ABSTRACT

During the period 7th November, 1978 to 6th November, 1979, the Bauhinia Joint Venture undertook a program of geological reconnaissance, continued evaluation of regional mapping and geochemical sampling and the implementation of geophysical surveys which included 13 kilometres of I.P./resistivity surveying and a gravity traverse of 5.2 kilometres. I.P. responses up to 14.5 millivolts per volt were located associated with the margins of a basin containing Barney Creek Formation. The results of the gravity line are currently being assessed.
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Appendix 1  Annual Expenditure Statement
1.00 INTRODUCTION

Exploration Licence 1439 covering an area of 48 square miles and located in the McArthur River region was initially granted to A.O. (Australia) Pty. Ltd. on 7th November, 1977. Following the 1979 field year the licence was reduced to an area of 23 square miles for tenure in the coming year. E.L. 1439 is one of a number of licences which are the subject of a Joint Venture Agreement known as the Bauhinia Joint Venture.

During the first year of tenure of the licence, literature reviews of previous exploration, airphoto interpretation studies, reconnaissance mapping and geochemical sampling were undertaken. The program of regional mapping continued during the 1979 field season. In addition an induced polarization/resistivity survey was implemented and a gravity traverse completed over a possible basinal structure containing Barney Creek Formation.

This report details investigations carried out in E.L. 1439 during the period 7th November, 1978 - 6th November, 1979. A statement of expenditure covering the period is included in the report.
Boundary during period 7-11-78 – 6-11-79
Boundary of area proposed for retention in coming year

FIGURE 1

BAUHINIA JOINT VENTURE
JANUARY, 1980
TENURE AND JOINT VENTURE AGREEMENTS

Title

Exploration Licence 1439, covering an area of 48.22 square miles was initially granted to A.O. (Australia) Pty. Ltd. on 7th November, 1977 for a period of twelve months and renewed for a further twelve months in November, 1978. An outline of the area of the licence effective during the first two years of tenure is given in Figure 1 and the area fully described below:

Commencing at the intersection of latitude 16 degrees 00 minutes with longitude 135 degrees 25 minutes thence proceeding to the intersection of latitude 16 degrees 00 minutes with longitude 135 degrees 30 minutes thence proceeding to the intersection of latitude 16 degrees 10 minutes with longitude 135 degrees 30 minutes thence proceeding to the intersection of latitude 16 degrees 10 minutes with longitude 135 degrees 28 minutes thence proceeding to the intersection of latitude 16 degrees 06 minutes with longitude 135 degrees 28 minutes thence proceeding to the intersection of latitude 16 degrees 06 minutes with longitude 135 degrees 25 minutes thence proceeding to the intersection of latitude 16 degrees 00 minutes with longitude 135 degrees 25 minutes.

There are no known mining tenements within the licence.

In accordance with the provisions of Section 38B(11) of the Mining Ordinance an application was lodged for the reduction of the licence to 22.86 square miles. The outline of this proposed area is shown in Figure 1.
Bauhinia Joint Venture

Exploration Licence 1439 is one of a number of licences in the McArthur River region which are the subject of the Bauhinia Joint Venture in which the following companies are participants:

A.O. (Australia) Pty. Ltd.
Electrolytic Zinc Company of Australia Ltd.
Penarroya (Australia) Pty. Ltd.
Preussag Australia Pty. Ltd.

The Joint Venture was formed in November 1976 with the aim of locating economic lead-zinc mineralization of the H.Y.C.-type within the McArthur River region. The Agreement was approved and registered under the Northern Territory Mining Ordinance on the 28th January, 1977 with A.O. (Australia) Pty. Ltd. as Manager. On 9th July, 1979, Shell Company of Australia Ltd. entered into an agreement with the four abovementioned companies by which it can earn a fifty percent interest in the Bauhinia Joint Venture.

During various stages, the Joint Venture has held and investigated a total of 3,463 square miles. A wide range of techniques have been employed including -

1. INPUT Surveys
2. photogeological and ERTS studies
3. induced polarization/resistivity surveys
4. gravity surveys
5. ground magnetic traversing
6. diamond drilling
7. geological reconnaissance
8. detailed geological mapping
9. geochemical programs - rock and soil
10. literature reviews

As at November 1979, a total of nearly one million dollars had been expended on the McArthur River Project. This represents major exploration effort by the Bauhinia Joint Venture which remains committed to maintain the momentum of its exploration during the coming tenure of its licences.
3.00 GEOGRAPHY

3.10 Location and Access

E.L. 1439 is located approximately 12 kilometres north of Bauhinia Downs Homestead. The licence occurs within the northeast corner of the Bauhinia Downs 1:100,000 topographic sheet and in the far north of the Bauhinia Downs 1:250,000 sheet.

Access to the licence is made by way of the Borroloola - Bauhinia Downs Homestead road passing south of the area. Vehicular tracks from the Bauhinia Downs Homestead enter the licence and continue in northerly directions toward Nathan River Homestead. In the vicinity of the intersection of the western track with Tawallah Creek an east-west vehicular track traverses the licence (refer to Figure 2).

3.20 Physiography

Topographically the licence occurs within a physiographic unit known as the Gulf Fall, the Fall being defined as the hill country surrounding the Gulf of Carpentaria in which the drainage is toward the Gulf. The region is predominantly a lowland area west of the Tawallah Range. The Range is one of a number of isolated ranges which occur within the area of the Bauhinia Downs sheet. Generally, however, land is undulating with low rounded hills up to fifteen metres high with occasional beds of Yalco Formation and parts of Lynott Formation forming strike ridges up to sixty metres in elevation. Ranges in the vicinity of the licence are composed of rocks of the Tawallah Group and consist of resistant sandstone ridges above steep-sided valleys formed by erosion of softer beds.
5.
The maximum elevation within the licence is of the order of one hundred and ten metres. Two prominent ridges occur west of the licence trending in a northwest-southeast direction. Further south in the vicinity of Bauhinia Downs Homestead the ridges trend north-south. A number of minor ridges occur within E.L. 1439, the most continuous of which trends north-north-east to south-south-west and passes through the centre of the western portion of the licence.

The Tawallah and Bauhinia Creeks flow through the licence area in a general northwest-southeast direction. The intersection of Tawallah and Mulholland Creeks occurs in the central eastern portion of the licence. Ridges throughout E.L. 1439 are drained by streams flowing into these creeks and perennial lakes occur within the vicinity. Forest and scrub are of medium density throughout E.L. 1439.
4.00 REGIONAL GEOLOGY

Exploration Licence 1439 occurs within the McArthur River Basin. The Basin is the largest of several mid-Proterozoic mildly deformed platform covers which compose the North Australian Platform Cover and which unconformably overlie highly deformed basements forming the North Australian Orogenic Province. The McArthur Basin lies near the eastern edge of the craton, adjacent to the penecontemporaneous mobile belt of the Mount Isa Orogen. Following cratonisation of the Mount Isa Orogen, it and the North Australian Platform Cover were unconformably overlain by Adelaidean and Palaeozoic basins belonging to the Central Australian Platform Cover.

The McArthur Basin is a relatively undeformed structure within which the Carpentarian Tawallah, McArthur and Roper Groups and their stratigraphic equivalents were deposited. The basin, containing up to 12,000 metres of Carpentarian sediments, is bounded by and unconformably overlies the Lower Proterozoic Pine Creek Inlier in the northwest, the Murphy Inlier in the southeast, and the Arnhem Inlier in the northeast (refer to Figure 3). In the north, south and east the basin extends beneath the unconformably overlying covers of the Palaeozoic Arafura Basin, the early Palaeozoic Georgina and Daly River Basins, and the Mesozoic Carpentaria Basin respectively.

In its present form the McArthur Basin is essentially a structural basin and the B.M.R. have indicated that broad trends in the basins succession would suggest basin margins
# SUMMARY OF STRATIGRAPHY

McARTHUR BASIN

*(after Plumb & Derrick, 1975)*

<table>
<thead>
<tr>
<th>Units and locality</th>
<th>Main rock types. Thickness in m</th>
<th>Remarks</th>
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<tr>
<td><strong>Dolerite sills</strong></td>
<td>Intrude Roper, Mt Rigg, &amp; Malay Road Gps</td>
<td></td>
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<tr>
<td><strong>ROPER GROUP</strong> (Throughout basin)</td>
<td>Quarts sandstone, minor ferruginous sandstone, shale (Limmern, Abaron, Besse Cr Spts); micaceous siltstone (Malmera Fm); micaceous glauconitic sandstone (Crawford Fm); interbedded micaceous fine sandstone, siltstone, &amp; shale (Cooberem, Cobbrinbrin Fms, Malwek Sub-Gps), 500-5 000</td>
<td>Fe (Roper B) in Sherwin Ironstone Mbr of McMinn Fm. Overlies McArthur &amp; Mt Rigg Gps with regional unconformity</td>
</tr>
<tr>
<td><strong>MALAY ROAD GROUP</strong> (Caledon Shelf)</td>
<td>Quarts sandstones (Mayall, Astell Spts); micaceous siltstone, quartzes greywacke (Wigram, Pahazoo Fms); black shale (Wigram Fm); glauconitic sandstone (Pahazoo Fm), 1 550+</td>
<td>Unconformably overlies Wilberforce Beds. Correlated with Roper Gp</td>
</tr>
<tr>
<td></td>
<td>Dominantly carbonate rocks, 0-5 500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chert/quartz sandstone, conglomerate (Smythe Spt); dolomite, siltstone, shale, chert, oolitic chert (Ames, Dungamernie, Stott Fms); dolomite, dolomudite, some stromatolites (Dalbrinbi Sub-Gp), 1 250</td>
<td>Locally unconformable on Batten Sub-Gp</td>
</tr>
<tr>
<td></td>
<td>Dolomitic siltstone, sandstone, shale (Lynn Fm); interlayered siltstone-chert (Yalgoo Fm); quartz sandstone (Straiton Spt); chert, cherty siltstone (Looking Glass Fm), 1 000</td>
<td>Locally unconformable on Umbilonga Sub-Gp</td>
</tr>
<tr>
<td></td>
<td>Correlated with Batten Sub-Gp</td>
<td></td>
</tr>
<tr>
<td><strong>Billergarrah Formation</strong></td>
<td>Chert, sandstone, dolomite, shale, 1 000</td>
<td>Pb-Zn (H.Y.C.) in H.Y.C. Pyritic Sh Mbr of Barney Cr Fm. Minor Pb in Emmeraggi Dol &amp; Cu in Amelia Dol &amp; Toonganlinie Fm</td>
</tr>
<tr>
<td><strong>UMBILONGA Sub-Group</strong></td>
<td>Ferruginous &amp; dolomitic sandstone &amp; siltstone, dolomite (Malilaynanah Fm); dolomite, dolomudite, abundant stromatolites (Ameila, Emmeraggi, Tenne, Reward Dals); flaky sandstone (Tennola Spt); shale; alternating dolomite (stromatolite), dolomitic siltstone &amp; sandstone (Toonganlinie Fm); dolomite, tuffaceous, bituminous &amp; pyritic shale (Barney Creek Fm), basic to intermediate volcanics (Amella Dals). Up to 7 250</td>
<td>Succession broadly similar to that at McArthur River although detailed correlations not possible. Vaughan Silt probably equivalent to Barney Cr Fm</td>
</tr>
<tr>
<td><strong>Batten Trough–McArthur River area</strong></td>
<td>Siltstone, shale, dolomite (Koolatong Slt); chert breccia (Strowbridge Breccia); black shale, dolomitic siltstone &amp; shale (Toofa Vaughan Slt); siltstone, chert (Cookea Fm, Zuma &amp; Zilla Fms); dolomitic siltstone, chert-quartz sandstone, conglomerate (Yarramurrun Fm); intercalated siltstone-claystone, feldspathic fine-grained sandstone (Balgadji Slt); feldspathic tuffaceous siltstone, pyritic &amp; oolitic chert, intercalated siltstone-claystone, dolomitic siltstone (Bark As Fm), 4 500</td>
<td>Minor Pb, Cu in Kookaburra Cr Fm</td>
</tr>
<tr>
<td><strong>TARWALLAH GROUP</strong> (Wearyan Shelf, Batten Trough–McArthur River area)</td>
<td>Dolomitic &amp; cherty siltstone; dolomite, stromatolitic dolomite, dolomite, feldspathic, &amp; quartz sandstones (Yalgoo, Kookaburra Cr Fms); feldspathic chert-quartz sandstone, conglomerate (Mt Birch Spt); oolitic chert (Kookaburra Cr Fm); basic to intermediate volcanics (Yalwarra Volc Mbr of Kookaburra Cr Fm), 750+</td>
<td>U (Westmoreland) in dolerite dykes in Westmoreland Cgl. Minor U in Peters Cr Volc, Cu (Rabordin) in breccia pipes in Gold Cr Volc Mbr</td>
</tr>
</tbody>
</table>

| **TABLE 1** |

| BAUHINIA JOINT VENTURE | JANUARY, 1980 |
near the present limits of preservation of many sequences.

It is presently thought, although not conclusively proven, that most of the major tectonic units were bounded by active faults during sedimentation. Faults were the sites of slow steady subsidence rather than uplift and sedimentation kept pace with subsidence.

The McArthur Basin basement inliers are small and widely spaced and as a result their interrelationships cannot be determined. They do, however, have similar rocks to the Pine Creek Geosyncline and so are broadly correlated. Tight folding, metamorphism and elements of transitional tectonism (post-tectonic granites and acid volcanics) following the main folding and metamorphism tends to suggest a similar geosynclinal facies.

Plumb and Derrick (1975) suggested that all the McArthur Basin basement inliers might be part of a large subsurface continuation of the Pine Creek Geosyncline. However, recent geochronological data indicate that the relationships may be more complex. It seems likely that most of the McArthur Basin is underlain either by the eastward extension of a continuous Pine Creek Geosyncline or by a number of smaller orogenic belts of similar age and nature.

Table 1 summarizes the stratigraphy of the McArthur Basin. The succession comprises three major subdivisions, the
Tawallah and McArthur Groups and their equivalents and, unconformably overlying the latter, the Roper Group.

Deposition of the basal arenites of the Tawallah Group was followed by widespread flood basalt volcanism. These early volcanics are succeeded by sandstone alternating with siltstone, carbonates and later volcanics.

Provisional interpretation by the B.M.R. (Plumb 1978) depicts the greater part of the McArthur Group deposited in very shallow seas or lakes (a large proportion intertidal and supratidal) with only the Barney Creek Formation, parts of the Reward Dolomite, "Lower Lynott Formation", and perhaps Amos Formation showing evidence of relatively deeper water conditions. Walker et al (1977) concluded, after a study of evaporitic relicts, that significant parts of the group were deposited in a marginal sabkha environment.

The widespread erosional unconformity below the Roper Group is believed to be of the same age as the folding and metamorphism in the Mount Isa Orogen. The group is characterised by mica-rich siltstone and quartz greywacke alternating with clean quartz sandstone, typical of an unstable shelf association. Muir and Plumb (1976) interpret the shales and siltstones of the Roper Group as representing shallow-water conditions, with fluviatile and deltaic channel open-marine areas and occasional stagnant lagoons.
5.00 PREVIOUS EXPLORATION

5.10 C.R.A. Exploration Pty. Ltd.

In 1974, C.R.A. Exploration Pty. Ltd. held E.L. 879, an area of 485 square kilometres in the Bauhinia Downs Homestead area. The present E.L. 1439 lies wholly within this former licence.

C.R.A. geologists were aware of the remapping by the B.M.R. of the Billengarrah Formation as Barney Creek Formation and Reward Dolomite and they undertook to investigate the former of these two units.

The maximum development of Barney Creek Formation was found to occur in the south of the licence near Four Mile Creek where the formation comprised 80 metres of dark grey, carbonaceous, dolomitic siltstones with thin interbeds of dololutite and pink tuffaceous shales. In this area beds were recorded as dipping at 8-10° to the west and the formation thinning gradually along strike to the north.

As the Barney Creek Formation outcrops poorly, a power auger was employed to obtain bedrock samples. Twenty-nine samples were collected at one kilometre spacing during the initial reconnaissance. All samples were assayed for Pb, Zn, Cu, Ni, Co, Cr, Mn and Ag.

Most samples assayed in the range 11-170 ppm Pb and 9-560 ppm Zn. One sample assayed 1480 ppm Pb and 900 ppm Zn (its approximate location in relation to Bauhinia Joint Venture mapping is given in Plan 1). At this locality an additional
eighteen samples were collected on a 500 metre grid. Assays for the second group of samples had an overall range of 34-640 ppm Pb and 9-360 ppm Zn. Most fall in the range of 60-240 ppm Pb and 21-57 ppm Zn.

C.R.A. concluded that results indicated that although Barney Creek Formation within the grid area is anomalous in lead and zinc, significant values are only sporadically distributed.

It is considered that C.R.A.'s work demonstrated that the Barney Creek Formation can carry significant anomalous values of lead and zinc at sizable distances removed from the Bulburra Depression area.

5.20 Carpentaria Exploration Co. Pty. Ltd.

C.E.C. began exploration in the McArthur River region in 1955. The last area of the present Scrutton Creek licence (E.L. 1439) held by that company was the southern portion in 1972.

During the period 1968-1971, the majority of the licence area was included in a regional stream sediment sampling program at a density of 3 samples per square mile conducted west of the Tawallah Fault. An anomalous lead value of 140 ppm was detected in a stream draining Scrutton Creek in the western portion of E.L. 1439; its approximate location being given in Plan 1.

Regional soil traverses were undertaken in conjunction with
the stream sediment sampling program. These produced some minor copper anomalies over the Amelia Dolomite that were further investigated using induced polarization/ resistivity surveys, which apparently failed to define percussion drilling targets.

In 1966, C.E.C. decided that helicopter-supported, reconnaissance geological traversing should be undertaken west of the Tawallah Fault in order that the development of H.Y.C. Pyritic Shale, at the appropriate stratigraphic level between the Emmerugga Dolomite and Billengarrah Formation as formerly mapped by the B.M.R., could be evaluated. Within the bounds of E.L. 1439, five such helicopter-supported traverses were undertaken along the western edge of the licence. Of these, C.E.C. considered that the rocks above the Laminated Dolomite did not resemble the McArthur Group sequence east of the Tawallah Fault. They were assessed as probable equivalents of the middle Batten Sub-Group or parts of the Roper Group.

5.30 Bauhinia Joint Venture

Previous investigations in E.L. 1439 by the Bauhinia Joint Venture have included air photo studies, literature reviews and an assessment of the potential of the licence to host stratiform copper mineralization as part of a wider study of the copper potential of the McArthur Basin Succession.

In addition geological reconnaissance mapping and geo-chemical rock chip sampling were undertaken. The presence of Barney Creek Formation was confirmed as were geochemically
anomalous lead-zinc values of the order located by C.R.A. .
The mapping and sampling program was carried out in the
final phase of the 1978 field season and the continuation
of the program and evaluation of the regional mapping and
geochemical results were concluded during the second term
of the licence.
FIGURE 4
COMPARISON OF STRATIGRAPHIC Nomenclature
BAUHINIA JOINT VENTURE
JANUARY, 1980
6.00 BAUHINIA JOINT VENTURE INVESTIGATIONS 1978/1979

6.10 Introduction
During the period under review from 7th November, 1978 to 6th November, 1979, a program involving geological reconnaissance, continuation and evaluation of regional mapping and rock chip sampling, and geophysical surveys including I.P. and gravity was undertaken.

6.20 Regional Mapping

6.21 General
Figure 4 shows the stratigraphic nomenclature used by the Bauhinia Joint Venture geologists during mapping programs in 1978/1979. Results of work carried out in E.L. 1439 are presented in Plan 1 and the relevant stratigraphic units are described below.

6.22 Mara and Mitchell Yard Dolomites
Exposures of the Mara Dolomite exhibit the normal characteristics of predominantly cherty, grey stromatolitic dolomite with the exception of recrystallized material occurring in the non-resistant zone and below the top of the unit.

The Mitchell Yard Dolomite appears to be generally absent from the area. When it does occur, it is confined to a few high points below a karsted surface at the base of the T₂ sub-unit of the Teena Formation.

6.23 Teena Formation
Outcrop of this formation is only sporadic throughout the area; T₁ and T₂ members are not well developed. Some
outcrop of less resistant stromatolitic dolomite occurs below the T₃ massive white dolomite in the south of the licence.

The T₃ member is represented by massive-grey-weathering dolomite (Coxco sensu stricto). The T₄ member is difficult to define as there are two major beds of laminated dolomitic tuff with dolomite between them. It was thought convenient to include this dolomite in T₄ as it is yellow weathering and distinctly laminated relative to the more massive grey-weathering T₃. Some chocolate coloured surface weathering, indicating ferroan alteration, was observed but not in abundance and usually associated with sinkhole fills.

6.24 Barney Creek Formation

The H.Y.C. shale equivalent in the area consists of the typical carbonaceous, dolomitic siltstones with some pink tuff beds for most of its thickness. In areas where basal H.Y.C. equivalent was accessible, flinty tuffaceous interbeds were common and samples of this material generally have anomalous geochemistry (refer to Sub-section 6.30). It is thought that this material is the equivalent of the green vitric tuff of the Wickens Hill area. Some anomalous gossan float was also observed in this interval.

One area in which the base of the H.Y.C. equivalent was sampled proved to be barren. The "flinty tuff" was absent from this locality, and the Barney Creek Formation appears to be thinner than usual. It seems that the flinty tuff is an indicator of basin subsidence operating during
deposition of the Barney Creek Formation.

The Surprise Creek Dolomite is well developed in the area. Below the pyritic shale marker bed the unit is a uniform flaggy dolomite. This is thickest to the south of E.L.1439 and becomes thinner in the centre of the licence. The thickness variation reflects the facies boundary with the H.Y.C. Pyritic Shale equivalent. The Upper Surprise Creek Dolomite is a more diverse unit although dominated by the smooth yellow surfaced flaggy dolomite lithology. Other pyritic shales are present together with two thick beds of tuffaceous dolomitic siltstone which develop into tuffs in the centre of E.L. 1439.

6.25 Reward Formation

The Reward Dolomite appears to represent the base of an unusually thick Reward section from which the upper beds have been removed. Nearer the H.Y.C. deposit area, the basal thin-bedded and dolomite-nodule-bearing, cherty dolomite is overlain by dolomites with larger chert nodules, dolomite breccia and/or the 'pastel tuff beds' and, in some areas, the dolomitic 'Boko Beds'.

The best developed sections of the Reward, (which in this area may be 100 metres thick) consist wholly of the dolomite-nodule cherty dolomite which is more usually less than 20 metres thick. Much of the variation in thickness of the Reward occurs through development of chert breccia at the expense of the dolomite, probably through solution-collapse prior to deposition of the Lynott Formation.
16.

A second type of chert replacement in which the original volume is maintained is also common in the licence. This lithology has been encountered elsewhere in the McArthur River region where it appeared to be a wall rock replacement adjacent to veins and was anomalous in lead. In the case of E.L. 1439 samples obtained from this unit were anomalous in copper only.

6.26 **Lynott Formation**

The Lynott Formation L\(_1\) member was very well developed with abundant pyritic shale.

An unconformity at the base of the L\(_4\) is postulated to account for the rarity of non stromatolitic impure dolomitic rocks assignable to the L\(_2\) and L\(_3\) units. The hard shale marker with mudcracks was not observed (possibly because of erosion at the L\(_4\) unconformity) but dolomitic sandstone beds more characteristic of L\(_3\) than L\(_2\) are common. The thickest section of L\(_2\)-L\(_3\) was observed in the southern portion of E.L. 1439.

The L\(_4\) member makes up most of the formation, but its base cannot always be determined as the white sandstone marker is not well developed and stromatolitic cherts are less abundant than usual. Pyritic shale was absent.

6.27 **Geological Structure**

A folded sequence of upper Umbolooga Sub-Group units occur within a fault-bounded block in the western portion of the licence. Within this sequence the Barney Creek Formation
outcrops as both an anticline to the west outside the licence and as an anticline-syncline pair within the licence.

In the southern half of E.L. 1439 pinch-and-swell outcrop patterns represent either apparent thickness variation due to changes in bedding dips, or actual thickness variation caused by oblique sectioning of small basins. A study of the lithologies makes the latter interpretation more likely to be correct.

6.30 Geochemistry
The maximum rock chip sample value for the Barney Creek Formation was 0.15% Pb with an accompanying zinc level of 260 ppm. This sample (R7573) was located in the southern part of the licence and is a flinty, ferruginous tuff at the base of the Formation, equated with the Green Vitric Tuff member.

Two samples of Barney Creek Formation from the central portion and one from the northern folded area of the licence also registered elevated lead-zinc values (maximum 800 ppm Pb and 390 ppm Zn). These were samples of limonitic and haematitic siltstone and shale (central region) and basal flinty tuff in the northern area.

Apart from the Barney Creek Formation, anomalous lead-zinc levels were recorded from limonitic regolith beneath the Reward Dolomite in the central area (R7576: 350 ppm Cu, 640 ppm Pb, 0.12% Zn) and from carbonaceous, pyritic shales
<table>
<thead>
<tr>
<th>Formation</th>
<th>Sample No.</th>
<th>Cu (ppm)</th>
<th>Pb (ppm)</th>
<th>Zn (ppm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lynott Formation</td>
<td>7567</td>
<td>20</td>
<td>135</td>
<td>155</td>
<td>Carbonaceous pyritic shale</td>
</tr>
<tr>
<td>Reward Dolomite</td>
<td>7568</td>
<td>0.23</td>
<td>10</td>
<td>10</td>
<td>Flinty tuff and pyritic chert</td>
</tr>
<tr>
<td></td>
<td>7569</td>
<td>10</td>
<td>10</td>
<td>40</td>
<td>Limonite and haematite concretions in shale</td>
</tr>
<tr>
<td></td>
<td>7576</td>
<td>350</td>
<td>640</td>
<td>0.12%</td>
<td>Limonitic regolith beneath Reward Dolomite</td>
</tr>
<tr>
<td>Surprise Creek</td>
<td>7570</td>
<td>90</td>
<td>85</td>
<td>230</td>
<td>2m section showing secondary limonite and pyrolusite with white efflorescence at top of the unit</td>
</tr>
<tr>
<td>Dolomite</td>
<td>7571</td>
<td>175</td>
<td>60</td>
<td>10</td>
<td>Carbonaceous shale below below sample 7570</td>
</tr>
<tr>
<td></td>
<td>7575</td>
<td>30</td>
<td>210</td>
<td>160</td>
<td>Ferruginous tuff and tuffaceous shale</td>
</tr>
<tr>
<td></td>
<td>7577</td>
<td>15</td>
<td>350</td>
<td>70</td>
<td>Pyrite and limonitic shale</td>
</tr>
<tr>
<td>Barney Creek</td>
<td>7573</td>
<td>40</td>
<td>0.15%</td>
<td>260</td>
<td>Flinty ferruginous tuff at the base of the formation</td>
</tr>
<tr>
<td>Formation</td>
<td>7579</td>
<td>35</td>
<td>95</td>
<td>60</td>
<td>Flinty tuff in lower part of the formation</td>
</tr>
<tr>
<td></td>
<td>7580</td>
<td>130</td>
<td>480</td>
<td>390</td>
<td>Limonite and haematite in dolomitic siltstone just below sample 7579</td>
</tr>
<tr>
<td></td>
<td>7581</td>
<td>60</td>
<td>370</td>
<td>360</td>
<td>Limonitic and haematite shale</td>
</tr>
<tr>
<td></td>
<td>7582</td>
<td>40</td>
<td>800</td>
<td>180</td>
<td>Creamy, flinty tuff; W-Fold equivalent</td>
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<td></td>
<td>7583</td>
<td>35</td>
<td>70</td>
<td>790</td>
<td>Gossan vein in tuff - selective sample</td>
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<tr>
<td></td>
<td>7584</td>
<td>30</td>
<td>10</td>
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<td>20m section of the basal part of the formation</td>
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<tr>
<td></td>
<td>7585</td>
<td>20</td>
<td>10</td>
<td>20</td>
<td>20m section of dololudite above sample 7584</td>
</tr>
<tr>
<td>Teena Dolomite</td>
<td>7572</td>
<td>10</td>
<td>10</td>
<td>80</td>
<td>Silicified limonitic sandstone and shale at the bottom of unit T4</td>
</tr>
<tr>
<td>Mara Dolomite</td>
<td>7574</td>
<td>&lt;2</td>
<td>10</td>
<td>10</td>
<td>Recrystallized dolomite at base of unit</td>
</tr>
<tr>
<td></td>
<td>7578</td>
<td>10</td>
<td>10</td>
<td>220</td>
<td>Limonite associated with recrystallized dolomite</td>
</tr>
</tbody>
</table>
of the Lynott Formation in the southern area (R7567; 135 ppm Pb, 155 ppm Zn).

Of additional note in Table 2 is the elevated copper value 0.23% from sample R7568, a flinty tuff and pyritic chert of the Reward Dolomite located in the southern region of the licence.

The geochemical results in E.L. 1439 are considered of interest, particularly in the light of the poorly developed nature of the outcrop present which hinders comprehensive assessment.

6.40 I.P. Survey

6.41 Introduction

The structural setting of the Barney Creek Formation and its associated geochemistry in the northern and central portions of the licence were considered favourable features and this region was subsequently regarded as an on-going target. Detailed assessment of the region however is impeded by lack of, and the poorly developed nature of the outcrop. It was therefore decided to implement an induced polarization/resistivity survey to aid in mapping the subsurface distribution of any polarizable material similar to the H.Y.C.-style mineralization which may be present in this area.

The survey, which was part of a larger program covering a number of Bauhinia Joint Venture licences was undertaken by Geoterrex Pty. Ltd. during September, 1979. Three lines, totalling 13 kilometres were gridded and surveyed using
200 metre dipoles. The location of these lines are given in Plan 1.

6.42 Results
Investigation of I.P. line 1S (refer to Plan 2) reveals anomalous chargeabilities between 400E and 2000E. A well defined zone of low chargeabilities between 600E and 1400E influenced the distribution of higher chargeabilities to such an extent that detailed interpretation of the 400E-2000E zone was rendered impossible. Geoterrex considered that a shorter dipole length across the near surface features could prove useful.

The data on Line 2N indicated a small basinal feature approximately 2.5 kilometres across. The edges occur at 400E and at 2800E. The low resistivities near those edges appear to be related to the chargeabilities but are not coincident. A massive sulphide as the source of the lower resistivities is regarded as highly unlikely (refer Plan 3).

Chargeable zones on line 1N were mapped between 0 and 1200E, 1600E and 2200E and a much weaker zone between 2900E and 2300E (refer to Plan 4). The anomalies on this line were less defined than on line 2N and may also have originated from a source slightly closer to the surface. It was considered by Geoterrex that detailing over the abovementioned intervals with a dipole length of 100 metres may provide beneficial follow-up data.
6.50 Gravity Survey

6.51 Introduction
A regional gravity survey totalling approximately 457 kilometres was performed in a number of licences held by the Bauhinia Joint Venture. A line of 5.2 kilometres was surveyed in E.L. 1439. The survey was positioned over I.P. line 2N and was carried out in this licence in an attempt to confirm the existence of a basinal structure. Furthermore, a gravity survey was performed by the B.M.R. in 1978 within the Batten Trough and Wearyan Shelf of the McArthur Basin, including one traverse over the H.Y.C. ore body. A number of anomalous gravity features were delineated and it was found that these could be interpreted in the context of ore bodies and mineralized zones (Anfiloff, 1979). The gravity survey, undertaken by A.O. (Australia) Pty. Ltd. on behalf of the Joint Venture, was carried out on the basis of the B.M.R. results in the hope of delineating a drilling target.

6.52 B.M.R. Gravity Surveys
Figure 5 illustrates the location and extent of gravity surveys conducted by the B.M.R. in the McArthur Basin.

The 1978 survey was performed at 500 metre spacing and consisted of two long and one short traverse, all totalling 185 kilometres (refer to Figure 5). Traverses 1 and 2 crossed large areas of the Batten Trough and Wearyan Shelf, and Traverse 3 crossed the H.Y.C. ore body. Traverses 1 and 2 crossed more than 30 ridges, but an advanced 2-D
processing method enabled observations made over ridges to be reduced directly to Bouguer gravity values, without applying a separate terrain correction (Anfiloff & Flavelle, 1979). There was, therefore, no need to avoid steep topography.

Important gravity features were delineated in the Emu Fault zone on all three traverses. Traverse 3 crossed the H.Y.C. ore body and detected an anomaly with a width of 6 kilometres and an amplitude of 5 mGal. A similar anomaly was detected on Traverse 1 suggesting that the mineralized zone extends to the north along the Emu Fault. The gradients associated with this anomaly indicate a near-surface source, and the anomaly corresponds to a shallow mineralized body. On Traverse 2 there is a distinct transition between a smooth field in the east, and a more irregular field to the west which does not coincide with the main topographic escarpment, possibly suggesting another mineralized zone.

The B.M.R. observed that the size of some important anomalies was less than 5mGal and recognized three sources, these being:

(a) Buried valleys filled with low density alluvium producing very sharp, narrow gravity lows

(b) A shallow dense body producing steep gradients on an abrupt localized gravity high next to the Emu Fault

(c) A broad basin or gradual lateral density changes in sediments or basement producing broad gravity lows east of the Emu Fault and fault-induced lateral density variations in sediments producing moderately broad anomalies west of the Emu Fault.
The lack of offset in gravity level across the Emu Fault when considered in conjunction with source (c) previously, tends to suggest that major displacement has not occurred across the fault. The B.M.R. concluded that the faults positioned near the top of the basement arch favour dilation of the fault plane and the passage of mineralizing fluids to form the dense shallow body.

6.53 Bauhinia Joint Venture Gravity Survey

The 1979 regional gravity survey was performed with the use of a Worden Master 806 Gravity Meter. The meter is exceptionally accurate and incorporates a low-powered temperature stabilizer system which maintains a nearly constant internal temperature. Each line was accurately levelled prior to commencement of the survey. Temperature readings were taken at each 200 metre station and, in order to account for drift, base stations were reoccupied and the gravity readings retaken a number of times for each line.

The gravity survey along I.P. line 2N in E.L. 1439 was carried out immediately prior to the conclusion of the second year of tenure of the licence. Interpretation of the data is currently being assessed by Wongela Geophysical Pty. Ltd. and will be included in the next annual report.
REFERENCES


<table>
<thead>
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<th>Category</th>
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Expenditure for the period
7th November 1978 to 6th November 1979 $11,542