DAVIS DOME
NGALIA BASIN
EL 1321
ANNUAL REPORT

AFEMCO PTY LTD
REPORT NT 292F

November, 1978
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DAVIS DOME

E.L. 1321 ANNUAL REPORT

BY

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I. SUMMARY

The Ngalia Basin is located about 300 km north-west of Alice Springs (Fig. 1.).

It is an elongated, intracratonic depression filled by Upper Proterozoic, Palaeozoic and Cainozoic sediments and surrounded by a basement of Precambrian crystalline and meta-sedimentary rocks. It is about 420 km long, east-west, and is about 70 km wide, north-south, at its widest part (Fig. 2.).

Strong folding and faulting have disturbed and disrupted the strata. Thrusting along the northern margin of the Ngalia Basin has moved Precambrian granitic basement south, in general, over the younger formations, which in many places near the margin are overturned. Folding and faulting of varying intensity was probably related to this thrusting.

Uranium was originally discovered by Central Pacific Minerals N.L. within the Ngalia Basin itself in 1971, in the Mount Eclipse Sandstone (of Carboniferous Age) which is the formation of greatest interest for uranium exploration. C.P.M. had a virtual monopoly on exploration till 1975. The area under discussion fell within E.L. 402/E.L. 605.

AFMECO Pty. Ltd. started a reconnaissance study (mapping, sectioning, drilling) of the Mount Eclipse in the western sub-basin in 1977, concentrating on areas of outcrop close to the basement, and on areas with surface anomalies and channelling facies.

During the 1977 field season very little prospective ground was available, and this area was drilled during this preliminary programme - on the basis of high background shales and siltstones being present in Unit 9 (AFMECO terminology, see III 3.2).
FIG 2. STRUCTURE AND SOLID GEOLOGY - SELECTED STRATIGRAPHIC SECTIONS - NGALIA BASIN

REFERENCE

Carboniferous: Mt. Eclipse Sst.
Ordovician: Kerridy Sst
         Djagamara Fm.
         Bloodwood Fm.
         Walbiri Dolomite
Gambrian: Yuendumu Sst.
         Mt. Doreen Fm.
Adelaidean: Vaughan Springs Quartzite (Treuerm Member)
Precambrian: Patmungala Beds
            Undifferentiated igneous and metamorphic rocks
The work of the 1978 field season in the western sub-basin has had the objective of testing, by drilling, the down dip extension of surface anomalies discovered by C.P.M. and now protected by C.P.M. claims and S.M.L.s. The one drill hole, DAV1, reached a total depth of 904.6 m. The drill site was located on the crest of Davis Dome, which is down dip of C.P.M.'s Bigrlyi No. 15 Anomaly.

Detailed field work (mapping, sectioning, structural study) accompanied the drilling to improve the understanding of the geology and to make possible a regional reconstruction of the palaeo-geography, in order to locate the most promising areas for uranium mineralisation.

The drill hole DAV1 penetrated all units from Unit 7 to perhaps the upper part of Unit 2, its total depth was 904 m. A single Radiometric Anomaly was present at 899.3 m (See log and Table 4).
II INTRODUCTION

1. Logistics (Fig. 1.)

The Ngalia Basin is centred 300 km north-west of Alice Springs. Graded roads link Alice Springs to the Yuendumu Aboriginal Settlement and the Tanami. Station access tracks link the western portion of the Ngalia Basin to the Tanami-Yuendumu Road. Cusack's Bore Camp is situated 60 km west of Yuendumu which is some 310 km north-west of Alice Springs.

Roads in the region are readily traversable at most times unless subjected to heavy and continuous rains. Even then access is not prevented for extended periods. Off-road travel is easily manageable for 4-wheel drive vehicles.

Temperature varies from a maximum of about 40°C in summer to a daily range of 0°C - 15°C during the winter months. Rain normally falls at the height of the Northern Monsoon, but can occur at any time.

There are no permanent streams, but 3 or 4 springs and a number of bores provide water for stock and human consumption. Water found in these bores is often saline.

Poll-Hereford cattle are raised on Mount Doreen Station, and at last count about 16,000 head of cattle and 300 horses grazed on about 7000 square kilometers of spinifex, rare grass and saltbush frequently in mulga scrub or mallee.

A weekly mail flight to Yuendumu carries mail to the settlement. C.P.M. used their own weekly charter service and Mount Doreen has its own Cessna 182.
E.L. 1321 is centred on longitude 131°5' and latitude 22°17'.

Permission to carry out mineral exploration on E.L. 1321 was renewed by the Director of Mines for a further period of 12 months from 16th March, 1978.

The area granted is 52.59 sq. miles or 136.21 km².

2. Previous Work

Both the Bureau of Mineral Resources and Magellan Petroleum Aust. Ltd. did preliminary seismic traverses in the area now called E.L. 1321.

The Bureau of Mineral Resources mapped the area using 1:42,000 scale aerial photographs (Black and White) in 1967 with Wells, Evans and Nicholas as the geologists. A geological map was published in 1972 at a scale of 1:250,000. Since that time the Bureau of Mineral Resources have conducted airborne and ground geophysics, drilled widely spaced stratigraphic holes and more recently Wells and Moss have completely re-interpreted the available seismic data with the aid of gravity and magnetic information. An account of all the B.M.R. work is to be published as a B.M.R. bulletin.

AFMECO drilled 8 Rotary-Percussion drill holes in E.L. 1321 during 1977, finding very high uranium contents in the ground water, but no anomalies of any significance on the diagraphy.

A preliminary field reconnaissance, and a detailed photo-geological study were undertaken.
The Annual Report for the E.L. for 1977/78 gives a full account of the above activities.

3. The Timing of the Field Work

After photogeological interpretation the first systematic reconnaissance and field checking of the photo Units was done in the latter part of March, 1978 (See Molina's Report April 1978) and a traverse was made between Davis Dome and Bigrlyi Anomaly 15, down the Falkoora Creek.

Two drill sites were planned in the event of success of the first hole, but only 1 site was utilised. Access was via 1977 drill access and a former B.M.R. seismic track. These tracks were regraded and extended to the drill sites.

The Widco logger was commissioned in July but as no "skinny" probe was immediately available and less than the 800-900 m of cable required for DAV1 was available - the drilling programme was postponed to the 12th of September and was finally completed on the 9th of October. By the time drilling in B0 commenced, the 1000 m cable and the skinny probes were to hand.

Detailed measured sections were made between Bigrlyi Anomaly 15 and Davis Dome and south to the Ridge in early September, and because of the lack of outcrop along the initial Falkoora section, a further section was measured in mid-October.

4. Personnel

All AFMECO personnel were involved in the area, especially A. Pacquet and M. Ruhland, and the Widco Logging was done by B. Doran seconded from Analabs, Perth for the duration of the drilling.
During the 1978 season, Prof. M. Ruhlman, a structural geologist, was engaged by APMECO to make an analysis of the regional structures, and the Resident Structural Geologist J.C. Rippert carried out further detailed studies, particularly in the Dingo's Rest Area, and the Bigrlyi Area.

5. Material

As part of the overall 1978 Programme APMECO had 3 Caravans, 4 vehicles, including the logging unit, 7 tents and all the wherewithal required for the field work, including 5 S.P.P.2. Scintillometers.

6. Drilling Programme

6.1 Contractor and Equipment

Longyear Australia Pty. Ltd.
919-929 Marion Road,
Mitchell Park, S.A. 5043.

Equipment
2 Longyear "44" Diamond Drills on skids.
3 Toyota Landcruisers for personnel transport.
1 Water Truck (Sub-contracted).
All Drilling Equipment required.
2. World Wide Transportable Units - an accommodation block and an ablution/kitchen block.
2 Tents.
1 D4 Bulldozer.
2 Monopumps.
Personnel
2 per shift (10 hour shift), 2 shifts per rig (2 rigs),
1 supervisor, 1 cook and female assistant.

6.2 Drilling Methods

DAVI was known from the start to have
(a) the possibility of intersecting gas
(b) a chance of being over 800 m deep.
The diamond drilling Company commenced drilling and
changed to N.O. prematurely.

The hole was then reamed to 300 m in H.O. size. The
casing was cemented in from 250-300 and drilling
continued in N.O. Problems were encountered almost
immediately with broken ground, sand inflow and the
escape of dissolved gas from the water - producing
artesian flow for a period. (The gas escaped from
approximately 350 m).

The Mines Department rather forcefully reminded
AFMECO that risks are associated with gas and accordingly
a "Blow-out protector" was hired and installed. In order
to install this "B.O.P." the drill had to be raised on
timbers to get the "B.O.P." underneath (about 1 metre
high).

At 500 metres drilling switched to B.Q. and no further
problems were encountered.

The drilling crew performed well under difficult/slow
conditions, at a drill site 28 km away from the base
camp.

Table 1 gives the drilling statistics.
LONGYEAR DIAMOND DRILLING - DAV AREA - 1978 (E.L. 1321)

<table>
<thead>
<tr>
<th>HOLE NO.</th>
<th>METERAGE DRILLED</th>
<th>1 Time (Machine)</th>
<th>1a Conditioning</th>
<th>$\Sigma = 1 + 1a$</th>
<th>$R_1 = \frac{M}{\Sigma}$</th>
<th>2 Reaming + Casing</th>
<th>3 Cementing</th>
<th>4 Moving</th>
<th>5 Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAV 1</td>
<td>Tricone 9</td>
<td>9 3.07</td>
<td>1</td>
<td>295.5</td>
<td>3.06</td>
<td>62</td>
<td>17</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>H.O. 90.3</td>
<td>9 124</td>
<td>3</td>
<td>294.5</td>
<td>11.25</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N.O. 400.7</td>
<td>4</td>
<td>8</td>
<td>295.5</td>
<td>3.06</td>
<td>62</td>
<td>17</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>B.O. 404.4</td>
<td>4 124</td>
<td>3</td>
<td>295.5</td>
<td>3.06</td>
<td>62</td>
<td>17</td>
<td>10</td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 Fishing</th>
<th>7 Delays</th>
<th>$\Sigma_2 = 2 + 3 + 4 + 5 + 6 + 7$</th>
<th>$R_2 = \frac{M}{\Sigma_1 + \Sigma_2}$</th>
<th>8 Tropari</th>
<th>9 Logging</th>
<th>$\Sigma_3 = 8 + 9$</th>
<th>$\Sigma_4 = \Sigma_1 + \Sigma_2 + \Sigma_3 + \Sigma_4$</th>
<th>$R_4 = \frac{M}{\Sigma_4}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>78</td>
<td>202.5</td>
<td>$R_2 = \frac{904.6}{294.5 + 202.5} = 1.82$</td>
<td>3</td>
<td>11</td>
<td>14</td>
<td>511</td>
<td>1.77</td>
</tr>
</tbody>
</table>

**TABLE 1 - DRILLING STATISTICS**
### 7. Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilisation/Demobilisation</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>Drilling costs</td>
<td>42,894.30</td>
</tr>
<tr>
<td>Miscellaneous (cementing, articles lost, surveys, trays, additives etc.)</td>
<td>10,812.09</td>
</tr>
<tr>
<td>Blow-out protector: Hire</td>
<td>641.51</td>
</tr>
<tr>
<td>&quot;   &quot;   &quot; : Freight &amp; Installation</td>
<td>4,112.00</td>
</tr>
<tr>
<td>&quot;   &quot;   &quot; : Timber</td>
<td>827.84</td>
</tr>
<tr>
<td>Water Cartage</td>
<td>2,011.56</td>
</tr>
<tr>
<td>Logging</td>
<td>1,549.85</td>
</tr>
<tr>
<td>Bulldozer grading (3 days)</td>
<td>300.00</td>
</tr>
<tr>
<td>Geologists time (12 geologists weeks)</td>
<td>18,000.00</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong> (Field Cost)</td>
<td><strong>$85,149.15</strong></td>
</tr>
</tbody>
</table>
III GEOMETRY OF E.L. 1321

1. Methods of Study

The classic methods of prospecting have been utilised for the field work including the study of drill cuttings and cores in adjoining E.L.'s.

Without going into too much detail we outline the methods and their objectives.

- Utilisation of aerial photographs at any available scale.
- Surface checking of all the data produced from the photo study by means of detailed mapping, measured sections, and detailed structural measurements. Particular attention was paid to the sedimentological features which with the petrographic study permit the division of the sediments into sub-units.
- Presentation of the data and interpretation: maps, log "armés" etc. are done where justified.

2. Regional Geological Setting

2.1 Geology and Stratigraphy

The Ngalia Basin is located in the Northern Territory, between latitudes 22°S and 23°S and longitudes 129°E and 133°45'E (See Fig. 2.).

It is an asymmetrical east-west trending intracratonic depression, being at its extremities, some 420 km long and 70 km wide.
The Stratigraphy of the Ngalia Basin is summarised and depicted on the accompanying Stratigraphic Column (Table 2.). The variations in the stratigraphy will be discussed in greater detail below in relation to each individual formation.

The sedimentary succession (Upper Proterozoic, Ordovician, Carboniferous and Quaternary overlies a Lower Precambrian crystalline basement - The Arunta Block - and is exposed in the northern part of the basin along the folded and faulted margin. The Carboniferous Mt. Eclipse Sandstone is the unit containing most of the known mineralisation in the basin.

The Ngalia Basin can be divided into two sub-basins separated by a high, the Mount Doreen Salient - Newhaven Ridge which trends N.E.-S.W. Geophysical surveys indicate a maximum thickness of about 5000 m for the sediments in the western sub-basin.

2.2 Regional Structure

The most significant features, depicted on the map (Fig. 2.), are the faults and folds associated with an intense thrusting from the north during the Mt. Eclipse Diastrophism (the local, post Mt. Eclipse Sandstone, expression of the regional Alice Springs Orogeny). Although there has been repeated tectonic activity in the area, at least since the Adelaidean, the folding seen on the map is post Mt. Eclipse Sandstone. The east-west fold pattern predates the Mt. Eclipse Sandstone, effecting both the Vaughan Springs Quartzite and the Djangama Formation.
"Hinge" folding is a widespread phenomenon, paralleling the northern margin of the basin. Notable associated features are the rapid changes in dip across the fold axes and the extensive bedding plane slip. N.N.W.-S.S.E. faults are associated with these folds.

The Mt. Doreen Salient which locally and temporarily acted as a high during sedimentation, has been reactivated after the deposition of the Mt. Eclipse Sandstone and thrust broadly southwards across the Yuendumu Fault. Similarly, the Vaughan Springs Syncline has been thrust S.E. along the Waite Creek Fault.

There has been no tectonic activity of similar magnitude since the Mt. Eclipse Diastrophism. The Kosciusko Uplift which is known to have effected the Lake Eyre region may have been responsible for regional warping and a consequent change in regional drainage patterns.

3. **Surface Results**

3.1 **Geomorphology**

The most important geomorphological feature of this E.L. is the Davis Dome.

The Davis Dome is an approximately east-west trending anticline showing a plunge to the east and the west. It disappears under a mulga covered plain to the south. Trend lines can be seen which give an east-west structural trend and dip measurements give a shallow southerly dip. Further south, a gentle east-west fold is outlined.
Lying to the east of Davis Dome is a plain with few or no outcrops but numerous clay pans (Davis Gap - Gum Creek area).

North of this dome there is a narrow east-west syncline bounded on the north by high sharp ridges (characterised by steep dips to the south, further north the beds are overturned – near the base of the Mount Eclipse Sandstone).

Pre-Mount Eclipse formations outcrop sporadically to the north of these northern ridges. A high ridge of Vaughan Springs Quartzite, strongly tectonised (vertical or overturned), is the last important relief feature in which the strata are obviously disrupted (North-east Bigrlyi - C.P.M's Camp).

Both the axes of the Davis Dome and that of the northern narrow syncline shallow toward the west near the "Kink" structure (See Fig. 3).

3.2 Generalised Stratigraphy

3.2.1 The Pre-Carboniferous Formations

The characteristics of the Pre-Mount Eclipse Sandstone formations will be summarized, with particular emphasis on the formations that are important for an understanding of the geological evolution in the western sub-basin.

3.2.1 (a) Precambrian Basement

The basement in the Mount Doreen Salient consists mainly of a porphyroblastic biotite granite with varying size, shape, number and orientation of potassic feldspar laths.
<table>
<thead>
<tr>
<th>AGE</th>
<th>FORMATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td></td>
<td>Sand, gravel beds, calcrete; fluvialite and eolian; up to 300 m thick</td>
</tr>
<tr>
<td>Tertiary</td>
<td></td>
<td><strong>ALICE SPRINGS OROGENY OR MT ECLIPSE DIASTROPHISM</strong></td>
</tr>
<tr>
<td></td>
<td>Mount Eclipse</td>
<td>Arkose, subarkose, siltstone and minor shales and carbonaceous shales, along with boulder and cobble conglomerates; Plant fossils present. Continental fluvialite and Piedmont; 2000 - 4000 m.</td>
</tr>
<tr>
<td></td>
<td>Sandstone</td>
<td><strong>KERRIDY EPEIROGENY</strong></td>
</tr>
<tr>
<td></td>
<td>Kerridy Sandstone</td>
<td>Sandstone and subgraywacke, medium and coarse grained, silty and in part calcareous and arkosic siltstone interbeds. Probably fluvialite. 700 m maximum (?).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td>Djagamara Formation</td>
<td>Sandstone, medium grained, glauconitic and with abundant clay pellets in part; local thick to thin siltstone (? - wls). Minimum age 450 m.y.; shallow marine; thickness 25-350 m.</td>
</tr>
<tr>
<td></td>
<td>Bloodwood Formation</td>
<td>Multicoloured silts and red sandstone very micaceous; shallow marine; 200 m.</td>
</tr>
<tr>
<td></td>
<td>(eastern sub-basin only)</td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td>Walbiri Dolomite</td>
<td>Dolomite, thick bedded, in part glauconitic, oolitic,stromatolitic and pelletel; interbeds of siltstone, micaceous in part; minor coarse grained, well sorted and rounded sandstones. Abundant fragmentary marine microfossils; Shallow marine; 430 m</td>
</tr>
<tr>
<td></td>
<td>(chiefly in the eastern sub-basin)</td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sandstone, fine and medium grained, moderately well sorted, cross-bedded and slumped in part</td>
</tr>
<tr>
<td></td>
<td>Yuendumu Sandstone</td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Siltstone, green, with striated erratics of various rocks types up to 5 m across. Pink laminated dolomite and red shale at the top of the formation and green siltstone at the base. Dolomite is predominant in some localities. Fluvio-glacial and partly marine; 340 m.</td>
</tr>
<tr>
<td></td>
<td>Mount Doreen Formation</td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td>(chiefly in the western sub-basin)</td>
<td>Silicified sandstone, closely jointed, thick bedded to massive, generally with basal coarse grained and pebbly hematitic sandstone and conglomerate. Dated by glauconite to be 1280 m old. Shallow marine; 2400 m. Ternier Member - silicified sandstone and siltstone. Shallow marine; 1370 m (western sub-basin only)</td>
</tr>
<tr>
<td></td>
<td>(including the newly defined Rinkabeena Shale and Naburula Formation)</td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td>Vaughan Springs Quartzite</td>
<td>Silty sandstone, quartzite, siltstone, vitric crystal tuff, minor stretched chert pebble conglomerate and shale</td>
</tr>
<tr>
<td></td>
<td>Patmungala Beds</td>
<td><strong>UNCONFORMITY</strong></td>
</tr>
<tr>
<td></td>
<td>Arunta Complex</td>
<td>Igneous and metamorphic rocks</td>
</tr>
</tbody>
</table>
The granite seems to be fresher and have a higher overall background radioactivity east of the Patmungala Syncline (e.g. along the Yuendumu track) than when it is overlain by the Vaughan Springs Quartzite (Wanabi High). North of Davis Dome the basement does not outcrop very well and seems to include schists and perhaps weathered granites also.

3.2.1 (b) Vaughan Springs Quartzite

This formation outcrops on the Wanabi High and between Bigrlyi and Mount Doreen Homestead (Vaughan Springs Syncline).

The Patmungala Syncline appears to have no Vaughan Springs Quartzite underlying it.

The Treuer Member occurs at the base of this formation in the Vaughan Springs Syncline area.

The Vaughan Springs Quartzite consists of a silicified sandstone interbedded with siltstone or shale, with varying grain size, and also gravel logs. The sediments are believed to be shallow marine or perhaps tidal. Numerous sedimentary structures are found in the Wanabi High to show the possibility of a shore line trending W.N.W. - E.S.E. These sedimentary structures are not observable in Bigrlyi and to the south-west due to a strong brittle jointing, overturned strata and sometimes folds with vertical axes. (N.E. of Bigrlyi Camp).
3.2.1 (c) The Mount Doreen Formation

In the Patmungala Syncline, the granitic basement is unconformably overlain by the Naburula Formation, the Rinkabeena Shale and the Mount Doreen Formation. Until a recent redefinition (Priess et al. 1978, B.M.R. J. Aust. Geol. Geophys., 3 (1), the Naburula Formation and Rinkabeena Shale were included in the lower part of the Mount Doreen Formation. The Mount Doreen Formation is now restricted to the upper glacial sediments – diamictite, minor conglomerate, dolomite and red shale.

The Rinkabeena Shale (~100 m thick) is predominantly green shale with some interbeds of silt-stone, in places slightly calcareous.

The Naburula Formation (about 10 m) consists of dolomite with interbedded shale, and with diamictite at the base.

The red shale at the top of the Mount Doreen Formation is unconformably overlain by the Ordovician Djamagarama Formation.

The Mount Doreen Formation also outcrops sporadically near Davis Gap, west of Anomaly 15 and beneath the overturned Vaughan Springs Quartzite west of C.P.M's Bigrlyi Camp.

3.2.1 (d) The Djamagarama Formation

This is a sandstone, medium grained, glauconitic and with abundant clay pellets, in part. Thick green siltstone lies between the lower and the upper sandstone horizons in the Patmungala Syncline. The formation thins rapidly south-south-eastwards, being only 24 m thick at Dingo's Rest South,
and the thick shale interval disappears, being replaced by an alternation of sandstone, siltstone and shale. Minor conglomerate horizons and rare carbonaceous material are present in drill cores only. The minimum age is 450 m.y. The formation is considered to be shallow marine in its thickest parts. The Djagamara Formation also outcrops in the Davis Gap - Bigryyi Camp area, but appears less well defined west of that camp.

3.2.1 (e) The Kerridy Sandstone

The Kerridy Sandstone outcrops mainly in the Central Part of the Patmungala Syncline. An even-grained sequence, purple-red in colour, with shaly interbeds. Numerous sedimentary structures are present, such as current ripples, cross-beds, overturned cross-beds, slump structures, and invertebrate tracks. Possible Kerridy Sandstone outcrops west of CPM's Bigryyi Camp, and in a thin sliver south of Wanabi High.

3.3 Results of Field Work

The Mount Eclipse Sandstone

This sandstone of Carboniferous age, has been subdivided in the Patmungala Syncline as follows:

Lower Mount Eclipse Units: 1 + 2 + 3 (Sections 1, 2, 4 and 5)
Middle Mount Eclipse Units: 4 + 5 + 6 + 7 (Sections 1, 2 and 5)
Upper Mount Eclipse Units: 8 + 9 (Sections 1, 2 and 3)

Up to the top of Unit 5, the units have been subdivided into two subunits (-a) for the coarse member (-b) for the fine member. The Mount Eclipse sandstone consists mainly of an arkosic to feldspathic and micaceous sandstone of varying grain size,
with numerous conglomeratic episodes: fluviatile facies
with common large to medium scale trough cross stratification.

The subdivision into major groups and units of the Mount Eclipse Sandstone in E.L. 1321 and in the area lying to the north, was done by photogeological extrapolation from the Patmungala syncline (E.L.1662). The strongest correlations are with Units 4 and 8 which can be followed almost continuously.

Within E.L. 1321 it was not possible to divide individual units up into a and b on every occasion.

3.3.(a) Lower Mount Eclipse Succession

Unit 1 Anomaly 2 area. The basal 20 meters consists of boulder beds. The cobbles and boulders range from 5 cm to 40 cm in diameter, and are found in a matrix of coarse-grained quartz sand and feldspar. The clasts are well rounded and exhibit moderate sphericity. The clasts have been considered by some to be reworked glacial. This is followed by 30 meters of sandstone and conglomerate, poorly sorted sandstone, feldspathic, with medium to coarse lenses of conglomerate. Cross-bedding is large-scale trough cross-bedding. Overall colour is yellowish nearly beige. The upper recessive member of Unit 1 is mostly covered by rubble. The medium to coarse-grained, poorly sorted feldspathic sandstone with a thickness of 40 m, possibly includes finer grained facies. Unit 1 does not outcrop or is not developed in the Anomaly 15 Area.

Unit 2 Anomaly 2 area. The basal member is a channelling unit with feldspathic sandstone, poorly sorted, medium-coarse and coarse-grained, large-scale trough cross-bedding and an overall rusty-beige colour. The unit is about 110 m thick but is poorly outcropping and recessive. In the upper part a small
mineralised trench can be seen in fine to medium sandstone, clayey, with small to medium crossbeds, and kaolinized feldspar.

In the Bigrlyi 15 area the Unit is 180 m thick and consists of an alternation of massive coarse or channelling units with recessive units.

East of Palkoora Creek the lower part of the unit outcrops. The outcrop commences with 3 m of strongly oxidised red siltstones, followed by medium to coarse-grained sandstones with decimetric size cross-bedding. Minor slumping of crossbeds in lower part. Clay pellets are abundant and pebbles moderately abundant to scattered. Sandstones are feldspathic with strongly kaolinised feldspar. On top of this 20 m sandstone sequence there is an alternating 11 m of fine-grained micaceous sandstones and siltstones.

Although the Djagamara outcrops nearby the contact with this unit is not exposed.

Unit 3 Anomaly 2 area. The unit is essentially a channelling unit, with poorly sorted feldspathic, medium to coarse-grained sandstone with scattered pebbles, clay pebble beds, large scale-trough cross-bedding. The unit has been "Bleached", i.e. kaolinised and is of the order to 80 meters thick.

In the Anomaly 8 and 15 areas there is a somewhat fuller succession as follows:

The basal member is a 20 m channelling unit of the Piedmont type with very large scale trough cross-bedding and thick laminae. The sandstone of medium to coarse grain size is
very feldspathic and micaceous with scattered pebbles. The cement is often carbonate and the overall colour is pink to purple-grey.

This is followed by a 10 meter recessive unit with medium to fine grained sandstone, medium trough cross-bedding and a purplish-grey colour.

The third member is once more a Piedmont type Channelling Unit with a feldspathic poorly sorted, medium to coarse-grained sandstone with scattered pebbles or clay pellet beds, large scale trough cross-bedding, a purple-grey colour and often a carbonate cement.

A 5-meter recessive feldspathic sandstone unit poorly sorted, medium to coarse-grained with medium scale trough cross-bedding and no pebbles, follows.

This is followed by a Piedmont channelling unit similar to the second channelling unit below. Then a 40 m recessive unit and a further 20 m channelling unit.

A 5 m recessive unit and a 10 meter channelling unit, with smaller trough cross-beds than below, clay pellets near base and local chloritised biotite follows.

The uppermost part of the unit is non-outcropping - and the whole unit is about 180 m thick.

3.3.(b) Middle Mount Eclipse Sequence

**Unit 4** This Unit can be readily further subdivided.

**Subunit 4a**

4a is a medium to coarse-grained whitish sandstone with feldspars, pebbles, limonite and minor mica. Lenses with grit and shale
pebbles are present. There are about 7 sequences in this subdivision with large to medium scale high angle oblique stratification. Total thickness 35 m. 4a2 is a medium to fine grained indurated violet sandstone with some feldspar. The member commences with flaggy shallow-dipping laminae. Thickness 6-7 m.

4a3 is a coarse to medium grained sandstone with rare fine facies. Quartzite pebbles (max. 5cm) form conglomeratic beds or lenses. The sandstone has traces of feldspar, and is less micaceous than the underlying member. Shale pebbles are present. Colour is violet. Medium to large scale cross-bedding with metric to decimetric beds. Scouring on basal contact. Total thickness is 54 - 57 m.

Subunit 4b is a medium grained sandstone interlayered with minor coarse-grained pebbly sandstone. This finer grained, poorly outcropping sandstone, forms narrow low ridges and is somewhat silicified. Decimetric size crossbeds.

Unit 5 This unit consists of graded sequences of 6 - 10 m thickness. Each sequence grades from a coarse-grained pebbly base (up to 10 cm pebbles) to a medium-grained sandstone, to a fine to medium-grained slightly laminated sandstone. Decimetric size crossbeds. Clay pellets and pebbles are generally abundant in lower parts of sequences. Only lower 70 m is exposed, scree suggests the upper part is probably similar.

Unit 6 From Unit 5 to Unit 8 the correlation in the Palkoora Creek area is very poor due to a very limited amount of outcrops.

In the lower part of Unit 6, 15 m of discontinuous outcrop is composed of coarse-grained gritty sandstone overlain
by medium to coarse grained micaceous sandstone. The upper poorly exposed 50 m of the unit consists of an alternation of medium to coarse-grained sandstone and fine to medium grained sandstone. Decimetric sized cross-bedding.

Unit 7 In the Palkoora area the base of Unit 7 is marked by 5 m of coarse gritty sandstones with abundant small pebbles overlain by 12 m of medium grained poorly exposed sandstone, in turn overlain by 20 m of very coarse-grained sandstone (gravelly) with abundant pebbles and metric crossbeds.

The central part of Unit 7 is poorly outcropping with only 25 m of graded sequences exposed. The graded sequences consist of 10 - 20 cm pebble beds grading to coarse-grained sandstones with 1 - 2 cm pebbles to medium-grained sandstone with decimetric sized crossbeds.

The upper 75 m of Unit 7 starts with a very coarse-grained poorly sorted sandstone, that changes upwards into a medium to coarse-grained sandstone followed by finer-grained micaceous laminated sandstones. Most of this sequence is strongly silicified.

3.3.(c) Upper Mount Eclipse Sequence

Unit 8 (See accompanying Log "armé" - Section 3)

This Unit is only known from surface outcrops and the description is for the area near the Drill Site at Davis Dome.

Twenty graded sequences are present in this unit. The basal sequences commence with conglomerates and medium to coarse-grained poorly sorted sandstones, with conglomeratic lenses.
The fine-grained part tends be less important than the coarser-grained part of each graded sequence. Up the unit the conglomerate is no longer developed, but large-scale cross-bedding with slumping and channelling features are developed instead grading upward to micaceous thinly bedded layers. Silts are important just beneath the contact with Unit 9. The colour is red-brown throughout.

3.3.(d) Radioactivity from outcrops

<table>
<thead>
<tr>
<th>Unit</th>
<th>Activity (cps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>---</td>
</tr>
<tr>
<td>Unit 2</td>
<td>---</td>
</tr>
<tr>
<td>Unit 3</td>
<td>80 - 1100</td>
</tr>
<tr>
<td>Unit 4a</td>
<td>60</td>
</tr>
<tr>
<td>Unit 4a2</td>
<td>---</td>
</tr>
<tr>
<td>Unit 4a3</td>
<td>80</td>
</tr>
<tr>
<td>Unit 4b</td>
<td>---</td>
</tr>
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<td>Unit 5</td>
<td>---</td>
</tr>
<tr>
<td>Unit 6</td>
<td>---</td>
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<tr>
<td>Unit 7</td>
<td>80-100</td>
</tr>
<tr>
<td>Unit 8</td>
<td>50-85</td>
</tr>
<tr>
<td>Unit 9</td>
<td>100-250</td>
</tr>
</tbody>
</table>

poorly outcropping
3.4 Structural Study

The study here is preliminary only. Further work will be done in conjunction with the data available in Prof. M. Ruhland's report, which is not yet to hand.

The dominant movement along faults in the area seem to be sinistral east-west movements. Near horizontal joint planes are common, and north-south trending slickensides indicate some movement. South-west of CPM's Bigryi Camp where the outcrops appear "twisted", there is sinistral displacement along W 110° - 120° faults.

At anomaly 8 there is dextral faulting along N 160° trends. N 20 trending faults are found in the small syncline north of Davis Dome. North of CPM's Bigryi Camp there are vertical folds in the Vaughan Springs Quartzite. From just west of CPM's Bigryi Camp to 12 Mile Creek, there appears to be duplication of the succession, particularly in Unit 1 conglomerates and in the Kerridy, due to strike-faulting.

3.5 Radiometric Anomalies at Surface

An airborne radiometric anomaly is depicted on C.P.M. maps. It lies N.W. of Dav. 1. in Unit 8 near the contact with Unit 9. It is explained by high background shales.

4. Results of Drilling

4.1 Geology from Subsurface Information

(Refer to the Geological/Radiometric log for Diamond Drill hole DAV 1) For location see fig. 4.

Unit 1. Not intersected in drilling.
FIG 4: E L 1321 DRILL SITE LOCATION

Scale: 1:250,000

Sheet Map SF 52-12
Unit 2. This unit may or may not have been intersected, depending on interpretation. If this unit has been intersected it is much finer-grained – along with Unit 3 – than the material seen in outcrop. It is possible that Unit 2 lies between 817 and 904 m depths.

The section consists of medium to course-grained sandstones with a number of subsequences contained therein. Near to the base of the drillhole a thin pyritic, mineralised, reduced black shale unit overlies medium to coarse-grained feldspathic sandstone with scattened pebbles to 1 cm. The next graded sequence consists of medium grained sandstone, mottled purple green, grading up to a zone of interbedded sandstones and siltstones with clay platelets and some carbonate. A coarse sequence follows; coarse-grained sandstone followed by medium-grained sandstone and then medium grained moderately sorted sandstone, with hematite, feldspar and mica. A few interbeds of medium to coarse-grained sandstone with clay platelets are present. The next graded sequence commences with an erosional contact and consists of coarse to medium-grained sandstone poorly sorted with clay platelets and calcareous matrix grading to argillaceous to fine-grained micaceous shale.

Unit 3. In the subsurface this unit can be readily subdivided into subunits (a) and (b). Subunit (a) extends from 817 m to 765 m and (b) to 740 m.

Subunit 3a. This subunit is a fairly shaley sandstone near the base, with green sandy micaceous shale lenses, pebble shale fragments are present about midway through the succession, the colour mottled light purple-green, in a coarse to medium grained sandstone matrix. Some very thin graded sequences are present. This is overlain by
medium to coarse-grained sandstone, with minor biotite, feldspar, hematite and red fine-grained clay spots with some carbonate.

**Subunit 3b.** This is a fine-grained subunit consisting of numerous interbeds of red sandy shale and fine-grained sandstone and shale, and patchy carbonate throughout. This is not an "alternance" as seen in the DIN Area. Reduced at 744 m.

4.1.(b) Middle Mount Eclipse Succession

All the subdivisions of Unit 4 are recognisable in the drill core:

<table>
<thead>
<tr>
<th>Subunit</th>
<th>Depth Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>4b</td>
<td>649.75 - 599.70 m</td>
</tr>
<tr>
<td>4a3</td>
<td>698 - 649.75 m</td>
</tr>
<tr>
<td>4a2</td>
<td>705 - 698 m</td>
</tr>
<tr>
<td>4a1</td>
<td>740 - 705 m</td>
</tr>
</tbody>
</table>

**Subunit 4a1.** A coarse-grained poorly sorted sandstone with carbonate, green to red platelets, minor fine-grained sandstone with mica, a general mottled light purple-green colour.

**Subunit 4a2.** Dominantly fine-grained sandstone with minor mica, oxidised and mottled as above.

**Subunit 4a3.** Medium-grained sandstone but grading from fine to medium-coarse grained with red clay spots, clay platelets, calcareous matrix, moderately to poorly sorted.

**Subunit 4b.** Essentially an "alternance" i.e. composed of graded sequences with fine-grained facies predominating.
Shale to sandy shale, light purple to green in colour with medium-coarse-grained sandstone starting each graded sequence (5 - 10 m sequences). Some scattered pebbles to 1 cm are present at the base of some sequences.

**Unit 5.** This unit lies between 599.70 and 461 meters.

Subunits cannot be identified in the core that can be confidently equated with the subdivisions in the Patmungala Syncline.

Coarse to fine graded sequences, 5 - 10 m sequences, about 13 in all, all terminating in red shale and greater or lesser amounts of carbonate. The unit starts with a conglomerate, pebbles up to 5 cm in size, and minor pebbles occur elsewhere. The sandstone ranges from coarse to medium-grained. Minor black shale and micaceous sandstone are present, along with organic matter and shale fragments and platelets. Reduced facies are present at 524 - 528 m, 508 - 510 m, 476 - 489 m with grey to black colouration and organic wisps, elsewhere the colour is mottled purple-green or red.

**Unit 6.** This unit is located between 375-6 m and 461 in D.A.V. 1.

This unit is composed of 8 graded sequences. Scattered pebbles and platelets in medium to fine-grained sandstone, red clay spots, patchy calcareous matrix. Overall colour is red to mottled purple-green.

**Unit 7.** Because of the extreme thickness of this unit, the succession has been subdivided in D.A.V. 1 in 7a and 7b.
Subunit 7a. Commencing with a coarse to medium-grained sandstone, and a conglomerate in about the fourth graded sequence with poor sorting and often a shattered or jointed appearance, the sandstone grades through clay fragments and platelets to a shale or siltstone. The coarse and fine material in each graded succession is present in about equal amounts in the 30 odd graded sequences present. The colour is dominantly red, 375-6 - 103 m.

Subunit 7b. Commencing with a conglomerate at 103 m which consists largely of shale fragments with minor quartz fragments, the graded sequences continue as above with perhaps slightly more fine facies than in 7a. The overall grain size of the sandstone is coarser and the colour is white to red with minor green. There are 13 sequences in all. The hole commenced 20 meters below the top of the unit. Total thickness is thus 123 m.

4.2 Structure

The core on the whole is very indurated, and unfolded. There are, however, joint and shatter zones that are recognised in the core:

194 - 195  slickensides
243 - 244  calcite or quartz filled joints
258       subvertical joints
310       several joints 60-65°
330 - 350  ) broken ground - sand inflow and
358 - 364  ) gas issue
337 - 338  is heavily shattered and brecciated
337.339.6  numerous joints 60°
352.7, 353  joints 75-80°
371        joints 70-80°
The bedding is horizontal or near horizontal throughout.

4.3 Radioactivity

The core was monitored with an S.P.P.2. scintillometer, and none of the reduced facies above the possible Unit 2 carried any radioactivity anomalous material - oxidation otherwise being almost universal all the way down to 904 m.

Within Unit 2 (?) there is a very thin black shale band. The highest reading recorded on the S.P.P.2 is 470 cps and the radioactive zone is 0.4 m thick. The relevant section of the core has been sent for chemical analysis and laboratory description; the mineralised section being black shale with no similarities to the mineralised material in the DIN Area.

The minor uranium mineralisation was encountered at 899.3 m depth in DAV 1.

The counts on the S.P.P.2 was the only information available - as the Widco probe stopped just short of the anomalous sector (to avoid immersion in grease).

4.4 Comparison of Thicknesses (See Chart)

Unit 2 (?). Only 87 metres of possible Unit 2 was intersected with 150 - 200 m being found in the Patmungala.

Unit 3. The drill intersection is comparable with the Patmungala, but is much thinner and much finer-grained than in outcrop - possibly due to the fact that when unravelled it would lie at least 3 km from the margin of the basin - i.e. a distal facies.
TABLE 4: Analytical results from anomalous zone in DAV 1 (Figures in ppm)

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<thead>
<tr>
<th>DEPTH</th>
<th>U</th>
<th>Th</th>
<th>Mo</th>
<th>Se</th>
<th>V</th>
<th>Cr</th>
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<tr>
<td>898.7 - 898.8</td>
<td>65</td>
<td>18</td>
<td>&lt;1</td>
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<td>1150</td>
<td>26</td>
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<td>30</td>
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<tr>
<td>- 899.5</td>
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<td>- 899.64</td>
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<td>E. OF PALKOORA</td>
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<td>7b</td>
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<td>235</td>
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<tr>
<td>2</td>
<td>150 - 200</td>
<td>87+</td>
<td>110 +</td>
<td>242</td>
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</tr>
<tr>
<td>1</td>
<td>?</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerridy</td>
<td>?</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Djagamara</td>
<td>25-350 m</td>
<td>?</td>
<td>?</td>
<td>?</td>
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<td></td>
</tr>
</tbody>
</table>
Unit 4. This unit is of comparable thickness throughout. The marker horizon $U_{4a3}$ is recognized throughout. This confirms the correlation with the Patmungala in both time and space.

Unit 5. The section is thicker in Davis Dome and even thicker in the measured section.

Unit 6. Thicker in Davis Dome and of uncertain thickness in outcrops near Palkoora Creek.

Unit 7. There is no major thickness variation anywhere - $351 - 400$ m.

Unit 8. This has only been accurately measured in the Davis Dome - Bigrlyi area where there is no major variation $260 - 290$ m.
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   1:5000 scale.

2. Section east of Palkoora - 1:5000 scale

3. Davis Dome Cross-Section - 1:5000 scale

4. Schematic Cross-Section Anomaly 15 & 8 Bigrlyi

5. Schematic Cross-Section Anomaly 2 Bigrlyi.

Litholog Dav 1.
Sect 1 Davis Dome - Biglyi Section
alias Palkoorra Section

0-0.5m: Gritty-set with dominantly to metric cross bedding. Small beds of ark pisolites (D) are generally slightly micaceous and were fieldpassable (greyish). Minor intercalations of micaceous set, moderately fieldpassable with low-angle cross bedding and stromata. Variable alternation. Feldspar generally altered to set white, mag set reddish. Sequences from a few metres to a few tens of metres. 50-80%/6 SPP

0.5-1m: Poorly interlocking with bodies of very red and micaceous to very micaceous beds, Small metric graded sequences. Grits. Variable stratification. Only minor cg set. 60-80%/6 SPP

1-1.5m: Alternations of sequence with cm. gritty set and cm micaceous. Layers of fine conglomerate (pseudocr.) and cm. fine micaceous flinty set are developed locally. Minor clay patches are present. Low angle cross bedding. 60-85%/6 SPP

1.5-2m: Succession of mega-sequences (100s) of cm. gritty fieldpassable and gritty micaceous set, intercalated with medium to fine (conglomerate) set (1-3cm). White to reddish. Feldspar relatively unaltered. The sequence is similar to the 0-05m succession. 50-70%/6 SPP

1 Unit 4b, Horsed of variable granulometry, but mainly mg-cg. Yellowish colour.

2 Unit 4c, Cm.-cm. violet siliflaced sandstone with medium to large scale cross-bedding. Shattered quartzite pebbles (2cm. Soma. shale pebbles and conglomeratic beds and breccias are common. Trace of feldspar. Slightly micaceous. 50-80%/6 SPP

3 Unit 4d, Horsed of variable granulometry, but mainly mg-cg. Yellowish colour.

4 Unit 4e, A whitish mega-set with feldspars and pebbles. Often with lenses of grit and shale pebbles. Limonite and minor iron is present. The pebbles consists of 3 sequences with high angle medium to large scale cross beds. 60-70%/6 SPP

REPORT NT 292F PLAN 1686
NGALIA BASIN  E.L.1321 Sect 2B
DAVIS DOME - BIGRYLI AREA
Supplementary North-South Traverse-Section
SCALE: 1:5,000

REPORT NT 292F
PLAN 1681