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SOURCE ANALYSES OF CANNED CUTTINGS
FROM THE NARIMBA-1 WELL, BASS BASIN, AUSTRALIA

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Structure and Evaluation Division

March 1974

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ESSO PRODUCTION RESEARCH COMPANY

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SAMPLE DESCRIPTIONS – 1 SEP 1973

PETROGRAPHY OF TWO ARENACEOUS SEDIMENTS FROM A DRILL CORE
REPORT MP 1727 / 74

CORE ANALYSIS RESULTS – 16 MAY 1975

SOURCE ANALYSES OF CANNED CUTTINGS FROM THE
NARIMBA-I WELL, BASS BASIN, AUSTRALIA

by

R. E. Metter

SUMMARY AND CONCLUSIONS

Canned cuttings from the interval 5200-11,000 ft. were analyzed for hydrocarbon gases, total organic matter, light gasolines (C₄-C₇) and visual kerogen characteristics.

This service work was requested in the December 13, 1973 letter VAR Dec 13 by E. B. Stanford. Charges for the work have been billed to our Job No. 6424 (Esso Australia 5-308-233-013-141).

Results of the analyses are interpreted as follows:

<u>Approximate Interval (feet)</u>	<u>Unit</u>	<u>Maturity</u>	<u>Average Richness</u>	<u>Indigenous Hydrocarbons Expected (if reservoired)</u>
5200-5400	Oligocene	Immature	Poor (except coals)	Lean
5400-5800	Eocene (undiff.)	Immature	Poor (except coals)	Lean
5800-7300	N. asperus	Immature	Poor to Fair	Lean
7300-7700	P. asperopolus	Immature	Fair	Gas
7700-8300	Upper M. div.	Immature	Good	Gas
8300-9200(?)	Middle M. div.	Transitional(?)	Good	Gas
9200-T.D.	Lower M. div.	Transitional to Mature	Rich	Gas; Minor Liquids

The analytical data are summarized graphically in Fig. 1, and they are listed in Tables I-IV.

The depth to "maturity" is questionable. The top of the "mature" zone may be as deep as 10,300 ft.

The entire section appears to be gas prone. The upper part of the N. asperus zone might be an oil source in more mature settings (as suggested by kerogen that is predominantly algal) but it is presently gas prone due to immaturity. The lower N. asperus zone and all of the underlying drilled section is rated as inherently gas prone, even in the "mature" lower M. diversus zone, where some condensate liquids might also be expected.

The lack of any hydrocarbon shows in this well is believed to be a result of problems of trapping, timing of structural growth, migration, or water flushing, rather than to lack of source beds. The lower M. diversus unit, in particular, has generated sufficient gas and gasolines to have produced at least some shows, if trapping conditions were timely and adequate. Apparently hydrocarbon gases have migrated elsewhere or have been lost to the surface.

PROCEDURES

Compositions and concentrations of hydrocarbon gases in the air spaces above the cuttings in the sample cans were determined by gas chromatography. Similar data were obtained on gases released from a standard mixture of cuttings and tap water after two minutes of agitation in a Waring blender. Combined results on the air space gas plus the cuttings gas were calculated for each sample. The data were plotted graphically to show vertical variations in total gas (C₁-C₄) and wet gas (C₂-C₄), and a graphical plot was also made of the percent wet gas in total gas (Figure 1). Detailed results of the analyses are listed in Table 1.

Chips of uniform lithologies were picked by hand from the heterogeneous mixtures of chips in the original samples. These are described in Table II.

Our standard analytical procedures were used for determining the C₄-C₇ content and the total organic contents of 23 selected samples of "picked" chips. These results are given in Table III and they are plotted graphically in Fig. 1. Visual kerogen characteristics of 15 of these samples were also determined (Table II and Fig. 1).

A suite of 54 kerogen slides prepared by Esso Australia were also described (Table IV). These slides were prepared from 51 sidewall core samples and three standard cores. Cores are much more reliable than cuttings for kerogen studies because cuttings include cavings as well as mixtures of chips from various beds in the designated sample intervals.

DISCUSSION

The analyses run on the Narimba-1 samples are the same as those that were used previously on samples from other wells in the Bass Basin. The results may be compared directly with the previous data. Some bases for interpreting the data are given in the Appendix.

The "maturity" ratings are somewhat questionable, and perhaps the section should not be rated as "mature" above about 10,300 ft. A "2+" kerogen rating was first encountered in the sidewall core from 10,294 ft. The "percent C₂-C₄" profile in Fig. 1 shows a significant increase starting at about 8700 ft., and the gasoline yield of the shale sample from 8500 ft. is appreciable. These latter observations suggest a shallower depth to the top of the "mature" zone. Actually, the ratings of "maturity" to which we refer

are based largely on oil-generating capabilities of rocks, and it is not at all certain that the same ratings are applicable to inherently gas-prone sections such as we see in the Bass Basin.

The lower M. diversus section, in particular, looks like a good source section of gas and condensate. We would have expected at least to find some gas "shows" in some of the sands if trapping conditions are adequate. Perhaps timing of trap formation with respect to maximum hydrocarbon generation is a problem. This can be discussed further at the STOILPOR workshop this June.

RELATED GEOCHEMICAL SERVICE REPORTS

- EPR67-ES60 "Canned Cuttings Gases from the Esso Bass-1, Bass-2 and Marlin B-1 Wells, Australia" by R. E. Metter, P. H. Monaghan, H. M. Fry, July 1967.
- EPR67-ES41 "Organic Analysis of Four Core Samples from the Esso Bass-3 Well, Australia" by R. E. Metter, May 1967.
- EPR67-ES69 "Organic Analysis of Six Core Samples from the Bass-2 Well, Australia" by R. E. Metter, July 1967.
- EPR-75ES-70 "Hydrocarbon Source Analyses of 33 Cores from the Pelican-1, Cormorant-1, and Bass-1, 2 and 3 Wells, Australia" by R. E. Metter, November 1970.
- EPR-81ES-70 "Geochemical Analyses of Condensates and an Oil from the Bass Basin" by R. E. Metter, December 1970.
- EPR.20ES.72 "Hydrocarbon Source Evaluation of Canned Cuttings Samples from the Cormorant-1 and Pelican-1 Wells, Bass Basin, Australia," by R. E. Metter, March 1972.
- EPR.3ES.73 "Hydrocarbon Source Characteristics of Canned Cuttings from the Pelican-3 Well, Bass Basin, Australia," by R. E. Metter et al, January 1973.
- EPR.4ES.73 "Source Analyses of Canned Cuttings from the Poonboon-1 and Tarook-1 Wells, Bass Basin, Australia" by R. E. Metter et al, January 1973.
- EPR.11ES.73 "Hydrocarbon Source Evaluation of Canned Cuttings from the Durroon-1 Well, Bass Basin, Australia" by R. E. Metter et al, January 1973.
- EPR.13ES.73 "A Brief Summary of Geochemical Patterns in the Bass Basin, Australia" by R. E. Metter, February 1973.
- EPR.74ES.73 "Hydrocarbon Source Characteristics of Canned Cuttings from the Konkon-1 Well, Bass Basin, Australia" by R. E. Metter et al, September 1973.
- EPR.86ES.73 "Source Evaluation of Canned Cuttings from the Dondu-1 Well, Bass Basin, Australia" by R. E. Metter et al, October 1973.

APPENDIXBASES FOR INTERPRETING DATATotal Organic Matter

The concentration of organic matter in a rock gives a rough indication of the amount of materials that might produce hydrocarbons. However, this measure alone does not indicate whether the organic material is oil prone, gas prone or mixed oil and gas prone. Rocks containing less than about 0.5 percent total organic matter are generally rated as poor sources, but this is modified by lithology. Some carbonate sequences possibly include hydrocarbon sources that contain less than 0.5% total organic matter.

Sections that are notable for their production of dry gas (mainly methane) have commonly been found to be characterized by source rocks containing greater than about 1.1 percent total organic matter. However, a measure of the liquid hydrocarbons in these richer rocks is also necessary to determine whether they should be rated as oil prone or gas prone.

Visual Kerogen

Kerogen data give two types of information. The color alteration (carbonization) is believed to indicate the amount of thermal diagenesis that the organic matter has undergone. The types of materials comprising the kerogen may indicate the source character of the rocks.

Kerogen color alterations are rated on a 1 to 5 index scale, from unaltered to almost completely carbonized, respectively. A rating of 4 suggests that subsurface temperatures have been high enough to destroy most of the producible liquid hydrocarbons. Producible hydrocarbons found in sections in which the kerogen alteration is rated as 4 or greater are likely to be mainly dry gas. Immobile pyrobitumens may also be found in the associated reservoir beds. The rating of 5 is reserved for highly altered strata, where there is petrographic evidence of metamorphism. A 5 rating implies a barren source section. Alteration ratings of 1 to 2 suggest that thermal diagenesis of the kerogen has barely begun, and reservoir hydrocarbons, if present, are likely to be gases, possibly associated with heavy, asphaltic oils. Ratings of 2+ to 3 suggest that maturation of the material has progressed to the point that gas, liquid hydrocarbons, or mixed oil and gas may be produced, depending on the nature of the original source materials. A rating of 2 may be associated with either immature or moderately mature sediments.

Types of kerogen materials that are commonly recognized include amorphous, finely disseminated, algal, herbaceous, woody and coaly. The source significance of these types is not established, but there have been suggestions in several areas, such as the offshore of southern Australia, that gas production is associated with woody and coaly kerogen, whereas rocks containing amorphous, finely disseminated and algal materials are sources of hydrocarbon liquids. A type of material referred to as "nonfilamentous algae" has more recently been distinguished, and tentatively this material is regarded as more gas prone. These observations are still speculative.

Cuttings Gas

Cuttings gas data give indications of the vertical variability in the source character of a section of interest. The ratio of wet gas (C_2-C_4) to total gas (C_1-C_4) may distinguish methane-prone from oil- and "wet" gas-prone sections. The critical value of this ratio varies from basin to basin. In Western Canada C_2-C_4 concentrations of about 45 percent or greater in the total gas are considered to be diagnostic of sections that are likely to produce oil or perhaps gas with appreciable amounts of hydrocarbon liquids. In the Permian section of West Texas the significant ratio appears to be closer to 20 percent or greater of wet gas in total gas.

The significant values for total amounts of hydrocarbon gas yielded by the cuttings also appear to vary from basin to basin, and possibly must be established separately for each area of interest. Zones with the greatest yields of gas are considered to be of most interest as sources. Samples from coal-bearing zones commonly give up large concentrations of gas, but we are not certain that coals produce commercial amounts of oil.

Oil in the drilling mud makes it nearly impossible to establish practical quantitative criteria that can be used in comparing different wells. The oil will tend to reduce the amount of cuttings gas released during agitation in the blender, and it will affect the composition of the hydrocarbon gas that is obtained for analysis. However, even with oil in the mud, significant vertical patterns in hydrocarbon gas concentrations and compositions can be established in each well. The patterns from different wells can be compared to establish regional trends or areal configurations of different organic facies within a section of interest.

Light Gasoline (C_4-C_7) Hydrocarbons

Light gasolines apparently do not appear in source beds in concentrations above one or two parts per million until a fair degree of maturation occurs. Therefore, gasoline concentrations give one criterion of the degree of thermal maturation that the organic matter has attained.

In addition, ratios of specific gasoline compounds may indicate the possible source character of the rocks. In particular, the ratio of cyclohexane to methylcyclopentane (CH/MCP) has been found to be useful in the U. S. Gulf Coast and the Alaskan areas for distinguishing "non oily" from "oily" facies. To date commercial oil has not been found associated with strata having a CH/MCP ratio of less than 0.25. However, dry gas has been found in strata characterized by ratio values greater than 0.25 as well as in sections having ratio values less than 0.25.

The CH/MCP ratio may also be useful in helping distinguish different organic facies that may be present within a section, even though all ratio values may be greater than 0.25. Zones with similar ratio values can sometimes be distinguished and such zones may differ from one another in their source ratings. Definition of such zones may be quite useful in correlating reservoired oils with specific source intervals.

Other ratios of gasoline compounds have proven useful in crude oil correlations and correlations of oils with source rocks. Some of these are included in Table III of this report.

Heavy (C₁₅+) Hydrocarbons

C₁₅+ data are combined with total organic content in interpreting source ratings of rocks. Yields of less than about 40 to 50 ppm total hydrocarbons are regarded as indicative of poor oil source rocks. However, even with low heavy hydrocarbon yields, if the total organic content is greater than about 1.1 percent the rocks are rated as gas sources.

If the C₁₅+ hydrocarbon yield is greater than about 50 ppm, then the ratio of hydrocarbons to total organic content is interpreted to distinguish oil from gas sources. Ratios of about 0.5 percent or higher suggest oil sources. Ratios much below 0.5 percent suggest gas sources. Ratios close to 0.5 percent suggest combined oil and gas sources.

TABLE IA

C₁-C₄ HYDROCARBON ANALYSES - AIR SPACE AT TOP OF CANS

SAMPLE NUMBER	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)							GAS COMPOSITION (PERCENT)							
			METHANE	ETHANE	PROPANE	ISO-BUTANE	NORMAL BUTANE	WET	TOTAL	TOTAL GAS					WET GAS		
			(C ₁)	(C ₂)	(C ₃)	(iC ₄)	(nC ₄)	(C ₂ -C ₄)	(C ₁ -C ₄)	C ₂ -C ₄	C ₁	C ₂	C ₃	iC ₄	nC ₄	C ₂	C ₃
61791A	7	5200	123.90	26.35	46.79	35.51	16.58	125.23	249.13	50.2669	49.11.19.14.	7.	21.38.28.13.				
61791B	7	5300	231.83	23.35	42.52	31.36	10.92	108.15	339.98	31.8106	68.7.13.9.3.	22.39.29.10.					
61791C	7	5400	1368.51	68.41	66.03	42.54	11.01	187.99	1556.50	12.0777	88.4.4.3.1.	36.35.23.6.					
61791D	7	5500	1652.49	78.00	69.06	44.52	10.40	201.98	1854.47	10.8915	89.4.4.2.1.	39.34.22.5.					
61791E	7	5600	1948.71	162.43	137.05	79.45	14.39	393.32	2342.03	16.7939	83.7.6.3.1.	41.35.20.4.					
61791F	7	5700	280.32	46.08	47.43	32.07	5.46	131.04	411.36	31.8552	68.11.12.8.1.	35.37.24.4.					
61791G	7	5800	933.67	138.88	111.87	70.20	12.86	333.81	1267.48	26.3365	73.11.9.6.1.	41.34.21.4.					
61791H	7	5900	1276.44	186.64	155.93	108.47	20.23	471.27	1747.71	26.9650	73.11.9.6.1.	40.33.23.4.					
61791I	7	6000	379.92	80.96	92.02	67.04	11.99	252.01	631.93	39.8794	59.13.15.11.2.	32.36.27.5.					
61791J	7	6100	1217.03	144.85	125.63	90.75	16.46	377.69	1594.72	23.6838	76.9.8.6.1.	39.33.24.4.					
61791K	7	6200	1185.34	126.52	101.59	82.66	15.25	326.02	1511.36	21.5713	79.8.7.5.1.	39.31.25.5.					
61791L	7	6300	874.60	71.17	42.66	46.99	6.35	167.17	1041.77	16.0467	83.7.4.5.1.	42.26.28.4.					
61791M	7	6400	431.26	64.59	34.11	27.63	3.63	129.96	561.22	23.1566	76.12.6.5.1.	50.26.21.3.					
61791N	7	6500	399.19	70.72	45.28	29.03	4.45	149.48	548.67	27.2440	73.13.8.5.1.	48.30.19.3.					
61791O	7	6600	141.05	52.66	51.48	42.38	7.92	154.44	295.49	52.2657	48.18.17.14.3.	35.33.27.5.					
61791P	7	6700	398.05	215.51	234.61	94.48	36.04	580.64	978.69	59.3283	40.22.24.10.4.	37.41.16.6.					
61791Q	7	6800	2157.93	362.26	119.98	66.85	7.85	556.94	2714.87	20.5144	81.13.4.2.0.	65.22.12.1.					
61791R	7	6900	834.90	148.76	57.29	46.87	4.78	257.70	1092.60	23.5859	77.14.5.4.0.	58.22.18.2.					
61791S	7	7000	562.71	231.40	154.90	119.87	15.32	521.49	1084.20	48.0990	53.21.14.11.1.	44.30.23.3.					
61791T	7	7100	2655.39	560.87	160.18	101.90	11.80	834.75	3490.14	23.9174	76.16.5.3.0.	68.19.12.1.					
61792A	7	7200	628.49	153.36	57.43	41.66	4.80	257.25	885.74	29.0435	71.17.6.5.1.	60.22.16.2.					
61792B	7	7300	5.81	0.63	0.18	0.14	0.04	0.99	6.80	14.5588	85.9.3.2.1.	64.18.14.4.					
61792C	7	7400	1079.75	320.47	73.60	42.21	4.73	441.01	1520.76	28.9993	71.21.5.3.0.	72.17.10.1.					
61792D	7	7500	1451.07	73.33	88.40	50.05	5.73	217.51	1668.58	13.0356	88.4.5.3.0.	34.40.23.3.					
61792E	7	7600	6300.45	447.19	170.67	115.34	15.15	748.34	7048.79	10.6166	90.6.2.2.0.	60.23.15.2.					
61792F	7	7700	12890.41	913.76	334.08	219.76	26.04	1493.63	14384.04	10.3840	90.6.2.2.0.	61.22.15.2.					
61792G	7	7800	8847.01	758.98	405.44	251.80	36.11	1452.32	10299.33	14.1011	87.7.4.2.0.	53.28.17.2.					
61792H	7	7900	32210.32	1758.19	660.52	372.18	52.99	2843.88	35054.19	8.1128	92.5.2.1.0.	62.23.13.2.					
61792I	7	8000	9234.73	790.09	351.45	175.32	27.83	1344.68	10579.41	12.7104	88.7.3.2.0.	59.26.13.2.					
61792J	7	8100	1258.96	81.27	26.57	11.81	1.81	121.46	1380.42	8.7987	91.6.2.1.0.	67.22.10.1.					
61792K	7	8200	20657.42	915.69	422.92	199.23	37.22	1575.05	22232.47	7.0845	93.4.2.1.0.	58.27.13.2.					
61792L	7	8300	4215.57	473.60	226.74	107.27	21.60	829.20	5044.77	16.4369	85.9.4.2.0.	57.27.13.3.					
61792M	7	8400	3114.96	534.11	346.74	144.17	39.98	1064.99	4179.95	25.4786	75.13.8.3.1.	49.33.14.4.					
61792N	7	8500	4969.31	775.64	507.04	207.20	56.85	1550.72	6520.03	23.7840	76.12.8.3.1.	50.33.13.4.					
61792O	7	8600	2496.92	235.61	174.19	82.11	20.63	512.54	3009.46	17.0309	82.8.6.3.1.	46.34.16.4.					
61792P	7	8700	8008.57	945.67	725.30	330.24	89.71	2094.91	10103.48	20.7345	80.9.7.3.1.	45.35.16.4.					
61792Q	7	8800	4608.98	833.49	813.36	408.62	161.14	2216.60	6825.58	32.4749	68.12.12.6.2.	38.37.18.7.					
61792R	7	8900	5428.67	2056.65	1903.65	585.72	234.30	4780.31	10208.98	46.8246	53.20.19.6.2.	43.40.12.5.					
61792S	7	9000	118.30	246.94	622.56	284.93	207.80	1362.23	1480.53	92.0096	8.17.42.19.14.	18.46.21.15.					
61792T	7	9100	2050.71	3763.09	5271.56	1192.80	884.22	11111.66	13162.37	84.4199	16.29.39.9.7.	34.47.11.8.					
61793A	7	9200	1271.38	696.22	1253.19	472.50	232.81	2654.72	3926.10	67.6172	32.18.32.12.6.	26.47.18.9.					
61793B	7	9300	9678.87	3401.40	2458.47	474.53	267.36	6641.75	16320.62	40.6955	59.21.15.3.2.	51.38.7.4.					
61793C	7	9400	46514.06	7626.85	4876.16	1156.46	491.28	14150.74	60664.80	23.3261	76.13.8.2.1.	55.34.8.3.					
61793D	7	9500	29086.79	6286.22	4963.09	1528.98	570.60	13348.88	42435.67	31.4567	68.15.12.4.1.	48.37.11.4.					
61793E	7	9600	46864.36	7906.91	6729.38	1446.63	834.15	16917.06	63781.42	26.5235	74.12.11.2.1.	46.40.9.5.					
61793F	7	9700	30274.57	4085.76	3338.49	752.14	454.25	8630.63	38905.20	22.1837	77.11.9.2.1.	47.39.9.5.					
61793G	7	9800	6125.36	1937.30	2146.09	558.60	372.37	5014.35	11139.71	45.0133	56.17.19.5.3.	39.43.11.7.					
61793H	7	9900	46214.90	5708.11	3459.69	588.00	338.05	10093.84	56308.74	17.9259	82.10.6.1.1.	57.34.6.3.					
61793I	7	10000	5834.61	900.28	709.68	190.64	128.93	1929.52	7764.13	24.8517	75.12.9.2.2.	46.37.10.7.					
61793J	7	10100	5880.84	2625.37	3242.52	818.66	738.53	7429.07	13309.91	55.8161	44.20.24.6.6.	35.44.11.10.					
61793K	7	10200	33243.32	6365.64	2702.95	330.27	261.82	9660.67	42903.99	22.5170	77.15.6.1.1.	66.28.3.3.					
61793L	7	10300	15327.66	3695.09	1475.40	272.98	162.64	5606.10	20933.76	26.7802	73.18.7.1.1.	66.26.5.3.					
61793M	7	10400	6634.47	1583.57	632.44	117.72	72.74	2406.46	9040.93	26.6174	73.18.7.1.1.	66.26.5.3.					
61793N	7	10500	6900.67	1546.71	1097.02	224.95	180.95	3049.63	9950.29	30.6486	69.16.11.2.2.	51.36.7.6.					
61793O	7	10600	3900.10	742.03	249.60	29.73	21.34	1042.69	4942.79	21.0952	79.15.5.1.0.	71.24.3.2.					
61793P	7	10700	8715.40	1170.62	430.56	59.33	38.19	1698.69	10414.09	16.3115	84.11.4.1.0.	70.25.3.2.					
61793Q	7	10800	11521.59	1462.99	547.31	81.37	49.50	2141.16	13662.75	15.6715	84.11.4.1.0.	68.26.4.2.					
61793R	7	10900	17604.22	2900.48	922.04	153.71	97.41	4073.63	21677.85	18.7917	82.13.4.1.0.	71.23.4.2.					
61793S	7	11000	12392.06	1820.69	495.66	81.27	52.90	2450.51	14842.57	16.5100	84.12.3.1.0.	75.20.3.2.					

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TABLE IB

C₁-C₄ HYDROCARBON ANALYSES - CUTTINGS ONLY

SAMPLE NUMBER	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)						GAS COMPOSITION (PERCENT)									
			METHANE	ETHANE	PROPANE	ISO-BUTANE	NORMAL BUTANE	WET	TOTAL	TOTAL GAS					WET GAS			
			(C ₁)	(C ₂)	(C ₃)	(iC ₄)	(nC ₄)	(C ₂ -C ₄)	(C ₁ -C ₄)	C ₂ -C ₄	C ₁	C ₂	C ₃	iC ₄	nC ₄	C ₂	C ₃	iC ₄
61791A	7	5200	766.66	63.90	74.99	59.05	49.56	247.50	1013.56	24.4188	76.6	7.6	5.5	26.30	24.20			
61791B	7	5300	622.84	25.50	66.45	82.36	49.56	223.87	846.71	26.4399	73.3	8.10	6.6	11.30	37.22			
61791C	7	5400	1300.86	111.00	176.98	158.51	71.68	518.17	1819.03	28.4860	71.6	10.9	4.4	21.34	31.14			
61791D	7	5500	1024.92	51.00	124.51	126.50	50.98	352.99	1377.91	25.6178	74.4	9.9	4.4	14.35	37.14			
61791E	7	5600	1095.87	237.00	602.37	425.80	138.06	1403.23	2499.10	56.1494	44.9	24.17	6.6	17.43	30.10			
61791F	7	5700	998.64	104.40	405.51	363.64	122.13	995.68	1994.32	49.9258	51.5	20.18	6.6	10.41	37.12			
61791G	7	5800	1603.08	777.60	2175.98	1796.42	548.70	5298.69	6901.77	76.7729	23.11	32.26	8.8	15.41	34.10			
61791H	7	5900	717.44	277.80	745.20	771.55	269.92	2064.48	2781.92	74.2106	26.10	27.27	10.10	13.36	38.13			
61791I	7	6000	1161.57	114.00	294.97	234.27	89.16	732.40	1893.97	38.6701	61.6	16.12	5.5	16.40	32.12			
61791J	7	6100	1989.39	318.60	618.52	443.67	163.72	1544.51	3533.90	43.7055	55.9	18.13	5.5	21.39	29.11			
61791K	7	6200	1511.10	211.20	492.45	460.61	158.24	1322.50	2933.60	46.6721	54.7	17.16	6.6	16.37	35.12			
61791L	7	6300	1779.15	324.00	394.33	368.61	205.32	1292.26	3071.41	42.0738	57.11	13.12	7.7	25.30	29.16			
61791M	7	6400	1679.29	548.40	737.75	609.17	151.78	2047.10	3726.39	54.9352	45.15	20.16	4.4	27.36	30.7			
61791N	7	6500	1235.16	187.80	270.13	198.13	55.31	711.37	1946.53	36.5455	63.10	14.10	3.3	26.38	28.8			
61791O	7	6600	1314.00	142.80	378.81	304.97	119.37	944.95	2258.95	41.8314	58.6	17.14	5.5	15.40	32.13			
61791P	7	6700	988.13	283.20	191.58	306.14	241.60	1022.52	2010.65	50.8552	49.14	10.15	12.12	28.19	29.24			
61791Q	7	6800	3090.53	1248.00	725.09	299.14	71.02	2342.24	5432.77	43.1132	57.23	13.6	1.1	53.31	19.3			
61791R	7	6900	2102.40	892.80	645.84	459.98	111.51	2110.13	4212.53	50.0917	50.21	15.11	3.3	42.31	22.5			
61791S	7	7000	848.64	630.00	431.59	529.91	134.96	1726.46	2575.30	67.0392	33.24	17.21	5.5	36.25	31.8			
61791T	7	7100	5087.81	1948.80	1117.80	574.98	121.24	3762.81	8850.62	42.5146	58.22	13.6	1.1	52.30	15.3			
61792A	7	7200	1327.14	560.40	540.27	363.64	86.29	1550.60	2877.74	53.8825	46.15	19.13	3.3	36.35	23.6			
61792B	7	7300	15263.41	3792.00	1465.56	815.85	155.32	6228.72	21492.13	28.9814	70.18	7.4	1.1	61.24	13.2			
61792C	7	7400	7621.20	3086.40	1368.68	665.11	168.15	5288.34	12909.54	40.9646	59.24	11.5	1.1	58.26	13.3			
61792D	7	7500	2407.25	888.00	565.11	330.22	74.56	1857.89	4265.14	43.5598	56.21	13.8	2.2	48.30	18.4			
61792E	7	7600	4152.24	818.40	529.09	327.89	100.00	1775.38	5927.61	29.9509	69.14	9.6	2.2	46.30	18.6			
61792F	7	7700	7284.81	2112.00	1510.27	716.39	215.94	4554.59	11839.40	38.4698	61.18	13.6	2.2	46.33	16.5			
61792G	7	7800	2128.68	1152.00	1028.37	651.13	201.34	3032.84	5161.52	58.7586	41.22	20.13	4.4	38.34	21.7			
61792H	7	7900	15053.17	4224.00	2657.88	823.62	303.55	8009.04	23062.21	34.7280	65.18	12.4	1.1	53.33	10.4			
61792I	7	8000	7505.56	2558.40	1957.39	829.83	285.85	5631.46	13137.02	42.8671	58.19	15.6	2.2	45.35	15.5			
61792J	7	8100	11794.45	3273.60	2302.67	957.26	331.87	6865.39	18659.84	36.7923	63.18	12.5	2.2	47.34	14.5			
61792K	7	8200	5760.57	2116.80	1763.64	741.26	327.89	4949.58	10710.14	46.2139	54.20	16.7	3.3	42.36	15.7			
61792L	7	8300	1356.05	150.00	66.76	25.17	7.85	249.78	1605.83	15.5545	85.9	4.2	0.0	60.27	10.3			
61792M	7	8400	1926.32	895.20	1237.03	470.08	278.77	2881.08	4807.40	59.9301	39.19	26.10	6.6	31.43	16.10			
61792N	7	8500	2531.85	1183.20	1373.65	470.96	281.43	3309.14	5810.99	56.9462	43.20	24.8	5.5	36.41	14.9			
61792O	7	8600	5051.01	1846.00	2756.98	1181.04	665.52	6491.54	11542.54	56.2401	44.16	24.10	6.6	28.44	18.10			
61792P	7	8700	4940.64	1536.00	2493.94	1210.56	654.01	5894.50	10835.14	54.4017	46.14	23.11	6.6	26.42	21.11			
61792Q	7	8800	2312.64	1221.60	2419.42	1146.85	649.59	5437.45	7750.09	70.1598	30.16	31.15	9.9	22.45	21.12			
61792R	7	8900	1103.76	1723.20	3090.10	686.87	685.87	6186.03	7289.79	84.6588	15.24	43.9	1.2	28.50	11.11			
61792S	7	9000	808.11	285.00	1153.82	643.36	659.32	2741.50	3549.61	77.2338	23.8	32.18	19.19	10.43	23.24			
61792T	7	9100	1034.12	957.60	2399.54	483.29	800.92	4641.34	5675.46	81.7791	18.17	42.9	14.14	21.52	10.17			
61793A	7	9200	733.21	634.80	2118.85	533.80	638.97	3926.42	4655.63	84.2646	16.14	45.11	14.14	16.54	14.16			
61793B	7	9300	2312.64	2217.60	3775.68	1062.93	1062.00	8118.21	10430.85	77.8288	22.21	37.10	10.10	27.47	13.13			
61793C	7	9400	13497.39	8256.00	7750.08	1482.51	1281.48	18770.06	32267.45	58.1703	41.26	24.5	4.4	44.41	8.7			
61793D	7	9500	7305.84	5731.19	8048.16	2160.06	1791.24	17730.64	25036.48	70.8192	29.23	32.9	7.7	22.46	12.10			
61793E	7	9600	10391.75	7296.00	10313.56	2234.65	2566.50	22410.71	32712.46	68.5082	31.22	32.7	8.8	33.46	10.11			
61793F	7	9700	17197.61	10444.79	17129.65	4270.39	5295.84	37140.66	54338.27	68.3508	32.19	31.8	10.10	28.47	11.14			
61793G	7	9800	5003.71	4606.00	8147.52	2312.35	2619.60	17687.46	22691.17	77.9487	22.20	36.10	12.12	26.46	12.15			
61793H	7	9900	21738.79	11212.79	11048.82	1460.76	1865.58	25587.94	47326.73	54.0666	46.24	23.3	4.4	44.43	6.7			
61793I	7	10000	6654.09	3000.00	3924.72	504.43	1184.13	9013.28	15667.37	57.5290	42.19	25.6	8.8	33.44	10.13			
61793J	7	10100	830.45	817.20	1778.54	477.08	835.44	3908.26	4738.71	82.4752	18.17	37.10	18.18	21.46	12.21			
61793K	7	10200	15431.60	10175.99	6597.50	800.31	1203.60	18777.39	34208.99	54.8902	45.30	19.2	4.4	55.35	4.6			
61793L	7	10300	12320.04	8256.00	5206.46	904.43	1258.47	15625.36	27945.39	55.9139	43.30	19.3	5.5	53.33	6.8			
61793M	7	10400	7053.54	4598.80	3984.33	632.48	761.10	9966.70	17020.24	58.5579	42.27	23.4	4.4	46.40	6.8			
61793N	7	10500	17491.94	10406.38	12896.91	3045.84	4127.64	30476.76	47968.70	63.5347	36.22	27.6	9.9	34.42	10.14			
61793O	7	10600	32713.31	18735.18	10512.27	1445.22	2088.60	32785.27	65498.57	50.0549	50.29	16.2	3.3	58.32	4.6			
61793P	7	10700	63408.34	37631.98	19037.36	2007.77	2640.84	61317.85	124726.19	49.1620	51.30	15.2	2.2	62.31	3.4			
61793Q	7	10800	54662.34	28531.18	13671.92	1491.84	2127.54	45822.35	100484.69	45.6013	55.28	14.1	2.2	62.30	3.5			
61793R	7	10900	44066.27	21849.58	9935.99	1118.88	1557.60	34461.92	78528.19	43.8848	56.28	13.1	2.2	63.29	3.5			
61793S	7	11000	40912.67	19276.77	8346.24	901.32	1302.72	29826.96	70739.63	42.1644	58.27	12.1	2.2	65.28	3.4			

345012

TABLE IC

C₁-C₄ HYDROCARBON ANALYSES - CUTTINGS AND AIR SPACE

SAMPLE NUMBER	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)						GAS COMPOSITION (PERCENT)										
			METHANE	ETHANE	PROPANE	ISO-BUTANE	NORMAL BUTANE	WET	TOTAL	TOTAL GAS					WET GAS				
			(C ₁)	(C ₂)	(C ₃)	(iC ₄)	(nC ₄)	(C ₂ -C ₄)	(C ₁ -C ₄)	C ₂ -C ₄	C ₁	C ₂	C ₃	iC ₄	nC ₄	C ₂	C ₃	iC ₄	nC ₄
61791A	7	5200	889.96	90.25	121.78	94.56	66.14	372.73	1262.69	29.5187	71.	7.	10.	7.	5.	24.	33.	25.	18.
61791B	7	5300	854.67	48.85	108.97	113.72	60.48	332.02	1186.69	27.9786	72.	4.	9.	10.	5.	15.	33.	34.	18.
61791C	7	5400	2669.37	175.41	243.01	201.05	82.69	706.16	3375.53	20.9199	80.	5.	7.	6.	2.	25.	35.	28.	12.
61791D	7	5500	2677.41	125.00	193.57	171.02	61.38	554.97	3232.38	17.1691	83.	4.	6.	5.	2.	23.	35.	31.	11.
61791E	7	5600	3044.58	395.43	739.42	505.25	152.45	1796.55	4841.13	37.1101	64.	8.	15.	10.	3.	22.	42.	28.	8.
61791F	7	5700	1278.96	150.48	452.94	395.71	127.59	1126.72	2405.68	46.8358	54.	6.	19.	16.	5.	13.	41.	35.	11.
61791G	7	5800	2536.75	916.48	2287.85	1866.62	561.56	5632.50	8169.25	68.9476	31.	11.	28.	23.	7.	16.	41.	33.	10.
61791H	7	5900	1994.88	464.44	901.13	880.03	290.15	2535.75	4529.63	55.9814	44.	10.	20.	19.	6.	18.	36.	35.	11.
61791I	7	6000	1541.49	154.96	386.99	301.31	101.15	984.41	2525.90	38.9726	61.	8.	15.	12.	4.	20.	39.	31.	10.
61791J	7	6100	3206.42	463.45	744.15	534.42	180.18	1922.20	5128.62	37.4799	62.	9.	15.	10.	4.	24.	39.	28.	9.
61791K	7	6200	2696.44	337.72	594.04	543.27	173.49	1648.52	4344.96	37.9410	61.	8.	14.	13.	4.	20.	36.	33.	11.
61791L	7	6300	2653.75	395.17	436.99	415.60	211.67	1459.43	4113.18	35.4818	64.	10.	11.	10.	5.	27.	30.	28.	15.
61791M	7	6400	2110.55	612.99	771.86	636.80	155.41	2177.06	4287.61	50.7756	49.	14.	18.	15.	4.	28.	36.	29.	7.
61791N	7	6500	1634.35	258.52	315.41	227.16	59.76	860.85	2495.20	34.5002	66.	10.	13.	9.	2.	30.	37.	26.	7.
61791O	7	6600	1455.05	195.46	430.29	347.35	126.29	1099.39	2554.44	43.0384	56.	8.	17.	14.	5.	18.	39.	32.	11.
61791P	7	6700	1387.18	498.71	426.19	400.62	277.64	1603.16	2989.34	53.6292	46.	17.	14.	13.	9.	31.	27.	25.	17.
61791Q	7	6800	5248.46	1610.26	844.07	365.99	78.87	2899.18	8147.64	35.5831	65.	20.	10.	4.	1.	55.	29.	13.	3.
61791R	7	6900	2937.30	1041.56	703.13	506.85	116.29	2367.83	5305.13	44.6328	55.	20.	13.	10.	2.	44.	30.	21.	5.
61791S	7	7000	1410.55	861.40	586.49	649.78	150.28	2247.95	3659.50	61.4278	39.	24.	16.	18.	4.	38.	26.	29.	7.
61791T	7	7100	7743.20	2505.67	1277.98	676.88	133.04	4597.55	12340.75	37.2551	64.	20.	10.	5.	1.	54.	28.	15.	3.
61792A	7	7200	1955.63	713.76	597.70	405.30	91.09	1807.85	3763.48	48.0366	52.	19.	16.	11.	2.	40.	33.	22.	5.
61792B	7	7300	15269.21	3792.63	1465.74	815.99	155.36	6229.71	21498.93	28.9768	70.	18.	7.	4.	1.	61.	24.	13.	2.
61792C	7	7400	8700.95	3406.87	1442.28	707.32	172.88	5729.34	14430.29	39.7036	60.	24.	10.	5.	1.	60.	25.	12.	3.
61792D	7	7500	3858.32	961.33	653.51	380.27	80.29	2075.40	5933.71	34.9763	66.	16.	11.	6.	1.	47.	31.	18.	4.
61792E	7	7600	10452.69	1265.59	699.76	443.23	115.15	2523.72	12976.41	19.4485	81.	10.	5.	3.	1.	49.	28.	18.	5.
61792F	7	7700	20175.21	3025.76	1844.35	936.15	241.98	6048.23	26223.44	23.0642	76.	12.	7.	4.	1.	51.	30.	15.	4.
61792G	7	7800	10575.69	1910.98	1433.81	902.93	237.45	4485.15	15460.84	29.0097	71.	12.	9.	6.	2.	43.	32.	20.	5.
61792H	7	7900	47263.46	5982.19	3318.40	1195.80	356.54	10852.92	58116.40	18.6744	81.	10.	6.	2.	1.	55.	31.	11.	3.
61792I	7	8000	16740.29	3348.49	2308.84	1005.15	313.68	6976.14	23716.43	29.4148	71.	14.	10.	4.	1.	49.	33.	14.	4.
61792J	7	8100	13053.41	3354.87	2329.24	569.07	333.68	6986.85	20040.26	34.8640	64.	17.	12.	5.	2.	48.	33.	14.	5.
61792K	7	8200	26417.98	3032.49	2186.56	940.49	365.11	6524.63	32942.61	19.8060	80.	9.	7.	3.	1.	46.	34.	14.	6.
61792L	7	8300	5571.61	623.60	293.50	132.44	29.45	1078.98	6650.60	16.2238	85.	9.	4.	2.	0.	58.	27.	12.	3.
61792M	7	8400	5041.28	1425.31	1583.77	614.25	318.75	3946.07	8987.35	43.9069	55.	16.	18.	7.	4.	36.	40.	16.	8.
61792N	7	8500	7471.16	1962.84	1880.69	678.06	338.28	4859.86	12331.02	39.4117	61.	16.	15.	5.	3.	40.	39.	14.	7.
61792O	7	8600	7547.93	2083.61	2971.17	1263.15	686.15	7004.07	14552.00	48.1313	52.	14.	20.	9.	5.	30.	42.	18.	10.
61792P	7	8700	12949.20	2485.67	3219.24	1540.80	743.72	7989.41	20938.62	38.1563	62.	12.	15.	7.	4.	31.	41.	19.	9.
61792Q	7	8800	6921.61	2055.09	3232.78	1555.47	810.73	7654.05	14575.67	52.5125	47.	14.	22.	11.	6.	27.	42.	20.	11.
61792R	7	8900	6532.43	3775.85	4993.75	1272.59	920.17	10966.34	17498.77	62.6692	37.	22.	29.	7.	5.	34.	46.	12.	8.
61792S	7	9000	927.41	531.94	1776.38	928.29	867.12	4103.73	5030.14	81.5828	18.	11.	35.	18.	17.	13.	43.	23.	21.
61792T	7	9100	3084.83	4720.69	7671.10	1676.09	1685.14	15753.00	18837.84	83.6243	16.	25.	41.	9.	9.	30.	48.	11.	11.
61793A	7	9200	2004.59	1331.02	3372.04	1006.30	871.78	6581.14	8585.73	76.6521	23.	16.	39.	12.	10.	20.	52.	15.	13.
61793B	7	9300	11991.50	5619.00	6274.15	1537.46	1329.36	14759.96	26751.47	55.1744	45.	21.	23.	6.	5.	38.	43.	10.	9.
61793C	7	9400	60011.45	15882.85	12626.23	2638.97	1772.76	32920.80	92932.19	35.4245	64.	17.	14.	3.	2.	49.	38.	8.	5.
61793D	7	9500	36392.63	12017.41	13011.25	3689.04	2361.84	31079.52	13472.13	46.0627	54.	18.	19.	5.	4.	39.	41.	12.	8.
61793E	7	9600	57166.11	15202.91	17042.94	3681.28	3400.65	39327.77	96493.88	40.7567	58.	16.	18.	4.	4.	39.	43.	9.	9.
61793F	7	9700	47472.18	14530.55	20468.14	5022.52	5750.09	45771.30	93243.44	49.0880	51.	16.	22.	5.	6.	32.	44.	11.	13.
61793G	7	9800	11130.07	6545.30	10293.61	2870.95	2991.97	22701.82	33830.88	67.1039	33.	19.	30.	8.	9.	29.	45.	13.	13.
61793H	7	9900	67953.69	16920.90	14508.50	2048.76	2203.63	35681.79	103635.44	34.4301	66.	16.	14.	2.	2.	47.	41.	6.	6.
61793I	7	10000	12488.70	3900.28	4634.40	1095.07	1313.06	10942.80	23431.50	46.7012	52.	17.	20.	5.	6.	36.	42.	10.	12.
61793J	7	10100	6711.29	3446.57	5021.06	1295.74	1573.97	11337.32	18048.62	62.8155	37.	19.	28.	7.	9.	30.	45.	11.	14.
61793K	7	10200	48674.91	16541.63	9300.45	1130.58	1465.42	28438.07	77112.94	36.8784	64.	21.	12.	1.	2.	58.	33.	4.	5.
61793L	7	10300	27647.70	11951.09	6681.86	1177.41	1421.11	21231.46	48879.15	43.4366	57.	24.	14.	2.	3.	56.	31.	6.	7.
61793M	7	10400	13688.01	6172.36	4616.77	750.20	833.84	12373.16	26061.17	47.4774	52.	24.	18.	3.	3.	50.	37.	6.	7.
61793N	7	10500	24392.61	11953.09	13993.93	3270.79	4308.59	33526.39	57918.99	57.8849	42.	21.	24.	6.	7.	36.	41.	10.	13.
61793O	7	10600	36613.41	15481.21	10761.87	1474.95	2109.94	33827.96	70441.31	48.0229	52.	28.	15.	2.	3.	58.	32.	4.	6.
61793P	7	10700	72123.69	38802.59	19467.92	2067.10	2679.03	63016.54	135140.25	46.6305	53.	29.	14.	2.	2.	62.	31.	3.	4.
61793Q	7	10800	66183.88	29994.17	14219.23	1573.21	2177.04	47963.51	114147.44	42.0189	59.	26.	12.	1.	2.	62.	30.	3.	5.
61793R	7	10900	61670.49	24750.05	10858.03	1272.59	1655.01	38535.55	102006.00	38.4563	61.	25.	11.	1.	2.	65.	28.	3.	4.
61793S	7	11000	53304.73	21097.46	8841.89	982.59	1355.62	32277.47	85582.19	37.7142	62.	25.	10.	1.	2.	66.	27.	3.	4.

345013

TABLE II Descriptions of "Picked" Cuttings Samples and of Visual Kerogen, Narimba-1
(Lithology by S. Thompson; Kerogen by J. L. Morgan)

Depth (feet)	EPR No.	Unit (L. E. Stover)	Gross Lithology	GSA Color Code (Drv)	Kerogen Alteration	Types of Kerogen*			Remarks
						Predominant	Secondary	Other	
5200	61791-A	Olig.(?)	Mudstone and shale, lt. olive gray, trace pyrite, disaggregates in acid; sl. calcareous	5Y 6/1	1+	H	W	A,C	Abundant pyrite
5700	-F	Eocene (undiff.)	Shale, med. olive gray, sl. silty, disaggregates in acid	5Y 5/1	1+	W	C	A,H,M	
5900	-H	N. asp.	Lignitic claystone, olive black to brownish black	5Y 2/1-5YR2/1	2	A1?	A	W	
6200	-K	"	Coal, olive black to grayish black	5Y 2/1-N2	2	A1?	A	W	
6300	-L	"	Clay, greenish gray to med. greenish gray, with complex of fine calcite veinlets, calc. skeletal debris	5G 6/1-5GY 5/1	1+	A1	C	W	Abundant pyrite
6800	-Q	"	Coal	N1	1+	W	C	H	
6900	-R	"	Interlaminated dk. olive gray mudstone and lt. gray silt; n. carbonaceous; specks of brownish material, sl. sandy	5Y 3/1					
7200	61792-A	"	As above	5Y 3/1	1+	W	A1	F	
7400	-C	"	Coal	N1					
7700	-F	P. asp.(?)	Coal	N1	1+	A1	W	F	
7800	-G	"	Interlaminated dk. olive gray mudstone and lt. gray silt or sand; some coaly laminae; micaceous	5Y 3/1	1+	W	A1,A	F	
8100	-J	U. M. div.	As above, plus buff pyritic claystone	5Y 3/1					
8200	-K	"	Coal		1+	W	A1	F,C	
8500	-N	M. M. div.	Mixture of shales, siltstones and mudstones, med. gray to lt. olive gray, (apparent lithologic break)	N5-5Y 6/1					
8700	-P	"	Interlaminated claystones and siltstones, dk. olive gray	5Y 3/1					
8900	-R	"	Claystone with silt laminae; lt. olive gray, med. calc; trace of skeletal debris; carbonaceous	5Y 6/1	1+	W	A1?	H	

345014

TABLE II (Cont.) - Narimba-1

Depth (feet)	EPR No.	Unit (L. E. Stover)	Gross Lithology	GSA Color Code (Dry)	Kerogen Alteration	Types of Kerogen*			Remarks
						Predominant	Secondary	Other	
9200	61793-A	"	Silty claystone with silt laminae, dk. olive gray to olive gray	5Y 3/1-4/1					
9700	-F	L. M. div.	Coal	N1	2-	C	W	H	
9800	-G	L. M. div.	Mixture of shale, siltstone and coal, olive gray	5Y 4/1					
10,000	-I	"	Shale, olive black to olive gray, sl. silty, elongate very thin flakes	5Y 2/1-4/1	2-	W	Al?	C	
10,300	-L	"	Coal						
10,400	-M	"	Shale, olive gray to olive black, sl. carbonaceous	5Y 4/1-2/1					
10,600	-O	"	Shale, olive gray, some coaly laminae, carbonaceous	5Y 4/1	2	W	Al?	C	
10,900	-R	"	Coal	N1	2+	C	W	Al?	

* A - amorphous W - woody
 Al - algal C - coaly
 H - herbaceous F - finely disseminated

345015

TABLE III Total Organic Matter and Light
Gasolines (C₄-C₇), NARIMBA-1 "Picked Cuttings"
(Analyses by H. M. Fry; S. Thompson)

Depth (feet)	EPR No.	Unit	Total Organic Matter(%)	Total C ₄ -C ₇	Correlation Ratios (See Table III-A)			n-Pent. i-Pent.	CH/MCP**
					C ₁ /C ₂	A/D ₂	C ₁ /D ₂		
5200	61791-A	Olig.	.49	0.	-	-	-	-	-
5700	-F	Eoc. undiff.	.55	0.	-	-	-	-	-
5900	-H	N. asp.	7.71	5.07	.36	7.16	8.59	.39	.12
6200	-K	"	44.02*	70.8	.38	4.14	11.90	.93	.09
6300	-L	"	.49	.23	.41	9.02	13.11	1.26	.11
6800	-Q	"	73.74*	53.4	.63	7.89	8.65	.55	.09
6900	-R	"	2.23	7.81	.51	6.20	9.73	1.31	.08
7200	61792-A	"	11.08	4.89	1.43	6.37	14.29	1.95	.51
7400	-C	"	80.03*	5.97	.82	5.55	12.17	.75	.16
7700	-F	P. asp.	59.05*	118.	.39	4.44	5.81	.39	.13
7800	-G	"	6.16	12.7	.69	4.90	10.19	.46	.12
8100	-J	U. M. div.	3.88	9.71	.57	4.84	9.01	.35	.12
8200	-K	"	37.21*	204.	.86	4.88	10.54	.48	.17
8500	-N	M. M. div.	2.93	32.8	.78	4.47	10.42	.48	.16
8700	-P	"	4.29	9.10	.48	6.91	8.29	.38	.13
8900	-R	"	1.46	6.66	.93	4.06	10.22	.51	.21
9200	61793-A	"	4.00	129.	1.05	4.50	10.37	.74	.31
9700	-F	L. M. div.	57.58*	242.	1.18	5.93	8.94	.80	.49
9800	-G	"	3.78	112.	1.49	5.51	11.66	.92	.55
10,000	-I	"	5.56	111.	1.63	6.39	12.52	.89	.70
10,300	-L	"	76.13*	608.	2.00	7.83	14.79	1.11	.86
10,400	-M	"	3.22	121.	2.09	7.35	13.41	1.03	.85
10,600	-O	"	8.98	391.	2.57	8.54	12.83	1.44	1.08
10,900	-R	"	60.02*	-	-	-	-	-	-

* Mostly coal chips

** CH - cyclohexane
MCP - methylcyclopentane

TABLE III-A

DEFINITION OF SIGNIFICANT GASOLINE RATIOS

Light Gasoline Compounds Determined by Gas Chromatography

1. Pentane
2. Hexane
3. Heptane
4. Iso-Pentane
5. 2-Methylpentane
6. 3-Methylpentane
7. 2,3-Dimethylbutane
8. 2,2-Dimethylbutane
9. 3-Methylhexane
10. 2-Methylhexane + 1,1-Dimethylcyclopentane
11. 2,3-Dimethylpentane
12. 2,4-Dimethylpentane
13. 2,2-Dimethylpentane
14. 2,2,3-Trimethylbutane
15. 2,2,4-Trimethylpentane
16. Cyclopentane
17. Methylcyclopentane
18. 1-c-3-Dimethylcyclopentane
19. 1-t-3-Dimethylcyclopentane
20. 1-c-2-Dimethylcyclopentane
21. 1-t-2-Dimethylcyclopentane + 3-Ethylpentane*
22. Cyclohexane + 3,3-Dimethylpentane*
23. Methylcyclohexane
24. Benzene
25. Toluene

Significant Groupings of Molecular Data

- A. Hexane + Heptane
- B. Pentane + iso-Pentane + 2-Methylpentane + 3-Methylpentane
- C. Naphthenes
 - C₁ 2-Methylhexane + 1,1-Dimethylcyclopentane* + Cyclohexane + 3,3-Dimethylpentane* + Methylcyclohexane
 - C₂ Methylcyclopentane + 1-c-3-Dimethylcyclopentane + 1-t-3-Dimethylcyclopentane + 1-c-2-Dimethylcyclopentane + (1-t-2-Dimethylcyclopentane + 3-Ethylpentane)*
- D. Aromatics Plus 3-Methylhexane
 - D₁ Benzene + Toluene
 - D₂ 3-Methylhexane

*Analyzed together by gas chromatography.

TABLE IV Kerogen from Sidewall Cores and Standard Cores
(Prepared by Esso Australia; Described by J. L. Morgan)

Depth (feet)	SW Core No.	Kerogen Alteration	Types of Kerogen**			Remarks
			Predominant	Secondary	Other	
5850	24	1+	W	H	C	
6160	23	"	W	H	C	
6505	22	"	W	H	C	
6800	21	"	W	C	H	
7105	20	"	W	H	C	
7243	19	"	W	H	C	
7318	18	"	W	C	AI?	
7434	16	"	W	C	N?	
7616	15	"	W	C	H	
7840	13	"	W	C	H	
8120	11	"	W	C	H	
8210	10	"	W	C	H	
8335	9	"	C	W	H	
8375	8	"	W	C	H	
8416	7	"	W	C	H	
8474	6	"	W	C	H	
8590	5	"	W	C	H	
8682	4	"	W	C	H	
8734	3	"	C	W	H	
8745	2	"	W	C	H	
8785	1	"	W	H	C	
8860	59	"	W	H	C	
8920	56	"	W	C	H	

TABLE IV (Cont.)

Depth (feet)	SW Core No.	Kerogen Alteration	Types of Kerogen**			Remarks
			Predominant	Secondary	Other	
8930	55	"	W	H	C	
9020	54	"	W	H	C	abdnt. pyrite
9060	52	2-	C	W	H	
9070	51	2-	W	C	H	
9100	49	2-	W	H	C	
9110	48	"	W	H	C	
9120	47	"	W	H	C	
9160	46	"	W	H	C	
9170	45	"	W	H	C	
9246	43	"	W	C	H	
9292	Core-1*	"	W	C	H	
9360	42	"	W	C	H	
9545	Core-2*	"	W	C	H	
9558	39	"	C	W	H	
9650	37	"	W	H	C	
9680	36	"	W	H	C	
9752	Core-3*	"	W	H	C	
9900	32	2	W	C	H	abdnt. pyrite "1+" & "2+" microfossils
9914	30	"	W	C	H	" " "
9950	29	"	W	H	C	" " "
10,038	27	"	W	H	C	" " "
10,084	25	"	W	H	C	" " "

TABLE IV (Cont.)

Depth (feet)	SW Core No.	Kerogen Alteration	Types of Kerogen**			Remarks
			Predominant	Secondary	Other	
10,200	23	"	C	W	-	O.M. very sparse
10,294	21	2+	W	C	H	
10,556	15	"	C	W	H	
10,640	13	"	C	W	H	
10,770	11	"	C	W	H	
10,844	9	"	W	C	H	
10,860	7	"	C	W	H	
10,970	3	"	W	C	H	
10,978	1	"	C	W	H	

* Standard Core

** A1 - Algal W - Woody
H - Herbaceous C - CoalyN - Nonfilamentous
algal

Sample Descriptions

18.9.73

J.R. Black, D. Maughan

DEPTHS	%	DESCRIPTION
8813-8820	20	<u>Sandstone</u> , white, fine grained, consolidated, with few unconsolidated coarse grains.
	20	<u>Siltstone</u> , white, moderately firm, trace carbonaceous laminae.
	60	<u>Shale</u> with trace coal
8820-8830	10	<u>Sandstone</u>
	30	<u>Siltstone</u> , laminated, with carbonaceous streaks
	60	<u>Shale</u> , brown, firm, slightly silty, finely micaceous
8830-8840	10	<u>Sandstone</u> as above
	10	<u>Siltstone</u> as above
	80	<u>Shale</u>
8840-8850	10	<u>Sandstone</u>
	20	<u>Siltstone</u> , trace pyrite
	70	<u>Shale</u> , trace fossil.
		POH to run casing Ran 9-5/8" casing with shoe at 8808'. Cemented with 374 Sx. Ran Seal assembly. Drilled out plug @ 530. Pressure checked 16.5# at 8861.
8850-8860	100	<u>Cement</u> cavings
8860-8870	30	<u>Cement</u> cavings
	20	<u>Siltstone</u> as above
	50	<u>Shale</u> as above
8870-8880	50	<u>Cement</u> cavings
	10	<u>Siltstone</u>
	40	<u>Shale</u>
8880-8890	30	<u>Cement</u>
	20	<u>Siltstone</u> as above with trace unconsolidated fine grained, subangular quartz
	50	<u>Shale</u> , brown, carbonaceous, silty, finely micaceous with trace fossil.
8890-8900	10	<u>Siltstone</u>
	10	<u>Shale</u>
	80	<u>Coal</u> , black, brittle.
8900-8910	20	<u>Siltstone</u> , white with very fine grained sand, firm, thin bedded.
	70	<u>Shale</u>
	10	<u>Coal</u>
8910-8920	20	<u>Siltstone</u>
	80	<u>Shale</u> , brown, silty, firm, carbonaceous, finely micaceous, trace coal.
8920-8930	40	<u>Siltstone</u> , white to tan white with some very fine grained sand, very hard indurated, slightly carbonaceous
	60	<u>Shale</u> , as above, trace fossil.
8930-8940	20	<u>Sandstone</u> , white, very fine to fine grained quartz, very silty, hard, tight.
	30	<u>Siltstone</u> as above
	50	<u>Shale</u> as above
		Ironstone ?
8975		PO to CB
8940-8950	10	<u>Siltstone</u>
	90	<u>Shale</u>
8950-8960	90	<u>Siltstone</u> , tan to buff, moderately firm, argillaceous
	10	<u>Shale</u>

DEPTHS	%	DESCRIPTION
8960-8970	20	<u>Sandstone</u> , white, very fine to fine grained, silty, consolidated, poorly sorted, moderately firm to hard, poor porosity and permeability
	30	<u>Siltstone</u> as above
	50	<u>Shale</u> , dark brown to brown, carbonaceous, silty, finely micaceous
8970-8980	40	<u>Sandstone</u>
	20	<u>Siltstone</u>
	40	<u>Shale</u> with trace coal
8980-8990	50	<u>Sandstone</u> , white, fine to medium grained, consolidated, subangular quartz, moderately firm with some unconsolidated subangular coarse quartz grains, slightly carbonaceous.
	20	<u>Siltstone</u>
	20	<u>Shale</u>
	10	<u>Coal</u> , with amber and mineral fluorescence.
8990-9000	90	<u>Sandstone</u> , white, fine grained, silty, consolidated, moderately firm, calcareous with few unconsolidated coarse to medium quartz grains.
	10	<u>Shale</u>
9000-9010	80	<u>Sandstone</u> , white, fine grained, becoming more silty
	20	<u>Shale</u> , brown, carbonaceous, silty.
9010-9020	60	<u>Sandstone</u> as above
	40	<u>Shale</u> as above
9020-9030	30	<u>Sandstone</u> as above, very silty
	70	<u>Shale</u> , brown, silty, carbonaceous
9030-9040	100	<u>Shale</u> , brown, firm with few silty streaks
9040-9050	80	<u>Shale</u>
	20	<u>Coal</u>
9050-9060	10	<u>Shale</u>
	90	<u>Coal</u> , black, brittle with abundant amber with bright yellow fluorescence
9060-9070	10	<u>Siltstone</u>
	90	<u>Shale</u> , brown, platy, slightly silty in places, slightly carbonaceous
9070-9080	20	<u>Siltstone</u>
	80	<u>Shale</u> as above, but silty
9080-9090	30	<u>Sandstone</u> , white, very fine grained, consolidated, firm, very silty, slightly carbonaceous
	70	<u>Shale</u> , brown, silty, carbonaceous
9090-9100	20	<u>Sandstone</u> as above
	80	<u>Shale</u>
9100-9110	20	<u>Siltstone</u>
	80	<u>Shale</u>
9110-9120	10	<u>Siltstone</u>
	90	<u>Shale</u> , brown, laminated silty, slightly carbonaceous, firm
9120-9130	20	<u>Siltstone</u> as above, becoming sandy
	80	<u>Shale</u> , trace coal
9130-9140	50	<u>Sandstone</u> , white, fine to medium grained, consolidated, moderately friable, subrounded, fair porosity and permeability, silty, poorly sorted with some unconsolidated coarse grains (subrounded)
Circ. 30 min. at 9144.	50	<u>Shale</u> as above, with silty stringers.

DEPTHS	%	DESCRIPTION
9140-9150	70	<u>Sandstone</u> as above
	30	<u>Shale</u>
9150-9160	30	<u>Sandstone</u> as above but more silty
	20	<u>Siltstone</u>
	50	<u>Shale</u> , brown, carbonaceous, finely micaceous, silty
9160-9170	10	<u>Sandstone</u>
	10	<u>Siltstone</u>
	80	<u>Shale</u>
9170-9180	40	<u>Siltstone</u> , white to buff, moderately firm, trace very fine grained sand.
	60	<u>Shale</u>
9180-9190	20	<u>Sandstone</u> , white, fine to medium grained, silty, poorly sorted, consolidated, moderately firm
	20	<u>Siltstone</u> as above
	60	<u>Shale</u>
9190-9200	70	<u>Sandstone</u> , white, very fine to fine grained, quartz, very silty, consolidated, firm, non calcareous, fair to poor porosity and permeability.
	30	<u>Shale</u> as above
9200-9210	30	<u>Sandstone</u>
	60	<u>Siltstone</u> , white to tan, moderately firm
	10	<u>Shale</u>
9210-9220	20	<u>Siltstone</u>
	10	<u>Shale</u>
	70	<u>Coal</u> , black, brittle, conchoidal fracture
9220-9230	90	<u>Siltstone</u> , white to tan, firm with trace very fine grained sand, hard, tight
	10	<u>Shale</u> , brown, carbonaceous with trace coal
9230-9240	80	<u>Siltstone</u> as above
	20	<u>Shale</u> , light brown, very argillaceous, soft, trace coal
9240-9250	90	<u>Siltstone</u>
	10	<u>Shale</u> , dark brown, carbonaceous, silty
9250-9260	10	<u>Siltstone</u> as above
	90	<u>Shale</u>
9260-9270	100	<u>Sandstone</u> , milky white, coarse to very coarse, unconsolidated, subangular to subrounded quartz, well sorted, good porosity and permeability. No show.
Circ. at 9277. Drill break at 9267		
9270-9277	100	<u>Sandstone</u> as above. No show. Came out of hole to run Core bbl Core #1. Core #1 9278-9307' Cut 29'. Recov. 29' 100% 16' siltstone, 9' shale, 3½' sandstone and ½' coal
9307-9310	100	<u>Coal</u> , black, conchoidal fracture with bright lustre.
9310-9320	90	<u>Siltstone</u> , light grey, firm, sandy, slightly carbonaceous
	10	<u>Coal</u>

DEPTHS	%	DESCRIPTION
9320-9330	100	<u>Siltstone</u> as above, some quartz and coal present
9330-9340	70	<u>Coal</u> , black, conchoidal fracture, bright lustre
	30	<u>Shale</u> , brown, carbonaceous, slightly silty
9340-9350	80	<u>Coal</u> as above
	10	<u>Siltstone</u> , white (non calcareous) to grey (very slightly calcareous)
	10	<u>Shale</u> , brown, carbonaceous
9350-9360	80	<u>Siltstone</u> , grey, slightly calcareous, few grains quartz
	20	<u>Coal</u> , black, conchoidal fracture
9360-9370	80	<u>Sandstone</u> , white, very fine to fine grained, well sorted, consolidated
	20	<u>Siltstone</u> , grey, non calcareous
9370-9380	80	<u>Sandstone</u> as above
	20	<u>Siltstone</u> as above
9380-9390	90	<u>Sandstone</u> as above
	10	<u>Siltstone</u>
9390-9400	100	<u>Sandstone</u> , white, fine to medium grained, very friable, slightly carbonaceous, subrounded with good to fair porosity and permeability
9400-9410	40	<u>Sandstone</u> , white, fine grained, moderately friable, subrounded, fair porosity and permeability
	20	<u>Siltstone</u> , white, sandy, slightly carbonaceous
	40	<u>Shale</u> , brown, slightly carbonaceous, moderately firm.
9410-9420	50	<u>Sandstone</u> , as above
	30	<u>Siltstone</u> , as above
	20	<u>Shale</u> , as above
9420-9430	50	<u>Sandstone</u> , white, fine grained becoming very silty, firm, hard, tight
	30	<u>Siltstone</u> as above
	20	<u>Shale</u> as above
9430-9440	10	<u>Sandstone</u>
	20	<u>Siltstone</u>
	70	<u>Shale</u> , chocolate brown, moderately soft to fissile, finely micaceous
9440-9450	90	<u>Sandstone</u> , white, medium to coarse grained, poorly sorted, angular to subrounded, about half consolidated, moderately firm and half unconsolidated (coarse grains), quartzose Fair to good porosity and permeability
	10	<u>Shale</u> as above with trace coal
9450-9460	90	<u>Sandstone</u> as above but less coarse grains
	10	<u>Shale</u> as above with trace coal
9460-9470	60	<u>Sandstone</u> , white, predominantly medium grained, moderately friable, subrounded, consolidated quartz with some unconsolidated subangular coarse quartz, fair to good porosity and permeability
	20	<u>Shale</u> as above
	20	<u>Coal</u> as above
9470-9480	40	<u>Sandstone</u> , white as above, poorly sorted
	60	<u>Shale</u> , brown, carbonaceous, fissile
9480-9490	10	<u>Sandstone</u>
	40	<u>Siltstone</u> , white, firm, sandy
	40	<u>Shale</u> as above
	10	<u>Coal</u>

DEPTHS	%	DESCRIPTION
9490-9500	10	<u>Sandstone</u>
	90	<u>Siltstone</u> , white, firm, indurated
9500-9510	90	<u>Siltstone</u> as above
	10	<u>Shale</u>
9510-9520	40	<u>Siltstone</u>
	20	<u>Shale</u>
	40	<u>Coal</u>
9520-9530	10	<u>Sandstone</u> , white, fine to medium grained, consolidated with few unconsolidated coarse quartz grains
	30	<u>Siltstone</u> , tan, firm, slightly carbonaceous
	60	<u>Shale</u> , brown, silty, carbonaceous
9530-9540	60	<u>Sandstone</u> , white, fine to coarse bimodal poorly sorted, moderately friable.
	40	<u>Shale</u>
9540-9544	90	<u>Sandstone</u> , white, fine to coarse, bimodal, predominantly fine grained, poorly sorted, moderately friable, subrounded fine grains, and subangular coarse grains, fair to good porosity and permeability
Circulation Spl.	10	<u>Shale</u> as above
<p>Core #2 9544-9561 Cut 19' Recov. 19'</p> <p>Ran FDC/CNT/GR/CAL 9542-8789'</p> <p>Casing checked 19' high</p> <p>ISF ISONIC 9535-8789'</p> <p>WLM (SCHLUMB.) TD 9543'</p> <p>Cores 1 & 2 should be adjusted upward 19'</p> <p>Ran in and drilled 15' on wiper trip. Circ. hole clear. Test BOP and did BOP drill.</p> <p>Ran FIT #1 @ 9440 (FDC depth)</p> <p>Spl. is 19' too deep 9542 to 9557'</p>		
9561-9576	60	<u>Siltstone</u> , brown and white, firm, carbonaceous
	40	<u>Shale</u> , brown, carbonaceous, silty
9557-7570	80	Readjusted 19' up. <u>Sandstone</u> , white, fine to medium grained quartz, with few lithics, consolidated, moderately firm, fair porosity and permeability, poorly sorted.
	20	<u>Shale</u> , brown, carbonaceous
9570-9580	100	<u>Sandstone</u> as above, but fair to good porosity and permeability
9580-9590	100	<u>Sandstone</u> as above
9590-9600	80	<u>Sandstone</u>
	20	<u>Coal</u> , black, brittle, dirty with some shale
9600-9610	100	<u>Coal</u> , black, brittle, abundant amber with yellow mineral fluorescence
9610-9620	10	<u>Sandstone</u> as above
	50	<u>Shale</u> , brown, carbonaceous, finely micaceous, moderately soft
	40	<u>Coal</u> as above
9620-9630	10	<u>Sandstone</u>
	80	<u>Shale</u> , dark brown, some silty, very carbonaceous
	10	<u>Coal</u>

DEPTHS	%	DESCRIPTION
9630-9640	70	<u>Sandstone</u> , white, very fine grained, silty, firm, consolidated, poor porosity and permeability, subrounded, non calcareous
	30	<u>Shale</u> as above
9640-9650	30	<u>Sandstone</u>
	40	<u>Siltstone</u> , tan to white, sandy, hard, indurated
	30	<u>Shale</u> as above
9650-9660	10	<u>Sandstone</u>
	20	<u>Siltstone</u>
	70	<u>Shale</u> , dark brown, carbonaceous
9660-9670	20	<u>Sandstone</u> , white, fine grained, firm, silty, subrounded, quartzose, poor porosity and permeability. <u>Scattered blue white fluorescence with fair blue yellow cut, good show on chromatograph.</u>
	80	<u>Shale</u>
9670-9680	30	<u>Sandstone</u> , white, fine grained, firm, consolidated, <u>scattered spotty blue yellow fluorescence, fair cut.</u>
	70	<u>Shale</u>
		Drill break at 9683. Cut 4' (adj. for closure of Bumper Subs to 9680)
9680-9687	50	<u>Sandstone</u> , white, fine grained with few medium grains, very silty, firm.
	30	<u>Siltstone</u> , trace blue white fluorescence, faint oil.
	20	<u>Shale</u>
9687-9690	40	<u>Sandstone</u> , white, fine grained, silty, moderately friable, spotty fluorescence, with good cut. Blue white fluorescence and cut.
	60	<u>Shale</u> , brown, carbonaceous, silty.
9690-9700	10	<u>Sandstone</u>
	90	<u>Shale</u> , dark grey, silty, moderately soft
9700-9710	30	<u>Sandstone</u> , buff to white, fine grained, silty, trace spotty fluorescence, with fair cut.
	30	<u>Siltstone</u> , tan, firm, indurated.
	40	<u>Shale</u> as above
9710-9720	60	<u>Sandstone</u> as above, but very silty, trace spotty blue white fluorescence
	30	<u>Siltstone</u>
	10	<u>Shale</u>
9720-9730	40	<u>Sandstone</u> , white to buff, fine grained, consolidated, moderately firm, subrounded quartz with some lithics even dull yellow mineral fluorescence with <u>spotty blue white fluorescence with fair cut.</u>
	20	<u>Siltstone</u> , tan, firm
	40	<u>Shale</u> , brown, carbonaceous, moderately soft
9730-9740	20	<u>Sandstone</u>
	60	<u>Siltstone</u> , buff to white, firm, slightly carbonaceous
	20	<u>Shale</u>
9740-9750	80	<u>Sandstone</u> , white, fine to medium grained, poorly sorted, subrounded quartz with few angular lithics, consolidated, moderately friable, dull yellow mineral fluorescence and <u>spotty bright yellow fluorescence with fair to good cut.</u>
	20	<u>Shale</u>
9750-9760 Circ. drill brk.	90	<u>Sandstone</u> , white, fine to coarse predominantly medium grained, mostly consolidated, but some unconsolidated, friable, subrounded to sub-angular quartz with some lithics, some clay choking? non calcareous, but has dull yellow mineral fluorescence. <u>Spotty bright yellow fluorescence with good bright yellow cut.</u> Residual oil?
	10	<u>Shale</u>

DEPTHS	%	DESCRIPTION
		Ran Core bbl for Core #3. Adjusted depth to 9750 on strap out of D.P. Core #3 9750-9756. Cut 6'. Rec. 6' 2' sand. 4' shale
9756-9770 Drilling with J/33	60	<u>Sandstone</u> , white to buff, fine to medium grained, consolidated, poorly sorted, <u>trace spotty bright yellow fluorescence with fair cut.</u> Fluorescence about 1% of total sample.
	40	<u>Shale</u> , dark brownish grey, firm
9770-9780	90	<u>Sandstone</u> , buff to white, fine grained, very silty, hard, firm, tight, subrounded quartz with some lithics. No show, clay choking
	10	<u>Shale</u> , as above, trace coal
9780-9790	100	<u>Sandstone</u> as above
9790-9800	90	<u>Sandstone</u> , as above, fine grained, silty, hard, tight, with some clay choking. No shows.
	10	<u>Shale</u>
9800-9810	100	<u>Coal</u> , black, bright lustre
9810-9820	40	<u>Coal</u>
	40	<u>Shale</u>
	20	<u>Sandstone</u> as above with shale laminae?
9820-9830	40	<u>Coal</u>
	40	<u>Sandstone</u>
	20	<u>Shale</u>
9830-9840	30	<u>Sandstone</u>
	40	<u>Siltstone</u>
	20	<u>Shale</u>
	10	<u>Coal</u>
9840-9850	20	<u>Sandstone</u>
	30	<u>Siltstone</u>
	40	<u>Shale</u> , brown, carbonaceous as above, and grey, soft, argillaceous
	10	<u>Coal</u>
9850-9860	70	<u>Sandstone</u> , fine to coarse grained, bimodal, half consolidated, half unconsolidated quartz, subangular to subrounded, clay choked.
	30	<u>Shale</u>
9860-9870	10	<u>Sandstone</u>
	90	<u>Coal</u> , platy fracture
9870-9880	10	<u>Coal</u>
	60	<u>Shale</u>
	30	<u>Sandstone</u> , fine grained to silty, clay choked
9880-9890	10	<u>Sandstone</u>
	50	<u>Siltstone</u>
	40	<u>Shale</u>
9890-9900	100	<u>Shale</u> , brown and light grey, soft
9900-9904	100	<u>Shale</u> , mostly medium grey, soft, some brown
		POH Run FDC/CNL, ISF/SONIC & FIT. Run #3

Sample Descriptions

A.K. Svalbe
25.9.1973

DEPTHS	%	DESCRIPTION
9900-9910	90	<u>Shale</u> , dark brown, massive to subfissile, hard, carbonaceous, micaceous, silty in part, coaly filaments and partings
	10	<u>Siltstone</u> , shaley, light brown, well consolidated, carbonaceous, tight. Trace coal and sandstone (uphole?)
9910-9920	90	<u>Shale</u> as above
	10	<u>Siltstone</u> as above Trace coal and sandstone (uphole?)
9920-9930	70	<u>Shale</u> as above
	30	<u>Siltstone</u> , trace fine grained to very fine grained sandstone. Trace coal and sandstone
9930-9940	30	<u>Shale</u> as above
	70	<u>Siltstone</u> , trace associated very fine grained sandstone, shaley with clay matrix and associated carbonaceous material and mica
9940-9950	10	<u>Sandstone</u> , white to light cream, fine to medium grained, consolidated, moderately well sorted, subangular to subrounded, clay matrix, tight.
	60	<u>Siltstone</u> , as above
	30	<u>Shale</u> as above, silty. Trace coal
9950-9960	10	<u>Sandstone</u> as above
	30	<u>Siltstone</u> as above
	60	<u>Shale</u> , silty as above Trace coal
9960-9970	20	<u>Sandstone</u> as above
	40	<u>Siltstone</u> as above
	40	<u>Shale</u> , silty as above Trace coal
9970-9980	20	<u>Sandstone</u> as above
	30	<u>Siltstone</u> as above
	50	<u>Shale</u> as above
9980-9990	40	<u>Sandstone</u> as above
	50	<u>Siltstone</u> as above with associated very fine grained sandstone
	10	<u>Shale</u> as above Trace coal
9990-10000	60	<u>Siltstone</u> as above
	40	<u>Shale</u> as above Trace coal and sandstone
10000-10010	60	<u>Siltstone</u> as above
	40	<u>Shale</u> , silty as above Trace sandstone and coal
10010-10020	60	<u>Siltstone</u> as above
	40	<u>Shale</u> as above Trace sandstone and coal
10020-10030	50	<u>Siltstone</u> with associated very fine grained sandstone
	50	<u>Shale</u> - silty as above Trace coal and sandstone
10030-10040	100	Silty <u>shale</u> , carbonaceous, micaceous, firm to hard (as above) Trace <u>siltstone</u> , sandstone and coal

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DEPTHS	%	DESCRIPTION
10040-10050	10	<u>Siltstone</u> as above
	90	<u>Shale</u> as above Trace coal and sandstone as above
10050-10060	10	<u>Siltstone</u> with associated very fine grained sandstone
	90	<u>Shale</u> , dark brown, micaceous, carbonaceous, firm-hard, well consolidated. Trace sandstone, medium to coarse grained, angular to rounded, moderately well sorted. Trace coal.
10060-10070	90	<u>Sandstone</u> , white to light cream, medium to coarse grained, subangular to subrounded, moderately well sorted, friable to weakly consolidated, minor clay cement. No fluorescence or cut. (Chromatograph to C3 only - very weak C4)
{ Top sand 10067 }	10	<u>Siltstone</u> , brown, as above. Trace coal.
10070-10080	90	<u>Sandstone</u> , white to cream, medium to fine grained, angular to rounded, moderately well sorted, consolidated with abundant clay matrix. No fluorescence or cut.
	10	<u>Siltstone</u> as above. Trace coal.
10080-10090	90	<u>Sandstone</u> , white, fine grained to silty, angular to rounded, as above with trace micaceous and carbonaceous debris.
	10	Silty <u>shale</u> and shale. Trace coal.
10090-10100	90	<u>Sandstone</u> , white, light brown, fine grained to silty, tight, clay matrix, no show.
	10	Silty <u>shale</u> , and shale. Trace coal.
10100-10110	50	<u>Sandstone</u> , becoming more silty than above
	40	Silty <u>shale</u> as above
	10	<u>Shale</u> and coaly carbonaceous shale.
10110-10120	10	<u>Sandstone</u> as above
	20	<u>Siltstone</u> as above
	30	<u>Shale</u> as above
	40	<u>Coal</u> , black, conchoidal (Coal bed 10115 - gas kick)
10120-10130	20	<u>Sandstone</u> , light brown to buff, fine to medium grained, angular to rounded, firm to hard, well consolidated - <u>calcareous</u> (dolomitic?) with associated clay matrix, dull mineral fluorescence.
	30	<u>Siltstone</u> , light brown, carbonaceous as above
	50	Silty <u>shale</u> Trace coal
10130-10140	50	<u>Sandstone</u> as above, <u>dolomitic</u>
Drill break 10145	30	<u>Siltstone</u> , light brown, weakly dolomitic
	20	<u>Shale</u> , silty, as above Trace coal
10140-10150	90	<u>Sandstone</u> as above - 20% dolomite and/or carbonate cemented - noncemented white to light brown, firm to friable, poor porosity and permeability. No show. Dull yellow to brown mineral fluorescence
	10	<u>Shale</u> , light to dark brown, silty with carbonaceous partings and flecks.
10150-10160	100	<u>Sandstone</u> - 10% dolomitic - remainder white with clay matrix. Trace shale and coal
10160-10170	80	<u>Sandstone</u> , dominantly medium grained as above, minor dolomite
	20	<u>Siltstone</u> , shaley as above

DEPTHS	%	DESCRIPTION
10170-10180	60	<u>Sandstone</u> as above
	40	<u>Coal</u> , black
10180-10190	100	<u>Coal</u> , black, (30 unit kick) Trace sandstone and shale
10190-10200	90	<u>Sandstone</u> as above, white, medium to coarse grained, with some fine grained, dominantly medium to coarse grained, friable, lack clay matrix, weakly consolidated. No show. Better porosity and permeability. Granitic lithics.
	10	<u>Shaley coal</u> , black.
10200-10210	80	<u>Sandstone</u> as above, becoming medium to fine grained with clay matrix, more consolidated, poor porosity and permeability. Trace dolomite.
	20	<u>Shaley siltstone</u> as above Trace coal
10210-10220	60	<u>Sandstone</u> , grey to light brown, trace <u>dolomite</u>
	30	Silty <u>shale</u>
	10	<u>Coal</u> , black
10220-10230	90	<u>Sandstone</u> as above, fine to coarse grained, dominantly fine to medium grained, trace dolomite - most sandstone clay choked and friable to well consolidated.
	10	Shaley <u>siltstone</u> , light brown, carbonaceous
10230-10240	60	Sandstone as above, <u>no fluorescence or cut</u>
	20	Silty <u>shale</u> as above
	20	<u>Coal</u> , black - bleeding gas
10240-10250	80	<u>Sandstone</u> , white, fine to coarse grained, dominantly fine to medium grained
	10	<u>Siltstone</u> , grey to white, tight, clay choked
	10	<u>Coal</u> , black, bleeding gas
10250-10260	100	<u>Sandstone</u> as above Trace shale and coal
10260-10270	30	<u>Sandstone</u> , white, fine to medium grained, angular to rounded, moderately well sorted, clay matrix, tight, no fluorescence or cut
	60	<u>Siltstone</u> , light to dark brown, shaley, carbonaceous, with filaments of coal and coaly flecks, very tight
	10	<u>Coal</u>
10270-10280	10	<u>Sandstone</u> as above
	30	<u>Siltstone</u> as above
	60	<u>Coal</u> , black, bleeding gas
10280-10290	40	<u>Sandstone</u> as above
	50	<u>Siltstone</u> as above
	10	<u>Shale</u> , grey brown, carbonaceous Trace coal
10290-10300	10	<u>Sandstone</u> as above
	60	<u>Siltstone</u> as above
	30	<u>Coal</u> as above Trace shale
10300-10310	40	<u>Siltstone</u> as above
	60	<u>Shale</u> , light to dark brown grey, weakly silty in part Trace coal and sandstone
10310-10320	30	<u>Sandstone</u> , white to grey, fine to medium grained, angular to rounded, moderately well sorted, firm to well consolidated, clay choked, poor porosity and permeability
	40	<u>Siltstone</u> , brown, carbonaceous, shaley
	30	<u>Shale</u> , brown. Trace coal

DEPTHS	%	DESCRIPTION
10320-10330	10 50 40	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Shale</u> as above Trace coal
10330-10340	20 50 30	<u>Sandstone</u> , white to grey, fine to medium grained, angular to rounded <u>Siltstone</u> as above <u>Shale</u> as above Trace coal
10340-10350	20 40 40	<u>Siltstone</u> as above <u>Shale</u> as above <u>Coal</u> as above Trace sandstone
10350-10360	50 30 20	<u>Sandstone</u> as above <u>Shale</u> as above <u>Coal</u> as above
10350-10370	100	<u>Sandstone</u> , grey to white, fine to medium grained, angular to rounded, moderately well sorted, quartzose, granitic lithics, with mica, feldspar and quartzose, partly weathered, clay choked, poor porosity and permeability Trace shale, coal and siltstone
10370-10380	100	<u>Sandstone</u> as above. Trace shale, siltstone and coal
10380-10390	90 10	<u>Sandstone</u> , abundant dolomitic cemented sand - 30% of sample fine to medium (coarse grained), dominantly fine to medium grained, angular to rounded, moderately well sorted as above <u>Silty shale</u> . Trace coal
10390-10400	90 10	<u>Sandstone</u> as above <u>Shale</u> , silty Trace coal
10400-10410	40 40 20	P.O.H. @ 10400 to Run ISF/BHC's and FDC/CNL combo - followed by FIT's (90 units trip gas after RIH at completion of logging)
10400-10410	40 40 20	<u>Sandstone</u> , white to cream, fine to medium grained, angular to rounded, moderately well sorted, firm to hard, dolomitic in part, clay matrix, tight, poor porosity and permeability. <u>Siltstone</u> , light brown, carbonaceous, with minor very fine grained sandstone. <u>Shale</u> , dark brown, carbonaceous, micaceous, subfissile. Trace coal
10410-10420	60 20 20	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Shale</u> as above Trace coal
10420-10430	80 10 10	<u>Sandstone</u> , white to light brown, partly dolomitic, fine to medium grained, angular to rounded, tight <u>Siltstone</u> , light to dark brown, as above <u>Shale</u> , dark brown to grey brown, as above Trace coal
10430-10440	30 20 50	<u>Sandstone</u> as above <u>Shale</u> as above, silty <u>Coal</u> as above Trace siltstone
10440-10450	60 20 20	<u>Sandstone</u> as above <u>Shale</u> as above, silty <u>Coal</u> as above. Trace siltstone.

DEPTHS	%	DESCRIPTION
10450-10460	40	<u>Sandstone</u> as above
	30	<u>Siltstone</u> as above
	20	<u>Shale</u> as above
	10	<u>Coal</u> as above
10460-10470	20	<u>Sandstone</u> as above
	60	<u>Siltstone</u> as above
	20	<u>Shale</u> as above
		Trace coal
10470-10480	20	<u>Sandstone</u> as above
	30	<u>Siltstone</u> as above
	50	<u>Shale</u> as above
		Trace coal
10480-10490	30	<u>Sandstone</u> , white to cream, fine to medium grained, angular to rounded, clay choked.
	50	<u>Siltstone</u> , light brown, shaley, carbonaceous
	20	<u>Shale</u> , as above, brown grey, carbonaceous, subfissile.
		Trace coal
10490-10500	10	<u>Sandstone</u>
	60	<u>Siltstone</u> , very shaley
	30	<u>Shale</u> as above
		Trace coal
10500-10510	20	<u>Sandstone</u> as above
	50	<u>Siltstone</u> as above
	30	<u>Shale</u> as above
		Trace coal
10510-10520	50	<u>Sandstone</u>
	40	<u>Siltstone</u> , sandy, white to light cream
	10	<u>Shale</u> , dark brown, subfissile
		Trace coal
10520-10530	30	<u>Sandstone</u> as above
	40	<u>Siltstone</u> as above
	30	<u>Shale</u>
10530-10540	30	<u>Sandstone</u> . Trace dolomitic cement
	30	<u>Siltstone</u> as above
	40	<u>Shale</u> as above
		Trace coal
10540-10550	60	<u>Sandstone</u> as above
	30	<u>Shale</u> as above
	10	<u>Siltstone</u> as above
		Trace coal
10550-10560	50	<u>Sandstone</u> as above
	20	<u>Siltstone</u> as above
	30	<u>Shale</u> as above
10560-10570	30	<u>Sandstone</u> as above
	40	<u>Siltstone</u> as above
	30	<u>Shale</u> as above
10570-10580	30	<u>Sandstone</u> , dolomitic, fine to medium grained, angular to rounded, moderately well sorted, tight
	40	<u>Siltstone</u> as above
	30	<u>Shale</u> as above
		Trace coal
10580-10590	100	<u>Coal</u> , bleeding gas

DEPTHS	%	DESCRIPTION
10590-10600	70 20 10	<u>Sandstone</u> , white, medium to coarse grained, subangular to subrounded, moderate to poor sorting, friable?, cemented - fragments only - have silica cement and overgrowths <u>Siltstone</u> as above <u>Shale</u> , dark brown. Trace coal
10600-10610	80 20	<u>Sandstone</u> , white, medium to coarse grained, angular to rounded, moderate to poor sorting, firm to hard <u>Shale</u> , dark brown, very coaly. Trace coal
10610-10620	80 20	<u>Sandstone</u> , fine to coarse grained, dominantly medium grained to fine grained, becoming more like above 10600', reappearance of clay matrix in cemented sand aggregates (above 20' had "quartzite" appearance with silica cement and outgrowths.) Still very hard to very firm <u>Shale</u> , dark brown, silty in part, carbonaceous
10620-10630	80 20	<u>Sandstone</u> as above <u>Shale</u> , dark brown, very carbonaceous. Trace coal
10630-10640	40 30 30	<u>Sandstone</u> as above <u>Siltstone</u> as above, dark brown, shaley <u>Shale</u> , dark brown, coaly, very carbonaceous. Trace coal
10640-10650	10 40 50	<u>Sandstone</u> as above <u>Siltstone</u> , shaley, light to dark brown, carbonaceous <u>Shale</u> , dark brown, locally silty. Trace coal
10650-10660	10 60 30	<u>Sandstone</u> as above <u>Siltstone</u> , shaley, dark grey brown to brown, carbonaceous, firm to hard, massive to weakly laminated. <u>Shale</u> , silty, dark brown, carbonaceous. Trace coal
10660-10670	100	<u>Coal</u> . Trace shale, sandstone and siltstone
10670-10680	10 50 30 10	<u>Sandstone</u> , grey to cream, fine to coarse grained, dominantly fine to medium grained, tight, hard with silica and clay cement matrix. Very poor porosity and permeability. <u>Siltstone</u> as above <u>Shale</u> , silty, carbonaceous Trace coal <u>Coal</u>
10680-10690	20 30 50	<u>Sandstone</u> as above <u>Siltstone</u> , shaley <u>Coal</u> , black
10690-10700	100	<u>Coal</u> Trace sandstone, shale and siltstone
10700-10710	10 30 20 40	<u>Sandstone</u> <u>Siltstone</u> <u>Shale</u> <u>Coal</u>

DEPTHS	%	DESCRIPTION
10710-10720	10 30 30 30	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Shale</u> as above <u>Coal</u> as above
10720-10730	10 30 20 40	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Shale</u> as above <u>Coal</u> as above
10730-10740	20 40 40	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Coal</u> as above
10740-10750	60 20 20	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Coal</u> as above
10750-10760	80 20	<u>Sandstone</u> as above Silty <u>shale</u> as above Trace coal
10760-10770	90 10	<u>Sandstone</u> as above Silty <u>shale</u> as above Trace coal
10770-10780	30 40 30	<u>Sandstone</u> , white to cream, angular to rounded, moderately well sorted, fine to coarse grained, dominantly fine to medium grained, dolomitic in part, tight, hard, well indurated. <u>Siltstone</u> , light to dark brown, carbonaceous, clay matrix, dirty, firm, well compacted. <u>Shale</u> , dark brown grey, carbonaceous, micaceous Trace coal.
10780-10790	20 40 40	<u>Sandstone</u> as above <u>Siltstone</u> , shaly as above <u>Shale</u> , silty as above Trace coal
10790-10800	40 30 30	<u>Sandstone</u> as above <u>Siltstone</u> <u>Shale</u> as above
10800-10810	10 40 20 30	<u>Sandstone</u> as above <u>Siltstone</u> as above <u>Shale</u> as above <u>Coal</u>
10810-10820	10 50 30 10	<u>Sandstone</u> as above <u>Siltstone</u> , shaly as above <u>Shale</u> , silty, as above <u>Coal</u> P.O.H. wash out on heavy weight collars.
10820-10830		Sample in hole - predominantly coal and minor shale and sandstone
10830-10840		" " " " "
10840-10850	50	<u>Sandstone</u> , white to cream, fine to medium grained, firm to hard, angular to rounded, moderately well sorted, tight, clay choked. Pale blue to white fluorescence, medium cut - fluorescence over 10% of sand aggregates.
Oil Show	40 10	<u>Coal</u> <u>Shale</u> , dark brown, carbonaceous

DEPTHS	%	DESCRIPTION
10850-10860	70	<u>Sandstone</u> as above - 2% show fluorescence, weak cut
	30	<u>Coal</u> as above
		Trace shale, siltstone
10860-10870	100	<u>Sandstone</u> as above. No show. Trace coal, siltstone and shale
10870-10880	100	<u>Sandstone</u> . show - possible very weak pale yellow fluorescence, very weak cut. Trace shale, siltstone, coal
10880-10890	100	<u>Sandstone</u> , as above Trace shale, siltstone, coal
10890-10900	100	<u>Sandstone</u> as above Trace shale, siltstone and coal
10900-10910	90	<u>Sandstone</u> as above
	10	<u>Coal</u> , as above
		Trace shale and siltstone
10910-10920	30	<u>Sandstone</u> as above
	10	<u>Siltstone</u> as above
	10	Shaley <u>coal</u>
10920-10930	80	<u>Sandstone</u> as above
	10	<u>Siltstone</u> as above
	10	<u>Coal</u>
		Trace shale
10930-10940	70	<u>Sandstone</u> as above
	20	<u>Siltstone</u> as above
	10	<u>Shale</u> as above
		Trace coal
10940-10950	30	<u>Sandstone</u> as above
	30	<u>Siltstone</u>
	20	<u>Shale</u> , silty, as above
	20	<u>Coal</u> as above
10950-10960	30	<u>Sandstone</u> as above
	30	<u>Siltstone</u> as above
	20	<u>Shale</u> as above
	20	<u>Coal</u> as above
10960-10970	50	<u>Sandstone</u> as above. Trace pale blue-white patchy fluorescence and weak cut.
	20	<u>Siltstone</u> as above
	20	<u>Shale</u> as above
	10	<u>Coal</u> as above
10970-10980	50	<u>Sandstone</u> as above. Trace minor spotty fluorescence and very weak cut.
	20	<u>Siltstone</u> , shaley
	20	<u>Shale</u> as above
	10	<u>Coal</u> as above
10980-10990	80	<u>Sandstone</u> as above
	10	<u>Siltstone</u> as above
	10	<u>Shale</u> as above
10990-11000	80	<u>Sandstone</u> as above
	10	<u>Siltstone</u> as above
	10	<u>Shale</u> as above

T.D. 11003'

CORE ANALYSIS RESULTS

Company ESSO AUSTRALIA LTD. Formation _____ File AP3-222
Well NARIMBA No. 1 Core Type CONV. Date Report 10 OCT 1973
Field _____ Drilling Fluid _____ Analysts GAK, WWF
County _____ State _____ Elev. _____ Location _____

Lithological Abbreviations

SAND - SD DOLOMITE - DOL ANHYDRITE - ANHY SANDY - SDY FINE - FN CRYSTALLINE - XLN BROWN - BRN FRACTURED - FRAC SLIGHTLY - SL/
SHALE - SH CHERT - CH CONGLOMERATE - CONG SHALY - SHY MEDIUM - MED GRAIN - GRN GRAY - GY LAMINATION - LAM VERY - V/
LIME - LM GYPSUM - GYP FOSSILIFEROUS - FOSS LIMY - LMY COARSE - CSE GRANULAR - GRNL VUGGY - VGY STYLOLITIC - STY WITH - W/

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCY	POROSITY PER CENT	RESIDUAL SATURATION PER CENT PORE		SAMPLE DESCRIPTION AND REMARKS
				OIL	TOTAL WATER	

1	9550	1.9	19.1			AT OVERBURDEN PRESSURE
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These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

NARIMBA 1LOGGING RUN #5 GUNS 1 AND 2

1. 10,978 Sandstone, grey, fine to medium grained, well compacted, firm, abundant clay cement. Tight, poor porosity and permeability. Interlaminated shaley partings. No show.
2. 10,974 NO RECOVERY.
3. 10,970 Sandstone with interlaminated silty shale partings. Sandstone, fine to medium grained, firm, to hard, local dolomitic ? cement.
4. 10,920 Siltstone, shaley, grey to dark grey, dolomitic in part, very hard to firm, weakly laminated, even parallel bedding, carbonaceous debris along bedding planes.
5. 10,894 Sandstone, grey to dark grey, fine to medium grained, laminated with shaley siltstone interbeds. Firm to hard, well compacted, clay matrix. Even parallel bedding. No shows. Carbonaceous debris in shaley siltstone laminae.
6. 10,874 Sandstone, grey to dark grey, fine to medium grained, silty with silty clay matrix, moderate to poor sorting, massive to weakly developed bedding, well compacted, firm to hard. Weak patchy yellow fluorescence in upper 1/3 segment of core - with weak pale yellow cut. Lower 2/3 of core face water wet - no fluorescence. Possible residual oil.
7. 10,860 Siltstone, dark grey, brown, very shaley, firm to hard, well compacted, massive to weakly developed bedding, carbonaceous flecks and debris. No show.
8. 10,848 NO RECOVERY - lost barrel.
9. 10,844 Siltstone, dark grey to grey, very shaley, firm to hard, massive to weakly developed even parallel bedding. Carbonaceous, micaceous. No shows.
10. 10,798 Siltstone, dark grey brown, very shaley, firm to hard, well compacted, massive to weakly developed bedding. Carbonaceous, micaceous. No show.
11. 10,770 Shale, dark grey brown, weakly silty, firm to hard, well compacted, carbonaceous and micaceous. Poorly developed bedding.
12. 10,704 Shale, dark grey brown, very silty, firm to hard, well compacted, carbonaceous, micaceous, massive to weakly developed bedding.
13. 10,640 Siltstone, dark grey, massive, shaley, firm to hard, well compacted. No show. Carbonaceous and micaceous
14. 10,606 Sandstone, grey, very fine to medium grained, firm to hard, moderate to poor sorting, subangular to subrounded, silty clay matrix, carbonaceous, silty interlaminations. No show.
15. 10,556 Siltstone, dark grey brown, firm to hard, poor sorting, very shaley with carbon debris. Massive.
16. 10,460 NO RECOVERY
17. 10,396 Sandstone, grey, fine to coarse grained, dominantly fine to medium grained, angular to subrounded, poorly sorted, massive, clay choked. Firm to hard, well consolidated, tight. No show.

18. 10,360 Sandstone, grey, fine to very fine grained, silty, massive, firm, clay choked, trace carbonaceous flecks. No show. Poor porosity and permeability.
19. 10,348 Sandstone, grey, fine to medium grained, trace silt sized quartz associated with clay matrix. Firm to friable, moderately well sorted, subangular to subrounded, massive. Frequent dark grey to black lithics of smoky quartz and heavy ? minerals. Poor porosity and permeability. Tight.
20. 10,337 Sandstone; grey to light tan, weakly shaley and abundant clay matrix. Firm to soft, fine to medium grained, subangular to subrounded, moderately well sorted, clay choked, tight. Poor porosity and permeability. Well compacted.
21. 10,294 Shale, grey to brown, massive to weakly laminated, weakly silty, trace carbonaceous flecks and mica. Firm to hard, well compacted.
22. 10,248 Sandstone, grey to light tan, fine to medium grained, firm to soft, moderately well sorted, subangular to subrounded, massive, abundant clay matrix, tight. No show.
23. 10,200 Siltstone, shaley, dark grey to grey, firm to soft, massive, moderately well sorted, abundant clay matrix, tight, poor porosity and permeability. No show.
24. 10,130 Sandstone, grey, fine to very fine grained, soft to firm, silty, massive, moderately well sorted, abundant clay matrix. Tight, poor porosity and permeability, no show.
25. 10,084 Siltstone, dark grey brown, argillaceous, firm, massive, carbonaceous, micaceous, tight. No show.
26. 10,048 Sandstone, silty, grey, fine to coarse grained, dominantly fine to medium grained, firm to soft, massive, well compacted, clay with associated silt matrix, poor sorting. Tight. Patchy yellow to white fluorescence, weak yellow to white cut. Residual oil.
27. 10,038 Siltstone, dark grey brown, very argillaceous, firm to hard, well compacted, massive. Carbonaceous, micaceous, no show.
28. 10,000 Siltstone, dark grey brown, very argillaceous, firm to hard, well compacted, massive, carbonaceous, micaceous, tight.
29. 9,950 Shale, grey to brown, massive to weakly bedded, weakly silty, firm to hard, well compacted. Trace carbonaceous flecks. Micromicaceous.
30. 9,914 Shale, dark grey brown, silty, firm to hard, even parallel micro bedding. Weakly carbonaceous, micaceous.
- GUN #2
1. 10,848 NO RECOVERY
2. 9,900 Shale, dark grey brown, firm to hard, massive, silty, weakly carbonaceous.
3. 9,886 NO RECOVERY.
4. 9,850 Sandstone, light grey, fine to coarse grained, dominantly medium to coarse grained, subangular to subrounded, moderate to poor sorting, silty clay matrix. Massive, no apparent bedding. Poor porosity and permeability. No show.

5. 9,784 Sandstone, white to light grey with shaley carbonaceous laminations and partings. Sandstone fine to very fine grained, angular to rounded, moderately well sorted, clay choked, quartzose. Poor porosity and permeability. Tight. No show. Shaley carbonaceous partings indicate weakly developed cross-bedding.
6. 9,680 Shale, grey brown, massive to weakly bedded, very weakly silty, firm to hard, well compacted.
7. 9,650 Shale, grey brown, with interlaminated siltstone lense. Firm to hard, well compacted, micromicaceous. Massive to weakly bedded. Shale section shows no bedding.
8. 9,620 Shale, grey brown to grey, with silty interlaminations, firm, well compacted and consolidated, weakly carbonaceous and micaceous. Even parallel bedding depicted by silty micro laminations.
9. 9,558 Siltstone, grey brown with associated very fine grained sandstone, shaley, massive to weakly bedded (even parallel) carbonaceous flecks and partings. Tight, well compacted.
10. 9,470 Sandstone, laminated, silty, white to grey, fine to very fine grained, firm to hard, well compacted, quartzose, with even, parallel, shaley laminations. Matrix clay. Tight. No show. Poor porosity and permeability.
11. 9,420 Siltstone, dark grey brown, argillaceous, hard to very hard, dolomitic, massive, with abundant associated clay matrix.
12. 9,360 Sandstone, grey to grey brown with shaley partings. Firm to hard, sand with associated silty clay matrix. Shaley partings with carbonaceous debris.
13. 9,246 Shale, grey brown, massive, firm, weakly silty, no apparent bedding. Trace microcrystalline pyrite, weakly micaceous.
14. 9,190 Interlaminated siltstone, silty mudstone and shaley siltstone, grey to brown grey, firm to soft, moderately well compacted, even parallel bedding. Trace carbonaceous flecks and filaments.
15. 9,170 Siltstone. Very argillaceous, grey brown, firm to moderately hard, well consolidated. Micro-micaceous.
16. 9,160 Shale, grey brown, massive to very weakly bedded, firm to hard, weakly silty, trace carbonaceous flecks and mica.
17. 9,120 Shale, dark brown grey, laminated, silty, carbonaceous, and micro-micaceous. Even parallel bedding defined by silty laminations.
18. 9,110 Shale, very silty, dark brown grey, massive to very poorly developed bedding, micro-micaceous and carbonaceous.
19. 9,100 Interlaminated grey siltstone and dark grey brown argillaceous siltstone. Firm to soft, well consolidated, even parallel bedding. Weakly carbonaceous.
20. 9,080 Interlaminated grey siltstone and dark grey brown argillaceous siltstone as above.

21. 9,070 Interlaminated siltstone and argillaceous siltstone as above.
22. 9,060 Shale, dark brown, massive, weakly silty, firm to hard, well compacted, strongly carbonaceous with coaly filaments and flecks.
23. 9,028 NO RECOVERY
24. 9,020 Shale, massive, grey brown, pyritic with scattered pyrite nodules (aggregates of microcrystals). Minor carbonaceous debris. Minor siltstone.
25. 8,930 Shale, weakly silty, brown to grey brown, evenly parallel bedded, firm to hard, well compacted, weakly developed minor silty interlaminations. Minor carbonaceous debris along bedding.
26. 8,920 Shale, very silty, grey brown, evenly laminated with silty shale interlaminations. Carbonaceous flecks and debris in shaley partings.
27. 8,910 Sandstone, silty, grey to dark grey, with carbonaceous shaley laminations, sandstone fine to very fine grained, subangular to subrounded, moderately sorted. Even parallel bedding shown by carbonaceous shaley laminations. No shows.
28. 8,880 Sandstone, grey, medium to coarse grained, dominantly medium grained with abundant silt associated with clay matrix, firm to friable, quartzose, massive, angular to subrounded, moderate to poor sorting, moderate to poor porosity, poor permeability, no fluorescence or cut.
29. 8,860 Shale with interlaminated grey brown very argillaceous siltstone. Shale dark brown to brown, carbonaceous, micro-micaceous. Even parallel bedding.
30. 8,850 Shale with grey brown argillaceous siltstone interlaminations. As above.

A.K. Svalbe
October 1973

NARIMBA-1

A.J. Mebberson
1.9.1973

DEPTHS	%	DESCRIPTION
		Set 20" casing 675'. Drilled out with OSC-3A bit.
772- 920	100	<u>Calcarenite</u> - skeletal, bryozoans, shell fragments, grey to white
920-1010	100	<u>Calcarenite</u> as above
1010-1520	100	<u>Calcarenite and calcirudite</u> , as above, trace calcareous cement, mostly loose skeletal material as above.
1520-1850	100	<u>Calcarenite</u> as above, skeletal material, becoming finer around 1700'.
1850-2000	100	<u>Calcarenite</u> as above, loose generally fragmented bryozoan and coral remains, well sorted, loose.
2000-2180	100	<u>Calcarenite</u> as above, trace calcareous cement
2180-2240	100	<u>Calcarenite</u> as above
2240-2330	100	<u>Calcarenite</u> as above, slightly coarser fragments, grey to yellow to white.
2330-2450	100	<u>Calcirudite</u> , grey to white, shell and bryozoan fragments
2450-2540	100	<u>Calcirudite</u> as above, moderate to poor sorting, sandstone-rudite
2540-2750	100	<u>Calcirudite</u> as above becoming finer, moderately soft micrite matrix
2750-2780	100	<u>Calcirudite</u> as above
2780-2810	100	<u>Calcarenite</u> , argillaceous, moderately softly micritic, predominantly fine to coarse skeletal fragments
2818 C.O.		P.O.H. to run 13-3/4 casing
		W. W. Hallstein
2818-3350	60 30 10	<u>Mudstone</u> , medium grey, soft, plastic, very fossiliferous, bryozoan etc. grading to 30% <u>calcarenite</u> , white, unconsolidated, fossil fragments <u>Siltstone</u> , medium grey to light brown, very argillaceous, slightly calcareous, siliceous, hard.
3350-3470	60 30 10	<u>Mudstone</u> as above <u>Calcarenite</u> as above <u>Siltstone</u> - as above, with few fragments chert, orange, sandy with very coarse angular grains. Trace siltstone.
3470-3500	60 30 10	<u>Mudstone</u> , medium grey to grey green to grey brown. <u>Calcarenite</u> as above <u>Siltstone</u> - as above, no chert.
3500-3770	60 30 10	<u>Mudstone</u> , medium grey to blue grey <u>Calcarenite</u> as above <u>Siltstone</u> as above
3770-3800	80 20	<u>Mudstone</u> , medium grey, some blue grey to grey brown, calcareous, less fossil, firmer, occasional silty streaks Fossil hash (<u>calcarenite</u>) as above
3800-3920	80 20	<u>Mudstone</u> as above Fossil hash (<u>calcarenite</u>) as above Rare pyrite fragments

DEPTHS	%	DESCRIPTION
3920-4070	80	<u>Mudstone</u> as above, becoming firmer, very fossiliferous, bryozoan, foraminiferous, etc.
	10	<u>Calcarenite</u> , as above
	10	<u>Siltstone</u> , medium grey, very argillaceous, calcareous
4070-4160	80	<u>Mudstone</u> as above, up to 30% fossil fragments
	10	<u>Calcarenite</u> , as above
	10	<u>Siltstone</u> as above
4160-4190	90	<u>Mudstone</u> as above with occasional thin lignitic parting
	10	<u>Calcarenite</u> as above Trace siltstone
4190-4340	100	<u>Mudstone</u> , medium grey to grey brown, calcareous, soft to medium firm, with fossil fragments and forams
4340-4430	100	<u>Mudstone</u> as above with rare pyrite. <u>Mudstone</u> becoming firmer, very slight fissile/hackley. Some silty.
4430-4460	100	<u>Mudstone</u> , medium grey to grey brown, firm, calcareous, very slight pyrite, fossiliferous with bryozoa, forams, pely fragments.
4460-4520	100	<u>Mudstone</u> , as above, some medium brown, silty
4520-4580	100	<u>Mudstone</u> as above with rare trace glauconite
4580-4640	90	<u>Mudstone</u> as above
	10	<u>Limestone</u> , tan to light brown, argillaceous, glauconitic
4640-4700	80	<u>Mudstone</u> as above
	20	<u>Limestone</u> , very argillaceous, grading to shale, calcareous
4700-4760	90	<u>Mudstone</u> as above, less fossiliferous.
	10	<u>Limestone</u> .
4760-4790	90	<u>Shale</u> , medium grey, some brown, calcareous, slightly fossiliferous, foraminiferous, firm, slightly fissile,
	10	<u>Limestone</u> , brown, very argillaceous, soft, silty
4790-4850	90	<u>Shale</u> , as above, trace pelletal
	10	<u>Limestone</u>
4850-4910	70	<u>Shale</u> as above
	30	<u>Limestone</u> , brown, very fine calcarenite, very argillaceous, slightly micaceous, occasional glauconite
4910-4940	70	<u>Shale</u> as above
	30	<u>Limestone</u> as above, much caving, probably more limestone
4940-5000	100	<u>Shale</u> - 80% medium grey and brown, calcareous, fossiliferous, as above; 20% brown, calcareous to very calcareous, soft, occasional glauconite, silty 10' samples below 5000'
5000-5020	50	<u>Shale</u> , medium grey
	50	<u>Shale</u> , brown, calcareous, silty
5020-5110	100	<u>Shale</u> , brown, calcareous to very calcareous, silty, some glauconite as above
5110-5130	90	<u>Shale</u> as above
	10	<u>Siltstone</u> , light grey to light brown, <u>hard</u> , tight, slightly argillaceous, slightly calcareous, rare glauconite

DEPTHS	%	DESCRIPTION
5130-5150	70	<u>Shale</u> , brown, calcareous to very calcareous, silty as above
	30	<u>Shale</u> , medium grey, soft, calcareous, probably cavings, occasional fragments limestone, brown, pelletal/medium calcarenite, hard. Much caving.
5150-5180	80	<u>Shale</u> as above
	10-20	<u>Limestone</u> , brown, micritic to very fine calcarenite, hard, silty
5180-5200	100	<u>Shale</u> as above Trace limestone. Very poor samples
5200-5230	50	<u>Shale</u> , brown as above
	50	<u>Shale</u> , medium grey as above, possible cavings. Trace limestone, micritic as above
5230-5300	80	<u>Shale</u>
	20	<u>Limestone</u> , brown, micritic, silty to very silty, hard, trace pyrite
5300-5320	80	<u>Shale</u> , brown, calcareous, soft to firm, silty to very silty
	20	<u>Limestone</u> , brown, micritic, silty to very silty. Appears limey streaks in shale. Trace pyrite
		30' samples -
5330-5410	80	<u>Shale</u> as above
	20	<u>Limestone</u> as above. Very poor samples
5410-5460	80	<u>Shale</u> as above
	20	<u>Limestone</u> grading to siltstone
5460-5530		No samples
5530-5600		Probably as above. Very poor samples
5600-5620	90	<u>Shale</u> , brown to dark brown, firm, calcareous, silty, slightly micaceous,
	10	<u>Limestone</u> , brown, micritic, silty, hard, trace pyrite
5620-5640	100	<u>Shale</u> , light grey, soft, calcareous, appears to be 100% caving.
5640-5660	80	<u>Shale</u> , light grey, slightly fossiliferous, calcareous, tough, fissile, probably caving.
	20	<u>Shale</u> , dark brown, soft, poorly fissile, some silty to very silty, rare large forams, trace pyrite
5660-5820	90	<u>Shale</u> , dark brown as above
	10	<u>Limestone</u> , tan to brown, micritic, silty
5820-5920	80	<u>Shale</u> as above
	20	<u>Limestone</u> , tan, micritic. Trace pyrite
5920-5950	50	<u>Shale</u> as above
	30	<u>Limestone</u> as above, dolomitic
	20	<u>Siltstone</u> , grey to tan to light green, very dolomitic, hard, slightly pyritic, probably very finely glauconitic
5950-5960	90	<u>Shale</u> as above
	10	<u>Siltstone</u> , light green, glauconitic as above Trace coarse sandstone grains in sample. Well rounded, some frosted.
5960-5970	70	<u>Sandstone</u> , fine to very coarse, subrounded to well rounded, poor sorting, some frosted, glauconitic, probably conglomeratic, unconsolidated,
	30	<u>Shale</u> as above

DEPTHS	%	DESCRIPTION
5970-5990	70	<u>Sandstone</u>
	10	<u>Siltstone</u> as above, light green to tan
	10	<u>Shale</u>
5990-6030	50	<u>Shale</u>
	30	<u>Sandstone</u>
	20	<u>Siltstone</u>
6030-6050	10	<u>Sandstone</u> , glauconitic
	50	<u>Shale</u>
	20	<u>Siltstone</u> , grey to tan, dolomitic, some glauconite
	20	<u>Dolomite</u> , tan, some silty, micritic
6050-6080	50	<u>Siltstone</u>
	10	<u>Dolomite</u>
	10	<u>Sandstone</u>
	30	<u>Shale</u>
6080-6090	80	<u>Sandstone</u> as above
	20	<u>Coal</u> , black to brown, pyritic, in part shaley
6090-6100	100	<u>Coal</u>
6100-6110	30	<u>Shale</u> , brown to dark brown, firm, coaly partings
	30	<u>Coal</u>
	40	<u>Sandstone</u> as above
6110-6120	100	<u>Shale</u> as above
6120-6150	50	<u>Shale</u>
	30	<u>Coal</u>
	20	<u>Siltstone</u> , brown, some very argillaceous, some micaceous
6150-6190	80	<u>Shale</u>
	20	<u>Siltstone</u> . Trace sandstone as above. Trace pyrite. Poor samples
6190-6200	80	<u>Shale</u>
	20	<u>Sandstone</u> , light grey, fine to very fine, subrounded, fair sorting, some glauconitic, dolomitic. Trace coal. Poor samples
6200-6210	60	<u>Sandstone</u> as above
	20	<u>Shale</u>
	20	<u>Coal</u> . Appear interbedded and interlaminated.
6210-6240	70	<u>Sandstone</u>
	20	<u>Shale</u>
	10	<u>Coal</u>
6240-6250	70	<u>Sandstone</u>
	20	<u>Shale</u>
	10	<u>Coal</u>
6250-6260	90	<u>Sandstone</u> , white, very fine, subangular, fair sorting, some dolomitic, one fragment with pale white fluorescence and cut, tight, hard.
	10	<u>Coal</u>
6260-6280	90	<u>Sandstone</u>
	10	<u>Shale</u> as above. Trace very coarse, well rounded sandstone grains in sample. No show.

DEPTHS	%	DESCRIPTION
6280-6310	40	<u>Sandstone</u>
	60	<u>Coal</u>
6310-6320	30	<u>Shale</u> , dark brown, firm, coaly partings, in part silty
	30	<u>Coal</u>
	40	<u>Sandstone</u> , white, very fine, subangular, hard, tight, fair sorting, coaly partings. Trace pyrite
6320-6350	70	<u>Sandstone</u>
	20	<u>Shale</u>
	10	<u>Coal</u>
6350-6360	50	<u>Sandstone</u>
	50	<u>Shale</u> Trace pyrite
6360-6380	40	<u>Sandstone</u>
	40	<u>Shale</u>
	20	<u>Coal</u>
6380-6390	80	<u>Sandstone</u>
	10	<u>Shale</u>
	10	<u>Coal</u>
6390-6400	70	<u>Coal</u>
	20	<u>Sandstone</u>
	10	<u>Shale</u>
6400-6410	50	<u>Sandstone</u>
	40	<u>Shale</u>
	10	<u>Coal</u>
6410-6430	30	<u>Sandstone</u>
	30	<u>Shale</u>
	30	<u>Siltstone</u> , brown, argillaceous, firm
	10	<u>Coal</u>
6430-6450	70	<u>Sandstone</u> , pyritic
	20	<u>Shale</u>
	10	<u>Coal</u>
6450-6460	60	<u>Sandstone</u>
	30	<u>Siltstone</u> , tan, firm, argillaceous, in part coaly
	10	<u>Shale</u>
6460-6490	80	<u>Sandstone</u> , pyritic
	10	<u>Shale</u>
	10	<u>Coal</u>
6490-6510	70	<u>Sandstone</u>
	20	<u>Shale</u>
	10	<u>Coal</u>
6510-6520	50	<u>Sandstone</u> , fine to medium
	50	<u>Shale</u> , trace pyrite
6520-6530	80	<u>Sandstone</u> , light grey to white, fine to medium, subrounded to subangular, fair sorting, tight, hard, some lithic grains, rare glauconite
	20	<u>Shale</u> , trace pyrite

DEPTHS	%	DESCRIPTION
6530-6560	100	<u>Sandstone</u> as above, chiefly medium to coarse
6560-6570	80	<u>Sandstone</u>
	20	<u>Shale</u> , trace tan micritic dolomite
6570-6580	30	<u>Sandstone</u> , fine to medium, as above
	50	<u>Siltstone</u> , tan to brown, argillaceous, sandy, coaly partings, firm
	10	<u>Shale</u> , dark brown, slightly dolomitic, firm.
	10	Micritic <u>dolomite</u> , in part silty
6580-6600	40	<u>Sandstone</u>
	20	<u>Siltstone</u>
	20	<u>Shale</u>
	20	<u>Dolomite</u>
6600-6610	100	<u>Shale</u> , dark brown, firm, in part coaly, with trace sandstone and dolomite as above
6610-6620	80	<u>Sandstone</u> , light grey to white, very fine to medium, subangular to subrounded, fair sorting, hard, tight, trace lithics, trace pyrite
	20	<u>Shale</u>
6620-6630	60	<u>Sandstone</u>
	20	<u>Shale</u>
	20	<u>Coal</u>
6630-6640	100	<u>Sandstone</u> , very pyritic
6640-6650	60	<u>Sandstone</u>
	40	<u>Shale</u>
6650-6700	100	<u>Sand to sandstone</u> , coarse to very coarse, conglomeratic, poor sorting, subrounded to well rounded, some frosted grains.
6700-6720	80	<u>Sandstone</u>
	20	<u>Shale</u>
6720-6730	100	<u>Sandstone</u> , light grey to white, fine to medium, poorly sorted, subrounded to subangular, trace lithic grains, hard, tight.
6730-6760	100	<u>Coal</u>
6760-6780	80	<u>Sandstone</u> , white, very fine to medium, as above, pyritic
	20	<u>Shale</u> , dark brown, as above
6780-6800	80	<u>Sandstone</u>
	20	<u>Coal</u>
6800-6810	60	<u>Siltstone</u> , brown, very argillaceous, coaly partings
	40	<u>Sandstone</u>
6810-6820	100	<u>Coal</u>
6820-6830	100	<u>Siltstone</u> , some glauconite
6830-6840	100	<u>Siltstone</u> , white, clean, hard, tight
6840-6850	100	<u>Siltstone</u> , brown, argillaceous, coaly, hard, tight, dolomitic, in part sandy, micaceous
6850-6890	70	<u>Siltstone</u> , as above, some argillaceous, some pyritic
	30	<u>Sandstone</u> , fine to medium, hard, tight, some pyritic

PETROGRAPHY OF TWO ARENACEOUS SEDIMENTS FROM A DRILL CORE

Sample: S136: TS 31210:

Location:
9303'

Rock Name:
Arkosic Conglomerate

Hand Specimen:

The rock consists of small pebbles (5-10mm) of varying degrees of roundness set in a medium grained (sand sized) sandy matrix. A green pebble is well rounded, quartzose pebbles are more angular.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Framework	90-95
Matrix	5-10
Quartz	60-70
Feldspar	15-25
Tourmaline	5
Biotite	1
Muscovite	1
Chert	5
Kaolin/illite	5
Opagues	tr
Carbornate	tr

The rock consists of an aggregate of pebbles and other lithic detrital material consolidated by diagenetic solution and recrystallisation and partly cemented by authigenic kaolin.

The pebbles are of various sorts. The two largest in thin section are grains of fairly fresh microcline (8-10mm) which contain inclusions (1-2mm) of altered plagioclase, muscovite, biotite and quartz. Another large well rounded grain is composed of chert carrying small amounts of white mica. Other smaller pebbles (3-5mm) are composed of compound grains of quartz, some of which contains grains (1mm) of either biotite or tourmaline.

Smaller detrital grains are generally monomineralic and are mainly quartz, with quite abundant tourmaline and some feldspar. These grains tend to be subangular and show signs of solution where two grains have been pressed together. The tourmaline is of variable colour. Along the c axis the dominant colour is yellow brown, but other grains are greenish brown. In other orientations the pleochroism is very marked varying from colourless to deep brown, light brown to deep green, fawn to grey green

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Please address all correspondence to the Director
In reply quote: 3/178/0

29 October 1973

Esso Standard Oil (Australia) Ltd
A.M.P. Building
Circular Quay
SYDNEY NSW 2000

*Bass Basin
Narimba-1*

Attention: Mr V.A. Robinson

REPORT MP 1727/74

YOUR REFERENCE: Order S.17207, account 5.308-233.013.141.
MATERIAL: Cores.
IDENTIFICATION: S136/7.
DATE RECEIVED: 25/10/73.
WORK REQUIRED: Petrography

Investigation and Report by: Dr R. Davy

Officer in Charge, Mineralogy/Petrology Section: Dr K.J. Henley.

AN APOLOGY

Because of rationing of paper by our suppliers we regret that we must temporarily limit the number of copies of reports and other documents to clients.

As soon as supplies return to normal we will revert to our previous arrangements.

AMDEL

K.J. Henley

for F.R. Hartley
Director

in different grains, with one or two grains even showing a trace of blue. The tourmaline grains are angular (broken), many show signs of zoning.

Opaques are red brown in colour and are rare: they are probably goethite.

Kaolin does not occupy a large part of this rock. It occurs as aggregates of small (0.04mm) grains filling gaps between the framework grains. In a few places it is accompanied by traces of carbonate and/or illitic clay. The present pore space appears to be in the range of 5-8%.

The provenance of this rock is acidic, probably plutonic igneous, since there is no sign of orientation of the micas present in the pebbles. However, the relative abundance of tourmaline suggests that hydrothermal activity, with boron-rich fluids, has been prominent on the formation of the igneous rocks. Such activity, however, has not affected the feldspar to any great extent. The presence of chert also indicates a sedimentary component. The environment of deposition has been of high-medium energy. Later diagenetic effects can be largely related to solution followed by some redeposition under the influence of compacting forces, and deposition of kaolin (and carbonate) from the ground waters.

Sample: S137: TS 31211:

Location:

9750'

Rock Name:

Argillaceous sandstone

Hand Specimen:

A rock composed of dominantly sand sized siliceous grains cemented by fine-grained white material. The rock is friable. Dark minerals are rare.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Quartz	80-85
Authigenic Kaolin	10-15
Carbonate	tr
Feldspar	tr-5
Altered titanium minerals	tr

The rock consists of aggregates of angular, anhedral, subequant quartz grains, together with a limited number of altered feldspar grains, separated by a matrix consisting largely of authigenic kaolin with trace amounts of carbonate.

The quartz shows the effects of compaction, and triple-point junctions tend to be present where quartz grains are in contact. In places overgrowths of quartz have developed, but more commonly the quartz shows marginal corrosion. A few rather rounded 'pebbles' of chert and quartzite are present. The quartz and other framework grains are in the size range 0.175-1.0mm with most grains being in the range 0.3-0.6mm.

A few rounded K-feldspar grains of size similar to that of the quartz are partly altered, but the greater part of the feldspar is almost wholly altered. It has a brown turbid appearance with local formation of both illitic mica and of ?kaolin.

The interstitial clay is almost wholly authigenic kaolin. This occurs in aggregates of book-like grains of varying (individual) size up to 0.06mm. Traces of carbonate, probably dolomite, occur with the clay. Well formed rhombs are present and some carbonate has penetrated along quartz-quartz boundaries.

Accessory minerals are very rare. Quartz contains very rare small inclusions of droplike zircon, and prisms of tourmaline. One grain of partly altered ?rutile was noted.

It is difficult to estimate the pore spaces because of the friable matrix of the rock, it probably exceeds 5%.

This appears to have been a relatively well sorted feldspathic sandstone laid down in low-medium energy conditions, which has been modified by diagenetic changes probably wholly due to the effects of burial. The source material for this rock is rather different for that of S136. There is little tourmaline in this specimen. Unfortunately the feldspar is too altered to allow for adequate comparison with the feldspar of S136 though both K-feldspar and plagioclase appear to be present. In comparison with the other sample deposition has probably occurred in deeper waters.

CORE ANALYSIS RESULTS

NOTE: (i) Unless otherwise stated, porosities and permeabilities were determined on two plugs (V&H) cut vertically and horizontally to the axis of the core. Ruska porosimeter and permeameter were used with air and dry nitrogen as the saturating and flowing media respectively. (ii) Oil and water saturations were determined using Soxhlet type apparatus. (iii) Acetone test precipitates are recorded as Neg., Trace, Fair, Strong or Very Strong.

WELL NAME AND NO. WARIMBA NO. 1

DATE ANALYSIS COMPLETED MAY 16, 1975

Core No.	Sample Depth		Lithology	Average Effective Porosity two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm/cc.)		Fluid Saturation (% pore space)		Core Water Salinity (p.p.m. NaCl)	Acetone Test	Fluorescence of freshly broken core	Sample "cut" in tetrachlorethylene
	From	To			V	H	Dry Bulk	Apparent Grain	Water	Oil				
1	9278'0"	9278'4"	Sst; f.gr carb	13.1	<0.1	<0.1	2.37	2.73	2.7	0.3	N.D.	Neg.	N11	N11
1	9282'0"	9282'3"	Sst; f.gr carb slty	8.2	<0.1	<0.1	2.50	2.72	1.9	0.8	N.D.	Neg.	N11	Trace
1	9286'0"	9286'3"	Slst; carb aren	9.4	<0.1	<0.1	2.46	2.72	2.4	5.3	N.D.	Trace	N11	Trace
1	9290'0"	9290'3"	Slst; aren	5.7	<0.1	<0.1	2.54	2.69	13.8	7.3	N.D.	Trace	N11	Trace
1	9294'0"	9294'3"	Sh; carb	1.6	<0.1	<0.1	2.55	2.60	62	30	N.D.	Trace	N11	Fair
1	9298'0"	9298'3"	Sst; f.gr carb	12.3	0.33	<0.1	2.36	2.69	23	7.3	N.D.	Trace	Even spotted Yellow	Trace
1	9302'0"	9302'3"	As above	11.4	<0.1	<0.1	2.40	2.71	1.6	2.5	N.D.	Trace	Even spotted Yellow	Trace
1	9306'0"	9306'3"	Sst; f.gr slty mic	7.5	<0.1	0.12	2.54	2.74	7.7	3.8	N.D.	Neg.	Even spotted Yellow	Trace

Remarks: -

General File No. 74/1076
Well File No. _____

CORE ANALYSIS RESULTS

NOTE: (i) Unless otherwise stated, porosities and permeabilities were determined on two plugs (V&H) cut vertically and horizontally to the axis of the core. Ruska porosimeter and permeameter were used with air and dry nitrogen as the saturating and flowing media respectively. (ii) Oil and water saturations were determined using Soxhlet type apparatus. (iii) Acetone test precipitates are recorded as Neg., Trace, Fair, Strong or Very Strong.

WELL NAME AND NO. NARIMBA NO. 1

DATE ANALYSIS COMPLETED May 16 1975

Core No.	Sample Depth		Lithology	Average Effective Porosity two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm/cc.)		Fluid Saturation (% pore space)		Core Water Salinity (p.p.m. NaCl)	Acetone Test	Fluorescence of freshly broken core	Sample "cut" in tetrachlorethylene
	From	To			V	H	Dry Bulk	Apparent Grain	Water	Oil				
2	9544'0"	9544'3"	Sst; f.gr. carb slty	16.7	0.45	2.2	2.26	2.71	1.7	0.4	N.D.	Neg.	N11	N11
2	9548'0"	9548'3"	Sst; f.gr. to m.gr.	19.5	8.6	0.95	2.17	2.70	0.2	1.3	N.D.	Neg.	N11	N11
2	9552'0"	9552'3"	Sh; slty aren.	8.8	<0.1	4.0	2.47	2.70	18	1.2	N.D.	Trace	Faint Yellow	Fair
2	9556'0"	9556'3"	Slst; aren carb	8.9	<0.1	<0.1	2.49	2.73	33	4.8	N.D.	Neg.	Faint Yellow	Fair
2	9560'0"	9560'3"	Sst; f.gr. Slty carb	10.0	<0.1	<0.1	2.46	2.74	19	2.4	N.D.	Neg.	N11	N11
3	9750'0"	9750'3"	Sst; m.gr. Sh; carb	19.4	45	54	2.16	2.69	4.8	3.4	N.D.	Trace	N11	Trace
3	9754'0"	9754'4"	aren.	1.9	<0.1	<0.1	2.64	2.69	67	33	N.D.	Trace	N11	Fair

Remarks: -

General File No. 74/1076
Well File No. _____

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