L. CARON

Minfile 082ESW055

~~021263~~
021681

ECONOMIC POTENTIAL
and
PROCESS DEVELOPMENT CONCEPT
on the
OLD NICK - NICKEL / COBALT
PROPERTY

Rock Creek, British Columbia, Canada

by
Project Manager - Old Nick
Frank R. Wright, BBA, BSc., P.Eng.

for
Applied Mine Technologies Inc.
1100 -789 W. Pender St.
Vancouver, BC
V6C 1H2

June 27, 1997

ECONOMIC POTENTIAL and PROCESS DEVELOPMENT CONCEPT on the
OLD NICK - NICKEL / COBALT PROPERTY
Rock Creek, British Columbia, Canada

TABLE OF CONTENTS

	Page Number
Introduction	1
Background	1
Process Concept	2
Project Comparisons	4
Summary	8
References	9

Appendix

Figure 1: Site Location
Figure 2: Conceptual Flowsheet
Figure 3: BC Mineral Deposits - Ranked by Deposit Gross Metal Value
Addendum: Hypothetical Economic Return

ECONOMIC POTENTIAL and PROCESS DEVELOPMENT CONCEPT on the OLD NICK - NICKEL / COBALT PROPERTY: Rock Creek, BC, Canada

Introduction

In response to a request from Applied Mine Technologies Inc.'s, senior management, supporting documentation has been summarized on the technical approach currently being undertaken to forward the metallurgical concept for the Old Nick Property. This report outlines the perceived economic potential and the rationale for the proposed treatment methodology. It is supported by data and referenced material, including independent reviews.

Background

The Old Nick deposit is located in South Central British Columbia (BC), Canada (see Appendix, Figure 1) approximately three kilometers north of the international boundary. The site is 38 km east of Osoyoos, on the Trans-provincial Highway #3, near the town of Rock Creek. The deposit is located within 3 km of the highway, and 5 km from a mainline natural gas pipeline and electrical power transmission line. The existing mineral claims cover an area of approximately 20 sq. km. The topography of the Old Nick claims consists of gently rolling hills, with some steep creek drainage basins. The elevation of the deposit is approximately 1000 m. The region experiences generally warm, dry summers and mild winters, with average precipitation reported at 450 mm (18") annually.

The known mineralized zone was originally staked in 1955, but there is evidence of earlier prospecting on the site from older workings. Geological studies indicate high tonnage, low grade nickel/cobalt mineralization, which could be mined by open pit methods. The property was first optioned to Utica Mines and subsequently to Newmont Mining Corporation, who conducted substantial work in 1967 and 1968. The Newmont Report[7] suggested a resource of 0.15 to 0.25% nickel over an area of 800 m long, by 120 m wide and with drilled cross sections of up to 120 m. At the time the deposit was deemed uneconomic due to a complicated metallurgical treatment process and low nickel recovery, given at 56%. Subsequent geological studies were undertaken by others and in 1983 a Canadian Mineral Deposits Bulletin[9] listed Old Nick at more than 100 million tonnes at 0.22 % Ni. A 1996 study, including confirmation diamond drilling by Applied Mine Technologies and outlined by Livgard[5], estimated a potential resource of 0.18% Ni at 300,000 tonnes per vertical meter. Surface geochem anomalies elsewhere on the claims offer additional targets for exploration. Further geological work is required to define grade and mineable reserves at Old Nick.

To date, the deposit has received only limited attention, primarily due to the low indicated metal grade, of approximately 0.2% Ni and 0.01% Co. Conventional treatment for recovery of nickel sulphides is by capital intensive methods (including mineral processing and pyrometallurgical steps), which further discouraged development work.

The ore has also shown a poor response to these process methods, in particular, sulphide flotation which results in low nickel grade and recovery to the concentrate.

Despite such apparent shortcomings there are some important facts which must be taken into consideration for the property evaluation. Firstly, the material can be mined by low cost bulk mining techniques, and at current cobalt and nickel prices the contained metals are valued at $28/tonne. The economic value of the mineralized rock exceeds those of most large tonnage, hard rock mines (operating, planned and under construction) in BC. Also, due to a highly evolved infrastructure, skilled work force, and low cost electrical power, BC is able to support a lower grade base metal mine[15] than might be required in many other locations. Even more relevant is that recent advances in nickel hydrometallurgy allow for a simplified flowsheet that corresponds to lower capital and operating costs.

Process Concept

The metallurgical concept for Old Nick would be to utilize conventional technologies in a simple, effective, and innovative process combination. Based on current data and information this development will be focusing on heap leaching to be followed by SX-EW (see Appendix, Figure 2). The approach is thought to be somewhat unique for nickel ores, but appears to be well suited to Old Nick, owing to its particular geology and mineralogy. It is further supported by reagents recently developed for nickel hydrometallurgical process circuits. These reagents are beginning to be utilized by major mining companies world wide, as discussed in the following section.

The best analogy for commercial process comparison is copper leaching techniques. Copper which is the next element to nickel on the periodic table of elements is often heap leached in commercial operations. Heap leaching of both copper oxide and sulphide ores has been gaining rapid acceptance in the last decade. At current metal prices, if the price equivalent nickel content at Old Nick is converted to copper, the grade would equal 0.7% Cu. There would also be additional credits for cobalt. This would rank the deposit grade higher than most global copper producers and greater than that of any of the major copper mines currently operating in the province.

Heap leaching technology can be applied to nickel ores. While it is not a traditional process method for nickel (often due to acid requirements) it has been suggested[8,11,16] for a number of years by various sources. The column leach test results on the Old Nick material confirm amenability to biologically assisted heap leaching. The initial testwork has shown that the meta-sedimentary ore types result in nickel recoveries ranging from 50-65% in column tests, and 80-85% in tank tests. A large scale column leach test using 270 kg of drill core crushed to -3/4" has resulted in a nickel recovery of 50% after 7 months and recoveries are still increasing. Based on the best available information, heap leaching, despite the long retention times and lower overall metal recoveries appears to offer a higher return on investment than other process options[6]. Again as with copper, the economics suggest such techniques benefit lower grade, higher tonnage deposits, due to the lower capital and operating costs.

An important fact is a significant portion of the meta-sedimentary type Old Nick ore requires little or no acid addition to conduct leaching. This is often a major cost consideration for copper heap leaching operations. The mineralized rock also has a very low clay content and only trace concentrations of copper, zinc and other detrimental metals, which might complicate a Ni-Co extraction flowsheet. The climate is generally warm and dry which is a positive attribute for heap leaching. Minimizing acid requirements and optimizing leach conditions are the major factors in the development work. The acidic, pregnant leachate solution (PLS) produced from the column tests is being used for down stream metal recovery studies.

Nickel and cobalt in the PLS are purified by solvent extraction (SX) techniques using either liquid solvent or solid resin (ion exchange). Unlike the copper SX reagents, this procedure requires removing most of the soluble iron prior to nickel / cobalt extraction. The favored method for soluble iron reduction is by precipitation, accomplished by pH adjustment of the PLS. This can be conducted in neutralizing heaps and/or agitated tanks, utilizing acid consuming nickel cobalt ore. If necessary, there would be a polishing step using alkaline reagents such as limestone. The deposit does contain distinct zones of acid consuming ore, that have a similar nickel grade to the acid generating ore. Preliminary studies indicate that the acid consuming material allows for the necessary iron removal. From solubility diagrams and laboratory studies it also appears that additional metal credits can be expected from utilizing acid consuming portions of the ore to neutralize the PLS. The geological and metallurgical work for the conceptual flowsheet has shown that acid/base accounting of the various ore types might be balanced to dramatically reduce reagent costs.

In the past, the solution chemistry for nickel recovery from acidic circuits has proven to be a technical challenge. However, new nickel specific reagents have allowed SX to be advanced for nickel in acidic solutions[4,14]. Recent attention particularly to lateritic nickel ores is offering a number of commercial products which can also be applied to Old Nick. Both the lateritic and Old Nick PLS have nickel dissolved in an acidic iron sulphate medium. Vendor information, confirmed by scoping tests on the Old Nick PLS, show some of these reagents had an excellent response to the selective recovery of nickel and cobalt from the column solutions. In a commercial application the barren leach solution (raffinate) would be recycled to the heap. The metal values extracted are then stripped to an electrolyte.

Soluble nickel in the electrolyte is recovered by electrowinning (EW), to produce a final high grade metal product. A cobalt by-product, such as cobalt carbonate salt, also appears to be feasible. In nickel electrowinning the power consumption would require an additional ~3 kwhr/kg for metal deposition, as compared to copper. This should be partially offset by the lower power costs available in BC, as compared to most parts of the world. Depending on the assumptions used, the additional costs for nickel EW at Old

Nick, as compared to an equivalent copper EW circuit, should be in the range of $0.10-0.20/tonne. No EW tests have been conducted to date, but this technology is considered the most conventional in the proposed flowsheet. Similar technology has now been piloted and/or used by major companies for the processing of nickel sulphate solutions.

Project Comparisons

Some of the world's largest mining companies are actively involved in applying SX/EW technology for acidic solutions containing nickel. These companies include Inco[17], BHP[18], Cominco[19], Gencor[20] and Dominion Mining[21]. Relevant public information from these companies show studies are focusing on recovery of nickel and cobalt originating from either sulphide or lateritic ores, often after pressure leaching, or in the case of Gencor after bioleaching. Since most of the studies are considered proprietary, there is little cost information available. One exception is Dominion Mining's Yakabindie Project in West Australia, which has put out a number of information packages[21] to assist in obtaining financing.

Yakabindie has a resource described as 0.52% nickel, contained in mineable reserves of 142 million tonnes. Processing is described as crushing, grinding, flotation, fine grinding of the float concentrate, followed by pressure leaching and SX/EW. Flotation recoveries are given as 63.3%. Since the flotation tailing are disposed and only the concentrate goes to pressure leaching, this automatically drops the effective nickel grade to 0.33%. One of the positive features quoted by Yakabindie is its more simplistic and lower cost concept than conventional treatment. However, compared to heap leach operations, Yakabindie has a relatively capital intensive flowsheet, with a project cost of $480 million Australian (Australian and Canadian currency are currently approximately at par). The relatively high costs are partially attributed to the 4:1 waste:ore strip ratio and the need for a power plant. Operating costs are given as $16.94/tonne. Over 80% of the operating costs are for mining, concentration and infrastructure. Of the remaining amount, only a minor portion appears to be allocated to SX/EW.

For Old Nick the SX/EW would be the only major processing plant required. It is encouraging that the heap leaching approach could eliminate most of the expensive pretreatment requirements of a Yakabindie type circuit. This would substantially reduce both capital and operating costs. It should also be noted that due to the high acid consumption of Yakabindie ore, heap leaching was not considered as a process option.

There are no similar types of nickel operations that exist or are planned in Canada. However, for purposes of showing the economic potential of the deposit, it is a worthwhile exercise to compare Old Nick to BC mines currently under construction. There are three BC mines that have received a positive feasibility, with construction to be initiated in, or to be completed by the end of 1997. These mines are all large tonnage, low grade, base metal mines that include:

- Mount Polley located near Williams Lake and scheduled for startup in summer 1997. It is a copper gold mine utilizing crushing, grinding and flotation. The flotation concentrate is then shipped overseas for metal smelting and refining. Imperial Metals 1996 annual[23] report lists the deposit as 82 million tonnes grading 0.3% copper and 0.012 oz/t gold, resulting in gross metal value of about $16/tonne. The milling process rate is 18,000 tonnes/day. Capital costs are $124 million and operating costs are at a gold equivalent of $189/oz. Infrastructure included a 56 km power line.

- Huckleberry project is located 86 km south west of Houston and will have a permanent 250 man camp. The mine is scheduled for startup in late 1997 to produce copper concentrate. It has calculated mineable reserves at 90 million tonnes, grading 0.51% Cu with some molybdenum and precious metal credits[24], resulting in a gross metal value of $20/tonne. The flowsheet utilizes crushing, grinding, flotation and tailings disposal at a rate of 16,500 tonnes/day. Capital costs are 137 million dollars and at a recent presentation operating costs are projected to be approximately $6.50/tonne.

- Kemess project is located in Northern BC and scheduled for startup in mid 1998. Royal Oak[25] reports mineable reserves at 221 million tonnes grading 0.018 oz/t gold and 0.22 % Cu resulting in a contained metal value of about $17/tonne. The mining and processing costs for the 50,000 ton/day mill are given at $6.01/ton. Projected capital costs are $390 million. A $50 million, 320 km power line is required.

Compared to Old Nick, these deposits have lower contained metal values (see Appendix, Figure 3). The projects are also located in more remote locations in the province, thereby increasing capital infrastructure costs. The process circuits, while conventional, are more complex and costly compared to heap leaching, SX/EW. Heap leaching does not appear to have been an option for these properties due to the relatively poor leaching characteristics of a major copper mineral (chalcopyrite) present, and/or high acid requirements. These process circuits all use grinding, flotation, and shipment overseas of a sulphide concentrate for smelting. This process route is not the preferred treatment circuit for Old Nick. Instead the ore would be placed in large heaps on impermeable pads. The leach solution would be collected, upgraded and a high grade metal product produced on site.

While the property requires additional geological study, it is anticipated Old Nick would be similar in throughput to these new BC operations at an ore process rate of approximately 15,000-30,000 tonnes per day. As outlined by similar hard rock, open pit operations in the province, mining costs would generally tend to be 0.75 -1.50 $/tonne of material mined. Overall operating costs vary for these new mines at between 6-7 $/tonne. The cost per tonne will decrease with the economy of scale. The climatic conditions also lead to a possible zero discharge operation, which would benefit permitting requirements and associated environmental monitoring costs. Old Nick may well experience lower capital and operating costs due to a more favorable geographic location and simplified flowsheet. Actual costs would be determined by a feasibility study, which is dependent on additional geological and metallurgical work being conducted.

Gibraltar Mines Ltd., located near Williams Lake, BC is the only operation in the province which uses leaching followed by SX/EW for production of a cathode metal product. The Gibraltar SX/EW plant was built in 1986 at a reported cost of 12 million dollars and process operating costs have been reported at approximately 0.50 US$/lb Cu. The operation uses biologically assisted leaching in a colder climate than Old Nick. Heat is generated in the heap from the exothermic reactions resulting from sulphide oxidation.

Gibraltar's SX/EW plant is profitably treating material previously designated as waste. Expected copper recoveries are estimated at only 33%, from grades of less than 0.2% [22]. The low recovery is due in part to how one of the predominant copper minerals present (chalcopyrite), responds to leaching. It is theorized an impassive surface layer forms preventing higher metal dissolution at ambient conditions. The principal sulphides present at Old Nick respond favorably to biological leaching. As well at Gibraltar, dump leaching is used in which the ore is not crushed, but leached run of mine, thereby decreasing the overall surface area which is exposed to the leach solution, resulting in reduced recovery. Despite the low metal grade and recovery, the electrowon copper has been shown to be an economic benefit to the Gibraltar operation[27].

At Old Nick the leaching of nickel sulphides (primarily pentlandite) is anticipated to require longer heap leaching retention time as compared to copper oxide minerals, but with similar or improved leach kinetics as compared to copper sulphides. Most of the sulphides at Old Nick are present as pyrrhotite, a non-economic iron mineral which encapsulates the pentlandite. Fortunately, pyrrhotite is among the most reactive of all sulphide minerals. Leaching may be further augmented by forced aeration of the heaps as practiced by some copper sulphide heap leaching operators. This procedure improves kinetics by providing more oxygen for the biological and chemical reactions.

The positive aspect of the sulphides is that they can provide most, if not all of the acid requirements for metal dissolution. At Old Nick acid can subsequently be neutralized by acid consuming ore that will remove the bulk of the soluble iron and solubilize additional nickel and cobalt to the PLS.

Copper heap leach and SX/EW operations in Australia, the United States and South America[12] are rapidly becoming the method of choice where applicable. The method can be applied to most, but not all oxide and sulphide copper minerals. Chalcocite and chalcopyrite are two copper minerals which present difficulties. For oxide ores, up to 1/3 or more of operating costs can be for sulfuric acid. Sulphide minerals are leached under conditions which promote bioleaching (pH~2). Therefore, consumption of sulfuric acid is a critical parameter.

A recent SX/EW project that has received a positive feasibility is Lisbon Valley, located near Moab, Utah. This project makes a good comparison to Old Nick, as it appears to be a similar sized deposit, with similar climate and nearby infrastructure present. The Summo Minerals[26] profile of the project indicates a reserve of 46.5 million tons, grading 0.424% copper. Production rates are anticipated to be 11,600 tonnes/day. The capital cost including engineering, process equipment and infrastructure is given as $US 42 million ($C 58 million). Total operating costs are given as $US 0.47/lb copper, which based on the information provided should translate into approximately $C 5.50/tonne of ore.

Other recently developed properties utilizing SX/EW have reported operating costs in the range $US 0.30 - 0.60 per pound of recovered copper[13]. The information required to translate these costs into dollars per tonne was often not readily available. For those operations where cost per tonne could be inferred, it was typically in a range of $C 3.00 to $C 6.00/tonne. This comparison exercise offers encouragement in proceeding with a feasibility study on the Old Nick project, which as previously mentioned has contained nickel-cobalt values of $C 28/tonne.

A hypothetical economic return based in part on the above discussions, is attached in the Appendix as an addendum. Using a number of assumptions and the best information available to date, the project is shown to have the potential to generate a very favorable internal rate of return.

Summary

A literature search, and laboratory studies have provided encouraging data in supporting the Old Nick project concept. Using other similar new mine programs (as a basis for comparison) and independent evaluations, Old Nick was shown to be a viable prospect for evaluation. The high reserve potential, significant value of contained mineralization, and proven new technologies offer the potential for a significant return on investment.

In summary, a study for feasibility is warranted for Old Nick due to:

1) Independent geological studies[5,7,9,10] that have identified a nickel cobalt resource with the potential for further reserve expansion. Geological work has included geophysical and geochemical studies, as well as diamond and percussion drilling.

2) The site is situated in a geographically favorable area of the province. It is close to population centers and existing infrastructure. This allows for ready access to transportation routes, a natural gas line, mainline power transmission and a skilled work force.

3) The project economics appear to be favorable by innovatively utilizing conventional technologies. This is based on preliminary laboratory studies and assumptions used in an internal assessment report[6]. Further the technical concept has been reviewed and deemed worthy of continuing investigation by two separate and recognized external metallurgical consultants[2,3].

4) Process methods are available and are being conducted or considered by major mining companies for similar types of operations to produce either copper or nickel. Capital and operating costs data from various references has been reviewed, establishing a preliminary economic and technical baseline for collating.

5) A comparison was made to three large BC mining projects which have recently received positive feasibility studies and are currently under construction. These projects have more complex process flowsheets than the conceptual Old Nick flowsheet. They are also located in more remote areas of the province and have lower contained metal values in their ore[23, 24, 25]. This data would lend further economic support to pursuing the Old Nick program.

6) The property is located in the Okanagan region of South Central BC which has a semi-arid, temperate climate. The climate is well suited to heap leaching, currently the favored processing approach. There is a ready supply of fresh water for processing. Both the climate and conceptual flowsheet offer a favorable chance for an operation which has zero discharge of effluents.

7) A preliminary report by an independent environmental consultant shows no insurmountable obstacles for permitting the project[1].

REFERENCES

A: Applied Mine Technologies Inc. - Consulting Reports and Communications (available for viewing during office hours at Applied Mine Technologies Inc.)

1. Brodie Chris, Permitting Considerations for the Old Nick Property, February 1997, Hallam Knight Piesold Ltd., Vancouver BC

2. Dreisinger David, Phd. (University of British Columbia), P.Eng., November 1996, Written Communication on Process Review for Old Nick, Dreisinger D., Delta, BC

3. Hawthorn Gary, P.Eng., April 1997, Hydrometallurgical Process Development for the Recovery of Nickel and Cobalt from the Old Nick Deposit, WestCoast Mineral Testing Inc., North Vancouver BC

4. Lawson John, Cox Mike, Phd., March 1997, Written Communication on Development Reagent, Zeneca Specialties, Manchester, UK.

5. Livgard E., Nov. 1996, Report on the Old Nick Nickel Property, A Geological Assessment Recommendations and Estimated Costs, Livgard Consulting, Vancouver BC

6. Wright Frank R., December 1996, A Preliminary Evaluation of the Metallurgical Approach in Treating the Old Nick Deposit, Applied Mine Technologies Inc., Vancouver BC

B: Published / Catalogued Material

7. Coope J.A., Dolan W.M., Costin C.P., (Newmont Mining Corp.), May 1968, Geological, Geochemical and Geophysical Reports on the Nickel Ridge Property -Old Nick Option, Bridesville, BC

8. Corrans I.J., Scholtz M.T., May 1976, A Kinetic Study of the Leaching of Pentlandite in Acidic Ferric Sulphate Solutions, Journal of South African Institute of Mining and Metallurgy, Johannesburg, South Africa.

9. Energy Mines and Resources Canada, May 1983, Mineral Bulletin MR 198 (Canmet IR 71-34), Canadian Mineral Deposits Not Being Mined in 1983, Ottawa Ont.

10. Enns Steve G., 1971, The Old Nick Prospect - A Nickel Deposit in Southern British Columbia, Thesis for Faculty of Graduate Studies and Research, University of Manitoba, Winnipeg, Manitoba

11. Fundamental and Applied Biohydrometallurgy, Proceeding of the Sixth International Symposium on Biohydrometallurgy, Vancouver, BC, August 1985, Editors: Lawrence R., Branion R., Ebner H., Elsevier, New York 1986

12. Lynch A., Taylor A., Varas C.A., December 1994, Solvent Extraction Boom in Latin America, Engineering and Mining Journal, Chicago Ill.

13. Pincock, Allen & Holt, Copper SX/EW Seminar, Copper Leach Project Development, September 28-30, 1994, Lakewood Colorado

14. Ritcey GM, November 1996, Process Options Using Solvent Extraction for the Processing of Laterites, GM Ritcey and Assoc., Nickel 96 - Kalgorlie Australia

References (cont.)

15. Schreiber H., Kuestermeyer A., January 1994, Cordilleran Roundup, Vancouver, A Qualification of and Underlying Factors for Differences in Mine Operating Costs in Selected Countries and States or Provinces of the American Continents, Behre Dolbear & Co., New York

16. Patent 5,089,412, February 18, 1992, Hackl R.P., Wright F.R., Bruynesteyn A., Bacteria for Oxidizing Multimetallic Sulphide Ores, Giant Bay Biotech, Burnaby BC

17. Patent 5,378,262, January 3, 1995, Mihaylov et al., Process for the Extraction and Separation of Nickel and/or Cobalt, Inco Limited, Toronto, Ontario

18. Patent 5,571,308, November 5, 1996, Duyesteyn et al., Method for Recovering Nickel from High Magnesium Containing Ni-Fe-Mg Ore, BHP Mineral International Inc., Reno Nev.

C: Relevant Corporate Brochures and Information Packages

19. Cominco Ltd., 500- 200 Burrard St., Vancouver BC, V6C 3L7 - 1996 Annual Report

20. Gencor Ltd., Johannesburg, South Africa - 1996 Annual Report, Relevant Brochures, and Press Releases

21. Dominion Mining Limited, 10 Richardson St., West Perth, Western Australia, 6005,- Annual Report 1996, The Yakabindie Nickel Project Brochures, February 1996, November 1996, Western Minerals Technology Pty. Ltd. Randol Vancouver 1996.

22. Gibraltar Mines Ltd. (now part of Westmin Resources, below) - 1990 Annual Report

23. Imperial Metals Corp., 420-355 Burrard St., Vancouver BC, V6C 2G8 - 1996 Annual Report

24. Princeton Mining Corporation, 2000-1055 W. Hastings St., Vancouver BC, - 1996 Annual Report

25. Royal Oak Mines Inc., 5501 Lakeview Dr., Kirland Washington 98033, - 1996 Annual Report

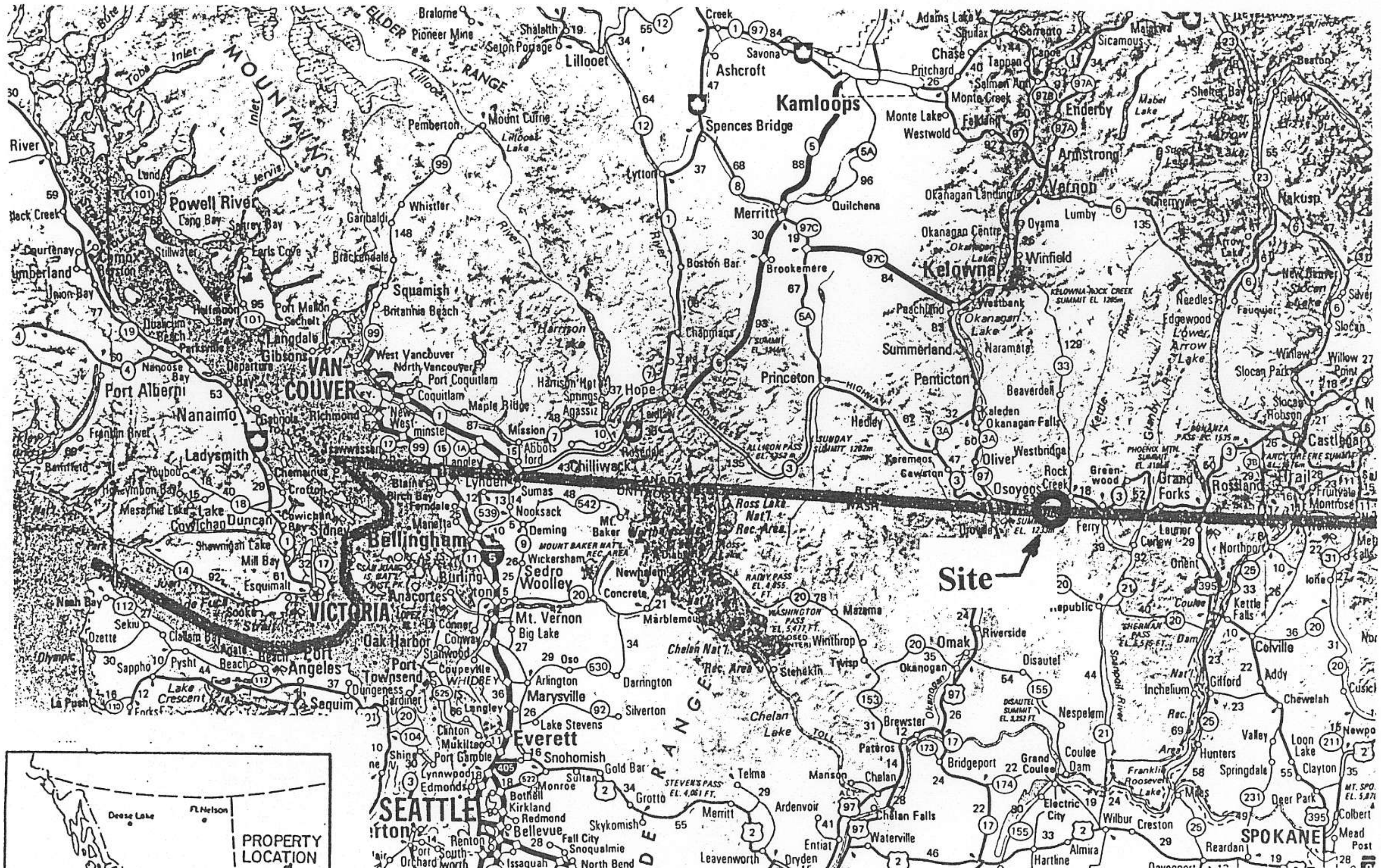
26. Summo Minerals Corp., 860 - 625 Howe St., Vancouver BC, 1996 Annual Report and March 25, 1997 Corporate Profile

27. Westmin Resources Ltd., 904 -1055 Dunsmuir St., Vancouver BC, V7X 1C4 - 1996 Annual Report

* Note metal prices (and related costs) used in this report are sourced from American Metal Market (March 17, 1997 listings), as quoted in the May 1997 edition of the Engineering and Mining Journal, Chicago Ill.

FW/H:/oldnick/metrep2.doc

APPENDIX



DRAWING NAME			PROJECT No.	
SITE LOCATION MAP			AMT-011	ROCK CREEK, B.C.
DRAWING No.	SCALE	REV.	PROJECT	OLD NICK
SITE-MAP	1cm=25Km	-		

DWG: SITEMAP

FIGURE 2: Conceptual Flowsheet

The Heap Leach, SX-EW Process (closed-circuit)

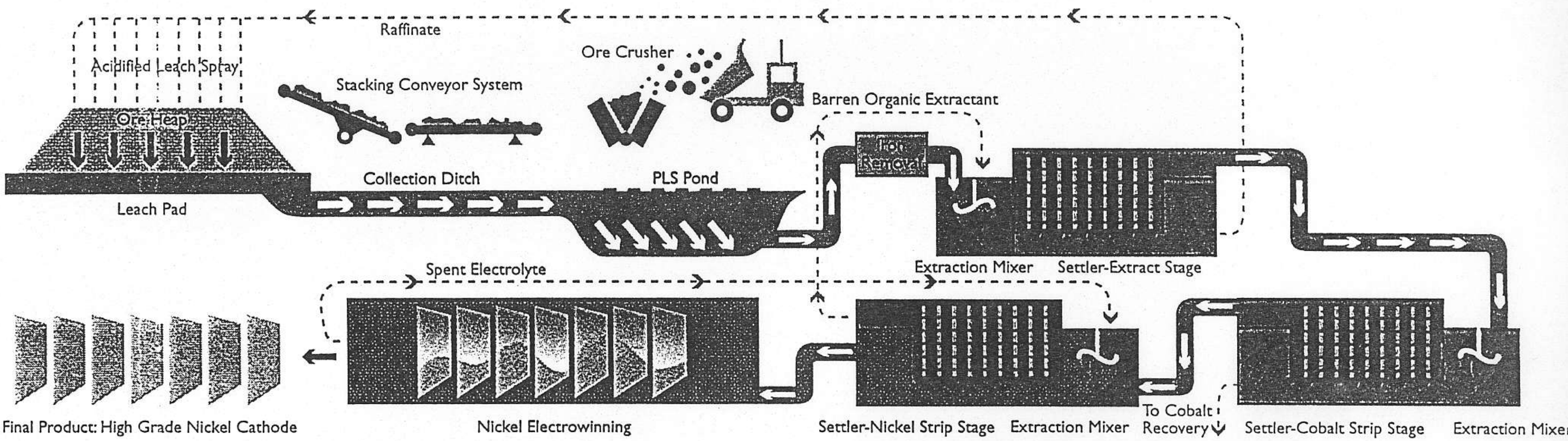
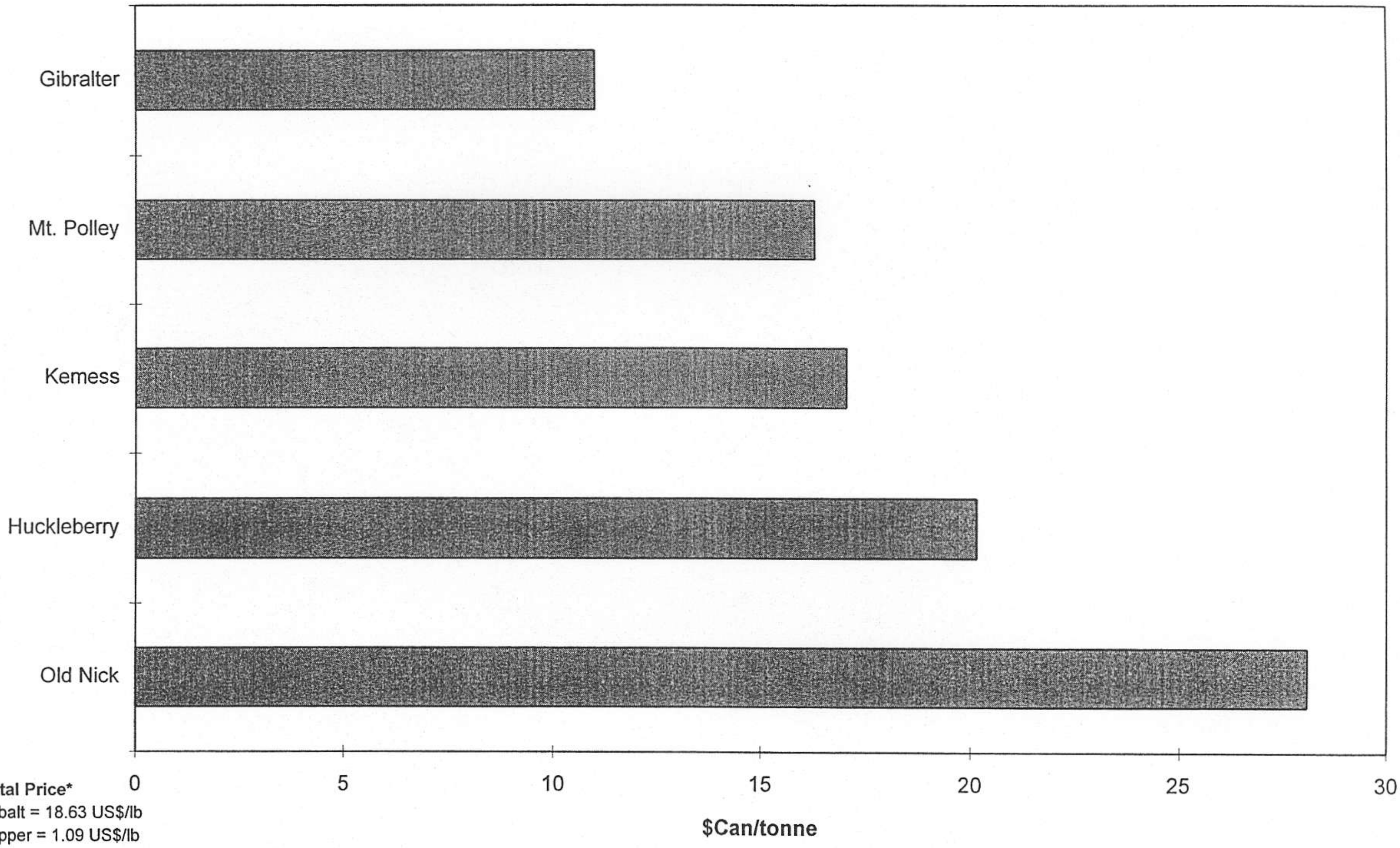


Figure 3 - British Columbia Mineral Deposits
Ranked by Deposit Gross Unit Metal Value



Metal Price*
Cobalt = 18.63 US$/lb
Copper = 1.09 US$/lb
Gold = 352 US$/oz
Nickel = 3.72 US$/lb
Silver = 5.27 US $/oz

*17/3/97 American Metal Market Quoted in May Engineering and Mining Journal

FW/H:metgrh2.xls
May 1997

Old Nick - Hypothetical Return on Investment (Crush Ore Heap Leach SX/EW [illegible]9 ton[illegible]y [illegible]-97

(based in part on Horseback numbers provided by J. Chapman, Gold City Mining)

	To Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Production												
Ore Processed (tonnes)		5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	50,000,000
Ni Grade (%)		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Co Grade (%)		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni Recovery (%)		60	60	60	60	60	60	60	60	60	60	60
Co Recovery (%)		50	50	50	50	50	50	50	50	50	50	50
Nickel Production (kg/yr)		6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	60,000,000
Cobalt Production (kg/yr)		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000
Revenue												
Nickel Revenue		67,394,794	67,394,794	67,394,794	67,394,794	67,394,794	67,394,794	67,394,794	67,394,794	67,394,794	67,394,794	673,947,936
Cobalt Revenue ($/yr)		14,063,228	14,063,228	14,063,228	14,063,228	14,063,228	14,063,228	14,063,228	14,063,228	14,063,228	14,063,228	140,632,281
Total Revenue ($/yr)		81,458,022	81,458,022	81,458,022	81,458,022	81,458,022	81,458,022	81,458,022	81,458,022	81,458,022	81,458,022	814,580,217
Total Revenue ($/tonne)		16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29	16.29
Unit Operating Costs ($ Can/tonne processed)												
Mining (Increasing Strip Ratio)		2.00	2.00	2.00	2.50	2.50	2.50	3.00	3.00	3.00	3.50	2.60
Crushing		0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Heap Leaching Ore		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SX/EW (Co to refining)		1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
G&A/Services/Misc		0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Total		6.00	6.00	6.00	6.50	6.50	6.50	7.00	7.00	7.00	7.50	6.60
Operating Costs												
Mining (Increasing Strip Ratio)		10,000,000	10,000,000	10,000,000	12,500,000	12,500,000	12,500,000	15,000,000	15,000,000	15,000,000	17,500,000	130,000,000
Crushing		3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	37,500,000
Heap Leaching Ore		5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	50,000,000
SX/EW		7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	75,000,000
G&A/Services/Misc		3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	37,500,000
Total		30,000,000	30,000,000	30,000,000	32,500,000	32,500,000	32,500,000	35,000,000	35,000,000	35,000,000	37,500,000	330,000,000
Operating Cash Flow												
Cash Flow ($/tonne)		10.29	10.29	10.29	9.79	9.79	9.79	9.29	9.29	9.29	8.79	9.69
Total Cash Flow ($)		51,458,022	51,458,022	51,458,022	48,958,022	48,958,022	48,958,022	46,458,022	46,458,022	46,458,022	43,958,022	484,580,217
Capital Cost ($ Can)												
Mine (Non-contract)	30,000,000		1,500,000		1,500,000		1,500,000		1,500,000			36,000,000
Buildings	2,000,000											2,000,000
Crushing/Stacking	10,000,000											10,000,000
Leach(Pond&Pads)/SX/EW	20,000,000											20,000,000
General Site	5,000,000	1,000,000		1,000,000		1,000,000						8,000,000
Power and Water	6,000,000											6,000,000
Tailings	0		0		0		0					0
EPCM	5,000,000											5,000,000
Sub-total	78,000,000	1,000,000	1,500,000	1,000,000	1,500,000	1,000,000	1,500,000	0	1,500,000	0	0	87,000,000
Contingency/Indirects	7,800,000	100,000	150,000	100,000	150,000	100,000	150,000	0	150,000	0	0	8,700,000
Reclaimation	0	0	0	0	0	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	12,000,000
Total	85,800,000	1,100,000	1,650,000	1,100,000	1,650,000	3,100,000	3,650,000	2,000,000	3,650,000	2,000,000	2,000,000	107,700,000
Net Cash Flow	-85,800,000	50,358,022	49,808,022	50,358,022	47,308,022	45,858,022	45,308,022	44,458,022	42,808,022	44,458,022	41,958,022	376,880,217
Net Pres.Value(@10%,tables)	-85,800,000	45,775,442	41,141,426	37,818,874	32,311,379	28,477,831	25,553,724	22,806,965	19,991,346	18,850,201	16,195,796	203,122,985
Assumptions:										Mine Operating Life (yrs):		10.0
Metal Price/Exchange*	$US/lb	$US/kg	Can Exch	$Can/kg	* based American metal market listings March 17, 1997							
Nickel Price	3.72	8.20	1.37	11.23					Internal (Discount Cash Flow) Rate of Return (%):			42.3
Cobalt Price	18.63	41.06	1.37	56.25								H fw/oldnick/oncost2.xls