

ANALYTICAL REPORT

SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

WHALEBACK 1

PREPARED FOR GEOLOGICAL SURVEY AND RESOURCE STRATEGY DIVISION DMIRS

SEPTEMBER 2021



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SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

INTRODUCTION

Samples were received (see table below) to be evaluated for the reflectance of organic matter (vitrinite where possible) as well as an assessment of the types of organic matter present. If HAWK pyrolysis was also requested, the equivalent sample number is also indicated. HAWK data are reported separately.

ERC Sample No.		Company Reference	Sample Type	Other information
V _r	HAWK			
E4433		237713	Cuttings	4570 - 80 ft
E4434		237764	Core	4712 - ft

METHODS

Sample preparation methods may vary slightly depending upon whether core/ outcrop or cuttings were received.

With core and outcrop samples, a flat face perpendicular to bedding is prepared by grinding. This is placed in a 30 mm diameter mould along with several randomly oriented grains. The whole is mounted in epoxy resin.

With cuttings, the samples are passed through a 2 mm sieve and where necessary are gently cracked in a mortar and pestle. This is then mounted in epoxy resin.

The epoxy resin mounted samples are polished using a variety of wet and dry papers, diamond polishing compounds and colloidal silica. The polished samples are dried in a desiccator for a minimum of 12 hours prior to analysis.

Analysis is made using a Leica MP4500P system with Hilgers DISKUS software. A mechanical stage is used to traverse the sample in a regular pattern. Mean maximum reflectance in oil of the organic matter is determined by rotating the microscope stage. Reflectance is determined of a 2 μm^2 area at 546nm using a total magnification of 500X.

A visual estimation of organic matter types and abundances was also made using comparison charts under both reflected and blue light excitation. The categories used are:

Descriptor	%
Absent	0
Rare	<0.1
Sparse	$0.1 < x < 0.5$
Common	$0.5 < x < 2.0$
Abundant	$2.0 < x < 10.0$
Major	$10.0 < x < 40.0$
Dominant	>40.0

The samples are also examined in blue light fluorescence using a Royal Blue LED as the excitation source.

RESULTS

Results are tabulated as follows. Low resolution images are provided in an appendix for reference purposes. High quality images are provided in a separate image file.

Data presentation

Individual sample results are reported in the following format:

ERC No. Client No.	Depth (ft / m)	R_{vmax}^{*1}	Range ^{*2}	SD ^{*3}	N ^{*4}
x1234	3106	0.79	0.64 - 0.91	0.145	25
	R_l^{*5}				
	Alginite ^{*5}				
	Bitumen ^{*5}				

*1 Mean of all the maximum reflectance readings obtained.

*2 Lowest Rmax and highest Rmax of the population considered to represent the first generation vitrinite population.

*3 Standard Deviation

*4 Number of fields measured (Number of measurements = 2N because 2 maximum values are recorded for each field)

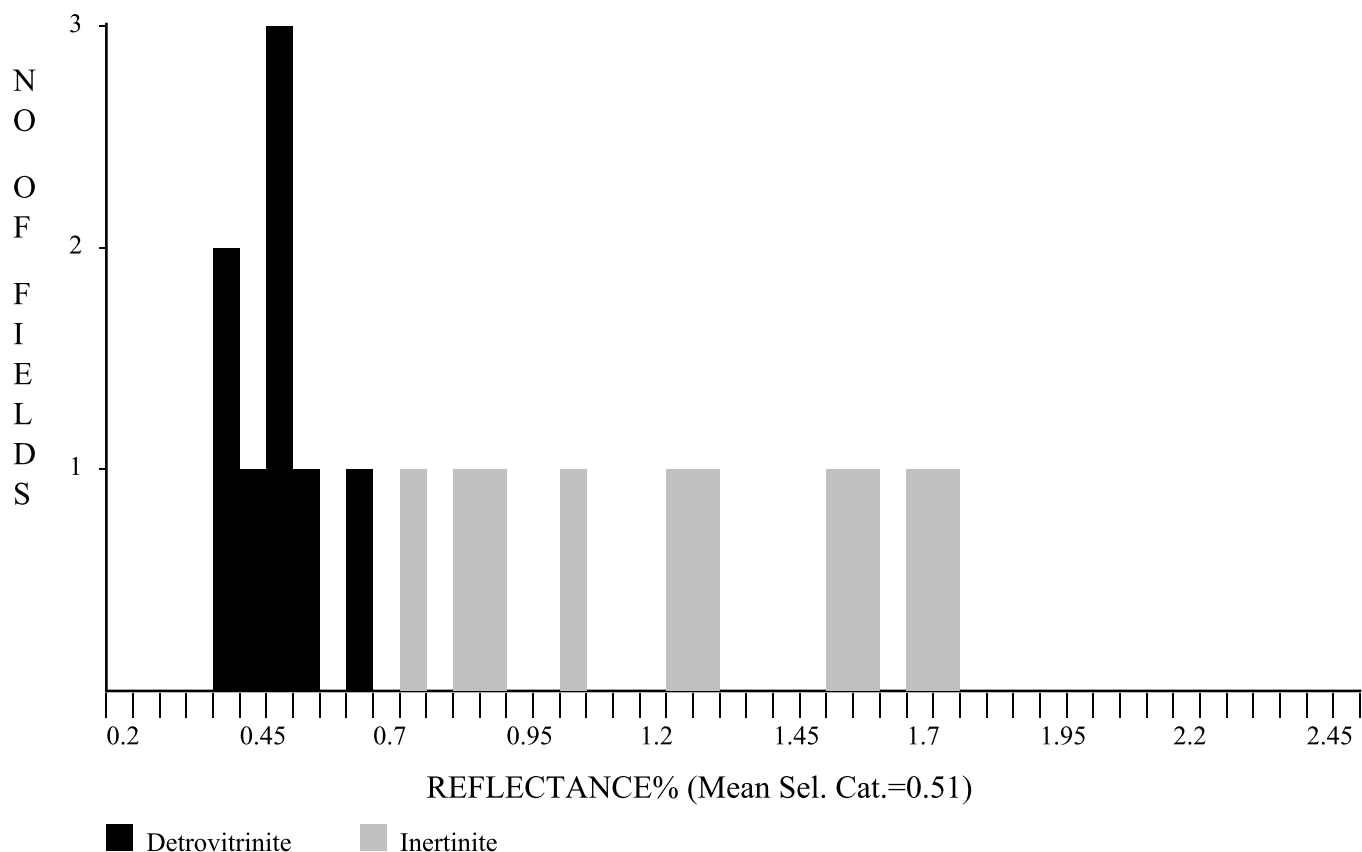
*5 Reflectance of multiple vitrinite populations or of other organic matter types. R_l = Inertinite mean maximum reflectance etc; subscripts may be expanded as necessary.

HAWK data, where requested, are reported separately in spread sheet format.

Note that if samples are retained by ERC, they will be held for at least 12 months after reporting but may be discarded after that date.

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA						N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
Sample# Client ref.	Depth (ft)	\overline{R}_{vmax}	Range	SD			
							WHALEBACK 1
							GSWA# 237713
E4433	4570-4580	0.51	0.41-0.65	0.071	8		Rare lamalginite and liptodetrinite orange to dull
237713	\overline{R}_I	1.29	0.79-1.76	0.348	10		orange, rare sporinite orange to dull orange. (Fine claystone>
Ctgs							sandstone>artificial composites>carbonate>calcareous
							claystone. Dom common to abundant, I>L>V. Inertinite
							common to abundant, liptinite and vitrinite rare. Artificial
							composites abundant and organic matter in these artificial
							composites were not considered in this analysis. Mineral
							fluorescence weak orange. Iron oxides rare. Pyrite
							common.)
							GSWA# 237764
E4434	4712	0.77	0.64-0.90	0.073	17		Rare lamalginite and liptodetrinite orange to dull orange.
#237764	\overline{R}_I	1.68	0.99-2.30	0.365	25		(Fine claystone. Dom common, I>L>V. Inertinite common,
Core							liptinite rare to sparse, vitrinite rare. Mineral fluorescence
							weak orange. Iron oxides rare. Pyrite common.)

GSWA, 237713, Whaleback 1, 4570-4580ft, Ctgs(E4433)

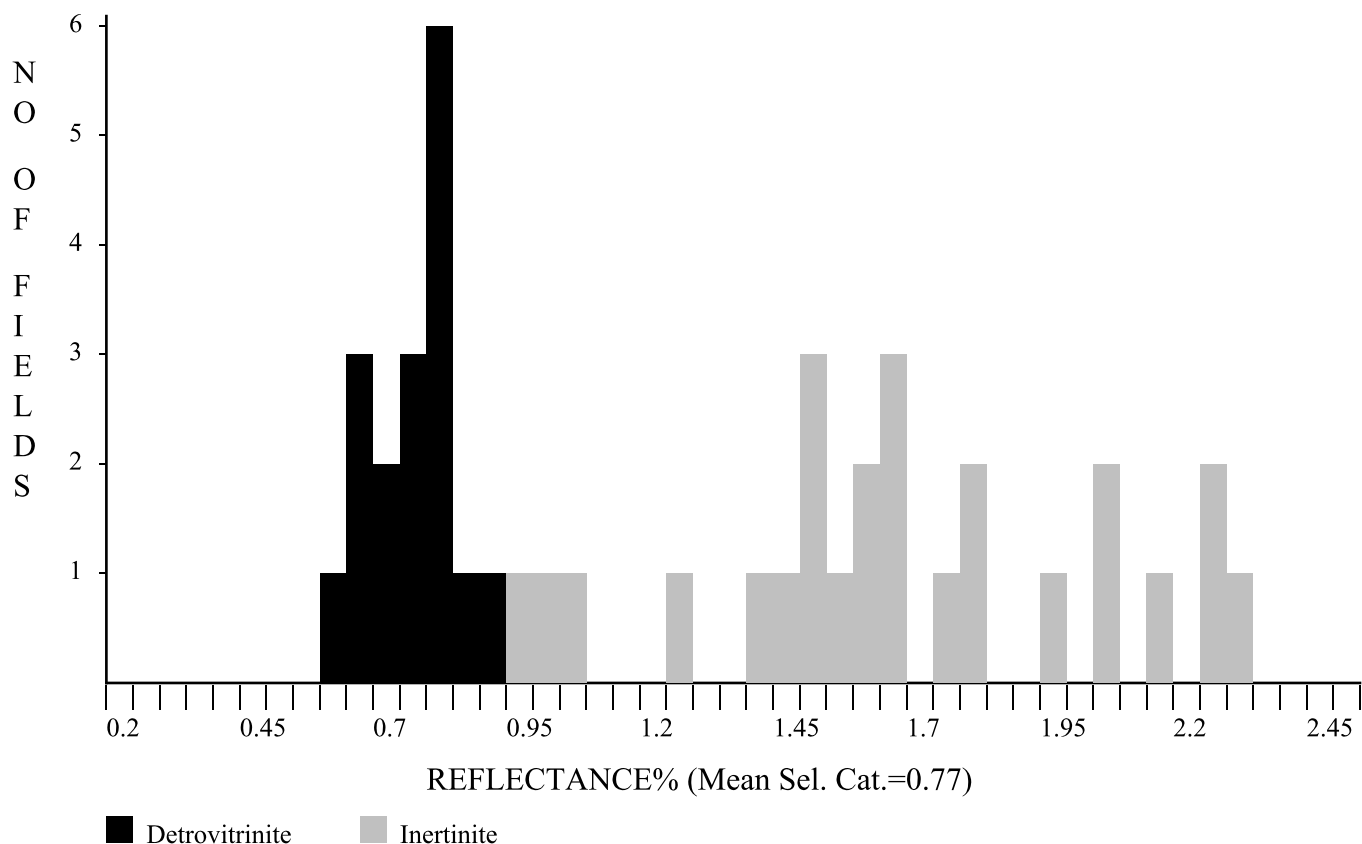


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Detrovitrinite	8	0.51	0.071
Inertinite	10	1.29	0.348
<u>Total</u>	18	0.94	0.469

Selected categories: Detrovitrinite:

No. of Readings:	8
Mean of Selected Categories:	0.51
Standard Deviation of Selected categories:	0.071

GSWA, 237764, Whaleback 1, 4712m, Core(E4434)



Maceral Category	N	Mean	Standard Deviation
Detrovitrinite	17	0.77	0.073
Inertinite	25	1.68	0.365
Total	42	1.31	0.532

Selected categories: Detrovitrinite:

No. of Readings:	17
Mean of Selected Categories:	0.77
Standard Deviation of Selected categories:	0.073

Dr Peter Crosdale (MAIG)
Director, ERC
29th September, 2021

APPENDIX - PLATES

High quality images are provided in a separate image file. Images provided in this report are for reference purposes only.

E4433A Detrovitrinite in fine claystone, $R_{v \max} = 0.55\%$, reflected white light, X50

E4433B Same as E4433A, in fluorescence mode

E4433C Lamalginitite and sporinite in fine claystone, reflected white light, X50

E4433D Same as E4433C, in fluorescence mode

E4433E Sporinite in calcareous claystone, reflected white light, X50

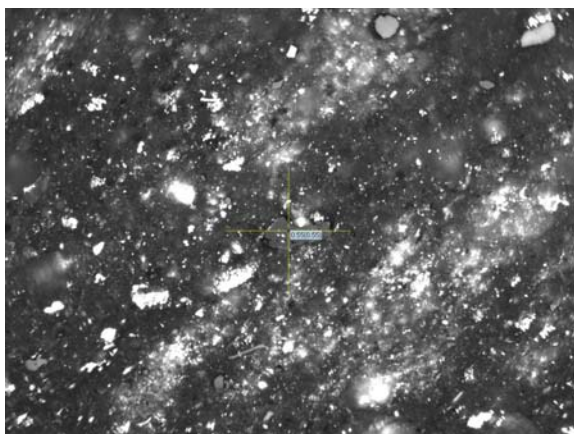
E4433F Same as E4433E, in fluorescence mode

E4434A Detrovitrinite in fine claystone, $R_{v \max} = 0.82\%$, reflected white light, X50

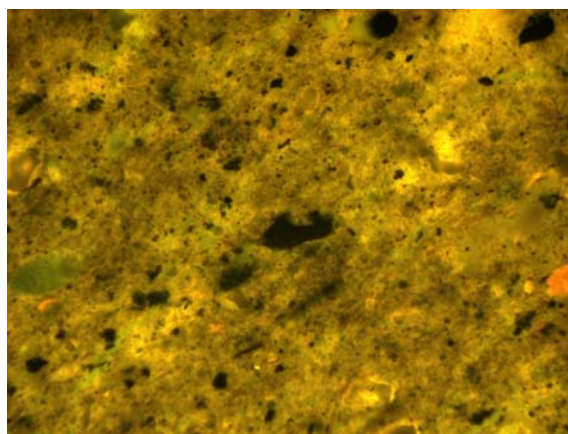
E4434B Same as E4434A, in fluorescence mode

E4434C Lamalginitite in fine claystone, reflected white light, X50

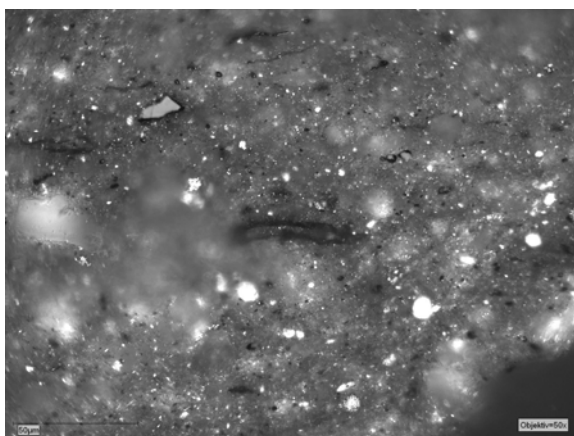
E4434D Same as E4434C, in fluorescence mode



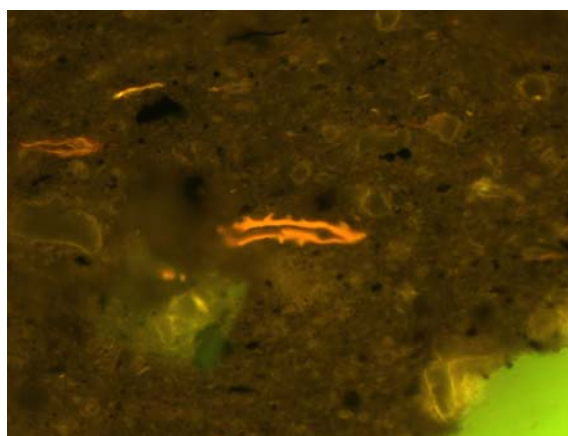
E4433A Detrovitrinite in fine claystone, $R_{\text{max}} = 0.55\%$, reflected white light, X50



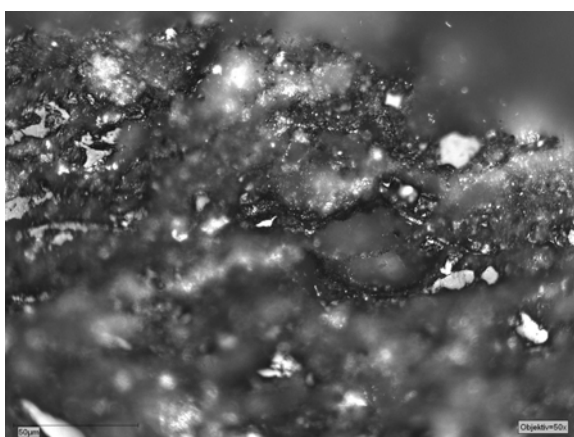
E4433B Same as E4433A, in fluorescence mode



E4433C Lamalginites and sporinites in fine claystone, reflected white light, X50



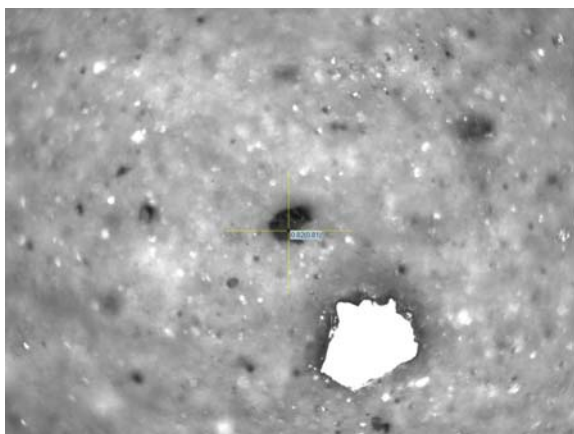
E4433D Same as E4433C, in fluorescence mode



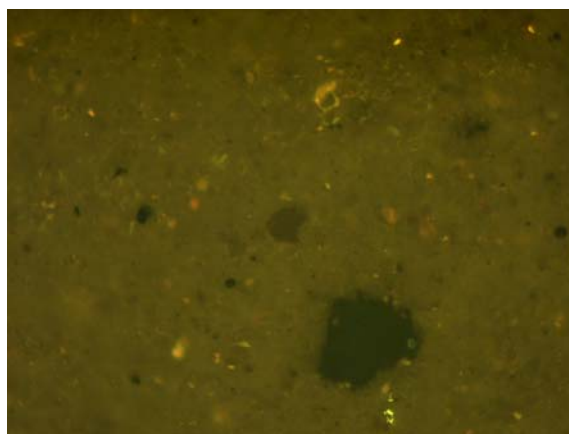
E4433E Sporinites in calcareous claystone, reflected white light, X50



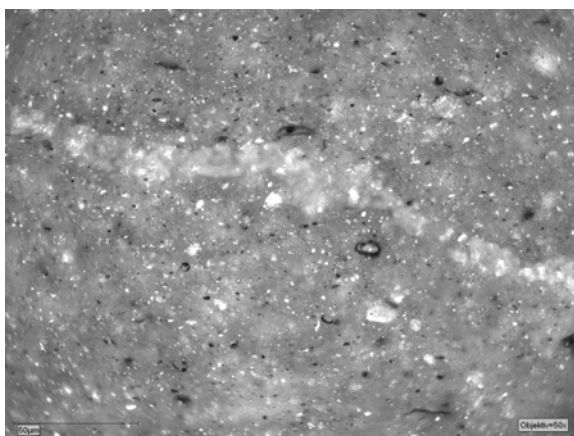
E4433F Same as E4433E, in fluorescence mode



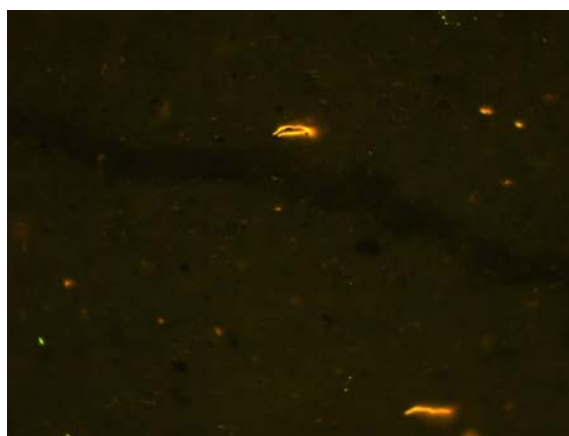
E4434A Detrovitrinite in fine claystone, $R_{\text{vmax}} = 0.82\%$, reflected white light, X50



E4434B Same as E4434A, in fluorescence mode



E4434C Lamalginite in fine claystone, reflected white light, X50



E4434D Same as E4434C, in fluorescence mode