IR 1626

O T T A W A April 12th, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1626.

Concentration of Ore from Diamond Drill Cores from the Homer Group, Walsh Lake Area, Yellowknife District, Northwest Territories.

(Copy No. 4.)

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Bureau of Mines
Division of Metallic
Minerals.

Ore Dressing
and Metallurgical
Laboratories

DEPARTMENT
OF
MINES AND RESOURCES
Mines and Geology Branch

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Shipment:

The shipment, weighing six pounds, was received on March 1st, 1944, and consisted of four samples of diamond drill cores (split). These were submitted by Mr. A. S. Dadson of the Frobisher Exploration Company Limited, 25 King Street West, Toronto, Ontario.

Location of the Property:

The samples were from the Homer Group on Likely Lake in the Walsh Lake area of the Yellowknife district, Northwest Territories.

Purpose of the Investigation:

The following test work was requested on the samples submitted: (a) selective flotation tests to make lead, zinc and pyrite concentrates; (b) determination of the distribution of gold and silver in the lead and zinc concentrates; and (c) determination, by spectrographic analysis, of the amounts of indium, gallium and cadmium in the zinc concentrate.

Results of the Investigation:

The results of the tests show that

85 per cent of the lead was recovered in a concentrate which assayed as follows: gold, 0.16 oz./ton; silver, 63.14 oz./ton; lead, 72.2 per cent; copper, 1.60 per cent; zinc, 5.12 per cent; arsenic, 0.74 per cent; and that

86.6 per cent of the zinc was recovered in a concentrate which assayed: gold, 0.07 oz./ton; silver, 3.61 oz./ton; lead, 2.21 per cent; copper, 1.94 per cent; zinc, 53.6 per cent; arsenic, 0.56 per cent; iron, 9.52 per cent; cadmium, 0.13 per cent; insoluble, 0.92 per cent. (Germanium, none detected).

The spectrographic analysis of the zinc concentrate shows:

Indium	-	trace.
Gallium	-	probable faint trace (?).
Cadmium	-	distinct trace.
Germanium	-	none detected.

32.9 per cent, 29.6 per cent, and 31.5 per cent of the gold was distributed in the lead, zinc and pyrite concentrates.

Character of the Ore:

A microscopic examination of polished sections made from selected pieces of the drill cores showed the following:

Gangue Minerals -

The gangue consists essentially of milky-white to glassy quartz with numerous small patches of soft rock material and a small amount of finely disseminated carbonate (calcite).

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(Character of the Ore, cont'd) -

Metallic Minerals -

The polished surfaces are well metallized, the metallic minerals being sphalerite, pyrite, marcasite, galena, arsenopyrite, chalcopyrite, and pyrrhotite. All these minerals are relatively abundant, except pyrrhotite, and occur in intimate admixture as coarse to fine crystals, irregular grains, and small masses in gangue. Each is closely associated with the other as inclusions and interlocking grains as well as with gangue. While the greater portion of the metallics occur in the coarser grain sizes, small percentages of each are present in the finer sizes also, much of which is too small to be economically released by grinding. Consequently it will be impossible to make a perfectly clean lead or zinc concentrate. This will be particularly true, most likely, in the case of copper and arsenic, since chalcopyrite and arsenopyrite, in general, occur in finer grain sizes than the other metallics, and are visible in them -- in sphalerite especially -- as tiny inclusions only a few microns in size. Only a negligible quantity of pyrrhotite is visible in the sections, as rare tiny grains in sphalerite and pyrite.

Sampling and Analysis:

The four samples were combined for test. They were crushed and sampled by standard methods and a representative portion was found to contain:

Gold	- 0.06	oz./ton
Silver	- 7.68	"
Lead	- 8.45	per cent.
Zinc	- 12.72	"
Iron	- 11.16	"
Copper	- 0.64	"
Arsenic	- 1.77	"
Antimony	- 0.11	"
Sulphur	- 11.30	"

Investigative Procedure:

The ore was treated by selective flotation to produce concentrates of lead, zinc, and pyrite.

The concentrates were assayed for gold and silver and analysed for the various base metals required.

TEST WORK:

Samples of the ore were ground to 85 per cent minus 200 mesh at a dilution of 4 parts ore to 3 parts water. The ground pulp was transferred to a flotation machine.

Reagents -

LEAD FLOTATION.

Conditioning:

Soda ash - 2.0 lb./ton (pH, 8.6)
Zinc sulphate - 1.0 "
Sodium cyanide - 0.1 "

Agitate for 10 minutes.

Collector: Potassium ethyl xanthate - 0.04 lb./ton

Frother: Cresylic acid - 0.1 lb./ton

Removed lead concentrate for 4 minutes.

ZINC FLOTATION.

Conditioning:

Lime - 2.0 lb./ton (pH, 10.2)
Copper sulphate - 1.0 "

Agitate for 10 minutes.

Collector: Potassium ethyl xanthate (stage feeding) - 0.12 lb./ton

Frother: Pine oil - 0.05 lb./ton

Removed zinc concentrate for 20 minutes.

PYRITE FLOTATION.

Conditioning:

Soda ash - 6.0 lb./ton
Copper sulphate - 1.0 "

Agitate for 10 minutes.

Collector: Potassium amyl xanthate - 0.2 lb./ton

Frother: Pine oil - 0.05 lb./ton

Removed pyrite concentrate for 7 minutes.
Recleaned each rougher concentrate.

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SUMMARY OF FLOTATION RESULTS

Product	Weight, per cent	ASSAYS Oz./ton Au	Ag	Per cent Cu	Pb	Zn	Distribution, per cent Au	Ag	Cu	Pb	Zn	Ratio of concentration
Feed	100.0	0.06	7.68	0.64	8.45	12.72	100.0	100.0	100.0	100.0	100.0	
Lead conc.	9.9	0.16	63.14	1.60	72.22	5.12	32.9	84.6	25.1	85.3	4.0	10.1:1.
Lead middling	1.1	-	-	0.92	35.71	17.50	-	-	1.6	4.8	1.6	
Zinc conc.	20.4	0.07	3.61	1.94	2.21	53.60	29.6	10.0	62.3	5.4	86.6	4.9:1.
Zinc middling	3.0	-	-	1.39	7.40	18.70	-	-	6.5	2.6	4.4	
Pyrite conc.	6.6	0.23	3.34	-	-	4.05	31.5	3.0	-	-	2.1	15.2:1.
Pyrite middling	1.7	-	-	-	-	2.70	-	-	-	-	0.4	
Flot. tailing	57.3	0.005	0.325	0.05	0.28	0.20	6.0	2.4	4.5	1.9	0.9	

ADDITIONAL ANALYSES:

	Zinc Concentrate	Lead Concentrate
	- Per cent -	
Arsenic -	0.56	0.74
Cadmium -	0.13	-
Iron -	9.52	-
Germanium -	None detected	-
Insoluble -	0.92	

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SUMMARY AND CONCLUSIONS:

As the quantity of material submitted was small (6 pounds), only a limited amount of test work could be carried out. The microscopic examination indicated that fine grinding will be required to obtain efficient separation of the various sulphide minerals.

Usually, in an ore containing copper, lead and zinc, the bulk of the copper is recovered with the lead. In this case 25.1 per cent of the copper is with the lead concentrate, while 62.3 per cent is found in the zinc concentrate.

A good separation of lead from zinc is indicated. The quantity of middling (cleaner tailing) in the various stages of flotation was too small for assay and analysis, consequently a complete picture of the distribution of the values is not given. In continuous operation these hidden values should slightly increase the overall recovery.

The arsenic content of the zinc concentrate is high. Some zinc refiners require a maximum of 0.015 per cent arsenic in the product, while others impose a stiff penalty. Germanium was not detected in the zinc concentrate.

The distribution of the copper and arsenic in the various concentrates, as shown by the test work, bears out the conclusions arrived at by the microscopic examination.

It is apparent from the results obtained in these preliminary tests that considerable laboratory and pilot-plant work will be required before sufficient information is obtained to lay out a flow-sheet.

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