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OFFSHORE  
BASS BASIN  
PART 2

THE BROKEN HILL PROPRIETARY COMPANY LIMITED  
RAW MATERIALS & EXPLORATION DEPARTMENT

PETROLOGICAL REPORT NO. M.26/65

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MISCELLANEOUS SPECIMENS FROM THE BASS STRAIT  
AREA  
SUBMITTED BY MR. B.M. HOPKINS

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TPR  
OR-002

By

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MELBOURNE.

OCTOBER 1965

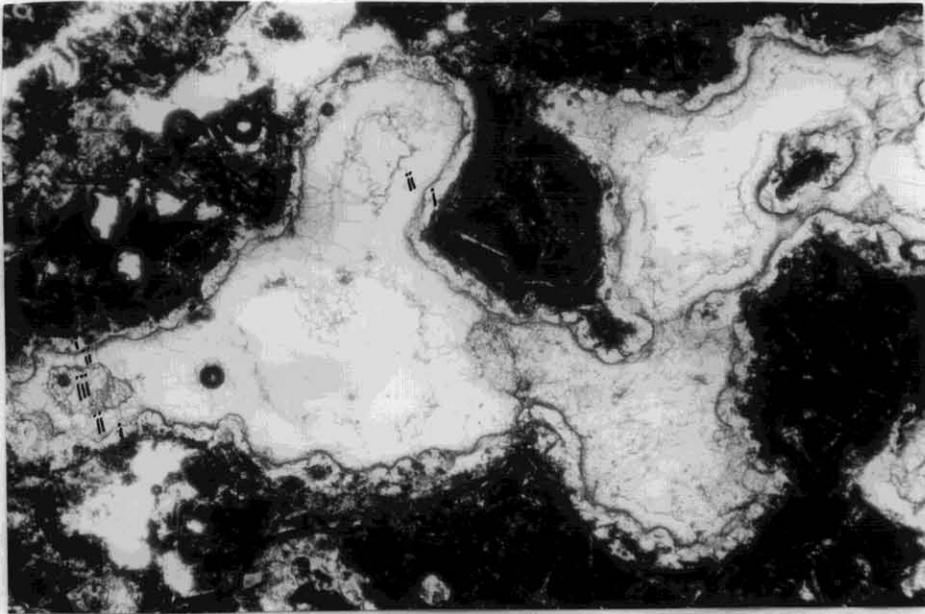
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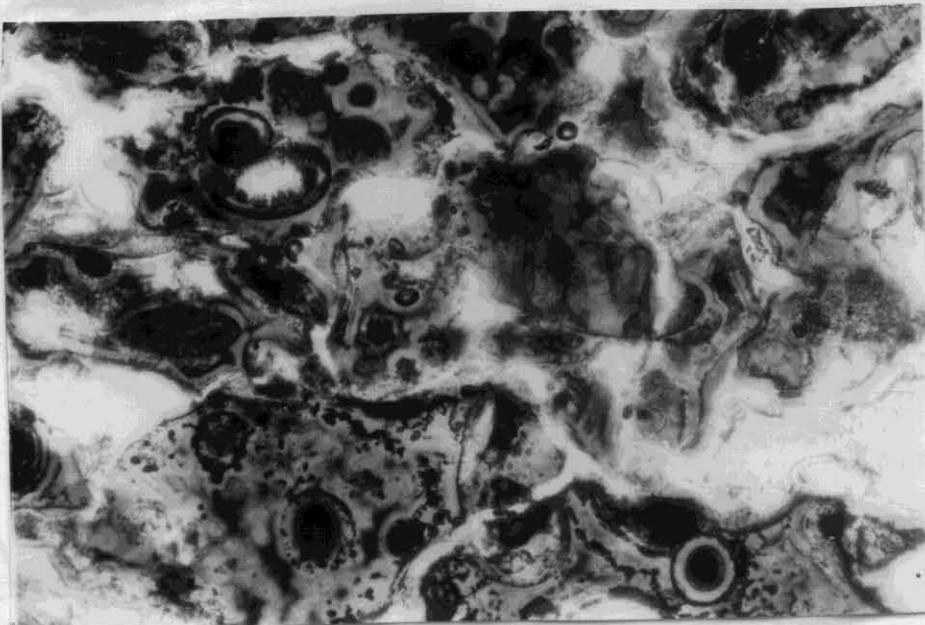
Specimen No. M1384	Volcanic Agglomerate
Specimen No. M1385	Pegmatitic Granite
Specimen No. M1386	Granite
Specimen No. M1403	Banded Carbonaceous Siltstone

This section M1384 x 150  
 Ovoids of ~~unidentified green mineral~~ green mineral in a confused mass of the same mineral. This material forms much of the matrix of the agglomerate.  
 Green palagonite



Thin Section M1384 x 50

Dark, altered glass with needlelike crystallites, in volcanic bomb. Vesicles are lined with i) pale brown spherular glass; ii) radiating zeolite crystals; iii) calcite.



Thin Section M1384 x 150

~~unidentified green mineral~~ green palagonite, many with dark cores, in a confused mass of the same mineral. This material forms much of the matrix of the agglomerate.

SPECIMEN NO. M1384 - Preliminary examination

Volcanic Agglomerate

Locality: Bass No.1 Well, 2636 feet (core 4).

Hand Specimen:

Grey-green rock consisting of poorly sorted rounded basaltic bombs up to 6 cm (2½ inches) across, set in a soft tuffaceous matrix. White zeolites and carbonate fill abundant small vesicles and pores in the rock; but many vesicles remain open or only partly filled, and the rock appears to possess a fairly high porosity.

When tested the specimen gave the positive reaction for phosphate characteristic of basaltic rocks, and collophane and/or glauconite may be present in the matrix. Three thin sections of a basaltic bomb were obtained and are described below.

Thin Section of Bomb:

A vesicular glassy basalt, composed of turbid dark brown glass, and rare ?zeolite pseudomorphs after biotite.

Although varying somewhat in type, the glass is mainly composed of small brown spherulites and amorphous black alteration material. Blurred and partially altered acicular feldspar crystallites are present in some places and obliterated in others. The crystallites average about 0.15 mm in length and are randomly oriented. The small size and altered condition of the crystallites made determination of the composition impossible.

However, a crushed sample had a high refractive index, indicating a basic glass.

Euhedral crystals of ?biotite are entirely replaced by fibrous and radial sheaves of a yellowish zeolite, probably thomsonite.

The vesicles comprise about 30%-40% of the rock, and average 0.5 mm - 1.5 mm across. They are bordered by spherulites of pale brown or clear glass. Forming a layer over this glass is a finely crystalline radiating zeolite band, probably the mineral mesolite. Radiating spherules of a yellowish green zeolite, which may be thomsonite, form a later filling. The central cavities of many vesicles are lined with coarsely crystalline calcite.

In places the vesicle walls are lined with spherical or oval bodies 0.07 - 0.1 mm across. This brownish-green mineral resembles chamosite in appearance, but lacks the true oolitic structure of that mineral. Most of the round bodies have a rim, or several concentric bands, but do not appear to have formed by mechanical accretion. They are firmly attached to the vesicle walls and have undoubtedly grown in situ. They may be an alteration product of the glass but their sporadic distribution and rarity in most of the tuff make this doubtful.

*The mineral has been identified as palagonite (altered basic glass.)*

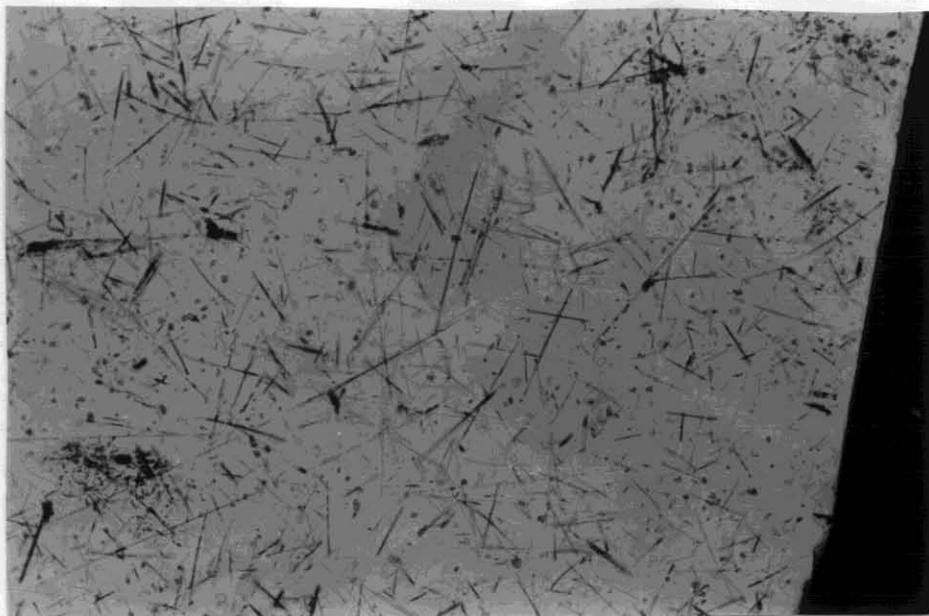
A small portion of one thin section illustrates the relationship between bombs and matrix. The matrix sectioned consists almost entirely of the green mineral described above.

The matrix is a confused mass of green ovoids, some elongated and deformed, of contorted or structureless green material of the same type (see photo) and of angular and prismatic areas filled with secondary minerals, largely chlorite and zeolite. Some pale brown glass is present, and the ~~unknown~~

*palagonite is*  
~~green mineral may be~~ a replacement of glass. The green ovoids often have a dark brown core, and both concentric and radial elements are present in some.

The hypothesis that the green mineral is a replacement of a glassy matrix seems the most satisfactory one available. None of the thin sections has encountered any material which can be called a normal tuffaceous matrix, all fragments being dark, turbidly altered and devitrified glass. The presence of small amounts of fresh spherulitic glass in the matrix supports this. The action of seawater on hot glass has probably been responsible for the formation of this mineral. A specimen will be sent for X-ray examination, and a report will be made when further work has been done on the specimen.

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Thin Section M.1385

x 50.

Crossed nicols.

Acicular inclusions in quartz.

Note straight grain boundary at  
right.

Specimen No. M.1385

Pegmatitic Granite

Locality: High point on Curtis Island, Bass Strait.

Hand Specimen: Very coarse grained greyish-pink granite. The specimen consists largely of weathered pink orthoclase, with lesser plagioclase and grey quartz. The crystal size ranges up to one centimetre across. Occasional flakes of altered ferruginous mica are visible, but these form a very small percentage of the rock. The specimen is highly weathered and crumbling in places.

Thin Section: A coarse grained granite, probably representing the end-product of the differentiation of a magma. It consists of quartz, orthoclase and plagioclase; ferromagnesian minerals are absent from the thin section. The minerals show a greater tendency to form euhedral crystals than a normal granite. These factors suggest a slow crystallization under aqueous, fairly low temperature conditions similar to those under which pegmatites are believed to form.

Although not present in the thin section, isolated crystals of biotite pseudomorphed by limonite occur sporadically. A crushed sample showed that all the biotite had been replaced, probably late in the cooling history of the rock. The flakes now consist of structureless orange-brown limonite containing very abundant small remnant crystals of zircon.

The thin section consists of approximately 45% quartz, 35% orthoclase, and 20% plagioclase.

Quartz occurs as large areas of intergrown subhedral, pegmatite-like crystals. Grain boundaries vary from slightly blurred and wavy to very sharp and straight, more generally the latter. Coarsely crystalline quartz often surrounds and is intergrown with small feldspar crystals. Perthitic intergrowth of minor quartz with orthoclase is common, but these intergrowths are of small size.

The quartz is notable for the form and abundance of its inclusions. These occur as tiny needles, frequently quite long (0.4 mm) and gently curved. They are sufficiently abundant to cloud the quartz, and would be distinctive in any sediment derived from this granite. They do not occur in the "normal" granite on Curtis Island, represented by specimen M.1386, and the use of this unusual quartz as a marker will depend on the extent of the pegmatite phase of the granite.

Of less potential use is the abnormally high zircon content of the granite. The zircon inclusions are mostly very small, and occur principally in the quartz and biotite.

Orthoclase occurs as coarse-grained subhedral crystals up to 6 mm across, all heavily altered to clay. Perthitic intergrowth of orthoclase and plagioclase is common; orthoclase intergrown with quartz is less frequent.

Plagioclase forms about 20% of the rock, occurring as subhedral crystals averaging 1.0-1.5 mm across. The crystals are commonly albite twinned, and moderately altered to clay. The composition ranges from An 0 to An 18 (pure albite to sodic oligoclase), with a fairly even distribution over this range. The composition of the plagioclase intergrown with

orthoclase is more calcic and shows less variation, ranging from An 10 - An 18. A few crystals are partly altered to sericite; this appears to be deuteritic alteration.

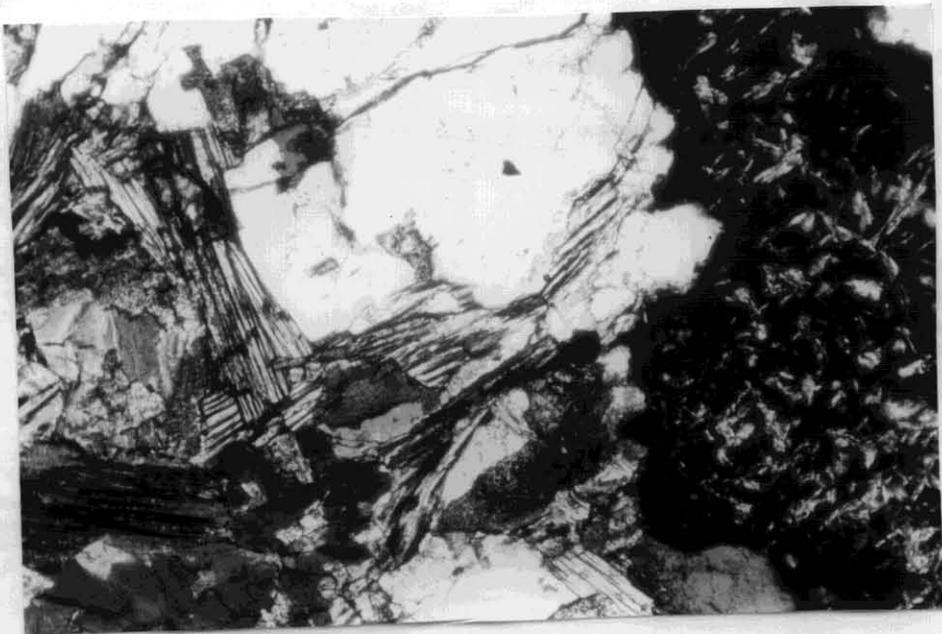
Weathering: Orthoclase is heavily altered to clay; plagioclase moderately altered, and quartz fresh.

Heavy Minerals: A crushed sample of this granite was separated with bromoform, and the following minerals were found in the concentrate:

- Zircon - in abundant euhedral crystals.
- Monazite - large crystals, some euhedral, most broken in the crushing of the sample. Pleochroic from neutral to very pale pink.
- Garnet - one pale pink anhedral grain.

The last two minerals are somewhat unusual and may be of possible use as markers.

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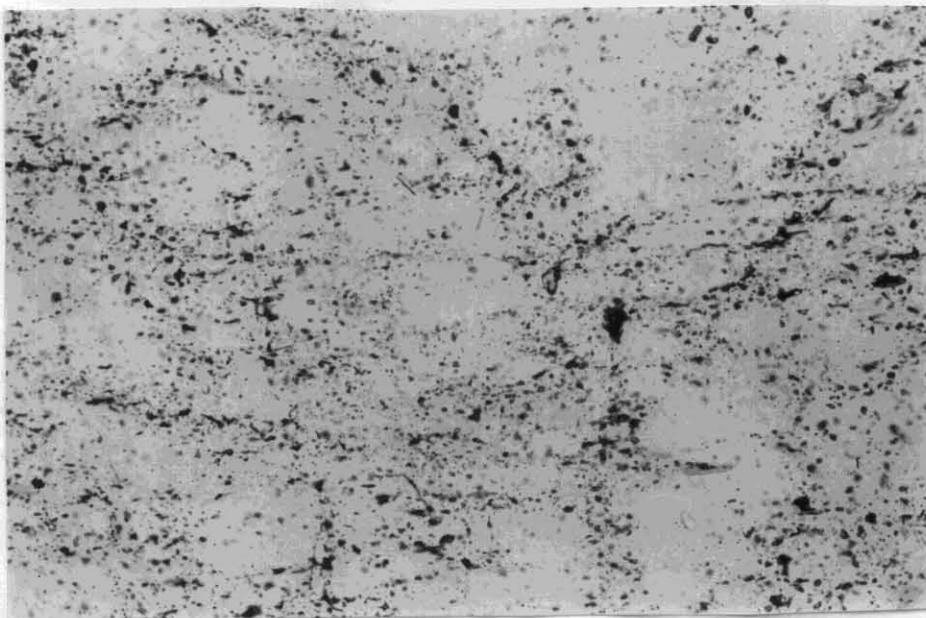


Thin Section M.1386B.

x 50.

Crossed nicols.

Granite. Quartz, muscovite, felspar  
(some partly altered to sericite, right).



Thin Section M.1386B.

x 150.

Crossed nicols.

"Normal" tiny globular inclusions in  
quartz.

Specimen No. M.1386.

Granite

Locality: South end of Curtis Island, Bass Strait.

Hand Specimen: Very coarsely crystalline granite consisting of grey quartz and white felspar, with lesser biotite. The rock is severely fractured, producing a brittle, crumbling fabric. This has assisted weathering, and the rock is heavily iron-stained in places.

Thin Section: A coarse grained granite consisting of quartz, orthoclase, plagioclase, muscovite, biotite, minor sericite, chlorite and two small xenoliths of ?pyroxene.

The specimen consists of approximately 50% coarse-grained subhedral to anhedral quartz, which is crossed by herringbone and irregular fractures. Streams and clouds of fine dusty inclusions are abundant. Under high power these inclusions are resolved as minute liquid-filled cavities, often containing a bubble of gas. The outlines of these cavities, particularly the largest ones (up to 0.04 mm) are highly irregular, suggesting their development under conditions of stress. These inclusions are quite different from the needlelike, randomly oriented inclusions of M.1385.

Weathered orthoclase, in anhedral and subhedral crystals up to 6 mm long, forms about 45% of the rock. The orthoclase, which is heavily altered to clay, is generally intergrown with ?microcline, plagioclase or quartz. In some crystals, optically continuous muscovite has replaced microcline, forming a network within the

orthoclase. In all crystals with this perthitic intergrowth, orthoclase comprises about 80% of the grain, therefore the relative amounts of microcline and plagioclase are difficult to assess. Microcline occurs only in this intergrowth, and because of the small size of individual areas of the mineral, its identification is a little uncertain.

Orthoclase also occurs as smaller homogeneous crystals, often altered to bladed crystals of sericite oriented along the cleavages. Carlsbad and diagonal Baveno twinning occurs in some crystals.

Plagioclase in distinct crystals of albite-oligoclase forms less than 5% of the rock. The prismatic crystals never exceed 2 mm in length, and are moderately to heavily altered to clay and sericite. A larger but unknown amount of plagioclase occurs in the perthitic intergrowths, but the total would appear to be less than 15%.

Primary muscovite and biotite together form about 5% of the rock. They occur as flakey, often slightly deformed crystals up to 3 mm long. The biotite is in all stages of alteration to chlorite and secondary muscovite. The primary muscovite, which is fresh, often occurs in partial intergrowth with late formed quartz.

Minor constituents include: Minor zircon crystals in the quartz. Grains of black iron oxide are present in extremely small numbers. Traces of limonite occur along numerous weathering cracks.

Two small ?xenoliths of ?pyroxene rimmed with muscovite are present. The crystals have a characteristic pyroxene cleavage; the birefringence on a basal section showed low first order colours; and an interference figure could not be obtained. The identification therefore could not be confirmed.

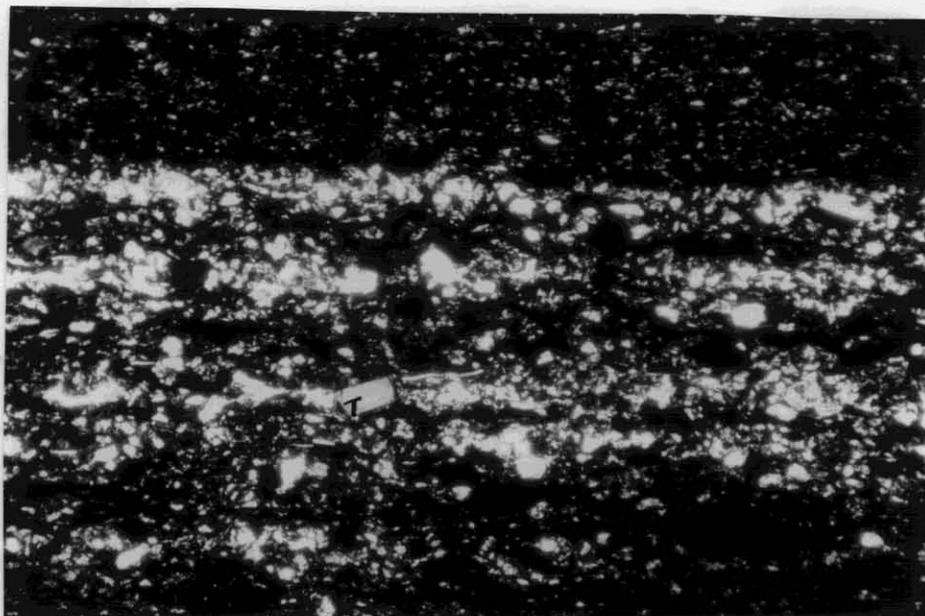
Weathering has severely altered the orthoclase but has had relatively little effect on other minerals.

The thin section reveals no distinctive features or minerals which could serve as markers in any sediment derived from this granite. However, a separation of the heavy minerals in bromoform produced several crystals of the aluminium silicate dumortierite. The rarity of this mineral may make it of some use as a marker, but when fine grained it is very difficult to distinguish it from blue tourmaline.

Heavy Minerals:

- Zircon: small crystals.
- Tourmaline: moderately abundant crystals, pleochroic from clear to greenish brown.
- Dumortierite: (HB Al<sub>8</sub> Si<sub>3</sub> O<sub>20</sub>) - several broken crystals, pleochroic from almost clear to dark blue.

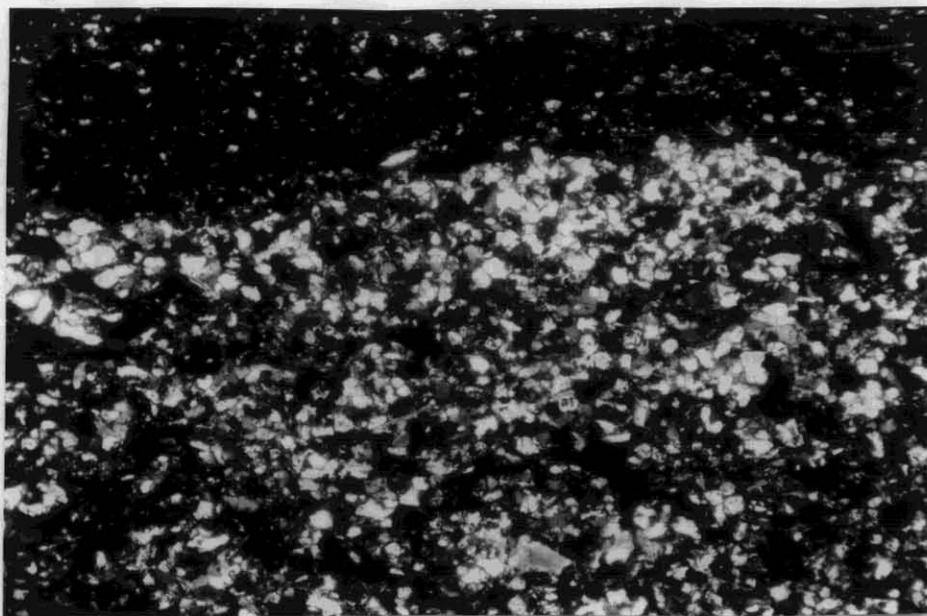
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Thin Section M.1403A.

x 50.

Quartz-rich bands, with grains of tourmaline,  
in dark carbonaceous material.



Thin Section M.1403A.

x 50.

Crossed nicols.  
Texture of a quartzose lens.

Specimen No. M.1403.

Banded Carbonaceous Siltstone

Locality: Bass No.1 Well, 7717'.

Hand Specimen: A dark, very fine grained banded sediment. The dominant bands are dark grey and up to 1 cm wide, with thin bands and regular lenses of white quartzose material. The latter bands average 0.5 mm across, but the lenses are up to 1.5 mm across. The bedding is very regular, with only very minor undulations to accommodate the thin quartz lenses. A shaly cleavage shows tiny micaceous flakes in the carbonaceous bands; one band contains a thin film of dull black coal.

Thin Section: A banded, very fine grained siltstone consisting of dark carbonaceous rich bands, and white coarser grained quartzitic bands and lenses. The grain size is extremely fine, averaging 0.02 mm - 0.04 mm for the quartz in the carbonaceous bands, and 0.05 mm - 0.08 mm for the quartz-rich bands.

Carbonaceous bands form the bulk of the rock. They are composed of very fine grained quartz, abundant streaky brown organic material, minute shreds of muscovite, and numerous spores and/or pollen grains. The quartz is even grained but highly angular, possibly due to its very small size. The cementing network of dark organic material may mask the presence of clay minerals. The spores are conspicuous, ranging in length from 0.02 - 0.1 mm, and in colour from orange-yellow to deep red. A few show some suggestion of colour zoning; and many spores are slightly deformed by compaction.

The quartzose bands are composed of angular quartz with blurred recrystallized boundaries. Small grains of greenish brown tourmaline are fairly common. Patches of fine dusty clay-like material occur in places. Most bands are highly regular, but a few grade laterally into carbonaceous material.

Heavy Minerals: The concentrate was contaminated with much organic material. The only heavy minerals detected were:

- Tourmaline - angular and euhedral crystals; very fine grained; pleochroic from colourless to greenish brown. Fairly abundant.
- Zircon - as moderately well rounded grains; and as euhedral crystals, with a brownish colouring. Two different sources probable. Both types fine grained.

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