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PETROGRAPHIC AND INTERPRETATIVE REPORTS

FOR THE

WHITE RIVER OPTION (PROJECT 505)
Hemlo Greenstone Belt
Ontario, Canada

For

PLACER DOME CANADA LTD
823 Birch Street South
Timmins, Ontario

By

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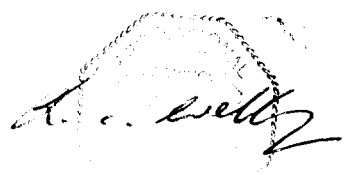
February 19, 1996



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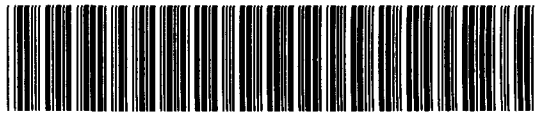

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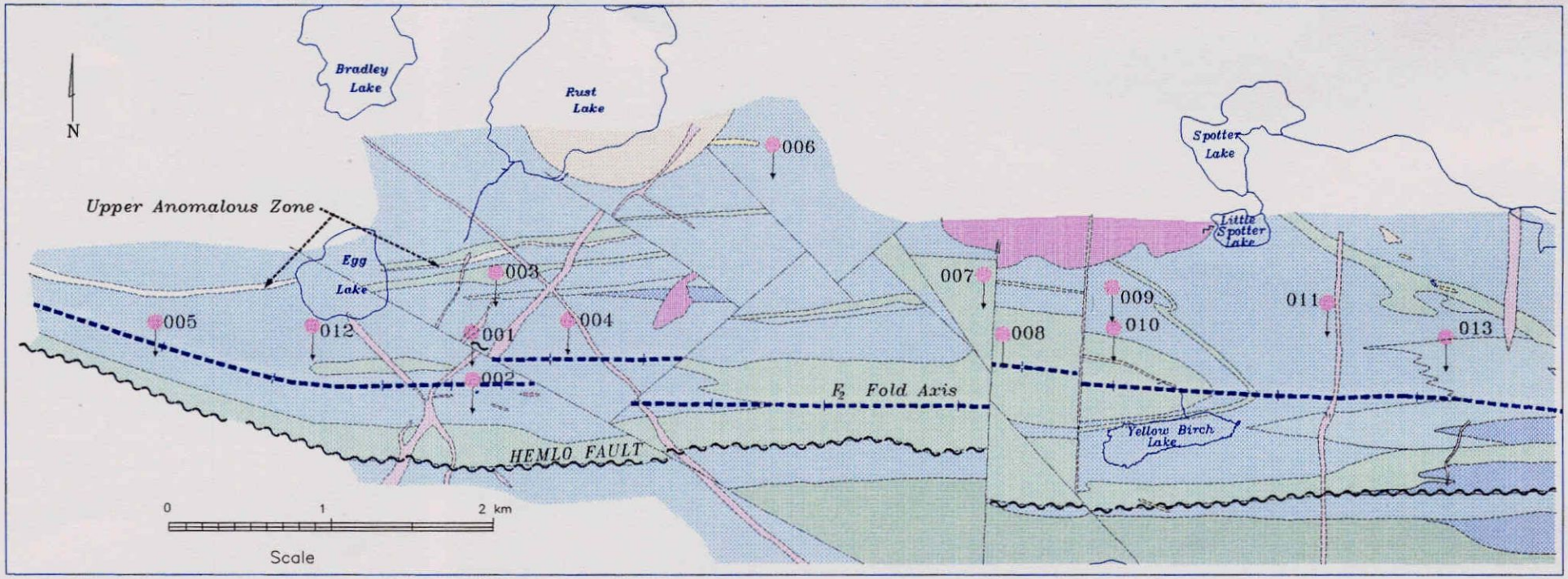
PREFACE

This report was at the request of Glen Shevchenko, project geologist with Placer Dome Canada Ltd, Timmins Exploration Office.

Placer Dome is exploring the White River Property-Barrick Option for Hemlo style gold targets. The property is located between Hemlo and Mobert. It covers a large section of the Hemlo Greenstone Belt south of the Cedar Lake Pluton a few kilometres east of the producing gold mines at Hemlo. The 1995 exploration program by Placer Dome included 13 widely spaced diamond drill holes on geophysical-geological targets (Figure A). Spotty low gold values were returned from several holes. Routine sodium cobaltinitrate staining indicated widespread zones of potassium feldspar in the core, locally associated with quartz-carbonate vein stockworks and pyrite in metasedimentary and volcaniclastic rocks. One of the most prominent of these occurred in hole 008.

Two batches of core samples from the 1995 drilling were forwarded to the author for petrographic examination with drill logs and other background technical data. The main object was to identify and interpret any alteration in the samples. The two sample shipments are treated separately in this combined report and constitute Part 1 and 2.

Thin sections from the 45 core samples were examined and photographed using a Zeiss research microscope in the Kamloops office of Placer Dome Canada Ltd. A variety of styles of veining and K.feldspar alteration can be recognized with variable silicification and pyrite. This alteration is commonly spatially associated with and probably genetically related to felsic intrusive rocks of rhyodacite to quartz monzonite composition. The alteration and intrusives display recrystallization, frequently a foliation and clearly predate (last) peak metamorphism (mid amphibolite grades). Strong pre-metamorphic? K.feldspar alteration is associated with gold mineralization in similar lithologies in the Hemlo gold deposits. Molybdenite, barite, vanadian muscovite and pyrite are other gold associated minerals in the deposits. Of these vanadian mica, molybdenite and barite are notably absent in the White River samples that were examined. K.feldspar is associated with a low gold value in hole 008 and anomalous Mo in one section in hole 010. Consequently a weak Hemlo type signature is apparent in the hole 008 to 010 area north of Yellow Birch Lake (Figure A). The metamorphic and intrusive history for this area based on this limited study does not appear to be significantly different for the Hemlo gold camp.



LEGEND

INTRUSIVE ROCKS

- Late Mafic Dike (Diabase)
- Granite, may be porphyritic
- Granodiorite/Quartz Diorite
- Quartz-Feldspar Porphyry

METASEDIMENTARY ROCKS

- Arkose
- Garnetiferous Arkose
- Wacke

METAVOLCANIC ROCKS

- Felsic
- Intermediate
- Mafic

001 1995 diamond drillhole

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

White River Option
Property Geology and
1995 Hole Location

A

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PART 1

PETROGRAPHIC AND INTERPRETATIVE REPORT

ON

SAMPLES FROM 1995 DIAMOND DRILL HOLE 0505-008

1. INTRODUCTION

This is a petrographic report on a series of eleven drill core samples taken from hole 0505-008, White River Property (Project 505), Ontario. Placer Dome Canada Ltd. is exploring this property for Hemlo style gold mineralization hosted by a variably deformed and metamorphosed succession of sedimentary, volcaniclastic and felsic intrusive rocks within the Hemlo Greenstone Belt (Figure A).

Hole 0505-008 intersected a strong zone of K.feldspar within this metamorphic sequence over a core length close to 30 metres. Eleven samples were selected to cover this zone and wallrocks mainly to investigate the possible potassic alteration, its geological setting and relationships. Abundant microcline probably representing potassium metasomatism has a close spatial (genetic?) relationship with the world class gold deposits in the Hemlo camp.

2. SAMPLES

A list of the eleven samples follows and includes the rock names taken from drill log. The first number (1 to 11) is used in this report.

1)	0505-008	186.44m	Polymictic Intermediate Volcaniclastic/Conglomerate
2)		190.32m	As above
3)		196.51m	Intermediate Volcaniclastic Tuff/Greywacke
4)		203.66m	Quartz-(Carbonate) Stockwork (Arkosic Wacke)
5)		210.99m	As above
6)		217.69m	Kspar Altered Arenite-Arkose
7)		220.35m	As above
8)		222.90m	As above
9)		227.05m	Silicified Arenite
10)		228.49m	As above
11)		230.28m	Silicified Arenite or Felsic Tuff/Lapilli Tuff

3. QUESTIONS AND PROCEDURES

The following questions regarding these samples were raised by project geologist, Glen Shevchenko:

I) Rock type, volcanic vs sedimentary? Is there a porphyry component to the clasts?

II) The lower two samples (228.49m & 230.28m) appear to host a crackle breccia texture, can you verify this?

III) Style of alteration and mineralization.

IV) Is there an alteration zonation from the top to bottom of the intersection.

Petrographic and hand specimen description of all samples occur in Appendix A. With each description occurs a scan (200% magnification) of the thin section to show larger scale textural features such as banding, foliation, fracturing etc. A number of photomicrographs are also included to show some microscopic features.

The terminology in the petrographic descriptions is kept as simple as possible and measurements are made in millimetres rather than microns. Descriptions are kept fairly brief and revolve around the stated questions, a summary follows.

4. PROTOLITHS AND METAMORPHISM

The original textures in these samples have been variably overprinted by both alteration and metamorphic recrystallization. Amphibolite grades of regional metamorphism are indicated from the mineral assemblages. The development of a penetrative foliation in mica bearing units was broadly coeval with last peak metamorphism.

Bulk mineralogy, relict textures and textural relationships in most of the samples allow reasonably confident protolith identification. The sequence begins and ends with coarser grained clastic rocks such as immature polymictic conglomerates (1 and 2) and epiclastics (11). In the meta-conglomerates both sedimentary, felsic intrusive (porphyritic?) and volcanic rock fragments to pebble size are present. In the lower epiclastic unit felsic volcanic or intrusive clasts predominate, few sediments could be recognized. Between these units finer grained massive to bedded semi-pelites (4 to 8) predominate. These quartz-plagioclase-biotite schists/rocks display good relict bedding (grain size-compositional layering), local graded bedding? (8) and relict grit size rock fragments (3). A greywacke sequence is probable. At the bottom of this sequence above the epiclastic unit (11) samples 9 and 10 possibly represent a felsic intrusive or less likely, volcanic/volcaniclastic unit (224.72m-232.25m). These are strongly quartz-carbonate veined rocks with granoblastic metamorphic textures and little mica (muscovite equal or greater than biotite).

5. ALTERATION AND VEINING

Both pre and post-peak metamorphic alteration and veining can be identified in some samples. These are in large part controlled by the lithology and are best developed within the interpreted greywacke sequence and felsic intrusive/volcanic.

Pre-peak metamorphic alteration can be identified largely by spatial relationships and is patchy often vein related. The mineralogy is recrystallized often granoblastic but largely retains its identity (metamorphism is isochemical). Veining is relatively straight forward and can be dated by recrystallization and cross cutting relationships.

Early pre-peak metamorphic quartz veining may contain significant calcite and minor pyrite, muscovite, rare biotite. Within the interpreted greywacke sequence and deformed conglomerate above (sample 3) significant microcline (K.feldspar) is commonly associated with this veining. This is clearly an alteration, Figure 1 shows microcline alteration envelopes to sub-concordant and crenulated, deformed vein sets and as patchy pervasive alteration (vein related) in a more inhomogenous greywacke protolith. The veining in the felsic unit below does not appear to have associated microcline. Some disseminated microcline occurs as disseminated grains in granoblastic metamorphic mosaics. Significantly more calcite occurs in the veins and muscovite is more abundant.

Early pyrite occurs throughout the sequence as disseminated grains in granoblastic mosaics and locally in veins. It is conspicuous by the frequent presence of fine magnetite rims. The pyrite does not occur in higher concentrations within 'altered' parts of the sequence, generally below 5%.

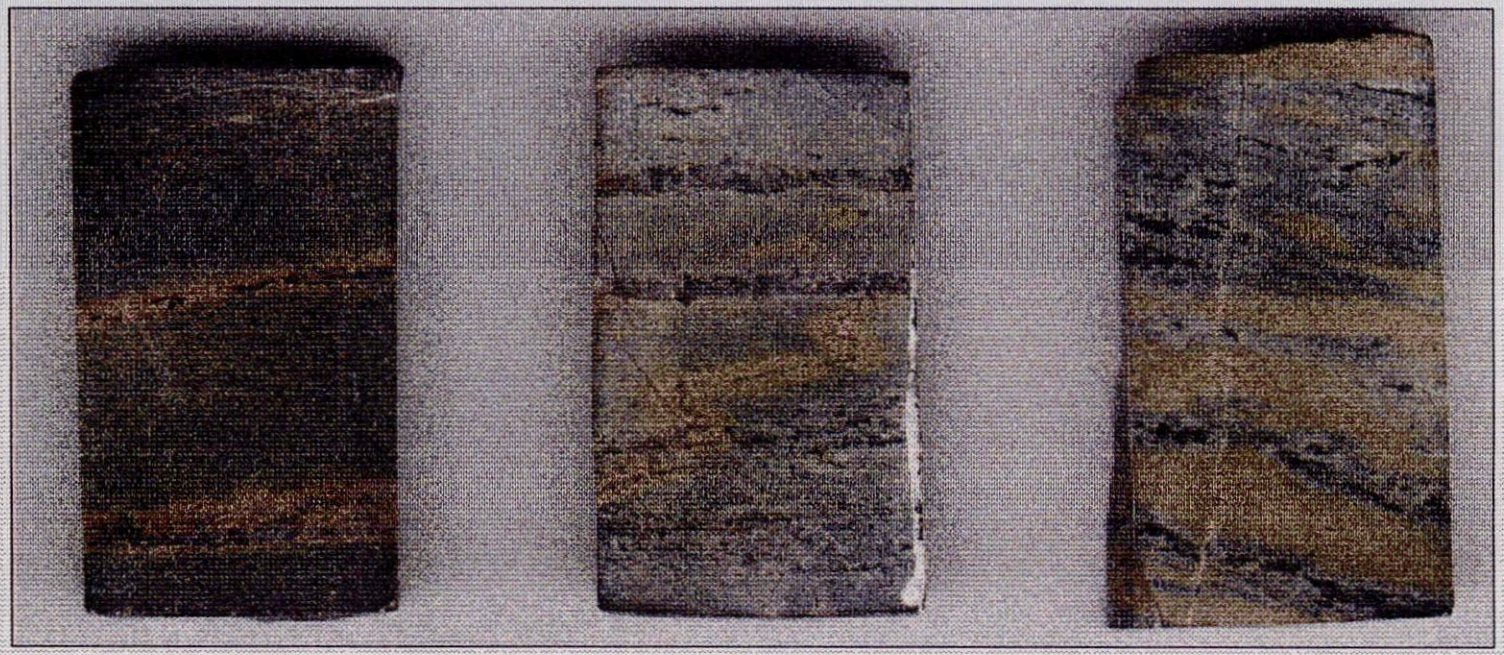
Post-peak metamorphic (and penetrative foliation) quartz and or calcite veins may be concordant or highly discordant (high angle) to penetrative foliation defined by micas. Much of this later veining appears to favour areas of earlier veining but does not have associated microcline alteration. Fine hematite may be present as fine inclusions in wallrock minerals giving the rock a pink colour (false K.feldspar). Significant late calcite>quartz veining occurs in the felsic unit (samples 9 and 10). Combined with earlier veining this produces vein stockworks. Minor displacements occur with some vein sets (different generations). Vein stockwork is a more appropriate descriptive term than 'crackle breccia' (incipient breccia).

The distribution of early potassic alteration (microcline) and quartz-carbonate veining (combined early and late) is shown schematically in Figure 2. The spatial association of microcline with the greywacke sequence above the quartz-carbonate vein stockwork in the felsic unit (intrusive?) is clear.

Late chlorite and or, calcite veinlets occur along hairline brittle fractures at high angles to foliation. These appear to be broadly coeval with weak pervasive chlorite alteration of biotite, epidote and local sericite alteration of plagioclase.

6. CONCLUSIONS

The following paragenesis is suggested: an early brittle fracture-potassic alteration event with pyrite may be related to intrusion of a felsic dike or sill. This has been overprinted by amphibolite grade regional metamorphism with coeval deformation (penetrative foliation). This deformation involved flattening with little rotation (shear) and appears strongest in the upper meta-conglomerate (sample 2). Later brittle fracturing with quartz-calcite veining does not have associated potassic alteration (microcline). A quartz-carbonate vein stockwork developed within the felsic unit and locally within the greywacke sequence.



0505-008-203.66 m. *0505-008-210.99 m.* *0505-008-220.35 m.*

FIGURE 1: VARIOUS STYLES OF K.FELDSPAR ALTERATION

Cut and stained slabs (200%)

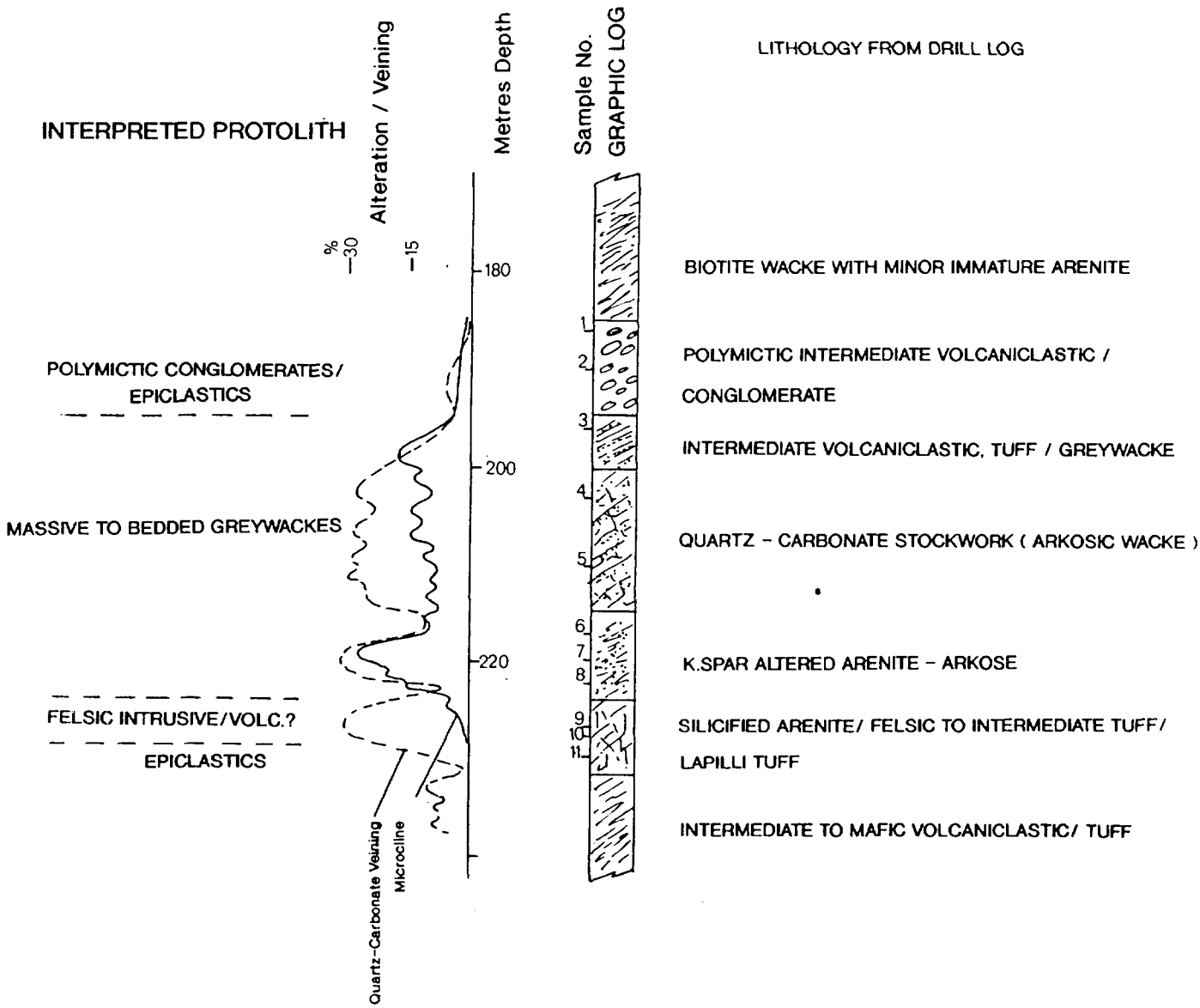


FIGURE 2 : DDH.0505-008, 175-240 METRES. DISTRIBUTION OF ALTERATION AND VEINING

In comparisons with Hemlo Au deposits there are several missing elements, in particular gold, molybdenite, barian microcline (zoned),and green vanadian muscovite.

STATEMENT OF QUALIFICATIONS

I, Ronald C. Wells, of the City of Kamloops, British Columbia, hereby certify that:

1. I am a Fellow of the Geological Association of Canada

2. I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia.

3. I am a graduate of the University of Wales, U.K. with a B. Sc. Hons. in Geology (1974), did post graduate (M. Sc.) studies at Laurentian University, Sudbury, Ontario (1976-77) in Economic Geology.

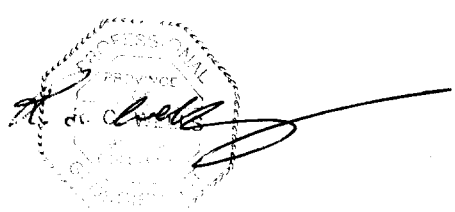
4. I am presently employed as Consulting Geologist and President of Kamloops Geological Services Ltd., Kamloops, B.C.

5. I have practised continuously as a geologist for the last 18 years throughout Canada, USA and Latin America and have past experience and employment as a geologist in Europe.

6. Ten of these years were in the capacity of Regional Geologist for Lacana Mining Corp., then Corona Corporation in both N. Ontario/Quebec and S. British Columbia.

7. The author completed for Placer Dome Canada Ltd. Petrographic and Interpretative Reports for the White River Option (Project 505) dated 19/2/96. These reports were based on detailed studies conducted by the author during January and February 1996.

R.C. Wells, P.Geo., F.G.A.C.



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APPENDIX A

PETROGRAPHIC DESCRIPTIONS AND PHOTOMICROGRAPHS FOR SAMPLES FROM 1995 DIAMOND DRILL HOLE 0505-008

1) SAMPLE 0505-008-186.44M. Polymictic Intermediate Volcaniclastic/Conglomerate Sequence in 1995 log.

SAMPLE DESCRIPTION

Mottled light to dark grey with elongate, aligned, subangular to rounded felsic clasts up to 3 cm but averaging 1cm or less. Matrix to weak fragment supported. Fine grained well foliated and locally sheared matrix. Foliation is defined by fine biotite and varies from 70 to 80° CA. Patchy matrix carbonate. Clasts include possible felsic volcanic, felsic intrusive and metasedimentary rocks. Some of the former contain minor disseminated K. feldspar grains based on staining. Disseminated to locally fracture, vein controlled fine pyrite. Moderate to strong magnetic.

THIN SECTION DESCRIPTION

1) *Comments*

This sample clearly represents a deformed metaconglomerate. Because of its heterogeneous nature an estimate of model mineralogy was not attempted.

The sample contains over 50 percent rock fragments. These are subangular to rounded and consist predominantly of variably recrystallized, fine grained quartz, plagioclase and biotite. Textures reflect metamorphic recrystallization and are lepidoblastic and, or fine granoblastic. Relict porphyritic (blastoporphyritic) textures are suggested in some pebble size clasts. Two clast types dominate: **(a)** quartz-biotite-plagioclase schists which are fairly equigranular and fine grained (less than 0.06 mm). These would probably have a quartzo-feldspathic sediment as a protolith. Some of these clasts have very little biotite and granoblastic textures, possibly representing more cherty protoliths. **(b)** Fine grained granoblastic quartz-plagioclase>>biotite rocks (.02 to .04mm) with coarser (to 1mm) plagioclase and quartz-calcite-oligoclase patches (0.5 to 2mm mosaics). The plagioclase may represent original phenocrysts and display muscovite/sericite alteration along cleavage traces. Isolated microcline grains display more advanced alteration to muscovite. The protolith to these clasts could be a felsic intrusive or volcanic. Both clast types contain minor fine disseminated pyrite and or magnetite. Magnetite commonly rims some of the coarser pyrite grains.

The matrix to the clasts is recrystallized and clearly contains a large proportion of now vague rock fragments. A foliation is defined by biotite laths up to 0.25 mm long and in concentrations locally up to 35%. Quartz and plagioclase (albite-oligoclase) are the other main minerals with minor amounts of muscovite and microcline/albite (can not distinguish). Up to 4% fine disseminated magnetite cubes (0.02-0.04 mm) may be present in the matrix and 2% subhedral to anhedral pyrite locally as grain aggregates up to 2mm. Commonly a thin rim of magnetite

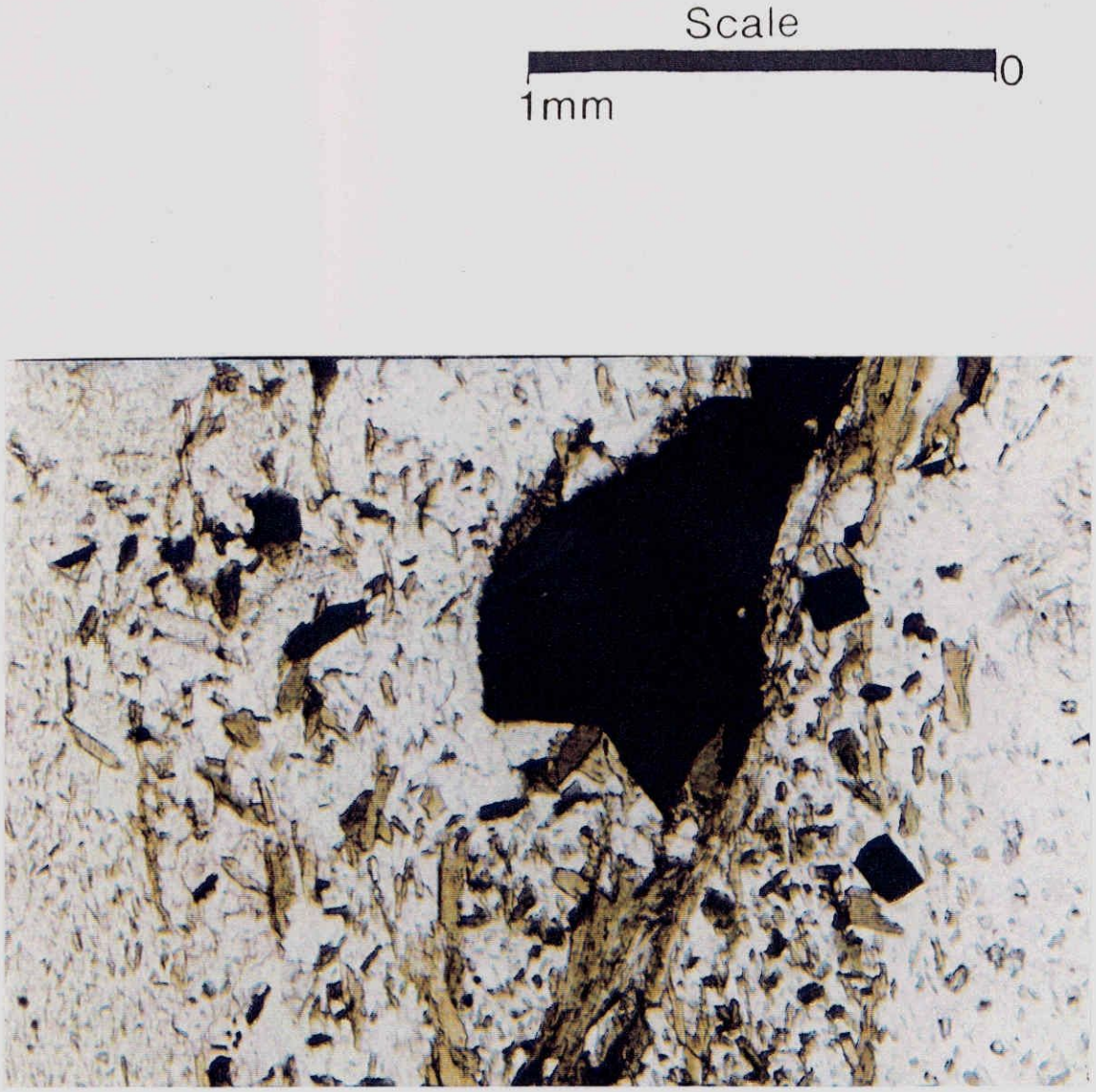
encloses the pyrite. The pyrite aggregates locally form broad 'S' shaped en-echelon lenses in small shears at the margins to pebbles.

The only veining observed in this sample was in the form of early recrystallized quartz-carbonate veinlets restricted to type (b) clasts. They do not penetrate into the matrix.

2) Conclusions

This deformed metaconglomerate is polymictic containing both sedimentary and intrusive/felsic volcanic rock fragments in a schistose biotite-quartz-plagioclase matrix. Deformation is mainly in the form of a flattening fabric developed during metamorphism with minor shear along the margins of some of the larger pebbles. Alteration in this sample consists of late sericitization of feldspars. Minor microcline is present but can not be related to alteration.

SAMPLE : 0505-008-186.44m.(Mag.200%)



Sample 0505-008-186.4m: PP Light Photograph. Polymictic Metaconglomerate. Biotite laths (green brown) define an irregular foliation between two siliceous pebbles (to right and left). These contain less biotite. Note coarse pyrite aggregate in upper area and smaller magnetite cubes below (opaques).

2) SAMPLE 0505-008-190.32 M Polymictic Intermediate Volcaniclastic/Conglomerate Sequence in 1995 Log

Sample Description

Mottled medium greens to greys, fine grained and strongly foliated 75-80° CA quartzo-feldspathic-biotite schist. Remnant subrounded felsic clasts to 2cm (often quite vague) contain less biotite than the matrix. Significant matrix carbonate (calcite?) with fine disseminated pyrite and magnetite. Fine subconcordant veinlets are indicated by larger pyrite trails up to 1cm long. These trails locally have wallrock concentrations of K. feldspar from staining. Moderate to locally strong magnetic.

Thin Section Description

1) *Mineralogy (excluding obvious pebbles and veins)*

	%
Quartz	50 - 55
Plagioclase	5 - 10
Biotite	15 - 20
Carbonate (calcite)	3 - 10
Epidote	2 - 5
Microcline	<2
Muscovite	Tr - 1
Hornblende	Tr - 1
Magnetite	3 - 4
Pyrite	1 - 2

2) *Comments*

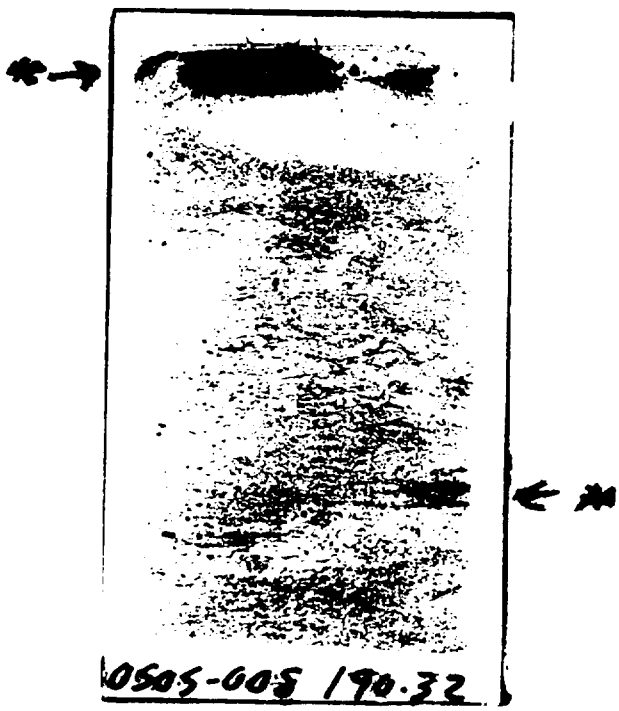
This sample displays strong metamorphic recrystallization overprinting a fragmental protolith (lepidoblastic to fine granoblastic textures). The boundaries to many fragments/clasts are vague, contacts are suggested by changes in grain size and, or bulk mineralogy. As in sample 186.44m fine quartzo-feldspathic igneous and sedimentary pebbles are indicated. There is a well developed foliation in the matrix defined by biotite laths (0.1 to 0.6mm long). Deflections in this foliation also indicates pre existing pebble location. The mineralogy of the "matrix" is shown above, quartz-plagioclase (oligoclase)-biotite and patchy carbonate mosaics predominate. The grain size is variable between 0.02 and 0.06mm. Other silicates are very patchy and probably reflect pre existing rock fragments. There appears to be a local association between hornblende, biotite, muscovite and epidote suggesting more mafic igneous protoliths (clasts).

Fine disseminated cubic to subhedral magnetite 0.02 to 0.08mm occurs throughout. Magnetite locally rims coarser subhedral pyrite to grains which may be up to 0.5mm in size. This

sample contains up to 5% quartz veins. These are very narrow and concordant to subconcordant with the foliation. Recrystallization during metamorphism has obscured vein contacts. Pyrite grain aggregates form trails up to 3mm long. Anhedral magnetite occurs as rims and local included grains. Recrystallized K. Feldspar, microcline occurs as embayments within quartz and as peripheral concentrations adjacent to the pyrite. There is a clear suggestion of early quartz veins with wallrock K. feldspar (pre metamorphic). More continuous, very narrow (0.02-0.04mm) quartz-carbonate veinlets cut the foliation at a high angle. These are pyrite poor and probably represent a later generation of fine fracture controlled veinlets.

3) Conclusions

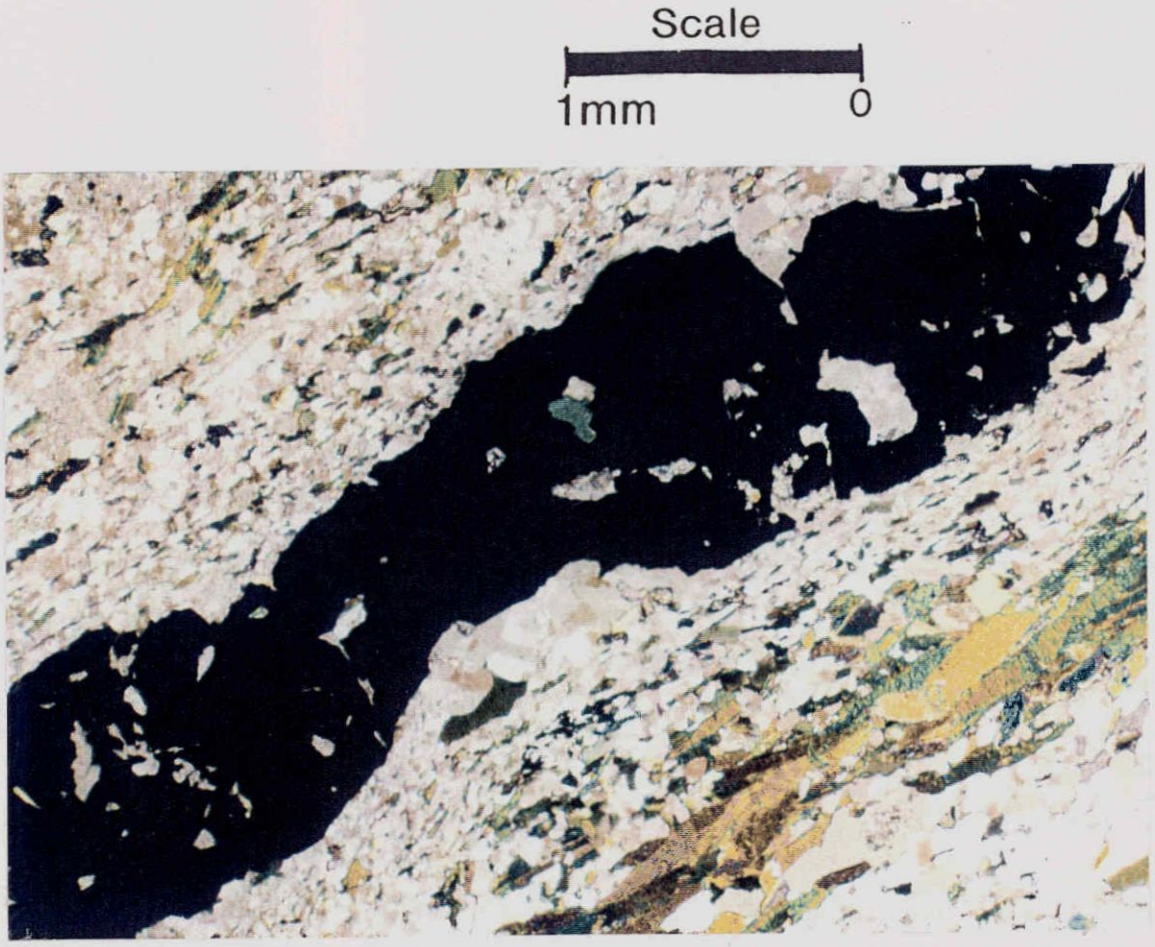
This sample has a similar protolith to 008-190.32m basically a deformed polymictic metaconglomerate. It contains fewer pebble size fragments. Recrystallization during metamorphism has partially overprinted (obscured) textures. Deformation does not appear to have involved any significant shear. An early generation (pre peak metamorphism) of quartz-pyrite veinlets with associated wallrock K.feldspar alteration is suggested. Narrow high angle quartz carbonate veinlets are associated with late brittle fracturing.



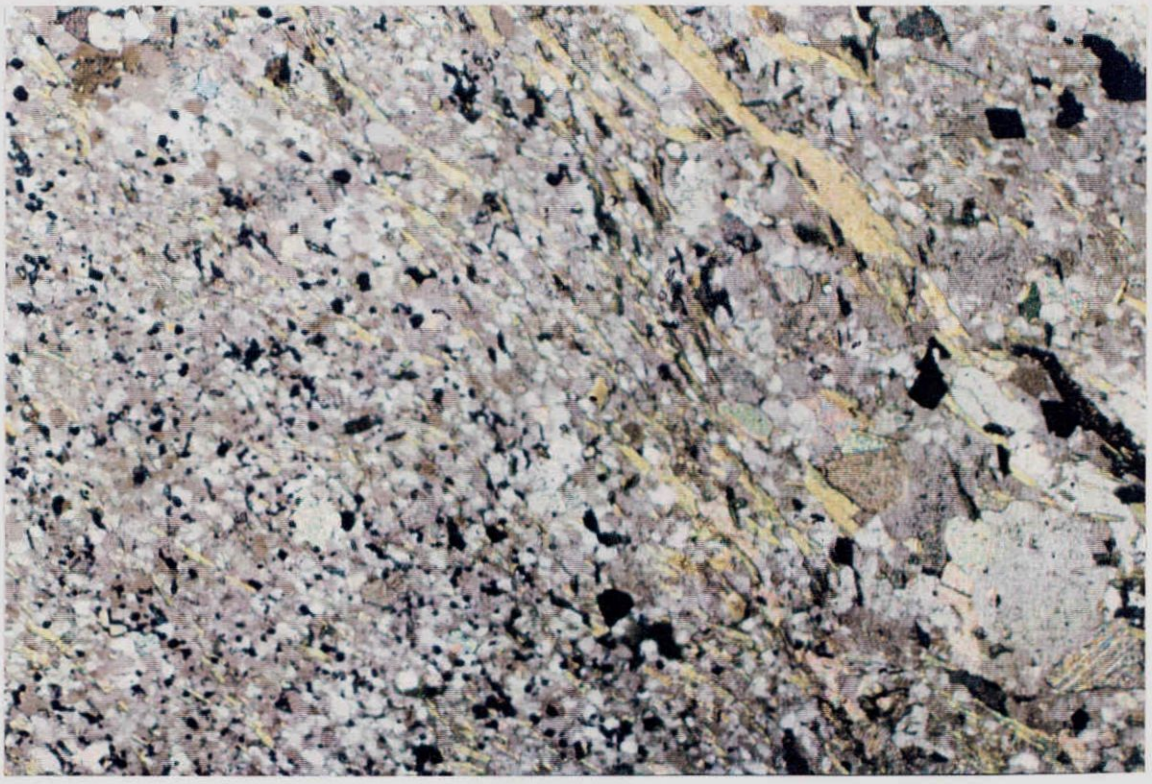
* Relict Qtz-Cal-Py veins with Mgt overprint

Microcline in wallrocks

SAMPLE : 0505-008-190.32m.(Mag.200%)



Sample 0505-008-190.32m: Strongly deformed fragmental unit. Above: CP Light Photograph. Note remnant pyrite vein (opaque) cutting quartz-biotite-plagioclase-schist. Microcline as coarser mosaics at wallrock contacts and in embayments in pyrite. **Below: CP Light Photograph.** Contact between fine grained, foliated quartz-biotite-plagioclase metasedimentary pebble with disseminated fine magnetite cubes (left) and coarser grained matrix (right) with biotite laths (green, yellow) calcite (twinned, orange, pink) and quartz-plagioclase.



3) SAMPLE 0505-008-196.51M. Intermediate Volcaniclastic Tuff/Greywacke in 1995 Log.

Sample Description

Light to medium greenish grey to pinkish, fine grained quartz-feldspathic biotite schist. Foliation 80 - 85° CA local grit size rock fragments. Patchy fine grained disseminated K. feldspar in higher concentrations than sample @190.32m. 2-3% disseminated fine grained pyrite locally as fracture/vein fill at high angle to foliation. Patchy moderate magnetic, weak carbonate reaction.

Thin Section Description

1) *Mineralogy*

	%	
Quartz	50	
Plagioclase (alb-olig)	5-10 (difficult due to lack of twinning)	
Biotite	10-15 (chlorite altered)	
Microcline	4-10 (possibly some albite)	
Carbonate (calcite)	2-7	
Epidote	Tr-2	
Muscovite	Tr-1	
Rock Fragments	5	Rounded/subrounded to 3mm, predominantly recrystallized polygonal quartz
Pyrite	1-2	
Magnetite	1-2	

2) *Comments*

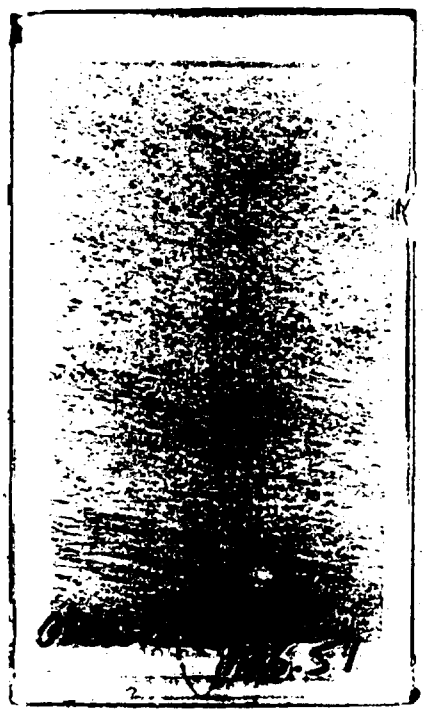
This sample has a weak to moderate foliation defined by biotite and a crude banding based on grain size. These bands are a centimetre or more wide and have fairly even grain size ranging from 0.03mm to 0.07mm. Textures are mixed granoblastic-weak lepidoblastic, clearly the result of metamorphic recrystallization. Biotite, quartz, plagioclase, carbonate and microcline form interlocking equilibrium mosaics with very little interstitial mineralogy. The biotite shows weak to moderate alteration to medium green chlorite. Rock fragments are common and consist of recrystallized polygonal quartz. Disseminated pyrite and magnetite form anhedral to subhedral grains (up to 0.4mm for pyrite, 0.2 for magnetite). Fine opaques are notably absent other than local narrow magnetite rims on pyrite. No relict early quartz veins were observed in this sample.

Late high angle to foliation quartz-carbonate veinlets 0.02 to 0.04mm occur in narrow millimetre wide zones (weak fracture cleavage). These cut some grains and do not display any off sets.

3) Conclusions

A greywacke (semi-pelite) is a probable protolith for this sample. The presence of small grit size rock fragments is consistent with this interpretation. Moderate deformation (flattening) accompanying metamorphism is indicated by the biotite foliation and granoblastic-lepidoblastic textures.

On the scale of the thin section K.feldspar can not be related to veining. If it was it would date pre-peak metamorphism as the microcline is part of granoblastic mosaics (recrystallized). Much of the pyrite in this sample appears early, especially where rimmed by fine magnetite. Late alteration appears to be associated with high angle brittle fracturing and carbonate (calcite) - minor quartz veinlets. Widespread chloritization of biotite may be associated with this (retrograde!) event.

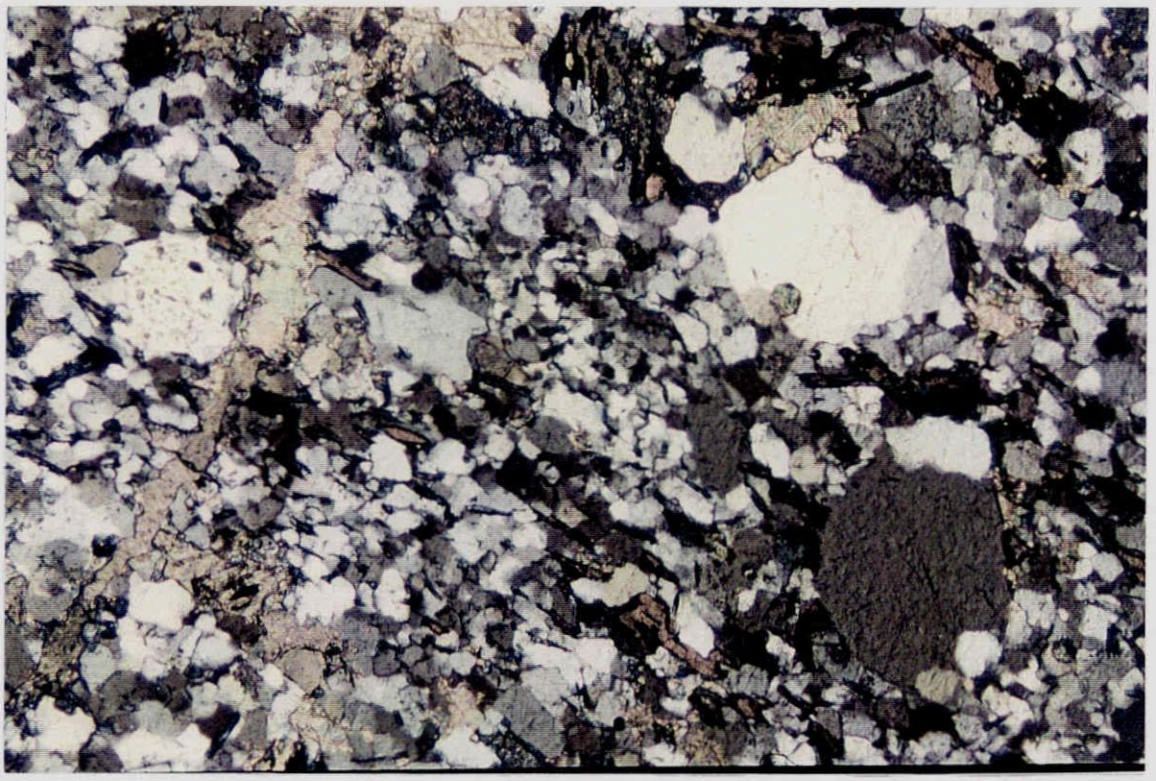


SAMPLE : 0505-008-196.51m.(Mag.200%)

Scale

0

1mm



Sample 0505-008-196.51: CP Light Photograph. Quartz-feldspathic metasediment.
Granoblastic to weak lepidoblastic quartz-plagioclase-biotite-minor microcline and carbonate (light colours). Note small quartz rich (composite) rock fragments and late calcite veinlet to left.

4) SAMPLE 0505-008-203.66M. From a Section Described as Quartz-(Carbonate) Stockwork (Arkosic Wacke)

Sample Description

Light grey to pinkish fine grained and banded quartzo-feldspathic rock with crude foliation defined by biotite 60-80° CA. Subconcordant to low angle quartz-carbonate veinlets up to 5mm wide with distinct pink-reddish K. feldspar selvages of similar to greater width (3-5mm). Some narrow high angle to foliation veinlets. From staining K. feldspar occurs as disseminated grains throughout much of the sample. 1 to 3% fine disseminated pyrite. Very weak magnetic.

Thin Section Description

1) *Mineralogy (excluding 10% vein material)*

	%
Quartz	45-50
Plagioclase (oligoclase)	10-15
Biotite	10-15
Microcline	5-15 Variable strong concentration near veins
Epidote	Tr-1
Carbonate	1
Magnetite	Tr
Pyrite	1-1.5
Chlorite	Tr
Veins	10

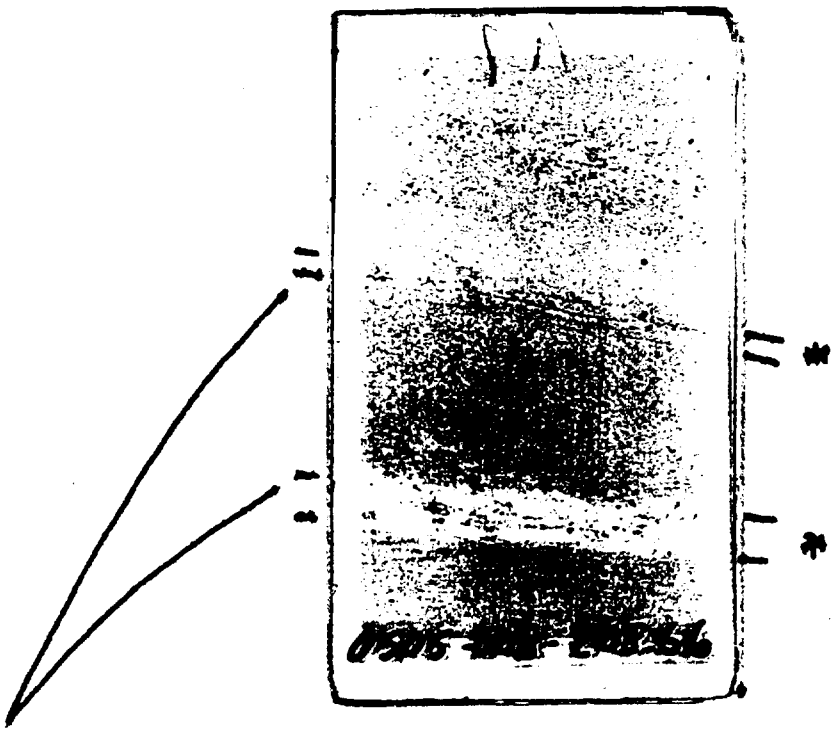
1) *Comments*

The textures in the bands are recrystallized, largely fine granoblastic to weak lepidoblastic equigranular mosaics. Quartz-plagioclase biotite and microcline are the main minerals with very minor amounts of calcite outside of veins. Grain size is between 0.05 and 0.2mm. A weak foliation is defined by biotite laths in some bands. This biotite shows patchy weak chlorite alteration. Some plagioclase displays weak sericite alteration.

The subconcordant veins are 2 to 5mm wide, recrystallized and locally zoned with coarse calcite (1-2mm) cores and finer quartz-microcline (0.5 to 1.5mm) margins. Granoblastic 1mm quartz-microcline mosaics form the wallrocks. Pyrite cubes and subhedra to 0.8mm may be present in concentrations up to 5% and locally have fine magnetite rims. Discontinuous stringers of very fine magnetite? occur along or near the margins of some veins. Some biotite laths peripheral to the veins display chlorite alteration. These recrystallized quartz-carbonate-pyrite-K.feldspar (microcline) veins are clearly pre peak metamorphism. A later set of fine high angle carbonate (calcite) veinlets are penetrative, commonly at 70° to early veins and foliation.

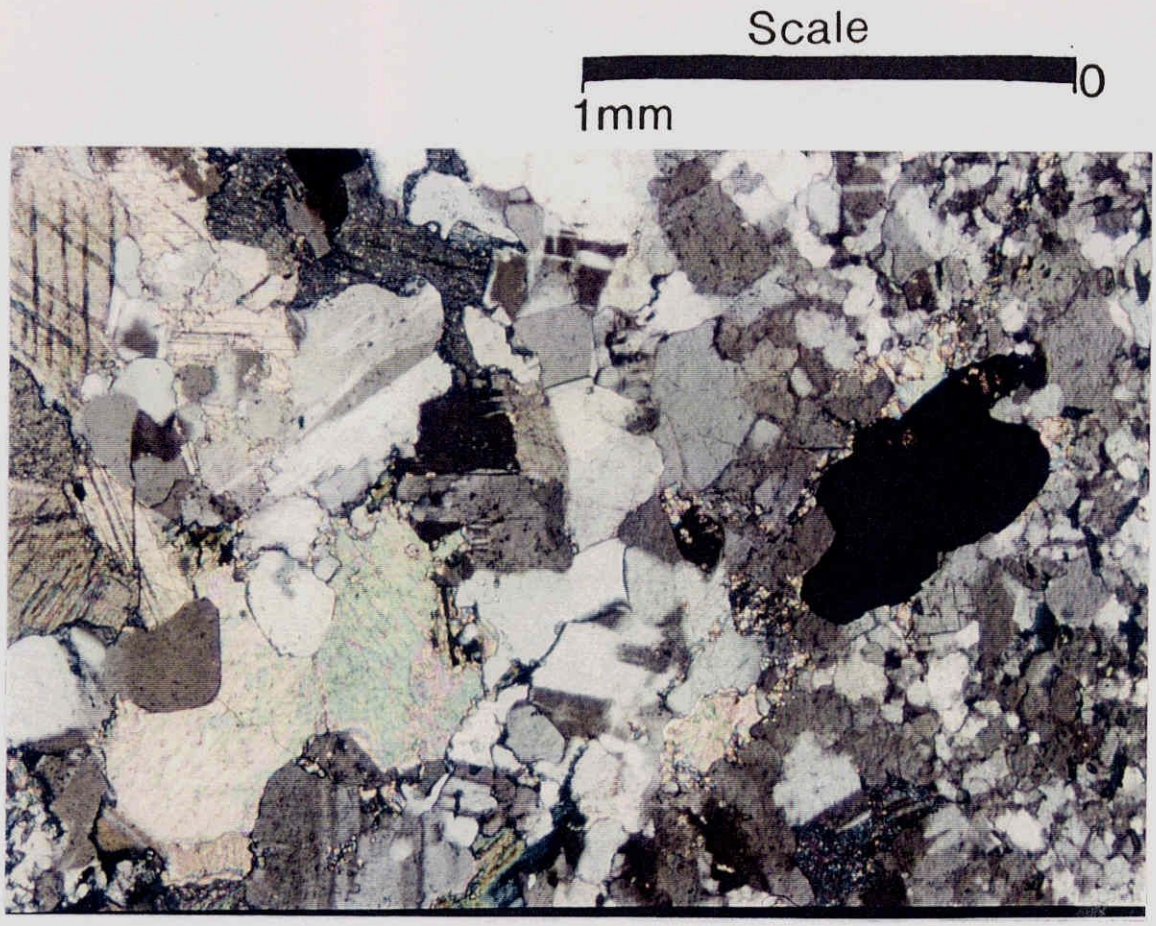
3) Conclusions

This sample has strong indications of pre peak metamorphic quartz-pyrite veining with associated wallrock K.feldspar alteration. Isochemical metamorphic recrystallization has not greatly affected some spatial relationships. The mineralogy of this sample other than the microcline alteration is consistent with a quartzo-feldspathic sediment (greywacke?).

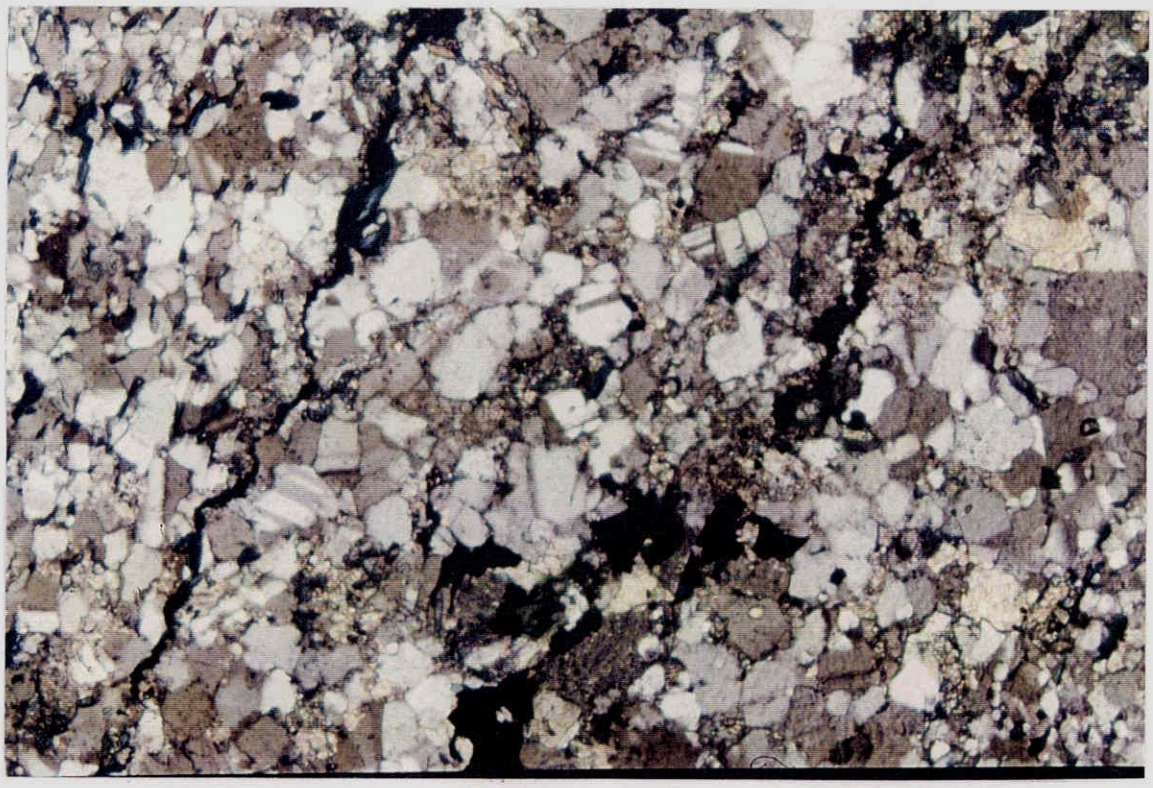


Qtz-Cal-Py veins with strong microcline in wallrocks.

SAMPLE : 0505-008-203.66m.(Mag.200%)



Sample 0505-008-203.66m: CP Light Photograph. Vein 1. Coarser grained granoblastic vein quartz-calcite-microcline (grey, twinned) mosaics to left. Wallrock quartz, microcline with pyrite aggregates (opaque) to right. Note recrystallized metamorphic texture.



Sample 0505-008-203.66m: CP Light Photograph. Vein 2. Fine grained granoblastic quartz, microcline (twinned) vein in centre with marginal magnetite trails (fine opaques). Wallrock quartz-microcline-calcite mosaics with fine biotite laths (aligned, bluish).

5) SAMPLE 0505-008-210.99M. From a Section of Weakly Fractured Arkosic Wacke within a Quartz Stockwork Zone in 1995 Log.

Sample Description

Medium grey to light pinkish grey, bleached appearance. Fine grained quartz-feldspathic rock with crude banding possibly representing original bedding. A crude foliation is present in these bands defined by very fine biotite and muscovite laths. Very little carbonate appears to be present outside of veined areas. Minor fine grained disseminated pyrite. The sample is very weak to non magnetic.

Veining accounts for approximately 10-12% of the rock with low and high angle sets to the foliation/banding. An early high angle set is crenulated and dislocated along the plane of foliation. These are millimetre scale with relatively broad zones of wallrock K. feldspar alteration (several times vein width). Staining indicates that only minor amounts K. feldspar occurs as disseminated grains outside of vein areas. Late sub concordant quartz-carbonate veinlets are wider up to 3mm but do not have any clearly associated K. feldspar. Any pink colouration associated with these may be due to fine hematite.

Thin Section Description

1) Mineralogy and Comments

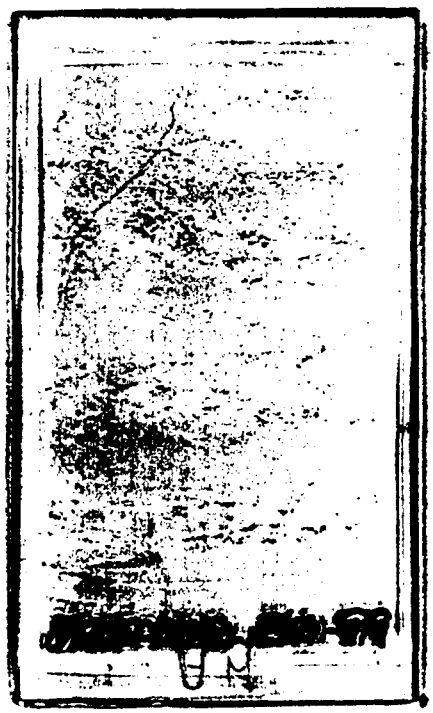
Metamorphic fine grained granoblastic to weak lepidoblastic textures predominate. Within bands the grain size is fairly even, generally in the 0.02 to 0.06mm range. 80-90% of the non veined areas is quartz-plagioclase mosaics with 3-6% twinned microcline, 2-3% biotite and locally up to 3% muscovite. The micas show good alignment and are fine grained laths generally less than 0.04mm long. It is impossible because of the lack of twinning and grain size to get the proportions of quartz and plagioclase (oligoclase compositions). Trace to 1% disseminated pyrite forms cubes and subhedral grains up to 1mm but generally less than 0.1mm. Clusters of fine opaques in the 0.01-0.04mm range may include both magnetite and hematite. However the total magnetite content is less than 1%.

The contorted quartz veinlets are generally less than 1mm wide and are recrystallized with their wallrocks. Quartz grains 0.05 to 0.7mm predominated with minor 0.1mm muscovite and local oxidized vein opaques. Granoblastic quartz and microcline 0.02 to 0.1mm form the wallrocks to the vein. Up to 25% microcline may extend for several millimetres from the vein. The 'late' veins are wider to 3mm and consist mainly (70%) of calcite (0.5 to 2mm) and finer quartz (0.2 to 0.7mm) mosaics with some fine dusty opaques (hematite) are rare pyrite. Some peripheral biotite laths up to 0.4mm long are present. These veins do not display the recrystallization seen in the early veins. Locally the early veins are dislocated and displaced along the late veins with possible sinistral movement.

3) Conclusions

The conclusions for this sample are very similar to those for 008-203.66m. In this sample the quartz veinlets with associated K.feldspar alteration are high angle and clearly pre-date penetrative foliation-peak metamorphism. Concordant quartz-calcite veins post date peak metamorphism and do not have associated K.feldspar. Any pink colouration appears to represent fine hematite inclusions in wallrock silicates and carbonate. These late veins follow concordant to low angle fractions (shears) which have off-set the earlier high angle veins.

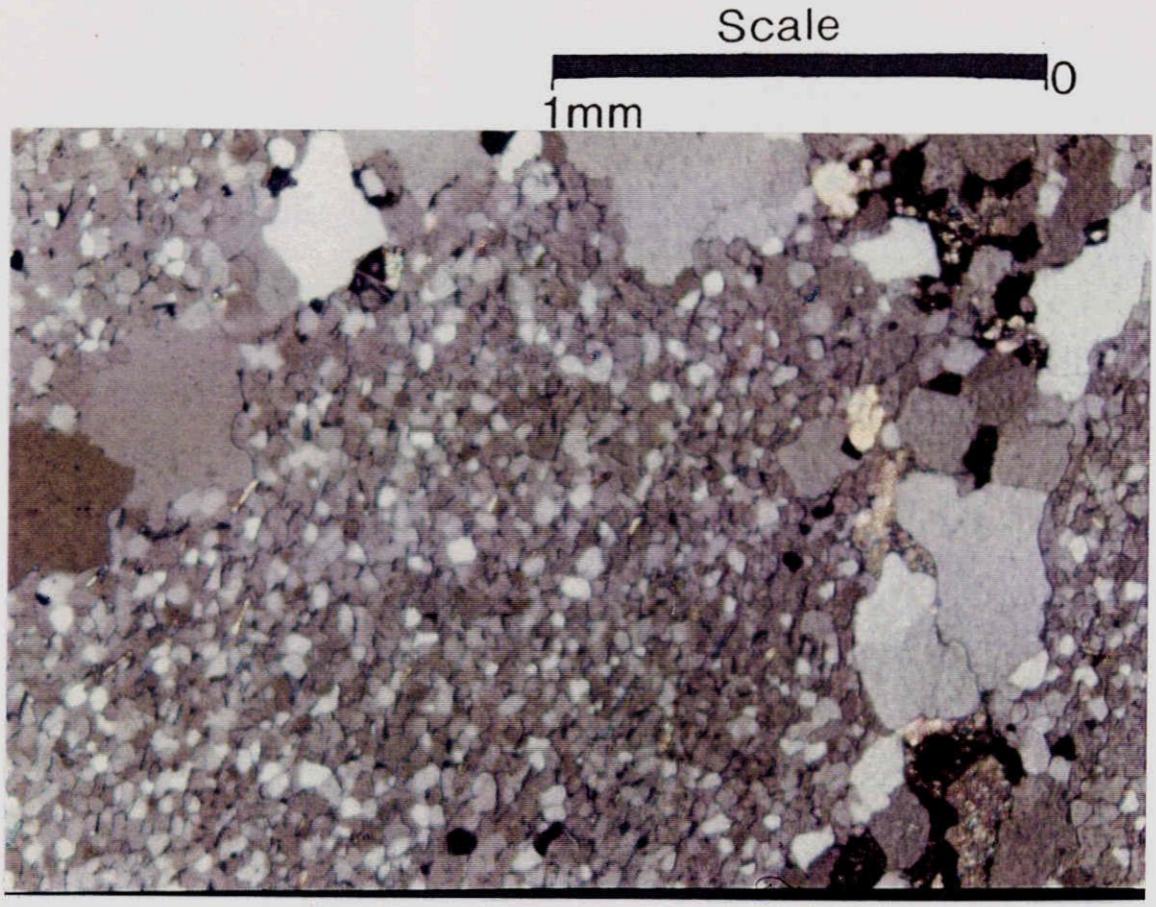
The probable protolith to this sample is a quartzo-feldspathic sediment (greywacke?).



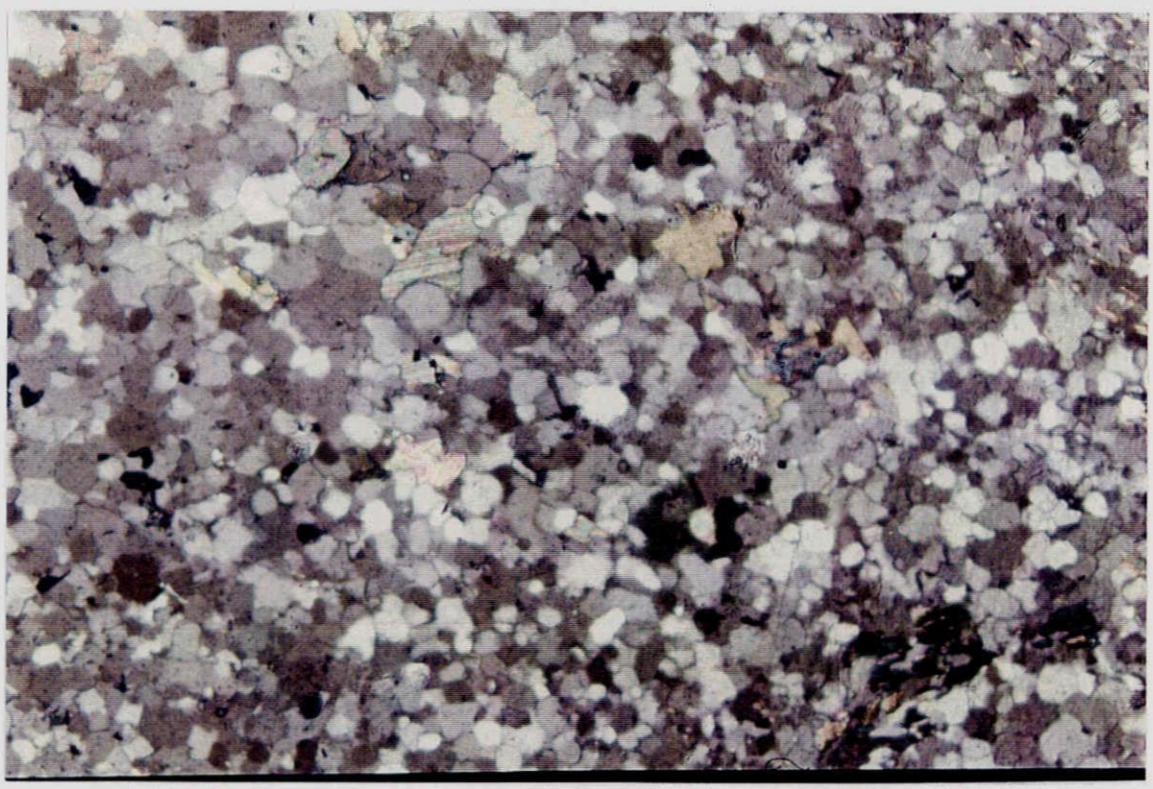
1* Crenulated Qtz-Cal-Py veins with strong microcline in wallrocks.

2* Later Qtz-Cal-Py veins

SAMPLE : 0505-008-210.99m.(Mag.200%)



Sample 0505-008-210.99m: CP Light Photograph. Short section of a strongly crenulated quartz vein (coarse grey grains) with muscovite (coloured) cutting much finer grained foliated biotite (bluish) with granoblastic quartz-plagioclase and minor microcline mosaics.



Sample 0505-008-210.99m: CP Light Photograph. Quartzo-feldspathic metasediment. Excellent granoblastic textures with quartz-plagioclase minor microcline, muscovite (light colours) and biotite. Very fine disseminated pyrite (black).

6) SAMPLE 0505-008-217.69M. From a Sequence of K.spar altered Arenite-Arkose in the 1995 Log.

Sample Description

Light to medium grey quartzo-feldspathic rock with significant biotite defining foliation. Fine grained with broad centimetre scale banding suggesting original bedding. Staining indicates low concentrations of disseminated K. feldspar. Low carbonate content. Minor high angle to foliation veinlets with possible weak K. feldspar association. Less than 2% fine grained disseminated pyrite. Patchy very weakly magnetic.

Thin Section Description

1) *Mineralogy*

In this sample two centimetre scale domains can be distinguished by grain size. In both domains disseminated K. feldspar is present. Pyrite occurs as isolated grains with local fine magnetite rims. Textures are metamorphic lepidoblastic-granoblastic and fairly even grained.

Domain 1: Average grain size 0.1 to 0.2mm

	%
Quartz	60-65
Plagioclase (oligoclase-albite)	5-10
Microcline	5-10
Biotite	10
Carbonate (Calcite)	1-3
Epidote	Tr
Muscovite	Tr
Pyrite	1-2
Magnetite	Tr

Domain 2: Average grain size 0.2 to 0.3mm

	%
Quartz	40-45
Plagioclase	7-10
Microcline	5
Biotite	15-18
Carbonate (calcite)	4-6
Epidote	5-10
Muscovite	Tr
Garnet	Tr

Pyrite	1-3
Magnetite	Tr

2) *Comments*

Both domains outlined above can be described as quartzo-feldspathic-biotite schists. Domain 2 is relatively coarser grained and more mafic with significantly more biotite and epidote, less quartz and microcline plus an additional mineral phase garnet. The mineralogy displays metamorphic recrystallization. Garnet occurs as anhedral grain clusters up to 0.4mm, they are colourless to light pink and have probable almandine composition. Often the garnet is in close association with biotite, carbonate (calcite) and epidote (fine) grain aggregates.

Veining is sparse in this sample and restricted to high angle to foliation, narrow (to 0.04mm), fine grained carbonate, chlorite filled fractures. These are semi-penetrative, locally they appear to be partially healed/recrystallized?

The K. Feldspar in this sample is disseminated throughout the two compositional domains and can not be directly related to any veining (in the sample).

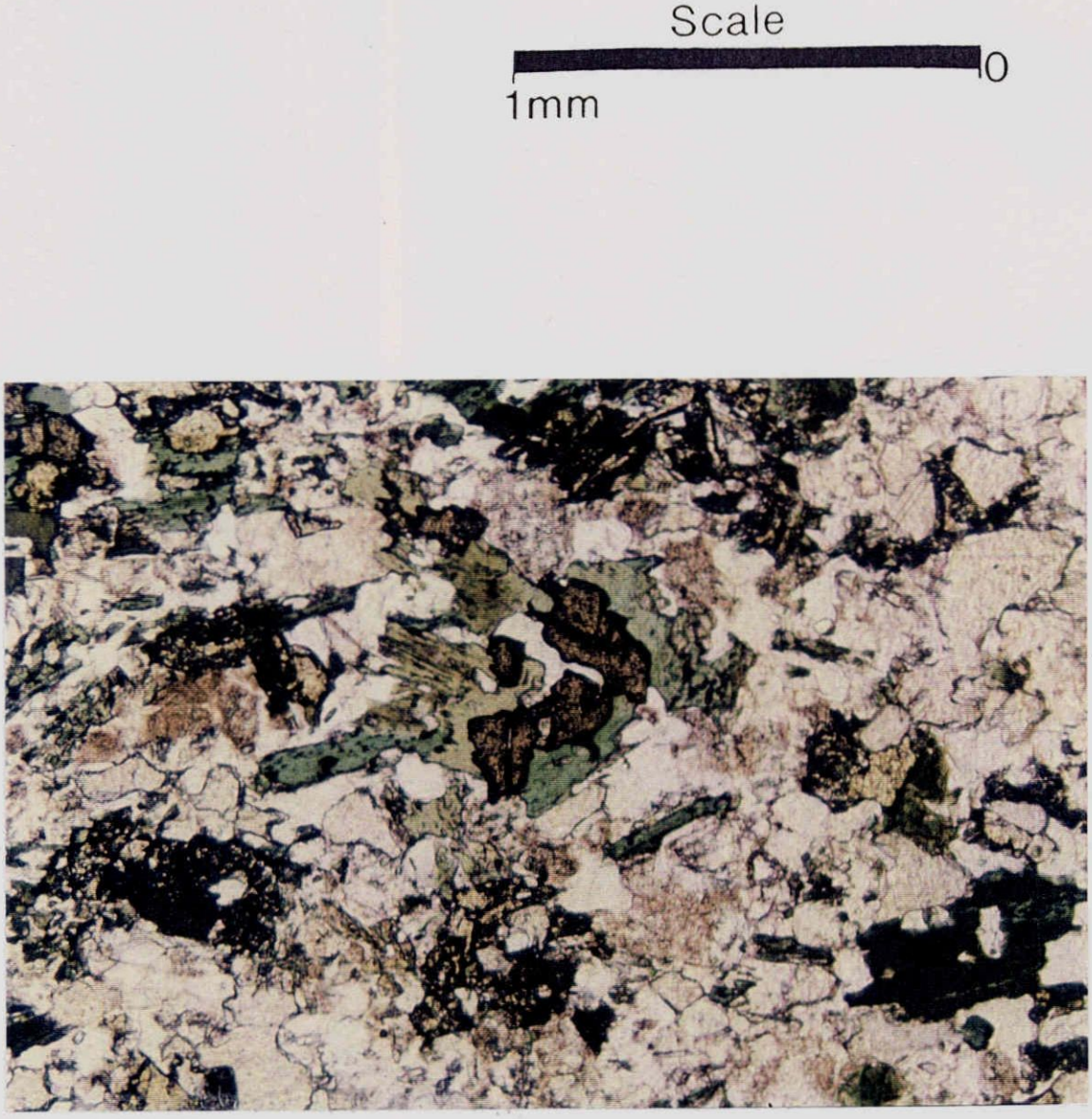
3) Conclusions

This sample appears to be represent a bedded, fine grained quartzo-feldspathic meta-sediment possibly a greywacke. There is no evidence of relict quartz veining in this sample so it is possible that the K.feldspar represents an original potassic component? The pyrite appears early based on magnetite rimming and its habit in granoblastic mosaics.

Domain 1

Domain 2

SAMPLE : 0505-008-217.69m.(Mag.200%)



Sample 0505-008-217.69m: PP Light Photograph. Quartzo-feldspathic metasediment. Domain 2. Fairly equigranular mosaics with green biotite, fine epidote aggregates (bottom left), brownish garnet (centre), quartz-plagioclase-minor microcline (all colourless).

7) SAMPLE 0505-008-220.35M. From a Sequence of K.spar altered Arenite-Arkose in the 1995 Log.

Sample Description

Light greys to pinkish greys, fine grained quartzo-feldspathic schist, minor biotite defining foliation. Lensy banding to centimetre scale with fine grained K. feldspar rich lenses separated by generally narrower bands containing quartz-plagioclase-fine mafics (K.feldspar poor). Fine disseminated pyrite and finer sparse magnetite occur in both domains. Magnetism is weak and patchy. Widely spaced (>cm) and narrow fracture veinlets are penetrative at high angles to foliation and contain no associated K. feldspar.

Thin Section Description

1) *Mineralogy*

The K. feldspar rich lenses and bands constitute 70% of the rock by volume. These consist of the following mineralogy.

	%
Microcline	30-40%
Quartz	20-40% some of this may be untwinned plagioclase
Plagioclase (oligoclase some albite)	>5
Biotite	3-7
Epidote	2-4 fine grained aggregates
Muscovite	Tr-1
Pyrite	Tr-2 Pyrite commonly has fine magnetite rims
Magnetite	Tr

The textures in these bands are fine grained (0.02-0.06mm) granoblastic equigranular to weak lepidoblastic, clearly the result of metamorphic recrystallization. K. feldspar rich bands are separated by K.feldspar poor (locally mafic rich) lenses and bands. The latter are a little coarser grained and possibly represent either subconcordant veins or compositional bands.

The probable veins are subconcordant and commonly discontinuous consisting of quartz-calcite mosaics to 0.6mm grain size. Irregular coarse patches of biotite and epidote grain aggregates 0.2 to 0.7mm are locally present and do not display alignment. The biotite frequently has weak patchy chlorite alteration. Pyrite is present locally as subhedral grains to cubes 0.1 to 0.6mm, some of which have fine magnetite rims. At the margins to these bands/veins the wallrocks are granoblastic but microcline poor for 2 to 3 mm.

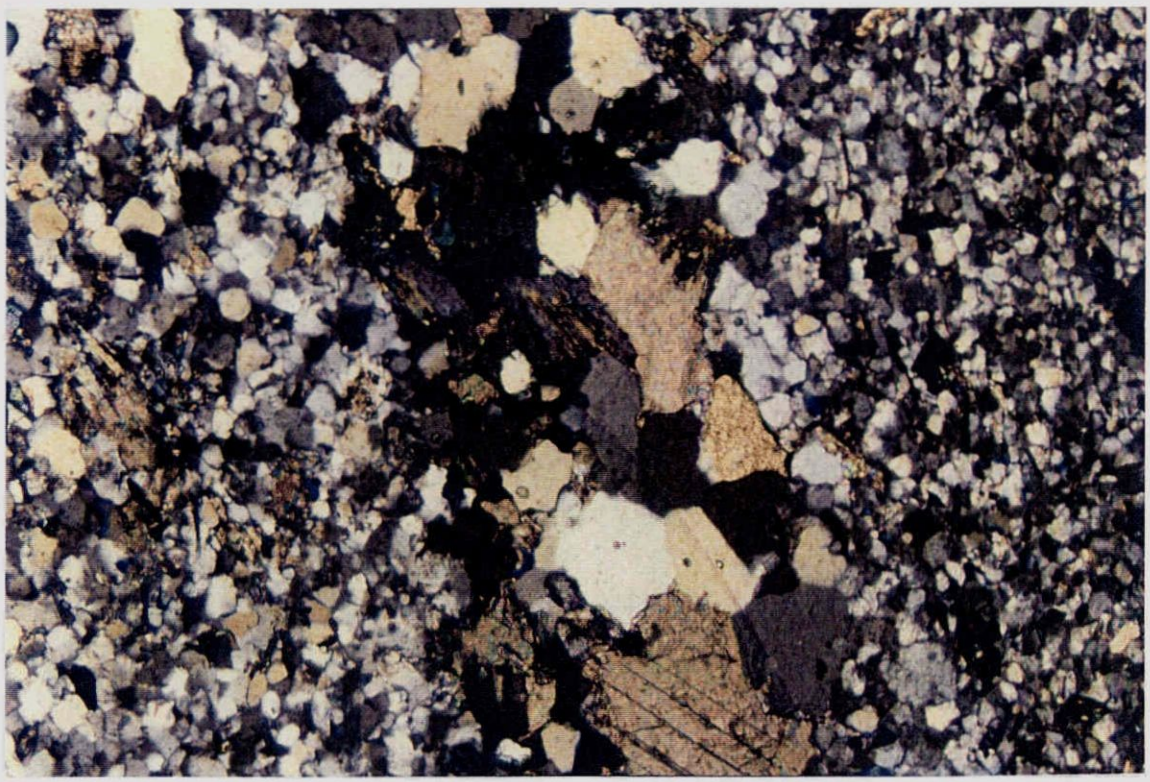
Possible compositional bands are wider and lensy featuring gradational increase in grain size from contacts. Core areas have 1mm anhedral quartz grain aggregates which may represent brecciated vein material. The mineralogy and grain sizes are very similar to the possible veins but it is patchy. Bitote defines a foliation and displays local chlorite alteration. Calcite occurs in trace amounts. Coarse epidote patches, grain aggregates often occur in association with the biotite and locally fine garnet (almandine). These are in a granoblastic association - recrystallized (metamorphic).

3) Conclusions

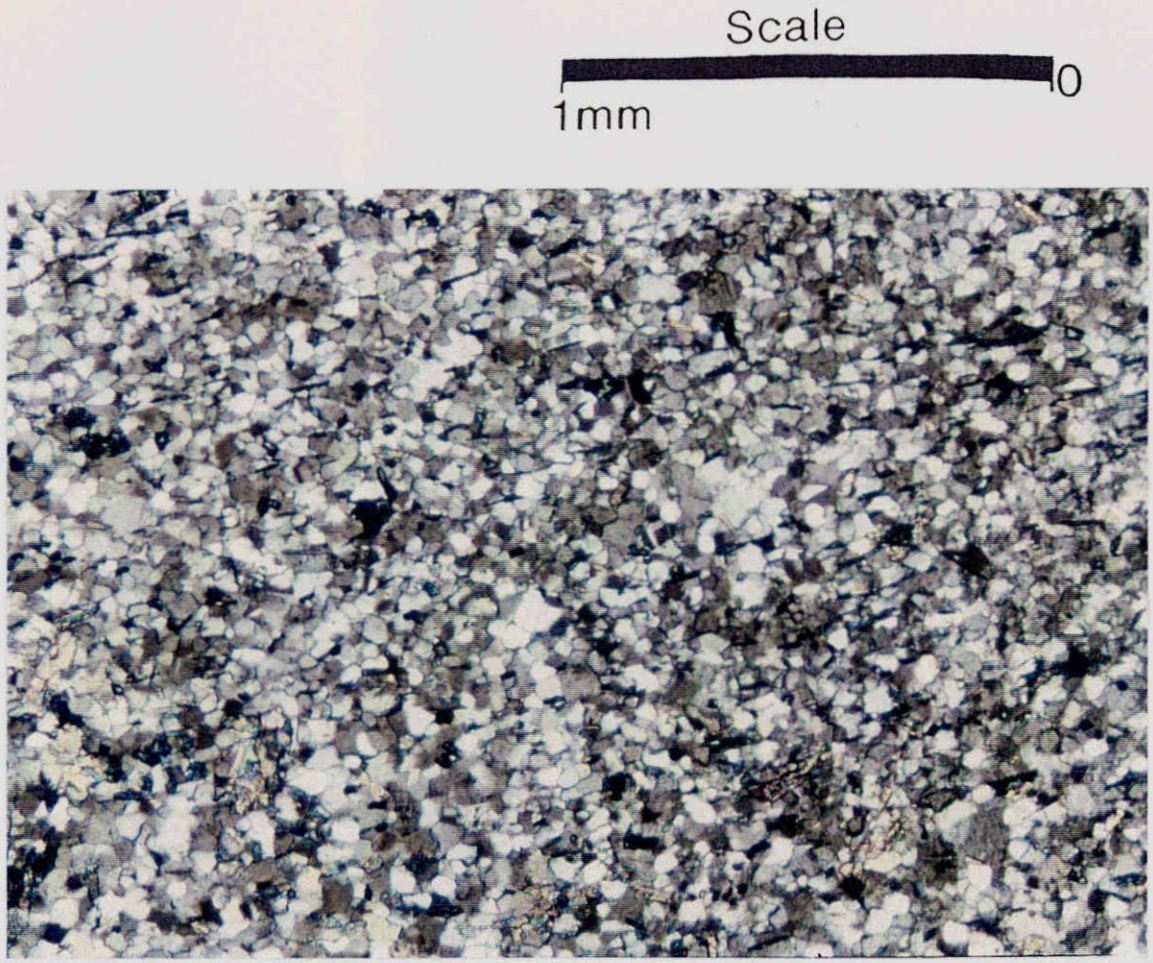
Metamorphic recrystallization has overprinted and obscured earlier alteration and veining. A significant amount of pre metamorphic (sub-concordant) veining is suggested with pervasive wallrock potassic alteration (K.feldspar). This alteration now appears very patchy through metamorphic recrystallization. Another possibility is that the protolith was a deformed or crudely bedded greywacke (heterogeneous structure) and that the pre peak metamorphic alteration was originally patchy. The distribution of the K.feldspar can not be simply explained by original compositional variations (sedimentary). Pyrite in this sample is also judged early based on granoblastic habit and magnetite rimming. This pyrite may be associated with the potassic alteration event.

Penetrative fine calcite – chlorite veinlet

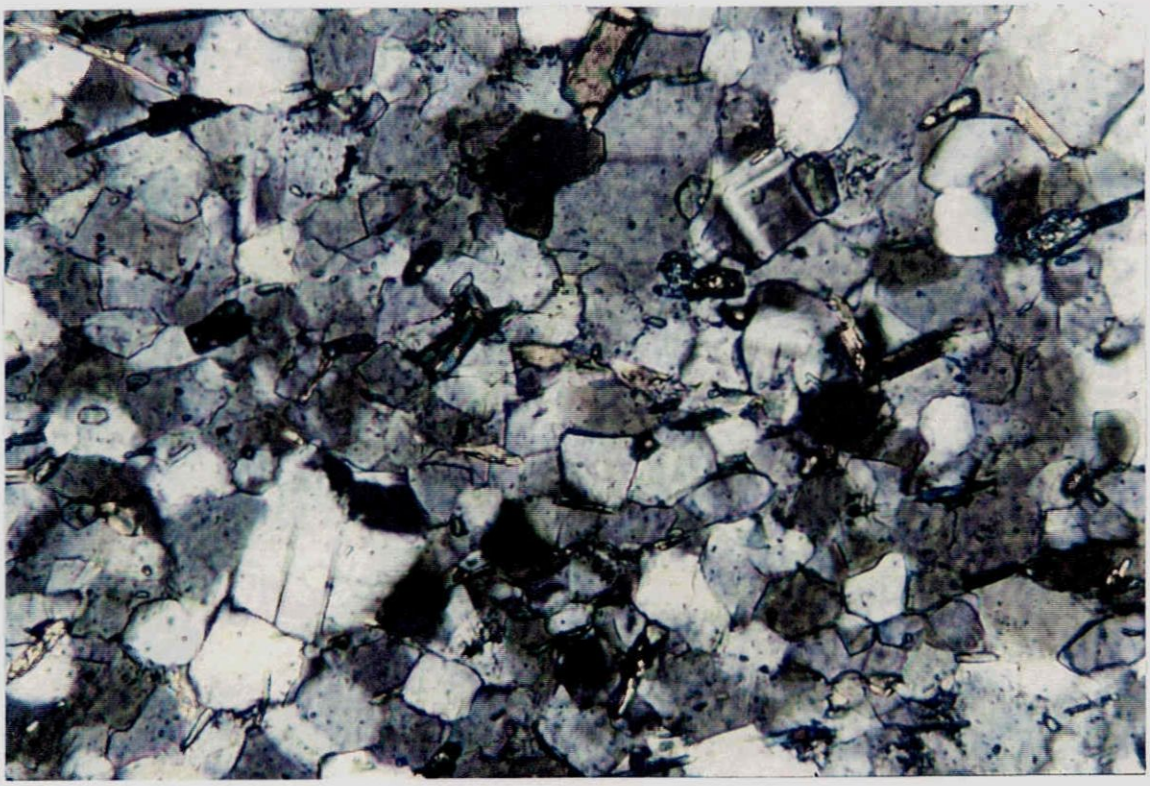
SAMPLE : 0505-008-220.35m.(Mag.200%)



Sample 0505-008-220.35m: CP Light Photograph. Sub-concordant vein with coarser grained quartz-calcite and finer marginal (to left) chlorite, epidote and pyrite. Host rock granoblastic, finer grained quartz-plagioclase-microcline mosaics.



Sample 0505-008-220.35m: CP Light Photographs. Microcline (K. feldspar) domain with granoblastic mosaics featuring twinned microcline-quartz and aligned biotite. Local muscovite laths (light colours). **Above:** low magnification, **below:** higher magnification of central area.



8) SAMPLE 0505-008-222.9M. From a Section of K.spar Altered Arenite in the 1995 Log.

Sample Description

Light to medium grey, fine grained quartz-feldspathic-biotite-muscovite? schist. Lensy banding at centimetre scale defined by grain size and percentage of mafic minerals possibly reflecting original bedding. Disseminated, generally fine grained pyrite with some cubes. Rock is non magnetic.

Thin Section Description

1) *Mineralogy*

Two domains can be distinguished as noted above, both contain minor amounts of K.feldspar as disseminated grains. Veining is notably absent in this sample.

Domain 1: Finer grained (0.02-0.06mm), moderate to good foliation, felsic

	%
Quartz/Plagioclase (can not distinguish)	75-80
Microcline	<3
Biotite	5-10
Muscovite	5
Epidote	1-2
Pyrite	2-5
Calcite	Tr

The textures are metamorphic mixed granoblastic-lepidoblastic, fine grained. Much of the pyrite is subhedral and of similar grain size to the host. Pyrite cubes are coarser up to 0.15mm. Both pyrite modes are disseminated and patchy.

Domain 2: The grain size is more variable, gradually increasing from 0.02mm at the domain 1 contact to 0.5 to 1mm (patchy). Textures are variable and more granoblastic due to lower mica content.

	%
Quartz/Plagioclase	50-55
Microcline	<5
Calcite	3-15 highly variable, patchy
Biotite	2-15 as above
Muscovite	Tr-1
Epidote	Tr-4
Pyrite	5 local fine magnetite rims

Garnet	Tr-1
Aggregates/veins	2 coarse lenses of quartz, calcite to 1mm

As in domain 1 the pyrite in domain 2 has similar grain size to the host. The quartz-carbonate grain aggregates are locally up to several millimetres in length and may represent early recrystallized veins.

2) Comments

This sample has good metamorphic granoblastic textures and distinct compositional banding probably reflecting original bedding. The fine grain size and lack of twinning makes it near impossible to distinguish between quartz and plagioclase. Microcline is commonly pericline twinned and occurs as isolated grains or small aggregates disseminated in granoblastic mosaics with quartz and plagioclase.

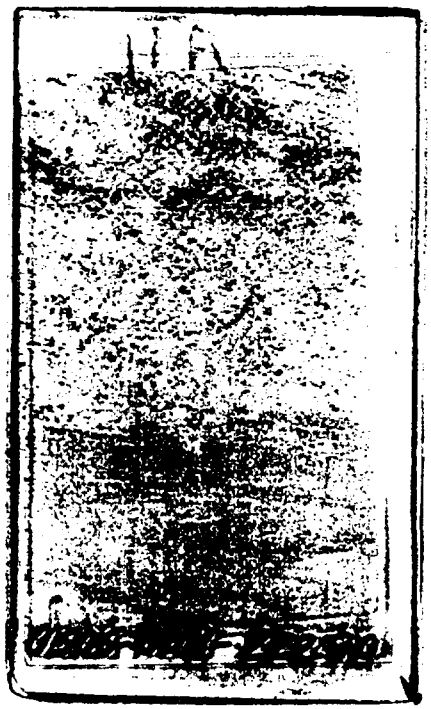
The main differences between the two bands (domains) is the grain size: however, there is more calcite, epidote and less muscovite in coarser grained domain 2. Pyrite grains have similar grain size as the granoblastic host. Magnetite rims are probably present in the finer grained band (domain 1) but are difficult to distinguish.

No early or late veining was observed in this sample.

3) Conclusions

A bedded greywacke is a very probable protolith for this sample. Compositional banding suggests bedding. Downward increase in grain size in domain 2 strongly suggests relict graded bedding.

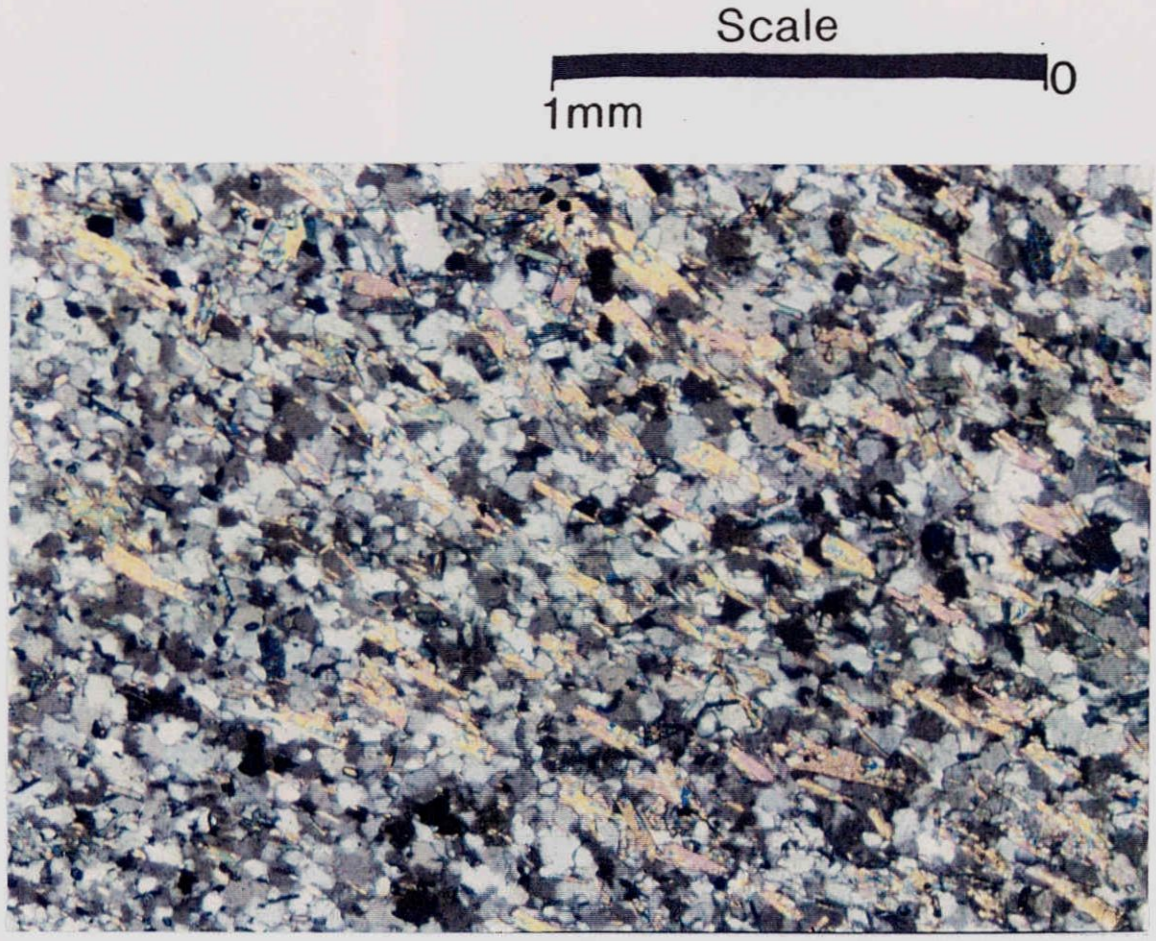
The microcline in this sample can not be related to any veining (on the scale of the thin section).



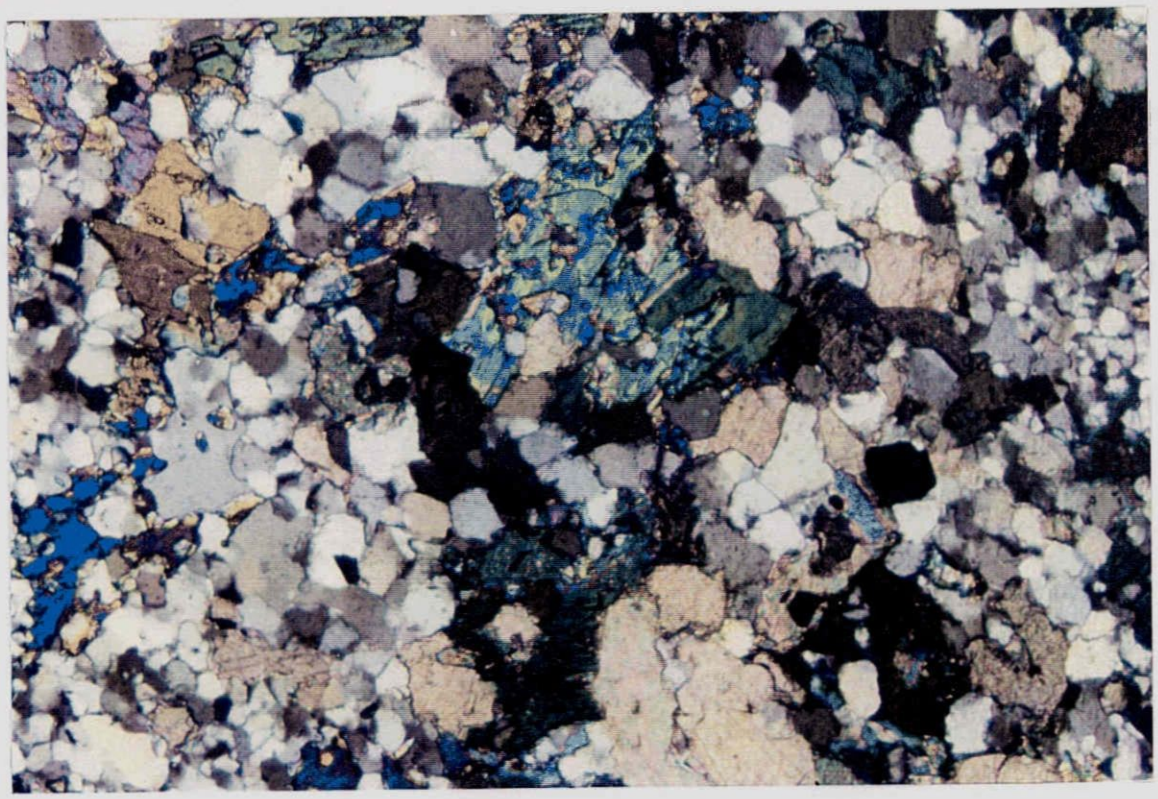
Domain 2

Domain 1

SAMPLE : 0505-608-222.90m.(Mag.200%)



Sample 0505-008-222.9m: CP Light Photographs. Above: Domain 1. Quartz-plagioclase-muscovite schist. **Below: Domain 2.** Coarser grained granoblastic quartz-biotite-calcite mosaics. Both domains contain disseminated pyrite (opaque) of similar grain size to host.



9) SAMPLE 0505-008-227.05M. From a Section of Silicified Arenite in the 1995 Log.

Sample Description

Pinkish to grey fine grained quartzo-feldspathic rock with a crude foliation at a high angle to the core axis. Vague banding based on mafic mineral content. Fine grained throughout local cherty appearance. Staining indicates very little disseminated K.feldspar, fine muscovite is quite abundant. Weak patchy carbonate (calcite) in the rock mass and in fine high angle (to foliation) fracture veinlets. Subconcordant to low angle veinlets contain quartz-carbonate and possibly significant amounts of fine hematite giving rock pinkish colour. Fine disseminated pyrite and magnetite. Patchy weak to moderate magnetism.

Thin Section Description

1) *Mineralogy*

	%
Quartz	30
Plagioclase (oligoclase)	25-30
Microcline	2
Muscovite	7-10
Biotite	1-3
Carbonate (calcite)	2-5
Epidote	Tr
Magnetite (some hematite)	1-3
Pyrite	2
Veining	20-25 Mainly quartz, carbonate

*Note significant amounts of fine disseminated hematite

2) *Comments*

The sample consists of fine granoblastic to weak lepidoblastic metamorphic recrystallized mosaics which are fairly equigranular having 0.05 to 0.1mm average grain size. Disseminated subhedral pyrite grains are larger up to 0.4mm and commonly rimmed by fine magnetite. Disseminated magnetite occurs as fine (0.02mm or less) grains, very fine grained disseminated opaque patches probably represent hematite and are widespread (gives rock pink colour). Significant fine veining is present in this sample, none of these appear to have associated K.feldspar.

Early crenulated and dismembered quartz-calcite veinlets **A** occur at high angles to the foliation. The grain size is variable from 0.1 to 0.3mm. Vein boundaries are diffuse through recrystallization during metamorphism. Quartz-calcite lenses and aggregates of similar grain size

and habit also occur sub parallel to the foliation and possibly represent remnant concordant veins of similar age.

Later subconcordant crosscutting (penetrative) quartz-calcite-muscovite-pyrite veins **B** up to 4mm wide. The mineralogy consists of polygonal mosaics up to 2mm grain size with peripheral muscovite as irregular shaped laths averaging 0.5mm. The muscovite appears to be a wallrock alteration product and decreases rapidly away from the vein contacts.

Narrow (<1mm) high angle to foliation, fracture controlled fine calcite chlorite veinlets **C**. These often occur as insets and are penetrative. Vein types **B** and **C** appear to be of similar age based on crosscutting relationship.

3) Conclusions

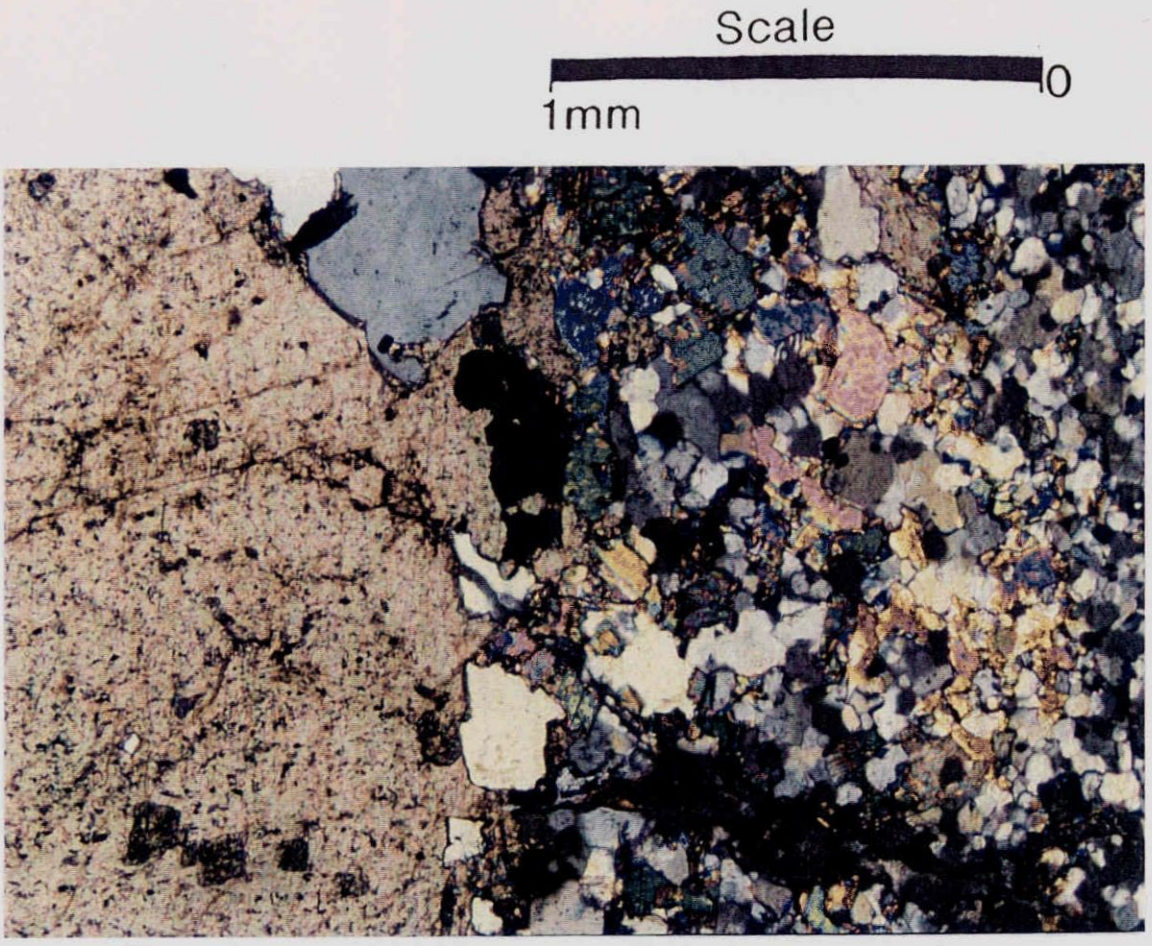
This strongly veined sample has only minor amounts of microcline and biotite. Several generations of quartz-carbonate veining are apparent one of which clearly pre-dates peak metamorphism/deformation (penetrative foliation). There does not appear to be any significant displacement along any of the brittle fractures. A weak vein stockwork is strongly preferred over 'crackle breccia' (incipient breccia) for describing observed textures.

The mineralogy of this sample indicates high sodium relative to potassium. Textures are uniform granoblastic with no suggested relict bedding. Much of the pyrite and some of the biotite, muscovite in this sample can be related to veining. These features suggest that the protolith to this sample was different from the sedimentary sequence above. This may be due to alteration prior to (last) peak metamorphism or more likely original composition. A felsic (rhyolite-dacite) intrusive protolith is suggested, fragmental textures were not observed.

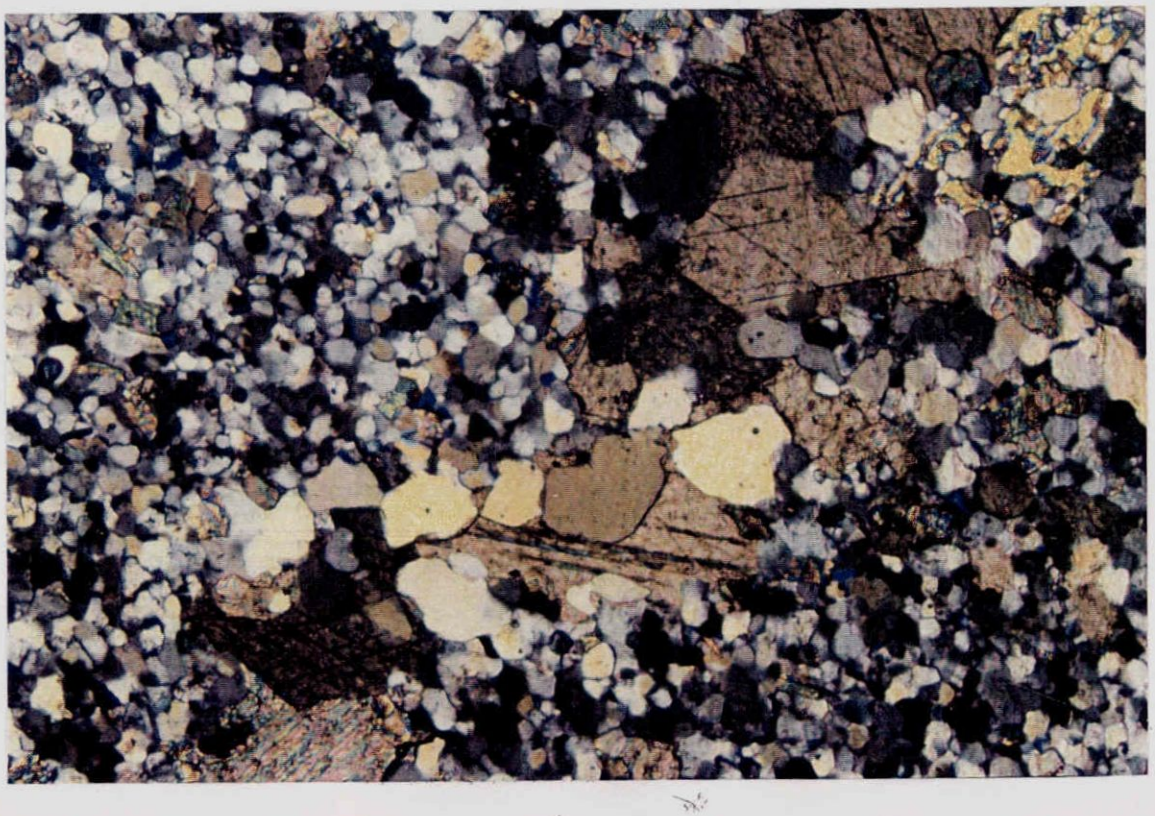
High angle calcite veinlets crossed by

concordant larger Qtz-Cal veins

SAMPLE : 0505-008-227.05m.(Mag.200%)



Sample 0505-008-227.05m: CP Light Photographs. Above: To left, coarser grained quartz-calcite vein with peripheral muscovite (coloured) and pyrite (black) cutting granoblastic quartz-plagioclase and muscovite mosaic. Note horizontal chlorite veinlet (lower part of photograph) is crosscut by larger vein. **Below:** Early buckled quartz-calcite vein (recrystallized) cutting finer grained granoblastic quartz-plagioclase-muscovite (yellow, blues) mosaics.



10) SAMPLE 0505-008-228.49M. From a Section of Silicified Arenite in the 1995 Log.

Sample Description

Light pinkish grey with a mottled, bleached appearance. Massive to crudely banded, fine grained and siliceous with local cherty appearance. Crude foliation is present in more biotite rich areas. K.feldspar is not apparent from staining. Numerous quartz calcite veinlets occur at low and high angles to foliation, banding. These do not have associated K.feldspar. Patchy calcite is also present in the rock mass. Minor fine grained disseminated pyrite (1-2% throughout, possible finer magnetite. Patchy weak magnetism.

Thin Section Description

1) *Mineralogy*

	%
Quartz	30-40
Plagioclase	30 or greater?
Calcite	5-8
Biotite	1-2
Muscovite	Tr-1
Microcline	Tr-1%? possibly albite
Pyrite	1-3
Hematite	1-2
Magnetite	1-2
Veining	15 up to 20

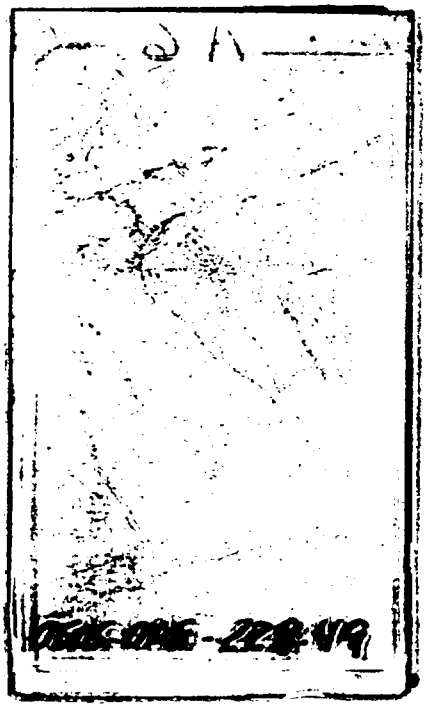
2) *Comments*

The texture is metamorphic and granoblastic. Grain size ranges from 0.04 to 0.3mm, generally less than 0.2mm. Pyrite occurs as disseminated 0.04 to 0.2mm subhedral grains locally with fine magnetite rims. Fine dusty hematite occurs as disseminated grains throughout commonly with the carbonate. The carbonate appears to be largely calcite and is patchy, part of the granoblastic mosaics.

Several vein styles and ages can be recognized. Some of the veins are similar to those @227.05m with : 1) crenulated high angle to foliation quartz-calcite 0.1 to 0.3mm veinlets. Local wallrock plagioclase (albite-oligoclase) no muscovite. Fine opaque trails (hematite?) occur along vein margins. 2) Sub-conformable to foliation quartz-carbonate (calcite)-hematite (fine)? Lensy veins up to 0.5mm wide. Some earlier often vague vein sets can be distinguished by trails of fine opaque minerals and larger grain sizes (recrystallized). The mineralogy is largely quartz, biotite, fine grained pyrite and magnetite (at rims) or fine hematite (after magnetite?).

3) Conclusions

This sample has granoblastic metamorphic mosaics with very little mica and significant fine veining. It has many similarities with the sample @227.05m and probably had a felsic intrusive or volcanic protolith. A major question is how much the original protolith was modified by pre peak metamorphic (last) alteration? Significant early veining is indicated, some of which has (probable) associated biotite. Much less muscovite is present in this sample than 227.05m. Weak vein stockwork is again strongly preferred over 'crackle breccia' for describing textures. Minor off-sets do occur with some of the cross cutting veins.



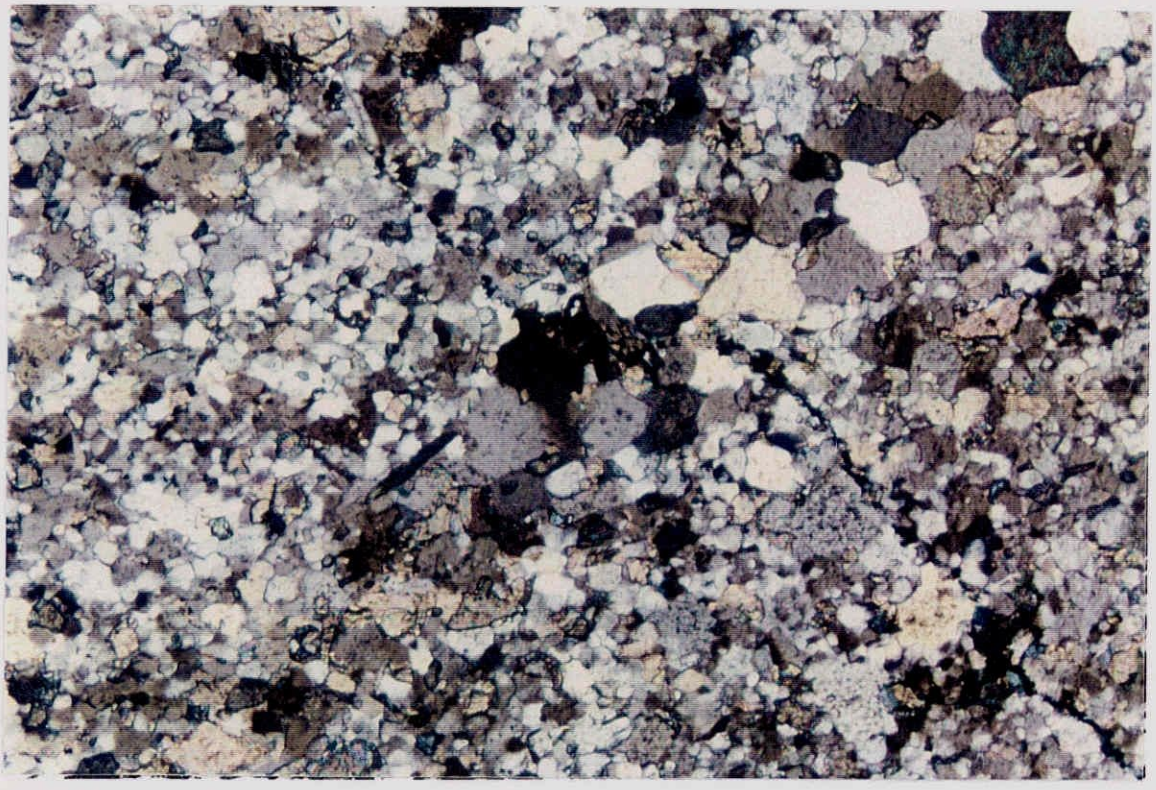
*Note stockwork of fine high and low angle quartz veinlets

SAMPLE : 0505-008-228.49m.(Mag.200%)

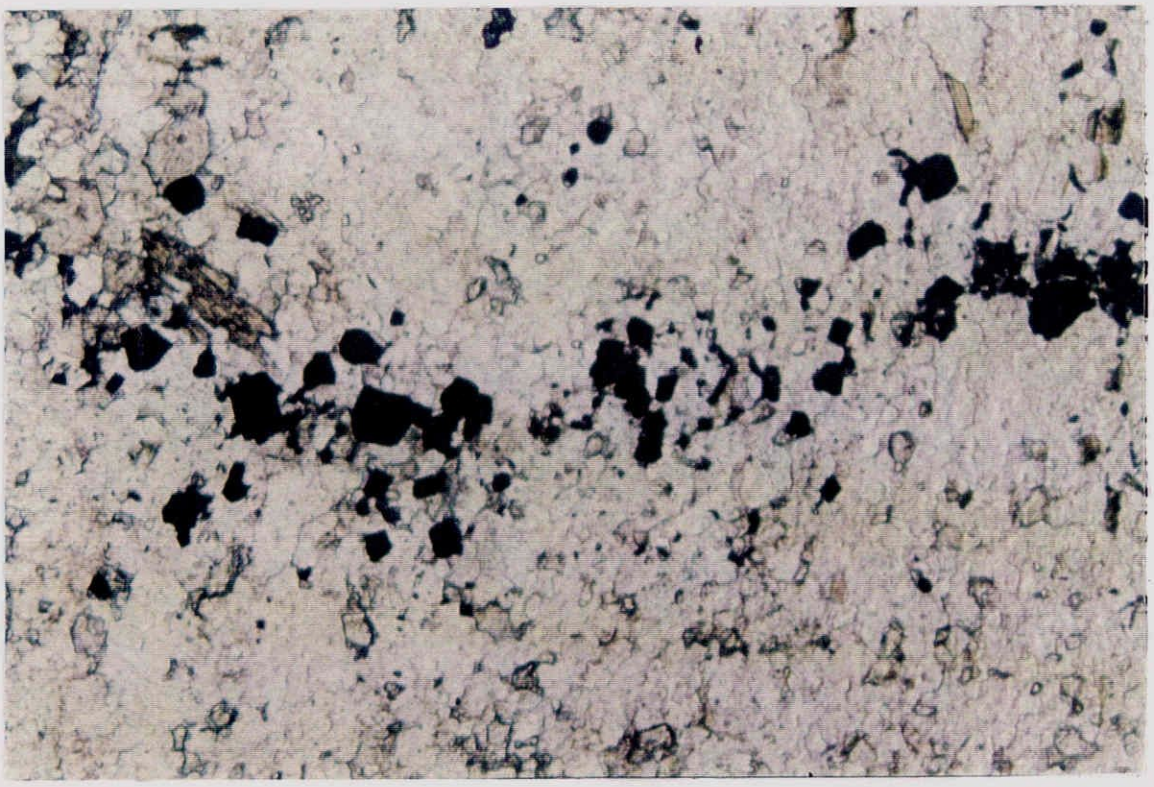
Scale

0

1mm



Sample 0505-008-228.49m: CP Light Photograph Above. High angle to foliation, very fine hematite-biotite veinlets (diagonal) crossing earlier subconcordant and recrystallized coarser grained quartz-calcite vein (opposite diagonal). **PP light Photograph Below.** Diffuse trail of fine magnetite, pyrite cubes biotite laths defining an early recrystallized, overprinted and high angle to foliation vein.



11) SAMPLE 0505-008-230.28. From Silicified Arenite or Felsic Tuff/Lapilli Tuff in the 1995 Log.

Sample Description

Mottled medium to light greys with lenses and discontinuous bands suggesting a fragmental protolith with centimetre scale clasts or lapilli. Fine grained and patchy siliceous with a moderate to strong foliation 80-85° CA defined by biotite laths. No K.feldspar is apparent from staining. Local fine veinlets and fractures cut foliation at 50-60°. Fine grained disseminated pyrite occurs throughout estimated at 3 to 4%, local fine fracture, veinlet controlled pyrite. The sample is moderately magnetic.

Thin Section Description

Textures and compositional variations this sample strongly suggests a fragmental protolith. Original features have been overprinted by metamorphic recrystallization and moderate to strong deformation. Compositional variability makes estimates of modal mineralogy meaningless.

The fragments appear poorly sorted and flattened ranging from millimetre to small centimetre scale. Their long axis are roughly parallel to the biotite foliation in the `matrix'. Textures in these clasts are largely granoblastic to weak lepidoblastic as the mica content is generally less than 5%. Granoblastic mosaics consist largely of quartz and plagioclase (commonly oligoclase where determinations can be made from twinning) with variable fine grain size from 0.02mm to 0.1mm . Within these mosaics are irregular and coarser plagioclase grains, aggregates up to 0.5mm possibly representing relict phenocrysts or recrystallized lapilli? Carbonate (calcite) occurs in low concentrations as isolated grains, part of granoblastic mosaics or as coarser aggregates (0.4mm grain size) possibly recrystallized pre peak metamorphic veins. Total carbonate content is 5 to 7%. Fine grained (0.02 to 0.06mm) pyrite and magnetite occur as patchy disseminated cubic to subhedral grains throughout in roughly equal amounts (5-6% combined). Locally where the pyrite is coarser fine magnetite rims can be observed.

The `matrix' areas are defined by higher concentration of biotite and mixed granoblastic-lepidoblastic textures (good foliation) approximately 20 to 25% of the rock. Up to 20% biotite may be present in these areas with laths up to 0.5mm long. It is common to observe the biotite foliation `wrapping around' the clasts. The other predominant minerals are quartz and plagioclase with variable grain size, generally less than 0.1mm. Fine opaques mainly pyrite and magnetite are disseminated throughout, however locally coarser subhedral pyrite up to 0.3mm may be present (without magnetite rims).

Remnant recrystallized quartz and or calcite veins are indicated in some fragments locally with associated trails of fine opaques. These possible veins do not exceed 5%. The strong recrystallization indicated in this sample could have destroyed many early veins.

An interesting feature in this sample is the small number of mineral phases basically quartz-plagioclase-biotite and calcite. Epidote, garnet and microcline are notably absent even in the more mafic locally biotite rich matrix. Microcline is not indicated in either matrix or fragment domains.

3) Conclusions

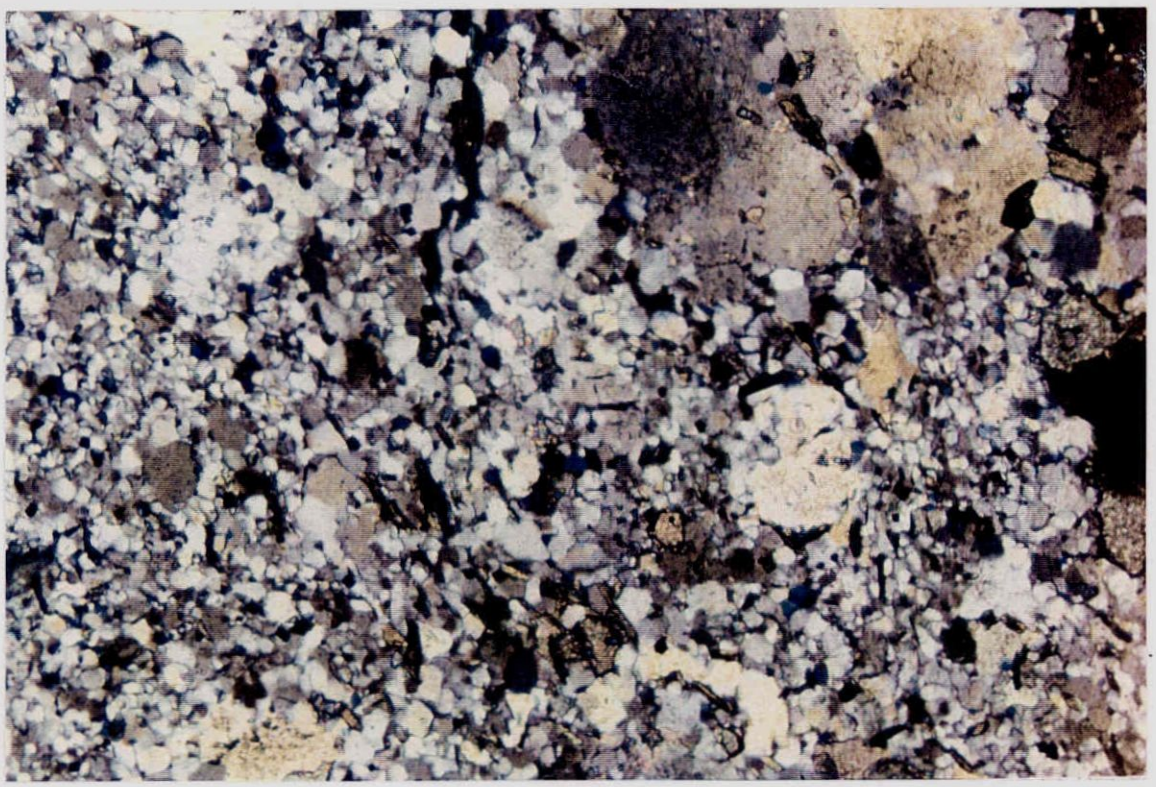
Textures in this sample strongly suggest a fragmental-lapilli tuff or immature sediment (epiclastic) protolith. Moderate to strong deformation (flattening) and metamorphic recrystallization have modified original textures. The fragments are fairly monolithic, siliceous and possibly have intrusive of felsic volcaniclastic protoliths (this is not an alteration!). This would be consistent with an epiclastic rather than a lapilli tuff.

Little quartz-carbonate veining or K.feldspar occurs in this sample compared to those above.

SAMPLE : 0505-008-230.28m.(Mag.200%)

Scale

1mm 0



Sample 0505-008-230.28m. CP Light Photograph. Fragmental Unit. Note highly variable grain sizes and granoblastic textured areas (quartz-plagioclase-minor-biotite) with patchy coarse calcite separated by narrow zones with weak foliation defined by biotite laths.

PART 2

PETROGRAPHIC AND INTERPRETATIVE REPORT

ON

SAMPLES FROM 1995 DIAMOND DRILL HOLES

0505-001, 002, 003, 004, 005, 006, 009, 010, 011, 012 AND 013

1. INTRODUCTION

This is a petrographic and interpretative report on 34 core samples taken from 11 of the 13, 1995 diamond drill holes that tested the White River Property (Project 505), Ontario. The hole locations are shown on Figure A. Placer Dome Canada Ltd is exploring this property for Hemlo style gold mineralization hosted by a variably deformed and metamorphosed succession of sedimentary, volcaniclastic and felsic intrusive rocks within the Hemlo Greenstone Belt.

2. SAMPLES

A list of thirty-four samples follows and includes the rock names supplied by S. Roach.

Hole No.	Metrage	Name
0505-001	352.00m	Aluminium-Silicate Altered Arenite
	371.00m	Silicified Sericitic Arenite
	374.00m	Pelitic Argillite
0505-002	121.00m	Silicified Arenite
	173.00m	Aluminium Silicate Altered Arenite
	197.00m	Biotitic Arenite
0505-003	12.00m	Felsic to Intermediate Crystal Tuff
	85.00m	Aluminium Silicate Intermediate Tuff
	100.00m	Chloritic-Biotitic Pelitic Argillite
0505-004	99.50m	Biotitic Arenite
	139.00m	Silicified Arenite
0505-005	144.50m	Aluminium Silicate Altered Arenite
	146.00m	Silicified sericitic Arenite
	156.50m	Aluminium Silicate Altered Arenite
0505-006	150.00m	Chloritic Intermediate Tuff
	185.50m	K.spar-Sericitic Arenite
	249.00m	Sillimanite-Garnet Arenite
0505-009	91.00m	Feldspar Porphyry
	185.50m	K.Spar-Silicified Arkosic-wacke
	229.00m	Crowded Feldspar Porphyry
0505-010	38.50m	Intermediate Lapilli Tuff/Tuff Bx

	44.00m	Silicified Intermediate Tuff
	62.50m	Polymictic Intermediate Tuff/lapilli Tf.
	165.00m	Felsite
0505-011	322.00m	Folded Intermediate Tuff/Volcaniclastic
0505-012	19.50m	Chloritic Intermediate Tuff/Volcaniclastic
	203.00m	Felsic To Intermediate Crystal Tuff
	240.00m	Aluminium Silicate Arenite
	264.00m	Silicified/Aluminium silicate Arenite and Chert
	273.00m	Interbanded Chert/Silicified Arenite
0505-013	35.50m	Aluminium-Silicate Arkosic-wacke
	88.00m	Quartz-Feldspar Vein Breccia
	276.00m	K.spar Altered Arkose
	288.00m	K.spar Altered Arenite

3. QUESTIONS AND PROCEDURES

The following questions regarding these samples were raised by S Roach, geologist.

1) Detailed aluminium-silicate mineralogy - appears to be two different types of coloured garnets. Do the aluminium-silicates show any degree of deformation?

2) Overprinting of different alteration types *i.e.* 0505-012 at 240 and 264m with both aluminium-silicate and possibly silicified alteration. I also want to know how much deformation these alteration zones have undergone.

3) Nature of biotite whether a good portion is detrital or hydrothermal. Is there any significance to black and brown biotite to any of the hydrothermal alteration. I have included a couple of unaltered biotitic 'dirty' arenites so you can compare to the altered sections. Comparison of deformation between unaltered biotitic metasediments should also be examined.

4) Nature of any Kspar alteration and how deformed is it in comparison to the surrounding clastic metasediments. I would also like to know if the Kspar is primary or secondary.

5) Intrusive or extrusive nature to all porphyritic rocks and the amount of deformation observed.

6) Epithermal nature in a sample from drill hole 0505-013 at 88m - is there quartz chalcedony? It appears to be a classic hydrothermal breccia.

Petrographic and hand specimen descriptions of all samples occur in Appendix B with photomicrographs to illustrate mineralogy and textures. The samples in this appendix are grouped under the related drill hole. For each hole there are brief summary comments preceding the sample descriptions. Wherever possible a direct answer is given to the stated questions (where relevant).

4. PROTOLITHS AND METAMORPHISM

The original textures in **all** of the samples have been overprinted by metamorphic recrystallization and in some cases alteration pre dating last peak metamorphism. A variety of protolith are indicated, metasedimentary rocks predominate with minor volcaniclastics, tuffs and felsic intrusives.

Quartzo-feldspathic-biotite schists with variable garnet have massive to bedded feldspathic wacke to greywacke parentage. The aluminium silicate bearing porphyroblastic schists contain variable amounts of kyanite, staurolite, sillimanite, garnet, chlorite/chloritoid and local yellow to green tourmaline. In most cases these appear to be semi-pelites or pelites, finer grained units within the greywacke sequence. Some of these samples have fine interbedded siliceous layers, possibly representing original chert? Rarely are there enough Ca-silicate minerals such as epidote to constitute meta-marls (calc-silicates).

Samples with probable volcaniclastic/tuff protoliths largely come from holes 10 and 11. These are quartz-plagioclase-microcline-hornblende rocks with relict fragmental textures (lapilli tuffs?). Samples from crystal tuff sections in holes 3 and 12 may be deformed and metamorphosed feldspar porphyry intrusives.

Samples from several holes have probable felsic intrusive (or less likely volcanic) protoliths. These are predominantly plagioclase feldspar porphyries which pre date peak metamorphism and deformation. Significant disseminated microcline occurs in the recrystallized groundmass. Rhyodacite to quartz monzonite original compositions for these intrusions are suggested.

This suite of samples displays mineral assemblages that are characteristic of medium grade regional metamorphism (amphibolite). The presence of pelitic samples with a large number of mineral phases allows more precise definition of metamorphic P/T conditions. Such minerals include staurolite (ST), kyanite (KY), sillimanite (SILL), garnet (GT), biotite (BIO), muscovite (MUS), plagioclase (P) and quartz (Q). Samples from nine of the thirteen holes contain pelitic mineral assemblages, unfortunately samples from holes 4, 9, 10 and 11 do not. The mineral assemblages are distributed as follows:

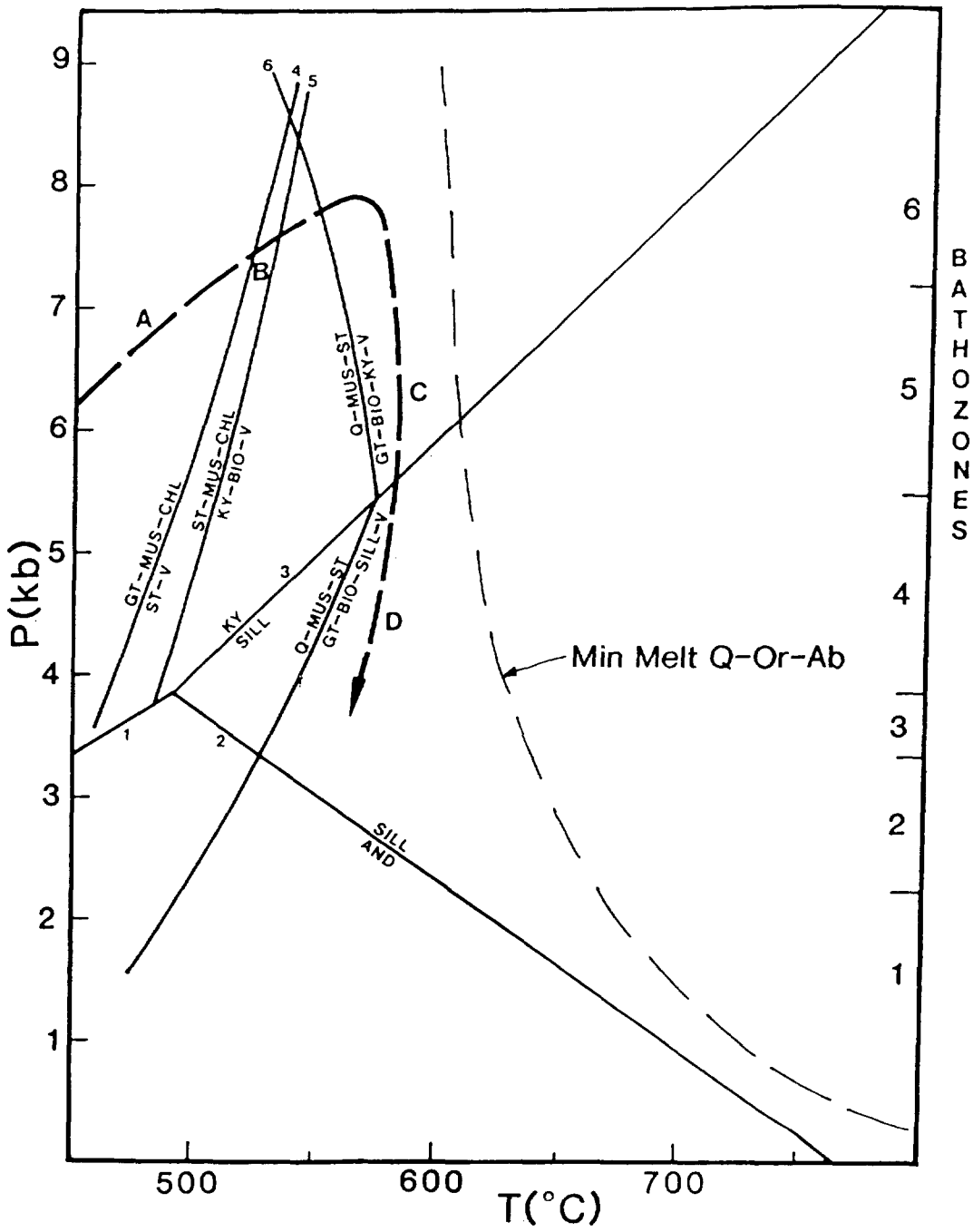


FIGURE 3:

Possible metamorphic path for Teck-Corona sequence. (A) Marked increase in lithostatic pressure possibly due to crustal thickening by thrust- and fold-nappe tectonics. (B) High pressure, moderate temperature metamorphism characterized by synchronous formation of staurolite and kyanite. (C) Rapid up-lift reduces lithostatic pressure with little change in temperature. (D) Lower pressure, moderate temperature metamorphism in which presently dominant fabric developed, characterized by crystallization of sillimanite, with kyanite persisting as metastable polymorph.

After Burk et al 1986

HOLE NO.	ST	KY	SILL	GT	BIO	MUS	P	Q
1			X		X	X	X	X
2			X	X	X	X	X	X
3	X	X		X	X		X	X
5			X	X	X	X	X	X
6	X	X	X		X		X	X
12	X	X	X	X	X	X	X	X
13	X		X	X	X		X	X

It is apparent from the above and the location of drill holes (Figure A) that similar aluminium silicate mineral assemblages occur in pelitic rocks over a large area. Holes 7 to 11 which occur fairly close to a granodiorite to quartz diorite intrusive stock in the north central area (Figure A) have similar aluminium silicate assemblages (based on the drill logs) The mineral assemblages overall indicate Middle to Lower Upper Amphibolite Grades of Regional Metamorphism.

Figure 3 shows a possible metamorphic path for the sequence in the Moose Lake area (Teck-Corona Property, Burk et al. 1986). A similar metamorphic pathway is suggested for the White River Property. In the pelitic samples from the property staurolite is coeval or earlier than kyanite, and sillimanite is late after biotite (locally kyanite?). The mineral assemblages are frequently 'metastable' and indicate high pressure, moderate temperature followed by lower pressure, moderate temperature metamorphism. Penetrative foliation is coeval with the sillimanite (D in Figure 3) or earlier. Deformation predominantly involves flattening and in some cases rotation (shear).

The only garnet type observed in the samples was almandine. A brown equant staurolite could easily be confused with garnet in hand specimen.

5. ALTERATION AND VEINING

Alteration and veining in the samples examined can be dated pre or post (last) peak metamorphism/penetrative foliation.

The early alteration that can be identified largely involves K feldspar (microcline). As observed in hole 8 this alteration may be vein related or patchy pervasive. Microcline occurs in some narrow quartz veins with minor associated pyrite. In all cases the K feldspar has been

subject to metamorphic recrystallization and is clearly part of granoblastic grain mosaics. There is a common spatial association between K.feldspar zones and feldspar porphyry felsic intrusions (dikes). These have interpreted rhyodacite to quartz monzonite composition and contain significant amounts of groundmass microcline. Metamorphic recrystallization and a foliation is evident in these intrusives. A genetic link between the F.P. dikes and country rock K.feldspar is strongly suggested especially where the units are permeable sediments or tuffs. Strong pervasive K.feldspar (microcline) occurs in volcaniclastic samples from hole 5 fairly distant from F.P. intrusions. A narrow fracture controlled quartz vein stockwork with associated K.feldspar alteration is indicated in samples from hole 5. Narrow F.P. dikes occur in the metasedimentary sequence above and below.

Regarding the aluminium silicate minerals. In the majority of samples these minerals can be related to metamorphism of clay rich sediments (pelites, semi-pelites) within greywacke sequences. In some cases it can be argued that staurolite and probably kyanite (not sillimanite) pre date the microcline.

Early recrystallized quartz veinlets with minor muscovite, pyrite and local wallrock biotite occur in many samples. These do not have associated microcline but do frequently occur in the same areas. Some of the F.P. felsic intrusions have these veinlets at the exclusion of the microcline type.

Late penetrative veining crosscutting metamorphic foliation at variable (commonly high) angles feature combination from-chlorite, calcite, epidote, sericite, quartz, minor pyrite and pyrrhotite. Chlorite, calcite and epidote veinlets predominate and commonly have associated broad envelopes or pervasive wallrock alteration. This alteration involves breakdown of metamorphic granoblastic grain mosaics, chloritization of biotite, sericitization of feldspars and patchy fine epidote. Such alteration appears to be largely isochemical (retrograde metamorphic!). The sericite alteration post dates metamorphism and can not be related to the K.feldspar event.

6. BRIEF COMMENTS ON CHEMISTRY

Examination of drill hole analytical data shows isolated low gold values (100 to 380 ppb) from holes 2, 3, 6, 8, 10 and 11. In most cases these values are associated with silicified or quartz veined 'arenite'. In hole 8, 132.37 to 137.86m gold values up to 130 ppb occur in a section with local 'intense' K.feldspar.

Hole 10 has local anomalous molybdenum values up to 80 ppm associated with weak patchy K.feldspar and a quartz-sulfide (pyrrhotite vein).

7. CONCLUSIONS

K.feldspar alteration is apparent in a large number of the samples examined. This alteration predates last peak metamorphism (amphibolite) and is probably related to the intrusion

of felsic dikes of rhyodacite to quartz monzonite composition. Permeable sedimentary, volcaniclastic units and early fracture zones would allow this intrusive driven potassic alteration to travel for significant distances.

The aluminium silicate mineralogy observed in pelitic units can not be related to K feldspar alteration in this study. This is not to say that it does not occur as the number of samples examined were limited. Sericite alteration in the samples clearly post-dates K feldspar alteration.

Holes 7, 8, 9 and 10 occur in a cluster (Figure A). Of these holes 8, 9 and 10 have quartz stockworks in arenite sequences, numerous felsic dikes, pervasive-patchy K feldspar and siliceous alteration zones. These features combined with spotty low gold values and locally molybdenum targets this area for intrusive related gold zones, possible of the Hemlo type.

APPENDIX B

PETROGRAPHIC DESCRIPTIONS AND PHOTOMICROGRAPHS FOR SAMPLES FROM 1995 DIAMOND DRILL HOLES 0505-001, 002, 003, 004, 005, 006, 009, 010, 011, 012 AND 013

DDH 0505-001. SUMMARY COMMENTS
Samples at 352.0, 371 and 374m.

The samples were taken from a metasedimentary sequence with a quartz vein stockwork section from 363.53 to 365.17m. Above the rocks are described as Arenite or Biotitic Arenite (304.83 to 363.53m). Below Silicified Sericitic Arenite (365.17 to 373.76m).

Sample 352m is a biotite-muscovite schist with late sillimanite. This is a metasediment (greywacke?) with recognizable early quartz veining and possible (minor) associated microcline (K. feldspar).

Sample 371m appears to represent a sediment that was fractured and altered (silicified) prior to peak metamorphism. The early quartz veining has spatially associated (wallrock) pyrite and muscovite.

Sample 374 represents a metamorphosed fine greywacke (semi-pelite) with no early quartz veining.

The first two samples indicate an early (pre-last peak metamorphic) fracture and vein event with associated siliceous alteration. Wallrock muscovite (not sericite) and pyrite may be related to this vein, alteration event (K.feldspar is minor). The aluminium silicate minerals in these samples, in particular sillimanite and garnet (almandine) can be related to polymetamorphism or changing metamorphic conditions (affecting sedimentary rocks) rather than alteration!

SAMPLE 0505-001-352.00M. Biotite Arenite-Aluminum Silicate Altered. From 1995 Drill Log

Sample Description

Mottled medium to dark grey, fine grained biotite schist. Local millimetre scale concordant to weak discordant (low angle to foliation) felsic bands with higher biotite concentrations along contacts. These bands are commonly discontinuous and may form small 2 to 3mm augen like features consisting of quartz and coarser muscovite. Staining indicates some disseminated K.feldspar in the schist and possible early strongly deformed (remnant) K.feldspar veinlets at intermediate to high angles to foliation. Minor amounts of very fine disseminated pyrite. Non magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	30-40
Plagioclase (largely untwinned)	10-15
Microcline (difficult to ID)	2?
Biotite	20-30
Muscovite	10-15
Sillimanite	2-3
Pyrite	1

Between 7 and 10% of the sample is discontinuous lighter coloured bands and augen consisting of muscovite and quartz with minor biotite and sillimanite.

2) Comments

This sample has mixed lepidoblastic and granoblastic metamorphic textures and is basically a quartz-biotite-plagioclase-muscovite schist with 7-10% sub concordant coarser grained bands and lenses (augen) of muscovite and quartz.

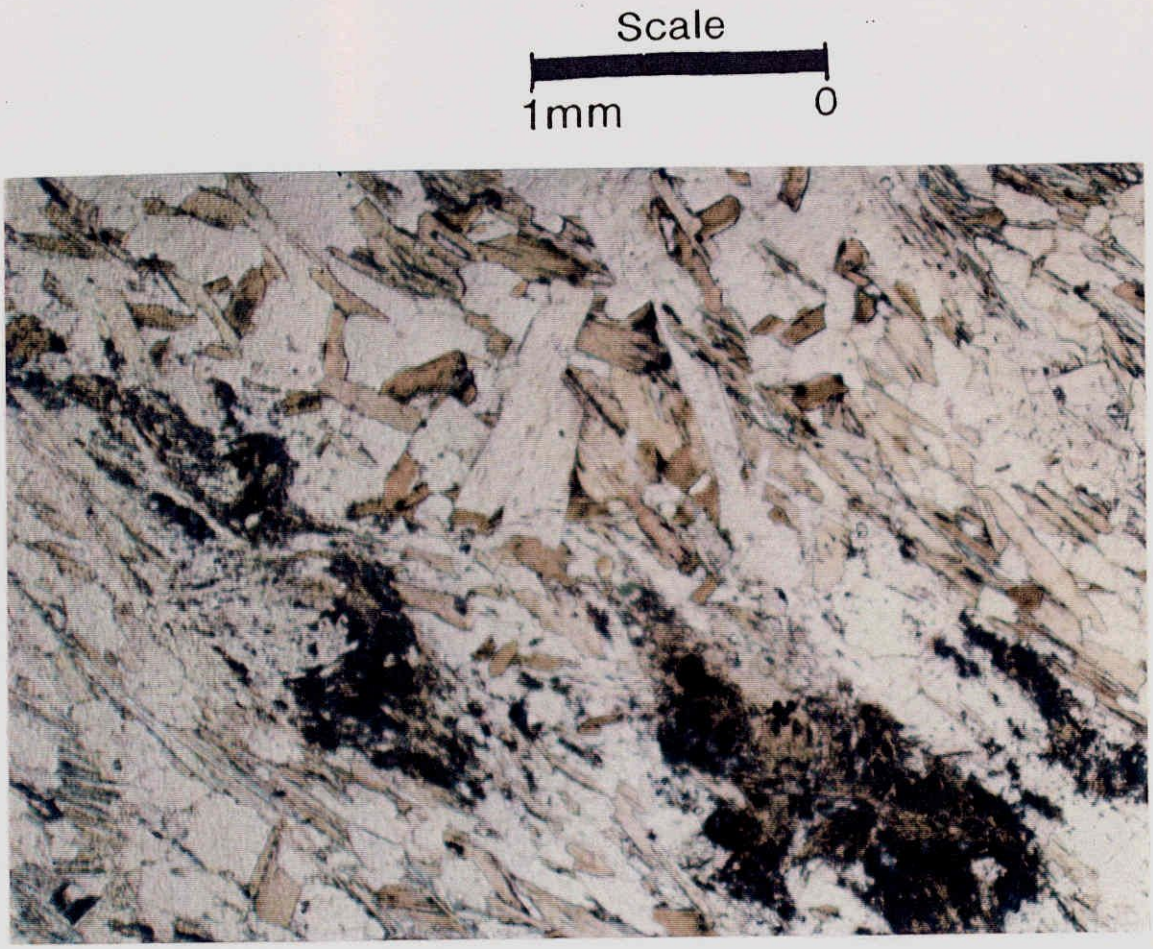
The schist is fairly even grained with the micas averaging 0.4mm and quartz, plagioclase 0.15 to 0.2mm. It is difficult to distinguish quartz from plagioclase because of the lack of twinning. Some microcline is locally evident but is also very difficult to positively identify. Greater concentrations of biotite (commonly coarser grained to 0.8mm) occur marginal to the quartz-muscovite bands and lenses. Locally the biotite and possibly muscovite display patchy alteration (breakdown) to very fine grained fibrous aggregates of sillimanite (fibrolite). These patches are between 1 and 2mm long and fairly evenly distributed. The possible K.feldspar veinlet observed in the cut slab is very difficult to locate in thin section. A local grain alignment of quartz and feldspar (low angle to foliation) is evident but very discontinuous. Up to 1% pyrite occurs in the schist as disseminated 0.1 to 0.2mm anhedral to subhedral grain (part of mosaics). The

quartz-muscovite bands feature muscovite blades up to 1mm long with inclusions (predominantly quartz) and granoblastic quartz-biotite mosaics, 0.1 to 0.3mm grain size. These bands are irregular in width from 1 to 2mm and locally form 'augen' with wrap around textures in the adjacent biotite schist (with sillimanite)

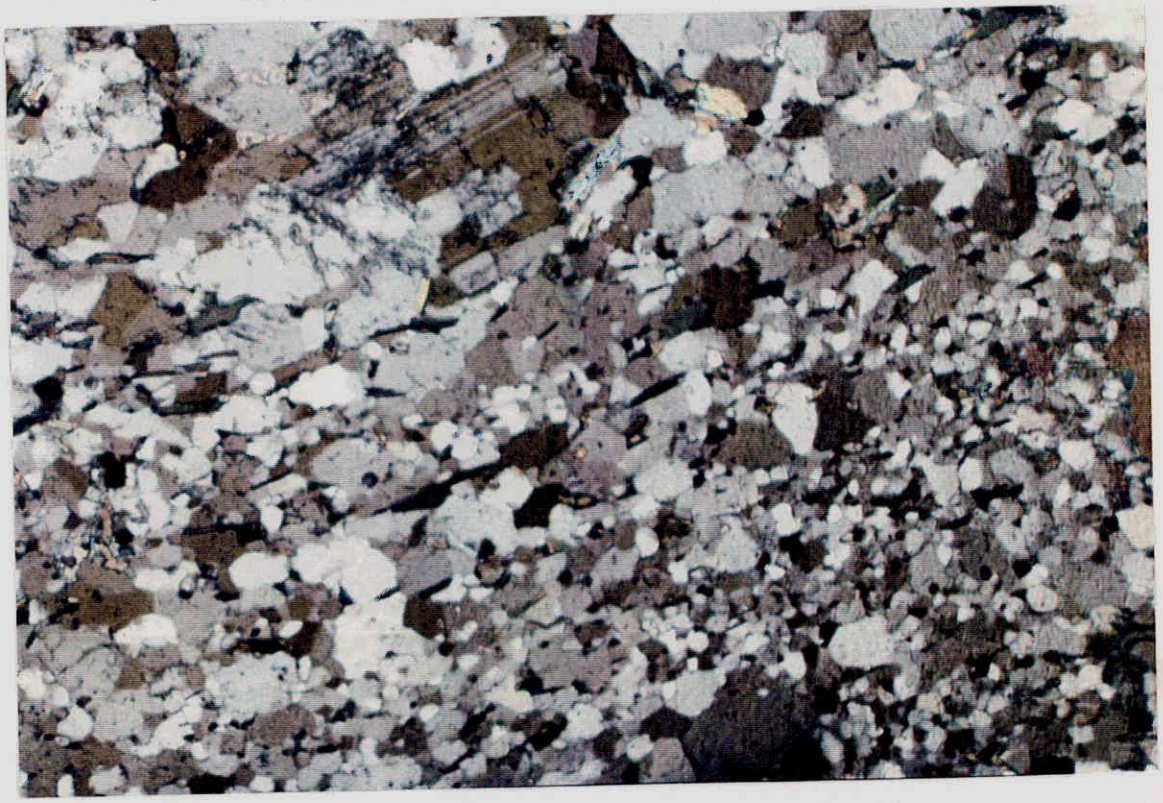
3) Conclusions

This strongly foliated sample has undergone strong deformation under amphibolite facies of regional metamorphism. The protolith to this sample would probably be a greywacke (semi-pelite). It is possible that the quartz muscovite bands represent original laminae. Some pre-metamorphic veining (K.spar) is indicated in the hand specimen. This appears to have been strongly overprinted and obscured by metamorphic recrystallization.

No kyanite was observed in this sample. Coarser muscovite laths and aggregates in augen could have been confused with this. Sillimanite is present as overprints to biotite and possibly adjacent muscovite. The breakdown of biotite to sillimanite in metamorphosed argillaceous rocks is a fairly common feature at middle to higher amphibolite grades of regional metamorphism



Sample 0505-001--352.00m: PP Light Photograph. Biotite-Muscovite Schist with Sillimanite. Note coarser brown biotite and clear muscovite laths in left central area defining the edge of an augen with dark peripheral fibrolite (sillimanite) patches.



Sample 005-001-371.00m: CP Light Photograph. Quartzose Metasediment. Note granoblastic textures with quartz, twinned plagioclase (albite-oligoclase) and fine aligned biotite laths.

SAMPLE 0505-001-371.00M. Silicified Sericitic Arenite within a Biotitic and Garnetiferous Metasedimentary Sequence. From 1995 Drill Log.

Sample Description

Mottled light greys and whites with a distinct patchy bleached appearance. Fine grained and highly siliceous with crude, irregular banding defined by biotite (low) content and grain size. Some concordant millimetre scale quartz lenses may represent remnant veins and have minor associated K. feldspar (from staining). White zones of bleaching up to several millimetres wide cross the foliation at a high angle and contain significantly less fine coloured micas. Between 1% and 2% fine disseminated pyrite up to 1mm. Non magnetic.

Thin Section Description

1) Mineralogy

This sample can be split into two domains based on mineralogy. Domain 1 makes up 90% of the sample. Domain 2 occurs at the end of the thin section and represents the edge of a different compositional band.

Domain 1

	Approximate %
Quartz	70-75
Plagioclase (albite-oligoclase)	3-10
Biotite	2-5
Muscovite	1-4
Pyrite	Tr
Magnetite	Tr
Hematite (dusty patches)	1-2 (difficult to estimate)
Early quartz veining	3-6

Domain 2 has similar mineralogy to above, however muscovite (7-10%) exceeds biotite (5-10%). Green coloured tourmaline occurs as fine grain clusters locally up to 5%.

2) Comments

Much of this sample (Domain 1) is highly siliceous and fairly equigranular with bands and patches defined by variations in average grain size. Granoblastic quartz mosaics dominate with 0.05 to 0.4mm average grain size. Locally twinned plagioclase occur as isolated grains and aggregate within the mosaics generally with similar to slightly coarser grain size. Brown biotite and colourless muscovite occur as fine laths 0.1 to 0.4mm long. The mica content varies from one band to another and the associated foliation is generally weak. Locally patches of optically continuous muscovite grains suggest recrystallization from original coarser grains up to 1mm.

Remnant quartz veins at high and low angles to the crude banding have coarser grain size up to 1mm and local peripheral concentrations (wallrock?) of granoblastic muscovite and isolated subhedral pyrite grains up to 0.2mm. The veins are discontinuous and clearly recrystallized, pre-dating peak metamorphism. If any K.feldspar is associated with these veins it is in trace amounts.

Domain 2 at the end of the sample has mixed lepidoblastic-granoblastic textures and coarser average grain size at 0.3 to 0.4mm. Quartz predominates with minor plagioclase (untwinned) and brown biotite laths in the mosaics. Elongate muscovite laths to 1mm in length form lepidoblastic bands defining a strong foliation (schistosity). Patches of disseminated light green coloured tourmaline (positive ID) mainly occur in cross section (to 0.1mm) and may have alkali composition (elbaite). The tourmaline is clear of intrusions and unfractured.

3) Conclusion

This is a highly siliceous sample which may represent a meta-arkosic or strongly altered sediment. Crude variations in grain size may represent relict bedding. Early quartz veining is clearly indicated in the sample. It has a possible association with wallrock muscovite and minor pyrite (K.feldspar?). There is no evidence for any late (post-peak metamorphism) introduction of silica. Hand specimen scale textures and 'bleaching' clearly suggest pervasive and fracture controlled silicification. This based on microscopic textures (pervasive recrystallization) must have occurred prior to peak metamorphism.

SAMPLE 0505-001-374.00M. Interbedded Pelitic Argillite and Arenite Sequence. From 1995 Drill Log.

Sample Description

Dark grey to greenish grey, fine grained biotite schist with fine irregular shaped light pink garnets. Up to 3% (visible) garnets are present as 1 to 2mm disseminated grains. Macroscopic veining is notable absent in this sample. Very fine disseminated pyrite occurs throughout. Non magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	40-45
Plagioclase (untwinned)	15-25
Biotite	20-25
Garnet (Almandine?)	5
Epidote?	Tr
Magnetite	Tr

2) Comments

This sample is a fine grained quartz-plagioclase-biotite schist with garnet. Metamorphic textures are mixed lepidoblastic-granoblastic. Brown biotite laths 0.2 to 0.6mm long define foliation with granoblastic quartz-untwinned plagioclase and anhedral pyrite mosaics averaging 0.1 to 0.15mm grain size. Irregular shaped light pink garnet poikiloblasts vary greatly in size up to 1.2mm. Fine inclusions are largely quartz with local magnetite? Many of the finer garnets are fragmentary forms, some have well developed and fine fracture cleavage. Metamorphic recrystallization has largely overprinted pressure shadow quartz and all garnets appear to pre-date peak metamorphism. Locally the garnet and recrystallized pressure shadow form millimetre scale 'augen'. Veining is notably absent in this sample, however minor hairline fractures do occur at high angle to foliation with associated epidote? veinlets.

3) Conclusions

This sample represents a metamorphosed greywacke (semi-pelite) sediment. The garnets and possibly pyrite pre-date peak metamorphism. (possible polymetamorphism). Fragmentation of garnet prior to peak metamorphic recrystallization also suggests an earlier deformation event which from symmetry involved flattening without significant rotation (shear).

Scale

1mm 0

Sample 005-001-374.00m: CP Light Photograph. Quartz-Plagioclase-Biotite-Garnet Schist. Note irregular `recrystallized' garnet in central area and strong foliation defined by coloured biotite.

DDH 0505-002. SUMMARY COMMENTS
Samples at 121.0, 173.0 and 197.0m.

The samples were taken from a metasedimentary sequence of rocks described as silicified Arenites, Arenite, Biotitic Arenites and Pelitic Argellites. Many units contain aluminium silicate minerals (meta-pelites?). The sequence has been intruded by several Feldspar Porphyry units and a narrow Diabase (123.22-124.11m).

Sample 121.0m, a meta-greywacke? displays strong epidote alteration/overprinting and chlorite alteration of biotite. This is late, post peak metamorphic and could well be related to intrusion of the nearby diabase. Epidote alteration could be confused with silicification in this area. No silicification was noted in the thin section. Disseminated granoblastic microcline could represent early potassic alteration (related to feldspar porphyry intrusion) or original composition?

Sample 173.0m probably represents a metamorphosed laminated semi-pelite (greywacke?). A large number of mineral phases are present including tourmaline and late sillimanite. The aluminium silicates are controlled by compositional banding (bedding?) and do not appear to be alteration related.

Sample 197.0 is from an early, pre peak metamorphic feldspar porphyry dyke? It has a foliation and relict phenocrysts. The presence of disseminated K.feldspar (microcline) is interesting as it suggests a possible genetic link with the same feldspar in the surrounding metasediments *ie.* intrusive related potassic alteration prior to peak metamorphism.

SAMPLE 0505-002-121.00M. Silicified Arenite within two metres of a narrow, one metre wide Diabase Dike. From 1995 Drill Log.

Sample Description

Mottled medium to dark grey, fine grained with a fairly well developed foliation (schistosity). Significant amounts of disseminated K.feldspar is indicated from staining. Light coloured patches suggest widespread epidote alteration/overprinting. Local fine disseminated pyrite. Non magnetic. Centimetre scale banding (relict bedding?) is clearly evident in core remnants.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	35-40
Plagioclase (largely untwinned)	10-15
Microcline (twinned)	20
Biotite	12-15
Epidote (colourless to yellowish)	10-12
Chlorite (after biotite)	2
Pyrite	Tr

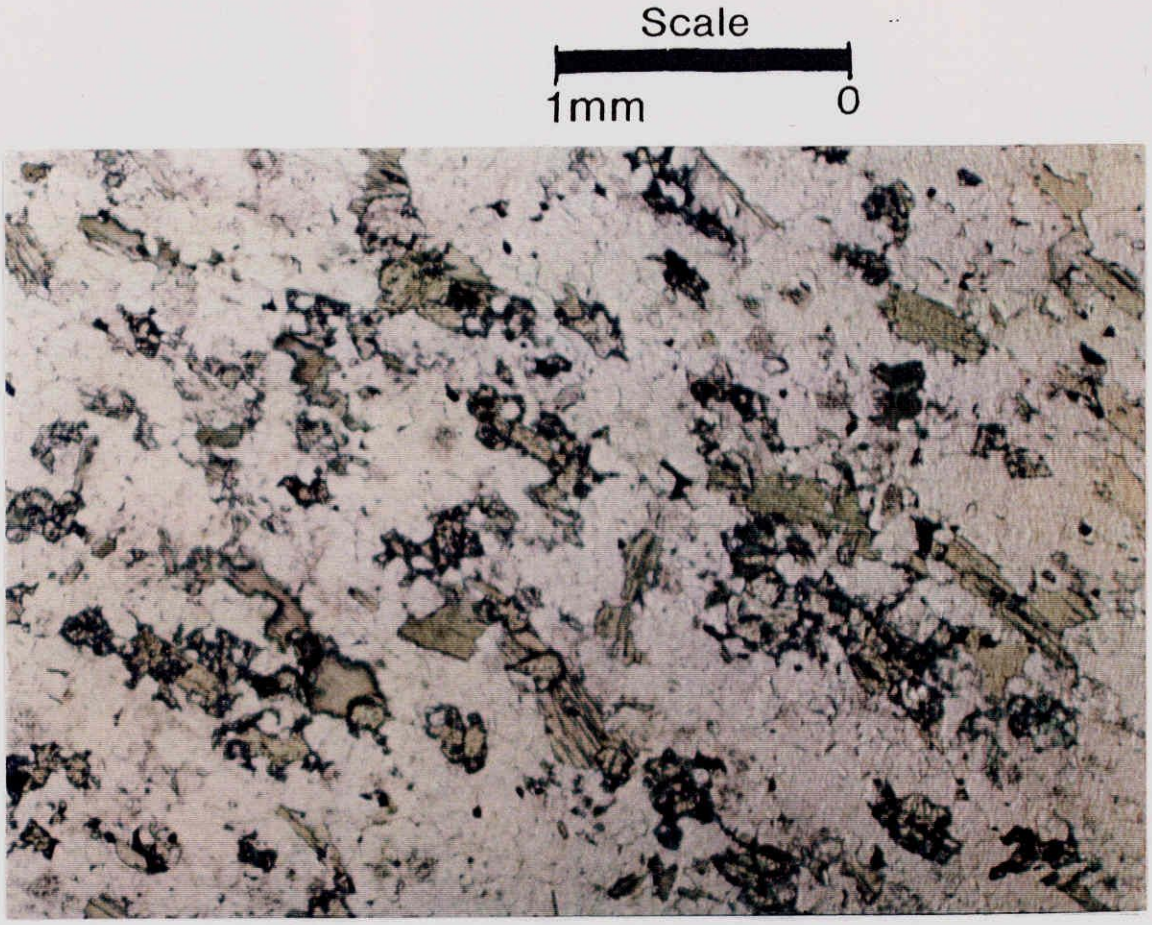
2) Comments

This sample has metamorphic granoblastic to weak lepidoblastic textures. Granoblastic mosaics feature relatively equigranular quartz, untwinned plagioclase and pericline twinned microcline with average grain size 0.1 to 0.3mm. Biotite forms elongate to tabular laths up to 0.6mm long defining a crude to locally moderate foliation. The biotite shows varying degrees of alteration to chlorite and many of the larger grains are quite ragged. Colourless to light yellow epidote forms individual grains but more commonly aggregates up to 1mm. These are disseminated throughout and overprint the metamorphic textures. Both chlorite and epidote represent a later, possibly retrograde alteration. Veining was not observed in this sample and sulfides are sparse.

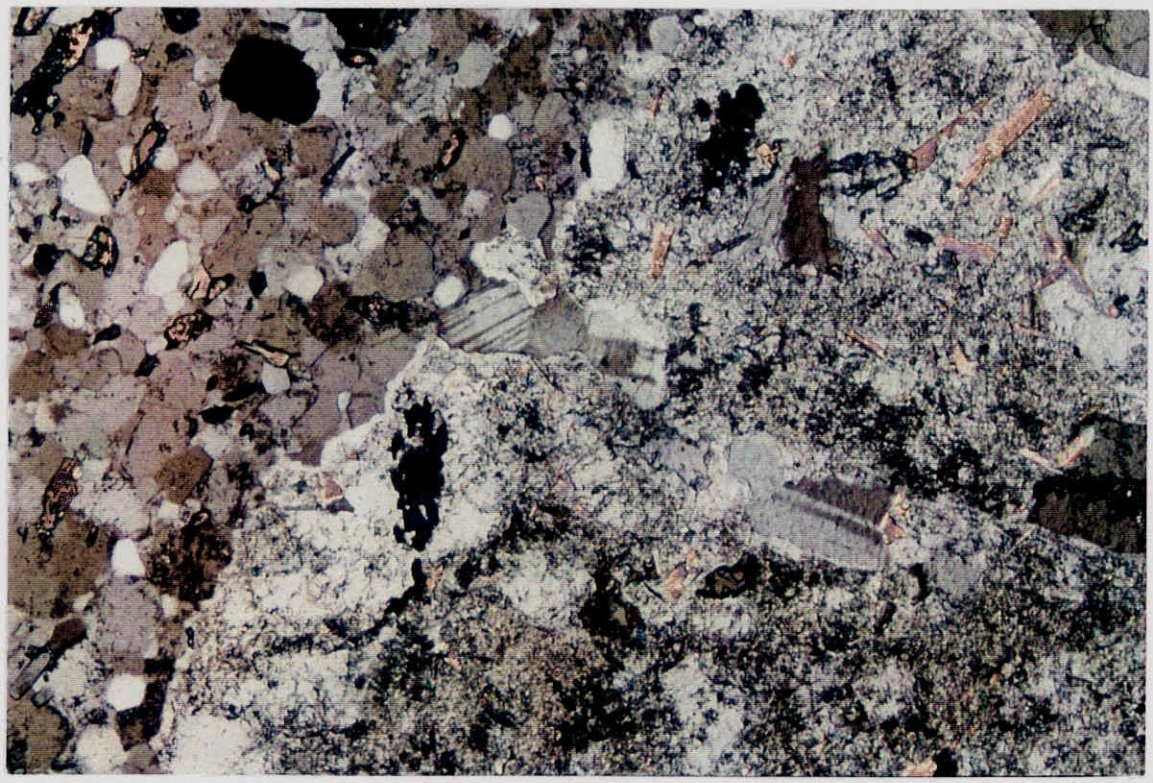
3) Conclusions

Several features in this sample especially the possible relict bedding suggests a sedimentary protolith. Bedded greywacke is preferred over arenite based on grain size and bulk composition. The high microcline content and apparent lack of veining and sulfides is not easily explained. Pervasive potassic alteration prior to peak metamorphism (not vein related) is a possibility especially considering the nearby felsic porphyries (131.36-135.50m).

The late (post peak metamorphic) chlorite-epidote alteration could be retrograde or related to intrusion of diabase dikes (later overprint).



Sample 005-002-121.00m: PP Light Photograph. Meta-greywacke with significant K.Feldspar . Note disseminated epidote (high relief) and variably chloritized biotite (green laths). These constitute late (retrograde?) alteration.



Sample 005-002-197.00m: CP Light Photograph. Crowded Feldspar Porphyry. Note large remnant albite phenocryst to right with fine sericite-epidote alteration and fracture veinlet with twinned microcline. Granoblastic quartz, plagioclase, epidote and pyrite (opaque) to left.

SAMPLE 0505-002-173.00M. Aluminium-Silicate Altered Arenite. From 1995 Drill Log.

Sample Description

Mottled medium to dark grey, fine grained with crude banding generally less than 1cm. Local concordant wavy quartz lenses up to 2mm wide. 5-7% disseminated 1mm garnet grains with light pink colour (almandine?). Fine disseminated pyrite to 2%, local pyrrhotite-pyrite aggregates. Non to very weak magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	30-40
Plagioclase (albitic?)	15-20
Biotite	7->20
Muscovite	1-3
Garnet	1-10
Sillimanite	1-5
Tourmaline (green)	Tr
Chlorite	Tr-1
Pyrite	2-5
Pyrrhotite	Tr
Chalcopyrite	Tr

2) Comments

This sample features fairly distinct compositional banding determined largely by the relative proportions of biotite, muscovite, garnet, sillimanite and pyrite. Significant amounts of granoblastic quartz and plagioclase are always present. The banding is millimetre scale. The grain size within individual bands is fairly uniform 0.1 to 0.2mm. Biotite laths may reach up to 0.6mm and define a crude to moderate foliation.

Quartz and plagioclase form granoblastic mosaics. Locally larger plagioclase grains up to 1mm display good twinning and albitic compositions. Quartz-plagioclase-biotite schist bands contain up to 5% fine disseminated subhedral to cubic pyrite. These grains form linear trends parallel to banding (beddings?).

The adjacent band contain up to 20% coarser, crudely aligned biotite laths to 0.7mm, muscovite and local pyrite grains up to 0.5mm. Hypidiomorphic to irregular garnets up to 1.2mm contain numerous quartz inclusions and locally display weak fracturing . Pressure shadows are notably absent. Locally the biotite in these bands is overprinted by fibrous aggregates of sillimanite up to 1mm long (fibrolite patches). This sillimanite overprint affects only a small proportion of the biotite.

The third type of compositional band is intermediate between the first two with 2 to 4% garnet poikiloblasts to 0.6mm, 0.1 to 0.25mm granoblastic quartz and plagioclase, 10 to 15% biotite and up to 5% sillimanite patches. Trace amounts of prismatic green tourmaline are also present in these bands. Pyrite occurs as isolated generally anhedral grains to 0.2mm.

Sparse isolated grains of pyrrhotite and chalcopyrite can be identified in this sample.

3) Conclusions

The most probable protolith for this sample would be a laminated marly greywacke (semi-pelite, pelite). Microcline and veining were not observed in the thin section. Unlike the garnets in Sample 374m DDH 001 these appear to post date peak metamorphism. No pressure shadow minerals are present, however some late fracturing was noted.

The lack of crosscutting relationships and band control on mineralogy argues against 'aluminium silicate alteration' and for isochemical metamorphism. Examination of a much larger sample or sequence of samples would be required to confirm this.

Scale

1mm 0

Sample 005-002-173.00m: PP Light Photograph. Meta-Pelite. Note small irregular shaped garnet porphyroblasts (left central-colourless) in quartz-plagioclase-biotite schist. Fibrolite (sillimanite) patches occur proximal to garnets. Fine green prismatic tourmaline in lower central photograph.

SAMPLE 0505-002-197.00. Sample list shows Biotitic Arenite however 1955 drill log has a location within a Crowded Feldspar Unit (196.59 to 197.12m).

Sample Description

This sample is a crowded feldspar porphyry, biotite schist with 15 to 20% aligned tabular plagioclase feldspars to 2mm in a foliated fine grained groundmass. Staining suggests minor disseminated K.feldspar in the groundmass. Plagioclase and quartz are the dominant minerals with 2 to 3% fine disseminated pyrite. Non magnetic. One cut block displays a crosscutting siliceous vein and alteration envelope 4mm wide with significant amounts of disseminated pyrite up to 1mm grain size.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	20-25
Plagioclase (some twinned)	30 (15% as relict phenocrysts, sericite alteration)
Microcline (twinned)	3-6
Hornblende (green)	5
Biotite (brown)	25
Muscovite	Tr
Epidote (zoisite?)	3-5
Pyrite	2
Magnetite	Tr
Quartz veins with Hbl, Biot, Py	5

2) Comments

This sample displays patchy moderate to strong metamorphic recrystallization with a well developed schistosity defined by biotite and other aligned silicates and grain aggregates. Remnant plagioclase phenocrysts to 1mm long are ragged locally twinned and albitic. Some are fractured with fine silicate inclusions (sericite-minor epidote) and very fine cloudy opaques (hematite?). Adjacent to these grains and in the plane of foliation occur granoblastic quartz, plagioclase and microcline mosaics, 0.1 to 0.25 grain size. These aggregates combined with the relict plagioclase enhance the aligned 'tabular porphyritic' texture observed in hand specimen. The groundmass consists largely of aligned laths of brown biotite up to 0.7mm, less strongly aligned tabular green hornblende to 0.4mm in granoblastic to irregular mosaics of plagioclase (albite to oligoclase), quartz, epidote and pyrite (minor muscovite) 0.05 to 0.2mm grain size. Local irregular shaped coarser biotite forms part of granoblastic mosaics. Epidote (some zoisite compositions) also may be part of granoblastic mosaics (0.1-0.2mm grain size) or as fine aggregates and trails (0.02 to 0.06mm grain size). The latter epidote is late, possibly retrograde. Microcline is uncommon away from remnant phenocrysts and has a probable close relationship with albite.

A 1mm wide quartz veinlet crosses foliation at a 10° angle in the plane of section. It has diffuse contacts and features coarse quartz (1mm) and some finer grained hornblende, biotite and pyrite. Much of the coarser quartz displays brittle fracturing. Textures clearly suggest some metamorphic recrystallization of vein mineralogy especially along contacts.

3) Conclusions

This sample represents a metamorphosed porphyritic felsic intrusive (dike?). There is a strong biotite foliation accompanying metamorphic recrystallization. Veining appears to involve largely quartz and possibly pyrite (not K.feldspar). Textures suggest that this veining pre-dates peak metamorphism (latest). A probable composition for intrusive would be dacite or quartz monzonite.

DDH 0505-003. SUMMARY COMMENTS
Samples at 12.0, 85.50 and 100.0m

The samples were taken from a volcaniclastic-sedimentary sequence with Intermediate Tuffs, Crystal Tuffs and Pyroclastic Breccias above, possible Oxide-Silicate Iron Formation? (including 4m diabase intrusive), altered Pelitic Argillite, Arenite and Arkose. The sedimentary part of this sequence is below 90.75 metres in the hole.

Sample 12.0m is strong veined and altered with several events probably separated by metamorphic peaks. Blastoporphyritic textures suggest an intrusive or volcanic protolith. Significant quartz-plagioclase (minor microcline) veining took place prior to peak metamorphism. Late epidote, sericite and chlorite alteration is clearly evident.

Sample 85.50m is a kyanite-staurolite schist, a semi-pelite or pelite. Veining of any sort is notably absent in the sample. The mineralogy appears to reflect rapidly changing metamorphic conditions.

Sample 100.0m is another pelite and the mineralogy again reflects changing metamorphic conditions. Green to colourless (in thin section) chlorite/chloritoid is a later overprint partially obscuring earlier metamorphic textures. The protolith to this sample would be highly aluminous and iron rich. Microcline is rare.

SAMPLE 0505-003-12.0M. Felsic to Intermediate Crystal Tuff from 1995 Drill Log.

Sample Description

Mottled greys and whites, fine to medium grained hornblende-quartz-plagioclase schist with crude grain size banding 2-3mm up to 1cm wide. Local fine specks of pink to reddish coloured garnet. Lenses to discordant zones of coarser plagioclase, quartz and hornblende some of which are at high angles to foliation. Staining indicates patchy fine disseminated K.feldspar. In one cut block strongly contorted quartz occurs with patchy medium to coarse grained plagioclase and significant fine garnet, disseminated pyrite and pyrrhotite. Another block has numerous white quartz-plagioclase 'augen' to 3mm aligned with foliation. Sample is weak patchy magnetic.

Thin Section Description

The thin section displays the millimetre to centimetre scale parallel banding observed in hand specimen as well as a crosscutting band of similar composition at 70° to 80°.

1) Mineralogy

Two domains (band types) can be distinguished based on mineralogy and textures.

Domain 1

	Approximate %
Quartz	30-35
Plagioclase (albitic)	35-40
Microcline	Tr-2
Hornblende (green)	7-12
Biotite (green)	2-4
Epidote	5
Chlorite	Tr
Pyrite	2
Pyrrhotite	Tr-1

Domain 2

Quartz	20-25
Plagioclase (altered)	50-55
Microcline	1-2
Biotite	1-2
Hornblende	6-8
Epidote (some very fine)	5-8
Chlorite	Tr
Pyrite	1-2
Pyrrhotite	Tr-1
Very fine veinlets (Qtz+Ep+microcline)	3-4

2. Comments

Close examination of mineral textures clearly indicates that Domain 1 represents the background lithology while Domain 2 is a later overprint and in part vein related alteration.

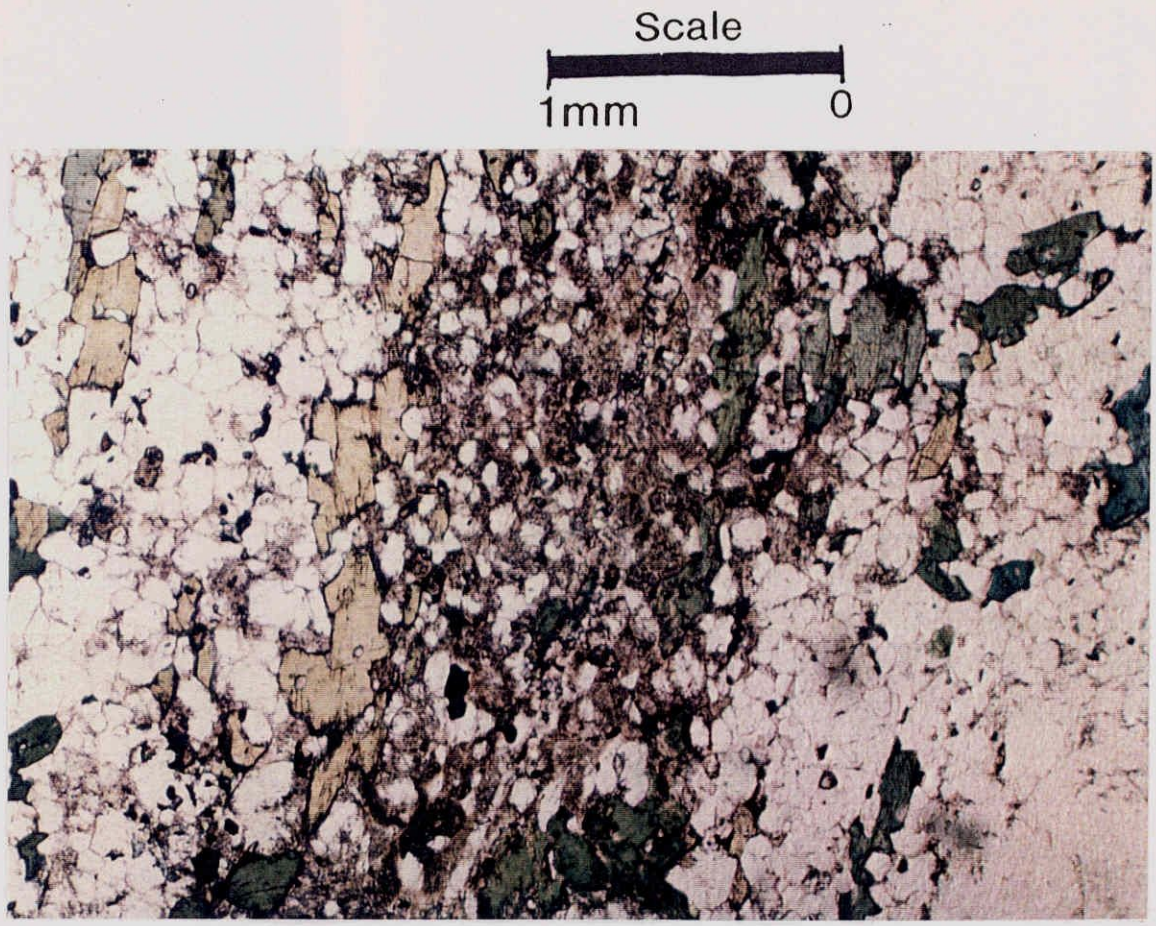
Domain 1 is fairly homogeneous with granoblastic 0.1 to 0.2mm grain size mosaics of plagioclase, quartz, green hornblende and lesser biotite. The later two minerals define a fairly coarse foliation. Light yellow to colourless epidote occurs as part of the granoblastic mosaics or as clusters of very fine grains. Some fine grained very weakly coloured garnet may also be present. One relict plagioclase (albitic) phenocryst could be identified. It is tabular, 6mm long with 0.1 to 0.2mm inclusions of yellowish epidote and light green chlorite. Pyrite occurs as disseminated anhedral grains and aggregates generally of similar grain size to mosaics but locally up to 0.5mm. Pyrrhotite grains are less common and finer. Textures in Domain 1 bands are metamorphic with little post peak metamorphic alteration other than possible fine epidote.

Domain 2 features a breakdown of the metamorphic granoblastic textures especially around grain boundaries which become vague and cloudy. These bands commonly have narrow discontinuous central veinlets less than 0.05mm wide with quartz, local fine epidote and K.feldspar (microcline?). These veinlets and associated bands are concordant or at 70° to 80° to the foliation in Domain 1. The breakdown of granoblastic textures is evident for several millimetres from the veinlets and the plagioclase is full of fine inclusions (saussuritized!). Hornblende and biotite display green chlorite alteration especially proximal to veinlets. Locally within the bands lensy coarser quartz aggregates (to 0.1mm grain size) have granoblastic textures and might represent relict veins.

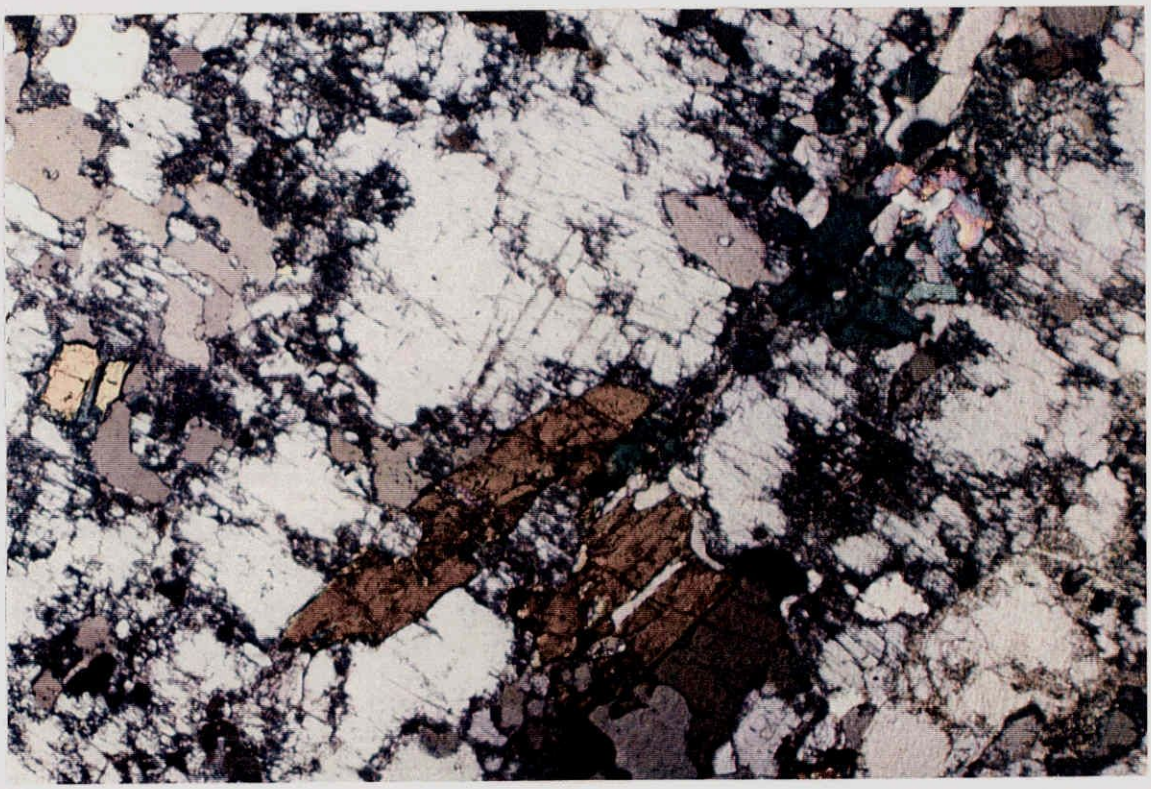
One of the main features of the discordant Domain 2 band is its patchy coarser grain size with plagioclase and hornblende greater than 1mm. Hornblende is not as common in this band (<5%). The plagioclase appears albitic and textures suggest some original grains (phenocrysts?) Greater than 1cm that have been overprinted by later alteration and or recrystallization. Granoblastic quartz and weak coloured epidote 0.1 to 0.4mm grain size constitute the rest of the band with local disseminated pyrite and pyrrhotite (trace amounts. Biotite is notably absent.

3) Conclusions

This is a difficult sample to interpret because of pre and post metamorphic veining and alteration. Significant veining took place prior to peak metamorphism and involved quartz-plagioclase and possibly microcline (quartz-feldspar veins). Post peak metamorphic alteration largely involves epidote and local chlorite basically along the same planes of weakness. Outside of the Domain 2 bands the mineralogy is fairly uniform with good metamorphic textures. This mineralogy and relict phenocrysts strongly suggests a felsic intrusive (or volcanic?) protolith. A crystal tuff is considered unlikely.



Sample 0505-003-12.00m: Strongly Altered Felsic Intrusive? Above: PP Light Photograph. Domain 2 Concordant Alteration Band, in centre. Note breakdown of granoblastic textures in bold Domain 2. Green hornblende and lighter green biotite laths. Significant fine epidote in Domain 2. **Below: CP Light Photograph. High Angle Domain 2.** Note coarse hornblende (brown, green) and fragmented larger albite (white with cleavage and dusty overprinted areas).



SAMPLE 0505-003-85.50M. Aluminium-Silicate Intermediate Tuff.

Sample Description

Mottled greys and greens, medium to coarse grained aluminium silicates in a finer quartz-biotite schist matrix. Kyanite and staurolite laths up to 1cm are the main visible aluminium silicates with loca pinkish finer grained garnet. Minor amounts of fine disseminated pyrite with local pyrrhotite grain. Sample is non magnetic and does not show any distinct veining.

Thin Section Description

1) Mineralogy and Comments

The aluminium silicate bearing schist locally contains greater than 50% coarse porphyroblasts (5-15mm) of staurolite and kyanite in a finer schistose quartz-biotite-plagioclase matrix with sparse pinkish garnet. Because of the variability and grain size variation of the mineralogy modal counts were not judged to be of any value.

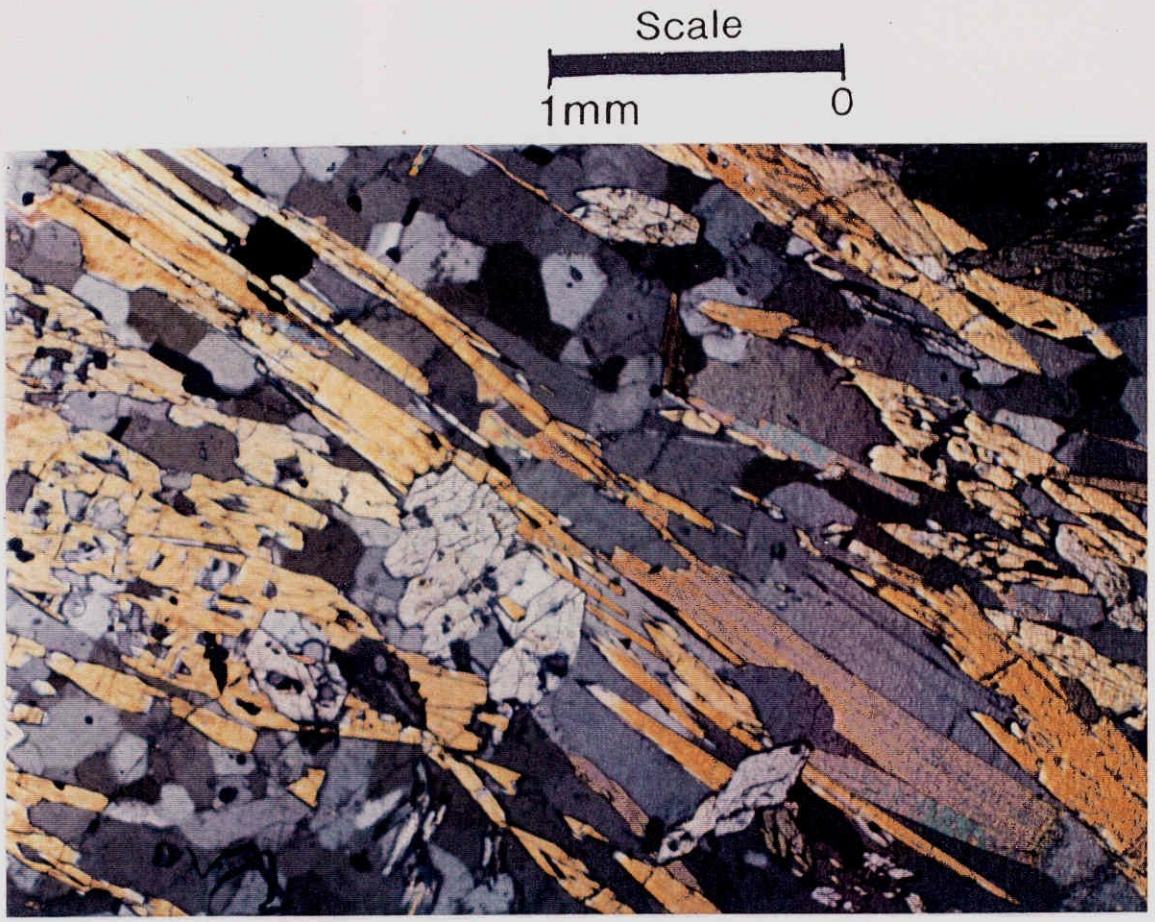
The staurolite and kyanite porphyroblasts are commonly coarse poikiloblastic blades to one centimetre or more in length. These form isolated grains, fans and mats with no apparent alignment. The staurolite is colourless to light yellow with numerous fine quartz and some biotite inclusions. Bladed kyanite is very weakly coloured with fewer, aligned quartz inclusions commonly along cleavages and fractures in the kyanite.

The porphyroblasts lie within finer lepidoblastic-granoblastic mosaics. Brown biotite laths and blades 0.2 to 10 mm define a foliation which is strongly influenced by the porphyroblasts. Locally the biotite forms narrow, semi-continuous lepidoblastic bands. One of these contains numerous aligned blades of a colourless mineral with well developed cleavage. Andalusite composition is preferred over chloritoid. Quartz and plagioclase form granoblastic mosaics within the schist with 0.2 to 0.6mm grain size. The plagioclase often contains fine dusty inclusions and a variety of twinning including pericline. Albite compositions appear fairly common. Pyrite (1-2%) forms part of the mosaics and has similar grain size.

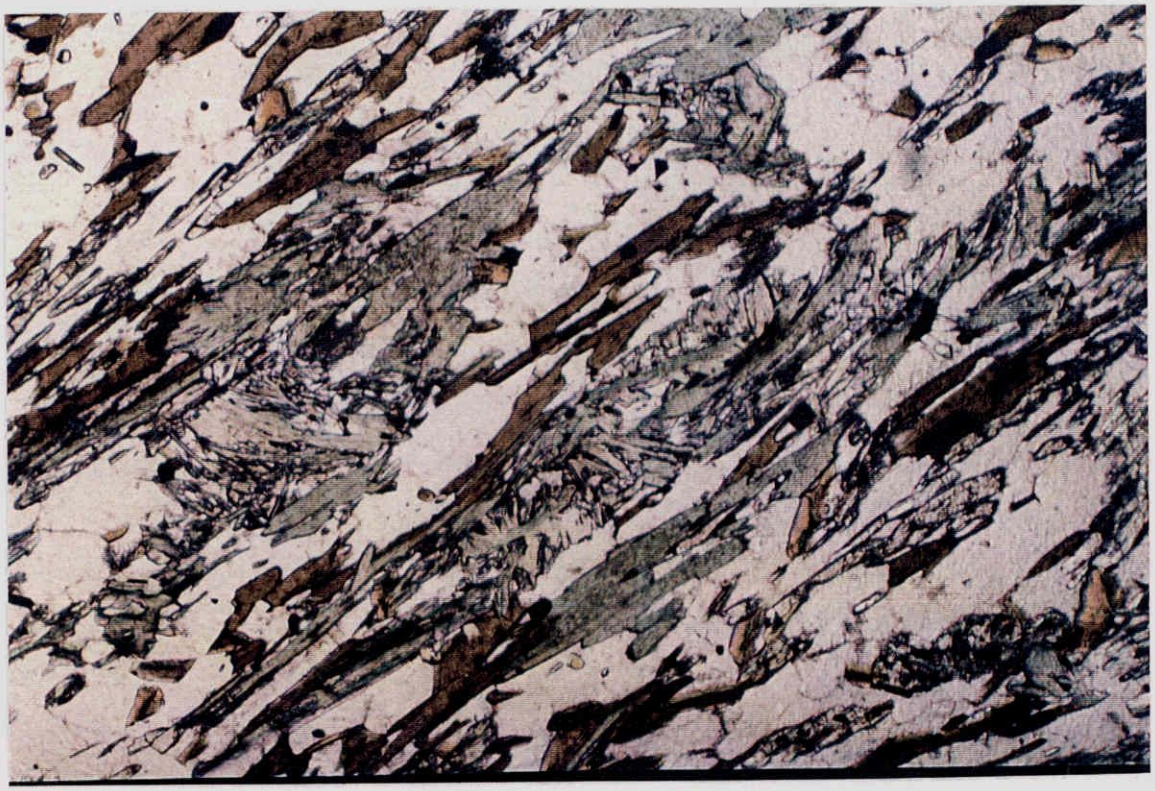
No veining, carbonate or microcline were identified in the thin section.

2) Conclusions

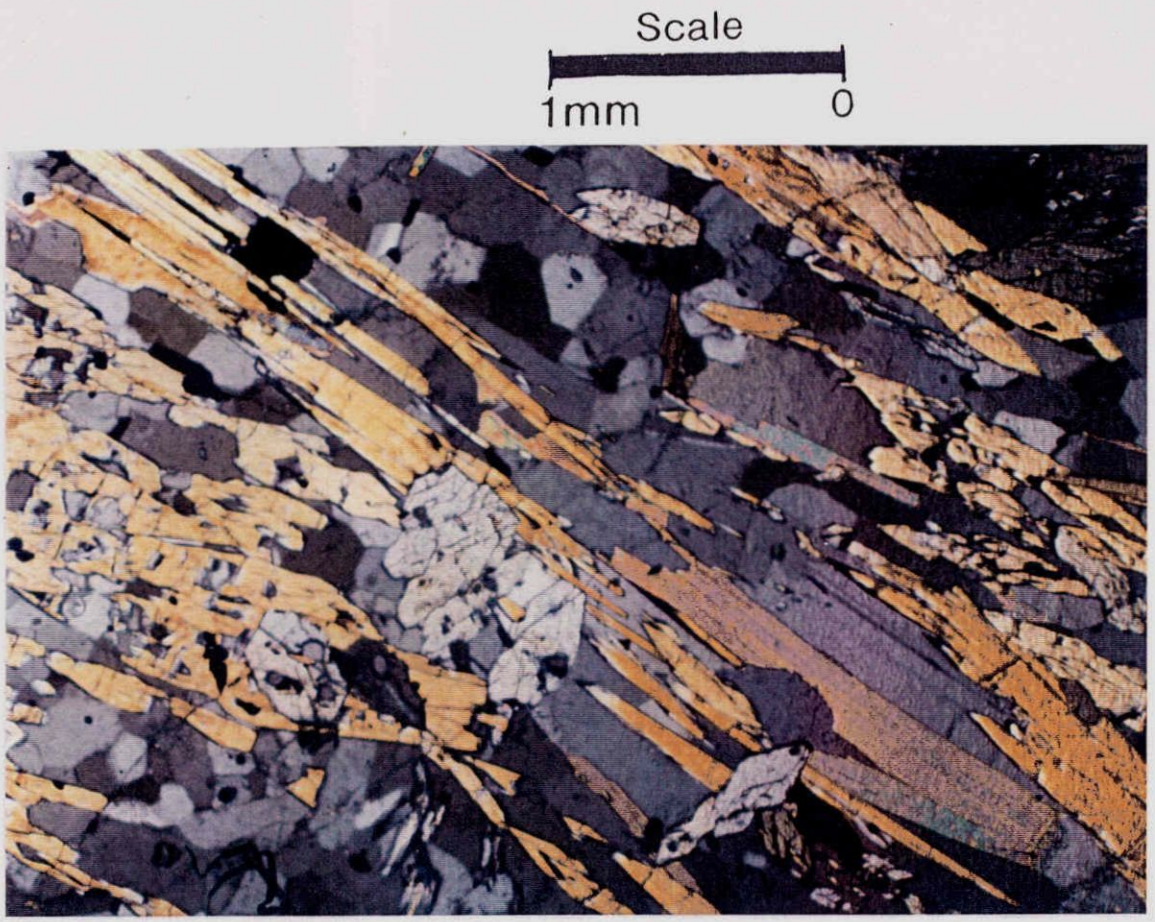
This sample is a semi-pelite or pelite. The absence of any relict veining and mineralogical variations argues against a metamorphosed alteration. Metamorphic mineral assemblages in this sample are notable metastable. There is some evidence of sillimanite after kyanite. A possible metamorphic pathway would be from high pressure, medium temperatures (kyanite, staurolite) followed by lower pressure metamorphism at similar temperatures (sillimanite, and schistosity).



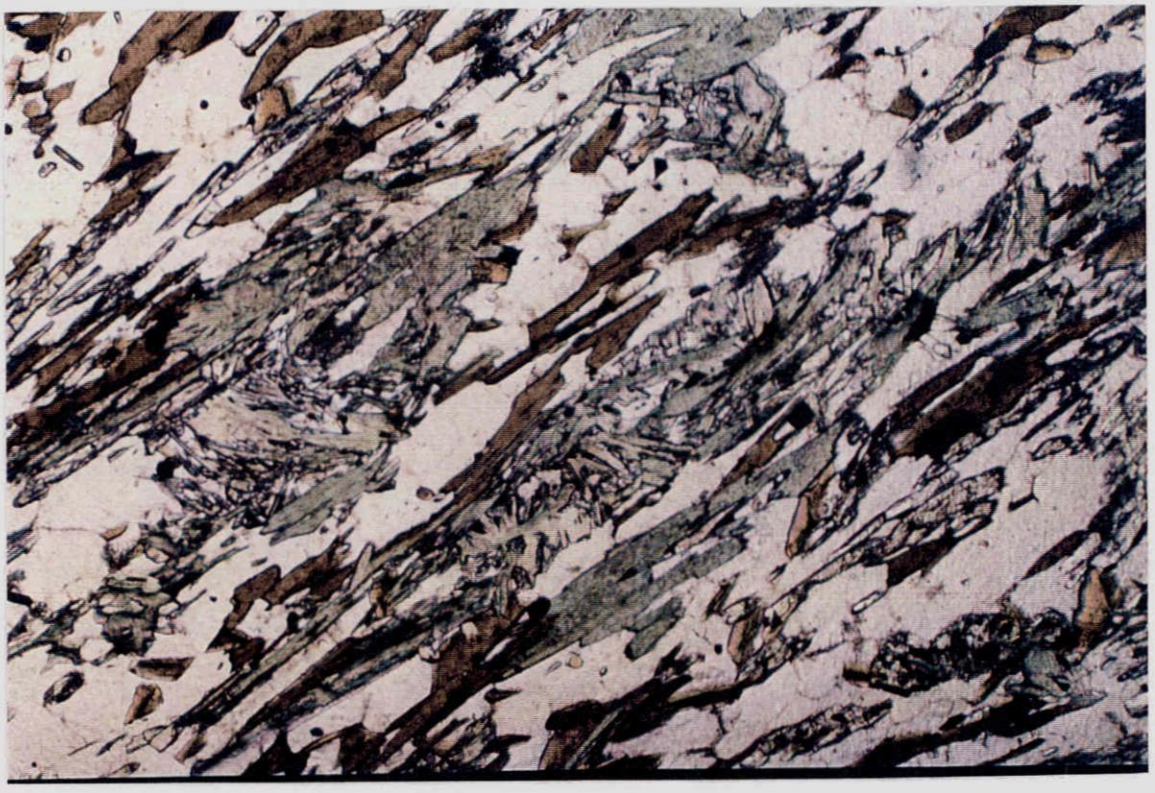
Sample 0505-003-85.5m: CP Light Photograph. Kyanite-Staurolite-Biotite Schist. Long kyanite blades, pinks-yellows and prismatic staurolite (weak yellow-white) in quartz, untwinned plagioclase and biotite matrix.



Sample 0505-003-100.00m: PP Light Photograph. Biotite-Chlorite/Chloritoid Schist. Note randomly to weakly orientated green chlorite/chloritoid overprinting biotite foliation (brown).



Sample 0505-003-85.5m: CP Light Photograph. Kyanite-Staurolite-Biotite Schist. Long kyanite blades, pinks-yellows and prismatic staurolite (weak yellow-white) in quartz, untwinned plagioclase and biotite matrix.



Sample 0505-003-100.00m: PP Light Photograph. Biotite-Chlorite/Chloritoid Schist. Note randomly to weakly orientated green chlorite/chloritoid overprinting biotite foliation (brown).

SAMPLE 0505-003-100.0M. Chlorite-Biotite Pelitic Argillite Arenite.

Sample Description

Mottled medium to dark grey, fine grained and patchy schistose. Local crude centimetre scale banding. Sparse fine disseminated pyrite, sample is non magnetic. Staining indicates possible K. feldspar along a 35° to 45° veinlet which appears to be overprinted by metamorphic recrystallization.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	20-35
Plagioclase	10-15
Microcline	Tr-1
Biotite (brown)	12-20
Chloritoid/Chlorite (green pleochroic)	30-35
Staurolite (poikiloblasts)	1-2
Kyanite	1
Pyrite	1
Magnetite	Tr
Fine opaques	1-1.5

2) Comments

This sample displays a variety of textures: a) good lepidoblastic with biotite and, or chlorite/chloritoid, b) granoblastic quartz-untwinned plagioclase and c) fairly randomly orientated laths, patches of chlorite/chloritoid. Grain size is relatively uniform with the mica and chloritic laths between 0.4 and 1mm and the other silicates 0.1 to 0.35mm. Staurolite forms isolated tabular poikiloblasts up to 1.5mm with numerous quartz inclusions and local brittle fractures. Kyanite occurs in the biotitic area as tabular to prismatic grains up to 0.3mm long.

Light green weakly pleochroic laths of chlorite/chloritoid in significant amounts. These have fairly high relief and variable clevage suggesting chloritoid. The laths occur parallel to foliation or as randomly orientated 'mats', locally the appear to overprint biotite. Kyanite also shows close spatial relationships with biotite and possible intergrowths.

Fine opaques occur as disseminated grains throughout the section. Pyrite forms anhedral grains commonly 0.05 to 0.1mm. Magnetite and possible rutile or ilmenite laths are generally less than 0.05 mm long.

A few isolated grains of twinned microcline were observed in one corner of the section. These do no link to form a vein but may represent recrystallized relicts?

3) Conclusions

This sample is a pelite or semi pelite. No carbonate minerals were recognized in this sample. The mineral assemblage Plagioclase-Staurolite-Kyanite-Biotite and Chlorite/Chloritoid is a `mixed bag' -metastable. These coexisting mineral phases suggest rapidly changing metamorphic PT conditions. The Chloritoid is possibly a lower temperature later overprint (after biotite?) And may be retrograde. There is no clear evidence for an alteration assemblage but it could be masked by later metamorphic recrystallization.

DDH 0505-004 SUMMARY COMMENT
Sample at 99.50 and 139.00m

From a sequence of Biotitic Arenite with scattered zones of silicification and epidote.

Sample 99.5m is a massive quartzo-feldspathic rock with biotite, few remnant quartz veins and probable greywacke parentage.

Sample 139.0m has relict bedding, fine rock fragments and similar parentage to the sample at 99.50m. Epidote alteration is associated with late brittle fracturing (post peak metamorphic). This may be confused with 'patchy silicification'. Early quartz veining has possible associated wallrock muscovite and some pyrite.

SAMPLE 0505-004-99.50M. Biotitic Arenite from 1995 Drill Log.

Sample Description

Light to medium grey with weak centimetre scale banding probably representing original bedding. Fine grained and biotitic with a weak foliation. A fine trail of K.feldspar grains are indicated from staining and possibly represent an early veinlet now crosscutting foliation at a small angle. 1 to 2% disseminated pyrite as cubes 0.2 to 0.5mm. Non magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	25-30
Plagioclase (largely untwinned)	40-45
Microcline (local pericline twins)	Tr
Biotite (green-brown)	20-25
Muscovite	Tr
Epidote (colourless)	1-2
Garnet (light coloured, pinkish)	Tr
Pyrite	1-2
Remnant veins. Qtz>Biot-Py-Musc.	2-3

2) Comments

This sample is a biotite rich schist with fine grained granoblastic to weak lepidoblastic mosaics of predominantly untwinned plagioclase, green-brown biotite and quartz. The textures and grain size is fairly uniform with quartz and plagioclase 0.1 to 0.2mm, biotite laths 0.3 to 0.5mm. Biotite defines the foliation, however only half of the blades are aligned, the rest occur at variable angles and locally form coarser patches with up to 1mm blade length. Plagioclase can often be distinguished by minor amounts of fine dusty inclusions. Identifiable microcline occurs in the felsic mosaics as isolated twinned grains. Fine disseminated xenomorphic and colourless epidote is disseminated throughout (<0.04mm). Light coloured garnet xenoblasts occur as rare isolated grains up to 0.4mm.

A few remnant veins can be distinguished with widths up to 1mm, subparallel to 25° to foliation. These are recrystallized with polygonal quartz mosaics 0.2 to 0.4mm grain size and minor, finer grained biotite, muscovite and pyrite (0.02 to 0.08mm). One of these contains minor identifiable microcline. These veins have recrystallized during metamorphism and have vague boundaries.

3) Conclusions

The protolith to this sample would probably be greywacke. Minor early quartz veining is evident. A very minor amount of biotite may be related to early veining.

SAMPLE 0505-004-139.00M. Silicified Arenite from 1995 Drill Log.

Sample Description

Light to medium grey, centimetre size banding probably representing relict bedding. Fine grained and biotitic with a moderate foliation in the finer, darker coloured (more biotitic) bands. Staining suggests possible remnant K.feldspar veinlets at intermediate to high angles to foliation. No K.feldspar is apparent outside of these. Minor fine disseminated pyrite (1%) as cubes up to 0.5mm. The sample is non magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	25-35
Plagioclase (untwinned)	25-30
Microcline	Tr
Biotite (local green chlorite altered)	25-30
Muscovite	1-2
Epidote	3-5
Calcite	1
Pyrite	1
Hematite	Tr-1
Rock Fragments (mostly quartz)	1-3
Quartz Veinlets	1

2) Comments

This sample displays fairly distinct compositional and grain size banding when compared with the sample at 99.50m. Fine grained biotite schist bands predominate with well aligned brown to green (chlorite altered) laths 0.1 to 0.5mm in granoblastic mosaics of quartz and untwinned plagioclase with quite variable grain size (0.2 to 0.2mm) and local coarser quartz rich rock fragments to 1mm. Microcline is rare. Fine muscovite blades to 0.15mm and epidote grain aggregates occur throughout. Several zones of fine epidote cut foliation at a high angle and commonly overprint plagioclase. The biotite blades in these areas are commonly chloritized. Some very fine, high angle, late quartz veinlets can be distinguished that clearly cut metamorphic biotite grains. Narrow 2 to 3mm wide compositional bands with coarser grained mineralogy and weak foliation contain quartz rock fragments (to 1mm), poorly aligned biotite laths (to 1mm), variable quartz, plagioclase, calcite, epidote and muscovite. Pyrite occurs as disseminated grains in both of these compositional bands as anhedral to subhedral fine grains less than 0.1mm or as cubes up to 0.6mm with blades of muscovite (pressure shadows?).

The third type of band occurs at the end of the thin section with quartz-plagioclase-fine biotite laths (10%) and coarser muscovite as well aligned laths up to 0.2mm long. A

subconcordant recrystallized quartz veinlet 0.2mm wide occurs central to this band. An early vein with alteration envelope is suggested rather than an original compositional band..

3) Conclusion

There are many relict features in this sample which suggest a metamorphosed bedded greywacke. It has variable grain size (poorly sorted) with relict rock fragments and local carbonate (calcite) in coarser grained bands.

Textures suggest two or more vein events. Early-pre-peak metamorphic quartz veinlets are recrystallized and have probable quartz-muscovite alteration haloes. Possible microcline veinlets at an angle to foliation can be distinguished by staining and fine hematite trails. Late high angle, fine quartz veining has associated zones of epidote alteration and chloritized biotite. The two different pyrite modes in this sample also suggest two generation possibly pre to syn and post peak metamorphic.

There is no evidence for pervasive silicification, possibly this is being confused with patchy fine epidote alteration.

DDH 0505-005 SUMMARY COMMENTS
Samples at 144.50, 146.00 and 156.50m

The samples were taken from the following sequence:

130.0-145.53	Aluminium Silicate Altered Arenite
145.53-156.20	Quartz-Sericite Altered Arenite with patchy K.feldspar
156.20-171/88	Biotitic Arenite with Barite?

Sample 144.50m is a biotite-muscovite schist with relict bedding and a semi-pelite. Sillimanite overprints metamorphic biotite and has a local association with rare low angle shears. Microcline is absent.

Sample 146.00m is a quartzo-feldspathic metasediment with relict rock fragments and possible greywacke parentage. Several vein events are evident including: Early (pre-peak metamorphic) discordant quartz-microcline (K.feldspar) zones; Early quartz-muscovite veins and Late (post-peak) penetrative, high angle chlorite-epidote veinlets. Sericite alteration of plagioclase and microcline is clearly late

Sample 156.50m is another quartzo-feldspathic metasediment (greywacke?) with very minor veining. Alteration is late and restricted to chlorite after biotite.

Pre-peak metamorphic brittle fracturing and quartz veining with associated K.feldspar (microcline) alteration is suggested. The host rocks are meta sediments probably massive to bedded greywackes. The lack of K. feldspar and quartz veining in peripheral samples suggests a fairly tight system (fracture zone). No obvious intrusive rocks are apparent in the drill log within the K.feldspar altered interval or below.

SAMPLE 0505-005-144.50M. Aluminium Silicate Altered from 1995 Drill Log.

Sample Description

Medium to dark grey, fine grained biotite schist with broad centimetre scale banding based largely on variation in grain size and local light coloured lamina. Local 1 to 2mm equant pinkish coloured (almandine?) garnets. Very fine concordant to low angle biotite shears. 1 to 2% fine disseminated tabular pyrite aggregates aligned with foliation. The sample is non magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	20-30
Plagioclase (locally twinned-albite-oligoclase)	30-35
Microcline	Tr?
Biotite (brown)	20-30
Muscovite	1-8
Epidote (colourless)	Tr-1
Garnet (almandine)	1
Sillimanite	2-3
Chlorite	Tr-1
Green Tourmaline	Tr-2
Pyrite	2

2) Comments

This fine grained biotite schist features a strong metamorphic fabric consisting of mixed granoblastic to lepidoblastic quartz-plagioclase-biotite mosaics. A distinct banding is evident involving differences in average grain size and some compositional variations. The main compositional variations are in the relative proportions of quartz, plagioclase, biotite and muscovite. Individual bands are even grained with granoblastic quartz and plagioclase between 0.1 and 0.35mm average grain size, biotite and muscovite laths between 0.2 and 1.5mm long. Pyrite occurs in most bands as part of granoblastic mosaics with local aligned grains and tabular aggregates up to 0.3mm long. Fine epidote is disseminated throughout as xenoblastic grains. Disseminated 'stubby' tabular grains of green tourmaline up to 0.2mm are largely restricted to bands of biotite-muscovite schist.

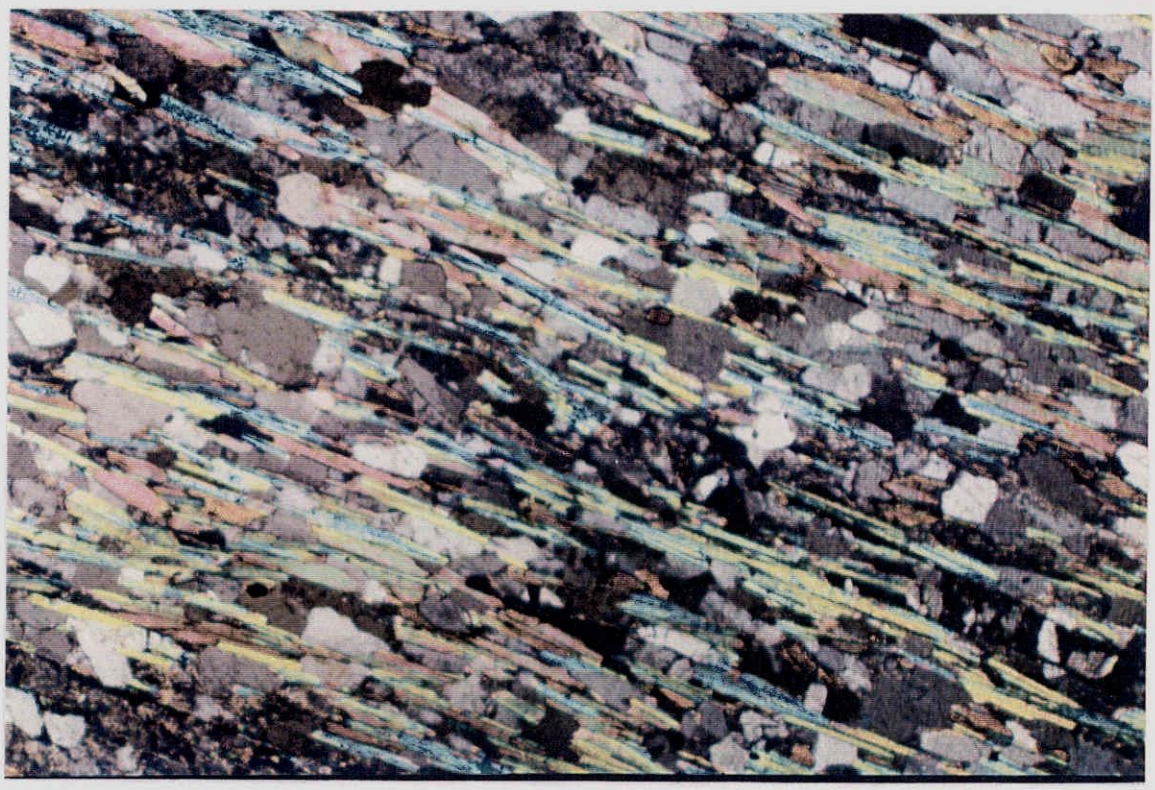
Poikiloblastic pink garnet occurs in quartz-biotite rich bands as grain aggregates up to 1.2mm with numerous quartz inclusions and relict pressure shadows. These garnets are pre peak deformation/metamorphism. Proximal biotite blades in pressure shadow areas display patchy chlorite alteration.

Within many of the bands there is weak patchy overprinting of biotite by mats of very fine grained sillimanite (fibrolite). Narrow shears featuring elongate biotite blades up to 1.7mm cut foliation at a very small angle and display patchy fine sillimanite. Some of the shears feature narrow veinlet/alteration zones up to 0.2mm wide with fine quartz, sillimanite and muscovite? Locally these fragmented vein textures suggest that the shearing in part followed pre existing vein sets.

3) Conclusions

This sample has a strong metamorphic fabric. Textures suggest early compression with little to no rotation (from garnets and pressure shadows). Followed by later shearing involving biotite, possibly sillimanite and muscovite under amphibolite grade metamorphism (moderate pressures). Some fine quartz veining pre dates this later shearing. Most if not all of the pyrite in this sample occurs as part of recrystallized metamorphic mosaics.

The nature of the compositional and grain size banding tends to argue against a pre metamorphic altered protolith. A laminated pelite to semi-pelite protolith is probable.



Sample 0505-005-144.5m: CP Light Photograph. Biotite Muscovite Schist. Note vague diagonal low angle fracture/shear and very fine associated fibrolite (sillimanite) bottom right.

Sample 0505-005-146.00m: CP Light Photograph. Quartz-Feldspathic Metasediment. Note early recrystallized quartz vein (diagonal) concordant with biotite (light colours) foliation. Late penetrative, high angle chlorite-epidote veinlet.

SAMPLE 0505-005-146.0. Silicified Sericitic Arenite Sequence from 1995 Drill Log.

Sample Description

Light grey, fine grained felsic schist with biotite and minor muscovite. Local light pink garnets (almandine) as isolated commonly 'augen' shaped grain aggregates up to 3mm. K. feldspar crossing foliation at 50° to 60°. These may or may not be spatially associated with late penetrative quartz-chlorite? veinlets/fractures at similar angles to foliation. In hand specimen the K. feldspar and veinlets give rise to strong discordant 'bleached' looking zones. The sample is non magnetic with 1 to 2% fine disseminated pyrite locally as aggregates to 1mm.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	30-35
Plagioclase (variable altered to Ser, Epid)	20-25
Microcline (weak twinning difficult to ID)	Tr-10?
Brown Biotite (commonly green chlorite altered)	15-20
Muscovite	3-4
Epidote (colourless)	1-3
Garnet (almandine?)	3-5
Chlorite (biotite alteration and veinlets)	3-5
Carbonate (calcite)	Tr
Pyrite	1-1.5
Hematite	Tr-1
Rock fragments (largely quartz)	5

2) Comments

This foliated sample features strongly aligned lepidoblastic brown biotite laths within granoblastic metamorphic mosaics of quartz, poorly twinned plagioclase, muscovite and patchy microcline. Biotite laths are up to 0.6mm long and are frequently green from chlorite alteration. Quartz, plagioclase and microcline occur as 0.1 to 0.3mm grains. These granoblastic mosaics are breaking down through alteration of the feldspars. Plagioclase is frequently ragged and cloudy with fine dusty inclusions, sericite and epidote alteration. Microcline occurs in patchy concentrations with rare twinning making identification difficult. Some large areas in the thin section have no recognizable microcline. Muscovite occurs as part of granoblastic mosaics with similar grain size, locally larger skeletal grains and aggregates are up to 0.5mm. Light coloured garnets occur as lensy shaped grain aggregates up to 2mm long aligned with foliation. They appear recrystallized with plagioclase and quartz, the larger more continuous grains commonly display weak to moderate fracturing. This suggests the garnets are early pre (last) peak metamorphism/deformation. Small relict rock fragments up to 2.0mm consist largely of recrystallized quartz up to 0.4mm and are elongate and f lattened. Some of these may be quartz

vein rock fragments (flattened).

Several generations of veins and possible alteration are indicated in this sample:

1) Very narrow 0.04 to 0.08mm high angle (55-80°) veinlets are associated with the broad zones of K.feldspar (microcline?) and quartz. These veinlets are later than some of the garnets but earlier than granoblastic mosaics (peak metamorphism). The K.feldspar in the wallrocks is recrystallized and part of granoblastic mosaics.

2) Early quartz veins concordant with foliation. Recrystallized polygonal quartz with local muscovite. These veins pre date peak metamorphism. Some clearly post date (1).

3) Late penetrative 50°-90° brown green chlorite or epidote-chlorite-carbonate veinlets. These post date metamorphism and are up to 0.2mm wide with sharp contacts. The plagioclase for several millimetres from these veinlets is altered with breakdown of granoblastic mosaics (retrograde alteration). The biotite displays widespread chlorite alteration. Dusty hematite is present locally. This vein set appears to be related to narrow zones of semi-penetrative fracture cleavage.

Pyrite does not appear to be directly related to any of these veins. It occurs as late cubic to subhedral 0.2 to 0.4mm disseminated grains.

3) Conclusions

This sample represents a metamorphosed quartzo-feldspathic sediment. The presence of fine rock or vein fragments is clear evidence for this.

A very strong linear schistosity/foliation and garnet textures indicates compression (flattening) with no clearly associated rotation (shear).

Significant veining appears to have occurred prior to peak metamorphism/deformation involving quartz and K.feldspar. Late veining accompanied brittle deformation with widespread epidote-chlorite (retrograde) alteration.

Garnets in this sample possibly indicates a possible earlier metamorphic event (contact or regional?).

SAMPLE 0505-005-156.50M. From a Sequence of Biotitic Arenite with Calc-Silicate Bands. From 1995 Drill Log.

Sample Description

Medium to dark grey, fine grained and biotitic with weak to moderate schistosity and local fine pink (almandine) garnets to 1mm. The sample appears even grained and does not take K. feldspar stain. Local concordant fine quartz and or plagioclase lenses. Very weak magnetic and sparse fine disseminated pyrite.

Thin Section Description

1) Mineralogy

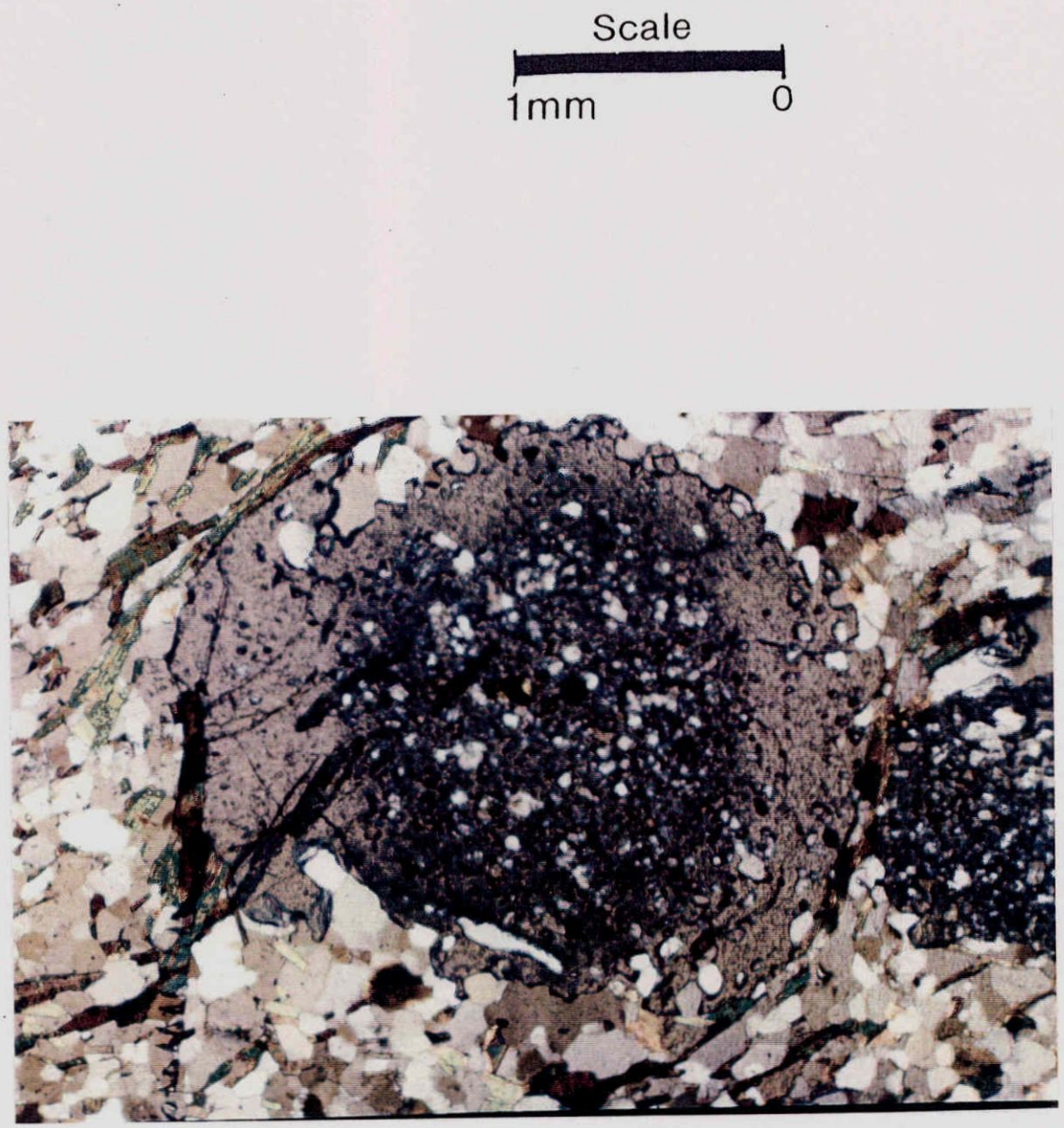
	Approximate %
Quartz	30-35
Plagioclase (untwinned)	35-40
Biotite	20-30
Garnet (pink to clear)	2-3
Chlorite/Chloritoid	Tr
Pyrrhotite	1-2
Pyrite	Tr
Magnetite	Tr

2) Comments

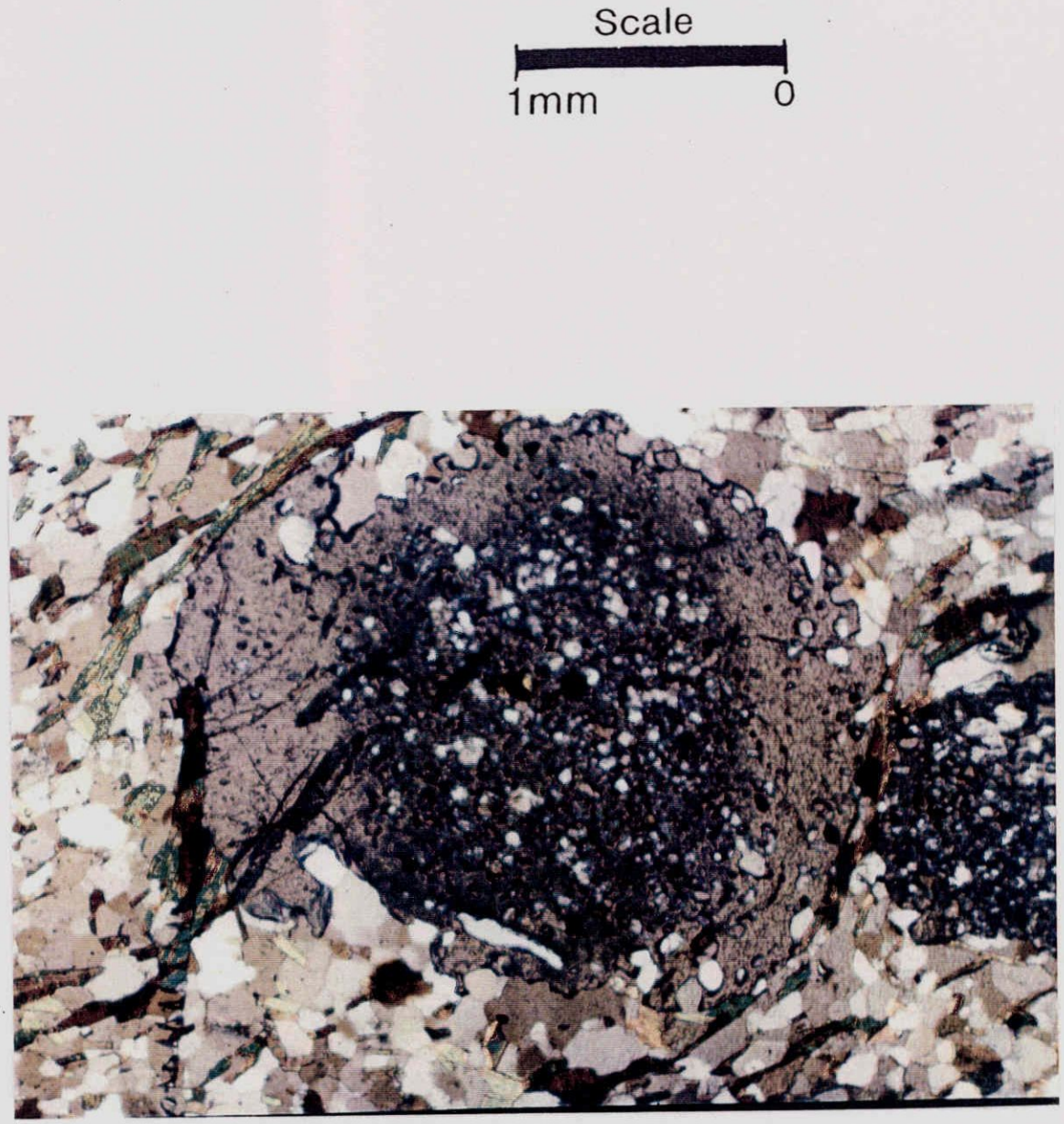
This sample is a quartz-plagioclase feldspar-biotite schist with good metamorphic mixed granoblastic-lepidoblastic textures. Brown biotite laths from 0.1 to 1mm define foliation with granoblastic mosaics of quartz and plagioclase averaging 0.1 to 0.25mm. Locally the plagioclase forms larger irregular grains up to 0.6mm with fine dusty inclusions. Biotite is generally fresh though minor patchy green chlorite, chloritoid can be observed as a weak overprint. Garnet has two modes as 1) fine 0.2 to 0.4mm irregular shaped grains with fine quartz inclusions or 2) as large equidimensional ball shaped grains up to 2.5mm with pinkish cores with numerous inclusions (largely quartz) and colourless rims with fewer but similar inclusions. The quartz pressure shadows in these are recrystallized-granoblastic. These relationships suggest two stages of garnet growth, pre and post kinematic (possible polymetamorphic history). Pyrrhotite is the dominant sulfide occurring as 0.02 to 0.1mm disseminated grains with trace amounts of pyrite and magnetite.

3) Conclusions

This sample probably represents another quartzo-feldspathic metasediment. Broad coeval metamorphism and deformation involved no obvious shearing (rotation). There is no clear remnant veining or microcline in this sample.



Sample 0505-005-156.50m: CP Light Photograph. Quartzo-Feldspathic Metasediment with garnet. Equidimensional garnet porphyroblast with zones of fine silicate inclusions. Note relationship with surrounding granoblastic silicates and biotite (colours).



Sample 0505-005-156.50m: CP Light Photograph. Quartzo-Feldspathic Metasediment with garnet. Equidimensional garnet porphyroblast with zones of fine silicate inclusions. Note relationship with surrounding granoblastic silicates and biotite (colours).

DDH 0505-006 SUMMARY COMMENTS
Samples at 150.0, 185.50 and 249.00m

The samples were taken from the following sequence:

133.83-173.22m	Spotty Chloritic-Biotitic Altered Intermediate Tuff/Volcaniclastic
173.22-205.54m	Variable K.spar-Sericite Altered Arenite
205.54-227.75m	Argillic Altered, Sillimanite bearing Arenite
227.75-284.29m	Intercalated Sillimanite-Garnet bearing Arenite.

All three samples are kyanite-staurolite-biotite-sillimanite bearing schists and pelites or semi-pelites.

Sample 150.0m has no observable veining or rotational deformation (shearing). Fibrolite (sillimanite) is late metamorphic possibly after biotite and/or kyanite.

Sample 185.50m is quite similar to the previous sample and does not contain identifiable microcline (K.feldspar). A chlorite/chloritoid rich band probably follows a low angle shear.

Sample 249.00m displays some early quartz veins (v. minor microcline?). Significant late sericite alteration of plagioclase and chlorite alteration of biotite is evident. As in the previous sample some shearing has probably occurred at a low angle to foliation an is marked by chlorite, chloritoid alteration.

In the three samples examined the aluminium silicate mineralogy probably reflects the original lithology (pelite or semi-pelite). Much of the observed alteration is late (post-peak metamorphic) involving sericite, chlorite and epidote (minor). Metastable metamorphic silicate mineral assemblages suggest a complex probable polymetamorphic rock history (or single variable event).

SAMPLE 0505-006-150.00M. Chloritic Intermediate Tuff, Volcaniclastic Sequence. From 1995 Drill Log.

Sample Description

Medium grey, fine to fine-medium grained schist with biotite and probable blades of kyanite and staurolite at variable angles. The sample does not display any obvious compositional banding and is weakly magnetic. Fine disseminated pyrite, sparse pyrrhotite.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	25-30
Plagioclase -untwinned	10-20
Brown Biotite	5-8
Kyanite	12-20
Staurolite	10-15
Sillimanite	5-10
Pyrite	2-3
Pyrrhotite	Tr
Fine opaques (magnetite, rutile, ilmenite?)	Tr-2

2) Mineralogy

In this sample the alumina-silicate minerals occur in larger concentrations that biotite, foliation is largely defined by kyanite. Metamorphic textures are mixed lepidoblastic and granoblastic with porphyroblasts of kyanite and staurolite.

Colourless kyanite forms narrow blades between 2 and 4mm long. Colourless to light yellow staurolite forms irregular poikiloblastic grains between 0.2 and 1mm with numerous quartz inclusions. These grains are commonly elongate but do not display any alignment. Brown biotite laths up to 0.4mm are locally aligned with foliation. Commonly biotite, kyanite and staurolite form aggregates of variably orientated grains. Patches of fibrolite (sillimanite) up to 0.5mm are common in these areas but also occur within granoblastic mosaics. These patches are spatially associated with biotite and or kyanite, however it is not clear what they overprint/replace. Lensy granoblastic mosaics feature quartz and untwinned plagioclase 0.1 to 0.7mm grain size with biotite and sillimanite. The plagioclase is commonly cloudy through fine inclusions. A variety of fine opaques are disseminated throughout the sample. Pyrite forms anhedral to subhedral grains up to 0.4mm. Trace amounts of much finer grained pyrrhotite, magnetite and possibly rutile and ilmenite (blades) are also present.

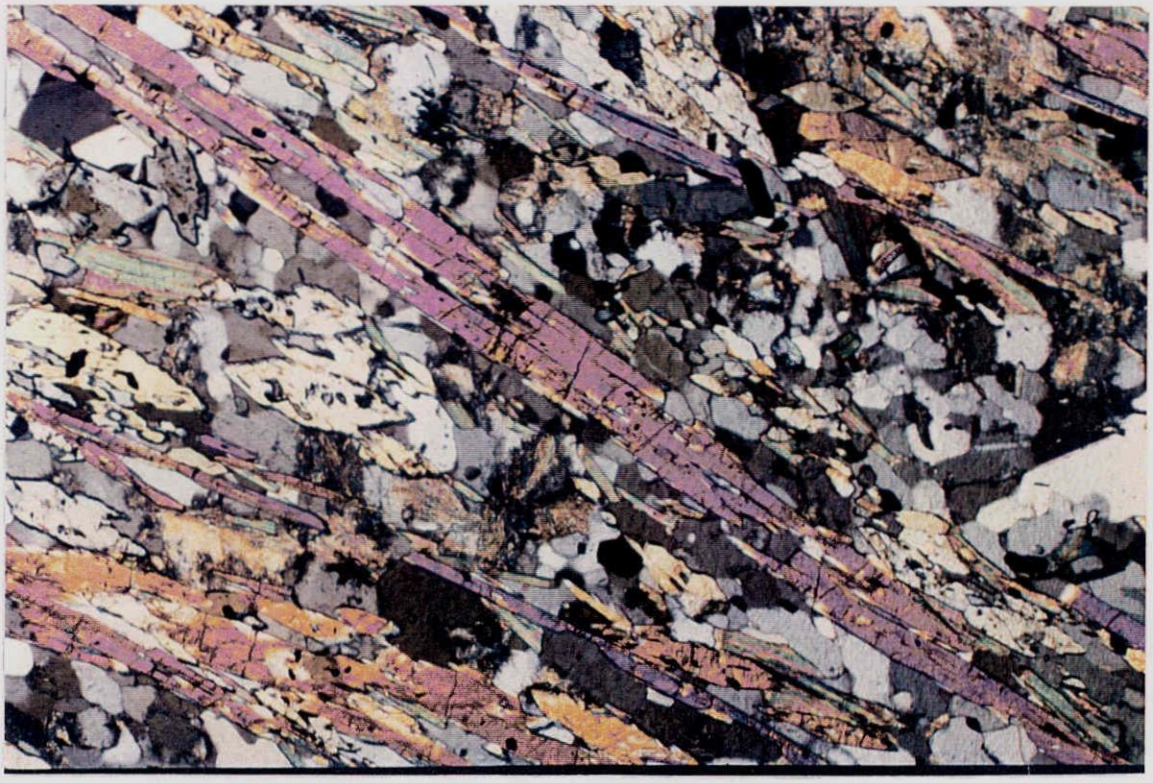
No veining or chlorite was identified in this sample.

3) Conclusions

An intermediate tuff as a protolith to this sample is considered highly unlikely. The mineralogy does not include garnet or true calc-silicates and suggests a semi-pelite or pelite. There are no indications of a meta-alteration assemblage.

Scale

1mm 0



Sample 0505-006-150.00m: CP Light Photograph. Kyanite-Staurolite-Sillimanite Schist. Large kyanite porphyroblasts (coloured blades) and prismatic staurolite (light yellows). Note fine radiating fibrolite (sillimanite), lower centre photograph.

Sample 0505-006-185.50m: CP Light Photograph. Kyanite-Staurolite-Schist. Note coarse grained band to left with blades of chloritoid/chlorite, irregular quartz and plagioclase.

SAMPLE 0505-006-185.50M. Kspar-Sericitic Arenite. From 1995 Drill Log.

Sample Description

Mottled light greys, fine to medium grained kyanite-biotite schist with 1 to 2% fine disseminated pyrite. Staining indicates possible fine disseminated K.feldspar. This sample displays weak patchy magnetism. No remnant veining or late fracturing is evident in hard specimen.

Thin Section Description

1) Mineralogy

This sample can be split into two domains based on grain size and mineralogy. Kyanite-staurolite schist predominates and consists of the following:

	Approximate %
Quartz	35-45
Plagioclase (untwinned)	10-20
Brown Biotite	5-7
Kyanite	15-20
Staurolite	5-10
Sillimanite	1-2
Chlorite/Chloritoid	Tr-1
Pyrite	1-2
Opaques (mainly Ti minerals some magnetite)	1-2

The other domain is defined by a lensy band up to 6mm wide with coarser mineralogy, predominantly chlorite/chloritoid, quartz and plagioclase.

2) Comments

This sample has variable grain size with kyanite and staurolite porphyroblasts in a granoblastic groundmass of quartz, plagioclase and brown biotite. Foliation is defined by aligned tabular kyanite porphyroblasts up to 6mm long and by less well aligned smaller biotite laths up to 0.6mm. The kyanite is colourless in thin section (light blue in hand specimen). Colourless to light yellow (brown in hand specimen) staurolite poikiloblasts up to 2mm are prismatic to short tabular with numerous quartz inclusions. Quartz and plagioclase form polygonal granoblastic mosaics with predominant grain size 0.1 to 0.4mm. Accessory minerals include green chlorite/chloritoid laths, subhedral disseminated pyrite (to 0.3mm) and anhedral to tabular Ti minerals (to 0.4mm), fine magnetite? Sillimanite is present but difficult to identify because the thin section is perpendicular to small fibrolite bundles. These fibrolite patches are quite common and frequently occur proximal to patches of staurolite, kyanite and biotite. The relationship of the sillimanite to these minerals is not clear, no overprinting could be observed.

A coarser grained lensy band up to 0.6mm wide is subconcordant to foliation. It consists predominantly of semi continuous masses of lepidoblastic light green chloritoid/chlorite?. This mineral forms blades and laths up to 4mm long which are commonly aligned with foliation in the host but may vary up to ten degrees. Coarse plagioclase (albitic?) to 3mm and irregular weakly fractured quartz grains to 2mm form granoblastic lenses enveloped by the chlorite mineral. Blades of ilmenite? up to 0.6mm long occur within the chlorite masses and have similar alignment. The relationship of this band to the surrounding schist and its strong foliation strongly suggests a low angle shear. Some lenses of schist occur within the band which locally appears to anastomose. Above the band the adjacent schist has a very strong linear fabric. The contacts to the band are sharp to locally diffuse.

3) Conclusions

No veining, remnant or late was observed in this sample. K.feldspar (microcline) may be present but could not be identified, hand specimen staining was far from being definitive.

This sample is a semi-pelite or pelite. It is not a calc-silicate as garnet and epidote etc are absent. No sericite was observed. There is probable confusion here with fine aluminium silicates.

Possible shearing is indicated by a coarser grained band with chlorite/chloritoid. This is at a low angle to foliation and probably represents a ductile shear zone syn to post peak metamorphism.

SAMPLE 005-006-249.00M. Intercalated Sillimanite-Garnet Arenite. From 1995 Drill Log.

Sample Description

Mottled light to dark grey, fine to medium grained and porphyroblastic with numerous bladed minerals including kyanite, staurolite and biotite. A weak to moderate irregular foliation is present with local centimetre scale augen which are more greenish grey, possibly chlorite altered and have slightly coarser grain size. Quartz and feldspar (plagioclase) lenses and veins up to 5mm are common and at variable low angles to foliation. K.feldspar staining indicates local minor concentrations of potassium feldspar. Minor amounts of fine disseminated pyrite and pyrrhotite, the sample is non magnetic.

Thin Section Description

1) Mineralogy and Comments

This sample shows significant variations in grain size and dominant mineralogy. These variations combined with veining and alteration make modal mineralogy very difficult and of little significance. Kyanite and staurolite blades and prisms up to 3mm commonly define foliation. These porphyroblasts account for up to 25% of the mineralogy and may occur together or separately. One area/band has colourless staurolite at the total exclusion of kyanite. Kyanite predominates in bands or areas containing augen and is commonly concentrated along the margins. The kyanite and staurolite porphyroblasts lie in a granoblastic matrix of quartz and strongly altered plagioclase. The grain size of the polygonal quartz is highly variable from 0.1 to greater than 1mm.. Plagioclase is almost unrecognizable, ragged from strong sericite and local fine epidote alteration? (retrograde?). Brown biotite is restricted to some areas and bands and forms aligned laths up to 1mm. These are commonly altered with local fibrolite (sillimanite). Kyanite in these areas also displays alteration, possibly to sillimanite and, or chlorite/chloritoid.

Irregular lenses and bands of coarser grained polygonal quartz up to 1.3mm probably represent recrystallized veins. Many of the larger grains exhibit weak brittle fracturing and undulose extinction (deformed). Rare pericline twinned grains occur near these veins and may represent microcline.

The augen have 0.5 to 3mm grain size with significant polygonal quartz that frequently displays brittle fracturing and undulose extinction. Recognizable blades and laths of biotite and kyanite up to 1mm are aligned with foliation. Numerous aligned laths of similar grain size occur at the margins to the augen. These are light green pleochroic to colourless and have perfect cleavage in one direction. Frequently the cleavage is kinked and distorted with highly irregular extinction. It is possible that this represents chlorite/chloritoid alteration of biotite. 18° extinction angles are more consistent with chloritoid.

Several late, very fine brittle fracture zones cross the sample (penetrative) at a high angle to foliation.

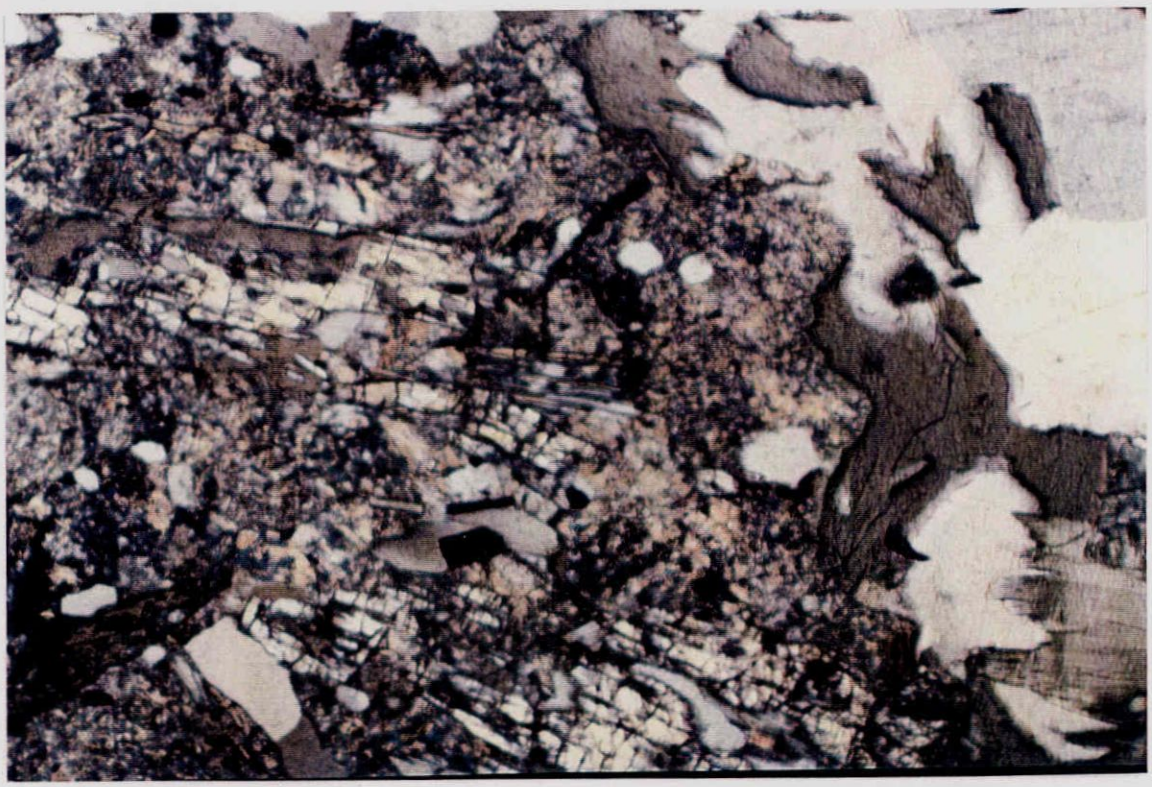
Fine anhedral opaques up to 0.1mm are disseminated throughout the sample (1 to 2%). Both pyrite and pyrrhotite are present. Narrow blades up to 0.3mm possibly represent titanium mineral phases (rutile-ilmenite).

2) Conclusions

This sample appears to represent a strongly metamorphosed, deformed and veined meta-pelite or semi-pelite. Significant veining and probably dislocation took place prior to the main metamorphic (last) event. It is very difficult to make comments how much alteration accompanied the veining in particular if the alumina-silicates had an alteration origin. Significant alteration (retrograde?) Has taken place post peak metamorphism with strong alteration of plagioclase and biotite. Late brittle fracturing (weak) is evident.

Scale

1mm 0



Sample 0505-006-249.00m: CP Light Photograph. Kyanite-Staurolight-Schist. Strongly deformed and sericite altered area and edge of quartz rich augen (to right).

DDH 0505-009 SUMMARY COMMENTS
Samples at 91.0, 110.0 and 229.0m.

The samples were taken from a mixed sequence of metamorphosed sediments (arkose-wacke) and intermediate to mafic volcaniclastics, tuffs. Several narrow feldspar porphyry intrusions up to 4 metres in apparent width were noted with one diabase from 182.95 to 188.73m. Zones of disseminated, commonly patchy K.feldspar have highly variable width and appear to be (in part) spatially associated with the FP intrusions (dikes).

Sample 91.00m is a deformed porphyritic felsic intrusive rock with relict albitic phenocrysts and quartz-microcline-plagioclase groundmass (lesser biotite, epidote). Significant microcline is present (15-20%) and may be related to both original composition and early alteration.

Sample 110.0m also has significant microcline (10-15%) and probably represents a bedded quartzo-feldspathic (greywacke?) sediment. The microcline is disseminated throughout and may represent an early pervasive alteration.

Sample 229.0m may have an immature sediment or tuff (fragmental) protolith. Again microcline may represent an early pervasive alteration. This is likely considering the proximity to a F.P. intrusive.

A close association between potassic alteration and Feldspar Porphyry intrusions is strongly evident in this group of samples. Alteration in the sediments appears to be pervasive rather than vein related.

SAMPLE 0505-009-91.00M. From a 0.69m wide section of Feldspar Porphyry within a sequence of Arkotic-Wacke/Arenite. 1995 Drill Log.

Sample Description

Mottled whites, pinks and greys with a distinct porphyritic appearance. Subrounded to tabular, 1-5mm white coloured phenocrysts? with patchy pink overprint. From staining some of this may be a combination of K. feldspar and fine hematite (as inclusions). The groundmass is fine grained and felsic with a moderate foliation defined by 5-7% dark green biotite laths up to 2mm long. Fine disseminated K. feldspar is indicated in the groundmass from staining, especially proximal to the white feldspar `phenocrysts'. Moderately magnetic, some fine disseminated magnetite, no visible pyrite.

Thin Section Description

1) Mineralogy

	Approximate %
Phenocrysts (albitic composition?)	20-25
Quartz	30-40
Plagioclase (groundmass albite-oligoclase)	5-8
Microcline	15-20
Biotite	5-7
Epidote	5-7
Hornblende	2-3
Muscovite/sericite	1
Garnet	Tr
Chlorite	Tr-1
Magnetite	1-2

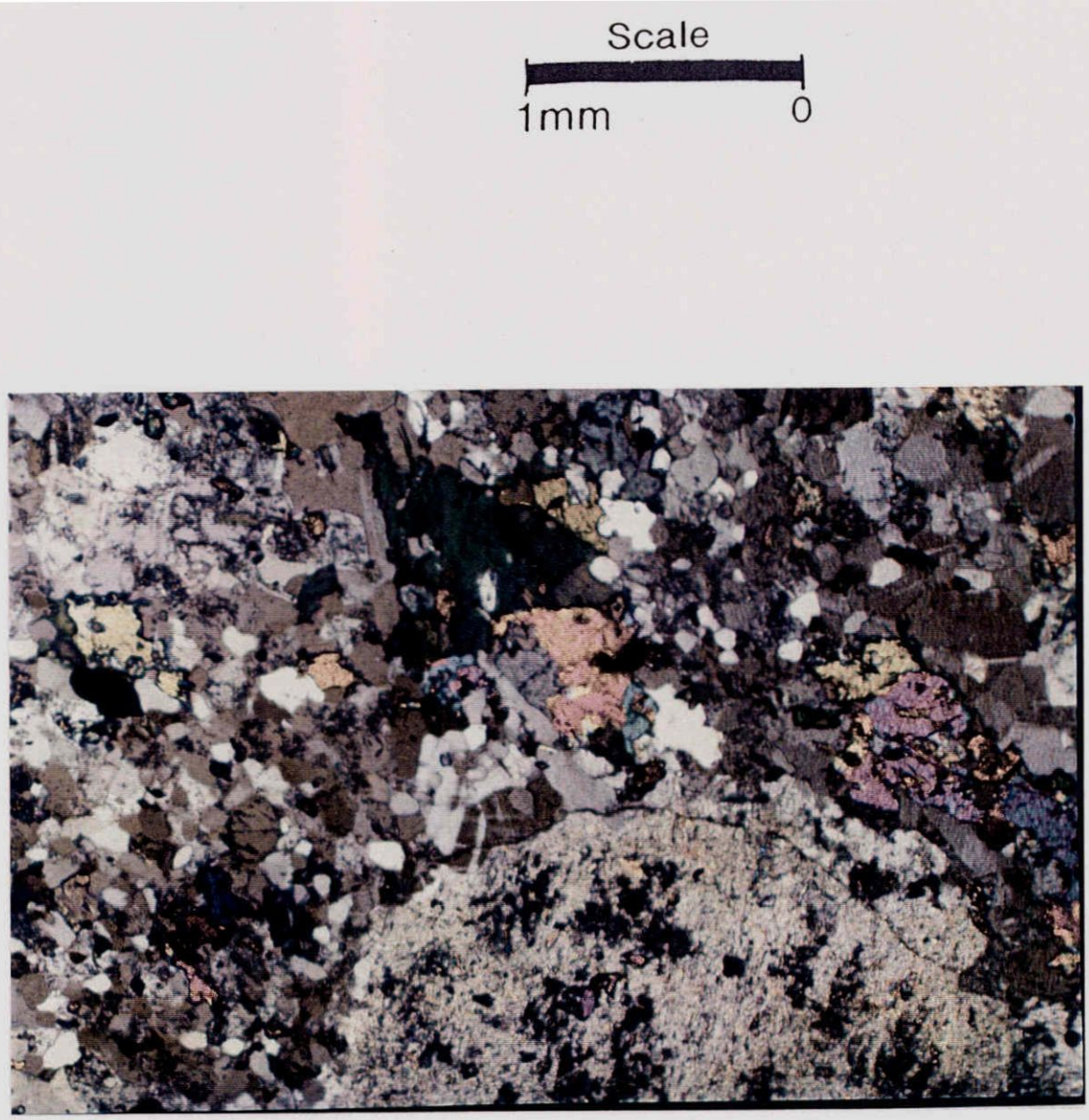
2) Comments

This sample has blastoporphyritic textures with relict, subrounded to crude tabular plagioclase (albitic) phenocrysts in a fine grained, moderate to well foliated groundmass. The phenocrysts average 1 to 3mm in length and contain numerous inclusions of epidote and, or muscovite /sericite up to 0.2mm. Significant fine dusty hematite forms patchy inclusions throughout. Well twinned microcline grains 0.1 to 0.3mm commonly form granoblastic mosaics around the phenocrysts and locally fill fractures within them. These textures suggest potassic alteration prior to (last) peak metamorphism.

The groundmass displays granoblastic to local weak lepidoblastic textures 0.1 to 0.4mm grains of quartz, microcline and lesser plagioclase (albite-oligoclase)form patchy granoblastic mosaics with local mafic aggregates of similar grain size including biotite, epidote, hornblende and fine garnet. Hornblende and biotite display local late chlorite alteration. Both epidote and biotite are disseminated throughout and in part define the foliation. Subhedral cubic to octahedral magnetite form disseminated grains 0.1 to 0.2mm in the groundmass.

3) Conclusions

This is a moderately deformed porphyritic intrusive rock that has undergone significant metamorphic recrystallization. The original composition would be rhyodacitic to quartz monzonite. There are some textural features that suggest pre peak metamorphism deformation and probable potassic alteration. These have been obscured in part by the metamorphic recrystallization.



Sample 0505-009-91.0m: CP Light Photograph. Feldspar Porphyry. Relict plagioclase phenocryst, sericite altered (bottom of photograph). Granoblastic groundmass mosaics with microcline (twinned), quartz, biotite and epidote.

SAMPLE 0505-009-110.00M. From a K. feldspar altered Arkosic-Wacke sequence (102.26-137.86m). 1995 Drill Log.

Sample Description

Patchy light greys, local pinkish greys. Fine grained with crude compositional banding (centimetre scale) and variable K. feldspar content indicated by staining. Weak to moderate fine foliation defined by mafic laths (biotite?). Some relict low angle 1 to 1.5mm wide quartz veinlets. More numerous high angle to foliation narrow (<1mm) fine carbonate-chlorite veinlets with associated wallrock bleaching for 1 to 2mm away. This is not K. feldspar alteration. Non magnetic, no visible disseminated sulfides.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	30-35
Plagioclase	20-25
Microcline	10-15
Green Hornblende	10-15
Green Biotite	2-5
Epidote	1
Muscovite	Tr
Magnetite	Tr
Quartz veins	2-3 relict low angle veins
Carbonate, chlorite, sericite veins	1-2 high angle fine veinlets

2) Comments

There is a crude banding in this sample which is defined by composition grain size and texture. The bands are up to several millimetres in width and are as follows:

1. 0.2 to 0.25mm grain size equigranular granoblastic mosaics with quartz-plagioclase-microcline-prismatic to tabular often twinned hornblende. Minor biotite, colourless to yellow green epidote and magnetite

or

2. 0.05 to 0.15mm grain size, fairly equigranular granoblastic to lepidoblastic mosaics with quartz-plagioclase-microcline-biotite-hornblende-minor fine epidote grain aggregates and magnetite.

No garnet or pyrite was observed in either domain.

Two types of vein can be observed:

1. Early recrystallized quartz veins. These are concordant to 10° to foliation and consist of coarser 0.1 to 0.3mm recrystallized quartz. Metamorphic overprinting appears to have largely obscured these.

2. Discontinuous to penetrative, high angle to foliation, fine veinlets up to 1mm wide. These feature a narrow central carbonate veinlet (which is frequently dislocated) surrounded by a light green chloritic envelope. Some weak displacements (kinking) of these veinlets can be observed along planes parallel to foliation. The 2 to 3mm wide zones of bleaching in the wallrocks to these veins appear to be related to sericite alteration of the feldspars and fine hematite inclusions? Some of the discontinuous veinlets have been clearly overprinted by metamorphic recrystallization. Others veinlets, especially the more chloritic are late and cut metamorphic mineralogy. These veins also have associated chloritic alteration of some wallrock biotite and hornblende.

3) Conclusions

The protolith to this sample is not clear. Its mineralogy is not incompatible with an arkose-greywacke. The uniformity of grain size and mineralogy in crude bands (relict beds?) does not suggest strong pervasive alteration. Veining is clearly apparent in this sample, some of which appears to pre-date peak (last) metamorphism. Minor high angle to foliation (penetrative) veining is later and has associated wallrock alteration of metamorphic minerals.

Amphibolite grade regional metamorphism has been accompanied by a penetrative foliation (flattening) with very little evidence for associated rotation other than weak kinking in some high angle veinlets.

SAMPLE 0505-009-229.0M. From Arkosic-Wacke near a Feldspar Porphyry Contact. 1995 Drill Log.

Sample Description

Mottled light to medium greys with distinct fine to fine-medium grained granular texture (metasediment). Moderate foliation developed in matrix basically a biotite schist. Larger grains to 1.5-2mm appear to be subangular-anhedral feldspars as well as mafics. Significant fine disseminated K.feldspar is indicated in the matrix from staining. Non magnetic.

Thin Section Description

1) Comments

This sample has very variable grain size from 0.06mm to 1.5mm, textures are metamorphic lepidoblastic to patchy granoblastic. The predominant mineral phases are quartz-plagioclase-biotite-muscovite-microcline. Biotite defines the foliation and may be present in amounts varying from 5 to 20% and in laths up to 0.6mm long. Quartz, plagioclase (albite-oligoclase), microcline and irregular muscovite laths form granoblastic mosaics with local relict coarse plagioclase grains up to 1.5mm. The plagioclase often has inclusions of fine dusty opaques (hematite?). The distribution of these patches suggests more numerous original coarse feldspars. It is very difficult to estimated the proportions of quartz-plagioclase and microcline in the mosaics because of the lack of twinning in both microcline and albitic plagioclase. Muscovite forms very patchy discontinuous grain aggregates recrystallized during metamorphism, optical continuity suggests original grains >1mm. Magnetite occurs as isolated subhedral grains up to 0.25mm. The minor mineralogy is fine grained with local epidote grain aggregates (individual 0.04 to 0.06mm grains) and rarer fine, light pink garnet aggregates (anhedral grains).

One of the main features of the schistosity in this sample is its variability, how it bends around grain aggregates. This strongly suggests original fragments.

2) Conclusions

The textures and mineralogy of this sample suggests a fragmental protolith, probably an immature sediment or tuff. Metamorphic recrystallization has obscured many original textures. Veining is notably absent in this sample. Microcline is fairly evenly distributed and nothing can be said regarding its pre metamorphic form and relationships. An intrusive origin for this sample is judged highly unlikely.

DDH 0505-010. SUMMARY COMMENTS
Samples at 38.50, 44.0, 62.50 and 165.0m

The samples come from the following sequence which appears to have a large volcaniclastic component:

16.61-87.25m	Intermediate to Mafic Lapilli Tuff
87.25-100.82m	Arkosic wacke
100.82-140.47m	Intermediate to Mafic Lapilli Tuff
140.47-169.80m	Felsic
169.80-174.10m	Feldspar Porphyry with Diorite below

The first three samples are foliated quartz-plagioclase-microcline-green hornblende rocks with variable accessory biotite and muscovite. Relict fragmental (lapilli tuff?) textures are apparent in the samples at 38.50 and 44.0m. Relict bedding in the sample at 62.50m suggest a tuff or more probable greywacke protolith. Strong metamorphic recrystallization and deformation (flattening) obscures primary textures.

Early recrystallized quartz veining with pyrite was observed in the sample at 44.0m but is absent in those samples at 38.5 and 62.5m. Each of the first three samples has more than 10% patchy disseminated microcline as part of granoblastic mosaics. Microcline is part of the metamorphic assemblage and not a later overprint. It is not clear whether the microcline represent early potassic alteration or original composition. However, some microcline does occur in early quartz veins in sample 44.0m suggesting a genitic link with potassic alteration.

Sample 165.00m is a probable felsic intrusive with predominant quartz, plagioclase and microcline. The presence of significant microcline (10-15%) provides another possible genetic link with the pervasive K.feldspar in the fragmental rocks above.

SAMPLE 0505-010-38.50M. Intermediate Lapilli-Tuff/Tuff Breccia. 1995 Drill Log.

Sample Description

Mottled light browns and greys, fine grained quartz-feldspathic-biotite or hornblende? schist. Strong, fine foliation with some groundmass K. feldspar indicated from staining. Possible relict elongate and flattened felsic lapilli up to 1cm. Patchy weak magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	20
Plagioclase (albite-oligoclase)	30-35
Microcline	10-15
Green Hornblende	15-20
Biotite	5-8
Muscovite	Tr
Epidote	2-4
Chlorite	Tr
Garnet	Tr
Calcite	1-2
Magnetite	1
Veinlets (late penetrative)	1-2 fine epidote >calcite

2) Comments

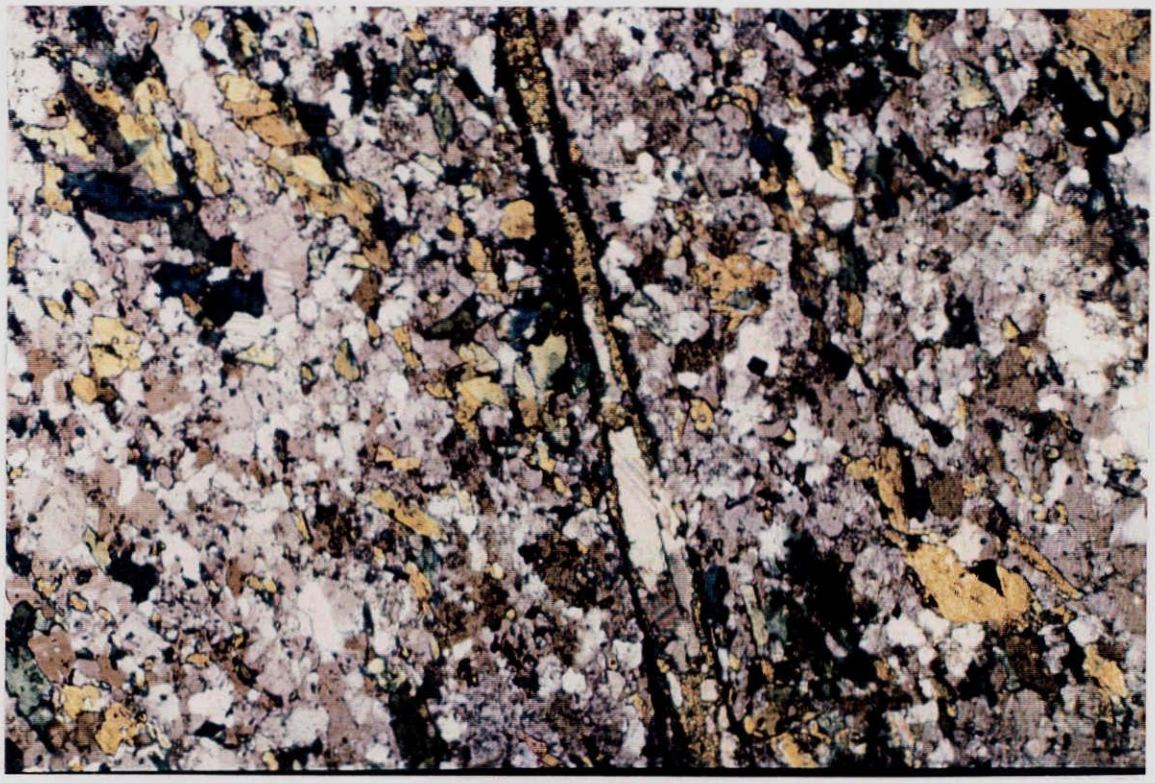
This sample has a strong foliation and is fairly even grained with average grain size between 0.1 and 0.2mm. The foliation is defined by lepidoblastic green hornblende and biotite mixed with granoblastic quartz, plagioclase, well twinned microcline and minor calcite. Tabular to prismatic twinned hornblende and biotite laths are up to 1mm long. The biotite laths commonly display weak chlorite alteration. Epidote forms anhedral to rarely prismatic grains between 0.04 and 0.1mm, fine grained aggregates are common up to 0.4mm. Trace amounts of very light coloured garnet occur as isolated xenomorphic grains and aggregates up to 0.3mm, some recrystallization is evident. In the larger grains minor quartz occurs as fine inclusions or embayments. The foliation is quite variable throughout this sample. Lensy granoblastic patches up to 2cm long and 1cm wide contain quartz and feldspars with minor mafic minerals (relict lapilli?). These have long axes parallel to foliation and rarely contain opaques. The main foliated mass contains 1% or more disseminated cubes and octahedra of magnetite generally of similar grain size to the granoblastic host, 0.1 to 0.2mm. One late penetrative veinlet 1 to 2mm wide is evident 20° to foliation (in this section). It consists largely of fine epidote (80%) and much larger elongate calcite grains to 0.4mm. This vein clearly post dates peak metamorphism and shows no evidence of recrystallization.

3) Conclusions

The mineralogy and relict textures in this sample suggest a fine lapilli tuff protolith of felsic to intermediate composition that has undergone strong deformation (flattening). There is no evidence of shearing. Pyrite is notably absent. Microcline is evenly distributed and is clearly part of metamorphic granoblastic mosaics, no vein association is apparent. The little veining that is present is post peak metamorphic with epidote and calcite. Some pervasive epidote alteration and weak chlorite alteration may be associated with this.

Scale

1mm 0



Sample 0505-010-38.5: CP Light Photograph. Quartzo-Feldspathic Rock with Hornblende (after Lapilli Tuff?). Note late penetrative calcite-epidote veinlet. Significant twinned microcline in granoblastic mosaics with quartz-plagioclase-hornblende and biotite.

SAMPLE 0505-0010-44.0M. Silicified Intermediate Tuff with an Intermediate Lapilli Tuff/Tuff Breccia Sequence. 1995 Drill Log.

Sample Description

Mottled light greys to greens locally pinkish, fine grained, quartzo-feldspathic schist with between 10 and 30% mafic minerals. Significant patchy fine grained K.feldspar is indicated from staining. A weak compositional banding is present suggesting original bedding or large fragments? This sample in many ways is quite similar to that @38.50m but contains stronger concentrations of K.feldspar. Very weak to non magnetic.

Thin Section Description

1) Mineralogy

There are significant variations in the relative proportions of the main mineral phases in this sample. These variations are largely related to compositional bands, lenses and possible rock fragments.

	Approximate %
Quartz	10-20
Plagioclase	20-30
Microcline	5-25
Green Hornblende	5-18
Biotite	Tr-2
Epidote	7-20
Pyrite	Tr
Magnetite	Tr
Veinlets (early recrystallized)	2

2) Comments

The compositional banding in this sample is reflected in varying proportions of the main mineral phases quartz, plagioclase, microcline hornblende and epidote. The main band compositions are as follows:

a) Granoblastic epidote-quartz-plagioclase minor microcline and hornblende. Grain size fairly even 0.1 to 0.2mm.

b) Granoblastic-lepidoblastic hornblende-quartz-microcline-plagioclase minor biotite. Overprinted by fine epidote aggregates (to 15%) and weak chlorite alteration of hornblende. Local mafic poor lensy granoblastic quartz-feldspar.

c) Largely granoblastic quartz and plagioclase 0.1 to 0.3mm grain size with 5 to 7% fine epidote trails defining foliation. Local relict? hornblende grains to 0.3mm.

Of these band types **b** is predominant in the sample and may contain up to 25% microcline in granoblastic mosaics with quartz and minor plagioclase. A very noticeable feature in this sample is the high epidote content. The epidote is colourless to light green to yellowish. Some or most of the epidote in band type **a** is part of the metamorphic assemblage while the fine epidote in bands **b** and **c** appears to overprint metamorphic hornblende, biotite and possibly plagioclase. Some or most of this epidote may be retrograde alteration; it is not associated with any veining or fracturing.

One subconcordant recrystallized vein 0.2 to 0.3mm wide can be observed. It contains fairly equigranular quartz-microcline-albite? mosaics with patchy fine dusty opaques and rare subhedral pyrite grains to 0.15mm. Recrystallization, metamorphic overprinting is evident.

3) Conclusions

A likely protolith to this sample would be and intermediate tuff, lapilli tuff. Metamorphic recrystallization and associated deformation (flattening) has obscured original textures?

The interesting features in this sample is the variable, strong band related microcline (K.feldspar) and the presence of pre to early metamorphic veins with microcline. There is a strong suggestion here of possible early potassic alteration. The only pyrite observed in this sample is spatially related to this vein.

SAMPLE 0505-010-62.50M. Intermediate tuff/lapilli Tuff. 1995 Drill Log.

Sample Description

Medium to dark grey, fine grained with a crude centimetre scale banding. Moderate foliation defined by fine dark coloured laths. Lensy fine K.feldspar throughout concordant with foliation (from staining). Local fine pyrite grain. Non to very weak magnetic.

Thin Section Description

1) Mineralogy

The sample is split into two domains by grain size, each of these represents a greater than 1cm wide band.

	Approximate %
Quartz	10-20
Plagioclase	25-30
Microcline	15-20
Green Hornblende	20-25
Epidote	1-2
Pyrite	Tr
Magnetite	Tr

2) Comments

Both bands are mineralogically similar with dark green tabular to prismatic, twinned hornblende-quartz-microcline in lepidoblastic-granoblastic grain mosaics. The hornblende defines foliation with often lensy quartz-microcline aggregates (1-2mm). Epidote forms fine anhedral grain aggregates or coarser yellow to green patches to 0.2mm overprinting metamorphic hornblende. Carbonate is notably absent in this sample.

The difference between the two bands is grain size, the coarser band 0.25 to 0.4mm with hornblende blades to 0.7mm, the finer band 0.15 to 0.2mm with hornblende blades to 0.4mm. Grain size distribution is more variable in the coarser grained band and epidote is a little more abundant. Cloudy millimetre scale areas occur in both bands and consist of very fine disseminated opaques (hematite). Isolated pyrite and magnetite grains have similar grain size to the host band and are subhedral to anhedral.

3) Conclusions

This sample has metamorphic textures. Compositions appear fairly homogenous and banding is related to variations in grain size. Compositionally the sample could have had a tuff or wacke protolith. The even distribution of microcline is a problem as it could equally represent original composition or pervasive alteration. The lack of any relict veining or significant sulfides

argues against the latter. Metamorphism is amphibolite grade, no shearing was observed in this sample.

SAMPLE 0505-010-165.00M. From an 8 metre `Felsite' Section above Feldspar Porphyry and Diorite. 1995 Drill Log.

Sample Description

Light mottled greys, equigranular, fine to fine medium grained felsic rock. Massive to weakly foliated with less than 7% mafics which are largely biotite. Significant (10%) disseminated K.feldspar indicated from staining. No visible sulfides or veining.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	40-45
Plagioclase (largely twinned(	30-35
Microcline (twinned)	10-15
Muscovite (colourless)	3-5
Biotite (altered)	2-3
Epidote	2-4
Hematite (fine patchy disseminated)	?

2) Comments

This sample is relatively even grained 0.1 to 0.4mm consisting largely of quartz-plagioclase-microcline, minor muscovite-epidote-biotite. The biotite defines a very weak foliation and is commonly altered to fine colourless to yellowish epidote aggregates. Granoblastic metamorphic textures predominate and there is no evidence of relict phenocrysts. Some grain size reduction is evident from skeletal muscovite. Patchy fine disseminated opaques (hematite) occur throughout the sample though largely restricted to felsic patches.

3) Conclusions

A felsic intrusive protolith to this sample is probable with rhyodacite to dacite composition. Metamorphic recrystallization has overprinted original textures. Possible retrograde metamorphism is indicated in the alteration of metamorphic biotite to finer grained epidote aggregates throughout the sample.

DDH 0505-011. SUMMARY COMMENTS
Sample at 322.0m

This sample was taken from a sequence of Intermediate to Mafic Volcaniclastic rocks with altered Arkose, Wacke above (to 299.30m). A bedded tuff or wacke protolith to the sample is probable. Asymmetric folding is evident with some dislocation on one limb. This folding was broadly coeval with peak metamorphism based on silicate mineral relationships. Possibly early quartz veining (or less likely chert layers) contain microcline. These pre-date peak metamorphism-deformation.

SAMPLE 0505-011-322.0M. Folded Intermediate Tuff/Volcaniclastic Sequence. 1995 Drill Log.

Sample Description

Light to medium grey to greenish grey, fine grained with millimetre scale schistose bands. Asymmetrical folding with dislocation of banding on one limb. Concordant folded quartz lenses on other limb with associated fine K.felsdpar (from staining). Fine grained amphibole-plagioclase-quartz schist distal to the fold axis contains significant fine disseminated K.feldspar. Minor disseminated fine grained pyrite? Patchy weakly magnetic.

Thin Section Description

1) Mineralogy

This sample can be split into two domains based on the presence or absence of quartz lenses.

(a) Quartz lenses absent

	Approximate %
Quartz	25
Plagioclase	40
Microcline	2-5
Biotite (green-brown)	20
Hornblende (green)	3-5 locally up to 10
Epidote	3
Pyrite	1
Magnetite	Tr-1

(b) Quartz lenses common

Quartz	40-50 more than half in lenses
Plagioclase	35-40
Microcline	3-5 spatially associated with quartz lenses
Biotite	4
Hornblende	-
Epidote	3-5
Pyrite	1
Magnetite	Tr

2) Comments

The textures in this sample clearly suggest a sheared fold. Crenulated quartz lenses on one limb clearly do not continue into the other domain (no remnants) suggesting centimetre or more scale displacement.

In domain (a) there is a well developed schistosity defined by brown biotite mixed with granoblastic mosaics of plagioclase-quartz and minor microcline. The grain size of these minerals is 0.05 to 0.15 (fine grained). Isolated anhedral to cubic pyrite grains have similar grain size. Tabular to prismatic green hornblende forms porphyroblasts up to 1.0mm which locally have fine quartz inclusions and are aligned with the axial plane of the fold (and dislocation zone). These porphyroblasts increase in density towards the dislocation (up to 10%). The biotite laths have a similar alignment (axial planar) though these may be as much as 10 to 15° difference between the two. A relict fine banding is locally apparent in these schists. It is vague, contorted and up to 50° to foliation.

In domain (b) Lensy quartz up to 1mm wide is strongly contorted and consists of recrystallized quartz mosaics, grain size 0.2 to 0.6mm. Locally these mosaics contain significant microcline (twinned) and sparse subhedral pyrite. The bands between the quartz lenses consist largely of finer grained 0.05 to 0.1mm quartz-plagioclase-biotite as granoblastic mosaics. Schistosity (from biotite) and hornblende porphyroblasts are notably absent.

Fine grained (0.02-0.04mm) transparent epidote is disseminated throughout both domains and is not part of granoblastic mosaics (retrograde overprint?).

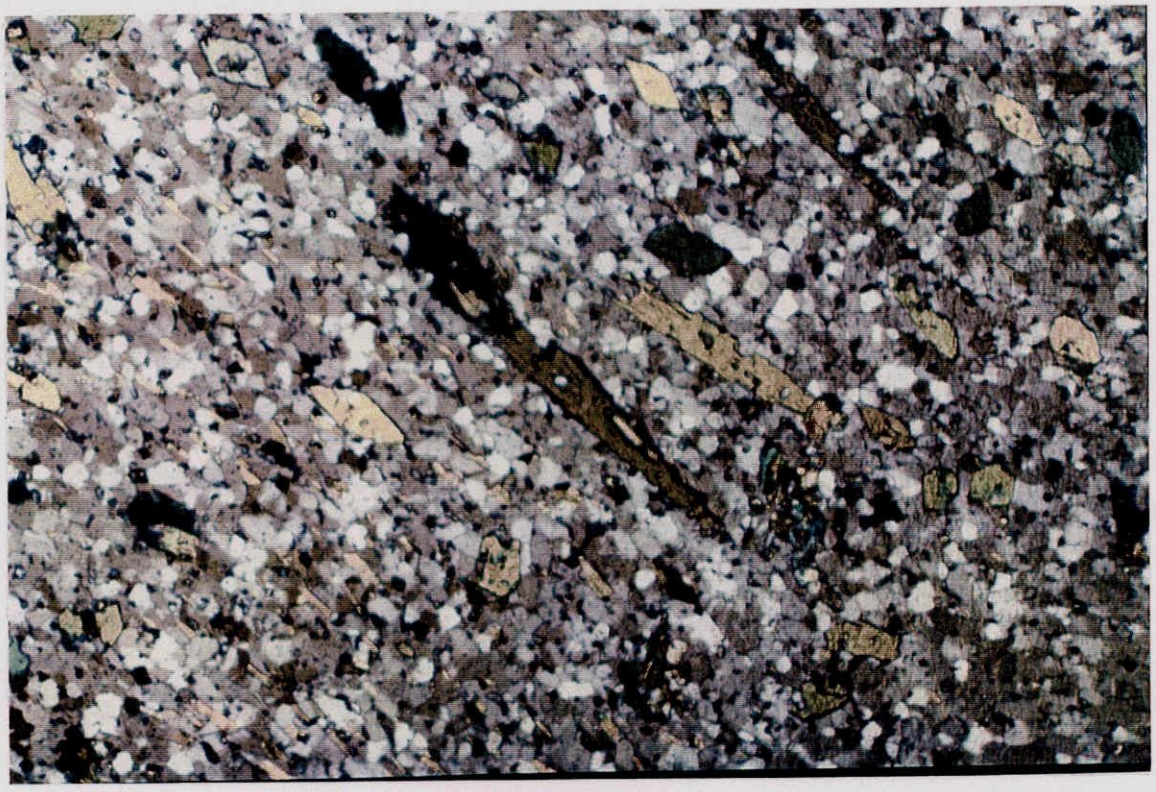
3. Conclusions

A bedded tuff or wacke are possible protoliths for this sample. Metamorphism and folding appear to have been broadly coeval. Some shearing and dislocation did however occur prior to the peak metamorphism.

The quartz lenses are probably veinlets rather than compositional (chert laminae). The association of quartz with K.feldspar (microcline) and pyrite is very interesting. If this is veining it clearly predates peak metamorphism and the last folding event.

Scale

1mm 0



Sample 0505-011-322.0m: CP Light Photograph. Quartzo-Feldspathic-Biotite Schist with Hornblende Porphyroblasts. Note aligned hornblende porphyroblasts in weakly foliated quartz-biotite (fine laths)-microcline-plagioclase

DDH 0505-012: SUMMARY COMMENTS
Samples at 19.50, 203.00, 240.00, 264.00 and 273.00m

Sample 19.50 was taken from a sequence of Chloritic Intermediate Tuffs/Volcaniclastics with Crystal Tuffs above. It is a biotite staurolite schist with minor kyanite, garnet, chlorite/chloritoid and is a pelite or semi-pelite. Very little veining is present and microcline is absent. Both syn and pre-kinematic garnets were observed, the former has 'S' inclusion trails indicating shearing during flattening (coeval with metamorphism).

The last four samples were taken from a thick Meta-arkose sequence with local Chert bands, Aluminium Silicates and patchy Silicification. Sample 203.00m has mineralogy and textural features suggesting an original feldspar porphyritic intrusive. 15 to 17% microcline is present within granoblastic grain mosaics. Another narrow feldspar porphyry dike occurs at 219.37 to 220.80m (from drill log).

Samples 240.0, 264.0 and 273.0m are staurolite bearing biotite schists with local sillimanite. Relict recrystallized staurolite porphyroblasts occur in these samples. Sillimanite is a later metamorphic overprint. This suggests poly metamorphism, possibly rapidly changing metamorphic conditions. Sample 240.00m has patchy pervasive and local veinlet K.feldspar (microcline). This is an important sample where it can be clearly be demonstrated that the K.feldspar alteration occurred during prolonged metamorphism. Samples 264.0 and 273.0m contain very little microcline. Probable relict bedding and narrow chert lamina indicate that this is a pelite, semi-pelite sequence. The aluminium silicate mineralogy is consistent with this. The relationships between aluminium silicates and K.feldspar (potassic alteration) in sample 240.0m does not indicate an alteration origin for the former. Significant green tourmaline was observed in the sample at 264.0m.

SAMPLE 0505-012-19.50M. Chlorite Intermediate Tuff/Volcaniclastic. From 1995 Drill Log.

Sample Description

Medium to dark grey, green, fine to fine medium grained biotite schist with blades of kyanite and possibly staurolite up to 4mm. Some other blades are distinctly green, possibly from alteration (chlorite?). Isolated pinkish coloured garnets up to 2mm (almandine) are equidimensional. Sulfides and quartz veining were not identified in hand specimen. Patchy very weak magnetic. One millimetre wide quartz veinlet is concordant to shallow angle to foliation and appears to be late.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	25
Plagioclase	20-30
Brown Biotite	10-15
Pink Garnet (almandine?)	1-2
Staurolite	10-20
Kyanite	2-5
Chlorite/chloritoid	2-5
Magnetite	Tr-1
Fine opaques (Ti minerals!)	1-2

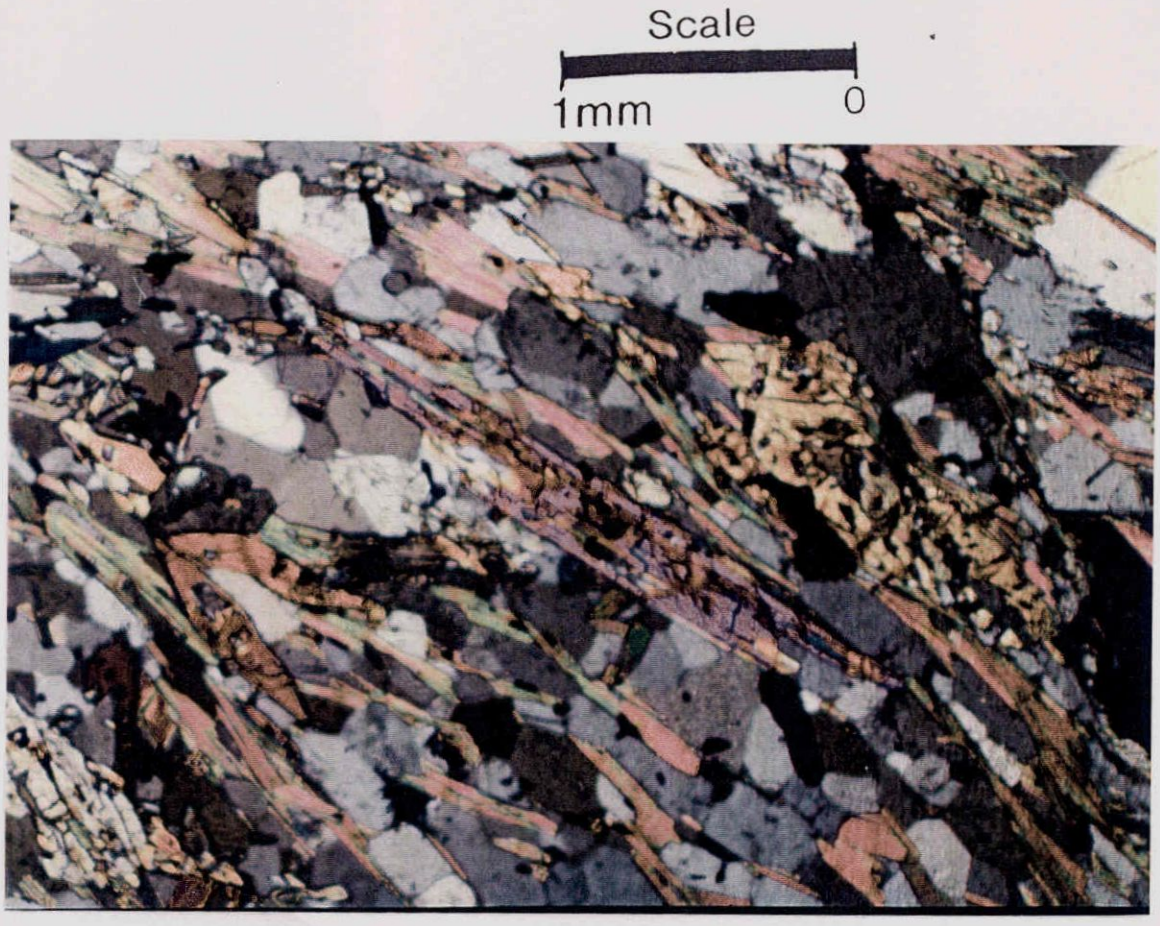
2) Comments

This sample is a porphyroblastic biotite schist with significant staurolite, minor kyanite and garnet. The porphyroblasts are staurolite and kyanite. Staurolite is light yellow to colourless with prismatic to skeletal forms from 0.3 up to 2mm. Locally large patches of up to 40% staurolite may be present. Most of the staurolite is poikiloblastic with quartz inclusions. Colourless kyanite forms random to poorly aligned blades up to 3mm long with minor inclusions. Pinkish to colourless garnet occurs as equidimensional grains with irregular outlines and numerous inclusions. One garnet with 'S' inclusion trails appears to be syn-kinematic, others are fractured with remnant pressure shadows (pre-kinematic). Brown biotite laths 0.4 to 1mm long define foliation. Locally patchy light green chlorite/chloritoid predominates over biotite. Extinction angles are greater than 10° and wavy (chloritoid!). The chlorite mineral possibly replaces earlier biotite?.

The matrix to the porphyroblasts consist of biotite laths and granoblastic mosaics of quartz, plagioclase (often twinned) prismatic staurolite and minor chlorite/chloritoid (after biotite?). The plagioclase has albitic to low oligoclase compositions. Disseminated magnetite and other fine often bladed opaques (Ti minerals) total between 2 and 3%.

3) Conclusions

This sample is a biotite-staurolite schist with minor kyanite, garnet and chlorite/chloritoid, a semi-pelite or pelite. The veining in this sample is insignificant and does not show any relationships with other silicates. Chlorite or chloritoid after biotite is interesting, possibly representing retrograde alteration. No sillimanite was observed in this thin section.



Sample 0505-012-19.50m: CP Light Photograph. Kyanite-Staurolite-Biotite Schist. Note coarse porphyroblastic kyanite blades, finer biotite laths (pinks) and poikiloblastic staurolite (straw colours)

Sample 0505-012-203.0m: CP Light Photograph. Feldspar Porphyry. Note zoned albitic plagioclase (blastoporphyritic textures). Groundmass granoblastic mosaics with plagioclase, microcline, quartz, biotite and muscovite

SAMPLE 0505-012-203.00M. Felsic to Intermediate Crystal Tuff. From 1995 Drill Log.

Sample Description

Mottled light greys, white and pinks with a distinct granular appearance. Variable fine to medium grained with 5 to 8% relict plagioclase phenocrysts? averaging 2 to 4mm in length. A very weak foliation is present. Staining indicates significant K. feldspar disseminated throughout the sample. Numerous penetrative green epidote veinlets generally less than 2mm wide cut foliation at moderate to steep angles. Moderately magnetic, sparse fine disseminated pyrite cubes.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	15-20
Plagioclase (5-7% relict phenocrysts)	45-50
Microcline	15-17
Biotite (green)	5-6
Muscovite	1-2
Epidote (excluding vein)	4-5
Garnet	Tr
Calcite	Tr
Chlorite	1-2
Sphene	Tr
Pyrite	Tr
Magnetite	1-2
Veinlets (Epidote>>quartz-plagioclase-calcite)	3-4

2) Comments

This sample has good blastoporphyritic textures with relict plagioclase phenocrysts in a fine grained recrystallized groundmass of predominantly plagioclase, quartz and microcline. The relict phenocrysts (0.5 to 2.5mm long) have tabular forms, commonly twinned, locally zoned and yield albitic compositions. Some if not many of the original phenocrysts are recrystallized and part of groundmass mosaics (slightly coarser grained aggregates of quartz and plagioclase).

Both phenocrysts and groundmass plagioclase is cloudy from fine inclusions and sericite alteration. Groundmass plagioclase rarely displays twinning, albite-oligoclase compositions are probable. Quartz, plagioclase and pericline twinned microcline form mosaics with variable grain size between 0.05 and 0.4mm. Biotite laths up to 0.4mm long are commonly green and chlorite (local epidote) altered. Finer 0.1 to 0.2mm muscovite laths are less common. Yellow green epidote forms fine disseminated grains with local pinkish garnet and colourless sphene. These all have grain size less than 0.1mm. 1 to 2% disseminated magnetite occurs as anhedral to subhedral grains and aggregates up to 0.4mm. Pyrite is sparse with several cubes up to 0.3mm.

Penetrative, yellow green epidote veining is very distinct and consists of tabular epidote to 0.3mm (dominant) with quartz, plagioclase and calcite of similar grain size. Minor calcite and concentrations of finer epidote occur locally in the wallrocks. These veins do not have sharp wallrocks contacts and have possibly undergone some recrystallization.

3) Conclusions

The mineralogy and textural features in this sample strongly suggest a feldspar porphyritic intrusive protolith that has undergone some metamorphic recrystallization. A feldspar crystal tuff is considered highly improbable.

Microcline possibly represents original potassic content rather than alteration. It is not related to the epidote veining. An original rhyodacite to quartz monzonite composition is probable for this rock.

SAMPLE 0505-012-240.00M. Aluminium-Silicate Arenite-Feldspathized Arkose. From the 1995 Drill Log.

Sample Description

Mottled light and dark grey, fine grained biotite schist with some weak compositional banding. Local millimetre scale augen with peripheral sillimanite and possibly chlorite aggregates. Staining indicates that the light grey 'bleached' areas are K.feldspar altered. These patches are at low angles to foliation and appear to be related to 20° to 30° crosscutting millimetre scale veinlets (to foliation) with significant K.feldspar. Patchy less than 2% fine disseminated pyrite. The sample is non magnetic.

Thin Section Description

1) Mineralogy

The thin section was taken from an area with a significant amount of bleaching (K.feldspar) and is not representative of the bulk mineralogy. The following modal mineralogy is for K.feldspar poor, biotite schist which have augen and are judged to represent the host lithology. A discussion on the K.feldspar rich bands follows in the comment section.

K.feldspar poor zones	Approximate %
Quartz	30-35
Plagioclase	25-28
Microcline	Tr-1
Biotite	15-25
Staurolite	3-5
Sillimanite	4-5
Pyrite	Tr

2) Comments

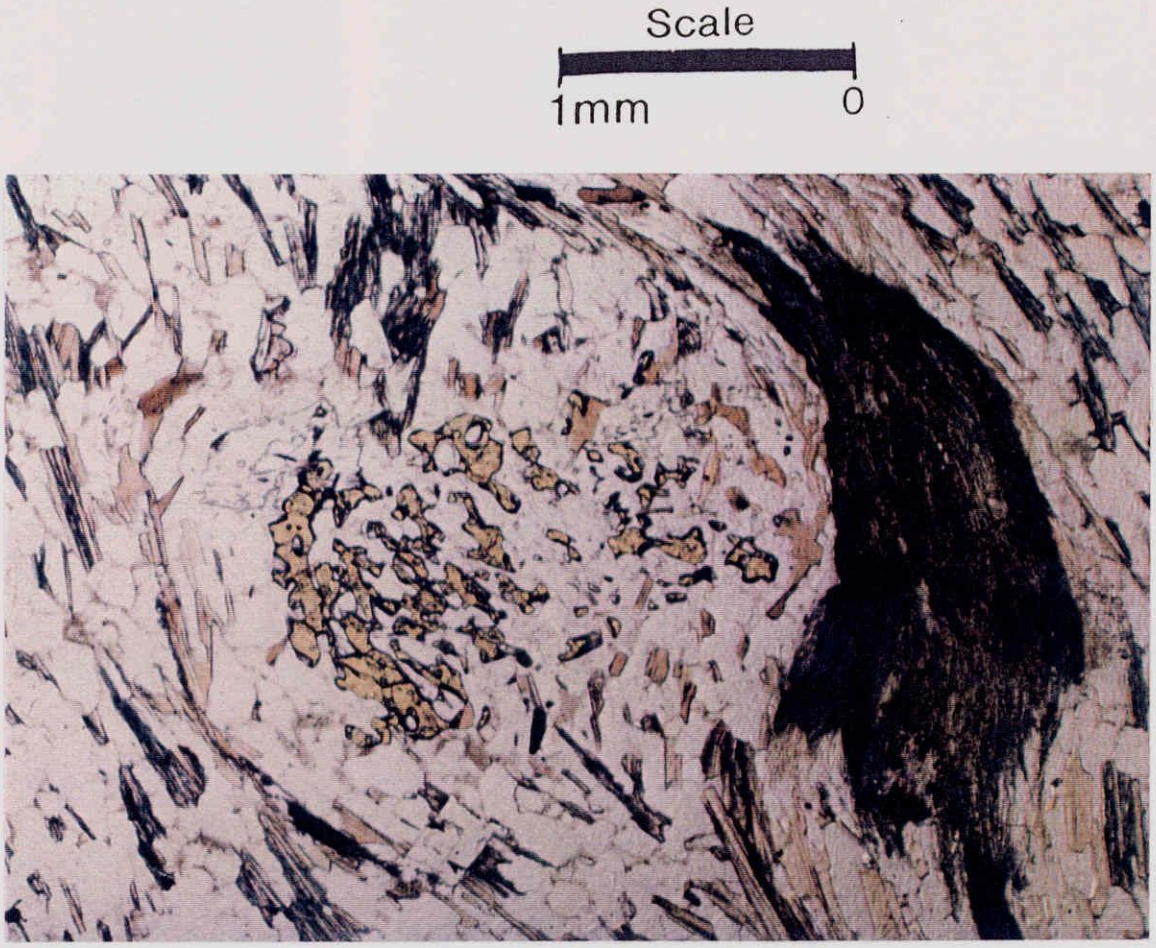
The K.feldspar poor bands and patches outlined above have relatively 'fresh' mineralogy with a strong linear foliation defined by green-brown laminated biotite (altered) laths 0.2 to 0.4mm long and granoblastic mosaics of quartz and plagioclase with 0.2mm average grain size. The augen observed in hand specimen constitute 5 to 10% of these areas, are between 3 and 5mm in length and consist of granoblastic mosaics of light yellow staurolite, quartz, muscovite and biotite. They clearly represent original tabular staurolite porphyroblasts up to 2mm long that have been deformed and recrystallized during later metamorphism. Elongate biotite blades up to 1mm long wrap around these augen with local 2mm long fibrolite patches (sillimanite). Sillimanite clearly post-dates the staurolite porphyroblasts. The asymmetric nature of some of the augen suggests some shear (rotational deformation). Very minor amounts of fine pyrite are present in K.feldspar poor areas.

The K.feldspar rich patches and zones are up to 1cm wide and clearly represent a later overprint. Narrow less than 0.3mm wide fine microcline veinlets are orientated at 30° to 40° to foliation, they are linear but discontinuous and commonly have recrystallized margins. One of the veinlets crosses an augen without any obvious displacement. For several millimetres from the veinlets the plagioclase in granoblastic mosaics is sericite altered and cloudy, the biotite is green from chlorite, chloritoid alteration, locally with fine epidote. Up to 15% microcline occurs within the mosaics, average grain size 0.1 to 0.2mm, pericline twinning is rare. These alteration zones contain more pyrite than the host commonly in peripheral areas. Here anhedral pyrite grains 0.05 to 0.3mm form clusters.

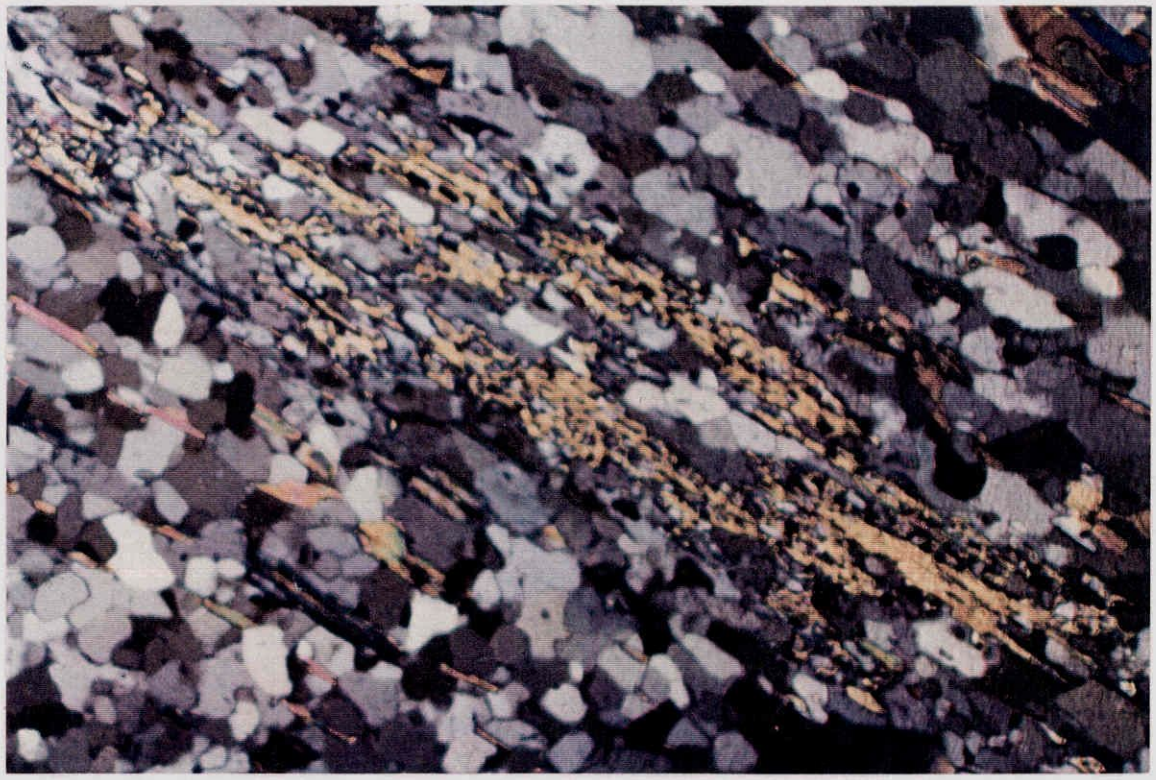
3) Conclusions

This sample represents a pelite or semi-pelite. Prolonged or polyphase metamorphism is indicated by overprinting of porphyroblastic staurolite. The relationship between microcline veinlets and the augen suggests potassic alteration prior to the last phase of metamorphism. Possibly the rock's history involves both regional and contact metamorphic events, overprints.

Potassic alteration is clearly indicated in this sample and is related to crosscutting veinlets, post dating penetrative foliation. The spatial association of pyrite with this alteration suggest a relationship. No clear relationship is indicated between the potassic alteration and aluminium silicate mineralogy.



Sample 0505-012-240.00m: PP Light Photograph. Biotite-Staurolite-Sillimanite Schist. Note relict, recrystallize tabular staurolite porphyroblast with light brown biotite, dark fibrolite (sillimanite) in enveloping schist. Asymmetry suggests some rotation.



Sample 0505-012-264.00m: CP Light Photograph. Biotite-Staurolite Schist. Note relict recrystallized staurolite porphyroblast aligned with foliation.

SAMPLE 0505-012-264.00M. Silicified Arenite and Chert with Aluminium Silicates. From 1995 Drill Log.

Sample Description

Banded light to medium greys and white, fine grained quartzo-feldspathic-biotite schist with 5 to 10%, 2 to 3mm brown patches which look like garnet but could be staurolite. Dark green bands appear to be chlorite altered, do not contain the brown mineral and have fine to medium grained disseminated pyrite and muscovite? The pyrite often appears tabular (aggregates?), parallel to foliation. Some remnant quartz veining or chert laminae may be present in these areas. Staining indicates very minor disseminated K.feldspar. Fine penetrative veinlets at very high angles to foliation cross all bands and may contain minor wallrock K.feldspar. This sample is not magnetic.

Thin Section Description

1) Mineralogy

As in the previous sample it is easiest to discuss mineralogy in terms of the predominant band composition and compare and contrast mineralogy. Over 65% of the sample consists of the quartzo-feldspathic-biotite schist with brown coloured porphyroblasts, aggregates. The modal mineralogy for this band type follows.

	Approximate %
Quartz	40
Plagioclase	20-25
Microcline	Tr
Biotite (commonly altered)	10
Muscovite	1-2
Staurolite yellow (light brown in hand specimen)	12-20
Sillimanite	2-3
Sericite	1-3
Tourmaline green	1-3
Epidote colourless	Tr
Fine opaques. Magnetite, Ti minerals	1
Pyrite	Tr

The green band is staurolite poor and consists mainly of quartz (40%), variably sericitized plagioclase (10%), chlorite altered biotite (30%), some coarser muscovite and significant remnant quartz veining (concordant) or chert.

2) Comments

The bulk of this sample is a porphyroblastic staurolite bearing schist. Brown biotite laths between 0.2 and 1.5mm long define foliation with granoblastic mosaics of quartz and plagioclase

0.1 to 04mm grain size. Microcline occurs as rare pericline twinned grains in the mosaics. Minor amounts of colourless muscovite, green tourmaline (0.1mm) and fine disseminated opaques (mainly Ti minerals) are evident.

The staurolite porphyroblasts are light yellow, coarse twinned and have skeletal forms consisting of patches of disseminated grains up to 3mm wide displaying optical continuity. They are recrystallized polygonal equigranular quartz-staurolite (granoblastic) mosaics. Most of these patches are roughly equidimensional or tabular, others are elongate aligned with foliation (flattening fabrics, little or no rotation). Brown biotite displays variable alteration with local fibrolite (sillimanite), chlorite/chloritoid-minor epidote. Some of the sillimanite may be after muscovite, and staurolite grains are commonly close by. Local coarser patches of quartz grains up to 2cm long (0.3 to 0.6mm grain size) may represent relict veins or possible flattened siliceous rock fragments.

The darker coloured (chloritic!) bands contain very little to no staurolite, are brecciated and altered. Quartz rich bands have coarser grain size 0.3 to 0.5mm, are concordant and may represent original cherty lamina or less probable early quartz veining. This brecciation occurred post peak metamorphism. Significant sericite alteration occurs in the matrix to the brecciated zone, but does not penetrate far into the staurolite band above. Most of the biotite in this band has been converted to green chlorite/chloritoid. Anhedral to tabular subhedral pyrite is common in the breccia matrix and has 0.5 to 3mm grain size. There is no strong evidence for any shearing associated with the brecciation.

A series of narrow penetrative fractures cut foliation and banding at a high angle. In the staurolite domain they are very narrow and sericitic with associated sericite alteration of wallrock plagioclase for 1 to 1.5mm away. In the chlorite domain the veinlets may be up to 0.1mm wide with some vein calcite. Strong wallrock chlorite and patchy strong sericite. This veining can be related to the pervasive alteration in the brecciated part of the band.

3) Conclusions

This staurolite schist probably represents a meta-pelite, semi-pelite. Some original compositional banding (bedding) is suggested. The staurolite porphyroblasts are pre kinematic, possibly representing an earlier metamorphic event. Subsequent brecciation and recrystallization has overprinted these porphyroblastic textures. Rotational deformation is not evident within this plane (plane of thin section).

Brittle deformation took place post-penetrative foliation (peak deformation and metamorphism). This fracturing was accompanied by sericite-chlorite alteration and by the apparent introduction of pyrite. The extent of the alteration is controlled by structural preparation and in part lithological contacts?

SAMPLE 0505-012-273.0M. Interbedded weakly silicified Arenite/Chert. From 1995 Drill Log.

Sample Description

Weak to well banded light greys, predominantly fine grained quartzo-feldspathic biotite-muscovite schist with concordant quartz rich bands or veins up to 5mm wide. These siliceous bands constitute less than 20% of the sample. Staining indicates negligible K.feldspar. The sample is patchy weak to moderate magnetic. Minor, very fine disseminated pyrite or pyrrhotite is present near the siliceous bands.

Thin Section Description

1) Mineralogy

The sample has fairly homogenous mineralogy and grain size outside of the quartz rich bands. The modal mineralogy of the homogeneous bands (65%) follows.

	Approximate %
Quartz	40-50
Plagioclase	20-30
Biotite (brown)	8-12
Muscovite	3-5
Staurolite (yellow)	Tr-1
Sillimanite (patchy in bands)	2-10
Magnetite	1-2
Ti minerals-opaques	1-1.5

The siliceous 'chert' bands consist of equal amounts though patchy quartz and plagioclase with lesser peripheral biotite and pyrrhotite, minor fine sillimanite.

2) Comments

This quartzo-feldspathic-biotite schist has up to 12% biotite laths 0.2 to 2mm long defining foliation. Muscovite is less abundant with moderately aligned blades and laths up to 1.3mm. Granoblastic mosaics of quartz and commonly dusty plagioclase dominate with variable grain size from 0.2 to 0.8mm, locally with coarser irregular grains to 1.5mm.

Light yellow staurolite forms irregular grain aggregates to 0.5mm and also occurs as inclusions in some muscovite laths. Sillimanite appears to occur within bands as fairly coarse patches of fibrolite up to several millimetres in length. These patches have long axes parallel to foliation and often overprint (in part) pre-existing biotite. Locally there is also a muscovite association. Fine opaques up to 0.15mm are disseminated throughout with anhedral magnetite and bladed or anhedral Ti minerals.

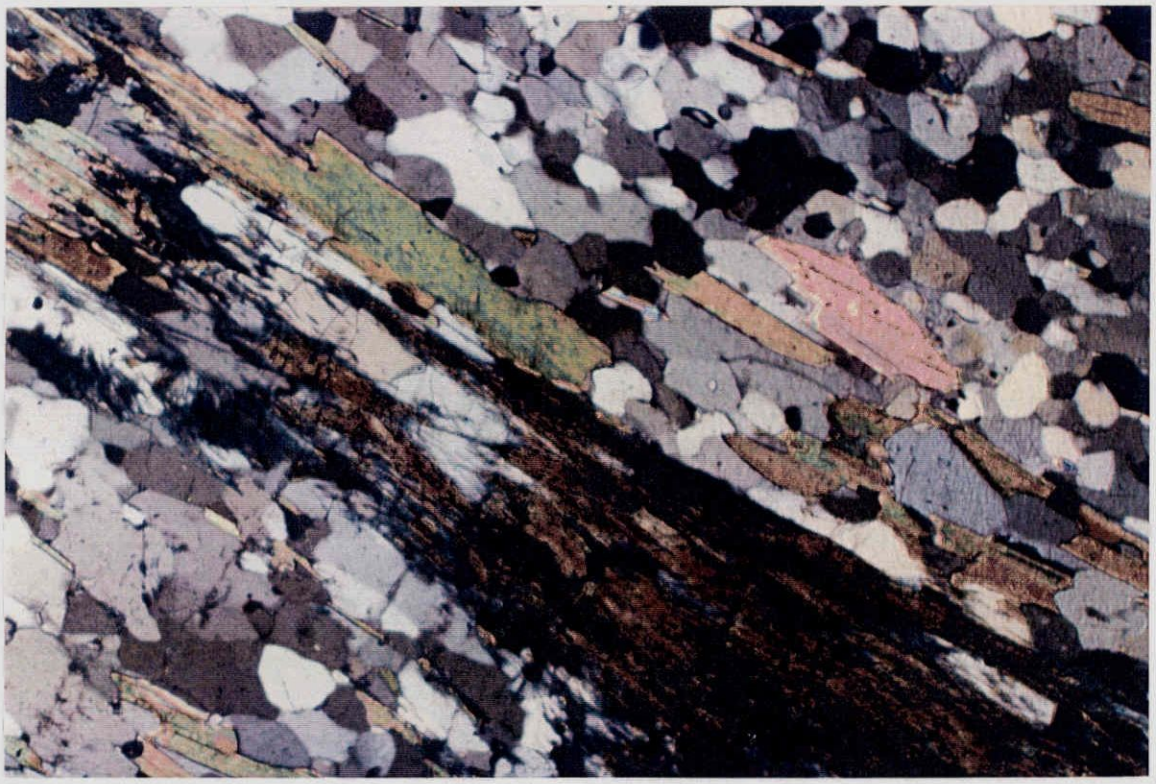
The cherty bands are up to 7mm in width and consist of irregular patches and bands of plagioclase and quartz. Coarse quartz grains up to 3mm locally form narrow bands and are weakly fractured. These possibly represent original siliceous laminae. The plagioclase surrounding the quartz a finer up to 1.5mm and locally twinned with albitic composition. Biotite (brown) laths occur at the edges of quartz-plagioclase areas, patches as elongate laths and blades to 3mm. Minor fine sillimanite is commonly found at the edges of these biotite grain aggregates. Outboard from the biotite up to 5% fine disseminated pyrrhotite (less than 0.1mm) occurs in granoblastic mosaics with sparse pyrite.

3) Conclusions

This sample possibly represents a metamorphosed laminated quartzo-feldspathic sediment (arenite!). As in previous samples the staurolite appears to be early and recrystallized, here it clearly pre-dates metamorphic peak muscovite. Sillimanite is later and overprints biotite (in part). There is no evidence of late fracturing, alteration or veining in this sample.

Scale

1mm 0



Sample 0505-012-273.00m: CP Light Photograph. Biotite-Muscovite-Sillimanite Schist. Note large patch of sillimanite (dark browns) aligned with biotite-muscovite foliation (coloured laths).

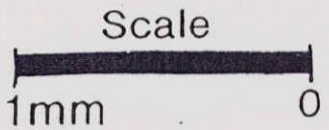
DDH 0505-13: SUMMARY COMMENTS
Samples at 35.50, 88.00, 276.00 and 288.00m

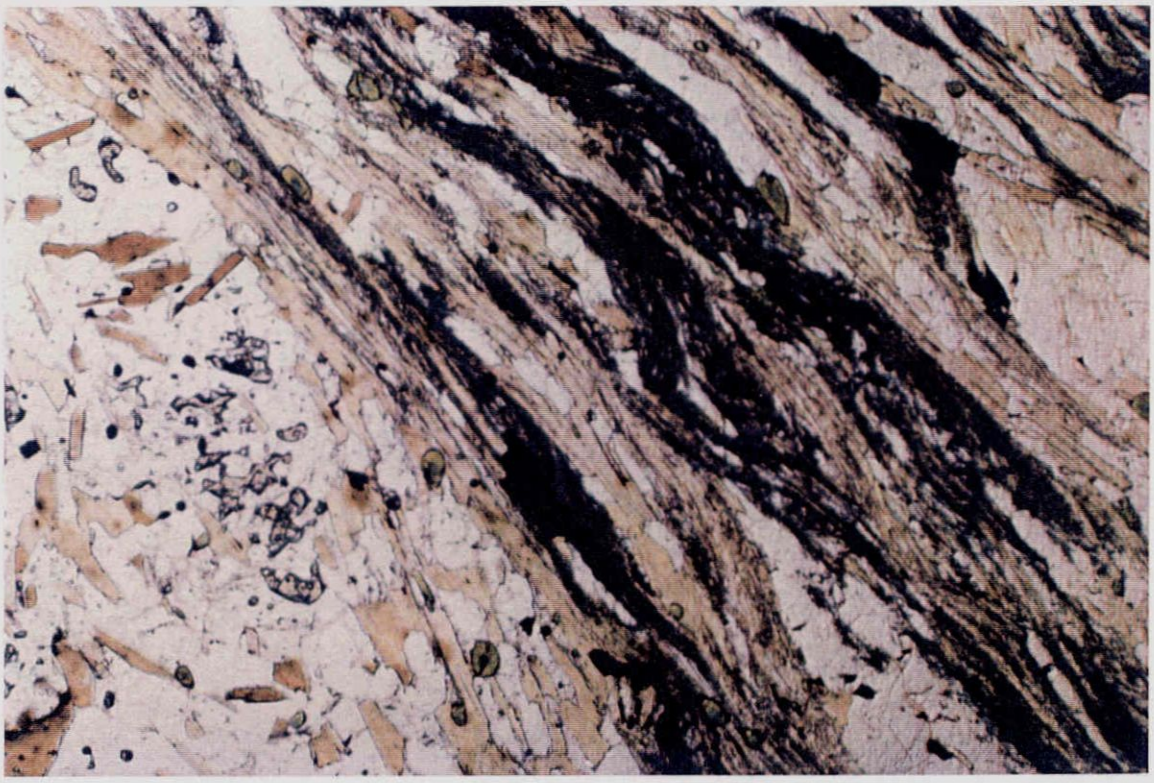
The first two samples were taken from a sequence of Arkose, Arkosic-wacke and Argillites with Quartz-Sericite Vein Breccia @59.90-60.69 and 86.94-88.53m. A Gabbro occurs between 23.40 and 26.76m. The Arkosic sequence below contains some aluminium silicates.

Sample 35.50m is a biotite-sillimanite-quartzo feldspathic schist with garnet (almandine), staurolite and green tourmaline. It has strong linear flattening fabrics (non rotational) and very probable pelite to semi-pelite parentage. No microcline or early quartz veining was observed. Sample 88.0m is a quartz vein breccia hosted by a sediment that has been overprinted by later metamorphism. K. feldspar is notably absent and no relict chalcedony textures were observed (or could be expected). There is very little sericite in this sample, muscovite blades and laths (metamorphic) occur with the plagioclase.

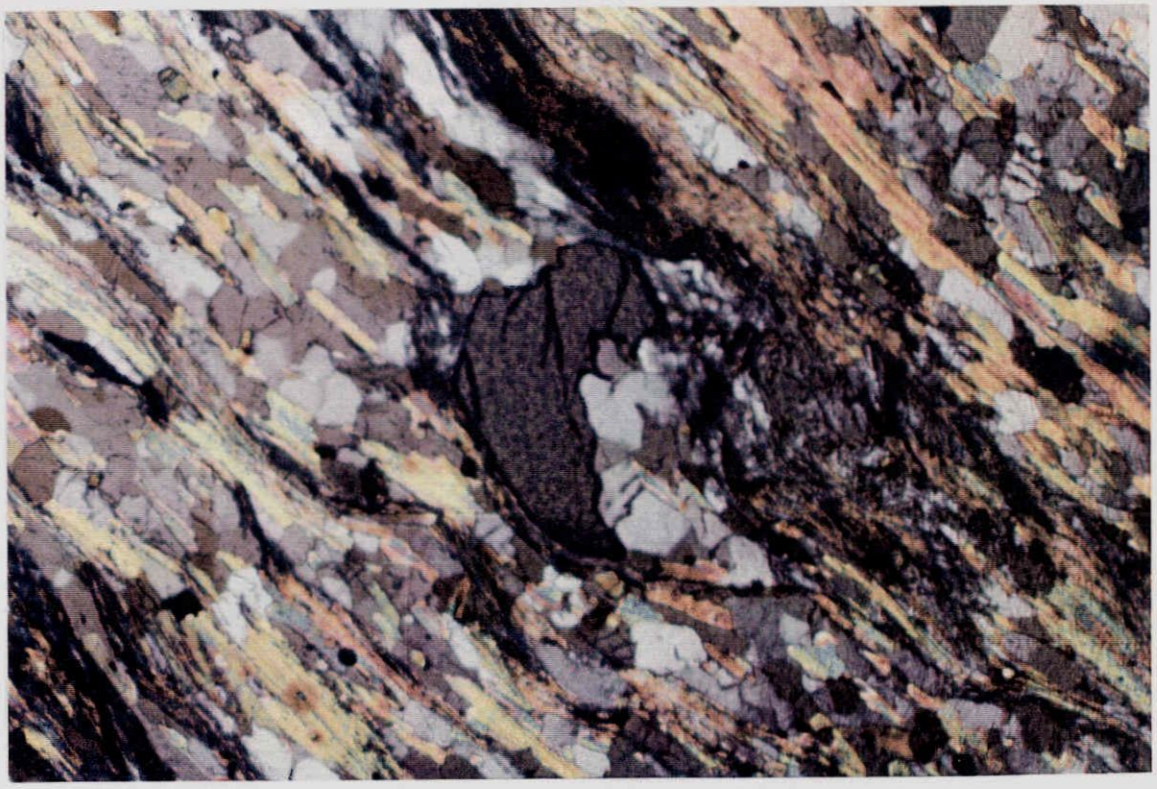
The last two samples were taken from an Arkosic-wacke, Argillite sequence with variable K.feldspar.

Sample 276.00m is a biotite schist with 4.5% yellow tourmaline and minor garnet (almandine). The garnet is pre-kinematic with a strong fracture cleavage parallel to foliation. Bleached fractures in hand specimen can be related to narrow quartz-feldspar? (plagioclase) veinlets with envelopes of sericitic alteration in the wallrock plagioclase. These fractures and veins are late, clearly post-peak metamorphism. No K.feldspar was observed. Sample 288.0m is a fine grained biotite schist with fine garnet (almandine) poikiloblasts. Numerous late fractures have bleached, sericitic alteration envelopes. Silicate and fracture relationships are similar to the previous sample and again there is a notable lack of K.feldspar (staining and petrographic)?? Both of the last two samples are pelites or semi-pelites.





Sample 0505-013-35.16m: Biotite-Sillimanite-Staurolite-Garnet Schist with yellow green Tourmaline. Above PP light photograph. Lepidoblastic sillimanite-biotite bands with relict staurolite porphyroblast and yellow green prismatic tourmaline to left. **Below CP Light Photograph.** Rotated and fractured garnet porphyroblast with proximal sillimanite (dark fibrolite).



SAMPLE 0505-013-35.50M. Weakly altered Aluminium Silicate Arkosic-Wacke/Argillite. From 1995 Drill Log.

Sample Description

Light to dark grey, fine laminated and fine grained biotite-sillimanite-garnet-quartzo-feldspathic schist. Disseminated light coloured (pinkish) garnet porphyroblasts up to 1.5mm in strongly foliated biotite and sillimanite. Fine concordant quartzo-feldspathic augen, lenses and discontinuous bands. Minor fine disseminated pyrrhotite or pyrite.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	30-35
Plagioclase	15-20
Biotite	20-30
Staurolite (yellow)	3-4
Sillimanite	10-12
Garnet (colourless to light pink)	3-4
Tourmaline (light green)	1-4
Magnetite, Ti minerals	1-2
Pyrite	Tr

2) Comments

This sample has mixed lepidoblastic-granoblastic metamorphic textures. A strong foliation is defined by lepidoblastic bands of biotite laths and fine sillimanite needles/fibrolite. Quartz and plagioclase form granoblastic mosaics either as coarse grained lenses (up to 1mm grain size) or as discontinuous bands 0.1mm average grain size. Within these bands and lenses occur small garnet porphyroblasts, fine staurolite patches, tourmaline and disseminated fine opaques.

Garnet porphyroblasts are commonly equidimensional to hypidiomorphic 0.4 to 1.2mm. They may or may not have fine inclusions and fractures. Both late-syn and post-kinematic forms appear to be present. In one garnet weak 'S' trails suggest some rotation (shear). Light yellow staurolite occurs with quartz as 1 to 2mm patches possibly representing early (pre-kinematic) relict porphyroblasts. Light green disseminated, tabular to prismatic tourmaline grains up to 0.2mm show a preference for particular bands (often a staurolite association). Fine opaques are disseminated throughout with anhedral aggregates of magnetite and Ti minerals.

3) Conclusions

This sample represents a deformed meta-pelite with strong flattening and some shear during amphibolite grade regional metamorphism. There is no evidence of alteration or veining.

The coarser grained lenses contain some staurolite, garnet and biotite besides quartz, plagioclase suggesting a sedimentary origin, not vein.

SAMPLE 0505-013-88.0M. Quartz-Feldspar-Sericite Vein Breccia within a sequence of Arkosic-Wacke. From 1995 Drill Log.

Sample Description

Mottled pink and white, medium to coarse grained consisting predominantly of quartz, feldspar and white mica. The grain size in this sample is highly variable with coarse grained aggregates of quartz, muscovite and feldspar up to 1.5cm in a fine to medium grained matrix of similar mineralogy with fine specks of pink coloured garnets. These textures strongly suggest a vein breccia. All of the feldspar in this sample is light pink in colour. Staining indicates that this is not K.feldspar, probably hematite bearing plagioclase (fine inclusions?). Locally the coarser muscovite has distinct yellow-green cleavage surfaces, this is not sericite as described in the drill log. Sparse specks of very fine grained pyrite or pyrrhotite are present. The sample displays very weak patchy magnetism.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	50
Plagioclase (albite-low oligoclase)	40-45
Muscovite	5-8
Garnet	Tr-2
Fine opaques (including hematite)	Tr-1

2) Comments

Textures in this sample are granoblastic with bimodal grain size (breccia and matrix). The coarser grained aggregates consist of weakly fractured, commonly strained quartz grains up to 8mm; composite plagioclase grains with patchy carlsbad, albite twinning yielding albite to low oligoclase compositions (up to 5mm grains); irregular to lath shaped muscovite grains up to 6mm long. Finer interstitial muscovite laths 0.2 to 0.8mm long commonly occur as trails along coarse plagioclase or quartz grain boundaries. This is not an alteration, none of the plagioclase displays any internal or peripheral breakdown to sericite. The matrix areas consist of similar (predominant) mineralogy with quartz and plagioclase (albite-oligoclase), 0.1 to 0.4mm average grain size. The main differences other than grain size is the presence of garnet and absence of muscovite. Light coloured equidimensional garnets are part of the granoblastic mosaics, have similar grain size and display weak fracturing. There is good textural evidence for significant early quartz veining. One remnant quartz vein in a matrix area is 'Z' folded with coarser 1 to 5mm strained and weakly fractured quartz grains.

The contacts between coarse grained and matrix areas are not as sharp as suggested in hand specimen. Commonly there are rapid though gradational changes in grain size. Minor, very fine opaques were noted in matrix areas, possibly magnetite and or pyrrhotite. Fine disseminated

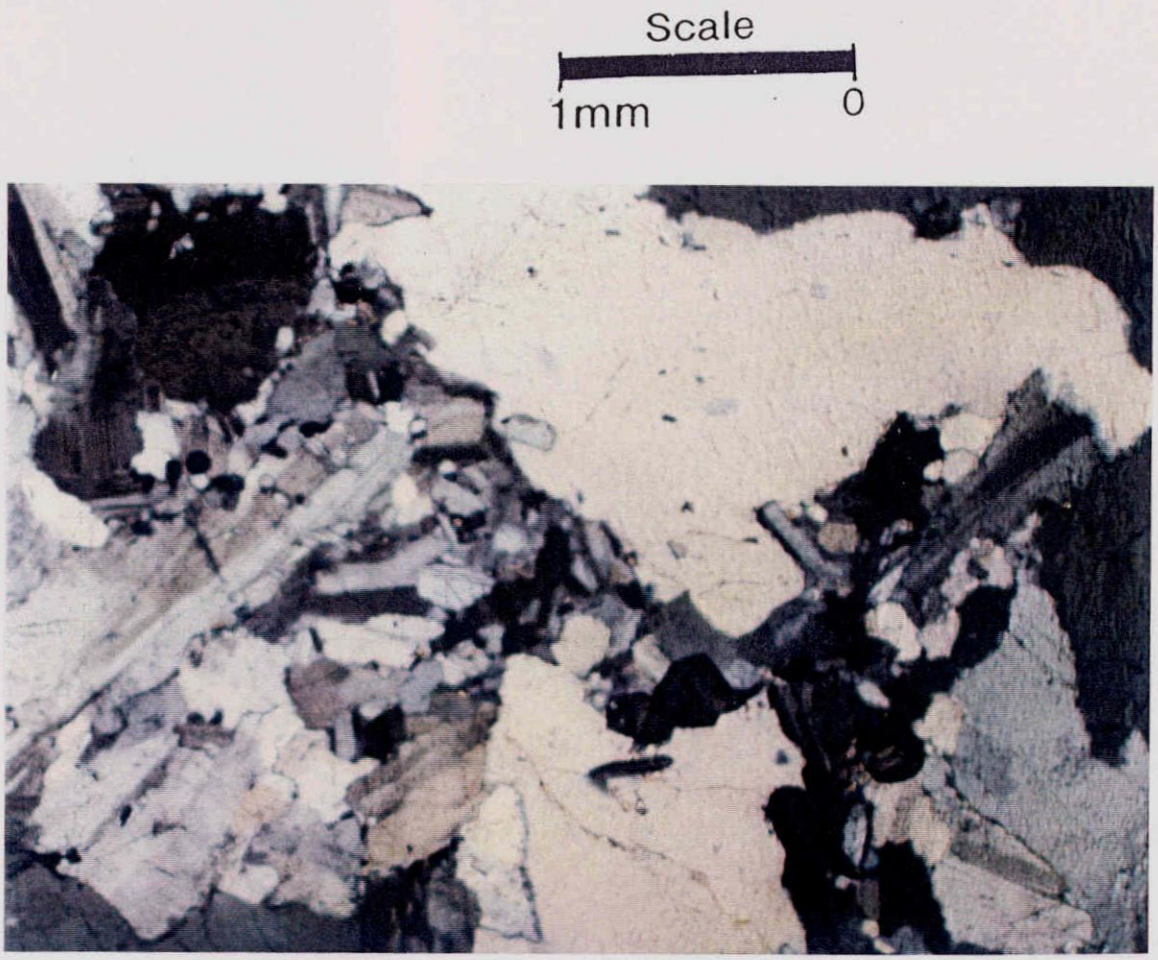
hematite inclusions occur throughout the feldspar grains which explains the rock's pink colouration.

3) Conclusions

This sample appears to represent a metamorphosed quartz vein breccia. There is good evidence for early deformed quartz veining. This veining and wallrocks were brecciated then recrystallized during later (peak) metamorphism. Muscovite based on spatial associations may be related to this vein event. K.feldspar is notably absent.

Because of the indicated veining and probable wallrock alteration no attempt is made at protolith identification.

Regarding the question on quartz-chalcedony. All of the quartz observed in the sample is recrystallized. No chalcedony or relict quartz textures such as banding were observed.



Sample 0505-013-88.0m: CP Light Photograph. Quartz Feldspar Vein Breccias. Edge of coarse recrystallized quartz vein fragment (right) in contact with albitic plagioclase (twinned) and equant prismatic garnets

Sample 0505-013-276.00m: PP Light Photograph. Biotite Schist with Garnet Porphyroblasts. Note concordant fracture cleavage in garnets and disseminated yellowish coloured fine tourmaline

SAMPLE 0505-013-276.00M. K.spar Altered Arkose. From 1995 Drill Log.

Sample Description

Medium grey, fine grained biotite schist with some fine garnet? Widely spaced and narrow fractures cross foliation at variable angles and have bleached envelopes. K.feldspar staining produces a very weak response from these bleached fractures (but is far from definitive). This sample is non magnetic, no sulfides were observed.

Thin Section Descriptions

1) Mineralogy

	Approximate %
Quartz	30-35
Plagioclase (untwinned)	40
Biotite	20-22
Garnet (almandine)	2-3
Yellow Tourmaline	4-5
Epidote	Tr-1
Chlorite	Tr-1
Sericite	Tr-1
Fine opaques	Tr

2) Comments

This sample is a plagioclase-quartz-biotite schist with fine garnet porphyroblasts and disseminated tourmaline. Mixed granoblastic to lepidoblastic recrystallized metamorphic textures are well developed. A strong foliation is defined by brown biotite laths between 0.2 and 0.6mm long. Granoblastic mosaics feature quartz and untwinned plagioclase with fairly even grain size between 0.2 and 0.4mm. There is no apparent grain size layering or banding in this sample.

Disseminated garnet porphyroblasts are light coloured to colourless, equidimensional (xenoblastic), between 0.1 and 1.0mm in cross section. Fractures are common and are closely spaced subparallel to foliation. Locally biotite laths in the plane of foliation fill these fractures. This clearly dates the garnet growth pre peak metamorphism and penetrative foliation (peak deformation). Significant amounts of disseminated yellow to yellow brown tourmaline is present. These display moderate to good crystal form, rarely contain fractures and in long section are aligned with foliation (post date garnets). The bleached 'fractures' observed in hand specimen can be related to very narrow fracture veinlets of quartz or feldspar. These have relatively broad, millimetre scale zones of wallrock alteration involving sericitization of plagioclase plus dusty inclusions (some epidote?) and chloritization of some biotite laths. This veining and fracturing clearly post dates peak metamorphism.

Disseminated fine opaques include tabular Ti minerals and possibly magnetite (anhedral) in trace amounts.

3) Conclusions

No K.feldspar or early veining was observed in this sample. The linear fabric does no give any indications of shear (flattening during metamorphism). Yellow tourmaline is part of the metamorphic assemblage (peak) while garnet (almandine) is prograde or from an earlier event (polymetamorphism?). The most likely protolith for this mineral assemblage is a greywacke or semi-pelite.

Late fracturing is represented by crosscutting veinlets with associated sericite, chlorite and possibly epidote, hematite alteration. This would be retrograde.

SAMPLE 0505-013-288.0M. K.spar Altered Arkose. From 1995 Drill Log.

Sample Description

Medium to dark grey, fine grained biotite schist with up to 5% fine disseminated pink coloured (almandine) garnets rarely exceeding 1mm in diameter. A crude coarse banding is observed in hand specimen with gradational contacts. Narrow bleached fracture zones up to 2mm wide crosscut foliation at variable angles from parallel to 60°. These locally appear sericitic. Sparse very fine grained disseminated pyrite or pyrrhotite is present. This sample is non magnetic.

Thin Section Description

1) Mineralogy

	Approximate %
Quartz	30-35
Plagioclase (albite-oligoclase)	30-40
Biotite	20
Epidote	Tr-1
Garnet (almandine)	1-2
Tourmaline	Tr
Sericite	4-6
Pyrite	Tr
Pyrrhotite	1
Ti minerals	Tr-1

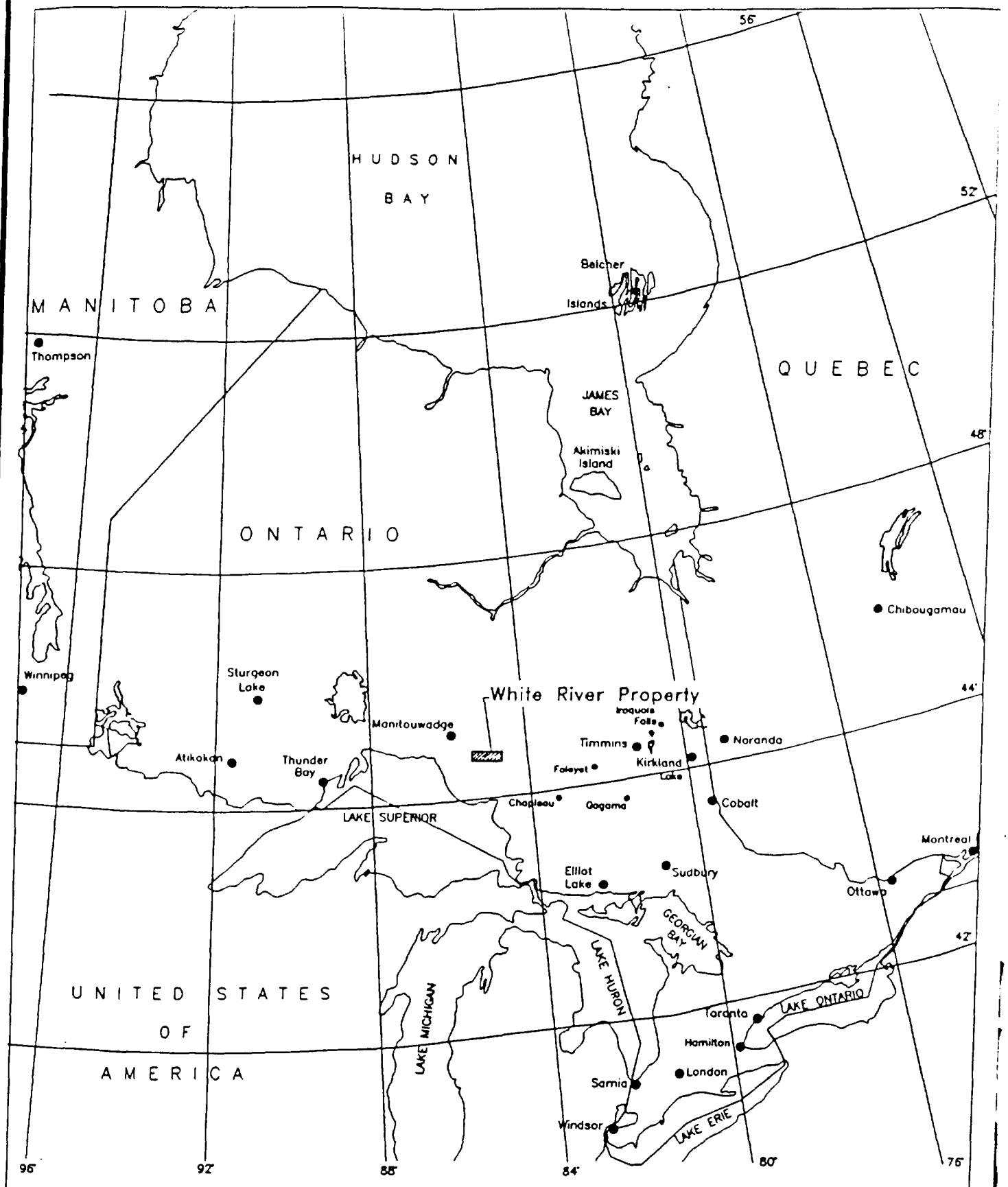
2) Comments

This sample has similarities with that at 276.0m. It is a fine grained plagioclase-quartz-biotite schist with fine garnet porphyroblasts. Very little tourmaline is present. Brown biotite laths between 0.1 and 0.6mm long define a strong linear foliation. Plagioclase is locally twinned with albite-low oligoclase compositions. It forms granoblastic mosaics with quartz averaging 0.2mm grain size. Light pink coloured garnet occurs as equidimensional to 'flattened' forms up to 0.8mm long. These are commonly full of inclusions and appear recrystallized. The flattened garnets clearly have long axes aligned with foliation. A few prismatic sections of light coloured tourmaline were observe. Fine anhedral to subhedral pyrrhotite (0.1mm or less) and anhedral to lathlike Ti minerals are disseminated throughout. One concordant quartz vein is 0.4mm wide and consists of recrystallized quartz to 0.3mm and little else.

The bleached zones in hand specimen are not K.feldspar. They are relatively broad fracture related bands of sericite alteration. Fine laths of sericite are clearly recognizable and overprint both plagioclase and biotite. Variably bleached biotite is common near these bands. Minor fine epidote is also associated with these alteration zones and occurs as fine isolated grains or in clusters up to 0.1mm. There is no noticeable increase or decrease in sulfide or opaque content within these zones.

3) Conclusions

The conclusions for this sample are identical to those in sample 276.0m. Some early concordant quartz veining is evident however most alteration is clearly associated with post peak (retrograde?) fractures and involves sericitization of metamorphic biotite and plagioclase. Garnets are early and possibly recrystallized. A greywacke (sub-pelite) protolith is probable.

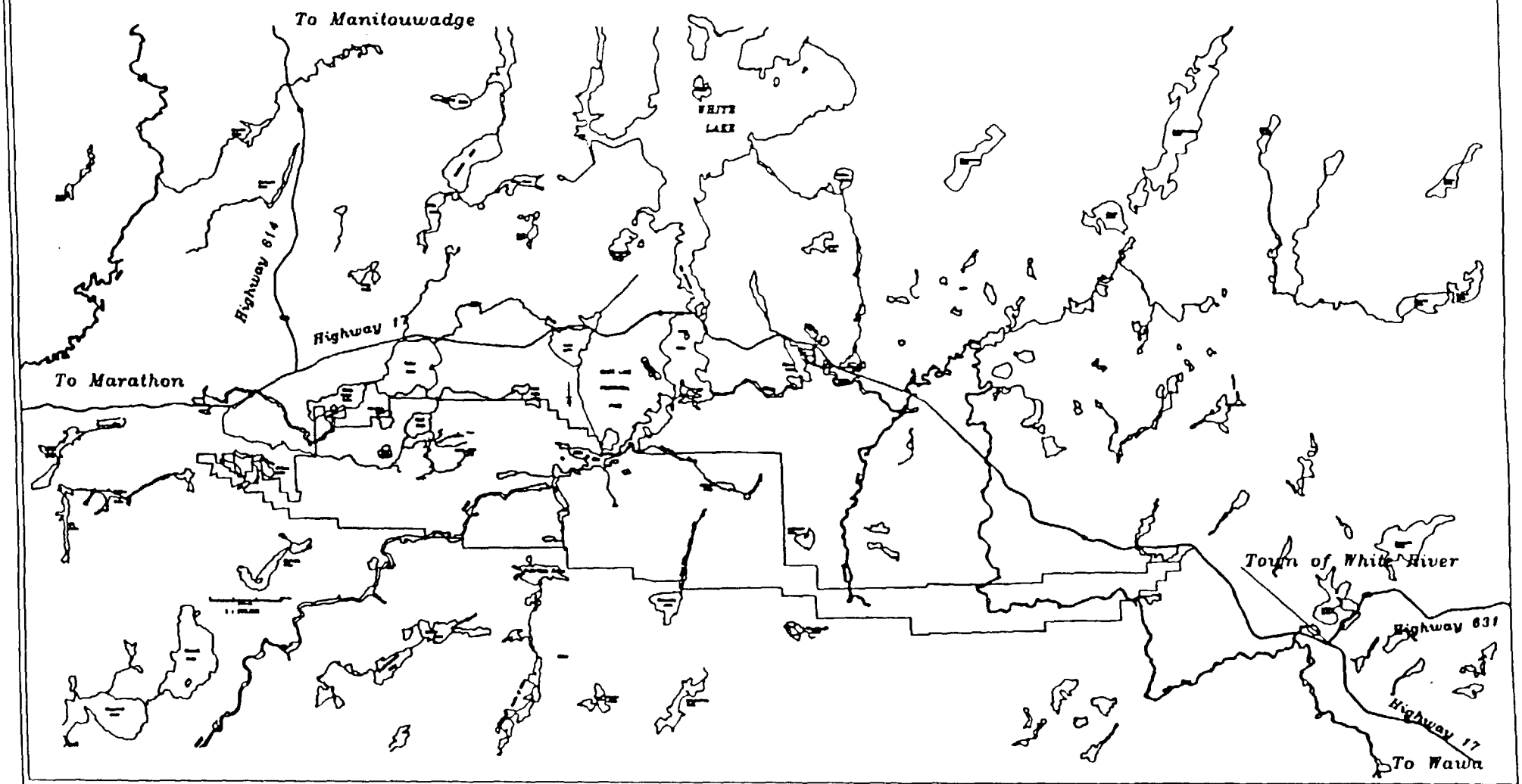


PLACER DOME INC.

PROJECT NO. CENTRAL ONTARIO

WHITE RIVER PROPERTY GENERAL LOCATION MAP

DATE: Nov 10, 1995	DRG BY: A.S. DRAWN BY: GDS	DRG.NO. 1
SCALE: 1:000,000	NTS REF: 42-C-11/12	



PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROJECT
PROPERTY LOCATION MAP

DATE: Dec. 27, 1996	DWG BY: BB DRAWN BY: DB	DWG NO 2
SCALE 1 : 250,000	NTS REF	

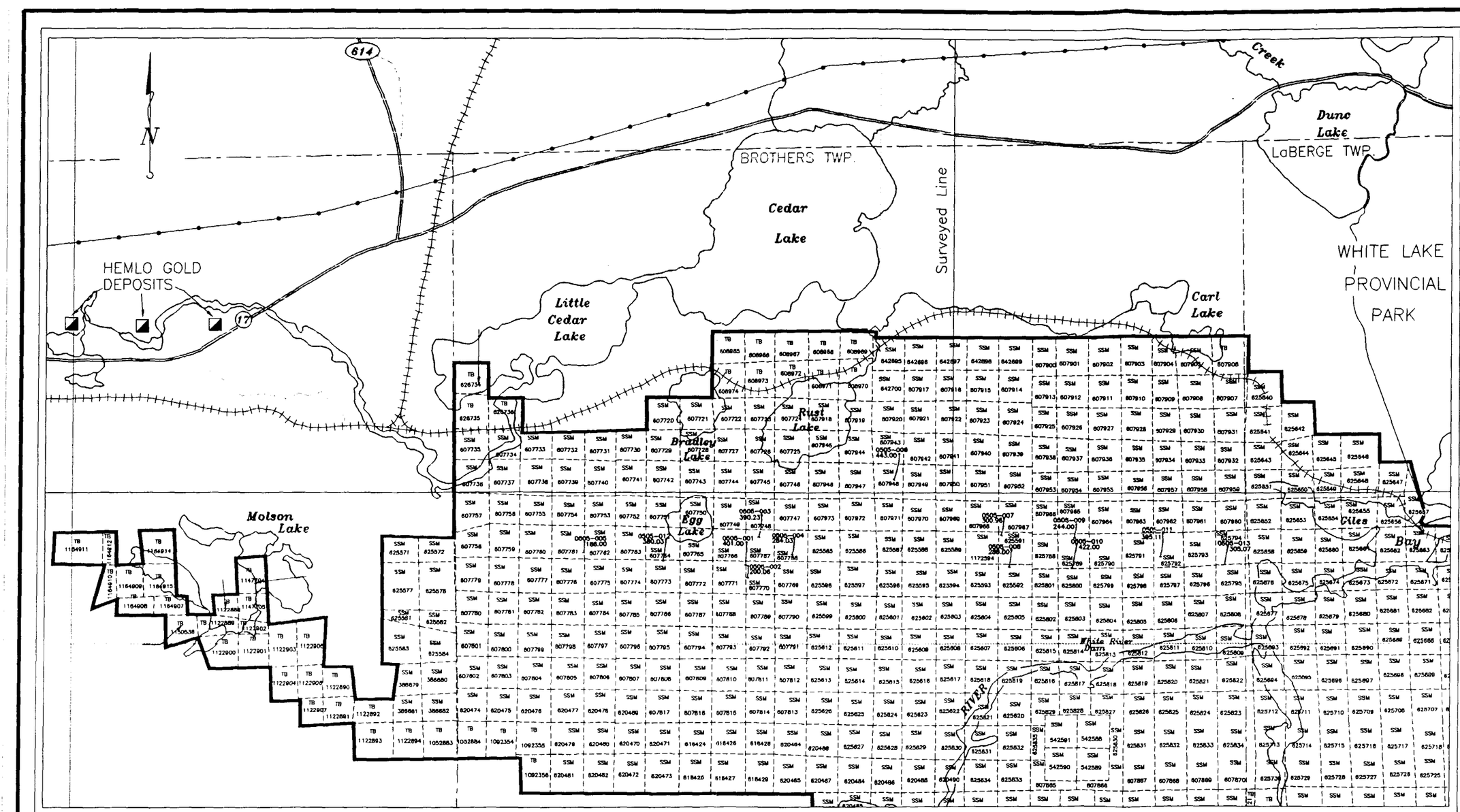
DDH: 505-01
LOCATION: 21200E 9000N
AZIMUTH: 180°
DIP: -45°
DEPTH:401.00m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

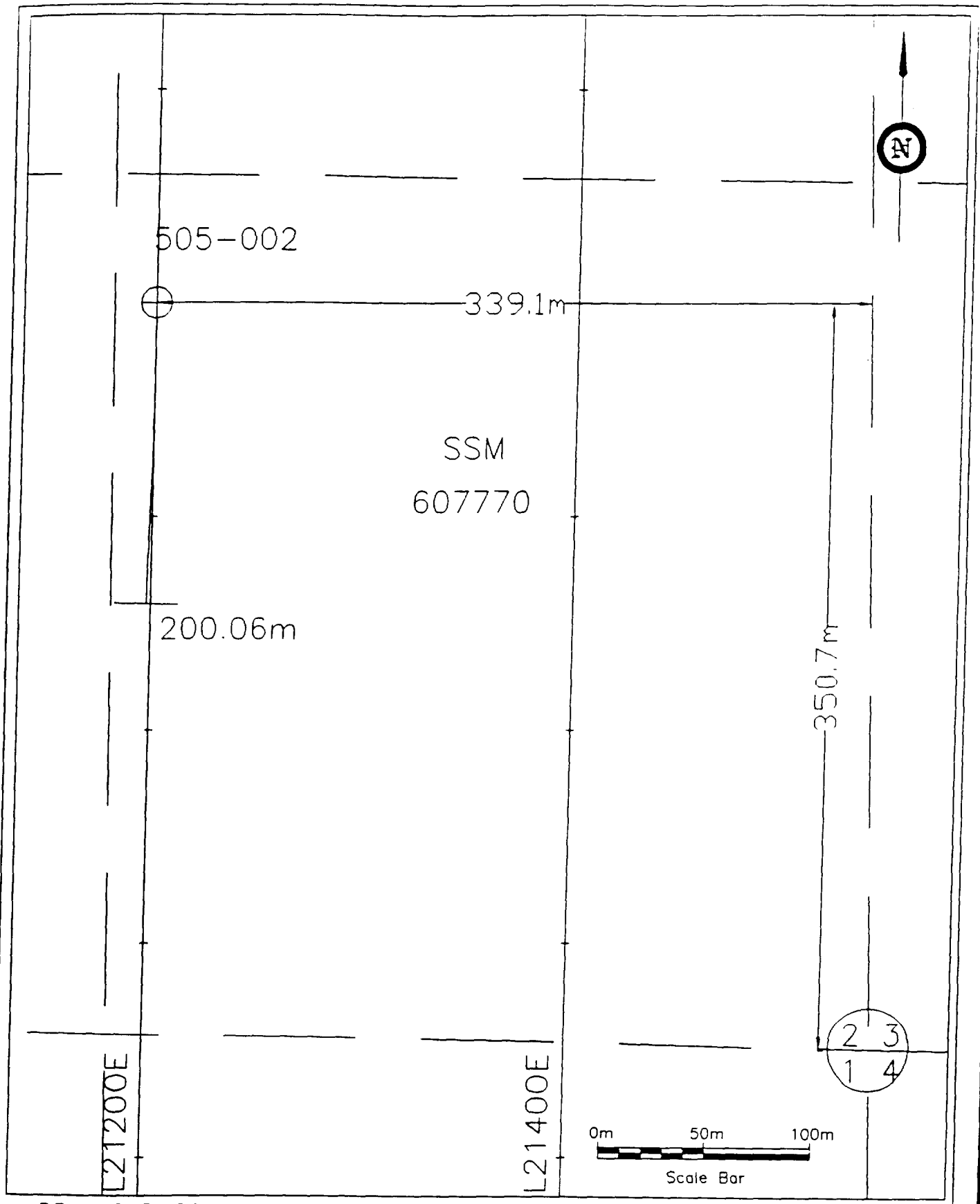
DRAWING #5

PLACER DOME CANADA LIMITED.

PROJECT NO. 505
WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-01

DATE: DEC. 99	ORIG BY: DRAWN BY: RCA	DWGNO 01\LOCMAP.DWG C:\ACADWINGS\505
SCALE: 1:2500	NTS REF 42C/12	


614
17
N
HEMLO GOLD DEPOSITS
BROTHERS TWP.
Cedar Lake
Little Cedar Lake
Surveyed Line
Carl Lake
Dune Lake
LaBERGE TWP.
Creek
WHITE LAKE PROVINCIAL PARK
Rust Lake
Bradley Lake
Molson Lake
Egg Lake
White River
RIVER
Bay
Cites
LEGEND
LAKES, RIVERS
RAILWAY TRACKS
MAJOR HIGHWAY
SECONDARY HIGHWAY
UTM GRID
TOWNSHIP BOUNDARY
HYDRO LINE
CLAIM GROUP
PLACER DOME CANADA LIMITED.
PROJECT NO.
WHITE RIVER PROJECT
1995 DIAMOND DRILL HOLE LOCATIONS
CLAIM MAP REFERENCE
DATE: December, 1995
SCALE: 1:50000
ORIG BY: GS
DRAWN BY: CBD
NTS REF. 42C/11&12
DWG NO.
95DDHCLM.DWG



DDH: 505-02
LOCATION: 21200E 8700N
AZIMUTH: 180°
DIP: -45°
DEPTH:200.06m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

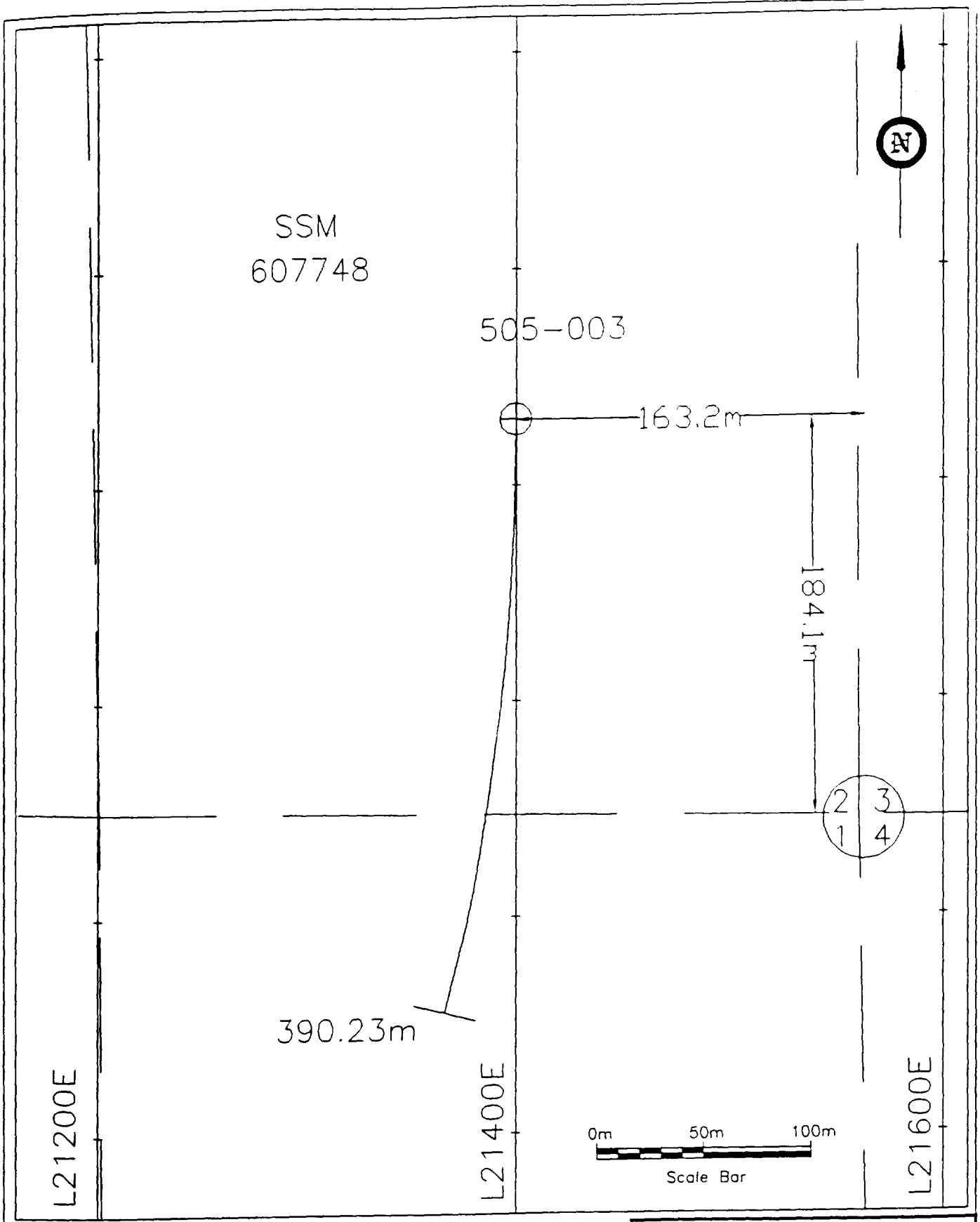
DRAWING #6

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-02

DATE: DEC. 99	DRG BY: DRAWN BY: RCA	DWG NO: 02LOCMAP.DWG G:\ACADDWGS\505
SCALE: 1:2500	NTS REF: 42C/12	



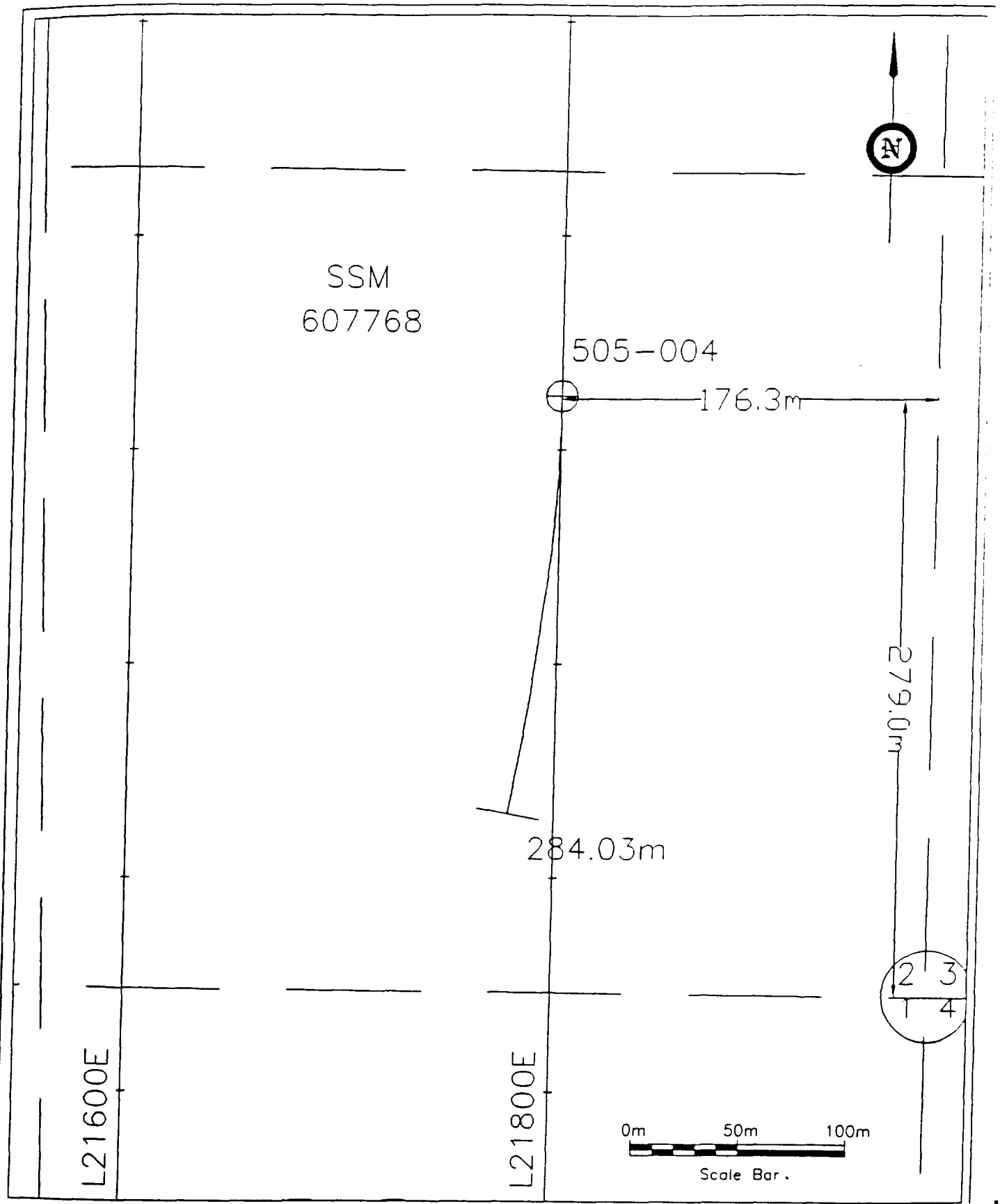
DDH: 505-03
LOCATION: 21400E 9330N
AZIMUTH: 180°
DIP: -45°
DEPTH: 390.23m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

DRAWING #7

PLACER DOME CANADA LIMITED.

PROJECT NO. 505
WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-03

DATE: DEC. 95	DRG BY: DRAWN BY: RCA	DWGNO: 0:\LOCMAP.DWG C:\ACADDWGS\505
SCALE: 1:2500	NTS REF 42C/12	



DDH: 505-04
LOCATION: 21800E 9025N
AZIMUTH: 180°
DIP: -45°
DEPTH: 284.03m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

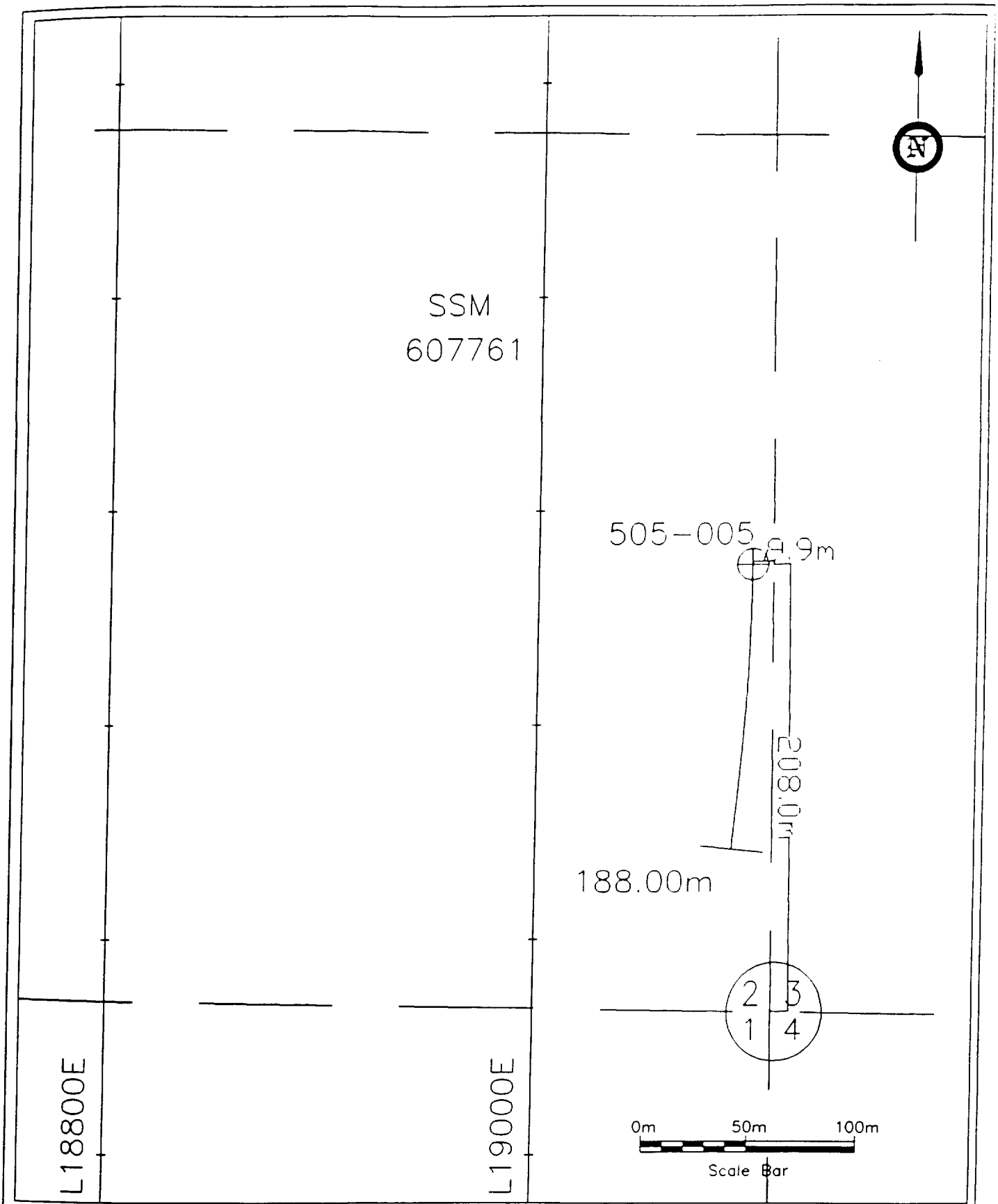
DRAWING #8

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-04

DATE: DEC. 95	ORIG. BY: DRAWN BY: PCA	DWG.NO. 04LOCMAP.DWG C:\ACADDWGS\505
SCALE: 1:2500	NTS REF 42C/12	



DDH: 505-05
LOCATION: 19100E 9075N
AZIMUTH: 180°
DIP: -45°
DEPTH:188.00m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

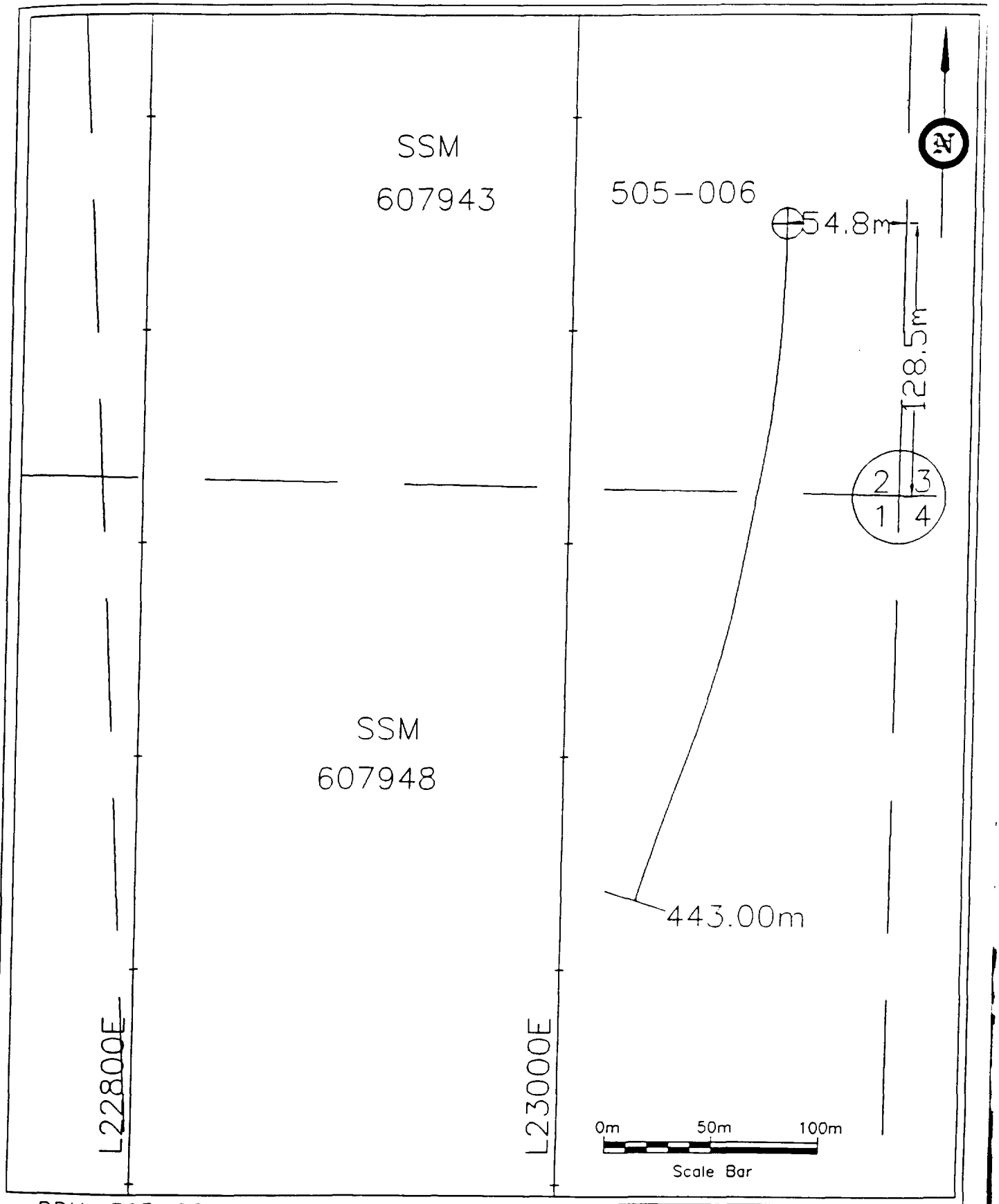
DRAWING #9

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-05

DATE: DEC. 99	ORIG BY: DRAWN BY: PCA	DWG NO. OSLOCMAP.DWG G:\ACADDWGS\505
SCALE 1:2500	NTS REF 42C/12	



DDH: 505-06
LOCATION: 23100E 10050N
AZIMUTH: 180°
DIP: -45°
DEPTH: 443.00m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

DRAWING #10

PLACER DOME CANADA LIMITED.

PROJECT NO. 505
WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-06

DATE: DEC. 95	ORIG BY: DRAWN BY: PCA	DWG.NO: ORLOCMAP.DWG G:\ACAD\DWGS\505
SCALE: 1:2500	NTS REF: 42C/12	

DDH: 505-07
LOCATION: 24400E 9230N
AZIMUTH: 180°
DIP: -45°
DEPTH: 300.96m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

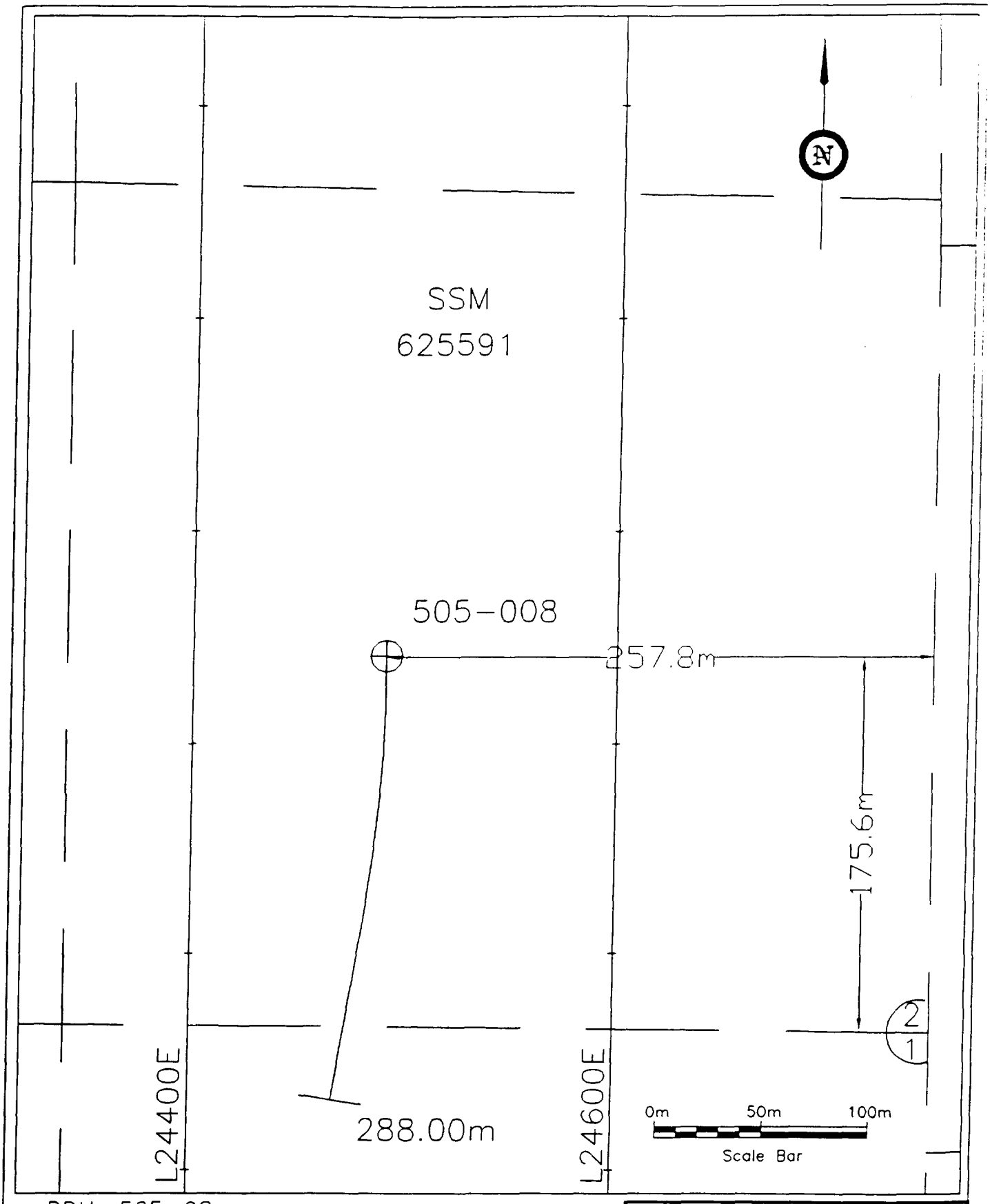
DRAWING #11

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-07

DATE DEC. 95	ORIG BY DRAWN BY PCA	DWGNO 07\LOCMAP DWG C:\ACADDWGS\505
SCALE 1:2500	NTS REF 42C/12	



DDH: 505-08
LOCATION: 24500E 8830N
AZIMUTH: 180°
DIP: -45°
DEPTH: 244.00m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

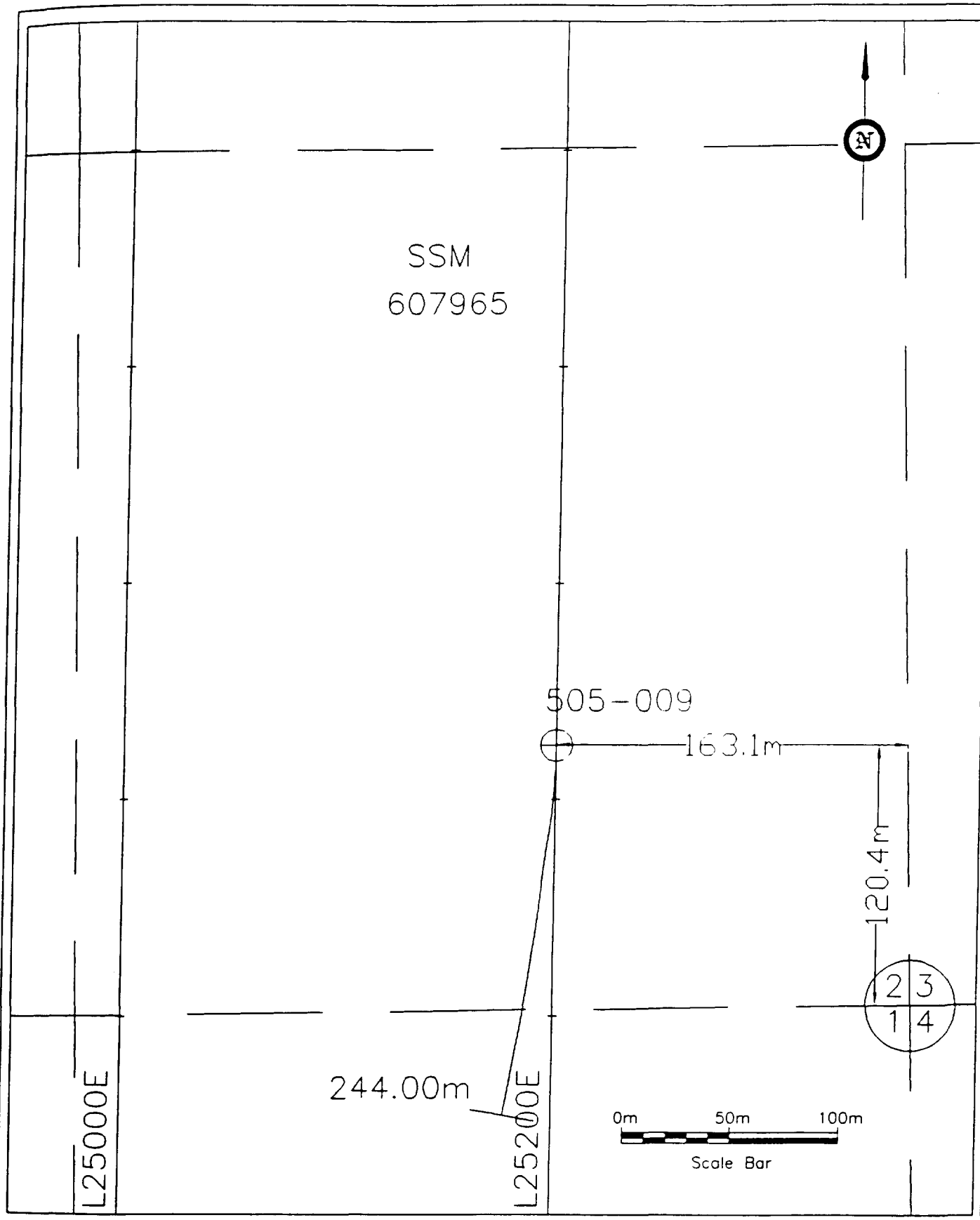
DRAWING #12

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-08

DATE: DEC. 98	ORIG BY: DRAWN BY: RCA	DWG NO: DRILLMAP.DWG C:\ACADDWGS\505
SCALE: 1:500	NTS REF 42C/12	



DDH: 505-09
LOCATION: 25200E 9125N
AZIMUTH: 180°
DIP: -45°
DEPTH:244.00m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

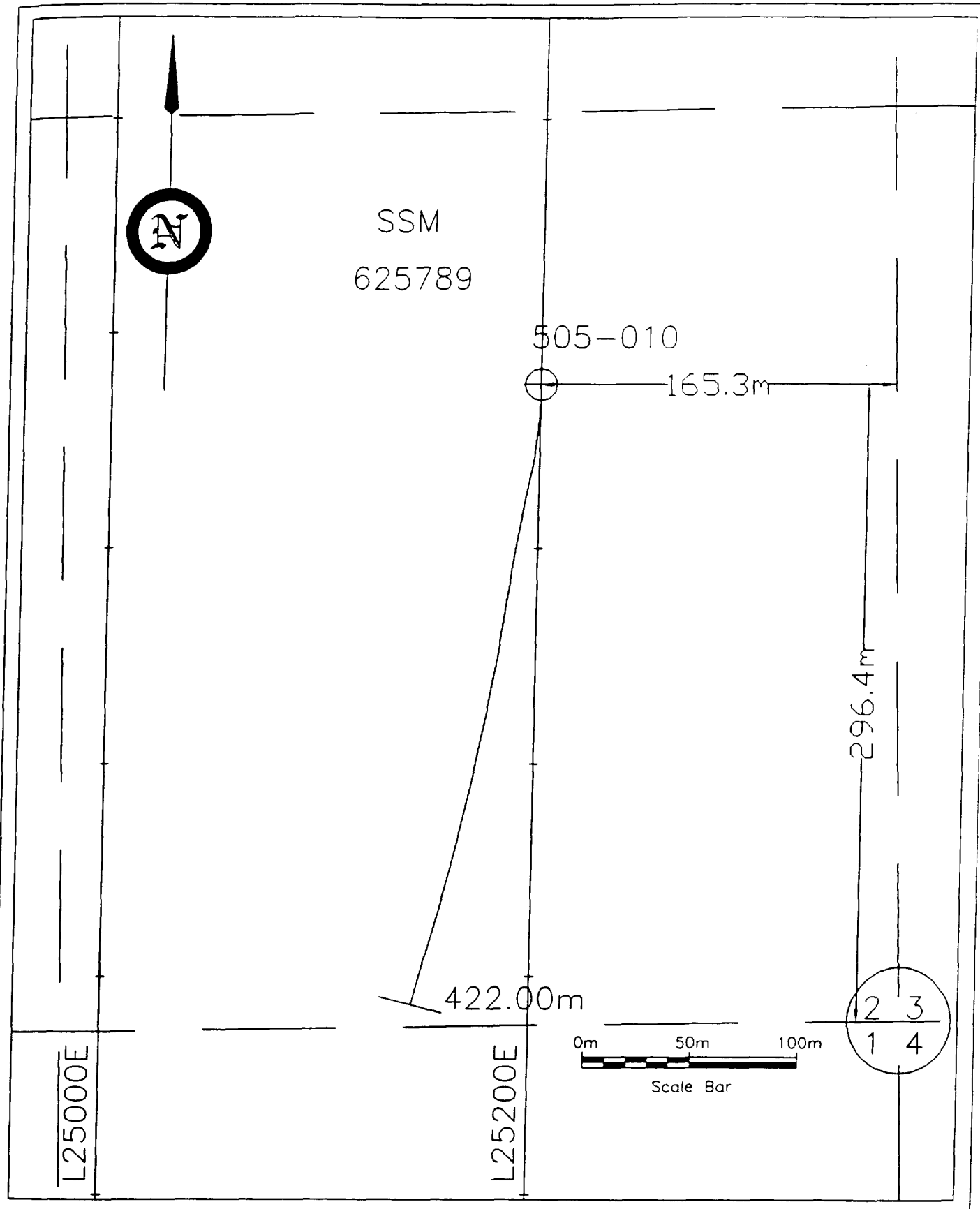
DRAWING #13

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-09

DATE DEC. 95	ORIG BY DRAWN BY: DCA	DWGNO ORLOCMAP.DWG C:\ACADDWGS\505
SCALE 1:2500	NTS REF 42C/12	



DDH: 505-10
LOCATION: 25200E 8875N
AZIMUTH: 180°
DIP: -45°
DEPTH: 422.00m.
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

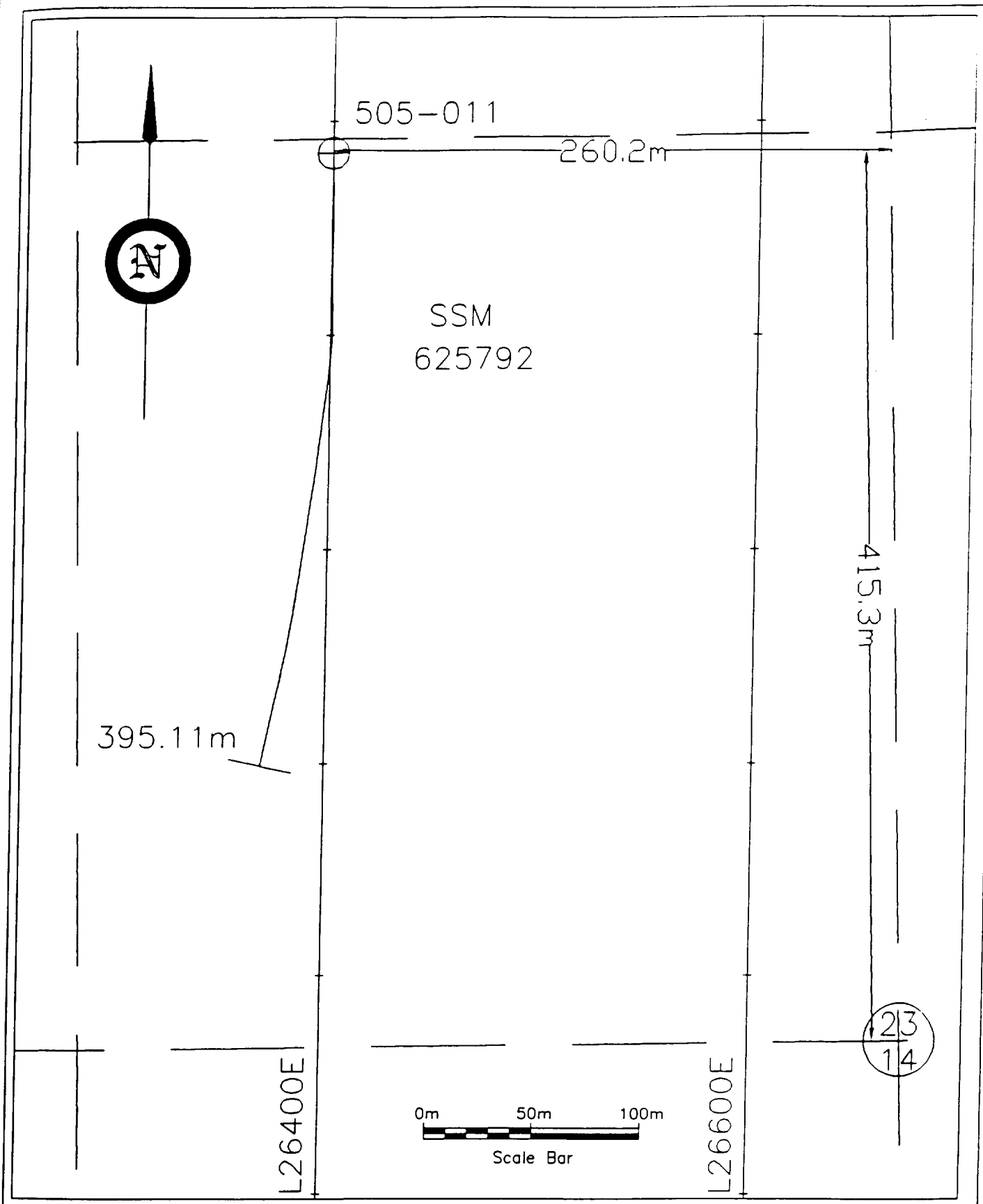
DRAWING #14

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-10

DATE: DEC. 95	ORIG BY: DRAWN BY: PCA	DWG NO. 10LOCMAP DWG G:\ACADDWGS\505
SCALE: 1:2500	NTS REF: 42C/12	



DDH: 505-11
LOCATION: 26400E 8985N
AZIMUTH: 180°
DIP: -45°
DEPTH: 395.11m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

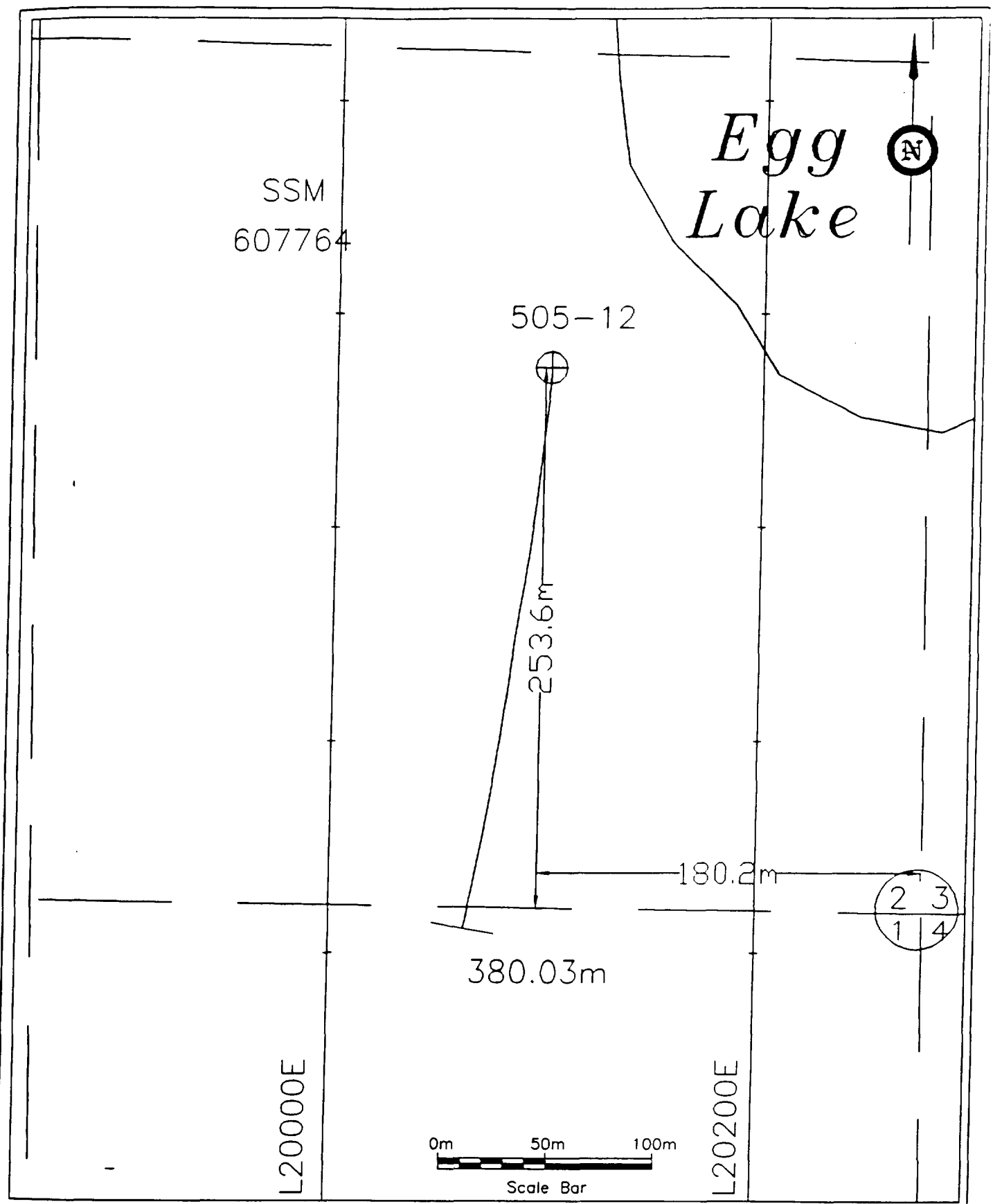
DRAWING #15

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-11

DATE: DEC. 95	ORIG BY: DRAWN BY: PCA	DWG NO 11LDCMAP.DWG C:\ACADDWGS\505
SCALE 1:2500	NTS REF 42C/12	



DDH: 505-12
LOCATION: 20100E 9075N
AZIMUTH: 180°
DIP: -45°
DEPTH:380.03m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

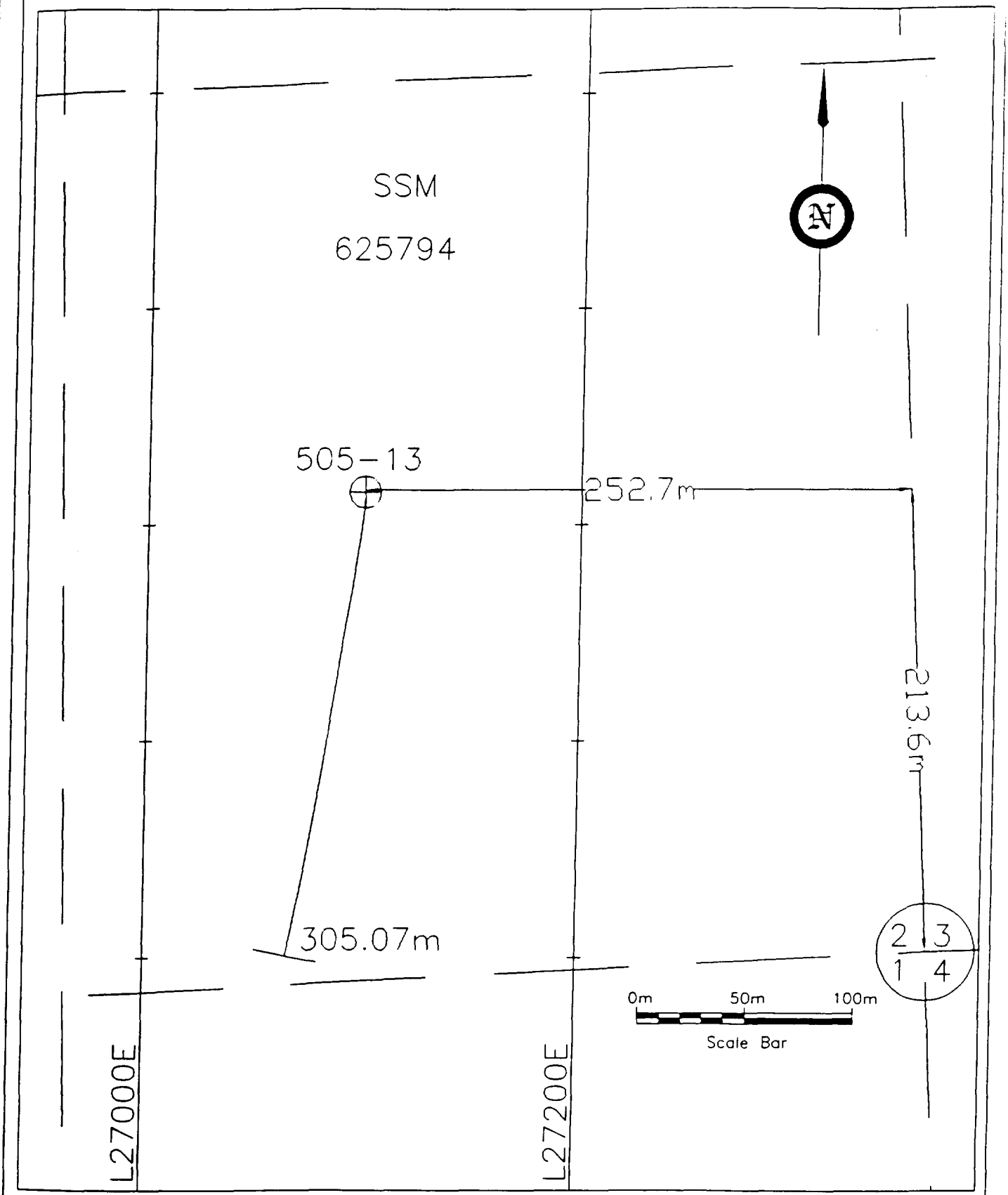
DRAWING #16

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-12

DATE: DEC. 99	ORIG BY: DRAWN BY: RDA	DWG.NO. 12LOCMAP.DWG G:\ACAD\WGS\505
SCALE: 1:2500	NTS REF 42C/12	



DDH: 505-13
LOCATION: 27100E 8815N
AZIMUTH: 180°
DIP: -45°
DEPTH: 305.07m
CORE SIZE: NQ
MAGNETIC DECLINATION: 4°W

DRAWING #17

PLACER DOME CANADA LIMITED.

PROJECT NO. 505

WHITE RIVER PROPERTY
LOCATION PLAN MAP
DDH 505-13

DATE: DEC. 95	ORIG BY: DRAWN BY: RCA	DWG.NO. 13\LOCMAP.DWG G:\ACADDWGS\505
SCALE: 1:2500	NTS REF 42C/12	

Ministry of Northern Development and Mines

Ontario

Report of Work Conducted After Recording Claim

Mining Act

Transaction Number: W9640-569

MINING LANDS

Personal information collected on this form is obtained under the authority of the Mining Act. This information will be used for correspondence. Questions about this collection should be directed to the Provincial Manager, Mining Lands, Ministry of Northern Development and Mines, Fourth Floor, 159 Cedar Street, Sudbury, Ontario, P3E 6A5, telephone (705) 670-7264.

Instructions: - I

42C12NE0028 2.16900 BROTHERS

900 k Gro… plicate… 2.16900

- A sketch, showing the claims the work is assigned to, must accompany this form.

Recorded Holder(s): Lac Minerals Ltd. / Lac Exploration Inc.		Client No. 155133 / 301000
Address: 2 Chemin Bousquet, Route 395; Pressiac, Quebec		Telephone No. (819) 759-3681
Mining Division: Thunder Bay	Township/Area: Brothers/[redacted]	M or G Plan No. G-3173/G-3172/G-3174
Dates Work Performed — From: June 12 1995	To: Feb 19 1996	

Work Performed (Check One Work Group Only)

	Work Group	Type
	Geotechnical Survey	
	Physical Work, Including Drilling	
	Rehabilitation	
x	Other Authorized Work	Petrographic analysis of drillcore from 12 holes (11 thin sections + 34 polished thin sections)
	Assays	
	Assignment from Reserve	

(W50) (other)

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NOV 26 1996
MINING LANDS BRANCH

Total Assessment Work Claimed on the Attached Statement of Costs $ 12,716.00

Note: The Minister may reject for assessment work credit all or part of the assessment work submitted if the recorded holder cannot verify expenditures claimed in the statement of costs within 30 days of a request for verification.

Persons and Survey Company Who Performed the Work (Give Name and Address of Author of Report)

Name	Address
Glenn Shevchenko	Placer Dome Canada Limited; PO Box 960, Timmins ON P4N 7H1
R. C. Wells	Kamloops Geological Services Ltd. 910 Heatherton Court, Kamloops B.C. V1S 1P9

(attach a schedule if necessary)

Certification of Beneficial Interest * See Note No. 1 on reverse side

	Date	Recorded Holder or Agent (Signature)
I certify that at the time the work was performed, the claims covered in this work report were recorded in the current holder's name or held under a beneficial interest by the current recorded holder.	Oct 29/96	Robin Price — Placer Dome Canada

Certification of Work Report

I certify that I have a personal knowledge of the facts set forth in this Work report, having performed the work or witnessed same during and/or after its completion and annexed report is true.

Name and Address of Person Certifying: Paul Burchell, Placer Dome Canada Limited; PO Box 960; Timmins ON P4N 7H1

Telepone No.	Date	Certified By (Signature)
(705) 267-5400	Oct 29/96	P Burchell

For Office Use Only

Total Value Cr. Recorded	Date Recorded	Mining Recorder	Received Stamp
#12,716	[redacted]	C J Allen (Acting)	Thunder Bay Mining Division OCT 30 1996
	Date Approved		
	Date Notice for Amendments Sent		

0241 (03/91)

Work Report Number for Applying Reserve	Claim Number (see Note 2)	Number of Claim Units	Value of Assessment Work Done on this Claim	Value Applied to this Claim	Value Assigned from this Claim	Reserve: Work to be Claimed at a Future Date
	607748	1	848	0	0	848
	607761	1	848	0	0	848
	607764	1	1413	0	0	1413
	607768	1	565	0	0	565
	607770	1	848	0	0	848
	607771	1	848	0	0	848
	607943	1	282	0	0	282
	607948	1	565	0	0	565
	607965	1	565	0	0	565
	625591	1	2827	0	1600	1227
	625592	1	282	0	0	282
	625789	1	1413	0	0	1413
	625792	1	282	0	0	282
	625794	1	1130	0	0	1130
	1052877	1	0	400	0	0
	1052878	1	0	400	0	0
	1052879	1	0	400	0	0
	1052880	1	0	400	0	0
	Total Number of Claims: 18	18	Total Value Work Done: 12,716	Total Value Work Applied: 1600	Total Assigned From: 1600	Total Reserve: 11,116

14 claims
14 Units

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NOV 26 1996
MINING LANDS BRANCH

Credits you are claiming in this report may be cut back. In order to minimize the adverse effects of such deletions, please indicate from which claims you wish to priorize the deletion of credits. Please mark (✓) one of the following:

1. ☐ Credits are to be cut back starting with the claim listed last, working backwards.
2. ☐ Credits are to be cut back equally over all claims contained in this report of work.
3. ☐ Credits are to be cut back as priorized on the attached appendix.
4. X credits are to be cut back from reserve work to be claimed later. Call R.Price at Placer Dome first (705) 267-5400.

In the event that you have not specified your choice of priority, option one will be implemented.

Note 1: Examples of beneficial interest are unrecorded transfers, option agreements, memorandum of agreements, etc., with respect to the mining claims.

Note 2: If work has been performed on patented or leased land, please complete the following:

I certify that the recorded holder had a beneficial interest in the patented or leased land at the time the work was performed.	Signature	Date

(03/91)

Ministry of Northern Development and Mines

Ministère du Développement du Nord et des mines

Statement of Costs for Assessment Credit

État des coûts aux fins du crédit d'évaluation

Mining Act/Loi sur les mines

Transaction No./N° de transaction
W9640-569

2.16900

Personal information collected on this form is obtained under the authority of the **Mining Act**. This information will be used to maintain a record and ongoing status of the mining claim(s). Questions about this collection should be directed to the Provincial Manager, Minings Lands, Ministry of Northern Development and Mines, 4th Floor, 159 Cedar Street, Sudbury, Ontario P3E 6A5, telephone (705) 670-7264.

Les renseignements personnels contenus dans la présente formule sont recueillis en vertu de la **Loi sur les mines** et serviront à tenir à jour un registre des concessions minières. Adresser toute quesiton sur la collece de ces renseignements au chef provincial des terrains miniers, ministère du Développement du Nord et des Mines, 159, rue Cedar, 4e étage, Sudbury (Ontario) P3E 6A5, téléphone (705) 670-7264.

1. Direct Costs/Coûts directs

Type	Description	Amount Montant	Totals Total global
Wages Salaires	Labour Main-d'oeuvre		
	Field Supervision Supervision sur le terrain		–
Contractor's and Consultant's Fees Droits de l'entrepreneur et de l'expert-conseil	Type Kamloops Geological Services		
		11,700	
	Vanc.Petrographics	1,016	12,716
Supplies Used Fournitures utilisées	Type		
			–
Equipment Rental Location de matériel	Type		
			–
	Total Direct Costs Total des coûts directs		12,716

2. Indirect Costs/Coûts indirects

** Note: When claiming Rehabilitation work Indirect costs are not allowable as assessment work.
Pour le remboursement des travaux de réhabilitation, les coûts indirects ne sont pas admissibles en tant que travaux d'évaluation.

Type	Description	Amount Montant	Totals Total global
Transportation Transport	Type		
			–
Food and Lodging Nourriture et hébergement			–
Mobilization and Demobilization Mobilisation et démobilisation			–
	Sub Total of Indirect Costs Total partiel des coûts indirects		0
	Amount Allowable (not greater than 20% of Direct Costs) Montant admissible (n'excédant pas 20 % des coûts directs)		2543.
	Total Value of Assessment Credit (Total of Direct and Allowable Indirect costs) **Valeur totale du crédit d'évaluation (Total des coûts directs et indirects admissibles)**		12,716

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NOV 26 1996
MINING LANDS BRANCH

Note: The recorded holder will be required to verify expenditures claimed in this statement of costs within 30 days of a request for verification. If verification is not made, the Minister may reject for assessment work *all or part of the assessment work submitted.*

Note : Le titulaire enregistré sera tenu de vérifier les dépenses demandées dans le présent état des coûts dans les 30 jours suivant une demande à cet effet. Si la vérification n'est pas effectuée, le ministre peut rejeter tout ou une partie des travaux d'évaluation présentés.

Filing Discounts

xx 1. Work filed within two years of completion is claimed at 100% of the above Total Value of Assessment Credit.

2. Work filed three, four or five years after completion is claimed at 50% of the above Total Value of Assessment Credit. See calculations below:

Total Value of Assessment Credit	Total Assessment Claimed
× 0.50 =	

Remises pour dépôt

1. Les travaux déposés dans les deux ans suivant leur achèvement sont remboursés à 100 % de la valeur totale susmentionnée du crédit d'évaluation.

2. Les travaux déposés trois, quatre ou cinq ans après leur achèvement sont remboursés à 50 % de la valeur totale du crédit d'évaluation susmentionné. Voir les calculs ci-dessous.

Valeur totale du crédit d'évaluation	Évaluation totale demandée
× 0,50 =	

Certification Verifying Statement of Costs

I hereby certify:
that the amounts shown are as accurate as possible and these costs were incurred while conducting assessment work on the lands shown on the accompanying Report of Work form.

that as SENIOR GEOLOGIST I am authorized
(Recorded Holder, Agent, Position in Company)

to make this certification

Thunder Bay Mining Division

OCT 30 1996

Attestation de l'état des coûts

J'atteste par la présente :
que les montants indiqués sont le plus exact possible et que ces dépenses ont été engagées pour effectuer les travaux d'évaluation sur les terrains indiqués dans la formule de rapport de travail ci-joint.

Et qu'à titre de _____ je suis autorisé
(titulaire enregistré, représentant, poste occupé dans la compagnie)

à faire cette attestation.

Signature	Date
Burchell	Oct 29/96

0212 (04/91)

Nota : Dans cette formule, lorsqu'il désigne des personnes, le masculin est utilisé au sens neutre.

Ministry of
Northern Development
and Mines

Ministère du
Développement du Nord
et des Mines

Ontario

Geoscience Assessment Office
933 Ramsey Lake Road
6th Floor
Sudbury, Ontario
P3E 6B5

Telephone: (705) 670-5853
Fax: (705) 670-5863

January 15, 1997

Michael Weirmeir
Mining Recorder
435 James Street South
Suite B003
Thunder Bay, ON
P7E 6E3

Dear Sir or Madam:

Submission Number: 2.16900

Subject: Transaction Number(s): W9640.00569

We have reviewed your Assessment Work submission with the above noted Transaction Number(s). The attached summary page(s) indicate the results of the review. WE RECOMMEND YOU READ THIS SUMMARY FOR THE DETAILS PERTAINING TO YOUR ASSESSMENT WORK.

If the status for a transaction is a 45 Day Notice, the summary will outline the reasons for the notice, and any steps you can take to remedy deficiencies. The 90-day deemed approval provision, subsection 6(7) of the Assessment Work Regulation, will no longer be in effect for assessment work which has received a 45 Day Notice.

Please note any revisions must be submitted in DUPLICATE to the Geoscience Assessment Office, by the response date on the summary.

NOTE: This correspondence may affect the status of your mining lands. Please contact the Mining Recorder to determine the available options and the status of your claims.

If you have any questions regarding this correspondence, please contact Steve Beneteau at (705)670-5855.

Yours sincerely,

ORIGINAL SIGNED BY
Ron C. Gashinski
Senior Manager, Mining Lands Section
Mines and Minerals Division

Correspondence ID: 10469
Copy for: Assessment Library

Work Report Assessment Results

Submission Number: 2.16900

Date Correspondence Sent: January 15, 1997 **Assessor:** Steve Beneteau

Transaction Number	First Claim Number	Township(s) / Area(s)	Status	Approval Date
W9640.00569	607748	BROTHERS, BOMBY, LABERGE	Approval	January 14, 1997

Section:
18 Other MICRO

Correspondence to:

Mining Recorder
Thunder Bay, ON

Resident Geologist
Thunder Bay, ON

Assessment Files Library
Sudbury, ON

Recorded Holder(s) and/or Agent(s):

Robin Price
TIMMINS, ONTARIO

LAC MINERALS LTD.
PREISSAC, QUEBEC

LAC EXPLORATION INC.
TORONTO, ONTARIO

Correspondence ID: 10469

REFERENCES

AREAS WITHDRAWN FROM DISPOSITION

M.R.O. – MINING RIGHTS ONLY
S.R.O. – SURFACE RIGHTS ONLY
M.+ S. – MINING AND SURFACE RIGHTS

...scription	Order No.	Date	Disposition	File

...JING RIGHTS ON THE WHITE R. GRANTED TO ONTARIO ...O TO CONTOUR ELEVATION 1080', FILE: 113986 ...WN THUS ——"——)

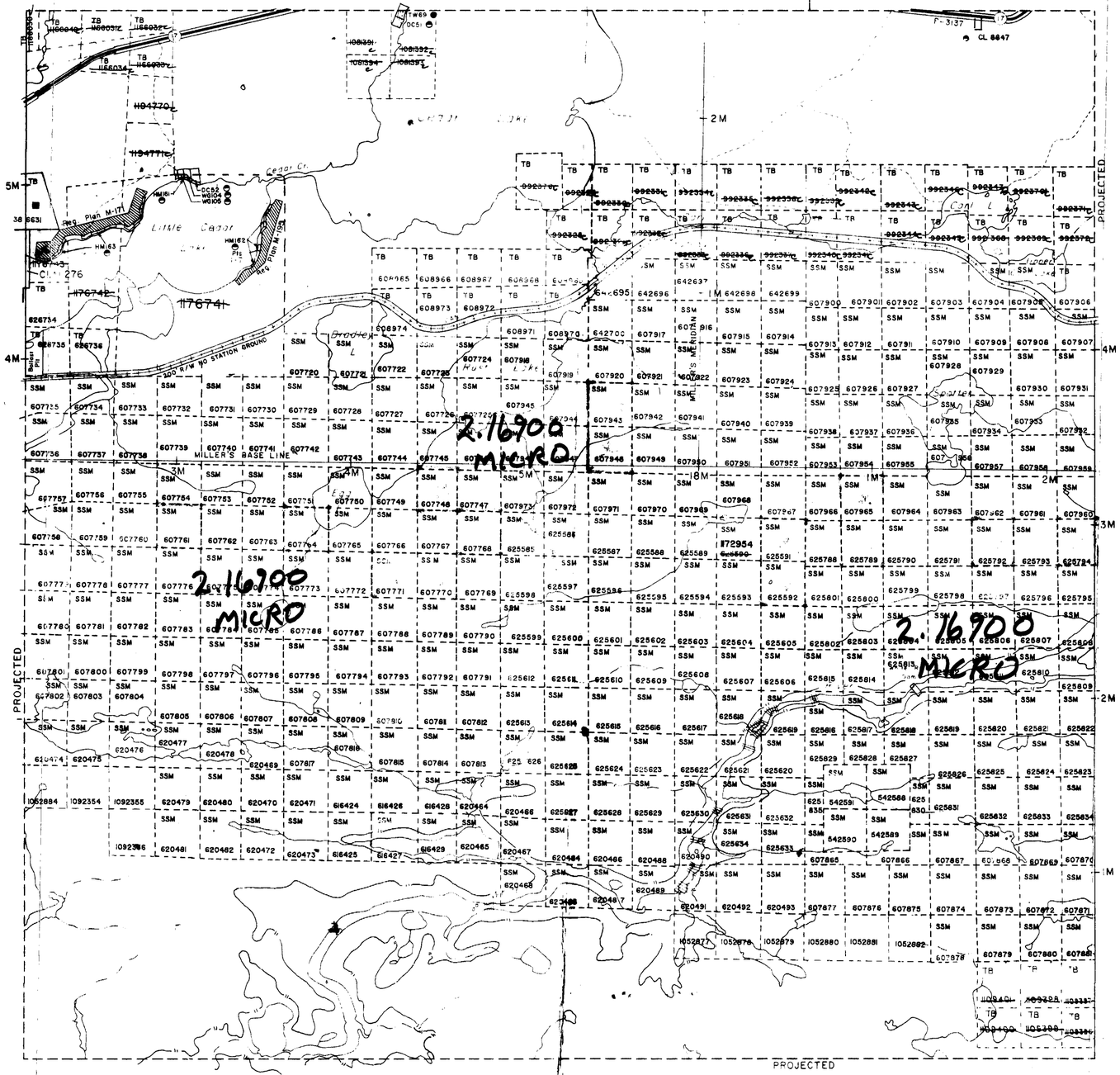
THE INFORMATION THAT APPEARS ON THIS MAP HAS BEEN COMPILED FROM VARIOUS SOURCES, AND ACCURACY IS NOT GUARANTEED. THOSE WISHING TO STAKE MINING CLAIMS SHOULD CONSULT WITH THE MINING RECORDER, MINISTRY OF NORTHERN DEVELOPMENT AND MINES, FOR ADDITIONAL INFORMATION ON THE STATUS OF THE LANDS SHOWN HEREON.

WABIKOBA LAKE G-620

WHITE LAKE (S.PT.) G-623

BOMBY TWP. G-3173

LABERGE TWP. G-3174



LEGEND

- HIGHWAY AND ROUTE No.
- OTHER ROADS
- TRAILS
- SURVEYED LINES:
  - TOWNSHIPS, BASE LINES, ETC.
  - LOTS, MINING CLAIMS, PARCELS, ETC.
- UNSURVEYED LINES:
  - LOT LINES
  - PARCEL BOUNDARY
  - MINING CLAIMS ETC.
- RAILWAY AND RIGHT OF WAY
- UTILITY LINES
- NON-PERENNIAL STREAM
- FLOODING OR FLOODING RIGHTS
- SUBDIVISION OR COMPOSITE PLAN
- RESERVATIONS
- ORIGINAL SHORELINE
- MARSH OR MUSKEG
- MINES
- TRAVERSE MONUMENT

DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT	SYMBOL
PATENT, SURFACE & MINING RIGHTS	
" , SURFACE RIGHTS ONLY	
" , MINING RIGHTS ONLY	
LEASE, SURFACE & MINING RIGHTS	
" , SURFACE RIGHTS ONLY	
" MINING RIGHTS ONLY	
LICENCE OF OCCUPATION	
ORDER-IN-COUNCIL	OC
RESERVATION	
CANCELLED	
SAND & GRAVEL	

LAND USE PERMITS FOR COMMERCIAL TOURISM, OUTPOST CAMPS

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 6, 1913, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT, R.S.O. 1970, CHAP. 380 SEC 63, SUBSEC 1.

SCALE 1 INCH = 40 CHAINS

FEET 0 1000 2000 4000 6000 8000

METRES 0 200 1000 2000 (1 KM) (2 KM)

TOWNSHIP

BROTHERS

M.N.R. ADMINISTRATIVE DISTRICT
TERRACE BAY / WAWA
MINING DIVISION
SAULT STE. MARIE / THUNDER BAY
LAND TITLES / REGISTRY DIVISION
THUNDER BAY

Ministry of Natural Resources — Land Management Branch
Ontario

2.16900

NOVEMBER 5, 1987

Date AUGUST, 1964

March 21, 1988

Number G-3172

42C12NE0028 2.16900 BROTHERS