ANNUAL REPORT ON
EXPLORATION ACTIVITIES FOR
EXPLORATION LICENCE 2083 TENNANT CREEK
FOR PERIOD JULY 25, 1980 TO JUNE 19, 1981

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September, 1981

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SUMMARY

Exploration Licence 2083, covers an area of 19.38 square kilometres in the vicinity of Tennant Creek in the Northern Territory, was granted to Australian Ores and Minerals Ltd. on 25th July, 1979.

Exploration is being carried out by the Operator, Marathon Petroleum Australia, Ltd. under the terms of a Joint Venture Agreement approved by the Minister for Mines and Energy on 13th December, 1978.

During 1980, 3 rotary drill holes were completed for a total of 105 metres as part of a larger drilling programme over this and adjacent EL's under similar Joint Venture Agreement. Drill cutting samples were submitted for geochemical analysis.

1.0 INTRODUCTION

1.1 Location, Climate, History

The township of Tennant Creek is located on the Stuart Highway approximately 500 kilometres north of Alice Springs and 1,000 kilometres south of Darwin in the Northern Territory. The Exploration Licences held in Joint Venture by Uranerz Australia Ltd. and Marathon Petroleum Australia Ltd. lie within the Tennant Creek 1:250,000 sheet area bounded by latitudes 19°S and 20°S and longtitudes 133°30' E and 135°E. (Fig. 1-1).

The main centre of population is Tennant Creek (population approximately 3500), however smaller settlements occur at Nobles Nob and Warrego Mines, the Threeways Roadhouse, and the two pastoral properties of "Phillip Creek" and "Tennant Creek".

The climate is hot in summer (mean daily temperature ranges from 24°C to 37°C) and mild in winter (11°C to 24°C). Temperatures into the mid-forties are common in summer. The yearly average rainfall is 365mm, confined mainly to the summer months.

The semi-arid country supports semi-desert vegetation comprising porcupine bush, spinifex, turpentine bush, small eucalypts and mulga.

Gold was first recognised in the area probably around 1870, but it wasn't until 1932 that the first significant deposit was discovered. The field subsequently developed into a major producer of copper and gold. Three major mines are in production at the present time:- Warrego (Au, Cu, Bi, Se, Ag), Gecko (Cu, Au) and Nobles Nob (Au). Details relevant to the geology and mineralization of various mines are presented by White (1962), Crohn (1965, 1975), Crohn and Oldershaw (1965), Wright (1965), Dunnet and Harding (1967), Large (1975) and Goulevitch (1975).

Marathon Petroleum Australia Ltd. are currently involved in exploration for U, Cu, Au, Bi and associated mineralization on Exploration Licences in the Tennant Creek field.

1.2 Land Title

Exploration Licence 2083 was granted to Australian Ores & Minerals in June 1979; the tenement has been reduced in accordance with the Mining Act. Figure 1-1 outlines the land situation.

During 1980 exploration on EL 2083 was carried out by Marathon Petroleum Australia, Ltd. under the terms of a Joint Venture Agreement that received Ministerial approval on 13th December 1978.

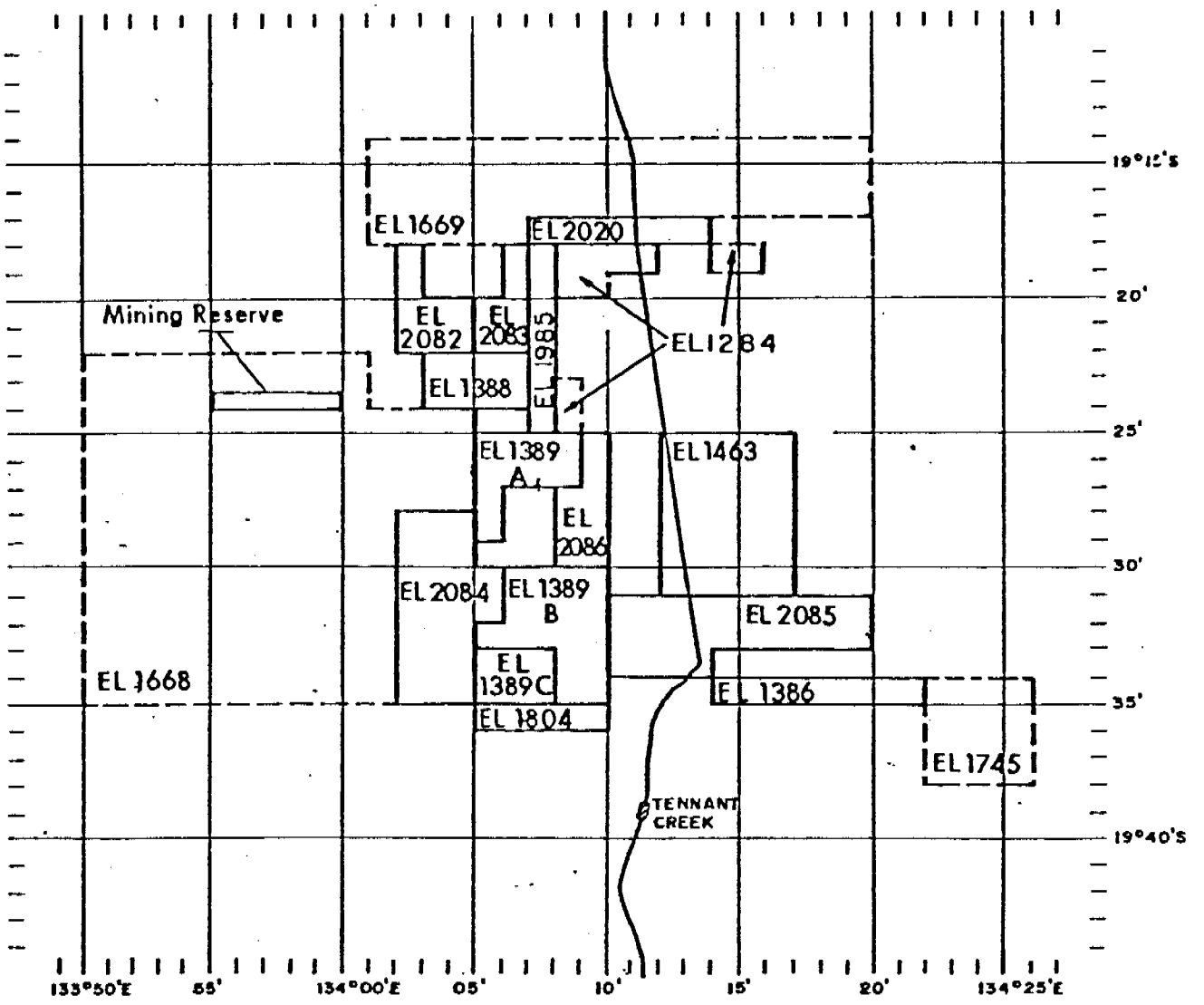
1.3 Previous Exploration

The first geological report on the Tennant Creek goldfield was compiled in 1936 by Woolnough. Ivanac carried out a comprehensive study of the regional geology and mineral deposits of the area in 1954. The geology of the Tennant Creek 1-mile sheet area was described by Crohn and Oldershaw (1965) and this was followed in 1967 by Dunnet and Harding's report on the adjoining Mount Woodcock 1-mile sheet area. Numerous unpublished geological and geophysical reports have been prepared by both government and private bodies (in particular the BMR, Geopecko Ltd., and Australian Development Ltd.). The most recent geological survey undertaken was in 1970-71 (Mendum and Tonkin).

1.4 Acknowledgements

A number of people have contributed in some way to the Tennant Creek programme. Geologists A.M. Mackie, J.A. Littler and M.A. Yates assisted the author in the field.

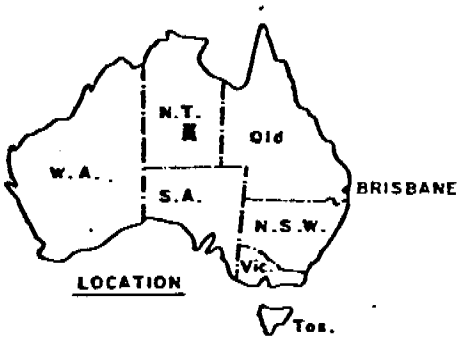
Dr R. Winn (Marathon Research Centre, Denver USA) provided sedimentological advice and Mr. C. Giles (Consultant, Adelaide) undertook a study of the outcropping volcanics in the area.



LEGEND

——— MPAL–ADM PARTICIPATION

— — — MPAL–UAL PARTICIPATION



MARATHON PETROLEUM AUSTRALIA LTD.
BRISBANE AUSTRALIA

TENNANT CREEK PROJECT

SCALE
5 0 5 10 15 20 km

Drawn by B A W & ASSOC. Plan No. C1G2 Date SEPT. 1980

Fig 1-1

2.0 REGIONAL GEOLOGY, STRUCTURAL AND METAMORPHIC HISTORY

2.1 Regional Geology

Comprehensive reviews of the regional geology have been given by Crohn (1965), Large (1975) and Black (1977). The generalised geology is shown in Figure 2-1.

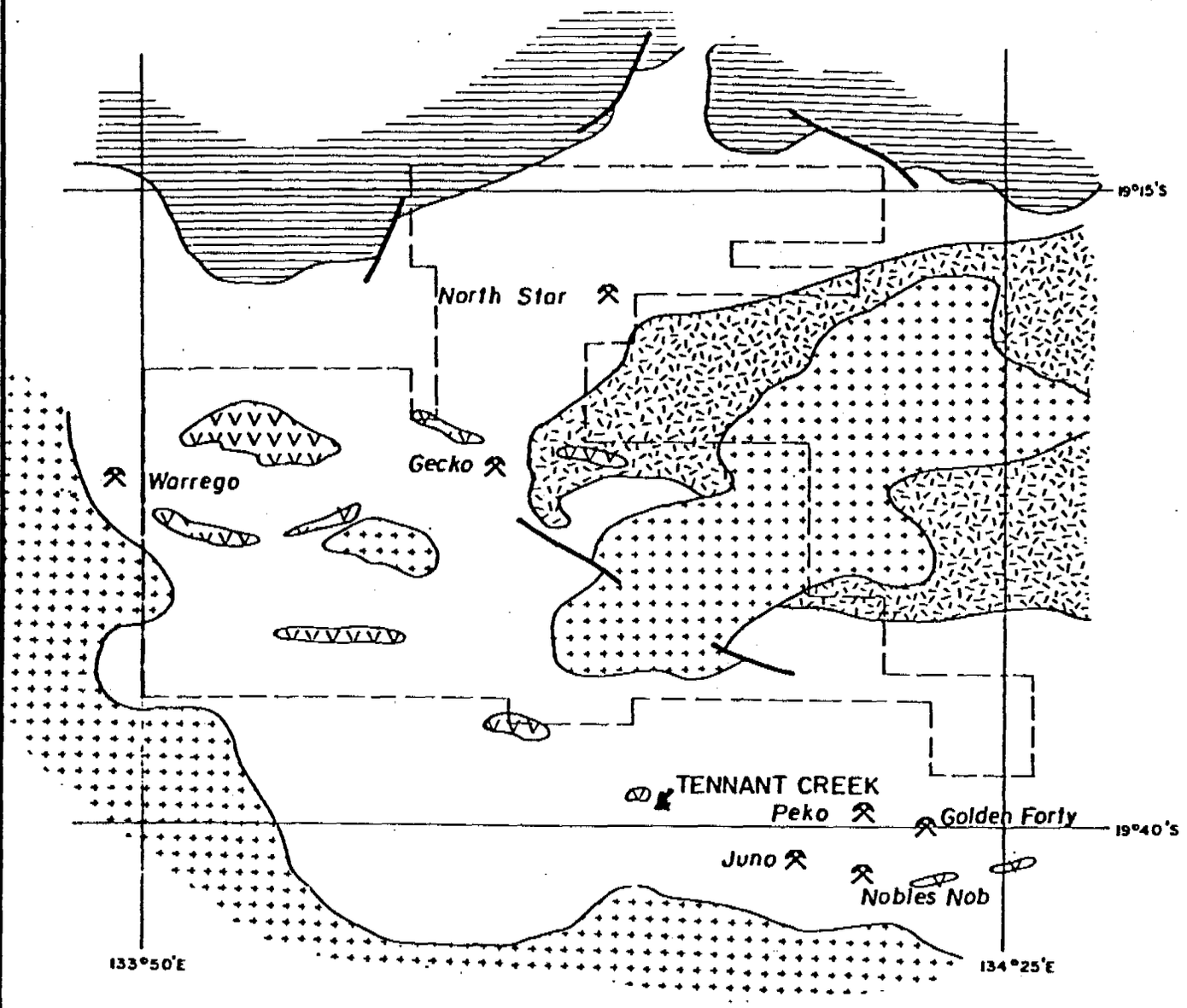
The Lower Proterozoic Warramunga Group forms a large proportion of the Tennant Creek Block and consists predominantly of tuffaceous greywackes, greywackes and shales with major intercalations of acid volcanics and associated pyroclastics. The Group is approximately 3,000 metres thick (Mendum and Tonkin, 1979).

The stratigraphic succession of the Warramunga Group comprises three formations, namely the Whippet Formation, the Bernborough Formation and the Carraman Formation in order of decreasing age.

The Whippet Formation underlies the eastern part of the Tennant Creek area and consists of shallow water sandstone with subordinate amounts of greywacke and shale.

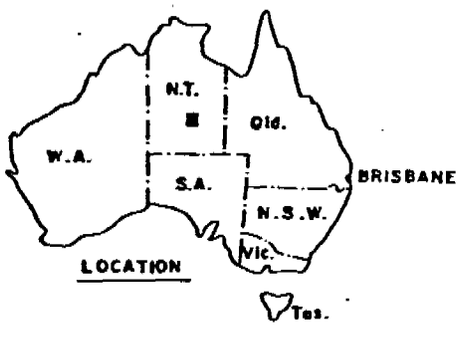
The Bernborough Formation consists of acid volcanic rocks, tuff, and tuffaceous greywacke that are interbedded with subordinate amounts of red shale and siltstone.

The Carraman Formation forms approximately 50 percent of the outcrops in the area, and consists mainly of argillite, shale, siltstone and tuffaceous greywacke that form units with features indicative of deposition by turbidity current. Isolated occurrences of dolomite have been reported at several localities (Dunnet and Harding, 1967, pp. 48-49), as have hematitic shales, ironstones, cherts and conglomerates.



LEGEND

- Geological contact
- Fault
- Major mine workings
- Limit of present exploration activities
- Tomkinson Creek Group
- Carraman Formation
- Bernborough and Whippet Formations
- Rhyolite extrusives and quartz feldspar porphyries
- Granitic intrusives



SCALE
5 0 5 10 15 20km.

MARATHON PETROLEUM AUSTRALIA LTD.
BRISBANE AUSTRALIA

TENNANT CREEK PROJECT

SOLID GEOLOGY

Drawn by L.PETERSON Plan No. C1025 Date SEPT. 80

Fig 2-1

Felsic volcanism is present throughout the formation and forms lenses that have been variously named Warrego, Orlando and Gecko Volcanics on the previous geological maps (Scales 1:63,360 and 1:250,000).

Sills and dykes of diorite and, less commonly, dolerite, intrude the upper parts of the Warramunga Group and lower part of the Tomkinson Creek Beds. Small lamprophyre dykes and sills intrude Warramunga Group sediments, particularly in the vicinity of the granite bodies.

The Warramunga Group is overlain unconformably by sediments of shallower water facies, namely the Hatches Creek Group in the south and the Tomkinsons Creek Beds to the north. The Warramunga Group was intruded by granitic plutons, deformed and metamorphosed prior to the deposition of both of the abovementioned Groups.

The Proterozoic rocks are overlain by flat-lying Cambrian rocks, and Mesozoic and Cainozoic sediments.

2.2 Structural and Metamorphic History

The structural and metamorphic histories of the region are only vaguely understood. Dunnet and Harding (1967) and Mendum and Tonkin (1979) briefly touch on both topics in their reports.

It seems that the structural and metamorphic events in the Tennant Creek area can be summarized as follows:-

(i) The Warramunga Group was intruded by the Tennant Creek Granite Complex and then tightly to isoclinally folded during D_1. Parallel S_1 surfaces in the sediments and the granite confirm this. Metamorphism accompanying this deformation was of low greenschist facies grade.

(ii) Uplift and erosion occurred. The Tomkinsons Creek Group was deposited unconformably over the Warramunga Group and the Tennant Creek Granite Complex.

(iii) During a second deformational event (D_2) the Warramunga and Tomkinsons Creek Groups were folded into broad, open anticlinal and synclinal structures.

(iv) A third, weak deformational event (D_3) affected the region causing flexuring of pre-existing folds; and

(v) Cambrian strata laid down unconformably on all Proterozoic rock types.

3.0 MINERALIZATION

Comprehensive details of the geology, structure and mineralization are described in White (1962), Crohn (1965 and 1975), Crohn and Oldershaw (1965), Dunnet and Harding (1967), Large (1975) and Goulevitch (1975).

Mineralization in the Warramunga Group is widespread and consists of gold deposits associated with more massive ironstones, and copper-gold-bismuth orebodies associated with quartz-hematite and quartz-magnetite lodes and chlorite alteration.

According to Large (1977), all known economic gold, bismuth and copper mineralization in the field occurs within the Carraman Formation.

According to Large, economic gold-bismuth-copper mineralization within the Tennant Creek field invariably occurs within lenticular, ellipsoidal or pipe-like bodies rich in magnetite and/or hematite.

Seven to eight hundred ironstone bodies of various sizes occur within the Warramunga Group, but only carry economic concentrations of ore minerals when located within the hematite facies of the Carraman Formation. Within this environment, mineralized magnetite-hematite bodies are commonly found close to thin beds of argillaceous banded iron formation and hematite rich shales (e,g. Nobles' Nob, Juno and Eldorado Mines), which Large interprets as representing "normal shales which received contributions from iron-rich submarine volcanic exhalations during their period of deposition".

Economic ore minerals found comprise gold, silver, sulphides of copper, lead and iron, sulfosalts of lead, bismuth and sellenium. Uraninite is known to be present in submicroscopic grains with values of over 80 ppm in the Juno ore deposit (Large, 1975, p. 1401), and monazite is present at Warrego (Goulevitch, 1975) with uranium values up to 500 ppm.

4.0 WORK UNDERTAKEN

4.1 Geological Investigations

Minor outcrop exists within EL 2083. Some 200 metres west of hole A8303 (Plate 1) a small hill contains outcropping shales and graded sandstones. The sandstones are medium grained, poorly sorted and lithic in nature. Rare clay pellets (?rip-ups) occur in local sandstone beds. The individual sandstone beds are up to one metre thick however 20-30cm is more than norm. The arenaceous levels often show A-E Bouma sequences (i.e. fine to medium sands grading to upper shaley levels). Shale interbeds are all less than 40cm in thickness.

In some of the thinner sandstone beds, low angle cross-sets are present, these beds then grade up to thin (<1cm) laminated shales prior to the presence of the next sandstone level (i.e. Bouma C-E sequences).

A sequence like this is a relatively low energy environment - shown by the thin sandstone and shale levels - with intermittent higher energy levels (the thicker arenaceous levels). The depositional environment is probably an overband situation with irregular inundations by turbiditic flows.

4.2 Ground Magnetic Survey

Prior to drilling, a ground magnetic survey was conducted on all traverse lines. A hand-held Geometrics proton procession magnetometer was used. All field readings were subsequently corrected for diurnal drift. Results are shown as Plate 1.

4.3 Drilling Programme

During August, 1980 Rockdril Contractors Pty. Ltd. of Brisbane supplied a truck-mounted Schramm 685 rig to carry out the open-hole rotary-percussion drilling programme.

A total of 105 metres in three holes were completed as part of a longer profile on the adjacent Licence Area - EL 1985.

All holes spudded and intersected Carraman Formation lithotypes. Lithotypes intersected include shale, hematite shale, siltstone and fine grained sandstone. Colour variations in the subsurface are a result of subaerial weathering.

The location of, and geological data on the drill profile on which the three holes in EL 2083 are located is enclosed as Plate 1.

Composite samples over one metre intervals were collected from the holes drilled and submitted for analysis. A duplicate sample was submitted to the N.T.G.S. for storage at Tennant Creek. Composite samples over one metre collected every five metres were submitted to Comlabs of Adelaide who analysed for Cu, Pb, Zn, Co, Bi, Fe, Mn, As and U. These assay results are enclosed as Appendix I.

5.0 EXPENDITURE

During the period July 25th 1980 to June 19th 1981 a total of $4,358.13 was incurred as a direct exploration expense.

A detailed Statement of Expenditure appears as Table 5-1.

STATEMENT OF EXPENDITURE

EXPLORATION LICENCE 2083 (PHILLIP CREEK SOUTH)

FOR PERIOD 25.7.81 TO 30.6.81

	$
Salaries and Associated Costs	519.86
Business Expense	22.75
Motor Vehicle Rental	38.61
Commercial Transportation	31.30
Communications Expense	12.94
Motor Vehicle Expenses	45.52
Aircraft Hire	78.69
Technical Publications	132.14
Contract Services	23.40
Reproduction Expense	15.50
Freight	31.39
Denver Research Centre	7.54
Roads and Sites	92.40
Materials and Supplies	196.63
Field Equipment Expense	5.95
Camp Costs	36.82
Geological Services	415.73
Geochemical Services	12.58
Geochemical Assays	218.50
Drilling Costs	2 083.69
Administrative Services	396.19
	$4 358.13

6.0 WORK PLANNED FOR 1981-82

The results of the 1980 drilling programme indicate that additional exploration is required. It is planned that the programme for the next tenement year will consist of establishing a grid, the base-line of which will be orientated east-west and located in the vicinity of the three holes drilled in 1980. The grid planned is approximately 1000m x 500m. Ground magnetometer surveys with station spacings at a minimum of 100 metres will be undertaken on this grid. Geochemical sampling will also be carried out. Approximately 1000 metres of drilling is proposed.

APPENDIX I

ASSAY DATA FROM DRILLHOLES

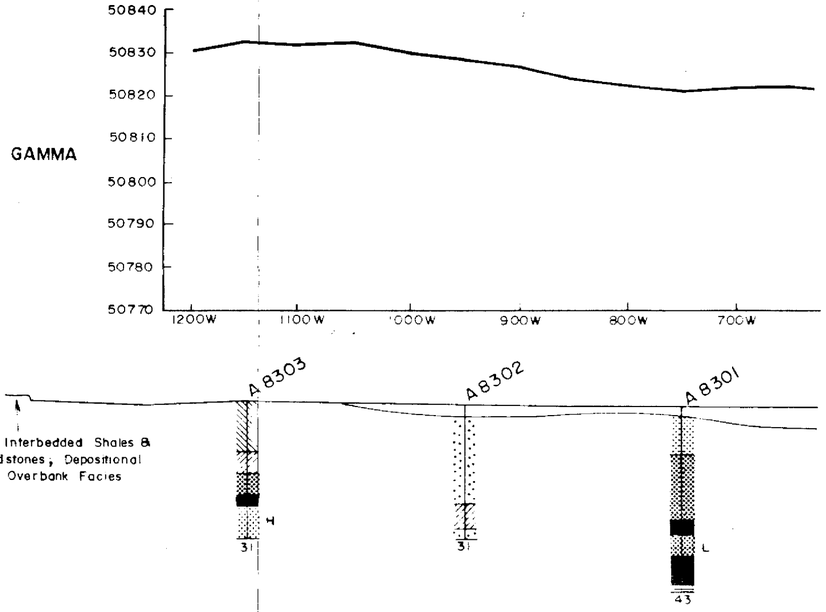
WITHIN E.L. 2083

ASSAY DATA FROM DRILLHOLES IN E.L. 2083

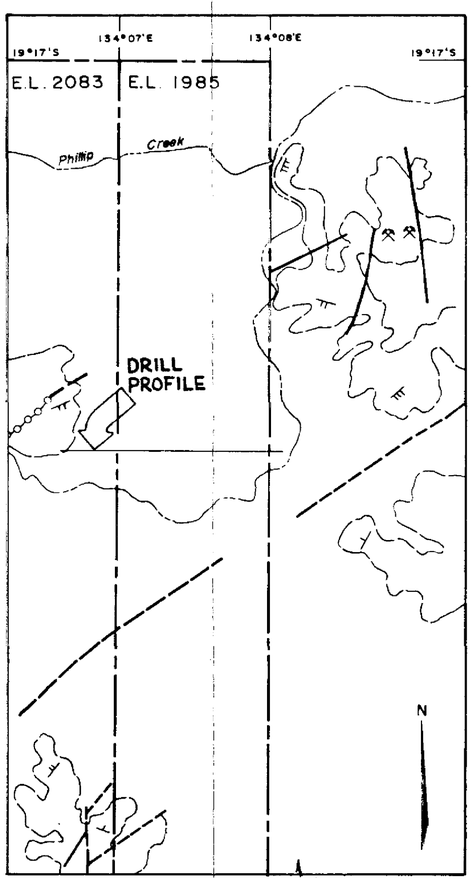
Hole No.	Depth (m)	Cu	Pb	Zn	Co	Bi	%Fe	Mn	As	U
A8301 /	4- 5	6	10	14	4	<4	5.40	90	4	<4
/	9-10	<2	10	16	<4	<4	4.75	70	8	<4
/	14-15	2	<4	12	<4	<4	1.90	28	5	<4
/	19-20	<2	4	14	<4	<4	2.00	30	5	<4
/	24-25	<2	<4	18	<4	<4	2.05	36	2	<4
/	29-30	<2	<4	10	<4	<4	1.75	30	4	<4
/	34-35	<2	<4	18	<4	<4	2.10	125	5	6
/	39-40	<2	4	28	4	<4	2.65	125	<2	4
/	42-43	<2	4	30	<4	<4	2.15	85	<2	4
A8302 /	4- 5	<2	<4	8	4	<4	2.30	40	6	6
/	9-10	<2	<4	8	<4	<4	2.05	26	4	<4
/	14-15	<2	4	10	<4	<4	2.10	26	6	<4
/	19-20	<2	6	16	<4	<4	2.70	40	<2	<4
/	24-25	<2	<4	18	<4	<4	1.95	36	<2	4
/	29-30	<2	6	12	<4	<4	1.50	28	2	<4
/	30-31	<2	<4	24	<4	<4	2.20	50	2	<4
A8303 /*		<2	<4	10	<4	<4	1.95	26	6	<4
		<2	10	16	<4	<4	3.00	40	<2	<4
		<2	<4	20	<4	<4	2.05	30	2	<4
		<2	<4	12	<4	<4	1.55	26	2	<4
		<2	<4	12	<4	<4	1.25	34	4	4
		<2	<4	6	<4	<4	0.85	36	<2	<4
		<2	<4	6	<4	<4	0.60	24	2	<4

* Samples intervals as for Hole A8302.

NOTE: Results in ppm except Fe.



LOCATION MAP



GEOLOGICAL LEGEND

QUATERNARY
- Silts, Clay
- Unconformity

LOWER PROTERZOIC
- Shale; red brown & ferruginous
- Shale; purple brown to choc brown
- Shale; light brown to yellow brown, local greys
- Hematite Shale
- Siltstone, yellow brown to brick red
- Siltstone, ferruginized
- Sandstone, very fine grained to fine grained

L — Limonite Traces

H — Hematite Traces

LEGEND

Ground Magnetic Survey Readings

A8528 — Hole Number Surface

43 — Total Depth (m.)

SCALES

200 metres

20 metres

$\frac{V}{H} = \frac{1}{4}$

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Tennant Creek Northern Territory

Tennant Creek Project

DRILL PROFILE E.L.2083

Drawn by L. PETERSON Plan No. VP 429 Date SEPT 81

PLATE 1