P.E.P. 104/108

HYDROCARBON POTENTIAL AND THE PROSPECTS FOR LOCATING HYDROCARBONS

PORT CAMPBELL EMBAYMENT

OTWAY BASIN

PART 2 (APPENDICES)

CONFIDENTIAL

BEACH PETROLEUM N.L.

(Incorporated in South Australia)

P.E.P. 104/108

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PORT CAMPBELL EMBAYMENT

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JDC Patchett

May 1983.

LIST OF CONTENTS

APPENDIX NO. 3

TABLES OF SOURCE ROCK DATA

LIST OF CONTENTS

TABLE 1

VITRINITE REFLECTANCE AND SOURCE ROCK DATA - GELTWOOD BEACH FORMATION

WELL NAME	SAMPLE DEPTH (m)	$\bar{R}O$ MAX %	T.O.C. %	COMMENTS
Flaxmans No. 1	3294	0.91	1.29	No exinite. (Dirty ss. with carb. shale clasts. D.O.M. rare except in carb. shale but only approx. 5% in carb. shale. SF and V clasts, some micrinite present in vitrinite).
	3513	1.16	ND	Very rare cutinite with dull brown fluorescence. (Ss. with coaly layers and vitrinite layers. V SF).
Pecten No. 1-1A	2738	0.51	ND	Exinite to 20%, chiefly sporinite dominant orange but ranging yellow to dull orange. (abundant, ? bitumen R 0.12%).
	2831	0.68	ND	Sparse to abundant sporinite, orange, ranging yellow orange to dull orange, minor fluorinite. (One grain $\bar{R}o$ max 1.0%, presumed to be contminant and omitted.)
Port Campbell No. 4	2523.4	0.77	0.75	-

TABLE 2

VITRINITE REFLECTANCE AND SOURCE ROCK DATA EUMERALLA FORMATION

WELL NAME	SAMPLE DEPTH (m)	$\bar{RO}$ MAX %	T.O.C. %	COMMENTS
Braeside No. 1	1700.5	0.52	0.45	Sparse sporinite and cutinite, yellow to orange. (Mudstone with some siltstone, d.o.m. sparse, I=E>V. Inertinite sparse, vitrinite rare. Pyrite rare.)
	1800	0.49	0.39	Rare liptodetrinite and sporinite, orange to dull orange. (Claystone siltstone sandstone, rare massive vitrinite. D.o.m. rare to sparse, V>I>E. Vitrinite rare, Inertinite rare. Carbonate minerals common pyrite rare. The single grain of cutinite-rich coal may be a contaminant.)
	1939.3	0.34	0.18	Rare sporinite, cutinite, and resinite to yellow orange to orange. (Siltstone, d.o.m. sparse, I>> E>V. Vitrinite very rare and the only occurrence found is resinous. Inertinite sparse.)
	2065	0.55	0.70	Sporinite and cutinite, yellow to orange. (Claystone siltstone, sparse to common, I>E>V. Vitrinite rare, inertinite sparse. Two grains of coal present, clarite and vitrinite. Pyrite sparse.)
	2147	0.67	0.51	Rare sporinite, cutinite and resinite, orange. (Claystone with d.o m. spare to common, I=V>E. Vitrinite and Inertinite sparse. Vitrinite phytoclasts relatively large.)
	2234	-	0.28	Rare sporinite, orange to dull orange. (Claystone, d.o.m. sparse, I>> E, no V. Inertinite sparse, exinite very rare.)
Curdie No. 1	2560-70	0.55	1.19	Rare sporinite and cutinite, orange to dull orange. (Claystone=siltstone > sandstone, d.o.m., rare to sparse, I>V>> E. Inertinite, rare, vitrinite rare.)
	2570-80	0.65	1.35	Rare sporinite and cutinite, yellow orange to orange (Siltstone>claystone, d.o.m. rare, I>V>E. Inertinite rare, vitrinite rare. Pyrite rare to very abundant, common overall.)

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TABLE 2 (Continued)

WELL NAME	SAMPLE DEPTH (m)	$\bar{R}O$ MAX %	T.O.C. %	COMMENTS
Curdie No. 1 (Continued)	2590-2600	0.7	1.06	Rare sporinite and cutinite, yellow orange to orange. (Siltstone>sandstone> claystone, d.o.m. rare to sparse, I>E=V. Inertinite rare, vitrinite rare. The large range in the reflectance reported for the vitrinite may be due to a number of factors. Some of the vitrinite has been oxidized and is transitional to inertinite, whereas some may contain suberinite-like tissue which cannot be resolved with an optical microscope. Additionally some contamination from cavings may be present. The opposite nature of some of these effects suggests that the mean as reported is likely to be close to that of the first generation vitrinite from this horizon.
Flaxmans No. 1	2198	0.66	2.8	Exinite rare overall but common in rare coal grains, cutinite and sporinite orange. (Ss with shell fragments, thin coaly scares and some reworked coal. Pyrite present.)
	2199	0.59	ND	
	2280	0.63	ND	Exinite sparse except in coal grains which contain yellow to orange sporinite and cutinite and ?algae. (Similar to above but some grains of vitrinite with abundant micrinite.)
	2332	-	ND	No exinite. (Sandy claystone with some finely dispersed pyrite and rare d.o.m., probably all inertinite. Some rim fluorescence on quartz grains.
	2481	0.73	ND	Sparse liptodertinite and sporinite, yellow orange. (Pale buff fine grained claystone, some pyrite, and small grains of inertinite. Two larger vitrinite layers.
	2486	0.73	ND	Cutinite sparse, yellow to dull orange, rare yellow orange spores. (Ss with abundant thin vitrinite layers, inertinite less abundant, trace of suberinite.)

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TABLE 2 (Continued)

WELL NAME	SAMPLE DEPTH(m)	RŌ MAX %	T.O.C. %	COMMENTS
Flaxmans No. 1 (Continued)	2584	0.74	ND	Cutinite common, medium orange to dull orange, rare yellow orange sporinite. (Vitrinite abundant as interbedded layers and as coal clasts in ss, some vitrinite shows weak fluorescence, some orange fluorescence from ?resin or clay clasts.
	2710	0.66 ?	ND	Rare orange liptodetrinite. (Sandy mudstone with shell fragments, about 3% I V is rare or absent.
	2783	0.6	1.15	Exinite common, sporinite and cutinite yellow orange to orange. (Sandy mudstone with common, thin laminae of vitrinite, some detrital coal. Pyrite present. Bright green fluorescence in mineral cleavage may be from dead oil.
	2899	0.74	ND	Exinite very rare or absent except in coal, as cutinite associated with some layers of vitrinite and abundant in some grains of detrital coal. (Ss. with shell fragments coal approx. 15% vitrinite as layers and as detrital coal. Some SF present. Detrital coal and vitrinite layers have similar vitrinite reflectance
	3087	0.78 0.84	ND	Exinite rare to absent in sandstone. (Thick layers of vitrinite, some layers of coal (conformable), SF present.)
		0.71	ND	Cutinite rare, yellow orange, in silty carb. shale. (D.o.m. chiefly SF but common thin layers of coal with vitrinite present). D.o.m. approx. 15% in both lithologies.)
Pecten No. 1-1A	1805	0.67	ND	-
	1907	-	ND	Bitumen which is soluble in immersion oil, initial reflectance 0.90% falling to 0.18% after 60 seconds.
	2359	0.55		Exinite abundant, sporinite yellow to dull orange. (E up to 20%, I up to 40%, some fluorinite, with bright green fluorescence.)
	1978	0.54	ND	-
	2228	0.56	ND	-
	2453	0.50	ND	Exinite abundant, sporinite green yellow to dull orange. (Clarite rich coal with minor claystones, minor pyrite).

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TABLE 2 (Continued)

WELL NAME	SAMPLE DEPTH (m)	$\bar{R}O$ MAX %	T.O.C. %	COMMENTS
Pecten No. 1-1A (Continued)	2463	0.62	ND	-
	2667	0.63	ND	-
	2742	0.85	ND	-
	2826	0.76	ND	-
Sherbrook No. 1	1239	0.57	-	-
	1590	0.98	-	-

TABLE 3

OTWAY GROUP - KEROGEN DATA

WELL NAME AND NUMBER	DEPTH (M)	THERMAL ALTERATION INDEX	KEROGEN TYPE % * 1	2	3	4	5	6	7
Flaxmans No. 1	2282	2.3	10	10	tr	-	15	55	10
	2332	2.1	15	20	5	10	15	30	5
	2481	2.3	40	10	tr	5	5	35	5
	2584	2.2	30	10	tr	5	10	35	10
	2710	2.3	40	10	tr	5	-	45	-
	2783	2.3	50	5	5	-	5	35	tr
	3085	2.3	20	5	5	5	20	40	5
Port Campbell No. 2	2407	1.8	5	5	5	5	5	65	10
	2409	1.5	15	10	5	10	10	40	10
	2409	1.5	5	10	10	10	10	50	5
	2412	1.8	5	5	5	5	5	70	5
	2468	1.8	5	15	5	10	30	30	5
	2491	1.5	2½	15	5	2½	40	30	5
	2531	1.5	2½	2½	2½	2½	20	60	5
	2534	1.5	5	5	5	10	10	60	5
	2542	1.5	5	10	10	10	15	40	10
	2563	1.5	5	30	10	10	10	30	5
	2564	1.8	5	25	10	15	10	30	5
	2566	1.5	5	30	10	10	10	30	5
	2608	1.8	5	15	5	10	15	40	10
	2612	1.5	5	10	5	10	10	50	10
	2622	1.5	5	10	5	10	20	40	10
	2629	1.8	5	15	10	5	5	50	10
Port Campbell No. 4	1663	2.0	-	-	-	5	-	80	15
	1755	1.5	-	5	15	15	50	10	5
	1854	1.8	-	55	15	10	5	10	5

* 1) Amorphous & Marine
2) Biodegraded Terrestrial
3) Spore-pollen
4) Laminar
5) Cellular
6) Semi-opaque
7) Inert.

Kerogen types, 1, 2, 3 and tend to be oil precussors whilst 4, 5 and 7 are precussors for gas. 6 is indefinite.

TABLE 4

SOURCE ROCK POTENTIAL AND LEVEL OF MATURITY

WAARRE FORMATION

WELL NAME AND NUMBER	DEPTH (M)	$R\bar{O}$ MAX %	T.O.C. %	COMMENTS
Braeside No. 1	1575	0.49	1.62	Sparse sporinite, yellow to dull orange. Rare fluorinite, green. (Claystone=mudstone=siltstone > sandstone. D.o.m. common, I> V=E. Inertinite and vitrinite both sparse. Pyrite common.)
Curdie No. 1	2500-10	0.55	1.82	Rare sporinite and cutinite, orange. (Siltstone>sandstone, d.o.m., sparse, I>V>E. Inertinit sparse, vitrinite rare to sparse Pyrite sparse. Micrinite present in some of the band vitrinite.)
	2530-50	0.56	2.05	Rare sporinite and cutinite, yellow to dull orange. ?Dinoflag-ellates also present, yellow orange. (Siltstone=sandstone>cla stone, d.o.m., sparse, I>V>E. Inertinite sparse, vitrinite rar Rare large nodules of pyrite.)
Flaxmans No. 1	2095	0.62	-	-
	2105	0.55	-	-
Port Campbell No. 1	1740	0.44	ND	Exinite abundant, mainly sporinite, bright yellow, orange, dull orange, cutinite and common bright green fluorinite. (Large grains of clarite E 10%, I trac minor pyrite).
	1807	0.45	ND	As for 1740 m sample.
	1808	0.65	ND	-
Port Campbell No. 2	2564	0.69	3.45	-

TABLE 5

WAARRE FORMATION - KEROGEN DATA

WELL NAME AND NUMBER	DEPTH (M)	TAI	KEROGEN TYPE * 1	2	3	4	5	6	7
Port Campbell No. 4	1517	1.5	5	5	5	20	5	50	10
	1520	1.5	5	5	15	20	10	40	5
	1526	1.8	5	10	10	10	30	30	5
	1570	1.5	-	-	5	10	10	70	5
Port Campbell No. 2	2258	1.5	5	5	2½	2½	5	75	5
	2342	1.8	5	5	5	5	5	70	5
	2342	1.5	5	10	5	5	10	60	5
Port Campbell No. 1	1738	1.5	10	15	5	10	10	45	5
	1739	1.5	5	15	5	10	5	55	5
	2112	1.5	5	40	5	10	5	30	5
	2113	1.5	5	15	5	5	5	60	5
Flaxmans No. 1	2098	1.5	5	10	5	10	5	60	5
	2104	1.5	5	10	5	10	10	55	5
	2105	1.5	5	10	5	10	5	60	5
	2128	1.5	5	10	5	10	10	55	5
	2196	1.5	tr	10	5	10	10	60	5
	2200	1.5	5	20	5	5	5	55	5

* See Footnote for Table 3

TABLE 6

SOURCE ROCK POENTIAL AND LEVEL OF MATURITY

FLAXMANS FORMATION

WELL NAME AND NUMBER	SAMPLE DEPTH (M)	$\bar{R}O$ MAX %	T.O.C. %	COMMENTS
Braeside No. 1	1482.5	0.51	1.19	Rare exinite, sporinite cutinite, orange to dull orange. (Siltstone> claystone, d.o.m. common, I>V>E. Inertinite sparse, vitrinite rare. Vitrinite as small to medium size phytoclasts, some possibly representing in situ roots. Pyrite sparse overall, but some large pyrite nodules.)
Curdie No. 1	2330-2350	0.57	1.47	Rare sporinite cutinite and dinoflagellates, yellow orange to orange. (Mudstone, some sandy, rare claystone. D.o.m. sparse, I>E>V, inertinite sparse, vitrinite very rare. Pyrite sparse.)
	2390-2410	0.57	1.26	Rare cutinite yellow to orange and dinoflagellates, orange. (Siltstone>claystone, d.o.m. I>E>V. Inertinite rare to sparse, vitrinite very rare. Pyrite rare to sparse.
	2430-2450	0.57	1.10	Rare sporinite, dinoflagellates and resinite, orange, cutinite to yellow to orange. (Siltstone > sandstone, d.o.m., sparse I>V E. Inertinite sparse, vitrinite rare. Pyrite sparse, carbonates present, possibly siderite.)
Pecten No. 1-1A	1740	0.54	ND	-
	1741	0.61	ND	-
	1741.2	0.46	ND	-

TABLE 7

KEROGEN DATA FLAXMANS FORMATION

WELL NAME AND NUMBER	DEPTH (M)	TAI	KEROGEN TYPE * 1	2	3	4	5	6	7
Flaxmans No. 1	2014	1.5	10	10	5	5	5	60	5
	2016	1.5	5	5	5	5	5	70	5
	2017	1.5	5	5	5	10	10	60	5
	2020	1.5	15	10	5	10	5	50	5
	2022	1.5	15	5	5	5	5	60	5
	2030	1.5	10	10	5	5	5	60	5
	2082	1.5	5	5	5	5	5	70	5
	2094	1.5	5	10	5	10	10	55	5
Port Campbell No. 4	1492	1.8	-	10	10	20	5	45	5

* See Footnote for Table 3

TABLE 8

SOURCE ROCK POTENTIAL AND LEVEL OF MATURITY

BELFAST FORMATION

WELL NAME AND NUMBER	SAMPLE DEPTH (M)	$\bar{R}O_{MAX}$ %	T.O.C.	COMMENTS
Braeside No. 1	1349.2	0.45	1.27	Rare exinite, dinoflagellates, yellow, > sporinite, orange. (Claystone with abundant ?glauconitic pellets d.o.m. sparse, I> V>E. Inertinite sparse, vitrinite rare, and occurring as small phytoclasts Pyrite sparse.)
Curdie No. 1	1895-1915	0.49	1.65	Rare sporinite, cutinite, dinoflagellates and resinite, yellow orange to orange. (Siltstone with some carbonate and rare coal. D.o.m sparse tending common, I> E=V. Vitrinite rare. Pyrite sparse.
	1990-2010	0.49	1.78	Rare sporinite and dinoflagellates, yellow to orange. (Siltstone, calcareous microfossils, ?glauconite pellets. D.o.m. sparse, I>E>V. Vitrinite rare. Pyrite sparse to common.
	2090-2110	?0.60?	1.90	Rare liptodetinite, yellow to orange. (Claystone and mudstone, d.o.m. sparse, I>E>V Inertinite sparse, vitrinite very rare.)
	2190-2210	0.49	1.91	Rare dinoflagellates, greenish yellow to orange. (Mudstone, d.o.m. sparse to common, I>E>V Inertinite sparse to common, vitrinite very rare. Pyritized foraminifers present. Sparry calcite is present, some of this has bright orange fluorescence.)
	2290-2310	0.52	1.84	Rare dinoflagellates, yellow t orange, ?sporinite orange. (Siltstone, d.o.m. common, I>E>V. Inertinite common. Vitrinite population poorly defined. The modes with higher reflectance appear to be oxidized or heat altered. The lowest of the modes is most likely to be representative of the horizon sampled. Pyrite common.)

TABLE 8 (Continued)

WELL NAME AND NUMBER	SAMPLE DEPTH (M)	$\bar{R}O$MAX %	T.O.C. %	COMMENTS
Flaxmans No. 1	1815	.67	ND	-
Pecten No. 1-1A	1717	0.53	ND	-
Port Campbell No. 1	1532	0.61	ND	-
	1593	0.43	ND	-
	1594	0.62	ND	-
Port Campbell No. 2	1801-1804	0.53	1.80	-
	2256-2258	0.60	1.75	-
	2162-2165	0.62	1.55	-
Sherbrook No. 1	1096	0.74		

TABLE 9

KEROGEN DATA BELFAST FORMATION

WELL NAME AND NUMBER	DEPTH (M)	TAI	KEROGEN TYPE * 1	2	3	4	5	6	7
Flaxmans No. 1	1814	1.5	5	10	5	10	5	60	5
	1816	1.5	5	10	10	10	10	50	5
	1945	1.5	5	10	5	10	5	60	5
	1947	1.8	5	5	5	5	5	70	5
Port Campbell No. 1	1532	1.5	5	10	5	10	5	60	5
	1532	1.5	5	5	5	10	10	60	5
	1533	1.5	10	10	5	10	5	55	5
	1726	1.5	10	10	5	15	10	45	5
Port Campbell No. 2	1801	1.5	5	5	10	5	10	60	5
	1803	1.8	-	10	10	5	10	60	5
	2162	1.5	-	5	5	5	5	75	5
Port Campbell No. 4	1372	1.5	10	5	10	10	-	60	5
	1402	1.5	5	5	5	15	5	60	5
	1403	1.5	5	5	5	10	5	65	5

* See Footnote on Table 3

TABLE 10

SOURCE ROCK POTENTIAL AND LEVEL OF MATURITY

PAARATTE FORMATION

WELL NAME AND NUMBER	SAMPLE DEPTH (M)	$\bar{R}O$MAX %	T.O.C. %	COMMENTS
Flaxmans No. 1	1258	0.53	ND	
Pecten No. 1-1A	1550	0.45	ND	
	1554	0.51	ND	
Port Campbell No. 1	1100	0.51	ND	
	1398	0.64	ND	
Sherbrook No. 1	885	0.74	ND	

TABLE 11

SOURCE ROCK POTENTIAL AND LEVEL OF MATURITY

YOUNGER FORMATIONS

WELL NAME AND NUMBER	SAMPLE DEPTH (M)	$\bar{R}O$MAX %	FORMATION NAME
Pecten No. 1-1A	901	0.46	Dilwyn
	1178	0.56	Pebble Point
Port Campbell No. 1	748	0.40	Pember Mudstone
Sherbrook No. 1	402	0.45	Pember Mudstone