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Invoice 7879 (Revised)

February 14th, 1989

Introduction:

This report presents modified descriptions and rock names for the suite previously described by Janet Gabites and Judy Radloff.

Samples are as follows:

Sample No.	Location	Sample No.	Location
3	88-30 65'	11	No number A
2	88-36 71'	16	No number B
8	88-36 93'	17	No number C
7	88-39 99'	18	No number D
9	88-39 171'	10	North End A
1	88-51 124'	12	North End B
6	88-52 96'	13	North End C
4	88-65 192'	14	North End D
5	88-66 71'	15	Bootjack Lake, West

For consistency in the following discussion, the numbering system used in the previous report (column 1 in the above table) is retained.

SUMMARY:

Classification:

This is a suite of quartz-free, more or less K-rich, intermediate igneous rocks with pyroxene as the principal mafic. All contain both plagioclase and K-feldspar - the latter generally making up about 20 - 50% of the total feldspars.

Mineralogy and Texture

The two andesites are of leucocratic character (with feldspars making up 80 - 90% of the rock).

Of the two trachyandesites, Sample 9 is a meshwork-textured rock with accessory hornblende, and Sample 17 is porphyritic, with pyroxene as the principal mafic.

The latites are all porphyritic rocks. Samples 6 and 13 are feldspar-rich leucocratic varieties. Samples 2 and 8 have meshwork-textured groundmasses with rather abundant pyroxene and/or biotite, and lack plagioclase phenocrysts. Sample 10 has phenocrysts of plagioclase and pyroxene, and minor hornblende.

Of the two diorites, Sample 3 is microgranular, and Sample 5 is coarsely porphyritic and highly leucocratic.

Of the monzonites, Sample 1 is porphyritic, with phenocrysts of plagioclase and minor pyroxene. The remainder are of equigranular type. Sample 4 is of highly leucocratic composition, and the others have pyroxene (or its altered equivalent) as the principal mafic.

The two fragmental rocks both lack fresh mafics, and are comparatively rich in chlorite and carbonate.

Alteration:

The rocks of this suite show a variety of styles and intensities of alteration.

Plagioclase shows relatively strong saussuritic alteration (to sericite, clays and fine-grained epidote) in Samples 1, 3, 10, 12 and 17. Feldspars often show a strong brownish turbidity (mainly clays?), notably in Samples 7 and 14.

Plagioclase is rather strongly altered to crystalline epidote in Samples 11 and 15.

Prehnite, as replacement clumps and/or vesicular fillings, sometimes with zeolites, is prominent in Samples 11 and 13.

Pyroxene is strongly altered to chlorite and carbonate in Samples 2, 8, 9, 13, 14 and 16.

Samples 4, 5, 6 and 18 are notably fresh.

Individual petrographic descriptions are attached.

J.F. Harris Ph.D.

According to the commonly used GSC classification, quartz-free volcanics, where K-spar makes up from 10 - 60% of the total feldspars, are all to be called andesites. This is contrary to the general conception of an andesite, which is typically low in K-feldspar.

The classification of Williams, Turner and Gilbert is more realistic, in that relatively K-rich andesitic rocks (with >10% modal K-spar) are distinguished as trachyandesites; this typifies almost all the rocks of the present suite. However - again, in deference to normal usage - the most K-rich varieties (with K-spar > 40% of total feldspars) are distinguished in the present report as latites, although they do not meet the requirements of >65% K-spar required for this rock group on the GSC classification.

As regards corresponding quartz-free intrusive rocks, according to the GSC classification, all those with up to 35% relative K-spar are to be called diorites, and those with 35 - 65% monzonites. For the purpose of this report, the monzonite category is extended to include rocks with relative K-spar percentages down to about 25.

On the above basis, the majority of the rocks of this suite are latites and/or monzonites.

The textural character of these rocks does not provide definite evidence as to whether they are extrusive or intrusive. They are generally fine-grained, and often porphyritic. They are occasionally vesicular and/or show flow-orientation of phenocrysts. Many of them look like flows, and have been named accordingly (trachyandesite - latite). Some have more granular, non-porphyritic textures, or are notably coarser grained. These could be dykes or border-phase intrusives, and have been so named (diorite - monzonite). Two samples are fragmental. One is a lithic tuff and the other a probable flow breccia.

Based on the above considerations, the rocks of the present suite are classified as follows:

Probable flows:

Andesite:	Samples 7, 15
Trachyandesites:	Samples 9, 17
Latite:	Samples 2, 6, 8, 10, 13

Possible intrusives:

Diorite"	Samples 3, 5
Monzonite:	Samples 1, 4, 11, 12, 18

Tuffs and Breccia flows:

Trachyandesite	Sample 16
Latite	Sample 14

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Job 89-10

February 14th, 1989

PHOTOMICROGRAPHIC ILLUSTRATIONS OF ROCKS FROM THE MOUNT POLLEY AREA

The following photomicrographs relate to a suite of rocks described in Vacouver Petrographic's report 7879 (revised) of February 14th, 1989.

Photos are by cross-polarized transmitted light (except where otherwise stated) and are at a scale of 1cm = 0.17mm.

J.F. Harris Ph.D.

No. 3

SAMPLE 88-30 65' **DIORITE**

Estimated mode

Plagioclase	67
K-feldspar	16
Pyroxene	10
Biotite	5
Opaques	2

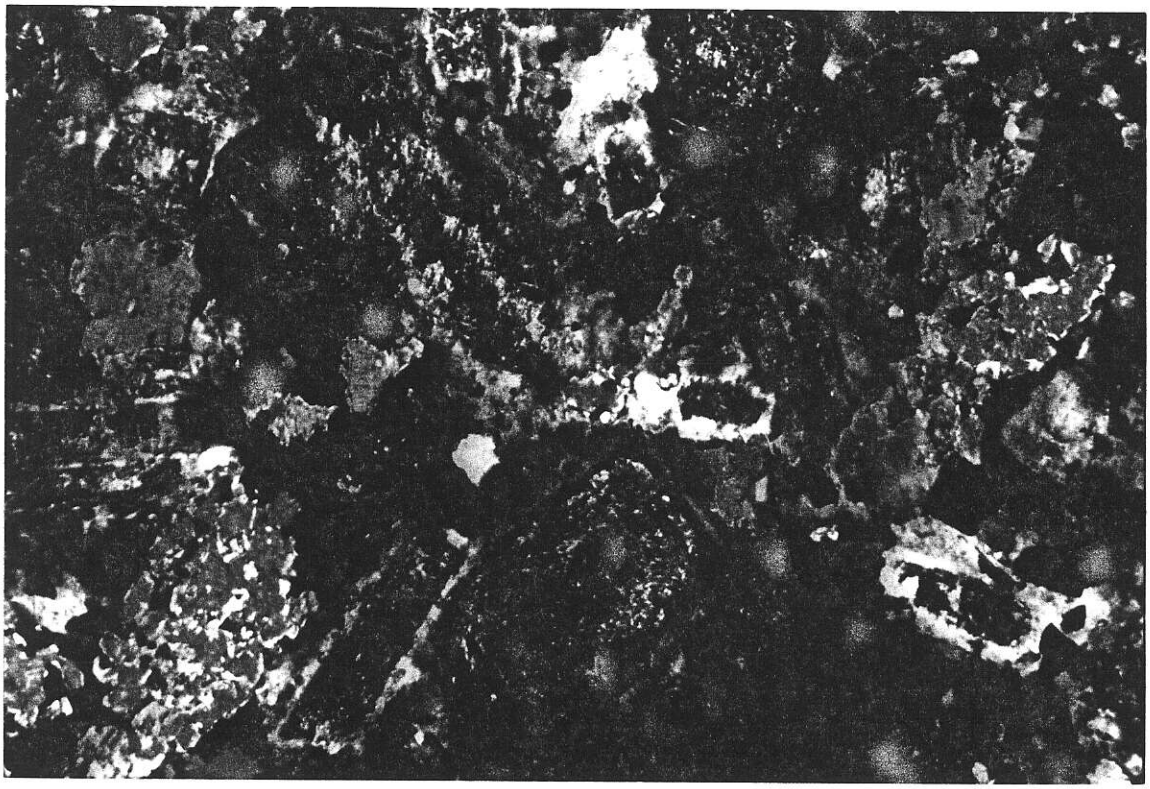
This is an even-grained rock composed principally of subhedral-euhedral, prismatic plagioclase crystals, 0.2 - 2.0mm in size. These form a close-packed, randomly-oriented meshwork aggregate, interstitially filled by K-feldspar.

The plagioclase grains show concentric zoning, and are more or less strongly saussuritized (pervasively clouded by clays and minutely fine-grained sericite and epidote). The K-spar ranges from fresh to brownish, turbid in appearance.

Mafics are fresh, colourless clinopyroxene (probably augite) as subhedral grains - sometimes somewhat poikilitic/skeletal - and biotite as ragged flakes, often closely associated with the augite. Grain size is 0.1 - 1.0mm (rarely to 2.0mm).

Accessory opaques (probably magnetite) are relatively abundant, as disseminated subhedra, 0.05 - 0.3mm in size. They are typically clustered with the mafic silicates.

This is a rather fresh, fine to medium-grained, somewhat potassic diorite - probably a minor intrusive.



SAMPLE 88-30 65'

Neg. 145-6: Shows blocky intrusive-type texture in fine-grained diorite. Subhedral prismatic plagioclase (rectangular grains) shows dark, speckled appearance due to pervasive saussuritization. Non-speckled grey mineral interstitial to the plagioclase is K-feldspar. Accessory mafics, showing higher birefringence (colours), are biotite (olive, orange brown e.g. left; top right) and pyroxene (poikilitic grains, blue, pink).

No. 2

SAMPLE 88-36 71' **LATITE**

Estimated mode

K-feldspar	30
Plagioclase	30
Altered pyroxene	16
Biotite	20
Apatite	trace
Opaques	4

This is a sparsely porphyritic rock, having totally altered phenocrysts, 0.2 - 2.0mm in size, set in a glassy to microcrystalline groundmass of potassic composition.

The phenocrysts are now composed of fine-grained carbonate with intergrown greenish sericite or talc. Their pseudomorphic form suggests that they originated as pyroxene.

The groundmass consists largely of K-feldspar, commonly showing a minutely fine-grained, fibrous/radiate texture, which is probably indicative of rapid chilling of a residual magmatic phase. Elsewhere the matrix is diffusely turbid, and may be, in part, cryptocrystalline. Its composition is probably equivalent to a mixture of K-feldpsar and plagioclase.

The other groundmass constituent is fresh, strongly pleochroic, red-brown biotite, as a meshwork of small, slender, individual flakes, 20 - 200 microns in size. A minor component of diffuse, greenish, altered pyroxene, similar to the material of the pseudomorphed phenocrysts, is also present.

The remaining groundmass component is an opaque oxide (probably magnetite) occurring as rather abundant, evenly disseminated, tiny euhedra, 20 - 50 microns in size.

Except for the pyroxene, the minerals making up this rock are fresh. It appears to be a rather mafic-rich latite.

SAMPLE 88-36 71'

Neg. 145-7: Shows distinctively-textured groundmass composed of decussate biotite flakes (brown) in matrix of feathery, minutely fine-grained, K-rich feldspars (greys), with tiny disseminated euhedra of opaque oxides (black). Field includes a clump of pseudomorphed phenocrysts (brownish white, bottom right) composed of micritic carbonate and micaceous secondary minerals (after pyroxene?).

No.8

SAMPLE 88-36 93' **LATITE**

Estimated mode

K-feldspar	30
Plagioclase	30
Altered pyroxene	10
Pyroxene	15
Biotite	10
Apatite	1
Opaques	4

This is a very similar type of rock to the previous sample (88-36 71').

Phenocrysts of probable original pyroxene, 0.2 - 1.0mm in size, now totally pseudomorphed by fine-grained carbonate and greenish secondary mica, make up about 10% of the rock.

They are set in a groundmass of fibrous/radiate to cryptocrystalline K-feldspar, intergrown with a meshwork of abundant slender prisms of partially altered pyroxene and flakes of fresh brown biotite.

Acicular crystals of apatite are a minor, but distinctive, accessory.

As in the previous sample, fine-grained, disseminated oxides are rather abundant. This sample also includes a component of minute, acicular to branching, opaque microlites - typical of a near glassy, rapidly chilled groundmass.

SAMPLE 88-36 93'

Neg. 145-8: Plane polarized transmitted light.
Shows textural similarity to 88-36 71' (Neg. 145-7). Groundmass of cryptocrystalline feldspar (white) set with meshwork of slender biotite flakes (brown) and needles of acicular pyroxene (greyish, greenish. Slightly coarser white acicular grains are apatite. Disseminated fine-grained opaques (black) are in the form of granules and tiny microlites. Field includes altered mafic phenocrysts (dark-rimmed, centre) pseudomorphed by carbonate and greenish-brown secondary micaceous/chloritic material.

NO. 7

SAMPLE 88-39 99' **LEUCOCRATIC ANDESITE**

Estimated mode

Plagioclase	78
K-feldspar	11
Sericite	2
Biotite	6
Muscovite	trace
Pyroxene	trace
Epidote	trace
Sphene	trace
Apatite	trace
Opaques	3

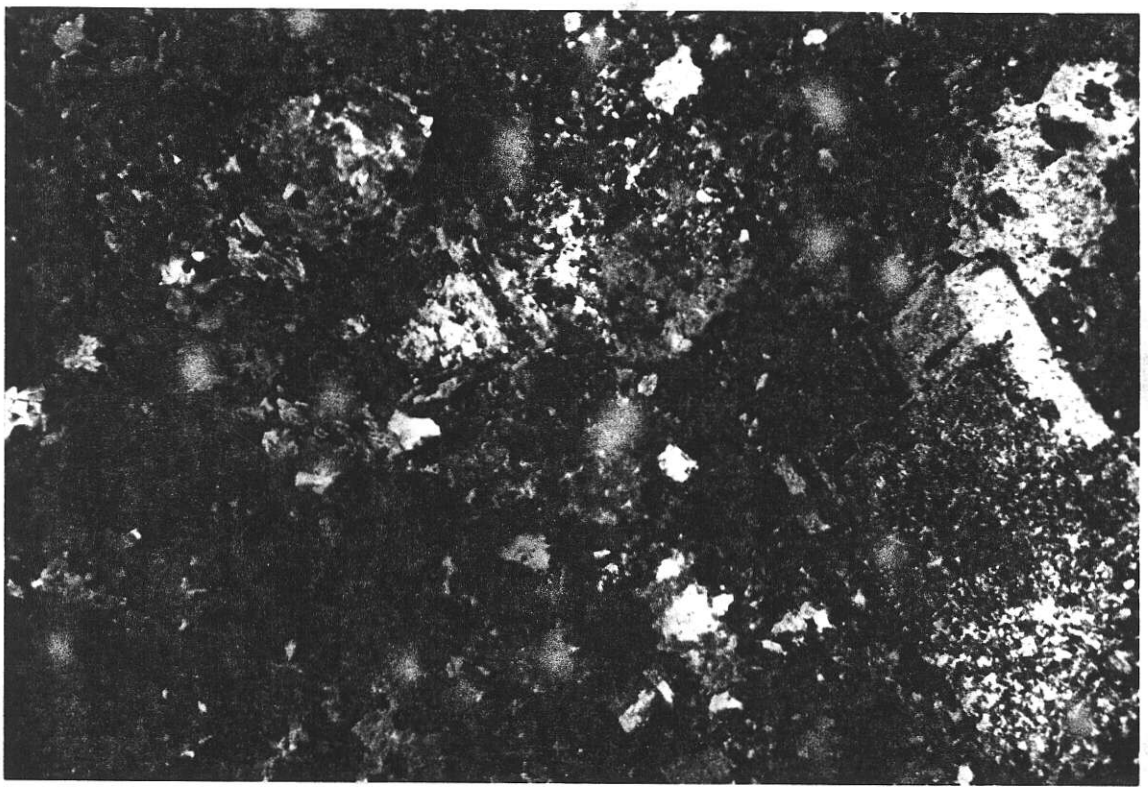
This is a rock of heterogenous texture.

It is composed largely of feldspar, which (judging from the very weak cobaltinitrite stain on the cut-off chip) is mainly plagioclase - possibly a somewhat K-rich albite (anti-perthite). Much of this shows a strong, brownish turbidity (hematite/clay alteration) which obscures any twinning.

The feldspar shows irregular, patchy variations from a varigranular, anhedral/interlocking, mosaic texture (grain size 0.02 - 0.7mm) to a porphyritic texture, in which subhedral-euhedral plagioclase phenocrysts, 0.1 - 1.0mm in size, are set in a microgranular felsitic groundmass. These two textural types (of which the first is generally strongly turbid, and the latter largely fresh -but for minor pervasive sericitization) show gradational relationships. They are probably primary crystallization features, or possibly the result of autobrecciation.

Accessories are minor, consisting chiefly of ragged clusters of pale biotite, traces of fine-grained pyrite and pockets of muscovite, disseminated euhedra of apatite, and rare, tiny granules of sphene. Opaques (oxides) as irregular clumps are relatively abundant.

The rock is a leucocratic, quartz-free, felsic volcanic of andesitic composition.



SAMPLE 88-39 99'

Neg. 145-10: Leucocratic andesite showing two textural types in patchy, partially intermingled juxtaposition. Left side of field shows granular mosaic aggregate of strongly turbid, brown feldspar. Right side shows porphyritic variant, with speckled (saussuritized) euhedral plagioclase phenocrysts in minutely felsitic groundmass. Minor ragged flecks of orange-brown mineral (left centre) are accessory biotite.

No. 9

SAMPLE 88-39 171' TRACHYANDESITE (DIABASE)

Estimated mode

Plagioclase	50
K-feldspar	22
Hornblende	15
Chlorite	5
Carbonate	5
Opaques	3

This is another even-grained, sparsely porphyritic rock somewhat similar to 88-36 71' and 91', but lacking biotite, and having a particularly well-developed, diabase-like meshwork fabric.

The few small (0.2 - 1.0mm), stumpy, prismatic phenocrysts are totally pseudomorphed by carbonate and minor chlorite; their original mineralogy is indeterminate (possibly pyroxene).

The groundmass is composed largely of lath-like feldspars 0.1 - 0.2mm in size. These are somewhat clouded with argillic or saussuritic alteration, and appear to be predominantly plagioclase (though the moderate cobaltinitrite stain on the cut-off block indicates somewhat potassic composition).

Acicular brownish hornblende crystals, 0.1 - 0.5mm in size, are developed throughout the feldspathic matrix, and form a striking meshwork to locally sub-trachytic fabric. The amphibole shows weak to moderate pervasive alteration to chlorite and carbonate.

Opaques (oxides)form evenly disseminated, individual, tiny euhedra, 10 - 30 microns in size, throughout.

SAMPLE 88-39 171'

Neg. 145-11: Shows meshwork-textured fabric somewhat similar to 88-36 71' and 91', but a little coarser and less potassic. Grey laths are plagioclase, somewhat dusted with saussuritization. Orange laths are hornblende. Note partial preferred orientation. Dark interstitial pockets include chlorite (olive green) and carbonate (whitish). More concentrated carbonate clumps (e.g. centre; bottom left) are pseudomorphed micro-phenocrysts.

No. 1

SAMPLE 88-51 124' **MONZONITE PORPHYRY**

Estimated mode

Plagioclase	40
K-feldspar	28
Sericite	19
Pyroxene	8
Hornblende	3
Biotite	trace
Carbonate	trace
Apatite	trace
Sphene	trace
Mineral X	trace
Prehnite(?)	trace
Opaques	2

This is a strongly porphyritic rock of leucocratic composition. It resembles 88-30 65' in composition.

About 65% of the rock consists of phenocrysts, 0.2 - 3.0mm in size. These are predominantly euhedral, prismatic plagioclase (oligoclase), showing moderate pervasive alteration to minutely fine-grained sericite. Occasional phenocrysts of fresh, pale clinopyroxene are also present.

The phenocrysts are set in a groundmass composed largely of a microgranular, anhedral aggregate of K-feldspar, of grain size 0.01 - 0.1mm. This is commonly strongly brownish and turbid.

Tiny subhedral grains of pyroxene are a minor accessory of the groundmass, together with disseminated anhedral granules of Fe-Ti oxides.

A few of the pyroxene phenocrysts are ragged and poikilitic in form, and show partial or complete alteration to brown hornblende and traces of biotite.

The rock includes occasional small clumps (vesicular fillings?) of a distinctive deuteric suite including carbonate, probable prehnite, and a strongly pleochroic blue-green to pinkish mineral which may be pumpellyite.

SAMPLE 88-51 124'

Neg. 145-22: Shows abundantly porphyritic texture with euhedral phencorysts of pervasively sericitized plagioclase (speckled greys) and fresh clinopyroxene (blues, orange). Groundmass is microgranular/felsitic K-feldspar (speckled dark greys) with tiny grains of mafics (colours) and opaque oxides (black).

No. 6

SAMPLE 88-52 96' LEUCOCRATIC PORPHYRITIC LATITE

Estimated mode

Plagioclase	55
K-feldspar	42
Pyroxene	1
Epidote	1
Prehnite	1
Amphibole	trace
Biotite	trace
Chlorite	trace
Sphene	trace
Opaques	trace

This is another monzonite (latite) porphyry, similar in general character to the previous sample (88-51 124'). It differs from that sample in having an extremely leucocratic composition.

It consists, essentially, of abundant, euhedral plagioclase phenocrysts, 0.2 - 1.5mm (rarely to 2.5mm) in size, set in a groundmass of equigranular, anhedral, mosaic-textured K-feldspar.

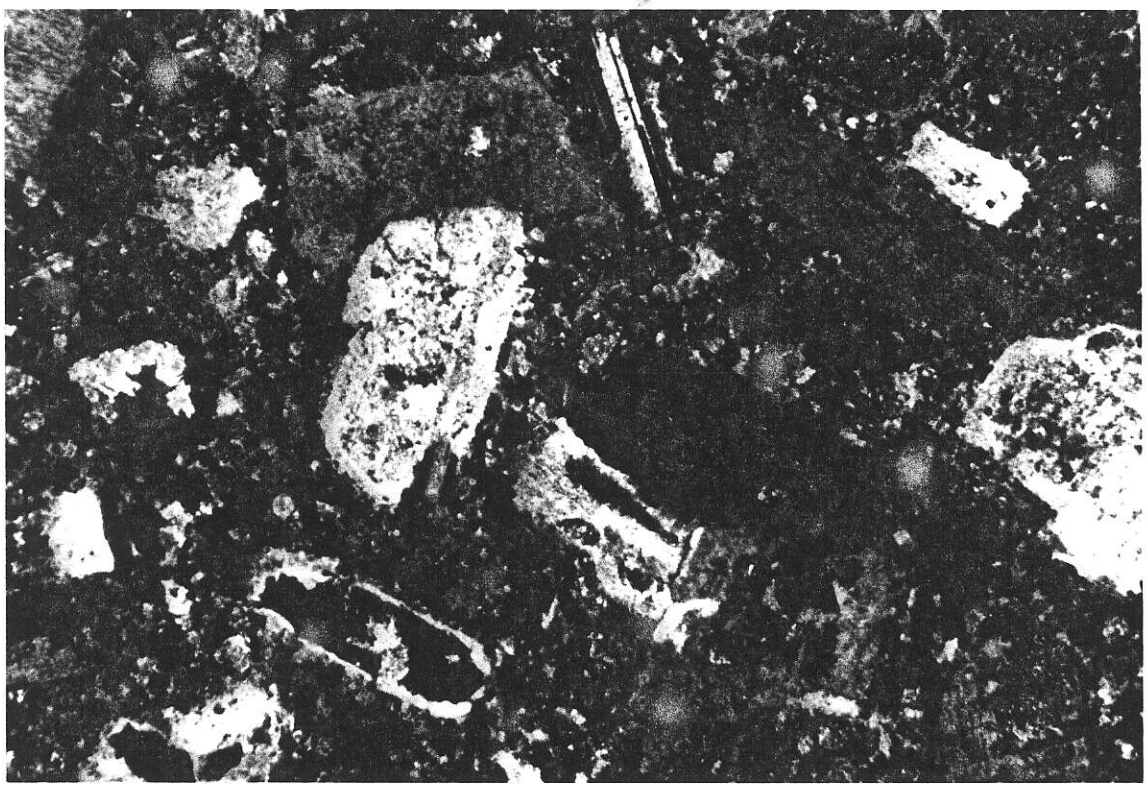
The plagioclase is generally fresh, except for patchy, mild saussuritization and replacement by prehnite and epidote, and the groundmass K-spar is typically brownish and turbid.

Mafics are very minor. Very rare relict phenocrysts, now altered to secondary amphibole and biotite, are seen, and the groundmass contains sparse granules of pyroxene and epidote.

Opaques (Fe-Ti oxides) are rare and, where seen, are often intergrown with sphene.

The rock is cut by occasional hairline veinlets and pockets of prehnite and epidote.

The phenocrysts show an incipient preferred orientation - presumably related to flow - but the rock could be of either minor intrusive or extrusive origin.



SAMPLE 88-52 96'

Neg. 145-23: Note textural similarity to 88-51 124' (Neg. 145-22). Abundant subhedral, prismatic phenocrysts of rather fresh plagioclase (greys, sometimes showing twinning) in groundmass of mosaic-textured, microgranular, brownish/turbid K-feldspar. Note essential absence of mafics, and slight tendency for preferred orientation of phenocrysts.

No. 4

SAMPLE 88-65 192' **MONZONITE**

Estimated mode

Plagioclase	43
Perthite	50
Amphibole	1
Biotite	trace
Carbonate	1
Sphene	trace
Opaques	1

This is another leucocratic rock composed essentially of feldspar.

It differs texturally from the previous samples in that it is non-porphyritic, and consists of a medium-grained, interlocking aggregate of stubby, subhedral, prismatic grains, 0.1 - 1.5mm in size. These are partly recognizable as plagioclase, but the majority are a mottled perthitic phase. Both show more or less strong pervasive argillization, rendering them brownish and turbid.

There is no groundmass as such, but tiny interstitial pockets in the equigranular aggregate are filled by later, water-clear feldspars, or are empty.

The rock is noticeably vesicular. Some vesicles are filled by calcite, and or amphibole, but many appear empty. This may be partly the effect of plucking during thin section preparation but, to a large degree, probably constitutes a natural porosity.

The very minor mafics consist of small, pale green, subhedral-euhedral amphibole crystals of primary aspect. Occasionally these are altered to clusters of secondary-type biotite. The amphibole sometimes concentrates with carbonate in vesicles, or with disseminated, ragged grains of opaques and sphene.

SAMPLE 88-65 192'

Neg. 145-24: Leucocratic monzonite showing varigranular aggregate texture of anhedral/subhedral perthitic feldspar and plagioclase. Note brownish turbid appearance of some of the feldspar due to argillic alteration. Interstitial pockets filled by clear feldspar (greys, white, black). Field also includes small clumps of carbonate (pinkish, left centre) and opaques with associated carbonate and sphene (lower right centre).

No. 5

SAMPLE 88-66 71' **DIORITE PORPHYRY**

Estimated mode

Plagioclase	75
K-feldspar	20
Clinopyroxene	5
Biotite	trace
Carbonate	trace
Apatite	trace
Sphene	trace
Opaques	trace

This is another leucocratic rock of monzonitic to dioritic composition. It is compositionally similar to previous samples in the suite, but is distinctive for the presence of some notably coarse plagioclase phenocrysts.

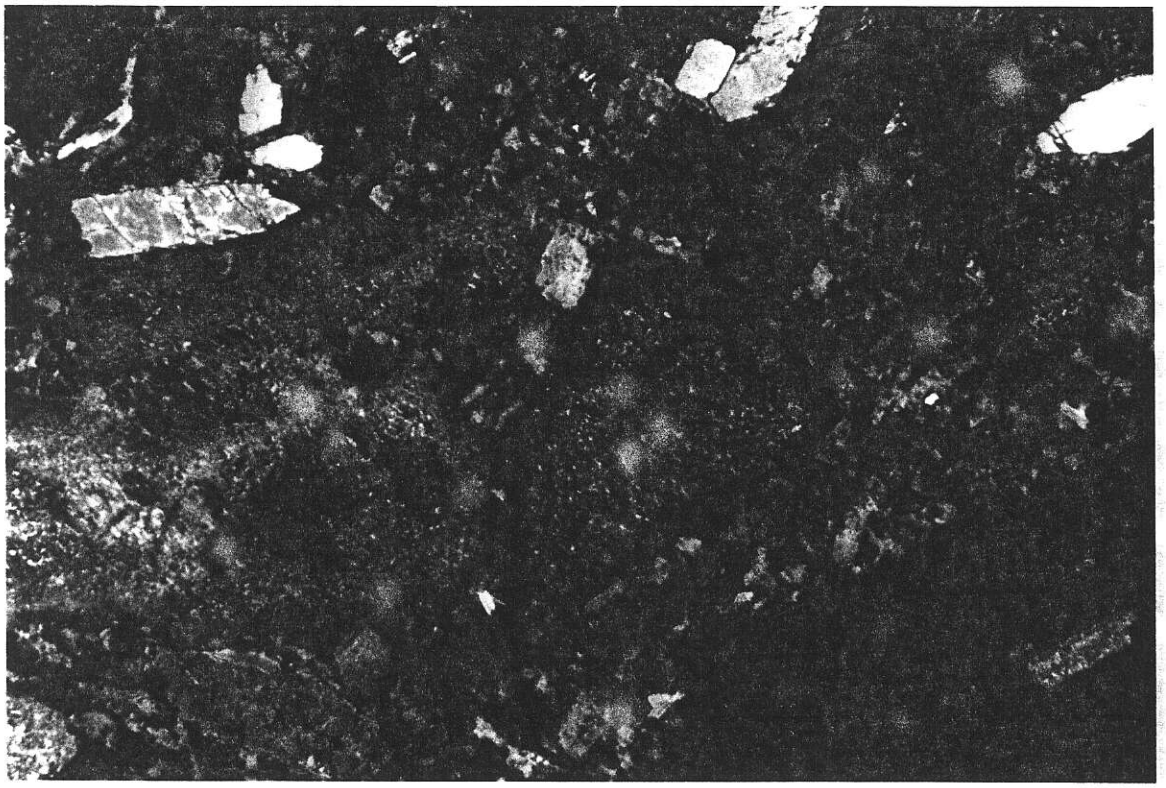
Euhedral plagioclase phenocrysts make up some 70% of the rock. The majority of these are in the size range 0.2 - 2.0mm, but there are also some in the range 7 - 20mm.

The smaller phenocrysts show a light pervasive dusting by sericite. The coarser ones (which often incorporate a number of the smaller ones) typically show a brownish argillic turbidity.

Mafics are minor, and consist of fresh euhedral clinopyroxene, 0.2 - 1.0mm in size. Rare crystals of similar form and size are altered to biotite, and may have originated as amphibole.

The abundant phenocrysts are randomly dispersed through an evenly mosaic-textured groundmass of brownish, turbid, microgranular, anhedral K-feldspar (grain size 10 - 100 microns) with intergrown, tiny, sub-phenocrysts of blocky, prismatic plagioclase.

The rock has an overall fresh, homogenous appearance.



SAMPLE 88-66 71'

Neg. 146-3: Shows coarsely porphyritic texture in diorite porphyry. Plagioclase phenocrysts in centre and at left show speckling of fine-grained sericitization; also partial marginal embayment by groundmass. Portion of large plagioclase phenocryst at bottom right (dark, in extinction position) seen to incorporate smaller prismatic phenocrysts. Field also includes small phenocrysts of clino-pyroxene (yellows, browns). Groundmass is microgranular, brownish/turbid K-feldspar.

No. 11

SAMPLE: No Number "A" **MONZONITE**

Estimated mode

Plagioclase	44
K-feldspar	30
Pyroxene	7
Biotite) Chlorite)	2
Epidote	10
Prehnite	4
Apatite	trace
Sphene	1
Zeolites	trace
Opaques) Rutile)	2

This is a texturally somewhat heterogenous rock of similar general composition to the rest of the suite, but including a higher proportion of secondary minerals.

It consists essentially of a varigranulr aggregate of subhedral plagioclase grains, 0.2 - 1.5mm in size, intergrown with an interstitial phase of finer grained, anhedral K-feldspar. These two phases form a grain size continuum, and the coarser (plagioclase) grains often show ragged outlines embayed by the microgranular interstitial phase. The texture is thus not porphyritic in the true sense.

Mafics consist of scattered, small subhedra of clinopyroxene, sometimes partially altered to chlorite, and rare flakes of more or less chloritized and epidotized biotite.

Epidote is rather abundant, as fine-grained, partial replacements of plagioclase, and as a few coarse crystalline segregations which may be totally altered mafic phenocrysts or vesicular segregations.

Sphene is a notable minor accessory, as scattered, discrete, subhedral grains, sometimes associated with Fe-Ti oxides and/or rutile.

A distinctive feature is the presence of prehnite, as scattered clumps (vesicular fillings), sometimes associated with sphene and altered mafics, and as partial replacements of plagioclase. Traces of zeolites are seen in similar mode.

SAMPLE No Number A

Neg. 146-4: Shows rather ill-defined, sub-porphyritic texture of granular plagioclase, with interstitial finer-grained K-feldspar. Field includes a prismatic crystal of pyroxene (orange, bottom left), patchily altered to chlorite (dark blue); a patch of epidote alteration (blue/yellow, upper left centre); prehnite as partial replacement of plagioclase (white-orange, centre); and prehnite (white/yellow/brown) associated with sphene (pinkish angular grains) and zeolites (greys) in vesicular pockets (right centre to bottom right).

NO. 16

SAMPLE: No Number "B" TRACHYANDESITE LAPILLI TUFF

Estimated mode

Plagioclase	47
K-feldspar	20
Chlorite) Altered amphibole)	12
Carbonate	15
Sericite	3
Opaques	3

This is a lithic pyroclastic or breccia flow, consisting of close-packed, somewhat rounded lapilli, 0.5 - 6.0mm or more in size.

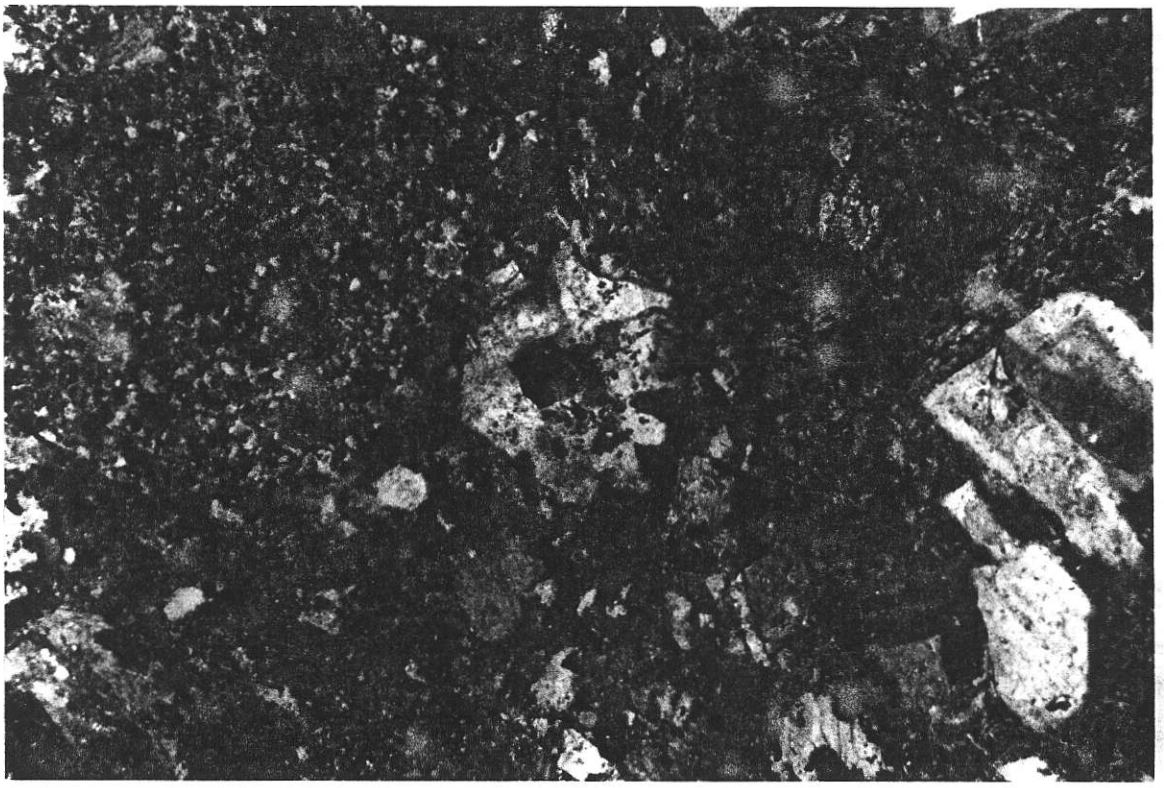
The lapilli are compositionally similar, but texturally slightly diverse. They consist of porphyritic trachyandesites (latites) composed of abundant euhedral plagioclase phenocrysts, 0.1 - 1.0mm in size, randomly set in microgranular, felsitic, feathery or cryptocrystalline groundmasses of predominant K-spar.

Minor original mafic phenocrysts (probably pyroxene) are now completely pseudomorphed by carbonate. Carbonate also often forms pervasive flecks (after mafics?) throughout the groundmasses.

Plagioclase phenocrysts show mild pervasive sericitization.

Chlorite is more prominent in this rock than in most of the non-fragmental volcanics of the suite, as intimate, fine-grained intergrowths with groundmass K-spar. In part, this association may represent a mildly altered matrix of ash, cementing disaggregated plagioclase crystals packed between the discrete lapilli (and of similar composition to them).

Opaques (Fe-Ti oxides) are relatively abundant, as disseminated anhedra and fine-grained clumps, 0.01 - 0.3mm in size. They vary in abundance in the different lapilli, and also occur in the probable matrix phase.



SAMPLE No Number B

Neg. 146-5: Shows poly-lithic fragments in lapilli tuff. Clast making up right side of field is made up of coarse euhedral plagioclase phenocrysts in feathery-textured K-spar groundmass. Rounded clast at upper left is of felsitic texture, flecked with brown carbonate. Dark matrix with disaggregated feldspar crystal clasts (e.g. bottom left) contains considerable chlorite.

No. 17

SAMPLE: No Number "C" PORPHYRITIC TRACHYANDESITE

Estimated mode

Plagioclase) Altered plagioclase)	60
K-feldspar	18
Pyroxene	15
Hornblende	3
Biotite	2
Epidote	trace
Prehnite	trace
Apatite	trace
Sphene	trace
Opaques	2

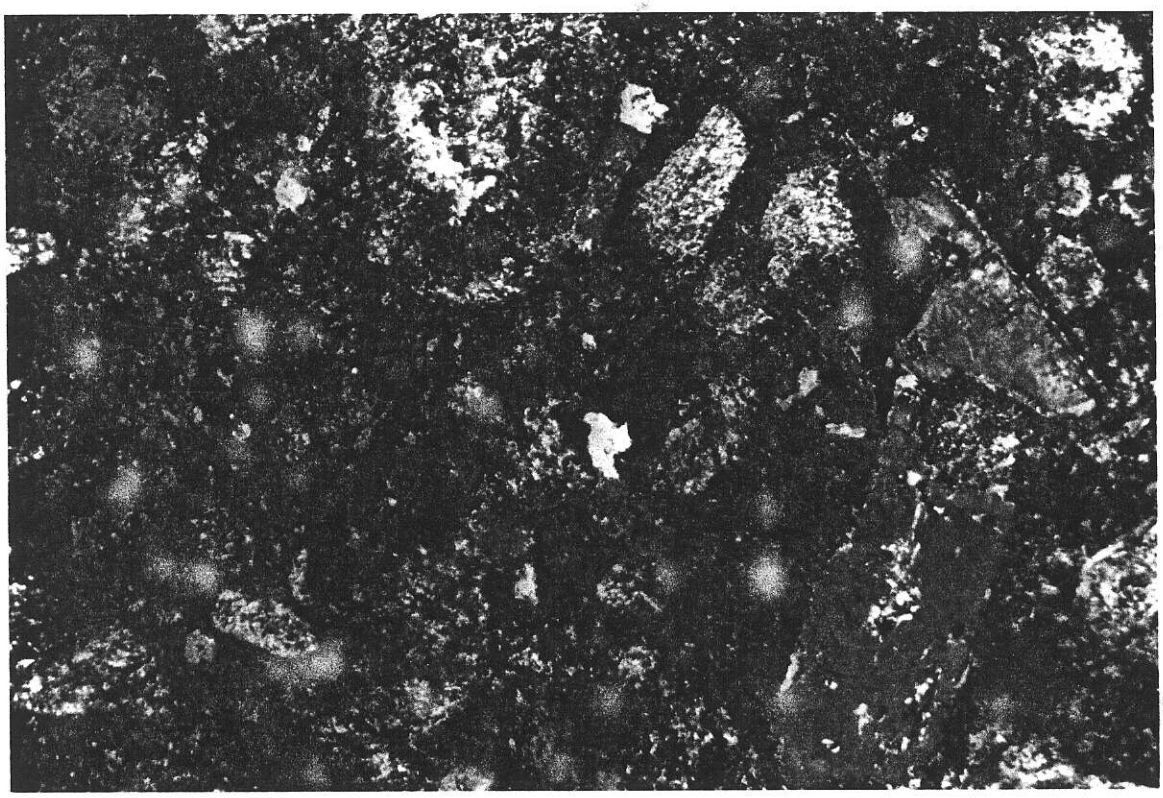
This is another homogenous porphyritic rock. It is distinguished by the strong alteration of plagioclase phenocrysts and the relative abundance of fresh pyroxene.

Phenocrysts, 0.1 - 2.0mm in size, make up about 70% of the rock. They are predominantly plagioclase, with accessory colourless to pale green clino-pyroxene, and minor hornblende and biotite.

The plagioclase phenocrysts are strongly pervasively altered to fine-grained sericite and clays. Pyroxene is typically fresh. The biotite commonly mantles the hornblende, and is apparently a late magmatic modification of that mineral.

The groundmass is very fine-grained, felsitic K-spar, with tiny sub-phenocrysts of plagioclase, flecks of pyroxene and disseminated fine-grained opaques. It is also turbid and pervasively altered, giving the rock a rather diffuse textural aspect in thin section.

Traces of epidote occur as rare hairline veinlets, and prehnite is seen as a few, small, feathery-textured patches.



SAMPLE No Number C

Neg. 146-6: Shows strongly porphyritic texture with abundant, somewhat ill-defined, subhedral phenocrysts of pervasively altered plagioclase (light grey, speckled) and fresh euhedral pyroxene (blues, brown). More scrappy orange-brown mafics (e.g. centre, bottom; left) are biotite and/or hornblende. Note fine-grained felsitic groundmass with dark speckled appearance due to alteration and fine-grained mafics.

No. 18

SAMPLE: No Number "D" FINE-GRAINED MONZONITE

Estimated mode

Plagioclase	50
K-feldspar	20
Sericite)	4
Clays)	
Clinopyroxene	14
Biotite	10
Apatite	trace
Opaques	2

This is another quartz-free intermediate igneous rock which has a similar general appearance to others of the suite on the macroscopic scale.

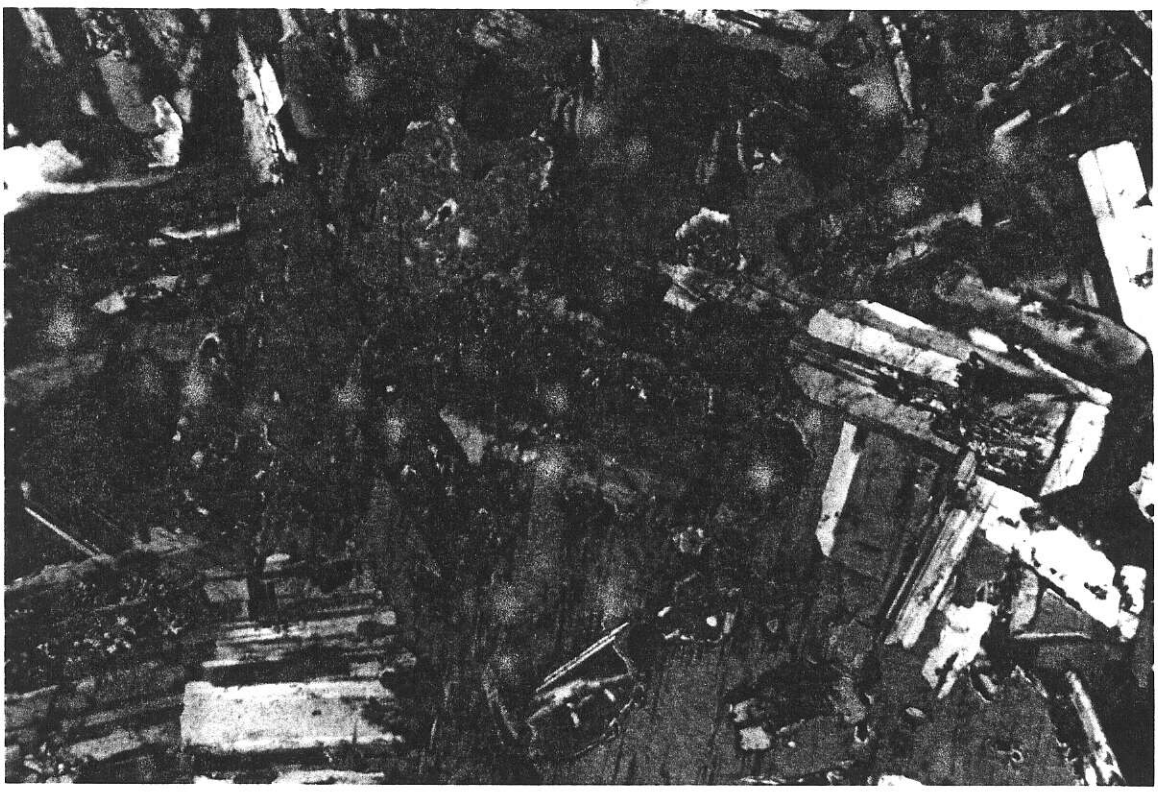
In thin section it is seen to be texturally distinctive and notably fresh.

The major constituent is plagioclase, which occurs as a sub-oriented aggregate of sharply defined, elongate, prismatic euhedra, 0.2 - 2.0mm in size. The interstices in this aggregate are filled by pockets of relatively coarse, fresh K-feldspar. The plagioclase shows sporadic, patchy alteration to sericite and clays, but is mostly water-clear and with sharply defined twinning. It has the composition of andesine.

Mafics consist of fresh, pale green clinopyroxene (diopsidic augite?) as subhedral, sub-equant grains, 0.1 - 1.0mm in size, often clumped. These are often mantled by fresh, coarse-grained biotite, as irregular grains to 2.0mm or more. The biotite also occurs independently, as skeletal/poikilitic plates. The pyroxene/biotite clumps commonly show sub-ophitic relations with the plagioclase aggregate.

Opaque oxides, as equant subhedral grains 0.02 - 0.2mm in size, show a close association with the mafic clumps - particularly the biotite.

This rock is of diabasic affinities, and is a fine-grained, monzo-diorite - possibly a dyke phase. The incipient flow alteration in the matrix is probably related to intrusion as a crystal mush.



SAMPLE No number D

Neg. 146-7: Typical field showing distinctively fresh, strongly-twinned, weakly oriented character of subhedral plagioclase aggregate, with coarse plates of biotite (brown or pinkish brown, e.g. top right; bottom) ophitically enclosing plagioclase and pyroxene grains (blue, violet, orange). Note pocket of coarse K-feldspar (grey, untwinned, top). Black grains are opaque oxides. This is a texture of intrusive aspect.

No. 10

SAMPLE: N. End "A" PORPHYRITIC LATITE

Estimated mode

Plagioclase	30
Sericite	17
K-feldspar	35
Pyroxene	12
Hornblende	3
Carbonate	trace
Apatite	trace
Opaques	3

This is a strongly porphyritic rock of simple composition - somewhat similar to that of No Number "C". It differs from that sample in the strongly defined flow orientation exhibited by the phenocrysts.

Euhedral phenocrysts make up some 60% of the rock. They are predominantly plagioclase, as discrete, rather elongate, prismatic crystals, 0.1 - 1.0mm in size. Fresh augitic pyroxene, as euhedra 0.05 - 0.5mm in size, plus minor brown hornblende, are the remaining phenocrysts.

The plagioclase shows rather strong pervasive alteration to minutely fine-grained sericite. The mafics are fresh.

The phenocrysts show a strong parallelism of orientation. They are set in a fine-grained, turbid, brownish, diffusely feathery to sub-trachytic groundmass of K-feldspar.

Opaques (Fe-Ti oxides) are relatively abundant, as tiny specks (5 - 20 microns), rather evenly disseminated through the groundmass, and as coarser, anhedral grains (sub-phenocrysts) to 0.2mm, randomly scattered and associated with the mafics.

SAMPLE N. End A

Neg. 146-8: Shows strongly oriented fabric of abundant prismatic phenocrysts of plagioclase (grey, showing pinkish speckling of pervasive sericitization); field also includes phenocrysts of fresh pyroxene (yellow, greys, bottom, left centre) and hornblende (brown: e.g. bottom right, top left). Small, equant, blue-grey grain at borrom right is apatite.

No. 12

SAMPLE: N. End "B" **ALTERED MONZONITE**

Estimated mode

Plagioclase	15
Sericite	15
K-feldspar	38
Chlorite(?)	8
Carbonate	19
Garnet	1
Apatite	1
Sphene	1
Opaques	2

This is another variant of the monzonitic igneous rocks of the suite. It is one of the granular aggregate type (as distinct from those made up of discrete phenocrysts in a fine-grained groundmass) and is rather strongly altered.

The proportions of plagioclase to K-feldspar are difficult to estimate, as twinning is only poorly developed. K-spar appears relatively abundant.

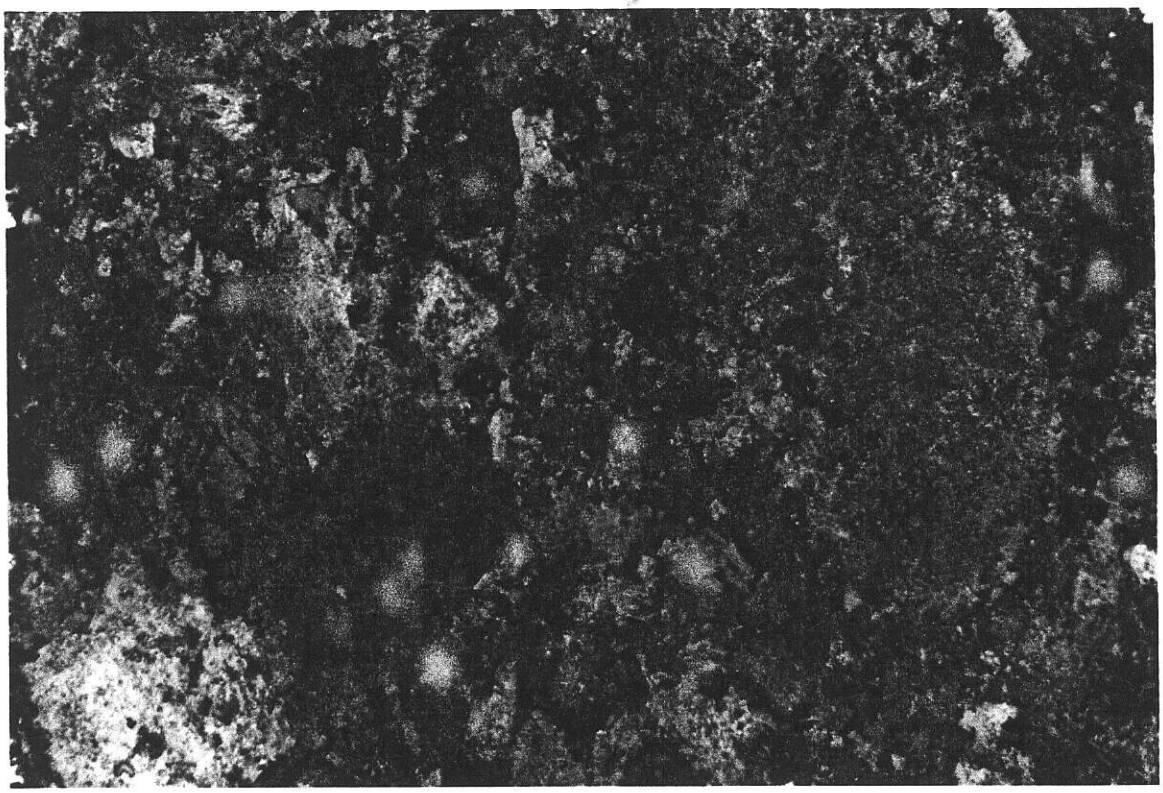
The feldspars are intimately intergrown as an aggregate of subhedral grains, 0.2 - 1.0mm in size, with a minor interstitial phase of somewhat finer grain size.

Sub-prismatic patches, 0.05 - 0.5mm in size, composed of carbonate intergrown with a pale green micaceous mineral (chlorite? secondary biotite?) occur evenly scattered throughout; these appear to represent totally altered mafics.

The feldspars are rather strongly and diffusely altered to fine-grained sericite and clays and/or flecked with carbonate.

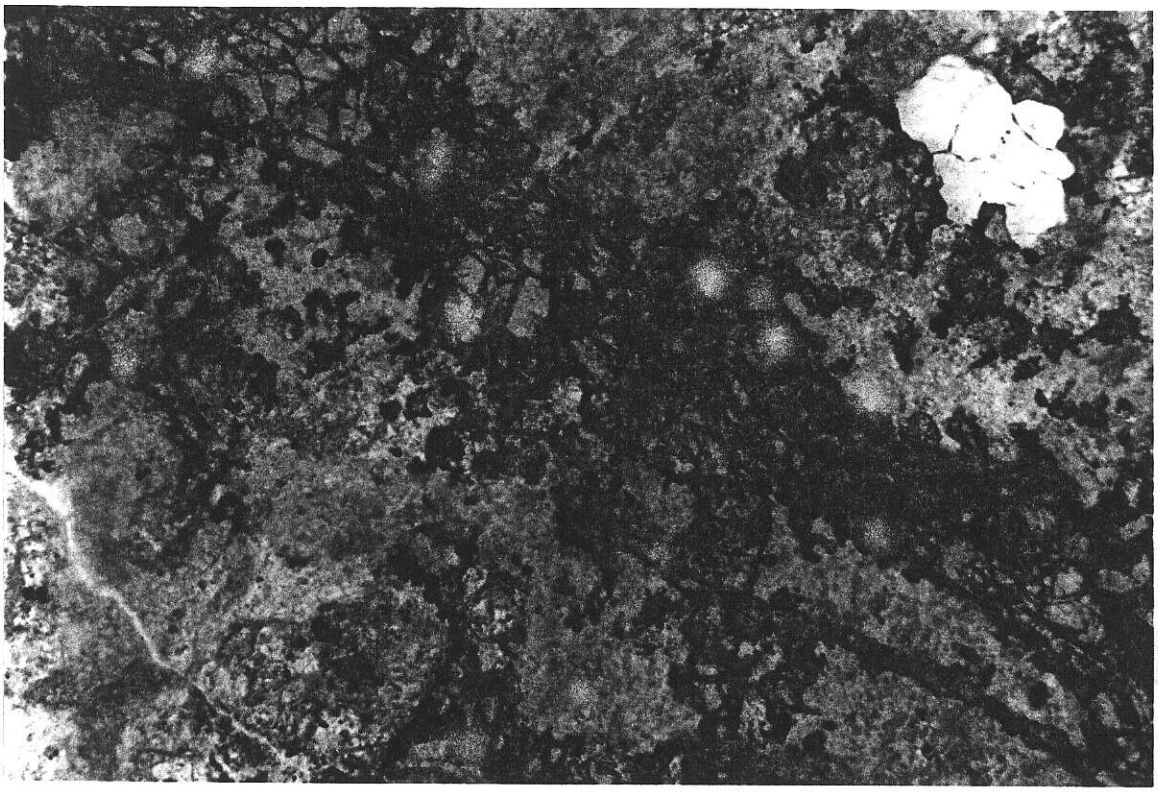
The relative abundance of accessory apatite and sphene, as discrete euhedral and subhedral grains, to 0.4mm in size, is notable. Opaques (Fe-Ti oxides) are also rather common, as randomly disseminated, equant subhedra, 0.01 - 0.2mm in size.

The rock is cut by a few hairline network veinlets of zoned, yellow-brown garnet.



SAMPLE N. End B

Neg. 146-9: Sub-porphyritic aggregate of subhedral-anhedral feldspars, showing minutely fine-grained dusting by sericite. Field includes accessory apatite (dark grey equant grain, lower left centre) and sphene (dark rimmed, light brown, to left of the apatite). Note abundant carbonate as fine-grained flecks intergranular to the feldspar aggregate. Dark areas of chlorite pockets scattered black grains are opaque oxides.



SAMPLE N. End B

Neg. 146-10: Plane-polarized light.
Shows altered feldspars (light brownish, mottled) with altered mafic grains (pseudomorphed by whitish carbonate and greenish secondary micas, lower left). Field includes irregular veinlet of garnet (yellow brown with dark cracks: top left to bottom right). Fresh white grain at top right is apatite.

No. 13

SAMPLE: N.End "C" ALTERED PORPHYRITIC LATITE

Estimated mode

Plagioclase	34
K-feldspar	38
Sericite	9
Pyroxene	3
Carbonate	4
Prehnite	8
Chlorite	2
Biotite	trace
Epidote	trace
Apatite	trace
Opaques	2

This is another example of the porphyritic latite lithotype common throughout the suite. It is distinctive for the relatively common occurrence of prehnite, and for the strongly altered form of the pyroxene.

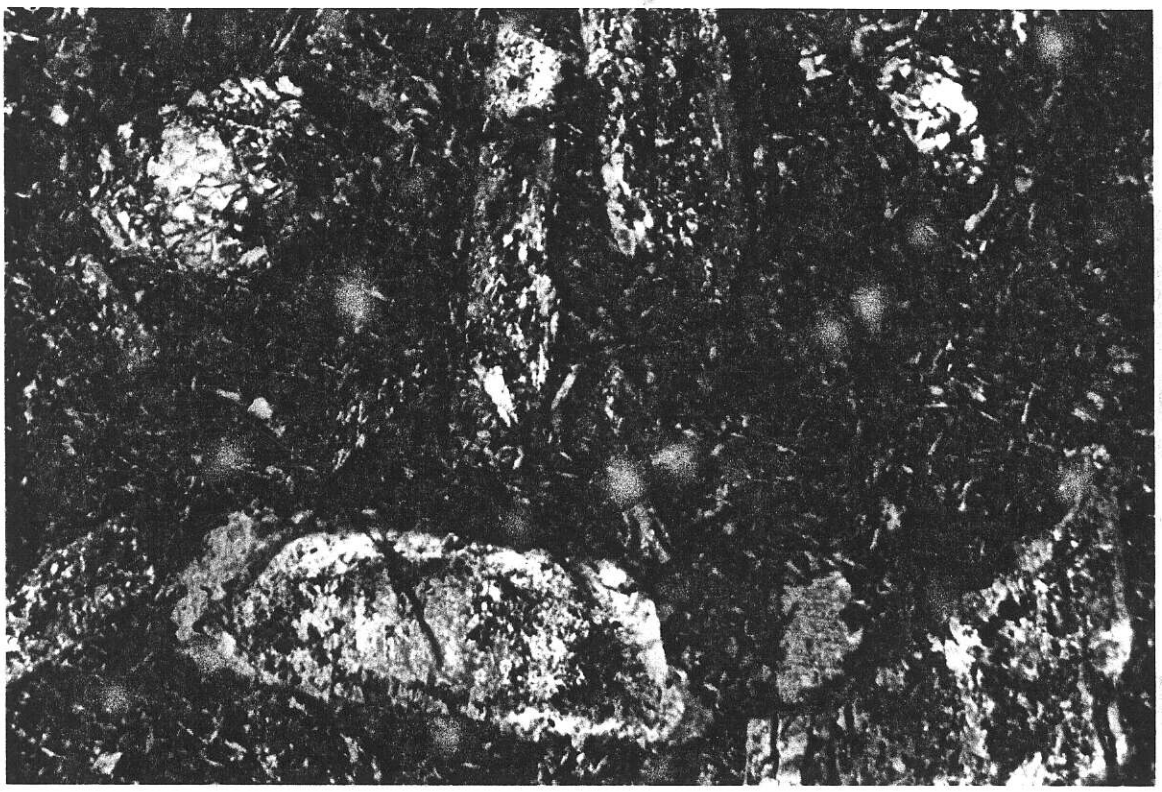
Phenocrysts make up about 60% of the rock. These are predominantly plagioclase, as subhedral-euhedral individuals, 0.2 - 2.5mm in size. Original pyroxene also forms phenocrysts (sometimes of notably elongate form) but is now partially, or completely, pseudomorphed by intergrowths of carbonate, chlorite and minor prehnite.

The plagioclase shows generally mild pervasive sericitization, but is often patchily altered to diffuse clumps of apparent prehnite.

A few small, rounded bodies of prehnite and of carbonate in the groundmass may be altered mafics, or are possibly vesicular fillings.

The groundmass is brownish, turbid, very fine-grained, feathery to meshwork-textured K-feldspar, with tiny granules of relict pyroxene, chloritic pseudomorphs and micron-sized opaques.

Coarser opaques (Fe-Ti oxides) form evenly disseminated, equant/subhedral individuals and clumps, 0.05 - 0.5mm in size.



SAMPLE N. End C

Neg. 146-11: Shows subhedral plagioclase phenocrysts with patches and flecks of replacement by prehnite (pastel colours). Also prehnite as small vesicular clump at top right. Note fine-grained meshwork texture of the potassic groundmass in this rock.

No. 14

SAMPLE: N.End "D" **FRAGMENTAL LATITE**

Estimated mode

Plagioclase) Perthite)	20
K-feldspar	38
Sericite) Clays)	10
Chlorite	15
Carbonate	15
Apatite	trace
Sphene	1
Opaques	1

This sample shows clearly recognizable fragmental character on the macroscopic scale (see stained cut-off block), with rounded to angular clasts, 1 - 15mm in size.

These are not readily distinguishable in thin section, due to the fact that the rock is essentially mono-lithic (single rock type). Very slight variations in texture, and intensity of alteration, are all that distinguish the fragmental components.

It is unclear whether this rock is actually a lithic lapilli tuff or a flow breccia.

The principal components are feldspars, as a granular aggregate of grain size 0.01 - 0.1mm, sometimes interstitial to rather diffuse phenocrysts in the size range 0.1 - 0.5mm (rarely to 1.0mm or more). The fine-grained matrix appears to be dominantly K-feldspar, whilst the phenocrysts are either plagioclase or perthite.

The rock shows a strong brownish turbidity, affecting both phenocrysts and matrix.

No primary mafics are seen, but carbonate and minutely felted chlorite, often intergrown, are common constituents, and may represent altered mafics. They occur as irregular to sub-prismatic clumps throughout.

Apatite, sphene and opaques are the usual minor accessories.

SAMPLE N. End D

Neg. 146-12: Heterogenous aggregate of feldspars, including scattered phenocryst-like grains (e.g. centre, upper centre), mosaic textured aggregates of strongly brown/turbid K-spar (e.g. lower left; right) and pockets of very fine felsitic material (bluish-grey e.g. upper left). Fine-grained carbonate (pinkish) occurs as intergranular flecks. This rock may be of related type to 88-39 99' (Neg. 145-10).

NO. 15

SAMPLE: Bootjack Lake, West Shore ANDESITE

Estimated mode

Plagioclase	65
K-feldspar	8
Chlorite	6
Epidote	15
Carbonate	3
Opaques) Rutile)	3

This is a rock of slightly different composition to most of the suite. It contains only minor K-feldspar, and shows relatively strong epidote development.

It consists of a randomly oriented, rather blocky aggregate of sharply defined, subhedral plagioclase crystals, 0.05 - 0.5mm in size (rarely to 1.0mm). A minor, very fine-grained felsitic (0.01 - 0.05mm) phase occurs interstitially; this is probably mainly K-spar.

Epidote is abundant, as irregular clumps and networks of well-crystallized granules, concentrating as sub-prismatic patches to 0.5mm or more in size. It appears mainly to replace plagioclase, and is often seen as patches and core zones in the coarser crystals.

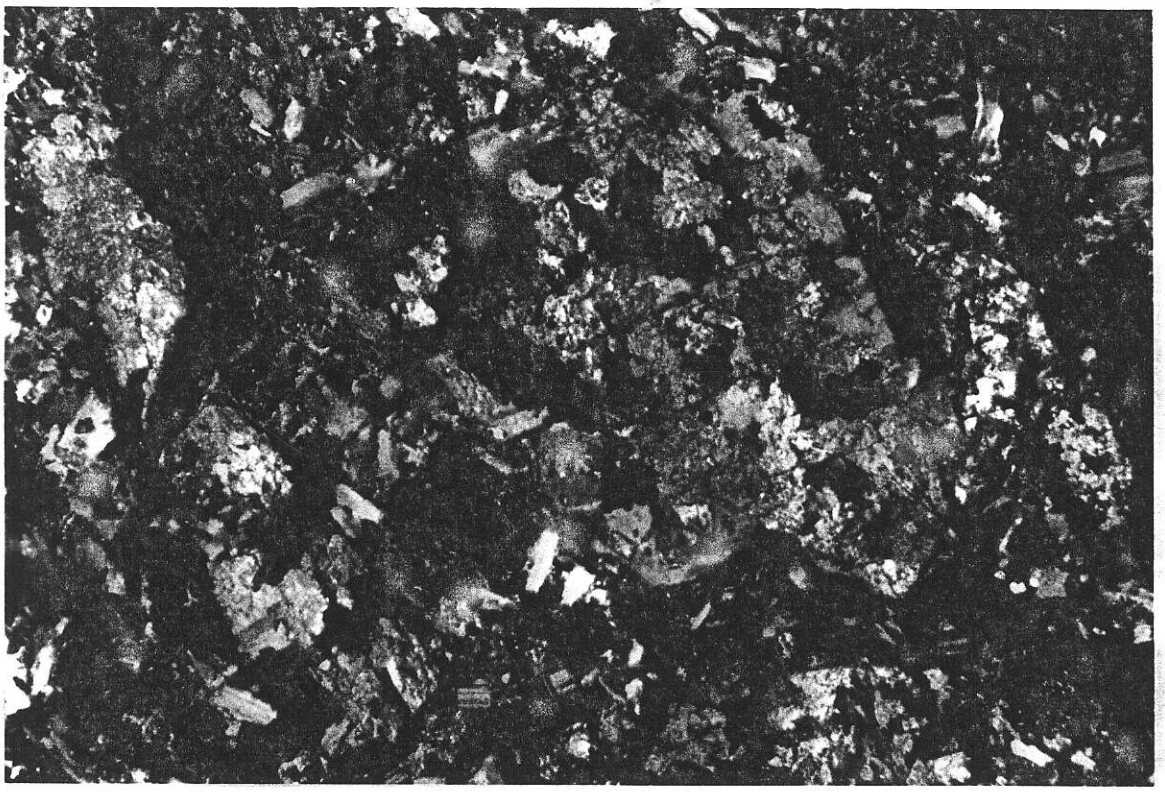
In part, the epidote may also replace original mafics. This is also true of chlorite, which forms small pockets and tiny pseudomorphs(?) throughout, and carbonate which locally forms irregular patches and networks similar to the epidote.

Other than the epidotization, the plagioclase aggregate is notably clear and fresh-looking. It shows good twinning, indicating a composition of around An_{35} (andesine).

Opaques and sub-opaques (rutile) are rather abundant, as randomly disseminated fine granules and small clumps, 10 - 200 microns in size.

SAMPLE Bootjack Lake, West Shore

Neg. 146-13: Shows microgranular aggregate of subhedral plagioclase. Note rather even development of epidote (orange-pink) as irregular granules interstitial to, and within, plagioclase - which is otherwise notably clear and fresh. Carbonate (pastel pink) shows similar mode to epidote (e.g. lower left).



SAMPLE Bootjack Lake, West Shore

Neg. 146-14: Shows core replacement of plagioclase phenocrysts by epidote (colours). Note chlorite (olive brown) and carbonate (pale pinkish) in groundmass.