

PROPERTY FILE

94FC08-07

INFORMATION SUMMARY

AKIE LEAD-ZINC DISTRICT

Cyprus Anvil Mining Corporation

and

Hudson's Bay Oil and Gas Company Limited

February, 1981

CYPRUS ANVIL

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CYPRUS ANVIL

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INFORMATION SUMMARY
AKIE LEAD-ZINC DISTRICT

SUMMARY

As a result of joint-venture exploration operations by Cyprus Anvil Mining Corporation and Hudson's Bay Oil and Gas Company Limited carried out between 1977 and 1980 at a total cost of over \$7.0 million, a major new lead-zinc-silver district has been identified in the Akie District situated some 230 kilometers north of Mackenzie in northeastern British Columbia (see Maps I-II).

To date one major massive sulphide deposit, the Cirque Deposit, containing over 35 million tonnes of 2.2% lead, 7.8% zinc and 48 grams per tonne silver has been identified along with at least three other mineralized areas of high potential in a 60 kilometer belt.

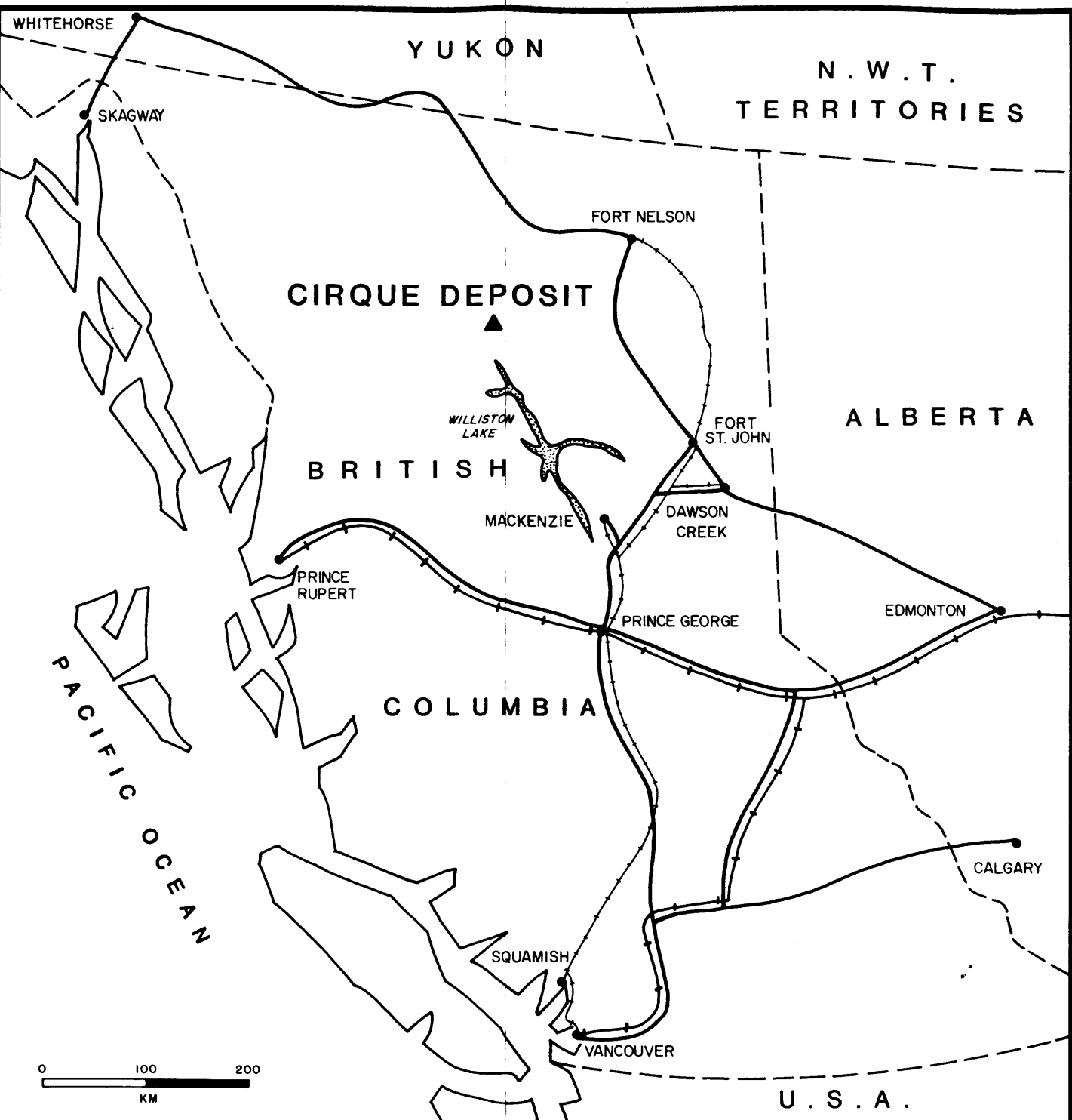
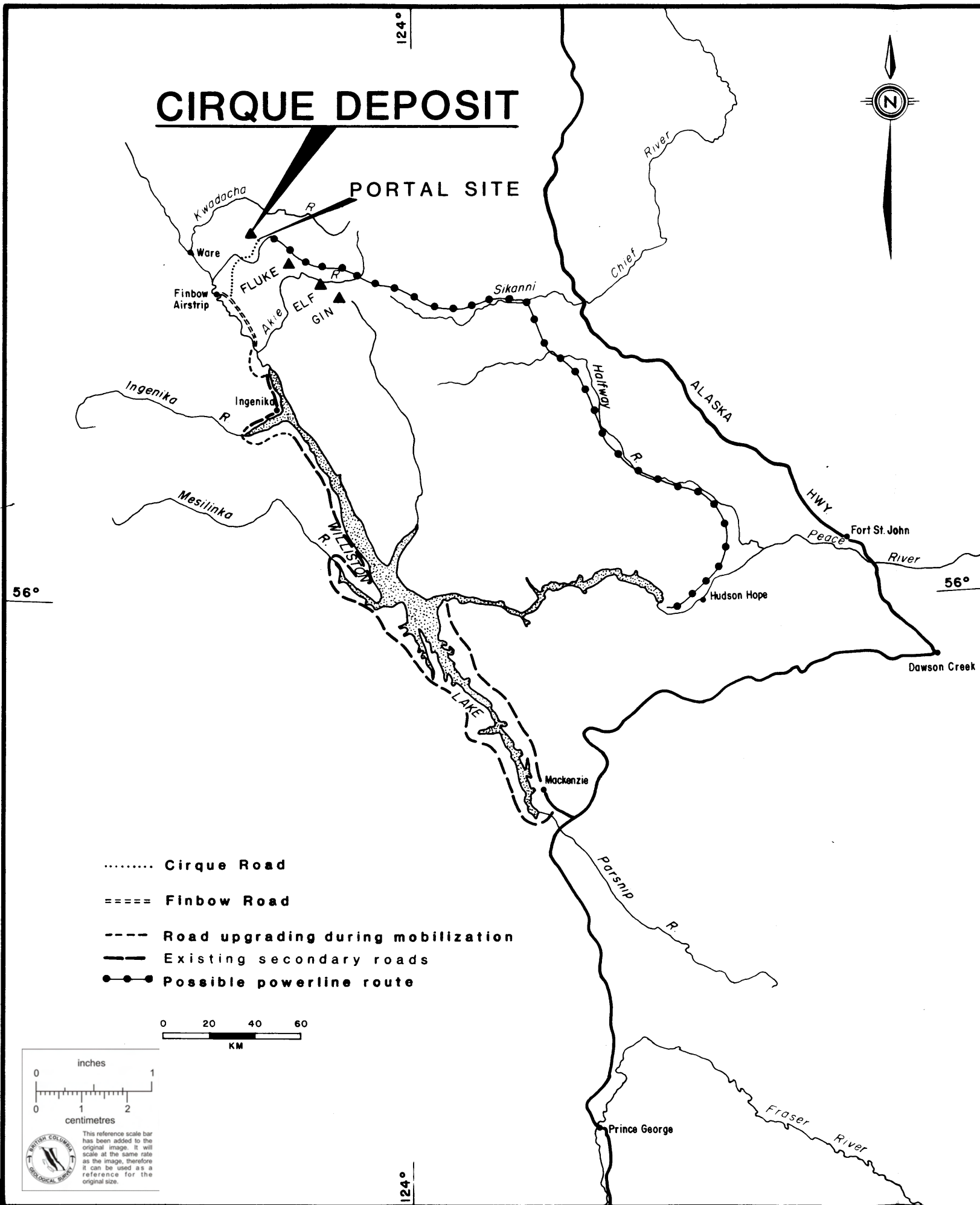
Preliminary evaluation indicates that a major mining operation based on the Cirque Deposit alone may be feasible by 1986-87 with a total capital cost of over \$370 million based on constant 1981 dollars. A potential contribution to new employment opportunities of over 1,000 jobs and a total revenue impact to British Columbia of \$4-5 billion dollars over a minimum life of 15 years can be projected, with excellent opportunities for expansion and longevity, based on a district mining concept.

In addition to the \$7.0 million spent on exploration to date the joint venture proposes additional expenditure of over \$11 million on road access and further exploration and development drilling in 1981 for a total \$18.0 million dollars.

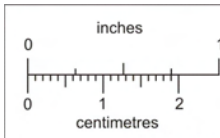
The magnitude of the opportunity can be compared to the Cyprus Anvil Mining Corporation Faro area operations in the Anvil District of Yukon where, these developments maintain 40% of the Yukons direct revenues and 60% when service and ancillary industry revenues are also considered.

CIRQUE DEPOSIT

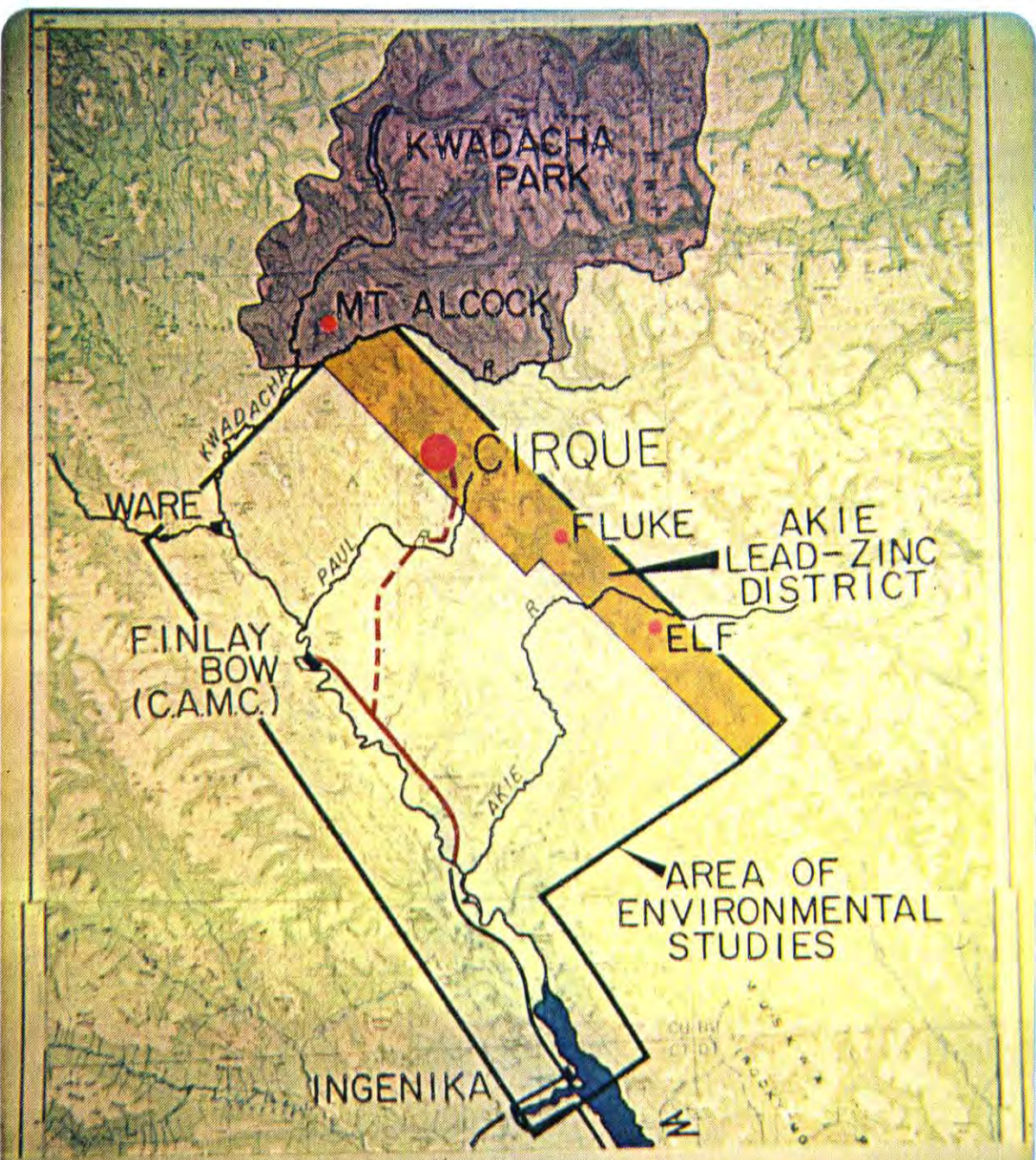
PORTAL SITE



CYPRUS ANVIL MINING CORPORATION
 AKIE LEAD-ZINC DISTRICT
 LOCATION MAP



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- Ba, Pb, Zn, Ag DEPOSIT
- AIRSTRIP
- EXISTING ROAD
- PROPOSED ROAD



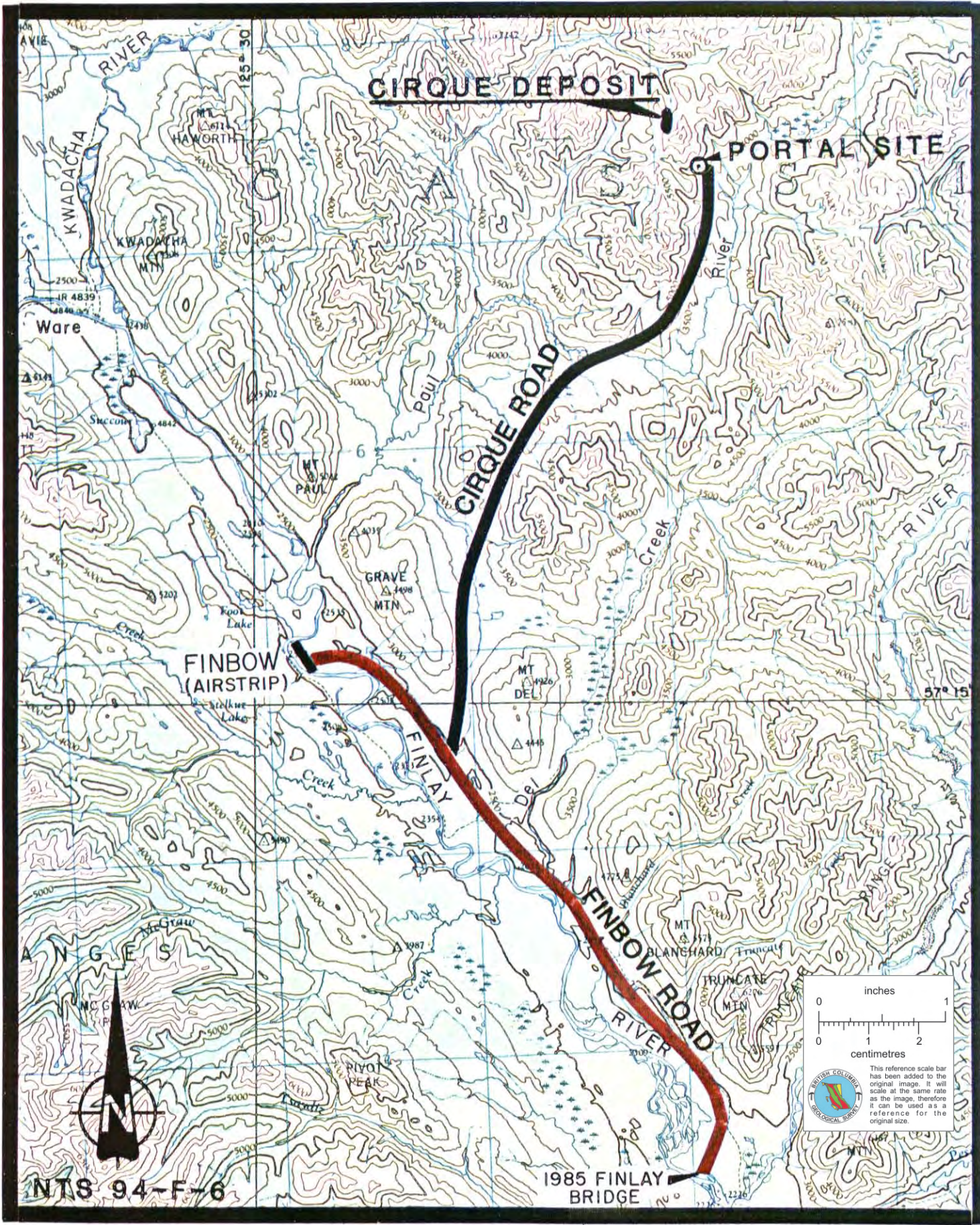
inches

1

centimetres

2

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CYPRUS ANVIL MINING CORPORATION
CIRQUE DEPOSIT
PROPOSED ACCESS CORRIDORS

HISTORY

The Akie lead-zinc district, located 230 kilometers north-northwest of Mackenzie in northeastern British Columbia, was discovered in 1977, as a result of reconnaissance geological mapping and chemical silt sampling, by a 50/50 joint venture of Cyprus Anvil Mining Corporation and Hudson's Bay Oil and Gas Company Limited. The project was a logical extension of similar programs carried out in the Yukon Selwyn Basin by the joint venture from 1976, backed by years of previous experience and data collated by Cyprus Anvil.

The Cirque claim group in the Akie District was staked in 1977, and in 1978 preliminary drilling was carried out on the property. In the same year two additional claim groups, Elf and Fluke, were staked on the basis of geological mapping and geochemical anomalies along a 60 kilometer belt south of Cirque. In 1979, follow-up drilling on Cirque indicated a major massive sulphide lead-zinc-silver deposit. A mineralized horizon with ore-grade intercepts has been traced for 1,200 meters on the Elf claims, and a similar sulphide-barite horizon has been cut in preliminary drilling on the Fluke claims; both remain open to further exploration. A fourth property, the Gin claims, was staked in 1979 on the basis of anomalous stream geochemistry and a subcropping sulphide bearing barite horizon.

To the end of 1980, some \$7.2 million has been expended by the joint venture in the Akie district involving approximately 26,000 meters of diamond drilling. Of this, some 19,000 meters drilled on the Cirque Deposit, has outlined 35 million tonnes grading 2.2% lead, 7.8% zinc and 48 grams per tonne silver, and is still open to extension by further drilling.

Clearly the Akie lead-zinc belt, with one major deposit and strong indications of similar mineralized sequences over a distance of 60 kilometers, has a high probability of developing into a major lead-zinc mining district. At current indicated reserves, the Cirque Deposit is second only to Sullivan and Faro in size and metal content of individual lead-zinc orebodies in western Canada. Our development of the district, although obviously still at an early stage, has resulted in a vigorous renewal of interest in lead-zinc exploration in northeastern British Columbia. Several major mining companies, in addition to the joint venture, have acquired land packages for a total in excess of 2,000 claim units.

Cyprus Anvil and Hudson's Bay plan continued aggressive assessment of both the Cirque and other properties held in the district through 1981, and are currently planning upgrading of a 5,500 foot airstrip and construction of tote road access from Williston Lake to the Cirque property at an estimated total cost in 1981 in excess of \$11 million.

CIRQUE DEPOSIT

Evaluation

By December, 1980, sufficient drill data was available on the Cirque deposit to carry out a preliminary economic evaluation, on which conceptual pre-production development schedules and optimum exploration-development programs could be developed.

Assuming an additional 5 million tons in addition to the present reserve, an ore reserve estimate of 40 million tonnes of drill-indicated and inferred ore at an average grade of 10% combined lead/zinc and 48 grams of silver per tonne was used in this study. A conceptual bulk mining plan based on adit access and a modified blasthole-stopping method was proposed. Induced caving of waste would constitute the stope fill. A total mineable tonnage of 30 million tonnes was used, and based on an annual ore production of 2 million tonnes, a 15 year mine life was assumed in the financial analysis.

A concentrator designed for an instantaneous daily rate of 6,250 tonnes was considered, which would handle the proposed 2 million tonnes per year. Conventional crushing and grinding facilities were incorporated into the design, along with selective flotation of lead, zinc, and silver-rich pyrite. A leaching and refining section was included for silver recovery from the pyrite.

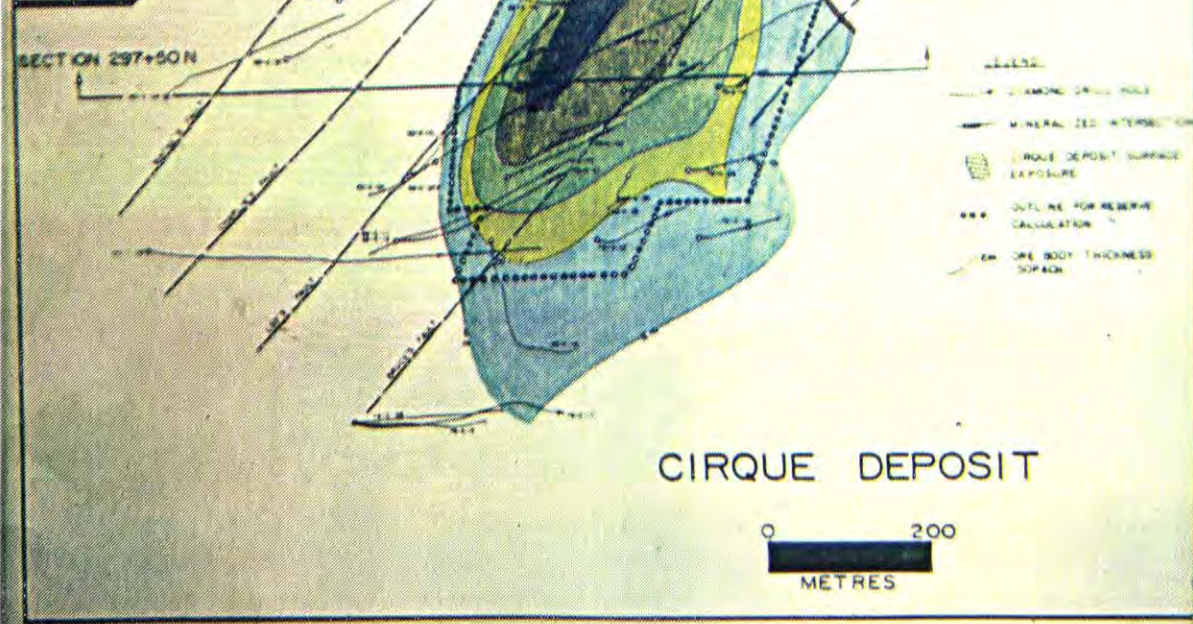
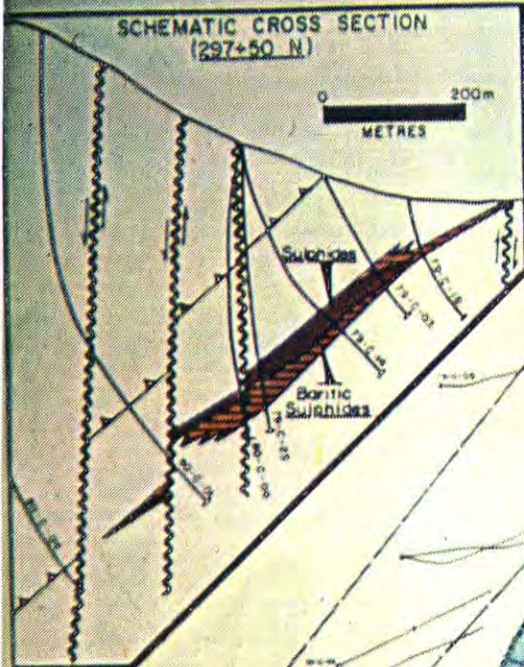
The concept for concentrate transportation to tidewater was for trucking and barge to Mackenzie, then by rail to the port.

No townsite was envisaged in this study. Instead, a single persons complex with a fly-in, fly-out scheme was used.

Total preproduction capital costs are estimated at \$370 million based on constant 1981 dollars. Operating costs were derived from a number of sources, and are considered to be in the order-of-magnitude range.

Ore Reserves

Forty-six holes totalling 19,000 meters, of which 29 holes cut mineralization, drilled from 1978 to 1980 have outlined the massive stratiform Cirque Deposit over a 800 meter length, 300 meter width and 2 to 70 meter thickness (see Fig.1). This massive barite-pyrite body enclosed in black shale strikes northwest and dips at 20 to 30 degrees to the southwest under Cirque Ridge. An increase in deposit thickness,



0 inches 1

0 1 2 centimetres

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overall grade, and lead-zinc ratios to the northwest is paralleled by a trend in ore types from I and II (baritic) to Types III and IV (pyritic).

A drill indicated reserve of 30 million tonnes grading 2.2 percent lead, 7.8 percent zinc, and 48 grams per tonne silver, which contains a higher grade portion of 14.8 million tonnes grading 2.8 percent lead, 9.4 percent zinc and 55.4 grams per tonne silver, was hand calculated using constructed cross sections with block limits at major faults or half distance between drill holes. The drill indicated reserve is surrounded by a conservatively estimated geological reserve of 5 million tons of similar grade. This deposit still remains open along strike to the north and south with a minimum potential of 40 to 50 million tonnes.

Additional reserves, particularly to the north, could increase overall mining grade by discarding some of the existing sub-economic grade portions in the lower sections of the mine blocks, thus enhancing the economic potential.

Mining

With the ore body located in mountaineous terrain, access is proposed by two parallel adits. One, 2.5 km long and measuring 4.5 m by 4.0 m, will serve as a main haulage level; the other, slightly shorter and of smaller dimension, will facilitate ventilation and provide an alternate escape way.

The remote location of the ore body, its massive character, and medium grade, preclude selective mining methods and dictate low cost bulk mining applications. A modified blasthole or vertical crater retreat method is proposed. Stopping blocks are laid out transverse to the dip and consist of primary, secondary and tertiary stopes (Fig. II-III). Primary stopes will be 20 m wide by 100 m long and will vary from 20 to 70 m in height. Secondary stopes consist of 20 m wide panels on either side of the primary stope. A rib pillar of 10 m width will be left between the secondary and tertiary stopes, each of which has a width of 40 m.

The mining described above introduces an open pit technology to an underground environment. With only one drilling level per stopping block, intermediate sub-levels are eliminated. Principal pre-production mine development (Fig. IV) consists of:

- 1) Twin adits to provide access and facilitate ventilation;
- 2) A F.W. ramp system connecting the main haulage level with the various production and drill drift levels;

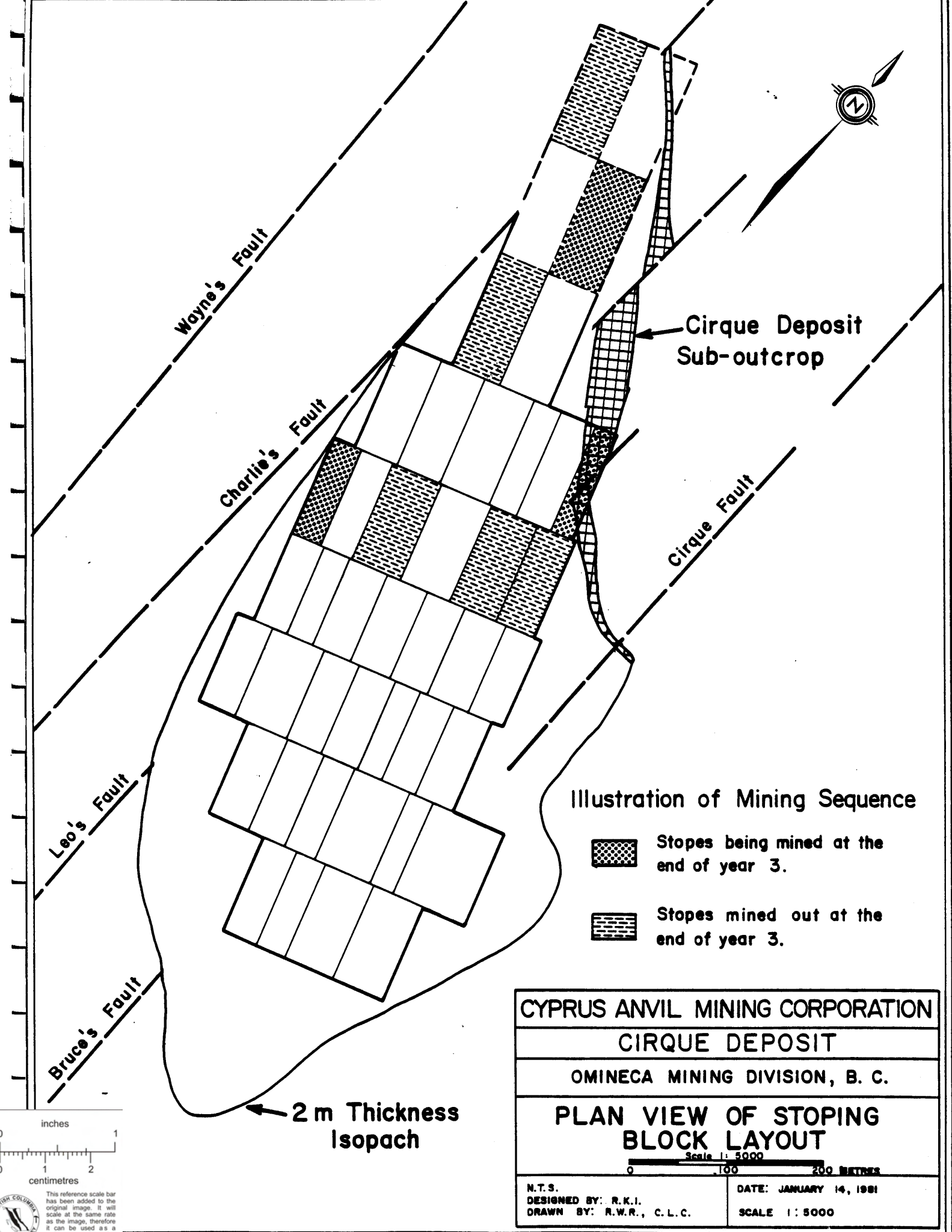


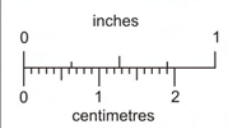


Illustration of Mining Sequence

-  Stopes being mined at the end of year 3.
-  Stopes mined out at the end of year 3.

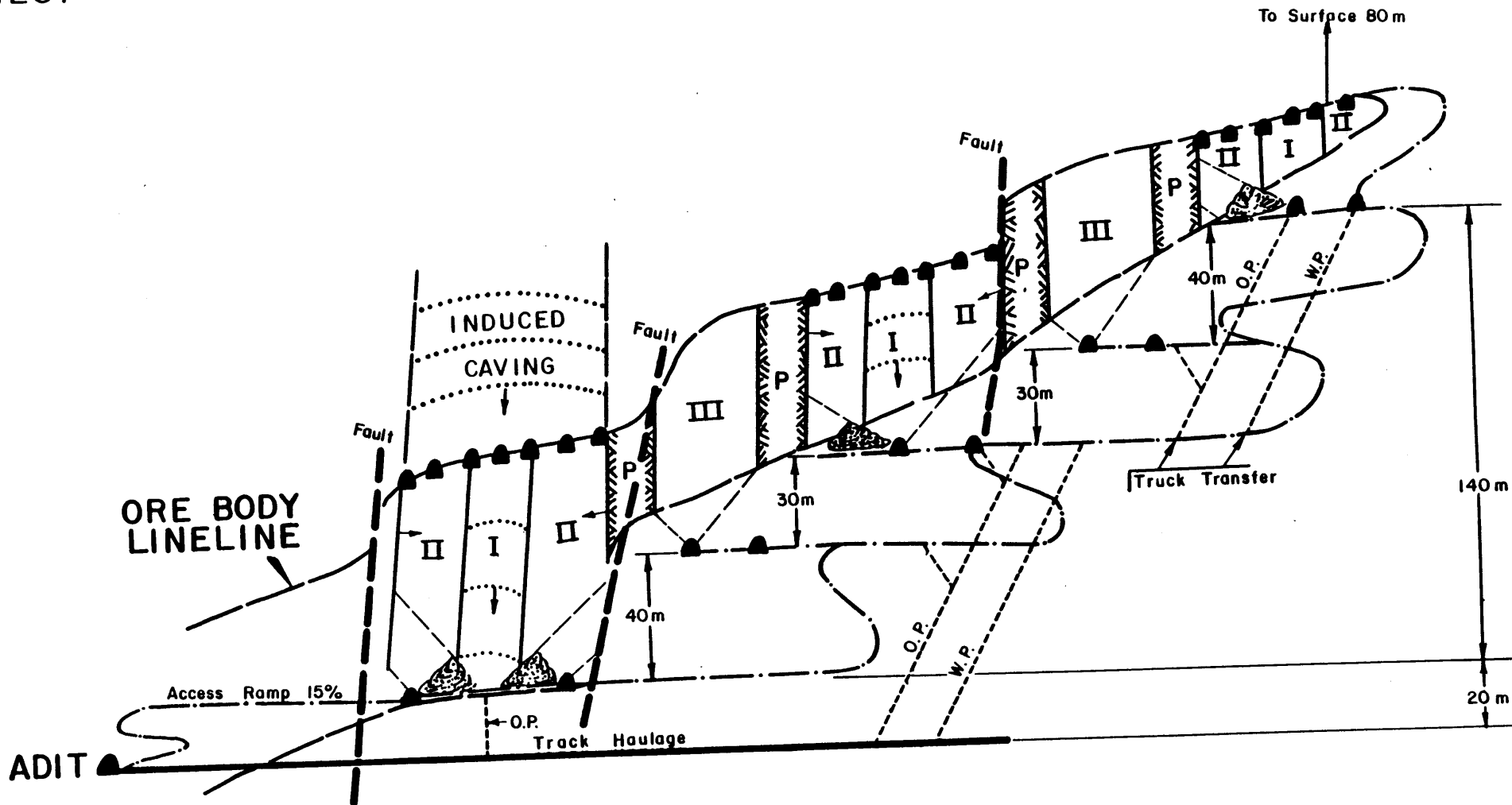
CYPRUS ANVIL MINING CORPORATION	
CIRQUE DEPOSIT	
OMINECA MINING DIVISION, B. C.	
PLAN VIEW OF STOPPING BLOCK LAYOUT	
Scale 1: 5000 0 100 200 METRES	
N.T.S. DESIGNED BY: R.K.I. DRAWN BY: R.W.R., C.L.C.	DATE: JANUARY 14, 1981 SCALE 1: 5000



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WEST

EAST



LEGEND:

- I Primary Slope
- II Secondary Slope
- III Tertiary Slope
- P Pillar
- O.P. Ore Passage
- W.P. Waste Passage

CYPRUS ANVIL MINING CORPORATION

CIRQUE DEPOSIT

OMINECA MINING DIVISION, B. C.

CROSS SECTION 297 + 50 N

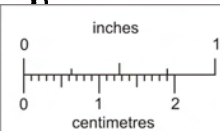
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0 25 50 100 METRES

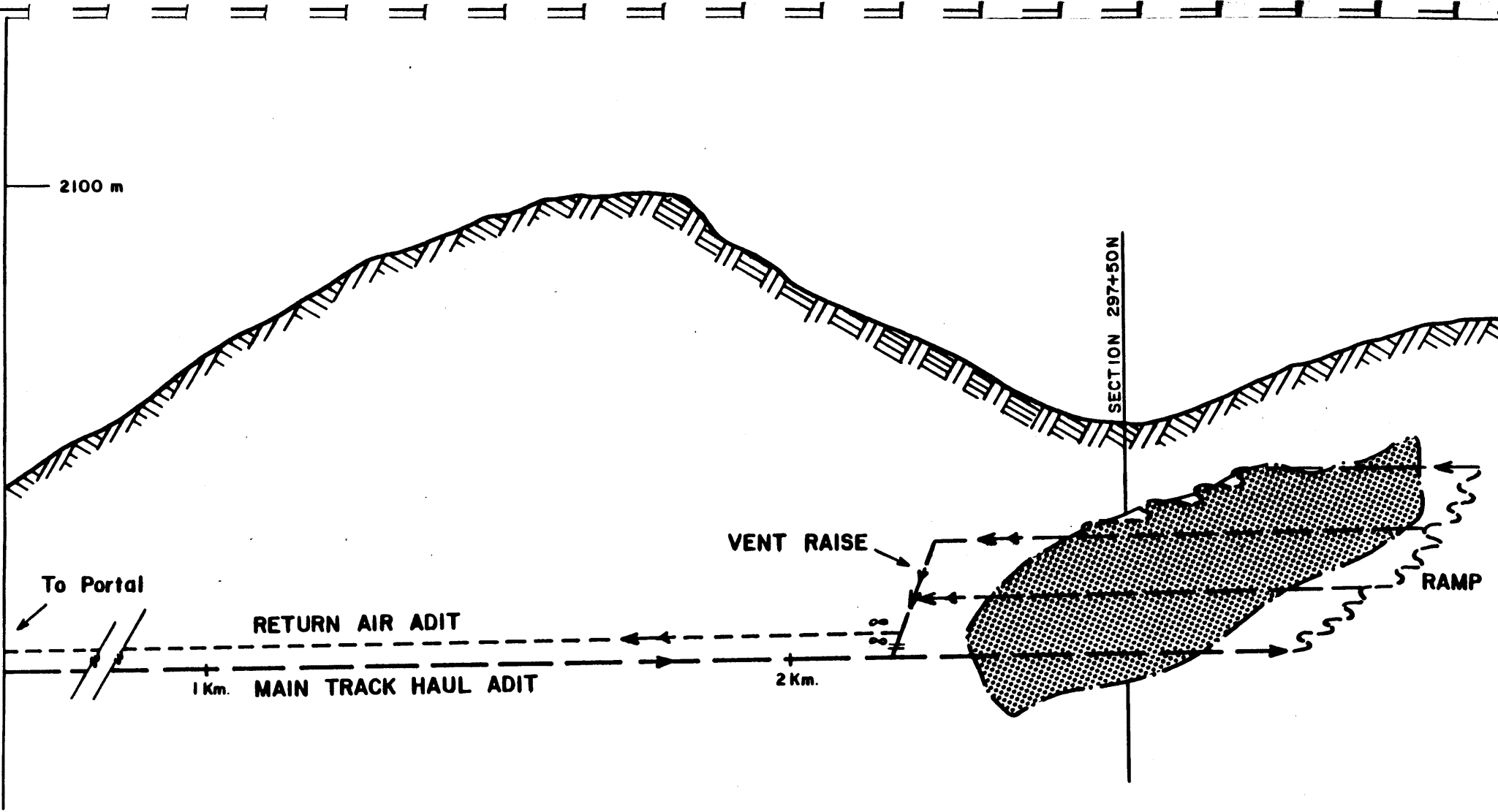
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DESIGNED BY: R.K.I.
DRAWN BY: r.w.j.

DATE: JAN. 14, 81

SCALE 1: 2000 FIG. III



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2100 m

SECTION 297+50N

To Portal

VENT RAISE

RAMP

RETURN AIR ADIT

1 Km.

MAIN TRACK HAUL ADIT

2 Km.

1000 m

- FRESH AIR
- ⇄ EXHAUST AIR
- ⊗ EXHAUST FANS

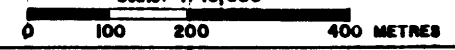
CYPRUS ANVIL MINING CORPORATION

CIRQUE DEPOSIT

OMINECA MINING DIVISION, B. C.

LONGITUDINAL VIEW

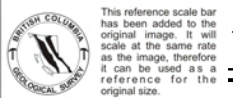
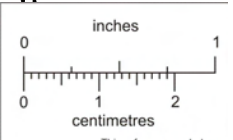
Scale: 1: 10,000



NTS:
DESIGNED BY: R.K.I.
DRAWN BY: C.L.CORY

DATE: JANUARY 1981

SCALE 1: 10,000 FIG. IV



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- 3) A H.W. ventilation raise to satisfy the ventilation requirements of the production horizons;
- 4) A ore and waste pass system complimented by haulage drifts and a muck transfer level;
- 5) Stope development for three stoping blocks, consisting of drill drifts, production drifts and twelve drawpoints per stope, to provide initial production.

A pre-production development schedule is illustrated in Table I.

At a production rate of 2 million tonnes per year, mine life is expected to be 15 years. Approximately 8 million tonnes of ore will be left behind as pillars, constituting an extraction rate of 78 percent.

Milling and Metallurgy

Metallurgical projections and the concentrator flowsheet were based on bench scale laboratory testwork performed by Kamloops Research and Assay Laboratory Ltd. Preliminary testwork on composited diamond drill cores was done in late 1979, and a further more extensive program was completed in 1980. The testwork showed that the Cirque deposit ore produces favorable metallurgical results at a very fine primary grind in the presence of cyanide and soda ash. The lead and zinc concentrates produced from the ore are of good quality and essentially free from deleterious elements. Overall silver recovery in the lead and zinc concentrates is relatively low since about half of the silver is dispersed in the iron mineral. For these purposes it is assumed that production of a silver-rich pyrite concentrate is feasible, with subsequent extraction of silver from the pyrite concentrate by cyanide leaching.

The conceptual mill design used for this study was based on an annual throughput of 2,000,000 tonnes per year or an instantaneous daily rate of 6,250 tonnes. The single grinding circuit consists of a rod mill, a secondary ball mill and a tertiary ball mill, with cyclone classification. Seperate lead, zinc, and pyrite flotation sections along with regrind mills are provided. The thickening section, including a tailings thickener, are all within the building structure. A cyanidation plant for silver recovery from pyrite concentrate is included, which is designed to produce refined doré metal for shipment. All other ancilliary facilities, including fine crushing, tailings disposal, fresh water supply, and warehouse and administration facilities were included in the capital cost estimate for the mill and related facilities. This estimate was prepared by Kilborn Engineering Ltd., and the total estimated capital cost is \$220,000,000. The breakdown of this estimate is shown in the attached

CIRQUE DEPOSIT

TABLE I

PRE-PRODUCTION DEVELOPMENT SCHEDULE

		1981	1982	1983	1984	1985	1986	REMARKS
ACCESS ROAD TO PORTAL		██████████						
MAIN HAUL & VENT ADITS TUNNEL BORER	14,700'		██████████	██████████				CONTRACTOR TO SUPPLY TOTAL PACKAGE
RAMP TO TEST STOPE TEST STOPE PREPARATION	2000' 2400'			██████████				
6 1/2" I.T.H. DRILLING 2" L.H. DRILLING	10,500' 18,400'			██████████ ██████████				DRILLS ON RENTAL PURCHASE PLAN
PRODUCTION BLASTING	241,600 t				██████████			
MUCK & HAUL 2-8 YD. SCOOPS 3-26 T. TRUCKS	217,400 t at 90% EXTRAC.				██████████			SCOOPS & TRUCKS ON RENTAL PURCHASE PLAN
RAMP ACCESS TO PRODUCTION LEVEL					██████████			
STOPE PREPARATION						██████████		
PRODUCTION DRILLING							██████████	FULL PRODUCTION
MILL CONSTRUCTION					██████████	██████████	██████████	

Table III. Operating costs for milling, including power are estimated at \$7.28 per tonne of ore, mill maintenance costs amounting to an additional \$1.86 per tonne.

The average plant metallurgical performance (Table II) is based upon the relative occurrence of the principal ore types within the deposit and the respective metallurgical characteristics assigned to each mineral specie.

Table II
Plant Metallurgical Balance

	WT Tonnes	ASSAYS				DISTRIBUTION			
		Pb%	Zn%	Ag%	Fe%	Pb%	Zn%	Ag%	Fe%
Annual Mill Feed	2,000,000	2.13	7.95	49	9.0	100.0	100.0	100.0	100.0
Lead Concentrate	53,250	60.0	4.0	137	12.0	75.0	1.0	7.0	2.0
Zinc Concentrate	239,847	0.5	59.0	173	2.0	3.0	89.0	40.0	2.0
Pyrite Concentrate	385,714	0.3	1.0	119	42.0	3.0	3.0	47.0	90.0
Tailings	1,321,189	0.55	0.89	4.0	0.8	19.0	8.0	6.0	6.0

The above metallurgical balance is approximate and based upon the average feed grade. Based on this data the leach/precipitation circuit will produce 46,250 kg/year of bullion containing 41,623 kg of silver per annum.

Concentrate Transportation

The concept used for inland concentrate transportation was trucking from the mill site to the head of Williston Lake at Ingenika, then tug and barge transport to Mackenzie where the concentrates would be loaded on rail for transportation to Prince Rupert, or alternatively, North Vancouver. Trimac Consulting Services Ltd. prepared a cost estimate for this haul, assuming a contract haulage from the mine to Mackenzie. The total cost to the shipping port, including terminal costs and ship loading, was \$65 per DMT based on a normal moisture content of concentrate. In addition to this cost, a fixed annual cost of \$1,700,000 per year for mine road maintenance was included in this study.

Power Supply

Arrangements have been made with B.C. Hydro to carry out route studies for power supply from Bennet Dam to the Cirque site. A "most favourable" route has been selected (see Map I) for a 235 Kv line. An estimated capital cost for construction of the line and transformers to deliver power on site is approximately \$65 million in 1981 dollars.

The joint venture is independently evaluating coal licences covering 20,000 hectares to the north of the east arm of Williston Lake, about 25 kilometers northwest of Hudson Hope, B.C. The primary objectives are to define low cost steam coal reserves as an alternate supply for some of the energy demands of a potential mine development, such as plant and townsite heating, concentrate drying and alternative electrical power generation.

Capital and Operating Costs

Total capital costs for the development of the Cirque deposit are estimated at \$370 million. The details of this estimate along with continuing capital costs are shown in Table III. In addition to the main capital costs for mine and mill development, the pre-production expenditures include a power line from the Bennett Dam to the minesite, the estimate of which was provided by B.C. Hydro. The townsite facilities consist of a single persons complex, designed for a "fly-in fly-out" crew rotation scheme. The cost of a single persons complex was established at \$13 million, versus a townsite cost of over \$60 million. The cost of fly-in, fly-out and operation of the SPQ are included in the G&A costs. These costs are approximately the same as the cost of operating a townsite.

In addition to the operating costs described under mining, milling, and transportation, a total General and Administration cost of \$14,300,000 was used. This cost includes all administration and staff department costs, flying costs, single persons complex operating costs and head office. A summary of production costs is:

Mining -		
Development	\$3.50	
Production	4.00	
General	<u>3.50</u>	
Total Mining		\$11.00 per tonne ore
Mechanical -		
Mine	\$4.50	
Mill	<u>1.86</u>	
Total Mechanical		\$6.36 per tonne ore

Summary of Pre-Production Expenditures
(1981 \$Can. 000's)

	1981		1982		1983		1984		1985		1986		TOTAL
Road		4,800		500		500		1,400		1,400		1,400	10,000
Air Strip		800											800
Exploration		2,400		1,000		1,500		1,500					6,400
Reclamation								200		200		200	600
Power Line								25,000		25,000		10,000	60,000
R & D								2,500		2,000		1,000	5,500
Townsite												13,000	13,000
Mine													
Development			3,050		5,200		4,464		8,281				20,995
Equipment							257		5,368		5,368		10,993
Surface Inst.									2,514		2,514		5,028
U/G Ancill.									9,572		9,572		19,144
Engineering							2,808		2,808				5,616
TOTAL MINE			3,050		5,200		7,529		28,543		17,454		61,776
Mill													
Engineering							10,000		4,000		4,600		18,600
Site							9,700						9,700
Process Build									12,000		28,900		40,900
Non-process Build									24,000		54,600		78,600
Equipment									6,000		9,800		15,800
Other							8,100		33,100		5,500		46,700
TOTAL MILL							27,800		79,100		103,400		210,300
TOTAL		8,000	4,550		7,200		65,929		136,243		146,454		368,376

Continuing Capital Expenditures

(1981 \$Can. 000's)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Townsite			200	200	200	200	200	200	200	200	200	200	100	100	100
Mill					10,700*	1,000	1,000	1,000	1,000	1,000	1,000	1,000	500	500	500
Mine			1,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,000	-	-
TOTAL			1,200	2,200	12,900	3,200	3,200	3,200	3,200	3,200	3,200	3,200	1,600	600	600

* Tailings Dam
\$Can. 9,700,000

Milling -		
Labour	\$1.64	
Operating Supplies	<u>5.64</u>	
Total Milling		\$7.28 per tonne ore

Total G & A \$14,300,000 per year

This amount is based on current Faro operation experience. Adjustments consist of the elimination of townsite costs and the inclusion of flying and camp costs.

Included in mining and milling are power costs of 1.7¢ per kwhr, derived from the present B.C. Hydro rates.

Potential Employment and Revenue Impact

A project of the scope envisaged would have a substantial positive impact on employment opportunities and revenues both direct and indirect generated within the economy of British Columbia.

The current labour force employment in exploration and evaluation varies seasonally between 20 and 60 persons. For the two year period of road access construction and underground development from mid 82 to mid 84 this will escalate to over 100 people on a more or less full time basis. The construction phase from mid 84 to the end of 86 would offer direct employment to over 600 people with concurrent indirect impact through service and supply industries. This same level of employment would be exceeded by mining, transport and associated services on achievement of full mine production with a labour force of over 700 people. In terms of revenue some \$150,000,000 per annum would be injected into the British Columbia economy via, wages, services, supplies, taxes, royalties etc. for at least 15-20 years even on the basis of known reserves, for a total direct input in 1981 dollars of 2.5 to 3.0 billion dollars. In addition, service and supply revenues and the injection of foreign exchange into the Canadian economy would have a substantial accumulative impact.

The overall magnitude of the project therefore may be in the order of over 1000 new employment opportunities and close to 5.0 billion dollars in real terms. The probability of escalation of these benefits both in scope and longevity must be considered excellent when the district aspect of the potential mining developments are considered.

Financial Analysis

In addition to the metallurgical parameters, operating cost and capital costs described above, various assumptions on metal prices, ocean freight, smelter treatment charges, metal prices and exchange rates were used in determining theoretical rates of return on investment, based on constant 1981 dollars. Dependent on the choice of values for these variables, a range of positive theoretic R.O.I.'s resulted. While the data on which the assumptions were based was too inaccurate for a precise financial analysis, the resulting R.O.I. indications and schedules provide an important framework for continued exploration and optimum development of the Cirque Deposit.

DISTRICT POTENTIAL

The Cirque Deposit drilling to date has effectively tested less than one kilometer of a known five kilometer strike length of favourable host rocks containing a high geochemical response in lead and zinc. The provenience of high grade float one kilometer north of the Cirque Deposit still remains to be evaluated. It seems likely therefore that other sulphide deposits, in addition to continuation of the Cirque Deposit itself, are a distinct probability on the Cirque Claims.

Preliminary drilling on the Elf property indicates continuity of high-grade surface showings in a steeply-dipping configuration for over 1,200 meters, with potential for lateral and depth extensions.

Barite-sulphide showings also discovered on the Fluke and Gin claims remain largely untested and will be evaluated further during 1981. Preliminary drilling on the Fluke in 1980 cut barite-sulphide horizon rocks indential to the sequence hosting lead-zinc mineralization on Cirque and Elf. Host rocks for the Fluke and Gin showings are similar to geologic strata containing the Cirque Deposit and Elf mineralization.

An additional barite deposit with potentially economic lead-zinc and silver mineralization, was discovered by the joint venture in a continuation of this northwest-trending belt of rocks into Kwadacha Park, and is the subject of a study by the Provincial Ministry of Energy, Mines and Resources.

Although outside our scope of knowledge, a considerable amount of additional exploration was carried out by other major companies in 1980 which, in due course, would have a possibility of turning up additional, as yet unidentified, targets and deposit areas.

The spatial association of these deposits with similar geologic strata, the concentration of surface showings over a 60 kilometer long belt, and the presence of the potentially economic Cirque deposit establishes the reality of a major lead-zinc-silver district with excellent potential for several deposits.

ENVIRONMENTAL & SOCIAL CONSIDERATIONS

Introduction

The program of environmental investigations carried out in the Akie District during 1980 was intended to fulfill three main functions:

- (a) Determine what biophysical and social information presently exists for the area, and identify information gaps which must be filled.
- (b) Begin data collection programs to provide the kinds of environmental information which are needed at the earliest stages of mine planning.
- (c) Begin monitoring programs for the collection of hydrologic and climatic data, since a number of years of data are needed to be able to predict long term trends.

Studies carried out in 1980 included water quality monitoring, installation of two weather stations, terrain and wildlife habitat mapping, a preliminary assessment of the usefulness of benthic monitoring, a social profile of Ft. Ware and Ingenika, and a preliminary assessment of possible water supply and tailings disposal sites in the Paul River valley.

Most of the monitoring programs initiated in 1980 will continue in 1981. In addition some new studies related to groundwater and surface hydrology will be carried out.

Topographic Mapping and Preparation of a Photomosaic

The Gataga Project lies in one of the few areas of Canada which has never been mapped at 1:50,000 scale. We therefore had to produce the topographic maps ourselves from the government photography in order to have base maps at an appropriate scale for recording regional environmental data. This topographic mapping, and a photomosaic at the same scale, were prepared for us by McElhanney Surveying and Engineering Ltd.

Hazardous Terrain / Surficial Geology / Wildlife

Habitat Mapping

This work was carried out by International Environmental Consultants and Reimchen Surficial Geology. The mapping was based mainly on airphotos with some "ground truthing" in the field to confirm the airphoto interpretations. The mapping was intended to provide a broad scale identification of surficial geology and wildlife habitat units, so that potential environmental problem areas could be identified. The mapping provided a useful input into the route selection for the access road into Cirque, and will be useful also in assessing the suitability of townsite and minesite locations.

Climatic Data

The nearest regularly monitored weather stations to our area of interest are at Mackenzie, Fort Nelson, and Watson Lake. The weather at these locations is likely to be substantially different from the weather at Finbow and Cirque, and therefore, it was necessary to set up our own weather stations on site. Selection of instruments, siting, and installation were carried out by International Environmental Consultants.

Baseline Water Quality Monitoring

In order to determine if a mining operation has caused any degradation of surface water quality it is essential to know what the pre-development water conditions were. We are therefore monitoring the water quality three times each season at twenty stream locations throughout the development area. The sites were selected to provide data upstream and downstream of all impact points where mining activities could potentially effect water quality. Samples were analysed for a wide range of physical and chemical parameters.

Preliminary Assessment of Aquatic Environments

The biological aspects of stream quality are just as important as the water chemistry aspects. Mr. Ken Weagle, a biologist who specializes in determining the effects of mining operations on stream biota, was retained to develop a program of baseline stream data acquisition of the district. Mr. Weagle compiled all existing information on the area, and carried out preliminary surveys of benthic invertebrate populations at a number of sites on the Paul River, Del Creek, and the Akie River.

Social Profile of Ft. Ware and Ingenika

The development of a major mine in the Akie District would undoubtedly have profound effects on the two small Indian villages in the Finlay Valley. Ft. Ware and Ingenika are presently among the most isolated native villages in B.C., but in spite of this isolation, they have suffered serious disruptions from outside industrial activities. The flooding of the Williston Reservoir, in particular, required the moving of entire villages, the destruction of traplines and moose stocks, and the splitting up of what was once a discrete tribal group. The forest industry also has had some impacts on the native population, although these have not been as severe as the impacts of B.C. Hydro up to this point. At the present time Ft. Ware and Ingenika suffer from a lack of public services such as nursing and schools, housing is considered to be inadequate, the costs of food are among the highest in B.C. and the level of nutrition is the lowest of any native group. The prevalence of violent crime is very high, and there is virtually a complete lack of employment, with both villages subsisting on government welfare handouts of one form or another. We are therefore inheriting a multitude of problems, some caused by previous industrial activities, some caused simply by the process of adjustment that all native people are going through.

The first step in developing a plan for dealing positively with these communities is to find out more about them. The second step is to develop regular channels of communication between the villages and our company. The first step was accomplished during 1980 with the development of a social profile of the communities by L.J. D'Amore and Associates. This report explores the history of these communities and describes their present demographics, culture, economic base, crime rates, and so on. A program of community consultation will begin during the spring in order that we can inform the tribal councils of our mine development plans, and they can have an opportunity to communicate their concerns to us. Hopefully this process of consultation will allow us to maximize the opportunities that our mining development will make available to these local inhabitants.

Preliminary Water Supply and Tailings Disposal Planning

During the latter part of 1980, Cyprus Anvil carried out a preliminary pre-feasibility study to evaluate the economic viability of the Cirque deposit. As a part of this study, the approximate costs of a water supply reservoir and a tailings pond were needed. Storage requirements for these two structures were generated, based on the proposed mine production and mill design, and sites which would probably be acceptable were located in the Paul River Valley near the mine. Estimated costs for these structures were generated by Kilborn Engineering.

Proposed Environmental Program for 1981

The program of environmental work planned for 1981 will not be substantially different in focus or magnitude from the 1980 program. The emphasis once again will be directed to collecting the baseline biophysical data required as part of a Stage I submission to the Metal Mines Steering committee. All of the monitoring programs which began in 1980 will continue in 1981, and in addition collection of stream flow data on the Paul River and other streams, where flow information is needed for water supply or flood estimation purposes will be implemented. The wildlife habitat mapping carried out during 1980 will be supplemented by game surveys during the early spring to determine the level of use of the winter ranges close to our road route and minesite on the Paul River. Ice thicknesses on Williston Reservoir will be measured periodically during the winter and spring to provide data which will be of use in designing a lake transportation system. The water quality sampling program will continue, and will be supplemented by a program of biological monitoring using benthic invertebrates. The importance of the Paul River as a habitat for fish will be evaluated in general, and the sites of road crossings will be examined in detail to ensure that the bridges or culverts conform to the requirements of the Fish and Game Department. Groundwater in the area of the Cirque mine and adit will be evaluated in a preliminary way to determine if aquifers are present and provide a preview of our potential mine dewatering costs. An on-going program of consultation will be set up with the communities of Ft. Ware and Ingenika. Finally, various areas around the Finbow airstrip and possibly along the margins of the new access road will be seeded and fertilized as needed to improve the appearance and prevent dust and erosion problems.

1981 PROGRAMS AND FUTURE DEVELOPMENT

Although still at an early phase, the rapid discovery rate on the Cirque Deposit and resultant encouraging economic evaluation indicate the presence of an important lead-zinc district in British Columbia of hitherto unexpected proportions. This prescribes a continued aggressive exploration and development program in 1981. The Cyprus Anvil/Hudson's Bay joint venture proposes to undertake an ambitious exploration drilling program in 1981 of over 20,000 meters of diamond drilling at a total cost of \$5 million. This includes further reserve definition on the Cirque Deposit, exploratory diamond drilling both for portal-adit development and exploration for additional deposits in the southern portion of the Cirque Claims, and follow-up drilling on the known mineralized horizons on both the Fluke and Elf showings. Continued mapping of the latter properties and exploration testing of geochemical anomalies remote from known showings is also scheduled.

In addition to the major exploration effort and associated Feasibility and Development studies, a major program of road and airstrip construction is scheduled for 1981 (see Map III).

The situation of the Cirque Deposit as a thick tabular body dipping at about 25° to the west and plunging 16° to the south, with an associated extreme rise in topography in both directions, eliminates further delineation and sampling by surface drilling after completion of the helicopter supported 1981 exploration program. In order to progress smoothly to bulk sampling and detailed underground development of the deposit commencing in early 1982, portal access road development must commence in early 1981 and be complete as a winter road to access heavy equipment by December 1981.

There is at present no means of winter access to the deposit from Ingenika at lakehead and no access on the lake itself during freeze-up from mid-December to late May. A winter road from Mackenzie to a point just south of Ingenika is opened and maintained by forest product companies each winter.

Improvement of the Finbow airstrip as well as construction and maintenance of a winter tote road is required for the 120 kilometers from Ingenika to portal access, of which the last 40 kilometers from the Finbow airstrip to the portal site would require an all weather surface to allow men and materials supply during the summer months. A gradual improvement of the 80 kilometers from Ingenika to Finbow during 1982-83 would allow heavy transport year round by 1983 using the tote road Mackenzie to Ingenika in winter and a combination of barge and all weather road in summer.

The route Ingenika to Finbow has been selected after consultation and agreement with local forest product companies and the Provincial Government regional managers concerned. The Finbow road will be surveyed and flagged by the Ministry of Forests, who will fund the final upgrading of this section to main forestry haulage road standards including the section Ingenika to Finlay River.

The Cirque road has been selected on the basis of a surficial geological and environmental study carried out in 1980 and represents the optimum route. The final 25 kilometers will be selected based on detailed inspection and analysis by road engineering consultants in early 1981.

All applications for approval of road route have been made to the necessary governmental agencies and no problems are anticipated in obtaining the required permits.

A 4,000 foot rough surfaced airstrip at Finbow was completed in 1980 using funds provided by the joint venture. A request for Provincial Government assistance with these construction costs is pending. Completion of the airstrip to a final 5,500 foot length with surface upgrading is proposed in 1981.

The preliminary evaluation of the Cirque Deposit encourages on-going exploration and development. After 1981, the deposit will require delineation and underground development in the form of combined exploration-production adit from the Paul River valley. Given the existing lack of overland access for heavy equipment, it is essential to complete the road system described by the winter of 1981/1982 in order to avoid at least a twelve month delay in developing the Cirque Deposit to a production stage.

The proposed portal site road access will be implemented in 1981 cost of \$5 million. A further \$1.4 million is scheduled for Feasibility and Development investigations on metallurgical testing, mine and mill planning, power investigations and environmental studies. Together with projected exploration costs a total \$11.4 million expenditure is anticipated by the joint venture in 1981. This in addition to the \$7.2 million spent to date, is a measure of the high priority given to this project development by the joint venture partners.