861874

T. E. ARNOLD

446 Roosevelt Avenue,
OAKHURST, N. J. 07755
(201) 531-2426

February 25, 1987.

Mr. Ninn Quan,
Pres. Pan American Minerals,
#520---885 Dunsmuir Street,
Vancouver, B. C. V6C - 1N8.

Dear Ninn: J&L-Noranda, Boliden Metall, and others

Enclosed are copies of letters to Boliden and Noranda, dated February 25, 1987.

It is my conclusion Noranda will request an extension on the pretext of not completing the testing. Under the circumstances you should be tough as others quite as well heeled will take over, and they will cooperate with Boliden.

The letter to Boliden covers what Dr. G. Lindkvist told me, or inferred. I feel a deal with Boliden could be set up so Boliden takes concentrates soon as they are available. Going a step further this would permit production of 25,000 oz gold to 50,000 oz gold per year plus the silver, starting in a few months. That production could no doubt be doubled as the mine is opened up. Put another way the lead, zinc and arsenic will be carrying the freight, and the gold and silver would be clear.

It is conceivable Noranda and Tech are getting together so concentrates could be shipped to Trail. That possibility is, however, in the future at least three years, which requires marking time.

If we can get Boliden to shoot, and Noranda to cooperate"I have pulled a rabbit out of a hat"for Pan Am. It would put Pan Am on the map almost immediately. So far I have done everything for Pan Am gratis, but if the above comes to pass will expect 500,000 Pam Am shares free and clear for the service. That would only be a small percentage of the stock Pan Am would have to sell if Noranda and/or BP-Selco proceeded, so is a reasonable fee.

If you don't already know I was largely responsible for setting up the deal with Noranda, although much credit should go to Ken Sanders. This is because I know the score, which you and the others don't. Just to keep the record straight you have nothing to fear from me as I have no desire to take over the daily grind of running a company that has reasonably competent management, Nevertheless lack of knowledge is a handicap to you, and makes you far too cautious. I do, however, insist on being kept informed, for as you state I am the largest shareholder, as well as being the Vendor, so please send along the Pan Am-Noranda contract and other relevant information.

It is now time to act, so be prepared for action that is positive. I am fed up with fence sitters who are scared to anything but sit.

Very truly yours,

T E Arnold

T. E. ARNOLD

446 Roosevelt Avenue,
OAKHURST, N. J. 07755
(201) 531-2426

February 25, 1987.

Mr. L. Reinertson,
Manager-Western Region,
Noranda Exploration Co., Ltd.,
P.O.BOX 2380,
1050 Davie Street,
Vancouver, B. C. V6B - 3T5.

Dear Mr, Reinertson: Treatment of J&L Ores, and possible cooperation with Boliden Metall, of Sweden.

Enclosed is a copy of a letter to Dr. G. Lindkvist, of Boliden Metall, regarding the handling of J&L ores and/or concentrates.

If what is stated is viable (and I feel strongly it is) the J&L operation could be put into profitable operation in a few months. This is because only minor changes in your mill would be required, and possibly the incorporation of jiggs to separate the Massive and Disseminated fractions of the ore. Boliden has all the required equipment in place and operative in Sweden; AND MOST IMPORTANTLY has storage for As_2O_3, which would be very expensive in B. C. (The mine would produce far more than the market can absorb)

The suggested approach is really Old Fashioned, but is effective and will do a thorough job. Incidentally in smelting 100% of the gold and silver are recovered, and sometimes even a bit more if gangue and fluxes carry any. It would appear the base metals and arsenic would pay the cost of handling, so the gold and silver would be free and clear.

It is suggested you consider the suggested Boliden procedure carefully as it would permit:

(1) Almost immediate profitable production and cash flow.

(2) Utilize your mill to advantage with only minor changes.

(3) Require no expensive construction at the mine site, thereby reducing the cost of getting into production, as well as the time factor.

(4) Give you time to explore other possible procedures, such as retorting, and treating ore at close to the critical temperature and pressure of water to separate the various minerals. (In connection with retorting the El Indio Mine, in Chile, controlled ny the Fluor Corp, through St. Joe Gold, uses such a procedure.)

I am interested in getting a profitable operation started, will cooperate in every way possible, and will move heaven and earth to this end.

Very truly yours,
T. E. Arnold.

T. E. ARNOLD
REGISTERED PROFESSIONAL ENGINEER

446 Roosevelt Avenue,
OAKHURST. N. J. 07755
(201) 531-2426

February 25, 1987.

Dr. Göran Lindkvist,
General Manager
Technology Marketing,
Boliden Metall, AB,
S-93200,
Skellefthamn, SWEDEN.

Dear Dr. Lindkvist: Your File: CU/gbw--J&L Mine, Revelstoke,B.C.
Pan American Minerals--Noranda Mines

Frankly: In the beginning I was dubious about shipping J&L ore and/or concentrates to Sweden as it was assumed freight rates would be prohibitive, which they have been until recently. After considering the matter more fully the idea now appeals to me for the following reasons:

(1) The arsenic problem would be solved as you have storage facilities for the excess that cannot be sold immediately.

(2) You have all necessary equipment set up and in operation. Noranda's mill could produce the concentrates, so nothing is required except a mining plant and to open up the mine. This would permit an operation in a very short time, a matter of months.

(3) It is obvious a suitable contract could be set up good for 3-5 years to take whatever concentrate could be produced up to a maximum tonnage per year, Payment would be made FOB Pacific port.

(4) It is assumed the lead, zinc and arsenic will produce sufficient revenue to cover expenses, leaving the gold and silver free and clear. They would be paid for at 100% of the assay value as the material will be smelted permitting 100% extraction. If the prices of base metals and arsenic rise considerably then some extra compensation appears in order.

(5) The 3-5 year period would permit ample time to explore the possibility of developing a more profitable extraction procedure, one that could be based at the mine.

(6) Noranda has until the end of March to decide whether or not to proceed. It is my offhand conclusion their work has not been completed. Therefore, if you could confirm your interest along,the above lines, it is my conclusion such would be received favourably.

The above statements are predicated on the following Scenario for handling the ore and/or concentrates:

(1) In the old workings virtually all the gold and silver, lead zinc, and most of the arsenic, occur in the Massive Sulphide fraction. It is concluded this Massive sulphide fraction could be easily separated and concentrated by jigging, leaving the Disseminated fraction to be concentrated by flotation.

In the new workings, made by Selco, the sulphide is apparently wider, so it would appear the Massive fraction, although no wider, is in narrow bands in the other sulphides. Whether jigging of this material would be in order is a moot question. It is my off hand conclusion a separation is possible.

Two possibilities remain: (a) It may be possible to produce a bulk concentrate of the Disseminated fraction that is high enough grade to permit shipping?: (b) If too badly mixed up a bulk concentrate of both without diluting the grade to any extent.

In any event it would appear the material produced for shipping would represent not more than half, probably one-third to even one-fifth of the original tonnage. This would reduce freight rates considerably.

<u>At Your Plant in Sweden</u>.

(2) Roast the material to remove the arsenic as As_2O_3, and produce lead, zinc and iron oxides.

(3) As much of the zinc as possible should be removed before smelting as zinc produces refractory slags. Also it is concluded you have some type of recovery system for zinc, more or less similar to the article enclosed, that uses liquid-liquid extraction methods, and also it appears feasible to concentrate the cadmium by similar means, thereby producing both metals cheaply.

(4) If there is sufficient lead oxide to collect the gold and silver in a similar manner to a fire assay such could be done. (In this connection we had some success by mixing the ground material with a reducing agent (powdered charcoal) and heating selectively by using high frequency induction; similar to Micro oven) The iron oxides are also heated to some extent, but not as much as the lead. If above selective heating not feasible then the material. with suitable slagging material could be melted, and if is is found some gold is left then add molten slag to input of your reverbatory copper furnace.

On the other hand if the percentage of lead is low forget it and smelt in your copper furnace. It is a matter of economics deciding whether saving the lead is feasible.

Going a step further you may have some leaching procedure to collect the lead?

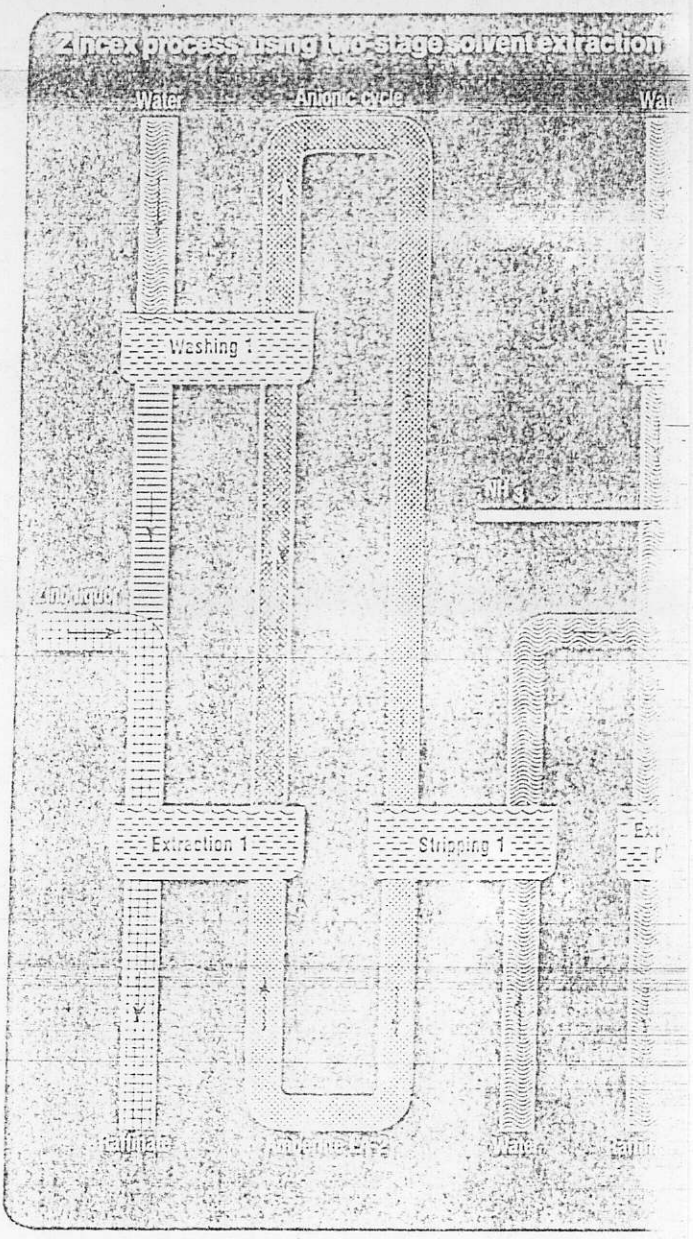
A copy of this letter will be sent to Noranda. If you haven't already heard from Noranda it is felt now is the time to ascertain if Noranda is interested in some cooperative operation. For your information Noranda has to decide by late in March whether or not to proceed. It is my conclusion Noranda has not completed its testing to a point a decision can be made? If Noranda elects to step out of the picture there is at least one large organization (probably three) that would cooperate with you.

It would be appreciated if you would inform me of Noranda's interest, and keep me informed of developments if Noranda proceeds.

Very truly yours,

T. E. Arnold.

CC: Mr.L. Reinertson, Noranda
Mr. A. Powis, Noranda.
Mr. N. Quan, Pan Am.
Mr. Ken Sanders, Pan Am.
Mr. T. Heard,
Mr. Jerry Pogue, Nat Secs.



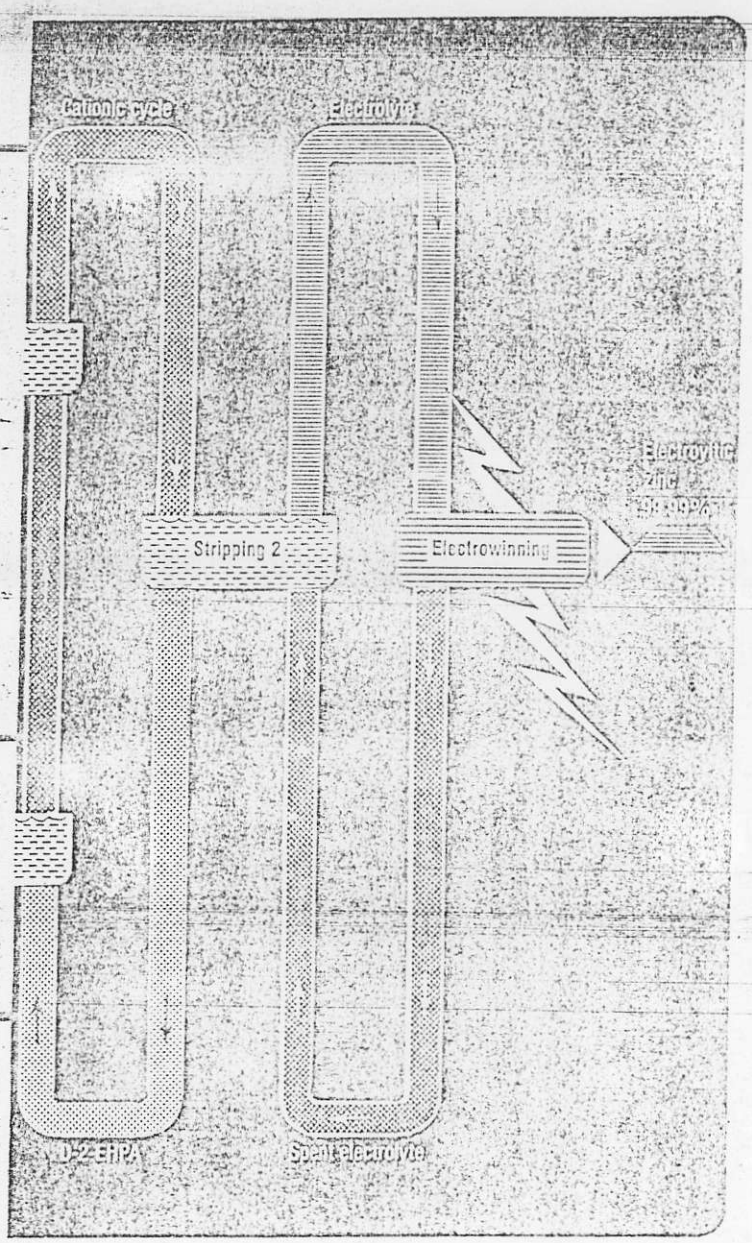
WINNING ZINC THROUGH SOLVENT EXTRACTION AND ELECTROWINNING

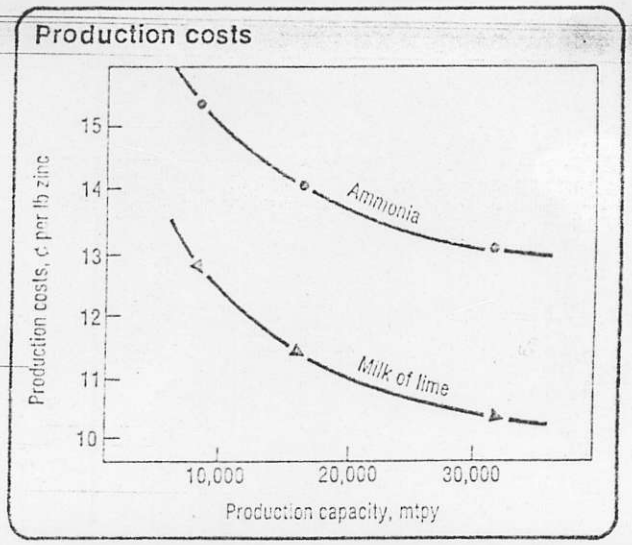
E. D. Nogueira, J. M. Regife, and A. M. Arcocha, research section, Tecnicas Reunidas SA, Spain

A new process that recovers zinc by solvent extraction and electrowinning has been developed in Spain by Tecnicas Reunidas SA, in cooperation with Union Explosivos Rio Tinto SA and Metalquimica del Nervion SA (MQN). The "Zincex" process has already been put to commercial application in a plant of MQN at Bilbao, Spain. The plant came on stream in August 1976 with a design capacity of 8,000 mtpy of slab zinc, which is produced from a pyrite cinders leach liquor.

CINDERS TO ZINC

The pyrite cinders leached at MQN are typical of the





Composition of zinc liquors in MQN plant after pyrite cinder leaching and copper cementation with scrap iron

Component	Concentration range (gpl)
Sulphate	120 – 155
Chloride	70 – 100
Sodium	60 – 90
Zinc	20 – 30
Iron	18 – 25
Magnesium	2 – 3
Manganese	0.5 – 0.9
Lead	0.13 – 0.5
Cobalt	0.15 – 0.30
Arsenic	0.04 – 0.10
Copper	0.04 – 0.10
Cadmium	0.05 – 0.07
Nickel	0.01 – 0.03

product obtained from roasting of Spanish pyrites, which contain about 0.6% Cu, 2.0% Zn, and 0.8% Pb. The cinders are treated to a chloridizing roast, using the DKH process in hearth furnaces, and then leached by percolation to produce a zinc-bearing liquor. Feed to the MQN plant contains 20-30 gpl zinc, 18-25 gpl iron, 70-100 gpl chloride, and 120-155 gpl sulphate, in addition to copper, cadmium, cobalt, nickel, arsenic, manganese, other less significant metals, and alkali and alkali-earth ions. Free chloride must be present in the feed liquor at a concentration higher than 1 N in order to obtain efficient zinc extraction in less than four extraction stages. Tolerance of the process to ferric ions is determined by the redox potential of the feed liquor, which must be below 300 mv to obtain good selectivity regarding iron-zinc separation.

The solvent extraction section of the MQN plant produces a zinc electrolyte containing 50-60 gpl zinc, with 20 ppm iron, 30 ppm chloride, and less than 1 ppm of metallic impurities such as copper, cadmium, cobalt, and arsenic.

The electrowinning section produces 99.99% electrolytic zinc from the electrolyte produced in the solvent extraction section. Conventional lead anodes (plus 0.8% silver) and commercial-grade aluminum cathodes are used in electrowinning.

In the first extraction stage, a secondary amine is used as the anion extraction reagent, removing zinc as the anionic complex chloride $ZnCl_4^{--}$. The extraction reaction is:

$$2R_2NH_2Cl\ (org) + ZnCl_4^{--}\ (aq) \rightleftharpoons \rightleftharpoons (R_2NH_2)_2ZnCl_4\ (org) + 2Cl^-\ (aq)$$

Loaded organic is washed in acidified water to remove entrained feed liquor and any other metal ions that entered the organic phase with the zinc. Wash water is returned to the extraction stage, joining the pregnant feed liquor. Zinc is stripped by water in accordance with the reaction:

$$(R_2NH_2)_2ZnCl_4\ (org) + H_2O\ (aq) \rightleftharpoons \rightleftharpoons 2R_2NH_2Cl\ (org) + Zn^{++}\ (aq) + 2Cl^-\ (aq)$$

The organic extraction agent is regenerated and returned to the extraction stage. At this stage, the only metals that

accompany zinc are those that form complex chlorides, principally copper, cadmium, and ferric iron, which partially pass to the second extraction stage. The discarded leach liquor, or raffinate, from the first extraction stage will contain about 0.1 gpl of zinc and 10 ppm of entrained organic material after adequate coalescence.

In the second extraction stage, zinc is removed as the metal cation Zn^{++} using the extraction reagent di-2-ethyl hexyl-phosphoric acid (D-2-EHPA) diluted in kerosene. The reaction is:

$$2(RO)_2PO_2H\ (org) + Zn^{++}\ (aq) \rightleftharpoons \rightleftharpoons [(RO)_2PO_2]_2Zn\ (org) + 2H^+\ (aq)$$

The pH level of the second extraction cycle should range between 2.2 and 2.8. Careful pH control using ammonia or milk of lime is necessary, because at high pH values other metals are extracted, including those harmful to subsequent zinc electrowinning. At low pH values, the above reaction is reversed.

Following extraction, the loaded organic is washed with dilute acid to remove entrained aqueous liquid and, in particular, chloride ions. Raffinate from the second extraction stage contains all the copper and cadmium ions extracted during the first stage.

Stripping is accomplished using spent electrolyte from the zinc electrowinning plant. Loaded electrolyte contains 80-90 gpl zinc and, after coalescence (using settling tanks and charcoal filters), the organic entrainment level in the electrolyte is about 1 ppm.

Iron ions—extracted by the second extraction stage reagent—are not stripped by the electrolyte and remain in the organic. A continuous bleed-off from the organic is required to remove these ions in a separate regeneration operation. The organic is placed in contact with concentrated hydrochloric acid, which removes the metal ions and leaves pure D-2-EHPA. Ferric ions are subsequently removed from the hydrochloric acid in a separate solvent extraction circuit, which uses the secondary amine extraction reagent from the first extraction stage.

EXPERIENCE AT MQN

The MQN plant at Bilbao has been producing 99.99% electrolytic zinc since startup in August 1976. The plant has fulfilled all design specifications, and overall yield for the solvent extraction section has been 98%.

During design and construction of the plant, the Tecnicas Reunidas research team, in cooperation with MQN personnel, developed a final procedure for removing iron from the organic solvent containing D-2-EHPA, and the process was incorporated into the design of the plant.

Since continuous operations began, use of ammonia for pH control has not caused any particular problem with slimes formation at the liquid/organic interface. Nevertheless, an alternative process has been developed in the last two years that uses milk of lime as the neutralizing agent in pH control, with corresponding savings in operating costs. To test the process, a small-scale plant with nominal capacity of 15 kg per hr of electrolytic zinc was erected at Bilbao. The pilot plant uses zinc chloride from the first solvent extraction stage of the industrial plant as feed—and milk of lime as pH control agent. As a result of these research efforts, four Spanish patents have been granted covering the industrial rights of the process. A fifth patent is pending.

At the MQN plant, consumption of raw materials and power, per metric ton of zinc product is:

Ammonia	527 kg
Sulphuric acid	215 kg
Secondary amine	400 g
D-2-EHPA	300 g
Kerosene	10 kg
Hydrochloric acid, 20°B	100 kg
Process water	110 cu m
Electric power	3,500 kwh
Electrolytic additives	100 g

Naturally, production costs at zinc recovery plants using the Zincex process will vary according to the nature of the feedstock. However, the use of milk of lime in place of ammonia for pH control during the second solvent extraction stage provides significant economies. (See figure.) By changing the pH agent, the process can be fully profitable for operations smaller than conventional zinc electrowinnning plants.

The process may be applied to a wide variety of feedstocks; the only limitations are that the pregnant feed liquor have a specific amount of excess free chloride and a low concentration of ferric ions in solution. If chloride is not present, it may be added in the form of any common chloride salt. If ferric ion concentration is excessive, it must be reduced in a preconditioning stage.

Some possible process applications include:

- Electrolyte purification, when elements that are not readily amenable to conventional zinc dust purification are present.
- Upgrading zinc concentrations in solution to acceptable levels for economic zinc electrowinning.
- Direct treatment of alkaline zinc ores and byproducts (such as carbonates and oxides), allowing economic zinc recovery for even small capacity production.
- Extraction of zinc from low-grade secondary sources, such as electric arc furnace dust (containing many impurities).

In addition, the process lends itself to a high degree of automation. It is possible to operate a 10,000-mtpy plant, including melting and casting operations, with fewer than 22 workers.

T. E. ARNOLD
REGISTERED PROFESSIONAL ENGINEER

446 Roosevelt Avenue,
OAKHURST, N. J. 07755
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February 25, 1987.

Dr. Göran Lindkvist,
General Manager,
Technology Marketing,
Boliden Metall AB.,
S-93200,
Skellefthamn, SWEDEN.

Dear Dr. Lindkvist: Your File CU/gbw--J&L Mine, Revelstoke, B. C. Massive and Disseminated Ore Fractions.

In connection with above matter the old workings showed a streak of Massive sulphides. It was sampled in three places, as per attached assay certificates, over a horizontal distance of at least 2,500 feet. The width was from 18 inches to about 2 feet.

It would appear more or less the same conditions occur in the workings made by Selco except the two fractions, that is Massive and Disseminated, occur together, the Massive fraction occurring in narrow widths in the Disseminated fraction. If this is the case it would appear the Massive fraction could be separated by jigging?

Work done years ago indicated the Disseminated fraction could be separated into lead and zinc concentrates very low in arsenic, that were acceptable at Trail, one hundred miles to south. If so that would leave arsenopyrite(and pyrite) that might carry sufficient gold to be worth concentrating and treating?

It won't take much work to find out.

Very truly yours,
T. E. Arnold.

PHONE: 652-3341 P.O. BOX 430

LAKEFIELD RESEARCH OF CANADA LIMITED
LAKEFIELD, ONTARIO
CANADA

Certificate of Analysis

Date: December 1, 1970
Received: November 10, 1970

From: Creek Tunnel

Our Reference No. 7019368

Invoice No. 9066

Samples submitted to us show results as follows:

Sample Number	% Cu	% Zn	% Pb	% As	% WO_3	% Sb
JL No. 1	0.08	7.06	5.17	8.39	0.007	0.033
JL No. 2	0.08	4.09	2.25	6.81	0.007	0.023
JL No. 3	0.06	9.72	1.84	12.07	0.007	0.033
JL No. 4	0.07	6.29	4.06	5.26	0.008	0.081
JL No. 5	0.18	6.97	4.84	4.01	0.008	0.115
JL No. 6	0.03	0.10	0.07	0.25	0.008	0.005
JL No. 7	0.10	11.24	1.49	17.18	0.008	0.025
JL No. 8	0.18	10.66	9.79	1.32	0.006	0.071
Jl No. 9	0.13	4.67	1.93	22.23	0.013	0.043
JL No. 10	0.19	8.56	8.52	1.58	0.006	0.124
		Av. 6.93	3.99			

Sample Number	Au oz/ton	Ag oz/ton
JL No. 1	0.320	2.86
JL No. 2	0.350	1.21
JL No. 3	0.290	1.33
JL No. 4	0.160	2.84
JL No. 5	0.160	3.99
JL No. 6	0.005	0.07
JL No. 7	0.480	0.88
JL No. 8	0.110	6.65
JL No. 9	0.890	2.11
JL No. 10	0.230	6.11
	Av. 0.299	2.80

To: Mr. S. Siscoe (2)

SIGNED A.G. Scobie
MANAGER
A.G. Scobie, P. Eng.

Analysis and Assaying - Mineral Processing Research - Pilot Plant Investigations

Arithmetic Average

Cu——0.110% As——7.910%

Zn——6.936% WO_3——0.0078%

Pb——3.996% Au—— 0.2995 0z/T

Sb——0.055% Ag—— 2.8050 0z/T

FILE No. 21793

CABLE ADDRESS: "ELDRICO"

HEAD OFFICE AND LABORATORIES:
633 HORNBY STREET
VANCOUVER 1, B.C.

PHONE TAtlow 1267

Certificate of Assay

G. S. ELDRIDGE & CO. LTD.

PROVINCIAL ASSAYERS, ANALYTICAL AND CONSULTING CHEMISTS
METALLURGICAL AND CEMENT INSPECTORS

G. S. ELDRIDGE, B.Sc.
MEMBER OF
CHEMICAL INSTITUTE OF CANADA
CANADIAN INSTITUTE OF MINING AND METALLURGY
AMERICAN SOCIETY FOR TESTING MATERIALS
AMERICAN CHEMICAL SOCIETY
AMERICAN SOCIETY OF METALS

We Hereby Certify *that the following are the results of assays made by us upon samples of* ORE

herein described and received from Old Tunnel Workings. (Mr. T.E. Arnold) March 2, 19 57

MARKED	GOLD		SILVER		LEAD		ZINC				TOTAL VALU
	OUNCES PER TON	VALUE PER TON	OUNCES PER TON	VALUE PER TON	PER CENT.	VALUE PER TON	PER CENT.	VALUE PER TON		VALUE PER TON	PER TON (2000 LBS.)
		$		$		$		$		$	$
16502	0.40	14.00	6.7		6.30		13.20	Iron	18.55%		
16503	0.32	11.20	7.5		6.60		13.05	Arsenic	9.39%		
16504	0.32	11.20	5.0		8.45		13.30	Insoluble	16.85%		
16505	0.32	11.20	5.7		8.05		15.05	Sulphur	28.80%		
16506	0.32	11.20	5.3		8.65		13.70	Copper	0.20%		
16507	0.28	9.80	6.2		7.05		12.10	Cadmium	0.07%		
16508	0.32	11.20	6.0		8.90		15.20	Antimony	0.10%		
16509	0.44	15.40	5.6		6.70		14.95	Bismuth	Large Trace		
16510	0.44	15.40	4.9		7.05		13.10	Tungsten	"	"	
16511	0.36	12.60	5.2		6.95		14.65	Tin	"	"	
16512	0.36	12.60	5.0		6.15		15.20				
16513	0.44	15.40	4.9		6.45		13.15				
16514	0.48	16.80	5.6		7.00		13.45				
								Massive Sulphides ONLY. Mine grade one-half of above			
								Samples taken 20 feet apart.			
ARITHMETIC AVERAGE	0.37		5.7		7.25		13.85				

3M-MP

Gold calculated at $ 35.00 *per ounce.* *Calculated at* _____ *cents per lb.*

Silver calculated at _____ *per ounce.* *Calculated at* _____ *cents per lb.*

NOTE.—Samples only retained 3 months unless otherwise specified R. H. McIntosh *Provincial Assayer*

D. KERR-LAWSON, B.A. PH.D.

TELEPHONE 306
P.O. DRAWER 10

Swastika, Ont., October 11, 1960.

SWASTIKA LABORATORIES LIMITED

Certificate of Analysis

No. 35390-A

We have assayed ..... samples of .....

Received ..... and submitted by T. E. Arnold, Esq.

..... with the following results:

Sample No.	Cadmium %	Sulphur %
Bulk Sample	0.10	27.10

Ker. Testing

WM. GERRIE, M.A.
D. KERR-LAWSON, B.A., PH.D.

TELEPHONE 306
P.O. DRAWER 10

Swastika, Ont., August 23rd, 1963 19

SWASTIKA LABORATORIES LIMITED

Certificate of Analysis

No. 35390

We have assayed one samples of ore

Received Aug. 14th, 1963 and submitted by T. E. Arnold, Esq., P. O. Box 362,

PLAINFIELD, NEW JERSEY, with the following results:

Sample Number - Not Indicated. Representative ore from Tunnel Fresh primary ore (massive sulphide)

GOLD PER TON Ozs.	Value @ $35.00	SILVER PER TON Ozs.	COPPER %	LEAD %	ZINC %	IRON %	ARSENIC %	INSOLUBLE %
0.36	$12.60	6.73	0.31	9.18	15.68	22.64	7.28	14.22

NOTE:-

The whole sample, weighing 67 pounds, was crushed and rolled to pass a ten mesh screen, and a portion representing one eighth of it (about eight pounds) was cut from it using a Jones riffle. This portion was ground to pass forty mesh and cut

Ker. Testing

WM. GERRIE, M.A.
D. KERR-LAWSON, B.A., PH.D.

TELEPHONE 306
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Swastika, Ont., August 23rd, 1963 19

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0.36	$12.60	6.73	0.31	9.18	15.68	22.64	7.28	14.22

NOTE:-

The whole sample, weighing 67 pounds, was crushed and rolled to pass a ten mesh screen, and a portion representing one eighth of it (about eight pounds) was cut from it using a Jones riffle. This portion was ground to pass forty mesh, and cut into two parts with the Jones riffle. Each part was further reduced by riffling until it represented one eighth of the original eighth, or about one pound. Each of these pound fractions was pulverized for assay, forming Pulp A and Pulp B. Pulp A and Pulp B were each assayed for gold and silver, and gave identical results, indicating that the sampling procedure was adequate for the type of ore involved.

SWASTIKA LABORATORIES LIMITED,

Per:- D. Kerr-Lawson

D. KERR-LAWSON, D A PH.D.

TELEPHONE 306
P.O. DRAWER 10

Swastika, Ont., October 11, 1940.

SWASTIKA LABORATORIES LIMITED

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Received ..... and submitted by T. E. Arnold, Esq.

..... with the following results:

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Bulk Sample	0.10	27.10

SWASTIKA LABORATORIES LIMITED,

per: .....

For Testing

WM. GERRIE, M.A.
D. KERR-LAWSON, B.A., PH.D.

TELEPHONE 306
P.O. DRAWER 10

Swastika, Ont., August 23rd, 1963 19

SWASTIKA LABORATORIES LIMITED

Certificate of Analysis

No. 35390

We have assayed one samples of ore

Received Aug. 14th, 1963 and submitted by T. E. Arnold, Esq., P. O. Box 362,

PLAINFIELD, NEW JERSEY, with the following results:

Sample Number - Not Indicated. Representative ore from tunnel Fresh primary ore (massive sulphide)

GOLD PER TON Ozs.	Value @ $35.00	SILVER PER TON Ozs.	COPPER %	LEAD %	ZINC %	IRON %	ARSENIC %	INSOLUBLE %
0.36	$12.60	6.73	0.31	9.18	15.68	22.64	7.28	14.22

NOTE:-

The whole sample, weighing 67 pounds, was crushed and rolled to pass a ten mesh screen, and a portion representing one eighth of it (about eight pounds) was cut from it using a Jones riffle. This portion was ground to pass forty mesh, and cut into two parts with the Jones riffle. Each part was further reduced by riffling until it represented one eighth of the original eighth, or about one pound. Each of these pound fractions was pulverized for assay, forming Pulp A and Pulp B. Pulp A and Pulp B were each assayed for gold and silver, and gave identical results, indicating that the sampling procedure was adequate for the type of ore involved.

SWASTIKA LABORATORIES LIMITED,

Per:- W. Kerr Lawson

M. GERRIE, M A
D. KERR-LAWSON, D A PH.D.

P.O. DRAWER 10

Swastika, Ont., October 11, 1940.

SWASTIKA LABORATORIES LIMITED

Certificate of Analysis

No. 35390-A

We have assayed ..... samples of .....

Received ..... and submitted by T. E. Arnold, Esq.

..... with the following results:

Sample No.	Cadmium %	Sulphur %
Bulk Sample	0.10	27.10

SWASTIKA LABORATORIES LIMITED,

per: .....

T. E. ARNOLD

446 Roosevelt Avenue,
OAKHURST, N. J. 07755
(201) 531-2426

February 25, 1987.

Mr. L. Reinertson,
Manager-Western Region,
Noranda Exploration Co., Ltd.,
P.O.BOX 2380,
1050 Davie Street,
Vancouver, B. C. V6B - 3T5.

Dear Mr, Reinertson: Treatment of J&L Ores, and possible cooperation with Boliden Metall, of Sweden.

Enclosed is a copy of a letter to Dr. G. Lindkvist, of Boliden Metall, regarding the handling of J&L ores and/or concentrates.

If what is stated is viable (and I feel strongly it is) the J&L operation could be put into profitable operation in a few months. This is because only minor changes in your mill would be required, and possibly the incorporation of jiggs to separate the Massive and Disseminated fractions of the ore. Boliden has all the required equipment in place and operative in Sweden; AND MOST IMPORTANTLY has storage for As_2O_3, which would be very expensive in B. C. (The mine would produce far more than the market can absorb)

The suggested approach is really Old Fashioned, but is effective and will do a thorough job. Incidentally in smelting 100% of the gold and silver are recovered, and sometimes even a bit more if gangue and fluxes carry any. It would appear the base metals and arsenic would pay the cost of handling, so the gold and silver would be free and clear.

It is suggested you consider the suggested Bolider procedure carefully as it would permit:

(1) Almost immediate profitable production and cash flow.

(2) Utilize your mill to advantage with only minor changes.

(3) Require no expensive construction at the mine site, thereby reducing the cost of getting into production, as well as the time factor.

(4) Give you time to explore other possible procedures, such as retorting, and treating ore at close to the critical temperature and pressure of water to separate the various minerals. (In connection with retorting the El Indio Mine, in Chile, controlled ny the Fluor Corp, through St. Joe Gold, uses such a procedure.)

I am interested in getting a profitable operation started, will cooperate in every way possible, and will move heaven and earth to this end.

Very truly yours,
T. E. Arnold.

boliden metall

Date: 1986-09-30
Yours dated

Reference: CU/gbw
Your reference

Attending to this matter
Dr. Göran Lindkvist
General Manager
Technology Marketing

T.E. Arnold Esq.
446 Roosevelt Ave.
Oakhurst
New Jersey 07755
USA

Re: Arsenic disposal from J & L Mines, Revelstoke, B.C., Canada

Dear Sir,

We thank you for the letter concerning the arsenic problem arising if treatment is initiated of the very complex sulphide ore occuring in the J & L mine at Revelstoke.

We understand that your processing of the bulk sulphide concentrate will start with a reducing heattreatment where As_2S_3 is eliminated by vaporization and condensation and followed by cyanidation.

The conclusion you are drawing that arsenic sulphide is not a marketable compound and the conversion of it to insoluble calcium/iron arsenite/ arsenate is very expensive agree completely with our opinion. In some countries, Japan, Chile and Finland for instance, arsenic sulphide is classified as an insoluble and harmless compound which is allowed to be put in deposit under controlled conditions. We suggest that you further investigate the legal and technical possibilities to deposit arsenic sulphide at the mentioned old mine workings.

There are also other interesting possibilities based upon a deeper involvment from our part. This could range from buying part or all of the bulk concentrate to developing the mine together with BP/Noranda or alone. Also if a process were selected where arsenic would be roasted off and collected as a crude arsenicoxide dust we would be prepared to discuss the terms for transportation, destruction or deposit at the Boliden Rönnskär Smelter.

We hope that our suggestions will encourage you and Noranda to proceed with the development and we are looking forward to hearing from you about your interest in discussing a deeper involvment by Boliden for realization of the J & L Mine.

Yours sincerely,

Göran Lindkvist

Göran Lindkvist

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