

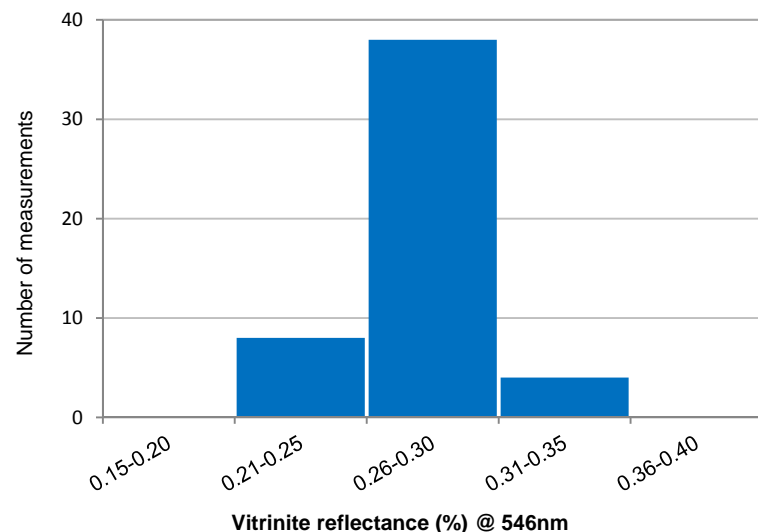
## Vitrinite Reflectance and MOA

**Project: BH-60425**

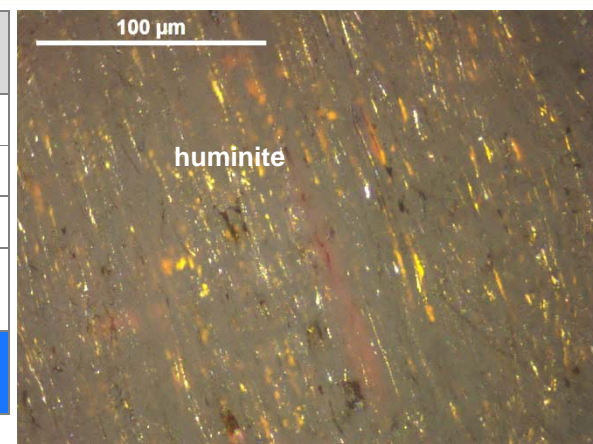
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 4450

**3402749524**



3402749524	Depth = 4450-4540
Minimum R <sub>o</sub> (%)	0.24
Maximum R <sub>o</sub> (%)	0.33
Number of points	50
Standard deviation	0.020
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.27</b>



**Comments:** The sample is composed almost exclusively of gelified woody material (huminite, see photo) with preserved cell structure. There are rare spores present. Some cells are filled with pyrite. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.27%. There are also quartz-rich fragments that do not have organic matter in them. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents lignite stage.

### Ordered R<sub>o random</sub> Values

0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26
0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
0.29	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.33	0.33

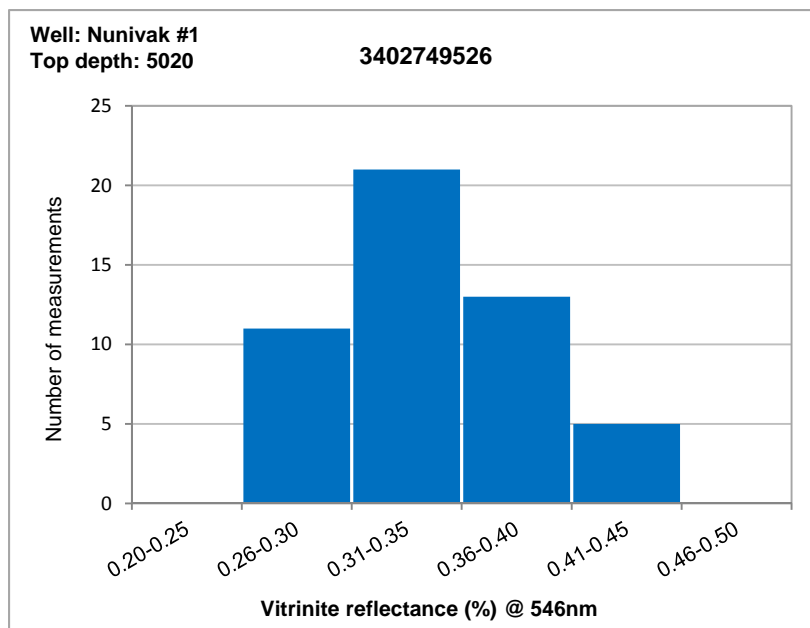
### Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	trace	trace	2	98	trace	0	2	2	98	yellow	No alginite

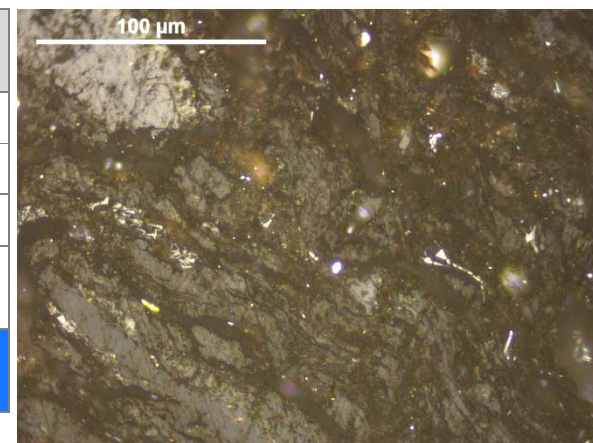
## Vitrinite Reflectance and MOA

**Project: BH-60425**

**Well: Nunivak #1**



3402749526	Depth = 5020-5080
Minimum R <sub>o</sub> (%)	0.27
Maximum R <sub>o</sub> (%)	0.43
Number of points	50
Standard deviation	0.044
Mean R <sub>o</sub> value of vitrinite (%)	0.34



**Comments:** The sample is composed of low rank coal fragments (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented by ulminite and attrinite. Liptinite is represented by sporinite and suberinite. Inertinite is relatively common and represented by semifusinite, inertodetrinite, and sporadic funginite. Pyrite is rare and occurs as filling of cell walls, like in the previous sample. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.34%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents lignite stage.

### Ordered R<sub>o</sub> random Values

0.27	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30
0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32
0.32	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34
0.35	0.35	0.36	0.36	0.37	0.37	0.38	0.38	0.38	0.39
0.39	0.39	0.40	0.40	0.40	0.42	0.42	0.42	0.42	0.43

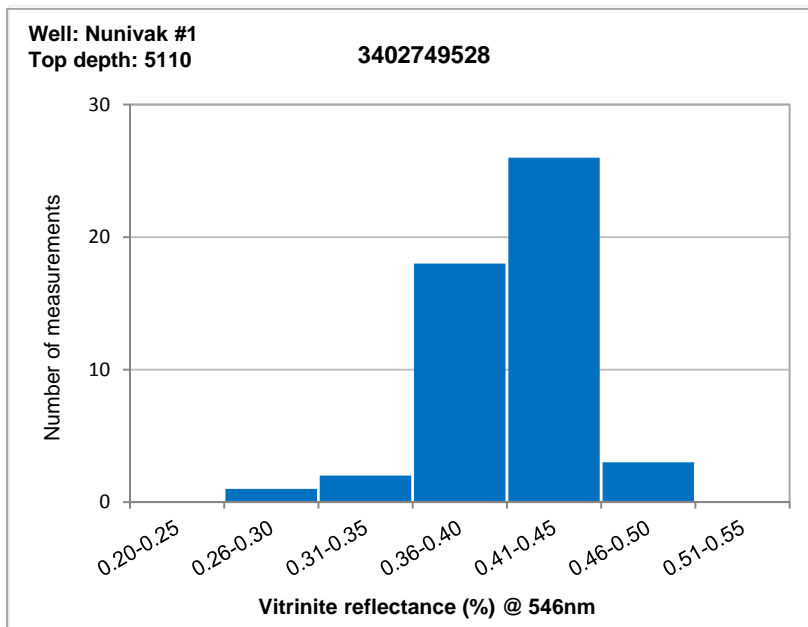
### Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	7	85	8	0	7	7	85	Yellow orange	No alginite

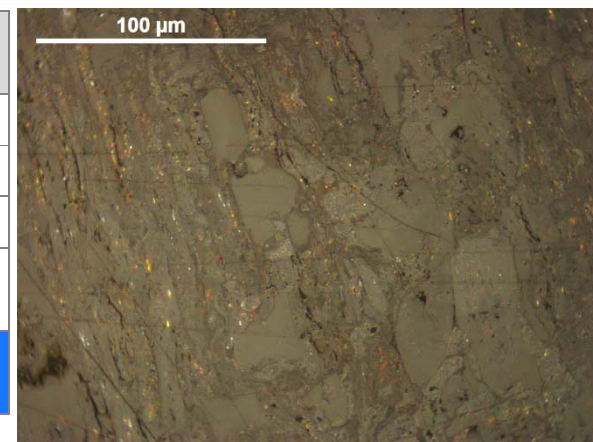
## Vitrinite Reflectance and MOA

**Project: BH-60425**

**Well: Nunivak #1**



3402749528	Depth = 5110-5140
Minimum R <sub>o</sub> (%)	0.30
Maximum R <sub>o</sub> (%)	0.47
Number of points	50
Standard deviation	0.035
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.41</b>



**Comments:** The sample is composed of low rank coal fragments (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented by ulminite, corpohuminites, and densinites. Liptinite is represented by sporinite and suberinites. Inertinite is rare and represented by inertodetrinite, and sporadic funginites. Pyrite is rare. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.41%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

### Ordered R<sub>o random</sub> Values

0.30	0.31	0.32	0.37	0.37	0.38	0.39	0.39	0.39	0.39
0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40
0.40	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.42	0.42
0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.44
0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.46	0.46	0.47

### Whole rock visual maceral estimates (volume %, mineral matter free basis)

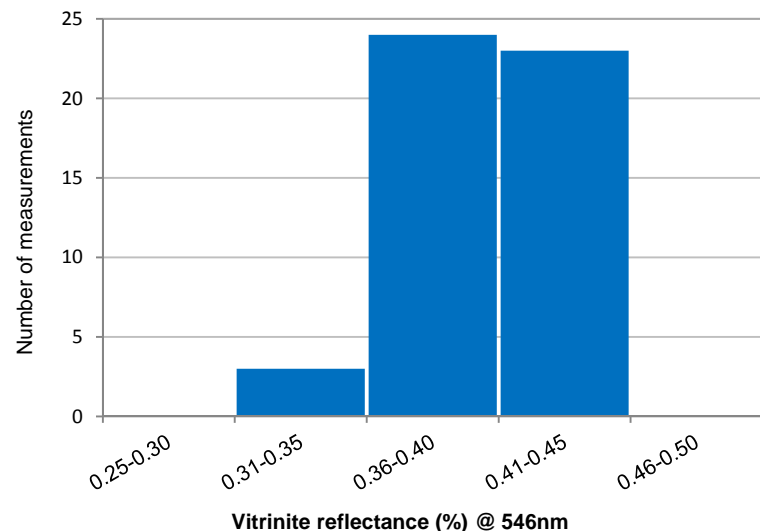
Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	8	90	2	0	8	8	90	Yellow orange	No alginite

**Project: BH-60425**

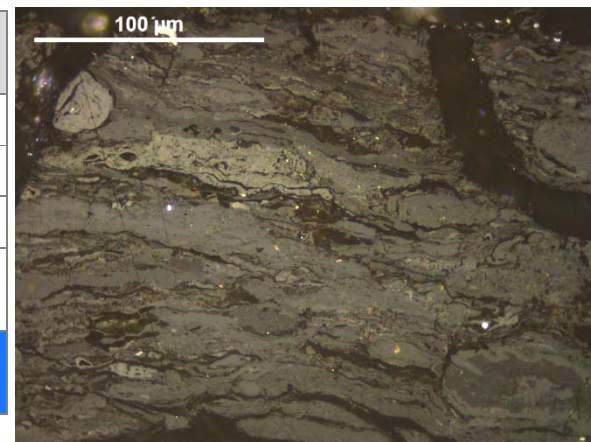
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 5380

**3402749530**



3402749530	Depth = 5380-5410
Minimum R <sub>o</sub> (%)	0.33
Maximum R <sub>o</sub> (%)	0.45
Number of points	50
Standard deviation	0.026
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.40</b>



**Comments:** The sample is composed of low rank coal fragments (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented by collotelinite and collodetrinite. Liptinite is represented by sporinite and suberinite. Inertinite is rare and represented by semifusinite and inertodetrinite. Pyrite is rare. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.40%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

## Ordered R<sub>o</sub> random Values

0.33	0.34	0.35	0.36	0.37	0.37	0.37	0.38	0.38	0.38
0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40
0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41
0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.42
0.42	0.42	0.43	0.43	0.43	0.43	0.44	0.45	0.45	0.45

## Whole rock visual maceral estimates (volume %, mineral matter free basis)

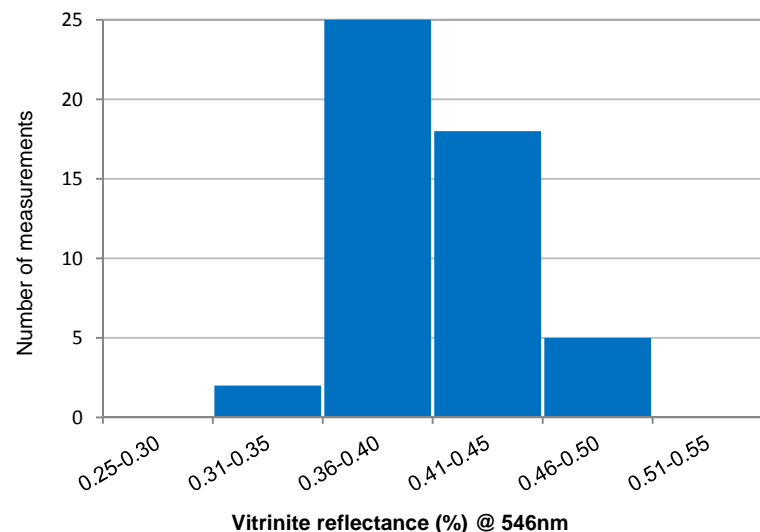
Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	10	85	5	0	10	10	85	Yellow orange	No alginite

**Project: BH-60425**

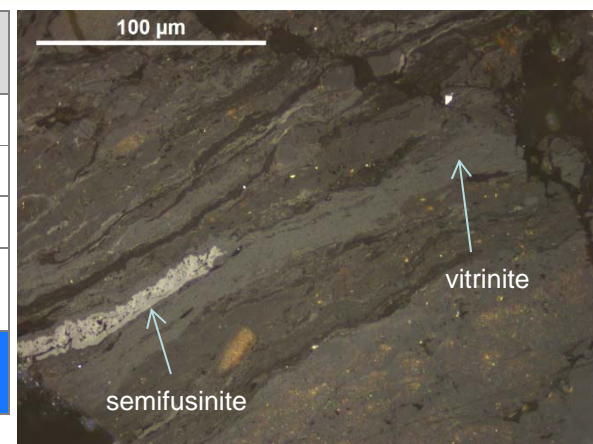
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 5560

**3402749532**



3402749532	Depth = 5560-5590
Minimum R <sub>o</sub> (%)	0.35
Maximum R <sub>o</sub> (%)	0.48
Number of points	50
Standard deviation	0.030
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.41</b>



**Comments:** The sample is composed of low rank coal fragments (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented by collotelinite and collodetrinite. Liptinite is common and represented by sporinite, cutinite, and suberinite. Inertinite is rare and represented by semifusinite and inertodetrinite. Pyrite is rare. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.41%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

## Ordered R<sub>o</sub> random Values

0.35	0.35	0.36	0.37	0.37	0.37	0.38	0.38	0.38	0.38
0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.40	0.40
0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41
0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.43	0.43
0.43	0.43	0.44	0.44	0.45	0.46	0.46	0.46	0.46	0.48

## Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	15	82	3	0	15	15	82	Yellow orange	No alginite



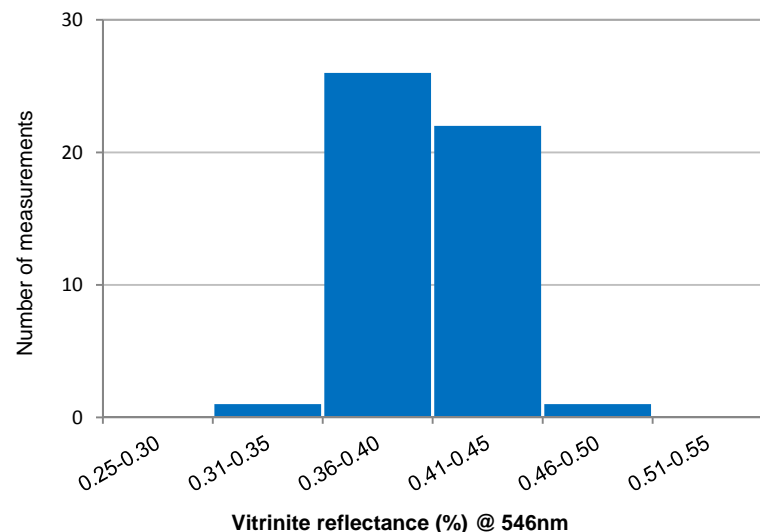
## Vitrinite Reflectance and MOA

**Project: BH-60425**

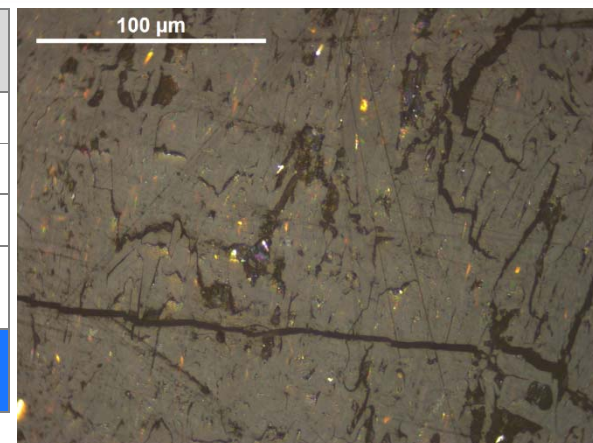
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 5740

**3402749534**



3402749534	Depth = 5740-5770
Minimum R <sub>o</sub> (%)	0.35
Maximum R <sub>o</sub> (%)	0.46
Number of points	50
Standard deviation	0.025
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.40</b>



**Comments:** The sample is composed of low rank coal fragments (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented by collotelinite and collodetrinite. Liptinite is represented by abundant sporinite and suberinite. Inertinite is rare and represented by fusinite and inertodetrinite. Pyrite is rare. There are also common quartz grains. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.40%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

### Ordered R<sub>o</sub> random Values

0.35	0.36	0.36	0.36	0.37	0.37	0.38	0.38	0.38	0.38
0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40
0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41
0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45	0.46

### Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	20	78	2	0	20	20	78	yellow orange	No alginite

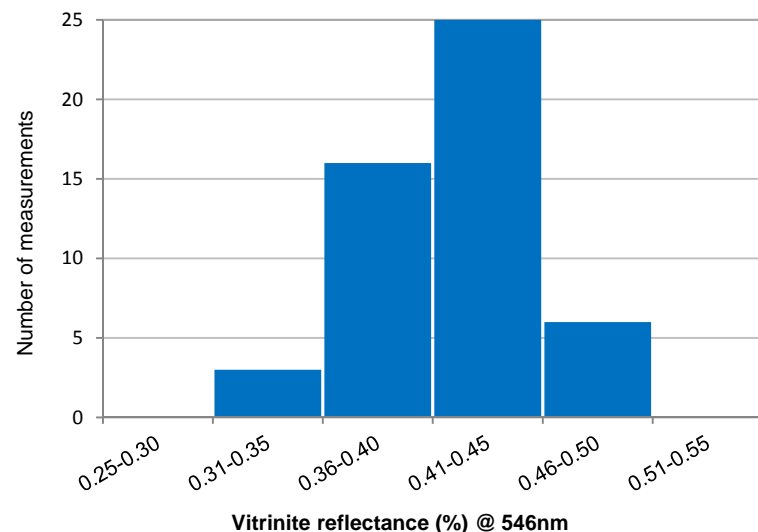
## Vitrinite Reflectance and MOA

**Project: BH-60425**

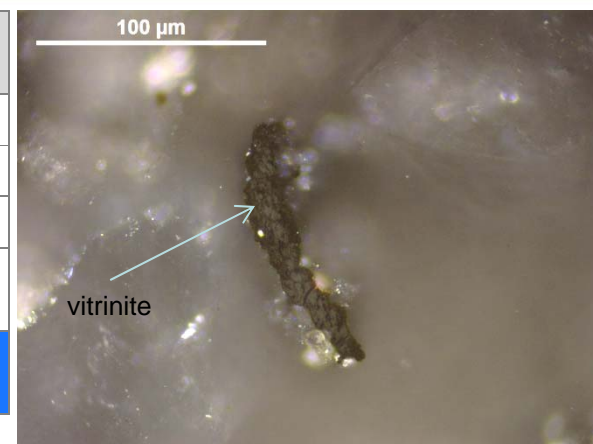
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 5830

**3402749536**



3402749536	Depth = 5830-5860
Minimum R <sub>o</sub> (%)	0.33
Maximum R <sub>o</sub> (%)	0.47
Number of points	50
Standard deviation	0.036
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.41</b>



**Comments:** The sample is composed quartz-rich fragments with sporadic organic matter (see photo), carbonaceous shale with vitrinite particles, and low rank coal fragments, some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates among organic matter types. Liptinite is represented by sporinite and suberinite. Inertinite is rare and represented by inertodetrinite and sporadic funginite. Pyrite is rare. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.41%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

### Ordered R<sub>o random</sub> Values

0.33	0.33	0.34	0.36	0.37	0.37	0.37	0.37	0.38	0.38
0.38	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.41
0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.43	0.43
0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.44
0.44	0.44	0.45	0.45	0.46	0.46	0.46	0.47	0.47	0.47

### Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	10	88	2	0	10	10	88	Yellow orange	No alginite

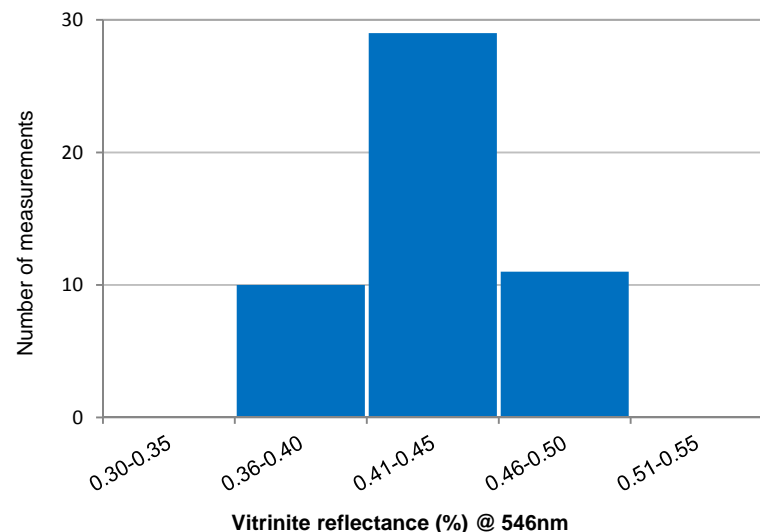
## Vitrinite Reflectance and MOA

**Project: BH-60425**

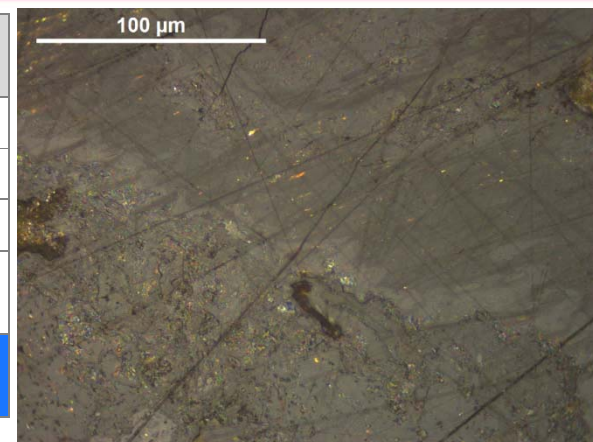
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 6010

**3402749538**



3402749538	Depth = 6010-6040
Minimum R <sub>o</sub> (%)	0.37
Maximum R <sub>o</sub> (%)	0.50
Number of points	50
Standard deviation	0.030
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.43</b>



**Comments:** The sample is composed of low rank coal fragments (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented by collotelinite and collodetrinite. Liptinite is represented by sporinite, cutinite, and suberinite. Inertinite is rare and represented by fusinite, semifusinite, and inertodetrinite. Pyrite is rare. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.43%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

### Ordered R<sub>o random</sub> Values

0.37	0.38	0.38	0.39	0.39	0.39	0.40	0.40	0.40	0.40
0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.43	0.43
0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44
0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.46
0.46	0.46	0.46	0.46	0.47	0.47	0.48	0.48	0.48	0.50

### Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	14	80	6	0	14	14	80	Yellow orange	No alginite



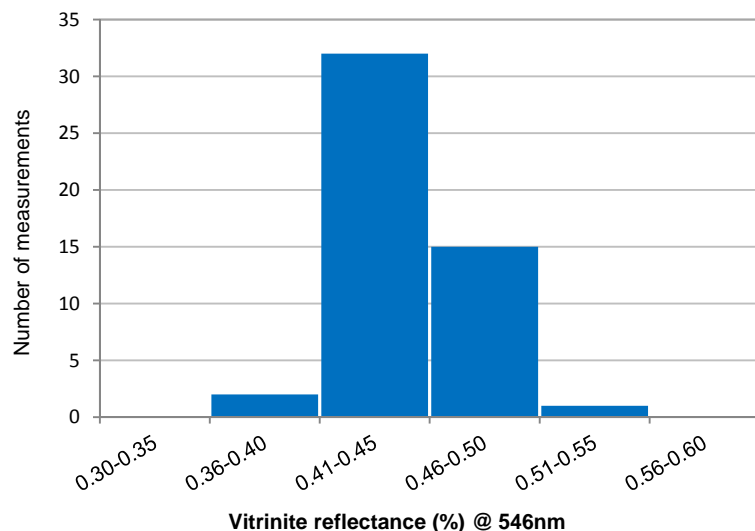
## Vitrinite Reflectance and MOA

**Project: BH-60425**

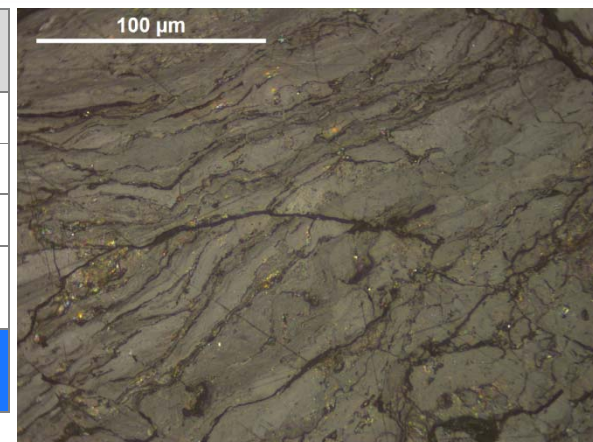
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 6910

**3402749540**



3402749540	Depth = 6910-6940
Minimum R <sub>o</sub> (%)	0.40
Maximum R <sub>o</sub> (%)	0.51
Number of points	50
Standard deviation	0.023
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.44</b>



**Comments:** The sample is composed of low rank coal fragment (see photo), some of which are enriched in mineral matter, dominantly clays. Vitrinite (huminites) dominates and is represented dominantly by ulminite and collodetrinite. Liptinite is represented by sporinite, cutinite, and abundant suberinite. Inertinite is rare. Pyrite is sporadic. Based on 50 measurements, the average R<sub>o</sub> of vitrinite is 0.44%. Vitrinite reflectance values indicate that the organic matter is immature. In terms of coal rank, the organic matter represents subbituminous stage.

### Ordered R<sub>o random</sub> Values

0.40	0.40	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42
0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.43	0.43
0.44	0.44	0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.45
0.45	0.45	0.45	0.45	0.46	0.46	0.46	0.46	0.46	0.46
0.46	0.46	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.51

### Whole rock visual maceral estimates (volume %, mineral matter free basis)

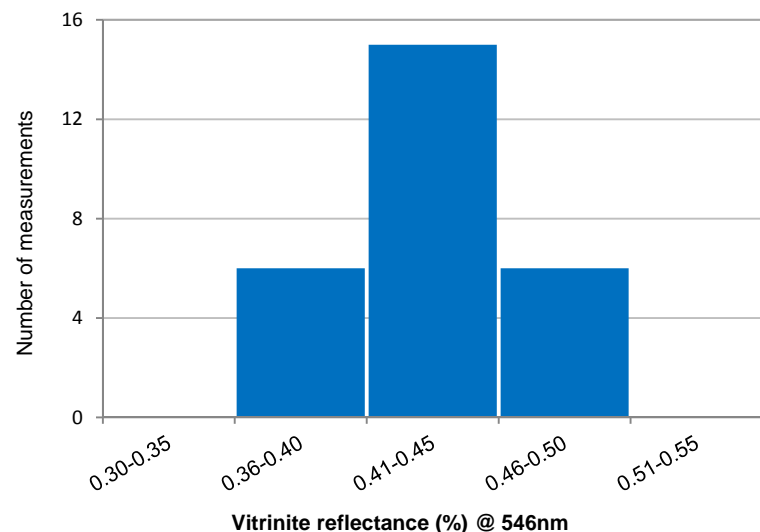
Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	0	0	15	82	3	0	15	15	82	Yellow orange	No alginite

**Project: BH-60425**

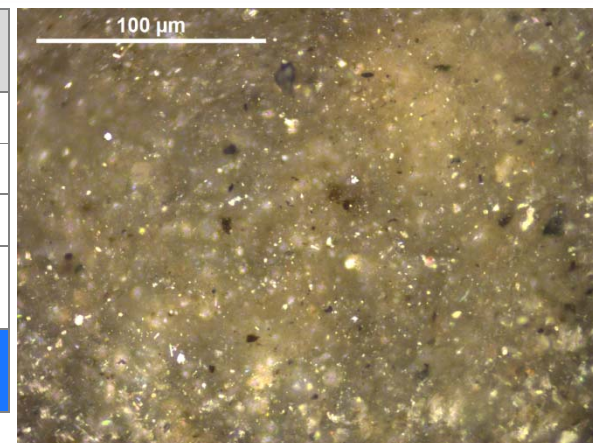
**Well: Nunivak #1**

Well: Nunivak #1  
Top depth: 6910

3402749542



3402749542	Depth = 6910-6940
Minimum R <sub>o</sub> (%)	0.36
Maximum R <sub>o</sub> (%)	0.50
Number of points	27
Standard deviation	0.037
<b>Mean R<sub>o</sub> value of vitrinite (%)</b>	<b>0.43</b>



**Comments:** This sample is different from all the previous samples because of the absence of coal fragments. Organic matter occurs as small particles in fine-grained sandstone and is represented dominantly by vitrinite that occurs as very small particles. Liptinite is represented by sporadic sporinite and liptodetrinite. Inertinite is sporadic. Pyrite is rare. Based on 27 measurements, the average R<sub>o</sub> of vitrinite is 0.43%. Vitrinite reflectance values indicate that the organic matter is immature.

### Ordered R<sub>o</sub> random Values

0.36	0.36	0.36	0.39	0.40	0.40	0.41	0.41	0.41	0.41
0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.44	0.45
0.45	0.46	0.46	0.47	0.48	0.50	0.50			

### Whole rock visual maceral estimates (volume %, mineral matter free basis)

Client ID	Liptinite (%)				Vitrinite (%)	Inertinite %	Solid Bitumen (%)	Liptinite Fluores. (%)	Oil prone (%)	Gas prone (%)	Spore Fluores. Color (SFC)	Alginite Fluores. Color (AFC)
	Alginite (%)	AOM (%)		Other Liptinite (%)								
		Fluorescent	Non Fluorescent									
	0	5	30	5	60	trace	0	10	10	90	Yellow orange	No alginite