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PETROGRAPHIC REPORT

SPECIMENS FROM STANLEY RIVER, STANLEY REWARD GRID, TASMANIA

75-1129

PMR 161/75

SYDNEY

October, 1975

P.J. CURTIS

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KEYWORDS

TASMANIA
8SK 55-03
9STANLEY RIVER
PETROLOGY
GREYWACKE
HORNFELS

1. INTRODUCTION

Specimens A47001 to A47028 were submitted for petrographic examination with emphasis on changes along and across strike with respect to :-

i) original petrology
ii) alteration/hornfelsing
and, iii) mineralisation.

2. SUMMARY

2.1 Contact Alteration

A scheme for the weakly to moderately contact metamorphosed rocks present was elaborated because of the slight changes seen in textures rather than any changes in mineralogy of most of the argillites involved. There are limitations in interpretation because of the pneumatolytic overprint which destroys or modifies the thermal metamorphic textures formed.

Information on the progressive thermal metamorphism of pelitic sediments as described in Harker (Ref. 1), was used as the yardstick in formulating the various 'grades' of alteration.

As an example of the code used, where a symbol such as 'B(C)' is involved this means mainly 'B' but trending towards 'C', etc.

Metamorphism increases from 'F' to 'A'.

A - Cordierite with abundant biotite or granoblastic biotite and quartz.

B - Andalusite or cordierite with sericite, little or no metamorphic biotite.

C - Porphyroblastic (poikiloblastic) quartz and muscovite, diablastic textures, hornfelsed matrix.

D - Polygonal quartz, some poikiloblastic quartz and muscovite.

E - Cherty (originally or presently carbonaceous) spotted areas, slightly hornfelsed, recrystallised matrix.

F - No contact (thermal) metamorphism.

2.2 Petrographic Descriptions

A47001 (601355R).

A non-feldspathic lithic greywacke. Fragments of argillite, quartz rock and quartz mineral grains are seen with an argillaceous matrix.

'E' grade contact metamorphism of some fragments.

A47002 (600313R).

A quartz wacke, altered to an argillite hornfels of silty quartz in a sericite matrix. A slightly recrystallised matrix. Cherty chlorite metamorphic spotting occurs.

'E' grade contact metamorphism.

A47003 (600317R).

Originally a shaley siltstone, or quartz wacke. Presently an andalusite hornfels. The andalusite present is of the chiastolite variety. The groundmass is of fine andalusite and quartz, magnetite with sericite and a little rutile.

'B' grade contact metamorphism.

A47004 (600316R).

Similar to A47002 mineralogically. A quartz wacke altered to an argillite hornfels. Contains cherty, chloritic, carbonaceous spotting. A recrystallised sericite-chlorite-quartz groundmass. Muscovite present is somewhat poikiloblastic. Fine tourmaline and traces of fluorite are seen. Veining of rock by quartz-feldspar-biotite veins is apparent.

'D' grade contact metamorphism.

A47005 (600315R).

Originally quartz wacke. Presently a cordierite-sericite-biotite hornfels showing crenulated laminal arrangement of

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large cordierite mineral grains. Biotite flakes, sericite, fine quartz and cordierite occur in the interstices. Traces of cassiterite and a little pyrite occur.

'B' grade contact metamorphism.

A47006 (600329R).

A quartz wacke, now argillite hornfels of recrystallised, polygonal quartz, possible nacrite and sericite, and diablastic muscovite:quartz grains. Abundant recrystallised fine rutile, a little cassiterite, tourmaline and some fluorite are seen. All the latter minerals (except rutile) are introduced with pneumatolysis which appears to be contemporaneous with hornfelsing (and are enclosed in hornfelsed quartz, etc.).

'C' grade contact metamorphism.

A47007 (600330R).

Originally a banded quartz wacke. A sericite, chlorite, argillite hornfels with quartz bands. Poikiloblastic porphyroblasts of muscovite are seen but no diablastic growths with quartz. Chlorite present is patchily associated with nacrite (?). Recrystallisation of quartz and sericite growths occur. A fair amount of cassiterite and tourmaline are seen and some apatite. Metamorphic grade is slightly less than A47006.

A quartz argillite hornfels.

'D' grade contact metamorphism.

A47008 (600333R).

Originally a quartz wacke with quartz arenite bands but altered to a hornfelsed argillite with quartz bands. Some zones contain patchy quartz. Chlorite (green and brown in coarse clumps) occurs patchily in abundant sericite groundmass. Adjoining quartz grains show slight polygonal recrystallised textures, poikiloblastic porphyroblasts of

muscovite are seen with quartz inclusions, and some quartz-muscovite diablastic textures. Abundant tourmaline prisms and traces of cassiterite and apatite are introduced pneumatolytic minerals. Recrystallised rutile grains are seen.

'C' grade contact metamorphism.

A47009 (600332R).

A lagoonal, banded quartz wacke. Sandy quartz bands alternate with bands of scattered quartz grains in an illite/nacrite matrix. Sutured quartz grain boundaries occur where grains abut, are seen in the quartz bands. The textures are remarkably free from metamorphism. Nacrite is presumably formed by hydrothermal degradation of illite.

Unmetamorphosed 'F' grade.

A47010 (600334R).

A banded quartz wacke, originally. Similar to previous Oonah Shale samples examined with mainly illite and quartzose bands alternating. Abutting polygonal quartz grains and areas of granoblastic sericite and quartz are seen, also metamorphic(?) spotty areas of cherty quartz with recrystallised rutile. A little nacrite occurs commonly in the vicinity of rutile and other heavy minerals. Poikiloblastic muscovite occurs as porphyroblasts. Scattered recrystallised rutile as well as introduced fine greenish and squat brown tourmaline and apatite are seen. A trace of cassiterite as small grains are also present

No carbonate is seen. Quartz argillite hornfels.

Metamorphic grade is estimated to be 'C(B)'.

A47011 (600335R).

Originally quartz wacke. Similar to A47010 but finer grained and with abundant muscovite as poikiloblastic porphyroblasts

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occur in coarse quartz bands. Fine sericite and quartz alternate with coarser mainly quartz bands. The sericite is recrystallised. Tourmaline as brown and pale green varieties is abundant. A little cassiterite is seen. No carbonate occurs. Blade-like opaque grains of possibly arsenopyrite occur. Poikiloblastic quartz as well as muscovite are seen here. More introduced tourmaline occurs than for A47010. A slightly higher metamorphic grade and rather more pneumatolysis than for A47010.

A quartz argillite hornfels. The metamorphic grade is however no more than 'C(B)'.

A47012 (600003R).

A weakly hornfelsed sandy quartz arenite containing bands of micaceous (sericitic) quartz wacke. Abutting quartz grains in the quartz arenite bands are polygonal. In both micaceous and quartz bands poikiloblastic muscovite has developed. Chlorite and coarse tourmaline are fairly common. Introduced cassiterite as fine grains are apparently fairly abundant as are coarse and fine tourmaline (much of the latter being enclosed in the quartz grains).

Pyrite appears to accompany pneumatolysis here.

A quartzite hornfels with argillite bands.

Estimated metamorphic grade is 'C'.

A47013 (600003R).

(Polished section only).

Shows pyrite replacing quartz of the rock, penetrating the rock through quartz interstices. Traces of cassiterite are present.

A47014 (600336R).

A typical hornfelsed quartz wacke with quartz arenite bands. Polygonal quartz and patchy muscovite porphyroblasts are poikiloblastic with tourmaline inclusions. Scattered chlorite bundles occur. Some recrystallisation of illite to sericite is seen. Abundant tourmaline, recrystallised rutile, and traces of cassiterite occur.

Metamorphic grade is 'D'.

A47015 (600027R).

Not like the red or grey chert of the Renison horizon but is more similar to the quartz wacke lithology of the Oonah Siltstone unit. Shows some recrystallisation of illite present and quartz shows some patchy weak silicified mosaic formations. Scattered brown chlorite flakes occur. Traces of recrystallised rutile, and introduced tourmaline are seen, also a little zircon; epigenetic pyrite occurs.

A mildly hornfelsed quartz wacke. Metamorphic grade is 'E'.

A47016 (600026R).

Banded quartz wacke. A finely banded, very fine grained sericite:nacrite:chlorite rock with micaceous silty quartz bands, only slightly hornfelsed but has been moderately pneumatolysed and kaolinite has been hydrothermally degraded to fibrous brown nacrite. Some introduced tourmaline and traces of cassiterite occur. There is a scattering of fine opaque minerals.

A slightly hornfelsed quartz argillite.

Metamorphic grade is 'E(F)'.

A47017 (600023R).

A sedimentary dolomite rock which shows gross alteration to diopside, then to tremolite and to calcite over most of

the section. However, a corner of the section shows some dolomite patchily altering to antigorite. Presumably contact metamorphism partially altered dolomite to diopside and tremolite. Later hydrothermal activity altered unchanged diopside (with the help of chert present) to antigorite.

Metamorphic grade has reached 'A'.

A47018 (600327R).

'Gossan'.

Shows a relict fibrous texture which though limonitised is not a goethite structure but is probably a weathered, ferruginised, tremolite structure and probably therefore an altered impure dolomite.

Tin test indicates a scattering of very small metallic particles which appear after the test and are probably cassiterite.

A47019 (600322R).

'Gossan'.

Some fibrous areas occur but the specimen consists of mainly botryoidal limonite masses with an indeterminate cellular structure. Carbonate fills some cellular cavities. Tin test results as for A47018 but rather more fine 'metallic' grains occur.

Possibly a more altered and oxidised version of A47018.

A47020 (600324R).

A mixture of oblong prismatic to fibrous bundles of biotite and fine equigranular quartz. Cherty lenticles, ovoid particles and veins of limonite and mottled limonite staining. A trace of chlorite as fine plates and opaque oxides are seen. Tourmaline as pneumatolytic fresh mineral occurs.

A contact altered marly and pelitic siltstone with a somewhat granoblastic texture. No oolites are identifiable.

Quartz-argillite hornfels.

Possibly 'B(C)' or 'C' grade metamorphism.

A47021 (600320R).

A tourmalinised shaley siltstone(?) or quartz wacke. Though presently an intimate mixture of massive green tourmaline, equigranular and cherty quartz and also of irregular poikiloblastic quartz intergrown with tourmaline (faintly coloured or colourless) which is intruded vein material. A little cassiterite is present (positive tin test). Some recrystallised rutile crystals and fine opaque mineral are seen.

Difficult to give an original metamorphic grade here because of drastic pneumatolytic alteration of host rock.

Possibly 'B' metamorphosed(?).

A47022 (600314R).

A mainly fibrous sericite rock showing some 'hydrothermal' downgrading of kaolinite to nacrite (Ref. 6) and chlorite occurs. Some staining by limonite occurs.

Massive pyrite is seen in polished section as botryoidal forms. No cassiterite is seen (tin test is negative).

A47023 (600022R).

A highly pneumatolysed (for the present series) silty argillite, originally quartz wacke, which contains mainly yellow nacrite, unaltered sericite and silt-sized quartz. The section shows possible porphyroblastic zinnwaldite (very high B.R.). Chlorite occurs with sericite and is intergrown with the zinnwaldite. Fine tourmaline as small brown rounded grains (with recrystallised rutile?) occurs in silty quartz

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where quartz growths form poikiloblasts. Tourmaline is also abundant as fresh prisms scattered interstitially throughout. Fluorite cubes are present but are rare.

Thought to be 'D' metamorphosed.

A47024 (600202R).

Originally marly quartz wacke. A contact altered marly argillite shows decussate biotite, chlorite and patchy poikiloblastic quartz. The rock is suffused with limonite particles and is cross-cut by quartz veins.

Heavy minerals other than pyrite are lacking.

Possibly 'A' contact metamorphism (but this was more obvious before weathering?).

A47025 (600312R).

A contact metamorphosed dolerite now consisting largely of decussate albite prisms (after labradorite) and actinolite hornblende (after augite). Hornblende shows replacement by biotite. Abundant magnetite varies between 7 and 10 percent of the section. It is partly secondary.

'B' metamorphosed.

A47026 (600338R).

A much contact altered variolitic basalt which consists now largely of fine actinolite needles (stellate masses in ex-variolitic areas), also as inclusions in albite. Abundant network of iron oxides margin the ex-variolitic structures.

'B' metamorphosed.

A47027 (600339R)

A biotite-magnetite-cordierite hornfels of mainly ovoid cordierite grains with abundant inclusions of biotite and

sericite or of chert. Between the main cordierite crystals are areas full of magnetite and fine biotite laths. Quartz as secondary veins and/or limonite traverse the section.

A quartz argillite. Some shear is noted of bands of abundant flattened cordierite grains.

Metamorphic grade is 'A'.

A47028 (600319R).

A silicified granite of silicified feldspar phenocrysts; actinolite bundles also pseudomorph (associated with quartz) hornblende phenocrysts. Elsewhere quartz occurs as a sutured partly irregular mosaic with interstitial fibrous bundles of actinolite which are part replaced by brown biotite. The rock has a replaced porphyritic granite texture and is undoubtedly a silicified granite. Calcium from plagioclase was presumably added to hornblende to form actinolite. Sphene occurs with iron oxides and chert.

A silicified granite.

3. DISCUSSION

3.1 Metamorphism

a) 'A' grade metamorphism. A47017 and A47027. Both are very close to the granite contact as mapped.

b) 'B' grade metamorphism includes A47003, A47005, A47021, A47025 and A47026. All close to granite but not symmetrically so in relation to the 'A' group.

c) 'C' grade metamorphism includes A47006, A47008, A47010, A47011, A47012 and A47020. All some distance from the granite contact except A47020 but this specimen could also be designated 'B(C)'.

d) 'D' grade metamorphism includes A47004, A47007, A47014 and A47023. Some specimens are 'further' from contact from surface mapping, others are closer.

e) 'E' and 'F' grades. A47001, A47002, A47009, A47015 and A47016. No pattern.

3.2 Mineralisation

This is scarce as far as cassiterite goes but there is normally some cassiterite where introduced tourmaline occurs but not necessarily any fluorite. Fluorite was seen in A47004 and A47023 from adjoining locations with apatite and fairly abundant tourmaline.

A fairly low grade of metamorphism is apparent where pneumatolysis is well marked. In some cases thermal metamorphic textures have been destroyed by pneumatolytic/hydrothermal alteration.

Sulphides are not abundant and then only pyrite occurs in any quantity with the possibility of arsenopyrite once (A47001).

In the more westerly traverses specimen A47010, A47009 and A47008 and specimens A47014, A47012 and A47013, cassiterite appears to increase northwards towards the contact but no eastward trend is noted except that there is a trace in A47014 and A47016.

The gossan specimens A47018 and A47019 contain very little apparent cassiterite but appear to have derived from metamorphosed carbonate rocks.

No oolites are preserved in siliceous rocks.

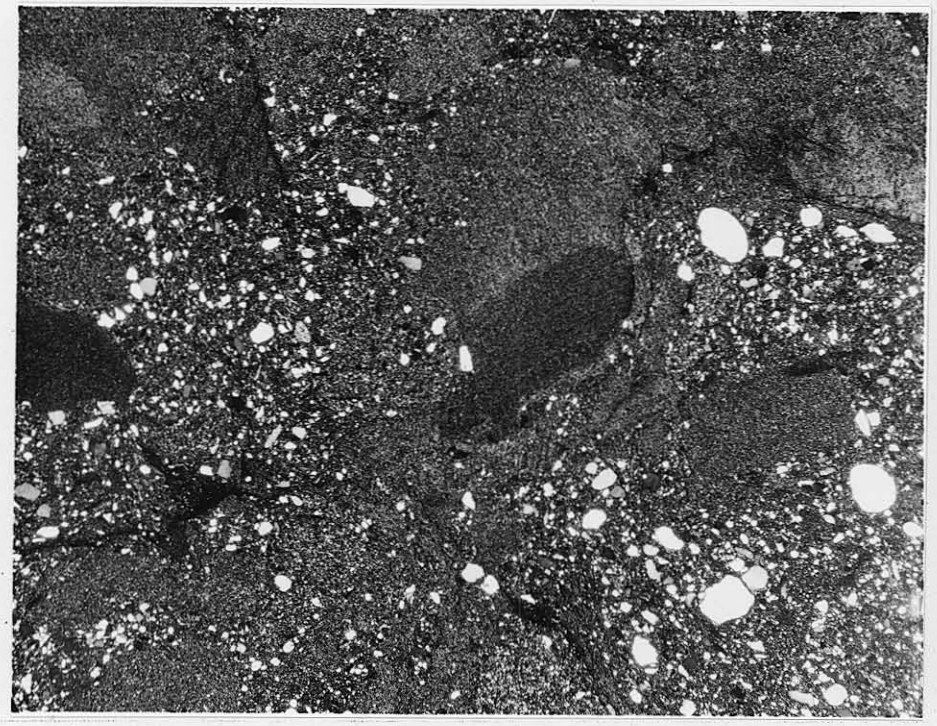

FIGURE 1 : Lithic Greywacke (A47001/601355R).

Fragments of quartz (flat white or grey) and shale (dark, fine stipple) in an argillaceous matrix (fine black and white stipple).

Crossed nicols Magnification x 12

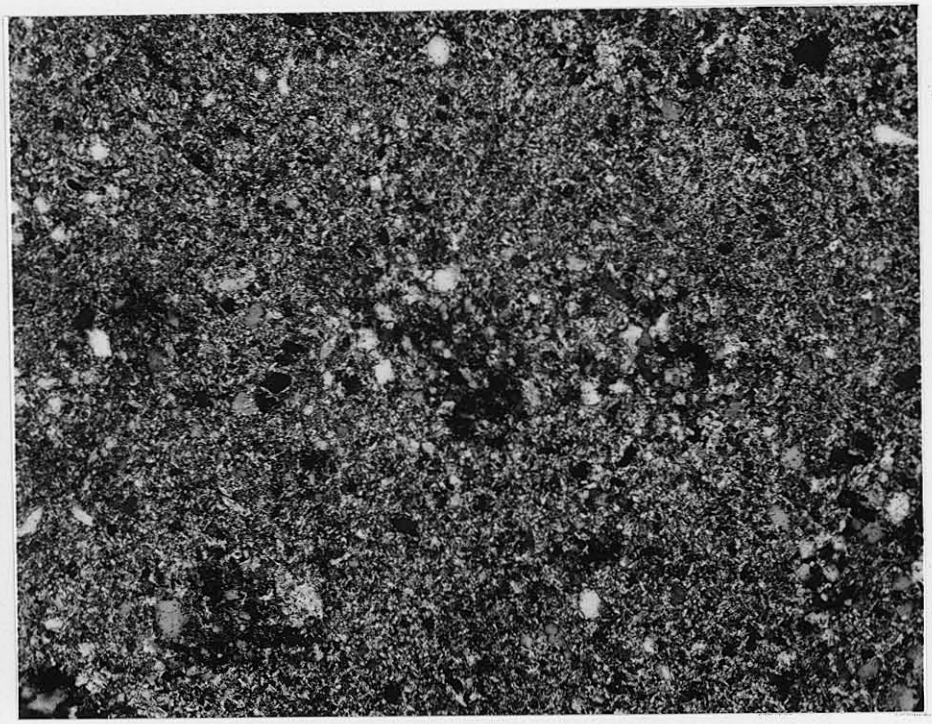

FIGURE 2 : Low grade Metamorphosed Argillite (A47002/600313R).

Fine white flakey recrystallised sericite and quartz matrix and metamorphic spotting of dark chert with coarser quartz and chlorite (?). Weak contact metamorphism.

Crossed nicols Magnification x 60

4. PETROGRAPHIC INVESTIGATION

A47001 (601355R). Black shaley siltstone with pyrite(?) graphite (Figure 1).

A non-feldspathic lithic greywacke.

Grains of quartz mineral and quartz rock varying from 0.03 to 0.7 mm are sharply angular or rounded and occur mainly in a matrix of sericite. Kaolinite and fine fragmentary quartz (approx. 0.02 mm and less) are also seen.

Some recrystallisation of clay has taken place resulting in replacement of margins of quartz grains. Fragments of argillite present (up to several millimetres in size) show variations in sericite:kaolinite ratio, variations in grain size and crumpling of argillaceous minerals. A coarse green tourmaline fragment (approx. 0.1 mm) is seen intergrown with quartz. A low grade metamorphic source of sedimentary rocks is thought to be the source of the fragments. Some possible arsenopyrite is seen embedded in a quartz rock fragment.

Opaque minerals similar in size to the larger quartz grains occur in the matrix.

P.S. Minute goethite and occasional specularite grains only are seen in polished section. Graphite, if present, is too finely disseminated to be identifiable.

A47002 (600313R). Pale grey siltstone (Oonah Quartzite and Slate). (Figure 2).

Quartz wacke. Metamorphic spots present consist of mosaics of quartz aggregates (approx. 0.6 mm) of rounded to subangular quartz (to 0.05 mm), welded together with some fine granular chert dust and a little chlorite as ragged flakey inclusions. These aggregates are set in a fine matrix of sericite and fine quartz and scattered larger subangular quartz grains

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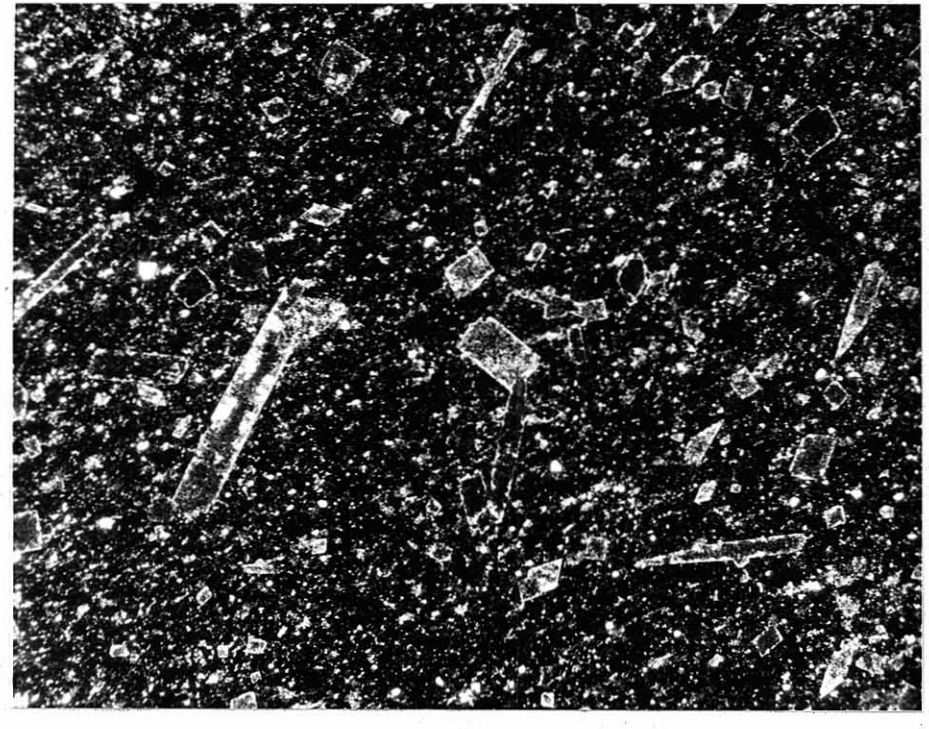

FIGURE 3 : Andalusite Hornfels (A47003/600317R).

Andalusite crystals occur as diamond shaped and prismatic sections which are set in a groundmass of fine andalusite, quartz, magnetite dust and minimal sericite.

Crossed nicols Magnification x 11

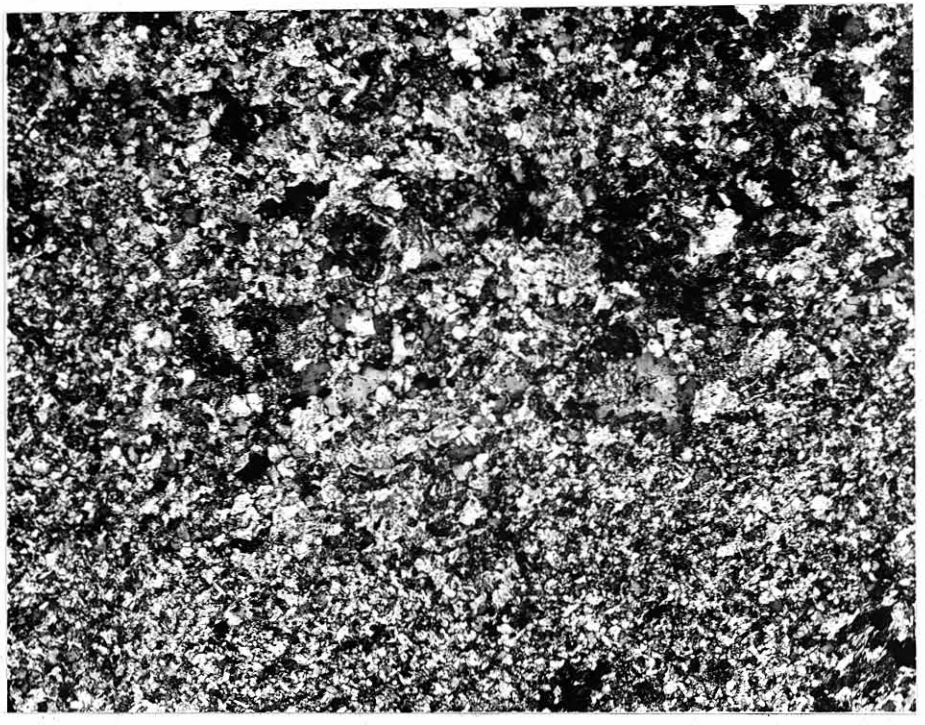

FIGURE 4 : Quartz Wacke Argillite Hornfels (A47004/600316R).

Mineralogically similar to A47002 but metamorphic spotting is not so obvious here because of the coarser sericite : quartz groundmass. Otherwise 'spots' contain more obvious chlorite and carbonaceous (?) matter.

Crossed nicols Magnification x 60

(to 0.05 mm). In the matrix occurs scattered worn and recrystallised prismatic grains (0.01 to 0.02 mm) of rutile and tourmaline grains of similar size; and a little fine cassiterite.

A recrystallised, hornfelsed quartzose/argillaceous rock.

Compared with the Oonah Siltstone (A47005), cordierite is present in the latter and it is therefore of higher metamorphic grade. Patchy limonite in A47002 is probably the result of weathering of iron oxide released from iron rich minerals during metamorphism.

A very low grade contact metamorphosed argillaceous rock, or quartz argillite.

A47003 (600317R). Shaley siltstone (Oonah). (Figure 3).

Coarse andalusite prisms (to 3 mm) and cross sections show typical chiastolite crosses of inclusions of carbonaceous matter(?); sericite and chlorite occur at centres of grains and sericite occurs just inside the grain perimeters forming an outer zone of alteration. The groundmass of the rock is of abundant fine opaque magnetite dust, fine andalusite, quartz and minimal coarse sericite or muscovite flakes. A little rutile as tiny prisms (approx. 0.01 mm) occurs sparsely. For the formation of andalusite rather than cordierite the original rock substance was less chloritic or less magnesia rich (Harker).

An andalusite hornfels, abundantly iron rich.

A medium-grade metamorphosed iron rich and aluminous shale.

A47004 (600316R). Silicified siltstone. (Figure 4).

Somewhat similar to A47002 (Oonah Siltstone) but more coarsely crystalline and shows metamorphic spotting of quartz, chlorite

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FIGURE 5 : Cordierite-Sericite-Biotite Hornfels (A47005/600315R).

Crenulate laminae of joined cordierite grains faintly specked with inclusions of sericite and tourmaline and the darker cordierite grains contain quartz. Interstices are mainly of fine sericite, chlorite and cherty quartz.

Crossed nicols Magnification x 11

and carbonaceous patches.

Masses of quartz grains are poikiloblastic with sericite, patchy chlorite, abundant fine apatite prisms, scattered tourmaline inclusions and traces of fluorite. Abundant muscovite flakes are intergrown with growths of hornfelsed quartz. Occasional brown biotite porphyroblasts are seen.

Adjoining recrystallised quartz grains show polygonal shapes.

Quartz-potash feldspar biotite veins occur at one end of the section which cross-cut the quartz wacke argillite after hornfelsing.

Low grade contact metamorphosed quartz wacke argillite hornfels.

Metamorphic grade was slightly greater than for A47002, and less so than for A47005.

A47005 (600315R). Brownish-grey silicified siltstone or volcanic. (Figure 5).

Originally a quartz wacke, presently a cordierite-sericite-biotite hornfels. Flat, round, oblong and elliptical masses of laminated cordierite grains (approx. 0.3 mm) are seen to contain inclusions of sericite and few flakes or biotite. Some grains include opaque minerals, tourmaline grains and possible cassiterite. Several shadowy cordierite grains with abundant quartz inclusions occur and appear to be developing from the groundmass minerals. The groundmass is of sericite, chlorite and some cherty looking quartz.

At intervals cordierite containing mineral inclusions occurs in bands 0.5 to 1.0 mm wide; elsewhere isolate grains and mosaics occur with a fine matrix of sericite, biotite and quartz, etc. interstitial to the grains and mosaics.

Pyrite as euhedra (approx. 0.05 mm) and growths (to 0.8 mm) occur, throughout.

Compared with other contact metamorphosed specimens of series, a relatively high contact metamorphosed aluminous sediment.

A cordierite-sericite-biotite hornfels.

A47006 (600329R). Pale pinkish white to buff-coloured weathered bedded siltstone.

A micaceous siltstone or quartz wacke which shows some evidence of contact alteration to a quartz argillite hornfels. The quartz grains vary from 0.02 to 0.06 mm, many of the grains are quite rounded and have fused together to form patch mosaics but few triple junctions are seen, mainly sutured (silicified, diagenetic) contacts remain. Some quartz grains show shadowy strain effects. The brownish micaceous interstitial mineral between quartz mosaic patches is probably nacrite which is associated with existing granular chlorite. The nacrite is mainly fine and flakey and is intergrown with sericite that has recrystallised to relatively large flakes of muscovite (0.06 to 0.08 mm), poikiloblastic with quartz inclusions. Some diablastic intergrowths of muscovite and quartz and biotite and quartz are seen.

As for pneumatolytic minerals, a little primary cassiterite occurs but mainly fresh squat red brown tourmaline prisms are seen and some tiny perfect prisms of recrystallised rutile mounted by sharp pyramids. The rutile grains are brown with high birefringence, they vary to 0.01 mm and are scattered through the section. Similar sized fresh apatite grains also occur and traces of fluorite (as octahedra) approx. 0.06 mm are seen.

A mildly recrystallised contact metamorphosed banded argillaceous siltstone of Oonah Siltstone. Quartz wacke narrow bands

occur alternating with quartz arenite bands. A pneumatolytic overprint is noted.

A47007 (600330R). Unweathered to slightly limonitic dark grey banded (5 mm) Oonah Siltstone.

A quartz wacke.

A fine, mainly argillaceous rock containing patchy quartz mosaics (approx. 0.5 mm) which are intergrown with muscovite. Also narrow quartzose horizons (to 1 mm wide) are intergrown with coarse muscovite associated with some limonite staining.

The fine argillaceous part makes up most of the rock and consists of intergrowths of greenish chlorite and recrystallised sericite, poikiloblastic muscovite (with quartz inclusions), and quartz grains (to 0.1 mm); the finer grains are finely granular and cherty looking.

The large spotty quartz mosaics are poikiloblastic with chlorite and sericite and show some triple junctions and recrystallised fine grains of rutile are associated with nacrite. Some mica is limonite stained.

The quartzose bands show unstrained extended equigranular silty quartz in mosaics which are riddled with sericite and some yellow nacrite as fine inclusions.

Patchy lenticular but fine brownish yellow nacrite is seen as groups of intergrowths trending parallel to and adjoining quartz silty lenticles. The mineral is associated with greenish chlorite.

Recrystallised rutile (showing prisms and pyramids), introduced tourmaline, some apatite and cassiterite (rough euhedral forms) all occur scattered throughout the section.

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Very low grade metamorphism roughly similar to A47006 (but no diablastic quartz:muscovite textures) quartz-muscovite-chlorite hornfels or quartz-argillite hornfels.

A47008 (600333R). Banded grey unweathered siltstone.

Bands of fine quartz and patchy poikiloblastic quartz mosaics occur in a fine sericite and granular quartz matrix associated with patchy green flakey chlorite containing leucoxene aggregates. Patchy coarse quartz is intergrown with poikiloblastic muscovite and brown chlorite flakes.

Equigranular quartz bands where quartz varies 0.02 to 0.07 mm are seen. The fine quartz is intergrown with brown nacrite and finer flakey sericite, but quartz shows adjoining polygonal structures possibly because of abundance of interstitial mica minerals. A little tourmaline (worn grains and short prisms) rutile and possible cassiterite (brownish, unworn grains) and apatite is seen.

Mildly contact altered banded silty shale, probably slightly more altered than A47007. Patchy chlorite is noted here.

A hornfelsed argillite with quartz bands.

A47009 (600332R). Brown shale (Oonah).

Bands show a sandy lagoonal type of sediment with rounded to angular and flat lenticular quartz grains (0.02 to 0.15 mm) in an abundant matrix of fine yellow brown nacrite and less illite and large (0.06 mm) brown tourmaline grains and chert. Clots of fine limonite granules occur in the matrix and one rounded zircon grain (0.03 mm) is seen. Some bands within the section show fine cherty quartz > illite in the matrix. Cherty veins traverse the section.

Most large quartz grains in fragments are unstrained. A little introduced tourmaline and apatite occur.

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A mudstone with scattered quartz clasts and discontinuous sandy quartz bands which have been silicified into sutured mosaics.

Not obviously a contact altered rock, but some pneumatolysis has occurred. This is the least altered of the Oonah Siltstone specimens in the present series, probably a lagoonal shale.

A47010 (600334). Weathered white to pinkish-white quartzite.

A metamorphosed micaceous siltstone or banded quartz wacke as per other Oonah Siltstone specimens examined and is just within the narrow limits of weak early metamorphism. No carbonate is present.

Patchy, fine granular, cherty quartz is associated with a little fine rutile in aggregates (a metamorphic spotting phenomenon?). Repeated bands of fine lenticular quartz are present as mosaics, show a triple junction texture and the quartz is commonly poikiloblastic with chlorite and sericite particles.

Patchy poikiloblastic muscovite which occur as large flakes (to 0.3 x 0.2 mm) contain fine quartz inclusions incorporated during growth.

There is still abundant fine sericite present in patches or lenticles and also as fine granoblastic intergrowths with quartz in quartz lenticles or bands. Yellow-brown nacrite (degraded kaolinite) is seen usually where tourmaline and apatite occur abundantly. Patchy limonite stains the mica minerals. The normal presence of scattered recrystallised rutile prisms (approx. 0.01 mm) which occur in quartz and muscovite, some rather larger apatite as prisms, tourmaline and traces of cassiterite occur.

The enlarged poikiloblastic muscovite flakes, poikiloblastic quartz with some triple junction contacts are extensive here as sedimentary bands.

Possibly the specimen occupies a position between A47005 (relatively higher) and A47006 and A47007 (relatively lower) in metamorphic grade.

A quartz argillite hornfels (originally quartz wacke).

A47011 (600335R). Fresh quartzite or siltstone.

Similar to A47010 but finer grained and with abundant muscovite porphyroblasts scattered around the section.

A very fine-grained groundmass of sericite flakes are intergrown with irregular fine quartz with embayed margins. Scattered rutile prisms (< 0.01 mm) occur. Scattered larger quartz grains (approx. 0.06 mm) and patchy areas where mosaics of the coarser quartz occur are poikiloblastic and porphyroblastic. Areas of cherty quartz occur and are possibly due to selective replacement of carbonate grains. No carbonate occurs as relicts in the rock.

Areas of patchy quartz mosaics show little evidence of polygonal grain growths but much intensive intergrowth between quartz and muscovite has taken place.

The contact metamorphic grade with few porphyroblasts and polygonal quartz forms, is probably similar to A47010, the previous specimen examined.

A47012 (600003R). Hornfelsed brown siltstone.

A weakly hornfelsed micaceous sandy quartzite with areas of recrystallised quartz and incorporated rounded tourmaline grains. The quartz grains vary from 0.02 to 0.14 mm, are variable in size and are not graded in any way. Adjoining

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the areas of tight fitting quartz mosaics are areas of intermixed quartz and abundant sericite in part radiate decussate 'books' and from these have grown much larger muscovite grains, the largest of which have surrounded many of the neighbouring quartz grains. Patchy chlorite (as fibrous bundles) and coarse rounded tourmaline grains are seen. Detrital twinned and untwinned potash feldspar grains adjoining quartz grains show alteration to sericite along cleavages.

Scattered coarse opaque minerals (pyrite,partly euhedral) and fine opaque dust occur abundantly throughout. A little of this has been limonitised and mobilised to form interstitial matrix between quartz grains.

The presence of intervening limonite dust may at the low recrystallisation temperature prevailing have prevented some triple junctions from forming between the quartz grains and has thus impeded quartz growths(?). Many triple junctions do occur where quartz grains abut.

Scattered rounded tourmaline grains (0.01 mm) and fine apatite are seen occupying zones of quartz growth within quartz crystals.

The metamorphic grade is somewhat similar to A47006 but higher than for A47007.

P.S. As mentioned above, pyrite as irregular grains is abundant and varies between 0.02 and 0.2 mm, is present as euhedral forms or is filling interstices between quartz grains. A little specularite also occurs. The pyrite is apparently epigenetic.

A47013 (600003R). As for A47012 (P.S. only).

P.S. pyrite (approx. 1 mm in size and with 2 percent present) is more massive than for A47012 and appears to be replacing quartz present, adjoining the interstices of grains. Several

pyrite grains contain quartz inclusions. Pyrite occupies channelways between the quartz grains and forms fine intergrowths in mica rich areas.

One short prism (approx. 0.03 mm) of cassiterite(?) only is seen.

The only sulphide present is epigenetic pyrite.

A47014 (600336R). Slightly limonitic grey siltstone (Oonah).

A banded siltstone/clay rock (quartz wacke) or quartz argillite hornfels.

The quartz bands present are variable up to 2 mm wide and the amount of interstitial mica mineral is also quite variable. Quartz grains are fairly equigranular (approx. 0.06 mm) although triple junction textures are apparently precluded by the abundance of interstitial sericite. However, some do occur. The quartz grains are slightly poikiloblastic with sericite flakes and of other originally interstitial minerals including recrystallised rutile as squat red-brown prisms (approx. 0.01 mm).

The clayey bands consist of fine sericite with associated small quartz (< .01 mm) and scattered bundles of flakes of brown and green chlorite (purple and grey polarisation colours), squat rutile prisms including geniculate twins are seen, coarse brown and finer green tourmaline grains are abundant and possible traces of cassiterite and scattered opaque minerals are seen. Occasional large poikiloblastic muscovite flakes occur developing from sericite.

The metamorphic grade is thought to be similar to A47007.

A47015 (600027R). Possible chert horizon, Stanley River Bed. Western cherty slate.

No resemblances to red chert A9533 (DDH LC2, 13.6 m) or to Renison red and grey chert (A9601 and A9602) are seen. There are greater resemblances to the Oonah Siltstone in the present series as examined so far although there are also differences. Banding of minerals is not so noticeable in section (but may be more easily seen in the hand specimen).

The section shows an abundance of fine, mainly even-grained subangular quartz grains (< 0.02 to 0.12 mm, median 0.04 mm) with most grains being fairly clear of other mineral inclusions. Illite is the next most abundant mineral as fine interstitial flakes and with somewhat less patchy chlorite (including a brown variety) and similar sized (approx. 0.1 mm) muscovite flakes constitutes a total of rather more than 10 percent of the rock making the rock a quartz wacke (Williams et al). There is an abundance (approx. 3 percent) of coarse (approx. 0.06 mm) to finer scattered recrystallised rutile present, and prismatic pale green and brown-green tourmaline (approx. 1% overall) usually as groups of euhedral grains, and also scarce rounded zircon grains occur. Scattered single grains and groups of pyrite grains (to 0.2 mm) are seen which have replaced quartz and mica minerals. The pyrite is epigenetic.

Intergrowths of quartz with mica minerals and growths of muscovite show some contact alteration textures but poikiloblastic textures are rare though porphyroblastic muscovite flakes and chlorite are evident.

P.S. Fine prismatic scattered rutile is seen, as mentioned above. Some goethite appears to pseudomorph pyrite which before alteration was present to 2 volume percent. No cassiterite is identifiable. Pyrite seen using reflected light under low power was not seen on the polished section.

A47016 (600026R). 'Cherty horizon'. Eastern cherty slate horizon.

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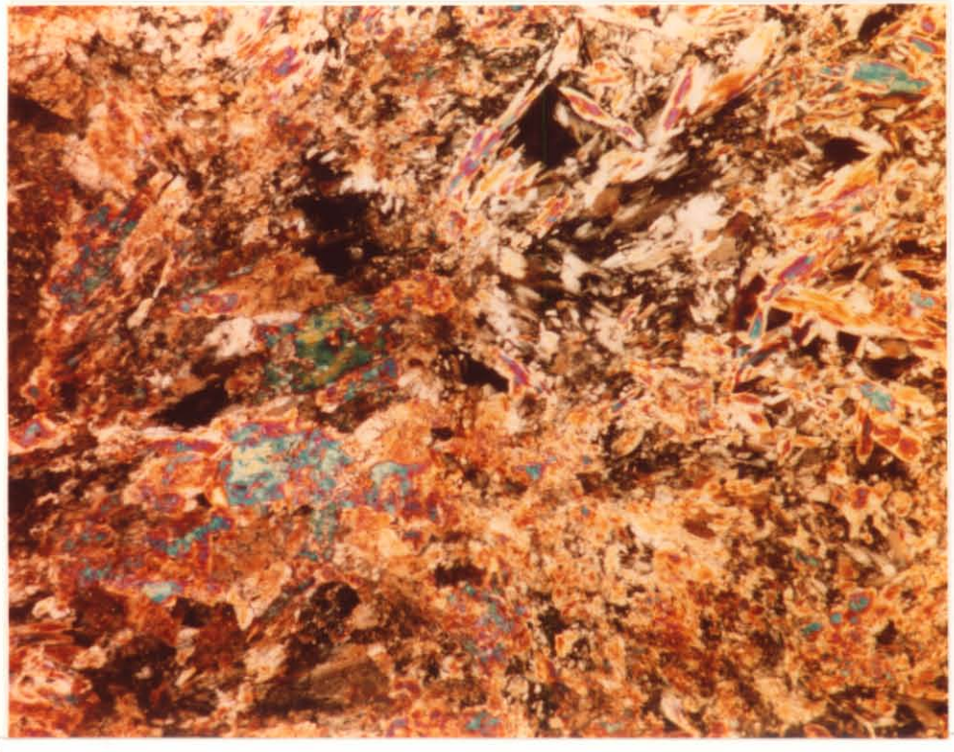

FIGURE 6 : Contact altered Dolomite (A47017/600023R).

Diopside is present as prisms or relicts (left side of photograph, blues, whites, greens, magenta colours). The rock is mainly of tremolite clusters which have formed from diopside crystals which in their turn formed from dolomite.

Crossed nicols Magnification x 88

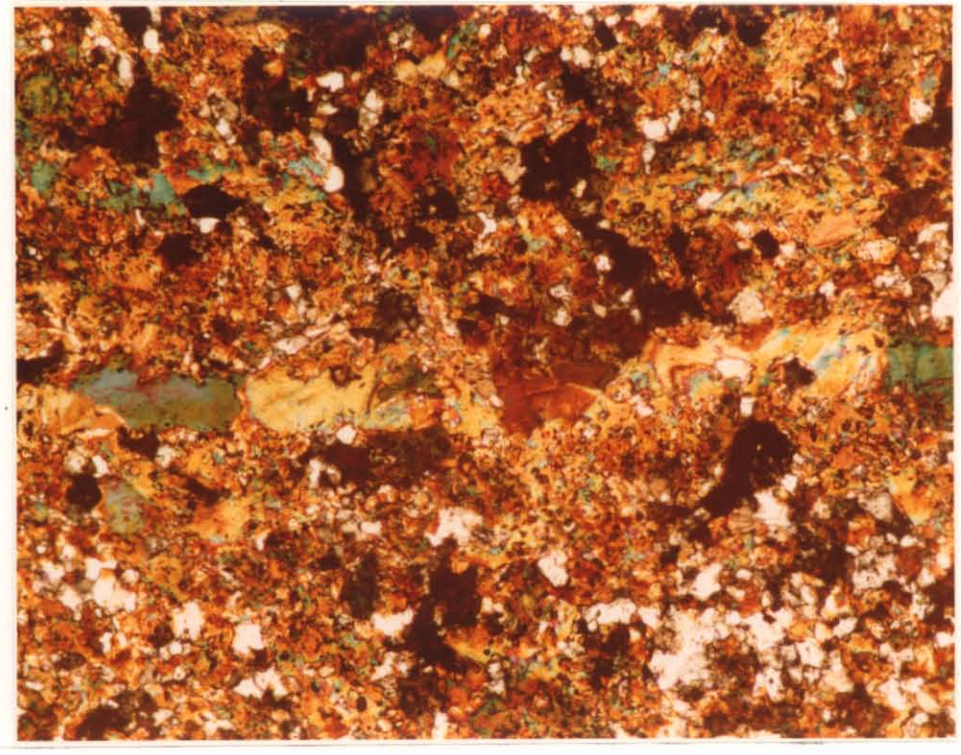

FIGURE 7 : Tourmaline-quartz Rock (A47021/600320R).

An intergrowth of tourmaline (browns, greens and blues, etc.) and quartz (white and grey colours).

Crossed nicols Magnification x 60

Bands (to 2 mm) of very fine sericite and nacrite (pale yellow, very faintly pleochroic and fibrous) together are also associated with very fine quartz (around 0.007 mm but some larger grains occur). The sericite and nacrite in one band are associated with patchy clusters of chlorite grains occurring with quartz (approx. 0.03 mm). Alternating with the micaceous bands are more abundant quartz (0.02 to 0.1 mm), subrounded to angular, associated with sericite as above and occasional laths of detrital muscovite. Some bands contain more nacrite and the quartz grains there appear more angular, elongate grains with long axes parallel to banding. Scattered fine opaque minerals where unoxidised are pyrite of mainly less than 0.02 mm; these grains occur throughout and are quite angular. Coarse brown tourmaline and finer green laths of the mineral are abundant. Rounded zircon grains (approx. 0.05 mm) occur and possible traces of brownish, rough cassiterite of similar grain size are seen.

This rock was slightly contact metamorphosed and has been pneumatolysed. There are only slight changes in the rock fabric such as marginal replacement of some quartz grains by intergrowths with micaceous minerals.

A faintly hornfelsed quartz argillite.

A47017 (600023R). Dolomite. (Figure 6).

An altered dolomite.

A rock which is now largely tremolite felts and anhedral calcite masses which were the result of contact metamorphism of impure dolomite, show initial patchy alteration to diopside as grains developing in dolomite mosaics or as clusters of diopside prisms. A zone of dolomite remains and shows development of diopside and patchy antigorite clusters. Clusters or single grains of opaque oxide occur in areas of calcite which suggests that the oxides are the result of 'decomposition' of a ferroan dolomite. The grade of metamorphism indicates an original amphibolite grade (Mason) similar

to that of some cordierite containing specimens of the argillaceous Oonah Siltstone and was close to the contact with a maximum temperature of slightly over 520°C (Winkler).

No cassiterite could be seen.

A contact thermal metamorphosed impure dolomite with some hydrothermal alteration.

A47018 (600327R). Gossan. Limonitic and banded.

In the thin-section are seen long fibrous bundles of a probable amphibole mineral but which have been mainly deeply stained by limonite. Detailed optical properties work was impossible and in an attempt to remove fibres from the hand specimen the mineral was found to be friable and have obviously changed to limonite composition. The mineral's external asbestiform appearance appears to be that of tremolite. However, good euhedral cross sections were not seen, the mineral being too finely fibrous. The interstitial mineral is massive limonite with no identifiable mineral structures.

No cassiterite is identifiable in thin-section but occasional metallic specks could be seen after subjection of a specimen to the tin test.

The specimen is a heavily oxidised tremolite hornfels rock originally a sedimentary carbonate rock, but now gossanised.

P.S. There is a thin scattering of cassiterite grains, rounded prisms varying between 0.02 and 0.05 mm and embedded in the structureless limonite.

A47019 (600322R). Gossan. As for A47018. Slicken-side on gossan.

Fibrous areas occur as in A47018 but are patchy, seen only on the surface of hand specimen. This specimen is much heavier and more ferruginous.

In thin-section the rock appears to be mainly botryoidal limonite masses with an indeterminate cellular structure.

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Possible carbonate fills some cavities in the gossanous material. All other structures are secondary but leached sulphide textures are not identifiable, only patchy fibrous goethite is seen.

P.S. Masses of goethite show fibrous cellular carbonate structures. No cassiterite as such is identifiable. Possible cassiterite specks are seen after tin test on a specimen.

A47020 (600324R). Green shale on west side of gossan.

A mixture of fine fibrous bundles and prismatic grains of yellow-brown biotite (size approx 0.016 mm) and fine quartz of similar grain size with which the biotite is intergrown as granoblastic textures. There is a little chlorite as fine plates mainly associated with the biotite and very fine opaque oxide (approx. 0.005 mm). Patchy limonite staining migrating from secondary quartz veins into the rock obscures the polarisation colours of some biotite flakes. Zones and lenticles (to 1 mm) of fine granular quartz occur in mosaics; the grains have polygonal shapes with triple junctions where interstitial biotite is minimal and some grains contain fine rounded chlorite inclusions. Elsewhere the quartz occurs as finer mosaics, is cherty and purplish under crossed polarisation. Granules of fresh tourmaline of similar or of rather larger size than associated biotite are seen, usually in veins with quartz and are post metamorphic or were introduced during metamorphism.

Hornfelsing has taken place of a probable pelitic siltstone. No carbonate is seen, but originally marly.

A47021 (600320R). Hornfelsed shale associated with gossan. (Figure 7).

A coarse tourmaline-quartz rock with tourmaline of variable grain size to 0.12 mm of coarse prismatic mineral. Patches of recrystallised quartz of mosaics of mainly irregular

quartz grain size (0.02 to 0.3 mm) polygonal grain shapes with triple junction contacts and poikiloblastic with fine rounded tourmaline inclusions. One cross-cutting coarse tourmaline vein is seen (1 mm wide) of tourmaline prisms with 'c' axes orientated transverse to the vein walls. Some messy iron oxides occur within cavities in the vein. Apatite grains singly and sphene crystals as masses occur as inclusions in the tourmaline growths, with a little cassiterite as fine prisms and including rutile and fine opaque mineral.

A proportion of the variable coarse to fine quartz is introduced as secondary material. Elsewhere a fine intermixture of tourmaline and quartz would appear to confirm tourmalinisation of a shaley siltstone. Tourmalinisation tends to drastically alter the host rock and comparison of this specimen with the rocks A47018 and others like it is made difficult.

A47022 (600314R). Pyritic hornfelsed shale.

A mixture of fine fibrous brownish kaolinite (nacrite), colourless sericite and possible residual chlorite. Patchy limonite dust fills some nacrite:sericite intergrowth clusters. Scattered pyrite cubes (0.02 to 0.05 mm) are seen.

This may be an example of hydrothermally altered A47020 which contains masses of biotite, but that specimen also contains abundant quartz which is not found here and would surely be present if it ever was a primary mineral in this rock.

A hydrothermally altered sericitic shale.

P.S. Massive pyrite growth has a botryoidal appearance though cubic forms have developed around some masses. Fine non-sulphide inclusions occur towards the centre of masses.

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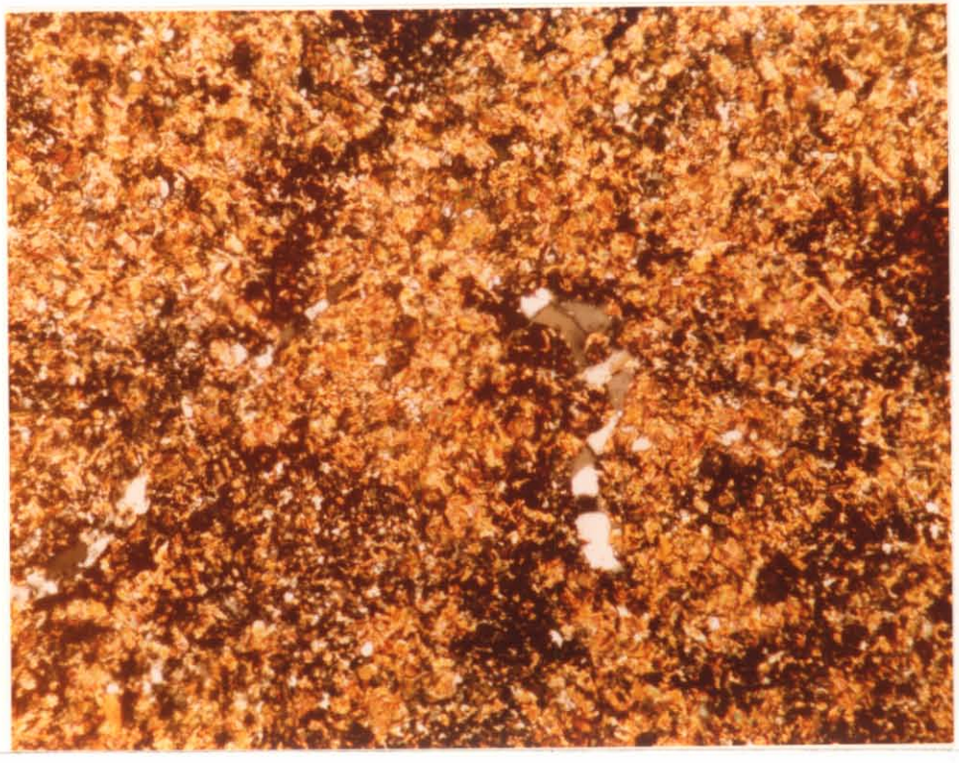

FIGURE 8 : Contact altered Marly Argillite (A47024/600202R).

Yellow-brown biotite, chlorite (green) and fine subangular quartz (white, grey or black). Limonite stained areas are dark brown. Secondary quartz veins are seen.

Crossed nicols Magnification x 60

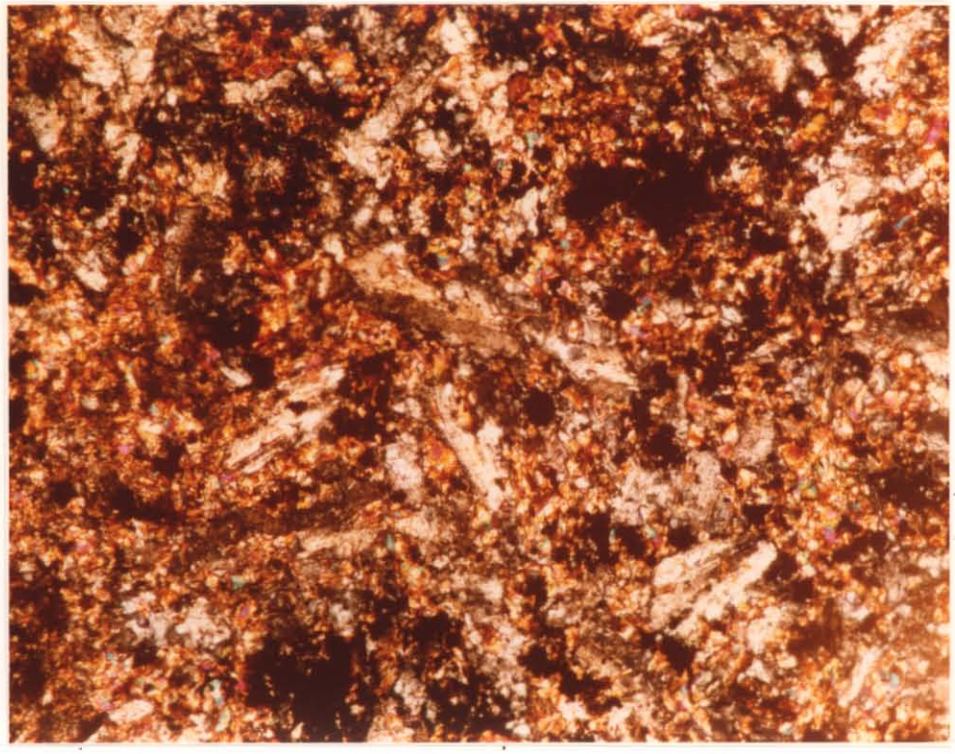

FIGURE 9 : Contact altered Dolerite (A47025/600312R).

A framework of decussate albitised plagioclase laths. Green actinolitic hornblende (brighter polarisation colours) occurs in the interstices. Some limonite staining is seen.

Crossed nicols Magnification x 65

Parallel cleavage cracks project to centre of masses.

No cassiterite is seen.

A47023 (600022R). Weathered, limonitic khaki siltstone.

A low grade contact metamorphosed banded argillaceous siltstone (quartz wacke). The groundmass is of fine felts of sericite and blotchy yellowish nacrite after kaolinite. Flakey possible zinnwaldite occurs (high polarisation colours). Chlorite also occurs as large flakes (up to 0.2 mm).

Quartz as rounded grains in aggregates (approx. 0.15 mm) or single grains (up to approx. 0.07 mm) of poikiloblastic, porphyroblastic grains which contain abundant rounded tourmaline grains and opaque mineral cubic inclusions are scattered throughout the rock as are coarse (approx. 0.08 mm) greenish tourmaline prisms which themselves contain opaque inclusions. Overall, tourmaline is abundant as fine rounded brown grains here. Apatite crystals are seen. Poikiloblastic zinnwaldite (?), (to 0.5 x 0.3 mm) is intergrown as parallel growths with equally large chlorite flakes. Colourless chlorite cubes to 0.2 mm occur. Opaque masses associated with chlorite are metamorphic spotted areas, or migration centres for dark rock pigment (Harker).

Silty quartz (approx. 0.04 mm) with sericite and less chlorite occurs in bands to 1 mm wide in the argillite. Some quartz grains in the bands are larger than median size and are poikiloblastic with tourmaline and/or recrystallised rutile. A contact metamorphosed silty argillite with abundant pneumatolytic minerals.

A47024 (600202R). (Figure 8).

A contact altered marly argillite. Decussate bundles or 'books' of biotite (approx. 0.03 mm), yellow-brown in colour

is the most abundant mineral present and the laths are seen to have locally altered to pale fibrous chlorite. Besides the chlorite, subangular quartz occurs and this is mainly around 0.02 mm. Large quartz relicts up to 0.2 mm also occur but rarely. Patchy limonite staining of biotite, streaks of limonite and some narrow cross-cutting veins associated with limonite also cut across the rock fabric with no particular orientation pattern.

Some similarities with specimen A47020 are noted but there is less quartz in this specimen. It is thought that like A47020 the rock was a marly argillaceous sediment which was close to the granite contact. The original hornfelsing produced the curious decussate equi-sized book-like textures of biotite. Finally, weathering of the rock and secondary quartz veining took place.

No heavy minerals, introduced or detrital, are present except traces of opaque mineral.

P.S. Traces of pyrite only are seen embedded in a quartz grain. No cassiterite occurs.

A47025 (600312R). (Figure 9).

The rock has a framework of decussate albitised plagioclase grains. Between plagioclase laths where ferromagnesian minerals normally reside, thermal metamorphism of the ferro-magnesian minerals has produced abundant patchworks of green granular actinolitic hornblende mosaics, which are slightly pleochroic. Clots of secondary iron oxides occur. Brown biotite, strongly pleochroic occurs replacing green hornblende aggregates. Masses of sphene with albite and iron oxides also occur. Albite which has replaced a more basic plagioclase

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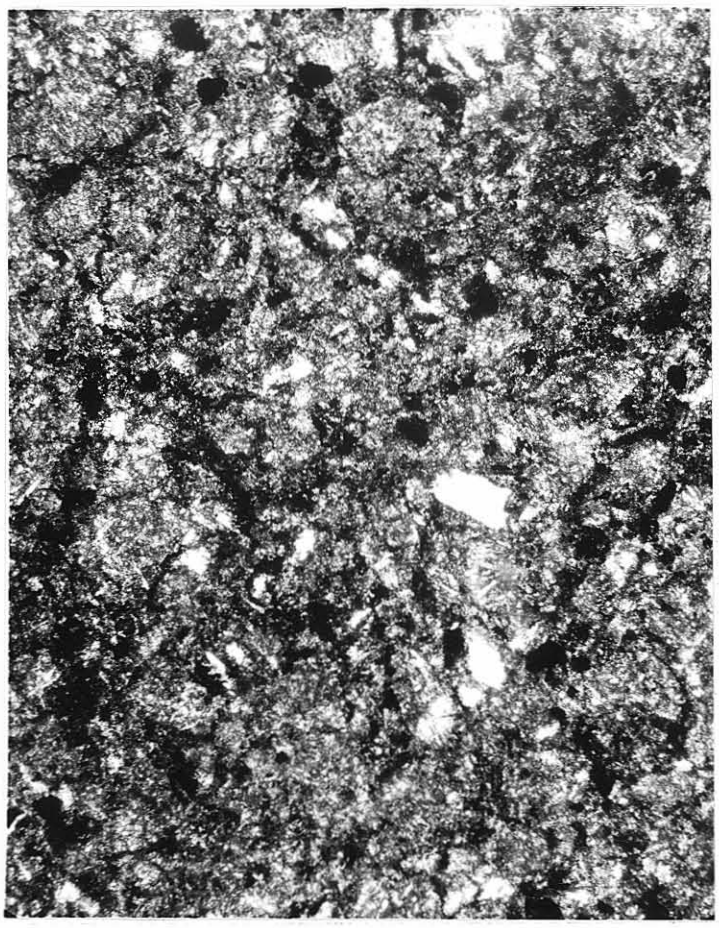

FIGURE 10 : Contact altered Variolitic Basalt (A47026/600338R).

Plagioclase phenocrysts (white) are now albite. Variolites consist of fine stellate acicular actinolite needles in ovoid structures. These structures are flanked by iron oxides (black).

Crossed nicols Magnification x 64

contains scattered fine amphibole laths. The plagioclase grains display original simple twins combined with faint lamellar twinning. This combination of two styles of twinning is typical of basic intrusives. Fine granulation of hornblende areas is also seen.

Abundant fine magnetite occurs in the interstices.

A thermally metamorphosed dolerite.

A47026 (600338R). (Figure 10).

The rock in hand specimen has the appearance of basalt with a conchoidal fracture and is fine grained with dark grains.

The rock presently consists of one-time variolitic ovoid masses of very fine aggregated stellate growths and felts of actinolite occasionally seen in the groundmass of albite phenocrysts (altered plagioclase). Alternating with the actinolite and occasionally within actinolite areas are masses of fine iron oxides (mainly primary but with some secondary mineral). These are present, largely arranged around ex-variolites; and fractures within the rocks are filled with secondary iron oxides.

A secondary quartz vein present contains trapped fibrous actinolite growths. A contact altered, variolitic basalt.

A47027 (600339R). (Figure 11).

A fairly advanced thermally metamorphosed argillite rock showing patchy ovoid to rounded cordierite masses (0.3 to 0.5 mm) and lenticles of fine mosaics of the mineral. Cordierite grains contain scattered squat biotite laths; fewer sericite laths, chlorite and tourmaline and chert at centres. Between the cordierite crystals are areas containing fine abundant brown biotite (0.004 to 0.05 mm) as irregular grains squat and decussate prisms to 20 percent of rock,

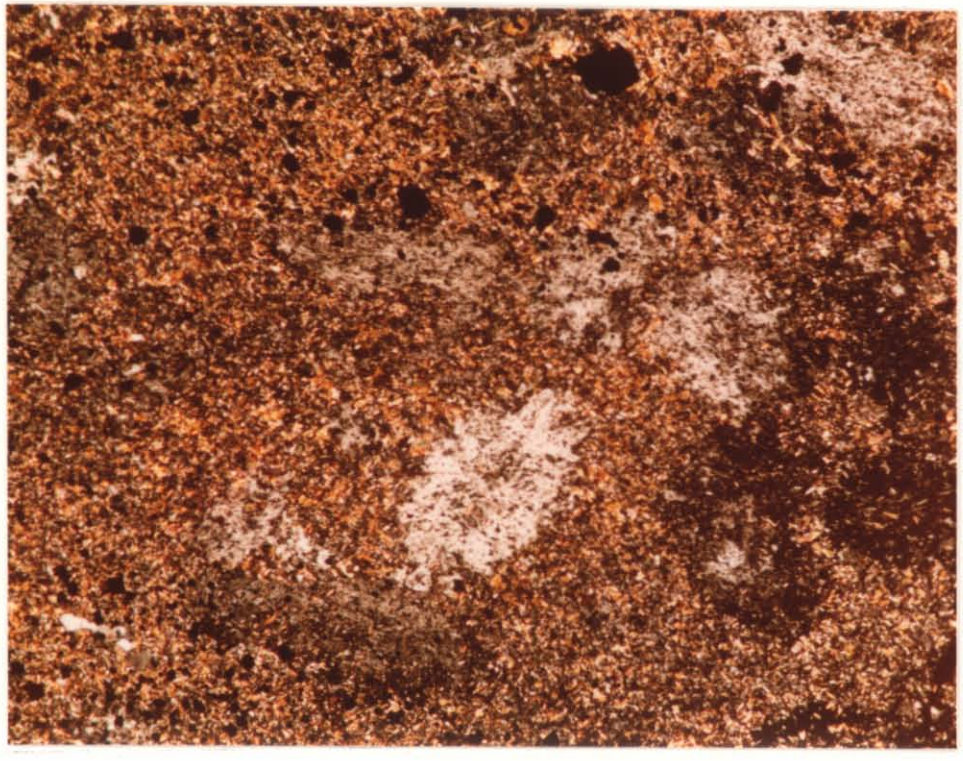

FIGURE 11 : Thermally metamorphosed Argillite or Cordierite-Biotite Hornfels (A47027/600339R).

Round to elliptical cordierite grains (white to green) contain inclusions of fine biotite, sericite, tourmaline and chert
Interstitial minerals are mainly fine flakey biotite and opaque oxide grains.

Crossed nicols Magnification x 65

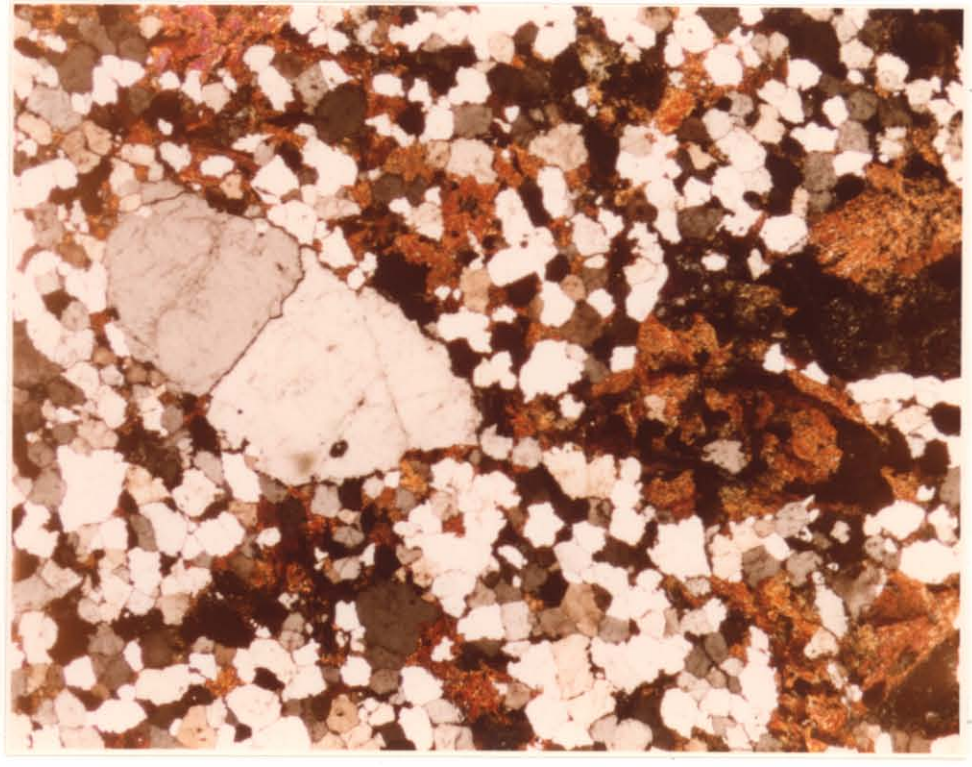

FIGURE 12 : Silicified Granite (A47028/600319R).

Large quartz grain (left of centre) simulates feldspar phenocryst. Intergrowths of actinolite (specked green and brown) occurring as fibrous masses are thought to be secondary after hornblende. Groundmass now mainly of quartz was silicified and recrystallized.

Crossed nicols Magnification x 10

also sericite and opaque oxide octahedra of magnetite (< 0.002 to 0.3 mm) very variable but with a concentration of 5 to 7 volume percent in the rock.

A shearing-out effect of bands of ovoid cordierite is noted.

Veins of limonite traverse the rock and secondary alteration of cordierite to clay mineral occurs locally.

This is a cordierite-biotite-sericite-quartz hornfels of altered iron-rich pelitic shale. Rather more biotite is seen and the section contains more iron oxide than A47005.

A47028 (600319R). (Figure 12).

A rock with a porphyritic granitic texture (c.f. A9599, DDH LCD3, 36.9 m) yet it is a mosaic of quartz grains (0.03 to 0.6 mm but mainly a median of 0.3 mm). Recrystallisation at low temperatures is indicated by the sutured contacts of quartz grains. Large quartz grains simulate the forms of feldspar phenocrysts (size up to 6 mm) and groundmass is of fine cherty quartz (grains approx. 0.02 mm). A large quartz mosaic grain, (4 x 2 mm) has an oblong appearance. Another coarse (6 x 4 mm) intergrowth of actinolite laths and quartz grains may simulate an ex-hornblende phenocryst. Actinolite laths as stellate intergrowths (0.05 to 0.3 mm) occur scattered around the section to 7 percent of the rock. Brown biotite is beginning to replace the actinolite along cleavages. Messy sphene as wedges (approx. 0.15 mm) containing iron oxides are abundant with cherty quartz in the cherty phenocrysts. Zones of secondary iron oxides occur, one in particular flanks a vug otherwise lined by actinolite. Vugs may also be lined by chert.

A silicified granite.

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APPENDIX I

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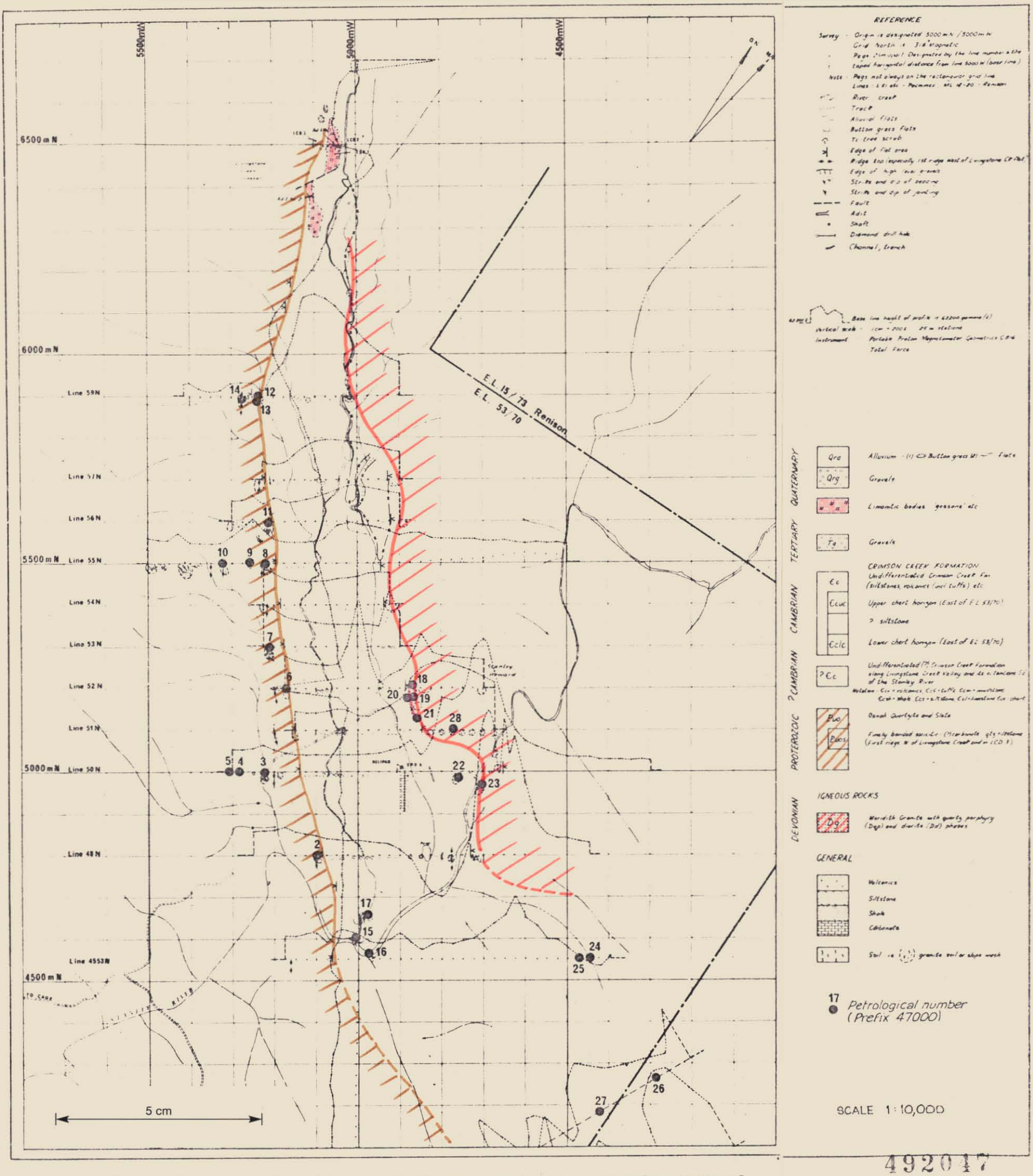

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Petrological Sample Locations, Livingstone Creek - Stanley Reward Area, E.L. 53/70, West Tasmania

APPENDIX II

PACMINEX PTY. LIMITED

MEMORANDUM TO: MR. P.J. CURTIS OUR REF: PMM/EMP

FROM: P.M. MACNAMARA DATE: 11th June, 1975.

PETROLOGY : E.L. 53/70 STANLEY RIVER
STANLEY REWARD GRID, TASMANIA

Attached is a list of 28 samples (A47001-A47028) which were collected from the Stanley Reward-Livingstone Creek area in February 1975. Your reports PMR 108/74 and 50/74 deal with rocks from this area also.

A map showing the location and geology of the area will be supplied eventually.

The main aim of thin section examination would be :-

1. Check the changes along and across strike of the units with respect to -
   original petrology
   alteration/hornfelsing
   mineralisation.

2. Group the rocks. This has been done to some extent in the order of listing from A47001 to A47028. This order lists the western Oonah Quartzite and Slate first and the eastern rocks last. There is a possible increase of hornfelsing going northwards (and eastwards along any one line) and increasing mineralisation eastwards.

3. Checking the shales/siltstones adjacent or on line with gossans.

4. Many siliceous rocks in the general area have been reported to be oolitic.

/...P. Macnamara...

Field No.	Petrological No.	Description
601335R	A47001	Black slaty siltstone with pyrite plus (?) graphite. Location E.L. 18/74 near E.M. anomaly. Check for graphite, sulphides.
600313R	A47002	4800N/5100W :Pale grey (Oonah Quartzite and Slate) siltstone, poorly bedded. Check petrology and compare with other Oonah sample w.r.t. hornfelsing, etc.
600317R	A47003	5000N/5224W (10 m north of) : Sub outcrop from tree roots of black f.g. (?) silicified shaley siltstone (Oonah). Check petrology, hornfelsing, graphite and compare with other Oonah samples.
600316R	A47004	5000N/5288W Oonah : pale grey fine gr. (?) silicified siltstone with introduced quartz; limonite after pyrite. Check petrology hornfelsing and w.r.t. other Oonah samples.
600315R	A47005	5000N/5302W Oonah : Brownish grey cherty laminated rock - silicified siltstone or volcanic? Check petrology hornfelsing, (?) oolitic structure, etc.
600329R	A47006	5200N/5175W : Pale pinkish-white to buff coloured weathered bedded siltstone. Oonah. Compare petrology, hornfelsing, etc., with other Oonah samples.
600330R	A47007	5300N/5212W Oonah : Unweathered slightly limonitic dark grey banded (5 mm) siltstone. Possibly carbonate present. Check for hornfelsing, oolites and with other Oonah samples.
600333R	A47008	5500N/5224W Oonah : Banded (1-4 mm) grey unweathered siltstone with (?) - carbonate. Check for carbonate, hornfelsing and with other Oonah samples.
600332R	A47009	5500N/5258W Oonah : Brown shale. Check for oolites, hornfelsing and with other Oonah samples.
600334?	A47010	5500N/5325W Oonah : Weathered white to pinkish-white quartzite. Check for carbonate, hornfelsing and with other Oonah samples.

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Field No.	Petrological No.	Description
600335R	A47011	5600N/5214W Oonah : Fresh quartzite or siltstone, "typical" Oonah. Possibly with carbonate. Check hornfelsing, petrology, etc.
600003R	A47012	5900N/5235W Oonah : Hornfelsed brown siltstone with biotitic alteration. Contact zone. Check petrology, hornfelsing, for SnO_2 and sulphide and with other Oonah samples.
600003R	A47013	As above : quartz vein material containing (?) biotite, sulphides, possibly SnO_2.
600336R	A47014	5897N/5275W Oonah : Banded (1-4 mm) slightly limonitic grey siltstone with (?) carbonate, sericite. Similar to A47011. Check for hornfelsing, carbonate and against other Oonah samples including DDH LCD 3 (PMR 108/74).
600027R	A47015	4550N/4475W : Possible "chert horizon". Western "cherty" slate in Stanley River bed. Check for petrology and oolites. Also sulphide SnO_2, etc.
600026R	A47016	4560N/4970W : "Chert horizon". Eastern cherty slate horizon in Stanley River bed. Pyritic. Check for oolites, petrology, skarning/ hornfelsing and with A47015 and Oonah rocks.
600023R	A47017	4650N/4990W : Dolomite. Check for skarning (olivine, etc.), ZnS, SnO_2 and oolites. Compare with LCD 4 (PMR 108/74).
600327R	A47018	5200N/4870W : Gossan. Limonitic banded "gossan" with radiating limonitic crystals and limonitic shale. Check mineralogy and petrology of shale bands and for ex-hornfels minerals.
600322R	A47019	"5175N/4860W" <u>approximately</u> : Gossan. As for A47018. Slickensides on gossan.

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Field No.	Petrological No.	Description
600324R	A47020	"5175N/4862W" approximately. Green shale on west side of gossan. Check petrology, hornfelsing, oolites, etc., and against A47018-A47025 samples.
600320R	A47021	5125N/4860W very approximately : Hornfelsed shale associated with gossan. From pit dumps (not in situ). Check alteration and petrology.
600314R	A47022	4994N/4766W : Shale. Near mineralised horizon? Pyritic altered (biotite, etc.) hornfelsed shale, biotite brown colour. Check petrology (including oolites, etc.), SnO_2, sulphide and alteration minerals. Compare.
600022R	A47023	South of line 5000N : 50 m at 136°M from ex-bridge over Stanley River, in bed of river. Weathered limonitic khaki siltstone. Check (if possible) petrology, hornfelsing, SnO_2 present, biotite alteration. Compare with others.
600202R	A47024	4550N/4450W : Shale. Limonitic very weathered khaki to light grey brown shale/siltstone. Not certain if in situ. Check type, alteration, SnO_2, etc.
600312R	A47025	4550N/4475W : Black Aphanite. Fine grained black aphanitic tough rock. Possibly a fine grained siliceous hornfels or a volcanic. Check petrology, alteration, etc.
600338R	A47026	Line ML20/400N : Black Aphanite. Black f.g. aphanitic rock, volcanic (basalt) or hornfelsed rock. Check petrology, alteration, etc.
600339R	A47027	Line ML20/250N : Black Aphanite. Black f.g. aphanitic rock - hard. Volcanic or hornfels? Check as for A47025-026.
600319R	A47028	5100N/4775W : Granite (porphyritic). Altered granite or porphyritic granite at contact of granite with siltstones. Porphyritic quartz - (?) tremolite/ actinolite. Cellular voids. Check mineralogy, SnO_2, etc.

APPENDIX III

052

Ian R. Pontifex & Associates

492054

MINERALOGY — PETROLOGY
GEOLOGY
SECTION PREPARATION

50 MARY STREET, UNLEY
SOUTH AUST. 5061
TEL. 272 2856. A.H. 31 3816

MINERALOGICAL REPORT NO. 1809

9th September, 1975

TO: Mr. P. Curtis
Pacminex Pty. Ltd.,
15-19 Bent Street,
SYDNEY, NSW, 2000

YOUR REFERENCE: Your letter dated 29/8/75
Order No. 13399
Sample despatch sheet 4912

MATERIAL: Thin sections

IDENTIFICATION: A47003, 005, 027

WORK REQUESTED: To give opinion on identity of minerals as specified in covering letter.

SAMPLES & SECTIONS: Returned to you.

IAN R. PONTIFEX & ASSOCIATES

COMMENTS

The mineral in question in A47003 is identified as original andalusite; the mineral in A47005 and A47027 as cordierite.

These identifications are given on petrographic evidence only, after detailed examination by the author and a brief check by Dr. A.W.G. Whittle and A.C. Purvis. They are believed to be conclusive, however XRD investigations can be carried out if required, after assessing this report.

The return of samples and sections will be delayed several days after sending this report, in case any follow-up XRD work is required.

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A47003 Metamorphosed impure pelitic sediment with metacrysts of andalusite largely pseudomorphed by chlorite and sericite.

The mineral investigated in this section was the square, rectangular to diamond shaped prisms and/or sections. These metacrysts, as noted in the covering letter are now very largely pseudomorphed by chlorite and extremely fine sericite along some inner margins, and quite crowded with ultra fine opaque inclusions.

The original mineral is interpreted to have been andalusite, (probably the variety chiastolite as suggested in the covering letter). This is based mainly on the form and mode of occurrence of the crystals, and indeed remnants of the original crystal have the essential optical properties of andalusite, i.e. weak birefringence, high 2V, biaxial and optically negative. Certainly the abundance of extremely fine opaque inclusions suggests the variety chiastolite.

The alternate possible identification of ottrelite noted in the covering letter is vaguely suggested by the form, mode of occurrence and chloritic nature of the pseudomorphous replacement products. However, this mineral does not exhibit such well-developed square sections; also the optical properties of relicts of the original mineral are inconsistent with those of ottrelite, which has a moderate 2V and is optically positive.

The nature of the alteration products is unusual, since andalusite generally breaks down essentially to sericite. Presumably Mg was introduced during the alteration to produce the chlorite, thus suggesting that the alteration was not simply retrograde (or weathering), but involved Mg metasomatism, with the Mg possibly derived from the enclosing host rock.

..../2

A47005 and A47027

The mineral in question in these two sections is petrographically identified as cordierite, as suggested in the covering letter.

The optical properties of the mineral in both sections are very poorly shown, possibly due to the incipient stages of formation of the mineral. It is however biaxial thus scapolite is not a possibility. It does not have high enough relief for andalusite -- another possible metamorphic mineral with this mode of occurrence.

The ultra fine dust-like and sericite inclusions are are characteristic of cordierite. Also its mode of occurrence in a biotite-rich ? hornfelsic schist is common for cordierite, particularly the way in which biotite is absent (or very depleted) in the patchy crystals of cordierite. The Mg which would normally be accommodated in the disseminated biotite, has been used to form cordierite instead.

APPENDIX IV

053

492059

Central Mineralogical Services Pty. Ltd.

231 Magill Road
Maylands, S.A. 5069
Telephone 42 5659

8th October 1975

Mr. P. J. Curtis,
Pacminex Pty. Ltd.,
7th Floor,
O'Connell House,
15-19 Bent St.,
SYDNEY, N.S.W. 2000

REPORT CMS 75/10/4

YOUR REFERENCE:	Field sample despatch sheet no. 4916
DATE RECEIVED:	6/10/75
SAMPLE NOS:	47022
SUBMITTED BY:	Mr. P. M. MacNamara
WORK REQUESTED:	X-ray powder diffraction

for H. W. Fander, M.Sc.

059

492060

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 8th October 1975

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
(A) 47022
Kaolin

Job No. CMS 75/10/4 Date Received: 6/10/75

Reference Field Sample despatch sheet no. 4916

Sample No. (A) 47022

Nature of Sample: Hand specimen

DESCRIPTION **SECTION No.** ----

a. Hand Specimen:

Massive Fe-stained grey-white clay.

b. Microscopic:

A representative portion of the sample was examined by XRD powder photography.

Indexing of the trace yielded characteristic kaolin lines, however, the trace is generally weak with broad lines. Extended exposure yielded but marginal improvements in intensity. This could reflect poor crystallinity but it is suspected that two (or more) kaolin polytypes are present. Halloysite and metahalloysite can be excluded. The most likely phases are kaolinite, nacrite and/or dickite.

The hand specimen appearance is suggestive of a degraded sericite.

D. Cowan, B.Sc.

H&J 65652