



DEPARTMENT OF MINES

GEOLOGICAL SURVEY OF NEW SOUTH WALES

Report No. 28

CLIEFDEN SPRINGS BARITE DEPOSIT

by G. S. Gibbons and D. J. Pogson

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REPORT ON THE BENDITHERA CAVES

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INSPECTION OF THE GLASS CAVE,
WOMBEGAN CAVES

by G. R. Wallis

NOT FOR SALE

Price: 60c

Issued under the authority of the Hon. T. L. Lewis, M.L.A., Minister for Mines.

1965

19995

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CLIEFDEN SPRINGS BARITE DEPOSIT

by

G.S. GIBBONS and D.J. POGSON

Abstract

Three steeply-dipping barite veins occur in andesite near Cliefden Springs, 140 miles west of Sydney, New South Wales. Surface prospecting indicates that the deposits will be economically minable only if cheap beneficiation methods can be applied to up-grade the product.

INTRODUCTION

The Cliefden Springs barite deposit is situated 4 miles north of the Canowindra-Mandurama road, midway between Cowra and Orange in central western New South Wales. It is approximately 12 miles by fair dirt road from the railway at Mandurama, and about 140 miles due west of Sydney.

GEOLOGY

The barite veins occur within the hinge area of a broad anticlinal structure developed in the Walli Andesite (Stevens, 1953, p.118). The andesites are here bounded to the north and west by the fossiliferous, Ordovician Cliefden Caves Limestone. In the north the boundary is apparently conformable, the limestone dipping at about 30° north. To the west, however, the limestone-andesite contact is faulted.

BARITE VEINS

The barite occurs in three sub-parallel, anastomosing veins which have been exposed over a total strike length of 500 yards by costeans, pits and a 35 foot shaft as shown in Plan D468. The veins strike parallel to the limestone bedding strike, but dip quite steeply to the south. They are thus approximately normal to the local major fold axis. The form of the veins may therefore be controlled by transverse joints associated with regional folding.

The barite itself is ironstained, though not heavily. Iron content (as Fe₂O₃) in material from near ground surface analysed by the N.S.W. Mines Department Chemical Laboratory varied from less than 0.01% to 0.35%. Other impurities are pyrite, chalcopyrite, and a little galena. In places quite heavy copper-staining (malachite and some azurite) is present, but CuO content does not exceed 0.01%.

Barium sulphate content varied from 81.2% to 92.3% in the samples tested.

PRODUCTION AND RESERVES

The total recorded production of barite from the Mandurama district is about 1500 tons, but only a minor part of this was obtained from the Cliefden Springs deposit. It is not possible to estimate the present reserves of this deposit, but as there seems to be no possibility of extraction by other than underground mining methods, the question is not one of immediate significance. The indicated maximum reserves may perhaps be set at 20,000 tons (to creek level), but it is extremely doubtful whether more than a fraction of this could be economically mined.

The best parts of the barite veins exposed at the surface are about 5 feet wide, of which perhaps 2 feet would be barite. If surface exposures present a fair picture of relations below ground level, and if a minimum stopeable width of 3 feet be assumed, recovery by underground mining should exceed 1 ton barite per cubic yard of rock extracted. Under these conditions, it should be possible to bring barite quite cheaply from the western section of these veins to the surface via an adit (or adits) driven from the west. Hand-sorting and up-grading would obviously add to final ex-mine cost, but if preliminary experiments in low-cost beneficiation methods are successful a price of perhaps £5 per ton, ex-mine, might be commanded by the final broken but unground product.

REFERENCES

- | | | |
|----------------------------------|------|--|
| Canavan, F. &
N. H. Ludbrook, | 1946 | Mineral Resources of Australia Summary Rept. 13: Barium (revised by N. H. Fisher).
Bureau of Mineral Resources, Canberra. |
| Stevens, N. C. | 1953 | Ordovician stratigraphy at Cliefden Caves,
near Mandurama, N.S.W.
Proc. Linn. Soc. N.S.W., v. LXXVII. p. 114. |

CLIEFDEN SPRINGS BARITE DEPOSIT

by

G. R. WALLIS

ABSTRACT

The prospecting of a barite deposit in the Walli Andesite at Cliefden Springs, near Mandurama, has proved the presence of a vein varying in width up to 3 feet, and dipping 55° to the south. The presence of veins seems to be controlled by an intersecting joint pattern, with associated pinching out of veins at some loci and making of veins at others, as borne out by the nature of the vein in the adit.

INTRODUCTION

At the request of the lease-holder, Mr. J. McCarron, an inspection was carried out with Mr. D. Pegum (Senior Geophysicist) of a barite prospect at Cliefden Springs, near Mandurama. It is situated 4 miles north of the Canowindra-Mandurama road, mid-way between Cowra and Orange. The main object of the survey was to ascertain whether geophysical prospecting methods could be used to assist in delineating the barite veins and also to determine the nature of the vein which was being prospected. See minute by Mr. D. Pegum in relation to geophysical assistance in the area.

Mr. McCarron has been granted aid to drive 100 feet of prospecting adit along one of the barite veins in the area, but encountered difficulty in following the vein through a zone of intense shearing. The prospect is subject of an earlier report by Gibbons and Pogson (1963) who recorded that "three sub-parallel anastomosing veins have been exposed" at the surface in costeans and pits, and in a 35 ft. shaft. The barite veins occur in the Walli Andesite, which is bounded on the north by limestone.

BARITE VEINS

OLD WORKINGS

An inspection of a disused shaft approximately 35 feet deep with a small stope at the bottom (see plan D468), which has recently been cleaned out, showed a barite vein with a minimum width of five feet. The vein contained a one foot band of Andesite, about 18 inches from the hanging wall. The andesite band pinched out in the width of the shaft and stope, i.e. approximately 10 feet. The dip of the vein varied between 50° and 60° to the south while the strike was difficult to determine but lay between 115° and 125° .

Old workings have been verbally reported by McCarron to exist in the area marked on the accompanying plan. The shaft is reputed to have been 100 feet deep on the underlay

with two drives, one 20 feet to the east ending in mullock and the second 40 feet to the west. The vein which was worked was two feet wide at the bottom and four feet wide at the 50 foot level. The mine had been stoped out nearly to the surface for a distance of approximately 40 feet downhill from the shaft.

RECENT WORKINGS

Gibbons and Pogson (1963) have reported on the exposures of barite veins striking between 75° and 90° magn., cropping out intermittently in surfaced pits and costeans.

The prospecting adit shown on the amended plan (D468) was commenced adjacent to the road on the 135 foot surface contour. The adit was driven on a vein of barite for 190 feet when a badly sheared zone was encountered. The vein at this stage is striking 135° magn. and dipping 55° to the south, having an average width of 14 inches.

At this point the vein pinched out to a number of thin stringers, no more than $1/8$ inch in width. Much copper mineralisation of both malachite and azurite, the latter predominating, was evident. McCarron and party developed a cross-cut at an angle of 60° to the adit bearing 75° magn. following what was considered to be the direction of the barite vein. This cross-out had been driven for 36 feet when this inspection took place.

Shearing of the rock in the cross-cut was intense for 18 feet, lessening in intensity from the 18 to 36 feet points. At the 18 foot point in the cross-cut a second vein had developed with a maximum width of six to eight inches, but branching strongly. The strike of this vein is approximately 125° magn. and dips vertically. Throughout much of the sheared andesite a predominance of barite veins with a maximum thickness of $1/2$ inch was noted. At the end of the cross-cut the barite veins had thinned out to being almost non-existent.

Advice was sought by McCarron as to where to continue prospecting after the original barite vein had pinched out.

RECOMMENDATIONS AND CONCLUSIONS

Two predominant directions of strike of the barite veins exist, viz. 75° to 80° and 115° to 135° . Those striking between 75° and 80° are exposed in surface workings as mapped by Gibbons and Pogson. Underground inspection reveals two sets of veins striking between 115° and 135° , viz. (a) at the bottom of the shaft and (b) the two veins in the prospecting adit. The relationship of these two vein directions to the regional pattern of folding is not evident but it seems that the deformation of the rocks has produced deposition of the barite along the intersecting joint patterns. That the vein which was being prospected pinched out in the shear zone may indicate an absence of deposition at certain intersection points of the joint system. The manner in which the vein thickness varies along the length both in the mine and on the surface seems to support this idea.

In view of the possibility of the barite occurring in a series of intersecting, roughly parallel veins it was considered that the probability of the vein, on which the adit had been driven, continuing in the same direction was high enough to continue prospecting in that direction. McCarron was therefore advised either to cross-cut back to the original line of lode or recommence driving the adit from the point where the cross-cut has been commenced.

SUBSEQUENT WORKINGS

On re-opening the adit at the latter point the vein had remade to a total of 26 inches in width, 15 inches of country rock splitting and eleven inch barite vein.

Since the completion of the above work, which had been carried out up to February 6th, only a small amount of developmental work has been continued with. The adit has been driven a further 25 feet and has swung slightly toward the north away from the original bearing of 135° magn. The barite vein made to approximately two feet six inches to three feet in width and then pinched out to six inches. McCarron advises that he is driving on this vein at present.

He has also drilled an 18 foot hole out from the end of the cross-cut but reports that no ore was encountered.

PRODUCTION

The quality of the barite that has been mined or exposed to date is good quality material with very little iron-staining. Little beneficiation appears to be necessary to date apart from selectively mining the barite vein.

Should the vein decrease below an average of 15 to 18 inches in width it may be necessary to resort to low cost beneficiation methods as referred to by Gibbons and Pogson (1963).

REFERENCES

Gibbons, G. S. and
Pogson, D. J.

1963

Cliefden Springs Barite Deposit.
Geol. Surv. N.S.W., Geol. Rep. 28.

REPORT ON BENDITHERA CAVES

by

G.R. WALLIS

ABSTRACT

The Bendithera Caves lie 32 miles by track to the west of Moruya and adjacent to the Deua River. One main cave, the Bendithera Cave, is approximately 250 yards long with ceiling heights up to 80 feet. It was a tourist cave between 1899 and 1903, though the decorations are only mediocre at present. Of the other caves in the area none are of any significance. The area cannot be considered suitable for tourist development because of the lack of large caverns and the extremely high cost necessary to develop the road and associated tourist facilities.

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INTRODUCTION

Following a request by Eurobodalla Shire and the N.S.W. Department of Tourist Activities for advice as to the suitability of developing the caves at Bendithera as a tourist resort, an inspection was carried out by D. R. Kennedy, K. R. Fitzpatrick and the author.

The caves are 32 miles west of Moruya, access being by the Coondella and Bendithera Fire Trails. For the most part these are trafficable in a four wheel drive vehicle and the last five miles in dry weather only. This last five mile section of the Bendithera Trail has only recently been constructed and sloped at grades of up to 1 in 3.5 are reached. At present the only access from Krawaree, to the west, is by a much overgrown pack-horse track.

The relief of the mountains between the coast and Bendithera is extremely variable. Heights above sea level range from only a few hundred feet in the bottom of the valleys to 2246 feet and 3268 feet at Coondella and Bendithera Trigonometrical Stations respectively. The vegetation is moderate to thick rain forest type often with thick undergrowth of ferns and vines.

HISTORY

The Bendithera Caves were discovered before 1889 and were first inspected by the then Superintendent of Caves, W. S. Leigh in April of 1890. The Caves were then developed as a tourist resort, walkways and stairs being constructed. It is assumed that the access to the area was by horse and pack horse. Yearly visitors to the Caves reached a maximum of 107 in 1894, then decreasing to 23 in 1899. In July of 1903 the services of the caretaker were dispensed with.

Until March of this year access had only been by horse or on foot. The final section of the fire trail from Bendithera Trigonometrical Station to Bendithera property was constructed in March, allowing four wheel drive vehicles access to the area. Evidence in both the visitors' book of the Caves and by the amount of desecration that has taken place in the main cave points to a considerable number of people having visited the area. Most of these people have been bushwalkers, speleologists and local residents.

GENERAL GEOLOGY

The geology of the area in the vicinity of Bendithera and Coondella is composed of both Devonian and Ordovician age rocks. The dating of some of the Devonian type quartzites and -porphyries is in doubt as they are intruded by granites which have been radio-carbon dated as Lower Devonian. Also present are lavas and porphyrites of Devonian (?) age.

The limestone in which the caves occur is of Lower Silurian age, being overlain by Lower Devonian porphyries and rhyolites and intruded by porphyry dykes. Close jointing and typical karstic solution phenomena typify the limestone. Solution cavities are extremely numerous but are commonly filled with red clay and debris.

THE CAVES

The caves are situated in a reserve for public recreation, R26010 of 1180 acres. It covers the area adjacent to both Con and Little Con Creeks and to the west of Bendithera Homestead and the Deua River (See plan P299.).

Reports received from the Illawarra Speleological Society state that there are four caves and a number of vertical shafts in the area. This group has carried out considerable exploration in the area but do not appear to have located the Gin Cave, situated near the southern boundary of the reserve. The entrances to these caves are difficult to locate as they are generally small and are covered by considerable bush-fire regrowth of timber and ferns. The entrance to the main cave of the area - The Bendithera Cave - was located but other small cave entrances were not located.

Two effluxes were noted, one in the side of Con Creek near the south west corner of ML 11 and a second in a tributary to Con Creek, below the Main Cave. They were both discharging small amounts of water into their respective creeks.

THE BENDITHERA CAVE

This cave is the only large cave of the group in the area. The entrance is approximately 300 feet above Con Creek in a very steep hillside. The entrance is small compared with the size of the cave, being 12 feet by 6 feet high. In places the roof would be over 80 feet high but averages 40 feet. The width is extremely variable, ranging from narrow passages ten feet wide to chambers of 60 to 70 feet across. The cave is basically one long one approximately 250 yards in length with a number of constrictions and bridges across it, forming a number of caverns of large dimension.

Because of the large size of the caverns and passages access through the cave is not difficult. Improvement of the existing ladders would render the cave accessible for most people, were the expense warranted.

The decorations of the cave are large and spectacular, rather than small and fine, as in some caves. A number of massive columns up to 80 feet in height and 25 feet maximum girth were noted. Flowstone of a white and crystalline appearance is particularly well developed in two sections of the cave. The development of shawls is limited to only a few fine examples.

The cave for the most part is a dry cave, that is, one in which the majority of water movement and growth of formations has ceased. The surface of many of the flowstone formations has become dry and crusty and scales off very easily.

The colour of the formations varies between yellow and pale red with a minimum of pure white ones. No strong colours of any consequence were noted.

Generally the ground of the deeper parts of the cave is covered with a red brown clay, which is moderately damp because of sub-surface seepage. Some sections are covered with bat guano.

OTHER CAVES

Of the other caves in the area the Fig Tree Cave is confined to a small cavern about 50 feet in diameter.

On the north western side of ML 11, near Con Creek are two caves. One is a cavern sloping at about 45° down for 50 feet and ends in a pool of water. The other cave would not exceed 200 feet in extent and 50 feet or so in depth. Neither of these caves could be located due to the thick fire re-growth.

DESECRATION OF CAVES

Caves throughout the state generally suffer from desecration and vandalism. This is due to a small but active minority. The type of vandalism is confined to two classes, breaking and damaging formations and the writing of names on walls.

The Bendithera Cave has in no way escaped damage by these means. Numerous of the smaller formations have been broken and the larger ones have been dirtied and walked across. Many names have been recorded on the walls and formations by carbide lamp or candle.

TOURIST VALUE OF THE CAVES

The tourist potential of the Bendithera Cave is limited to one main cave, unless other large caves are found at some later date. This cave, although it has been a tourist cave in the past would not warrant the expenditure necessary to develop it into a satisfactory tourist attraction. The cost of importing into the area equipment for lighting and constructing suitable accommodation for guides would be too great for the expected return from visitors to the area. When the cost of improving and reconstructing the existing fire trail is added to the above outlay the overall financial situation loses all proportion.

RECOMMENDATIONS

Due to the difficulty of the present access to the area and the cost necessary to rebuild the road and construct suitable amenities at Bendithera it is not considered that the development of Bendithera Caves is a feasible proposition. Should further caves be discovered in the future, it would be necessary that the decorations should be of extremely high quality and the cave of somewhat considerable dimensions.

However it is felt that some move could be made to preserve the caves by preventing vandalism. This could adequately be done by gating the cave with a gate of suitable design and having the key kept by a responsible authority such as the Eurobodalla Shire Council or local Police Officers. Possibly a number of speleological societies, particularly the Illawarra Speleological Society, could be approached to assist in this matter.

REFERENCE

Leigh, W. S.

Report on Bendithera Caves
App. No. 8A. Ann. Rept. Dept of Mines for 1890,
p.310.

INSPECTION OF THE GLASS CAVE

WOMBEGAN CAVES

by

G. R. WALLIS

Abstract

The Glass Cave at Wombeyan Caves is situated within the boundaries of ML 3, parish of Bouverie, county of Westmoreland. While not warranting development at the moment it offers positive tourist potential in future years and as such, should be preserved from damage by mining activity.

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Plan P403

INTRODUCTION

Wombeyan Caves is situated 40 miles west of Mittagong and 47 miles north of Goulburn. The area is generally mountainous and moderately timbered.

Following representations by the Director of the Department of Tourist Activities and other preservation-conscious groups an inspection and survey has been carried out of the Glass Cave at Wombeyan Caves by Mr. Inspector M. Simmons and the author. The Glass Cave is situated in Portion ML 3, parish of Bouverie, county of Westmoreland, and concern has been expressed as to possible damage to the Cave by mining interests in the area.

Wombeyan Caves are included in the Reserve R43616/7 for the Preservation of Caves (Notified 24th February 1909). A number of caves in the area have been developed as tourist caves and are very popular, while other caves are planned for opening in future years.

GEOLOGY

The caves at Wombeyan are formed in limestone and marble outcrops of Silurian age. To the south of the Reserve granite intrudes the limestone.

Inspection of the limestone and marble on the mining lease reveals that it varies from white and cream to grey in colour. The most common colour appears to be cream. Iron staining is extremely variable, especially within short distances. The iron staining generally occurs in fine hair-line fractures and cracks and less commonly as surface staining.

The grainsize of the marble ranges from fine to coarse with the majority being medium to coarse. Coarse sugary patches of marble occur throughout the outcrops.

Jointing is a variable feature, varying from closely to medium spaced and is irregular in direction.

An area which has been prospected in the eastern portion of the lease suggests quantities of good quality, white crystalline marble.

Boring in various parts of the lease has been carried out but only one core was available for inspection. This core was from a borehole adjacent to the Glass Cave and revealed marble of a cream and an ironstained white colouration with medium-grained crystals. No other details were available from the boring. Elsewhere in the vicinity of the Glass Cave, surface examination indicates the presence of both white and cream coloured marble with ironstaining varying from absent to strong but generally present in minor amounts.

THE GLASS CAVE

The Glass Cave has been ascertained as being situated near the southern boundary of the portion ML 3. This mining lease is on the northern boundary of, and inside the Reserve for the preservation of caves referred to above.

A compass and tape survey was carried out with peg A(ML 3) as datum and check sights with a theodolite were made from peg D. The cave is positioned within one chain of the south-eastern boundary of the mining lease and 18 chains from peg D (see accompanying plan P403).

The extent of the cave is approximately 4 chains to the west and 3 chains to the east of the entrance. One arm of the cave is 167 feet deep and the other approximately 120 feet deep from the surface. Inspection of the cave showed it to be variable in character and accessibility. Some sections, though difficult of access at the present time could be opened up without much difficulty. For the most part, the cave is quite accessible, having wide caverns with high roofs. The construction of steps or ladders would be sufficient.

Decoration of this cave is variable and, while not rivalling some of the tourist caves in the area, could warrant opening up in future years. Some fine examples of cave pearls were noted. Many sections of the floor are somewhat muddy.

CONCLUSIONS AND RECOMMENDATIONS

(1) The Glass Cave has been ascertained as being in the area covered by ML 3 and adjacent to the southern boundary of the lease.

(2) With respect to the preservation of the cave it is considered that it warrants protecting since it possesses positive tourist potential in future years.

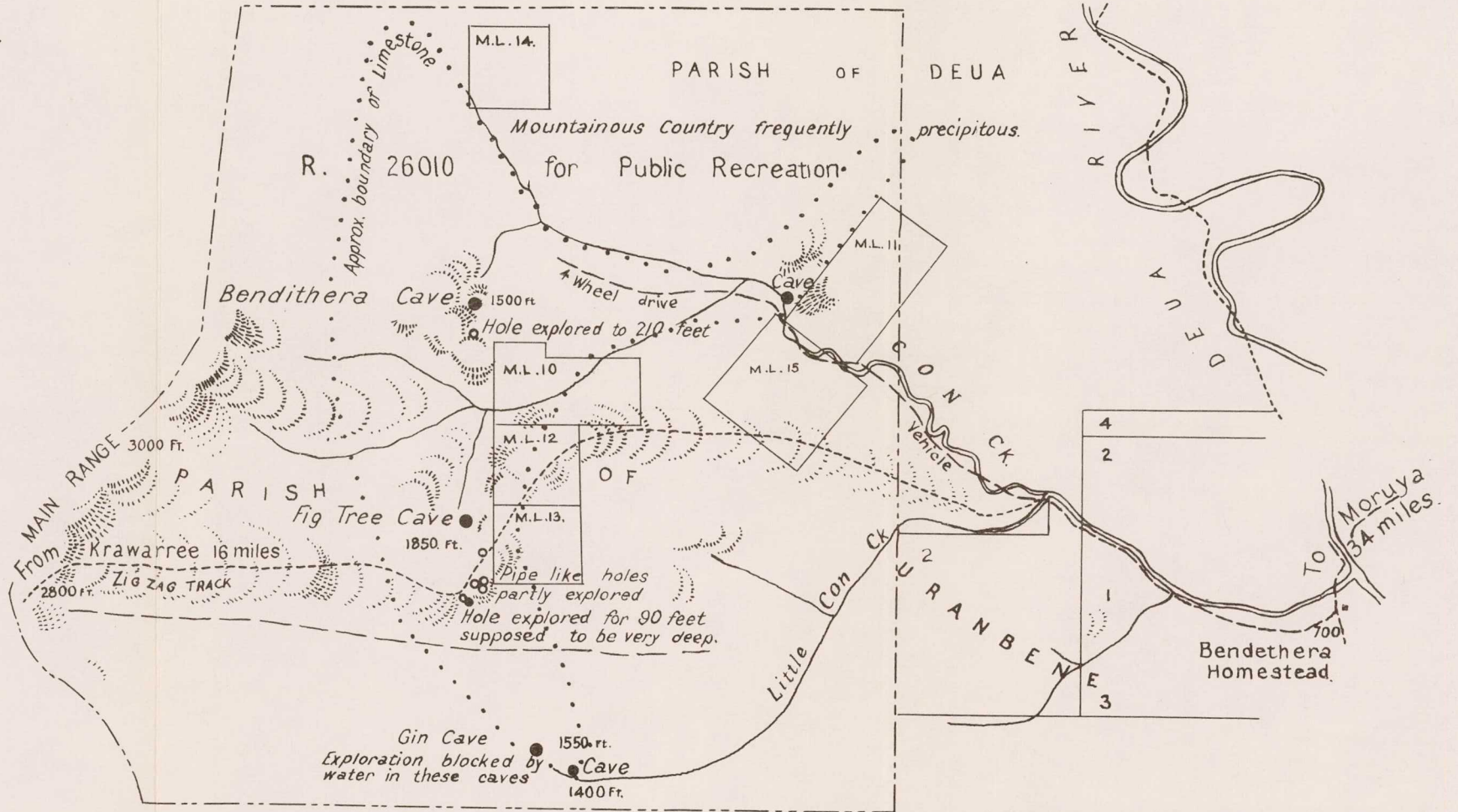
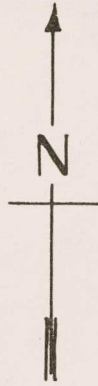
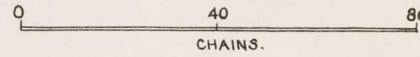
(3) It is believed that the lessee has no immediate intentions of mining the calcite on the lease in question. (See Mr. Inspector C. Harris' report of 9th March 1965.) The marble at the eastern end of the lease appears from the surface indications to be of comparable if not better quality than that in the vicinity of the Cave. Therefore it is recommended that a five chain strip be revoked from the lease along the south-western boundary. This width would adequately protect the cave and its extensions.

(4) I also agree with Mr. Harris' suggestion that "consideration be given to restricting operations to mining marble as a dimensional stone in which no explosives are used and very little waste rock results".

BENDITHERA CAVES

County of Dampier.

21 Miles W.S.W of Moruya.
34 Miles S. of Braidwood.



Annual report, N.S.W. Department of Mines 1897.

Geological Survey of N.S.W.

Department of Mines.

REPORT ON BENDITHERA CAVES.

To accompany report by G. R. Wallis.

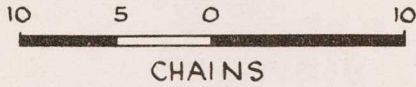
Drawn by J. Brewster.

Date: 7th. Dec. '64. Ref. No. 2930.

P.399.

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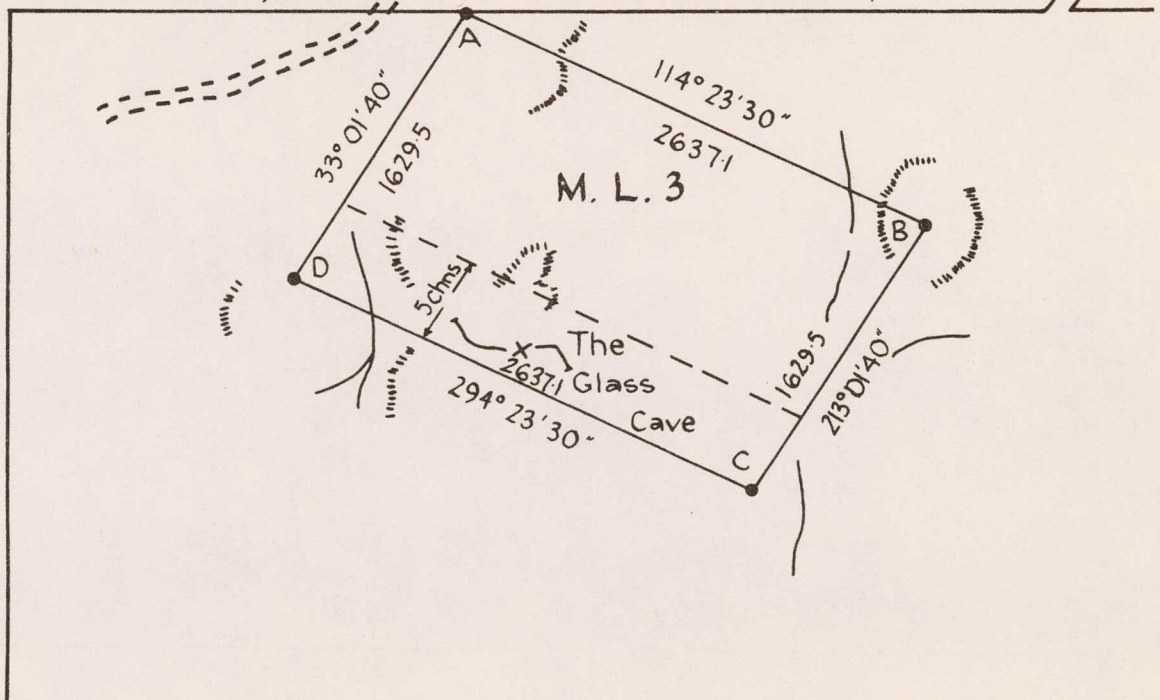
Scale



Por 103

To Taralga

Boundary of Reserve R 43616/7



Legend

- x- Extent of cave
- x Entrance to cave.

Geological Survey of New South Wales
Department of Mines.

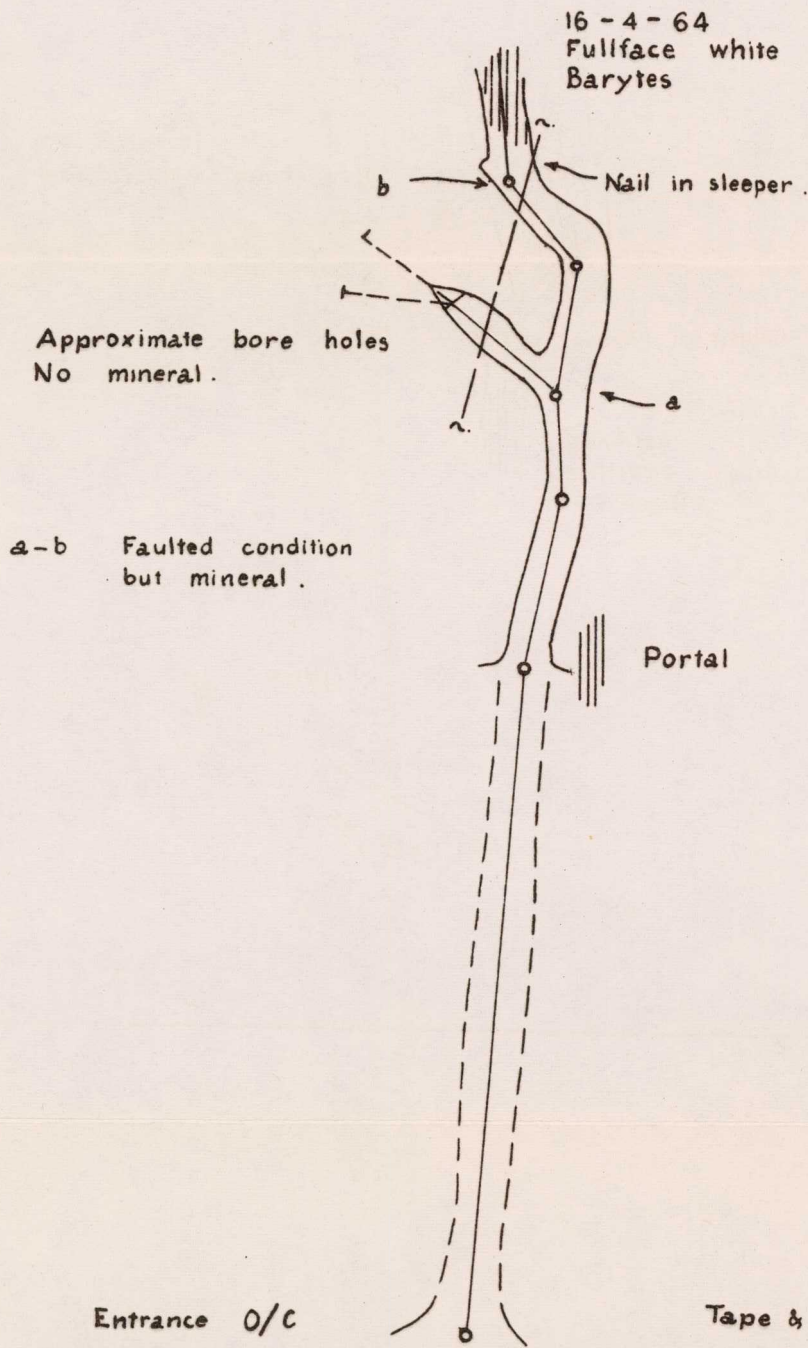
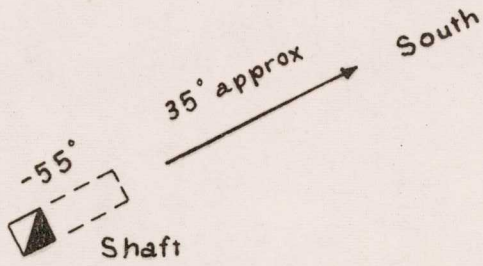
Location of the Glass Cave

Wombeyan Caves

Por. M.L.3. Pⁿ Bouverie C^o Westmorland

To accompany report by G.R. Wallis.

Date: 17-5-65. Ref. N^o 3085. P 403



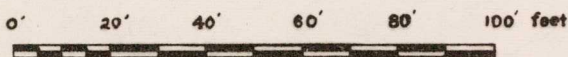
Tape & Compass Survey
A.G. Reid

Geological Survey of New South Wales
Department of Mines

J. M^c Carron.

BARYTES PROSPECT
Ph. Malongulli.
Co. Bathurst
A to E 8755
Cootamundra

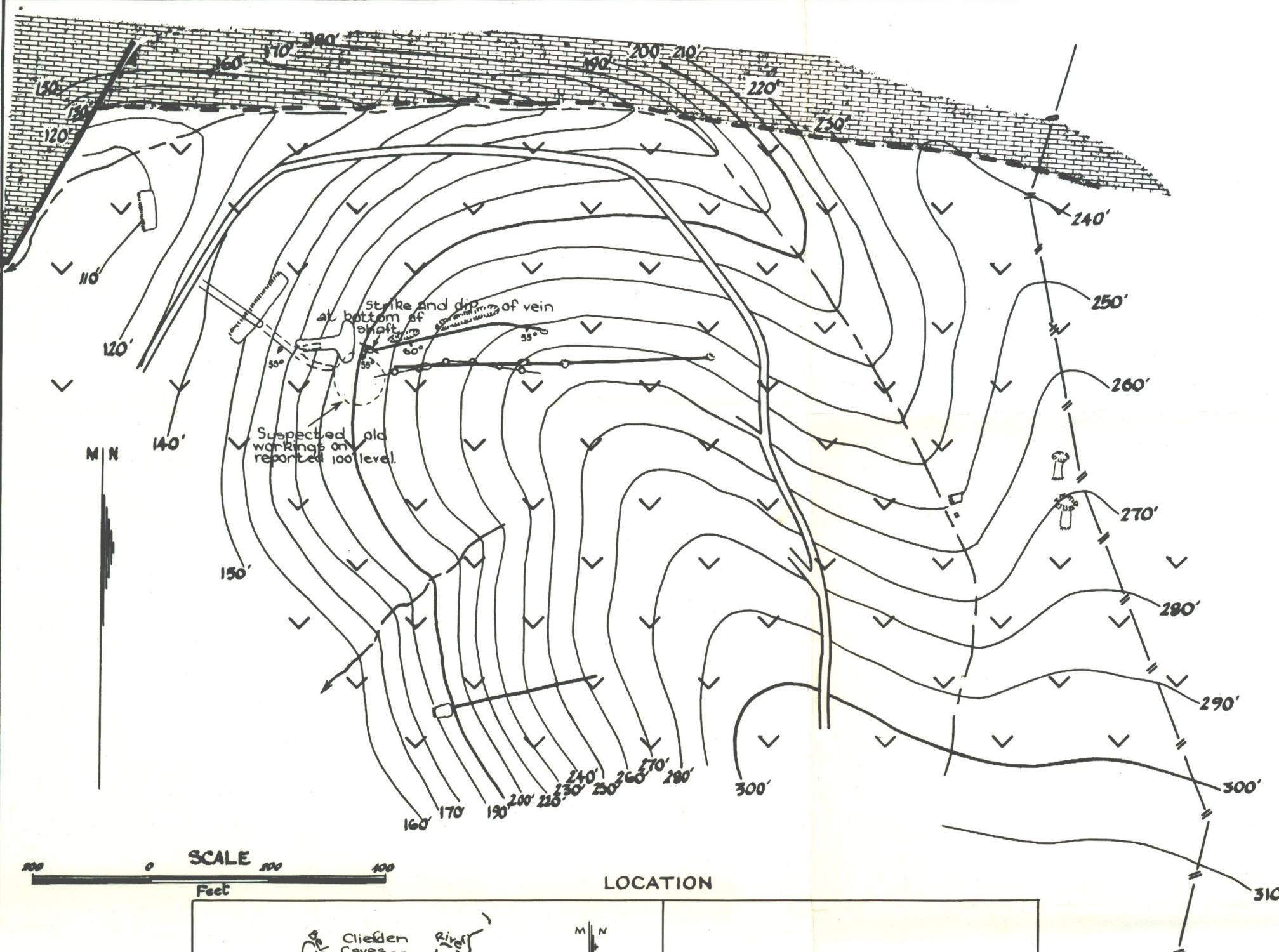
SCALE






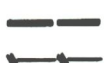









Drawn by R.G. Cameron.

Date: 19-5-64 No. 2846

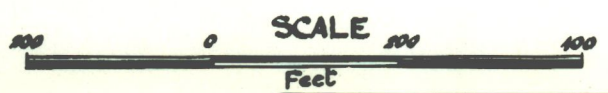
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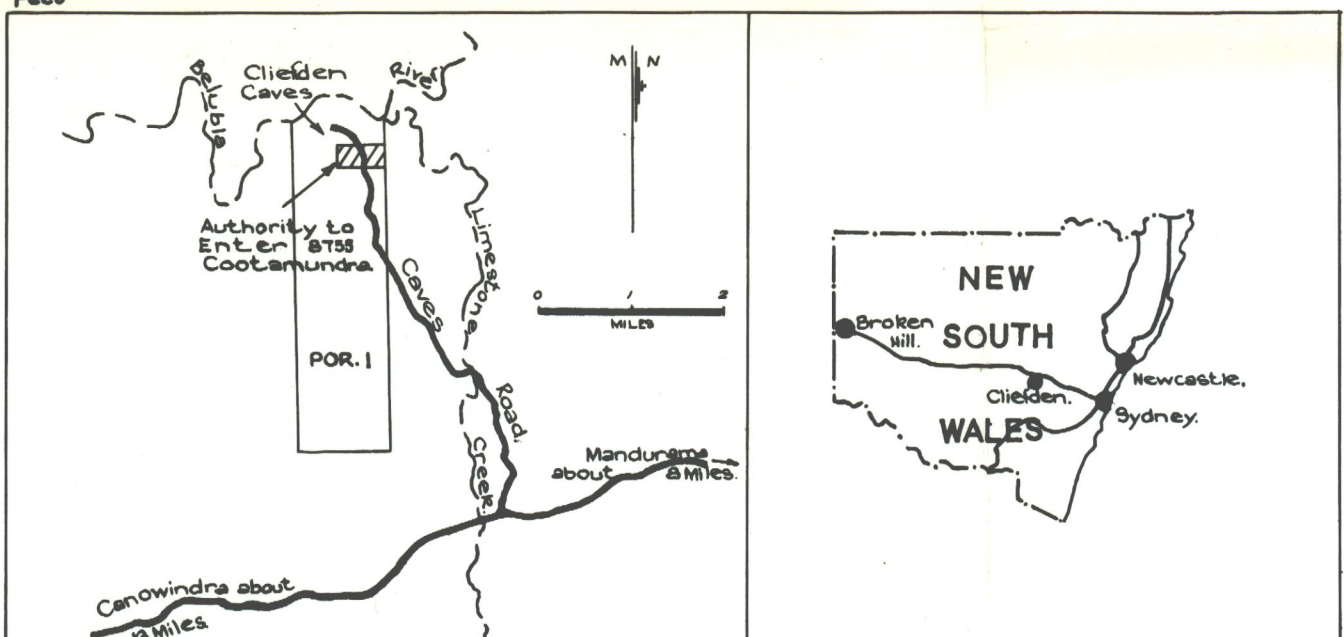
LEGEND

-  Cliefden Caves Limestone.
-  Walli Andesite.
-  Geological boundary.
-  Fault. (After N.C. Stevens 1953.)
-  Fence.
-  Surface Contour: Height Datum. Main Collar Shaft = 200 ft.
-  Gully or trench with dip of exposed vein.
-  Creek or Gully.
-  Shaft.
-  Bulldozed cut or pit with mullock heap.
-  Vein in wall of adit.
-  Adit on 135' level.
-  Projection of veins on 135' level.

SE corner peg
 Authority to
 Enter
 8755 Cootamundra



LOCATION



Geological Survey of New South Wales
 Department of Mines.

**CLIEFDEN BARYTES
 DEPOSIT
 MANDURAMA N.S.W.**

Parish Malongulli County Bathurst.

To accompany report by G.S. Gibbons
 and D.J. Pogson.
 Ammended G.R. Wallis 27-2-64.

DATE: 19th SEPT. 1963. REF. No 2706 D 468.