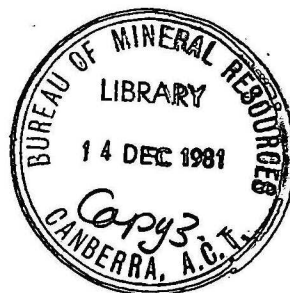


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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

BMR RECORD 1981/38

STRATIGRAPHIC DRILLING IN THE CRETACEOUS TOOLEBUC FORMATION
IN THE CHARLEVILLE DISTRICT, SOUTHERN QUEENSLAND, JUNE 1981.
A contribution to BMR/CSIRO, NERDDC Project, 78/2616

By

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ABSTRACT

Shallow stratigraphic drilling carried out by BMR in the Charleville district southern Queensland in June 1981 showed that:

- the oil shale bearing facies intersected in BMR Charleville No. 5 stratigraphic hole comprises two beds of oil shale separated and underlain by a claystone lithologically similar to the overlying Allaru Mudstone
- there is a moderate gamma-ray anomaly at the level of the upper oil shale bed intersected in BMR Charleville No. 5 stratigraphic hole
- kerosene-like fluid is widespread within the oil shale bearing facies of the Toolebuc Formation

Oil shale of the Toolebuc Formation pinches out towards the southeast margin of the Eromanga Basin near Charleville, and the formation itself either pinches out there or changes in facies.

INTRODUCTION

The NERDDC Oil Shale Methodology Project is being carried out jointly by the Bureau of Mineral Resources and CSIRO Fossil Fuel Division.

A shallow stratigraphic drilling program by BMR, completed in June 1981, is the subject of this report.

BMR Charleville Nos. 3, 3A, 4, 4A and 5 stratigraphic holes were drilled in the southeastern part of the Eromanga Basin in the Charleville district, Queensland (Fig. 1).

The holes were sited to test the hypothesis that a change from marine (oil shale-bearing) to a continental (non oil shale-bearing) facies may occur within the Toolebuc Formation in this part of the Eromanga Basin.

The holes were drilled and wire-line logged by BMR, using its own equipment and personnel, during May and June 1981. Cuttings samples were collected from intervals not cored at 2.00 m intervals. Cores were cut as required and 34 cores were recovered. The cuttings samples and the cores are stored at the BMR Core and Cuttings Laboratory, Fyshwick, A.C.T.

A suite of wire-line logs was run in each of the holes either in the course of drilling or on completion of each hole. The logging was carried out by a two-man crew of the Geophysical Branch of the BMR, using BMR slim-hole tools and a density sonde hired from SIE Inc. Brisbane, QLD. Copies of the logs together with gross lithologies are shown in Figures 2, 3 & 4. The original copies of wire-line logs are held by the BMR Geological Branch.

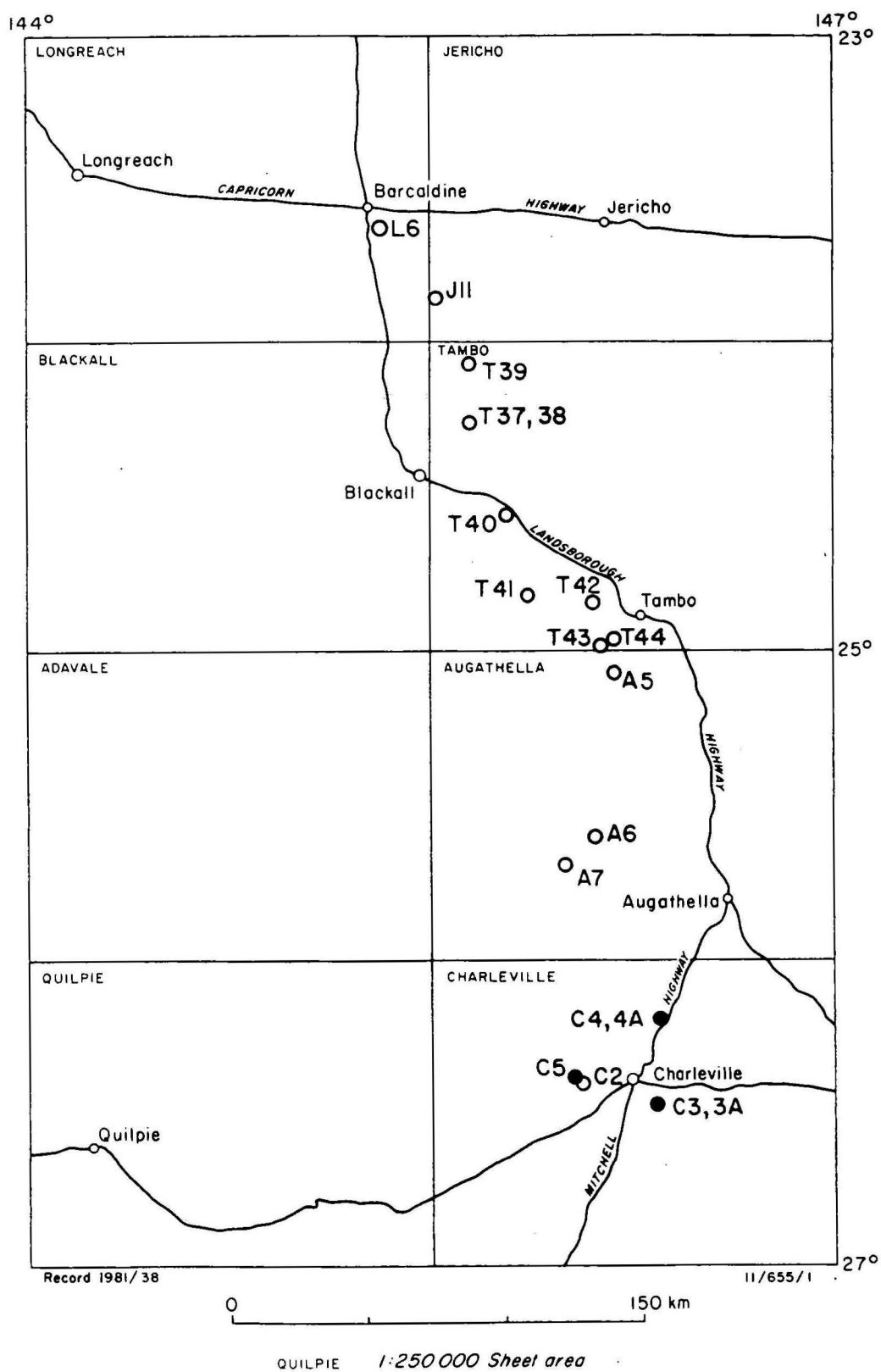
DRILLING RESULTS

As well as superficial deposits, three lithological units of the Cretaceous Rolling Downs Group were penetrated (Table 1). BMR Charleville Nos. 3 & 3A and 4 & 4A intersected the lower part of the Allaru Mudstone Formation, and bottomed in the upper part of the Coreena Member Sandstone of the Wallumbilla Formation. BMR Charleville No. 5 penetrated the lower part of the Allaru Mudstone Formation; intersected the Toolebuc Formation; and bottomed in the Coreena Member Sandstone.

The oil shale-bearing facies of the Toolebuc Formation are absent in BMR Charleville Nos. 3 & 3A and 4 & 4A holes (Figs. 2 & 3). In BMR Charleville No. 5 stratigraphic hole the facies are, however, present and contain beds of oil shale that are separated by montmorillonite claystone. In the same hole, a moderately anomalous gamma-ray response was noted opposite the upper oil shale bed (Fig. 4).

In the course of drilling through the oil shale facies of the Toolebuc Formation in BMR Charleville No. 5, a kerosene-like fluid (similar to that found further north in the basin during the 1980 drilling program (Ozimic, 1981) flowed to the surface along with the drilling mud.

Correlation of the lithological units penetrated in the drilled holes (Fig. 5) suggests either a pinch-out, or a change, of the oil shale-bearing facies of the Toolebuc Formation between BMR Augathella No. 7 and BMR Charleville Nos. 4 & 4A, and between BMR Charleville No. 5 and BMR Charleville Nos. 3 & 3A. However, the current tentative interpretation (still to be confirmed by palynological dating) is that the Toolebuc Formation oil shale facies do not pinch-out, but are merely replaced by a time-equivalent non - oil shale-bearing sequence.



○ T40 Stratigraphic hole
(BMR Tambo 40)

○ Holes drilled in 1980 (Ozmic, 1981)

● Holes drilled in 1981 (this report)

Fig.1 Location map, stratigraphic drilling

BMR
CHARLEVILLE NOS. 3 & 3A
STRATIGRAPHIC HOLES

Table 2:

Stratigraphic hole history and general data

| Parameters | BMR CHARLEVILLE NO. 3 | *BMR CHARLEVILLE NO. 3A |
|--------------------|--|-------------------------|
| Geol. Sheet Area | CHARLEVILLE 1:250,000 | CHARLEVILLE 1:250,000 |
| General Location | 12 km southeast along road from Charleville to Bollon. BMR Charleville No. 3A is located 3 metres west of BMR Charleville No. 3. | |
| Latitude | 26° 28' 30"S | |
| Longitude | 146° 20' 00"E | |
| Commenced Drilling | 13-5-81 | 18-5-81 |
| Completed Drilling | 17-5-81 | 24-5-81 |
| Drilled by | BMR | BMR |
| Total Depth | 91.00 m B.G.L. | 85.70 m B.G.L. |

Wire-line logs

| | | |
|-------------------|------------------------|----------------------|
| - Gamma Ray | Surface - 89.00 m | Surface - 84.00 m |
| - Neutron | - | " - 84.00 m |
| - Resistivity | - | 9.00 - 84.00 m |
| - Density | - | 4.00 - 84.00 m |
| - Caliper | - | Surface - 84.00 m |
| - Spon. Potential | - | 6.00 - 84.00 m |
| Cuttings | Surface - 91.00 m T.D. | Surface - 50.00 m |
| Cores | - | 50.00 - 85.70 m T.D. |

As a re-examination of cuttings and wire-line logs of BMR Charleville No. 3 did not rule out the possibility of some facies of the Toolebuc Formation being present, BMR Charleville No. 3A was drilled to obtain cores of the suspect interval 50-80 m.

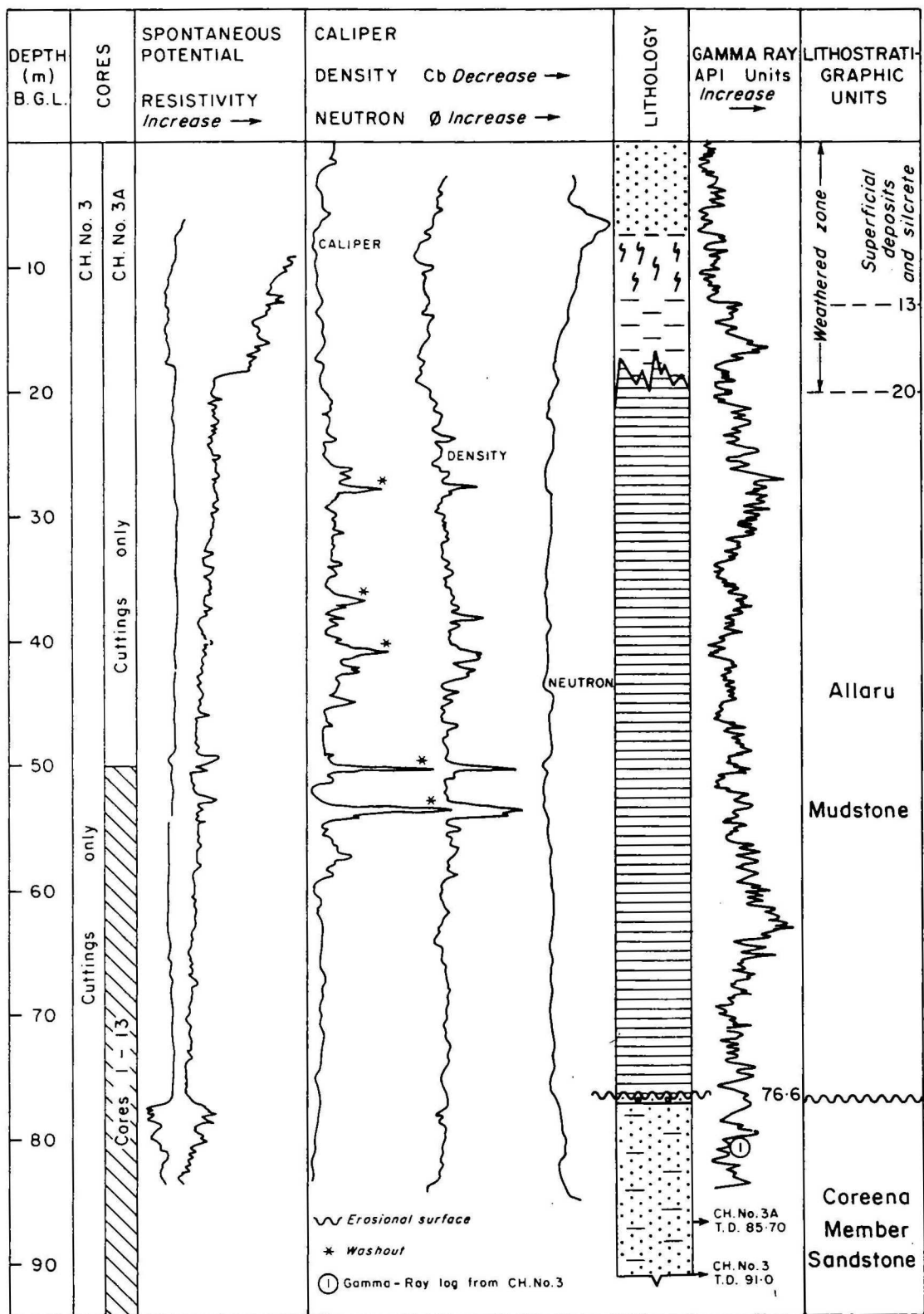
STRATIGRAPHY

The rock units penetrated in the BMR Charleville Nos. 3 & 3A stratigraphic hole and the thickness are listed in Table 3 below.

Table 3

| Rock Units | Interval (m) | Thickness (m) |
|--------------------------------------|-------------------|------------------|
| Superficial deposits and silcrete | Surface - 13.00 m | 13.00 m |
| Allaru Mudstone | 13.00 - 76.60 m | 63.60 m |
| Coreena Member Sandstone | 76.60 - 91.00 m | 14.40 m |

The lithological units penetrated are correlated with the wire-line logs on Figure 2.



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Fig.2 BMR Charleville 3, 3A

BMR
CHARLEVILLE NOS. 4 & 4A
STRATIGRAPHIC HOLES

Table 4:

Stratigraphic hole history and general data

| Parameters | BMR CHARLEVILLE NO. 4 | *BMR CHARLEVILLE NO. 4A |
|-----------------------|---|-------------------------|
| Geol. Sheet Area | CHARLEVILLE 1:250,000 | |
| General Location | 26.5 km northeast along road from to Charleville to Augathella. BMR Charleville No. 4A is located 3 m west of BMR Charleville No. 4 | |
| Latitude | 26° 11' 18"S | |
| Longitude | 146° 21' 42"E | |
| Commenced Drilling | 28-5-81 | 9-6-81 |
| Completed Drilling | 5-6-81 | 13-6-81 |
| Drilled by | BMR | BMR |
| Total Depth | 77.00 m B.G.L. | 32.10 m |
| <u>Wire-line logs</u> | | |
| - Gamma Ray | Surface - 75.00 m | Surface - 31.10 m |
| - Neutron | - | Surface - 31.10 m |
| - Resistivity | - | - |
| - Density | - | Surface - 31.10 m |
| - Caliper | - | Surface - 31.10 m |
| - Spon. Potential | - | - |
| Cuttings | Surface - 45.40 m | Surface - 16.00 m |
| | 50.00 - 77.00 m T.D. | |
| Cores | 45.40 - 50.00 m | 16.00 - 32.10 m T.D. |

*At the time of drilling BMR Charleville No. 4, heavy rain caused difficult drilling conditions resulting in poor and unreliable circulation returns.

Another hole was therefore drilled so as to obtain the necessary samples.

STRATIGRAPHY

The rock units penetrated in the BMR Charleville Nos. 4 & 4A stratigraphic hole and the thicknesses are listed in Table 5 below.

Table 5

| Rock Units | Interval (m) | Thickness (m) |
|--------------------------|-------------------|------------------|
| Superficial deposits | Surface - 16.00 m | 16.00 m |
| Allaru Mudstone | 16.00 - 31.40 m | 15.40 m |
| Coreena Member Sandstone | 31.40 - 77.00 m | 45.60 m |

The lithological units penetrated are correlated with the wire-line logs on Figure 3.

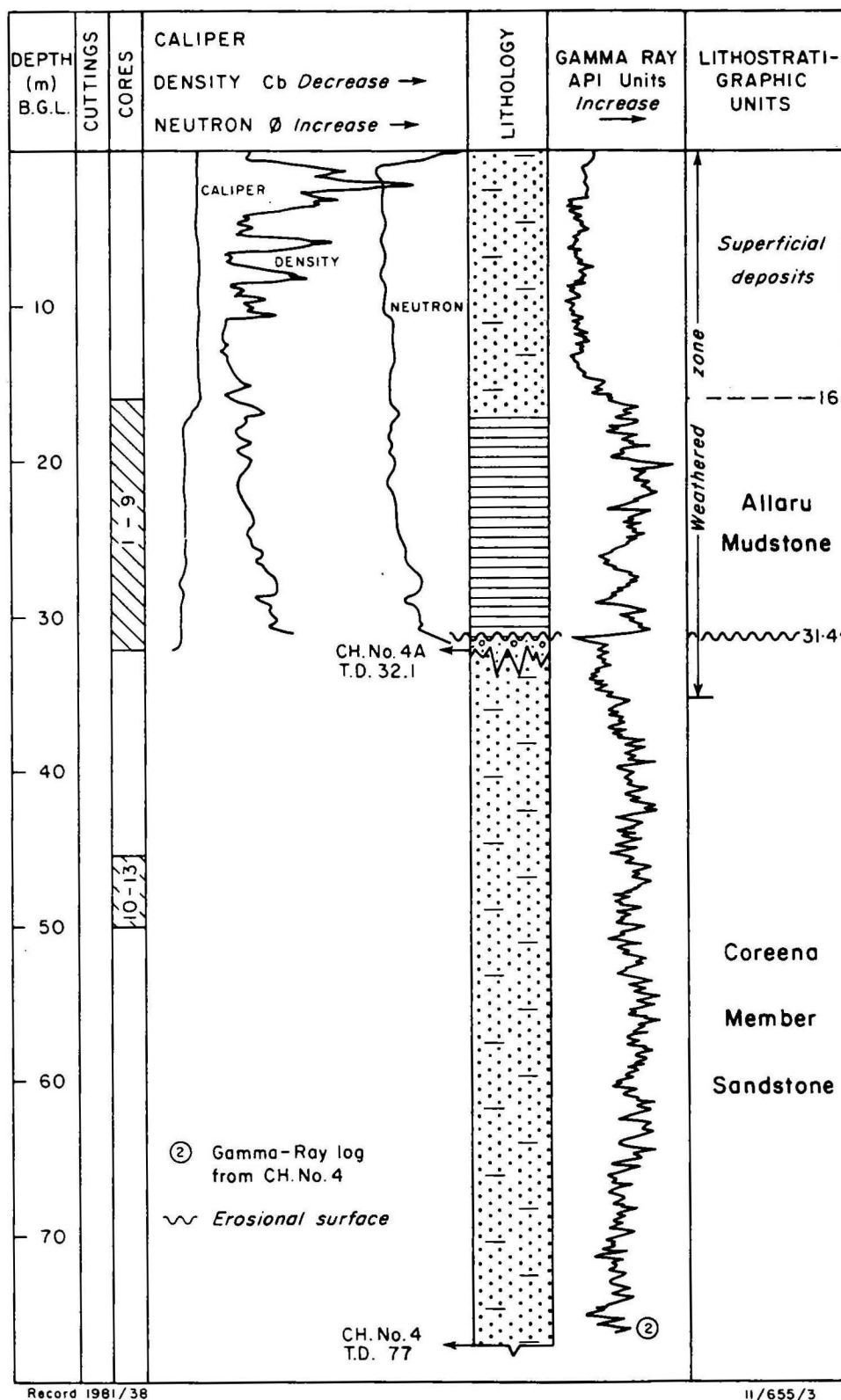


Fig.3 BMR Charleville 4,4A

BMR
CHARLEVILLE NO. 5
STRATIGRAPHIC HOLE

Table 6:

Stratigraphic hole history and general data

| Parameters | BMR CHARLEVILLE NO. 5 |
|-----------------------|--|
| Geol. Sheet Area | CHARLEVILLE NO. 5 |
| General Location | 11 km west of Charleville 1 km south of Registered Water Bore No. 2871 |
| Latitude | 26° 23' 17"S |
| Longitude | 146° 02' 04"E |
| Commenced Drilling | 15-6-81 |
| Completed Drilling | 19-6-81 |
| Drilled by | BMR |
| Total Depth | 78.8 m B.G.L. |
| <u>Wire-line logs</u> | |
| - Gamma Ray | Surface - 76.00 m |
| - Neutron | Surface - 76.00 m |
| - Resistivity | 2.00 - 74.00 m |
| - Density | Surface - 74.00 m |
| - Caliper | Surface - 74.00 m |
| - Spon. Potential | 2.00 - 59.70 m |
| Cuttings | Surface - 59.70 m |
| Cores | 59.70 - 78.80 m T.D. |

STRATIGRAPHY

The rock units penetrated in the BMR Charleville No. 5 stratigraphic hole and the thicknesses are listed in Table 7 below.

Table 7

| Rock Units | Interval (m) | Thickness (m) |
|--------------------------|------------------|------------------|
| Superficial deposits | Surface - 2.00 m | 2.00 m |
| Allaru Mudstone | 2.00 - 60.50 m | 58.00 m |
| Toolebuc Formation | 60.5 - 73.05 m | 12.55 m |
| Coreena Member Sandstone | 73.05 - 78.80 m | 5.75 m |

The Toolebuc Formation oil shale intersected in BMR Charleville No. 5, consists of black, firm and massive bituminous shale. It is readily distinguishable from the overlying and the interbedded blue-grey, poorly consolidated claystone beds by colour, firmness and comparatively lower specific gravity, and yields oil on heating.

The lithological units penetrated are correlated with the wire-line logs on Figure 4.

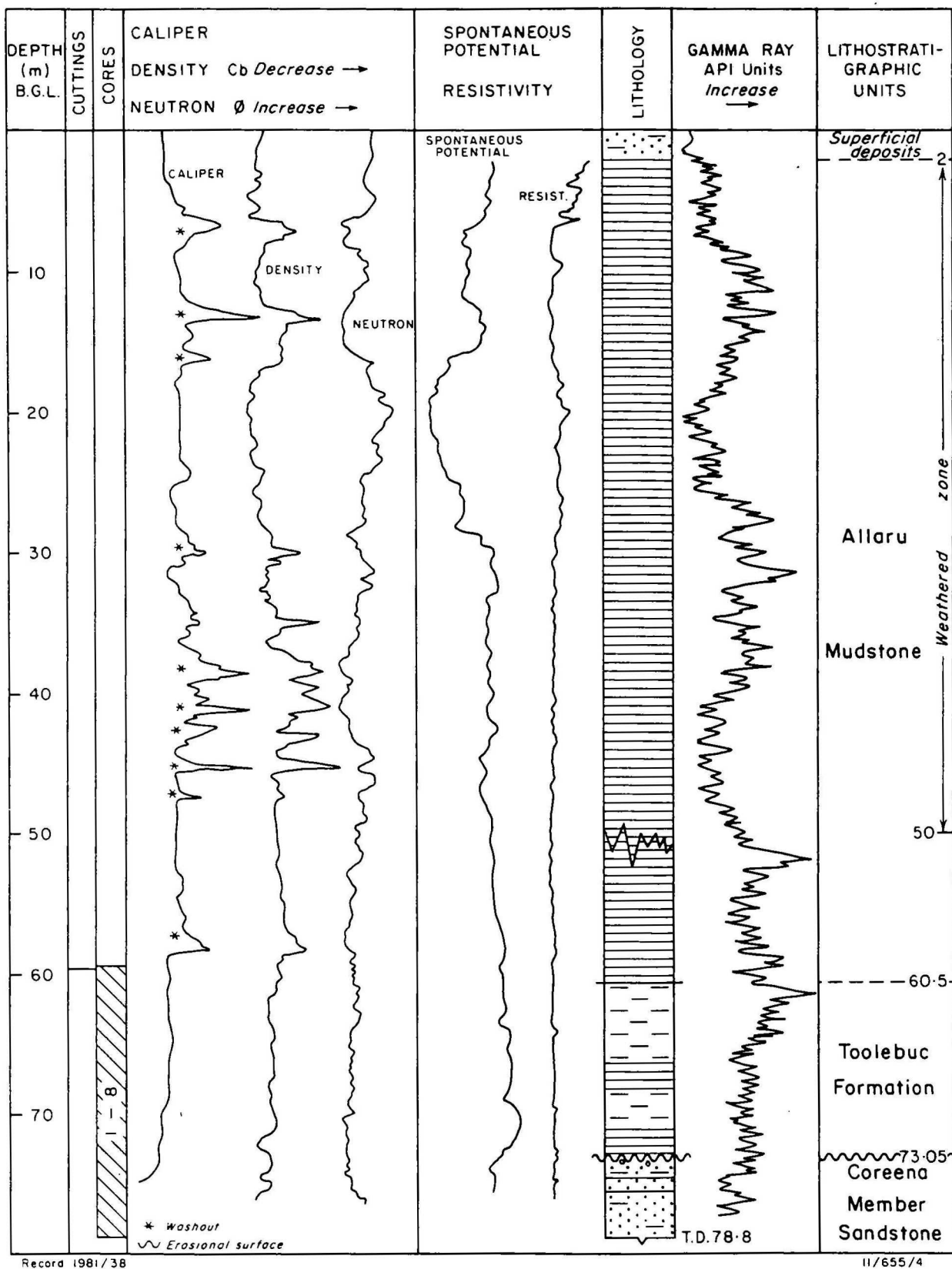
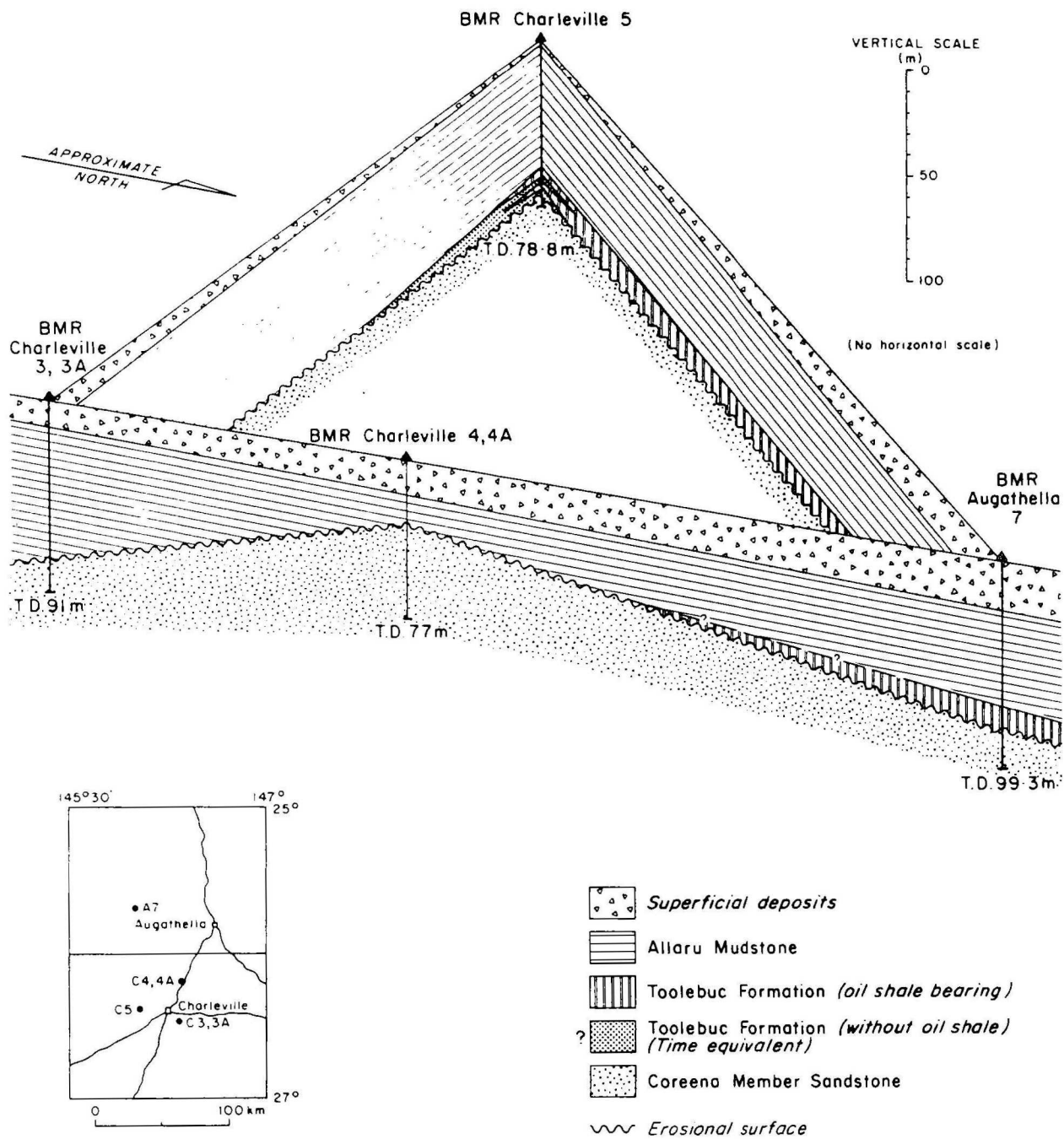


Fig.4 BMR Charleville 5



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Fig.5 Correlations between Toolebuc and associated formations

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