PROGRESS REPORT ON THE GEOLOGY OF AN AREA IN THE VICINITY OF LAVERTON AND MORGANS—MT. MARGARET GOLDFIELD.

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INTRODUCTION.

During 1917 and 1918 regional geological mapping was undertaken by Clarke in the Leonora-Duketon district, and the maps published on a scale of 4 miles to an inch. [1] Prior to this, and mostly before 1908, various mining centres had been examined by members of the Geological Survey Staff. In late 1937, the writer, with Messrs. Matheson and Miles, commenced field work in the vicinity of Beria. The object was to carry out geological work of a similar nature to that then only recently completed in the Yilgarn Goldfield. It was intended to cover a smaller area than that broadly mapped by Clarke, and to include more detailed work in the vicinity of active mining centres. Particular emphasis was to be given to the structural aspect of the work, as it had already been found[2] that there was a relationship between geological structure and gold deposition.

FIELD WORK.

Field work was commenced by Mr. R. S. Matheson on 4th October, 1937, at the Lancefield Gold Mine. On 28th October he was joined by Mr. K. R. Miles. During the 1937 field season, these two officers completed the examination of the Lancefield Gold Mine, the country in its immediate vicinity,[3] and commenced the mapping of the jaspilites in the vicinity of Laverton and Beria. After Mr. Matheson's departure on 25th November this latter work was continued by Mr. Miles. The writer joined the field party on 2nd November, and field work was continued until 17th December. In addition to making a broad examination of the country the writer reported upon the King of Creation Gold Mine.[4]

Field work was resumed by Mr. Miles on 26th March, 1938, and he continued with the mapping of the jaspilites in the vicinity of Laverton and to S.W. He was joined by the writer on 21st April. On 4th August the writer was withdrawn to take over work at Koolyanobbing in connection with the iron survey, and Mr. Miles continued with both the jaspilite mapping and the broader geological mapping. During the period 18th August to 29th October, Mr. Matheson was also in the district, and in addition to mapping the jaspilites to the S.E. of Laverton, also made an examination of the Erlistoun Gold Mine at Cox's Find.

As a result of the work outlined in the previous two paragraphs 2,000 square miles of country have been mapped on a scale of one mile to an inch. It is worthy of record that this includes the accurate mapping of all jaspilite outcrops. The Lancefield Group (including the Lancefield Gold Mine), the Gladiator Group[5] (including the Gladiator Gold Mine), the King of Creation Gold Mine and the Erlistoun Gold Mine[6] have been examined, and appropriate maps and plans prepared.

During the 1938 field season the work was severely handicapped by the lack of adequate transport—only one utility being provided. Had an additional utility truck been provided, appreciably more country would have been mapped.

MAPS AND PLANS.

The broad scheme of work followed during the course of the Yilgarn Survey[7] has been used. Broad geological mapping has been done on a scale of one mile to an inch, and recorded on Lands Department lithos. numbers 137, 138, 139, 144, 145, 146 and 172. During the course of the field work it was found that the one mile to an inch lithos. contained too much irrelevant detail to be suitable for base maps, and accordingly base maps, showing only survey information, were prepared from these lithos. Jaspilite mapping has been done for the most part using a plane table and telescopic alidade, and intersection and resection methods on a scale of 20 chains or 40 chains to an inch.

GENERAL GEOLOGY.

The principal rocks of economic importance are those of the Greenstone Complex. This consists of a highly folded series of basic lavas, tuffs, agglomerates, epidiorites, coarse-grained greenstones (probably intrusive), with fairly frequent thin bands of erosion sediments. Of the erosion sediments the most useful for structural purposes are the jaspilites, which form conspicuous outcrops, and which are continuous along their strike for many miles. The Greenstone Complex is invaded by a Granitic Series, consisting of granite, gneiss and acid dykes of various types, including the auriferous quartz veins. This is, in turn, intruded by dolerite dykes, which are, however, not of very frequent occurrence. Overlying all these unconformably, are rocks of much more recent origin—glacial erratics, siliceous and ferruginous laterite, soil and alluvium. As elsewhere in the Western Australian Goldfields soil and alluvium extend over large areas, and effectively cover much geological detail. During the course of the geological mapping soil covered areas, in which the underlying rocks could not be reasonably inferred from the soil, are mapped as soil.

[1] Clarke, E. de C. The field geology and broader mining features of the Leonora-Duketon district, Western Australia, Geological Survey Bulletin No. 84, 1925.

[2] Ellis, H. A. Progress report on the geology and mines of the Yilgarn Goldfield, south of the Great Eastern Railway, Annual Progress Report of the Geological Survey for the year 1936, p. 31. Also—The geology of the Yilgarn Goldfield, south of the Great Eastern Railway, Geological Survey Bulletin 97 (in press).

[3] Matheson, R. S., Lancefield Gold Mine Mt. Margaret Goldfield; Miles, K. R., Lancefield Group—Report on "Beria Main Lode," G.M.L. 2216T, Mt. Margaret Goldfield, Annual Progress Report of the Geological Survey for the year 1937, pp. 14 and 20.

[4] Hobson, R. A., King of Creation Gold Mine, Mt. Margaret Goldfield, Annual Progress Report of the Geological Survey for year 1937, p. 12.

[5] P. 27.

[6] P. 24.

[7] Ellis, H. A., Progress report on the geology and mines of the Yilgarn Goldfield, Annual Progress Report of the Geological Survey for the year 1935, p. 19.

So far no sedimentary series, corresponding to the Whitestone Series of the Yilgarn Goldfield, has been found. It was thought that an outcrop of chiastolitic rock, occurring 2½ miles S.E. of the late Childe Harold Gold Mine, might be portion of such a series. This outcrop forms a low hill, approximately one mile by half a mile, and is completely surrounded by alluvium. Geological mapping has not yet been continued southward from here, so that it is not known if there are any further outcrops of this rock. It occurs in a broad synclinal fold, and would therefore be in a stratagraphic position similar to the Whitestone Series. Mapping to the S.W. of Morgans in an area where there is another large synclinal fold, has not revealed any extent of sedimentary rocks. The small outcrop referred to above is therefore, for the present, best regarded as merely another sedimentary band in the Greenstone Complex.

The following is put forward as a tentative rock classification, subject to expansion and alteration as the work proceeds:

RECENT.

Soil, alluvium, siliceous and ferruginous laterite.

AGE UNKNOWN.

Glacial erratics.

PRE-CAMBRIAN.

Dolerite dykes.

Granitic Series: granite, gneiss, pegmatite and aplite dykes, porphyry dykes of various types, quartz reefs.

Greenstone Complex: lavas, tuffs, agglomerates, epidiorites, coarse-grained greenstones (probably intrusive) with thin bands of erosion sediments. Includes the jaspilites.

In the paragraphs preceding the above table, a very brief summary of the geology has been given. In the following paragraphs it is not intended to give a more detailed account of the general geology, but only to draw attention to certain features.

Soil and alluvium.

Large portions of the area under examination are covered with a reddish brown to yellow sandy soil, and a spinifex and stunted mallee vegetation. In these areas typical sand dunes frequently occur. Immediately south of Mt. Windarra, and also 2 miles S.S.W. of J.R. 33 soil of this type is seen to be blown against jaspilite ridges, and sometimes through gaps in the ridges. Almost without exception no rock outcrops occur in areas covered with soil of this type. The writer has, however, seen small outcrops of granite, and at one place soil of this type is seen to overlie a much weathered granite exposed in a breakaway. Areas with this type of soil and vegetation are regarded as being covered with transported soil, which obscures the underlying geology. Other areas of sandy soil, but with mulga vegetation and scattered small outcrops of granite or gneiss are regarded as overlying granite and/or gneiss.

Alluvium covers very extensive portions of the country, and is readily recognised by the absence of outcrops, the flat nature of the country and the vigorous growth of the vegetation.

Glacial erratics.

These were first seen by the writer, who knew of their existence in the district, on the Beria-Cox's Find road, about 8 miles from Beria. Their presence in the district was recognised by Clarke,[9] and later by Talbot,[10] who may have seen the boulders referred to above. They have now been recognised in the vicinity of Beria and Morgans.

No facetted boulders have been found, but flattened boulders are of frequent occurrence. A big variety of rock types is found, many of which are recognised in the district. A collection of boulders has been made, and should make an interesting petrological study.

Granitic Series.

A striking feature of the Mt. Margaret Goldfield, to one who has recently been in the Yilgarn Goldfield, is the almost complete absence of pegmatite dykes. Except for minor occurrences of pegmatite at granite "rocks" no pegmatite was seen by the writer or his colleagues.

Porphyry dykes are particularly abundant, while aplite dykes are of frequent occurrence. Porphyry dykes may be either sheared or massive, and at least some are of pre-gold age. The quartz reef at the Gladiator Gold Mine occurs at some levels in a porphyry dyke.[11] It is considered probable that the sheared dykes and the massive dykes are, for the most part, of the same age, and that the difference is merely one of degree. However, some massive fresh looking dykes, e.g., the one cutting through lavas and agglomerates on the Mt. Weld Station road, 6 miles S.S.E. from Laverton, is probably of a later age. Various types of porphyry are known to exist, but no petrological examination of specimens has yet been made. All are intrusive into rocks of the Greenstone Complex.

Greenstone Complex.

The Greenstone Complex consists of a highly folded series[12] of basic lavas, tuffs, agglomerates, epidiorites, coarse grained greenstones, with fairly frequent relatively thin bands of erosion sediments. The most interesting and important of the erosion sediments is the jaspilite, which is the subject of a separte report by my colleague, Mr. K. R. Miles. Throughout the area there are fairly numerous bands of graphitic schist which can sometimes be traced for some distance along their strikes. There are also isolated occurrences of more massive graphitic rocks, sometimes containing chiastolite or andalusite, and at one place a rock believed to be a greywacke. These bands of metamorphosed sediments vary in width from a few feet, as for example in the vicinity of Laverton, to over half a mile at Murrin Murrin.

Good exposures of lava are to be found in the deeper mines, and on low rounded hills, which are of frequent occurrence. Less frequently lavas and agglomerates form fairly conspicuous hills. Small and much weathered exposures of greenstone schist are frequently to be found in areas which at first sight appear to be completely soil covered.

[9] Clarke, E. de C., op. cit., Bulletin 84, p. 37.

[10] Talbot, H. W. B., personal communication to Government Geologist.

[11] P. 27.

[12] For a description of the structural geology refer to a report by Mr. Miles on page 29.

A very coarse grained greenstone, forming fairly conspicuous outcrops, is believed to be intrusive into the other rocks of the Greenstone Complex, but no evidence has yet been obtained to indicate whether it occurs as sills or is transgressively intrusive.

Because of the general paucity of outcrops it is very unlikely that it will be possible to sub-divide the Greenstone Complex on the maps. Distinctive varieties of greenstone are, however, being indicated.

It is proposed to continue field work in this area during the 1939 field season.

REPORTS ON SOME MINING GROUPS IN THE YILGARN GOLDFIELD.

(North of the Great Eastern Railway.)

(R. S. Matheson, B.Sc.)

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PILOT GROUP.

YILGARN GOLDFIELD.

(By R. S. Matheson, B.Sc.)

GENERAL INFORMATION.

The Pilot Group is situated on the western side of the Southern Cross-Bullfinch railway, approximately 6¼ miles from Southern Cross, and is 1¼ miles W.S.W. from the 6-mile peg on the main road between these two centres.

At the time of inspection (May-June, 1938), there were two existing leases, "Pilot" G.M.L. 3414 and "Exonia" G.M.L. 3483 both under the control of T. J. White and W. J. Heydon, and prospecting was being done in the old workings on the late "Colleen Bawn" G.M.L. 2544.

The present lessees of the "Pilot" G.M.L. 3414, first pegged the ground in December, 1932, but official records show that gold was discovered in this vicinity in the year 1909.

A 5-head battery and cyanidation plant is in operation on the "Pilot" mine, but only on rare occasions it is available for public crushings.

Water for domestic and mining purposes is obtained from the Southern Cross-Bullfinch water supply pipeline, which passes through the group.

There are adequate supplies of morrel, gimlet and salmon gum in the vicinity, which are suitable for mining purposes.

It is impossible to determine accurately the total production from this group, as some production may be included under "sundry claims" in the Hope's Hill official grouping, but a study of the official figures shows that 12,075.20 tons of ore have been treated yielding 6,739.86 fine ozs. of gold, and specimens total 17.81 fine ozs.

GENERAL GEOLOGY.

The group is situated in an area of highly metamorphosed interbedded, greenstones, jaspilites and erosion sediments, which are presumably of Pre-Cambrian age and the country grades eastwards into replacement gneiss of granitic origin. The rocks are sheared and contorted, but have a general north-west strike and steep dips varying from 70° N.E. to 70° S.W.

A geological subsurface map of the area, on a scale of 5 chains to 1 inch, has been compiled, and it will be included in a later publication dealing with all the mining groups in the northern portion of the Yilgarn Goldfield.

Greenstones.—Metamorphosed basic lavas and tuffs constitute the major portion of the greenstones. The lavas are dark greenish in colour, and dense to medium-grained varieties occur. They are often amygdaloidal, and exhibit only a rude schistosity.

The tuffaceous rocks are distinguished from the lavas by their greyish-green colour and their greater schistosity.

Anthophyllite Schist.—A band of this rock 15 chains wide, occurs 45 chains south-west of the leases. It is believed to be a pre-folding, ultra-basic sill. It is yellowish to grey in colour, and is everywhere associated with chromite-bearing ironstone and cellular quartz, which are believed to be its decomposition products. The anthophyllite schist is regarded as a component of the greenstones, and it would probably be green in colour, if it could be seen in a fresh state.

Irregular masses of intrusive, coarse-grained, greenstone are associated with the anthophyllite schist in a few places.

Jaspilites.—Two main beds of jaspilite, approximately 16 chains apart, are present in the area, and there is some suggestion that these may be the same bed repeated by folding on a north-west-south-east axis.

The western bed occurs fairly continuously throughout the group forming a sinuous outcrop line. In places along its strike, two or more outcrop lines appear, and this is thought to be due to the presence of dragfolds.

The eastern bed is poorly represented, and can be best seen in the vicinity of the "Pilot" workings. To the north-west it is obscured by a thick overburden, while to the south-east it becomes almost completely granitised.

Erosion Sediments.—A band of metamorphosed erosion sediments, 10-15 chains wide, and consisting of quartzites and grey garnetiferous phyllites, occurs ¼ mile south-west of the workings. Numerous flows of amygdaloidal basic lava are interbedded with the erosion sediments, and are of necessity mapped with them.

At the time of inspection it was impossible to be certain whether these erosion sediments were a synclinal remnant of the Whitestone Series, or only a sedimentary band in the Greenstone Series. It is hoped that this point will be elucidated by future fieldwork.

Gneiss.—The gneiss is granitic in composition, and in the area mapped, is believed to have been formed by the replacement of greenstones. Owing to the mode of origin of the gneiss, its boundary with the greenstone is not sharp. A zone of intermediate rocks occurs between the greenstone proper and gneiss proper.