Giant Mascot Mine, New Westminister M.D.

Lat. 49° 25-30' Long. 121° 12-18' (92H/6)

Introduction:

The Giant Mascot Mine represents the only significant nickel producer in British Columbia. With the depletion of ore reserves and closure of the mine in sight, a study of the deposit was undertaken to consolidate geological data for future reference in exploring ultramafic rocks in this and other parts of the Canadian Cordillera. The study has included underground mapping, core logging, surface mapping, examination of showings, sampling for petrographic and geochemical studies, and a review of mine plans and engineering reports.

This report incorporates data compiled by the geological and engineering staff of Giant Mascot Mines. The assistance and information provided by F.W. Holland (mine manager), L. DeRoux (mine geologist), and R. Gonzalez (exploration geologist) is acknowledged.

History:

The initial discovery on the Giant Mascot Mine property (also called: Pride of Emory Mine; B.C. Nickel; Pacific Nickel; Western Nickel and Giant Nickel Mine) was made in 1923 when Carl Zofka, a trapper, located outcrops of the Pride of Emory orebody on Emory Mountain. B.C. Nickel Company purchased the property in 1927 and conducted surface exploration until 1933. In 1933 B.C. Nickel Company was reorganized as B.C. Nickel Mines Limited by the Smith, Sloan, Spencer Syndicate. Refinancing permitted underground development on the 3550 (No. 1 tunnel) and 3275 (No.2 or Chinaman tunnel) levels. By 1937 the Syndicate had spent

$1,300,000 to develop 1.2 million tons of ore at 1.38% Ni and 0.50% Cu. Four ore shipments, totalling 2,134 short tons at 5% Ni were made to Japan for test purposes and gross returns of $63,600 were obtained.

In 1938 B.C. Nickel Mines was reorganized as Pacific Nickel Mines, but poor market conditions caused the property to remain idle till 1952. In 1952, Western Nickel was formed as an operating company by Newmont Corporation and Pacific Nickel. The property was further explored by establishing the 2600 (main haulage), 2950 and 3250 levels and connecting the levels with an internal inclined shaft. A favorable sales contract was arranged by Western Nickel and from January to July of 1958, under the managment of Granby Mining and Smelting Company, 181,133 tons of ore were treated before market conditions again forced closure.

In 1959 Newmont's interest in the property was sold to Giant Mascot Mines and Giant Nickel Mines formed as an operating company. The mine was reopened as a salvage operation in July of 1959 and continued in production until August 31, 1974. In March of 1961, Giant Mascot Mines gained full control of the property by purchasing Pacific Nickel's 49% interest.

From 1958 to closure on August 31, 1974, total production from 26 orebodies was about 4,700,000 tons of ore, containing about 59,000,000 lbs. of nickel and about 28,000,000 lbs. of copper.

Regional Setting:

Pyrrhotitic nickel-copper deposits are situated in an ultrabasic complex with chronologically and probably genetically related basic, dioritic and noritic phases. The complex forms part of a 15-mile-wide, north-south trending, block of Late Paleozoic metamorphic rocks and Mesozoic intrusive rocks. The block is bounded on the east by the Fraser River Fault Zone and on the west by the Shukson Fault Zone.

Local Geology:

Pipelike mineral deposits occur within a segmented, crudely eliptical ultramafic complex about one and one half miles in diameter. The stock like mass contains pendents of metamorphosed Paleozoic rocks of the Chilliwack Group (?) and is in turn enclosed in younger granitic rocks considered to be part of the Spuzzum Pluton. K-Ar ages from the ultramafic complex range from about 120 m.y. to 95 m.y. (J. McLeod, personal communication) with the youngest ages obtained from late hornblendite dikes and the ~~majority~~ hornblende pyroxenite phase having older ages. All ages from the ultramafic complex are older than ages obtained from the Spuzzum Pluton.

The complex contains a complete spectrum of ultramafic rocks with pyroxenite and peridotite (generally hornblendic) the most common rock types and dunitic phases rare. Hornblendite is often found adjacent to a granitic contact, prompting several workers to suggest a metamorphic or metasomatic origin for these bodies.

Clarke (1969) concluded that structure has played an important

role in the control of ore bodies and that the intersection of N45° to 50°W striking faults and N10°W to N30°E striking faults ~~xxxxx~~ exert control over ore deposition. The four main fault trends recognized at the mine are:

(1) N45 to 50°W 50-75°NE
(2) N15 to 30°E 70°SE-70°NW
(3) N10°W to 10°E ~~xxxxxxxxxxxxx~~ 55°E to 55°W
(4) N30°W to 30°E 20-30° E or W

The first three sets appear to provide ground preparation and access for ore while the fourth group appears to be post ore and often displaces ore zones. Tectonic and intrusive breccia zones and agmatite are found to be spatially related to several orebodies (eg. below 1500, adjacent to Chinaman, south of and below 4600, adjacent to 6800 etc.) and breccia fragments are found in some massive ores. The genetic relationship between breccia zones and ore deposits is not clear, but remobalization is apparent in some of the breccia ore.

Alteration seems to be closely related to structure and intrusive contacts and therefore, is often associated with ore bodies. Four main types have been recognized: (1) crumbly alteration (also called pervasive shearing), (2) talc-amphibole ± magnetite, (3) uralization and (4) hornblendization. Crumbly alteration is a descriptive term applied to breakdown of olivine grains to micaceous minerals (phlogopite and chlorite) and where intense, serpentine is formed. Crumbly alteration is generally restricted to peridotite or dunite and is often present as a partial envalope around orebodies. Talc-amplibole alteration is general associated with intensely faulted or fractured bodies of pyroxenite and is often found adjacent to the ore zones. Although alteration is generally present as a partial envalope around orebodies, there is no established pattern that can be relied upon as an ore indicator.

Twenty eight mineral deposits have been outlined within the main ultramafic mass (Fig. 1 and 2). Of these deposits, production has been obtained from twenty two and five (4600, Pride of Emory, 1500, Brunswick 2 and Brunswick 5) accounted for over two thirds of the production. Pipelike ore bodies range from a vertical continuity of 1,200 feet to 100 feet and have horizontal sections ranging from 250 by 120 feet to 20 by 40 feet. The ore bodies can be divided into three types: (1) zoned, in which sulfides are disseminated through one or more rock types and show gradational change in tenor (eg. Brunswick Nos. 1, 5, 6, 4600, 1900 and 512), (2) massive, are generally confined to fault or contact zones and have sharp contacts (eg. Pride of Emory; Brunswick Nos. 2, 8, and 9), (3) vein, narrow tabular bodies that may enrich an ore zone but have limited tonnage potential.

A summary of the various ore bodies is provided in Tables 1. AND 2

Summary

A geological study is presently being conducted at the Giant Mascot Mine near Hope, B.C. to consolidate geological information on this unique deposit. Chemical and petrographic examinations to be carried out should help define ore controls and help consolidate genetic theories.

Since low grade reserves are present within the ultramafic complex and less than a third of the known ultramafic complex has been explored by underground development, this deposit provides an intreaging exploration target.

Table 1. Summary of Mineral Deposits

Name	Dimentions (ft.) Horizontal	Vertical	Tons x1,000	Grade Ni;Cu	Ni:Cu	Co ore / Co waste	Cr ore / Cr waste	Plunge of Ore	Discovery
Pride of Emory	max. @ 3550 150x60'	875'	~~875~~ 70%	1.46;0.38	3.84	-	-	N40W 53° 3200-4000	Prospecting
Br 1	max. @ 3850' 110x60	525' 3350-3875	123	1.10;0.35	3.14	-	-	N20W 75° 3350-3800	Prospecting
Br 2	max. @ 3150' 180x70	825' 2700-3525	570	1.40;0.60	2.33	-	-	N30W 56° 2800-3525	S.P.?
Br 2A	max. @ 3675' 110x70'	350' 3575-3925	290	0.98;0.35	2.80	-	-	N40W 72° 3600-3750	S.P.?
Br 2G	max. @ 2800' 70x65'	300' 2675-2975	131	0.56;0.27	2.07	0.07/0.01=7	-	N45W 77° 2700-2875	Below Br 2
Br 5	max. @ 3550 120x70'	600 3300-3900	409	1.49;0.50	2.98	-	-	N30E 77° 3600-3825 Vertical 33-3600	S.P.?
Br 7	max. @ 3350 90x50'	200' 3275-3475	23	2.37;0.75	3.16	-	-	N30W 68° 3275-3450	Underground
Br 8	max. @ 3600 20x40'	175' 3475-3650	12	1.75;0.61	2.86	-	-	N20E 79°	Underground
Br 10	max. @ 3500 70x55'	200'+ 3350-3575	38	0.74;0.35	2.11	-	-	N30W 70-80°	Underground
2663	max. @ 2750 50x60'	325' 2675-3025	102	0.86;0.32	2.69	-	-	N40W 68°	Underground
6800	max. @ 3100 50x50'	300' 2950-3250	47	0.66;0.24	2.75	0.052/0.002= 26	-	~~N70W 66°~~	Underground
600	max. 100x45'	300'+ 3225-3550	83	1.42;0.42	3.04	~	-	S30W 68°	Underground
Portal Zone		620'	2,375	0.25;0.11	2.27	-	-	probable steep southeast plunge surface 2700'	Prospecting

Name	Dimentions(ft.) Horizontal	Vertical	Tons x1,000	Grade Ni;Cu	Ni:Cu	Co ore / Co waste	Cr ore / Cr waste	Plunge of Ore	Discovery
4600	max. @ 3100' 250x100'	643'+ 2800-3550	805	1.35;0.73	1.80	0.027/0.002 =13.5	0.185/0.152 =1.22	N45W 82° 2800-3250	Underground
4400	max. 40x50'	150'+ 3075-3275	27¼	0.51;0.22	2.31	0.012/0.006 =2.0	-	N50W 76° 3075-3275	Underground
4300	max. 90x40'	225 3200-3425	62	0.91;0.51	1.78	0.063/0.002 =31.5	0.083/0.040 =2.07	N50W 61°	Underground
2200	max. 50x50'	750 2650-3350+	135	0.68;0.38	1.79	0.036/0.002 =18.0	0.148/0.087 =1.70	N60W 75° 2650-3350	Underground
2000	max. 30x30'	50'	3.4	1.33;0.33	4.03	—	—	N45W 80°	offset of 2200?
1800 (1700)	max. 50x80'	150' 3250-3400	40	0.53;0.23	2.30	0.025/0.005 =5.0	—	S60E 60° ~~N45W~~	Above 2200
1900	max. 50x80'	300' 3295-3575+	45	0.86;0.45	1.91	—	—	N60W 63° 3400-3550	Underground offset of 2000?
1700 showing	max. 12x20'	50'	1	2100 APPROX.	—	—	—	—	
1600	max. 170'x90'	425' 3225-3650	216	0.97;0.34	2.85	0.04/0.01 =4.0		S50W 69° 3200-3600	Underground 200' interval D.D. on 3550level
1500	max. 200'x70'	1,130' 2675-3675+	668	1.37;0.45	3.04	0.06/0.01 =6.0	0.12/0.01 =12.0	N30E 55° 2700-3400	"
1400	max. 50x60'	468' 3275-3725+	53	0.71;0.32	2.21	0.03/0.005 =6.0		N50W 65° 3275-3725	"
Chinaman	max. 90x100'	638' 2700-3290+	376	0.73;0.30	2.43	0.046/0.010 =4.6	0.225/0.10 =2.5	N60W 68° 2650-3050	Below Trail Surface showing
Climax	max. 50x90'	598' 2700-3200+	211	0.78;0.36	2.16	0.028/0.010 =2.8		N30W 63° 2650-3250	Intersected in ~~2620~~ 3050 X.C.
512	max. 30x50'	225'+ 3875-4015	28	1.08;0.41	2.63	—	—	S45W° 75° 3725-3850	Below Nickel Star showing

Name	Geological Setting	Alteration	Structural Setting
4300	Probably off shoot of 4600; disseminated sulfides in H.Px;	Fracture zones contain act. alteration.	Faulting N15Wvertical;
2200	Ore near the contact of norite embayment; sulfides are disseminated in pdt. pipe enclosed in barren px.	Px north of ore body shows strong act. alt.	Faulting N15E; NW 70E;
2000	A small zone of pdt or dunite ore with disseminated halo.		
1800	Mineralized body occurs in pipelike body of Pdt enclosed in px.	some talc-act. alt at contact	1800 may be a faulted off set of 2200
1900	Zoned body; consists of irregular ~~xxxxxxxxxx~~ dissemination in an oval shaped body ~~of~~ with H. Pdt. core rimmed by enstatite-hypersthene rock and a partial H. Px shell.	Strong talc alt. of ore near footwall	Faulting N15W 40W
1700	Dunitic ore NW of 2000	Crumbly altered	
1600	Zoned body; dunitic core to barren H.Pdt; On 3200 level a breccia with ore fragments in norite may indicate post-ore faulting.	Strong talc alt. of ore near diorite contact along hanging wall; strong crumbly alteration near top of ore.	
1500	Ore in both H.Pdt. and H.Px as both massive and lacy types with a concentration of massive near bottom; ore has been either dammed or cut off by a flat fhornblendite dike; footwall contains a breccia with diorite fragments in mineralized H.Px.	Large zone of crumbly alt. north of ore zone; some crumbly in zone.	moderate faulting parallel to ore body. major axis of
1400	Ore in a Pdt-px mixture with diorite on southwest and northeast contacts.	Moderate act. alt. in px.	NW trending faults dip east and west.
Chinaman	Ore mainly in H.Px, barren pdt. core; footwall and NE side is a H.Px-Diorite Breccia; Entire ore zone is more hornblendic than other zones.	Strong act.-talc-magnetite alteration below and in hanging wall of zone.	" "
Climax	Ore parallels norite contact and overlaps pdt-px contact;	Crumbly near north contact.	
512	Zoned structure with barren core and sulfides in shell of olivine px; barren H.Px and hornblendite surronds ore.		

TABLE 2. Summary of mineral deposits

Name	Geological Setting	Alteration	Structural Setting
ride of mory	Several elongate mineralized bodies; in ore zone rock grades from dunite to bronzite; sharp contact to east with H. Px and grades into pdt. or dunite on the west.	Strong talc alt. of H. Px immediately north of P.E. pit.	N20E strong fractures; NW and NE faulting
runswick 1	Zoned from dunite core to harzburgite to barren bronzite; main diorite contact to the south is parallel to footwall of ore.		sketchy info. indicates mod. faulting NW-NE throughout Br 1,2,2A.
runswick 2; 2A;2G	Massive type; enstatine and olivine with interstitial sulfides;	Mod.-strong act, alt. in hanging wall parallel to xplunge.	
runswick 5; 7	Enclosed in enstatitic Px. Br 5 has dunitic core grading to pdt. to barren enstatite rock.	Most of the dunite shows crumbly alteration	Weak NW faults dip 45°E
runswick 8	Massive ore body; Ore is enstatitic px. in sulfide groundmass; barren px and norite lenses may be inclusions	H. Px on NW side shows act. alt.	
runswick 10	Ore associated with a lense of enstatite		Intersecting NW and NE fault zone below ore zone
663	Mineralized Pdt. core surrounded by barren px; diorite contact in footwall	Mod. crumbly in pdt. to north; mod. act. parallel to pdt.-px contact to south	Faulting N75W60°N; N20E40E
800	Several tabular zones; fine sulfides in px;Breccia fragments of norite occur in ore zone.	Crumbly zone below deposit on 2950 level.	Faulting N 50-70W
00	Pdt. ore follows steeply plunging norite-H.px contact	Zones of crumbly alt. have irregular distribution.	Faulting N15E parallel to long axis.
ortal Zone	Low grade pdt. mineralization enclosed in H.px.		
600	Zoned with olivine barren core and olivine rich rim; Inclusions of diorite occur in ultramafic; Massive ore zections favor footwall side of ore body.	Weak act. in footwall mod. crumbly at px-pdt contact to north	Fault N15E40°W
400	Ore lies along a N-S Pdt.-Px contact	Crumbly alteration parallel to north and east contacts in footwall; act. with faults	Faulting NW dip E; N20E 35E;N15W 55E

GIANT MASCOT MINES LIMITED.

LONGITUDINAL PROJECTION OF GIANT NICKEL MINE

HOPE, B.C.

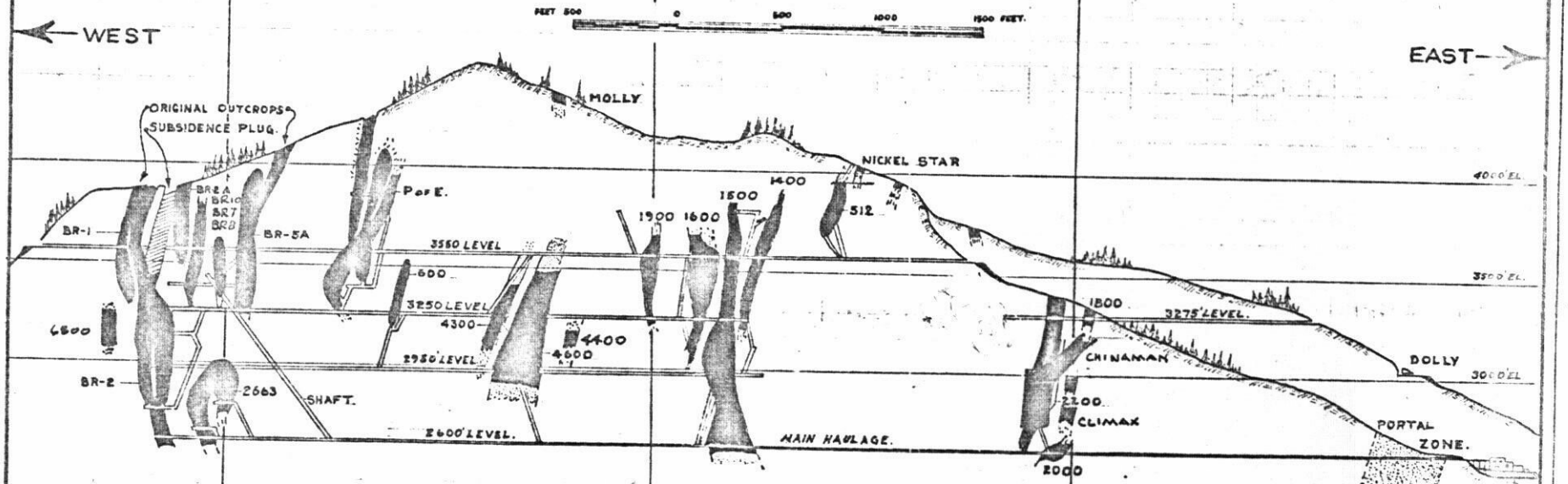


FIG. NO. 2

MODIFIED FROM
W.E. CLARKE

LEGEND

ORE BODIES PRIOR TO MINING

inches
0 1
0 1 2
centimetres

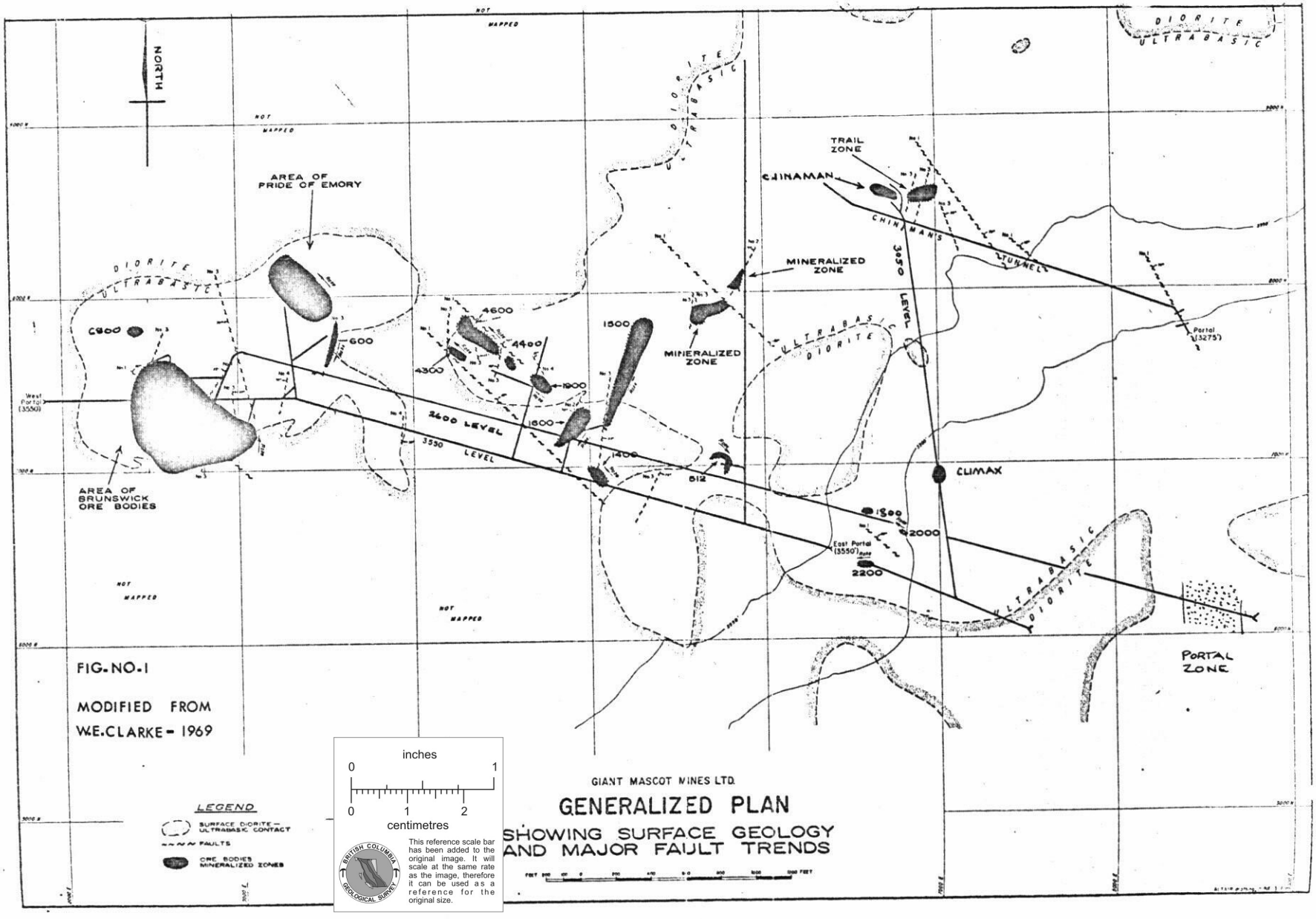
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

BRITISH COLUMBIA GEOLOGICAL SURVEY

JUNE, 1969.

PROPERTY LOCATED 75 MILES EAST OF VANCOUVER.

RLH


NORTH
NOT MAPPED
DIORITE
ULTRABASIC
AREA OF PRIDE OF EMORY
TRAIL ZONE
CHINAMAN
CHINAMAN'S TUNNEL
3550 LEVEL
MINERALIZED ZONE
MINERALIZED ZONE
4600
4400
4300
1900
1500
1600
1400
600
C800
West Portal (3550)
2400 LEVEL
3550 LEVEL
512
AREA OF BRUNSWICK ORE BODIES
CLIMAX
1800
2000
2200
East Portal (3550')
Portal (3275')
PORTAL ZONE
FIG. NO. 1
MODIFIED FROM W.E. CLARKE - 1969
LEGEND
SURFACE DIORITE — ULTRABASIC CONTACT
FAULTS
ORE BODIES MINERALIZED ZONES
inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.
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GIANT MASCOT MINES LTD.
GENERALIZED PLAN
SHOWING SURFACE GEOLOGY AND MAJOR FAULT TRENDS