

ANALYTICAL REPORT

SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

BURNA 1

**PREPARED FOR
GEOLOGICAL SURVEY AND RESOURCE STRATEGY DIVISION
DMIRS**

SEPTEMBER 2021



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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			
E4435		237727	Cuttings	125 - 135 m
E4436		237723	Cuttings	325 - 335 m

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_I^{*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)

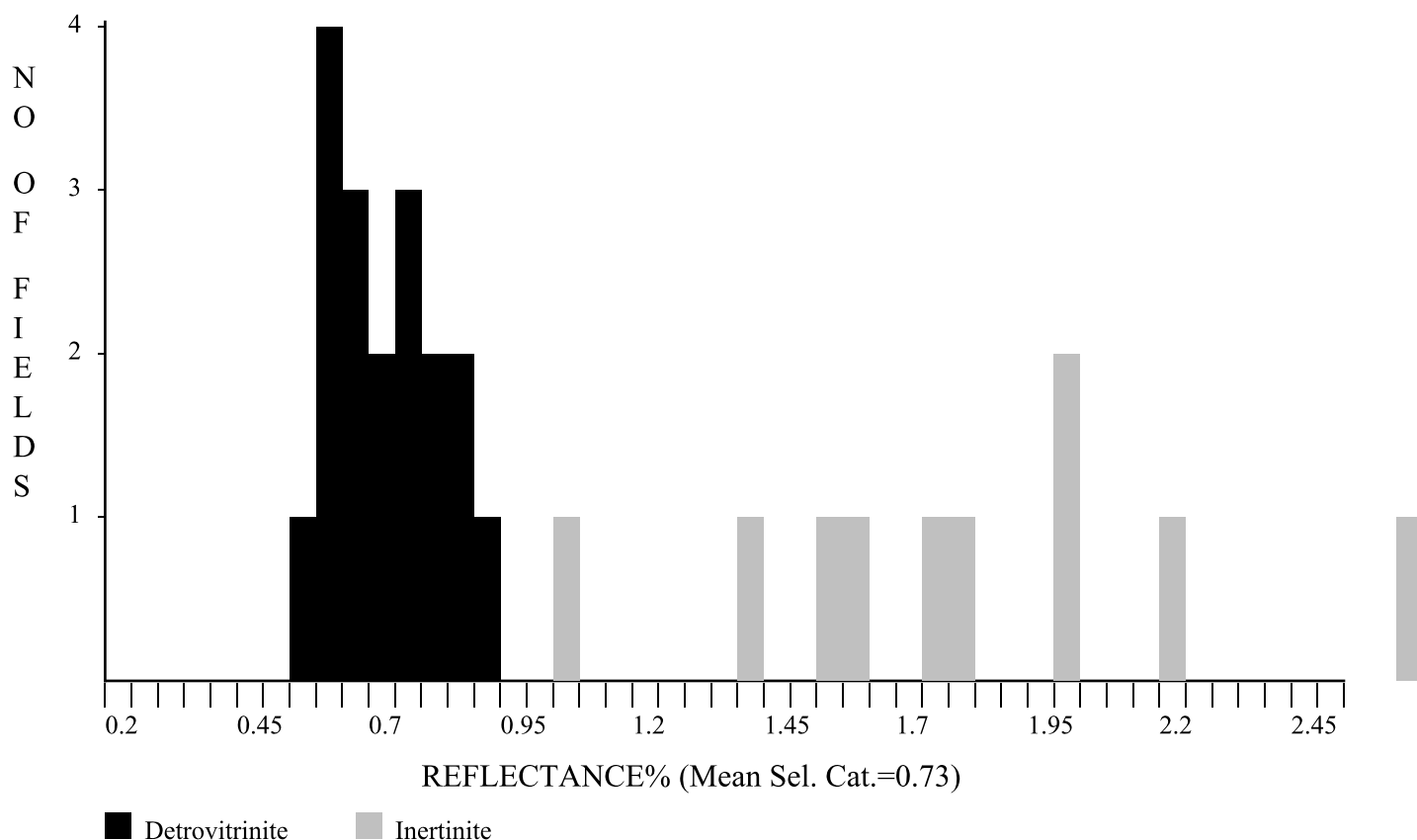
*5 Reflectance of multiple vitrinite populations or of other organic matter types. R_I = Inertinite mean maximum reflectance etc; subscripts may be expanded as necessary.

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.

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Sample# Client ref.	Depth (m)	\overline{R}_{vmax}	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence BURN A 1 GSWA# 237727
E4435	125-135	0.73	0.59-0.91	0.097	18	Common sporinite and sparse liptodetrinite orange to dull orange, sparse cutinite orange dull orange. (Calcareous siltstone>claystone>carbonate. Dom major, I>>L>V. Inertinite major, liptinite common, vitrinite rare. Mineral fluorescence weak orange. Iron oxides rare. Pyrite common.) GSWA# 237723
237727	\overline{R}_I	1.82	1.09-2.66	0.416	10	
Ctgs						
E4436	325-335	0.76	0.62-0.95	0.094	25	Abundant sporinite and sparse liptodetrinite orange to dull orange, sparse cutinite orange to dull orange. (Calcareous siltstone>sandstone>carbonate>coal. Coal sparse, V>I, vitrite>inertite. Dom major, I>L>V. Inertinite and liptinite abundant, vitrinite sparse to common. Mineral fluorescence weak orange. Iron oxides rare. Pyrite common.)
#237723	\overline{R}_I	1.54	1.05-1.83	0.248	10	
Core						

GSWA, 237727, Burna 1, 125-135m, Ctgs(E4435)

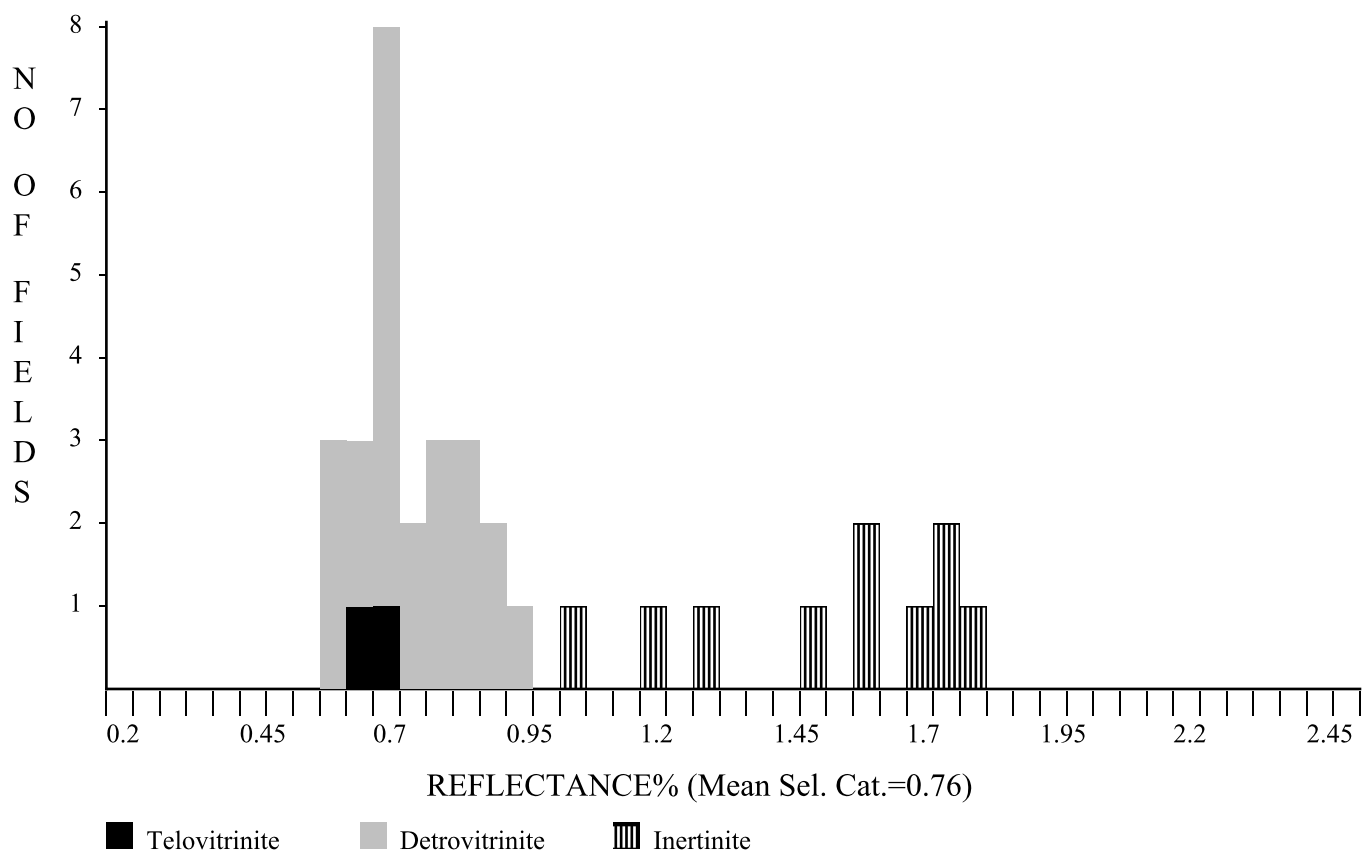


Maceral Category	N	Mean	Standard Deviation
Detrovitrinite	18	0.73	0.097
Inertinite	10	1.82	0.416
Total	28	1.12	0.581

Selected categories: Detrovitrinite:

No. of Readings:	18
Mean of Selected Categories:	0.73
Standard Deviation of Selected categories:	0.097

GSWA, 237723, Burna 1, 325-335m, Ctgs(E4436)



Maceral Category	N	Mean	Standard Deviation
Telovitrinite	2	0.69	0.005
Detrovitrinite	23	0.76	0.096
Inertinite	10	1.54	0.248
Total	35	0.98	0.388

Selected categories: Telovitrinite, Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.76
Standard Deviation of Selected categories:	0.094

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.

E4435A Detrovitrinite in calcareous siltstone, $R_{v \max} = 0.83\%$, reflected white light, X50

E4435B Same as E4435A, in fluorescence mode

E4435C Semifusinite in calcareous siltstone, $R_l = 2.20\%$, reflected white light, X50

E4435D Same as E4435C, in fluorescence mode

E4435E Common sporinite in calcareous siltstone, reflected white light, X50

E4435F Same as E4435E, in fluorescence mode

E4436A Detrovitrinite in calcareous siltstone, $R_{v \max} = 0.71\%$, reflected white light, X50

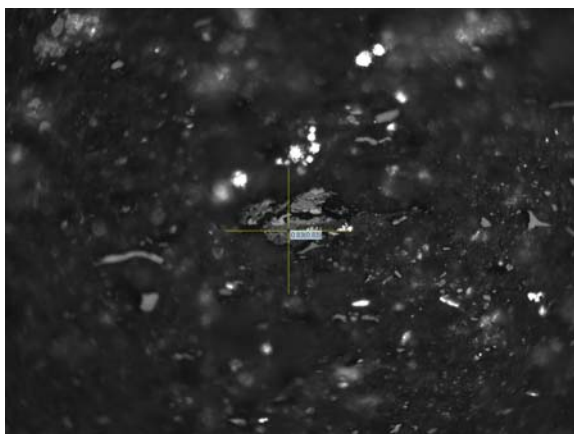
E4436B Same as E4436A, in fluorescence mode

E4436C Vitrite coal, $R_{v \max} = 0.70\%$, reflected white light, X50

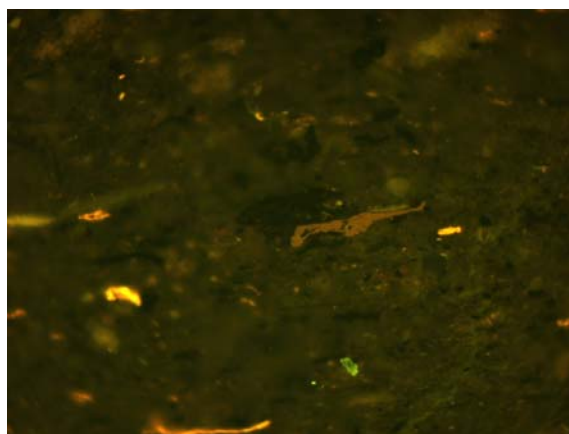
E4436D Same as E4436C, in fluorescence mode

E4436E Cutinite in calcareous siltstone, reflected white light, X50

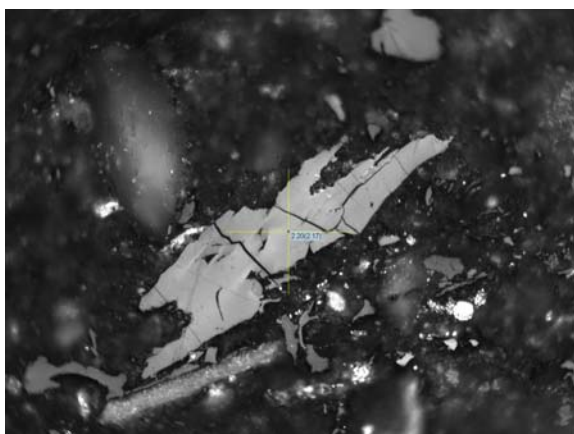
E4436F Same as E4436E, in fluorescence mode



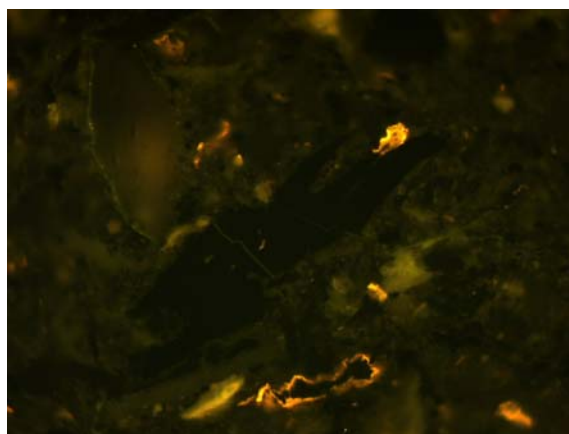
E4435A Detrovitrinite in calcareous siltstone, $R_{v\max} = 0.83\%$, reflected white light, X50



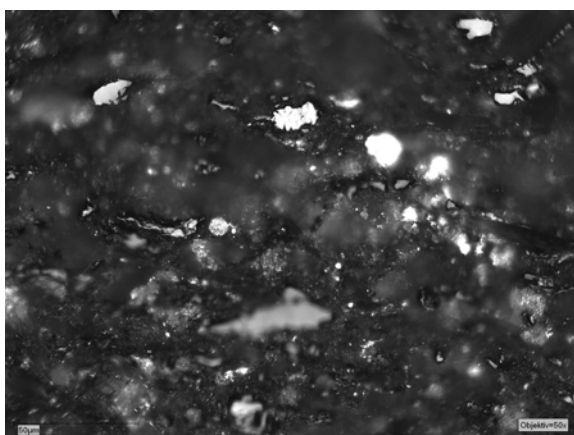
E4435B Same as E4435A, in fluorescence mode



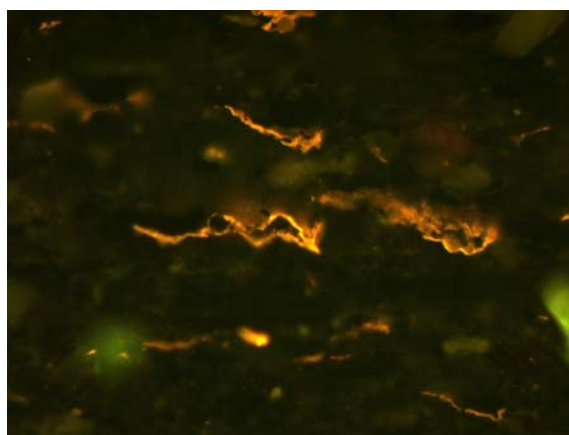
E4435C Semifusinite in calcareous siltstone, $R_l = 2.20\%$, reflected white light, X50



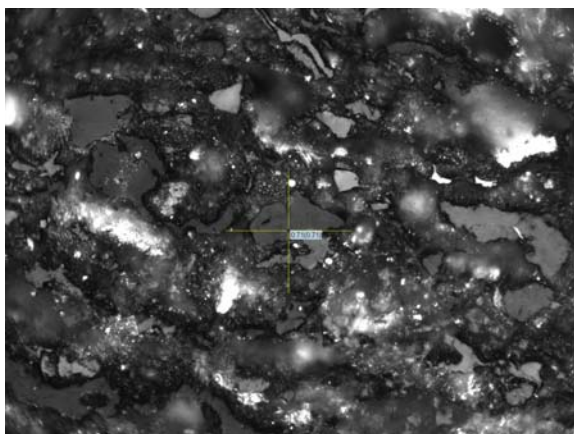
E4435D Same as E4435C, in fluorescence mode



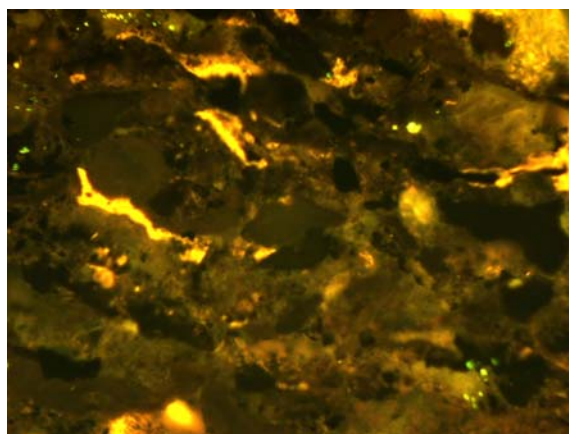
E4435E Common sporinite in calcareous siltstone, reflected white light, X50



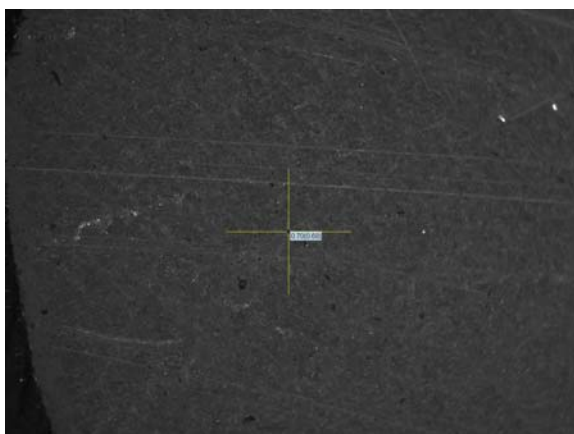
E4435F Same as E4435E, in fluorescence mode



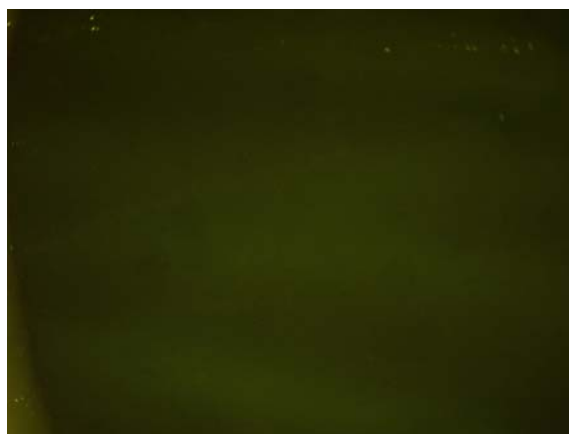
E4436A Detrovitrinite in calcareous siltstone, $R_{v\max} = 0.71\%$, reflected white light, X50



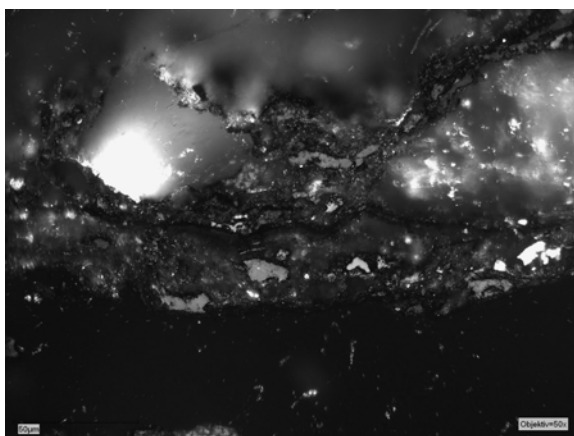
E4436B Same as E4436A, in fluorescence mode



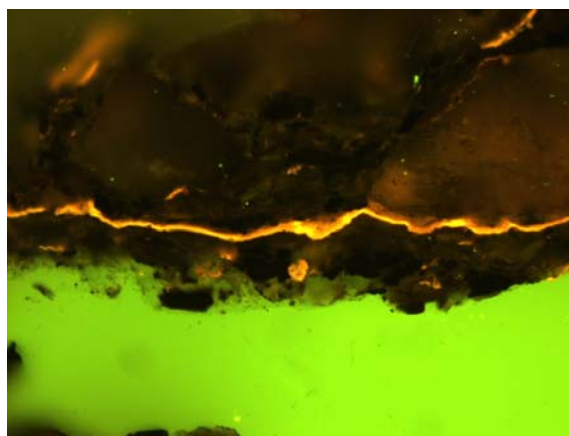
E4436C Vitrite coal, $R_{v\max} = 0.70\%$, reflected white light, X50



E4436D Same as E4436C, in fluorescence mode



E4436E Cutinite in calcareous siltstone, reflected white light, X50



E4436F Same as E4436E, in fluorescence mode