

DEPARTMENT OF MINES
SOUTH AUSTRALIA

NOTES ON GEOPHYSICAL LOGGING OF CLARENCE RIVER
BASIN OIL EXPLORATION DIAMOND DRILL HOLE WOOMERA

NO.1

by

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OIL EXPLORATION DIAMOND DRILL HOLE WOOLFEA NO. 1.

The following logs have been obtained in the above hole:-

- (1) short normal probe resistivity, electrode spacing EA = 18 ins.;
- (2) long normal probe resistivity, electrode spacing EA = 66 ins.;
- (3) lateral probe resistivity, electrode spacings EA = 234 ins.,
AB = 18 ins.
- (4) spontaneous potential;
- (5) radioactivity;
- (6) temperature;

and are shown on plan L58-19. Logs (1) and (2) were run concurrently down the hole, (3) & (4) concurrently up the hole, (5) alone, upwards and (6), alone, downwards. The depth reached in each trip down the hole was about 40 feet short of the drilled depth, 2005 feet, possibly due to the accumulation of cuttings in the bottom. The top 1090 feet were cased and water stood at 10 feet below the surface.

The short normal, long normal and portion of the lateral probe resistivities were measured with a constant applied current of 0.1 amp. While the lateral was being run the applied current was increased to 0.5 amp at the point indicated. No quantitative interpretation of the logs has been made and the horizontal scales of the resistivity curves have not been converted to resistivity units but left in terms of the measured potential.

A thermistor in the tip of the probe was used to measure the temperature of the water in the hole after it had lain undisturbed for several days. The radioactivity within the hole was detected with a 10 inch Geiger tube and recorded as shown with a full scale deflection of 20 counts per minute.

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The general principles of electric log interpretation have been stated in "Geophysical Prospecting for Oil", by L.L. Ketelton, as follows:-

1. A high resistivity means either
 - a. A non porous formation containing relatively little conducting fluid (i.e. salt water)
 - b. A porous formation containing a non-conducting fluid such as oil or gas
2. A low resistivity means a porous formation containing a conducting fluid (i.e. salt water)
3. A high self-potential value means a permeable formation."

(It must be remembered that as a rule clays and shales have lower resistivities than sands)

To these may be added the fact that an increase in radioactivity is probably caused by an increase in potassium content, the potassium being present in feldspathic or clayey material.

Between 770 feet and 1100 feet, and below 1370 feet the general level of radioactivity is low. These areas may be sandstone and the higher radioactivity areas may be predominantly shale. A change in the general temperature gradient near 800 feet suggests a change in rock type.

From the number of peaks on the resistivity logs the succession below the casing must consist of thin, alternating beds of non-porous rock (peaks) and either shale or salt water saturated porous rock (low resistivities).

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