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EXPLANATORY NOTES ON THE ROEBOURNE

1:250,000 GEOLOGICAL SHEET SF/50-3

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Record No. 1964/11

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17th April, 1964

APPENDIX 1

Underground water supplies, Roebourne Sheet.

Roebourne 1:250,000 sheet.

Fig.1 Structural sketch map, Roebourne sheet.

Fig.2 Water supplies, Roebourne sheet.

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INTRODUCTION

The Roebourne Sheet, SF/50-3, is bounded by latitudes 20° and 21° S, and longitudes 117° and $118^{\circ}30'$ E. The area lies in the North West Land Division of the State of Western Australia and the principal town is Roebourne, 13 miles inland by road from the port of Point Sampson. Cossack, the original settlement at the mouth of the Harding River, was abandoned because of an inadequate water supply. Balla Balla Landing, also abandoned, served as an outlet for the mining centre of Whim Creek when operations were at their peak.

The North West Coastal Highway crosses the area from west to east, and connects Roebourne with the ports of Port Hedland, 126 miles to the east, and Onslow, 196 miles to the west. A metalled road joins the Highway at the Jones River, and serves the crocidolite-mining centre of Wittencoom Gorge, about 180 miles to the southeast.

The pastoral industry was established in 1863 and is devoted almost entirely to sheep. The following properties lie wholly or partly within the Sheet area: Woodbrook, Mt. Welcome, Cooya Pooya, Warambie, Sherlock, Mallina, Mundabullangana and Boedarie. Access within the area is generally very good because of the close spacing of wells and the tracks used to service them.

HISTORY OF INVESTIGATIONS

The first geological investigation in the area followed the early discoveries of copper. Woodward (1890), Calvert (1899) and Cadell (1899) made brief inspections.

At about the same time A.G. Maitland and H.W.B. Talbot began a systematic survey of the geology of the adjacent Pilbara Goldfield (Maitland, 1908), and many of their conclusions apply to the Roebourne area.

In 1910 Woodward (1911) carried out a similar survey of the West Pilbara Goldfield, which includes the Roebourne area. Apart from brief inspections by officers of the Western Australian Department of Mines, there were no further detailed surveys until the Aerial, Geological and Geophysical Survey of Northern Australia (A.G.G.S.N.A.) began work in 1935. This work was confined to known mineral deposits and the various reports are listed in the Bibliography. Adams (1943) examined chrysotile deposits within the area, and descriptions of iron and copper deposits are included in reports by Connolly (1959) and Low (1963). Brief mention of the area, and of the mines within it, may be found in many of the annual reports of the Western Australian Department of Mines, and in publications of the Geological Survey of Western Australia.

In 1962 and 1963 the Geological Survey mapped the Roebourne Sheet area in conjunction with the adjacent Sheets of Dampier and Pyramid. Field work was carried out by G.R. Ryan, M. Kriewaldt and W. Bock, under the direction of R.C. Horwitz. The Port Hedland Sheet area to the east was mapped in 1961 by G.H. Low (1965), and the Dampier Sheet area to the west has been described by Kriewaldt (1964a). Petrological and palaeontological determinations were made by A.F. Trendall and H.S. Edgell respectively, both of the Geological Survey of Western Australia.

PHYSIOGRAPHY

The area is low-lying, and consists of extensive plains from which project low hills of Precambrian rocks.

Broadly, four units may be distinguished:

- (a) In the east a wide sandy plain extends from the hills east of Whim Creek to the Turner River.
- (b) From Whim Creek westwards to Roebourne a similar plain skirts the foothills, but is of clay with a gilgai type surface.
- (c) A low-lying tract of tidal marshes, mangroves, and sand dunes fringe the coast from Point Sampson eastwards to the edge of the Sheet area.
- (d) Tumbled hills, the highest of which stands about 600 feet above sea level, occupy the western part of the area and form the peninsula upon which Point Sampson lies; then skirt the coastal plain eastwards towards Whim Creek, where they again project north-eastwards almost to the coast; and continue as low isolated hills eastwards along the southern edge of the area.

A prominent feature is the bold massive outcrop of gabbro which forms Depuch Island. Bezout Island, Jarman Island, and Picard Island are also composed of crystalline rocks, whereas the other islands are dissected remnants of cemented coastal deposits upon which sand has accumulated.

The physiography reflects the geology of the rocks which form the Precambrian basement. Granite and gneiss underlie the plain areas; slate forms the low isolated hills in the southeastern sector; and altered basic volcanic rocks and jaspilite formations form the more upstanding ridges to the west. The highest hills are composed of basic intrusive and extrusive rocks of Proterozoic age.

The lower reaches of several rivers cross the Sheet area from south to north. They flow only after the torrential cyclonic rains experienced in the summer months and have a braided pattern typical of this type of drainage.

For most of the year they consist of permanent or nearly permanent waterholes scattered along the sandy and cobbly river beds. The rivers rise to the south in the Nullagine Plateau of Jutson (1950), known locally as The Tableland. They originated on an earlier land surface and have been superimposed. Several fine water gaps may be seen, along the Harding River in particular. Subsequent drainage is demonstrated by the Jones River west of Warambie Homestead, and obsequent streams in this area drain southwards into the Jones River from the dip slope of the Proterozoic basalts.

The rivers do not persist to the sea but debouch on to extensive tidal flats as much as 4 miles inland from the coast. Tidal inlets are incised into these flats and the rivers themselves are incised into the coastal plains. The coast line is formed by a belt of sand dunes of various ages, around which sand shoals and mangrove swamps have formed. North of Mallina Homestead the Peawah River has been diverted by the encroachment of self dunes; and old drainage lines along the eastern bank of the Yule River are similarly covered. Veivers and Wells (1961) consider that similar dunes in the Canning Basin are Pleistocene in age, which suggests that the present drainage of the Roebourne area has changed little since then.

The coastal plain is a pediplain left by the retreating scarp of the Nullagine Plateau, and the soil, gravel and boulder beds left thereon are residual deposits, the size of which varies with distance from the scarp.

Relicts of a land surface, probably Tertiary, form mesas of pisolite and planed tops to some of the higher hills and ridges. The mesas adjoin these planed surfaces, in places forming a profile which is continuous from one to the other. Between Cape Lambert and Point Sampson pisolite lies at sea level, whereas west of Mt. Welcome the mesa tops lie

about 100 feet above plain level. Intervening mesa levels delineate a profile sloping gradually to the north.

GEOLOGY

The oldest rocks in the area are thought to be the folded and metamorphosed volcanic and sedimentary rocks of the Roebourne Group (Ryan, 1964). They occupy fold belts between large granitic domes. Both Maitland (1908) and Noldart and Wyatt (1962) have suggested that similar domes in the Pilbara Goldfield to the east might represent, at least in part, an older basement, but neither they nor anyone else has yet found any evidence to support this view. Kriewaldt (1964a) has compared the domes with the "mantled gneiss domes" of Eskola (1949).

In Western Australia the time boundary between the Archaean and Proterozoic is provisionally placed at about 2,500 million years. The granitic domes, other intrusives, and sedimentary and volcanic rocks of the Roebourne Group, have been included in the Pilbara System (Noldart and Wyatt, 1962; Ryan, 1964). At Wodgina, in the Marble Bar 1:250,000 Sheet area, a lithium-bearing pegmatite similar to those southeast of Roebourne gave an age in excess of 2,700 million years (Wilson, and others, 1960): so the Pilbara System is of Archaean age. It is overlain with strong angular unconformity by the "Nullagine Series" of Maitland (1908), which is of Lower Proterozoic age (Leggo and others, in press). Only the oldest members of this succession, belonging to the Fortescue Group of MacLeod and others (1963) are present within the area. They are cut by basic intrusives of probable Precambrian age.

The only younger rocks in the Sheet area are loosely consolidated or unconsolidated terrestrial sediments of Cainozoic age. The geological history is summarised in Table I.

ARCHAIC: PILBARA SYSTEM

ROEBOURNE GROUP

Two contemporaneous environments are represented in the Roebourne Group (Ryan and Kriewaldt, 1964). Volcanic rocks and chemical sediments predominate between Whim Creek and the western edge of the Sheet area, but south and east of Whim Creek they pass to a much thicker succession which consists principally of fine-grained detrital rocks with some interbedded volcanic, siliceous, calcareous and ferruginous beds. The thicker clastic succession is poorly represented on the Roebourne Sheet area and has been mapped principally on the adjacent Pyramid Sheet area (Kriewaldt and Ryan, in press).

The volcanic succession has been divided into three stratigraphic assemblages which are, from top to bottom:

Cleaverville Formation - banded iron formation and pelitic rocks.

Regal Formation - basic volcanic rocks with acid igneous rocks and thin intercalated sedimentary rocks.

Altered chemical sediments, pelitic rocks, acid and basic volcanic rocks, and some coarser detrital rocks.

In the Pyramid Sheet area, the clastic succession has been divided into three units, (Kriewaldt and Ryan, in press) and the stratigraphy may be summarised as:

Top Greywacke, shale, calcareous shale, chert, sandstone.

Shale, slate, thin chemical sediments, with greywacke, acid igneous rocks, and locally developed basic volcanic rocks.

Sandstone, shale, greywacke.

Of these units only the lower and the upper are well exposed on the Roebourne Sheet area. The top unit of the clastic succession is correlated with the Cleaverville Formation, and the middle unit of the clastic succession is correlated broadly with the Regal Formation and the underlying altered volcanic and sedimentary rocks. More detailed descriptions of the lithology, the stratigraphy and the correlations within the Roebourne Group are given in Ryan and Kriewaldt (1964) and Ryan (1964; and in press). A summary of the stratigraphy is given in Table 2.

Volcanic succession

The volcanic succession occupies a number of synclinoria, folded between granite and gneiss domes and ridges, which lie in a rough en echelon pattern between Whim Creek and the western edge of the Sheet area. The lowermost stratigraphic unit adjoins the granitic domes, and has been metamorphosed and intruded by granite in many places. It consists of banded chert formation, altered dolomite and calcareous schist, interbedded pelite and basic volcanic rocks around Roebourne; but to the east, from the George River to Mt. Brown, the same stratigraphic position is occupied by a suite of acidic rocks, including fine-grained breccia and green coloured granular and aphanitic siliceous rocks. Similar rocks are associated with porphyry at the Ilingotherra Hills, and are thinly interbedded with slate at Whim Creek.

Sandstone and conglomerate are developed locally south of Cleaverville townsite. They overlies a local disconformity, but to the west pass laterally to an unbroken succession of finer-grained detrital rocks and altered calcareous rocks more typical of this stratigraphic unit (Horwitz, 1963). The sandstone is overlain by banded chert, which is in turn overlain by the Regal Formation.

The Regal Formation consists predominantly of basic volcanic rocks, including pillow lavas, massive green amphibolite with pale-coloured spheroidal bodies, and rocks with clusters of acicular crystals of bastite after pyroxene. Chert, dolomite, ferruginous dolomite, quartz-amphibole schist and garnet gneiss are intercalated thinly with the volcanic rocks.

Acid volcanic rocks, and detrital and pyroclastic rocks are more common in the syncline west of Andover Homestead, where the formation has an estimated thickness of 10,000 feet, compared to the more typical thinner succession to the north. Intrusive, and concordant, bodies of porphyry are also more common in this area, and also towards Whim Creek.

Relicts of the Regal Formation lie in a complex of serpentinite, amphibolite and intrusive gabbro south of Roebourne. Serpentinisation of the basic rocks of the Regal Formation is widespread between here and Whim Creek; and the serpentinites south of Roebourne may represent altered members in which the alteration has completely masked the original composition of the rock.

The Cleaverville Formation conformably overlies the Regal Formation, probably with some interdigitation. It occupies synclinal axes in the western part of the area, but is missing east of the Sherlock River, possibly through erosion.

Banded chert, acid rocks, serpentinite and ?skarn rocks crop out as isolated low hills in the extreme southeastern corner of the Sheet area. They are tentatively equated with the lowest part of the volcanic succession. They have irregular dips and strikes, but foliation in a small outcrop of gneiss in this area has a gentle westerly dip and the gneiss apparently lies below them.

Clastic succession

The lowest unit in the clastic succession is represented by the sandstone and shale sequence south of Towerama. It is overlain by shale and slate which in turn is overlain by an assemblage of acid, calcareous and detrital rocks that appears to represent the lowest unit in the volcanic succession. The Regal Formation is the highest stratigraphic unit in this area, and it passes eastwards to slate at Whim Creek.

Scattered outcrops of slate, shale, siltstone and calcareous shale, which are equated with the slate at Whim Creek, are present between the Peawah River and the Yule River, and to the northwest of Mt. Berghaus. Quartz greywacke, with interbedded pelite, crops out at Mt. Berghaus. The greywacke beds contain graded bedding, small-scale cross-bedding, swarms of clay pellets and signs of bottom erosion; all indicative of deposition by turbidity currents. The greywacke is thought to be the uppermost member of the clastic succession (Ryan, 1964).

A variety of rock types crop out along the southern margin of the Sheet area between the Peawah River and the Yule River. Green to grey shale and quartz greywacke, probably derived from porphyry (Trendall, 1964; Ryan in press) is present near the Peawah River, and here concordant bodies of porphyry and amphibole-serpentine-magnetite rock are interbedded with them. Further east there are outcrops of green-coloured granular and aphanitic rocks which resemble members of the Regal Formation. These rocks probably represent an extension into the clastic succession of products of the adjacent vulcanicity.

INTRUSIVE AND METASOMATIC ROCKS

The oldest known intrusive in the area is an altered dolerite dyke that is truncated by the disconformity near Cleaverville townsite (Horwitz, 1963).

Many similar dolerites crop out within the Regal Formation. They are comparable to the "younger greenstones" of the Pilbara Goldfield (Maitland, 1908) and of the Kalgoorlie area in the southern part of Western Australia. They are typically more massive and less sheared than the enclosing lavas, as well as being somewhat coarser in grain size. A medium-grained massive amphibolite crops out in many places between the Sherlock River and Balla Balla Landing. It is apparently concordant, but similar bodies that crop out within the Regal Formation are thought to be intrusive, though no intrusive contact has been seen. Amphibolite also crops out east of Toweranna, and is contiguous in strike with an amphibolite on the Pyramid Sheet area which is one of a number of such bodies that intrude the clastic succession (Kriewaldt and Ryan, in press).

Small bodies of porphyry are present in many places, notably at the Ilingotherra Hills and between Warambie Homestead and Whim Creek in the Regal Formation. Most of them are concordant, and although some are definitely intrusive, others may be extrusive. The similarity between the feldspar and quartz of the porphyry, and detrital grains of feldspar and quartz in greywacke south of Mallina Homestead has led Trendall (1964) to suggest that bulk flow of acid igneous rock, possibly with admixed sediment, has taken place. The porphyry bodies are folded with the Roebourne Group.

Large irregular masses of dolerite and gabbro crop out between Mt. Welcome, Mt. Hall, Mt. Gregory and the western edge of the Sheet area. The basic rocks have intruded the Roebourne Group although in some cases the contact between gabbro and altered members of the Roebourne Group is gradational. The gabbro has been intruded by granite.

Gabbro, dolerite, granite, amphibolite, and serpentinite form part of this metamorphic and intrusive complex which occupies much of the area between the East Harding River, Roebourne and the western boundary of the Sheet area.

The complex is bounded on the south by granite, gneiss and mylonite and on the north by the Roebourne Group. It contains a wide variety of metasomatised rocks, hybrid rocks and recognisable relicts of the Roebourne Group in addition to the intrusive rocks. The lithological variety cannot be differentiated at a scale of 1:250,000 so that the complex is represented as hybrid and "metasomatic rocks" in order to distinguish it from the lower-grade metamorphic rocks of the Roebourne Group.

Metasomatism, dynamic metamorphism and igneous intrusion are common at the contact of the Roebourne Group with the large domes of granite and gneiss about which it is folded. However, regional metamorphism is generally of very low grade.

The granite and gneiss of the domes crops out in few places, but underlies the extensive plains between Roebourne and Whim Creek and between the Peawah River and the eastern edge of the Sheet area. Massive granite in the core of the domes passes to granitic gneiss at the edges. The granite of the cores is weakly foliated and leucocratic, and is generally non-porphyrific. However, there are smaller bodies of intrusive melanocratic granite which carry hornblende or biotite and contain xenoliths. Granite porphyry intrudes shale at Toweranna and leucocratic granite intrudes the Regal Formation southwest of Sherlock Homestead. The smaller intrusive granites are distinguished from the large granite domes because of their obvious intrusive relationships, their slight differences in mineralogy and the presence of xenoliths. They appear to be slightly younger, and may have been derived by remobilisation either of an older basement, or of the lower part of the Roebourne Group (Ryan, in press).

The largest body of intrusive granite is that which lies south of Mallina Homestead. It is a hornblende granite

with abundant xenoliths, and locally is of dioritic composition. Contaminated hornblende granite is associated with the metamorphic complex south of Roebourne. Jarman Island and Picard Island are composed of tonalite, and small bodies of tonalite porphyry crop out between Point Sampson and Roebourne. The tonalite is probably related to the hornblende granite.

Dykes of aplite, pegmatite and granite cut serpentine, gabbro and amphibolite between Mt. Hall and Mt. Gregory. Granite is so common in the valley floors in this area that it is thought to be continuous below the outcropping basic and ultramafic rocks at shallow depth.

CORRELATION

The two laterally equivalent successions of the Roebourne Group are lithologically similar to the Warrawoona succession (volcanic) and Mosquito Creek succession (sedimentary) of Noldart and Wyatt (1962): but there is no sign of the erosional break which separates the Warrawoona succession from the Mosquito Creek succession in the type area (Maitland, 1908; Finucane, 1939). This erosional break does not appear to be as widespread as has been thought, and is apparently represented by continuous sedimentation in the clastic succession southeast of Whim Creek (Ryan, 1964).

Nevertheless the Roebourne Group can be correlated roughly with successions in the type area (Table 3). The Cleaverville Formation is lithologically similar to the jaspilite member of the Gorge Creek Formation of Noldart and Wyatt (1962), and the greywacke at Mt. Berghaus is the equivalent of similar rocks on the adjacent Fort Hedland Sheet area which Low (1965) has correlated tentatively with the Gorge Creek Formation. The Gorge Creek Formation is part of the Mosquito Creek succession, so that the uppermost units in both the volcanic and the clastic successions in the Roebourne

Group can be correlated with the upper Mosquito Creek succession of the type area.

The Regal Formation and underlying altered sedimentary and volcanic rocks, and their equivalents in the clastic succession, are correlated with the Warrawoona succession.

LOWER PROTEROZOIC

FORTESCUE GROUP

The Mt. Roe Basalt (Kriewaldt, 1964b) is the oldest Proterozoic formation present. Its outcrop is restricted to three areas, where it occupies faulted shallow basins overlying the Pilbara System. It consists of basaltic and andesitic amygdaloidal, vesicular and columnar lavas with intercalated sedimentary and pyroclastic rocks.

At Mt. Roe, near Andover Homestead, and from there to the Sherlock River, a variable thickness of volcanic rocks dips generally to the south, though dips are reversed locally by faulting. This passes upwards to agglomerate and tuffaceous sandstone. A similar succession is found between Dixon Island and Mt. Anketell, where the lavas are capped by more than 100 feet of coarse boulder agglomerate which includes elements of granite and jaspilite.

Sandstone, shale and claystone are intercalated with the lavas of the outlier at Whim Creek. Similar beds lie at the base of the lavas between Mt. Ada and Mt. Oscar. Here they are involved in faulting which was apparently contemporaneous with deposition. They include elements derived from the Cleaverville Formation and older members of the Roebourne Group.

Up to 1,000 feet of coarse-grained, tuffaceous, micaceous sandstone overlies the Mt. Roe Basalt south of Mt. Ada. At the base about 50 feet of coarse agglomerate marks the passage from the sandstone to the underlying volcanic rocks. The sandstone is a correlative of the Hardey Sandstone (MacLeod and others, 1963; Kriewaldt, 1964b).

INTRUSIVE ROCKS

At Depuch Island, Peawah Hill and Mt. Spinifex, gabbro and dolerite form bold hills of tumbled black rock fragments, some of spectacular size. Although none of these basic bodies can be seen to intrude Proterozoic rocks, they are similar to the Cooya Pooya Dolerite which crops out along the southern edge of the Sheet area from Lockyer Gap to the Sherlock River, and which intrudes the Fortescue Group. Quartz, possibly of secondary origin, is present in these rocks which Glauert (1911) compared with the quartz diabase of the Kalgoorlie region. Saussurite is also common. A.F. Trendall has observed serpentine in a thin section of the Cooya Pooya Dolerite.

Dykes, sills and small stocks of quartz-bearing dolerite, uranitised in many places, cut the Mt. Roe Basalt, the Cooya Pooya Dolerite, and the Archaean rocks. They tend to occur in association with faults. They are the youngest crystalline rocks known within the area.

CENOZOIC

TERTIARY

Pisolite

Isolated outcrops of limonitic pisolite containing fossil wood fragments and clastic material are found west of the Harding River from Cape Lambert to a point 4 miles

southwest of the Weerianna Mine; on the east bank of the Peawah River near Mallina Homestead; and on either side of the Yule River south of Portree Homestead. The pisolite is comparable to the Robe Pisolite of MacLeod and others (1963) in appearance and composition, and probably in origin; and is the Poondano Formation of Lindner and Drew (in McWhae and others, 1958). Low (1965) considered the Poondano Formation to be homechronous with the Tertiary Oakover Formation, and Noldart and Wyatt (1962) observed ferruginous pisolite at the base of the latter formation.

The pisolites are thought to represent ferruginised valley fill, and their distribution delineates drainage lines of probable Tertiary age.

QUATERNARY

Kunkar

Widespread deposits of impure calcareous concretionary material form a dissected plain between Toweranna and the eastern margin of the Sheet area. They are formed upon calcareous and basic members of the Roebourne Group and are considered to have derived magnesia and lime from these rocks. Similar deposits are found along present-day drainage channels; and may be seen in the process of deposition where lime-rich waters are exposed to evaporation in the Jones River west of Inthanuna Pool. Kunkar also forms encrustations in the red clay of the high-level plain (see below); and the cement of loosely consolidated gravel and boulder beds of older scree slopes. The lime cement of the Bossut Formation may be related.

Lime and magnesia mobilisation and deposition began in Tertiary or Pleistocene time and continues at the present day, forming cementations, encrustations and sheets in the contemporaneous sediments. The kunkar deposits can be related in every case to underlying calcareous or basic rocks, or to

waters draining such rocks. The oldest of these deposits may be comparable with the Oakover Formation, of late Tertiary age, as they form a dissected profile which predates the Pleistocene high-level plain.

Bossut Formation

Lime-cemented dune sand, beach sand and beach conglomerate crop out in several places from Cape Lambert to Boodarie Landing. It is most extensively exposed north-east of Mundabullangana Homestead. Dune bedding is common and old dune lines may be distinguished in places. Similar deposits on the adjacent Sheet areas of Dampier and Port Hedland were correlated with the Coastal Limestone of Fairbridge (1953) by Kriewaldt (1964a) and Low (1965). Following Johnstone (1960), Low named them the Bossut Formation.

A sample of beach conglomerate from east of Cape Thouin which was examined by H.S. Edgell, contained fauna of inconclusive age. Fairbridge suggests a late Pleistocene age for the Coastal Limestone and a similar age has been adopted for the Bossut Formation.

Alluvial and Eluvial Deposits

The coastal plains are composed of up to 150 feet of red clay, silt and sandy clay, forming a high-level plain into which the present day drainage channels have cut deeply. Disposed along these channels are levees and sheets of silt, which are themselves dissected, though in some places they merge with the creek alluvium. They are also associated with river benches intermediate in level between the Creek bottoms and the high-level plain. Similar deposits have been recognized on the adjoining Dampier Sheet area (Kriewaldt, 1964a). Successively younger stages of deposition are also apparent in the coastal deposits and in the slope deposits which flank the hills.

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Boulders, cobbles, talus and scree predominate on the slopes and grade outwards into the argillites of the plain. The oldest unit, exposed in gullies incised into fossil scree slopes, is cemented by calcareous, ferruginous, or argillic interstitial material. The younger uncemented deposits overlie these, and form river benches and levee-type embankments in places along the upper reaches of creeks. Scree and coarse creek deposits comprise the youngest sediments.

Washed river sand and gravel has been obtained from wells and bores well removed from present river channels on the high-level plain. Turner River No.5 Bore penetrated 149 feet of this formation. Microfossils from a sample taken near Cape Thoun were identified by H.S. Edgell as of Late Pliocene or Pleistocene to Recent age. No marine fauna were seen.

The actual composition of the plain varies from dark clay with gilgais over basic rocks to sandy clay and gravel over granite. The plain is believed to be residual, left by the degradation of underlying rock. It is veneered in places by sand and gravel which increase in particle size towards the outcrop.

The flood silt deposited along drainage channels overlies a dissected profile of the plain, and towards the coast coalesces to form extensive silt plains up to 10 feet thick. Thick accumulations of Anadara aff. thackweyii are found in this silt along the edges of the tidal flats. Comparable beds in South Australia contain a similar fauna (Horwitz, 1962; Sprigg, 1952).

These Anadara deposits are themselves dissected, and they merge into tussocky claypan country consisting of silty grassed hummocks which rise several feet above a hard claypan. The claypan itself is covered by silt for the most part. Associated with both the claypans and the silt beds

are dunes and belts of lightly vegetated red sand which accumulate downwind and form self dunes. The westward migration of these dunes is evidenced by the westward deflection of the Peawah River north of Mellins Homestead.

In the Canning Basin similar dunes are considered by Veevers and Wells (1961) to have been formed during the Pleistocene. If the dunes of the Roebourne area are of similar age, then the unconsolidated flood deposits from which they derive sand must also be of the same age. On the other hand, an age of 2,000 years was obtained from specimens of Anadara by radiocarbon dating. This work was carried out by the Department of Industrial and Scientific Research in New Zealand, on specimens obtained from the Dampier Sheet area.

The coast is marked by three roughly parallel dune series whose relative ages are indicated by the degree of dissection and vegetation. The oldest is associated with a sandy high-level plain which is the coastal equivalent of the red clay. It has been dissected by tidal and fluvial activity and forms prominent breakaways bordering the tidal flats; and is covered in places by Anadara-bearing silt. Younger dunes have formed successively to seaward, in places truncating older dune lines. The youngest merges with the beach and shoal sand of the present coast.

STRUCTURE

The major tectonic elements of the area are the two broad granitic domes which underlie the plains. The Roebourne Group is folded between these domes, and incorporated in them to some extent. Dips are generally steep, but vary from overturned in the axes of synclines to gentle where the Roebourne Group dips off the flanks of the granite. The doming is attributed to the rising of the granitic material, and there is no evidence of lateral orotonic movement. The domes may consist entirely of primary granite magma with assimilated Archaean rocks; they may be palingenetic granite derived from

the lower elastic members of the Roebourne Group; elements of an older basement; or a combination of any of these (Ryan, in press).

The dominant folding in the Archaean trends east to northeast, with a marked left hand offset in places, which is thought to have been caused by cross-folding. Two sets of foliation are exposed in gneiss in the bed of the Sherlock River, and Cadell (1899, p.181) states that "The older and coarser banding has a north-south strike.....and at right angles to this there are zones of secondary and much finer foliation". Noldart and Wyatt (1962) also noted two directions of deformation within the Pilbara System.

A succession of large folds in the Roebourne Group between Dixon Island and Andover Homestead consists of tight synclines and rather broader domes and ridges with granite cores. The principal synclinal axes strike southeast at Dixon Island and Point Sampson, and easterly at Mt. Ada. The metamorphic and intrusive complex south of Roebourne occupies a shallow faulted basin flanked, and probably underlain at shallow depth, by granite and metasomatised rocks. Northeast trending synclines north of Mt. Negri and south of Whim Creek are intersected by folds which trend roughly north; and a northerly fold direction, superimposed on the predominant easterly trend, is also apparent west of Mt. Dove, approximately along the course of the Yule River.

A number of faults, which strike west of north, have displaced the syncline which lies between Roebourne and Mt. Anketell. To the south an apparent continuation of this zone strikes southwest, and basic igneous activity has been located along it.

A major tectonic lineament, marked by shearing, mylonitisation, and cataclasis, separates a truncated syncline of the Roebourne Group from granite and gneiss along a line from west of Andover Homestead eastwards to the Jones River, where superficial deposits obscure the outcrop.

It is thought to be a zone of vertical or near-vertical movement, along which granitic rocks have moved upwards relative to the southern block of volcanic and sedimentary rocks.

Proterozoic rocks are insufficiently preserved for a determination of Proterozoic tectonic trends. They occupy flat, faulted basins at Dixon Island and Whim Creek; and in the principal area of outcrop between the Harding River and the George River they dip gently south, except between Mt. Ada and Mt. Oscar where faulting and irregular dips are common. Fault subsidence during deposition is apparent from at least two localities.

The Mt. Roe Basalt, the lowermost formation in the Fortescue Group, is almost entirely restricted in occurrence to the centres or flanks of underlying Archaean synclines. This, coupled with the evidence of contemporaneous subsidence, points to a continuation into the Lower Proterozoic of movement initiated during the Archaean Pilbaran Orogeny (Kriewaldt, 1964b).

ECONOMIC GEOLOGY

Copper was first discovered southwest of Roebourne in 1872, and subsequent discoveries created much interest in the area. However, the apparent potential was never realised, and only the Whim Creek copper lode remained as a significant producer. Many small metallic and non-metallic deposits have been exploited with varying success; but mining was at a standstill in 1962, apart from an attempt by the Depuch Mining and Shipping Co. to revive Whim Creek, and sporadic working of beryl-bearing pegmatites by aboriginals south of Mt. Hall. However, the area has proved to be well endowed with excellent groundwater supplies which has permitted the establishment of a thriving pastoral industry. Summaries of mineral production is given in Tables 5 and 6.

MINERAL DEPOSITS

By 1910 activity in the West Pilbara Goldfield was declining, and in that year Woodward (1911) made a comprehensive examination of the area. The next intensive survey was that of the A.G.G.S.N.A. between 1935 and 1940. Brief reports have appeared in publications of the Department of Mines from time to time.

The mineral deposits of the Sheet area may be classified as follows:

Auriferous quartz lodes and magnetite lodes associated with intrusive and metasomatic rocks.

Cupriferous lodes in slate.

Antimony-bearing gold quartz lodes in slate.

Crysotile lodes in ultrabasic rocks.

Pegmatites.

Pisolites.

Lodes associated with metasomatism.

Copper and cobalt-bearing gold-quartz lodes occur near Roebourne where they occupy short irregular fissures in metamorphosed lower members of the volcanic facies of the Roebourne Group. The most important lodes are those of the Weeriana, Carlow Castle, Good Luck and Fortune groups, which have been described by Finucane and others (1941). At Toweranna quartz reefs lie in an outcrop of granite porphyry which has intruded slate (Telford, 1939a).

Assays of up to 18% TiO_2 have been obtained from a group of magnetite bodies west of Mt. Gregory (Finucane and Telford, 1941). Similar ferruginous bodies crop out about 6 miles north-northwest of Whim Creek (Jones, 1965). Southwest of Mt. Gregory the Andover lead lode lies in metasomatized rocks. Maitland (1919) gives the following assay of a

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sample taken from open cuts along the lode:

Lead 67.17%; copper 0.42%; silver 3 oz. 18 dwt. per ton.

Copper deposits in slate.

The copper deposits of Whim Creek and Mons Cupri, and several small showings of copper in the vicinity, are localised at the contact of slate with underlying siliceous rocks of the Mt. Brown type (see p.7). Quartz is rare and iron oxides (after sulphide) constitute the dominant gangue minerals.

Lead mineralisation is present in the copper lodes, and there is also a small lead-silver lode, the Comstock, south of Mons Cupri. Assays of three samples of ore from the Comstock lode were as follows (Maitland, 1919):-

Lead, 41-57%; silver, 3-66 oz. per ton; gold, Trace.

The Whim Creek lode has been one of the largest producers of copper in Western Australia. Descriptions have been given by many, of whom Woodward (1911), Finucane and Sullivan (undated), and Low (1963) are the most comprehensive.

Antimony-bearing quartz lodes.

Antimony and gold has been won from quartz reefs around Mallina Homestead, and at Peawah, 4 miles to the south-east (Telford, 1939b). An antimony lode, the Star, has also been reported by Telford from a locality 5 miles northeast of Mt. Negri.

Chrysotile lodes.

Seams of chrysotile are found in serpentinite and other altered basic rocks throughout the area. The fibre has been exploited near Sherlock Homestead, and from several localities southeast of Roebourne (Adams, 1943; Finucane and others, 1939). Corundum is also found in serpentinite south of Roebourne; and magnetite in a concordant ultramafic body south of Mallina Homestead.

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Permatites.

The serpentinites south of Mt. Hall near Roebourne contain many acidic dykes, and some of these carry quantities of beryl and spodumene as well as lepidolite, zinnwaldite, tantalite and other economic minerals in less abundance. The beryl has been exploited by a co-operative of aboriginals. It occurs in a finely disseminated form and Ellis (1962) considers it unlikely that the beryl can be mined on a large scale. Tantalite and cassiterite is won from the adjacent gullies by the aboriginals.

Pisolites.

The pisolites of the area are similar to the Robe Pisolite of MacLeod and others (1963) in the Hamersley Iron Province, but they are of insufficient tonnage to warrant attention; although more extensive deposits could exist below the plain near the Yule River.

Roebourne is the centre of a small semi-precious stone industry. Stones are obtained from the Cleaverville Formation (jaspilite), the Regal Formation and underlying sediments (jadeite, prase, serpentine, agate, carnelian) and from the Mt. Roe Basalt (agate), as well as localities outside the Sheet area.

Granite and gneiss, quartz float, dolerite and pisolite provide abundant sources of aggregate, road metal, and ballast.

Between Bezout Island and the mainland there is a very strong magnetic anomaly which has been discussed in detail by Woodward (1911). It may be caused by a magnetite or basic body in the Roebourne Group; a basic intrusive similar to that at Depuch Island; or the Mt. Roe Basalt.

WATER

Stock water, used principally for sheep and horses, abounds throughout the area. The sand and gravel beds of the high level plain, kunkar deposits, and cemented cobble and gravel beds near hills all provide suitable aquifers. Water is rarely found deeper than about 40 feet, and is in general of excellent quality. Saline waters are found along the coast and in places where bedrock is shallow, though rarely is the water too salty for sheep. Fresh water is obtained from dune sand and the underlying Bossut Formation both at Point Sampson and north of Mundabullangana, though supplies are limited. Water derived from basic rocks may be rich in lime. There are also many permanent or nearly permanent water holes along the rivers. Sub-surface flow persists throughout the year along these rivers.

Water for the township of Roebourne is obtained from bores in deep alluvium near the town. The Port Hedland water supply is drawn from similar alluvium on the Turner River south of Boodarie Homestead, where large quantities of fresh water have been obtained. To date no consideration has been given to surface storage because no need has arisen, and in general suitable sites are rare. However, the Harding River offers several potential dam sites should greater supplies of water be required in the Roebourne area. At present domestic water for Point Sampson is brought as ballast by ships calling at the port. At Whim Creek water is obtained from wells along the banks of creeks, and from the mine workings.

Table 7 shows some typical underground water supplies in the Sheet area and the locations of about 285 known wells and bores are shown on Figure 2*.

Footnote *Details for wells and bores shown on Fig.2 are available at the Geological Survey of Western Australia.

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TABLE 1
SUMMARY OF GEOLOGICAL HISTORY
ROEBOURNE 1:250,000 GEOLOGICAL SERIES

	PERIOD	EVENT		ROCKS FORMED
CAINOZOIC	Quaternary	Erosion and deposition; changes in sea level.		Alluvium, residual deposits, colluvium, flood silt, aeolian sand, beach sand.
	?	-----?-----?-----?-----?		UNCONFORMITY
	Tertiary	Erosion, deposition, and cementation.		<u>Bossut Formation;</u> kunkar.
				UNCONFORMITY
PROTEROZOIC	?	Minor folding and faulting. Basic igneous intrusion.		Dolerite dykes and sills, gabbro intrusives, <u>Cooya Pooya Dolerite.</u>
		Detrital sedimentation, minor explosive activity.	FORTESCUE GROUP	Tuffaceous sandstone, tuff, agglomerate.
		Volcanic extrusion, early detrital sedimentation. Contemporaneous subsidence.		<u>Mt. Roe Basalt,</u> basal arenite, boulder agglomerate.
		EROSION		UNCONFORMITY
ARCHAIC		Folding and faulting. Acid and basic intrusion, metamorphism.		Granite, gneiss, gabbro, metasomatic rocks; pegmatite, quartz veins, mineral deposits.
	Pilbara System	Chemical and detrital sedimentation, minor igneous activity and folding; turbidity currents.	ROEBOURNE GROUP	<u>Cleaverville Formation;</u> shale; calcareous shale, siltstone, greywacke; dolerite sills or tuff; turbidities.
		Contemporaneous vulcanicity and chemical and detrital sedimentation; acid and basic hypabyssal intrusion; folding; turbidity currents and bulk transport of magma and unconsolidated sediment.		<u>Regal Formation;</u> banded chert, dolomite, shale, siltstone, greywacke and acid rocks; pyroclastic rocks; porphyry, dolerite sills and dykes; turbidites and mixed igneous and sedimentary rocks; local disconformity.
		Detrital sedimentation, from unknown source. Possibly from area now		Sandstone, shale, siltstone.

TABLE 2
 STRATIGRAPHY OF THE ROEBOURNE GROUP
 ROEBOURNE 1:250,000 GEOLOGICAL SERIES

Map Symbol	Thickness (feet)	Rock Unit			Thickness (feet)	Map Symbol
Ai	0-2000	<u>Cleaverville Formation.</u> Correlated with Gorge Creek Formation.				
Ae	0-10,000	<u>Regal Formation.</u> Equated with Warrawoona succession.	<u>Greywacke.</u> Tentatively equated with Gorge Creek Formation. Slate, calcareous shale etc.	0-1000(est.)	Ar	
				0-2000(est.)	Ar	
Al	0-500(est.)	Ultrabasic rocks.				
As	500-2000	<u>Metamorphosed sedimentary rocks.</u> Equated with Warrawoona succession.	<u>Granular siliceous rocks.</u>	<u>Folite psammite, calcareous rocks, etc.</u>	?	As
			Granular amphibolite			
				<u>Slate.</u>	± 15,000	Arr
Am		Zone of metasomatism.		<u>Sandstone.</u>	± 15,000	Are

TABLE 3
STRATIGRAPHIC CORRELATIONS IN THE PILBARA SYSTEM

	ROEBOURNE SHEET		PORT HEDLAND SHEET	MARBLE BAR SHEET	
	Volcanic Succession	Clastic Succession			
ROEBOURNE GROUP	<u>Cleaverville Formation</u> Jaspilite, pelite.	Pelite, psammite.	<u>Gorge Creek Formation</u> Jaspilite, psammite, pelite.	Pelite, psammite.	MOSQUITO CREEK SUCCESSION
	<u>Regal Formation</u> Basic and acid volcanic rocks.		Pelite, minor volcan- ic rocks.	Basic and acid volcanic rocks.	
	Altered sedimentary and volcanic rocks.	? ?	----- Altered sedimentary and volcanic rocks		
	?	Psammite, pelite. ?	?	?	WARRAWOONA SUCCESSION

TABLE 4
 CAINOZOIC DEPOSITS
 ROUBOURNE 1:250,000 GEOLOGICAL SERIES

Age	Map Sym- bol	Thick- ness (feet)	Formation	Description	Geomorphology	Remarks
Recent	Qr	0-50?	Alluvium	Silt, sand, gravel, and pebbles; beach deposits, aeolian sand, and scree.	In present-day drainage channels, along the coast, and on slopes.	Merges with older alluvium in places.
Recent to Pleistocene?	Qa	0-10	Older alluvium	Silt and sand, aeolian sand flood silt, lightly consolidated in places.	On older flood plain and river terraces, disposed along present-day drainage channels, and coast line.	Coastal deposits contain <u>Anadara</u> aff. <u>thackweyii</u> .
			Claypan	Sand, silt, silty tussocks and claypans.	Principally at a level slightly lower than the high-level plain.	Thought to have been formed by simultaneous erosion of, and deposition on, high-level plain.
Fleisticene	Qp	0-150 ⁺	Residual deposits	Red and mottled clay, sandy clay, and silt, with sheet kunkar; and local veneer of sand and gravel. Talus and scree cemented by kunkar.	Plediment; high-level plain formed by retreating scarp. Dissected, and overlain by younger deposits in places.	Sandy lenses are good aquifers. Clay contains pollen and microfossils, but no marine organisms.
Pleistocene	=	0-100?	<u>Bossut Formation</u>	Lime-cemented sand and shell conglomerate.	Cemented beach conglomerate beach sand, and sand dunes.	Correlated with <u>Coastal Limestone</u> . Possible aquifer.
Recent to Pleistocene	Qk	20+	Kunkar	Impure calcareous deposits and incrustations, with some siliceous nodules.	Forms dissected profile, topographically above high-level plain between Toweranna and Yule River. Also forms along drainage channels and as sheets in high-level plain.	Chemical deposits, still forming at present day, from lime-rich waters derived from basic or calcareous rocks. Older kunkar formed on calcareous rocks and may be correlative of kunkar on <u>Oakover Formation</u> .
? Pliocene	T	20-50	Pisolite	Limonitic, goethitic, hematitic pisolite, with detrital grains and fossil wood.	Ferruginised valley-fill, deposited along ?Pliocene drainage channels. Dissected mesas of Pliocene land surface.	Correlated with <u>Poondano Formation</u> and <u>Robe Pisolite</u> . Contains iron ore.

QUATERNARY

TERTIARY

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TABLE 5
ROEBOURNE 1:250,000 SHEET
RECORDED PRODUCTION OF MINERALS OTHER THAN GOLD
TO 31.12.63 (a)

Mineral	Locality	Production	Value	Remarks
		Tons	£	
Chrysotile	Roebourne	4.29	253	
	Sherlock	816.09	19,592	
Copper ore	Roebourne	2,573.00	37,658	Only from 1899
	Whim Creek	77,541.00	66,109	
Cupreous ore	Whim Creek	11,394.53	115,779	489 tons in 1963
	Roebourne	41.15	696	
Beryl	Roebourne	104.71	16,036	
	Whim Creek	3.39	600	
Tanto-columbite	Roebourne	8.47	16,424	
Tin	Roebourne	3.56	1,759	Production shown jointly.
	Pilbara			
Lead ore	Whim Creek	180.05	7,732	Production shown jointly.
	Roebourne			
(a) - Figures supplied by Statistics Branch, Mines Department.				

TABLE 6
ROEBOURNE 1:250,000 SHEET
RECORDED GOLD PRODUCTION TO 31.12.63 (a)

Mining Centre	Alluvial, Dollied Specimens	Milled or Smelted Ore Treated Gold		Total
	Fine oz.	Tons	Fine oz.	Fine oz.
Mallina	-	141.60	128.44	128.44
Roebourne	18.76	4,343.71	2,241.93	2,260.69
Weerianna	-	3,536.15	3,349.81	3,349.81
Toweranna	2.62	3,987.80	5,199.86	5,202.48
(a) - Figures supplied by Statistics Branch, Mines Department.				

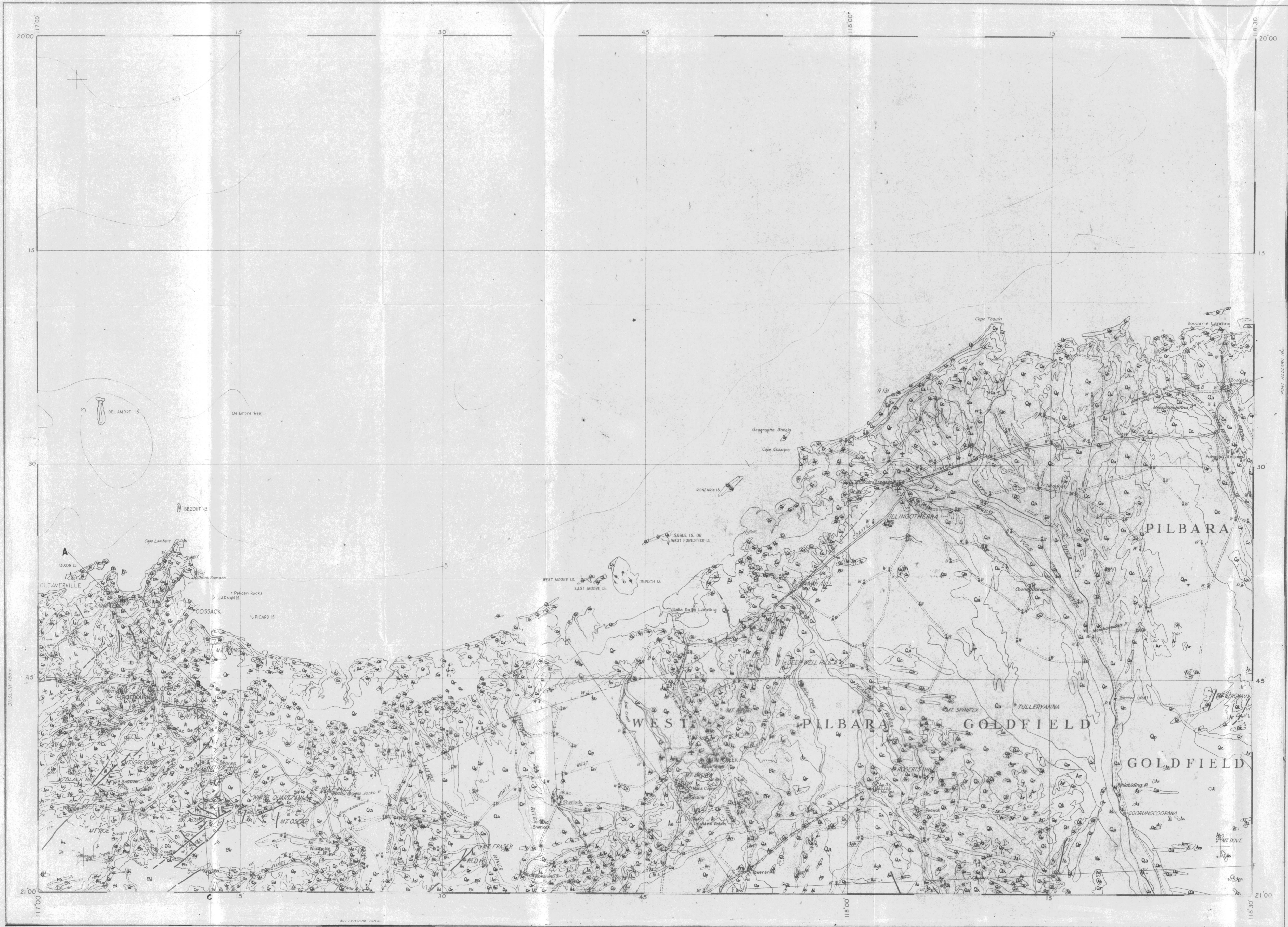
TABLE 7.

TYPICAL UNDERGROUND WATER SUPPLIES - ROEBOURNE SHEET

Name	No.*	Depth of Hole Feet	Depth to Water Feet	Quality	Aquifer
<u>Roebourne Town</u>					
Town Supply Bore 2	R5	64	23	Potable	Alluvium. Supply 5700gph.
<u>Port Hedland Town</u>					
Turner River Bore 3	T6	85	30	Potable	Clayey sand, gravel. Supply 2800 g.p.h.
Turner River Bore 5	T8	149	30	Potable	Clayey sand. Supply 5000 g.p.h.
<u>Mt. Welcome Station</u>					
Rocky Creek Well	E8	16	8	Stock	Alluvium, kunkar
Shaw Well	E7	16	12	Stock	Red clay, sand
<u>Woodbrook Station</u>					
Lead Mine Well	W7	23	20	Stock	Old mine shaft
Lockyer Well	W11	45	30	Potable	Alluvium over sandstone
White Quartz Well	W13	32	24	Potable	Alluvium
Woodbrook Well	W1	35	17	Potable	Alluvium, kunkar
<u>Waramble Station</u>					
Andy Well	A6	58	27	Stock	Alluvium, kunkar
Terena Well	A20	19	12	Stock	Alluvium
Willie Well	A12	25	17	Potable	Alluvium, kunkar
Withnell Well	A28	18	16	Stock	Alluvium
Koodipuntja Well	A32	36	21	Stock	Alluvium, kunkar
<u>Sherlock Station</u>					
Ryan Well	S26	34	31	Potable	Red clay, sand
Good Luck Well	S2	35	19	Potable	Alluvium
Louden Well	S9	40	20	Potable	Alluvium
Croydon Deep Well	S19	92	70	Potable	Red clay
<u>Mallina Station</u>					
Negri Well	M28	45	15	Stock	Alluvium
Gorge Well	M6	60	23	Potable	Alluvium
Homestead Well (N)	M18	57	50	Potable	Old mine shaft
Six Mile Well	M13	40	32	Stock	Alluvium, kunkar
Langenbeck Well	M14	50	29	Stock	Alluvium, kunkar

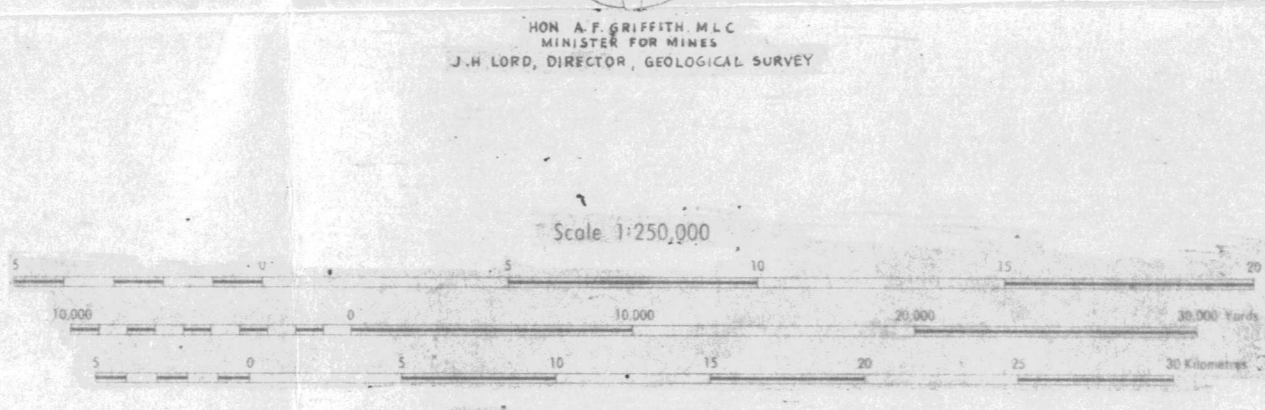
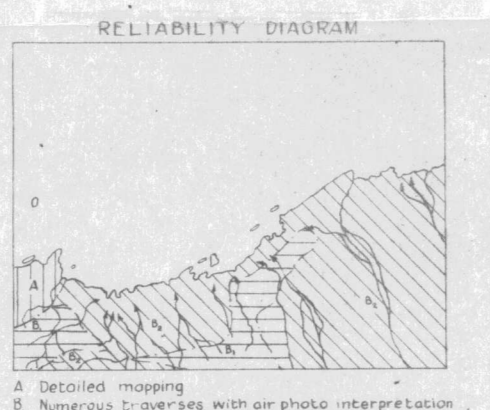
	No.*	Depth of Hole Feet	Depth to Water Feet	Quality	Aquifer
<u>Mundabullangana Station</u>					
Victory Well	U71	10	7	Potable	Sand over Bossut Formation
Parracumurra Well	U36	34	30	Potable	Sandy clay over wash
Woolshed Well	U10	38	37	Potable	Sandy clay over sand and gravel
Progress Bore	U84	40	35	Potable	Sandy clay over sand
Ah Tie Well	U56	44	40	Potable	Sand
Johnson Well	U93	31	23	Stock	Alluvium
Walter Well	U15	80	35	Stock	Red sandy clay. Granite spoil
Munerina Well	U23	34	29	Potable	Sand, gravel, kunkar
Portree No.4 Well	U46	56	28	Potable	Alluvium over gneiss
No. 17 Well	U6	43	36	Potable	Alluvium, kunkar
<u>Boodarie Station</u>					
Garden Well	B7	37	31	Potable	Alluvium

- SYMBOLS**
- Geological boundary
 - Fault
 - Strike and dip of bedding
 - Vertical bedding
 - Dip and plunge of drag structures
 - Plunge of fold axis
 - Facing from sedimentary rocks
 - Facing from pillow lavas
 - Strike and dip of lava
 - Vertical lavas
 - Strike of lava, dip unknown
 - Strike and dip of bedding
 - Strike and dip of lava
 - Strike and dip of foliation
 - Vertical foliation
 - Strike and dip of joints
 - Strike and dip of bedding
 - Vertical joints
 - Strike and dip of cleavage
- air-photo interpretation**
- Major road
 - Minor road
 - Track
 - Tramway (abandoned)
 - Telegraph line
 - Building
 - Airport
 - Landing ground
 - Tring stations
 - Well
 - Bore
 - Pool
 - Watercourse (non perennial)
 - Fathom line
 - High water area
- Mine or mining area**
- Prospect
 - Gold
 - Copper
 - Cobalt
 - Lead
 - Iron
 - Antimony
 - Beryl
 - Chrysoberyl
 - Spodumene



- RECENT**
- Qr Alluvium: Creek deposits, flood out deposits, silt on high tidal flats
 - Sand: Beach sand, mobile coastal and inland dune sand
 - Gravel: Downwash, scree talus, slope deposits
 - Dune sand: Brown and white fixed, coastal sand dunes
 - Qa Dune sand: Red fixed inland sand dunes, silt dunes
 - Silt sand: Fluviatile fixed deposits, levees, older alluvium silt with *Amblyops* and *Strophomena*
 - Clay silt: Flood plain deposits of silty tussack and clayey silt on level plain
 - Red sandy clay: High level sand plain with some clear flood deposits and clayey
 - Qp Clay, gravel: High level clay plain with gravel veneer, pediment
 - Red sand gravel: High level plain over granite, pediment
 - Red clay: High level plain of red and mixed clay and silt, silt, intermittent silt and gravel veneer, some sheet sand
 - BOSSUT FORMATION: Fine laminated hard conglomerate and sand
 - Qk Kunjar: Impure calcareous limestone sheets and as incrustations, some quartzite
- PLEISTOCENE**
- T Pleistocene: For rugged and later level valley fill and bedrock, with sand and fossiliferous laterite gravel (Correlated with PONDING FORMATION)
- PLIOCENE**
- d Dolerite: Basaltic quartz dolerite dykes
 - Ed Dolerite: Altered dolerite dykes and sills
 - b Basic intrusives: Massive medium-grained to coarse-grained altered basic rocks, including Archean rocks only but considered to be of Proterozoic age
- LOWER PROTEROZOIC**
- Efs Tuff: Reddish green sandy tuff with concentric structures, upper tuffaceous sandstone (Correlated with HADEBY SANDSTONE)
 - Pfr Agglomerate: Boulder agglomerate with elements of granite and gneiss
 - MT DOE BASALT: Basic and intermediate amygdaloid vesicular and columnar basalt, pyroclastic and sedimentary rocks, basal breccia, and scattered distinctive flows with steller clusters of feldspar phenocrysts
 - Sandstone
 - Shale, claystone
 - Sandstone
 - Porphyritic flow
 - Basaltic lava
- ARCHAEN**
- A Granite: Beryliferous and beryliferous bearing peridotites, melanocratic granite, coarse grained, with irregular rock fragments, some coarse grained, some fine grained, some with quartzite and quartzite
 - Am Amphibolite: Amphibolite, medium to coarse grained, with quartzite and quartzite
 - Ar Gneiss: Medium to coarse grained, with quartzite and quartzite
 - Ai Ultrabasic rocks: Ultrabasic rocks, medium to coarse grained, with quartzite and quartzite
 - As Metamorphosed sedimentary rocks: Metamorphosed sedimentary rocks, medium to coarse grained, with quartzite and quartzite
 - Arr Metasiltstone: Metasiltstone, medium to coarse grained, with quartzite and quartzite
 - Ars Sandstone: Metamorphosed, bedded and massive, with interbedded sand and silt

Compiled by Geological Survey of Western Australia Cartography by Geological Drafting Section, Mines Department, Topographic base. Published by Bureau of Mineral Resources, Geology and Geophysics, Department of National Development, Canberra, A.C.T.



INDEX TO ADJOINING SHEETS

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Geology by G. P. Ryan, M. G. Rowland and W. S. 1962-63

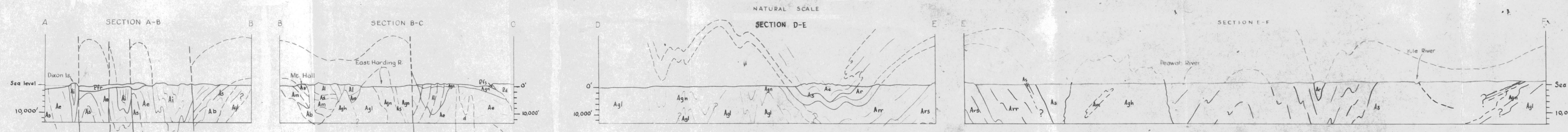
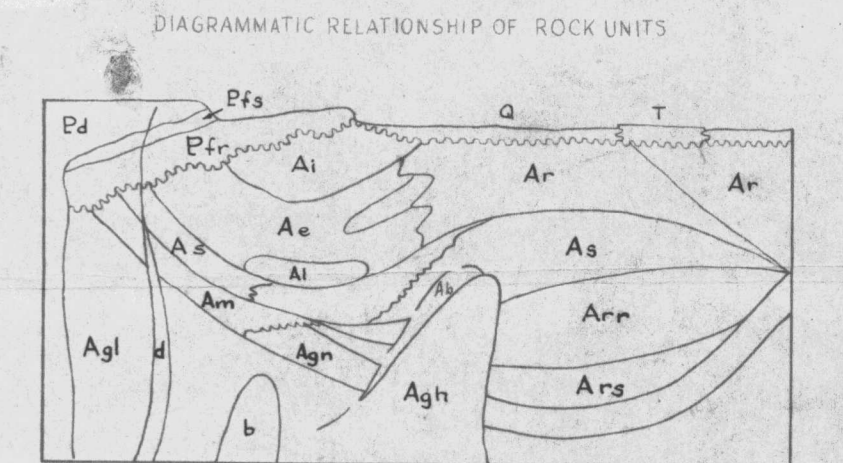
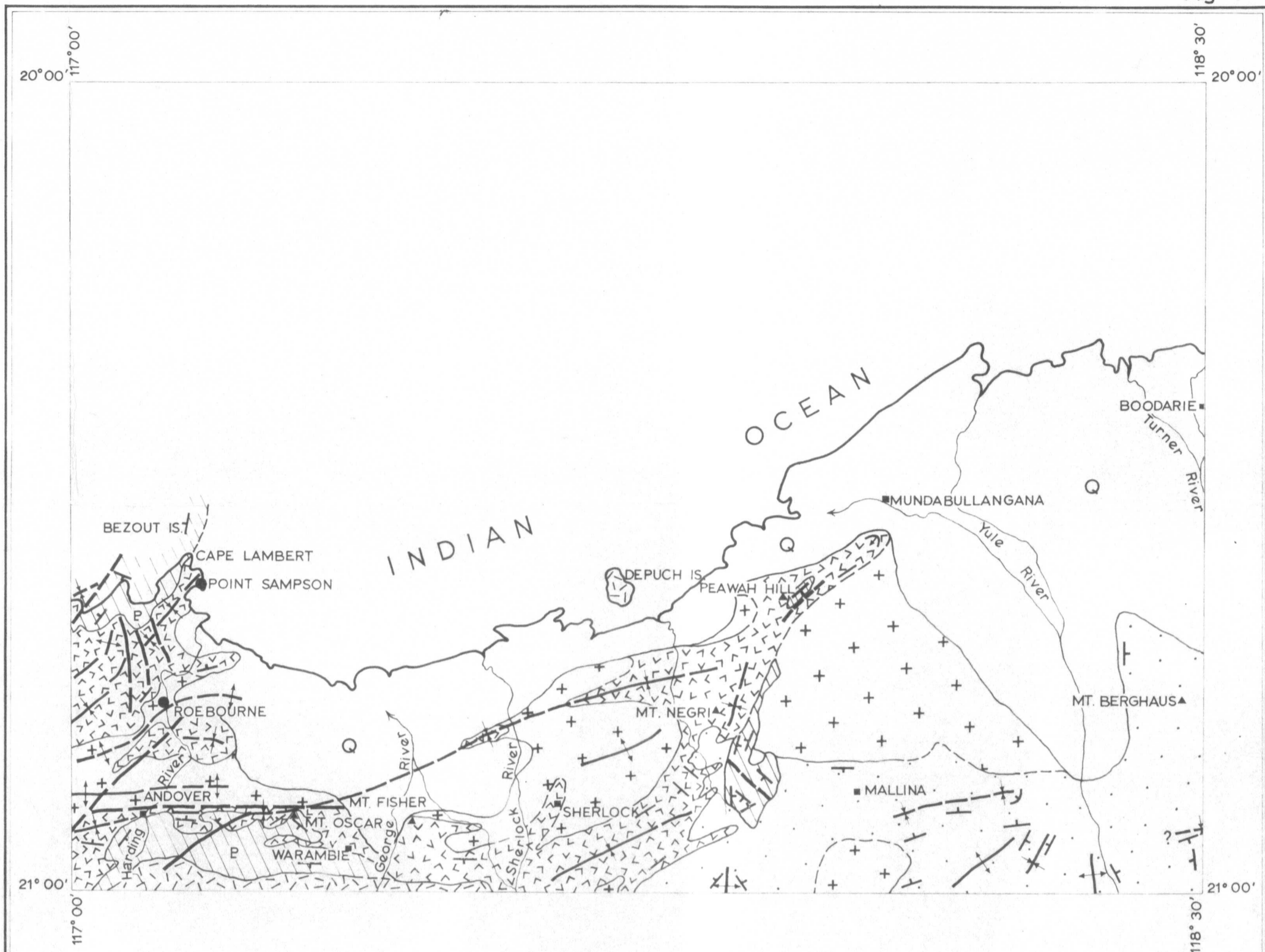


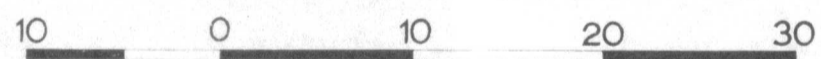
Fig 1



STRUCTURAL SKETCH MAP

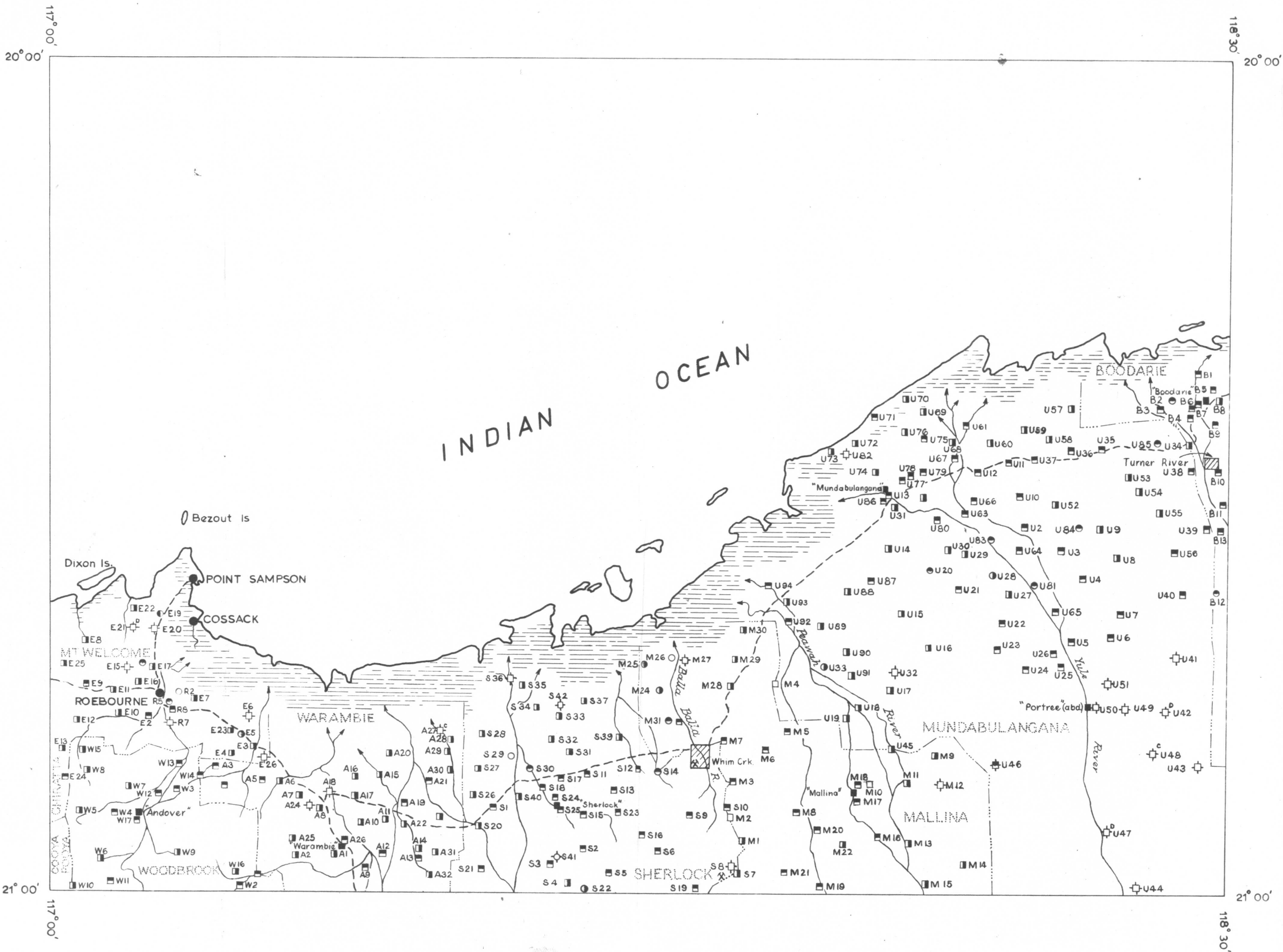
ROEBOURNE SHEET SF50-3

SCALE OF MILES



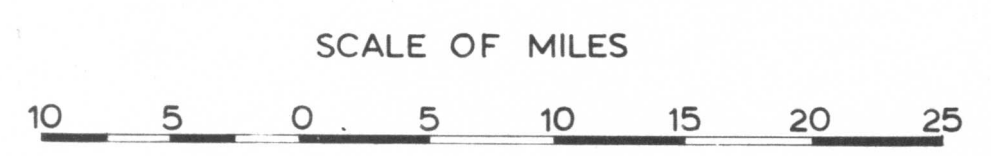
REFERENCE

QUATERNARY	Q		Geological boundary
PROTEROZOIC	P	Dolerite, gabbro	" " pos ⁿ approx.
	+	Roebourne Group	Fault
	+		" inferred
ARCHAEAN	∧	Clastic facies	Anticlinal axis
	∨		" " inferred
	■	Homestead	Synclinal axis
	●	Town	" " inferred
	▲	Hill	Strike and dip of bedding



WATER SUPPLIES

ROEBOURNE SHEET SF 50-3



REFERENCE	
Main road	
Station boundary	
Pastoral station	
Homestead	
Mining centre	
Town	
Stream (non perennial)	
Area of closely spaced wells and bores	
Bore - quality potable	
quality stock	
abandoned	
abandoned, dry	
abandoned, collapsed	
Well - quality not specified	
quality potable	
quality stock	
abandoned	

NOTE: Details for wells and bores shown on this sheet are available at the Geological Survey of Western Australia