MINERAL RESOURCES TASMANIA

LABORATORY REPORT

LJN2018-112

MINERAGRAPHIC/PETROGRAPHIC ANALYSES

GREAT PYRAMID MINE

SCAMANDER

An unpublished Mineral Resources Tasmania Report for:

Russell Fulton

By: R.S. Bottrill and L Unwin

Date: 12 September 2022

Mineral Resources Tasmania
Department of State Growth

Tasmanian Government

SUMMARY

Several, mostly mineralized, rocks from a drillcore in the Great Pyramid prospect were studied by petrography, mineragraphy and some XRF analyses. One sample is probably a Devonian dolerite, but all other samples are veined Mathinna Group sandstones: these vary from having sulphide-poor chlorite or quartz veins to greisen style quartz - sulphide +/- muscovite +/- carbonate +/- chlorite +/- tourmaline +/- fluorite +/- cassiterite veins. The sulphides vary greatly in abundance, and they are variably dominant in arsenopyrite, pyrite, pyrrhotite and sphalerite.

INTRODUCTION

Several samples were taken from a drill core at the Great Pyramid mine near Scamander; details are shown in Table 1. They were prepared for a detailed petrological and mineragraphic study, plus some geochemistry.

Table 1: Sample Details.

Reg #	Field Number	Location	Sample Description	Process
C113269	18gpd001/58.1	Great Pyramid	Dolerite	PTS, XRF
C113270	18gpd001/67.6	Great Pyramid	Sandstone and weathered-Sulphide quartz veins	PTS, XRF
C113271	18gpd001/124.3	Great Pyramid	Sandstone and Muscovite-Sulphide quartz veins	PTS
C113272	18gpd001/129.2	Great Pyramid	Sandstone and Cassiterite-Sulphide quartz veins	PTS
C113273	18gpd001/140.1	Great Pyramid	Sandstone and Cassiterite-Sulphide quartz veins	PTS
C113274	18gpd001/187.0	Great Pyramid	Sandstone and Quartz-chlorite veins	PTS
C113275	18gpd001/205.1	Great Pyramid	Sandstone and Cassiterite-Sulphide quartz veins	PTS
C113276	18gpd001/224.6	Great Pyramid	Sandstone and Cassiterite-Sulphide quartz veins	PTS
C113277	18gpd001/246.6	Great Pyramid	Sandstone and Carbonate-Sulphide quartz veins	PTS
C113278	18gpd001/299.1	Great Pyramid	Sandstone and Carbonate-Sulphide quartz veins	PTS
C113279	18gpd001/205.1	Great Pyramid	Sandstone and Cassiterite-Sulphide quartz veins	PTS

The samples were all cut and prepared as polished thin sections and studied under reflected and transmitted polarised light microscopy. Some subsamples were also extracted for XRF analysis.

SAMPLE DESCRIPTIONS

C113269 Great Pyramid Dolerite

Under the stereomicroscope the sample C113269 is a fine grained, homogeneous, medium grey, crystalline igneous rock (Fig. 1). There are no obvious phenocrysts, vesicles, alteration features or veins.

Figure 1: C113269, showing fresh, homogeneous dolerite. FOV: about 190 mm.

In thin section (Figs. 2 - 5) the sample is composed of (approx. vol. %):

- Plagioclase: 55%, laths, < 0.6 mm
- Mesostasis: ~10%, dendritic to microgranophyric patches, <0.2mm
- Biotite: 10%, brown, <0.5 mm
- Amphiboles: 5%, brown, <0.5 mm
- Clinopyroxene: 5%, green, <0.5 mm
- Chlorite: 2%, green, replacing biotite, <0.5 mm
- Carbonates; 2%, clots <0.5 mm
- Quartz: ~2%, patches <0.2mm
- Sericite: ~2%, fine alteration in plagioclase
- Magnetite: 5%, disseminated euhedra <0.2 mm
- Ilmenite: 1%, amoeboid grains, <0.1mm
- Pyrite: 1%, disseminated skeletal grains <0.2 mm

This is probably a Devonian aged dolerite, based on the degree of alteration and high biotite and amphibole contents.

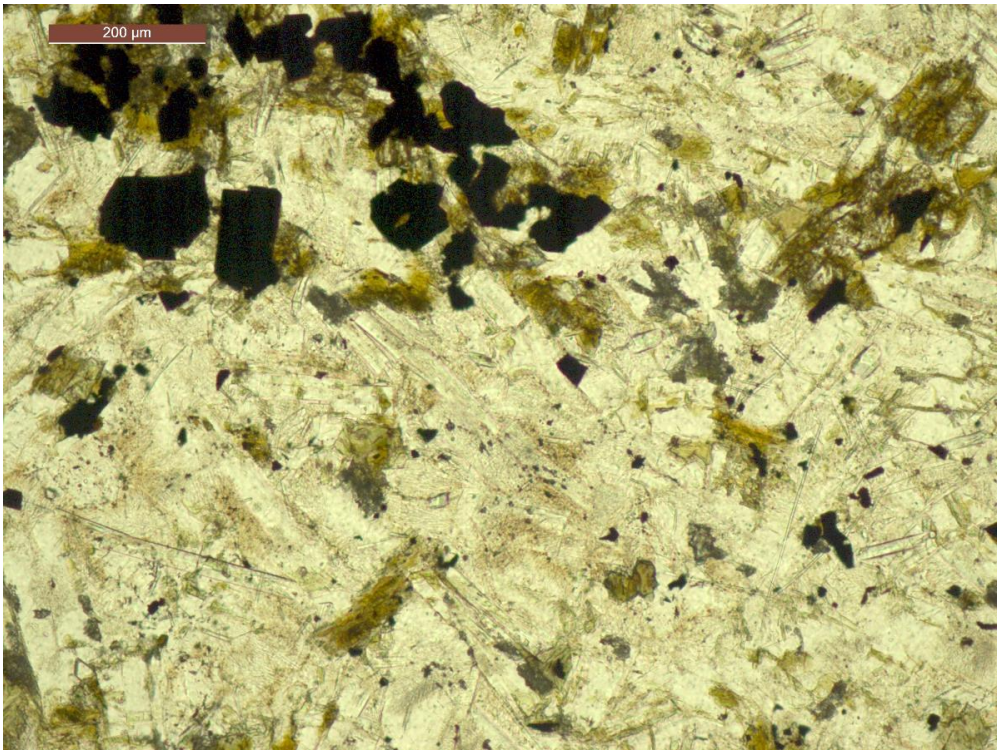

Figure 2: C113269. Dolerite, with magnetite (black), biotite and amphibole (both green-brown), clinopyroxene (upper right), in a matrix of mostly plagioclase (colourless) feldspar. PPTL (Plane polarised transmitted light).

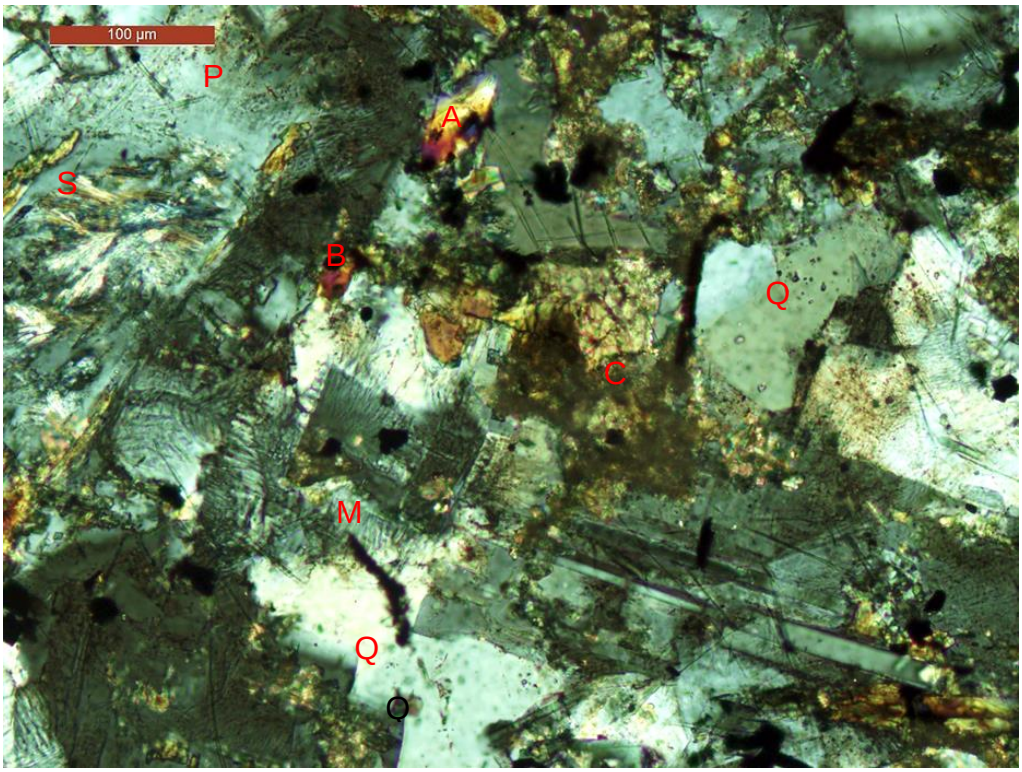

Figure 3: C113269. Dolerite, showing a patch of quartz (Q)and dendritic mesostasis (M) with plagioclase (P), biotite, carbonate (C), clinopyroxene, sericite (S) and amphibole (A). XPTL (Cross polarised transmitted light).

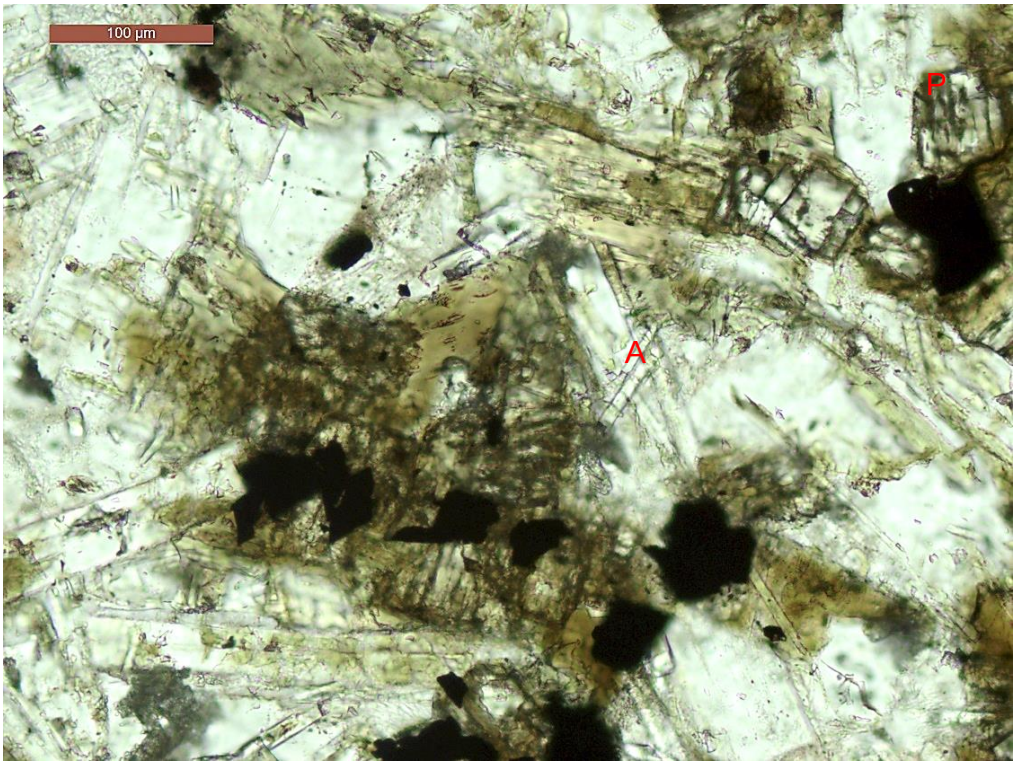

Figure 4: C113269. Dolerite, showing clinopyroxene (P), altering to biotite and amphibole (both green-brown), plus apatite needles (A), and magnetite (black) in a matrix of plagioclase (colourless). Plagioclase is partly sericitised (upper right). There is a large carbonate grain just left of centre. XPTL.

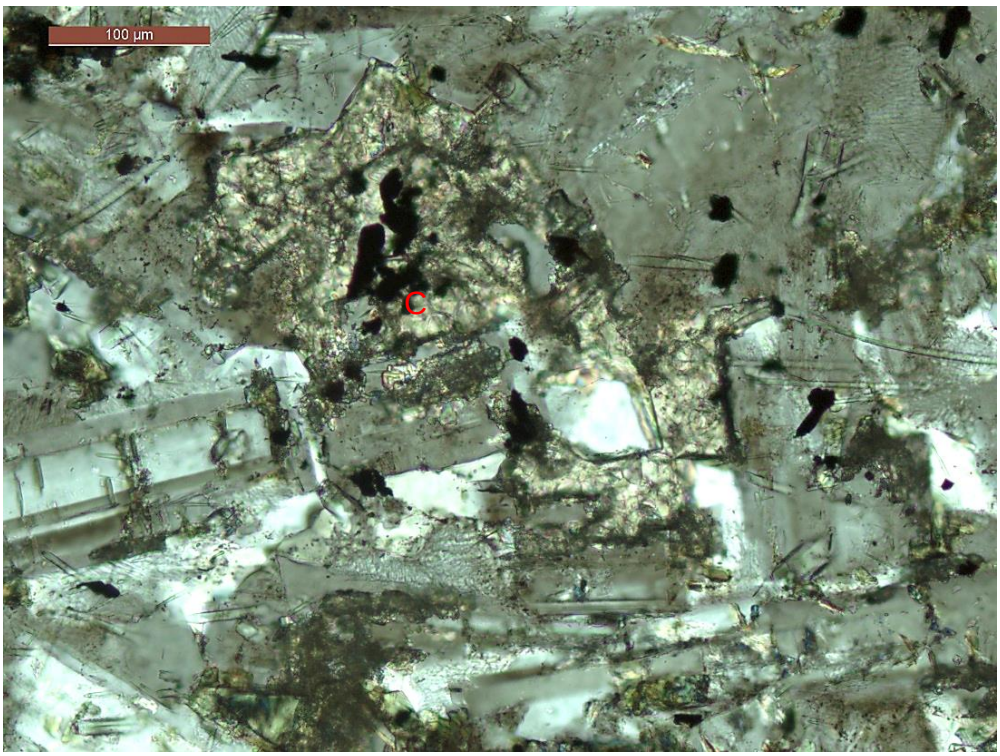

Figure 5: C113269. Dolerite, showing carbonate (C, replacing clinopyroxene?), plus apatite needles, and magnetite (black) in a matrix of plagioclase (colourless). XPTL.

C113270 Great Pyramid Sandstone and oxidised veins

Under the stereomicroscope the sample C113270 is mostly white to pale brown, medium grained, quartz sandstone, with abundant thin, leached, brown limonitic veins and an earlier generation of thin white to grey quartz veins and stockworks (Fig. 6). The veins are generally <5mm thick. There is no definite cassiterite or sulphides, but the oxidised veins may contain secondary minerals like limonite, jarosite and scorodite.

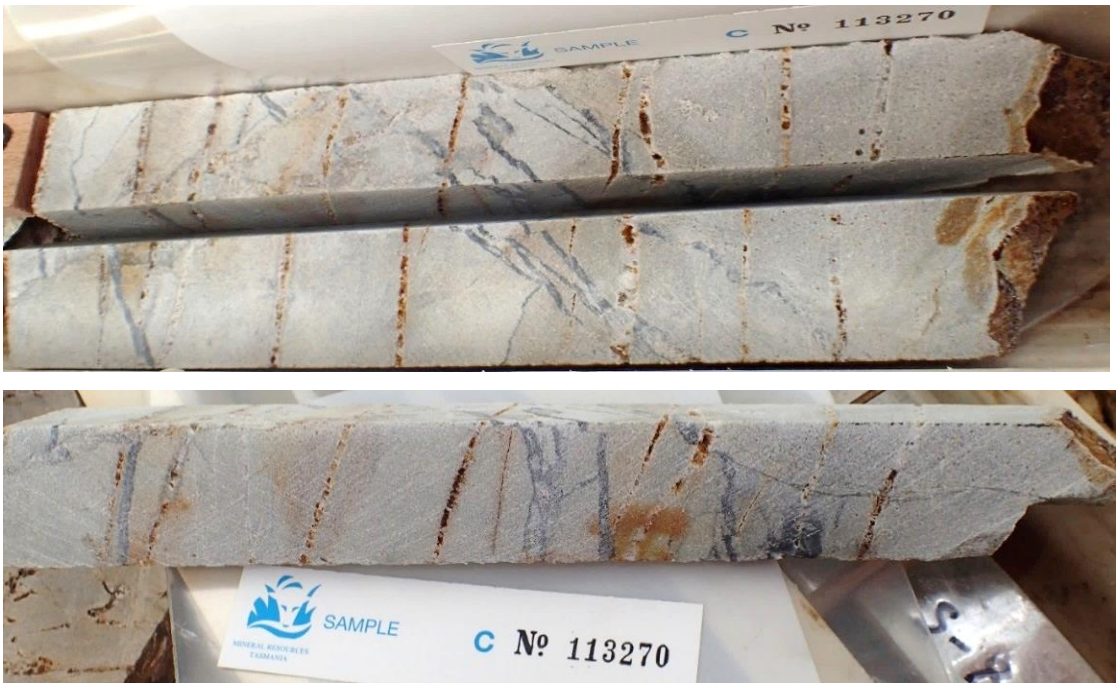

Figure 6: Sample C113270, showing grey quartz veins and brown limonitic veins, in a white sandstone with some iron staining. FOV (field of view): about 200 mm.

In thin section (Fig. 7) the sample is a quartz wacke cut by oxidised quartz – muscovite – topaz? - sulphide veins to about 2 mm wide. The sulphides have totally oxidised to limonite and scorodite. The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz. Tourmaline is present as both small detrital and hydrothermal grains.

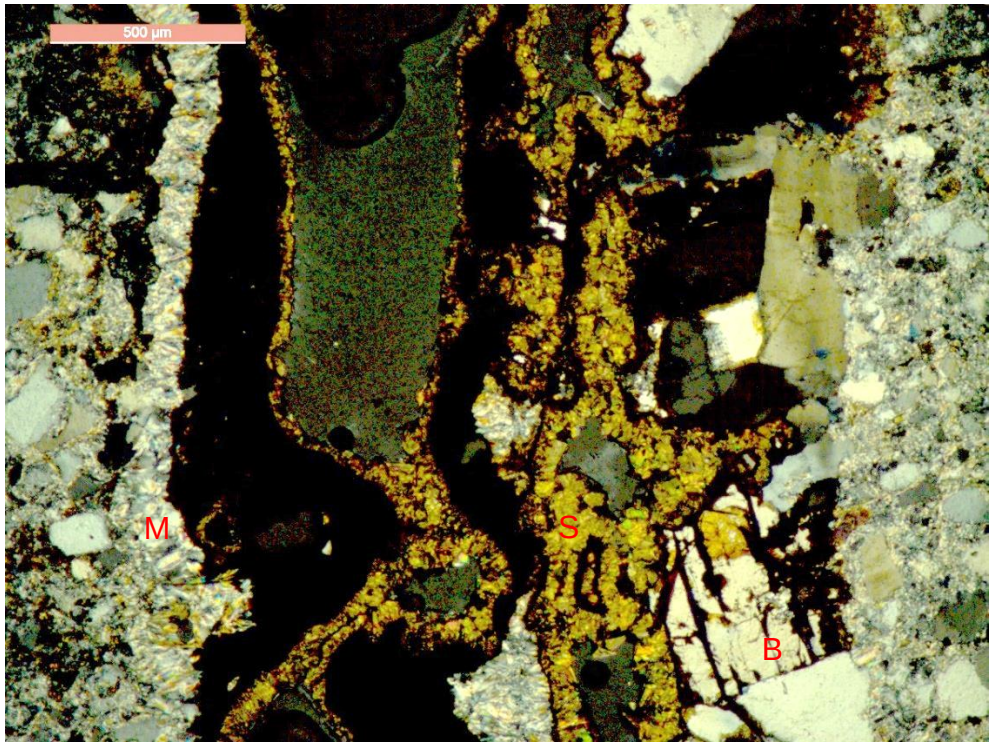

Figure 7: C113270. Micaceous quartz wacke, cut by a quartz vein with muscovite (M) selvages. It has cavities partly filled with yellowish scorodite (S) and dark brown limonite. There is probable baryte (B). XPTL

C113271 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113271 is mostly grey, medium grained, silicified quartz sandstone or quartzite, with several thin, irregular vuggy, white to grey quartz – muscovite - sulphide veins and stockworks, a few mm thick (Fig. 8). The veins are generally <5mm thick. There is no observable cassiterite and the main sulphides are probably pyrite and arsenopyrite.

Figure 8: Sample C113271, showing white, vuggy micaceous quartz veins, in a grey sandstone. FOV: about 200 mm.

In thin section (Fig. 9) the sample is a micaceous quartz wacke cut by quartz – muscovite – baryte(?) - sulphide veins to about 2 mm wide. The veins have fine-grained, comb to rosette textured muscovite selvages up to 1mm thick, overgrown by quartz, arsenopyrite and pyrite crystals to ~1mm (Fig. 9). Some bladed, skeletal grains appear to be pyrrhotite altered to pyrite (Fig. 10). Chalcopyrite and pyrrhotite occur mostly as inclusions in pyrite, indicating a paragenesis of increasing sulphidation (Figs. 11, 12). No cassiterite or c+arbonates were evident.

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz. Tourmaline is present as both small detrital and hydrothermal grains, and there are small, disseminated pyrite grains.

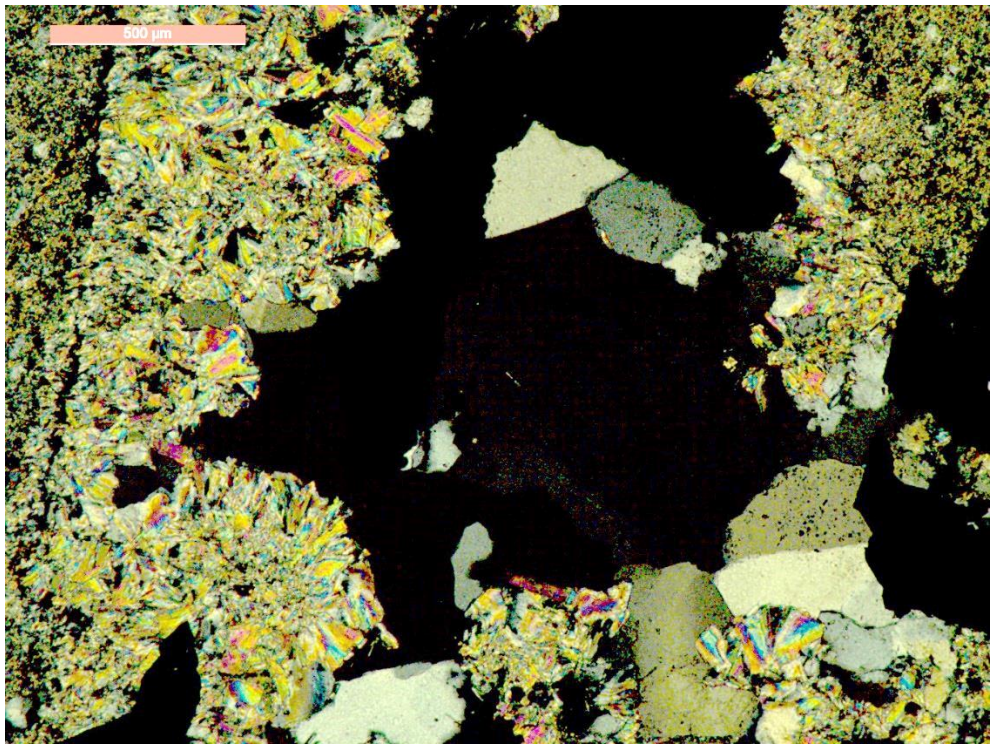

Figure 9:. C113271. Micaceous selvages coating vein walls in quartz wacke, infilled by later sulphides and quartz. XPTL. FOV ~2.8mm.

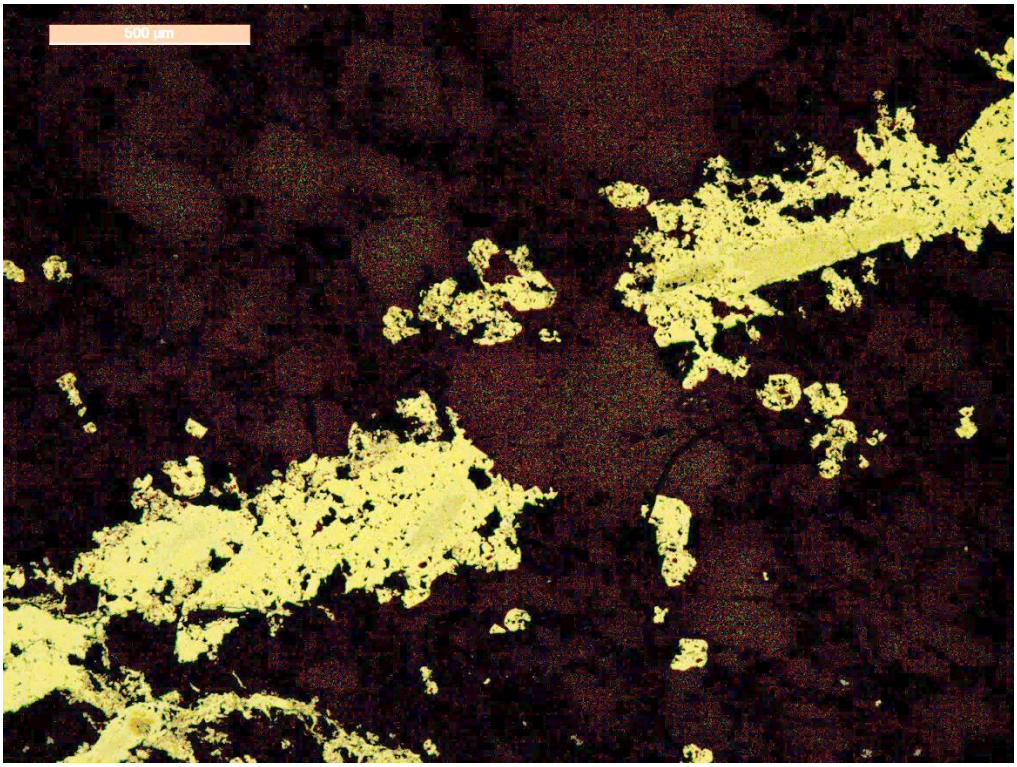

Figure 10: C113271. Elongate, skeletal clots of pyrite which probably replaced pyrrhotite. PPRL (Plane polarised reflected light). FOV ~2.8mm.

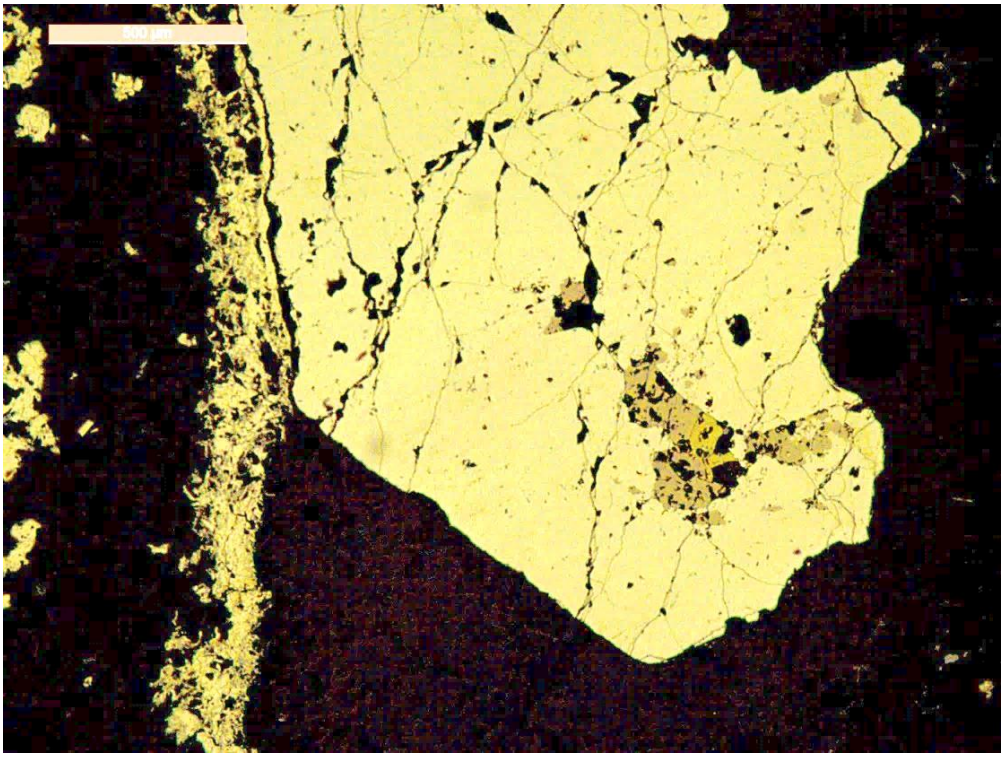

Figure 11: C113271. Subhedral pyrite grain with pyrrhotite (brown) inclusions, and a late stage, ragged vein of pyrite and marcasite? PPRL. FOV ~2.8mm.

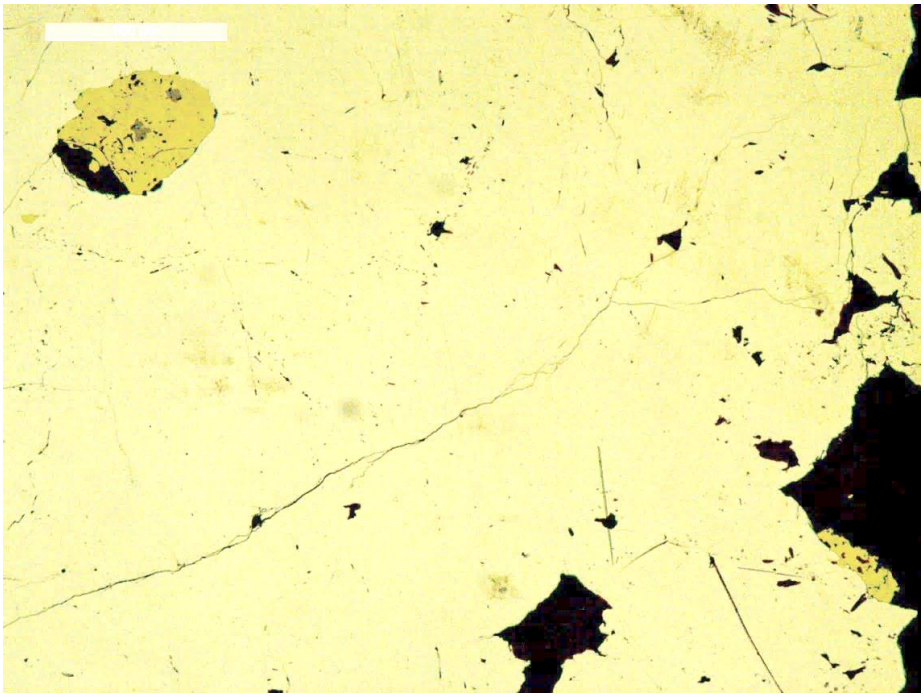

Figure 12: C113271. Chalcopyrite (yellow) inclusion in pyrite. PPRL. FOV ~2.8mm.

C113272 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113272 is mostly grey, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 13). The veins are generally <5mm thick. There is probably some trace brown cassiterite and the main sulphide is probably pyrite.

Figure 13: Sample C113272, showing white, vuggy, sulphidic quartz veins in a grey sandstone. FOV: about 120 mm

In thin section (Fig. 14) the sample is a brecciated, silicified quartz wacke cut by quartz – muscovite – cassiterite - sulphide veins to about 5 mm wide. The veins have patches of fine to coarse muscovite, coarse quartz and marcasite-pyrite aggregates replacing pyrrhotite, ~5 mm (Fig. 15). There is some sparse galena (<0.2 mm; Fig. 16), chalcopyrite, stannite(?) and sphalerite, plus euhedral cassiterite grains to about 0.2 mm (Fig. 14).

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, but has abundant patchy silicification to rice-grain textured quartz. (Fig. 14). Tourmaline is present as both small detrital and hydrothermal grains, and there are small, disseminated pyrite grains.

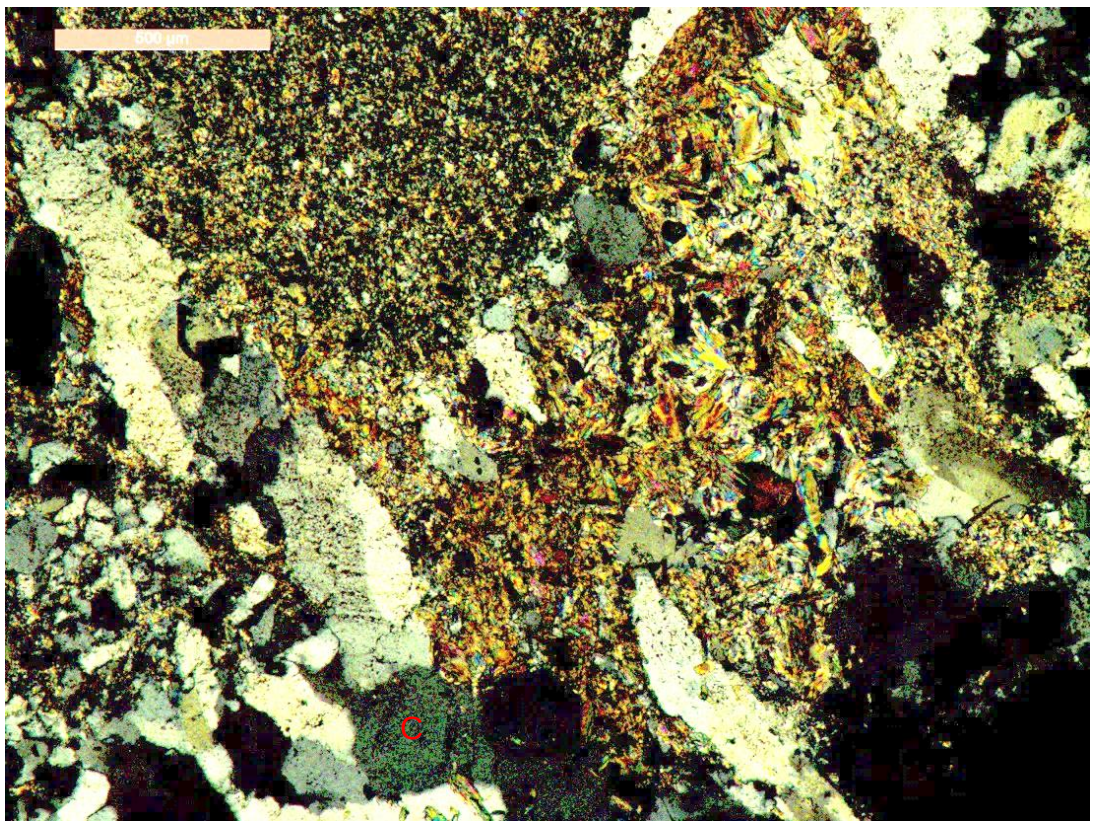

Figure 14: C113272. Cherty silicified breccia with patches of fine to coarse muscovite, and a grain of cassiterite (C). XPTL. FOV ~2.8mm.

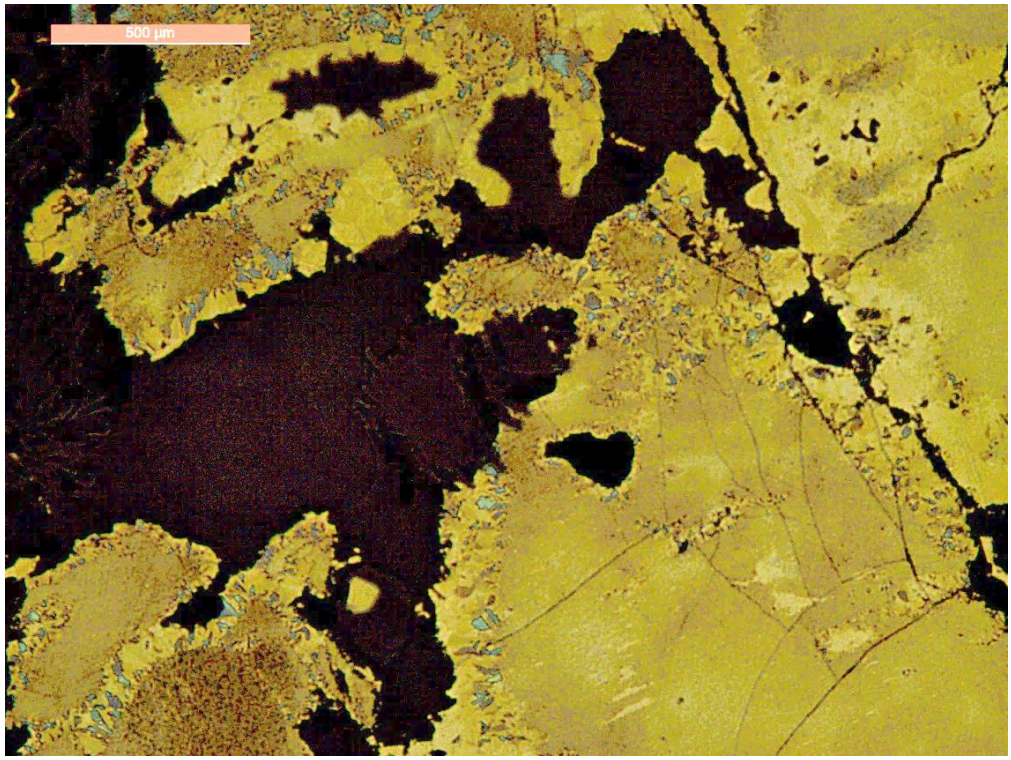

Figure 15: C113272. Bladed aggregates of marcasite and pyrite replacing pyrrhotite. PPRL. FOV ~2.8mm.

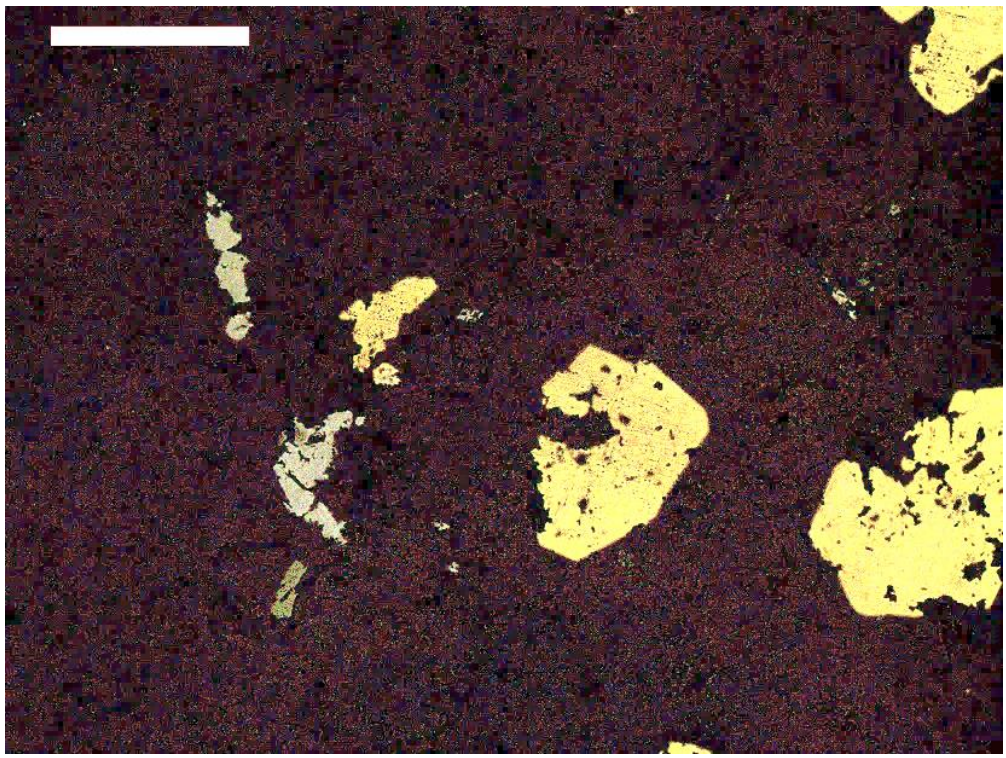

Figure 16: C113272. Galena (pale grey) and skeletal pyrite (yellow). PPRL. FOV ~2.8mm.

C113273 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113273 is mostly grey, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 17). The veins are generally <5mm thick. The main sulphides are probably arsenopyrite and sphalerite, probably with some brown cassiterite in the veins. The sandstone appears to be strongly brecciated and silicified.

Figure 17: Sample C113273, showing grey quartz veins and brown limonitic veins, in a white to grey sandstone. FOV: about 200 mm.

In thin section (Fig. 18) the sample is a brecciated, silicified quartz wacke cut by quartz – muscovite – cassiterite - sulphide veins to about 5 mm wide. The veins have medium to coarse-grained quartz and sulphides intermixed with variable patches of fine to medium grained cassiterite, muscovite, chlorite, carbonates (siderite?) and fluorite (Fig. 19 - 23). Sulphides include arsenopyrite, pyrite, sphalerite and chalcopyrite.

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, but has abundant patchy silicification to rice-grain textured quartz associated with quartz veins (Fig. 18). Tourmaline is present as both small detrital and sparse hydrothermal grains, and there are small, disseminated pyrite grains.

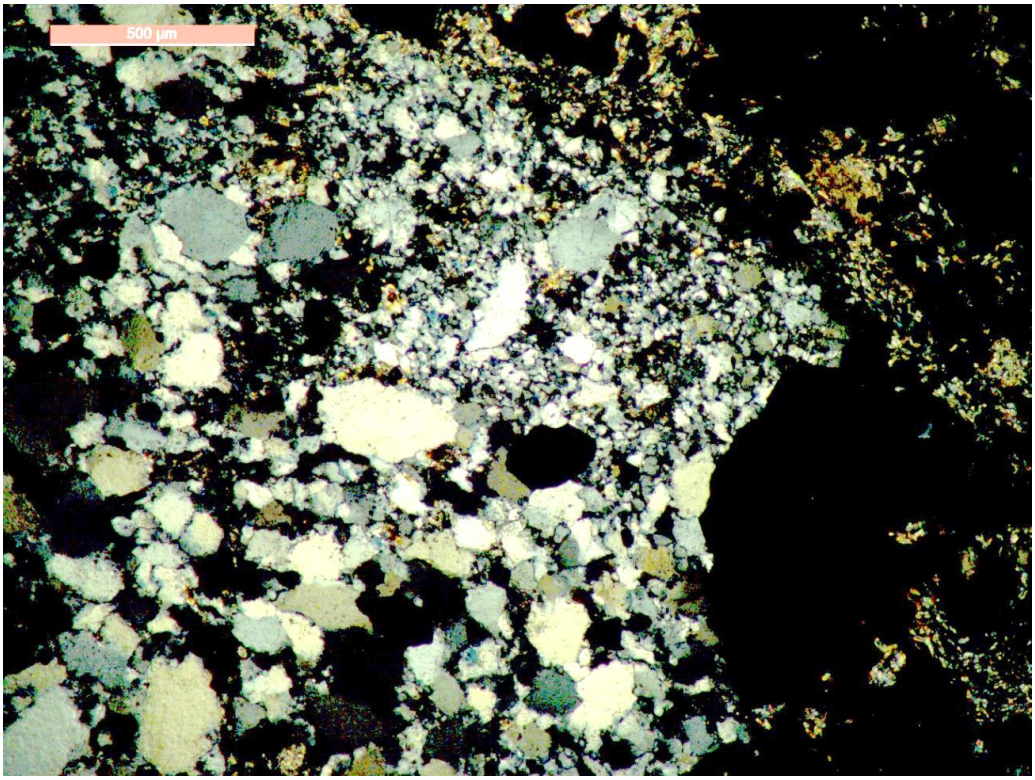

Figure 18: C113273. Cherty silicified breccia with coarse sulphides and muscovite, carbonate and cassiterite. XPTL. FOV ~2.8mm.

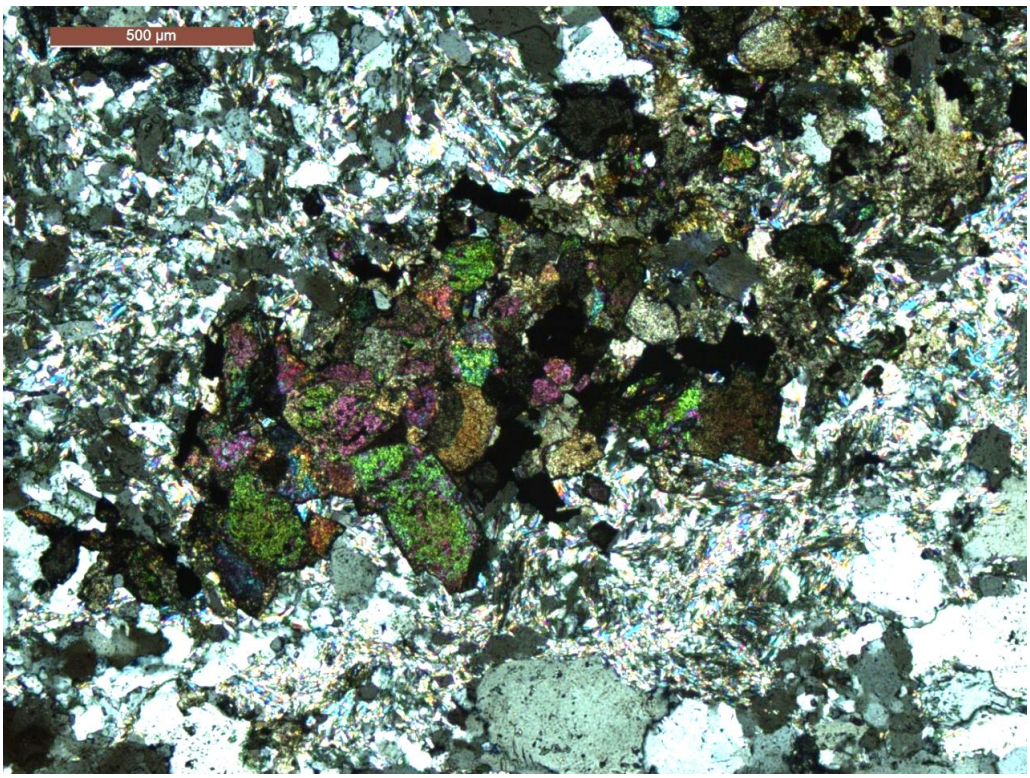

Figure 19: C113273. Fine grained muscovite-fluorite clots, containing aggregates of cassiterite (high relief and birefringence) with carbonates (brown) and sulphides (black). XPTL. FOV ~2.8mm.

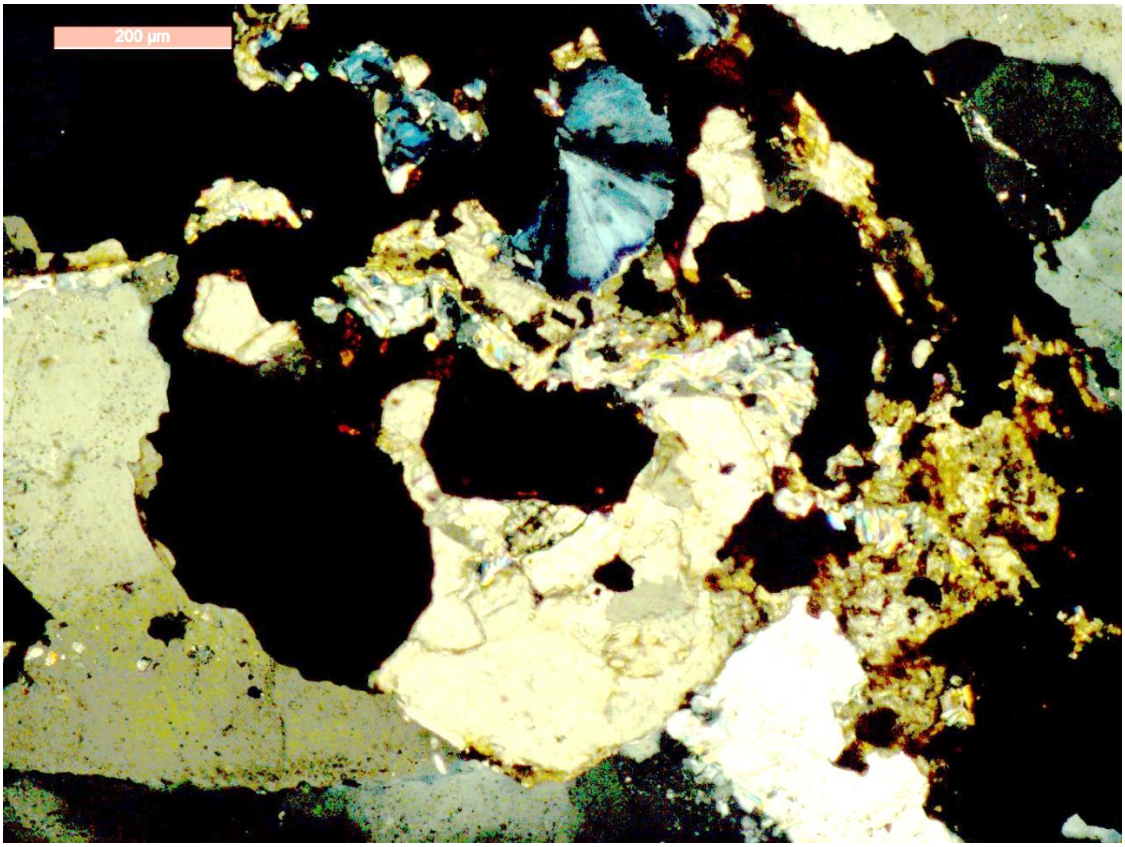

Figure 20: C113273. Spherulitic chlorite (grey) with sphalerite (red), sulphides (black), quartz and carbonates (pale brown). XPTL. FOV ~1.4mm.

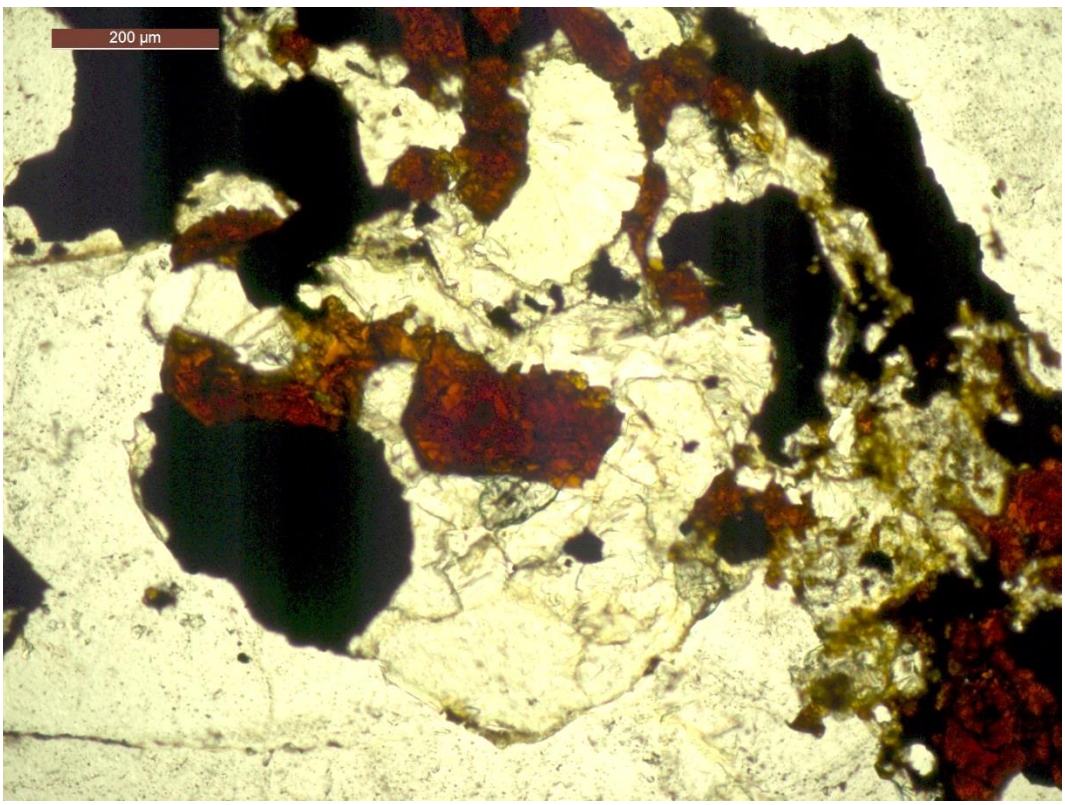

Figure 21: C113273. Area as above showing sphalerite (red), sulphides (black), quartz and carbonates (mottled brown). PPTL. FOV ~1.4mm.

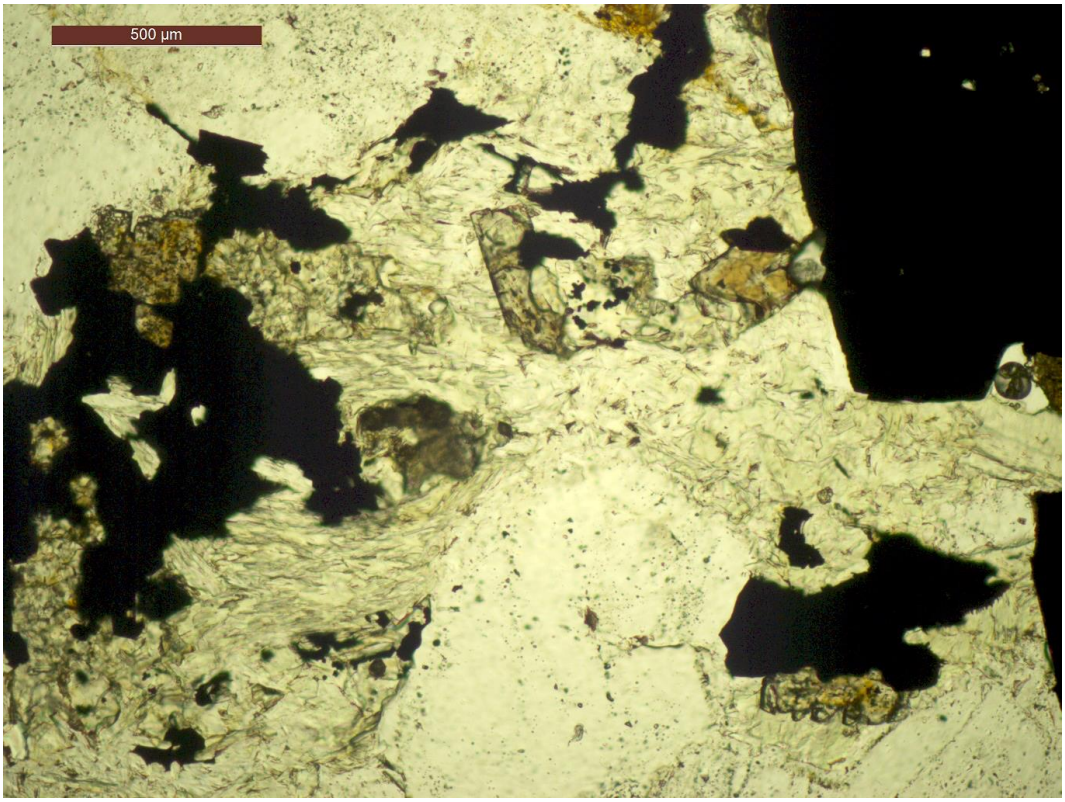

Figure 22: C113273. Fine grained muscovite clots containing cassiterite (high relief and birefringence) plus sulphides (black). PPTL. FOV ~2.8mm.

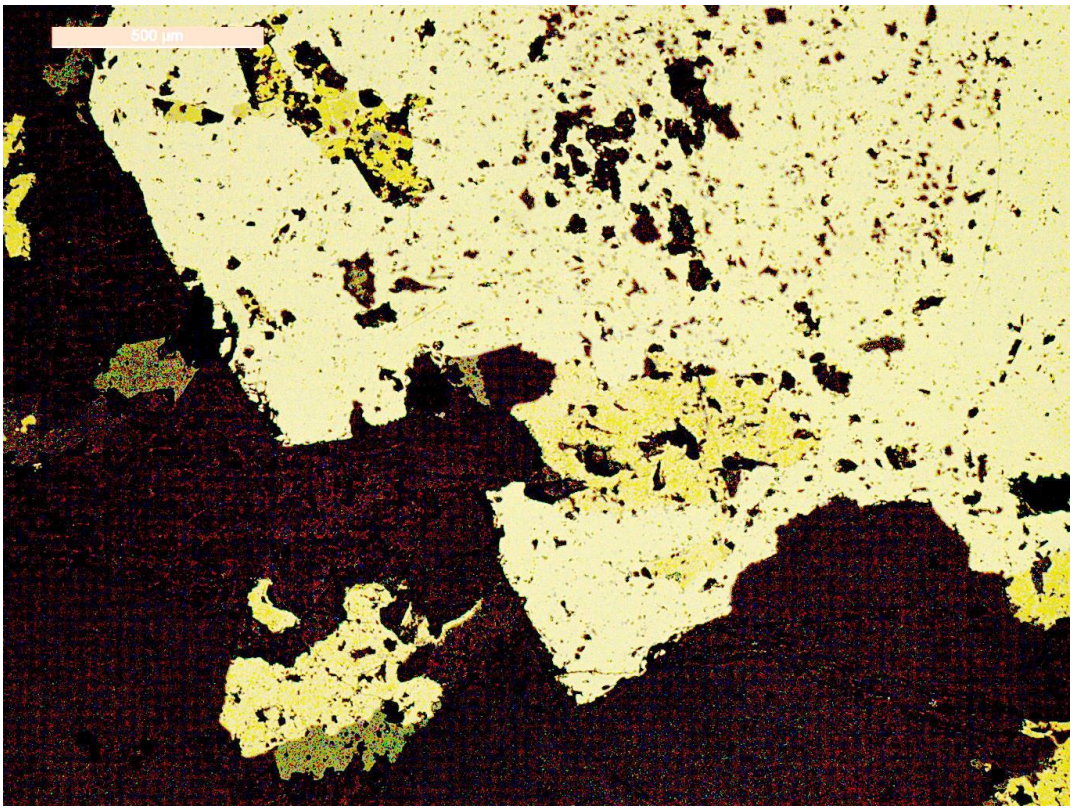

Figure 23: C113273. Coarse grained, inclusion-rich arsenopyrite containing pyrite and chalcopyrite, with some attached cassiterite (medium grey). PPTL. FOV ~2.8mm.

C113274 Great Pyramid Sandstone and Chlorite veins

Under the stereomicroscope the sample C113274 is mostly grey to white, medium grained, quartz sandstone, with abundant thin, white to black quartz +/- chlorite veins (Fig. 24). The veins are generally <5mm thick.

Figure 24: Sample C113274, showing black and white quartz-chlorite veins in a white – grey sandstone. FOV: about 200 mm.

In thin section the sample is a brecciated, silicified quartz wacke cut by quartz – chlorite veins to about 5 mm wide. The veins have medium to coarse-grained, growth-zoned quartz and spherulitic chlorite (Fig. 25). Sulphides are very sparse but include some fine pyrite altering to limonite.

Figure 25: C113274. Zoned quartz crystals with patches of green chlorite, in veins cutting sandstone. PPTL. FOV ~2.8mm.

C113275 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113275 is mostly grey to white, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 26). The veins are generally <5mm thick. There is probably some black cassiterite (<0.5 mm) in the veins and the main sulphide is probably pyrite. The sandstone contains abundant disseminated sulphides.

Figure 26: Sample C113275, showing grey quartz veins and brown limonitic veins, in a white sandstone with some iron staining. FOV: about 200 mm.

In thin section (Fig. 27) the sample is a brecciated, silicified quartz wacke cut by quartz – carbonate – cassiterite - sulphide veins to about 5 mm wide. The veins have medium to coarse-grained quartz and sulphides intermixed with variable patches of fine to medium grained cassiterite, muscovite, chlorite, carbonates (siderite?) and fluorite (Fig. 27 - 31). Sulphides include arsenopyrite, pyrite, sphalerite, galena, stannite(?) and chalcopyrite. The pyrrhotite has totally altered to mixtures of pyrite, marcasite and “melnickovite” (colloidal iron sulphides). Cassiterite is <0.5mm.

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, with some patchy silicification to rice-grain textured quartz associated with quartz veins. Tourmaline is present as both small detrital and sparse hydrothermal grains, and there are small, disseminated pyrite grains.

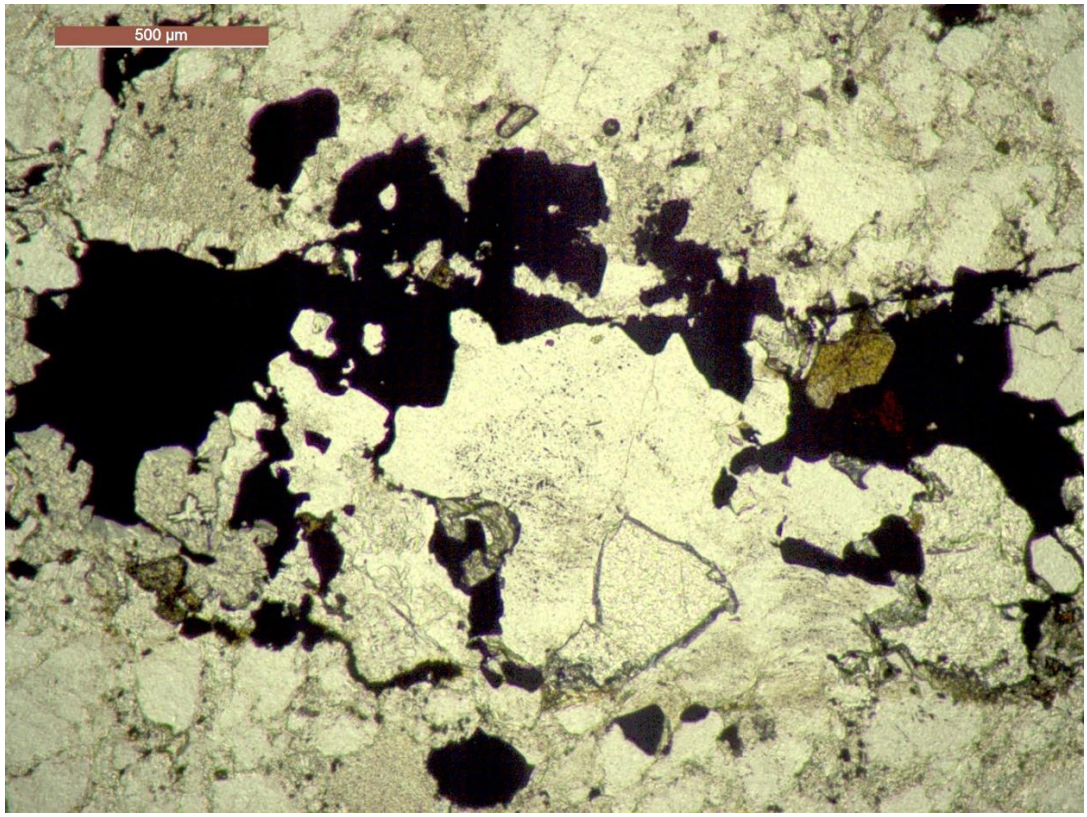

Figure 27. C113275. Vein in sandstone, with sulphides (black), quartz, fluorite (frosty) and cassiterite (brown). PPTL.

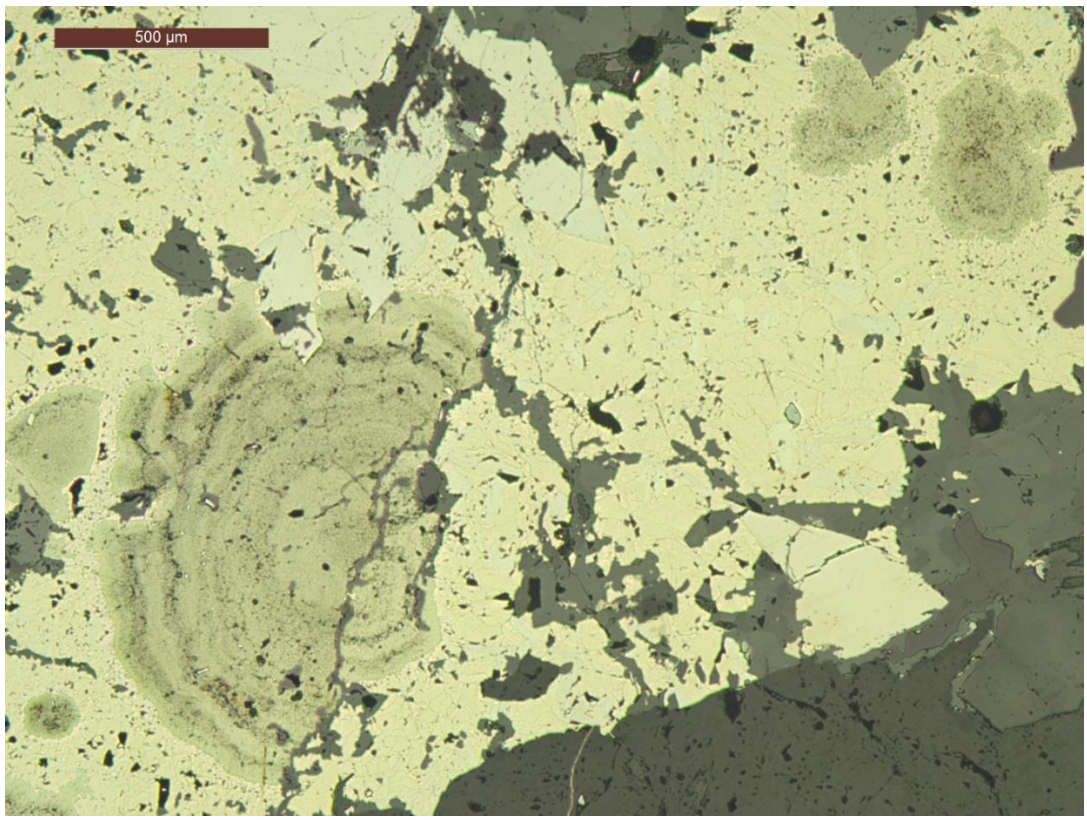

Figure 28: C113275. "Melnickovite" (greyish colloidal pyrite-marcasite, probably replacing pyrrhotite), with coarser pyrite-marcasite aggregates and arsenopyrite (very pale blue). PPRL.

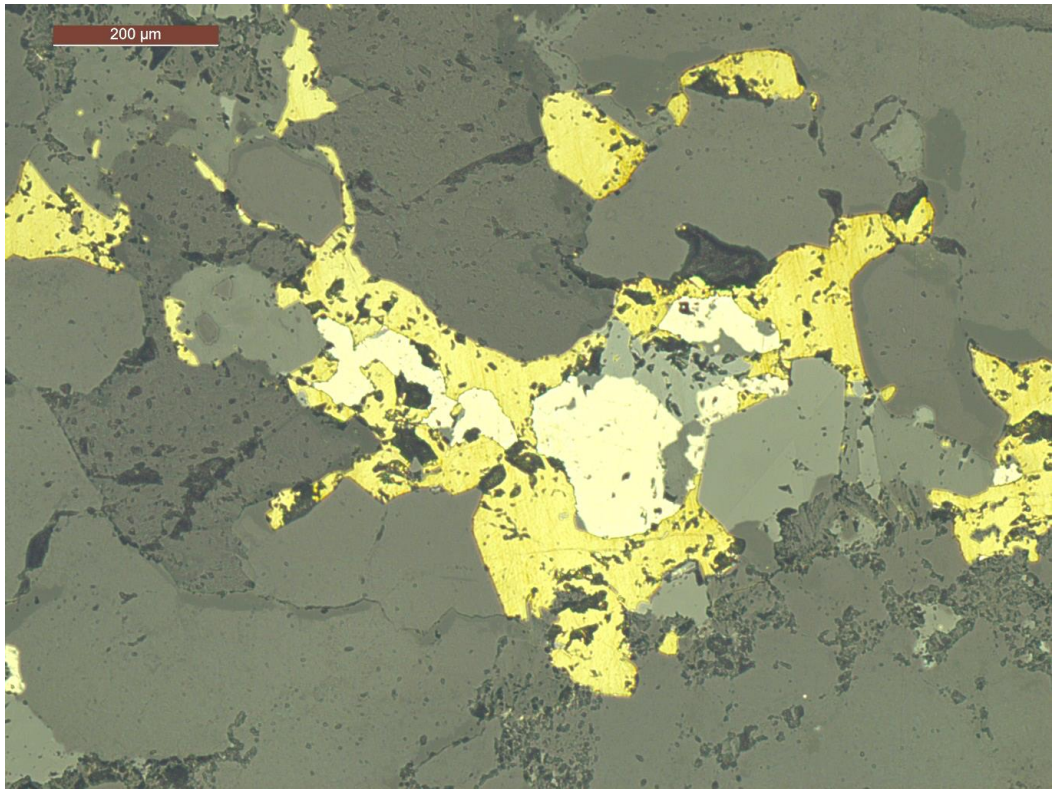

Figure 29: C113275. Chalcopyrite (yellow), pyrite (cream), and sphalerite (lightest grey), with cassiterite (mid-grey, euhedral) in quartz-carbonate matrix; PPRL.

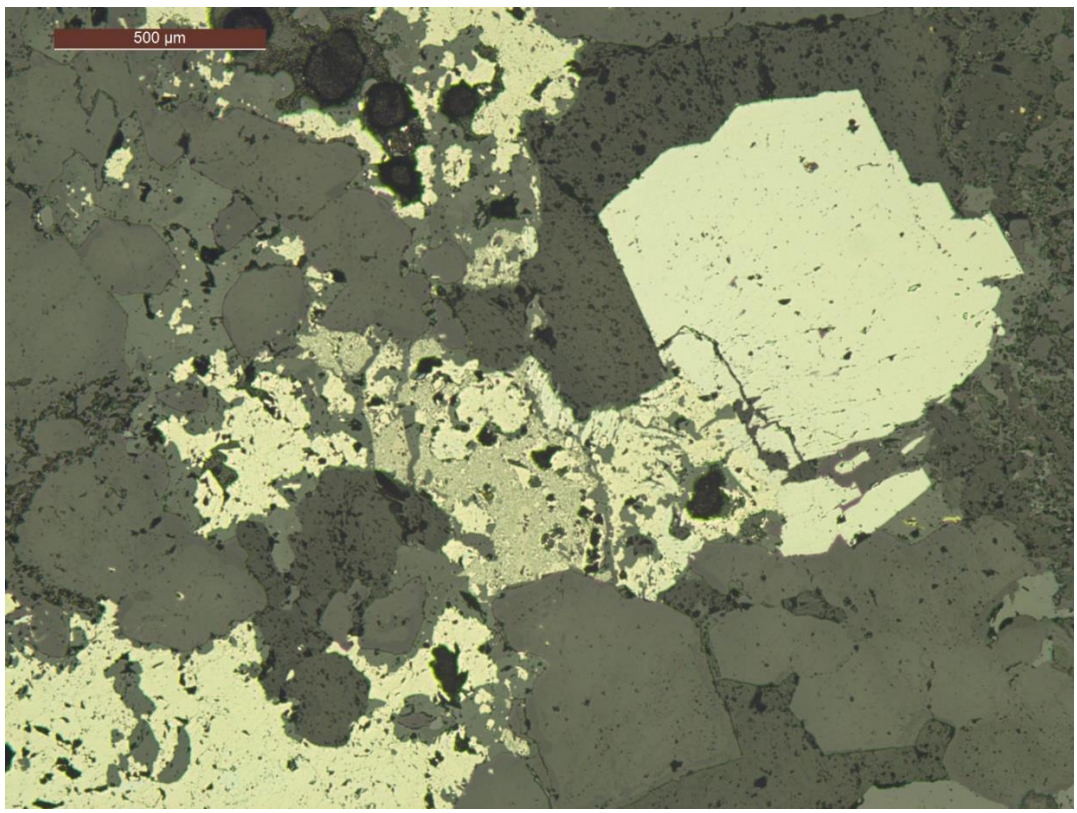

Figure 30: C113275. Possible stannite (grey), altering to pyrite (cream) with arsenopyrite (white) in quartz-carbonate matrix; PPRL.

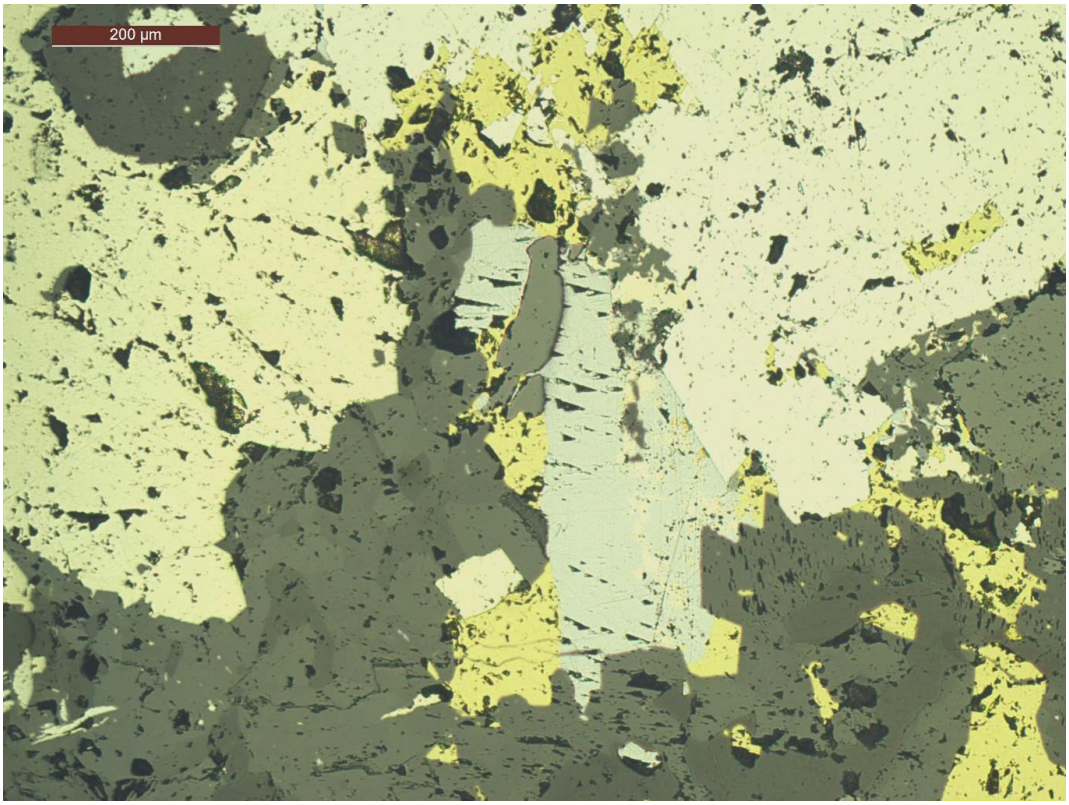

Figure 31: C113275. Chalcopyrite (yellow), pyrite (cream), arsenopyrite (white) and galena (pale blue), with cassiterite (centre right) in quartz-carbonate matrix; PPRL.

C113276 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113276 is mostly grey to white, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 32). The veins are generally <5mm thick. There is probably some brown cassiterite in the veins and the main sulphide is probably arsenopyrite and pyrite.

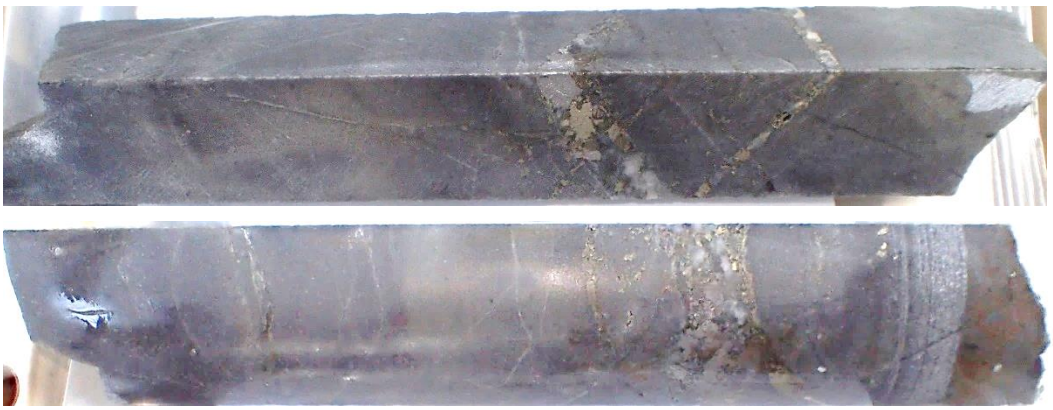

Figure 32: Sample C113276, showing pyritic quartz veins in a grey sandstone. FOV: about 200 mm.

In thin section (Figs. 33 - 35) the sample is a brecciated, silicified quartz wacke cut by quartz – carbonate – muscovite - cassiterite - sulphide veins to about 5 mm wide. The veins have medium to coarse-grained quartz and sulphides intermixed with variable patches of fine to medium-grained cassiterite, muscovite, and carbonates (siderite?). Sulphides include arsenopyrite, pyrite, sphalerite, stannite(?) and chalcopyrite (Fig. 36 - 37). The pyrrhotite has totally altered to mixtures of pyrite, marcasite and “melnickovite” (colloidal iron sulphides). Cassiterite is <0.5mm. There are also clots of intergrown sulphides and carbonates in the sandstone matrix (Fig. 35).

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, with some patchy silicification to rice-grain textured quartz associated with quartz veins. Tourmaline is present as both small detrital and sparse hydrothermal grains, and there are small, disseminated pyrite grains.

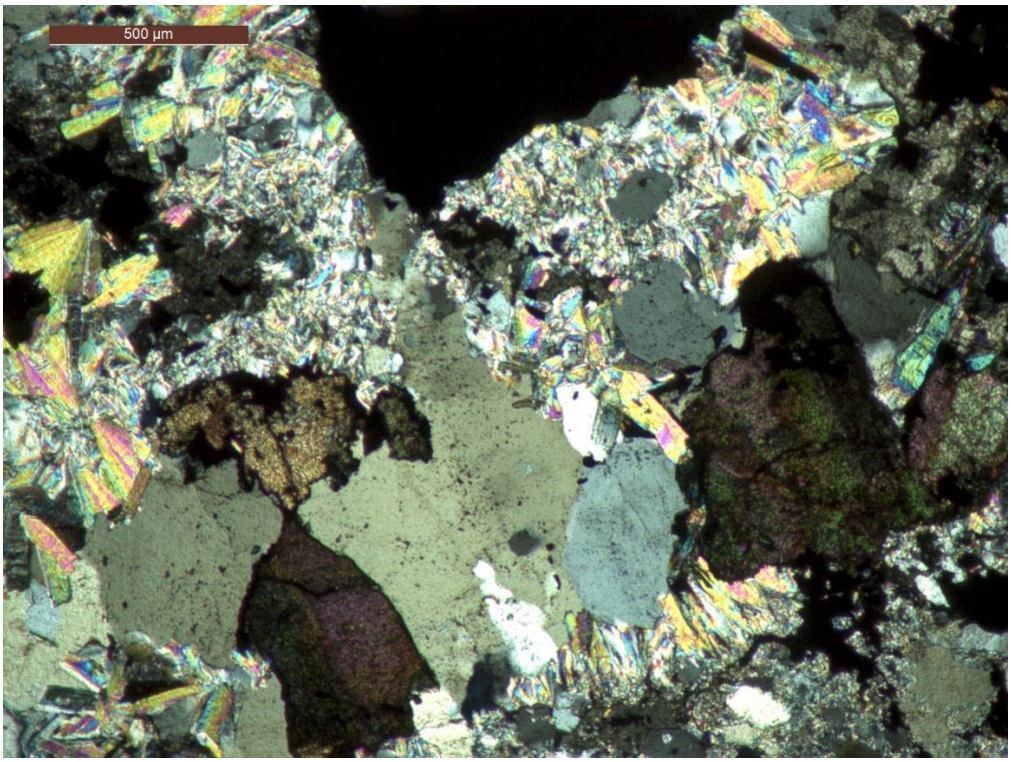

Figure 33:. C113276. Cassiterite (dark brown), muscovite (high birefringence, radiating), sulphides (black) and quartz; XPTL.

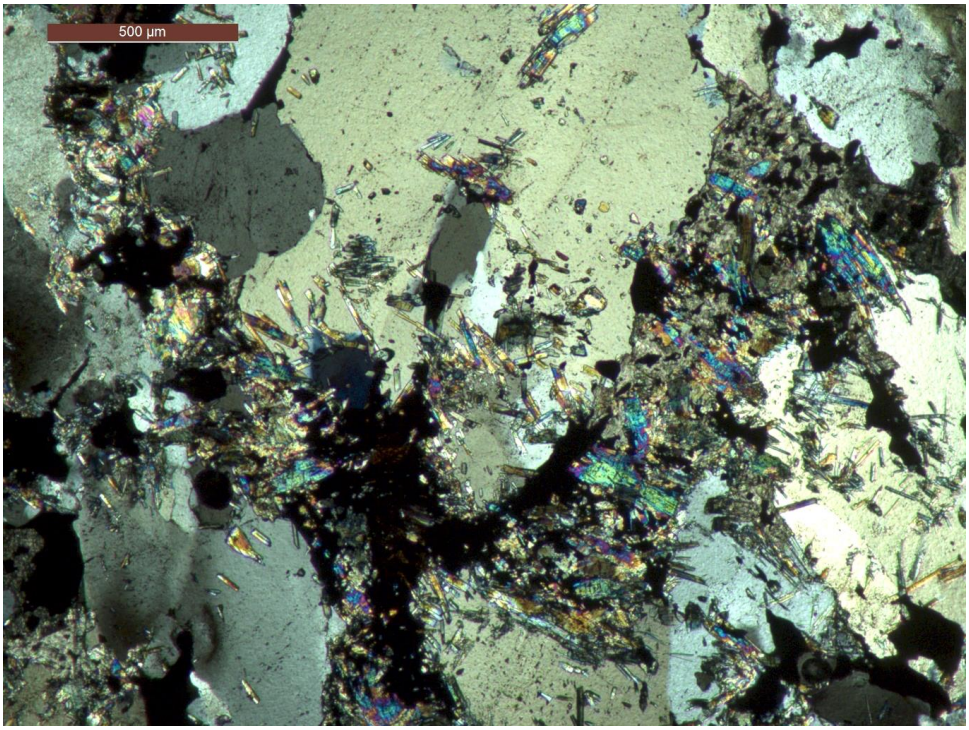

Figure 34: C113276. Tourmaline (prismatic), muscovite (high birefringence), sulphides (black) and quartz; XPTL

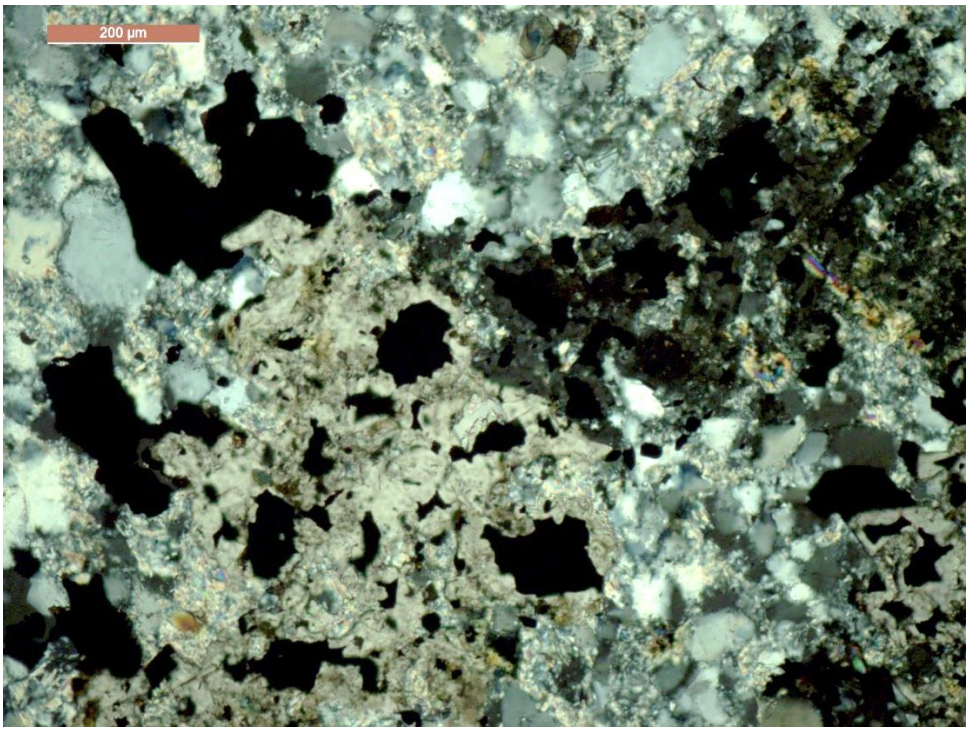

Figure 35: C113276. Clots of carbonates and sulphides (black)in the quartz arenite; XPTL

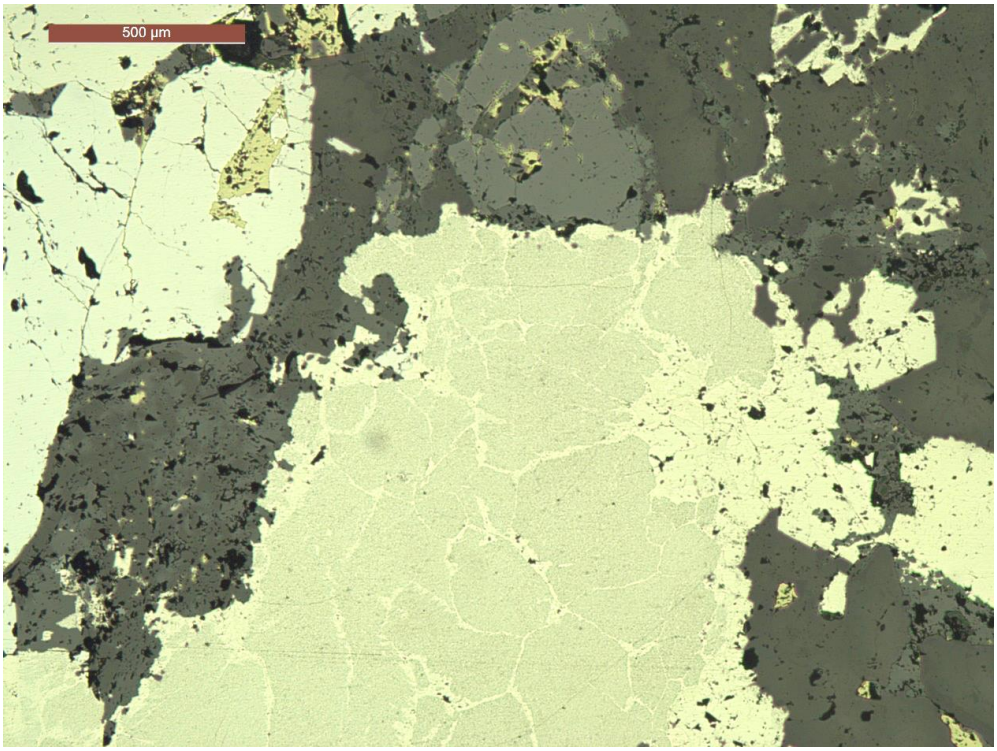

Figure 36:. C113276. Pyrrhotite altering to "melnickovite" and pyrite (cream), with chalcopyrite (yellow), cassiterite (top centre) and arsenopyrite (bluish white) in quartz-carbonate matrix; PPRL.

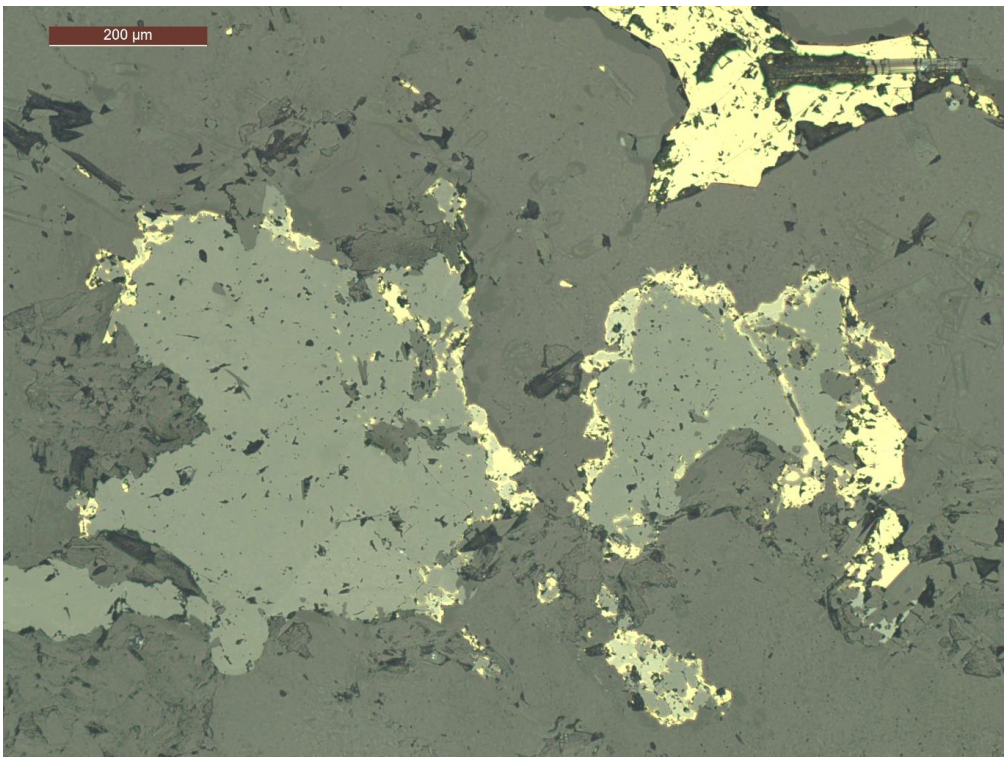

Figure 37: C113276. Cassiterite (mid grey), altering to stannite (pale grey), with pyrrhotite (cream) in quartz-carbonate matrix; PPRL.

C113277 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113277 is mostly grey to white, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 38). The veins are generally <5mm thick. The main sulphides are probably sphalerite and pyrite; no cassiterite was visible.

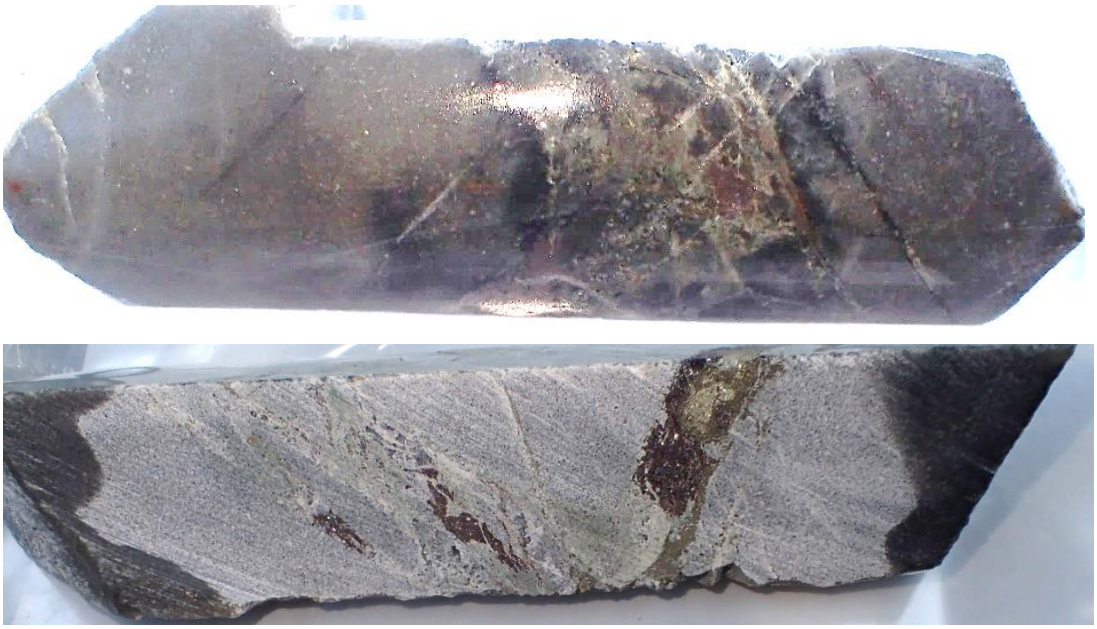

Figure 38:: Sample C113277 showing sulphidic quartz veins in a pale grey sandstone. FOV: about 200 mm.

In thin section (Figs. 39 - 42) the sample is a brecciated, silicified quartz wacke cut by quartz – chlorite - carbonate – sulphide veins to about 20 mm wide. The veins have medium to coarse-grained quartz, chlorite, fluorite and sulphides intermixed with abundant fine to medium grained carbonates (siderite?). Sulphides include pyrite, sphalerite, galena and chalcopyrite. Cassiterite was not detected.

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, with some patchy silicification to rice-grain textured quartz associated with quartz veins. Tourmaline is present as both small detrital and sparse hydrothermal grains, and there are small, disseminated pyrite grains.

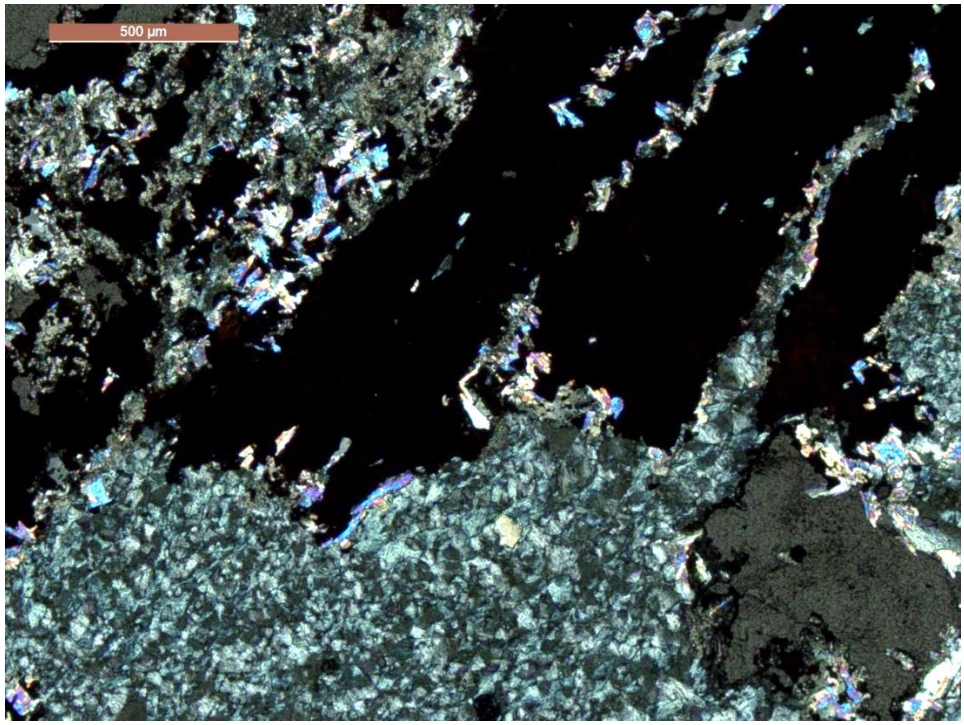

Figure 39: C113277. Sphalerite (black), muscovite (high birefringence), chlorite (green-grey), carbonate and fluorite (mid grey); XPTL

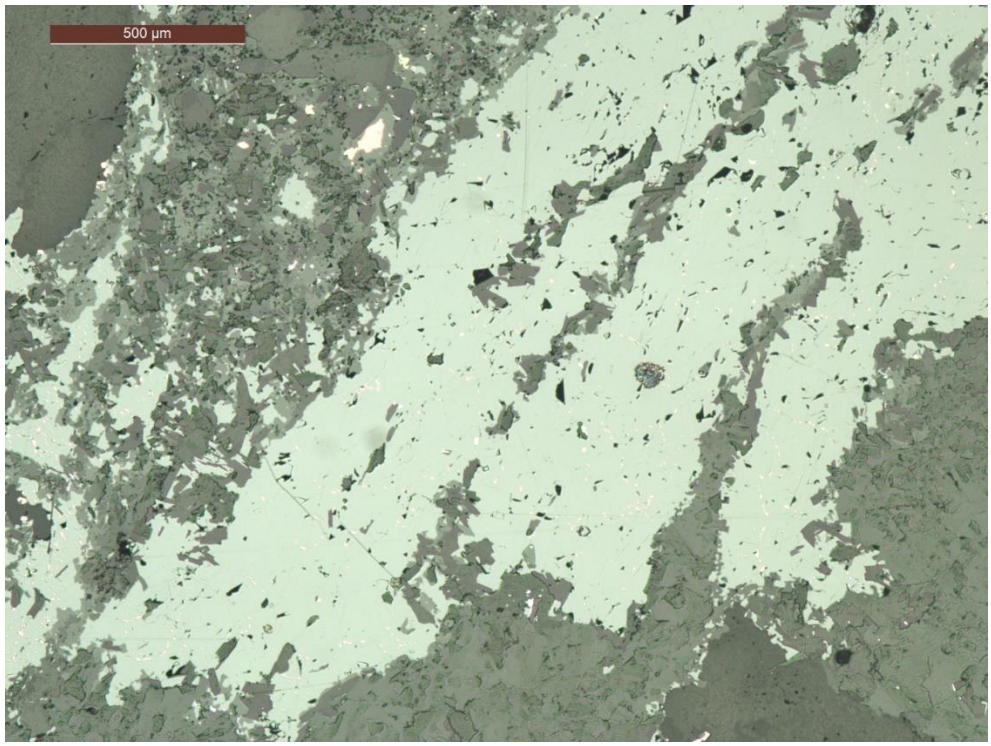

Figure 40:. C113277. Same area: sphalerite (pale grey), muscovite, chlorite, carbonate and fluorite (mid grey); PPRL

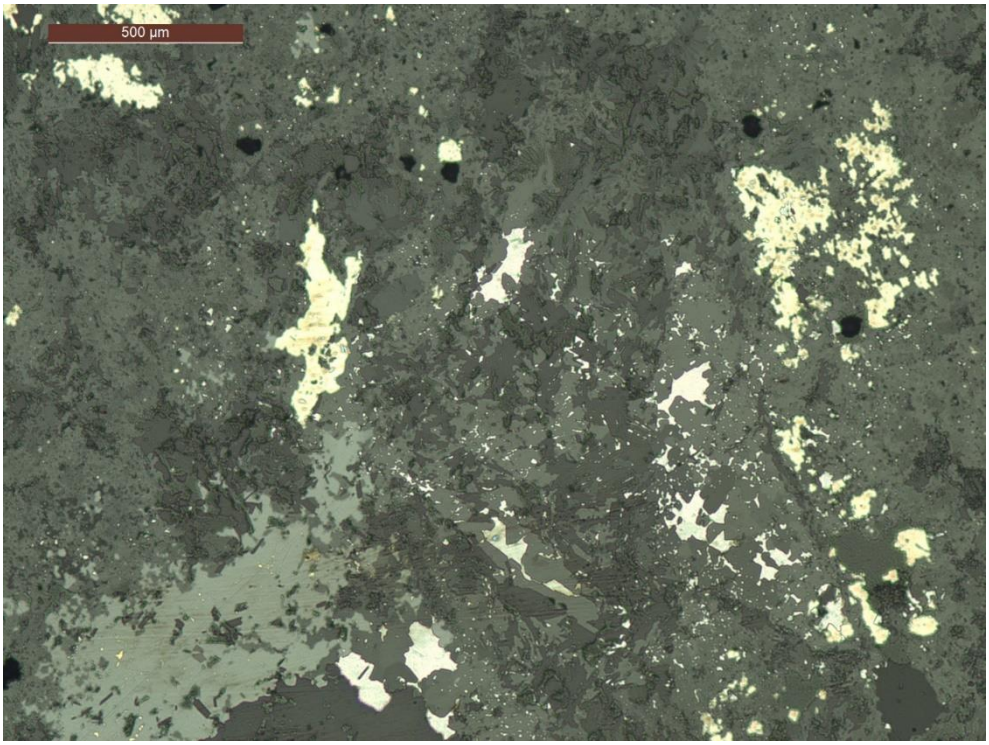

Figure 41: C113277. Pyrite (cream), sphalerite (pale grey), galena (white), in carbonate (mid grey) and quartz (dark grey); PPRL

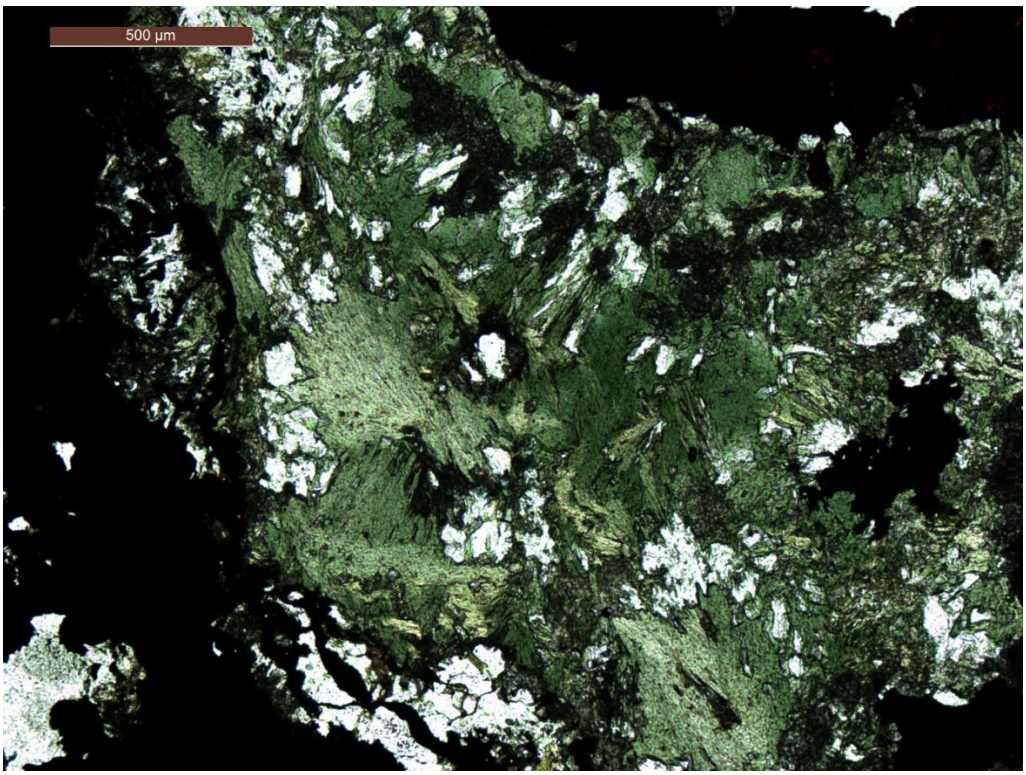

Figure 42: C113277. Sphalerite (black), muscovite (high birefringence), chlorite (green-grey), carbonate and fluorite (mid grey); XPTL

C113278 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113278 is mostly grey to white, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 43). The veins are generally <5mm thick. There is possibly some brown cassiterite in the veins and the main sulphide is probably arsenopyrite.

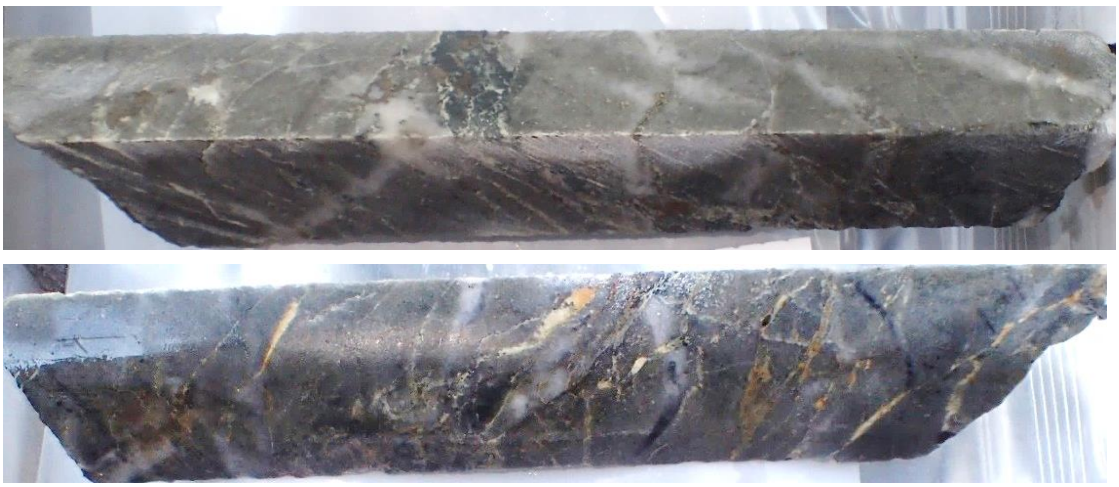

Figure 43: Sample C113278, showing grey quartz veins and brown limonitic veins, in a white sandstone with some iron staining. FOV (field of view): about 200 mm.

In thin section (Figs. 44 - 45) the sample is a brecciated, silicified quartz wacke cut by quartz – chlorite - carbonate – sulphide veins to about 10 mm wide. The veins have medium to coarse-grained quartz, chlorite, fluorite and sulphides intermixed with abundant fine to medium grained carbonates (siderite?). Sulphides include pyrrhotite, arsenopyrite, sphalerite, galena and chalcopyrite. Cassiterite was not detected.

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, with some patchy silicification to rice-grain textured quartz associated with quartz veins. Tourmaline is present as both small detrital and sparse hydrothermal grains, and there are small, disseminated pyrite grains.

Figure 44: C113278. Pyrrhotite (cream), sphalerite (pale grey), chalcopyrite (yellow) and arsenopyrite (bluish white), in carbonate (mid grey); PPRL

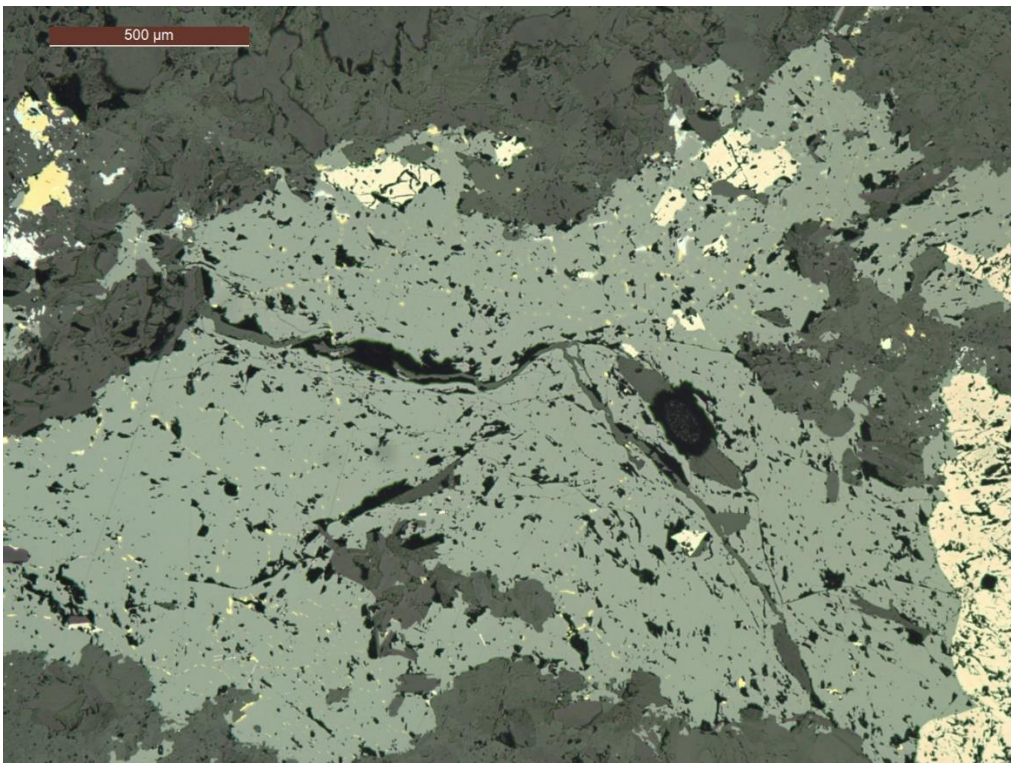

Figure 45: C113278. Pyrrhotite (cream), sphalerite (pale grey), galena (white), chalcopyrite (yellow) in carbonate (mid grey); PPRL

C113279 Great Pyramid Sandstone and Cassiterite-Sulphide veins

Under the stereomicroscope the sample C113279 is mostly grey to white, medium grained, quartz sandstone, with abundant thin, vuggy, white to grey quartz-sulphide veins and stockworks (Fig. 46). The veins are generally <5mm thick. There is probably some brown cassiterite in the veins and the main sulphide is probably pyrrhotite.

Figure 46: Sample C113279, showing grey quartz veins and brown limonitic veins, in a white sandstone with some iron staining. FOV (field of view): about 200 mm.

In thin section (Figs. 47 - 49) the sample is a brecciated, silicified quartz wacke cut by quartz – tourmaline - cassiterite – sulphide veins to about 20 mm wide. The veins have medium to coarse-grained quartz, tourmaline, cassiterite and sulphides with thin muscovite selvages. Sulphides are mostly pyrrhotite, with minor sphalerite, arsenopyrite and chalcopyrite. Cassiterite is up to 0.4mm.

The sandstone has quartz grains to about 0.5 mm diameter, in a matrix of fine-grained muscovite and quartz, with some patchy silicification to rice-grain textured quartz associated with quartz veins. Tourmaline is present as both small detrital and sparse hydrothermal grains, and there are small, disseminated pyrite grains.

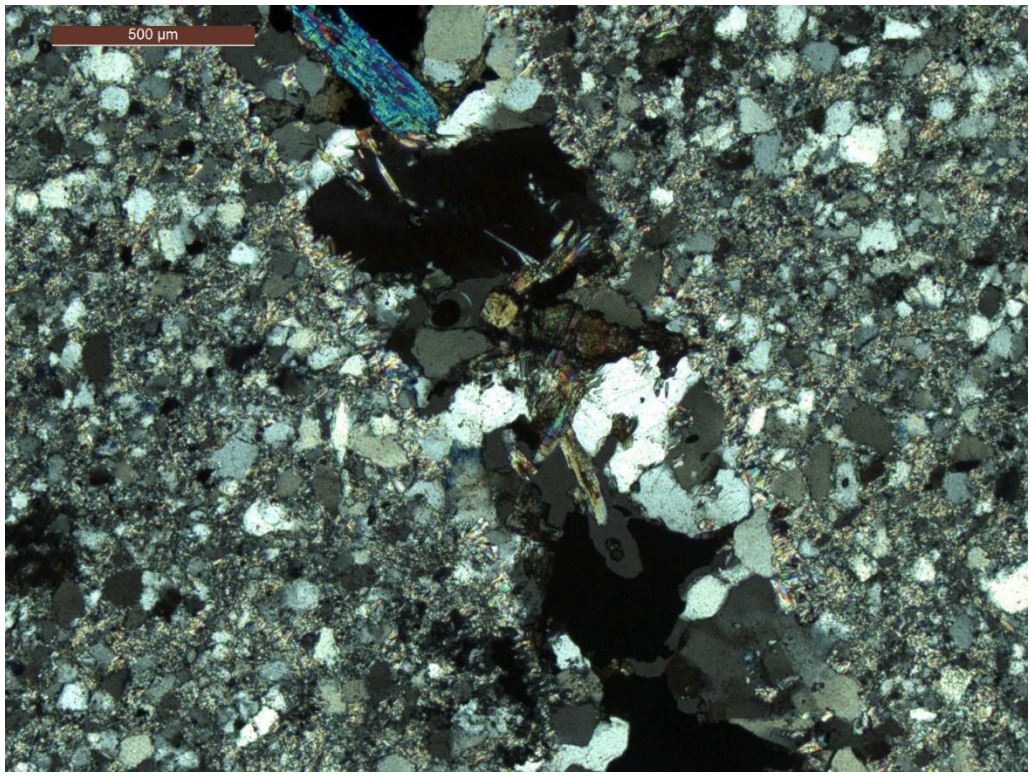

Figure 47: C113279. Tourmaline (birefringent), muscovite (high birefringence), sulphides (black), cassiterite (high relief) and quartz in veins cutting arenite. XPTL

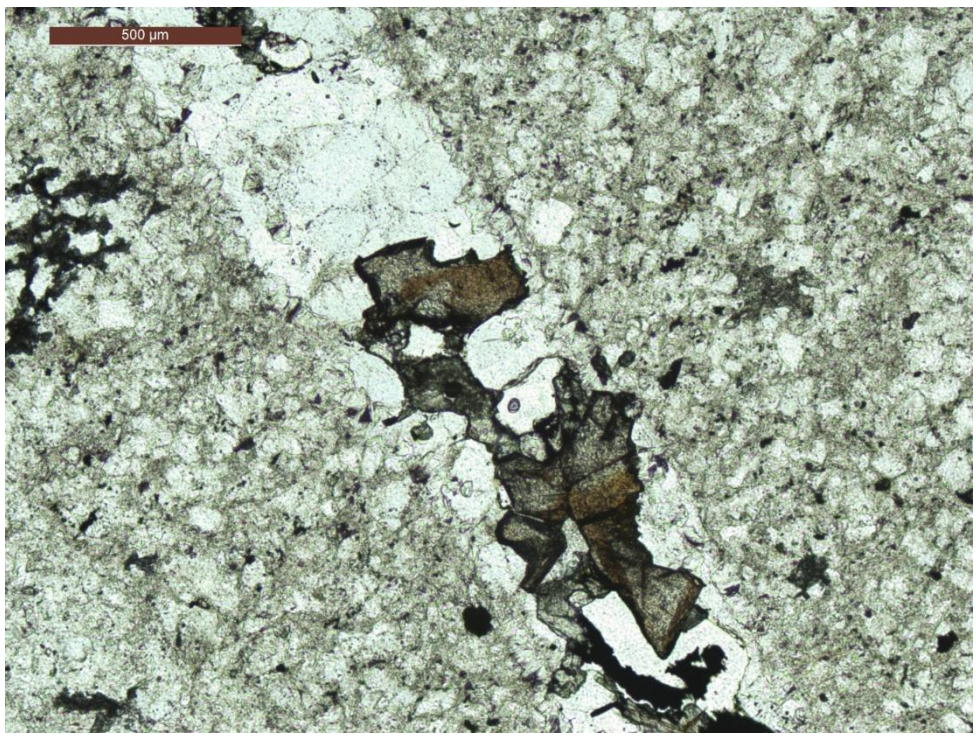

Figure 48:. C113279. Sulphides (black), cassiterite (high relief) and quartz in veins cutting arenite. XPTL

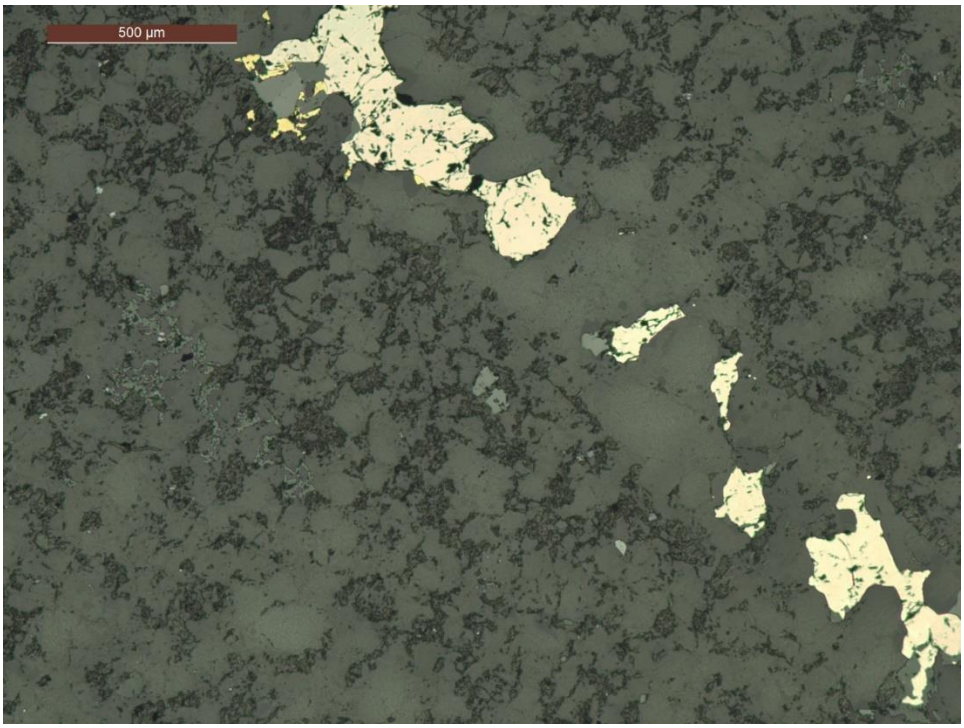

Figure 49:. C113279. Pyrrhotite (cream), chalcopyrite (yellow) and cassiterite (bright grey) in quartz veins cutting arenite. PPRL

XRF ANALYSES

Some samples were analysed for major elements on a fused disk, and/or trace elements on a pressed pellet, in a Bruker ASX58 XRF, with proprietary Bruker software and a series of commercial standards. The results are shown in Appendix 1.

The XRF results on the dolerite sample (C113269) indicate that it is Ti-rich relative to Jurassic dolerites and best matches the Devonian dolerites that cut many granites in NE Tasmania.

The XRF results on the mineralised sample (C113270) indicate that it is anomalous in As, Sn and Rb, consistent with the petrology. Rb is generally rich in granite-related muscovite micas.

DISCUSSION AND CONCLUSIONS

The petrology is summarised in Table 2.

Table 2: Petrology Summary

Reg# /Field#	Petrology
C113269 18gpd001/58.1	A Devonian aged dolerite, based on the degree of alteration and high biotite and amphibole contents.
C113270 18gpd001/67.6	A Mathinna Supergroup quartz sandstone, with thin, leached, oxidized veins containing quartz, baryte, limonite, jarosite and scorodite plus an earlier generation of thin white to grey quartz veins. There is no definite cassiterite or remaining sulphides, which were probably arsenopyrite-dominant.
C113271 18gpd001/124.3	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – muscovite – sulphide (arsenopyrite and pyrite) veins. No cassiterite seen.
C113272 18gpd001/129.2	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – muscovite – cassiterite - sulphide (mostly pyrite replacing pyrrhotite) veins.
C113273 18gpd001/140.1	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – muscovite – cassiterite - sulphide (mostly pyrite, arsenopyrite, sphalerite and chalcopyrite) veins.
C113274 18gpd001/187.0	A micaceous quartz wacke (Mathinna Supergroup) cut by unmineralized quartz – chlorite veins.
C113275 18gpd001/205.1	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – carbonate (siderite?) – cassiterite - sulphide (pyrrhotite, pyrite, arsenopyrite, sphalerite and chalcopyrite) veins.
C113276 18gpd001/224.6	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – carbonate (siderite?) – muscovite – tourmaline - cassiterite - sulphide (pyrrhotite, pyrite, arsenopyrite, sphalerite and chalcopyrite) veins.
C113277 18gpd001/246.6	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – carbonate (siderite?) – chlorite – fluorite - sulphide (pyrite, galena, sphalerite and chalcopyrite) veins. Cassiterite was not detected.
C113278 18gpd001/299.1	This is micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – carbonate (siderite?) – chlorite – fluorite - sulphide (sphalerite, pyrrhotite and chalcopyrite) veins. Cassiterite was not detected.
C113279 18gpd001/205.1	A micaceous, pyritic quartz wacke (Mathinna Supergroup) cut by quartz – tourmaline - cassiterite – sulphide (pyrrhotite) veins.

One sample is probably a Devonian dolerite, but all other samples are veined Mathinna sandstones: these vary from sulphide-poor chlorite or quartz veins to

greisen style quartz - sulphide +/- muscovite +/- carbonate +/- chlorite +/- tourmaline +/- fluorite +/- cassiterite veins. The sulphides vary greatly, and they are variably dominant in arsenopyrite, pyrite, pyrrhotite and sphalerite, Galena and chalcopyrite are usually minor, and stannite is rare. Wolframite was not detected in any samples.

The sandstones all appear to be Mathinna Group sediments, metamorphosed and metasomatised by Devonian granite to produce very complex, sulphidic greisen-style veins and stockworks, at moderate to high temperatures. The chloritic nature of some of the veins is unusual for granite-related tin greisens, and this may relate to the nearby dolerite? The chloritic veins are tin poor and zinc rich. Cassiterite is generally associated with muscovite (some possibly replacing topaz?), and tourmaline.

Mineral Resources Tasmania

R.S. Bottrill — **MINERALOGIST/PETROLOGIST**

L Unwin — **TECHNICAL OFFICER**

DISCLAIMERS

While every care has been taken in the preparation of this report, no warranty is given as to the correctness of the information and no liability is accepted for any statement or opinion or for any error or omission. No reader should act or fail to act on the basis of any material contained herein. Readers should consult professional advisers. As a result the Crown in Right of the State of Tasmania and its employees, contractors and agents expressly disclaim all and any liability (including all liability from or attributable to any negligent or wrongful act or omission) to any persons whatsoever in respect of anything done or omitted to be done by any such person in reliance whether in whole or in part upon any of the material in this report. The MRT laboratories are not NATA registered but work to similar standards. This and other data collected in MRT laboratories may enter the MRT databases but every attempt will be made to ensure it remains closed file and not be available externally, unless at your request.

LABORATORY DETAILS

Mineral Resources Tasmania (MRT) operates a laboratory facility at its offices at Rosny Park and Mornington, Tasmania. In the interests of full disclosure, these laboratories do not have NATA accreditation. However, all tests are performed according to relevant Australian Standards cited in the report and subject to internal peer review processes. The analytical facilities at MRT are periodically compared against other similar laboratories in other jurisdictions with favourable results.

Appendix 1: XRF Laboratory Report

Job Number: LJN2018-112
Sample Location: Great Pyramid
Client: R Bottrill
Analysis: Geochemistry
Method: X-Ray Fluorescence
Analyst: L Unwin
Lab Manager: R Bottrill
Date: 18/9/18

Results:

Reg. #		**C113269**	**C113270**
Field #		**18gpd001/58.1**	**18gpd001/67.6**
Sample Description	DL	dolerite	SSt + Sn-Sx veins
Lithology		dolerite	sandstone
Lithostratigraphy			Mathinna Supergroup
Other References		LJN2018-112	LJN2018-112
Locality		Gt Pyramid	Gt Pyramid
mE (MGA94/Z55)		599622	599622
mN (MGA94/Z55)		5413436	5413436
Drill ID		82397	82397
Depth From		58.1	67.6
Depth To		58.4	67.8
SiO2 %	0.1	53.79	
TiO2 %	0.01	2.49	
Al2O3 %	0.2	13.42	
Fe2O3TOT %	0.1	13.94	
MnO %	0.01	0.33	
MgO %	0.02	2.93	
CaO %	0.01	4.32	
Na2O %	0.1	3.04	
K2O %	0.01	2.03	
P2O5 %	0.01	0.92	
LOI %	0.05	1.89	
TOTAL %	0.04	99.33	

Reg. #	DL	C113269	C113270
As ppm	5	4	375
Ba ppm	5	589	328
Bi ppm	2	2	6
Ce ppm	6	63	37
Co ppm	4	29	0
Cr ppm	4	7	23
Cs ppm	4	19	39
Cu ppm	5	14	48
Ga ppm	1	23	13
La ppm	5	33	19
Mo ppm	2	1	1
Nb ppm	2	6	0
Nd ppm	5	33	9
Ni ppm	7	0	9
Pb ppm	3	41	35
Rb ppm	3	97	447
Sb ppm	2	0	4
Sc ppm	2	26	2
Sn ppm	2	0	145
Sr ppm	4	270	9
Th ppm	2	4	4
U ppm	1	2	0
V ppm	2	245	30
W ppm	3	0	7
Y ppm	2	44	11
Zn ppm	6	212	17
Zr ppm	6	189	195