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GEOLOGICAL REPORT ON THE STRUCTURAL BEHAVIOUR OF THE LODE SYSTEM AT NORTHERN HERCULES MINE, NORTHERN TERRITORY

by

K. W. A. Summers

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Resident Geologist's Office,
Darwin, N.T.
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SUMMARY

The Northern Hercules Gold Mine is situated in rocks of the Burrell Creek formation of Lower Proterozoic Age. Within this formation, the Hercules lode shears form a part of a system which strikes at 343°. Three parallel shears occur in the vicinity of the mine. Mining has been concentrated on the easterly one which contains three shoots. These have been mined to a depth of 300 ft. and development on the 400 ft. level is proceeding. Mineralisation is finely disseminated gold in pyrite with minor amounts of copper, lead and zinc sulphides. There is no indication of any major change at depth in the gold content of the ore or the tons per vertical foot. On present evidence these should continue to the 400 ft. level.

A series of seven horizontal diamond drill holes from the 300 ft. level are proposed to test the parallel shears to the west of the present workings.

Judged by the shoots developed the potential of the mine does not warrant a great expenditure on drilling, but it is advisable to test for extensions or repetitions of ore shoots in the vicinity of the present workings while they are still open.

INTRODUCTION

The Northern Hercules Gold Mine is situated 30 miles by road north-east of the township of Pine Creek on the Darwin-Birdum railway, 147 miles by rail south-east of Darwin. The road from Pine Creek is moderately good.

This report is a brief description of the mine geology. It is a supplement to a previous report by Sullivan (1940) which covers the history and development of the mine to that year. The object is to discuss the behaviour of the ore body at depth and the possible repetition of ore shoots. It summarises the exploration to date and indicates where the emphasis in future exploration should be directed.

GENERAL GEOLOGY

Regional mapping by field parties from the Bureau of Mineral Resources has shown that the mine is in rocks of the Burrell Creek formation of Lower Proterozoic Age. The rocks consist of interbedded greywacke, siltstone and fine-grained sandstone. The strike ranges from 292° to 300° and the dip is 60° to 70° south.

The shears to which the Northern Hercules lodes belong generally strike 343° and dip at 65° to 70° west.

In the vicinity of the mine three parallel shears occur; these have been named the Western, Central and Eastern Lodes (see Plate 1). The Eastern Lode is the most prominent and it is in this that mining has been extensively carried out. The foot-wall and hanging-wall of the shear zone are mostly well defined, although there is no great development of pug on either wall. The core is brecciated and gives a blocky appearance to the lode material. Small post-shear veins of galena cut obliquely across the shear zone.

THE LODES

The metallic minerals are pyrite and significant amounts of chalcopyrite, chalcocite, tetrahedrite, sphalerite, galena, arsenopyrite and native gold. Quartz is the main gangue material. The greater part of the gold is contained in the pyrite but the other sulphides also carry a small amount. The gold occurs as small particles, ranging in size from 0.001 mm. to 0.025 mm. in diameter, along thread-like fractures within the pyrite. Much of it, although isolated in pyrite, is close to veinlets or small areas of chalcopyrite.

The shoots, which are composed of one or more lenses of pyritic material have no defined pattern of enrichment. (See Plate 3). Gold content is usually lowest in the massive pyrite and highest where the copper content increases. Where the shoots break up and tail out within the lodes the gold content is almost invariably much higher than in the main portion of the lode.

Eastern Lode.

The Eastern Lode has provided the bulk of the production to date. It consists of a well-defined shear which strikes approximately 340° and dips 65° to 70° west. On the surface the shear zone has been worked at intervals over a distance of 1000 feet. Within this distance three distinct ore shoots occur; the southernmost or No. 1 shoot has a length of approximately 220 feet; the No. 2 shoot, immediately north of the main shaft, has a maximum length of 120 feet; the northern or No. 3 shoot a length of 200 feet.

The shoots are developed within the shear zone and cut across it obliquely from footwall to hanging wall. They tend to reach maximum development where the direction of the shear diverges 5° to 10° to the north of its normal course. There is therefore a shear-link pattern which gives an en-echelon arrangement to the three main shoots. Pitch is 55° south, which co-incides with the intersection of bedding and shearing planes.

Central Lode.

This lode runs parallel to, and to the west of, the Eastern Lode. The surface is marked by a series of opencuts which extend over a distance of 600 feet. The attitude of the shoots is similar to those of the Eastern Lode but they are shorter and narrower. The open cuts have been worked to a maximum depth of 70 feet. The indications are that they follow an en-echelon pattern and pitch to the south.

Western Lode.

This parallel lode is west of the Central lode. It has been worked over a length of 400 feet. In general the attitude and pitch of its shoots appear similar to those of the other lodes.

DEVELOPMENT TO DATE

Eastern Lode.

To date the development has shown that the three shoots on the Eastern lode continue to the 300 foot level. The pitch of each shoot is constant and there is no noticeable

alteration in the character of mineralisation.

The southern shoot is strong to the 300 foot level and indications suggest that it should continue to the 400 foot level. 55 tons per vertical foot were indicated on the 200 foot level and 60 tons on the 300 foot level.

In the central shoot the cross-section at 5230N (Plate 5) indicates that one lens cuts out just below the 200 foot level and is replaced below and to the west by another lens similar in character and values. On the 300 foot level this new lens is quite strongly developed and has similar characteristics to the upper lens, although there may be a tendency for it to weaken between the 300 and the 400 foot levels. It is possible that a third lens may occur further down the pitch and to the west. On the 200 foot level 26 tons per vertical foot were indicated, and on the 300 foot level 28 tons per vertical foot.

The No. 3 (northern) shoot shows no change between the 200 and 300 foot levels and should extend to the 400 foot level. 73 tons per vertical foot were indicated on the 200 foot level and 70 tons on the 300 foot level.

The average width and grade of ore in the shoots mined to date is as follows:-

Number	1	Shoot	38.7 ins	at	15.5	dwts per ton
"	2	"	35.7 ins	at	20.8	" " "
"	3	"	57 ins	at	19.9	" " "

Central Lode.

This lode has been opened up over a length of 300 feet on the 200 foot level. The gold content was low and no ore-shoots were indicated. It does not appear that any mineable ore-shoots will be located from workings in the northern section of the mine, because the pitch would carry any continuation of surface indications well south of the development carried out at the 200 foot level.

Western Lode.

This lode has been opened up on the 200 foot level for a distance of 50 feet. The shear is strong but the gold content is low. Development is not sufficient to indicate the value of this lode.

SUGGESTIONS FOR PROSPECTING AND FUTURE DEVELOPMENT

Future exploration should test -

(a) any downward continuation of known shoots in the Eastern Lode,

(b) possible new shoots en-echelon and down pitch south of the No. 1 shoot of the Eastern Lode, and

(c) any downward extension of shoots in the central and western shears.

The most logical plan for future development openings lies in following the downward extension of the existing ore shoots. These do not appear to be cutting out, but there is no indication of any increase in gold content or tonnage of ore with depth.

The possibility of a further shoot of ore, in the eastern shear en-echelon to the south, is one which is already being prospected by the mine. The south drive is being extended on the 300 foot level and has already advanced approximately 200 feet beyond the southern limit of the No. 1 shoot. The intervals between the other shoots are:-

No. 1 to No. 2 approximately 250 feet;
No. 2 to No. 3 approximately 200 feet.

The drive might therefore be extended to cover a similar spacing, but if not successful within another 50 feet may not be worth continuing.

The downward extent of shoots on the adjacent lodes to the west has not yet been tested. These present an opportunity for easy prospecting by lateral diamond drilling; if shoots were intersected they could be developed from the present workings. Four diamond drill holes, Nos. 1 - 4 (Plate 4), have been planned to intersect possible downward extensions of shoots on the central shear. It is suggested that holes Nos. 1 and 4 be extended to intersect the western shear. Holes Nos. 5 - 7 (Plate 4) are prospecting holes designed to examine an area to the south of the main shaft. These horizontal drill holes can be drilled from the 300 foot level of the mine. Details are given in the table below.

TABLE I

Horizontal Diamond Drilling from 300 foot level

Diamond Drill Hole No.		Bearing Magnetic	Co-ordinate	Zone of intersection of Lode
Target Drilling	BH 1.	253°	5555 N	165-210 feet
	BH 2.	253°	5450 N	155-205 feet
	BH 3.	253°	5262 N	125-170 feet
	BH 4.	253°	5073 N	155-200 feet
Prospecting Drilling	BH 5.	253°	4849 N	250 feet
	BH 6.	253°	4700 N	250 feet
	BH 7.	253°	4550 N	250 feet

CONCLUSION

The downward extension of the eastern lode appears probable but there is no indication of increase in tonnage per vertical foot or grade of ore. A further shoot might occur en-echelon to the south of the known shoots, but the drive being put out on the 300 foot level to explore this section should probably not be extended more than 250 feet beyond the southern limit of the No. 1 shoot.

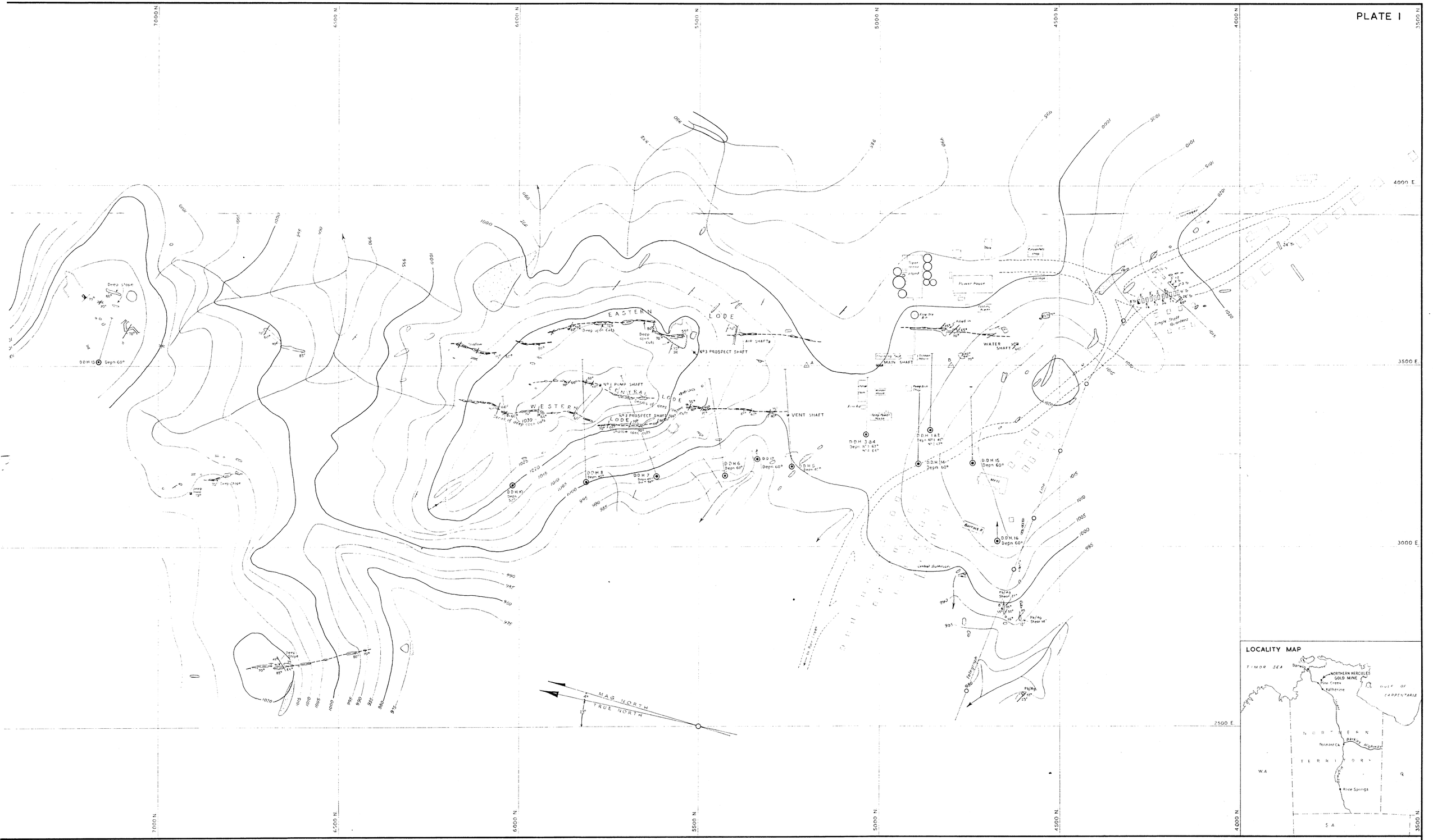
Ore-shoots may occur within the central and western shears as a downward continuation of surface indications, and these could be tested by lateral diamond drilling designed to explore the area immediately west of the present workings.

REFERENCES

SULLIVAN, C.J., 1940 - Hercules Gold Mine. Aerial, Geological and Geophysical Survey of N.T. Vol. 47.

C.S.I.R.O., 1956 - Ore Specimens from Northern Hercules Mine, Northern Territory. Mineragraphic Investigations Rep. No. 643.

PLATE I



LOCALITY MAP

SCALE

0 25 50 0 100 200 300 ft.

NORTHERN HERCULES N.L.
PINE CREEK N.T.

REFERENCE

- Shaft
- Costean
- Open-cut (depth in feet)
- Interbedded siltstone & greywacke
- Quartz outcrops
- D.D.H 14 Depn — Diamond Drill Hole & direction drilled
- Depression
- 80° — Strike & dip of strata
- 60° — Main lode shear, showing dip
- 1000 — Topographic contours
- Track
- Foot of dump
- Pitch of bedding plane / shear intersection
- Pb 15 — Prospecting Pit (showing width of sample) and assay in dwts/ton
- Breccia

GEOLOGICAL PLAN & SURFACE LAYOUT
&
LOCALITY MAP

Bureau of Mineral Resources ✓Geology & Geophysics
Darwin 8-6-1957

Resident Geologist's Office
Base Plan of Northern Hercules Modified by K.W.A Summers

drawn by
E.Feeken

PLATE 2

NORTHERN HERCULES N.L.

PINE CREEK N.T.

SURFACE PLAN
showing
PRINCIPAL WORKINGS

Bureau of Mineral Resources · Geology & Geophysics.
Darwin 8.6.1957

Resident Geologist's Office

Base Plan by Northern Hercules mod-fied by K.W.A. Summers

SCALE

40 0 40 80 120 160 200 feet

REFERENCE

- Open cut or shaft (Depth in feet)
- Shaft
- Run of dump
- Costeans
- Strike & dip of strata
- Direction of plunge of shear/cleavage intersection
- Fault
- Topographic Contours
- Interbedded siltstone & greywacke
- Quartz outcrops
- Diamond Drill Hole & direction
- Main lode shear (showing dip)
- Cross - Sections (see plate 5)

EASTERN LODE
CENTRAL LODE
WESTERN LODE
AIR SHAFT
No 3 PROSPECT SHAFT
No 1 PUMP SHAFT
No 2 PROSPECT SHAFT
VENT SHAFT
MAIN SHAFT
OLD UNDERLAY SHAFT
WATER SHAFT
DDH 1 & 2 Depn 45° 67°
DDH 3 & 4 Depn 63° 64°
DDH 5 Depn 45°
DDH 7 Depn 45°
DDH 8 Depn 42°
DDH 14 Depn 60°
DDH 15 Depn 62°
DDH 16 Depn 60°
DDH 17 Depn 60°
Magnetic North
True North
Grid North

PLATE 3

5900 N. 5700 N. 5500 N. 5300 N. 5100 N. 4900 N. 4700 N. 4500 N.

No 3 PROSPECT SHAFT | AIR SHAFT | HERCULES MAIN SHAFT | D.D.H. N° 14 | OLD UNDERLAY SHAFT | D.D.H. N° 15 | D.D.H. N° 16 | WATER SHAFT

66 FT. LEVEL

RL 900'

112' LEVEL

130 FT. LEVEL

BLOCK AVERAGE
55' 35.2 dwts/ton
(73 tons/vert. Ft)

Note: 200' Level
Central Lode not included
in tungsto-tinal Section

71' 63.5 dwts/ton

BLOCK AVERAGE
30' 25.7 dwts/ton
(26 ton/vert Ft)

34' 14.9 dwts/ton

BLOCK AVERAGE
35.3' 13.6 dwts/ton
(55 tons/vert Ft)

200 FT. LEVEL

37' 24.7 dwts/ton

36.7' 19.10 dwts/tons

58.3' 13.5 dwts ton

(70 tons/vert Ft)

BLOCK AVERAGE
41.5' 17.3 dwts/ton
(28 tons/vert Ft)

BLOCK AVERAGE
42' 17.2 dwts/tons
(43 tons/vert ft)

34.2' 9.2 dwts/ton

in progress

300 FT. LEVEL

RL 700'

57.7' 11.9 dwts ton

57' 22.1 dwts/ton

48.3' 23.8 dwts/ton

Zone of Intersection
D.D.H. 14
49' 17.6 dwts

Zone of Intersection
D.D.H. 15
54' 7.7 dwts

NO. 3 ORE SHOOT

NO. 2 ORE SHOOT

NO. 1 ORE SHOOT

400 FT. LEVEL

RL 500'

RL 300'

5550N - CROSS - SECTION C - C'

5230N - CROSS - SECTION B - B'

4739N - CROSS - SECTION A - A'

5200 N. 5700 N. 5100 N. 4900 N. 4700 N.

40 20 0 40 80 120 160 200

SCALE IN FEET

NORTHERN HERCULES N.L.
PINE CREEK N.T.

REFERENCE

36" 1.7 Width of Lode in inches & Assay dwts/tons

Outline of Stope to 7.6.1957

Zone of Intersection of Diamond Drill Holes (not surveyed)

LONGITUDINAL PROJECTION OF EASTERN LODE

Showing Assay Results and Stope Outlines

Bureau of Mineral Resources Geology & Geophysics
Darwin 7.6.1957

Resident Geologist's Office

Taken from plan of Northern Hercules N.L. & modified by K.W.A. Summers


5800 N
5600 N
5400 N
5200 N
5000 N
4800 N
4600 N
MAG. NORTH
TRUE NORTH
C′
B′
A′
C
B
A
200 FT. LEVEL
300 FT. LEVEL
Nº3 PROSPECT SHAFT
AIR SHAFT
INACCESSIBLE
EASTERN
LODE
UNDERLAY SHAFT
WATER SHA
MAIN
SHAFT
150 Ft Level
200 Ft Level
300 Ft Level
400 Ft Level
Nº1 PUMP SHAFT
Nº2 PROSPECT SHAFT
CENTRAL LODE
WEST LODE
200 Ft Level
VENT SHAFT
PROPOSED HOLE No 1
PROPOSED HOLE No 2
PROPOSED HOLE No3
PROPOSED HOLE No 4
PROPOSED HOLE No 5
PROPOSED HOLE No 6
PROPOSED HOLE No
Possible extension
to test West Lode
3000 E

40 0 40 80 120 160 200

SCALE IN FEET

NORTHERN HERCULES N.L.

PINE CREEK N.T.

REFERENCE

- Main Shaft
- Raise
- Level Plan
- No 1 — Proposed bore hole showing zone of intersection
- A—A′ Cross-section
- Massive Pyrite
- Main Shear (showing Dip)
- Strike & Dip of Strata
- Pitch and Direction of Shear/bedding intersections
- Laminated Siltstone & Greywacke

COMPOSITE GEOLOGICAL PLAN OF LEVELS.

SHOWING POSITION OF LODE IN RELATION TO
MAIN SHEAR ZONE
AND PROPOSED DIAMOND DRILLING

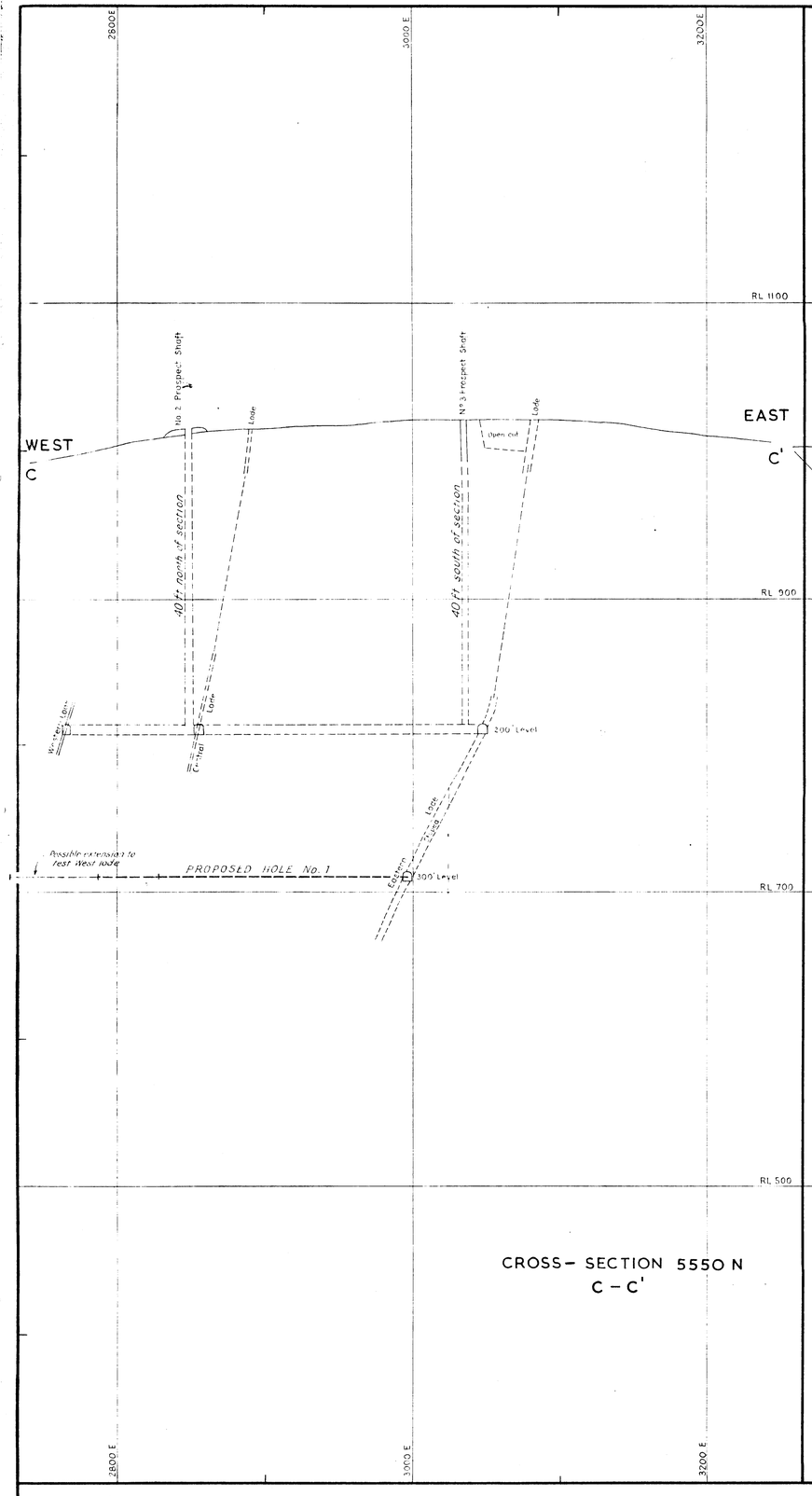
Bureau of Mineral Resources/Geology & Geophysics
Darwin 7.6.1957

Resident Geologist's Office

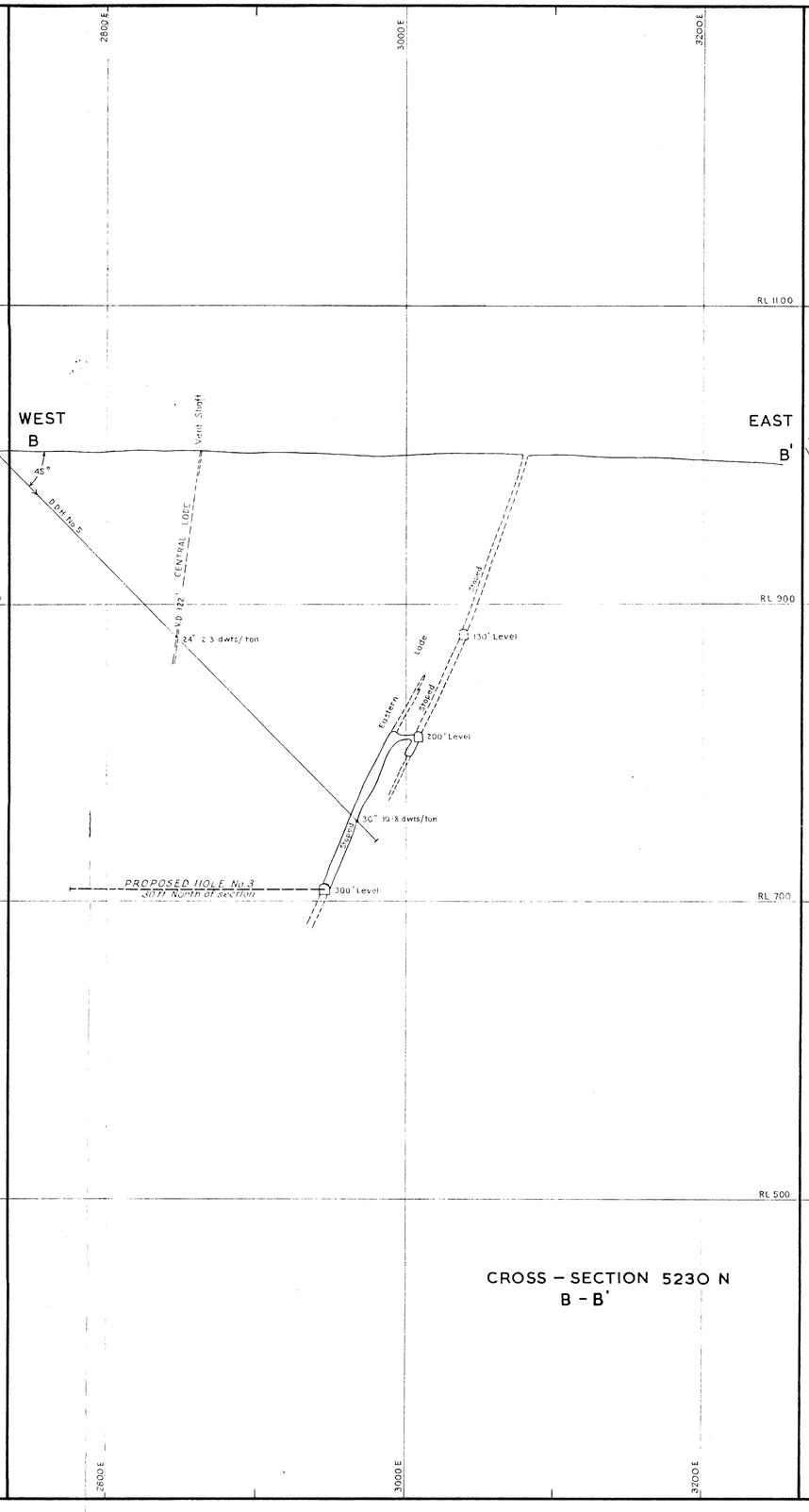
Base Plan of Northern Hercules modified by R.W.A. Summers

Drawn by I. Teeken

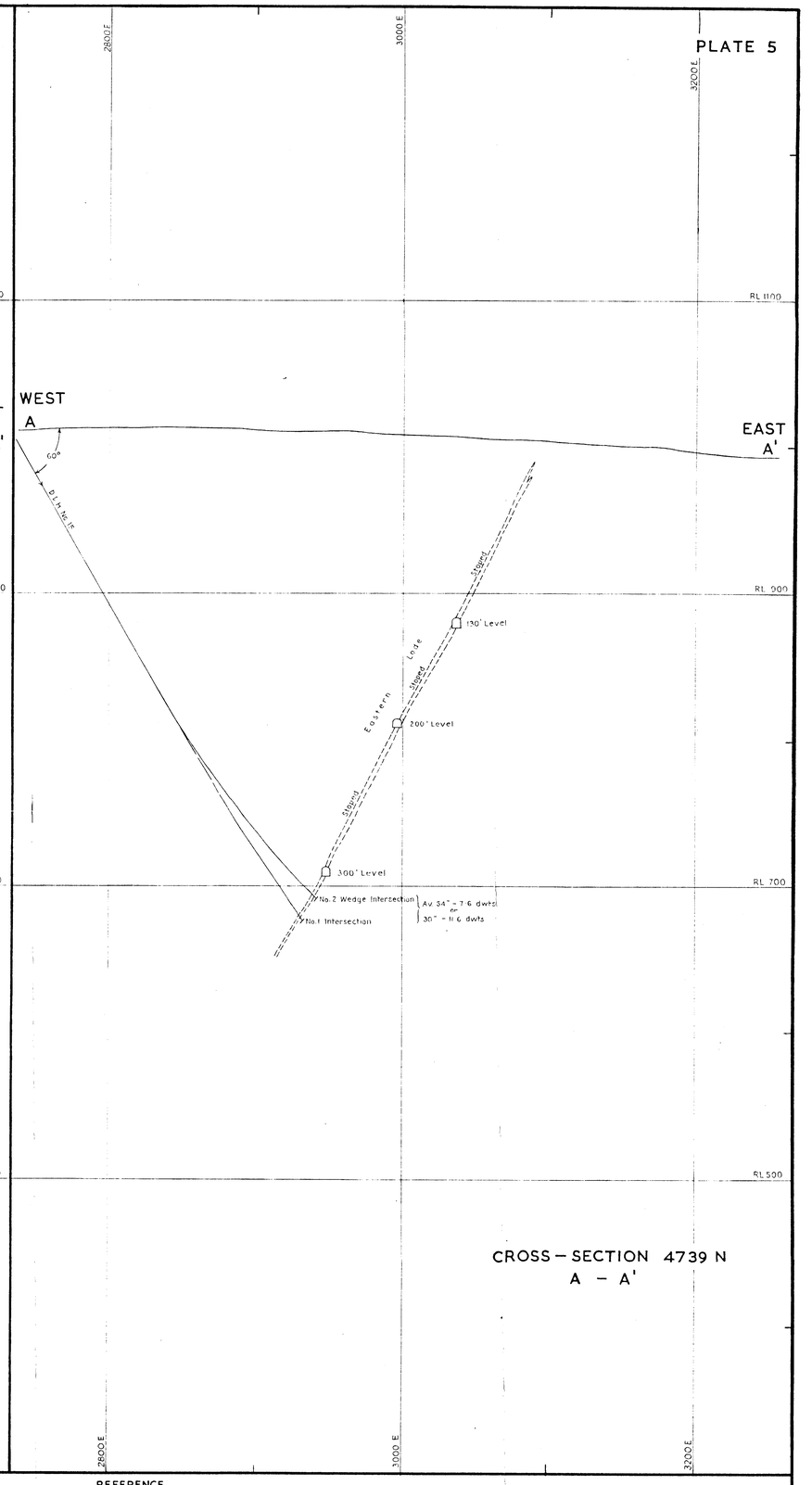
PLATE 5



CROSS – SECTION 5550 N
C – C'



CROSS – SECTION 5230 N
B – B'



CROSS – SECTION 4739 N
A – A'

40 20 0 40 80 120 160 200 FEET
SCALE

NORTHERN HERCULES N.L.

PINE CREEK N.T.

REFERENCE

- Drive
- Shaft
- Diamond Drill Hole
- 36" 19·8 Assay Result for Grid showing width in inches & dwts per ton

CROSS – SECTIONS 4739 N, 5230 N, 5550 N

SHOWING DIAMOND DRILL INTERSECTIONS
(LOOKING NORTH)

Resident Geologist's Office Darwin 1967
Bureau of Mineral Resources, Geology & Geophysics