APPENDIX J

Organic Petrology
of Core from Permian
of Hunterston #1
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ORGANIC PETROLOGY OF SOME CORE SAMPLES FROM THE PERMIAN OF TASMANIA

Report

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Appendix 1. Suite one.

KK # Ref #.	Depth (m) /Type	$\overline{R}_v$max	Range	N	**DRILLHOLE H, p 1** Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
					CASCADE GROUP
T8898 Core	828.5 $\overline{R}_I$max	- 2.09	- 1.54-3.46	- 25	Fluorescing liptinite absent. (Siltstone with minor silty claystone. Dom common, I. Inertinite common, vitrinite and liptinite absent. Mineral fluorescence pervasive moderate orange. Iron oxides rare. Pyrite abundant.)
					LIFFEY GROUP
T8899 Core	856.5 $\overline{R}_I$max	1.06 2.10	0.94-1.26 1.62-2.72	9 25	Fluorescing liptinite absent. (Siltstone. Dom abundant, I>>V. Inertinite abundant, vitrinite rare, liptinite absent. Diffuse organic matter common. Mineral fluorescence patchy moderate orange. Iron oxides rare. Pyrite rare.)
					BUNDELLA MUDSTONE
T8900 Core	874.4 $\overline{R}_I$max	- 2.02	- 1.56-2.84	- 25	Fluorescing liptinite absent. (Argillaceous siltstone with minor sandstone. Dom common, I. Inertinite common, vitrinite and liptinite absent. Sparse foraminiferal tests. Mineral fluorescence patchy weak orange. Iron oxides rare. Pyrite abundant.)

The shallowest sample appears to contain only inertinite. Identification of vitrinite in dispersed organic matter (dom) is difficult at vitrinite reflectance levels between about 1.0% and 2.0% and it is possible that the lower part of the range reported as inertinite includes some vitrinite. However, the vitrinite present within the second sample was relatively easy to distinguish, suggesting that the other two samples do not contain vitrinite.

No evidence was found of carbonized organic matter, but the level of vitrinite reflectance may have been elevated by the doleritic intrusions near the horizons sampled. Small amounts of oil droplets are present in the two deeper samples. The oil is occluded within mineral grains.

KK # Ref #.	Depth (m) /Type	$\overline{R}_v$max	Range	N	**DRILLHOLE GV, p 1** Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
					BUNDELLA MUDSTONE
T8901 Core	34.8 $\overline{R}_I$max	0.80 1.88	0.66-0.92 1.26-2.62	4 25	Sparse lamalginite and liptodetrinite, orange to dull orange, rare sporinite, orange to dull orange, rare *Botryococcus*-related telalginite, bright orange. (Sandy siltstone. Dom common, I>L>V. Inertinite and liptinite common, vitrinite rare. Sparse foraminiferal tests. Mineral fluorescence weak dull orange. Iron oxides rare. Pyrite sparse.)
					WOODY ISLAND SILTSTONE "
T8902 Core	142.4 $\overline{R}_I$max	0.73 1.72	0.68-0.77 1.28-2.40	2 25	Abundant lamalginite and sparse liptodetrinite, orange to dull orange, sparse sporinite, orange to dull orange, rare *Botryococcus*-related telalginite, bright orange. (Argillaceous siltstone. Dom abundant, L>I>V. Liptinite abundant, inertinite sparse to common, vitrinite rare. Mineral fluorescence weak dull orange. Iron oxides rare. Pyrite abundant.)

Small populations of vitrinite are present in both the samples and fluorescing liptinite is also present. Mineral fluorescence is very weak in the shallower of the two samples. More normal mineral fluorescence is present in the deeper sample

Lamalginite is present in both samples and a small colony of *Botryococcus*-type telalginite was noted in T8901. Both samples also contain moderate-sized thin-walled palynomorphs that may be small tasmanitid cysts.

KK # Ref #.	Depth (m) /Type	$\overline{R}_v$max	Range	N	**DRILLHOLE T, p 1** Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
					LIFFEY GROUP
T8903	383.6	1.71	1.45-1.94	25	Fluorescing liptinite absent. (Sandy siltstone. Dom common,
Core	$\overline{R}_I$max	2.77	2.26-4.54	10	I>V. Inertinite common, vitrinite sparse, liptinite absent. Diffuse organic matter abundant. Sparse yellow fluorescing specks in the fractures in some quartz grain, probably from oil. Mineral fluorescence patchy weak orange. Iron oxides rare. Pyrite common.)
					WOODY ISLAND SILTSTONE
T8904	676.3	1.74	1.53-1.87	10	Fluorescing liptinite absent. (Claystone. Dom sparse, I>V.
Core	$\overline{R}_I$max	2.61	2.14-4.70	20	Inertinite sparse, vitrinite rare, liptinite absent. Coke rare, fine mosaic. Diffuse organic matter abundant. Mineral fluorescence patchy weak orange. Iron oxides rare. Pyrite abundant.)

The fields reported as vitrinite show relatively angular outlines and the vitrinite populations are not well-defined. The restricted ranges of reflectance found suggest that the material is vitrinite but it is possible that they represent low reflecting inertinite. The deeper of the samples contains one larger phytoclast that shows semicoke textures, with a fine coke mosaic. The reflectance of the semicoke is about 1.33% but with fine mosaics it is difficult to measure the maximum reflectance. The deeper sample clearly has been affected by contact metamorphism and it is likely that its vitrinite reflectance was about 0.6% or 0.7% at the time when the contact alteration occurred.

KK # Ref #.	Depth (m) /Type	$\overline{R}_v$max	Range	N	**OUTCROP SAMPLE, p 1** Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
					WOODY ISLAND SILTSTONE
T8905	-	1.31	1.16-1.45	5	Fluorescing liptinite absent. (Argillaceous siltstone. Dom
Outcrop	$\overline{R}_I$max	2.28	1.62-4.74	25	sparse, I>V. Inertinite sparse, vitrinite rare, liptinite absent. Mineral fluorescence pervasive dull orange with bright orange patches. Most of the bright areas seem to represent oil inclusions but some could be liptodetrinite. If they do represent liptodetrinite, the values reported as vitrinite may represent low reflectance inertinite. Iron oxides rare. Pyrite sparse, locally abundant.)

A small population is present that is similar morphologically to the populations reported as vitrinite for the samples from Drillhole T. Again, it is possible that the material reported as vitrinite is a low reflecting inertinite population but the relatively small range is more consistent with it representing vitrinite. The presence of occluded oil is possible at a vitrinite reflectance of about 1.3%. However, if the more elongate fluorescing areas are liptodetrinite, then the vitrinite reflectance reported is too high.

Appendix 2. Second suite of samples

KK # / Ref #.	40772 Depth (m)	$R_v$max Mean	Range	SD	N	UNIVERSITY OF TASMANIA Sample description including liptinite fluorescence maceral abundances, mineral fluorescence
						H - Liffey Group
T9028 Core	850.5	1.28*	0.90-1.55	0.195	17	Fluorescing liptinite absent. (Sandstone with abundant fossils, ?fish. Dom commcn, "V">I, L absent. *The material included within the reported vitrinite population includes some telovitrinite, some detrovitrinite and some material that appears to represent bitumen inclusions within ?fish bones. Some of the bitumen occurrences show fine coke mosaic. Rare bright yellow oil drops within ?carbonate. Mineral fluorescence patchy, bright orange to weak dull orange. Pyrite abundant.)
	$\overline{R}_I$max	2.10	1.54-2.72	0.456	5	
T9029 Ctgs	869.5	1.23	1.11-1.31	0.061	25	Fluorescing liptinite absent. (Sandstone. Dom abundant, V>I, L absent. Vitrinite abundant, inertinite common and liptinite absent. A high proportion of the vitrinite is present as thick layers of telovitrinite with common to abundant pyrite. Oil drops common, small to moderate in size, within quartz grains and probably within overgrowths, but overgrowth boundaries are not clearly defined. Some of the oil inclusions show prominent gas bubbles. Mineral fluorescence patchy, moderate orange to weak dull orange. Pyrite common to abundant.)
						R - Liffey Group
T9030 Ctgs	138.4	0.80	0.60-0.94	0.099	24	Rare cutinite dull orange, rare sporinite orange to dull orange.
	$\overline{R}_I$max	1.46	1.04-2.78	0.461	11	(Silty sandstone. Dom abundant, I>V>L. Inertinite abundant, vitrinite common and liptinite rare. A small proportion of the vitrinite is present as thin layers of telovitrinite. Mineral fluorescence weakly patchy, moderate to weak dull orange. Pyrite common to abundant.)
T9031 Ctgs	171.5	0.76	0.61-0.93	0..111	17	Common sporinite yellowish orange to dull orange, sparse telalginite yellowish orange to dull orange, rare resinite dull orange. (Sandy siltstone. Dom abundant, I>L>V. Inertinite abundant, liptinite common, vitrinite rare to sparse. The telalginite is derived from *Reinschia sp.* and shows well preserved cell structures. The presence of telalginite may be the cause of the lower reflectances in this sample compared with T9030 rather than a lower level of rank. Rare thucholitic bitumens, too poorly developed for reflectances to be measured but appear to be about 0.6%. Mineral fluorescence weakly patchy, moderate to weak dull orange. Iron oxides sparse to common. Pyrite sparse to common.)
	$\overline{R}_I$max					
						Q - Liffey Group
T9032 Ctgs	20.4	0.57	0.42-0.71	0.084	25	Rare cutinite dull orange. (Silty micaceous sandstone. Dom abundant, I>V>L. Inertinite abundant, vitrinite sparse, liptinite rare. The inertinite is dominated by large phytoclasts of fusinite and semifusinite. Most of the vitrinite appears to be either from root tissues or more rarely leaves. Mineral fluorescence weak dull orange. Pyrite sparse.)
	$\overline{R}_I$max					

The organic matter assemblages in most of the samples are dominated by inertinite, mainly semifusinite and fusinite. T9031 contains sparse telalginite that is fresh-water in origin. Oil inclusions are prominent in T9028. In T9031 the presence of thucholitic bitumen on a small grain of zircon indicates some migration of hydrocarbons through the section.

Most of the samples show prominent populations of relatively massive low reflecting inertinite. This makes determination of vitrinite reflectance relatively difficult. However, the determination for T9028 is the only one that is problematical.

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