

TORENA AS

Nedre Rælingsvei 589, N-2009 Nordby, Norway

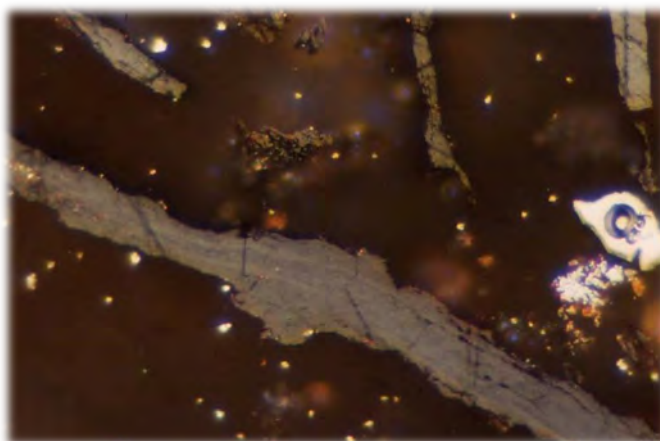
Email: torbjorn.throndsen@torena.no

Tel: (+47) 9075 8861

www.torena.no

Vitrinite reflectance analysis of core samples from 36 shallow boreholes and one exploration well in the Norwegian Barents Sea

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Prepared for:	The Norwegian Petroleum Directorate
Prepared by:	Torbjørn Throndsen
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Available Torena AS studies on vitrinite reflectance

Throndsen, T. & Throndsen, T. S. (2011) Vitrinite reflectance database and interpretations offshore Norway – Mid Norway. Torena AS report 2011_05.

Throndsen, T. & Throndsen, T. S. (2013) Vitrinite reflectance database and interpretations offshore Norway – Norwegian North Sea. Torena AS report 2013_23.

Throndsen, T. (2014) Vitrinite reflectance analysis of well DH10-2008 Sysselembreen, Svalbard. Torena AS report 2014_18.

Throndsen, T. (2015) Vitrinite reflectance analysis of well DH4 Adventdalen, Svalbard. Torena AS report 2015_18.

Throndsen, T. (2017) Vitrinite reflectance data and interpretations – Norwegian Barents Sea wells and onshore locations at Andøya, Bjørnøya, Hopen and Svalbard. Torena AS report 2017_31.

1

Introduction

This report gives the results of routine vitrinite reflectance analysis of core samples from 36 shallow boreholes and one exploration well from the Norwegian Barents Sea (Tab. 1). For location see Fig. 1.

318 samples have been subjected for analysis. Of these 203 gave results, 79 proved barren of vitrinite or the particles were too small to be measured and 36 could not be satisfactorily polished due to expanding mineral phases. Some of the samples that could not be polished may provide positive results if treated with HCL and HF acids.

Sample material

Sample material was provided as core chips sampled by T. Throndsen at Sintef Petroleum's core store in Trondheim (Dora) and The Norwegian Petroleum Directorate's core store in Stavanger.

Geological information

The lithostratigraphic information shown in tables in the report was provided by The Norwegian Petroleum Directorate.

Analytical techniques

PREPARATION

The samples were not treated with HCL and HF acids prior to further preparation. Bulk rock samples were embedded in epoxy resin to make briquettes, ground flat and polished according to Torenas routines [1]. The preparation procedure proved successful for most samples, but 36 samples could not be satisfactorily polished due to expanding mineral phases. They will need HCL and HF acid treatment in order to obtain satisfactory polish.

ANALYSIS

The analytical equipment being used was a Leitz Orthoplan reflected light microscope equipped with a Tidas 200 photometer system. The measurements were made with a Leitz 50X/0.85 oil objective. The sensitive measuring spot was kept constant for all measurements at about 6 microns in diameter. The measurements were made at a wavelength of 546 nm and in oil immersion (refractive index 1.515 at 18 °C). The readings were made without a polarizer and using a stationary stage. This procedure is called

measurement of random reflectance (%Rm). Up to 20 particles were measured for each sample, if possible.

The photometer was calibrated against four Klein & Becker standards of known reflectance (%Ro=0.422, 0.589, 0.899 and 1.715).

Each productive sample (*i.e.* samples containing measurable vitrinite) is given a general quality rating and a rating based on various factors that may affect the measurements. These factors are abundance of vitrinite, confidence in identification of true vitrinite, type of vitrinite, particle size and particle surface quality. This is symbolized in the tables in this report as follows.

0 0 0 0 0

1 2 3 4 5

1: Abundance of vitrinite

2: Confidence in identification of true vitrinite

3: Type of vitrinite

4: Vitrinite particle size

5: Vitrinite particle surface quality

o: No effect on the vitrinite reflectance value

-: May give too low values

+: May give too high values

±: May give too high or too low values

Results

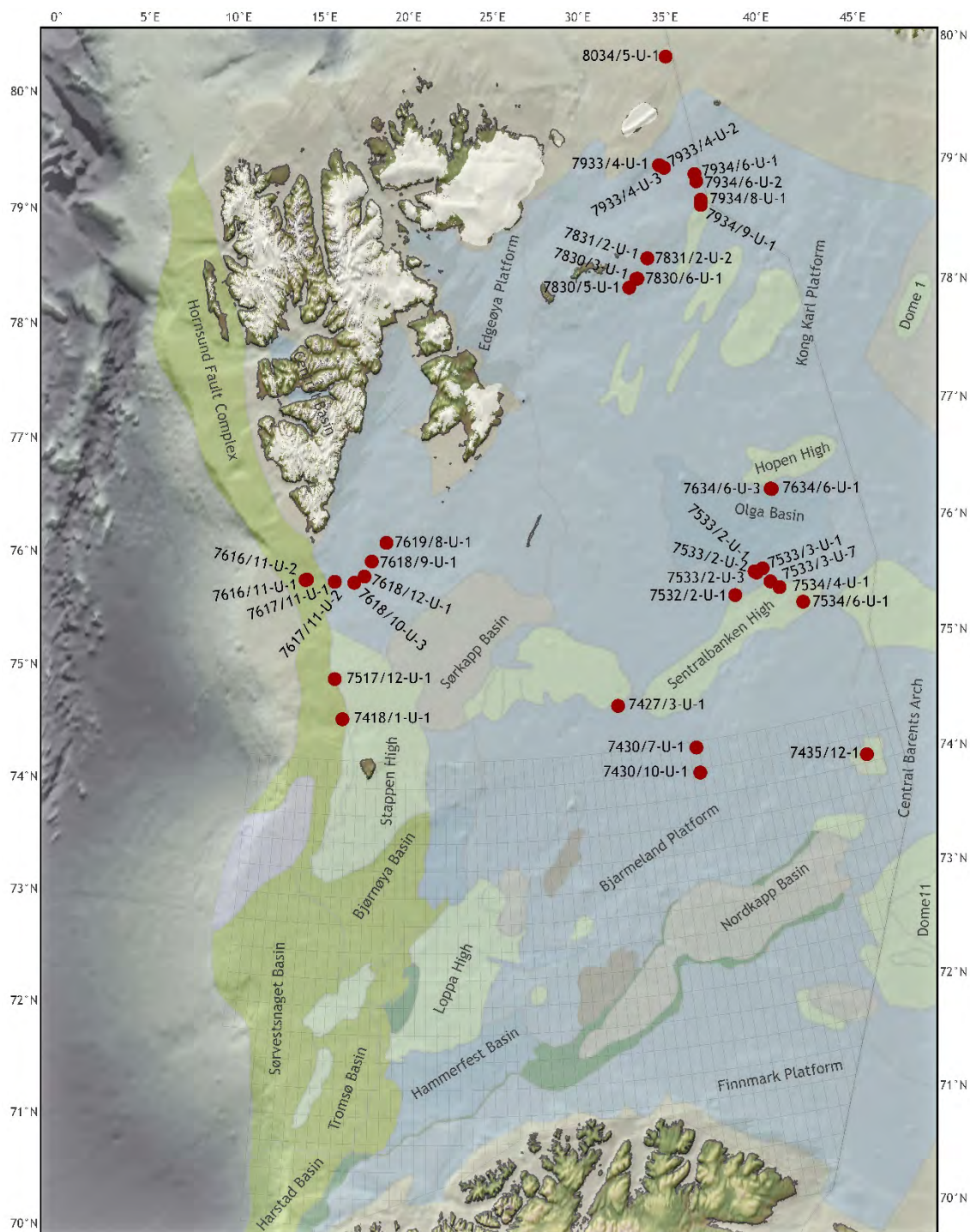
The results from the measurements are presented well by well in the appendix as a general results table and as histograms for each sample. Samples barren of vitrinite and samples that could not be polished are not shown as histograms but are included in the results tables. The given mean value and standard deviation are considered to be representative for each sample and is associated with a quality rating based on the operator's observations during measuring.

Reference

- [1] Throndsen, T. (2015) Torena AS procedures for vitrinite reflectance sample preparation and analysis. *Torena AS report no. 2015_10* (internal).

Borehole	Average of all samples %Rm
7418/01-U-01	0.48
7427/03-U-01	0.64
7430/07-U-01	0.41
7430/10-U-01	0.31
7435/12-1 exploration well	0.40
7517/12-U-01	0.58
7532/02-U-01	0.46
7533/02-U-01	0.47
7533/02-U-02	0.39
7533/02-U-03	0.40
7533/03-U-01	0.33
7533/03-U-07	0.43
7534/04-U-01	0.42
7534/06-U-01	0.83
7616/11-U-01	0.59
7616/11-U-02	0.56, 2.38*
7617/11-U-01	1.84
7617/11-U-02	1.85
7618/09-U-01	2.09
7618/10-U-03	2.25
7618/12-U-01	2.44
7619/08-U-01	1.87
7634/06-U-01	0.35
7634/06-U-03	0.28
7830/03-U-01	0.65
7830/05-U-01	0.54
7830/06-U-01	0.73
7831/02-U-01	0.71
7831/02-U-02	0.43
7933/04-U-01	0.46
7933/04-U-02	0.50
7933/04-U-03	0.26
7934/06-U-01	0.37
7934/06-U-02	0.36
7934/08-U-01	0.36
7934/09-U-01	0.36
8034/05-U-01	No data
*) see comment in text page 51	

Tab.1 List of boreholes with average vitrinite reflectance for all measured samples.



Norwegian Barents Sea

- Shallow boreholes for vitrinite reflectance analysis -



Fig. 1

Map showing location of the shallow boreholes and the single exploration well (7435/12-1) subjected for vitrinite reflectance.

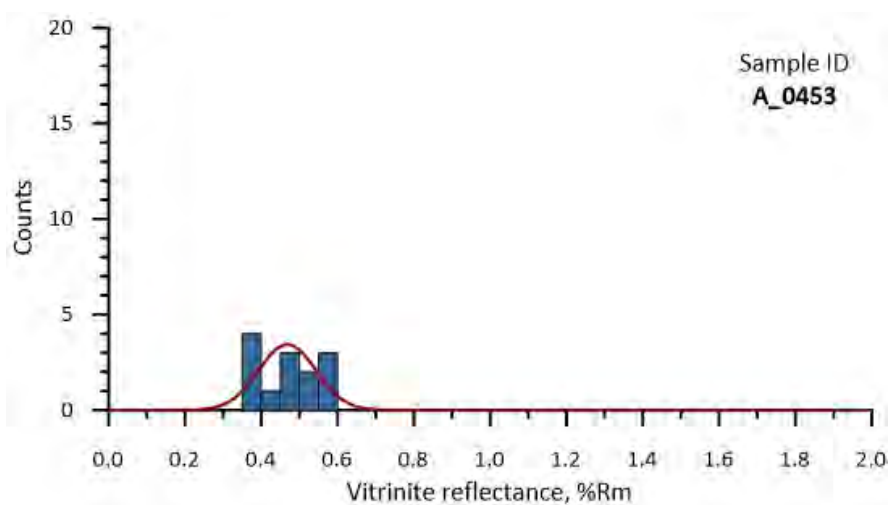
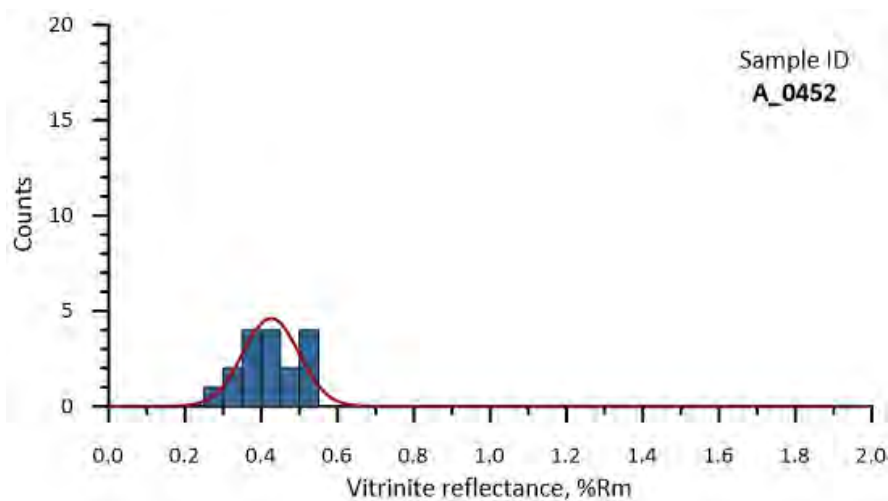
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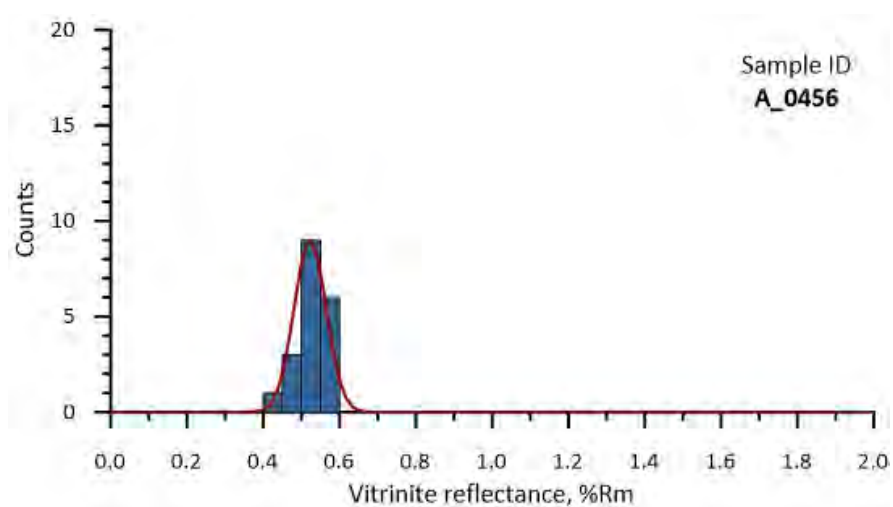
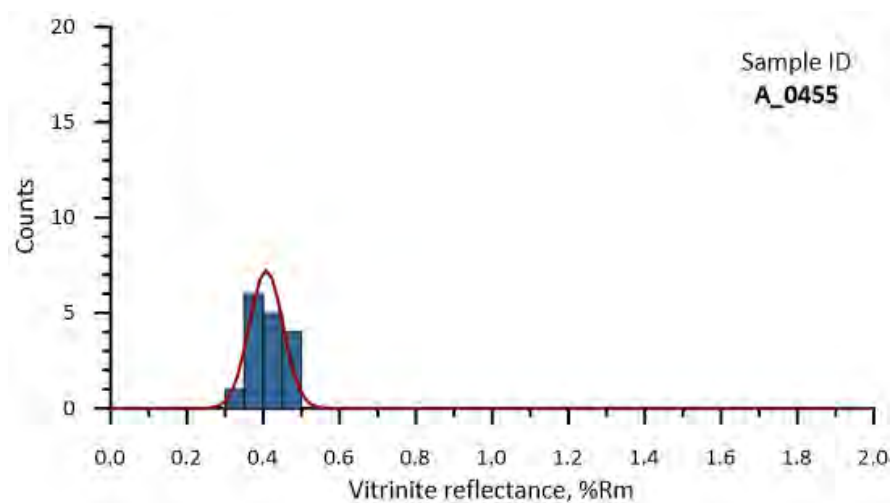
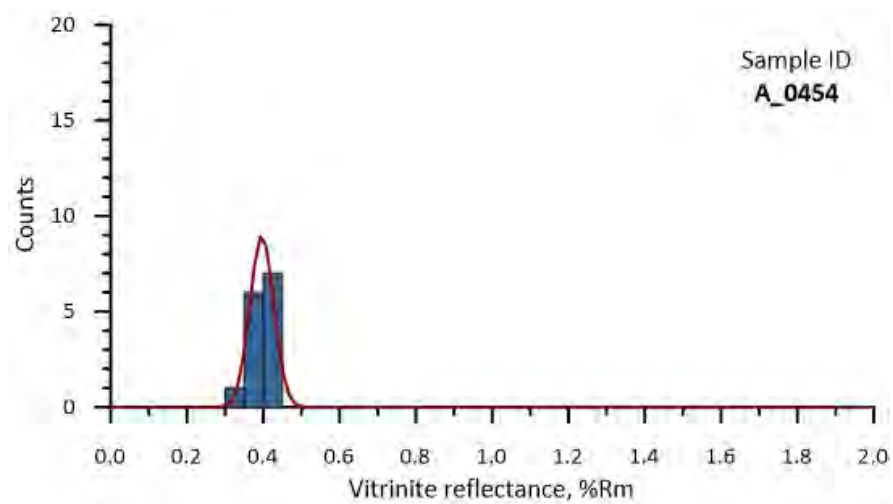
Appendix with individual well result

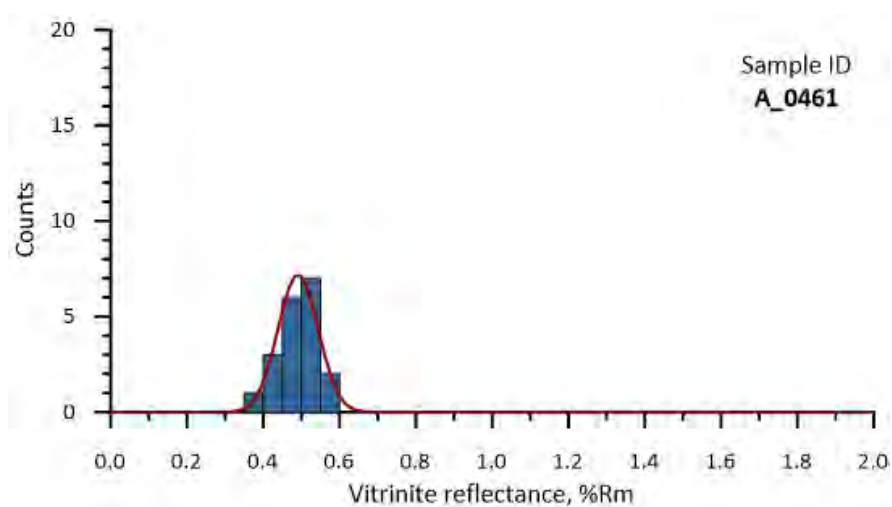
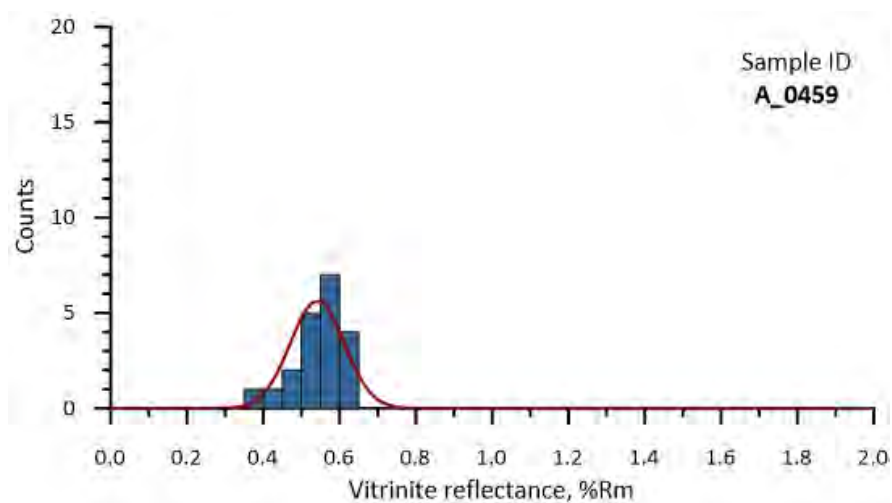
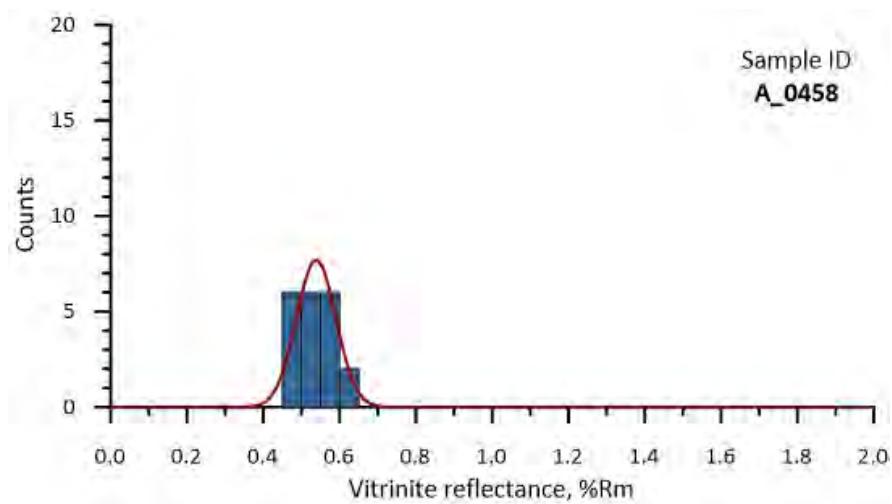
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7418/01-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0452	7418/01-U-01	10.70	Paleocene-Eocene	Core	Bulk	Shale	0.43	0.08	17	Poor	-o±-o	0.48
A_0453	7418/01-U-01	25.45	Paleocene-Eocene	Core	Bulk	Shale	0.47	0.08	13	Poor	-o±-o	
A_0454	7418/01-U-01	40.50	Paleocene-Eocene	Core	Bulk	Shale	0.40	0.04	15	Poor	-o±-o	
A_0455	7418/01-U-01	47.30	Paleocene-Eocene	Core	Bulk	Shale	0.41	0.05	16	Poor	-o±-o	
A_0456	7418/01-U-01	67.40	Paleocene-Eocene	Core	Bulk	Shale	0.52	0.04	19	Poor	oo±-o	
A_0457	7418/01-U-01	89.40	Paleocene-Eocene	Core	Bulk	Shale				No polish		
A_0458	7418/01-U-01	97.30	Paleocene-Eocene	Core	Bulk	Shale	0.54	0.05	20	Poor	-±±-o	
A_0459	7418/01-U-01	108.50		Core	Bulk	Shale	0.54	0.07	20	Poor	o++-o	
A_0460	7418/01-U-01	111.80		Core	Bulk	Shale				Barren		
A_0461	7418/01-U-01	121.10		Core	Bulk	Shale	0.49	0.05	19	Poor	-±±--	

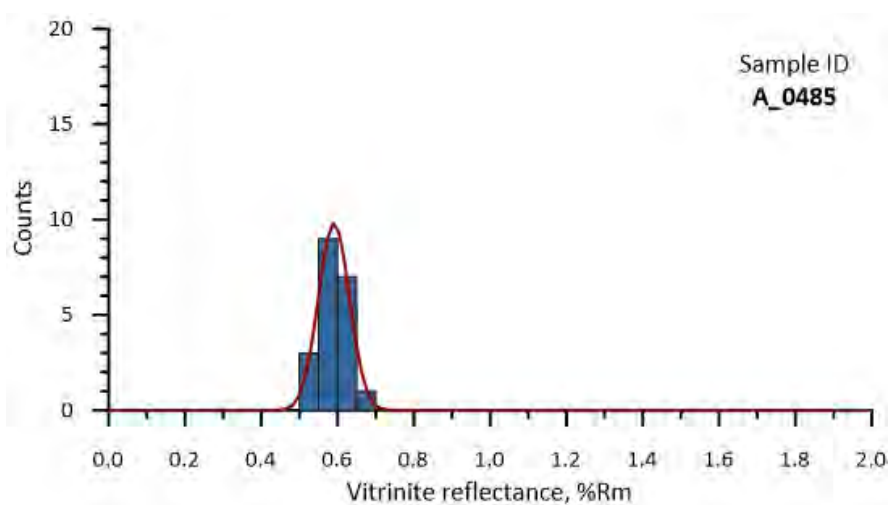
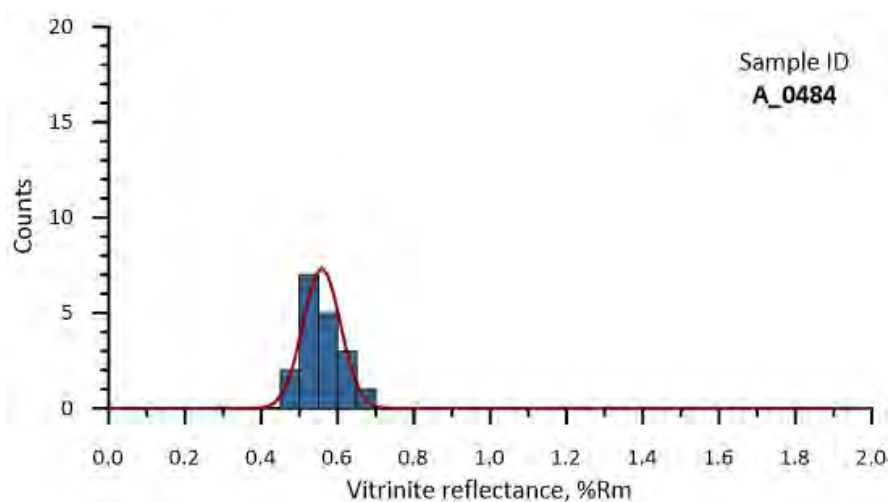


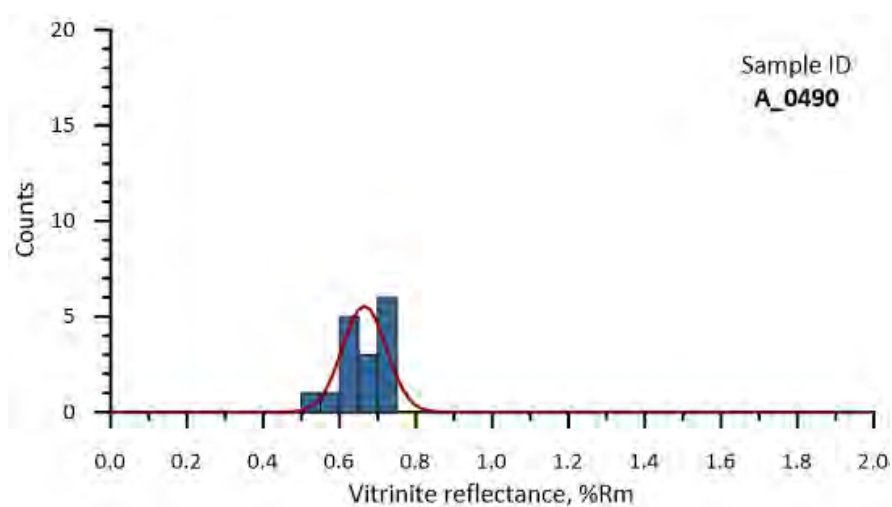
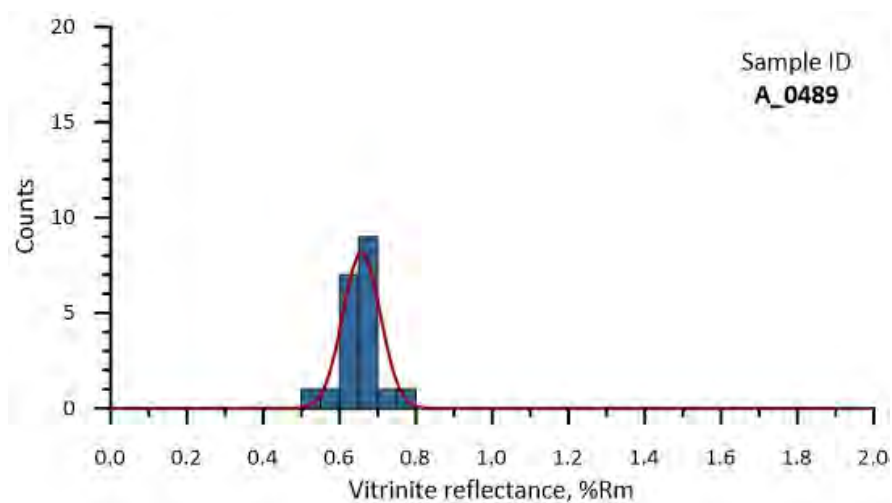
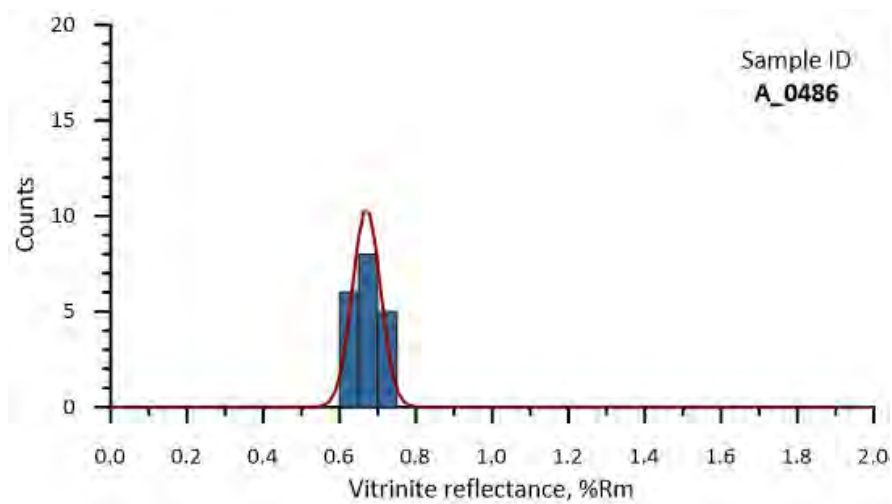


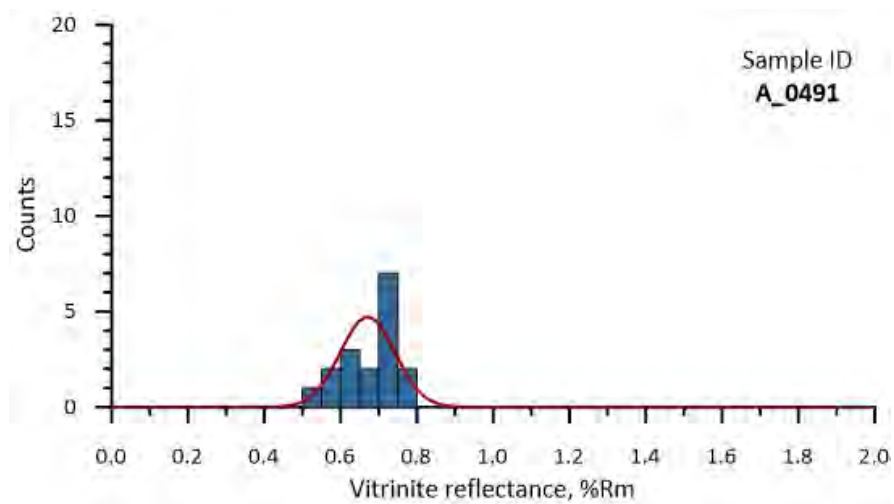


7427/03-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0482	7427/03-U-01	7.40	Early Ladinian	Core	Bulk	Shale				Barren		0.64
A_0483	7427/03-U-01	13.30	Early Ladinian	Core	Bulk	Shale				Barren		
A_0484	7427/03-U-01	16.60	Early Ladinian	Core	Bulk	Shale	0.56	0.05	18	Moderate	-o+-o	
A_0485	7427/03-U-01	18.30	Early Ladinian	Core	Bulk	Shale	0.59	0.04	20	Moderate	-o+oo	
A_0486	7427/03-U-01	21.80	Early Ladinian	Core	Bulk	Shale	0.67	0.04	19	Poor	-++oo	
A_0487	7427/03-U-01	31.12	Early Ladinian	Core	Bulk	Siltstone				Barren		
A_0488	7427/03-U-01	38.10	Early Ladinian	Core	Bulk	Shale				Barren		
A_0489	7427/03-U-01	59.50	Early Ladinian	Core	Bulk	Shale	0.66	0.05	20	Moderate	oo+oo	
A_0490	7427/03-U-01	64.20	Early Ladinian	Core	Bulk	Shale	0.67	0.06	16	Poor	-++o-	
A_0491	7427/03-U-01	75.56	Early Ladinian	Core	Bulk	Shale	0.67	0.07	17	Poor	-++-o	

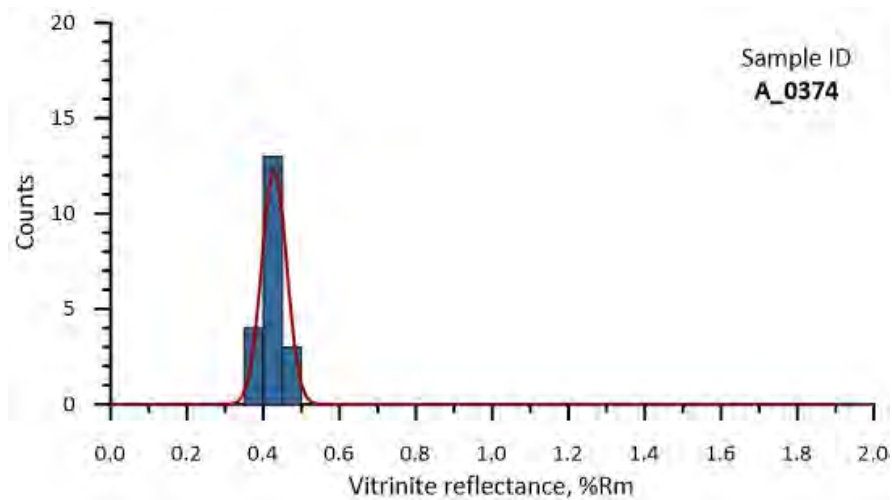
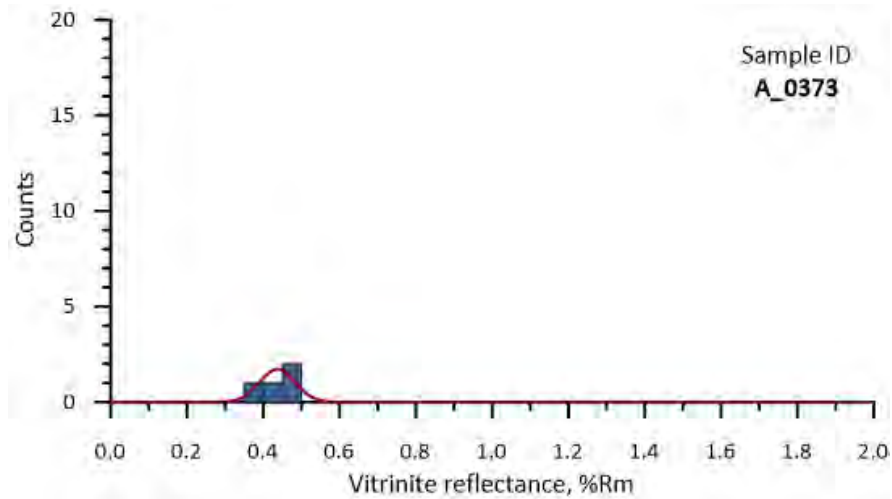


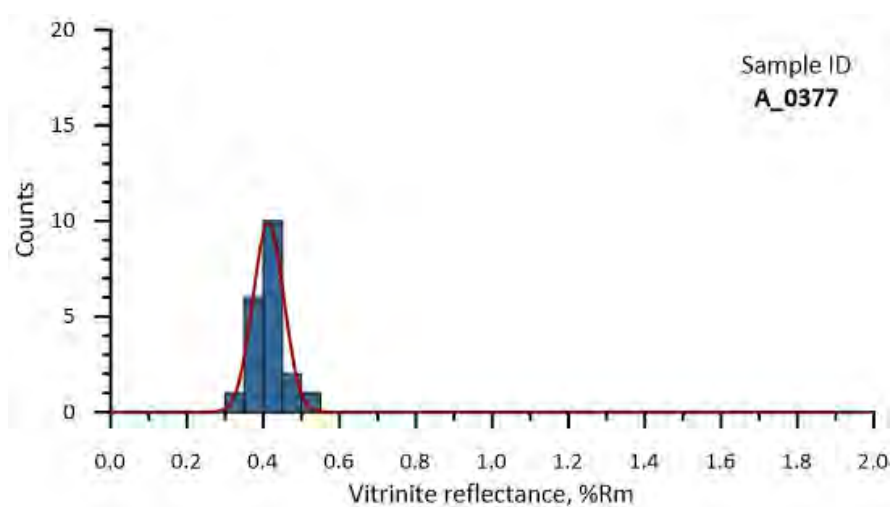
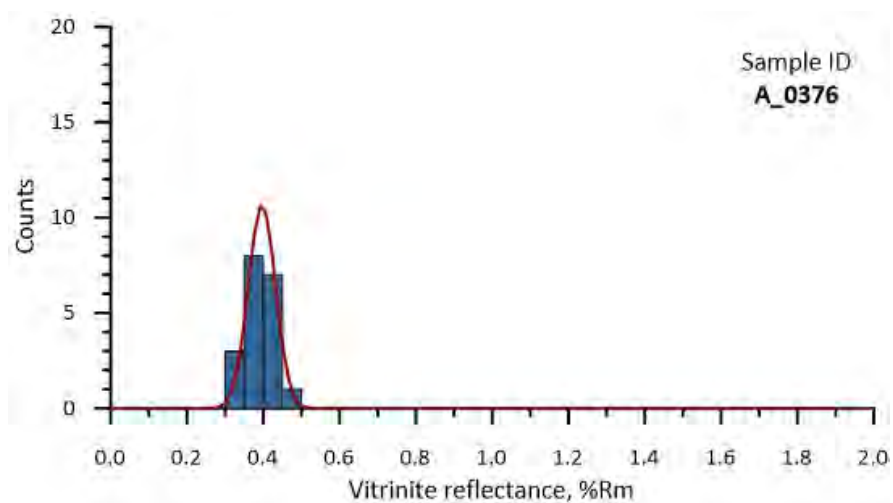
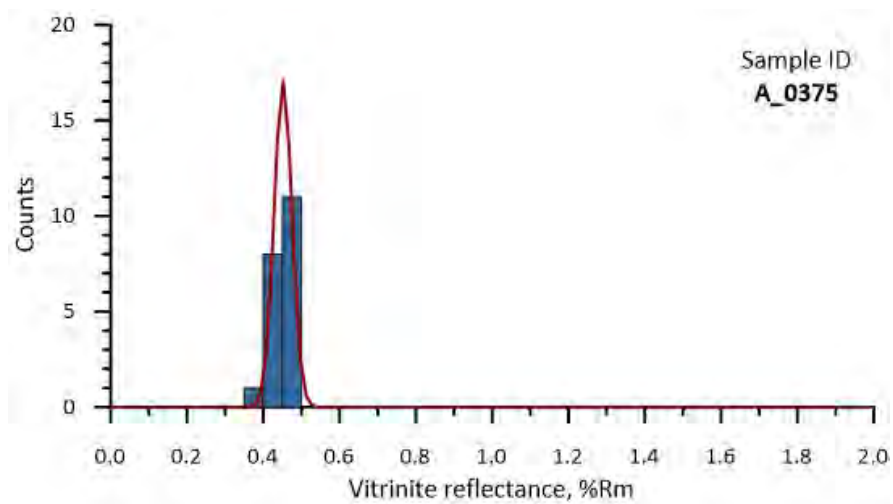


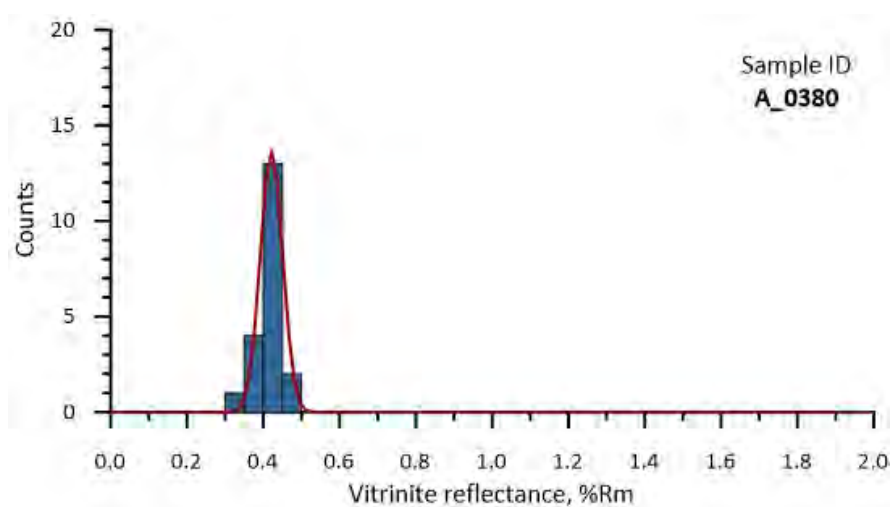
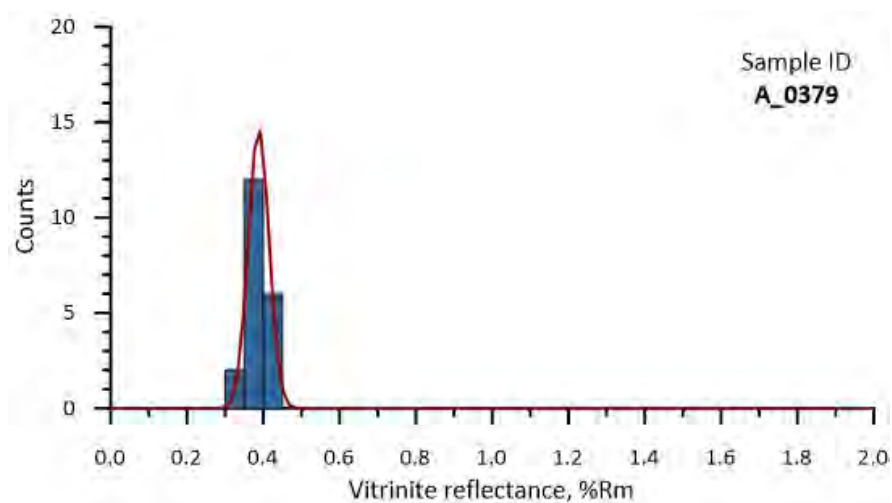
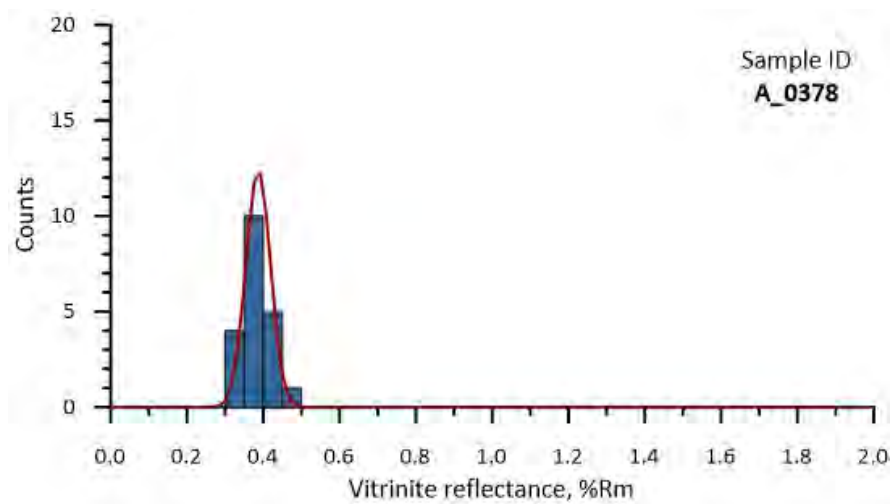


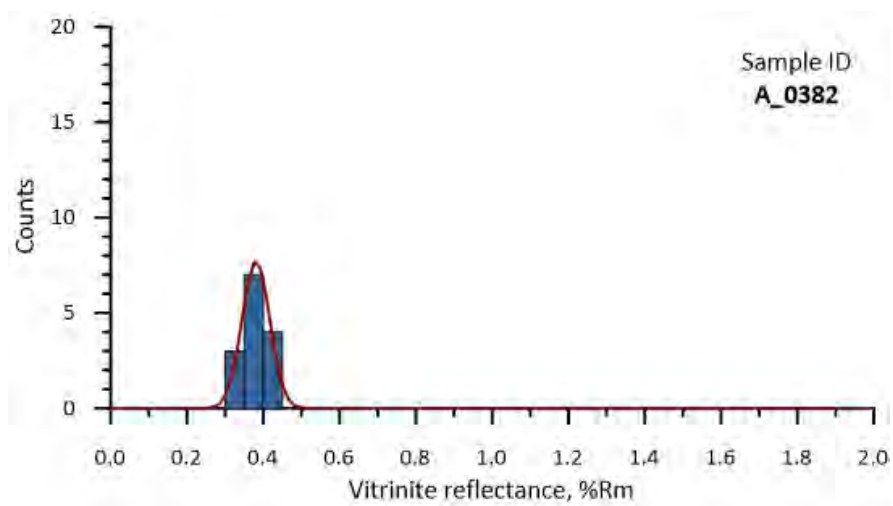
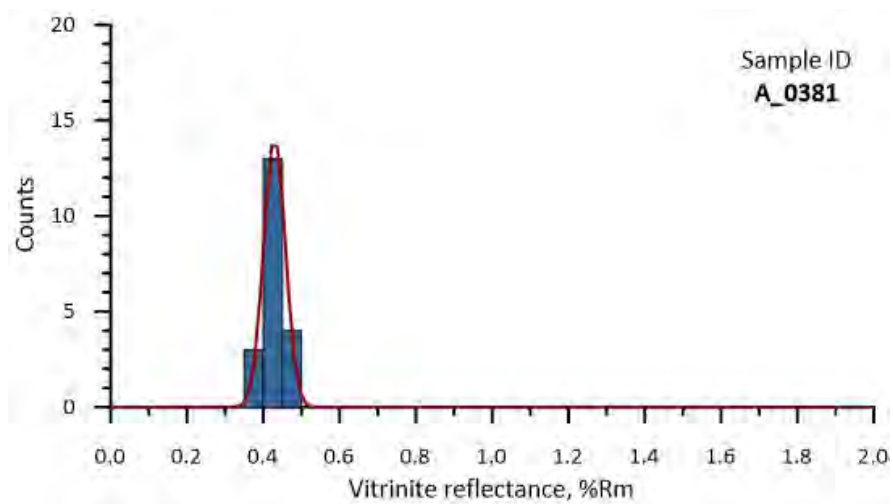
7430/07-U-01

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A_0373	7430/07-U-01	12.80	Snadd Fm	Core	Bulk	Shale	0.44	0.05	4	Poor	---+---	0.41
A_0374	7430/07-U-01	37.76	Snadd Fm	Core	Bulk	Organic rich shale	0.43	0.03	20	Moderate	----	
A_0375	7430/07-U-01	50.22	Snadd Fm	Core	Bulk	Coal	0.45	0.02	20	Good	-----	
A_0376	7430/07-U-01	76.10	Snadd Fm	Core	Bulk	Organic rich shale	0.40	0.04	19	Moderate	----	
A_0377	7430/07-U-01	78.20	Snadd Fm	Core	Bulk	Coal	0.41	0.04	20	Good	-----	
A_0378	7430/07-U-01	78.50	Snadd Fm	Core	Bulk	Coal	0.39	0.03	20	Good	-----	
A_0379	7430/07-U-01	82.65	Snadd Fm	Core	Bulk	Coal	0.39	0.03	20	Good	-----	
A_0380	7430/07-U-01	82.95	Snadd Fm	Core	Bulk	Coal	0.42	0.03	20	Good	-----	
A_0381	7430/07-U-01	97.70	Snadd Fm	Core	Bulk	Coal	0.42	0.03	20	Good	-----	
A_0382	7430/07-U-01	106.75	Snadd Fm	Core	Bulk	Organic rich shale	0.38	0.04	14	Moderate	-----	



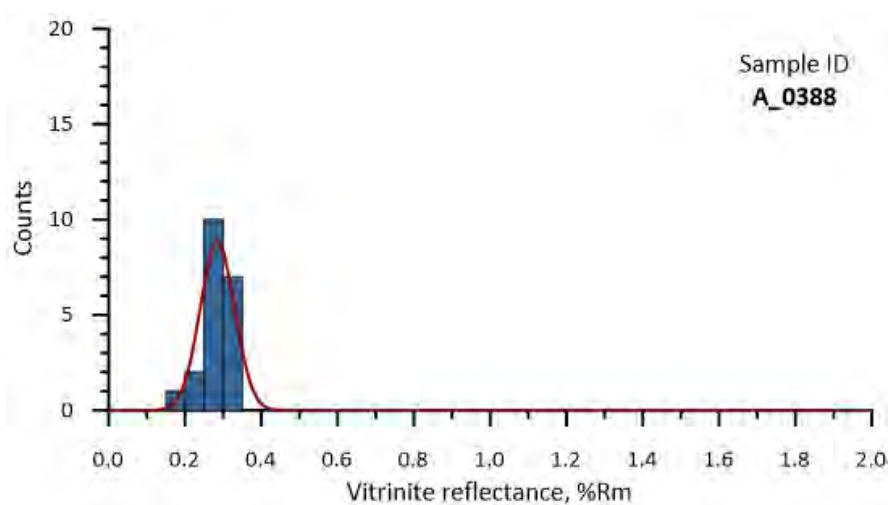
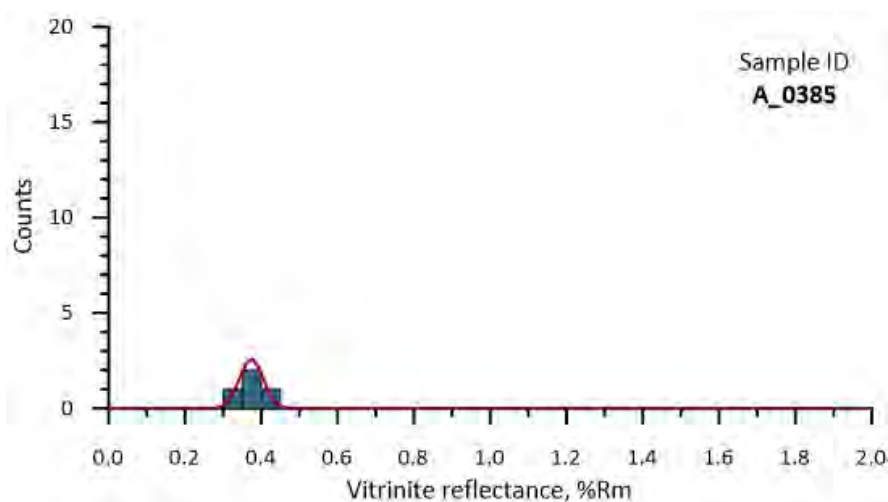


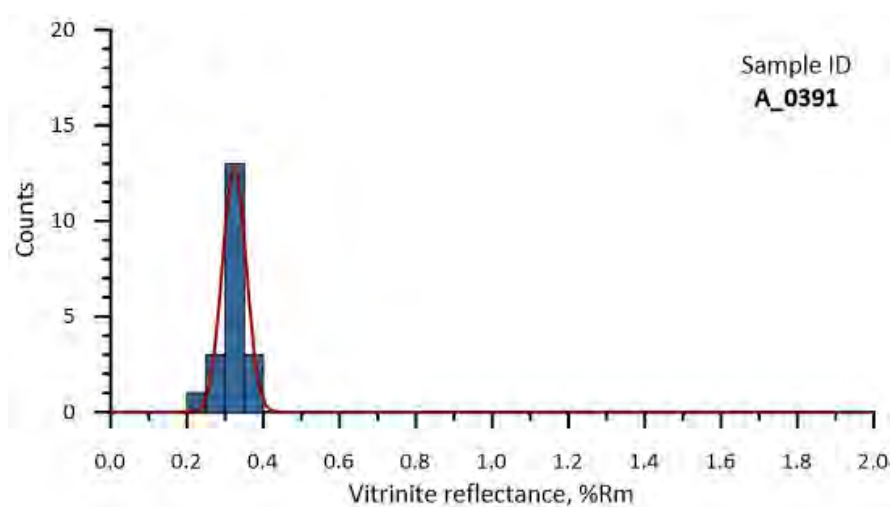
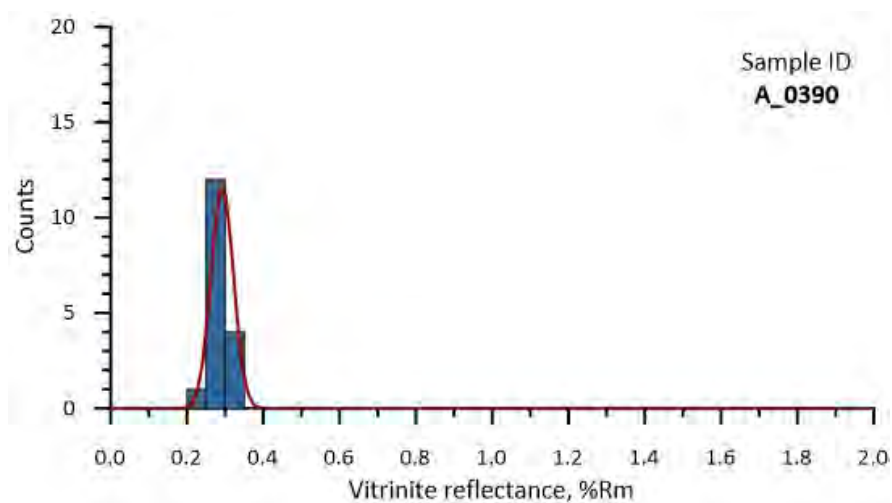
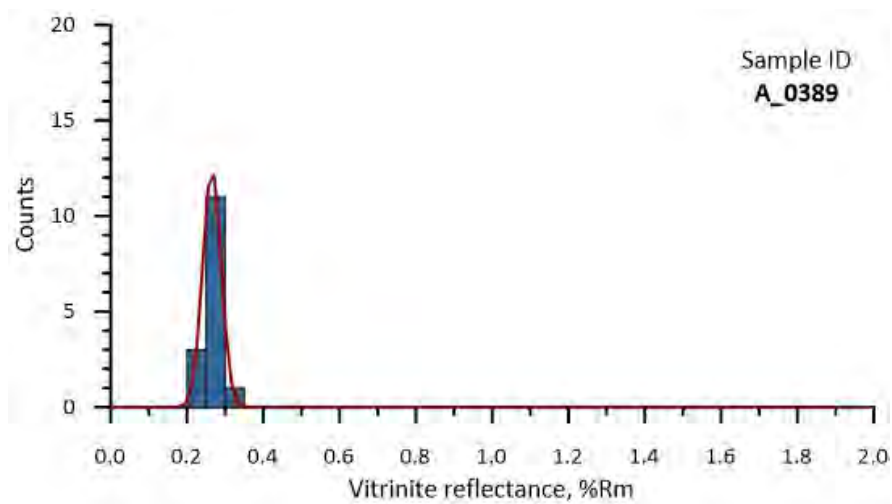


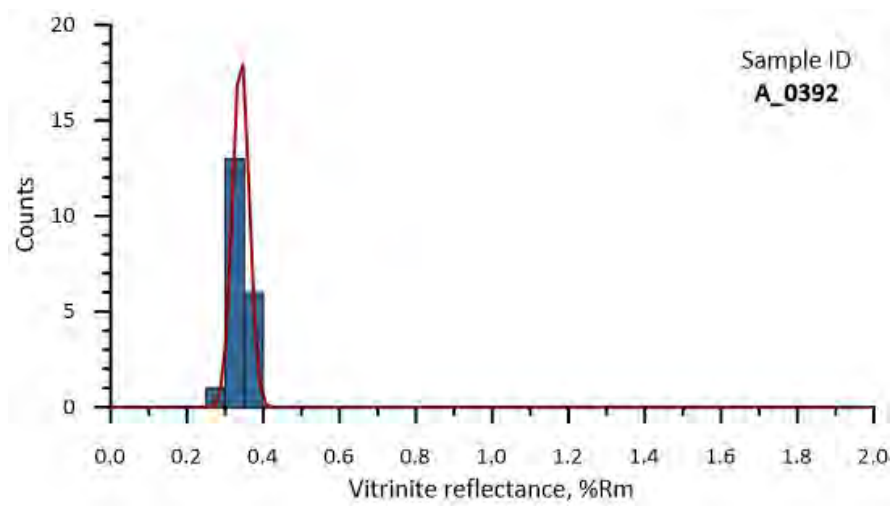


7430/10-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0383	7430/10-U-01	13.00	Knurr Fm	Core	Bulk	Shale				Barren		0.31
A_0384	7430/10-U-01	15.10	Knurr Fm	Core	Bulk	Shale				Barren		
A_0385	7430/10-U-01	19.80	Knurr Fm	Core	Bulk	Shale	0.37	0.05	4	Poor	-oooo	
A_0386	7430/10-U-01	26.40	Knurr Fm	Core	Bulk	Shale				Barren		
A_0387	7430/10-U-01	32.40	Knurr Fm	Core	Bulk	Shale				Barren		
A_0388	7430/10-U-01	54.37	Hekkingen	Core	Bulk	Organic rich shale	0.29	0.05	20	Poor	oo---	
A_0389	7430/10-U-01	55.95	Hekkingen	Core	Bulk	Shale	0.27	0.03	15	Poor	-oo--	
A_0390	7430/10-U-01	58.55	Hekkingen	Core	Bulk	Shale	0.29	0.03	17	Poor	oo---	
A_0391	7430/10-U-01	61.80	Hekkingen	Core	Bulk	Organic rich shale	0.32	0.03	20	Poor	oo---	
A_0392	7430/10-U-01	67.58	Hekkingen	Core	Bulk	Organic rich shale	0.34	0.02	20	Poor	oo---	

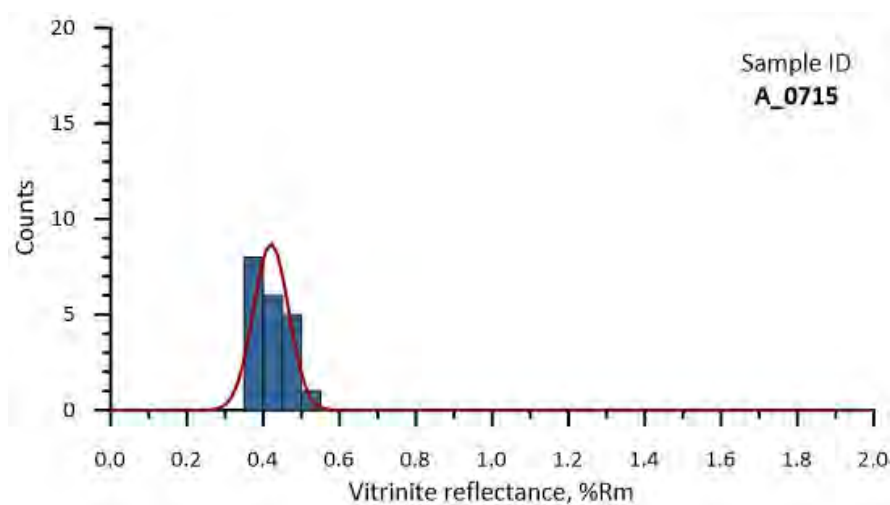
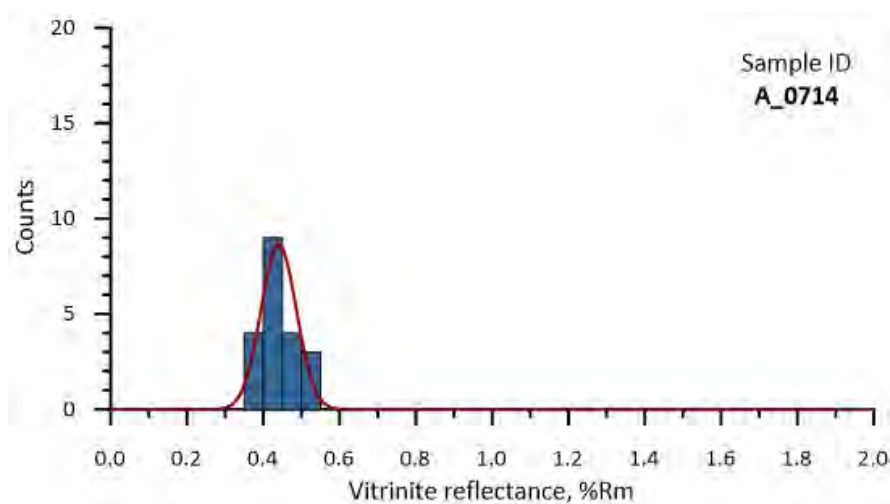


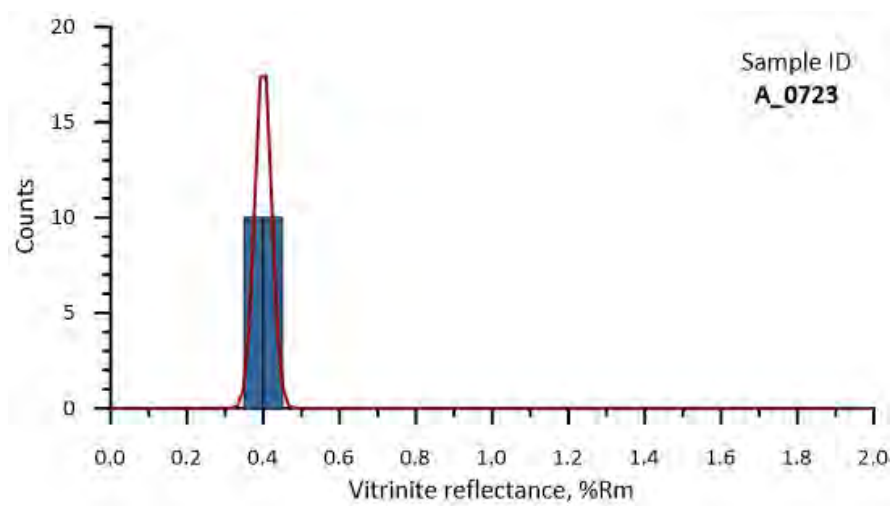
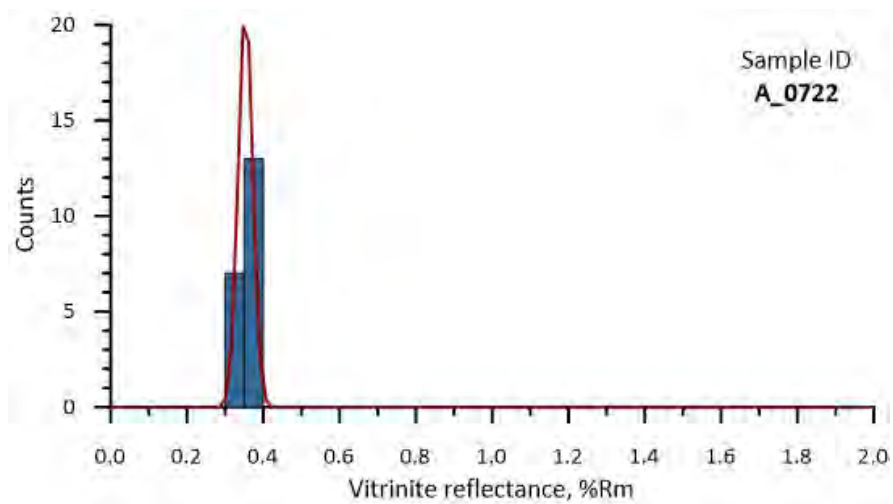




7435/12-1 exploration well

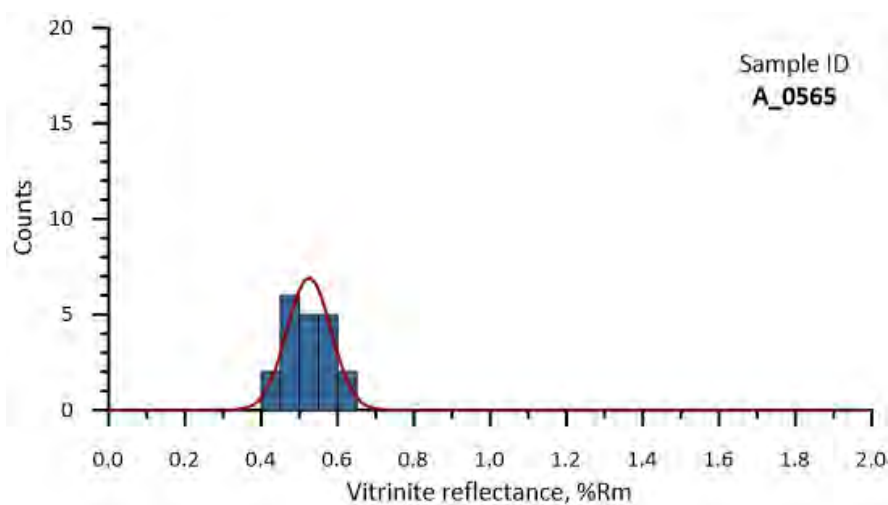
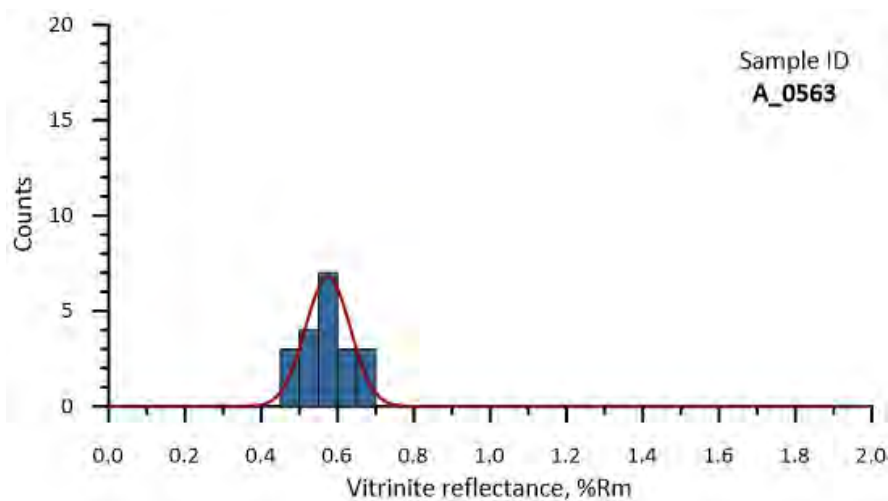
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0714	7435/12-1	606.85	Realgrunnen Subgp	Core	Bulk	Pyritic sandstone	0.44	0.05	20	Moderate	o++oo	0.40
A_0715	7435/12-1	607.75	Realgrunnen Subgp	Core	Bulk	Shale	0.42	0.05	20	Good	ooooo	
A_0716	7435/12-1	608.00	Realgrunnen Subgp	Core	Bulk					No polish		
A_0717	7435/12-1	608.40	Realgrunnen Subgp	Core	Bulk					No polish		
A_0718	7435/12-1	608.75	Realgrunnen Subgp	Core	Bulk					No polish		
A_0719	7435/12-1	615.95	Realgrunnen Subgp	Core	Bulk					No polish		
A_0720	7435/12-1	616.15	Realgrunnen Subgp	Core	Bulk					No polish		
A_0721	7435/12-1	616.50	Realgrunnen Subgp	Core	Bulk					No polish		
A_0722	7435/12-1	618.90	Realgrunnen Subgp	Core	Bulk	Coal	0.35	0.02	20	Good	ooooo	
A_0723	7435/12-1	619.80	Realgrunnen Subgp	Core	Bulk	Coal	0.40	0.02	20	Good	ooooo	

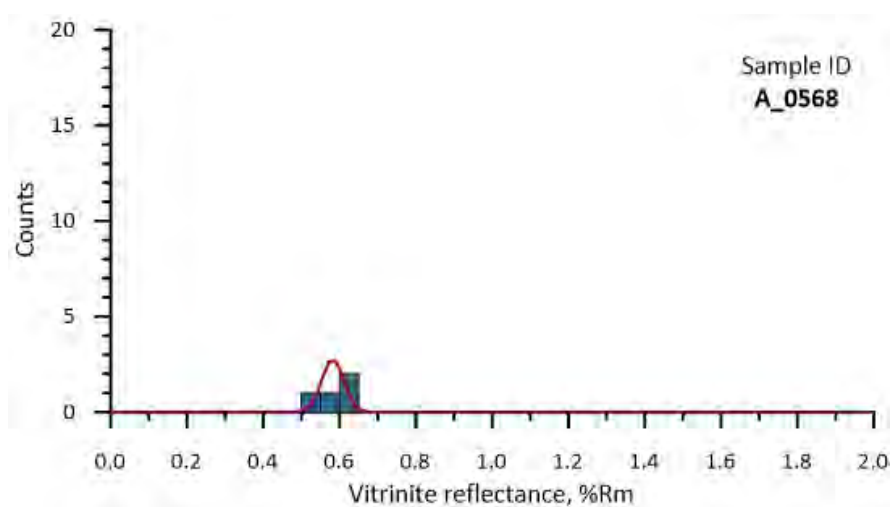
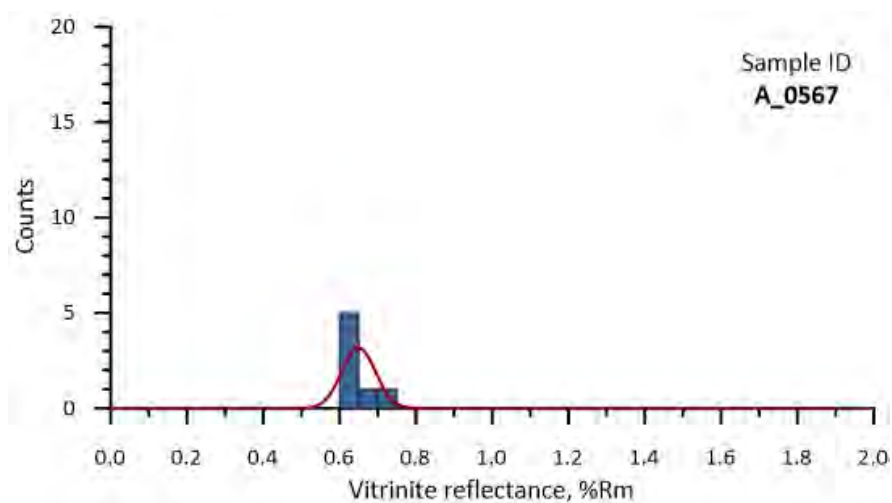
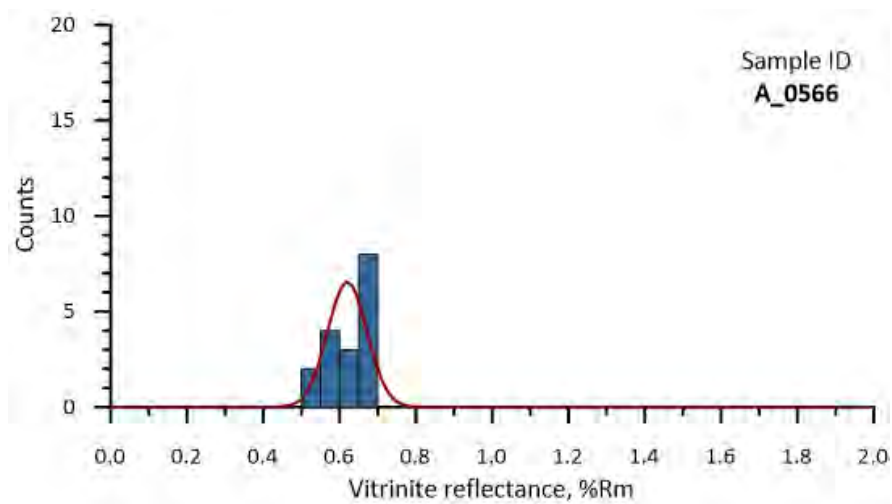


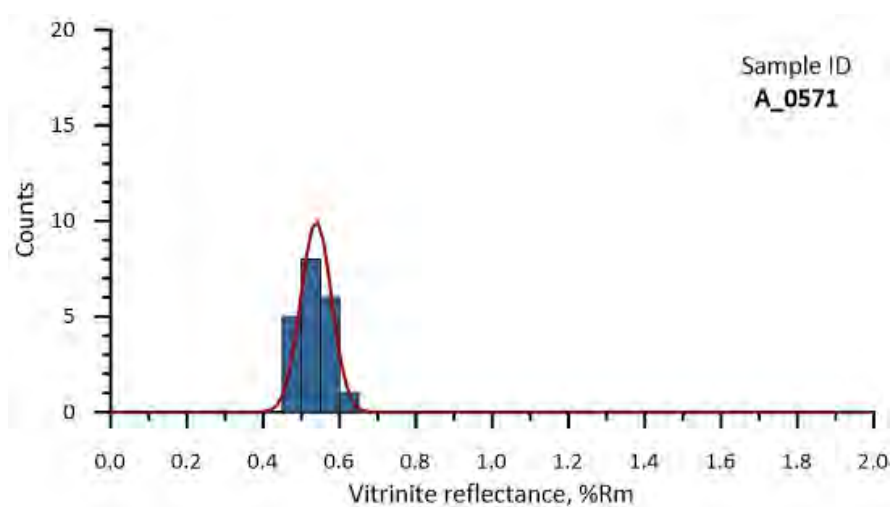
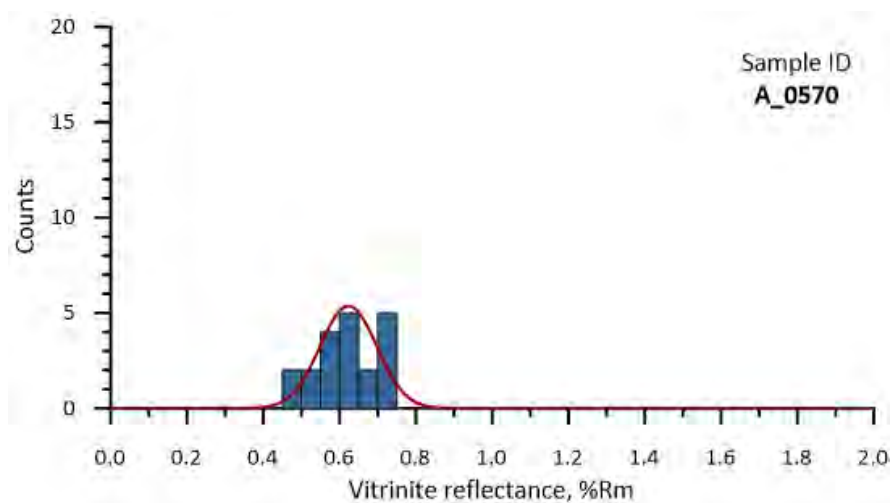
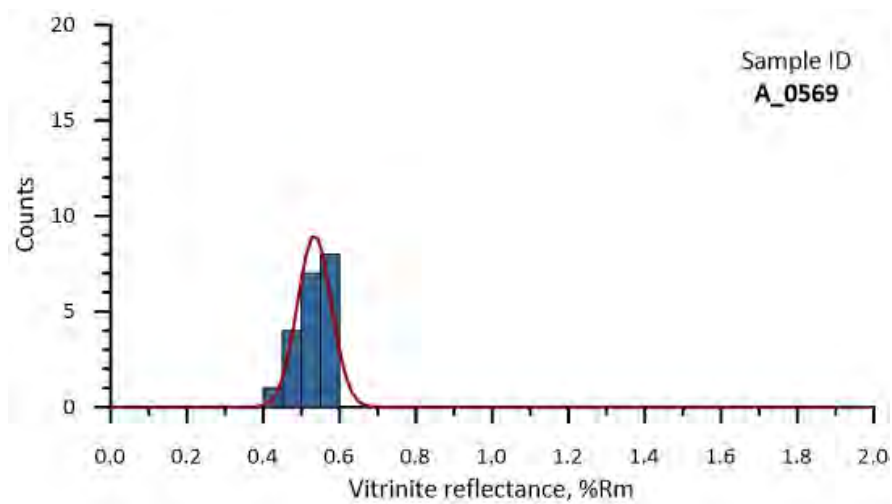


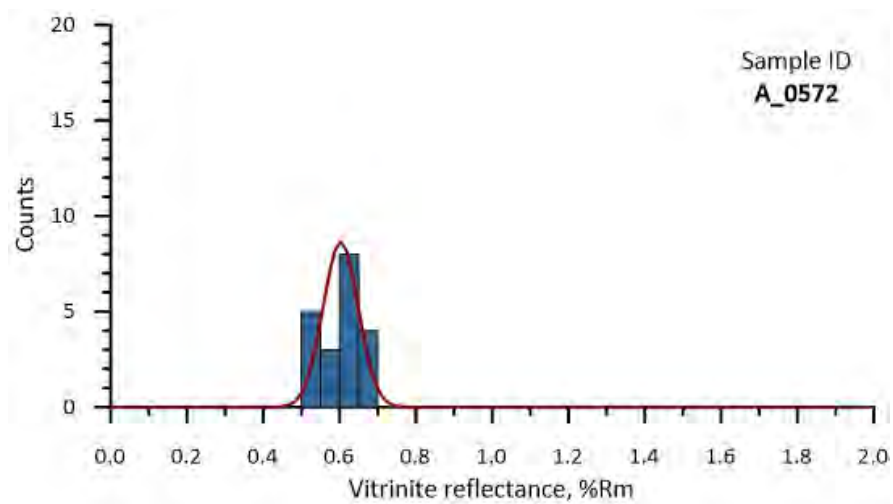
7517/12-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0563	7517/12-U-01	23.08	Late Paleocene	Core	Bulk	Sandstone/siltstone	0.58	0.06	20	Moderate	o++oo	0.58
A_0564	7517/12-U-01	51.35	Late Paleocene	Core	Bulk					No polish		
A_0565	7517/12-U-01	132.40	Late Paleocene	Core	Bulk	Sandstone/siltstone	0.53	0.06	0	Moderate	o++oo	
A_0566	7517/12-U-01	136.64	Late Paleocene	Core	Bulk	Siltstone	0.62	0.05	17	Fair	-o+oo	
A_0567	7517/12-U-01	160.38	Late Paleocene	Core	Bulk	Sandstone	0.65	0.05	7	Fair	-o+oo	
A_0568	7517/12-U-01	181.45		Core	Bulk	Siltstone/Shale	0.58	0.03	4	Fair	-o+oo	
A_0569	7517/12-U-01	190.00		Core	Bulk	Shale	0.53	0.05	20	Moderate	oo+oo	
A_0570	7517/12-U-01	194.63		Core	Bulk	Shale	0.62	0.08	20	Moderate	oo+oo	
A_0571	7517/12-U-01	198.28		Core	Bulk	Shale	0.54	0.04	20	Moderate	o+ooo	
A_0572	7517/12-U-01	199.00		Core	Bulk	Shale	0.60	0.05	20	Fair	oo+-o	



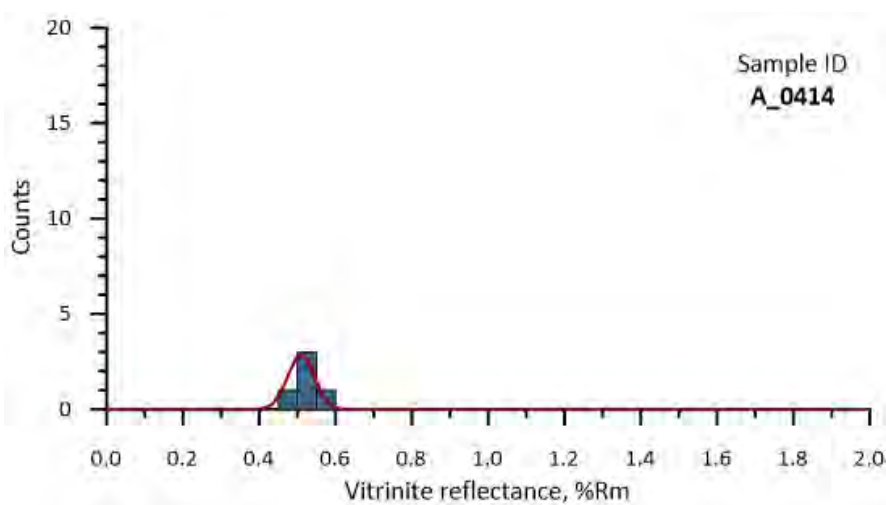
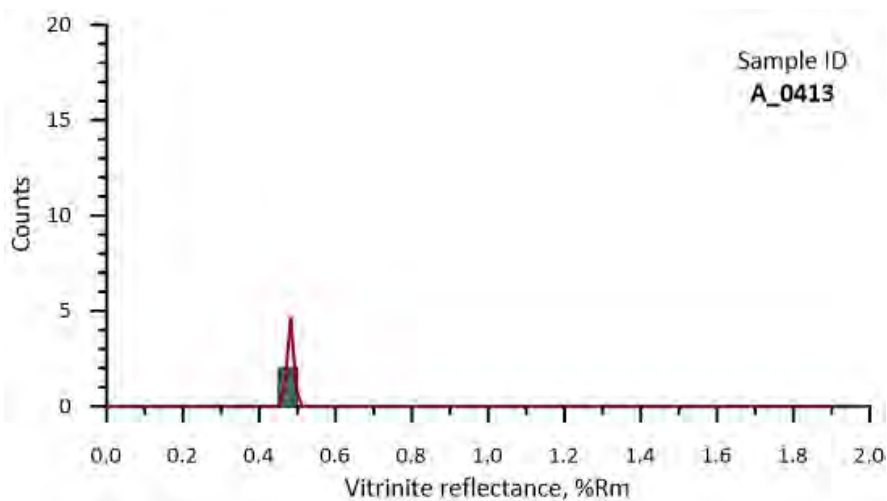


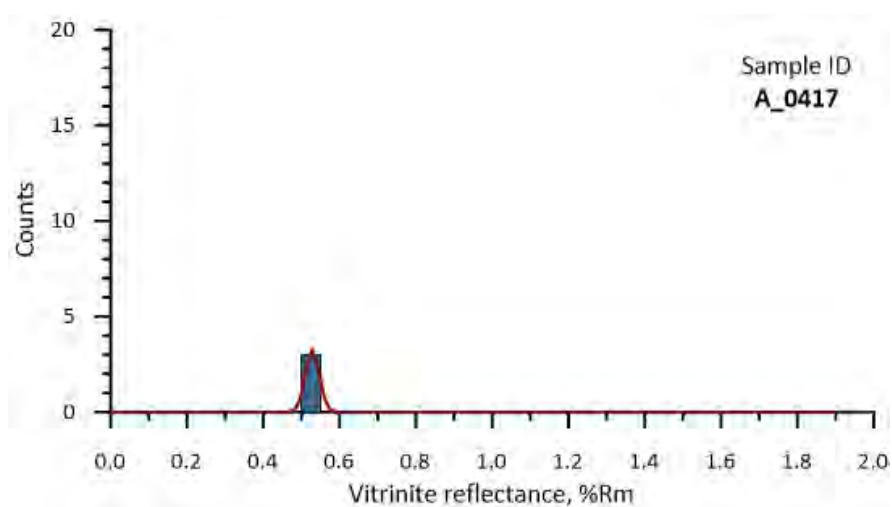
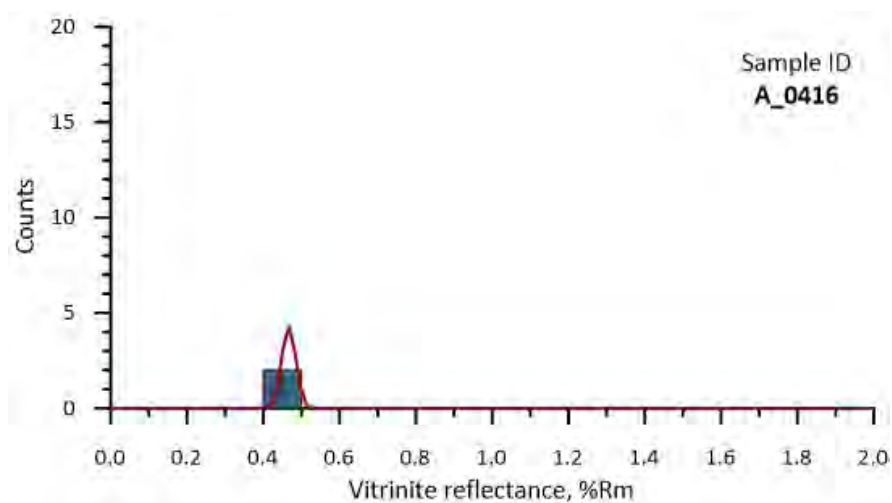
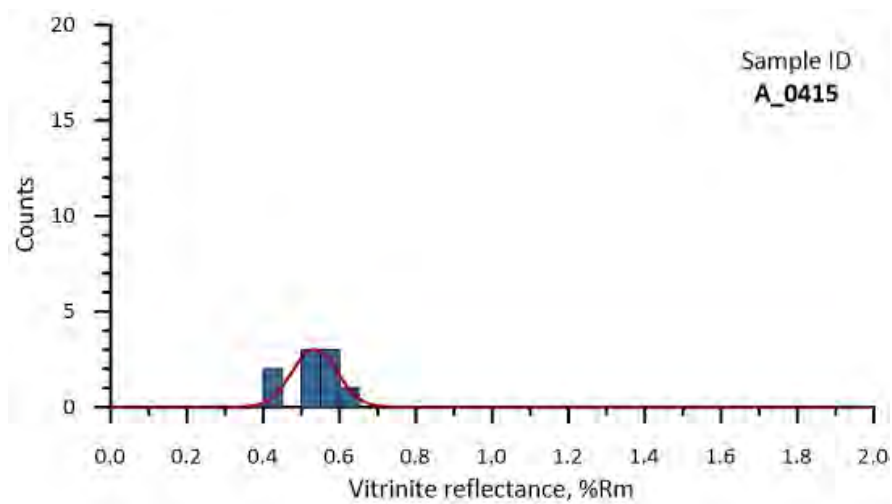


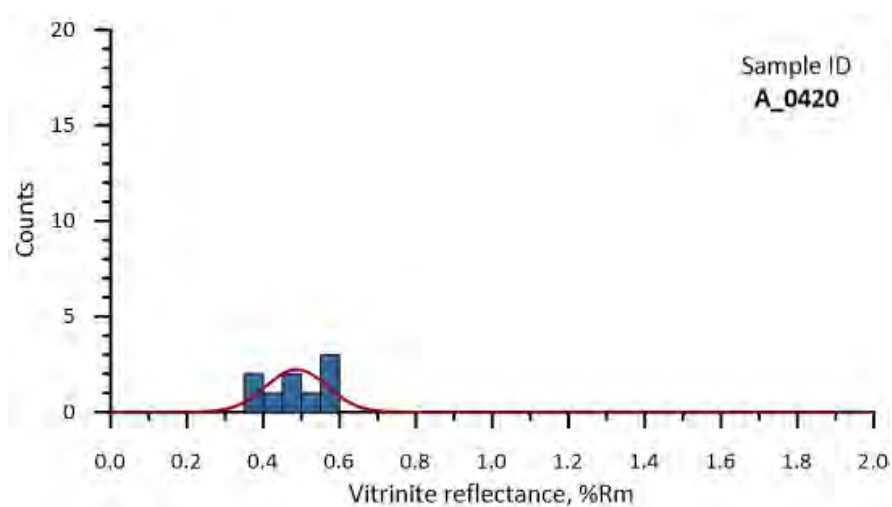
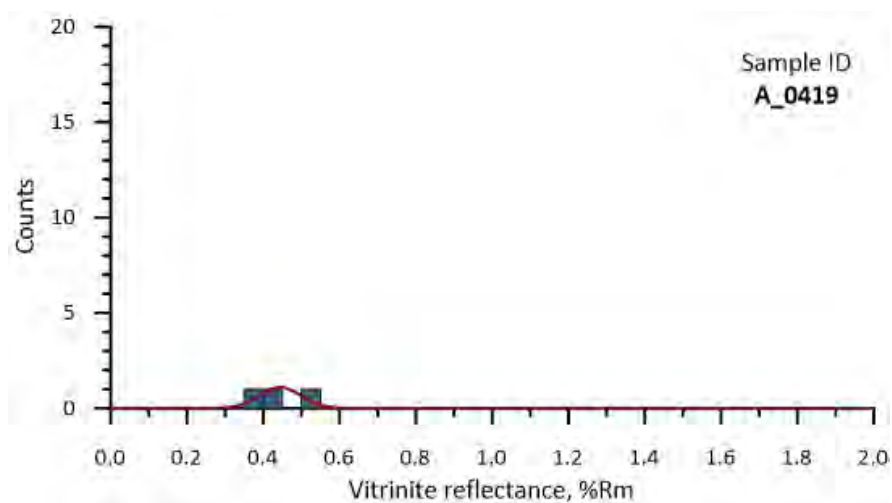
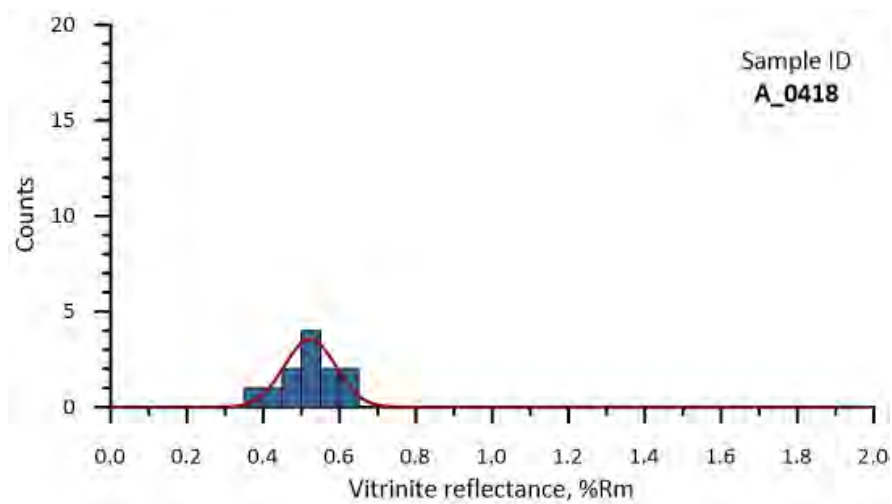


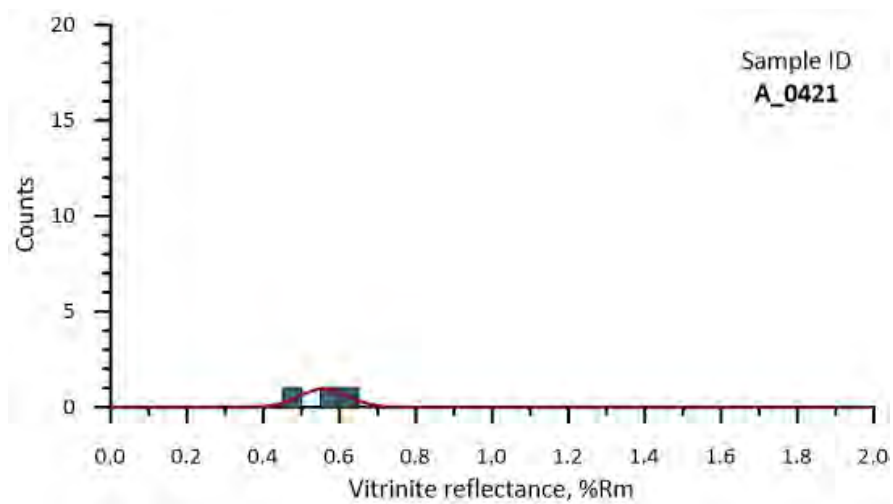
7532/02-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0413	7532/02-U-01	10.20	Botneheia Fm	Core	Bulk	Shale	0.48	0.01	2	Poor	--+-	0.46
A_0414	7532/02-U-01	10.30	Botneheia Fm	Core	Bulk	Shale	0.51	0.04	5	Poor	--+-	
A_0415	7532/02-U-01	10.40	Botneheia Fm	Core	Bulk	Shale	0.54	0.06	9	Poor	--+-	
A_0416	7532/02-U-01	10.70	Botneheia Fm	Core	Bulk	Shale	0.47	0.02	4	Poor	--+-	
A_0417	7532/02-U-01	12.05	Botneheia Fm	Core	Bulk	Shale	0.53	0.02	3	Poor	--+-	
A_0418	7532/02-U-01	12.15	Botneheia Fm	Core	Bulk	Shale	0.52	0.07	12	Poor	--+-	
A_0419	7532/02-U-01	12.30	Botneheia Fm	Core	Bulk	Shale	0.45	0.07	3	Poor	--+-	
A_0420	7532/02-U-01	12.90	Botneheia Fm	Core	Bulk	Shale	0.49	0.09	9	Poor	--+-	
A_0421	7532/02-U-01	13.25	Botneheia Fm	Core	Bulk	Shale	0.56	0.08	3	Poor	--+-	



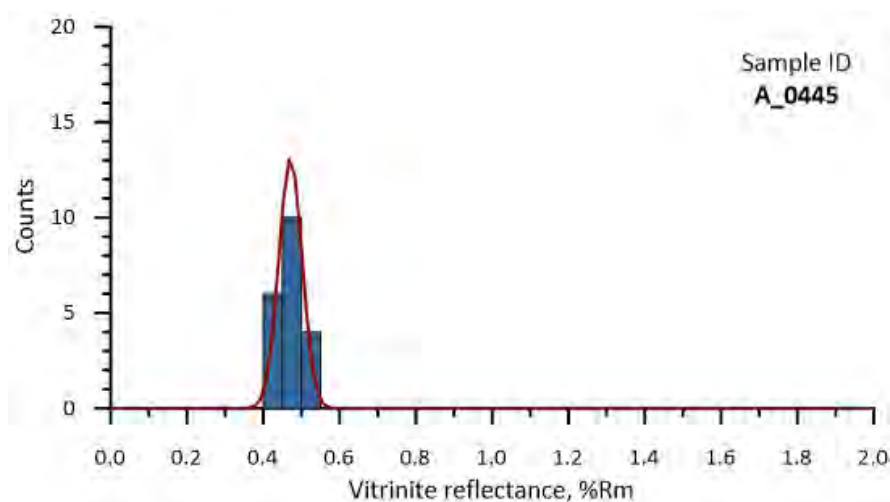
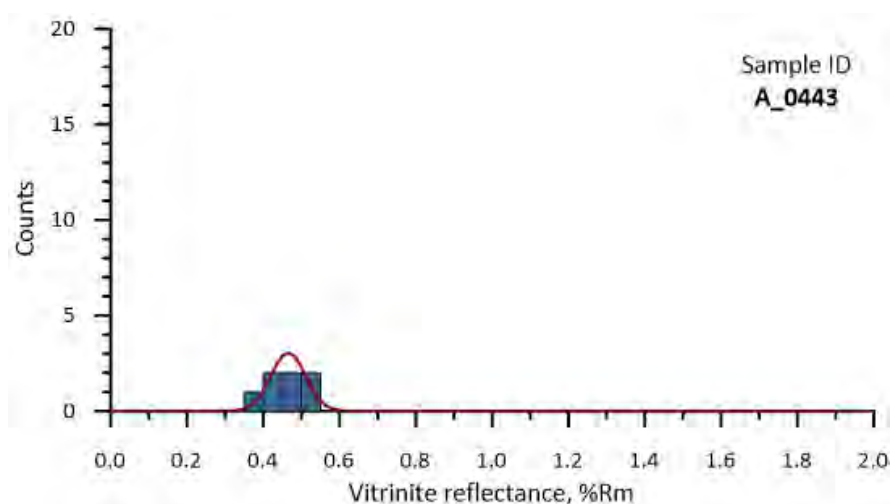


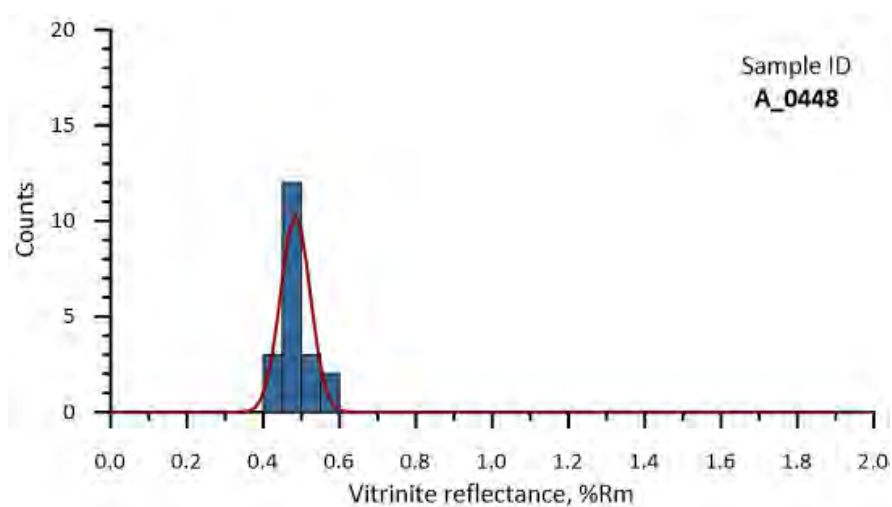
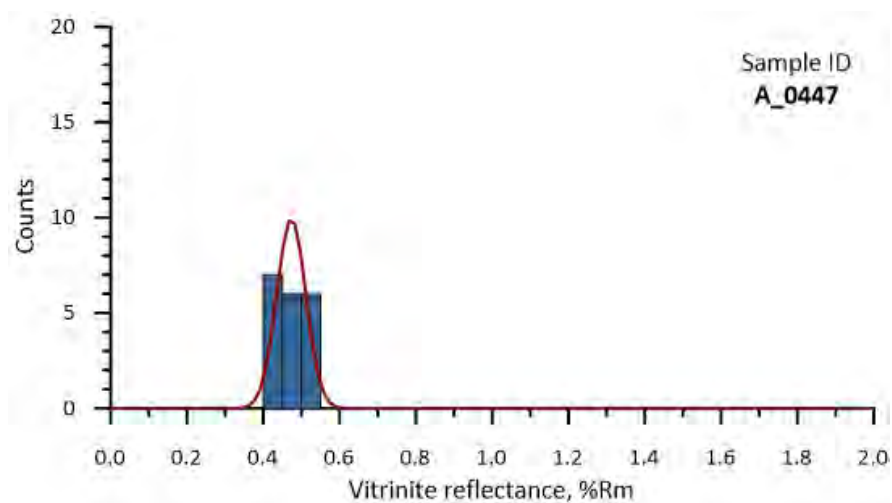
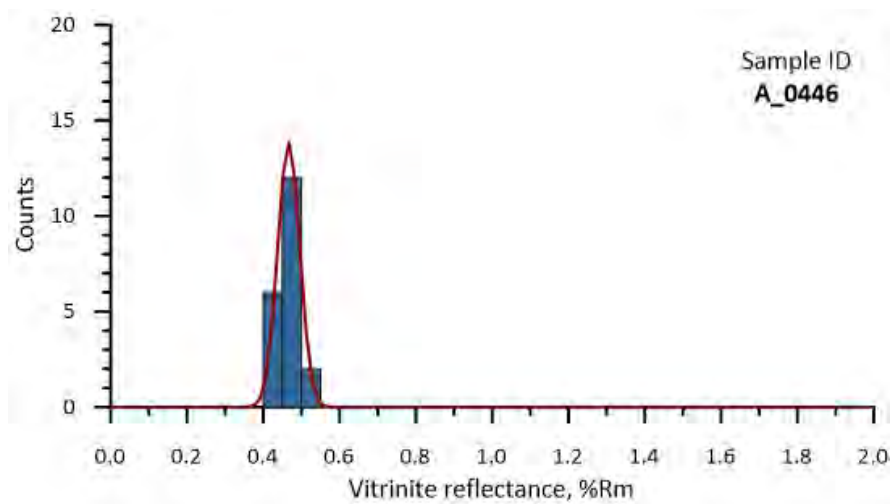


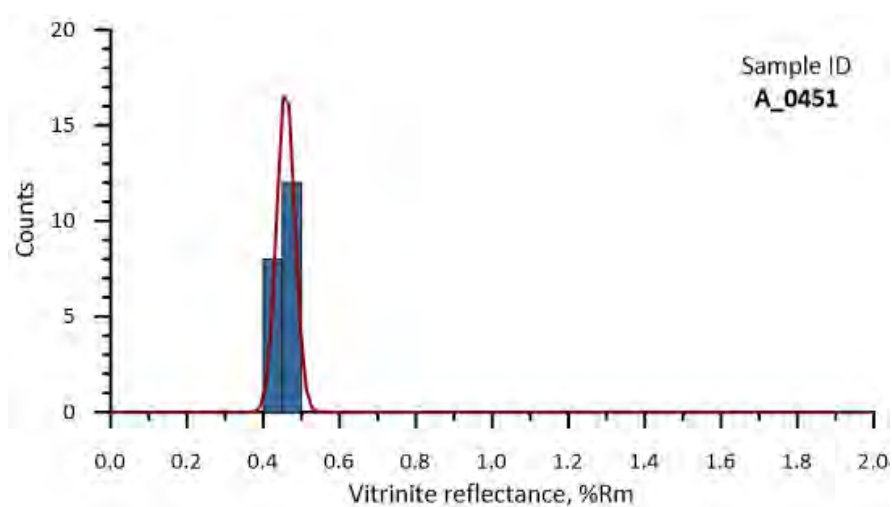
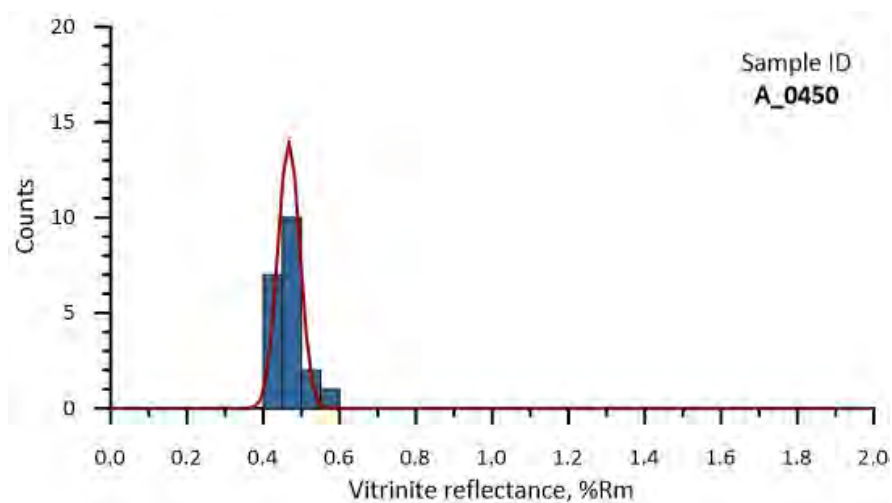
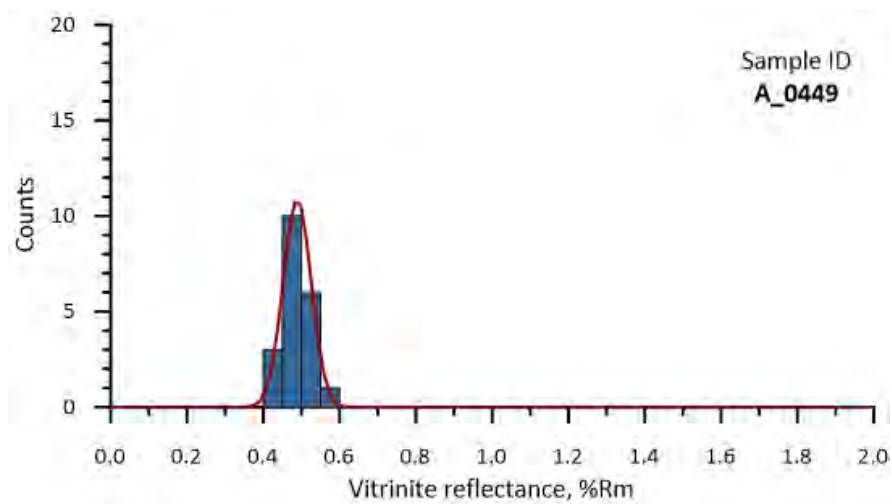


7533/02-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0443	7533/02-U-01	9.92	De Geerdalen Fm	Core	Bulk	Shale	0.47	0.05	7	Poor	-o±-o	0.47
A_0444	7533/02-U-01	12.95	De Geerdalen Fm	Core	Bulk	Siltstone				Barren		
A_0445	7533/02-U-01	48.82	De Geerdalen Fm	Core	Bulk	Shaly coal	0.47	0.03	20	Good	ooooo	
A_0446	7533/02-U-01	131.48	De Geerdalen Fm	Core	Bulk	coal	0.47	0.03	20	Good	ooooo	
A_0447	7533/02-U-01	137.70	De Geerdalen Fm	Core	Bulk	coal	0.47	0.04	20	Good	ooooo	
A_0448	7533/02-U-01	165.10	De Geerdalen Fm	Core	Bulk	coal	0.48	0.04	20	Good	ooooo	
A_0449	7533/02-U-01	167.35	De Geerdalen Fm	Core	Bulk	coal	0.49	0.04	20	Good	ooooo	
A_0450	7533/02-U-01	174.15	De Geerdalen Fm	Core	Bulk	coal	0.47	0.03	20	Good	ooooo	
A_0451	7533/02-U-01	176.68	De Geerdalen Fm	Core	Bulk	coal	0.46	0.02	20	Good	ooooo	

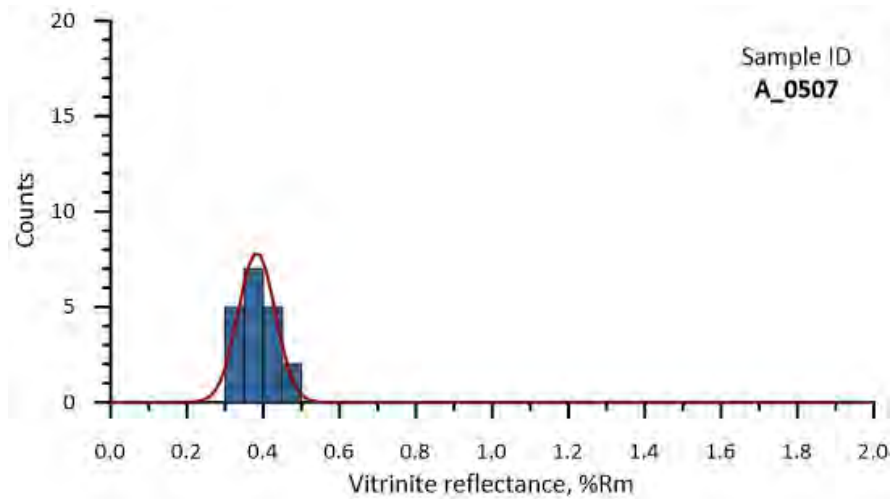






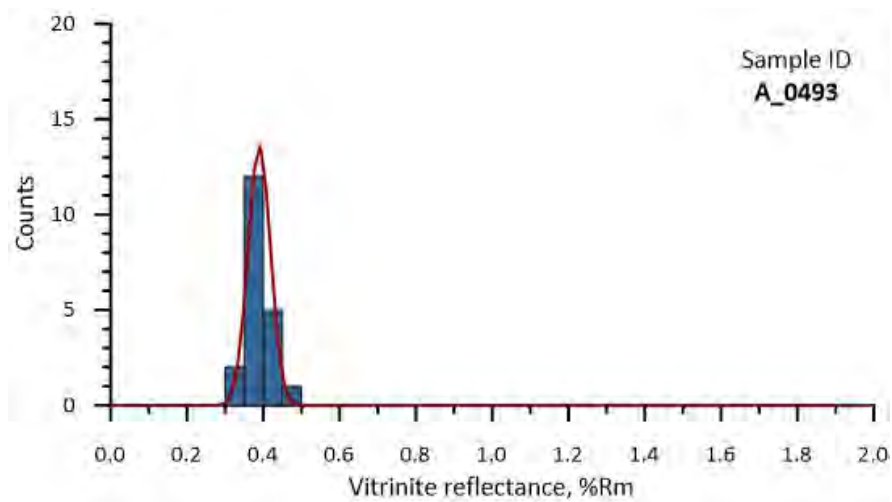
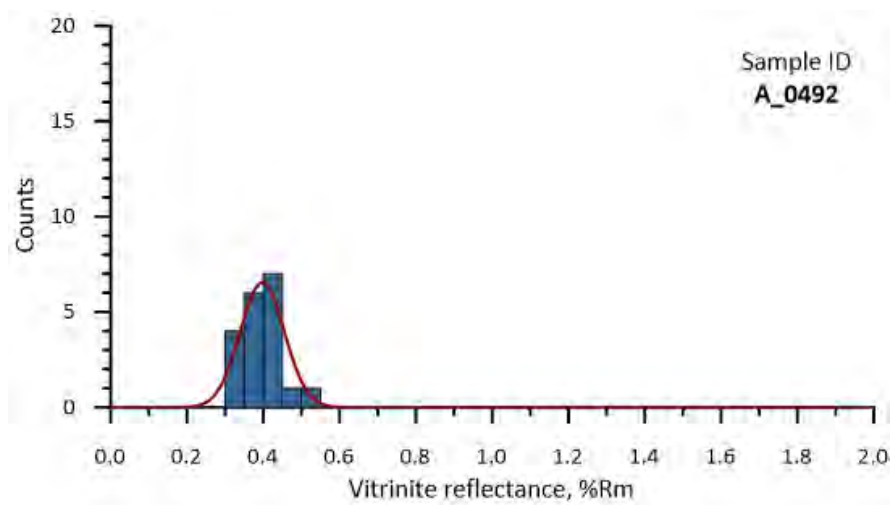
7533/02-U-02

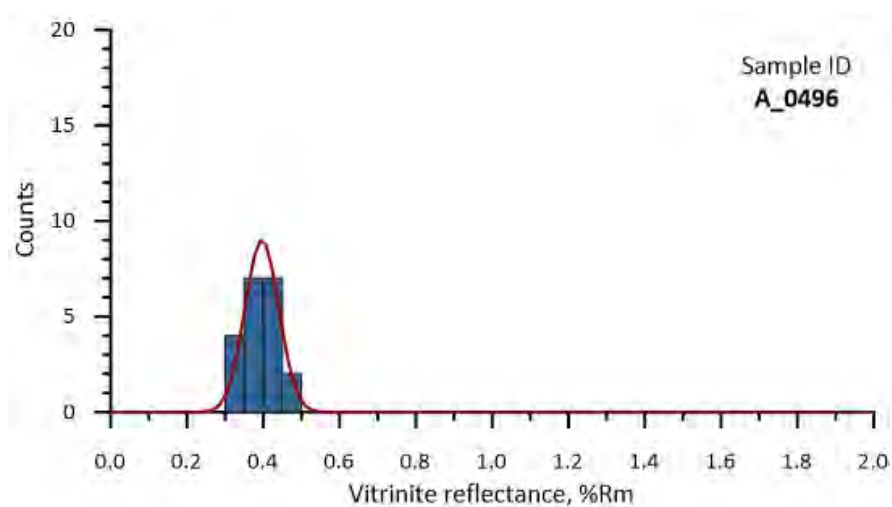
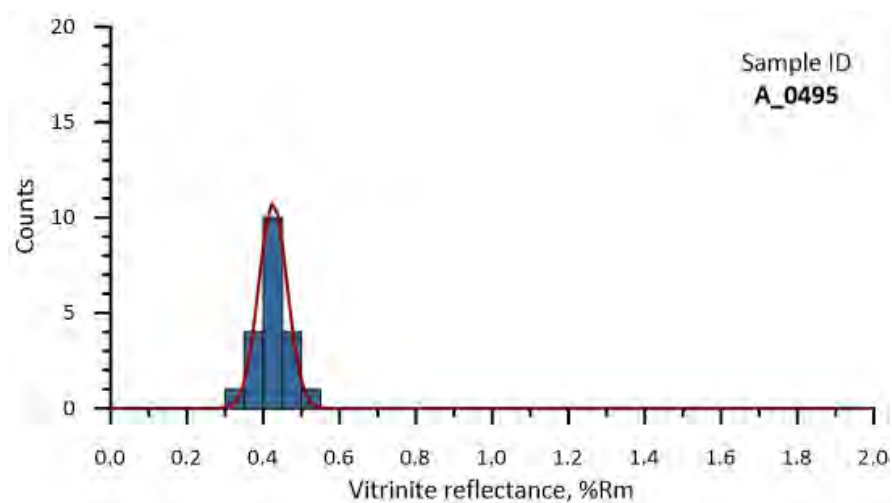
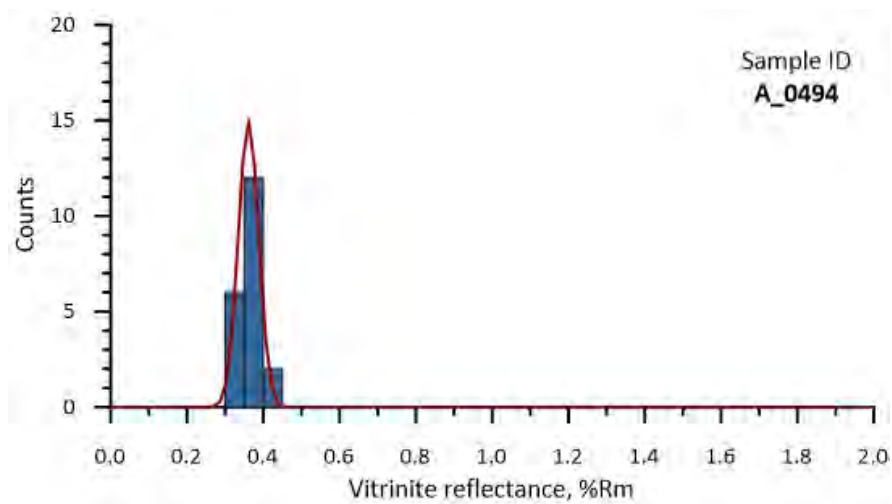
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0507	7533/02-U-02	16.60	Svenskeøya Fm	Core	Bulk	Sandstone w/coal	0.39	0.03	19	Fair	—○○○—	0.39
A_0508	7533/02-U-02	30.22	Flatsalen Fm	Core	Bulk	Shale				Barren		
A_0509	7533/02-U-02	45.02	Flatsalen Fm	Core	Bulk	Shale				Barren		
A_0510	7533/02-U-02	51.40	Flatsalen Fm	Core	Bulk	Shale				Barren		
A_0511	7533/02-U-02	63.85	Flatsalen Fm	Core	Bulk	Shale				Barren		
A_0512	7533/02-U-02	64.80	Flatsalen Fm	Core	Bulk	Shale				Barren		
A_0513	7533/02-U-02	68.05	Flatsalen Fm	Core	Bulk	Shale				Barren		
A_0514	7533/02-U-02	70.65	De Geerdalen Fm	Core	Bulk	Siltstone				Barren		
A_0515	7533/02-U-02	78.50	De Geerdalen Fm	Core	Bulk	Sandstone				Barren		
A_0516	7533/02-U-02	84.95	De Geerdalen Fm	Core	Bulk	Sandstone				Barren		



7533/02-U-03

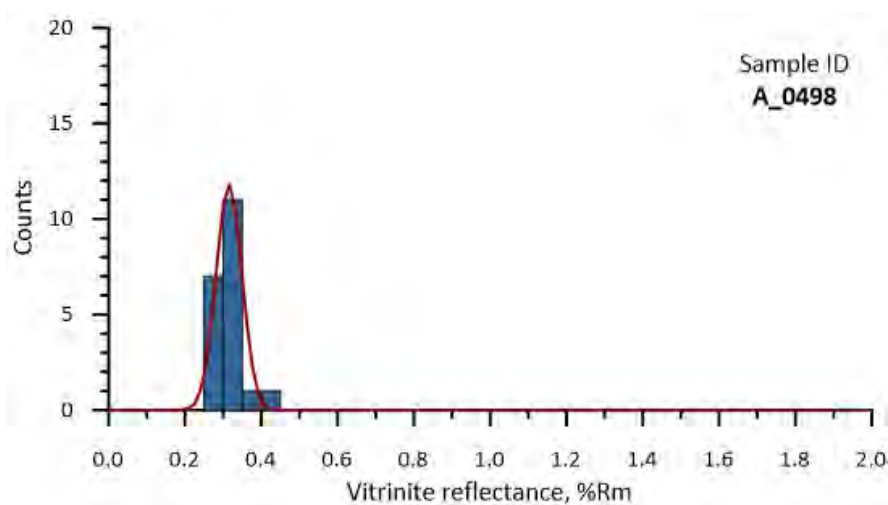
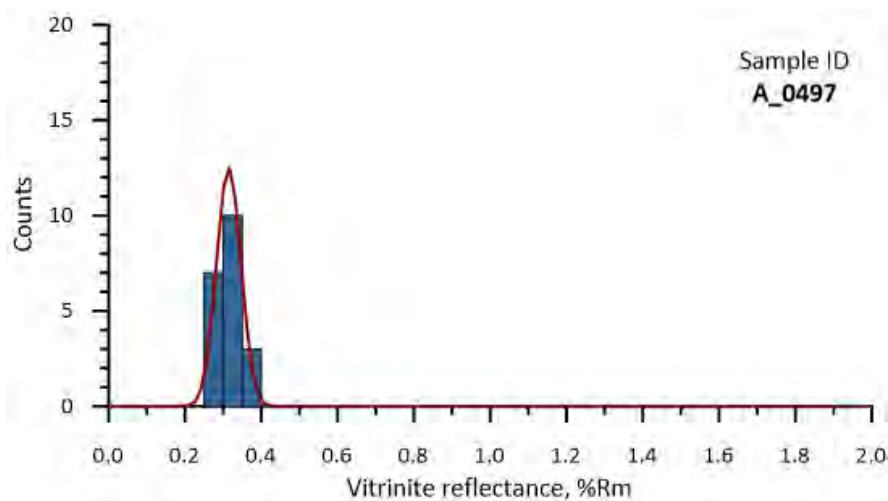
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0492	7533/02-U-03	10.00	Stø Fm	Core	Bulk	Sandstone w/coal	0.40	0.06	19	Moderate	oooo-	0.40
A_0493	7533/02-U-03	10.05	Stø Fm	Core	Bulk	Sandstone w/coal	0.39	0.03	20	Moderate	oooo-	
A_0494	7533/02-U-03	13.60	Svenskeøya Fm	Core	Bulk	Sandstone w/coal	0.36	0.03	20	Moderate	oooo-	
A_0495	7533/02-U-03	13.70	Svenskeøya Fm	Core	Bulk	Sandstone w/coal	0.43	0.04	20	Moderate	oooo-	
A_0496	7533/02-U-03	25.90	Svenskeøya Fm	Core	Bulk	Sandstone w/coal	0.40	0.05	20	Moderate	oooo-	

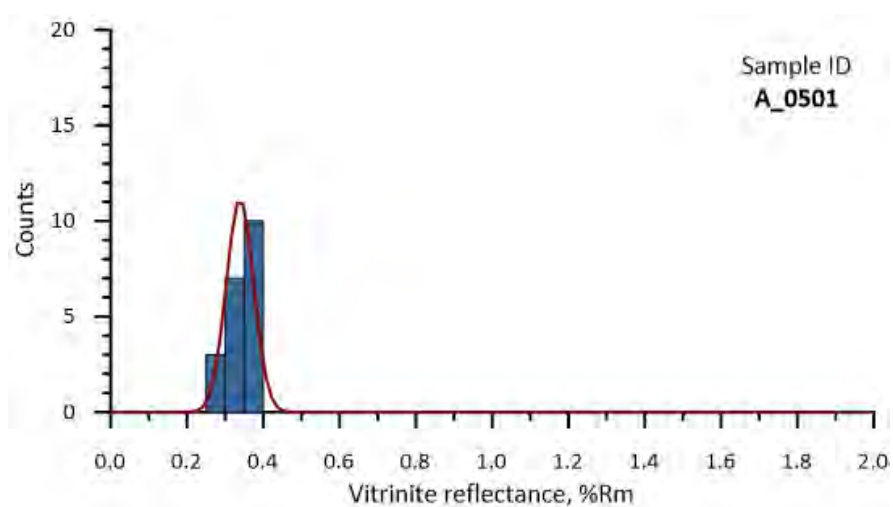
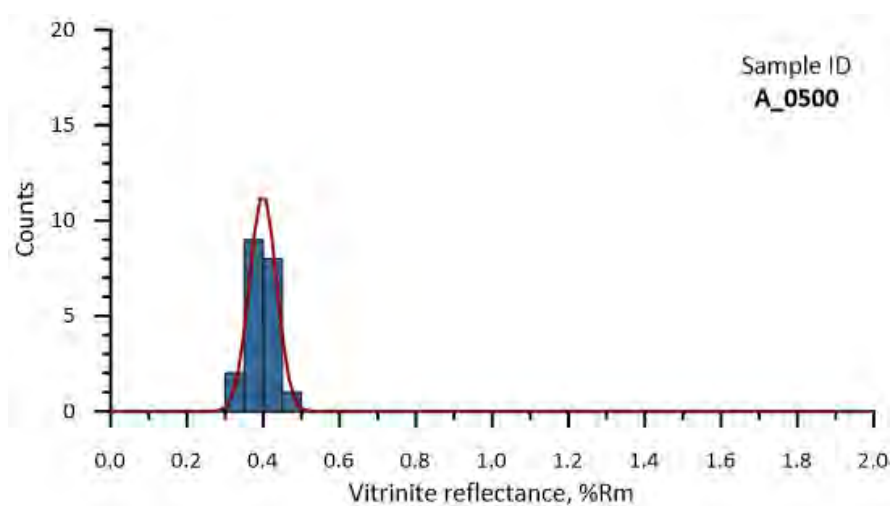
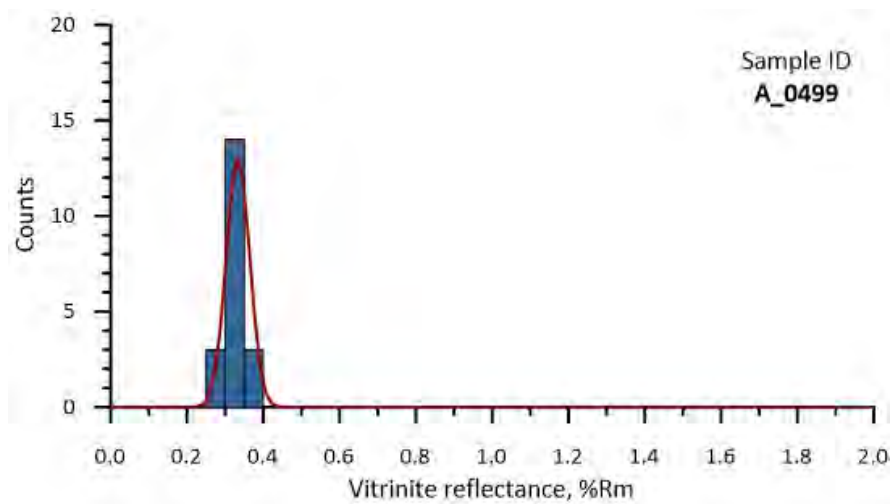


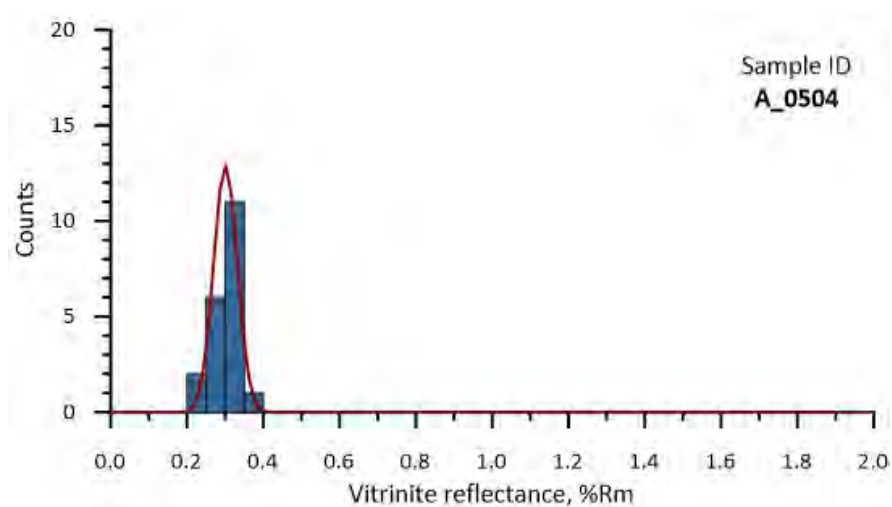
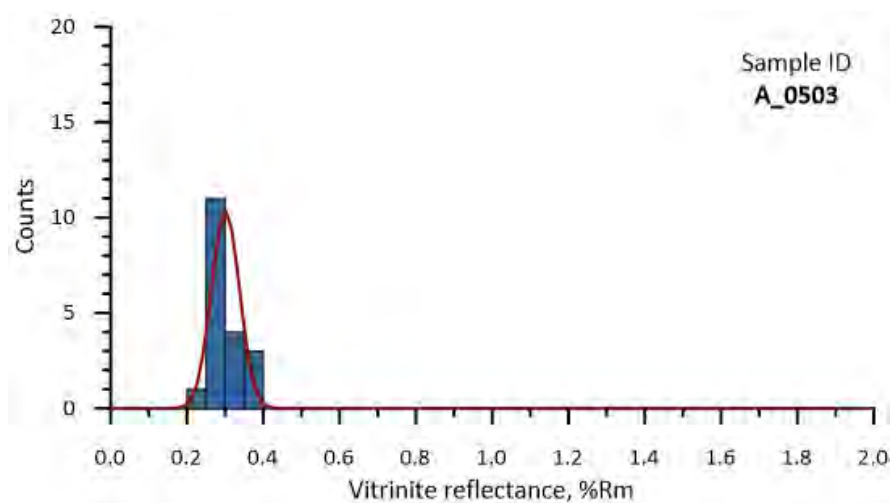
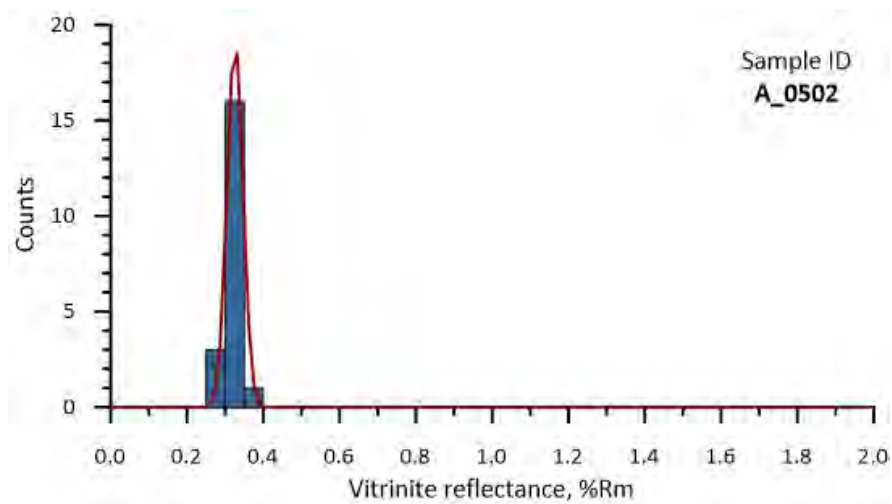


7533/03-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0497	7533/03-U-01	36.85	Cretaceous	Core	Bulk	Shale	0.32	0.03	20	Fair	○○-○-	0.33
A_0498	7533/03-U-01	49.00	Late Jurassic	Core	Bulk	Shale	0.32	0.03	20	Fair	○○-○-	
A_0499	7533/03-U-01	49.67	Late Jurassic	Core	Bulk	Shale	0.33	0.03	20	Fair	○○-○-	
A_0500	7533/03-U-01	54.55	Late Jurassic	Core	Bulk	Shale	0.40	0.03	20	Fair	○○-○-	
A_0501	7533/03-U-01	59.55	Late Jurassic	Core	Bulk	Shale	0.34	0.03	20	Fair	○○-○-	
A_0502	7533/03-U-01	62.09	Late Jurassic	Core	Bulk	Shale	0.32	0.02	20	Fair	○○-○-	
A_0503	7533/03-U-01	62.80	Late Jurassic	Core	Bulk	Shale	0.30	0.04	19	Fair	○○-○-	
A_0504	7533/03-U-01	66.70	Late Jurassic	Core	Bulk	Shale	0.30	0.04	20	Fair	○○-○-	
A_0505	7533/03-U-01	106.30	Late Jurassic	Core	Bulk	Shale				Barren		
A_0506	7533/03-U-01	110.30	Late Jurassic	Core	Bulk	Shale				Barren		

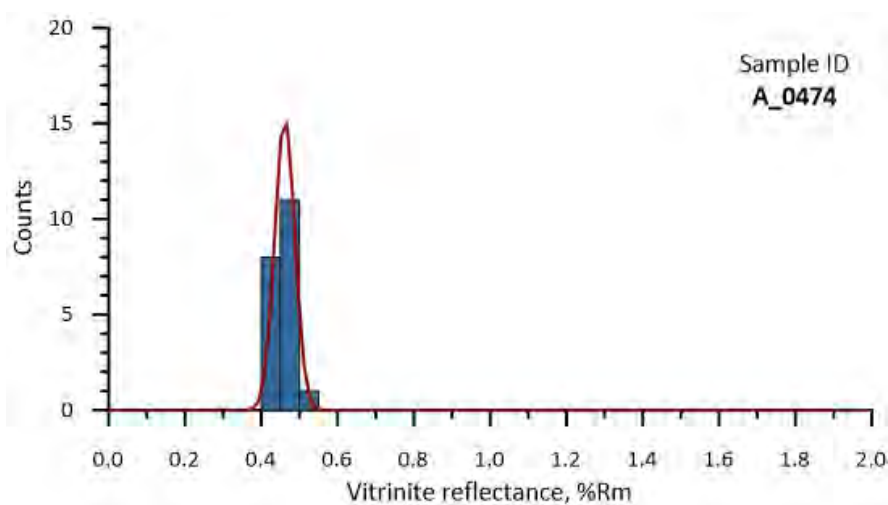
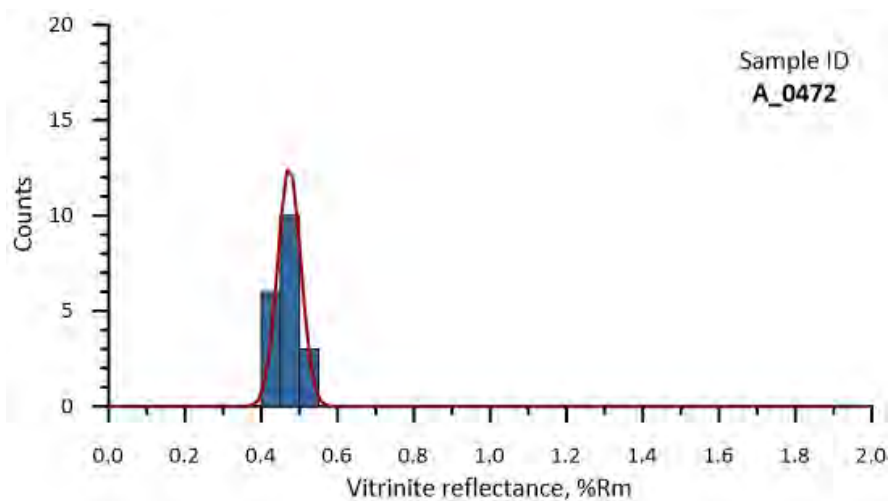


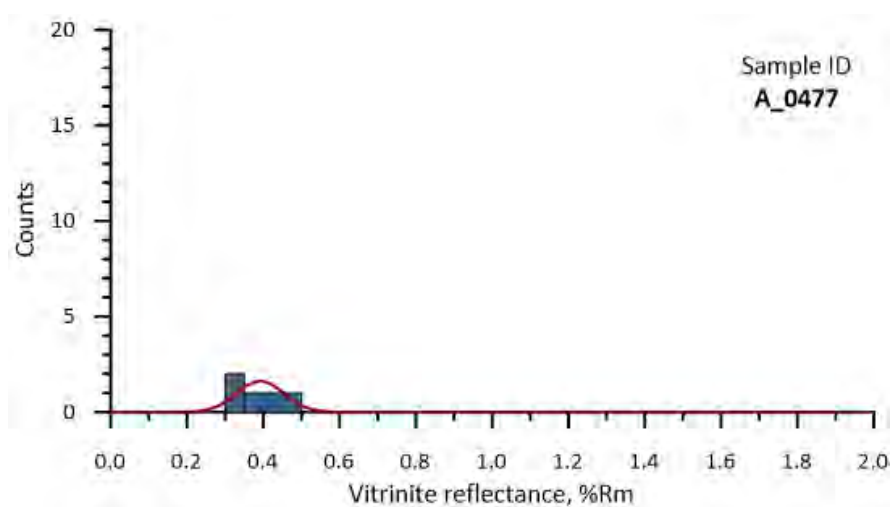
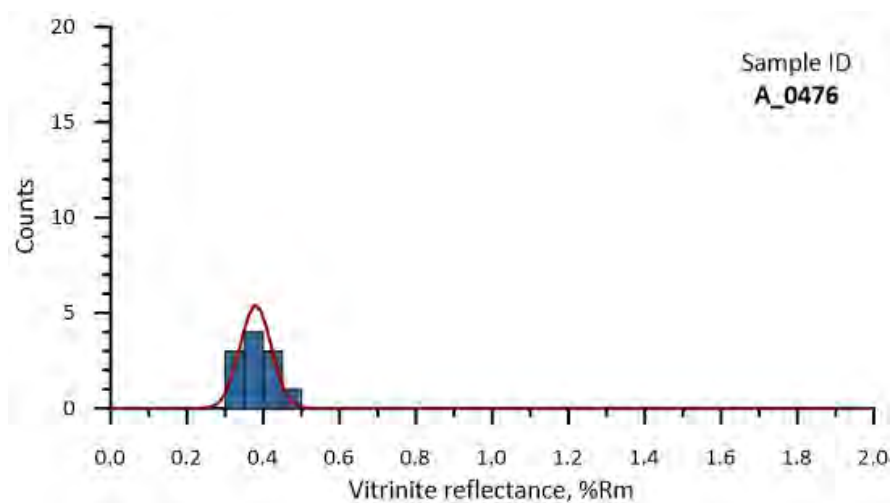
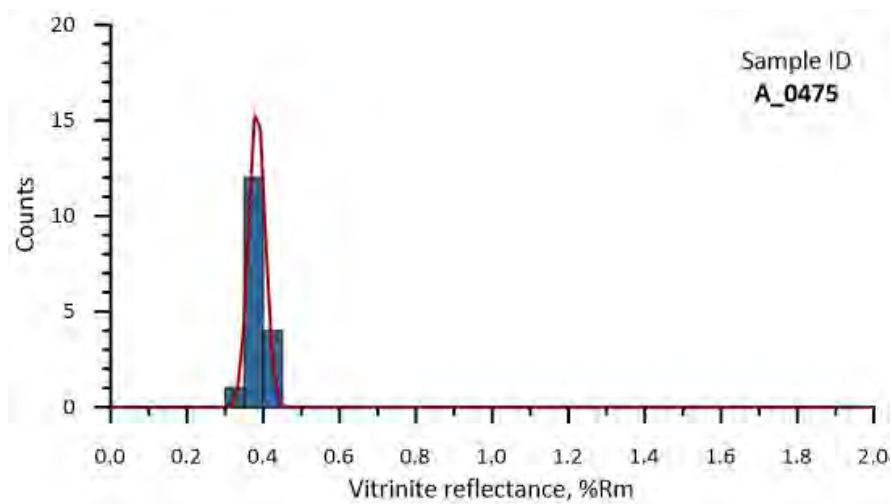


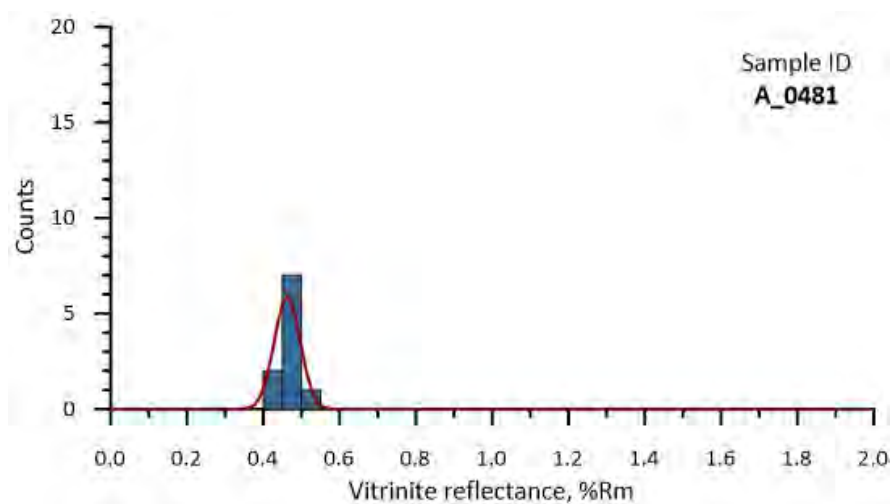
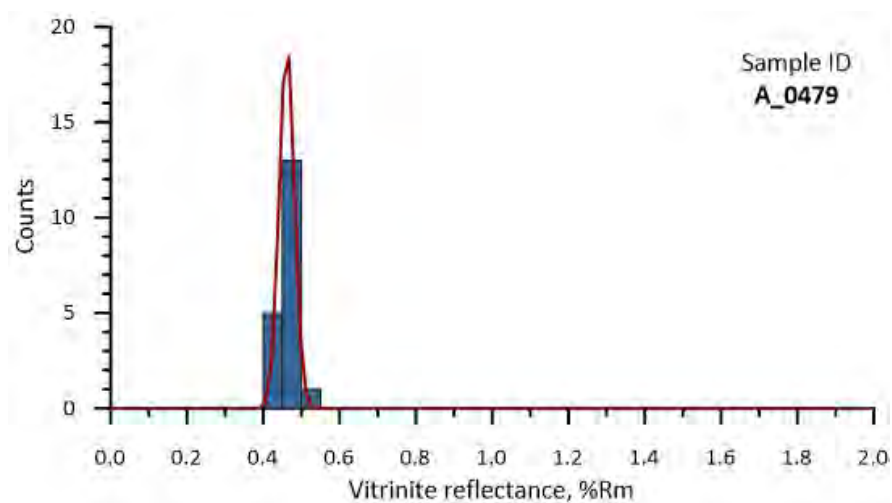
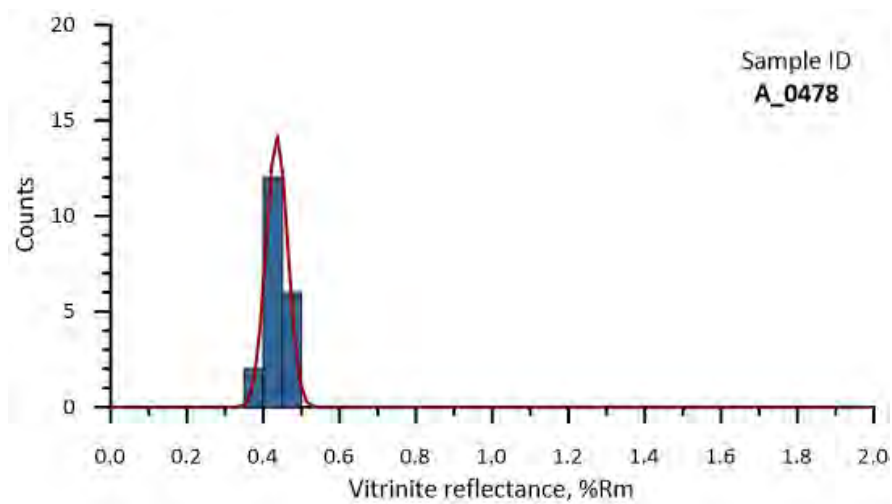


7533/03-U-07

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0472	7533/03-U-07	22.18	De Geerdalen Fm	Core	Bulk	Coal	0.45	0.03	20	Good	ooooo	0.43
A_0473	7533/03-U-07	27.02	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0474	7533/03-U-07	41.35	De Geerdalen Fm	Core	Bulk	Coal	0.46	0.03	20	Good	ooooo	
A_0475	7533/03-U-07	43.50	De Geerdalen Fm	Core	Bulk	Coal	0.38	0.02	20	Good	ooooo	
A_0476	7533/03-U-07	176.30	De Geerdalen Fm	Core	Bulk	Shale	0.38	0.04	11	Poor	-o---	
A_0477	7533/03-U-07	180.15	De Geerdalen Fm	Core	Bulk	Shale	0.39	0.07	5	Poor	-o---	
A_0478	7533/03-U-07	187.35	De Geerdalen Fm	Core	Bulk	Coal	0.44	0.03	20	Good	ooooo	
A_0479	7533/03-U-07	187.60	De Geerdalen Fm	Core	Bulk	Coal	0.46	0.02	20	Good	ooooo	
A_0480	7533/03-U-07	192.40	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0481	7533/03-U-07	197.00	De Geerdalen Fm	Core	Bulk	Shale	0.46	0.04	10	Poor	-o---	

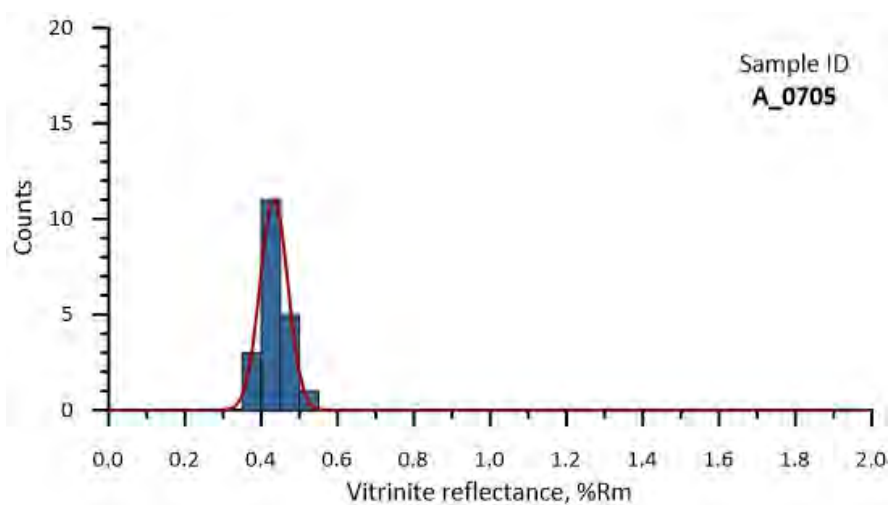
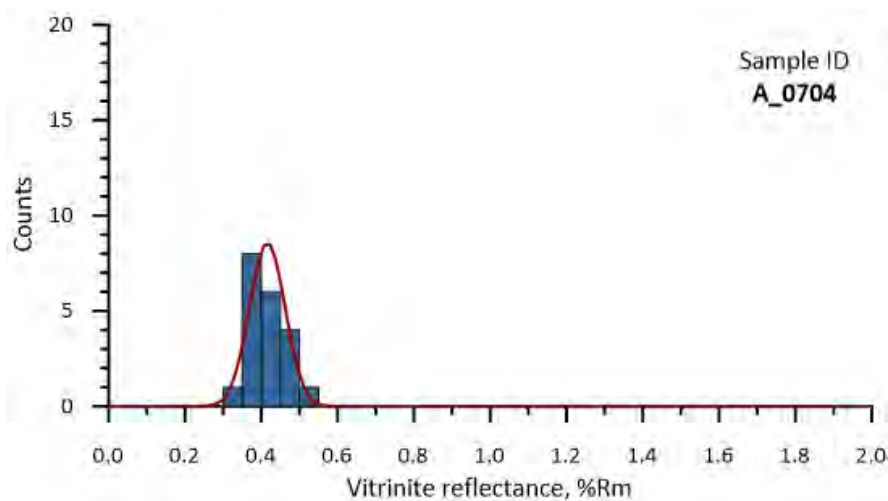


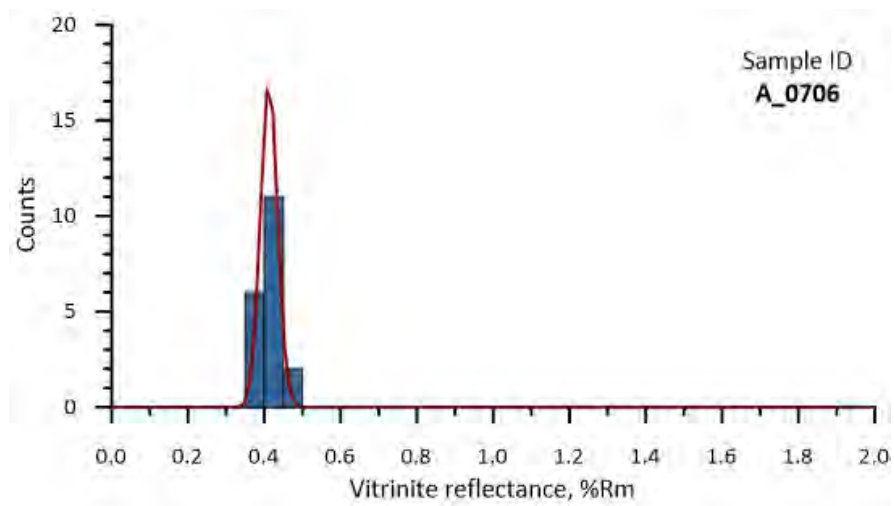




7534/04-U-01

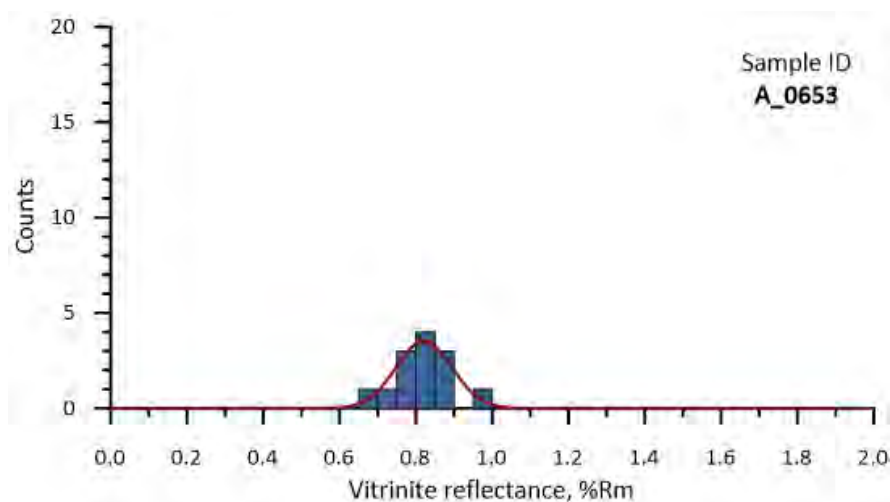
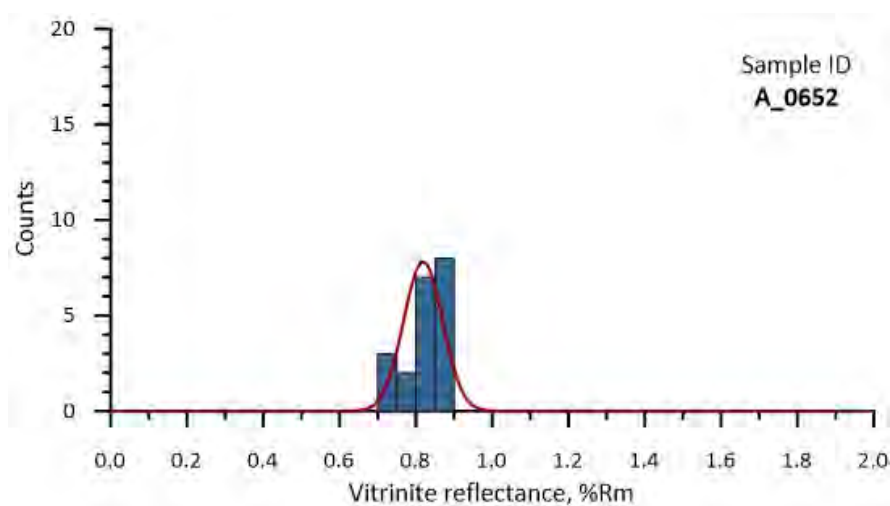
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0704	7534/04-U-01	25.60	De Geerdalen Fm	Core	Bulk	Shale	0.42	0.05	20	Moderate	○○○--	0.42
A_0705	7534/04-U-01	54.15	De Geerdalen Fm	Core	Bulk	Shale	0.43	0.04	20	Good	○○○○○	
A_0706	7534/04-U-01	59.35	De Geerdalen Fm	Core	Bulk	Org. rich shale	0.41	0.02	19	Good	○○○○○	
A_0707	7534/04-U-01	113.85	De Geerdalen Fm	Core	Bulk					No polish		
A_0708	7534/04-U-01	114.10	De Geerdalen Fm	Core	Bulk					No polish		
A_0709	7534/04-U-01	116.40	De Geerdalen Fm	Core	Bulk					No polish		
A_0710	7534/04-U-01	183.35	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0711	7534/04-U-01	211.70	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0712	7534/04-U-01	221.62	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0713	7534/04-U-01	233.00	De Geerdalen Fm	Core	Bulk	Shale				Barren		

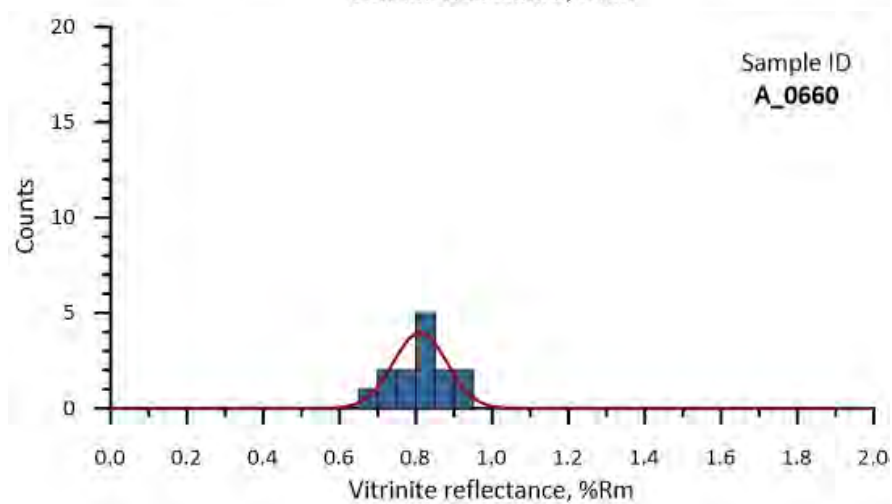
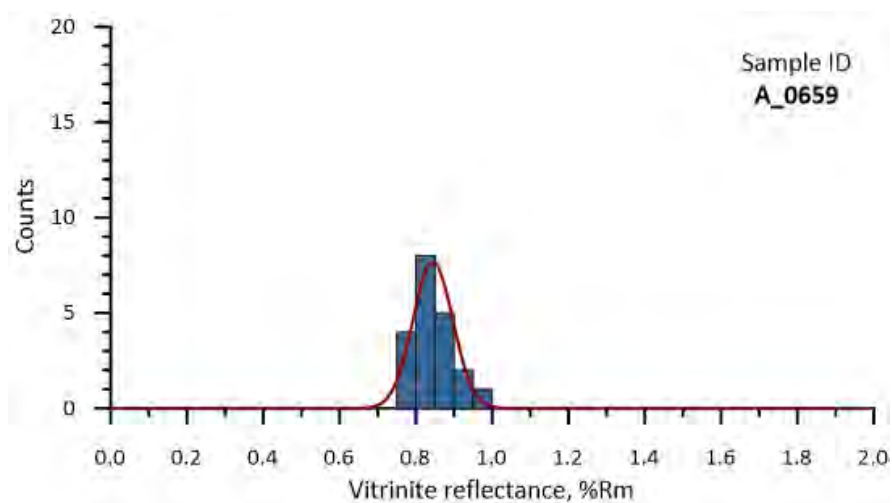
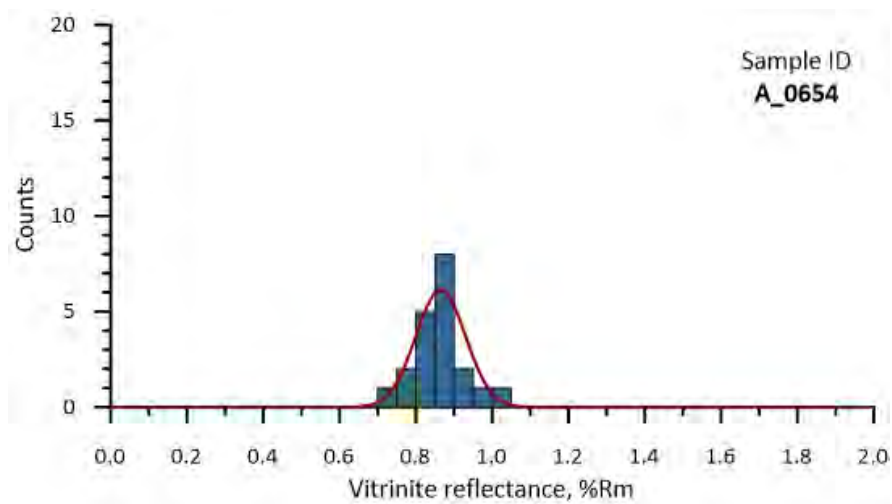




7534/06-U-01

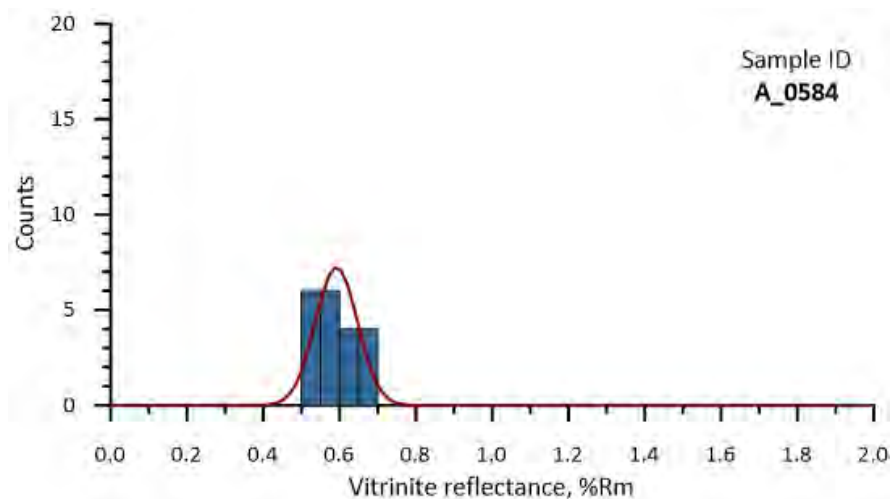
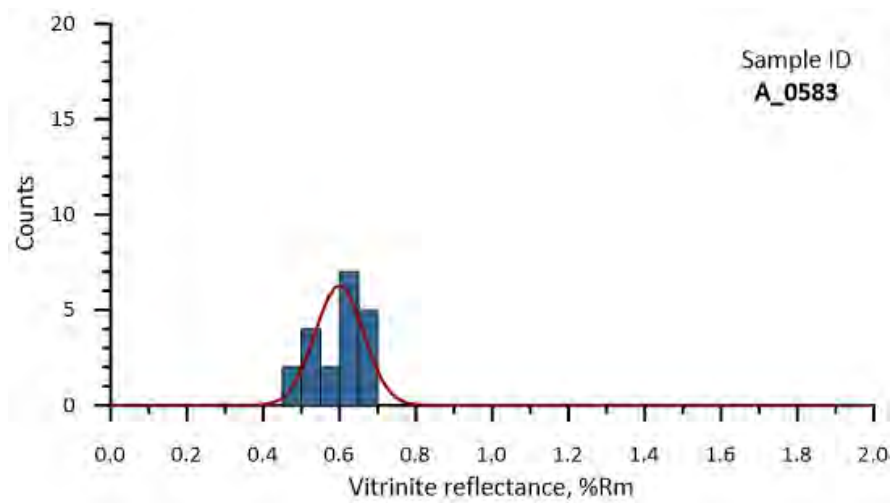
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0652	7534/06-U-01	29.25	Botneheia Fm	Core	Bulk	Shale	0.82	0.05	20	Poor	---+o	0.83
A_0653	7534/06-U-01	41.70	Botneheia Fm	Core	Bulk	Shale	0.82	0.08	13	Poor	---+o	
A_0654	7534/06-U-01	55.85	Botneheia Fm	Core	Bulk	Shale	0.87	0.07	20	Poor	---+o	
A_0655	7534/06-U-01	59.00	Botneheia Fm	Core	Bulk	Shale				Barren		
A_0656	7534/06-U-01	62.05	Botneheia Fm	Core	Bulk	Shale				Barren		
A_0657	7534/06-U-01	65.80	Botneheia Fm	Core	Bulk	Shale				Barren		
A_0658	7534/06-U-01	68.20	Botneheia Fm	Core	Bulk	Shale	0.84	0.05	20	Moderate	o++oo	
A_0659	7534/06-U-01	110.80	Botneheia Fm	Core	Bulk	Shale	0.81	0.07	14	Fair	-o+-o	
A_0660	7534/06-U-01	114.60	Botneheia Fm	Core	Bulk	Shale				Barren		

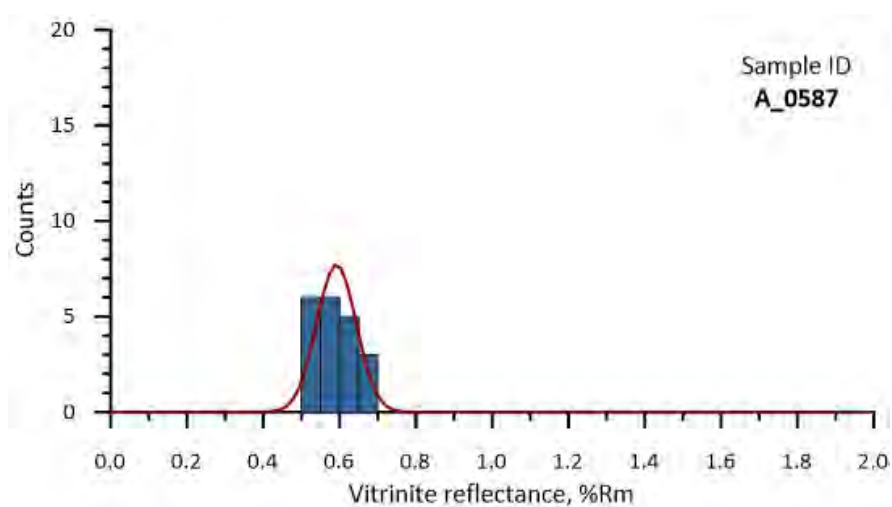
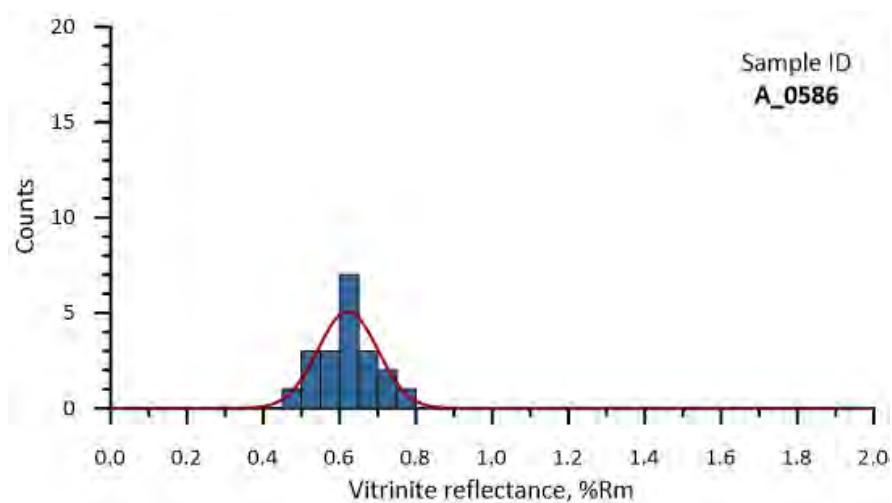
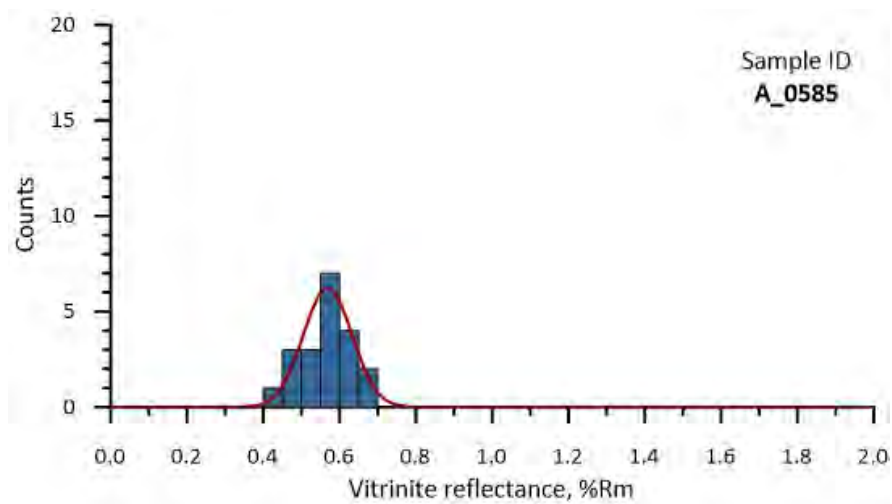




7616/11-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0583	7616/11-U-01	27.05	Cretaceous	Core	Bulk	Shale	0.60	0.07	20	Moderate	o+ooo	0.59
A_0584	7616/11-U-01	37.00	Cretaceous	Core	Bulk	Shale	0.59	0.06	20	Moderate	o+ooo	
A_0585	7616/11-U-01	39.00	Cretaceous	Core	Bulk	Shale	0.57	0.07	20	Moderate	o+ooo	
A_0586	7616/11-U-01	42.15	Cretaceous	Core	Bulk	Shale	0.62	0.08	20	Moderate	o+ooo	
A_0587	7616/11-U-01	42.88	Cretaceous	Core	Bulk	Silty shale	0.59	0.05	20	Good	ooooo	



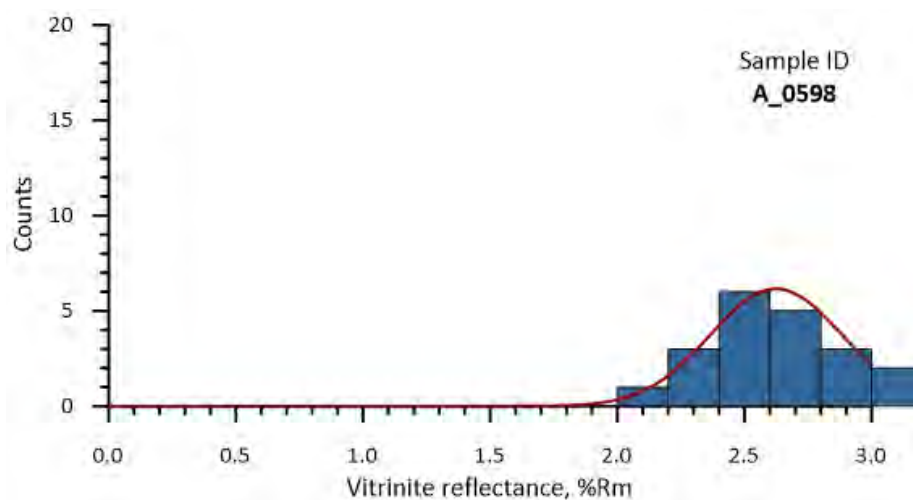


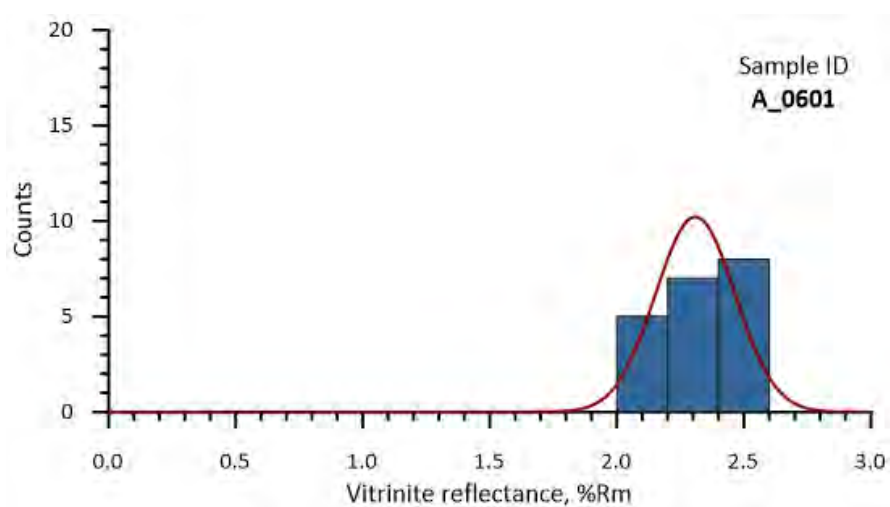
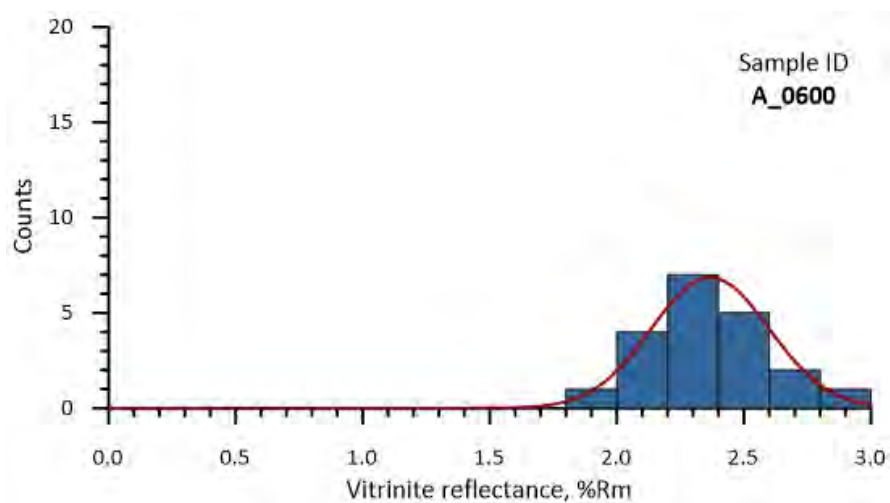
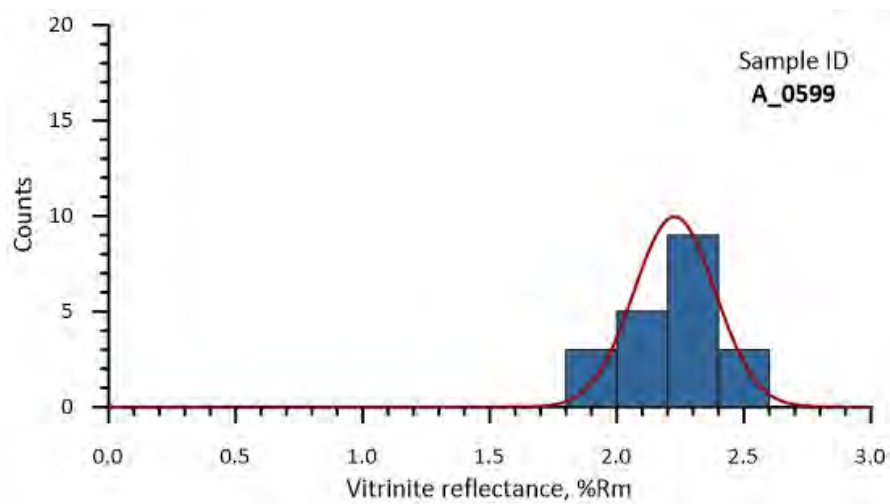
7616/11-U-02

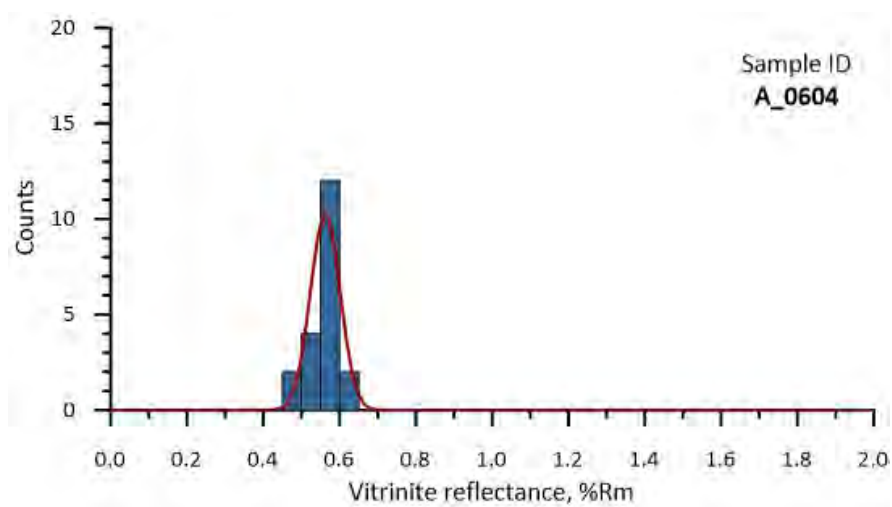
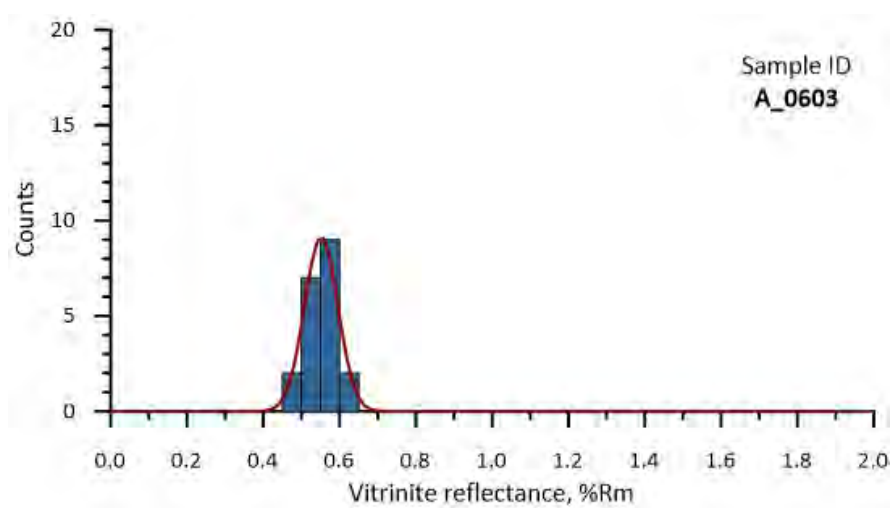
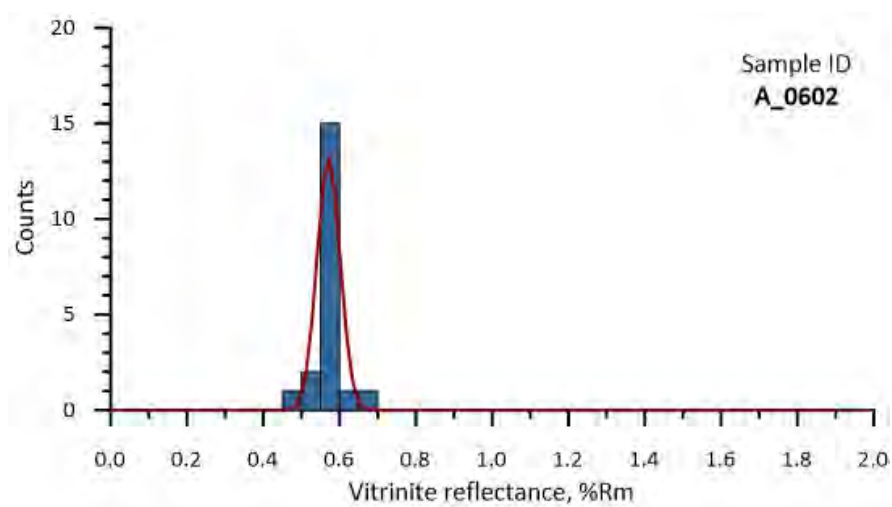
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A_0598	7616/11-U-02	20.12	Paleocene	Core	Bulk	Shale	2.62	0.27	20	Moderate	o+ooo	0.56, 2.38
A_0599	7616/11-U-02	20.62	Paleocene	Core	Bulk	Shale	2.23	0.16	20	Moderate	o+ooo	
A_0600	7616/11-U-02	22.54	Paleocene	Core	Bulk	Shale	2.37	0.24	20	Moderate	o+ooo	
A_0601	7616/11-U-02	23.00	Paleocene	Core	Bulk	Shale	2.31	0.16	20	Moderate	o+ooo	
A_0602	7616/11-U-02	39.17	Paleocene	Core	Bulk	Shale	0.57	0.03	20	Good	ooooo	
A_0603	7616/11-U-02	41.54	Paleocene	Core	Bulk	Shale	0.55	0.05	20	Good	ooooo	
A_0604	7616/11-U-02	47.53	Paleocene	Core	Bulk	Shale	0.56	0.04	20	Good	ooooo	

IMPORTANT COMMENT:

The results from this well are peculiar with very high maturity in the upper part and moderate maturity levels in the lower part. The measurements have moderate to good quality, thus analytical error can be discounted. There may have occurred mistakes during sampling, marking of the core boxes or the geological setting is peculiar. This ought to be checked out by resampling and reanalysis of the well.

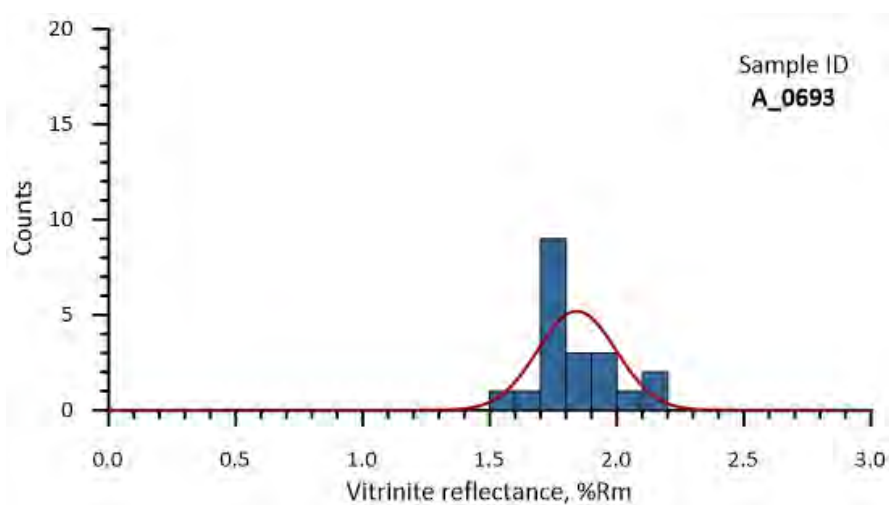
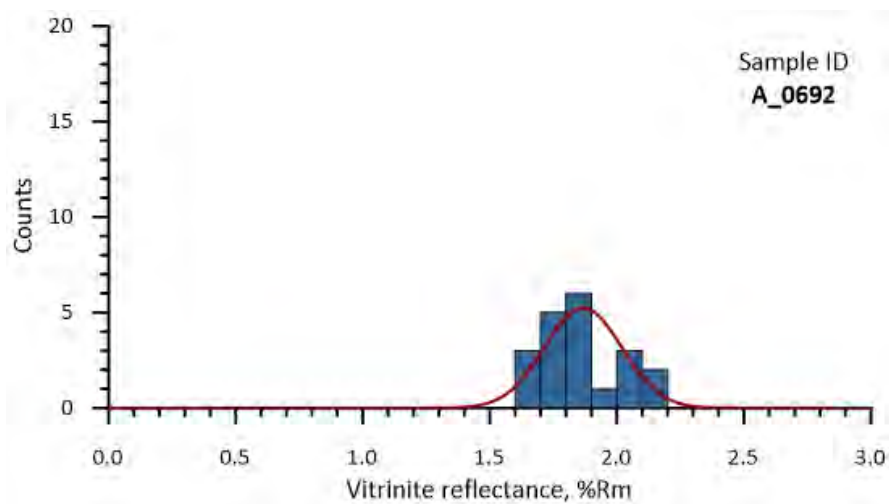


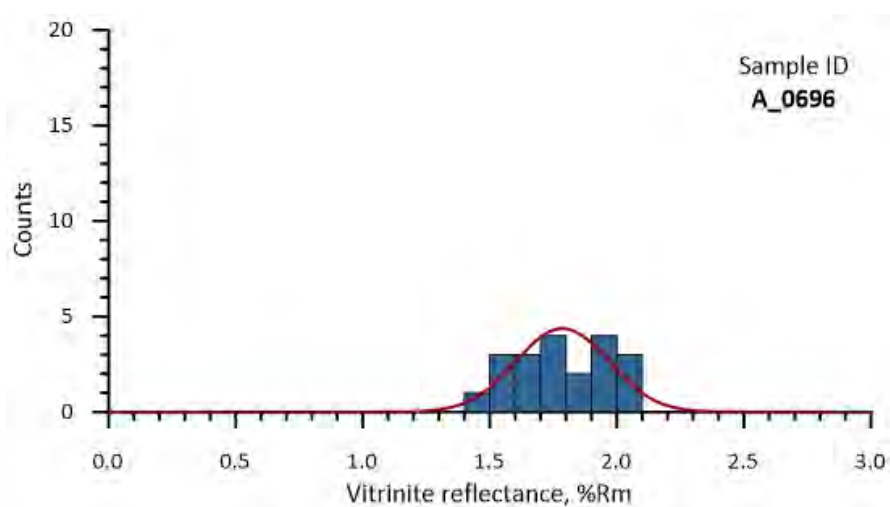
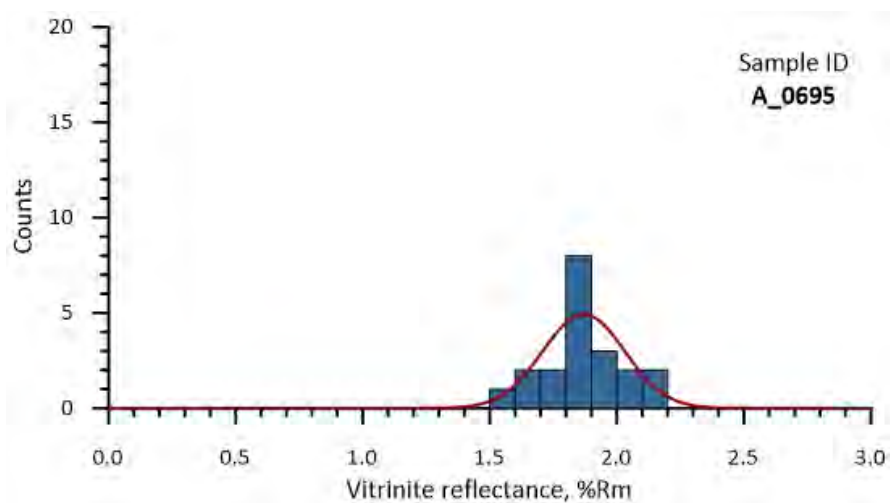
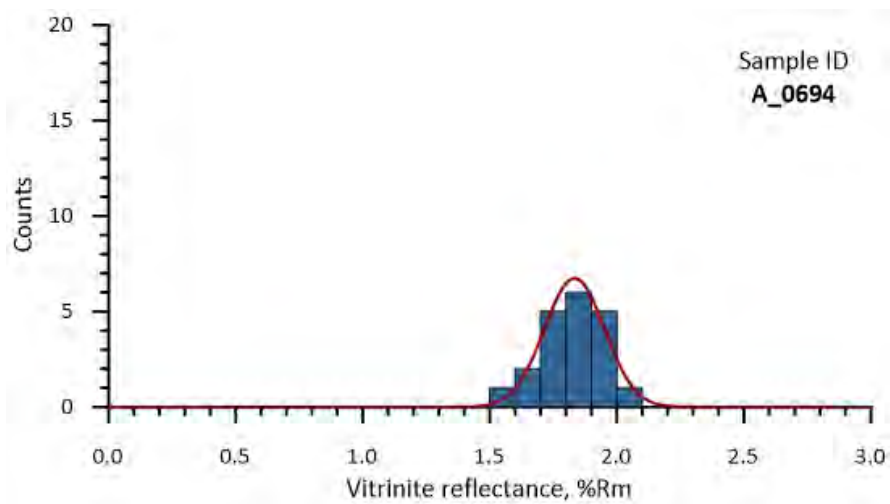


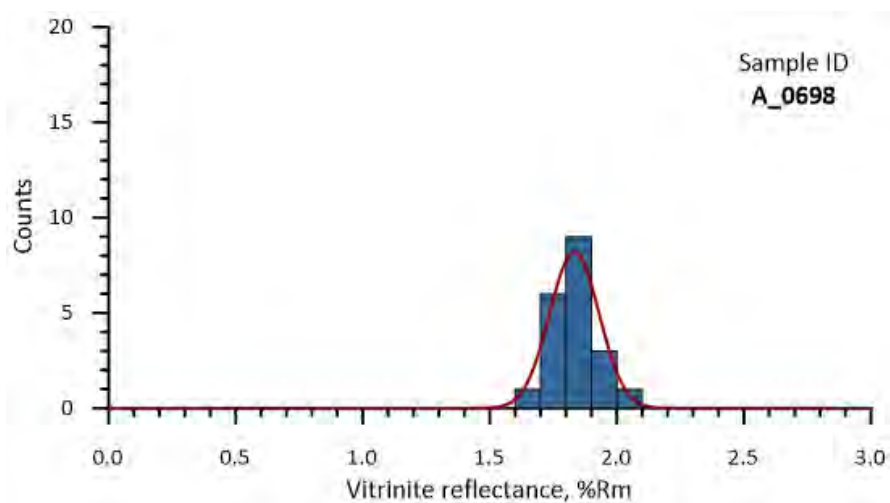
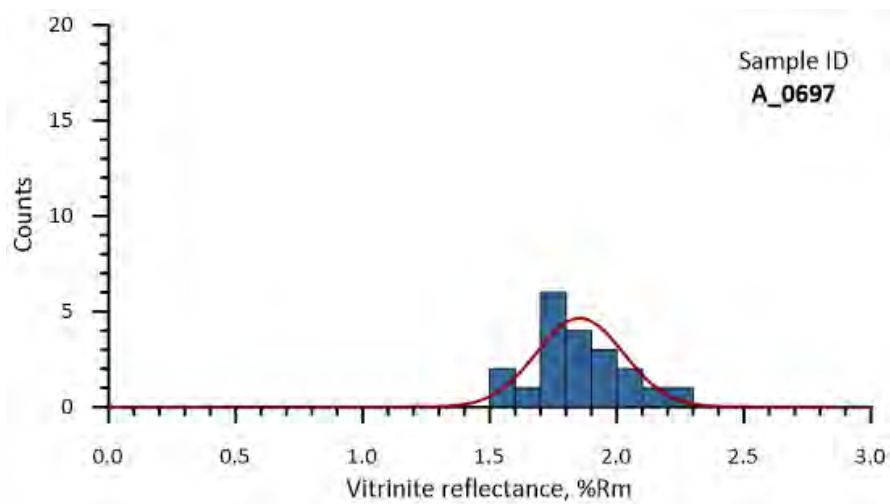


7617/11-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0692	7617/11-U-01	13.25	Late Paleocene	Core	Bulk	Shale	1.87	0.16	20	Moderate	o+ooo	1.84
A_0693	7617/11-U-01	13.90	Late Paleocene	Core	Bulk	Shale	1.84	0.16	20	Moderate	o+ooo	
A_0694	7617/11-U-01	17.00	Late Paleocene	Core	Bulk	Shale	1.83	0.12	20	Moderate	o+ooo	
A_0695	7617/11-U-01	18.95	Late Paleocene	Core	Bulk	Shale	1.87	0.17	20	Moderate	o+ooo	
A_0696	7617/11-U-01	23.00	Late Paleocene	Core	Bulk	Shale	1.79	0.19	20	Moderate	o+ooo	
A_0697	7617/11-U-01	25.40	Late Paleocene	Core	Bulk	Shale	1.86	0.18	20	Moderate	o+ooo	
A_0698	7617/11-U-01	28.40	Late Paleocene	Core	Bulk	Shale	1.83	0.10	20	Moderate	o+ooo	

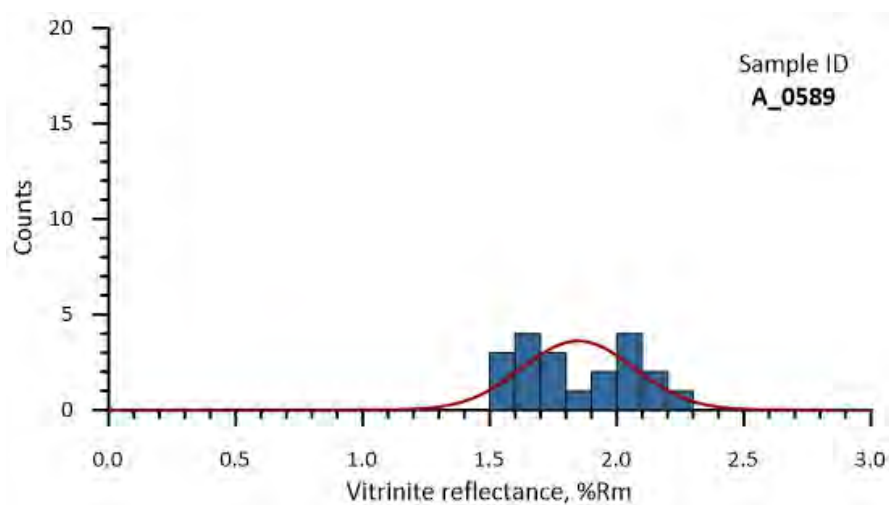
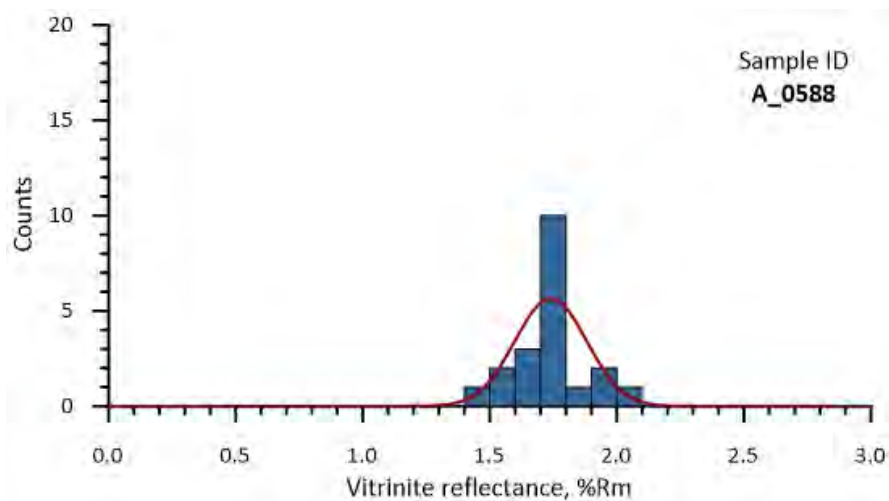


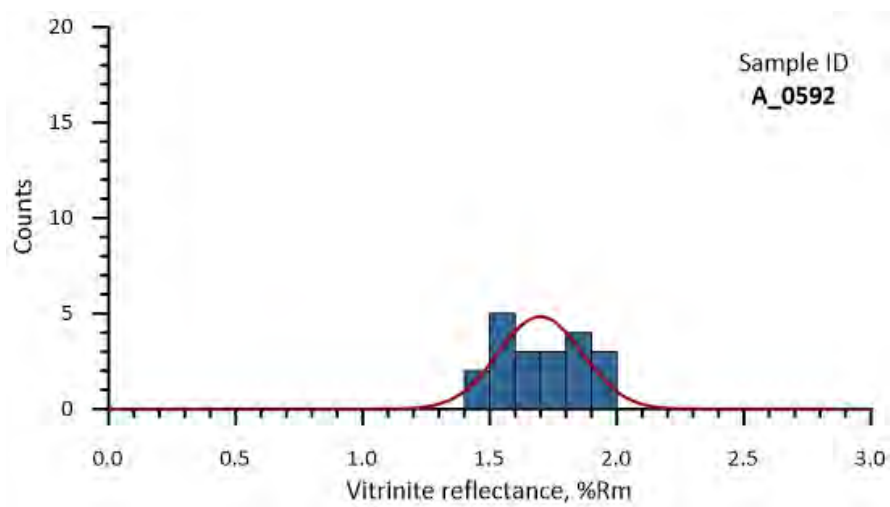
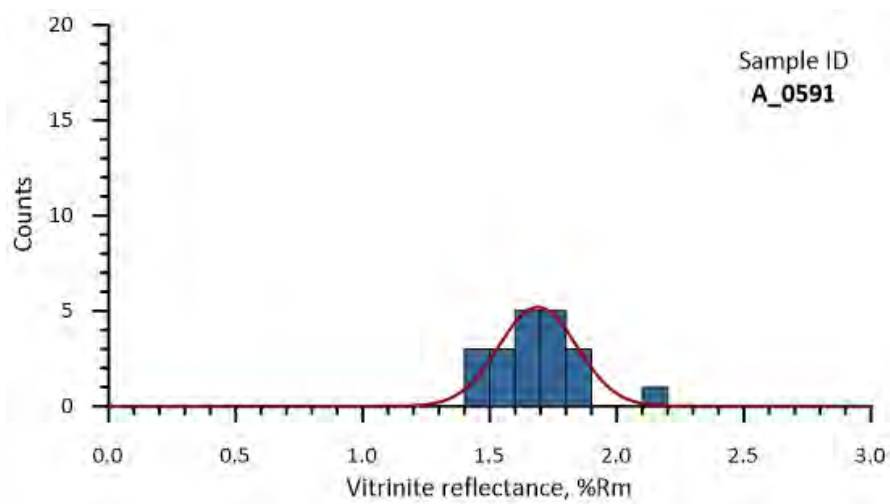
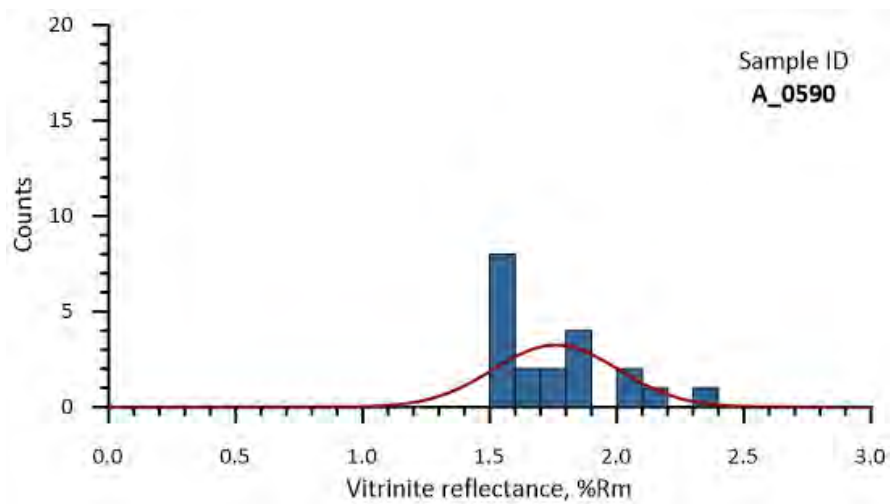


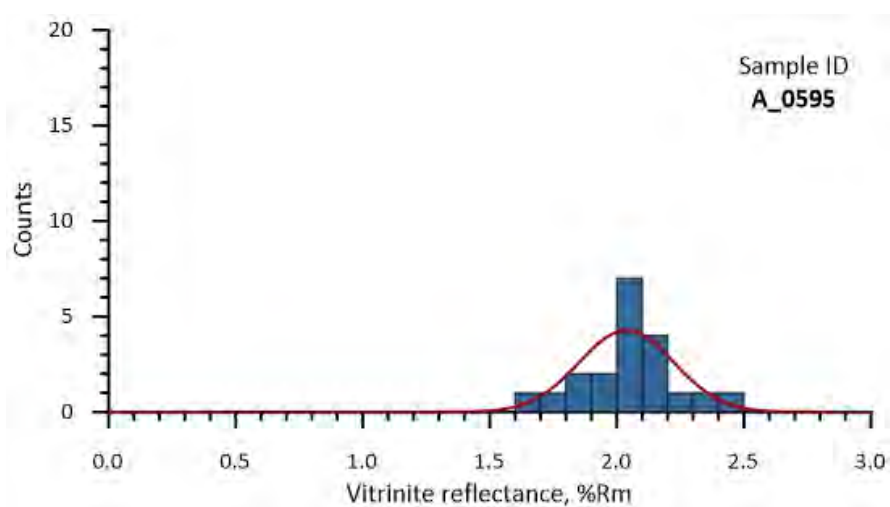
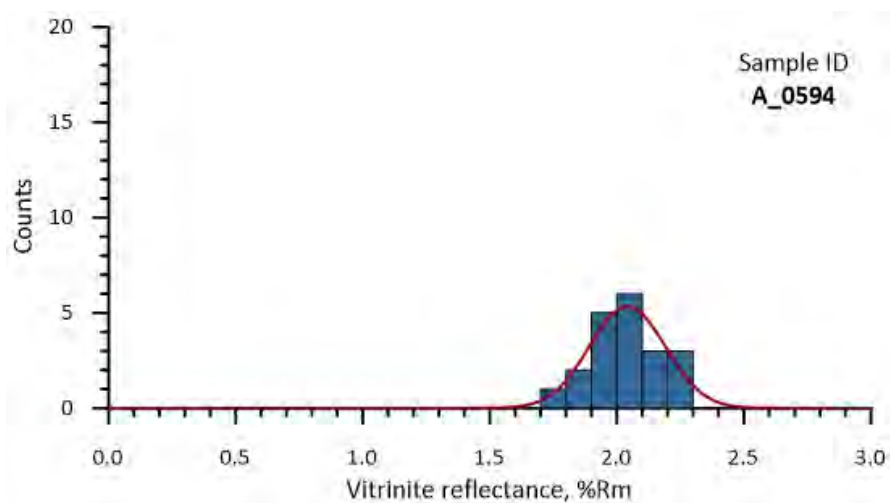
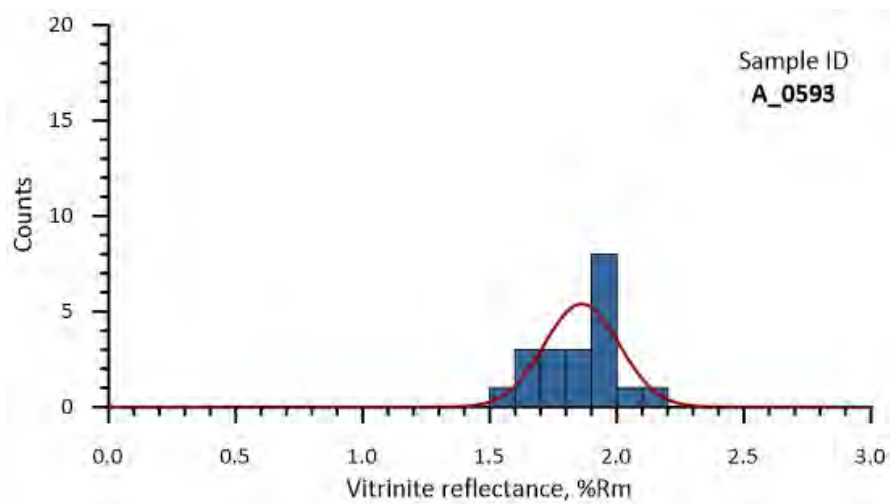


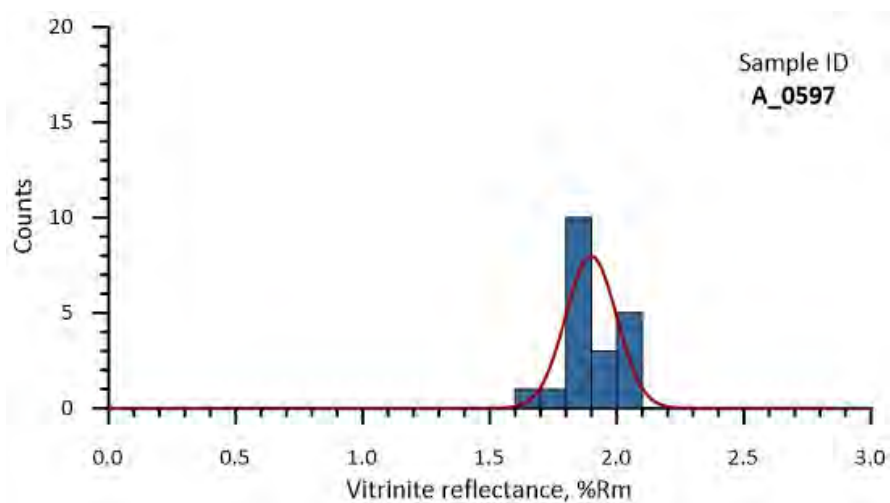
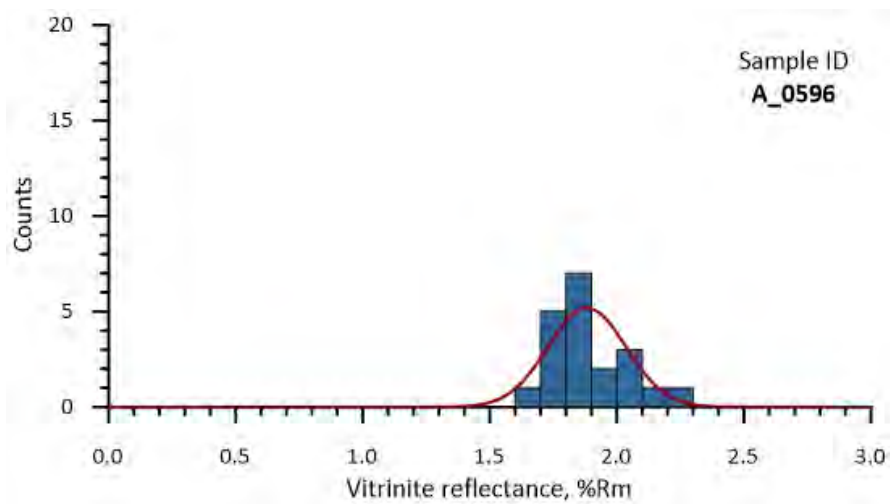
7617/11-U-02

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0588	7617/11-U-02	11.65	Paleocene	Core	Bulk	Shale	1.74	0.15	20	Moderate	o+ooo	1.85
A_0589	7617/11-U-02	34.97	Paleocene	Core	Bulk	Shale	1.85	0.23	20	Moderate	o+ooo	
A_0590	7617/11-U-02	46.95	Paleocene	Core	Bulk	Shale	1.76	0.25	20	Moderate	o+ooo	
A_0591	7617/11-U-02	53.00	Paleocene	Core	Bulk	Shale	1.69	0.16	20	Moderate	o+ooo	
A_0592	7617/11-U-02	55.99	Paleocene	Core	Bulk	Siltstone	1.70	0.17	20	Moderate	o+ooo	
A_0593	7617/11-U-02	86.95	Paleocene	Core	Bulk	Siltstone	1.86	0.15	20	Moderate	o+ooo	
A_0594	7617/11-U-02	113.48	Paleocene	Core	Bulk	Shale	2.04	0.15	20	Moderate	o+ooo	
A_0595	7617/11-U-02	118.80	Paleocene	Core	Bulk	Shale	2.04	0.19	20	Moderate	o+ooo	
A_0596	7617/11-U-02	150.49	Paleocene	Core	Bulk	Shale	1.88	0.16	20	Moderate	o+ooo	
A_0597	7617/11-U-02	153.81	Paleocene	Core	Bulk	Shale	1.90	0.10	20	Moderate	o+ooo	



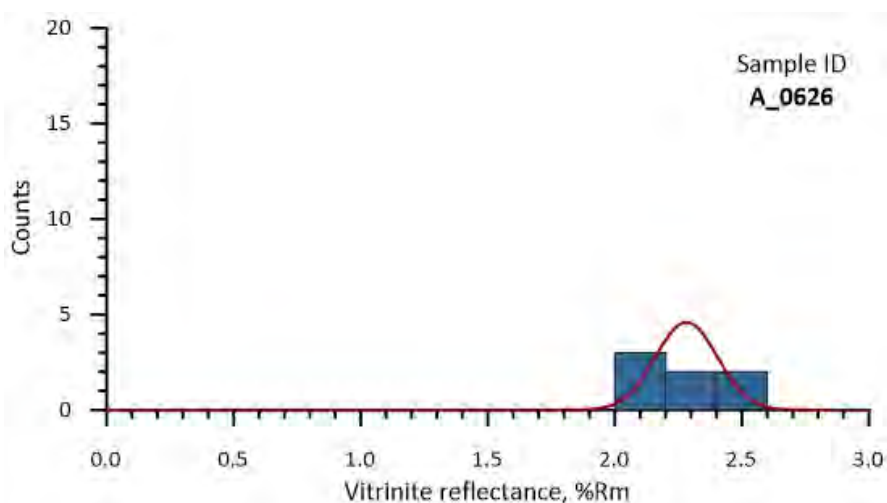
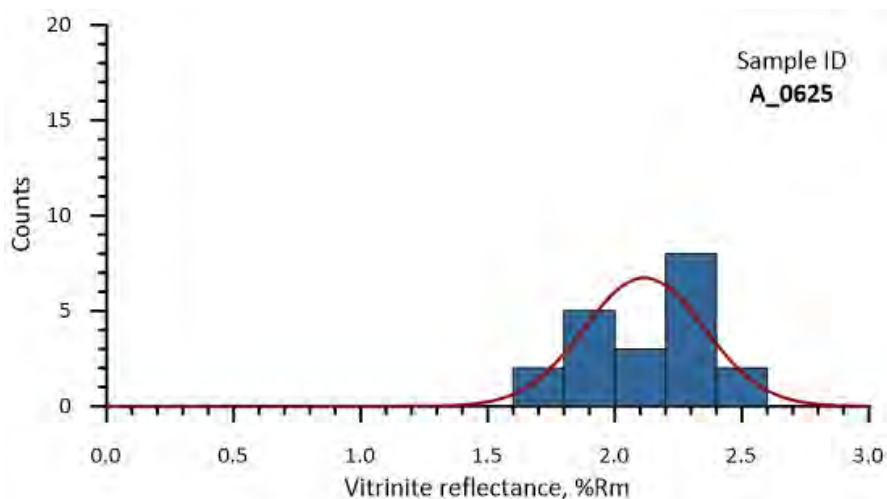


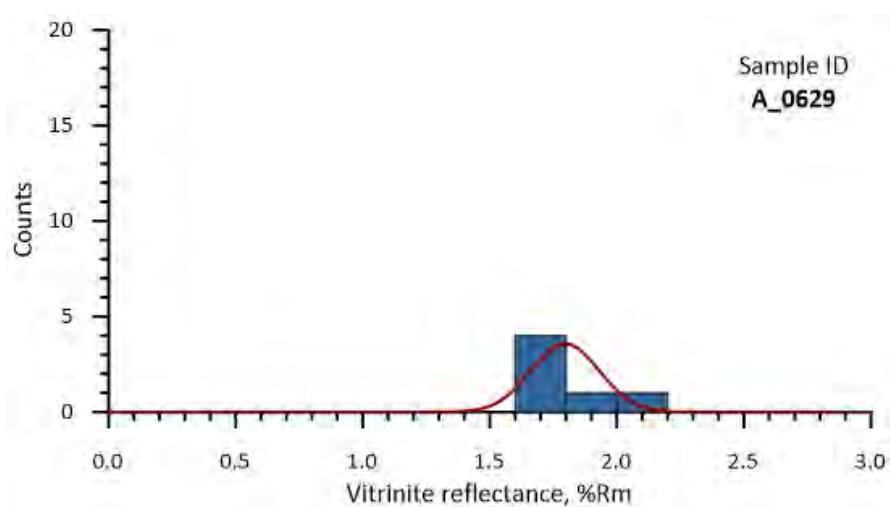
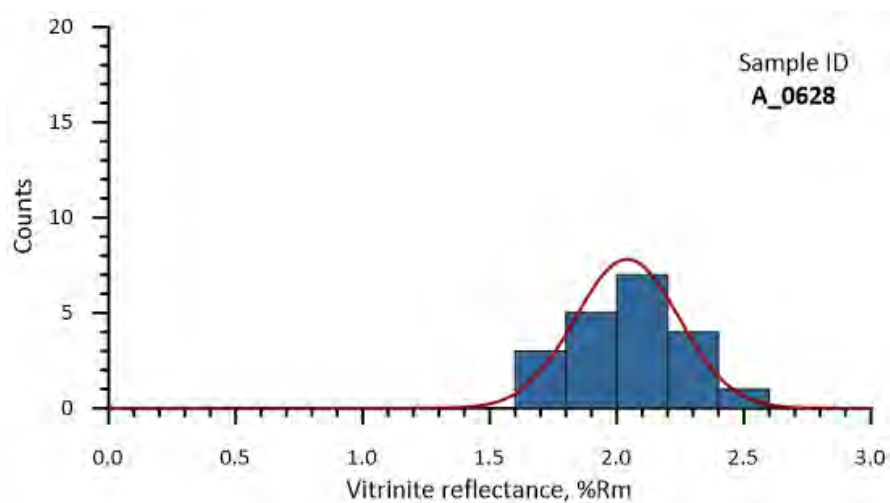
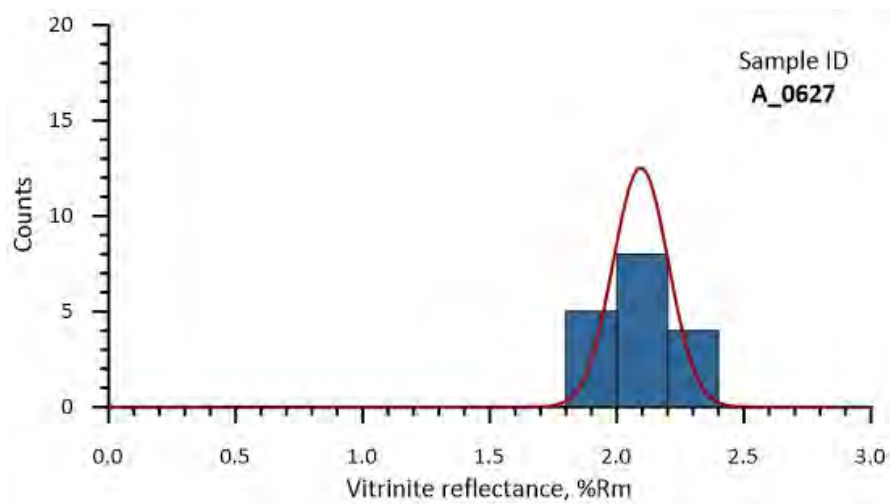


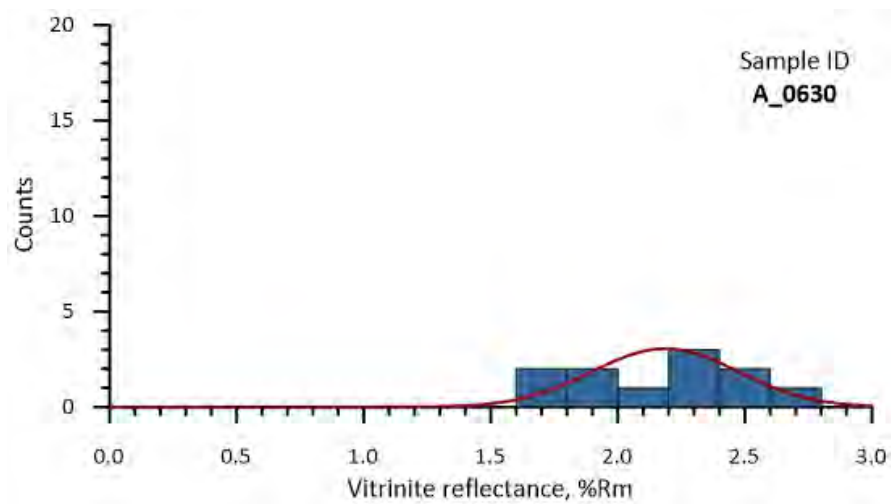


7618/09-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0625	7618/09-U-01	14.55	Rurikfjellet Fm	Core	Bulk	Shale	2.12	0.24	20	Poor	-+o-o	2.09
A_0626	7618/09-U-01	20.85	Rurikfjellet Fm	Core	Bulk	Shale	2.28	0.13	7	Poor	-+o-o	
A_0627	7618/09-U-01	35.55	Rurikfjellet Fm	Core	Bulk	Shale	2.09	0.11	17	Poor	-+o-o	
A_0628	7618/09-U-01	58.75	Agardfjellet Fm	Core	Bulk	Shale	2.04	0.21	20	Poor	-+o-o	
A_0629	7618/09-U-01	93.90	Agardfjellet Fm	Core	Bulk	Pyritic shale	1.80	0.15	6	Poor	-+o-o	
A_0630	7618/09-U-01	135.60	Agardfjellet Fm	Core	Bulk	Pyritic shale	2.19	0.30	11	Poor	-+o-o	
A_0631	7618/09-U-01	136.95	Agardfjellet Fm	Core	Bulk	Pyritic shale				Barren		
A_0632	7618/09-U-01	140.45	Agardfjellet Fm	Core	Bulk	Pyritic shale				Barren		
A_0633	7618/09-U-01	148.15	Agardfjellet Fm	Core	Bulk	Pyritic shale				Barren		
A_0634	7618/09-U-01	166.50	Agardfjellet Fm	Core	Bulk	Pyritic shale				Barren		

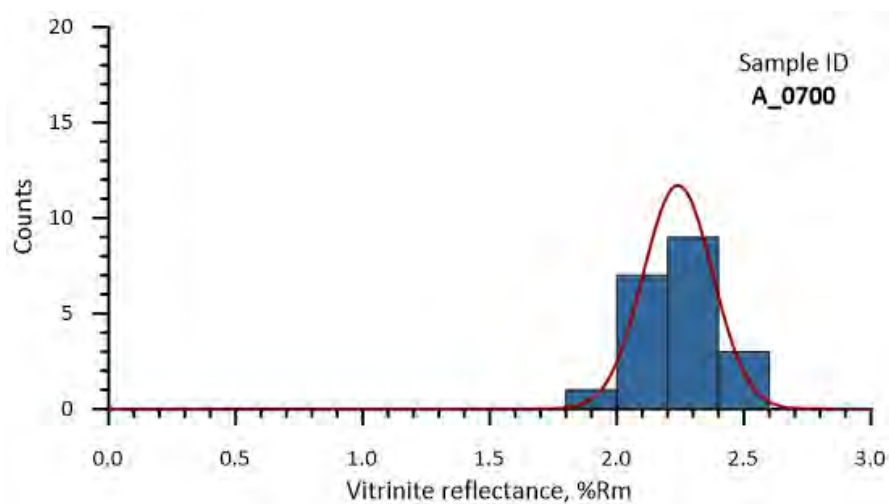
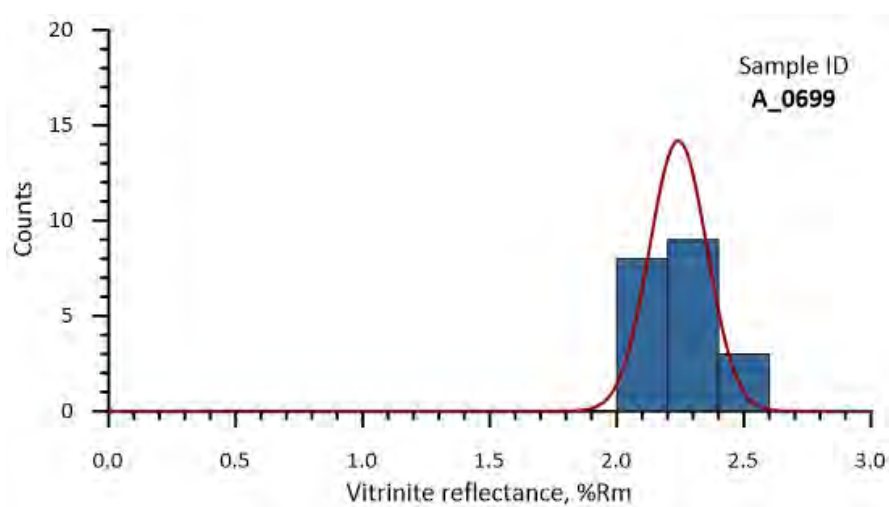


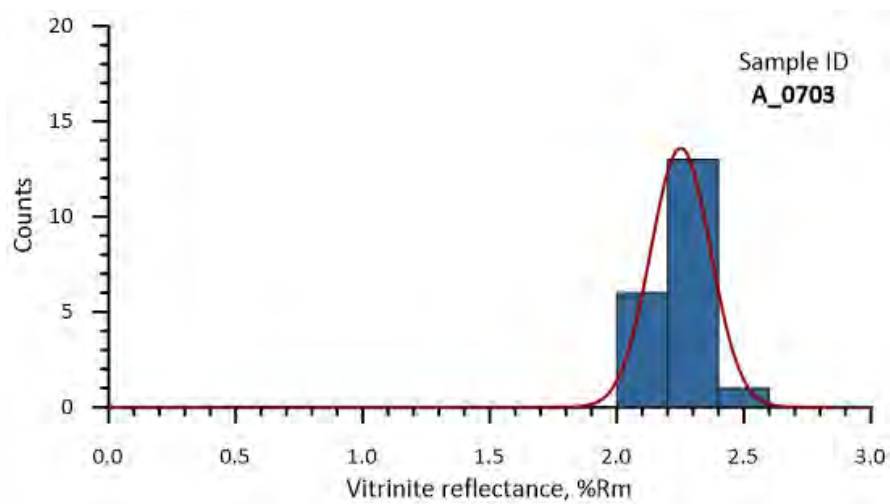
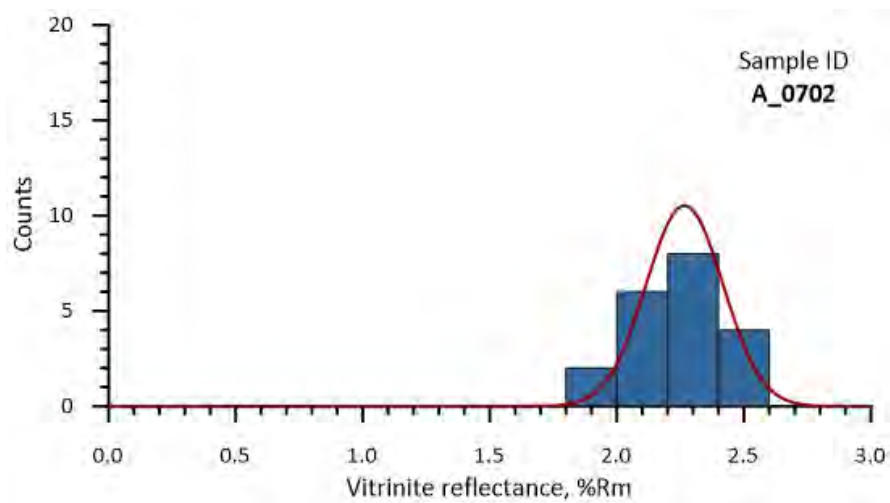
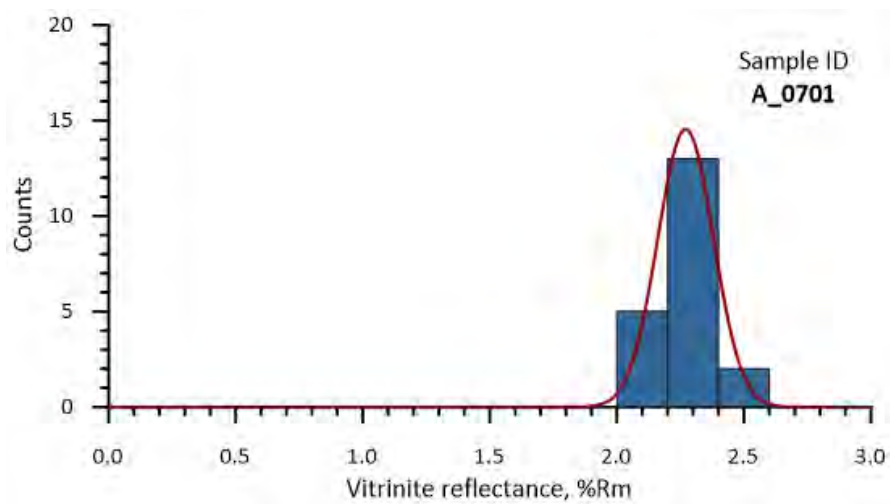




7618/10-U-03

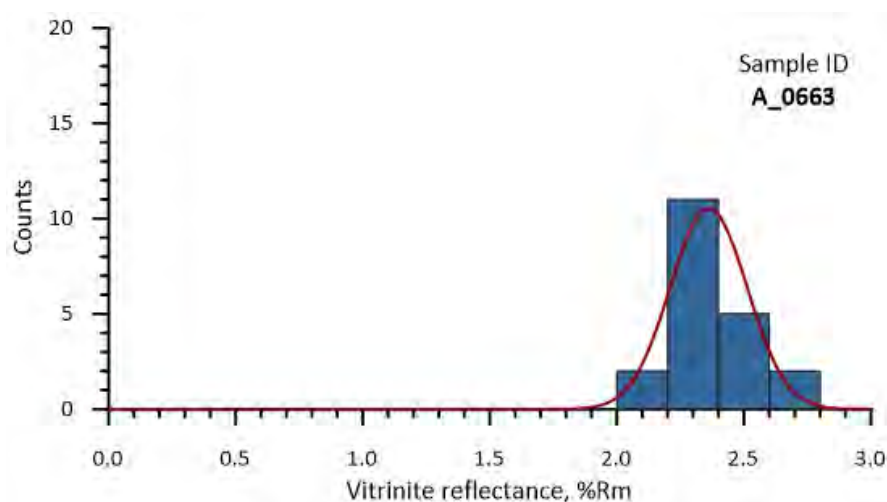
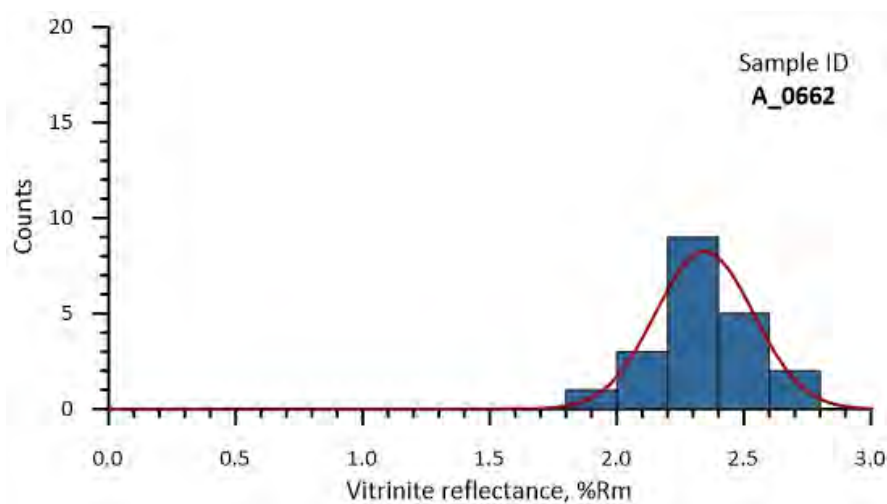
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0699	7618/10-U-03	14.80	Early Cretaceous	Core	Bulk	Shale	2.24	0.12	20	Moderate	o+ooo	2.25
A_0700	7618/10-U-03	15.30	Early Cretaceous	Core	Bulk	Shale	2.24	0.14	20	Moderate	o+ooo	
A_0701	7618/10-U-03	18.75	Early Cretaceous	Core	Bulk	Shale	2.27	0.11	20	Moderate	o+ooo	
A_0702	7618/10-U-03	19.60	Early Cretaceous	Core	Bulk	Shale	2.27	0.16	20	Moderate	o+ooo	
A_0703	7618/10-U-03	20.90	Early Cretaceous	Core	Bulk	Shale	2.25	0.12	20	Moderate	o+ooo	

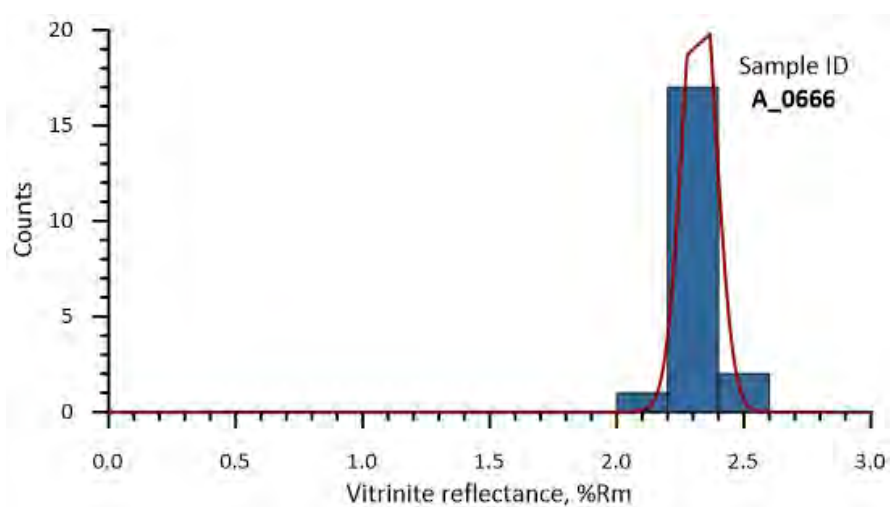
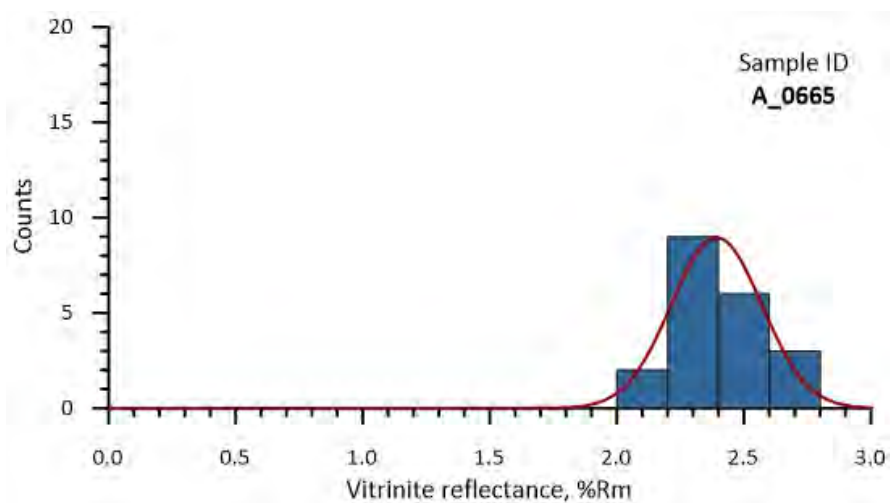
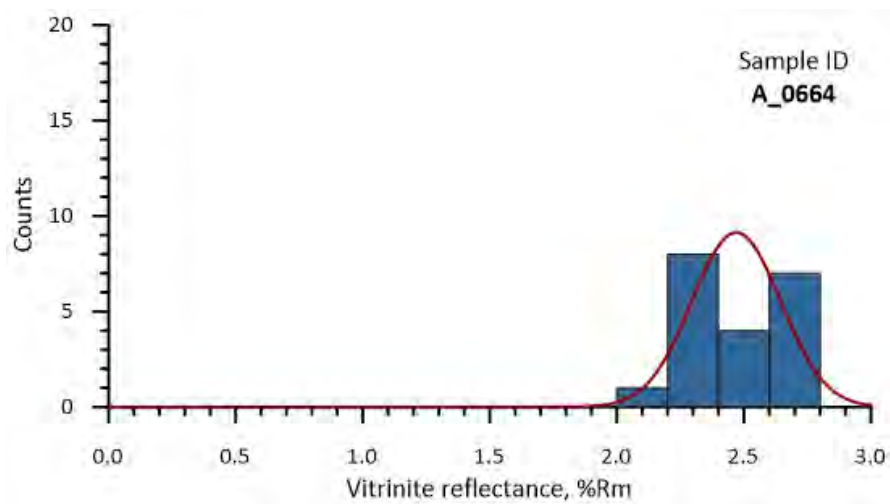


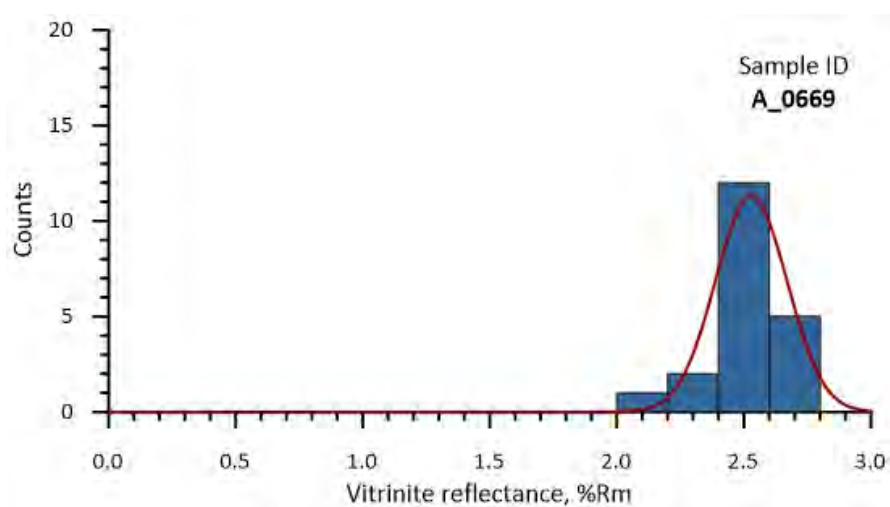
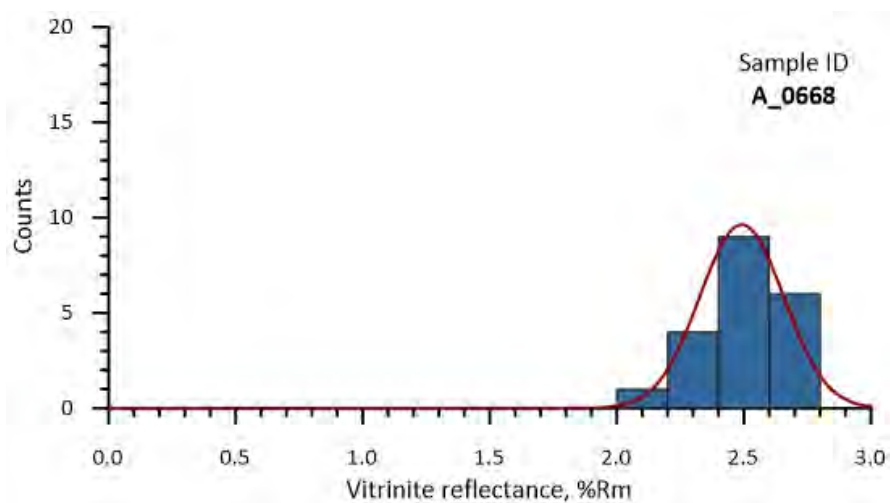
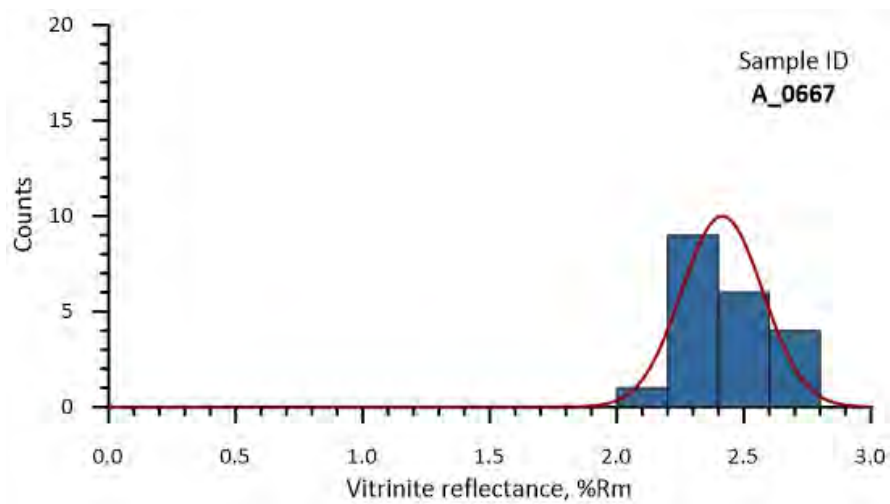


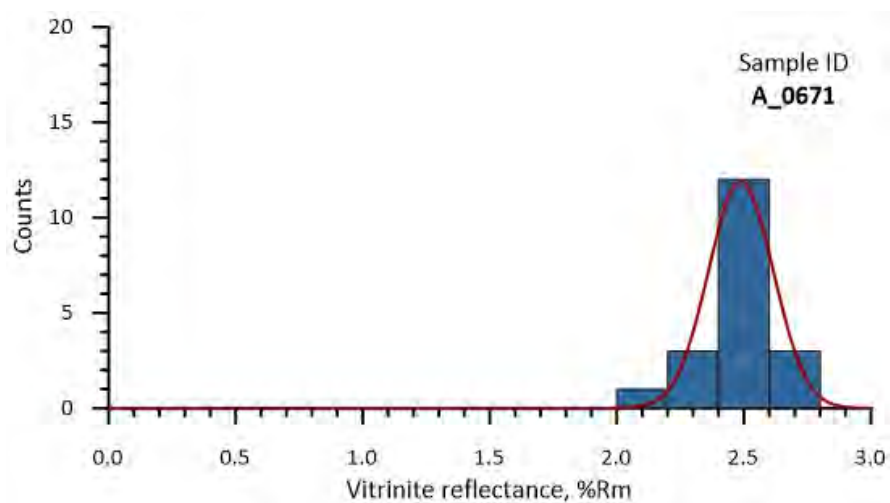
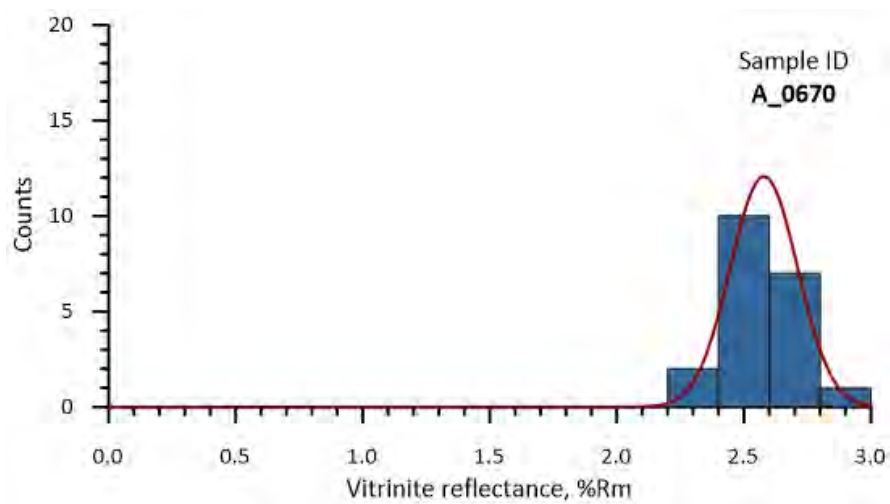
7618/12-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0662	7618/12-U-01	13.90	Rurikfjellet	Core	Bulk	Org. rich shale	2.35	0.20	20	Moderate	o+ooo	2.44
A_0663	7618/12-U-01	20.00	Rurikfjellet	Core	Bulk	Org. rich shale	2.36	0.16	20	Moderate	o+ooo	
A_0664	7618/12-U-01	54.25	Rurikfjellet	Core	Bulk	Org. rich shale	2.47	0.18	20	Moderate	o+ooo	
A_0665	7618/12-U-01	59.90	Rurikfjellet	Core	Bulk	Org. rich shale	2.39	0.18	20	Moderate	o+ooo	
A_0666	7618/12-U-01	94.55	Rurikfjellet	Core	Bulk	Org. rich shale	2.32	0.07	20	Moderate	o+ooo	
A_0667	7618/12-U-01	99.70	Rurikfjellet	Core	Bulk	Org. rich shale	2.42	0.16	20	Moderate	o+ooo	
A_0668	7618/12-U-01	133.25	Rurikfjellet	Core	Bulk	Shale	2.49	0.17	20	Moderate	o+ooo	
A_0669	7618/12-U-01	140.30	Rurikfjellet	Core	Bulk	Shale	2.53	0.15	20	Moderate	o+ooo	
A_0670	7618/12-U-01	174.00	Rurikfjellet	Core	Bulk	Shale	2.58	0.14	20	Moderate	o+ooo	
A_0671	7618/12-U-01	184.85	Rurikfjellet	Core	Bulk	Shale	2.49	0.13	20	Moderate	o+ooo	



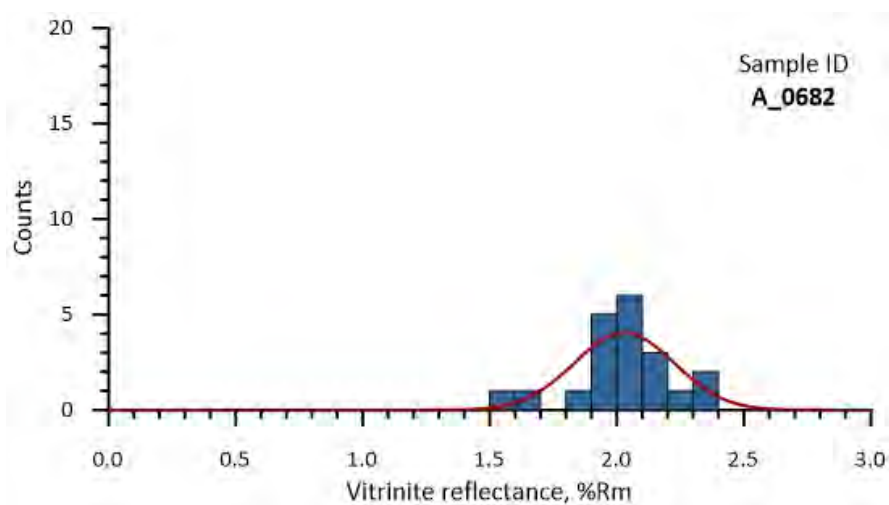
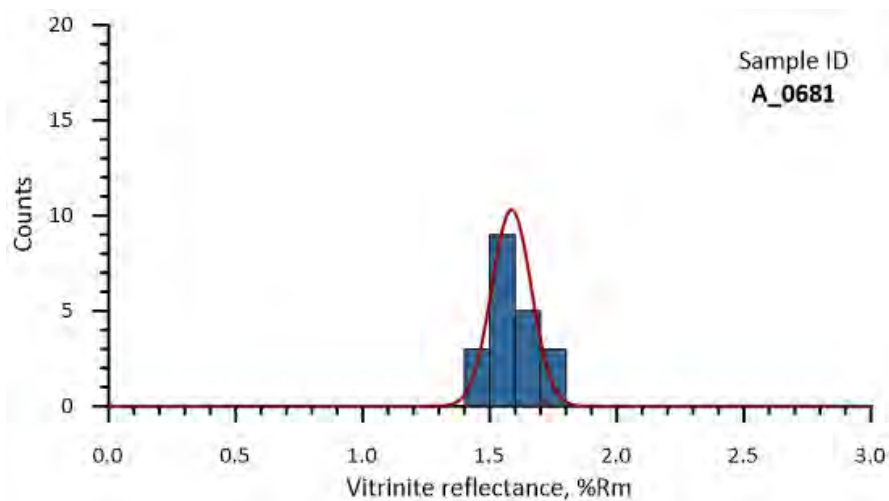


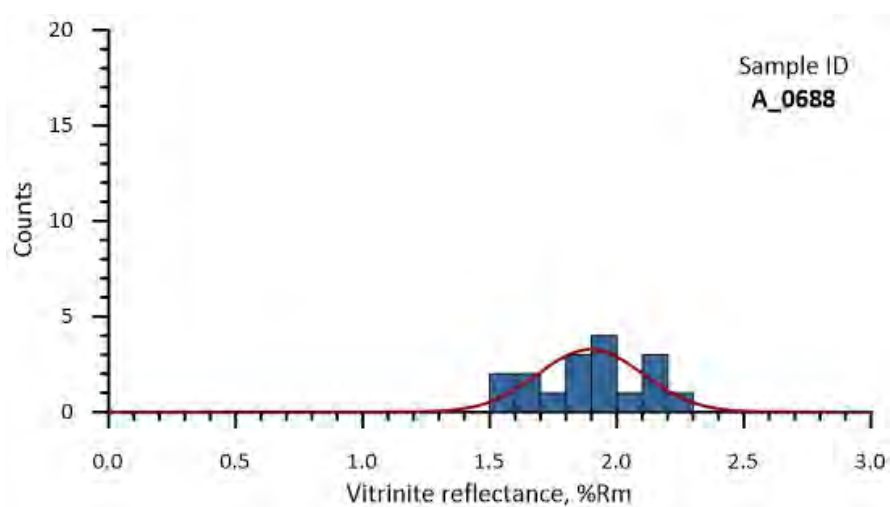
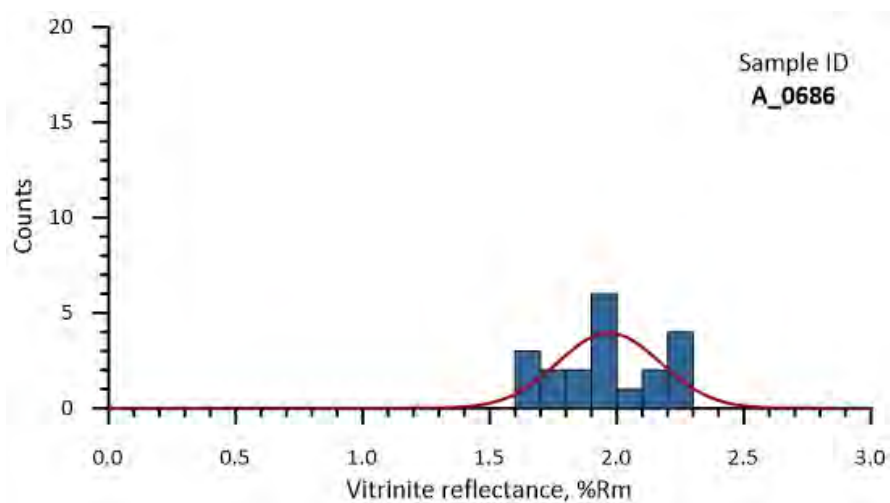
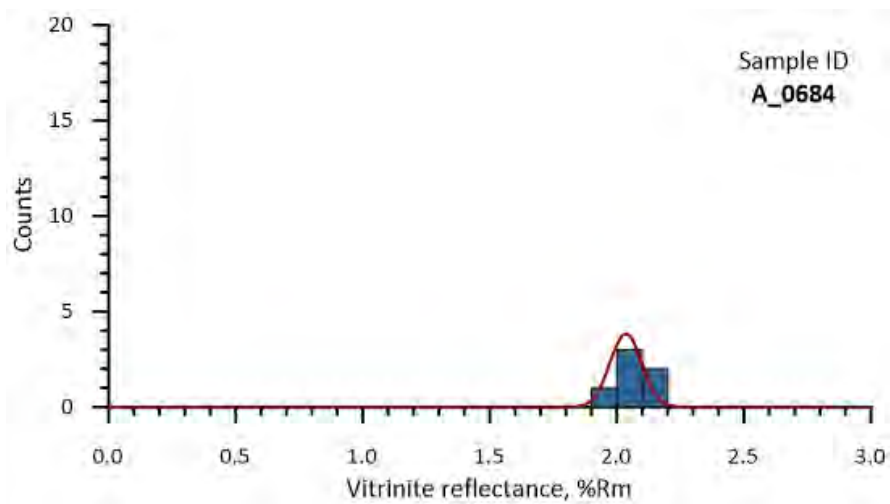


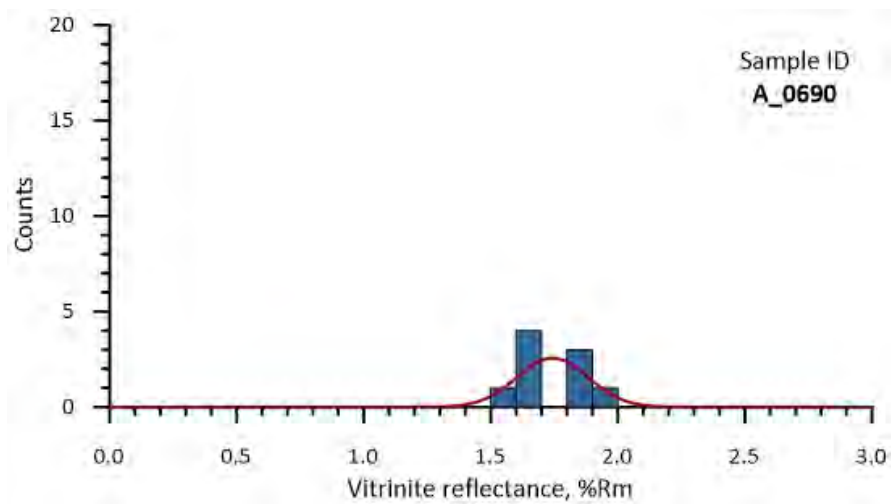


7619/08-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0681	7619/08-U-01	6.85	Agardfjellet Fm	Core	Bulk	Org. rich shale	1.59	0.08	20	Moderate	o+ooo	1.87
A_0682	7619/08-U-01	47.00	Agardfjellet Fm	Core	Bulk	Org. rich shale	2.03	0.20	20	Poor	-+o-o	
A_0683	7619/08-U-01	97.27	Fuglen Fm	Core	Bulk	Siltstone				Barren		
A_0684	7619/08-U-01	98.78	Fuglen Fm	Core	Bulk	Siltstone	2.04	0.07	6	Poor	-+o-o	
A_0685	7619/08-U-01	122.30	Wilhelmøya Fm	Core	Bulk	Siltstone/sandstone				Barren		
A_0686	7619/08-U-01	128.95	Wilhelmøya Fm	Core	Bulk	Shale	1.97	0.21	20	Poor	-+o-o	
A_0687	7619/08-U-01	130.62	Wilhelmøya Fm	Core	Bulk	Sandstone				Barren		
A_0688	7619/08-U-01	133.15	Wilhelmøya Fm	Core	Bulk	Shale	1.90	0.21	17	Poor	-+o-o	
A_0689	7619/08-U-01	133.31	Wilhelmøya Fm	Core	Bulk	Shale				Barren		
A_0690	7619/08-U-01	138.71	Wilhelmøya Fm	Core	Bulk	Shale	1.74	0.15	9	Poor	-+o-o	

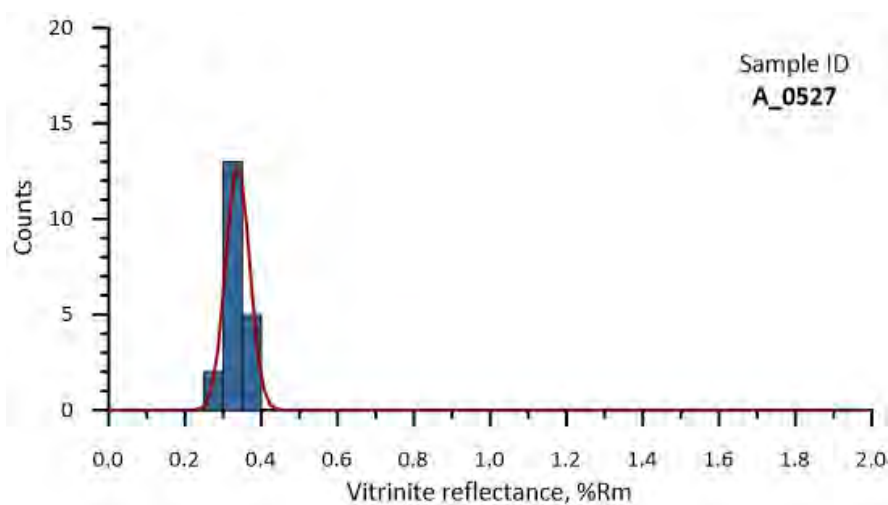
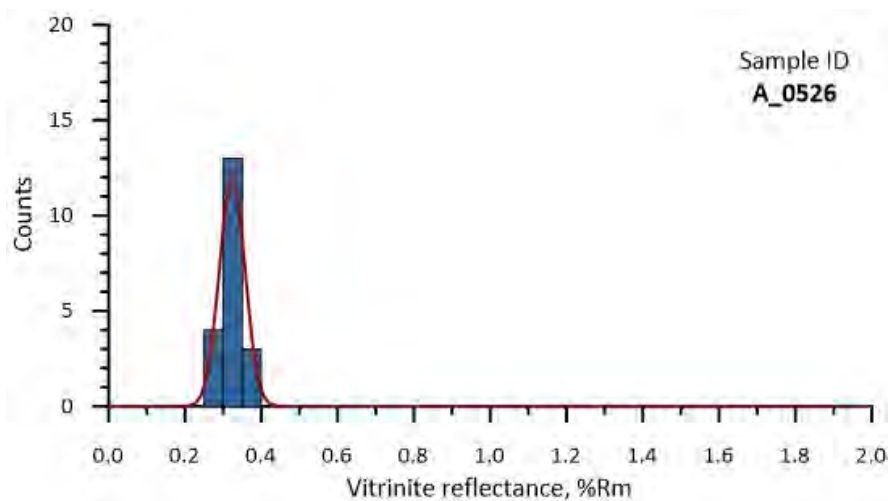


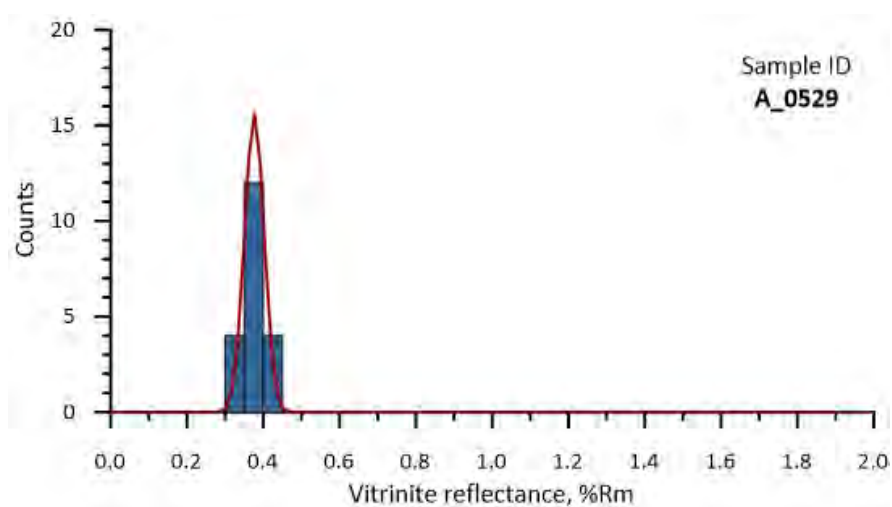
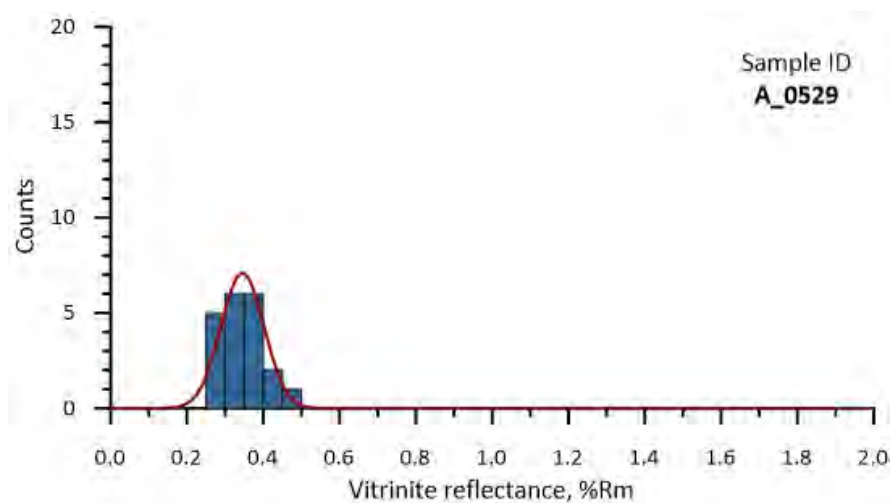
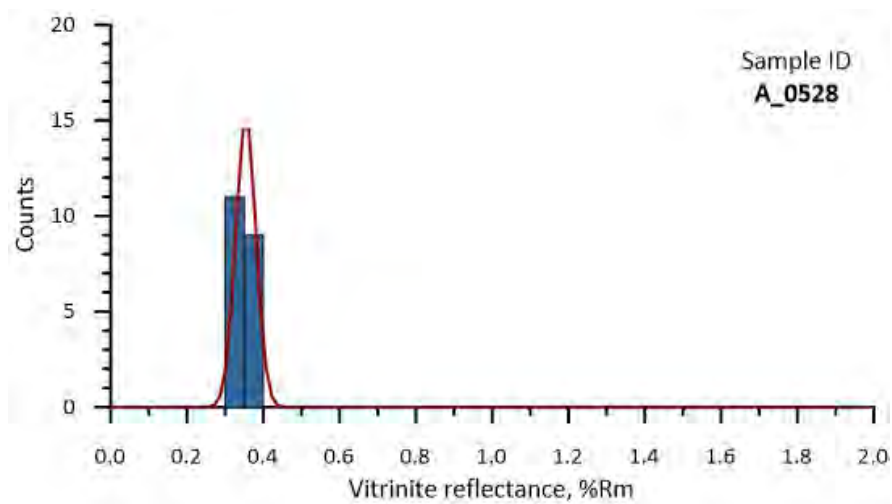




7634/06-U-01

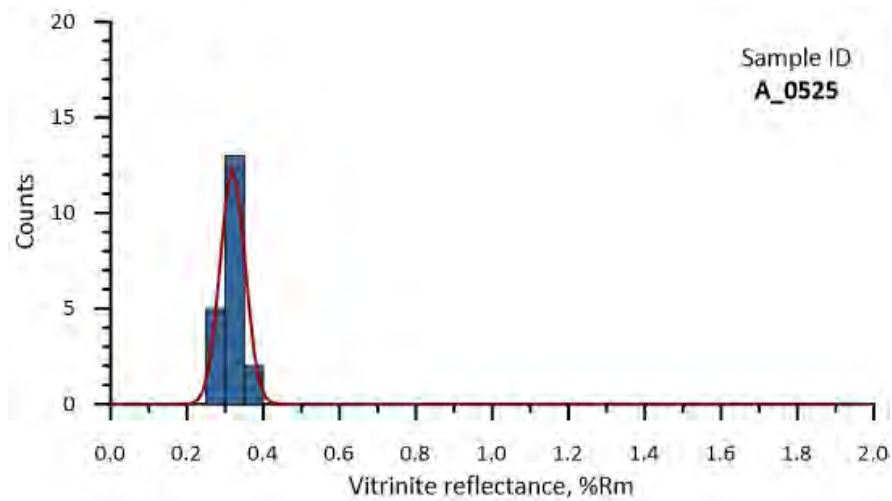
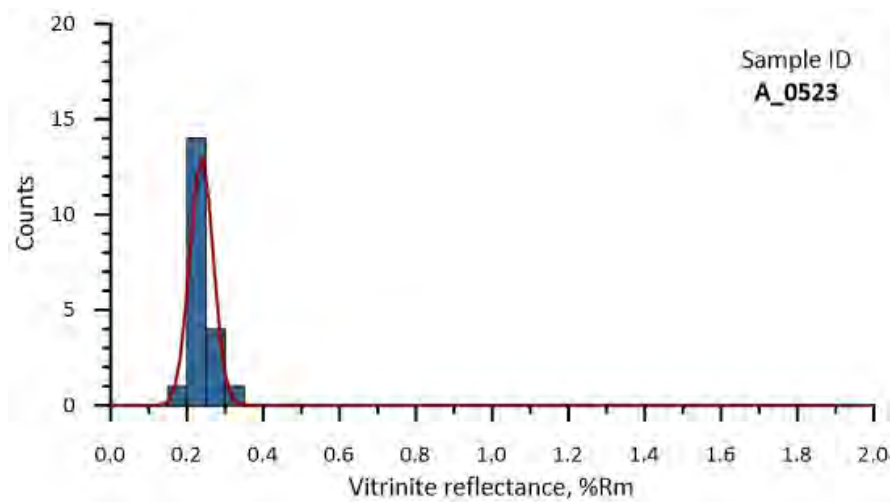
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0526	7634/06-U-01	28.15	Hekkingen Fm	Core	Bulk	Org. rich shale	0.32	0.03	20	Fair	oo-o-	0.35
A_0527	7634/06-U-01	29.50	Hekkingen Fm	Core	Bulk	Org. rich shale	0.34	0.03	20	Fair	oo-o-	
A_0528	7634/06-U-01	31.75	Hekkingen Fm	Core	Bulk	Org. rich shale	0.35	0.03	20	Fair	oo-o-	
A_0529	7634/06-U-01	32.10	Hekkingen Fm	Core	Bulk	Org. rich shale	0.35	0.06	20	Fair	oo-o-	
A_0530	7634/06-U-01	35.62	Fuglen Fm	Core	Bulk	Siltstone				Barren		
A_0531	7634/06-U-01	42.30	Fuglen Fm	Core	Bulk					No polish		
A_0532	7634/06-U-01	48.80	Fuglen Fm	Core	Bulk	Siltstone				Barren		
A_0533	7634/06-U-01	84.50	Stø Fm	Core	Bulk	Coal	0.38	0.03	20	Good	ooooo	
A_0534	7634/06-U-01	87.03	Stø Fm	Core	Bulk	Pyrite				Barren		
A_0535	7634/06-U-01	117.90	Stø Fm	Core	Bulk					No polish		





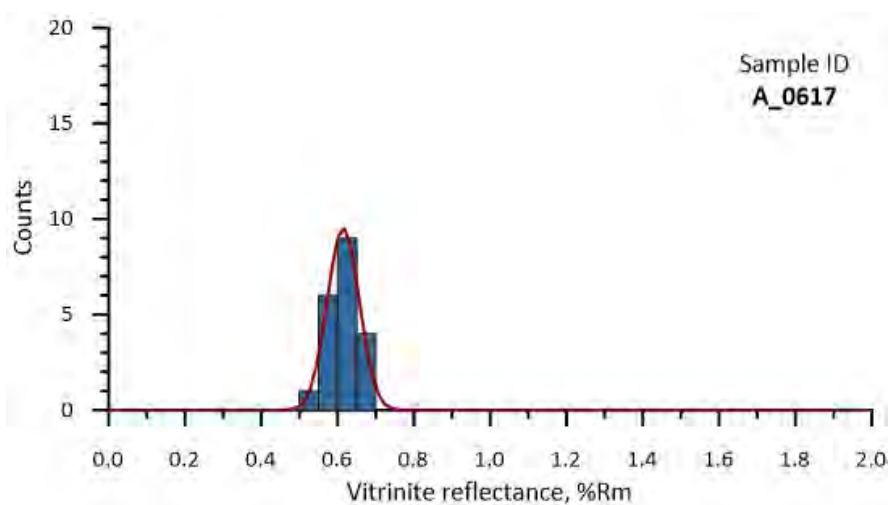
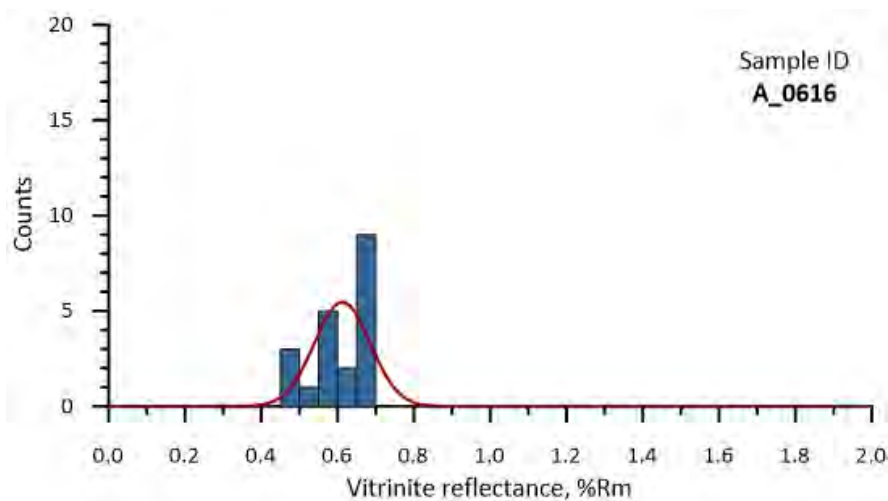
7634/06-U-03

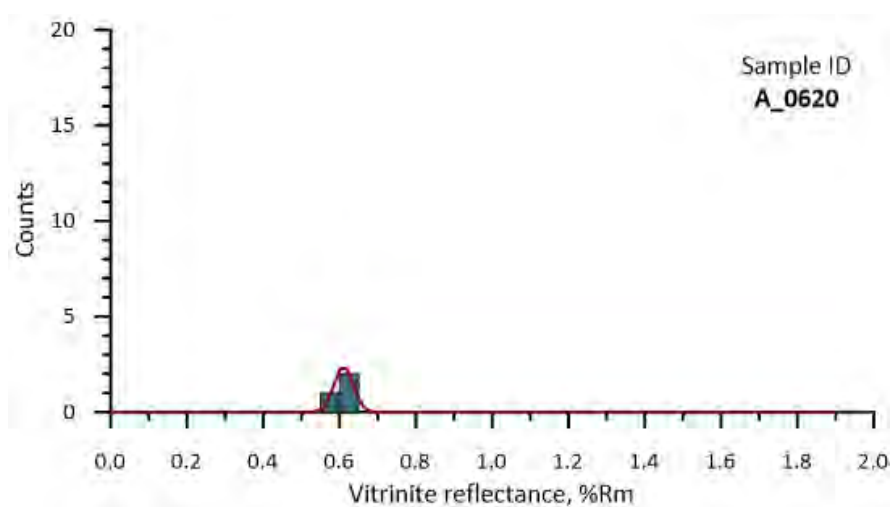
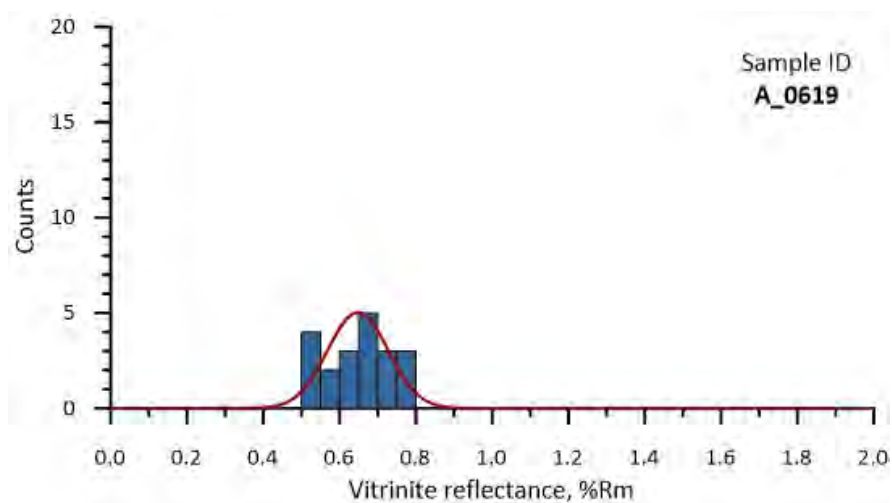
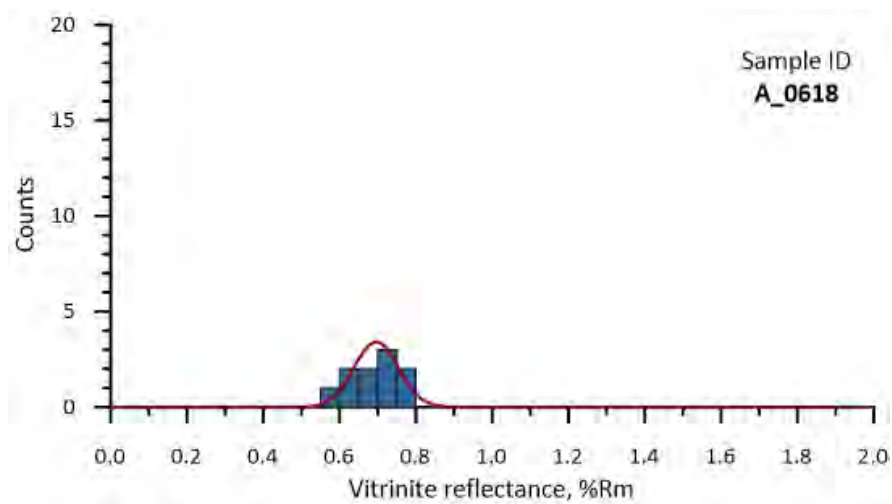
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0517	7634/06-U-03	7.53	Fuglen Fm	Core	Bulk					No polish		.28
A_0518	7634/06-U-03	12.08	Fuglen Fm	Core	Bulk					No polish		
A_0519	7634/06-U-03	12.44	Fuglen Fm	Core	Bulk					No polish		
A_0520	7634/06-U-03	15.30	Fuglen Fm	Core	Bulk					No polish		
A_0521	7634/06-U-03	18.57	Fuglen Fm	Core	Bulk					No polish		
A_0522	7634/06-U-03	20.22	Fuglen Fm	Core	Bulk					No polish		
A_0523	7634/06-U-03	36.65	Stø Fm	Core	Bulk	Sandstone w/coal	0.24	0.03	20	Fair	○○-○-	
A_0524	7634/06-U-03	39.50	Stø Fm	Core	Bulk	Sandstone				Barren		
A_0525	7634/06-U-03	40.33	Stø Fm	Core	Bulk	Sandstone w/coal	0.32	0.03	20	Fair	○○-○-	

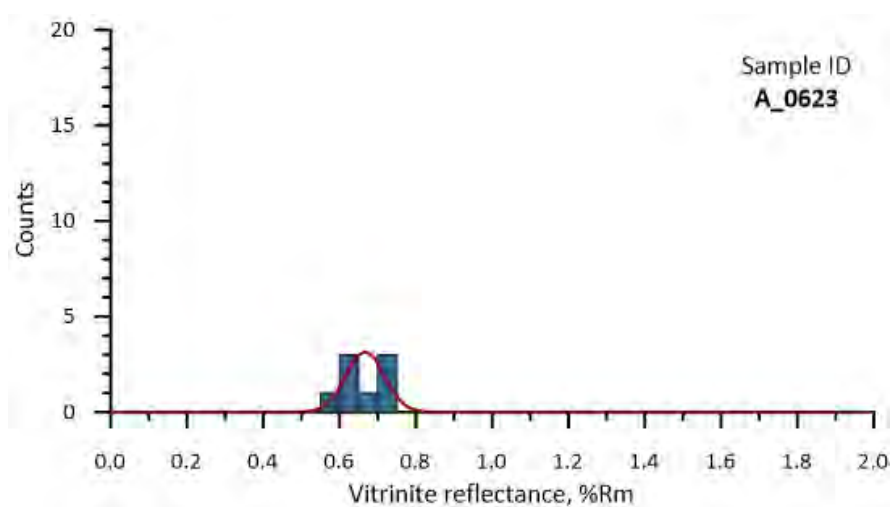
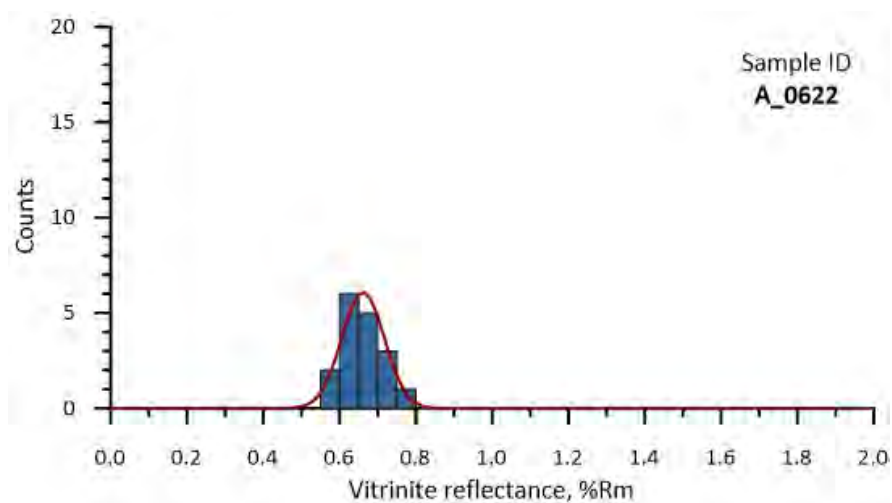
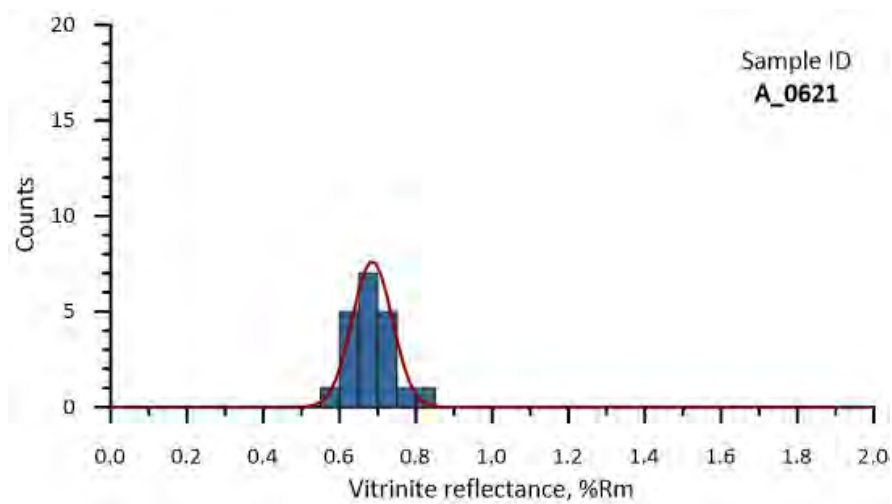


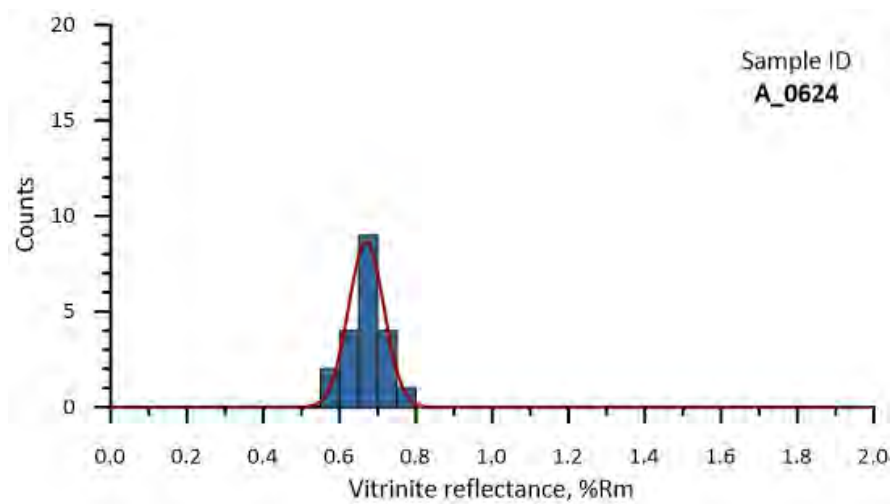
7830/03-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0615	7830/03-U-01	6.47		Core	Bulk	Shale				Barren		0.65
A_0616	7830/03-U-01	29.59		Core	Bulk	Shale	0.61	0.08	20	Poor	-+o-o	
A_0617	7830/03-U-01	51.00		Core	Bulk	Sandstone	0.62	0.04	20	Moderate	oo+oo	
A_0618	7830/03-U-01	60.36		Core	Bulk	Shale	0.70	0.06	10	Poor	-+++o	
A_0619	7830/03-U-01	86.00		Core	Bulk	Shale	0.65	0.08	20	Poor	o++-o	
A_0620	7830/03-U-01	99.57		Core	Bulk	Shale	0.61	0.03	3	Poor	-+++o	
A_0621	7830/03-U-01	127.00		Core	Bulk	Sandstone	0.69	0.05	20	Good	ooooo	
A_0622	7830/03-U-01	141.00		Core	Bulk	Shale	0.66	0.06	17	Poor	-o+-o	
A_0623	7830/03-U-01	177.05		Core	Bulk	Shale	0.67	0.05	8	Poor	-o+-o	
A_0624	7830/03-U-01	180.47		Core	Bulk	Shale	0.67	0.05	20	Good	ooooo	



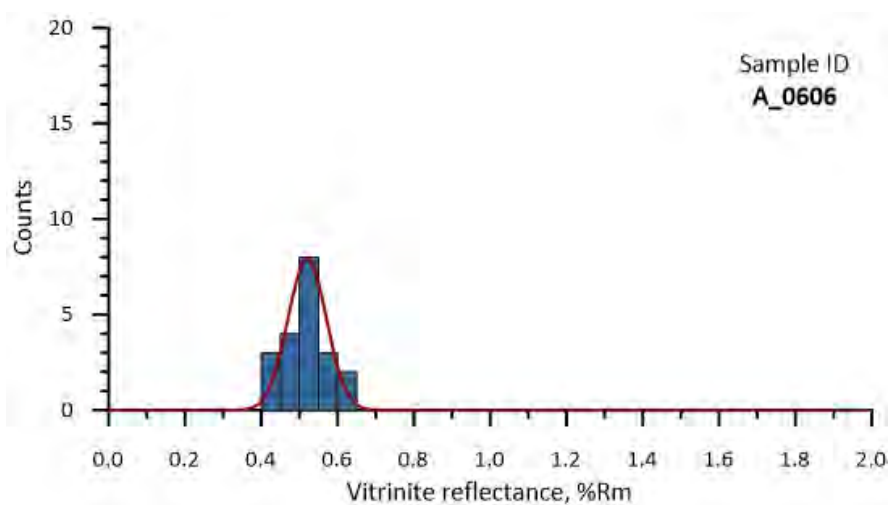
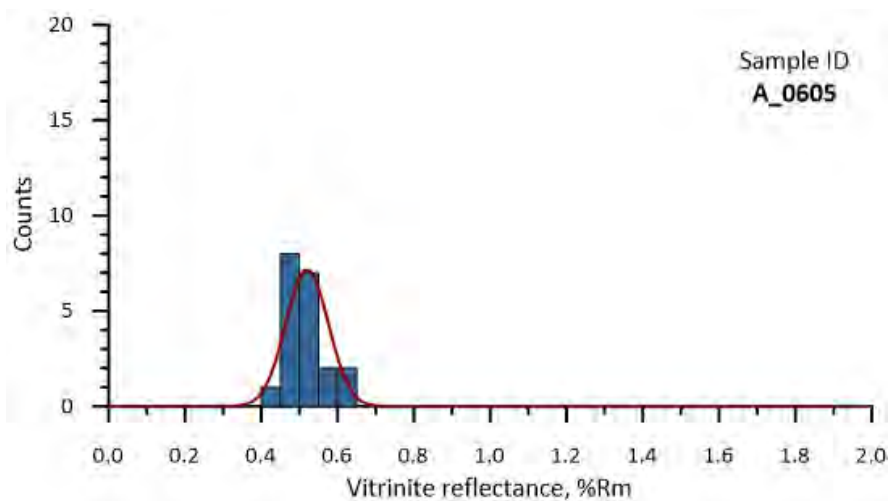


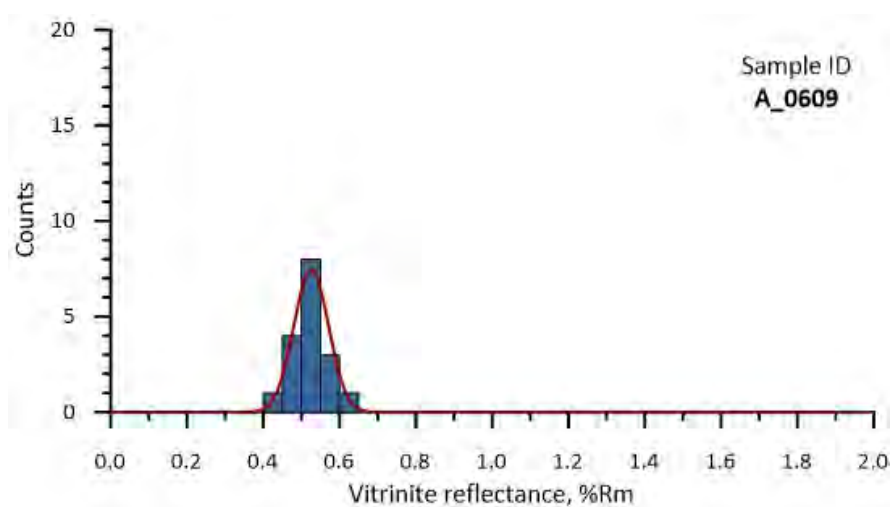
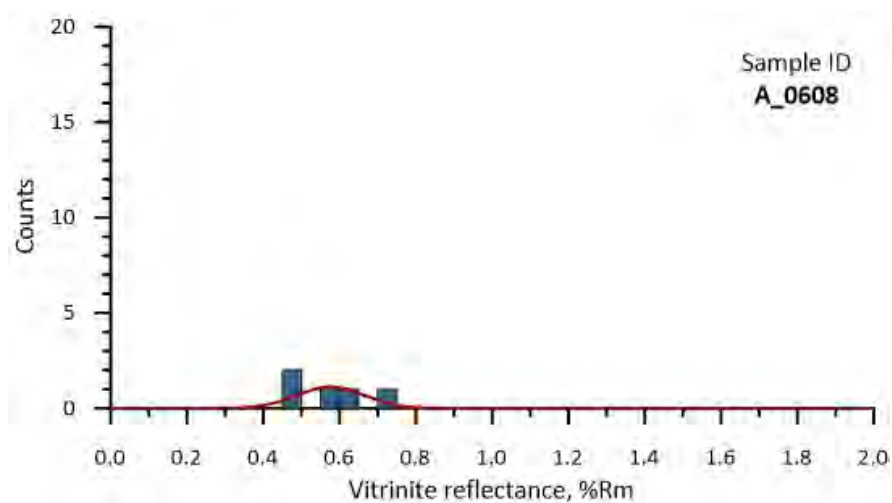
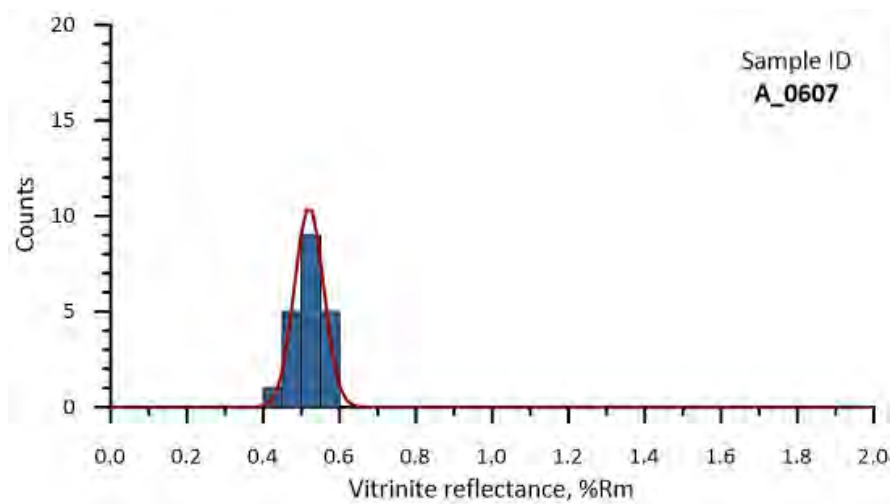


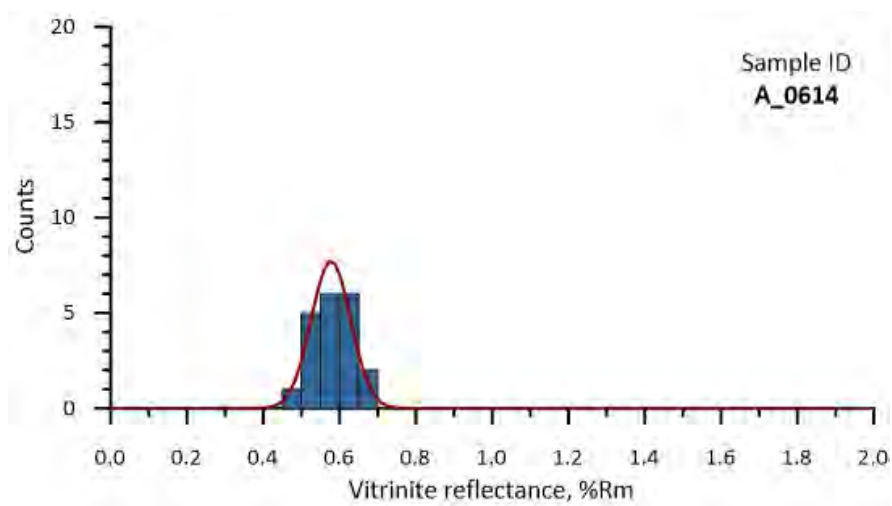
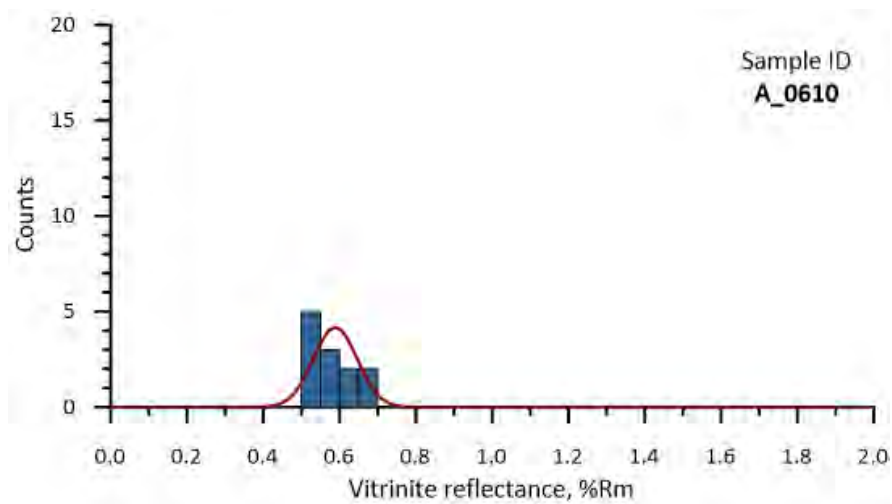


7830/05-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0605	7830/05-U-01	24.05		Core	Bulk	Siltstone	0.52	0.06	20	Good	○○○○○	0.54
A_0606	7830/05-U-01	41.55		Core	Bulk	Siltstone	0.52	0.05	20	Moderate	—○○—○	
A_0607	7830/05-U-01	58.98		Core	Bulk	Siltstone	0.52	0.04	20	Moderate	—○○—○	
A_0608	7830/05-U-01	74.00		Core	Bulk	Shale	0.58	0.10	5	Poor	—++—○	
A_0609	7830/05-U-01	89.50		Core	Bulk	Shale	0.53	0.05	17	Fair	—○○—○	
A_0610	7830/05-U-01	103.94		Core	Bulk	Shale	0.59	0.06	12	Fair	—○○—○	
A_0611	7830/05-U-01	106.19		Core	Bulk	Shale				Barren		
A_0612	7830/05-U-01	110.89		Core	Bulk	Shale				Barren		
A_0613	7830/05-U-01	127.02		Core	Bulk	Shale				Barren		
A_0614	7830/05-U-01	143.77		Core	Bulk	Shale	0.58	0.05	20	Good	○○○○○	

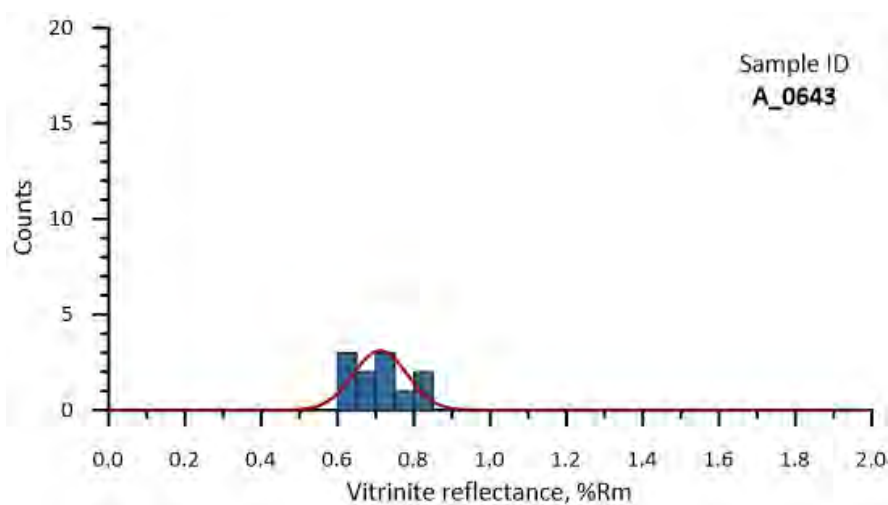
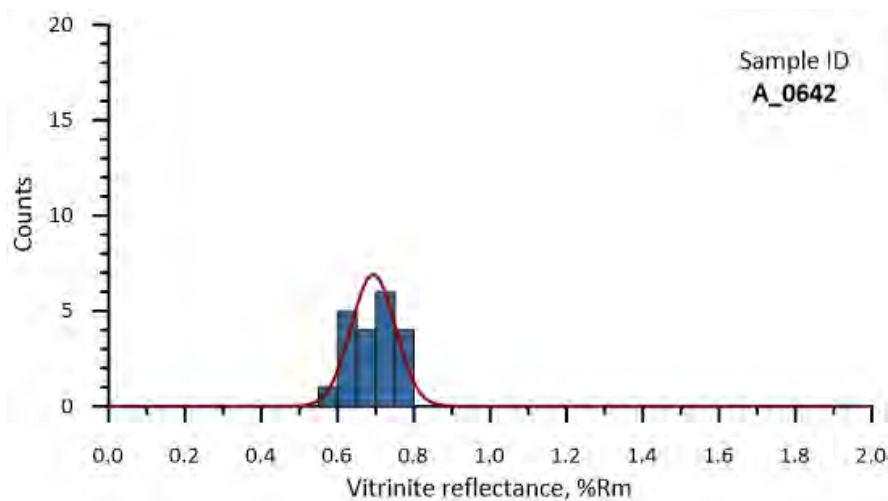


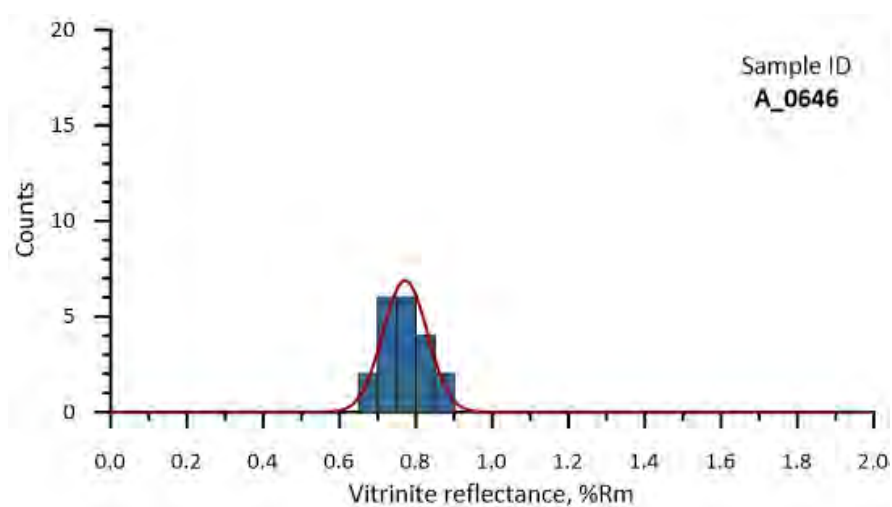
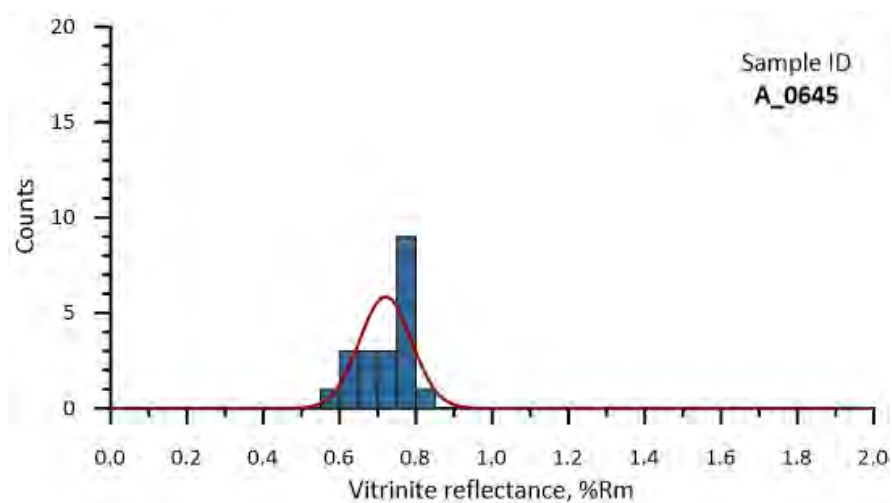
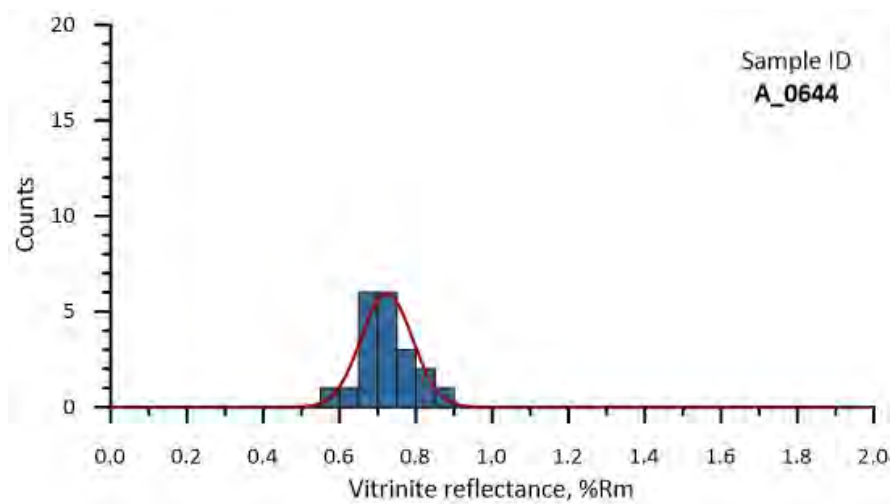


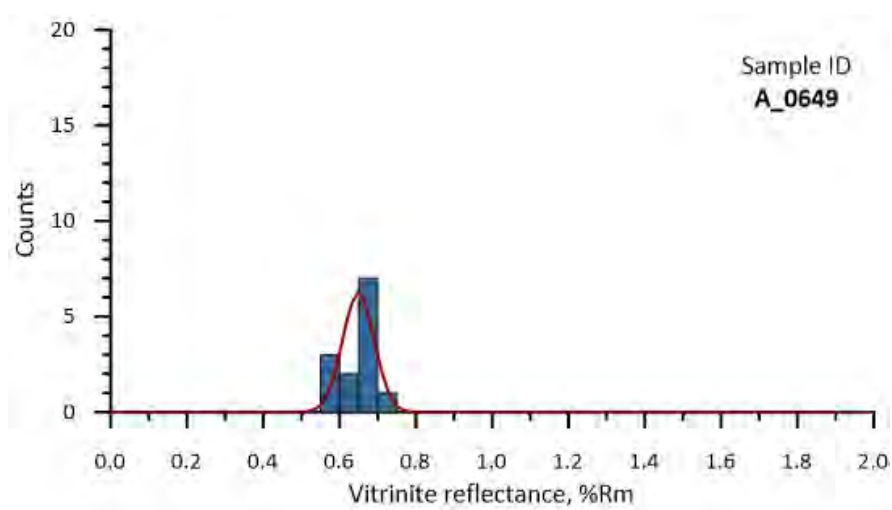
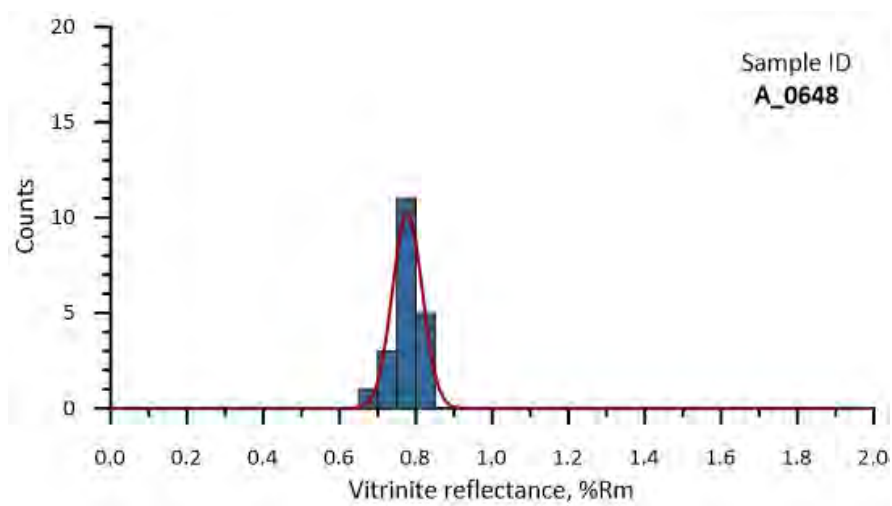
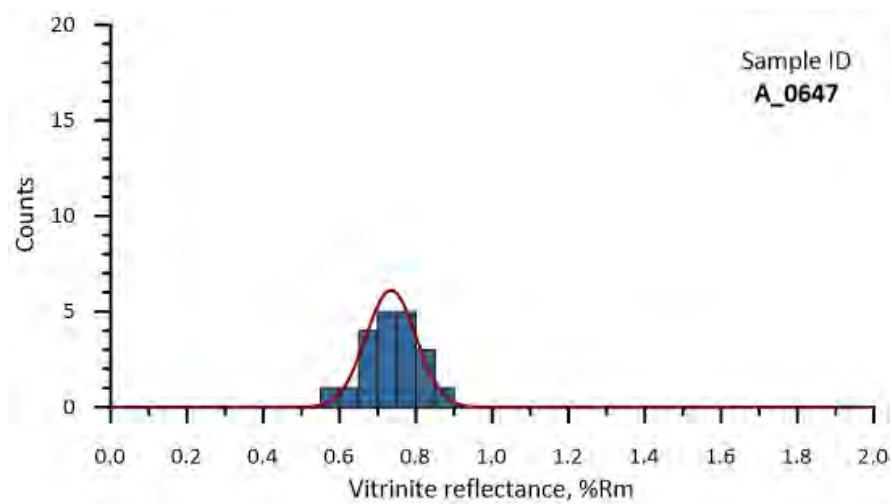


7830/06-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0642	7830/06-U-01	6.42		Core	Bulk	Shale	0.69	0.06	20	Fair	-○○-○	0.73
A_0643	7830/06-U-01	17.75		Core	Bulk		0.71	0.07	11	Fair	-○○-○	
A_0644	7830/06-U-01	19.85		Core	Bulk	Siltstone	0.72	0.07	20	Good	○○○○○	
A_0645	7830/06-U-01	26.65		Core	Bulk		0.72	0.07	20	Good	○○○○○	
A_0646	7830/06-U-01	28.10		Core	Bulk	Shale	0.77	0.06	20	Moderate	-○○-○	
A_0647	7830/06-U-01	31.05		Core	Bulk		0.74	0.07	20	Moderate	-○○-○	
A_0648	7830/06-U-01	34.35		Core	Bulk		0.78	0.04	20	Moderate	-○○-○	
A_0649	7830/06-U-01	42.00		Core	Bulk	Org. rich shale	0.65	0.04	13	Poor	-+++○	
A_0650	7830/06-U-01	45.70		Core	Bulk	Org. rich shale				Barren		
A_0651	7830/06-U-01	51.00		Core	Bulk	Org. rich shale				Barren		

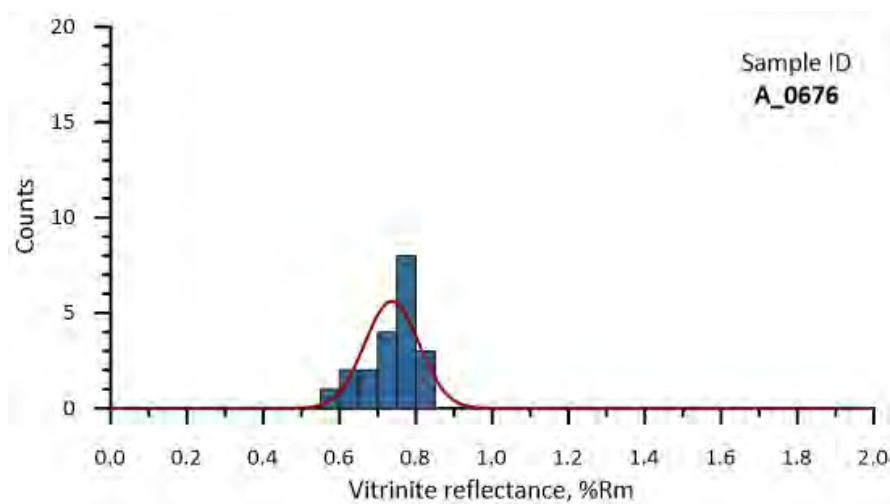
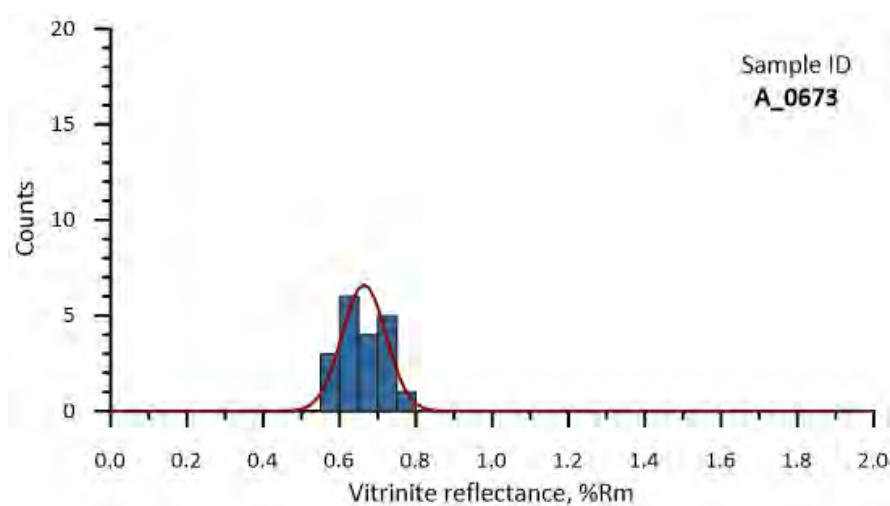






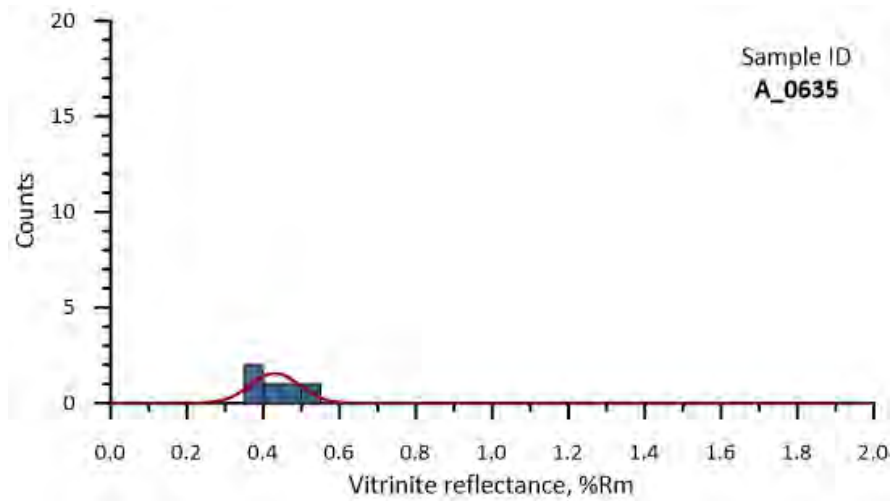
7831/02-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0672	7831/02-U-01	12.50		Core	Bulk	Pyritic sandstone				Barren		0.71
A_0673	7831/02-U-01	15.50		Core	Bulk	Siltstone/sandstone	0.67	0.06	20	Moderate	oo+o-	
A_0674	7831/02-U-01	16.50		Core	Bulk	Shale				Barren		
A_0675	7831/02-U-01	19.50		Core	Bulk	Shale				Barren		
A_0676	7831/02-U-01	20.50		Core	Bulk	Shale	0.74	0.07	20	Moderate	-o+oo	
A_0677	7831/02-U-01	21.50		Core	Bulk	Shale				Barren		
A_0678	7831/02-U-01	23.50		Core	Bulk	Shale				Barren		
A_0679	7831/02-U-01	24.50		Core	Bulk	Shale				Barren		
A_0680	7831/02-U-01	27.50		Core	Bulk	Shale				Barren		



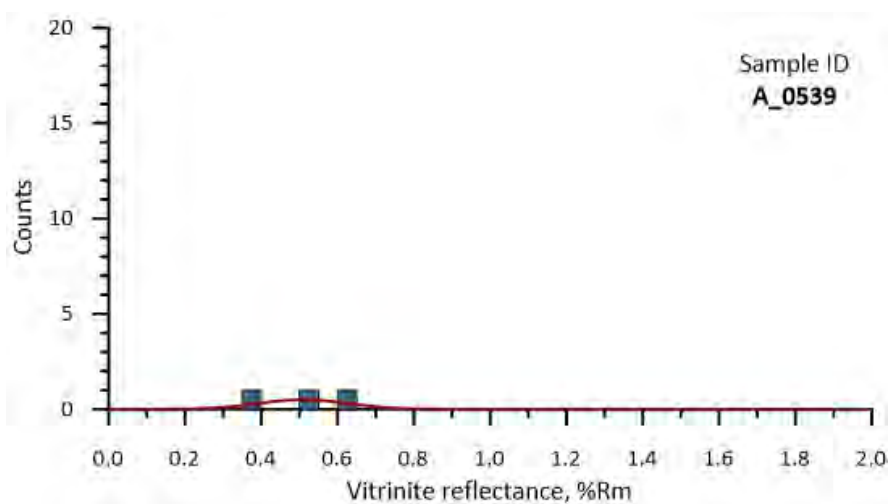
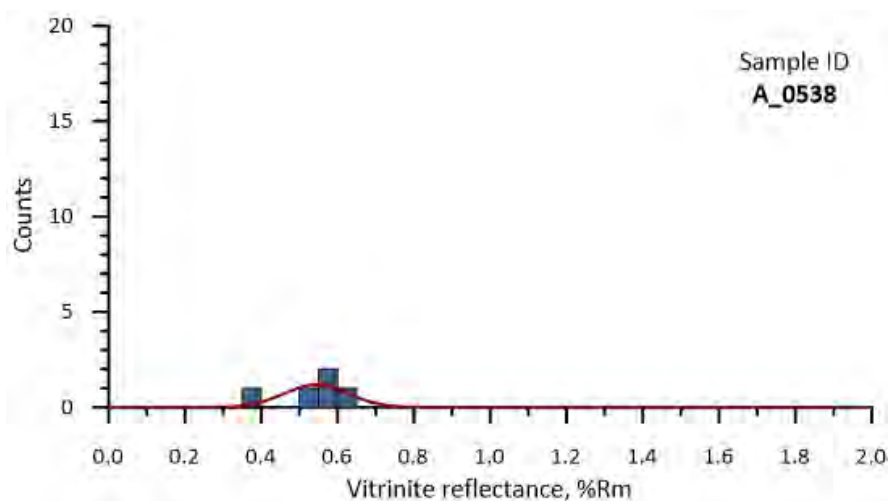
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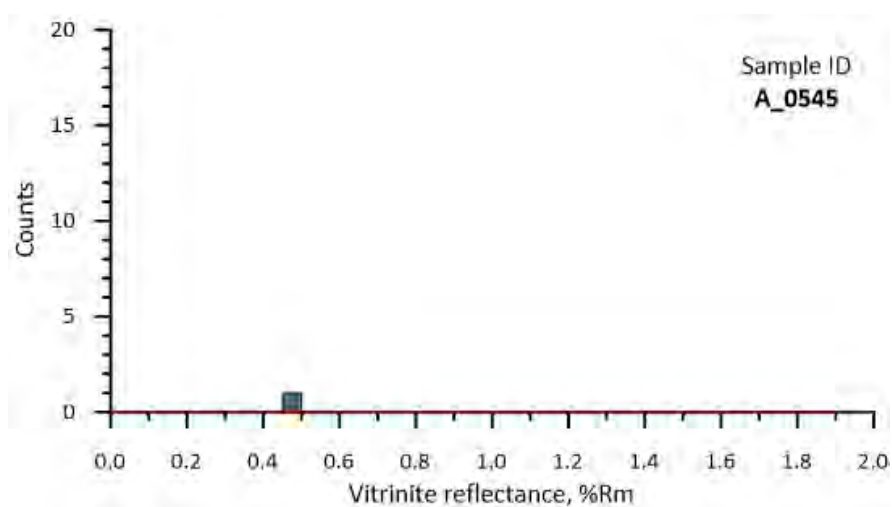
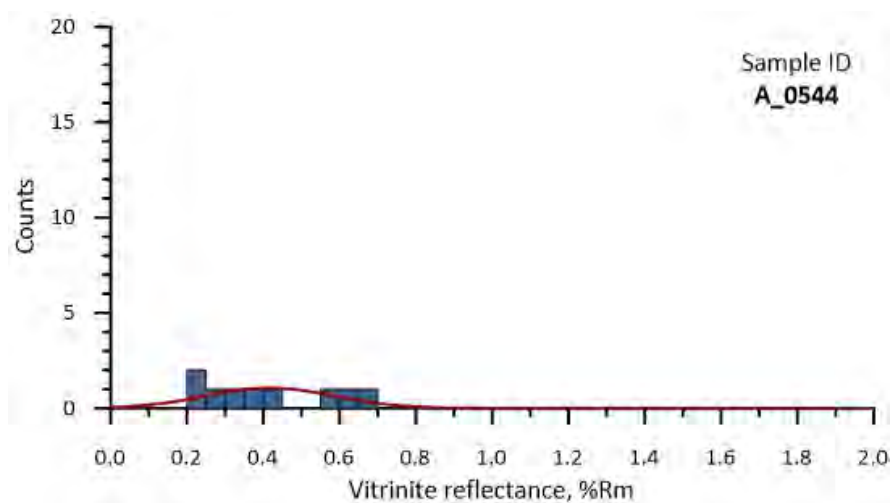
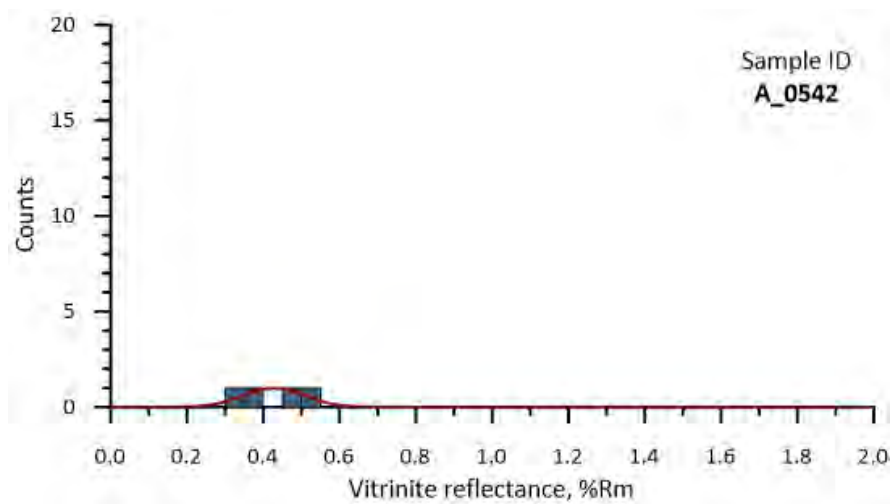
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0635	7831/02-U-02	6.45		Core	Bulk	Shale				Barren		0.43
A_0636	7831/02-U-02	8.50		Core	Bulk	Pyritic sandstone				Barren		
A_0637	7831/02-U-02	9.50		Core	Bulk	Pyritic shale				Barren		
A_0638	7831/02-U-02	12.50		Core	Bulk					No polish		
A_0639	7831/02-U-02	13.50		Core	Bulk	Pyritic shale				Barren		
A_0640	7831/02-U-02	15.70		Core	Bulk	Pyritic shale	0.43	0.07	5	Poor	~+ooo	
A_0641	7831/02-U-02	18.75		Core	Bulk	Pyritic shale				Barren		



7933/04-U-01

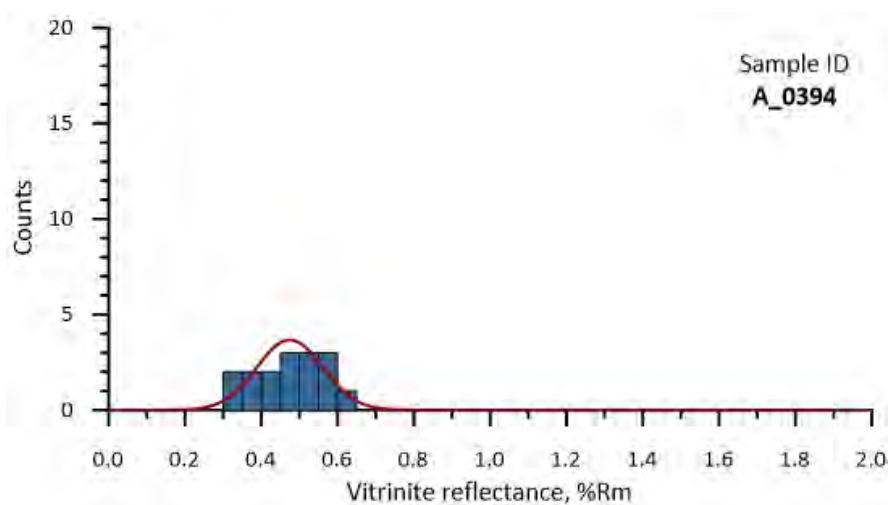
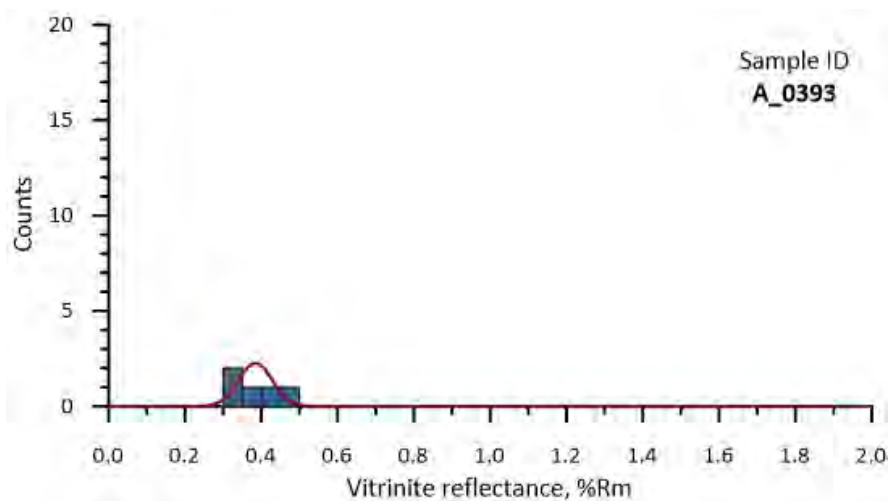
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0536	7933/04-U-01	20.60	Tschemakfjellet Fm	Core	Bulk	Shale				Barren		0.46
A_0537	7933/04-U-01	24.60	Tschemakfjellet Fm	Core	Bulk	Shale				Barren		
A_0538	7933/04-U-01	27.62	Tschemakfjellet Fm	Core	Bulk	Shale	0.54	0.09	5	Poor	---+---	
A_0539	7933/04-U-01	30.40	Tschemakfjellet Fm	Core	Bulk	Shale	0.51	0.01	3	Poor	---+---	
A_0540	7933/04-U-01	61.44	Tschemakfjellet Fm	Core	Bulk	Shale				Barren		
A_0541	7933/04-U-01	64.40	Tschemakfjellet Fm	Core	Bulk	Shale				Barren		
A_0542	7933/04-U-01	67.55	Tschemakfjellet Fm	Core	Bulk	Shale	0.43	0.09	4	Poor	---+---	
A_0543	7933/04-U-01	71.45		Core	Bulk	Shale				Barren		
A_0544	7933/04-U-01	104.45		Core	Bulk	Shale	0.42	0.02	9	Poor	---+---	
A_0545	7933/04-U-01	109.55		Core	Bulk	Shale	0.49		1	Poor	---+---	

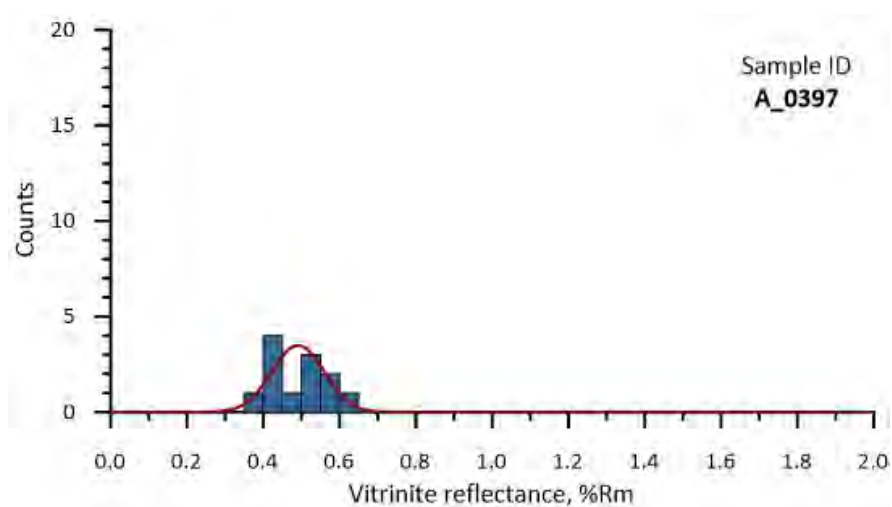
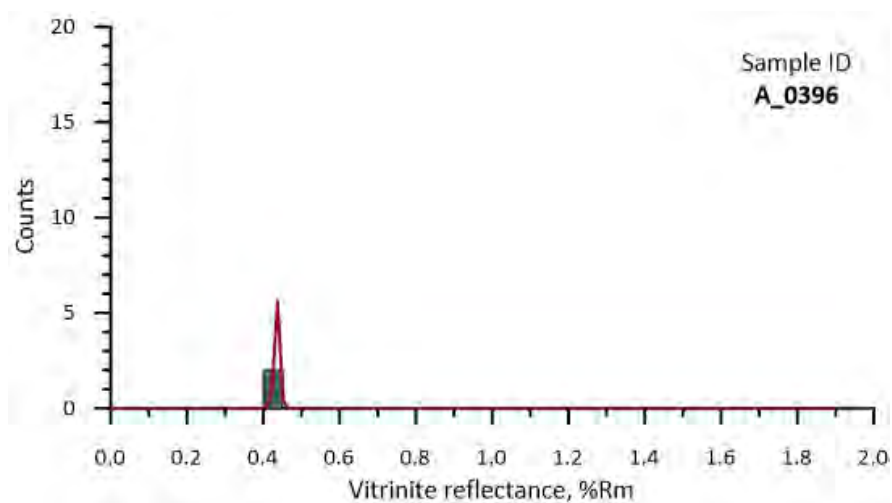
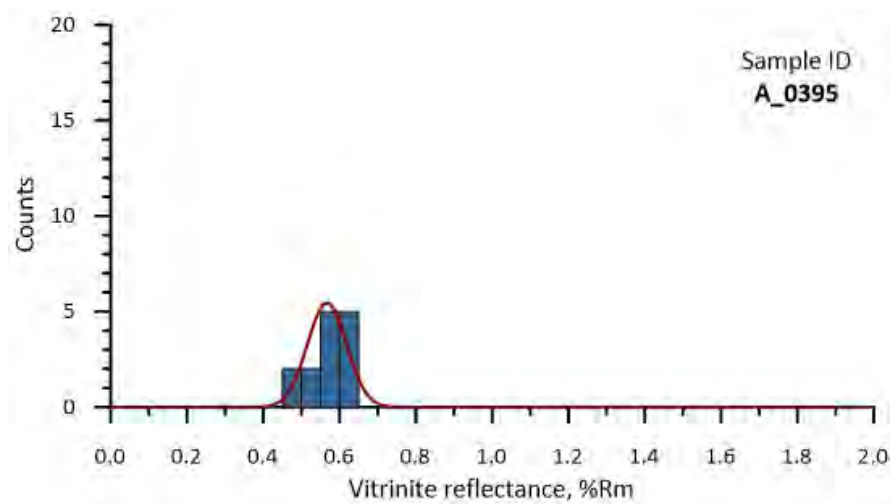


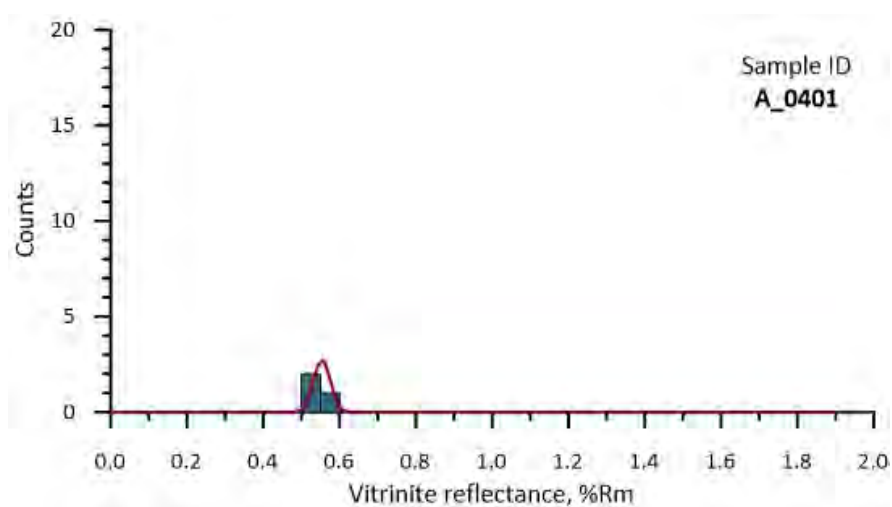
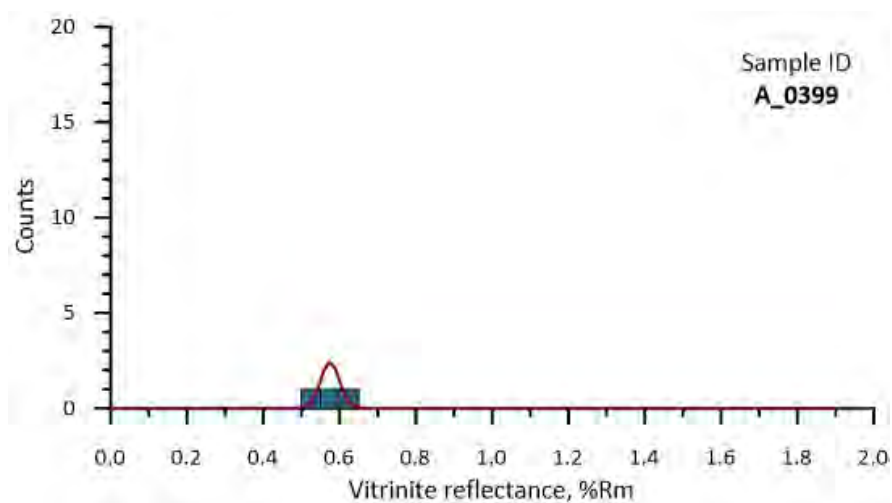
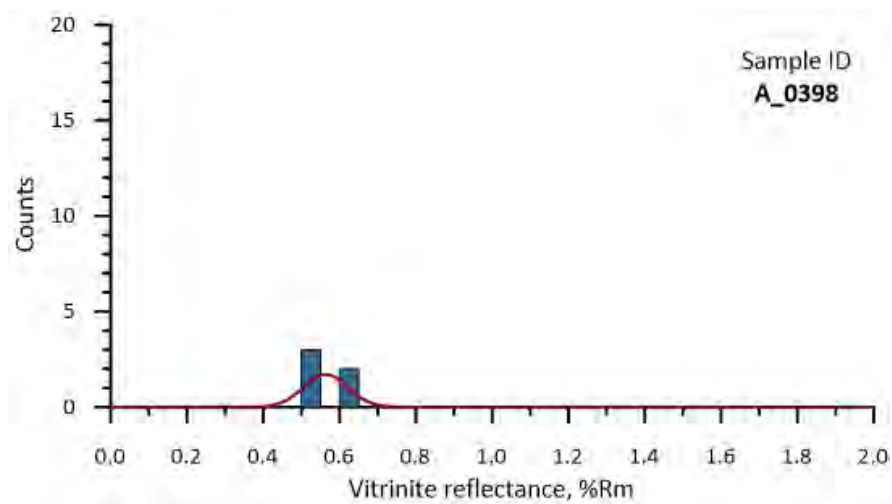


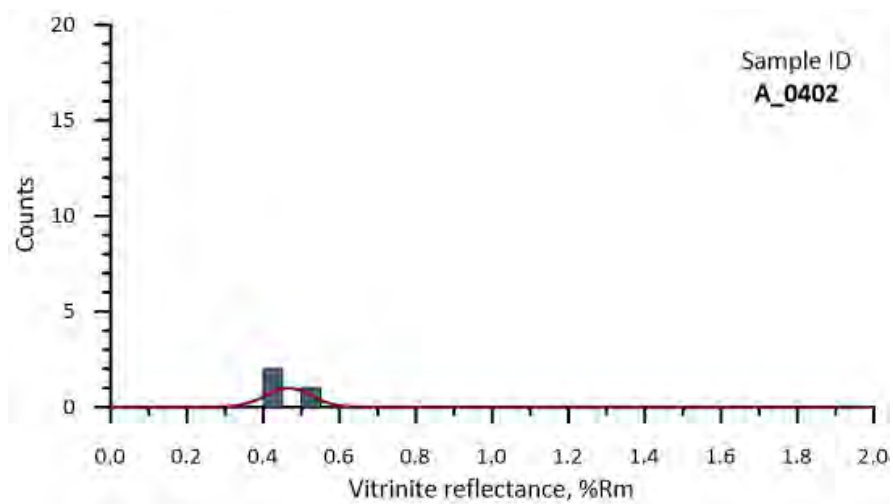
7933/04-U-02

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0393	7933/04-U-02	5.22	Tschemakfjellet Fm	Core	Bulk	Shale	0.38	0.04	5	Poor	- $\pm$ -	0.50
A_0394	7933/04-U-02	5.49	Tschemakfjellet Fm	Core	Bulk	Shale	0.47	0.09	16	Poor	- $\pm$ -	
A_0395	7933/04-U-02	6.20	Tschemakfjellet Fm	Core	Bulk	Shale	0.57	0.05	14	Poor	- $\pm$ -	
A_0396	7933/04-U-02	6.85	Tschemakfjellet Fm	Core	Bulk	Shale	0.44	0.01	2	Poor	- $\pm$ -	
A_0397	7933/04-U-02	7.15	Tschemakfjellet Fm	Core	Bulk	Shale	0.49	0.07	12	Poor	- $\pm$ -	
A_0398	7933/04-U-02	8.80	Tschemakfjellet Fm	Core	Bulk	Shale	0.56	0.06	5	Poor	- $\pm$ -	
A_0399	7933/04-U-02	10.47	Tschemakfjellet Fm	Core	Bulk	Shale	0.57	0.02	3	Poor	- $\pm$ -	
A_0400	7933/04-U-02	11.50	Tschemakfjellet Fm	Core	Bulk	Shale	0.51	0.04	11	Poor	- $\pm$ -	
A_0401	7933/04-U-02	13.90	Tschemakfjellet Fm	Core	Bulk	Shale	0.55	0.02	3	Poor	- $\pm$ -	
A_0402	7933/04-U-02	15.00	Tschemakfjellet Fm	Core	Bulk	Shale	0.47	0.06	3	Poor	- $\pm$ -	



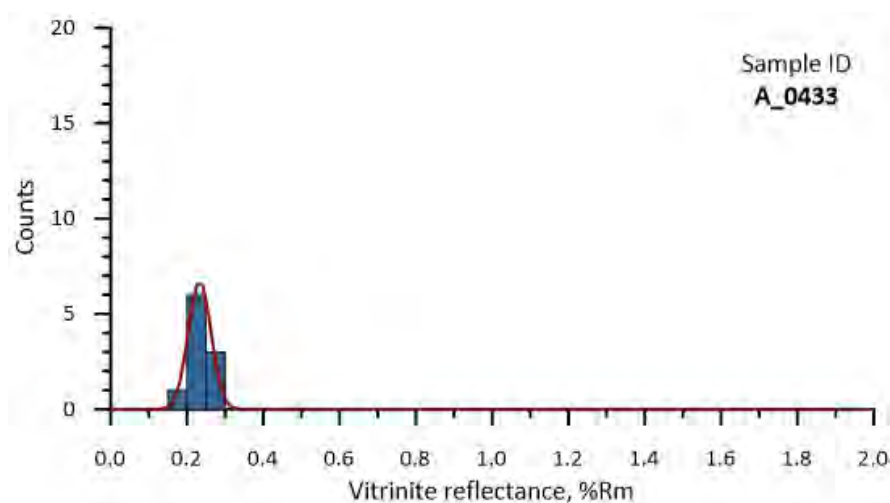
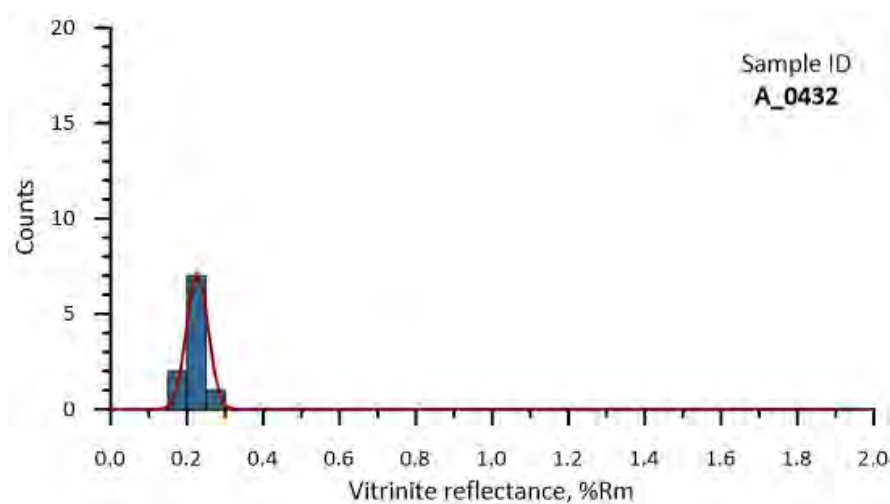


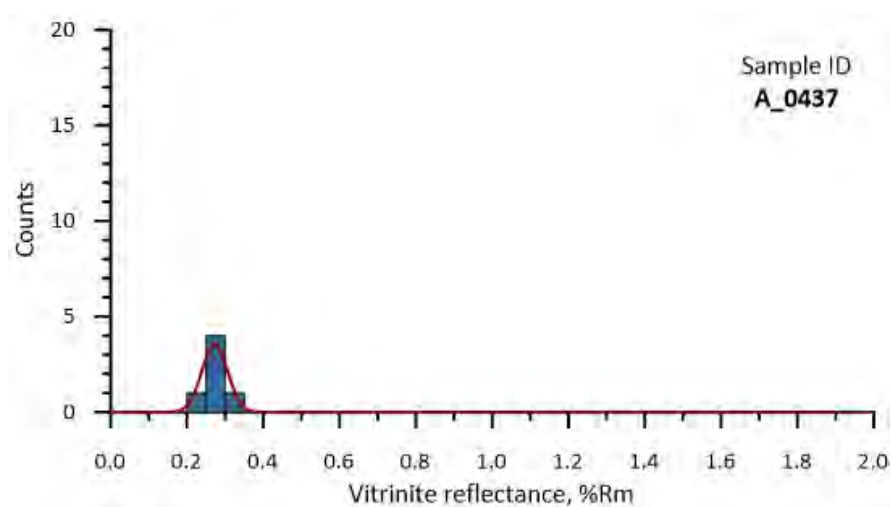
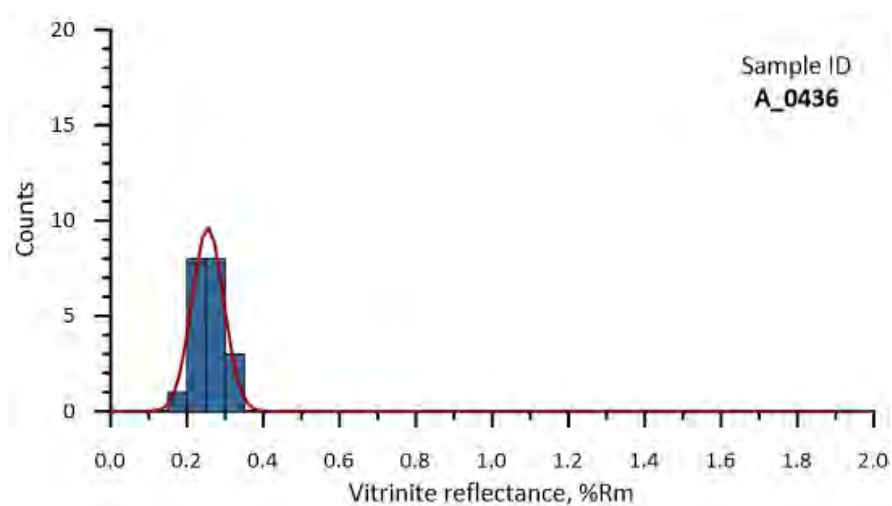
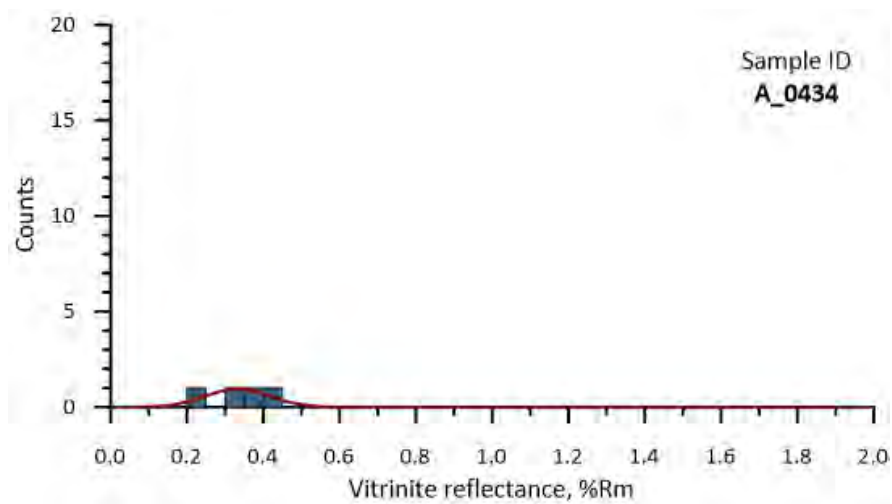


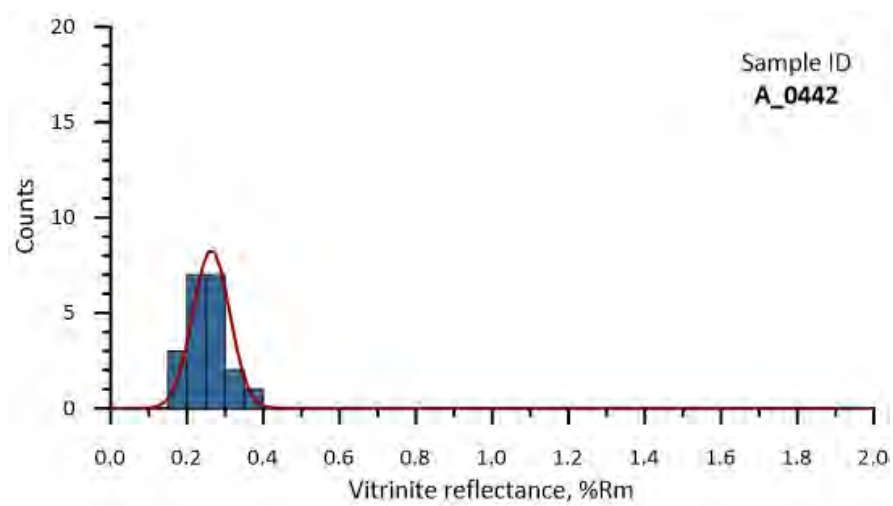
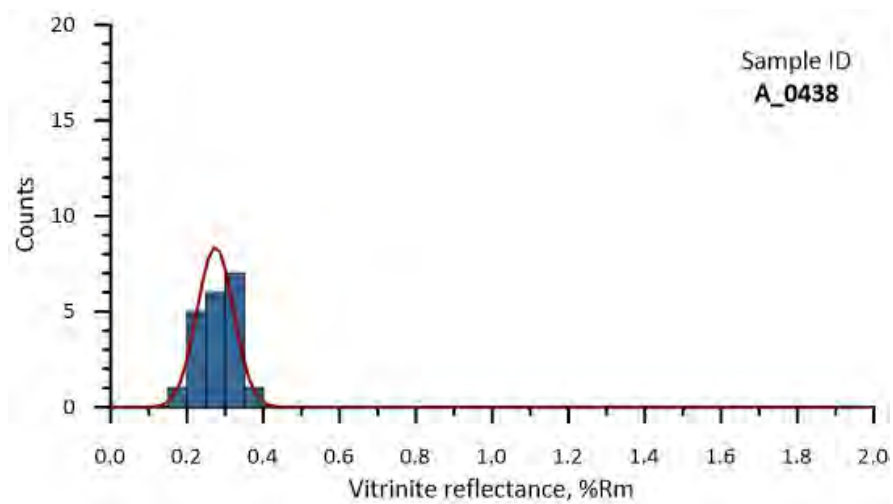


7933/04-U-03

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0432	7933/04-U-03	15.10	Tschemakfjellet Fm	Core	Bulk	Shale	0.23	0.03	10	Poor	----○	0.26
A_0433	7933/04-U-03	43.50	Tschemakfjellet Fm	Core	Bulk	Shale	0.23	0.03	10	Poor	----○	
A_0434	7933/04-U-03	54.07	Tschemakfjellet Fm	Core	Bulk	Shale	0.33	0.10	4	Poor	----○	
A_0435	7933/04-U-03	86.92	Tschemakfjellet Fm	Core	Bulk	Shale				Barren		
A_0436	7933/04-U-03	111.40	Tschemakfjellet Fm	Core	Bulk	Siltstone	0.26	0.04	20	Poor	○--○	
A_0437	7933/04-U-03	120.80	Tschemakfjellet Fm	Core	Bulk	Siltstone	0.27	0.04	6	Poor	○--○	
A_0438	7933/04-U-03	122.30	Tschemakfjellet Fm	Core	Bulk	Siltstone	0.27	0.05	20	Poor	○--○	
A_0439	7933/04-U-03	127.70	Tschemakfjellet Fm	Core	Bulk	Shale				Barren		
A_0440	7933/04-U-03	132.05	Tschemakfjellet Fm	Core	Bulk	Shale				No polish		
A_0441	7933/04-U-03	165.80	Tschemakfjellet Fm	Core	Bulk	Shale				No polish		
A_0442	7933/04-U-03	167.20	Tschemakfjellet Fm	Core	Bulk	Shale	0.26	0.05	20	Moderate	○○--○○	

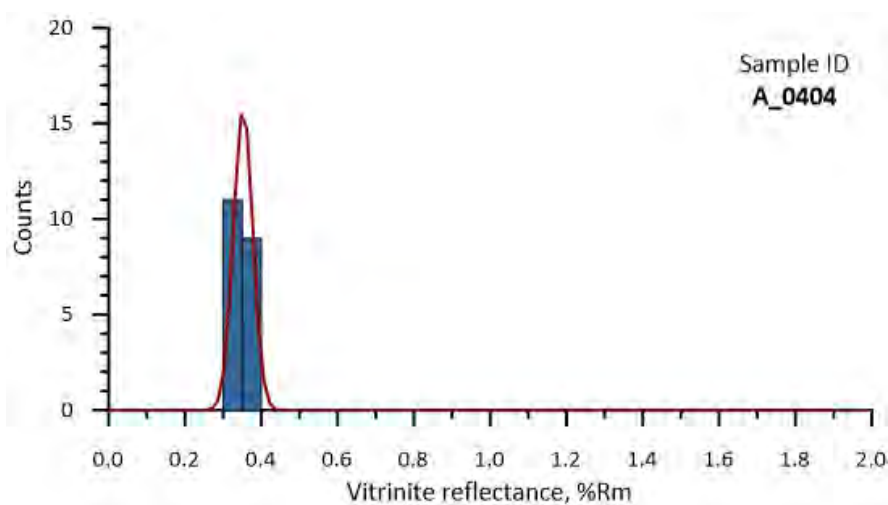
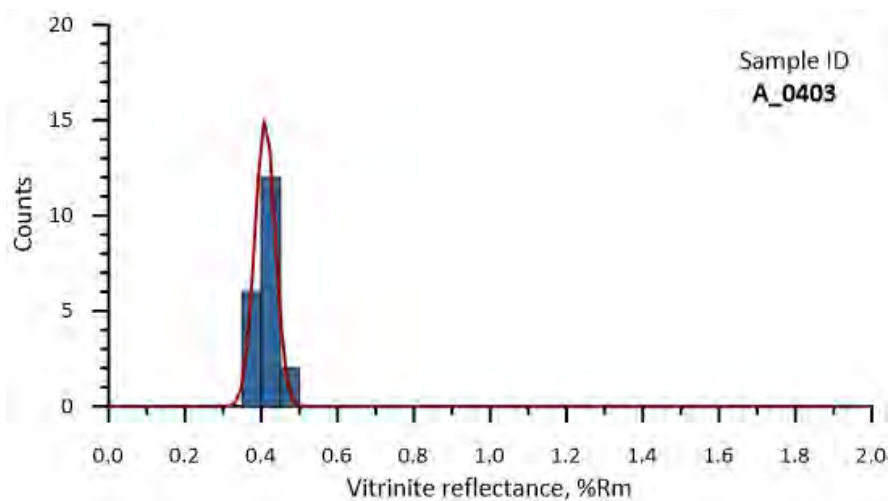


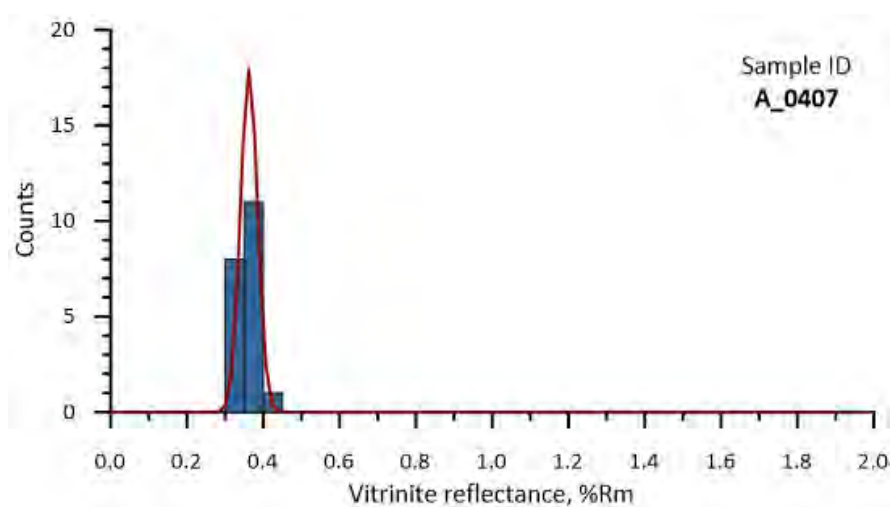
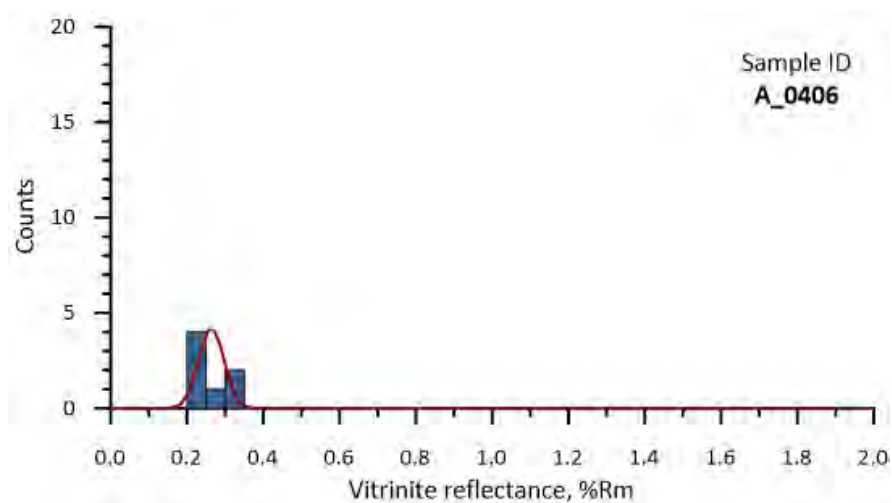
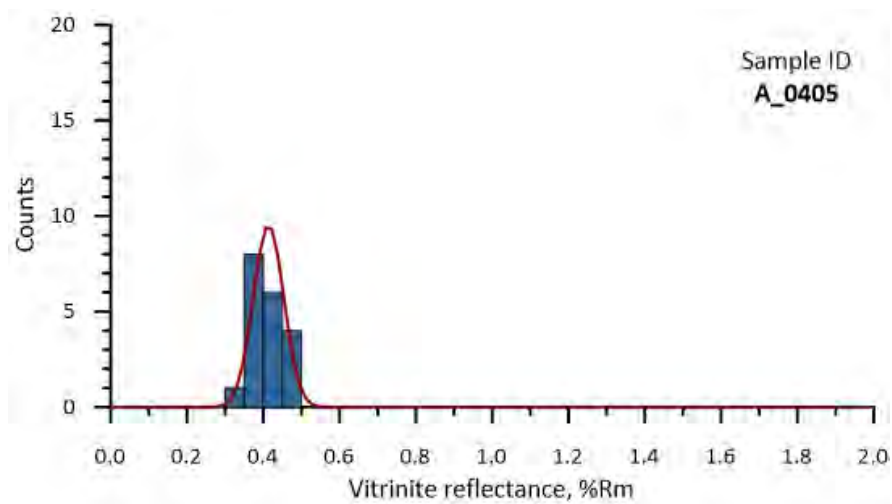


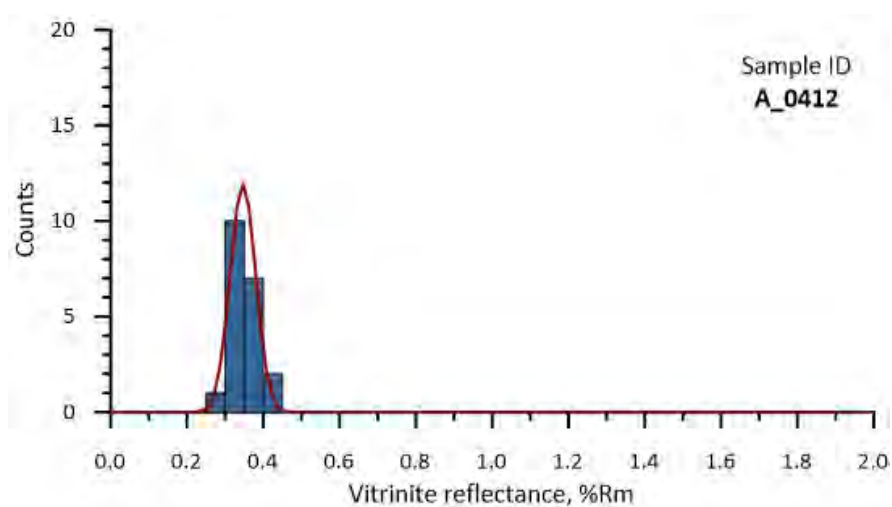
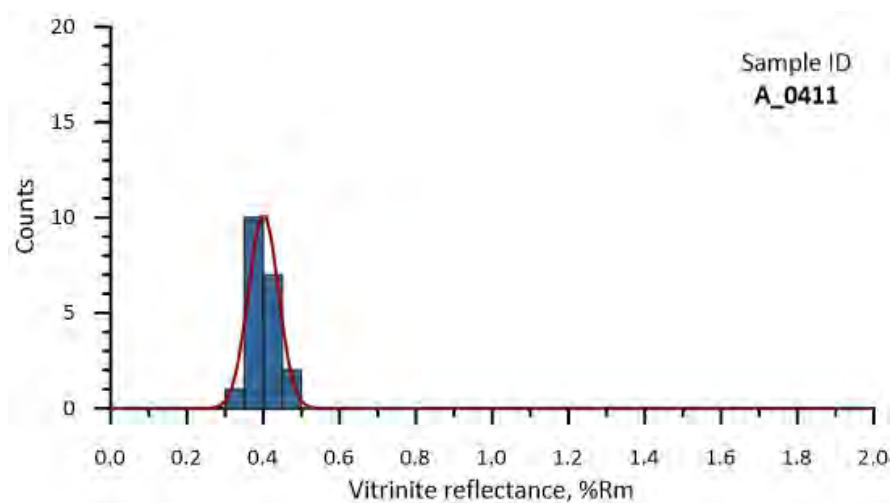
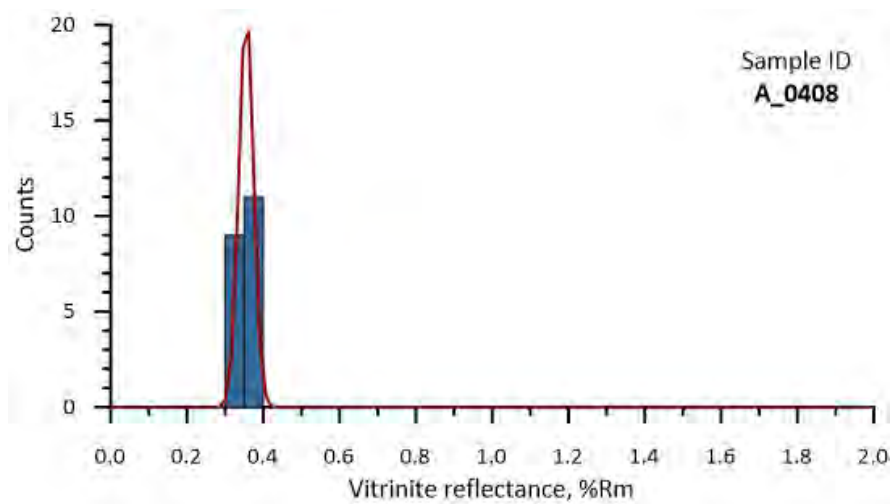


7934/06-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0403	7934/06-U-01	24.10	De Geerdalen Fm	Core	Bulk	Coal	0.41	0.03	20	Good	ooooo	0.37
A_0404	7934/06-U-01	33.85	De Geerdalen Fm	Core	Bulk	Coal	0.35	0.03	20	Good	ooooo	
A_0405	7934/06-U-01	42.70	De Geerdalen Fm	Core	Bulk	Shale	0.42	0.04	20	Moderate	oooo-	
A_0406	7934/06-U-01	73.40	De Geerdalen Fm	Core	Bulk	Siltstone	0.26	0.04	7	Poor	-o---	
A_0407	7934/06-U-01	73.65	De Geerdalen Fm	Core	Bulk	Coal	0.36	0.02	20	Good	ooooo	
A_0408	7934/06-U-01	73.80	De Geerdalen Fm	Core	Bulk	Coal	0.36	0.02	20	Good	ooooo	
A_0409	7934/06-U-01	107.00	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0410	7934/06-U-01	109.40	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0411	7934/06-U-01	150.30	De Geerdalen Fm	Core	Bulk	Sandstone w/coal	0.40	0.04	20	Good	ooooo	
A_0412	7934/06-U-01	178.10	De Geerdalen Fm	Core	Bulk	Coal	0.35	0.05	20	Good	ooooo	

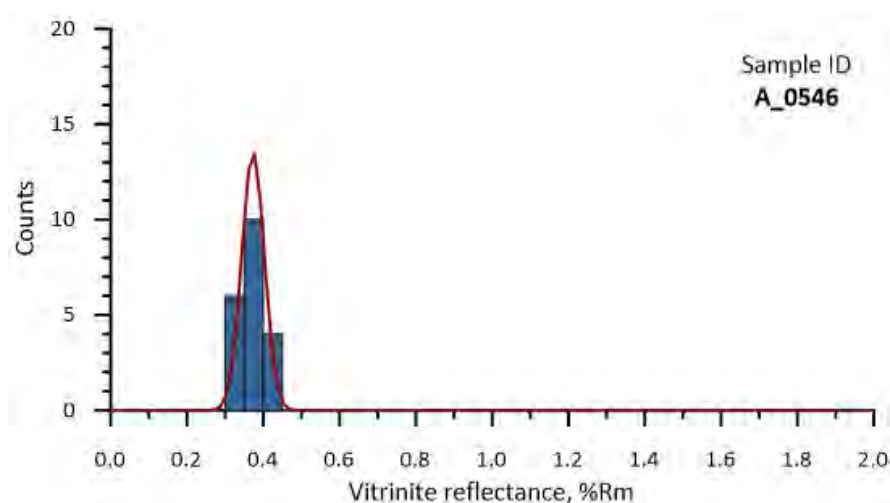


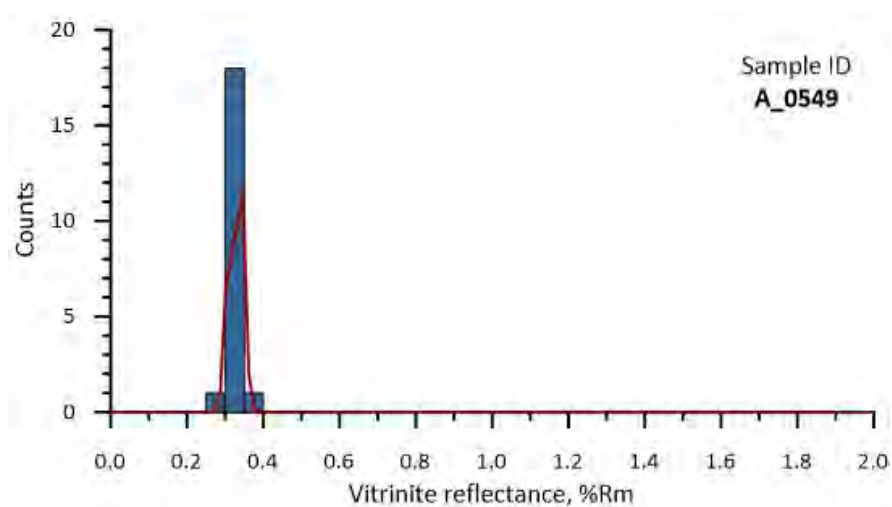
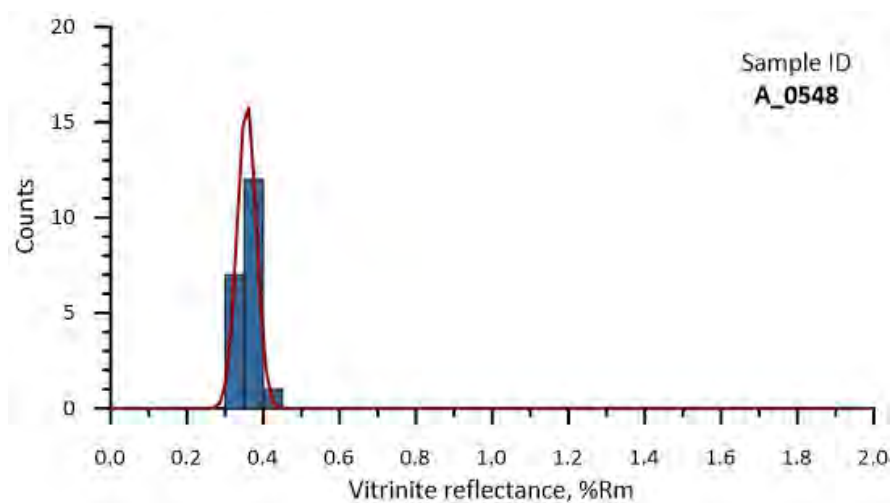
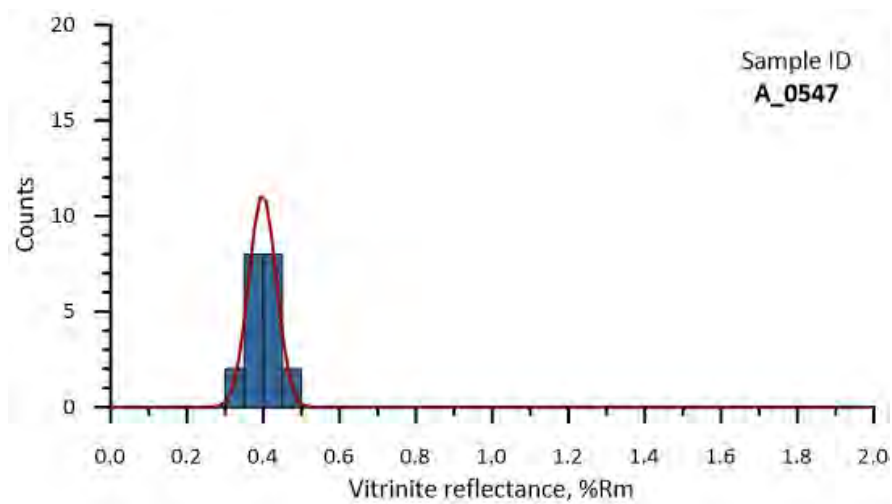


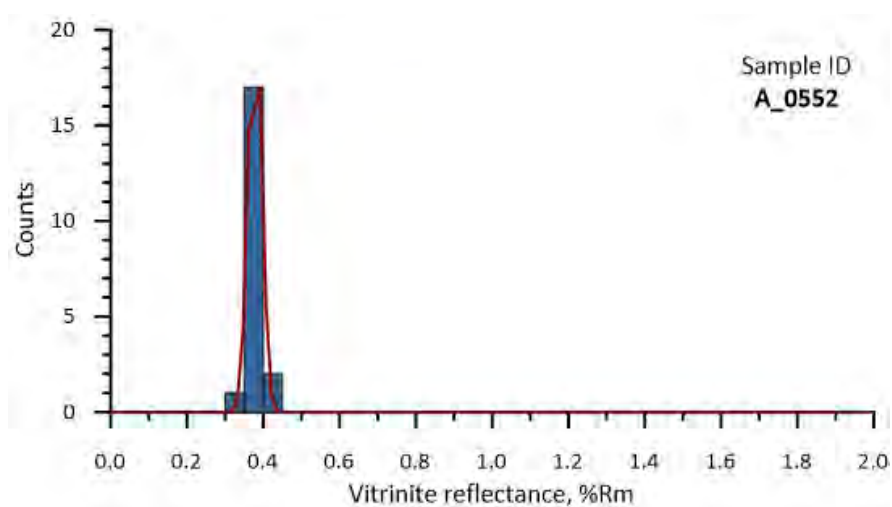
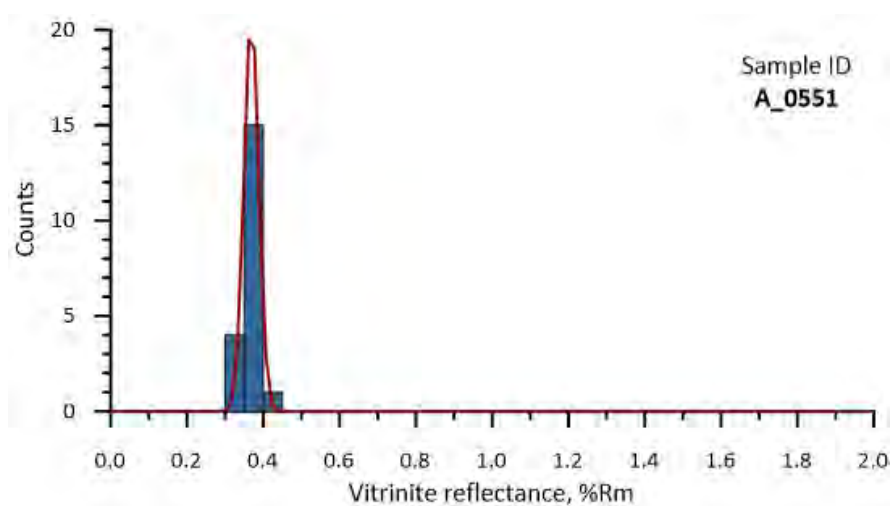
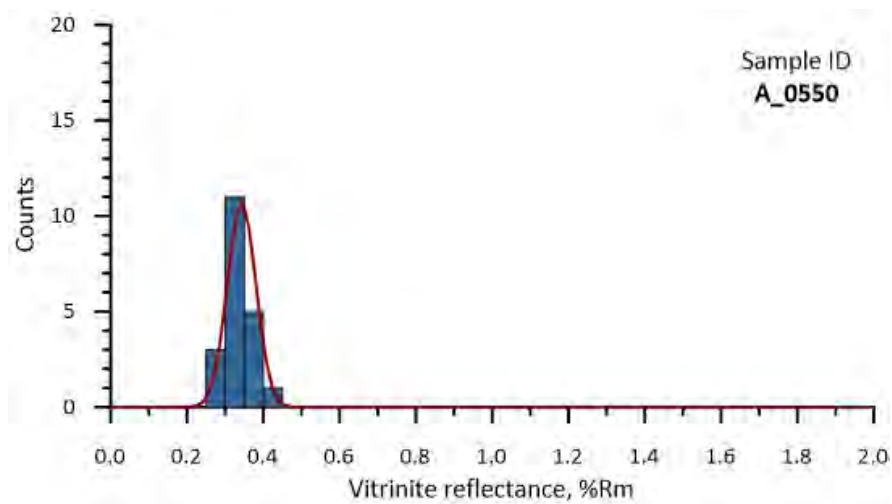


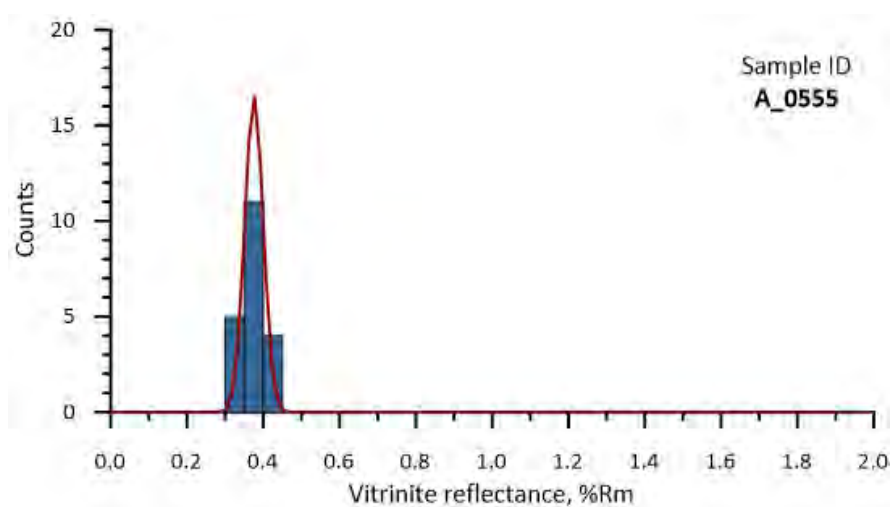
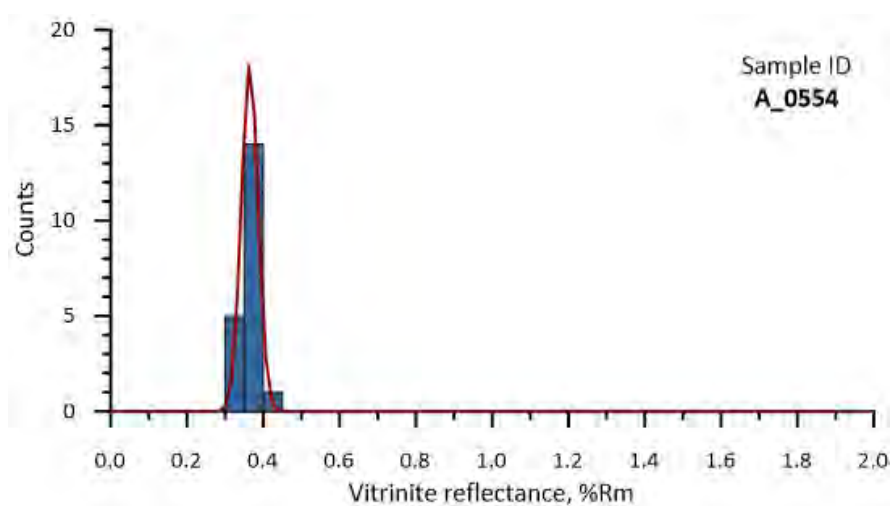
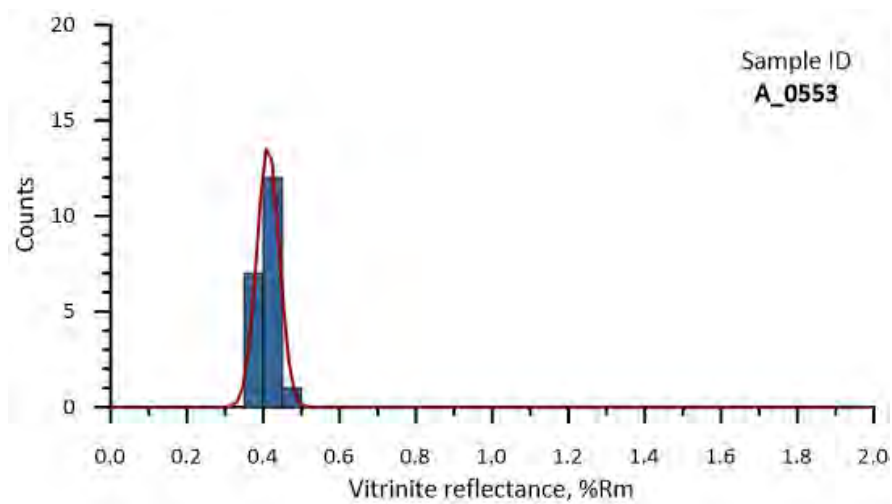
7934/06-U-02

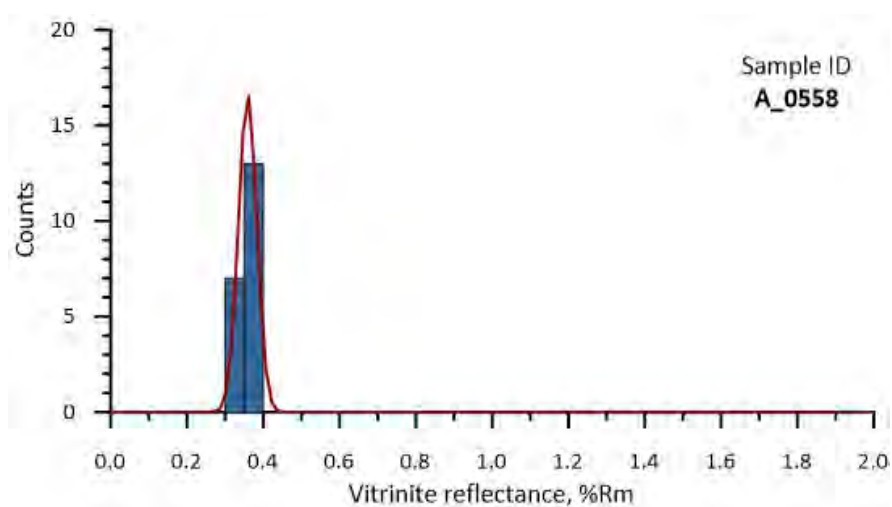
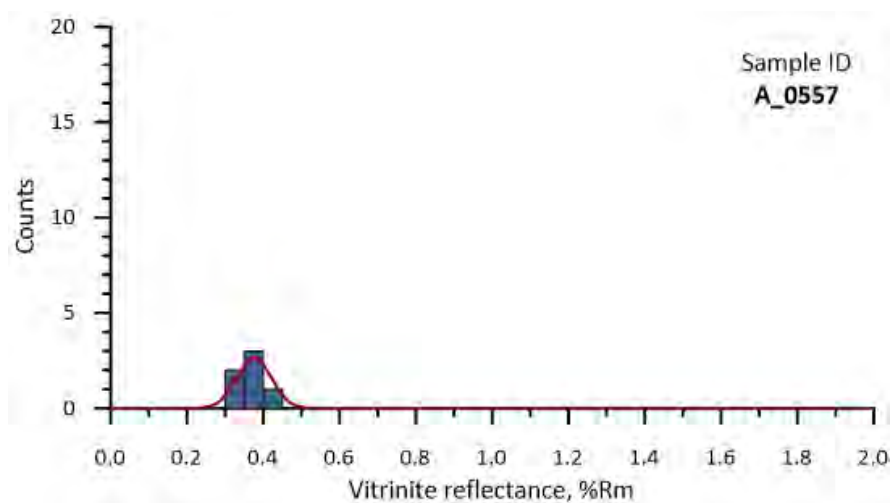
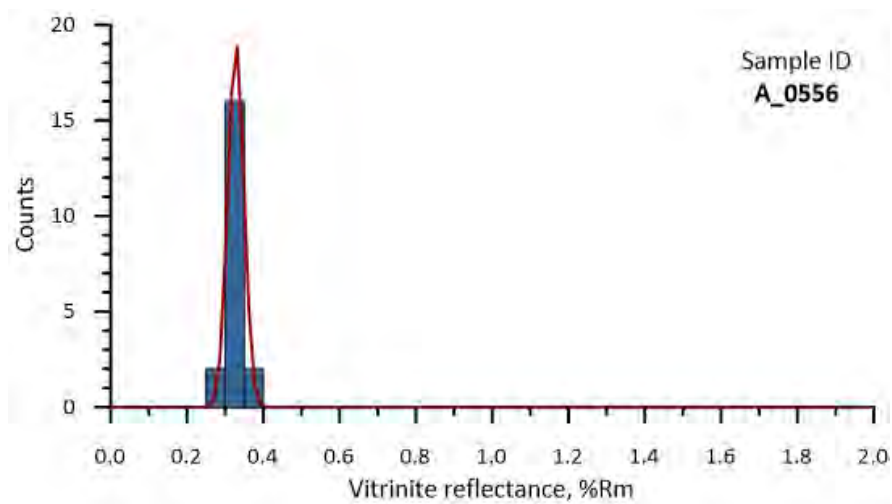
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0546	7934/06-U-02	21.99	De Geerdalen Fm	Core	Bulk	Coaly shale	0.37	0.03	20	Good	ooooo	0.36
A_0547	7934/06-U-02	44.29	De Geerdalen Fm	Core	Bulk	Coaly shale	0.40	0.04	20	Good	ooooo	
A_0548	7934/06-U-02	54.25	De Geerdalen Fm	Core	Bulk	Coal	0.36	0.03	20	Good	ooooo	
A_0549	7934/06-U-02	62.40	De Geerdalen Fm	Core	Bulk	Coal	0.33	0.02	20	Good	ooooo	
A_0550	7934/06-U-02	70.85	De Geerdalen Fm	Core	Bulk	Coal	0.34	0.04	20	Good	ooooo	
A_0551	7934/06-U-02	78.77	De Geerdalen Fm	Core	Bulk	Coal	0.37	0.02	20	Good	ooooo	
A_0552	7934/06-U-02	85.10	De Geerdalen Fm	Core	Bulk	Coal	0.38	0.02	20	Good	ooooo	
A_0553	7934/06-U-02	121.50	De Geerdalen Fm	Core	Bulk	Coal	0.41	0.03	20	Good	ooooo	
A_0554	7934/06-U-02	121.99	De Geerdalen Fm	Core	Bulk	Coal	0.36	0.02	20	Good	ooooo	
A_0555	7934/06-U-02	142.40	De Geerdalen Fm	Core	Bulk	Coal	0.38	0.03	20	Good	ooooo	
A_0556	7934/06-U-02	160.27	De Geerdalen Fm	Core	Bulk	Coal	0.33	0.02	20	Good	ooooo	
A_0557	7934/06-U-02	170.94	De Geerdalen Fm	Core	Bulk	Shale	0.38	0.05	6	Poor	~oo~o	
A_0558	7934/06-U-02	172.10	De Geerdalen Fm	Core	Bulk	Coal	0.36	0.03	20	Good	ooooo	
A_0559	7934/06-U-02	177.60	De Geerdalen Fm	Core	Bulk					No polish		
A_0560	7934/06-U-02	180.75	De Geerdalen Fm	Core	Bulk	Shale	0.30	0.04	20	Good	ooooo	
A_0561	7934/06-U-02	185.90	De Geerdalen Fm	Core	Bulk					No polish		
A_0562	7934/06-U-02	186.10	De Geerdalen Fm	Core	Bulk					No polish		

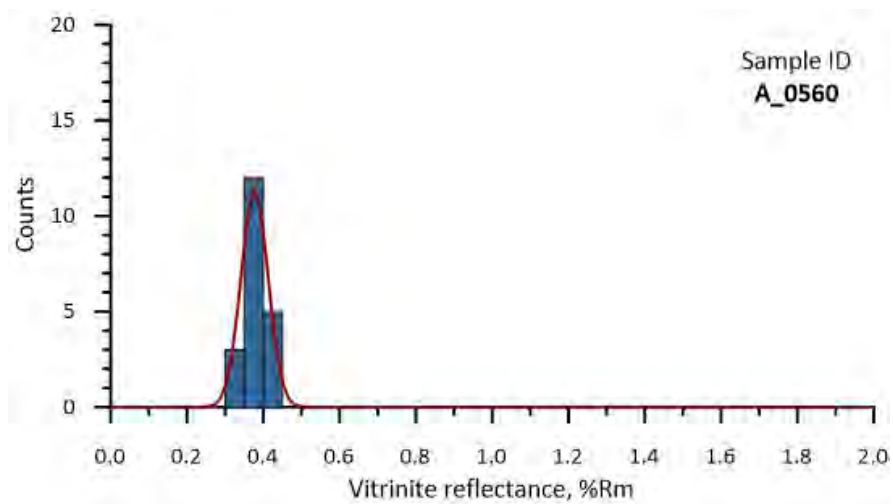






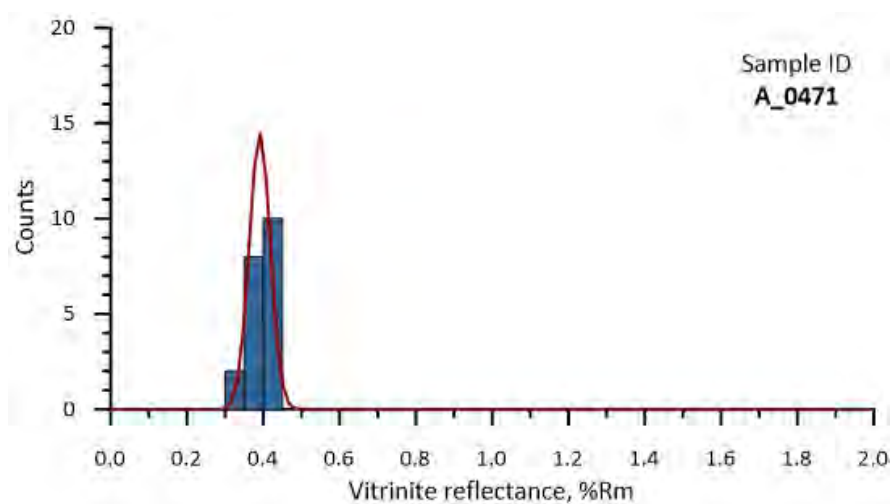
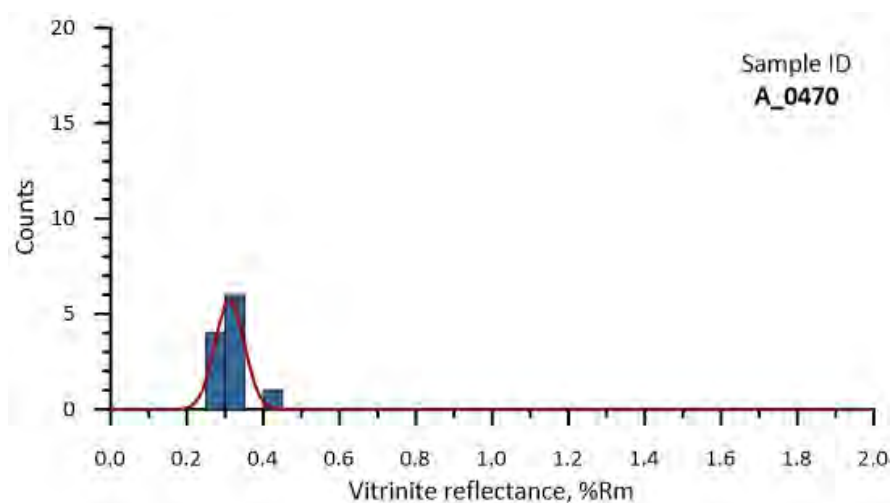






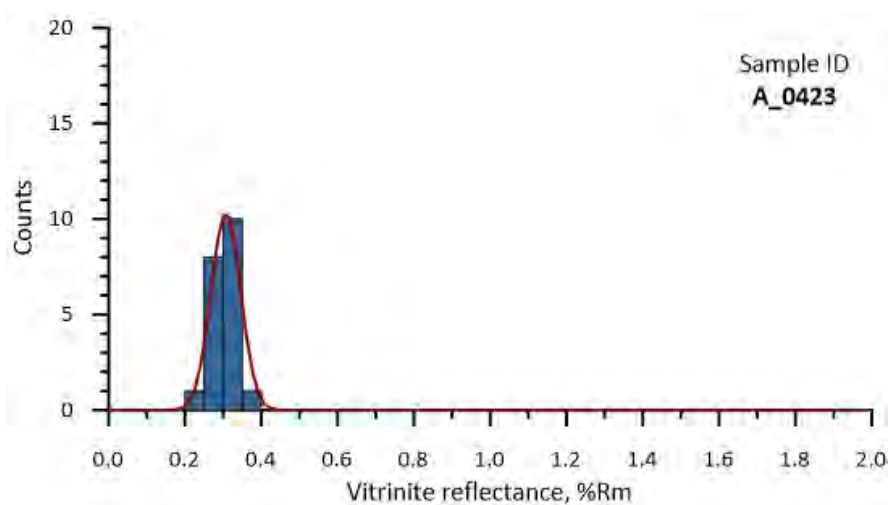
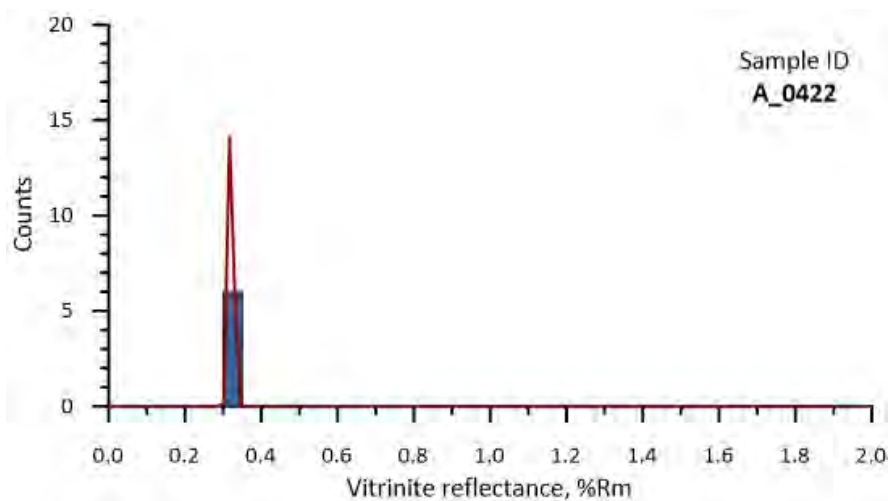
7934/08-U-01

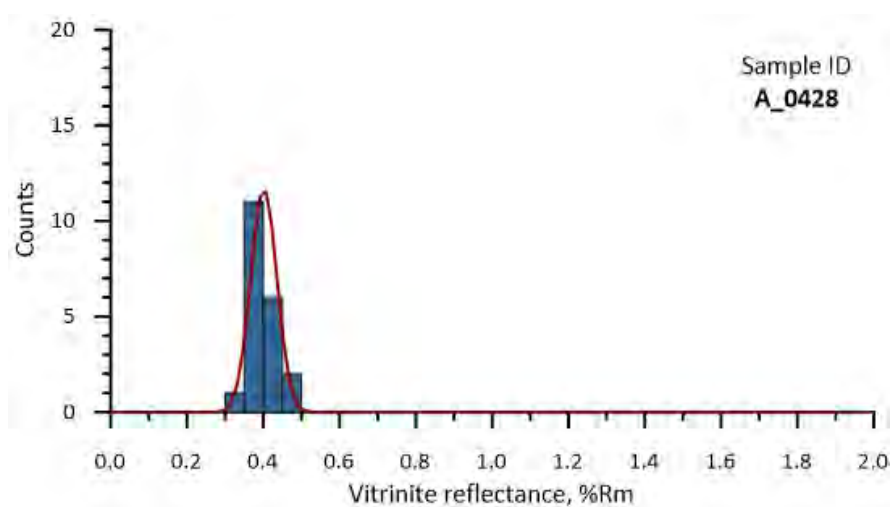
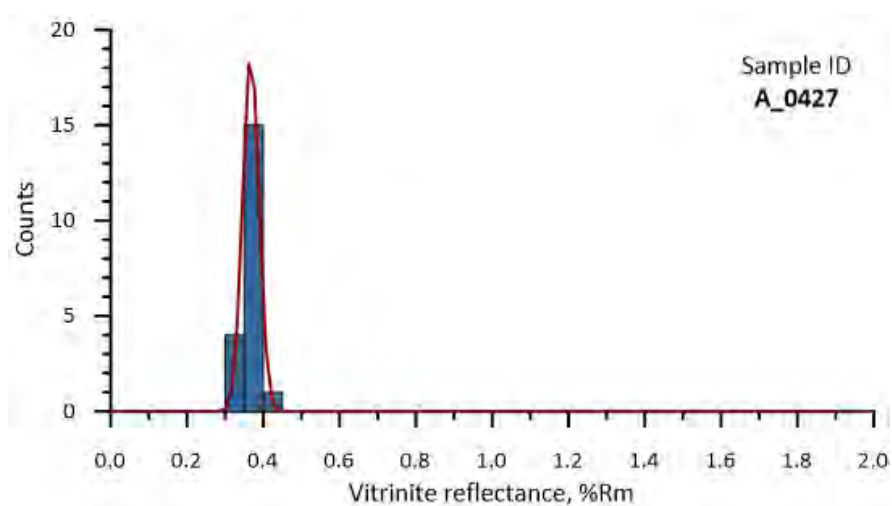
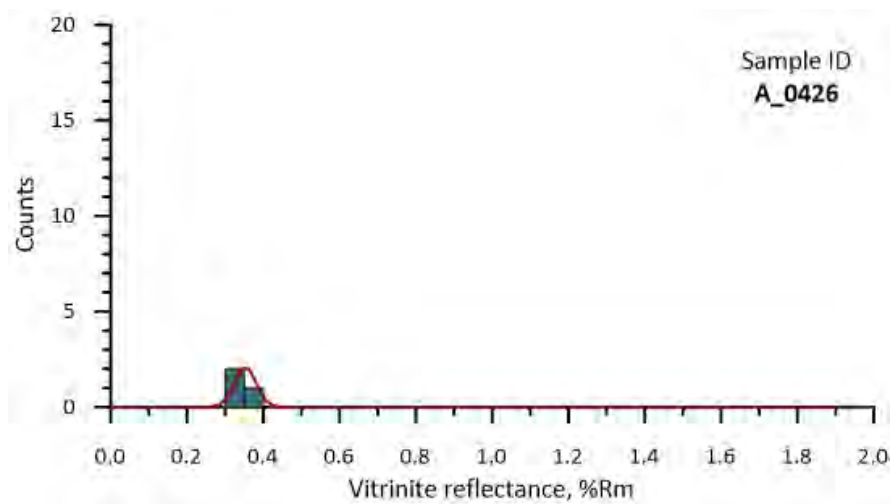
Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0462	7934/08-U-01	27.85		Core	Bulk	Shale				Barren		0.36
A_0463	7934/08-U-01	39.30		Core	Bulk	Shale				No polish		
A_0464	7934/08-U-01	49.40		Core	Bulk	Shale				Barren		
A_0465	7934/08-U-01	80.55		Core	Bulk	Shale				No polish		
A_0466	7934/08-U-01	84.35		Core	Bulk	Shale				No polish		
A_0467	7934/08-U-01	122.60	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0468	7934/08-U-01	126.45	De Geerdalen Fm	Core	Bulk	Shale				No polish		
A_0469	7934/08-U-01	129.85	De Geerdalen Fm	Core	Bulk	Shale				No polish		
A_0470	7934/08-U-01	154.95	De Geerdalen Fm	Core	Bulk	Shale	0.31	0.04	11	Poor	---+---	
A_0471	7934/08-U-01	166.62	De Geerdalen Fm	Core	Bulk	Shale and Coal	0.39	0.03	20	Good	ooooo	

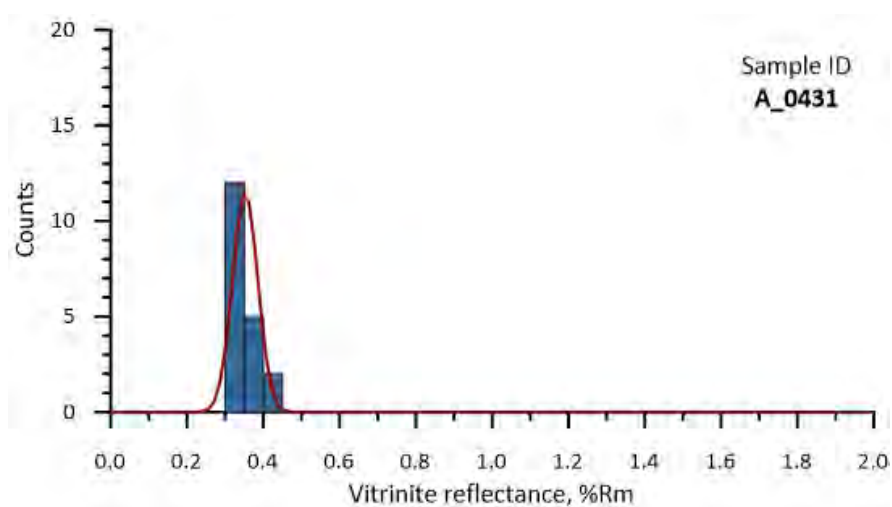
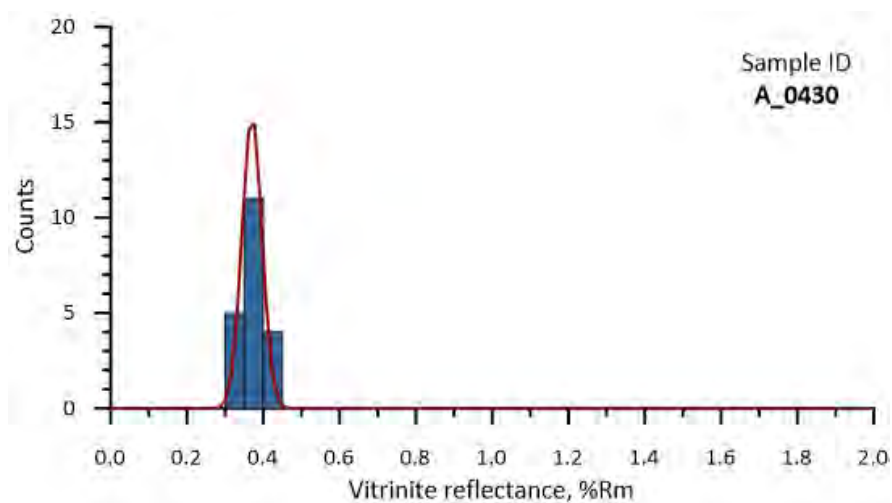
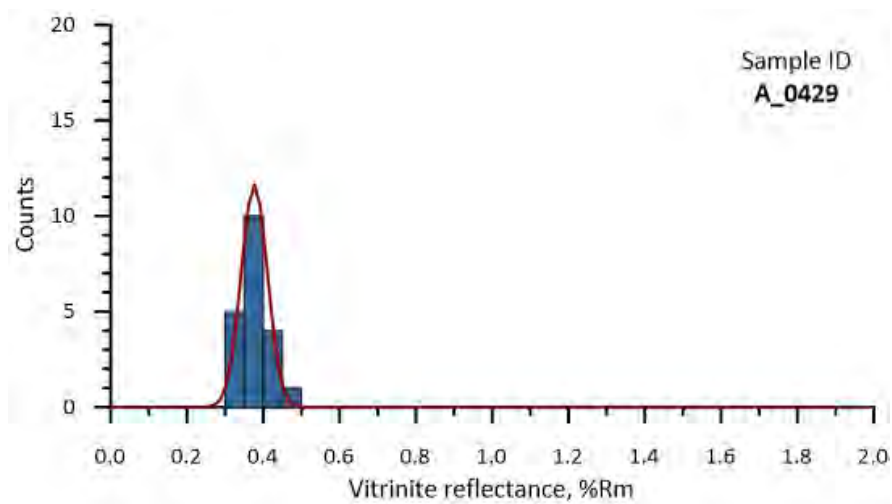


7934/09-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0422	7934/09-U-01	40.55	De Geerdalen Fm	Core	Bulk	Sandstone	0.32	0.01	6	Moderate	-oooo	0.36
A_0423	7934/09-U-01	43.50	De Geerdalen Fm	Core	Bulk	Siltstone	0.31	0.04	20	Moderate	oooo-o	
A_0424	7934/09-U-01	68.20	De Geerdalen Fm	Core	Bulk	Siltstone				Barren		
A_0425	7934/09-U-01	83.10	De Geerdalen Fm	Core	Bulk	Shale				Barren		
A_0426	7934/09-U-01	83.45	De Geerdalen Fm	Core	Bulk	Shale	0.35	0.04	3	Poor	-±±--	
A_0427	7934/09-U-01	85.80	De Geerdalen Fm	Core	Bulk	Coal	0.37	0.02	20	Good	ooooo	
A_0428	7934/09-U-01	86.40	De Geerdalen Fm	Core	Bulk	Coal	0.40	0.04	20	Good	ooooo	
A_0429	7934/09-U-01	92.20	De Geerdalen Fm	Core	Bulk	Coaly shale	0.38	0.04	20	Good	ooooo	
A_0430	7934/09-U-01	134.90	De Geerdalen Fm	Core	Bulk	Coaly shale	0.37	0.03	20	Good	ooooo	
A_0431	7934/09-U-01	138.60	De Geerdalen Fm	Core	Bulk	Coaly shale	0.35	0.03	20	Good	ooooo	







8034/05-U-01

Torena AS Sample ID	Borehole	Depth m	Formation	Sample type	Prep.	Lithology	%Rm mean	Std. Dev.	N	Confidence	Confidence in detail	Average of all samples %Rm
A_0573	8034/05-U-01	47.90	Permian	Core	Bulk	Sandstone				Barren		No data
A_0574	8034/05-U-01	48.30	Permian	Core	Bulk	Sandstone				Barren		
A_0575	8034/05-U-01	48.50	Permian	Core	Bulk	Sandstone				Barren		
A_0576	8034/05-U-01	48.75	Permian	Core	Bulk					No polish		
A_0577	8034/05-U-01	49.12	Permian	Core	Bulk					No polish		
A_0578	8034/05-U-01	49.32	Permian	Core	Bulk					No polish		
A_0579	8034/05-U-01	49.45	Permian	Core	Bulk					No polish		
A_0580	8034/05-U-01	49.50	Permian	Core	Bulk					No polish		
A_0581	8034/05-U-01	51.73	Permian	Core	Bulk					No polish		
A_0582	8034/05-U-01	57.85	Permian	Core	Bulk					No polish		

TORENA  AS

Nedre Rælingsvei 589, 2009 Nordby, Norway

Email: torbjorn.throndsen@torena.no

Tel: (+47) 9075 8861

www.torena.no

