COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

Copy 1

REPORT No. 1947/74.

THE GEOLOGY OF THE COBAR MINERAL FIELD AND ITS BEARING ON PROSPECTING.

BY

C.J. Sullivan

assisted by

W.B. Dallwitz, K.R. Fleischman and J.F. Ivanac.

CANBERRA. A.C.T.

9th December, 1947

TABLE OF CONTENTS.

		Page
I.	SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	1
II.	INTRODUCTION	2
III.	SITUATION	3
IV.	CLIMATE - TOPOGRAPHY	3
V.	HISTORY	3
VI.	MAPPING METHODS - COORDINATE SYSTEM	6
VII.	STRUCTURAL GEOLOGY	6
VIII.	GENERAL GEOLOGY	13
IX.	INDIVIDUAL DEPOSITS:	
	1. The New Occidental Mine	
	A. History	14
	B. Workings - Ventilation	15
	C. Type of Ore	15
	D. Shape and Dimensions of Lode	15
	E. Ore Reserves - Costs	17
	F. Structure	18
	2. The New Cobar (Fort Bourke) Mine	
	A. History	21
	B. Workings - Ventilation	21
	C. Type of Ore	23
	D. Ore Reserves, Costs	23
	E. Structure	23
	F. New Orebodies - Prospecting	25
	3. The Chesney Mine	
	A. History and Production	26
	B. Workings - Ventilation - Nature of Ground .	27
	C. Nature of Ore	28
	D. Dimensions of Lode - Ore Reserves	28
	E. Structure	29
	4. The Peaks Area	
	Production Tables	31-32
	General Description	32
	Diamond Drilling	33
	Prospecting	34
X.	LIST OF REFERENCES	35

Appendix I.
The Petrology of the Rocks in the Neighbourhood of the New Cobar Mine. W.B. Dallwitz.

Appendix II.
Minerographic Investigation of Ore Specimens from New Cobar Mine. C.S.I.R. Rpt. No. 328. F.L. Stillwell.

Appendix III.
Tables showing Production of Mines in Cobar District, not described in Text.

Lode Dimensions

List of References and Appendix I are missing from the hardcopy of record 1947/74.

LIST OF PLATES.

Reproductions of Mulholland and Rayner's

Surface Plans

Plate 1. Locality Sketch Map, showing Generalised Geology and Areas covered by Detailed Plans.
Scale 1" = 16 chains.

Plate 2. Sheet 1. Spain's Tank - New Cobar Section.
Scale 1" = 100'.

Plate 2. Sheet 2. New Cobar - Chesney Section.
Scale 1" = 100'.

Plate 2. Sheet 3. Burrabungie - Young Australia Section.
Scale 1"= 100'.

Plate 2. Sheet 4. New Occidental Section.
Scale 1"= 100'.

Plate LP. County of Robinson (Cobar Area) Lease Plan.
Scale 1" = 80 chains.

NEW OCCIDENTAL MINE.

Plate	0 - 1.	Geological Plan, No. 1 level.	Scale 1" = 40'.
"	0 - 2.	" " No. 2 "	" "
"	0 - 3.	" " No. 3 "	" "
"	0 - 4.	" " No. 4 "	" "
"	0 - 5.	" " No. 5 "	" "
"	0 - 6.	" " No. 6 "	" "
"	0 - 7.	" " No. 7 "	" "
"	0 - 8.	" " No. 8 "	" "
"	0- 9.	" " No. 9 "	" "
"	0 -10.	" " No.10 "	" "
"	0 -11.	" " No.11 "	" "
"	0 -12.	" " No.12 "	" "
"	0 -13.	" " No.13 "	" "
"	0 -14.	" " No.14 "	" "
"	0 -15.	Composite Assay Plan, Nos. 12, 13 and 14 levels. Scale 1" = 20'.	
"	0 -16.	Longitudinal Projection showing Assay Contours in dwt-ft. Scale 1" = 60'.	
"	0 -17.	Plans showing Stope Outlines, Nos. 1-14 levels. Scale 1" = 100'.	
"	0 -18.	Ore Distribution on Nos. 9-14 levels. Scale 1" = 40'.	
"	0 -19.	Cross Section of Lode showing Details of Ore Distribution from No. 8 level to No. 11 level. Scale 1" = 40'.	
"	0 -21.	East-West Projections at 700N and 200N, showing Possible New Orebody and Existing Main Orebody. Scale 1" = 100'.	

NEW COBAR MINE.

Plate	N.C.- 5A.	Assay Plan,	No. 5	Level.	Scale 1" = 40'.
"	N.C.- 6A.	" "	No. 6	"	" "
"	N.C.- 7A.	" "	No. 7	"	" "
"	N.C.- 8A.	" "	No. 8	"	" "
"	N.C.- 9A.	" "	No. 9	"	" "

Plate	N.C. - 0.	Geological Plan,	Surface.	Scale 1" = 40'. *	
"	N.C. - 1.	" "	No. 1	level	" "
"	N.C. - 2.	" "	No. 2	"	" "
"	N.C. - 3.	" "	No. 3	"	" "
"	N.C. - 4.	" "	No. 4	"	" "
"	N.C. - 5.	" "	No. 5	"	" "
"	N.C. - 6.	" "	No. 6	"	" "
"	N.C. - 7.	" "	No. 7	"	" "
"	N.C. - 8.	" "	No. 8	"	" "
"	N.C. - 9.	" "	No. 9	"	" "
"	N.C. -10.	" "	No.10	"	" "
"	N.C. -11.	Longitudinal Projection on N 13°W showing Ore Distribution. * Scale 1" = 60'.			
"	N.C. -12.	Projection on Vertical Plane striking N55°E., through 8,300N and 2,900W. Scale 1" = 60'. *			

CHESNEY MINE.

Plate	C - 1.	Geological Plan,	No. 1	level.	Scale 1" = 40'.
"	C - 2.	" "	No. 2	"	" "
"	C - 3.	" "	No. 3	"	" "
"	C - 4.	" "	No. 4	"	" "
"	C - 5.	" "	No. 5	"	" "
"	C - 6.	" "	No. 6	"	" *
"	C - 7.	" "	No. 7	"	" "
"	C - 8.	" "	No. 8	"	" "
"	C - 9.	Longitudinal Projection showing Ore Distribution and Related Geological Features. * Scale 1" = 30'.			

PEAK MINE.

Plate	P - 1.	Geological Plan of Surface showing Brown Lode, Conqueror Lode and Big Lode. Scale 1 " = 40'.
"	P - 2.	Geological Plan of Surface showing Blue Lode. Scale 1" = 40'.
"	P - 3.	47 ft. level, Peak Shaft. 53 ft. level, Brown Shaft. Scale 1" = 40'.
"	P - 4.	100 ft. level, Peak Shaft 100 ft. level, Brown Shaft. "
"	P - 5.	160 ft. level, Peak Shaft. "
"	P - 6.	226 ft. level, Peak Shaft. "
"	P - 7.	267 ft. level, Peak Shaft. 307 ft. level. Peak Shaft. "
"	P - 8.	Longitudinal Projections of Brown and Conqueror Lodes. "
"	P - 9.	Longitudinal Projection of Brown Lode. "

Plate P - 10. Longitudinal Projection on Plane C.D. of "Big Lode" - Intersections by Diamond Drill Holes and Workings. Scale 1" = 40'.

" P - 11. "Big Lode" - Cross Sections along Diamond Drill Holes. Scale 1" = 40'.

" P - 12. Sections along Diamond Drill Holes, Nos. 2 and 3. Scale 1" = 40'.

" P - 13. Section along No. 4 Diamond Drill Hole. Scale 1" = 40'.

" P - 14. Section along No. 6 Diamond Drill Hole. Scale 1" = 40'.

" P - 15. Southern Extension of "Big Lode" Shear as mapped by E.C. Andrews. Scale 1" = 100'.

LIST OF TEXT FIGURES.

		Page
1.	Photograph showing relation of cleavage, mineral-grain elongation and bedding.	8
2.	Photograph showing relation of cleavage, jointing and mineral grain elongation.	9
3.	Sketch-plan showing relation of folding, fracture pattern and ore occurrence.	11
4.	Sketch section showing same relationships as figure 3.	12
5.	Sketch-plan showing essentials of structure, New Occidental Mine.	18

* Only plans marked thus are reproduced published with the printed report. Copies of the remainder of the plans are available at the Bureau of Mineral Resources in Canberra and Melbourne, at the Mines Department, Sydney and at the offices of New Occidental Gold Mines Ltd., Cobar, N.S.W.

THE GEOLOGY OF THE COBAR MINERAL FIELD

AND ITS BEARING ON PROSPECTING.

Report No. 1947/74.

I. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.

The Cobar mining field was examined by the Bureau in conjunction with the Department of Mines, New South Wales, between August, 1946 and June, 1947.

Attention was concentrated on the operating mines, viz. New Occidental, New Cobar and Chesney. New Occidental Gold Mines, N.L., owns all three deposits and had requested assistance from the Commonwealth Government to search for new orebodies on their leases.

It had previously been recognised that each of these orebodies lay close to a sharp contact between fine-grained and coarse-grained sediments. The contact has been variously interpreted as a fault and as the sheared limb of an overturned fold. It is here considered that the feature is a discordant contact of a regional character - possibly a fault of large displacement, an unconformity, or a plane along which slumping of sediments has occurred - which has been folded. The discordant contact is itself an ore-channel and, in addition, has localised later shear-zones of small displacement in which the present orebodies have been deposited.

The folding of the contact and the development of the fracture pattern are closely related.

Of particular interest are the portions of the contact which have been subjected to minor folding, because, immediately to the south of these folds, fracturing favourable for ore localisation has developed.

From Andrews' reconnaissance-mapping it seems likely that the discordant, ore-bearing contact extends for 20 miles south of Cobar and, from its nature, it may well extend both north and south of Cobar for very considerable distances. Since the conditions under which deposits occur along it are known, it is considered that this is a first-class opportunity to try to find new dposits on a regional basis.

The contact should be mapped wherever it may extend and all minor folds noted. Detailed mapping of the area adjacent to these folds should be followed by geophysical investigation and diamond drilling where warranted. That non-outcropping shoots may occur is shown by the examples of the Western Orebody, New Cobar Mine, and by the southern oreshoot, Chesney Mine. The "Big Lode", Peaks area, is an example of a deposit which is leached and worthless in the oxidised zone but gave promising results when drilled in the sulphide zone.

Referring to the individual mines, it is believed that there are only moderate chances of finding complete repetitions of either the New Cobar or Chesney deposits, though the finding of further shoots related to the known orebodies is a distinct possibility, particularly at New Cobar.

It is believed that at New Occidental, the chances of a major find are somewhat greater. The most promising ground lies to the north of the present orebody and within 600 feet along the strike. It could be cheaply tested at No. 6 level and No. 11 level.

The exploration outlined for these three deposits is as follows:-

Mine	No. of D.D.hs.	Total length feet	Purposes
New Occidental	8	1845 Note - 910 ft. of drilling, No. 11 level could be replaced by 300-400 ft. driving plus lateral drilling.	Horizontal drilling to test at Nos. 6 and 11 levels, possibility of ore occurrence north of present lode and to test carbonate-lead-zinc lode at Nos. 6 and 7 levels.
New Cobar	10	1760 ft.	Horizontal drilling to test for ore south of Western Orebody, for possible occurrences related to contact north-east of deposit and for ore in walls of main lode. Structural information is also sought.
Total: -	18	3,605 ft.	
Chesney			Normal development programme recommended but no special drilling envisaged. Localities are suggested in which it is thought further small shoots might be discovered.

The Peaks Area.

Diamond drilling of the "Big Lode" revealed the presence of marginal grade copper-lead-zinc mineralisation over widths up to 200 ft. The area has interesting potentialities but has not been mapped in the light of the information gained on the other deposits. It occurs close to the discordant contact and this contact has not been adequately outlined to the north and south of the lode. It is intended to carry out this work as soon as possible.

General. The Mount Drysdale-Cobar-Nymagee belt offers a promising field for testing and developing techniques of searching for orebodies by geological, geophysical and diamond drilling methods and the chances of success are considered to be relatively high. The results to date of the current geophysical investigation of the area are given in Geophysical Report No. 1947/60. These results are most encouraging and are based on the use of the magnetic method only.

II. INTRODUCTION.

Many aspects of the Cobar mineral field have been described with considerable accuracy and detail by E.C. Andrews (1911). This report has been found to contain a penetrating study of the field and the conclusions reached have, in general, survived a good deal of searching criticism and re-examination. The reader requiring details of the history, climate and general geology of the field is referred to this report.

The present examination arose from an application by New Occidental Gold Mines N.L., for assistance from the Commonwealth Government to prospect the extensive areas held by the Company at Cobar for extensions of known ore deposits and for possible non-outcropping deposits. Investigation was concentrated on the present operating mines viz:- The New Occidental, the New Cobar and the Chesney. Some attention was paid to the Great Cobar and the Peaks area, where prospecting is proceeding.

The geological examination was carried out in conjunction with the Geological Survey, Mines Department, New South Wales. Most of the surface mapping together with some underground mapping was carried out by C. St. J. Mulholland and E.O. Rayner of the Mines Department, who were on the field from mid-August, 1946 to early October, 1946. Officers of the Bureau of Mineral Resources carried out the more detailed underground mapping. The following periods were spent at Cobar by members of the geological staff of the Bureau:- C.J. Sullivan, 14th August, 1946 to December 12th, 1946; K.R. Fleischman, October, 1946 to December, 1946; and March, 1947 to June, 1947; J.F. Ivanac, April, 1947 to June 1947; W.B. Dallwitz, March 24th to April 14th, 1947.

Mulholland and Rayner (1947) have described the area in an unpublished report.

A preliminary magnetic survey of part of the field was carried out by the Geophysical Section of the Bureau during the first half of 1947.

Messrs. Dallwitz, Fleischman and Ivanac made a special study of the New Cobar Mine and the plans of that deposit and the report on it are largely their work. Mr. Dallwitz has contributed very considerably to the report in general. Mr. A. Crisp has been most helpful as photographer. (AE)

The full co-operation of the Department of Mines, New South Wales, is gratefully acknowledged and so also is the assistance of the staff of New Occidental Gold Mines, N.L.

III. SITUATION.

Cobar is situated 464 miles by rail west-north-west of Sydney and is at the head of a branch line from the Sydney-Bourke railway, with which it junctions at Nyngan. Cobar is connected with Broken Hill by a formed gravel motor road 260 miles in length.

Nearly all stores and equipment are brought from Sydney. Flotation concentrates are forwarded by rail for treatment at Port Kembla.

IV. CLIMATE - TOPOGRAPHY.

Cobar is in the midst of sheep grazing country of a semi-arid nature. Summer temperatures are high and the average rainfall is approximately 15 inches per year, a considerable proportion of which is derived from summer storms. Dust storms are frequent.

Water supply is a major problem. Water for domestic purposes is obtained from earth tanks or dams and it frequently contains a high proportion of suspended clay. Mine water is used for treatment purposes.

The area is one of very low relief, and has been reduced to a broad plain, which at Cobar, is only 800 feet above sea level. A number of low ridges, composed of the more resistant formations, rise at intervals from the plain.

V. HISTORY.

The history of the Cobar mining field up to 1911 is given in considerable detail by Andrews, and the details of production are best seen from the tables accompanying this report.

The Great Cobar deposit was discovered in 1870, the Occidental and C.S.A. in 1871, and the New Cobar and Peaks in 1887. Mining was commenced in 1871. The Great Cobar Copper-Mining Company Limited, with a capital of £80,000, was formed in 1876.

Prior to 1875, ore was shipped to Adelaide, as South Australia was then the home of copper-mining in Australia, but in that year the first smelters were erected at Cobar.

Mining was suspended in 1889 owing to the low price of copper and to the high cost of transport. However, the railway to Cobar was completed in 1891 and this made a great difference to mining costs.

In 1906, the Great Cobar property was purchased by an English Company - The Great Cobar Limited - for £804,000 cash. At this time, there were 1,350 miners employed on the field, including those employed at the Occidental, Chesney and Fort Bourke (New Cobar).

To the end of 1911, total production from the field was reported to have been:-

Copper	95,000 tons.
Gold	460,000 ounces.
Silver	1,180,300 ounces.

A steady production was maintained until 1914, when the Great Cobar Group (Great Cobar, Chesney, Fort Bourke and Peaks) closed down, partly owing to war conditions. Government finance was made available for the reorganisation of the smelters on the Great Cobar Mine, which recommenced operations early in 1916 and continued throughout the remainder of the war. In 1919, however, the price of copper fell and the Great Cobar Group again closed down. The C.S.A. Mine closed in 1920, and since then no copper smelting has taken place at Cobar.

The Occidental gold mine produced intermittently up to 1920 and then closed down. From 1921 to 1930 inclusive, mining at Cobar virtually ceased. The town, which previously had a population of several thousands, dwindled to one of approximately 700 people.

Mulholland and Rayner describe the subsequent history as follows:-

"In 1930 the price of gold rose rapidly and New Occidental Limited was formed to test the Occidental Mine. In 1931 this Company went into liquidation and a new company with more capital, New Occidental Gold Mines, N.L., was formed to operate the Mine.

Production commenced in 1935. In the previous year New Cobar Gold Mines N.L., had been formed to work the Cobar Gold Mine, but in 1935 this company was absorbed into New Occidental Gold Mines and the mill at New Occidental was re-organised with a flotation section to take the cupriferous sulphides of the New Cobar mine. In 1937 the Chesney Mine was acquired by the New Occidental Company. In this year G. Wright commenced mining the oxidised cap of the middle lens of the Great Cobar lode and produced some very rich gold ore. In 1940 operations on this area were carried out by Great Western Mines Pty. Ltd.

Despite the outbreak of World War II in 1939, production and development continued at a normal rate until 1942. After this year, owing to shortages of man-power and restrictions on gold-mining, development at the Occidental Mine was curtailed and attention paid to production from New Cobar and Chesney Mines. Production from the Chesney Mines commenced in 1943 and continued until 1945 and the mine was opened again in 1946. Developmental work and production have been resumed at the Occidental Mine, but shortage of man-power has been an obstacle to carrying out full-scale operations.

Since 1911 the Cobar Mines have produced more than 33,000 tons of copper, 570,000 oz. of gold and 780,000 oz. silver, valued in excess of £7,000,000, of which more than £4,000,000 is

the value of products from New Occidental Gold Mines".

From 1935 to May, 1946, the present company paid £738,110 in dividends on a capital of £303,750.

Table I shows the total recorded value of metal-production from the Cobar field 1871-1946.

TABLE I.

Year	£
1871-1896	917,180ж
1897	108,306
1898	178,900
1899	265,580
1900	292,070
1901	343,249
1902	224,699
1903	492,686
1904	503,756
1905	688,642
1906	767,822
1907	718,199
1908	628,976
1909	505,936
1910	552,049
1911	647,353
1912	746,083
1913	694,864
1914	326,367
1915	301,810
1916	629,148
1917	608,084
1918	648,470
1919	161,889
1920	138,270
1921	-
1922	-
1923	-
1924	-
1925	1,692
1926	493
1927	240
1928	59
1929	-
1930	215
1931	157
1932	140
1933	42
1934	29
1935	101,242≠
1936	229,065≠
1937	284,807
1938	415,926
1939	473,828
1940	548,905
1941	543,978
1942	532,010
1943	541,254
1944	561,950
1945	288,802
1946	353,004
Total:	16,968,226

ж Incomplete. ≠ Estimated Australian value.

Available records show that the field has probably produced, to the end of 1946, 129,000 tons of copper, 1,000,000 oz. of gold and 1,900,000 oz. of silver. At current Australian prices this production would be valued at approximately £A27,000,000.

VI. MAPPING METHODS - COORDINATE SYSTEM.

The mineralised belt extending from Spains Tank to the New Occidental Mine, a distance of 1,500 feet, was mapped on a scale of 1 inch to 100 feet. Accessible parts of each level of the New Cobar, Chesney and New Occidental Mines were mapped on a scale of 1 inch to 40 feet and all available assay and diamond drilling information was assembled and studied. Assay plans of critical levels are attached to this report.

The surface was mapped by establishing a pegged grid based on fixed survey points, the area between the pegs being mapped by plane table or by chain and compass.

The underground mapping was based on mine survey plans, geological features being plotted as mapped. The marking of boundaries between the rocks of various grain sizes within the finer-grained series was found to be difficult, particularly at New Cobar where numerous specimens were collected and studied under the microscope for the purpose of checking the mapping. Bedding in the finer rocks is generally totally obscured by cleavage and this causes an added difficulty.

The origin of the coordinate-system is situated 350 feet south-east of the New Occidental Shaft and the meridians are true north and south.

VII. STRUCTURAL GEOLOGY.

The general geological setting of the deposits is illustrated on Plate 2, sheets 1-4, by Mulholland and Rayner (included in this report), by the surface plan of the New Cobar deposit (Plate N.C.-0) and by the geological maps of the Cobar Mining Field by E.C. Andrews.

The orebodies occur in a series of shear zones which normally strike north-north-westerly ~~south-south-east~~ and are vertical or dip to the east at angles of 80 to 85 degrees. The New Occidental-Chesney shear is situated at a contact between coarse and fine rocks and the New Cobar shear is very close to this contact. From Andrews mapping it seems likely that the association of ore with the contact persists at least as far south as Nurri Trig Station, a distance of 20 miles. The contact is thus an important feature and its character warrants careful consideration.

Much attention has been devoted to this problem and during the course of the examination a number of different hypotheses have been entertained. Changes in emphasis and points of view may be detected on some of the plans, particularly at New Occidental. The features which control ore-deposition on any field are often obscure and perhaps this is more so at Cobar than is normally the case. It is believed that only by detailed and continuous study can an accurate knowledge of these features be obtained.

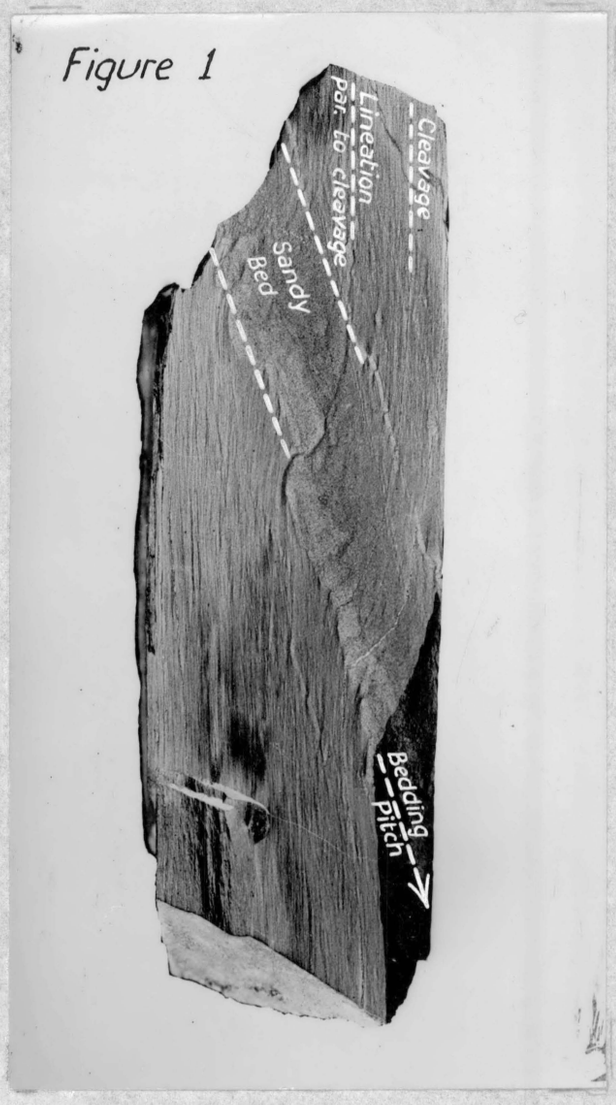
As shown on the surface plans, the bedding of the coarse rock is rarely parallel to the contact in strike, and the mapping of the New Occidental and Chesney mines indicates that, in section also, the hanging-wall (coarse) rock dips consistently westward into the easterly-dipping contact for depths to be measured in thousands of feet. It has generally been concluded by previous workers that the Occidental-Chesney line of lode fills one fault which has caused the discordance noted, and that the New Cobar line of lode fills a second fault occurring en echelon to the north and west.

There are, however, a number of serious difficulties to this interpretation. Thus, the Chesney shear dies out quite rapidly at about 8,700 N (Plate 2, sheet 2) although, at the Chesney itself, the vertical displacement on the contact is known to exceed 1,000 feet and is probably much greater. Detailed mapping by W.B. Dallwitz suggests that from 8,300N to 8,500N (see surface plan New Cobar Mine, plate N.C.-0) the silicified zone marking the Chesney shear remains only approximately at the contact and that sandy tuff is sometimes found to the west of the lode channel. The main Chesney lode is not at the contact and the New Cobar lode shear is also at some distance to the west of it. Wherever the contact is seen underground, there is little evidence in the way of crushing or brecciation to suggest the presence of a large-scale high-angle fault such as is envisaged above. Finally, the character of the north-westerly trending contact extending from 8,500N to 9,000N (Plate N.C.-0) is of critical importance. If the Occidental-Chesney and New Cobar shears are en echelon faults and the observed discordance along the contacts near which they occur is due to them, then the portion of the contact between them (8,500N to 9,000N) should be a normal bedding contact, dipping southward with the dip of the bedding in the sandy tuffs. Exploration at Nos. 7, 8 and 9 levels (including d.d.h. 81A) indicates however, that this contact dips north-easterly and that the nose in the contact at 9,000N, 2,860W pitches northward. In fact, this portion of the contact is strictly comparable to that marked by the Occidental-Chesney shear, for example, except that the former has been folded, whereas the latter approximates to a plane surface. Both are markedly discordant to the coarse tuff in the hanging-wall.

Attempts have been made to explain the apparent displacement at the contact by assuming that, in the vicinity of the contact there has been a local overturning of the folding to the east and that, in effect, the shear zones at and near the contact are elongated folds, accompanied by great thinning of the beds along the limbs. The bedding in both hangingwall and footwall is assumed to be parallel or nearly parallel to the contact. In this way the conception of a large displacement is avoided. In the vicinity of orebodies, folds in bedding in both hangingwall and footwall rocks are assumed to pitch northward with the orebodies.

However, in mapping the mines from level to level it is not possible to avoid the conclusion that the hangingwall sandy tuff, in which bedding planes can in many places be clearly seen, consistently dips and strikes at a considerable angle to the contact and, although it shows the effect of drag, especially where a lode exists along the contact, in no instance does it become parallel in dip and strike with the contact. Workings and diamond drilling results at New Occidental clearly show that the lode cuts across the direction of dip of the hangingwall tuff for a distance of 3,000 feet vertically, representing a true thickness of perhaps 2,000 feet of sandy tuff.

In connection with the above-mentioned folding hypothesis, it may be noted there has been a tendency to speak of the pitch of orebodies, bedding planes, folds in the contact and mineral grain elongation as though they were synonymous. The mineral grain elongation or lineation in the shear zones at Cobar pitches at approximately 80 degrees northward which is parallel with the striae on the walls of the lodes and presumably parallel with the direction of movement within the shear zones. It is not related to the pitch of bedding though in folded rocks, as distinct from shear zones, lineation does normally parallel the pitch of the folds.



This is illustrated by figure I, which is a photograph of a specimen from the New Occidental open cut showing a fine-grained tuff with an interbedded coarser band. The observer is looking southward. The bedding is dipping westward and pitching southward and the cleavage is dipping at 85 degrees east. The mineral grain elongation is in the plane of the cleavage and is pitching steeply towards to observer. The cleavage is strongly developed in the fine-grained rock and is much less marked in the coarser, sandy material.

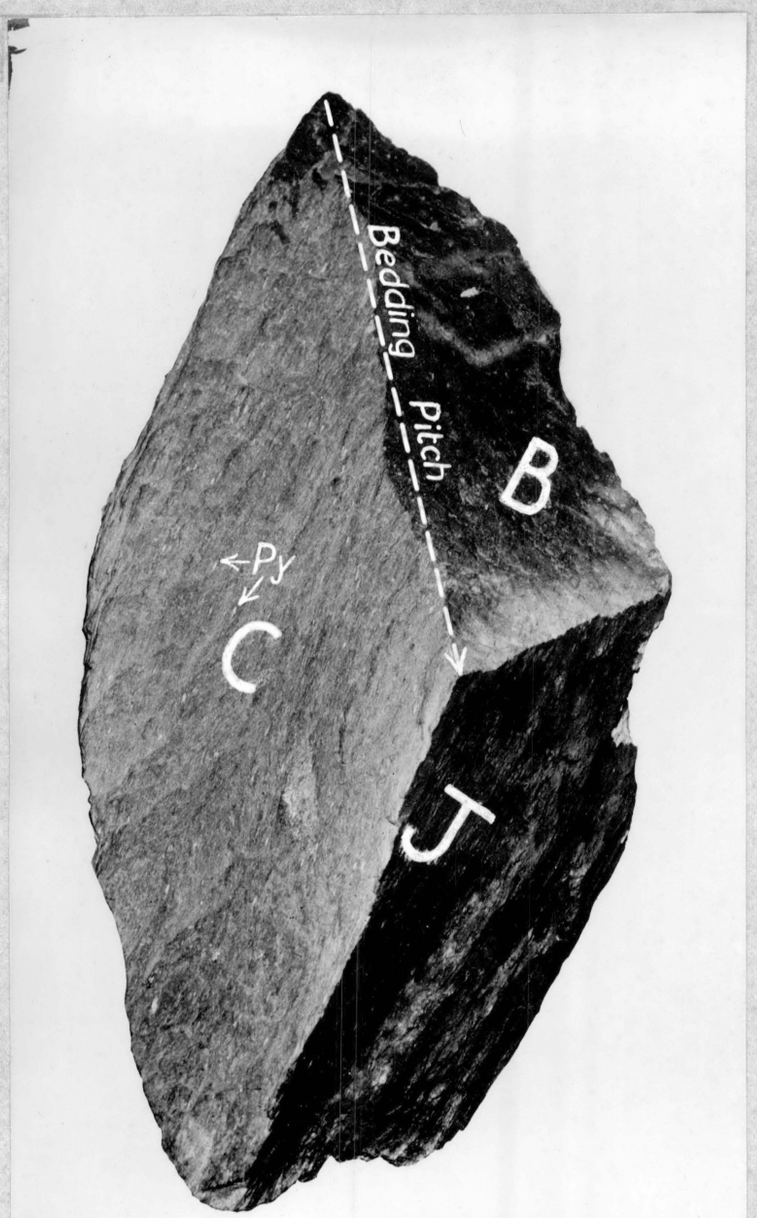


Figure 2

As shown in figure 2, in which C indicates the cleavage face (trending north-south), B the bedding plane and J a joint plane, the lineation, as well as being in the plane of the cleavage, has a pitch parallel to the joint plane J, which is sometimes known as the grain plane. The white elongated grains which can be seen on the cleavage face are grains of pyrite which have the same orientation. The bedding is again pitching southward across the cleavage.

However, bedding-readings in the fine-grained rocks to the west of the contact are most difficult to obtain and most geological maps of the district give very few authentic readings. Beds of sandy tuff near the New Cobar shaft have an almost vertical to north dip and are sub-parallel to the contact. Similar conditions were mapped to the west of the Albion-Bowman lodes at the New Occidental mine where these lodes follow the discordant contact. Where these conditions apply, the pitch of folding in the footwall (fine-grained) rocks will be to the north, parallel with the pitch of folds in the contact. In other instances the fine-grained beds are non-parallel with the contact and may pitch southward.

Considering all the information available, it is believed that neither the faulting nor folding hypotheses given above account satisfactorily for the conditions found at Cobar and that the junction between the fine and coarse rocks must be regarded as a

discordant contact which has been tilted and folded.. It existed prior to the formation of the lode-shears, but the shearing has been localised and guided by the contact. The degree of displacement on the lode shears may be quite small (see plate N.C.-12). The contact itself may be regarded as a major channel along which ore-bearing solutions have circulated and, near the Queen Bee Mine, it also appears to have controlled the emplacement of small bodies of quartz-porphyry. It apparently represents ~~a major line of earth weakness~~ a deeply-penetrating channel.

Regarding the origin of the feature, there is room for speculation.

With the knowledge available at present, it seems possible, on the one hand, that the junction represents a definite time-break in the sedimentation and is an unconformity. The coarse beds would be the older, distinctly truncated beds, on the eroded surface of which the fine-grained beds have been deposited. Locally, as described in the last paragraph but one, these beds are sub-parallel to the contact, as would normally be expected, but elsewhere, both in plan and in section, they are at an angle to it. The latter condition may be due to the fact that the beds were deposited in a volcanic environment, which is often characterised by comparatively rapid movements of the sea-floor, thus giving rise to lack of parallellism between the younger and older beds as a result of overlap.

On the other hand, the discordant contact could have resulted from submarine slumping of sediments on a regional scale. This may take place in a continental slope and is also likely to occur in regions of volcanic activity, where the sea floor is likely to be disturbed and where earthquakes may be prevalent (Fairbridge, 1946).

If slumping is the explanation of the origin of the discordant contact, there would be no significant time-break between the deposition of the beds in either side of the contact. The lithological similarity of these beds is suggestive of some such explanation. Thus the sandy tuff occurring in the vicinity of the Main Shaft, New Cobar, is microscopically indistinguishable from the main mass of sandy tuff to the east of the contact.

Thirdly, the contact may mark the course of a large-scale regional fault of an age earlier than the lode shears. If so, the old fault has been folded and has localised later shearing.

Although the discordant contact may itself be regarded as an ore-bearing channel, it is only at certain points along it that payable concentrations have so far been found. In the case of the three mines studied, the deposits have essentially the same relationship to the contact and an attempt is made to explain this in figure 3.

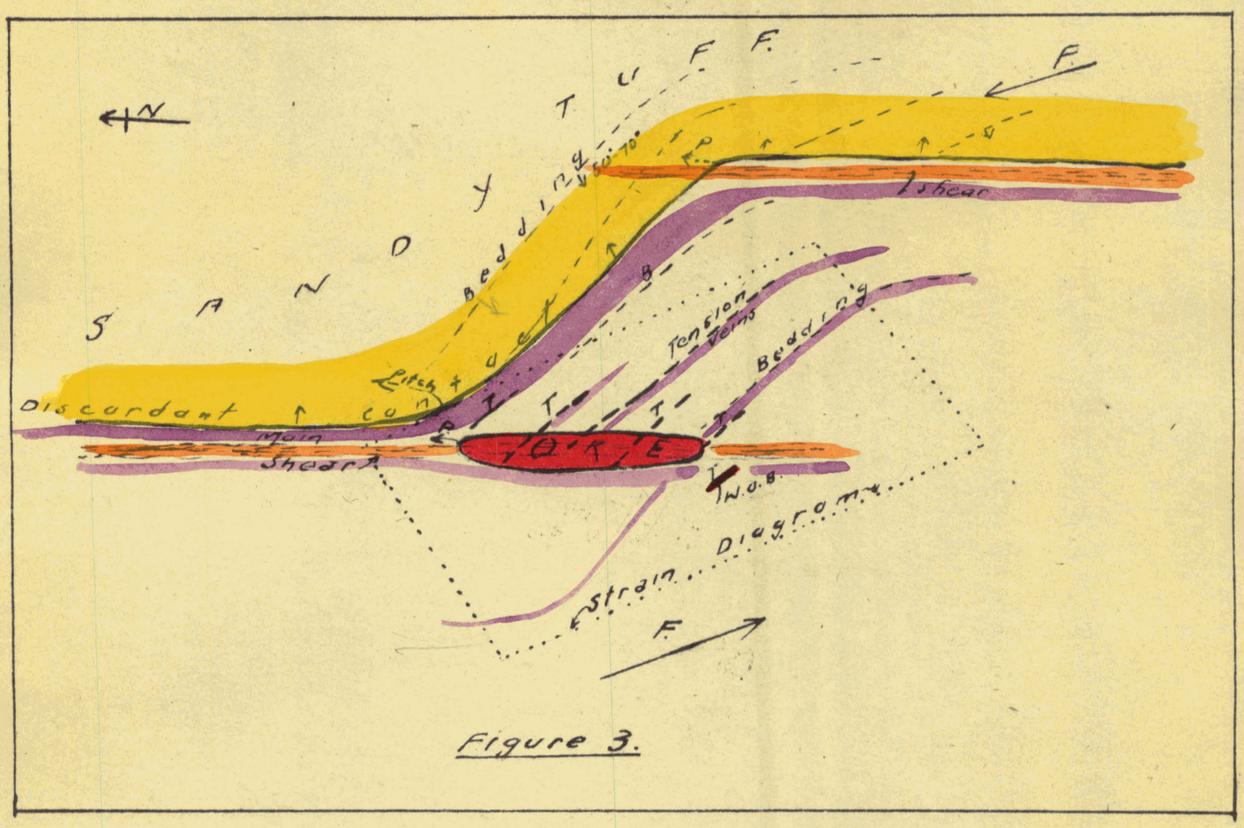


Figure 3.

In plan view, forces acting in the directions shown would buckle the contact as observed at New Cobar and elsewhere. A further consequence of the application of the same forces is the development of two systems of fractures, one parallel to the north-south contact, the other trending northwest-southeast. The latter are gash-fractures and are sub-parallel to the bedding and to the northwest-southeast trending portion of the contact. The intersection of these two sets of fractures has given rise to pipe-like bodies of highly-sheared rock in the vicinity of a channel (the contact) in which weak ore-bearing solutions have circulated. These pipes of sheared rock have been favourable loci for the development of ore-deposits. There can be no doubt also - especially at New Cobar - that the thinly bedded rocks lying south-west of the folded portions of the contact have been considerably crumpled, and this may have contributed to ore-localisation. The zones of crumpling would pitch northward with the folds in the contact.

A further strong possibility is that, in the vicinity of folds in the contact, the rate of circulation of the ore-bearing fluids decreased, resulting in the availability of greater than average quantities of these solutions. This is suggested by the relatively high grade of mineralisation along the Albion-Bowman fold in the contact at New Occidental Mine.

The tendency for ore to be deposited south of folds in the contact may be noted in the case of even small deposits occurring along the contact, as shown in plate 2. In the area mapped the New Cobar fold is the most pronounced, the New Occidental next and the Chesney next. No other folds of comparable amplitude have been noted.

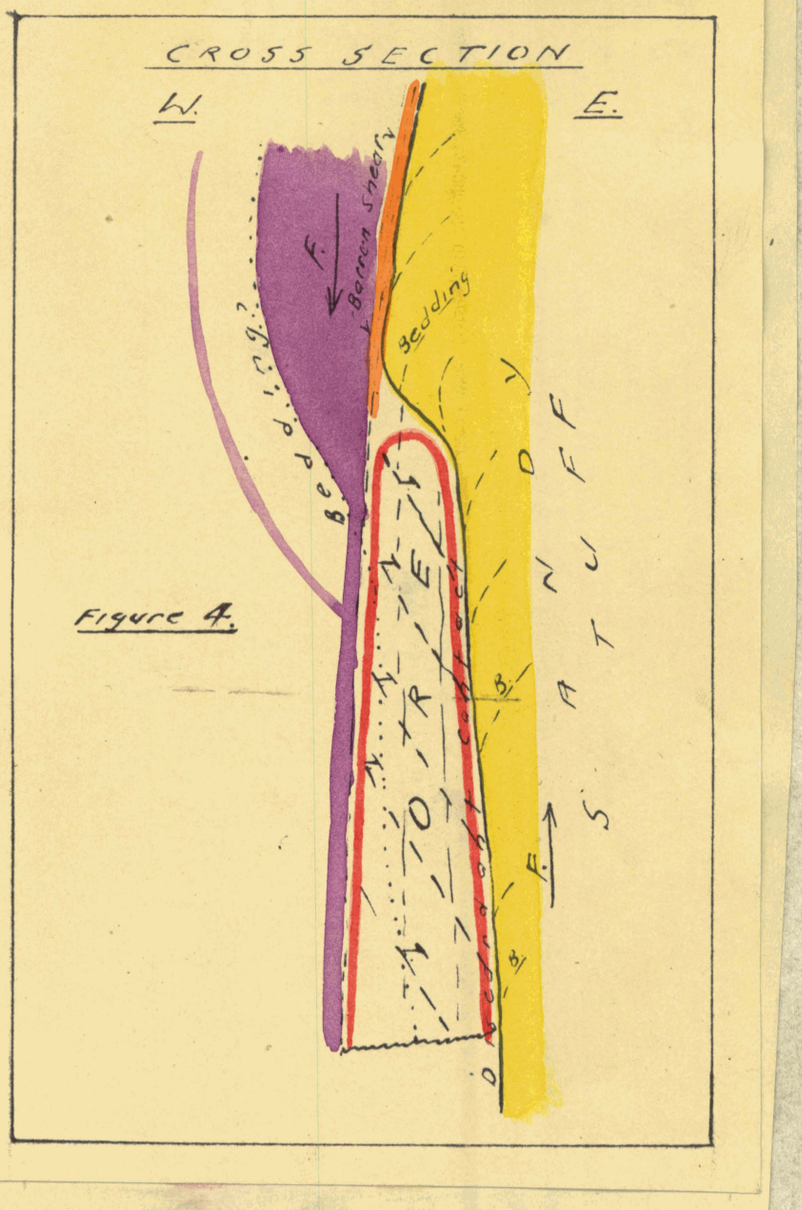


Figure 4.

Figure 4 illustrates a corollary of figure 3, viz. that a non-outcropping ore deposit may occur beneath a relatively flatly dipping position of the contact.

Within the orebodies themselves, there are a number of features which illustrate the strain-pattern of the area. As already mentioned, the mineral grain elongation pitches steeply northward parallel to the axis of maximum stretching, and parallel to the pitch of the orebodies. In a plane approximately at right angles to this, there are a large number of tension joints. They normally dip flatly southward (south-eastward) and, in many cases, are filled with alternating layers of fine-grained quartz and sulphides followed by botryoidal calcite accompanied by pyrite. They may be responsible for local enrichments within orebodies and it is not unlikely that
/a the presence of/large number of these joints within a mass of rock has contributed to the development of the orebodies as a whole.

The shear zones in which the ore occurs are considered to have relatively small reverse displacements. The eastern walls appear to have moved upward relative to the western walls. This is suggested by the direction and type of the striae on the walls, the arrangement of complementary fractures, the direction of dragging of the beds, the occurrence of ore on the relatively flatly dipping portions of the shears and in fractures concave to the east.

Perhaps the most important point arising from the conception of the existence of a discordant contact of regional character and pre-dating the lode shearing, is its application to regional prospecting. As already mentioned, this feature is itself a lode channel, and orebodies may occur in its vicinity. It is likely that it extends for nearly 20 miles south of Cobar and may extend to Nymagee (50 miles). To the north of Cobar are the C.S.A. Mines (7 miles) and the Mount Drysdale Mine (30 miles). It would be most useful to determine whether these deposits are related to the discordant contact and whether the contact is a continuous feature rather than a series of shears (Andrews, 1911).

It should be noted that the contact may not always be a junction between coarse and fine rocks. To the west of the Bowman-Albion lode for example, the younger beds are alternating sandy and slaty tuffs. Away from the Cobar belt, fine-grained rocks may be found on either side of the contact. The juxtaposition of fine and coarse rocks would, however, have a favourable influence on shearing and ore deposition.

Air photographs might help in tracing the discordant contact, though the low relief of the district and the wide-spread soil-cover would decrease their usefulness.

Folds in the contact, similar to those found at New Cobar, Chesney and New Occidental should be carefully sought, and particular attention should be paid to the area lying southward from these. Geophysical testing would be necessary before drilling was undertaken.

It is not often that the geological examination of a district reveals the presence of a large-scale feature so intimately related to ore distribution, and it would be a great pity if this contact were not mapped and investigated to the limits of its occurrence. It presents an opportunity for regional prospecting rarely noted elsewhere.

The Great Cobar, Gladstone and Dapville deposits do not lie at the contact, but from a regional point of view, they are probably related to it. They were not thoroughly investigated during the present examination.

The structural setting of each of the three deposits examined varies, and details will be given with the description of each deposit.

VIII. GENERAL GEOLOGY.

During the present investigation, it was not possible to map the regional stratigraphy and structure, though it is believed that it would be very much worthwhile, even from a strictly economic point of view, to map the whole Cobar-Nymagee area, possibly with the aid of air photographs. The lack of outcrops renders this task difficult, though some trend-lines can be detected on photographs taken at Cobar in past years.

The following description of the area is taken from the report by Mulholland and Rayner:-

"Stratigraphy. The rocks in the vicinity of Cobar are of probable Silurian age overlain on the west by a thick series of Devonian sediments. The area described in this report, however, lies entirely within the region occupied by Silurian rocks. Andrews has divided the Silurian at Cobar into Cobar Beds and C.S.A. Beds. Lithologically both groups are very similar, being made up of slates, cherts, sandy slates, sandy mudstones, fine-grained sandstones and quartzites. The Cobar Beds are generally more altered by regional metamorphism than the C.S.A. Beds and the latter contain more sandy members. The Cobar Beds proper have a well developed cleavage, but cleavage is not always so prominent in the C.S.A. Beds.

The main mass of sandstones of the Cobar Beds is stronger than the neighbouring finer-grained rocks, and as they form the hanging-wall rocks of the lode systems, they have suffered a certain amount of silicification. These two factors tend to make the sandstones more resistant to weathering than the neighbouring members of the series and consequently they outcrop as a well-marked ridge extending from the Nyngan Road to the Peaks. They are underlain by sandy slates and fine-grained, cleaved micaceous sandstones. They are overlain by red and yellow sandy slates, slates and fine-grained sandstones. The latter overlying group are the host rocks for the main lodes of the district.

There appears to be a variation in any one horizon from sandy to slaty types. The main sandstones of the Cobar Beds become finer-grained and appear to merge into sandy slates when followed north. North of the Cobar-Nyngan Road the sandstones are not nearly so prominent as south therefrom.

Areas of mineralisation are indicated on the surface by red slates frequently traversed by quartz veins, outcrops of silicified breccia and siliceous manganese-stained gossans. The red slates appear as grey slates and cherts below the zones of oxidation.

The C.S.A. Beds overly the Cobar Beds to the west and outcrop strongly between the Public School and the Hospital. They contain a number of sandstone beds and yellow sandy slates.

There are no igneous rocks within the area under reveiw, but porphyries occur in a number of areas within 30 miles of Cobar, the closest being near the Queen Bee Mine about 7 miles south-east of the Occidental Mine. Granites have been recorded from the vicinity of Mount Drysdale (24 miles north of Cobar) and near Wirlong (about 50 miles south of Cobar). Both granites and porphyries intrude the Silurian sediments. At Wirlong the granite is overlain by Upper Devonian Sandstones and its probable age is Middle Devonian or late Silurian.....

.....Recent deposits mask most of the less elevated areas, particularly in the vicinity of Young Australia Dam and Spain's Tank."

The distribution of the various formations within the area surveyed is illustrated on plate 2.

The petrological work of W.B. Dallwitz (appendix I) shows that the sediments of the Cobar Series, at least, were deposited in a volcanic environment and are tuffaceous in character. In the present report they are referred to as sandy tuffs, slaty tuffs and fine tuffs. The fine tuffs are uniformly fine-grained, while the slaty tuffs have scattered, coarse grains set in a fine-grained groundmass.

IX. INDIVIDUAL DEPOSITS.

1. THE NEW OCCIDENTAL MINE.

A. History.

The early history of the New Occidental Mine is given by E.C. Andrews, to whose report the reader is referred. The deposit is said to have been discovered in 1871 and was taken up for copper mining in 1872. However, it was found to be mainly a gold-bearing lode and a trial crushing of 2 tons sent to Ballarat assayed 2 ounces of gold per ton. Mining operations were short-lived, as were those initiated about 1878. During this period the mine was known as the United.

In 1889, the mine was renamed the Occidental, mining was re-commenced and was continued, with minor interruptions, until

1921, when production ceased on almost the whole of the Cobar field.

No steps were taken to re-open the mine until 1930, when the price of gold was increased. The history of the property since that date is given in the chapter dealing with the general history of the field.

Table II shows the available production statistics from 1889 to 1946. It will be noted that, after the secondarily enriched ore had been mined from 1889-1891, the grade dropped to 4 to 6 dwts per ton. However, in 1908, according to Andrews, the total mining and milling cost was only 7/7.37 per ton. At that time, ore assaying 4.5 dwt. was being worked at a profit, and up to the end of 1908 a total of £51,450 had been paid in dividends on capital amounting to only £4,320.

The present company, to the end of 1946, treated 888,488 tons of ore from this mine averaging 6.8 dwt. gold per ton.

B. Workings, Ventilation.

The deposit has been opened by means of fourteen levels to a depth of approximately 2,000 feet. The present company has worked the deposit from No. 7 level at 740 feet depth. Access is through a vertical three-compartment shaft, 12 feet by 4 feet 6 inches in the clear. Difficulty is being experienced with haulage from a depth of 2,000 feet in such a small shaft. It may have to be extended in size to cope with mining at deeper levels.

Ventilation is a considerable problem on Nos. 13 and 14 levels. The pipe-like form of the orebody and the fact that there is only one shaft, contribute to these difficulties.

Working of the deposit at deeper levels will thus involve problems of haulage, servicing and ventilation.

C. Type of Ore.

The Occidental gold-lodes consist primarily of quartz, together with pyrite, pyrrhotite, chalcopyrite and gold. Minor quantities of galena, sphalerite and magnetite are found in some places.

The quartz is usually fine-grained and, in the hand specimen, some of it has the appearance of chert.

Numerous fragments of chloritised slate occur in the ore, which has been formed by replacement rather than by filling.

Up to the present, the copper content of the ore has been sufficiently low to allow straight cyanidation after fine grinding. In the north drive at No. 13 level, there appeared to be an increase in chalcopyrite, but this may be quite local. Diamond drilling below the No. 14 level has revealed ore of a similar type to that mined to date.

The bullion recovered by cyanidation has a fineness ranging from 810 to 860 and contains from 21 to 36 parts per thousand of silver.

D. Shape and Dimensions of Lode.

The normal shape of the Occidental lode is shown in figure 5 and on the various level plans (plates O-1 to O-14). There are five lodes on the property which have been worked; they are known as the Eastern lode, the Western lode, the Gossan lode, the Bowman lode and the Albion lode.

The Eastern lode lies immediately to the west of the discordant contact, between the coarse and the fine rocks. It has been worked over a maximum length of about 480 feet and a

Occidental Deposit

Diagram showing structure

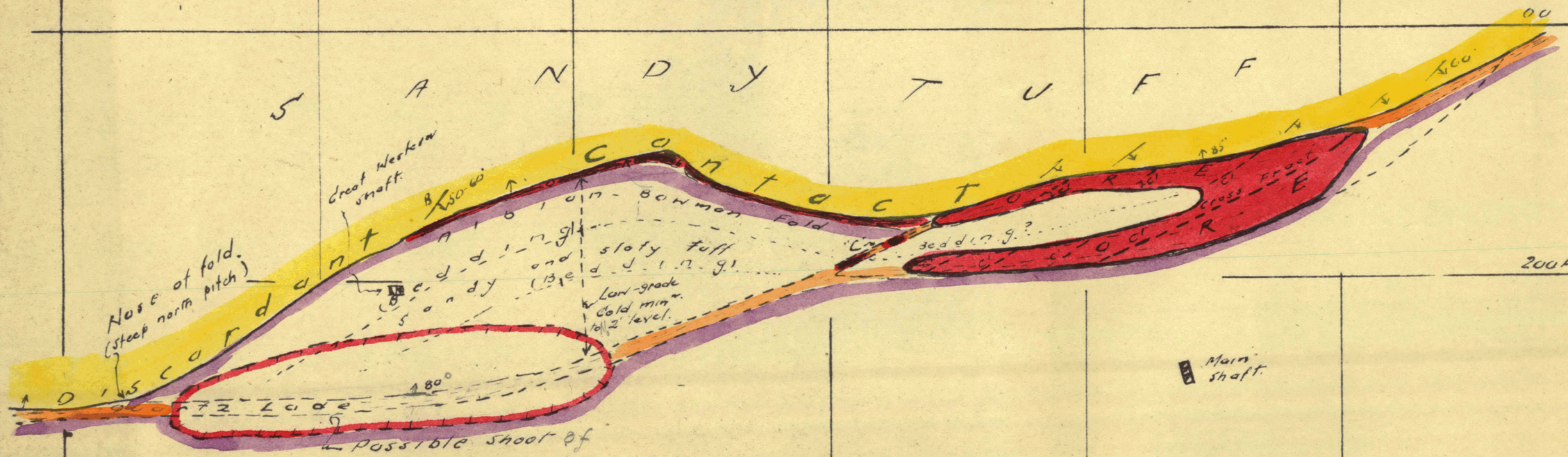


Figure 5.

width of 10 to 25 feet. The Western lode is sub-parallel to the Eastern lode and at the Southern end may coalesce with it, as on Nos. 9 and 10 levels, to form a continuous orebody up to 60 feet wide. The Northern portion of the Western lode is normally distinct from the Eastern lode and has been mined over widths of 15 to 40 feet. The two lodes together are known as the Main Orebody, which in plan is shaped like a peg or a tuning-fork with the legs pointing northward.

The Glossan lode lies to the west of the Western lode, and is parallel thereto; it is intersected in each of the crosscuts from the Main Shaft. It has been mined appreciably only on Nos. 1 and 2 levels, but recent diamond drilling (T25B) intersected payable ore in this lode 675 feet below No. 14 level.

The Bowman lode lies immediately to the north-east of the East lode and has been exposed by driving on Nos. 1 to 10 levels over widths up to 10 feet and lengths up to 100 feet. The Albion lode (plate O-2) lies to the north of the Bowman lode. It has been stoped from the surface to No. 2 level over a width of approximately 10 feet and a length of 110 feet. Andrews reports that 870 tons of ore obtained from the Albion lode in 1895 yielded over an ounce of gold to the ton. Subsequent records of production are not available.

The Bowman lode is reported to have yielded some high-grade ore. Andrews (p.142) quotes assays of an "indicator" found on No. 5 level from 200 to 260 feet north of the crosscut from the Main Shaft in the position of what is now called the Bowman lode. The indicator consisted of bands of magnetite and slate occurring over a maximum width of 2 feet 6 inches to 3 feet, Along its west wall, the magnetite-bearing slate was rich in bismuth and also contained galena and pyrite. Three specimens assayed 1 oz. 6 dwt., 27 oz. and 33oz. 17 dwt. gold per ton respectively.

E. ORE RESERVES AND COSTS.

Assay plans of Nos. 12, 13 and 14 levels and the results of drilling at No. 15 horizon are shown on Plate O-15.

Ore reserves were estimated at December 1st, 1946 as follows:-

	tons	dwt. per ton
Positive ore above No. 12 level	148,000	7.2
Broken ore on stopes	24,296	6.58
Total:	172,296	
Ore partly developed between Nos. 12 and 14 levels.	274,390	7.0
Grand total :	446,686	

The yield of ore per vertical foot at Nos. 12, 13 and 14 levels is estimated at 746 tons, 707 tons and 445 tons respectively. These compare with approximate 1,800 tons per vertical foot at No. 10 level and 1,500 tons per vertical foot at No. 9 level.

Costs.

Costs per ton for 1946 when 35,925 tons were treated were as follows:-

Ore extraction	£1. 3. 2
Development	4. 0
Treatment	17. 3
	£2. 4. 5

This compares with an average cost of £1.15.0 per ton for the years 1939-1941.

F. Structure.

The essentials of New Occidental Structure as understood during the present examination are shown in figure 5.

Probably the major addition to previous knowledge resulting from the present examination is the realization that the discordant contact, after following the eastern side of the main ore shoot, then bounds the Bowman-Albion lode on its eastern side. This is shown most clearly by the mapping on Nos. 2, 3, 7, 8 and 9 levels. The tough sandy rock in the hangingwall strikes north-west ~~south-east~~ and generally dips south-westerly into the lode at 45 to 65 degrees, the lode channel having a vertical to easterly dip. The beds to the west of the Bowman-Albion lode vary from sandy to fine tuff, and are almost parallel to the lode in both strike and dip. On some of the level plans, these beds are coloured similarly to the coarser hanging-wall rock because, during the early part of the examination, it was thought that the north-westerly prolongation of the east leg of the Occidental lode (C, figure 5) marked the position of the "main fault". It is now considered, however, that this is a major cross-fracture parallel to the northern leg of the Albion fold in the discordant contact and marks the northern limit of the cross-fracturing which has helped to localise the orebody.

The amount of movement along the contact revealed in the Albion-Bowman lode workings is thought to have been slight, and the unusual enrichment may be related to the damming effect of the fold in the contact, along which ore-bearing solutions have apparently circulated.

The fold in the contact and the folds in the footwall beds are pitching steeply northward while the coarse hanging-wall beds are pitching relatively flatly southward across the lode-channel.

As explained in the general description of the structure of the field, the cross-fractures C, C' (figure 5) have tended to develop in their observed positions for the same reason that the fold in the contact developed. Probably they do not occur between 500N and 700N because, in this area, they would have to break across the bedding at too high an angle. In the position of the main orebody, the bedding has probably had a north-westerly trend which has pre-disposed it towards fracturing in this direction. These conditions could recur between 700 and 1,100W (figure 5) where bedding probably again turns to the north-west, but cross-cutting in this vicinity at No. 2 level revealed that though a width of 170 feet had been slightly mineralsied, the grade was only 1 to 2 dwt. per ton.

The effect in plan of the cross-fracturing on the distribution of gold-mineralisation is shown on plate 0-18 (after Mulholland and Rayner). The accompanying photograph of a thin section shows the detail of the controlling structure. Plate 0-19 gives a cross-sectional view of this feature.

As illustrated in figure 4 (p. 12), changes of dip in the contact are likely to affect ore-deposition in the same way as do changes of strike. Plate 0-21, section 700N, suggests that ore could occur below No. 8 level for this reason. However, as described in the section on the New Cobar Mine, the relatively flatly-dipping shears are generally more favourable than the steeply dipping portions because of the reverse nature of the shearing. For this reason an increase in gold-mineralisation could occur below No. 2 level, where a change of dip takes place.

These feature, combined with the favourable attitude of the bedding, might be sufficient to cause the localisation of an orebody to the north of the present orebody and below No. 2 level. Changes might also be expected to occur at No. 8 level. The favourable position would be to the south of the northern (north-west - south-east) limb of the Albion fold.

Apart from the structural reasoning outlined above, there are a number of direct indications that the country immediately to the north of the Occidental lode is interesting. Some of these are:-

(1) The cross-cutting at No. 2 level revealed values ranging from 0.8 to 2.4 dwt. over a width of 170 feet. The dip here is unfavourable, as explained above. The ground has not been explored below this level. Gold-bearing solutions must have been available to cause such widespread mineralisation.

(2) At No. 6 level, diamond drill hole No. 2 revealed a zone of gold-mineralisation over 100 feet wide to the west of the Albion lode, three of the samples assaying 4.4, 4.6 and 6.8 dwt. respectively. The north drive on the main lode was stopped only 20 feet north of ore, two samples of which assayed 26.8 dwt. and 28.4 dwt. (plate O-6).

(3) At No.12 level, ore practically in the face of the north drive assays 5.9 dwt. per ton.

General considerations also point to the desirability of prospecting along the strike of the lode as distinct from the search for repetitions (not extensions) by very deep drill holes.

(a) An ore deposit above the present bottom level is of much greater value than one at a great depth below it.

(b) The pipe-like form of the Cobar orebodies, with their remarkable persistence in depth, favours lateral prospecting. One diamond drill intersection at an arbitrary point has a poor chance of ore-finding as compared with a drive along the known ore channel. Some deep drill holes require long cross-cuts and, in addition, it is extremely difficult to ensure that they intersect a given target.

It is a rather remarkable fact that at no point below No. 2 level has the northern extension of the Occidental lode channel been explored for more than 100 feet - and this in spite of the facts that quartz mineralisation continues to the northern limits of exploration and that encouraging, though sporadic, gold-assays have been obtained.

Plate O-11 suggests that a new orebody could develop where the strike of bedding is favourable and where the ground may lie below a change in dip of the contact. Structurally, the deposit would resemble the New Cobar. The area could be tested initially by drilling as shown from the eastern cross-cut on No.11 level. This drilling would amount to a total of 910 feet. An alternative would be to continue the north drive at No. 12 level for an additional 300 to 400 feet, depending on the results being obtained. From this drive lateral drill holes should be extended at regular intervals to the contact marked by the Albion-Bowman lode-channel and some lateral drilling to the west would also be desirable. It would be necessary to carry the exploration as far north as the nose of the Albion-Bowman fold shown on figure 5 at approximately 1,000N.

The apparent change in dip of the discordant contact at about No. 2 level (plate O-21, section 700N), could also have a favourable affect on ore deposition, as this has happened on the New Cobar Mine (plate N.C.-12). It is, therefore, recommended that from the end of the eastern drive on No. 6 level at approximately 700N, three holes should be drilled horizontally in a north-westerly direction to intersect the probable northward extension of the western lode-system which has been worked to 650N (plate O-6). The drill holes should be directed so as to cut this extension at approximately 720N, 800N and 900N, respectively. They would be known as d.d. holes Nos. 4, 5 and 6, and their combined lengths would be 650 feet. The payable ore obtained on the stope on the Western lode-system extending from 570N to 650N is taken as a hopeful sign. This stope is north of the normal position of the northern termination of workings in the Western lode.

The method of testing the favourable ground could best be decided in consultation with the mine staff.

No doubt the chances of finding another shoot of Occidental proportions are not large, as will be noted from the fact that, although Cobar orebodies have a considerable vertical range, only three important deposits outcrop over a distance of 2.5 miles. However, in this instance the size of the possible prize is large and the cost of testing should not exceed £5,000.

A further prospect at New Occidental, which is well worth testing, is the shear zone replaced by calcite and dolomite which occurs near the shaft at No. 4 and No. 5 levels. At No. 4 level, this zone is exposed over a width of 35 feet and may continue over a greater width to the west of the platt. The slate has been almost completely replaced by calcite and dolomite and a sample of selected high-grade material assayed 11.74 per cent lead and 14.04 per cent zinc. The average lead-zinc content of the lode at No. 4 and 5 levels is low, but it is not impossible that the calcite-dolomite mass represents the upper, relatively barren portion of a lead-zinc lode. The fact that it is not found in the lower-level shaft-crosscuts may be explained if it is assumed that the lode has a north pitch, similar to that of the main shoots of the district. To test this possibility, it is suggested that d.d.h. No. 7 (135 feet) be drilled from No. 6 level and that d.d.h. No. 8 (150 feet) be drilled from No. 7 level. The latter will test ground that could be interesting even from the point of view of gold-mineralisation. Any orebody which might be intersected by these holes could be outlined readily and cheaply by lateral drilling from existing levels.

Effects of Structural Pattern on Extension of Occidental Orebody.

The variation of the Occidental orebody with depth is shown on plate O-17. At all levels, the ore occurs within an ellipse bounded on the west by the Gossan lode, on the east by the discordant contact and on the north-east by a cross-shear (C, plate 5) which strikes off in a north-westerly direction from the point at which Bowmans lode (at the discordant contact) branches from the main lode. The shape and size of the ellipse determine, to a large extent, the shape and size of the lode.

At Nos. 13 and 14 levels, there is a marked diminution in the area of the ellipse and of payable ore as compared with the levels above. This is accompanied by an increased degree of crenulation in the hanging-wall (noted at No. 13 level) and by a sharp westerly swing of the northern extension of the East lode shear (C, plate 5). The hanging-wall of the East lode, which above this level is composed of hard sandy tuff, consists here of alternating sandy and fine tuff.

The evidence suggests that, perhaps on account of the less competent nature of the hanging-wall rock at this level, the northern limb of the Bowman-Albion fold has developed a more

westerly trend than is common in the upper levels, i.e., the change in strike in the contact from north-~~south~~ to north-west ~~to south-east~~ has become more pronounced. Since the cross-shear marking the north-eastern boundary of the Occidental lode is believed to be parallel to the north-west ~~to south-east~~ trending limb of this fold (figures 3 and 5) the observed effect could easily result from this condition. At the same time, any such increase in the amplitude of the fold would increase the similarity between the position of the possible new shoot illustrated on plate O-11 and the position of the New Cobar orebody.

Another factor which may have influenced the variation in grade and width of the Occidental orebody with depth is the change of dip at No. 5 level which has already been mentioned (plate O-21, section 200N). This would tend to cause an increase in cross-fracturing as illustrated in figure 4. This, in turn, would tend to shatter the area between the eastern and western shears, thus giving rise to a wide orebody.

It can thus be said that the size and value of the Occidental orebody depend to a large extent on the shape of the Bowman-Albion fold in the discordant contact - and the behaviour of this fold in depth is rather unpredictable. Diamond drill hole T25B indicates that, to the east of the main lode, the contact may extend in almost a straight semi-vertical line for a distance of 1,250 feet below No. 14 level. This, together with the encouraging assay-results, is taken as a hopeful sign for the downward continuation of the orebody. There is little direct knowledge, however, of the behaviour of the fold in the discordant contact at depth, mainly because there has been little exploration to the north of the Occidental orebody.

2. THE NEW COBAR (Fort Bourke) MINE.

A. History.

The history and past production of the New Cobar Mine are epitomised in Table 3.

The orebody was discovered in 1887, 17 years after the finding of the Great Cobar, though it is only one and a half miles from the latter and forms a bold, siliceous outcrop. It was first known as the Fort Bourke, and it was worked successfully to a depth of approximately 325 feet, where free-milling ore cut out. The mixed gold-copper ore of the sulphide zone was difficult to treat by standard methods available in the years 1890 to 1910.

The Great Cobar Company acquired the property in 1910, and from that year to 1919 ore from this mine was treated in the Great Cobar Smelting plant, and no separate records of gold and copper production were kept.

The mine was idle during the period 1920-1933, but in 1934, New Cobar Gold Mines, N.L., was formed to work the property. In 1935 this Company was absorbed into New Occidental Gold Mines. Production began in 1937 and has continued to the present time. Maximum output of approximately 5,000 tons per month was attained in 1946. The total output 1890-1946 was recorded 956,706 tons and the average recovery 1937-1946 was 5.4 dwt. gold per ton and 1.3 per cent copper.

B. Workings, Ventilation.

The deposit is worked from a three-compartment vertical shaft and 10 levels, the bottom level being at 1,277 feet below the collar of the shaft. The workings are in good condition and the shaft is able to cope with haulage and servicing requirements. No filling is required to support the stopes, though it was used in the upper levels.

An adequate fan-system provides good ventilation.

TABLE II.

PRODUCTION - NEW OCCIDENTAL MINE.

Year	Ore treated	Tailings treated	Slimes treated	Yield Gold	Average Gold dwt/ton	Value
	tons	tons	tons	oz.		£
1889	690			718	20.8	474
1890	140			118.5	16.9	474
1891	2,534			1,555	12.3	6,207
1892	2,800			841	6.0	3,488
1893	4,400			1,090	4.9	
1894			no record			
1895	8,647			1,492	3.5	
1896	9,900			1,651	3.3	
1897-8			no record			
1899				3,703		
1900			no record			
1901	28,076			3,353	2.4	14,990
		22,215		3,079	2.8	9,887
1902	6,654			1,144	3.4	3,700
1903	45,567			8,800	3.9	34,200
1904	47,066			5,005	2.1	18,450
		34,00		3,870	2.3	15,250
1905	44,089			4,150	1.9	16,164
		34,300		4,544	2.6	14,924
			7,500	1,015	2.7	2,658
1906	46,258			4,821	2.1	17,765
		63,037		7,030	2.2	25,878
1907	45,103			3,959	1.7	14,662
			27,600	8,449	6.1	28,500
	51,103			4,480	1.8	15,338
1908		36,000		5,606	3.1	19,390
			40,771	3,599	1.8	22,909
	49,557			5,428	2.2	18,911
1909		33,000		5,926	3.6	20,243
	49,784			4,356	1.7	14,421
1910		33,000		5,878	3.6	16,775
			22,930	4,581	4.0	13,825
	33,164			1,755	1.0	5,077
	201(cons)			1,302	135.4	5,209
1911		33,800		6,424	3.8	21,186
			12,145	3,783	6.2	12,083
1912	36,827			11,893	6.4	48,231
1913	26,783			12,562	9.4	53,263
1914	28,739			11,768	8.2	49,897
1915	25,714			9,997	7.8	44,078
1916	13,297			6,600	9.9	27,602
1917	18,661			8,100	8.7	33,223
1918	10,176			4,334	8.5	18,370
1919			no record			
1920	42			420	200.0	1,780
1921	2,069			671	6.5	3,455
1922-34			no record			
1935	34,297			11,502	6.7	48,883
1936	72,373			24,276	6.7	103,173
1937	82,984			27,504	6.6	240,657
1937	2,585(leased)			802	6.2	7,016
1938	96,213			32,063	6.7	282,851
1939	97,524			34,386	7.1	335,607
1940	97,158			31,787	6.5	346,706
1941	87,458			27,888	6.3	365,731
1942	107,266			37,783	7.0	395,901
1943	85,125			30,479	7.1	318,875
1944	72,800			28,517	7.8	299,440
1945	16,780			6,114	7.3	64,947
1946	35,925		48,418	11,410	4.9	121,390
Total:	1,527,145	289,352	159,364	494,361	5.0	3,623,640

Approximate; values for New Occicental and New Cobar not published separately.

Approximate.

Mainly to figure

TABLE 3.
PRODUCTION
NEW COBAR MINE (COBAR OR FORT BOURKE).

Year	Ore raised	Ore treated		Yield		Average		Value
		crude ore	tailings etc.	Gold	Copper	Gold	Copper	
	tons	tons	tons	oz	tons	dwt/ton	per cent	£
1890				no record				
1891		600		150		5		
1892-5				no record				
1896		1,474		509		6.9		
1897-9				no record				
1900		72,607		7,971.24		2.2		27,818
			42,294	10,382.38		4.9		32,321
1901		74,349		18,153		4.9		54,767
1902		17,621		9,915		1.1		30,539
1903		76,307		32,840		8.6		100,916
1904		64,700		27,666		8.5		94,943
1905		15,176		10,503		13.8		32,750
1906		3,034		413		2.7		1,193
1906			5,179	2,235		8.6		7,026
1907	1,679							
		500		177.93	2.65	7.1	.5	712
1908								160
				75				321
1909	1,450	6,558		2,596		7.9		9,733
					98.0			1,254
1910	18,360	24,603						
1911	48,804	43,209						
1912		50,906						
1913		44,192		Included in Great Cobar returns.				
1914	11,829	11,829						
1915	-	-						
1916	19,115	21,548						
1917	19,823	15,235						
1918	6,421	9,132						
1919	179	637						
1920-36				no record				
1937		2,694		835	28	6.2	1.0	8,845
1938		48,004		14,474	648	6.0	1.3	130,245≠
1939		39,775		14,028	515	7.0	1.3	13,692≠
1940		51,908		15,372	579	5.9	1.1	201,891
1941		40,822		13,006	582	6,3	1.4	171,134
1942		35,029		8,935	491	5.1	1.4	135,159
1943		43,100		9,708	⁂	4.4		153,887
1944		25,528		6,691	405	5.2	1.6	107,725
1945		54,183		12,623	744	4.6	1.4	216,387
1946		61,446		12,414	693	4.0	1.1	≠
Total 1890-1946		956,706	47,473	231,672				
Total 1937-1946		402,489		108,086	4,204	5.4	1.3	1,533,418

≠ Approximate; New Occidental and New Cobar not published separately.

⁂ New Cobar not recorded separately.

≠ Not recorded.

C. Type of Ore.

The ore is silicified chloritic fine tuff impregnated with sulphides and containing veins and segregations of white quartz. Small quantities of ferriferous dolomite are present. Pyrrhotite and chalcopyrite are the two chief sulphides, but the ore commonly contains a little pyrite, sphalerite, galena and bismuthinite. Native bismuth and gold are also present. A mineographic report on the ore by F.L. Stillwell is included as appendix II to this report.

The ore from New Cobar is carted by diesel motor truck to the New Occidental plant, a distance of 2 miles, where it is bulked with ore from the Chesney Mine. A copper-gold flotation concentrate is produced, and this is forwarded to The Electrolytic Refining and Smelting Co., at Port Kembla, N.S.W., for extraction of gold and copper.

D. Ore Reserves & Costs.

At December 1st, 1946, ore-reserves were estimated at 112,459 tons, consisting of 23,559 tons of positive and broken ore and 88,900 tons of partly developed and probable ore. The grade of this ore is not known precisely, but is probably of the order of 4.5 dwt. gold per ton and 1.5 per cent. copper.

In 1946, for the treatment of 61,446 tons, the cost per ton were as follows:-

Ore-extraction	£1.	2. 8
Development		7. 3
Treatment		16. 5
	£2.	6. 4

E. Structure.

The structure of the New Cobar deposits, as understood during the present examination, is illustrated diagrammatically in figure 3, which has been discussed with the Cobar structure as a whole.

The ore lies to the south of a sharp fold in the discordant contact between fine and coarse-grained rocks. The fold is the most marked of the three associated with the mines here discussed. The development of tension-fractures to the south of the north-westerly ~~south-east~~ trending portion of the contact is clearly shown on the surface plan of the New Cobar area (plate N.C.-0). It is considered that the intersection of these fractures with the New Cobar shear is mainly responsible for the localisation of the orebody.

The position of the New Cobar orebody has caused some geologists to consider that the southern ends of the north-south shears are, for some reason, favourable to ore-localisation. Figure 3 shows clearly how the north-south shears quickly die out when they move away from the discordant contact, which has enabled them to develop. The termination of the shear and the position of the orebody have a common cause, viz. the folding of the contact.

One of the most interesting features of the New Cobar deposit is the behaviour of the junction between fine and coarse rocks from 8,500N to 9,000N (plate N.C.-0). This contact is not easily mapped, as the overlying finer-grained rocks contain numerous coarse bands.

However, close mapping indicates that this contact is not a straight line, but is folded somewhat as shown. As with the straight north-south portions of the contact, the bedding in the coarse rocks is discordant to the contact. The information about the structure of the finer beds is much more limited, though some

readings show a southerly dip. Other beds, e.g. those near the main shaft on the upper levels (plate N.C.-11) dip in a southerly direction.

As previously explained, it was at first expected that the contact occurring at the surface between 8,500N and 9,000N (plate N.C.-0) would pitch southward with the bedding in the sandy tuffs.

Underground exploration indicates that this is not the case, and it is now evident that it is a folded discordant contact dipping to the north-east and that the nose at 9,000N pitches northward as shown on plate N.C.-11. The position of the nose has been interpolated from only a few exposures and intersections; these are enumerated below:-

The contact is exposed in the crosscut at 9130N, No. 7 level. The position of the nose was interpolated from this intersection, taking into account the position of the nose relative to that of the orebody at the surface. Diamond drill holes 64A and 156 gave further information on No. 8 level (plate N.C.-8). The crosscut at 8,770N on No. 9 level did not reveal any coarse rocks, though on the previously anticipated southerly pitch of the nose at 9,000N (surface), their presence would have been expected. Finally, diamond drill hole 81A (plates N.C. -0, N.C. -9) remained in fine tuff for almost the whole of its length, but entered coarse-grained rocks near the end. The hole terminated approximately 2,400 feet below the surface, and the position of the contact at this depth as shown on plate N.C. -0 has been interpolated from this result and from what appears to be the line of pitch of the nose as inferred from the evidence mentioned above. It is evident that the north-easterly dip of the contact between 8,500N and 9,000N is flatter than the easterly dip of the contact from 9,000N northwards.

If the longitudinal projection (plate N.C.-11) is a correct interpretation of the structure, the New Cobar orebody remains at all levels at a short distance to the south of the nose and, presumably, it will continue in depth as long as the fold continues. The fold is a most pronounced feature and is not likely to die out rapidly. The results obtained by diamond drill hole 81A, which intersected the main orebody, not the Western Orebody at which it was aimed, show that the main orebody probably continues for 1,200 feet below No. 9 level substantially as it has to that level.

In saying this, it is realised that, as shown on plate N.C.-11, the main orebody dropped substantially in width and grade from above No. 7 level to No. 9 level. To investigate this problem, crossections were drawn at 100 feet intervals along the strike of the orebody using stope assay plans as well as level plans. It was found that, at just below No. 6 level, there is a general steepening of dip (plate N.C.-12). This was noted on sections from 8,500N to 8,800N inclusive but it is less marked from 8,900N northward. As the shear is considered to be of a reverse type, the steeply-dipping portions are relatively compressed and are unfavourable areas for ore-deposition.

The variation in dip of the lode is accompanied by a change in strike of the lode-channel with depth. From No. 7 level downward the strike swings towards a north-westerly direction south-east position as compared with the upper levels. The variation in the detail of ore-arrangement pointed out by Mulholland and Rayner are also marked.

It is considered that these changes may reflect changes of dip and strike of the contact from 9,000N northward, and they also appear to be related to changes in dip of the contact from 8,500N southward (plates N.C.-0, N.C.-12). These changes are certain to occur and they will affect the attitude of the shear which has been localised by the contact. Conversely, the orebody is likely to make again to its former size where the north-south portion of the contact resumes its former attitude (always provided that the fold itself continues). Too little is known regarding the attitude of the fold at depth to predict where the orebody will reform, but it is considered that the case for development downward is a strong one.

F. New Orebodies - Prospecting.

Although considerable thought has been given to the possibility of discovering further orebodies at New Cobar, the conception of the deposit which has emerged from the study indicates that the chances of finding a repetition-body of the size of the deposit already exploited are probably slender. There is little evidence that the structural conditions under which the orebody has formed are repeated within the vicinity of the mine. The bulk of the ore to be won from the area will probably be obtained from the downward extension of the present deposit. This is limited on the south by the sandy tuffs in the vicinity of the main shaft (plates N.C. -0, N.C.-11, N.C.-12) and on the north by the nose of the fold in the discordant contact.

There is always a chance that smaller orebodies subsidiary to the main deposit will be discovered. The Western Orebody occupies a gash-fracture and was not payable beyond 40 feet above No. 8 level.

Plate N.C.-12 illustrates this point and shows that this orebody flattened in dip and gained in gold-content when it emerged from the sandy tuffs occurring in the vicinity of the main shaft. This plate also shows how the Western Orebody dips towards the main orebody in vertical crossection. The pitch of the intersection of the two lodes is steep and to the north and is parallel with the pitch of the main orebody.

From the position of the Western Orebody underground and from its known dip and pitch, it appears likely that the area of silicified, brecciated rock occurring immediately to the south-east of the main shaft in sandy tuff, corresponds to the position of the Western Orebody on the surface (plate N.C.-0). A second siliceous formation commences 85 feet south of this and extends a further 170 feet in a southerly direction. It is to be anticipated that this also will emerge from the sandy tuff and may become payable. This emergence will occur at a deeper level than in the case of the Western Orebody and diamond drill hole P4, No. 10 level, is designed to test this possibility.

This hole will also test the additional possibility that the main oreshoot is becoming payable at depth to the south of the downward prolongation of the line shown in plate N.C.-11, as limiting the southern end of the orebody on the upper levels. The southerly extension of the main orebody as seen between 8,560N and 8,670N, No. 9 level, is probably due to the migration with depth of the unfavourable sandy tuff to the southward relative to the normal pitch-line of the orebody (plate N.C.-11). As stated above, the orebody is limited on the south by the sandy rocks (plate N.C.-0), and if the sandy beds dip southward while the nose of the fold in the discordant contact at 9,000N (plate N.C.-0), pitches northward the main shear remains for a greater distance in favourable rocks with increasing depth. Diamond drill hole P4 will test this possibility as well as prospecting for ore to the south of the Western Orebody as described above. This prospect is considered to be one of the most hopefullat New Cobar. While drilling, the position of the boundary of the sandy tuff occurring around the main shaft should be noted.

Between Nos. 5 and 6 levels, small lenses of ore have been intersected in the southern wall of the main lode between 8,500N and 8,600N. A comparison between plates N.C.-6 and N.C.-0 shows that at the surface, the sandy tuff lies immediately against the south-western portion of the main orebody. At No. 6 level, it is 150 feet south-west of the orebody. The lenses between Nos. 5 and 6 levels probably correspond at the surface to the patch of silicified, brecciated rock occurring 80 feet north-north-east of the shaft. This position is in sandy tuff. The brecciated zones have emerged into favourable, fine-grained rocks at No. 6 level, which reasonably accounts for the payable nature of the deposits at that level.

The general picture thus emerges of the increasing possibilities of the southern end of the New Cobar deposit, as a whole, resulting from the trend of the unfavourable sandy tuffs around the main shaft away from the north-pitching zones of fracturing in which the orebodies are localised.

It is considered that the best chances of a larger-scale find lie to the south of the contact occurring on the surface between 8,500N and 9,000N (plate N.C.-0). The reasons are that this is believed to be the main ore-bearing channel, that the magnetic anomaly tends to wrap itself around this contact and that if the fold X, for example, were accentuated at depth into a fold such as X', favourable structural conditions for the occurrence of a new deposit could occur. The limited diamond drilling programme outlined for this deposit has been designed on these assumptions and also to supply information on the behaviour of the discordant contact which is likely to have an important influence on the occurrence of ore.

The diamond drilling recommended is shown on the level plans and is as follows:-

Level	Diamond drill hole	Length feet	Purpose
No. 3	S1	250)	To test ground between main lode and folded contact and to locate contact.
"	S2	130)	
"	S3	150)	
"	S4	60)	
"	P1	100	Testing mineralised ground intersected in x-cut, 9,400N.
"	P2	85	To test northern extension of promising mineralisation in x-cuts, 8,900N.
No. 4	P3	280	To test possible mineralised ground. Drill to contact.
No. 7	S5	260	To test possible ore-bearing position and to locate contact.
"	S6	50	To locate nose.
"	S7	100(?)	To find contact and, hence, its dip and strike.
No. 9	S8	60	To locate nose.
No. 10	P4	260	To test for new orebody to south of Western Orebody and to test southern extension of main lode.
	Total:	1,785	

Estimated cost £1,000.

The drilling should be under geological supervision and the programme might have to be modified as results become known.

3. THE CHESNEY MINE.

A. History and Production.

The following production-table summarises the history of the Chesney Mine from 1887 to the end of 1946.

TABLE 4.

PRODUCTION - CHESNEY MINE.

Year	Ore raised	Ore treated	Yield		Average		Value £
			Gold	Copper	Gold	Copper	
	tons	tons	oz	tons	dwt/ton	per cent	
1887	-	2	9	-	90	-	-
1888	-	59.5	127.3	-	43.7	-	-
1889	-	2,436	796.6	-	6.5	-	3,099
1890	-	880	586	-	13.3	-	-
1891	-		885.42	-	-	-	-
1892	-	-	-	-	-	-	-
1893	-	328	222.45	-	13.4	-	-
1894	-	1,985	1,019	-	10.3	-	-
1895	-	1,781	288	-	3.2	-	-
1896	-	2,440	436	-	2.5	-	-
1897	-	-	-	-	-	-	-
1898	-	-	-	-	-	-	-
1899	-	-	-	-	-	-	-
1900	-	-	-	-	-	-	-
1901	-	4,500	255	135	10.1	3.0	-
1902	-	420	9.5	-	0.4	-	-
1903	-	1,140	53.5	27.5	9.2	2.4	-
1904	16,885.11	16,885					
1905	45,310.73	45,310					
1906	26,613.73	26,613					
1907	-	-					
1908	51,579	51,473					
1909	41,272	40,679					
1910	34,236	32,076					
1911	22,431	22,919			Not available		
1912	67,000	45,995					
1913	-	67,035					
1914	-	45					
1915	-	-					
1916	5,684	5,481					
1917	-	251					
1918	-	-					
1919	41	-		3.5			267
1920	925	925		55			5,438
1921-42	-	-		-			-
1943	-	20,985	1,322	466	1.3	2.2	68,492
1944	-	38,888	5,733	881	2.9	2.3	154,785
1945	-	1,421	301	36	4.2	2.5	7,076
1946	-	5,605	832	141	3.0	2.5	≠
Total :	311,976*	438,558					

* Incomplete. ≠ Not stated.

From 1904 to 1920, the Chesney Mine was worked by Great Cobar Limited and no separate records of gold and copper production are now available. The ore is reported to have been mined partly because of its siliceous nature, which facilitated smelting of the basic Great Cobar ore. The mine was re-opened in 1942 at the request of the Commonwealth Government, in order to help supply Australia's copper requirements.

B. Workings, Ventilation, Nature of Ground.

The Mine has been opened up by means of a three-compartment vertical shaft and eight levels, the lowest of which is 925 feet below the collar of the shaft (plate C-9).

Ventilation is adequate. The ground, as elsewhere at Cobar, stands very well and requires a minimum of timbering. Stope-filling is not required.

C. Nature of Ore.

The orebody is a siliceous gold-copper deposit, the ore consisting of chlorite-schist with fine-grained quartz, some calcite, chalcopyrite, pyrrhotite, pyrite, sphalerite, galena and gold.

D. Dimensions of Lode and Ore Reserves.

The lode has been mined over a length of 600 feet and over widths up to 60 feet, the average width being approximately 20 feet. Below No. 5 level, the orebody consists of two gold-copper shoots, each approximately 100 feet in length, connected by a low-grade copper-bearing lode.

The northern gold-copper pipe extends from near the surface to No. 8 level, while the Southern pipe was first found at No. 6 level. It appears to extends for 100 feet above this level and has been mined to No. 8 level.

Sampling in the Chesney has been sporadic and has not been well recorded. In these circumstances, probably the best guides to grade are the records of recent production shown on Table 4. During the years 1943 to 1946, 66,889 tons of ore yielded an average of 2.4 dwt. gold per ton and 2.3 per cent copper.

From stope measurements it is estimated that approximately 14,000 tons of this ore came from the central section of the mine, the remainder being derived from the northern and southern gold-pipes.

It was estimated by the present writer in November, 1946, that between Nos. 8 and 5 levels (363 feet vertically) the northern gold pipe possibly contained 50,000 tons of ore assaying 3.0 dwt. gold per ton and 2.0 per cent copper. Between 5/8/46 and 27/10/46, 3,690 tons of ore, obtained mainly from this section had a head value of 3.69 dwt. gold per ton and 3.0 per cent copper. The recovery was 80.47 per cent for gold and 95.5 per cent for copper. However, judging from the overall operations result, this grade was unusually high.

At the time of the examination, the southern orebody appeared to be continuing strongly underfoot at No. 8 level, but very small quantities of ore remained in it above this level. A drill hole below No. 8 level revealed ore assaying 2.8 per cent copper over a width of 20 feet. It is believed that the proposed No. 9 level, 150 feet below No. 8 level, would develop about 25,000 tons of ore in this shoot which should average 2.5 per cent copper and perhaps 2.0 dwt. gold per ton. In the past, this ore has yielded up to 3 dwt. gold per ton, but the management is of the opinion that the gold-content is decreasing.

The central orebody at Chesney is approximately 350 feet long and has been mined over widths up to 30 feet; it would probably average 16 feet in width. The body is largely intact between No. 8 and No. 6 levels (vertical interval 212 feet), and hence this block may contain approximately 100,000 tons of mineralised lode-material. Probably a further 50,000 tons remains between Nos. 6 and 5 levels, making a total of 150,000 tons.

The grade of this material is most problematical, as it has not been given an adequate separate stoping test nor has it been thoroughly sampled. The available assay plans indicate that, as shown in the longitudinal projection (plate C-9), the strike-length of 350 feet contains a core of higher-grade ore about 150 feet in length which probably contain 2.5 to 3.0 per cent copper, but that the remaining 200 feet of length contains only 1.0 to 1.5 per cent copper. In both cases, the recoverable gold-content is less than 1 dwt. per ton. The sampling at No. 8 level suggests that the high-grade core cuts out about 50 feet above this level, but this may be quite a local phenomenon.

On the available evidence, it is believed that the 150,000 tons of possible ore remaining in the central section could be expected to yield 1.75 to 2.0 per cent copper and less than 1 dwt. gold per ton.

A production of 61,294 tons of ore from the Chesney Mine between 25/1/43 and 24/12/44 yielded a profit of £21,617/15/8 equivalent to 7/0½ per ton. The operation was credited with a subsidy of £20 per ton on copper-production, the fixed price of copper during the period being £A100 per ton. Operating costs in 1946 totalled £2. 7. 1 per ton.

During recent years, the Chesney has been mined at a rate of only 1,500 to 1,800 tons per month and the mine could not be worked except in conjunction with the other properties held by New Occidental Gold Mines, N.C. The ore is treated at a central plant along with that from the New Cobar Mine.

Recently, the company proposed to mine from this deposit 6,000 tons per four-weekly period, but it is likely that this would be possible only if the price of copper were considerably in excess of the present price of £130 per ton. Thus, it was estimated by the company at 20/7/43 that the cost of producing 101.5 tons of copper from the Chesney mine was £145/13/9 per ton. The profitable operation of the deposit has depended on the gold content of the ore but at the higher rate of mining (approximately 75,000 tons per year) most of the ore would be low in gold content.

E. Structure.

The structure of the Chesney Lode is illustrated on the plan of No. 6 level (plate C-6)*; on the longitudinal projection of the mine (plate C-9)*; and on the surface plan (plate 2, sheet 2)*. The central 350 feet of the lode strikes N. 14 degrees W. and dips 85 degrees east. This is the strike and dip of the Chesney shear which has been traced for 800 feet on the surface and also of the main Chesney - Young Australia - Occidental shear (discordant contact) some 80 feet east of the Chesney shear, and referred to in this mine as the East Lode shear.

At either end of the Chesney lode, shears striking approximately N. 30 degrees W. intersect the main lode system, and the strike of the ore swings in sympathy with them. The northern and southern gold-pipes occur at the intersection of the cross-shears, and the Chesney shear, the locus of intersection pitching steeply northward. The N. 30 degrees W.-structures are in the nature of gash-fractures, joining the East lode to the Chesney lode and it would appear that they have fed gold from the predominantly gold-bearing East lode into the predominantly copper-bearing Chesney shear.

The pipe-like bodies formed at the intersections of fracture-systems are thus essentially similar to those found at New Occidental and New Cobar and it is considered very likely that they are closely related in origin to folds in the contact similar to those at the above mines. One such bend occurs between 7,000N and 7,200N (plate 2, sheet 2)* and a second minor fold occurs in the vicinity of the main shaft.

Plate C-9* shows that the line joining the top of the gold-pipes is tilted southward at approximately 45 degrees from the horizontal, and it was at first thought that this behaviour may be related to the pitch of the sandy tuff (called quartzite on the plans) across the hanging-wall of the East lode shear. It is possible that certain types of beds, being more or less competent than average, have influenced the formation of folds in the contact and thus influenced the formation of gash-fractures. However, there is not much information regarding the shape of the contact at depth.

F. Prospecting.

The Chesney main lode copper mineralisation is of doubtful value at present prices and the results of lateral drilling indicate

that there is no body of low-grade ore of sufficient size to warrant large-scale mining. This being so, prospecting resolves itself into the search for non-outcropping gold-copper shoots, similar to those found previously. These shoots have, to date, yielded only 15,000 to 20,000 tons per 100 feet vertically, and it is extremely doubtful if a pipe of this size and grade would be of value at 1,000 feet below the present bottom level, for example, unless it could be worked in conjunction with a number of other shoots of payable ore.

In addition, it must be pointed out that short shoots which have limited vertical extent are poor targets for deep drilling and that, in view of the present ore position at Cobar, it is more important to find ore within reasonable range of present openings than to obtain one or two drilling intersections at extreme depth. The extension of the north drives on Nos. 7 and 8 levels is necessary for the testing and possible mining of the northern gold pipe. Taking into account the known pitch, this shoot would be expected to extend northward from the intersection obtained in diamond drill hole 60A on No. 8 level.

After the limits of the northern gold-pipe at No. 8 level have been explored, some further information should be obtained by lateral drilling, concerning the ore intersected to the west of this shoot in drill-holes 41A and 53A. This ore could be related to the iron-stained siliceous outcrop mapped on the surface by Mulholland and Rayner to the north and west of the Chesney lode (6,600N to 6,750N). If favourable results are obtained at No. 8 level, the upward extension of the ore could readily be tested. However, it was not intersected in d.d.h. 60A, indicating that at this level, the area of payable ore is probably small.

The next logical step in exploration would be the normal one of driving No. 9 level, perhaps after some preliminary shallow drilling from selected positions in the western crosscut at 6,300N. No. 8 level. No. 9 level, if carefully sampled, would give most valuable information concerning the behaviour of the known orebodies. The central body is poor at No. 8 level, and it would be important to find out if this condition continues to No. 9 level. No diamond drilling could possibly give the complete picture of the ore-distribution that would be obtained in this manner.

Between 6,000N and 5,500N. there are a number of minor folds in the discordant contact to which short "makes" of quartz and lode-formation appear to be related (plate 2, sheets 2 and 3). These could be tested at moderate expense by driving southward along the Chesney shear from No. 9 level for a distance of 300 to 500 feet (depending on results) and drilling laterally to the contact, this would take into account the southern pitch of the line joining the tops of the north and south shoots as well as the occurrence of the features mentioned above.

However, the Chesney deposit is small and the bulk of it is low-grade. The magnetic testing gave an anomaly over the northern ore pipe, but revealed nothing over the Southern pipe, the top of which is approximately 550 feet below the surface. No other anomalies were obtained in the vicinity of the Chesney orebody. There are no known geological features in the vicinity of the mine which would lead one to suspect the presence of a large non-outcropping shoot, the most notable feature being the bend in the vicinity of 7,000N (plate 2, sheet 2). The folds to the south of the mine are small and could be expected to localise only small orebodies.

In the circumstances, it is not recommended that ~~the Government finance~~ any major exploration in the neighbourhood of this deposit.

With normal development and limited prospecting the mine would have every chance of contributing 3,000 to 4,000 tons per month of gold-copper ore to the general pool of Cobar production.

TABLE 5.
PRODUCTION
PEAK MINES (BLUE, BROWN AND CONQUEROR LODES).

Year	Ore raised	Ore treated	Yield		Average		Value £
			Gold	Silver	gold	Silver	
	tons	tons	oz	oz	dwt/ton	oz/ton	
1896		1,500	3,205		42.6		
1897				121,251			11,762
1901		2,570	2,000		15.6		7,950
1902		832	657		15.8		2,499
1903		3,430	2,640		15.4		9,912
1904		3,272	1,829		11.2		7,118
1905		1,827	1,275		13.8		4,945
1906		862	1,117		25.8		4,327
1907*	2,681	2,681	Included with Great Cobar				
1908*	2,701	2,524					
1909*	2,209	2,013	1,249		12.4		
1910*	2,467	310	*				
1911		785	2,563	8,592	6.4	10.9	10,049
1912		1,432					
1913		307					
1914		427	145		6.8		580
1915	656	657	657		20		2,464
1916	209	175					
1917	127	127					4,373
1918	40≠						
1919	227	227	195	975	17.2	4.3	1,010
1920	204	204/	128	37,082	12.5	181.7	9,224
1921		139≠	100	9,713	14.4	69.9	1,842
		283≠	331	70,155	23.4	247.9	6,473
1925		285	133	5,300	9.3	18.6	1,192
1926-27	-	-	-	-	-	-	-
1928	13	13	14	605	21.5	46.5	59
1931	12	12	19		31.6	-	87
1932	-	9⊖	33		73.2	-	140
1933-35	-	-	-	-	-	-	-
1936	156	118	213.5	6,018	36.2	51.0	
1937		111.5	173.5	2,329	31.1	20.9	1,794
1938			123	1,196			
1939		5.5	10	124	36.2	22.54	
1940	250	200	32		3.2		308
1941	190	190	57Ø		6.0		670
1942	216	216	65Ø		6.0		670
	35	27	38//		28.1		380
1943-44	-	-	-	-	-	-	-
1945	50	50	24		9.6		240
1946			80				716
Total :	7, 1	27,821	19,106	236,340			90,628

* Incomplete returns.
≠ Brown Lode.
≠ Conqueror Lode.
⊖ Battery residues.
Ø The Blue Lode.
Ø The Blue Peak.
// The Peak.

TABLE 6.
PRODUCTION
PEAK SILVER MINE.

Year	Ore raised	Ore treated	Yield			Average			Value £
			Gold	Silver	Lead	Gold	Silver	Lead	
	tons	tons	oz	oz	tons	dwt/ton	oz/ton	per cent	
1906		200	17	6,059	25	1.7	30.3	12.5	1,349
1907	600	167	15	5,600	29	1.8	33.5	17.4	1,280
1908	-	-	-	-	-	-	-	-	-
1909					no returns				
1910	1,076	751			no record				832
1911	200		20	3,400	1.5				523
1912	188		26	8,135	18				1,329
1913	483		42	12,652	35				2,275
1914	-	-	-	-	-	-	-	-	-
1915	656	656	657	1,838					2,811
Total :	3,203		777	37,684	108				10,399

4. THE PEAKS AREA.

The recorded production from the Peaks area is shown in Tables 5 and 6.

Only a short time was spent in the area, but available information has been assembled on plates P-1 to P-15. These reveal that the Blue Lode, Brown Lode and Conqueror Lode workings contain only small rich shoots of gold-silver ore and that they are essentially deposits best suited to exploitation by small parties and syndicates. No plans of the Peak Silver Mine, another small deposit, are available. The group comprising the Brown, Conqueror and Big lodes lies west of the discordant contact between sandy and fine tuffs. This contact, however, has been mapped over only 900 feet of its length (plate P-1).

Interest centres in the "Big Lode" which lies in the most marked shear zone. The southern extension of this zone has not been thoroughly prospected. The lode is exposed on the surface over a length of 500 feet and ranges in width from 25 to 65 feet. Here it consists of brown, gossanous material with boxworks after sulphides. It has been thoroughly leached.

L.F. Harper (unpublished report, 1929) states that the lode was tested while the leases were held by the Great Cobar Company by one crosscut at/53-feet level (plates P-3, P-11) and by another at the 100 ft. level (plates P-4, P-11). Gold content was reported as "low". "In 1927-28, the Peak Company received aid from the Prospecting Vote to drive a crosscut to the Big Lode at the 160ft.-level (plate P-5). The ore channel was reached at 68 feet, and the crosscut was continued for 30 feet in channel material and ore. Values (gold) were again low, however, but with increased copper content." At the time of Mr. Harper's visit, a crosscut at the 226-ft. level had not reached the lode.

Mulholland and Rayner (1947) state that the lode was cut at the 226-ft. level (plate P-6) "and is stated to have assayed 7 dwt. gold and a trace of copper over a width of 9 feet". These authors also state that the lode was intersected in a crosscut from a winze 65 feet below the 100-ft. level. Samples taken from there are said to have ranged from a trace to 7 dwt. gold per ton. Small quantities of native copper are present in the lode. One hundred tons hauled from this section is said to have had an average gold content of 5½ dwt. per ton.

The most interesting information about the lode was obtained from diamond-drilling carried out during 1942-43 with the aid of money advanced by the Commonwealth Government. The results are shown on plates P-10 to P-14.

No. 1 d.d.h deflected from an inclination of 65 degrees at the collar to one of 83 degrees, and had to be abandoned at 290 feet.

No. 2 d.d.h. penetrated the lode at a vertical depth of 530 feet and remained in it to a vertical depth of 600 feet. It revealed copper-lead-zinc mineralisation, which, over a length of 248 feet down the borehole (a true width of approximately 200 feet), has a weighted average value of £2/3/5 per ton sterling or £2/14/5 per ton Australian currency at the London metal prices ruling at 4/6/47. This is the value of the total metal content, not the recoverable value.

In sections, the bore assayed as follows:-

Position feet	Width feet	Pb. %	Zn %	Cu %	Ag. dwt	Au. dwt.	Value in sterling London.	Value at fixed price Aust.
595-650	55	0.94	2.86	0.52	2.3	-	£3/11/7	£1/11/0
650-764	114	0.24	1.09	0.18	-	-	£1/ 4/2	10/2
764-819	55	0.50	1.19	1.58	9.7	0.5	£3/10/4	£2/10/4
819-843	24	0.20	0.35	0.06	0.2	-	10/1	4/0
Weighted Averages	248	0.45	1.43	0.55	2.68		£2/ 3/5 £A2/14/5	16/11

The details of the sampling are shown on plate P-12. Although the values are low, the width of mineralisation is very interesting.

No. 3 d.d.h. (plates P-11, P-12) intersected the lode at an approximate vertical depth of 250 feet and revealed 25 feet true width of low-grade copper-silver-gold mineralisation. The detailed results are shown with the section of the hole on plate P-12. The most promising result obtained was from 365 to 370 feet; this section assayed 1.39 per cent Cu, 4.6 dwt. Ag and 1.6 dwt. Au per ton. It is probable that leaching extends to this depth, and native copper was noted in the core. In these circumstances, some copper and zinc may have been removed by leaching, but a considerable proportion of the original lead content of the lode would be expected to be present. No assays for lead were made.

No. 4 d.d.h. intersected the lode between vertical depths of 285feet and 420 feet. The detailed results of this drillhole are shown on plate P-13. Over a length along the hole of 169 feet, equal to a true lode-width of approximately 130 feet, the ore averaged 0.88 per cent Pb, 0.52 per cent Zn, 1.24 per cent Cu and 3.0 dwt. Ag per ton. The gross value of the metal-content at the current Australian fixed prices is £1/9/9 per ton, the value in sterling at current London prices is £2/5/2 per ton and the equivalent of this in Australian currency is £2/16/7 per ton.

The section from 314 feet to 433 feet, a drilling-width of 119 feet, has a gross value of £A1/19/0 at the current fixed prices and a sterling value of £2/17/7 per ton at current London prices.

No. 5 d.d.h. (plates P-1 and P-10) was apparently outside the limits of the oreshoot and gave very low results.

No. 6 d.d.h. (plates P-1, P-10, P-11, P-14) revealed mineralisation assaying 1.8 per cent copper from 838 to 840 feet and 1.2 per cent copper from 990 to 995 feet, but the general result was disappointing. The drilling was carried out primarily as a search for copper needed in wartime and, in this case, no assays for lead-

zinc content appear to have been made.

The results of the drilling suggest that the "Big lode" has been leached to a depth of approximately 250 feet. The leaching has removed a considerable proportion of the original copper-content of the primary ore and probably most of the zinc. There is an enrichment of gold in the oxidised zone. There is little evidence of a zone of secondary copper-enrichment, though such enrichment is possible.

The drilling indicates that, below the leached zone, there is a mineralised lens from 350 to 400 feet in length and from 100 to 150 or more feet in width, containing copper-lead-zinc mineralisation of - at present - marginal grade.

Southern Extension.

As shown on plate P-15, Andrews' mapping indicates that the crush-zone in which the Big Lode occurs extends for a further 3,500 feet south of the southern end of the lode. The Great South Peak shaft, towards the southern end of this crush-zone was sunk to 240 feet and some driving and crosscutting were carried out. Quartz veins up to 20 inches in width only were worked for their gold content, but crosscutting for 25 feet east of the shaft and for 50 feet west of the shaft is reported to have intersected quartz stringers carrying "fair" gold prospects (Andrews, pp. 181-182)

The Perseverence shafts are stated to have revealed nothing of value. A number of other shafts, two of which are reported to have exceeded 200 feet in depth, were put down in this crush-zone, but did not yield payable results.

It will be seen from the plan, however, that only a small fraction of the crush-zone has been tested. During the present examination, very little attention could be paid to this area, as work had to be concentrated on the ground held by New Occidental Gold Mines, N.L. In view of the drilling results, it is suggested that the Peaks and the area to the southward should be investigated as follows:-

(1) The discordant contact (plate P-1) should be mapped both north and south of the "Big Lode", taking into account the relationships between ore and the contact found elsewhere.

During the course of the mapping careful comparison of all gossans occurring along the zone should be made with the "Big Lode" gossan. Investigation would probably reveal the presence of oxidised lead-minerals in this type of outcrop. The "Big Lode" type of gossan is relatively soft and would not form a conspicious outcrop.

(2) Following this detailed outcrop mapping, geophysical prospecting would probably be warranted.

(3) Given favourable results from (1) and (2) drilling would be warranted. In view of the drilling results of the "Big Lode", it is not at all unlikely that further base-metal deposits occur in this important shear zone. Leaching has been extensive and surface outcrops are both inconspicious and valueless from the prospector's point of view. In these circumstances, leached outcrop interpretation might yield valuable results. In placed in this low-lying area, outcrops are obsecured by soil and here, in particular, geophysical investigation would be most helpful.

Although the drilling revealed grades which at the present time are unpayable, the width of mineralisation is impressive. The shoot outlined is short, but could possibly yield in the vicinity of 3,000 tons per vertical foot of low-grade ore. If three or four additional shoots of this size could be located, the area would have possibilities as a large-scale low-grade mine. The world shortage of lead and zinc and the rapid depletion of Australian copper-reserves emphasize the need for prospecting for these metals.

APPENDIX II.

MINERAGRAPHIC INVESTIGATIONS

OF THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

REPORT NO. 328. UNIVERSITY OF MELBOURNE.

1st September, 1945.

ORE SPECIMENS FROM NEW COBAR MINE.

Specimens of ore from the Western Ore Body, New Cobar Mine, have been submitted for mineragraphic examination by the New Occidental Gold Mines.

The specimens consist of silicified chloritic slate impregnated with sulphides and containing veins and segregations of white quartz. Pyrrhotite and chalcopyrite are the two chief sulphides visible in the hand specimens. Pyrrhotite is prominent in the dark silicified slate in which there are occasional small segregations of galena. Chalcopyrite is more noticeable in irregular patches and seams in the white quartz.

A thin section of the ore shows that the dark areas consist essentially of dusty quartz in small crystals with inter-locking crenulate boundaries. The white quartz consists of much larger, clear crystals from which the dusty inclusions have been expelled. Other transparent minerals present are chlorite, biotite and carbonate. Chlorite and the sulphides tend to occur around the margins of the larger quartz crystals. Laminae of chlorite and biotite are, in part, intimately intergrown with the sulphides. The carbonate contains iron, lime and magnesium, and is very sporadic and subordinate.

Polished sections have revealed the following minerals: magnetite, pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, native bismuth, bismuthinite and gold.

Magnetite occurs as occasional grains throughout the sulphides and quartz. In places it occurs in parallel bands representing traces of original bedding planes and forms isolated clusters or rosettes in quartz. The individuals in the rosettes are prismatic and resemble the form of hematite rather than magnetite, but they are magnetic and have the colour and reflectivity of magnetite, and no internal reflections.

Pyrite is much less abundant than pyrrhotite and appears to be confined to definite bands. In some fragments it occurs as clusters of coarse crystals in quartz. Many of these pyrite crystals are shattered and traversed by veins of quartz or sulphides. The latter consists mainly of pyrrhotite and chalcopyrite which are accompanied by small amounts of sphalerite and galena and gold. In areas of abundant chalcopyrite, a limited amount of replacement of pyrite by chalcopyrite is indicated by the presence of small residuals of pyrite in the chalcopyrite.

Pyrrhotite is the most abundant sulphide. Where its development is limited and quartz predominates, it occurs around the margins of quartz crystals. With more extensive development it forms large areas isolating particles of quartz. In places it has developed along the cleavage laminae of biotite and chlorite in such a way as to leave a tangle of micaceous laminae (often bent) in large areas of pyrrhotite. These areas of associated pyrrhotite and gangue are practically devoid of pyrite and tend to pass by transition into areas with abundant chalcopyrite.

Chalcopyrite, like pyrrhotite, occurs in wide areas and veins but is less often in intimate association with the gangue minerals. It ranges in size from areas in white quartz which are

often visible to the naked eye down to particles only a few microns in width. In places, small areas of pyrrhotite are included in chalcopyrite, while in other places chalcopyrite is moulded on large areas of pyrrhotite, but the two minerals are not extensively intergrown. It appears as if chalcopyrite has crystallised a little later in the mineralisation sequence than pyrrhotite.

Sphalerite, compared with pyrrhotite and chalcopyrite, is a very minor constituent. It is found as occasional small grains of the order of 0.03 mm. in width, chiefly in chalcopyrite, but also in pyrrhotite. It also occurs in veins traversing pyrite crystals. It is similar in colour and reflection to magnetite from which it is distinguished by its reddish internal reflections.

Galena occurs in segregations up to 1 cm. in width. Such areas appear to be bounded chiefly by the gangue minerals except for a little marginal chalcopyrite. Galena also occurs in segregation veinlets in quartz which are sometimes continuous with chalcopyrite. It also appears in veins traversing pyrite along with chalcopyrite and sphalerite and rarely gold.

Native bismuth has been observed in one section and is readily recognised by its pink colour and high reflection. It occurs in shapeless grains usually surrounded by bismuthinite in areas of chalcopyrite or pyrrhotite and gangue. Some grains are 0.06 mm. in width, but others are only two or three microns wide along the grain boundaries of bismuthinite.

Bismuthinite is recognised as a bismuth-bearing sulphide, but cannot be positively distinguished from bismuth-lead-sulphides, which are known to occur in the New Occidental mine. It occurs in small composite areas of fine fibres and plates in either quartz, pyrrhotite or chalcopyrite. The largest of these areas is about 0.03 mm. wide and one of the fibres was 0.05mm. x 0.004 mm. It is characterised by strong pleochroism and anisotropism, and it is negative to the standard etching agents other than HNO_3. A slow effervescence appears to occur with HNO_3, but it is difficult to be sure that this does not arise fron native bismuth. Its very sporadic occurrence and its almost constant association with corroded particles of native bismuth suggest that it may have been derived from the earlier formed native bismuth during the development of pyrrhotite and chalcopyrite.

Gold has previously been reported to occur as small particles enclosed in pyrrhotite and chalcopyrite (see Mineragraphic Report No. 58) from other parts of the New Cobar Mine. In the examination of the present series of sections, it has been observed as small particles along with sphalerite and galena in a vein traversing pyrite. Three particles of a pale-coloured gold were visible and the largest occupied the full width of the vein 0.024 mm. for a length of 0.042 mm. The other gold particles in this vein were 0.012 mm. x 0.012 mm. and 0.004 mm. x 0.005 mm.

Order of Crystallisation. No evidence appears from this examination of more than one period of mineralisation. There is, however, a mineralisation sequence within the single period.

Pyrite is the first sulphide to crystallise and is followed by pyrrhotite, sphalerite, chalcopyrite and galena. Pyrite is intersected by veins containing pyrrhotite, sphalerite, chalcopyrite and galena. In some cases it is clear that galena forms the continuation of a veins beyond chalcopyrite, indicating a sequence in which galena is slightly later than chalcopyrite.

The few observations of the gold particles indicate that it crystallised in the sphalerite-galena range. The small vein in chalcopyrite indicates it is later than chalcopyrite. Inclusions of gold in pyrrhotite, however, suggest that some of the gold has been deposited with or before the pyrrhotite. The observations of

native bismuth and bismuthinite in relation to other sulphides are also limited. They suggest that native bismuth probably formed before the sulphides, and its alteration to bismuthinite may have accompanied the development of pyrrhotite and chalcopyrite.

(Sgd.) Frank. L. Stillwell.

APPENDIX III.

Production from mines of Cobar District, not described in text.

TABLE 7.

PRODUCTION - GREAT COBAR MINE.

Year	Ore raised	Great Cobar ore treated	Total≠ ore treated	Total yield≠			Average≠			Value £
				Gold	Copper	Silver	Gold	Copper	Silver	
	tons	tons	tons	oz	tons	oz	dwt/ton	per cent	oz/ton	
1871-6	-	3,000	3,000	-	900	-	-	30.0	-	-
1876 (June-Dec).	-	1,458	1,458	-	255	-	-	17.5	-	-
1877	-	4,880	4,880	--	523	-	-	10.7	-	-
1878	-	8,389	8,389	-	1,457	-	-	17.3	-	114,000
1879	-	12,615	12,615	-	1,891	-	-	15.0	-	-
1880	-	20,566	20,566	-	2,600	-	-	12.6	-	-
1881	21,109	21,552	21,552	-	2,568	-	-	11.9	-	-
1882	13,787	11,702	11,702	-	1,805	-	-	15.4	-	126,350
1883	19,000	18,096	18,096	-	2,401	-	-	13.3	-	158,464
1884	21,561	23,879	23,879	-	2,769	-	-	11.6	-	-
1885	23,300	23,300	23,300	-	2,135	-	-	9.1	-	106,750
1886	25,887	25,887	25,887	-	2,044	-	-	7.9	-	80,951
1887	19,163	19,163	19,163	-	1,521	-	-	7.9	-	68,445
1888	13,210	13,210	13,210	-	1,005	-	-	7.6	-	60,300
1889	8,177	8,177	8,177	-	668	-	-	8.2	-	-
1890-1893	-	-	-	-	-	-	-	-	-	-
1894	13,460	13,460	13,460	-	665	-	-	4.9	-	26,600
1895	-	38,278	38,278	-	1,694	-	-	4.4	-	68,120
1896	-	63,185	63,185	-	2,708	-	-	4.3	-	107,200
1897	-	64,262	64,262	-	2,492	-	-	3.9	-	-
1898	-	111,557	111,557	16,215	3,520	145,665	2.9	3.2	1.3	-
1899	-	123,834	123,834	13,698	3,746	59,586	2.2	3.0	0.5	-
1900	-	114,465	114,465	8,900	3,475	60,366	1.5	3.0	0.5	-
1901	-	110,767	110,767	7,253	3,206	52,336	1.3	2.9	0.5	-
1902	-	89,634	89,634	3,097	2,416	16,933	0.7	2.7	0.2	-
1903	-	141,781	141,781	11,078	3,333	40,403	1.6	2.4	0.3	-
1904	-	127,083	143,244	9,495	3,580	57,635	1.3	2.5	0.4	-
1905	-	135,248	180,538	9,160	4,061	53,207	1.0	2.2	0.3	-
1906	-	ø	198,168	11,758	4,030	78,522	1.2	2.0	0.4	-
1907	-	ø	167,605	12,569	4,359	64,934	1.5	2.6	0.4	-
1908	177,592	169,697	234,877	16,568	5,127	90,196	1.4	2.1	0.4	-
1909	160,265	203,746	203,746	13,069	4,855	79,887	1.3	2.4	0.4	-
1910	244,987	241,764	293,324	22,048	6,248	109,421	1.5	2.1	0.4	-
1911	278,049	279,589	352,149	29,332	6,548	122,559	1.7	1.9	0.3	485,875
1912	not rec'd	255,993	361,298	39,072	6,650	202,330	2.2	1.8	0.6	575,521
1913	219,875	219,875	334,187	24,942	5,985	103,837	1.5	1.8	0.3	379,477
1914	56,032	57,371	69,690	6,014	1,410	24,305	1.7	2.0	0.3	111,164
1915	1,449	-	-	-	-	-	-	-	-	-
1916	134,596	134,421	170,833	11,436	2,642	47,819	1.3	1.5	0.3	314,726
1917	126,624	126,995	158,270	10,878	2,694	45,206	1.4	1.7	0.3	364,596
1918	114,270	113,540	122,672	10,298	2,413	38,009	1.7	2.0	0.3	266,146
1919	25,623	25,623	26,301	1,134	540	8,594	0.9	2.1	0.3	60,948
1920	240	240	-	-	45	-	-	18.8	-	4,546
1921	83	83	83	-	15	-	-	18.0	-	1,120
1922-1935	-	-	-	-	-	-	-	-	-	-
1936	3,300	1,300	-	1,825	-	-	28.0	-	-	-
1937	2,934	2,934	-	2,834	15/	-	19.3	-	-	25,019
1938-40	-	-	-	-	-	-	-	-	-	-
1941	-	3,206	-	636	-	-	3.9	-	-	25,019
1942-1945	-	-	-	-	-	-	-	-	-	-
1946	50	30	-	7	18	34	4.6	6.0	1.1	265
Total:		3,182,629* 3,450,000≠	4,104,082	293,316	113,018	1,501,784	1.4	2.8	0.4	

≠ Includes Chesney, Peak and produce of other mines in Great Cobar group, tested at Great Cobar.

ø Not published. * Incomplete. ≠ Estimated, approximate. / From 50 tons ore.

TABLE 8.

PRODUCTION - TINTO MINE.

Year	Ore raised	Ore treated	Ore sold	Yield				Average				Value £
				Gold	Silver	Lead	Copper	Gold	Silver	Lead	Copper	
	tons	tons	tons	oz	oz	tons	tons	dwt/ton	oz/ton	per cent	per cent	
1906	300	300			450	45			1.5	15		900
1907	80	47	47				5				10.6	350
1908	-	-	-	-	-	-	-	-	-	-	-	-
1909	2,385		1,485	-	-	-	113	-	-	-	7.6	6,831
1910	2,364		2,364	113	132	-	123	9.6	.06	-	5.2	7,586
1911	97		97	-	-	-	3.5	-	-	-	3.6	190
1912	60	-	-	-	-	-	-	-	-	-	-	-
1913	-	815	-	-	-	24	17	-	-	2.9	2.1	1,587
1914												
Total:	5,286	1,162	3,993									17,444

TABLE 9.

PRODUCTION - C.S.A. MINE.

Year	Ore treated	Yield				Average				Value Total
		Gold	Silver	Lead	Copper	Gold	Silver	Lead	Copper	
	tons	oz	oz	tons	tons	dwt/ton	oz/ton	per cent	per cent	
1905	300	30	600	150	-	2.0	2	50	-	2,595
1906	3,800	235	3,800	912	-	1.2	1	24	-	17,941
1907	1,200	60	1,200	288	-	1.0	1	24	-	4,140
1908-10	-	-	-	-	no record	-	-	-	-	-
1911	491	-	-	-	22.5	-	-	-	4.6	1,259
1912	2,519	250	10,076	806	-	2.0	4	32	-	14,185
1913	4,053	-	-	1,000	-	-	-	-	-	11,697
1914	1,499	-	-	-	79*	-	-	-	5.3	5,700
1915	4,350	-	-	-	455	-	-	-	10.5	34,139
1916	2,530	-	-		380	-	-	-	15.0	47,910
1916	1,643	-	-	332	-	-	-	-	20.2	
1917	12,646	75	-	-	443/	0.11	-	-	3.5	35,364
1918	55,028	558	60,294	-	2,232	0.2	1.1	-	4.1	237,290
1919	15,626	43	8,791	-	396	0.05	0.6	-	2.5	44,173
1920	7,874	84	10,194	-	232	0.2	1.3	-	2.9	26,144
1921-44	-	-	-	-	-	-	-	-	-	-
1945	9	-	13	-	3.8	-	1.4	-	42.2	392
1946	29	-	25	-	4.0	-	0.86	-	13.79	420
Total:	113,597	1,335	94,993	3,488	4,247					483,358

* Estimated from value. / Included 79 tons copper from purchased ores.

TABLE 10.

PRODUCTION - GLADSTONE MINE.

Year	Ore raised	Ore sold or treated	Yield		Average		Value £
			Copper	Silver	Copper	Silver	
	tons	tons	tons	oz	per cent	oz/ton	
1908	8	8	2	-	25	-	126
1909	209	28.75	10.5	91	36.5	3.2	455
1910	300	210	28	-	13.3	-	1,204
1911	1,300	1,111	94	-	8.5	-	-
1912			no record				
1913	1,000	508	149	-	29.3	-	10,000
1914	-	3,297	231	-	7.0	-	15,009
1915	11,116	11,116	627	-	5.6	-	46,398
1916	6,513	6,513	245	-	3.8	-	24,480
1917	5,732	5,732	284	10,716	5.0	1.9	35,099
1918	6,607	1,987	222	-	11.2	-	22,698
1919	2,214	1,356	109	-	8.0	-	10,557
1920	1,976	1,976	127	-	6.4	-	12,600
Total:	36,975	33,843	2,129	10,807	6.3	1.9	178,726

TABLE 11.

PRODUCTION - MOUNT PLEASANT MINE.

Year	Ore treated	Yield		Average		Value £
		Gold	Copper	Gold	Copper	
	tons	oz	tons	dwt/ton	per cent.	
1895	469	87	-	2.7	-	-
1896-7	-	-	-	-	-	-
1898	10	-	2.7	-	27	-
1899	-	-	-	-	-	-
1900	510	-	28.75	-	5.6	-
1901	-	-	-	-	-	-
1902	2,353	-	150	-	6.4	-
1903-14	-	-	-	-	-	-
1915	338	-	-	-	-	2,117
Total:	3,680		181.45			

TABLE 12.

PRODUCTION - YOUNG AUSTRALIA MINE.

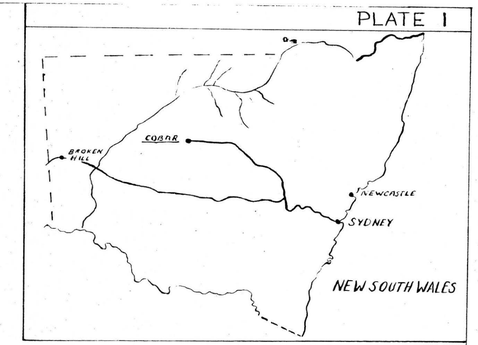
Year	Ore raised	Ore treated	Yield		Average		Value £
			Gold	Copper	Gold	Copper	
	tons	tons	oz	tons	dwt/ton	per cent.	
1896	1,900		1,003		10.6	-	-
1897-1911	-	-	-	-	-	-	-
1912	730	-	-	61	-	8.4	2,390
1913	770	-	-	53	-	6.9	3,454
1914	950	600	37	59	1.2	9.8	3,835
1915	1,027	700	300	31	8.6	4.4	3,306
1916	900	-	-	28	-	3.1	2,900
Total:	6,277		1,340	232			15,885

TABLE 13.

PRODUCTION - QUEEN BEE MINE.

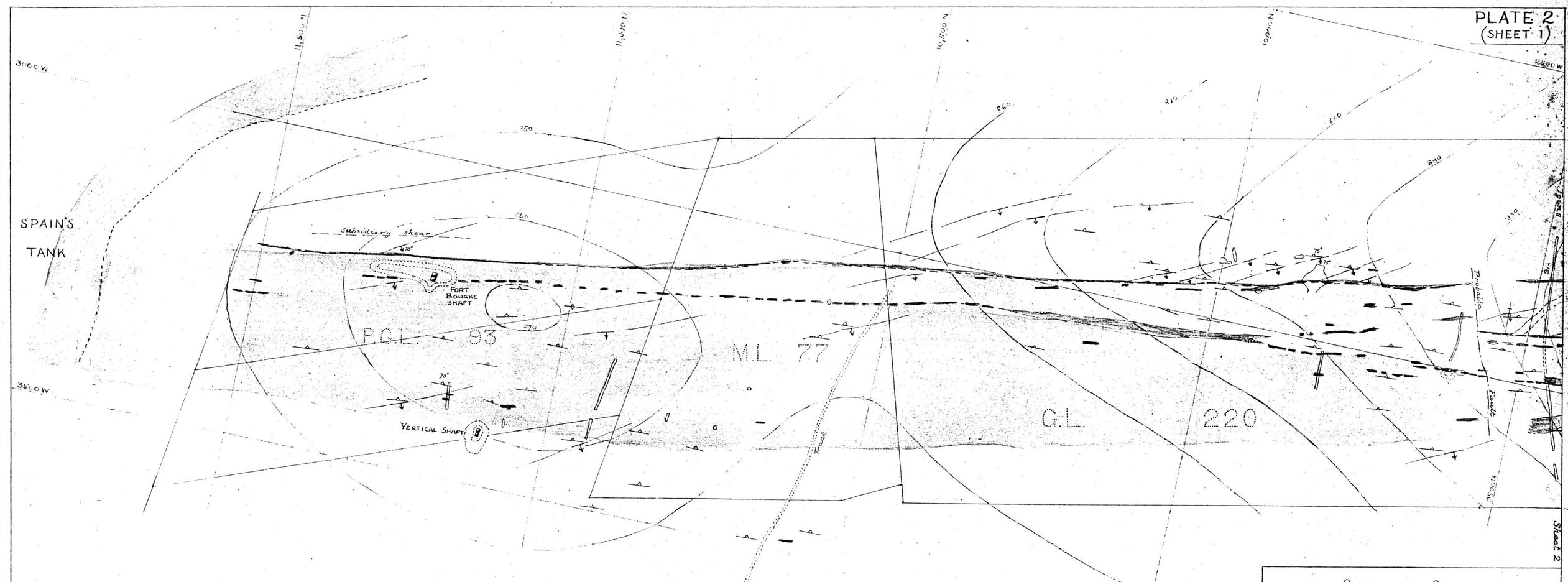
Year	Ore raised	Ore treated	Ore sold	Yield		Average Copper	Value £
				Copper	Silver		
	tons	tons	tons	tons	oz	per cent	
1902	383	-	83	-	-	-	497
1903	-	970	-	161	-	16.6	4,312
1904	1,469	1,150	-	136.5	-	11.9	7,789
1904	-	-	319	-	-	-	2,565
1905	7,854	5,388	-	499.75	-	9.3	31,535
1906	11,556	7,158	-	573	-	8.0	47,525
1907	10,235	6,422	-	493.25	-	7.7	37,087
1908	10,467	9,978	-	663.5	-	6.6	35,378
1909	8,328	8,501	-	474	-	5.6	24,770
1910-11	-	-	-	-	-	-	-
1912	1,808	1,400	-	103	-	7.4	7,725
1913	-	300	-	4	-	1.3	457
1914	50	10	-	1.5	-	15.0	100
1915	700	178	-	45	-	25.3	3,150
1916	-	227	-	25	149	11.0	2,536
1917-18	-	-	-	-	-	-	-
1919	27	27	-	3.26	-	12.1	326
Total:	52,877	41,709	402	3,183	149	7.6	205,752

PLATE 1



SHEET 1
SHEET 2
SHEET 3
SHEET 4
PLATE 2 (SURFACE PLAN)
COBAR
Great Cobar
Open Cut
Dump
Tank
New Cobar
Chesney
WRIGHTVILLE
DARVILLE
Gladstone
Mine
See text Fig. 6
New Occidental
Young Australia
To Hillston
To Nymagee
To Willowie
Tank
Dump
Aug. Lode
Peak Mines
Mine
Workings
Mine
Workings
Mine
Workings

PLATE 2
(SHEET 1)



REFERENCE

- Alluvium — RECENT
- Sandy slates, slates & sandstones strongly cleaved
- Sandstones (with sandy slates) — COBAR SERIES (SILURIAN?)
- Quartz-crushed slate formations
- Quartz
- Main fault line (eastern limit of main shears)
- Bedding
- Cleavage
- Jointing
- Surface contours (datum standard)
- Mine co-ordinates
- Surface workings
- Dumps

Mag. N.

True N

SCALE

FT. 0 25 50 100 200 300 400 FT.

GEOLOGICAL SURVEY
DEPARTMENT OF MINES, N.S.W.

COBAR SURVEY

SURFACE PLAN Nº 2, SHEET 1

SPAIN'S TANK - NEW COBAR SECTION

GEOLOGY BY	E.W. Mutholland E.O. Rayner	AUG.-SEPT. 1946
DRAWN BY	E.O. Rayner	OCT. 1946

PLATE 2
(SHEET 2)

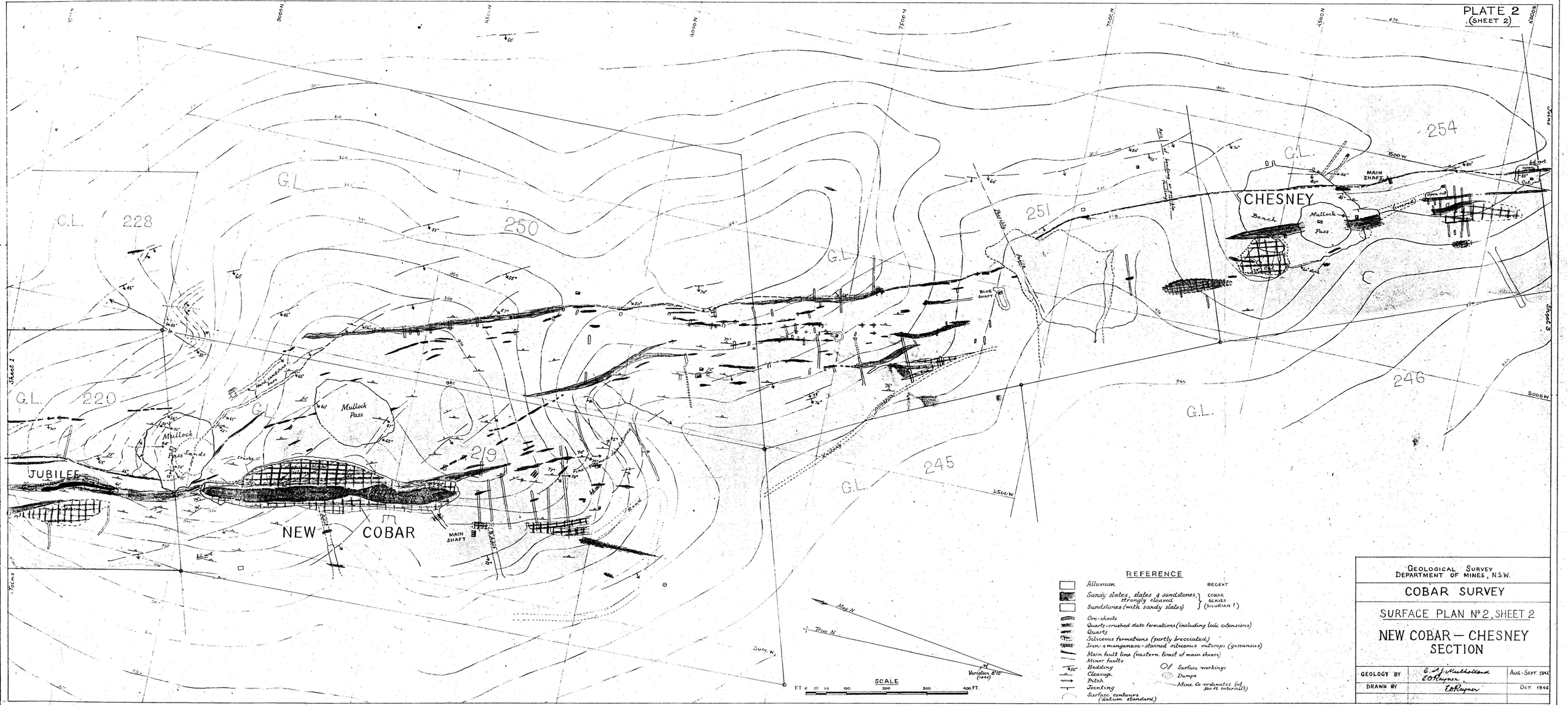
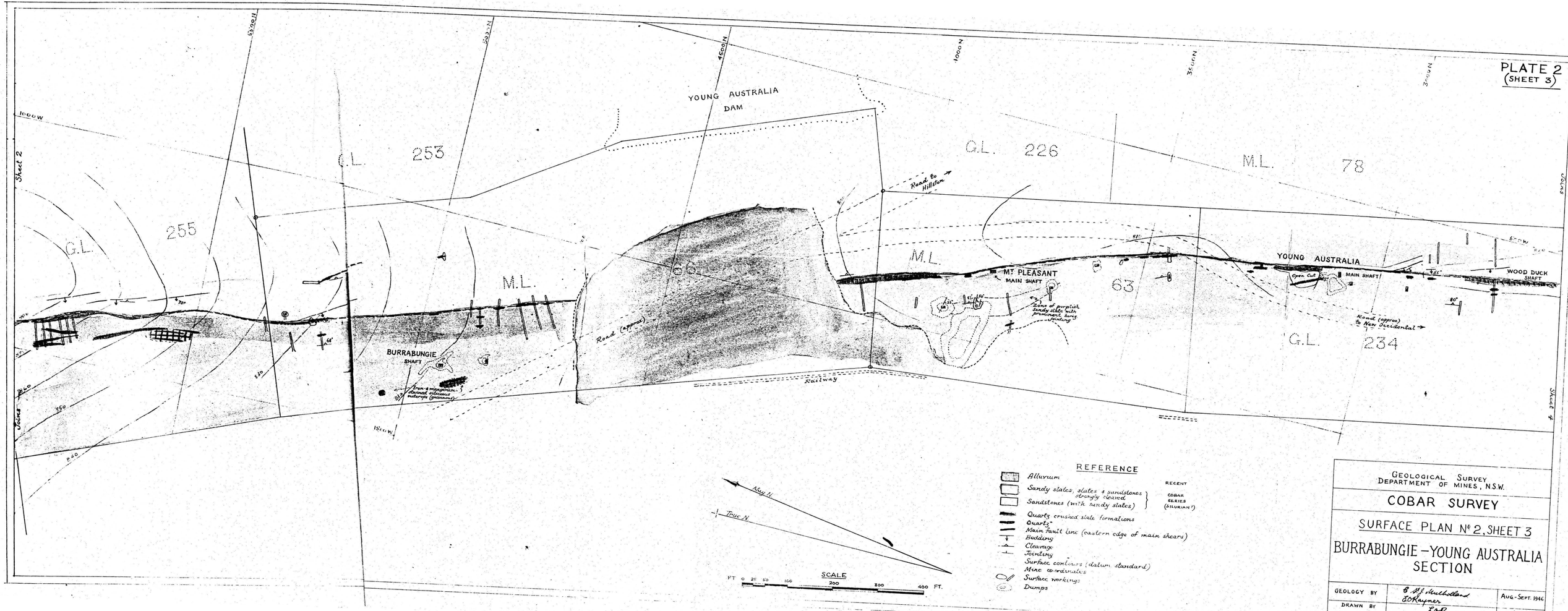


PLATE 2
(SHEET 3)



REFERENCE

- Alluvum
- Sandy slates, slates & sandstones strongly cleaved
- Sandstones (with sandy slates)

RECENT

COBAR SERIES (SILURIAN?)

- Quartz crushed slate formations
- Quartz
- Main fault line (eastern edge of main shears)
- Bedding
- Cleavage
- Jointing
- Surface contours (datum standard)
- Mine co-ordinates
- Surface workings
- Dumps

GEOLOGICAL SURVEY
DEPARTMENT OF MINES, N.S.W.

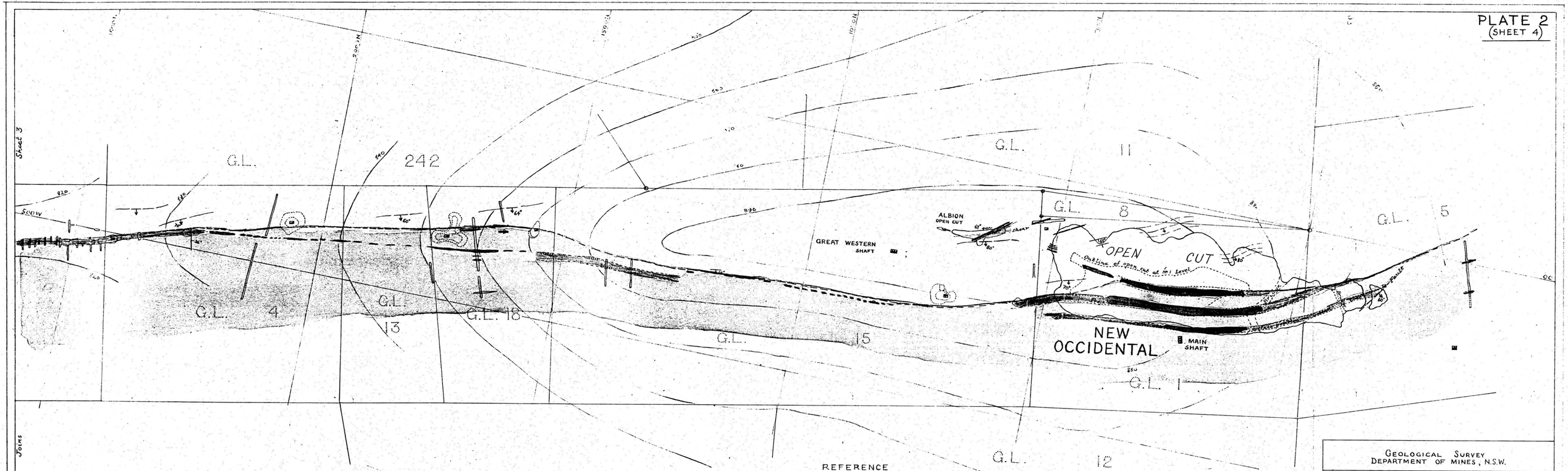
COBAR SURVEY

SURFACE PLAN Nº 2, SHEET 3

BURRABUNGIE – YOUNG AUSTRALIA SECTION

GEOLOGY BY	B.H.J. Mutholland	AUG-SEPT. 1946
DRAWN BY	E.O. Raymer	OCT. 1946
	E.O. Raymer	

PLATE 2
(SHEET 4)



SCALE

FT. 0 25 50 100 200 300 400 FT.

REFERENCE

- Alluvium — RECENT
- Sandy slates, slates & sandstones strongly cleaved
- Sandstones (with sandy slates) — COBAR SERIES (SILURIAN?)
- Quartz-crushed slate formations
- Quartz
- Main fault line (eastern limit of main shears)
- Bedding
- Clearage
- Jointing
- Surface contours (datum standard)
- Mine co-ordinates
- Surface workings
- Dumps

GEOLOGICAL SURVEY
DEPARTMENT OF MINES, N.S.W.

COBAR SURVEY

SURFACE PLAN No 2, SHEET 4

NEW OCCIDENTAL SECTION

GEOLOGY BY	B. W. J. Mulholland E. O. Rayner	AUG-SEPT 1946
DRAWN BY	E. O. Rayner	OCT 1946

PARISH OF COBAR

MINING LEASES AS OF 11 AUG 47

SCALE
CHAINS 0 5 10 20 30 40 50 CHAINS

ML 77

NYNGAN TO COBAR RAILWAY LINE

NYNGAN ROAD

COBAR

PGL 94 · ML 81 · PGL 23 · PGL 24 · PGL 25 · PGL 31 · PML 96B · PML 96A · PML 107 · PML 95 · PML 97 · PGL 86 · GL 236 · ML 87 · PML 98 · ML 85 · PGL 104 · PGL 105 · PGL 103 · ML 77 · GL 220 · GL 228 · GL 244 · GL 219 · GL 250 · GL 231 · GL 245 · GL 251 · GL 254 · GL 248 · GL 25 · GL 253 · PML 87 · ML 88 · ML 64 · ML 63 · ML 78 · PGL 102 · GL 242 · ML 182 · GL 15 · GL 241 · GL 257 · GL 239 · GL 12 · GL 1 · GL 104 · GL 5 · GL 130 · GL 103 · MT 2 · GL 88 · GL 102 · GL 260 · GL 263 · GL 264 · GL 262 · GL 261 · GL 221

DARVILLE

See Inset "A"

FIDO† BOURKE SHAFT

CHESNEY SHAFT

See Inset "B"

BROWNINGIE SHAFT

ML 69

MT 8

MT 9

WRIGHTVILLE

GREAT WESTERN SHAFT

GREAT WESTERN MINE

OCCIDENTAL MINE

BOURKE SHAFT

MUSTAPHA SHAFT

NYNGAN ROAD

SOUTH EAST ROAD

INSET "A"

PML 98 · PML 3 · PML 2 · PML 4 · PML 1 · PGL 103 · GL 248 · GL 244

SCALE
CH. 0 4 8 16 LK.

INSET "B"

@ PGL 73
@ ML 90
@ MGL 106

ML 61 · PGL 68 · PGL 77 · ML 39 · PGL 76 · PGL 75 · PGL 74 · PGL 70 · PGL 69 · PGL 71 · PGL 72

SCALE
CH. 0 5 10 20 LK.

INSET "C"

GL 44 · GL 211 · PGL 5 · MT 13 · GL 252 · GL 2 6 · PGL 6

SCALE
CH. 0 5 10 20 LK.

ML 67 · PGL 8 · GL 195 · GL 44 · GL 211 · GL 252 · GL 256 · PGL 5 · PGL 6 · THE PEAK · PGL 7 · PGL 29 · GL 259 · MT 6

ELOUERA

LOUTH ROAD

ALVANLEY ROAD

NYNGAN TO COBAR RAILWAY LINE

NYNGAN ROAD

COBAR

DARVILLE

WRIGHTVILLE

THE PEAK

ILLEWONG

NYNGAR...

SOUTH EAST ROAD

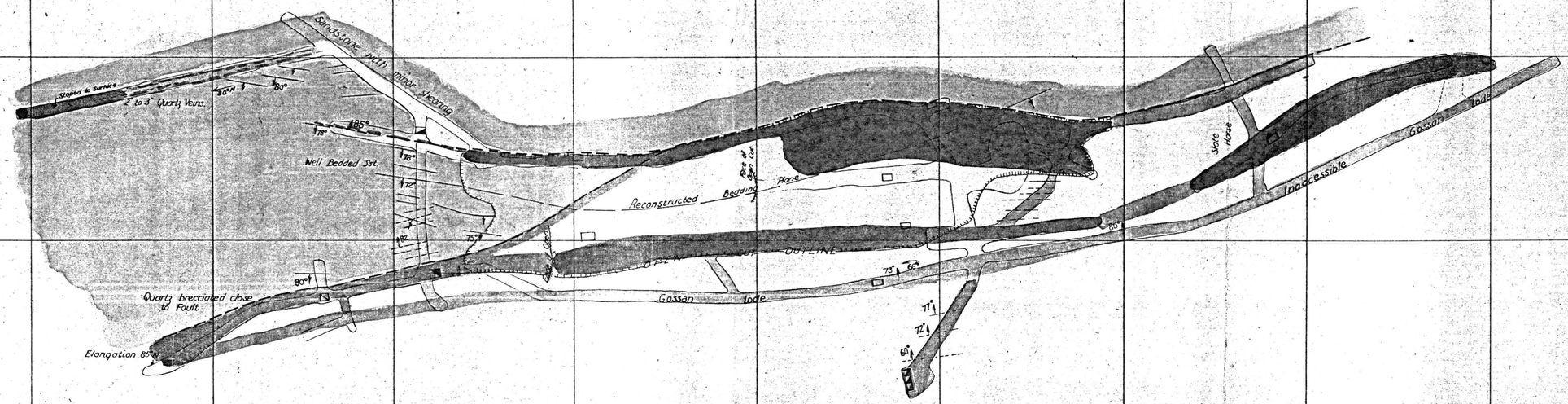
COUNTY OF ROBINSON

PROPOSED LEASE OF ZINC CORP. L7

MINING LEASES IN FORCE 11 AUG 47 SHOWN THUS

SCALE
CHAINS 0 40 80 160 200 CHAINS

Pl. O-1



200E
100E
00
100W
200W
300W
800N
700N
600N
500N
400N
300N
200N
100N
00

NEW OCCIDENTAL G. M.

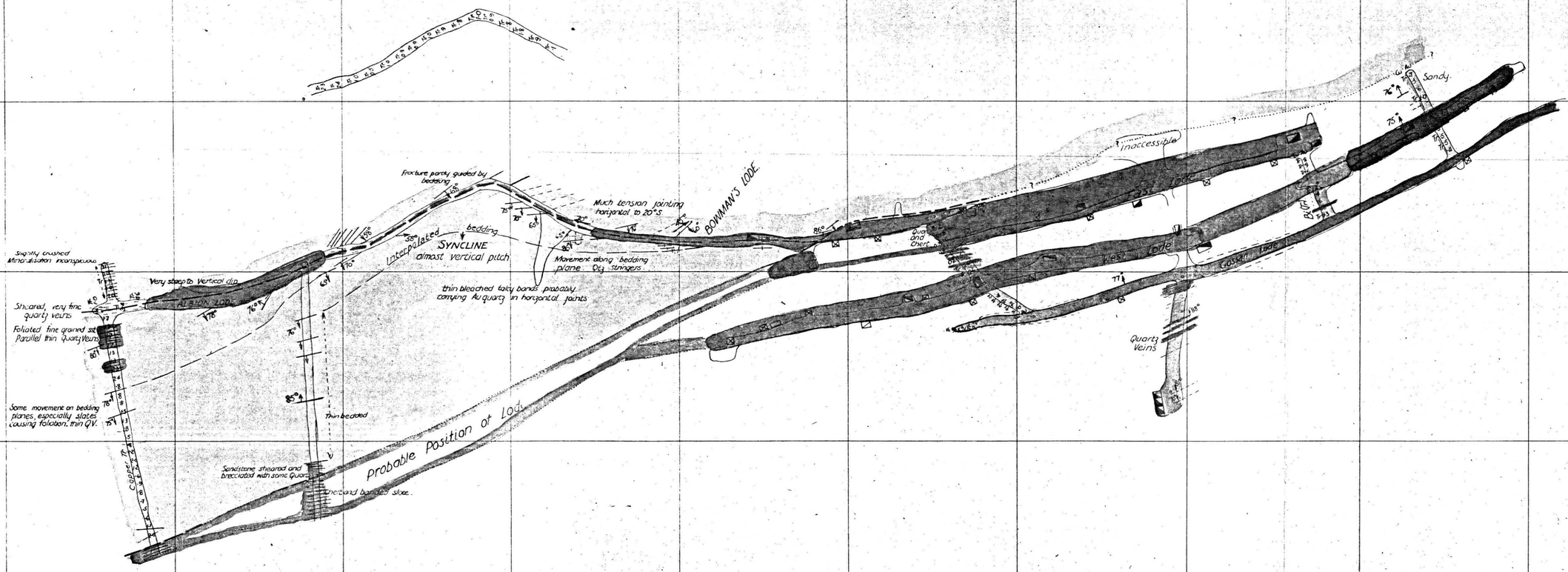
GEOLOGICAL PLAN / LEVEL

Scale 1" = 40'

- Ore
- Calcite Dolomite Lode (Pb-Zn)
- Unpayable Lode
- Chert
- Sandstone
- Chlorite-Sericite Schist
- Slate.
- 78° Dip of Ore.
- 70° Lode Dip
- 85° Major Faults
- 60° Cross Fractures
- RV. Ramifying Quartz Veinlets
- E. elongation
- 70° (Vert) Pitch of Striae across wall of Lode
- 70° Bedding, Joints, Pitch of Country, relative to shearing and cleav.
- 85° Cleavage, Shears,

1489

Pl. O-2



NEW OCCIDENTAL G. M.

GEOLOGICAL PLAN 2 LEVEL

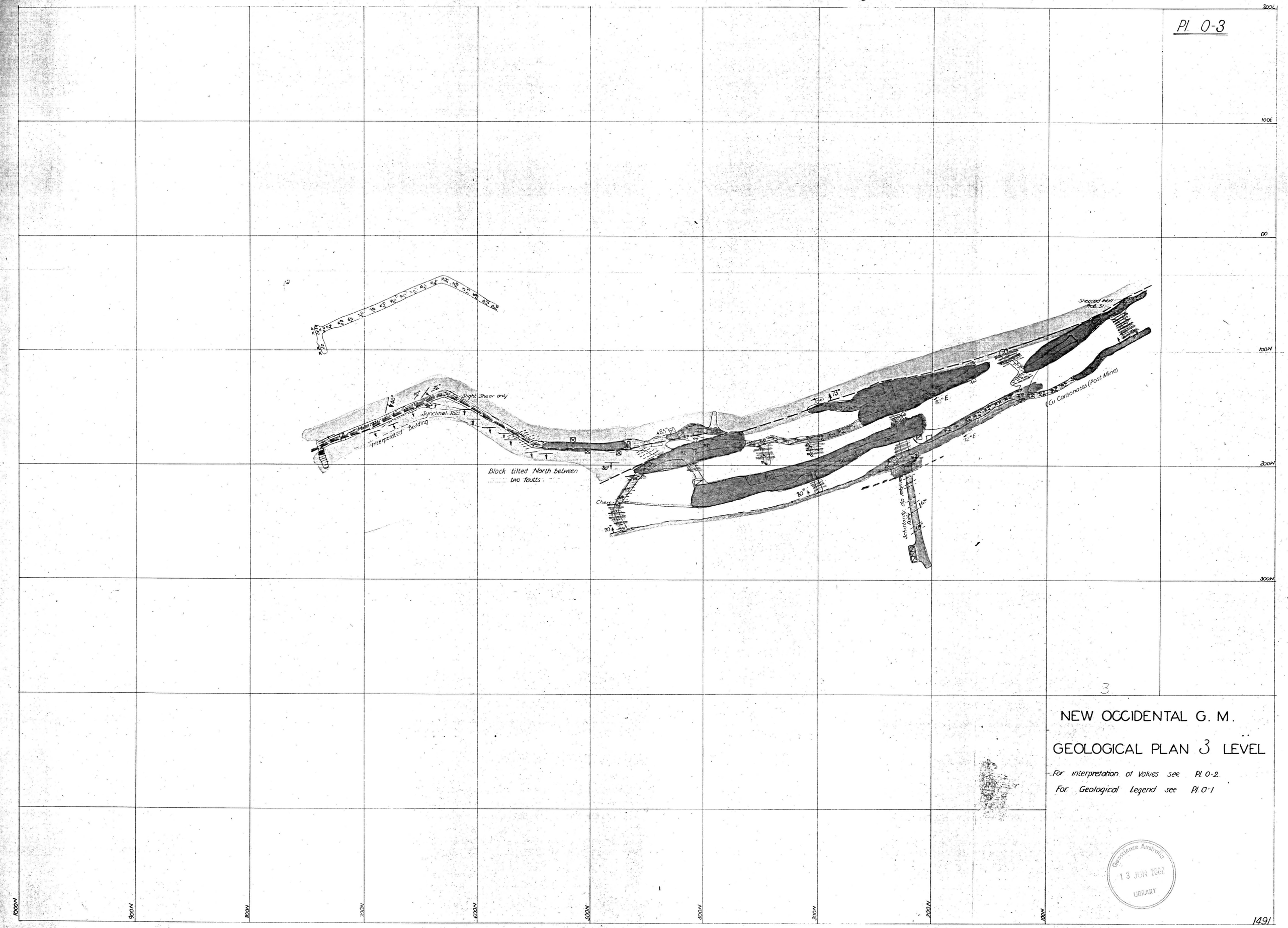
Gold Values in dwts 5 dwts and over Red
Under 5 dwts. Black
Copper Values in % all in black. -
Note:- Gold values to right and above Cu values
e.g. Tr 0.2 / Cu 4.0 — 2 Au / Tr Cu

For Geological Legend see Pl. O-1.

Geoscience Australia
13 JUN 2002
LIBRARY

1490

Pl. 0-3



NEW OCCIDENTAL G. M.

GEOLOGICAL PLAN 3 LEVEL

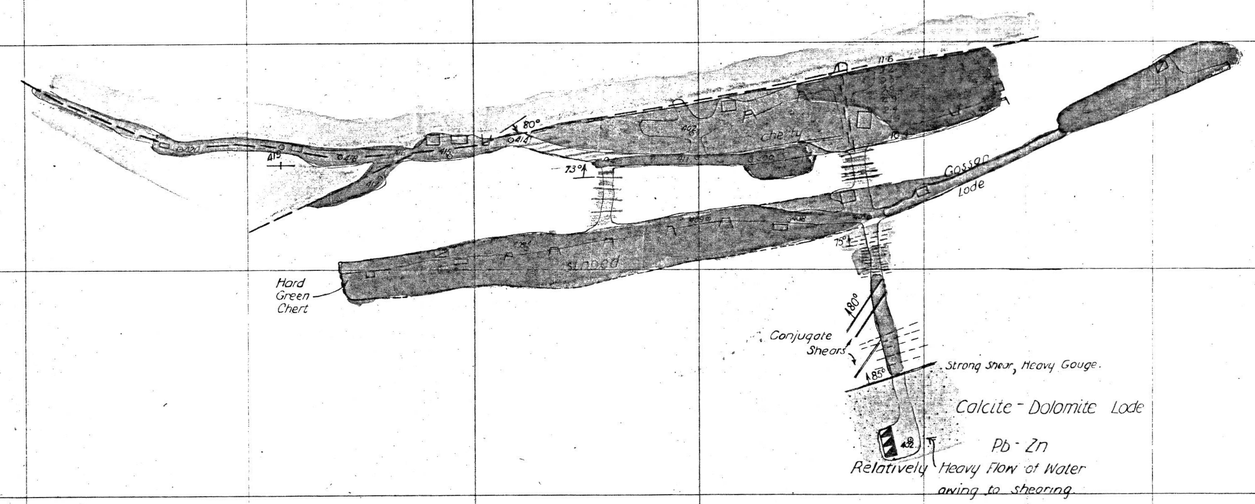
For interpretation of Values see Pl. 0-2.

For Geological Legend see Pl. 0-1

Geoscience Australia
13 JUN 2002
LIBRARY

1491

Pl 0-4



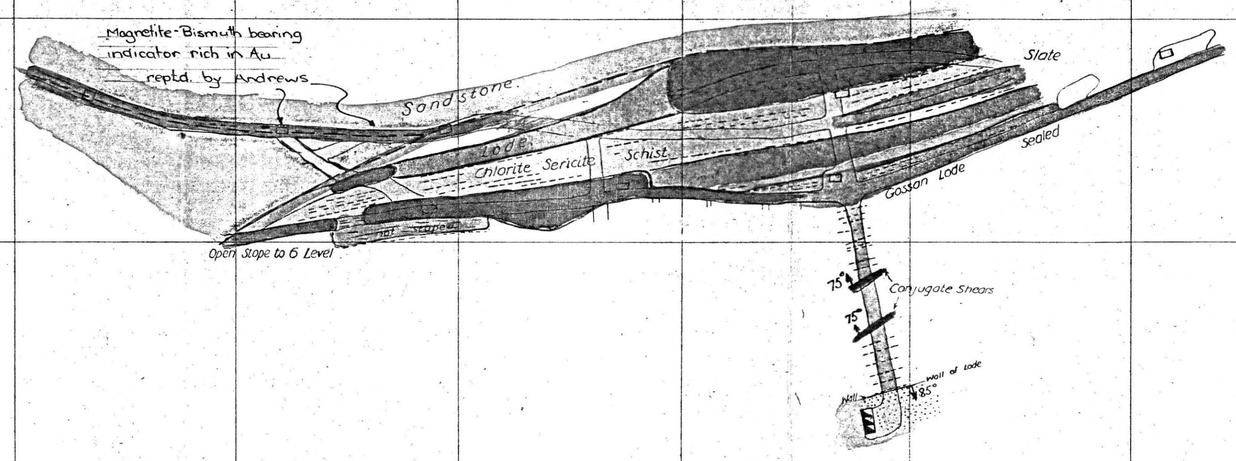
NEW OCCIDENTAL G. M.

GEOLOGICAL PLAN 4 LEVEL

For Geological Legend see Pl 0-1

Geoscience Australia
13 JUN 2007
LIBRARY

1492



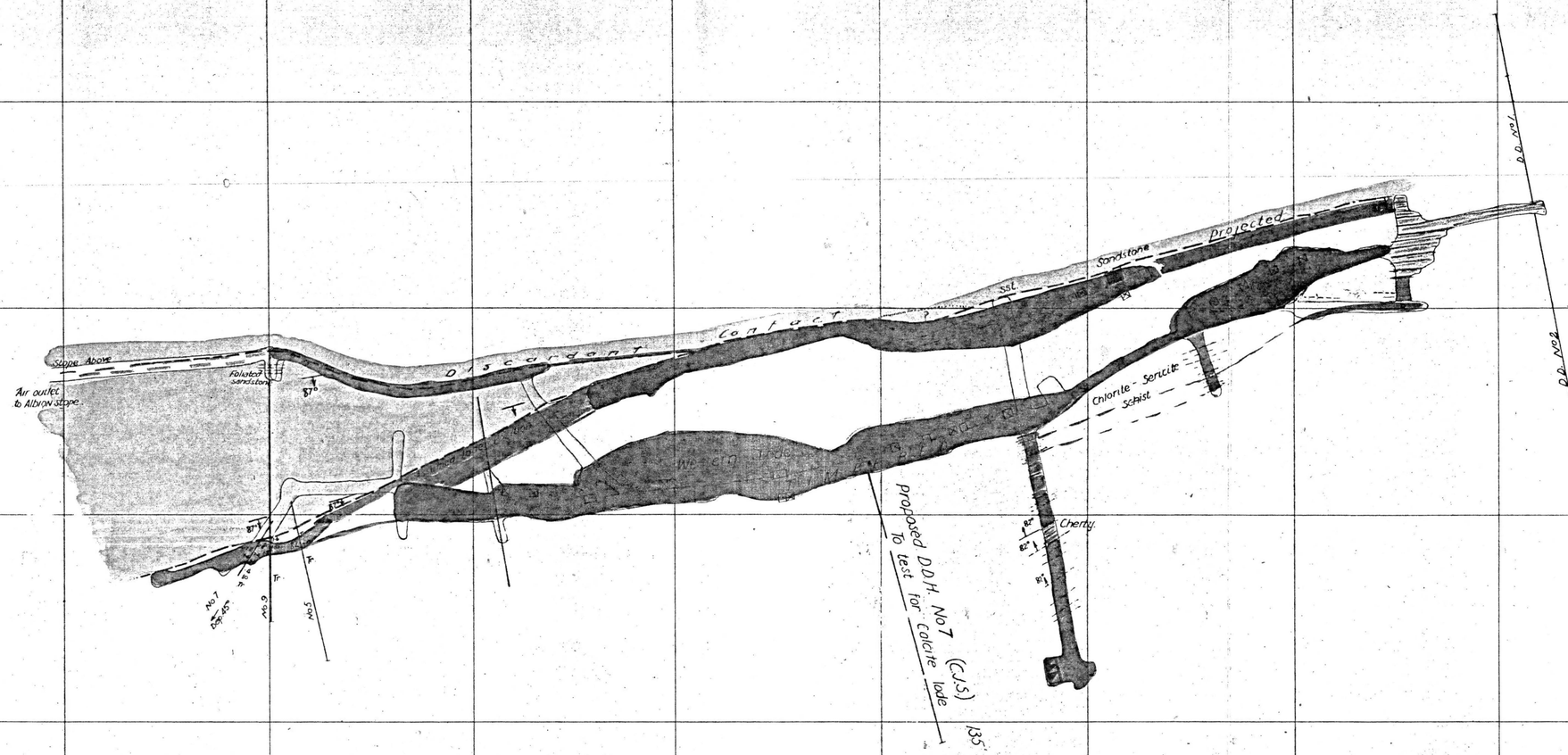
NEW OCCIDENTAL G. M.

GEOLOGICAL PLAN 5 LEVEL

For Geological Legend see Pl.O-1

Resistance Australia
13 JUN 2002
LIBRARY

Pl 0-6



200E
100E
00
100N
200N
300N
00
100S
900N
800N
700N
600N
500N
400N
300N
200N
100N

NEW OCCIDENTAL G. M.

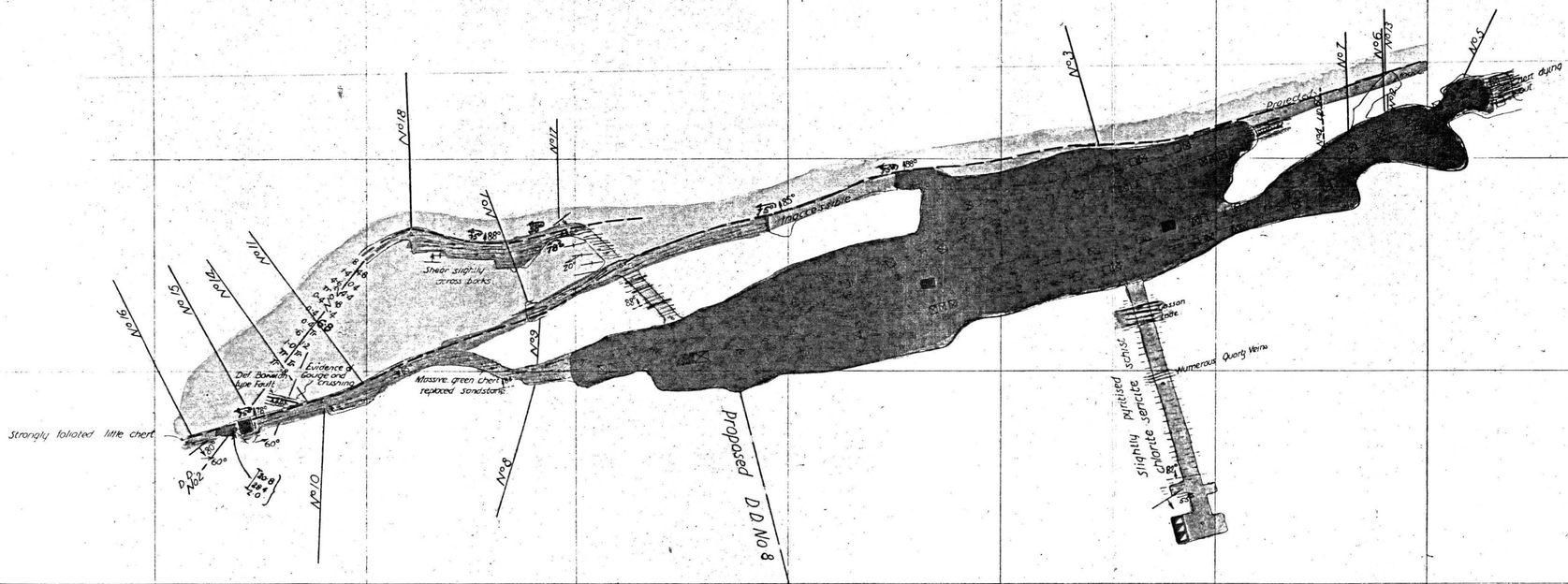
GEOLOGICAL PLAN 6 LEVEL

For Geological Legend See Pl. 0-1

Geological Survey of Western Australia
15 JUN 2002
LIBRARY

1494

Pl. 0-7



NEW OCCIDENTAL G.M.

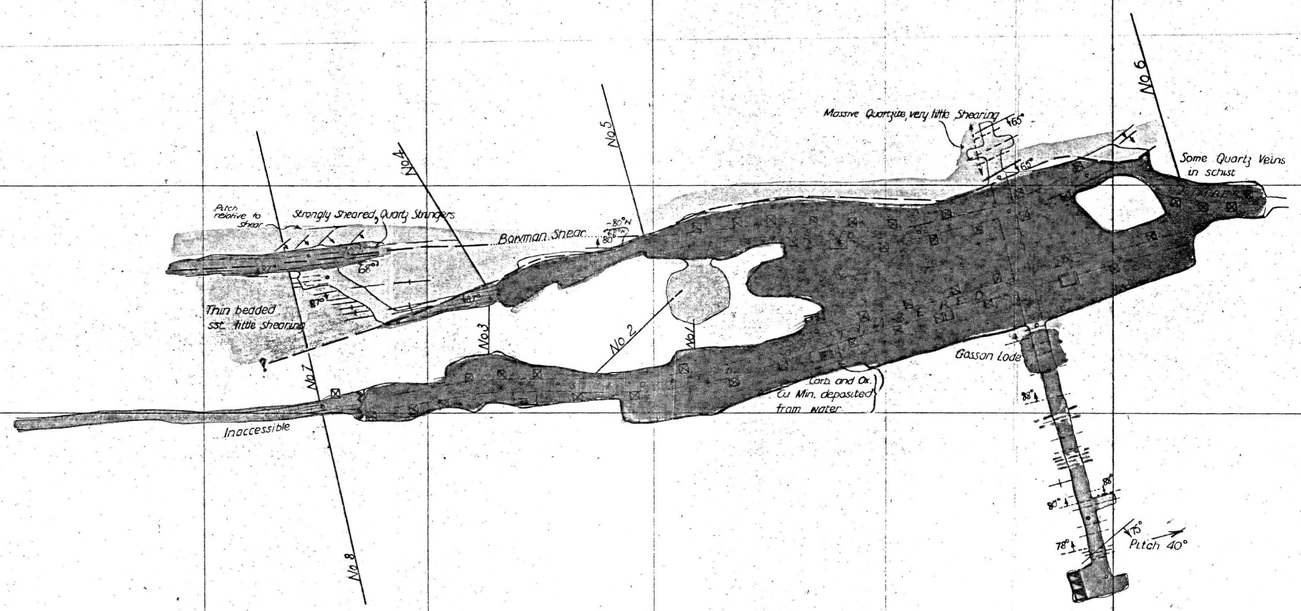
GEOLOGICAL PLAN 7 LEVEL

For Geological Legend see Pl. 0-1
For assay value interpretation see Pl. 0-2.

Geoscience Australia
13 JUN 2002
LIBRARY

1495

Pl 0-8



NEW OCCIDENTAL G. M.

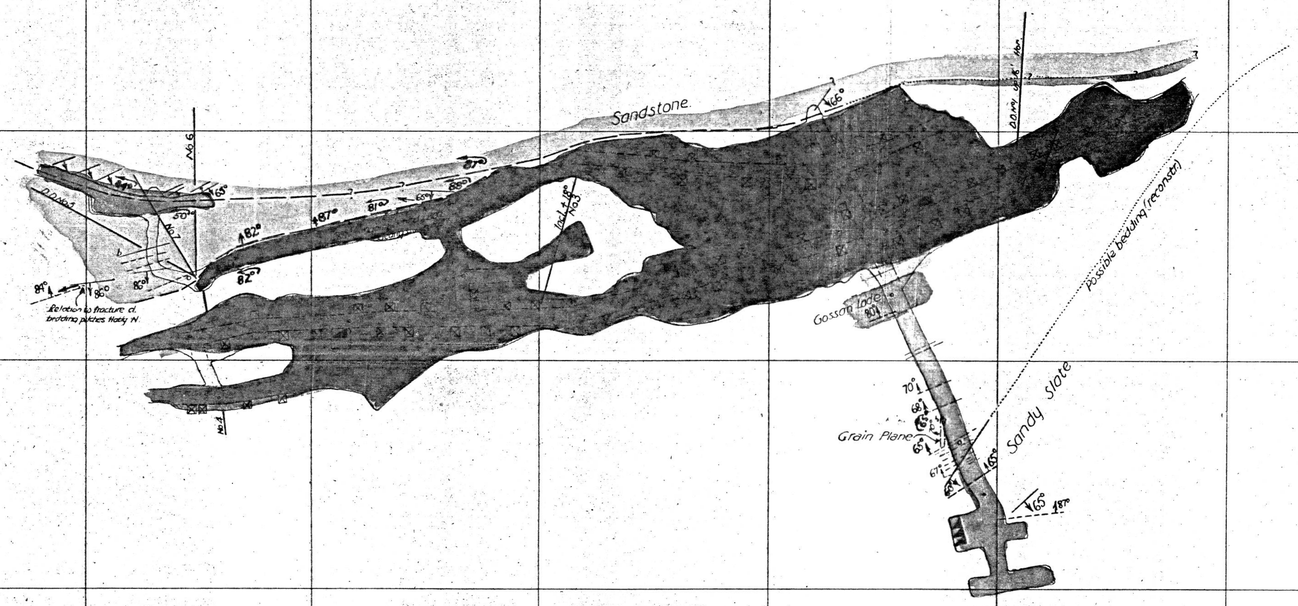
GEOLOGICAL PLAN 8 LEVEL

For Geological Legend see Pl 0-1

Geoscience Australia
13 JUN 2001
LIBRARY

1496

Pl. 0-9



NEW OCCIDENTAL G.M.

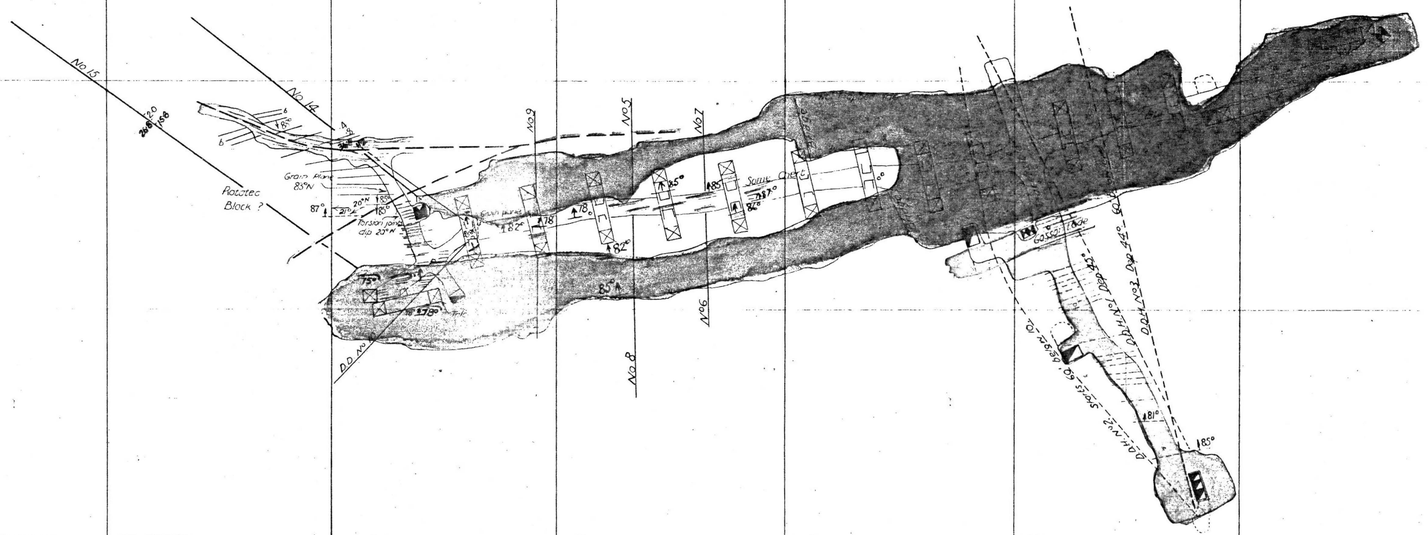
GEOLOGICAL PLAN 9 LEVEL

For Geological Legend see Pl 0-1.

Geoscience Australia
13 JUN 2007
LIBRARY

1497

Pl. O-10



NEW OCCIDENTAL G.M.

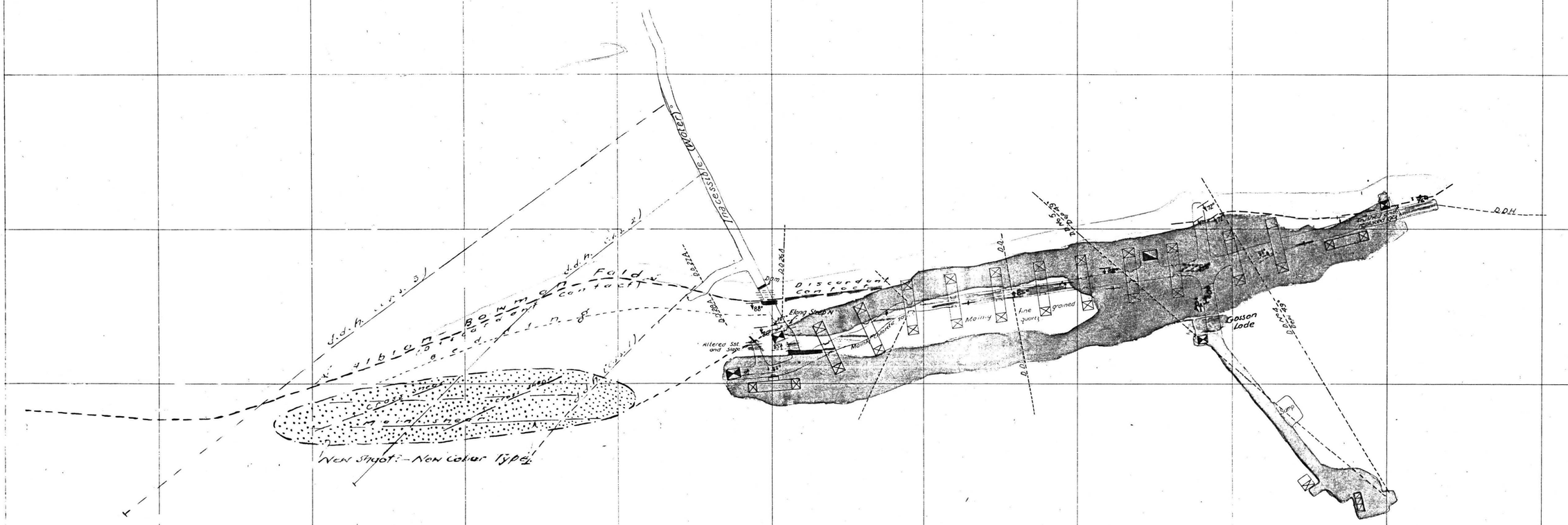
GEOLOGICAL PLAN 10 LEVEL

For Geological Legend see Pl O-1

Geoscience Australia
13 JUN 2002
LIBRARY

1498

Pl. O-11



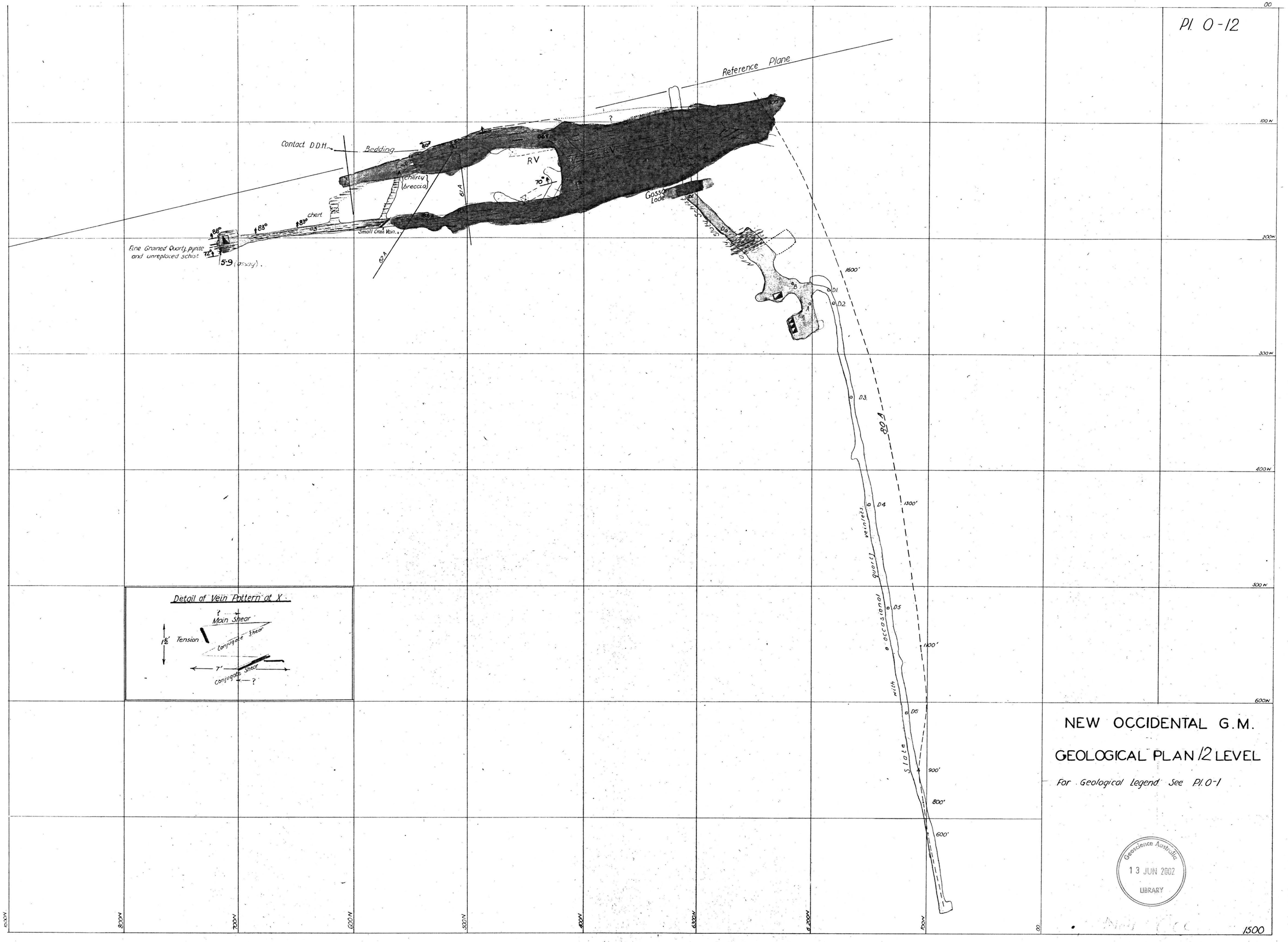
NEW OCCIDENTAL G.M.

GEOLOGICAL PLAN // LEVEL

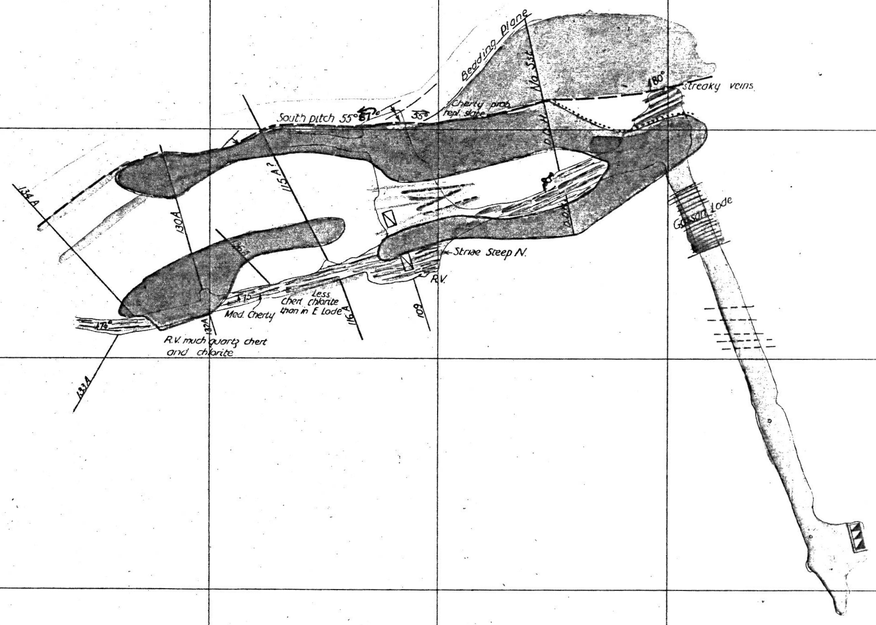
For Geological Legend see Pl O-1.

Geoscience Australia
13 JUN 2002
LIBRARY

1499


Pl. O-12
Reference Plane
Contact D.D.H.
Bedding
RV
cherty breccia
chert
Small Cross Vein
Fine Grained Quartz, pyrite and unreplaced schist
5·9 (assay)
Gossan Lode
Slate with occasional quartz veinlets
D1
D2
D3
D4
D5
D6
1600'
1300'
1100'
900'
800'
600'
80 A
Detail of Vein Pattern at X
Main Shear
Tension
Conjugate Shear
Conjugate Shear
7'
1½'
NEW OCCIDENTAL G.M.
GEOLOGICAL PLAN 12 LEVEL
For Geological Legend See Pl. O-1
Geoscience Australia
13 JUN 2002
LIBRARY
1500

Pl 0-13



NEW OCCIDENTAL G. M.

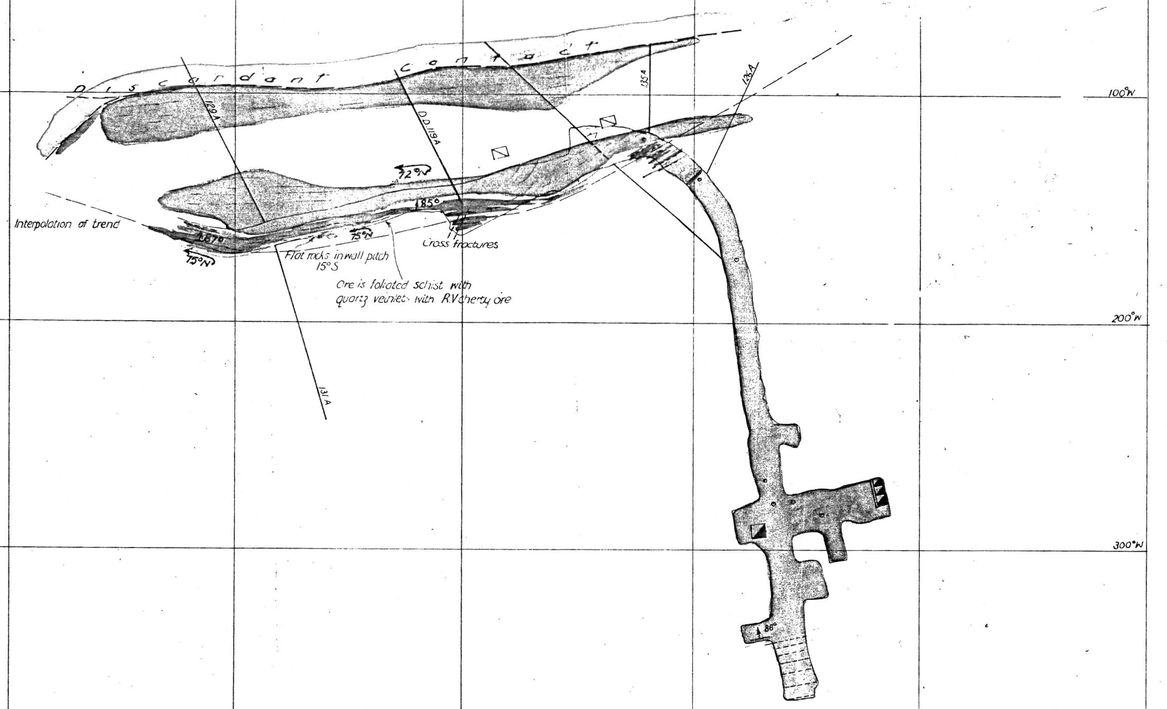
GEOLOGICAL PLAN 13 LEVEL

For Geological Legend see Pl 0-1.

Geoscience Australia
13 JUN 2002
LIBRARY

1501

Pl. 0-14



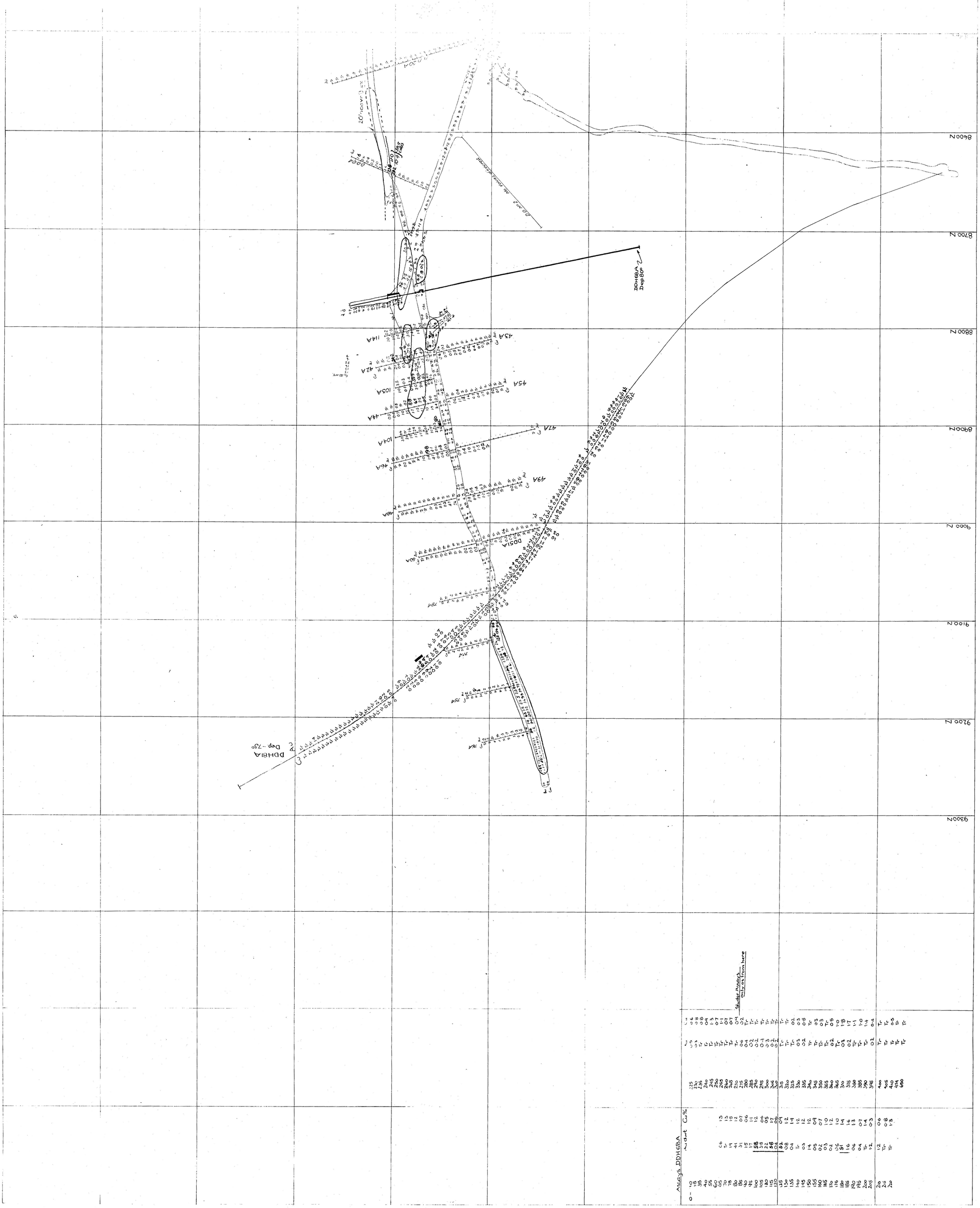
NEW OCCIDENTAL G. M.

GEOLOGICAL PLAN 4 LEVEL

For Geological Legend : see Pl 0-1

Geoscience Australia
13 JUN 2002
LIBRARY

1502

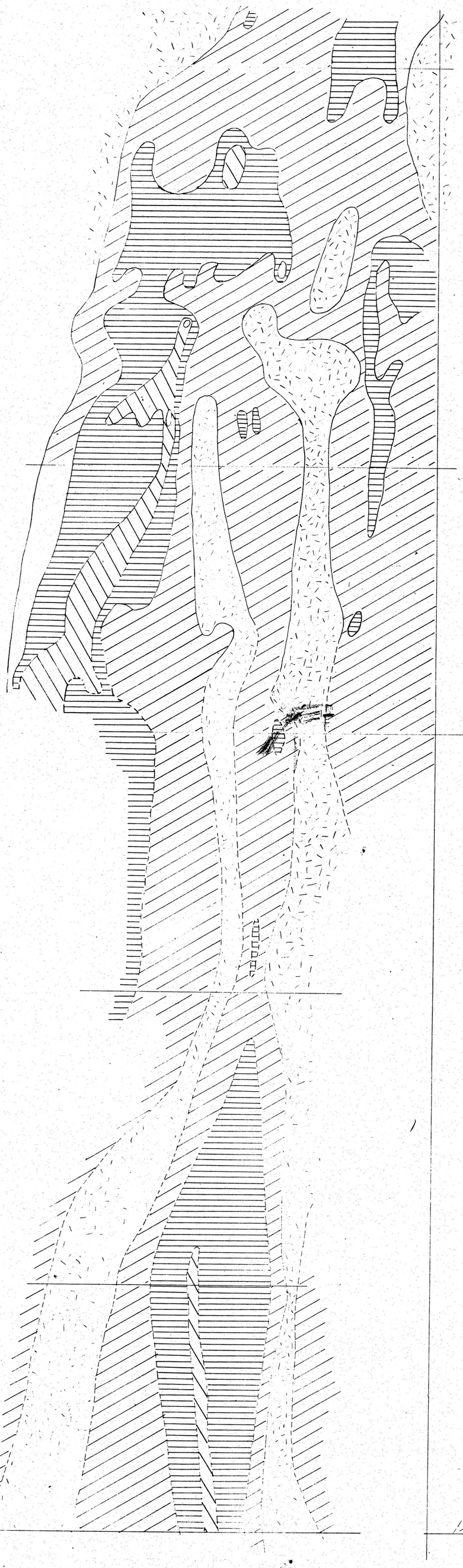


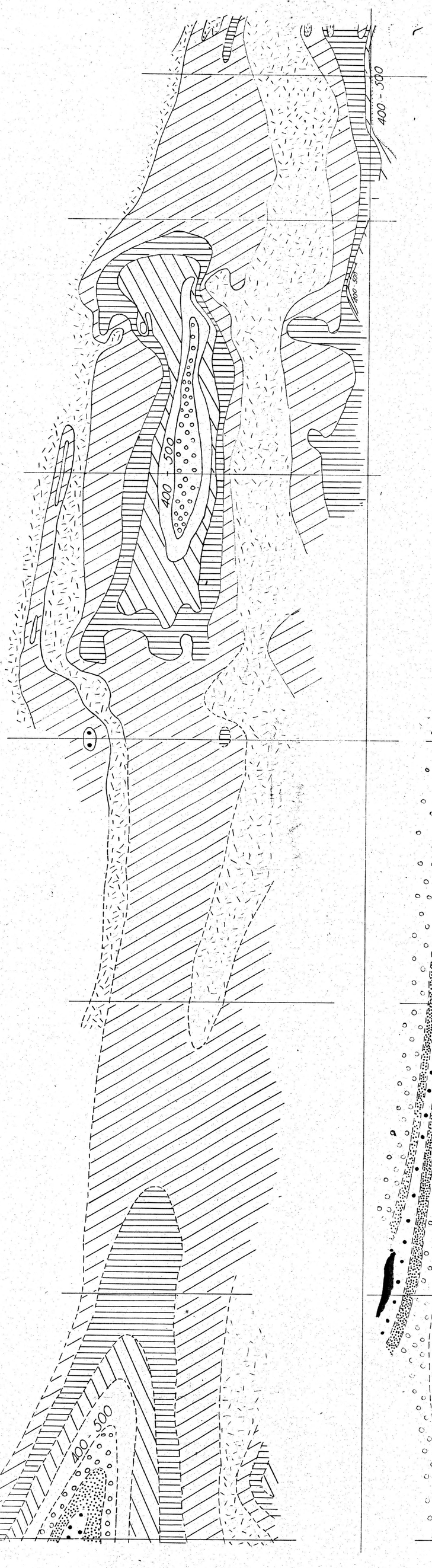
8600 N
8700 N
8800 N
8900 N
9000 N
9100 N
9200 N
9300 N
DDH68A
Dep 80°
DDH81A
Dep -73°
DD51A
114A
42A
43A
103A
44A
45A
104A
46A
47A
49A
48A
50A
78A
74A
75A
76A
Assays DDH68A
Au dwt
Cu %
Sludge Assays only as from here

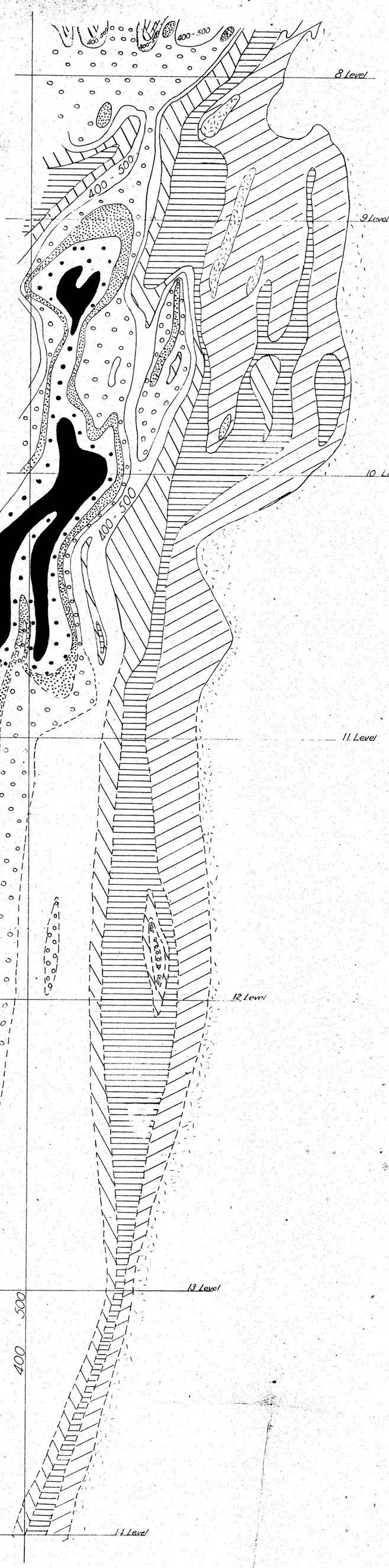
WEST LEG

EAST LEG

MAIN ORE-BODY







NEW OCCIDENTAL MINE

LONGITUDINAL PROJECTION SHOWING ASSAY CONTOURS IN DWT.-FT.

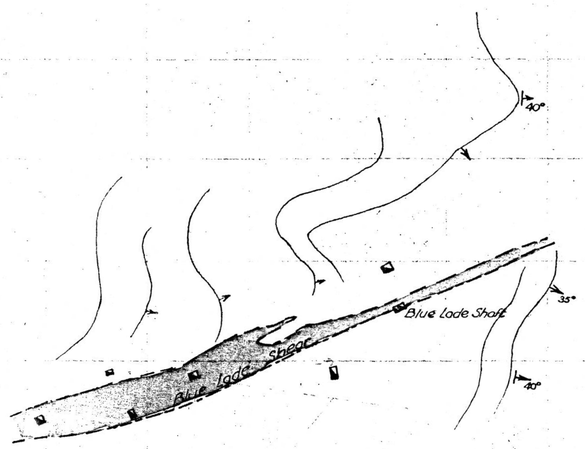
PLANE OF PROJECTION N(TRUE) 13° W VERTICAL THROUGH 350 N - 100 W.

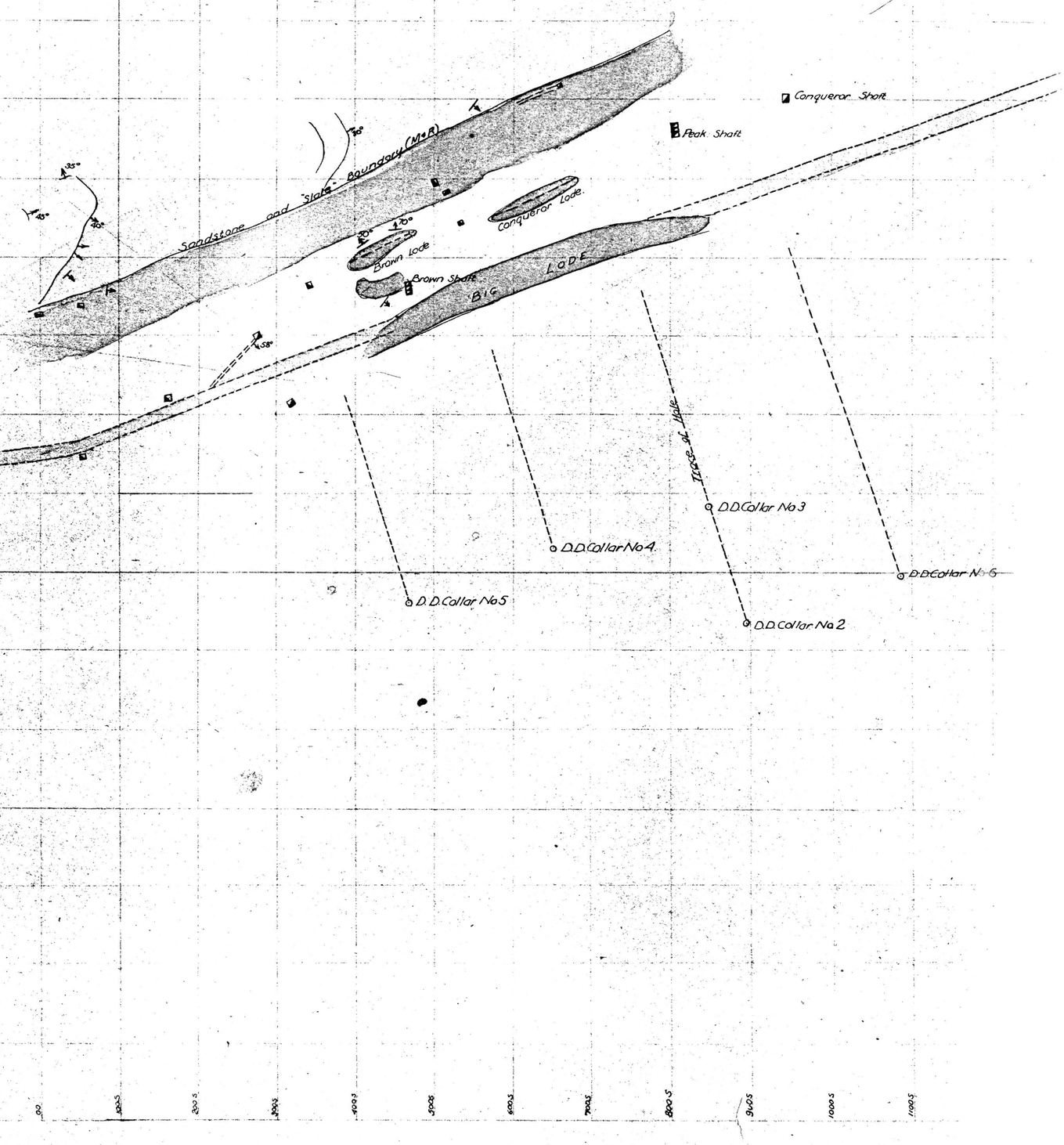
AFTER MULHOLLAND and RAYNER. (N.S.W.G.S)

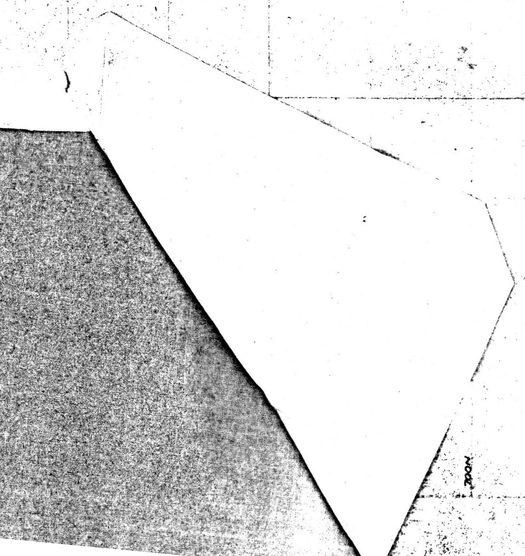
Scale: 1 inch = 40 ft.

+ 800 dwt-ft	300 - 400
700 - 800	200 - 300
600 - 700	100 - 200
500 - 600	0 - 100
400 - 500	

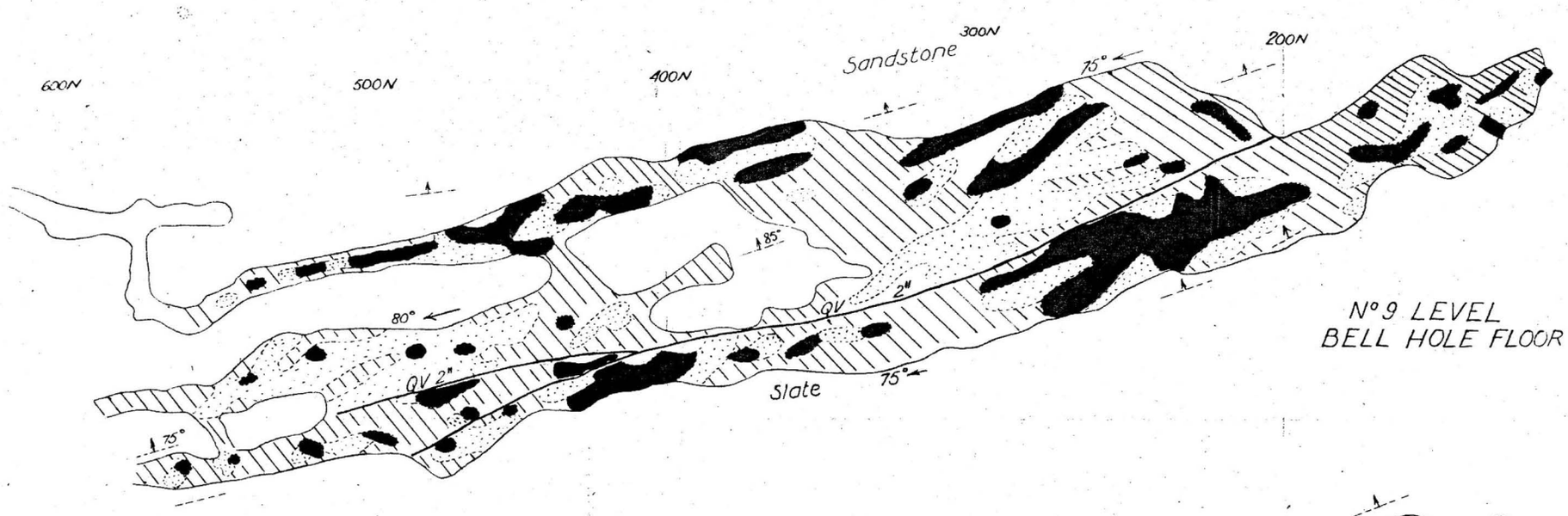
Note: More assay data available above 11 Level (solid lines) than below (broken lines)


40°
Blue Lode Shaft
Blue Lode Shear
35°
40°

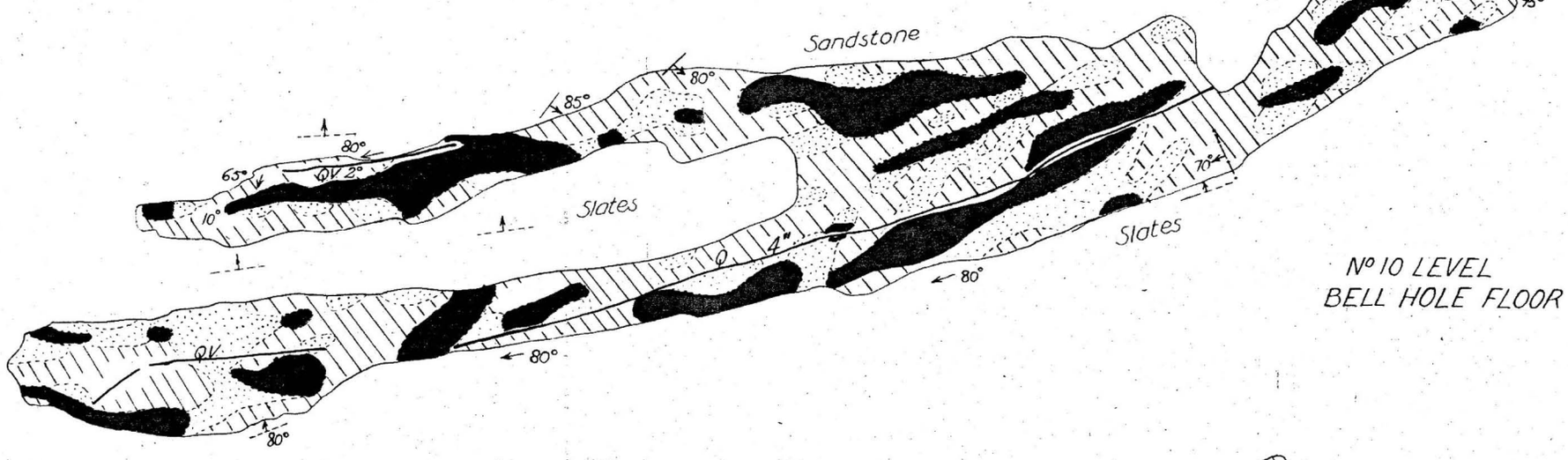

Conqueror Shaft
Peak Shaft
35°
45°
35°
Sandstone and Slate Boundary (M&R)
70°
Conqueror Lode
70°
Brown Lode
Brown Shaft
BIG LODE
58°
Trace of Hole
D.D.Collar No 3
D.D.Collar No 4
D.D.Collar No 6
D.D.Collar No 5
D.D.Collar No 2
46°


200N
600N
900N
1400N
1800N
1000N
00
200S
400S
600S
800S
1000S
1100S

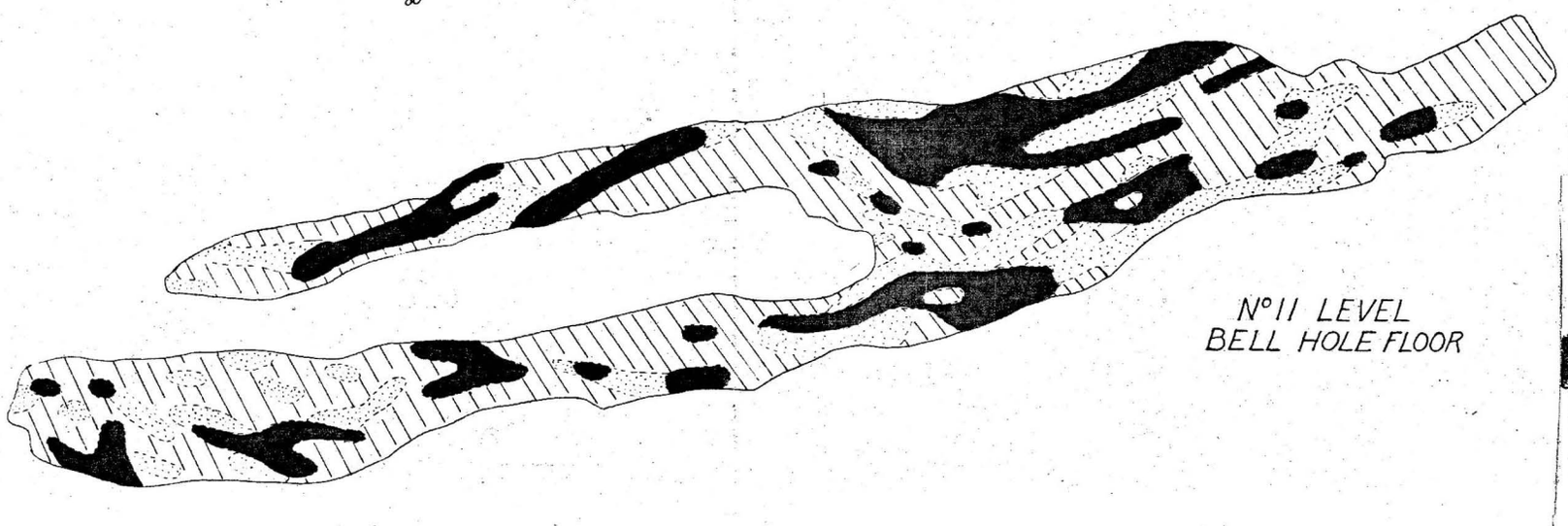
Pl. O-18



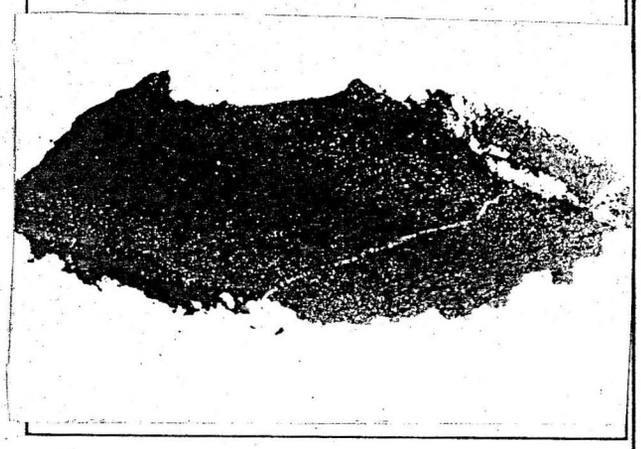
N° 9 LEVEL
BELL HOLE FLOOR



N° 10 LEVEL
BELL HOLE FLOOR

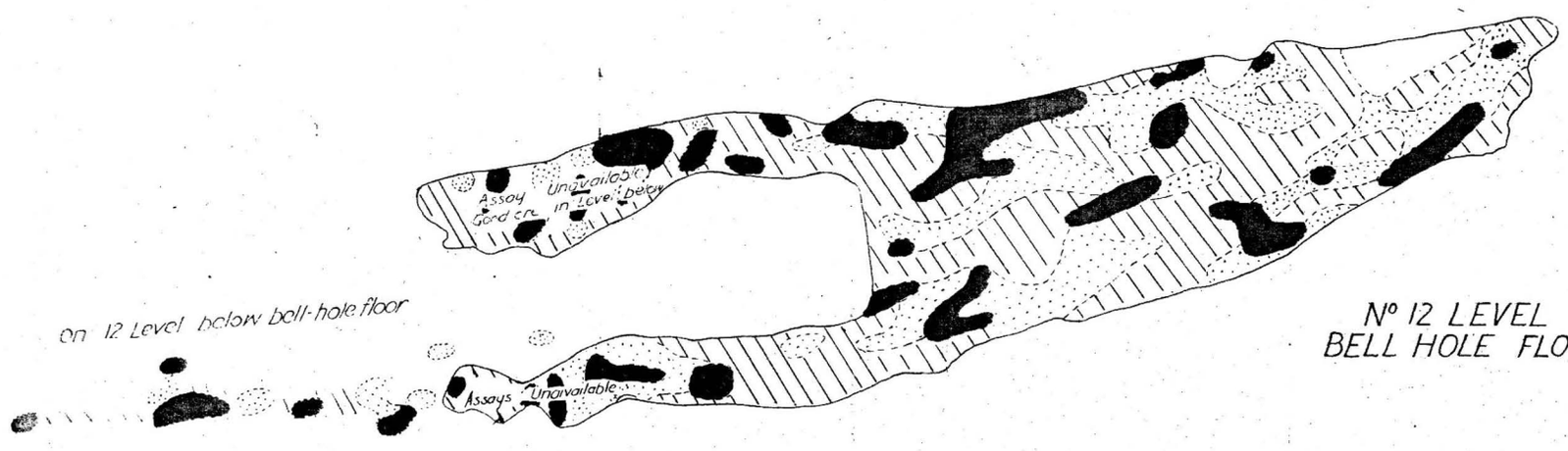


N° 11 LEVEL
BELL HOLE FLOOR



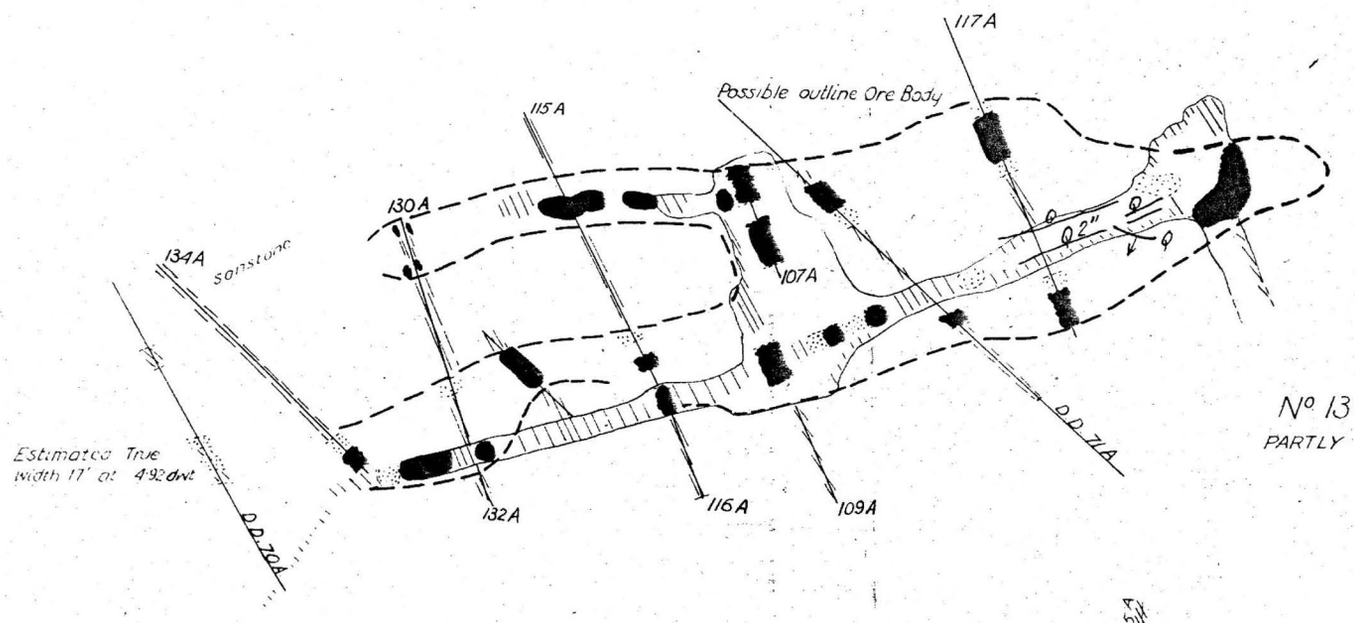
100W

Photograph of thin section of ore oriented in horizontal plane showing developement of cleavage in direction of conjugate shearing



N° 12 LEVEL
BELL HOLE FLOOR

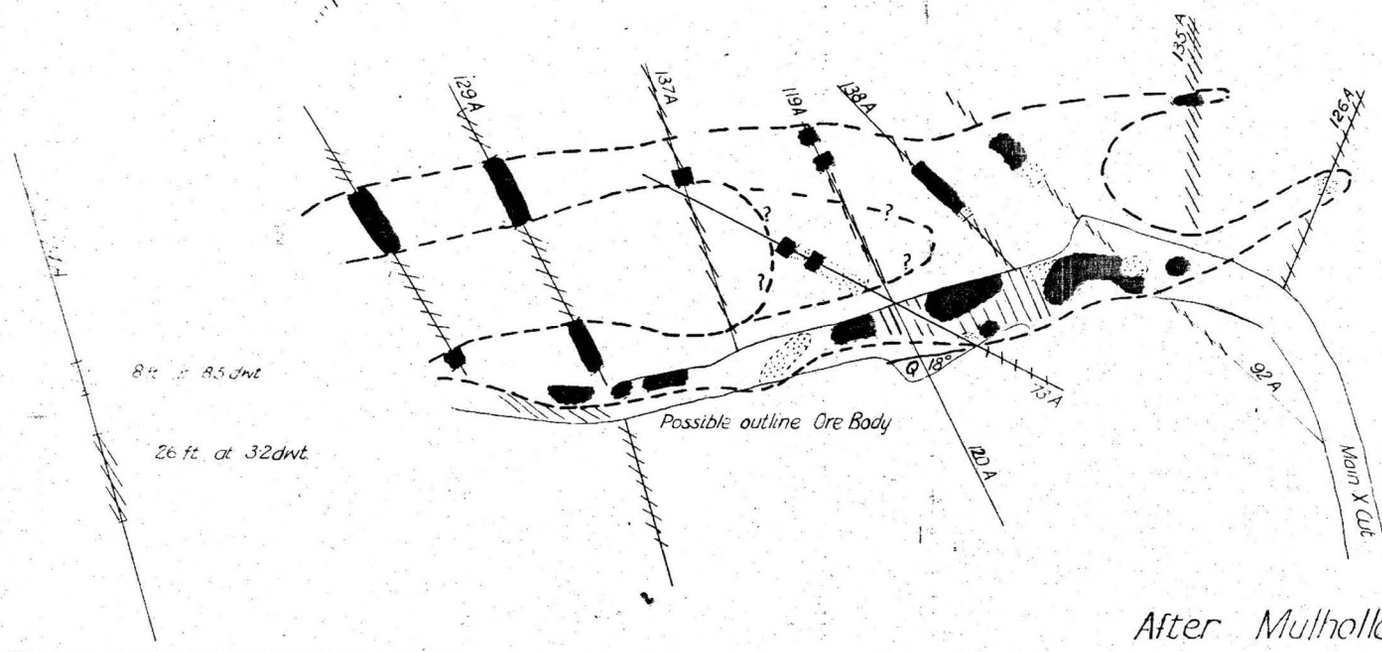
200N



100W

N° 13 LEVEL
PARTLY DEVELOPED

200W



700N

100N

200N

N° 14 LEVEL
PARTLY DEVELOPED

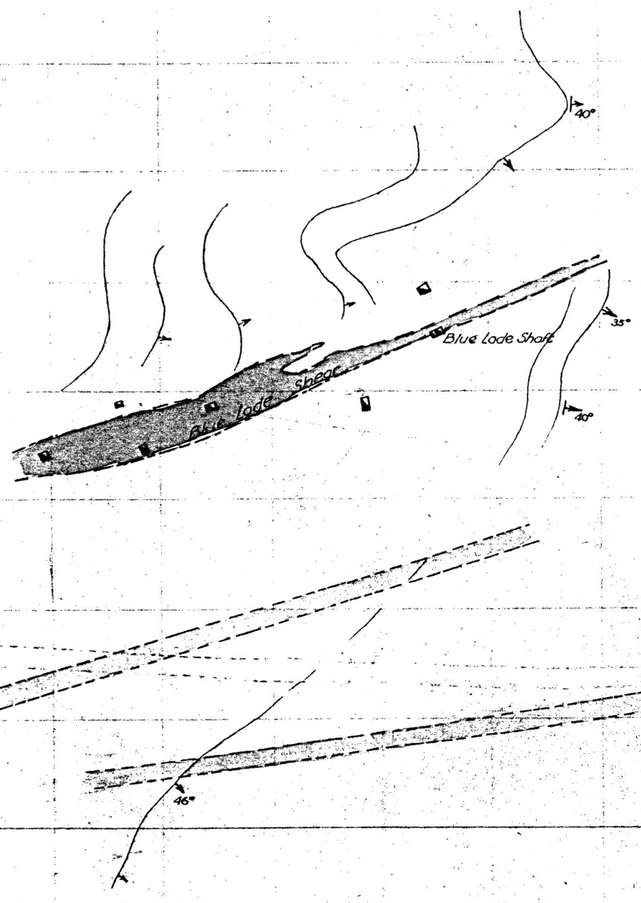
NEW OCCIDENTAL MINE

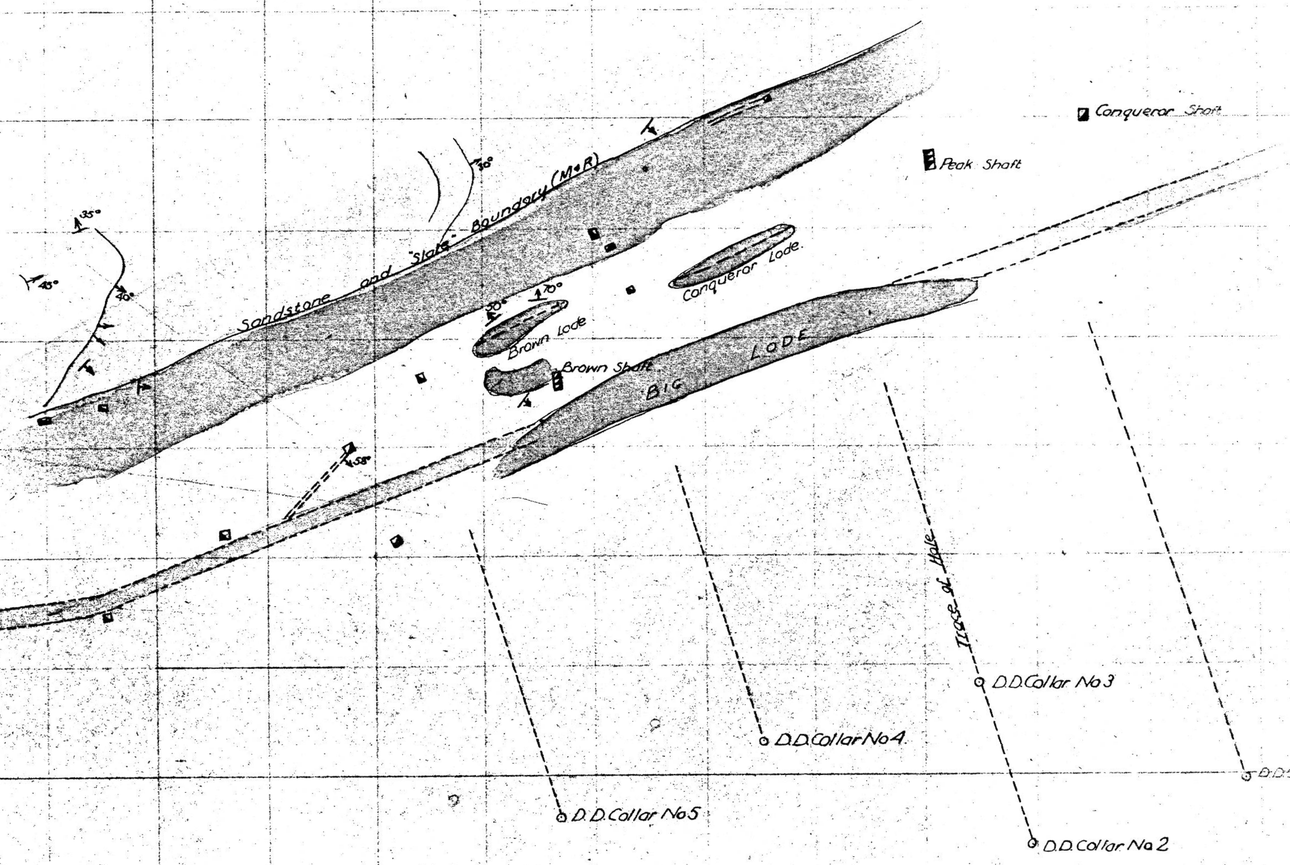
PLAN OF LOWER LEVELS SHOWING ORE DISTRIBUTION

0 20 40 80 ft.

- + 10 dwt Ore by Assay
- 6 - 10 dwt
- Tr - 6 dwt
- DD — Diamond Drill Hole
- 75° Cleavage
- 80° Bedding
- Joints
- 70° Striae Pitch
- Q Zones of Strong Quartz Veins

After Mulholland and Rayner (NSWGS)


40°
Blue Lode Shaft
Blue Lode Shear
35°
40°
46°


Conqueror Shaft
Peak Shaft
Sandstone and "Slate" Boundary (M°R)
35°
45°
30°
70°
Conqueror Lode
Brown Lode
Brown Shaft
B.C. LODE
58°
Trace of Hole
D.D.Collar No 3
D.D.Collar No 4
D.D.Collar No 5
D.D.Collar No 2
D.D.Collar No 1


500N
400N
300N
200N
100N
0
100S
200S
300S
400S
500S
600S
700S
800S
900S
1000S

Pl 0-21

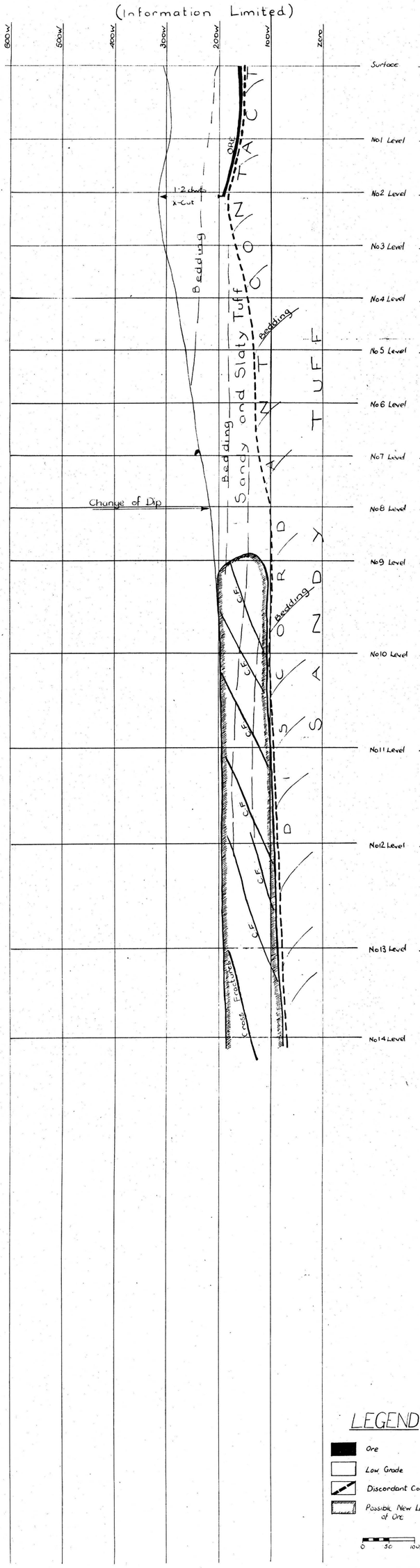
NEW OCCIDENTAL MINE

Geol
13 JU
LIBRARY

E-W PROJECTION AT 700N

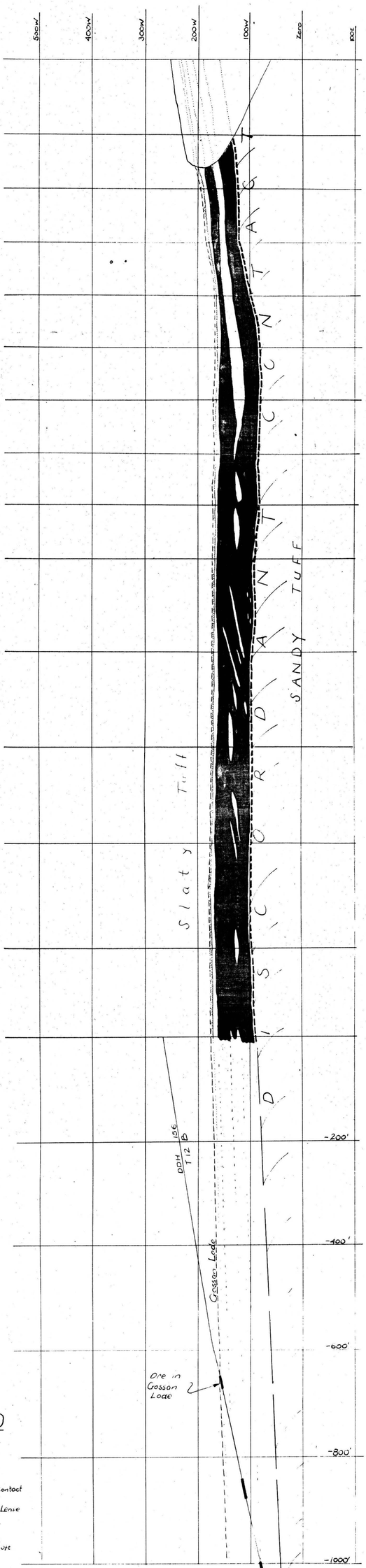
SHOWING POSSIBLE NEW OREBODY

(Information Limited)



E-W PROJECTION AT 200N

SHOWING MAIN OREBODY



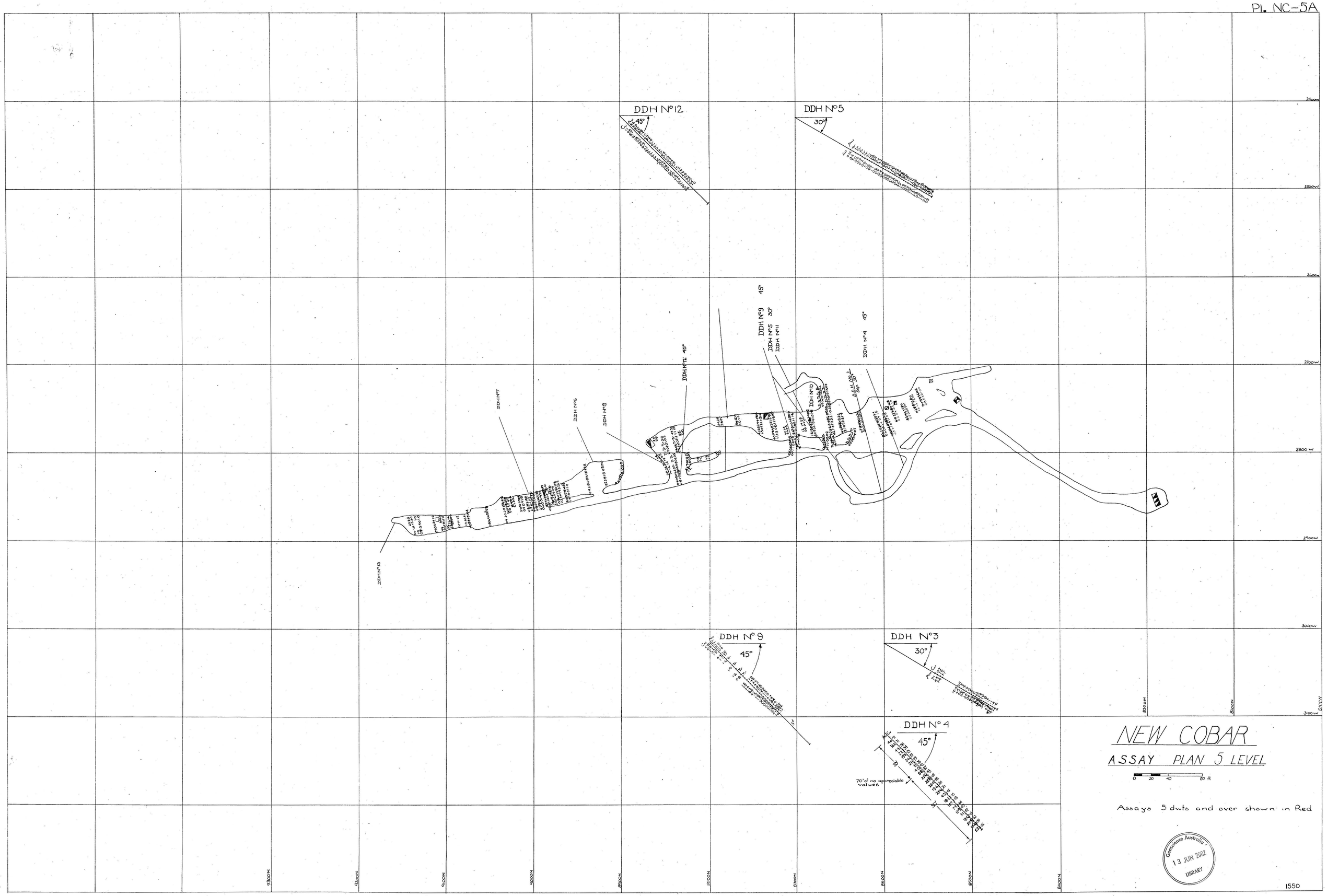
LEGEND

- Ore
- Low Grade
- Discordant Contact
- Possible New Lense of Ore

0 30 100ft

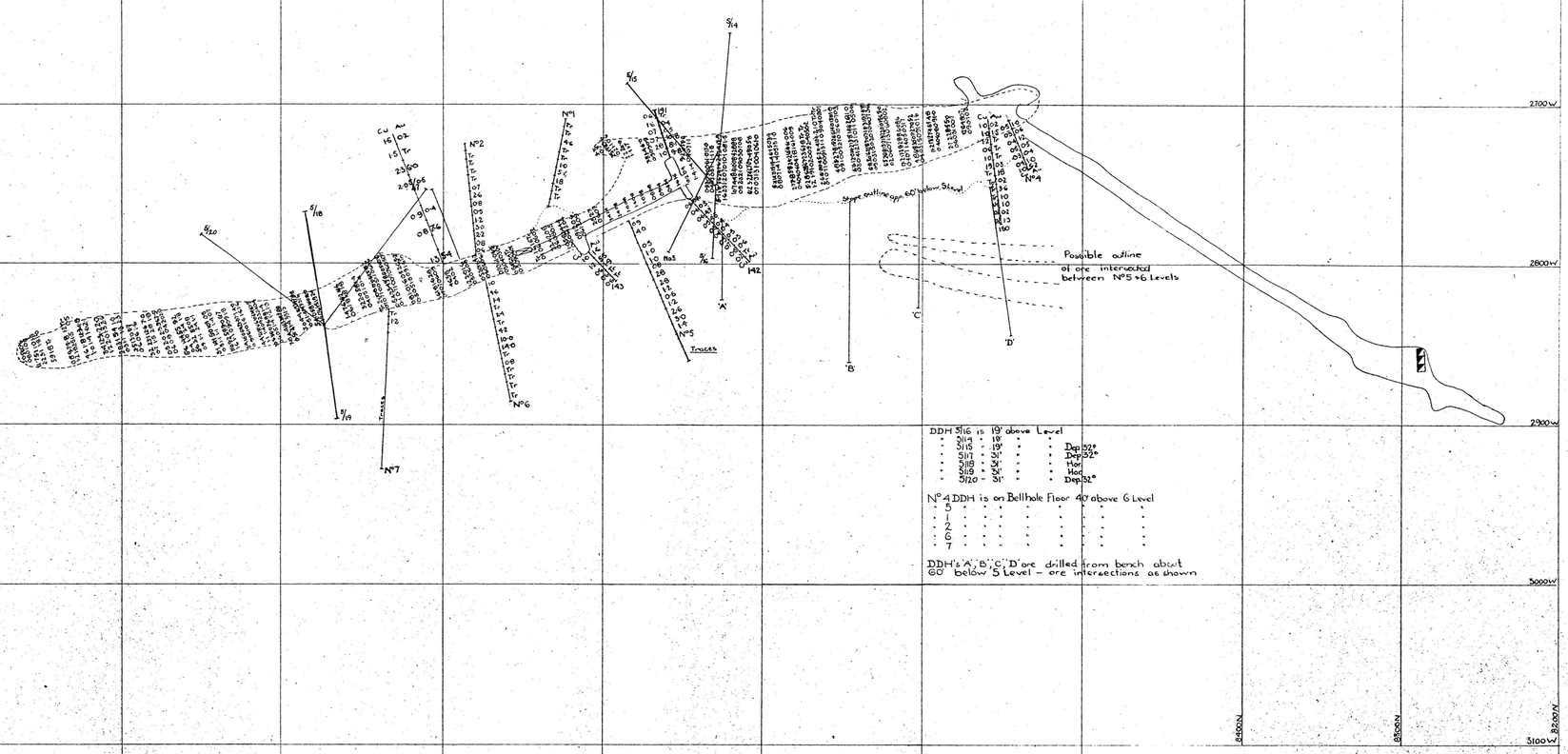
1509

Pl. NC-5A



Geoscience Australia
13 JUN 2002
LIBRARY

1550



NEW COBAR

ASSAY PLAN 6 LEVEL

Scale 40ft-1inch

Assays 5dwts and above shown in red

Geoscience Australia
13 JUN 2002
LIBRARY

PL. NC-7A

Backs slope 100ft above No7 Level

Backs Bell hole Floor about 40' above 7 Level

Backs South Slope No7 Level Bell hole Floor about 40' above Level

No1 Sublevel 38' below No7 Level

No2 Sublevel 80'bdow No7 Level

NEW COBAR

ASSAY PLAN 7 LEVEL

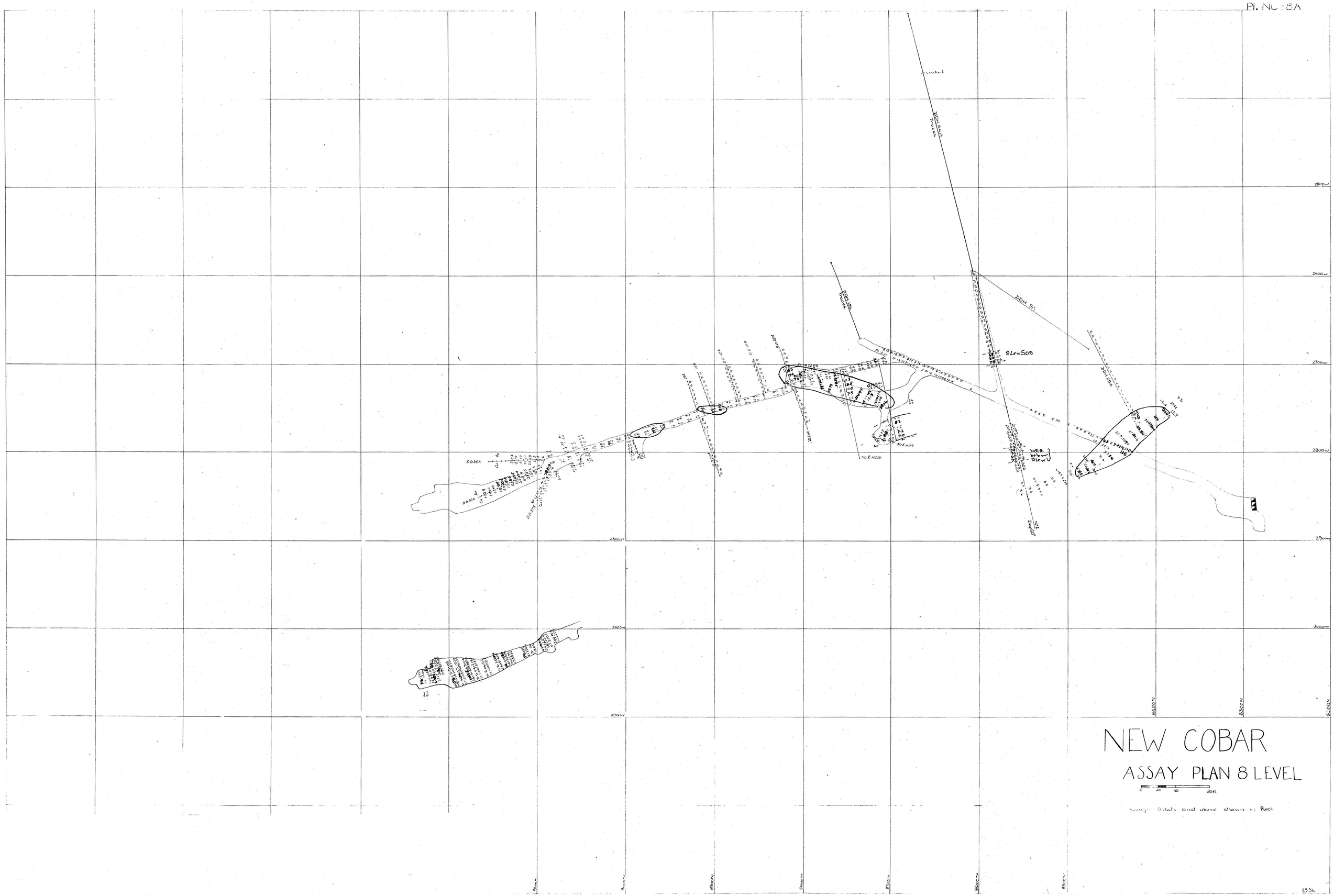
0 20 40 80 ft

Assays 5 dwts. and above shown in Red

Geoscience Australia
13 JUN 2002
LIBRARY

1554

Pl. NC-8A



NEW COBAR

ASSAY PLAN 8 LEVEL

0 20 40 80ft

Assays 5 dwts and above shown in Red.

2600W

2700W

2800W

2900W

3000W

8400N

8300N

3100W

8200N

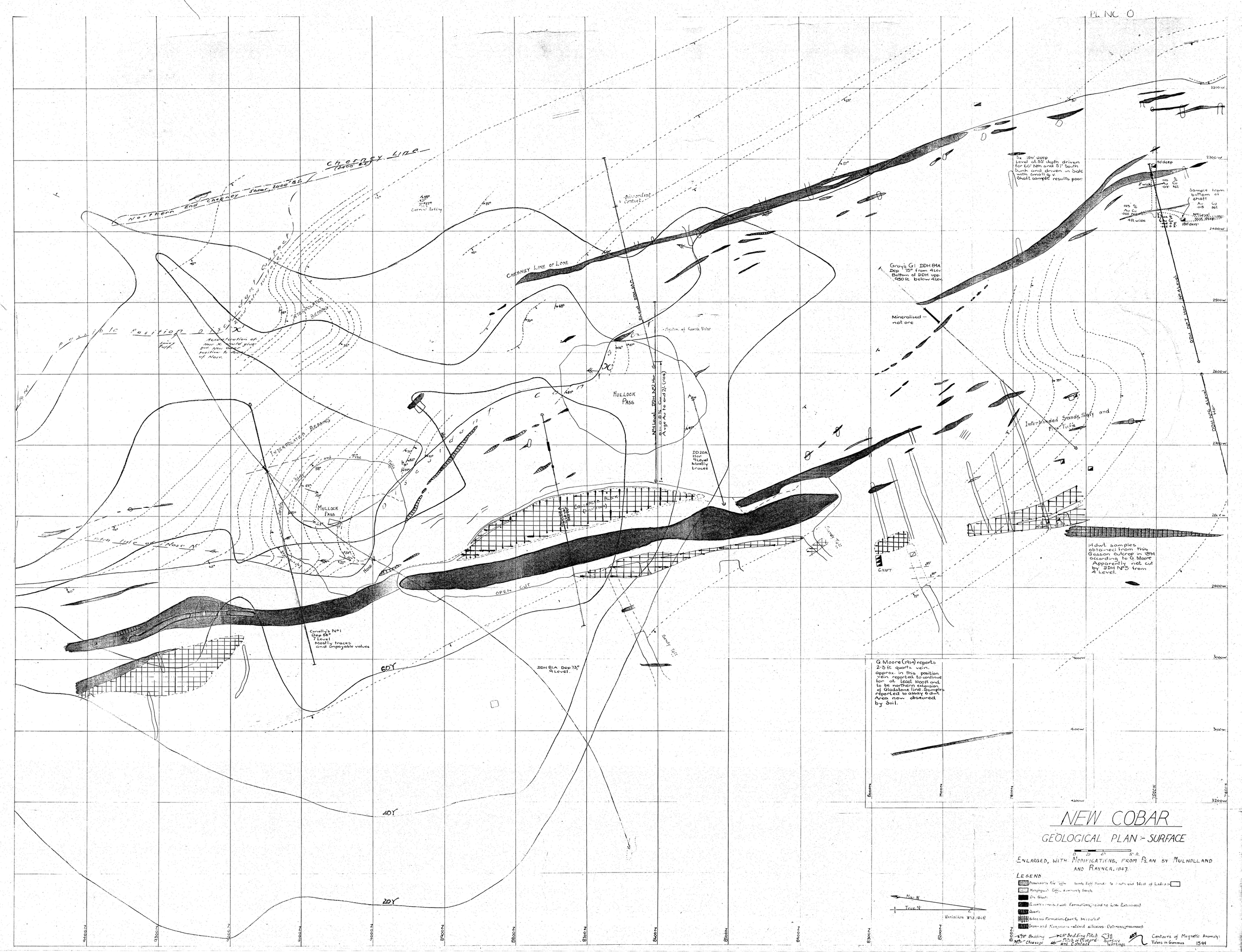
8500N

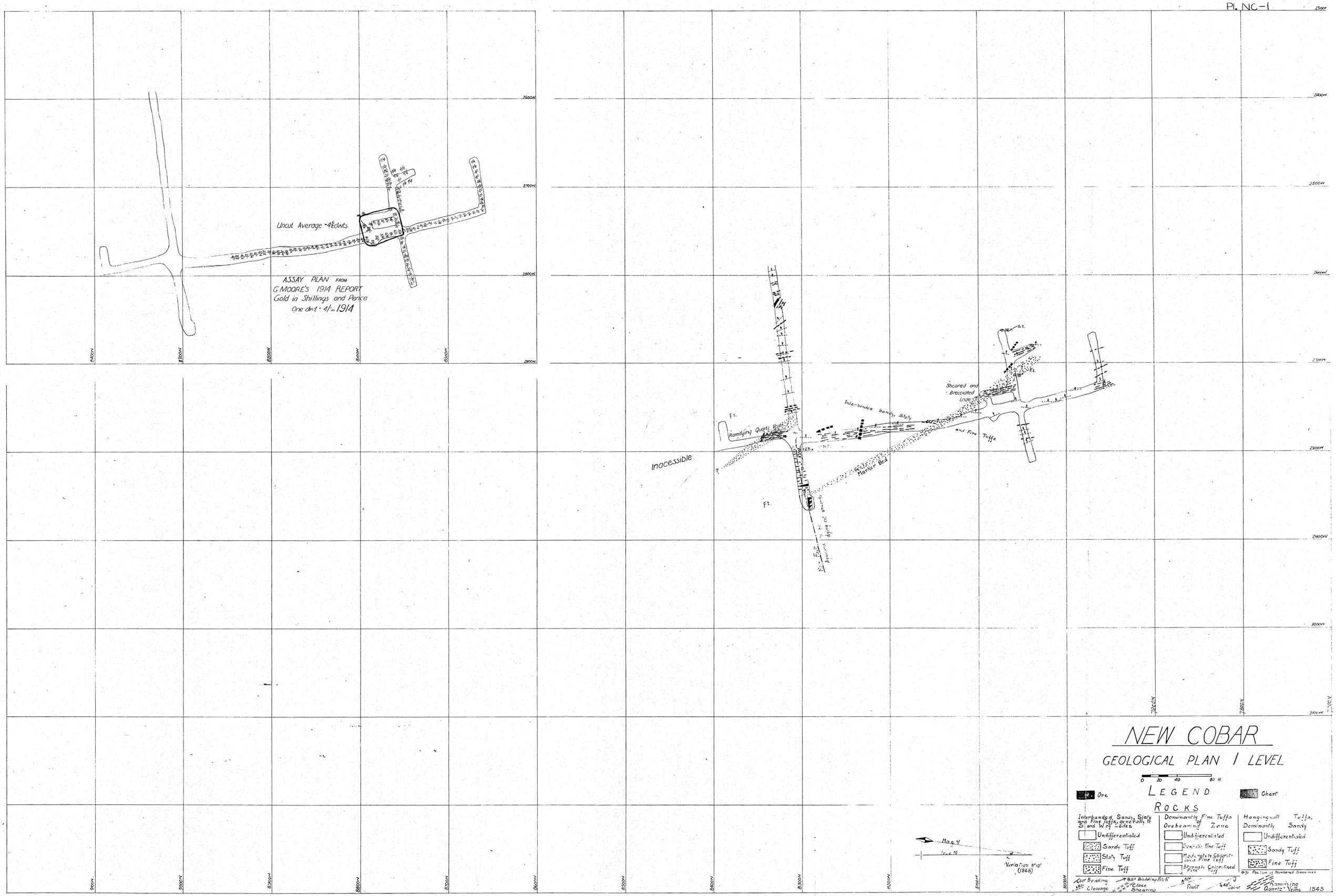
NEW COBAR

ASSAY PLAN 9 LEVEL

0 20 40 80ft

Assays 5 dwts. and above shown in Red.


PL. NO. 0
Chesney Line
Northern End Chesney Shear 2400 B.S.
Chesney Line of Lode
Discordant Contact
Interpolated Bedding
Mullock Pass
Open Cut
Conolly's No 1 Dep 58° 7 Level Mostly traces and unpayable values
DDH 81A Dep 73° 9 Level.
DD 20A Hor 9 Level Mostly traces
Gray's G1 DDH 84A Dep 75° from 4 Lev Bottom of DDH upp. 950 ft below 4 Lev
Mineralised — not ore
Interbanded Sandy, Slaty and Fine Tuffs
Sample from bottom of shaft
Sandy Tuff
Shaft
14 dwt samples obtained from this Gossan outcrop in 1894 according to G. Moore Apparently not cut by DDH No 5 from 4 Level.
G. Moore (1914) reports 2-3 ft quartz vein. approx. in this position vein reported to continue for at least 1000 ft and to be northern extension of Gladstone line. Samples reported to assay 6 dwt Area now obscured by Soil.
60Y
40Y
20Y
NEW COBAR
GEOLOGICAL PLAN - SURFACE
ENLARGED, WITH MODIFICATIONS, FROM PLAN BY MULHOLLAND AND RAYNER, 1947.
LEGEND
Quartz
Silicous Formations (partly brecciated)
Iron and Manganese-stained siliceous Outcrops (gossanous)
Contours of Magnetic Anomaly: Values in Gammas 1544
Mag. N
True N
Variation 8°13' (1945)


Uncut Average - 4½ dwts
ASSAY PLAN FROM
G MOORE'S 1914 REPORT
Gold in Shillings and Pence
One dwt = 4/- 1914
Inacessible
Ramifying Quartz Veins
Interbanded Sandy, Slaty and Fine Tuffs
Shcared and Brecciated Lode
Marker Bed
Ft.
Mag. N
True N
Variation 8°10' (1946)
NEW COBAR
GEOLOGICAL PLAN 1 LEVEL
0 20 40 80 ft.
LEGEND
Ore
Chert
ROCKS
Interbanded Sandy, Slaty and Fine Tuffs, generally to S and W of Lodes
Undifferentiated
Sandy Tuff
Slaty Tuff
Fine Tuff
Dominantly Fine Tuffs of Orebearing Zone
Undifferentiated
Sericitic Fine Tuff
Moderately Chloritised Fine Tuff
Strongly Chloritised Fine Tuff
Hangingwall Tuffs, Dominantly Sandy
Undifferentiated
Sandy Tuff
Fine Tuff
Position of Numbered Specimen
Bedding
Cleavage
Bedding Pitch
Close Shearing
Fault
Joint
Ramifying Quartz Veins
1545

CHESNEY LINE OF LODE

PROJECTED FROM SURFACE

H.W. Tuffs

Surface

Projected from Surface Contact

H.W. Tuffs

Nest

Ft.

Outline of 100ft level

Ore Outlines from Mulholland and Rayner's Report

Ft.

Ft.

Inaccessible Course

Interbanded Sandy Silts and Firm Turfs

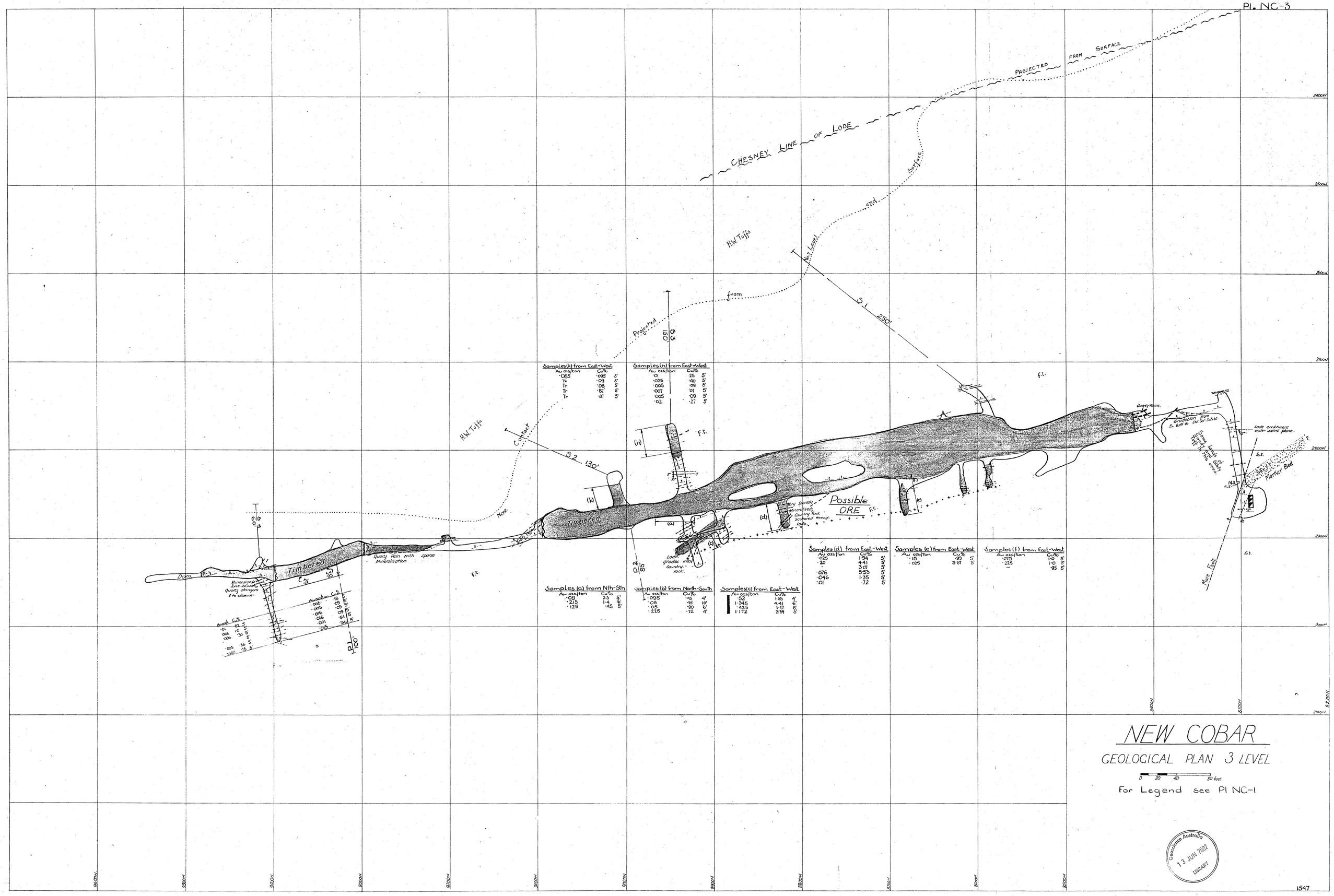
Quartzite

Sheared

Ft.

Ft.

Ft.



Samples (k) from East-West

Au ozs/ton	Cu%	
·085	·095	5'
Tr	·09	5'
Tr	·08	5'
Tr	·87	5'
Tr	·81	5'

Samples (h) from East-West

Au ozs/ton	Cu%	
·01	·25	5'
·025	·40	5'
·005	·09	5'
·007	·07	5'
·005	·09	5'
·02	·27	5'

Samples (d) from East-West

Au ozs/ton	Cu%	
·025	1·94	5'
·20	4·41	5'
–	3·07	5'
·076	5·53	5'
·046	1·35	5'
·01	·72	5'

Samples (e) from East-West

Au ozs/ton	Cu%	
·15	·99	5'
·025	3·37	5'

Samples (f) from East-West

Au ozs/ton	Cu%	
·075	1·0	5'
·225	1·0	5'
–	·95	5'

Samples (a) from Nth-Sth

Au ozs/ton	Cu%	
·08	2·3	5'
·215	1·4	6'
·125	·45	5'

Samples (b) from North-South

Au ozs/ton	Cu%	
·095	·45	4'
·08	·45	10'
·05	·90	6'
·225	·72	4'

Samples (c) from East-West

Au ozs/ton	Cu%	
·52	1·35	4'
1·345	4·41	6'
·425	1·17	5'
1·172	2·34	5'

NEW COBAR

GEOLOGICAL PLAN 3 LEVEL

0 20 40 80 feet

For Legend see Pl NC-1

Geoscience Australia
13 JUN 2002
LIBRARY

1547

CHESNEY LINE OF LODE

PROJECTED FROM SURFACE

TIMBERED

H.W. Tuffs

Surface

and

No.7 Level

from

Projected

Contour

H.W. Tuffs

Crosscut partly filled and not accessible – Lode channel indicated appears to extend some distance beyond point indicated

Lode appears to widen on Strike

Samples (d)

Samples (a)

Samples (b)

Samples (c)

F.f.

DDH No 1

DDH No 2

DDH No 3 Length uncertain

DDH No 4 Probable position

Avge Au to end 2/-(1914)

St

Low Values

Cu values 01-0.8%

Side and frequent quartz leaders

DDH No?
low Values

Gold 1/9-2/- from G. Moore's report (1914) 01-0.6% Cu

No available information - not likely to have cut further western bodies Au 1/9 - 2/- per ton (1914)

No information - Length uncertain - not likely to have cut western bodies

Samples (d) from west to East

Au ozs/ton	Cu %	
.025	.09	4'
.025	.14	4'
.025	.008	4'
.010	.09	4'

Samples (a) from E to W

Au ozs/ton	Cu %	
.085	.28	4'
.025	.24	4'
.020	.64	4'

Samples (b)

Au ozs/ton	Cu %	
.09	.67	6'

Samples (c) from E to W

Au ozs/ton	Cu %	
.04	.21	-
.175	.90	-
.02	.23	-
.25	.83	5'
.31	1.70	5'

Gray's G1 DDH81A
Dip -75°

Mineralised formation
Avge Values Au Tr
Cu 0.6
Max Values Au Tr
Cu 1.9
Bottom of hole about 950 ft below 4 Level

Au 66/-
Cu 0.18% } 264'
Au 81-
Cu 0.24% } 266'
according to G. Moore's report (1914)

To contact

280'

P.3 cut

Z.N. HADE

Sandy Tuffs

Two vert. samples on west wall of drive
Au 007ozs 005ozs
Cu Nil Nil

No records available

Some Bands of Sandy Tuff

Au 19ozs
Cu 1.26%

Au 08ozs
Cu 38%

Slate and Fine

Slaty

CHERTY

80°

85° Main Fault

Interbanded

DDH No 5

FeS2 bands
Au 015ozs

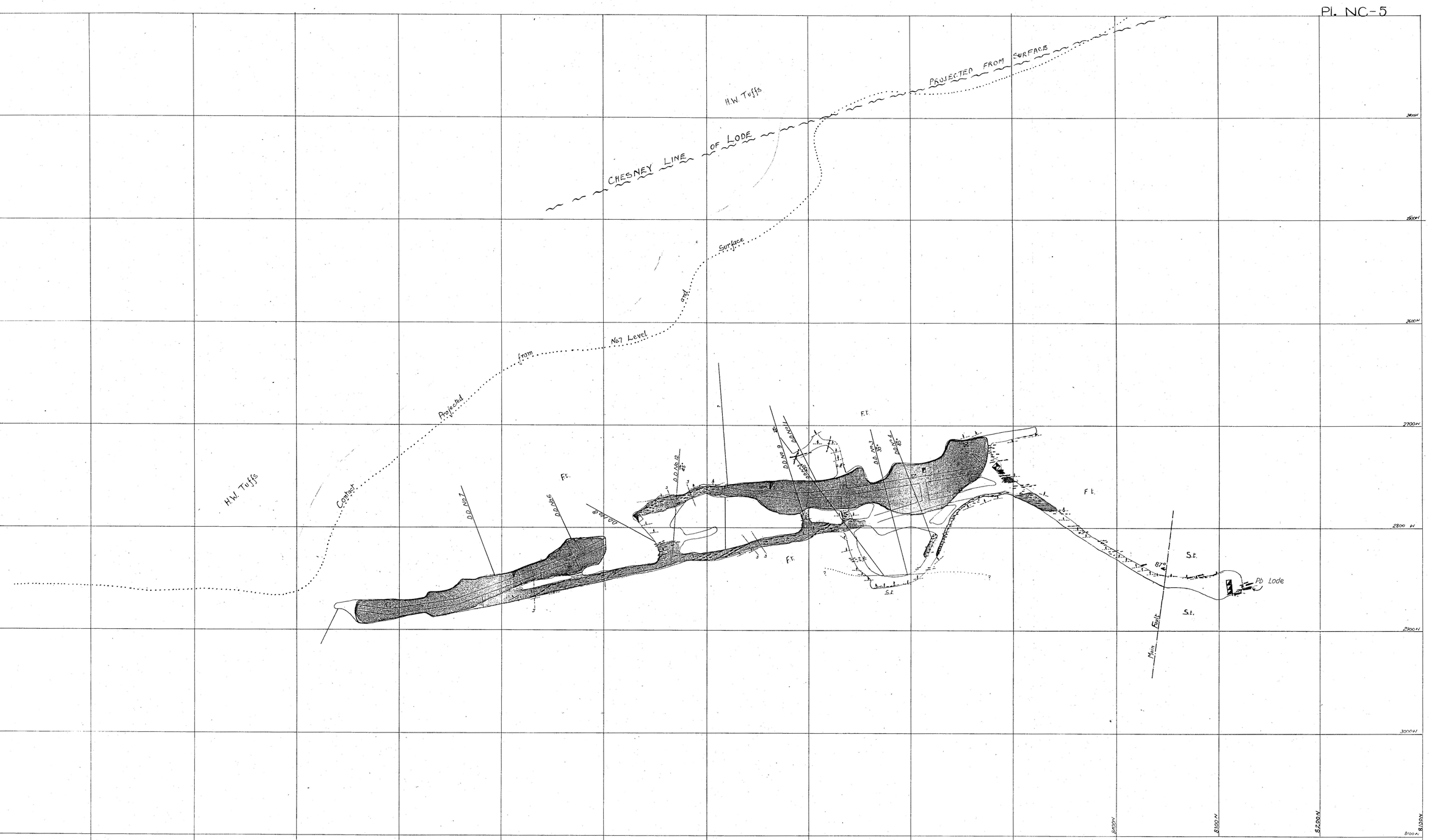
NEW COBAR

GEOLOGICAL PLAN 4 LEVEL

0 20 40 80 ft

For Legend see Pl NC-1

Geoscience Australia
13 JUN 2002
LIBRARY



NEW COBAR

GEOLOGICAL PLAN 5 LEVEL

0 20 40 80 ft

For Legend see Pl NC-1

Geoscience Australia
13 JUN 2012
LIBRARY

NEW COBAR

GEOLOGICAL PLAN 6 LEVEL

0 10 20 30 40 80 Feet

For Legend see Pl. NC-1

Geoscience Australia
13 JUN 2002
LIBRARY

NEW COBAR

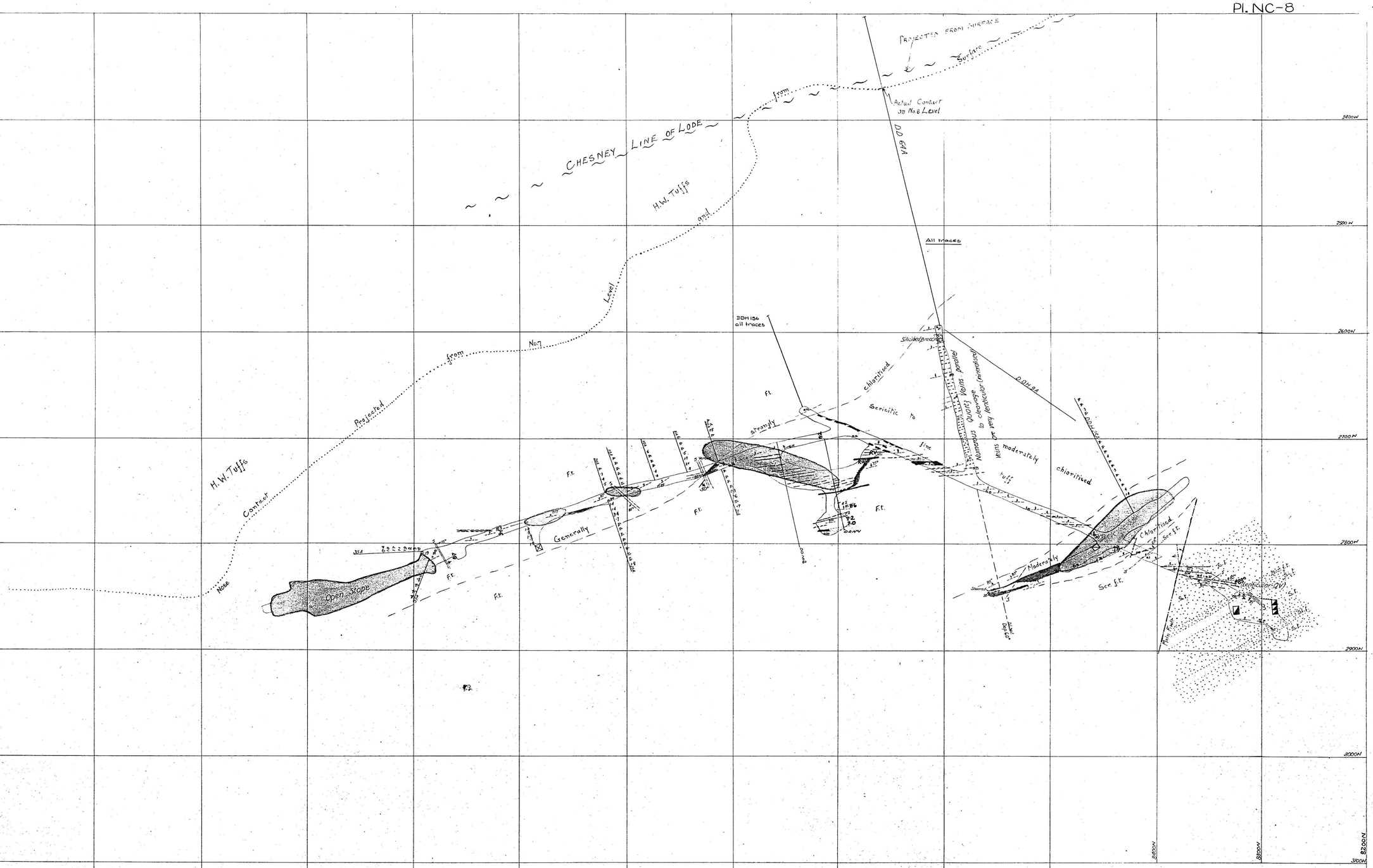
GEOLOGICAL PLAN 7 LEVEL

0 20 40 80 ft.

For Legend see Pl. NC-1

Geoscience Australia
13 JUN 2002
LIBRARY

1553



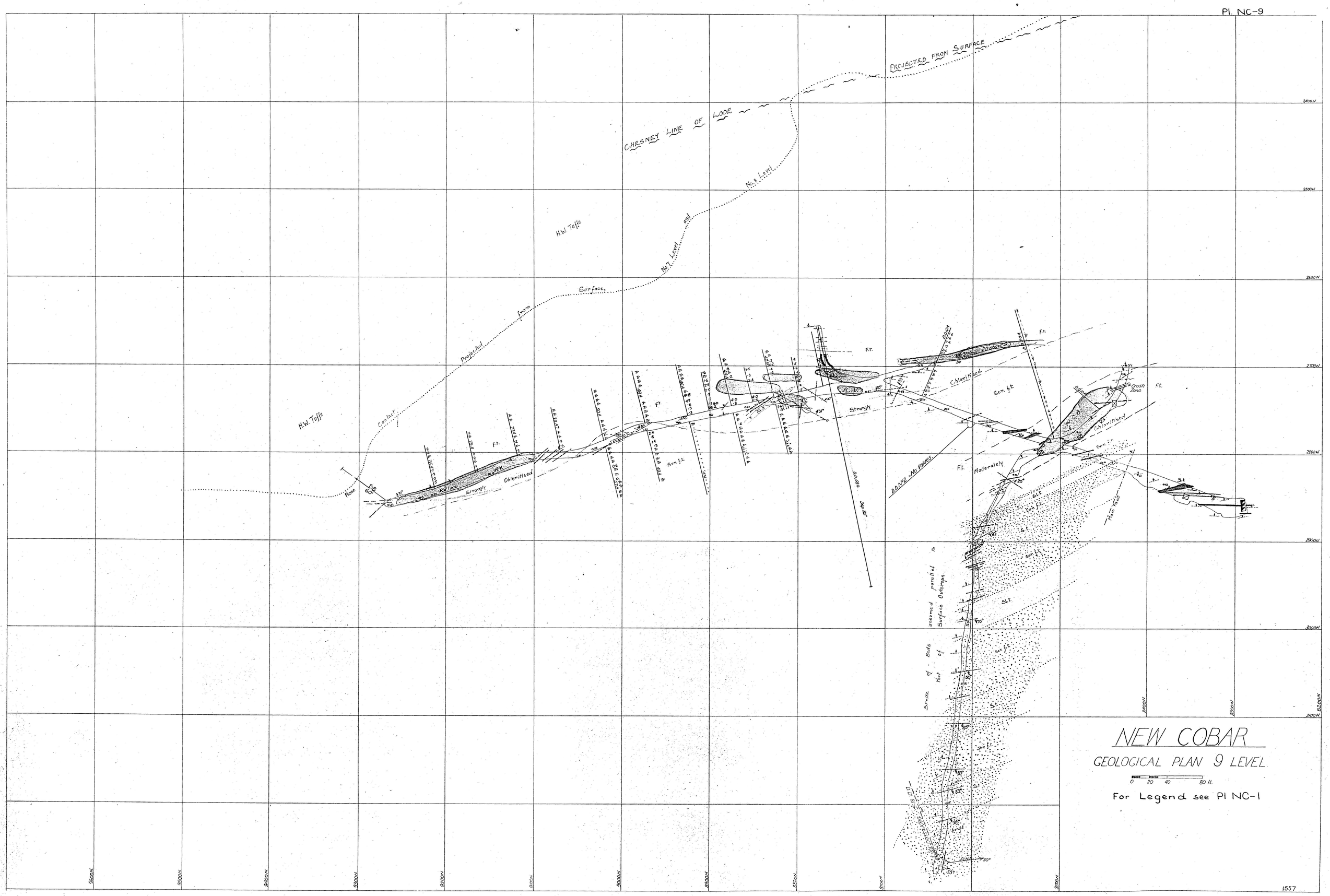
NEW COBAR

GEOLOGICAL PLAN 8 LEVEL

0 20 40 80 ft.

For Legend see Pl. NC-1

1555



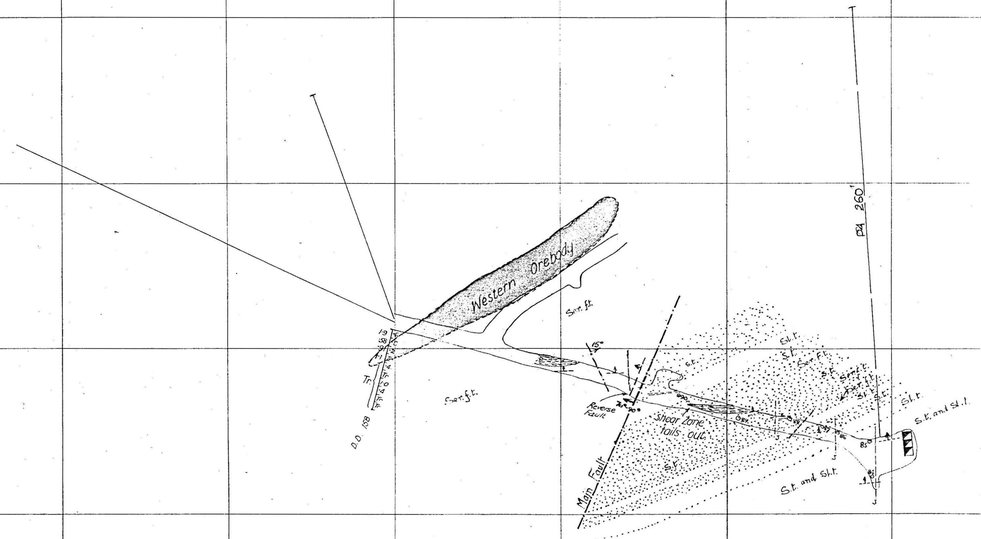
NEW COBAR

GEOLOGICAL PLAN 9 LEVEL

0 20 40 80 ft.

For Legend see Pl NC-1

1557


Western Orebody
Surf.ft.
15°
Surf.ft.
Reverse fault
Shear zone tails out
Main Fault
Surf.ft.
Surf.ft.
Surf.ft.
Surf.ft.
S.t. and Gl.r.
S.t. and Gl.r.
S.t. and Gl.r.
S.t.
Gl.r.
Gl.r.
Gl.r

Mullock Pass

Main Shaft

Footwall of Open Cut

No 1 Level

No 2 Level

No 3 Level

No 4 Level

No 5 Level

No 6 Level

No 7 Level

No 8 Level

No 9 Level

No 10 Level

Stoped. NO Assay Information

H.W. TUFFS

NORTH FINE TUFFS

PITCHING

BEDDING PITCHES SOUTH

CONTACT

PREDOMINANTLY SANDY TUFFS IN NOSE OF DISCORDANT FOLD

HANGING WALL TUFFS IN POSITION OF NOSE PROJECTED

BEDDING PITCHES SOUTH

H.W. TUFFS

FINE TUFFS

Position of contact with plane of Main Lode projected up Western Ore Body and projected Southern end of Western Ore Body

Position of contact of sands and fine tuffs relative to Southern end of Western Ore Body

Approximate intersection of contact with plane of Main Lode

MAIN FAULT

Service Fine Tuff

Marker Bed

MAIN FAULT

SANDY TUFFS MAINLY

WESTERN ORE BODY

Direct Projection
(Not along strike)

Projected 8 ft wide

D.D.H. 81A

54 dwts.
/85
32

Position of Nose interpolated from Intersection of NW-SE Contact by D.D.H. 81A. See Surface Plan.

Probable H.W. Tuffs near End of Hole(1575') at 1285' vertically below 9 Level.

JUBILEE

COPPER SHOOT

N

N

N

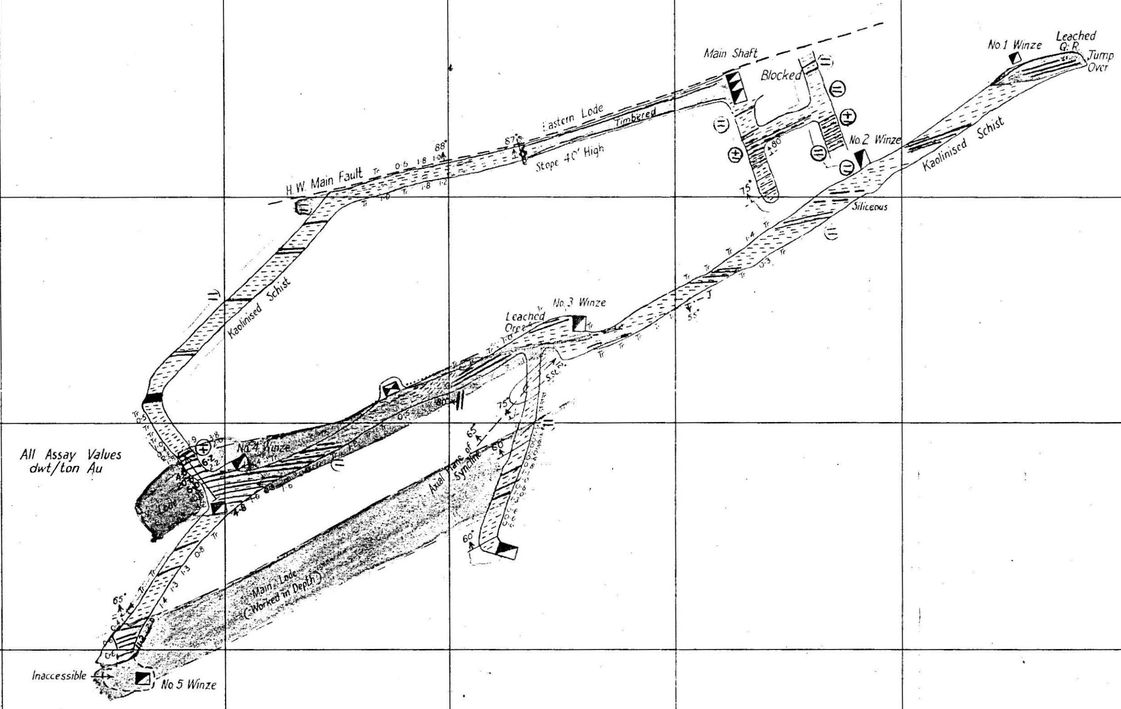
NEW COBAR MINE

Projection on vertical plane striking N55°E through 8300N, 2900W showing deflection and enrichment of orebodies on passing from sandy tuff to fine tuff, and change in dip of Main Orebody below No 6 Level accompanied by fall in grade. SCALE 1" = 60ft.

Pl. C-1

1300W 1400W 1500W 1600W 1700W 1800W 1900W 2000W 2100W

6900N 6800N 6700N 6600N 6500N 6400N 6300N 6200N 6100N 6000N 5900N 5800N



CHESNEY MINE

PLAN OF No 1 LEVEL

LEGEND

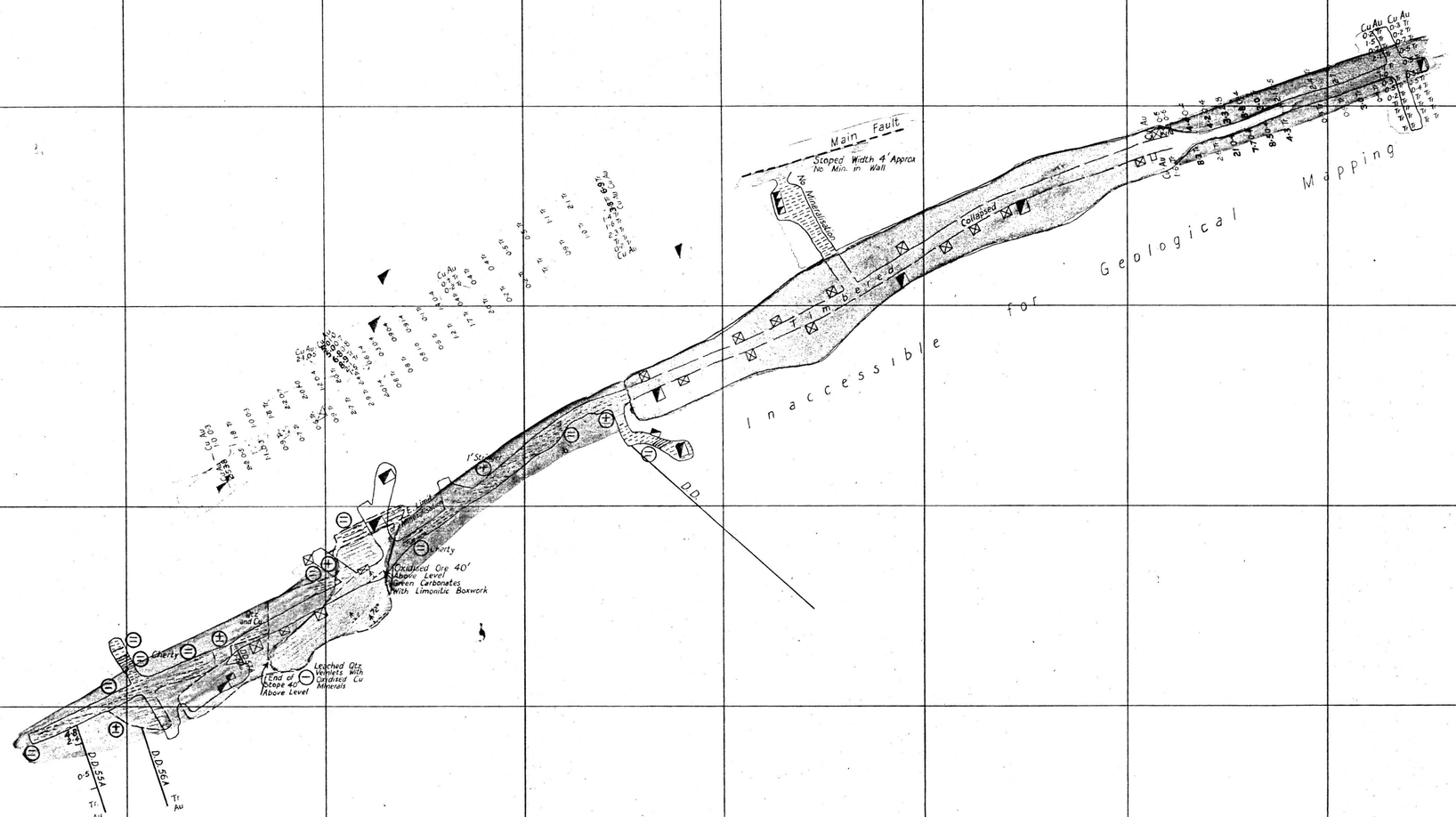
- Ore
- Unpayable lode, chert
- Sandstone
- Chlorite sericite schist
- Slate
- Major faults
- Bedding
- Cleavage
- Joints
- Shears
- Dip of lode
- Quartz veins
- Pitch of striae across plane of movement
- Pitch of country relative to shearing and cleavage
- (+ Strong mineralisation
- (± Moderate mineralisation
- (- Weak mineralisation
- (n. Very weak mineralisation

Scale 1" = 40'

0 40 80ft

1524

Pl. C-2



1300W
1400W
1500W
1600W
1700W
1800W
1900W
2000W
2100W

5900N
5800N
6000N
6100N
6200N
6300N
6400N
6500N
6600N
6700N
6800N
6900N

CHESNEY MINE
PLAN OF No 2 LEVEL

For **LEGEND** see Pl. C-1

Geoscience Australia
13 JUN 2002
LIBRARY

Scale 1" = 40'
0 40 80ft

1525

Pl. C-3

1300W

1400W

1500W

1600W

1700W

1800W

1900W

2000W

2100W

5900N

6000N

6100N

6200N

6300N

6400N

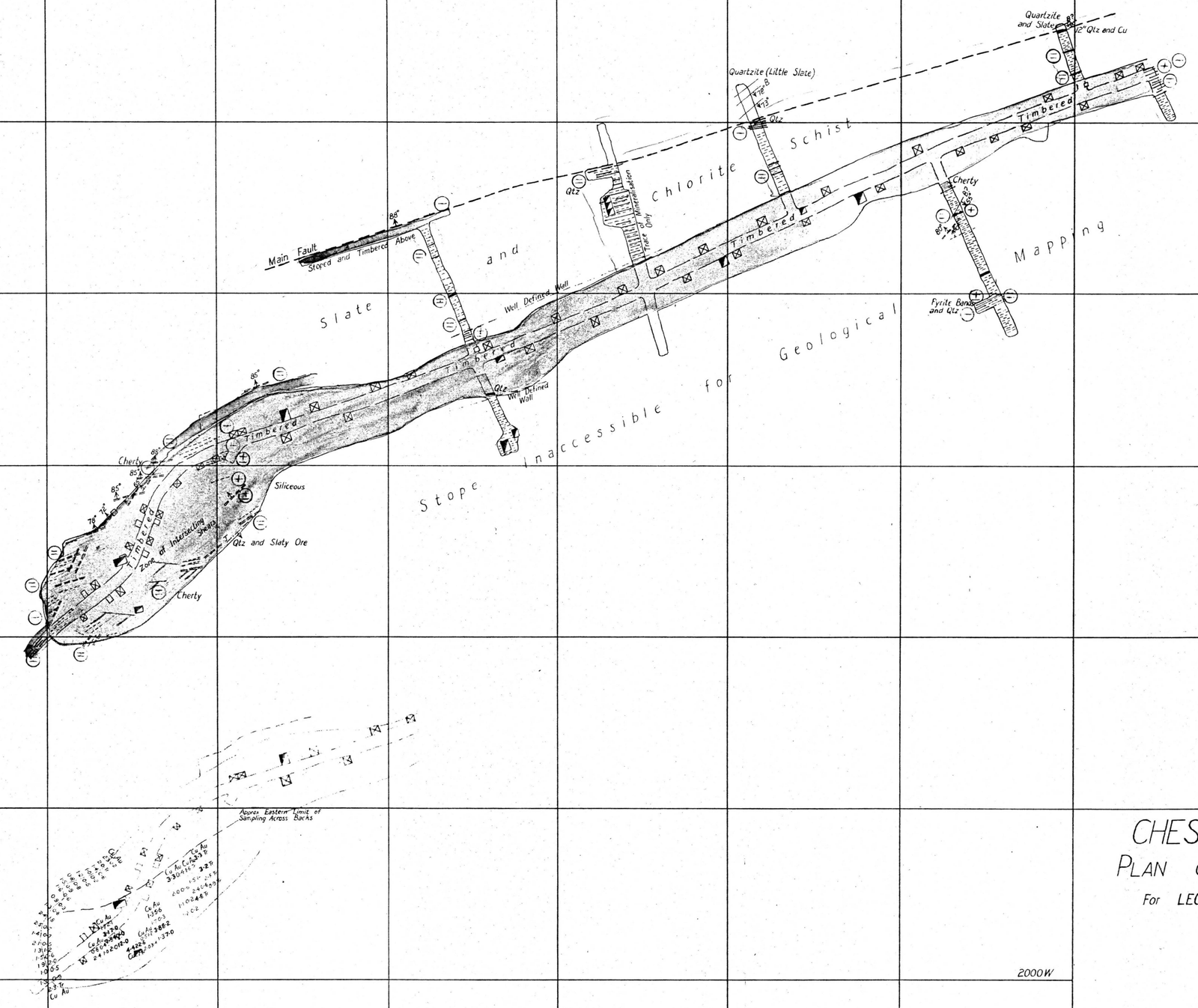
6500N

6600N

6700N

6800N

6900N



CHESNEY MINE

PLAN OF No 3 LEVEL

For LEGEND see Pl. C-1

Scale 1" = 40'

0 40 80ft

1526

Pl. C-4

1300W

1400W

1500W

1600W

1700W

1800W

1900W

2000W

2100W

6900N

6800N

6700N

6600N

6500N

6400N

6300N

6200N

6100N

6000N

5900N

5800N

Reference Plane

For Continuation See Inset "A"

Timbered

Inaccessible for Geological Mapping

Stope

Strike Show The Move of E. W.

Numerous Shears Striking 130°-140° Intersect Normal Shears Striking 160°-170°

T.P.2

T.P.3

See Inset "B"

Stringers

INSET "A"

DETAIL SECTION AT X (Looking W.)

INSET "B"

CHESNEY MINE

PLAN OF No 4 LEVEL

For LEGEND see Pl. C-1

Scale 1" = 40'

0 40 80 ft

1527

Pl. C-5

1300 W

1400 W

1500 W

1600 W

1700 W

1800 W

1900 W

2000 W

2100 W

5900 N

5800 N

6900 N

6800 N

6700 N

6600 N

6500 N

6400 N

6300 N

6200 N

6100 N

6000 N

Reference Plane

Sandy Slate

Flat Jointing From Dip 20°S

South Drive Inaccessible No Plan Available

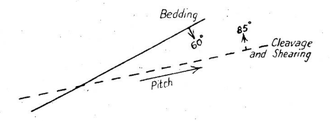
Timbered Above — Not Mapped

Geological Mapping for Stope Inaccessible

Northern Gold Pipe

Intersecting Shear Planes

DIAGRAM SHOWING GENERAL RELATIONSHIP OF BEDDING AND FRACTURE CLEAVAGE



CHESNEY MINE

PLAN OF No 5 LEVEL

For LEGEND see Pl. C-1

Scale 1" = 40'

0 40 80ft

1528

1300W 1400W 1500W 1600W 1700W 1800W 1900W 2000W 2100W

6100N 6000N 5900N 5800N 6700N 6600N 6500N 6400N 6300N 6200N

Reference Plane

F Projected Position Hanging East Wall Lode (Main) Fault (Tight Structure)

Bedding

Quartzite

F

Zone of Conjugate Shearing Commencing Between Nos 5 and 6 Levels

Timbered

Southern Gold – Copper Shoot
North Pitching Ore Pipe on Intersection of Conjugate Shears with Chesney Shear

Zone of Conjugate Shearing Commencing Between Nos 7 and 8 Levels?

Timbered end

Stopes (Inaccessible)

Strike of Main Chesney Shear (1% to 2·5% Cu Mineralisation)

F?

Qtz in Wall

Qtz V.

Northern Gold – Copper Shoot
North Pitching Ore Pipe on Intersection of Conjugate Shears with Chesney Shear

Much Sub-Horizontal Jointing

Inaccessible Owing to Fall of Roof

DD55A

Assay values plotted from rough compass survey supplied by N.O.G.M.N.L.



Photograph of thin section of ore, oriented in horizontal plane, showing development of cleavage in direction of conjugate shearing and main shearing direction.

CHESNEY MINE PLAN OF No6 LEVEL

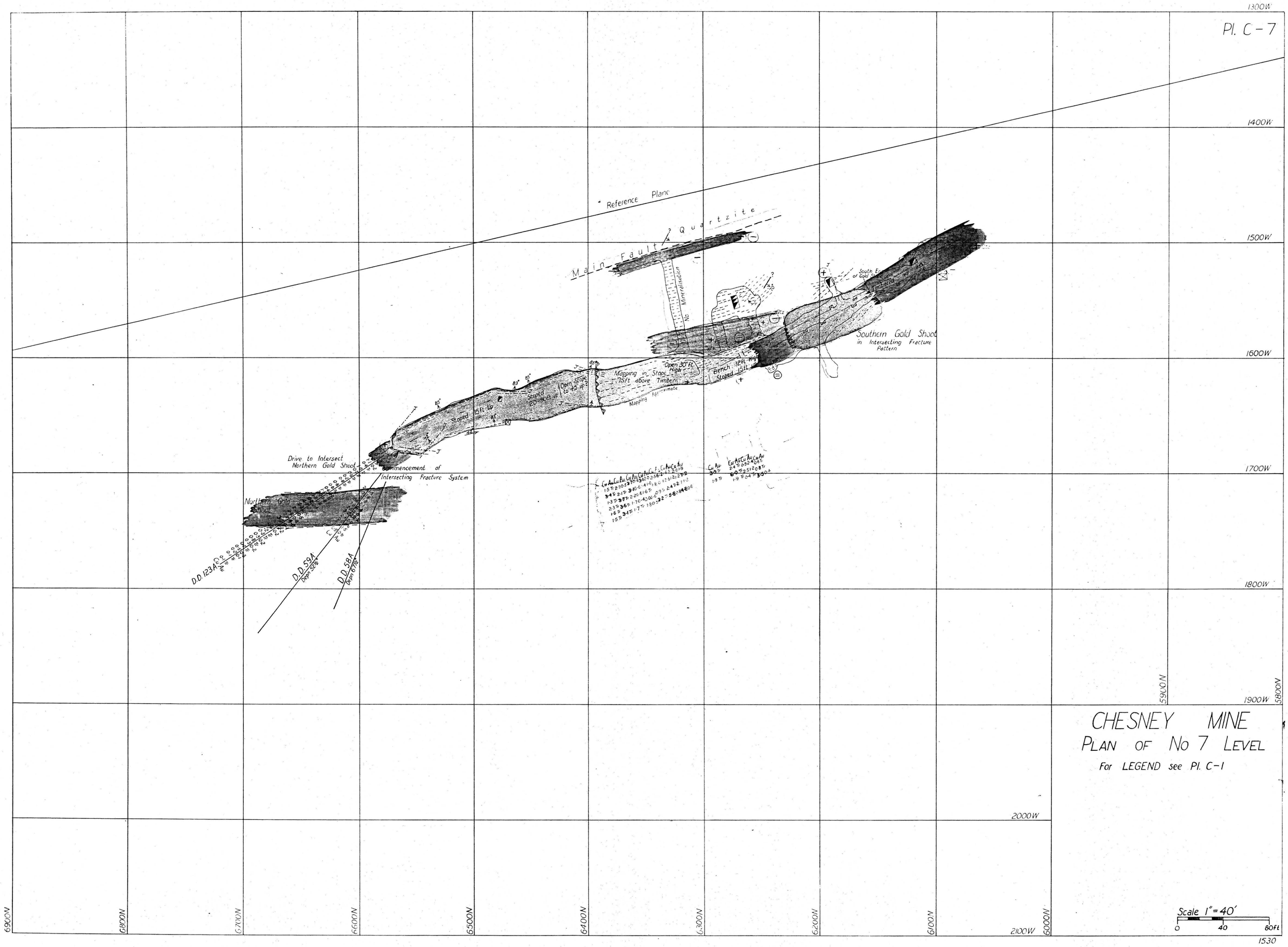
LEGEND

- Quartzite
- Quartz Chlorite Schist
- Fault
- Bedding
- Cleavage
- Estimated Boundary of Shearing
- Quartz Veins

Scale 1" = 40'

0 40 80 ft

1529


Pl. C-7
1300W
1400W
1500W
1600W
1700W
1800W
1900W
2000W
2100W
6900N
6800N
6700N
6600N
6500N
6400N
6300N
6200N
6100N
6000N
5900N
5800N
Reference Plane
Main Fault
Quartzite
No Mineralisation
Southern Gold Shoot
in Intersecting Fracture Pattern
Mapping in Stope 15ft above Timber
Open 30 ft High
Bench 12ft High
Stoped 15ft Up
Stoped 15ft Up
Stoped 20-30ft up
Open Stope to 45 up
Mapping Approximate
Drive to Intersect Northern Gold Shoot
Commencement of Intersecting Fracture System
Northern Gold Shoot
D.D. 123A
D.D. 59A
Depn 52½°
D.D. 58A
Depn 67½°
CHESNEY MINE
PLAN OF No 7 LEVEL
For LEGEND see Pl. C-1
Scale 1" = 40'
0
40
80ft
1530

Pl. C-8

CHESNEY MINE
PLAN OF No 8 LEVEL

For LEGEND see Pl. C-1

Scale 1"= 40'
0 40 80ft

1531

6700N 6600N 6500N 6400N 6300N 6200N 6100N 6000N 5900N

Main Shear

1·5dwt/ton Au

In Lode E of Main Lode

Less Than 1·3dwt/ton Au

Tr. Au

Less Than 1dwt/ton Au

1·5dwt/ton Au

Tr. Au

Pitch of Bedding Across Chesney Shear

No Conjugate Shears

Cu Leached

Level No1

101·05'

Tr. Au

1·5dwt/ton Au

Upper Limit of Conjugate Shears ?

Approx. Base of Zone Leached of Cu

Cu Carbs

15/- to 22/- per ton

10/- to 18/- Ore

6/- to 22/- Cu

Level No2

200·32'

20/- Cu

Tr. Cu

Approx. Pitch of H.W. Beds (Slates) Across Chesney Shear

No Assays

Level No 3

365·32'

No Assays

Approx. Pitch of Conjugate Shears and Gold Shoots Across East Lode Shear

No Conjugate Shears

18/- to 22/- Cu

Tr. Cu

No Information

No Assays

Level No 4

465·23'

No Assays

Northern Limit of Conjugate Shears

Approx. Pitch of Bedding Across Chesney Shear

No Assays

Level No 5

465·26'

No Information

Upper Limit of Conjugate Shears ?

Southern Limit of Conjugate Shears

50,000 Tons Ore

Marginal Copper Ore

Level No 6

No Information

Northern Limit of Conjugate Shears

Southern Limit of Conjugate Shears

20/- to 30/- Cu - Tr. Au

D.D. Information

Tr. Cu

27/- Cu

20/- Cu

Level No 7

25/- to 30/- Cu

Approx. Pitch of Bedding Across Chesney Shear ?

Unpayable

Unpayable

D.D. Information

No Information

No Information

Level No 8

12/- to 28/- Cu - Tr. Au

25,000 Tons Ore

Level No 9 (Proposed)

CHESNEY MINE

Longitudinal Section Showing Ore Distribution and Related Geological Features.

(NOTE:- Only limited assay information available, necessitating considerable interpolation)

LEGEND

Ore values calculated on the basis of 1% Cu = 12/- and 1dwt Au = 9/- (Value on field Oct/46, allowing for transport, smelting, refining and realisation.)

- Ore with high gold values (Numerous assays over 3·5dwt/ton)
- Probable area of ore with high gold values
- Marginal ore with gold predominant (assaying 35/- to 40/- per ton)
- Probable area of marginal ore with gold predominant
- Ore with high copper values (numerous assays over 3%)
- Probable area of ore with high copper values
- Marginal ore with copper predominant (assaying 35/- to 40/- per ton)
- Probable area of marginal ore with copper predominant
- Areas stoped by N.O.G.M.N.L.

0 30 60 90 ft

Geoscience Australia 13 JUN 2002 LIBRARY

Pl. P-1

PEAK MINES

SURFACE PLAN-

Contact of Sandstones and Silicified Sandy Slates

Conglomerate Lode

Brown Lode East

Brown Lode West

BROWN SHAFT

PEAK SHAFT

COMPRESSOR SHAFT

BIG LODE

BATTERY

Longitudinal Sections parallel this Line

A

B

C

D

E

F

P1

P2

P3

P4

D.D. Collar No. 1

D.D. Collar No. 2

D.D. Collar No. 3

D.D. Collar No. 4

D.D. Collar No. 5

D.D. Collar No. 6

0 10 20 30 40 80 feet

- Lode and Quartz Formation
- "Slates" altered
- Sandstones and Quartzites
- Heavy Shear
- Bedding
- Cleavage
- Jointing

Geology from Mulholland and Rayner's Rep. on Copper, N.S.W.

1000E

900E

800E

700E

600E

500E

400E

300E

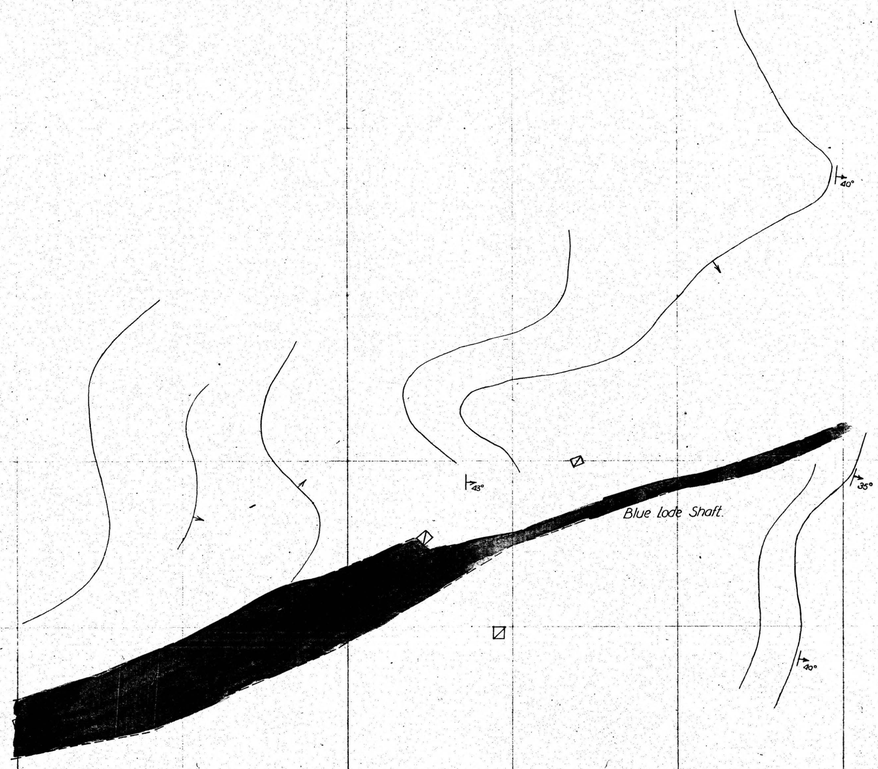
200E

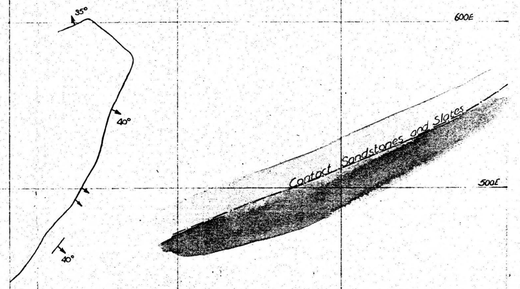
100S

000S

100N

Pl P-2





1300N 1100N 1000N 900N 800N 700N 600N 500N 400N 300N 200N 100N 00 100S

1000E 900E 800E 700E 600E 500E 400E 300E 200E

PEAK MINES

SURFACE PLAN-

0 10 20 30 40 80 feet

- Lode and Quartz Formation
- Slates altered
- Sandstones and Quartzites
- Heavy Shear
- Bedding
- Cleavage
- Jointing

Geology from Mulholland and Rayner's Report on Au-Cu deposits of COBAR N.S.W.

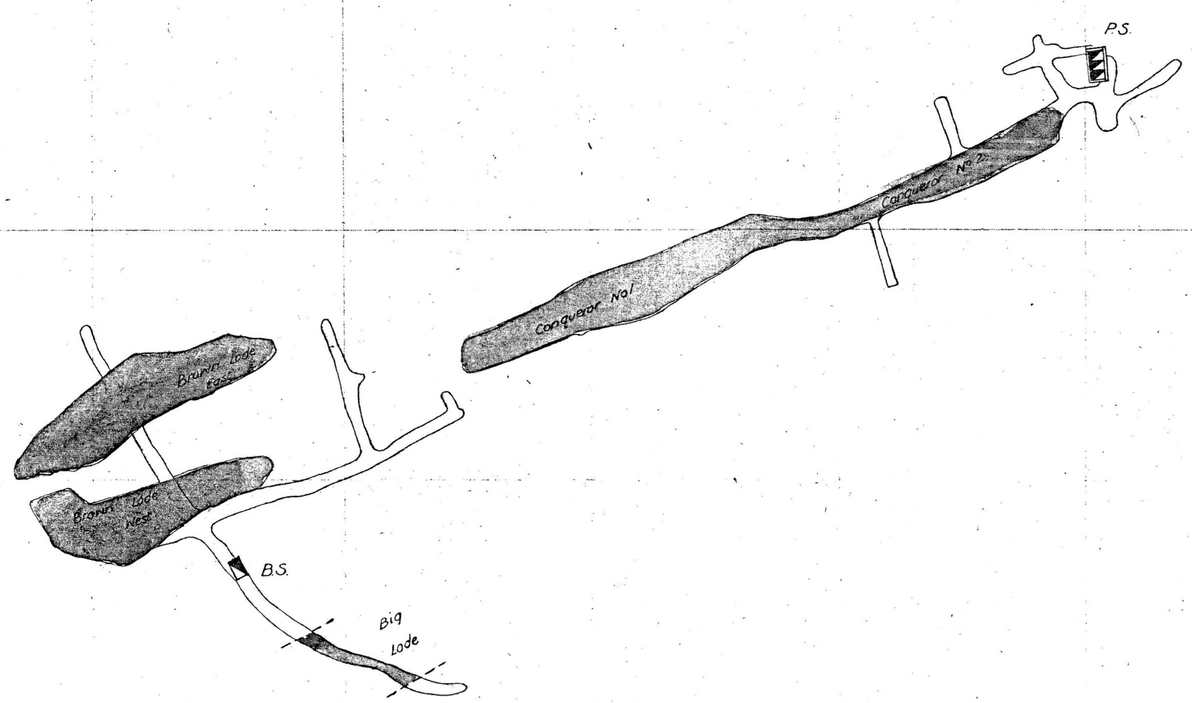
1511

Pl. P-3

900E.

800E.

700E.



600E.

500E.

PEAK MINES

47 ft. Level Peak Shaft
53 ft. Level Brown Shaft

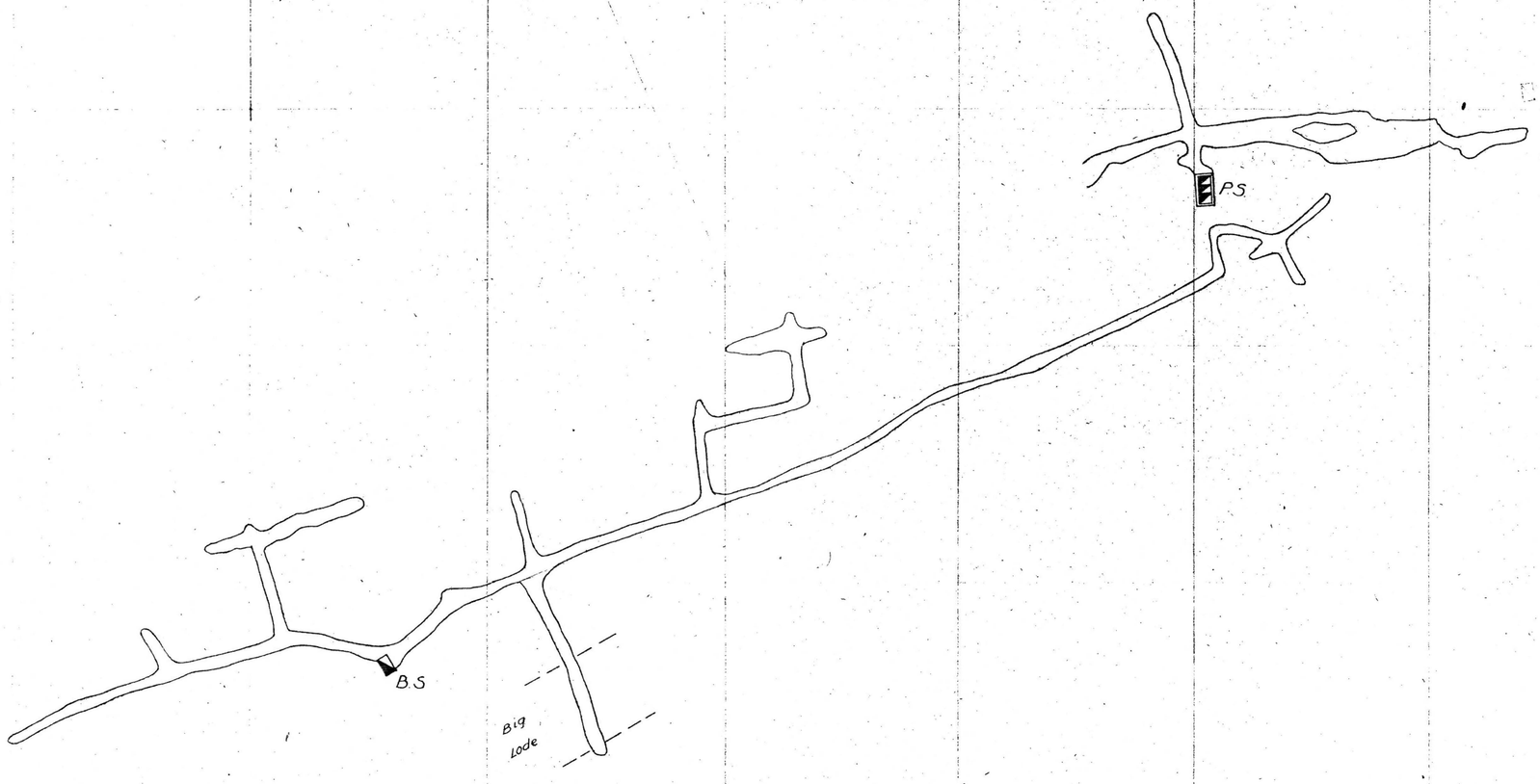
Scale 1" = 40'

Geoscience Australia
13 JUN 2002
LIBRARY

200S 300S 400S 500S 600S 700S 800S 900S 1000S

1512

300E



PEAK MINES

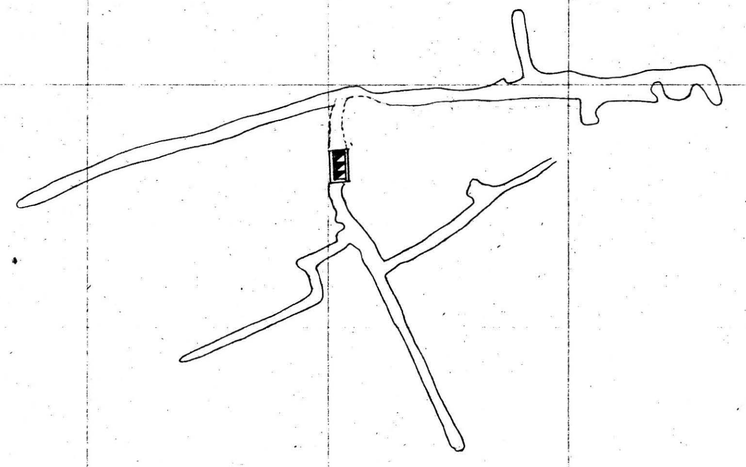
100 ft. Level Peak Shaft
" ft Level Brown Shaft

Scale 1" = 40'

38-762

Geoscience Australia
13 JUN 2002
LIBRARY

Pl P



700E

600E

500E

PEAK MINES

160 ft Level Peak Shaft

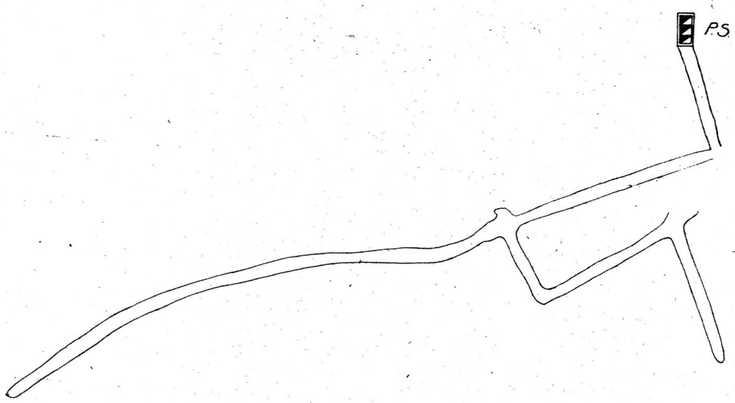
Scale 1" = 40'

Geoscience Australia
13 JUN 2002
LIBRARY

1514

200S 300S 400S 500S 600S 700S 800S 900S 1000S

Pl. P-6



900E

800E

700E

600E

500E

400S

500S

600S

700S

800S

900S

1000S

PEAK MINES

226 ft. Level Peak Shaft

Scale 1" = 40'

Geoscience Australia
13 JUN 2002
LIBRARY

1515

Pl. P-7



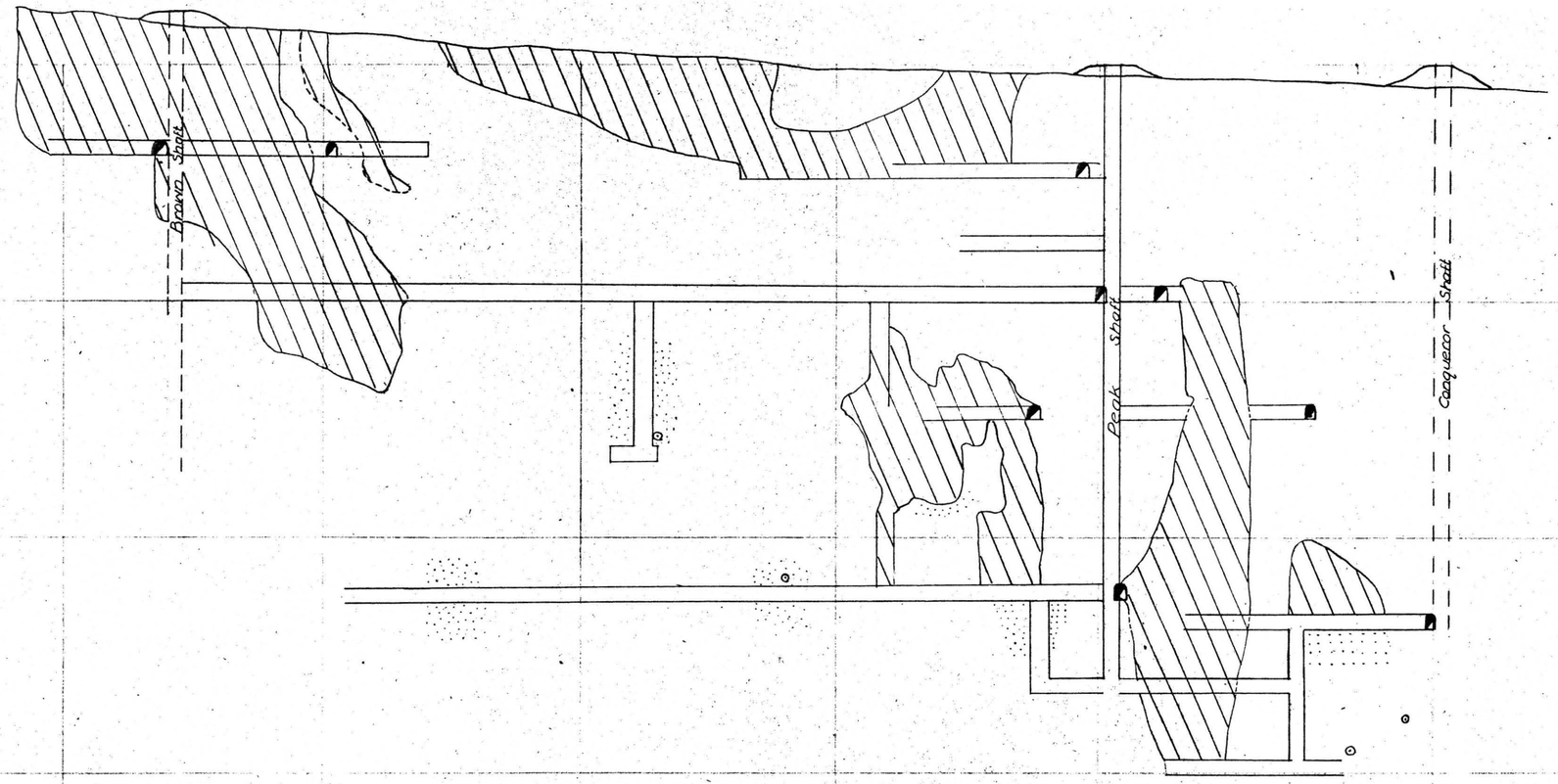
PEAK MINES

267 ft. Level Peak Shaft
307 ft. Level

Scale 1" = 40'

1516

Pl. P-8



PEAK MINES

Longitudinal Section of West (Brown) Lode and Conqueror Lode along Line AB

Scale 1" = 40 ft.

Stoped Ore

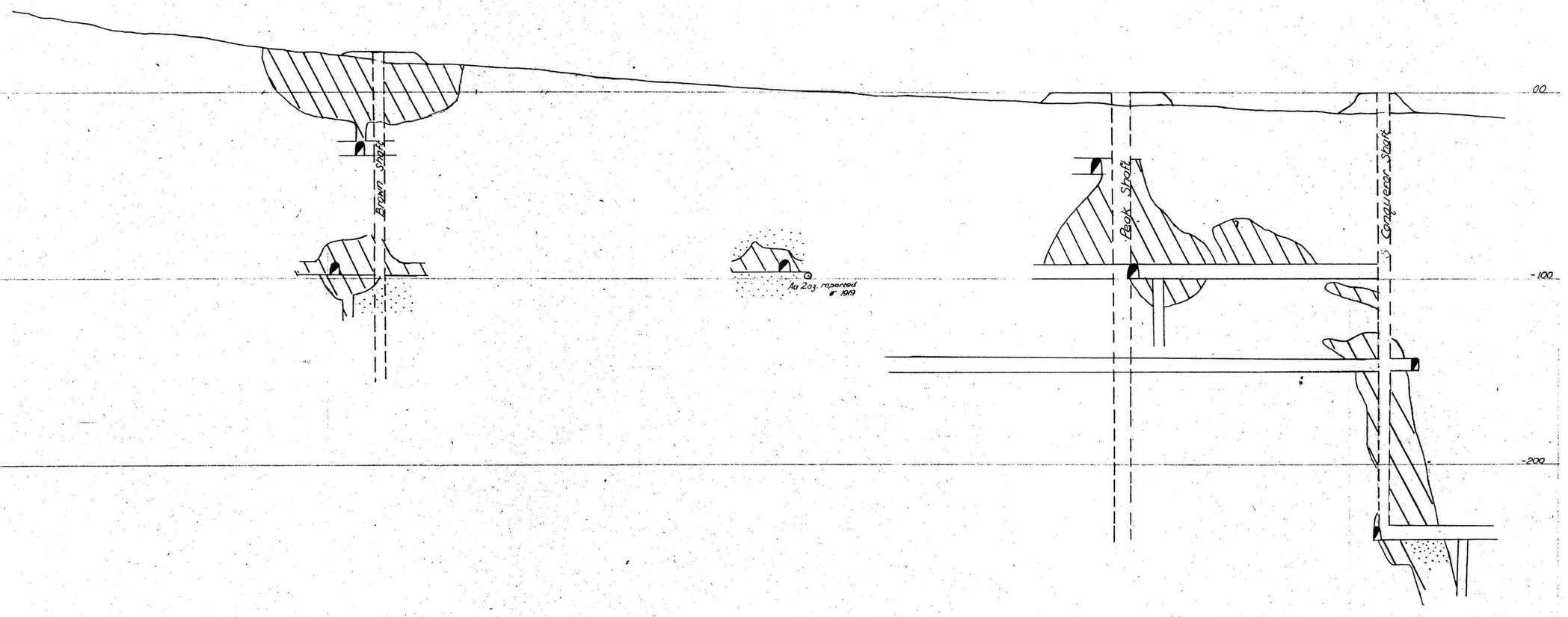
Undeveloped Lode exposed

Gold. High Values reported

200S 300S 400S 500S 600S 700S 800S 900S 1000S

Geoscience Australia 13 JUN 2002 LIBRARY 1517

Pl. P-9



PEAK MINES

Longitudinal Section of East (BROWN) Lode along line E.F.

Scale 1" = 40 ft

Stoped Ore

Undeveloped Lode exposed

100S 200S 300S 400S 500S 600S 700S 800S 1000S

Geoscience Australia 13 JUN 2002 LIBRARY

1518

Geoscience Australia
13 JUN 2002
LIBRARY

Brown Shaft

Peak Shaft

Ironstained Quartz and Crushed Slate Gossanous

Leached Zone strongly defined

Trace No.5 D.D.H. No Values

D.D.H No3

D.D.No4
169 at £2-5-2

D.D. No 2
248 at £2-3-10

D.D.No6
Low Values

Surface

-100

-200

-300

-400

-500

-600

-700

-800

-900

0'

100'

200'

300'

400'

500'

600'

700'

800'

900'

1000'

1100'

PEAK MINES

Longitudinal Projection on Plane C.D of BIG LODE intersection & D.D.H's and workings

Scale 1" = 40 ft

- Over £2 Ore
- Below £2
- Slate

Copper	£137	per ton	Values in Sterling based on London Metals Price at 4/6/47
Lead	£90	"	
Zinc	£70	"	
Silver	3/7	per oz.	

15/9

700E

600E

400E

300E

200E

100E

P1 P-11

00

00

-100

-200

-300

-400

-500

-600

-700

-800

-900

-1000

Quartz and highly altered "slates"

Low Values

Values Low
Cu content increased

Cu Ag Pb
Native Cu Visible.

No 4 ddh

109 ft. at £2·5·2
Pb Zn Cu Ag

Probable Eastern Shear

248 ft at £2·3·10
Cu Pb Zn Ag Au

No 6 ddh

D.D.H No 3

D.D.H No 2

PEAK MINES

BIG LODE

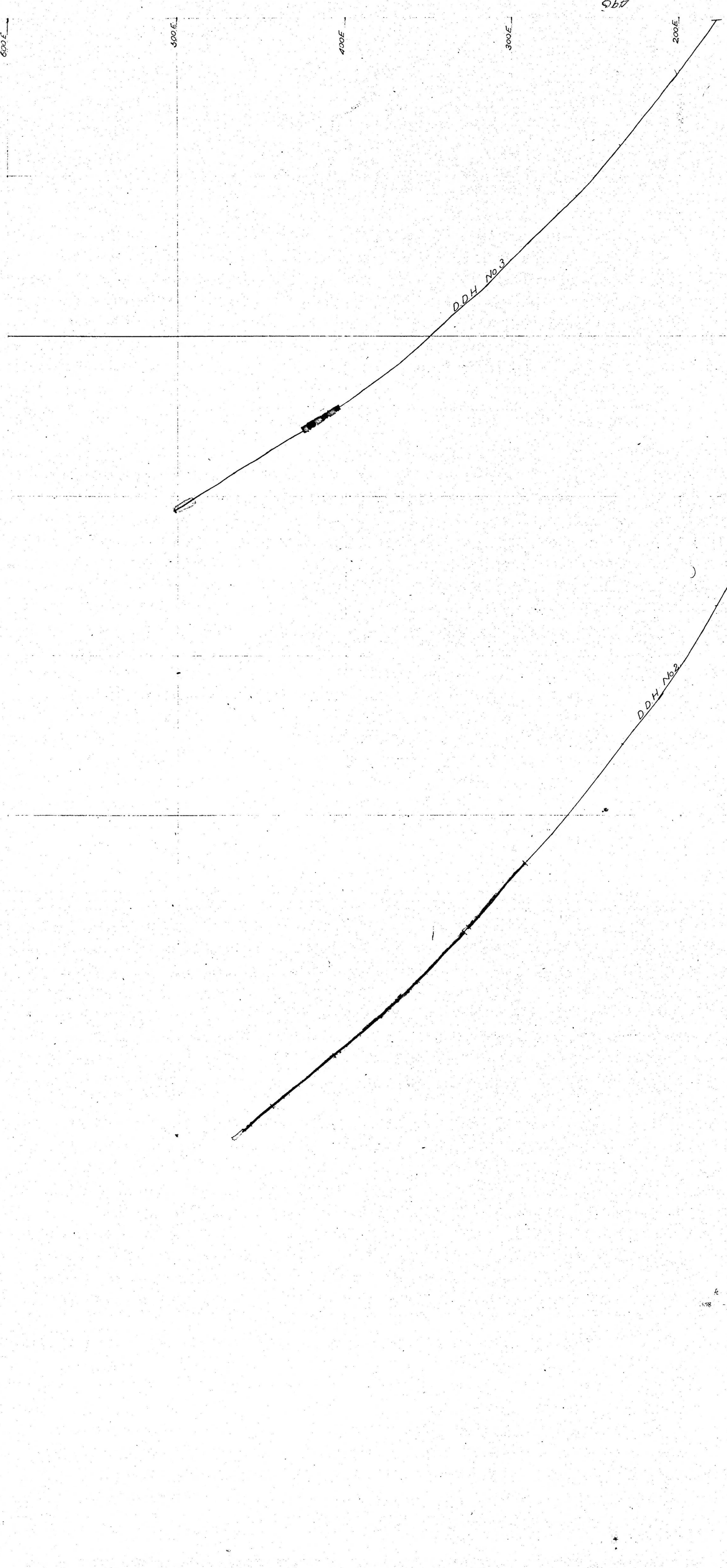
Cross Section of Nos 2 and 3 d.d.h's -
with Nos 4 and 6 projected along strike on to
the line of Section

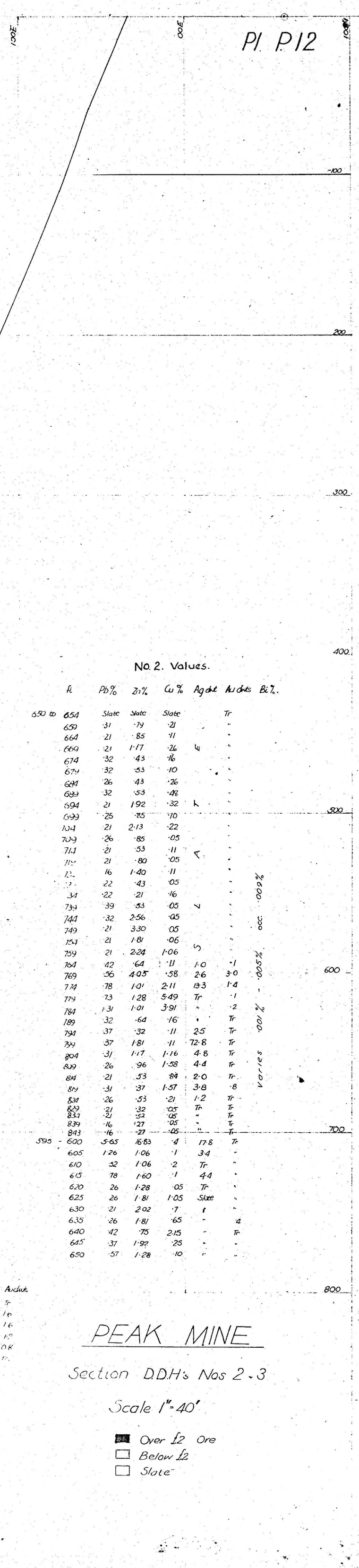
Values in Sterling based on London Metal
Price at 4/6/47 viz Copper £137 per ton
Lead £90 " "
Zinc £70 " "
Silver 3/7 per oz.

Over £2 ore
Below £2
"Slate"

SCALE 1in - 40ft

1520 Ft.





No. 2. Values.

ft		Pb%	Zn%	Cu %	Ag ozs/t	Au ozs/t	Bi %.
650 to	654	Slate	Slate	Slate		Tr	
	659	·31	·79	·21		"	
	664	·21	·85	·11		"	
	669	·21	1·17	·26		"	
	674	·32	·43	·16		"	
	679	·32	·53	·10		"	
	684	·26	·43	·26		"	
	689	·32	·53	·48		"	
	694	·21	1·92	·32		"	
	699	·25	·85	·10		"	
	704	·21	2·13	·22		"	
	709	·26	·85	·05		"	
	714	·21	·53	·11		"	
	719	·21	·80	·05		"	
	[illegible]	·16	1·40	·11		"	
	[illegible]	·22	·43	·05		"	
	34	·22	·21	·16		"	
	739	·39	·53	·05		"	
	744	·32	2·56	·05		"	
	749	·21	3·30	·05		"	
	754	·21	1·81	·06		"	
	759	·21	2·24	1·06		"	
	764	·42	·64	·11	1·0	·1	
	769	·56	4·05	·58	2·6	3·0	
	774	·78	1·01	2·11	13·3	1·4	
	779	·73	1·28	5·49	Tr	·1	
	784	1·31	1·01	3·91	"	·2	
	789	·32	·64	·16	"	Tr	
	794	·37	·32	·11	2·5	Tr	
	799	·37	1·81	·11	72·8	Tr	
	804	·31	1·17	1·16	4·8	Tr	
	809	·26	·96	1·58	4·4	Tr	
	814	·21	·53	·84	2·0	Tr	
	819	·31	·37	1·57	3·8	·8	
	824	·26	·53	·21	1·2	Tr	
	829	·21	·32	·05	Tr	Tr	
	834	·21	·52	·05	"	Tr	
	839	·16	·27	·05	"	Tr	
	843	·16	·27	·05	"	Tr	
595 -	600	5·65	16·83	·4	17·8	Tr	
	605	1·26	1·06	·1	3·4	"	
	610	·52	1·06	·2	Tr	"	
	615	·78	1·60	·1	4·4	"	
	620	·26	1·28	·05	Tr	"	
	625	·26	1·81	1·05	Slate	"	
	630	·21	2·02	·7	"	"	
	635	·26	1·81	·65	"	·4	
	640	·42	·75	2·15	"	Tr	
	645	·37	1·92	·25	"	"	
	650	·57	1·28	·10	"	"	

Values .005% - .100% .600 ozs.

No 3

ft		Cu %	Ag ozs/t	Au ozs/t
358 -	360	1·0	·53	Tr
	365	·51	1·1	16
	370	1·34	4·0	16
	375	23	Tr	1·2
	380	1·10	55·0	0·8
	385	60	Tr	1·2

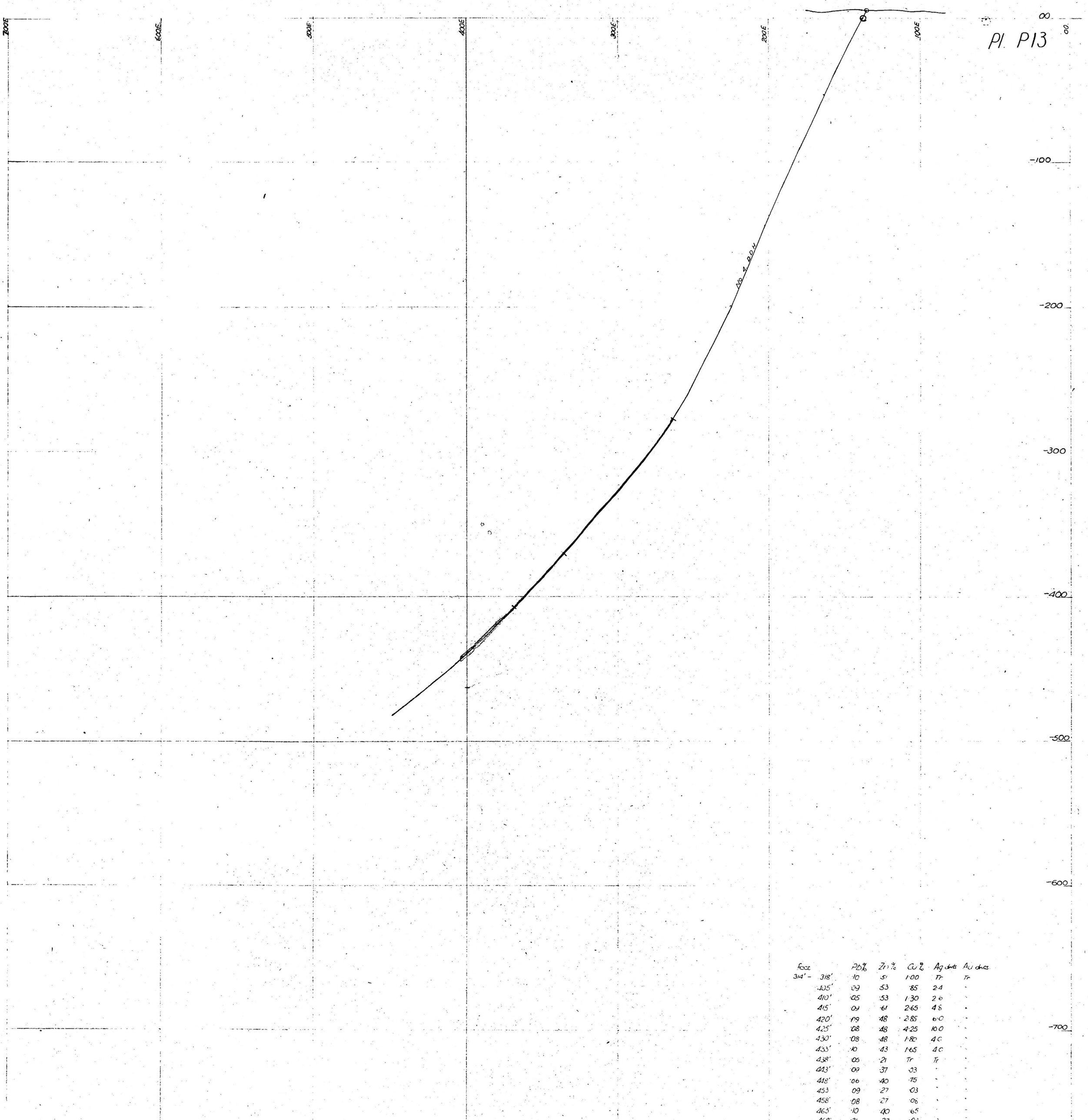
PEAK MINE

Section D.D.H's Nos 2 - 3

Scale 1" = 40'

- Over £2 Ore
- Below £2
- Slate

Pl. P13



Feet		Pb%	Zn%	Cu%	Ag ozs/t	Au ozs/t
314' -	318'	·10	·51	1·00	Tr	Tr
	405'	·09	·53	·85	2·4	"
	410'	·05	·53	1·30	2·6	"
	415'	·09	·61	2·65	4·8	"
	420'	·09	·48	2·85	6·0	"
	425'	·08	·48	4·25	10·0	"
	430'	·08	·48	1·80	4·0	"
	433'	·10	·43	1·65	4·0	"
	438'	·05	·21	Tr	Tr	"
	443'	·09	·37	·03	"	"
	448'	·06	·40	·75	"	"
	453	·09	·27	·03	"	"
	458'	·08	·27	·06	"	"
	463'	·10	·40	·65	"	"
	468'	·21	·27	·03	"	"
	473'	·09	·35	·03	"	"
	478'	·18	1·23	·03	·21	"
	483'	·92	1·54	·10	3·4	"

PEAK MINES

Scale 1" = 40'

Section of No 4 D.D. Hole

- Over 12 Ore
- Below 12
- Slate

1522

Pl. P-14

700E 600E 500E 400E 300E 200E 100E

-100 -200 -300 -400 -500 -600 -700 -800

		Cu %	Ag dwts	Au dwts
838' to	840'	1·8	Tr	·4
	845	Tr	"	·4
	850	·3	"	·2
	855	Tr	"	Tr
	860	"	"	"
905	910	"	"	"
	915	·5	"	"
945	950	Tr	"	·8
	955	"	"	Tr
	960	·3	"	"
	965	·2	"	·6
	970	Tr	"	Tr
	975	"	"	"
	980	"	"	"
	985	·4	"	"
	990	·3	"	"
	995	1·2	"	"
1000		·4	"	"
1005		Tr	"	"

PEAK MINES

Section DDH No 6

Scale 1"-40'.

- Over £2 Ore
- Below £2
- Slate

1523.

Geoscience Australia
13 JUN 2022
LIBRARY

Pl. P-15.

Great South Peak Shaft
240' deep

Perseverance Shafts

Crush Zone after Andrews

Whip Shaft

1600E
1400E
1200E
1000E
800E
600E
400E
200E
00
100W
200W

1500S 1600S 1700S 1800S 1900S 2000S 2100S 2200S 2300S 2400S 2500S 2600S 2700S 2800S 2900S 3000S 3100S 3200S 3300S 3400S 3500S 3600S 3700S

PEAKS AREA

Southern Extension of BIG LODE Shear as mapped by E.C. ANDREWS

Geology by Mulholland and Rayner

Scale 1 in = 100 ft

- Lodes and Quartz Veins
- Slates 'altered'
- Sandstones
- Shears and Shear Zones
- Bedding
- Diamond drill holes

600M JJ