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GEOCHEMICAL ANALYSIS OF OUTCROP SAMPLES FROM TINGMERKPUK 1998 PROJECT

by
Wallace G. Dow
DGSI, Inc.

June 2000

Released by

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys
794 University Avenue, Suite 200
Fairbanks, Alaska 99709-3645

$20.00

GEOCHEMICAL ANALYSIS OF OUTCROP SAMPLES FROM TINGMERKPUK 1998 PROJECT

This report contains analytical data on the organic geochemistry 96 shale samples from the foothills of the northwestern DeLong Mountains of the western Brooks Range, collected as part of a regional study of the hydrocarbon potential of the northwestern Arctic Slope.

This study is one of a series in a project investigating the geology of the western Brooks Range and Arctic Slope of northern Alaska. The objective of the project is to expand the data base for evaluation of potential hydrocarbon exploration objectives of the future on the western part of the Colville basin, including the western part of the National Petroleum Reserve, Alaska (NPRA). The project includes geologic mapping and acquisition of data concerning the stratigraphy, paleontology, organic geochemistry, and tectonic evolution of the foothills of the western DeLong Mountains. Field operations and analytical studies were partially funded by grants from Anadarko Petroleum Corporation, ARCO Alaska, Inc, Arctic Slope Regional Corporation, BP Exploration Inc., North Slope Borough, Phillips Petroleum Company, the U.S. Geological Survey, and Alfred James III.

Additional DGGS reports in this series include:

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C.G. Mull
Project leader
June 2000

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Prepared For:

Alaska Division of Geological and Geophysical Surveys
794 University Avenue, Suite 200
Fairbanks, AK 99709

Prepared By:

Wallace G. Dow
DGSI Project: 98/4372
February 10, 1999

DGSI
Total Quality Geochemistry
DGSI • 8701 NEW TRAILS DRIVE • THE WOODLANDS, TX 77381
(281) 363-2176 • FAX (281) 292-3528 • EMAIL: dgsilab@onramp.net • www.dgsilab.com

1998 ORGANIC GEOCHEMISTRY SAMPLES, TINGMERKPUK PROJECT

Sample #	Location	Collector	Formation	Integrated age	Description	Comments	LAT	LONG
	XUKPOWRUK REDWUL MEASURED SECTION			Paleontology by Micropaleo Consultants, Inc.		30 samples		
	SEGMENT 1, TOP OF BLUFF					**Measured interval in segment**		
98 Mu 11	Redwul, Kukpowruk River	Mull/Kirkham	HRZ	Probable Barremian	Sooty bk sh w bentonite	19 m. Top of exposed section	68.715	161.213
98 Mu 11-1	Redwul, Kukpowruk River	Mull/Kirkham	HRZ	Probable Barremian	Sooty bk sh	17.2 m. Wet gummy sample	68.715	161.213
98 Mu 11-2	Redwul, Kukpowruk River	Mull/Kirkham	HRZ	Probable Barremian	Fissile paper sh	16.7 m. Wet gummy sample	68.715	161.213
98 Mu 11-2A	Redwul, Kukpowruk River	Mull/Kirkham	HRZ					
98 Mu 11-3	Redwul, Kukpowruk River	Mull/Kirkham	HRZ	Probable Barremian	Sooty earthy sh and bentonite, slumped	15 m.	68.715	161.213
98 Mu 11-4	Redwul, Kukpowruk River	Mull/Kirkham	HRZ	Probable Hauterivian	Sooty earthy sh and bentonite	13 m	68.715	161.213
98 Mu 11-5	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale	Probable Hauterivian	Silic silty sh	10.9 m, just below tuff	68.715	161.213
98 Mu 11-6A	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale					
98 Mu 11-6	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale	Hauterivian	Silic silty sh	9 m. 110°, 65° S	68.715	161.213
98 Mu 11-7	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale (?)	Oxfordian or Hauterivian?	Silic silty sh, red br oxidized	7 m	68.715	161.213
98 Mu 11-8	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Gr to bk fissile clay sh, rusty surface weathering	3.8 m	68.715	161.213
98 Mu 11-9	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Gr to bk fissile clay sh, rusty surface weathering	1.0 m	68.716	161.213
	SEGMENT 2, OFFSET TO EAST IN SMALL GULLY					**Measured interval in segment**		
98 Mu 11-10	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile dk gr clay sh	6 m	68.715	161.213
98 Mu 11-11	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile dk gr clay sh	4 m	68.716	161.213
98 Mu 11-12	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile dk gr clay sh	2 m. 120°, 55°SW, on hard siltstone	68.715	161.213
98 Mu 11-13	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile dk gr clay sh	0 m	68.715	161.213
	SEGMENT 3, OFFSET TO EAST ON SLOPE FACE					**Measured interval in segment**		
98 Mu 11-14	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile dk gr clay sh, has white sulfate powder on surface	12 m. 120°, 60°S	68.715	161.213
98 Mu 11-15	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile dk gr clay sh with occasional thin siltstone beds, has rusty surface weathering	10 m.	68.715	161.213
98 Mu 11-16	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Shale as above, slightly harder (silty?), more rusty weathering, some intervals of dk gr clay shale	8 m.	68.715	161.213
98 Mu 11-17	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Shale as above, with scattered discontinuous concretions and three intervals of dk gr limestone with abundant Inoceramus, some large and thick prisms	6 m. Sample just below Inoceramus ls lens. One lens 30 cm. thick, 2 m long	68.715	161.213

1998 ORGANIC GEOCHEMISTRY SAMPLES, TINGMERKPUK PROJECT

Sample #	Location	Collector	Formation	Integrated age	Description	Comments	LAT	LONG
98 Mu 11-18	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Fissile clay shale with rusty weathering shale, occasional thin yel white dry bentonite seams, as above, ovoid concretions more abundant below.	4 m.	68.715	161.213
98 Mu 11-19	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Rusty weathering shale as above, with some dark gray fissile intervals	2 m. One belemnite in fragments.	68.715	161.213
98 Mu 11-19A	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Rusty weathering shale as above, with some dark gray fissile intervals	0 m.	68.715	161.213
	SEGMENT 4, OFFSET TO WEST IN BOTTOM OF GULLY					**Measured interval in segment**		
98 MU 11-20	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Shale, dk gr, fissils, partly oxidized.	SAMPLE NOT LISTED PREVIOUSLY	68.715	161.213
98 Mu 11-21	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Shale, as above, concretions more abundant downward, range from cannon ball size up to 25 cm thick ovoid. Section appears to have bentonitic shale intervals, seen in weathering surface.	23 m.	68 715	161 213
98 Mu 11-21A	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dr gr fissile clay shale	22 m. Surface sample	68.715	161.213
98 Mu 11-22	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dr gr fissile clay shale, with abundant red br oxidized intervals, some thin bentonitic shale intervals	19 m.	68.715	161.213
98 Mu 11-23	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dk gr clay shale, with abundant red oxidized zones as above, abundant concretions	17 m. 5 m interval below, covered by talus.	68.715	161.213
98 Mu 11-24	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dk gr clay shale, 1/2 m interval in overall red oxidized shales	10 m.	68.715	161 213
98 Mu 11-25	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dk gr clay shale, 1/2 m interval in overall red oxidized shales	6.8 m. Sample below 30 cm X 1 m concretion.	68 715	161.213
98 Mu 11-26	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dk gr clay shale, 1/2 m interval in overall red oxidized shales	4 m.	68.715	161.213
98 Mu 11-27	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Dk gr shale, oxidized as above	2 m. Base of exposed section.	68.715	161 213
	HORSESHOE BEND MEASURED SECTION					12 samples		
98 Mu 19-11	Horseshoe Bend, Ipewik R.	Mull	Pebble Shale	Indeterminate	Organic-rich paper shale	50 yards up gulch from 19-10		
	SEGMENT 2, measured 100 m up gully					**Measured interval in segment**		
98 Mu 19-10	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Ck gr to bk clay sh.	Top of measured segment. 4.8m		
98 Mu 19-9	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Dk gr to bk clay shale, bentonittic, w/ glauconite layers	3.5m. Glauconite layer found in ~15cm interval		

1998 ORGANIC GEOCHEMISTRY SAMPLES, TINGMERKPUK PROJECT

Sample #	Location	Collector	Formation	Integrated age	Description	Comments	LAT	LONG
98 Mu 19 8	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Dk gr to bk clay shale, bentonitic, w/ glauconite layers	1 5m		
98 Mu 19-7	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Dk gr to bk clay shale, intermittant Fe staining	0 m. Base of exposed section		
	SEGMENT 1, measured at mouth of gully off Ipewik River					**Measured interval in segment**		
98 Mu 19-6	Horseshoe Bend, Ipewik R	Mull/Kirkham	Kingak Shale	Oxfordian	Dk gr to bk clay sh, bentonitic	12 m, sampled section. Stratigraphic top uncertain.		
98 Mu 19-5	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable Oxfordian	Dk gr to bk clay sh, bentonitic	10 m, sampled section		
98 Mu 19-4	Horseshoe Bend, Ipewik R	Mull/Kirkham	Kingak Shale	Probable E - M Jurassic	Dk gr to bk clay sh, bentonitic	8 m, sampled section		
98 Mu 19-3	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable E - M Jurassic	Dk gr to bk clay sh, bentonitic	6 m, sampled section		
98 Mu 19-2	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable E - M Jurassic	Dk gr to bk clay sh, bentonitic	4 m, sampled section		
98 Mu 19-1	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	E - M Jurassic	Dk gr to bk clay sh, bentonitic	2 m, sampled section		
98 Mu 19	Horseshoe Bend, Ipewik R	Mull		Probable E - M Jurassic	Dk gr to bk clay sh, bentonitic	0 m, sampled section		
	IPEWIK TRIBUTARY MEASURED SECTION					7 samples		
98 Mu 33-7	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	bk to dk gr paper sh, w/ red/yellow dirty clay	Top of exposed section, 15.5m	68°37.9	164°35.5
98 Mu 33-6	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Bk to dk gr paper shale,	14m	68°37.9	164°35.5
98 Mu 33-5	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Bk paper sh	13m	68°37.9	164°35.5
						Covered interval 7m		
98 Mu 33-4	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Dk gr to bk paper sh	6m	68°37.9	164°35.5
98 Mu 33-3	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Bk sooty paper sh, w bentonite	4m	68°37.9	164°35.5
98 Mu 33-2	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	gr to bk paper sh w/ yellow bentonite	2m	68°37.9	164°35.5
98 Mu 33-1	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Gr paper shale, red oxidation abundant	Base of exposed section, 0m	68°37.9	164°35.5
	TOP OF TINGMERKPUK MOUNTAIN MEASURED SECTION					2 samples		
98 DL 120-27	Tingmerkpuk Mtn.	LePain/Adams	Tingmerkpuk	Possible Aptian (w/rewrk Valanginian)	Bk clay shale	Tingmerkpuk section 6 m below top		
98 DL 120-26	Tingmerkpuk Mtn.	LePain/Adams	Tingmerkpuk	Possible Aptian (w/rewrk Valanginian)	Bk clay shale	Tingmerkpuk measured section, 77 m		
	SURPRISE CREEK MEASURED SECTION					6 samples		
98 RK1-91	Surprise Creek	Kirkham/Harris	Kingak	Possible Aptian-Albian	Dk brn shale, small clay component	Resample of 96MAW22, 91m		
98 RK1-84	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Bk sh, small clay component	84m		
98 RK1-78	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Dk gr to bk sh, has a significant color change at bottom of auger hole, changes to brn-dk brn color, minor clay content	78m		
98 RK1-65	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	dk gr to bk shale, minor clay content,	65m		

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Sample #	Location	Collector	Formation	Integrated age	Description	Comments	LAT	LONG
98 RK1-57	Surprise Creek	Kirkham/Harris	Kingak	Possible Oxfordian-	Bk sh w/ significant clay content, mostly water & ice.	57m		
98 RK1-43	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Bk sh, very high clay content, mostly water &ice?	43m		
	SOUTH TINGMERKPUK MEASURED SECTION					Section underlies Tingmerkpuk Ss, southern facies. 12 samples		
98 JC 302-1	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Gr to med dk gr sh, alternating greenish gr sh	3 m. Top of section.		
98 JC 302-2	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	brownish gr sh	12 m.		
98 JC 302-3	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Greenish gr sh	17 5 m.		
98 JC 302-4	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	brown gr sh	36 m.		
98 JC 302-5	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	gr to br sh	53 m.		
98 JC 302-6	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	gr sh	63 m.		
98 JC 302-7	South Tingmerkpuk	Clough/Kirkham	Kingak	Probable Valanginian	maroon to brnish sh	78 m.		
98 JC 302-8	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Gr clay sh	90 m.		
98 JC 302-9	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Gr sh	108 m.		
98 JC 302-10	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Grnish bk sh	121m.		
98 JC 302-11	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Gr shale	133 m.		
98 JC 302-12	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	gr to dk gr shale	141 m. Base of section.		
	MISCELLANEOUS GRAB SAMPLES					27 samples		
98 Mu 7-1	Kukpowruk River, Redwul	Mull	KJk	Probable Barremian	Bk cl sh, soft	2 m exposure, composite of 7-1 and 7-2		
98 Mu 7-3	Kukpowruk River, Redwul	Mull	KJK	Oxfordian-Kimmeridgian	BK claystone	Claystone around concretion		
98 Mu 8	Kukpowruk River, Redwul	Mull	KJk	Valanginian-Hauterivian	Shale, dk gr	080° 42° S. Sequential samples w auger, 1/2 m above hard siltstone		
98 Mu 8-1	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Shale, med gr.	15 m stratigraphically below 98 Mu 8. Fissile shale in coutcrop, contains ovoid concretions w pyrite-marcasite knobs		
98Mu 8-2	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Shale, med gr	7 m below. Auger sample lighter gray. Slope above has popcorn whtrg		
98Mu 8-3	Kukpowruk River, Redwul	Mull	KJk	Possible Valanginian	Shale, br gr	~7 m below. No apparent conc		
98Mu 8-4	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Shale, br gr	7 m below. Dk gr weathered . Has 1/2 cm bent above hole. Conc with B sublaevis coquina in float.		
98 Mu 8-5	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Shale, dk br gr	10 m below 98 Mu 8. Gr fissile sh on weathered surface. Interval contains large round to ovoid concretions,some w large Buchias, poss B. rugosa (Jur.). = 98 Mu 7.3		
98 Mu 9	Kukpowruk River, Redwul	Mull	KJk	Valanginian-Hauterivian	Shale, gr, whtrs lt gr-wh	Sh intbd with oxidized gr siltstone. Section has distinctive red br whtrd appearance. Silts prob bioturbated. Sect downstream from above, prob across fault		

1998 ORGANIC GEOCHEMISTRY SAMPLES, TINGMERKPUK PROJECT

Sample #	Location	Collector	Formation	Integrated age	Description	Comments	LAT	LONG
98Mu 9-?	Kukpowruk River, Redwul	Mull	KJk	Oxfordian-Barremian	Shale, gr, whtrs lt gr-wh	Sh intbd with oxidized gr siltstone. Section has distinctive red br wthrd appearance. Silts prob bioturbated.		
98 Mu 12	Redwul Kukpowruk	Mull	Pebble Shale	Possible Hauterivian	Bk sooty clayst & bentonite			
98 Mu 14-1	Upper Ipewik River	Mull	Upper Kingak?	Indeterminate	Fissile clay shale	Composite from siksik holes on slope		
98 Mu 24	East Tingmerkpuk	Mull	Kingak	Probable Hauterivian-Barremian	Hard gn gr shale		68°33.98	162°27.1
98 Mu 24-1	East Tingmerkpuk	Mull	Kingak	Possible Hauterivian-Barremian	Hard gn gr shale		68°33 98	162°27.1
98 Mu 32	Ipewik River tributary	Mull	Shublik	Upper Triassic	Black limestone, strong odor			
98 Mu 32-A	Ipewik River tributary	Mull	Shublik	Upper Triassic	Flakes of platy limestone, weathered, contain Monotis and			
98 Mu 32-1	Ipewik River tributary	Harris	?? Float	??	Gilsonite, solid hydrocarbon, float			
98 Mu 34	Ipewik River tributary	Mull	Lower Brookian	Possible Hauterivian-Barremian	Bk claystone		68°37'	164°28.5'
98 Mu 38	S fork Ipewik	Mull	Lower Brookian ?	Probable Barrem-Aptian	Clay shale, bentonitic, with oxidized siltstones		69°32.1'	164°14.6'
98 Mu 39	Ipewik valley	Mull	Lower Brookian ?	Probable Barremian	Clay shale, bentonitic, with oxidized siltstones		68°34.35'	164°17.25'
98 Mu 39-1	Ipewik valley	Mull	Pebble Shale ?	Indeterminate	Black sooty claystone		68°34 35'	164°17.25'
98 Ha126	E. of Sooner, SW of Kukpowruk R.	E. Harris	Kk	Probable Oxfordian-Kimmeridgian	Shales	Ammonite, Buchia (large)		
98 Ha129	Ipewik R.	E. Harris	JKk	Probable Oxfordian-Kimmeridgian	Black shale	Concretions		
98 RR 185B	Dugout syncline	Reifenstuhl	Torok	Probable Aptian	Silty sh			
98 RR 186B	Dugout syncline	Reifenstuhl	Torok	Probable Aptian-Albian	Silty sh			
98 RR 197C	Dugout syncline	Reifenstuhl	Torok	Indeterminate	Siltstone			
98 RR 240B	Kokolik-Tupikshak	Reifenstuhl	Torok	Possible Barremian-	Siltstone			
98 RR 250	Tupikchak Mtn	Reifenstuhl	Torok	Possible Barremian-	Siltstone			
98 RR 251A	S of Tupikchak Mtn	Reifenstuhl	Torok	Possible Barremian-	Siltstone			
Micropaleo data by Micropaleo Consultants, Inc., formation designations by C.G. Mull, table compiled by C. G. Mull, May 2000.								

ORGANIC CARBON AND PYROLYSIS DATA

Total Organic Carbon (TOC) and Rock-Eval pyrolysis data provide basic geochemical information and are frequently used to select samples for more detailed studies, particularly kerogen microscopy, extract chromatography and biomarker analyses. Well data can be plotted to make geochemical logs. Unless otherwise specified by a client, DGSI uses LECO TOC then Rock-Eval II pyrolysis as the standard analytical sequence and Rock-Eval is recommended for samples with greater than 0.4% TOC. Samples for LECO TOC and Rock-Eval pyrolysis are ground to pass through a 60 mesh sieve to assure homogeneity.

LECO Organic Carbon and Total Sulfur

Total Organic Carbon is best determined by direct combustion. Approximately 0.15 grams of sample are carefully weighed, treated with concentrated HCl to remove carbonates, and vacuum filtered on glass fiber paper. The residue and paper are placed in a ceramic crucible, dried, and combusted with pure oxygen in a LECO EC-12 or LECO CS-444 carbon analyzer at about 1,000°C. A laboratory standard is run every five samples. Total, insoluble, mineral plus organic sulfur can be determined by the CS-444 analyzer during the carbon analysis. Total carbonate can be determined from sample and acid residue weight differences or by LECO combustion TOC differences before and after acid digestion.

Rock-Eval II Pyrolysis

Rock-Eval II pyrolysis is used to determine kerogen type, kerogen maturity and the amount of free hydrocarbons. About 0.1 grams of the same ground sample used for LECO TOC are carefully weighed in a pyrolysis crucible and then heated to 300°C to determine the amount of free hydrocarbons, S_1, that is thermally distilled. Next, the amount of pyrolyzable hydrocarbons, S_2, is measured when the sample is heated in an inert environment which rises from 300° to 550°C at a heating rate of 25°C/minute. S_1 and S_2 are reported in mg HC/g sample. T_{max}, a maturity indicator, is the temperature of maximum S_2 generation. When S_2 values are less than 0.2 mg HC/g sample, the S_2 maximum typically has poor definition and thus, Tmax cannot be reliably determined (Peters, 1986). T_{max} values are reported as N.A. on samples with 0.00 S_2. Carbon dioxide generated during the S_2 pyrolysis, an indicator of kerogen oxidation, is collected up to a temperature of 390°C and reported as S_3 in units of mg CO_2/g sample. A laboratory standard is run every 10 samples. Hydrogen Index (HI = S_2 *100/TOC) and Oxygen Index (OI = S_3*100/TOC) are used as kerogen type indicators when plotted on a van Krevelen type diagram.

Rock-Eval II Pyrolysis with TOC

Rock-Eval II Plus TOC is used to determine both Rock-Eval data (S_1, S_2, S_3, T_{max}) and TOC of a 0.1 gram ground sample. With this instrument, the pyrolysis stage (S_2) ramps to 600°C at which point the sample is switched to an oxidation oven where the sample is oxidized at 600°C for 5 minutes in air to measure the residual organic matter (S_4). A laboratory standard is run every 10 samples. S_1, S_2, S_3, and S_4 are summed appropriately to calculate TOC. True TOC will be greater than this calculated sum for samples with maturity greater than about 1.0% R_o because the Rock-Eval final temperature is inadequate for complete combustion (Peters, 1986). This instrument is preferred when there is insufficient sample to run TOC and pyrolysis separately, or when all samples in a study are to be analyzed for both TOC and Rock-Eval data without prior TOC screening.

Tingmerkpuk 1998 Project Samples

DGSI Project: 98/4372

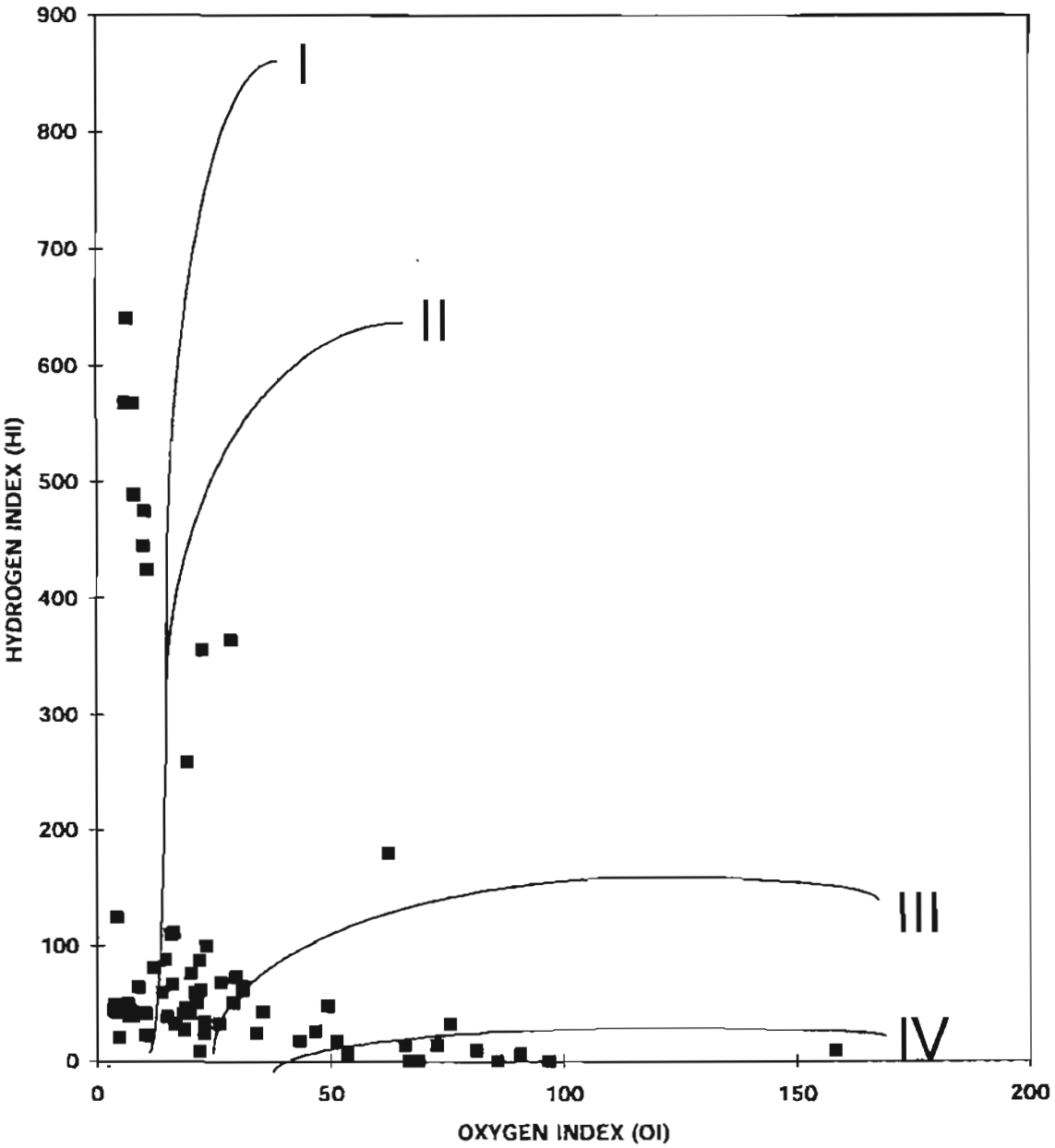


FIGURE 1 - Kerogen type determination from TOC and Rock-Eval pyrolysis data. Types I and II will generate oil, type III gas, and type IV little or no hydrocarbons.

ORGANIC CARBON AND ROCK-EVAL PYROLYSIS DATA

Tingmerkpuk 1998 Project Samples

DGSI Project: 98/4372

SAMPLE IDENTIFICATION DGSI ID			TOC Wt%	S1 mg/g	S2 mg/g	S3 mg/g	Tmax degC	S1/ TOC	HI	OI	S2/ S3	PI
KUKPOWRUK REDWUL MEASURED SECTION							SEGMENT 1, TOP OF BLUFF					
1	:	98 Mu 11	5.49	0.40	3.66	0.88	420	7	67	16	4.16	0.10
2	:	98 Mu 11-1	3.79	0.16	1.28	0.87	419	4	34	23	1.47	0.11
3	:	98 Mu 11-2	6.61	0.47	2.71	1.22	423	7	41	18	2.22	0.15
4	:	98 Mu 11-2A	4.03	0.15	1.29	1.06	428	4	32	26	1.22	0.10
5	:	98 Mu 11-3	5.24	0.33	2.41	0.99	426	6	46	19	2.43	0.12
6	:	98 Mu 11-4	7.36	0.35	4.57	1.64	437	5	62	22	2.79	0.07
7	:	98 Mu 11-5	0.44	0.01	0.06	0.32	451	2	14	73	0.19	0.14
8	:	98 Mu 11-6A	11.16	0.61	13.89	0.48	438	5	124	4	28.94	0.04
9	:	98 Mu 11-6	4.09	0.18	0.92	0.42	474	4	22	10	2.19	0.16
10	:	98 Mu 11-7	0.30	0.02	0	0.20	N.A.	7	—	67	—	—
11	:	98 Mu 11-8	1.34	0.15	0.63	0.66	444	11	47	49	0.95	0.19
12	:	98 Mu 11-9	1.96	0.14	1.16	0.27	446	7	59	14	4.30	0.11
							SEGMENT 2, OFFSET TO EAST IN SMALL GULLY					
13	:	98 Mu 11-10	1.94	0.11	0.81	0.18	444	6	42	9	4.50	0.12
14	:	98 Mu 11-11	2.15	0.10	1.07	0.14	447	5	50	7	7.64	0.09
15	:	98 Mu 11-12	2.02	0.16	0.83	0.4	442	8	41	20	2.08	0.16
16	:	98 Mu 11-13	2.03	0.21	0.9	0.07	446	10	44	3	12.86	0.19
							SEGMENT 2, OFFSET TO EAST ON SLOPE FACE					
17	:	98 Mu 11-14	2.23	0.15	0.95	0.09	441	7	43	4	10.56	0.14
18	:	98 Mu 11-15	2.09	0.22	1.02	0.11	446	11	49	5	9.27	0.18
19	:	98 Mu 11-16	2.12	0.10	1.02	0.09	442	5	48	4	11.33	0.09
20	:	98 Mu 11-17	1.96	0.16	0.81	0.20	437	8	41	10	4.05	0.16
21	:	98 Mu 11-18	2.17	0.10	1.07	0.08	447	5	49	4	13.38	0.09
22	:	98 Mu 11-19	2.80	0.11	1.27	0.19	446	4	45	7	6.68	0.08
23	:	98 Mu 11-19-A	2.08	0.09	0.8	0.31	445	4	38	15	2.58	0.10
							SEGMENT 2, OFFSET TO WEST IN BOTTOM OF GULLY					
24	:	98 Mu 11-20	2.10	0.06	0.81	0.16	447	3	39	8	5.06	0.07
25	:	98 Mu 11-21	1.85	0.21	1.18	0.16	447	11	64	9	7.38	0.15
26	:	98 Mu 11-21A	1.80	0.12	0.58	0.30	438	7	32	17	1.93	0.17
27	:	98 Mu 11-22	2.46	0.30	2.15	0.54	447	12	87	22	3.98	0.12
28	:	98 Mu 11-23	2.33	0.21	1.88	0.28	450	9	81	12	6.71	0.10
29	:	98 Mu 11-24	2.52	0.18	1.26	0.54	450	7	50	21	2.33	0.13
30	:	98 Mu 11-25	2.39	0.53	2.66	0.39	449	22	111	16	6.82	0.17
31	:	98 Mu 11-26	2.20	0.32	1.67	0.44	447	15	76	20	3.80	0.16
32	:	98 Mu 11-27	1.71	0.26	0.86	0.50	449	15	50	29	1.72	0.23
HORSESHOE BEND MEASURED SECTION												
33	:	98 Mu 19-11	9.65	0.00	1.96	0.45	468	0	20	5	4.36	0.00
							SEGMENT 2, measured 100 m up gully					
34	:	98 Mu19-10	1.18	0.03	0.46	0.08	440	3	39	7	5.75	0.06
35	:	98Mu19-9	0.90	0.07	0.58	0.28	439	8	64	31	2.07	0.11
36	:	98Mu19-8	0.87	0.10	0.53	0.27	439	11	61	31	1.96	0.16
37	:	98Mu19-7	0.91	0.08	0.66	0.27	439	9	73	30	2.44	0.11

SEGMENT 1, measured at mouth of gully, north side of Ipewik River

ORGANIC CARBON AND ROCK-EVAL PYROLYSIS DATA

Tingmerkpuk 1998 Project Samples

DGSI Project: 98/4372

SAMPLE IDENTIFICATION DGSI ID			TOC Wt%	S1 mg/g	S2 mg/g	S3 mg/g	Tmax degC	S1/ TOC	HI	OI	S2/ S3	PI
38	:	98 Mu 19-6	1.95	0.11	1.71	0.28	428	6	88	14	6.11	0.06
39	:	98 Mu 19-5	0.82	0.00	0.35	0.29	458	0	43	35	1.21	0.00
40	:	98 Mu 19-4	1.97	0.08	1.18	0.41	425	4	60	21	2.88	0.06
41	:	98 Mu 19-3	2.37	0.12	1.61	0.63	425	5	68	27	2.56	0.07
42	:	98 Mu 19-2	2.90	0.11	7.48	0.56	436	4	258	19	13.36	0.01
43	:	98 Mu 19-1	2.44	0.15	2.44	0.57	429	6	100	23	4.28	0.06
44	:	98 Mu 19	2.73	0.10	2.99	0.43	430	4	110	16	6.95	0.03
IPEWIK TRIBUTARY MEASURED SECTION												
45	:	98Mu 33-7	21.28	2.96	77.56	6.12	420	14	364	29	12.67	0.04
46	:	98Mu 33-6	16.17	1.61	91.82	0.97	432	10	568	6	94.66	0.02
47	:	98Mu 33-5	13.49	0.64	76.55	1.04	431	5	567	8	73.61	0.01
48	:	98Mu 33-4	9.68	0.59	47.37	0.76	430	6	489	8	62.33	0.01
49	:	98Mu 33-3	11.94	1.36	50.71	1.27	419	11	425	11	39.93	0.03
50	:	98Mu 33-2	11.93	0.89	53.16	1.17	424	7	446	10	45.44	0.02
51	:	98Mu 33-1	12.03	0.78	57.21	1.20	425	6	476	10	47.68	0.01
SURPRISE CREEK MEASURED SECTION (AUGER SAMPLES)												
57	:	98 RK 1-91										
56	:	98 RK 1-84										
55	:	98 RK 1-78										
54	:	98 RK 1-65										
53	:	98 RK 1-57										
52	:	98 RK 1-43										
SOUTH TINGMERKPUK MEASURED SECTION												
58	:	98 JC 302-1	0.58	0.00	0.04	0.31	451	0	7	53	0.13	0.00
59	:	98 JC 302-2	0.32	0.00	0.03	0.26	418	0	9	81	0.12	0.00
60	:	98 JC 302-3	0.28	0.00	0	0.24	N.A.	0	—	86	—	—
61	:	98 JC 302-4	0.44	0.00	0.06	0.29	467	0	14	66	0.21	0.00
62	:	98 JC 302-5	0.32	0.00	0	0.22	N.A.	0	—	69	—	—
63	:	98 JC 302-6	0.41	0.00	0.07	0.21	515	0	17	51	0.33	0.00
82	:	98 JC 302-7	0.44	0.00	0.08	0.19	482	0	18	43	0.42	0.00
83	:	98 JC 302-8	0.43	0.01	0.11	0.20	498	2	26	47	0.55	0.08
84	:	98 JC 302-9	0.32	0.00	0.02	0.29	482	0	6	91	0.07	0.00
85	:	98 JC 302-10	0.31	0.00	0	0.30	N.A.	0	—	97	—	—
86	:	98 JC 302-11	0.53	0.00	0.13	0.18	494	0	25	34	0.72	0.00
87	:	98 JC 302-12	0.48	0.00	0.13	0.09	491	0	27	19	1.44	0.00
MISCELLANEOUS GRAB SAMPLES												
89	:	98 Mu 32	5.27	0.78	18.74	1.19	432	15	356	23	15.75	0.04
90	:	98 Mu 32-A	1.01	0.24	1.82	0.63	438	24	180	62	2.89	0.12
91	:	98 Mu 32-1	79.44	17.69	508.94	5.00	426	22	641	6	101.79	0.03
92	:	98 Mu 34	1.47	0.04	0.47	1.11	436	3	32	76	0.42	0.08
93	:	98 Mu 38	2.88	0.12	0.7	0.66	476	4	24	23	1.06	0.15
94	:	98 Mu 39-1	5.67	0.01	0.51	8.98	411	0	9	158	0.06	0.02
95	:	98Ha109a										
96	:	98Ha126	1.00	0.01	0.09	0.22	516	1	9	22	0.41	0.10

KEROGEN MICROSCOPY

Visual kerogen analysis employs a Zeiss Universal microscope system equipped with halogen, xenon, and tungsten light sources or a Jena Lumar microscope equipped with halogen and mercury light sources. Vitrinite reflectance and kerogen typing are performed on a polished epoxy plug of unfloated kerogen concentrate using reflected light from the halogen source. In certain situations, the whole rock is used for analysis. This approach is used for coals, where acid treatment is unnecessary in studies of solid bitumen and graptolites where preservation of rock structure is important, and in samples too small for acid treatment. The digital indicator is calibrated using a glass standard with a reflectance of 1.02% in oil. This calibration is linearly accurate for reflectance values ranging from peat (R_O 0.20%) through anthracite (R_O 4.0%).

Vitrinite Reflectance

Reflectance values are recorded only on good quality vitrinite, including obvious contamination and recycled material. The relative abundance of normal, altered, lipid-rich, oxidized, and coked vitrinite is recorded. When good quality, normal vitrinite is absent, notations are made indicating how the maturity is affected by weathering, oxidation, bitumen saturation, or coking. When normal vitrinite is absent or sparse, other macerals may be substituted. Solid bitumen, for example is present in many samples. Although solid bitumen has a different reflectance than vitrinite, Landis and Castaño's calibration chart is used to obtain an estimated vitrinite reflectance equivalent. Graptolites have a slightly higher reflectance than vitrinite and can often be used to obtain maturity data in Upper Cambrian-Silurian rocks that have no vitrinite.

Maturity calculations are made from the vitrinite reflectance histograms. Decisions as to which reflectance measurements indicate the maturity of the sample are based not only on the histogram but on all of the kerogen descriptive elements as well. Because it is not done at the time of measurement, alternate maturity calculations can be made if kerogen data and geological information dictate.

DGSI's vitrinite reflectance histograms contain much useful information. All reflectance measurements are graphically displayed and the individual readings are listed below the histogram in numeric order. In the reflectance table, each reading is coded with a letter corresponding to the measured maceral. Capital letters are used to designate reflectance values that are used in calculating the mean reflectance while reflectance values falling outside the selected range are shown with a lower case letter code. Reflectance readings lying inside the selected range are marked with a pattern on the histogram diagram and readings falling outside the selected range are left open. Each maceral has a different pattern.

Codes currently in use include: **Solid bitumen – B, Granular solid bitumen – X, Coked solid bitumen –Y, Graptolites – G, Inertinite – I, Other1 - O, Other2 - W, Vitrinite - V, Lipid-rich vitrinite -L, and Coked Vitrinite - Z.** The use of two 'other' categories allows us the flexibility of measuring unusual materials that do not fall into one of the other classes or contamination from mud additives or caving. Specific information regarding 'other' material is shown in the Comments section at the lower right corner of the Figure and in the Comments section of the VKA data sheet.

Statistics for selected macerals are listed adjacent to the histogram and the mean reflectance values are also listed below the TOC and Rock-Eval data at the upper right corner of the Figure. The measured reflectance values for solid bitumen and graptolites are recalculated in order to obtain a **vitrinite reflectance equivalent (VRE).** Therefore, for these two macerals we show both the measured reflectance and the VRE. For example, VRE-B signifies vitrinite reflectance equivalent for solid bitumen and VRE-G is the vitrinite reflectance equivalent for graptolites.

In summary, vitrinite reflectance measurements are performed on a polished plug in reflected light, TAI is performed on a slide in transmitted light, and kerogen typing is estimated from both preparations using a combination of reflected, transmitted, and fluorescent light techniques. Fluorescence in blue light is used to enhance the identification of structured and unstructured lipid material, solid bitumens, and drilling mud contaminants. Fluorescence also correlates with the maturity and state of preservation of the sample. Maturity calculations from measured reflectance data are made from the histograms and are influenced by all of the kerogen data.

Visual Kerogen Analysis Techniques

Unstructured lipid kerogen changes in texture and color during the maturation process. Typically, unstructured kerogen at low maturity is reddish brown and amorphous. Somewhere between R_o 0.50 to 0.65%, the kerogen takes on a massive texture and is gray in color. At higher maturity, generally above R_o 1.30%, unstructured kerogen is light gray and micrinized.

Kerogen typing and maturity assessments from the polished plug are enhanced by utilizing fluorescence from blue light excitation. The xenon or mercury lamp is used with an excitation filter at 495 nm coupled with a barrier filter of 520 nm. With the Jena microscope we also have the option of observing fluorescence under ultraviolet excitation. The intensity of fluorescence in the epoxy mounting medium (background fluorescence) correlates well with the onset of oil generation and destruction. The identification of structured and unstructured liptinite is also enhanced with the use of fluorescence in those samples having a maturity less than R_o 1.3%. The relative abundance and type of pyrite is also recorded.

Thermal alteration index (TAI) is performed using tungsten or halogen light source that is transmitted through a glass slide made from the unfloated kerogen concentrate. Ideally, TAI color is based on sporinite of terrestrial origin. When sporinite is absent, TAI is estimated from the unstructured lipid material. Weathering, bitumen admixed with the unstructured material and micrinization can darken the kerogen and raise the TAI value. The character of the organic matter in transmitted light is correlated with observations made in reflected light for kerogen typing.

Kerogen typing and maturity assessments from the slide preparation are also reinforced by using different light sources. The slide is first observed in transmitted light to obtain TAI color and organic matter structure or type. The light is then switched to reflected halogen light to observe structure and amount of pyrite and finally to reflected blue light excitation from the xenon or mercury source for fluorescence. The fluorescence of structured and unstructured liptinite is not masked by the epoxy fluorescence as it is in the reflected light mode because the mounting medium is non-fluorescent. Lipid structures (e.g. sporinite and alginite) within the unstructured kerogen can often be identified in blue light.

VISUAL KEROGEN ANALYSIS GLOSSARY

Several key definitions are included in this glossary in order to make our reports more self-explanatory. In our reports, we refer to organic substances as macerals. Macerals are akin to minerals in rock in that they are organic constituents that have microscopically recognizable characteristics. However, macerals vary widely in their chemical and physical properties and they are not crystalline.

1. UNSTRUCTURED KEROGEN is sometimes called structureless organic matter (SOM) or bituminite. It is widely held that unstructured kerogen represents the bacterial breakdown of lipid material. It also includes fecal pellets, minute particles of algae, organic gels, and may contain a humic component. As described on the first page of this section, unstructured lipid kerogen changes character during maturation. The three principal stages are amorphous, massive, and micrinized. Amorphous kerogen is simply without any structure. Massive kerogen has taken on a cohesive structure, as the result of polymerization during the process of oil generation. At high maturity, unstructured kerogen becomes micrinized. Micrinite is characterized optically by an aggregation of very small (less than one micron) round bodies that make up the kerogen.
2. STRUCTURED LIPID KEROGEN consists of a group of macerals which have a recognized structure, and can be related to the original living tissue from which they were derived. There are many different types, and the types can be group follows:
   a. Alginite, derived from algae. It is sometimes very useful to distinguish the different algal types, for botryococcus and pediastrum are associated with lacustrine and non-marine source rocks, while algae such as tasmanites, gloecapsomorpha, and nostocopsis are typically marine. Acritarchs and dinoflaggelates are marine organisms which are also included in the algal category.
   b. Cutinite, derived from plant cuticles, the remains of leaves.
   c. Resinite, (including fluorinite) derived from plant resins, balsams, latexes, and waxes.
   d. Sporinite, derived from spores and pollen from a wide variety of land plants.
   e. Suberinite is derived from the corky tissue of land plants.

f. Liptodetrinite is that structured lipid material that is too small to be specifically identified. Usually, it is derived from alginite or sporinite.

The algae are an important part of many oil source rocks, both marine and lacustrine. Alginite has a very high hydrogen index in Rock-Eval pyrolysis. Resins, cuticles, and suberinite contribute to the waxy, non-marine oils that are found in Africa and the Far East. At vitrinite reflectance levels above R_0 1.2 - 1.4%, structured lipid kerogen changes structure and it becomes very difficult to distinguish them from vitrinite.

3. SOLID BITUMEN also is called migrabitumen and solid hydrocarbon. In 1992, the International Committee for Coal and Organic Petrology (ICCP) decided to include solid bitumen in the Exsudatinite group. Solid bitumens are expelled hydrocarbon products which have particular morphology, reflectance and fluorescence properties which make it possible to identify them. They represent two classes of substances: one which is present at or near the place where it was generated, and second is a substance which is present in a reservoir rock and may have migrated a great distance from its point of origin. The solid bitumens have been given names, such as gilsonite, imposonite, grahamite, etc., but they represent generated heavy hydrocarbons which remain in place in the source rock or have migrated into a reservoir and mature along with the rock. Consequently, it is possible to use the reflectance of solid bitumens for maturation determinations when vitrinite is not present.

4. HUMIC TISSUE is organic material derived from the woody tissue of land plants. The most important of this group are vitrinite and inertinite:

   a. Vitrinite is derived from woody tissue which has been subjected to a minimum amount of oxidation. Normally it is by far the most abundant maceral in humic coals and because the rate of change of vitrinite reflectance is at a more even pace than it is for other macerals, it offers the best means of obtaining thermal maturity data in coals and other types of sedimentary rocks.

Because the measurement of vitrinite is so important, care is taken to distinguish normal (fresh, unaltered) vitrinite from other kinds of vitrinite. Rough vitrinite does not take a good polish and therefore may not yield good data. Oxidized vitrinite may have a reflectance higher or lower than fresh vitrinite; this is a problem often encountered in outcrop samples. Lipid-rich vitrinite, or saprovitrinite, has a lower reflectance than normal vitrinite and will produce an abnormally low thermal maturity value. Coked vitrinite is vitrinite that has structures found in vitrinite heated in a coke oven. Naturally coked vitrinite is the product of very rapid heating, such as that found adjacent to intrusions. Where it is possible to do so, vitrinite derived from an uphole portion of a well will be identified as caved vitrinite. Recycled vitrinite is the vitrinite of higher maturity which clearly can be separated from the indigenous first-cycle vitrinite population. Often, the recycled vitrinite merges in with the inert group.

   b. Inertinite is made up of woody tissue that has been matured by a different pathway. Early intense oxidation, usually involving charring, fungal attack or biochemical gelification, creates the much more highly reflecting fusinite and semi-fusinite. Sometimes the division between vitrinite and fusinite is transitional. Sclerotinite, fungal remains having a distinct morphology, are considered to be inert. An important consideration is that the inerts, as the name implies, are largely non-reactive "dead carbon" and they have an extremely low hydrogen index in Rock-Eval pyrolysis.

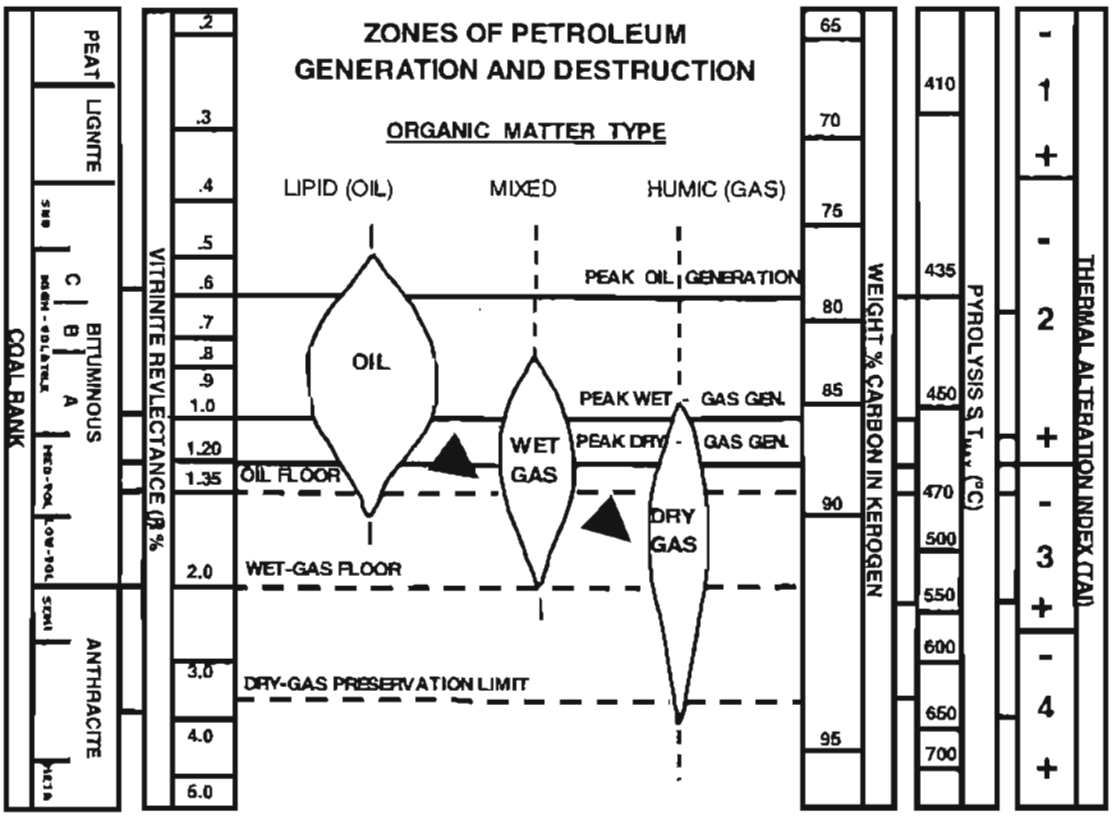
5. OTHER ORGANIC MATERIAL

   a. Lipid-rich, caved and recycled vitrinite. These are put in this section so we can show the percentages of these macerals; they are described above.

   b. Exsudatinite. Oil and oily exudates fall in this group. Exsudatinite differs from the solid bitumens on the basis of mobility and solubility. We prefer to maintain this distinction although the ICCP has now included the solid bitumens in with the Exsudatinite group.

   c. Graptolites are marine organisms that range from the Cambrian to the lower Mississippian; it has been found that they have a reflectance slightly higher than vitrinite. Because vitrinite is lacking in early Paleozoic rocks, the proper identification and measurement of graptolites is important in these sediments.

6. PYRITE. Various forms of pyrite can be readily identified under the microscope. Euhedral is pyrite with a definite crystalline habit. Framboidal is pyrite in the form of grape-like clusters which are made up of euhedral to subhedral crystals. Framboidal pyrite is normally found in sediments with a marine influence; for example, coals with a marine shale roof rock usually contain framboidal pyrite. Massive pyrite is pyrite with no particular external form. Often this is pyrite that forms rather late in the pore spaces of the sediment. Replacement/infilling is self-explanatory.



CORRELATION OF VARIOUS MATURATION INDICES AND ZONES OF PETROLEUM GENERATION AND DESTRUCTION

Tingmerkpuk 1998 Project Samples

Kukpowruk Redwul Measured Section

SEGMENT 1, Top of Bluff

98 Mu 11 Organic matter consists primarily of dark gray, micrinized unstructured lipids with granular solid bitumen inclusions. Some vitrinite and lipid-rich vitrinite fragments have rough texture and are difficult to differentiate from solid bitumen. Rough texture may lower some R_o values. Solid bitumen formation may raise TAI values.

98 Mu 11-1 Organic matter is similar to that in **98 Mu 11**, but structured fragments are smaller. There is also a trace of coking material.

98 Mu 11-2 Organic matter is similar to that in **98 Mu 11** with more solid bitumen.

98 Mu 11-2A Organic matter continues to be similar to that in **98 Mu 11**. All R_o values may be lowered.

98 Mu 11-4 Micrinized unstructured lipids with solid bitumen formation, as previously. Difficult to differentiate some solid bitumen fragments from lipid-rich vitrinite.

98 Mu 11-5 In reflected light, the unstructured lipids are small particles mixed with mineral. Some particles have a shape similar to terrestrial material, but in transmitted light, the organic matter is evenly dispersed in the mounting medium and has a granular texture.

98 Mu 11-6A Organic matter consists of micrinized lipids with solid bitumen formation. It is difficult to differentiate some structured fragments as previously.

98 Mu 11-6 Micrinized lipids with small, difficult to identify structured fragments as previously.

98 Mu 11-7 Similar to **98 Mu 11-5**.

98 Mu 11-8 Organic matter type is the same as previously, but appearance is different. Unstructured lipids are brown with dense, grainy texture. Terrestrial fragments are very small and difficult to identify. There is a moderate amount of pyrite.

98 Mu 11-9 Unstructured lipids are brown with grainy texture. Some structured lipids.

SEGMENT 2, Offset to East in Small Gully

98 Mu 11-10 In reflected light, the unstructured lipids have a grainy texture with solid bitumen inclusions and are mixed with mineral. Some small terrestrial fragments are difficult to differentiate from solid bitumen fragments.

98 Mu 11-12 Organic matter consists primarily of micrinized lipids with solid bitumen inclusions. Terrestrial fragments are small and difficult to identify.

SEGMENT 2, Offset to East on Slope Face

98 Mu 11-14 Unstructured lipids are gray-brown with grainy-micrinized texture. Solid bitumen and terrestrial fragments are small. There is a trace of sporinite.

98 Mu 11-16 Unstructured lipids are brown with grainy texture. Terrestrial fragments are small. There is a trace of sporinite.

98 Mu 11-18 Organic matter consists of grainy lipids with small, difficult to identify fragments. There is a trace of graphite.

98 Mu 11-19A Organic matter is similar to that in **98 Mu 11-18**, plus abundant pyrite.

98 Mu 11-20 Organic matter consists primarily of dense masses of brown, grainy, unstructured lipids. Low-rank reflectance values may be on solid bitumen or oxidized vitrinite. There is a trace of graphite.

98 Mu 11-21A Unstructured lipids have micrinized-grainy texture. There is a trace of coking vitrinite. Possible oxidation.

98 Mu 11-23 Organic matter consists of grainy unstructured lipids with small, difficult to identify terrestrial and solid bitumen fragments. Possible oxidation.

98 Mu 11-25 Similar to **98 Mu 11-23**.

98 Mu 11-27 Unstructured lipids are brown to gray with micrinized texture. Small structured fragments are difficult to identify. Trace of graphite and coking vitrinite.

Horseshoe Bend Measured Section

98 Mu 19-11 Organic matter consists of amorphous-massive textured unstructured lipids with algal structures and formation of angular solid bitumen. Solid bitumen formation may raise TAI value of unstructured lipids.

SEGMENT 2, Measured 100 m. up gully

98 Mu 19-10 Small amount of organic matter mixed with mineral. Small terrestrial fragments are difficult to identify – some R_o values may be on inertinite. There is a trace of sporinite.

98 Mu 19-8 Similar to **98 Mu 19-10**.

SEGMENT 1, Measured at mouth of gully, north side of Ipewik River

98 Mu 19-6 Organic matter consists of unstructured lipids with some angular solid bitumen formation and small terrestrial fragments. The formation of solid bitumen may raise TAI value of unstructured lipids.

98 Mu 19-4 Similar to **98 Mu 19-6**, plus several fragments of coking vitrinite.

98 Mu 19-2 Similar to **98 Mu 19-6**. Terrestrial fragments are very small and difficult to identify.

98 Mu 19 Unstructured lipids are similar to **98 Mu 19-6**.

Ipewik Tributary Measured Section

98 Mu 33-7 Organic matter consists of a sapropelic groundmass of unstructured lipids, bituminite, and structured lipids. Reflectance measurements are on solid bitumen. Solid bitumen formation may raise TAI value of unstructured lipids.

98 Mu 33-6 Similar to **98 Mu 33-7**. Difficult to differentiate lipid-rich vitrinite and some solid bitumen fragments.

98 Mu 33-5 Similar to **98 Mu 33-6**, with less bituminite.

98 Mu 33-4 Organic matter continues to consist of a sapropelic groundmass of unstructured lipids, bituminite, and structured lipids. Trace of graphite.

98 Mu 33-3 Sapropelic material as previously. Difficult to differentiate solid bitumen and some lipid-rich vitrinite.

98 Mu 33-2 Similar to **98 Mu 33-3**. Trace of graphite.

98 Mu 33-1 Organic matter is similar to that in **98 Mu 33-2** with some mineral mixed with it. There is a trace of sporinite.

South Tingmerkpuk Measured Section

98 JC 302-1 Organic matter consists of small terrestrial fragments and high-rank sporinite in a mineral groundmass. Some reflectance values may be on inertinite.

98 FC 302-4 Small amount of organic matter as in **JC 302-1**.

98 JC 302-7 Organic matter consists primarily of small particles of unstructured lipids mixed with mineral. Vitrinite fragments are small and difficult to identify.

98 JC 302-10 Organic fragments are very small and difficult to identify.

98 JC 302-12 Small organic fragments as previously. Some vitrinite is beginning to coke.

Miscellaneous Grab Samples

98 Mu 32 Organic matter consists of black, micrinized unstructured lipids with angular solid bitumen formation. Solid bitumen formation may raise TAI value on unstructured lipids.

98 Mu 32-A Dark gray, micrinized, unstructured lipids with angular solid bitumen formation.

98 Mu 32-1 Whole rock sample consists of large solid bitumen fragements that have dark brown fluorescence. Based upon Jacob's solid bitumen classification using reflectance, fluorescence, and solubility tests, the bitumen is probably albertite.

98 Mu 34 Organic matter is a mixture of unstructured lipids and small terrestrial fragments.

98 Mu 38 Micrinized lipids with angular solid bitumen formation. Some lipid-rich vitrinite and solid bitumen are beginning to coke.

98 Mu 39-1 Organic matter consists of black, micrinized lipids with small fragments of oxidized terrestrial material. There is low yellow, background fluorescence in the transmitted light slide.

98 Ha 126 Grainy unstructured lipids and small terrestrial fragments in a mineral groundmass. Trace of coking vitrinite.

Tingmerkpuk 1998 Project Samples

KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372

DGSI

DGSI Number	Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED Undifferentiated	Amorphous	Massive	Micrinized	STRUCTURED Type	Type	Type	Type	Solid Bitumen	HUMIC Inertinite	Vitrinite	OTHER Type	Type	RELATIVE ABUNDANCE Pyrite Type	Pyrite	Organic Concentration	VITRINITE Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI Value	FLUOR. Color	Intensity	STRU. TAI Value	FLUOR. Color	Intensity	Ro Vit. Reflectance or Eqi
SEGMENT 1, TOP OF BLUFF		K																																	
1	98 Mu 11	OC				75					10	5	5	VL 5		MA	-	+	-	+	M			BL	0			2	3+ 3-	BL	0				V 1.28
Comments:	*Dark gray, micrinized lipids with granular solid bitumen. Difficult to differentiate some vitrinite, lipid-rich vitrinite, and solid bitumen fragments.*																																		
2	98 Mu 11-1	K OC				75					10	5	5	VL 5		MA	T	+	-	M	M		T	BL	0			2 3	3-	BL	0				V 1.27
Comments:	*Similar to 98 Mu 11, but terrestrial fragments are smaller. Trace of coking material.*																																		
3	98 Mu 11-2	K OC				75					20	T	5	VL T		MA	-	+	M	M	T	T		BL	0			1	3-	BL	0				-
Comments:	*Similar to 98 Mu 11 with more solid bitumen.*																																		
4	98 Mu 11-2A	K OC				80					10	5	5	VL T		MA	T	+	?	M	T		T	BL	0			2 3	3-	BL	0				V 1.04
Comments:	*Organic matter continues to be similar to that in 98 Mu 11. All Ro values may be slightly lowered.*																																		
6	98 Mu 11-4	K OC				70					20	5	T	VL 5		MA	-	+	?	M	M			BL	0			3	3-	BL	0				V 0.94
Comments:	*Micrinized lipids with solid bitumen formation. Difficult to differentiate some solid bitumen and lipid-rich vitrinite.*																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

____ Jena

____ Leitz

SAMPLE TYPE/PREP

CTG	Cuttings
CC	Conv. Core
SWC	SideWallCore
OC	Outcrop
Nf	No Inform.
C	Coal
K	Kerogen
WR	Whole Rock
n.d.	Not Determined

STRUCTURED LIPIDS

AL	Alginite
SB	Suberinite
C	Cutinite
LD	Liptodetrinite
U	Undiffer.
S	Sporinite
R	Resinite
O	Other

OTHER ORGANIC MATTER

E	Exsudatinite
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	VitriniteContamination
VR	Recycled Vitrinite

PURITE

E	Euhedral
F	Framboid
MA	Massive
RI	Replace-infill

ABUND.

N	None
T	Trace
-	Small Amt.
M	Mod. Amt.
+	Large Amt.
++	Abundant

FLUOR. INTENS.

0	None
1	Weak
2	Moderate
3	Strong
4	Intense

VIT. REFLECT. EQUIVALENCE

B	Bitumen
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	Vitrinite Contam.
VR	Recycled Vitrinite

FLUOR. COLOR

W	White
G	Green
Y	Yellow
O	Orange
R	Red
B	Brown
BL	Black
L	Light
D	Dark

TAI COLOR VALUES

1-	Straw Yellow
1	Pale Yellow
1+	Yellow
2-	Yellow-Orange
2	Golden
2+	Amber
3-	Reddish Brown
3	Medium Brown
3+	Dark Brown
4-	Brown-Black
4	Black
4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR.: Color	Intensity	STRU.: Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI: Value	UNSTR. FLUOR.: Color	Intensity	STRU. TAI: Value	STRU. FLUOR.: Color	Intensity	Ro: Vit. Reflectance or Eq.
7	98 Mu 11-5	K OC				100					T	T	T			MA	-	M	?					BL	0			2	3	BL	0				V U
Comments:	*Small particles of micrinized lipids. In transmitted light, unstructured lipids have a granular texture and are evenly dispersed in mounting medium.*																																		
8	98 Mu 11-6A	K OC				75					25	T	T	VL T		MA	T	+	M	M	M			BL	0			2 3	3- 3	BL	0				B 1.00 V 0.91
Comments:	*Difficult to identify some structured fragments as previously.*																																		
9	98 Mu 11-6	K OC				90					10	T	?	VL T		MA	T	+	?	M	+			BL	0			2 3	3-	BL	0				B 1.35 V 1.21
Comments:	*Micrinized lipids with small, difficult to identify structured fragments as previously.*																																		
10	98 Mu 11-7	K OC				100					?					MA	T	-						BL	0			1	3	BL	0				V U
Comments:	*Similar to 98 Mu 11-5.*																																		
11	98 Mu 11-8	K OC	95								5	T	T			MA	M	+	+					BL	0			3	3- 3	BL	0				V 1.15
Comments:	*Brown unstructured lipids have a dense, grainy texture. Very small structured fragments are difficult to identify. Moderate amount of pyrite.*																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

____ Jena

____ Leitz

SAMPLE TYPE/PREP		STRUCTURED LIPIDS		OTHER ORGANIC MATTER		PYRITE		ABUND.		FLUOR. INTENS.		VIT. REFLECT. EQUIVALENCE		FLUOR. COLOR		TAI COLOR VALUES	
CTG	Cuttings	AL	Alginite	E	Exsudatinite	E	Euhedral	N	None	0	None	B	Bitumen	W	White	1-	Straw Yellow
CC	Conv. Core	SB	Suberinite	G	Graptolites	F	Framboid	T	Trace	1	Weak	G	Graptolites	G	Green	1	Pale Yellow
SWC	SideWallCore	C	Cutinite	VL	Lipid-Rich Vitrinite	MA	Massive	-	Small Amt.	2	Moderate	VL	Lipid-Rich Vitrinite	Y	Yellow	1+	Yellow
OC	Outcrop	LD	Liptodetrinite	VC	VitriniteContamination	RI	Replace-infill	M	Mod. Amt.	3	Strong	VC	Vitrinite Contam.	O	Orange	2-	Yellow-Orange
NI	No Inform.	U	Undiffer.	VR	Recycled Vitrinite			+	Large Amt.	4	Intense	VR	Recycled Vitrinite	R	Red	2	Golden
C	Coal	S	Sporinite					++	Abundant					B	Brown	2+	Amber
		R	Resinite											BL	Black	3-	Reddish Brown
K	Kerogen	O	Other													3	Medium Brown
WR	Whole Rock															3+	Dark Brown
														L	Light	4-	Brown-Black
n.d.	Not Determined													D	Dark	4	Black
																4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample Type	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR.: Color	Intensity	STRU.: Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI: Value	FLUOR.: Color	Intensity	STRU. TAI: Value	FLUOR.: Color	Intensity	Ro: Vit. Reflectance or Eqi
12	98 Mu 11-9	K OC	80				U 5	S ?	AL ?		10	T	5			MA	M	+	+					DB	1			4	3-	BL	0				V 1.35
Comments:	Brown, grainy unstructured lipids. Some structured lipids.																																		
13	98 Mu 11-10	K OC	85		T		U T				10	T	5			MA	-	M	+			?		BL	0			3	3-	BL	0				V 1.25
Comments:	Grainy unstructured lipids are mixed with mineral. Difficult to identify small terrestrial fragments.																																		
15	98 Mu 11-12	K OC				85	U T				15	T	T			MA	M	+	+					BL	0			3	3-	BL	0				V 1.35
Comments:	Micrinized lipids with solid bitumen inclusions. Small terrestrial fragments.																																		
17	98 Mu 11-14	K OC				85	U T	S T			5	5	5			MA	-	+	+	-				DB BL	1 0			4	3- 3	BL	0	3- 3	BL	0	V 1.44
Comments:	Gray-brown, grainy-micrinized lipids.																																		
19	98 Mu 11-16	K OC	85				U T	S T			T	5	5	VL 5		MA	M	+	M	-	M	?		BL	0			4	3-	BL	0	3-	BL	0	V 1.17
Comments:	Brown, grainy, unstructured lipids.																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss
____ Jena
____ Leitz

SAMPLE TYPE/PREP

CTG	Cuttings
CC	Conv. Core
SWC	SideWallCore
OC	Outcrop
NI	No Inform.
C	Coal
K	Kerogen
WR	Whole Rock
n.d.	Not Determined

STRUCTURED LIPIDS

AL	Alginite
SB	Suberinite
C	Cutinite
LD	Liptodetrinite
U	Undiffer.
S	Sporinite
R	Resinite
O	Other

OTHER ORGANIC MATTER

E	Exsudatinite
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	VitriniteContamination
VR	Recycled Vitrinite

PYRITE

E	Euhedral
F	Framboid
MA	Massive
RI	Replace-infill

ABUND.

N	None
T	Trace
-	Small Amt.
M	Mod. Amt.
+	Large Amt.
++	Abundant

FLUOR. INTENS.

0	None
1	Weak
2	Moderate
3	Strong
4	Intense

VIT. REFLECT. EQUIVALENCE

B	Bitumen
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	Vitrinite Contam
VR	Recycled Vitrinite

FLUOR. COLOR

W	White
G	Green
Y	Yellow
O	Orange
R	Red
B	Brown
BL	Black
L	Light
D	Dark

TAI COLOR VALUES

1-	Straw Yellow
1	Pale Yellow
1+	Yellow
2-	Yellow-Orange
2	Golden
2+	Amber
3-	Reddish Brown
3	Medium Brown
3+	Dark Brown
4-	Brown-Black
4	Black
4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED Type	Type	Type	Type	Solid Bitumen	HUMIC Inertinite	Vitrinite	OTHER Type	Type	RELATIVE ABUNDANCE Pyrite Type	Pyrite	Organic Concentration	VITRINITE Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI Value	FLUOR. Color	Intensity	STRU. TAI Value	FLUOR. Color	Intensity	Ro Vit. Reflectance or Eqi
21	98 Mu 11-18	K OC	90				U T				5	T	5			MA E	M	+	+				T	DB BL	1 0			4	3-	BL	0				V 1.45
Comments:	*Grainy lipids with small, difficult to identify fragments. Trace graphite.*																																		
23	98 Mu 11-19-A	K OC	90								5	T	5	VL T		MA	+	+	+	T	T			DB	1			4	3-	BL	0				V 1.27
Comments:	*Similar to 98 Mu 11-18, plus abundant pyrite.*																																		
24	98 Mu 11-20	K OC	80								10	T	5	VL 5		MA	M	M	M	-	M	?	T	BL	0			4	3-	BL	0				V 1.26
Comments:	*Dense masses of brown, grainy, unstructured lipids. Low Ro values may be on solid bitumen or oxidized vitrinite. Trace graphite.*																																		
26	98 Mu 11-21A	K OC				80	U 5				5	5	5	VL T		MA	M	M	+	-	T	?	T	BL	0	BL	0	4	3-	BL	0				V 1.31
Comments:	*Trace coking vitrinite.*																																		
28	98 Mu 11-23	K OC	80				U T				5	5	10			F MA	M	M	+	-		?		DB BL	1 0			4	3-	BL	0				V 1.26
Comments:	*Small terrestrial and solid bitumen fragments are difficult to differentiate.*																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

____ Jena

____ Leitz

SAMPLE TYPE/PREP

CTG	Cuttings
CC	Conv. Core
SWC	SideWallCore
OC	Outcrop
NI	No Inform.
C	Coal
K	Kerogen
WR	Whole Rock
n.d.	Not Determined

STRUCTURED LIPIDS

AL	Alginite
SB	Subennite
C	Cutinite
LD	Liptodetrinite
U	Undiffer.
S	Sporinite
R	Resinite
O	Other

OTHER ORGANIC MATTER

E	Exsudatinite
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	VitriniteContamination
VR	Recycled Vitrinite

PYRITE

E	Euhedral
F	Framboid
MA	Massive
RI	Replace-infill

ABUND.

N	None
T	Trace
-	Small Amt.
M	Mod. Amt.
+	Large Amt
++	Abundant

FLUOR. INTENS.

0	None
1	Weak
2	Moderate
3	Strong
4	Intense

VIT. REFLECT. EQUIVALENCE

B	Bitumen
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	Vitrinite Contam.
VR	Recycled Vitrinite

FLUOR. COLOR

W	White
G	Green
Y	Yellow
O	Orange
R	Red
B	Brown
BL	Black
L	Light
D	Dark

TAI COLOR VALUES

1-	Straw Yellow
1	Pale Yellow
1+	Yellow
2-	Yellow-Orange
2	Golden
2+	Amber
3-	Reddish Brown
3	Medium Brown
3+	Dark Brown
4-	Brown-Black
4	Black
4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED Type	Type	Type	Type	Solid Bitumen	HUMIC Inertinite	Vitrinite	OTHER Type	Type	RELATIVE ABUNDANCE Pyrite Type	Pyrite	Organic Concentration	VITRINITE Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI Value	FLUOR. Color	Intensity	STRU. TAI Value	FLUOR. Color	Intensity	Ro Vit. Reflectance or Eqv
30	98 Mu 11-25	K OC	90								5	T	5	VL T		T E	M	+	+		T			BL	0			4	3-	BL	0				- V 1.32
Comments:	*Brown, grainy unstructured lipids. Difficult to identify small structured fragments.*																																		
32	98 Mu 11-27	K OC				80	S T				5	5	10	VL T		MA	M	M	+	T	T	T	T	BL	0			4	3-	BL	0	3-	BL	0	- V 1.26
Comments:	*Small structured fragments are difficult to identify. Trace of graphite and coking vitrinite.*																																		
Comments:																																			
Comments:																																			
Comments:																																			

ANALYST	SAMPLE TYPE/PREP	STRUCTURED LIPIDS	OTHER ORGANIC MATTER	PYRITE	ABUND.	FLUOR. INTENS.	VIT. REFLECT. EQUIVALENCE	FLUOR. COLOR	TAI COLOR VALUES
X O'Connor	CTG Cuttings	AL Alginite	E Exsudatinite	E Euhedral	N None	0 None	B Bitumen	W White	1- Straw Yellow
	CC Conv. Core	SB Suberinite	G Graptolites	F Framboid	T Trace	1 Weak	G Graptolites	G Green	1 Pale Yellow
MICROSCOPE	SWC SideWallCore	C Cutinite	VL Lipid-Rich Vitrinite	MA Massive	- Small Amt.	2 Moderate	VL Lipid-Rich Vitrinite	Y Yellow	1+ Yellow
	OC Outcrop	LD Liptodetrinite	VC VitriniteContamination	RI Replace-ment	M Mod. Amt.	3 Strong	VC Vitrinite Contam.	O Orange	2- Yellow-Orange
X Zeiss	NI No Inform	U Undiffer.	VR Recycled Vitrinite	infill	+ Large Amt.	4 Intense	VR Recycled Vitrinite	R Red	2 Golden
Jena	C Coal	S Sporinite			++ Abundant			B Brown	2+ Amber
Leitz	K Kerogen	R Resinite						BL Black	3- Reddish Brown
	WR Whole Rock	O Other							3 Medium Brown
	n.d. Not Determined							L Light	3+ Dark Brown
								D Dark	4- Brown-Black
									4 Black
									4+ Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

HORSESHOE BEND MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR.: Color	Intensity	STRU.: Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI: Value	UNSTR. FLUOR.: Color	Intensity	STRU. TAI: Value	STRU. FLUOR.: Color	Intensity	Ro: Vit. Reflectance or Eq.
33	98 Mu 19-11	K OC		65			AL 15				20	T				F MA	M	+						B	1	DO	1	2	2+	O OB	2 1		Y O	2	B 0.87 -
Comments:	*Amorphous-massive lipids with algal structure and some solid bitumen formation. Bitumen formation may raise TAI value of unstructured lipids.*																																		
34	98 Mu19-10	K OC	40				LD T	S T			T	30	30			F	M	-	+	-	?			BL	0	DB	1	3	3	BL	0	2+	O	1	V 1.25
Comments:	*Small amount of organic matter. Small terrestrial fragments are difficult to identify and some Ro may be on inertinite.*																																		
36	98Mu19-8	K OC	60				LD T					20	20	VL T		F MA	M	-	+	T	T	T		B	1	O	2	3	2+	BL	0		YO	2	V 1.16
Comments:	*Similar to 98 Mu 19-10.*																																		
38	98 Mu 19-6	K OC	65				S T				5	5	5	VL T		MA	-	M	M		M	T		BL	0	O	3	2	3- 3	BL	0		O YO	1 2	V 1.07
Comments:	*Grainy, unstructured lipids with some angular solid bitumen formation. Bitumen formation may raise TAI value of unstructured lipids.*																																		
40	98 Mu 19-4	K OC	80				LD T	U T			5	5	10	VL T		MA	-	M	+	T		-	T	DB	1	DB	1	2 3	3- 3	BL	0				V 1.19
Comments:	*Trace coking vitrinite. Unstructured lipids have some angular solid bitumen formation. Ro on small fragments.*																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss
____ Jena
____ Leitz

SAMPLE TYPE/PREP

CTG	Cuttings
CC	Conv. Core
SWC	Side Wall Core
OC	Outcrop
NI	No Inform.
C	Coal
K	Kerogen
WR	Whole Rock
n.d.	Not Determined

STRUCTURED LIPIDS

AL	Alginite
SB	Suberinite
C	Cutinite
LD	Liptodetrinite
U	Undiffer.
S	Sporinite
R	Resinite
O	Other

OTHER ORGANIC MATTER

E	Exsudatinite
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	VitriniteContamination
VR	Recycled Vitrinite

PYRITE

E	Euhedral
F	Framboid
MA	Massive
RI	Replace-infill

ABUND.

N	None
T	Trace
-	Small Amt.
M	Mod. Amt.
+	Large Amt
++	Abundant

FLUOR. INTENS.

0	None
1	Weak
2	Moderate
3	Strong
4	Intense

VIT. REFLECT. EQUIVALENCE

B	Bituroen
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	Vitrinite Contam.
VR	Recycled Vitrinite

FLUOR. COLOR

W	White
G	Green
Y	Yellow
O	Orange
R	Red
B	Brown
BL	Black
L	Light
D	Dark

TAI COLOR VALUES

1-	Straw Yellow
1	Pale Yellow
1+	Yellow
2-	Yellow-Orange
2	Golden
2+	Amber
3-	Reddish Brown
3	Medium Brown
3+	Dark Brown
4-	Brown-Black
4	Black
4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

HORSESHOE BEND MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS: UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS: UNSTR. TAI Value	UNSTR. FLUOR. Color	UNSTR. FLUOR. Intensity	STRU. TAI Value	STRU. FLUOR. Color	STRU. FLUOR. Intensity	Ro: Vit. Reflectance or Eq.
42	98 Mu 19-2	K OC	95								T	5	T			MA	-	M	+					DB	1			2 3	3	BL	0				- -
Comments:	*Similar to 98 Mu 19-6. Very small terrestrial fragments are difficult to identify.*																																		
44	98 Mu 19	K OC	90								5	5	T	VL T		MA	-	M	M	M	M			DB	1			2 3	3	BL	0				V 1.13
Comments:	*Grainy unstructured lipids with some angular solid bitumen formation as previously.*																																		
Comments:																																			
Comments:																																			
Comments:																																			

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

Jena

Leitz

SAMPLE TYPE/PREP		STRUCTURED LIPIDS		OTHER ORGANIC MATTER		PYRITE		ABUND.		FLUOR. INTENS.		VIT. REFLECT. EQUIVALENCE		FLUOR. COLOR		TAI COLOR VALUES	
CTG	Cuttings	AL	Alginite	E	Exsudatinite	E	Euhedral	N	None	0	None	B	Bitumen	W	White	1-	Straw Yellow
CC	Conv. Core	SB	Suberinite	G	Graptolites	F	Framboid	T	Trace	1	Weak	G	Graptolites	G	Green	1	Pale Yellow
SWC	SideWallCore	C	Cutinite	VL	Lipid-Rich Vitrinite	MA	Massive	-	Small Amt.	2	Moderate	VL	Lipid-Rich Vitrinite	Y	Yellow	1+	Yellow
OC	Outcrop	LD	Liptodetrinite	VC	VitriniteContamination	RI	Replace-infill	M	Mod. Amt.	3	Strong	VC	Vitrinite Contam.	O	Orange	2-	Yellow-Orange
NI	No Inform.	U	Undiffer.	VR	Recycled Vitrinite			+	Large Amt.	4	Intense	VR	Recycled Vitrinite	R	Red	2	Golden
C	Coal	S	Sporinite					++	Abundant					B	Brown	2+	Amber
		R	Resinite											BL	Black	3-	Reddish Brown
K	Kerogen	O	Other													3	Medium Brown
WR	Whole Rock															3+	Dark Brown
														L	Light	4-	Brown-Black
n.d.	Not Determined													D	Dark	4	Black
																4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

IPEWIK TRIBUTARY MEASURED SECTION

DGSI Project: 98/4372

DGSI

DGSI Number	Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS: UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS: UNSTR. TAI	FLUOR. Color	Intensity	STRU. TAI	FLUOR. Color	Intensity	Ro: Vit. Reflectance or Eq.
45	98Mu 33-7	K OC			30		AL 20				50	T				MA	T	+						DB	1	O YO	1 2	2	3-	OB O	2		Y O	2	B 0.73 -
Comments:	*Sapropelic groundmass of unstructured lipids, bituminite, and structured lipids. Ro on solid bitumen.*																																		
46	98Mu 33-6	K OC			30		AL 30				40	T		VL T		MA	T	+	N		+			DB	1	YO O	2	2 3	3-	DOB	1		Y	2	B 0.69 -
Comments:	*Similar to sample 98 Mu 33-7.*																																		
47	98Mu 33-5	K OC			55		AL 20				20	T	T	VL 5		MA	T	+	T	-	+			O B	1	O YO	2	2 3	3-	O DOB	1		Y YO	2	B 0.77 V 0.53
Comments:	*Similar to sample 98 Mu 33-6, with less bituminite.*																																		
48	98Mu 33-4	K OC			55		AL 10				25	5	T	VL 5		MA	T	+	T	-	+		T	B O	1	O Y	1 2	2 3	3-	O OB	1		Y YO	2	B 0.61 -
Comments:	*Sapropelic groundmass continues. Trace graphite.*																																		
49	98Mu 33-3	K OC			60		AL 10				30	T		VL T		MA	T	+	N	-	+			DB B	1	O	1 2	2 3	3-	OB	2		Y	1 2	B 0.83 -
Comments:	*Sapropelic material as previously. Difficult to differentiate solid bitumen and lipid-rich vitrinite.*																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

____ Jena

____ Leitz

SAMPLE TYPE/PREP

CTG	Cuttings
CC	Conv. Core
SWC	SideWallCore
OC	Outcrop
NI	No Inform.
C	Coal
K	Kerogen
WR	Whole Rock
n.d.	Not Determined

STRUCTURED LIPIDS

AL	Alginite
SB	Suberinite
C	Cutinite
LD	Liptodetrinite
U	Undiffer.
S	Sporinite
R	Resinite
O	Other

OTHER ORGANIC MATTER

E	Exsudatinite
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	VitriniteContamination
VR	Recycled Vitrinite

PYRITE

E	Euhedral
F	Framboid
MA	Massive
RI	Replace-infill

ABUND.

N	None
T	Trace
-	Small Amt.
M	Mod. Amt.
+	Large Amt.
++	Abundant

FLUOR. INTENS.

0	None
1	Weak
2	Moderate
3	Strong
4	Intense

VIT. REFLECT. EQUIVALENCE

B	Bitumen
G	Graptolites
VL	Lipid-Rich Vitrinite
VC	Vitrinite Contam.
VR	Recycled Vitrinite

FLUOR. COLOR

W	White
G	Green
Y	Yellow
O	Orange
R	Red
B	Brown
BL	Black
L	Light
D	Dark

TAI COLOR VALUES

1-	Straw Yellow
1	Pale Yellow
1+	Yellow
2-	Yellow-Orange
2	Golden
2+	Amber
3-	Reddish Brown
3	Medium Brown
3+	Dark Brown
4-	Brown-Black
4	Black
4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

IPEWIK TRIBUTARY MEASURED SECTION

DGSI Project: 98/4372

DGSI

DGSI Number	Sample Id or Depth	Preparation/Sample T:	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS: UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS: UNSTR. TAI	UNSTR. FLUOR. Color	UNSTR. FLUOR. Intensity	STRU. TAI	STRU. FLUOR. Color	STRU. FLUOR. Intensity	Ro: Vit. Reflectance or Eq:
50	98Mu 33-2	K OC			40		AL 20	S ?			40	T		VL T		MA	T	+	N		+		T	B O	1	O Y	2	3	3-	DOB OB	1 2		Y	2 3	B 0.80 -
Comments:	*Similar to sample 98 Mu 33-3. Trace graphite.*																																		
51	98Mu 33-1	K OC			25		AL 20	S T			45	5	T	VL 5		F MA	-	+	?		+	T		DB	1	O Y	2	3	3-	DOB	1	1 2-	Y YO	2 3	- -
Comments:	*Similar to sample 98 Mu 33-2, with some mineral mixed with it and more pyrite than previously. Trace sponnite.*																																		
Comments:																																			
Comments:																																			
Comments:																																			

ANALYST	SAMPLE TYPE/PREP	STRUCTURED LIPIDS	OTHER ORGANIC MATTER	PYRITE	ABUND.	FLUOR. INTENS.	VIT. REFLECT. EQUIVALENCE	FLUOR. COLOR	TAI COLOR VALUES
X O'Connor	CTG Cuttings	AL Alginite	E Exsudatinite	E Euhedral	N None	0 None	B Bitumen	W White	1- Straw Yellow
	CC Conv. Core	SB Suberinite	G Graptolites	F Framboid	T Trace	1 Weak	G Graptolites	G Green	1 Pale Yellow
MICROSCOPE	SWC SideWallCore	C Cutinite	VL Lipid-Rich Vitrinite	MA Massive	- Small Amt.	2 Moderate	VL Lipid-Rich Vitrinite	Y Yellow	1+ Yellow
X Zeiss	OC Outcrop	LD Liptodetrinite	VC VitriniteContamination	RI Replace-infill	M Mod. Amt.	3 Strong	VC Vitrinite Contam.	O Orange	2- Yellow-Orange
Jena	NI No Inform.	U Undiffer.	VR Recycled Vitrinite		+ Large Amt.	4 Intense	VR Recycled Vitrinite	R Red	2 Golden
Leitz	C Coal	S Sporinite			++ Abundant			B Brown	2+ Amber
		R Resinite						BL Black	3- Reddish Brown
	K Kerogen	O Other							3 Medium Brown
	WR Whole Rock								3+ Dark Brown
								L Light	4- Brown-Black
	n.d. Not Determined							D Dark	4 Black
									4+ Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

SOUTH TINGMERKPUK MEASURED SECTION

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED: Type	Type	Type	Type	Solid Bitumen	HUMIC: Inertinite	Vitrinite	OTHER: Type	Type	RELATIVE ABUNDANCE: Pyrite Type	Pyrite	Organic Concentration	VITRINITE: Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS: Color	Intensity	Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI: Value	UNSTR. FLUOR.: Color	Intensity	STRU. TAI: Value	STRU. FLUOR.: Color	Intensity	Ro: Vit. Reflectance or Eq
58	98 JC 302-1	K OC	10				S 20					20	50	VL T		MA	T	-	+		?			BL	0			0	n.d.			3+	BL	0	V 1.76
Comments:	*Small terrestrial fragments in mineral groundmass. High-rank sporinite. Some Ro may be on inertinite.*																																		
61	98 JC 302-4	K OC	20				S 20					10	50	VL T		MA	T	-	+		T		T	BL	0			0	n.d.			3 3+	BL	0	V 1.76
Comments:	*Similar to sample 98 JC 302-1. Trace graphite.*																																		
82	98 JC 302-7	K OC	85									5	10			MA	T	-	+		?			BL	0			0	3-	BL	0				V 1.69
Comments:	*Small particles of unstructured lipids mixed with mineral.*																																		
85	98 JC 302-10	K OC	-				S T					-	-			MA	T	-	+					BL	0			0	n.d.			3+	BL	0	-
Comments:	*Very small organic fragments are difficult to identify.*																																		
87	98 JC 302-12	K OC	80				S T					5	15	VL T		MA	T	-	+	-	T		T	BL	0			0	3+	BL	0	3+	BL	0	V 1.68
Comments:	*Small organic fragments. Some vitrinite is beginning to coke.*																																		

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

____ Jena

____ Leitz

SAMPLE TYPE/PREP		STRUCTURED LIPIDS		OTHER ORGANIC MATTER		PYRITE		ABUND.		FLUOR. INTENS.	VIT. REFLECT. EQUIVALENCE	FLUOR. COLOR		TAI COLOR VALUES	
CTG	Cuttings	AL	Alginite	E	Exudatinite	E	Euhedral	N	None	0	B Bitumen	W	White	1-	Straw Yellow
CC	Conv Core	SB	Suberinite	G	Graptolites	F	Framboid	T	Trace	1	G Graptolites	G	Green	1	Pale Yellow
SWC	SideWallCore	C	Cutinite	VL	Lipid-Rich Vitrinite	MA	Massive	-	Small Amt.	2	VL Lipid-Rich Vitrinite	Y	Yellow	1+	Yellow
OC	Outcrop	LD	Liptodetrinite	VC	VitriniteContamination	RI	Replace-infill	M	Mod. Amt.	3	VC Vitrinite Contam.	O	Orange	2-	Yellow-Orange
NI	No Inform	U	Undiffer.	VR	Recycled Vitrinite			+	Large Amt.	4	VR Recycled Vitrinite	R	Red	2	Golden
C	Coal	S	Sporinite					++	Abundant			B	Brown	2+	Amber
		R	Resinite									BL	Black	3-	Reddish Brown
K	Kerogen	O	Other											3	Medium Brown
WR	Whole Rock													3+	Dark Brown
												L	Light	4-	Brown-Black
a.d.	Not Determined											D	Dark	4	Black
														4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

MISCELLANEOUS GRAB SAMPLES

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED Undifferentiated	Amorphous	Massive	Micrinized	STRUCTURED Type	Type	Type	Type	Solid Bitumen	HUMIC Inertinite	Vitrinite	OTHER Type	Type	RELATIVE ABUNDANCE Pyrite Type	Pyrite	Organic Concentration	VITRINITE Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI	FLUOR. Value	FLUOR. Color	FLUOR. Intensity	STRU. TAI	FLUOR. Value	FLUOR. Color	FLUOR. Intensity	Ro Vit. Reflectance or Eq.
MISCELLANEOUS GRAB SAM		K														E								BL	0												-
89	98 Mu 32	OC				70					30	T	?	VL ?		MA	M	+	+		?			B	1			2	3	BL	0						-
Comments:	Black, micrinized lipids with angular solid bitumen formation. Solid bitumen inclusions may raise TAI value of unstructured lipids.																																				
		K														MA																					-
90	98 Mu 32-A	OC				50					50	T	T			F	M	+	+					DB	1			2	3+	BL	0						-
Comments:	Dark gray, micrinized lipids with angular solid bitumen formation.																																				
		WR																																			B 0.66
91	98 Mu 32-1	OC									100						N	+																			-
Comments:	Large solid bitumen fragments have dark brown fluorescence.																																				
		K					LD							VL																							-
92	98 Mu 34	OC	50				T					10	40	T		MA	-	M	M	M	T			DB	1			2	3	BL	0		O	1			V 1.28
Comments:	Abundant small terrestrial fragments.																																				
		K					S							VL																							-
93	98 Mu 38	OC				75	T				10	5	T	10		E	-	+	T	M	+		-	BL	0			3	3	BL	0						V 1.17
Comments:	Micrinized lipids with angular solid bitumen formation. Some lipid-rich vitrinite and solid bitumen are beginning to coke.																																				

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

_____ Jena

_____ Leitz

SAMPLE TYPE/PREP

- CTG Cuttings
- CC Conv. Core
- SWC SideWallCore
- OC Outcrop
- NI No Inform.
- C Coal
- K Kerogen
- WR Whole Rock
- n.d. Not Determined

STRUCTURED LIPIDS

- AL Alginite
- SB Suberinite
- C Cutinite
- LD Liptodetrinite
- U Undiffer.
- S Sporinite
- R Resinite
- O Other

OTHER ORGANIC MATTER

- E Exsudatinite
- G Graptolites
- VL Lipid-Rich Vitrinite
- VC VitriniteContamination
- VR Recycled Vitrinite

PYRITE

- E Euhedral
- F Framboid
- MA Massive
- RI Replace-infill

ABUND.

- N None
- T Trace
- - Small Amt.
- M Mod. Amt.
- + Large Amt.
- ++ Abundant

FLUOR. INTENS.

- 0 None
- 1 Weak
- 2 Moderate
- 3 Strong
- 4 Intense

VIT. REFLECT. EQUIVALENCE

- B Bitumen
- G Graptolites
- VL Lipid-Rich Vitrinite
- VC Vitrinite Contam.
- VR Recycled Vitrinite

FLUOR. COLOR

- W White
- G Green
- Y Yellow
- O Orange
- R Red
- B Brown
- BL Black
- L Light
- D Dark

TAI COLOR VALUES

- 1- Straw Yellow
- 1 Pale Yellow
- 1+ Yellow
- 2- Yellow-Orange
- 2 Golden
- 2+ Amber
- 3- Reddish Brown
- 3 Medium Brown
- 3+ Dark Brown
- 4- Brown-Black
- 4 Black
- 4+ Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

Tingmerkpuk 1998 Project Samples

MISCELLANEOUS GRAB SAMPLES

DGSI Project: 98/4372

DGSI Number	DGSI Sample Id or Depth	Preparation/Sample T.	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED Undifferentiated	Amorphous	Massive	Micrinized	LIPIDS STRUCTURED Type	Type	Type	Type	Solid Bitumen	HUMIC Inertinite	Vitrinite	OTHER Type	Type	RELATIVE ABUNDANCE Pyrite Type	Pyrite	Organic Concentration	VITRINITE Normal	Rough	Lipid-Rich	Oxidized	Coked	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR. Color	Intensity	STRU. Color	Intensity	Background Intensity	TRANSMITTED LIPIDS UNSTR. TAI Value	FLUOR. Color	Intensity	STRU. TAI Value	FLUOR. Color	Intensity	Ro Vit. Reflectance or Eq.
94	98 Mu 39-1	K OC				90					?	5	5			MA	T	+	T	M		M		BL	0			0	3+	BL	0				-
Comments:	*Black, micrinized unstructured lipids with oxidized terrestrial material. Low yellow background fluorescence in transmitted light slide.*																																		
96	98Ha126	K OC	75				U T	S 5				10	10			F MA	M	-	+				-	BL	0			0	3+	BL	0	4-	BL	0	V 2.30
Comments:	*Grainy unstructured lipids and small terrestrial fragments in a mineral groundmass. Trace of coking vitrinite.*																																		
Comments:																																			
Comments:																																			
Comments:																																			

ANALYST

X O'Connor

MICROSCOPE

X Zeiss

____ Jena

____ Leitz

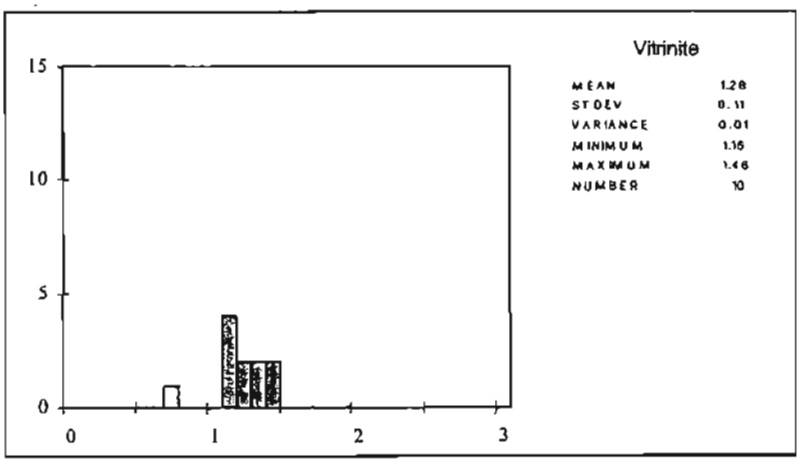
SAMPLE TYPE/PREP		STRUCTURED LIPIDS		OTHER ORGANIC MATTER		PYRITE		ABUND.		FLUOR. INTENS.	VIT. REFLECT. EQUIVALENCE		FLUOR. COLOR		TAI COLOR VALUES	
CTG	Cuttings	AL	Alginite	E	Exsudatinite	E	Euhedral	N	None	0	None	B	Bitumen	W	White	1-	Straw Yellow
CC	Conv. Core	SB	Suberinite	G	Graptolites	F	Framboid	T	Trace	1	Weak	G	Graptolites	G	Green	1	Pale Yellow
SWC	SideWallCore	C	Cutinite	VL	Lipid-Rich Vitrinite	MA	Massive	-	Small Amt.	2	Moderate	VL	Lipid-Rich Vitrinite	Y	Yellow	1+	Yellow
OC	Outcrop	LD	Liptodetrinite	VC	VitriniteContamination	RI	Replace-infill	M	Mod. Amt.	3	Strong	VC	Vitrinite Contam.	O	Orange	2-	Yellow-Orange
NI	No Inform.	U	Undiffer.	VR	Recycled Vitrinite			+	Large Amt.	4	Intense	VR	Recycled Vitrinite	R	Red	2	Golden
C	Coal	S	Sporinite					++	Abundant					B	Brown	2+	Amber
		R	Resinite											BL	Black	3-	Reddish Brown
K	Kerogen	O	Other													3	Medium Brown
WR	Whole Rock															3+	Dark Brown
														L	Light	4-	Brown-Black
n.d.	Not Determined													D	Dark	4	Black
																4+	Black-Opaque

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 1
OTHER ID: 98 Mu 11 SEGMENT 1, TOP OF BLUFF



I 0.75 V 1.20 V 1.46
L 1.16 V 1.27
V 1.18 V 1.37
V 1.19 V 1.37
V 1.19 L 1.40

TYPE	K/OC	
	TOC	5.49
	TMAX	420
	HI	67
	V Ro	1.28

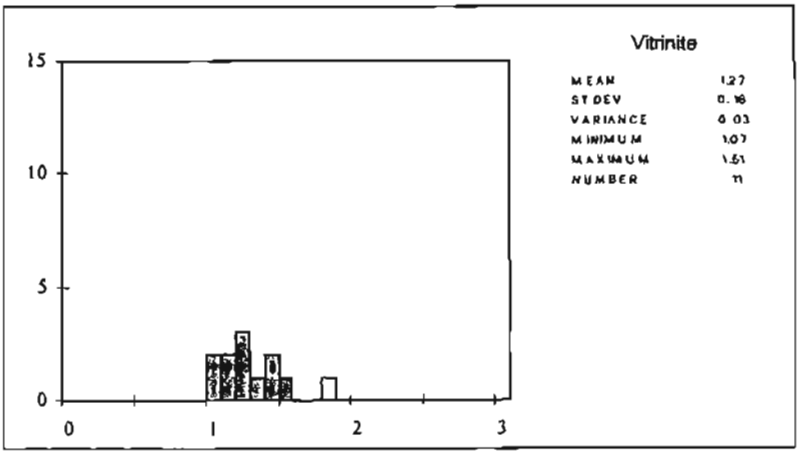
Visual Kerogen Summary

Unstructured Lipids	75
Structured Lipids	-
Solid Bitumen	10
Inertinite	5
Vitrinite	5
Other	5
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	3+,3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 2
OTHER ID: 98 Mu 11-1



L 1.07 L 1.27 V 1.51
V 1.08 V 1.29 v 1.84
V 1.10 V 1.34
V 1.15 L 1.44
L 1.23 V 1.47

TYPE	K/OC	
	TOC	3.79
	TMAX	419
	HI	34
	V Ro	1.27

Visual Kerogen Summary

Unstructured Lipids	75
Structured Lipids	-
Solid Bitumen	10
Inertinite	5
Vitrinite	5
Other	5
TOTAL	100

Background Fluorescence	Mod,Strong
TAI Unstructured	3-
TAI Structured	

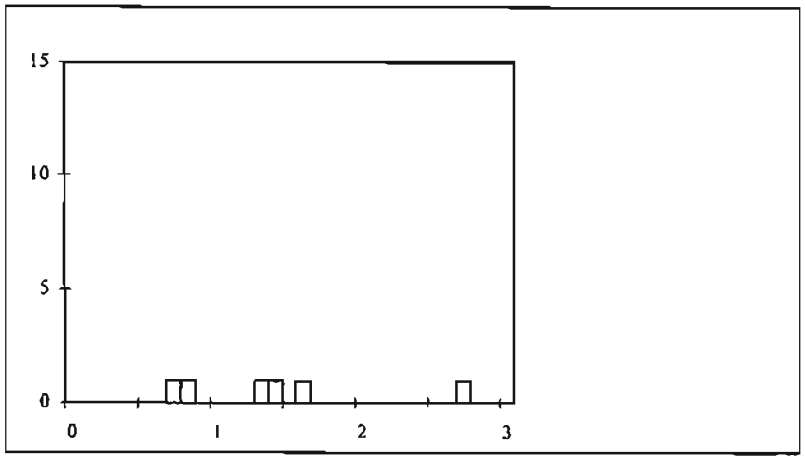
COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 3
OTHER ID: 98 Mu 11-2

TYPE	K/OC
	TOC 6.61
	TMAX 423
	HI 41



v 0.74 v 2.73
l 0.83
v 1.33
v 1.44
v 1.67

Visual Kerogen Summary

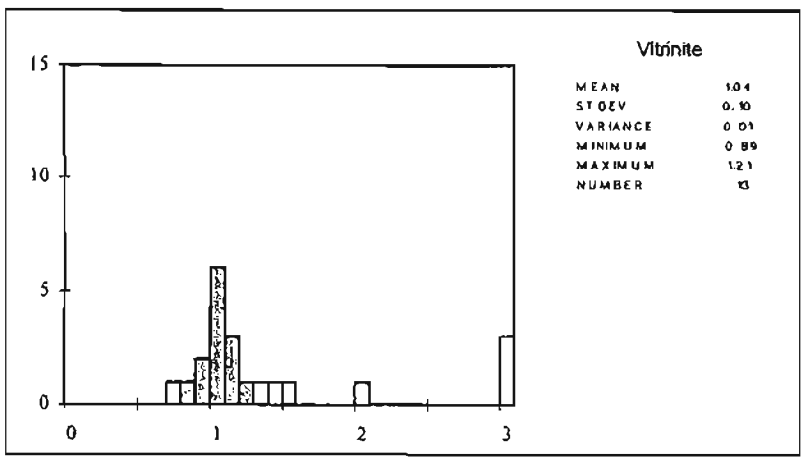
Unstructured Lipids	75
Structured Lipids	-
Solid Bitumen	20
Inertinite	T
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	Weak
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 4
OTHER ID:98 Mu 11-2A

TYPE	K/OC
	TOC 4.03
	TMAX 428
	HI 32
	V Ro 1.04



v 0.74 V 1.00 L 1.13 v 1.44 v 4.45
L 0.89 V 1.02 V 1.13 v 1.57
V 0.90 V 1.02 V 1.16 v 2.01
V 0.99 V 1.03 V 1.21 v 4.13
V 1.00 L 1.07 v 1.32 v 4.40

Visual Kerogen Summary

Unstructured Lipids	80
Structured Lipids	-
Solid Bitumen	10
Inertinite	5
Vitrinite	5
Other	0
TOTAL	100

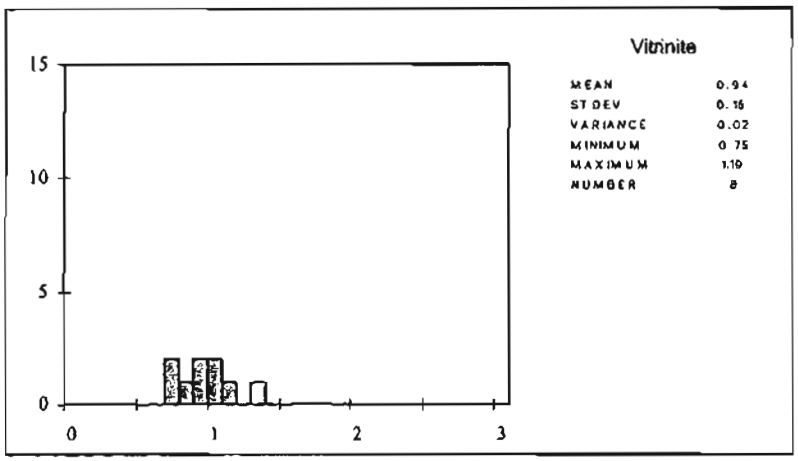
Background Fluorescence	Mod,Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:
Oxidation may reduce Ro.

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 6
OTHER ID: 98 Mu 11-4



L 0.75 L 1.00
V 0.79 V 1.08
L 0.86 L 1.19
L 0.90 L 1.30
L 0.94

TYPE	K/OC
TOC	7.36
TMAX	437
HI	62
V Ro	0.94

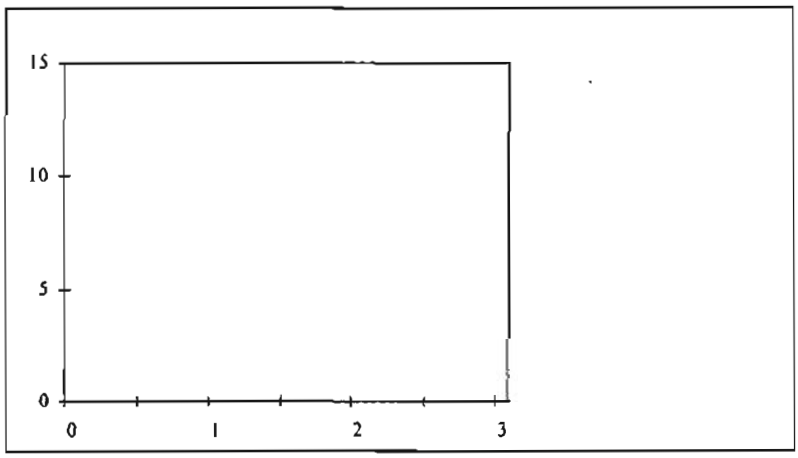
Visual Kerogen Summary

Unstructured Lipids	70
Structured Lipids	-
Solid Bitumen	20
Inertinite	5
Vitrinite	T
Other	5
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:
Oxidation may reduce Ro.

DGSI Project: 98/4372 Sample No. 7
OTHER ID: 98 Mu 11-5



TYPE	K/OC
TOC	0.44
TMAX	451
HI	14

Visual Kerogen Summary

Unstructured Lipids	100
Structured Lipids	-
Solid Bitumen	T
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

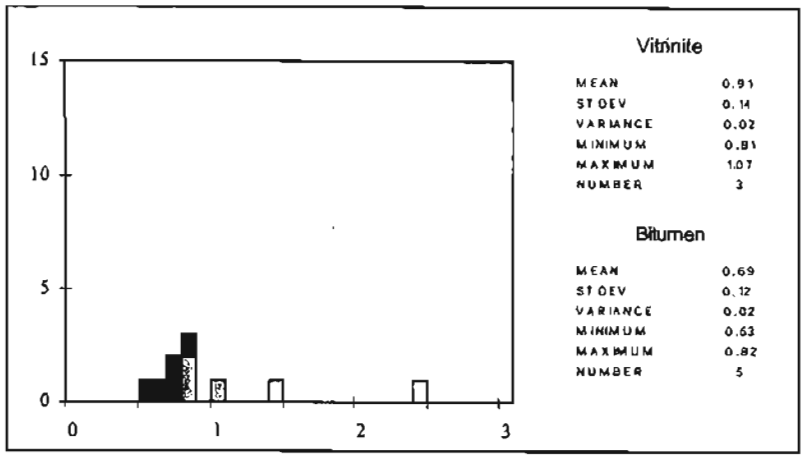
Background Fluorescence	Moderate
TAI Unstructured	3
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 8
OTHER ID:98 Mu 11-6A



B 0.53 B 0.82
B 0.60 V 0.85
B 0.71 L 1.07
B 0.79 v 1.46
L 0.81 v 2.49

TYPE	K/OC
TOC	11.16
TMAX	438
HI	124
V Ro	0.91
B Ro	0.69
VRE-B	1.00

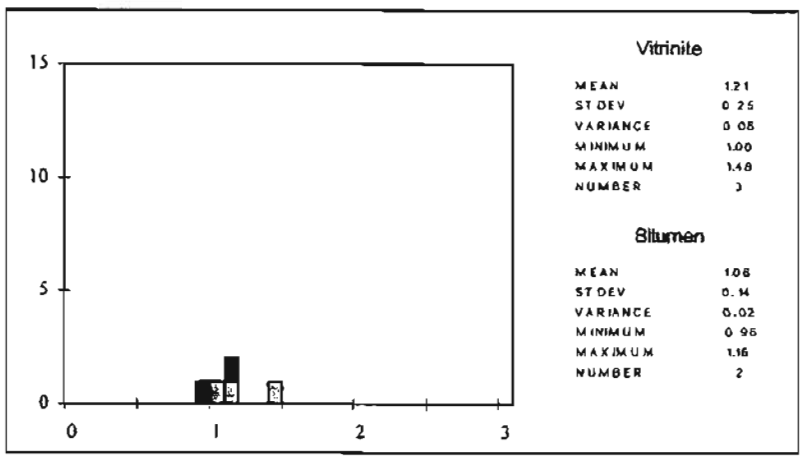
Visual Kerogen Summary

Unstructured Lipids	75
Structured Lipids	-
Solid Bitumen	25
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Mod,Strong
TAI Unstructured	3-,3
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 9
OTHER ID: 98 Mu 11-6



B 0.96
L 1.00
V 1.14
B 1.16
L 1.48

TYPE	K/OC
TOC	4.09
TMAX	474
HI	22
V Ro	?1.21
B Ro	?1.06
VRE-B	?1.35

Visual Kerogen Summary

Unstructured Lipids	90
Structured Lipids	-
Solid Bitumen	10
Inertinite	T
Vitrinite	?
Other	0
TOTAL	100

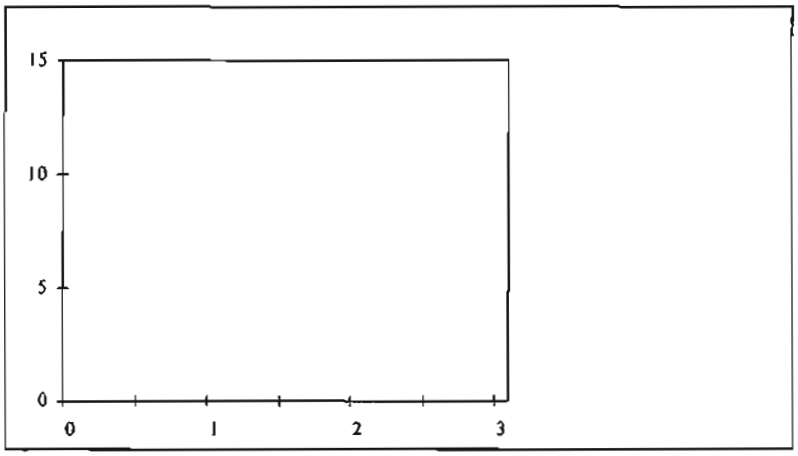
Background Fluorescence	Mod,Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 10
OTHER ID: 98 Mu 11-7



TYPE	K/OC
TOC	0.30
TMAX	N.A.
HI	—

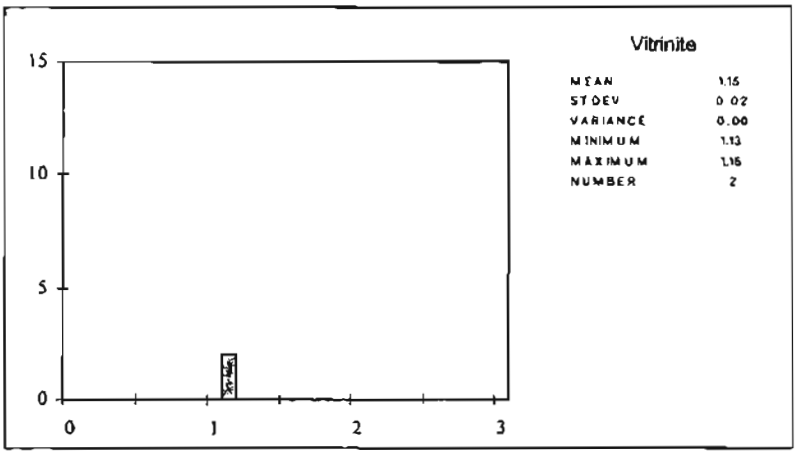
Visual Kerogen Summary

Unstructured Lipids	100
Structured Lipids	-
Solid Bitumen	?
Inertinite	-
Vitrinite	-
Other	0
TOTAL	100

Background Fluorescence	Weak
TAI Unstructured	3
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 11
OTHER ID: 98 Mu 11-8



V 1.13
V 1.16

TYPE	K/OC
TOC	1.34
TMAX	444
HI	47
V Ro	?1.15

Visual Kerogen Summary

Unstructured Lipids	95
Structured Lipids	-
Solid Bitumen	5
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3-,3
TAI Structured	

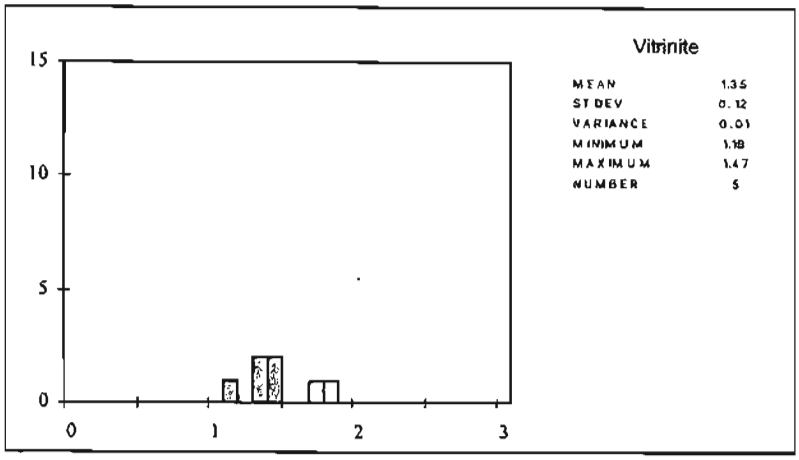
COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 12
OTHER ID: 98 Mu 11-9

TYPE	K/OC
TOC	1.96
TMAX	446
HI	59
V Ro	71.35



V 1.18 v 1.76
V 1.31 v 1.83
V 1.35
V 1.46
V 1.47

Visual Kerogen Summary

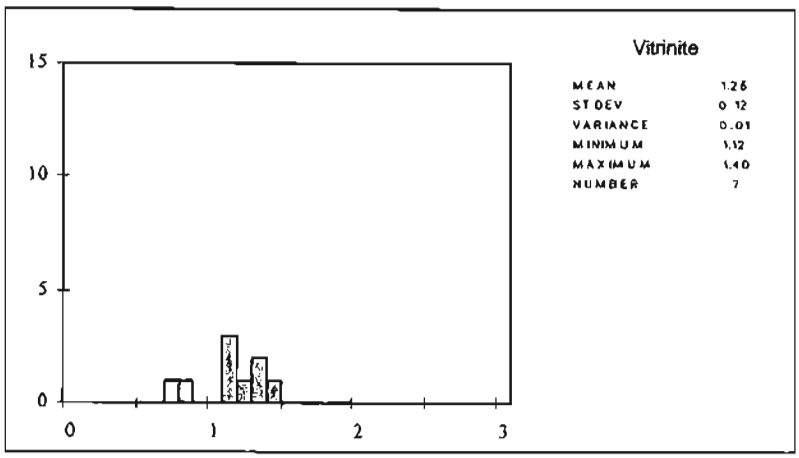
Unstructured Lipids	80
Structured Lipids	5
Solid Bitumen	10
Inertinite	T
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 13
OTHER ID:98 Mu 11-10 SEGMENT 2, OFFSET TO EAST IN SMALL GULLY

TYPE	K/OC
TOC	1.94
TMAX	444
HI	42
V Ro	71.25



v 0.71 V 1.29
v 0.87 V 1.32
V 1.12 V 1.36
V 1.14 V 1.40
V 1.14

Visual Kerogen Summary

Unstructured Lipids	85
Structured Lipids	-
Solid Bitumen	10
Inertinite	T
Vitrinite	5
Other	0
TOTAL	100

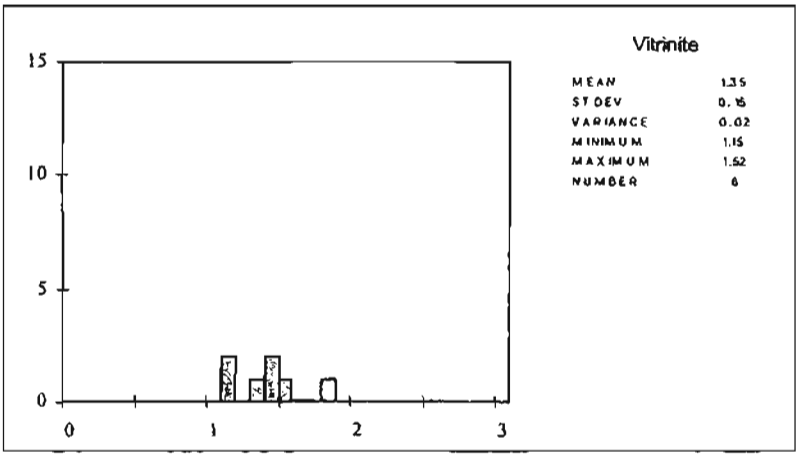
Background Fluorescence	Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 15 TYPE K/OC
OTHER ID:98 Mu 11-12 TOC 2.02
TMAX 442
HI 41
V Ro ?1.35



V 1.15 V 1.52
V 1.19 v 1.88
V 1.30
V 1.43
V 1.48

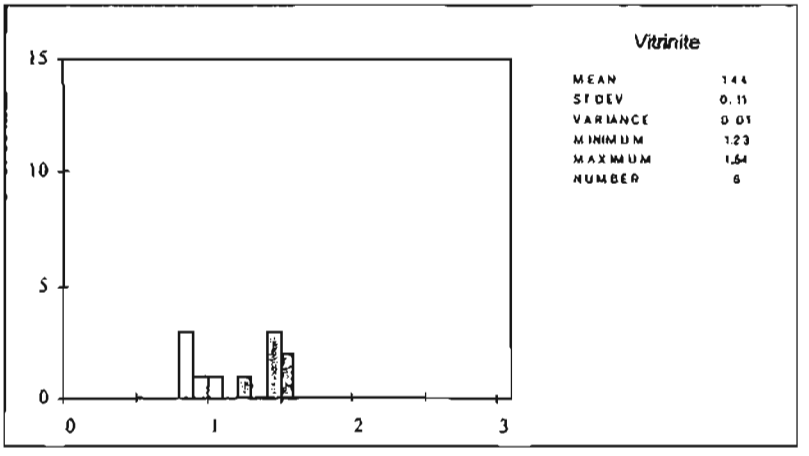
Visual Kerogen Summary

Unstructured Lipids	85
Structured Lipids	-
Solid Bitumen	15
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 17 TYPE K/OC
OTHER ID:98 Mu 11-14 SEGMENT 2, OFFSET TO EAST ON SLOPE FACE TOC 2.23
TMAX 441
HI 43
V Ro ?1.44



v 0.82 V 1.23 V 1.54
v 0.83 V 1.42
v 0.89 V 1.45
v 0.98 V 1.46
v 1.06 V 1.53

Visual Kerogen Summary

Unstructured Lipids	85
Structured Lipids	-
Solid Bitumen	5
Inertinite	5
Vitrinite	5
Other	0
TOTAL	100

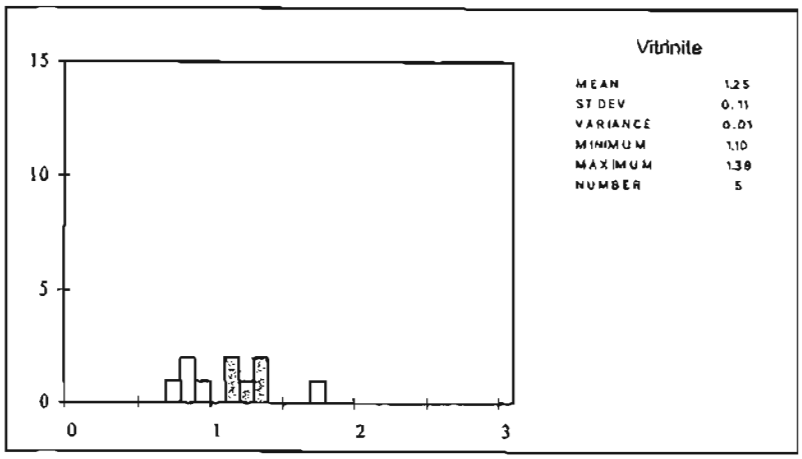
Background Fluorescence	Intense
TAI Unstructured	3-,3
TAI Structured	3-,3

COMMENTS:
Trace low reflecting weathered vitrinite.

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 19
OTHER ID:98 Mu 11-16



v 0.76 V 1.19
l 0.80 L 1.25
v 0.83 V 1.31
v 0.97 L 1.38
L 1.10 v 1.70

TYPE	K/OC
TOC	2.12
TMAX	442
HI	48
V Ro	?1.25

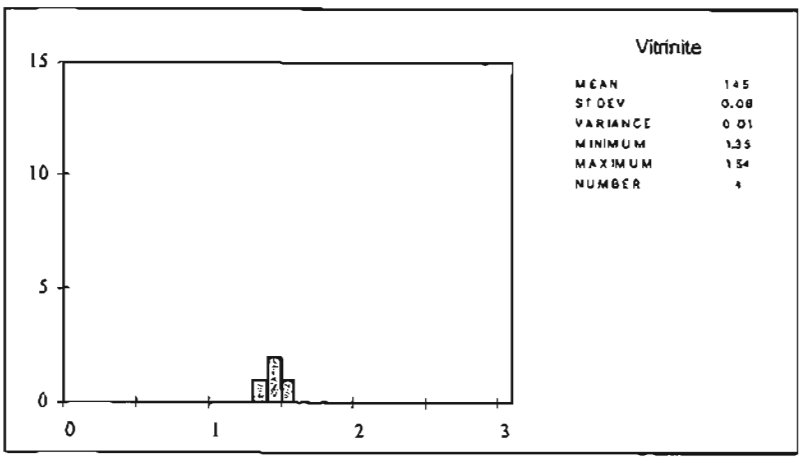
Visual Kerogen Summary

Unstructured Lipids	85
Structured Lipids	-
Solid Bitumen	T
Inertinite	5
Vitrinite	5
Other	5
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	3-

COMMENTS:
Trace low reflecting weathered vitrinite.

DGSI Project: 98/4372 Sample No. 21
OTHER ID:98 Mu 11-18



V 1.36
V 1.44
V 1.45
V 1.54

TYPE	K/OC
TOC	2.17
TMAX	447
HI	49
V Ro	?1.45

Visual Kerogen Summary

Unstructured Lipids	90
Structured Lipids	-
Solid Bitumen	5
Inertinite	T
Vitrinite	5
Other	0
TOTAL	100

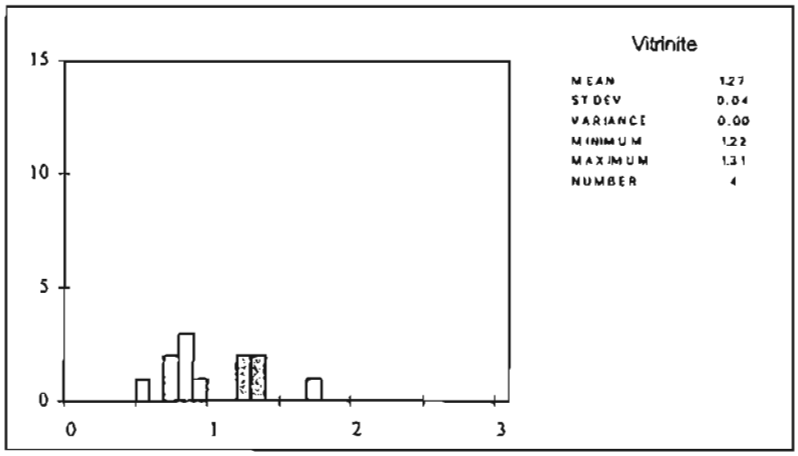
Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 23
OTHER ID:98 Mu 11-19-A



b 0.57 v 0.89 V 1.31
b 0.76 l 0.91 v 1.74
v 0.78 V 1.22
v 0.82 V 1.26
v 0.88 V 1.30

TYPE	K/OC	
	TOC	2.08
	TMAX	445
	HI	38
	V Ro	?1.27

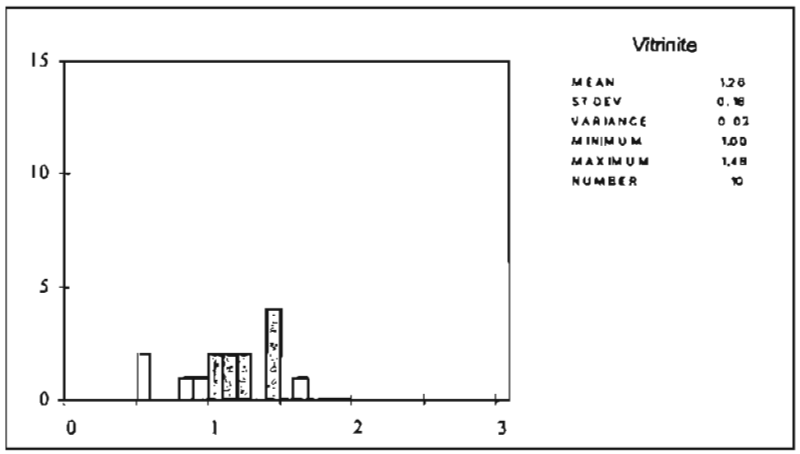
Visual Kerogen Summary

Unstructured Lipids	90
Structured Lipids	-
Solid Bitumen	5
Inertinite	T
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

COMMENTS:
Trace low reflecting weathered vitrinite.

DGSI Project: 98/4372 Sample No. 24
OTHER ID:98 Mu 11-20 SEGMENT 2, OFFSET TO WEST IN BOTTOM OF GULLY



b 0.57 V 1.07 V 1.42
l 0.57 L 1.11 V 1.45
v 0.82 L 1.12 L 1.46
v 0.92 L 1.25 V 1.48
V 1.00 L 1.26 v 1.69

TYPE	K/OC	
	TOC	2.10
	TMAX	447
	HI	39
	V Ro	1.26

Visual Kerogen Summary

Unstructured Lipids	80
Structured Lipids	-
Solid Bitumen	10
Inertinite	T
Vitrinite	5
Other	5
TOTAL	100

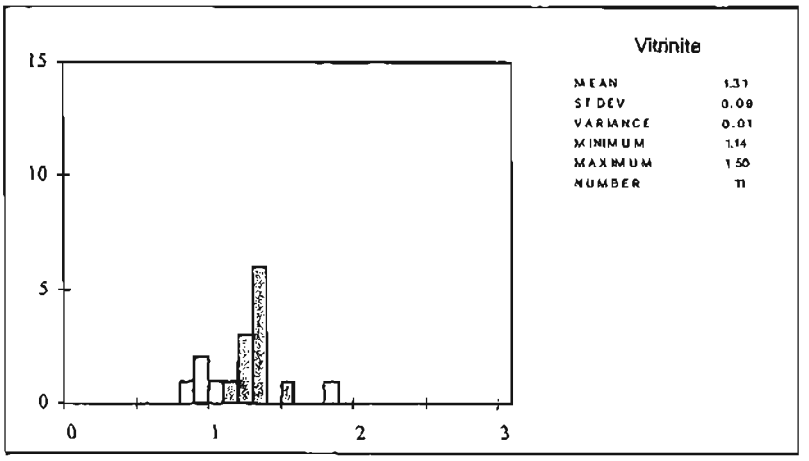
Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 26
OTHER ID:98 Mu 11-21A



v 0.83 V 1.24 V 1.31 v 1.81
v 0.91 V 1.25 V 1.32
v 0.96 V 1.28 V 1.39
v 1.02 L 1.30 V 1.39
V 1.14 V 1.31 V 1.50

TYPE	K/OC	
	TOC	1.80
	TMAX	438
	HI	32
	V Ro	1.31

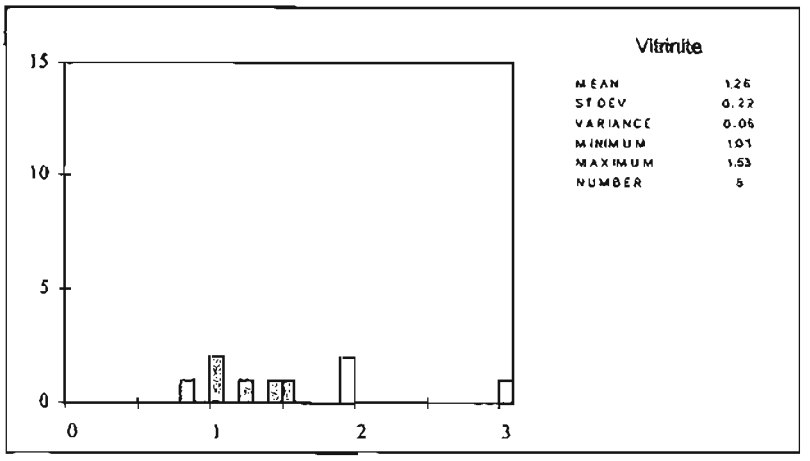
Visual Kerogen Summary

Unstructured Lipids	80
Structured Lipids	5
Solid Bitumen	5
Inertinite	5
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

COMMENTS:
Trace low reflecting weathered vitrinite.

DGSI Project: 98/4372 Sample No. 28
OTHER ID:98 Mu 11-23



v 0.89 V 1.53
V 1.01 v 1.93
V 1.07 v 1.96
V 1.29 v 5.27
V 1.42

TYPE	K/OC	
	TOC	2.33
	TMAX	450
	HI	81
	V Ro	?1.26

Visual Kerogen Summary

Unstructured Lipids	80
Structured Lipids	-
Solid Bitumen	5
Inertinite	5
Vitrinite	10
Other	0
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

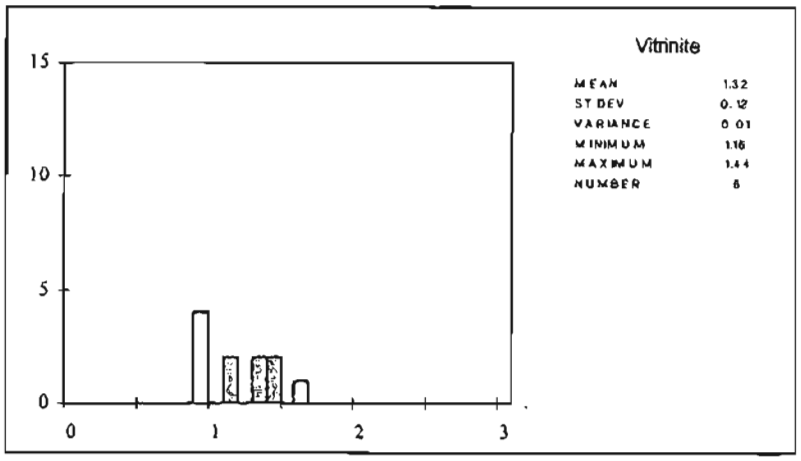
COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
KUKPOWRUK REDWUL MEASURED SECTION

DGSI Project: 98/4372 Sample No. 30
OTHER ID:98 Mu 11-25

TYPE	K/OC	
	TOC	2.39
	TMAX	449
	HI	111
	V Ro	?1.32



I 0.93 V 1.19 v 1.64
v 0.93 V 1.36
v 0.95 V 1.37
v 0.98 V 1.41
L 1.16 V 1.44

Visual Kerogen Summary

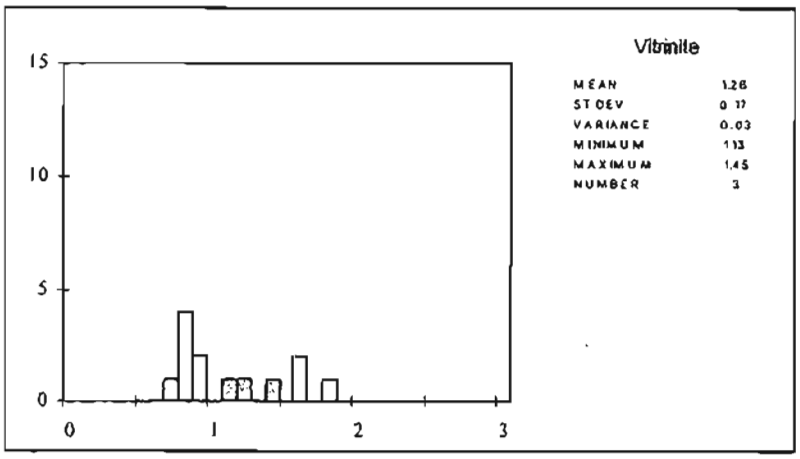
Unstructured Lipids	90
Structured Lipids	-
Solid Bitumen	5
Inertinite	T
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 32
OTHER ID:98 Mu 11-27

TYPE	K/OC	
	TOC	1.71
	TMAX	449
	HI	50
	V Ro	?1.26



I 0.78 I 0.94 v 1.61
v 0.82 v 0.99 v 1.67
I 0.87 V 1.13 v 1.86
v 0.87 V 1.21
I 0.88 V 1.45

Visual Kerogen Summary

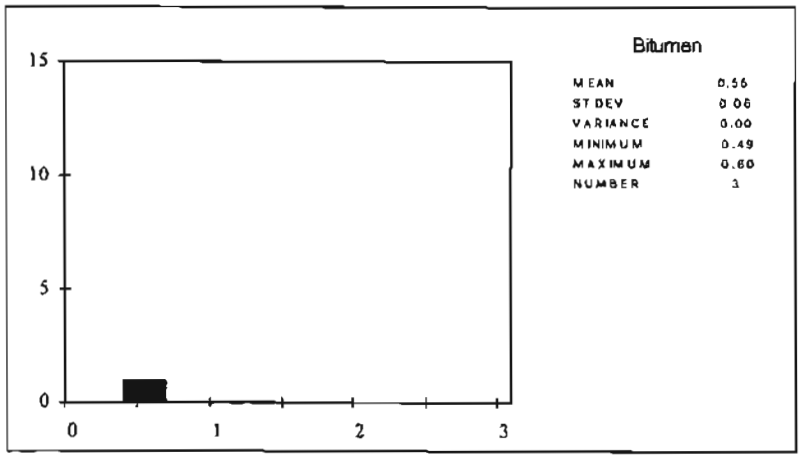
Unstructured Lipids	80
Structured Lipids	-
Solid Bitumen	5
Inertinite	5
Vitrinite	10
Other	0
TOTAL	100

Background Fluorescence	Intense
TAI Unstructured	3-
TAI Structured	3-

COMMENTS:
Lipid-rich vitrinite Ro 0.88.

VITRINITE REFLECTANCE **Tingmerkpuk 1998 Project Samples**

DGSI Project: 98/4372 Sample No. 33 TYPE K/OC
OTHER ID:98 Mu 19-11 HORSESHOE BEND MEASURED SECTION TOC 9.65
TMAX 468
HI 20
V Ro -
B Ro ?0.55
VRE-B ?0.87



B 0.49
B 0.57
B 0.60

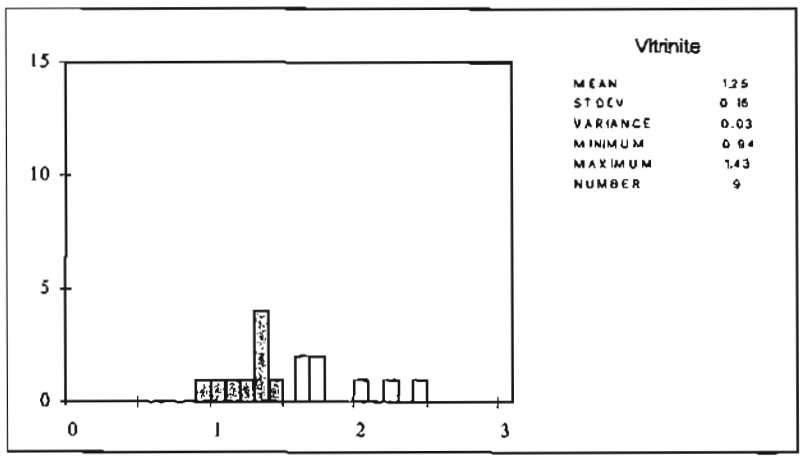
Visual Kerogen Summary

Unstructured Lipids	65
Structured Lipids	15
Solid Bitumen	20
Inertinite	T
Vitrinite	-
Other	0
TOTAL	100

Background Fluorescence Moderate
TAI Unstructured 2+
TAI Structured

COMMENTS:

DGSI Project: 98/4372 Sample No. 34 TYPE K/OC
OTHER ID:98 Mu19-10 SEGMENT 2, measured 100 m up gully TOC 1.18
TMAX 440
HI 39
V Ro ?1.25



V 0.94 V 1.33 v 1.69 v 2.42
V 1.06 V 1.37 v 1.73
V 1.19 V 1.38 v 1.73
V 1.27 V 1.43 v 2.01
V 1.32 v 1.64 v 2.25

Visual Kerogen Summary

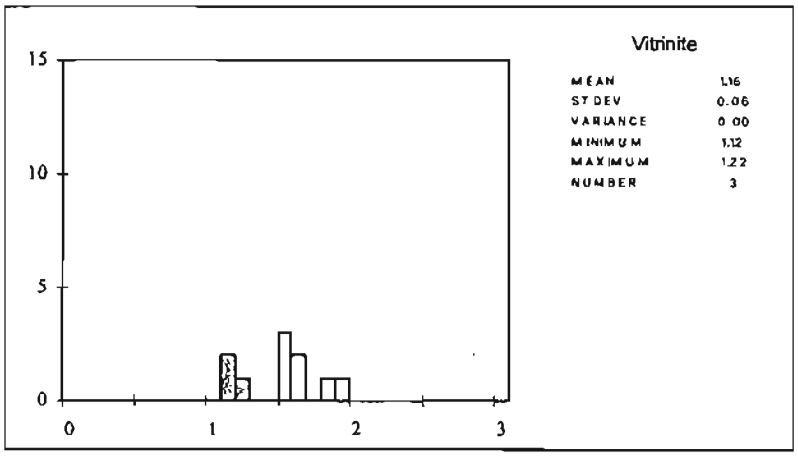
Unstructured Lipids	40
Structured Lipids	-
Solid Bitumen	T
Inertinite	30
Vitrinite	30
Other	0
TOTAL	100

Background Fluorescence Strong
TAI Unstructured 3
TAI Structured 2+

COMMENTS:
Trace recycled vitrinite.

VITRINITE REFLECTANCE **Tingmerkpuk 1998 Project Samples**

DGSI Project: 98/4372 Sample No. 36
OTHER ID: 98Mu19-8



V 1.12 v 1.59
V 1.13 v 1.61
V 1.22 v 1.65
I 1.55 v 1.84
v 1.56 v 1.98

TYPE	K/OC	
	TOC	0.87
	TMAX	439
	HI	61
	V Ro	?1.16

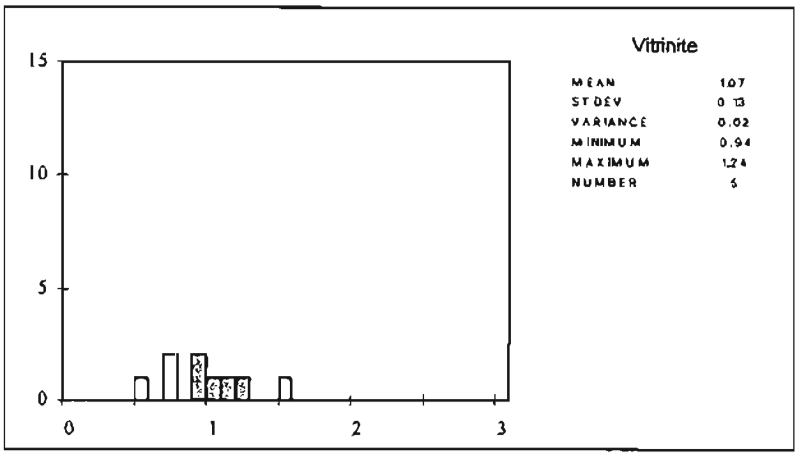
Visual Kerogen Summary

Unstructured Lipids	60
Structured Lipids	-
Solid Bitumen	-
Inertinite	20
Vitrinite	20
Other	0
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	2+
TAI Structured	

COMMENTS:
Some recycled vitrinite?

DGSI Project: 98/4372 Sample No. 38
OTHER ID: 98 Mu 19-6 SEGMENT 1, measured at mouth of gully, north side of Ipewik River



b 0.59 V 1.03
v 0.74 V 1.15
b 0.76 V 1.24
L 0.94 v 1.52
V 0.97

TYPE	K/OC	
	TOC	1.95
	TMAX	428
	HI	88
	V Ro	?1.07

Visual Kerogen Summary

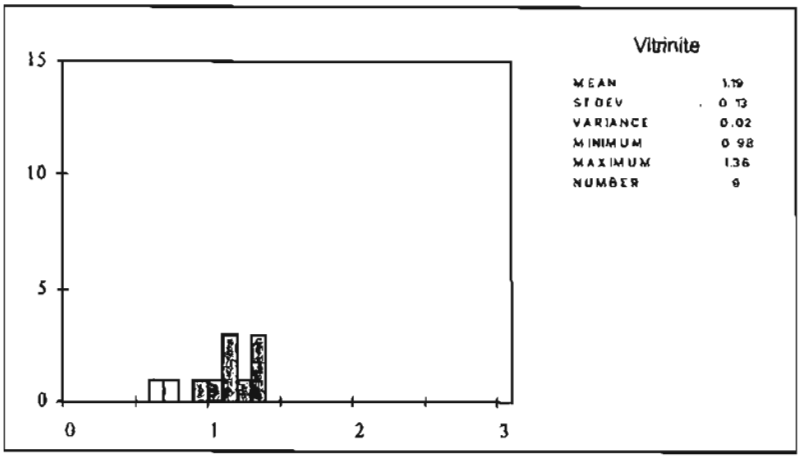
Unstructured Lipids	85
Structured Lipids	-
Solid Bitumen	5
Inertinite	5
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	3-,3
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE **Tingmerkpuk 1998 Project Samples**

DGSI Project: 98/4372 Sample No. 40
OTHER ID: 98 Mu 19-4



b 0.81 V 1.14 V 1.36
v 0.72 V 1.15
V 0.98 V 1.21
V 1.08 V 1.32
V 1.11 V 1.35

TYPE	K/OC	
	TOC	1.97
	TMAX	425
	HI	60
	V Ro	?1.19

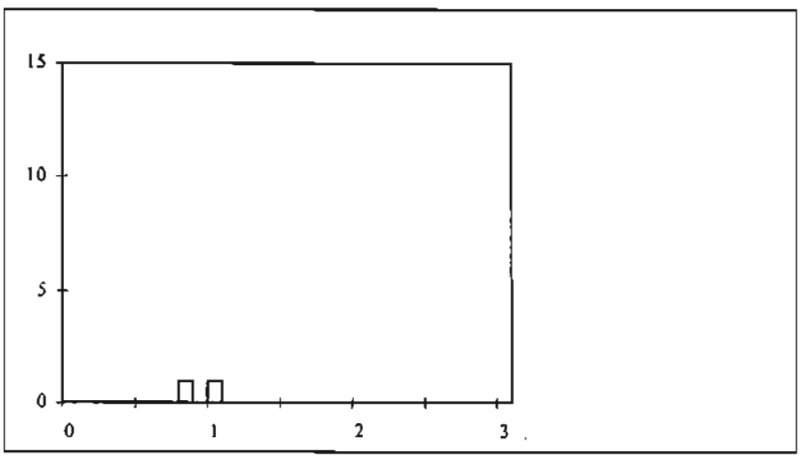
Visual Kerogen Summary

Unstructured Lipids	80
Structured Lipids	-
Solid Bitumen	5
Inertinite	5
Vitrinite	10
Other	0
TOTAL	100

Background Fluorescence	Mod,Strong
TAI Unstructured	3-,3
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 42
OTHER ID: 98 Mu 19-2



v 0.88
v 1.02

TYPE	K/OC	
	TOC	2.90
	TMAX	436
	HI	258

Visual Kerogen Summary

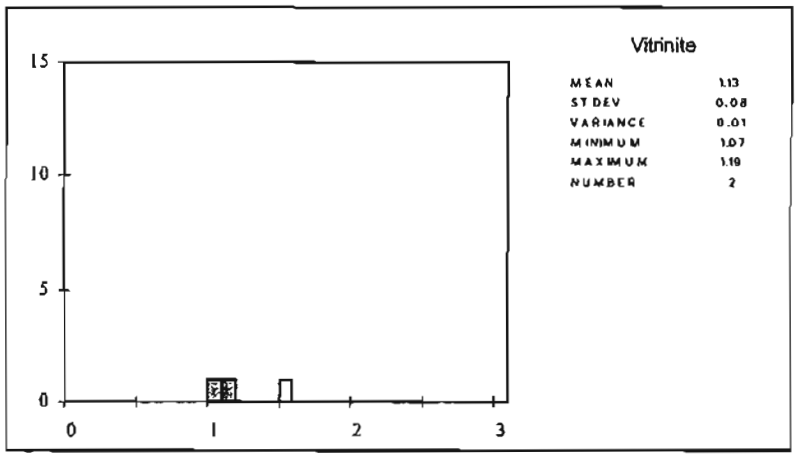
Unstructured Lipids	95
Structured Lipids	-
Solid Bitumen	T
Inertinite	5
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Mod,Strong
TAI Unstructured	3
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE **Tingmerkpuk 1998 Project Samples**

DGSI Project: 98/4372 Sample No. 44
OTHER ID: 98 Mu 19



L 1.07
V 1.19
v 1.57

TYPE	K/OC	
	TOC	2.73
	TMAX	430
	HI	110
	V Ro	?1.13

Visual Kerogen Summary

Unstructured Lipids	90
Structured Lipids	-
Solid Bitumen	5
Inertinite	5
Vitrinite	T
Other	0
TOTAL	100

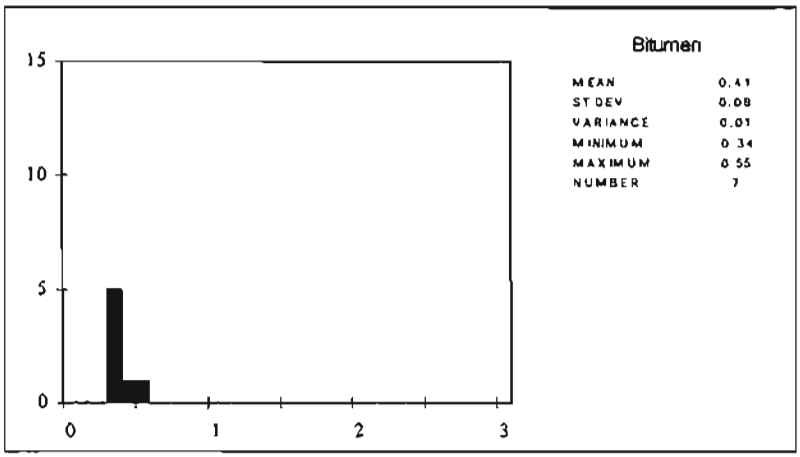
Background Fluorescence	Mod.Strong
TAI Unstructured	3
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
IPEWIK TRIBUTARY MEASURED SECTION

DGSI Project: 98/4372 Sample No. 45
OTHER ID: 98Mu 33-7



B 0.34 B 0.47
B 0.34 B 0.55
B 0.38
B 0.39
B 0.39

TYPE	K/OC	
	TOC	21.28
	TMAX	420
	HI	364
	V Ro	-
	B Ro	?0.41
	VRE-B	?0.73

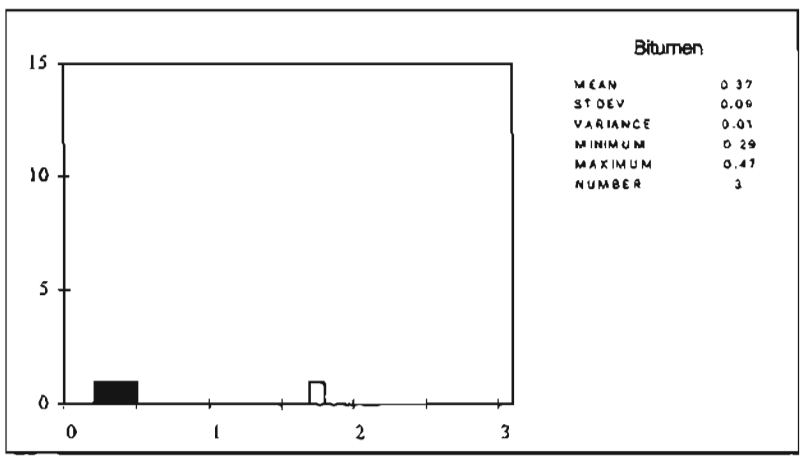
Visual Kerogen Summary

Unstructured Lipids	30
Structured Lipids	20
Solid Bitumen	50
Inertinite	T
Vitrinite	-
Other	0
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 46
OTHER ID: 98Mu 33-6



B 0.29
B 0.35
B 0.47
I 1.76

TYPE	K/OC	
	TOC	16.17
	TMAX	432
	HI	568
	V Ro	-
	B Ro	?0.37
	VRE-B	?0.69

Visual Kerogen Summary

Unstructured Lipids	30
Structured Lipids	30
Solid Bitumen	40
Inertinite	T
Vitrinite	-
Other	0
TOTAL	100

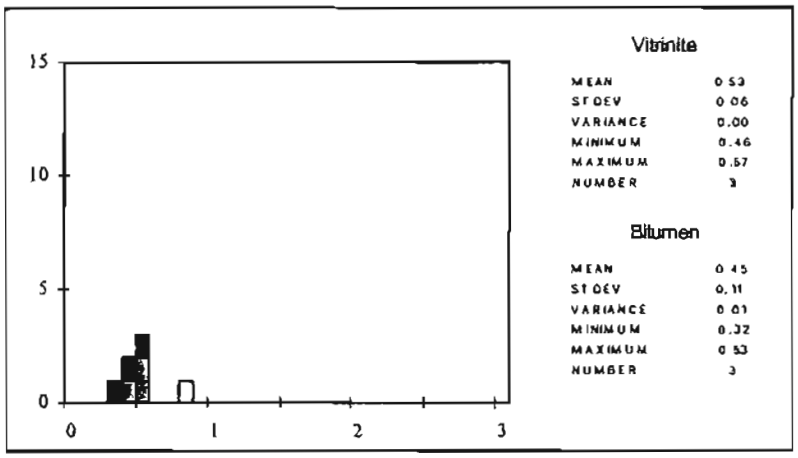
Background Fluorescence	Mod,Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
IPEWIK TRIBUTARY MEASURED SECTION

DGSI Project: 98/4372 Sample No. 47
OTHER ID: 98Mu 33-5



B 0.32 L 0.57
V 0.46 I 0.83
B 0.49
B 0.53
L 0.56

TYPE	K/OC	
	TOC	13.49
	TMAX	431
	HI	567
	V Ro	?0.53
	B Ro	?0.45
	VRE-B	?0.77

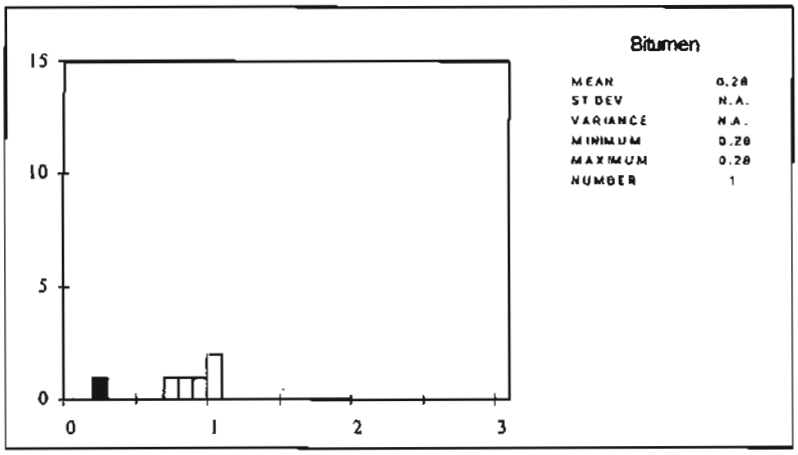
Visual Kerogen Summary

Unstructured Lipids	55
Structured Lipids	20
Solid Bitumen	20
Inertinite	T
Vitrinite	T
Other	5
TOTAL	100

Background Fluorescence	Mod,Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 48
OTHER ID: 98Mu 33-4



B 0.28 I 1.07
I 0.75
v 0.84
I 0.92
I 1.05

TYPE	K/OC	
	TOC	9.68
	TMAX	430
	HI	489
	V Ro	-
	B Ro	?0.28
	VRE-B	?0.61

Visual Kerogen Summary

Unstructured Lipids	55
Structured Lipids	10
Solid Bitumen	25
Inertinite	5
Vitrinite	T
Other	5
TOTAL	100

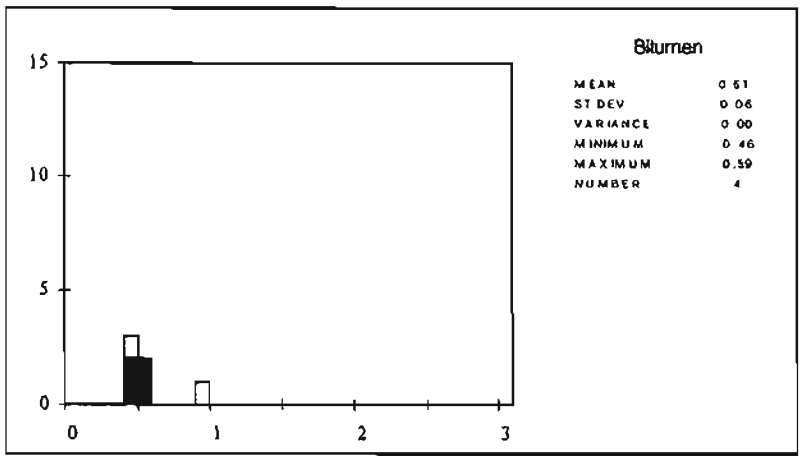
Background Fluorescence	Mod,Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:
Recycled vitrinite?

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
IPEWIK TRIBUTARY MEASURED SECTION

DGSI Project: 98/4372 Sample No. 49
OTHER ID: 98Mu 33-3



I 0.44 I 0.93
B 0.46
B 0.47
B 0.52
B 0.59

TYPE	K/OC	
	TOC	11.94
	TMAX	419
	HI	425
	V Ro	-
	B Ro	?0.51
	VRE-B	?0.83

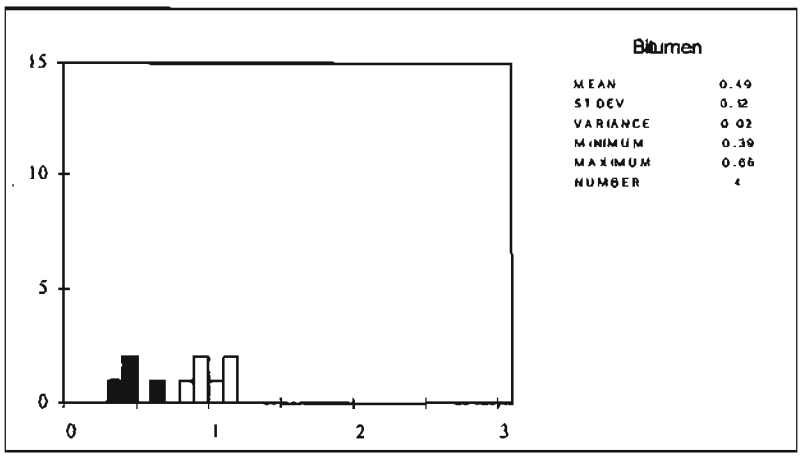
Visual Kerogen Summary

Unstructured Lipids	60
Structured Lipids	10
Solid Bitumen	30
Inertinite	T
Vitrinite	-
Other	0
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 50
OTHER ID: 98Mu 33-2



B 0.39 I 0.90
B 0.41 I 0.92
B 0.48 b 1.09
B 0.66 I 1.13
I 0.81 I 1.15

TYPE	K/OC	
	TOC	11.93
	TMAX	424
	HI	446
	V Ro	-
	B Ro	?0.49
	VRE-B	?0.80

Visual Kerogen Summary

Unstructured Lipids	40
Structured Lipids	20
Solid Bitumen	40
Inertinite	T
Vitrinite	-
Other	0
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3-
TAI Structured	

COMMENTS:
Recycled vitrinite?

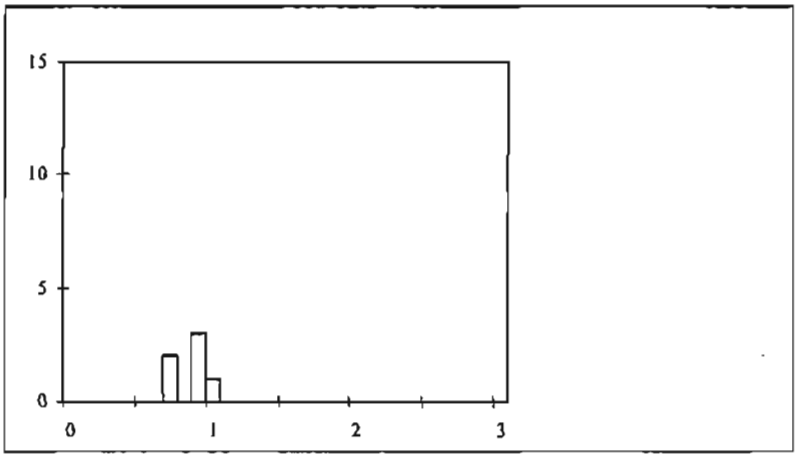
VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
IPEWIK TRIBUTARY MEASURED SECTION

DGSI Project: 98/4372 Sample No. 51
OTHER ID: 98Mu 33-1

TYPE

K/OC	
TOC	12.03
TMAX	425
HI	476



I 0.72 v 1.03
I 0.74
I 0.95
v 0.95
I 0.97

Visual Kerogen Summary

Unstructured Lipids	25
Structured Lipids	20
Solid Bitumen	45
Inertinite	5
Vitrinite	T
Other	5
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3-
TAI Structured	1,2-

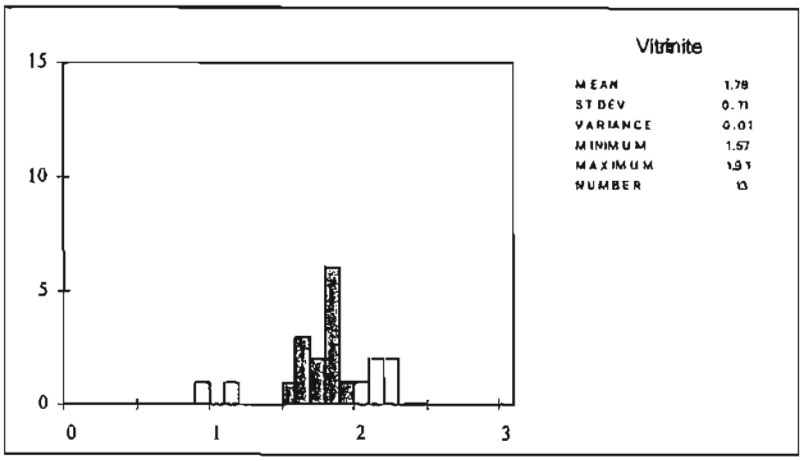
COMMENTS:
Recycled vitrinite?

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
SOUTH TINGMERKPUK MEASURED SECTION

DGSI Project: 98/4372 Sample No. 58
OTHER ID:98 JC 302-1

TYPE	K/OC
	TOC 0.58
	TMAX 451
	HI 7
	V Ro 1.78



I 0.97 V 1.69 V 1.88 v 2.02
v 1.17 V 1.71 V 1.88 v 2.11
V 1.57 V 1.75 V 1.89 v 2.15
V 1.64 V 1.81 V 1.89 v 2.22
V 1.65 V 1.82 V 1.91 v 2.23

Visual Kerogen Summary

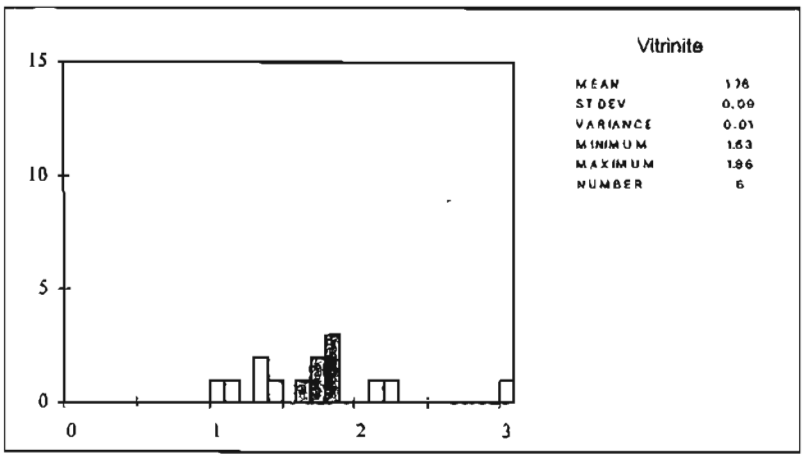
Unstructured Lipids	10
Structured Lipids	20
Solid Bitumen	-
Inertinite	20
Vitrinite	50
Other	0
TOTAL	100

Background Fluorescence	None
TAI Unstructured	n.d.
TAI Structured	3+

COMMENTS:
Trace recycled vitrinite.

DGSI Project: 98/4372 Sample No. 61
OTHER ID:98 JC 302-4

TYPE	K/OC
	TOC 0.44
	TMAX 467
	HI 14
	V Ro ?1.76



v 1.00 V 1.63 V 1.86
v 1.11 V 1.70 v 2.13
v 1.34 V 1.73 v 2.26
v 1.39 V 1.83 v 4.20
v 1.41 V 1.83

Visual Kerogen Summary

Unstructured Lipids	20
Structured Lipids	20
Solid Bitumen	-
Inertinite	10
Vitrinite	50
Other	0
TOTAL	100

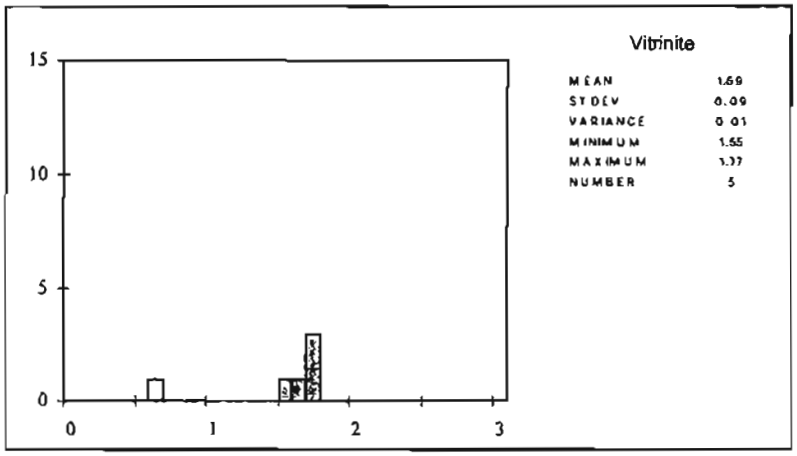
Background Fluorescence	None
TAI Unstructured	n.d.
TAI Structured	3,3+

COMMENTS:
Trace low reflecting weathered vitrinite.

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
SOUTH TINGMERKPUK MEASURED SECTION

DGSI Project: 98/4372 Sample No. 82
OTHER ID:98 JC 302-7



v 0.65 V 1.77
V 1.55
V 1.65
V 1.75
V 1.75

TYPE	K/OC	
	TOC	0.44
	TMAX	482
	HI	18
	V Ro	?1.69

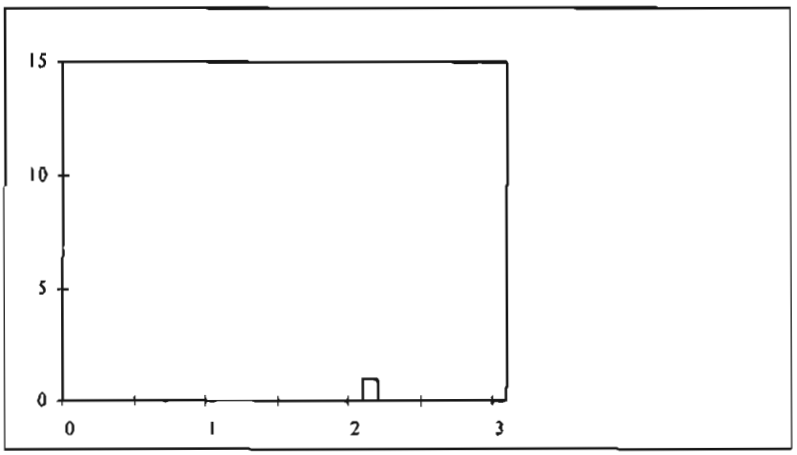
Visual Kerogen Summary

Unstructured Lipids	85
Structured Lipids	-
Solid Bitumen	-
Inertinite	5
Vitrinite	10
Other	0
TOTAL	100

Background Fluorescence	None
TAI Unstructured	3-
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 85
OTHER ID98 JC 302-10



v 2.11

TYPE	K/OC	
	TOC	0.31
	TMAX	N.A.
	HI	—

Visual Kerogen Summary

Unstructured Lipids	-
Structured Lipids	-
Solid Bitumen	-
Inertinite	-
Vitrinite	-
Other	0
TOTAL	0

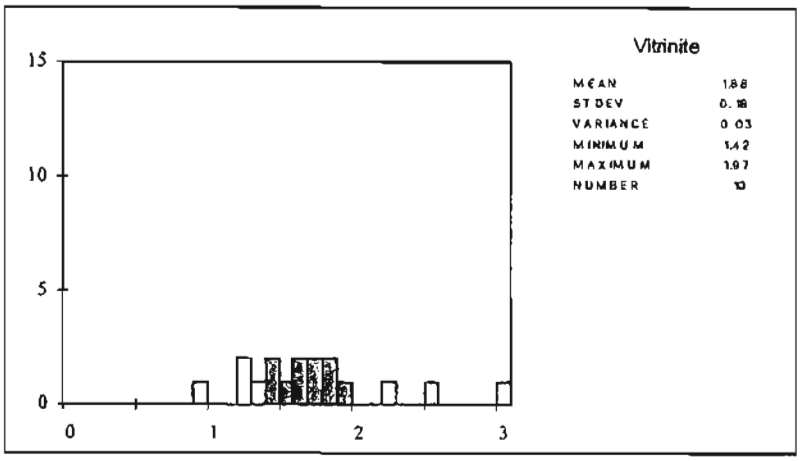
Background Fluorescence	None
TAI Unstructured	n.d.
TAI Structured	3+

COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples
SOUTH TINGMERKPUK MEASURED SECTION

DGSI Project: 98/4372 Sample No. 87
OTHER ID98 JC 302-12



v 0.93 V 1.49 V 1.74 v 2.59
v 1.23 V 1.50 V 1.82 v 3.41
v 1.25 V 1.62 V 1.88
I 1.36 V 1.63 V 1.97
V 1.42 V 1.71 v 2.29

TYPE	K/OC
	TOC 0.48
	TMAX 491
	HI 27
	V Ro 1.68

Visual Kerogen Summary

Unstructured Lipids	80
Structured Lipids	-
Solid Bitumen	-
Inertinite	5
Vitrinite	15
Other	0
TOTAL	100

Background Fluorescence	None
TAI Unstructured	3+
TAI Structured	3+

COMMENTS:

VITRINITE REFLECTANCE

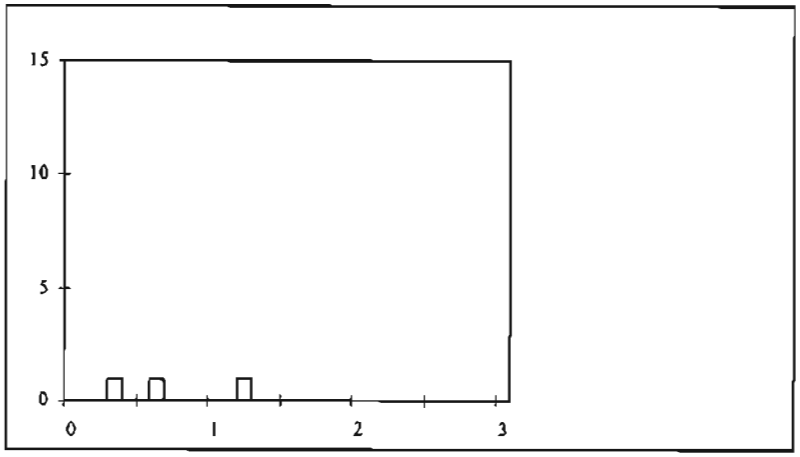
Tingmerkpuk 1998 Project Samples

MISCELLANEOUS GRAB SAMPLES

DGSI Project: 98/4372 Sample No. 89

OTHER ID: 98 Mu 32

TYPE	K/OC
TOC	5.27
TMAX	432
HI	356



b 0.34
b 0.60
b 1.25

Visual Kerogen Summary

Unstructured Lipids	70
Structured Lipids	-
Solid Bitumen	30
Inertinite	T
Vitrinite	?
Other	0
TOTAL	100

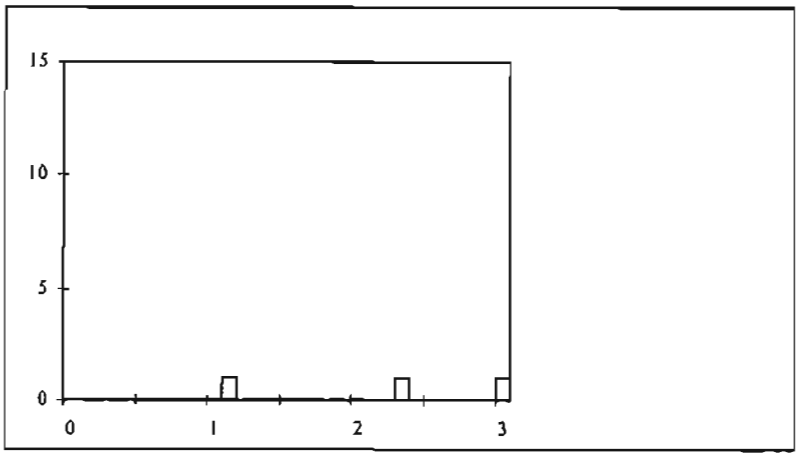
Background Fluorescence	Moderate
TAI Unstructured	3
TAI Structured	

COMMENTS:

DGSI Project: 98/4372 Sample No. 90

OTHER ID: 98 Mu 32-A

TYPE	K/OC
TOC	1.01
TMAX	438
HI	180



v 1.14
v 2.37
v 3.75

Visual Kerogen Summary

Unstructured Lipids	50
Structured Lipids	-
Solid Bitumen	50
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	3+
TAI Structured	

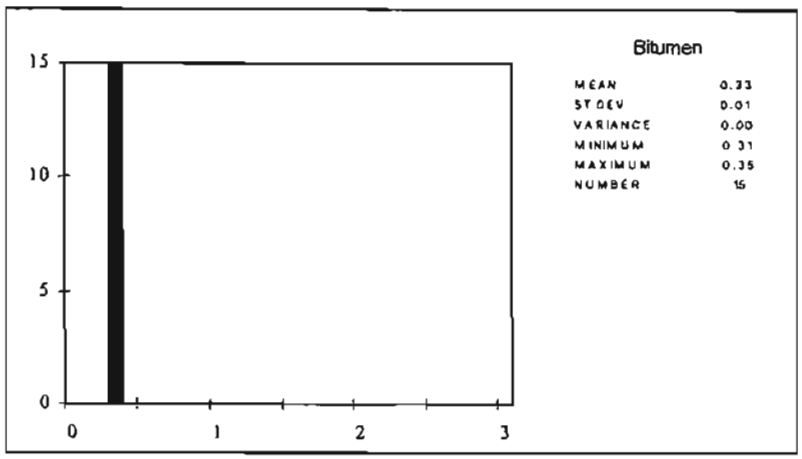
COMMENTS:

VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples

MISCELLANEOUS GRAB SAMPLES

DGSI Project: 98/4372 Sample No. 91
OTHER ID: 98 Mu 32-1



B 0.31 B 0.33 B 0.34
B 0.32 B 0.33 B 0.34
B 0.32 B 0.33 B 0.34
B 0.32 B 0.33 B 0.35
B 0.33 B 0.33 B 0.35

TYPE	WR/OC
TOC	79.44
TMAX	426
HI	641
V Ro	-
B Ro	0.33
VRE-B	0.66

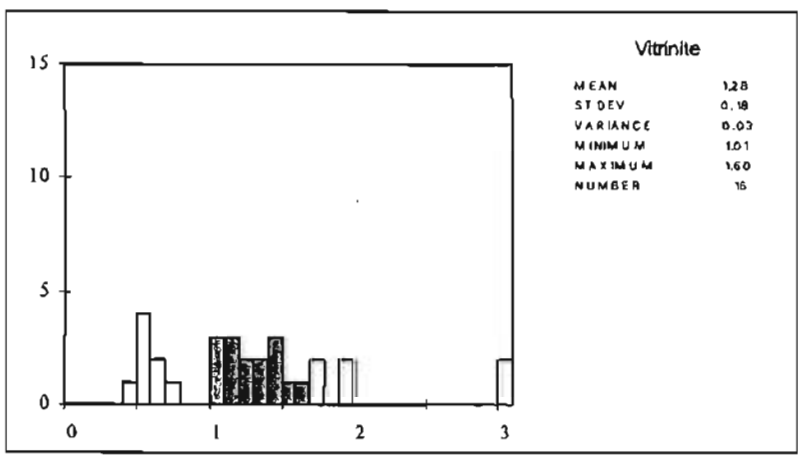
Visual Kerogen Summary

Unstructured Lipids	-
Structured Lipids	-
Solid Bitumen	100
Inertinite	-
Vitrinite	-
Other	0
TOTAL	100

Background Fluorescence
TAI Unstructured
TAI Structured

COMMENTS:

DGSI Project: 98/4372 Sample No. 92
OTHER ID: 98 Mu 34



v 0.45 v 0.60 V 1.09 V 1.24 V 1.48 v 1.90
v 0.50 v 0.62 V 1.15 V 1.30 V 1.55 v 1.92
v 0.52 v 0.77 V 1.17 V 1.32 V 1.60 v 5.25
v 0.53 V 1.01 V 1.18 V 1.42 v 1.70 v 5.61
I 0.59 V 1.04 V 1.22 V 1.42 v 1.71

TYPE	K/OC
TOC	1.47
TMAX	436
HI	32
V Ro	1.28

Visual Kerogen Summary

Unstructured Lipids	50
Structured Lipids	-
Solid Bitumen	-
Inertinite	10
Vitrinite	40
Other	0
TOTAL	100

Background Fluorescence Moderate
TAI Unstructured 3
TAI Structured

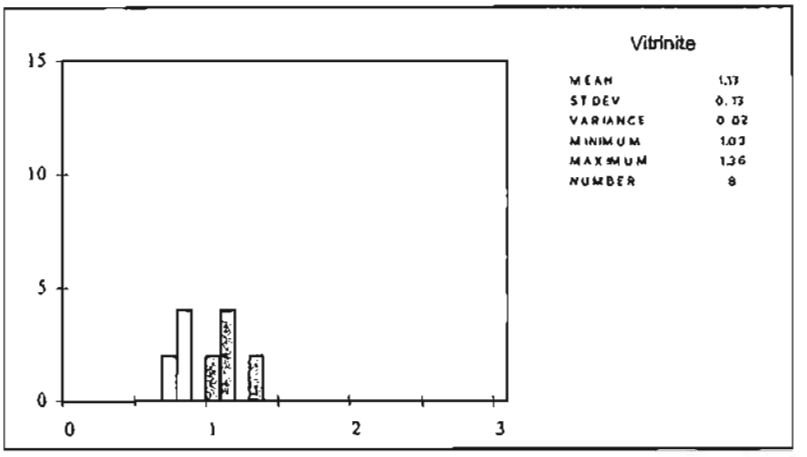
COMMENTS:
Some low reflecting weathered vitrinite & trace recycled vitrinite.

VITRINITE REFLECTANCE *Tingmerkpuk 1998 Project Samples*

MISCELLANEOUS GRAB SAMPLES

DGSI Project: 98/4372 Sample No. 93
OTHER ID: 98 Mu 38

TYPE	K/OC
	TOC 2.88
	TMAX 476
	HI 24
	V Ro 1.17



v 0.76 I 0.86 L 1.13
I 0.78 L 1.03 L 1.18
I 0.84 L 1.04 V 1.35
I 0.85 L 1.10 L 1.36
I 0.85 L 1.13

Visual Kerogen Summary

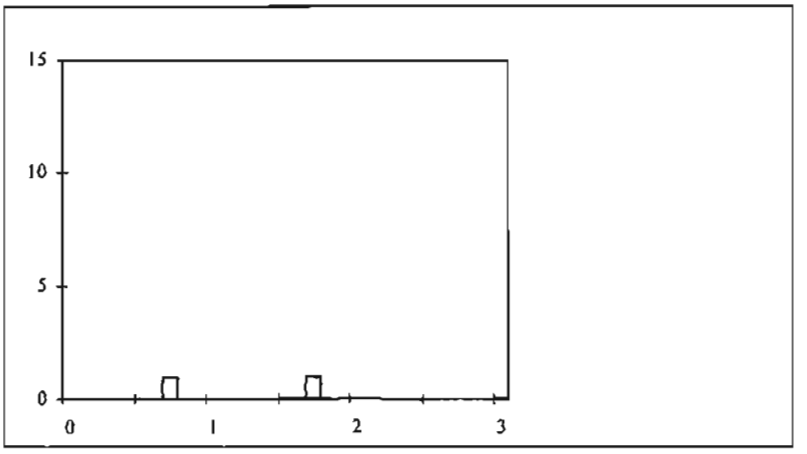
Unstructured Lipids	75
Structured Lipids	-
Solid Bitumen	10
Inertinite	5
Vitrinite	T
Other	10
TOTAL	100

Background Fluorescence	Strong
TAI Unstructured	3
TAI Structured	

COMMENTS:
Some low reflecting weathered vitrinite.

DGSI Project: 98/4372 Sample No. 94
OTHER ID: 98 Mu 39-1

TYPE	K/OC
	TOC 5.67
	TMAX 411
	HI 9



v 0.78
v 1.70

Visual Kerogen Summary

Unstructured Lipids	90
Structured Lipids	-
Solid Bitumen	?
Inertinite	5
Vitrinite	5
Other	0
TOTAL	100

Background Fluorescence	None
TAI Unstructured	3+
TAI Structured	

COMMENTS:

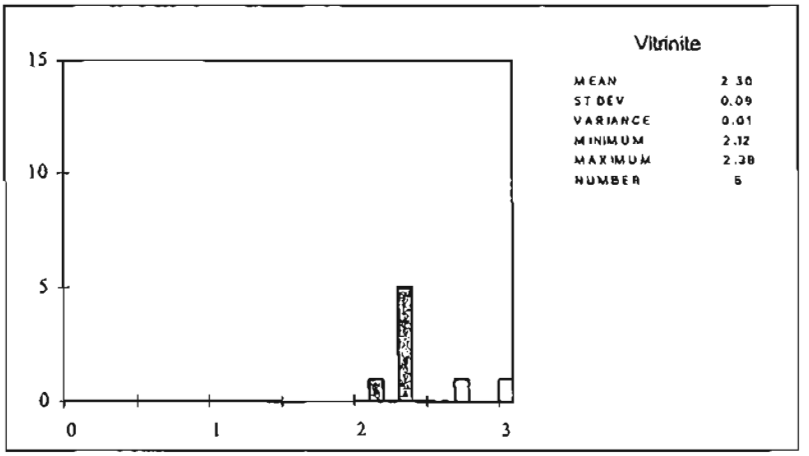
VITRINITE REFLECTANCE

Tingmerkpuk 1998 Project Samples

MISCELLANEOUS GRAB SAMPLES

DGSI Project: 98/4372 Sample No. 96

OTHER ID: 98Ha126



V 2.12 V 2.38
V 2.30 v 2.73
V 2.30 v 3.55
V 2.35
V 2.36

TYPE	K/OC
TOC	1.00
TMAX	516
HI	9
V Ro	?2.30

Visual Kerogen Summary

Unstructured Lipids	75
Structured Lipids	5
Solid Bitumen	-
Inertinite	10
Vitrinite	10
Other	0
TOTAL	100

Background Fluorescence	None
TAI Unstructured	3+
TAI Structured	4-

COMMENTS:

WHOLE EXTRACT GAS CHROMATOGRAPHY

About 50 grams of sample are crushed, passed through a 20 micron sieve, accurately weighed, and soxhlet extracted for 16 hours with dichloromethane. Other solvents can be substituted if desired. The solvent is evaporated and the residue weighed to obtain the weight percent of total organic extract. The advantage of whole extract chromatography over saturate chromatography is more of the lighter fraction (C_{10} - C_{15}) is preserved. A minor disadvantage is the nonsaturate compounds are retained and complicate the chromatograms in relatively immature extracts.

A sample of whole extract is injected directly into a Varian model 3400 gas chromatograph fitted with a Quadrex 50 meter fused silica capillary column. The GC is programmed from 40°C to 340°C at 10°C/minute with a 2 minute hold at 40°C and a 20 minute hold at 340°C. Analytical data are processed with a Nelson Analytical model 3000 chromatographic data system and IBM computer hardware. This software system facilitates data processing and graphic display as well as electronic data transmittal. All standard calculations are made including pristane/phytane ratio, carbon preference index, and other key parameters.

Whole extract gas chromatography provides information on organic facies and thermal maturity of source rocks and migrated petroleum. It serves as a basis for oil-rock correlations. It is recommended primarily to evaluate know or suspected source beds, oil shows, samples with anomalous pyrolysis S_1 values and to identify possible contamination products.

WHOLE EXTRACT GAS CHROMATOGRAPHY

Tingmerkpuk 1998 Project Samples

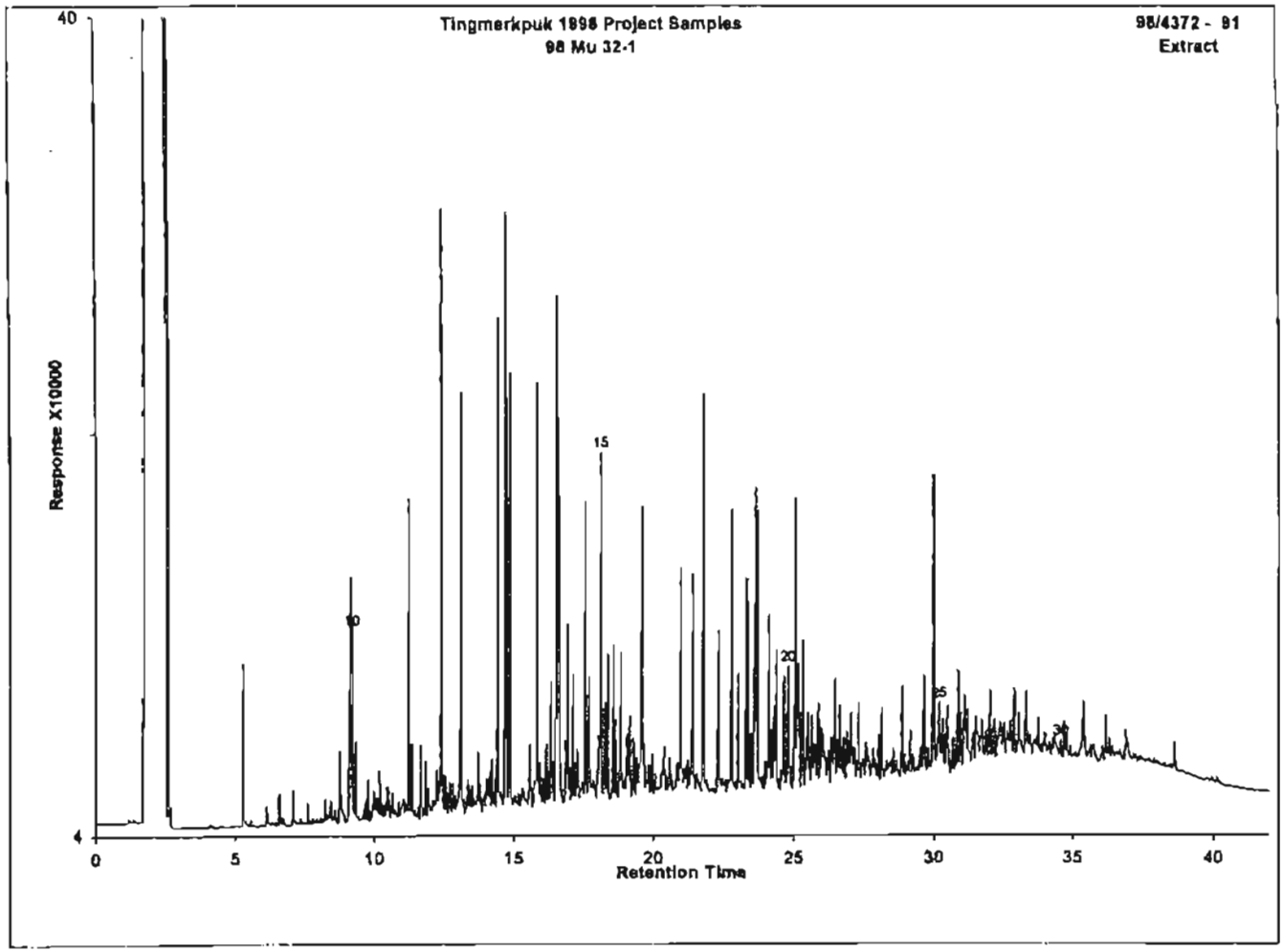
DGSI Project: 98/4372

Sample Identification DGSI ID	TOC Wt%	PPM	GAS CHROMATOGRAPHY RATIOS Ext./TOC	Pr/Ph	Pr/C17	Ph/C18	OEP
91 : 98 Mu 32-1	79.44	23948	0.030	N.A.	N.A.	N.A.	0.54

DGSI ID	Sample Weight	Extract Weight	AREA DATA C17	Pr	C18	Ph	C28	C29	C30
91 :	1.2903	0.0309	190355	n.d.	167379	n.d.	109289	35028	20796

Sample Identification DGSI ID	NORMALIZED ISOPRENOID PERCENT IC13	IC14	IC15	IC16	IC18	IC19	IC20
91 : 98 Mu 32-1	3.7	54.9	7.3	29.8	4.3	N.A.	N.A.

Sample Identification DGSI ID	AREA DATA IC13	IC14	IC15	IC16	IC18	IC19	IC20
91 : 98 Mu 32-1	32307	480242	63631	260947	37695	n.d.	n.d.


Tingmerkpuk 1998 Project Samples
98 Mu 32-1
98/4372 - 91
Extract
Response X10000
40
4
0
5
10
15
20
25
30
35
40
Retention Time