Therefore, a permanent, continuous stream recorder was installed by DIAND prior to freshet 1991 and will be maintained over high and low flow seasons. This will allow estimation of monthly streamflows (high, low and mean) at the minesite which will be compared to stream gauging stations within the region that have collected data for a longer period of record (recognizing the differences in drainage areas between gauging stations). The nearest long-term station is located on the Ross

Table 3-2

**Regional Mean Monthly Precipitation Distribution
at the Grum Camp, Faro and Anvil**

Months	Grum Camp			Anvil	Faro
	Total Precip (mm)	Total Rainfall (mm)	Total Snowfall (cm)	Total Precip (mm)	Total Precip (mm)
January	25.4	0.0	25.4	26.0	21.0
February	25.9	0.0	25.9	22.4	16.4
March	31.2	0.0	31.2	30.4	24.6
April	32.8	0.8	32.0	15.5	7.6
May	51.9	7.9	44.0	16.3	17.4
June	56.6	49.7	6.9	41.6	50.4
July	98.5	98.5	0.0	49.7	28.7
August	80.4	67.6	12.8	41.5	25.2
September	42.3	25.1	17.2	32.9	31.1
October	47.8	7.6	40.2	36.9	21.7
November	22.3	0.0	22.3	29.9	27.0
December	23.7	0.0	23.7	24.6	18.6
Mean Annual	538.8	257.1	281.6	367.7	287.7
Years of Record	6	6	6	12	11

Source: Steffen Robertson and Kirsten, 1989.

River, about 65 kilometres southeast of Faro. In addition local stream gauging stations have been established on Vangorda and Rose Creeks as part of environmental studies associated with other ore deposits. Data from these stations is seasonal, covering the ice-free period only. Ross River is a major tributary of the Pelly River and has a drainage area of 7,250 square kilometres. The 1985 mean monthly unit discharges (cubic metres/sec) for Ross River, Pelly River and Vangorda and Rose Creeks are presented in Table 3-3. The Rose and Vangorda Creek stations cited below are no longer operational. However, new continuous streamflow recorders were established on both of these creeks in the fall, 1990. Data from these devices is currently not yet available but will be incorporated into the final hydrologic analysis.

Table 3-3

Mean Monthly Discharge (1985) in m³/s at Selected Gauging Stations

Months	Blind* Creek (1975)	Pelly** River (09BC004)	Ross** River (09BA001)	Vangorda** Creek (at Faro)	Rose** Creek (1968)
January	NR	27.00	9.42	NR	0.27
February	NR	23.60	7.52	NR	0.21
March	NR	22.70	6.42	NR	0.20
April	NR	24.60	7.51	NR	0.24
May	NR	321.00	132.00	NR	4.01
June	12.90	837.00	295.00	2.01	6.14
July	6.15	548.00	184.00	1.26	4.58
August	4.50	277.00	94.00	1.06	4.24
September	5.41	260.00	68.10	1.05	5.43
October	NR	165.00	52.00	NR	1.39
November	NR	49.90	11.60	NR	0.92
December	NR	36.40	8.50	NR	0.64
Mean Monthly Drainage Area (km ³)	605	216.02 22,100	73.01 7,250	90.8	2.36 208.00

NR = No record

* Source: Montreal Engineering Company, 1976.

** Source: Steffen, Robertson and Kirsten, 1989.

3.2.3 Water Quality

A baseline water quality survey of Blind Creek was initiated in September 1990. Four sites within the watershed were sampled and analyzed (Table 3-4; Figure 3-2). Generally this watercourse can be described as very slightly alkaline in pH (7.52 - 7.89), clear (< 25 colour units), relatively soft (< 65 mg/l total hardness), and low in total suspended solids (< 8.7 mg/l). Total and dissolved metals were present at very low levels (*i.e.* < 0.022 mg/l zinc, < 0.01 mg/l lead, < 0.16 mg/l iron). Results of previous sampling of Blind Creek (see 1988 data; Table 3-4) are generally consistent with the above findings. However it should be noted that higher hardness and high metals concentrations are evident at times.

Table 3-4

Water Quality Test Results for Water from Blind and Swim Creeks
1988 - 1990

Parameter		Blind Creek* Aug 5/88	Blind Creek* Sep 23/88	Blind 1 Sep 20/90 (New Bridge)	Blind 2 Sep 20/90 (Old Bridge)	Blind 3 Sep 20/90 (Above Swim Creek)	Swim 1 Sep 20/90 (Above Confluence)
Physical Tests							
Colour	CO	-	-	24.00	24.00	25.00	34.00
Conductivity	umhos/cm	-	-	113.00	119.00	130.00	368.00
Total Dissolved Solids		-	-	90.00	100.00	110.00	320.00
Hardness	CaCO ₃	-	-	53.00	55.20	65.70	189.00
pH		8.06	7.31	7.52	7.59	7.78	7.89
Total Suspended Solids		4.10	1.00	6.70	7.30	4.00	8.70
Dissolved Anions							
Alkalinity	CaCO ₃	59.90	66.20	48.30	50.40	53.70	129.00
Chloride	Cl	-	-	<0.50	<0.50	<0.50	<0.50
Fluoride	F	-	-	0.11	0.10	0.10	0.19
Sulphate	SO ₄	10.00	7.00	8.30	9.00	10.00	68.10
Cyanides							
Total Cyanide	CN	-	-	<0.005	<0.005	<0.005	0.007
Other Tests							
Sulphide	S	-	-	<0.020	<0.020	<0.020	<0.020
Ammonia			0.29	0.05			
Total Metals							
Aluminum	T-Al	-	-	0.099	0.136	0.100	0.074
Antimony	T-Sb	-	-	0.0009	0.0013	0.0004	<0.0001
Arsenic	T-As	-	-	0.0006	0.0007	0.0006	0.0010
Barium	T-Ba	-	-	0.037	0.041	0.039	0.039
Beryllium	T-Be	-	-	<0.005	<0.005	<0.005	<0.005

Table 3-4 (cont'd)

Water Quality Test Results for Water from Blind and Swim Creeks
1988 - 1990

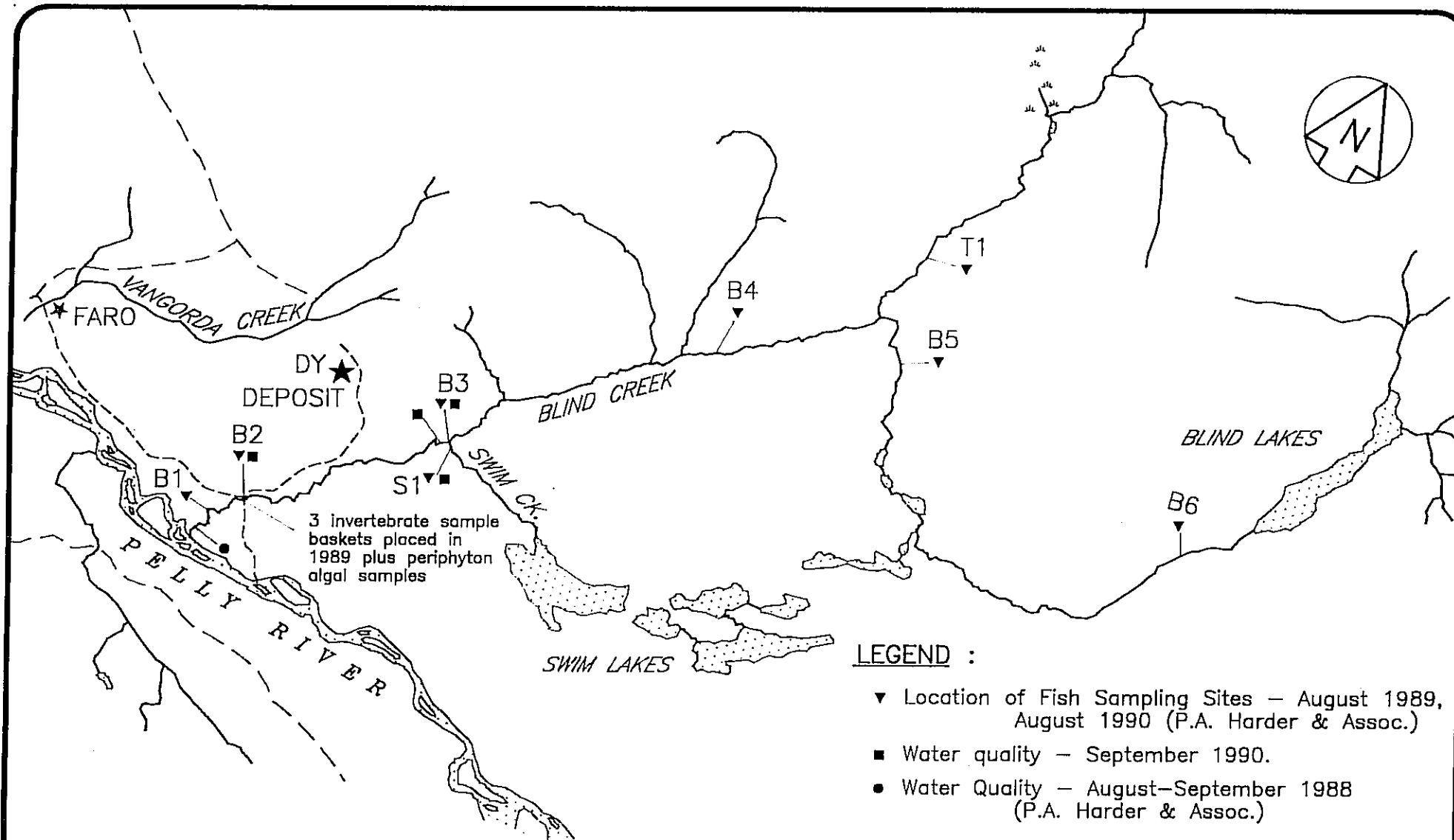
Parameter		Blind Creek* Aug 5/88	Blind Creek* Sep 23/88	Blind 1 Sep 20/90 (New Bridge)	Blind 2 Sep 20/90 (Old Bridge)	Blind 3 Sep 20/90 (Above Swim Creek)	Swim 1 Sep 20/90 (Above Confluence)
Total Metals (cont'd)							
Boron	T-B	-	-	<0.100	<0.100	<0.100	<0.100
Cadmium	T-Cd	-	-	<0.0002	<0.0002	<0.0002	<0.0002
Chromium	T-Cr	-	-	<0.001	<0.001	<0.001	<0.001
Cobalt	T-Co	-	-	<0.001	<0.001	<0.001	<0.001
Copper	T-Cu	<0.002	<0.002	0.001	0.004	0.004	0.004
Iron	T-Fe	0.250	0.155	0.060	0.160	0.070	0.090
Lead	T-Pb	<0.005	<0.005	0.001	0.010	0.002	0.005
Manganese	T-Mn	-	-	0.900	<0.005	0.028	0.008
Mercury	T-Hg	-	-	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	T-Mo	0.017	0.014	<0.001	<0.001	<0.001	<0.001
Nickel	T-Ni	-	-	0.001	0.001	0.001	0.001
Selenium	T-Se	-	-	<0.0005	<0.0005	<0.0005	<0.0005
Silver	T-Ag	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	T-V	-	-	<0.005	<0.005	<0.005	<0.005
Zinc	T-Zn	0.002	0.002	0.018	0.022	0.016	0.014
Dissolved Metals							
Calcium	D-Ca	-	-	15.40	16.20	18.90	46.30
Magnesium	D-Mg	-	-	3.46	3.49	4.39	17.40
Potassium	D-K	-	-	0.64	0.67	0.69	1.48
Sodium	D-Na	-	-	2.00	2.07	2.06	4.95

< - less than

Results are expressed as milligrams per litre except for pH, colour (CU)

* Detail of sites on Figure 3-2.

* Data from report entitled "Biological Monitoring at Blind, Vangorda and Anvil Creeks, 1988". Curragh Resources Inc. (February 1989).



**Curragh
 Resources Inc.**

Figure 3-2 : FISHERIES RESOURCES
 AND WATER QUALITY SAMPLING SITES



A regular water quality monitoring program, designed to fully characterize the pre-development surface water quality in the Blind Creek drainage basin, is presently underway.

3.2.4 Fisheries Resources

Investigations were undertaken during August 1989 to characterize the fisheries resource potential and habitat features of stream reaches on Blind Creek (see Figure 3-2 for sampling sites). Populations of slimy sculpin (36.4%), Arctic grayling (29.3%), juvenile chinook salmon (25.4%), burbot (8.4%) and round whitefish (0.4%) were estimated (all percentages based on species biomass measured in g/m²).

Juvenile chinook were found throughout the Blind Creek drainage. Grayling were captured near the lake-head source, and at the mouth of Blind Creek. None were found between the lake and the creek mouth. Burbot and whitefish were only identified below the lower bridge crossing (approximately 2 km upstream from the confluence with the Pelly River). Slimy sculpins were found throughout the system.

Up to 700 returning chinook salmon spawn in Blind Creek (Harder 1989, 1990, unpublished data). The salmon return to the stream in early-August. Spawning takes place throughout the lower 35 km of Blind Creek.

3.2.5 Wildlife Resources

Wildlife having management, economic or recreational importance in the Dy Project area include ungulates such as moose (*Alces alces*), caribou (*Rangifer tarandus caribou*), and mountain sheep (*Ovis dalli stonei*); carnivores such as grizzly (*Ursus arctos*) and black bear (*Ursus americanus*), wolves (*Canis lupus*), foxes (*Vulpes vulpes*), wolverine (*Gulo gulo*) and lynx (*Lynx lynx*); furbearers such as marten (*Martes americanus*), mink (*Mustela vison*), otter (*Lontra canadensis*) and beaver (*Castor canadensis*); game birds such as ptarmigan (*Lagopus lagopus*) and blue grouse (*Dendragapus obscurus*), ruffed grouse (*Bonasa umbellus*) and spruce grouse (*Canachites canadensis*); and small mammals like the snowshoe hare (*Lepus americanus*).

Ungulates

Distribution and density of ungulates in the region is seasonal. A formal survey of wildlife in the Faro area, including the proposed exploration portal as well as various possible production shaft sites, was conducted in September 1990. During this survey, moose were only found at elevations between 1,756 m (4,500 ft) and 1,950 m (5,000 ft) which is at or slightly above the treeline. However, dense growths of willow, aspen and poplar located in the sub-alpine transition zone, which includes the location of the proposed portal (Plate 3-1), and in the flood plain of the Pelly River suggest that these areas provide summer and winter forage habitat for moose. During the September 1990 survey, a single-transect survey through willow-brush habitat between the proposed shaft site and Blind Creek resulted in a count of 8 pellet groups over 100 m. This suggests significant use of the area by moose.

Caribou were only observed in alpine meadows on Mt. Mye, above 1,950 m (5,000 ft). This is typical of their distribution during summer months (Banfield 1977). These animals are known to overwinter in the Tay River valley to the north of Mt. Mye, far removed from the location of the proposed mine. There have been no reported sightings of caribou on the south-facing slopes of Mt. Mye (B. Pelchart, pers. comm. 1991).

The high alpine on Mt. Mye provides summer range for a population of Fannin sheep (Figure 3-3; McLeod 1981; Lortie 1988; Schweinsburg 1989). However, during September 1990 only one flock of 11 young rams were seen utilizing summer habitat on Mt. Mye during an extensive aerial survey of the region. The largest portion of the known herd, a flock containing approximately 8 rams and 32 ewes was observed at much lower elevations migrating towards their known wintering grounds on Sheep Mountain near the town of Faro (Figure 3-3). Sheep Mountain is a sparsely treed ridge between 980 m and 1,750 m elevation with a predominantly south-facing aspect where the animals find grasses and other forage under a comparatively thin blanket of snow.

The proponent, Curragh Inc., has consulted with representatives of the Yukon Territorial Government Fish and Wildlife Branch (YTG) and with other various interested parties about the local sheep population and the impacts of mining development on the sheep. These consultations have led to the establishment of a



Plate 3-1: Typical Willow-aspen-scrub birch habitat in the vicinity of the proposed mine shaft.

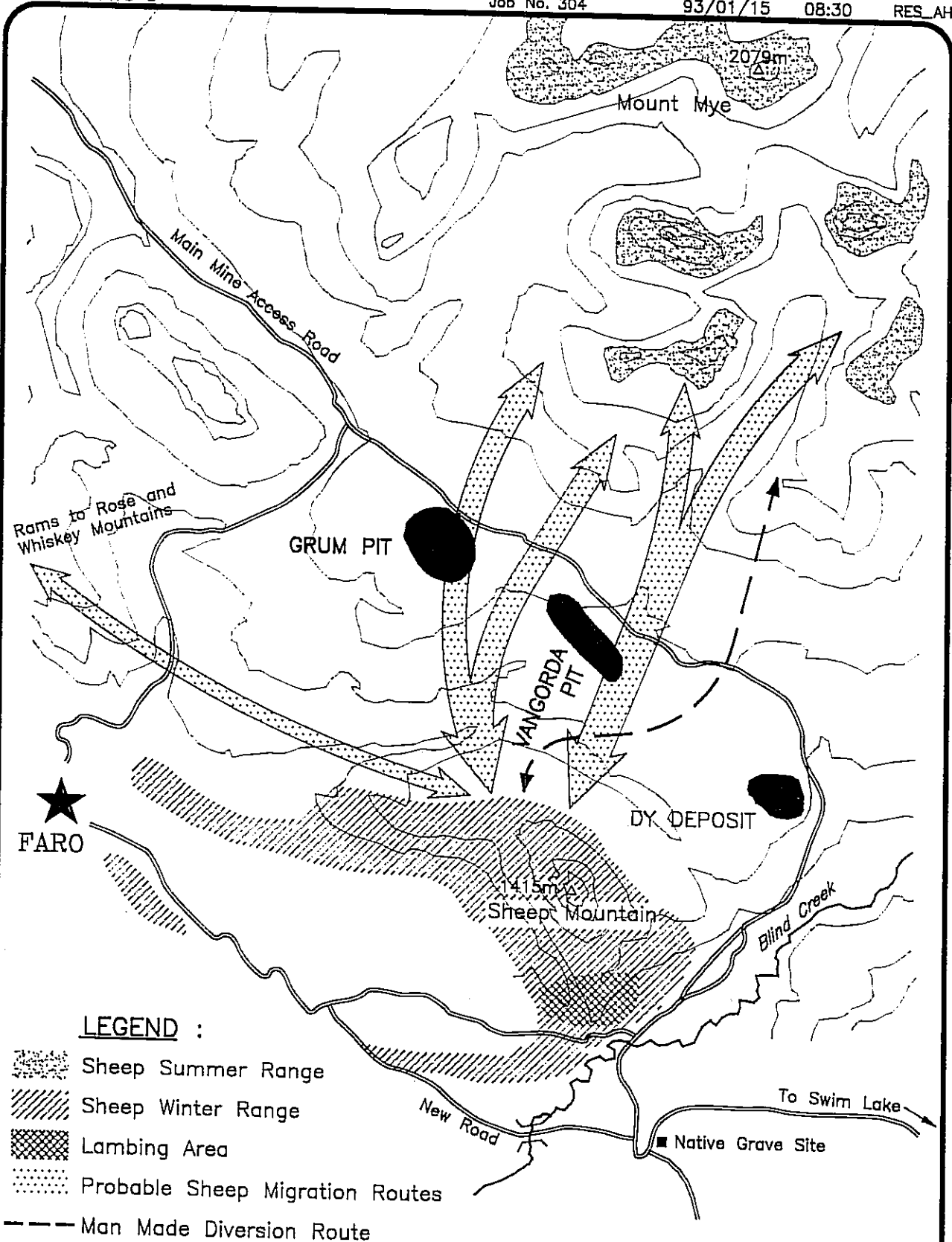


Figure 3-3 : SHEEP DISTRIBUTION IN RELATION TO DY DEPOSIT



Curragh Resources Inc.



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joint undertaking between Curragh and YTG to protect and manage the sheep (Hoefs 1988). Curragh is committed to continuing their involvement in this undertaking to include the additional period of operational mining activity brought about by implementation of planned activities at the Dy Property.

Carnivores

Grizzly bear and the black bear frequent the Faro area. Both species are omnivorous scavengers and are attracted to any easy source of food such as at a camp or dump. Grizzly bears are particularly concentrated in the Faro area. While typical population densities for grizzlies in the Yukon would be approximately one bear for every 80 square kilometers, on a typical night at the Faro dump (approximately 1 km from town), one can see as many as 5 to 8 of these animals scavenging for food. However, no grizzlies were spotted during two extensive overflights of the proposed location for the exploration portal and surrounding terrain. Two black bears were observed in the alpine meadows of Mt. Mye.

There are no reported sightings of wolves, fox or lynx in the immediate vicinity of the town of Faro or the proposed exploration site, nor were any sighted during the September 1990 wildlife survey. However, scats of either fox or lynx (or both) were found in and around the area of the proposed project.

Much of the area surrounding the Dy deposit has been burned over and is not suitable for marten. Mink inhabit stream banks, lakeshores, swamps and forest edges (Banfield 1977). None of these habitats exist near the proposed exploration site. However, they are prevalent lower down in the Blind Creek valley. Notwithstanding this, Native trappers from Ross River suggest the terrain in the vicinity of the Dy deposit is productive habitat for marten and mink.

There have been no recently reported trappings or sightings of beaver in this area although they have been sited/trapped in the past.

Game Birds and Small Mammals

The dense brush near the proposed exploration portal site is prime habitat for game birds like grouse and ptarmigan and small mammals like the snowshoe hare. A

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single 150 m transect walk through this habitat resulted in the sighting of 3 ruffed grouse, 1 spruce grouse, 3 blue grouse, 2 willow ptarmigan and 7 snowshoe hares.

The information provided above, describing the environmental setting and land use for the Dy Property will be supplemented with additional data gathered during future field excursions. The proponent recognizes that more detailed information is required to permit an accurate assessment of the potential project related impacts.

4 - Proposed Work Plan

4.0 PROPOSED WORK PLAN

4.1 Introduction

Development of the Dy Project has been structured into two phases - advanced exploration and production. The two phases will be separated by a production decision once a final mine plan is completed and the economic feasibility of commercial operation is confirmed. The purpose of the advanced exploration phase is to gather information required to carry out the feasibility assessment. This includes details of ore zone geometry and grade distribution to enhance ore reserve estimate reliability and mine layout; information on rock quality, rock conditions and groundwater hydrology to allow final mine design; and, bulk sampling to allow bench and pilot plant testing of metallurgical performance and blending characteristics. Access to the deposit will be gained by developing a shaft which will extend 700 m from the surface. This report deals almost exclusively with the advanced exploration; the production phase will be the subject of further investigation and description.

The advanced exploration program will have six stages:

1. Earthwork and construction of the surface facilities.
2. Upper shaft development (0 to 530 m) through non-acid generating rock. Waste will be disposed adjacent to the shaft site and will serve to enlarge the site area.
3. Lower shaft development (530 to 700 m) through waste which may be acid generating and will require a variation in waste handling techniques. Concurrent with the exploratory work, construction of an access road will begin to facilitate the haulage of acid generating waste to the Vangorda pit for final disposal and ore to the Faro processing facilities when it is encountered in the later stages of the program.
4. Lateral development within the ore body commencing once the shaft has been completed to a depth of about 700 m. Diamond drilling will be completed underground to further define the adjacent mineral reserves.

5. Test mining and bulk sample extraction to provide an opportunity to evaluate various mining techniques and ground conditions within the Dy Deposit. Processing the bulk sample through the Faro concentrator will allow for the assessment of the metallurgical characteristics of the deposit.
6. Engineering and design work leading to a production decision based on the results of items 4 and 5 above.

The following sections will provide a description of each stage of the exploration process, outline our understanding of the permitting required, and identify the environmental issues and mitigative measures which will be adopted to minimize potential impacts.

4.2 Phase I - Advanced Exploration

4.2.1 Stage 1 - Surface Setup

4.2.1.1 Description of Activities

Limited surface activities began in mid January of 1991 but were suspended in February of 1991. Initial dozer work included the construction of a small vehicle access road, excavation and levelling to facilitate collaring of an access decline and surface infrastructure for what was initially planned as a portal entry.

A more detailed assessment conducted after February 1991 has led to a change in plan. The orebody will now be developed through a shaft rather than a decline. This decision has favourable environmental implications as the development site for a shaft will be further away from Blind Creek (Figure 2-4). This will enable the operation to economically discharge waste water to the Vangorda Creek drainage basin where mining activities are currently licensed.

The surface facilities for the advanced exploration phase of the Dy Project will include the collar and headframe building located on top of the shaft excavation, a mine ventilation fan installation and mine air heater, a mine office and dry, maintenance shop, warehouse, and hoist room. An access road will connect the Dy operations with the other Vangorda Plateau mining operations which will be utilized for transportation of personnel and materials as well as hauling ore to the

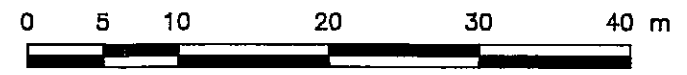
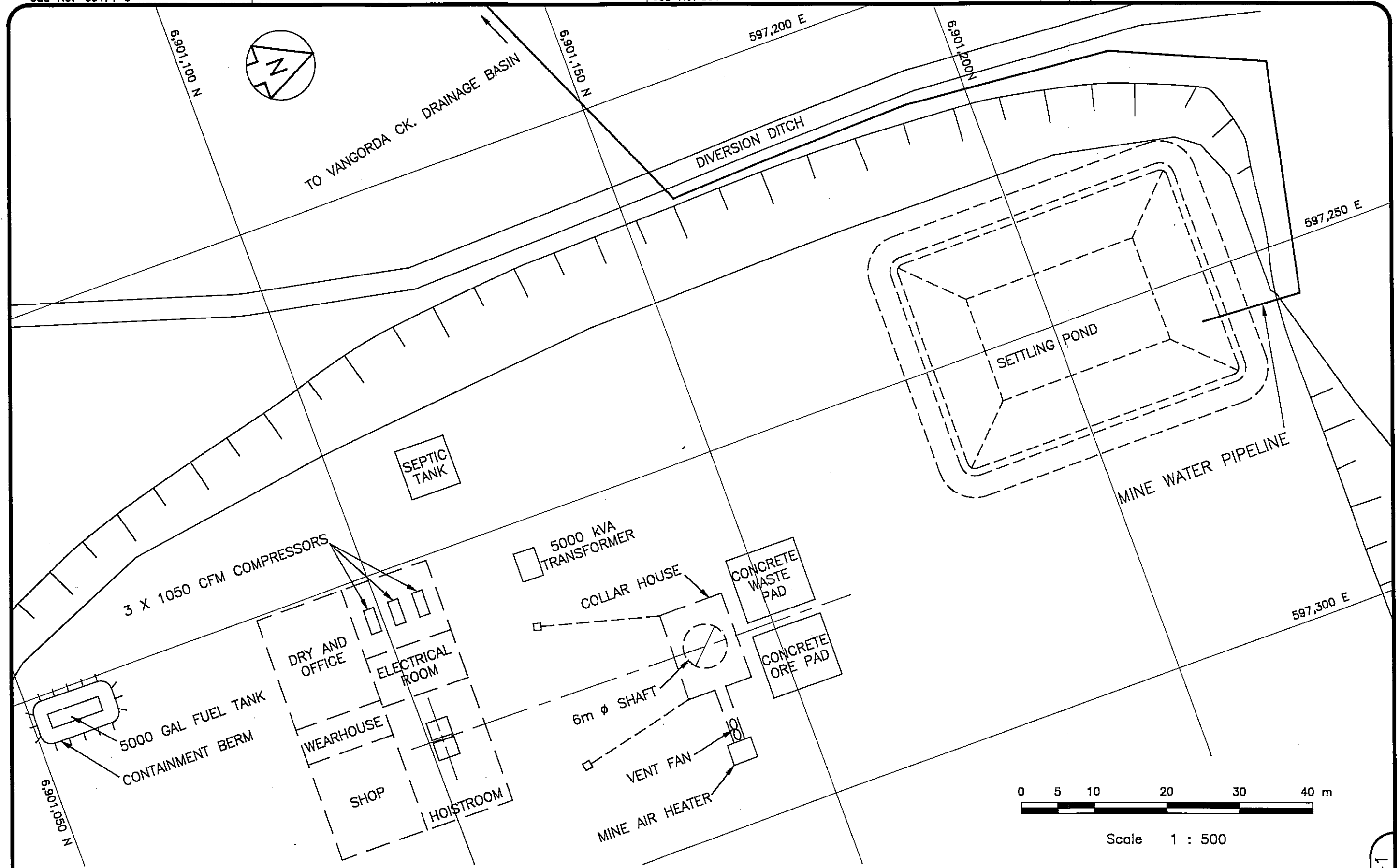
mill and acid generating waste materials to Vangorda pit. Runoff from the Dy surface facilities and mine water discharge will be directed to a sedimentation control pond located adjacent to the shaft site. Lime treatment facilities will be installed on the pond inflow and will be used as required to remove soluble metals prior to pumping the discharge over the ridge and into a small Vangorda Creek tributary. The surface facilities yard will be constructed by excavating and placing local materials and will be enlarged by end dumping non-acid generating waste material mined from the shaft development. A powerline will be constructed from the existing Vangorda transformer station to a transformer station located adjacent to the shaft facilities. A septic tank/field system will be utilized to clarify domestic sewage effluent from the dry. Surface facilities are portrayed in Figure 4-1.

Site development and infrastructure setup is anticipated to take approximately five months. Section 7.0 includes a bar chart which provides a relative indication of the sequence of development and the time required for each phase.

4.2.1.2 Permitting Required

The area of the Dy Project has been acquired as claims and leases under the Yukon Quartz Mining Act. Surface setup for the advanced exploration program will be conducted under the authority of this legislation. Additionally, the Environmental Operating Conditions (Appendix A), which are normally part of a Land Use Permit but not generally in force on claims, will be voluntarily adopted by the company to ensure environmental protection is an integral component of the construction design and implementation. Water use is not expected to reach levels requiring licensing under the Northern Inland Waters Act. Since this stage requires no federal decision making, an EARP screening is not required.

It is recognized that as the project approaches the production phase, a more complete environmental assessment and perhaps an Initial Environmental Evaluation (IEE) of the proposed mining operation will be required to enable a screening under the Environmental Assessment and Review Process (EARP).



Scale 1 : 500

Figure 4-1 : DY SURFACE FACILITIES

4.2.1.3 *Environmental Issues and Mitigative Measures*

Site development will cause a limited amount of surface disturbance with the shaft collaring and the initial access construction. Additionally, the land disturbance resulting from the development of the decline portal site in January of 1991 will require remediation upon closure. Decommissioning will involve the removal of all infrastructure and facilities, levelling and contouring of the surface and revegetation with a suitable grass/legume mixture.

Development of the site will also subject the area to the possibility of erosion in the advent of spring freshet or summer rainfalls. The runoff, if allowed to leave the site without mitigation, could have implications on the water quality of the receiving stream. A settling pond designed to collect and clarify flows up to and including a 1:10 year peak instantaneous rainfall event will be constructed immediately adjacent to the shaft development location along with all required drainage ditches to move site runoff to the pond. The pond will be effective in removing all sediments larger than 15 micron particle size (medium/fine silt) at the design inflow rate; during lower flow events, it will remove even smaller particle sizes as retention time increases. The clarified effluent will be discharged to a tributary of Vangorda Creek through a pump/pipeline system. The choice of shaft as opposed to decline access to the orebody will result in sulphides being handled a further distance from the sensitive fisheries habitat of Blind Creek and will substantially reduce water quality concerns regarding the Dy Project.

The increased access and site disturbance will have an impact on wildlife habitat of the immediate area. However, disturbance will be limited to approximately 0.8 ha of wildlife habitat and every effort will be made to minimize impact to snowshoe hare and upland game bird populations found to be abundant in the area. In addition all employees and personnel at the site will be reminded of the "no hunting" status of the area. Native use of the area will not be restricted by personnel or policies at the site provided safety concerns are not an issue. All garbage and solid waste generated at the site will be collected and hauled to the Faro minesite landfill for disposal.

Fuel and petroleum products will be stored in accordance with the Gasoline Handling Regulations. Impermeable containment areas will be constructed which are capable of withholding 110% of the largest tank. Propane will be stored in a

safe open area in accordance to the *Gas Burning Devices Act* and the *Fire Prevention Act*. The inventory of explosives will be stored in a facility approved by the Chief Mines Safety Officer and the necessary permitting and employee certification will be obtained.

4.2.1.4 Impacts of Closure and Decommissioning

Should circumstances prevail whereby there is a permanent cessation of exploration and/or development activities, closure and decommissioning activities would involve removal of all infrastructure and revegetation of areas of surface disturbance. Should collaring of the shaft have commenced, the mouth of the shaft would be filled with local material or permanently sealed for public and wildlife safety. All waste rock at the surface will be non-acid generating and may be simply levelled and reclaimed with the remaining site disturbance. Hazardous materials and wastes will be removed for use or disposal at the Faro minesite landfill. The final site will be left in a natural non-erodible state following the successful establishment of the grass/legume cover crop.

4.2.2 Stage 2 - Initial Shaft Construction - Access to the Ore Zone

4.2.2.1 Description of Activities

Advanced exploration will be carried out over a period of approximately 26 months. Access to the orebody will be gained through a 6 m diameter circular shaft which is concrete lined. It will be collared at about the 1140 m elevation approximately 1.8 km from the closest point of Blind Creek. The shaft will pass through non-acid generating phyllites and greenstones for the initial 530 m. This waste rock will be end dumped from the outside edge of the cleared pad in a downslope direction. Excavation of the final 170 m of the shaft and the lateral development will encounter ore and potentially acid generating waste rock. It will be discussed in the next section.

Shaft excavation is anticipated to require a total time of 14 months following surface setup. Initial shaft construction, to the point where acid generating waste rock may be encountered, will take the first 10 months of this timeframe. Excavation will be initiated once the headframe is in place and the hoist is operational. Small diameter drillholes within the perimeter of the shaft will be

loaded with explosives and blasted. The fractured and broken rock or "muck" is then excavated using a small scoop or clam to load the shaft bucket which is then hoisted to surface for disposal. At approximately every seven metres of advance, depending on ground conditions, circular forms are erected and secured to the walls with rock bolts such that concrete can be poured between the forms and the wall. After curing, the forms are removed and a circular concrete shaft with a final diameter of six metres remains. This sequence repeats through the entire length of the shaft.

Groundwater inflows to the shaft will be significantly below the levels which would require a water licence under the Northern Inland Waters Act (NIWA). As the shaft deepens, the potential for increased groundwater inflows exists. EBA Engineering has estimated that, based on double packer percolation tests in 1990 drill holes, the phyllites will be relatively impermeable (10^{-6} cm/sec) whereas fault zones will be significantly more permeable (10^{-4} cm/sec) and water bearing. Efficient shaft development requires that any groundwater flows of significance must be grouted off otherwise the shaft bottom becomes flooded and significant delays occur. Grouting is conducted by drilling small diameter holes into the floor and walls at the face and pumping in a concrete slurry under pressure in order to plug the fractures and seepage zones in the surrounding rock. Consequently relatively little water is expected to be pumped from the shaft, however surface facilities capable of handling over 500 IGPM will be available.

4.2.2.2 Permitting Required

Water utilization throughout this segment of development will be limited to the consumption of the drilling equipment and surface plant. As discussed in the previous section, groundwater inflows are expected to be minimal in the shaft excavation stage. These water use levels will be well below the 50,000 IGPD specified within the NIWA as requiring a water licence.

4.2.2.3 Environmental Issues and Mitigative Measures

Rock testing is currently underway to verify that waste rock produced from the upper decline will be non-acid generating. This testing program will confirm that waste rock from this segment of the exploration program may be disposed in a

dump located at the outside edge of the portal area with no concern for high metal concentrations in the surface water.

Site drainage from the shaft and infrastructure area will be channelled to the settling pond facility for gravitational settling prior to being pumped to a small tributary of Vangorda Creek. In anticipation of groundwater in the next stage of development exhibiting high levels of dissolved metals, a small water treatment plant will be constructed at the settling pond inflow. This plant will be a contingency since grouting may well increase pH to a level where metals are not a concern. It will utilize lime addition to increase pH of the effluent to levels which will precipitate the dissolved metals and will be capable of handling a constant flow of 500 IGPM as a minimum.

Drilling and blasting will be required in the excavation of the shaft. ANFO (Ammonium Nitrate-Fuel Oil) will be utilized where ground conditions are dry. In wet conditions, a high explosive such as GELDYNE, which is insoluble, will be utilized. This will minimize the ammonia in the water discharged to the settling pond.

A regular monitoring program will be implemented to ensure that water pumped from the settling pond is suitable for release to the Vangorda Creek drainage basin.

Operational guidelines will be devised and enforced to limit the releases of spilled petroleum products and uncombusted explosives. Spill contingency plans and clean up techniques will be defined such that these problems may be prevented or immediately addressed.

4.2.2.4 Impacts of Closure

In the event of a premature permanent closure occurring within this phase of development, the decommissioning plan would be identical to that discussed for the previous phase (Section 4.2.1.4) with the exception that the shaft will not be backfilled. Shaft sealing, infrastructure removal and site revegetation would be adequate as none of the material at the surface during this phase would have acid generation potential.

4.2.3 Stage 3 - Lower Shaft Excavation

4.2.3.1 Description of Activities

At a depth of 530 m the shaft will reach the upper sulphide bearing horizons of the Dy Deposit and their associated altered phyllites. These horizons are not ore under current geologic interpretation, however, massive sulphides will be encountered. This will cause no change in methods of shaft sinking but material handling practices will be implemented that take account of the acid generating character of the material.

Sulphide waste and altered phyllite will be brought to the surface and dumped on the pad adjacent to the hoist as shown in Figure 4-1. This material will then be loaded onto trucks and transported for final disposal at the bottom of Vangorda pit.

Grouting in advance of shaft development will continue if groundwater inflows to the shaft are excessive. The grouting in combination with the cementing of the walls of the shaft are expected to introduce sufficient alkalinity that the dissolved metals will be removed from the groundwater at the face and a short period of natural settling in the sedimentation impoundment at the surface should result in water quality suitable for release. Regular monitoring will be employed to continually assess this and should dissolved metals persist, the lime treatment facility will be in place and ready for operation.

Once the shaft reaches its total depth, a shaft bottom station and associated material handling facilities will be developed.

4.2.3.2 Permitting Required

At this stage in the shaft development it is anticipated that water which has interacted with sulphides will be entering the shaft. This may be metal enriched. Furthermore, water falling down the shaft will interact with blasted altered phyllite and sulphide waste muck and may similarly become metal rich. Mining operations will also be hoisting acid generating material to surface. It is expected that the waste handling involved will require a Water License although quantities of water involved will be small. Under the current regulatory regime of Yukon Territory, it is at this stage where a successful *EARP Screening* of the exploration phase will

also be required. This document will provide the screening information supplemented by the documentation submitted with the application for the exploration stage Water License. Licensing will not be delayed until this stage of the program but the process will begin as soon as a go ahead for the project is given by the company such that a water licence for the advanced exploration project can be in place as soon as possible.

4.2.3.3 Environmental Issues and Mitigation

The issues at this stage of the program will be those raised by the solid and liquid waste handling noted above, otherwise the issues and their mitigation are identical to Stage 2 Initial Shaft construction.

Waste will be hauled for final disposal within the Vangorda Pit, thus complete mitigation of any sulphide waste storage on site will be provided and there will be zero risk of failure. Although ore is not expected at this stage of shaft sinking it is possible some could be encountered. This will be stockpiled at the shaft collar and periodically moved to stockpiles at the Faro Concentrator.

Liquid waste handling will be as described previously. At this stage the lime treatment plant may be required, however it is expected that cement grout will probably still inhibit metals in solution.

4.2.3.4 Impacts of Closure

It is highly unlikely that the operation would be closed at this stage before the exploration program is complete, however the remedial measures outlined for the previous stages will provide complete mitigation for this stage as well.

4.2.4 Stages 4 and 5 - Lateral Development and Exploration in the Ore Zone and Bulk Sampling/Test Mining

4.2.4.1 Description of Activities

The shaft sinking will be completed within 21 months of initial excavation. In order to access the orebody for detailed diamond drilling, lateral development of approximately 2,000 m will commence. Lateral development is expected to require about 3 months at which time a diamond drilling and bulk sampling

program will be initiated. Drilling and sampling is expected to take an additional four months to complete. To the extent possible, drifting will be in ore as part of the bulk sample program; the ore will be temporarily stockpiled at the shaft site until it can be transported to the Faro concentrator for processing. Ventilation raises may also be installed during this component of the exploration program. The methods to be used will be decided at a later date; currently tracked and trackless options are being considered and costed. There will be no environmental difference between the two options. The trackless option requires a ventilation raise but this will not impact closure beyond requiring sealing similar to the shaft.

As soon as sufficient ore can be accessed, an initial test mining operation will be established to finalize production mining methods and suitable stope sizes and to secure sufficient ore to assist in determining the metallurgical features of the ore for processing. It is likely that much of the initial underground mining work will be by room and pillar in areas of shallow dip with long hole stoping developed in fold noses and cut and fill methods utilized in narrow high grade areas. Optimum blending of Dy and Grum ores (to be mined concurrently) that can be most effectively handled in the mill must also be assessed. The bulk sampling program for piloting purposes will involve 100,000 tonnes from the B Zone. A sample size of this magnitude is required considering the size of the pilot plant to be utilized, namely the Faro Concentrator. The initial test mining operation will begin at 1500 tonnes per day. The mining method will be definitively selected once ore zone geometry is better known.

4.2.4.2 Permitting Required

Since there will not likely be any effort to grout the groundwater other than adjacent to the shaft, it is most probable that underground development during this stage will produce significant volumes of groundwater which will have to be discharged from the shaft. The quality of water discharged from the shaft may be somewhat reduced due to more extensive interaction with sulphides. It is expected that this volume will, at some time, exceed the 50,000 IGPD specified by NIWA as the maximum volume which may be used without the acquisition of a Water Licence. The advanced exploration program water license application noted previously will account for these larger flows.

Activities outlined in this phase of operation continue to be exploratory in nature. Results of the diamond drilling, the test mining and the bulk sampling in the A and B Zones will form the basis of a decision to proceed to production mining.

4.2.4.3 Environmental Issues and Mitigative Measures

The water which will collect in the underground development will contain substantial levels of suspended solids, total lead, zinc, copper and barium. It is also anticipated that pH, ammonia and possibly dissolved zinc will be elevated. The contaminated water will be pumped up the shaft to the surface. It will then be discharged to the settling pond and, if dissolved metal levels are elevated, the secondary treatment facility will be utilized. A small primary receiving pond may be excavated immediately in front of the main pond to remove the coarse fraction of the total suspended solids in an accessible location which may be easily dredged and will also allow the collection of a suitable volume of effluent to run the secondary lime treatment facility on a batch operation basis to accommodate lower flows. The addition of slurried lime from the small treatment plant will raise the pH to levels which permit the precipitation of dissolved zinc upon release and containment within the large settling pond. The aeration provided by the pumping and handling through this process coupled with the inherent warm temperatures of the underground waters will assist in reducing ammonia levels to acceptable standards.

The outflow from the large settling pond will be monitored on a weekly basis throughout this period to ensure the acceptability of discharges to the Vangorda Creek system.

4.2.4.4 Impacts of Closure

Mine closure considerations are greatly simplified by the fact that the entire orebody scheduled for mining and all altered phyllite is below the elevation of Blind Creek. At the cessation of advanced exploration operations, should a decision be made not to proceed to production, the workings will be allowed to flood with stagnant water. This will eliminate acid generation potential and the subsequent groundwater contamination as a significant issue.

The surface facilities will be removed and underground openings sealed. Since all potentially acid generating mine waste from advanced exploration of the Dy deposit will have been disposed of within the Vangorda pit, final flooding of the pit will prevent acid generation from the mine waste materials. Recontouring and revegetation of surface disturbances will be conducted to reduce the possibility of future erosion.

This work would only be done if the feasibility study shows there is no chance of mining the deposit, otherwise the site would be maintained and this reclamation deferred until all other Faro operations are closed.

4.2.5 Manpower During the Exploration Phase

The Dy Project will require approximately 10 people during the initial surface construction period increasing to about 45 during the advanced exploration stage. These personnel will be specialists in underground mining and shaft construction and will most probably be contractors.

Plans regarding accommodations for these people have not yet been finalized, however, it is expected that the existing camp within the Town of Faro will be utilized and the men will be bussed from that location on a shift by shift basis.

4.2.6 Access Road

Ore produced during the bulk sampling period will be transported to the Faro concentrator to evaluate the milling characteristics. In order to get large haulage trucks to the shaft site, the access road must be upgraded to provide suitable grades and configuration. Various access routes are currently being assessed and a final route selection has not yet been made. The decision to access the ore reserve by shaft has substantially reduced the length of access road required by moving the entire operation approximately 1.5 km closer to the existing Vangorda activities.

Construction will involve the clearing and disposal of vegetation from the route location and initial layout by dozer utilizing cut and fill techniques. The final road surface will be standard haulroad configuration with a 30 m running surface flanked by 1 m safety berms. Crushed rock placement will be required to upgrade and stabilize the final road surface; non-acid generating rock from the Grum

operations will be used for this purpose. The current alignment of the Blind Creek road east of Vangorda Creek crossing will be utilized wherever possible to minimize surface disturbance.

4.2.7 Power Supply

A powerline will be constructed from the current Vangorda transformer station to the shaft site. The corridor location has not yet been finalized, however, every effort will be made to parallel the access road in order to minimize surface disturbance.

4.3 Phase II - Production

4.3.1 Final Mine Development and Production

4.3.1.1 Description of Mining

Test mining operations will determine mining methods and suitable stope sizes. Room and pillar development in combination with long hole stoping techniques will be established to produce a maximum annual output of 1.25 million tonnes. This translates to an average of 3,500 tonnes daily. At some stage during this phase the shaft will be deepened to 900 m to provide access to the deeper A zone portion of the deposit.

Waste rock will be disposed of within mined out sections of the workings. Waste volume will be minimal in the production stage.

4.3.1.2 Permitting Required

Due to the continued need to keep active workings dewatered, pumping will be employed to remove all groundwater inflows from the mine. The volume is expected to be in the range of 350 IGPM or more and will require a water licence under NIWA. Water quality is expected to be similar to or higher than that encountered in the advanced exploration development. A Water Licence for the production phase will be applied for which will allow for the increased water volumes generated during mining, compared to the exploration phase. This license will also allow the specific purpose of mining ore on a commercial basis as opposed to the advanced exploration license.

PROPOSED WORK PLAN

All activity preceding Phase II will be instrumental in providing sufficient information to decide whether a mine is feasible as well as the daily tonnage and configuration of the mine. Should this decision be positive, it is expected that a more intensive screening of the mine development under the EARP process may be necessary prior to proceeding with the mining phase.

Curragh has been actively collecting baseline environmental information since 1988 and will be preparing more detailed documentation. This should allow for sufficient time for review and discussion of the potential impacts of the Dy project such that a decision report on the screening may be in the hands of the Minister, before a production water licence is required.

5 - Proposed Recovery Process

5.0 PROPOSED RECOVERY PROCESS

All ore mined from the Dy Deposit will be trucked or conveyed from the shaft area to the existing stockpiles near the mill site at the Faro Pit. Processing of the ore to produce lead and zinc concentrates will be in the current Faro concentrator using processes of crushing, grinding, selective flotation, dewatering and drying similar to those in use today. Preliminary testing of the Dy ores indicates that they are similar to the ores of the other deposits of the Vangorda Plateau. Thus, grinding and reagent consumption will be similar to that used for Vangorda, and particularly for Grum ores. Tailings will be disposed of in the mined out Faro pit although the downvalley scheme at Faro may still be employed as a component of the overall tailings deposition and water management plan for the Faro concentrator effluent. The processing of Dy ore and storage of waste materials generated from the processing will have no significant incremental environmental impact on the Rose Creek Basin.

6 - Environmental and Socioeconomic Considerations

6.0 ENVIRONMENTAL AND SOCIOECONOMIC CONSIDERATIONS

6.1 Environmental Program

The principal environmental issues associated with the development of the Dy deposit are anticipated to be:

- protection of the water quality and fisheries resources in Blind and Vangorda Creeks;
- potential for waste materials to generate acid mine drainage;
- development of a effective materials handling, waste rock and waste water management plan;
- effects on local wildlife populations; and
- mine reclamation and project decommissioning.

6.1.1 Environmental Considerations

A responsible approach is being undertaken by Curragh Inc. to identify and assess the potential environmental impacts of the proposed development such that appropriate mitigative measures can be incorporated to minimize those impacts. The environmental impacts of principal concern likely to be associated with the development of the Dy Property are related to construction of the shaft site and ore haul roads, siting and construction of surface facilities, the treatment and disposal of mine water, the storage and transportation of mined ore, and the storage and disposal of potentially acid generating waste rock and final mine decommissioning. Accordingly, studies have been initiated to assess the baseline environmental conditions in the vicinity of the proposed site and laboratory tests are currently under way to determine, among other things, the acid generation potential of the ore and waste rock to come from the proposed underground mine.

6.1.1.1 Acid Generation Testwork

Based on the similarity of the massive sulphide deposits comprising the Dy ore body to those of the Faro, Grum and Vangorda deposits, it is likely that the ore and

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some waste rock produced by the mine will be acid generating. Static and kinetic testwork is underway to determine the acid producing capability of all types of waste rock and to estimate the rate of acid generation. It is important to realize that the first 530 m of the shaft will be excavated in non-acid generating phyllites and greenstones of the Vangorda formation. This conclusion is based on drilling results, visual identification of rocktypes as being similar to those tested and shown to be net acid consumers at the Grum deposit (CRI 1989), and on the known natural weathering characteristics of the rocks. Altered phyllites, like those that comprise the Vangorda wall rocks (CRI 1989), will not be encountered until excavation reaches geological strata near the first mineralization.

Acid generation potential will be determined through testwork on each lithology identified for the Dy deposit. Acid-generation tests can be divided into instantaneous "static tests", which provide an approximate indication of acid potential, and longer-term, more intensive "kinetic tests", which directly measure the rate of acid generation, acid neutralization, and metal leaching through time.

The static test is known as acid-base accounting (ABA). An acid-base account attempts to determine the net-neutralization potential (NNP) of a rock by examining the balance between acid-producing components (primarily pyrite, FeS_2) and acid-consuming components (carbonates and other minerals capable of neutralizing strong acids).

The kinetic test employs the humidity cell. Samples are placed in enclosed containers, or cells, and subjected to a weekly cycle of dry and humid air. At the end of each week, each sample is rinsed with deionized water to remove any acid products and leached metals. Chemical analyses of the rinse waters indicate the weekly rates of acid generation, acid neutralization, and metal leaching. Extrapolation of these rates into the future permits the long-term prediction of acid production and consumption of sulphide minerals.

6.1.1.2 Climate

Climate data such as total precipitation and evaporation are required to permit an accurate assessment of the required design parameters for domestic water supply and drainage facilities. Existing data in the vicinity of Dy is available from three Atmospheric Environment Services (AES) meteorological stations located at Faro

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(established 1977), a location known as the Anvil site (est. 1967), and at the Grum Camp (est. 1983), where daily measurements of temperature and precipitation have been recorded since their installation. The climate station at the Grum Camp is closest to the proposed Dy Project and is located at latitude 62°18'N and longitude 133°16'W at an elevation of 1,150 metres. No additional station is proposed at Dy.

6.1.1.3 Hydrology

Surface Water

The proposed mine site is located on the western slopes of the Blind Creek drainage basin. The southeast facing slope of the property sheds runoff directly into Blind Creek. As all site drainage and underground dewatering will be collected and treated on site then pumped over the ridge to the Vangorda Creek system, there will be no direct water quality impact on Blind Creek. All temporary storage of ore and potentially acid generating waste rock will also be within the Vangorda Creek drainage.

Hydrological baseline data for the vicinity of the proposed mine site is available from Water Survey of Canada gauging stations located on the Ross (09BA001) and Pelly (09BC004) Rivers and from selected streamflow gauge sites established on Rose and Vangorda Creeks in conjunction with environmental studies associated with the development of the Vangorda and Grum deposits (which are also located on the Vangorda Plateau). In addition a stream flow gauging station equipped with a continuous streamflow recorder and datalogger supplemented with staff and crest gauges have been established on Blind Creek. Data obtained from these stations will permit the development of stage-discharge flow curves and will be instrumental in allowing the prediction of water quality impacts on the Vangorda Creek system.

Groundwater

A good understanding of the groundwater flows in the area of the proposed mine is required in order to demonstrate that there are no potential long-term environmental impacts from the underground mining operations.

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Groundwater levels will be obtained from selected exploration holes and samples of groundwater drainage will be collected as shaft development proceeds. Possible sites for locating piezometers include: in drill holes located near the shaft, at the ore and waste rock storage sites and on the downhill slopes from the shaft location. However, due to the nature of the location of the Dy orebody (below the level of Blind Creek), and the means by which it will be mined, it is likely that piezometers will only be required at the lower end of development.

6.1.1.4 Water Quality

The potential impacts to water quality in the Vangorda Creek drainage associated with the development of the Dy Property may include:

- possible increased acidification and migration of heavy metals in surface and groundwaters caused by exposure of the rock to oxygen in underground workings and surface storage facilities; and
- diversion of groundwater from the Blind Creek basin into the Vangorda Creek system.

The potential for increases in the concentration of heavy metals, ammonia from blasting residues and suspended solids from surface runoff, and the potential for acid generation to affect the aquatic resources in the Vangorda Creek valley will be examined during the assessment of impacts associated with the mining phase of development.

A water quality monitoring program commenced at the property in September 1990 and will continue in order to characterize pre-development parameters and provide a baseline for comparison with post-development water quality. Given site conditions and the careful environmental considerations included in preliminary development concepts, it is anticipated that there will be no impact on Blind Creek associated with proposed development.

Groundwater samples for water quality will be sampled from piezometer wells. Five surface water quality sampling sites will be established in the Blind Creek drainage as follows: above Swim Creek, in Swim Creek, below Swim Creek but above mine influence, immediately below mine influence, and at the confluence of

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Blind Creek and the Pelly River. Additionally, background samples from upper and lower Shrimp Creek (a tributary to Vangorda Creek) will be collected.

Field water quality tests will include pH, dissolved oxygen, conductivity and temperature. Laboratory water quality analyses include a 21 metal (total and dissolved) ICP Scan, total and dissolved solids, turbidity, color, pH, alkalinity, hardness, conductivity, dissolved anions, ammonia and other nitrogen species, and phosphorous (total and dissolved).

As discussed previously, initial development of the shaft will be in rock which is non-acid generating and may be disposed of adjacent to the shaft site. A small settling pond will be constructed on the pad to collect and clarify surface runoff. Further exploration will yield rock which is potentially acid generating. Minewater discharge in this later stage of exploration will likely be high in zinc and possibly copper and lead concentration. It is the proponent's expectation to construct and operate a secondary water treatment facility to mitigate the potential impacts arising from acid mine drainage. The facility will consist of a lime treatment plant which will be designed to remove metallic complexes from mine and surface runoff water and to lower pH prior to the pumping of water to Vangorda Creek.

6.1.1.5 Aquatic Resources

The only water courses that have the potential to be affected by the proposed development are Vangorda and Blind Creeks; Vangorda Creek will be the recipient of surface runoff water and treated mine water (as previously discussed). The potential impacts are likely to be confined to nearly undetectable changes in water quality in the receiving waters. To ensure that adequate data is available to assess these impacts, a comprehensive assessment of baseline aquatic resources will continue.

Benthic Macroinvertebrates

Representative samples of pre-development benthic macroinvertebrate communities will be collected at each of the five water quality stream sites in Blind Creek (discussed above) during the summer of 1991. The samples will be

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enumerated and individual organisms identified to the level of genera (species where possible).

Periphyton

Periphyton communities are sensitive indicators of changes in water quality. Therefore knowledge of the state of the community is required in order to assess whether operation of the mine is having an impact on water quality. Representative samples of pre-development periphyton communities will be collected at each of the seven stations discussed above during the summer of 1991. The samples will be enumerated and individual organisms identified to the level of genera (species where possible).

Fish

Fisheries studies have already been implemented to characterize the existing fisheries resources in Blind Creek. Fisheries resources within Vangorda Creek have been documented in the past and studies are ongoing to assess their continued representation. The purpose of this program will be to document the presence/absence of species present in the creek and to categorize their various life stages; determine the spatial distributions and movements of each species in relation to siting of the proposed mine; determine relative abundances of each species; and to locate sensitive habitats that may be affected by altered water quality or other development/operation related effects.

Fisheries studies were completed in 1991 to characterize the extent of use of overwintering habitat in Blind Creek and resident populations in Vangorda Creek. Also, federal and territorial government data on fisheries resources and their use within the proposed development area will be utilized. Preliminary studies were also conducted during the summers (August) of 1989 and 1990 to characterize the summer fish fauna and their distribution throughout the Blind Creek drainage. In addition, benthic invertebrate studies were undertaken to characterize seasonal changes in abundance and distribution of fish food.

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6.1.1.6 Soils, Terrain and Landform

Field excursions will characterize the soil and terrain features of the proposed project site for consideration of mine site reclamation and the location and engineering of mine site facilities. A review of existing soils data will support these efforts. Features that will be considered include slope gradient and stabilities, drainage features, particle size, and parent material origin (e.g. colluvium, alluvium, glacial till, etc.).

Terrain mapping will be conducted for the mine property and access and ore haul corridor routes. Mapping for both soils and terrain will entail the review of existing information, air photo interpretation, and a field program to verify map units and collect samples for laboratory analysis. Soil maps will depict parent material types, landforms, soil texture and depths, soil stratigraphy and sites of active geomorphic processes such as erosion. Terrain maps will depict erosion potentials and potential hazard constraints.

Results from the terrain mapping will be used to evaluate engineering aspects of sites for shaft and surface facility development, access and haul roads, sites for ore and waste rock storage and handling, and sites for water management facilities (settling ponds). Natural hazards will be identified (such as landslide, avalanche and rockfall areas) which could affect operation of the mine and the integrity of waste storage and/or disposal sites.

6.1.1.7 Vegetation

An adequate assessment of the vegetation in the vicinity of the proposed mine is required to ensure a complete understanding of wildlife habitat capabilities of the area.

Recent airphotos and some vegetation mapping is available from the Forest Resources section of DIAND and from Yukon Territorial Government Renewable Resources Habitat Branch. This information will be utilized, in addition to ground truthing, to assess wildlife habitat capability in the area.

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6.1.1.8 Wildlife Resources

The potential impact to wildlife resources of the area associated with the property development will be limited to small and large game habitat loss in the vicinity of the proposed shaft and surface infrastructure as a result of site clearing activities; interference with traditional wildlife migration routes caused by construction and use of the haul road; and noise related impacts.

Evaluation of the wildlife resources in the vicinity of the Dy Project has already been initiated. Studies have been designed to categorize the area in relation to species composition and their spatial and temporal utilization of the area. The evaluation will cover the proposed minesite, the haul and access roads, and the section of the Blind Creek valley downstream from the proposed mine.

Contact has already been established with Yukon Territorial Government staff regarding existing wildlife survey data and hunter harvest data. Field investigations to-date have included helicopter surveys of alpine areas and valley floors, and a ground assessment of late summer habitat capability. Further seasonal wildlife surveys are planned in order to characterize the extent of usage of the area by local wildlife. This will be supplemented by government wildlife data for the area and, information obtained from Natives who hunt and trap in the project area.

6.1.1.9 Closure Plan

A closure plan for the Dy Project will be developed. The plan will examine such options as stabilizing disturbed areas, road ditching, culvert repair and cleanout. Because of the great depth to ore of the Dy Deposit, all potentially acid generating rocks will be flooded after the mine is closed. Consequently, closure issues will be limited to surface facilities.

These and other environmental aspects (*e.g.* waste management, water management, etc.) related to the proposed project will be investigated in detail during 1993.

6.2 Socioeconomic Considerations

In 1975, Kerr Addison Mines Limited commissioned a socioeconomic profile of the Faro and Ross River area in an effort to assess the potential impacts associated with the development and operation of a new mine and mill complex in the Vangorda Creek area. This study identified numerous potential impacts, both positive and negative, on the residents of both communities and on the Yukon Territory as a whole. However, the proposed Kerr-Addison mine never evolved and Curragh Inc. has since acquired the mineral rights to all other known lead-zinc deposits on the Vangorda Plateau. Thus, any socioeconomic impacts associated with the proposed project will be in relation to mine continuity rather than the start-up of a new mine or a new mill and will, therefore, be less substantial. Continued employment as a result of mine life extension, in addition to tax revenues, etc., will provide the principal economic benefits of the project.

The proposed mine lies within the Ross River Group trapping area and, consequently, mine development may have an adverse impact on Native traplines. It is important to note, however, that additional impacts attributable to Dy are likely to be minor since the areal impact associated with development of the Dy Property will be relatively minor compared to the development of the existing mine infrastructure for the Faro Vangorda and Grum ore deposits.

Contact with the Kaska Dena Band Council in Ross River was first established in August 1990 and many meetings have been held since to address native concerns over the proposed exploration program and provide an opportunity for input to the environmental assessment. Discussions were held concerning future access to traditional hunting, trapping and fishing areas, the potential impacts of exploration activities on wildlife, and locations of sites of archaeological/historical significance to the Ross River Band. These talks continue and an atmosphere of cooperative consultation will be afforded priority attention throughout advanced exploration and, ultimately, underground development.

Studies will be undertaken to contemporize earlier efforts and to identify all of the potential socioeconomic impacts associated with the development of the Dy ore body, with particular emphasis on the Native peoples from Ross River.

7 - Preliminary Development Schedule

7.0 PRELIMINARY SCHEDULE

Figure 7-1 offers a projected schedule for the Phase I - Advanced Exploration Program including all stages of development. It predicts a thirty month time period between initial surface setup until a production decision can be made. Shaft excavation is expected to require approximately 16 months.

Scheduled concurrently is the anticipated permitting which will be required for the exploratory program. Shaft development may encounter water in quantities exceeding 50,000 IGPD or water containing impurities which would require treatment prior to release. Either of these conditions would necessitate a water licence for the project to continue; rather than defer the application and cause a project delay while awaiting a licence, Curragh has chosen to apply for a licence immediately. A Federal Decision on a Water Licence will also trigger the need for an EARP screening on the project. The attached schedule indicates the application for the required permitting will not be submitted until the exploration work has commenced, however, Curragh has decided to initiate the permitting process earlier to provide additional time for licence finalization.

Mine production will commence (dependent on a positive Stage 6 Production Decision) after the thirty month exploration period and will extend into the 21st Century. Full scale permitting for production will be initiated shortly after upper shaft excavation has commenced to allow ample opportunity for final preparation of a complete impact assessment and regulatory/stakeholder review prior to the production decision.

CURRAGH INC - DY PROJECT

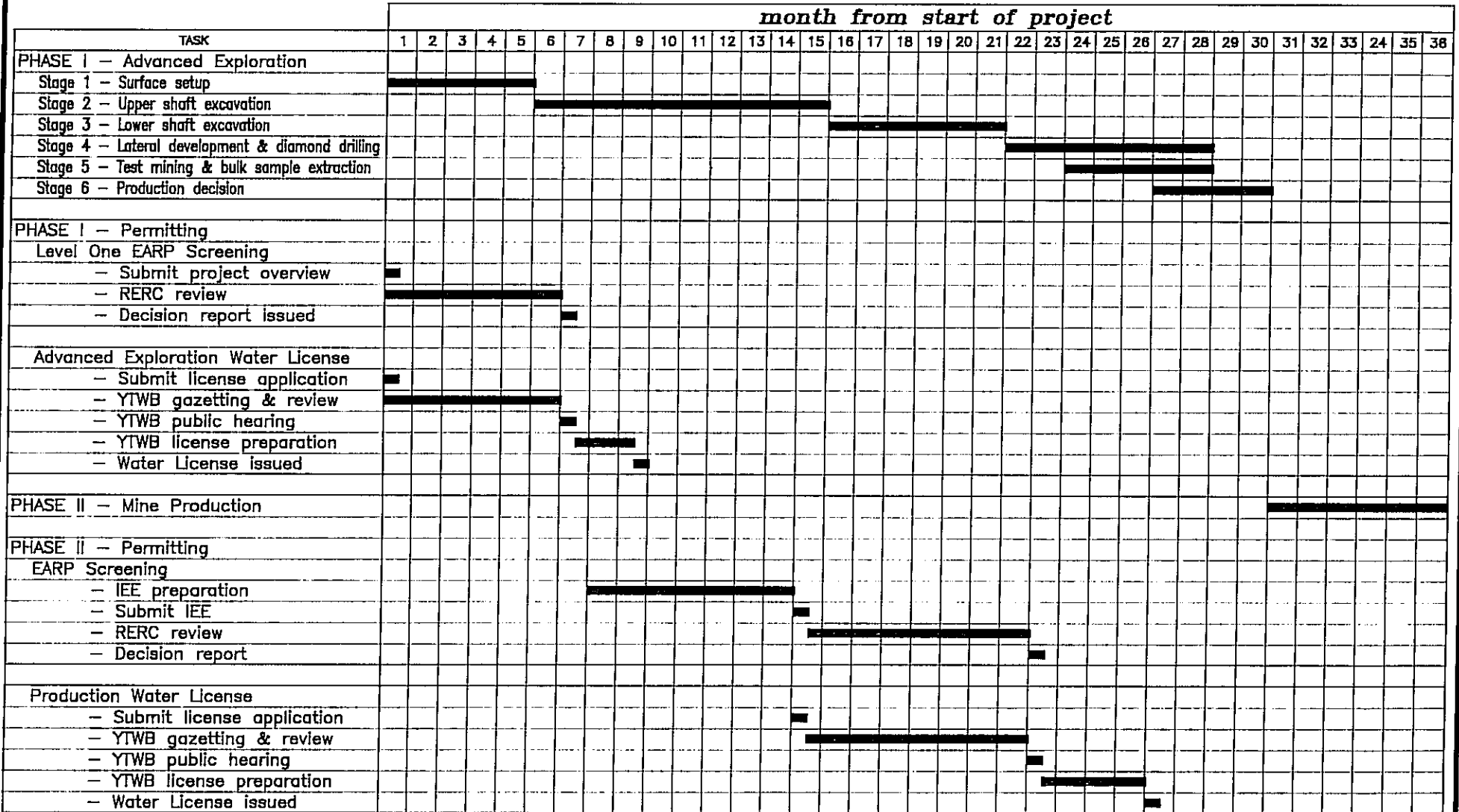


Figure 7-1 : ADVANCED EXPLORATION PROGRAM
PROPOSED WORK SCHEDULE



Cod No. C0475-10
 Job No. 304
 93/01/16 10:30
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Appendix A - Environmental Operating Conditions



APPENDIX A

Environmental Operating Conditions Dy Project

1.0 Petroleum

- | | | |
|-----|--|-------------------------|
| 1.1 | The Proponent shall report in writing to the Engineer the location and quantity of all petroleum fuel caches within 10 days after establishment. | REPORT FUEL LOCATION |
| 1.2 | The Proponent shall clearly mark with stakes or flags the location of any spill of any petroleum and forthwith report the time, manner, location, amount and type of spill to the Engineer NAP and the Environmental Protection Service. (For the purpose of this condition reports can be made to the Environmental Protection Service at Phone No. (403) 667-7244, Whitehorse, Yukon). | REPORT PETROLEUM SPILLS |
| 1.3 | The Proponent shall not place any Petroleum fuel storage containers within 12 metres of the normal high water mark of any stream. | FUEL BY STREAM |
| 1.4 | The Proponent shall construct a dyke around each stationary fuel container or group of stationary fuel containers where any one container has a capacity exceeding 4000 litres. The capacity in the dyked area shall be at least 110% of the container capacity. | DYKE FUEL CONTAINER |
| 1.5 | The Proponent shall ensure that the dyke and the area enclosed by the dyke shall be impermeable to petroleum products at all times. | IMPERMEABLE DYKE |
| 1.6 | The Proponent shall take every precaution to ensure petroleum fuel or associated products do not escape from storage, distribution or dispensing facilities in such a manner as: | FUEL CONTAINMENT |

- a) to create a hazard to public health or safety;
- b) to contaminate any fresh water source or stream;
- c) to interfere with the rights of any person; or
- d) to allow entry of a product into a sewer system or underground stream or drainage system.

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| 1.7 | The Proponent shall dispose of all combustible waste petroleum products by incineration or removal to an approved disposal site. | WASTE
PETROLEUM
DISPOSAL |
| 1.8 | Proponent shall have a Spill Contingency Plan, filed with the Engineer, in place prior to the movement of any petroleum product, or ensure that the haul contractor can provide for response to and clean-up of any spills of fuel or other hazardous materials. | SPILL
CONTINGENCY |

2.0 Wildlife and Fisheries Habitat

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| 2.1 | The Proponent shall not unnecessarily damage wildlife habitat in conducting this Land Use Operation. | HABITAT
DAMAGE |
| 2.2 | The Proponent shall not destroy or damage beaver dams. | BEAVER DAMS |
| 2.3 | The Proponent shall construct and maintain all structures placed in streams frequented by fish in such a manner that will not obstruct passage of fish. | FREE FISH
MOVEMENT |

3.0 Lines, Trails, R.O.W.'s

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| 3.1 | The Proponent shall dogleg lines (except geophysical survey lines), trails and rights-of-way (except powerline rights-of-way) that approach quarry locations. | DOGLEG
APPROACHES |
|-----|---|----------------------|

4.0 Forest Fire Prevention

- 4.1 The Proponent shall have located in a central and accessible location the following fire control equipment in active readiness:
- a) 4 backpack bags or cans complete with hand pumps;
 - b) a minimum of 2 pieces of each of the following: pulaskis, axes, shovels; and
 - c) 1 power pump c/w 1000 ft of 1½" hose and auxiliary equipment.

5.0 Disposal - Brush and Trees

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| 5.1 | The Proponent shall totally dispose of all debris and brush by burning or burial if burning unsafe. | BURN BRUSH |
| 5.2 | The Proponent shall progressively complete disposal of all debris and brush. | PROGRESSIVE DISPOSAL |

6.0 Disposal - Garbage and Solid Waste

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| 6.1 | The Proponent shall remove all garbage and debris from the area of Construction to an approved disposal site. | REMOVE GARBAGE |
| 6.2 | The Proponent shall remove all scrap metal, discarded machinery and parts, barrels and kegs, buildings and building materials to an approved disposal site. | REMOVE WASTE MATERIAL |

7.0 Disposal - Sewage and Liquid Waste

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| 7.1 | The Proponent shall deposit all sewage in a sump or as required by Health and Welfare Canada. | SEWAGE DISPOSAL |
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8.0 Streams

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| 8.1 | The Proponent shall remove any obstruction to natural drainage caused by any part of this Land Use Operation. | NATURAL
DRAINAGE |
| 8.2 | The Proponent shall not clear any brush or trees within 30 meters of the ordinary high water mark of any stream except by hand. | HAND CLEAR
CROSSINGS |
| 8.3 | The Proponent shall not in any circumstances place or allow any soil debris or deleterious substances to enter into any stream. | DEPOSITING
SOIL IN
STREAMS
PROHIBITED |
| 8.4 | The Proponent shall use culverts of a size that will ensure the velocity of the stream flow is not increased. | CULVERT SIZE |
| 8.5 | The Proponent shall place the bottoms of all culverts installed in streams inhabited by fish at a level that maintains the natural gradient of the stream. | CULVERT
INSTALLATION |
| 8.6 | The Proponent shall screen all water intakes. | SCREEN WATER
INTAKES |

9.0 Erosion Control/Prevention

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| 9.1 | The Proponent shall locate all camps on gravel, sand or other durable land. | CAMP
LOCATION |
| 9.2 | The Proponent shall not construct ditches in permafrost areas. | DITCHES
PERMAFROST |
| 9.3 | The Proponent shall not allow construction to cause the ponding of water in permafrost areas. | PONDING
WATER
PERMAFROST |
| 9.4 | The Proponent shall use water bars on all slopes exceeding 8% or over 60 metres in length. | WATER BARS |

10.0 Restoration

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| 10.1 | The Proponent shall replace all excavated material from the test pits on completion of testing. | TEST PITS |
| 10.2 | The Proponent shall save the organic soil stripped from excavation areas provided it's over 10 cm thick. | SAVE
ORGANIC SOIL |
| 10.3 | The Proponent shall, where practical, replace the organic soil over disturbed areas upon completion. | ORGANIC SOIL |
| 10.4 | The Proponent shall slope the sides of excavations and embankments, except in solid rock, to two horizontal to one vertical prior to completion of construction. | EXCAVATIONS
AND
EMBANKMENTS |
| 10.5 | The Proponent shall apply grass seed and fertilizer to areas subject to run-off erosion. | REPLANT
DESIGNATED
AREAS |
| 10.6 | The Proponent shall commence and foster revegetation on all parts of the land used, upon completion of the construction phase and upon abandonment. | RE-ESTABLISH
VEGETATION |
| 10.7 | The Proponents shall fill in any sumps and ensure there is no degradation of the sump cap. | FILL SUMPS |