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REDFERN RESOURCES LTD.

SUMMARY REPORT

on the

TULSEQUAH CHIEF

MASSIVE SULPHIDE PROPERTY

January 6, 1989

## TULSEQUAH CHIEF PROPERTY

### SUMMARY

Reserves at the Tulsequah Chief base metal-precious metal property increased in 1988 by a factor of 3 times to 2.4 million tons in all categories. The average grade is 2.03% copper, 1.25% lead, 6.28% zinc, 0.075 oz/ton gold and 2.68 oz/ton silver. At current Canadian producer prices these reserves have a gross value in the range of \$240 to \$250 per ton.

Based on assumed capital costs of \$80 million and on combined operating, smelting and refining costs of \$90 per ton, a mining operation with a proven reserve of 2.4 million tons at the above grades and metal prices would be economically viable.

A \$1,500,000 underground program of drifting and diamond drilling is planned for 1989. Redfern will spend the first \$300,000 to complete its 40% earn-in and the remaining \$1.2 million of expenditures will be shared 60% by Cominco and 40% by Redfern.

The 1989 program could result in a doubling of the reserves to approximately 5,000,000 tons. An ultimate potential of 10-20 million tons is possible based on the size of the mineral system and other geological considerations.

The property is located in the Tulsequah River Valley at approximately 500 feet elevation, 35 miles northeast of Juneau, Alaska. Access is excellent with a gravel airstrip located close to the property. Metal concentrates from a producing operation can be barged 42 miles by water to the deep water port of Juneau, Alaska as was done in the 1950's when the property was previously in production.

Redfern is debt free and has approximately \$700,000 of unallocated working capital as at December 31, 1988. The Company's directors and officers include professionals with many years of experience in the geological, accounting and legal fields.

## LOCATION AND ACCESS

The Tulsequah Chief property is located in northwestern B.C. on the east side of the Tulsequah River Valley at latitude 58°43', longitude 133°35', approximately 60 miles south of Atlin, B.C. and 35 miles northeast of Juneau, Alaska. A gravel airstrip capable of handling DC3 aircraft is located 6 miles south of the mine and provides good access. Concentrates from a mining operation can be easily transported by barge along the Taku Inlet to the deep water port of Juneau, a distance of 42 miles, as was done when the property was in production in the 1950's (see location map). An ideal location for townsite, mill and tailings disposal exists about 4 miles south of the mine. A road will have to be constructed for the 4 miles between the mine and mill.

## REDFERN - COMINCO JOINT VENTURE

Redfern has the option to earn a 40% participating interest through the expenditure of \$3 million by December 31, 1990. As at December 31, 1988 Redfern has spent \$2.7 million leaving \$300,000 to be expended to complete the earn-in. After earn-in, the property will be developed on a 60% Cominco - 40% Redfern joint venture basis.

## HISTORY

Cominco Ltd. operated the Tulsequah Chief mine in the period 1951 - 1957. The mine closed in 1957 due to low metal prices. Much of the mine revenue was from its copper content.

Milling facilities were leased at the nearby Polaris Taku gold mine which abandoned operations in 1950. The mill was retooled and produced at the rate of 500 tons per day. Mill concentrates were barged from the Taku River landing some 6 miles south of the mill site to the deep water port of Juneau, Alaska, a total distance of 42 miles.

Past production from the Tulsequah Chief totalled 633,000 tons grading 1.8% copper, 1.3% lead, 6.7% zinc, 0.1 oz/ton gold, 3.16 oz/ton silver. When the mine closed, remaining in place reserves totalled 780,000 tons as detailed under the heading "Reserves".

The property lay dormant from 1957 until the first drilling in 1987 under the Redfern - Cominco option.

## GEOLOGY

The Tulsequah Chief mineral deposit is a polymetallic volcanogenic massive sulphide (VMS) containing zinc, copper, lead, gold and silver. More specifically the deposit belongs to a class of massive sulphides known as Kuroko type which are rich in gold and silver. One particularly favourable aspect of VMS deposits as compared to other deposit types is that they display good continuity and reserve calculations can therefore be reliably made with a much wider spaced drill pattern. Another favourable aspect is that the deposits are polymetallic and therefore not strongly affected by negative price changes of a single metal.

When the mine was in production in the 1950's a lack of understanding of the geological controls of VMS deposits hampered the search for new ore. Today VMS deposits are well understood geologically. Tulsequah ore is now known to be stratigraphically controlled as opposed to structurally controlled, hence exploration can be focussed on the right targets and discovery of new ore is relatively simple.

The Tulsequah Chief deposit consists of several ore lenses ("A" to "G") which are contained within a particular volcanic horizon known as the "mineral horizon". The volcanic strata have been tilted so that the mineral horizon and the ore lenses contained within it all plunge or dip generally to the north at about 60° from the horizontal. The 1987 and 1988 drill programs have shown that the mineral system is strengthening with depth and the quantity of ore, measured as tons per vertical foot, is increasing dramatically with depth.

Underground drilling in 1987 and 1988 focussed on the "B", "E" and "G" ore lenses and was successful in tripling the reserves from 780,000 to 2,380,680 tons. Four drill holes extended the "G" lens to at least 575 feet in strike length and 500 feet down dip; 2 holes extended the "E" lens 700 feet down dip from the lowest mine level and a single hole extended the "B" lens 425 feet down dip.

For a more complete geological picture, the reader is referred to the attached maps and sections including surface geology, geology plan maps of the 5400 and 5200 mine levels, and vertical cross sections and longitudinal sections of the "E" and "G" ore lenses.

The mineral system at the Tulsequah Chief, considering the dimensions of the alteration zone and of the mineral horizon which contains the ore deposits, is one of the largest examples of the Kuroko type. Based on the scale of the mineral system, the fact that almost none of the deposit has been lost through erosion and the fact that the quantity of ore, measured as tons per vertical foot, is increasing dramatically with depth, it appears that the heart of the mineral system is still down dip from the lowest levels tested to date. For these reasons, geologists familiar with the property recognize that the potential reserves could be as large as 10-20 million tons.

In addition to the main Tulsequah Chief mineral system and alteration zone, a second alteration zone like that associated with the main deposit, and with even better base metal and precious metal geochemistry, is located to the west. Two drill holes tested this target in 1988 and results encourage the view that this may represent a whole new mineral system.

#### RESERVES

When the mine closed in 1957 Cominco Ltd. calculated a measured and indicated ore reserve of 780,000 tons grading 1.3% copper, 1.6% lead, 8.0% zinc, 0.07 oz/ton gold and 2.9 oz/ton silver. The 5200 level is the lowest mine adit and serves as the demarcation level for upper and lower ore reserves. Calculations are based on a tonnage factor of 10 cubic feet per ton, a 20% dilution factor for ore above the 5200 level and 10% dilution for indicated reserves below the 5200 level. No dilution has been calculated for inferred reserves. Measured reserve blocks have four sided development and a 25 foot area of influence. Indicated ore is less than four sided development with a 50 foot area of

influence or a halo of 25 feet around measured ore. Inferred reserves are calculated from diamond drill data with an approximate 165 foot area of assay influence or less if hole perimeters overlap. The table below is a presentation of reserves in all categories.

<u>Category</u>	<u>Tons</u>	<u>% Cu</u>	<u>% Pb</u>	<u>% Zn</u>	<u>Au oz/ton</u>	<u>Ag oz/ton</u>
Measured	156,980	1.75	1.27	7.30	0.08	3.67
Indicated	621,700	1.20	1.60	8.20	0.07	2.70
Inferred	1,602,000	2.39	1.09	5.45	0.078	2.58
	2,380,680	2.03	1.25	6.28	0.075	2.68

Almost all of the reserves are contained within the "B", "E" and "G" ore lenses which are wide open to depth. Additionally the "G" lens remains open above the 5200 level, possibly for as much as 1,000 feet. The "A" and "C" ore lenses have not as yet been explored to depth.

### METALLURGY

When the Tulsequah Chief mine was in production in the period 1951 to 1957 average metallurgical recoveries were as follows:

<u>Metal</u>	<u>Recovery</u>
Copper	84.4%
Lead	85.0%
Zinc	87.3%
Gold	76.5%
Silver	89.9%

These recoveries are remarkably high considering that the mill (Polaris-Taku) was originally constructed for the treatment of arsenical gold ores. It is reasonable to expect that a mill specifically designed for the treatment of the polymetallic ores of the Tulsequah Chief will achieve much better recoveries. A 90% recovery as an average for all metals is a reasonable expectation. Importantly, concentrates are clean and contain no deleterious components that would compromise milling, smelting or cause environmental concern.

### 1989 PROGRAM

A \$1,500,000 underground program is planned and will include 500 to 700 feet of drifting to establish drill stations for continued deeper drilling of the "B", "E" and "G" ore lenses. Drilling may also test the upward extension of the "G" lens as well as the depth extensions of the "A" and "C" ore lenses. It is also likely that new ore lenses will be found within the ore hosting mineral horizon.

### POTENTIAL

Reserves were tripled from 780,000 to 2,380,680 tons in 1988 and it is considered likely that the 1989 program could double the reserves again to approximately 5,000,000 tons.

An ultimate potential of 10-20 million tons appears very realistic based on the substantial increase in the dimensions of the ore zones with depth and on other geological considerations. VMS deposits generally occur in clusters and therefore other deposits may be discovered on the extensive Cominco - Redfern property.

### ECONOMICS

The table on page 6 presents an economic analysis for various deposit sizes ranging from 2.5 to 20 million tons. The capital costs are estimates in as much as they cannot be determined with any accuracy until a detailed feasibility study is done. Based on the parameters as given, it would appear that a deposit with the present reserves and grade of the Tulsequah Chief would be commercially viable with a substantial profit margin (the example of 2.5 million tons compares with the present reserves of approximately 2.4 million tons which when diluted by 10% would increase to 2.6 million tons). Assuming 10,000,000 shares outstanding and a price to earnings ratio of 8:1 the Case I scenario would yield a potential price per share of \$6.00. At 5 million tons the corresponding potential share price would be about \$12.00.

### CONCLUSION

The Tulsequah Chief Property is western Canada's best undeveloped base metal-precious metal deposit.

The association with Cominco insures that the property will have the best geological, engineering and mining expertise.

This property has an excellent chance of realizing production and we anticipate that the forthcoming exploration programs will substantially advance the property toward this goal.

**TULSEQUAH CHIEF  
ECONOMIC ESTIMATE**

	Case I 2,500,000 ton reserve	Case II 5,000,000 ton reserve	Case III 10,000,000 ton reserve	Case IV 20,000,000 ton reserve
Production Rate - tons/day	1,000	1,500	3,000	4,000
Production - tons/year based on 350 days production/year	350,000	525,000	1,050,000	1,400,000
Mine Life - years	7.14	9.5	9.5	14.3
Capital Costs - estimated	80,000,000	100,000,000	140,000,000	160,000,000
*Gross Value of Ore - per ton based on current reserve grades and metal prices	250.00	250.00	250.00	250.00
Net Value of Ore - per ton after 10% average mining dilution	225.00	225.00	225.00	225.00
Net Value of Ore - per ton based on 90% average milling recovery	203.00	203.00	203.00	203.00
**Less Mine Operating Costs - per ton (mining, milling & overheads, etc.)	55.00	50.00	45.00	40.00
**Less Smelting, Refining & Transportation Costs - per ton	40.00	40.00	40.00	40.00
Pre-tax Profit - per ton of ore	108.00	113.00	118.00	123.00
Pre-tax Mine Profit - per year	37,800,000	59,325,000	123,900,000	172,200,000
Capital Payback Period - in years at 10% interest rate, quarterly payments (assumes 100% of initial cash flow to amortize capital costs)	2.4	1.9	1.3	1.0
Pre-tax Income to Redfern after capital payback - (40% Redfern) - per year	15,120,000 for 4.75 years	23,730,000 for 7.6 years	49,560,000 for 8.2 years	68,880,000 for 13.3 years
After-tax earnings to Redfern (combined federal & provincial taxes = 50%)	7,560,000	11,865,000	24,780,000	34,440,000
After-tax earnings per share of Redfern - assuming 10,000,000 shares issued	.76	1.19	2.48	3.44
Price/Earnings Ratio	8:1	10:1	10:1	12:1
POTENTIAL REDFERN SHARE PRICE \$	6.08	11.90	24.80	41.28

\*Based on Canadian Producer Prices, December 5, 1988

\*\*Based on Industry Average Costs for this type of operation.  
(All monetary figures herein are in \$ Canadian)

**CORPORATE INFORMATION**

Redfern Resources Ltd. has traded on the Vancouver Stock Exchange (RFR) since December, 1979. The Company's directors and officers include professionals with extensive experience in the geological, accounting and legal fields.

**Board of Directors**

John A. Greig, M.Sc., P.Geol.  
Director, President & Chairman

George F. Fink, B.Comm., C.A.  
Director, Co-Chairman

J. Michael Kenyon, M.Sc., P.Geol.  
Director, Secretary-Treasurer

F. William Woodward  
Director, Assistant Secretary

Wayne J. Babcock, B.Sc., P.Geoph.  
Director

Murray W. Pyke, M.Sc., P.Geol.  
Director

Jonathan A. Rubenstein, LLB.  
Director

Carl R. Jonsson, LLB.  
Director

**Share Capitalization**

As at December 31, 1988, 8,245,678 shares are issued and outstanding of an authorized 10,000,000 shares. There are 300,000 warrants exercisable at \$1.60 which expire June 29, 1989 and directors, officers and employees have approximately 500,000 shares under option which expire in 1992.

**Financial**

The Company is debt free and has approximately \$700,000 of unallocated working capital as at December 31, 1988. During 1987 and 1988, financings for the Tulsequah project were provided by NIM, Mutual Trust Company and C.M. Oliver, all of which were flow through financings, and by Yorkton Securities, Canarim Investment Corporation and Midland Doherty Ltd. which were non-flow through financings.

**Head Office**

166 - 10551 Shellbridge Way  
Richmond, British Columbia  
V6X 2W9  
Telephone: (604) 278-3028  
Telecopier: (604) 278-8837

**Legal Counsel**

Angus, McClellan, Rubenstein & Haslam  
World Trade Centre  
Vancouver, British Columbia  
V6C 3C8

**Registrar and Transfer Agent**

Montreal Trust Company  
510 Burrard Street  
Vancouver, British Columbia

**Auditors**

KPMG Peat Marwick  
Richmond, British Columbia





