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			February 19	81 TORONTO OFFICE COPY	J.T. Neelands
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Dwg. No.	Drawings	
NP-1	Compilation 1" - 300'.	
-2	Property Status of Hedley Camp	1:10,000
-3	Regional Geology approximately	1:6 miles
-4	Aeromagnatics of Hedley Camp	1:10,000
-5	Geology of Nickel Plate Area	1"-300'
-6	Geochemistry of Nickel Plate area	1"-300'
-7	Geophysics of Nickel Plate area	1"-300'
NP-8A	Geology, Northwest Quarter	1"-100'
-8B	Geology, Northeast Quarter	1"-100'
-8C	Geology, Southwest Quarter	1"-100'
-8D	Geology, Southeast Quarter	1"-100'
NP-9	Section through centre of Skarn Bowe, looking northeast, southwe	est.
NP-10	Isometric diagram of the undergrou workings.	und

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Report No. V-7 N.T.S. 92H-8E, 82E-5W

# EXPLORATION POTENTIAL OF THE NICKEL PLATE MOUNTAIN AREA

# OSOYOOS MINING DIVISION BRITISH COLUMBIA

FOR

KERR ADDISON MINES LIMITED 703-1112 WEST PENDER ST. VANCOUVER, BRITISH COLUMBIA

February, 1981

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J.T. Neelands.



Fig. 1 Looking northeast up Twenty mile Creek, Daly Reduction Mill in right foreground.

Photo from Camsell (1910)

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#### SUMMARY AND RECOMMENDATIONS

The Hedley Gold Camp has seen activity since the turn of the century. At present Banbury Gold Mines Limited, Good Hope Resources, Grove Explorations Limited and Mascot Gold Mines Limited are exploring in the camp. Nickel Plate Mountain, on which Mascot Gold is working, has produced approximately 4 million tons averaging 0.42 oz/ton Au between 1902 and 1955. The ore occurs in arsenopyrite near the contact between dioritic sills and dykes and altered limestones, skarn. The ore controls are structural. G.M. Resources gained control of the property by excercising an option which began in 1967. Recently G.M. has formed a public company, Mascot Gold Mines Limited, in order to explore and possibly mine the reserves. Ģ

It is recommended that a joint venture be formed with Mascot and that Kerr Addison earn a controlling interest in the property by spending exploration and development dollars. The exploration program would involve geological mapping, sampling and geophysical surveys of the 2.6 square miles (4.2 sq. km.) area. Even though it has been mapped at a scale of 1"-100', numerous questions arose in the process of developing the enclosed compilation due to the scarcity of data. The tools of geochemistry and geophysics have only been applied inconclusively to locate copper mineralization so that there is opportunity to locate numerous gold targets by these methods. These combined with the many geological indicators that are outlined in this report should optimize the success potential of the joint venture.

#### Recommendations Detailed

1. Determine the stratigraphy of the Red Top, Nickel Plate and Red Mountain Formations in order to locate marker horizons.

2. Determine the extent of skarn alteration, the Marble Line, and the limit of the Toronto Stock. Acquire more ground if necessary.

3. Remap the surface, tunnels and adits beyond the ore deposits in search of structural controls. Determine, if possible, structural controls in the Sunnyside Deposits. 4. Produce eastwest and northsouth sections every 1000 feet.

5. Soil and rock sample area and analyze for gold, silver, copper and arsenic.

6. Drill targets.

#### INTRODUCTION

The Hedley Camp is 340 km. east of Vancouver halfway between Princeton and Penticton. It is situated at the southern edge of the Thompson Plateau within the Intermontane System. Topographic expression is provided by the Triassic Nicola Group of sediments and volcanics which have been intruded by the Okanagan Intrusives of Jurassic age. 4

Mineralization at Nickel Plate Mountain, 2 miles (3 km) northeast of the village of Hedley, occurs in a structurally complex skarn zone that consists of numerous sills and dykes and a 1200 foot (366m) thick unit of predominantly altered limestone called the Nickel Plate Formation. Mineralization is controlled by one or a combination of the following geological features: altitude of formations, stratigraphy, folds, faults and fractures, sills and dykes, and skarn alteration. According to Dolmage and Brown (1945) the auriferous hydrothermal solutions were formed in the late stages of differentiation within a stock, The Toronto Stock and were injected along the paths of the skarn zones produced by the apophyses of the stock.

Four areas within a skarn halo are considered potential exploration areas. These are: 1) the vertical and lateral extensions of the known ore deposits, 2) the Central Area, 3) the South Rim, part of which is virtually unexplored, and 4) the West Side (Windfall Canyon and the Galena Claim).

### LOCATION AND ACCESS

The property is located in the Osoyoos Mining Division (N.T.S. 92-H-8E, 82E-5W) at longitude  $120^{0}03'$  West, latitude  $49^{0}20'$  North, Fig. 2. The area is serviced by highway transport from Vancouver and Penticton which are respectively 210 miles (340 km) and 27 miles (45 km) from Hedley.

Access to the Property is by a 20 kilometer gravel road from Hedley that follows the south and eastern slopes of Nickel Plate Mountain to the former mine. This road continues some 5 kilometers to Nickel Plate Lake near the present Apex ski resort. Apex is connected to Penticton by some 5 kilometers of well maintained gravel road and some 30 kilometers of black top road.



#### HISTORY

1897 Peter Scott staked the Rollo claim.

- 1898-1902 Wollaston and Arundel staked Horsefly, Bulldog, Sunnyside, Nickel Plate and Copperfield claims. Mineralization in Rodgers Fault on Nickel Plate was explored by Adit 3.
- 1902-1909 A power plant, a tramway and a forty stamp and large cyanide mill by the Daly estate was constructed, Figs. 5 and 6. The mining was carried out by Yale Mining Company and the milling by Daly Reduction Company. In 1909 Hedley Gold Mining Company became new operators of the mine.
- 1909-1921 Mill feed was maintained at a grade of 0.55 oz/ton and 200 tons/day, and the skip operated Dickson Incline (30<sup>0</sup>) was extended to the 1500 level from the No.4 adit. Sunnyside deposits 1, 2, 3 and 4 were mined. Deep hole drilling was carried out from the surface.
- 1922-1931 Started mining west side of Mascot Fraction which could not be purchased from H. Woods. Mineralization ended in breccia at 1600 level. Unsuccessful checker-board drilling was carried out from surface. In 1931 mining ceased.
- 1929-1934 Paul Billingsley's mapping and review of data which was presented to Kelowna Exploration Company resulted in an exploration program of drilling and tunnelling that eventually located the richest deposit, the Sunnyside 4<sup>1</sup>/<sub>2</sub>.



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Fig. 3 Looking East across Hedley towards Red Eagle Gulch. Daly Reduction gravity tram line is on the right. Cliffs formed by rocks of Nickel Plate formation. Photo from Camsell (1910).



Fig. 4 Looking North towards Lookout Mountain. Photo from Camsell (1910)

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Fig. 5. Stamp mill and cyanide plant of Daly Reduction Company. From Camsell (1910).



Fig. 6.

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Gravity tram line, lower section. From Camsell (1910). 10

- 1935 Mining was resumed. Wood sold his fraction to the Hedley Mascot Gold Mines Limited, a predecessor to Giant Mascot Resources. A mine camp and plant was built on the west side of Nickel Plate Mountain and an aerial tram line was used to connect the mine to the mill in Twentymile Creek.
- 1937 Tretheway Syndicate Operations in partnership with Hedley Mascot Gold Mines Limited drilled 1770 feet (540m) on the Galena Group and 5285 feet (1610m) on the Horsefly Gp.
- 1941 Kelowna sunk the Morning shaft along the west boundary of the Mascot Fraction. These ores were mined to an elevation of 4,150 (1,265m) which is 1,450 (440m) below the portal Adit 4.
- 1949 Hedley Mascot Gold Mines ceased operation.
- 1955 Kelowna Exploration Company ceased operation.
- 1964 Dundee Mines Limited drilled eight holes totalling 3,513 feet (1,071m) in the South Rim area.
- 1967-1970 G.M. Resources Limited (Giant Mascot Mines Limited acquired an option on the property, through its wholly-owned subsidiary, G.M. Explorations Limited, from Burden Investors Services Inc., the parent of Kelowna. In 1970 a new private company, Mascot Nickel Plate Mines Limited (MNP) was formed with GMR holding 75% and Burden 25% of issued shares. The exploration program, for mainly copper, involved geophysics and geochemistry and was concentrated in the South Rim, Central (including Bulldog and Sunnyside 1), Nickel Plate and Mascot areas.
- 1973 MNP drilled 3 surface diamond drill holes totalling 1,973 feet (601.5m) for assessment purposes.
- 1974 Noranda Exploration Company Limited sampled the tailings on MNP lands and estimated 1,681,711 tons grading 0.0318 oz/ton Au.

1979-1981 MNP initiated a \$200,000 exploration program consisting of opening up the upper 4 level and exploring the lateral extensions of the Nickel Plate Mine by chip sampling and drilling.

#### REGIONAL GEOLOGY

The oldest rocks in the area are sediments and volcanics that correlate with the Triassic Nicola Group, Dwg. NP-3. They form a large belt that extends from Osoyoos to the northwest of Princeton and that, in part, parallels the Similkamean River. This belt was intruded by four distinct phases which include Mafic Intrusions, Shuswap Complex, Coast Intrusions and the Copper Mountain Intrusions. These rocks together with the Nicola Volcanics cover most of the area. The Toronto Stock, represented by the Mafic Intrusions, is associated with the mineralization at Hedley. Only a few stocks occur in the map area between Hedley and Oliver.

#### ORE CONTROLS AND ORE DEPOSITS

#### INTRODUCTION

The Nickel Plate area contains one large and eight smaller deposits which in total have produced 1.7 million ozs. of gold, 0.2 million ozs. of silver and 4.0 million pounds of copper from approximately 4.0 million tons of rock milled, Barr, 1980. They are the Nickel Plate-Mascot-Morning\*, the five Sunnyside deposits, the Bulldog, the Canty, the Good Hope and the French, Dwg. NP-2. Except for the Good Hope and the Grove, all the deposits occur in the Nickel Plate Formation. The Good Hope and the French probably occur in the underlying Red Top Formation. The deposits are the igneous metamorphic (skarn) type, and are associated with chemical and structural traps produced by the intrusion of intermediate to mafic sills and dykes into a limestone-sandstone facies.

\* Because a number of companies have worked in the area, some topographic and geological features have two or more names. In order to avoid confusion the names have been combined. The major deposit on Nickel Plate Mountain then becomes Nickel Plate-Mascot-Morning Deposit instead of Nickel Plate Deposit or Mascot Deposit.

#### ORE CONTROLS

Five characteristics favoured the deposition of ore and these characteristics are described in the geological order that they occurred at Nickel Plate Mountain. The order consists of the deposition of a marginal facies of limestones and sandstones proximal to a volcanic source, the tilting of this sequence to the northwest possibly by thrust faulting or folding, and the intrusion of this sequence by sills and dykes of intermediate to mafic composition. The intrusion probably entered the sediments actively along a fault as the Toronto Stock but, because of the shallow dip of the sediments the apophyses of the stock were bled off as sills and dykes when they encountered the non-resistant limestone overlain by resistant quartzite and breccia. As a consequence a bowl-shaped alteration halo of skarn has been mapped, dwg. NP-5. The resulting chemical and structural traps provided an ideal host for mineral solutions which were either contemporaneous with or later than the intrusions. In late Triassic thewhole melange was intruded by a batholith to form a large roof pendant.

Therefore, as a result of these geological events, the five characteristics are: stratigraphy and altitude of the Nickel Plate Formation, anticline-syncline folds, faulting and fracturing, high density of trapping sills and dykes, and alteration.

#### 1. Stratigraphy and attitude of the Nickel Plate Formation

The stratigraphy of the Nickel Plate Formation is subdivided into 3 members totalling approximately 1200 feet which strikes northeast and dips between 16 and 20 degrees northwest. The stratigraphy may then form the western limb of an anticline or a monocline formed by thrust faulting. The Upper Member (300 feet) of the Nickel Plate Formation consists of highly siliceous quartzite, the Middle Member (600-700 feet) consists of impure limestones and quartzites intercalated with massive limestone beds up to 80 feet thick, and the <u>Sunnyside Limestone</u> (150-200 feet) consists of massive limestone with a small proportion of thinly bedded quartzites. The Upper Member contains a thin bed of chert breccia which is considered a good marker horizon, Dwg. NP-2, Section C-C1. Within the formation there are breccia zones which parallel bedding and are considered to be related to motion, alteration and recrystallization rather than a diagenetic or primary sedimentary feature. The Formation is capped by the Red Mountain formation which consists of predominantly volcanic and siliceous rocks and is underlain by the Red Top Formation which consists of quartzite, limestone, argillite and tuffs. As noted above the shallow dip of the sediments to the northwest probably enhanced the development of sills and dykes adjacent to the Toronto Stock, and the chemical and physical differences between the limestone and the quartzites favoured the former as a host. Shearing as indicated by the brecciation may have also occurred between the limestone and the quartzites along which the sills may have penetrated.

#### 2. Anticline-syncline Folds

The Nickel Plate area is dominated by a sheet of sediments that strikes northeast and dips northwest. Along this sheet five transverse fold areas strike northwest and pitch 20 to 30 degrees. From southwest to northeast they are Red Eagle, Kingston, Tipple, Bull Dog and Nickel Plate. The folding is relatively gentle and is more gentle in the north than the south. Some folds are limited to the confines of a single stratum and others are sharpest in one stratum but persist with diminishing intensity into upper or lower horizons. Gentle folds are related to thick bedding and crumpled folds to thin bedding. The folding is not considered to be related to the intrusion of the Toronto Stock since the Red Eagle fold does not contain any sills or dykes. The sills then followed the folded bedding planes and the dykes followed cross fracturing or faulting. Most ore occurs either near the fold axis, or along the north limb of folds where north limb fractures predominate over southlimb or in crumples which are perpendicular to the fold axis. The Mascot Fraction ore deposit contains approximately 5 small pairs of anticline-synclines and the Nickel Plate deposit contains two large anticlines separated by a syncline. The larger and more continuous ore zones occur within the Nickel Plate Deposit.

## 3. Faulting and Fracturing

Three sets of faulting which strike west, northwest and north are both pre-mineral and post-mineral. As such they are related to the same forces that caused the folding. Some of the faults and fractures such as the Central Fault are post-ore. In the Nickel Plate zone the fault forms a strip 60 ft. wide that is partly coincident with a shared anticline-syncline limb. Within the zone the ore is displaced 200 feet eastward forming a right lateral fault.

#### 4. High Density of Trapping Sills and Dykes

Following the tilting of the formations and minor transverse folding and faulting, the Toronto Stock intruded the formations in the area of the Toronto Claim. The composition of the stock ranges from gabbro through guartz-gabbro, and augite diorite to quartz diorite. The long axis of the stock strikes N60<sup>0</sup>W and the dimensions are 7000 by 2500 feet. From the stock concordant sills and dykes were intruded eastward up along the beds of the formations, Fig. 7. Dolmage and Hume (1945) report that "No fundamental difference can be detected on petrological grounds between individual members of the sill groups or between cross-cutting dykes such as the Central (-Flange) dyke or Hot (-Midway) sill, and the sills." Individual sills are extremely irregular; they are not intruded exactly parallel to the bedding planes but frequently step to a higher horizon to create short connecting dykes or branches. In the Nickel Plate Formation the number of sills is much greater than in the Aberdeen or Redtop formations. In the mine area they make up 30 to 40 percent of the total thickness of the formation. Three different groups of sills may be recognized in the Nickel Plate Formation, the lowest is located close to the bottom of the Sunnyside, the middle group or Mine sills are situated approximately 500 feet, or one-third from the bottom, and the highest is distributed through the uppermost 500 feet of the formation. Most of the highest group has been removed by erosion. Two major dykes, the Central-Flange and the Hot-Midway have been mapped in detail because of their relationship to the ore. The Central-Flange dyke strikes north and dips 80° south; and the Hot-Midway strikes north and dips 45 to 55 degrees west in the Mascot Fraction and 25 to 30



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Fig. 7

Banding of the sedimentary rocks due to the injected apophyses of the Toronto Stock.

degrees west in the Nickel Plate ore deposit. The Hot-Midway dyke is in part a sill in the Nickel Plate ore deposit. The ore follows the Central-Flange and is found at the intersection of it and the sills and Hot-Midway dyke. The three upper ore bodies occur in the "V formed by the intersection of the Central-Flange and the Hot-Midway dyke.

Both the brown and black dykes are post ore. The brown dykes probably emanated from the younger granodiorite batholith which intruded the Nickel Plate area approximately 25-30 million years after the Toronto Stock was intruded. The black dykes cross-cut all rock types. The brown dykes, a soda rhyolite porphyry, are seldom over 15 feet wide and follow a fracture pattern which in part coincides with the northwest axial pattern. The Central Fault contains two brown dykes. The black dykes, an andesite, vary in width from one inch to 10 feet and generally follow a tension pattern that strikes north-south.

### 5. Alteration

The last event to precede ore deposition was the <u>almost complete</u> alteration of the Nickel Plate Formation by the apophyses of the Toronto Stock. The edge of metamorphic alteration, the Marble Line, is recognized as a circular chemical fence along which the ore bodies have formed. The transition from pyroxene-garnet rocks, or skarn to unaltered limestone is abrupt and often takes place within a few feet. Metamorphic products are chert, diopside-hedenbergite, grossularite minor amounts of epidote, and wollastonite. On the northern edge of the Nickel Plate deposit, the marble line is upturned similar to the edge of a bowl. It is along the edge of this bowl in the keels of synclines and in the pinches and swells of the sills that massive garnet and pyroxene occur. This was readily fractured to produce openings for the precipitation of ore.

The genesis of the ore deposits is then dependent upon five characteristic which produced a favourable host and a unique model that to-date has no equivalent. Like most epigenetic gold deposits the result of the host preparation was to create a large space in which minerals could be deposited. In searching for more ore it is not necessary to have exactly identical structural conditions within this large gold anomaly, Nickel Plate Mountain. In general, any large space within the skarn bowl through which mineral solutions could be piped would provide a suitable site for mineral deposition.

Before proceeding with a description of the areas proposed for exploration, a discussion of the ore deposits and their mineralization is necessary.

#### ORE DEPOSITS

#### Introduction

The Nickel Plate-Mascot-Morning, and Sunnyside and Bull Dog deposits; and the South Rim and Galena showings form a circle of mineralization centred on the Climax Claim. The Nickel Plate-Mascot -My oning Deposit was the largest of the deposits and it contains an area 3,000 feet long and 250-500 feet wide. It consisted of 7 major tabular ore lenses which averaged 25 feet thick. Within the deposit, the sills and dykes make up 40 per cent and the ore-bearing altered sediments make up the balance of 60 per cent. The richer mineralized areas consisted of gold bearing arsenopyrite in a green gangue of metamorphic silicates.

No detailed description of any ore lens exists. Billingsley compiled the works of Camsell, Bostock, Schmitt (1933) Warren and Cummings to suggest the following paragenesis:

- 1. Formation of silicates
- 2. Introduction of arsenopyrite
- Introduction of pyrrhotite, chalcopyrite and sphalerite
- 4. Fracturing and veining of ore by calcite stringers.

The most significant minerals identified in the area are: gold, silver, platinum, nickel, cobalt, tetradymite, pyrite, arsenopyrite, molybdenite, galena, chalcopyrite, sphalerite, pyrrhotite, magnetite, limonite, calcite, wollastonite, amphibole, garnet, epidote, axinite, apatite, sericite, chlorite, erythrite and scapolite.

The <u>gold</u> is distributed randomly as tiny inclusions ( 7 microns) throughout the arsenopyrite. Even in sections containing mainly pyrrhotite the gold is generally surrounded by arsenopyrite.

<u>Arsenopyrite</u> is the most ubiquitous sulphide in the area and is found in all the igneous rocks, in the Red Mountain Formation and in the skarn zones of the Nickel Plate Formation. Within the skarn zones it occurs as a white euhedral crystal as well as in blue massive forms which generally carry higher gold values.

<u>Chalcopyrite</u> is confined to the sedimentary rocks and to the skarn zones. It is most abundant in the Warhorse and Bulldog claims where it occurs in the massive form as irregular veinlets. In the Nickel Plate ore zone chalcopyrite accompanies arsenopyrite.

Next to arsenopyrite, <u>pyrrhotite</u> is the most abundant sulphide but not a carrier of gold. It is most abundant along the South Rim and the Bull Dog ore zones. It also is abundant in the Mountain Top Formation and is probably the cause of the regional high Mag centred on Lookout Mountain.

The following descriptions of the deposits are from Hainsworth (1980).

There are three general systems of gold bearing orebodies in the Nickel Plate area.

1. Nickel Plate Orebodies - This system is composed of a series

of tabular gold bearing lenses that may be described as a set of overlapping shingles following the dip of the strata for a distance of some 3,000 feet (900 meters) on a bearing of N  $70^{\circ}$  W. There are seven lenses from the surface each in a different skarn bed. For convenience, the previous operators identified the ore shoots or beds by a color code and other appropriate symbols. In order of descending elevation they are the violet, upper purple, lower purple, red, orange, yellow blister and yellow. This system is assoc-iated with porphyry sills called "the mine sills" which are intrusive structures that lie slightly discordant to the bedding planes and rake gently across them while maintaining the same dip attitude. Best known of these sills is the Midway Sill. This sill is more persistent than the others and has been traced intermittently down dip into the Mascot Fraction claim where it is known as the Hot Sill. As with the other sills, it steepens sharply in the Mascot Fraction to 70 west.

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Of the numerous dykes in the system, which crosscut the ore bearing lenses and sills, the strongest and best identified is the Flange Dyke. This 35 to 50 foot (10 to 15 meter) dyke that strikes N 80 W and dips 70 N to 75 S separates the ore beds. The dyke is weakly mineralized but has never

been mined.

Another dyke, the South Dyke, lies 525 feet (160 meters) to the south of the Flange dyke and roughly parallels it. The orebodies in their downward convergence pass from close proximity to the South Dyke at surface, across the Flange Dyke and approach the North Dyke, in the deepest portion of the Mine, where they abut the Climax Breccia.

The ore beds have been mined from the surface through to the 17th Level at elevation 4,750 feet (1,450 meters).

This system of orebodies which are unlike the Nickel Plate orebodies in both structure and grade derives its name from the claim on -

which it was first identified, the Morning claim.

As the Midway Sill descends towards the Mascot Fraction claim it steepens and cuts across the underlying Middle Formation thus taking on the identity of a dyke. Its pre-Sence was recognised by Hedley Gold Mines Limited in the Mascot Fraction where it was named the Hot Sill.

At the junction of the Hot Sill (Midway Sill) and the Flange Dyke orebodies were formed. The grade and persistence of the mineralization was related in most instances to the tight folding at these "crotches". The juncture of other porphyry sills with the Flange Dyke also gave rise to concentrations of gold although the larger and richer orebodies were generally associated with the Midway Sill. Refer to Figure 3.

2. Morning Orebodies

The Morning ore structures, because of their rich grades were thoroughly stoped above the 4,050 level and possibly below. Good drill intersections were made below the Mascot Fraction 3,700 level, but the extent of exploration and development in this area is not clear. 3. Sunnyside Orebodies -

The surface expression of the Sunnyside orebodies was discovered early in the history of the Mine. The Sunnyside 1 through 4 orebodies were stoped early in the operation of the Mine with the 2 being mined out prior to 1930. The Sunnyside  $4\frac{1}{2}$  which is not exposed on the surface was not discovered until 1945 and was the richest of the five Sunnyside deposits.

The Sunnyside ore beds lie deep in the Middle formation and are closely related to indentations or keels in the Marble Line. They are moderately folded with the mineralization being confined to the apex and/or one limb of the fold. Their down dip expression is shallow.

The Sunnyside 4½, like the others, is associated with mine Sills, the principal one being the Flipper Sill. In addition, two dykes converging to the east form a loci with the sill where ore grade mineralization is generally formed.

The Bulldog ore zones are similar to the Sunnysides in stratigraphy, but lie further to the south and down the rake of the strata.

Sills here are prominent and have an important relationship to the distribution of the gold values. Only one of the zones, the Bulldog #1-820 Stope, was mined and this work was discontinued in 1953 due to heavy concentrations of chalcopyrite that caused metallurgical recovery problems in the mill.

The Morning orebodies which are at lower elevations in the Middle Formations are similar in design and ore tenor to the Sunnyside orebodies. Both Billingsley and Dolmage postulated they might be the depth image of the Sunnysides

#### EXPLORATION AREAS

The areas which have received sporadic interest in the past are the Central area, South Rim area which includes, Kingston, Warhouse, Rollo and Horsefly claims and the West Side area which includes the Galena claim and Windfall Canyon, Dwg. NP-1. More recently, since the closing of the mines, interest has been refocused on the extension of the ore deposits. Since recorded reserves are presently only 95,999 tons, Hainsworth (1980) exploration will eventually have to be directed towards the location of new ore deposits. Most of the area has been mapped on a scale of 1 inch to 100 feet and has in part received limited geochemical sampling and geophysical surveys in the South Rim area, the Central area and the Nickel Plate claim. The property has been broken up into four areas: the ore deposits, the Central area, the South Rim area and the West Side area.

### Ore Deposits

In 1955 Kelowna Exploration Company ceased production and exploration. Since then work has been renewed by G.M. Explorations Limited during the following periods: from 1967 to 1970 by G.M. Explorations, in 1973, for assessment purposes by MNP, and from 1979 to the present by MNP, now Mascot Gold Mines Limited.

During 1967, at the Bulldog, 14 underground drill holes totalling 2,319 were drilled, Dwg. NP-8D. The mineralized zone of the Bulldog outcrops on surface and has been partially explored by two adits 100 feet (30m) and 200 feet (61m) below surface. The drilling from the adits was not able to enlarge the known reserves of 6,635 tons of 0.37 Au or verify the high copper values obtained by Kelowna. One drill hole B67-2 intercepted a 52 foot (16m) zone grading 0.18 oz/ton Au and 0.48 oz/ton Ag. During the same period, the 1500 crosscut in the Morning Claim was sampled from collar to face and averaged 0.46% Cu across 200 feet (61m), Dwg. NP-8A. On the 15 level in the Nickel Plate ore deposit the Orange Footwall assayed 0.626% Cu for 170 feet. Besides sampling the 15 level, samples were taken from levels 8 and 9 of which no lengths were reported. In the northeast corner of Nickel Plate claim north of the Nickel Plate-Mascot-Morning glory hole E.M., Mag. and geochemical surveys located numerous anomalies which appear to be directly related to mineralization of the east end of the ore deposit.

In 1973, MNP drilled a 1,470 foot (448m) hole which was collared in Red Mountain Formation west of the Sunnyside  $4\frac{1}{2}$  Deposit, Dwg. NP-8B. The drill was spotted at an approximate elevation of 6,000 feet (1,829m) in order to cut the westward plunge of the trough-like structural trap defined by the intersection of the Sunnyside  $4\frac{1}{2}$  dyke and the Sunnyside "flange" dyke. The drill core which is stored at Silver Creek cut through approximately 1300 feet (396m) of altered sediments intruded by dykes 10 to 40 feet (3 to 12m) thick, Dwg. NP-9. Skarned zones which correspond generally with the estimated position of the Nickel Plate horizon between 826 and 1,043 feet (251 and 318m) contained pyrrhotite, chalcopyrite, sphalerite and minor arsenopyrite, Rote (1973).

The following excerpt from Hainsworth (1980) outlines MNP's plans and progress.

The 1979 program by MNP, which commenced in the early summer and was terminated in December because of inclement weather was primarily oriented to establishing access to and in the Mine between the surface and 4 Level (elevation 5,450 feet - 1,660 meters) to:

- chip sample the walls (ribs) of the formerly productive stopes and ascertain the grades or physical features on which the walls were established and the possibilities of extending them laterally in areas where the available records show no limiting factors to the mineralization.
- verify, where possible, by chip sampling the existing mineral reserves.
- assess the possibility of undertaking drilling from underground to test the downward extension of certain of the formerly productive zones with particular reference, to the Sunnysides.
- 4) correlate the previous geologic and engineering data and recently obtained information with the intent of developing new geological hypotheses and examining old hypotheses in areas of the Mine that may warrant additional or new exploration.
- To clean out and sample the old surface trenches with particular reference to the "glory hole" area.

Not all of this was accomplished in 1979 because ground conditions, due to deterioration of the support timbers in the Dickson Shaft and the pillars of the secondary or escape accesses of the Mine were in somewhat worse condition than had been anticipated. Therefore, it was necessary to find alternate access routes in place of the Dickson Shaft and to open up and retimber the main adit, A adit, This delayed the program and limited its scope. However, the A adit is now open for 275 feet (84 meters) with only some 150 feet (45 meters) remaining to be rehabilitated. Access has been gained through stopes and levels from the surface not only to 4 Levei but through to 8 Level. A modern 20 man camp has been establised at the Mine site, most of the old surface trenches have been cleaned out and sampled (48 samples), initial character sampling has been done in 8 stopes and the north wall of the Upper Purple bed stopes have been sampled over a length of 1,400 feet (425 meters) from elevation 5,550 feet (1,690 meters) down to 5,310 feet (1,620 meters).

#### A summary of the sample results is as follows:

1) North Wall of Purple Stopes - 259 samples grading

			0.168 ounces gold per ton 0.124 ounces silver per ton
2)	8 stopes -		421 samples grading 0.198 ounces gold per ton 0.100 ounces silver per ton
3)	Miscellaneous Underground sampling	-	107 samples grading 0.041 ounces gold per ton
4)	3 Dumps -	-	21 samples grading 0.058 ounces gold per ton 0.157 ounces silver per ton
5)	Glory Hole -	-	20 samples grading 0.464 ounces gold per ton 0.298 ounces silver per ton
6)	01d Trenches -	-	48 samples grading 0.052 ounces gold per ton 0.182 ounces silver per ton

#### Central Area

The claims that have received limited exploration in the Central Area are the IXL, Climax, Mound, Exchange Fraction and Copper Cleft. The area contains similar geology and structure to the Nickel Plate-Mascot-Morning Deposit. Other favourable features are the northwest trending Climax Fault, a dyke within the fault and the Bulldog anticline. Since previous workers tended to explore by tunnelling rather than by drilling, the area has been explored by the Mound Tunnel (5215' elevation) the IXL Tunnel (5215' elevation) the 1505 Drift (4800' elevation). Dwg. NP- is a section across the Central Area. \_1 +

Throughout most of its length the <u>Mound Tunnel</u> remains in altered cherts and argillites. Favourable dykes occur near the Mound and the Bulldog Tunnel and along the west arm of the Mound Tunnel near the Climax Fault. Sparse arsenopyrite was intersected near the Mound and Bulldog junction.

The <u>IXL Tunnel</u> encountered the Climax Fault, interbedded limestones, cherts, garnetized beds, and diorite porphyry sills. One skarn section assayed 0.20 oz/ton Au, 5.65 oz/ton Ag and 2.00% Cu over a 0.5 foot (15 cm) section. Two samples taken across the Climax Fault averaged 0.10 oz/ton Au, 0.07 oz/ton Ag and 0.22% Cu. In 1967, MNP took 53 samples 150 feet (46m) back from the northeast face in silicified limestone and skarn. A 90 foot section averaged 0.01 oz/ton Au, 0.44 oz/ton Ag and 0.19% Cu.

Information is lacking on the 1505 Drift and 4160 Drift.

#### Previous Work

Prior to 1970 work in the Central Area consisted of geological mapping, tunnels and a few drill holes by Hedley Gold Mining and Kelowna, Dwgs. NP-8B, 8D. In 1970, soil sampling and magnetic and electromagnatic surveys were completed by MNP over this area as well as the Bulldog claim, Dwg. Nos. 6, 7. Unfortunately the soils were only analyzed for copper. Numerous anoamlies greater than 500 ppm trend east and northeast which Gerun (1970) related to fracture patterns. The Climax Fault is not anomalous in copper which may, like the Central Fault, be post-ore. No apparent work was completed on these anomalies or the E.M. anomalies even though one copper anomaly overlies the Sunnyside 1 Deposit. One untested coincident E.M. and copper anomaly occurs 600 feet (183m) over the end of the IXL Tunnel where 0.19% Cu occurs over 90 feet.

#### South Rim Area

The South Rim area extends from the Metropolitan claim to the Alice claim and includes the Kingston, Warhorse, Rollo, Princeton and Horsefly claims. This area has been worked by Tretheway Syndicate (1937), Dundee Mines (1964) and G.M. Explorations Limited (1967-1970 and 1979-1980). The work by G.M. was carried out primarily to search for copper.

#### Geology

In the South Rim, the Nickel Plate Formation dips steeply between 30 and 50 degrees and is intruded by thicker sills and dykes than found in the mines. The Nickel Plate Formation is wedged between the Toronto Stock and its apophyses to the northeast and a granodiorite dyke to the southwest. There is no record of skarn caused by the granodiorite dyke. This wedge of altered sediments points northeast, pinches out in the Metropolitan Claim and, at the tramway is approximately 2,000 feet (610m) wide. Most of the exploration has been carried out along the northwestern side of the wedge. On the Kingston claim the intrusive is interpreted to be part of the Toronto Stock which on the Warhorse and Rollo claims is extended as a dyke which then branches into sills. Mineralization is associated with the stock, dyke and sills. Since the relief approximates the dip of the sills, a more resistant sill may cap underlying mineralization, Clarke (1972). <u>\_</u>\_\_\_\_

### Mineralization

According to Gerun (1971) the mineralization is controlled by faults and fractures in the sediments and in contacts along sills and dykes. Wider mineralized zones occur at the intersection of fractures, and fractures are wider in the sediments than the dykes and sills. The mineralized fractures may represent vertical leakage zones between mineralized strata. The trend of the mineralization is northwest and eastwest coincident with a northwest trending magnetometer high. This strike is similar to the Nickel Plate-Mascot-Morning deposit which has a magnetic and electromagnetic expression on the Nickel Plate claim.

#### Geophysics

Magnetometer and horizontal loop surveys were carried out over the Kingston, Warhorse and Rollo claims, Dwg. NP-7. The magnetometer defines a high which strikes northwest across the Kingston, Warhorse and Rollo claims. The E.M. is coincident with this strike only in the Kingston and Rollo claims. In the Warhorse claim the E.M. anomalies strike northwest and northeast. Except for the E.M. anomaly on the Victoria Fraction, all of the anomalies are related to mineralized fractures, Gerun (1971).

#### Previous Work

In the South Rim most of the work has been carried out on the Kingston, Warhorse, Rollo and Horsefly. Very little work is recorded in the area of the Alice or Terrier claims.

### Kingston Claim

The Kingston claim is at an elevation of 3,279 feet which is stratigraphic equivalent of the Upper Nickel Plate Formation. The ground has been explored by 6 short adits and 15 diamond drill holes. The intervening ground between Kingston and Warhorse has not been explored.

The Marble Line on the claim is vertical.

In 1907 MNP sampled surface exposures and underground workings. The No. 1 Adit analyzed 0.0702/ton Au, 0.78 oz/ton Ag and 1.57% Cu over 32 feet (10m). Within the same Adit four previous underground drill holes, totalling 829 feet (253m) tested a massive sulphide zone down rake for 150 feet and gave results of 0.05 oz/ton Au, 0.56 oz/ton Ag and 1.02% Cu. Three surface holes (K67-1, -2 and -3) were drilled and K67-1 intersected 2% Cu over 15.7 feet (5m) in the same sulphide zone. Horizontal loop and mag. of the same zone indicated a 700 feet long conductor which corresponds with the drill results.

#### Warhorse Claim

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In 1964 Dundee Mines Limited drilled eight surface holes. Five of the holes were mainly in diorite porphyry with narrow intersections of skarn and limestone. In DDH 5-6 gold values of 0.84 oz/ton over 10 feet (3m) were intersected.

In 1967 MNP took 67 surface samples and located two mineralized zones separated by 400 feet (122m) of relatively unexplored ground. The northwest zone averaged 0.04 oz/ton Au, 0.55 oz/ton Ag and 1.51% Cu over an area 150 by 150 feet (46 by 46m). The southwest zone averaged 0.06 oz/ton Au, 0.55 oz/ton Ag and 1.51% Cu over an area 200 by 600 feet (61 by 183m).

In 1973, MNP drilled two holes in the northwest zone. DDH 73-2 encountered 170 feet (52m) of disseminated pyrrhotite and sphalerite and 150 feet (46m) of barren interbedded skarn and diorite sills. DDH 73-3 encountered a 4.5 foot section (1.3m) grading 0.25 oz/ton Au, 0.26 oz/ton Ag in massive pyrrhotite.

#### Rollo Claim

The Tiger Fracture zone traverses the Rollo and Warhorse claims and has an aerial extent of 1200 by 300 to 600 feet (365 by 92 by 180 meters) encompassing the Rollo exposures. This zone returned assays of 0.04 oz/ton Au, 6.75 oz/ton Ag and 1.0% Cu. Copper mineralization extends from surface to a depth of 400 feet, Clarke (1972). The south part of the claim returned erratically distributed but interesting gold and copper values.

In 1937 the Tretheway Syndicate drilled 4 holes parallel to the Mag. trend rather than perpendicular to it. DDH T-3 intersected 0.18 oz/ton Au over 3.0 feet (1m).

In 1967 MNP carried out surface sampling and cut 4 trenches in the Tiger Fracture zone. A sampled strike length of 360 feet (110m) over 5.8 feet (1.8m) averaged 1.24% Cu, 2.15 oz/ton Ag and 0.025 oz/ton Au.

In 1970 MNP drilled 3 holes in the east end of the Tiger Fracture zone. DDH R70-1 intersected 0.025 oz/ton Au, 1.2 oz/ton Ag and 0.61% Cu over 12 feet and DDH R70-2, drilled below R70-1 intersected 0.44% Cu across 42.5 feet. DDH R70-3 encountered poor drilling and was aborted at 96 feet.

### Horsefly Claim

Surface drilling and tunnelling has been carried out mainly in the northeast corner where strong mineralization occurs in two eastwest trending shears. Massive sulphides consisting of pyrrhotite, arsenopyrite, chalcopyrite and minor sphalerite were encountered. In 1937 Tretheway Syndicate drilled 7 holes and intersected a mineralized shear. The best intersection in DDH T-2 encountered 0.36 oz/ton Au over a true width of 6 feet which was drilled parallel to strike. In the late 1940s an adit was sunk on this mineralization and underground drilling was carried out. The 300 foot (91m) adit encountered cherty skarn, limestone, porphyry and massive pyrrhotite.

#### West Side Area

The area contains those claims between the Metropolitan and Czar Fraction including the Galena claim and the Windfall Canyon.

In 1937 Tretheway Syndicate drilled three holes on the Galena Claim to test the updip extension of mineralization outcroping in the cliff face. The drilling cut a 50 foot (15m) thick bed that contained gold and copper mineralization, Fig. \_\_\_\_\_ Two intersections contained 0.11 oz/ton Au over 5 feet (1.5m) and one section analyzed 0.09 oz/ton Au and 1.68% Cu over 5 feet (1.5m). DDH-2 encountered 500 feet (152m) of diorite that is interpreted to be the Toronto Stock. Mineralization near the contact of the stock analyzed 0.18 oz/ton Au over 2.7 feet (0.8m). It is unfortunate that the content of the stock was not encountered in drill holes 1 and 2.

Between 1913 to 1914 Hedley Gold Mining drilled the "B" series of 8 diamond drill holes in the Windfall Canyon. Several intersections were reported to have copper mineralization.

Between 1967 and 1970 G.M. Explorations found 10-20 foot (3-6m) sections of pyrrhotite, chalcopyrite and minor arsenopyrite along the south wall of Windfall Canyon at the contacts of the Central-Flange dyke. It is their assumption that the Nickel Plate-Mascot-Morning beds extend down dip, Gerun (1971), Clarke (1972).

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# 49000





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8 8 a



Granite, syenite, granodiorite, quartz diorite. Kingsvale Group-Andesite & basalt, andesite & basalt porphyry, volcanic breccia.

8 - Lavas, tuff , breccia , grit & shale . 8a - reddish



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JURASSIC AND OR LATER

Copper Mtn Intrusions - Syenogabbro , augite - syenite & diorite, pegmatite, alkali rich granitic rocks. Coast Intrusions: 4 - Granite, granodiorite, 4a-Gneissic

granodiorite, 4b-quartz diorite, diorite, gabbro, 4c-felsitic intrusions.



Shuswap Complex - Granite, granodiorite, pegmatites, gneiss, schist, 2a - partly gneissic granodiorite, quartz diorite & diorite.



120°00'

Nicola Group: I - Varicoloured lava, argillite, tuff, conglomerate, chert, quartzite, amphibolite, basic intrusives. Ia - andesite, basalt & related intrusives. Ib-limestone.











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