

# **ANALYTICAL REPORT**

## **SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING**

**PREPARED FOR  
GEOLOGICAL SURVEY OF QUEENSLAND**

**JUNE 2017**



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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.		Sample Type	Sample Details
Vr	HAWK		
n/a	HWA2598	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (16)
E2599	HWA2599	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (20.69)
n/a	HWA2600	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (31)
E2601	HWA2601	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (36)
n/a	HWA2602	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (41)
E2603	HWA2603	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (26)
n/a	HWA2604	core	AAE Lawn Hill 83-3 - Lower Mullera Formation (51)
E2605	HWA2605	core	AAE Lawn Hill 83-4 - Doomadgee Formation? (156.26)
n/a	HWA2606	core	AAE Lawn Hill 83-4 - Doomadgee Formation? (157.43)
n/a	HWA2607	core	AAE Lawn Hill 83-4 - Doomadgee Formation? (160.89)
E2608	HWA2608	core	AAE Lawn Hill 83-4 - Doomadgee Formation? (163.33)
E2609	HWA2609	core	AAE Lawn Hill 83-4 - Doomadgee Formation? (166)
E2610	HWA2610	core	BHP Constance Range 10A - Mullera Formation? (85'5")
n/a	HWA2611	core	COM Argyle Creek 1 - Lower Constance Sandstone? (36)
n/a	HWA2612	core	COM Argyle Creek 1 - Lower Constance Sandstone? (51)
n/a	HWA2613	core	COM Argyle Creek 1 - Lower Constance Sandstone? (66)
E2614	HWA2614	core	COM Argyle Creek 1 - Lower Constance Sandstone? (81)
n/a	HWA2615	core	COM Argyle Creek 1 - Lower Constance Sandstone? (90)
E2616	HWA2616	core	COM Argyle Creek 1 - Lower Constance Sandstone? (111)
n/a	HWA2617	core	COM Argyle Creek 1 - Lower Constance Sandstone? (126)
n/a	HWA2618	core	COM Egilabria 1 - Lower Constance Sandstone? (570)
E2619	HWA2619	core	COM Egilabria 1 - Lower Constance Sandstone? (585)
n/a	HWA2620	core	COM Egilabria 1 - Lower Constance Sandstone? (600)
n/a	HWA2621	core	COM Egilabria 1 - Lower Constance Sandstone? (825)
n/a	HWA2622	core	PPC Bury 1 - Bury Limestone (8029 ft)
n/a	HWA2623	core	PPC Bury 1 - Bury Limestone (8030.33 ft)
E2624	HWA2624	core	PPC Bury 1 - Bury Limestone (8034 ft)
n/a	HWA2625	core	PPC Bury 1 - Bury Limestone (8035 ft)
n/a	HWA2626	core	PPC Bury 1 - Bury Limestone (8398.8333 ft)
n/a	HWA2627	core	PPC Bury 1 - Bury Limestone (8402.66 ft)
E2628	HWA2628	core	PPC Bury 1 - Bury Limestone (8404.33 ft)
E2629	HWA2629	core	PPC Bury 1 - Bury Limestone (8405 ft)
E2630	HWA2630	core	AAE Lawn Hill 83-3 - Constance Sandstone? (453.88)
n/a	HWA2631	core	AAE Lawn Hill 83-3 - Constance Sandstone? (458.91)
E2632	HWA2632	core	AAE Lawn Hill 83-3 - Constance Sandstone? (461.11)
n/a	HWA2633	core	AAE Lawn Hill 83-3 - Constance Sandstone? (466.76)
n/a	HWA2634	core	AAE Lawn Hill 83-3 - Constance Sandstone? (472.7)
E2635	HWA2635	core	AAE Lawn Hill 83-3 - Constance Sandstone? (470.86)

## 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  $\mu\text{m}^2$  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 <sup>*2</sup>	SD <sup>*3</sup>	N <sup>*4</sup>
x1234	3106 $R_1^{*5}$ Alginite <sup>*5</sup> Bitumen <sup>*5</sup>	0.79	0.64 - 0.91	0.145	25

\*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.  $R_1$  = 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 QUEENSLAND  
SOUTH NICHOLSON BASIN  
AAE LAWN HILL 83-3**

ERC# Type	Depth (m)	$\bar{R}_{vmax}$	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence <b>Lower Mullera Formation</b>
E2599 Core	20.69	-	-	-	-	Rare alginite dull orange to weak brown. (Silty claystone with minor silty claystone. Dom rare, L only. Liptinite rare, other macerals absent. Diffuse organic matter common. Common pyrobitumen. ?Coalified alginite occur as weak brown fluorescing narrow strands, associated with diffuse organic matter, with smooth polishing surface. Pyrobitumen occur as non-fluorescing blocks and strands with irregular polishing surfaces. Pyrobitumen grains have polishing surfaces ranging from slightly pitted to highly mottled. Some pyrobitumen grains have a coarse mosaic with wavy extinction. Reflectance values obtained for pyrobitumen may not be reproducible owing to high degree of surface irregularities. ?Migrato-bitumen occur as dull orange fluorescing round to oval shaped bodies with smooth polishing surfaces and these could also be dead oil. Mineral fluorescence weak to patchy moderate orange. Iron oxides abundant. Pyrite sparse.)
	?Alginite	1.05	0.87-1.39	0.163	10	
	Pyrobitumen	2.02	1.56-2.56	0.257	25	
	Bitumen	0.75	0.42-1.06	0.205	6	
E2601 Core	36	-	-	-	-	Rare alginite weak brown. (Silty claystone and siltstone with minor sandstone. Dom rare, L only. Liptinite rare, other macerals absent. Diffuse organic matter common. Common pyrobitumen. ?Coalified alginite occur as weak brown fluorescing narrow strands, associated with diffuse organic matter, with smooth polishing surface. Pyrobitumen occur as non-fluorescing blocks and strands with irregular polishing surfaces. Pyrobitumen grains have polishing surfaces ranging from slightly pitted to highly mottled. Some pyrobitumen grains have a coarse mosaic with wavy extinction. Reflectance values obtained for pyrobitumen may not be reproducible owing to high degree of surface irregularities. ?Migrato-bitumen occur as orange to dull orange fluorescing round to oval shaped bodies with smooth polishing surfaces and these could also be dead oil. Mineral fluorescence weak to patchy moderate orange. Iron oxides rare. Pyrite rare.)
	?Alginite	1.37	1.23-1.51	0.093	7	
	Pyrobitumen	2.08	1.56-2.76	0.315	25	
	Bitumen	0.75	0.49-0.92	0.163	6	

**GEOLOGICAL SURVEY QUEENSLAND  
SOUTH NICHOLSON BASIN  
AAE LAWN HILL 83-3, p2**

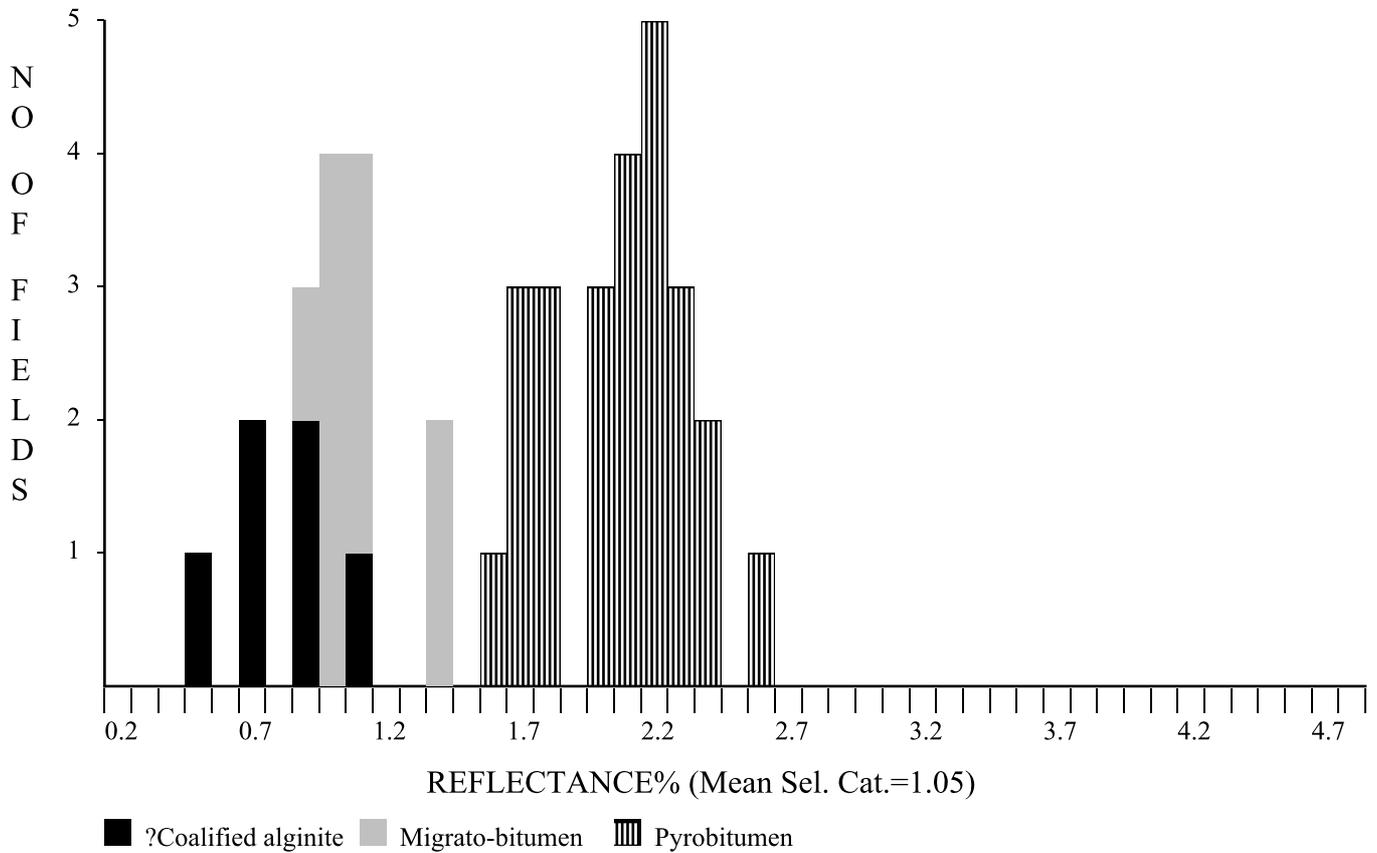
ERC# Type	Depth (m)	$\bar{R}$ vmax	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
E2603 Core	26	-	-	-	-	<b>Lower Mullera Formation</b> Sparse alginite dull orange to weak brown to none. (Silty claystone and argillaceous siltstone. Dom sparse, L only. Liptinite sparse, other macerals absent. Diffuse organic matter abundant. Common pyrobitumen. ?Coalified alginite sparse and occur as weak brown fluorescing narrow strands, associated with diffuse organic matter, with smooth polishing surface. Pyrobitumen occur as non-fluorescing blocks and strands with irregular polishing surfaces. Pyrobitumen grains have polishing surfaces ranging from slightly pitted to highly mottled. Some pyrobitumen grains have a coarse mosaic with wavy extinction. Reflectance values obtained for pyrobitumen may not be reproducible owing to high degree of surface irregularities. ?Migrato-bitumen occur as orange to dull orange fluorescing round to oval shaped bodies with smooth polishing surfaces and these could also be dead oil. Mineral fluorescence weak to patchy moderate orange. Iron oxides rare. Pyrite rare.)
	?Alginite	1.31	1.11-1.53	0.125	25	
	Pyrobitumen	2.04	1.61-2.33	0.231	10	
	Bitumen	0.54	0.44-0.74	0.088	8	
E2630 Core	453.88-3.91	-	-	-	-	<b>?Constance sandstone</b> Fluorescing liptinite absent. (Sandstone with minor claystone. Dom sparse, L only. Liptinite sparse, other macerals absent. Diffuse organic matter sparse. ?Coalified alginite sparse and occur as non-fluorescing narrow strands with smooth polishing surface and low polishing relief. Bitumen occur as non-fluorescing bodies with high polishing relief and usually formed around mineral grains. Mineral fluorescence patchy weak orange to pervasive dull orange. Iron oxides rare. Pyrite rare.)
	?Alginite	2.60	2.10-3.17	0.260	25	
	Bitumen	3.02	2.45-3.90	0.527	6	
E2632 Core	461.11-61.12	-	-	-	-	Fluorescing liptinite absent. (Silty claystone, highly micaceous. Dom common, L only. Liptinite common, other macerals absent. Diffuse organic matter common. ?Coalified alginite common and occur as non-fluorescing long narrow strands with smooth polishing surface, often enveloped in strands of diffuse organic matter. Bireflectance of alginite is low to moderate with a mean bireflectance ratio of 0.27. Mineral fluorescence pervasive dull orange. Iron oxides rare. Pyrite sparse.)
E2635 Core	470.86-70.88	-	-	-	-	Common alginite weak brown. (Silty claystone. Dom common to abundant, L only. Liptinite common to abundant, other macerals absent. Diffuse organic matter common. ?Coalified alginite common and occur as non-fluorescing long narrow strands with smooth polishing surface, often enveloped in strands of diffuse organic matter. Alginite with reflectance values at the lower end of the range exhibits a weak brown fluorescence under blue light excitation. Bireflectance of alginite is low to moderate with a mean bireflectance ratio of 0.22. Mineral fluorescence pervasive dull orange. Iron oxides rare. Pyrite sparse.)
	?Alginite	2.34	1.51-2.83	0.337	25	

Note: In the VRW Excel workbook, assessed pyrobitumen volume is recorded in the inertinite box.

Plates

E2599A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.02\%$ , reflected white light, X50  
E2599B Same as E2599A, in fluorescence mode  
E2599C Pyrobitumen in silty claystone,  $R_{PBit} = 1.91\%$ , reflected white light, X50  
E2599D Same as E2599C, in fluorescence mode  
E2599E ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.86\%$ , reflected white light, X50  
E2599F Same as E2599E, in fluorescence mode  
E2599G Lamalginite in silty claystone, reflected white light, X50  
E2599H Same as E2599G, in fluorescence mode  
E2601A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.23\%$ , reflected white light, X50  
E2601B Same as E2601A, in fluorescence mode  
E2601C Pyrobitumen in silty claystone,  $R_{PBit} = 2.61\%$ , reflected white light, X50  
E2601D Same as E2601C, in fluorescence mode  
E2601E ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.58\%$ , reflected white light, X50  
E2601F Same as E2601E, in fluorescence mode  
E2603A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.27\%$ , reflected white light, X50  
E2603B Same as E2603A, in fluorescence mode  
E2603C ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.52\%$ , reflected white light, X50  
E2603D Same as E2603C, in fluorescence mode  
E2603E Weakly fluorescing lamalginite in fine claystone, reflected white light, X50  
E2603F Same as E2603C, in fluorescence mode  
E2630A ?Coalified alginite in silty claystone,  $R_{Alg} = 2.97\%$ , reflected white light, X50  
E2630B Same as E2630A, in fluorescence mode  
E2630C Bitumen in silty claystone,  $R_{Bit} = 2.45\%$ , reflected white light, X50  
E2630D Same as E2630C, in fluorescence mode  
E2632A ?Coalified alginite in silty claystone, maximum reflectance position,  $R_{Alg} = 2.66\%$ , reflected white light, X50  
E2632B Same grain, after rotating stage at  $90^0$ ,  $R_{Alg}$  minimum = 2.04%  
E2632C Same as E2632A, in fluorescence mode  
E2635A ?Coalified alginite in silty claystone, maximum reflectance position,  $R_{Alg} = 2.56\%$ , reflected white light, X50  
E2635B Same grain, after rotating stage at  $90^0$ ,  $R_{Alg}$  minimum = 2.11%  
E2635C Same as E2635A, in fluorescence mode  
E2635D ?Coalified alginite in the lower end of range,  $R_{Alg} = 1.87\%$ , reflected white light, X50  
E2635E Same as E2630A, in fluorescence mode, note weak brown fluorescence

AAE Lawn Hill 83-3, Lower Mullera Fm, 20.69m, Core(E2599)

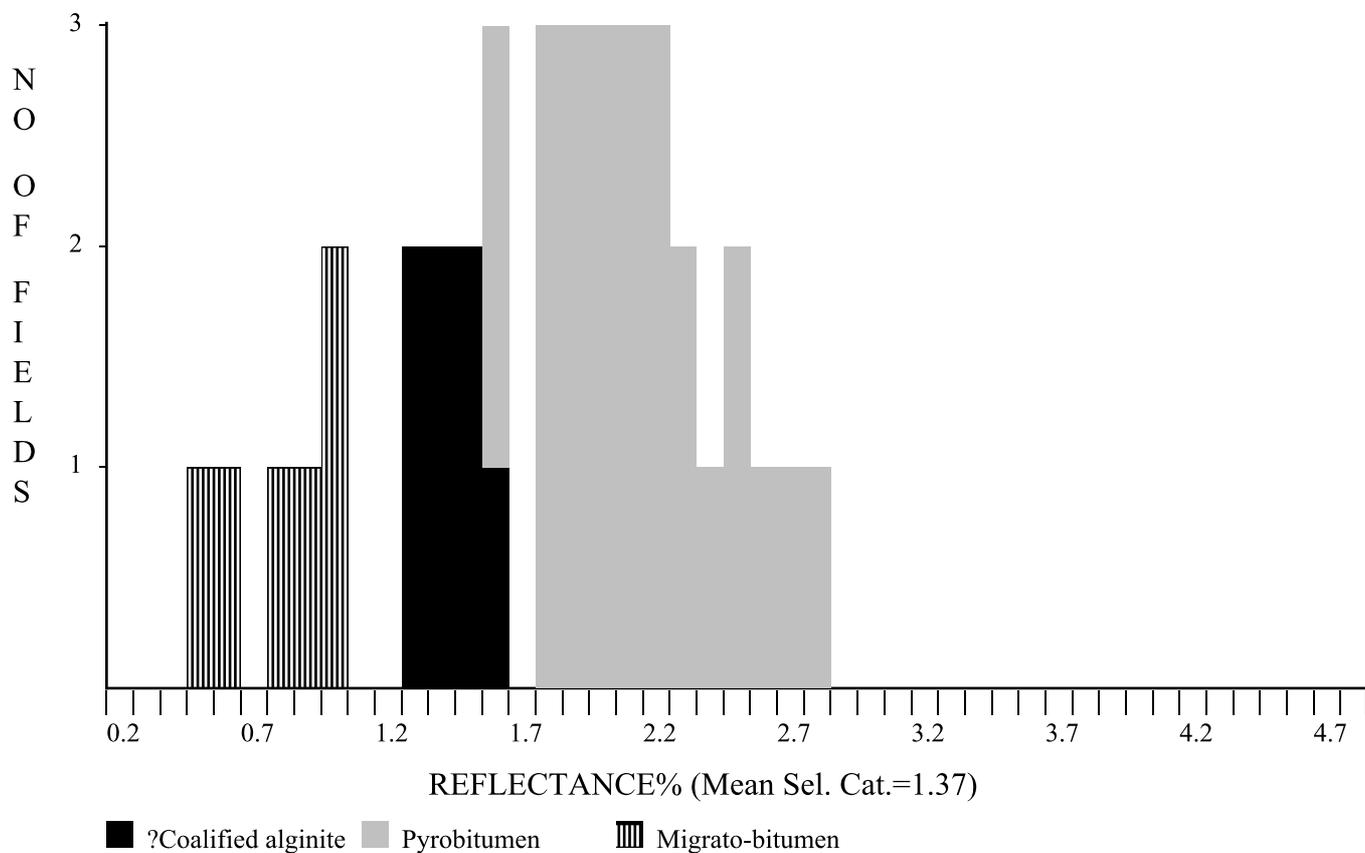


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	10	1.05	0.163
Migrato-bitumen	6	0.75	0.205
Pyrobitumen	25	2.02	0.257
<u>Total</u>	41	1.60	0.584

Selected categories: ?Coalified alginite:

No. of Readings: 10  
 Mean of Selected Categories: 1.05  
 Standard Deviation of Selected categories: 0.163

AAE Lawn Hill 83-3, Lower Mullera Fm, 36m, Core(E2601)

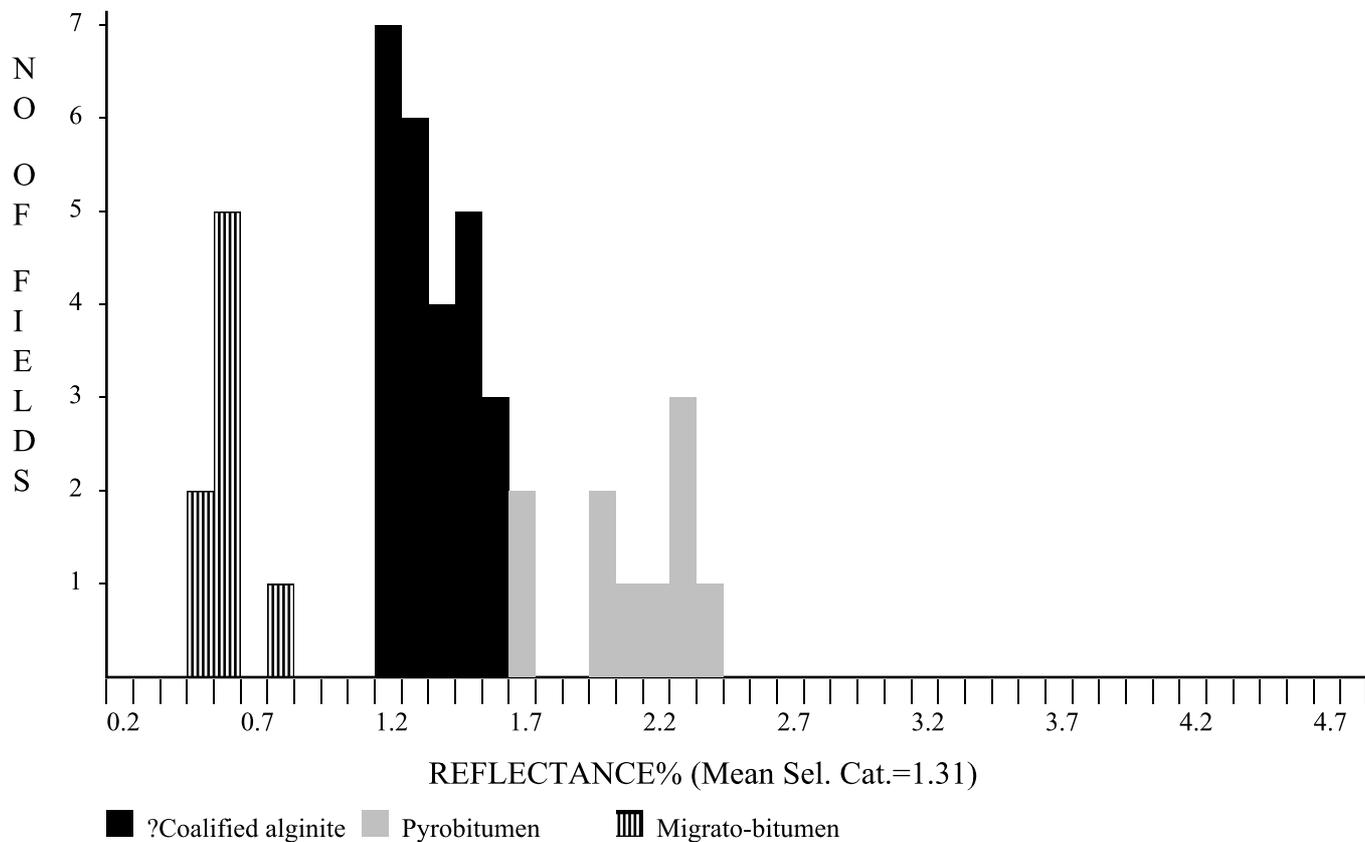


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	7	1.37	0.093
Pyrobitumen	25	2.08	0.315
Migrato-bitumen	6	0.75	0.163
<u>Total</u>	38	1.74	0.571

Selected categories: ?Coalified alginite:

No. of Readings: 7  
 Mean of Selected Categories: 1.37  
 Standard Deviation of Selected categories: 0.093

AAE Lawn Hill 83-3, Lower Mullera Fm, 26m, Core(E2603)

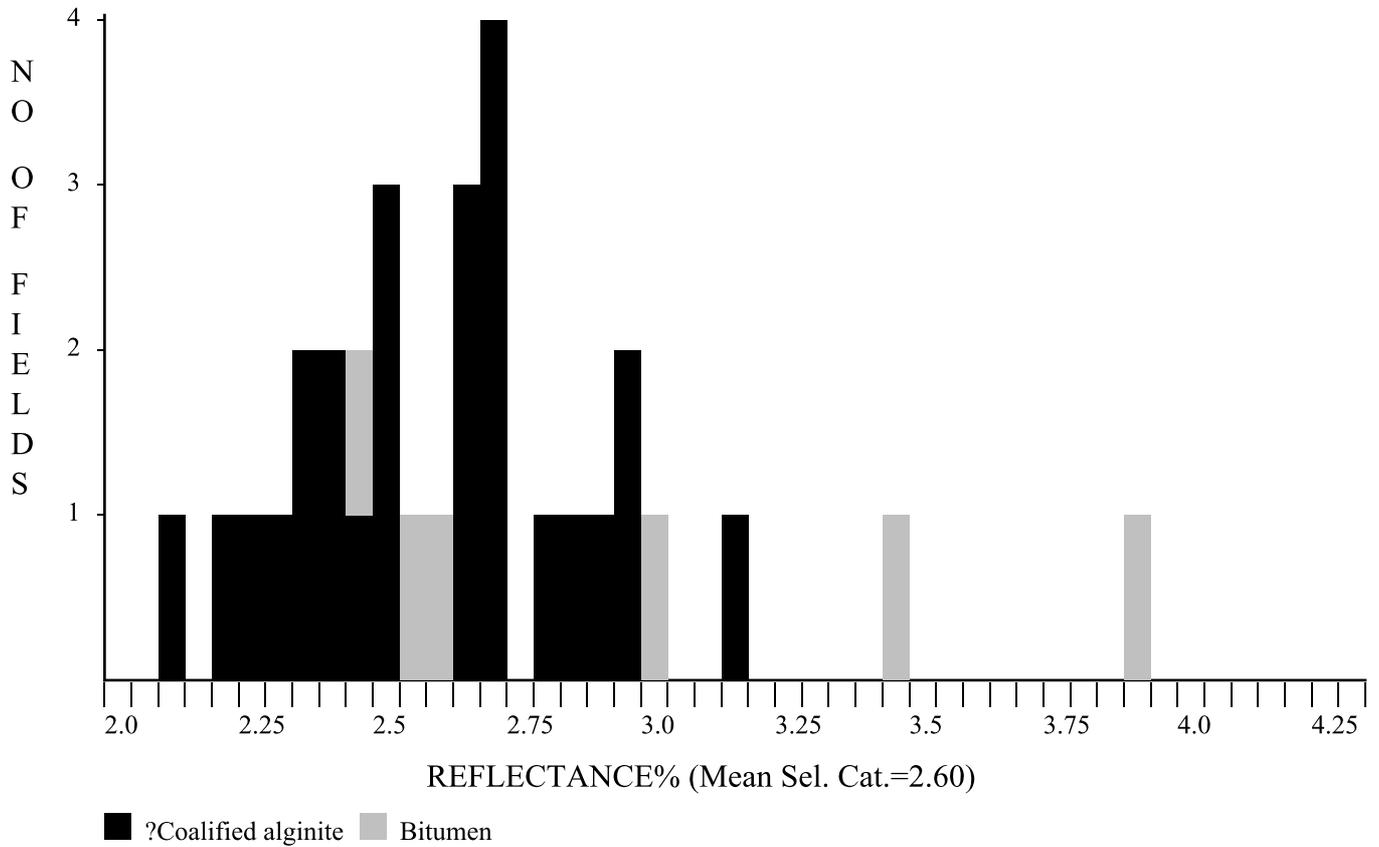


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	25	1.31	0.125
Pyrobitumen	10	2.04	0.231
Migrato-bitumen	8	0.54	0.088
<u>Total</u>	43	1.34	0.506

Selected categories: ?Coalified alginite:

No. of Readings: 25  
 Mean of Selected Categories: 1.31  
 Standard Deviation of Selected categories: 0.125

AAE Lawn Hill 83-3, ?Constance sandstone, 453.88-453.91m, Core(E2630)

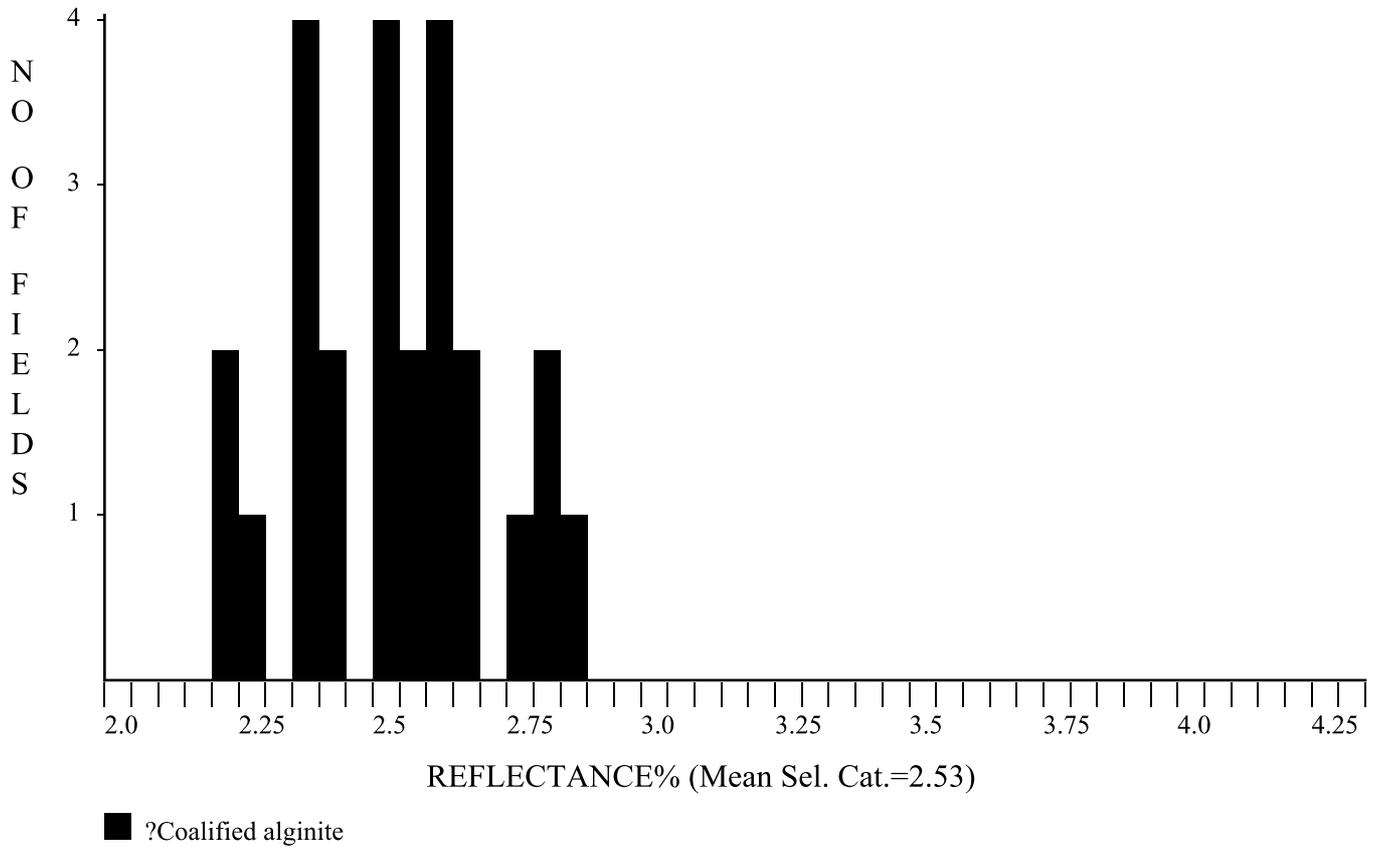


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	25	2.60	0.260
Bitumen	6	3.02	0.527
<u>Total</u>	31	2.68	0.367

Selected categories: ?Coalified alginite:

No. of Readings:	25
Mean of Selected Categories:	2.60
Standard Deviation of Selected categories:	0.260

AAE Lawn Hill 83-3, ?Constance sandstone, 461.11-461.12m, Core(E2632)

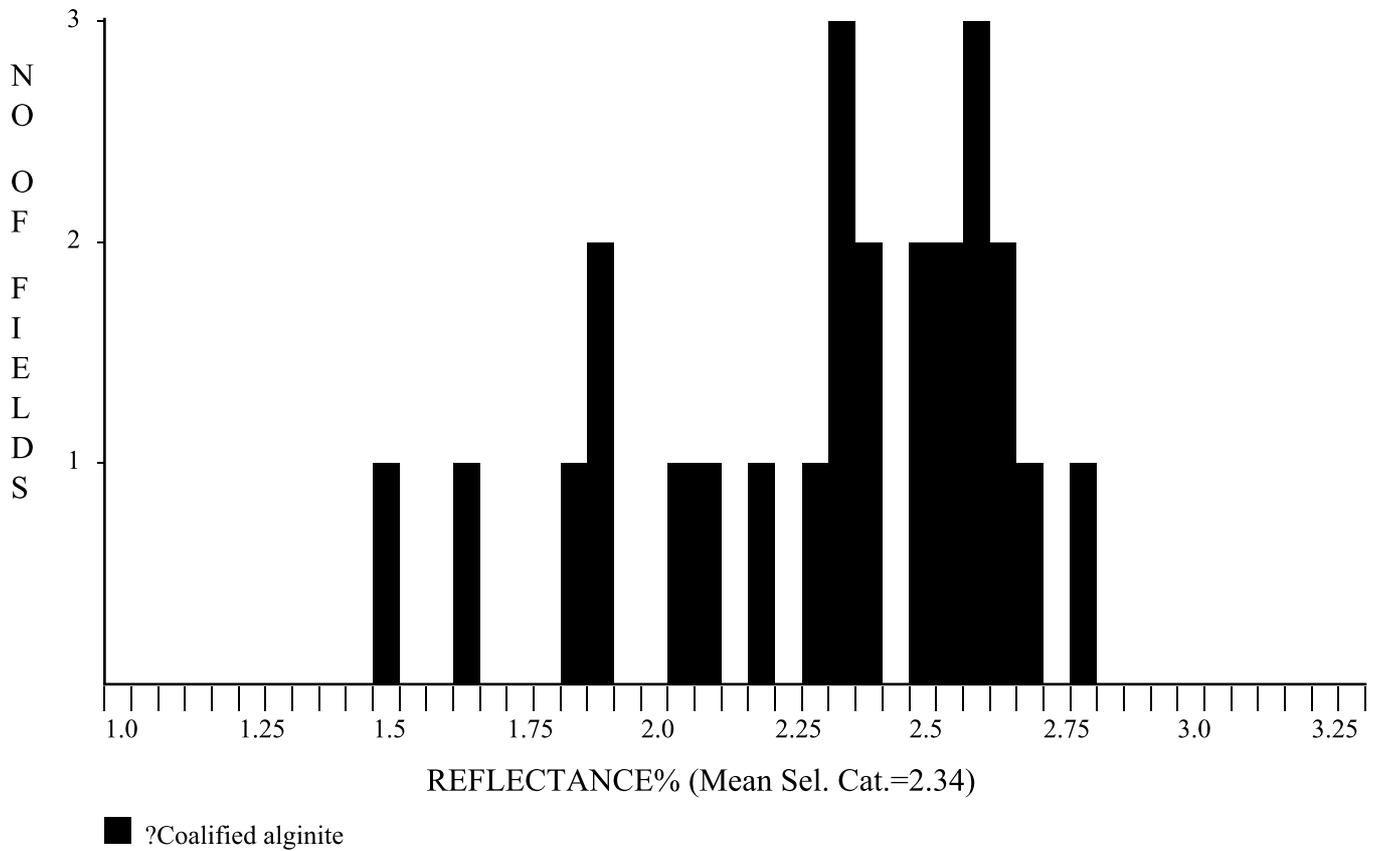


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	25	2.53	0.178
<u>Total</u>	25	2.53	0.178

Selected categories: ?Coalified alginite:

No. of Readings: 25  
 Mean of Selected Categories: 2.53  
 Standard Deviation of Selected categories: 0.178

AAE Lawn Hill 83-3, ?Constance sandstone, 470.86-470.88m, Core(E2635)



<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	25	2.34	0.337
<u>Total</u>	25	2.34	0.337

Selected categories: ?Coalified alginite:

No. of Readings: 25  
 Mean of Selected Categories: 2.34  
 Standard Deviation of Selected categories: 0.337

**GEOLOGICAL SURVEY QUEENSLAND  
ISA SUPERBASIN**

**AAE LAWN HILL 83-4**

**?Doomadgee Formation**

E2605	156.26	-	-	-	-	Rare to sparse coalified alginite dull orange to weak brown.
Core	Alginite	0.92	0.78-1.13	0.082	22	(Silty claystone with minor argillaceous siltstone, part calcareous. Dom rare to sparse, L only. Liptinite rare to sparse, other macerals absent. Abundant non-fluorescing granular bitumen disseminated in the mineral matrix. Rare pyrobitumen. Coalified alginite rare to sparse and occur as dull orange to weak brown fluorescing narrow strands with smooth polishing surface. Pyrobitumen occur as non-fluorescing veins with irregular polishing surfaces. Migrato-bitumen is rare and occur as orange to dull orange fluorescing round to oval shaped bodies with smooth polishing. Rare thucholites probably associated with alginite. Mineral fluorescence patchy weak orange. Iron oxides rare. Pyrite abundant.)
	Pyrobitumen	1.62	1.45-1.87	0.181	3	
	Bitumen	0.75	0.66-0.84	0.090	2	
E2608	163.33	-	-	-	-	Rare coalified alginite dull orange to weak brown. (Fine claystone and silty claystone, part calcareous. Dom rare, L only. Liptinite rare, other macerals absent. Abundant non-fluorescing granular bitumen disseminated in the mineral matrix. Coalified alginite rare and occur as dull orange to weak brown fluorescing narrow strands with smooth polishing surface. Migrato-bitumen is rare and occur as orange to dull orange fluorescing round to oval shaped bodies with smooth polishing. Rare thucholites probably associated with alginite. Mineral fluorescence patchy weak orange. Iron oxides rare. Pyrite abundant.)
Core	Alginite	0.93	0.75-1.08	0.107	7	
	Bitumen	0.59	0.47-0.78	0.138	3	
E2609	166	-	-	-	-	Rare to sparse coalified alginite dull orange to weak brown. (Fine claystone and silty claystone, part calcareous. Dom rare to sparse, L only. Liptinite rare to sparse, other macerals absent. Abundant non-fluorescing granular bitumen disseminated in the mineral matrix. Coalified alginite rare to sparse and occur as dull orange to weak brown fluorescing narrow strands with smooth polishing surface. Migrato-bitumen is rare and occur as orange to dull orange fluorescing round to oval shaped bodies with smooth polishing. Rare thucholites probably associated with alginite. Mineral fluorescence patchy weak orange. Iron oxides rare. Pyrite abundant.)
Core	Alginite	0.94	0.79-1.11	0.093	18	
	Bitumen	0.52	-	-	1	

Note: In the VRW Excel workbook, assessed pyrobitumen volume is recorded in the inertinite box.

Plates

E2605A Fluorescing coalified alginite in silty claystone,  $R_{Alg} = 1.02\%$ , reflected white light, X50

E2605B Same as E2605A, in fluorescence mode

E2605C Pyrobitumen in silty claystone,  $R_{PBit} = 1.54\%$ , reflected white light, X50

E2605D Same as E2605C, in fluorescence mode

E2605E Migrato-bitumen in silty claystone,  $R_{Bit} = 0.84\%$ , reflected white light, X50

E2605F Same as E2605E, in fluorescence mode

E2605G Non-fluorescing granular bitumen in silty claystone, reflected white light, X50

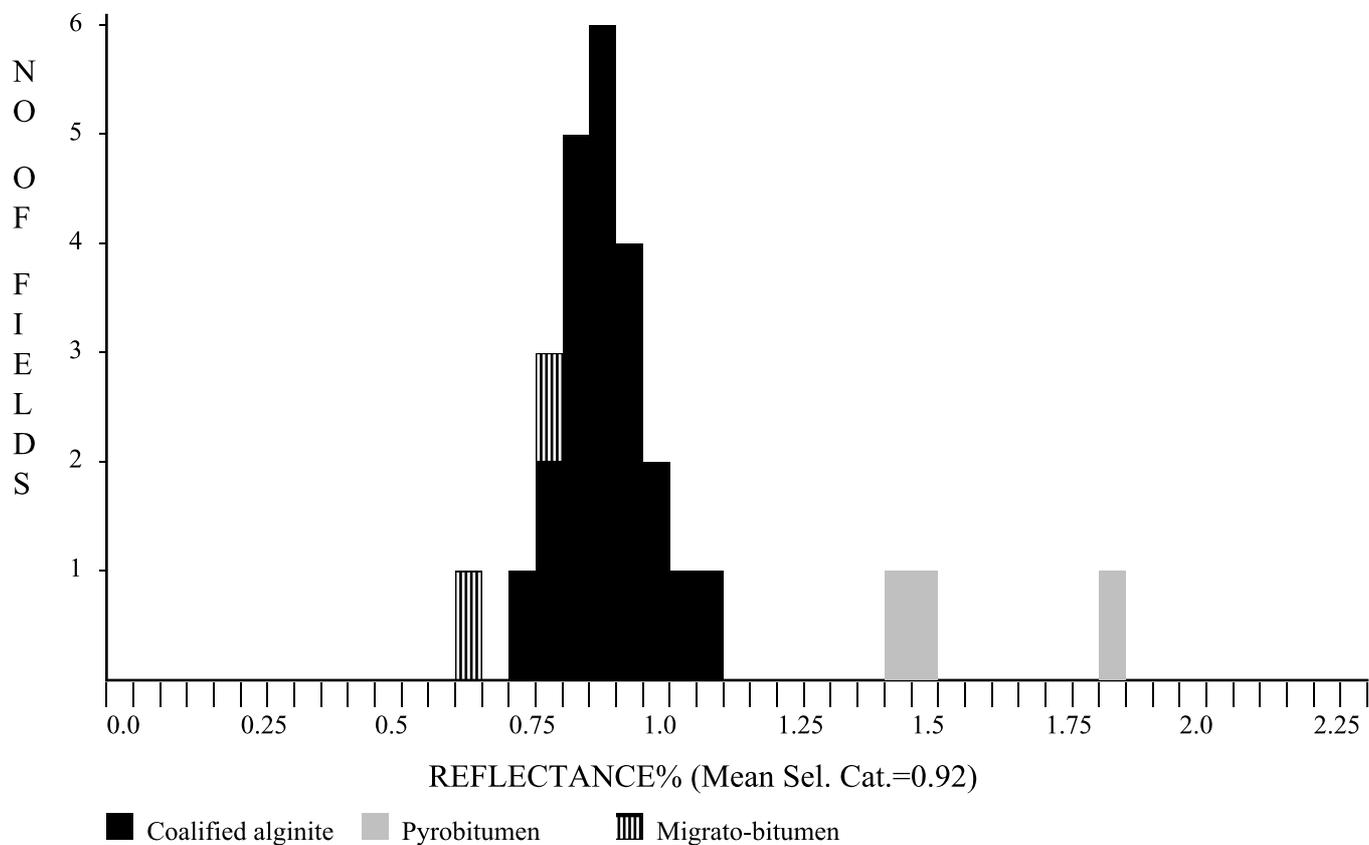
E2605H Same as E2605G, in fluorescence mode

E2605I Thucholites in silty claystone, reflected white light, X50

E2605J Same as E2605J, in fluorescence mode

E2608A Fluorescing coalified alginite in silty claystone,  $R_{Alg} = 0.82\%$ , reflected white light, X50  
E2608B Same as E2608A, in fluorescence mode  
E2608C Migrato-bitumen in silty claystone,  $R_{Bit} = 0.51\%$ , reflected white light, X50  
E2608D Same as E2608C, in fluorescence mode  
E2609A Fluorescing coalified alginite in claystone,  $R_{Alg} = 0.98\%$ , reflected white light, X50  
E2609B Same as E2609A, in fluorescence mode  
E2609C Thucholites in claystone, reflected white light, X50  
E2609D Same as E2609C, in fluorescence mode  
E2609E Non-fluorescing granular bitumen in silty claystone, reflected white light, X50  
E2609F Same as E2609E, in fluorescence mode

AAE Lawn Hill 83-4, ?Doomadgee Fm, 156.26m, Core(E2605)

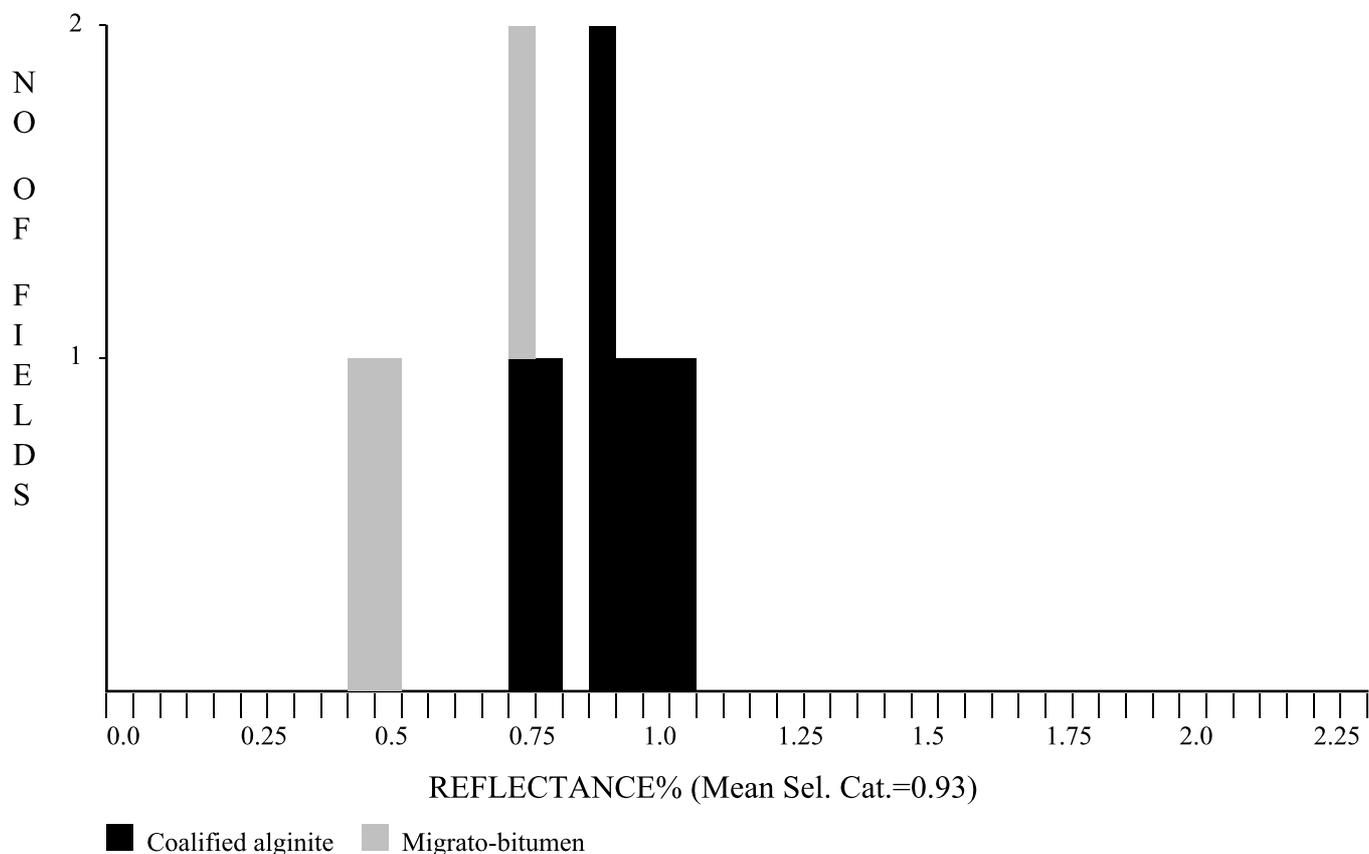


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Coalified alginite	22	0.92	0.082
Pyrobitumen	3	1.62	0.181
Migrato-bitumen	2	0.75	0.090
<u>Total</u>	<u>27</u>	<u>0.99</u>	<u>0.248</u>

Selected categories: Coalified alginite:

No. of Readings: 22  
 Mean of Selected Categories: 0.92  
 Standard Deviation of Selected categories: 0.082

AAE Lawn Hill 83-4, ?Doomadgee Fm, 163.33m, Core(E2608)

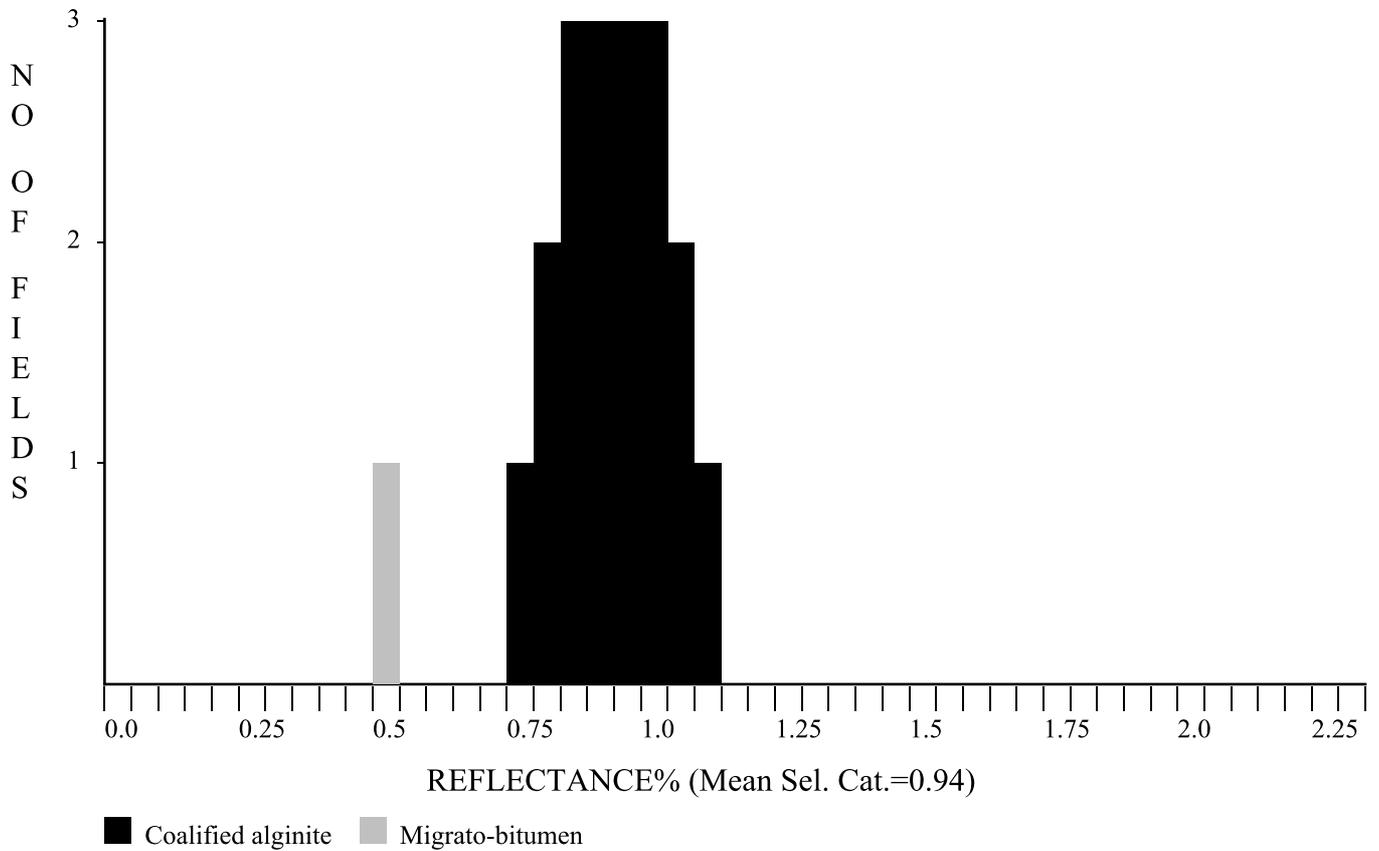


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Coalified alginite	7	0.93	0.107
Migrato-bitumen	3	0.59	0.138
<u>Total</u>	10	0.83	0.195

Selected categories: Coalified alginite:

No. of Readings: 7  
 Mean of Selected Categories: 0.93  
 Standard Deviation of Selected categories: 0.107

AAE Lawn Hill 83-4, ?Doomadgee Fm, 166m, Core(E2609)



<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Coalified alginite	18	0.94	0.093
Migrato-bitumen	1	0.52	0.000
<u>Total</u>	19	0.92	0.130

Selected categories: Coalified alginite:

No. of Readings: 18  
 Mean of Selected Categories: 0.94  
 Standard Deviation of Selected categories: 0.093

**GEOLOGICAL SURVEY QUEENSLAND  
SOUTH NICHOLSON BASIN  
BHP CONSTANCE RANGE 10A**

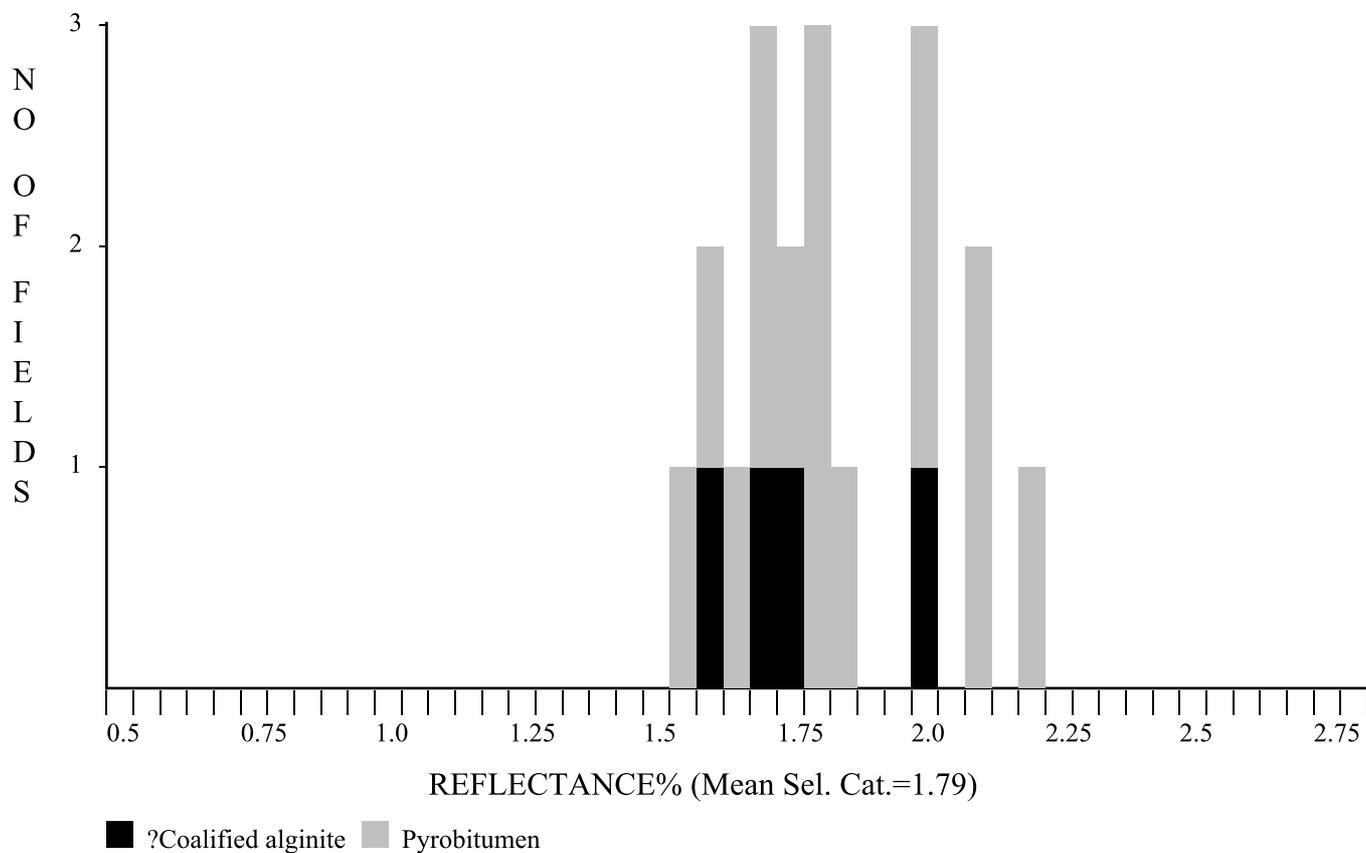
ERC# Type	Depth (ft)	$\overline{R}_{vmax}$	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence <b>?Mullera Formation</b>
E2610 Core	85' 5''	-	-	-	-	Fluorescing liptinite absent. (Fine claystone. Dom rare, L only. Liptinite rare, other macerals absent. Diffuse organic matter abundant. Common pyrobitumen. Coalified alginite rare to sparse and occur as non-fluorescing narrow strands with smooth polishing surface. Pyrobitumen occur as narrow non-fluorescing strands with pitted to mottled polishing surfaces. Most pyrobitumen strands occur enveloped in bands of diffuse organic matter and it is possible that both ?alginite and pyrobitumen represent the same material and textural difference could be due to varying levels of thermal maturity attained. Mineral fluorescence pervasive dull orange. Iron oxides rare. Pyrite sparse.)
	?Alginite	1.79	1.62-2.03	0.149	4	
	Pyrobitumen	1.86	1.59-2.23	0.190	15	

Note: In the VRW Excel workbook, assessed pyrobitumen volume is recorded in the inertinite box.

Plates

- E2610A ?Coalified alginite in fine claystone,  $R_{Alg} = 1.74\%$ , reflected white light, X50
- E2610B Same as E2610A, in fluorescence mode
- E2610C Pyrobitumen in silty claystone,  $R_{PBit} = 1.84\%$ , reflected white light, X50
- E2610D Same as E2610C, in fluorescence mode
- E2610E Abundant diffuse organic matter in fine claystone, reflected white light, X50
- E2610F Same as E2610E, in fluorescence mode

BHP Constance Range 10A, ? Mullera Fm, 85ft 5inch, Core(E2610)



<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	4	1.79	0.149
Pyrobitumen	15	1.86	0.190
<u>Total</u>	19	1.85	0.185

Selected categories: ?Coalified alginite:

No. of Readings: 4  
 Mean of Selected Categories: 1.79  
 Standard Deviation of Selected categories: 0.149

**GEOLOGICAL SURVEY QUEENSLAND  
SOUTH NICHOLSON BASIN  
COM ARGYLE CREEK 1**

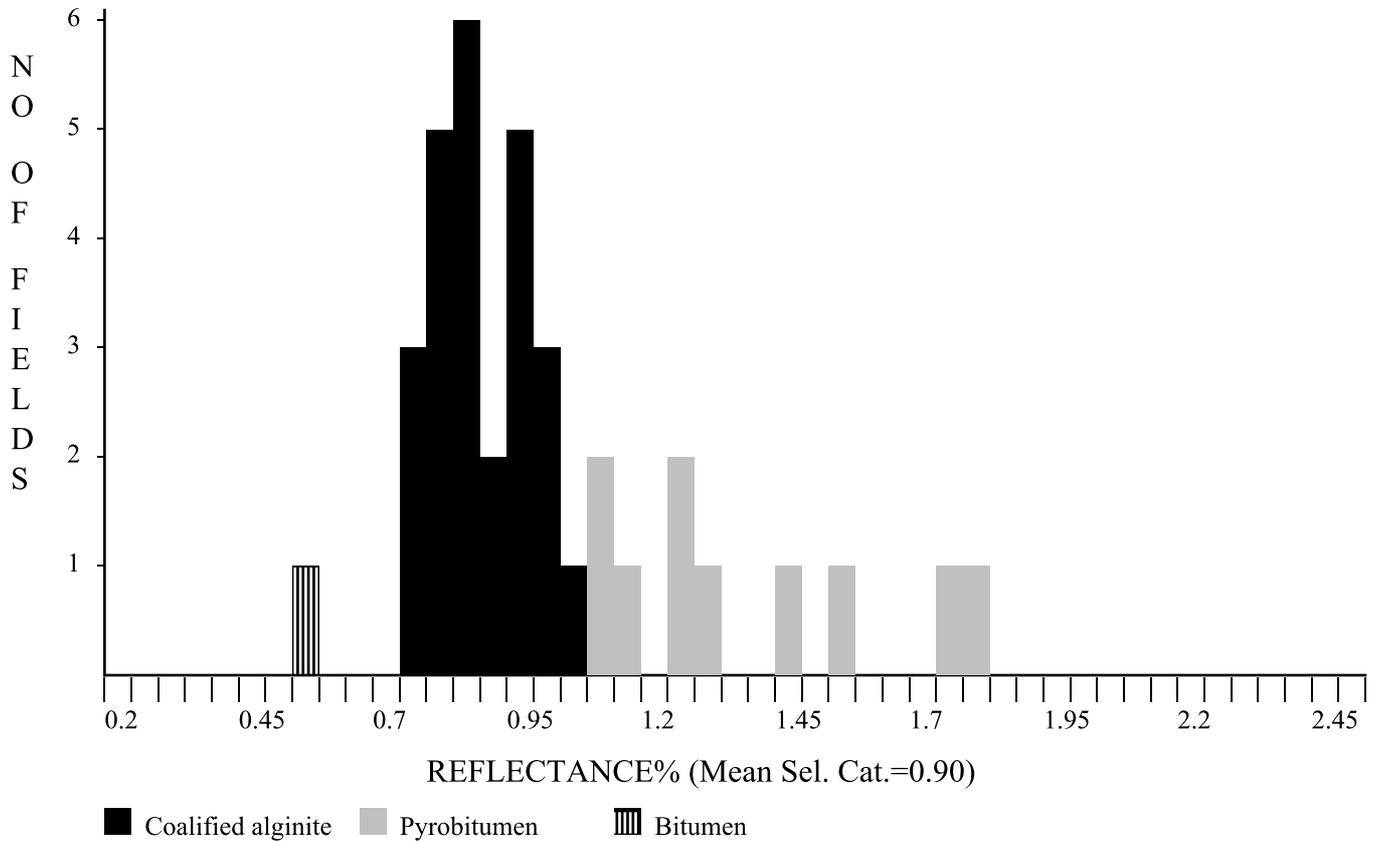
ERC# Type	Depth (m)	$\bar{R}_{vmax}$	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence <b>?Lower Constance Sandstone</b>
E2614 Core	81-84	-	-	-	-	Rare to sparse alginite dull orange to weak brown. (Silty claystone and argillaceous siltstone. Dom rare to sparse, L only. Liptinite rare to sparse, other macerals absent. Diffuse organic matter common. Sparse pyrobitumen. Coalified alginite rare to sparse and occur as weak fluorescing narrow strands with smooth polishing surface. Pyrobitumen occur as narrow non-fluorescing strands with pitted to mottled polishing surfaces. Rare bitumen in siltstone. Rare thucholites, probably associated with alginite. Mineral fluorescence moderate orange. Glauconite sparse. Iron oxides rare. Pyrite sparse.)
	Alginite	0.90	0.75-1.07	0.088	25	
	Pyrobitumen	1.38	1.11-1.82	0.248	10	
	Bitumen	0.57	-	-	1	
E2616 Core	111-114	-	-	-	-	Sparse alginite dull orange to weak brown. (Coarse sandstone with minor claystone and argillaceous siltstone. Dom sparse, L only. Liptinite sparse, other macerals absent. Diffuse organic matter common. Common pyrobitumen. Coalified alginite sparse and occur as weak to moderate fluorescing narrow strands with smooth polishing surface. Pyrobitumen occur as narrow non-fluorescing strands with pitted to mottled polishing surfaces. Mineral fluorescence moderate orange to none. Glauconite common. Iron oxides rare. Pyrite sparse.)
	Alginite	0.97	0.84-1.14	0.080	25	
	Pyrobitumen	1.60	1.24-1.81	0.167	10	

Note: In the VRW Excel workbook, assessed pyrobitumen volume is recorded in the inertinite box.

Plates

- E2614A Coalified alginite in silty claystone,  $R_{Alg} = 0.89\%$ , reflected white light, X50
- E2614B Same as E2614A, in fluorescence mode
- E2614C Pyrobitumen in siltstone,  $R_{PBit} = 1.82\%$ , reflected white light, X50
- E2614D Same as E2614C, in fluorescence mode
- E2614E Bitumen in siltstone,  $R_{Bit} = 0.57\%$ , reflected white light, X50
- E2614F Same as E2614E, in fluorescence mode
- E2614G Dull fluorescing lamalginite in silty claystone, reflected white light, X50
- E2614H Same as E2614G, in fluorescence mode
- E2614I Thucholites in siltstone, reflected white light, X50
- E2614J Same as E2614I, in fluorescence mode
- E2616A Coalified alginite in claystone,  $R_{Alg} = 0.90\%$ , reflected white light, X50
- E2616B Same as E2616A, in fluorescence mode
- E2616C Pyrobitumen in siltstone,  $R_{PBit} = 1.60\%$ , reflected white light, X50
- E2616D Same as E2616C, in fluorescence mode
- E2616E Fluorescing lamalginite in silty claystone, reflected white light, X50
- E2616F Same as E2616E, in fluorescence mode

Com Argyle Creek 1, ?Lower Constance Sandstone, 81-84m, Core(E2614)

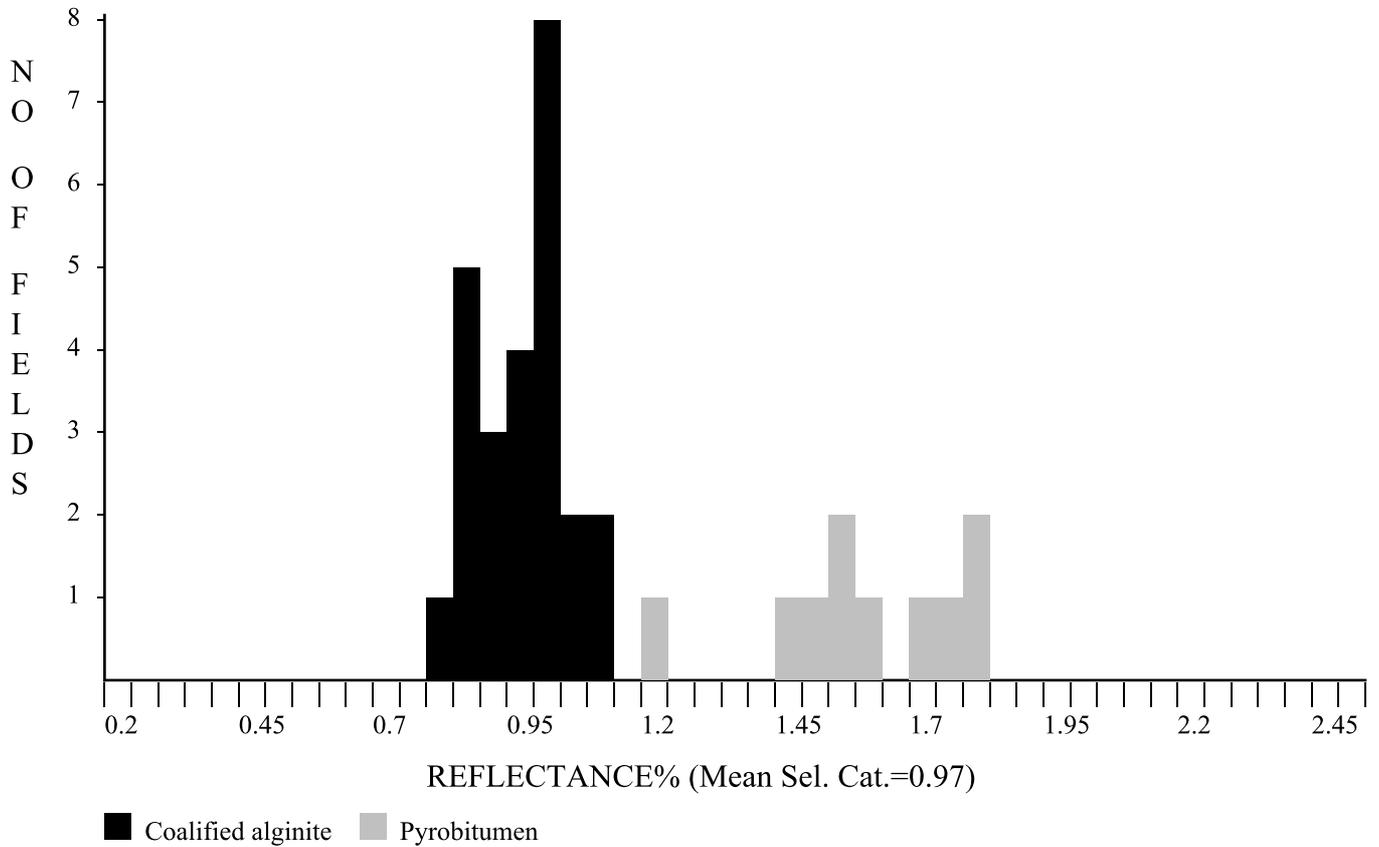


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Coalified alginite	25	0.90	0.088
Pyrobitumen	10	1.38	0.248
Bitumen	1	0.57	0.000
<u>Total</u>	36	1.02	0.275

Selected categories: Coalified alginite:

No. of Readings: 25  
 Mean of Selected Categories: 0.90  
 Standard Deviation of Selected categories: 0.088

Com Argyle Creek 1, ?Lower Constance Sandstone, 111-114m, Core(E2616)



<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Coalified alginite	25	0.97	0.080
Pyrobitumen	10	1.60	0.167
<u>Total</u>	35	1.15	0.307

Selected categories: Coalified alginite:

No. of Readings: 25  
 Mean of Selected Categories: 0.97  
 Standard Deviation of Selected categories: 0.080

**GEOLOGICAL SURVEY QUEENSLAND  
SOUTH NICHOLSON BASIN  
COM EGILABRIA 1**

<b>ERC# Type</b>	<b>Depth (m)</b>	<b><math>\bar{R}_{vmax}</math></b>	<b>Range</b>	<b>SD</b>	<b>N</b>	<b>Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence ?Lower Constance Sandstone</b>
E2619 Core	585-584 ?Alginite	- 2.47	- 2.01-2.83	- 0.224	- 22	Fluorescing liptinite absent. (Siltstone with minor sandstone and claystone. Dom rare to sparse, L only. Liptinite rare to sparse, other macerals absent. Diffuse organic matter sparse. ?Coalified alginite rare to sparse and occur as non-fluorescing narrow elongated strands with smooth polishing surface. Rare thucholites. Mineral fluorescence weakorange. Glauconite sparse. Iron oxides rare. Pyrite sparse.)

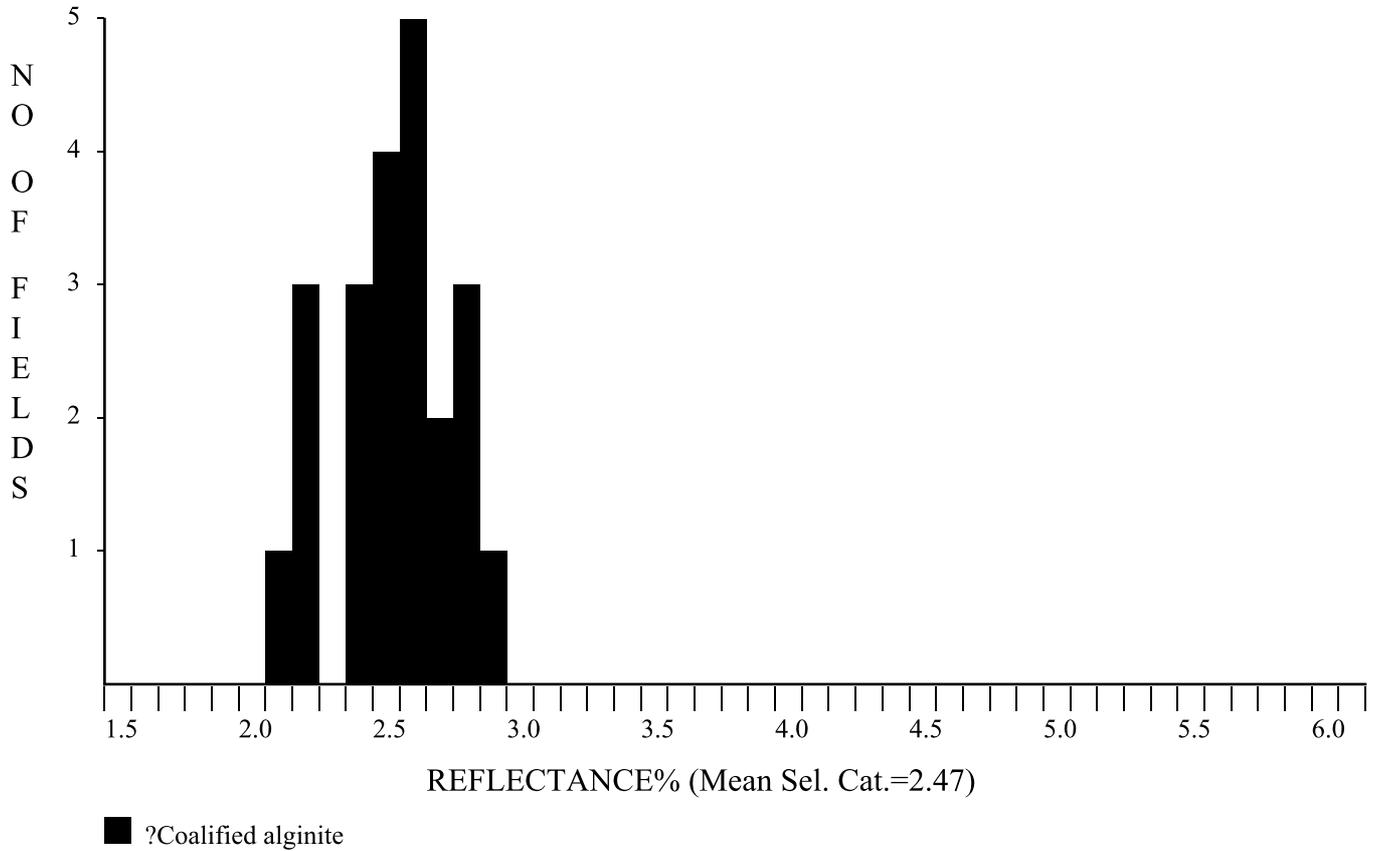
Note: In the VRW Excel workbook, assessed pyrobitumen volume is recorded in the inertinite box.

Plates

E2619A ?Coalified alginite in siltstone,  $R_{Alg} = 2.68\%$ , reflected white light, X50

E2619B Same as E2619A, in fluorescence mode

Com Egilabria 1 1, ?Lower Constance Sandstone, 585-584m, Core(E2619)



<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
?Coalified alginite	22	2.47	0.224
<u>Total</u>	22	2.47	0.224

Selected categories: ?Coalified alginite:

No. of Readings: 22  
 Mean of Selected Categories: 2.47  
 Standard Deviation of Selected categories: 0.224

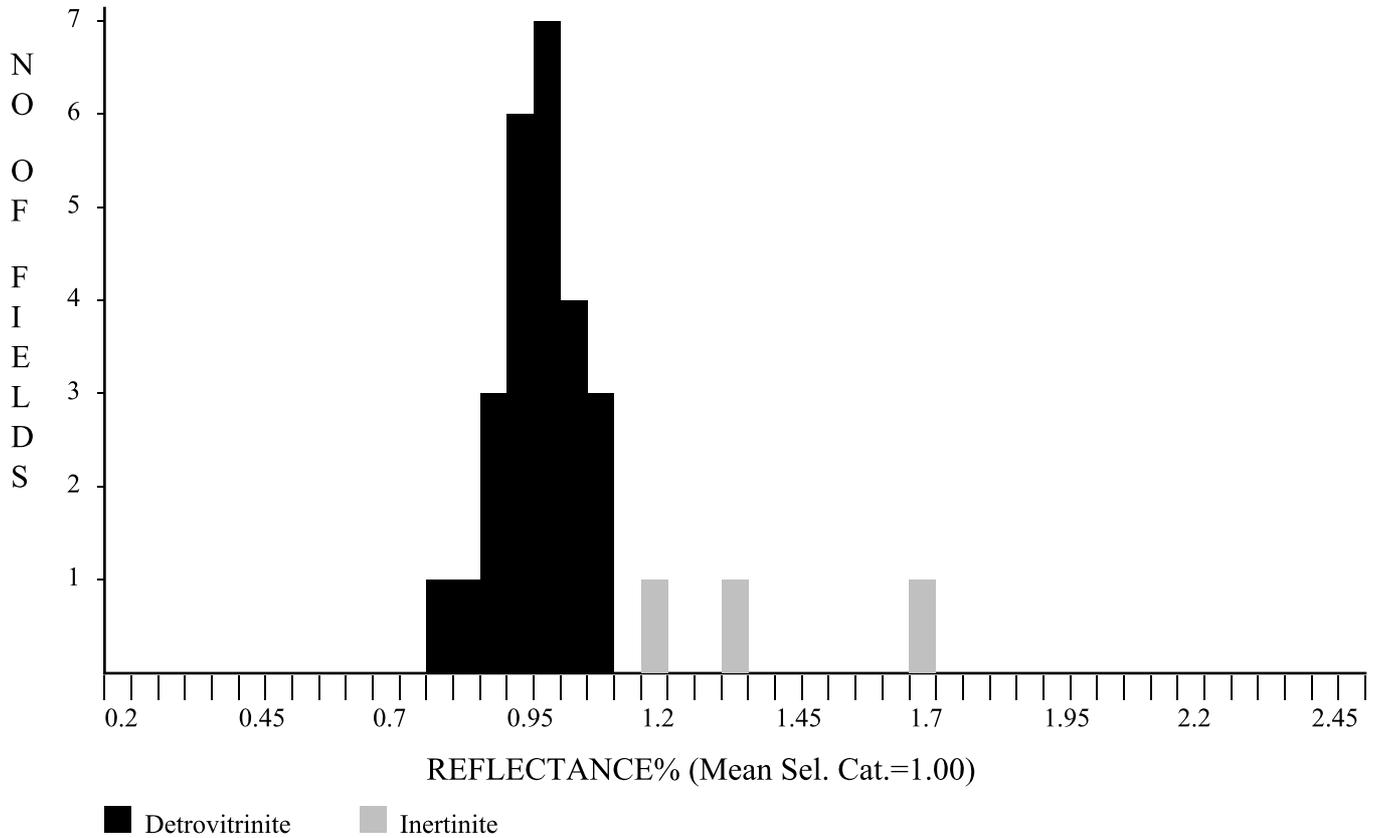
**GEOLOGICAL SURVEY QUEENSLAND  
ADAVALE BASIN  
PPC BURY 1**

ERC# Type	Depth (ft)	$\overline{R}_{vmax}$	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence <b>Bury Limestone</b>
E2624 Core	8034	1.00	0.83-1.13	0.074	25	Sparse sporinite and rare liptodetrinite orange to dull orange, rare cutinite dull orange. (Argillaceous siltstone with minor claystone. Dom abundant, V>>L>I. Vitrinite abundant, liptinite sparse, inertinite rare. Micrinite abundant in some vitrinite. Mineral fluorescence moderate to strong orange. Iron oxides sparse. Pyrite abundant.)
	$\overline{R}_I$	1.43	1.21-1.70	0.204	3	
E2628 Core	8404.33	1.05	0.88-1.21	0.077	25	Rare to sparse sporinite and rare liptodetrinite dull orange to weak brown, rare cutinite dull orange to weak brown. (Argillaceous siltstone and sandstone with minor claystone. Dom common, V>>L>I. Vitrinite common, liptinite rare to sparse, inertinite rare. Rare well preserved megaspores. Vitrinite bireflectance is low with a mean bireflectance ratio of 0.06. Micrinite abundant in some vitrinite. Mineral fluorescence weak orange. Iron oxides rare. Pyrite abundant.)
	Liptinite	0.56	0.52-0.63	0.048	3	
	$\overline{R}_I$	2.00	1.38-3.01	0.719	3	
E2629 Core	8405	1.06	0.88-1.26	0.105	25	Rare sporinite and liptodetrinite dull orange to weak brown. (Argillaceous siltstone with minor sandstone. Dom common, V>>L>I. Vitrinite common, liptinite and inertinite rare. Vitrinite bireflectance is low with a mean bireflectance ratio of 0.10. Mineral fluorescence moderate orange. Iron oxides abundant. Pyrite abundant.)
	Liptinite	0.52	0.40-0.63	0.066	7	
	$\overline{R}_I$	1.91	-	-	1	

Plates

- E2624A Detrovitrinite in argillaceous siltstone, Rv max = 1.01%, reflected white light, X50
- E2624B Same as E2624A, in fluorescence mode
- E2624C Inertodetrinite in argillaceous siltstone, R<sub>I</sub> = 1.70%, reflected white light, X50
- E2624D Same as E2624C, in fluorescence mode
- E2624E Micrinite in vitrinite, Rv max = 0.99%, reflected white light, X50
- E2624F Sporinite in argillaceous siltstone, reflected white light, X50
- E2624G Same as E2624F, in fluorescence mode
- E2628A Detrovitrinite in argillaceous siltstone, Rv max = 1.07%, reflected white light, X50
- E2628B Same as E2628A, in fluorescence mode
- E2628C Inertodetrinite in argillaceous siltstone, R<sub>I</sub> = 1.62%, reflected white light, X50
- E2628D Vitrinite in siltstone, maximum reflectance position, Rv max = 1.11%, reflected white light, X50
- E2628E Same grain, after rotating microscope stage at 90°, Rv min = 0.98%, reflected white light, X50
- E2628F Megaspore in argillaceous siltstone, R<sub>Sp</sub> = 0.63%, reflected white light, X50
- E2628G Same as E2628F, in fluorescence mode
- E2628H Weak fluorescing cutinite in argillaceous siltstone, reflected white light, X50
- E2628I Same as E2628H, in fluorescence mode
- E2629A Detrovitrinite in argillaceous siltstone, Rv max = 1.10%, reflected white light, X50
- E2629B Same as E2629A, in fluorescence mode
- E2629C Inertodetrinite in argillaceous siltstone, R<sub>I</sub> = 1.91%, reflected white light, X50
- E2629D Same as E2629C, in fluorescence mode
- E2629E Megaspore in argillaceous siltstone, R<sub>Sp</sub> = 0.52%, reflected white light, X50
- E2629F Same as E2629E, in fluorescence mode
- E2629G Weak fluorescing cutinite in argillaceous siltstone, reflected white light, X50
- E2629H Same as E2629G, in fluorescence mode

PPC Bury 1, Bury Limestone, 8034ft, Core(E2624)

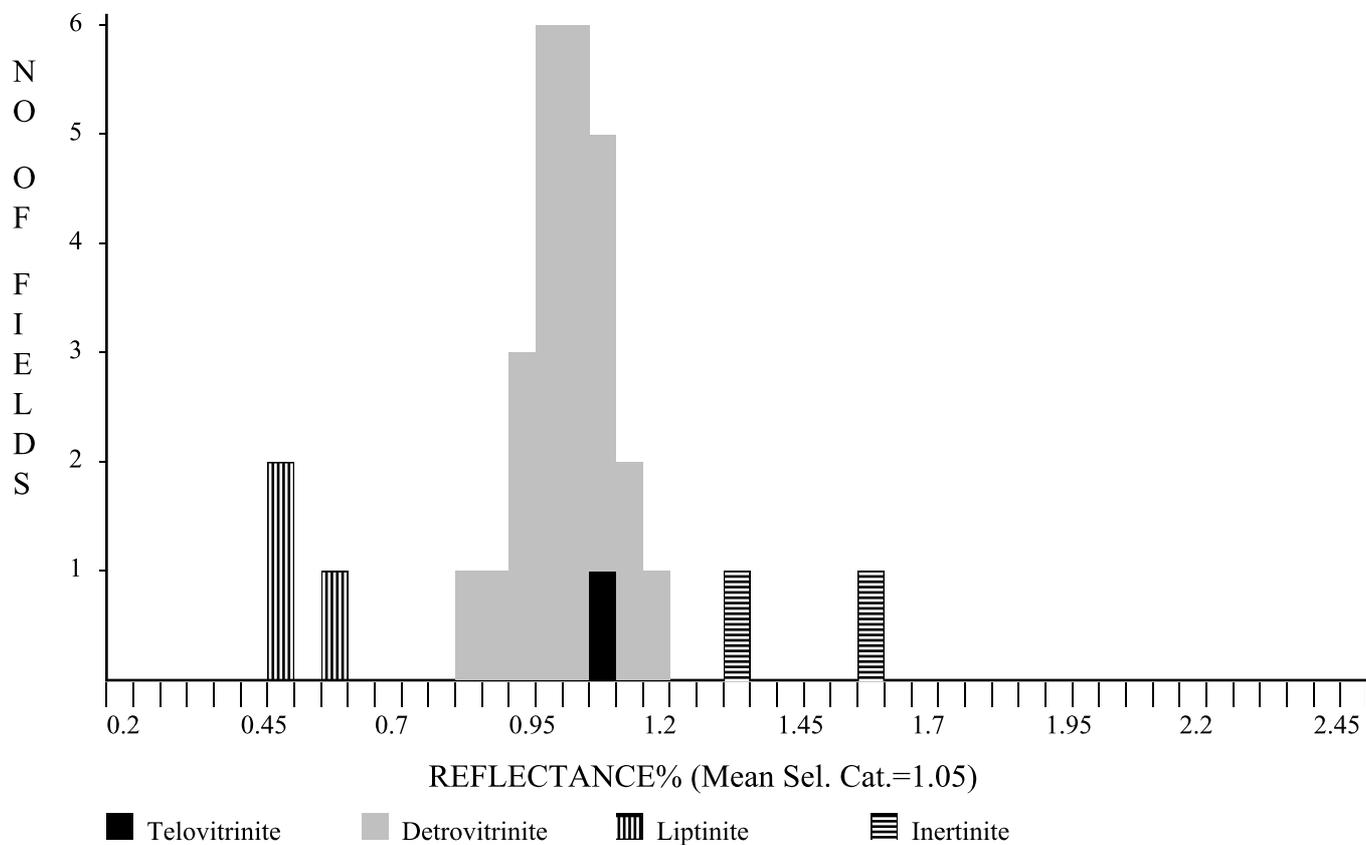


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Detrovitrinite	25	1.00	0.074
Inertinite	3	1.43	0.204
<u>Total</u>	28	1.04	0.164

Selected categories: Detrovitrinite:

No. of Readings: 25  
 Mean of Selected Categories: 1.00  
 Standard Deviation of Selected categories: 0.074

PPC Bury 1, Bury Limestone, 8404.33ft, Core(E2628)

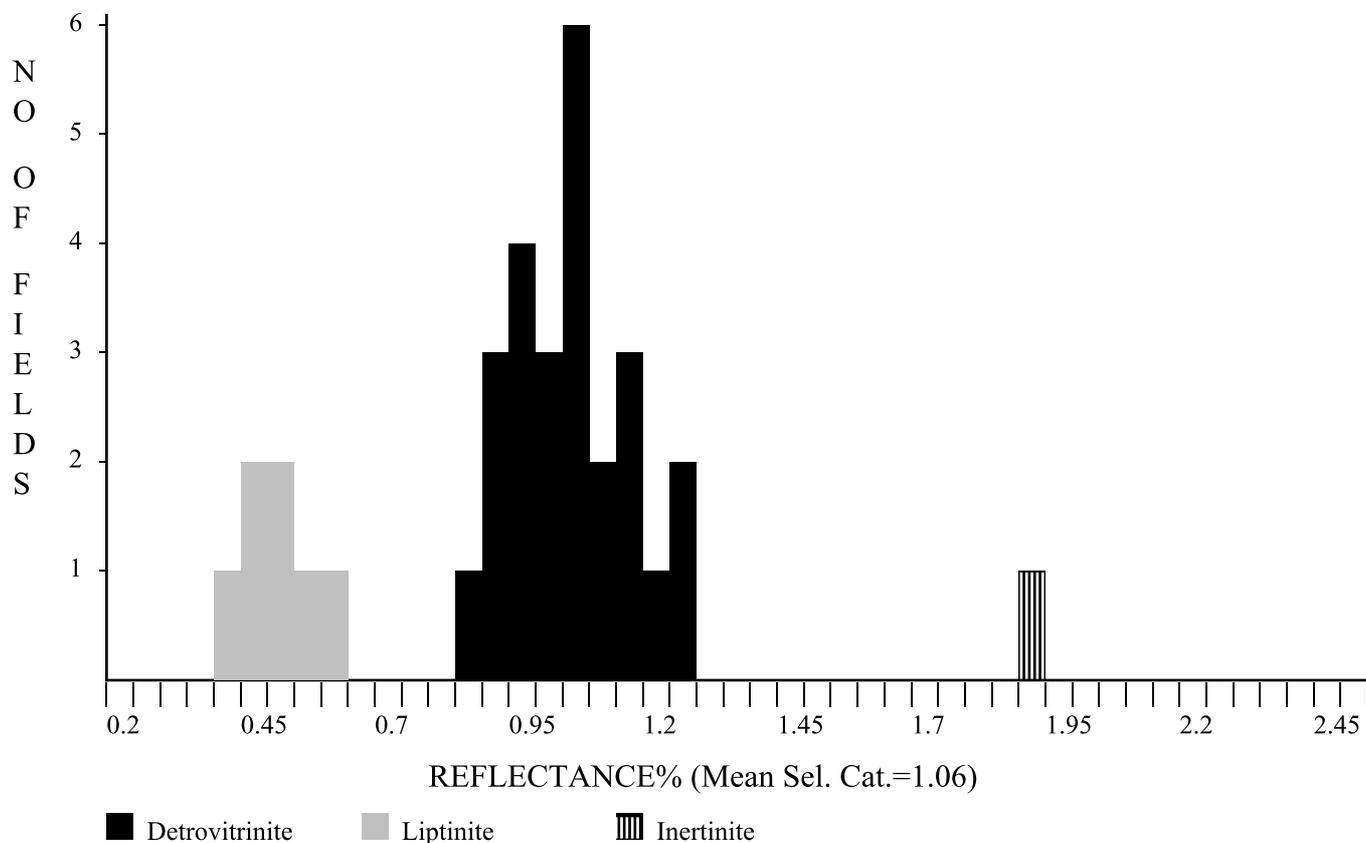


<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Telovitrinite	1	1.11	0.000
Detrovitrinite	24	1.05	0.077
Liptinite	3	0.56	0.048
Inertinite	3	2.00	0.719
<u>Total</u>	31	1.10	0.404

Selected categories: Telovitrinite, Detrovitrinite:

No. of Readings: 25  
 Mean of Selected Categories: 1.05  
 Standard Deviation of Selected categories: 0.077

PPC Bury 1, Bury Limestone, 8405ft, Core(E2629)



<u>Maceral Category</u>	<u>N</u>	<u>Mean</u>	<u>Standard Deviation</u>
Detrovitrinite	25	1.06	0.105
Liptinite	7	0.52	0.066
Inertinite	1	1.91	0.000
<u>Total</u>	33	0.97	0.293

Selected categories: Detrovitrinite:

No. of Readings: 25  
 Mean of Selected Categories: 1.06  
 Standard Deviation of Selected categories: 0.105

Dr Peter Crosdale (MAIG)  
Director, ERC  
15<sup>th</sup> June, 2017

## **APPENDIX - PLATES**

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

AAE Lawn Hill 83-3

E2599A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.02\%$ , reflected white light, X50

E2599B Same as E2599A, in fluorescence mode

E2599C Pyrobitumen in silty claystone,  $R_{PBit} = 1.91\%$ , reflected white light, X50

E2599D Same as E2599C, in fluorescence mode

E2599E ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.86\%$ , reflected white light, X50

E2599F Same as E2599E, in fluorescence mode

E2599G Lamalginite in silty claystone, reflected white light, X50

E2599H Same as E2599G, in fluorescence mode

E2601A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.23\%$ , reflected white light, X50

E2601B Same as E2601A, in fluorescence mode

E2601C Pyrobitumen in silty claystone,  $R_{PBit} = 2.61\%$ , reflected white light, X50

E2601D Same as E2601C, in fluorescence mode

E2601E ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.58\%$ , reflected white light, X50

E2601F Same as E2601E, in fluorescence mode

E2603A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.27\%$ , reflected white light, X50

E2603B Same as E2603A, in fluorescence mode

E2603C ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.52\%$ , reflected white light, X50

E2603D Same as E2603C, in fluorescence mode

E2603E Weakly fluorescing lamalginite in fine claystone, reflected white light, X50

E2603F Same as E2603C, in fluorescence mode

E2630A ?Coalified alginite in silty claystone,  $R_{Alg} = 2.97\%$ , reflected white light, X50

E2630B Same as E2630A, in fluorescence mode

E2630C Bitumen in silty claystone,  $R_{Bit} = 2.45\%$ , reflected white light, X50

E2630D Same as E2630C, in fluorescence mode

E2632A ?Coalified alginite in silty claystone, maximum reflectance position,  $R_{Alg} = 2.66\%$ , reflected white light, X50

E2632B Same grain, after rotating stage at  $90^\circ$ ,  $R_{Alg}$  minimum =  $2.04\%$

E2632C Same as E2632A, in fluorescence mode

E2635A ?Coalified alginite in silty claystone, maximum reflectance position,  $R_{Alg} = 2.56\%$ , reflected white light, X50

E2635B Same grain, after rotating stage at  $90^\circ$ ,  $R_{Alg}$  minimum =  $2.11\%$

E2635C Same as E2635A, in fluorescence mode

E2635D ?Coalified alginite in the lower end of range,  $R_{Alg} = 1.87\%$ , reflected white light, X50

E2635E Same as E2630A, in fluorescence mode, note weak brown fluorescence

AAE Lawn Hill 83-4

E2605A Fluorescing coalified alginite in silty claystone,  $R_{Alg} = 1.02\%$ , reflected white light, X50

E2605B Same as E2605A, in fluorescence mode

E2605C Pyrobitumen in silty claystone,  $R_{pBit} = 1.54\%$ , reflected white light, X50

E2605D Same as E2605C, in fluorescence mode

E2605E Migrato-bitumen in silty claystone,  $R_{Bit} = 0.84\%$ , reflected white light, X50

E2605F Same as E2605E, in fluorescence mode

E2605G Non-fluorescing granular bitumen in silty claystone, reflected white light, X50

E2605H Same as E2605G, in fluorescence mode

E2605I Thucholites in silty claystone, reflected white light, X50

E2605J Same as E2605I, in fluorescence mode

E2608A Fluorescing coalified alginite in silty claystone,  $R_{Alg} = 0.82\%$ , reflected white light, X50

E2608B Same as E2608A, in fluorescence mode

E2608C Migrato-bitumen in silty claystone,  $R_{Bit} = 0.51\%$ , reflected white light, X50

E2608D Same as E2608C, in fluorescence mode

E2609A Fluorescing coalified alginite in claystone,  $R_{Alg} = 0.98\%$ , reflected white light, X50

E2609B Same as E2609A, in fluorescence mode

E2609C Thucholites in claystone, reflected white light, X50

E2609D Same as E2609C, in fluorescence mode

E2609E Non-fluorescing granular bitumen in silty claystone, reflected white light, X50

E2609F Same as E2609E, in fluorescence mode

BHP Constance Range 10A

E2610A ?Coalified alginite in fine claystone,  $R_{Alg} = 1.74\%$ , reflected white light, X50

E2610B Same as E2610A, in fluorescence mode

E2610C Pyrobitumen in silty claystone,  $R_{pBit} = 1.84\%$ , reflected white light, X50

E2610D Same as E2610C, in fluorescence mode

E2610E Abundant diffuse organic matter in fine claystone, reflected white light, X50

E2610F Same as E2610E, in fluorescence mode

COM Argyle Creek 1

E2614A Coalified alginite in silty claystone,  $R_{Alg} = 0.89\%$ , reflected white light, X50

E2614B Same as E2614A, in fluorescence mode

E2614C Pyrobitumen in siltstone,  $R_{pBit} = 1.82\%$ , reflected white light, X50

E2614D Same as E2614C, in fluorescence mode

E2614E Bitumen in siltstone,  $R_{Bit} = 0.57\%$ , reflected white light, X50

E2614F Same as E2614E, in fluorescence mode

E2614G Dull fluorescing lamalginite in silty claystone, reflected white light, X50

E2614H Same as E2614G, in fluorescence mode

E2614I Thucholites in siltstone, reflected white light, X50

E2614J Same as E2614I, in fluorescence mode

E2616A Coalified alginite in claystone,  $R_{Alg} = 0.90\%$ , reflected white light, X50  
 E2616B Same as E2616A, in fluorescence mode  
 E2616C Pyrobitumen in siltstone,  $R_{PBit} = 1.60\%$ , reflected white light, X50  
 E2616D Same as E2616C, in fluorescence mode  
 E2616E Fluorescing lamalginite in silty claystone, reflected white light, X50  
 E2616F Same as E2616E, in fluorescence mode

#### COM Egilabria 1

E2619A ?Coalified alginite in siltstone,  $R_{Alg} = 2.68\%$ , reflected white light, X50  
 E2619B Same as E2619A, in fluorescence mode

#### PPC Bury 1

E2624A Detrovitrinite in argillaceous siltstone,  $R_v \text{ max} = 1.01\%$ , reflected white light, X50  
 E2624B Same as E2624A, in fluorescence mode  
 E2624C Inertodetrinite in argillaceous siltstone,  $RI = 1.70\%$ , reflected white light, X50  
 E2624D Same as E2624C, in fluorescence mode  
 E2624E Micrinite in vitrinite,  $R_v \text{ max} = 0.99\%$ , reflected white light, X50

E2624F Sporinite in argillaceous siltstone, reflected white light, X50  
 E2624G Same as E2624F, in fluorescence mode

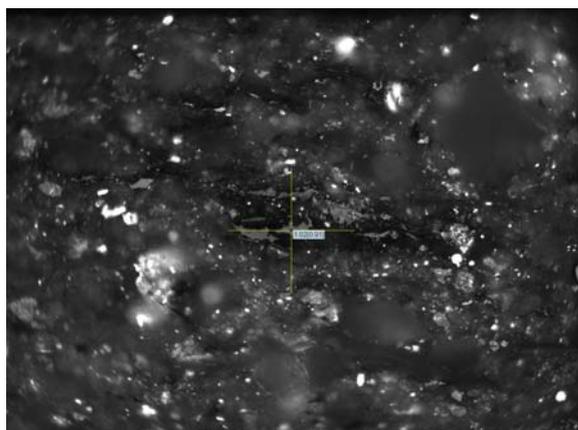
E2628A Detrovitrinite in argillaceous siltstone,  $R_v \text{ max} = 1.07\%$ , reflected white light, X50  
 E2628B Same as E2628A, in fluorescence mode  
 E2628C Inertodetrinite in argillaceous siltstone,  $RI = 1.62\%$ , reflected white light, X50  
 E2628D Vitrinite in siltstone, maximum reflectance position,  $R_v \text{ max} = 1.11\%$ , reflected white light, X50  
 E2628E Same grain, after rotating microscope stage at  $90^\circ$ ,  $R_v \text{ min} = 0.98\%$ , reflected white light, X50

E2628F Megaspore in argillaceous siltstone,  $R_{Sp} = 0.63\%$ , reflected white light, X50  
 E2628G Same as E2628F, in fluorescence mode  
 E2628H Weak fluorescing cutinite in argillaceous siltstone, reflected white light, X50  
 E2628I Same as E2628H, in fluorescence mode

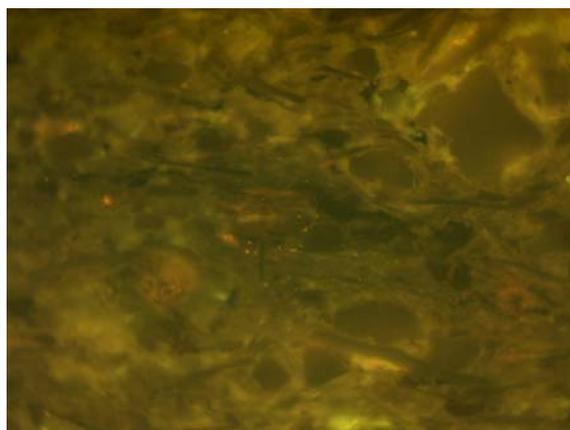
E2629A Detrovitrinite in argillaceous siltstone,  $R_v \text{ max} = 1.10\%$ , reflected white light, X50  
 E2629B Same as E2629A, in fluorescence mode  
 E2629C Inertodetrinite in argillaceous siltstone,  $RI = 1.91\%$ , reflected white light, X50  
 E2629D Same as E2629C, in fluorescence mode  
 E2629E Megaspore in argillaceous siltstone,  $R_{Sp} = 0.52\%$ , reflected white light, X50  
 E2629F Same as E2629E, in fluorescence mode

E2629G Weak fluorescing cutinite in argillaceous siltstone, reflected white light, X50  
 E2629H Same as E2629G, in fluorescence mode

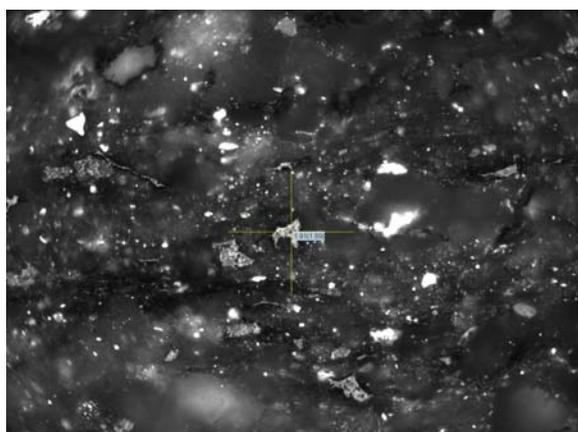
AAE Lawn Hill 83-3



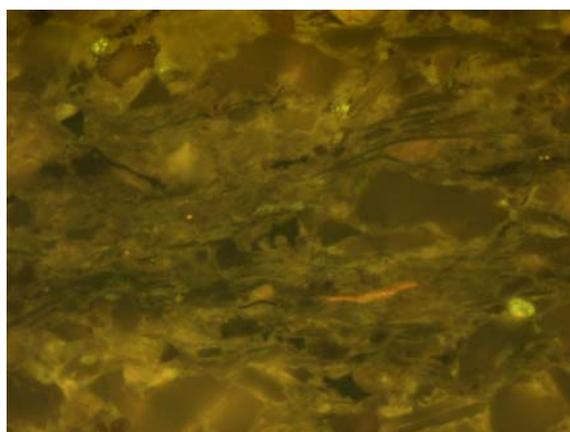
E2599A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.02\%$ , reflected white light, X50



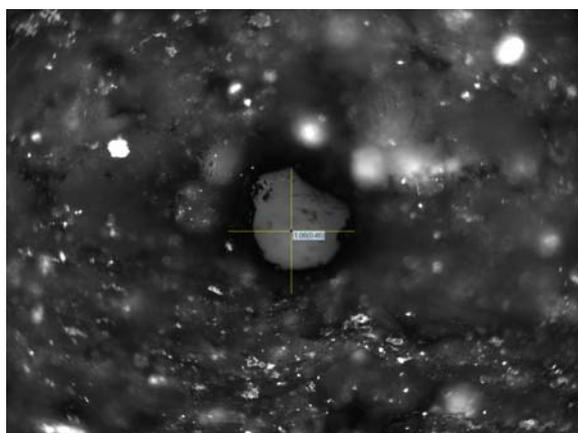
E2599B Same as E2599A, in fluorescence mode



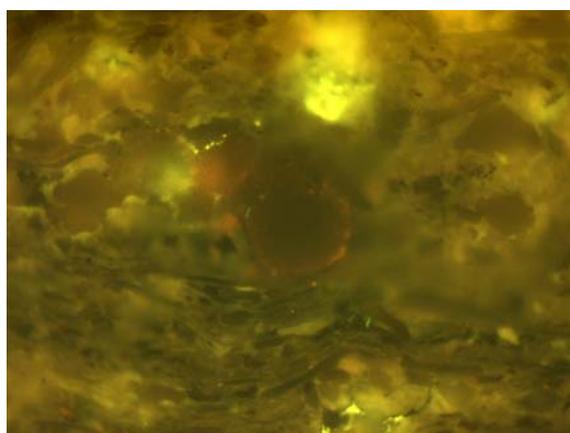
E2599C Pyrobitumen in silty claystone,  $R_{PBit} = 1.91\%$ , reflected white light, X50



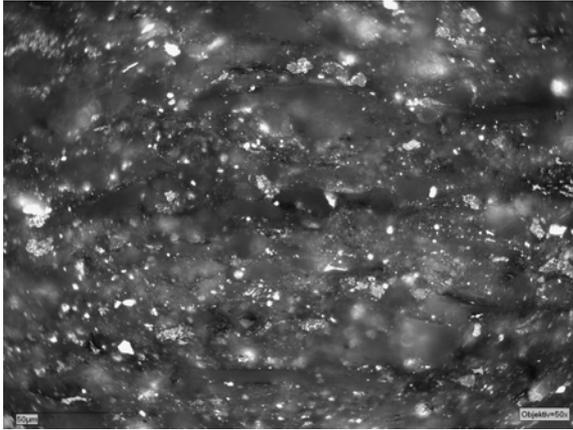
E2599D Same as E2599C, in fluorescence mode



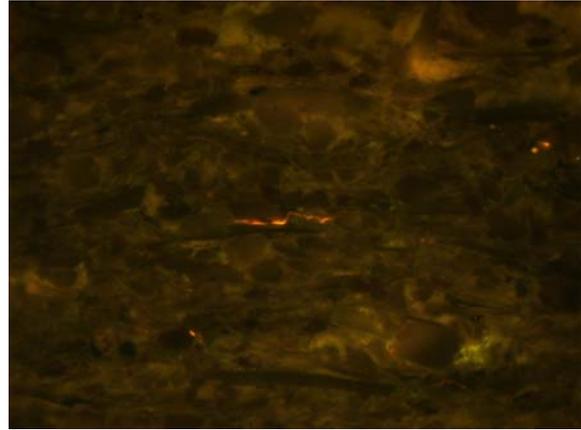
E2599E ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.86\%$ , reflected white light, X50



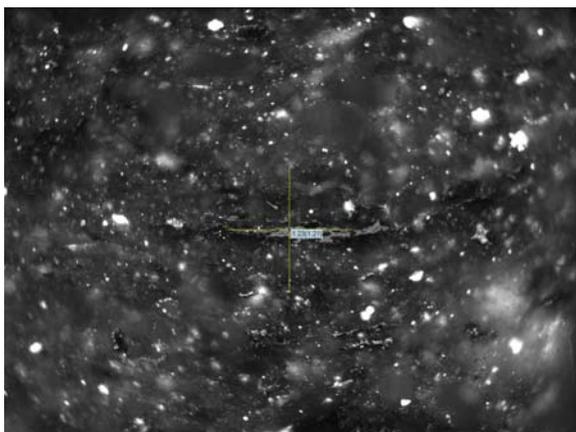
E2599F Same as E2599E, in fluorescence mode



E2599G Lamalginite in silty claystone,  
reflected white light, X50



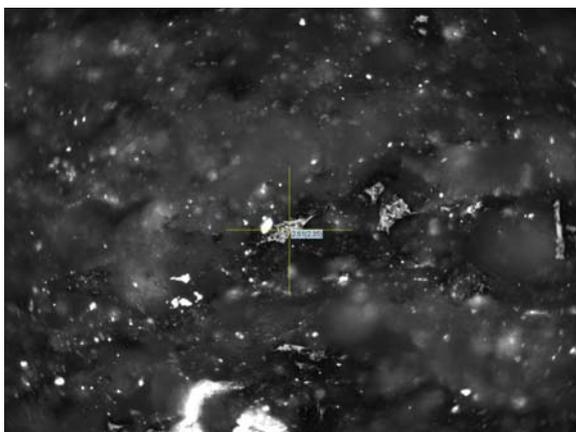
E2599H Same as E2599G, in fluorescence  
mode



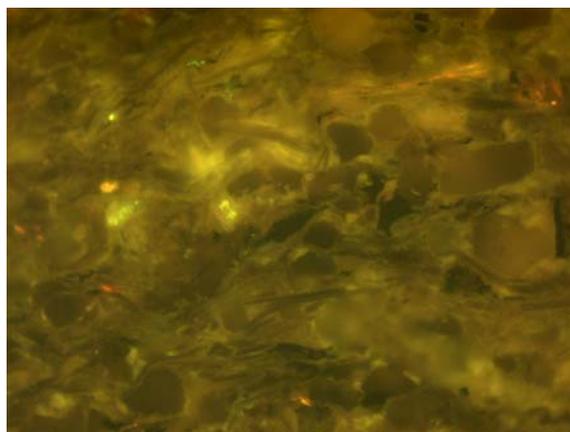
E2601A ?Coalified alginite in silty claystone,  $R_{Alg} = 1.23\%$ , reflected white light, X50



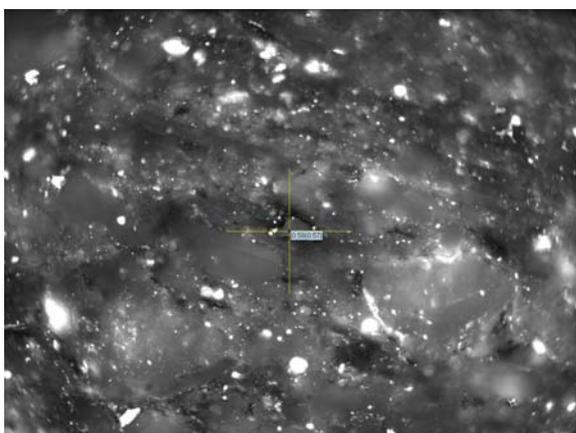
E2601B Same as E2601A, in fluorescence mode



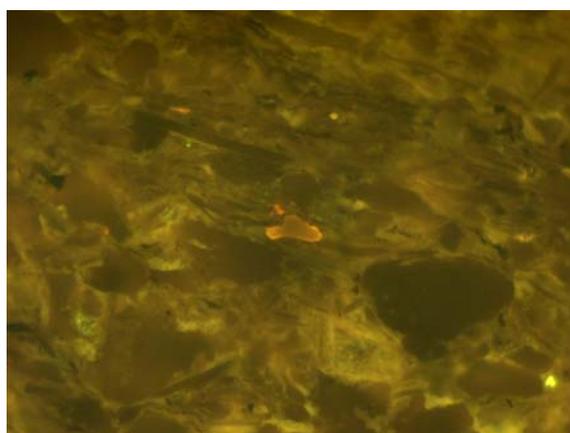
E2601C Pyrobitumen in silty claystone,  $R_{PBit} = 2.61\%$ , reflected white light, X50



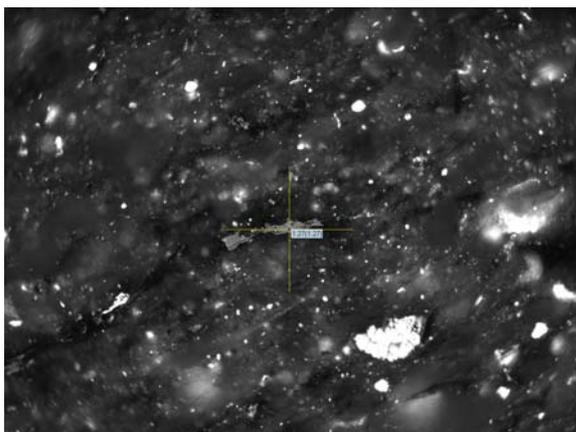
E2601D Same as E2601C, in fluorescence mode



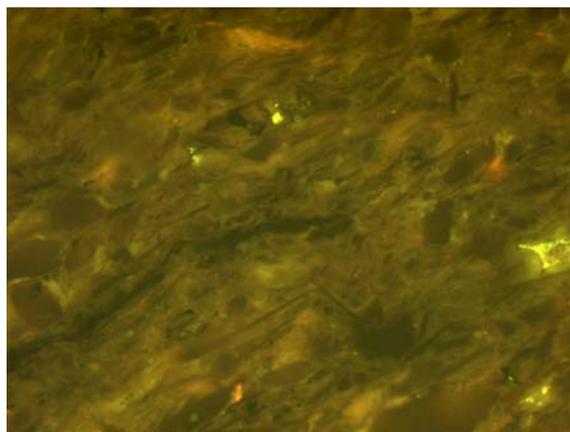
E2601E ?Migrato-bitumen in silty claystone,  $R_{Bit} = 0.58\%$ , reflected white light, X50



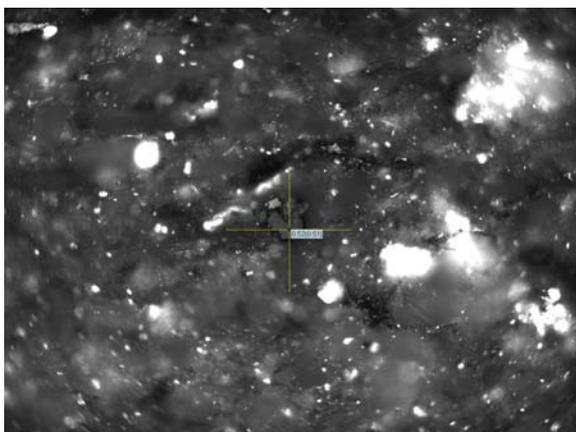
E2601F Same as E2601E, in fluorescence mode



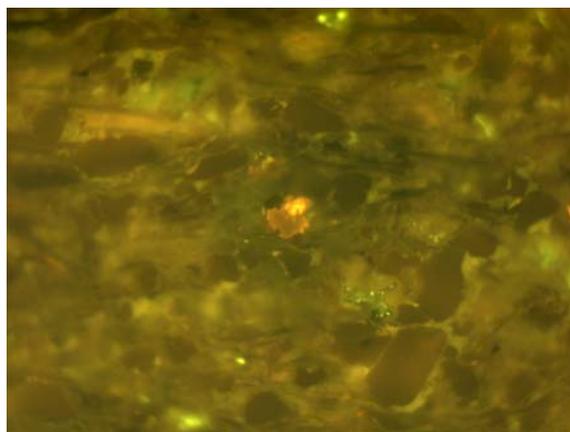
E2603A ?Coalified alginite in silty claystone,  $R_{\text{Alg}} = 1.27\%$ , reflected white light, X50



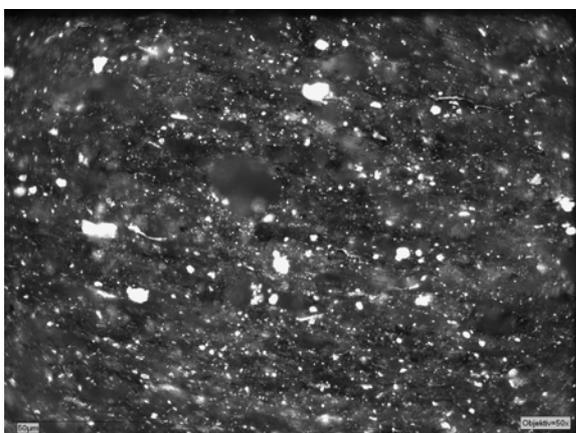
E2603B Same as E2603A, in fluorescence mode



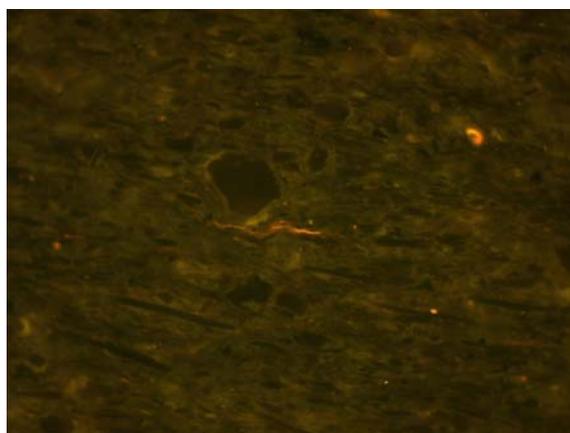
E2603C ?Migrato-bitumen in silty claystone,  $R_{\text{Bit}} = 0.52\%$ , reflected white light, X50



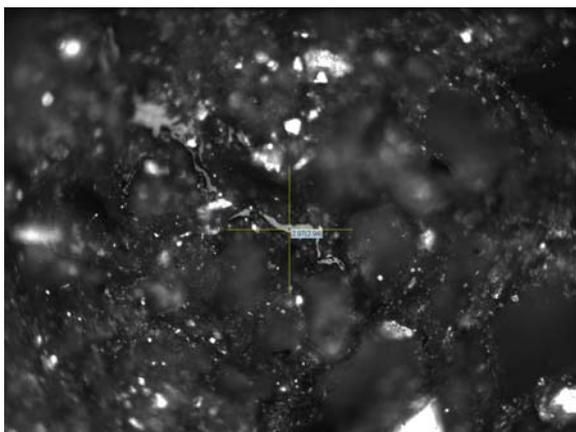
E2603D Same as E2603C, in fluorescence mode



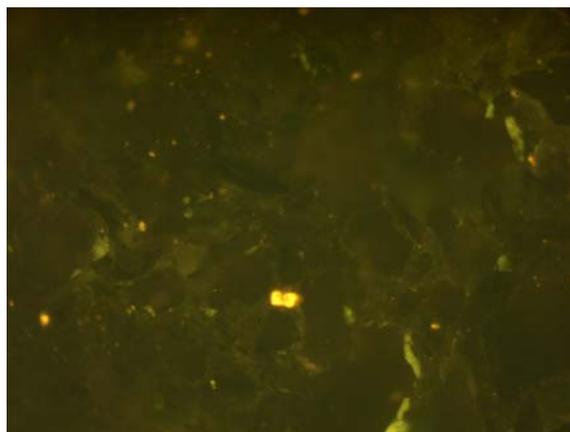
E2603E Weakly fluorescing lamalginite in fine claystone, reflected white light, X50



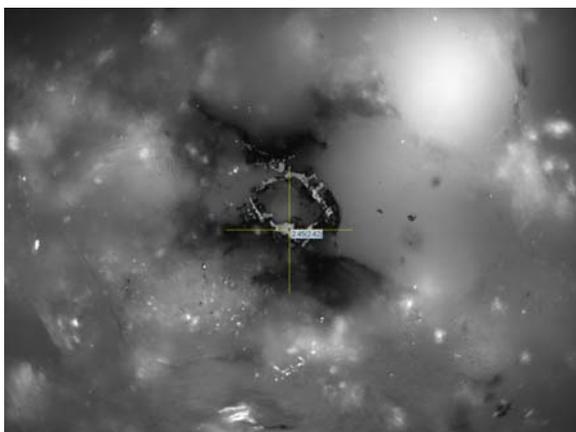
E2603F Same as E2603E, in fluorescence mode



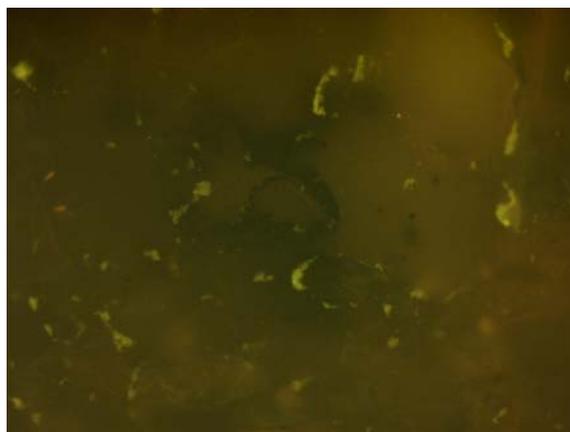
E2630A ?Coalified alginite in silty claystone,  $R_{Alg} = 2.97\%$ , reflected white light, X50



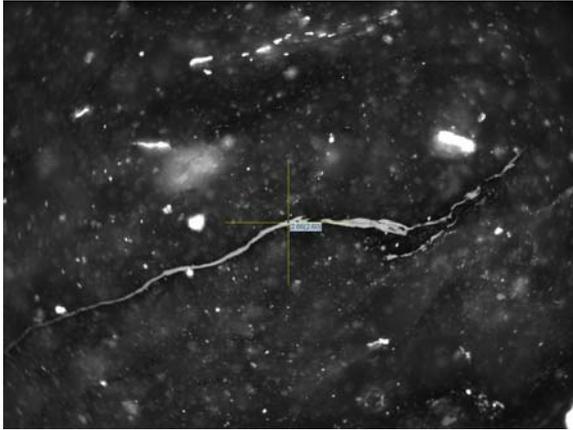
E2630B Same as E2630A, in fluorescence mode



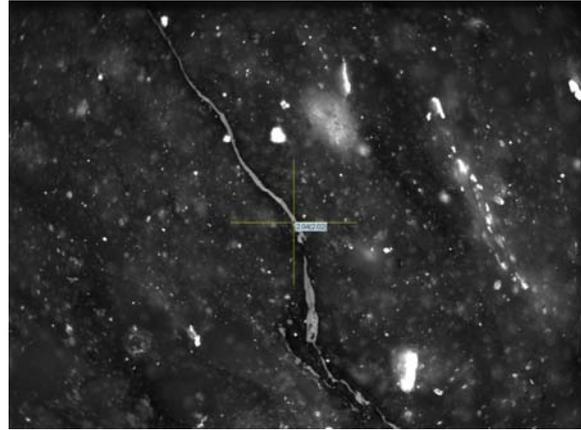
E2630C Bitumen in silty claystone,  $R_{Bit} = 2.45\%$ , reflected white light, X50



E2630D Same as E2630C, in fluorescence mode



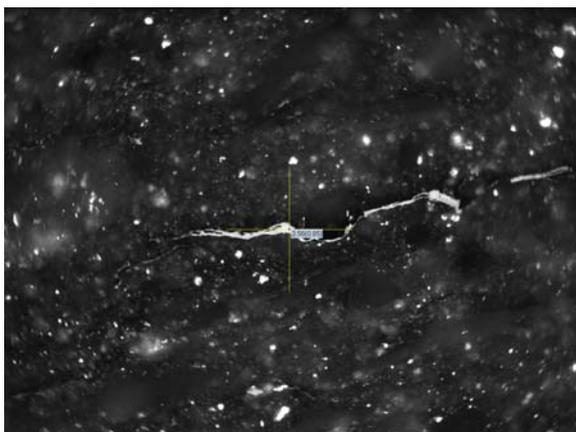
E2632A ?Coalified alginite in silty claystone, maximum reflectance position,  $R_{Alg} = 2.66\%$ , reflected white light, X50



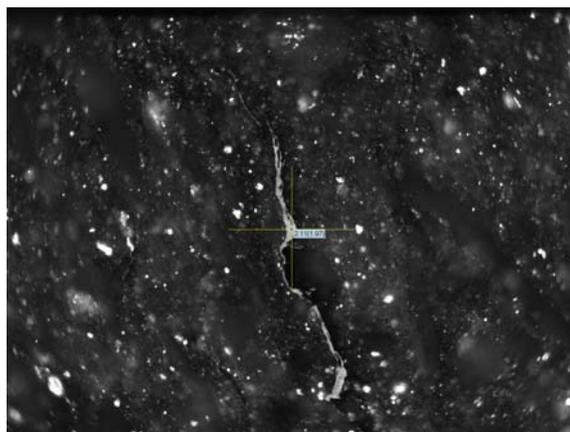
E2632B Same grain, after rotating stage at  $90^\circ$ ,  $R_{Alg}$  minimum =  $2.04\%$



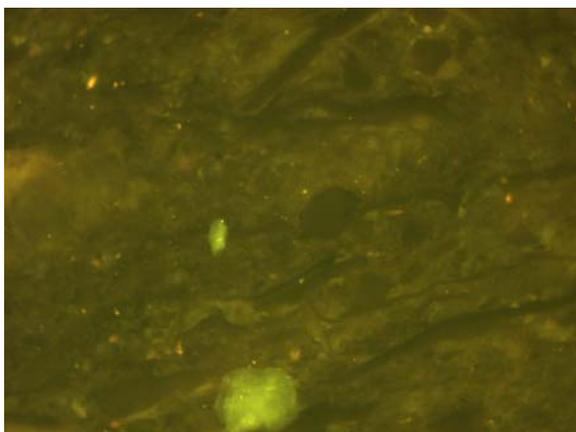
E2632C Same as E2632A, in fluorescence mode



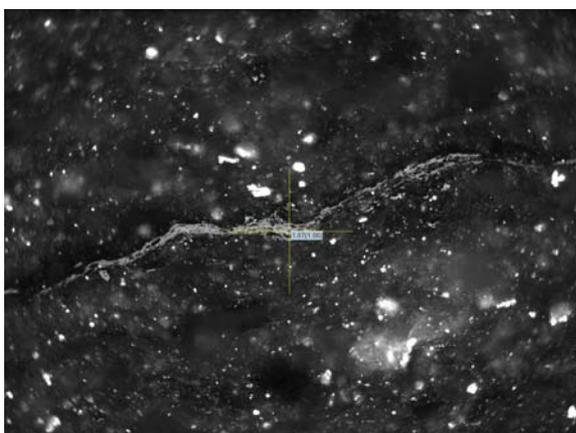
E2635A ?Coalified alginite in silty claystone, maximum reflectance position,  $R_{Alg} = 2.56\%$ , reflected white light, X50



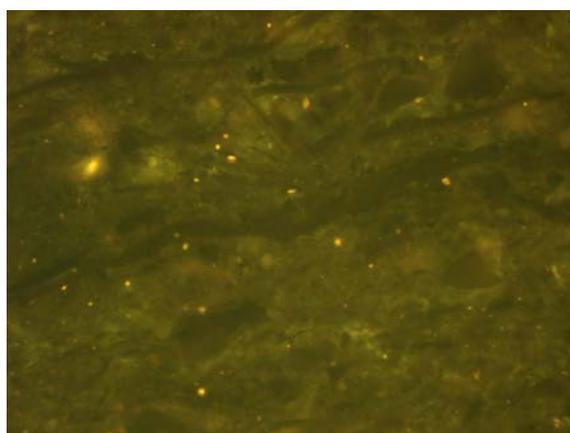
E2635B Same grain, after rotating stage at  $90^\circ$ ,  $R_{Alg}$  minimum =  $2.11\%$



E2635C Same as E2635A, in fluorescence mode

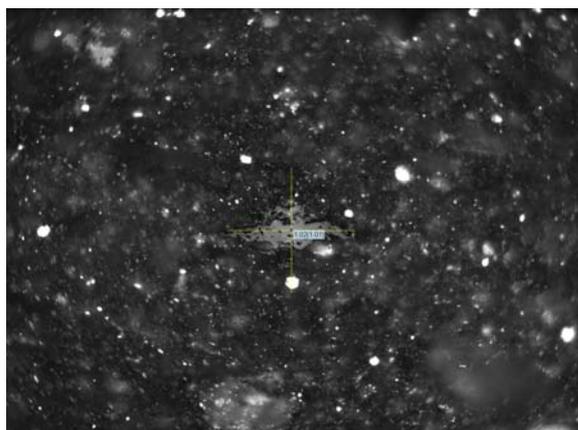


E2635D ?Coalified alginite in the lower end of range,  $R_{Alg} = 1.87\%$ , reflected white light, X50

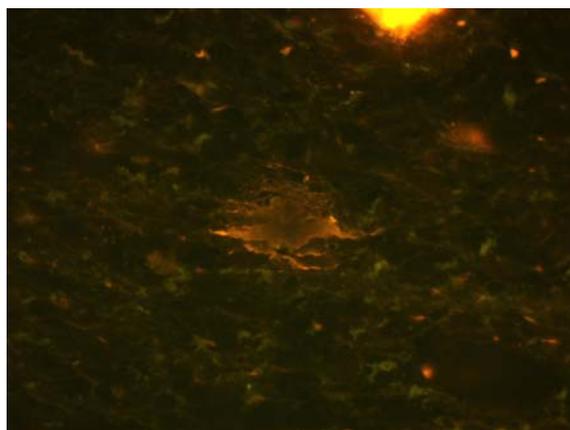


E2635E Same as E2635A, in fluorescence mode, note weak brown fluorescence

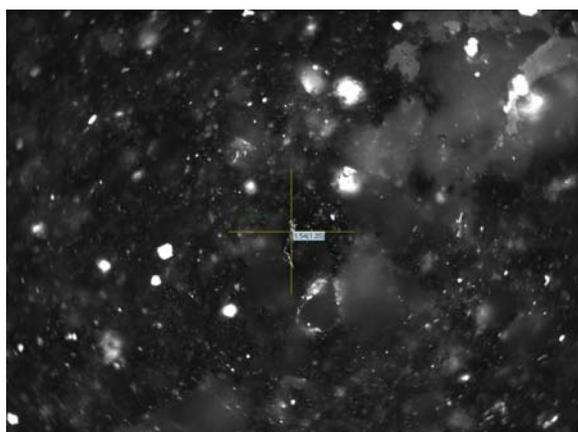
AAE Lawn Hill 83-4



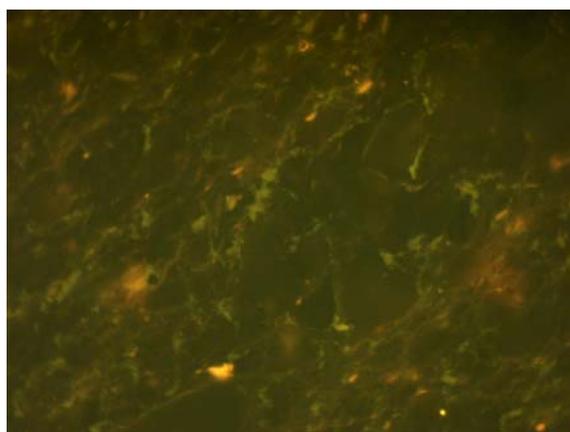
E2605A Fluorescing coalified alginite in silty claystone,  $R_{Alg} = 1.02\%$ , reflected white light, X50



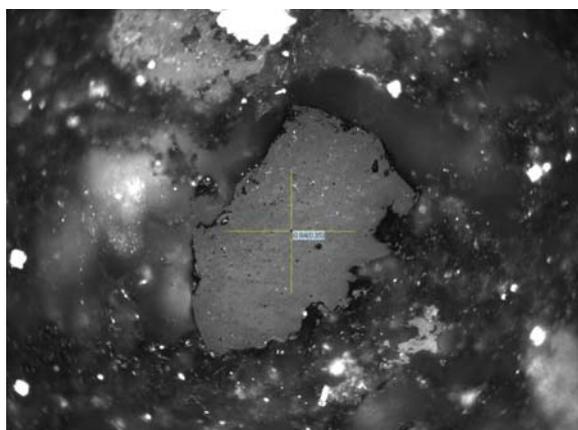
E2605B Same as E2605A, in fluorescence mode



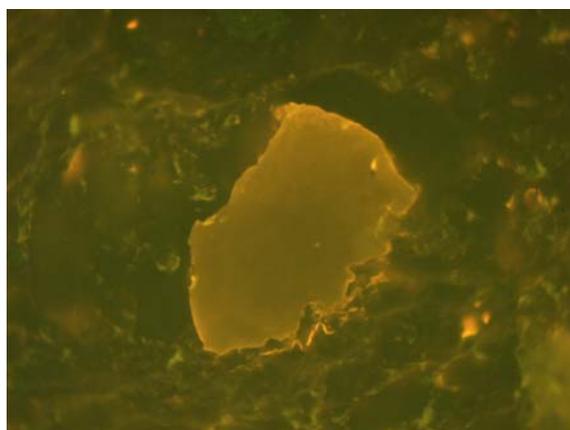
E2605C Pyrobitumen in silty claystone,  $R_{PBit} = 1.54\%$ , reflected white light, X50



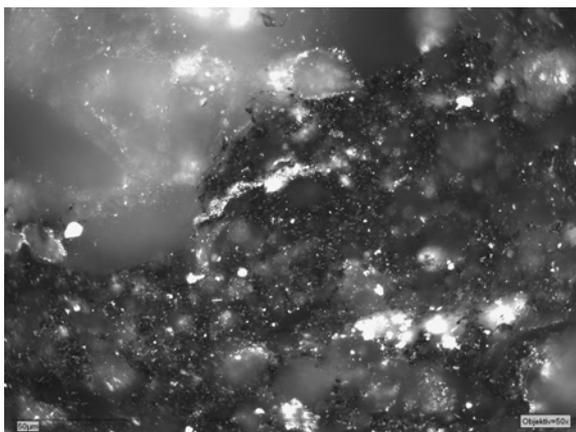
E2605D Same as E2605C, in fluorescence mode



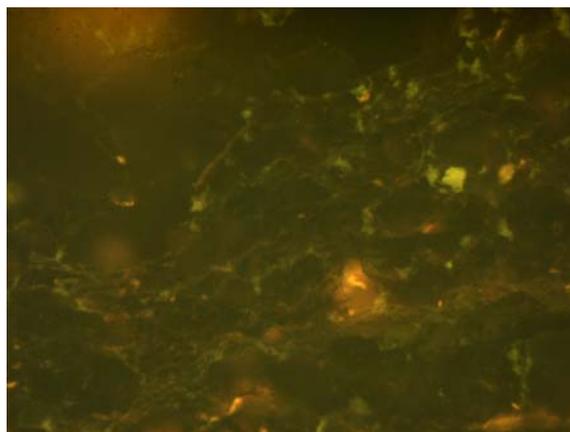
E2605E Migrato-bitumen in silty claystone,  $R_{Bit} = 0.84\%$ , reflected white light, X50



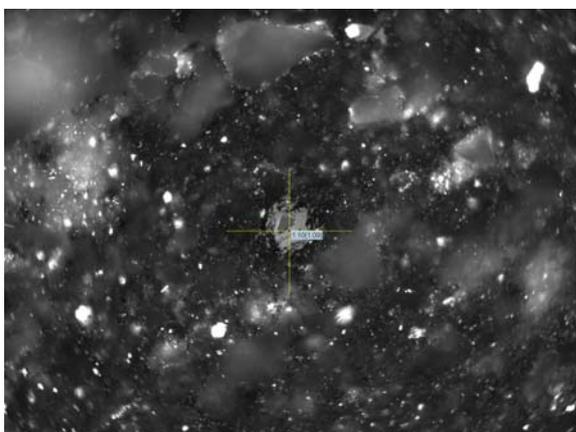
E2605F Same as E2605E, in fluorescence mode



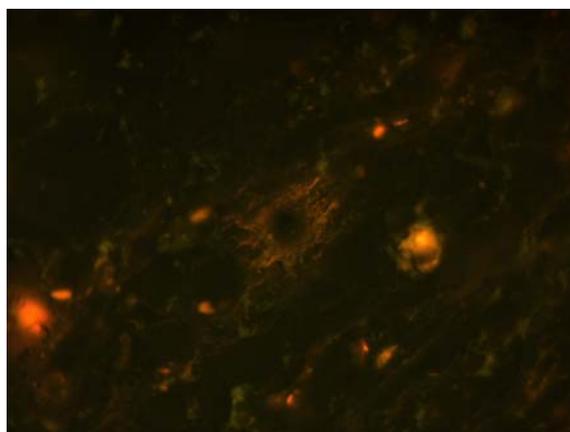
E2605G Non-fluorescing granular bitumen in silty claystone, reflected white light, X50



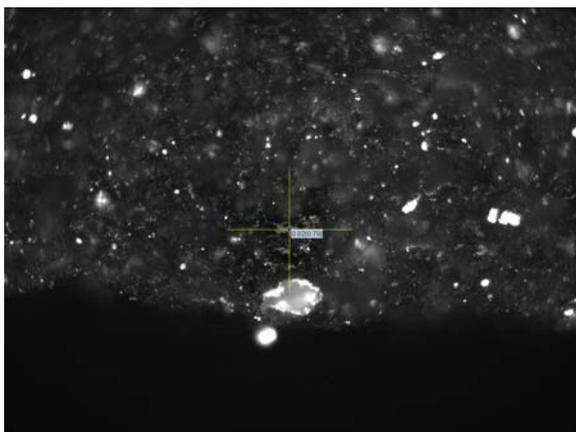
E2605H Same as E2605G, in fluorescence mode



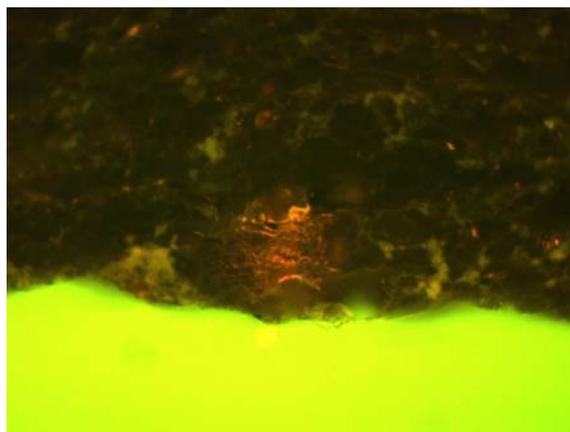
E2605I Thucholites in silty claystone, reflected white light, X50



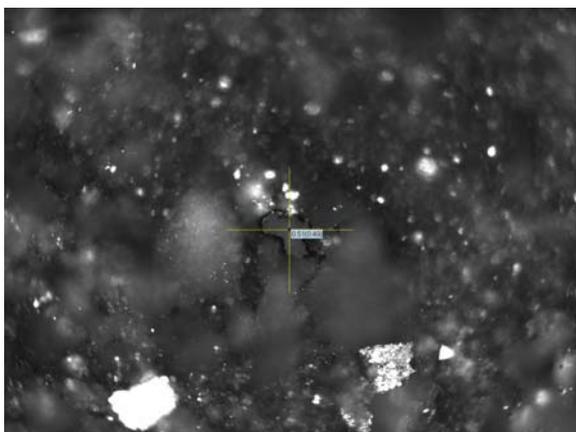
E2605J Same as E2605I, in fluorescence mode



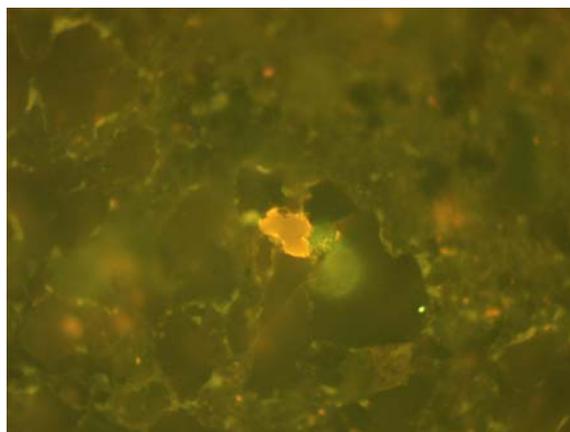
E2608A Fluorescing coalified alginite in silty claystone,  $R_{Alg} = 0.82\%$ , reflected white light, X50



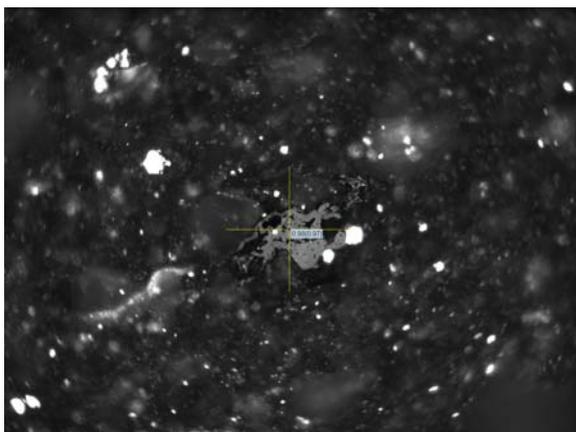
E2608B Same as E2608A, in fluorescence mode



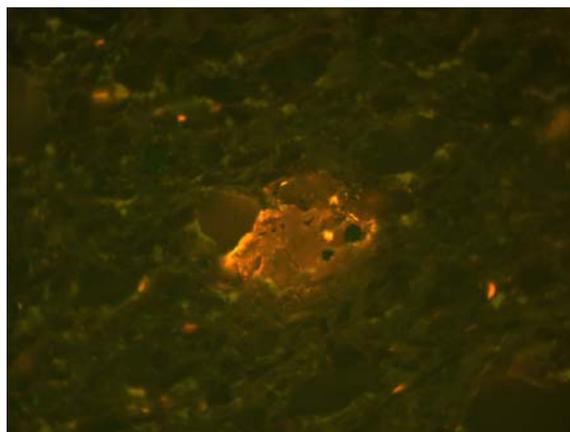
E2608C Migrato-bitumen in silty claystone,  $R_{Bit} = 0.51\%$ , reflected white light, X50



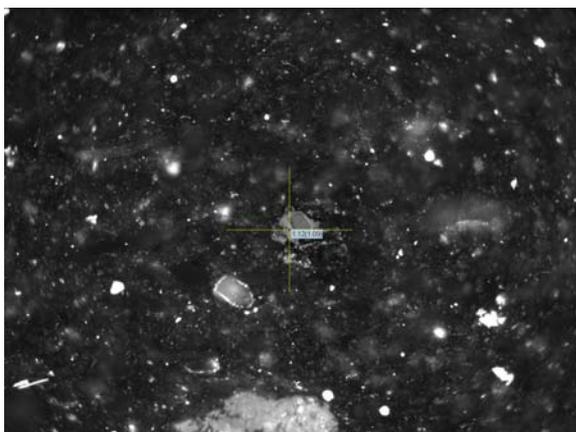
E2608D Same as E2608C, in fluorescence mode



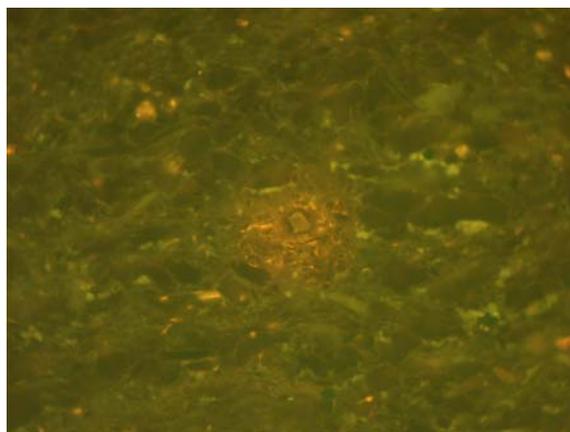
E2609A Fluorescing coalified alginite in claystone,  $R_{Alg} = 0.98\%$ , reflected white light, X50



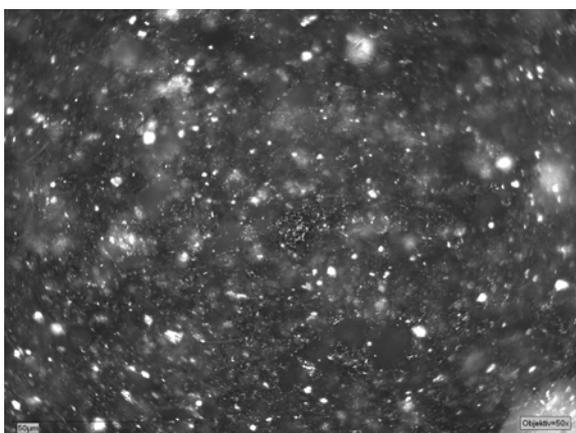
E2609B Same as E2609A, in fluorescence mode



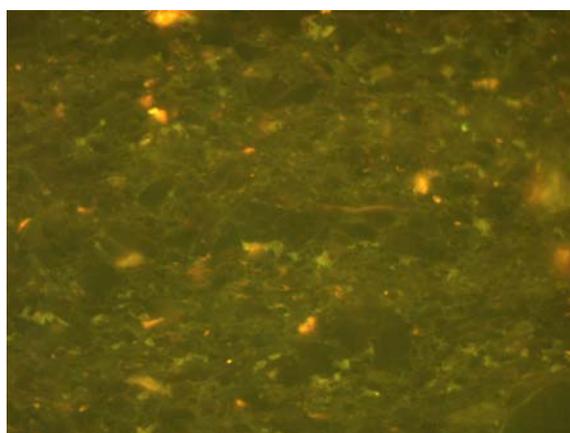
E2609C Thucholites in claystone, reflected white light, X50



E2609D Same as E2609C, in fluorescence mode

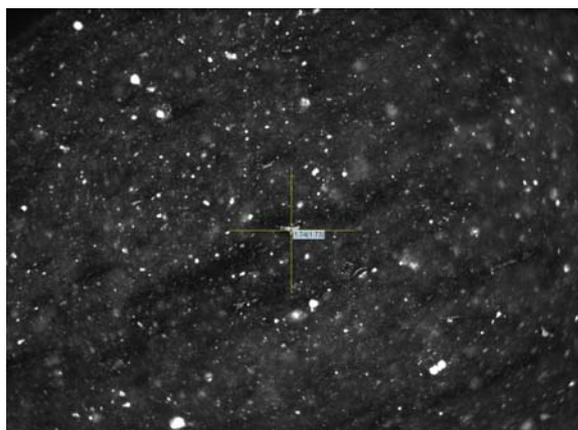


E2609E Non-fluorescing granular bitumen in silty claystone, reflected white light, X50



E2609F Same as E2609E, in fluorescence mode

BHP Constance Range 10A



E2610A ?Coalified alginite in fine claystone,  $R_{Alg} = 1.74\%$ , reflected white light, X50



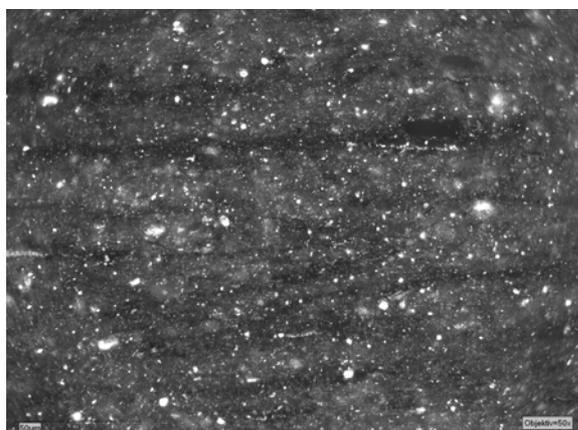
E2610B Same as E2610A, in fluorescence mode



E2610C Pyrobitumen in silty claystone,  $R_{PBit} = 1.84\%$ , reflected white light, X50



E2610D Same as E2610C, in fluorescence mode

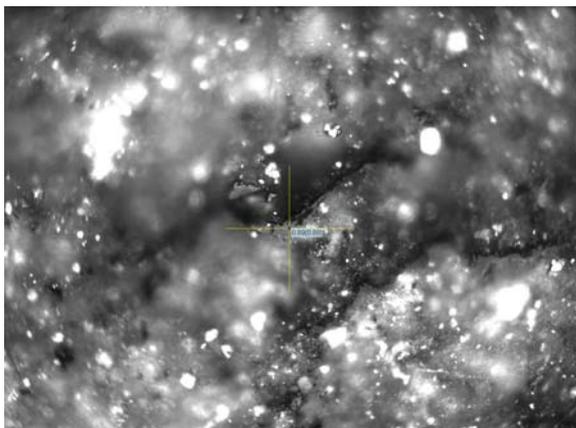


E2610E Abundant diffuse organic matter in fine claystone, reflected white light, X50

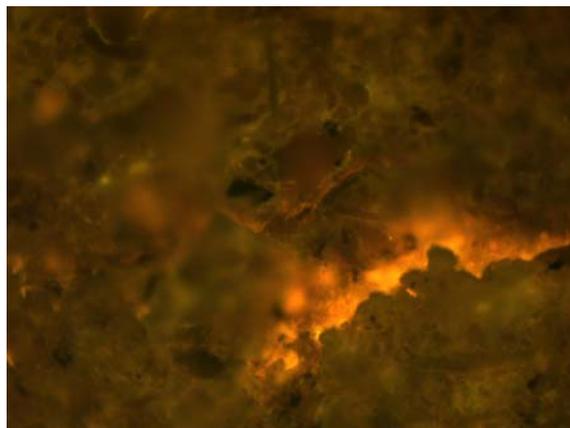


E2610F Same as E2610E, in fluorescence mode

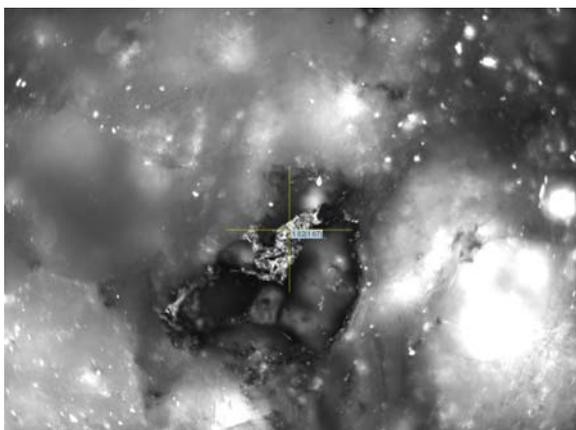
COM Argyle Creek 1



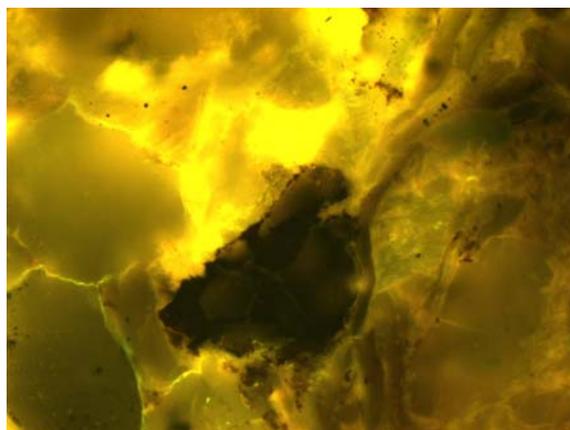
E2614A Coalified alginite in silty claystone,  $R_{Alg} = 0.89\%$ , reflected white light, X50



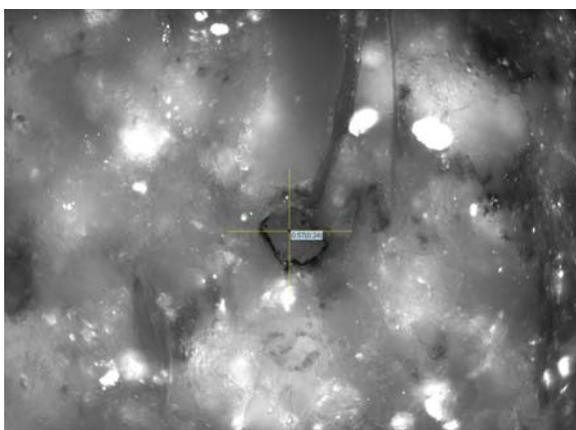
E2614B Same as E2614A, in fluorescence mode



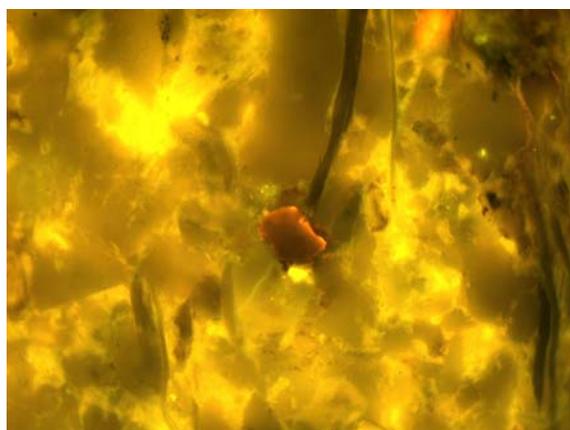
E2614C Pyrobitumen in siltstone,  $R_{pBit} = 1.82\%$ , reflected white light, X50



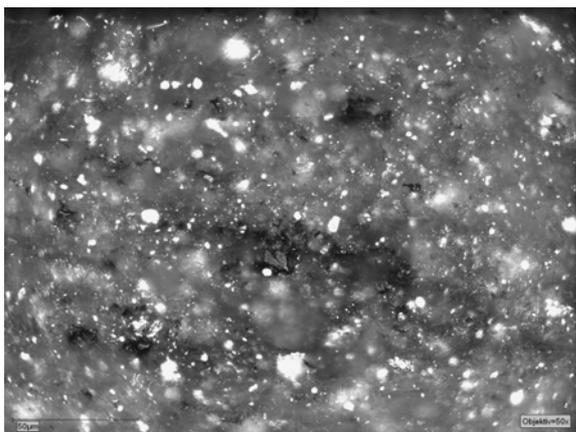
E2614D Same as E2614C, in fluorescence mode



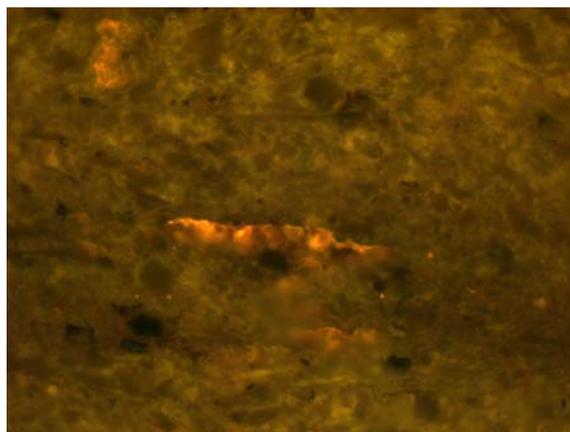
E2614E Bitumen in siltstone,  $R_{Bit} = 0.57\%$ , reflected white light, X50



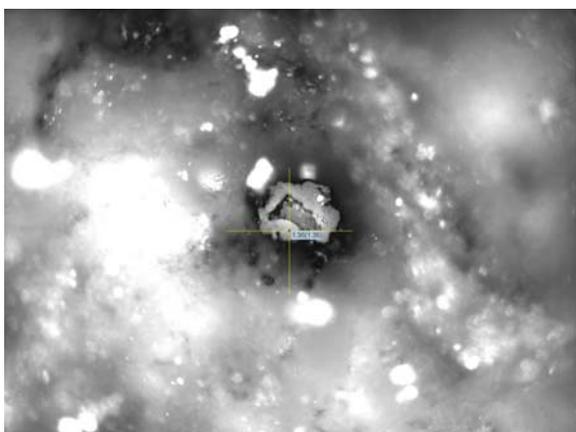
E2614F Same as E2614E, in fluorescence mode



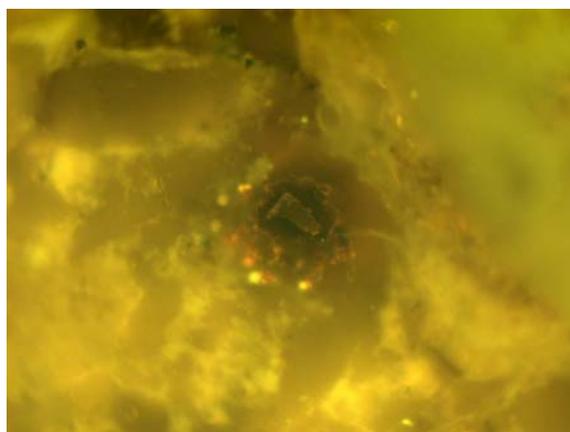
E2614G Dull fluorescing lamalginite in silty claystone, reflected white light, X50



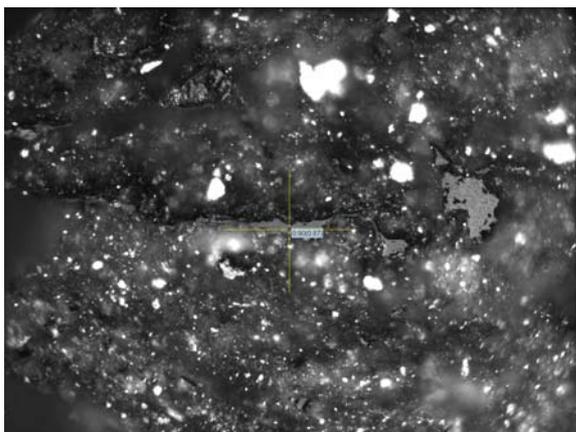
E2614H Same as E2614G, in fluorescence mode



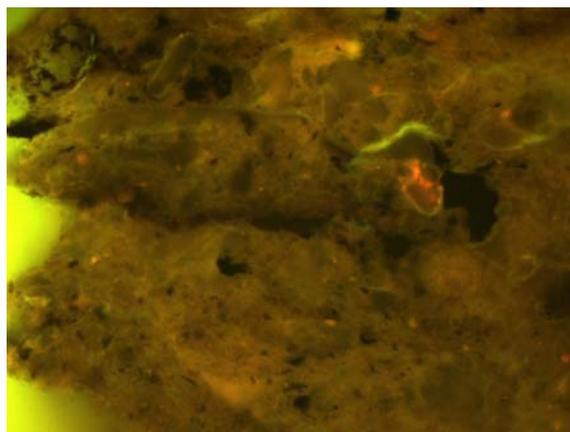
E2614I Thucholites in siltstone, reflected white light, X50



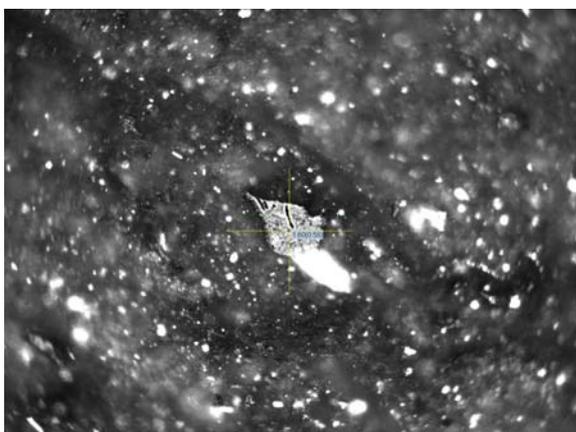
E2614J Same as E2614I, in fluorescence mode



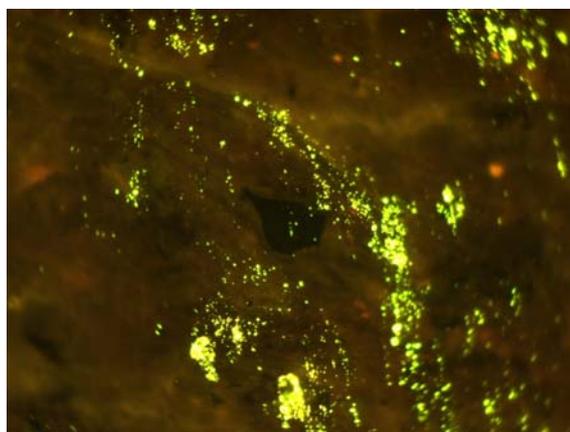
E2616A Coalified alginite in claystone,  $R_{Alg} = 0.90\%$ , reflected white light, X50



E2616B Same as E2616A, in fluorescence mode



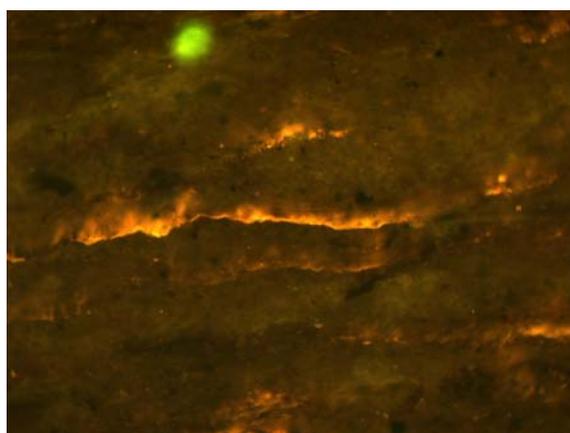
E2616C Pyrobitumen in siltstone,  $R_{PBit} = 1.60\%$ , reflected white light, X50



E2616D Same as E2616C, in fluorescence mode

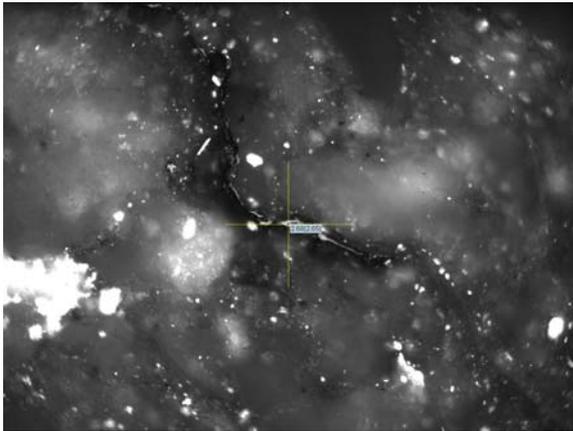


E2616E Fluorescing lamalginite in silty claystone, reflected white light, X50

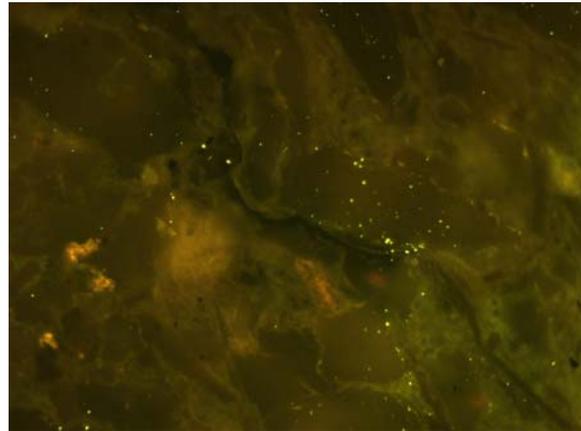


E2616F Same as E2616E, in fluorescence mode

COM Egilabria 1

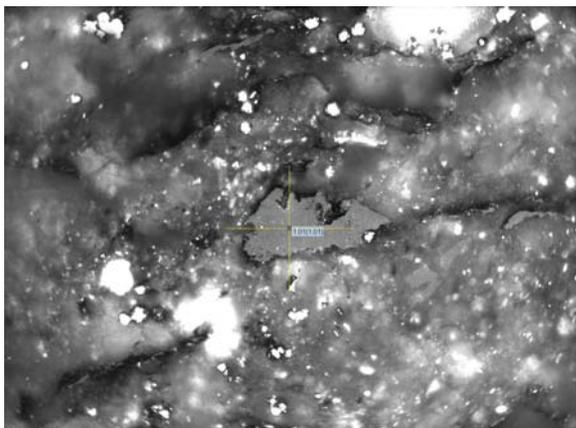


E2619A ?Coalified alginite in siltstone,  
 $R_{\text{Alg}} = 2.68\%$ , reflected white light, X50

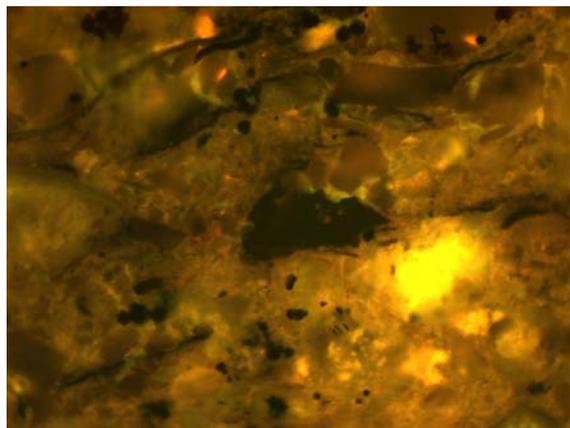


E2619B Same as E2619A, in fluorescence mode

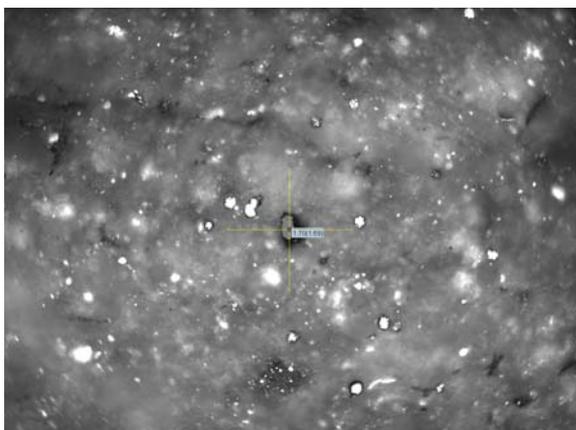
PPC Bury 1



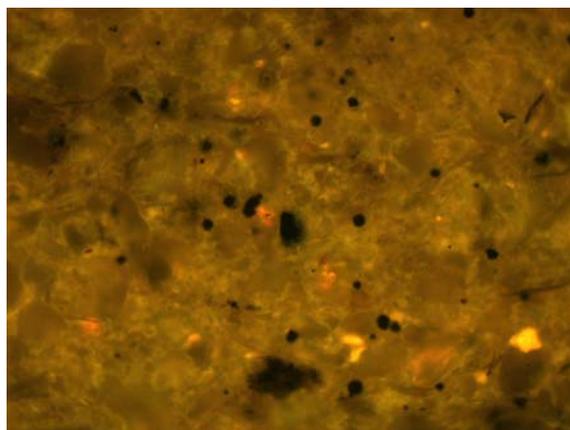
E2624A Detrovitrinite in argillaceous siltstone, Rv max = 1.01%, reflected white light, X50



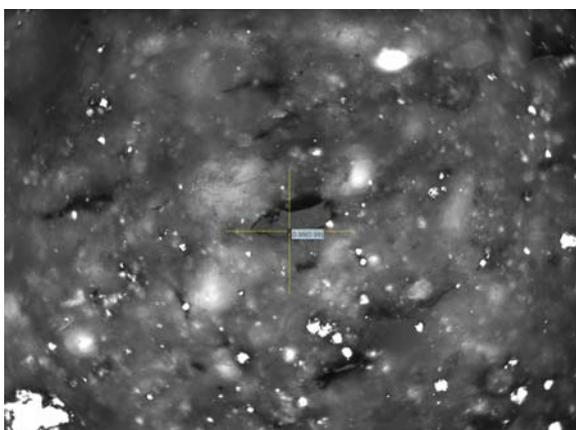
E2624B Same as E2624A, in fluorescence mode



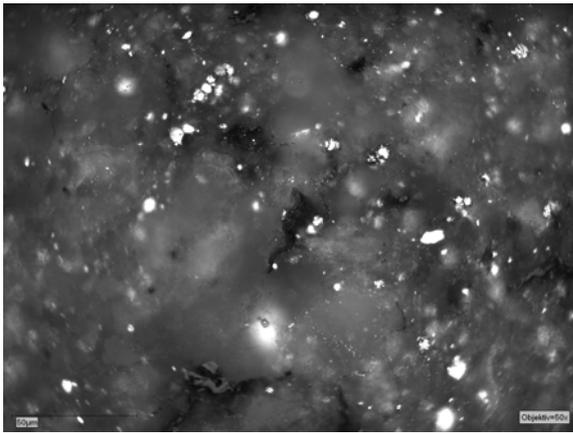
E2624C Inertodetrinite in argillaceous siltstone, RI = 1.70%, reflected white light, X50



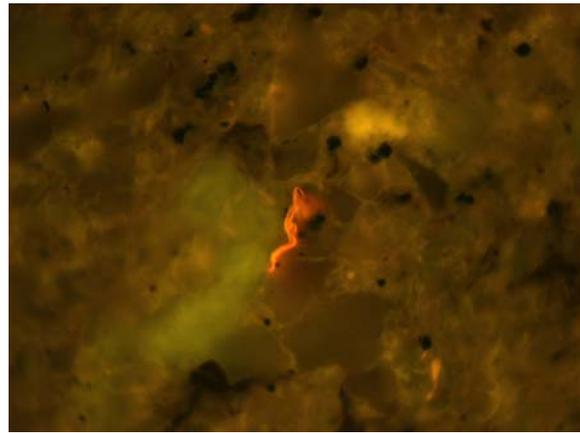
E2624D Same as E2624C, in fluorescence mode



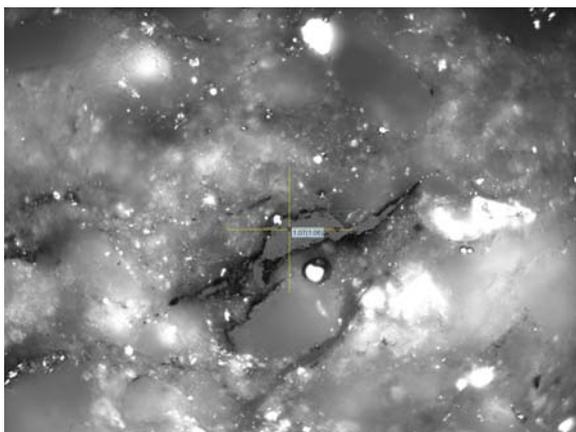
E2624E Micrinite in vitrinite, Rv max = 0.99%, reflected white light, X50



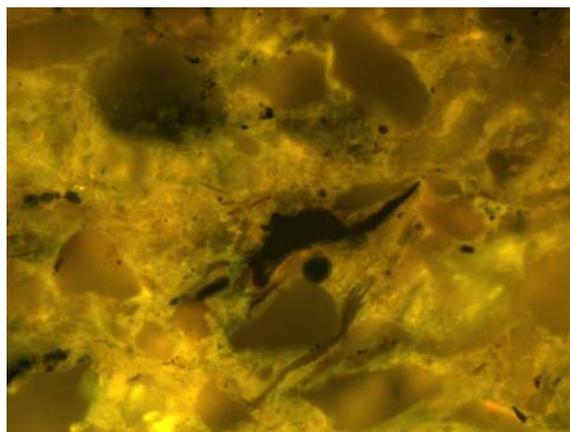
E2624F Sporinite in argillaceous siltstone,  
reflected white light, X50



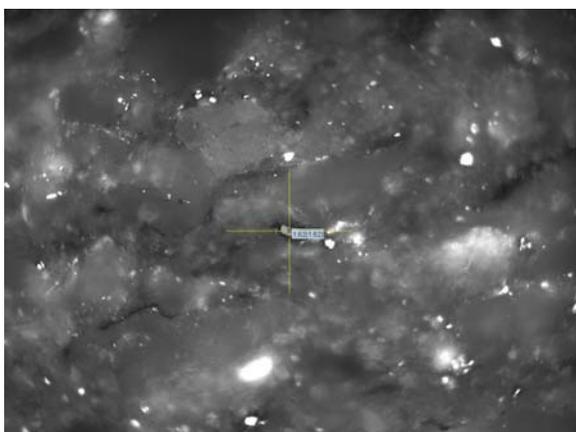
E2624G Same as E2624F, in fluorescence  
mode



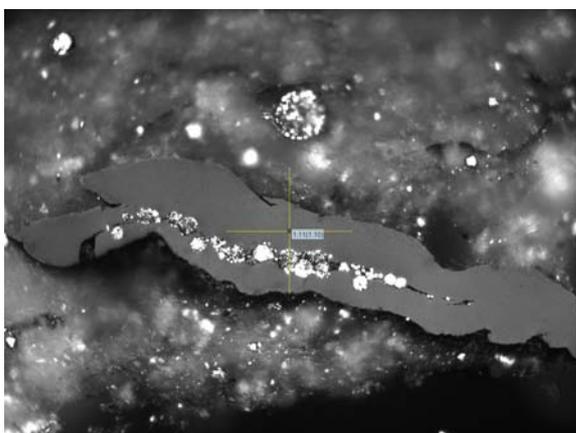
E2628A Detrovitrinite in argillaceous siltstone, Rv max = 1.07%, reflected white light, X50



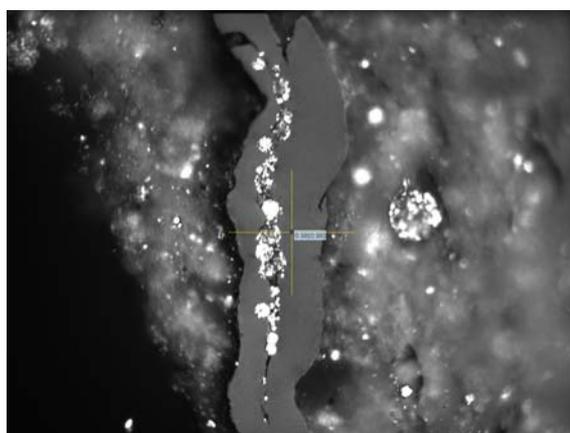
E2628B Same as E2628A, in fluorescence mode



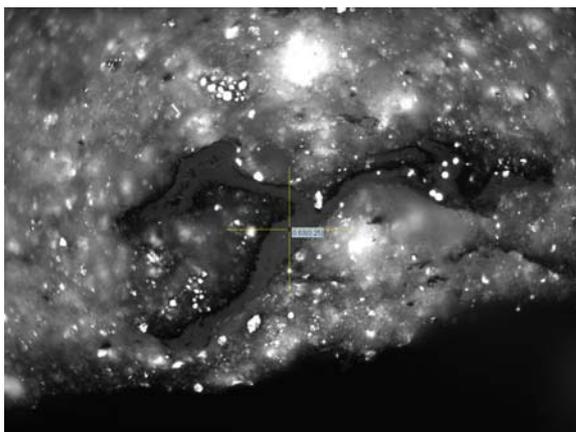
E2628C Inertodetrinite in argillaceous siltstone, RI = 1.62%, reflected white light, X50



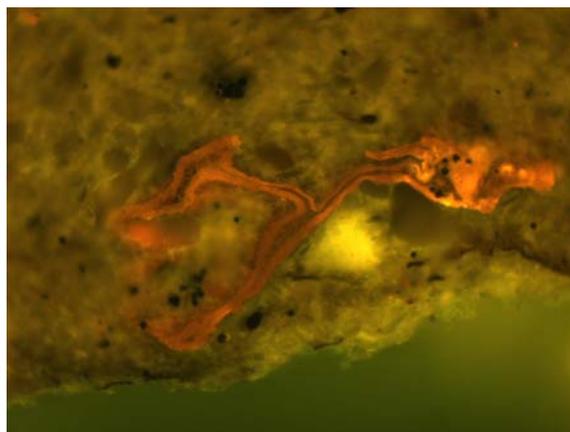
E2628D Vitrinite in siltstone, maximum reflectance position, Rv max = 1.11%, reflected white light, X50



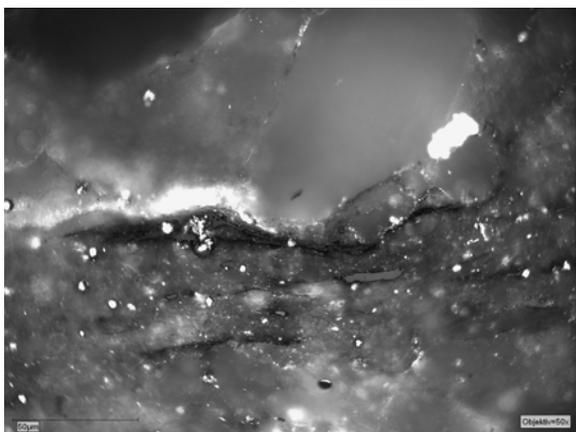
E2628E Same grain, after rotating microscope stage at 90°, Rv min = 0.98%, reflected white light, X50



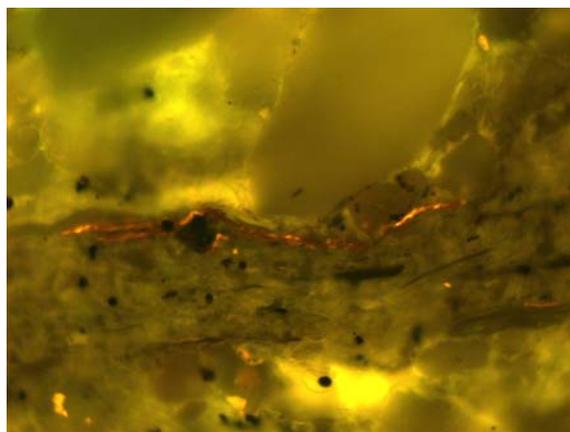
E2628F Megaspore in argillaceous siltstone, RSp = 0.63%, reflected white light, X50



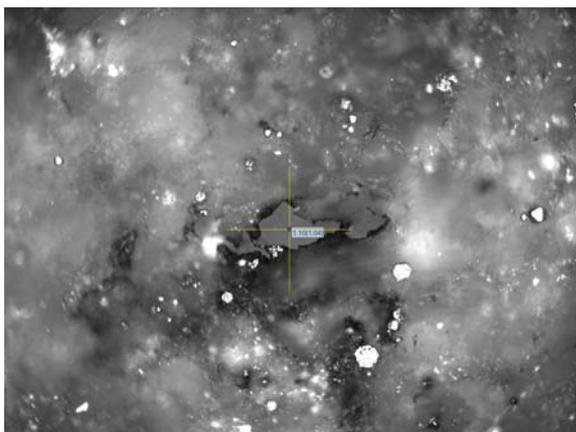
E2628G Same as E2628F, in fluorescence mode



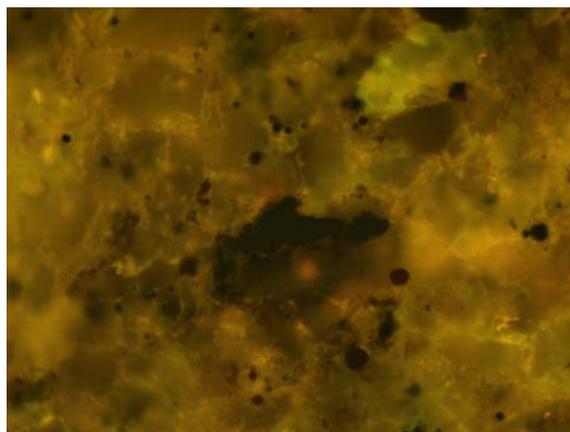
E2628H Weak fluorescing cutinite in argillaceous siltstone, reflected white light, X50



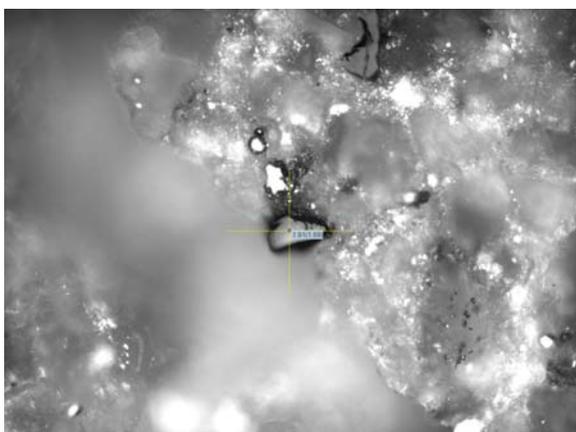
E2628I Same as E2628H, in fluorescence mode



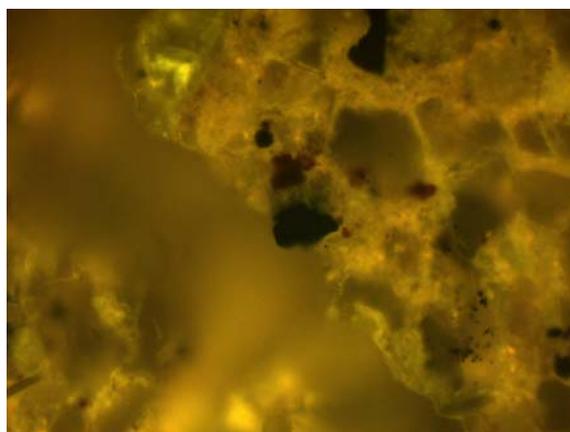
E2629A Detrovitrinite in argillaceous siltstone, Rv max = 1.10%, reflected white light, X50



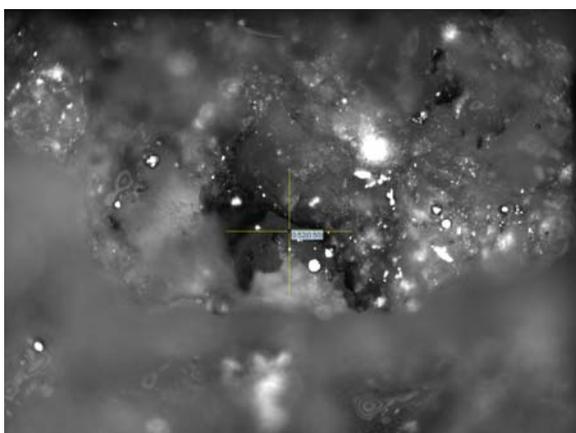
E2629B Same as E2629A, in fluorescence mode



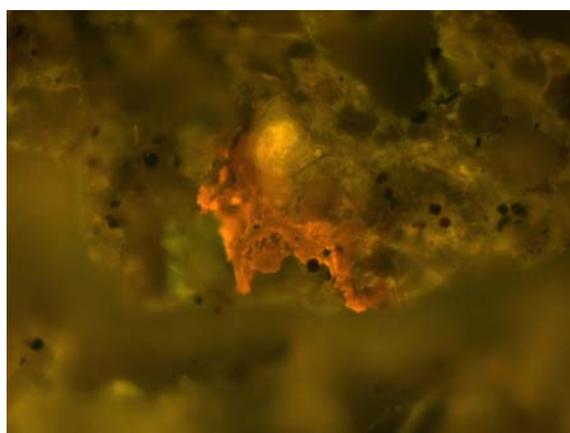
E2629C Inertodetrinite in argillaceous siltstone, RI = 1.91%, reflected white light, X50



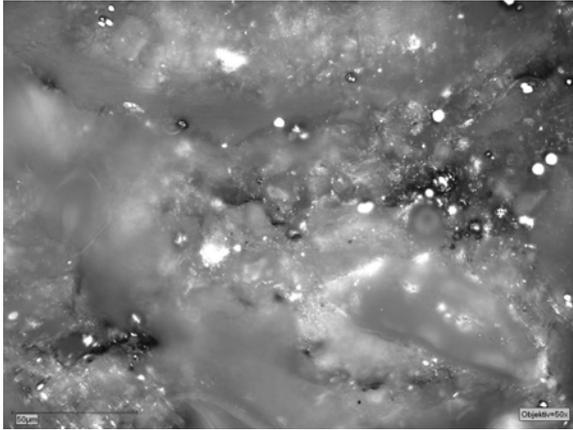
E2629D Same as E2629C, in fluorescence mode



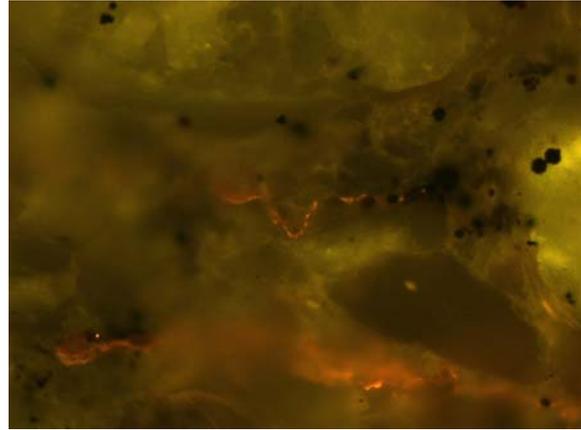
E2629E Megaspore in argillaceous siltstone, RSp = 0.52%, reflected white light, X50



E2629F Same as E2629E, in fluorescence mode



E2629G Weak fluorescing cutinite in argillaceous siltstone, reflected white light, X50



E2629H Same as E2629G, in fluorescence mode