



**GEOLOGICAL SURVEY OF CANADA
OPEN FILE 5812**

**Vitrinite reflectance data on samples
from the
Mackenzie Corridor, Northwest Territories**

M.P. Avery

2009



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Dartmouth, Nova Scotia, B2Y 4A2

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Abstract

Vitrinite reflectance on the 19 samples from the Mackenzie Corridor yielded the following 4 maturity groups. Four samples from the Redstone River and Old Fort areas were immature. Five samples from the Sigma line W4, Redstone River and Keele River areas were mature to overmature. Four samples from the Sigma line W6 & 7 areas were marginally mature. Four samples from the Cadillac Mine were overmature. Two samples did not produce any reflectance values.

Introduction

Nineteen polished, whole rock stubs (pellets) were analysed for Vitrinite reflectance (VR). The stubs were prepared from material originally sampled from mostly outcrops in the Mackenzie Corridor by D. K. Norris, GSC Calgary between 1976 and 1986 (Table I, Figure 2). The stubs provided by GSCC were prepared and polished for incident light photometric microscopical analysis. This requires a level scratch free surface when viewed at about 640 magnification. The analysis was run on a Zeiss microscope system interfaced to a microcomputer to record and display the photometric data.

General Remarks

Typically, vitrinite reflectance analyses on whole rock preparations yield less than optimum measurable particles. Most of these samples provided fewer readings than typically needed for a thermal maturity assessment (Table II and Appendix II); with the exception of those from the Cadillac Mine. Also, since most of the samples are from outcrops they are less than ideal because of oxidation by weathering, the association between sulphides and vitrinites also may have affected some reflectance measurements (Table 2).

Results

The vitrinite reflectance data for the 19 samples can be grouped into 4 maturity ranges (Table II).

Four samples (at sample map locations #'s 1 & 2) from the Redstone River and Old Fort areas produced values (0.34-0.47) in the immature range (Appendix I) which is at the lignite to subbituminous coalification level. This group is Cretaceous age with (#1) coming from the East Fork Fm and (#2) from the Little Bear Fm (Table III).

Four samples (#3 to 6) from the Sigma line W6 & 7 areas produced values (0.48-0.58) which are just at the start of the mature range which is in the subbituminous coalification level. This group comes from a Tertiary conglomerate and sandstone unit.

Five samples (#7 to 12) from the Sigma line W4, Redstone River (different map area) and Keele River areas produced values (1.04-1.69) in the upper mature to overmature range which is about in the medium to low volatile matter coalification level. Sample #12 from the Keele River did not yield any data. This group comes from an upper Devonian sandstone unit.

Sample (#13) from the Cadillac Mine area did not yield any data. It came from the Silurian Delorme Fm.

Four samples (#14) from an adjacent area also labelled Cadillac Mine produced values (2.33-2.68) which are very overmature and in the anthracite coalification level. This group comes from the middle Devonian Nahanni Fm.

References

Powell, T. G. and Snowdon, L. R., 1983. A composite hydrocarbon generation model. Erdöl und Kohle, Erdgas, Petrochemie, v. 36, p. 163-170.

Duchesne, C., Ednie, M., Wright, J.F., 2007. Digital elevation model of the Mackenzie River valley, Northwest Territories; Geological Survey of Canada, Open File 5337, 1 DVD-ROM.

Table I - Location and general information for Mackenzie Corridor samples used in this study originally collected by DK Norris, 1976, 1983 and 1986

DK Norris Samples

Vern Stasiuk Scientific Authority

Dave Morrow - Energy Program
(NRD - Mackenzie Corridor)

Organic Petrology Laboratory: Program Delivery

308 to 326/06

C_Number	Area Description	Pellet #	Map Key *	Latitude	Longitude	Station or Well	MS_Datum	Interval		Units
								From	To	
C-112271	Redstone River	308/06	2	64.316667	-124.916667	6/C-112271				
C-112272		309/06				6/C-112272				
C-139168	Old Fort Point	310/06	1	64.7	-124.883333	1450/C-139168				
C-139169		311/06				1450/C-139169				
C-145535	Sigma line W4. West of Mackenzie River, near Johnson River	312/06	7	63.649722	-124.204722	12/C-145535-50.0	TOP OF SECTION	50		F
C-145536	Sigma line W4. West of Johnson River	313/06	8	63.631667	-124.179167	30/C-145536-50.0	TOP OF SECTION	50		F
C-145537		314/06	9	63.625556	-124.168611	36/C-145537-50.0	TOP OF SECTION	50		F
C-145538	Redstone River	315/06	10	63.523056	-124.015278	138/C-145538-50.0	TOP OF SECTION	50		F
C-145539	Keele River	316/06	11	63.517500	-124.005000	144/C-145539-50.0	TOP OF SECTION	50		F
C-145540		317/06	12	63.070278	-124.170833	144/C-145540-50.0	TOP OF SECTION	50		F
C-145541	Sigma line W6, SE of the Redstone River near Cloverleaf Lake	318/06	6	63.929444	-124.881667	6/C-145541-47.0	TOP OF SECTION	47		F
C-145542	Sigma line W7, SE of the Redstone River near Cloverleaf Lake	319/06	5	63.937222	-124.867778	12/C-145542-47.0	TOP OF SECTION	47		F
C-145543		320/06	4	63.945000	-124.848333	18/C-145543-47.0	TOP OF SECTION	47		F
C-145544		321/06	3	63.978611	-124.793611	42/C-145544-47.0	TOP OF SECTION	47		F
C-057152	Cadillac Mine	322/06	14	62.55	-124.783333	2NBa/C-057152				
C-057155		323/06				2NBd/C-057155-42.0	BASE OF SECTION	42	m	
C-057156		324/06				2NBc/C-057156-51.0	BASE OF SECTION	51	m	
C-057158		325/06				2NBg/C-057158-111.0	BASE OF SECTION	111	m	
C-057162		326/06	13	62.550000	-124.833333	3NBb/C-057162-759.0	BASE OF SECTION	759		m

* Note: Some of the area descriptions of where samples were collected do not seem to match the locations where those samples plot on the map based on the latitude/longitude coordinates. Because more than 20 years have elapsed since the sampling was done it has not been possible to settle the discrepancy. The coordinates are accepted as correct.

Table II - Vitrinite reflectance analysis results

GSC- Calgary Pellet #	Primary Vitrinite Population Statistics			Polish quality	Polished organic matter available	Confidence level (1-10)	Comments
	Mean (%R _{OR})	SD	n				
308/06	0.34	0.05	8	g	v low	7	0.89 %Ro on high reflecting vitrinite; 0.34 %Ro on large bimaceral particle
309/06	0.47	0.07	8	g	v low	7	0.51 %Ro on large vitrinite particle; 0.53 %Ro on large particle with pyrite
310/06	0.40	0.06	5	f	ext low	6	
311/06	0.35	0.08	8	g	v low	7	
312/06	1.04	0.03	2	g-f	low	5	very difficult to find non-recycled vitrinite
313/06	1.43	0.07	5	g-f	low	6	
314/06	1.42	0.06	4	g-f	low	6	
315/06	1.69	0.17	6	p	v low	4	
316/06	1.34	0.08	7	p	v low	4	
317/06	--	--	0	p	ext low	--	
318/06	0.58	0.07	9	p	low	7	0.5 %Ro on large particle with pyrite; 0.94 %Ro on large trimaceral coal particle
319/06	0.50	0.07	3	p	ext low	7	
320/06	0.48	0.06	8	p	v low	8	0.64 %Ro on large trimaceral coal particle
321/06	0.48	0.03	17	g	abun	9	
322/06	2.68	0.07	11	g-f	adq	6	large amount of sulphides associated with measured vitrinite
323/06	2.33	0.06	7	f	low	4	some large sulphides associated with measured vitrinite
324/06	2.66	0.11	10	g	adq	6	some large sulphides associated with measured vitrinite
325/06	2.37	0	1	p	low	2	
326/06	--	--	0	p	ext low	--	
Keys: Polish: g = good; f = fair; p = poor Confidence level: operator's confidence in measurements Polished organic matter available (on polished surface): v low = very low, ext low = extremely low, abun = abundant, adq = adequate							

Table III

Age and Formation information

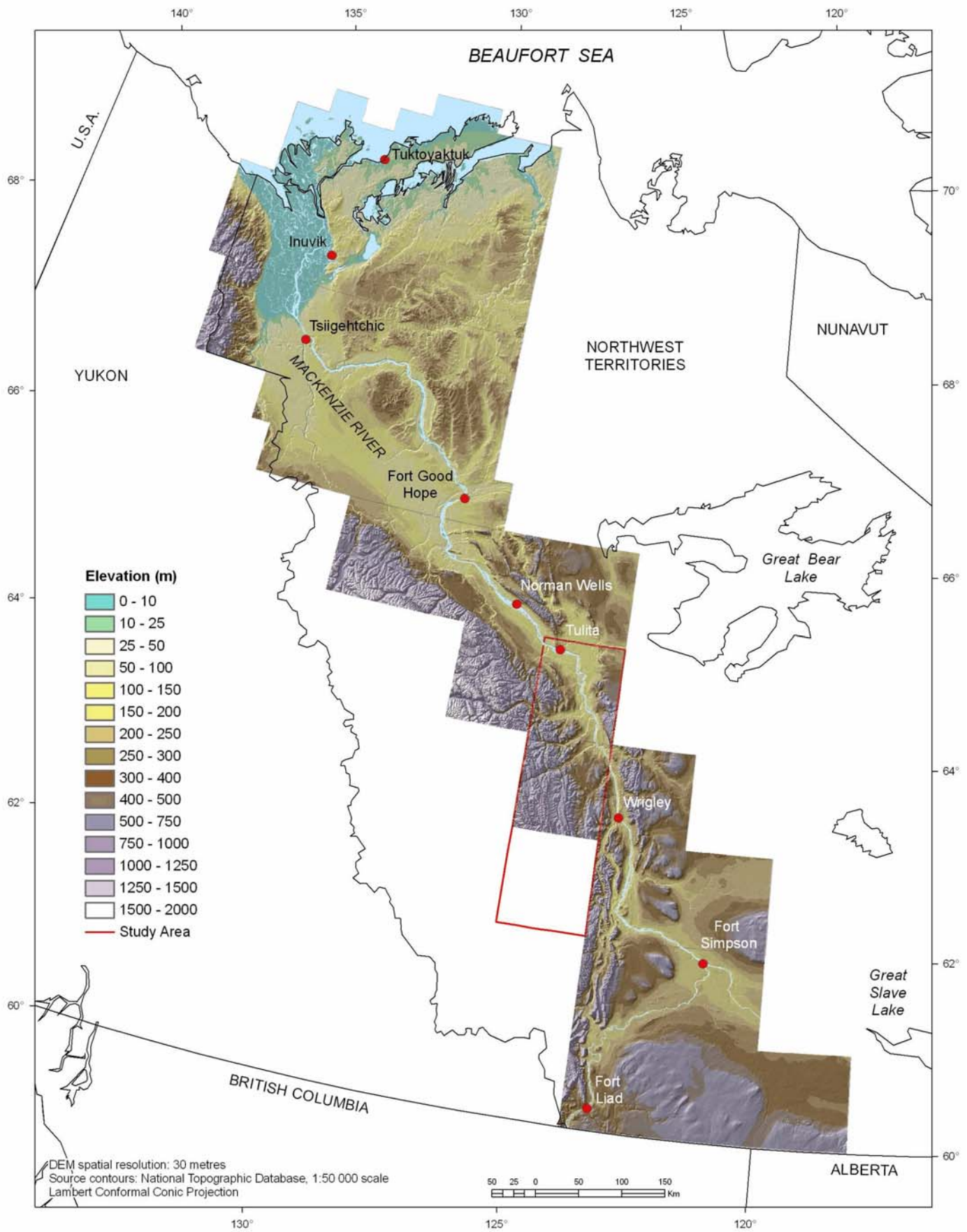
Samples keyed to location map	Map * reference	Age	Formation
1	UTM96C	Cretaceous	Little Bear Fm
2	UTM96C	Cretaceous	East Fork Fm
3-6	UTM95N	Tertiary	conglomerate and sandstone
7-12	UTM95N	upper Devonian	sandstone
13	UTM95K	Silurian	Delorme Fm
14	UTM95K	middle Devonian	Nahanni

* Following reference information provided by B. MacLean, GSC Calgary

UTM96C: Cook, D G; Aitken, J D (1977), Geological map of Blackwater lake [96b] and Fort Norman [96c], District of Mackenzie

UTM95N: Douglas, R J W (1974), Map 1374a, Geology, Dahadinni River, District of Mackenzie

UTM95K: Douglas, R J W; Norris, D K (1977), Map 1376a, Geology, Root River, District of Mackenzie



(After Duchesne, C., et al 2007)

Figure 1: Digital Elevation Model, Mackenzie River Valley, NWT with study area outlined in red

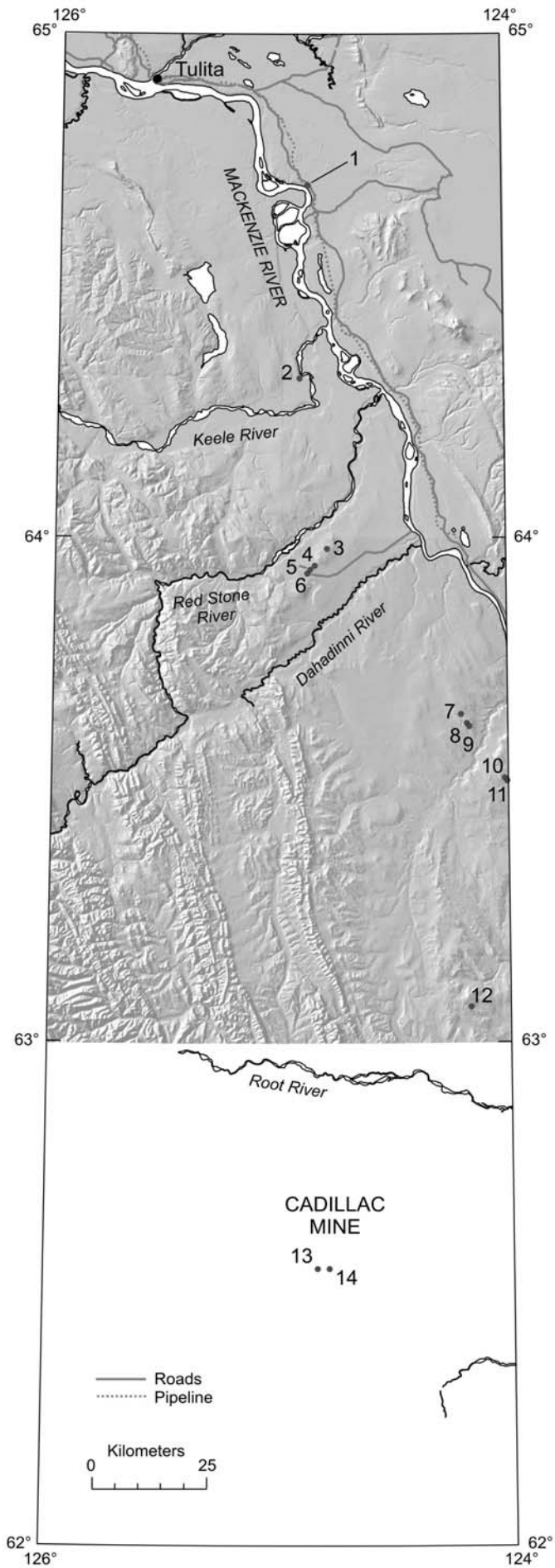
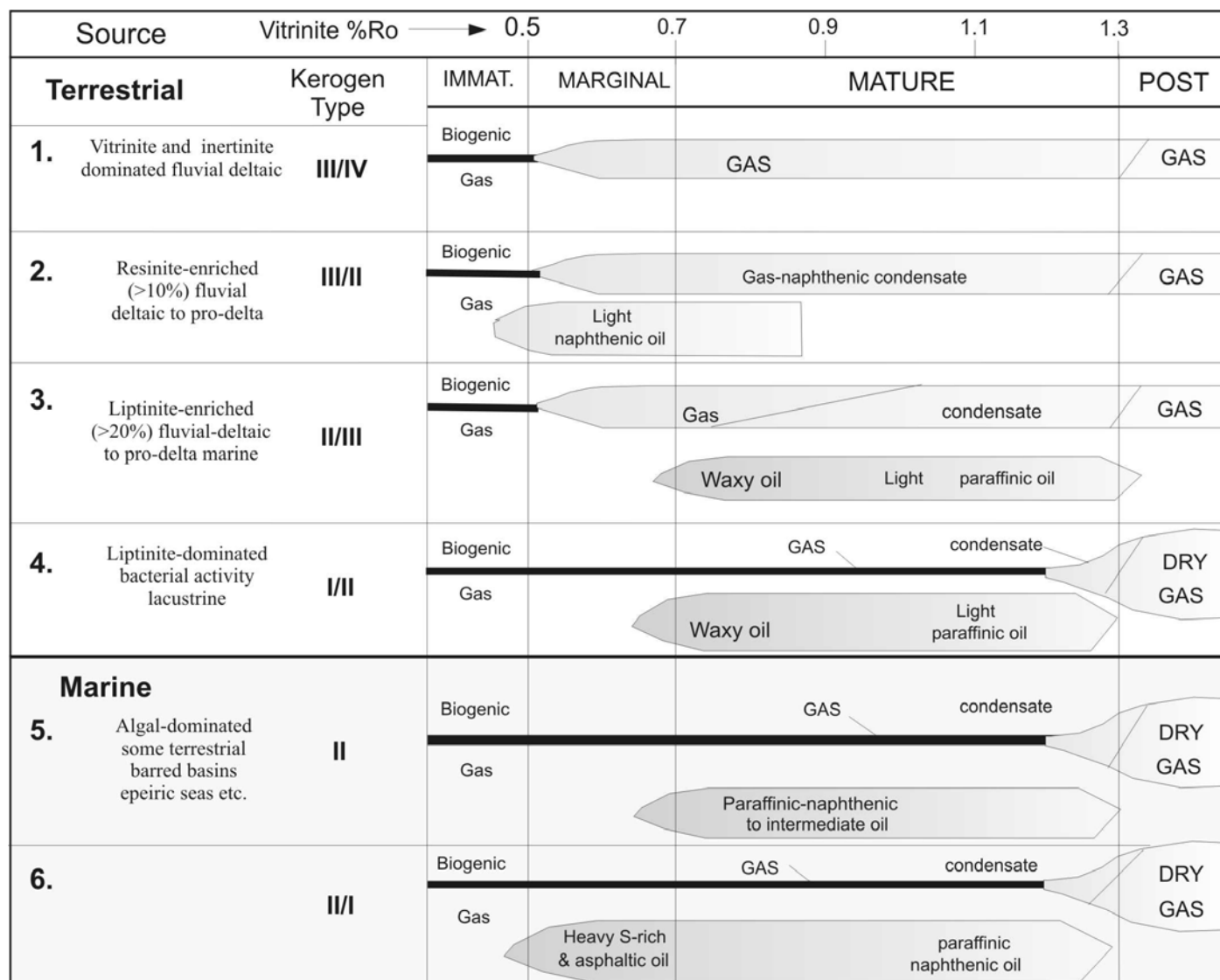


Figure 2: Sample location map, Mackenzie River Valley , NWT

Note 1: Digital Elevation Model data did not cover the lower section of this map (see Figure 1).

Note 2: Map was produced from basemaps available from Geomatics Canada. Thanks to Larry Lane, GSC Calgary for his assistance in obtaining them. Geomatics Canada website: <http://geogratis.cgdi.gc.ca/geogratis/en/download/topographic.html>

Appendix I (Snowdon and Powell 1984)



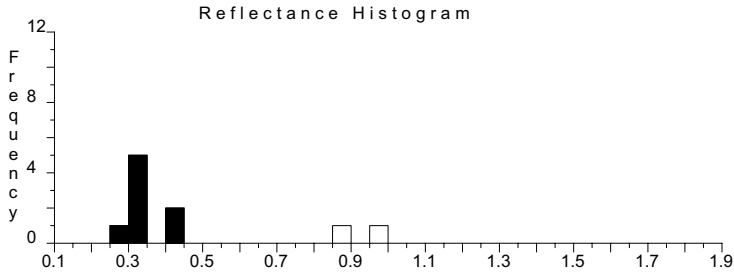
Hydrocarbon generation model compiled from Snowdon and Powell (1984) illustrating the different thresholds of hydrocarbon generation and products as related to thermal maturity, kerogen type and paleodepositional environment.

Appendix II - Vitrinite reflectance data listings and basic statistics

Data listings and basic statistics for: DK Norris (NRD - Mackenzie Corridor)

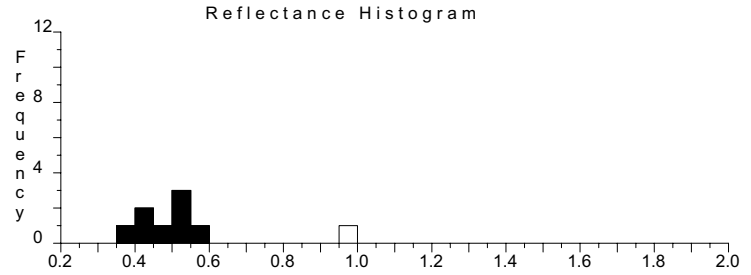
C308-06

Col >	1	2	3	4	5	6	7	8	9	
Row	(0.44)	0.89	(0.34)	(0.29)	(0.32)	(0.34)	(0.30)	0.96	(0.40)	(0.31)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.46	0.25	10	0.29	0.96	4.59				
(Edit)	0.34	0.05	8	0.29	0.44	2.74				



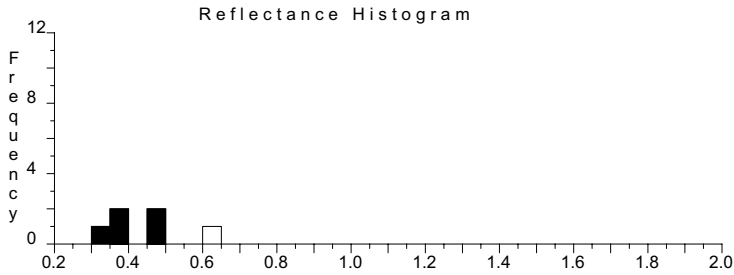
C309-06

Col >	1	2	3	4	5	6	7	8	
Row	0.97	(0.51)	(0.36)	(0.43)	(0.41)	(0.53)	(0.56)	(0.48)	(0.50)
	Mean	Stand Dev	Pts	Min	Max	Sum			
Total	0.53	0.18	9	0.36	0.97	4.75			
(Edit)	0.47	0.07	8	0.36	0.56	3.78			



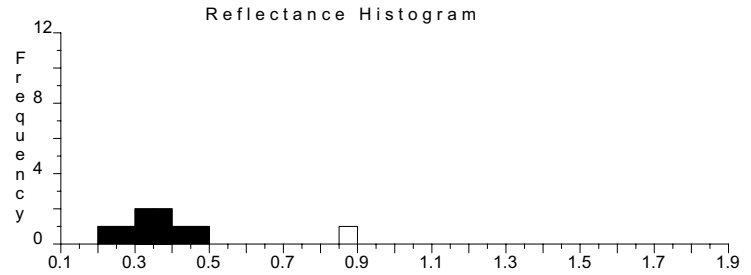
C310-06

Col >	1	2	3	4	5	
Row	(0.38)	(0.33)	(0.45)	(0.48)	(0.35)	0.62
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.44	0.11	6	0.33	0.62	2.61
(Edit)	0.40	0.06	5	0.33	0.48	1.99



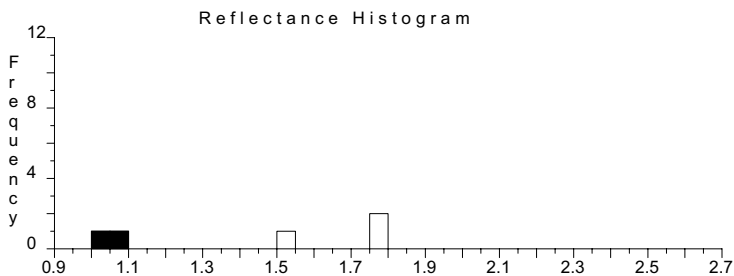
C311-06

Col >	1	2	3	4	5	6	7	8	
Row	0.86	(0.24)	(0.42)	(0.30)	(0.35)	(0.33)	(0.39)	(0.49)	(0.29)
	Mean	Stand Dev	Pts	Min	Max	Sum			
Total	0.41	0.19	9	0.24	0.86	3.67			
(Edit)	0.35	0.08	8	0.24	0.49	2.81			



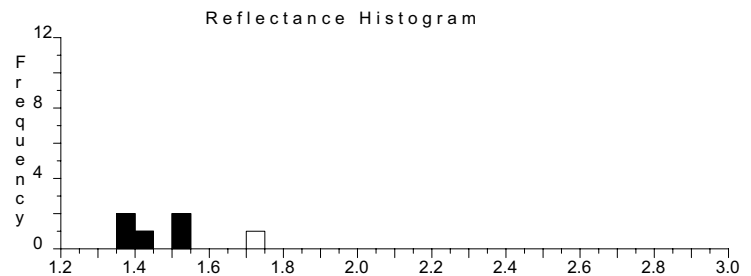
C312-06

Col >	1	2	3	4		
Row	1.79	1.50	(1.02)	1.76	(1.06)	
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.43	0.37	5	1.02	1.79	7.13
(Edit)	1.04	0.03	2	1.02	1.06	2.08



C313-06

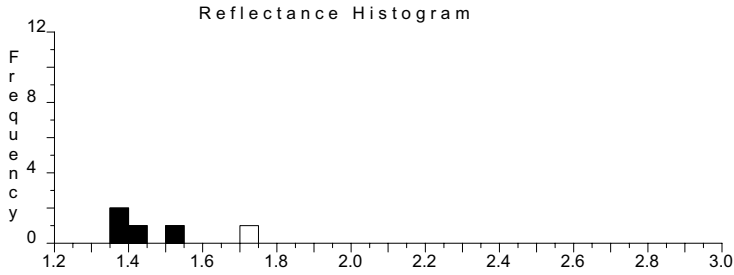
Col >	1	2	3	4	5	
Row	(1.40)	(1.51)	(1.38)	(1.38)	1.74	(1.50)
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.48	0.14	6	1.38	1.74	8.91
(Edit)	1.43	0.07	5	1.38	1.51	7.17



Data listings and basic statistics for: DK Norris (NRD - Mackenzie Corridor)

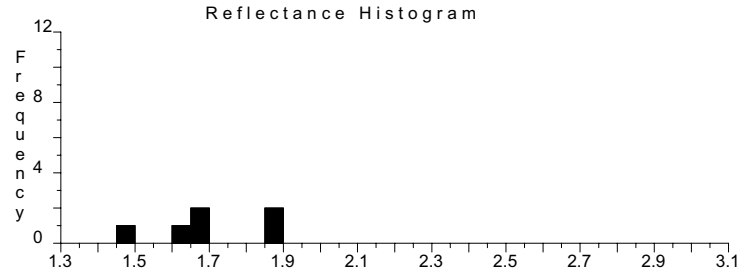
C314-06

Col >	1	2	3	4		
Row	(1.40)	(1.51)	(1.38)	(1.38)	1.74	
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.48	0.15	5	1.38	1.74	7.41
(Edit)	1.42	0.06	4	1.38	1.51	5.67



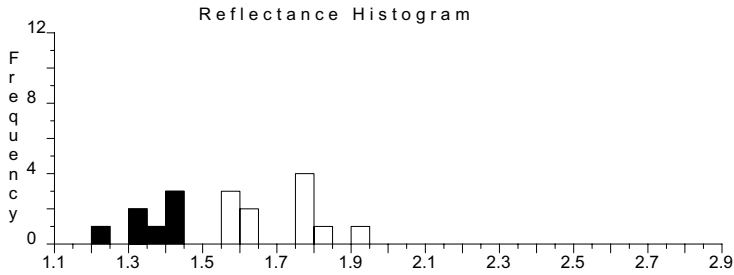
C315-06

Col >	1	2	3	4	5		
Row	(1.60)	(1.46)	(1.89)	(1.65)	(1.89)	(1.66)	
	Mean	Stand Dev	Pts	Min	Max	Sum	
Total	1.69	0.17	6	1.46	1.89	10.15	
(Edit)	1.69	0.17	6	1.46	1.89	10.15	



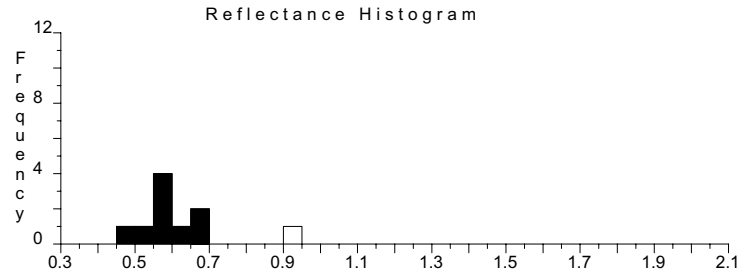
C316-06

Col >	1	2	3	4	5	6	7	8	9	0
Row	1.56	1.75	(1.35)	1.84	1.77	(1.43)	(1.40)	1.91	1.58	1.79
1	1.60	1.55	1.79	(1.32)	(1.21)	(1.40)	1.64	(1.30)		
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	1.57	0.21	18	1.21	1.91	28.19				
(Edit)	1.34	0.08	7	1.21	1.43	9.41				



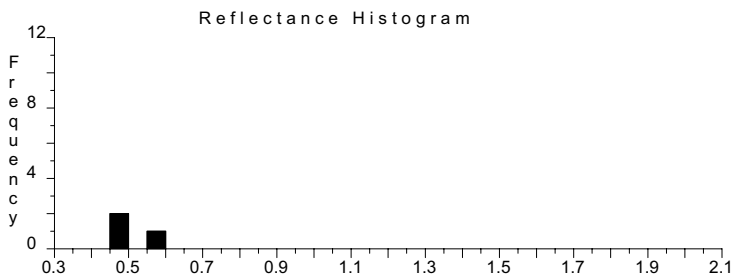
C318-06

Col >	1	2	3	4	5	6	7	8	9	
Row	(0.57)	(0.50)	(0.63)	(0.47)	(0.57)	(0.65)	0.94	(0.57)	(0.56)	(0.67)
	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.61	0.13	10	0.47	0.94	6.13				
(Edit)	0.58	0.07	9	0.47	0.67	5.19				



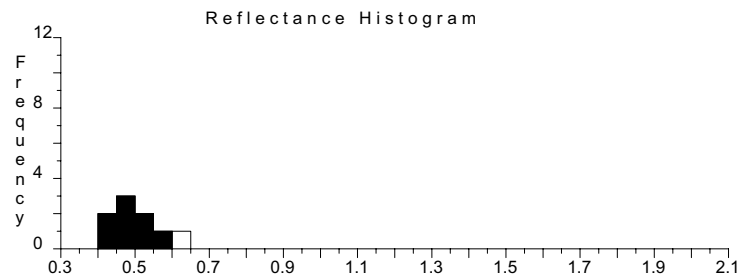
C319-06

Col >	1	2		
Row	(0.47)	(0.45)	(0.58)	
	Mean	Stand Dev	Pts	Min
Total	0.50	0.07	3	0.45
(Edit)	0.50	0.07	3	0.45



C320-06

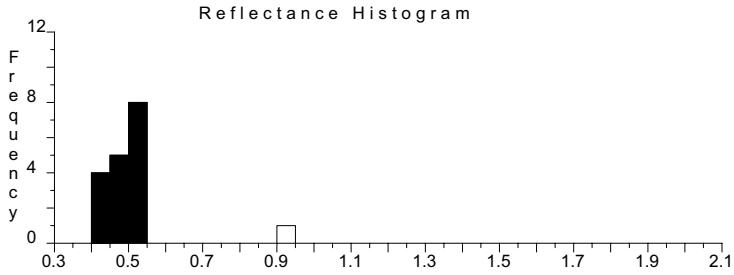
Col >	1	2	3	4	5	6	7	8	
Row	(0.47)	0.64	(0.49)	(0.50)	(0.54)	(0.45)	(0.40)	(0.44)	(0.59)
	Mean	Stand Dev	Pts	Min	Max	Sum			
Total	0.50	0.08	9	0.40	0.64	4.52			
(Edit)	0.48	0.06	8	0.40	0.59	3.88			



Data listings and basic statistics for: DK Norris (NRD - Mackenzie Corridor)

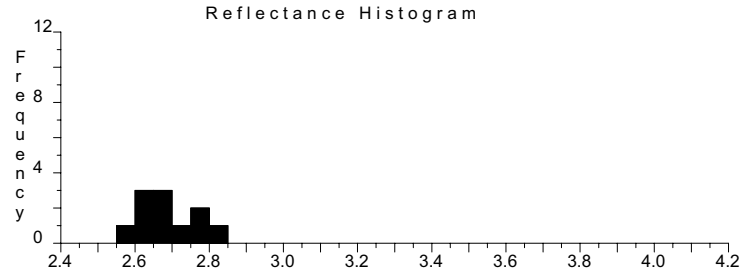
C321-06

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	0.92 (0.50)	(0.54) (0.47)	(0.48) (0.44)	(0.44) (0.42)	(0.45) (0.44)	(0.53) (0.50)	(0.47) (0.50)	(0.51) (0.49)	(0.51)	(0.50)
Total	Mean 0.51	Stand Dev 0.11	Pts 18	Min 0.42	Max 0.92	Sum 9.11				
(Edit)	0.48	0.03	17	0.42	0.54	8.19				



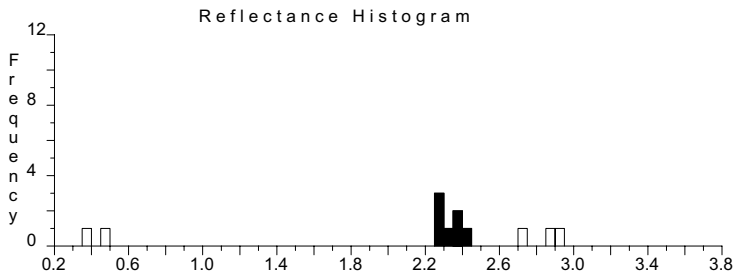
C322-06

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(2.60) (2.64)	(2.69)	(2.83)	(2.63)	(2.65)	(2.59)	(2.75)	(2.75)	(2.68)	(2.70)
Total	Mean 2.68	Stand Dev 0.07	Pts 11	Min 2.59	Max 2.83	Sum 29.51				
(Edit)	2.68	0.07	11	2.59	2.83	29.51				



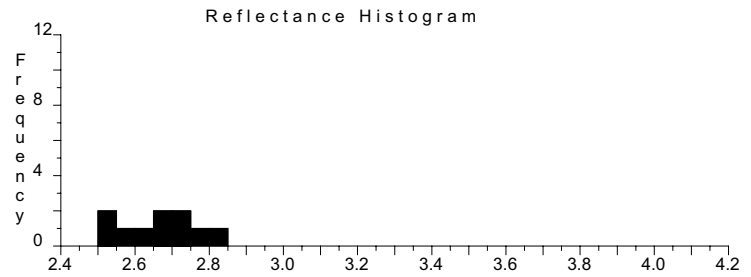
C323-06

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	0.35 2.91	0.46 2.86	(2.35)	(2.34)	(2.44)	(2.36)	(2.28)	(2.29)	(2.28)	2.72
Total	Mean 2.14	Stand Dev 0.84	Pts 12	Min 0.35	Max 2.91	Sum 25.64				
(Edit)	2.33	0.06	7	2.28	2.44	16.34				



C324-06

Col >	1	2	3	4	5	6	7	8	9	
Row	(2.53)	(2.61)	(2.67)	(2.71)	(2.79)	(2.51)	(2.84)	(2.56)	(2.69)	(2.72)
Total	Mean 2.66	Stand Dev 0.11	Pts 10	Min 2.51	Max 2.84	Sum 26.63				
(Edit)	2.66	0.11	10	2.51	2.84	26.63				



C325-06

Col >	1					
Row	(2.37) 2.56					
Total	Mean 2.46	Stand Dev 0.13	Pts 2	Min 2.37	Max 2.56	Sum 4.93
(Edit)	2.37	0.00	1	2.37	2.37	2.37

