Gold City Mining Corporation; VSE.GCP
Orion International Mineral Corp.; VSE.OIM
Phoenix Gold Resources Ltd.; VSE.PHO

#96-01

JOINT NEWS RELEASE

FEBRUARY 9, 1996 FOR IMMEDIATE RELEASE

MEMORANDUM OF UNDERSTANDING SIGNED TO DEVELOP OLD NICK DEPOSIT

Vancouver, B.C.: Mr. John A. Chapman, President & CEO of Gold City Mining Corporation, is pleased to announce that the Rock Creek Gold Trend Joint Venture ("RCGTJV"), Gold City Mining Corporation, Phoenix Gold Resources Ltd., and Orion International Mineral Corp. have entered into a Memorandum of Understanding with Guy F. Atkinson Holdings Ltd. with respect to exploration and development of the Old Nick nickel and cobalt deposit near Bridesville in Southern British Columbia. A Formal Agreement, which is being prepared, will be subject to board and regulatory approval.

Ownership of the Old Nick claims will be transferred to a new company owned by the participants of the RCGTJV. Initial equity interest in the new company will be Gold City, 50%; Phoenix Gold, 25%; Orion International, 25%. These owners will retain a 3% NSR up to receipt of $10 Million and thereafter a 1% NSR, on a pro-rata basis, in their Old Nick property. Atkinson has the right to earn up to a 70% equity interest in this company by spending $8 Million over the next four years on the development of the Old Nick property through to a bankable feasibility study.

The Old Nick is a unique sulfide deposit that has 30 million drill indicated tonnes grading 0.22% nickel and 0.015% cobalt. Previous operators estimated the deposit could contain in excess of 100 million tonnes. At present metal prices the contained gross metal value is $30 per tonne.

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For further information contact:

John Chapman, President, Gold City Mining Corporation, at 604.682-7677
John Carson, President, Phoenix Gold Resources Ltd., at 604.442-2406
Robert Miller, President, Orion International Mineral Corp., at 604.445-6184

Atkinson

Atkinson is a leading, full-service construction company, operating worldwide principally through three companies: Atkinson Construction, Commonwealth and Walsh Construction. In its long history, it has helped build what are widely recognized as some of the world's major engineering and construction achievements.

Atkinson Construction is one of the largest contractors of heavy civil projects, serving both public and private sectors, working not only in the U.S., but also internationally. Projects include hydroelectric power, bridges, highways, dams, tunnels and shafts. It also has extensive experience with water and wastewater treatment facilities.

Commonwealth serves a variety of industrial markets including pulp and paper, mining, metallurgical processing, water and wastewater treatment, and energy throughout the Americas and Southeast Asia. It also is active in markets for power generation and process facilities for oil and gas, chemical and petrochemical as well as general industrial construction.

Walsh Construction is a major provider of design-construct services to both the power and building markets. Its power experience includes geothermal and cogeneration development, using fuels ranging from gas and coal to municipal solid waste and biomass. Its buildings are equally diverse, encompassing commercial, industrial, institutional and R&D laboratory facilities.

Besides construction expertise, Atkinson's capabilities embrace a wide range of construction-related services including engineering design, feasibility studies, regulatory approvals, financing, bonding, equipment procurement and installation, plant start-up, and operator training.

082ESW055

GOLD CITY MINING CORPORATION

OLD NICK

Ni, Co

SUMMARY The Old Nick Nickel Deposit is located in South-Central British Columbia, just north of the U.S. border, and south-west of the village of Rock Creek. This unique surface-minable sulphide deposit has been estimated to contain in excess of 100 million tonnes grading 0.22% nickel and 0.015% cobalt.

PROPERTY The Old Nick deposit is located at 49° 04'N and 119° 06'W, 36 kilometres east of Osoyoos, B.C. and just south of the main Trans-Provincial Highway #3. Services and accommodation are available at the Town of Rock Creek, 10 kilometres east of the Property. Topography is characteristic of a glaciated, maturely-eroded highland, with stands of fir, pine and scrub grasslands. Access to the property is from highway #3 at Rock Creek, onto the abandoned Great Northern Railway right-of-way which passes through the heart of the deposit. Within the deposit, there are numerous logging, mining and drill roads which allow for vehicle access. This property is controlled by the Rock Creek Gold Trend Joint Venture.

GEOLOGY Generally, the property is underlain by rocks of the Permian (and/or) Triassic Anarchist Group (greenstone, quartzite greywacke), which have been intruded by Cretaceous Nelson plutonic rocks (granodiorite, quartz diorites, and monzonites) and by ultra-basic magnetic dykes, also of the Nelson series. The structure of the area has been described as being complex with the bedding tightly folded and cut by several fault trends, the dominant being north-westerly.

MINERALIZATION Nickel sulphide mineralization occurs in two rock types: (a) in peridotitic dunite rocks as pentlandite occluded in pyrrhotite; pentlandite and pyrrhotite occurring in amphiboles, serpentine and talc in the altered dunite, and (b) in pyrometasomatic quartzite of the Anarchist Group; pentlandite in minute inter-growths with pyrrhotite and pyrite in fine sericitic-chloritic veinlets.

The pentlandite mineralization occurs in pyrometasomatic quartzite, as a band, "2,600 feet long and approximately 400 feet wide, and in adjacent peridotitic-dunite dykes. Petrological work on the mineralized quartzite has revealed the presence of minute injections of basic rock into the sediments. The pentlandite is closely associated with these injections"[1] - "Nickeliferous zones, grading 0.15 to 0.25% nickel, were found to be remarkably uniform and continuous within the quartzite horizon."[1]

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1 Coope, J.A.; Dolan, W.M.; Costin, C.P. Geological, Geochemical, and Geophysical Exploration of the Nickel Ridge Property (Old Nick Option), Bridesville, B.C. Newmont Mining Corp. of Canada Ltd., May 7, 1968.

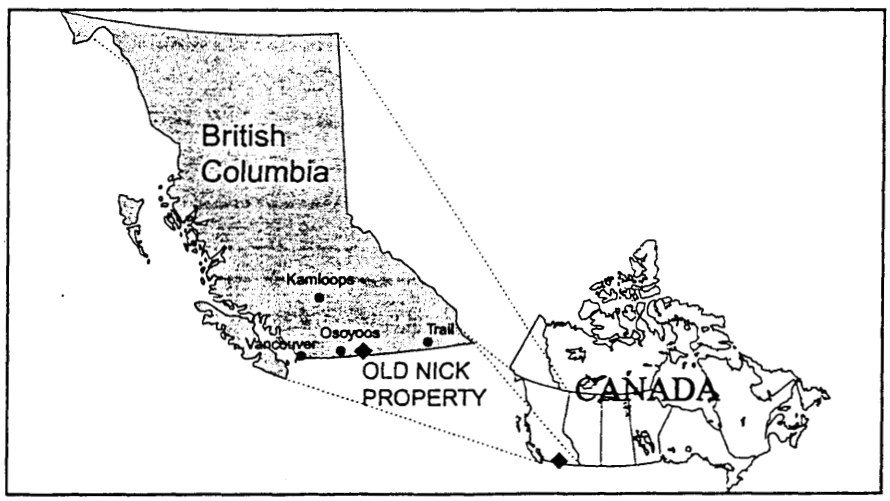
EXPLORATION HISTORY Since discovery by prospecting in 1955, considerable exploration and development work has been completed, including geological mapping, stream sediment geochemistry, soil geochemistry, ground magnetics and EM, airborne magnetics, trenching, percussion drilling, diamond drilling and metallurgical testing. The property has had the benefit of investigation by major mining companies including Newmont in the 1960's.

MINERAL RESERVES Detailed information in support of the quoted mineral inventory at the Old Nick is being obtained by the Company. Mr. E. Livgard, B.Sc.,P.Eng., in a report dated May, 1982 states that nickel mineralization is "*about 120m thick and extends for about 1,500m in an overturned anticline". "The values are in Nickel (0.25%), Cobalt (0.03%) and minor Copper, Silver and Gold.*" Crown Resources Corp. in an Assessment Report dated June, 1991 states "... *Newmont Mining Corp., Nickel Ridge Mines Ltd., and Utica Mines Ltd. have carried out extensive exploration programs, including drilling, that has outlined a minimum of 100,000,000 tons of 0.22% nickel...*" Newmont reports that by using a flotation process, nickel recoveries of 75% would be anticipated.

PROPERTY POTENTIAL The Property has excellent potential for development as a large-scale +20,000 tonnes of ore per day open-pit operation with either:

- an agitated leach, solvent-extraction and electrowinning plant, or
- a heap leach, solvent-extraction and electrowinning plant.

Recent advances in bio-leaching and ferric chloride leach applications have demonstrable applications at Old Nick. The property location, in British Columbia's driest and warmest region (semi-desert), is a positive attribute for whole-rock leach operations. Soil and silt geochemical surveys and geological mapping indicate there is good potential to expand the known nickel cobalt mineral reserves.



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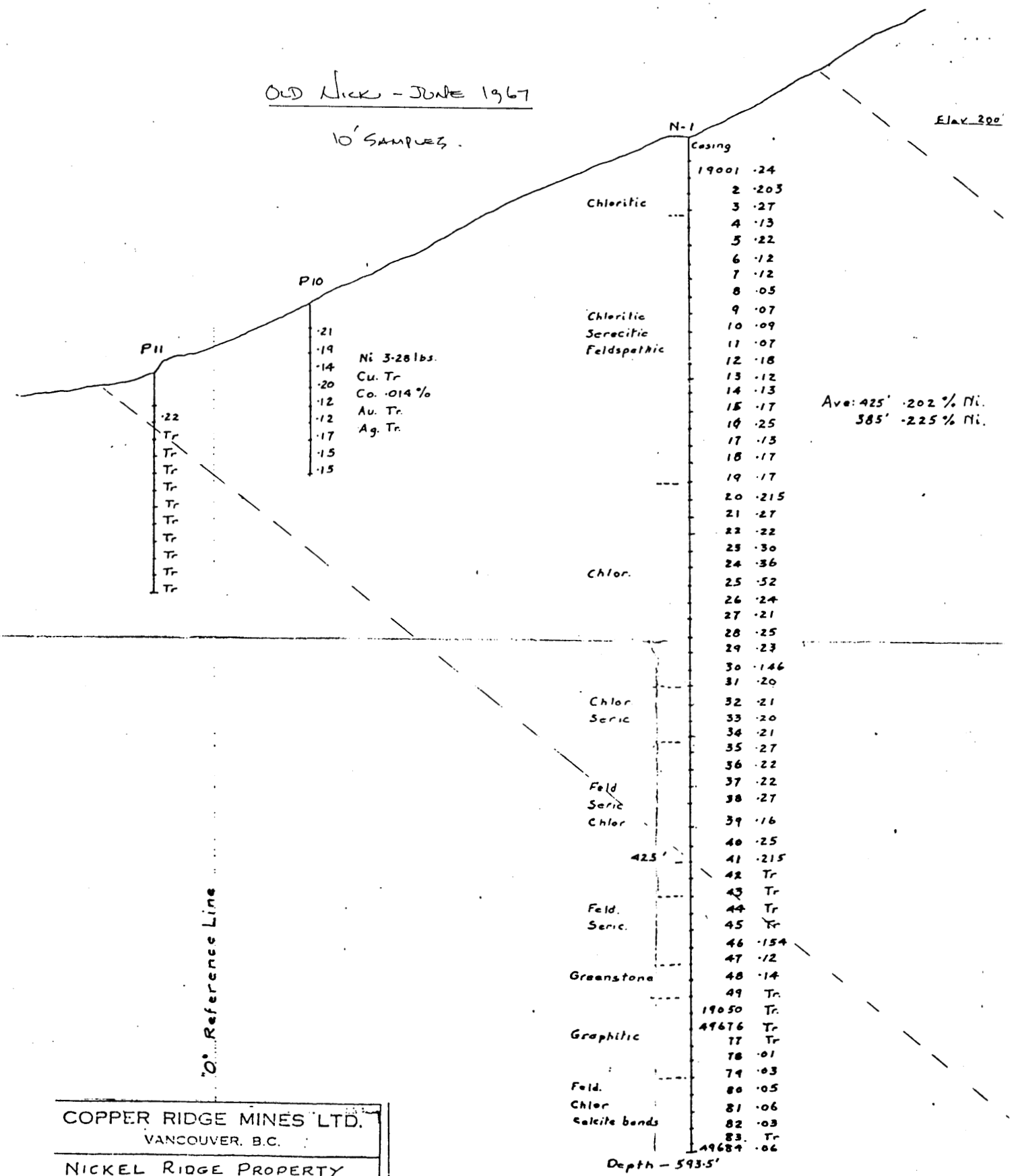


COPPER RIDGE MINES LTD.	
VANCOUVER, B.C.	
NICKEL RIDGE PROPERTY	
ROCK CREEK, B.C.	
SECTION 800' EAST	
SCALE: ~~1" = 50'~~	DRG. NO.
DRAWN BY: C.H.D.	S-1.
TRACED BY: C.H.D.	
DATE: June 5 1967	

2. Remobilization of nickel contained in earlier formed primary silicates by fluid phases invading the crystalline ultrabasic rocks followed by dispersion into the sedimentary horizons. Fluid phases capable of this remobilization may have been: (a) granitization fronts or; (b) volatiles from late stage cooling of the Nelson Intrusives. The composition of these mobilizing phases were such as to allow separation and crystallization of sulphide minerals.

The second mode of genesis (2) is favoured.

ECONOMIC CONSIDERATIONS

Grade of Mineralization

1. Previous Drilling

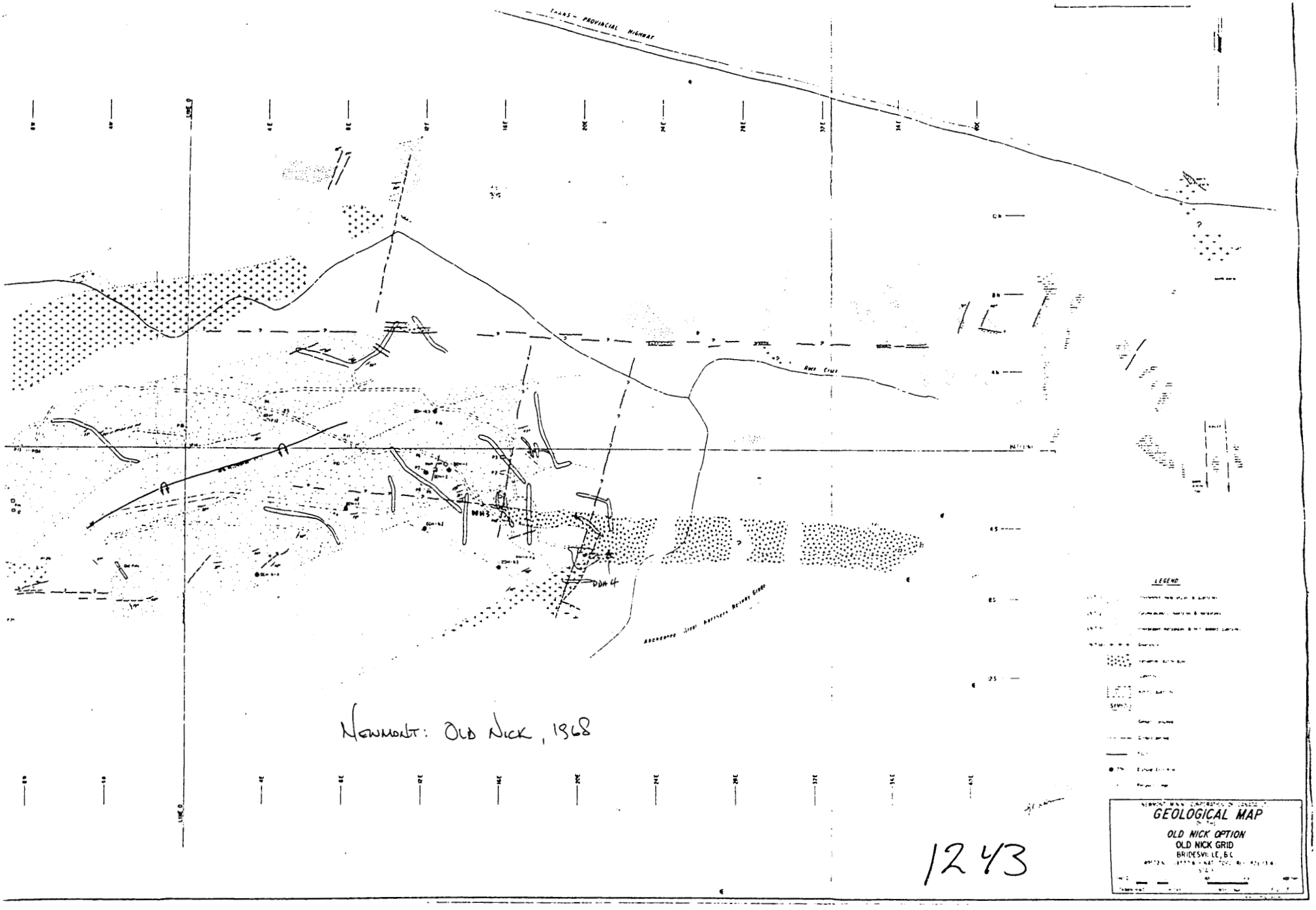
Nine diamond drill holes and 26 percussion holes were drilled on the Nickel Ridge property by Utica Mines and Copper Ridge Mines. The majority of these holes were drilled on the Old Nick grid (Figs. 3 and 4). All holes were assayed for nickel.

Four short diamond drill holes (DDH 1 - DDH 4) were drilled by Utica Mines in 1966. Holes DDH 1 - DDH 3 were collared in nickeliferous quartzite and DDH 4 in a peridotite dyke. DDH's 1 - 3 intersected grades of 0.15 to 0.26% nickel in quartzite and 0.10 to 0.33% nickel in basic intrusive rock. Assayed sections of peridotite dyke rock in Hole 4 grade 0.15 to 0.22% nickel.

Relatively deep diamond drill holes (DDHN 1 - DDHN 5) were drilled by Copper Ridge Mines in 1967. Holes DDHN 1 and DDHN 2 intersected nickeliferous quartzite and give a good picture of mineralization at depth. Hole DDHN 1, collared in nickeliferous quartzite, indicates a minimum apparent width of 420 feet of mineralized quartzite, grading 0.195% nickel. Typically, grades range from 0.07% nickel to 0.26% nickel. One 10 foot section returned an anomalous 0.52% nickel. Hole DDHN 2 intersected an apparent width of 272 feet of nickeliferous quartzite with grades ranging from 0.05% nickel to 0.25% nickel. Holes DDHN 3, DDHN 4, and DDHN 5 failed to intersect significant mineralization, hole DDHN 3 being lost before reaching its projected target.

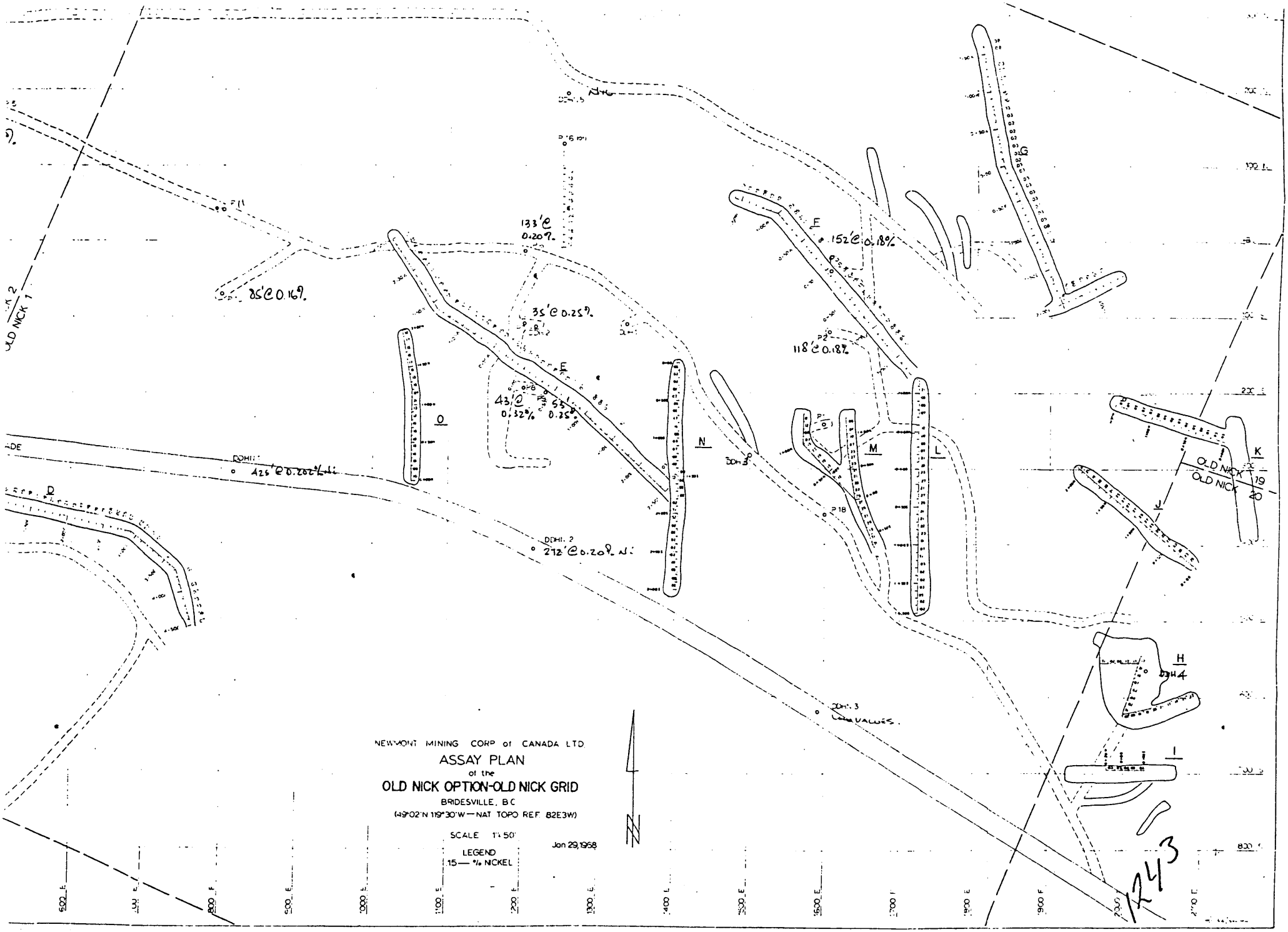
A number of percussion drill holes, 40 feet to 200 feet in length, were drilled by Copper Ridge Mines with an Atlas Copco O.D. drill (Figs. 3 and 4). Holes P 2, P 3, P 5 to P 10, P 12, and P 16 intersected significant nickel mineralization in quartzites and holes P 19 to P 23 intersected nickel bearing peridotite dykes. Assay results are summarized below:

Hole Number	Nickel Grades
P 2	0.18% Ni/22' - 140'
P 3	0.175% Ni/5' - 157'
P 5	0.082% Ni/3' - 103'
P 6	0.196% Ni/12' - 145'
P 7	0.25% Ni/5' - 40'
P 8	0.32% Ni/17' - 60'
P 9	0.245% Ni/7' - 60'
P 10	0.164% Ni/15' - 100'
P 12	0.171% Ni/12' - 125'
P 16 (Flat hole - Fig. 4)	0.152% Ni/32' - 137'
P 19	0.085% Ni/120' - 200'
P 20	0.22% Ni/10' - 80'
P 21	0.19% Ni/30' - 70'
P 22	0.214% Ni/2' - 95'
P 23	0.205% Ni/110' - 130'



NEWMONT: OLD NICK, 1968

1243


NEWMONT MINING CORP of CANADA LTD.
ASSAY PLAN
of the
OLD NICK OPTION-OLD NICK GRID
BRIDESVILLE, B.C.
(49°02'N 119°30'W — NAT. TOPO REF. 82E3W)
SCALE 1" = 50'
Jan 29, 1968
LEGEND
15 — % NICKEL
OLD NICK 1
OLD NICK 2
OLD NICK
DDH 1
425' @ 0.202% Ni
DDH. 2
272' @ 0.20% Ni
DDH. 3
Low VALUES.
DDH 4
133' @ 0.20%
85' @ 0.16%
35' @ 0.25%
43' @ 0.32%
55' @ 0.25%
118' @ 0.18%
152' @ 0.18%
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P1
P2
P6
P8
P18
500 E
600 E
700 E
800 E
900 E
1000 E
1100 E
1200 E
1300 E
1400 E
1500 E
1600 E
1700 E
1800 E
1900 E
2000 E
2100 E
100 N
200 N
300 N
400 N
500 N
600 N
700 N
800 N
900 N
1243

1243

AIRBORNE MAGNETOMETER SURVEY
of the
NICKEL RIDGE CLAIM GROUP

BRIDESVILLE, B.C.

Gold City Mining Corporation

Suite 600 - 750 Cambie Street ❖ Vancouver, B.C., V6B 5E5 ❖ Telephone: (604) 682-7677 ❖ Facsimile: (604) 682-0089

NEWS RELEASE

VSE:GCP #95-15
NOVEMBER 1, 1995 FOR IMMEDIATE RELEASE

OLD NICK DEPOSIT
METALLURGICAL TEST RESULTS

Vancouver, B.C., John Chapman, President, reports additional positive results from agitated leach tests on Old Nick deposit samples containing nickel and cobalt (refer to News Release #95-13 of September 21, 1995 for prior results).

Sample Number	Rock Type	Grade Ni% / Co%	Particle (% -75μ)	Retention (hours)	Nickel (% extracted)	Cobalt (% extracted)
ON-1	Quartzite	0.15 / 0.02	75	25	81	80
ON-2	Quartzite	0.16 / 0.01	91	48	92	60
ON-3	Dunite	0.22 / 0.01	81	48	87	76

Results indicate that there may be potential to leach this very large surface-exposed sulfide nickel/cobalt deposit (may be the largest in British Columbia). The Deposit is located within three kilometres of mainline power and natural gas, and immediately adjacent to Highway #3 at the Town of Bridesville in Southern British Columbia. The Deposit may be large enough to support an open-pit operation and an adjacent 20,000 tonne per day whole rock leaching plant.

The bench scale agitated leach tests were run under weak acidic conditions at atmospheric pressure. Leaching tests are being conducted in Burnaby, B.C. by International Water Solutions Corporation. The leach solutions will be further tested, by other laboratories, using SX (solvent extraction), precipitation and EW (electro-winning) methods to determine the viability of these modern methods to produce marketable nickel and cobalt from Old Nick.

Negotiations are being conducted between Gold City and a major company, toward an arrangement whereby the major could become involved in further exploration and development of the Old Nick property.

The Old Nick deposit is controlled by the Rock Creek Gold Trend Joint Venture. The Joint Venture consists of Gold City Mining Corporation (49%), Phoenix Gold Resources Ltd. (25.5%) and Sway Resources Inc. (25.5%).

Gold City Mining Corporation shares are traded under the ticker symbol GCP on the Vancouver Stock Exchange.

- 30 -

For further information contact John Chapman at 604.682.7677

Gold City Mining Corporation

Suite 600 - 750 Cambie Street ◆ Vancouver, B.C., V6B 5E5 ◆ Telephone: (604) 682-7677 ◆ Facsimile: (604) 682-0089

VSE:GCP **NEWS RELEASE** #95-13

SEPTEMBER 21, 1995 FOR IMMEDIATE RELEASE

OLD NICK DEPOSIT, METALLURGICAL TEST RESULTS

Vancouver, B.C., John Chapman, President reports positive results from agitated leach tests on Old Nick deposit samples containing nickel and cobalt. Results indicate that there may be potential to leach this very large surface exposed sulfide deposit, located adjacent to Highway 3 at Bridesville in Southern British Columbia.

The bench scale agitated leach tests were run under weak acidic conditions at atmospheric pressure on a 10 kilogram sample ground to 65% minus 45 microns (325 mesh). At 25 hours, 81% of the nickel and 80% of the cobalt were released to solution. Two similar tests have just been completed on samples from different parts of the Old Nick deposit and leach solution assays are pending. Also, column leach tests will commence next week on a sample crushed to minus one centimetre diameter. Leaching tests are being conducted in Burnaby, B.C. by International Water Solutions Corporation. The leach solutions will be further tested, in other laboratories, using SX (solvent extraction), precipitation and EW (electrowinning) methods to determine the viability of these modern methods to produce marketable nickel and cobalt from Old Nick.

The Old Nick is a unique sulfide deposit that has been estimated by previous operators to contain in excess of 100 million tons grading 0.22% nickel and 0.015% cobalt. At present metal prices the contained gross metal value is $3,000,000,000 ($30 per ton). Gold City management estimates that there is a mineral inventory of 30,000,000 tonnes based upon drilling and trenching done by: Utica Mines Ltd. (1966), Copper Ridge Mines Ltd. (1966), and Newmont Mining Corporation of Canada Limited (1967 & 1968). There is excellent potential to expand the mineral inventory down dip and along strike. In a May 1968 report by Newmont, the authors describe the deposit as follows: "Pentlandite mineralization was found in a pyrometasomatic quartzite band, 2,600 feet long and approximately 400 feet wide, and in adjacent peridotite-dunite dykes....nickeliferous zones grading 0.15% to 0.25% nickel, were found to be remarkably uniform and continuous within the quartzite horizon". In report IR71-34 (1971) prepared by the Department of Energy Mines and Resources, Ottawa, Canada, the authors determined that the nickel occurs as pentlandite in very small grains (average 35 microns).

A mid October meeting has been scheduled between Gold City and a major company, to discuss an arrangement whereby the major could become involved in the further exploration and development of the Old Nick property.

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- 30 -

For further information contact John Chapman, President, 604.682.7677

diamond miner, accounted for 80% of MMC's revenue.

Separately, Plutonic will shortly begin mining rich underground veins at its Plutonic gold mine in Australia. Ronald Hawkes, managing director, believes the area to be of the same calibre as mined zones in the main pit area of the mine, which has already yielded 1.4 Moz of recoverable gold.

Development

Gencor Technical Input

Gencor Ltd of South Africa has entered into an agreement with Maggie Hays Nickel, a wholly-owned subsidiary of Forrestania Gold of Australia to further develop the Lake Johnston Nickel project in Western Australia and increase production to 14,000 t/y nickel. Gencor will provide the technical input which will include the BioNIC™ process, a new approach to nickel extraction, based upon Gencor's proven process for the bacterial oxidation of refractory ores.

Gencor, through its subsidiary Minsaco Resources, will earn up to 50% equity in the project within two years and, in addition to the technical assistance, it will contribute SA5 million of a SA6.6 million exploration budget to be spent over the two years.

A study is being undertaken to determine the best location for the BioNIC™ plant. In the event that the BioNIC™ process does not achieve the anticipated improvements, Gencor will earn a 25% interest in the project, with an option to acquire a further 25%, solely by expending the next SA10 million of project expenditures.

Codelco Investment In 1995

Chile Copper Corp. (Codelco) is expecting SUS2,550 million in operating revenues in 1995, assuming an average copper price of 96 c/lb. The state-owned copper company is forecasting SUS350 million of new investment next year. The new investment figure includes funds to be allocated for projects already underway as well as new projects. Money will be allocated after projects have been evaluated by the Chilean Copper Commission and the Planning Ministry.

Industrial Disease Report

The Ontario Mining Association (OMA) has released its submission to the Workers' Compensation Board (WCB) in response to the Industrial Disease Standards Panel (IDSP) report no. 12 on lung cancer in the hardrock mining industry. The OMA maintains that the IDSP report presents no evidence of current lung cancer risk from current mining exposures: any excess lung cancer cases appear to be restricted to uranium miners in the earliest periods of the industry, gold miners prior to 1945 and nickel miners prior to 1936.

OMA suggests that a comprehensive study of lung cancer as a public health issue should be conducted to identify the prevailing causes of the disease among the mining population and any potential workplace related risk. Whilst OMA supports the principle of compensation entitlements where work has been the cause, it believes that the WCB was not presented with properly supported scientific and legal evidence to determine if lung cancer is an industrial disease related to hardrock mining.

Alumax Disposal

Alumax Inc. of the U.S. is to sell its wholly-owned subsidiary, Prime Metals Company, to Reynolds Metals Co. Negotiations have been continuing since June when a proposal was made. Prime Metals distributes aluminium and steel mill products through six facilities located across the United States.

Cyprus Receives Safety Award

Cyprus Sierrita Corp., part of the metals unit of U.S.-based Cyprus Amax Mineral Co., has been named the nation's safest open pit mine for 1993 by the U.S. Mine Safety and Health Administration (MSHA) and the American Mining Congress (AMC), co-sponsors of the Sentinels of Safety award.

Begun in 1925, the Sentinels of Safety awards are considered the U.S. mining industry's most prestigious recognition of safety achievement. The awards honour mines in eight categories that have worked the most employee hours during the year without suffering lost-time injuries. The Cyprus Sierrita copper mine was declared the safest open pit mine with 741,966 employee hours worked without a lost-time injury.

Companies Vie For Indian JV

Twenty of the world's largest mining companies are in a race to set up joint ventures with Bharat Gold Mines Ltd (BGML) in India. The companies have submitted bids in response to the recent gold tender floated by BGML.

The companies include American Barrick Resources Corp., General Gold Resources, BRGM, Niugini Mining Co. Ltd, CRA Exploration Ltd, and RTZ Corp. Mr. I. G. Jhingram was reported as saying, "The collaboration with BGML will not just be technical but also financial."

Besides setting up joint ventures, a host of foreign companies have applied for mining leases in various states, for example CRA has applied for a total of six in as many states.

China Lures Foreign Funds

China will gradually allow foreign investment participation in exploring its mineral resources, with the exception of uranium, tungsten, tin and rare earths. More than 100 areas are open to investment and the number is to increase progressively. According to Song Ruixiang, Minister of Geology and Mineral Resources, a total of 28 Sino-foreign joint ventures have been formed to prospect for minerals and a further 60 to explore for oil and gas.

Ilo Port Consortium

Southern Peru Copper Corp. (SPCC) plans to join two other firms in a venture to bid for a 30-year concession to run the port of Ilo. SPCC has signed a letter agreement with a Peruvian and a Bolivian company both, as yet, unnamed. The port on the Pacific coast, 1,300 km south of Lima, is part of the Ilo free-trade zone through which Peru has granted Bolivia access to the ocean. SPCC, 53.2%-owned by U.S.-based Asarco Inc., is Peru's largest copper producer. From its mines at Cuajone and Toquepala, SPCC accounts for 65% of Peruvian copper output. The company expanded its investment when it bought the Ilo copper refinery in a state privatisation sale four and a half months ago (*MJ*, June 10, p.425).

Berenguela Auction Postponed

The auction of a concession to explore and develop the polymetallic Berenguela deposit in southern Peru has been postponed until next month. An advertisement has been taken out in the official gazette *El Peruano* stating that the auction will be held in early October to give prospective bidders more time to study the project. Berenguela, located at 4,200 m above sea level, contains an estimated 14.3 Mt of minerals, including silver and copper. The deposit, to be developed as an open pit, is situated in Puno department 800 km south of Lima.

Royal Gold Begins Production And Revises Resource

Royal Gold Inc. of Denver, Colorado, U.S., began production this week from the Crescent open-pit at its South Pipeline gold project in Nevada. Coincidentally, Royal Gold has upgraded the resource to an estimated 4.4 Moz gold (from 3.68 Moz) following a recently completed exploration programme. The project, in which Royal Gold holds a 20% net profits royalty interest, involves some 4,000 ha of mining claims in the Cortez district, in the Crescent Valley, Lander Co., Nevada.

Exploration in the GAP and Windmill target areas has been encouraging with recent wide-spaced drilling southeast of the South Pipeline deposit indicating the presence of gold mineralisation in the area. Selected results include 6 m grading 3.4 g/t Au at 40 m depth and 21 m grading 0.9 g/t Au at 43 m depth from two holes at GAP, and 6 m grading 5.4 g/t Au at 85 m depth, 70 m grading 2.2 g/t at 119 m depth and 76 m grading 1.2 g/t at 57 m depth from three holes at Windmill.

In addition to the South Pipeline project, Royal Gold has an agreement with Union Pacific Minerals Inc. to test the mineral potential of its land positions located in Wyoming and Colorado, and is actively exploring these areas to identify and evaluate the precious metals potential of selected blocks within what constitutes one of the largest private land positions in the U.S.

Iscor To Produce Stainless Steel

Iscor Ltd is to enter the stainless steel market by converting the steel plant at its Pretoria works. The existing infrastructure and facilities can be utilised more profitably by conversion to a stainless steel operation at a limited capital cost. The Iscor board has approved the feasibility study which indicated that Iscor Pretoria would be able to produce 40,000 t/month of stainless steel. Production could begin 12 to 18 months after final approval.

Production

De Beers Wage Settlement

Consolidated Diamond Mines (CDM), the Namibian operation of De Beers Centenary AG, and the Mineworkers Union of Namibia (MUN) have reached a 1994-95 wage agreement. Unskilled workers will receive a 10% increase, semi-skilled workers 9.75% and skilled workers 9.5%.

Although the agreement is to be implemented this month, increases will be backdated to June. The MUN had originally demanded 25% across the board, while CDM had offered only 5% in return. The settlement represents a monthly wage increase of between R93 and R253.

Tomago Strike Ends

A three-week-long strike at Australia's largest aluminium smelter, Tomago, has ended, thereby averting the proposed shutdown of one of the plant's three potlines (*MJ*, September 2, p.165). Some 700 striking workers who walked out on August 12 demanding an immediate 8% pay rise, resumed normal shifts last Monday.

The company has abandoned plans to close pot-line two at the smelter in

Caledonia's exploration program in Canada, Europe and Africa remains aggressive. The Corporation's recent copper discovery on the Skyona project in the Northwest Territories and cobalt discovery on its Nama property in Zambia are the rewards of a tenacious exploration effort.

The Corporation has two prospecting licences in Zambia. The Kadola licence is primarily prospective for copper and cobalt and covers an area of 2,179 square kilometres. The Nama licence is highly prospective for cobalt and covers 93 square kilometres and is located about 10 kilometres west of Konkola on the northern boundary of the famous Zambian Copperbelt.

Recently the Company announced that preliminary exploration results at its Nama property indicate that it may encounter a very significant and unique cobalt discovery.

A geochemical survey on the Nama license area revealed 14 cobalt anomalies. A reverse circulation drilling program of 29 shallow close spaced holes have been completed over an area in which the geochemical anomalies were first detected. The holes had an average depth of 29 metres and gave average values of 0.12% cobalt and 0.17% copper. This drilling has outlined approximately 2,000,000 tonnes of potential ore and only represents less than 1% of the total area of anomalies covering the property.

Lakefield Research Limited have carried out preliminary mineralization and leach investigations on a bulk pit sample assaying 0.31% cobalt and 0.20% copper. A leach test work programme on milled samples resulted in recoveries of 93% cobalt and 50% copper. Preliminary cost estimates for an open pit-agitation leach-electrowinning project give an economic cut-off less than 0.02% cobalt. These estimates show that all of the drill holes are in economic mineralization which is open at depth.

Caledonia is now mobilizing four drilling rigs to complete a 10,000 metre drilling program that will be carried out throughout the geochemical anomalies of the Nama license during the first half of 1996. About 20 holes will probe the extensions of the original discovery area, with a further 80 holes being scattered throughout the anomalies. The Nama deposit will require a dedicated work effort in 1996 to fully explore its further potential but initial results show great promise of it becoming a significant world cobalt producer.

INTRODUCTION

Property

The sample submitted by Arctic Gold & Silver Mines Limited is from a nickel prospect, known as the "Old Nick" property, and is located in the Greenwood Mining Division, near the town of Bridesville, B.C. The latter is 25 miles east of Osoyoos in the Okanagan or 277 miles by road from Vancouver. The tonnage of the mineralized area is estimated at over 100 million tons. The grade of the deposit averages 0.22% Ni, but this figure might be increased by selective mining according to the company's geological report.

Purpose of Investigation

The investigation was requested by Mr. Egil Livgard, Managing Director, Arctic Gold & Silver Mines Limited, 1300 Marine Building, 355 Burrard Street, Vancouver 1, B.C. Mr. Livgard was interested in a feasibility study on the concentration of the nickel minerals for subsequent bacteriological leaching. The latter was to be carried out by the B.C. Research Council. The present investigation was aimed at finding the best method for producing concentrates of optimum grade and recovery.

Shipment

On September 24, 1970, six bags of lump ore weighing 550 lbs were received from the company for the investigation. The shipment was sent by Mr. Livgard.

Sampling and Analysis

All the sample was crushed to minus one inch and a few representative fragments were selected for minerological examination. The remainder was reduced to minus 10 mesh and a head sample was riffled out for chemical analysis.

TABLE 1

Chemical Analysis of Head Sample*

Nickel (Ni)	-	0.23%
Iron (Fe)	-	4.77%
Sulphur (S)	-	0.65%
Insoluble	-	45.1%

* From Internal Report MS-AC-70-1013.

A semi-quantitative spectrographic analysis on a portion of the head sample indicated the presence of the following elements listed in their approximate order of decreasing abundance.

TABLE 2

Semi-Quantitative Spectrographic Analysis of Head Sample*

I	-	Si, Ca, Mg, Fe ($>$ 1.0%)
II	-	Ni, Al, Cr (1.0 - 0.01%)
III	-	Cu, Mn, Sn, Ti ($<$ 0.01%)

* From Internal Report MS-AC-70-944.

MINERALOGICAL EXAMINATION*

A portion of the head sample and several representative pieces of rock were sent to the Mineralogy Section of the Mineral Sciences Division for identification of the minerals and determination of their grain sizes and textural relationships. Excerpts from the report on this work are included here for convenience.

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* From Investigation Report IR 71-5 by D. Owens, January 14, 1971.

Summary

"Mineralogical studies made on a sample of nickel ore from the Old Nick nickel property, show that the ore is composed essentially of a serpentinized mafic rock, in which are disseminated small amounts of iron oxides and nickel-iron sulphides. The nickel is present largely as pentlandite, small amounts of mackinawite and traces of valleriite account for the remainder. Other minerals identified in the ore include pyrrhotite, magnetite, chromite, geothite, marcasite, molybdenite, ilmenite, hematite, pyrite, chalcopyrite, olivine (forsterite), amphibole, serpentine, calcite, asbestos, dolomite, and feldspar.

Textures of the Ore Minerals

The ore minerals in the hand specimens tend to occur in two basic forms: those associated with the fibrous amphibole are typically elongate or acicular, whereas those associated with the serpentine and olivine are more equidimensional.

Nickel-bearing Minerals

Three nickel-bearing minerals were identified in the ore: pentlandite, mackinawite and valleriite, with the pentlandite greatly predominating. Routine electron microprobe analyses were made on all the other ore and gangue minerals to determine if any of them contained trace amounts of nickel. The results were negative in all cases, except for some of the pyrrhotite.

The pentlandite $(Ni, Fe, Co)_9S_8$ is present essentially as inclusions in pyrrhotite and to a lesser extent in magnetite and chromite. Minor amounts of pentlandite also occur as combined grains with pyrrhotite, magnetite and gangue. The pentlandite grains vary from about 5 to 400 microns

in size*; those present in the magnetite and chromite have a maximum size of about 100 microns. The majority of the pentlandite grains are between 15 and 100 microns, with an estimated average size of about 30 to 40 microns. A large proportion of the pentlandite that occurs as inclusions in the pyrrhotite is rimmed and penetrated by thin bands of magnetite. This characteristic is also true of some of the pentlandite inclusions in chromite.

The pentlandite is riddled with inclusions, the majority of which consist of mackinawite (Fe, Ni, Co)S, some of magnetite, and a few of pyrrhotite. Almost every grain of pentlandite contains at least a few of these very small and irregularly shaped grains of mackinawite. The mackinawite inclusions vary from 2 to about 35 microns in size, with the majority smaller than 5 microns. Inclusions of other minerals in the pentlandite are of the same order of size. Nearly all of the mackinawite occurs in the pentlandite; the few exceptions are a number of inclusions in magnetite and pyrrhotite, but the amount is insignificant. The composition of the mackinawite, determined from electron microprobe analysis of two of the largest grains, is shown below.

Electron Microprobe Analysis of Mackinawite

Element	Wt %
Fe	57.95
Ni	5.66
Co	0.66
S	35.23
Total	99.50

Valleriite is present in the sample in trace amounts. Its normal composition is given as $(CuFeS_2) \cdot 1.5(Mg, Al(OH)_2)$. All the grains of

* The word "size" as used in this report, refers to the greatest dimension of the mineral grains being described.

valleriite are very small, and range from about 5 to 35 microns in size. Two types of valleriite appear to be present in the ore. The first is a nickel-copper variety occurring as a few inclusions in magnetite and pyrrhotite. The nickel content of the valleriite, based on electron microprobe studies, is slightly less than four per cent; the existence of a nickel-bearing valleriite has not been reported previously. The second type of valleriite consists of very minor disseminations in gangue. These appear to be simply an iron-rich variety, because neither nickel nor copper was detected.

Conclusion

Based on the mineralogical examinations of the ore sample, the following conclusions can be drawn: nickel is represented in the ore chiefly by pentlandite, to a much smaller extent by mackinawite, and only insignificantly by valleriite. The low nickel content of the mackinawite, which is present almost entirely as minute inclusions in the pentlandite, will inevitably reduce the grade of any pentlandite concentrate. In addition, much of the pentlandite will be difficult to liberate, from the other minerals with which it is associated, due to its small average particle size.

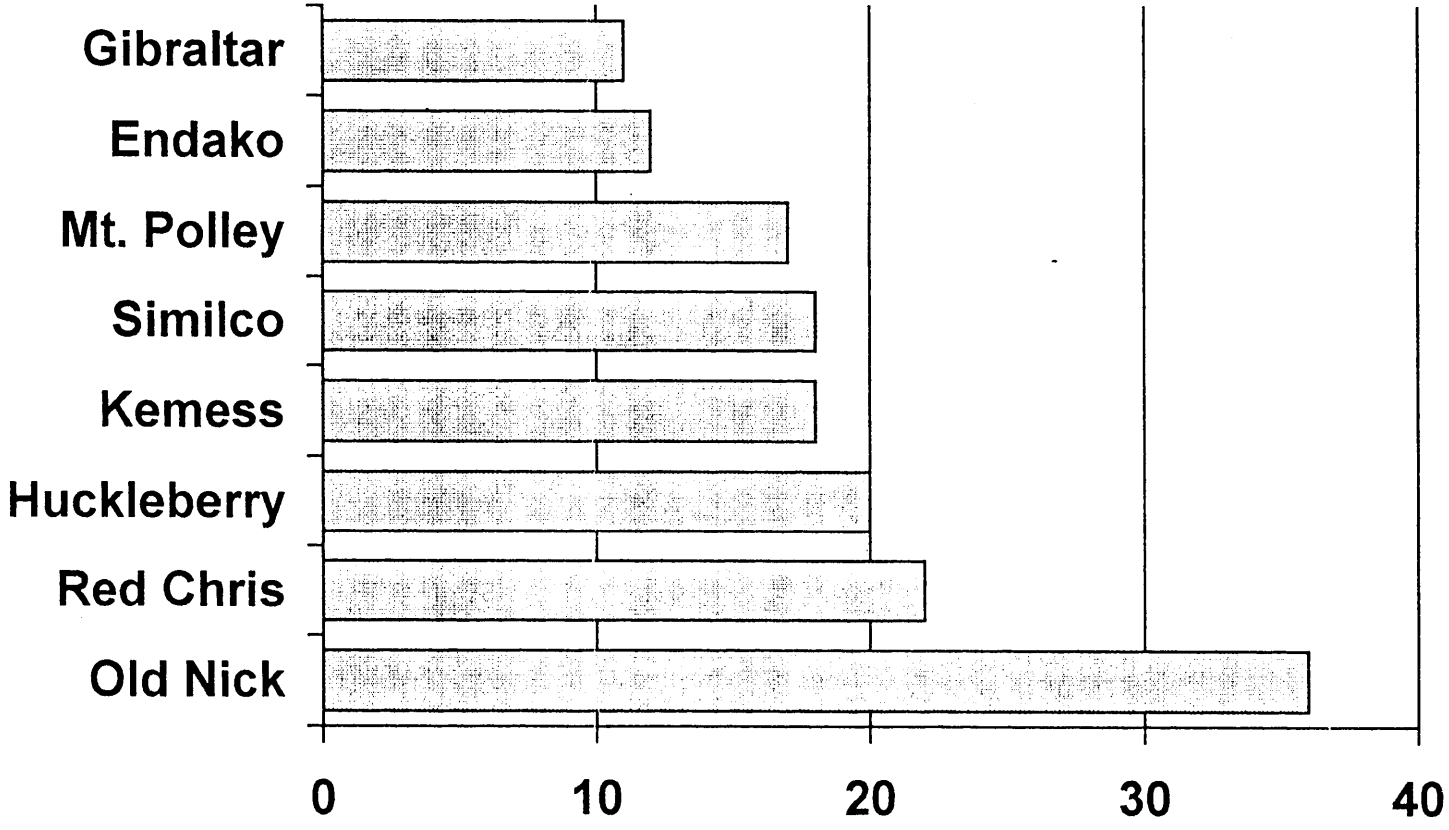
DETAILS OF INVESTIGATION

Flotation

This part of the investigation consists of a series of rougher flotation tests with increasing degrees of fineness, concentration of reagents, and time of flotation as variables. The best rougher concentrates were combined for cleaning.

British Columbia Mineral Deposits

Ranked by Deposit Gross Unit Metal Value



Metal Prices	
(US$/pound)	
cobalt	25.00
copper	1.10
moly	4.25
nickel	3.75
(US$/ounce)	
gold	390.00
silver	5.50

J.A.C. 96/05/12

British Columbia Mineral Deposits

Deposit Gross Unit Metal Value (C$/Tonne)

By: J.A. Chapman 5/12/96 14:28

Contained Metal	Copper (%)	Cobalt (%)	Gold (gpt)	Moly (%Mo)	Nickel (%)	Silver (gpt)	
Old Nick		0.015			0.220		
Similco	0.456		0.127			1.724	
Huckleberry	0.513		0.062	0.014		2.812	
Mount Polley	0.300		0.417				
Gibraltar	0.300			0.009			
Kemess	0.220		0.630				
Red Chris	0.480		0.370				
Endako				0.090			
Metal Price (US$)	**1.10**	**25.00**	**12.54**	**4.25**	**3.75**	**0.18**	
Metal Price (C$)	**1.51**	**34.25**	**17.18**	**5.82**	**5.14**	**0.25**	
							Gross Value C$/Tonne
Old Nick	0.00	11.30	0.00	0.00	24.86	0.00	36.16
Similco	15.12	0.00	2.18	0.00	0.00	0.43	17.72
Huckleberry	17.01	0.00	1.07	1.79	0.00	0.69	20.56
Mount Polley	9.95	0.00	7.16	0.00	0.00	0.00	17.11
Gibraltar	9.95	0.00	0.00	1.15	0.00	0.00	11.10
Kemess	7.29	0.00	10.82	0.00	0.00	0.00	18.12
Red Chris	15.91	0.00	6.36	0.00	0.00	0.00	22.27
Endako	0.00	0.00	0.00	11.53	0.00	0.00	11.53