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## PROPERTY FILE

SUMMARY REPORT ON  
RECONNAISSANCE ROCK, SOIL  
AND SILT SAMPLING  
PROGRAM  
ARROWSMITH - SINGAPORE PROPERTY  
(Arrowsmith, Arrowsmith 2, 3, and 4,  
Singapore Claims)

Alberni and Nanaimo Mining Divisions  
NTS 92F/2,7  
49°09'N Lat., 124°37'W Long.  
for  
SUNPORT METALS CORPORATION

May 1, 1989  
T.G. Hawkins, P.Geol.

PROPERTY FILE  
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**SUMMARY**

The Arrowsmith and Arrowsmith 2, 3 and 4 claims, of Sunport Metals Corporation, are located 10 km due east of Port Alberni in the Nanaimo Mining Division of British Columbia on mapsheets 92F/2E and 92F/7E. The Singapore claim, also of Sunport Metals Corporation, is located 17 km east of Port Alberni, approximately 2 km south of the Arrowsmith 4 claim, in the Alberni Mining Division on mapsheet 92F/2E.

The Arrowsmith claims are underlain by Nitinat, Myra and Buttle Lake Formation rocks of the Paleozoic Sicker Group, Karmutsen Formation rocks of the Triassic Vancouver Group and Cretaceous Nanaimo Group rocks which have been intruded by Tertiary Sooke Intrusions. The Singapore claim is underlain by Nitinat Formation rocks of the Paleozoic Sicker Group.

North-south trending pervasive quartz-carbonate alteration zones which locally contain anomalous levels of gold, silver, copper and arsenic, are located on the Arrowsmith claims. Grab samples from these zones returned up to 79 ppb Au, 4.3 ppm Ag, 3350 ppm Cu and 220 ppm As. A heavy mineral concentrate stream sediment sample, which is along the strike projection of these quartz-carbonate alteration zones, returned 810 ppb Au.

Previous soil sampling surveys on four separate grids returned near background values for all elements. The exception is on the Arrowsmith grid, which contains a 200 m by 75 m wide north-south trending weak copper 'anomaly' (values to 207 ppm Cu) in the southwest portion of the grid.

Historical work on the Singapore claim near the Bank Group silver/copper showing, uncovered an east-west trending shear zone from which a grab sample returned 900 ppb Au. A heavy mineral concentrate stream sediment sample, located downslope of both the Bank Group Showing and the gold-bearing shear zone, returned 1210 ppb Au.

The Arrowsmith and Singapore claims have good potential to host a structurally controlled vein deposit similar to that on the nearby Debbie-Yellow property. Similar quartz-carbonate alteration zones in Sicker Group rocks, and north-south structural controls, have been observed on both properties.

Phase IA and IB work programs consisting of geological mapping, rock sampling, soil geochemistry, magnetometer and VLF-EM surveying, trenching and heavy mineral concentrate stream sediment sampling are recommended at an estimated cost of \$86,000. A Phase II work program, contingent upon favourable results from the Phase I program, is also included at a cost of \$100,000.



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## 1.0 INTRODUCTION

This report documents the preliminary exploration programs conducted from April 30 to May 19, 1988 by Edsons Resources Ltd., and November 14 to 28, 1988 by MPH Consulting Limited at the request of Scott E. Angus of Sunport Metals Corporation. It is a summary of the previous MPH report entitled "Report on Reconnaissance Rock, Soil and Silt Sampling Arrowsmith-Singapore Property for Sunport Metals Corporation" dated December 23, 1988 by T.G. Hawkins, P.Geol. and C. Naas, B.Sc.

Field work by Edsons Resources Ltd. consisted of rock sampling (58 samples collected) and heavy mineral stream sediment sampling (16 samples). Field work by MPH Consulting Limited under the direction of the writer, consisted of rock sampling (41 rock samples) and heavy mineral stream sediment sampling (12 samples).

The objective of these programs was to evaluate the potential for gold at a reconnaissance scale in view of the exploration and possible development of a potentially economic gold deposit on the nearby Debbie and Yellow properties held by Westmin and Nexus.

## 2.0 PROPERTY LOCATION, ACCESS, TITLE

The Arrowsmith and Arrowsmith 2, 3, and 4 claims are located 10 km due east of Port Alberni in the Cameron River Valley within the Nanaimo Mining Division of British Columbia. They are centred at approximately 49°13'N latitude, 124°37'W longitude on NTS mapsheets 92F/2E and 92F/7E (Figure 1).

The Singapore claim is located 17 km east of Port Alberni, approximately 2 km south of the Arrowsmith 4 claim, on the south slope of McLaughlin Ridge in the Alberni Mining Division. It is centred at approximately 49°09'N latitude, 124°37'W longitude on NTS mapsheet 92F/2E (Figure 1).

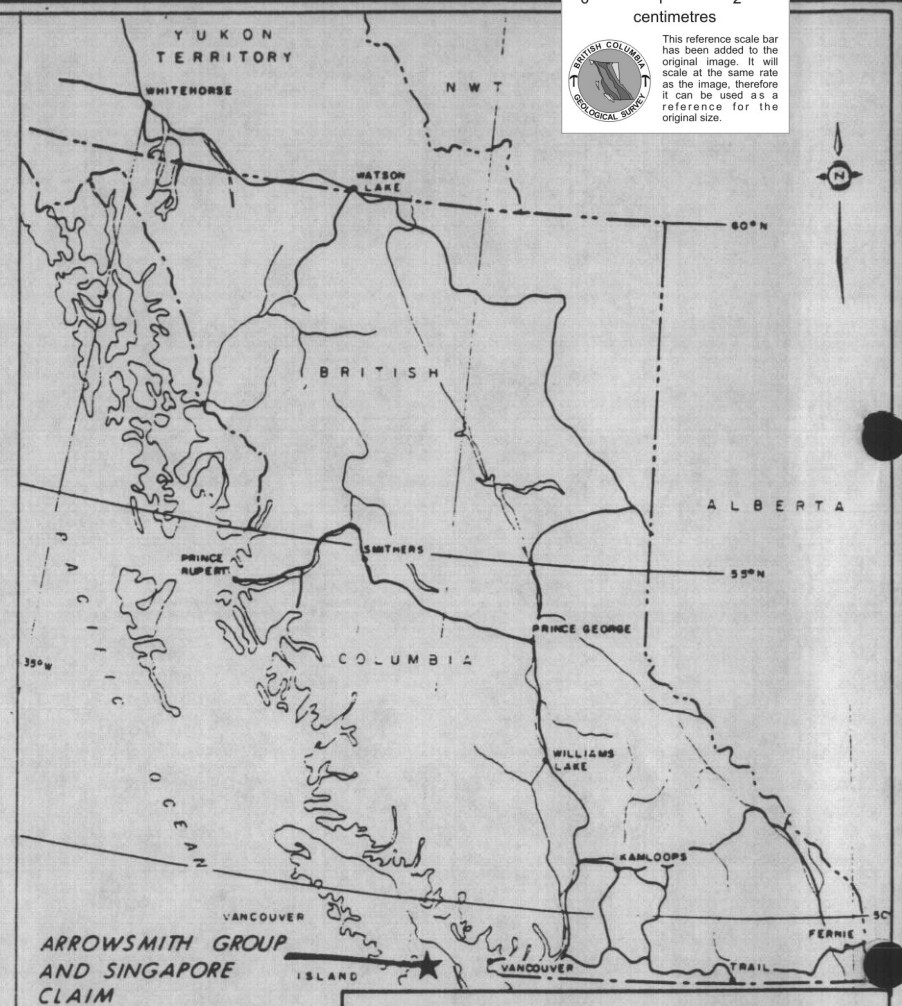
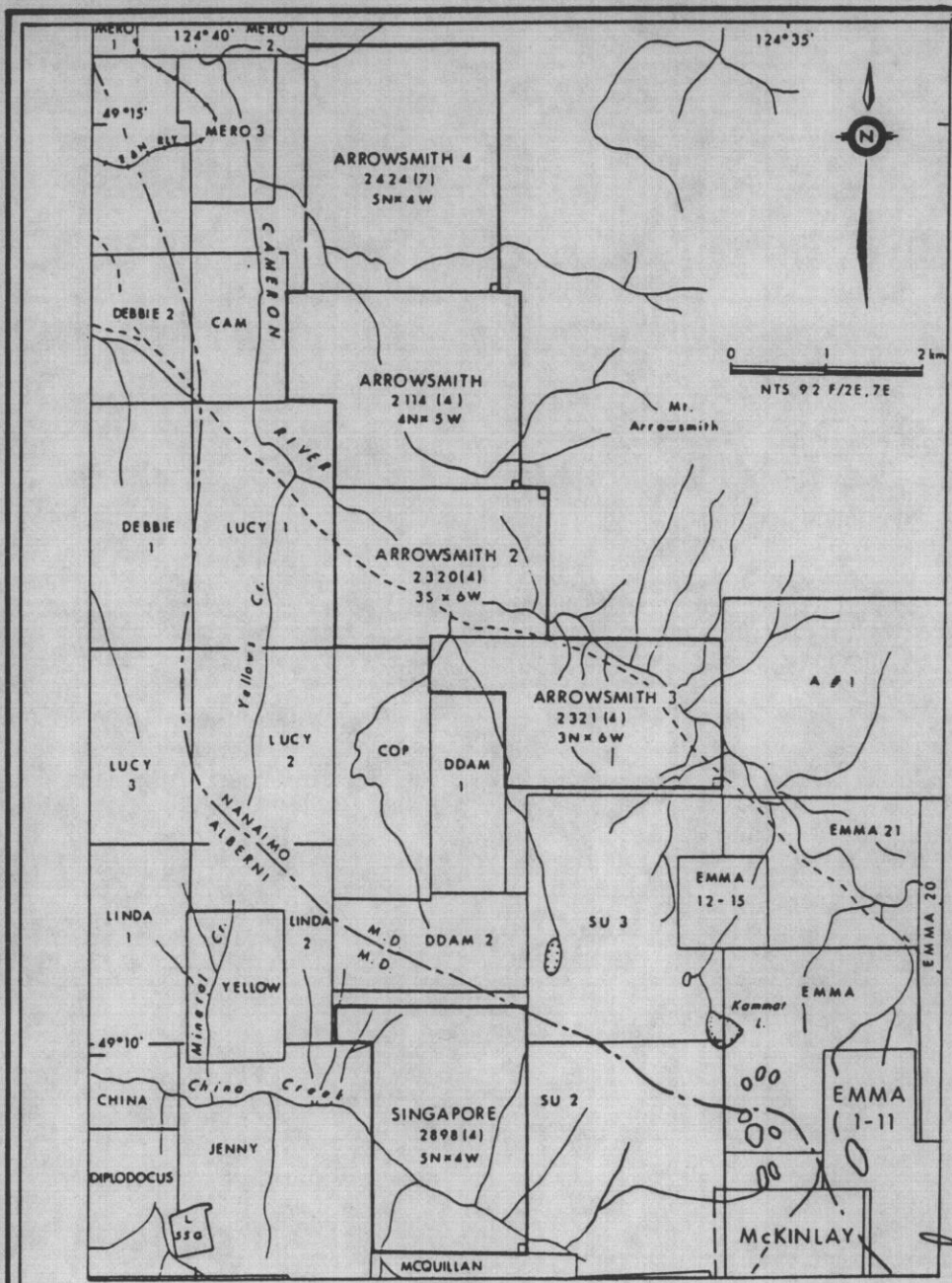
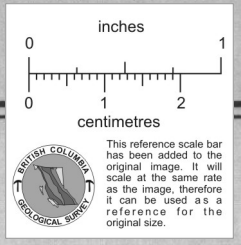
Access to the Arrowsmith claims is by way of the Mt. Arrowsmith ski hill road which exits the paved No. 4 Highway, 8 km east of Port Alberni. A network of driveable logging roads allows direct access to most areas of the property.


Access to the Alberni claim is gained via the all-weather gravel, China Creek Road, which crosses the southwestern portion of the claim. The entrance gate for this road is usually locked and therefore permission from MacMillan Bloedel is required.

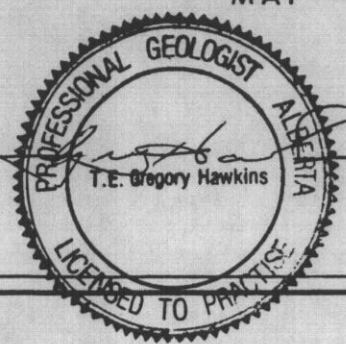
Claim information is as follows:

Claim	Record No.	Units	Anniversary Date	Year Recorded
Arrowsmith	2114 (4)	20	April 11/91	1985
Arrowsmith 2	2320 (4)	18	April 11/91	1986
Arrowsmith 3	2321 (4)	18	April 11/91	1986
Arrowsmith 4	2424 (7)	20	July 15/91	1986
		Total		
		76		
Singapore	2898 (4)	20	April 1/93	1986

These anniversary dates include the work which was done on the project discussed herein.



<b>SUNPORT METALS CORPORATION</b>	
<b>GENERAL LOCATION MAP AND CLAIM MAP</b>	
<b>ARROWSMITH PROJECT</b>	
Project No: V 296	By: B. Y. T., K. S.
Scale:	Drawn: J. S.
Drawing No: 1	Date: MAY, 1989.
 <b>MPH Consulting Limited</b>	



The Arrowsmith, Arrowsmith 2 and Singapore claims are 100% owned by Scott E. Angus, while the Arrowsmith 3 and Arrowsmith 4 claims are 100% owned by Alfred E. Angus.

The Arrowsmith claims were grouped on March 24, 1987 as the Arrowsmith Group.

### 3.0 PREVIOUS WORK

The Singapore claim, which covers the previous Alberni claim, was staked in April 1986. Work on the former Alberni claim was carried out by Gunnex Ltd. between 1963 and 1966. Gunnex conducted regional mapping with some prospecting and silt sampling and compiled a list of mineral occurrences. The Alberni claim area was mapped but mineralization was not discovered. The 1962 Hunting aeromagnetic survey also covered the area of the Alberni claim but no anomalies were located on or near the claim.

The Bank Group showing occurs on or near the southwestern corner of the Singapore claim. A series of open cuts had been dug on a zone of quartz veins carrying pyrite, chalcopyrite, and galena with some silver and gold values. A 7.6 m shaft had been sunk in the largest open cut and a caved adit also exists. The mineralized zone was reported to be 3 m wide and 100 m or so along strike. A grab sample from the dump assayed trace Au, 34 g/t Ag, and 3.2% Cu (Ministry of Mines Annual Report, 1917).

During reconnaissance geologic mapping and rock sampling by MPH Consulting Limited, on behalf of Sunfield Management Ltd., a sample of a quartz-carbonate veined, sulphide-rich 'volcanic' contained 900 ppb Au (Neale and Hawkins, 1984).

In 1987, Edsons Resources Ltd. conducted a preliminary soil geochemical program which included 81 samples taken from the Singapore grid on the north side of China Creek. Only very weakly anomalous results for all elements were returned from this area (Angus, 1988).

In 1987, 373 soil samples were collected from Grids A and B on the Arrowsmith 2 and 3 claims. No anomalous precious or base metal element concentrations were encountered in the survey areas except for a spot copper anomaly (606 ppm) on Grid B (MacLeod, 1987).

In April 1988, 265 soil samples were collected from the Arrowsmith grid on the Arrowsmith claim. The highest values were 35 ppb Au, 0.8 ppm Ag, 213 ppm Cu, 14 ppm Pb and 129 ppm Zn (Angus, 1988).

Government geological work in the area includes mapping by C.H. Clapp (1912 and 1914), J.E. Muller and D.J.T. Carson (1969), J.E. Muller (1977 and 1980), N.W. Massey (1988). A mineral inventory report was prepared by J.S. Stevenson (1945).

## 4.0 REGIONAL GEOLOGY

Geology in the Port Alberni-Nitinat River area comprises mainly Upper Paleozoic Sicker Group rocks and Lower Mesozoic Vancouver Group rocks. These represent eugeosynclinal sequences of volcanic and sedimentary rocks. Jurassic Bonanza Group volcanics are present locally in the southern part of this area. Lesser amounts of Upper Cretaceous Nanaimo Group rocks and intrusive rocks of various ages occur also. During 1988, geologic mapping, headed by Mr. N. Massey, was conducted in the Port Alberni area as part of an ongoing, federally funded research project on the stratigraphy of the Sicker Group. Renaming of the formations and changes have been proposed. The original nomenclature introduced by Muller and previous workers has largely been retained by the mining industry to this point. For the purposes of this report Muller's terminology will be used due to its seemingly wider applicability over Vancouver Island and the economic significance associated with specific formations.

### 4.1 Sicker Group

Muller (1980) proposed the following subdivision of the Sicker Group, from oldest to youngest: Nitinat Formation, Myra Formation, 'Sediment-Sill' Unit, and Buttle Lake Formation.

The **Nitinat Formation** comprises mainly mafic volcanic rocks. These occur most commonly as flow breccias or agglomerates, including some massive flows, and rare pillow basalts. Locally, medium-grained, generally massive, basaltic tuff is interbedded with the flows. The thickness of the Nitinat Formation is estimated at 2000 m (Muller 1980).

The **Myra Formation** unconformably overlies the Nitinat Formation. In the Nitinat-Cameron River area, the Myra Formation comprises a lower, massive to widely banded, basaltic tuff and breccia unit, a middle, thinly banded, albite-trachyte tuff and argillite unit, and an upper, thick-bedded, medium-grained, albite-trachyte tuff and breccia unit.

The type locality of the Myra Formation is at Myra Creek, at the south end of Buttle Lake. There, volcanoclastic rocks consisting dominantly of rhyodacitic or rhyolitic tuff, lapilli tuff, breccia, and some quartz porphyry and minor mafic flows and argillite (Upper Myra Formation), are host to Westmin Resources' Myra, Lynx, Price, and H-W massive sulphide (Cu-Zn-Pb-Au-Ag-Cd) deposits. The Myra Formation is approximately 750 to 1000 m thick and both the Nitinat and Myra Formations are dated as Devonian and/or older by Muller (1980).

The **'Sediment-Sill Unit'** contains thinly bedded to massive argillite, siltstone, and chert with interlayered sills of diabase. It is transitional between the Myra and Buttle Lake Formations.

The **Buttle Lake Formation** comprises a basal, green and maroon tuff and/or breccia, overlain by coarse-grained, crinoidal and calcarenitic limestone, fine-grained limestone with chert nodules, and some dolomitic limestone. Lesser amounts of argillite, siltstone, greywacke, and chert are also present.

The Buttle Lake Formation is up to 470 m thick. It has been dated as Middle Pennsylvanian, based on fossil evidence but may be as young as Early Permian (Muller, 1980). Confirmation of this age through recent work done by Brandon and others (1986) includes isotopic and conodont ages which indicate that rocks of the Buttle Lake Formation are early Middle Pennsylvanian (Atokan) through Early Permian (probably Sakmarian).

#### 4.2 Vancouver Group

The Upper Triassic **Karmutsen Formation** volcanic rocks unconformably to paraconformably overlie the Buttle Lake Formation limestone, forming the base of the Vancouver Group. The Karmutsen Formation is the thickest and most widespread sequence of rocks on Vancouver Island. It is well exposed south-east of Port Alberni, comprising mainly dark grey to black, or dark green tholeiitic pillow basalt, massive basalt, and pillow breccia. Pillow lavas generally occur near the base of the section. Conglomerate, which contains clasts of Sicker Group rocks and jasperoidal tuff, forms basal sections in the Nitinat-Horne Lake area.

Upper Triassic massive to thick-bedded dark grey to black, fine-grained to microcrystalline limestone of the **Quatsino Formation** occurs south of Mount Spencer. Coarse-grained marble occurs near intrusive rocks. Quatsino Formation limestone hosts the majority of known economic skarn deposits on Vancouver Island.

#### 4.3 Bonanza Group

The **Bonanza Group** stratigraphy represents parts of several different eruptive centres of a volcanic arc. Basaltic, rhyolitic and lesser andesitic and dacitic lava, tuff, and breccia with intercalated beds and sequences of marine argillite and greywacke make up the Bonanza Group. The Bonanza Volcanics are considered to be extrusive equivalents of the Island Intrusions and to be of Early Jurassic age.

#### 4.4 Nanaimo Group

Upper Cretaceous Nanaimo Group sedimentary rocks are scattered throughout the area. Extensive exposures occur near Port Alberni, Patlicant Mountain, and south and northwest of Mount Moriarty. The basal portions of the Nanaimo Group include; the **Comox Formation** which comprises mainly quartzofeldspathic, cross-bedded beach facies sandstone and lesser conglomerate with numerous intercalations of carbonaceous and fossiliferous shale and coal, the **Haslam Formation** which is a near-shore, littoral depositional facies characterized by thickly bedded fossiliferous, sandy shale, siltstone and shaly sandstone.

Interbedded, coarse clastic, conglomerate, pebbly sandstone and arkosic sandstone with minor shale and coal of the **Extension-Protection Formation** are beach and deltaic sand facies.



#### 4.5 Intrusive Rocks

**Gabbro, peridotite, and diabase** of Triassic or Permian age occurs locally throughout the area. A large band is exposed approximately 8 km north of Port Alberni. Although mapped as intrusive, some of these rocks may be basal flow units of the Karmutsen Formation.

Middle to Upper Jurassic **Island Intrusions** comprising quartz diorite and lesser biotite-hornblende granodiorite occur throughout the area. Intrusive contacts with Sicker and Bonanza Group volcanic rocks are characterized by transitional zones of gneissic rocks and migmatitic rocks, whereas contacts with Karmutsen Formation volcanic rocks are well-defined. Skarn zones are reported at the contact of Island Intrusions with Quatsino Formation limestone, and less commonly with Buttle Lake Formation limestone.

**Tertiary (Catface or Sooke)** intrusive sills, dykes and stocks cut Sicker Group rocks and possibly Nanaimo Group sediments as well. They comprise mainly hornblende-quartz diorite and dacitic hornblende-feldspar porphyry and lesser leucocratic quartz monzonite.

#### 4.6 Structure

The Buttle Lake Arch, Cowichan-Horne Lake Arch and Nanoose Uplift are north-northwesterly trending axial uplifts believed to be among the oldest structural elements in south central Vancouver Island. Folding and uplift occurred before the late Cretaceous, and possibly before the Mesozoic (Muller and Carson, 1969), and more tilting, folding, and uplift occurred after the late Cretaceous. Sicker Group volcanic and sedimentary rocks occur at the cores of these uplifts.

Asymmetric, southwest-verging, northwest-trending, antiformal fold structures, characterized by subvertical southwest limbs and moderately dipping northeast limbs occur at Buttle Lake, in the Cameron-Nitinat River area, and north of Cowichan Lake. Well-developed foliation was formed during metamorphism to chlorite-actinolite and chlorite-sericite schist, in steep and overturned limbs of folds. The folding may have occurred prior to intrusion of Triassic(?) mafic sills along axial planar surfaces in folded 'Sediment-Sill' unit rocks. Evidence from K-Ar dating also suggests Jurassic folding. Buttle Lake Formation limestones are relatively undeformed in some places, although in others, as in the Chemainus River Canyon, they are highly deformed, along with other Sicker Group rocks (Brandon and others, 1986). Vancouver Group units are not as intensely folded; gentle monoclinial and domal structures have been mapped. However, Karmutsen Formation volcanic rocks locally conform to the attitude of underlying Myra and Buttle Lake Formations (Muller, 1980a).

Some early Mesozoic faulting occurred in the area prior to emplacement of Island Intrusions. Middle to Upper Jurassic intrusive activity (Island Intrusions) is localized along northwesterly trends.

Extensive west-northwest trending faulting occurred during the Tertiary, and is best illustrated by large displacements of Nanaimo Group sediments in some areas, such as the north side of the Chemainus River Valley, placing Sicker Group rocks above Nanaimo Group rocks. These faults have been traced for up to 100 km.

The **Mineral Creek Zone** occurs within tectonic breccias which are spatially related to the Mineral Creek fault zone. Arsenopyrite is associated with gold in discrete quartz veins and adjacent alteration zones. The old Vancouver Island Gold Mine appears to be on strike with the Mineral Creek Zone (Massey, et al, 1988).

The **Linda Zone** is located 800 m east of the Mineral Creek Zone and may be an extension of the Vancouver Island Gold Mine. A series of high grade, easterly dipping quartz veins crosscuts the Mineral Creek fault.

The **900 Zone**, located approximately 1.4 km west of Mineral Creek, is hosted in pyroxene-aphyric basalt, flow-top breccias, tuffwackes and banded chert which resemble a massive sulphide environment. An isoclinally folded chert unit "lean iron formation" with magnetite at the base, is underlain by an auriferous, pipe-like, quartz vein stockwork (Massey, 1988).

Quartz veinlets containing native gold, pyrite, magnetite and trace arsenopyrite cut chert and red jasper host rocks.

Some of the best drill intersections to September 12, 1988 include:

Mineral Creek Zone		Linda Zone		900 Zone	
m	g/t Au	m	g/t Au	m	g/t Au
4.6	18.9	3.0	19.9	14.4	139.8
21.0	3.5	1.5	34.1	21.8	25.2
9.5	4.4	1.0	47.4	6.1	49.4
5.5	5.9				
2.7	10.6				

The **Regina Workings**, on the east side of the southern extension of the Mineral Creek fault contain anomalous gold and silver in quartz lenses and veinlets. The gold and silver is associated with pyrite, chalcopyrite and minor galena. The massive sulphide zone is up to 300 m wide and may be associated with jasper. The quartz is contained in shears in silicified and pyritized basalt. A pre-Jurassic age has been determined from lead isotope data.

On the north side of McLaughlin Ridge, the **Rogers Creek Showing** comprises thin lenses and layers of stratabound sphalerite and galena in chlorite-sericite schist within mafic volcanic rocks.

#### 4.8 Regional Airborne Magnetic Survey

An aeromagnetic survey conducted in 1962 by Hunting Corporation covers the area southeast of Port Alberni.

The magnetic interpretation complies with the lithologic units and conclusions arrived at by Muller and other workers. For example, Arkani-Hamed and Strangway (1988) concluded from airborne data, that Island Intrusives south of the surveyed area are strongly magnetic and that Sicker and Nanaimo Group rocks along with Bonanza Volcanics are characterized by relatively lower



magnetization. Observations from ground work conducted by MPH crews throughout the area demonstrate that Karmutsen basalts and Island Intrusions exhibit a strong magnetization relative to Sicker Group rocks.

The airborne magnetic survey outlines a possible northerly trending feature along the Debeaux Creek Valley. Other northerly trending faults as mapped by workers in the area, are not clearly observed from the airborne magnetic survey, possibly due to fault features within similar units and data density insufficient to define the weaker magnetic features.

The northwest trending 'Cameron River Fault' and the northerly trending 'Debeaux Creek Fault' project onto the Arrowsmith claim group and Singapore claim.

## 5.0 1988 WORK PROGRAM

Preliminary exploration of the Arrowsmith and Singapore claims was conducted by Edsons Resources Ltd. between April 30 and May 19, 1988, and by MPH Consulting Limited between November 14 and 28, 1988. Both programs consisted of rock sampling (99 samples) and heavy mineral concentrate stream sediment sampling (28 samples). Extensive snow coverage prevented exploration in areas of interest.

### 5.1 Property Geology

The geology, based on Muller's mapping (1980) with slight modifications generally complies with field work conducted by MPH Consulting Limited (Figure 2).

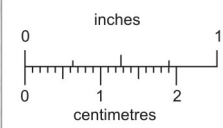
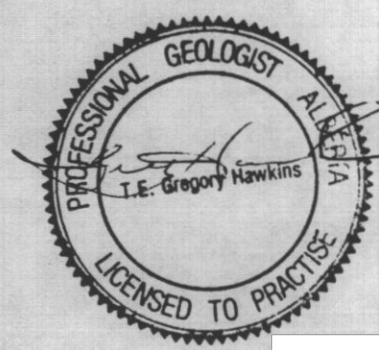
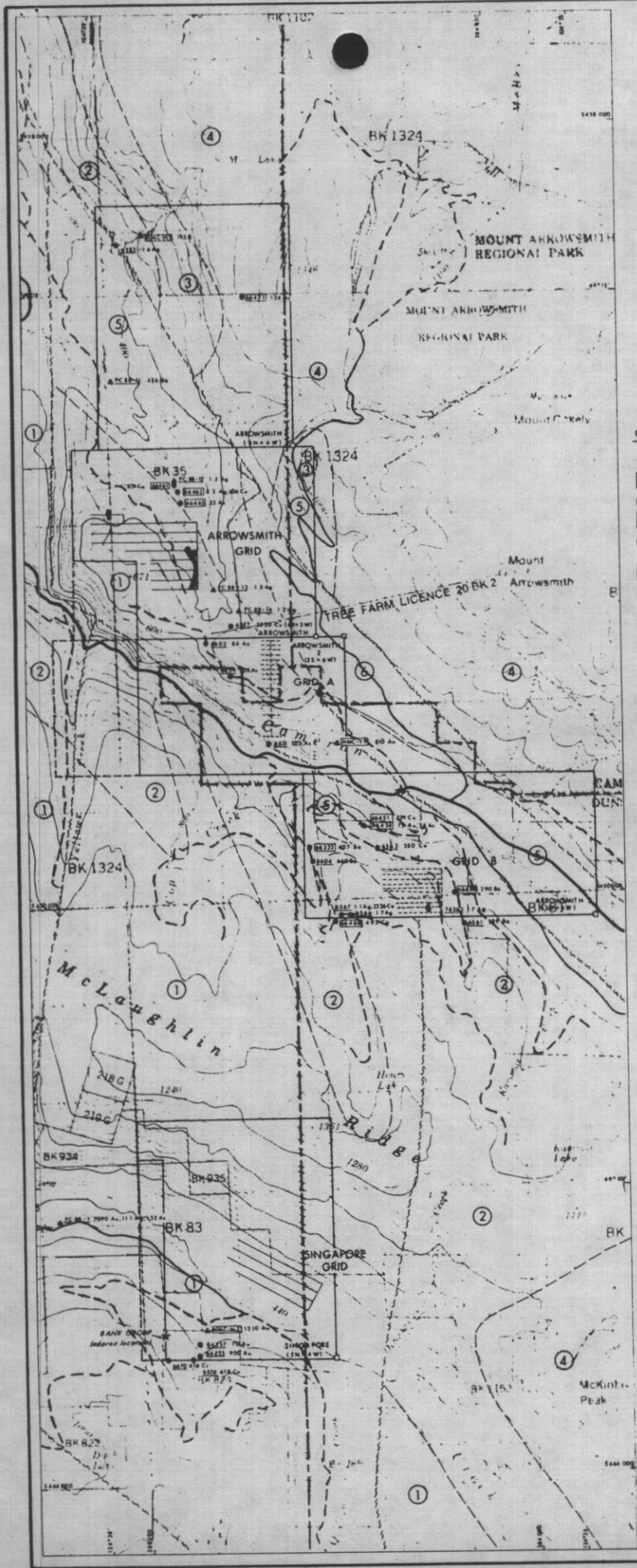
The Arrowsmith claims are underlain by rocks of the Nitinat, Myra and Buttle Lake Formations of the Paleozoic Sicker Group, Triassic Karmutsen Formation and Cretaceous Nanaimo Group, all intruded by Tertiary Intrusions. The Singapore claim is underlain by Nitinat Formation rocks of the Paleozoic Sicker Group.

#### 5.1.1 Arrowsmith Group

The Nitinat Formation (Unit 1) comprising mainly mafic volcanic rocks, occurs in the western half of the Arrowsmith claim and the eastern half of the Arrowsmith 2 claim. Small portions of the Arrowsmith 4 and the Arrowsmith 3 claims are also underlain by the Nitinat Formation. Fine-grained to massive andesitic rocks were observed in the creek which intersects the Arrowsmith grid.

Myra Formation (Unit 2) rocks occur in the northern half of Arrowsmith 4 claim, western half of the Arrowsmith 2 claim and in the central part of the Arrowsmith 3 claim. A small portion also occurs in the southwest corner of the Arrowsmith claim.

The Buttle Lake Formation (Unit 3) occurs in the northern half of the Arrowsmith 4 claim and the northeastern portion of the Arrowsmith claim. White to greyish white, bedded limestone with bedding from 3 cm to 5 m thick, strikes northeast with a moderate southeast dip on the Arrowsmith 3 claim. The limestone contains trace fine pyrite which weathers rusty brown.



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**LEGEND**

**GEOLOGY**

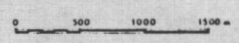
- TERTIARY**
- 6 Sooke Intrusions - quartz diorite, agmatite porphyry
- LATE CRETACEOUS**
- 5 Nanama Group - undifferentiated sandstone, siltstone, shale, conglomerate
- LATE TRIASSIC**
- Vancouver Group
- 4 Karmutsen Formation - basaltic lava, pillow lava breccia, tuff
- PALEOZOIC**
- Sicker Group
- 3 Buttle Lake Formation - limestone chert
- 2 Myra Formation - metagreywacke, argillite, schist, marble
- 1 Nitinat Formation - basaltic to rhyolitic metavolcanic flows, tuff agglomerate

Reference: Muller, 1977 (1:250 000 scale map)

**SYMBOLS**

- Lithologic boundary
- Fault
- Soil sampling grid (Edsons Resources Ltd, 1988)
- Soil sampling grid (Edsons Resources Ltd, 1987)
- Copper soil anomaly  $\geq 150$  ppm
- 06454 Rock sample (MPH Consulting Ltd)
- 0561 Rock sample (Edsons Resources Ltd and MPH Consulting Ltd, 1984)
- ▲ HMC-11 Silt sample (MPH Consulting Ltd)
- ▲ 04257 Silt sample (Edsons Resources Ltd)
- Selected results are Au in ppb, others in ppm.
- Trench (hand dug)
- ★ Mineral occurrence
- Road (2 wh dr, 4 wh dr)
- Claim boundary (dashed where overlapping previous claims) and LCP

Topographic contour interval 20 m and 40 m



92 F / 7

<b>SUNPORT METALS CORPORATION</b>	
<b>SUMMARY COMPILATION MAP</b>	
<b>ARROWSMITH PROJECT</b>	
<b>NANAIMO &amp; ALBERNI MINING DIVISIONS, B.C.</b>	
Project No: V 296	By: B.T.
Scale: 1 : 60 000	Drawn: J. S.
Drawing No: 2	Date: MAY 1989.
<b>MPH Consulting Limited</b>	

The Karmutsen Formation (Unit 4) underlies the Arrowsmith, Arrowsmith 3 and 4 claims east of Cameron River. It comprises mainly dark grey to black, or dark green, tholeiitic pillow basalt, massive basalt, and pillow breccia.

Nanaimo Group sediments (Unit 5) occur in the southeast portion of the Arrowsmith 4 claim, and the central portion of the Arrowsmith claim. The Nanaimo Group also occurs locally within the Arrowsmith 2 and Arrowsmith 3 claims areas. Coarse-grained pebble conglomerates were observed within the creek which intersects the Arrowsmith grid. The subrounded to rounded clasts vary in lithology (quartz, chert, volcanic origins), and are up to 8 cm in diameter within a fine-grained silty sandstone matrix. Along the Mt. Arrowsmith ski hill road which is topographically higher than the creek, dark brown, coarse-grained, well sorted sandstones occur.

Tertiary (?) quartz diorite dykes and/or sills (Unit 6) occur in the north-eastern part of the Arrowsmith 2 claim.

### 5.1.2 Singapore Claim

The Singapore claim is underlain by fine to medium-grained and massive andesitic rocks of the Nitinat Formation (Unit 1). Quartz and/or quartz-carbonate veinlets occur locally. Pyrite appears to be more abundant in the veined rocks. On the road near McQuillan Creek, fine-grained feldspar phenocrysts occur within the andesitic rocks. Andesitic rocks are amygdaloidal in the southwestern corner of the claim (Neale, 1984).

## **5.2 Structure**

The dominant fault(?) trends defined by airphoto lineaments are northerly and northwesterly. The Debeaux Creek fault extends southwest from Cameron River along Kammat, Debeaux and McQuillan Creeks. The Mineral Creek fault is located 4 km west of the Debeaux Creek fault and extends southwest from Cameron River along Yellow and Mineral Creeks. The Cameron River fault is a northwest trending, northeast dipping, regional structure which extends from Horne Lake south to Maple Bay.

## **5.3 Rock Sampling and Mineralization**

A total of 99 rock samples was collected by Edsons Resources Ltd. and MPH Consulting Limited during the latter part of 1988. Samples collected by Edsons Resources Ltd. were analyzed for gold and for 28 elements by ICP at Vangeochem Labs. Samples collected by MPH Consulting Limited were analyzed for gold and for 30 elements by ICP at Acme Laboratories. Selected sample geochemical results are shown in Figure 2.

### 5.3.1 Arrowsmith Group

Mineralization within the Arrowsmith Group consists of up to 2% fine-grained disseminated pyrite localized in strongly quartz-carbonate altered volcanic rocks. The alteration consists of 70 to 80% carbonate, 10 to 15% silica, up to 5% fuchsite with trace to 5% volcanic fragments. These alteration zones appear to be related to northerly trending faults and/or shear zones and extend up to 5 m into the wall rocks. On the banks of a tributary of Cop Creek, a westerly trending fault contains similar quartz-carbonate alteration.

Samples 66451 (229 ppm Cu), 66454 (79 ppb Au, 34 ppm As), 6563 (550 ppm Cu) and 6566 (2326 ppm Cu, 93 ppm As) are all from quartz-carbonate alteration zones. The northerly trending Debeaux Creek fault is located within 500 m of these rock samples suggesting a possible association with or influence by this structure.

Samples 6571 (618 ppm Cu), 6557 (3350 ppm Cu), 6559 (220 ppm As), 66461 (631 ppm Cu), 66462 (606 ppm Cu, 4.3 ppm Ag) and 66465 (33 ppb Au) were all collected from quartz-carbonate altered Nitinat Formation rocks. These samples contain up to 1% pyrite and are located between the Arrowsmith Grid and Grid A. The Cameron River fault, cuts the Nitinat Formation rocks in this area.

**5.3.2 Singapore Claim**

Rock sampling (13 samples) was conducted on the southern portion of the Singapore claim.

The Bank Group Showing consists of pyrite, chalcopyrite and galena in quartz veins. A grab sample from the dump assayed trace Au, 34 g/t Ag and 3.2% Cu (MMAR, 1917). A schistose zone with abundant fine disseminated pyrite occurs in the creek where sample HMC-N2 was taken. A sample of a quartz carbonate vein from within this zone returned 900 ppb Au (Neale and Hawkins, 1984). A strongly silicified shear zone oriented at 310°/45°NE occurs further down this creek. It cuts dark grey, andesitic volcanic rocks, contains 40% quartz veins and is limonitic stained. Sample 6576, from within this zone, returned 618 ppm Cu and a previous grab sample returned 70 ppb Au (Neale and Hawkins, 1984).

**5.4 Stream Sediment Sampling**

**5.4.1 Arrowsmith Group**

A total of 16 HMC silt samples (6 by Edsons Resources Ltd. and 10 by MPH) was collected from stream sediments on the Arrowsmith claims.

Sample HMC-Y1, which returned 810 ppb Au, was the only sample collected within the Arrowsmith claims which contained anomalous gold. It was taken from a creek draining an area north of Cameron River, approximately 3 km east of Yellow(s) Creek. An airphoto lineament extends south to the northern slopes of McLaughlin Ridge along this creek. Quartz-carbonate altered volcanics with finely disseminated pyrite (up to 2%) occur along this lineament. Grab samples from these altered zones contained significant values of gold (up to 79 ppb Au from sample 66454).

**5.4.2 Singapore Claim**

A total of 12 HMC silt samples (10 by Edsons and 2 by MPH) was collected from stream sediments on the Singapore claim. The following is a list of the anomalous gold-in-silt samples collected.

Edsons Resources Ltd.		MPH Consulting Limited	
PC88-1	7090 ppb Au	HMC-N2	1210 ppb Au
PC88-2	40 ppb Au		
PC88-5	60 ppb Au		
PC88-6	40 ppb Au		
PC88-10	55 ppb Au		



Sample PC88-1 (7090 ppb Au) is located 1 km west of the Singapore claim in China Creek. China Creek drains ground up to 6 km to the east of the property making it difficult to determine whether the anomalous gold-in-silt reflects bedrock gold mineralization from within or outside the Singapore property.

Sample PC88-3 (20 ppb Au), from near the eastern claim boundary in China Creek, is approximately 4 km upstream from PC88-1.

Sample HMC-N2, which returned 1210 ppb Au, was taken from the creek draining an area near the Bank Group showing. Although historical records show that the Bank Group showing hosts only a trace of gold, grab samples taken of a schistose zone from within the Bank Group showing area have returned up to 900 ppb Au (Neale, 1984).

Samples PC88-5 (60 ppb Au) and PC88-10 (55 ppb Au) were collected from creeks 250 m and 500 m west, respectively, of the HMC-N2 silt sample. These moderately anomalous gold concentrations may reflect downslope migration of gold from the pyritic schistose zone. Sample PC88-6 (40 ppb Au) is from a creek draining the southern slope of McLaughlin Ridge, 200 m upstream from China Creek.

### 5.5 Soil Geochemistry Survey

Edsons Resources Ltd. carried out four separate soil surveys between 1987 and 1988. These surveys are documented in reports by MacLeod (1987), Angus (1988a) and Angus (1988b). Samples from these grids were analyzed at Vangeochem Labs for gold and for 28 elements by ICP. Small anomalous copper-in-soil anomalies have been outlined on the Arrowsmith grid.

A total of 265 samples was collected from the Arrowsmith grid. The grid consisted of nine 100 m spaced lines with 25 m sample station intervals.

Anomalous soil sample results for copper were determined by statistical methods whereby, the mean and standard deviation were calculated using the complete data set, which, after taking out the outliers was recalculated. Values over mean plus one standard deviation were considered above background, while those over mean plus two standard deviations were considered anomalous.

Gold-in-soil anomalies were determined by inspection rather than by statistical methods because 38% of the samples returned non detectable levels of gold.

	Au (ppb)	Cu (ppm)
Above background	20	98
Anomalous	30	125
Range	ND-35	11-213
ND = Non detectable		

#### Copper

Two anomalous zones of copper have been outlined. The first zone, located in the southeast corner ranges between 150 ppm and 207 ppm Cu. It is 400 m long, up to 50 m wide and runs from L0+00, 0+75W to L4+00N, 1+00W. The large anomalous zone is open both to the southeast and to the south. This anomaly



may be associated with the northwest trending Cameron River Fault. Along the northerly strike projection of this zone, grab samples of quartz-carbonate altered Vancouver Group conglomerates returned up to 631 ppm Cu, 4.3 ppm Ag, and 33 ppb Au. Along the southerly strike projection, grab samples of quartz-carbonate altered rocks returned up to 3350 ppm Cu and 84 ppm As.

The second anomalous copper zone is located in the northwest corner of the grid. Concentrations range from 138 ppm to 213 ppm Cu. It is a north-south trending anomaly which is 100 m long and 25 m wide running from L7+00N, 9+00W to L8+00N, 9+25W. This zone may also be related to the Cameron River fault.

#### Gold

Only slightly anomalous spot highs of 20 ppb to 35 ppb gold occur over the grid area. These spot highs do not appear to be coincident with known geological structure or lithochemical results.

Analysis for all other elements returned only background concentrations.

## 6.0 PROPOSED WORK PROGRAM

### 6.1 Plan

Phase Ia exploration of the Arrowsmith and the Singapore claims will concentrate on geologic mapping and rock sampling, as well as silt sampling. Detailed mapping and rock sampling of the entire claim area will be carried out at a 1:2500 scale. Stream sediment sampling will be carried out in all creeks on the property, with detailed sampling to be undertaken in anomalous areas.

Phase Ib will consist of further detailed geologic mapping, sampling, hand trenching and rock sampling of anomalous targets. Soil, magnetometer and VLF-EM surveys will be carried out on grid(s) over the most promising areas.

A Phase II program budget, contingent on favourable Phase I results is contingent on the Phase I program.

### 6.2 Budget

#### Phase I

Mob/Demob \$ 800

#### Phase Ia:

Personnel	\$16,925	
Support Costs	2,970	
Transportation, Communications, Supplies	690	
Equipment Rental	1,680	
Consulting	3,542	
Analyses	<u>3,545</u>	
		\$29,352



Phase Ib:

Personnel	\$16,050	
Support Costs	2,860	
Transportation, Communications, Supplies	820	
Equipment Rental	4,390	
Consulting	3,542	
Analyses	<u>7,525</u>	\$35,187
Administration @ 15%		2,382
Contingency @ 15%		10,184
Report Preparation		<u>8,050</u>
<b>Total Cost, say</b>		<b>\$86,000</b>

**Phase II**

Personnel	\$48,200	
Equipment Rental	11,550	
Support Costs	7,645	
Analyses	10,176	
Miscellaneous (gas, shipping, supplies)	2,450	
Report Costs	4,400	
Administration	2,554	
Contingency	<u>13,025</u>	
<b>Total, say</b>		<b>\$100,000</b>

The Phase I program will require approximately four weeks to complete with two weeks allotted for synthesis of data and report writing. Phase II work is estimated to require a total of four weeks for completion of field work and a further two weeks for compilation of results and report writing.

**7.0 CONCLUSIONS**

1. The Arrowsmith claims are underlain by rocks of the Nitinat, Myra and Buttle Lake Formations of the Paleozoic Sicker Group, Karmutsen Formation of the Triassic Vancouver Group and Cretaceous Nanaimo Group which have been intruded by Tertiary dykes and plugs.
2. The Singapore claim is underlain by Nitinat Formation rocks of the Paleozoic Sicker Group.
3. North-south trending quartz-carbonate alteration zones, which locally contain anomalous levels of gold, silver, copper and arsenic, are located on the Arrowsmith claims. These should be explored further.
4. Copper-in-soil anomalies were outlined on the Arrowsmith soil grid. They appear to be related to the Cameron River fault. Rock samples (grab) taken along the strike projection of these copper anomalies returned up to 3350 ppm Cu, 220 ppm As, 4.3 ppm Ag and 33 ppb Au.




5. On McLaughlin Ridge, extensive quartz-carbonate alteration zones occur in rocks which are located along a northwest-southeast trending airphoto lineament. A heavy mineral concentrate sample which contained 810 ppb Au is located along this airphoto lineament north of the alteration zones.
6. The anomalous stream sediment sample (1210 ppb Au) located on the Singapore claim may be derived from the gold bearing schistose zone located 500 m upstream.
7. The Arrowsmith and Singapore claims have a high potential to host a structurally controlled vein deposit similar to the nearby Debbie-Yellow property, based on similar quartz-carbonate alteration zones in Sicker Group rocks and north-south structural controls.

### 8.0 RECOMMENDATIONS

1. Additional soil sampling at 100 m line spacing and 25 m station intervals on the Arrowsmith grid is recommended. Extensions to the south should cover the anomalous lithochemical samples and extensions to the east should be long enough to define the extent of the present copper-in-soil anomaly.
2. Additional soil sampling at 100 m line spacing and 25 m station intervals on Grid A and Grid B is recommended. Extensions to these grids should cover the airphoto lineament which overlies alteration zones and an anomalous gold stream sediment sample.
3. It is recommended that further stream sediment sampling be conducted in creeks not previously sampled, as well as resampling and prospecting up streams containing anomalous gold in heavy mineral concentrate samples.
4. Geologic mapping, trenching and rock sampling are recommended in the Bank Group showing area to determine the extent and source of gold mineralization in the creek.
5. Geologic mapping (1:5000 scale) and rock sampling are recommended over the southern slopes of McLaughlin Ridge on the Singapore claim as well as the Arrowsmith claims to determine the lithologic succession.
6. Trenching, geological mapping and rock sampling in areas defined by anomalous soil and rock samples are recommended. Attention should be directed to the quartz-carbonate alteration zones on the Arrowsmith claims.
7. Phase Ia and Ib work programs consisting of geologic mapping, rock sampling, soil geochemistry, magnetometer and VLF-EM surveying, trenching and heavy mineral concentrate silt sampling are recommended at an estimated cost of \$86,000.

8. Contingent upon favourable Phase I results, Phase II work including geological mapping, rock sampling, IP surveying and possible additional soil sampling/magnetometer/VLF-EM grid(s) is recommended at an estimated cost of \$100,000.

Respectfully submitted,  
MPH CONSULTING LIMITED

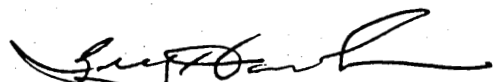


T.E. Gregory Hawkins, P.Geol.

#### CERTIFICATE

I, T.E. Gregory Hawkins, do hereby certify:

1. That I am a Consulting Geologist with business office at #2406 - 555 West Hastings Street, Vancouver, B.C. V6B 4N5.
2. That I am a graduate in geology of The University of Alberta, Edmonton (B.Sc. 1973), and of McGill University, Montreal (M.Sc. 1979).
3. That I have practised within the geological profession for the past seventeen years.
4. That I am a Fellow of the Geological Association of Canada and a Professional Geologist registered in the Province of Alberta.
5. That the opinions, conclusions and recommendations contained herein are based on field work carried out on the Arrowsmith - Singapore property by MPH Consulting Limited personnel under my supervision.
6. That I own no direct, indirect, or contingent interests in the area, the subject property, or shares or securities of Sunport Metals Corporation or associated companies.



T.E. Gregory Hawkins, P.Geol.

Vancouver, B.C.  
May 1, 1989



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