86-522-15151

REPORT ON

MARK PROPERTY

PANGMAN PEAK 82N/15W

GOLDEN MINING DIVISION

LAT 51°47.2'N - LONG 116°58.3'W

FOR

Owner/Operator: DIA MET MINERALS LTD.

KELOWNA, B.C.

by

C.E. FIPKE of

C.F. MINERAL RESEARCH LTD.

Kelowna, B.C.

SEPTEMBER, 1986

CONTENTS

PLATES (con't)

APPENDIX

ASSESSMENT REPORT ON MARK CLAIMS GROUP GOLDEN M.D.

INTRODUCTION

The Mark Group consists of four contiguous claims totalling 26 units. The claims are presently 100% owned by Dia Met Minerals Ltd. of Kelowna, B. C. C.E. Fipke was contracted as operator to complete two years assessment work on the claims. As a consequence bulk rock extraction of any macro-diamonds or diamond indicator minerals was completed on three of four helicopter collected ±35 kg samples of kimberlitic rocks on the claims. In addition some binocular microscope extractions and S.E.M. analysis of previously heavy mineral concentrated stream sediments from the claims was also completed for the period June 20, 1985 to June 20, 1986. Microscope and thin section descriptions by petrographer Barbra Scott Smith on rock samples from the Mark claims are also given.

LOCATION, TOPOGRAPHY, ACCESS

The Mark claim, the principal claim of the group is located Latitude 51°47'N, Longitude 116°58'W, NTS 82N/15W, approximately 55 kilometres north of Golden in the Golden Mining District. This claim is located on the ridge leading northerly from Pangman Peak forming the B.C.-Alberta border and is bounded by Banff National Park at the border. See Figures 1 and 2. The claim group extends for 3 kilometres north-south and 2 kilometres east-west; extending westerly to Valenciennes River.

The topography is extremely rugged and hazardous with some perennial snow cover and exposed precipitous slopes and cliffs.

Elevations on the property range from 1800 metres (6000 ft.) at Valenciennes River to 2900 metres (9500 ft.) between Pangman Peak and Bush Pass. See Figure 2.

The claims are accessible by helicopter from Golden. There is reported to be road access to within 15 kilometres west of the property. When the logging road scheduled to be completed by Evans Logging Company in 1986 is completed, the road access distance will be shortened to about 10 kilometres west of the claims.

GEOLOGY

The Mark claims are underlain by Middle & Upper Cambrian to Ordovician limestones, limy slate intraformational limestone breccia and dolomite. These N.W. trending isoclinally folded and thrusted marine carbonate units are intruded by at least seven subvertical kimberlitic diatremes that outcrop or partially outcrop on the claims (refer fig.3). A kimberlitic picroilmenite with 4.32% Cr_2O_3 and 13.46% MgO as well as fourteen chromites were previously recovered from the Big Mark (sample #1) diatreme that outcrops over an area of 17 acres, 2/3 of which is in Banff Park and 1/3 of which outcrops on the claims. A microdiamond chip was recovered from a 35 kg assorted kimberlitic talus collected downslope from the largest outcroping Big Mark pipe (refer to Northcotes June, 1983 assessment report).

METHODOLOGY

1. FIELD

The three $\pm$35 kg bulk rock samples processed in the 1986 assessment period were collected with the use of a helicopter by geologist C. Fipke from sites New Mark Lower,

Mark 6 and Big Mark Lower Talus (fig.3). The foremost samples are rock outcrop samples collected from several locals from a new located diatreme as well as from several locals from Big Mark diatreme. The latter bulk sample consists of assorted diatreme talus collected from the general area from which the previous rock sample that contained a microdiamond (refer to Northcote's 1983 assessment report) had been collected.

The rock samples macroscopically and microscopically thin section described by petrographer Barbra Scott Smith were also collected by geologist C.E. Fipke. "Sample 1" Appendix I was collected from the outcrop sample Mark 6 from the Big Mark diatreme. Samples (2 to 16) inclusive were assorted rock float samples found on the Bill I claims in the Valenciennes River between sample sites J16 and J17 (fig.3).

2. LABORATORY

The three ±35 kg samples were crushed and pulvarized to -6 mesh and slowly ball milled over a 3 to 4 week period. About every 4 hours the ball mill products were wet sieved to -20 mesh and the resultant -6+20 mesh products resubmitted to ball milling until nearly all of the rock samples were -20 mesh. The entire ±35 kg of ball mill products were subsequently washed and wet sieved in 70 gallons of water so that the light clay fraction suspensions were decanted from settled out detrital components of the ball milled products. The 70 gallons of light clay fractions and water were placed in 5 gallon pails and settled over a one month period so that the settled clay components

could be removed from most of the water. The entire detrital components were then dried; TBE and MI heavy liquid separated; and electromagnetic separated into heavy magnetic (HM), Ilm (ilmenite), Py-Crd (Pyrope-Chrome Diopside) and D (diamond) concentrates. With the exception of the HM concentrates most of the concentrates were binocular microscope inspected by technicians for any indicator minerals present in the concentrates. Any possible indicator minerals were placed in vials. Owing to the presence of abundance colorless to whitish carbonate, apatite, zircon and other tiny minerals that could be mistaken for small diamond, the "D" concentrate of sample Big Mark Lower Ta 2 was uninspected in detail. Instead this large concentrate was submitted for a series of acid treatments designed to destroy the minerals potentially mistaken for diamonds, prior to binocular microscope examination. Only about 1600 of the estimated 6600 possible ilmenites and chromites present in the ilmenite and Py-Crd concentrates of the same sample were binocular microscope extracted for S.E.M. analysis.

The possible chromites and ilmenites were mounted on polished sections and S.E.M. area scanned for Cr-Mg-Ti-Fe to determine the presence of possible indicator minerals. Five grains from the "D" concentrate of Mark 6 sample were S.E.M. tested for the presence of diamond. In addition five potentially kimberlitic ilmenites and chromites as well as a chromite standard were S.E.M. semi quantitatively analysed.

The 16 rock hand samples were diamond sawed in half and macroscopically examined by Barbra Scott Smith. Petrographic thin sections were made of parts of the hand specimen and examined by Barbra Scott Smith with a petrographic microscope.

RESULTS AND DISCUSSION OF RESULTS

No diamonds were found in the binocular microscope examination of the "D" concentrates of the New Mark Lower rock or the Mark 6 bulk rock samples. The acid treatment required to remove interference minerals on the Big Mark Lower Talus 2 "D" concentrate prior to microscope examination was not completed at the time of report. It is thus not yet known if this important sample, collected in the area from which the microdiamond had previously been recovered, is diamondiferous. Five grains binocular microscope picked as possible macrodiamond from the "D" concentrate of the Mark 6 sample turned out on S.E.M. analysis to be zircon and apatite.

The scanning electron microscope elemental area scans (Plates 1 to 11) indicate that chromite (green) with some minor magnetite (yellow) is the primary opaque mineral present in the three bulk rock samples concentrate. Only three grains of ilmenite (red) could be identified in the area scans of New Mark Lower

concentrate grains and four grains of ilmenite (red) in Mark 6 concentrate grains. In addition three grains of ilmenite were detected in the Big Mark Lower Talus 2 area scan (plate 6) however an additional 200 mounted grains of possible ilmenite and an additional estimated 5500 grains of opaques (chromites, ilmenites and magnetites) were unpicked from the concentrates.

Even though most or all of the ice present on the x-ray detector had been removed prior to analysis of unknowns, the semi quantitative S.E.M. analysis of the standard (plate 17) is inaccurate. As a consequence the analysis of plates 12 to 16 are probably incorrect. At best plates 12 to 16 indicate that the grains are chromite. Plate 14 indicates the grain analysed is ilmenite. However, as there is a suggestion that the MgO content is greater than 2 to 3% (ie the result is 6.03% MgO) this grain could be picro(kimberlitic) ilmenite.

The estimated bulk sample results of this report are plotted with all previous results on figure 3.

The petrographic results of Barbra Scott Smith (Appendix 1) indicate that the float rocks collected from the Valenciennes on the BILL I claim are tuffaceous crator facies breccia's (samples 1, 3, 5, 10, 13 and 14) and olivene-clinopyroxene lamprophyre (samples 2, 6, 7, 8, 9, 12, 15 and 16). According to Barbra Scott Smith sample 4 is probably also an igneous rock but is different from the other in that it is composed

predominantly of possible feldspar with only rare probable mafic phenocrysts.

CONCLUSIONS

The S.E.M. diamond indicator mineral results of plates 1 to 16 are consistent with previous Falconbridge Metalurgical lab results (Northcote's report, Assessment 1983, P.12) whereby 13 chromite and 1 picroilmenite from the Big Mark I rock sample collected at the same local as the Mark 6 sample (figure 3).

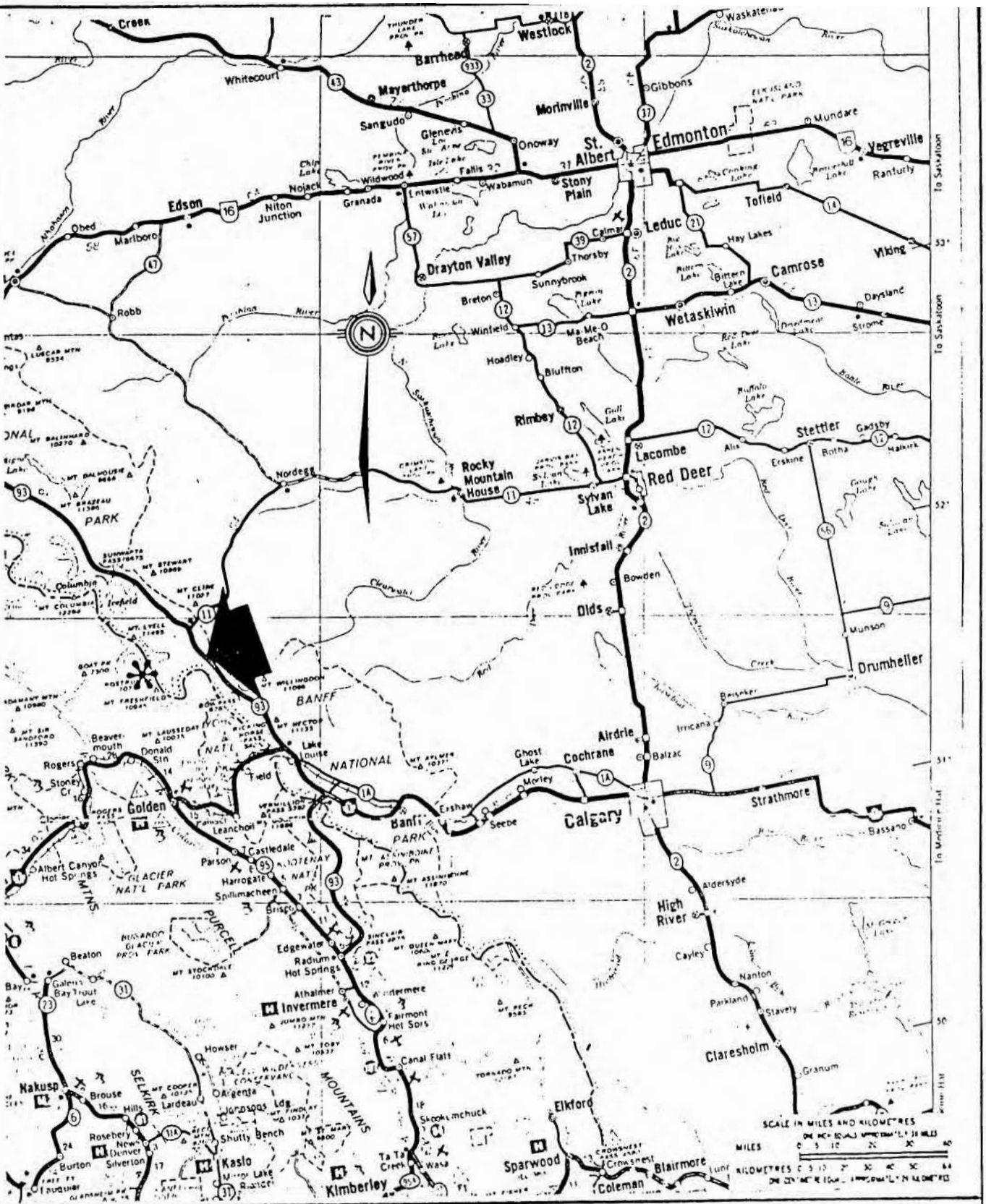
As pircroilmenite of 4.03% Cr_2O_3 and 13.46% MgO (Northcote's 1983, Appendix A) and abundant chromites have been concentrated from rock samples described by Barbra Scott Smith as probable tuffaceous crator facies breccias the Big Mark diatreme outcrops (sample 1, Mark 6 etc. of Figure 3) are probably kimberlite crator facies.

RECOMMENDATIONS

After acid digestion to remove diamond interference minerals, the Big Mark Lower Ta "D" should be binocular microsccpe checked for macrodiamond. The tiny -150 mesh portions of the resultant "D" concentrates should be S.E.M. area scanned for the presence of pure "C" (microdiamond) as it is unlikely the technicians would have detected tiny -150 mesh microdiamonds in the concentrates binocular microscope examined. As it is probable tiny microdiamonds would be lost, in the concentrating process used, the clay tailings, as well as intermediate and light

tailings saved should be fused in an autoclave to destroy or etch all minerals but microdiamond. Only in this way will it be possible to establish whether or not the bulk samples treated are diamondiferous. K. E. Northcote (1983 page iii) has recommended that at least 40 bulk ±35 kg samples need be tested for microdiamond, to determine which kimberlite phases present on the claims are diamondiferous.

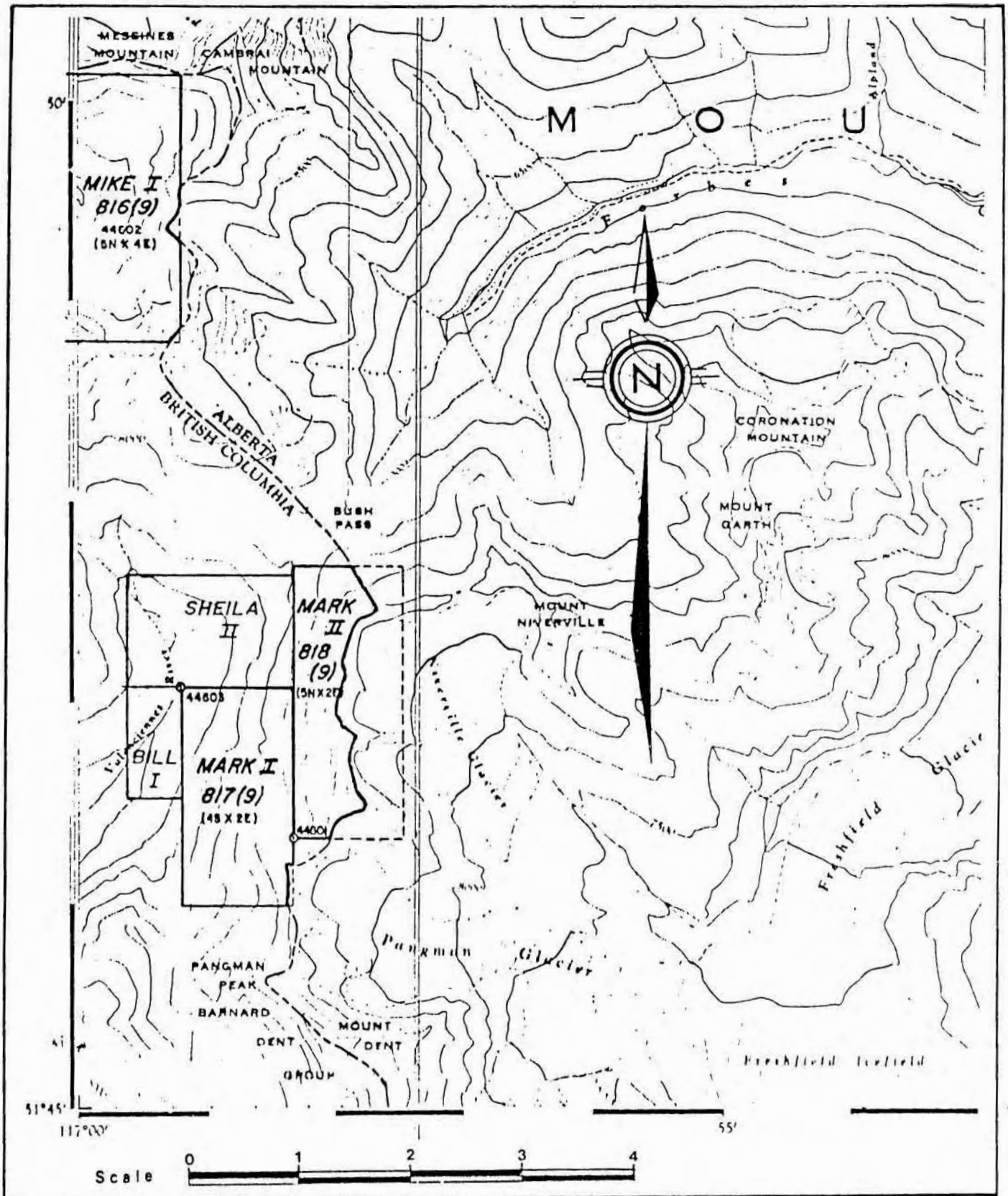
The inaccurate S.E.M. analytical result problem need be identified and corrected. As previous analysis, before an ice on the detector problem was identified, were very accurate and as the ice on the detector has apparently been removed, it is possible a humanistic parameter input error is involved. In fact the high MgO value of the chromite standard (plate 17) suggests that the Be window thickness parameter inputed maybe inexcess of the actual thickness of the Be window used.



DIA MET MINERALS LTD
INDEX MAP
MARK PROPERTY

82N/15W	51° 47′N 116° 58′W

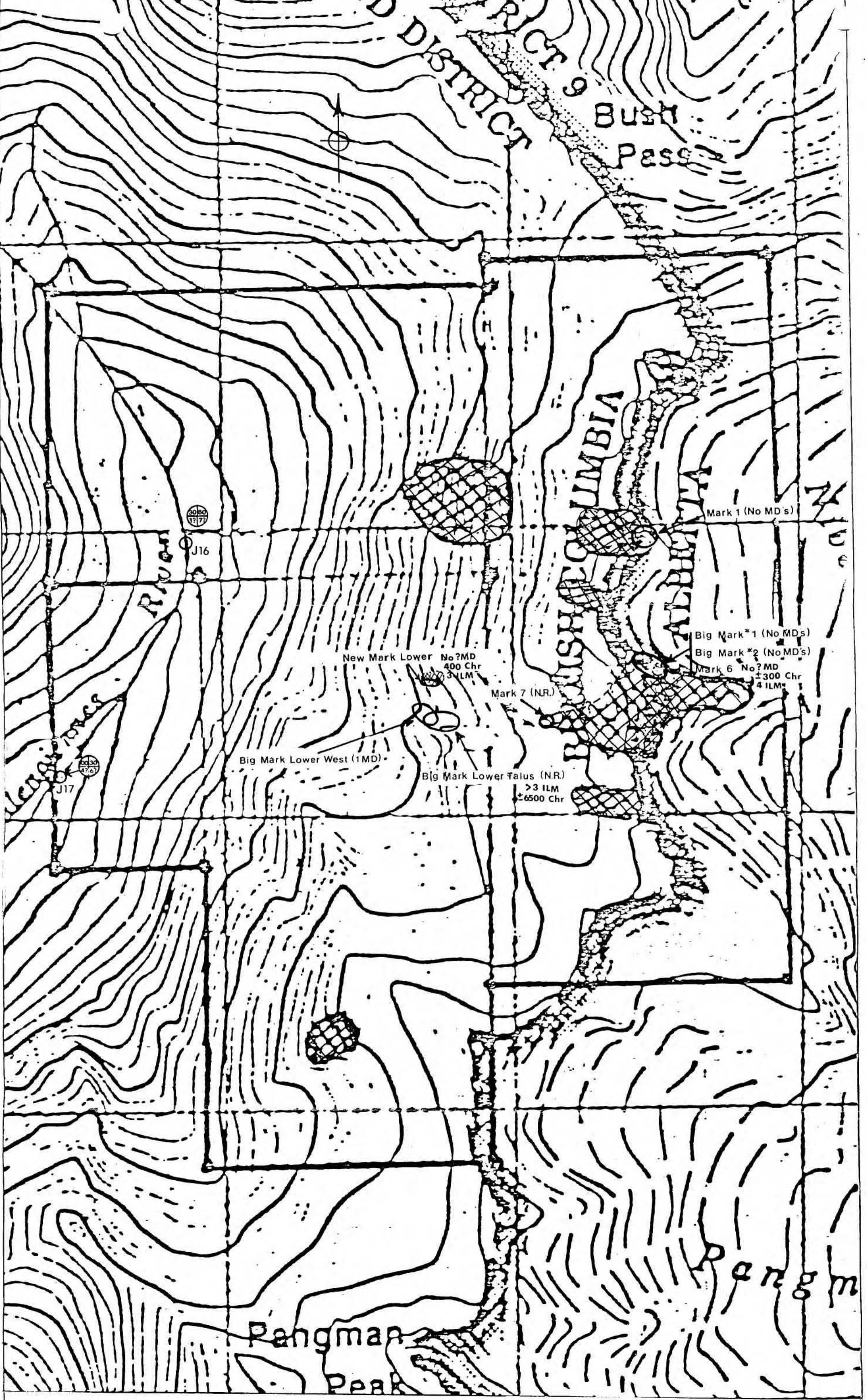
FIGURE 1



DIA MET MINERALS LTD
CLAIM MAP
MARK PROPERTY

82 N/15W	51° 47′N 116° 58′W

FIGURE 2



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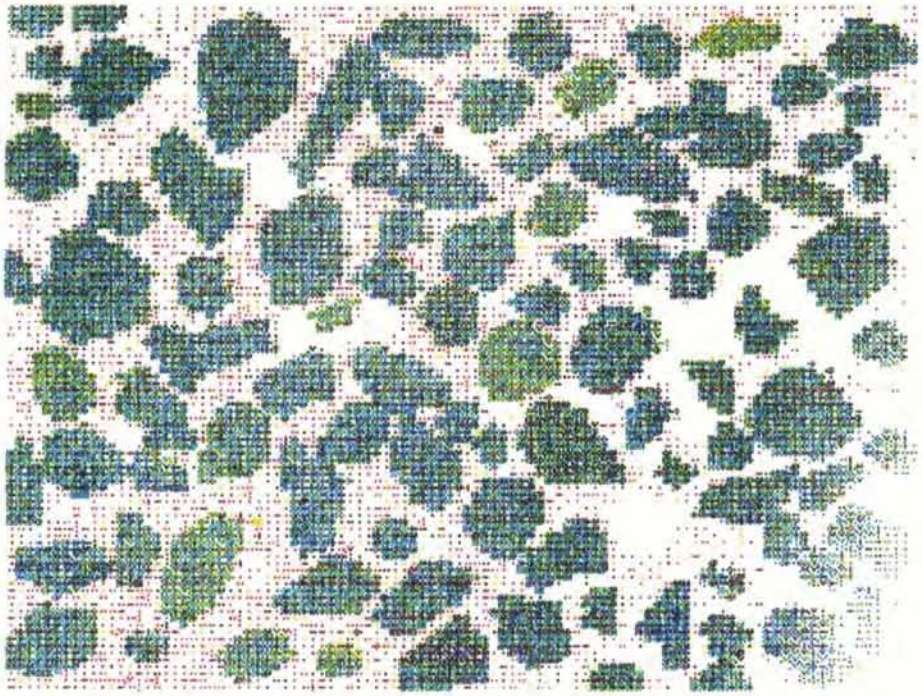
LEGEND

MARK CLAIMS



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MG	TI	CR	FE	EDAX
BLACK	MAGENTA	CYAN	YELLOW	EDscan

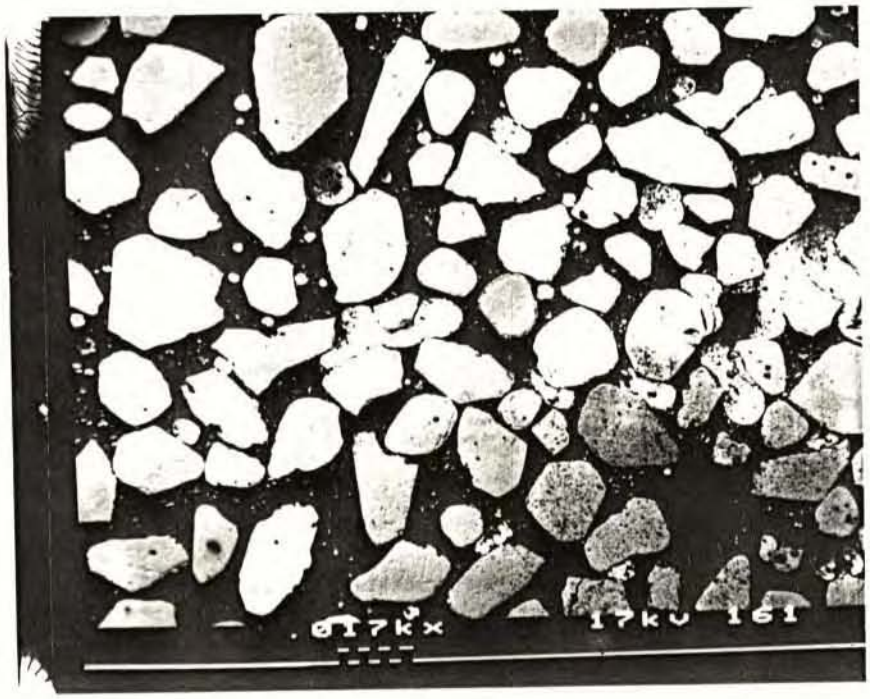
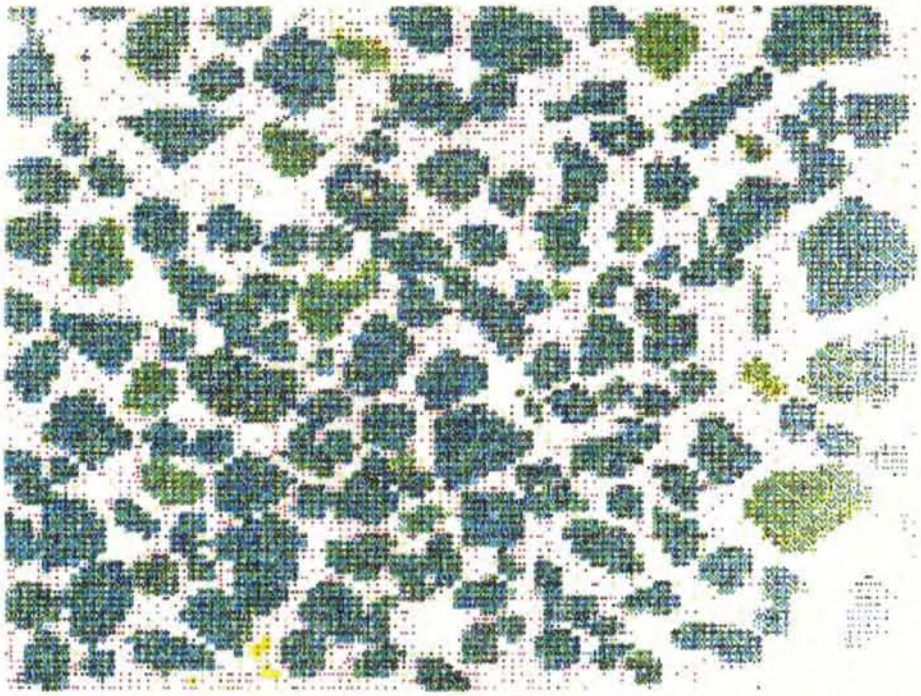


PLATE 1



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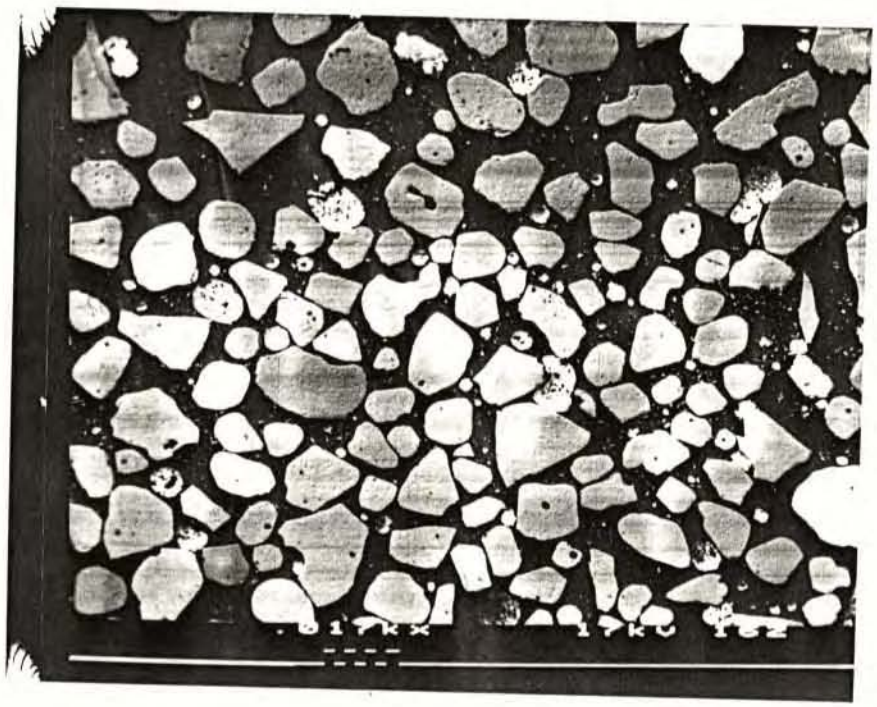

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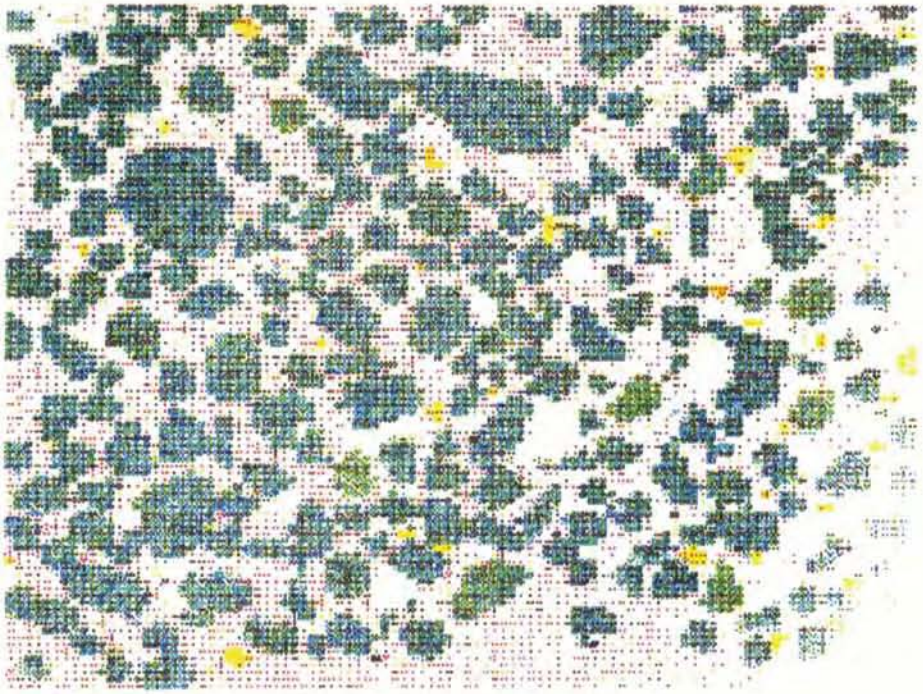

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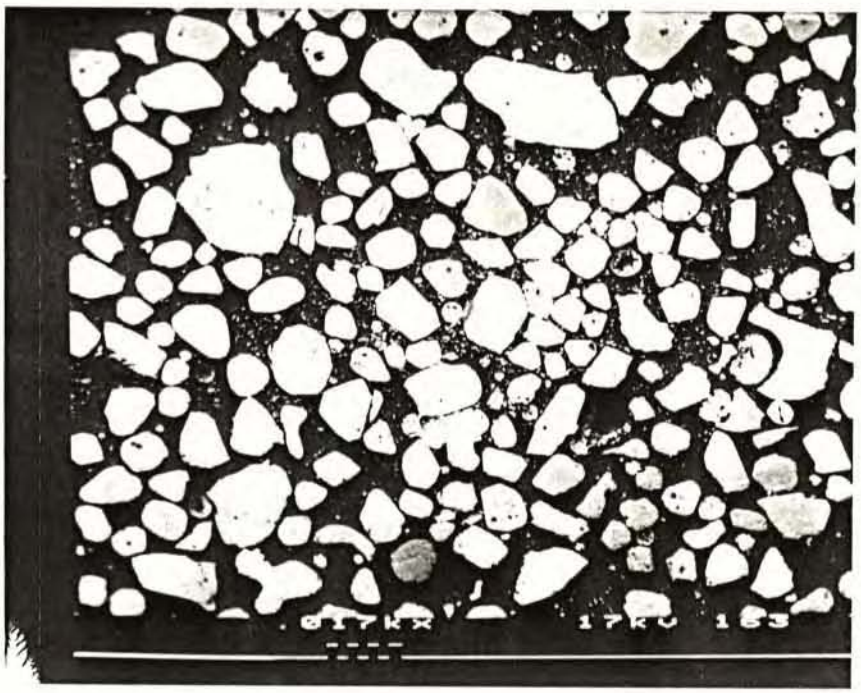

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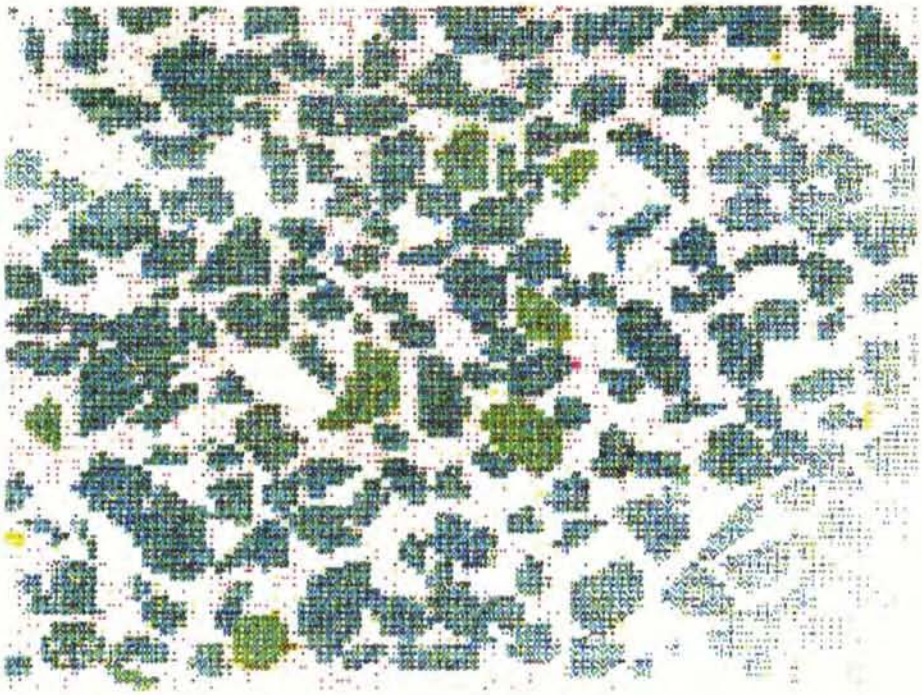

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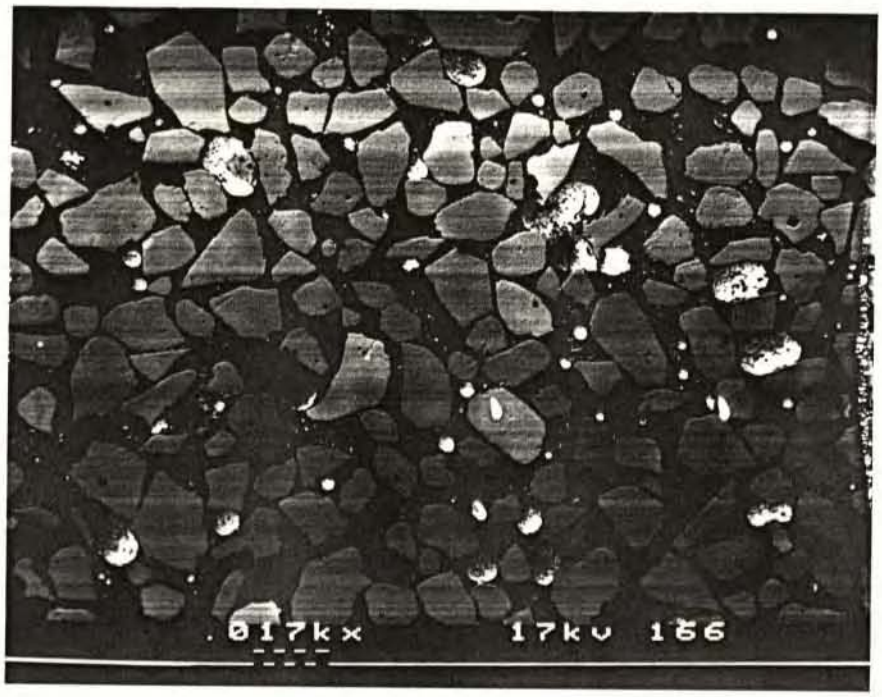

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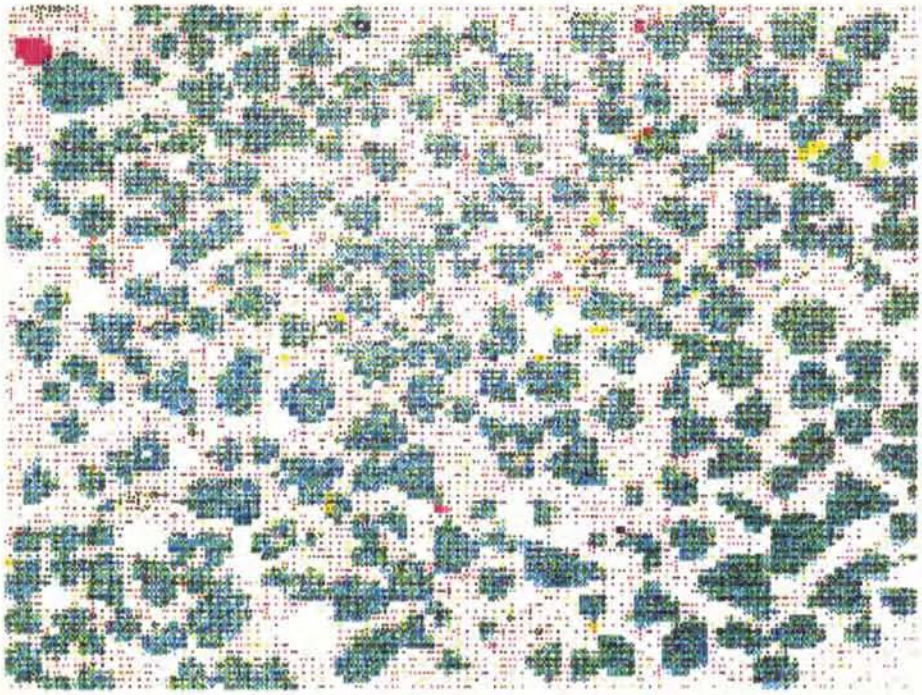

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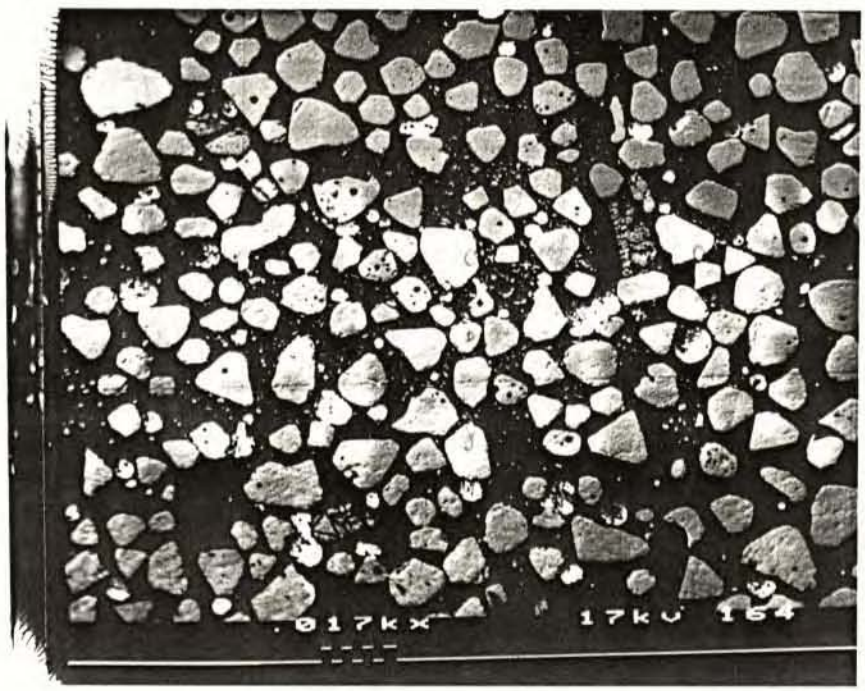
MG	TI	CR	FE	EDAX
BLACK	MAGENTA	CYAN	YELLOW	EDscan



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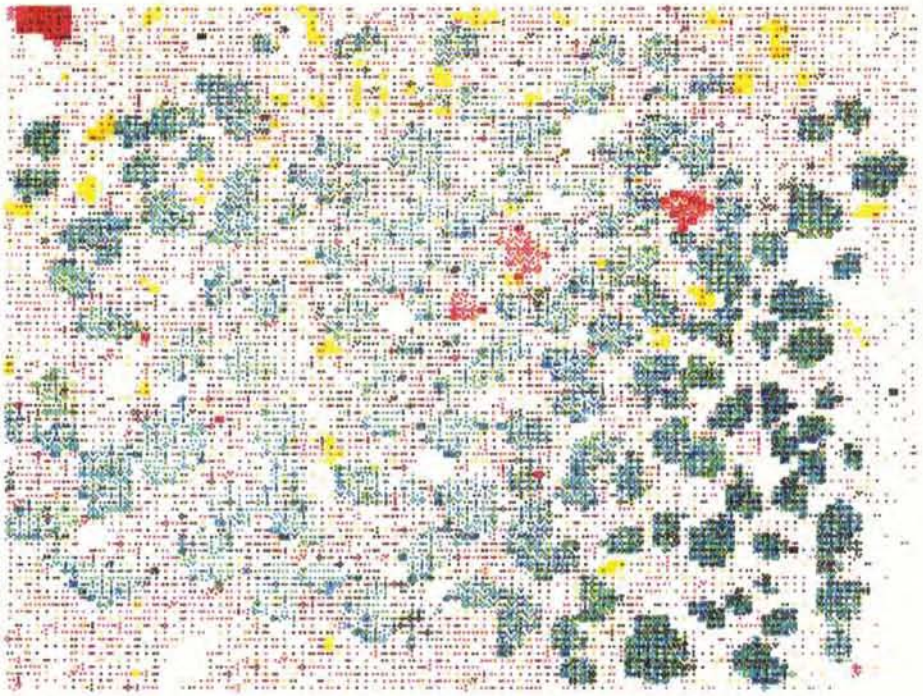

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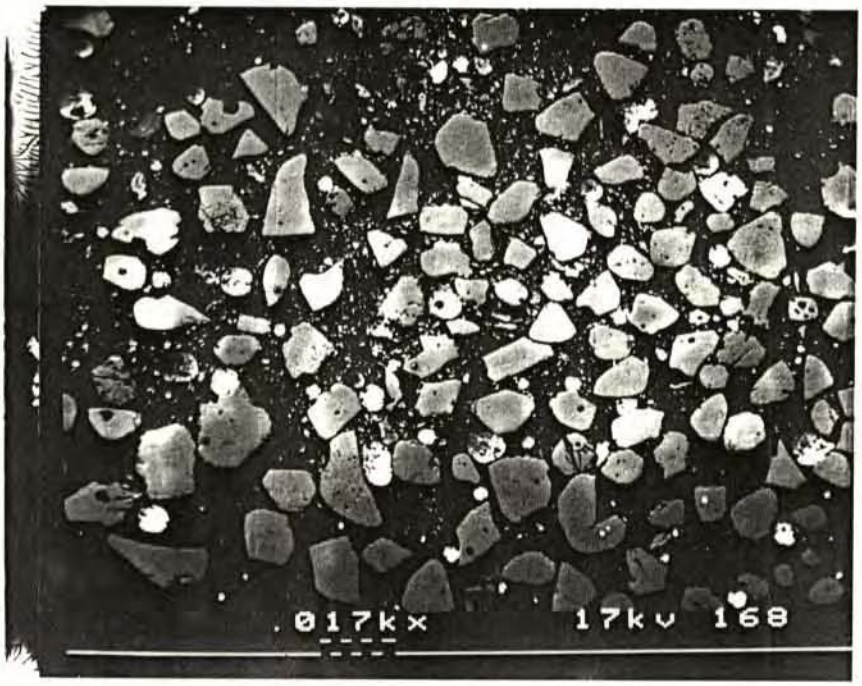
BLACK	MAGENTA	CYAN	YELLOW	EDscan



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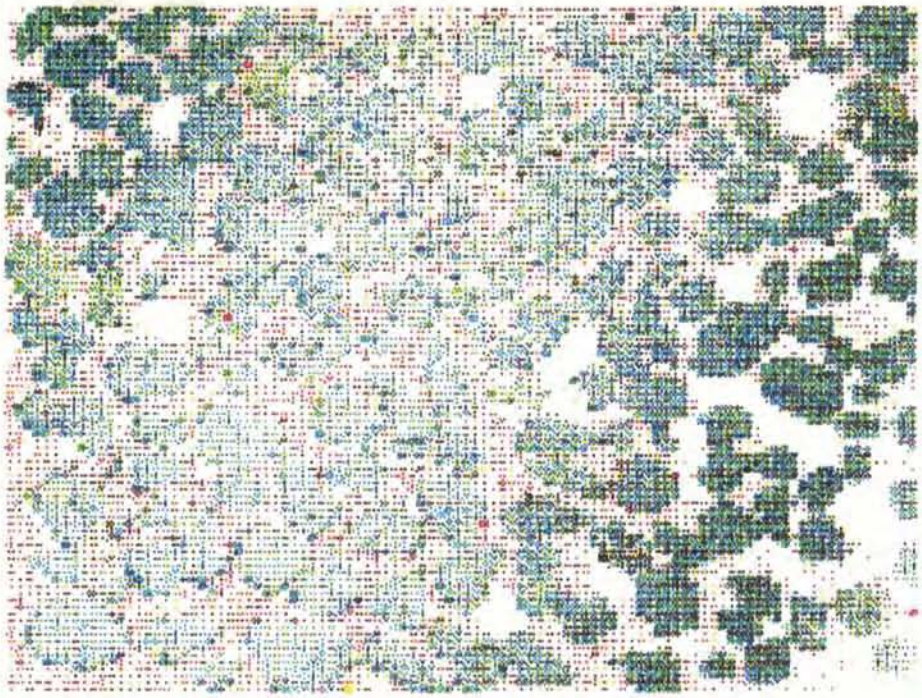

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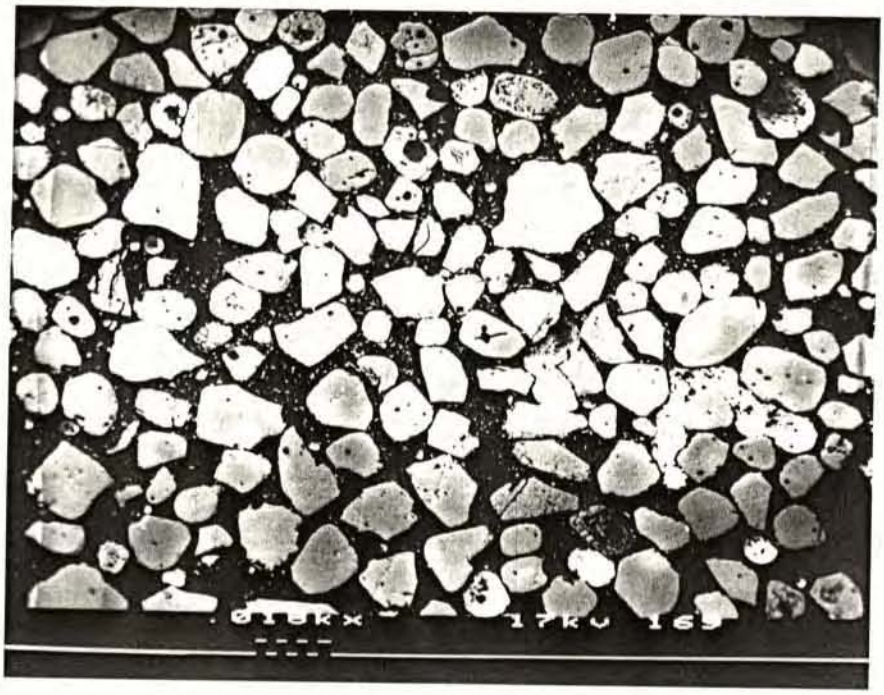

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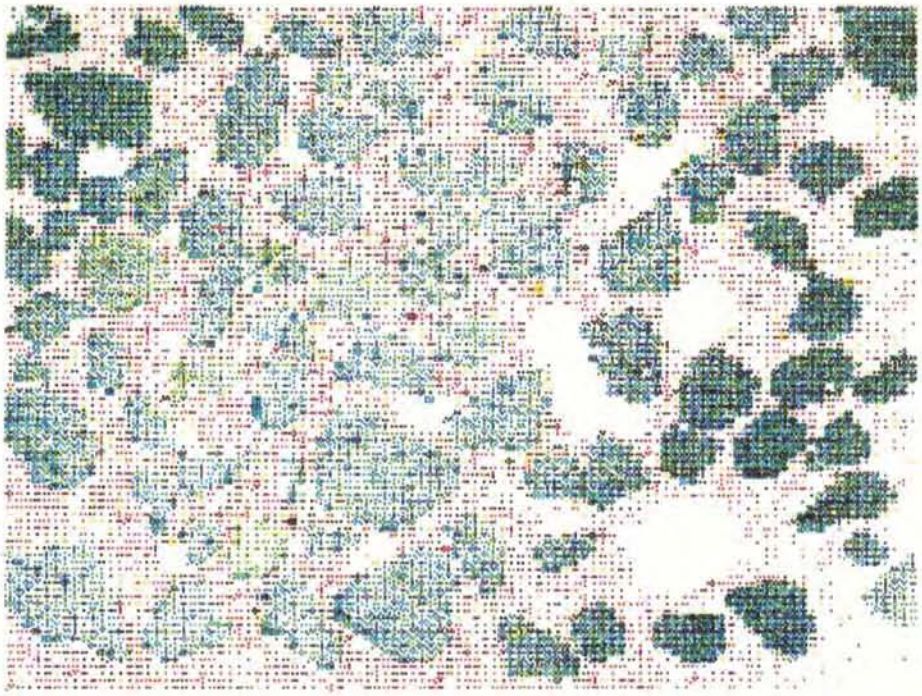

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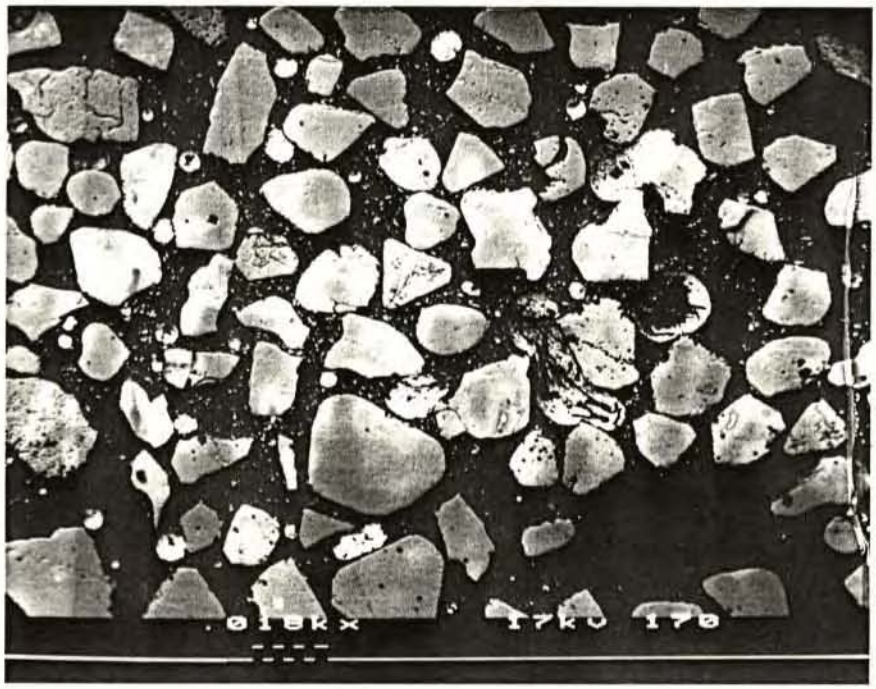
BLACK	MAGENTA	CYAN	YELLOW	EDscan



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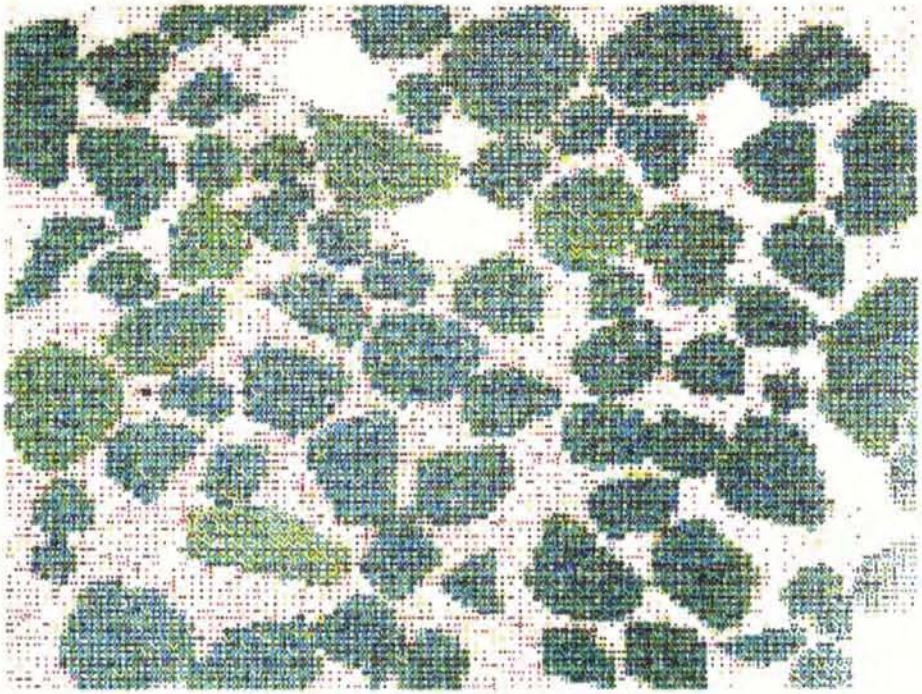

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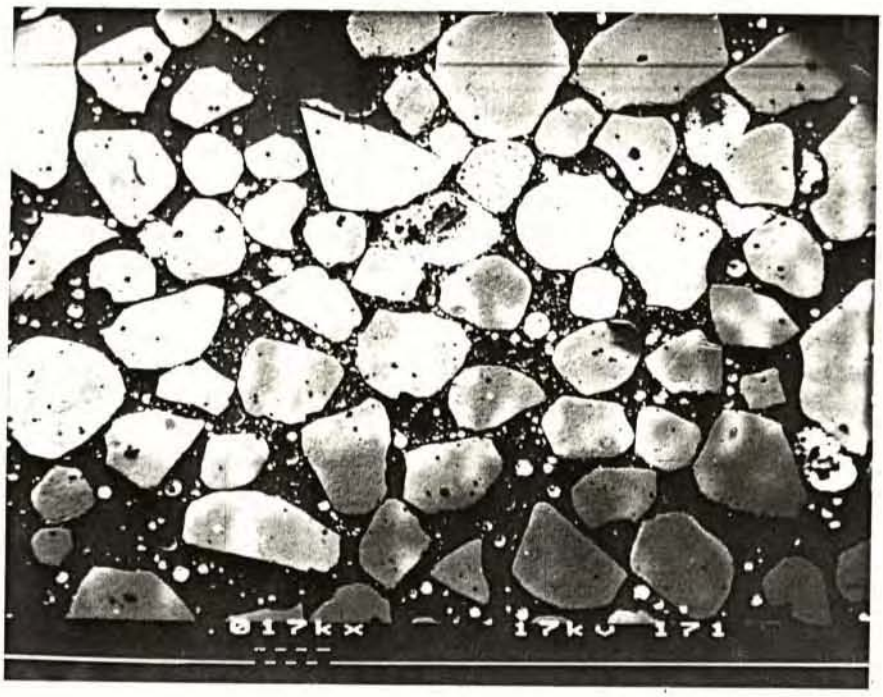
BLACK	MAGENTA	CYAN	YELLOW	EDscan



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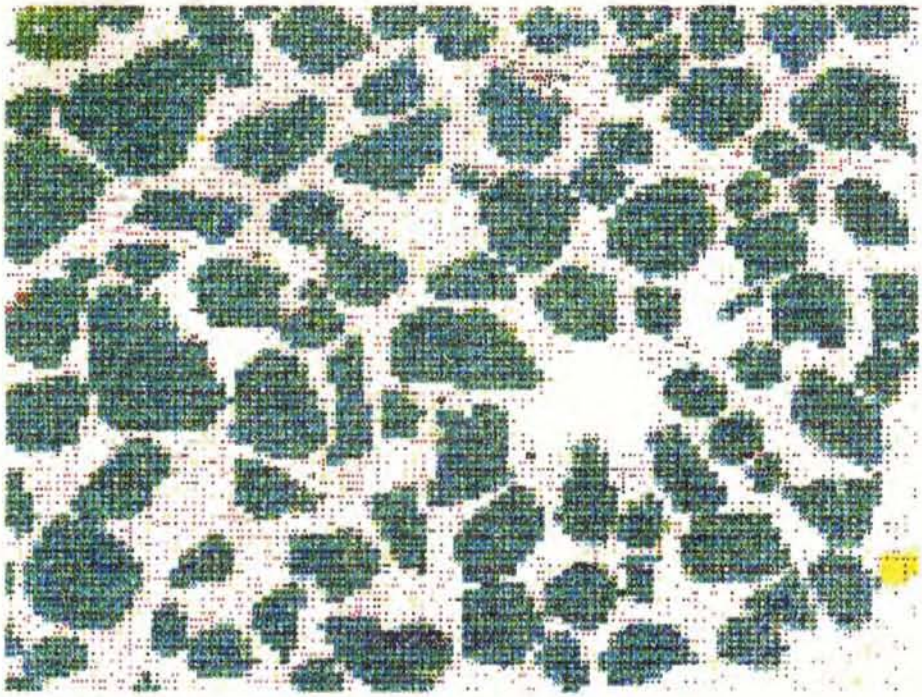

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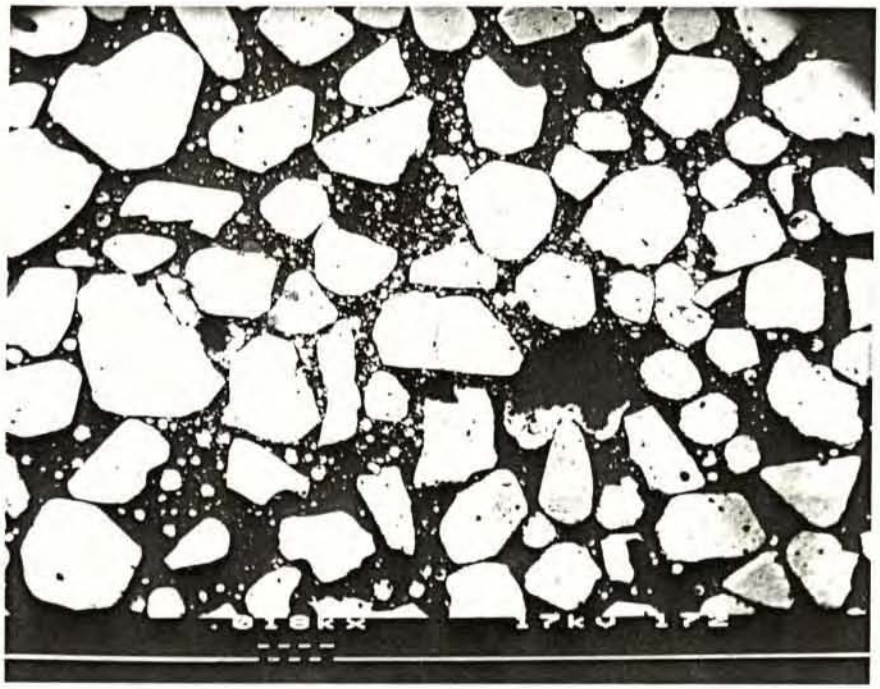

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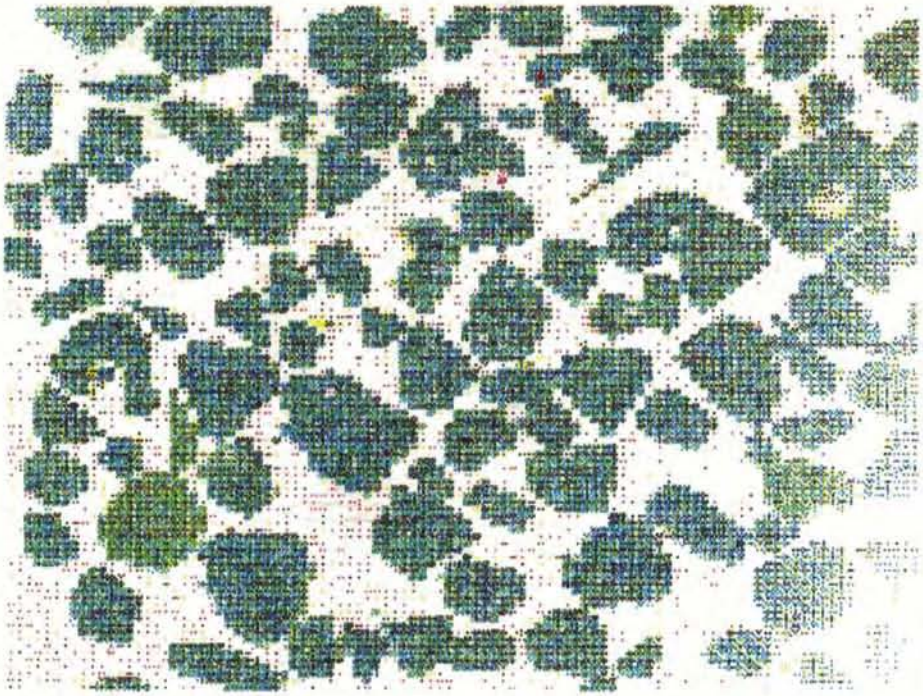

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MG	TI	CR	FE	EDAX
BLACK	MAGENTA	CYAN	YELLOW	EDscan

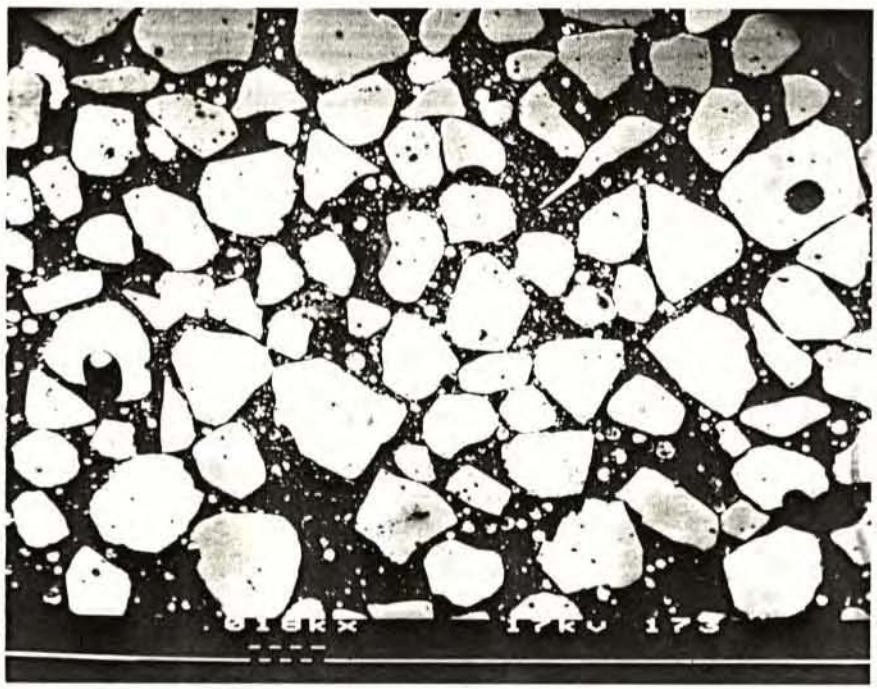

PLATE 11

LIST-%-ZAF:
LABEL = MK 6 CHRM #1
17-SEP-86 11:36:28
300.006 LIVE SECONDS
KV= 15. TILT=40. TKOFF=43.
ZAF CORRECTION

ELEM	K	Z	A	F
MGK	0.0982	1.085	0.700	1.002
ALK	0.0720	1.057	0.731	1.000
TIK	0.0039	0.958	0.999	1.115
CRK	0.3091	0.954	1.003	1.020
FEK	0.0923	0.953	0.981	1.000

ELEM	CPS	WT % ELEM	OXIDE
MGK	213.8555	12.90	21.39
ALK	254.1047	9.32	17.62
TIK	10.8898	0.37	0.61
CRK	677.7558	31.65	46.26
FEK	145.0636	9.88	14.12

PLATE 12

```
LIST-%-ZAF:
LABEL = MK 6 CHRM #2
17-SEP-86    11:50:22
  300.002  LIVE SECONDS
KV= 15.    TILT=40.    TKOFF=43.
           ZAF CORRECTION

 ELEM    K       Z       A       F

 MGK  0.0986  1.084  0.705  1.002
 ALK  0.0775  1.056  0.734  1.000
 TIK  0.0038  0.957  0.999  1.112
 CRK  0.3019  0.953  1.003  1.020
 FEK  0.0910  0.951  0.982  1.000


                      WT %
ELEM      CPS         ELEM      OXIDE
MGK    210.0519      12.87      21.34
ALK    267.6115      10.00      18.90
TIK     10.3099       0.35       0.59
CRK    647.4955      30.95      45.24
FEK    139.8723       9.74      13.93
```

PLATE 13

```
LIST-%-ZAF:
LABEL = N MK L ILM 1
17-SEP-86    12:31:46
  300.004  LIVE SECONDS
KV= 15.    TILT=40.    TKOFF=43.
           ZAF CORRECTION

 ELEM    K       Z       A       F

 MGK  0.0247  1.122  0.604  1.000
 TIK  0.2811  0.994  1.002  1.038
 MNK  0.0257  0.972  0.984  1.000
 FEK  0.3092  0.990  0.989  1.000


                      WT %
ELEM      CPS         ELEM      OXIDE
MGK     57.7659       3.64       6.03
TIK    844.3718      27.19      45.35
MNK     51.3326       2.69       3.47
FEK    522.4196      31.58      45.15
```

PLATE 14

```
LIST-%-ZAF:
LABEL = N MK L CHR 1
17-SEP-86    12:57:43
  300.002  LIVE SECONDS
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           ZAF CORRECTION

 ELEM    K       Z       A       F

 MGK  0.0983  1.087  0.692  1.002
 ALK  0.0619  1.059  0.724  1.001
 CRK  0.3320  0.956  1.004  1.019
 FEK  0.0883  0.955  0.980  1.000


                      WT %
ELEM      CPS         ELEM      OXIDE
MGK    249.3983      13.05      21.63
ALK    254.2050       8.06      15.23
CRK    847.7610      33.96      49.63
FEK    161.6556       9.45      13.50
```

PLATE 15

LIST-%-ZAF:
LABEL = B MK LT 2 CHR
17-SEP-86 13:33:53
300.002 LIVE SECONDS
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ZAF CORRECTION

ELEM	K	Z	A	F
MGK	0.0975	1.085	0.702	1.002
ALK	0.0755	1.056	0.733	1.000
TIK	0.0043	0.958	0.999	1.113
CRK	0.3037	0.953	1.003	1.021
FEK	0.0933	0.952	0.982	1.000

ELEM	CPS	WT % ELEM	OXIDE
MGK	269.3081	12.77	21.17
ALK	338.1043	9.76	18.43
TIK	15.0832	0.40	0.67
CRK	844.6974	31.10	45.46
FEK	185.9287	9.98	14.27

PLATE 16

LIST-%-ZAF:
LABEL = CHROMITE STD
17-SEP-86 13:46:15
300.001 LIVE SECONDS
KV= 15. TILT=40. TKOFF=43.
ZAF CORRECTION

ELEM	K	Z	A	F
MGK	0.0954	1.092	0.677	1.001
ALK	0.0443	1.063	0.715	1.001
CAK	0.0011	1.058	0.989	1.045
CRK	0.3694	0.960	1.004	1.016
FEK	0.0812	0.959	0.977	1.000

ELEM	CPS	WT % ELEM	OXIDE	OXIDE % OF STANDARD
MGK	156.0827	12.89	21.37	15.20
ALK	117.4262	5.82	11.00	9.92
CAK	2.8933	0.10	0.14	0.12
CRK	608.5511	37.70	55.10	60.5
FEK	95.9130	8.67	12.40	13.04

PLATE 17

APPENDIX I

Petrography

by BARBRA SCOTT SMITH

A1.1 SAMPLE 1

A1.1.1 Macroscopic Examination

The sample is a breccia with an overall grey colour but it is composed of a variety of fragments including black, grey, green, orangy brown and lighter types. The fragments reach 6cm in size. The sample displays a possible fabric parallel to the main plane of the sample. The matrix to the fragments is fine-grained, blue-grey material.

A1.1.2 Microscopic Examination

The fragmental nature of this sample observed in hand specimen is also obvious in thin section (Plate 1). The rock comprises a variety of fragments now predominantly composed of carbonate as well as some grains (generally less than 1mm) of quartz. The sample has been deformed and has a sub-parallel foliation throughout the rock. The texture of the rock is perhaps best compared to a flaser structure (AGI dictionary definition:- small lenses of granular material are separated by wavy ribbons and streaks of finely crystalline, foliated material usually as aggregates of parallel scales in wavy or bent lines) where the coarser fragments which have undergone minor amounts of deformation are separated by wavy ribbons and streaks of foliated material. The larger and more competent fragments are predominantly composed of uniform (within individual fragments), fine-grained (mostly less than 0.1mm) carbonate (Plate 1). The grain size is somewhat variable between different fragments. These fragments may represent xenoliths of country rock which is apparently limestone (C.Fipke, pers.comm.) but the author has not examined any samples from the country rock for comparison. Other fragments which are generally smaller in size have a different appearance. They are composed of carbonate and a low birefringent material (serpentine?) together with some opaque mineral grains which have a uniform distribution throughout these fragments (Plate 3). Possible altered mica and apatite can be seen in some fragments. Textural variations in the carbonate of some of these fragments suggests that they may originally have had an inequigranular, probably porphyritic texture (Plate 4). Although phenocrysts seem to be present in these fragments their original nature cannot be discerned but may include clinopyroxene and/or olivine.

The possible country rock xenoliths appear to have undergone little deformation except for some minor brittle fragmentation which has occurred at the very extremes (along the foliation) of some xenoliths (Plate 1). A fibrous, low birefringent, serpentine-like material has crystallised in elongate patches perpendicular to the main deformation fabric which are generally located at the extremes (along the foliation) of both the xenoliths and quartz grains (Plate 1). These features resemble straight fibre pressure fringes in which the fibre axis is parallel to the foliation. The probable igneous fragments seldom show these features but in contrast have undergone plastic deformation which in some cases is extreme and is responsible for the flaser-like structures (Plate 2).

A1.1.3 Conclusion

This sample is a fragmental rock which appears to be composed of possible country rock xenoliths of fine-grained carbonate, individual quartz grains and probable igneous fragments. The sample has been somewhat deformed producing textures comparible to flaser structures in parts of the sample.

A1.2 SAMPLE 2

A1.2.1 Macroscopic Examination

The sample has a mottled appearance, is brownish in colour on weathered surfaces but on a fresh surface has an overall grey colour. The texture displayed on a polished cut surface of the sample suggests that it is a porphyritic igneous rock. The most conspicuous feature is the occurrence of numerous green pseudomorphed phenocrysts. They generally appear to be euhedral while some complex multiple growth aggregates are also present. The morphology of the phenocrysts suggests that they were probably pyroxene. Other dark grey, generally anhedral patches may represent another altered phenocrystal/macrocrystal mineral, possibly olivine. The matrix comprises numerous green to milky microphenocryts, often with lath-like shapes, in a fine-grained matrix.

A1.2.2 **Microscopic Examination**

As noted in the macroscopic examination, the sample is a porphyritic igneous rock. Two varieties of phenocrysts are present (Plate 5). The most conspicuous and dominant phenocrysts are greenish brown in colour in thin section, range in size up to 3mm and are now composed of carbonate and probable clay minerals. Variations in colour, texture and mineralogy in the alteration products of these phenocrysts suggests that they were originally zoned. Many of these phenocrysts are euhedral with lath-like shapes and hexagonal basal sections as well as more complex multiple growth aggregates which include 'rosettes' of lath-like crystals. All these features suggest that this phenocryst phase was originally clinopyroxene. The other coarse constituent of this rock is now composed of microcrystalline carbonate which has a grey colour in thin section. Most of these crystals are less than 2.5mm in size and are subhedral to anhedral. In most cases the nature of these pseudomorphs suggests that these grains were originally olivine but the occasional rectangular shaped grain would be somewhat atypical of olivine, but might be expected to occur in rocks of this type.

The matrix to the phenocrysts is composed of numerous microphenocrysts, mostly with lath-like shapes, which resemble the probable clinopyroxene phenocrysts (Plate 6). Discernible primary constituents of the groundmass are mica and opaque minerals (Plate 6). The mica occurs as altered rectangular plates and hexagonal basal sections which are mostly less than 0.3mm in size and pleochroic from brown to very pale brown or colourless. Small (less than 0.1mm) opaque grains occur throughout the groundmass and are generally euhedral to subhedral in shape and are probably spinels. Rare translucent, brown, grains are probably Cr-Al-spinels. Some grains, which are rather similar in appearance to the phlogopite occur as subhedral hexagonal crystals but have slightly higher relief, are clearer and isotropic, may be garnets (of the andradite/melanite/-schorlomite-type) rather than basal sections of phlogopite.

The remainder of the groundmass, which occurs interstitially to the minerals described above, is composed of a low birefringent, somewhat fibrous mineral which resembles serpentine as well as fine-grained (less than 0.05mm) carbonate (Plate 6). The original nature of this part of the groundmass is difficult to assess as this mineralogy may be totally secondary.

A1.2.3 Conclusions

The sample is substantially altered which masks many of the original features of the rock but on the other hand many primary features can be discerned. The sample is a magmatic or hypabyssal rock. The rock appears to have originally been composed of phenocrysts and microphenocrysts of clinopyroxene together with less abundant phenocrysts of olivine set in a finer grained groundmass which contains mica, spinel and perhaps some andradite/-melanite/schorlomite-type garnet. The original nature of the base of the groundmass is difficult to assess but it is now composed of carbonate and possible serpentine.

A1.3 SAMPLE 3

A1.3.1 Macroscopic Examination

The sample is a green-grey breccia. The fragments reach 2cm in size and the larger ones are generally fine-grained, grey coloured (carbonate?). Numerous smaller fragments of a different type occur in the overall greenish matrix.

A1.3.2 Microscopic Examination

The thin sections examined were cut to avoid the larger xenoliths. Examination of the thin sections confirms the fragmental nature of the rock but the sample is extensively altered and not all primary features are discernible. In the thin sections the fragments are generally less than 4mm in size. The fragments are usually angular and comprise two main varieties. One type are composed of carbonate which is generally relatively fine-grained with uniform textures. These are probably similar to the larger, grey-coloured fragments observed in hand specimen and may represent fragments of the country rock limestone. The other type of fragment appears to be of a porphyritic igneous rock (Plate 7). Numerous phenocrysts occur within these fragments. The phenocrysts have been totally pseudomorphosed by carbonate and it is difficult to identify the original nature of the grains but they may have been clinopyroxene (+ olivine?). The groundmass of these fragments is now composed predominantly of carbonate and a low birefringent mineral (serpentine?) but primary constituents included fine opaque minerals and a lath-like mineral (clinopyroxene or melilite?). The remainder of the rock which may include smaller fragments as well as possible matrix to the fragments is composed of

carbonate and it is not possible to determine the original nature of these areas.

A1.3.3 Conclusions

Sample 3 is an extensively altered fragmental rock which is composed of fragments of possible country rock limestone and porphyritic igneous (magmatic) material.

A1.4 SAMPLE 4

A1.4.1 Macroscopic Examination

This sample is a fine grained mottled greenish grey rock with a few lighter and darker patches. The darker patches might represent phenocrysts.

A1.4.2 Microscopic Examination

The rock is somewhat altered and cut by secondary veins of carbonate. It has a uniform texture except for a few green pseudomorphs (chlorite) which may represent rare mafic phenocrysts. The main minerals of this rock are carbonate and possible feldspar. The carbonate may be secondary and the possible feldspar occurs as relatively coarse grained (1mm) interlocking, equant crystals. It is not possible for the author to make any further comments without additional mineralogical work.

A1.4.3 Conclusions

The rock forming sample 4 may be a feldspathic (containing rare mafic phenocrysts) igneous rock (andesitic?). It is not possible to make further comment from this investigation.

A1.5 SAMPLE 5

A1.5.1 Macroscopic Examination

This sample is a relatively coarse (2cm) breccia which contains abundant angular grey to black, fine grained fragments as well as fewer greenish fragments which may be igneous. The matrix appears to be white.

A1.5.2 Microscopic Examination

The sample is composed of numerous large carbonate-rich fragments which may represent country rock xenoliths. Also present are fewer, smaller and rather deformed fragments which, although totally altered, appear to display an original inequigranular texture. In comparison with samples 1 and 3 (of this report) these fragments are probably similar to the igneous fragments observed in those samples. Other areas (matrix?) are composed of carbonate.

A1.5.3 Conclusions

This sample is a fragmental rock comprising abundant, relatively coarse carbonate-rich fragments of possible country rock as well as some rather deformed probable porphyritic igneous material.

A1.6 SAMPLE 6

A1.6.1 Macroscopic Examination

The sample has an overall greenish grey colour but the presence of some dark grey to black phenocrysts (up to 5mm) and smaller, dark, possible microphenocrysts suggest the rock is a porphyritic igneous rock. Also present are some white patches up to 8mm in size which resemble groundmass segregations.

A1.6.2 Microscopic Examination

The sample is a fresh porphyritic igneous rock (Plate 8). The main constituent is clinopyroxene. Some phenocrysts occur. They are mostly less than 3mm in size, generally euhedral and extremely zoned. In plane polarised light the phenocrysts have a distinct anhedral core which is pleochroic from a dull green to a yellowy brown colour. The core is surrounded by a paler overgrowth but the whole phenocryst displays undulose extinction indicating zoning. The numerous smaller microphenocrysts are also strongly zoned (indicated by undulose extinction) but the darker core is seldom present. The clinopyroxenes have a range in grain size down to smaller crystals which form a felt-like groundmass to the rock. In some areas the smaller clinopyroxene grains have a yellow colour but these seem to be associated with groundmass pools or segregations. It is very difficult to identify the base to the clinopyroxene. Where this groundmass mineral forms pools or segregations the clinopyroxene is associated with a coarser grained interstitial mineral which has low birefringence and is probably feldspar (sanidine) but may be nepheline. More detailed work would be required to confirm the nature of this mineral.

Another coarse-grained constituent is present but has been totally pseudomorphed. These grains have been replaced by a pale green, very low birefringent mineral which is probably serpentine as well as some carbonate. Most of the larger grains (up to 3mm) are generally anhedral and could be termed macrocrysts. The smaller grains (typically less than 0.4mm) are more euhedral in shape (Plate 9) but include more complex shapes probably indicative of multiple growth aggregates. This mineral is probably olivine. A single anhedral, brown transluscent grain is probably an Cr-Al-spinel.

A1.6.3 Conclusions

This rock is a fresh magmatic (hypabyssal) igneous rock which is composed predominantly of clinopyroxene which ranges from phenocrysts to groundmass grains. Less abundant olivine (pseudomorphed) occurs as anhedral macrocrysts and euhedral microphenocrysts. A low birefringent, interstitial mineral may be sanidine or nepheline.

A1.7 SAMPLE 7

A1.7.1 Macroscopic Examination

The sample is a mottled greenish grey rock. The inequigranular texture suggests that the sample may be a porphyritic igneous rock but no more can be discerned from the hand specimen.

A1.7.2 Microscopic Examination

The sample is substantially altered making the petrographic interpretation of the sample somewhat problematic. The most abundant and conspicuous constituent of the rock is clinopyroxene. It occurs as subhedral to euhedral, somewhat altered crystals up to 3mm in size which include phenocrysts and microphenocrysts. Subtle colour differences and undulose extinction show that they are zoned and a few crystals have darker cores similar to those described from sample 6. Finer grained clinopyroxene also occurs throughout the groundmass and in some areas it has a distinctly more yellow colour.

Another coarse constituent of this rock occurs as a lath-like mineral. The laths are altered, reach 3mm in length, have irregular outlines, are sometimes deformed, enclose fine grained clinopyroxene and sometimes appear to comprise of several domains each of which has a slightly different optical orientation. The laths have been pseudomorphed by a low birefringent mineral which is probably zeolite and some carbonate. The mode of occurrence of these laths suggest that the original mineral was a phyllosilicate (mica?). Rare laths of apatite are also observed.

The remainder of the rock is extensively altered but the groundmass minerals include clinopyroxene and possibly sanidine or nepheline. Patches of carbonate which could be primary or secondary are also present. Irregular patches or segregations are composed of carbonate and/or probable zeolites.

A1.7.3 Conclusions

The sample is an altered porphyritic igneous rock and is composed of phenocrystal and groundmass clinopyroxene, and an altered lath-like mineral (mica?). The rock is similar to sample 6 except for the occurrence of the lath-like phenocrysts.

A1.8 SAMPLE 8

A1.8.1 Macroscopic Examination

The sample has a distinctly inequigranular texture which is clearly visible on a polished, cut surface. The coarse constituents are generally orangy in colour and the larger ones may represent altered xenoliths but the smaller ones appear to be altered macrocrysts. The matrix is porphyritic. The phenocrysts are mostly less than 1.5mm in size but some reach 5mm, mostly euhedral with some complex shapes and two different varieties appear to be present which could be clinopyroxene and olivine.

A1.8.2 Microscopic Examination

The thin sections were cut to avoid the xenolithic material but the latter is probably now composed of carbonate. The rock is somewhat altered and cut by numerous, thin, parallel veinlets of carbonate but many of the primary features can be discerned.

The rock is strongly porphyritic and is composed of similar amounts of pseudomorphs after olivine and clinopyroxene. The olivine occurs as both macrocrysts and smaller phenocrysts. They have all been replaced by fine grained, dirty carbonate and these pseudomorphs have a grey colour in thin section. The larger grains are best termed macrocrysts and have an overall anhedral shape but in detail some parts of the margins show some euhedralism. The phenocrysts and microphenocrysts are generally subhedral or euhedral but have complex shapes.

The clinopyroxene phenocrysts are similar in size to most of the olivine phenocrysts (generally less than 2mm but may be larger). They have been replaced by serpentine-like material possibly with some clay minerals giving these grains a browny colour in thin section. Variation in colour and textures of the secondary material suggests that the original clinopyroxene was probably zoned.

Two large grains appear to be polycrystalline and were probably composed of clinopyroxene and olivine. One of these may represent intergrown phenocrystal/macrocrystal phases while the other more closely resembles an ultramafic xenolith.

The groundmass to the olivine and clinopyroxene is almost colourless in thin section. It appears to be composed predominantly of virtually isotropic material which may be glass, as well as fine-grained carbonate which may be secondary. A few small grains of mica and opaque minerals were observed in the groundmass.

A1.8.3 Conclusions

The sample is a magmatic rock composed predominantly of olivine and clinopyroxene phenocrysts and microphenocrysts together with a few macrocrysts set in a probable glassy base.

A1.9 SAMPLE 9

A1.9.1 Macroscopic Examination

The sample has an overall palish grey colour but a strongly porphyritic texture is clearly visible on a cut surface. The sample contains numerous pseudomorphed phenocrysts (up to 5mm) which include two distinct varieties. One type comprise dark grey pseudomorphs that are generally euhedral but may be complex in shape and resemble olivine. The second type of phenocryst has been replaced by some green material. Their complex but euhedral shapes suggest that they were originally clinopyroxene. The matrix appears to contain abundant microphenocrysts which may also be clinopyroxene but they have a more lath-like habit in contrast to the more equant phenocrysts. All these grains are set in a finer grained grey matrix.

A1.9.2 Microscopic Examination

The sample is similar to that described in the macroscopic examination above. The sample contains numerous pseudomorphs after phenocrysts of both olivine and clinopyroxene. Both minerals display different complex but euhedral shapes indicative of multiple growth aggregates (Plate 10). The olivines have been replaced by dirty, fine grained carbonate and minor serpentine while the clinopyroxene has a brownish colour in thin section presumably resulting from the presence of clay minerals. The size of these aggregates is typically less than 3mm. Similar microphenocrysts are also present.

The groundmass to the phenocrysts is composed of numerous small (less than 0.3mm) lath-like pseudomorphs of clinopyroxene in a clear base which is now composed of carbonate and possible serpentine. A few small grains of mica and more common opaque minerals are also present. The base to the discernible groundmass minerals may have been glassy. The coarser constituents also display signs of possible flow alignment.

A1.9.3 Conclusions

The sample is a porphyritic igneous rock composed of approximately similar amounts of olivine and clinopyroxene which are both present as phenocrysts and smaller grains set in a finer grained (perhaps glassy) groundmass.

A1.10 SAMPLE 10

A1.10.1 Macroscopic Examination

The sample is a breccia composed of numerous fragments which reach 2cm in size. Many fragments have a whitish colour while some greenish coloured, possible igneous fragments are also present. In hand specimen this rock resembles Sample 5.

A1.10.2 Microscopic Examination

In thin section this rock is somewhat similar to Sample 1, although the flaser structure is less well developed and no pressure fringes are present. There is greater variation in the textures and overall appearance of the carbonate-rich, possible country rock xenoliths than observed in Sample 1. Also relatively coarse-grained (up to 1.5mm), altered mica is more abundant in some igneous fragments which may represent a different type of fragment.

A1.10.3 Conclusions

This sample is a breccia comprising fragments of carbonate-rich, possible country rock material and other porphyritic igneous fragments which show some signs of deformation. Some fragments contain abundant relatively, coarse grained mica. This rock is somewhat similar to Sample 1.

A1.11 SAMPLE 11

A1.11.1 Macroscopic Examination

The sample has a mottled greeny, grey, buff colour and is rather difficult to interpret. The sample is probably a relatively fine grained (less than 5mm) fragmental rock.

A1.11.2 Microscopic Examination

This rock seems to be composed of two main constituents which occur in irregular patches. The darker areas are composed of carbonate and lesser amounts of a low birefringent serpentine-like mineral with fine grained opaque minerals occurring throughout. The preserved textures within these areas suggests that they were originally porphyritic, magmatic material. The other areas are lighter coloured and are composed predominantly of carbonate but also include a low birefringent mineral (serpentine?) and a very high birefringent mineral.

The overall texture of the rock is difficult to interpret. The lighter coloured areas could either be replacing an originally uniform igneous rock or be cementing numerous irregular igneous fragments. The latter would seem the most likely.

A1.11.3 Conclusions

The main part of the rock probably comprises a porphyritic, magmatic rock. Other carbonate-rich areas may be cementing numerous magmatic fragments rather than representing secondary replacement of originally homogeneous magmatic material. If so, this rock may be derived from crater-facies material (possibly pyroclastic).

A1.12 SAMPLE 12

A1.12.1 Macroscopic Examination

The sample is greenish grey and appears to have an inequigranular texture resulting mainly from the presence of probable phenocrysts as well as a few small xenoliths. This texture would suggest that the sample is an altered porphyritic igneous rock.

A1.12.2 Microscopic Examination

The sample is extensively altered and has been replaced predominantly by carbonate and only a few primary features are discernible. Variations in the textures of the secondary minerals as well as a few fresh remnants suggest that the rock contains abundant phenocrysts which probably include clinopyroxene and olivine. The groundmass is almost totally replaced but some clinopyroxene was observed.

A1.12.3 Conclusions

The rock is extensively altered particularly by carbonatisation. Discernible features suggests that the sample is a porphyritic igneous rock with phenocrysts of olivine and clinopyroxene in a groundmass which contains clinopyroxene. It would be reasonable to assume that this sample is similar to the other fresher magmatic rocks described in this report.

A1.13 SAMPLE 13

A1.13.1 Macroscopic Examination

This rock is a breccia containing dark grey, fine-grained fragments up to 3cm in size. The matrix is more buff coloured and may have a possible fabric.

A1.13.2 Microscopic Examination

This rock is broadly similar to Sample 1 although the sample is somewhat more deformed, the pressure fringes are more common and as a result the probable igneous material is more difficult to discern.

A1.13.3 Conclusions

The sample is a deformed fragmental rock which contains fragments of possibly country rock and probable deformed igneous material.

A1.14 SAMPLE 14

A1.14.1 Macroscopic Examination

This sample is similar in appearance in hand specimen to Sample 13 but is more extensively altered resulting in an overall orange-brown colour.

A1.14.2 Microscopic Examination

The main constituents of the rock are carbonate-rich fragments of possible country rock, rounded quartz grains and deformed probable igneous material. As such it is similar to many of the other breccias described in this report. The sample is however more extensively altered giving the rock an orangy-brown colour which presumably results from the presence of clay minerals. This sample was not examined in detail.

A1.14.3 Conclusions

The sample is a more extensively altered breccia which is broadly similar to others described in this report.

A1.15 SAMPLE 15

A1.15.1 Macroscopic Examination

The sample has an overall medium grey colour with an inequigranular texture. The sample is probably a porphyritic igneous rock with numerous phenocrysts generally less than 2mm in size. The phenocrysts vary in colour (green versus grey) and shape and seem to comprise two different minerals. The phenocrysts are set in a darkish grey, fine grained matrix.

A1.15.2 Microscopic Examination

The sample is extensively altered and now composed virtually completely of secondary minerals which include carbonate and a low birefringent mineral which may be serpentine. Discernible variations in these secondary minerals show that the sample originally contained abundant phenocrysts which comprise two mineral types. One variety is now composed of carbonate while the other type is a mineral with very low or no birefringence which may be serpentine which in turn is probably altered to clay minerals in the brown areas. The shapes of these pseudomorphs and a comparison with the fresher rocks of this consignment suggest that they are olivine and clinopyroxene. It is not possible to suggest the original nature of the groundmass.

A1.15.3 Conclusions

The rock is extensively altered but probable olivine and clinopyroxene phenocrysts and microphenocrysts can be discerned. This sample is probably similar to the other magmatic, porphyritic rocks described in this report.

A1.16 SAMPLE 16

A1.16.1 Macroscopic Examination

The sample has an overall grey colour but it has a porphyritic texture. Numerous phenocrysts are present and may represent two different pseudomorphed varieties which now have green and grey colour. Rare xenoliths are also present.

A1.16.2 Microscopic Examination

This sample is extremely similar to Sample 2 and will not be described here.

Plate 1 Sample 1

Field of view = 1.6mm. PPL. The sample has an obvious fragmental texture. The coarsest constituent in this photomicrograph is a xenolith (X) composed of carbonate. Quartz grains (Q) and igneous fragments (I) are also present. Note also the pressure fringes (F). Plane of foliation is parallel to the long axis of the photomicrogrph.

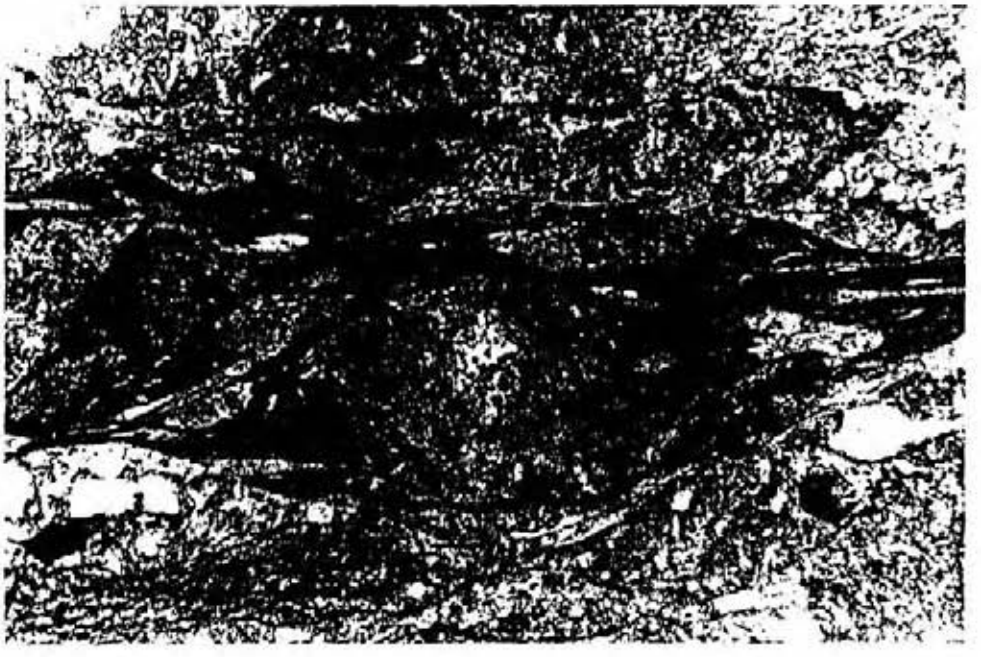

Plate 2 Sample 1

Field of view 1.6mm. PPL. This photomicrograph illustrates the deformation of the darker igneous fragments to produce a texture comparable with a flaser structure. The carbonate xenoliths (X) display only minor deformation.

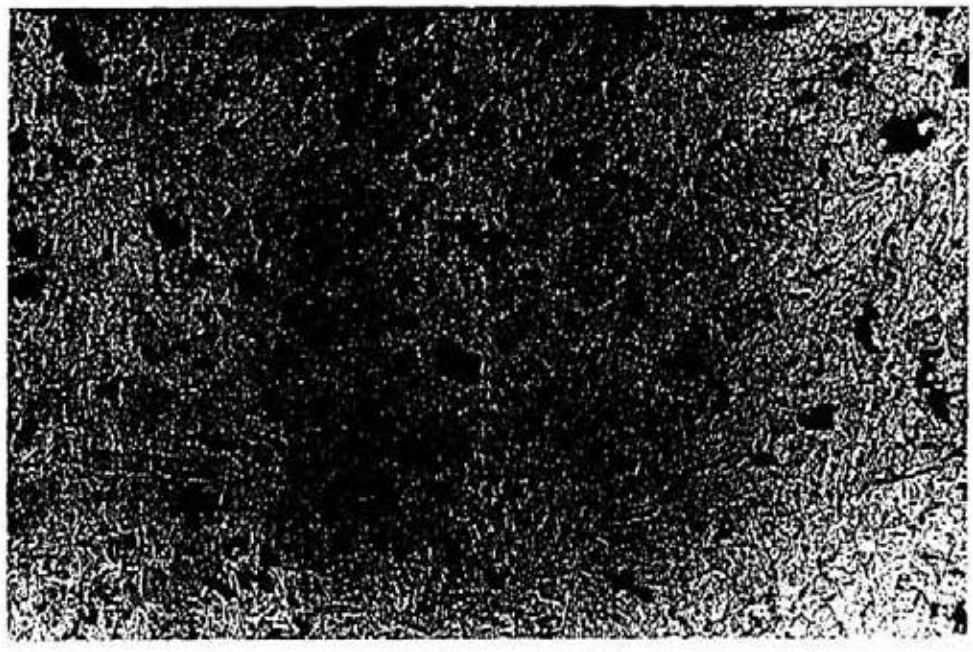

Plate 3 Sample 1

Field of view = 0.6mm. PPL. This photomicrograph illustrates the groundmass of the igneous fragments. The main constituents are high relief carbonate (C), a low relief, low birefringent mineral (serpentine?) and opaque oxides.

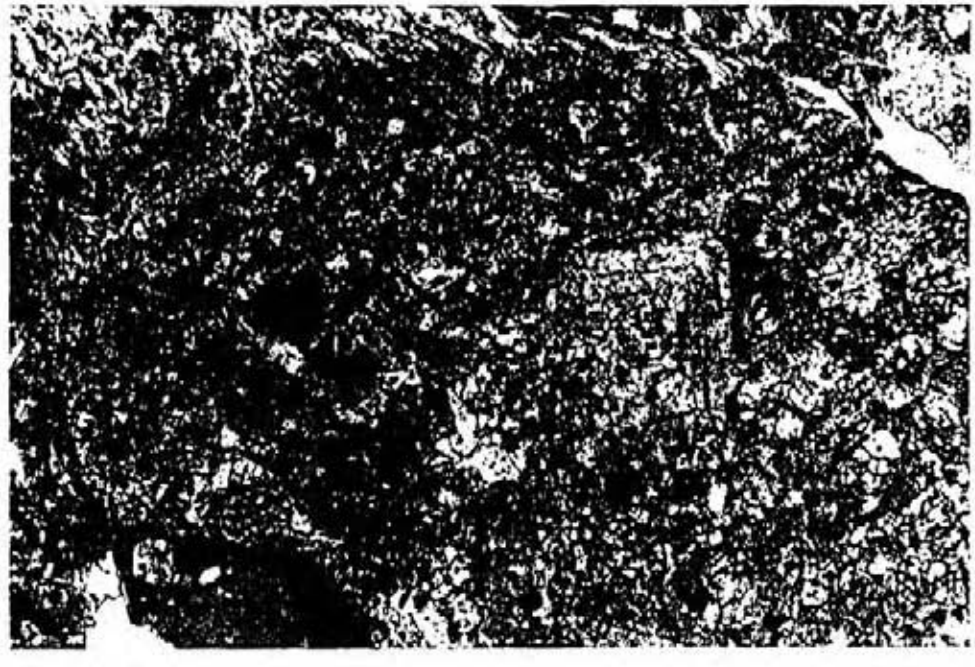

Plate 4 Sample 1

Field of view = 1.6mm. PPL. Variation in textures of the secondary carbonate within this igneous fragment suggests a primary porphyritic texture.

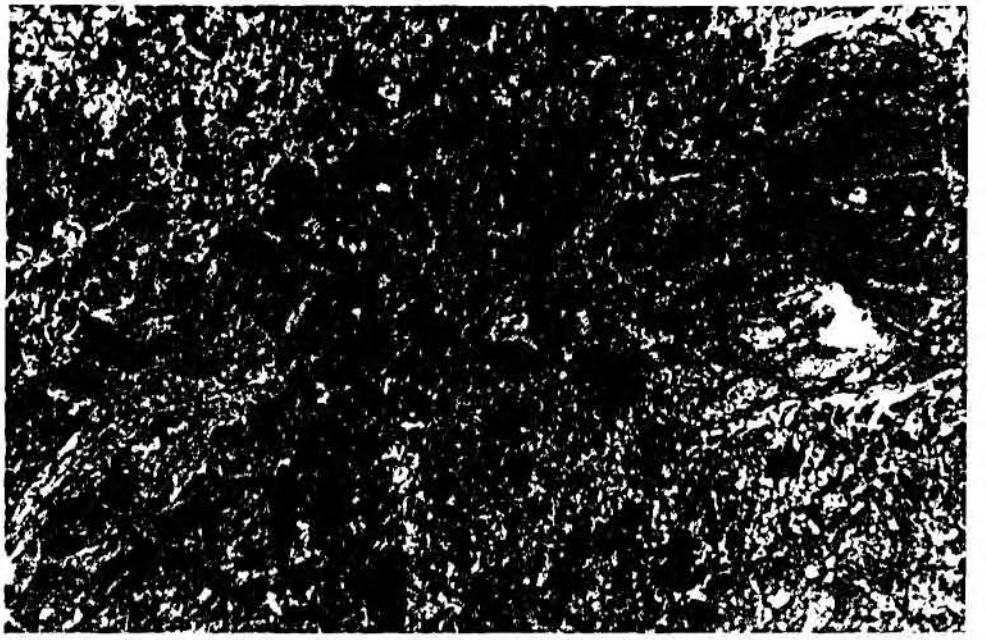

Plate 5 Sample 2

Field of view = 4mm. PPL. This photomicrograph illustrates the porphyritic igneous texture of the rock. One phenocryst/macrocryst of olivine (O) and one complex phenocryst of clinopyroxene (C) are set in a microporphyritic matrix containing abundant dark, brownish crystals of clinopyroxene. All these primary minerals have been pseudomorphed.

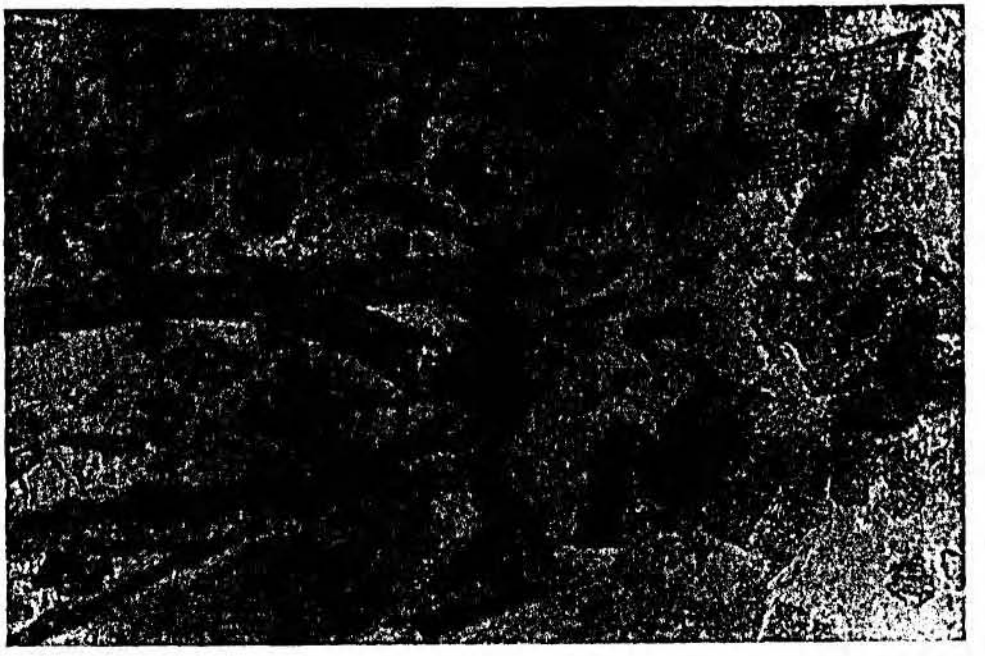

Plate 6 Sample 2

Field of view = 0.6mm. PPL. This photomicrograph shows the matrix of Plate 5. The brownish lath-like crystals are pseudomorphs after clinopyroxene (C) and the more equant crystals are altered phlogopite. The base to these minerals is composed of high relief carbonate and a low relief, colourless mineral which has low birefringence (serpentine?).

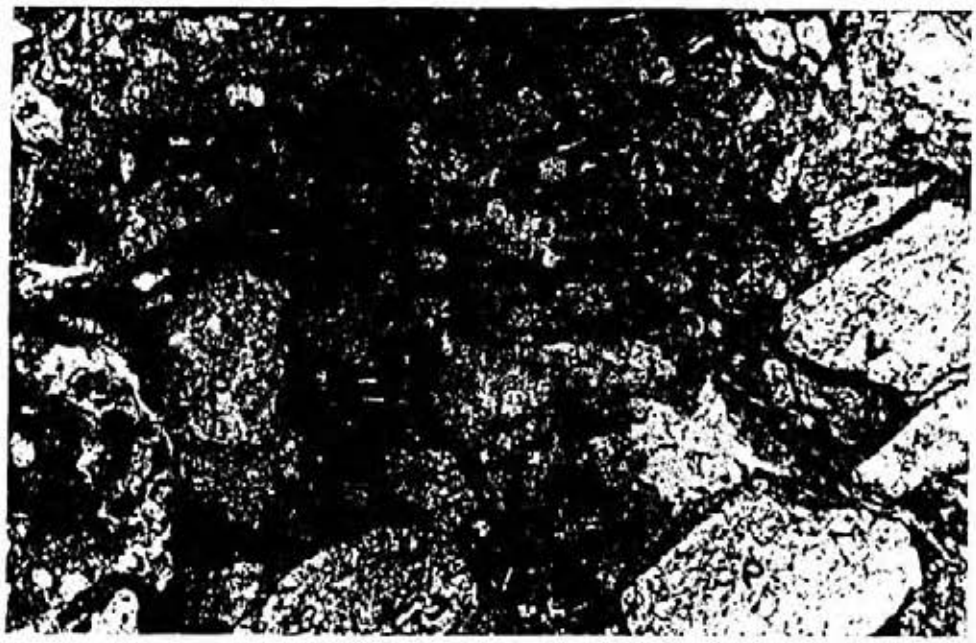

Plate 7 Sample 3

Field of view = 1.6mm. PPL. Part of an igneous fragment. The larger lighter coloured areas are probably pseudomorphed mafic phenocrysts (P). The phenocrysts are set in a darker coloured groundmass which contains numerous colourless lath-like pseudomorphs.

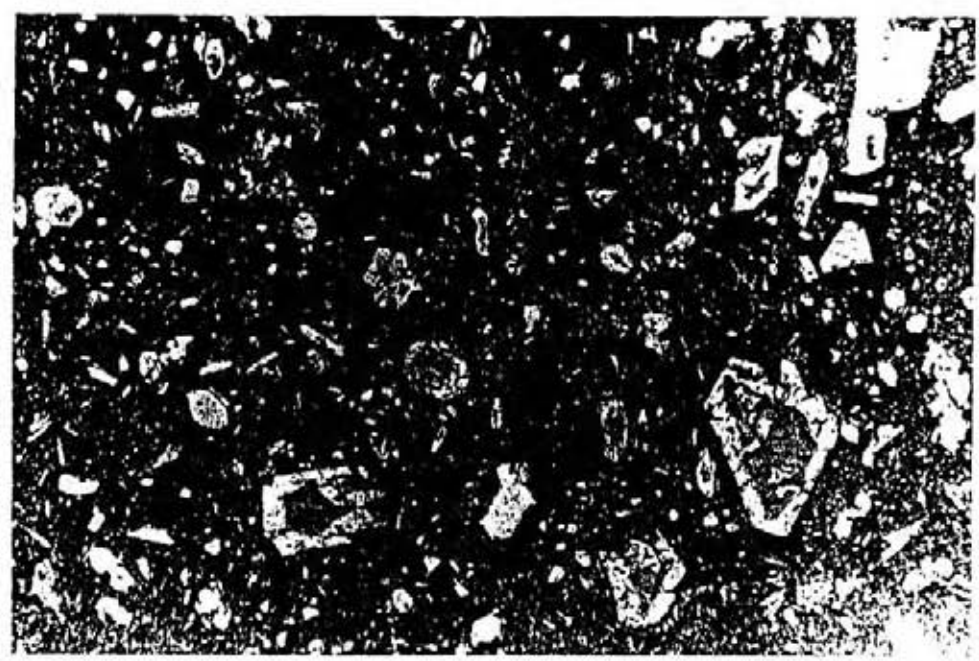

Plate 8 Sample 6

Field of view = 4mm. PPL. The porphyritic texture of this sample results from the occurrence of numerous phenocrysts and microphenocrysts of fresh clinopyroxene. The larger crystals of clinopyroxene have a darker core.

Plate 9 Sample 7

Field of view = 0.4mm. PPL. A clinopyroxene microphenocryst (C) is intergrown with an olivine pseudomorph (O). The groundmass contains abundant small crystals of clinopyroxene.

Plate 10 Sample 8

Field of view = 10mm. PPL. The porphyritic texture results from the presence of numerous pseudomorphs after clinopyroxene (C) and olivine (O).

Plate 11 Sample 9

Field of view = 4mm. PPL. Pseudomorphs of phenocrysts of clinopyroxene (C) and olivine (O) both display complex shapes indicative of multiple grown aggregates. The groundmass is composed of numerous small laths of clinopyroxene in a clear base.

APPENDIX "2"

STATEMENT OF EXPENDITURES

	$
Okanagan Helicopter	1,178.65
Processing three ±35 kg rock samples:	
Crushing & pulvarizing to -6 mesh 8 hrs @ $15.00/hr x 3 samples	360.00
Ball milling to -20 mesh & reball milling TBE & MI lights to about -35 mesh @ av. 80 hrs. each x $5.00/hr x 3 samples	1,200.00
Washing & drying $7.80/10 kg x 35 kg x 3 samples	81.90
Wet sieving, sizing & semigravity concentration @ $14.30/10 kg. sample x 35 kg x 3 samples	150.15
Tetrabromoethane separations using 0.5-1.0 micron double filtration:	
first 3000 G sized concentrate @ $11.00/sample	33.00
10 additional sized concentrates @ $9.00each	270.00
Methylene iodide separations using 0.5-1.0 micron double filtration:	
first sized concentrate @ $16.90/sample	50.70
10 additional sized concentrates @ $13.80/sample	414.00
Electromagnetic separations: 2 sized heavy concentrates @ $6.50 each	429.00
Binocular microscope extration of all possible ilmenites from Ilm. fraction, all Pyr.-Cr diopside and chromite from Py-Crd fraction and all diamond from the microdiamond fractions 43 hrs @ $16.30/hr	700.90
Making polish section epoxy S.E.M. sample mounts of extracted indicator minerals total of 11 areas @ $20.00/area, $20.00/sample x 11 samples	220.00
S.E.M. scanning selected indicator grains to determine which are kimberlitic, testing 5 grains for diamond, completing S.Q. analysis on 5 grains and one standard. 16 hrs @ $100.00/hr	1,600.00

Barbra Scott Smith petrographic work 40 hrs. @ $40.00/hr.	1,600.00
Cost of geologist C.E. Fipke: 1 day field & 1 day travelling 2 days @ $350.00/day	700.00
expenses of above	54.98
Cost of professional report writing including typing, proof reading, copying, materials, drafting	750.00
TOTAL	$9,793.28
TOTAL ASSESSMENT TO BE APPLIED TO CLAIMS	$9,600.00
Apply to PAC Account of Dia Met Minerals	$ 193.28

APPENDIX "3"

STATEMENT OF QUALIFICATIONS

C. Fipke is a BSc Honors Geology graduate of the University of British Columbia. Between 1970 and 1977, C. Fipke worked as a geologist involved to a large extent in heavy mineral exploration and research for Kennecott Copper in New Guinea, Samedan Oil in Australia, Johannesburg Consolidated Investments in Southern Africa and Cominco Ltd. in Brazil and British Columbia. C. Fipke and L.M. Fipke organized C.F. Mineral Research Ltd. in 1977. Currently the C. F. Mineral Research heavy mineral laboratory, which employs 25 to 35 people, is involved in heavy mineral exploration and processing on behalf of many international companies.