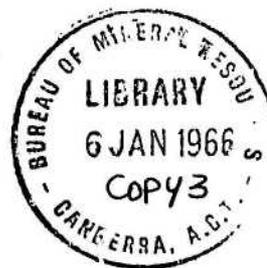


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COMMONWEALTH OF AUSTRALIA



DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS

RECORDS:

004740

1965/215

PETROGRAPHIC NOTES ON BOWEN BASIN SHALLOW HOLES DRILLED IN 1963.

by

M. Arman

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1. INTRODUCTION

This report deals with the petrography of rocks encountered in 31 shallow holes drilled during October 1963 in the Bowen Basin for the Bureau of Mineral Resources. These were located in the Springsure, Baralaba, Taroom and Mundubbera 1:250,000 Sheet area,* Queensland (Fig.1)

Comparisons were made between the subsurface samples and any available surface samples from nearby areas. In some cases, fairly confident correlations of the subsurface units with outcrop formations had already been made; in other cases correlations were only tentative. In the areas under consideration no outcrop samples were available for the Ducabrook Formation, Lower Bowen Volcanics, Upper Bowen Coal Measures and Bandanna Formation.

Altogether 87 thin sections were prepared from the subsurface samples. These were cut from the cores, and from mounted cuttings picked from certain intervals as being representative of the predominant or significant rock types. The outcrop samples used in the comparison include more than 80 thin sections, which were previously described, for the most part, by L.V. Bastian. Rock names are based on the classification and nomenclature of sedimentary rocks by Pettijohn (1957), with the exception of those subgreywackes rich in reworked volcanic detritus, which have been called volcanic sandstones. A class having less than 25% labile constituents and from 15 to 75% detrital clay matrix is here called "argillaceous sandstone".

The lithologies in the drill holes are described first, followed by comparisons of the lithological units. In describing the general lithology of the subsurface units, references were made to the preliminary report by Malone (1963) and to the detailed binocular studies given in the appendices to the reports by Mollan et.al (1964), Olgers et.al. (1964) and Jensen et.al. (1964). Tables of the textures and mineral compositions of the thin sections are appended.

2. PETROGRAPHY

B.M.R. Springsure No.1 (Depth: 145 feet)

The main rock types encountered in this hole are brown to yellow-green sandstone down to 100 feet and mainly dark grey carbonaceous mudstone in the rest of the section. They are thought to be from the lower part of the Peawaddy Formation.

* Hereafter the 1:250,000 Sheet names appear in capital letters.

The three samples thin sectioned are feldspathic greywacke (from cuttings between 40 and 45 feet) and argillaceous sandstones (from 60 to 67 feet and 130 to 140 feet). They are fine-to medium-grained, and poorly to fairly well sorted. The grains are mostly subangular and of moderate sphericity; generally, they are finer and better sorted in the upper part than in the lower part of the hole.

The samples contain up to 35% quartz, about 25% illite and micaceous matrix and 15 to 25% kaolinite, which appears to be derived mainly from feldspar. The quartz generally has minor inclusions and slight to moderate undulose extinction; overgrowths were not seen. Unlike the kaolinite, which decreases upwards, the feldspars range from about 5 to 7% near the lower part of the hole to 15% near the top. They consist mainly of potash feldspar, with plagioclase comprising only up to 3% of the rocks. Some of the samples also contain chert clasts (up to 15%) and carbonaceous matter (up to 10%).

B.M.R. Springsure No.2 (Depth: 180 feet)

This hole was probably spudded in the Rewan Formation, and entered the underlying Bandanna Formation within the first 40 feet. The upper section contains weathered brown shale, siltstone and some fine-grained sandstone, whereas the underlying formation consists mainly of dark grey to black shale and siltstone with a number of light grey sandstone intercalations.

Five thin sections were prepared from samples of this hole. The one cut from 20 to 30 feet is a ferruginous subgreywacke, it is fine-to medium-grained, rather poorly sorted with angular to subangular grains of moderate sphericity. It is composed of about 10% each of quartz, feldspar, clay matrix, mainly intermediate volcanics, and 20% each of chert, shale and iron oxide cement.

The samples from 60 to 70 feet and 80 to 90 feet are volcanic sandstones, while one from 90 to 100 feet is a kaolinitic sandstone. They are mainly fine-grained, well sorted with angular to subrounded grains of low to moderate sphericity. The samples have about 15% quartz and 10 to 20% feldspars generally increasing downwards. (In all cases, potash feldspar is slightly predominant over plagioclase). Generally, about 15% kaolinite is present, while the proportion of chert appears to increase downwards from almost none to about 30%. Calcareous cement (25%) shale (10%) and mainly acid volcanics (15%) are present in the two upper samples.

The core samples from 176' to 176'6" are crystal-vitric tuff. They are coarse-to very coarse-grained, poorly sorted and grains are angular to rounded. The samples contain about the same amount of feldspar as those mentioned above (i.e. 15%), but more quartz (35%), common metaquartzite grains (15%), about 20% volcanic dust (partly altered to montmorillonite) and a few chert and shale fragments. Other minerals present are spherulitic chalcedony, zeolite(?), glauconite and epidote (Fig.2). The glauconite occurrence is in a most unusual setting.

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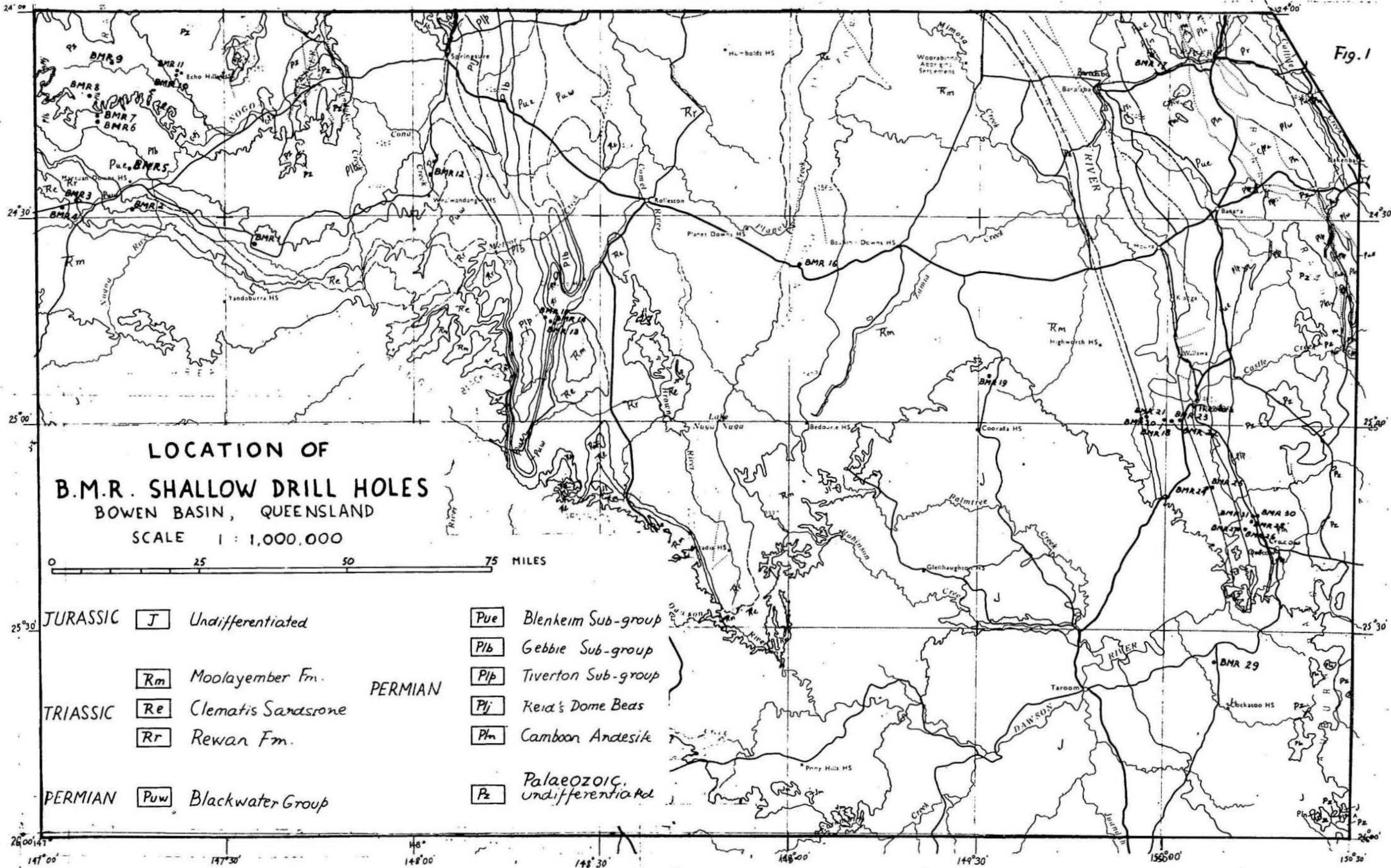




Fig.2. Field 2.2 mm. mag. x 51, ordinary light. Springsure No.2, 176'; crystal-vitric tuff, showing fragments of quartz, quartzite, feldspar (f), galuconite (g), and micaceous siltstone in a matrix of volcanic dust, partly altered to montmorillonite (m). BMR. neg F/4748.

B.M.R. Springsure No. 3 (Depth: 205 feet)

The top 90 feet of this hole probably were drilled in the Clematis Sandstone, whereas the rest, which consists mainly of greenish fine-grained sandstone and siltstone, is possibly equivalent to the Rewan Formation.

The two samples from the upper formation (from the intervals 30 to 40 feet and 70 to 80 feet) are fine- to medium-grained micaceous orthoquartzite; they are moderately sorted with angular to subangular grains of moderate to high sphericity. They have a fairly high content of quartz (65 to 75%) and little or no feldspar. The quartz shows, in general, little evidence of overgrowth, strain or inclusions, except in the sample from 30 to 40 feet interval, where moderate to abundant fluid inclusions are present. Clay matrix is common (15 to 20%), and consists mainly of illite and sericite. Also present is about 5% chert and devitrified glass, while the accessories include abundant tourmaline.

In contrast to the sandstone just described, the two samples from the unit below 90 feet (from the intervals 100 to 110 feet and 160 to 167 feet) were found to be fine- to medium-grained subgreywackes; they are fairly well sorted, with subangular to subrounded grains of low to moderate sphericity. The constituents include only 15% quartz, 5 to 10% feldspar (mostly potash feldspar), 15 to 20% chert and glass, 15 to 25% kaolinite and up to 35% shale and siltstone fragments.

B.M.R. Springsure No. 4 (Depth: 215 feet)

The section in this hole consists mainly of micaceous and carbonaceous siltstone and shale, and some fine-grained sandstone interbeds at the intervals 70 to 72 feet, 80 to 90 feet, 100 to 110 feet and 207 to 215 feet. It belongs mostly to the basal part of the Moolayember Formation, except for the last-mentioned interval, which may be part of the Clematis Sandstone.

Two thin sections were cut from the intervals 70 to 72 feet and 212 feet; they are calcareous sandstone and argillaceous sandstone respectively. They are both mainly fine-grained, well sorted, with angular to subangular grains of moderate to high sphericity. The sample from the upper interval contains 25% quartz, 7% feldspar, 45% calcite with features indicating replacement of detritus, and 10% chert. It is probable that this sample was a subgreywacke before replacement.

The other sample contains 60% quartz, less than 5% feldspar, 10% kaolinite, 5% shale and 20% clay (mainly illite) matrix.

B.M.R. Springsure No. 5 (Depth: 205 feet)

In this hole, the top 90 feet consists of black and dark grey shale, mudstone and tuff, probably of the Bandanna Formation, while the lower part, consisting mostly of fine- to medium-grained sandstone, belongs possibly to the upper part of the Peawaddy Formation.

The sample from 60 to 67 feet is a vitric tuff with some quartz grains and calcareous replacement. The three samples from the lower section, i.e., from the intervals 100 to 110 feet and 130 to 140 feet and from 141 feet are calcareous sandstones and volcanic sandstones. The sands are fine to medium-grained, moderately sorted; grains are subangular to subrounded and of moderate sphericity. They contain 25 to 35% quartz with little or no overgrowth, some inclusions and some strain. Other common constituents are feldspar (5 to 12%), kaolinite (about 20%), "chert" and devitrified volcanic glass (up to 10%), acid volcanics (about 15%) and calcareous cement and replacement (15 to 25%). The interval between 135 and 140 feet is part of the Mantuan Productus Beds; contains abundant remains of Productids

B.M.R. Springsure No.6 (Depth: 160 feet)

The section encountered in this hole belongs to the upper part of the Colinlea Sandstone, and consists mainly of fine-to medium-grained sandstone with some intercalations of pebbly sandstone and siltstone below 100 feet.

The samples from 20 to 30 feet and 80 to 90 feet are protoquartzites; they are fine to medium-grained, fairly well sorted, with mostly subangular grains of moderate sphericity. They have generally about 65% quartz and 10% meta-quartzite and ortho-quartzite grains. The quartz has a moderate amount of overgrowth, moderate to abundant fluid inclusions and some wavy extinction. Feldspar is virtually absent, but kaolinite ranges up to 10%. Also present are chert (about 10%) and shale and micaceous rock fragments (about 5%). The interval 100 to 120 feet contains a pebbly sandstone with pebbles of quartz and metaquartzite.

B.M.R. Springsure No.7 (Depth: 110 feet)

The section drilled probably corresponds to the basal part of the Colinlea Sandstone. The lithology includes very fine sandstone to coarse siltstone, and some shale and mudstone interbeds between 70 and 90 feet.

The samples from 90 to 100 feet and from 105 feet level are micaceous quartz sandstone and kaolinitic sandstone respectively. They are very fine to fine-grained fairly well sorted, and have subangular to subrounded grains of low to moderate sphericity. Quartz content ranges from 30 to 60%, but only minor amounts (up to 3%) of feldspar are present. Other common constituents include kaolinite probably of diagenetic origin (15 to 20%), chert, including devitrified volcanic glass (up to 20%) and calcareous cement and replacement (about 10%).

B.M.R. Springsure No.8 (Depth: 150 feet)

This section consists of dark grey shale and mudstone in the interval between 35 and 100 feet, and light grey sandstone below 100 feet. It corresponds to the upper part of the Joe Joe Formation.

A sample from 100 to 110 feet is a feldspathic greywacke; it is generally fine-grained, moderately sorted, with subangular to subrounded grains of low to moderate sphericity. The sample has a fairly low percentage of quartz (30%), but abundant feldspar - about 15% potash feldspar, and 10% plagioclase. The quartz has no overgrowth, minor wavy extinction and a moderate amount of fluid inclusions. Clay matrix, consisting mainly of sericite and illite, is plentiful (about 20%), while chert and shale fragments are common (10 and 15% respectively).

B.M.R. Springsure No.9 (Depth: 205 feet)

The section in this hole is thought to be equivalent to the lower part of the Joe Joe Formation. It includes fine-to medium-grained sandstone, some sandy siltstone and minor shale laminae.

A sample from 40 to 50 feet is a fine-grained arkose, while samples from 140 to 150 feet and 190 to 197 feet are medium-grained subgreywackes. These samples are poorly to moderately sorted, the grains are angular to subangular and of low to moderate sphericity. Quartz content ranges from 35 to 40%, and metaquartzite and orthoquartzite grains range up to 10%. The quartz has little or no overgrowth, and amounts of inclusion or undulose extinction are generally minor. Feldspar are plentiful, ranging from about 12% in the subgreywackes to 20% in the arkose. In all cases, potash feldspar is slightly in excess of plagioclase.

Other constituents include about 10% clay matrix (fine mica and illite), 5 to 15% shale and micaceous rock fragments (?metamorphics); 10% chert, and volcanics, mainly of acid types, varying from about 10% in the subgreywacke to a trace only in the arkose.

B.M.R. Springsure No.10 (Depth: 40 feet)

The sediments in this hole are brown, slightly weathered fine-grained sandstone and siltstone, with some grey and reddish brown mudstone in the 30 to 40 feet interval. They are considered to correspond to the upper part of the Ducabrook Formation.

The sample from 30 to 40 feet is a fine-grained, well sorted subgreywacke, with subangular to subrounded grains of moderate sphericity. It has about 25% quartz, 10% metaquartzite and orthoquartzite, and about 12% feldspar, with similar amounts of potash feldspar and plagioclase. Other constituents include up to 25% shale and schist, about 10% chert and up to 10% acid to intermediate volcanics. Some clay matrix and kaolinite clumps are also present (about 5% each).

B.M.R. Springsure No.11 (Depth: 140 feet)

As in hole B.M.R. No.10, this section belongs to the upper part of the Ducabrook Formation. It consists mainly of fine-to medium-grained sandstone, with some minor reddish-brown siltstone and mudstone.

The samples from 30 to 40 feet, 90 to 100 feet and 120 to 130 feet are subgreywackes while the sample from 50 to 60 feet is a volcanic sandstone. The subgreywackes are in general fine-to medium-grained, fairly well sorted, and have subangular to subrounded grains of moderate sphericity. The volcanic sandstone is fine-grained, rather poorly sorted and has subangular grains of fairly low sphericity.

The subgreywackes contain 20 to 25% quartz, about 10% metaquartzite and orthoquartzite, and feldspars ranging from 10% for the upper sample to 20% for the lower one. The main constituents are shale (up to 20%), chert (up to 15%) and mainly acid volcanics (up to 15%). The volcanic sandstone, on the other hand, contains about 15% each of quartz, feldspar and iron oxide cement, 10% shale, but pumice is abundant (25%) and andesite and rhyolite is common (10%). This distinctive mineral assemblage suggests a predominantly volcanic source; the poor rounding of the grains suggests that this source was nearby.

B.M.R. Springsure No.12 (Depth: 80 feet)

In this hole, the section consists mainly of white to buff, fine-to medium-grained sandstone with mudstone intercalations in the 40 to 50 feet interval. These sediments are thought to be equivalent to the lower part of the Bandanna Formation.

The sample from 55 to 60 feet is medium-to coarse-grained, moderately sorted arkose; with angular to subangular grains of moderate sphericity. It contains about 35% quartz showing moderate overgrowth and strain. Feldspars, mostly potash feldspar, are plentiful (about 20%); chert (or ?devitrified glass) is also plentiful (20%) while shale and volcanics are common (15 and 5% respectively).

B.M.R. Springsure No.13 (Depth: 250 feet)

The sediments in this hole are mostly light grey, fine-grained sandstone with interbeds of dark grey siltstone and shale. They probably represent the upper part of the Peawaddy Formation.

The samples are medium-grained calcareous subgreywacke (from 20 to 30 feet), very fine-grained and medium-grained kaolinitic volcanic sandstone (40 to 50 feet and 150 to 160 feet) and fine-grained lithic greywacke (170 to 180 feet). They are poorly to fairly well sorted; grains are angular to subangular and of low to moderate sphericity. Quartz content increases upward from about 15% in the lowermost sample to 30% in the uppermost sample. The quartz has little or no overgrowth, minor inclusions and minor to moderate strain. Feldspar content appears to be fairly constant at about 15% throughout the section, although the plagioclase to potash feldspar ratio increases upwards. (Feldspars appear to have suffered strong replacement of calcite in the sample from 20 to 30 feet. Other common constituents are kaolinite (15 to 25%), chert (up to 10%) and acid to intermediate volcanics, which decreases upwards from 25 to 10%. The kaolinite is mostly an alteration product of feldspar.

B.M.R. Springsure No.14 (Depth: 230 feet)

This hole, spudded in the lower part of the Peawaddy Formation, encountered black carbonaceous and sandy shale, from 130 to 170 feet, separating two lithologically distinct units. Glauconite (10%) was found in the sample from 160 to 170 feet. (Fig.3).

The two samples from below the shale interval are very fine-grained protoquartzite, with quartz content ranging from 55 to 60%. They are fairly well sorted and the grains are angular to subangular.

The samples from above the shale, i.e. from 50 to 60 feet, 100 to 110 feet, 110 to 120 feet and 160 to 170 feet are respectively volcanic sandstone, argillaceous sandstone, calcareous subgreywacke and argillaceous sandstone; all contain only 15 to 20% quartz and are only poorly to moderately sorted. Further, the upper specimens contain more kaolinite (by 10 to 20%), and, generally, an appreciable amount of "chert" (10 to 25%) and calcareous cement (about 10%), both of which were rarely seen in the lower section. This mineralogical difference between the upper and lower units is very similar to that between the Peawaddy Formation and the Catherine Sandstone in Warrinilla North No.1 (Arman, 1964). It is probable, therefore, that the sandstone below the 170 feet level is part of the Catherine Sandstone.

B.M.R. Springsure No.15 (Depth: 250 feet)

The section penetrated is probably equivalent to the top part of the Ingelara Formation. It consists mainly of micaceous and carbonaceous siltstone and mudstone with a few fine-to medium-grained sandstone intercalations in the intervals 20 to 30 feet, 40 to 50 feet, 160 to 170 feet and 240 to 250 feet.

The sample from 20 to 30 feet is an argillaceous sandstone, while those from the other three intervals are micaceous, carbonaceous sandstone. They are generally fine grained moderately sorted (except in the lowermost sample, which is bimodal) and have subangular to subrounded grains of low to moderate sphericity. The quartz and feldspar contents both increase upwards; the former from 35 to 50% and the latter from 5 to 10%. Other constituents include clay matrix (10 to 20%) black carbonaceous matter (10 to 20%), iron oxide cement (5 to 20%).

B.M.R. Baralaba No.16 (Depth: 200 feet)

Yellow-brown to buff medium-to coarse-grained sandstone thought to correspond to the basal part of the Clematis Sandstone occurs throughout this hole.

The samples from the intervals 40 to 60 feet and 100 to 110 feet are ferruginous and argillaceous sandstone, respectively. They are medium to coarse-grained, poorly sorted, having angular to subangular grains of moderate sphericity. Quartz, which comprises about 50% of the rock,

generally has no overgrowths or inclusions and is rarely strained. Feldspar is absent, but matrix, consisting of mixed clay aggregate is abundant; iron oxide cement and staining are common (20 to 25%).

B.M.R. Baralaba No.17 (Depth: 200 feet)

This hole spudded in Tertiary sediments, probably entered andesite, part of the Lower Bowen Volcanics, at the depth of 174 feet. The Tertiary sediments are mainly clay and weathered shale.

The sample from 20 to 30 feet is an argillaceous sandstone, containing about 20% medium-grained quartz and metaquartzite in a fine groundmass consisting of very low birefringence materials, possibly kaolinite. Two samples from 174 to 180 feet and from 190 to 200 feet are andesite containing about 70% plagioclase phenocrysts, mostly andesine but with some labradorite, and up to 20% altered pyroxene. The texture is ophitic with slender euhedral plagioclase laths 0.2 mm. to 0.3 mm. long and anhedral to subhedral pyroxene. The upper sample is more weathered, and many of the plagioclase laths are partly sericitized. Also present are ilmenite (about 10%) commonly as skeletal crystals, and amygdules filled with zealites and chalcedony.

B.M.R. Baralaba No.18 (Depth: 210 feet)

Clay and siltstone were encountered on the upper 50 feet of this hole and fine-to medium-grained sandstone elsewhere. This section is thought to be equivalent to the middle part of the Rewan Formation.

Of the six samples, from 40 to 50 feet, 50 to 60 feet, 90 to 100 feet, 130 to 140 feet, 170 to 180 feet and from 208 feet, the first four are subgreywackes and the last two lithic greywackes. They are generally fine-to medium-grained, moderately sorted, and have subangular to subrounded grains of moderate sphericity. These sediments contain 10 to 20% quartz, about 5% metaquartzite, 15 to 25% feldspar (mostly potash feldspar), 15% clay matrix, 15 to 20% chert and 15 to 30% shale fragments. Iron oxide cement comprises up to 25% of some of the rocks, while in the specimen from the 130 to 140 feet interval chlorites, and chloritized volcanics and shales occupy as much as 15%. Epidote and opaque detrital minerals are common accessories (Fig.4).

B.M.R. Baralaba No.19 (Depth: 130 feet)

The lithologies encountered in this hole include clay, dark grey shale, sandstone, and, towards the bottom, some cobble conglomerate. These sediments probably represent the uppermost part of the Moolayember Formation.

Samples from the intervals 70 to 80 feet and 110 to 115 feet are calcareous argillaceous sandstone and subgreywacke, respectively. They are fine to medium-grained generally moderately sorted, with subrounded to angular grains of moderate to high sphericity. The samples contain 10 to 15% quartz, about 15% feldspar (mostly potash feldspar), 10 to 20% kaolinite and illite matrix, 10 to 20% chert and devitrified glass, up to 15% shale and up to 20% calcareous cement. A characteristic of the unit is the abundance of swollen (leached) micas, mainly biotite.

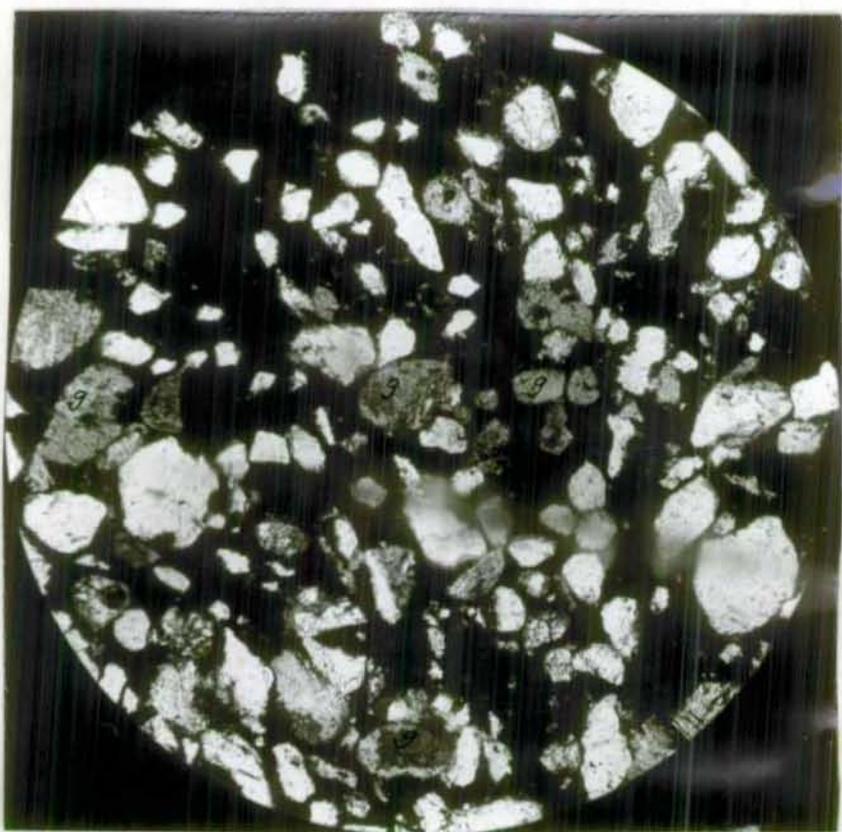


Fig. 3. 2.2 mm. mag. x 51, ordinary light. Springsure No. 14, 160'-170'; rather poorly sorted argillaceous sandstone, with grains of quartz, glauconite (g) and feldspar set in a richly carbonaceous clay matrix. Glauconite constitutes about 10% of the rock. BMR. neg. F/4749.

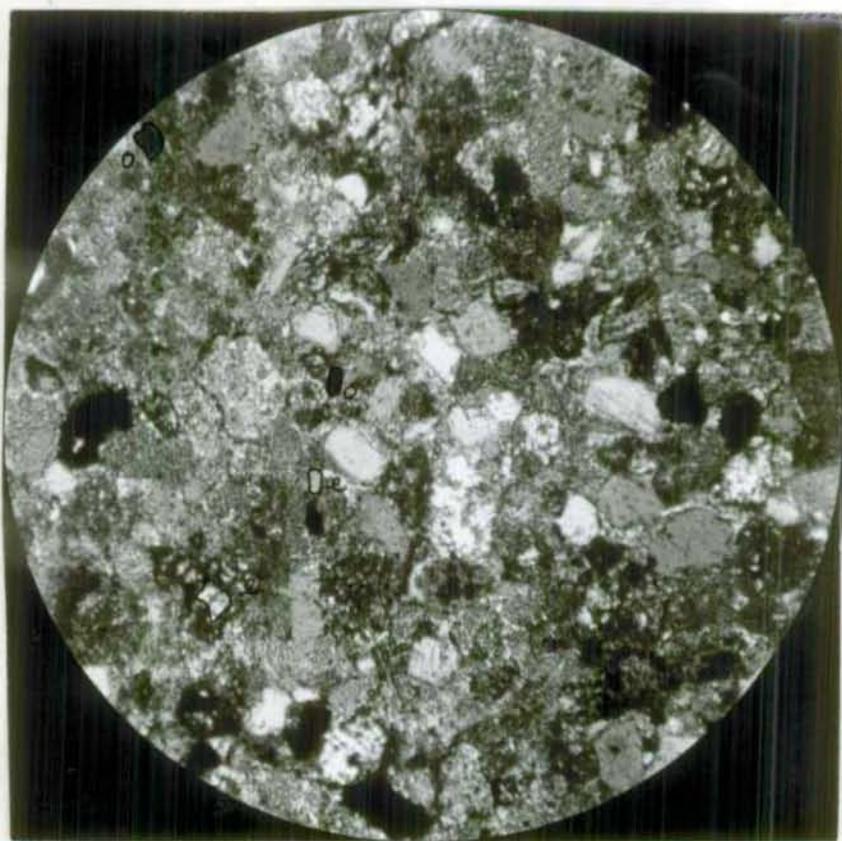


Fig. 4 Field 1.9 mm, mag. x 59, crossed nicols. Baralaba No. 18, 50' - 60'; subgreywacke, showing quartz, feldspar and lithic fragments, consisting of shale, schist and acid volcanics. Also shown are iron ores (o) and epidote (e). BMR neg. F/4750.

B.M.R. Baralaba No.20 (Depth: 90 feet)

In this hole, the sediments are mainly medium - to coarse-grained sandstone, with some intercalations of dark blue-grey mudstone between 50 and 80 feet. They are considered to be part of the Clematis Sandstone.

The core from 85 feet is fine to coarse-grained kaolinitic poorly sorted, sandstone having angular to subangular grains with moderate sphericity. The sample consists of about 35% quartz, 15% "chert" and devitrified volcanic glass, at least 15% potash feldspar, and 20% kaolinite matrix, probably diagenetic. The quartz has minor overgrowth and strain, and has virtually no inclusions. Also present are some reworked volcanics and siderite cement, in part replacing detrital grains.

B.M.R. Baralaba No.21 (Depth: 110 feet)

The section in this hole belongs probably to the top part of the Rewan Formation, and consists mostly of fine - to medium-grained sandstone. Water was struck at 35 feet, and no samples were available for the interval between 35 and 100 feet. The following description is based on the samples taken from 30 to 35 feet and 102 feet.

The upper sample is a calcareous subgreywacke, while the lower is an argillaceous sandstone. They are fine to medium-grained, rather poorly sorted and have angular to subangular grains of moderate to low sphericity. (In the lower sample elongated grains are predominant). The samples contain 25 to 30% quartz, 5 to 10% feldspar (mostly potash feldspar) 10 to 15% chert, 10 to 30% calcareous and ferruginous cement, 5 to 15% micaceous rock fragments and up to 20% clay matrix, mostly in the lower sample.

B.M.R. Baralaba No.22 (Depth: 230 feet)

The sediments encountered in this hole are fine - to medium-grained sandstone, with red-brown to dark grey shale interbeds mainly in the intervals 20 to 30 feet, 70 to 110 feet, 120 to 150 feet, 160 to 170 feet, 190 to 210 feet and 220 to 230 feet. This section is equated with the middle part of the Rewan Formation.

The samples from 20 to 30 feet and 70 to 80 feet are sandy to silty claystones, while those from 40 to 50 feet and 170 to 180 feet are subgreywackes. The subgreywackes are fine to medium-grained, moderately sorted, and have subangular to subrounded grains with low to moderate sphericity. They consist of about 5% quartz, 15% feldspar (mostly potash feldspar), 15% chert and devitrified glass, 25 to 30% red shale and claystone, 10% clay matrix, up to 15% acid to intermediate volcanics. Abundant epidote and detrital opaque minerals are present as accessories. The claystone samples, on the other hand, have 10 to 20% quartz and up to 75% mixed clay aggregates which are partly ferruginized.

B.M.R. Baralaba No.23 (Depth: 130 feet)

This hole, drilled in the lower part of the Rewan Formation, encountered mainly chocolate brown shale and mudstone, with some intercalations of fine-to medium-grained sandstone in the intervals 80 to 90 feet and 110 to 130 feet.

The samples from 80 to 90 feet and 110 to 120 feet are fine-to medium-grained subgreywackes, while that from 128 feet is a medium-grained calcareous volcanic sandstone. These sediments are generally moderately sorted and the grains range from angular to subrounded and have moderate sphericity; rounding is more pronounced in the deepest sample. The subgreywackes contain about 10% quartz, 5% metaquartzite, 15% feldspar (mostly potash feldspar), and 15 to 25% chert and devitrified glass. Also present are 20 to 30% shale, 10 to 15% of matrix clay aggregate, and, in the sample from 80 to 90 feet 10% acid and intermediate volcanics.

The calcareous volcanic sandstone, on the other hand, consists of 10% quartz, 5% metaquartzite, 10% feldspar (mostly potash feldspar), 10% "chert" and devitrified glass, 20% acid and intermediate volcanics, 15% shale and siltstone and 25% calcite cement and replacement. As in the previous hole, epidote and opaque detrital minerals are common accessories.

B.M.R. Taroom No.24 (Depth: 85 feet)

The section encountered in this hole consists mostly of chocolate-brown to greenish black mudstone, with some medium-grained sandstone intercalations mainly in the intervals 5 to 30 feet and 70 to 80 feet. It is equivalent to the basal part of the Rewan Formation.

The samples from 20 to 30 feet and 70 to 80 feet are fine-to medium-grained, fairly well sorted, volcanic sandstone, having subangular to rounded grains with moderate sphericity. They contain about 5% quartz and 10% feldspar, the latter consisting of about equal amounts of potash feldspar and plagioclase (oligoclase to labradorite). The sample from the upper interval includes 20% andesite, 15% rhyolite, 10% chert and 28% calcite cement. The other sample contains 25% andesite and andesitic tuff and 30% "chert" and devitrified volcanic glass.

B.M.R. Taroom No.25 (Depth: 85 feet)

The lithology consists of volcanic pebble conglomerate and sandstone with some brown to dark mudstone mainly in 30 to 50 feet interval. The section is probably equivalent to the basal part of the Rewan Formation.

The samples from the intervals 20 to 30 feet, 40 to 50 feet, 50 to 60 feet and from 82 feet are all volcanic sandstones. The sample from 40 to 50 feet is fine-grained and moderately sorted, and the remainder are coarse-grained, rather poorly sorted, having subangular to rounded grains with moderate to high sphericity. They contain little or no quartz, up to 10% potash feldspar, about 5% kaolinite and abundant glass and rock fragments. The latter include 15 to 20% andesite, up to 25% rhyolite, 10 to 20% "chert" (probably groundmass material from siliceous volcanics such as rhyolite) and 5 to 10% shale.

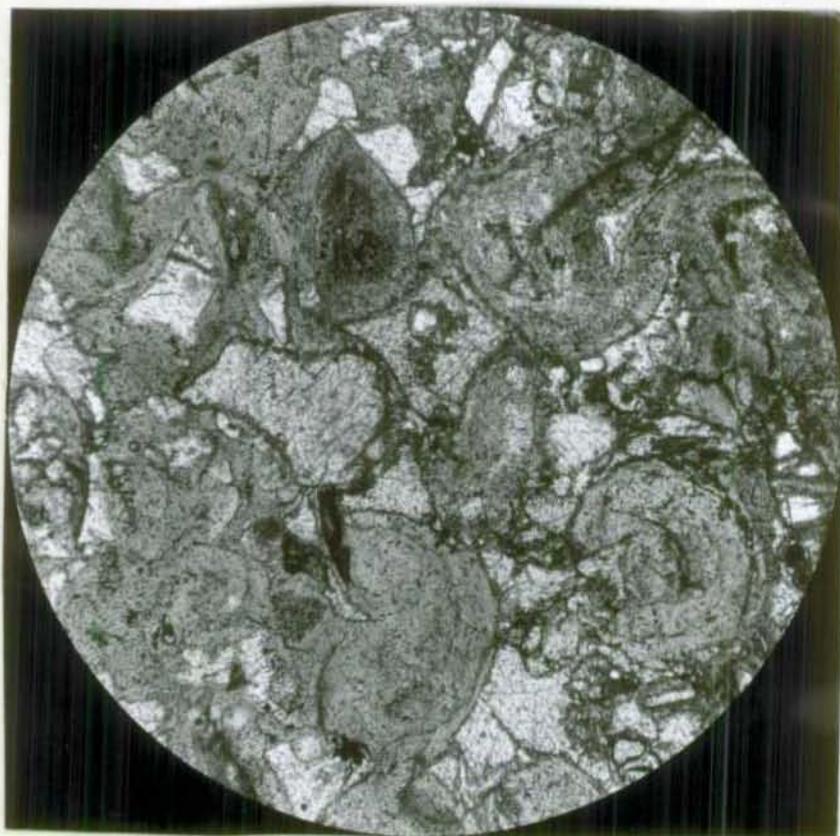


Fig.5 Field 1.8 mm. mag. X62, ordinary light. Taroom No.29, 70' - 80'; chamositic oolite rock showing broken and rejoined oolites and vague concentric texture. The cement is siderite which has partly replaced some of the oolites. Darker zones may suggest partial oxidation. BMR neg. F/4558.

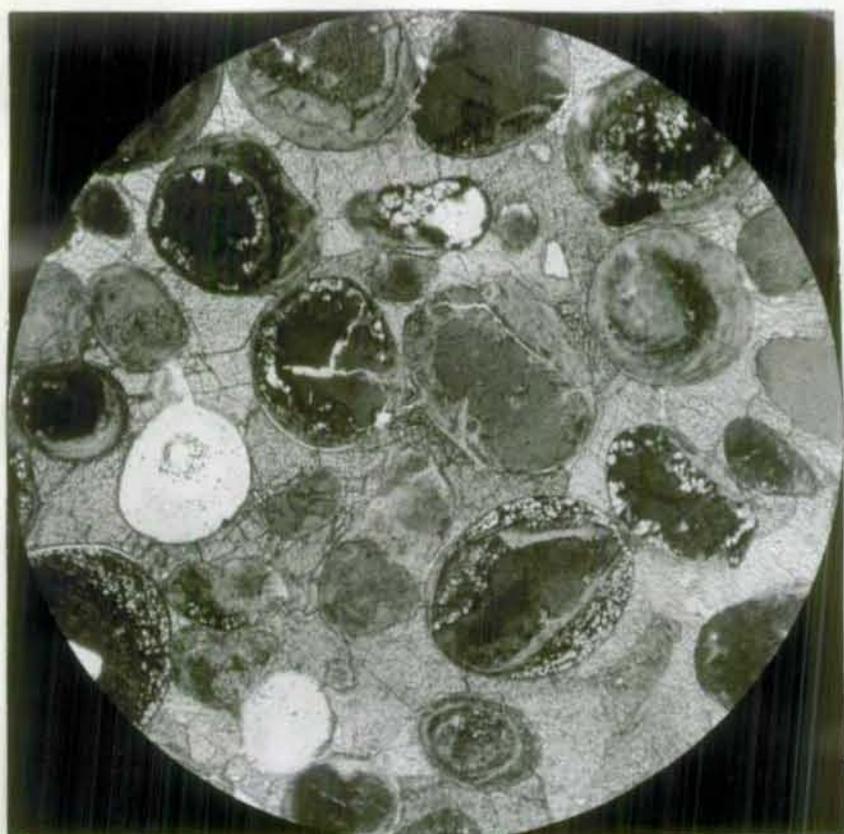


Fig. 6 Field 2.0 mm. mag. x 56 ordinary light. Taroom No. 29 80' - 90'; chamositic oolite rock with siderite cement. Some oolites consist almost entirely of chamosite - others have brownish structureless cores and coatings rich in quartz silt, often with well developed concentric texture. BMR. neg. F14563.

Most samples contain 5 to 15% calcite replacements; the sample from 20 to 30 feet has up to 40% calcite. There is also 5 to 10% iron oxide cement in some specimens.

B.M.R. Taroom No.26 (Depth: 80 feet)

The section in this hole belongs to the upper part of the Flat Top Formation, and consists of clay, mudstone and tuff.

Two samples of vitric tuff from the intervals 30 to 40 feet and 70 to 80 feet contain about 60% glass and devitrified glass, 5% quartz and about the same amount of feldspar. Both quartz and feldspar grains range up to 0.08 mm. and are, in some cases, difficult to distinguish from the groundmass because of the recrystallization of the glass. Shards are hard to detect in these rocks because the groundmass of sediments of this Flat Top Formation is characteristically fine volcanic "dust". Also present in the samples are 10% illite and sericite (probably diagenetic), and 15% iron oxide resulting from weathering.

B.M.R. Taroom No.27 (Depth: 60 feet)

This hole was drilled entirely in soft, clayey Tertiary sediments and no thin sections of cuttings were made.

B.M.R. Taroom No.28 (Depth: 105 feet)

The sections in this hole is equivalent to the middle part of the Barfield Formation, and consists of mudstone and siltstone.

Samples from 40 to 50 feet and 70 to 80 feet are volcanic siltstone and calcareous siltstone respectively. The grains are generally of coarse silt size, moderately sorted, subangular to subrounded, and of moderate sphericity. The samples consist of 10 to 15% quartz, 5 to 10% feldspar, mostly potash, and 10 to 15% clay matrix. The volcanic-rich siltstone has about 40% volcanic "dust", while the calcareous siltstone contains 20% calcareous replacements.

B.M.R. Taroom No.29 (Depth: 145 feet)

This hole spudded in the Boxvale Sandstone, and cores were cut above and below the "oolite horizon". The lithology includes mudstone and siltstone, and some fine-to medium-grained sandstone from 140 to 145 feet.

Beds of oolitic chamosite occur in the 70 to 90 feet interval. The oolites, which comprise from 55 to 75% of the samples, range from 0.1 to 0.7 mm. in diameter and range from light green to brown and dark brown in colour. In the specimen from 70 to 80 feet there is some evidence of brecciation and recementation by siderite, while in the sample from 80 to 90 feet some of the oolites contain nuclei or coatings of quartzose silt.

The sample from 20 to 30 feet is a clayey siltstone and contains about 15% quartz, a few grains of feldspar, 35% chert and divitrified glass, 30% clay (mainly illitic matrix and about 20% shale and schist fragments). The sample from 90 to 100 feet below the oolite horizon is a calcareous sandstone having about 10% quartz, 7% feldspar (mostly potash feldspar), 20% chert, some kaolinite and 45% calcareous cement and replacements. In both, the 20 to 30 feet and the 90 to 100 feet samples, the grains are fairly well sorted, angular to subangular and of low to moderate sphericity.

B.M.R. Taroom Nos. 30 and 31 Depths 82 and 85 feet)

These holes encountered similar lithologies, considered to belong to the lower part of the Barfield Formation. This lithology consists mainly of mudstone, with some sandy soil at the top of the section. The two thin sections prepared from B.M.R. No. 30 (from 25 to 40 feet, and 80 feet) are sandy mudstone and cherty mudstone, respectively. The former consists mainly of clay aggregate and some fine sand-sized quartz and feldspar grains. Also present are a few grains of chert and andesite, some calcite replacements and a number of reworked shale fragments ranging up to 1.5 mm. in size. The shale fragments may have been derived from penecontemporaneous deposits. The other sample contains about 40% clay aggregate and 25% "chert" (probably siliceous volcanic dust) with patches of calcite and carbonaceous matter (about 15% each) and a few silt-sized grains of quartz.

A sample from 84 feet in B.M.R. No. 31 is also a cherty mudstone, having very similar composition and texture to the lower sample in the B.M.R. No. 30.

3. Lithological Correlations

Joe Joe Formation

The lithologies in the holes B.M.R. Springsure Nos. 8 and 9 near the northwest corner of SPRINGSURE were compared with those of certain outcrop samples from near the top of the Joe Joe Formation. These samples, S.P.126/Ic-If and S.P. 127/lB-lH were collected from measured sections S6, a few miles east of the holes (see Mollan et.al. 1964, for details of the measured sections).

It was found that both the subsurface and outcrop sections contain intercalations of mudstone, siltstone and sandstone. A comparison of the sandy and silty portions of the two suites shows that the subsurface samples have slightly higher percentages of quartz and feldspar and less shaly and micaceous rock fragments (by about 10%). The subsurface samples appear to be slightly coarser, relatively more poorly sorted and, generally, the grains have lower sphericity than those of the outcrop samples.

However, there is a tendency for the grainsize to increase downwards in both the subsurface and the outcrop sections. Furthermore, the samples from the lower parts of both suites contain up to 15% volcanics and tuff, which are virtually absent in the upper parts. The wide variety of lithic fragments found in both groups, the presence of crushed material or "rock flour", and poor sorting (especially in the subsurface samples) appear to indicate a fluvio-glacial origin of this formation.

It may be concluded that the outcrop section and the units encountered in the holes B.M.R. Nos. 8 and 9 compare well lithologically. The differences in their composition and texture are only slight, and are within the expected range of variability.

Colinlea Sandstone

A comparison was made between certain outcrop samples of the Colinlea Sandstone (specimens SP124/1-4b, SP125/1A-1C and SP126/1A-1B - all from section S6) and the units in the holes B.M.R. Springsure Nos. 6 and 7 situated within the area of the outcrop.

In both suites the sequence consists mainly of fine-grained sandstone with interbeds of siltstone and rounded pebbles of sandstones, metaquartzite and rhyolite. Thin sections of the samples show that the lithology of the subsurface sections is closest to that of the lower part of the outcrop section. They are similar in many features - fine to medium grain size, fairly good sorting subangularity and moderate sphericity. Further, the quartz content is up to 60% or higher; up to 10% meta and orthoquartzite is present but there is little or no feldspar. Kaolinite matrix and chert fragments are common in both suites - about 10 to 15% each. This is not entirely consistent with the findings of Bastian (1965) who noted feldspar in samples from near the top of the Colinlea Sandstone in the same area.

Ingelara Formation

The section in B.M.R. Springsure No.15 was compared with the outcrop of Ingelara Formation in measured section S15, about 25 miles north-north-west of this hole.

Samples from both outcrop and subsurface consist dominantly of micaceous or carbonaceous siltstone and shale with some thin interbeds of fine-grained sandstone. Thin sections of the more sandy samples show that both suites consist of about 40% quartz, 5 to 10% feldspar (mostly potash feldspar), 10 to 20% clay matrix and iron oxide cement. The subsurface samples appear to have more carbonaceous matter, to be finer grained and somewhat better sorted than the outcrop material (except for the lowermost subsurface sample, which is poorly sorted.)

Peawaddy Formation

The material from B.M.R. Springsure Nos.13 and 14, thought to be equivalent to the upper and lower parts of the Peawaddy Formation respectively, was compared with the relevant samples of outcrops of the Peawaddy Formation at measured sections S23 and S24, about 2 and 10 miles, respectively, south of the holes. A comparison was also made between the subsurface material and the Peawaddy outcrop samples from measured sections S15 and S25, about 25 miles north-north-west of the holes. The detailed petrography of these outcrop samples has been described by Bastian (1964).

It was found that the outcrop samples of the lower part of the Peawaddy Formation (i.e. specimens SP470 a, b of section S23) differ to some extent from the specimens sampled

from the upper part of B.M.R. No.14. The latter appear to contain somewhat better rounded grains, more quartz (by up to 10%), more kaolinite (by about 15%), and less calcite cement and replacement (by more than 20%). It is probable that in part these differences may be attributed to more extensive replacement by calcite in the outcrop samples.

The outcrop samples from the upper part of the Peawaddy Formation (i.e., specimens SP471 and SP476a of sections S23 and S24 respectively) contain about the same proportions of quartz, feldspar and volcanics (both acid and intermediate) as in samples from B.M.R. No.13. On the other hand, the outcrop samples have less kaolinite (by 10%) and are generally better sorted than the subsurface samples.

Thus, on the whole the samples from B.M.R. Nos. 13 and 14 compare well with the outcrop samples of the upper and lower parts of the Peawaddy Formation. Generally, they all have a low percentage of quartz (up to 20%), plentiful feldspar (up to 20%) and relatively abundant volcanics and chert (from 20 to 35%).

Farther west on SPRINGSURE there seems to be less similarity between the samples from B.M.R. No.1 and an outcrop sample of the Peawaddy Formation from measured section S26, a few miles to the east. While both contain about the same amounts of clay matrix and shale fragments, the former have more quartz (by 10%), less feldspar (by up to 10%), less chert (by 20%) and more kaolinite (by 10%).

Barfield Formation

Samples from B.M.R. Taroom Nos.28, 30 and 31 (and also from certain parts of B.M.R. Mundubbera Nos.55 and 56 drilled in 1964 - see Appendix A) were compared with some outcrop samples of the Barfield Formation, especially with specimens T130c and T152a.

Both suites were found to have up to 10% quartz, between 15% and 40% "chert" and devitrified volcanic glass, and a high percentage (more than 25%) of clay and ferruginized clay matrix. The wide range in the percentages of chert and clay matrix probably result from differences in the extent of calcareous cementation and replacement, because the carbonates range from nil in one specimen to more than 50% in another. The two suites, therefore, appear to be essentially similar, inasmuch as they are carbonate-replaced clayey siltstone or cherty mudstone. Fossils were generally absent, except in some samples from the B.M.R. Mundubbera No.55, where molluscs, bryozoans and crinoids are abundant.

Flat Top Formation

Outcrop samples of the Flat Top Formation were compared with the samples from B.M.R. Taroom No.26, a few miles from the outcrop.

The rocks of both suites are vitric tuff, consisting of up to about 60% glass and devitrified glass, little or no quartz, 5 to 15% feldspar, with plagioclase predominating over potash feldspar, especially in the outcrop samples. However, while the outcrop samples contain up to 20% calcareous cement and replacement and no clay matrix, there is virtually no calcareous cement, but up to 25% clay matrix (probably diagenetic), in the subsurface samples. Further, sodic plagioclase constitutes most of the feldspar in the outcrop samples, whereas in the subsurface samples the feldspar consists of about equal amounts of potash feldspar and plagioclase.

It seems that samples from the two groups are essentially similar. The differences mentioned above, i.e., the presence of clay matrix and decrease in plagioclase relative to orthoclase in the subsurface samples may be attributed to reworking.

Rewan Formation

Outcrop of the Rewan Formation is generally poor on BARALABA. In the area under consideration, i.e. the south-east of BARALABA, only one outcrop sample suitable for thin section was available (taken at a locality about 2 miles east of the Glenmoral Gap).

A comparison between this sample and samples from B.M.R. Nos.18, 22 and 23 (but not with those from B.M.R. Nos. 24 and 25) shows a number of similarities. Both are subgreywackes, and contain up to 15% quartz, 10 to 20% feldspar, (about equal amounts of potash feldspar and plagioclase,) and up to 30% shale fragments. They are generally fine to medium-grained and fairly well sorted. However, the outcrop sample has less chert and devitrified glass (by about 10%), about 10% kaolinite, which is virtually absent from the subsurface samples, and rare epidote, which is a dominant accessory mineral in many subsurface samples. Probably these differences in the proportions of kaolinite and epidote are the result of weathering on the outcrop.

A comparison of samples from the various holes shows distinct vertical compositional trends in the lower part of the Rewan Formation (as seen in B.M.R. Nos.24 and 25), through the middle part (in B.M.R. Nos.18, 22 and 23) to the upper part (in B.M.R. No.21). Quartz content ranges from up to 5% in the lower part, to 10 to 15% in the middle part and to 25 to 30% in the upper part. On the other hand, the proportion of volcanics (acid and intermediate) decreases from an average of about 30% in the lower part, to 10 to 20% in the middle part and to vertically none in the upper part. Feldspar and shale reach maximum percentages in the middle part of the unit, but are relatively subordinate in both the lower and upper parts. Similarly, epidote and iron ore minerals are abundant in the middle part (up to 3 and 5% respectively), and are virtually absent in the lower and upper parts.

It seems that the sediments of the upper part of the formation, with a relatively high quartz percentage and low feldspar and lithic percentages, are more mature than those of both the lower and middle parts. While the latter are both rich in lithic fragments; the lower part has more volcanics than shale and other lithic fragments, whereas the middle part contains more shale than volcanics. Of the sediments in the middle part of the Rewan Formation, those in B.M.R. No.18 have more feldspar than those in B.M.R. Nos. 22 and 23 a few miles to the east.

Clematis Sandstone

The units in B.M.R. Nos.16 and 20 were compared with outcrop samples of the lower part of the Clematis Sandstone. These were collected from localities in the Expedition Range and Glenmarsh Gap, close to B.M.R. Nos.16 and 20 respectively. Both the Expedition Range samples and the samples from B.M.R. No.16 are medium to coarse-grained, relatively poorly sorted and contain 50 to 60% quartz, 10 to 20% clay and partly ferruginized clay matrix. Even closer similarities were found between the samples from B.M.R. No.20 and the outcrop specimens Ba 83A and Ba 83B from Glenmoral Gap. They consist mostly of medium - to coarse-grained, rather poorly sorted sandstone with about 35% quartz, 15% potash feldspar, 15 to 20% chert and volcanic glass and about 15% kaolinite matrix.

While both the subsurface and outcrop samples from Glenmoral Gap area contain up to 15% feldspar, those from near B.M.R. Baralaba No.16 (in the Expedition Range area) have virtually no feldspar. Further, outcrop samples of the Clematis Sandstone about 40 miles distant from B.M.R. No.16, i.e. those from measured section S29 to the west, and samples T225 and T227 to the south-west contained no feldspar. This difference in the feldspar content could be attributed to a feldspar source (? the Auburn Complex) close to the Glenmoral Gap localities. The predominant source for the unit in the Expedition Range may have been more distant, possibly the schists of the Anakie Metamorphics of the Anakie High. This suggestion is supported by the results of a study of cross-bedding in the Clematis Sandstone by Olgers et.al., (1964, page 17), which indicate an anomalous south-westerly current direction in the south-east corner of BARALABA, in contrast to a south-easterly direction farther west.

Moolayember Formation

Here the section in B.M.R. No.19 was compared with outcrop samples of the upper part of the Moolayember Formation, i.e. specimens Ba 548, Ba 557 and Ba 558.

The comparison shows a number of slight differences in lithologies. The subsurface samples have less quartz (by 10%), more feldspar (by 5%), more clay matrix (by 10%), and less calcite replacement. On the other hand, both suites contain similar amounts of chert and devitrified glass, and are generally fine to medium-grained and moderately well sorted. In some of the outcrop samples, there is also about 10% or more swollen (leached) micas; a characteristic of the subsurface samples. It is concluded that the two suites of samples compare fairly well lithologically.

A comparison was also made between the outcrop sample T230A of the basal part of the Moolayember Formation from near the Carnarvon Highway and the sample from B.M.R. No.4 in the western part of SPRINGSURE. The latter appears to be more mature, as it contains more quartz (by 10%), slightly less feldspar (by about 5%), and much less lithic fragments (by 25%).

Evergreen Formation

A comparison between samples from B.M.R. Taroom No.29 and nearby outcrop samples of the Evergreen Formation shows a number of similarities. They both contain horizons of oolitic and pelletal chamosite, in which oolites comprise between 60 and 75% of the rocks. Those of the outcrop samples, however, are finer and more ferruginized than those from the hole. Further, the oolites in the outcrop samples are less well developed; many of them are broken and recemented. This suggests disturbance at the time of development of the oolites.

The other samples of both suites consist of 10 to 20% quartz, trace to 20% feldspar, 20 to 45% chert, volcanic glass and volcanics, 5 to 20% shale and generally scant matrix. In both cases they are well sorted, grains are subangular to subrounded, and of fine sand to coarse silt size. Jensen et.al. (1964) place the oolitic horizons within the Evergreen Formation.

4. Conclusion

The correlation study suggests the following conclusions:

1. The petrography of samples from B.M.R. Springsure Nos. 8 and 9 is fairly similar to that of some samples of the Joe Joe Formation. The wide variety of lithic fragments found in both suites, the presence of crushed material or "rock flour", and the generally poor sorting, are consistent with a fluvio-glacial origin for this formation.
2. Samples from B.M.R. Springsure Nos.6 and 7 are generally similar lithologically to those of the Colinlea Sandstone outcrops, except that the subsurface samples contain little or no feldspar. This indicates that the feldspathic sands found near the top of the Colinlea Sandstone (Bastian, 1965) may be only minor intercalations in a unit which is in general feldspar-poor.
3. Samples from B.M.R. Springsure No.15 are somewhat better sorted than the outcrop material from the Ingelara Formation. However, the lowermost subsurface sample is poorly sorted and bimodal - a feature which seems to be characteristic of the outcrop material.
4. Generally, the samples from B.M.R. Springsure Nos.13 and 14 are similar to the outcrop samples of the upper and lower parts of the Peawaddy Formation, respectively. They have a low percentage of quartz (up to 20%), plentiful feldspar (up to 20%) and relatively abundant volcanics (from 20 to 35%). Kaolinite content increases northwards from generally a trace in the southern-most samples, to about 20% in the samples from B.M.R. Nos.13 and 14 and to as high as 80% in the outcrop samples farther north.

5. Samples from B.M.R. Taroom Nos. 28, 30 and 31 were found to be essentially similar to the outcrop samples of the Barfield Formation, inasmuch as they are carbonate-replaced clayey siltstone and cherty mudstone. Fossils were generally absent.
6. Outcrop samples of the Flat Top Formation were compared with the samples from B.M.R. Taroom No. 26. The rocks of both suites are vitric tuff, containing up to 60% glass and devitrified glass. Most of the feldspar in the outcrop samples is sodic plagioclase, whereas in the subsurface samples the feldspar consists of potash feldspar and plagioclase in approximately equal amounts. This difference and the relative abundance of clay matrix (probably diagenetic) in the subsurface samples may be attributed to reworking.
7. The study shows that the sediments of the upper part of the Rewan Formation (as seen in B.M.R. Baralaba No. 21), which contain a relatively high quartz percentage and low feldspar and lithic percentages, are more mature than those of the lower (in B.M.R. Taroom Nos. 24 and 25) and middle parts (in B.M.R. Baralaba Nos. 18, 22 and 23). Feldspar and shale fragments are most common in the middle part, whereas volcanics are predominant in the lower part.
8. Both the subsurface samples (B.M.R. Baralaba No. 20) and outcrop samples from the Glenmoral Gap area contain up to 15% feldspar, while those from the Expedition Range area (i.e. from B.M.R. Baralaba No. 16 and nearby outcrops) have virtually no feldspar. This difference could be attributed to a feldspar source (the Auburn Complex) close to the Glenmoral Gap localities. The predominant source for the unit in the Expedition Range may have been more distant, possibly the schists of the Anakie Metamorphics of the Anakie High. This suggestion is supported by the results of a study of cross-bedding in the Clematis Sandstone by Olgers et al. (1964).
9. The section in B.M.R. Baralaba No. 19 compares fairly well with some outcrop samples of the upper part of the Moolayember Formation. The subsurface samples are characterized by the presence of plentiful swollen (leached) micas, mainly biotite, which are also present in the outcrop samples.
10. Both the section penetrated in B.M.R. Taroom No. 29 and nearby outcrop samples of the Evergreen Formation contain horizons of oolitic and pelletal chamosite. Many of which are broken and recemented; this suggests disturbance at the time of development of the oolites.

Hole No. Depth Name	TEXTURE				PERCENTAGE ESTIMATES								ACCESSORIES							
	sorting	grain-size (mm)	round- ness	sphericity orientation	quartz	quartzite	chert	micas	K-felds.	plag.	rock frags.	matrix	cement	opaque	chamosite	glauc.	tourm.	zircon	apatite	epidote
No.1, 40'-45' felds- pathic grey- wacke	mod.	max. 0.35 av. 0.15	subang.- subrd.	low-mod.	35		10	5	12	3	5 shale	30 (10 kaol.)						r	r	
No.1, 60'-67' Argillac- eous Sandstone	fairly good	max. 0.2	subang.- subrd.	mod.	30				3	2	5 shale	50 (25 kaol.)						c	u	r
No.1, 130'-140' Argillac- eous Sandstone	poor	max. 1.0 av. 0.3	subang.	mod.	30	5	15		5	2		40 (15 kaol.)							r	
No.2, 20'-30' Ferrug- inous subgrey- wacke	mod.	max. 0.3 av. 0.1	ang.- subang.	mod.	10		20		10		30 (10 volc.)	10	20 Fe.ox.						r	
No.2, 60'-70' Calcar- eous, volcanic sandstone	fairly good	max. 0.3 av. 0.2	ang.- subang.	low to (mod.)	20	<5		<5	6	4	30 (20 volc.)	15 kaol.	25 calc.	c	c					
No.2, 80'-90' Volcanic Sandstone	fairly good	max. 0.3 av. 0.15	subang.- subrd.	low-mod.	15		10	5	7	8	15 volc.	15	25 calc.			u		r	r	
No.2, 90'-100' Kaolin- itic Sandstone	Bimodal	0.06-0.4	ang.- subang.	low-mod.	15		30		15	5		35 kaol.						c		
No.2, 176' Volcanic Sandstone	poor	max. 1.5 av. 0.6	subang.- subrd.	low-mod.	35	15	5		7	8			10 calc. repl.					r	r	u
No.3, 30'-40' Micaceous Ortho- quartzite	good	max. 0.15 av. 0.1	subang.	high	65		5					20 micas	10 Fe.ox					c	r	
No.3, 70'-80' Micaceous Ortho- quartzite	rather poor	max. 0.7 av. 0.25	subang.- subrd.	mod.	75							25 (15 micas)						u		

Hole No. Depth Name	TEXTURE				PERCENTAGE ESTIMATES									ACCESSORIES								
	sorting	grain-size (mm)	round- ness	sphericity orientation	quartz	quartz- zite	chert	micas	K- felds	plag.	rock frags.	matrix	cement	opaque	osite	cham- osite	glauc.	tourm.	zircon	apatite	epidote	
No. 3, 100'-110' Kaolinitic Subgrey- wacke	fairly good	max. 0.3 av. 0.15	Subang.- subrd.	mod.	15	5	15		5	few	30 shale & sltst.	30 (25 kaol.)							r			
No. 3, 160'-167' Subgrey- wacke	mod.	max. 0.4 av. 0.2	Subang.	low to mod.	15	5	20		5	2	30 (10 volc.)	25 (15 kaol)							r			
No. 4, 70'-72' Calcar- eous Sandstone	fairly good	max. 0.25 av. 0.15	Ang. to Subang.	mod.	25	5	10	3	3	4		5 kaol.	45 calc. repl.						u	r		
No. 4, 212' Argillac- eous Sandstone	good	max. 0.2 av. 0.1	Subang.- Subrd.	mod. (fairly good orientation)	60				<5	few	5 shale	30 (10 kaol)							r	r		
No. 5, 60'-67' Vitric tuff																						
No. 5, 100'-110' Calcareous, Volcanic Sandstone	mod.	max. 0.4 av. 0.2	Subrd.	mod.	30		10	3	8	4	15 volc.	5 kaol.	25 calc.						r			
No. 5, 130'-140' Kaolinitic Sandstone	fairly good	max. 0.15 av. 0.08	Subang.- Subrd.	mod.	25			5	5	few	5	40 (35 kaol.)	15 (5 calc. & fos.)						r		r	
No. 5, 141' Carbon- aceous Sandstone	mod.	max. 0.6 av. 0.3	Ang. - Subrd.	mod.	30		10		8	2	5 volc.	20 (15 kaol.)	25 calc.						r			
No. 6, 20'-30' Proto- quartzite	fairly good	max. 0.5 av. 0.15	Ang.- Subang.	mod.	65	10	10				10 shale	5 kaol.								c		
No. 6, 80'-90' Proto- quartzite	fairly good	max. 0.3 av. 0.15	Subang.	mod.	>65	10	10				5	10 kaol.								r		
No. 7, 90'-100' Argill- aceous quartz sandstone	Bimodal	0.03-0.15	Subang.- Subrd.	mod.	<60		5		3		5	< 25 (15 kaol.)	5 calc. repl.							u	a	c
No. 7, 105' Kaolinitic Sandstone	fairly good	max. 0.15 av. 0.1	Ang.- Subang.	low-mod.	30		20	3	2		10 shale	20 kaol.	15 calc. repl.							u	e	r
No. 8, 100'-110' Felds- pathic grey- wacke	mod.	max. 0.3 av. 0.15	Ang.- Subang.	low-mod.	30		10		15	10	15 shale	20 mic.									r	u

About 80% glass, with shards.
Others: Calc. repl, quartz
and micas

plus 5% Carb. matter

Hole No. Depth Name	TEXTURE			PERCENTAGE ESTIMATES									ACCESSORIES							
	sorting	grain-size (mm)	round- ness	sphericity orientation	quartz	quartz- size	chert	micas	K-felds.	plag.	rock frags.	matrix	cement	opaque	osite	cham- blanc.	tourm.	zircon	apatite	epidote
No. 9, 40'-50' Arkose	mod.	max. 0.3 av. 0.15	Subang.- Subrd.	mod.	40		10		12	8	10 shale	15 (5 kaol.)	5 calc.				r	r		c
No. 9 140'-150' Subgrey- wacke	poor	max. 1.0 av. 0.25	Subang.	low-(mod.)	35	5	10		10	5	15 (5 volc.)	15 (5 kaol.)	5 calc.				r	u		
No. 9, 190'-197' Subgrey- wacke	poor	max. 0.9 av. 0.35	Ang.- Subang.	low-mod.	35	10	10		7	5	30 (15 volc.)		< 5 calc.					c	a	a
No. 10, 30'-40' Subgrey- wacke	good	max. 0.4 av. 0.25	Ang.- Subang.	low-mod. (good dimen- sional orientation)	25	10	8		7	5	35 (10 volc.)	10 (5 kaol.)						c	r	
No. 11, 30'-40' Subgrey- wacke	fairly good	max. 0.4 av. 0.2	Subang.- Subrd.	mod.	20	5	15		7	3	35 (15 volc.)	15 (5 kaol.)					r		u	
No. 11, 50'-60' Volcanic Sandstone	rather poor	mod. 0.5 av. 0.15	Subang.	low-mod.	15	5	5		12	3	35 volc. (25% pumice)	10	15 Fe. ox				r	u		
No. 11, 90'-100' Subgrey- wacke	fairly good	max. 0.35 av. 0.15	Subang.- Subrd.	mod.	25	10	15		10	5	30 (15 volc.)	5 kaol.)						u	u	
No. 11, 120'-130' Subgrey- wacke	mod.	max. 0.5 av. 0.20	Subang- Subrd.	low-mod.	20	5	15		15	5	35 (15 volc.)						r	r		
No. 12, 55'-60' Arkose	mod.	max. 0.8 av. 0.4	Ang.- Subang.	mod.	35		20		18	2	< 20 (5 volc.)	5 kaol.								
No. 13, 20'-30' Calcareous Subgrey- wacke	poor	max. 1.2	Subang.	low-mod.	30		2		8		10 volc.	15 kaol.	35 calc. repl.							
No. 13, 40'-50' Kaolinitic, volcanic sandstone	good	max. 0.1 av. 0.06	Ang.- Subang.	mod	25		5		8	7	20 (15 volc.)	30 (25 kaol.)	5 calc.				r			
No. 13, 150'-160' Kaolinitic, volcanic sandstone	rather poor	max. 0.6 av. 0.25	Ang.- Subang.	low-mod.	15		5		5	10	15 (10 volc.)	25 kaol.	15 calc.		r					
No. 13, 170'-180' Lithic greywacke	fairly good	max. 0.25 av. 0.12	Ang.- Subang.	low-mod.	15		< 10		5	10	25 volc.	30 (15 kaol.)			r		r	r		
No. 14, 50'-60' Volcanic, kaolin- itic sandstone	rather poor	max. 0.5 av. 0.2	Ang.- Subang.	mod.	20		5		12	8	15 volc.	25 kaol.	15 calc. & sid.							
No. 14, 100'-110' Argill- aceous Sandstone	mod.	max. 0.25 av. 0.1	Subang.- Subrd.	mod.	20		25		10	few		25 kaol.	10 calc. repl.							

plus about 10% iron oxide cement and carb. matter

plus 5% carb. matter

plus 10% carb. matter

5. REFERENCES

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Appendix A

Petrographic notes on the shallow holes B.M.R. Mundubbera No.55 and B.M.R. Mundubbera No.56.

Petrographic descriptions of these two holes drilled in 1964 are incorporated in this Record to complete the data from holes drilled in the Barfield Formation. The estimated stratigraphic positions of these collars of these holes above the base of the Barfield Formation are: No.28 - 1000 feet; No.30 - 600 feet; No.31 - 200 feet; Nos.55 and 56 were spudded at base of Barfield Formation and top of Otrack Formation, respectively.

B.M.R. Mundubbera No.55, interval 50' - 59'

- 50' - 54' : Mudstone, generally medium bluish grey, moderately hard and fissile; calcareous and richly fossiliferous in parts, with scattered quartz grains and patches of brown clay aggregates. Rare pyrite. A thin section of a sample from 52'6" has the following composition :
- 40% calcite fragments and fossil debris; molluscs, corals, bryozoas, and crinoids.
 - 30% dark brown clay.

25% "chert" (or volcanic dust?)
5% quartz grains, about 0.25 mm. size;
a few concretions of chalcedony and quartz.

Name : calcareous cherty mudstone.

54' - 57' : Mudstone : light greenish grey with some yellowish streaks; slightly fissile; a thin, light brown limestone interbed at top of the interval, with laminae and patches of dark carbonaceous matter. A sample from 54'6" contains:

40% clay, slightly ferruginized.
35% very fine siliceous matter ("chert").
10% carbonaceous matter - in laminae.
10% calcite and some fossil debris (molluscs, crinoids and bryozoa).
5% quartz grains of silt size; rare plagioclase.

Name : cherty mudstone.

A sample from 56' contains about 60% clay and 40% fine silica.

57' - 59' : Mudstone : medium grey, massive and homogeneous; a few patches of carbonaceous matter.

A thin section of a sample from 58'6" has the following composition.

75% clay.
20% siliceous matter ("chert").
5% quartz grains of silt size.

Name : siliceous cherty mudstone.

B.M.R. Mundubbera No.56

Interval 35' - 38'6" : Sandy mudstone : generally, medium grey, slightly brownish in parts. About 20% fine sand grains, decreasing downwards.

A sample from the top of the interval contains:

65% clay aggregate.
10% fragments of devitrified glass, including some rhyolite; size: 0.1 - 0.25 mm.
3% feldspar (mainly plagioclase).
2% quartz.
>5% calcite fragments; one calcite concretion of about 2.5 mm. size.
15% groundmass of fine siliceous matter ("chert").

Name : sandy cherty mudstone.

APPENDIX B

List of Abbreviations used in Tables

a	abundant	mic.	micaceous
ang.	angular	mod.	moderate
av.	average	r.	rare
c.	common	rd.	rounded
calc.	calcite	repl.	replacement
carb.	carbonaceous	sid.	siderite
clst.	claystone	sltst.	siltstone
Fe. ox.	iron oxide	subang.	subangular
fos.	fossil	subrd.	subrounded
frags	fragments	u.	uncommon
kaol.	kaolinite	volc.	volcanic
max.	maximum		

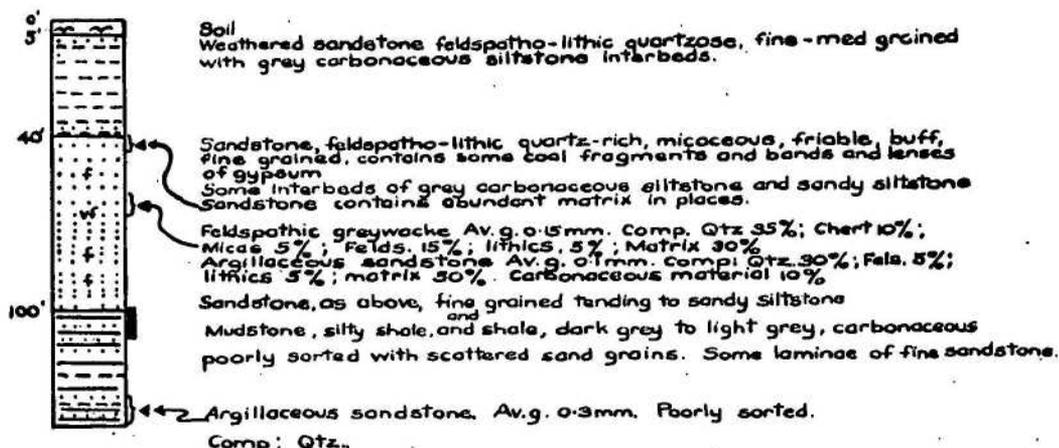
APPENDIX C

Drill logs

Megascope lithological descriptions shown in the following logs were taken from Malone (1963), Mollan et.al. (1964), Olgers et.al. (1964) and Jensen et.al. (1964).

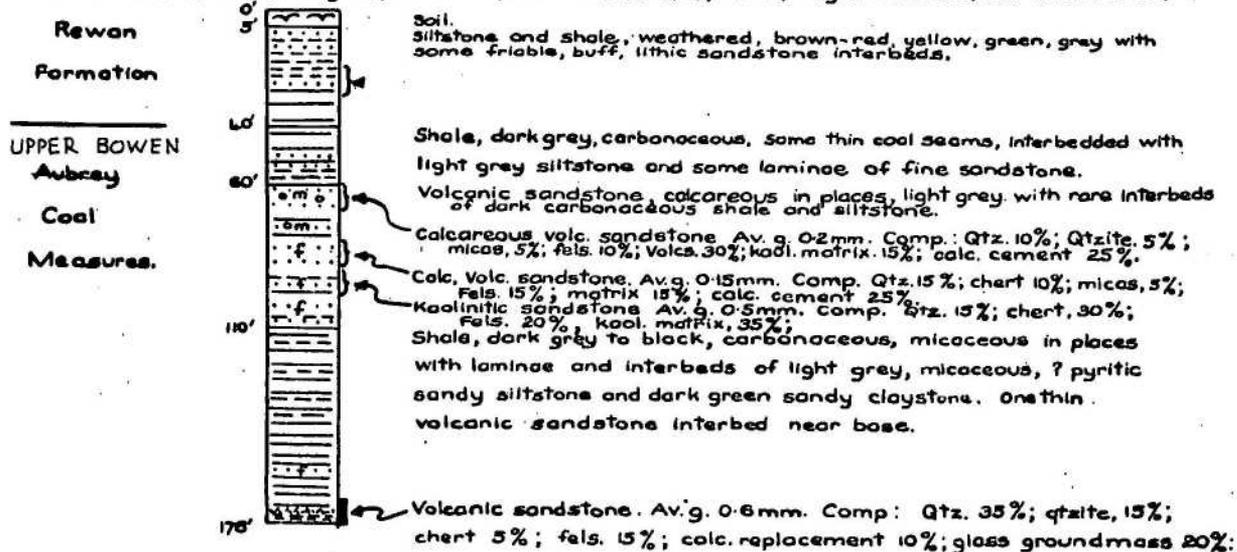
Peawaddy Formation, lower part.

Shallow drill hole BMR Springsure #1, 5 miles north-west of Tanderra Hs.
at Lat. 24°34'S, Long. 147°34'E, in the central part of Springsure 1:250,000 Sheet area.



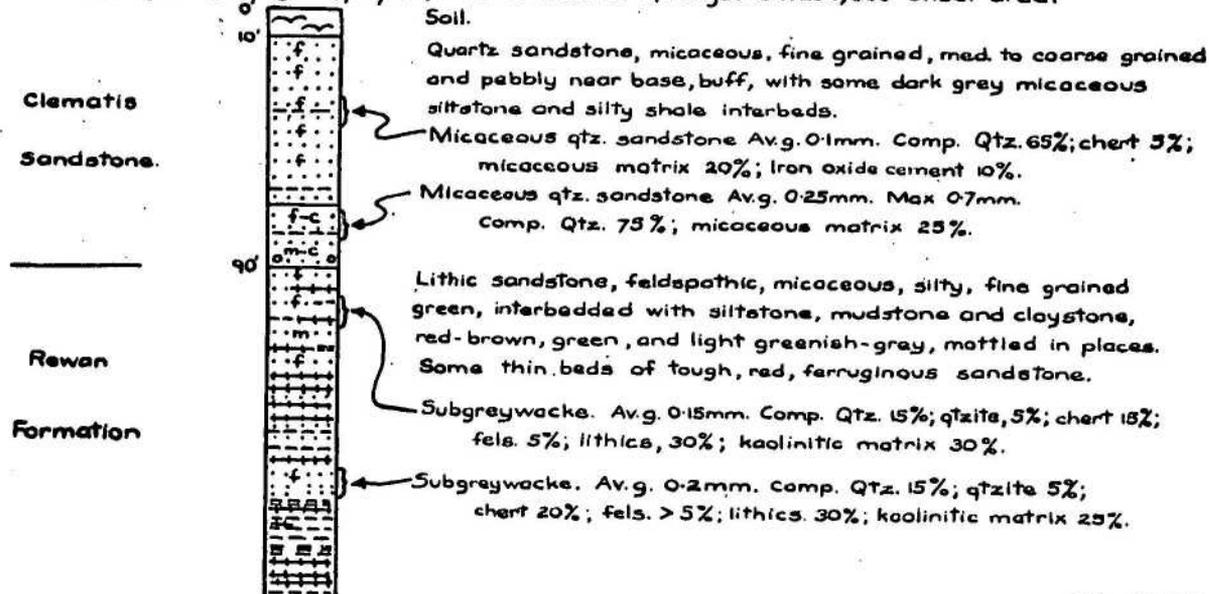
Rewan Formation (base) and Aubrey Coal Measures (top).

Shallow drill hole BMR Springsure #2, 4 miles south of Mantuan Downs Hs.
at Lat. 24°29'S, Long. 147°15'E, in the North-West of Springsure 1:250,000 Sheet area.



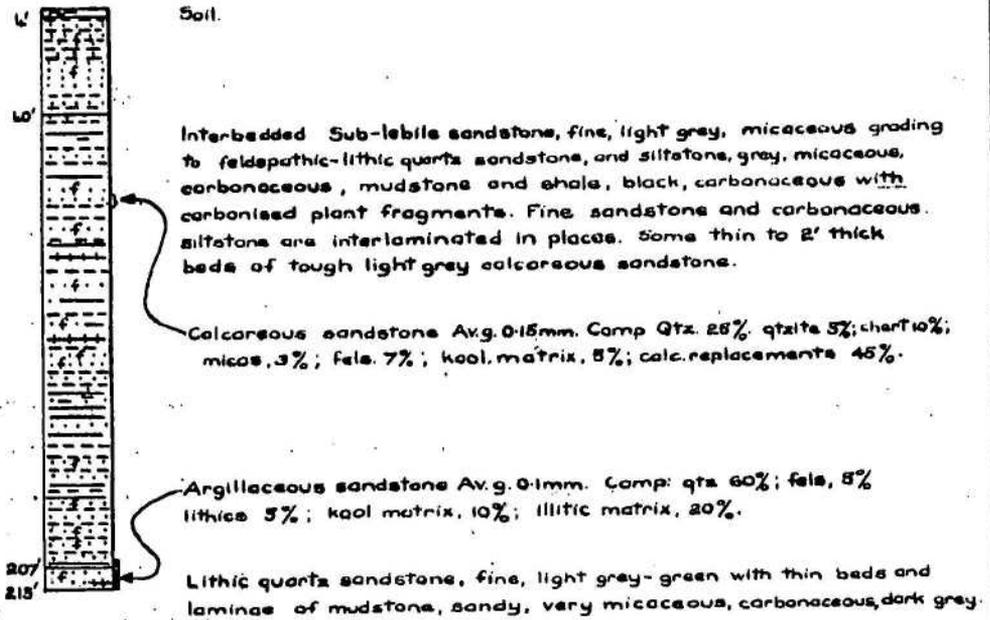
Clematis Sandstone, (base) and Rewan Formation, (top)

Shallow drill hole BMR Springsure #3, 12 miles west of Mantuan Downs Hs,
Lat. 24°27'S, Long. 147°07'E, in north-west of Springsure 1:250,000 Sheet area.



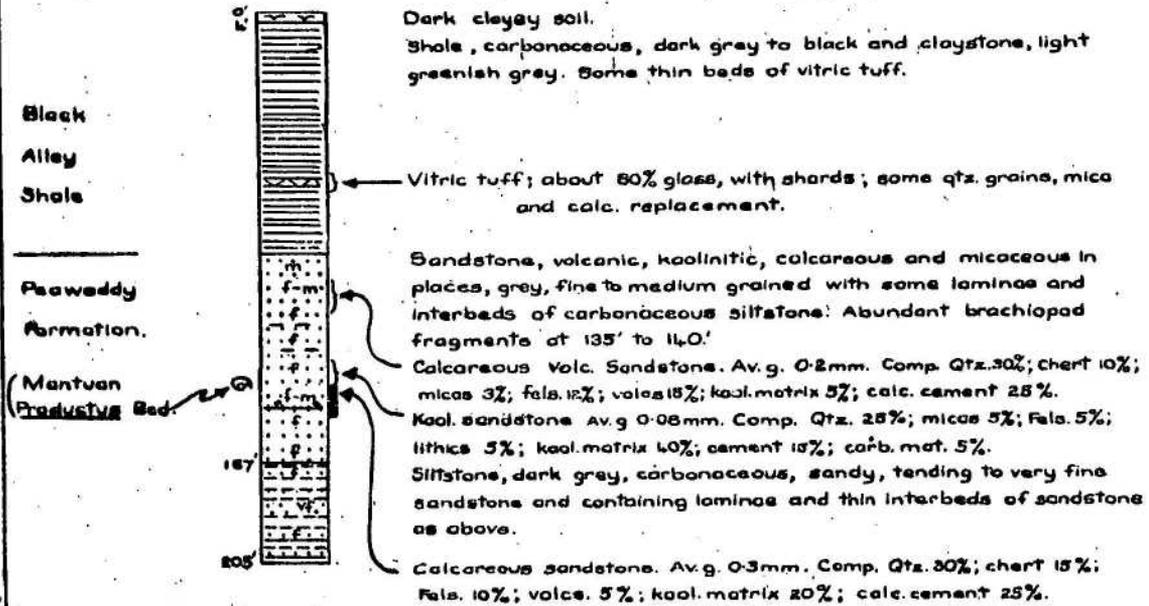
Moolayember Formation. (basal part) transitional to underlying Clematis Sandstone.

Shallow drill hole BMR Springsure #4, 16 miles west of Mantuan Downs Hs.
 Lat. 24° 29' S, Long. 147° 04' E, in the north-west of Springsure 1:250,000 Sheet area.



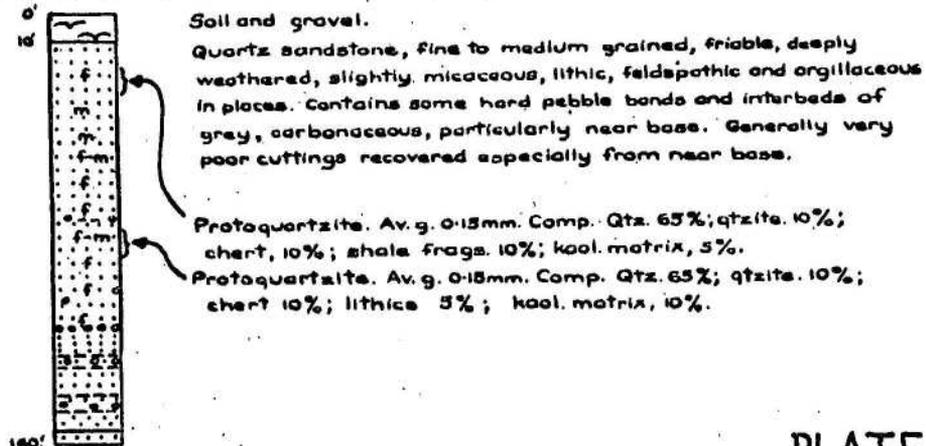
Black Alley Shale (basal part) and Piawaddy Formation (top).

Shallow drill hole BMR Springsure #5, 2 miles north of Mantuan Downs Hs.
 Lat. 24° 23' S, Long. 147° 14' E, in the north-west of the Springsure 1:250,000 Sheet area.



Colinlea Sandstone Upper part.

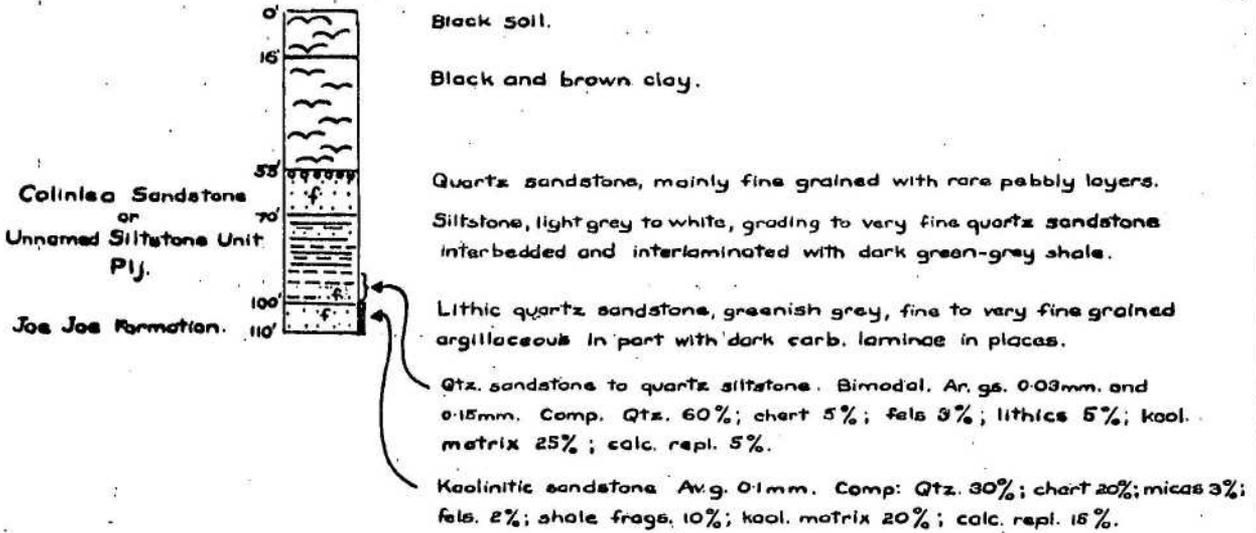
Shallow drill hole BMR Springsure #6, 11 miles north-west of Mantuan Downs Hs.
 Lat. 24° 17' S, Long. 147° 09' E, in north-west of Springsure 1:250,000 Sheet area.



Colinea Sandstone, (basal part) or Unnamed Siltstone Unit (PIJ) and Joe Joe Formation, (top).

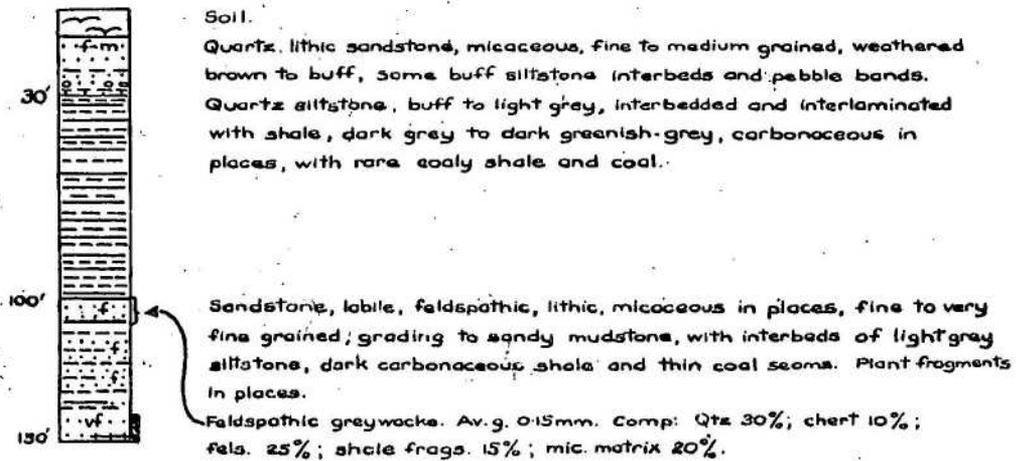
Shallow drill hole BMR Springsure #7, 12½ miles north-west of Mantuan Downs Hs.

Lat. 24°15'S, Long. 147°10'E, in north-west of Springsure 1:250,000 Sheet area.



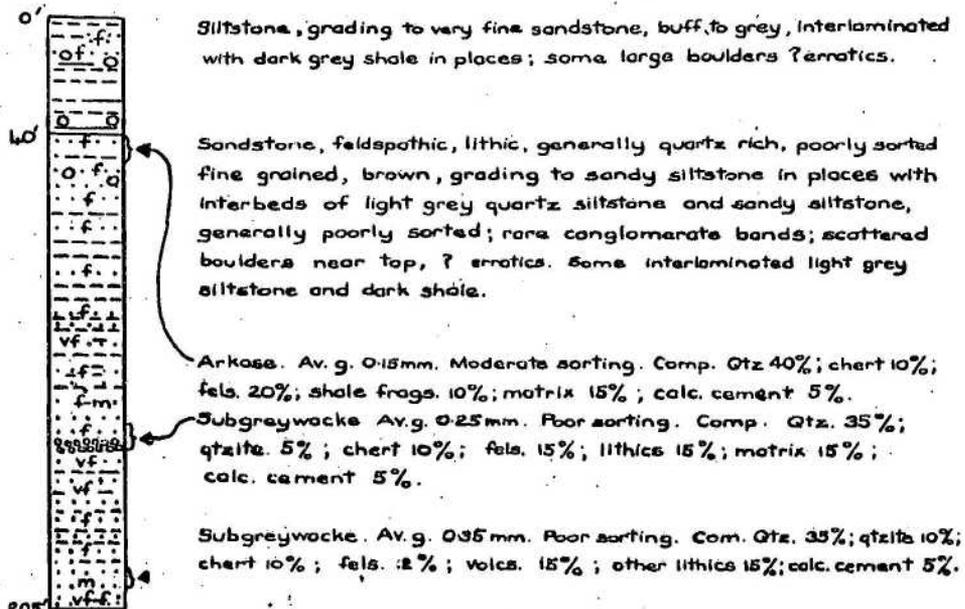
Joe Joe Fn., upper part.

Shallow drill hole BMR Springsure #8, Lat. 24°12'S, Long 147°08', in north-west of Springsure 1:250,000 Sheet area.



Joe Joe Formation, (lower part).

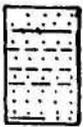
Shallow drill hole BMR Springsure #9. Lat. 24°07'S, Long. 147°12'E, in the north-west of the Springsure 1:250,000 Sheet area.



Ducebrook Formation, upper part.

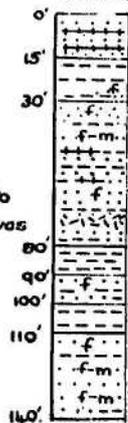
Shallow drill holes, BMR Springsure #10 and #11, 1 1/2 miles west of Echo Hills Hs.
 Lat. 24°09'S, Long. 147°22'E, in north-west of Springsure 1:250,000 Sheet area.

BMR #10.



Hole BMR #10 abandoned due to caving. Hole #11 was located 15' away.

BMR #11.



Weathered lithic sandstone and mudstone.

Siltstone, light grey, weathering buff, sandy in places, grading to fine sandstone; minor reddish-brown mudstone. Sandstone, feldspatho-lithic, volcanic in places, micaceous in places, some tuffaceous sandstone, grey, brown or pink. Some siltstone, light grey, sandy; mudstone, green-grey and red-brown; Tuff, fine, pink.

Subgreywacke. Av. g. 0.2mm. Comp. Qtz. 20%; quartzite, 5%; chert 15% fels. 10%; volcs. 15%; other lithics 20%; matrix 15%.

Siltstone, tough, grey.

Feldspatho-lithic sandstone, grey, fine, and some siltstone, reddish-brown.

Siltstone, tough, grey and dark reddish brown.

Sandstone, as above.

Volcanic sandstone. Av. g. 0.15mm. Comp. Qtz. 15%; quartzite, 5%; chert, 5%; fels. 15%; volcs. 35%; mic. matrix 10%; Iron oxide, 15%.

Subgreywacke. Av. g. 0.15mm. Comp. Qtz. 25%; quartzite, 10%; chert, 15%; fels. 15%; volcs. 15%; other lithics, 15%; kaol. matrix, 5%.

Subgreywacke. Av. g. 0.20mm. Comp. Qtz. 20%; quartzite, 5%; chert 15%; fels. 20%; volcs. 15%; other lithics 20%; matrix 5%.

Black Alley Shale.

Shallow drill hole, BMR Springsure #12, 2 miles north of Wielwandangie Hs.,

Lat. 24°24'S, Long. 148°03'E, in the south-east of Springsure 1:250,000 Sheet area.

Tertiary Basalt.

Black Alley Shale.



Black soil.

Weathered basalt and clay.

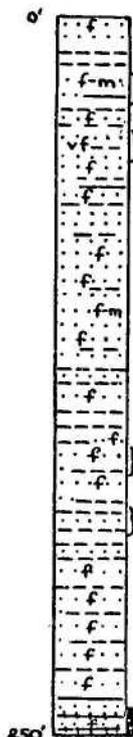
Siltstone, white-buff, mudstone, sandy mudstone, claystone, buff, pink and mauve, carbonaceous siltstone, sandstone, feldspatho-lithic, fine grained.

Sandstone, feldspatho-lithic, fine-med. grained, friable, micaceous, brown.

Arkose. Av. g. 0.4mm. Comp. Qtz., 35%; chert, 20%; Fels. 20%; lithics < 20%; kaol. matrix, 5%.

Peowaddy Formation, (Upper part).

Shallow drill hole BMR Springsure #13, Lat. 24°46', Long. 148°22', in south-east of Springsure 1:250,000 Sheet area.



Sandstone, feldspathic, lithic, volcanic, argillaceous and calcareous in places, fine grained, rarely med. grained, light grey, dark and carbonaceous in places, thickly to thinly interbedded and interlaminated with siltstone, dark grey, carbonaceous, sandy and micaceous in places, rarely plant bearing, and dark carbonaceous mudstone and shale. Sandstone contains abundant coal fragments in places.

Calcareous subgreywacke. Av. g. 0.35mm. Comp. Qtz. 30%; chert 2%; fels. 8%; volcs. 10%; kaol. matrix 15%; calc. repl. 35%.

Kaolinitic, volcanic sandstone. Av. g. 0.06mm. Comp. Qtz. 25%; chert, 5%; fels. 15%; volcs. 15%; other lithics, 5%; kaol. matrix 30%; calc. cement 5%.

Kaol. volc. sandstone. Av. g. 0.25mm. Comp. Qtz. 15%; chert, 5%; Fels 15%; volcs. 10%; other lithics, 5%; kaol. matrix, 25%; cement, 15%, inc. calc., iron oxide and carbonaceous material.

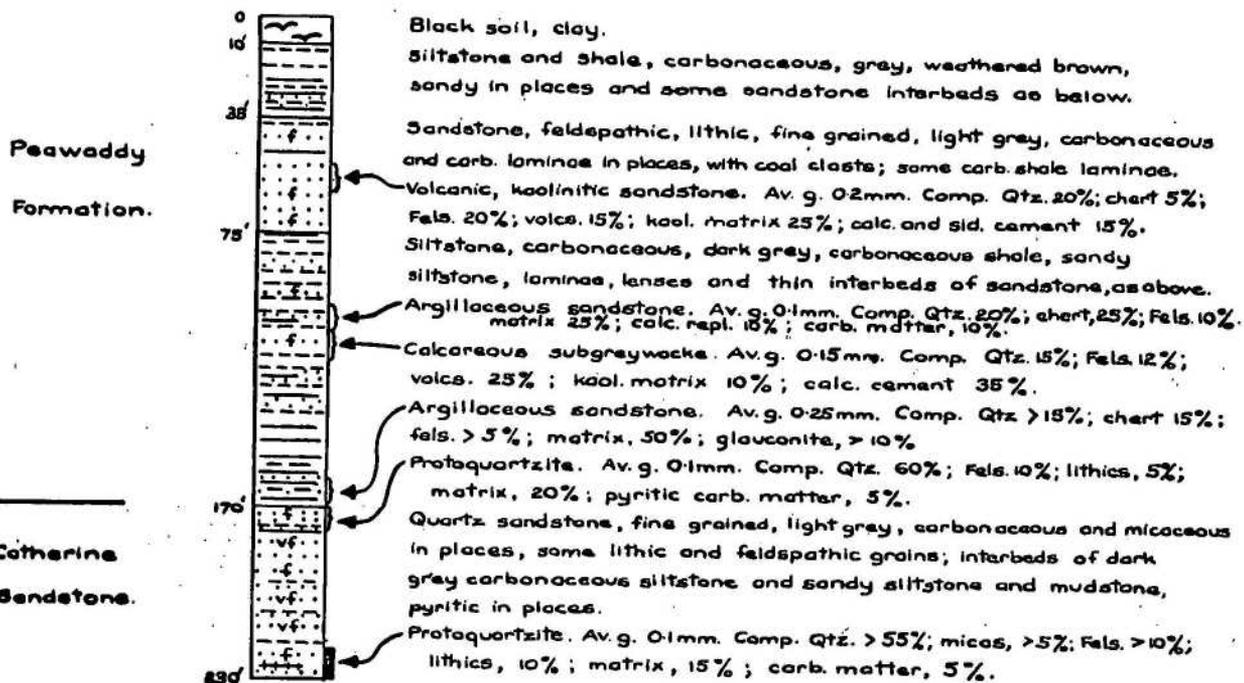
Lithic greywacke. Av. g. 0.12mm. Comp. Qtz. 15%; chert < 10%; Fels. 15%; volcs. 25%; matrix, 30%.

Sandstone, siltstone, mudstone, as above. Some laminae of ? cherty siltstone with pockets of ? pyrite in places.

Peawaddy Formation (basal part) and Catherine Sandstone. (top).

Shallow drill hole BMR Springsure # 14, Lat. 24°45'30"S, Long. 148°21'30"E, in south-east of

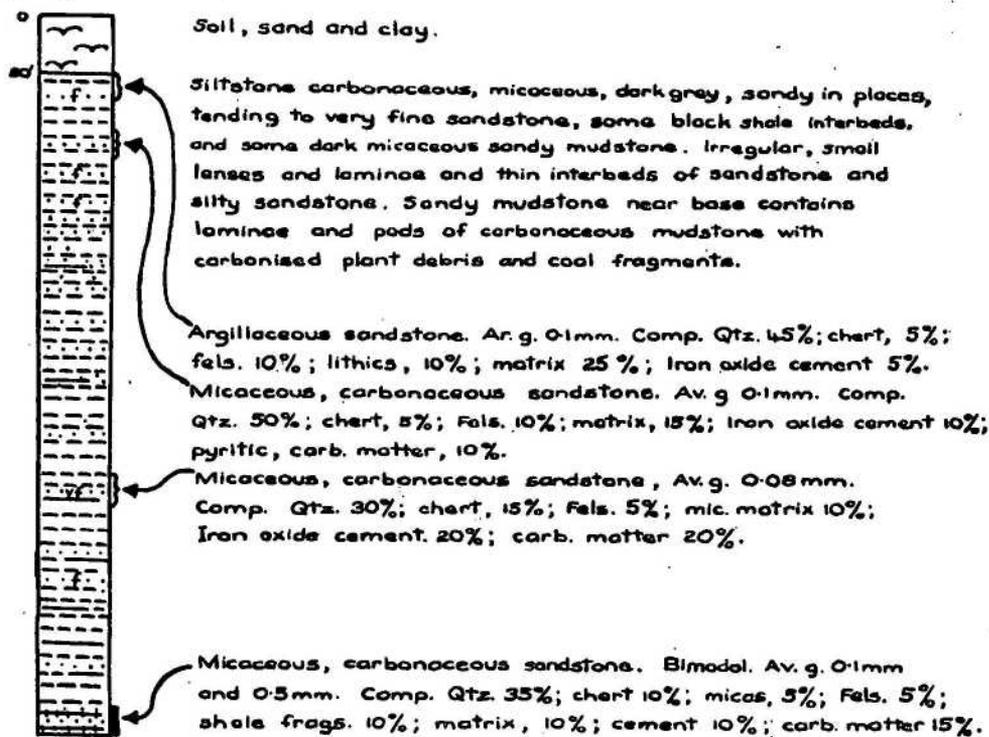
Springsure 1: 250,000 Sheet area.



Inglara Formation, top part.

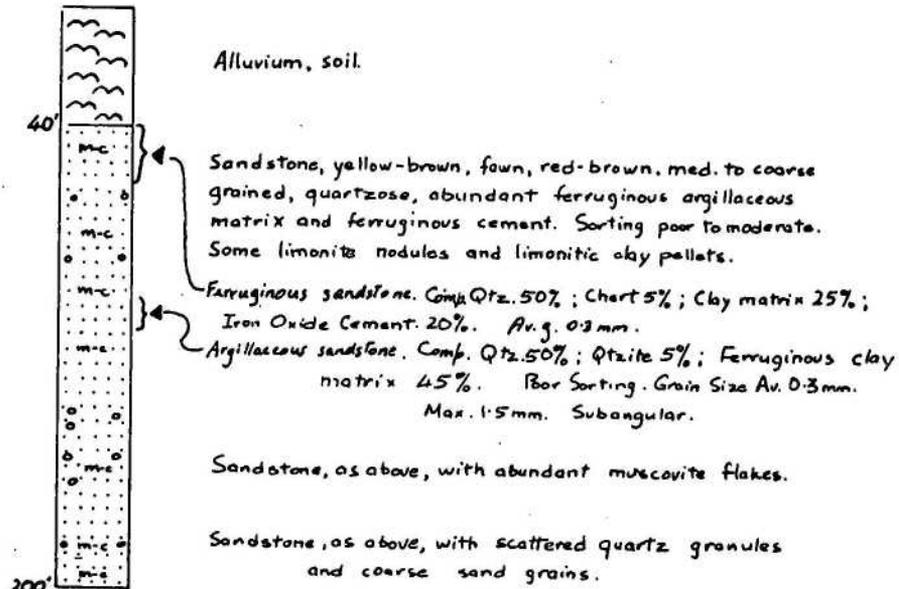
Shallow drill hole BMR Springsure # 15, Lat. 24°45'S, Long. 148°21'E, in south-east

of Springsure 1: 250,000 Sheet area.



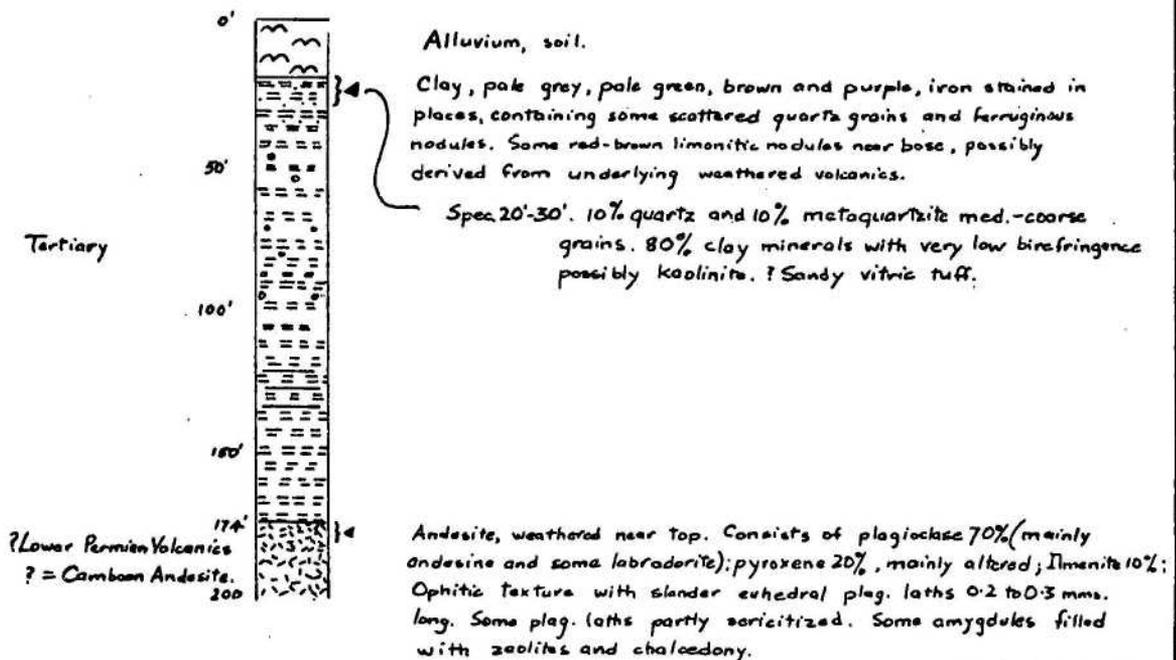
Clematis Sandstone (basal part)

Shallow drill hole B.M.R. Baralaba No. 16, located at Lat. 26° 37' S.
 Long. 149° 1' E. about 17 miles south-west of the centre of the
 Baralaba 1:250,000 sheet area.



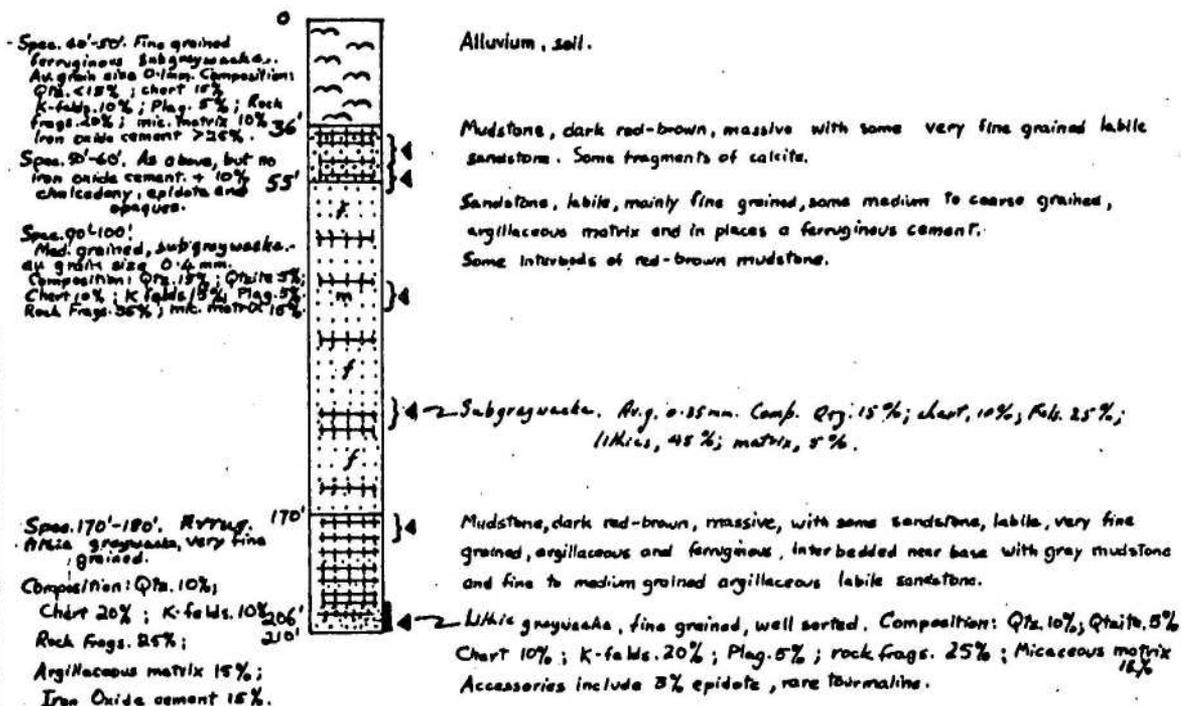
Tertiary and Lower Permian.

Shallow drill hole B.M.R. Baralaba No. 17, located at
 Lat. 26° 7' S., Long. 149° 58' E., in the extreme
 North-East of the Baralaba 1:250,000 sheet area.



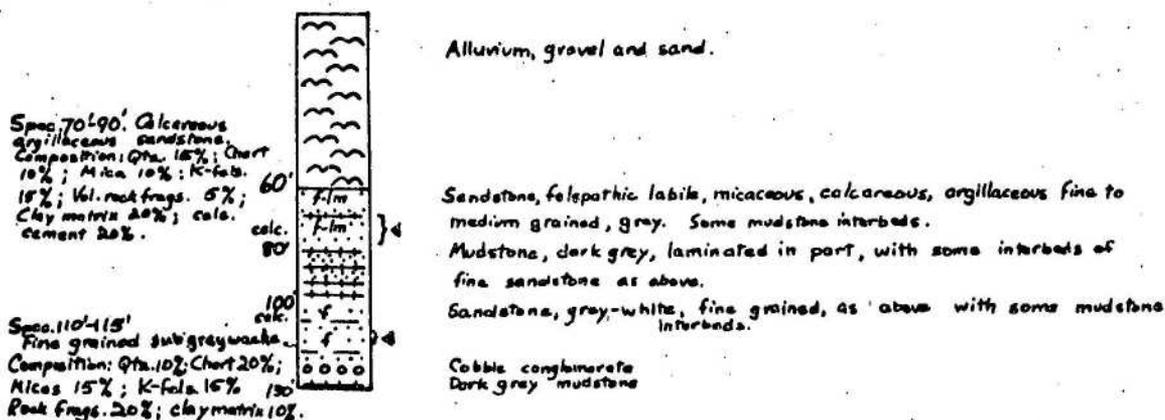
Rewan Formation (middle part)

Shallow drill hole B.M.R. Baralaba No. 18, located at Lat. 24° 59' S; Long. 150° E, in the south-east corner of the Baralaba 1:250,000 Sheet Area.



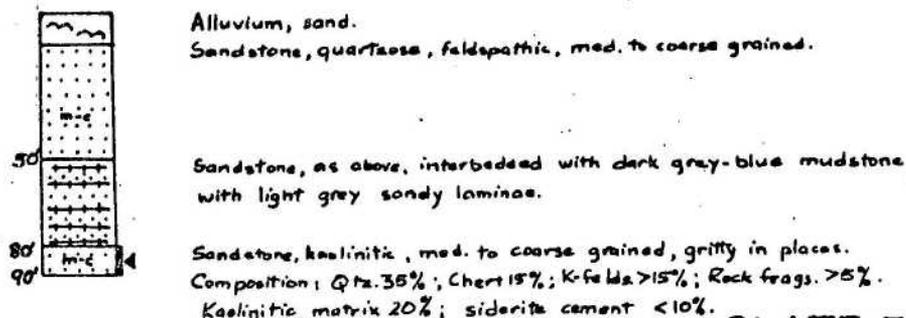
Moolayember Formation (top part)

Shallow drill hole B.M.R. Baralaba No. 19, located at Lat. 24° 50' S, Long. 149° 32' E, in the south-east of the Baralaba 1:250,000 Sheet Area.



Clematis Sandstone (near base)

Shallow drill hole B.M.R. Baralaba No. 20, located at Lat. 24° 59' S, Long. 149° 56' E, in the extreme south-east of the Baralaba 1:250,000 Sheet Area.

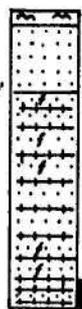


Clematis Sandstone (base) and Rewan Formation (top)

Shallow drill hole B.M.R. Baralaba No. 21, located at Lat. 24° 58' S.,
Long. 149° 37' E., in the extreme south-east of the Baralaba 1:250,000
sheet area.

Clematis
Sandstone.
(basal part
weathered)

Rewan
Formation.
(top part)



Sandy Soil.
Mainly weathered sandstone and sandy clay.

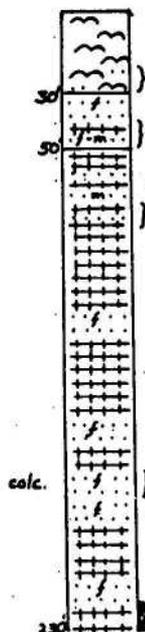
Sandstone, calcareous labile, fine grained, hard, dark blue-grey,
interbedded with dark grey and purple mudstone, containing
abundant plants near base.

Spec. 30'-35'. Calcareous subgreywacke, fine-med. grained.
Composition: Qtz. < 30%; Chert 10%; K-felds. 10%; Rock Frags. > 15%;
Matrix 5%; Calcareous Cement 30%.

Spec. 102'. Argillaceous sandstone, very fine grained.
Composition: Qtz. 25%; Chert 15%; Micas 10%; K-felds. 5%;
rock frags 5%; clay matrix 20%; Calcareous cement 10%; Chlorite 5%;
Carbonaceous Matter 5%.

Rewan Formation (middle part - below B.M.R. No. 18)

Shallow drill hole B.M.R. Baralaba No. 22, located at
Lat. 24° 59' S., Long. 150° 1' E., in the south-west corner
of the Monte 1:250,000 sheet area.



Sandy soil, sand, sandy clay and clay.

Sandy claystone. Comp. Qty. 20%; Fels. 5%; clay 75%.

Sandstone, argillaceous, weathered grey to brown, mainly fine-med. grained,
mudstone interbedded.

Subgreywacke. Av. g. 0.15 mm. Composition: Qtz. > 5%; Chert 15%;
K-felds. 15%; Rock Frags. 35%; Clay Matrix > 10%; Iron Oxide Cement 15%.

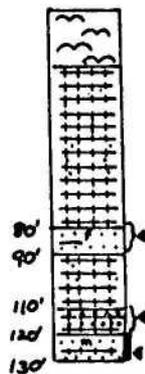
Mudstone, dark red-brown, massive, interbedded with dark grey mudstone
containing scattered sand grains and grading into fine grained
lithic sandstone, and fine lithic sandstone.

Spec. 70'-90'. Mudstone. 15% fine silt grains (Qtz. and Feldspar)
20% clay aggregates; 35% ferruginized mass; 30% Chert.

Spec. 170'-180'. Subgreywacke, fine grained. Av. grain size 0.2 mm.
Composition: Qtz. 5%; Qtzite > 5%; Chert 15%; K-felds. 15%;
Rock frags. 40%; Argillaceous matrix 10%; Chlorite 5%; Opaques 5%;
mainly epidote and detrital iron oxide.

Rewan Formation (lower part)

Shallow drill hole B.M.R. Baralaba No. 23, located at
Lat. 25° 0' S., Long. 150° 3' E. in the North-West of
the Munduberra 1:250,000 sheet area.



Soil, clay.

Mudstone, dark red-brown, massive in part, interbedded and
interlaminated with greenish-grey mudstone, sandy in places, and
fine to medium grained, argillaceous lithic sandstone.

Sandstone, lithic, fine-med. grained, buff. Composition: Qtz. and Qtzite 15%;
Chert 15%; K-felds. 12%; Plag. 3%; Rock Frags. 40%; Clay matrix 15%.

Mudstone as above.

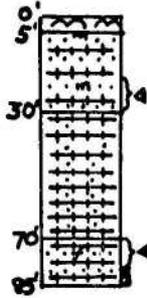
Interbedded feldspathic-lithic sandstone and mudstone, as above.

Sandstone, calcareous, volcanic with some mudstone interbeds, med. grained.
Composition: Qtz. 10%; Qtzite 5%; K-feld. 10%; Rock frags, mainly volcs. 35%;
Calcareous cement 25%; Chlorite 5%.

Spec. 110'-120'. Sub greywacke. Av. g. 0.15 mm. fine-med. grained.
Composition: Qtz. 10%; Qtzite 5%; Chert 25%; K-felds. 15%;
Shale frags. 20%; Clay matrix < 15%; Chlorite 10%.

Rewan Formation (near base)

Shallow drill hole B.M.R. Taroom No. 24, located at Lat. 25° 9' S., Long. 150° 7' E. in the North-West of the Mundubbera 1:250,000 Sheet Area.



Sandy soil.

Volcanic sandstone, calcareous, med. grained, interbedded with mudstone, dark red brown to dark grey-green. Sandstone Comp.: Qtz. <5%; K-felds. 3%; Plag. 7%; Volc. frags. 50%; Calc. cement 25%; Opaques 3%.

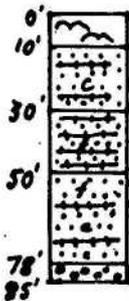
Mudstone, dark red-brown and dark grey-green, massive in places, elsewhere interlaminated, sandy in places; some interbeds of green-grey volcanic sandstone.

Volcanic sandstone, calcareous and micaceous in places, fine grained with some mudstone interbeds.

Volcanic sandstone, micaceous, fine grained, Av grain size 0.12 mm. Composition: Qtz. >5%; Chert 30%; mica <5%; K-felds. 10%; Volc. frags. 30%; Iron Oxide Cement 10%.

Rewan Formation (base)

Shallow drill hole BMR Taroom No. 25, located at Lat. 25° 9' S., Long. 150° 7' E., in the north-west corner of the Mundubbera 1:250,000 Sheet area.



Sandy soil.

Volcanic sandstone, calcareous, gray-brown, with some brown mudstone interbeds.

Mudstone, red-brown, sandy in part, with some fine volc. sandstone interbeds.

Volc. sandstone. Avg. 0.15 mm. Qtz. 5%; chert, 30%; feld. 5%; volcs. 20%; matrix, 15%; cement 20%.

Mainly coarse volc. sandstone with some mudstone interbeds.

Volc. sandstone. Avg. 0.6 mm. Comp. Qtz. 5%; chert, 10%; felds, 10%; volcs, 40%; other lithics, 15%; matrix, 5%; calc. cement, 5%; chloritic mat 10%.

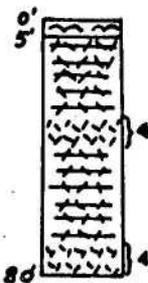
Volc. pebble conglomerate and coarse pebbly volc. sandstone; pebbles to 2" across, well rounded, mainly volcanic.

Spec. 20-30'. Calc. volc. sandstone. Avg. 0.8 mm. Comp. Qtz. 3%; chert 15%; micas, 2%; felds. 5%; volcs. 15%; other lithics, 10%; calc. cement. 50%; coal fragments, 3%.

Spec. 82'. Volc. sandstone. Avg. 0.8 mm. Comp. Qtz. 5%; chert, 20%; felds. 10%; volcs. 40%; other lithics, 10%; matrix, 5%; calc. cement 10%.

Flat Top Formation (upper part)

Shallow drill hole B.M.R. Taroom No 26, located at Lat. 25° 15' S., Long. 150° 13' E., in the North-West of the Mundubbera 1:250000 sheet area.



Clayey soil.

Mudstone and tuffaceous mudstone, tough, dark grey, weathers buff, includes large proportion of volc. dust. Interbedded with vitric tuff in places.

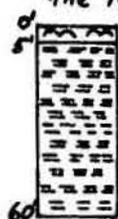
Vitric tuff. Qtz. 5%; sericite and illite (? diagenetic) 20%; K-felds. <5%; glass (? volc. dust) 60%; calc. cement 10%.

Tuffaceous mudstone as above.

Vitric tuff. as above.

Tertiary

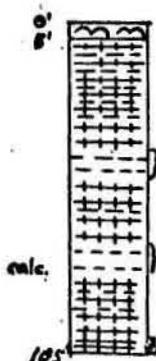
Shallow drill hole B.M.R. Taroom No. 27, located at Lat. 25° 16' S., Long. 150° 12' E., in the North-West of the Mundubbera Sheet Area.



sandy clayey soil
Clay, brown, damp.

Barfield Formation (middle part)

Shallow drill hole B.M.R. Taroom No. 28, located at Lat. 25° 14' S., Long. 150° 14' E., in the North-West of the Mundubbera Sheet Area.



Red soil.

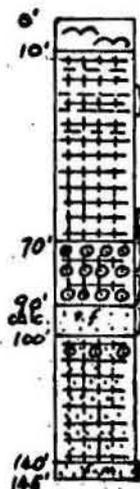
Mudstone, mainly, grading to siltstone in places and containing scattered coarse silt/sand grains. Black to purplish black.

Volcanic siltstone, coarse. Avg. 0.05mm. Comp: Qtz. 10%; K-felds. 10%; Clay matrix 25%; Calc. repl. 15%; Volc. dust 45%.

Ferruginous calcareous siltstone, coarse, Avg. 0.06mm. Comp: Qtz. 15%; Chert 25%; Micas 5%; K-Felds. 2%; Cement, inc. Iron oxide, 30%; Ferrug. clay 15%; Carbonaceous matter < 10%.

Evergreen Formation (equiv. to Boxvale Sandstone)

Shallow drill hole B.M.R. Taroom No. 29, located at Lat. 24° 34' S., Long. 150° 8' E., towards the Western margin of the Mundubbera 1:250,000 Sheet Area.



Sandy soil and ferruginous hard cap.

Mudstone, dark grey to black, containing scattered sand grains and grading to siltstone in places. Argillaceous siltstone. Comp: Qtz. 15%; Chert 35%; Shale fragments 20%; Clay 30%.

Mudstone, dark, as above, with many oolitic chamosite beds.

Calcareous oolitic chamosite, oolites 0.4 to 0.7 mm diameter. Comp: Qtz. 5%; calc. and sideritic cement 20% to 40%; oolitic chamosite 55%.

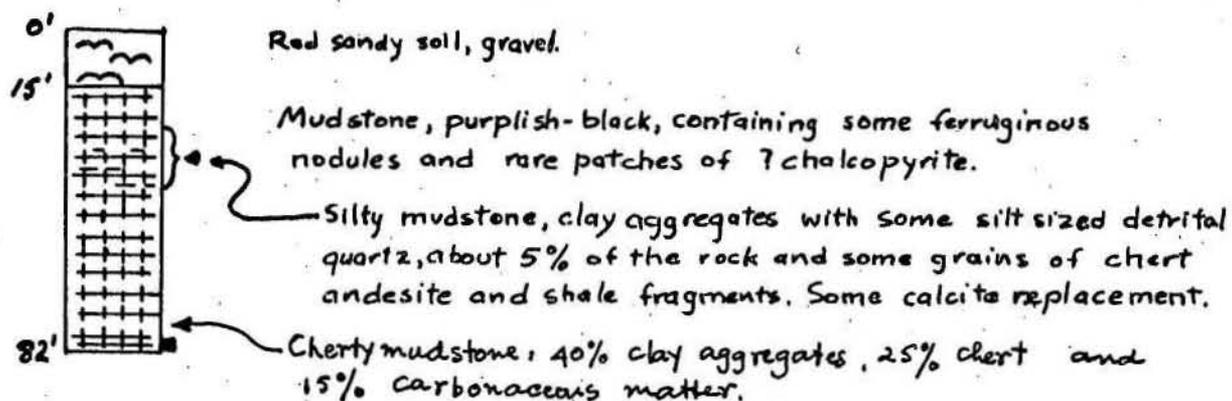
Calcareous sandstone, Avg. 0.08 mm. Comp: Qtz. 10%; Chert < 20% 75% K-felds. 5%; Plag. 2%; Shale frags. 15%; coal. matrix 5%; calc. cement 45%.

Mudstone, as above, sandy in places, and with fine sandstone interbeds and some oolitic beds.

Sandstone, lithic, argillaceous, micaceous, fine to medium grained, grey-green.

Barfield Formation (near base)

Shallow drill hole B.M.R. Taroom No. 30, located at Lat. $25^{\circ}14'$ S., Long. $150^{\circ}15'$ E., in the North-West of the Mundubbera 1:250,000 Sheet Area.



Barfield Formation

(near base, below B.M.R. No. 30)

Shallow drill hole B.M.R. Taroom No. 31, located at Lat. $25^{\circ}14'$ S., Long. $150^{\circ}15'$ E., in the North-West of the Mundubbera 1:250,000 Sheet Area.

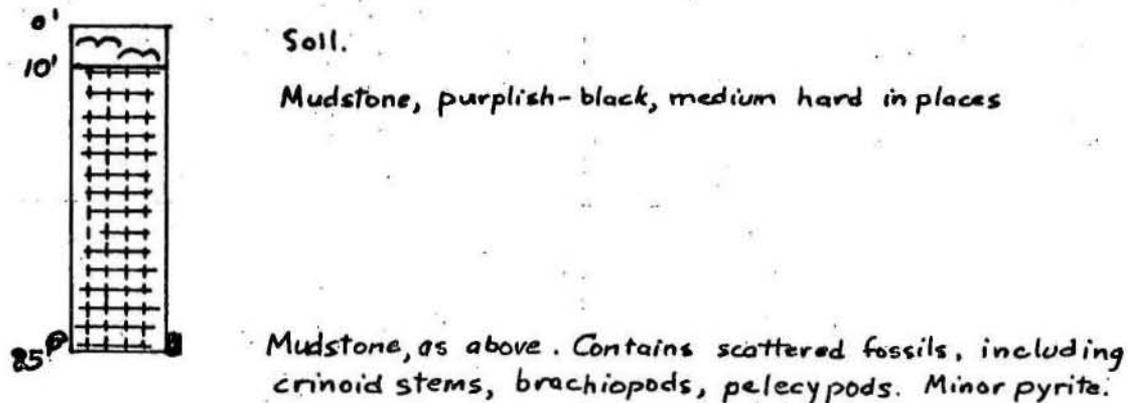


PLATE II