Geochemical data of cores from the UPRR 41-23 and the ERDA White Mountain 1 wells

H. B. Lo

M E M O R A N D U M

DATE: February 22, 1996

TO: John R. Dyni
USGS Mail Stop 939, Building 25
Federal Center
Denver Colorado 80225

FROM: H. B. Lo

RE: Geochemical data of cores from the UPRR 41-23 and the ERDA White Mountain 1 wells

Attached please find three sets of geochemical data that we generated from the cores I sampled from USGS Core Research Center on Oct. 27, 1995. I'll ship the unused samples to you in a separate package. This shall fulfill my obligation for obtaining/removing core material from your facility. Thank you for letting me analyze the samples.

Three sets of data are:

A: Total organic carbon (TOC) and Rock-Eval Pyrolysis
B: Inorganic Elemental Analyses
C: Visual Kerogen Analyses and Vitrinite Reflectance

Data Set A:

Total organic carbon (TOC) and Rock-Eval Pyrolysis

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
	(ft)	(ft)			(Wt.%)	(mg/gRk)	(mg/gRk)	(mg/gRk)		(mg/gOC)	(mg/gOC)	(deg. C)
UP41-23	1570.0	1570.1	201659	A	2.60	0.41	17.45	6.72	0.02	671	258	436
UP41-23	1571.5	1571.5	201659	B	4.95	0.72	39.00	9.11	0.02	787	184	440
UP41-23	1572.9	1573.0	201659	C	2.17	0.40	14.26	9.82	0.03	657	452	434
UP41-23	1573.3	1573.4	201659	D	2.98	0.50	22.37	8.10	0.02	750	271	439
UP41-23	1573.8	1573.8	201659	E	13.19	2.50	121.07	31.07	0.02	917	235	442
UP41-23	1575.0	1575.1	201659	F	11.99	1.88	101.96	29.50	0.02	850	246	444
UP41-23	1576.0	1576.1	201659	G	3.33	0.56	27.21	7.74	0.02	817	232	440
UP41-23	1576.6	1576.7	201659	H	1.44	0.17	9.30	6.19	0.02	645	429	445
UP41-23	1577.8	1577.9	201659	I	1.72	0.31	10.50	7.38	0.03	610	429	444
UP41-23	1578.9	1579.0	201659	J	1.15	0.32	6.85	4.25	0.04	595	369	441
UP41-23	1579.3	1579.4	201659	K	1.17	0.33	5.74	6.14	0.05	490	524	442
UP41-23	1580.5	1580.6	201659	L	5.16	0.62	41.70	12.29	0.01	808	238	442
UP41-23	1581.6	1581.7	201659	M	6.72	1.24	47.39	24.97	0.03	705	371	440
UP41-23	1582.0	1582.1	201659	N	5.29	0.95	42.49	8.16	0.02	803	154	442
UP41-23	1583.4	1583.5	201659	O	2.91	0.17	17.15	9.73	0.01	589	334	441
UP41-23	1584.9	1585.0	201659	P	0.80	0.26	4.20	11.12	0.06	525	1390	440
UP41-23	1585.2	1585.3	201659	Q	0.78	0.20	4.14	10.09	0.05	530	--	438
UP41-23	1586.2	1586.3	201659	R	0.89	0.14	3.44	8.42	0.04	386	946	439
UP41-23	1587.7	1587.8	201659	S	0.67	0.07	1.93	5.50	0.03	288	820	432
UP41-23	1588.1	1588.2	201659	T	0.44							
UP41-23	1589.4	1589.5	201659	U	0.70	0.13	2.47	7.80	0.05	352	--	439
UP41-23	1590.5	1590.6	201659	V	1.76	0.68	10.55	9.56	0.06	599	543	442
UP41-23	1591.9	1592.0	201659	W	2.26	0.46	14.14	6.14	0.03	625	271	437
UP41-23	1592.3	1592.4	201659	X	1.01	0.19	5.45	6.87	0.03	539	680	441
UP41-23	1593.6	1593.7	201659	Y	1.71	0.46	12.27	9.20	0.04	717	538	441
UP41-23	1594.0	1594.1	201659	Z	1.86	0.34	12.17	13.93	0.03	654	748	439
UP41-23	1595.4	1595.6	201660	A	1.11	0.25	6.97	16.33	0.03	627	--	439
UP41-23	1596.9	1597.0	201660	B	1.10	0.40	6.97	15.40	0.05	633	--	424
UP41-23	1597.2	1597.4	201660	C	1.46	0.49	10.58	9.23	0.04	724	632	431
UP41-23	1598.7	1598.8	201660	D	3.62	0.46	26.28	11.84	0.02	725	327	435
UP41-23	1599.0	1599.0	201660	E	2.77	0.47	19.37	3.91	0.02	699	141	433
UP41-23	1599.9	1600.0	201660	F	11.59	0.72	88.01	19.18	0.01	759	165	446
UP41-23	1600.4	1600.6	201660	G	10.81	1.11	87.03	15.98	0.01	805	147	446
UP41-23	1601.0	1601.2	201660	H	6.88	0.94	51.78	13.76	0.02	752	200	445
UP41-23	1602.4	1602.6	201660	I	9.53	0.90	63.50	17.20	0.01	666	180	445
UP41-23	1603.8	1603.9	201660	J	3.30	0.74	23.39	16.97	0.03	708	514	434
UP41-23	1604.3	1604.4	201660	K	5.01	0.89	37.13	14.92	0.02	741	297	440
UP41-23	1605.9	1606.0	201660	L	14.83	2.24	109.66	31.91	0.02	739	215	442

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
UP41-23	1606.5	1606.7	201660	M	18.96	3.58	136.60	47.54	0.03	720	250	442
UP41-23	1607.1	1607.2	201660	N	6.26	1.07	45.08	35.80	0.02	720	571	445
UP41-23	1608.4	1608.5	201660	O	1.36	0.53	7.56	8.19	0.07	555	602	440
UP41-23	1609.9	1610.0	201660	P	1.03	0.54	5.51	17.19	0.09	534	--	430
UP41-23	1610.2	1610.4	201660	Q	1.66	0.61	10.33	4.55	0.06	622	274	416
UP41-23	1611.6	1611.8	201660	R	1.97	0.89	13.73	6.80	0.06	696	345	431
UP41-23	1612.0	1612.2	201660	S	1.99	1.02	14.49	20.49	0.07	728	--	431
UP41-23	1613.6	1613.7	201660	T	0.47							
UP41-23	1613.8	1613.9	201660	U	14.19	1.79	113.70	40.89	0.02	801	288	441
UP41-23	1615.3	1615.6	201660	V	1.81	0.36	13.09	118.97	0.03	723	--	434
UP41-23	1616.0	1616.1	201660	W	13.66	1.91	96.36	30.60	0.02	705	224	445
UP41-23	1616.2	1616.3	201660	X	4.14	0.55	17.36	8.87	0.03	419	214	437
UP41-23	1617.6	1617.8	201660	Y	0.51	0.38	4.05	19.10	0.09	794	--	439
UP41-23	1618.0	1618.1	201660	Z	0.75	0.20	4.05	25.84	0.05	540	--	438
UP41-23	1619.4	1619.5	201661	A	5.16	1.29	39.42	7.71	0.03	764	149	441
UP41-23	1620.8	1620.9	201661	B	10.97	2.61	109.84	33.65	0.02	1001	306	437
UP41-23	1621.3	1621.4	201661	C	8.23	1.40	74.15	26.61	0.02	900	323	443
UP41-23	1622.6	1622.7	201661	D	8.14	0.84	50.79	40.90	0.02	623	502	442
UP41-23	1623.1	1623.2	201661	E	4.08	0.77	33.08	5.54	0.02	810	135	446
UP41-23	1624.4	1624.6	201661	F	1.55	0.30	14.66	4.96	0.02	945	320	442
UP41-23	1625.8	1626.0	201661	G	1.55	0.46	8.54	15.83	0.05	550	--	437
UP41-23	1626.3	1626.5	201661	H	1.73	0.45	12.34	12.82	0.04	713	741	433
UP41-23	1638.4	1638.7	201661	I	8.51	1.44	59.08	10.73	0.02	694	126	447
UP41-23	1639.3	1639.5	201661	J	11.38	1.77	82.97	16.91	0.02	729	149	446
UP41-23	1640.2	1640.4	201661	K	4.71	0.41	22.12	10.00	0.02	469	212	443
UP41-23	1641.8	1642.0	201661	L	9.88	2.21	73.28	29.28	0.03	743	297	443
UP41-23	1642.2	1642.4	201661	M	11.29	1.52	70.10	40.43	0.02	620	358	440
UP41-23	1643.8	1643.9	201661	N	12.46	1.15	81.78	34.42	0.01	656	276	443
UP41-23	1644.0	1644.1	201661	O	7.92	1.00	67.33	23.95	0.01	850	302	443
UP41-23	1645.3	1645.4	201661	P	4.10	0.55	38.93	14.16	0.01	949	345	443
UP41-23	1646.8	1647.0	201661	Q	1.24	0.16	6.06	3.08	0.03	488	248	438
UP41-23	1647.4	1647.6	201661	R	4.70	2.87	43.24	20.21	0.06	920	430	436
UP41-23	1648.6	1648.8	201661	S	1.85	0.22	9.32	4.78	0.02	503	258	439
UP41-23	1649.0	1649.2	201661	T	2.61	0.64	14.19	5.79	0.04	543	221	430
UP41-23	1649.7	1649.9	201661	U	12.41	5.47	122.45	38.86	0.04	986	313	432
UP41-23	1650.2	1650.4	201661	V	1.21	0.98	5.33	8.59	0.16	440	710	435
UP41-23	1651.6	1651.8	201661	W	0.32							
UP41-23	1652.1	1652.2	201661	X	0.25							
UP41-23	1653.4	1653.6	201661	Y	0.17							

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
UP41-23	1654.6	1654.7	201661	Z	0.12							
UP41-23	1655.2	1655.3	201662	A	0.21							
UP41-23	1656.6	1656.8	201662	B	0.13							
UP41-23	1657.0	1657.2	201662	C	0.04							
UP41-23	1658.3	1658.5	201662	D	0.26							
UP41-23	1659.8	1659.9	201662	E	1.70	0.65	8.47	8.52	0.07	498	501	434
UP41-23	1660.3	1660.4	201662	F	0.73	0.10	2.70	4.31	0.04	369	590	435
UP41-23	1661.2	1661.3	201662	G	0.29							
UP41-23	1661.6	1661.7	201662	H	0.17							
UP41-23	1662.2	1662.3	201662	I	0.16							
UP41-23	1663.5	1663.6	201662	J	0.27							
UP41-23	1664.2	1664.3	201662	K	0.26							
UP41-23	1665.5	1665.6	201662	L	0.29							
UP41-23	1666.8	1667.0	201662	M	0.40							
UP41-23	1667.3	1667.5	201662	N	0.78	0.13	1.68	5.56	0.07	215	712	430
UP41-23	1668.7	1668.8	201662	O	1.36	0.30	3.72	6.60	0.07	273	485	428
UP41-23	1669.0	1669.2	201662	P	1.80	0.35	6.78	5.86	0.05	376	325	434
WM-1	880.0	880.2	201651	A	0.92	0.10	4.32	3.20	0.02	469	347	433
WM-1	880.6	880.7	201651	B	0.60	0.23	2.14	1.68	0.10	357	280	430
WM-1	881.4	881.7	201651	C	3.01	0.19	19.13	4.94	0.01	635	164	438
WM-1	882.1	882.3	201651	D	1.60	0.15	8.01	5.62	0.02	500	351	433
WM-1	882.8	883.0	201651	E	3.04	0.17	16.48	12.53	0.01	542	412	438
WM-1	883.1	883.3	201651	F	3.23	0.22	21.49	8.30	0.01	665	256	439
WM-1	883.5	883.6	201651	G	2.09	0.31	14.20	11.30	0.02	679	540	437
WM-1	883.8	884.0	201651	H	0.79	0.13	5.55	3.73	0.02	702	472	433
WM-1	884.2	884.4	201651	I	0.70	0.37	5.06	2.05	0.07	496	201	436
WM-1	884.6	884.8	201651	J	1.02	0.37	5.08	2.05	0.07	496	201	432
WM-1	885.4	885.6	201651	K	0.55	0.08	2.52	3.79	0.03	458	689	429
WM-1	886.0	886.2	201651	L	1.30	0.16	8.01	4.20	0.02	616	323	431
WM-1	886.6	886.8	201651	M	1.13	0.12	5.80	4.11	0.02	513	364	435
WM-1	887.3	887.5	201651	N	1.26	0.13	6.23	5.06	0.02	494	401	435
WM-1	887.9	888.1	201651	O	3.24	0.21	23.52	10.76	0.01	725	332	439
WM-1	888.4	888.5	201651	P	9.15	1.12	71.50	35.50	0.02	781	387	444
WM-1	888.5	888.6	201651	Q	6.15	0.63	51.51	16.00	0.01	837	260	441
WM-1	888.8	889.0	201651	R	0.73	0.04	2.22	7.60	0.02	304	--	443
WM-1	889.3	889.5	201651	S	0.51	0.04	0.82	6.67	0.05	160	--	430
WM-1	890.0	890.2	201651	T	0.47	0.03	0.76	6.02	0.04	161	--	430
WM-1	890.6	890.7	201651	U	0.85	0.04	3.72	6.09	0.01	437	716	447
WM-1	891.1	891.2	201651	V	1.65	0.08	7.72	7.47	0.01	467	452	447

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
WM-1	891.9	892.1	201651	W	1.89	0.13	10.83	6.28	0.01	573	332	441
WM-1	892.4	892.6	201651	X	3.42	0.35	24.88	6.92	0.01	727	202	437
WM-1	893.8	893.9	201651	Y	2.52	0.24	18.47	7.25	0.01	732	287	436
WM-1	894.4	894.5	201651	Z	1.87	0.11	12.02	7.22	0.01	642	386	437
WM-1	895.2	895.4	201652	A	0.39							
WM-1	895.8	896.0	201652	B	0.70	0.06	0.23	6.90	0.21	32	985	414
WM-1	896.6	896.8	201652	C	0.05							
WM-1	897.1	897.3	201652	D	0.21							
WM-1	898.4	898.6	201652	E	0.07							
WM-1	899.8	899.9	201652	F	0.29							
WM-1	900.1	900.3	201652	G	0.14							
WM-1	901.6	901.7	201652	H	0.40							
WM-1	902.1	902.3	201652	I	0.37							
WM-1	903.5	903.7	201652	J	0.17							
WM-1	904.2	904.3	201652	K	1.04	0.06	2.58	4.90	0.02	248	471	431
WM-1	904.8	905.0	201652	L	0.51	0.04	1.75	1.94	0.02	343	380	440
WM-1	905.2	905.4	201652	M	0.64	0.13	2.57	2.37	0.05	401	370	436
WM-1	907.1	907.3	201652	N	1.15	0.15	5.30	3.71	0.03	460	322	437
WM-1	908.4	908.6	201652	O	0.66	0.04	1.95	4.67	0.02	295	707	436
WM-1	909.8	910.0	201652	P	0.61	0.04	2.75	3.86	0.01	450	632	441
WM-1	910.2	910.4	201652	Q	1.01	0.07	4.11	4.44	0.02	407	440	441
WM-1	911.6	911.8	201652	R	1.28	0.14	6.64	2.21	0.02	518	172	439
WM-1	912.0	912.1	201652	S	0.92	0.25	4.28	2.54	0.06	465	276	433
WM-1	913.4	913.6	201652	T	0.91	0.10	5.20	1.86	0.02	571	204	429
WM-1	913.8	914.0	201652	U	0.61	0.12	2.93	1.86	0.04	480	304	431
WM-1	914.8	915.0	201652	V	1.98	0.38	13.75	3.44	0.03	694	173	431
WM-1	915.6	915.7	201652	W	10.63	1.06	81.21	19.09	0.01	763	179	442
WM-1	916.0	916.2	201652	X	2.86	0.39	19.49	2.94	0.02	681	102	438
WM-1	916.6	916.8	201652	Y	2.19	0.23	13.79	5.20	0.02	629	237	435
WM-1	917.1	917.2	201652	Z	0.95	0.16	5.51	4.39	0.03	580	462	432
WM-1	917.5	917.7	201653	A	1.76	0.10	5.28	11.03	0.02	300	626	445
WM-1	918.3	918.5	201653	B	1.81	0.24	12.11	2.72	0.02	669	150	437
WM-1	919.0	919.1	201653	C	2.49	0.33	15.93	4.85	0.02	639	194	438
WM-1	919.8	920.1	201653	D	6.29	0.85	46.55	10.34	0.02	740	164	439
WM-1	920.1	920.4	201653	E	12.90	1.90	86.70	25.20	0.02	672	195	440
WM-1	920.7	920.9	201653	F	12.58	1.43	96.00	14.82	0.01	763	117	441
WM-1	921.1	921.3	201653	G	12.16	1.55	85.42	18.83	0.02	702	154	442
WM-1	921.6	921.8	201658		0.27							
WM-1	922.1	922.2	201653	H	1.76	0.22	7.79	5.40	0.03	442	306	435

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
WM-1	923.4	923.6	201653	I	1.68	0.19	6.08	4.72	0.03	361	280	437
WM-1	924.1	924.3	201653	J	3.05	0.47	20.79	5.09	0.02	681	166	435
WM-1	924.5	924.6	201653	K	13.19	1.96	101.60	11.73	0.02	770	89	436
WM-1	925.2	925.3	201653	L	13.19	2.07	104.50	27.02	0.02	792	204	439
WM-1	925.6	925.8	201653	M	1.77	0.55	11.50	4.73	0.05	649	267	430
WM-1	926.6	926.7	201653	N	1.69	0.11	6.95	7.76	0.02	411	459	446
WM-1	927.0	927.1	201653	O	2.31	0.25	11.80	5.29	0.02	510	229	446
WM-1	928.4	928.6	201653	P	2.48	0.18	17.49	4.48	0.01	705	180	441
WM-1	929.5	929.6	201653	Q	6.10	0.72	45.34	8.42	0.02	743	138	438
WM-1	929.9	930.0	201653	R	6.38	0.76	48.12	11.01	0.02	754	172	439
WM-1	930.2	930.4	201653	S	8.46	1.42	66.82	7.73	0.02	789	91	438
WM-1	931.1	931.2	201653	T	0.94	0.05	1.66	5.08	0.03	176	540	438
WM-1	932.0	932.1	201653	U	0.59	0.08	1.42	3.22	0.05	240	545	435
WM-1	932.9	933.0	201653	V	1.34	0.17	7.43	2.88	0.02	554	214	442
WM-1	933.3	933.4	201653	W	9.24	1.08	64.33	12.92	0.02	696	139	441
WM-1	933.5	933.7	201653	X	6.74	0.85	54.85	9.30	0.02	813	137	438
WM-1	934.5	934.6	201653	Y	6.36	1.01	50.29	12.47	0.02	790	196	440
WM-1	934.8	934.9	201653	Z	4.23	1.38	33.66	14.16	0.04	795	334	432
WM-1	935.1	935.3	201654	A	1.60	0.26	10.56	4.36	0.02	660	272	434
WM-1	936.6	936.8	201654	B	2.69	0.29	17.84	6.65	0.02	663	247	437
WM-1	937.0	937.2	201654	C	3.40	0.62	23.44	7.49	0.03	689	220	439
WM-1	937.5	937.7	201654	D	3.57	0.58	21.00	7.32	0.03	588	205	439
WM-1	938.4	938.5	201654	E	2.86	0.50	19.40	7.20	0.03	678	251	440
WM-1	939.8	939.9	201654	F	3.68	0.34	23.01	6.69	0.01	625	181	440
WM-1	940.2	940.3	201654	G	4.01	0.50	28.99	8.06	0.02	722	200	440
WM-1	941.5	941.8	201654	H	9.05	1.73	65.61	24.69	0.03	724	272	439
WM-1	942.0	942.2	201654	I	6.44	0.94	46.21	13.33	0.02	717	206	441
WM-1	943.4	943.5	201654	J	9.41	2.29	61.21	48.10	0.04	650	511	437
WM-1	943.8	944.0	201654	K	9.58	2.84	50.64	24.49	0.05	528	255	432
WM-1	944.8	945.0	201654	L	6.53	1.45	47.98	17.56	0.03	734	268	439
WM-1	945.2	945.3	201654	M	7.61	1.28	58.95	12.20	0.02	774	160	441
WM-1	945.5	945.6	201654	N	6.78	1.14	48.98	14.62	0.02	722	215	441
WM-1	946.2	946.4	201654	O	1.23	0.15	6.16	3.82	0.02	500	310	436
WM-1	946.6	946.7	201654	P	1.27	0.09	4.00	5.34	0.02	314	420	446
WM-1	947.2	947.3	201654	Q	1.02	0.08	4.15	4.49	0.02	406	440	444
WM-1	948.4	948.5	201654	R	0.88	0.13	2.40	3.92	0.05	272	445	442
WM-1	949.2	949.3	201654	S	8.97	1.08	67.61	11.47	0.02	753	127	434
WM-1	949.5	949.6	201654	T	4.06	0.85	28.29	14.74	0.03	696	363	434
WM-1	949.8	949.9	201654	U	1.72	0.25	9.48	6.12	0.03	551	355	431

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
WM-1	950.2	950.3	201654	V	0.81	0.13	2.55	4.71	0.05	314	581	436
WM-1	950.4	950.5	201654	W	0.72	0.05	1.38	2.16	0.03	192	300	436
WM-1	951.0	951.1	201654	X	0.26							
WM-1	951.4	951.5	201654	Y	0.15							
WM-1	951.6	951.8	201654	Z	0.18							
WM-1	951.9	952.0	201655	A	0.16							
WM-1	952.2	952.3	201655	B	0.07							
WM-1	952.4	952.5	201655	C	0.19							
WM-1	953.4	953.5	201655	D	0.12							
WM-1	954.8	954.9	201655	E	0.29							
WM-1	956.2	956.4	201655	F	0.33							
WM-1	957.0	957.1	201655	G	0.11							
WM-1	957.1	957.2	201655	H	0.13							
WM-1	957.2	957.3	201655	I	0.11							
WM-1	958.0	958.2	201655	J	0.11							
WM-1	958.3	958.4	201655	K	0.06							
WM-1	959.5	959.6	201655	L	0.07							
WM-1	960.6	960.8	201655	M	0.13							
WM-1	961.0	961.2	201655	N	0.07							
WM-1	962.4	962.6	201655	O	0.07							
WM-1	963.8	963.9	201655	P	0.08							
WM-1	964.6	964.8	201655	Q	0.08							
WM-1	965.2	965.3	201655	R	0.05							
WM-1	966.6	966.7	201655	S	0.37							
WM-1	966.9	967.0	201655	T	0.10							
WM-1	967.0	967.1	201655	U	0.37							
WM-1	968.4	968.5	201655	V	0.38							
WM-1	969.8	969.9	201655	W	0.71	0.05	2.23	4.46	0.02	314	628	438
WM-1	970.0	970.1	201655	X	0.71	0.05	2.87	3.53	0.02	404	497	440
WM-1	971.4	971.6	201655	Y	0.59	0.07	2.32	0.77	0.03	393	130	430
WM-1	973.0	973.1	201655	Z	2.55	0.20	17.11	3.04	0.01	670	119	438
WM-1	973.2	973.3	201656	A	2.54	0.30	17.69	5.72	0.02	696	225	437
WM-1	973.4	973.5	201656	B	3.77	0.36	27.17	7.98	0.01	720	211	437
WM-1	973.6	973.7	201656	C	6.06	0.93	45.04	12.07	0.02	743	199	433
WM-1	973.7	973.8	201656	D	1.95	1.41	15.02	5.88	0.09	770	301	429
WM-1	974.0	974.1	201656	E	0.75	0.12	4.11	2.81	0.03	548	374	432
WM-1	974.7	974.8	201656	F	0.50	0.07	1.37	3.25	0.05	274	650	436
WM-1	975.0	975.1	201656	G	0.23							
WM-1	975.6	975.8	201656	H	0.17							

TOC and Rock-Eval data of cores from the UPRR 41-23 and the White Mountain 1 wells

Name	Top_dep	Bas_dep	EPRID	a	TOC	S1	S2	S3	PI	HI	OI	Tmax
WM-1	976.0	976.2	201656	I	0.20							
WM-1	977.4	977.6	201656	J	0.15							
WM-1	978.7	978.9	201656	K	0.42							
WM-1	979.4	979.5	201656	L	0.51	0.05	2.20	3.60	0.02	431	705	443
WM-1	980.2	980.3	201656	M	1.75	0.14	11.77	2.64	0.01	672	150	441
WM-1	980.5	980.6	201656	N	5.95	0.51	47.41	7.75	0.01	796	130	439
WM-1	980.6	980.7	201656	O	10.60	1.08	79.32	32.56	0.01	748	307	438
WM-1	981.0	981.1	201656	P	8.96	0.88	71.71	11.98	0.01	800	133	439
WM-1	981.4	981.5	201656	Q	1.52	0.12	10.02	4.24	0.01	659	278	437
WM-1	981.6	981.8	201656	R	0.60	0.05	1.55	5.45	0.03	258	908	441
WM-1	982.0	982.2	201656	S	0.39							
WM-1	982.5	982.6	201656	T	0.42							
WM-1	983.8	983.9	201656	U	3.08	0.57	21.65	6.83	0.03	702	221	436
WM-1	984.3	984.4	201656	V	0.33							
WM-1	985.4	985.6	201656	W	0.60	0.08	2.26	5.14	0.03	376	856	438
WM-1	986.0	986.1	201656	X	0.97	0.13	5.17	4.33	0.02	532	446	441
WM-1	986.6	986.7	201656	Y	1.58	0.54	12.24	4.00	0.04	774	253	433
WM-1	987.4	987.6	201656	Z	8.23	0.83	63.49	16.71	0.01	771	203	434
WM-1	988.4	988.6	201657	A	8.90	0.84	67.51	19.01	0.01	758	213	436
WM-1	988.8	988.9	201657	B	6.00	1.68	46.32	19.75	0.04	772	329	435
WM-1	988.9	989.0	201657	C	5.16	2.07	44.94	12.25	0.04	870	237	435
WM-1	989.2	989.4	201657	D	2.07	0.47	14.66	6.53	0.03	708	315	435
WM-1	989.9	990.0	201657	E	3.11	0.38	23.07	8.10	0.02	741	260	438
WM-1	990.3	990.5	201657	F	2.52	0.69	16.05	7.89	0.04	637	313	440
WM-1	991.8	992.0	201657	G	3.94	0.38	30.83	7.57	0.01	782	192	440
WM-1	992.3	992.5	201657	H	3.32	0.42	26.00	6.87	0.02	783	206	439
WM-1	992.6	992.7	201657	I	6.57	0.80	53.36	11.94	0.01	812	181	437
WM-1	993.1	993.2	201657	J	8.59	1.09	69.71	16.58	0.02	811	193	435
WM-1	993.6	993.7	201657	K	5.86	1.42	45.88	16.34	0.03	782	278	441
WM-1	994.4	994.6	201657	L	9.83	1.20	79.19	21.93	0.01	805	223	434
WM-1	995.4	995.5	201657	M	9.78	1.54	77.71	19.46	0.02	794	198	433
WM-1	996.8	997.0	201657	N	11.32	1.84	87.17	28.36	0.02	770	251	436
WM-1	997.4	997.5	201657	O	9.82	1.30	74.20	18.03	0.02	755	183	434
WM-1	997.5	997.6	201657	P	4.54	3.75	36.50	20.18	0.09	803	444	426
WM-1	997.6	997.7	201657	Q	7.26	1.94	54.50	16.22	0.03	750	223	439
WM-1	997.8	997.9	201657	R	2.91	0.30	22.09	6.83	0.01	759	234	433
WM-1	998.7	998.8	201657	S	0.57	0.13	0.84	3.26	0.14	147	572	434
WM-1	999.4	999.5	201657	T	0.51	0.04	0.91	6.14	0.04	178	--	433

Data Set B:

Inorganic Elemental Analyses

Inorganic Elemental Data of Wilkins Peak Samples

Name	Top_dep	Bas_dep	EPRID	a	C	Na2O	MgO	Al2O3	SiO2	P2O5	S	K2O	CaO	TiO2	Cr2O3	MnO	Fe2O3	Rb	Sr	Y	Zr	Nb	Ba	
	(ft)	(ft)			(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(p
UP41-23	1572.9	1573.0	201659	C	9.67	4.69	11.10	3.24	25.00	0.18	0.79	1.56	19.10	0.14		0.09	3.11	37	1050		44		501	
UP41-23	1573.8	1573.8	201659	E	20.20	2.38	9.88	4.90	25.70		0.64	3.00	13.80	0.17		0.09	2.49	48	665	12	82		647	
UP41-23	1579.3	1579.4	201659	K	9.49	9.63	7.62	2.37	18.00	0.06	0.46	0.94	24.40	0.11		0.07	2.05	18	1230	17	44		845	
UP41-23	1581.6	1581.7	201659	M	15.60	3.76	9.44	3.27	20.50	0.05	0.39	1.46	21.00	0.19	0.03	0.11	1.85	183	1190				386	
UP41-23	1583.4	1583.5	201659	O	8.17	7.00	7.02	6.50	32.30		0.37	2.97	14.20	0.29		0.11	2.89	49	748	14	55		422	
UP41-23	1588.1	1588.2	201659	T	5.19	6.67	3.91	9.14	35.90	0.05	0.57	4.29	11.90	0.46	0.03	0.08	3.12	188	710	23	77		369	
UP41-23	1592.3	1592.4	201659	X	9.10	7.94	6.81	2.43	19.00	0.07	0.41	0.68	23.70	0.15	0.03	0.10	2.15	178	1340				819	
UP41-23	1599.9	1600.0	201660	F	20.50	5.03	8.07	2.26	17.00	0.05	0.12	0.46	20.80	0.16	0.03	0.08	1.26	183	995				407	
UP41-23	1600.4	1600.6	201660	G	19.40	5.91	7.49	2.86	18.00		0.26	1.15	19.60	0.14		0.06	2.14		943	12	41		506	
UP41-23	1601.0	1601.2	201660	H	16.10	4.61	7.77	3.10	19.10	0.11	0.16	1.05	20.90	0.19	0.03	0.09	1.18	180	897				349	
UP41-23	1603.8	1603.9	201660	J	10.00	0.99	12.40	5.01	31.40	0.02	0.06	3.22	15.30	0.22		0.07	1.71	47	833		49		498	
UP41-23	1606.5	1606.7	201660	M	27.30	2.34	7.61	4.49	25.10	0.05	1.31	2.04	12.70	0.26	0.04	0.08	2.75	174	696		43		376	
UP41-23	1608.4	1608.5	201660	O	8.23	5.21	7.73	4.32	26.50	0.04	0.12	1.99	18.90	0.19	0.03	0.09	0.59	193	908		22		1040	
UP41-23	1616.0	1616.1	201660	W	24.30	2.96	8.81	3.68	17.60	0.04	0.82	1.53	17.60	0.21	0.04	0.09	2.03	190	1010				376	
UP41-23	1616.2	1616.3	201660	X	11.50	5.16	8.40	3.99	24.40	0.05	0.51	1.67	19.50	0.25	0.03	0.08	2.47	174	898		31		371	
UP41-23	1620.8	1620.9	201661	B	18.80	1.39	12.20	3.27	21.50	0.04	0.58	1.77	17.70	0.19	0.03	0.10	1.62	184	714				396	
UP41-23	1622.6	1622.7	201661	D	17.80	6.90	6.78	3.35	19.00	0.09	0.96	1.77	20.60	0.14		0.06	2.68	41	1140	15	40		924	
UP41-23	1623.1	1623.2	201661	E	11.80	4.44	7.88	4.50	23.20	0.05	1.14	2.55	20.00	0.24	0.03	0.09	3.24	165	868	20	13		312	
UP41-23	1624.4	1624.6	201661	F	9.06	5.71	7.67	3.54	22.60	0.04	0.79	1.70	19.50	0.21	0.03	0.09	1.55	188	1040				339	
UP41-23	1626.3	1626.5	201661	H	10.10	3.05	11.10	3.17	24.50	0.09	0.07	1.59	19.80	0.18	0.03	0.08	0.93	188	1100				392	
UP41-23	1638.4	1638.7	201661	I	17.10	5.26	5.94	4.59	20.20	0.12	1.25	2.43	17.20	0.23	0.03	0.07	2.84	179	669		21		345	
UP41-23	1639.3	1639.5	201661	J	19.80	3.32	5.69	5.58	24.50	0.05	1.75	3.93	15.10	0.25	0.03	0.06	3.39	176	680	13	28		540	
UP41-23	1643.8	1643.9	201661	N	23.20	4.58	7.24	2.60	18.70	1.24	0.30	0.99	17.60	0.17	0.03	0.08	0.95	195	1240				414	
UP41-23	1646.8	1647.0	201661	Q	11.00	4.69	9.30	2.53	16.60	0.07	0.17	0.77	25.50	0.17	0.03	0.11	1.41	179	1220	16			495	
UP41-23	1649.7	1649.9	201661	U	21.80	2.26	8.75	5.18	22.50	0.05	0.37	2.29	16.10	0.26	0.04	0.08	1.69	195	961	13	23		425	
UP41-23	1650.2	1650.4	201661	V	4.25	5.22	2.99	11.80	42.80	0.07	0.42	4.52	9.05	0.58	0.03	0.09	4.14	179	437	42	106	12	342	
UP41-23	1653.4	1653.6	201661	Y	0.95	4.12	1.54	12.00	63.60	0.09	0.63	3.09	2.23	0.61	0.03	0.06	3.69	179	223	39	285	12	436	
UP41-23	1661.6	1661.7	201662	H	1.22	5.07	2.12	15.20	52.40	0.06	1.00	4.69	2.72	0.71	0.03	0.05	5.83	160	229	33	112	11	406	
UP41-23	1665.5	1665.6	201662	L	1.96	4.77	2.88	15.50	49.70	0.05	0.38	4.89	4.19	0.69	0.04	0.08	4.44	173	191	26	67	11	324	
UP41-23	1668.7	1668.8	201662	O	7.96	3.20	8.87	6.24	31.70	0.47	0.03	3.24	16.90	0.31	0.03	0.11	2.10	185	919	13	30		379	
WM-1	888.5	888.6	201651	Q	13.80	1.11	9.40	4.47	23.30	0.04	0.07	2.55	19.20	0.15		0.07	2.95	51	1110	13	69		764	
WM-1	888.8	889.0	201651	R	4.86	0.76	12.00	3.61	24.10	0.05	0.01	1.77	20.00	0.16		0.10	1.46	40	1060	15	53		718	
WM-1	899.8	899.9	201652	F	4.13	3.30	8.66	7.79	35.20	0.11	0.09	2.84	14.00	0.36		0.11	4.38	81	689	16	82		569	
WM-1	915.6	915.7	201652	W	17.70	1.25	9.10	4.10	22.00	0.05	0.22	1.61	20.60	0.20		0.08	2.50	78	1210	47	46		689	
WM-1	917.5	917.7	201653	A	8.94	0.96	10.00	5.61	26.00	0.09	0.22	2.29	22.10	0.28		0.08	2.70	53	1120	18	68		528	
WM-1	920.1	920.4	201653	E	19.30	1.34	7.85	5.58	26.20	0.05	0.85	3.47	16.40	0.27		0.06	3.46	54	882	22	63		661	
WM-1	921.1	921.3	201653	G	17.80	1.56	8.44	5.70	25.80	0.05	0.55	3.06	16.50	0.29		0.05	3.22	58	847	11	68		762	
WM-1	924.5	924.6	201653	K	19.70	1.40	7.66	7.20	31.60	0.04	1.29	4.51	10.90	0.30		0.05	3.95	77	638	19	60		618	
WM-1	930.2	930.4	201653	S	13.70	1.18	6.31	7.14	32.80	0.11	1.23	4.51	16.70	0.25		0.08	3.55	76	739	18	58		786	
WM-1	933.3	933.4	201653	W	15.20	1.38	6.97	7.61	31.30	0.05	0.97	4.58	14.60	0.31		0.05	3.65	76	900	17	63		786	
WM-1	933.5	933.7	201653	X	12.40	1.20	1.95	8.08	32.10	0.08	1.72	5.29	22.20	0.25		0.06	3.82	68	1420	20	71		880	
WM-1	935.1	935.3	201654	A	10.90	0.84	11.00	2.88	23.00	0.07	0.07	0.97	25.00	0.13		0.07	1.64	25	1210	20	57		690	
WM-1	937.0	937.2	201654	C	11.20	1.33	13.40	4.39	25.70	0.07	0.06	1.50	17.50	0.21		0.06	2.55	35	980	14	56		554	
WM-1	940.2	940.3	201654	G	10.70	1.58	14.20	4.83	29.00	0.02	0.05	1.40	14.80	0.22		0.04	2.50	49	935	14	50		493	
WM-1	941.5	941.8	201654	H	15.60	1.77	9.32	5.75	30.70	0.04	1.16	2.12	15.00	0.23		0.05	3.77	64	913	18	56		578	
WM-1	943.8	944.0	201654	K	14.70	2.03	8.20	8.49	34.00	0.04	1.19	4.12	10.70	0.36		0.05	4.72	89	625	17	62		569	
WM-1	945.5	945.6	201654	N	14.80	1.10	10.10	4.27	21.00	0.06	0.06	1.65	21.60	0.22		0.07	2.55	39	1150	18	58		805	
WM-1	947.2	947.3	201654	Q	7.46	1.77	14.10	4.79	27.30	0.15	0.02	1.28	17.40	0.22		0.11	3.09	89	1280	53	56		576	

Inorganic Elemental Data of Wilkins Peak Samples

Name	Top_dep	Bas_dep	EPRID	a	C	Na2O	MgO	Al2O3	SiO2	P2O5	S	K2O	CaO	TiO2	Cr2O3	MnO	Fe2O3	Rb	Sr	Y	Zr	Nb	Ba
WM-1	949.2	949.3	201654	S	16.00	1.51	8.56	6.77	25.30	0.05	0.44	3.34	16.60	0.29		0.08	3.66	72	1050	21	63		752
WM-1	949.5	949.6	201654	T	13.20	1.09	11.90	4.34	18.00	0.07	0.05	1.72	21.70	0.23		0.11	2.69	33	1400	19	75		924
WM-1	949.8	949.9	201654	U	8.01	1.80	7.76	5.72	35.20	0.10	0.06	1.90	18.90	0.29		0.11	2.53	41	1220	21	144		1040
WM-1	950.2	950.3	201654	V	6.77	2.00	8.21	7.24	32.40	0.11	0.14	2.63	19.00	0.36		0.19	3.72	60	970	22	114		775
WM-1	951.6	951.8	201654	Z	1.75	4.20	3.72	14.40	51.10	0.14	0.30	4.62	5.71	0.62		0.09	5.22	141	369	25	127	16	646
WM-1	954.8	954.9	201655	E	1.66	4.32	3.17	14.50	50.40	0.24	0.41	4.57	6.32	0.63		0.06	5.67	142	312	30	127	16	760
WM-1	961.0	961.2	201655	N	1.21	3.48	1.00	9.27	70.80	0.10	0.45	1.98	5.09	0.53		0.09	2.82	60	296	45	1150	14	1020
WM-1	966.9	967.0	201655	T	2.58	2.31	3.37	7.89	60.00	0.10	0.07	2.49	9.73	0.38		0.06	2.65	59	670	22	269		595
WM-1	969.8	969.9	201655	W	4.35	3.24	11.90	7.28	38.00	0.20	0.02	2.66	10.40	0.38		0.11	4.44	75	569	27	81		552
WM-1	973.6	973.7	201656	C	11.40	2.42	7.06	8.85	33.40	0.06	0.20	2.93	14.00	0.40		0.10	4.18	127	1020	48	70	10	802
WM-1	973.7	973.8	201656	D	12.20	0.53	14.70	2.03	15.40	0.07	0.02	0.41	24.80	0.13	0.03	0.12	1.70	179	1470				419
WM-1	974.7	974.8	201656	F	5.25	2.18	5.99	8.40	39.80	0.06	0.42	3.32	16.20	0.37		0.09	3.92	79	1180	13	91		838
WM-1	976.0	976.2	201656	I	4.31	2.85	8.30	8.10	35.20	0.49	0.05	2.62	16.40	0.36		0.08	4.01	82	814	23	89		527
WM-1	978.7	978.9	201656	K	5.64	2.69	11.40	5.41	31.40	0.67	0.02	1.66	16.30	0.22		0.10	2.79	53	973	24	63		1080
WM-1	980.6	980.7	201656	O	16.70	1.37	6.19	6.65	30.90	0.04	0.45	3.75	15.50	0.26		0.07	3.09	59	975	14	74		1270
WM-1	981.4	981.5	201656	Q	9.00	0.77	8.40	2.56	33.80	0.06	0.13	1.18	22.60	0.12		0.11	1.32		1280		62		820
WM-1	984.3	984.4	201656	V	5.30	3.00	11.80	5.67	31.60	0.17	0.03	2.04	15.40	0.25		0.09	2.92	41	784	14	64		474
WM-1	986.0	986.1	201656	X	6.89	2.01	13.20	5.48	31.00	0.10	0.02	2.07	15.00	0.24		0.07	3.09	62	999	11	62		574
WM-1	988.4	988.6	201657	A	14.80	2.06	7.95	7.63	32.60	0.04	0.52	2.98	12.40	0.31		0.06	4.14	79	709	13	58		628
WM-1	989.2	989.4	201657	D	10.60	1.08	8.63	3.23	24.40	0.08	0.08	0.99	25.20	0.14		0.10	1.82	19	1230	15	62		808
WM-1	989.9	990.0	201657	E	10.90	1.44	10.70	5.09	24.90	0.08	0.05	2.16	20.00	0.24		0.09	2.40	39	1180	15	68		666
WM-1	992.3	992.5	201657	H	10.50	1.32	12.10	4.45	28.50	0.04	0.03	1.77	17.30	0.21		0.07	2.34	57	1160	24	52		594
WM-1	993.1	993.2	201657	J	13.90	1.88	8.71	6.55	34.90	0.04	0.11	2.47	12.20	0.29		0.04	2.88	57	800	15	57		556
WM-1	996.8	997.0	201657	N	16.90	1.90	6.66	8.58	35.00	0.04	0.78	4.16	9.39	0.34		0.05	4.37	96	558	17	61		519

Data Set C:

Visual Kerogen Analyses and Vitrinite Reflectance

KEROGEN MICROSCOPY OF SEVENTY-FOUR CORE SAMPLES FROM TWO WELLS

Prepared For:

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Prepared By:

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DGSI Project: 96/3471
February 5, 1996

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Total Quality Geochemistry

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VISUAL KEROGEN ANALYSIS SUMMARY

Introduction

Seventy-four core samples from the Green River Shale in two wells were submitted for kerogen microscopy study. Visual kerogen analysis (VKA) was performed on 74 core samples and based on the results of the VKA study, vitrinite reflectance analysis was conducted on five samples from each well. Kerogen type was described after examination in transmitted, reflected, and fluorescent light.

Well WM-1

The amorphous kerogen in these cores generally exhibits a very strong to intense fluorescence. Many samples display a uniform light yellow fluorescence, while others have a wide range of fluorescence colors. Samples with orange-brown, brown, or reddish brown fluorescence usually have a moderate to strong fluorescence rather than the intense fluorescence noted when yellow fluorescence prevails. TAI mirrors the same relationship: the lowest TAI values occur where yellow fluorescence dominates. The interval from 954.8 to 961.2 feet is made up mostly of massive-micrinized kerogen with little or no fluorescence; TAI for these samples is higher than it is above and below.

Amorphous kerogen is the predominant component of the organic matter in this sample set. Vitrinite and inertinite are found in trace amounts in many samples. In a few cases, vitrinite displays an orange-brown fluorescence but the strong to intense fluorescence of the amorphous kerogen makes it very difficult to detect fluorescence in the very small vitrinite particles especially when they are surrounded by structured liptinite which typically has a brown or orange-brown fluorescence. This structured liptinite sometimes is associated with vitrinite and probably has a humic affinity. Filamentous alginite and liptodetrinite are noted in a number of samples, but never comprise more than 15% of the kerogen present. Once again, the intense fluorescence of the amorphous kerogen makes it difficult to observe and identify the structured lipids. Round bodies, up to 40 microns in diameter, are present in a few samples (e.g. 984.3-986.1 feet). They have been classed as liptodetrinite if small, and alginite? when larger than 20 microns.

Although vitrinite is present in very small proportions, good reflectance data was obtained from four of the five samples where reflectance was measured. Reflectance ranges from 0.27 to 0.31 R_o, showing that the Green River Shale in the WM-1 well is very immature.

Pyrite is present in small quantities in most samples and the dominant form is massive.

Well UP 41-23

The Green River Shale in the UP 41-23 well is very similar to that observed in the WM-1 well. In UP 41-23 from 1,572.9 to 1,622.7 feet, most of the samples contain amorphous kerogen that fluoresces light yellow-yellow with a strong to intense brightness. Below this depth, TAI is slightly higher and fluorescence intensity is somewhat lower, although strong compared with most other source rocks. A few samples near the base of the section analyzed have very weak or no fluorescence. Unidentified rounded bodies of probable algal affinity were noted in well WM-1 and also are found here in two samples. Small euhedral pyrite crystals are present in many samples at this locality and this pyrite form is absent in the WM-1 well samples.

Vitrinite reflectance analysis was made on five samples, with four yielding useful data. Reflectance for the samples from 1,639.3-1,649.9 feet ranges from 0.20 to 0.28% R_o, somewhat lower to about the same maturity as noted in the WM-1 well. The deepest sample, from 1,666.5-1,666.6 feet, has an R_o of 0.45%. Some of the particles included in the selected population from 1,166.5-1,666.6 feet may be semi-fusinite or recycled, but even eliminating some of the higher reflectance readings would result in a reflectance higher than that measured in the shallower samples.

VISUAL KEROGEN ANALYSIS TECHNIQUES

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%).

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 can be 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 Paleozoic rocks that have no vitrinite.

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.

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.

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. Remnant lipid structures (e.g. sporinite and alginite) within the unstructured kerogen can often be identified in blue light.

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.

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 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 [illegible]
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_o 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, impsonite, 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.

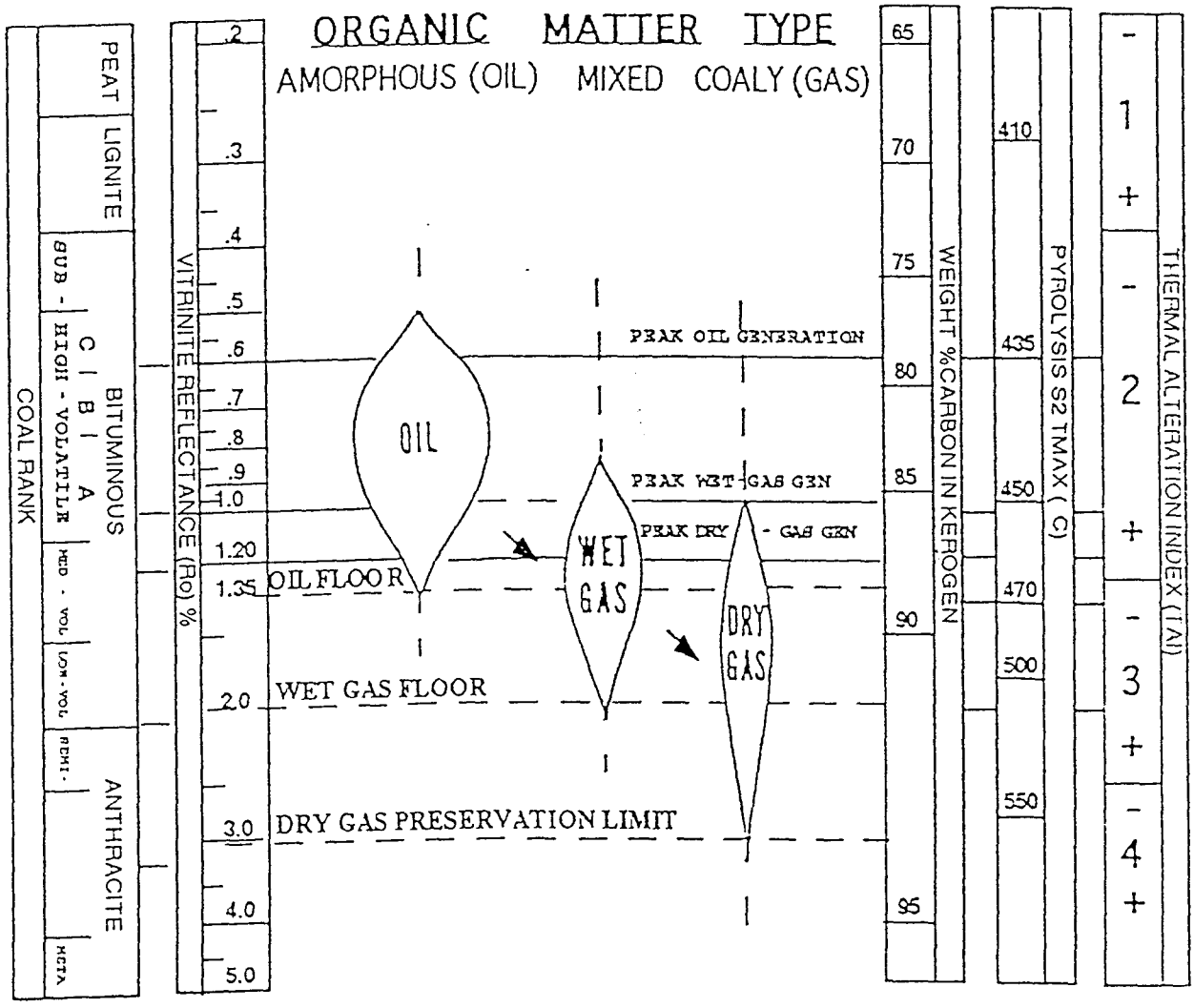
b. Inertinite is made up of woody tissue that has been matured by a different pathway. Early intense oxidation, usually involving charring, fungal attack or biochemical gelification, creates the much more highly reflecting fusinite and semi-fusinite. Sometimes the division between vitrinite and fusinite 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.

ZONES OF PETROLEUM GENERATION AND DESTRUCTION



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

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) – LIPIDS – UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR. COLOR	FLUOR. INTENSITY
1	201651G 883.5	883.6	K/CC		100									T			MA	-	M	M	M	?			LY O	4			3	1+ 2	Y OY	4 3			
Comments:	*Good slide. Vitrinite fluoresces orange-brown. Vitrinite particles small and rough.*																																		
2	201651H 883.8	884.0	K/CC		100				U T					T			MA	-	M	M	M				LY	4	RB	2	2 3	1+ 2	Y OY	4 3			
Comments:	*Good slide. U = unknown fluorescing liptinitic matter. Vit as above.*																																		
3	201651P 888.4	888.5	K/CC		100				U T					T?			MA	-	+		+				LY OB	2 4	RB	2	2 3	2- 2+	Y O	4 2			
Comments:	*Good slide. Vitrinite? particles very small and rough. U - as above. Very wide variety of fluorescence colors noted in kerogen.*																																		
4	201651R 888.8	889.0	K/CC		95				LD 5								MA	M	-						OY	2	Y	2	2	2- 2+	YO	2			
Comments:	*Slide - fair-poor. Lean sample.*																																		
5	201652F 899.8	899.9	K/CC		95				LD 5								MA	M	M						B Y	1 2	Y	2	2	2 2+	O Y	2 3			
Comments:	*Slide fair-poor.*																																		

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	VITRINITE: NORMAL	ROUGH	LIPID-RICH	OXIDIZED	COKED	BACKGROUND INTENSITY	FLUORESCENCE / TAI REFLECTED LIPIDS UNSTR.: COLOR	INTENSITY	STRU.: COLOR	INTENSITY	TRANSMITTED LIPIDS UNSTR. TAI: VALUE	FLUOR.: COLOR	INTENSITY	STRU. TAI: VALUE	FLUOR: COLOR	INTENSITY
201652W								LD	U																Y	4	Y	4		1+	DY	4			
6	915.6	915.7	K/CC		100			T	T					T			MA	-	+	-	+				OB	3	OB	2	3	2+	OR	3			
Comments:	*Good slide. Wide variety of fluorescence colors noted in amorphous kerogen. Orange red also noted in plug.*																																		
201663A								LD	U																		Y	4		1+					
7	917.5	917.7	K/CC		95			5	T				T	T			MA	T	+						Y	4	OB	2	3	2	Y	4			
Comments:	*Good slide. U= liptinite material of ? origin fluorescence OB. LD - small particle elongate or rounded.*																																		
201653E								LD	U																Y	4	Y	4		2-	OR	3			
8	920.1	920.4	K/CC		95			T	5				T	T			MA	T	+	+	M				OB	3	OB	2	2	2+	Y	4			
Comments:	*Good slide. In slide, fluorescence is mainly orange-red. Large variation in fluorescence noted in plug.*																																		
201653G								LD	U	AL															OB	4				2-	OR	3			
9	921.1	921.3	K/CC		90			5	5	T				T			MA	T	+	+					Y	3	OB	2	2	2+	Y	4			
Comments:	*As above. In plug fluorescence is largely OB, some Y, some R. AL? - filamentous material.*																																		
201653K								AL	U	LD															OB	2	Y	3		2	OR	3			
10	924.5	924.5	K/CC		85			T	5	10			T	T			MA	-	+	+					Y	3	OB	2	2	2+	Y	4			
Comments:	*AL? - filamentous strands.*																																		

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) – LIPIDS – UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR. COLOR	FLUOR. INTENSITY
11	201653S	930.2 930.4	K/CC		95			AL	LD	U							MA	-	+	-	+				Y	3	Y		2	2-	OB				
								T	5	T			T	T											OB	2	RB	3	3	2+	Y	3			
Comments:	Good slide. TAI mainly 2-. In slide fluorescence mostly OB. Filamentous alginite well displayed. Red fluorescence noted in plug.																																		
12	201653W	933.3 933.4	K/CC		95			AL	LD	U							MA	-	+	+					Y	4		2	2	2-	OB				
								5	T	T				T											OB	3	RB	3	3	2+	R	3			
Comments:	Good slide. Small amount of fluorescence in slide, more 2+ TAI than in previous sample. Red fluorescence seen in plug.																																		
13	201653X	933.5 933.7	K/CC		95			AL	LD	U							MA	-	+	+					Y	4		2	2	2-	OB	3			
								5	T	T				T											OB	3	RB	3	3	2+	Y	4			
Comments:	Good slide. Small amount of R fluorescence in slide. Algae well displayed in laminations.																																		
14	201654A	935.1 935.3	K/CC		100					U							MA	T	M	M	M				Y	4	RB	3	3	1+	Y	4			
										T			T	T																2	OR	3			
Comments:	Good slide. Lower TAI than above, dominantly Y flourescence in slide.																																		
15	201654C	937.0 937.2	K/CC		100					U							MA	T	M						Y	4	RB	3	3	1+	Y	4			
										T			T																	2					
Comments:	Good slide. Generally, similar to previous, but without RO fluorescence in slide.																																		

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

WM-1

Green River Shale

DGSI Project: 96/3471

DGSI

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR COLOR	INTENSITY
201654G									U																				1+					
16	940.2	940.3	K/CC		100				T				T				MA	T	+						Y	4	RB	3	3	2	Y	4			
Comments:	Good slide. As above sample.																																		
201654H								AL	LD	U														Y	4	Y	4	3	2-	Y	4			
17	941.5	941.8	K/CC		95			T	5	T			T	T			MA	T	+	+					OB	3	RB	3	4	2+	OY	3			
Comments:	Good slide. Y and RO fluorescence in slide present in equal amounts.																																		
201654K									LD	U														OB	3	Y	4	3	2-	OB				
18	943.8	944.0	K/CC		95				5	T			T				MA	T	+						RB		RB	3	4	2+	R	3			
Comments:	Good slide. Small amount of fluorescence noted, TAI mostly 2 to 2+. In plug, some Y fluorescence noted. In plane light, kerogen color darker than typical for this well.																																		
201654N								AL	LD	U														Y	4	Y	4	3	1+	OB	3			
19	945.5	945.6	K/CC		95			T	5	T			T	T			MA	T	+	+					OB	3	RB	3	4	2+	Y	4			
Comments:	Good slide. Small amount of Red fluorescence in slide. OB and Y fluorescence about equal in slide. filamentous algae noted.																																		
201654Q									LD	U														Y	4	Y	4		2-	B	3			
20	947.2	947.3	K/CC		100				T	Y			T				MA	-	M						B	3	RB	3	3	2+	Y	4			
Comments:	Fair slide.																																		

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	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	TOTAL ORGANIC MATTER	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
201654S								LD	U																Y	4	Y	4	2	2-	OB				
21	949.2	949.3	K/CC		95			5	T				T	T			MA	-	-	+					OB	3	RB	3	3	2+	Y	3			
Comments:	*Good slide. Some red fluorescence noted in slide; fluorescence is mainly BO in slide. Trace red fluorescence slim in plug.*																																			
201654T								LD	U																OY	3	Y	4	2	2-	OB				
22	949.5	949.6	K/CC		95			5	T					T			MA	T	-	+					O	3	RB	2	3	2+	Y	3			
Comments:	*Good slide. Similar to previous.*																																			
201654V								LD	U	AL															Y	3	Y	3		2-		2			3
23	950.2	950.3	K/CC		90			10	T	T							MA	+	-						YO	2	RB	2	2	2	DY	3		Y	4
Comments:	*Good slide.*																																			
201654Z								LD	U								MA										OY	2	1		DB	1		O	3
24	951.6	951.8	K/CC			50	45	5	T								E	M	M						BL	0	RB	3	2	3	BL	0		Y	2
Comments:	*Kerogen aspect very distinct from previous samples. Massive-micrinized transition. In slide, very tiny particles make TAI questionable.*																																			
201655E								LD									MA										O		1	2+	LYB			O	2
25	954.8	954.9	K/CC			50	45	5									E	M	-						BL	0	OR	2	2	3	BL	0		OR	3
Comments:	*Similar to previous sample. TAI questionable, as above. Good slide.*																																			

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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 C VAL

- 1- Str
- 1 Pal
- 1+ Ye
- 2- Ye
- 2 Go
- 2+ An
- 3- Re
- 3 Me
- 3+ Da
- 4- Br
- 4 Bl
- 4+ Bl

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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
201655N								LD																		OY	1								2
26	961.0	961.2	K/CC			50	50	T									MA	++	T						BL	0	O	2	1	3	BL	0		O	3
Comments:	Good slide, TAI questionable, as above.																																			
201655T								LD																					1	2-					
27	966.9	967.0	K/CC		100			T					T	T			MA	++	-	M	M				DB	1	Y	2	2	2	YO	1		Y	2
Comments:	Although kerogen is amorphous, it has a different aspect than samples down to 950.3 ft. Good slide.																																			
201655W								LD																			2		2-	LB					
28	969.8	969.9	K/CC		85			15					T				MA	-	-		+				B	1	Y	3	2	2+	Y	2		Y	3
Comments:	Good slide. Stronger fluorescence than at 966.9-967.0.																																			
201656C								AL	LD	U															YO		Y	4	2	2	LY	4			3
29	973.6	973.7	K/CC		90			5	5	T				T			MA	-	M						Y	3	RB	3	3	2	O	3		Y	4
Comments:	Good slide.																																			
201656F								LD	U																Y		Y	3	2	2-	LB	2			
30	974.7	974.8	K/CC		100			T	T					T			MA	-	M		+				YO	3	RB	3	3	2	Y	4			
Comments:	Good slide.																																			

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR COLOR	INTENSITY
31	2016561 976.0	976.2	K/CC		100			LD T									MA E	M	-						B	1	Y O	2 3	2	2 2+	LB	1 2		Y O	2 3
Comments:	*Good slide.*																																		
32	201656K 978.7	978.9	K/CC		100			LD T									MA	-	T						B OB	1	Y O	2 3	2	2+ 2	LB	2		Y	3
Comments:	*Good slide. TAI mainly 2+.*																																		
33	201656O 980.6	980.7	K/CC		95			AL 5	LD T	U T			T	T			MA	-	+	+	M				YO Y	2 3	Y RB	3 3	2	2- 2	OR Y	3 4		Y	3
Comments:	*Good slide. In slide, fluorescence color is dominantly red-orange, very little is yellow.*																																		
34	201656Q 981.4	981.5	K/CC		100					U T				T			MA	++	T		+				Y LY	3	RB	2	2	1+ 2	DY Y	3 4			
Comments:	*Kerogen shows stronger fluorescence than preceeding sample. Good slide.*																																		
35	201656V 984.3	984.4	K/CC		90			LD 10									MA	T	M						B	1 2	YO	3	2 3	2- 2	DY LB	2		Y	3
Comments:	*Good slide. LD generally rounded bodies around 10 microns in size.*																																		

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 31-Jan-96 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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
	201656X							LD	AL																LB			3	2	2-	DY	2			
36	986.0	986.1	K/CC		85			15	?								MA	T	+						DY	3	Y	4	3	2	LB	3		Y	4
Comments:	*Good slide - LD - rounded bodies as noted in previous sample and range up to 40 microns. Is this algal material?*																																			
	201657A							LD	AL																O				2	2-	O	2			
37	988.4	988.6	K/CC		85			15	T					T			MA	T	+	+					OB	3	Y	3	3	2	OB	3		Y	4
Comments:	*Fair-good slides. Much variation in kerogen fluorescence seen in slide and plug, also includes red-brown and yellow. LD is small fragments, different from previous.*																																			
	201657D							LD	AL																Y	3		3		1+	Y				
38	989.2	989.4	K/CC		100			T	T					T			MA	T	M		+				LY	4	Y	4	3	2	DY	3			
Comments:	*Good slide. Little variation in fluorescence.*																																			
	201657E								LD	U															Y	3	Y	3		1+	Y				
39	989.9	990.0	K/CC		100				T	T				T			MA	T	+	+					LY	4	RB	4	3	2-	DY	3			
Comments:	*Good slide. Little variation in fluorescence.*																																			
	201657H								LD	AL																				1+		3			
40	992.3	992.5	K/CC		100				T	T				T			MA	T	+		+				Y	4	Y	4	3	2-	Y	4			
Comments:	*Slide as above. Intense fluorescence.*																																			

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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 C VALU

1-	Stri
1	Pal
1+	Yel
2-	Yel
2	Gol
2+	Am
3-	Rec
3	Me
3+	Da
4-	Bro
4	Bla
4+	Bla

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

WM-1
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 131/1996 / DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUO COLOR
	201657J							LD	AL																OB			3	2	2-	OR				
41	993.1	993.2	K/CC		100			T	T				T	T			MA	T	+	+	M				YO	3	Y	4	3	2+	Y	3			
Comments:	*Good slide. Fluorescence quite different from preceding sample. Alginite - filamentous strands 10-20 microns long.*																																		
	201657N							LD	AL	U							MA										Y	3	2	2	OR				
42	996.8	997.0	K/CC		95			5	T	T			T	T			RI	-	+	+							RB	4	3	2+	Y	3			
Comments:	*Slide as preceding sample, slightly higher TIA. Some particles display good laminations. LD - small linear fragments.*																																		
Comments:																																			
Comments:																																			
Comments:																																			

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

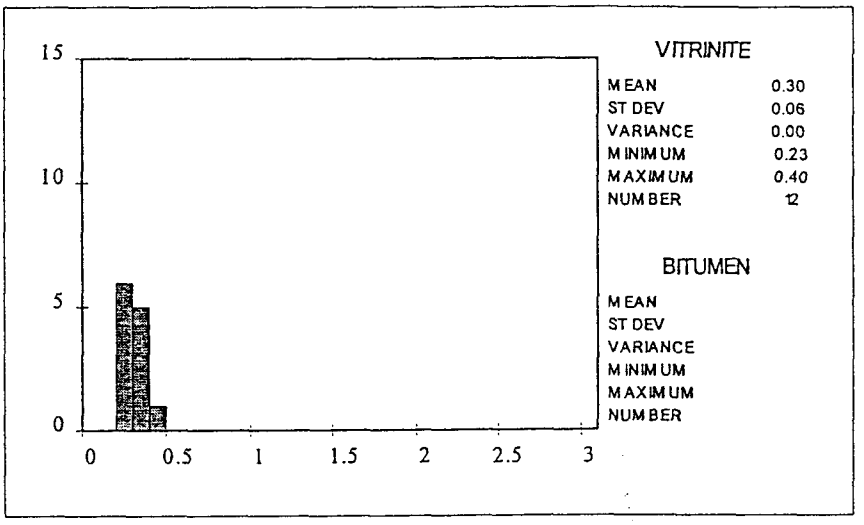
VITRINITE REFLECTANCE

WM-1

Green River Shale

DGSI Project 96/3471 Sample No. 8

OTHER ID: 201653E 920.1 - 920.4



VITRINITE	
MEAN	0.30
ST DEV	0.06
VARIANCE	0.00
MINIMUM	0.23
MAXIMUM	0.40
NUMBER	12

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.23 V 0.29 V 0.39
V 0.23 V 0.32 V 0.40
V 0.24 V 0.32
V 0.25 V 0.34
V 0.25 V 0.37

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	0.30
	B Ro	-
	VRE	-

Visual Kerogen Summary

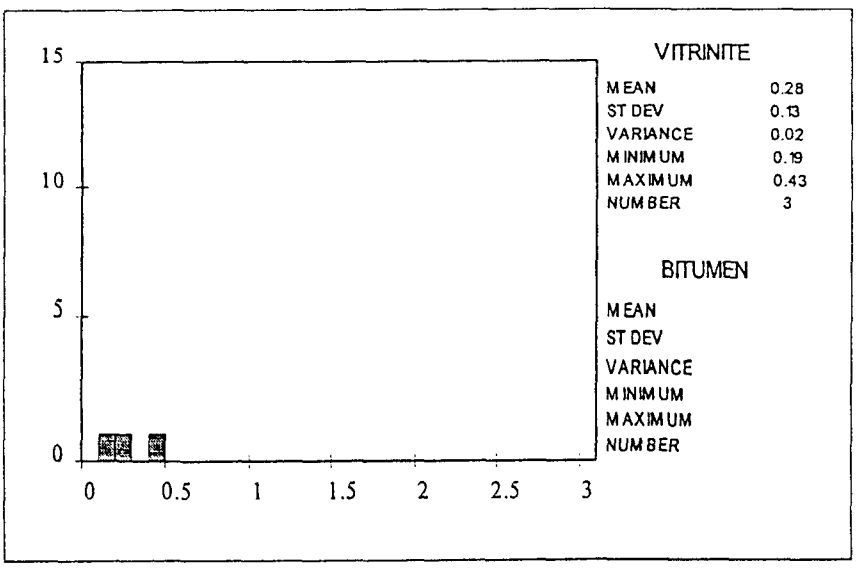
Unstructured Lipids	95
Structured Lipids	5
Solid Bitumen	-
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	2-,2+
TAI Structured	

COMMENTS:

DGSI Project 96/3471 Sample No. 11

OTHER ID: 201653S 930.2 - 930.4



VITRINITE	
MEAN	0.28
ST DEV	0.13
VARIANCE	0.02
MINIMUM	0.19
MAXIMUM	0.43
NUMBER	3

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.19
V 0.23
V 0.43

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	0.28
	B Ro	-
	VRE	-

Visual Kerogen Summary

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

Background Fluorescence	Mod,Strong
TAI Unstructured	2-,2+
TAI Structured	

COMMENTS:

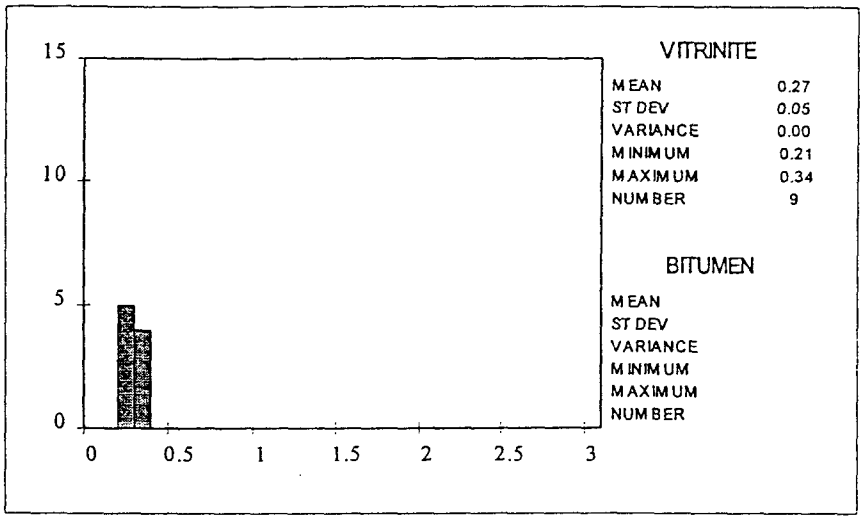
VITRINITE REFLECTANCE

WM-1

Green River Shale

DGSI Project 96/3471 Sample No. 33

OTHER ID: 201656O 980.6 - 980.7



VITRINITE	
MEAN	0.27
ST DEV	0.05
VARIANCE	0.00
MINIMUM	0.21
MAXIMUM	0.34
NUMBER	9

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.21 V 0.31
V 0.21 V 0.31
V 0.23 V 0.32
V 0.25 V 0.34
V 0.26

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	0.27
	B Ro	-
	VRE	-

Visual Kerogen Summary

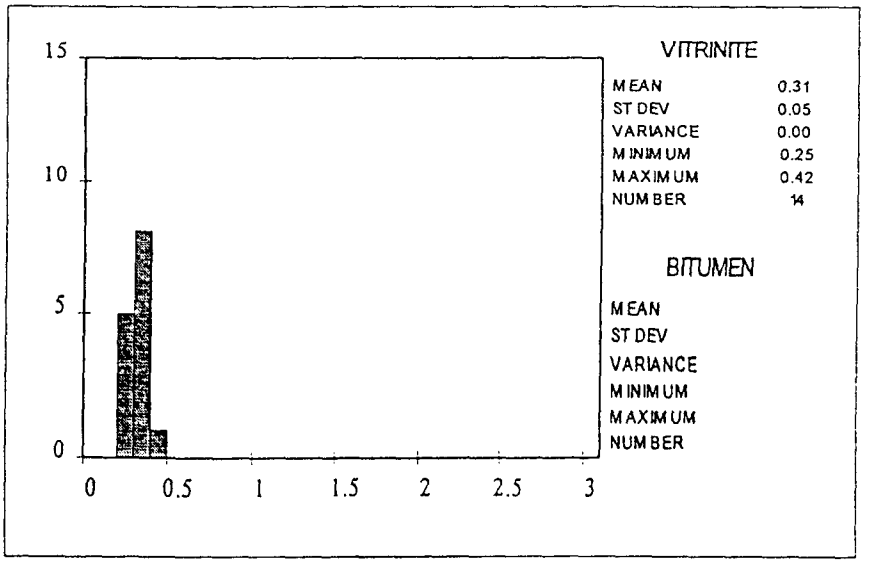
Unstructured Lipids	95
Structured Lipids	5
Solid Bitumen	-
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	2-,2
TAI Structured	

COMMENTS:

DGSI Project 96/3471 Sample No. 37

OTHER ID: 201657A 988.4 - 988.6



VITRINITE	
MEAN	0.31
ST DEV	0.05
VARIANCE	0.00
MINIMUM	0.25
MAXIMUM	0.42
NUMBER	14

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.25 V 0.30 V 0.34
V 0.25 V 0.30 V 0.34
V 0.26 V 0.31 V 0.36
V 0.27 V 0.32 V 0.42
V 0.27 V 0.33

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	0.31
	B Ro	-
	VRE	-

Visual Kerogen Summary

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

Background Fluorescence	Mod,Strong
TAI Unstructured	2-,2
TAI Structured	

COMMENTS:

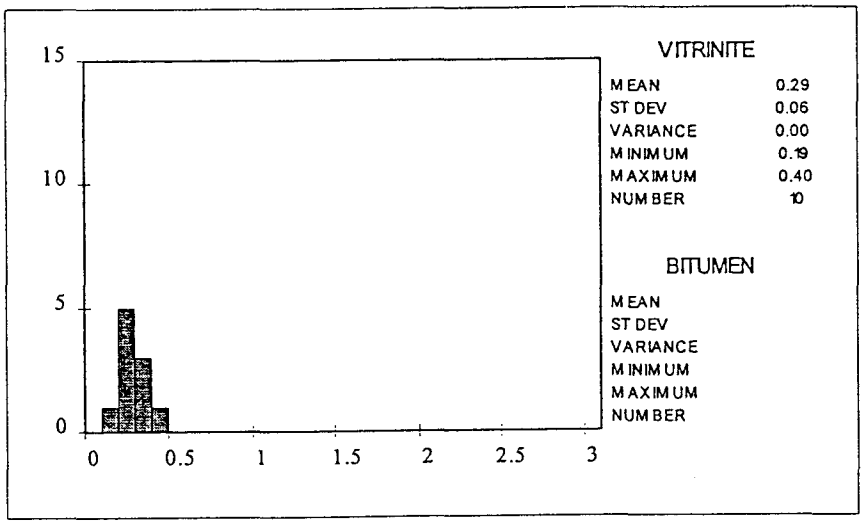
VITRINITE REFLECTANCE

WM-1

Green River Shale

DGSI Project 96/3471 Sample No. 42

OTHER ID: 201657N 996.8 - 997.0



VITRINITE	
MEAN	0.29
ST DEV	0.06
VARIANCE	0.00
MINIMUM	0.19
MAXIMUM	0.40
NUMBER	10

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.19 V 0.29
V 0.20 V 0.31
V 0.27 V 0.33
V 0.27 V 0.34
V 0.28 V 0.40

TYPE	
K/CC	
TOC	
TMAX	
HI	
V Ro	0.29
B Ro	-
VRE	-

Visual Kerogen Summary

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

Background Fluorescence	Mod,Strong
TAI Unstructured	2,2+
TAI Structured	

COMMENTS:

DGSI

UP41-23 WELL
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 30-Jan-96 ID/DEPTH (FT)			PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC INERTINITE	VITRINITE	OTHER TYPE	TYPE	RELATIVE ABUNDANCE PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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
	201659C								U	LD								MA									Y		4		1+	LY				
101	1572.9	1573.0	K/CC			100			T	T								E	-	M						Y	4	RB	3	3	2-	Y	4			
Comments:	U= Fluorescing particles (RB) of unknown affinity, possibly VL?																																			
	201659E								U	LD															Y	4	Y	4		1+	LY				
102	1573.8	1573.8	K/CC			100			T	T					T			MA	T	+		+				DY	3	RB	3	3	2-	Y	4			
Comments:	Slide also exhibits a trace of GY fluor.																																			
	201659K								U	LD	AL															3	Y	4		1+					
103	1579.3	1579.4	K/CC			95			T	5	T			T	T			MA	-	+	M	+				Y	4	RB	3	3	2-	Y	4		LY	4
Comments:	LD- mainly round particles 10-20 microns. Al? similar but larger-up to 40 microns in diameter. TAI mostly 1+.																																			
	201659M								U	LD								MA												1+	LY				
104	1581.6	1581.7	K/CC			100			T	T					T			E	-	+	+	+				Y	4	RB	3	3	2-	Y	4			
Comments:	TAI as above, mostly 1+.																																			
	201659O								U																					1+	LY				
105	1583.4	1583.5	K/CC			100			T						T			MA	T	+	+					LY	4	RB	3	3	2-	GY	4			
Comments:	TAI as above, mostly 1+.																																			

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

UP41-23 WELL
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 30-Jan-96 / ID/DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR. COLOR	FLUOR. INTENSITY
	201659T							S	LD								E								LB	2		3		2-	LB	2			
106	1588.1	1588.2	K/CC		90			?	10				T	T			MA	M	M	+	M				Y	4	Y	4	3	2	Y	4		Y	3
Comments:	*Most of kerogen has a light brown fluorescence.*																																		
	201659X																E													1+	LY				
107	1592.3	1592.4	K/CC		100												MA	T	+						LY	4			3	2-	Y	4			
Comments:	*TAI mostly 1+.*																																		
	201660G							U																						1+	LY				
108	1600.4	1600.6	K/CC		100			T					T	T			MA	T	+		+				LY	4	RB	3	3	2-	GY	4			
Comments:	*TAI mostly 1+.*																																		
	201660H							U																						1					
109	1601.0	1601.2	K/CC		100			T						T			MA	T	+	+					LY	4	RB	3	3	2-	GY	4			
Comments:																																			
	201660J							U																	Y	4			2	1+					
110	1603.8	1603.9	K/CC		100			T						T			MA	T	+	+					LB	3	RB	3	3	2-	Y	4			
Comments:																																			

ANALYST

X Castano
___ O'Connor

MICROSCOPE

X Jena
___ Zeiss

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 C VALI

1-	Str
1	Pal
1+	Yel
2-	Yel
2	Go
2+	An
3-	Re
3	Me
3+	Da
4-	Br
4	Bla
4+	Bla

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

UP41-23 WELL
Green River Shale
DGSI Project: 96/3471

DGSI NUMBER	DATE: 30-Jan-96 / ID/DEPTH (FT)			PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR. COLOR	FLUOR. INTENSITY
201660M									LD	U															OB	2	Y	3		2-	YO	3			
111	1606.5	1606.7	K/CC			100			T	T					T			MA	T	+	+					Y	3	RB	3	3	2+	Y	4			
Comments:																																			
201660O									LD									MA							Y					1+	DY	3			
112	1608.4	1608.5	K/CC			100			T					T	T			E	-	M	+	M				YO	3	Y	3	2	2-	Y	4			
Comments:																																			
201660T																		MA												2-	YO				
113	1613.6	1613.7	K/CC			100												E	M	-										2	OR	3			
Comments:	*No plug.*																																		
201660U									LD																		Y			1+	YO	3			
114	1613.8	1613.9	K/CC			100			T						T			MA	T	M		+				Y	3	RB	3	2	2-	OY	4			
Comments:																																			
201660V									U																OR	2				1+	YO	3			
115	1615.3	1615.6	K/CC			100			T					T	T			MA	T	+						Y	3	RB	3	2	2-	Y	4			
Comments:	*Wide range of fluorcolors in plug, LB color also present. More vitrinite than previous sample. Microlam.*																																		

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

UP41-23 WELL

Green River Shale

DGSI Project: 96/3471

DGSI NUMBER	DATE: 30-Jan-96 / ID/DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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
	201660W							U	LD																Y	4	Y	3		1+	Y	4			
116	1616.0	1616.1	K/CC		100			T	T				T	T			MA	T	+	+	M				OB	2	RB	2	2	2	B	2			
Comments:	*Micro-laminated.*																																			
	201660X																								LY	3			2	1+		3			
117	1616.2	1616.3	K/CC		100									T			MA	T	+	+					Y	4			3	2-	Y	4			
Comments:	*Uniform Y-LY fluorescence in plug from kerogen.*																																			
	201661B							U	LD								MA								Y	3	Y	2		2-	YO	3			
118	1620.8	1620.9	K/CC		100			T	T				T	T			E	-	+	M	+				YO	2	RB	3	3	2+	Y	4			
Comments:																																				
	201661D																MA													1+	GY				
119	1622.6	1622.7	K/CC		100												E	-	M						Y	4			3	2-	Y	4			
Comments:	*Uniform yellow flour. in plug from kerogen, in slide GY fluor prevails.*																																			
	201661F																								Y	4				2-					
120	1624.4	1624.6	K/CC		100												MA	-	M						LB	3			3	2	Y	3			
Comments:	*Similar to previous, trace of LB fluor.*																																			

ANALYST

X Castano
____ O'Connor

MICROSCOPE

X Jena
____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

UP41-23 WELL

Green River Shale

DGSI Project: 96/3471

DGSI NUMBER	DATE: 30-Jan-96 ID/DEPTH (FT)			PREPARATION/ SAMPLE TYPE	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	TOTAL ORGANIC MATTER	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
121	201661H	1626.3	1626.5	K/CC		100									T			MA	-	-		+				LY GY	4			3	2- 2	Y	4			
Comments:																																				
122	201661I	1638.4	1638.7	K/CC		100			U T					T	T			MA	-	+	+					LY DY	4 3	RB	3	2 3	2- 2	Y	4			
Comments:																																				
123	201661J	1639.3	1639.5	K/CC		100								T	T			MA E	-	+	+	-				LY LB	3 2			2	2- 2+	Y OB	4 3			
Comments:																																				
124	201661N	1643.8	1643.9	K/CC		100			LD T	AL T				T	T			MA	-	+	M	M				LY LB	4 2	Y	3	3	2- 2	Y OB	4 3			
Comments:	*TAI also includes some 1+ and 2+, but mainly 2- to 2.*																																			
125	201661Q	1646.8	1647.0	K/CC		100								T	T			MA	-	+		+				LY Y	4			3	1+ 2	Y	4			
Comments:																																				

ANALYST

X Castano

____ O'Connor

MICROSCOPE

X Jena

____ Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

UP41-23 WELL

Green River Shale

DGSI Project: 96/3471

DGSI

DGSI NUMBER	DATE: 30-Jan-96 / ID/DEPTH (FT)			PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED: UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED: TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC: INERTINITE	VITRINITE	OTHER: TYPE	TYPE	RELATIVE ABUNDANCE: PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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	FLUOR. INTENSITY	STRU.: TAI VALUE	FLUOR. COLOR	FLUOR. INTENSITY
	201661U								LD																	Y	4		3	2	2-	Y	4			
126	1649.7	1649.9		K/CC		100			T					T	T			MA	-	+	+	M				O	3	O	4	3	2+	OY	3			
Comments:	*TAI mostly 2- to 2.*																																			
	201661V																	MA								YB	2				2-	O	3			
127	1650.2	1650.4		K/CC		100									T			E	M	-		+				Y	3			2	2	B	2			
Comments:																																				
	201661Y								LD																	BL	0	Y	2	1	4	BL	0		Y	4
128	1653.4	1653.6		K/CC		T		95	5						T			MA	+	M	+					Y	4	O	3	2	2-	Y	4		O	3
Comments:	*Yellow fluorescence amorphous kerogen is present as trace, remainder is micrinized and has no fluor.*																																			
	201662E								LD									MA										Y	2	1	3-	DB			Y	2
129	1659.8	1659.9		K/CC	95				5									E	M	M						B	1	O	3	2	2-	B	1		O	3
Comments:	*In plug, kerogen particles are dark gray to black. In slide, most particles too small to see color properly for TAI, but they fluor B to DB.*																																			
	201662H								LD																			Y	2	1					Y	
130	1661.6	1661.7		K/CC	95				T						T			E	+	-	M	M				BL	0	O	3	2	2	DB	1		O	2
Comments:	*Similar to previous sample, but no fluor in plug for kerogen. TAI questionable.*																																			

ANALYST

X Castano
O'Connor

MICROSCOPE

X Jena
Zeiss

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

DGSI

UP41-23 WELL

Green River Shale

DGSI Project: 96/3471

DGSI NUMBER	DATE: 30-Jan-96 ID/DEPTH (FT)		PREPARATION/ SAMPLE TYPE	ORGANIC MATTER (%) LIPIDS UNSTRUCTURED UNDIFFERENTIATE	AMORPHOUS	MASSIVE	MICRINIZED	STRUCTURED TYPE	TYPE	TYPE	TYPE	SOLID BITUMEN	HUMIC INERTINITE	VITRINITE	OTHER TYPE	TYPE	RELATIVE ABUNDANCE PYRITE TYPE	PYRITE	TOTAL ORGANIC MATTER	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
	201662L							LD	AL								MA								O	2	O	2		2	O	2		O	
131	1665.5	1665.6	K/CC		95			5	T				T	T			E	M	+	+					B	1	Y	3	2	2+	B	1		Y	

Comments: *Ro .85 and higher is rounded,is recycled or SF.*

	201662O							LD																	LB	2	O	2		2-	YB	2			
132	1668.7	1668.8	K/CC		90			10						T			MA	-	+	+					O	3	Y	4	2	2	OB	3		Y	

Comments: *LD - Small round objects, less than 20 microns in diameter. Some filaments LD (algal?).*

Comments:

Comments:

Comments:

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

VISUAL KEROGEN ANALYSIS
Total Quality Geochemistry

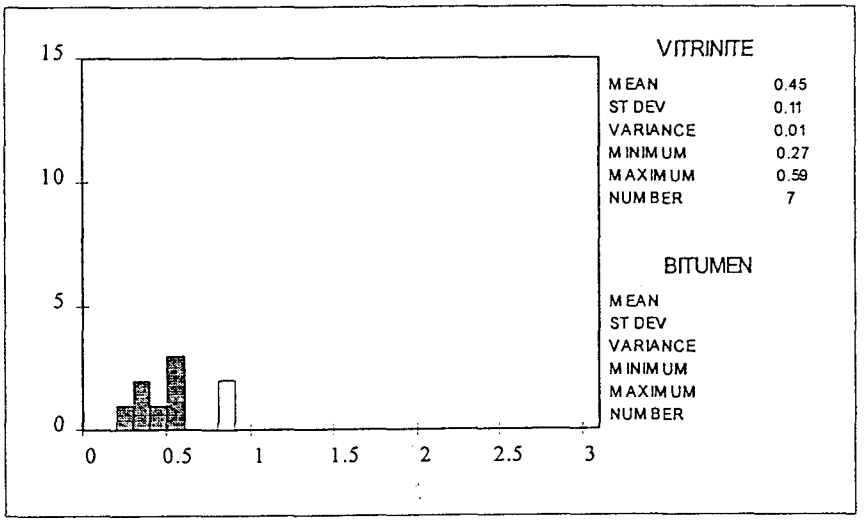
VITRINITE REFLECTANCE

UP41-23 WELL

Green River Shale

DGSI Project 96/3471 Sample No. 131

OTHER ID: 201662L 1665.5 - 1665.6 ft.



VITRINITE	
MEAN	0.45
ST DEV	0.11
VARIANCE	0.01
MINIMUM	0.27
MAXIMUM	0.59
NUMBER	7

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.27 V 0.53
V 0.38 V 0.59
V 0.39 0.85
V 0.48 0.88
V 0.50

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	0.45
	B Ro	-
	VRE	-

Visual Kerogen Summary

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

Background Fluorescence	Moderate
TAI Unstructured	2,2+
TAI Structured	

COMMENTS:

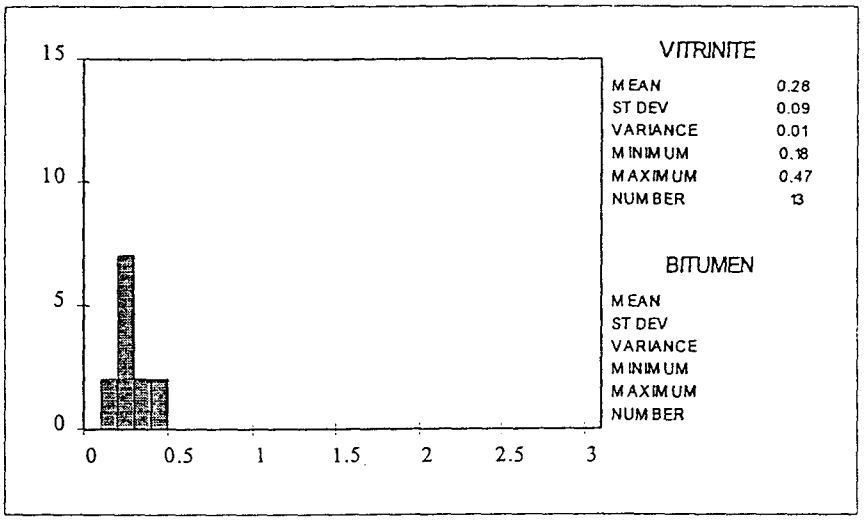
VITRINITE REFLECTANCE

UP41-23 WELL

Green River Shale

DGSI Project 96/3471 Sample No. 123

OTHER ID: 201661J 1639.3 - 1639.5 ft.



VITRINITE	
MEAN	0.28
ST DEV	0.09
VARIANCE	0.01
MINIMUM	0.18
MAXIMUM	0.47
NUMBER	13

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.18 V 0.25 V 0.32
V 0.19 V 0.26 V 0.45
V 0.21 V 0.28 V 0.47
V 0.21 V 0.28
V 0.25 V 0.31

TYPE	
K/CC	
TOC	
TMAX	
HI	
V Ro	0.28
B Ro	-
VRE	-

Visual Kerogen Summary

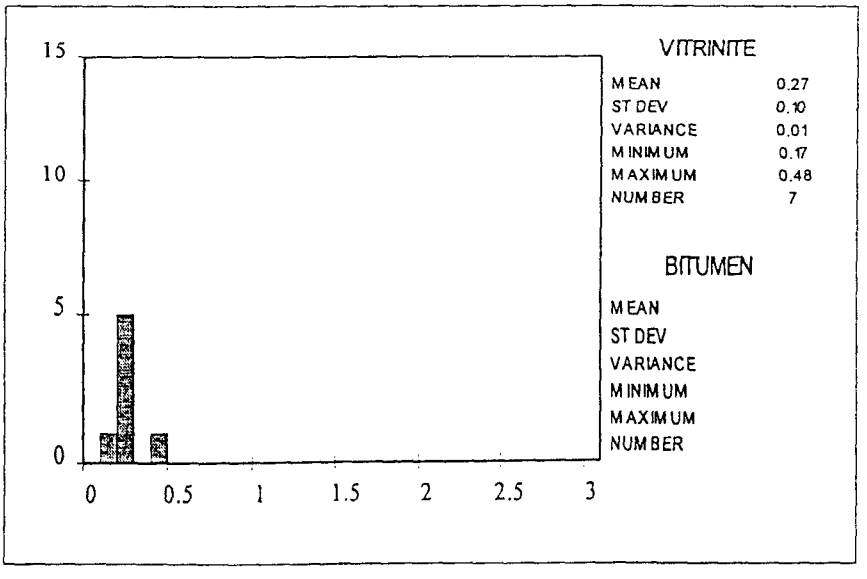
Unstructured Lipids	100
Structured Lipids	-
Solid Bitumen	-
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Moderate
TAI Unstructured	2-,2+
TAI Structured	

COMMENTS:

DGSI Project 96/3471 Sample No. 124

OTHER ID: 201661N 1643.8 - 1643.9 ft.



VITRINITE	
MEAN	0.27
ST DEV	0.10
VARIANCE	0.01
MINIMUM	0.17
MAXIMUM	0.48
NUMBER	7

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.17 V 0.27
V 0.21 V 0.48
V 0.23
V 0.25
V 0.25

TYPE	
K/CC	
TOC	
TMAX	
HI	
V Ro	0.27
B Ro	-
VRE	-

Visual Kerogen Summary

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

Background Fluorescence	Strong
TAI Unstructured	2-,2
TAI Structured	

COMMENTS:

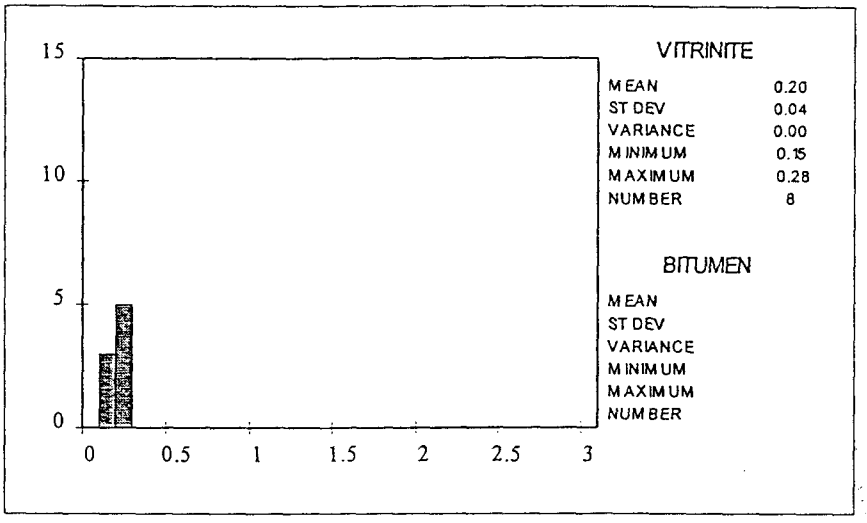
VITRINITE REFLECTANCE

UP41-23 WELL

Green River Shale

DGSI Project 96/3471 Sample No. 126

OTHER ID: 201661U 1649.7 - 1649.9 ft.



VITRINITE	
MEAN	0.20
ST DEV	0.04
VARIANCE	0.00
MINIMUM	0.15
MAXIMUM	0.28
NUMBER	8

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.15 V 0.21
V 0.17 V 0.22
V 0.19 V 0.28
V 0.20
V 0.21

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	0.20
	B Ro	-
	VRE	-

Visual Kerogen Summary

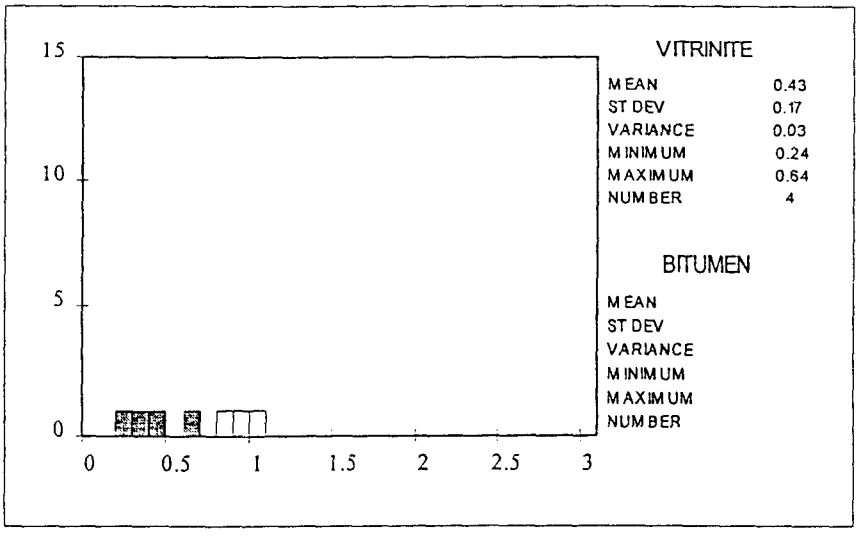
Unstructured Lipids	100
Structured Lipids	-
Solid Bitumen	-
Inertinite	T
Vitrinite	T
Other	0
TOTAL	100

Background Fluorescence	Mod,Strong
TAI Unstructured	2-,2+
TAI Structured	

COMMENTS:

DGSI Project 96/3471 Sample No. 128

OTHER ID: 201661Y 1653.4 - 1653.6 ft.



VITRINITE	
MEAN	0.43
ST DEV	0.17
VARIANCE	0.03
MINIMUM	0.24
MAXIMUM	0.64
NUMBER	4

BITUMEN	
MEAN	
ST DEV	
VARIANCE	
MINIMUM	
MAXIMUM	
NUMBER	

V 0.24 0.93
V 0.38 1.02
V 0.46
V 0.64
0.84

TYPE	K/CC	
	TOC	
	TMAX	
	HI	
	V Ro	?0.43
	B Ro	-
	VRE	-

Visual Kerogen Summary

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

Background Fluorescence	Weak,Mod
TAI Unstructured	4,2-
TAI Structured	

COMMENTS: