

**PETROGRAPHIC REPORT ON FIVE ROCK SAMPLES FROM
WESTERN TASMANIA**

For

Pasminco Exploration

Sample Despatch Sheet #4503

P.M. Ashley
Earth Sciences
University of New England
Armidale
NSW 2351

May, 2001

SUMMARY

Five rock samples from western Tasmania, labelled 337025 and 337027-337030, were submitted for petrographic preparation, description and interpretation. The samples included drill core and surface rock material. Standard thin sections were prepared from 337028-337030, but due to the presence of disseminated sulphides, polished thin sections were prepared from 337025 and 337027. All samples were tested for magnetic susceptibility (all found to be very low) and a couple of sample with carbonate were tested with dilute HCl on the section offcut.

Summary descriptions of each sample are listed below:

337025 PTS.

Summary: Originally, most likely a porphyritic felsic volcanic rock, e.g. of dacite composition, with phenocrysts of quartz, plagioclase and minor ferromagnesian material. The rock has undergone very strong hydrothermal alteration, with development of a replacement assemblage of carbonate (e.g. ferroan dolomite), quartz, albite and sericite, with minor galena and traces of rutile, pyrite and sphalerite.

337027 PTS.

Summary: Felsic vitric-crystal tuff with abundant altered former pumiceous fragments and scattered quartz and feldspar phenocrystal grains. The rock has undergone strong pervasive hydrothermal alteration, with development of abundant fine grained quartz, with subordinate albite, sericite and carbonate (e.g. ankerite), and traces of rutile, pyrite, galena, and sphalerite. A few thin quartz veins and sericite schlieren occur in the rock. Incipient weathering has caused minor goethite and Mn oxide to develop from breakdown of carbonate and pyrite.

337028 TS.

Summary: Felsic vitric-crystal tuff with abundant altered former pumiceous fragments and a few quartz and feldspar phenocrystal grains. The rock has undergone strong pervasive hydrothermal alteration, with development of abundant fine grained quartz, with subordinate albite, sericite and carbonate (e.g. ankerite), and traces of rutile, pyrite and graphite. A stockwork of veins pervades the sample and includes minor early stylolitic veins containing graphite and rutile, associated with abundant thin irregular sericite veinlets. These are cut by abundant sub-planar fine to medium grained quartz ± carbonate veins.

337029 TS.

Summary: Probably a strongly recrystallised medium grained quartzofeldspathic sandstone showing local cataclastic zones and fine grained quartz flooding. The original rock may have contained abundant detrital feldspar and quartz, with minor lithic fragments (?cherty and felsic volcanic material). It was recrystallised to an interlocking aggregate dominated by albite and quartz, with minor sericite. Quartz flooding forms fine grained granular patches interstitial to larger albite and quartz grains.

337030 TS.

Summary: Rather coarse grained crystal-lithic felsic tuff, with abundant phenocrystal grains of quartz and sodic plagioclase and subordinate altered pumiceous fragments and K-feldspar, in a fine grained recrystallised quartzofeldspathic groundmass. The rock has been strongly affected by hydrothermal alteration with development of albite, quartz, sericite and a Fe-bearing carbonate. There has been minor veining by carbonate, sericite and quartz. Subsequently, weathering effects have caused carbonate to be replaced by goethite and traces of Mn oxide.

Each of the samples represents either porphyritic felsic volcanic rock or derived pyroclastic or epiclastic material. The original volcanic material is interpreted to have been dacitic to rhyolitic in composition and it is assumed

that the sample suite is likely to be from the Mt Read Volcanics. Relict textures are weakly through to well preserved in the samples. From the relict textures and interpreted primary mineralogy, it is considered that sample 337025 may represent juvenile magmatic material (e.g. a lava or possibly shallow intrusive). Samples 337027, 337028 and 337030 may be tuffs with large components of crystals and pumiceous lithic (vitric) material. Sample 337029 is interpreted to have been a medium grained quartzofeldspathic sandstone originally and since it contains minor felsic volcanic lithic grains it could represent a type of epiclastic rock.

In the porphyritic volcanic rocks, phenocryst phases are dominated by sodic plagioclase and quartz. There are a few K-feldspar phenocrysts and pseudomorphs after small amounts of former ferromagnesian and FeTi oxide phases. Rare accessory phases include zircon and apatite. Tuffaceous rocks contain abundant lithic fragments, most of which are interpreted to have been former pumice. These commonly retain relict shapes after former bubble holes and some have relict flow foliation. In sample 337029, relict detrital grain texture has been heavily modified by subsequent alteration and recrystallisation, but it is likely that the original rock was a medium grained sandstone, dominated by detrital feldspar and quartz grains with minor lithic grains (including felsic volcanic material).

All the samples in the suite have experienced hydrothermal alteration and considerable mineralogical reconstitution. However, as mentioned, relict textures are variably preserved and it is common to find relict quartz (plus rare accessory zircon and apatite). Feldspars are locally preserved, but commonly have undergone significant alteration. The alteration effects are mostly pervasive and have most strongly affected finer groundmass material and former pumiceous (vitric) fragments. However, several samples also show evidence of fracturing and subsequent veining. The alteration assemblages are dominated by development of rather fine grained quartz and albite, along with variable amounts of sericite and carbonate and traces of rutile. Phenocrystal and detrital feldspar (e.g. in 337029) has been variably replaced by albite, along with local sericite and carbonate. Vein assemblages commonly contain sericite, carbonate and quartz, with sample 337028 showing early anastomosing veinlets containing sericite, rutile and trace graphitic material, subsequently cut by a stockwork of veins containing quartz and carbonate. Pervasive alteration and vein carbonate is most likely an iron-bearing variety (orange-brown weathering on surfaces), e.g. ankerite or ferroan dolomite. It may also contain a little Mn.

The samples are not significantly deformed. However, it is common to observe relict quartz phenocrysts with weak fracturing and strain phenomena and some of the altered lithic fragments which contain abundant alteration sericite display a weak to moderate foliation. Minor early veining (e.g. in 337028) is locally stylolitic in character, whereas later veining tends to be in brittle dilational structures (fracture fill).

Evidence of sulphide mineralisation is restricted to samples 337025 and 337027. The former contains irregularly distributed aggregates of galena (in the altered rock and in veins, most typically with carbonate) and tiny traces of pyrite and sphalerite. In 337027, there are traces of finely disseminated pyrite, galena and sphalerite, typically intergrown with quartz in the altered groundmass.

Weak weathering effects are evident in several samples and mostly relate to the breakdown of carbonate, although in 337027, minor goethite has commenced forming from the alteration of pyrite. It is likely that alteration carbonate contains Fe (and Mn) and weathering has therefore developed goethite as a replacement product and as a more dispersed intergranular and fracture controlled staining. Traces of Mn oxide (e.g. in 337027 and 337030) have probably formed by the same mechanism.

337025 **PTS.**

Summary: Originally, most likely a porphyritic felsic volcanic rock, e.g. of dacite composition, with phenocrysts of quartz, plagioclase and minor ferromagnesian material. The rock has undergone very strong hydrothermal alteration, with development of a replacement assemblage of carbonate (e.g. ferroan dolomite), quartz, albite and sericite, with minor galena and traces of rutile, pyrite and sphalerite.

Handspecimen: The drill core sample is composed of a very strongly altered, porphyritic felsic volcanic rock. There are scattered relict phenocrysts of quartz and altered feldspar up to 5-6 mm across in a white to grey carbonate-rich matrix which contains a little disseminated galena in aggregates up to 2 mm across. A few irregular veins of creamy-coloured carbonate cut the sample. The carbonate reacts slowly with dilute HCl and has a brown colour on the exposed core surface, implying that it might be ferroan dolomite. The sample is essentially non-magnetic ($<5 \times 10^{-5}$ SI units).

Thin Section:

a) Primary mineralogy and textures: In the section, the rock has a moderately preserved relict porphyritic texture despite being very strongly hydrothermally altered. It is evident that the original rock was rather strongly porphyritic with scattered large phenocrysts of quartz and plagioclase in an originally fine grained groundmass. Relict quartz phenocrysts are commonly sub-rounded and locally embayed and up to 6 mm across. Former plagioclase phenocrysts are tabular in outline and up to 4 mm long; they are now completely altered. There were a few small ferromagnesian phenocrysts, but they are also completely altered. The groundmass was presumably quartzofeldspathic in composition and contains a trace of relict zircon. From the relict textures and interpreted primary mineralogy, it is considered that the original rock may have been dacitic in composition, perhaps a volcanic (maybe pyroclastic) or shallow intrusive.

b) Alteration and structure: The rock has undergone very strong pervasive alteration and only relict quartz phenocrysts and zircon are preserved as igneous phases. Even quartz phenocrysts are slightly replaced by carbonate and trace galena. Former phenocrysts of plagioclase have been albitised, with further replacement by sericite and carbonate. Former ferromagnesian grains have been replaced by carbonate and minor rutile. The groundmass has been totally replaced by fine grained granular to prismatic quartz and albite, with irregular aggregates of fine to medium grained carbonate, minor sericite, galena and traces of rutile, pyrite and sphalerite. The rock has been cut by a few irregular to sub-planar veins up to a few millimetres wide containing fine to medium grained carbonate, with a little quartz and galena.

c) Mineragraphy and paragenesis: The rock contains minor, irregularly distributed galena, in small grains and aggregates up to 1.5 mm across. It occurs in the altered rock and in veins and is commonly intergrown with carbonate. A trace of fine grained pyrite occurs in rare aggregates up to 0.05 mm across, in places with traces of galena and sphalerite.

Mineral Mode: Approximate modal proportions are: carbonate (e.g. ferroan dolomite) 45%, quartz 30%, albitised plagioclase 17%, sericite 6%, galena 1% and traces of rutile, zircon, pyrite and sphalerite.

Interpretation and Comments: It is interpreted that the sample most likely represents a former porphyritic felsic volcanic rock, e.g. of dacite composition, with phenocrysts of quartz, plagioclase and minor ferromagnesian material. The rock has undergone very strong hydrothermal alteration, with development of a replacement assemblage of carbonate (e.g. ferroan dolomite), quartz, albite and sericite, plus minor galena and traces of rutile, pyrite and sphalerite. Replacement of groundmass material, plagioclase and ferromagnesian grains has been complete.

337027 **PTS.**

Summary: Felsic vitric-crystal tuff with abundant altered former pumiceous fragments and scattered quartz and feldspar phenocrystal grains. The rock has undergone strong pervasive hydrothermal alteration, with development of abundant fine grained quartz, with subordinate albite, sericite and carbonate (e.g. ankerite), and traces of rutile, pyrite, galena, and sphalerite. A few thin quartz veins and sericite schlieren occur in the rock. Incipient weathering has caused minor goethite and Mn oxide to develop from breakdown of carbonate and pyrite.

Handspecimen: The sample is composed of a strongly altered, porphyritic felsic volcanic rock with a few relict phenocrysts of quartz and altered feldspar up to 1-2 mm across in a grey and orange-brown groundmass which appears to be rich in fine grained quartz and patches of carbonate. There may also be minor sericite and a trace of disseminated pyrite. Slight weathering may have formed goethite from the replacement of carbonate. The sample is essentially non-magnetic ($<5 \times 10^{-5}$ SI units).

Thin Section:

a) Primary mineralogy and textures: In the section, the rock has a moderately well preserved relict vitric-crystal tuffaceous texture. There are abundant angular to sub-rounded former pumiceous fragments up to several millimetres across, accompanied by scattered relict phenocrystal grains of quartz (up to 1.5 mm across) and tabular feldspar (up to 2 mm across). The latter are mostly sodic plagioclase, although there are a few alkali feldspar (e.g. sanidine) grains. Former pumice fragments preserve relict bubble holes and some have a relict flow foliation. The pumice fragments and phenocrysts are set in a fine grained altered vitric groundmass. The rock is interpreted to have originally been a vitric-crystal felsic tuff (e.g. of rhyolitic-dacitic composition).

b) Alteration and structure: The rock has undergone strong pervasive hydrothermal alteration and minor veining. All pumiceous and groundmass material has been completely altered, mostly by fine grained granular quartz, but with subordinate albite, irregular patches of carbonate and sericite, and traces of disseminated fine grained rutile and sulphides. Feldspar phenocrysts are locally fresh, but are commonly partly replaced by albite, carbonate and sericite. All carbonate is turbid and partly replaced by goethite due to incipient weathering effects. It is probably an Fe-bearing type, e.g. ankerite. There is also a little black Mn oxide staining as a result of weathering (perhaps Mn from carbonate). A few thin fine grained sub-planar quartz-rich veins cut the altered rock which also has a few elongate, sericite-rich schlieren.

c) Mineragraphy and paragenesis: The rock contains rare disseminated sulphide grains, including small pyrite aggregates up to 0.4 mm across and traces of galena and sphalerite intergrown with quartz in the altered groundmass. Pyrite is locally altered to goethite due to weathering effects.

Mineral Mode: Approximate modal proportions are: quartz 50%, plagioclase (including albite) 20%, sericite 15%, carbonate 10%, K-feldspar 3%, goethite 1% and traces of pyrite, galena, sphalerite, Mn oxide and goethite.

Interpretation and Comments: It is interpreted that the sample represents a felsic vitric-crystal tuff with abundant altered former pumiceous fragments and scattered quartz and feldspar phenocrystal grains. The rock has undergone strong pervasive hydrothermal alteration, with development of abundant fine grained quartz, with subordinate albite, sericite and carbonate (e.g. ankerite), and traces of rutile, pyrite, galena and sphalerite. A few thin quartz veins and sericite schlieren occur in the rock. Incipient weathering has caused minor goethite and Mn oxide to develop from breakdown of carbonate and pyrite.

337028 TS.

Summary: Felsic vitric-crystal tuff with abundant altered former pumiceous fragments and a few quartz and feldspar phenocrystal grains. The rock has undergone strong pervasive hydrothermal alteration, with development of abundant fine grained quartz, with subordinate albite, sericite and carbonate (e.g. ankerite), and traces of rutile, pyrite and graphite. A stockwork of veins pervades the sample and includes minor early stylolitic veins containing graphite and rutile, associated with abundant thin irregular sericite veinlets. These are cut by abundant sub-planar fine to medium grained quartz ± carbonate veins.

Handspecimen: The sample is composed of a grey to pale brown, strongly altered felsic volcanic rock with apparently strong fragmentation. The rock contains a few small relict phenocrystal quartz grains and displays fine grained quartz and carbonate alteration. There are numerous stockwork quartz and carbonate veins up to several millimetres wide. Carbonate is orange-brown weathering and has a very low reaction with dilute HCl; it may be ankerite. Some early veining appears to be stylolitic and darkly pigmented by fine carbonaceous material. The sample is essentially non-magnetic ($<10 \times 10^{-5}$ SI units).

Thin Section:

a) Primary mineralogy and textures: In the section, the rock has a weakly preserved relict vitric-crystal tuffaceous texture. There are vague outlines after former abundant pumiceous fragments up to several millimetres across, accompanied by a few relict phenocrystal grains of quartz and tabular feldspar up to 1.5 mm across. Feldspars are mostly sodic plagioclase, although there are a few alkali feldspar grains. Former pumice fragments preserve relict bubble holes and some have a relict flow foliation. The rock is interpreted to have originally been a vitric-crystal felsic tuff (e.g. of rhyolitic-dacitic composition).

b) Alteration and structure: The rock has undergone very strong pervasive hydrothermal alteration and stockwork veining. All pumiceous material has been completely altered, mostly to fine grained granular quartz, but with subordinate albite, carbonate and sericite, and traces of disseminated fine grained rutile, pyrite and graphite. Feldspar phenocrysts are commonly partly replaced by albite, carbonate and sericite. A little dark, fine grained carbonaceous material (e.g. graphite) occurs interstitial to pumiceous fragments. The sample contains numerous veins. There appears to have been development of a few thin stylolitic, irregular veins containing carbonaceous material (graphite) and trace rutile and these are associated with abundant thin, irregular and diffuse veinlets of sericite. Subsequently, there has been emplacement of numerous sub-planar, fine to medium grained veins of quartz ± carbonate up to 2.5 mm wide. In these veins, quartz ranges from finely granular to prismatic.

c) Mineragraphy and paragenesis: The rock contains a trace of disseminated pyrite in aggregates up to 0.2 mm across.

Mineral Mode: Approximate modal proportions are: quartz 50%, sericite 18%, plagioclase (including albite) and carbonate each 15%, K-feldspar and graphite each 1% and traces of rutile and pyrite.

Interpretation and Comments: It is interpreted that the sample represents a felsic vitric-crystal tuff with abundant altered former pumiceous fragments and a few quartz and feldspar phenocrystal grains. The rock has undergone strong pervasive hydrothermal alteration, with development of abundant fine grained quartz, with subordinate albite, sericite and carbonate (e.g. ankerite), and traces of rutile, pyrite and graphite. A stockwork of veins pervades the sample and includes minor early stylolitic veins containing graphite and rutile, associated with abundant thin irregular sericite veinlets. These are cut by abundant sub-planar fine to medium grained quartz ± carbonate veins.

337029 TS.

Summary: Probably a strongly recrystallised medium grained quartzofeldspathic sandstone showing local cataclastic zones and fine grained quartz flooding. The original rock may have contained abundant detrital feldspar and quartz, with minor lithic fragments (?cherty and felsic volcanic material). It was recrystallised to an interlocking aggregate dominated by albite and quartz, with minor sericite. Quartz flooding forms fine grained granular patches interstitial to larger albite and quartz grains.

Handspecimen: The sample is composed of a medium grained, pale to mid-grey quartzofeldspathic rock with a vague relict detrital texture. It could represent a type of sandstone. In places, it appears to have undergone flooding by fine grained quartz, forming irregular patches up to several millimetres across. The sample is essentially non-magnetic ($<10 \times 10^{-5}$ SI units).

Thin Section:

a) Primary mineralogy and textures: In the section, the rock is composed dominantly of an inequigranular mass of interlocking feldspar (albitic plagioclase) and quartz grains. These are up to 2-3 mm across, with albite locally forming tabular grains up to 3 mm long. Most grains, are however, in the range 0.2-1 mm across. Superficially, the texture of the rock appears to be "granitic", but it does contain numerous small apparently lithic grains up to 1 mm across. The latter are mostly composed of finely recrystallised quartz and could represent former cherty of felsic volcanic material; there are also rare porphyritic felsic volcanic grains, along with rare grains of zircon. Although the rock has evidently been strongly recrystallised, it is interpreted to represent a former quartzofeldspathic sandstone.

b) Alteration and structure: The rock has been strongly recrystallised, now forming an interlocking, inequigranular aggregate dominated by albite and quartz. It is possible that albite has formed from the replacement of former plagioclase and maybe K-feldspar. Subsequently, albite has been slightly flecked by sericite. The rock may contain several irregular to sub-planar zones up to a few millimetres wide of microcataclasis. In the latter, the rock is reduced in grain size, has "porphyroclastic" fragments of quartz and feldspar and shows local development of elongate sericite aggregates. Interstitial to quartz and feldspar grains are rare aggregates of rutile and a dark substance, possibly Mn oxide. The rock shows minor development of fine grained quartz alteration ("quartz flooding"). These are manifest by development of fine grained quartz interstitial to larger quartz and feldspar grains, locally grading into irregular patches of fine grained quartz up to 4-5 mm across. The rock has evidently been incipiently weathered, with local goethite and Mn oxide staining along grain boundaries.

c) Mineragraphy and paragenesis: No sulphides have been noted in the sample.

Mineral Mode: Approximate modal proportions are: albitic feldspar 70%, quartz 27%, sericite 2% and traces of rutile, Mn oxide, zircon and goethite.

Interpretation and Comments: It is interpreted that the sample represents a strongly recrystallised medium grained quartzofeldspathic sandstone showing local cataclastic zones and fine grained quartz flooding. The original rock may have contained abundant detrital feldspar and quartz, with minor lithic fragments (?cherty and felsic volcanic material). It was recrystallised to an interlocking aggregate dominated by albite and quartz, with minor sericite. Quartz flooding forms fine grained granular patches interstitial to larger albite and quartz grains.

337030 TS.

Summary: Rather coarse grained crystal-lithic felsic tuff, with abundant phenocrystal grains of quartz and sodic plagioclase and subordinate altered pumiceous fragments and K-feldspar, in a fine grained recrystallised quartzofeldspathic groundmass. The rock has been strongly affected by hydrothermal alteration with development of albite, quartz, sericite and a Fe-bearing carbonate. There has been minor veining by carbonate, sericite and quartz. Subsequently, weathering effects have caused carbonate to be replaced by goethite and traces of Mn oxide.

Handspecimen: The sample is composed of a rather coarse grained, porphyritic felsic igneous rock, possibly a felsic volcanic. There are scattered phenocrystal grains of grey quartz and white-creamy feldspar up to 5 mm across set in a relatively fine grained grey quartzofeldspathic groundmass. The rock has been slightly weathered and minor goethite staining pervades fractures and grain boundaries. The sample is essentially non-magnetic ($<5 \times 10^{-5}$ SI units).

Thin Section:

a) Primary mineralogy and textures: In the section, porphyritic texture is well preserved and it is evident that the rock is likely to represent an altered coarse crystal-lithic felsic tuff. There are abundant phenocrystal grains of quartz (locally embayed and fractured) and sodic plagioclase, with a few K-feldspar phenocrysts up to 5 mm across. There are also a few lithic fragments. The latter appear to have originally been fine felsic volcanic material, including former pumice. Fragments are irregular to elongate in outline, with one or two being up to 1 cm long. Rare microphenocrysts of a former ferromagnesian phase are closely associated with plagioclase phenocrysts. The lithic fragments and crystals are set in a fine grained, variably altered and recrystallised groundmass containing rare small grains of relict apatite and zircon, and altered FeTi oxide.

b) Alteration and structure: The rock has been hydrothermally altered. This has caused strongly replacement of the groundmass, lithic fragments and former ferromagnesian material. Feldspars have been less affected. The groundmass has been variably recrystallised into a fine grained granular to prismatic aggregate of quartz and albite, with minor sericite and carbonate. In the groundmass, former FeTi oxide has been replaced by rutile. Lithic fragments have commonly been intensely sericitised, locally accompanied by quartz and carbonate. Former ferromagnesian material has been altered to sericite, carbonate and rutile, whereas feldspars have been variably replaced by albite, sericite and carbonate. The rock has experienced minor fracturing and veining. There has been emplacement of a few thin (<0.3 mm) anastomosing to sub-planar veins containing sericite, carbonate and quartz. The rock has subsequently been affected by weathering. All hydrothermal carbonate (presumably an Fe-bearing type) has been replaced by goethite and there is also grain boundary staining by goethite and a little black Mn oxide.

c) Mineragraphy and paragenesis: No sulphides have been noted in the sample.

Mineral Mode: Approximate modal proportions are: quartz 40%, plagioclase (including albite) 35%, sericite 16%, K-feldspar 5%, goethite 3% and traces of rutile, Mn oxide, zircon and apatite.

Interpretation and Comments: It is interpreted that the sample represents a rather coarse grained crystal-lithic felsic tuff, with abundant phenocrystal grains of quartz and sodic plagioclase and subordinate altered pumiceous fragments and K-feldspar, in a fine grained recrystallised quartzofeldspathic groundmass. The rock has been strongly affected by hydrothermal alteration with development of albite, quartz, sericite and a Fe-bearing carbonate. There has been minor veining by carbonate, sericite and quartz. Subsequently, weathering effects have caused carbonate to be replaced by goethite and traces of Mn oxide.