

# OPEN FILE

January 1982

RKER 82.007

DETERMINATION OF SOURCE ROCK QUALITY  
OF CUTTING SAMPLES FROM WELL  
OORAMINNA-1, AUSTRALIA

by

G. KONERT and F.M. van der VEEN

code: 774.103

BUREAU OF MINERAL RESOURCES

**CORE AND CUTTINGS  
LABORATORY**

Available for public inspection

and/or copying after 10 JAN. 1982

AM

Investigation

9.12.480

This **CONFIDENTIAL** report is made available subject to the condition that the recipient will use the information contained therein for his own business only and will not divulge it to third parties without the written authority of the sponsoring party.

Copyright is vested in Shell Research B.V.

**KONINKLIJKE/SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM**

**RIJSWIJK, THE NETHERLANDS**

(Shell Research B.V.)

PR82/04

CONTENTS

	page
I Introduction	1
II Results	4
III Discussion and conclusions	5
IV Summary	5

Figure 1 : Location map

Table I : Source rock properties

Table II : Maceral descriptions

Enclosure 1 : Geochemical log

## I INTRODUCTION

A source rock evaluation has been carried out on cutting samples from well Ooraminna-1, onshore, Australia. The approximate location of the well is shown in figure 1.

The samples derive from the interval 100- 6095 ft (TD), i.e. Cambrian sediments from the Arumbera Formation and Proterozoic sediments from the Pertatataka, Areyonga and Bitter Springs Formation.

Source rock evaluation commonly comprises determination of:

1. the presence (or absence) of hydrocarbons source material in the rock samples;
2. the quality of the organic matter as well as the distribution of its specific constituents;
3. the degree of organic metamorphism (= level of maturity).

A source rock is identified by measuring the amount of temperature reactive ("live") organic matter present, i.e. the amount of organic matter that yields hydrocarbons upon pyrolysis. The method excludes any ("dead") organic matter such as inertinites.

In addition, the total organic carbon content can be determined which gives the sum of "live" and "dead" organic carbon. Rocks containing less than 0.5 % organic carbon are not considered to have a potential for commercial oil accumulations.

The source rock indications (SRI), which are a measure of the amount of pyrolysable organic matter, are determined on the original samples and in certain cases also after extraction with organic solvents. A systematically lower value after extraction is due to the presence of extractable hydrocarbons. These may consist of trapped oil, oil generated in situ by a source rock, or e.g. gasoil used in the drilling fluid.

In general, samples with source rock indications of 30 or less do not represent (immature or mature) source rocks. Values between 30 and 100 generally indicate marginal source rocks, while values above 100 commonly indicate good source rocks.

Intervals or samples with high source rock indications are investigated under a microscope to ensure that the high values indicate genuine source rock properties and are not due to contaminants of an organic nature such as lost circulation material.

The quality of a source rock for oil/gas generation depends on the type of organic matter present. Five categories of organic matter can be distinguished, viz.: humic, mainly humic, mixed, mainly kerogenous, kerogenous. This classification

is based on the hydrogen content of the organic matter.

Source rocks with organic matter of kerogenous, mainly kerogenous and/or mixed type generate predominantly oil. Organic matter of humic type generates gas only. Strata with organic matter of mainly humic quality generate either gas, or gas and oil.

In addition to the type and the concentration of the organic matter, the source rock quality is also characterised by the distribution of the typical organic constituents, or macerals<sup>1</sup>, in the sediments. The maceral distribution can be used to further qualify the source rock, especially when mainly humic quality is found. For this purpose a microscopic investigation on polished rock fragments is carried out.

The maturity of source rocks is expressed in terms of degree of organic metamorphism. With increasing degree of organic metamorphism the organic matter is gradually carbonised while generating hydrocarbons. With increased carbonification the light reflectance of vitrinite, one of the coal macerals, increases. The degree of organic metamorphism can be assessed by measuring this reflectance.

- 1) maceral: an organic constituent which can be recognised with the microscope (with objectives 25x to 50 x).

## II RESULTS

The analytical results are plotted in the geochemical log (enclosure 1) and detailed in tables I and II.

### a) Source rock indications (SRI)

All samples show insignificant SRI values after extraction (less than 30 units).

### b) Total organic carbon content

This parameter has been measured in nine samples. Significant values of 0.4, 0.5, and 0.7 wt% have been found on respectively 2750, 3900, and 4050 ft, i.e. in the Proterozoic. All other samples showed total organic carbon contents of 0.1- 0.2 wt%.

### c) Maceral analysis

Two samples, 3900 and 4050 ft have been selected for maceral analysis. The samples show common partly favourable SOM. In both samples the SOM is totally converted.

### III DISCUSSION AND CONCLUSIONS

Samples 3900 and 4050 ft have significant organic carbon contents of 0.5 wt% respectively 0.7 wt%. The main maceral in both samples is common partly favourable SOM indicating source rocks for gas and possibly some oil. The complete lack of source rock indications and the totally converted SOM show that they are postmature. More detailed information about the thickness of the postmature source rock interval(s) can only be obtained by a series of organic carbon content measurements.

### IV SUMMARY

In the Areyonga Formation (Proterozoic) two selected samples show properties, which point to a postmature source rock for gas and possibly some oil.

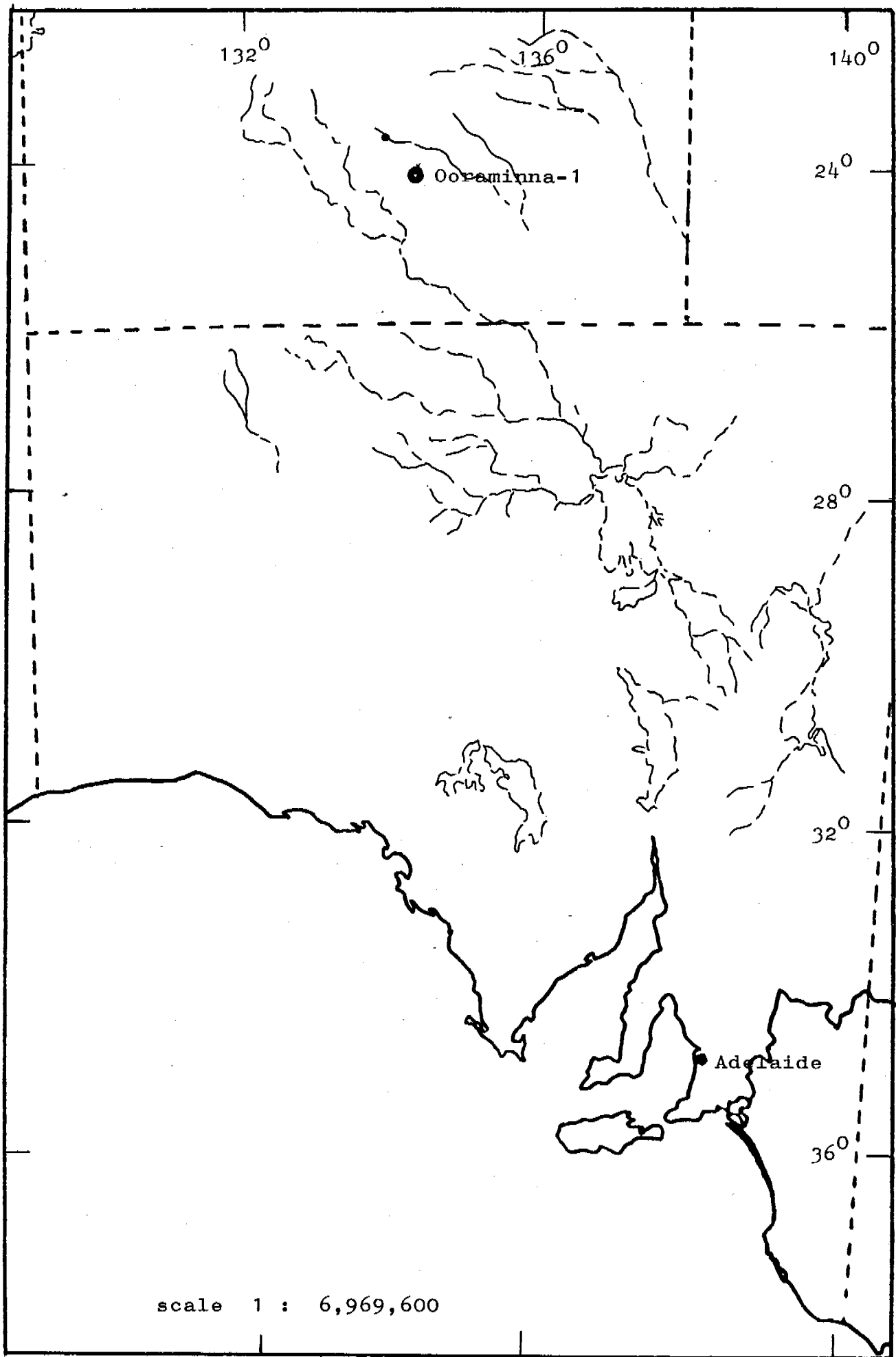


Figure 1. Location well Ooraminna-1



TABLE I (PART 1)

WELL: ~~X~~ OORAMINNA-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION	SOURCE ROCK INDICATION	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT
F		BEFORE EXTR.	AFTER EXTR.		%W
100	C	5	-		-
150	C	5	-		-
200	C	5	-		-
250	C	5	-		-
300	C	10	-		-
350	C	10	-		-
470	C	10	-		.1
500	C	10	-		-
550	C	20	-		-
630	C	50	25		-
650	C	15	-		-
730	C	25	-		-
1170	C	25	-		-
1250	C	25	-		-
1520	C	5	-		-
1550	C	5	-		-
1600	C	5	-		-
1650	C	5	-		-
1700	C	5	-		-
1760	C	5	-		-
1800	C	5	-		-
1850	C	10	-		-
1900	C	20	-		-
1960	C	15	-		-
2000	C	5	-		-
2050	C	5	-		-
2100	C	5	-		-
2150	C	5	-		-
2200	C	5	-		-
2250	C	5	-		-

TABLE I (PART 2)

WELL: OORAMINNA-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION	SOURCE ROCK INDICATION	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT
F		BEFORE EXTR.	AFTER EXTR.		%
2300	C	5	-		-
✓2350	C	5	-		.1
2400	C	5	-		-
2450	C	5	-		-
2500	C	5	-		-
2550	C	5	-		-
✓2600	C	5	-		.2
2650	C	5	-		-
2700	C	5	-		-
✓2750	C	5	-		.4
2800	C	5	-		-
2850	C	5	-		-
2900	C	5	-		-
2950	C	5	-		-
3000	C	5	-		-
✓3050	C	5	-		.1
3100	C	5	-		-
3150	C	5	-		-
3200	C	5	-		-
3250	C	5	-		-
3300	C	5	-		-
✓3350	C	5	-		.1
3400	C	5	-		-
3450	C	5	-		-
3500	C	5	-		-
3550	C	5	-		-
3600	C	5	-		-
3650	C	5	-		-
3700	C	5	-		-
3750	C	5	-		-

TABLE I (PART 3)

WELL: OORAMINNA-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION	SOURCE ROCK INDICATION	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT
F		BEFORE EXTR.	AFTER EXTR.		%
3800	C	5	-		-
3850	C	5	-		-
3900	C	10	-		.5
3900	C	10	-		.5
3950	C	10	-		-
4000	C	5	-		-
4050	C	5	-		.7
4100	C	5	-		-
4150	C	5	-		-
4205	C	5	-		-
4250	C	5	-		-
4300	C	5	-		-
4400	C	5	-		-
4450	C	5	-		-
4500	C	5	-		-
4550	C	5	-		-
4695	C	5	-		-
4740	C	5	-		-
4800	C	5	-		-
4850	C	5	-		-
4900	C	5	-		-
4950	C	5	-		-
5000	C	5	-		-
5050	C	5	-		-
5100	C	5	-		-
5150	C	5	-		-
5200	C	5	-		-
5250	C	5	-		-
5300	C	5	-		-
5350	C	5	-		-

TABLE I (PART 4)

WELL: OORAMINNA-1

DEPTH	TYPE OF SAMPLE	SOURCE ROCK INDICATION		TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT %
		BEFORE EXTR.	AFTER EXTR.		
5400	C	S	-		-
5450	C	S	-		-
5500	C	S	-		-
5550	C	S	-		-
5600	C	S	-		-
* 5650	C	S	-		.1
* 5650	C	S	-		.1
5700	C	S	-		-
5750	C	S	-		-
5800	C	S	-		-
5850	C	S	-		-
5900	C	S	-		-
5950	C	S	-		-

TYPE OF SAMPLE C = CUTTINGS, R = CORE, S = SIDEWALL SAMPLE

CONTAMINATION : W = WALNUT FRAGMENTS OR SOME SIMILAR PRODUCT,  
E = CELLOPHANE SHREDS, F = FIBRES, P = PLASTIC OR PAINT AND  
C = CONTAMINATED BUT KIND NOT SPECIFIED

A DASH (-) INDICATES TEST NOT MADE, ASTERISKS INDICATE THE  
ORGANIC CARBON CONTENT IS THE AVERAGE FOR THE SAMPLES CONCERNED

# MACERAL DESCRIPTION OF 2 SAMPLES FROM WELL OORAMINNA-1

DEPTH IN FT	SAMPLE TYPE
3900.0	CTGS
4050.0	CTGS

3900.0	CTGS
4050.0	CTGS

SAPROPALIC ORG. MATTER	ORGANIC										INORG.							
	VITR.	LIPTINITE					ALGAE	INERT.				UNDEFINED MINERALS	FRAMBOIDAL PYRITE	AGGREGATES OF PYRITE	CRYSTALS OF PYRITE			
		TELOCOLLINITE	TELINITE	DESMOCOLLINITE	SPORINITE	CUTINITE		RESINITE	LIPTODETRINITE	BOTRYOCOCCUS	TASMANITES					OTHER ALGAE	MICROPLANKTON	EXSUDATINITE
+											-				+	*	/	/
+											-				+	*	/	-

**Comment lines:**

3900 ft: SOM totally converted

4050 ft: SOM totally converted

5650 ft: sample partly severely oxidised

L E G E N D	
*	: ABUNDANT
+	: COMMON
/	: FEW
-	: RARE

TABLE II

# GEOCHEMICAL LOG

SCALE 1:5000

WELL

OORAMINNA-1

LOCATION

REGEO IDENTIFIER

AGE	FORMATION	DEPTH IN F	LITHOLOGY	DDM(VR)	SOURCE ROCK INDICATION OF ORIGINAL SAMPLE						TYPE OF SAMPLE	SOURCE ROCK INDICATION OF SAMPLE AFTER EXTRACTION WITH CHLOROFORM						CONTAMINATION	DEPTH IN F	ORG. CARBON (PCT. WT.)	TYPE OF ORGANIC MATTER
					100	200	300	400	500	600		100	200	300	400	500	600				
CAMBRIAN	ARUMBERA	0																			
		500																			
PROTEROZOIC	PERTATATAKA	1000																			
		1500																			
	AREYONGA	2000																			
PROTEROZOIC	BITTER SPRINGS	2500																			
		3000																			
		3500																			
		4000																			
		4500																			
		5000																			
		5500																			
		6000																			

VALUES SMALLER THAN 30 ARE CONSIDERED  
NOT TO BE OF SIGNIFICANCE

TWO SELECTED SAMPLES (3900 AND 4060 FT)  
CAN BE REGARDED AS POST-MATURE SOURCE  
ROCKS FOR GAS AND POSSIBLY SOME OIL.

TD 8095

NUMBER OF SAMPLES ANALYSED 103

NUMBER OF SAMPLES ANALYSED 1

**LEGEND**  
 TYPE OF SAMPLE  
 ○ = CORE  
 ▸ = SIDEWALL SAMPLE  
 CONTAMINATION  
 C = UNSPECIFIED  
 W = WALNUTS  
 E = CELLOPHANE  
 F = FIBRES  
 P = PLASTIC OR PAINT

EXPLORATIVE & PRODUCTION LABORATORY

**GEOCHEMICAL LOG OF  
OORAMINNA-1  
AUSTRALIA**

AUTHOR: KRM DATE: JANUARY 1982  
 REF: 82-007-007 ENCL: 1 DRAWING: 1

PR8107