THE POLARIS-TAKU GOLD MINE

Prepared by

Beacon Hill Consultants Ltd.

for

SUNTAC MINERALS CORPORATION

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TABLE OF CONTENTS

DESCRIPTION	PAGE NO.
Summary	1
General Introduction	3
Property Description	3
Geology	6
Reserves	9
Exploration Potential	10
Mine Plan	12
Metallurgy	13
Conclusions	16
Acknowledgements	16
References	17

LIST OF FIGURES

Figure 1	Location Map
Figure 2	Property Location Plan
Figure 3	Claim Map
Figure 4	Surface Plan
Figure 5A	Regional Geology
Figure 5B	Stratigraphic Column
Figure 6	Geological Map
Figure 7	Geological Overview
Figure 8	Stope Plan
Figure 9	Stope Plan - Structural Interpretation
Figure 10	Cross-Section A-A'
Figure 11	Cross Section A-A' - Exploration Potential
Figure 12	Surface Plan-Exploration Potential
Figure 13	Longitudinal Section of "Y" and "332" Veins
Figure 14	Longitudinal Section of "A" Vein
Figure 15	Longitudinal Section of "B" Vein
Figure 16	Metallurgy-Preliminary Flowsheet-Roasting

SUNTAC MINERALS CORPORATION

POLARIS-TAKU GOLD MINE

Summary

The Polaris-Taku gold mine is located approximately 40 miles northeast of Juneau, Alaska, and 60 miles south of Atlin, British Columbia, in the Coast Range mountains.

The property lies on the west side of the Tulsequah River Valley, approximately 6 miles upstream from the confluence of the Tulsequah and Taku Rivers. The former mine facilities and townsite are situated on the western edge of the valley bottom at an elevation of about 100 feet ASL. The claims cover an area of some 2100 acres and consist of 61 contiguous Crown grants owned by Rembrandt Gold Mines Ltd., and under option to Suntac Minerals Corporation.

The Polaris-Taku property is underlain by Upper Paleozoic volcanic and sedimentary rocks, which form a portion of the west limb of the Tulsequah synclinorium. The sequence comprises basal sediments, quartzites, and schists, irregularly occurring limestone, and volcanics that host the deposit. The greenstone assemblage includes fragmentals, andesite flows, and minor intrusions. The property is within 5 miles of the Coast Range Intrusives that form the B.C.-Alaska border.

The deposit is confined to a wedge-shaped zone of volcanics trending southeast and apexing to the northwest. It is bounded on the southwest by limestone and on the north by a belt of amphibolite and serpentine. The mine wedge is thought to be a syncline plunging gently to the southeast, composed mainly of thin-bedded tuffs and more massive pyroclastics with limited continuity.

Gold mineralization is in quartz veins and associated altered volcanics. The best gold values are from fine needles of arsenopyrite disseminated in carbonitized greenstone adjacent to fractures. Late carbonate veins with stibnite occur in some fractures.

It is proposed that the deposit is confined to a major shear zone with the veins following principal shear fractures, extension fractures, and low angle Riedel shear fractures. The deposit is a result of the combination of this structurally prepared ground and chemically attractive host rock and can be classified as a mesothermal lode gold deposit.

Gold mineralization was first discovered on Whitewater Creek in 1929. Surface exploration was carried out from 1929 to 1932, and underground development commenced in 1933. The Polaris-Taku mine operated from 1938 to 1942 and again from 1946 to 1951, and produced a total of 760,000 tons of ore at an average grade of 0.30 oz Au/t. The mine was closed because of steadily increasing operating costs and a relatively low gold price. Mine records indicate that ore grade increased during the final years of operation and that areas of mineable grade mineralization remain undeveloped.

The probable and possible reserves remaining within the developed area of the mine are estimated to be 244,000 tons at an average grade of 0.33 oz Au/t, based on a cut-off grade of 0.15 oz Au/t and a minimum mining width of 5 feet. Inferred reserves are estimated as 704,000 tons at the same grade, giving a total of 948,000 tons at 0.33 oz Au/t, or 312,840 oz of gold in place, above the 750 level, which is the bottom of the existing workings and the deepest drill holes. Existing geological information suggests the potential for further reserves at depth and along strike.

A Phase I exploration program was completed in the last quarter of 1988. The program consisted of eight diamond drill holes totalling 3372 feet. Thicknesses ranged from 6.0 to 25.0 feet with grades of 0.17 to 0.93 oz Au/t. These results are very encouraging, as they indicate the existence of additional reserve blocks not included in previous probable and possible reserve estimates.

A Phase II exploration program, which commenced in mid-March 1989, will consist of 10,000 feet of diamond drilling, opening of the Polaris adit, rehabilitation and geological evaluation of the underground openings, and evaluation of underground hoisting facilities. The estimated cost of this program is Cdn$ 950,000, and it is expected to take 3.5 months to complete.

A review of the available geological data indicates that the Polaris-Taku gold mine has excellent potential for developing additional vein systems both along strike and at depth, and that present reserves should be greatly enhanced through further exploration.

A conceptual mine plan, currently under preparation, envisages trackless mining utilizing predominantly shrinkage stoping methods, with some blasthole and cut-and-fill mining where appropriate.

Metallurgy completed prior to 1951 indicates that an antimony and arsenopyrite flotation, followed by concentrate roasting and calcine cyanidation, is the most appropriate flowsheet concept for this type of ore. Pressure oxidation is also considered to be an option to improve recoveries.

GENERAL INTRODUCTION

Suntac Minerals Corporation has recently taken an option on the Polaris-Taku property, a former producing gold mine located in the Atlin District of northwestern B.C., some 40 miles northeast of Juneau, Alaska. Under the terms of the agreement Suntac may earn an interest in the property, owned by Rembrandt Gold Mines Ltd., by funding an exploration program and completing an evaluation of the project.

The property was originally developed in the 1930s as an underground mining operation and was in production over a period of 11 years before being closed in 1951.

PROPERTY DESCRIPTION

Location and Access

The Polaris-Taku mine is located on the eastern flank of the Pacific Coast Range Mountains in northwestern British Columbia, approximately 40 miles northeast of Juneau, Alaska, and 60 miles south of Atlin, B.C. (Figures 1 & 2). The property lies about 5 miles from the Alaska-B.C. border.

Access to the site is currently by air, with service available from both Juneau and Atlin. A 4000 foot airstrip, built to serve the former operation and located 4 miles south of the mine, is currently in use and can accommodate DC-3 aircraft. An access road extends from the airstrip along the west bank of the Tulsequah River through extensive sand and gravel flats. This road requires upgrading before it can be utilized.

The former mine and townsite facilities are situated at the western edge of the level valley bottom, near the area where Whitewater Creek descends into the valley from the west. An airstrip located at the mine site can accomodate the smaller one and two engined aircrafts. Elevations on the property range from less than 100 feet ASL at river level to over 2400 feet on the western edge.

Adequate water supply is available from creeks running through the property. There is no electrical power at the site.

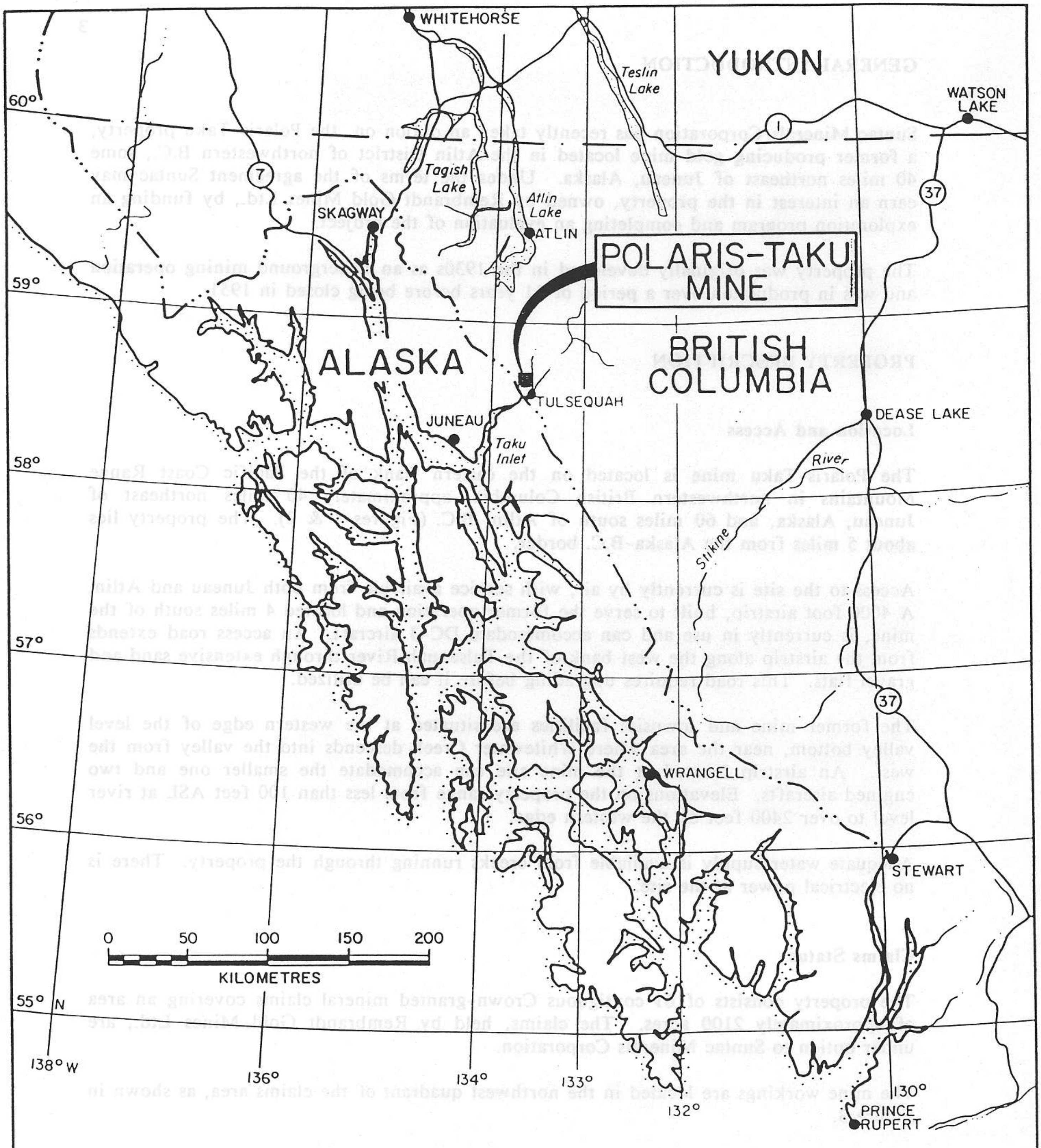
Claims Status

The property consists of 61 contiguous Crown-granted mineral claims covering an area of approximately 2100 acres. The claims, held by Rembrandt Gold Mines Ltd., are under option to Suntac Minerals Corporation.

The mine workings are located in the northwest quadrant of the claims area, as shown in Figure 3.

Property History

The property was originally staked in 1929, and exploration was carried out by various groups until 1936 when the Polaris-Taku Mining Company acquired the property. A 250 tpd mill was erected in 1937, and the mine was operated continuously until



POLARIS-TAKU MINE
LOCATION MAP
SUNTAC MINERALS CORPORATION

FIG. 1

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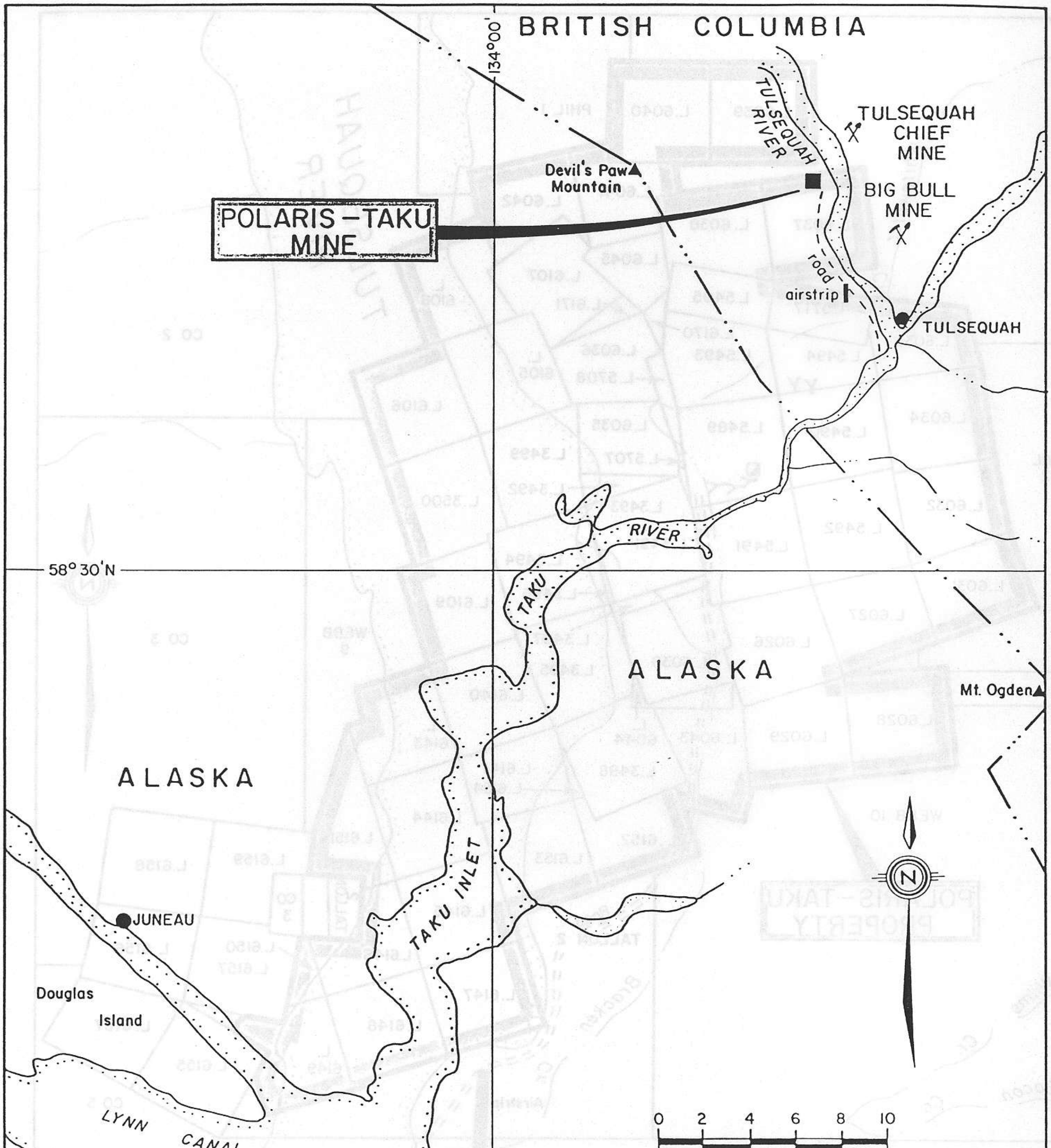
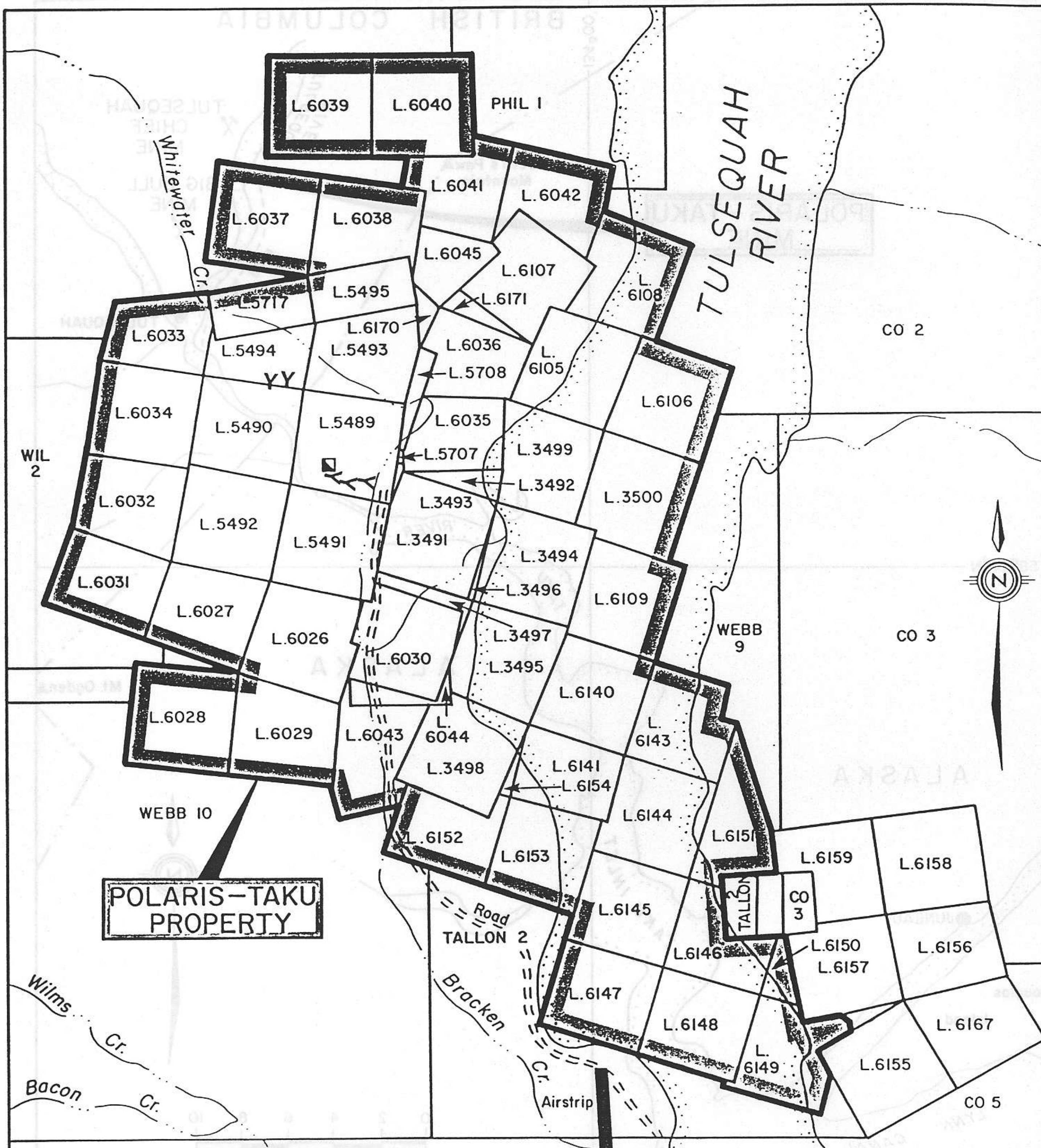


POLARIS-TAKU MINE

PROPERTY
LOCATION PLAN

SUNTAC MINERALS CORPORATION

FIG. 2 **Prepared by: BEACON HILL CONSULTANTS LTD.**



MINE SHAFT
PORTALS

0 .25 .5
Miles

0 .5 1
Kilometres

POLARIS-TAKU MINE
CLAIM MAP
SUNTAC MINERALS CORPORATION

FIG. 3

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shutdown in 1942 due to the Second World War. Operations resumed in 1946 and continued until 1951 when the mine was closed because of high operating costs. During the 11 years of operation the mine produced a total of 760,000 tons of ore, yielding some 231,000 oz of gold at an average grade of 0.30 oz Au/t.

Shortly after mine closure the mill was leased to Tulsequah Mines Ltd., and modified to process 500 tpd from two separate but adjacent mines, Tulsequah Chief and Big Bull. This operation ceased in 1957.

All major equipment was removed from the Polaris-Taku site and no further work was done at the property. The buildings and services fell into disrepair. Figure 4 shows the surface facilities.

Mine Development & Production

The upper part of the mine had been developed on five levels: Canyon (elev. 580 feet ASL), C (elev. 482 feet), B (elev. 364 feet), AJ (elev. 246 feet), and Polaris (elev. 136 feet). All levels except C were developed from adits. A vertical, three-compartment, timbered shaft was sunk from the AJ level to a depth of 900 feet, providing access to the five lower levels, the 150, 300, 450, 600, and 750.

The ore veins were generally mined by shrinkage stoping methods, with some cut-and-fill and open stoping where applicable. The ground conditions for the most part were reportedly competent, with few areas requiring extensive support.

The Polaris level was the main haulage level, with ore transported via a tracked system. Ore was fed from the stopes on the Polaris level through timbered chutes into the rail cars. The levels above the Polaris also used rail haulage to move the ore to a main ore pass that terminated on the Polaris level.

The three-compartment shaft, using a skip cage combination, was used to hoist ore, men, and materials from the Polaris level to the 750 level. The hoist, a double-drum Ingersoll Rand 48" x 36" with a 125 hp motor, operated at 580 feet/min. The hoist is located on the AJ level with a horizontal rope raise to the shaft.

The following data (Table 1), obtained from the B.C. Ministry of Energy, Mines and Petroleum Resources, provide a record of the annual mine production during the operating period 1938-1951.

POLARIS - TAKU MINE

SURFACE PLAN

SUNTAC MINERALS CORPORATION

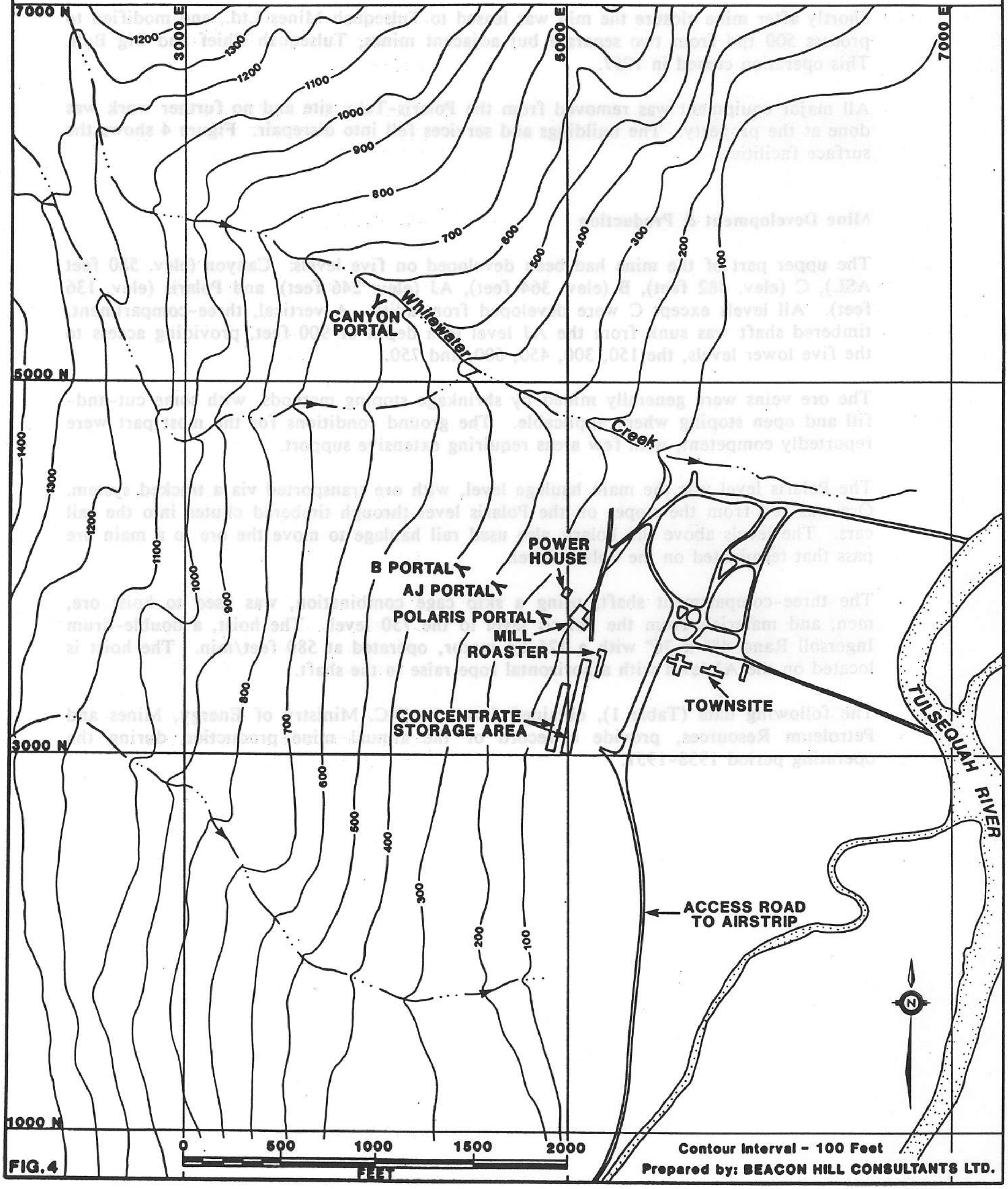

TABLE 1

MINE PRODUCTION 1938 - 1951

Year	Tons Mined	Tons Milled	Av. Gold Grade (oz/t)	Oz Gold (net)	Av. Silver Grade (oz/t)	Oz Silver (net)
1938	52,678	58,759	0.22	12,765	0.008	495
1939	69,044	68,967	0.25	16,995	0.012	874
1940	80,320	80,364	0.29	22,954	0.017	1371
1941	89,684	89,609	0.21	19,091	0.014	1212
1942	30,966	31,335	0.56	17,506	0.037	1175
1946	25,724	25,724	0.13	3,267	0.019	486
1947	92,039	92,039	0.25	22,714	0.017	1589
1948	102,622	102,622	0.28	29,156	0.013	1311
1949	93,806	93,806	0.42	39,345	0.015	1384
1950	95,666	95,666	0.35	33,228	0.012	1182
1951	20,700	20,700	0.70	14,583	0.033	681
	753,249	759,600	231,604	0.30	11,760	0.015

As previously noted, the level of mine production and the grades of ore generally improved after the wartime shutdown, particularly during the final two years of operation. The average grade for the six years of operation after the shutdown averaged 0.33 oz Au/t compared to the average of 0.27 oz Au/t during the five years prior. Production was some 6000 tons greater per year during the second period of mining. The increased mining grade was necessitated by higher mining costs, but there is also some indication that higher in situ grades occurred naturally on some of the lower mining levels.

During almost the entire operating period, concentrates produced at the Polaris-Taku mill were stored on site over the winter and shipped in summer by shallow draught barges down the Taku River to a freight anchorage at the head of Taku Inlet.

In an attempt to improve gold recoveries and reduce the high cost of shipping concentrates to the Tacoma smelter, an Edwards roaster and a cyanide plant were installed and tested in 1949; after some modifications to the equipment and circuits, the plant commenced operation in September 1950. Although the addition of the roaster helped improve milling economics, its capacity was somewhat limited and it could treat only about 45% of the concentrates produced from the flotation plant. The roaster continued to be used for flotation concentrates for a short period after the mine and mill ceased operation in March 1951.

Power for the mine and surface facilities was provided by an on-site hydroelectric plant, utilizing water from Whitewater Creek during the heavy summer run-off period, and by diesel generators, which provided additional power in the summer as well as all power in the winter.

GEOLOGY

Available Data

A significant quantity of geological data is available from the mine production period. The following information was used in evaluating the property and building a geologic base from which to proceed with further exploration activities.

- 10 level plan maps summarizing geological mapping, drilling, and ore interpretation; scale 1" = 100ft.
- 22 level plan maps with detailed geological mapping, surveying, and drilling; scale 1" = 40ft.
- drill hole records for 794 holes.
- geological reports as listed in the references.

Method of Interpretation

In order to utilize all the available data and to provide an acceptable method of manipulating the large data bank, it was decided to computerize the initial data and then add to the data bank as exploration activities continued. Two software packages were used: "Geo-Model" and "PC-xplor" (Gemcom Services Inc., Vancouver, B.C.).

Geo-Model was used to digitize and store the data from the mine openings on the 1" = 40ft level plans. Two sets of cross sections (1" = 100ft) were interpolated through the old mine workings at 100 foot spacing to provide a base for geological interpretation. One set of cross sections was oriented east-west to view the deposit looking north, while the second set was oriented northeast-southwest at 45^{0} to view the deposit looking northwest. Geological data were transferred from the level plans (1" = 100ft) to the cross sections, and an interpretation was completed.

A drill hole data base was created, which included all of the old drilling as well as the 1988 holes. The drill holes were loaded into the PC-xplor software package. Data entered from the old holes included location, orientation, and the depth, thickness, and grade of the mineralized intercepts. Rock types were not entered, though information on faults and overburden was collected.

A final set of level plans at approximately 75 foot intervals and two sets of cross sections at 50 foot intervals were produced, which showed mine workings, stopes, faults, overburden, and drill holes.

Work is continuing to increase the data base with the addition of soil geochemistry, underground mapping and sampling (old and new), and new drilling.

Regional Geology

The map area is part of the Stikine Arch comprising older layered rocks and intrusives of the Coast Crystalline Belt.

The Polaris-Taku mine lies on the western edge of a large body of Stuhini Group volcanics. The Upper Triassic Stuhini comprises mainly volcanics and is underlain by older Triassic volcanics and earlier sediments. Nearby intrusives include a Jurassic-Cretaceous granodiorite body north of the mine and a portion of the Central Plutonic Complex to the west.

The structural trend in the area is northwest-southeast, paralleling major faults and folds to the east and the intrusive alignment to the west. The Triassic and older sediments have been intensely folded and sheared. Stuhini rocks are deformed into broad symmetrical folds with large amplitudes, which are doubly plunging.

Stratigraphy

Figure 5 summarizes the regional stratigraphy. Lithologies covering the property have been described in detail by Smith (1950).

The oldest rocks in the area are Triassic and older quartzites and schists, which are exposed in the northwest corner of the property. Commonly the unit consists of quartzite bands about one inch thick alternating with thinner argillaceous or sericitic layers. Overlying the metasediments are chloritic schists. The central part of the property is underlain by Stuhini Group volcanics, which are locally divided into basal and upper units. The basal unit comprises interbedded limestone and pyroclastics, while the upper unit is a typical assemblage of greenstones, mainly fragmentals, andesite flow, and minor intrusions. The upper volcanic is up to 1100 feet thick and can be divided into thin bedded tuffs, massive pyroclastics, and intrusives. The tuffs are generally fine-grained and thinly bedded. The pyroclastics are further divided into very fine-grained and coarse-grained varieties. The fine-grained sequence is up to 200 feet thick, while the coarse-grained unit is up to 600 feet thick. Intrusives include dyke-like bodies of serpentine, amphibolite, gabbro, diorite, and hornblende andesite.

A late stage felsite dyke occupies a north-south fracture. It is a hard, fine-grained, light coloured, dense quartz albite rock, which has been classified as a soda rhyolite or trachyte.

Structure

All of the strata within the property have been subjected to compression, rotation, and subsequent extension. Figures 6 and 7 show the prominent structural orientation, which is characterized by folds trending northwest-southeast and plunging to the southeast. The plunge of the folds appears to be variable though generally shallow.

Numerous important faults cross the property, as shown on Figures 6, 7 and 10. Three of these faults appear to separate favourable strata from unfavourable lithologies. The Limestone fault follows a contact between the basal volcanic horizons and the upper volcanics, while to the northeast a pair of faults separates an ultramafic body from upper volcanics in the south and from basal volcanics in the north. There is a complex system of normal and reverse faults within the main volcanic body.

The Limestone fault is considered to be the southwest boundary of the "mine wedge". The fault is projected on surface where it separates basal and upper volcanic sequences and appears to dip steeply to the northeast at 85°. There is limited control on the location of the Limestone fault within the mined area. Some of the upper mine workings as well as several several drill holes encountered limestone interbeds, which are interpreted to be the contact between basal and upper volcanics.

The ultramafic unit marks the northwest limit of the "mine wedge". This sequence is called the Whitewater Creek schist zone and is bound on both sides by faults dipping to the southeast.

Three major faults, Nos. 1, 5, and unnamed, lie within the main volcanic body. The No. 1 and No. 5 faults strike northwest-southeast, dip approximately 45° to the northeast, and are subparallel to the unnamed fault, which dips steeply to the southwest. The No. 1 fault shows normal displacement of up to 100 feet while the displacement of the No. 5 fault is poorly defined. The southwest dipping, unnamed fault shows no displacement, as it apparently parallels the A-B vein system. Between the No. 1 and No. 5 faults the subparallel Nos. 2, 3, and 4 faults have been mapped in the upper levels. Displacement along these three faults is poorly defined, although movement of up to 30 feet is observed. Nos. 2, 3, and 4 faults appear to converge into a single fault and to peter out with depth.

The plan of the stoping areas, Figure 8, clearly shows the general structure of the veins. The earlier mining operations indicate the wedge shape, the continuity of the zones, the plunge to the southeast, and generally the splay of the veins. Figure 9 is an early attempt at interpretation of the structure, and it can be seen that various veins appear to meet and form structural knots where both thickness and grade improve. Figures 8 and 9 also show the potential for vein structures within the wedge and along strike to the north.

Mineralization

The arsenical gold ores of the Polaris-Taku mine occur in highly fractured and carbonatized Stuhini volcanic rocks. The gold-bearing arsenopyrite is disseminated in the altered rock and in quartz-carbonate stringers.

Vein mineralization consists of arsenopyrite, pyrite, stibnite, pyrrhotite, and gold in a gangue of quartz and carbonates. The gold is associated with the arsenopyrite and possibly to some extent with pyrite. The sulphide content of the veins is up to 10%, with arsenopyrite the most abundant and pyrite the next important. Stibnite is fairly abundant in some specimens but overall comprises less than one-tenth of 1% of the vein matter. Alteration minerals include fuchsite, silica, pyrite, carbonate, and albite.

Orebodies of commercial size have been deposited only on the larger and stronger shears. Developed oreshoots range from 50 to 800 feet in length with widths up to 35 feet. The walls pinch and swell and show considerable irregularity, both vertically and horizontally.

Gold values in the veins show remarkable continuity and uniformity, and are usually directly associated with the amount of arsenopyrite present.

An analysis of vein and fault orientations from old geological mapping data shows a strong correlation between the two. The most prominent strike directions are north-south and northwest-southeast with weaker sets east-west and northeast-southwest.

STRATIGRAPHIC COLUMN

CENOZOIC

QUATERNARY
PLEISTOCENE AND RECENT

19 — *Fluviatile gravel, sand, silt; glacial outwash, till, alpine moraine and undifferentiated colluvium; 19a, landslides*

TERTIARY AND QUATERNARY
LATE TERTIARY AND PLEISTOCENE
LEVEL MOUNTAIN GROUP

18 — *Basalt, olivine basalt, related pyroclastic rocks; in part younger than some of 19*

17 — *HEART PEAKS FORMATION rusty-weathering trachyte and rhyolite flows, pyroclastic rocks, and related intrusions*

MESOZOIC

CRETACEOUS AND TERTIARY
LATE CRETACEOUS AND EARLY TERTIARY
SLOKO GROUP

14 — *Light green, purple and white rhyolite, dacite, and trachyte flows, pyroclastic rocks, and derived sediments*

15 | 16 — *Probably genetically related to 14. 15 Felsite, quartz-feldspar porphyry 16 Medium- to coarse-grained, pink, biotite-hornblende quartz monzonite*

PRE-UPPER CRETACEOUS

13 — *CENTRAL PLUTONIC COMPLEX granodiorite, quartz diorite minor diorite, leuco-granite, migmatite and agmatite, age and relationship to 12 uncertain*

JURASSIC AND/OR CRETACEOUS
POST MIDDLE JURASSIC

12 — *12a, hornblende-biotite granodiorite, 12b, biotite-hornblende quartz diorite, 12c, hornblende diorite, 12d, augite diorite. Age and relationship to 13 uncertain*

JURASSIC
LOWER AND MIDDLE JURASSIC
LABERGE GROUP (10 11)

11 — *TAKWAHONI FORMATION granite-boulder conglomerate chert-pebble conglomerate, greywacke quartzose sandstone, siltstone, shale*

10 — *INKLIN FORMATION well bedded greywacke, graded siltstone and silty sandstone, pebbly mudstone, limy pebble conglomerate; 10a, limestone*

TRIASSIC
UPPER TRIASSIC

9 — *SINWA FORMATION limestone; minor sandstone, argillite, chert*

STUHINI GROUP (7 8)

7 | 8 — *7 Mainly volcanic rocks, andesite and basalt flows, pillow lava volcanic breccia and agglomerate, lapilli tuff; minor volcanic sandstone, greywacke, and siltstone 8 KING SALMON FORMATION thick bedded, dark greywacke, conglomerate, mudstone, siltstone, and shale; minor andesitic lava, volcanic breccia, tuff, limestone, limy shale, locally enclosed in 7*

LOWER OR MIDDLE TRIASSIC (?)

6 — *Fine- to medium-grained, strongly foliated diorite, quartz diorite; and minor granodiorite, age uncertain*

TRIASSIC AND EARLIER
PRE-UPPER TRIASSIC

4 — *Fine-grained, clastic sediments and intercalated volcanic rocks, largely altered to greenstone and phyllite, chert, jasper, greywacke, limestone. 4a, mainly chert, slate, argillite; minor greenstone. 4b, mainly greenstone. 4c, limestone, may include some 1*

5 — *Quartz-albite-amphibole gneiss; quartz-biotite schist, garnetiferous schist, augen gneiss, tremolite marble; mainly metamorphosed equivalents of 3 and 4, may be in part older than 3*

PALEOZOIC

PERMIAN

3 — *Chiefly limestone and dolomitic limestone; minor chert, argillite, sandy limestone*

PERMIAN (?)

1 | 2 — *May not all be of the same age*
1. Peridotite, serpentite, small irregular bodies of gabbro and pyroxene diorite
2. Fine- to medium-grained gabbro and pyroxene diorite

Diorite gneiss, amphibolite, migmatite; age unknown

FIG 5B adapted from J.G. Souther, 1971 Prepared by: BEACON HILL CONSULTANTS LTD.

REGIONAL GEOLOGY

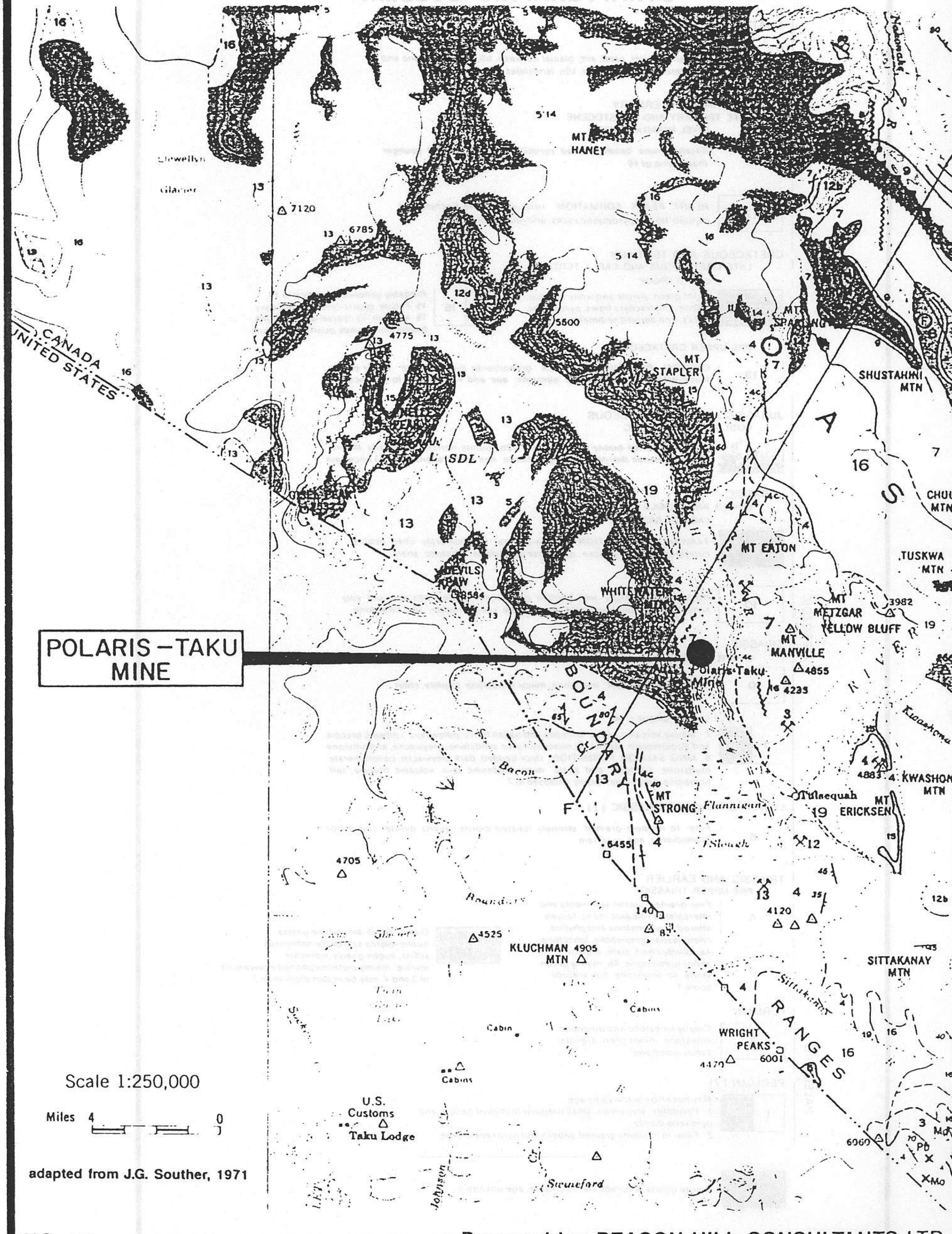

FIG. 5A

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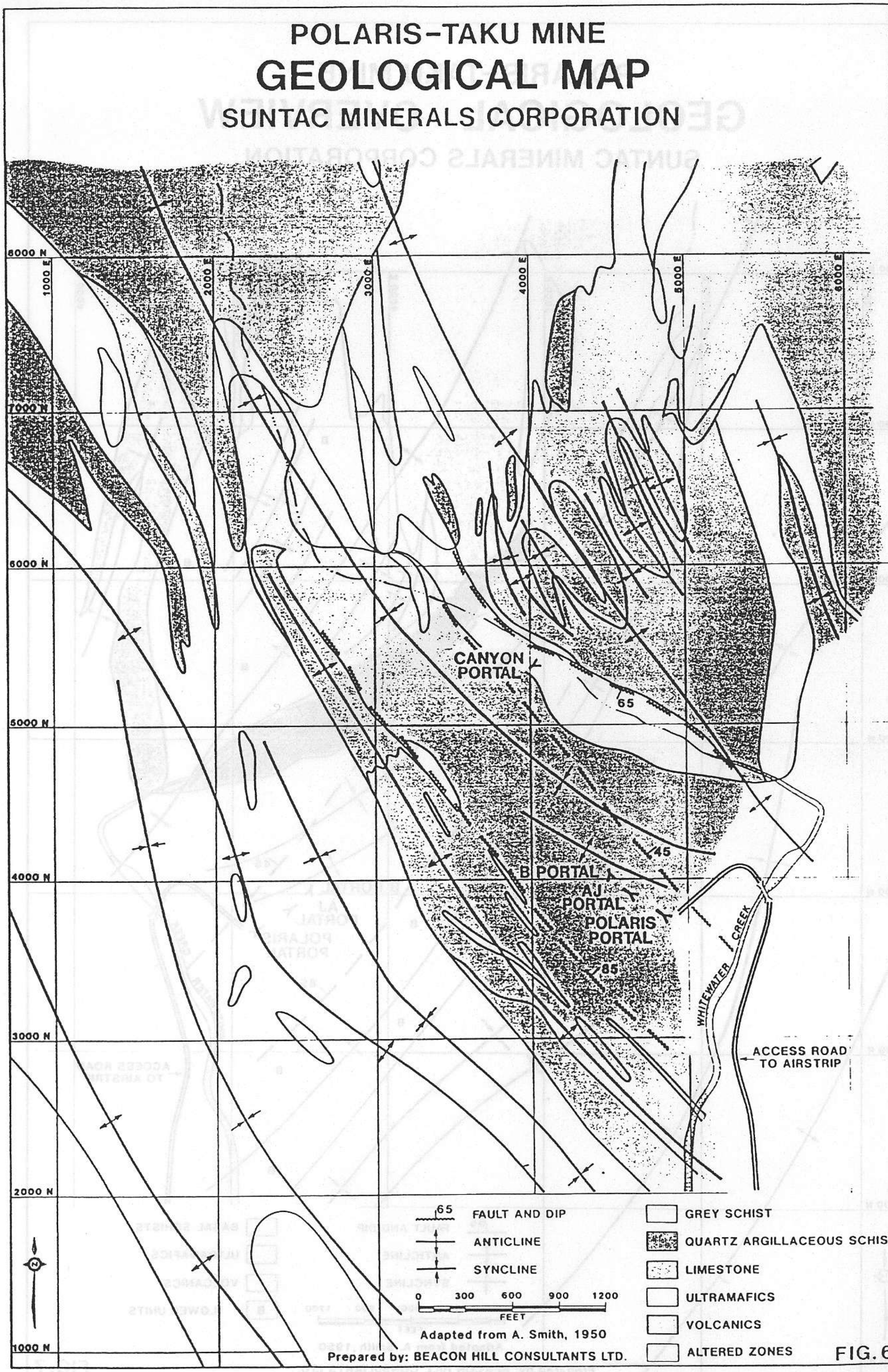
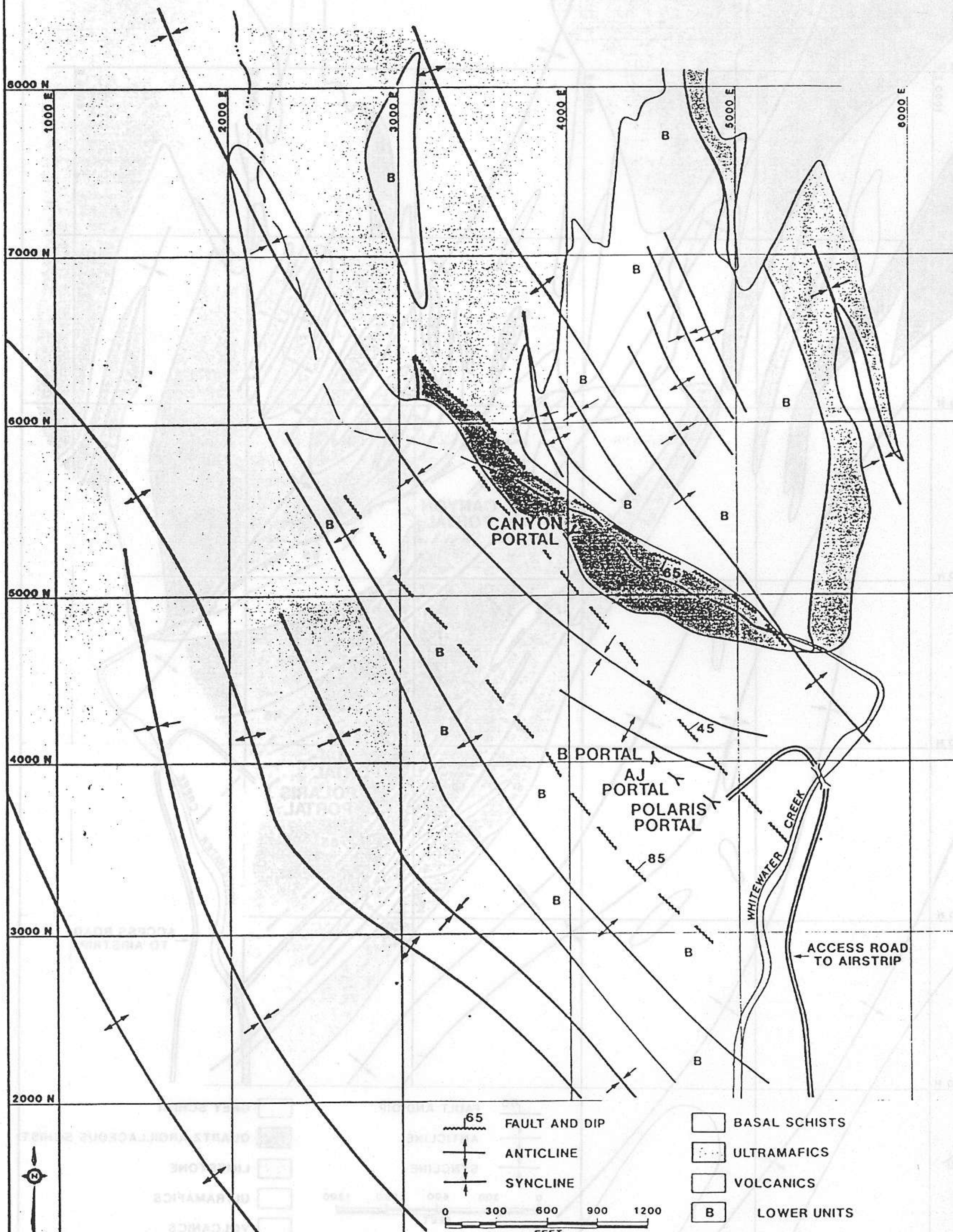

POLARIS–TAKU MINE
GEOLOGICAL MAP
SUNTAC MINERALS CORPORATION
8000 N
7000 N
6000 N
5000 N
4000 N
3000 N
2000 N
1000 N
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E
CANYON PORTAL
65
45
B PORTAL
AJ PORTAL
POLARIS PORTAL
85
WHITEWATER CREEK
ACCESS ROAD TO AIRSTRIP
65
FAULT AND DIP
ANTICLINE
SYNCLINE
0 300 600 900 1200
FEET
Adapted from A. Smith, 1950
Prepared by: BEACON HILL CONSULTANTS LTD.
GREY SCHIST
QUARTZ ARGILLACEOUS SCHIST
LIMESTONE
ULTRAMAFICS
VOLCANICS
ALTERED ZONES
FIG. 6

POLARIS–TAKU MINE
GEOLOGICAL OVERVIEW
SUNTAC MINERALS CORPORATION



Adapted from A. Smith, 1950

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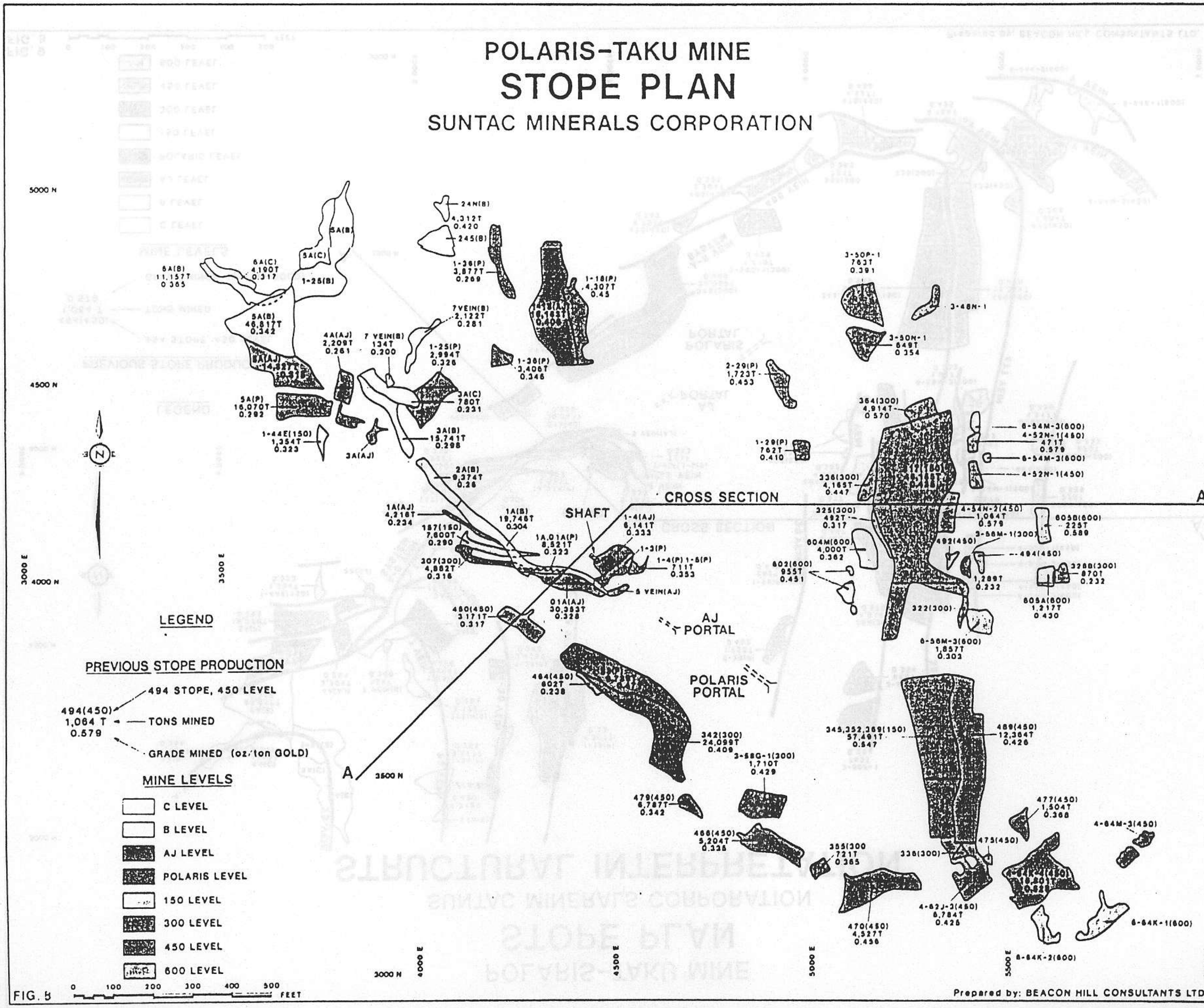
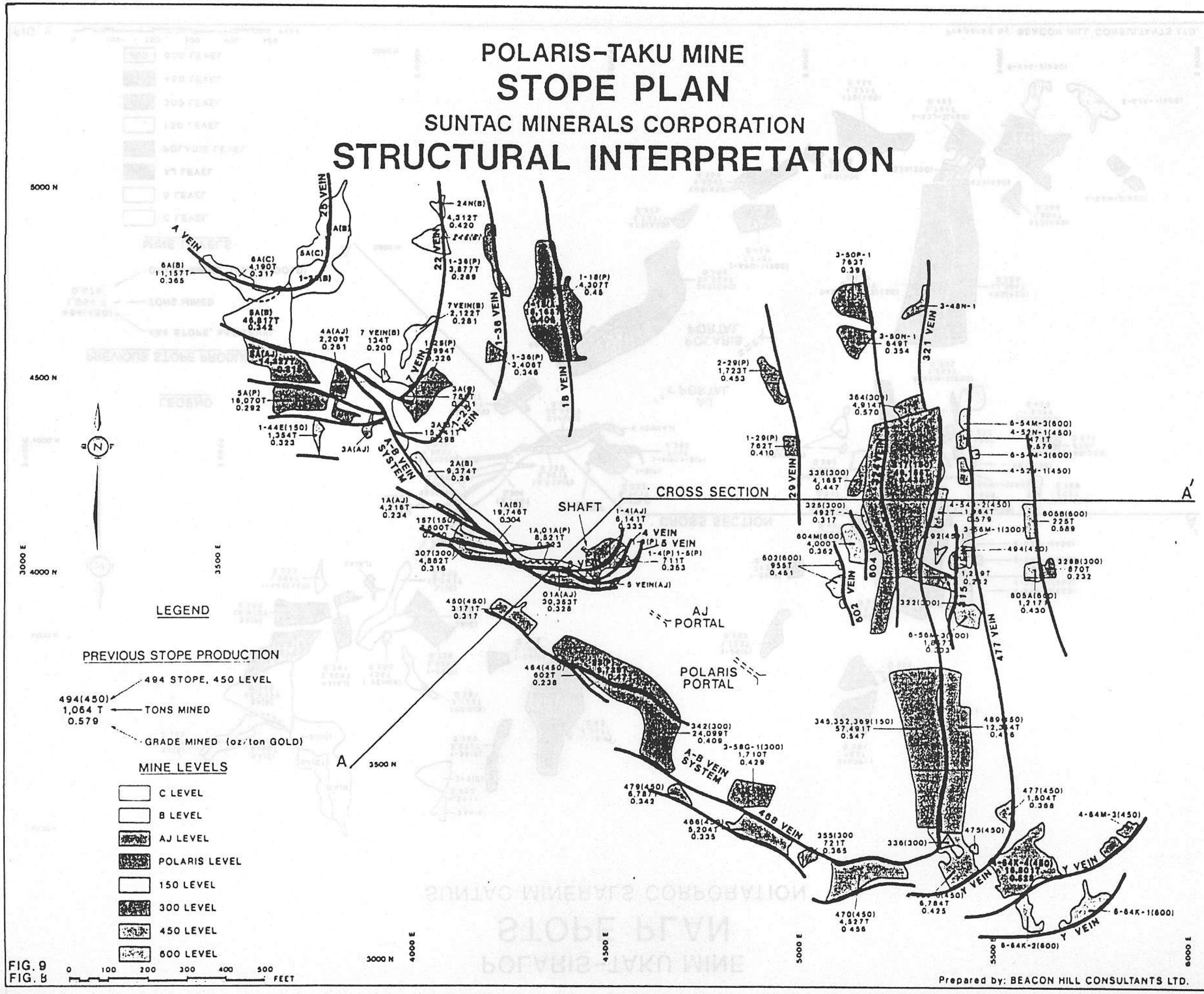
FIG. 7



POLARIS-TAKU MINE
STOPE PLAN
SUNTAC MINERALS CORPORATION
CROSS SECTION
A
A'
SHAFT
AJ PORTAL
POLARIS PORTAL
LEGEND
PREVIOUS STOPE PRODUCTION
494 STOPE, 450 LEVEL
494(450)
1,064 T
0.579
TONS MINED
GRADE MINED (oz/ton GOLD)
MINE LEVELS
C LEVEL
B LEVEL
AJ LEVEL
POLARIS LEVEL
150 LEVEL
300 LEVEL
450 LEVEL
600 LEVEL
5000 N
4500 N
4000 N
3500 N
3000 N
3000 E
3500 E
4000 E
4500 E
5000 E
5500 E
6000 E
0 100 200 300 400 500 FEET
FIG. 5
Prepared by: BEACON HILL CONSULTANTS LTD.


POLARIS–TAKU MINE
STOPE PLAN
SUNTAC MINERALS CORPORATION
STRUCTURAL INTERPRETATION
A VEIN
26 VEIN
22 VEIN
1-38 VEIN
18 VEIN
7 VEIN
1-2 VEIN
A-B VEIN SYSTEM
29 VEIN
321 VEIN
604 VEIN
602 VEIN
15 VEIN
477 VEIN
4 VEIN
5 VEIN
488 VEIN
Y VEIN
SHAFT
CROSS SECTION
A
A'
AJ PORTAL
POLARIS PORTAL
5000 N
4500 N
4000 N
3500 N
3000 N
3000 E
3500 E
4000 E
4500 E
5000 E
5500 E
6000 E
LEGEND
PREVIOUS STOPE PRODUCTION
494 STOPE, 450 LEVEL
494(450)
1,064 T
0.579
TONS MINED
GRADE MINED (oz/ton GOLD)
MINE LEVELS
C LEVEL
B LEVEL
AJ LEVEL
POLARIS LEVEL
150 LEVEL
300 LEVEL
450 LEVEL
600 LEVEL
FIG. 9
FIG. 8
0 100 200 300 400 500 FEET
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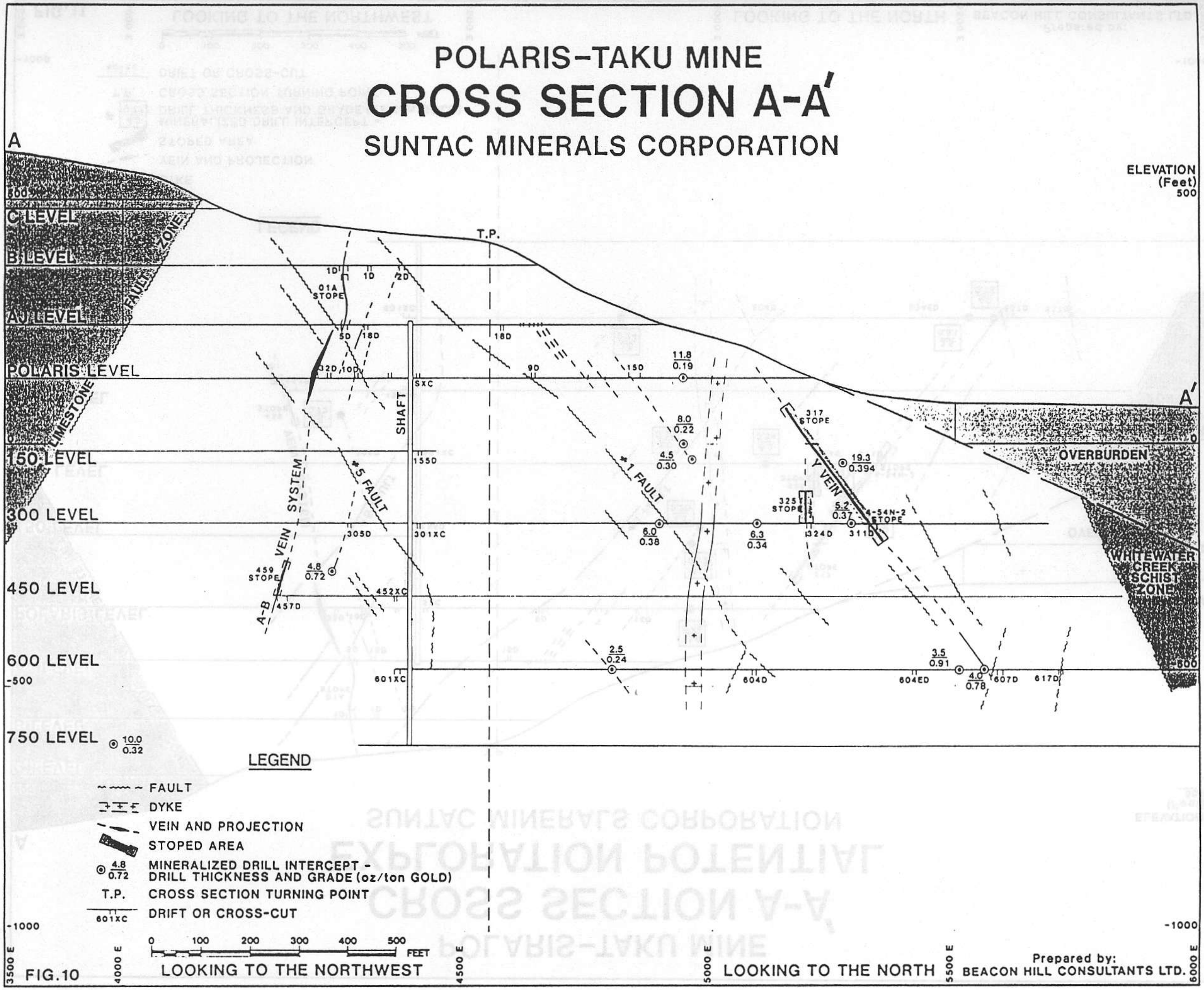
POLARIS-TAKU MINE
CROSS SECTION A-A'
SUNTAC MINERALS CORPORATION
A
A'
ELEVATION (Feet)
500
0
-500
-1000
C LEVEL
B LEVEL
AJ LEVEL
POLARIS LEVEL
150 LEVEL
300 LEVEL
450 LEVEL
600 LEVEL
750 LEVEL
FAULT ZONE
LIMESTONE
T.P.
SHAFT
A-B VEIN SYSTEM
#5 FAULT
#1 FAULT
Y VEIN
OVERBURDEN
WHITEWATER CREEK SCHIST ZONE
01A STOPE
317 STOPE
325 STOPE
4-54N-2 STOPE
459 STOPE
LEGEND
FAULT
DYKE
VEIN AND PROJECTION
STOPED AREA
MINERALIZED DRILL INTERCEPT - DRILL THICKNESS AND GRADE (oz/ton GOLD)
T.P. CROSS SECTION TURNING POINT
601XC DRIFT OR CROSS-CUT
0 100 200 300 400 500 FEET
3500 E
4000 E
4500 E
5000 E
5500 E
6000 E
FIG.10
LOOKING TO THE NORTHWEST
LOOKING TO THE NORTH
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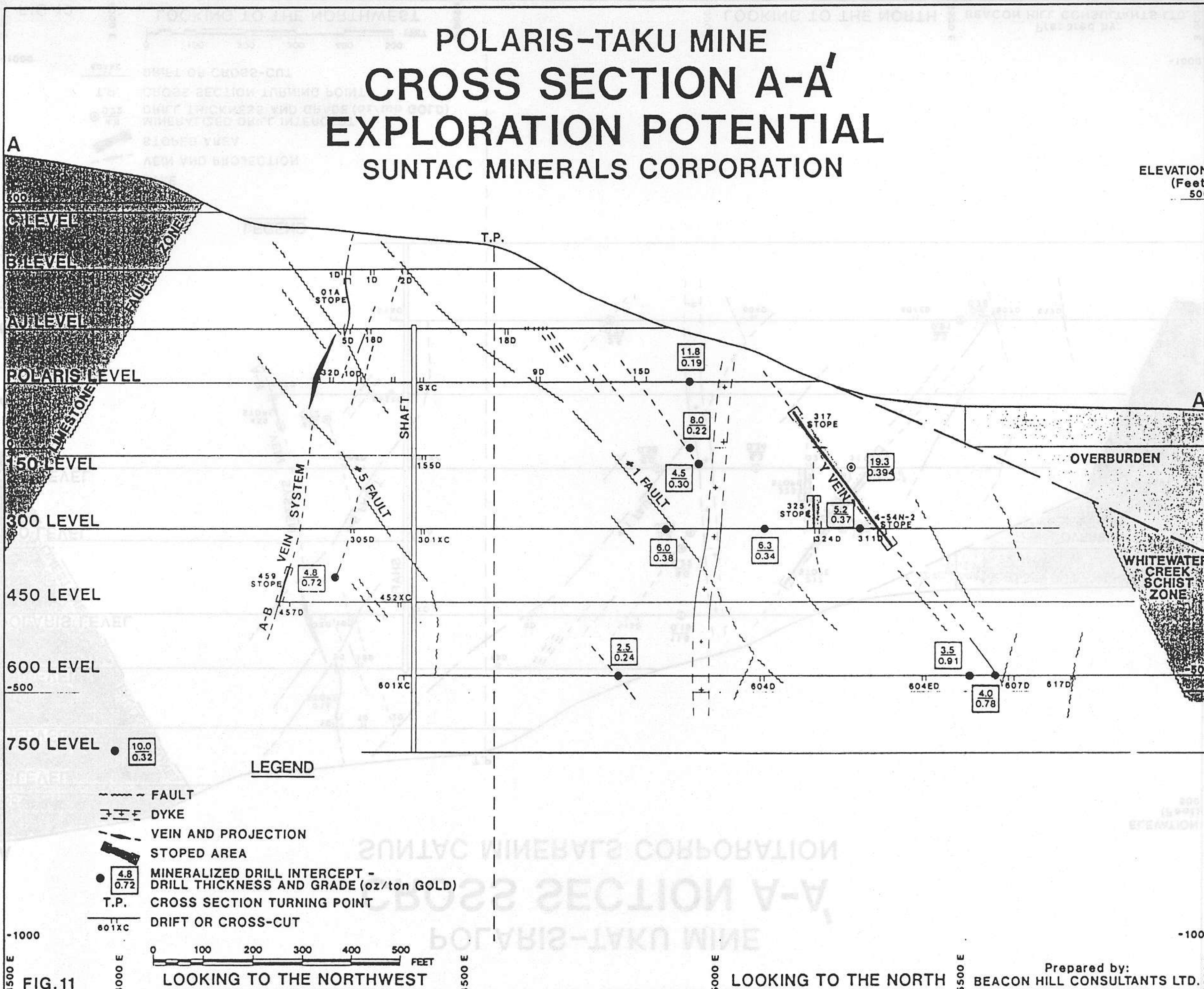

POLARIS-TAKU MINE
CROSS SECTION A-A′
EXPLORATION POTENTIAL
SUNTAC MINERALS CORPORATION
A
A′
ELEVATION (Feet)
500
0
-500
-1000
C LEVEL
B LEVEL
AJ LEVEL
POLARIS LEVEL
150 LEVEL
300 LEVEL
450 LEVEL
600 LEVEL
750 LEVEL
LIMESTONE FAULT ZONE
T.P.
SHAFT
VEIN SYSTEM
A-B
#5 FAULT
#1 FAULT
Y VEIN
OVERBURDEN
WHITEWATER CREEK SCHIST ZONE
01A STOPE
317 STOPE
325 STOPE
459 STOPE
4-54N-2 STOPE
1D
1D
2D
5D
18D
18D
32D
10D
9D
15D
SXC
155D
305D
301XC
452XC
457D
601XC
604D
604ED
607D
617D
324D
311D
11.8 0.19
8.0 0.22
4.5 0.30
19.3 0.394
5.2 0.37
6.0 0.38
6.3 0.34
4.8 0.72
2.5 0.24
3.5 0.91
4.0 0.78
10.0 0.32
LEGEND
FAULT
DYKE
VEIN AND PROJECTION
STOPED AREA
MINERALIZED DRILL INTERCEPT - DRILL THICKNESS AND GRADE (oz/ton GOLD)
T.P. CROSS SECTION TURNING POINT
DRIFT OR CROSS-CUT
0 100 200 300 400 500 FEET
3500 E
4000 E
4500 E
5000 E
5500 E
6000 E
LOOKING TO THE NORTHWEST
LOOKING TO THE NORTH
Prepared by: BEACON HILL CONSULTANTS LTD.

FIG. 11

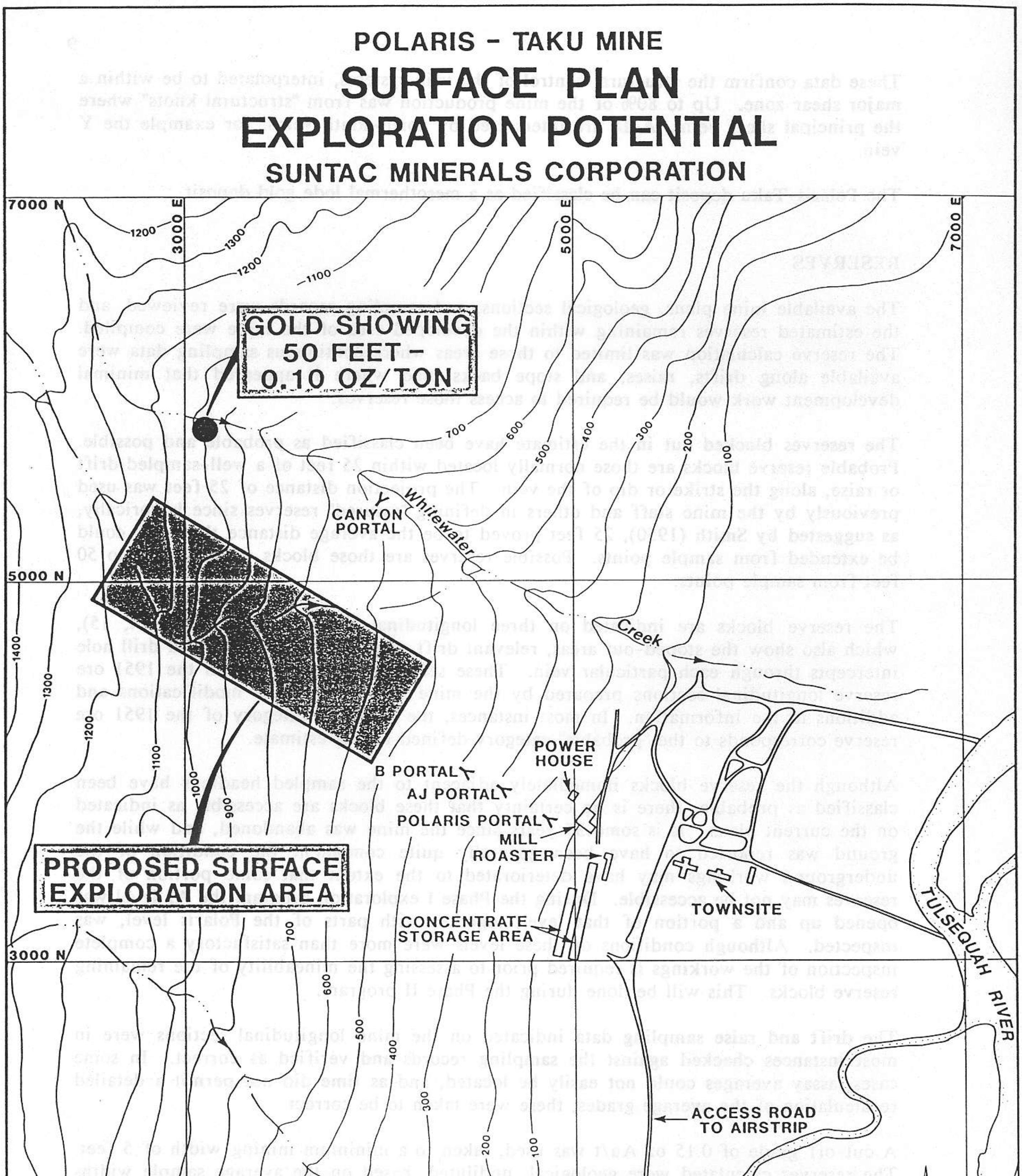
POLARIS - TAKU MINE
SURFACE PLAN
EXPLORATION POTENTIAL
SUNTAC MINERALS CORPORATION
GOLD SHOWING
50 FEET -
0.10 OZ/TON
CANYON PORTAL
Whitewater
Creek
POWER HOUSE
B PORTAL
AJ PORTAL
POLARIS PORTAL
MILL
ROASTER
PROPOSED SURFACE EXPLORATION AREA
CONCENTRATE STORAGE AREA
TOWNSITE
TULSEQUAH RIVER
ACCESS ROAD TO AIRSTRIP
7000 N
5000 N
3000 N
1000 N
3000 E
5000 E
7000 E
0
500
1000
1500
2000
FEET
Contour Interval - 100 Feet
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FIG.12

These data confirm the structural control of the vein systems, interpolated to be within a major shear zone. Up to 80% of the mine production was from "structural knots" where the principal shear veins, A-B, are intersected by north-south veins, for example the Y vein.

The Polaris-Taku deposit can be classified as a mesothermal lode gold deposit.

RESERVES

The available mine plans, geological sections, and sampling records were reviewed, and the estimated reserves remaining within the developed area of the mine were compiled. The reserve calculation was limited to those areas where continuous sampling data were available along drifts, raises, and stope backs, and where it appeared that minimal development work would be required to access those reserves.

The reserves blocked out in the estimate have been classified as probable and possible. Probable reserve blocks are those normally located within 25 feet of a well-sampled drift or raise, along the strike or dip of the vein. The projection distance of 25 feet was used previously by the mine staff and others in defining "assured" reserves since historically, as suggested by Smith (1950), 25 feet proved to be the average distance the veins could be extended from sample points. Possible reserves are those blocks extending 25 to 50 feet from sample points.

The reserve blocks are indicated on three longitudinal sections (Figures 13, 14, 15), which also show the stoped-out areas, relevant drift sample data, and diamond drill hole intercepts through each particular vein. These sections are adapted from the 1951 ore reserve longitudinal sections prepared by the mine staff, with some modifications and additions to the information. In most instances, the "assured" category of the 1951 ore reserve corresponds to the "probable" category defined in this estimate.

Although the reserve blocks immediately adjacent to the sampled headings have been classified as probable, there is no certainty that these blocks are accessible as indicated on the current plans. It is some 37 years since the mine was abandoned, and while the ground was reported to have been generally quite competent the condition of the underground workings may have deteriorated to the extent that some portion of the reserves may not be accessible. During the Phase I exploration program the AJ level was opened up and a portion of that level, together with parts of the Polaris level, was inspected. Although conditions on these levels were more than satisfactory a complete inspection of the workings is required prior to assessing the mineability of the remaining reserve blocks. This will be done during the Phase II program.

The drift and raise sampling data indicated on the mine longitudinal sections were in most instances checked against the sampling records and verified as correct. In some cases, assay averages could not easily be located, and as time did not permit a detailed recalculation of the average grades, these were taken to be correct.

A cut-off grade of 0.15 oz Au/t was used, taken to a minimum mining width of 5 feet. The reserves calculated were geological, undiluted, based on the average sample widths and grades (Sections 13, 14, 15 are shown as examples). These were diluted to determine a mining reserve. Reserve blocks of less than 4 feet average width were diluted to 5 feet minimum width, while blocks over 4 feet were allowed a minimum 1 foot of dilution. Table 2 is a summary of the probable and possible reserves.

As can be seen from the longitudinal sections of the various veins systems, there is considerable potential to enhance the estimated reserves. A substantial number of diamond drill holes have intersected ore-grade values in areas that have not yet been mined.

TABLE 2

Summary of Probable and Possible Reserves

	Geological Undiluted		Diluted Mining Reserves	
	Tons (short)	Grade (oz Au/t)	Tons (short)	Grade (oz Au/t)
Total All levels	190,170	0.43	244,420	0.33

EXPLORATION POTENTIAL

The Polaris-Taku mine wedge shear zone has significant potential both along strike and at depth for all vein systems. Figures 13, 14, and 15 indicate the potential for the Y, 332, A, and B vein systems. The area of influence of the inferred reserves has been limited down to the 750 level, the level to which the shaft was previously sunk.

The potential of the various vein structures is clearly shown by the results of the exploration drilling carried out during the earlier operating period, and also by the results of the recent Phase I drilling program. Although mining widths were often in excess of 5 feet, the inferred reserves have been estimated on the basis of an average 5 feet thickness and limited to the Y, 332, A, and B vein systems. Additional potential of the other vein systems has not been estimated. The areas outlined as inferred were measured on the longitudinal section and factored by 50%. The inferred reserves have been estimated at 700,000 tons grading 0.33 oz Au/t (Figures 13, 14, 15).

Several examples of the potential of the vein structures are indicated below:

1. Depth potential is indicated by DDH L84, which cut 10 feet of 0.32 oz/t material. This supports the concept that the mine wedge shear zone is a structural block with unlimited depth (Figure 11).

2. Potential is indicated west of the mine wedge, in both the volcanics and the limestone (the Banker and Erickson-Ashby deposits are partially in the limestone).

3. Extension to the northwest is indicated by 50 feet of 0.1 oz Au/t grade material found on surface, which may be the A shear extension (Figure 12).

4. Extension to the southeast is essentially untested, although several holes located the Y vein up to 230 feet northeast of the mill.

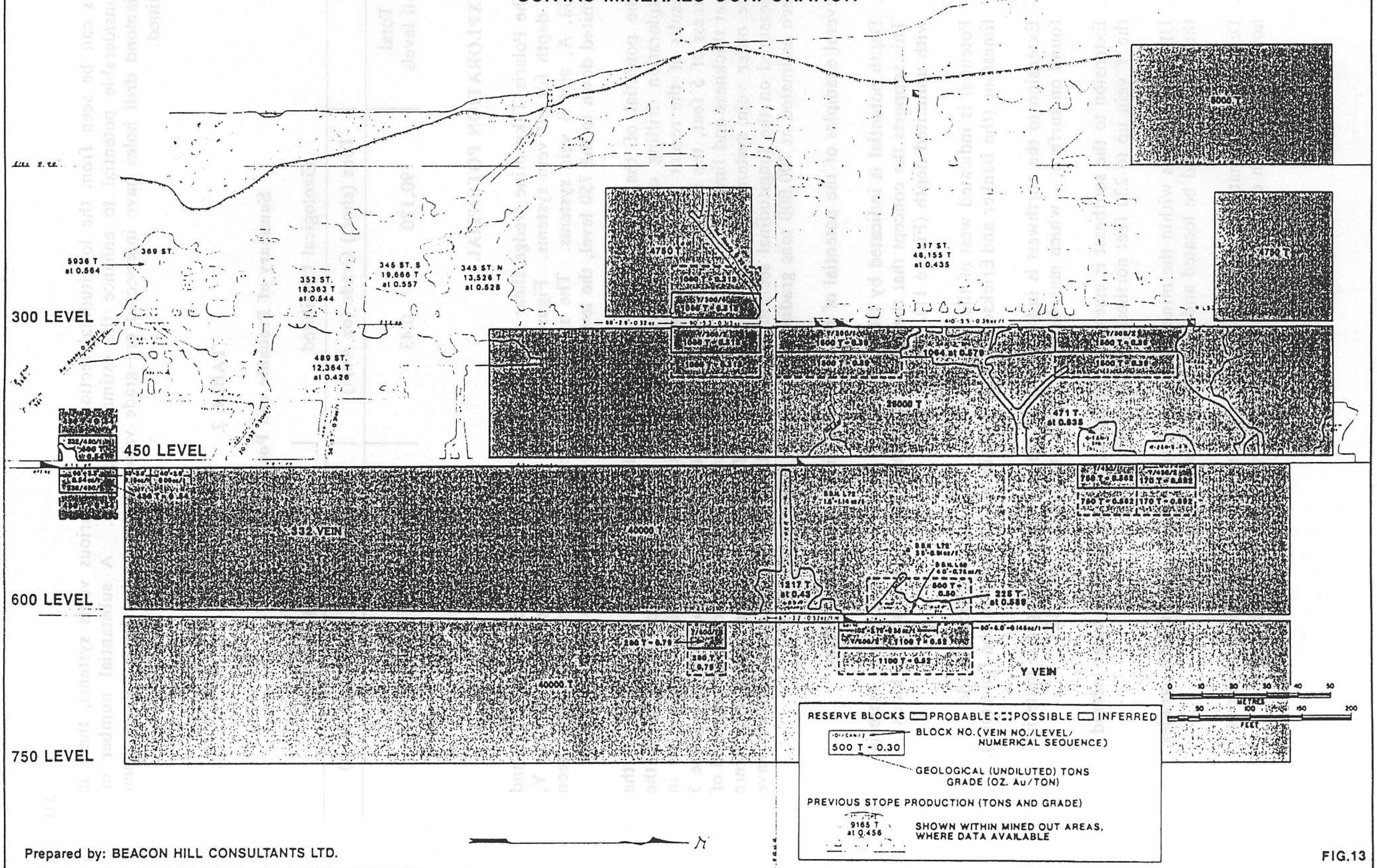
5. Ultramafic lenses within the mine wedge carry free gold as well as high grades; these units should be located and further explored.

6. Drill hole information from the 88 series of holes together with the L series of holes indicates an extension of an existing reserve block with a significant

POLARIS-TAKU MINE

LONGITUDINAL SECTION OF "Y" AND 332 VEINS STOPES AND RESERVE BLOCKS

SUNTAC MINERALS CORPORATION



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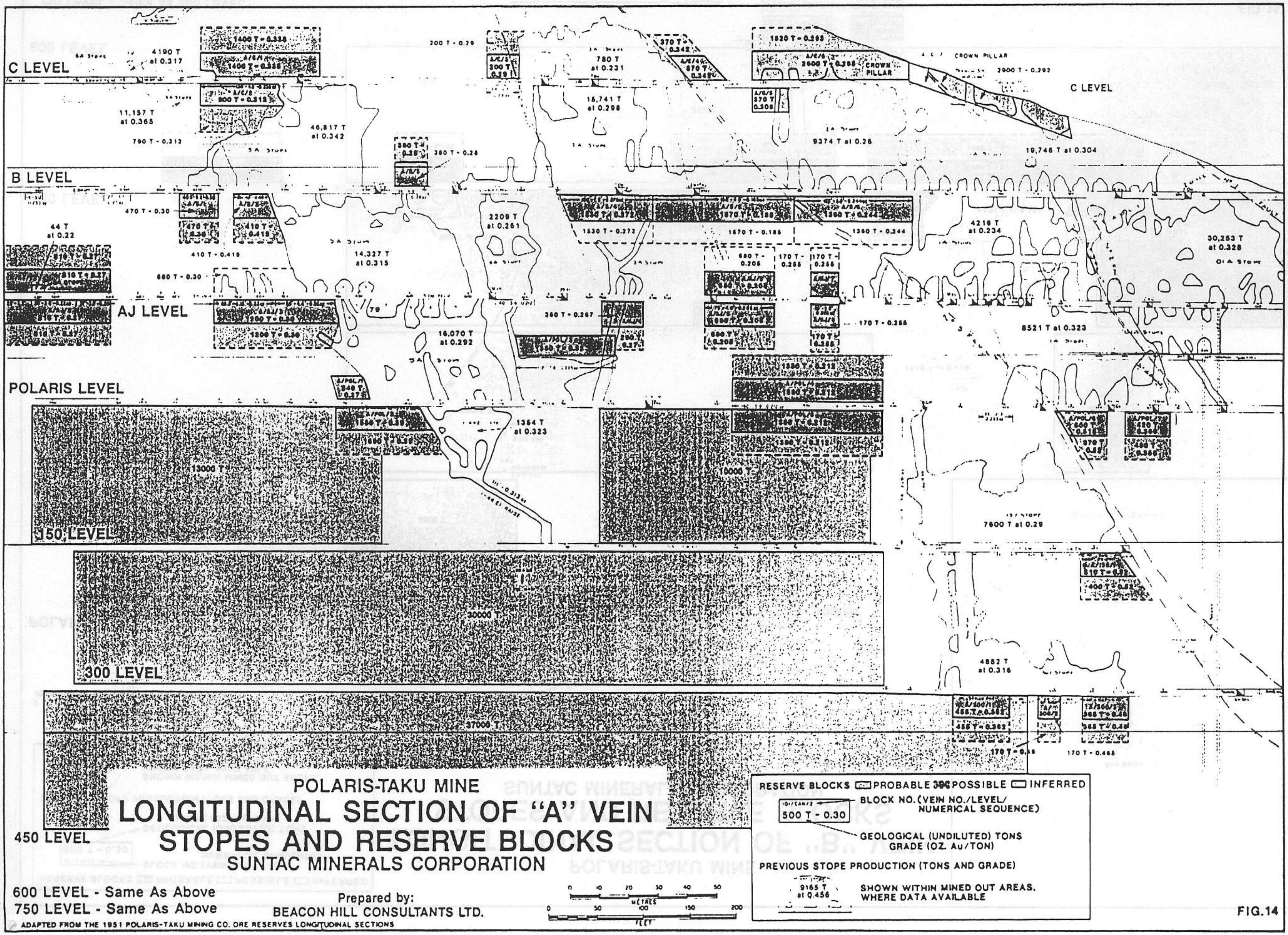
ADAPTED FROM THE 1951 POLARIS-TAKU MINING CO. ORE RESERVES LONGITUDINAL SECTIONS

FIG.13



POLARIS-TAKU MINE

LONGITUDINAL SECTION OF "A" VEIN STOPES AND RESERVE BLOCKS

SUNTAC MINERALS CORPORATION

600 LEVEL - Same As Above
750 LEVEL - Same As Above

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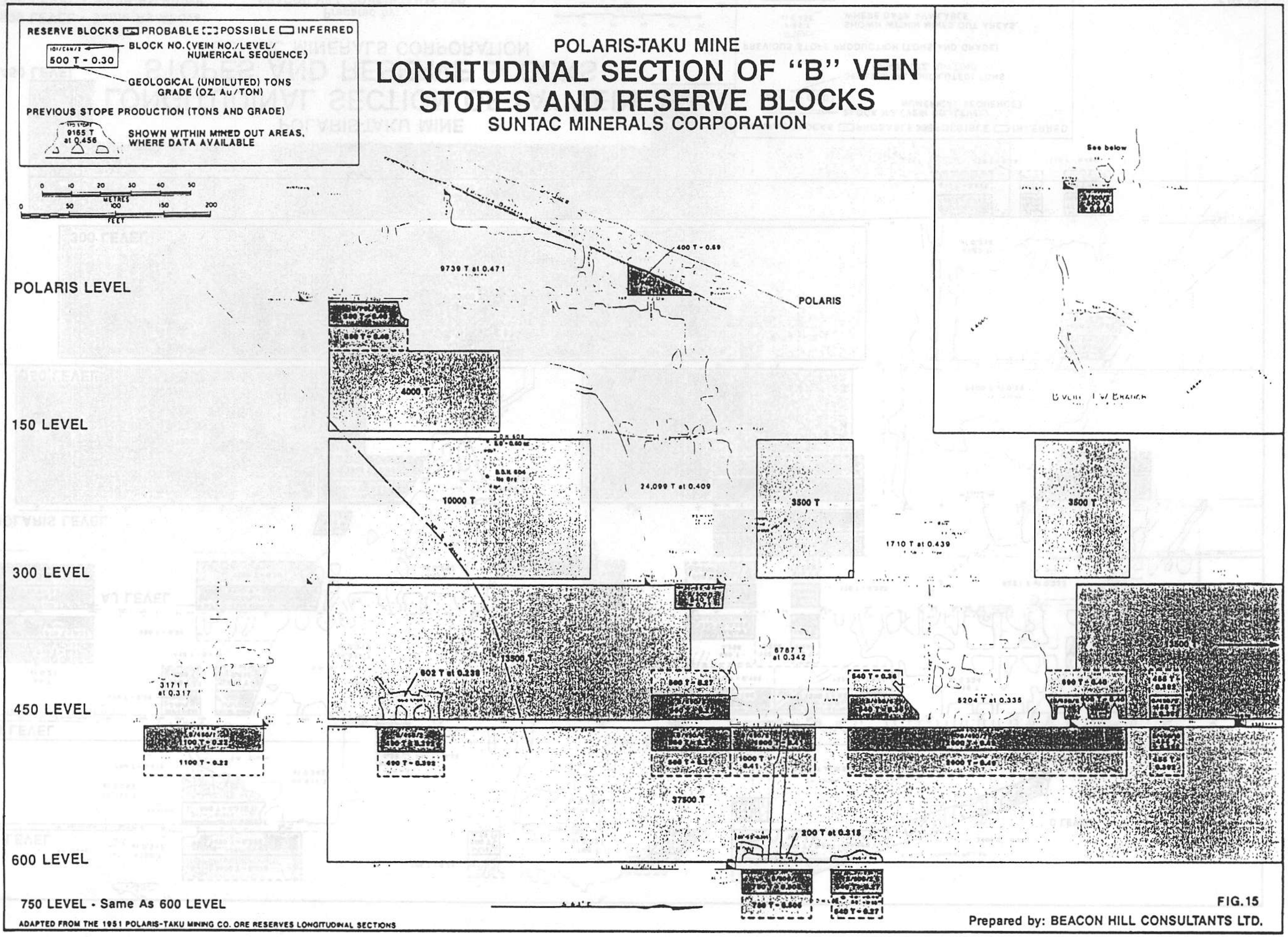
BEACON HILL CONSULTANTS LTD.

ADAPTED FROM THE 1951 POLARIS-TAKU MINING CO. ORE RESERVES LONGITUDINAL SECTIONS

FIG.14

POLARIS-TAKU MINE
LONGITUDINAL SECTION OF "B" VEIN STOPES AND RESERVE BLOCKS
SUNTAC MINERALS CORPORATION



750 LEVEL - Same As 600 LEVEL

ADAPTED FROM THE 1951 POLARIS-TAKU MINING CO. ORE RESERVES LONGITUDINAL SECTIONS

FIG.15

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increase in strike length of the Y vein system above Polaris level. The drill hole information is shown in Table 3.

TABLE 3

Drill Holes 88 Series and L Series

Hole No.	Intercept (ft) From	Intercept (ft) To	Thickness (ft)	Grade (oz Au/t)
88-1	20	25	5.0	0.500
	241	243	2.0	0.162
88-2	20	41	21.0	0.472
88-3	249	252	3.0	1.190
	379	381	2.0	0.318
88-4	387	390	3.0	0.175
88-5	172.0	178.0	6.0	0.480
	318.7	324.7	6.0	0.404
	461.9	465.3	3.4	0.580
88-6	samples in for re-assay			
88-7	202.0	212.3	10.3	0.569
	217.2	219.8	2.6	0.595
	467	468.8	1.8	0.232
88-8	257.0	268.0	11.0	0.510
	325.4	334.4	9.0	0.455
L50	-	-	18.8	0.394
L52	-	-	8.5	0.324
L58	-	-	25.0 (true width = 6.2ft)	0.930
L59	-	-	8.0	0.170

Drill holes 88-1 and 88-2 (Table 3) intercepted a vein system at the bedrock-overburden contact. The vein is up to 21 feet thick and could represent a faulted or folded splay of the same vein as described above.

Drill holes 88-3 and 88-4 (Table 3) intercepted several vein systems that were generally narrower but with some very high grades; hole 88-3 intersected 3 feet of material grading 1.190 oz Au/t.

It is quite obvious from the above that the potential of the property exceeds the currently defined probable, possible, and inferred reserves.

Phase II Exploration Program

The Phase II exploration program is intended to enhance the reserves above the Polaris level while defining the potential down to 750 level. Upon completion and interpretation of Phase II, a third phase will be designed to further enhance the confidence level down to the 750 level, and also the potential below the 750 level. The potential along strike will be evaluated at each stage.

The proposed drilling, with the exception of the Y-vein holes, will test for mineralization above the Polaris level. The locations of the holes have been designed to intercept mineralization at intervals of 100 to 150 feet.

Drill holes will be surveyed utilizing a down-the-hole Sperry Sun instrument. Core will be logged and sampled, and a check assay program will be implemented. The check sample program will begin with a random sample, one of every twenty, being re-assayed at a different laboratory. A check assay on the same basis will also be completed for the 1988 samples. Multi-element analysis will be completed on all core samples to provide data for lithogeochemical research. This information will be used in the search for new zones.

Soil sampling will be completed to the north over an enlarged grid to follow up a spot high on line 11, 3+00 N (10,500 p.p.b. gold). A ground magnetometer survey is also planned over the total grid area. The results of the magnetometer survey will determine whether a VLF-EM survey should then be undertaken.

The underground drifts and openings will be rehabilitated, mapped, and sampled to confirm grades of the reserve blocks. The surface grid area as well as the surrounding area will be mapped. Samples collected during mapping and drilling will be described petrographically to aid in the understanding of the geological history.

The Polaris portal will be opened and made safe, and the underground openings will be inspected and rehabilitated. The underground hoisting facilities and dewatering requirements will be evaluated.

Access around the site is not adequate, at present, for an efficient operation, and the access road from the airstrip requires upgrading. Drainage at the site will be improved, roads re-established, and bridges re-installed.

MINE PLAN

A conceptual mine plan is currently being prepared to evaluate the overall viability of the Polaris-Taku property. The conceptual plan will indicate not only the reserves required to support a viable operation but also areas of concern that need to be verified before preparation of a bankable project document.

The mine plan concept will be developed around three mining methods, shrinkage, blasthole, and cut-and-fill. The shrinkage method will be predominant since the thickness of the zones will generally be 5 feet. These narrow stopes are expected to be relatively productive, utilizing two working faces per stope and a central access raise with a cribbed raise at each end of the stope. Ore will be mucked from drawpoints into diesel-fueled trucks or rail cars depending on the level being mined. It is expected that at least 80% of the production will be from shrinkage mining methods.

Blasthole stoping will be utilized where the dip is greater than 55°, the thickness of the ore zone is greater than 15 feet, and the continuity of the structure will allow the drilling of longholes. The general approach is to use a single slot raise at one end of the stope and an access raise at the other. Two sub-levels will be developed for ring drilling with small diameter holes. Again, ore will be mucked via drawpoints into diesel-fueled trucks or rail cars.

Cut-and-fill will be used where dips are less than 55^{o} and where ground conditions require the extra support of fill, or where the configuration of the mineralized zone does not allow for the use of the other two methods.

The overall design of the mine would be split into two areas, above the Polaris level and below the Polaris level.

Above the Polaris level, access to each level would be via portals at each adit allowing the use of mechanized equipment as needed. Some widening of the present drifts may be required. Ore would be moved horizontally by diesel-fueled trucks to an ore pass and then fed into rail cars or diesel-fueled trucks and transported to surface via the Polaris level. Waste would be dumped into underground openings and left as fill underground wherever possible. The remainder would be brought to surface and dumped on the waste pile.

Access to the area below the Polaris level would be via a ramp driven from the surface or from the Polaris level. This ramp would provide access for men and materials and would be the main haulage system for ore. The present shaft, which extends down to 750 level, would serve as a second means of egress from the mine and also as a ventilation airway. The ramp would be advanced at a rate designed to provide access for the required exploration/definition drilling in conjunction with development for production. This method of access will provide flexibility and minimize capital costs, and offers the advantage of incurring development costs at the same time that income is generated from mining. It eliminates the high cost and time-consuming activities of shaft re-furbishing, hoist installation, and ore and waste pass system development.

Production Rates

Production rates for the Polaris-Taku mine have been based on the available reserves, a six-year mine life, and the expected production from the selected mining methods. The present criteria indicate a rate of 450 tpd based on 350 days per year milling. This would produce approximately 41,000 saleable ounces of gold per year.

The mining camp will be based on a fly-in, fly-out schedule utilizing four crews on a 7 day week, with 2 or 3 shifts per day.

METALLURGY

General

The first Polaris-Taku concentrator, a 150 tpd flotation mill, began operation in November 1937 and produced a gold-bearing arsenopyrite flotation concentrate that was shipped to the Tacoma smelter.

The shipping of concentrate was an expensive procedure. The concentrate storage and handling system was labour-intensive and costly, and loss of revenue resulted from delays in concentrate shipments caused by the restricted transportation system, which operated only in summer. These factors, combined with the smelter treatment charges and penalties for antimony and arsenic in the concentrate, gave impetus to the development of an alternative to concentrate shipment.

The solution to the problem - concentrate cyanidation and gold bullion production at the mine site - was obvious; however, implementation of the solution presented some difficulties. It had been recognized early in development of the mine that the Polaris-Taku flotation concentrate was refractory to direct cyanidation, with very low gold extraction of only 10%.

Alternatives to direct cyanidation had been investigated with indeterminate results. While early testwork had shown that gold recovery could be enhanced by roasting the concentrate prior to cyanidation, with gold extraction in some tests in excess of 90%, later work failed to duplicate these results.

This anomaly was resolved in 1948 when Professor Howard of U.B.C. demonstrated that gold recovery was related to the antimony content of the concentrate. Howard's work showed that cyanidation recoveries of 90% were possible when the antimony assay was 1% or less, and that while concentrate antimony assays of up to 2% could be tolerated, the gold recovery was significantly reduced when this critical level was exceeded.

Under Professor Howard's direction a 20-spindle Edwards hearth roaster was built at the mine site. This machine, with a capacity of approximately 15 tph, could process only 45% of the daily concentrate production. The immediate plan at that time was to produce a low-antimony concentrate for roaster feed and to ship the remaining high-antimony concentrate to the Tacoma smelter. The long-term plan was to provide equipment for the production of a saleable antimony flotation concentrate and increase roaster capacity to process the total de-antimonized arsenic concentrate. The immediate plan was successful. The Edwards roaster and the calcine cyanidation circuit were in operation in early 1950.

A comparison between the net returns generated by concentrate shipping and by bullion production, based on a 1947 mill report, is given in Table 4.

TABLE 4

Net Return Comparison - 1947

Product	Gold in Product oz troy	Net Return $	Unit Return $/oz troy
Arsenopyrite Concentrate	3.33	103.57	31.10
Gold Bullion	3.06	111.17	36.33

The estimated net smelter return, based on the 1947-1950 data and present day economics, indicates that an arsenopyrite concentrate is not viable due to the large amounts of arsenic and the associated onerous penalties.

Based on previous work, the antimony flotation, arsenopyrite flotation, concentrate roasting, and calcine cyanidation concept proposed in 1948 by Professor Howard, with the exception of replacing the inefficient hearth roaster with a modern fluid solids roaster (See Figure 16), would appear to be the best available alternative.

Other process options, such as the Arseno process, pressure oxidation, and bioleaching, are now available for the treatment of refractory gold concentrates. Of these alternatives, pressure oxidation is considered the most favorable process for the following reasons:

1. In the roaster option, antimony must be removed from the roaster feed and some gold values will be tied up in the antimony concentrate. It is estimated that some 100 oz of gold would report to the antimony concentrate each month. With an uncertain market for this product, potential revenue could be tied up for lengthy periods.

2. In all comparisons of roasting versus pressure oxidation on similar ores, gold recovery almost without fail is significantly higher in pressure oxidation.

3. A roaster generally presents environmental problems and will, particularly in the Taku-Polaris case, where the scrubbing of a large volume of sulphur dioxide bearing off-gas and the disposal of some 16 tpd of arsenic trioxide will present major difficulties.

4. Pressure oxidation has been proved in plant practice, and both engineering and design data are readily available. Bioleaching and the Arseno process have yet to be proven at more than a pilot plant scale.

The capital costs for the pressure oxidation method will be higher than for the roaster alternative; however, operating costs for pressure oxidation can be expected to be lower than for the roaster. This difference in operating cost, combined with higher recovery, is expected to more than compensate for the higher capital cost of the pressure oxidation option.

A comparison of anticipated recoveries from a flotation/roasting/cyanidation process, a flotation/pressure oxidation/cyanidation process, and an ore pressure oxidation process is given in Table 5.

TABLE 5

Process Comparison

Option	% Recovery Flotation	% Recovery Overall	Annual Value* U.S.$
Flotation & Roasting	87.9	78.7	$ 16,360,000
Flotation & Pressure Oxidation	90.2	83.9	17,440,000
Ore, Pressure Oxidation	-	93.0	19,330,000

* Based on 450 tons per day. 157,500 tpy.
Mill feed assay 0.33 oz Au/ton.
Gold U.S.$ 400/oz. troy.

A metallurgical program is currently being designed with the objective, initially, to optimize grinding and flotation conditions, and then, to focus on optimizing pressure oxidation and cyanidation conditions.

POLARIS-TAKU METALLURGY
PRELIMINARY FLOWSHEET-ROASTING
SUNTAC MINERALS CORPORATION

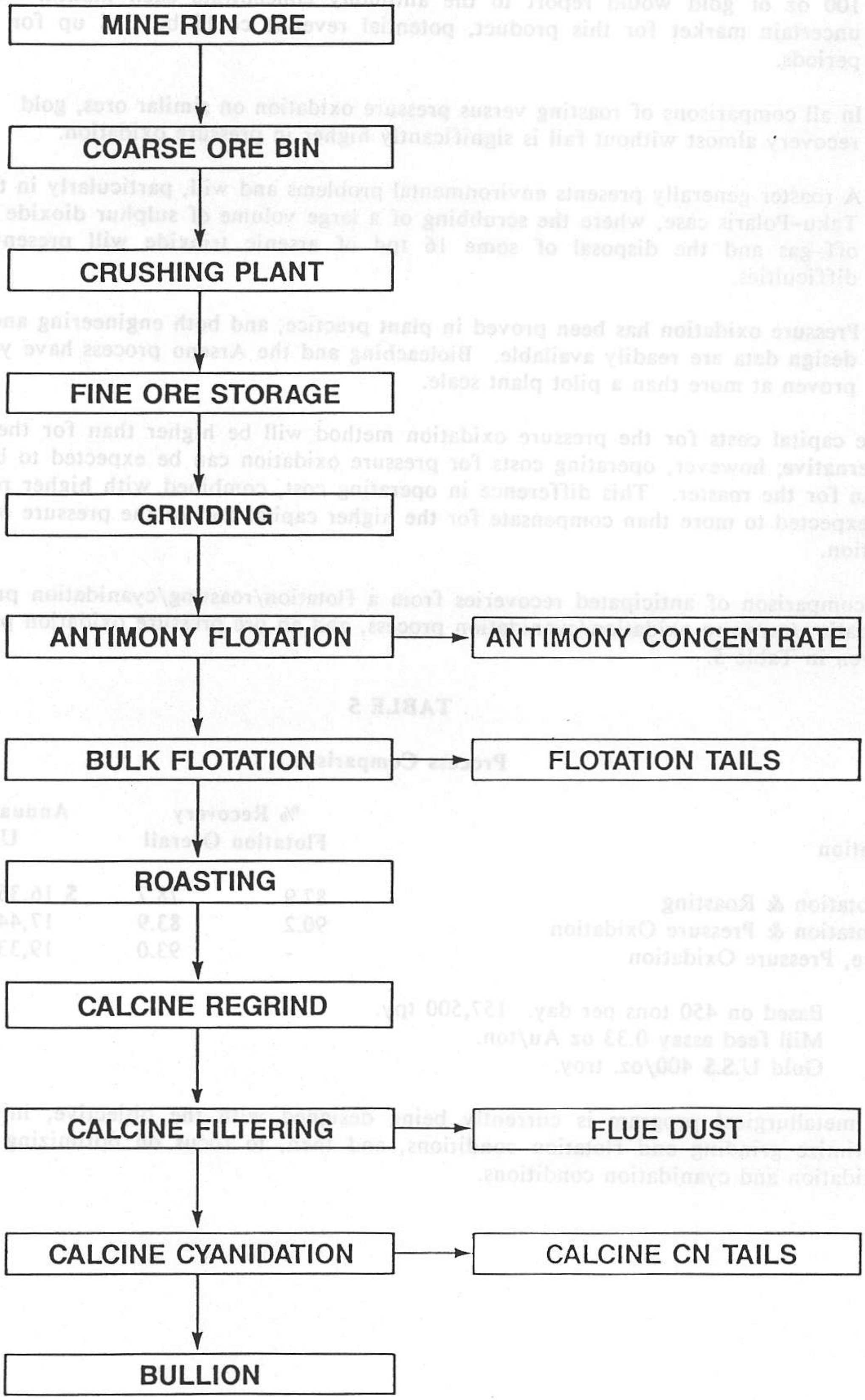

FIG. 16

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CONCLUSIONS

The Polaris-Taku mine has, in the past, been a significant gold producer. During its eleven years of operation, the mine produced a total of 760,000 tons of ore, yielding some 231,000 oz of gold at an average grade of 0.30 oz Au/t. Evaluation of the geological data and associated information gathered during that time indicates that a substantial reserve remained in place when mining ceased in 1951. These data also indicate the following:

(a) numerous drill hole intersects of significant grade and thickness that had not been further investigated;

(b) an intersection of mineable grade and thickness outside of the "mine wedge" shear zone, and

(c) a low grade wide intersection near surface in an area adjacent to the Whitewater Creek.

Thus it can be concluded the potential for enhancement of the reserve base for the Polaris-Taku mine is high. The available data indicate the possibility of increasing the currently estimated probable and possible reserves of 244,000 tons @ 0.33 oz Au/t to 1,000,000+ tons to 750 level, and infer further enhancement below.

The Polaris-Taku mine has been successfully mined in the past using the same methods proposed for future operations. Inspection of the accessible underground opening indicates competent ground conditions that would require minimal ground support. Present information indicates that an efficient mining system utilizing state-of-the-art methods could easily be implemented.

Metallurgically, the high antimony and arsenic content of the ore raises some concern. The metallurgical work completed by U.B.C. and the mine during 1948-1949 indicated recoveries of 78% utilizing flotation-roasting-calcine cyanidation. These recoveries were later confirmed by the installation of a roaster at site. A metallurgical review, to be supported by bench-scale metallurgical testwork, indicates that pressure oxidation may improve recoveries and eliminate some of the concerns associated with roasting.

Access to the site, always a concern for such properties as the Polaris-Taku, will be by air for men, small supplies, and emergency equipment. The majority of freight will be transported by barge. The production of a dore bar will eliminate the difficulties and high cost associated with shipping concentrate.

ACKNOWLEDGEMENTS

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