AUSTRALIAN MINING AND SMELTING COMPANY LIMITED

No. 1

McARTHUR RIVER PROSPECT, N.T.

by

K. J. MURRAY

BROKEN HILL, N.S.W.

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INTRODUCTION

In June, 1952 a special reservation of 100 square miles was made in the McArthur River area, Northern Territory. This was reduced to two areas of one square mile each in June, 1953, and these reservations were effective until December, 1953.

After a preliminary investigation by Mr. H.F. King (Zinc Corporation confidential memo. No. 273, July, 1952), a geological mapping and drilling programme was commenced in August, 1952 (A.M. & S. Co. Report No. 316 by K.J. Murray, December, 1952 - A.M. & S. Co. Interim Report Memo. No. 23 by K.J. Murray, August, 1953.)

This programme was suspended for the 1952-53 Northern Territory wet season, and was resumed in June and concluded in October, 1953.

SUMMARY

Bulburra prospect was abandoned after completion of 598½ feet of drilling.

Cook's prospect was abandoned after the sampling of three shafts and the completion of 648¼ feet of drilling. Other occurrences of galena mineralisation in the area were investigated.

CONCLUSION

Bulburra

Drill logs and assays for the three holes put down (total footage 598½ feet) have been very disappointing, and suggest that the grade of the prospect does not compare at all favourably with the apparent surface grade.

Cook's

High assay values were found for zinc both in the shafts and on the surface, but information gained from drilling indicates at the best a narrow seam of high grade ore beneath the broad oxidised outcrop.

RECOMMENDATION

No further interest in any of the McArthur River prospects already investigated.

LOCATION AND ACCESS

Bulburra is 3.5 miles west and Cook's 5.6 miles south east of the McArthur River station. Access to Bulburra from the station is by six miles of fairweather track, whilst access to Cook's is by a poor nine and a half mile track over black soil flats and low limestone ridges. McArthur River station, which is about 45 miles from Borroloola, (fortnightly air service and radio) can be reached from Tennant Creek (345 miles) via Rockhampton Downs and Anthony's Lagoon (140 miles - weekly air service and radio). This includes only 90 miles of bitumen and the remainder is by graded dry weather track.

Borroloola is serviced thrice yearly by boat (Cora) and the landing is about 30 track miles down stream.

MINERALISATION

Old reports on the McArthur River area indicated that about eight occurrences of mineralisation were known. Of these, Bulburra (Bald Hills) and Cook's, have been geologically mapped and diamond drilled.

Barney Creek was drilled by the McArthur River Exploration Company (1912?) and inspected by Mr. King (Zinc Corporation Limited) in June, 1952.

Bull Creek, Turnbull's and Conway's were not considered to warrant more than a brief inspection.

Leichhardts (copper) was seen by me in July, 1953.

Weldon's Ridge, six miles south east of homestead, and Lynott's, two miles south of homestead, were not located.

BULBURRA (BALD HILL)

As shown on the Bulburra 1" = 100 feet plan, low grade lead zinc mineralization occurs as irregular patches in the limestone to the west of the low bare hills which are known locally as "Bald Hills." These barren hills consist of folded quartzites which overlie the mineralized limestone.

The principal mineralized outcrop is a 20-foot high hill which forms the north east extremity of a low limestone ridge. From the 40-scale plan it may be seen that the mineralization is more or less restricted to a particular limestone horizon and apparently concentrated in the apex of a small syncline with a 30 - 40 degree pitch to the south Here there are at least 60,000 sq. feet of mineralized area of an ore grade by visual estimate of not less than 8% combined lead and zinc. This area is equivalent to 5,000 tons of mineralized material per foot of depth and the drilling aimed at determining the grade of this body.

To the north west of the quartzite folds low grade galena mineralization occurs on another low limestone hill, with dips of about 30 degrees to the north.

At Bulburra the lead occurs as galena and this is seen -

(a) Along east-west fractures as irregular seams opened up by two shallow pits.

(b) As rice size and larger grains in the limestone (most low grade patches).

(c) As irregular veins and veinlets in some portions of the limestone.

(d) As a thin "gravel" of decomposing galena in patches on the limestone, having been released by weathering.

(e) As slugs in the limestone on the eastern side of the main outcrop and with copper carbonates in two small pits to the east of the main outcrop.

The zinc occurs -

(a) As small grains or seams of pale honey coloured sphalerite over a large area. Similar sphalerite was found in the first 18 feet of D.D.H. No. 2 and last 40 feet of D.D.H. No. 1.

(b) As an irregular network of tiny veins of a fluorescent mineral which may be hydrozincite.

(c) Small brownish patches containing a few percent zinc and less lead. These patches are probably weathered holes in the limestone filled with calcareous debris and enriched by decomposed lead and zinc.

Mineralization does not continue south west along the ridge but specks of galena and sphalerite have been found in the low scattered outcrops to the south. Most of this area is concealed under a hard lateritic cap.

D.D.H. A.M. & S. No. 1 (205½ feet), location as shown on the plan and dipping north at 60°, located only very low grade mineralisation for its entire length. Sphalerite content increased slightly over the last 40 feet. Average - 205½ feet, 0.12% Pb and 0.64% Zn.

D.D.H. A.M. & S. No. 2 found low grade sulphide over entire 191½ feet, with slightly higher grade mineralisation for first 35 feet. Overall average for first 18½ feet was 2% Pb, 7.8% Zn, for first 35 feet 1.2% Pb, 6.5% Zn, for last 156½ feet 0.25% Pb, 0.25% Zn.

D.D.H. A.M. & S. No. 3 (201½ feet), very low grade mineralisation over entire length. Average, 0.14% Pb, 1.07% Zn.

Due to these unfavourable results, further drilling at Bulburra was abandoned.

Drill core for holes 1, 2 and 3 have been sent to Alice Springs.

COOK'S AND CONWAY'S

Cook's and Conway's are 5½ miles S.E. of McArthur River station and on the eastern side of a prominent sandstone range.

On Cook's mine there are two patches of strong mineralization, both 50 to 60 feet wide and exposed at surface or in trenches. These two mineralized patches are about 300 feet apart along the trend of the ridge. The mineralization may or may not be continuous. It consists of a ferruginous zincy crust, brilliantly fluorescent in places with a good deal of visible coarse galena. Samples of this crustal material reveal its high grade 6.9% Pb, 29.5% Zn over 60 feet horizontal width in the northern costean and 10% Pb, 37.6% Zn over 50 feet horizontal width in the southern costean. The high grade oxidized material passes under laterite about 80 feet north of the northern costean.

There is a mineralised area of about 12,000 square feet around these two costeans, with a possible further 12,000 square feet if the mineralisation is continuous between the two outcrops. This indicates, per vertical foot, 1,000 - 2,000 tons of material, averaging about 5% Pb and 25 - 30% Zn. With a maximum depth of 40 feet, this indicates a possible 40,000 tons of 30% Pb and Zn.

Drill hole information apparently indicates that this material covers a wide zone of low grade mineralisation including a 10 foot wide zone of 6.45% Pb and 12.19% Zn.

D.D.H. A.M.&S. No. 4 (330 feet)

Location and direction is shown on plan No. X27/321 . This hole indicated 155 feet of low grade mineralisation including 10 feet of 6.45% Pb, 0.4 ozs. Ag, 12.19% Zn.

D.D.H. A.M. & S. No. 5 (253¼ feet)

For location see plan. Revealed low grade material from 92 feet to end of hole, but included 2 feet of 42.6% Pb and 14.7% Zn.

D.D.H. A. M. & S. No. 6

This hole was abandoned at 65 feet after passing from cherty limestone to silicified sandstone at 50 feet.

Shafts A, B and C were mapped and sampled (see section X27/312). No fluorescent material was evident, yet the reddish earthy material yielded consistent high zinc values.

Shaft A (26 feet) and the 19 feet cross-cut to west were both completely in red brown earthy material.

The 19 feet crosscut to the east from Shaft B (48 feet) revealed one solid section containing galena. Non fluorescent white crusty material ($PbSO_4$? or $PbCO_3$) was also present. Dips within 20 feet of the surface are practically horizontal, but the westward dip becomes progressively steeper towards the bottom of the shaft. In the vicinity of the mineralisation, no dips or thicknesses could be recorded.

In Shaft C (41 feet) information was scanty, but dips seen were steeply easterly. Conformable thin stringers of galena were seen in places towards the surface. The upper boundary for the cherty claystone shown on section X27/312 is probably the limit of complete weathering. The boundary was irregular, and was transgressed on all four walls by brown earthy material.

Sample assays, together with the mapping, suggest that the lode passed out of the south wall of the shaft at about 26 feet below the surface.

Geological mapping (see plan) suggests that the mineralization is just to the west of the axis of a northerly pitching anticline. This anticline is composed of a series of limestones, sandstones, and claystones. "Quartzite" cap marks the western limit of mineralization and extends to a greater or less degree from Cook's to Conway's. At Conway's, however, the cap has developed into a ridge 50 feet high. This "quartzite" appears to transgress both limestone and sandstone, yet the mineralization is confined to the limestone. The only possible exception is the northern outcrop of Cook's, and here the country rock is obscured by "quartzite" cap, laterite and alluvium.

At Cook's the claystone beds displayed in the creek banks dip steeply west (about 70 degrees). The mapping of shaft 3 confirmed this dip, yet dips in shaft C were steeply to the east.

Conway's consists of three pits and a shallow shaft on a galena bearing fluorescent zincy crust, specimens of which assayed 5.5% Pb and 43.2% Zn.

A quarter of a mile south of Conway's in the flat limestone outcrops there is a narrow zone of low grade galena mineralization extending southward for another half mile.

A series of "quartzite" caps to the east of the showings appear to more or less follow the bedding and are generally capping the limestones. Easterly dipping silicified algal remnants are evident in some of the bands.

The line of low grade mineralization from Cook's to Conway's and the continuation to the south east are too small to be of any interest. Mineralization along this line consists of galena specks with occasional specks of fluorescent zinc. At Conway's, however, mineralized crusty material on two of the dumps is highly fluorescent.

STUBB'S PROSPECT (TURNBULL'S)

Pegged in names of Woods, Bullock and Stubbs. Lease pegs for this prospect are 6.7 miles at 137½° from McArthur River Station (Plan X27/319).

In the N.W. corner of Bullock's lease the lode is in limestone which is immediately covered by a siliceous cap. This cap forms part of the ridge which extends from east of Cook's for miles to the south.

The ridge consists of three or more highly siliceous bands and has a band of fine slaty sandstone then limestone between it and the younger sandstone (all dip east).

On Bullock's lease the mineralisation consists of galena veinlets and slugs associated with copper carbonate and sulphate in the limestone. One pit (10 feet deep) showed the galena in irregular cross hatched fractures in what is probably a crushed limestone.

On Stubbs' lease the mineralisation consists of disseminated galena in a collenia limestone and appears to be confined to one horizon. A similar occurrence of disseminated galena was seen near the McArthur River and 1¼ miles south of the station (see plan X27/319). There, the mineralised band, which was about 3 feet thick, dipped west about 60°, and was overlain by a sandy bed about 2 feet thick. This was followed for about 200 feet before it was covered by alluvium.

BARNEY CREEK AND BULL'S CREEK

These two showings were visited by Mr. H.F. King in June, 1952.

"BARNEY CREEK

This showing is two miles north of McArthur River homestead by the Borroloola road, then about half a mile west to the creek. In the bed of Barney Creek and in two shallow pits on the eastern bank there are slugs of galena up to 1 or 2 lb. in weight in decomposed limestone. The decomposed limestone is jarositic with more or less iron as limonite, hematite and siderite. To the east of the creek the limestone is the usual buff colour, thin bedded and dips 30° north west. In this, there is an irregular brecciated band with a jarositic matrix, but without galena.

There is no zincy crust and no evidence of any mineable orebody.

"BULL'S CREEK

About four miles north east of McArthur River homestead and about 100 yards east of a large creek there is a large outcrop of buff coloured limestone dipping 60° west. The limestone is fractured in the 300°-120° direction and these fractures have been filled with siliceous and limey material.

"Three of these fractures contain vertical seams of galena up to 2" wide. One of them has been opened up over a length of 20 feet and to a depth of 4 feet. No other galena was seen and there is none of the zincy crust which accompanies all the larger showings of mineralization.

"The pit appears to be comparatively recent. Since Parkes (1891) describes splats of galena spread over a large area, there may be another showing in the vicinity.

The one seen is not of any interest." [1]

ORE OCCURRENCE

As previously mentioned Bulburra showed 60,000 sq. ft. averaging (visual estimate) at least 8% combined lead and zinc, yet the drill holes averaged less than 1.5% combined lead and zinc.

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[1] H.F. King confidential memo No. 273, Zinc Corporation Limited, July 1952.

A similar variation was seen at Cook's where 12,000 sq. ft. averaging 5% Pb and 25-30% Zn covers only a narrow high grade lode and a large low grade area.

Mineralisation at Bulburra occurs as galena, sphalerite and hydrozincite with minor pyrite in siliceous limestone. The galena and sphalerite protrude beyond the limestone surface, apparently indicating that the sulphides are more resistant to weathering than the limestone. Low grade pyrite is more common in depth at Cook's than at Bulburra.

Dump assays of reddish non fluorescent soil from shafts A and B at Cook's recorded up to 45% Zinc.

At Cook's hydrozincite containing seams of galena is prominent but sphalerite is not common on the surface.

Since assays and observations indicate far higher values for the surface zone there must have been a high degree of surface enrichment of lead as galena and zinc as sphalerite and hydrozincite.

K. J. Murray

K. J. MURRAY

APPENDIX I

DIAMOND DRILL LOGS

BULBURRA, McARTHUR RIVER, N.T.

Diamond Drill Hole A.M. & S. No. 1

Footage From	Footage To	Description
0	3'8"	Crystallised calcite with a few leached holes. Cubic galena found at drill site.
3'8"	5'7"	Siliceous limestone with calcite bands.
5'7"	7'5"	Siliceous limestone.
7'5"	9'3"	Siliceous limestone, fractured at 50° to core. Trace of copper at 9'3".
9'3"	10'5"	Grey limestone with calcite and reddish brown patches.
10'5"	13'7"	Grey siliceous limestone, banded at 25° to core.
13'7"	24'0"	Limestone and calcite.
24'0"	29'9"	Grey limestone 50% white calcite, leached patch. 24'3" - 24'9".
29'9"	31'5"	Grey siliceous limestone with calcite from 29'9" - 30'3".
31'5"	36'4"	Leached fracture at 25° to core, no sulphides apparent.
36'4"	37'0"	Hard reddish patches. (Similar patches on surface rich in zinc.)
37'0"	38'2"	Hard siliceous limestone.
38'2"	39'2"	3 inches core lost, yellow leached vugh.
39'2"	39'8"	Weathered breccia.
39'8"	43'0"	Soft friable reddish material. Poor core recovery.
43'0"	44'0"	White calcite with speck of green in vugh.
44'0"	47'0"	Reddish material, very broken.
47'0"	50'0"	Grey and white crystallised limestone, greenish speck at 50' (weathered pyrite).
50'0"	55'10"	Fine grained limestone fractured at 30° to core. Core shattered at 52'.
55'10"	65'10"	Four feet core lost. Fine grained limestone, speck of galena at 65'.
65'10"	66'2"	Brecciated. Some pyrite.
66'2"	69'10"	Grey limestone with specks pyrite and sphalerite at 69'.
69'10"	72'9"	Specks of pyrite in grey limestone.
72'9"	90'9"	Grey limestone pyrite, sphalerite and galena at 74'6". Occasional specks of pyrite to 81'. 81' - 88'8" white calcite patches. Pyrite at 84'6".

Footage From	Footage To	Description
90'9"	92'10"	Mottled grey limestone, some coarse sphalerite. Sheared at 45° to core.
92'10"	95'8"	Mottled grey limestone with coarse pyrite at 94'6".
95'8"	99'1"	Very broken, 2' core lost.
99'1"	102'3"	Mottled (brecciated) limestone banded at 40° to core.
102'3"	105'9"	Mottled limestone banded at 45° to core. One foot core lost.
105'9"	108'0"	Some reddish sphalerite 9" core lost.
108'0"	114'5"	Banded limestone.
114'5"	116'7"	Very broken (45° to core).
116'7"	118'1"	Dark grey limestone.
118'1"	126'0"	Light grey limestone breaking at 30° to core.
126'0"	127'2"	Vughy with grey sludge.
127'2"	129'8"	Light grey limestone with pyrite 129'4" - 129'8"
129'8"	137'9"	Grey limestone. White veinlets (breccia) to 130'8".
137'9"	153'0"	Pale grey limestone with numerous fine leached areas containing dark grey sludge. Some galena mineralisation. 144'2" - 153'0".
153'0"	164'9"	Whitish limestone with some sphalerite, galena and veins of black sludge. 161' fracture at 30° to core with some pyrite 165' patch of pyrite.
164'9"	205'6"	Whitish limestone with black sludge veins, speck pyrite at 168'3", sphalerite patch at 169' and specks galena at 172'. Very low grade pale yellow sphalerite over entire length 164'9" - 205'6".
		Sampled 196½' - 199½'.
205'6"		Hole completed 11/10/52.

DIAMOND DRILL HOLE A.M. & S. NO. 1

ASSAYS

From	To	Pb %	Ag Ozs per Ton	Zn %
0	5'	.12	N.D.	.40
5'	10'	.16	N.D.	.40
10'	15'	.16	N.D.	.50
15'	20'	.14	N.D.	.50
20'	25'	.14	N.D.	.40
25'	30'	.14	N.D.	.50
30'	35'	.14	N.D.	.40
35'	39'8"	.12	.02	.50
41'6"	45'	.12	.02	.25
45'	50'	.12	Trace	.20
50'	55'	.10	.02	.20
55'	60'	.12	.02	.20
60'	65'	.12	.04	.35
65'	70'	.16	.02	.25
70'	75'	.12	.02	.55
75'	80'	.12	.02	.20
80'	85'	.14	.04	.35
85'	90'	.16	Trace	.25
90'	95'	.16	Trace	.70
95'	100'	.10	Trace	.20
100'	105'	.08	Nil	.30
105'	110'	.06	Nil	.25
110'	115'	.10	Nil	.20
115'	120'	.08	Nil	.15
120'	125'	.10	Nil	.25
125'	130'	.04	Nil	.10
130'	135'	.12	Nil	.40
135'	140'	.16	Nil	.40
140'	145'	.14	Nil	.40
145'	150'	.12	Nil	.50
150'	155'	.14	Nil	.70
155'	160'	.14	Nil	.50
160'	165'	.14	.04	1.0
165'	170'	.14	Nil	0.6
170'	175'	.06	.02	2.1
175'	180'	.10	Nil	1.4
180'	185'	.08	Nil	0.9
185'	190'	.14	Nil	2.0
190'	196½'	.08	.04	1.9
196½'	199½'	.00	Nil	4.6
199½'	205½'	.14	.04	2.2

ASSAYS

COOK'S, McARTHUR RIVER, N.T.

X-Cut W. from Shaft A

From	To	Pb %	Ag Ozs. per Ton	Zn %
15'	19'	2.9	0.14	21.0
10'	15'	3.2	0.16	28.4
5'	10'	0.9	0.10	26.6
0'	5'	0.4	0.06	24.6

Shaft A. Bottom W. Wall

Bottom of Shaft	0.6	0.10	21.2
5' above bottom	0.9	0.04	24.6
10' " "	0.7	0.06	24.6
15' " "	1.3	0.10	31.0
20' " "	2.5	0.06	31.6
25' " "	6.7	0.08	16.6

Shaft B. X Cut to E

0-7' from shaft	13.7	0.68	31.0
7' 13'	2.9	0.34	41.2
13' 19'	5.4	0.02	38.8

Shaft B

Bottom of shaft	0.7	0.02	30.0
5' above bottom	3.7	0.64	31.6
10' " "	0.3	0.14	34.0
15' " "	1.1	0.20	18.4
20' " "	0.3	0.12	12.0
25' " "	0.1	0.12	7.0
30' " "	0.1	0.02	2.2

Shaft C

Bottom of shaft	0.0	x N.D.	1.0
5' above bottom	0.0	N.D.	1.3
10' " "	0.0	N.D.	1.5
15' " "	0.2	N.D.	5.4
20' " "	1.4	0.18	16.4
25' " "	4.4	0.22	38.9
30' " "	4.5	0.34	30.5
35' " "	16.7	0.88	28.7

x N.D. - Not determined

DIAMOND DRILL HOLE A.M. & S. NO. 2

ASSAYS

From	To	Pb %	Ag Ozs. per Ton	Zn %
0	4'2"	0.0	0.0	1.0
4'2"	7'1"	0.6	0.2	11.3
7'1"	10'	0.3	0.1	0.8
10'	15'	1.5	0.0	5.6
15'	18½'	7.4	0.1	21.9
18½'	22'2"	0.40	0.1	5.8
22'2"	26'	0.2	0.04	3.8
26'	28'6"	0.3	0.10	7.8
28'6"	30'2"	0.4	0.14	9.5
30'2"	35'	0.3	0.10	2.9
35'	40'	0.4	0.02	0.8
40'	45'	0.4	0.02	0.9
45'	50'	0.3	0.02	0.7
50'	55'	0.4	Nil	0.6
55'	60'	0.5	Nil	0.4
60'	65'	0.3	Nil	0.5
65'	70'	0.4	0.00	0.2
70'	75'	0.3	0.00	0.1
75'	80'	0.3	0.00	0.3
80'	83'1"	0.3	Nil	0.1
83'1"	88'	0.3	0.00	0.15
88'	93'	0.3	0.00	0.25
93'	98'	0.3	0.00	0.1
98'	103'	0.2	0.00	0.1
103'	108'	0.4	0.00	0.1
108'	112'	0.3	0.02	0.1
112'	116'1"	0.2	0.02	0.1
116'1"	120'	0.2	0.00	0.1
120'	125'	0.3	Nil	0.00
125'	130'	0.3	Nil	0.00
130'	135'	0.3	Nil	0.00
135'	140'	0.3	0.00	0.00
140'	145'	0.10	Trace	0.3
145'	150'	0.16	Trace	0.2
150'	155'	0.20	0.12	0.3
155'	160'	0.10	Trace	0.2
160'	165'	0.06	Trace	0.3
165'	170'	0.06	Trace	0.2
170'	175'	0.12	0.10	0.2
175'	180'	0.06	Trace	0.2
180'	185'	0.10	Trace	0.2
185'	191⅓'	0.10	Trace	0.3

APPENDIX II

Diamond Drill Hole A.M. & S. No. 2

CORE LOG

Footage From	Footage To	Description
0	1'2"	Grey limestone with some veinlets sphalerite and galena.
1'2"	4'2"	Grey limestone with little sphalerite and galena banded 45° to core - sampled 0-4'2".
4'2"	7'1"	Very vughy, contains galena. Sampled.
7'1"	10'0"	Grey limestone with occasional patches of galena (at 7'2" and 10'0"). Sampled.
10'0"	15'0"	Grey breccia with galena and sphalerite. Sampled.
15'0"	18'5"	Weathered and vughy contains some galena. Sampled.
18'5"	22'2"	Banded grey limestone with some black veins containing galena, banded 15° to core.
22'2"	26'0"	Grey limestone.
26'0"	28'6"	Shattered limestone with one patch of high grade galena and sphalerite with some pyrite.
28'6"	30'2"	Brecciated with 2" high grade patch.
30'2"	110'0"	Grey limestone, speck of pyrite at 31', 33', 45'9", 104'-110' sheared and broken at 45° to core.
110'0"	112'	Weathered and broken at 45° to core. Trace pyrite.
112'	116'1"	Barren grey limestone.
116'1"	126'7"	Grey limestone, irregular fracture pattern. Trace sulphides, weathered at 126'7".
126'7"	131'11"	Banded grey limestone. 129' - 130' weathered. 130' banded 10° - 15° to core. Fractured at 10° to core.
131'11"	145'7"	Patterned grey limestone 10° - 15° to core. Slightly mineralised.
145'7"	191'6"	Grey limestone. 176' - 180' vesicles still damp. 173' Banded 45° to core, traces sulphide. Fine pencil line fractures containing sulphides, galena, pyrite. Hole completed at 191'6".

DIAMOND DRILL HOLE A.M. & S. NO. 3

ASSAYS

From	To	Pb %	Ag Ozs. per Ton	Zn %
0	5'	.12	Nil	.40
5'	10'	.16	.04	2.1
10'	15'	.14	Nil	2.8
15'	20'	.14	.08	1.2
20'	25'	.06	Trace	0.9
25'	30'	.10	.04	1.9
30'	35'	.12	Trace	2.0
35'	40'	.12	Trace	1.5
40'	45'	.16	Trace	1.2
45'	50'	.10	Trace	1.0
50'	55'	.26	.18	1.5
55'	60'	.16	Trace	1.2
60'	65'	.14	.04	2.6
65'	70'	.12	.16	0.9
70'	75'1"	.12	Nil	0.4
75'1"	80'	.14	Nil	0.6
80'	85'	.25	Trace	1.4
85'	90'	.25	Nil	0.5
90'	95'	0.0	.02	1.1
95'	100'	.25	Nil	1.3
100'	105'	.14	N.D.	0.9
105'	110'	.14	N.D.	.95
110'	115'	.12	N.D.	.90
115'	120'	.12	N.D.	1.25
120'	125'	.12	N.D.	4.05
125'	130'	.12	N.D.	1.45
130'	135'	.12	N.D.	.35
135'	140'	Nil	N.D.	.35
140'	145'	.14	N.D.	.25
145'	150'	.14	N.D.	.20
150'	155'	.16	N.D.	.20
155'	160'	.18	N.D.	.25
160'	165'	.14	N.D.	.25
165'	170'	.14	N.D.	.20
170'	175'	.14	N.D.	.15
175'	180'	.00	N.D.	.20
180'	185'	.14	N.D.	.20
185'	190'	.12	N.D.	.50
190'	195'	.35	N.D.	1.8
195'	201'5"	.20	N.D.	1.7

APPENDIX III

Diamond Drill Hole A.M. & S. No. 3

CORE LOG

Footage From	Footage To	Description
0	5'	Barren grey limestone with numerous irregular weathered cracks. Fractured at 70° to core.
5'	6'4"	Weathered brownish material.
6'4"	10'	Grey limestone with irregular weathered cracks containing specks of sulphides.
10'	15'	Grey limestone with irregular cracks brown weathered material 13' - 15'. Galena at 12 feet.
15'	20'6"	Grey limestone at 15'6". Fractured 50° to core. Weathered brown patch 19' - 19'5" contains galena.
20'6"	22'	Brown weathered material.
22'	24'	Barren grey limestone with weathered cracks.
24'	29'11"	Grey limestone - evidence of slickensiding. Some black stringers. Some sulphides including pyrite.
29'11"	33'	Brownish weathered limestone.
33'	36'	Grey limestone with black stringers containing sulphides.
36'	40'	Brey-grey limestone with some black stringers.
40'	44'	Grey limestone, some mineralisation.
44'	44'10"	Weathered material.
44'10"	86'10"	Grey limestone with traces of sulphides. 60' - 70' low grade mineralisation. Weathered patch at 83'3".
86'10"	92'	Grey limestone with some irregular cracks.
92'	94'5"	Some pressure fractures at 45° to core.
94'5"	102'8"	Grey limestone with pressure cracks at 45° to core. Some sulphides (ZnS) present. Brown weathered broken material 102' - 103'.
102'8"	104'10"	Grey limestone with many irregular cracks.
104'10"	108'10"	Grey limestone. 106' stringer sphalerite.
108'10"	111'9"	Grey limestone with irregular fractures containing reddish material. 108'10" - 110' some galena and sphalerite.
111'9"	114'5"	Grey limestone with irregular light grey-white markings cracked at 70° - 80° to core.
114'5"	119'8"	As above. Banded 60° - 70° to core. 115'0" banded. Core at 70° becoming spotted. Trace of mineralisation.
119'8"	130'9"	Very spotted - Grey limestone, weathered at 125' to 126', 129' - 130'9". (123' - 125' mineralised sphalerite).

Footage From	Footage To	Description
130'9"	136'9"	Grey limestone with brown weathered material at 132', 133' - 134' (2' core lost).
136'9"	141'1"	Grey limestone, weathered and broken 140' - 141'1".
141'1"	144'	Reddish weathering, very broken.
144'	155'11"	Dark grey limestone, very broken (irregular), generally about 60°.
155'11"	188'8"	Grey limestone, irregular fractures 184' - 60°.
188'8"	201'5"	Grey limestone, broken - weathered at 195'. 192' thin stringer containing sphalerite.
		Traces of sphalerite at 88', 92'10", 98', 106', galena at 114'.
		End of hole - 201'5".

DIAMOND DRILL HOLE A.M. & S. NO. 4

SLUDGE SAMPLES

From	To	Pb %	Zn %
23'	31.5'	0.05	0.3
31.5	35	0.05	0.3
35	37	0.05	0.3
37	41	0.05	1.0
41	47	0.0	0.80
47	56	0.0	0.6
56	61	0.0	0.5
61	67	0.05	0.5

APPENDIX IV

Diamond Drill Hole A.M. & S. No. 4

CORE LOG

Logged by B.P. Thomson

% Pb	Ag Oz	% Zn	Footage From	Footage To	Description	
			80'	85'	Dark grey chert	
			85'	90'	do.	trace pyrite
			90'	95'	do.	
			95'	100'	do.	with polished slickensides
			100'	105'	do.	with calcite veinlets
			105'	110'	do.	
			110'	115'	do.	chert becoming paler grey
			115'	120'	do.	minute calcite veinlets
			120'	125'	do.	minute calcite veinlets
			125'	130'	do.	
			130'	135'	do.	
			135'	140'	do.	light grey and partly leached in places.
			140'	145'	do.	rust cracks
			145'	150'	do	and light coloured chert
			150'	155'	do.	
			155'	160'	do.	few rust cracks
			160'	165'	do.	few calcite veinlets
			165'	170'	do.	
0.02		1.3	175'	180'	do.	light grey cherty. Traces pyrite and seams pale yellow sphalerite.
0.04		5.2	180'	185'	do.	pyrite seams with abundant pale sphalerite veinlets.
0.08		2.6	185'	190'	do.	do.
0.0		2.8	190'	195'	do.	do.
0.02		5.45	195'	200'	do.	do.
0.06		5.6	200'	205'	do.	do.
0.0		5.35	205'	210'	do.	pyrite seams with galena splashes, pale sphalerite veinlets.
0.16		3.35	210'	215'	Dark grey chert	pyrite and pale sphalerite veinlets.
0.06		6.8	215'	220'	do.	do.

% Pb	Ag Oz	% Zn	Footage From	Footage To	Description
1.96	0.6	4.45	220'	223'	Dark grey chert fine grained galena sphalerite and pyrite
14.16	0.5	22.15	223'	225'	Sulphide, partly leached, galena, sphalerite and pyrite. Little brecciated chert calcite gangue.
6.06	0.3	12.85	225'	230'	Disseminated galena, sphalerite, pyrite in cherty gangue.
0.12		3.2	230'	235'	Grey cherty limestone ? Little sphalerite, trace pyrite.
0.18		2.25	235'	240'	do. ? do.
0.66		5.6	240'	245'	do. ? do.
0.24		3.4	245'	250'	do. ? do.
0.30		4.95	250'	252'	Grey cherty limestone ? Little sphalerite, pyrite splashes.
0.12		1.55	252'	255'	Grey chert, partly brecciated and ironstone
0.14		2.75	255'	260'	Grey chert, no sulphides except trace pyrite
0.12		4.2	260'	265'	Grey chert, sphalerite veinlets
1.12		2.65	265'	270'	Grey cherty limestone, sphalerite veinlets.
0.25		4.7	270'	275'	do. traces pyrite, sphalerite and galena?
0.0		2.8	275'	280'	do. do.
0.30		1.6	280'	285'	do. trace pyrite
0.15		2.0	285'	290'	do. trace galena and pyrite
0.15		13.3	290'	295'	do. galena sphalerite and pyrite increasing.
1.50		6.7	295'	300'	do. sphalerite veinlets, galena flecks.
0.55		3.1	300'	305'	do. sphalerite veinlets, galena flecks somewhat sparser.
0.20		2.6	305'	310'	do. traces sphalerite and pyrite.
0.20		2.5	310'	315'	do. traces sphalerite and pyrite, core somewhat brecciated.
0.30		1.8	315'	320'	do. traces sphalerite and pyrite, core somewhat brecciated.
0.15		3.1	320'	325'	do. do. do.
0.20		2.0	325'	330'	do. breccia structures.

APPENDIX V

Diamond Drill Hole A.M. & S. No. 5

CORE LOG

Logged by B.P. Thomson

% Pb	Ag Oz	Zn %	Footage From	Footage To	Description	
			0	5'	Sludge	
			5'	10'	Cherty claystone, weakly iron and manganese stained.	
			10'	15'	do.	
			15'	20'	do.	
			20'	25'	do.	Rust stained cracks
			25'	30'	do.	
			30'	35'	do.	
0.05		0.60	35'	40'	do.	Rust stained cracks and weathered sphalerite ? veinlets
			40'	45'	Cherty claystone	
			45'	50'	do.	Some brecciation and iron staining
			50'	55'	do.	
			55'	60'	do.	
			60'	65'	do.	
			65'	70'	do.	
			70'	75'	do.	
			75'	80'	do.	
			80'	86'	)	
0.25		2.6	86'	87'	) Limestone pebbles and iron oxide.	
0.30		0.8	92'	95'	Unweathered cherty limestone with trace sphalerite and galena?	
0.15		3.9	95'	100'	Unweathered cherty limestone, doubtful sphalerite traces	
1.25		4.7	100'	105'	Cherty brecciated limestone with rusty seams containing galena veinlets.	
0.35		5.5	105'	110'	Cherty limestone with sphalerite veinlets, traces pyrite.	
0.15		0.2	110'	115'	Cherty limestone with sphalerite veinlets, traces pyrite.	
42.6	1.3	14.7	110'8"	112'7"	Coarse galena, partly leached.	
0.30		13.9	115'	120'	Galena and sphalerite in brecciated cherty limestone.	

Pb %	Ag Oz	Zn %	Footage From	Footage To	Description
3.1	Nil	6.0	120'	125'	Several small intersections coarse galena partly leached in cherty limestone.
16.9	0.1	4.5	125'	130'	do., with a little sphalerite
0.3		2.0	130'	135'	Weak galena sphalerite in grey cherty limestone.
0.5		3.4	135'	140'	Weak galena sphalerite in grey cherty limestone
0.2		4.0	140'	145'	Grey cherty limestone, traces sphalerite
0.2		9.8	145'	150'	Brecciated cherty limestone, patches sphalerite
2.2	Nil	10.8	150'	155'	do., with little fine grained galena
1.4	Trace	10.7	155'	160'	do, with fine grained pale pyrite
0.25		6.1	160'	165'	do., with fine grained pale pyrite
0.1		3.5	165'	170'	do.
0.1		0.3	170'	175'	Traces sphalerite in cherty limestone
0.2		2.2	175'	180'	Traces sphalerite in cherty limestone
0.3		1.3	180'	185'	Traces sphalerite in brecciated cherty limestone
0.25		1.2	185'	190'	Traces sphalerite in brecciated cherty limestone
0.2		2.6	190'	195'	Few irregular veinlets sphalerite and pyrite in grey cherty limestone
			195'	200'	Grey cherty limestone, occasional traces pyrite and sphalerite
			200'	205'	do.
			205'	210'	do.
			210'	215'	do.
			215'	220'	do.
			220'	225'	do.
			225'	230'	do.
			230'	235'	do.
			235'	240'	do.
			240'	245'	do.
			245'	253'3"	do.

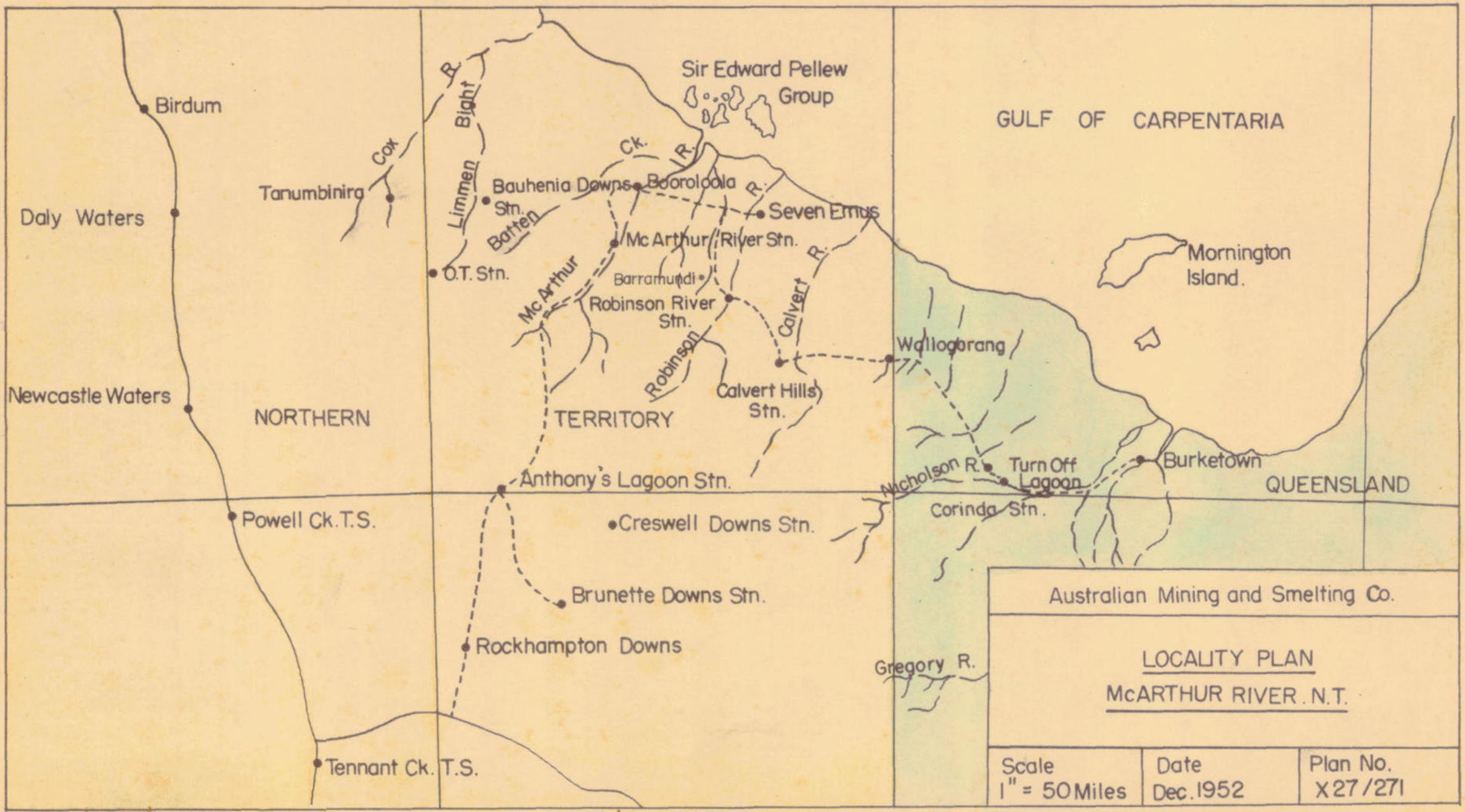
APPENDIX VI

Diamond Drill Hole A.M. & S. No. 6

CORE LOG

Logged by K.J. Murray

Footage From	Footage To	Description
0	5	Weathered green banded limestone with calcite stringers banded at 60° to core.
5	10	Weathered green banded limestone with fine calcite and siliceous stringers.
10	15	Grey cherty limestone breccia.
15	20	Hard dark grey cherty limestone. Broken ground
20	27	No core recovery
27	30	Hard dark grey cherty limestone, slightly weathered in places. Fractured in two directions at 45° to core.
30	35	Hard dark grey cherty limestone
35	40	Hard grey limestone banded at 70° to core, bands showing step faulting, contains fine calcite stringers
40	45	Hard dark grey limestone with some weathered patches. Core very broken and recovery low.
45	50	No core recovery
50	55	Hard pale red brown sandy limestone, very small core recovery
55	60	Hard brown sandy quartz, very broken, little core recovered.
60	65	Hard brown sandy quartz, very broken, little core recovered.


Birdum
Daly Waters
Newcastle Waters
Powell Ck. T.S.
Tennant Ck. T.S.
Tanumbiniri
Cox R.
Bight
Limmen
Batten
Bauhenia Downs Stn.
O.T. Stn.
Sir Edward Pellew Group
Ck.
I.R.
Booroloola
R.
Seven Emus
Mc Arthur River Stn.
Mc Arthur
Barramundi
Robinson River Stn.
Robinson
Calvert R.
Calvert Hills Stn.
NORTHERN TERRITORY
Anthony's Lagoon Stn.
Creswell Downs Stn.
Brunette Downs Stn.
Rockhampton Downs
Gregory R.
GULF OF CARPENTARIA
Mornington Island.
Wallogbrang
Nicholson R.
Turn Off Lagoon
Burketown
Corinda Stn.
QUEENSLAND
Australian Mining and Smelting Co.
LOCALITY PLAN
McARTHUR RIVER. N.T.
Scale 1" = 50 Miles
Date Dec. 1952
Plan No. X27/271

Barney Ck.

To Barroloola

Black soil

Sandy Ridge

Good Track

Bulburra

Bald Hills

Barney Ck.

L'st

87

87

Bulls Ck.

Clyde River

M.N.

N 70° W.

3·1 miles

To Anthony's Lagoon

McArthur River H.S.

Black soil

60-70

60-70

Pit. min

lst.

40

Lam. lst.

fine silic.

¾" laminae

one band"ate

McArthur River

Bull's Ck.

4·90 miles S. 45° E

Younger Sandstone

COOKS

CONWAYS

STUBBS

WOODS

BULLOCKS

Cu. min in lst

Ripple marked

f.g.

m.g. ss

85

45

slate? f.g. lam. ss.?

70

60 silic. lst.

Cu. min. in lst.

grey lst.

Collenia

10

85

ss

60

30

15

60

lst- ss.

Horiz. lst.

60

massive lst.

LEGEND

Sandstone

Limestone

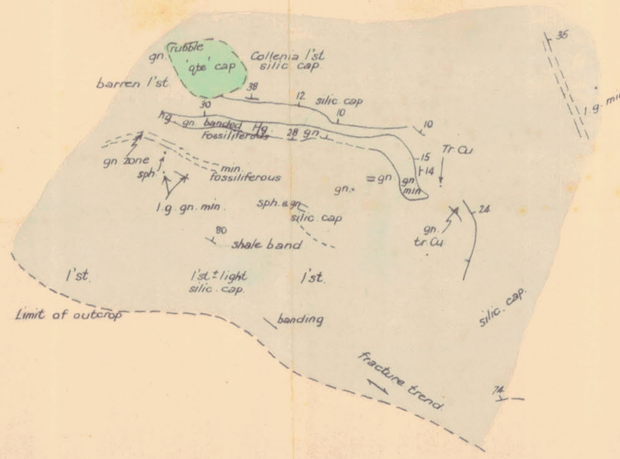
Limestone and siliceous sediments. Quartzite capping in places

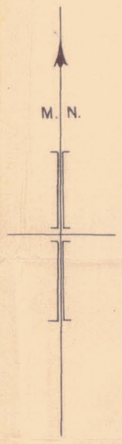
Australian Mining and Smelting Co.

GEOLOGICAL PLAN

McARTHUR RIVER. N.T.

Scale	Date	Plan No.
1" = ·74 miles	Sept. 1953	X 27/319

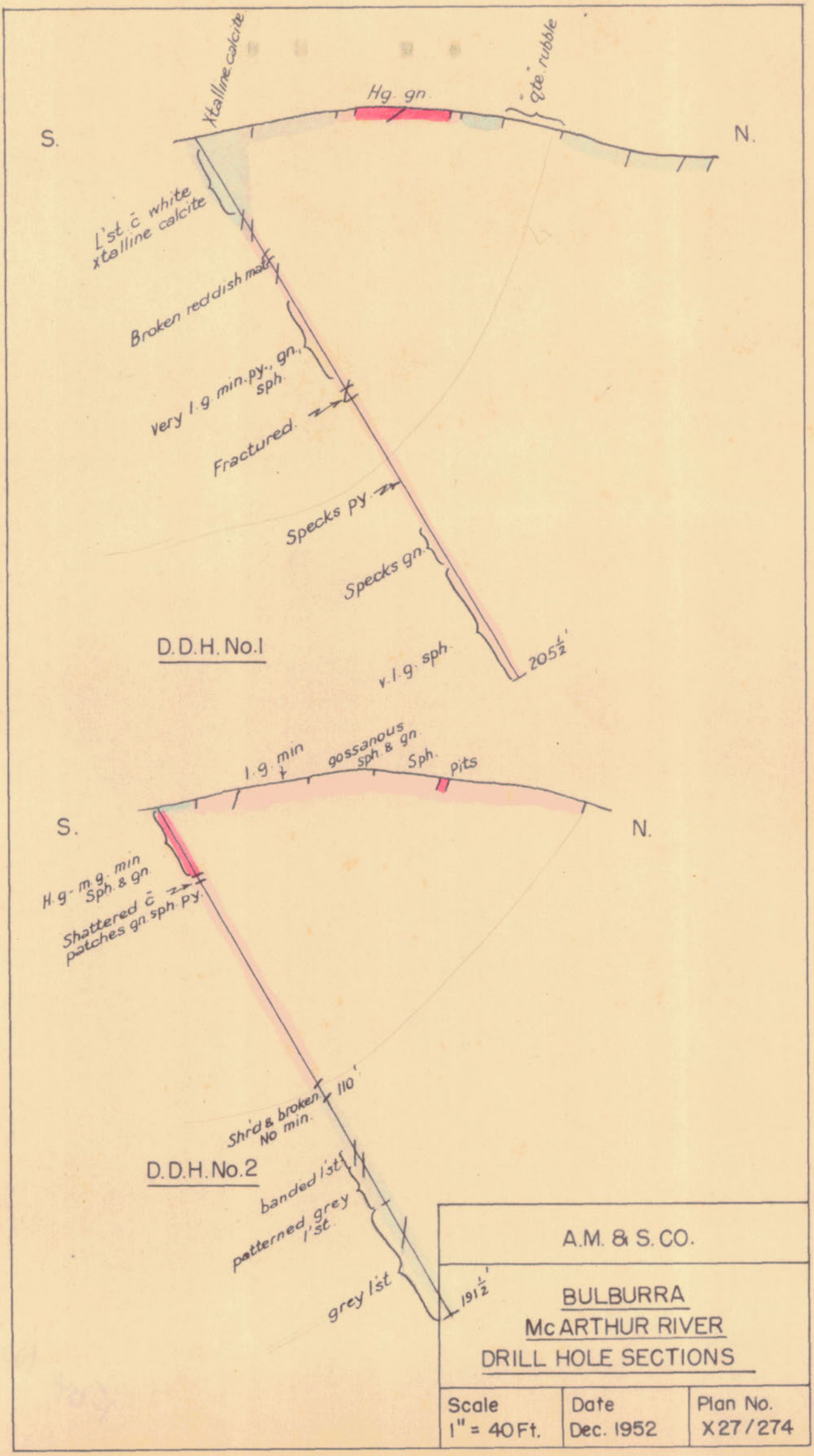


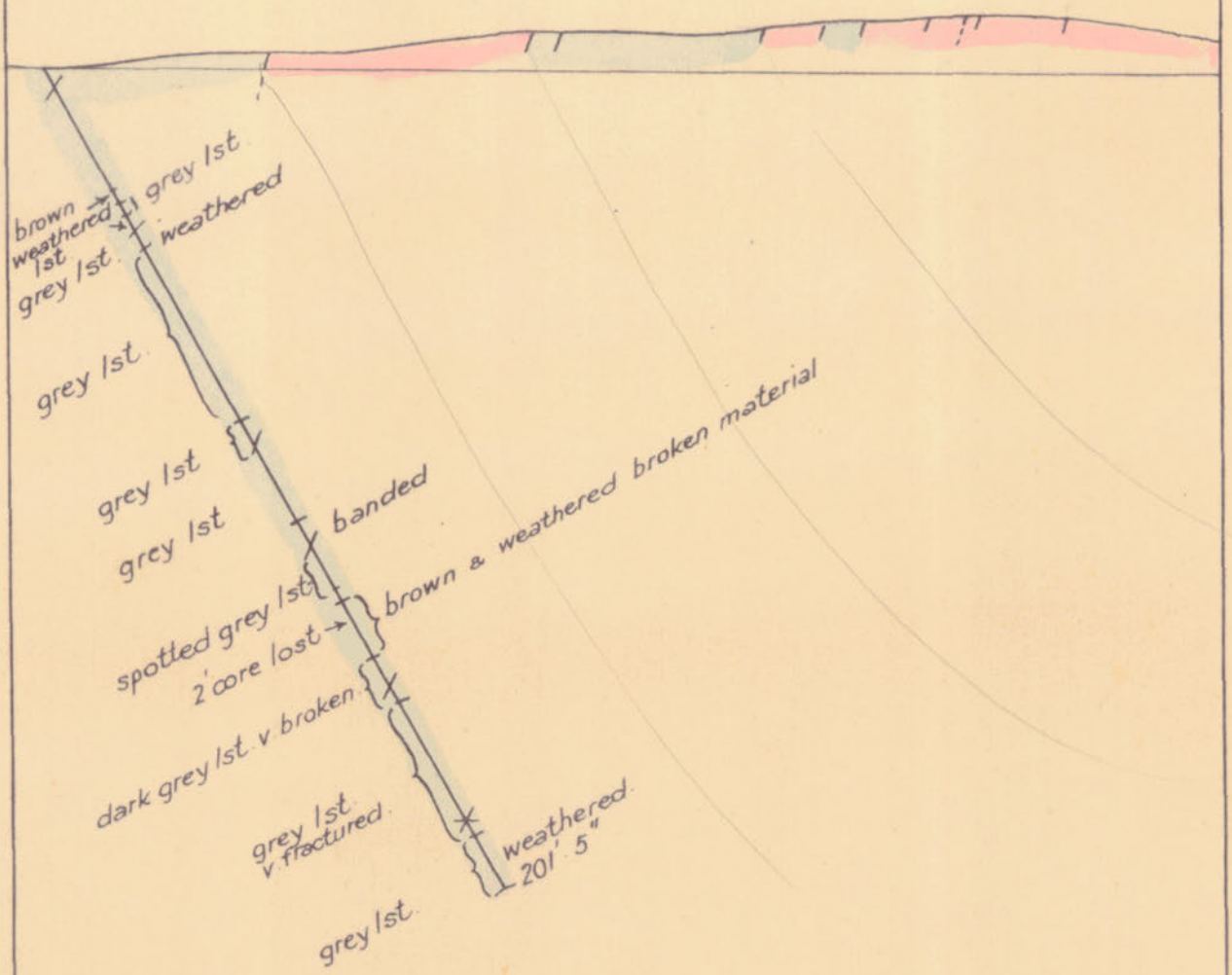


Australian Mining and Smelting Co.

BULBURRA. N.T.

Scale	Date	Plan No.
1" = 100'	Dec. 1952	X27/276


Xtalline calcite
Hg. gn.
qte rubble
S.
N.
L'st. c white xtalline calcite
Broken reddish matr
Very l.g. min. py., gn., sph.
Fractured
Specks py.
Specks gn.
v. l.g. sph.
205½'
D.D.H. No.1
l.g. min
gossanous sph. & gn.
Sph.
Pits
S.
N.
H.g. - m.g. min Sph. & gn.
Shattered c
patches gn. sph. py.
Shr'd & broken No min.
110'
D.D.H. No.2
banded l'st
patterned grey l'st.
grey l'st
191½'
A.M. & S. CO.
BULBURRA
McARTHUR RIVER
DRILL HOLE SECTIONS
Scale 1" = 40 Ft.
Date Dec. 1952
Plan No. X27/274



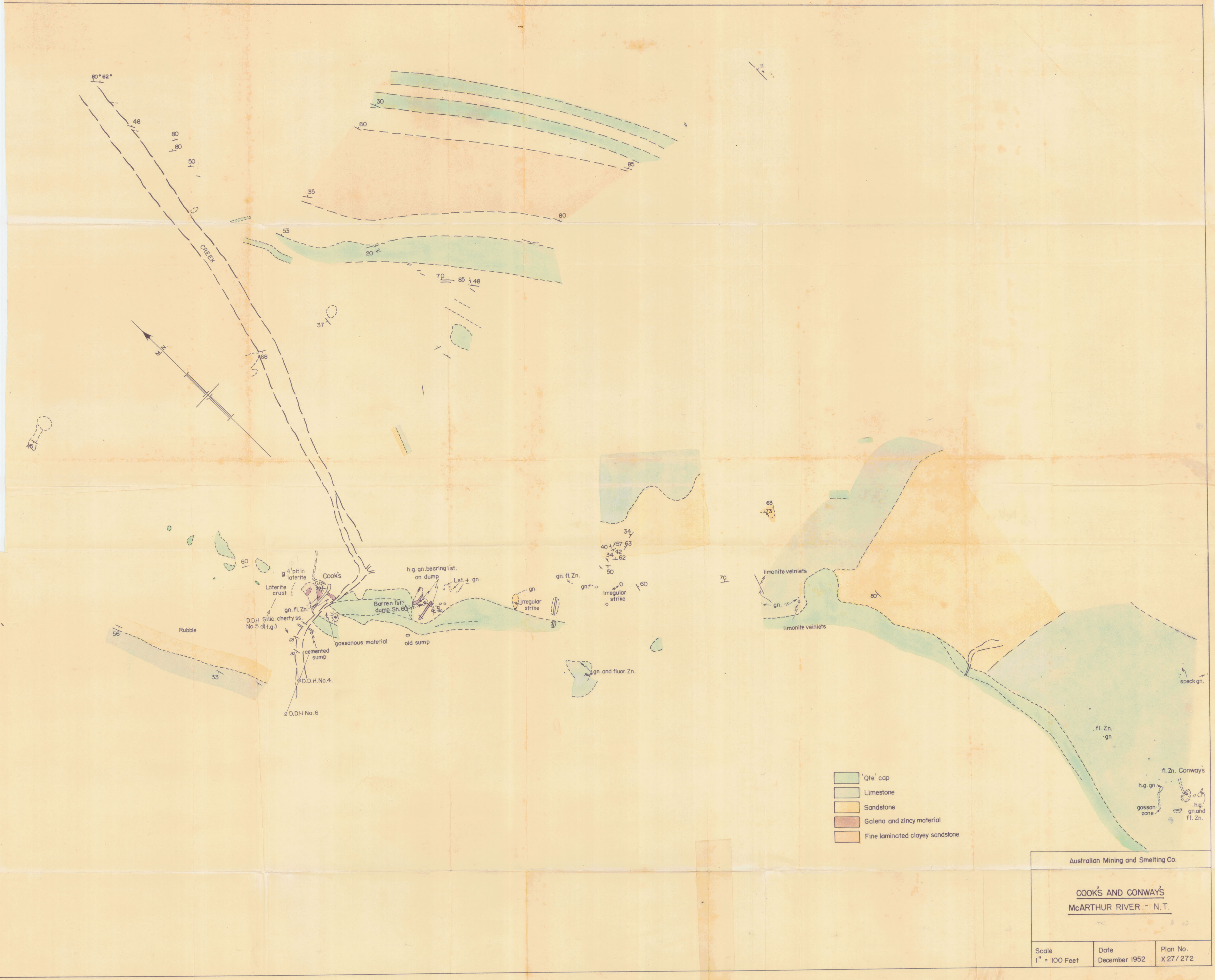
Barren 1st.

Mineralized 1st.

A. M. & S. Co. Ltd.

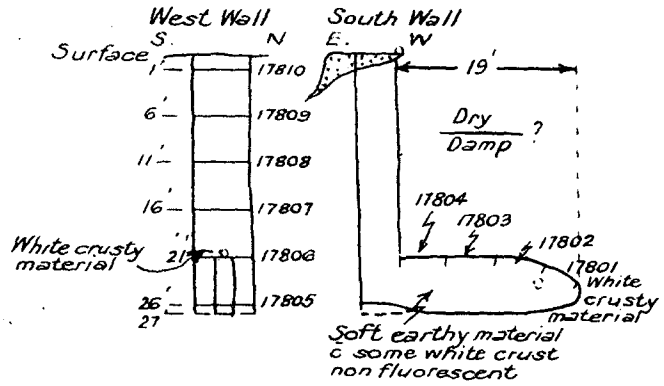
SECTION. D.D.H. NO. 3.
BULBURRA
McARTHUR RIVER. N.T.

Scale	Date	Plan No.
1" = 40'	Jan. 1954.	X27/349

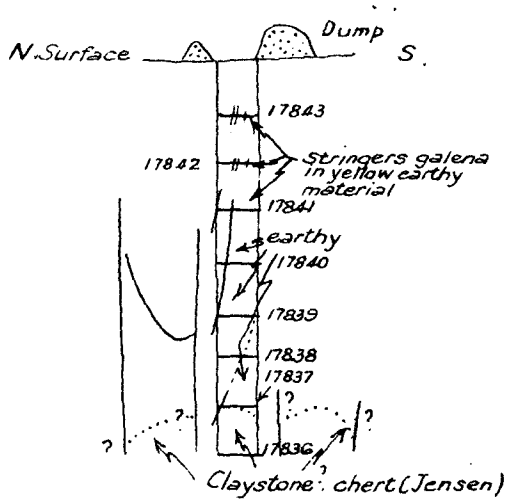


CREEK
M.N.
Cook's
4' pit in laterite
Laterite crust
gn. fl. Zn.
D.D.H. No.5
Silic. cherty ss. (f.g.)
gossanous material
cemented sump
D.D.H. No.4.
D.D.H. No.6
Rubble
h.g. gn. bearing l'st. on dump
Lst. ± gn.
Barren lst. dump Sh. 60
old sump
gn.
irregular strike
gn. fl. Zn.
gn.
Irregular strike
gn. and fluor. Zn.
limonite veinlets
gn.
limonite veinlets
speck gn.
fl. Zn.
gn
fl. Zn. Conway's
h.g. gn.
gossan zone
h.g. gn. and fl. Zn.
'Qte' cap
Limestone
Sandstone
Galena and zincy material
Fine laminated clayey sandstone
Australian Mining and Smelting Co.
COOK'S AND CONWAY'S
McARTHUR RIVER.- N.T.
Scale
1" = 100 Feet
Date
December 1952
Plan No.
X 27/272

Cook's Shaft "A"

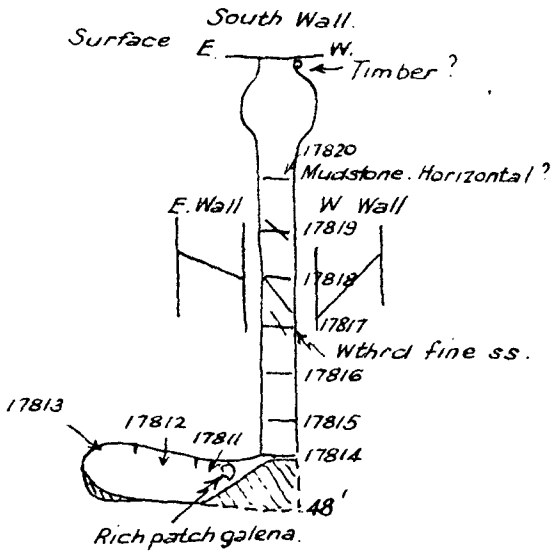


Cook's Shaft "C"



Sampled on East Wall.

Cook's Shaft "B"

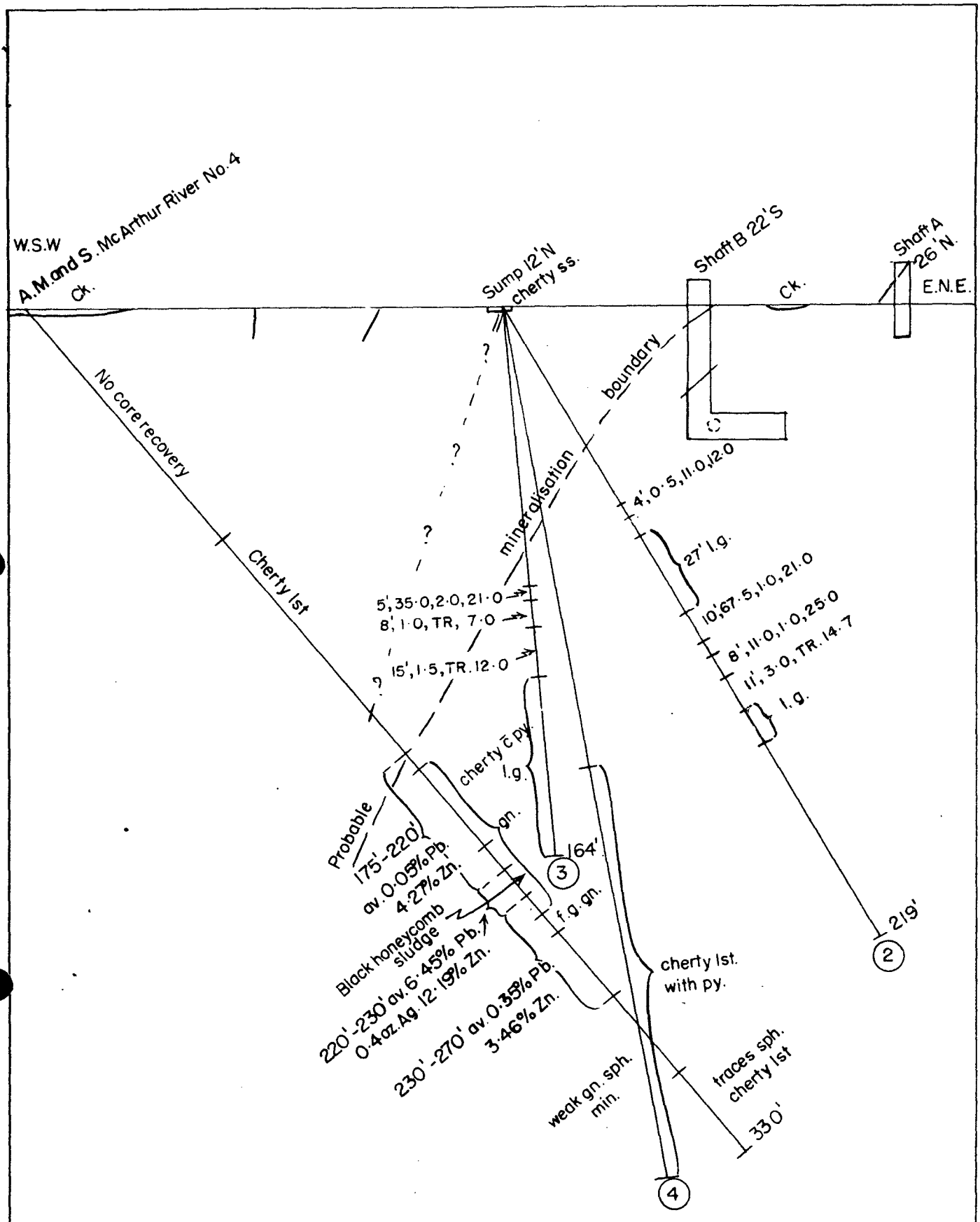


Sample No.	% Pb.	oz. Ag.	% Zn.	
17801	2·9	0·14	21·0	"A"
02	3·2	0·16	28·4	
03	0·9	0·10	26·6	
04	0·4	0·06	24·6	
05	0·6	0·10	21·2	
06	0·9	0·04	24·6	
07	0·7	0·06	24·6	
08	1·3	0·10	31·0	
09	2·5	0·06	31·6	
17810	6·7	0·08	16·6	
11	13·7	0·68	31·0	"B"
12	2·9	0·34	41·2	
13	5·4	0·02	38·8	
14	0·7	0·02	30·0	
15	3·7	0·64	31·6	
16	0·3	0·14	34·0	
17	1·7	0·20	18·4	
18	0·3	0·12	12·0	
19	0·1	0·12	7·0	
17820	0·1	0·02	2·2	
17836	0·0	N.D	1·0	"C"
37	0·0	N.D.	1·3	
38	0·0	N D	1·5	
39	0·2	N.D.	5·4	
40	1·4	0·18	16·4	
41	4·4	0·22	38·9	
42	4·5	0·34	30·5	
17843	16·7	0·88	28·7	

Enterprise Exploration Co. Pty.

SECTIONS. COOK'S SHAFTS
McARTHUR RIVER AREA

Scale	Date	Plan No.
1" = 20ft.	July. 1953	X27/312

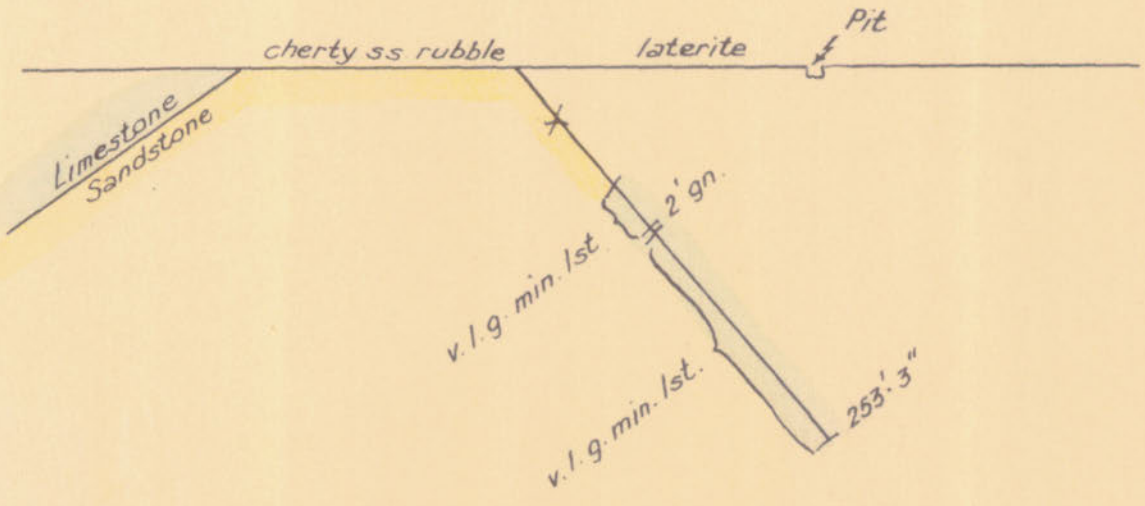


(2) Holes drilled by McArthur River Exploration Co. 1912 - 13.

Australian Mining and Smelting Co. Ltd.

COOK'S - D.D.H. NO.4.
McARTHUR RIVER.N.T.

Scale	Date	Plan No.
•1" = 40'	Sept. 1953	X 27 / 321



Limestone

Cherty sandstone

A.M.& S. Co. Ltd.

SECTION. D.D.H. NO. 5. (A.M.& S.)

COOK'S

McARTHUR RIVER. N.T.

Scale	Date	Plan No.
1" = 100'	Jan. 1954	X27/350

2 Lease pegs

3 low silic. cap bands
1 high one

silic. cap

Ck.

Lease Peg.

1st.

brown. silic. cap.

M.N.

Ck.

Collenia 1st.
silic. bands

40
30

30

30

60

40

30 - 40

STUBB'S LEASE

Collenia 1st.

20

No min.

45

Collenia 1st.

Collenia

well defined
collenia - no
silic. material

30

15

15 20

20

30

15

15

15

15

10

1st

Lst. Ridge

1st.

1st.

Beginning of ridge

1st. markings

45

Ck.

Scattered 1st.
outcrops

silic. cap
material

70

Top of first rise
2 more silic. caps

1st.

High ridge

1st.

WOOD'S LEASE

Top of first silic. ridge

grey 1st. silic. cap

High silic. cap

1st.

30

1st.

1st. shows bladed
light brown calcite
crystals (Recrystallised)

Rubble
(silic. cap)

Datum. 3 Lease Pegs

BULLOCK'S LEASE

silic. cap.

Pit in lode

Beginning
of rise

gn. occurs as
weathered slugs
on the surface and
in the 1st. and the
overlying silic. cap.
True width unknown. -
not solid lode.

Cu. stained silic. cap
containing Gn.

Pit

gn.

1st.

Cu. stnd. and gn. in silic. cap.

Min.
Low 1st. outcrop. gn. slugs and Cu. stnd.
flat

Pit in 1st. & gn.
10' deep

Mineralization is in criss cross fashion
filling irregular fractures in a
crusted? 1st. Mn. staining also present.

Concealed

Lease Peg.

grassy flat.

silic. rubble

concealed

low grass
covered 1st.

1st.

scattered
silic. cap.

1st.

scattered 1st.
& silic. cap.

1st.

1st.

light silic. rubble

fawn 1st.

silic. cap. rubble

silic. rubble

highly silic. rubble

Mineralized collenia limestone

Australian Mining and Smelting Co.

GEOLOGICAL PLAN.
STUBB'S, WOOD'S & BULLOCK'S LEASES
McARTHUR RIVER. N.T.

Scale	Date	Plan No.
1" = 100'	Sept. 1953	X 27/320