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**DEPARTMENT OF NATIONAL DEVELOPMENT.**

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GEOLOGY AND GEOPHYSICS.

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**RECORDS.**

1953/45.




# THE GEOLOGY OF THE RYE PARK DISTRICT.

by

G.M. BURTON & K.G. SMITH.

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## CONTENTS

## SUMMARY

An area of approximately 32 square miles in the vicinity of Rye Park has been mapped in greater detail than that of previous regional surveys.

Three possible tungsten-bearing areas have been delineated as warranting magnetometric and plane-table surveys. An extension of each of these three areas is indicated.

Attention is drawn to the copper, tin, silver, lead, and zinc mineralisation of the area, and it is considered that there are possibilities of finding payable orebodies containing these metals.

## INTRODUCTION

The village of Rye Park is situated in the County of King, Parish of Olney, on the southern Tablelands of N.S.W., and is 26 miles, by gravel-surfaced road, north-north-west of Yass. The nearest rail-head is at Boorowa, 12 miles to the west-north-west.

Prior to this survey there had been little detailed geological mapping in the Rye Park-Boorowa area. Brief examinations had been made of antimony, bismuth, copper, lead, silver, wolfram, and zinc deposits near Rye Park, by officers of the N.S.W. Department of Mines, and by others, and from 1951 onwards, geological investigations, magnetometer surveys, and diamond drilling have been carried out at and near the Rye Park tungsten mine. Recently a geological survey was carried out by J.C. Lloyd and F.C. Loughnan of the N.S.W. Department of Mines (Lloyd, 1951), who mapped in detail a small area around the Rye Park mine.

The present mapping was undertaken to assist in the compilation of the Goulburn Four-mile Geological Map, and to meet recommendations contained in a report on tungsten deposits at Rye Park, by C.J. Sullivan and W.B. Dallwitz (1952).

Field work commenced on 9th December, 1952, and was completed on 24th February, 1953. During this period, two short intermissions were spent in Canberra for the purpose of carrying out petrological studies on rocks collected in the field. The party was led by G.M. Burton, who was assisted at different stages by G.F.U. Baker, G.D. Kemp Robinson, K.G. Smith, and G.I. Wilson.

The first stage of the survey was in the nature of a broad reconnaissance of the Silurian rocks within a radius of 6 miles of the Rye Park scheelite orebody, and brief visits to the Ordovician sediments approximately 1½ miles east of the mine. The second stage consisted of detailed mapping, plotting at a scale of 1" to 650', approximately, on enlarged aerial photographs. This was accompanied by ultra-violet lamp inspections of re-opened costeans, of outcrops, and of an adit at Mica Hill.

## GEOLOGY

General. In this report, reference is made to the probable Silurian and Ordovician ages of two groups of rocks. In the area mapped, there is no direct evidence that the limestones and most of the igneous rocks are of Silurian age; nor is there any direct evidence that the more elevated hills of slate and quartzite are Ordovician in age. In neighbouring districts of New South Wales the rock sequence consisting of dacites, rhyolites, acid tuffs, and limestones, and including also intrusive granodiorite porphpry, is regarded as being of Silurian age; therefore, in the absence of diagnostic fossil criteria, similar rocks in the Rye Park district are assigned to the Silurian period. The quartzite-slate lithology is distinct from that of the Silurian rocks, and conforms to that commonly found in nearby Ordovician terrains; in addition, there is evidence of a structural break between the two groups. On these grounds the slates and quartzites are assigned to the Ordovician.

The most common rocks in the Rye Park district are dacitic volcanics and granodiorite porphyry. In most of the area these rocks are sheared, and the intensity of shearing increases noticeably towards the Silurian-Ordovician boundary. On the hills, outcrops of porphyry are in the form of pointed tors; where shearing has been more intense the tors are elongated and more pointed. Between the hills, numerous gullies have been cut through a deep soil cover to expose sheared porphyries and volcanic rocks. Over large areas, soil either completely covers the underlying rocks or partly obscures outcrops, so that few rock units can be traced further than the particular gully in which they are exposed. The depth of soil ranges to 15 feet.

In the igneous rocks variations occur in quartz/felspar ratio, in groundmass, and in type of outcrop. The most common variant is a rock which has a high proportion of quartz phenocrysts, small felspar phenocrysts, and a greenish groundmass; its outcrops are characterized by blocks smaller and more angular than the tors of normal granodiorite-porphyry. Some of the gradations may be due to differences in the intensity of shearing and/or differences in degree of metamorphism, rather than to differences in original composition of the rocks. Only a detailed petrological study may reveal the reasons for these differences. In the field, it is difficult or impossible to differentiate the rock types, and so most of the igneous rocks have been mapped as a single rock unit.

There is little visible evidence to indicate whether the porphyries are intrusive or extrusive in nature. Porphyry established as intrusive occurs in one locality only, viz., in Portion 54, Parish of Olney. Here quartz-felspar porphyry has intruded an acid tuff, and small fragments of this tuff are enclosed in the adjacent porphyry.

Other rock types in the area are granite, greisen, rhyolite, limestone, and quartzite. In addition, quartz-epidote, quartz-epidote-actinolite, and garnet-actinolite rocks have been mapped. Several highly ferruginous outcrops were located, and, although these are shown on the plans as gossan, the outcrops are not characteristic of such material; they are generally composed of compact, non-cellular limonite, which may be residual or partly transported, but must, nevertheless, have been derived from nearby lode material. In gullies in Portions 54 and 55, Parish of Olney, many limonitic boulders show boxwork structure; their source has not been located. Some of these boxworks exhibit rhomb-shaped voids whose dimensions range to 1⅛ inches.

Outcrops of limestone are generally small. They occur within the rock-suite designated as Silurian, but because the only recognizable fossils contained in them are stems of crinoids, their exact stratigraphic position is unknown.

Two cupolas of granite occur in the vicinity of the Rye Park tungsten orebody, and other smaller outcrops ~~ex~~ of rocks of granitic composition have been mapped. Some of these rocks are aplitic. The presence of small areas of moderately high grade metamorphism in Silurian rocks, and of cassiterite and wolfram in Ordovician rocks, indicates that granite may underlie the present land surface at fairly shallow depth.

Metamorphic and metasomatic effects occur over a large area. The metamorphic minerals are finely recrystallised biotite, epidote, actinolite, and garnet. In the granodiorite-porphyry and in the volcanic rocks epidote and finely recrystallised biotite are common. Epidote occurs as veins and crystal aggregates in the igneous rocks. Garnet has been found, among other places, in a bed about 650 feet south of the Rye Park Mine, and in another bed west of Stringybark Hill. Many shear planes in porphyry are filled with epidote.

The Ordovician rocks are, as previously stated, slates and quartzites. Their western margin is marked by a line of hills, trending approximately north-south, 1½ miles east of Rye Park. On this survey, no detailed mapping of these sediments was attempted.

Gravels are present in various parts of the area mapped, but particularly on the eastern side. The main constituents of these gravels are subangular quartz pebbles, and angular fragments of black slate, probably derived from Ordovician beds. Pebbles of igneous rock have not been found in them, but a more thorough search may yet reveal their presence. Some of the gravels lie on hilltops, and are, therefore, remnants of much more extensive formation, which has now been dissected. For this reason it is considered that the gravels are pre-Recent in age, and may date back to pre-Kosciuskan times, or even considerably earlier in the Tertiary. Traces of scheelite have been obtained by panning soil overlying gravel on the eastern flank of the more southerly of the two hills situated about 1,800 feet east of the Rye Park mine.

Structural. In the Silurian rocks, only three reliable dips of bedding planes have been recorded. The structural relationship of bedded rocks with rocks suspected to be bedded cannot be ascertained.

There are two prominent directions of shear. The most common has a north-south strike, with variations of 10° to both east and west. This is the strike direction observed in most of the heavily-sheared porphyry. In the western and central sectors of the area, shear planes dip east at 50° approximately. Towards the Silurian-Ordovician boundary, the shearing exhibits a marked increase in intensity; shear planes are more closely spaced, their dip increases to 70°E, and in the Silurian rocks certain minerals, particularly quartz and recrystallised mica, show a pronounced lineation.

The increase in intensity of shearing, and the increase probably in dip of the shear planes, indicate that the Ordovician rocks have been thrust over the Silurian; the direction of the postulated thrusting is from the east. To confirm this thrust, detailed mapping of Ordovician rocks would be necessary.

The second prominent direction of shear strikes at 140 degrees; in one such shear the Mayfield copper lode is located. It is probable that the brecciation of volcanic rock in the Stringybark Hill has been effected by a shear of this type. On this hill a long quartz vein strikes 145° ; it may have been injected into a sheared zone.

The relative ages of these two sets of shears is unknown, but both preceded the intrusion of granite. Epidote fills many shear planes of the north-south set, and copper mineralisation occurs in some of the shears which strike 140°.

## MINERALISATION IN SILURIAN ROCKS

(i) Copper.

In the past, copper ore was raised from the Wallah Wallah and Mayfield mines. Two small occurrences have been prospected in Portions 32 and 134, Parish of Olney.

The Wallah Wallah mine is situated in Portion 15, Parish of Ware, and is 5 miles north-west of Rye Park. This mine was opened in 1846. The width of the lode is recorded as four feet. Spoil on the surface shows azurite and malachite in heavily-sheared volcanic rock. At least seven shafts ranging from 30 to 150 feet in depth were sunk along a 500 ft. line trending approximately 114° (magnetic).

The Mayfield copper mine is situated 3½ miles south-south-west of Rye Park. The lode, 2½ ft. wide, occurs in a zone of strongly sheared quartz-felspar-porphyry. This shear zone strikes 140° ; shear planes dip 52°E. The main shaft was sunk on the dip of the shear planes.

Records of N.S.W. Dept. of Mines reveal that mining operations began in 1895, when 50 tons of ore yielded 9 tons of copper valued at £360. No production was recorded in 1896; in

1897 copper worth £1,065 was produced. There are no records of any later production.

The main shaft was sunk to a depth of 125 feet. Specimens of azurite and malachite were observed on the spoil dump, but no primary ore was present.

Lightly-sheared porphyry is exposed in the walls of a vertical shaft of unknown depth, approximately 60 feet east-north-east of the main shaft. On the dump at this shaft there are specimens of azurite and malachite in strongly-sheared quartz-felspar porphyry. If these specimens were raised from the vertical shaft, it is assumed that the shaft was sunk to a depth sufficient to intersect the strongly-sheared zone. No evidence of the westerly extension of this zone is available.

Two hundred feet north-north-west of the inclined shaft, an adit has been driven into the strongly-sheared zone. There is no copper ore on the dump at the adit's entrance. No work was done to test the extension of the shear in a south-south-east direction.

Verbal reports indicate that traces of copper ore, with gold and some silver, were obtained from a shaft sunk on "Everton", Portion 32, Parish of Olney. At present this shaft is filled completely with rubbish.

East of Stringybark Hill, in Portion 134, Parish of Olney, seven shallow pits were sunk. Limonite, vein quartz, and metamorphosed limestone are found on the spoil dump of the most northerly pit; one specimen of quartz carried traces of malachite. It was impossible to obtain reliable information on what ore, if any, was raised from the pits of this area. Some reports suggested that zinc had been obtained, and this is quite probable, because sphalerite is found in limestone at Pudman, between Rye Park and Yass, and in limestone in area 1, north of the Rye Park mine.

(ii) Tungsten.

Investigations for tungsten ore were carried out in several localities. Seven old costeans, sunk by prospectors for gold, were cleaned out and deepened, and then examined thoroughly by ultra-violet light. Scheelite was found in four costeans; in Nos. 1, 4 and 5, the grade is sufficient to warrant further investigation of the appropriate areas. From No. 7, traces of scheelite were obtained.

Six areas in which payable ore might be found are shown on the plan. As granite is closely associated with the known tungsten orebodies at Rye Park, the demarcation of the limits of these areas is based on the actural presence of outcropping granite, and/or on features indicating that granite probably occurs not far below the surface. These features, not all of which are necessarily to be found in any one area, are as follows:

a. Traces of scheelite in quartz-epidote and epidote-actinolite hornfels, and in associated soils. These rocks represent original carbonate-bearing beds which have been metamorphosed and only lightly mineralized at some distance from granite (e.g., in area 2). The rock in area 2 contains also sporadically distributed masses of garnet and pyroxene.

b. Presence of zones of epidotization in volcanic rocks (e.g., in areas 1, 1A, and 3A). Scheelite has been detected in such rocks, and in nearby soils, in area 1.

c. Presence of garnet-actinolite hornfels, also representing a bed of metamorphosed impure carbonate-bearing rock (in area 3).

d. Presence of gossan (e.g., in areas 3 and 3A), and of magnetite (in area 1).

e. Presence of felspathized volcanic rock or hybridized granite (in area 1).

Two factors appear most likely to influence the possible occurrence of, and the search for, tungsten in payable quantities in these areas:-

1. The presence, within the volcanic rocks, of beds favourable for metasomatism and mineralization. These beds must, of course, be somewhere intersected by granite or greisen. Indicative of the presence of such beds are the garnet-actinolite hornfels, the epidote-actinolite hornfels, and the metamorphosed limestone, found in areas 3, 2, and 1, respectively.

2. The persistence of the magnetite-scheelite-wolfram association. Unless magnetite constantly accompanies payable tungsten mineralization of the contact type in this district, testing by magnetometer will be of extremely doubtful value, as only weak readings can be expected from other minerals, such as garnet, hornblende, and pyroxene, which occur in the known orebodies. In any case, as any possible orebodies in the six areas outlined are likely to be at considerably greater depth than those previously detected, it may be necessary to use a rather sensitive instrument for the survey. It is of interest to note that outcropping magnetite in area 1 contains only 50 p.p.m. of tungsten. The salutary lesson to be learned from this is that it can not be assumed that any magnetic bodies indicated by the magnetometer will necessarily carry payable tungsten mineralization.

Although the areas marked out are extensive, it is not possible, in the present state of knowledge, to decrease or subdivide them, and still be sure of covering all places of interest. In fact, outcrops are generally so small and so scattered, that interpretation of their significance is very difficult; therefore it is necessary to bear in mind the possibility that work may have to be extended beyond the boundaries indicated, especially, of course, if magnetic readings tend to lead operators further afield.

Area 1 is to the north and north-east of the Rye Park orebody. In this area, much of the volcanic rock is heavily epidotised. In some places the volcanic rock has been recrystallised and felspathized to such an extent that it assumes a granitic appearance; these changes have evidently been brought about by granite now lying at no great depth below the surface. An outcrop of magnetite containing a trace of tungsten but no visible scheelite or wolfram, occurs near a large quartz vein (see plan). Ultra-violet lamp inspection revealed traces of scheelite in a band of westerly-dipping limestone near the eastern margin of the area; This limestone contains a little blende in places. Traces of scheelite occur also in epidotised volcanic rocks, and fluorite has been noted in some of them.

Area 2 is west of the mine; it includes the area of epidote-actinolite (-garnet-pyroxene) rock surrounding costeans 4 and 5. This rock is lightly but very sporadically mineralized with scheelite. It was originally a carbonate-bearing sediment or tuff, and may contain payable tungsten mineralization if and where it is intersected by granite. Small outcrops of granite and aplite occur about 350 feet east of these costeans, and granite is also exposed in one place between the costeans and Mica Hill.

Area 3 is located south-west of Rye Park. The common rock type is a brecciated volcanic; other rock types are garnet-actinolite hornfels, quartz-epidote-actinolite rock, and limestone. In addition, several gossans have been found there. The area includes Stringybark Hill and Red Hill, and gossans occur on each of these.

On Stringybark Hill, in Portions 160, 161 and 165, Parish

of Olney, volcanic rock has been brecciated to a high degree, and heavily injected with quartz veins. On much of the south-eastern extremity of this hill, the rock type is a quartz-breccia cemented by compact limonite. There are few outcrops on the western flank of the hill.

Two costeans have been sunk at the northern end of Red Hill in Portion 72, Parish of Olney. In one of them a block of compact limonite 5' by 5' by 4' is revealed.

A few samples of each of the quartz-epidote-actinolite and garnet-actinolite outcrops were tested by ultra-violet light, but no schoelite was found in them. The garnet-actinolite rock is important in that it represents a metamorphosed bed of either impure dolomitic limestone or calcareous and dolomitic tuff; beds of this type have been selectively replaced by ore-fluids to form the known Rye Park tungsten deposit.

## MINERALIZATION IN ORDOVICIAN ROCKS.

### (i) Silver-lead-zinc.

These ores have been raised from shafts at the Walla Walla mine, which is situated three miles east of Rye Park. The lode was mined in 1898 and 1899; since then, operations have been confined to prospecting.

The ores occur in slates and sandstones. According to the N.S.W. Geological Survey Bulletin No. 2, pp.35-36, cerussite, pyromorphite, mimetite, zinc blende, and traces of chalcopyrite have been found in the oxidized zone. Nickel, galena, and zinc blende were mined at depth, and these minerals occurred in a network of quartz veins occupying a total width of from two to nine feet. The average grade of the ore is recorded as 25 per cent lead, 25 oz. silver per ton, and 15 per cent zinc. Records of production are not available.

### (ii) Tungsten

In Portion 207, Parish of Rugby, about 5 miles north-east of Rye Park, small pockets of wolfram have been mined from brecciated sandstone and slate. The wolfram occurs as grains and striated crystals in the interstices between fragments of sandstone and slate, and it has been mined by the sinking of shallow pits. In this locality there are several outcrops of breccia, and it is probable that additional pockets of wolfram occur in them.

### (iii) Tin

The Kiowarrah alluvial deposit of cassiterite is worked at a site 6 miles east-south-east of Rye Park. Access to the deposit is by either of two poorly-maintained gravel roads. By the shorter, one proceeds in an easterly direction from Rye Park, for 8 miles; the longer route (15 miles) entails a journey of 9 miles on the Rye Park-Rugby road, thence south-east for 6 miles.

In this locality the presence of cassiterite has been recognised since about 1931, and there are numerous trenches from which prospectors have taken material for panning. Sluicing operations, too, have been undertaken previously, and water which fills a hole made by a former sluicing plant is used now to operate hydraulic sluicing machinery installed in December, 1952.

The lease is held by Messrs. L. Lomax and H.J. Gordon, and operations are controlled by a syndicate.

Cassiterite grains have been concentrated in clayey gravels which overlie strongly-jointed sandstones with thin, interbedded shales. At the site of sluicing operations on 22nd February, 1953, the depth of gravel was 15 feet. In some places the depth of gravel on the tops of the low hills which surround this site is

2 ft. 6 ins. or more. In all areas where gravels were observed, grains of cassiterite were seen in both the banks and beds of narrow gullies.

In a shallow trench 200 yds. south of the workmen's quarters, a source of the cassiterite is exposed. At this place, crystals of quartz and cassiterite line joint planes in sandstone. Numerous other small quartz-cassiterite veins occur in situ in the vicinity of the workings, and these and similar veins are thought to be the source of the deposits in the gullies and on the hilltops. A search of the spoil dumps of the old trenches, and of a large dump of coarse, angular pebbles accumulated during past sluicing, revealed many specimens of quartzite flanked on both sides by quartz veins studded with large and small crystals of cassiterite. No outcrops of granite are known in the area of the lease, and Mr. Gordon reports that he has not found any within a radius of at least two or three miles from the mine.

The initial clean-up of the sluice boxes began on 23rd February, 1953; 21 cwt. of concentrate were obtained from about 1,200 cubic yards of gravel - i.e., about 2 lb. per cubic yard. However, this gravel was taken out from a block of ground from which some of the richer ore had already been removed by tunnelling; furthermore, some previously sluiced gravel, which had to be moved, was also included in the yardage treated. The second block of ground taken out was about 6 feet deep, and yielded 25 cwt. of concentrate from 550 cubic yards of gravel, or about 5 lb. of cassiterite per cubic yard; this ground was not touched by previous mining. Thicker portions of the deposit can scarcely be expected to be as rich as this in overall grade, as the cassiterite is virtually confined to the bottom three feet of alluvium.

During the past 3½ years, Mr. Gordon and his partners have sold small quantities of cassiterite obtained by panning and other simple methods of concentration in this locality. The coarseness of grain-size facilitates separation, and to date the buyers have imposed no penalties for impurities.

The grains of cassiterite are coarse, and have evidently not been transported very far; the deposits are, therefore, perhaps better described as eluvial and residual (on hill tops), rather than alluvial.

Their full extent is unknown. Mr. Gordon states that he has panned successfully for cassiterite over a distance of 1½ miles south of the mens' quarters, and for some miles to the north-east in the general direction taken by Preston's Creek as it flows towards the Lachlan River. He and his partners have sunk many successful test shafts and bores in the areas held on lease, and have found that the gravels deepen to over 20 feet within half a mile, or less, downstream from the present workings. A combination of geological mapping, shaft-sinking or boring, and panning methods may reveal additional areas of payable ground.

## RECOMMENDATIONS AND CONCLUSIONS.

In this report, attention has been drawn already to six areas of possible tungsten mineralisation. These areas are necessarily large ones, because poor exposures and lack of outcrops have prevented subdivision. The selected areas have been delineated in such a way as to ensure the inclusion of all significant, but often widely-separated, features. It is recommended that these areas be geophysically prospected, and geologically mapped at a scale of 1" to 100'.

Area 1 should be surveyed by east-west magnetometer traverses, and its westerly extension (area 1A) by north-south traverses. The spacing of the traverse lines should not exceed 150 feet, and stations along these lines should be about 50 feet apart; these distances are recommended because wider spacings would make it possible to miss orebodies of size similar to those already found at Rye Park. Because traces of scheelite have been found in the limestone and in epidotized volcanic rocks of the area, it is suggested that experimental

geochemical traverses be made in the vicinity of these outcrops. If geochemical methods prove successful, they may be of considerable value in areas 2 and 3.

In area 2 north-south magnetometer traverses are advised, and they should be spaced as suggested for areas 1 and 1A.

In area 3, magnetometer traverses should be made in a north-east-south-west direction; a maximum interval of 150 feet between traverse lines is again suggested. Area 3A should be covered by east-west traverses.

Priority in testing has been allotted to areas 1, 2, and 3, largely because their geology is known more fully than that of areas 1A, 2A, and 3A. The testing of the latter three areas should, therefore, not necessarily depend upon promising results from areas 1, 2 and 3. Although ultra-violet light inspections failed to reveal scheelite in specimens from areas 1A, 2A, and 3A, only a few samples from each outcrop have been tested, and so the ostensible absence of scheelite in those places is not considered sufficient ground to condemn the prospects. Some evidence of the presence of tungsten in one of these areas (3A) has actually been found, for a gossan (E) in the southern part of the area contains about 400 p.p.m. of that metal.

The possibilities of finding economic deposits of copper in the Rye Park area are sufficiently encouraging to warrant some further prospecting. The prominent shear direction of 140° indicates a suitable structural control of copper deposition in the district. An examination of the abandoned workings at Wallah Wallah and Mayfield, together with detailed mapping of shear zones, and tests on gossans, may yield promising results.

This survey did not extend to the Ordovician rocks east of Rye Park, but the presence of wolfram, tin, silver, lead, and zinc in them justifies further prospecting.

ACKNOWLEDGMENTS.

We wish to record our appreciation of the substantial assistance rendered by Mr. H.J. Gordon, of Rye Park; he directed us to, and also personally pointed out, many old workings and important outcrops. Thanks are due, also, to Messrs. J.O. and L.A.C. Edgerton, of Rye Park, for help in the field. During the course of a three-day visit, Mr. W.B. Dallwitz inspected critical areas, and discussed petrological problems associated with establishing criteria for possible tungsten mineralization. Other officers of the Bureau of Mineral Resources who paid brief visits of inspection were Dr. N.H. Fisher, and Messrs. C.J. Sullivan, L.C. Noakes, and W.J. Perry.

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Lloyd, J.C., 1951: Rye Park Tungsten Deposit, Dept. of Mines, N.S.W. (unpubl.)

Sullivan, C.J., and Dallwitz, W.B., 1952: Tungsten Deposits at Rye Park, N.S.W., Bur.Min.Res.Aust., Records 52/54 (unpubl.)

References to copper mining at (i) Wallah Wallah, are contained in N.S.W. Geological Survey, Mineral Resources No. 6, p.368. (ii) Mayfield, N.S.W. Geological Survey, Mineral Resources No. 6, p.362.

Reference to the mining of silver-lead-zinc at Walla Walla is contained in N.S.W. Geological Survey, Bulletin No. 2, pp.35-36.

References to the mining of cassiterite at Kiowarrah appear in the Annual Reports of the N.S.W. Department of Mines, as follows:-

1932, p.30; 1933, p. 27; 1934, p.28; 1935, p.26; 1938, p.30; 1939 p.29.

## APPENDIX.

Results of laboratory tests, by A.H. Debnam, on samples of gossans from the Rye Park area, are tabulated below. Copper, zinc, and lead tests were carried out with dithizone after extraction of the sample with aqua regia - sensitivity limit 0.0001 per cent. Silver was tested for by a microchemical method, using ammonium dichromate - sensitivity limit 0.02 per cent. The estimation of tungsten was done by a U.S.G.S. field method involving the use of potassium thiocyanate and stannous chloride - sensitivity limit 0.002 per cent.

The samples were obtained from gossans designated A,B,C, etc., on the plan which accompanies this report.

| Sample | Locality. | Element. | Quantity. |
|---|---|---|---|
| | A | Cu | Strong trace |
| | | Zn | Strong trace |
| | | Pb | Nil |
| | | Ag | Nil |
| | | W | Nil |
| | B | Cu | Strong trace |
| | | Zn | Strong trace |
| | | Pb | Nil |
| | | Ag | Nil |
| | | W | Nil |
| | C (Magnetite) | Cu | Trace |
| | | Zn | Trace |
| | | Pb | Nil |
| | | Ag | Nil |
| | | W | 50 p.p.m. |
| | D | Cu | Trace |
| | | Zn | Trace |
| | | Pb | Nil |
| | | Ag | Nil |
| | | W | 50. p.p.m. |
| | E | Cu | Nil |
| | | Zn | Trace |
| | | Pb | Nil |
| | | Ag | Nil |
| | | W | 400 p.p.m. |
| | F | Cu | Trace |
| | | Zn | Trace |
| | | Pb | Nil |
| | | Ag | Nil |
| | | W | 50 p.p.m. |

# RYE PARK AREA (N.S.W.)

## DETAILED GEOLOGY AND AREAS FOR MAGNETOMETER SURVEYS.

GEOLOGY BY G.M.BURTON AND K.G.SMITH

BASE MAP COMPILED FROM ENLARGED AERIAL PHOTOGRAPHS

APPROXIMATE SCALE

1000 0 1000 2000 3000 FEET

### Reference

TERTIARY
- Gravel
- Greisen
- Granite

SILURIAN
- qeh — Quartz-epidote hornfels
- eah — Epidote-actinolite hornfels
- Garnet-actinolite hornfels
- Limestone
- Brecciated volcanic rocks
- Acid tuff
- Rhyolite
- Epidotized quartz-felspar porphyry and volcanic rocks
- Quartz-felspar porphyry & volcanic rocks

ORDOVICIAN
- Slates and quartzites
- q — Quartz
- a — Actinolite
- e — Epidote
- Gossan
- A.....F — Gossans tested in laboratory

Geological boundaries
- Established - position accurate
- Established - position approximate
- Inferred
- 20 — Strike and dip of bedding
- so — Strike and dip of shear plane
- Fault - inferred
- Costeans and pits - (Nos. 1 to 7)
- Shaft
- Buildings
- Principal roads
- Minor roads
- Tracks
- Boundaries of areas for magnetometer survey
- Boundaries of area mapped by J. C. Lloyd and F. C. Loughnan.

Bureau of Mineral Resources, Geology & Geophysics · June 1953.

N78-3

H.E.S.