OF 248

GEOCHEMICAL SERVICE REPORT

BISBEE HILLS UNIT NO. 1

Prepared

for

MARSHALL R. YOUNG OIL COMPANY

CONFIDENTIAL

October, 1983

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HYDROCARBON SOURCE-ROCK EVALUATION STUDY, MARSHALL R. YOUNG OIL CO. NO. 1 BISBEE HILLS UNIT WELL LUNA COUNTY, NEW MEXICO

by Douglas A. Muckelroy
GeoChem Laboratories, Inc.
Houston, Texas
October, 1983

HYDROCARBON SOURCE ROCK EVALUATION

MARSHALL R. YOUNG OIL COMPANY

BISBEE HILLS UNIT NO. 1

SUMMARY

Representative cuttings samples of Mesozoic and Paleozoic age frcm the Marshall R. Young, Bisbee Hills Unit No. 1 Well were submitted for gecchemical analyses. The clastic sediments of the U-Bar and Hell-to-Finish formations and the carbonate sediments of the Fusselman, Montoya, El Paso and Bliss formations are considered lean organically with a poor hydrocarbon source potential. Kerogen types found in the Cretaceous U-Bar and Hell-to-Finish formations are predominantly gas-prone; conversely kerogen types found in the remaining sediments (Silurian Fusselman, Ordovician Montoya, and El Paso) are considered oil-prone.

Post depositional history of these formations is such that organic matter has undergone a moderate geothermal history and can be rated as mature. At this state of thermal maturity, these sediments have passed beyong the biogenic phase of hydrocarbon generation into the catagenic and early metagenic phase of hydrocarbon generation. Thus, any hydrocarbons generated by these sediments is expected to be a mature oil and possibly petrogenic gas depending on kerogen source characteristics. If reservoired hydrocarbons were to be found in the sampled interval their most probable source would be at the same maturity level, situated laterally within organically richer zones of these formations.

INTRODUCTION

This report presents results and interpretations of geochemical analyses performed on cuttings samples from 2250 feet to 7100 feet of the Marshall R. Young Bisbee Hills Unit No.1 Well, Luna County, New Mexico. All work was performed under GeoChem Job No. 2721.

The principal objective of this geochemical study, and the guide followed while outlining and modifying the analytical program, was to determine the present hydrocarbon source character of the Mesozoic and Paleozoic sediments penetrated by the Bisbee Hills Unit No. 1 Well. The Mesozoic sediments were represented by cuttings from 2250 feet to 5035 feet; the Paleozoic age sediments were represented by cuttings from 5035 feet to 6980 feet (Basement).

Analytical Program

The samples of GeoChem Job No. 2721 were submitted to the following sequence of examinations and analyses as the cuttings were received. The sequence followed the initial recommended geochemical program or its modifications by Marshall R. Young Oil Company.

A. Lithological and Organic Content Screening Analyses

- Brief Lithologic Description (97 samples).....Figure 3, Table III
- Total Organic Carbon (TOC) Determination (46 samples).....Figure 3, Table III

B. Organic Matter Characterization

- Visual Kerogen Classification (18 samples).....Figure 5, Table V
- Visual Kerogen Maturation Indexing (TAI) (18 samples).....Figure 5, Table V
- Vitrinite Reflectance (%Ro) Determination (5 samples).....Table VI

C. Source Rock Hydrocarbon Analysis

- C_1-C_7 Hydrocarbon Gas Chromatographic Analysis, Air Space and Cuttings Gas (38 samples).....Figure 1, Tables I,II
- Rock-Eval Pyrolysis (15 samples).....Figure 6, Table IV

Analytical results from this sequence were submitted for a systematic computerized formation-by-formation and sample-by-sample source type interpretation before a final overall evaluation was made. The systematic computer interpretation presentation is carried as Appendix A of this evaluation report. For users who wish to consider individual results, Appendix A gives a very detailed interpretation of the cuttings data together with graphs and plots of this information in down-hole format. It carries its own explanation at the beginning of the Appendix. As observed above, findings from Appendix A are incorporated in this interpretive text.

GENERAL INFORMATION

Copies of this report have been sent to Mr. Clayton Valder, Marshall R. Young Oil Company, Fort Worth, Texas and Mr. Sam Thompson III, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico. If there are any questions concerning this report, the analytical data presented in it, or their interpretations , please contact Doug Muckelroy or John Bond at GeoChem Laboratories, Inc., (713) 467-7011.

For general information purposes, brief descriptions of the various analyses performed in well studies such as the Bisbee Hills Unit No.1 are presented in the attached Appendix B. This information can serve as a ready reference while considering our discussion of results and interpretations.

Formation tops and designations were provided by Marshall R. Young Oil Company. Lithologies determined from the cuttings do not take into account mud circultion lag time or the mixing of cuttings near formational boundaries during up-hole travel.

RESULTS AND INTERPRETATIONS

A. Lithologic and Organic Content Screening

o Brief Lithologic Description (Table III)

The sediments of the Cretaceous U-Bar and Hell-to-Finish formations, 2060 feet to 5035 feet, are generally medium gray to blackish red shale, brownish gray limestones and gray sandstones. A Tertiary intrusion from 2410 feet to 2670 feet separates these formations. An igneous formation also intrudes the Hell-to-Finish formation from 3550 feet to 3700 feet. Cuttings from these intrusions were not submitted for organic geochemical analyses.

The Silurian Fusselman (5035 feet to 5590 feet) and Ordovician Montoya (5590 feet to 5985 feet) formations are predominantly a light to dark gray dolomite. There is also an appearance of gray chert in the lower portion of the Montoya formation.

The remaining Ordovician sediments, the El Paso (5985 feet to 6930 feet) and the Bliss (6930 feet to 6980 feet) consist mainly of brownish gray limestone with varying amounts of gray dolomite throughout these formations.

o Total Organic Carbon (TOC) Determination (Table III)
(see also Figure 2, Section II of Appendix A)

Organic carbon content within the U-Bar and Hell-to-Finish formations range from a low of 0.04% TOC to a high of 0.26% TOC, with an overall mean of 0.14% TOC. This average for clastic sediments indicates these formations have a poor potential for hydrocarbon generation.

The carbonate sediments within the Fusselman, Montoya, and El Paso formations also contain low amounts of organic carbon. These sediments contain an average of 0.06% TOC, with a high to 0.09% TOC found within the El Paso formation. As a result of these low values, these sediments have a poor potential to be source rocks.

B. Organic Matter Characterization

o Visual Kerogen Characterization (Table V)
(see also Figure 2, Section II of Appendix A)

Kerogen of the U-Bar and Hell-to-Finish intervals are predominantly woody with secondary amounts of herbaceous organic matter. This sequence of kerogen types give these formations a dominantly gas-prone character.

The Paleozoic sediments, Fusselman, Montoya and El Paso formations, contain amorphous kerogen giving these units an oil-prone character.

o Visual Kerogen Maturation Indexing (TAI) (Table V)
(see also Figure 1, Section I, and Figure 2,
Section II of Appendix A)

Indigenous kerogen analyzed from this well range from a thermal alteration index (TAI) of 3.2 in the U-Bar formation to a thermal alteration index (TAI) of 3.4 in the El Paso formation. Overall, the thermal maturity of these sediments has changed little, if any, with down-hole depth. At the level of alteration observed, these sediments are considered mature and have progressed beyond the biogenic generating phase into the catagenic (thermal) hydrocarbon generation range and possibly the early stages of metagenic late-stage methane generation phase.

o Vitrinite Reflectance (%Ro) Determination (Table VI)
(see also Figure 2, Section I)

Overall, vitrinite reflectance measurements (%Ro) in the Bisbee Hills Unit No. 1 Well were insufficient for analyses. However, indigenous vitrinite reflectance measurements (%Ro) determined in the Hell-to-Finish formation fall in the 1.17 %Ro range confirm the mature ratings given this formation during visual kerogen analyses.

C. Source Rock-Hydrocarbon Analysis

o C_1-C_7 Hydrocarbon Analysis (Air Space and Cuttings Gas) (Table I, II)
(see also Figure 1, Section II)

C_1-C_7 hydrocarbon analyses performed on air space and canned cuttings from this well indicate these sediments contain, both a poor source character and a poor reservoired hydrocarbon character. Lean amounts of methane (C_1), Total C_2-C_4 and Total C_5-C_7 indicate poor ratings throughout this well; these are compatible with the poor amounts of organic carbon (TOC) earlier discussed.

o Rock-Eval Pyrolysis (Table IV)
(see also Figure 3, Section II of Appendix A)

Pyrolysis analysis of cuttings samples from Mesozoic and Paleozoic formations indicate these sediments have a very poor source character. Poor concentrations of free hydrocarbon (S_1) and hydrocarbon generating potential (S_2) are detected from each of the formations analyzed, thus contributing to the overall poor source character of the formations penetrated by the Bisbee Hills Unit No.1 Well.

CONCLUSIONS

Low concentrations of organic matter found in the sediments of the U-Bar, Hell-to-Finish, Fusselman, Montoya, and El Paso formations gave these sediments a poor hydrocarbon source character when deposited. The clastic sediments of the U-Bar and Hell-to-Finish formations contain gas-prone organic matter (kerogen) types; the remaining carbonate formations, Fusselman, Montoya and El Paso, contain organic matter (kerogen) types which favor oil-generation.

The sediments analyzed from the Bisbee Hills Unit No.1 Well have a geothermal history which has passed through the biogenic and early catagenic phase of hydrocarbon generation; they now are in the late catagenic ard early metagenic generating phase.

C_1-C_7 hydrocarbon analysis and Rock-Eval pyrolysis show that the sediments penetrated by this well are nonprospective for hydrocarbon generation.

Doug Muckelroy

Douglas A. Muckelroy
GEOCHEM LABORATORIES, INC.

TABLE I-A
AIRSPACE DATA

GEOCHEM ID	CLIENT DEPTH	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	ISOBUTANE	N BUTANE	C5-C7
2721-001	2250-2300	41.76	3.51	1.13	4.30	0.12	0.19	0.38	26.54
2721-005	2450-2500	13.34	0.99	1.19	0.42	0.24	1.92	0.00	0.00
2721-008*	2600-2650	18.27	3.73	2.59	1.51	1.17	0.13	0.52	0.00
2721-009*	2650-2700	28.70	3.37	2.14	1.39	1.21	0.00	0.18	0.00
2721-010*	2700-2750	53.96	20.09	11.52	9.75	6.59	0.46	2.67	1.47
2721-011	2750-2800	58.65	22.78	16.03	9.46	8.96	0.69	3.36	18.28
2721-014	2900-2950	64.69	22.21	15.92	8.99	6.60	0.13	2.23	0.00
2721-015	2950-3000	64.60	16.37	11.59	6.49	4.76	0.41	2.28	10.88
2721-016	3000-3050	174.62	40.95	22.71	13.32	11.17	0.85	3.04	13.01
2721-017**	3050-3100	578.70	19.64	12.83	16.92	5.80	0.22	1.39	19.83
2721-018**	3100-3150	348.96	14.51	10.64	4.45	5.16	0.13	1.08	22.55
2721-019***	3180-3210	5.32	1.23	0.71	0.38	0.34	0.00	0.09	13.90
2721-025	3150-3200	110.43	48.32	28.97	18.98	12.81	0.85	5.69	21.00
2721-027	3250-3300	180.29	70.51	42.53	25.30	20.38	1.36	5.19	17.94
2721-029	3350-3400	230.36	96.80	58.57	39.01	28.66	2.23	11.32	23.91
2721-031	3450-3500	51.23	17.03	14.39	7.17	5.99	0.47	2.46	0.00
2721-034	3600-3650	117.94	44.88	27.18	18.04	14.20	1.00	5.22	24.74
2721-037	3750-3800	116.85	38.01	26.41	12.62	11.77	0.58	3.30	20.54
2721-040	3900-3950	80.50	23.42	14.66	6.21	6.58	0.00	1.00	0.00
2721-043	4050-4100	37.67	9.46	6.33	3.13	2.74	0.00	0.55	0.00
2721-046	4200-4250	32.16	7.75	6.38	1.52	1.58	0.00	0.22	0.00
2721-049	4350-4400	65.23	20.19	16.06	7.07	8.86	0.00	1.42	0.00
2721-052	4500-4550	122.12	47.36	25.00	320.65	9.88	3.10	1.52	0.00

*:- Drill Stem Test #1
** - Drill Stem Test #2
*** - Drilling Fluid (mud) from Pit

TABLE I-A
AIRSPACE DATA

GEOCHEM ID	CLIENT DEPTH	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	ISOBUTANE	N BUTANE	C5-C7
2721-055	4650-4700	47.54	14.15	10.31	5.21	4.29	0.00	0.84	50.86
2721-058	4800-4850	34.16	8.24	6.36	2.26	2.14	0.00	0.46	60.87
2721-061	4947-5000	105.76	11.27	4.99	2.19	1.40	0.00	0.00	51.27
2721-064	5100-5150	25.52	1.94	2.94	14.64	0.95	0.00	0.00	22.19
2721-067	5250-5300	94.22	13.25	13.80	35.40	9.87	0.19	2.65	41.89
2721-070	5400-5450	23.72	6.33	6.69	18.21	4.62	0.00	0.96	4.12
2721-073	5550-5600	74.08	1.68	0.67	2.90	0.45	0.00	0.00	22.48
2721-076	5700-5750	94.54	18.99	15.83	55.74	10.43	1.06	3.57	13.32
2721-079	5850-5900	125.47	10.83	7.92	14.44	3.92	0.16	1.11	11.39
2721-080	5900-5950	253.79	24.36	15.34	9.12	8.02	0.85	2.73	7.09
2721-082	6000-6050	83.90	15.68	9.52	7.15	4.39	0.58	0.88	21.73
2721-083	6050-6100	129.96	15.03	8.03	4.41	5.02	0.00	0.99	0.00
2721-087	6250-6300	70.95	7.65	2.60	4.03	1.40	0.50	0.39	27.54
2721-093	6550-6600	21.74	2.77	2.34	19.17	1.10	0.00	0.15	18.52
2721-101	6950-7000	22.00	4.63	4.00	2.61	2.55	0.00	0.38	18.15

TABLE I-B
CUTTINGS DATA

GEOCHEM ID	CLIENT DEPTH	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	ISOBUTANE	N BUTANE	C5-C7
2721-001	2250-2300	1262.82	31.71	0.00	8.98	0.00	2.93	3.12	8.36
2721-005	2450-2500	1041.28	1.94	0.00	0.00	0.00	0.00	0.00	0.00
2721-008*	2600-2650	1066.10	2.95	0.65	0.24	0.19	0.00	0.00	0.00
2721-009*	2650-2700	1435.65	25.32	0.84	3.99	0.00	0.74	1.02	0.00
2721-010*	2700-2710	1713.76	39.29	3.01	8.77	0.69	3.17	2.78	0.00
2721-011	2750-2800	1297.86	28.20	1.34	6.43	0.39	2.32	2.23	0.00
2721-014	2900-2950	425.66	9.30	0.40	2.56	0.28	0.53	0.82	0.00
2721-015	2950-3000	832.28	13.91	1.09	3.25	0.28	0.94	1.03	0.54
2721-016	3000-3050	634.47	15.60	4.13	5.89	2.65	0.91	2.37	0.00
2721-017**	3050-3100	522.64	13.74	2.49	4.35	1.05	1.02	1.43	24.02
2721-018**	3100-3150	544.81	8.08	2.32	2.67	1.25	0.32	0.91	32.98
2721-019***	3180-3210	SAMPLE NOT ANALYZED							
2721-025	3150-3200	370.53	4.94	1.87	1.26	0.70	0.30	0.41	45.85
2721-027	3250-3300	771.69	10.48	2.82	3.04	1.73	0.48	1.45	1.83
2721-029	3350-3400	642.07	9.47	4.37	2.64	2.79	0.36	1.15	5.47
2721-031	3450-3500	613.94	6.71	1.13	1.96	0.87	0.40	0.78	3.04
2721-034	3600-3650	506.01	4.23	1.82	0.65	0.99	0.00	0.34	0.00
2721-037	3750-3800	782.44	11.27	3.13	3.76	1.98	0.39	0.94	3.82
2721-040	3900-3950	688.98	8.33	2.51	2.61	1.85	0.54	0.75	0.00
2721-043	4050-4100	694.96	6.81	2.43	1.81	1.05	0.25	0.36	4.27
2721-046	4200-4250	586.20	5.92	1.03	1.25	0.62	0.28	0.48	0.00
2721-049	4350-4400	470.96	3.57	1.74	0.98	1.25	0.00	0.04	0.00
2721-052	4500-4550	616.53	8.32	3.44	7.17	2.35	0.03	0.75	0.00

* - Drill Stem Test #1
** - Drill Stem Test #2
*** - Drilling Fluid (mud) from Pit

TABLE I-B
CUTTINGS DATA

GEOCHEM ID	CLIENT DEPTH	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	ISOBUTANE	N BUTANE	C5-C7
2721-055	4650-4700	509.55	7.00	3.09	2.07	2.04	0.24	0.81	0.00
2721-058	4800-4850	457.34	4.08	0.92	1.11	0.89	0.00	0.38	0.00
2721-061	4947-5000	2755.92	76.19	0.00	9.00	0.00	1.30	1.34	31.50
2721-064	5100-5150	1438.97	9.17	0.00	0.93	0.00	0.00	0.00	22.18
2721-067	5250-5300	7479.91	76.06	13.08	3.59	2.09	0.10	0.88	16.01
2721-070	5400-5450	1649.18	12.89	0.97	0.52	0.63	0.00	0.00	0.00
2721-073	5550-5600	8895.66	128.77	0.00	6.92	0.25	0.31	0.43	16.30
2721-076	5700-5750	12408.18	110.29	11.90	4.46	1.74	0.09	0.62	0.09
2721-079	5850-5900	6485.11	58.16	7.57	3.49	1.91	0.00	0.35	6.66
2721-080	5900-5950	12644.24	127.88	29.96	8.10	5.19	0.64	1.47	1.51
2721-082	6000-6050	2898.40	48.82	8.67	14.93	4.50	3.04	4.75	2.08
2721-083	6050-6100	2268.52	30.29	6.15	5.63	2.87	0.89	1.02	0.00
2721-087	6250-6300	2515.45	55.30	6.26	16.56	2.15	3.88	4.95	14.23
2721-093	6550-6600	960.95	10.84	1.92	2.54	0.86	0.00	0.26	0.00
2721-101		1271.32	9.44	3.69	1.15	1.86	0.00	0.27	31.43

TABLE I-C
COMBINED DATA

GEOCHEM ID	CLIENT DEPTH	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	ISOBUTANE	N BUTANE	C5-C7
2721-001	2250-2300	1304.59	35.23	1.13	13.29	0.12	3.12	3.51	34.91
2721-005	2450-2500	1054.63	2.94	1.19	0.42	0.24	1.92	0.00	0.00
2721-008*	2600-2650	1084.38	6.68	3.24	1.76	1.37	0.13	0.52	0.00
2721-009*	2650-2700	1464.36	28.69	2.98	5.39	1.21	0.74	1.20	0.00
2721-010*	2700-2750	1767.72	59.39	14.53	18.52	7.28	3.64	5.45	1.47
2721-011	2750-2800	1356.52	50.98	17.37	15.90	9.35	3.01	5.59	18.28
2721-014	2900-2950	490.35	31.52	16.33	11.56	6.89	0.66	3.05	0.00
2721-015	2950-3000	896.88	30.28	12.69	9.74	5.05	1.35	3.31	11.42
2721-016	3000-3050	809.09	56.55	26.85	19.22	13.82	1.77	5.41	13.01
2721-017**	3050-3100	1101.35	33.38	15.33	21.28	6.86	1.25	2.82	43.86
2721-018**	3100-3150	893.77	22.60	12.97	7.12	6.41	0.46	2.00	55.54
2721-019***	3180-3210	5.32	1.23	0.71	0.38	0.34	0.00	0.09	13.90
2721-025	3150-3200	480.96	53.27	30.84	20.25	13.51	1.15	6.11	66.85
2721-027	3250-3300	951.98	81.00	45.36	28.34	22.11	1.84	6.65	19.77
2721-029	3350-3400	872.44	106.28	62.95	41.66	31.45	2.59	12.48	29.39
2721-031	3450-3500	665.17	23.75	15.52	9.14	6.86	0.88	3.24	3.04
2721-034	3600-3650	623.95	49.11	29.00	18.69	15.19	1.00	5.57	24.74
2721-037	3750-3800	899.29	49.28	29.54	16.39	13.75	0.97	4.24	24.37
2721-040	3900-3950	769.49	31.75	17.18	8.82	8.43	0.54	1.76	0.00
2721-043	4050-4100	732.64	16.27	8.76	4.94	3.80	0.25	0.91	4.27
2721-046	4200-4250	618.37	13.68	7.42	2.77	2.21	0.28	0.71	0.00
2721-049	4350-4400	536.19	23.76	17.81	8.05	10.11	0.00	1.47	0.00
2721-052	4500-4550	738.65	55.68	28.45	327.82	12.23	3.14	2.28	0.00

* - Drill Stem Test #1
** - Drill Stem Test #2
*** - Drilling Fluid (mud) from Pit

TABLE I-C
COMBINED DATA

GEOCHEM ID	CLIENT DEPTH	METHANE	ETHANE	ETHYLENE	PROPANE	PROPYLENE	ISOBUTANE	N BUTANE	C5-C7
2721-055	4650-4700	557.10	21.16	13.40	7.28	6.34	0.24	1.65	50.86
2721-058	4800-4850	491.50	12.32	7.29	3.37	3.04	0.00	0.84	60.87
2721-061	4947-5000	2861.69	87.46	4.99	11.20	1.40	1.30	1.34	82.78
2721-064	5100-5150	1464.49	11.11	2.94	15.58	0.95	0.00	0.00	44.37
2721-067	5250-5300	7574.13	89.31	26.88	38.99	11.96	0.30	3.54	57.91
2721-070	5400-5450	1672.91	19.22	7.66	18.74	5.26	0.00	0.96	4.12
2721-073	5550-5600	8969.74	130.46	0.67	9.83	0.71	0.31	0.43	38.78
2721-076	5700-5750	12502.73	129.28	27.73	60.20	12.17	1.16	4.20	13.41
2721-079	5850-5900	6610.58	69.00	15.50	17.93	5.83	0.16	1.46	18.05
2721-080	5900-5950	12898.04	152.25	45.31	17.23	13.22	1.49	4.20	8.61
2721-082	6000-6050	2982.31	64.51	18.19	22.08	8.90	3.62	5.63	23.82
2721-083	6050-6100	2398.48	45.33	14.18	10.05	7.89	0.89	2.02	0.00
2721-087	6250-6300	2586.41	62.96	8.86	20.60	3.55	4.38	5.34	41.77
2721-093	6550-6600	982.69	13.62	4.27	21.72	1.96	0.00	0.41	18.52
2721-101	6950-7000	1293.33	14.07	7.69	3.77	4.42	0.00	0.66	49.59

TABLE II-A
AIRSPACE DATA

GEOCHEM ID	CLIENT DEPTH	C1-C4	C2-C4	C2/C2=	C3/C3=	IC4/NC4	C1/(C2+C3)	%WETNESS
2721-001	2250-2300	50.16	8.40	3.09	35.35	0.49	5.33	16.75
2721-005	2450-2500	16.69	3.34	0.83	1.72	---	9.38	20.05
2721-008*	2600-2650	24.18	5.90	1.44	1.29	0.26	3.48	24.43
2721-009*	2650-2700	33.66	4.95	1.56	1.15	0.00	6.01	14.72
2721-010*	2700-2750	86.95	32.99	1.74	1.48	0.17	1.80	37.94
2721-011	2750-2800	94.95	36.30	1.42	1.05	0.20	1.81	38.23
2721-014	2900-2950	98.27	33.58	1.39	1.36	0.05	2.07	34.16
2721-015	2950-3000	90.16	25.56	1.41	1.36	0.18	2.82	28.34
2721-016	3000-3050	232.80	58.17	1.80	1.19	0.28	3.21	24.99
2721-017**	3050-3100	616.89	38.19	1.53	2.91	0.16	15.82	6.19
2721-018**	3100-3150	369.15	20.18	1.36	0.86	0.12	18.39	5.46
2721-019***	3180-3210	7.03	1.71	1.71	1.10	0.00	3.29	24.32
2721-025	3150-3200	184.30	73.86	1.66	1.48	0.14	1.64	40.08
2721-027	3250-3300	282.67	102.38	1.65	1.24	0.26	1.88	36.21
2721-029	3350-3400	379.75	149.38	1.65	1.36	0.19	1.69	39.33
2721-031	3450-3500	78.38	27.14	1.18	1.19	0.19	2.11	34.63
2721-034	3600-3650	187.10	69.16	1.65	1.27	0.19	1.87	36.96
2721-037	3750-3800	171.37	54.52	1.43	1.07	0.17	2.30	31.81
2721-040	3900-3950	111.14	30.63	1.59	0.94	0.00	2.71	27.56
2721-043	4050-4100	50.82	13.14	1.49	1.14	0.00	2.99	25.87
2721-045	4200-4250	41.57	9.50	1.21	0.95	0.00	3.46	22.81
2721-049	4350-4400	93.91	28.68	1.25	0.79	0.00	2.39	30.54
2721-052	4500-4550	494.77	372.65	1.89	32.44	2.03	0.33	75.31

* - Drill Stem Test #1
** - Drill Stem Test #2
*** - Drilling Fluid (mud) from Pit

TABLE II-A
AIRSPACE DATA

GEOCHEM ID	CLIENT DEPTH	C1-C4	C2-C4	C2/C2=	C3/C3=	IC4/NC4	C1/(C2+C3)	%WETNESS
2721-055	4650-4700	67.76	20.21	1.37	1.21	0.00	2.45	29.83
2721-058	4800-4850	45.12	10.96	1.29	1.05	0.00	3.25	24.30
2721-061	4947-5000	119.24	13.47	2.25	1.56	0.00	7.84	11.30
2721-064	5100-5150	42.11	16.58	0.65	15.33	0.00	1.53	39.39
2721-067	5250-5300	145.73	51.50	0.96	3.58	0.07	1.93	35.34
2721-070	5400-5450	49.24	25.51	0.94	3.93	0.00	0.96	51.81
2721-073	5550-5600	78.67	4.58	2.48	6.35	0.00	16.14	5.83
2721-076	5700-5750	173.93	79.38	1.19	5.34	0.29	1.26	45.64
2721-079	5850-5900	152.03	26.56	1.36	3.68	0.15	4.96	17.47
2721-080	5900-5950	290.88	37.09	1.58	1.13	0.31	7.57	12.75
2721-082	6000-6050	108.20	24.30	1.64	1.62	0.65	3.67	22.46
2721-083	6050-6100	150.41	20.45	1.87	0.87	0.00	6.68	13.59
2721-087	6250-6300	83.55	12.59	2.94	2.87	1.26	6.06	15.07
2721-093	6550-6600	43.84	22.10	1.18	17.39	0.00	0.99	50.41
2721-101	6950-7000	29.63	7.63	1.15	1.02	0.00	3.03	25.76

TABLE II-B
CUTTINGS DATA

GEOCHEM ID	CLIENT DEPTH	C1-C4	C2-C4	C2/C2=	C3/C3=	IC4/NC4	C1/(C2+C3)	%WETNESS
2721-001	2250-2300	1309.59	46.76	—	—	0.93	31.02	3.57
2721-005	2450-2500	1043.23	1.94	—	0.00	0.00	536.38	0.18
2721-008*	2600-2650	1069.30	3.19	4.48	1.23	0.00	333.47	0.29
2721-009*	2650-2700	1466.75	31.09	30.12	—	0.73	48.95	2.12
2721-010*	2700-2750	1767.79	54.03	13.05	12.65	1.13	35.65	3.05
2721-011	2750-2800	1337.06	39.19	20.99	16.31	1.04	37.46	2.93
2721-014	2900-2950	438.89	13.23	22.92	8.90	0.65	35.84	3.01
2721-015	2950-3000	851.42	19.13	12.72	11.26	0.91	48.48	2.24
2721-016	3000-3050	659.26	24.79	3.76	2.22	0.38	29.51	3.76
2721-017**	3050-3100	543.21	20.56	5.49	4.11	0.71	28.87	3.78
2721-018**	3100-3150	556.82	12.01	3.47	2.13	0.35	50.61	2.15
2721-019***	3180-3210	SAMPLE NOT ANALYZED						
2721-025	3150-3200	377.46	6.92	2.63	1.80	0.72	59.72	1.83
2721-027	3250-3300	787.15	15.46	3.70	1.75	0.33	57.04	1.96
2721-029	3350-3400	655.72	13.64	2.16	0.94	0.31	52.95	2.08
2721-031	3450-3500	623.82	9.87	5.94	2.25	0.51	70.71	1.58
2721-034	3600-3650	511.23	5.22	2.31	0.65	0.00	103.63	1.02
2721-037	3750-3800	798.81	16.37	3.59	1.89	0.41	52.02	2.04
2721-040	3900-3950	701.23	12.24	3.30	1.41	0.71	62.93	1.74
2721-043	4050-4100	704.20	9.24	2.79	1.72	0.69	80.54	1.31
2721-046	4200-4250	594.15	7.95	5.71	2.00	0.58	81.67	1.33
2721-049	4350-4400	475.57	4.60	2.04	0.78	0.00	103.36	0.96
2721-052	4500-4550	632.82	16.29	2.41	3.05	0.04	39.77	2.57

* - Drill Stem Test #1
** - Drill Stem Test #2
*** - Drilling Fluid (mud) from Pit

TABLE II-B
CUTTINGS DATA

GEOCHEM ID	CLIENT DEPTH	C1-C4	C2-C4	C2/C2=	C3/C3=	IC4/NC4	C1/(C2+C3)	%WETNESS
2721-055	4650-4700	519.69	10.13	2.26	1.01	0.30	56.12	1.95
2721-058	4800-4850	462.92	5.58	4.40	1.24	0.00	87.92	1.20
2721-061	4947-5000	2843.78	87.85	—	—	0.96	32.34	3.08
2721-064	5100-5150	1449.08	10.10	—	—	0.00	142.35	0.69
2721-067	5250-5300	7560.56	80.65	5.81	1.71	0.12	93.89	1.06
2721-070	5400-5450	1662.60	13.41	13.26	0.83	0.00	122.89	0.80
2721-073	5550-5600	9032.11	136.45	—	27.25	0.71	65.55	1.51
2721-076	5700-5750	12523.66	115.48	9.26	2.56	0.15	108.12	0.92
2721-079	5850-5900	6547.12	62.00	7.67	1.82	0.00	105.18	0.94
2721-080	5900-5950	12782.34	138.09	4.26	1.55	0.43	92.98	1.08
2721-082	6000-6050	2969.96	71.55	5.63	3.31	0.64	45.45	2.40
2721-083	6050-6100	2306.38	37.85	4.92	1.96	0.87	63.13	1.64
2721-087	6250-6300	2596.16	80.70	8.82	7.68	0.78	34.99	3.10
2721-093	6550-6600	974.61	13.65	5.63	2.94	0.00	71.73	1.40
2721-101	6950-7000	1282.20	10.87	2.55	0.62	0.00	119.92	0.84

TABLE II-C
COMBINED DATA

GEOCHEM ID	CLIENT DEPTH	C1-C4	C2-C4	C2/C2=	C3/C3=	IC4/NC4	C1/(C2+C3)	%WETNESS
2721-001	2250-2300	1359.76	55.17	31.03	109.11	0.89	26.87	4.05
2721-005	2450-2500	1059.92	5.28	2.45	1.72	—	313.56	0.49
2721-008*	2600-2650	1093.49	9.10	2.05	1.28	0.26	128.37	0.83
2721-009*	2650-2700	1500.41	36.05	9.60	4.43	0.62	42.94	2.40
2721-010*	2700-2750	1854.75	87.02	4.08	2.54	0.66	22.68	4.69
2721-011	2750-2800	1432.01	75.49	2.93	1.69	0.53	20.27	5.27
2721-014	2900-2950	537.17	46.81	1.92	1.67	0.21	11.37	8.71
2721-015	2950-3000	941.58	44.69	2.38	1.92	0.40	22.40	4.74
2721-016	3000-3050	892.06	82.97	2.10	1.39	0.32	10.67	9.30
2721-017**	3050-3100	1160.10	58.75	2.17	3.10	0.44	20.14	5.06
2721-018**	3100-3150	925.97	32.19	1.74	1.11	0.22	30.06	3.47
2721-019***	3180-3210	7.03	1.71	1.71	1.10	0.00	3.29	24.32
2721-025	3150-3200	561.76	80.79	1.72	1.49	0.18	6.54	14.38
2721-027	3250-3300	1069.83	117.85	1.78	1.28	0.27	8.70	11.01
2721-029	3350-3400	1035.47	163.02	1.68	1.32	0.20	5.89	15.74
2721-031	3450-3500	702.20	37.02	1.52	1.33	0.27	20.22	5.27
2721-034	3600-3650	698.34	74.39	1.69	1.23	0.18	9.20	10.65
2721-037	3750-3800	970.19	70.90	1.66	1.19	0.23	13.69	7.30
2721-040	3900-3950	812.37	42.88	1.84	1.04	0.30	18.96	5.27
2721-043	4050-4100	755.03	22.39	1.85	1.30	0.27	34.51	2.96
2721-046	4200-4250	635.83	17.46	1.84	1.25	0.40	37.57	2.74
2721-049	4350-4400	569.49	33.29	1.33	0.79	0.00	16.85	5.84
2721-052	4500-4550	1127.60	388.94	1.95	26.79	1.37	1.92	34.49

* - Drill Stem Test #1
** - Drill Stem Test #2
*** - Drilling Fluid (mud) from Pit

TABLE II-C
COMBINED DATA

GEOCHEM ID	CLIENT DEPTH	C1-C4	C2-C4	C2/C2=	C3/C3=	IC4/NC4	C1/(C2+C3)	%WETNESS
2721-055	4650-4700	587.45	30.35	1.57	1.14	0.14	19.57	5.16
2721-058	4800-4850	508.05	16.55	1.69	1.11	0.00	31.29	3.25
2721-061	4947-5000	2963.02	101.32	17.49	7.95	0.96	29.00	3.41
2721-064	5100-5150	1491.19	26.69	3.77	16.31	0.00	54.85	1.79
2721-067	5250-5300	7706.29	132.15	3.32	3.25	0.08	59.02	1.71
2721-070	5400-5450	1711.85	38.93	2.50	3.56	0.00	44.05	2.27
2721-073	5550-5600	9110.78	141.04	192.80	13.82	0.71	63.93	1.54
2721-076	5700-5750	12697.59	194.86	4.66	4.94	0.27	65.98	1.53
2721-079	5850-5900	6699.16	88.57	4.45	3.07	0.11	76.03	1.32
2721-080	5900-5950	13073.23	175.18	3.36	1.30	0.35	76.10	1.34
2721-082	6000-6050	3078.17	95.86	3.54	2.48	0.64	34.43	3.11
2721-083	6050-6100	2456.80	58.31	3.19	1.27	0.44	43.30	2.37
2721-087	6250-6300	2679.71	93.30	7.10	5.79	0.81	30.94	3.48
2721-093	6550-6600	1018.46	35.76	3.18	11.03	0.00	27.79	3.51
2721-101	6950-7000	1311.84	18.51	1.82	0.85	0.00	72.44	1.41

Table III

SCREEN ANALYSIS SUMMARY

eoChem ample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-001	2250-2300	60% Shale, medium gray to very dusky red. 30% Sandstone, calcareous, light brownish gray. 10% Limestone, light brownish gray.	0.12
721-002	2300-2350	60% Limestone, light brownish gray. 30% Shale, medium gray to very dusky red. 10% Sandstone, calcareous, light brownish gray.	
2721-003	2350-2400	60% Shale, medium gray to very dusky red. 30% Sandstone, calcareous, light brownish gray. 10% Limestone, light brownish gray.	0.07
721-004	2400-2450	70% Rhyolite, pinkish gray. 20% Shale, medium gray to very dusky red. 10% Limestone, light brownish gray.	
721-005	2450-2500	100% Rhyolite, pinkish gray. Trace of shale and limestone.	
721-006	2500-2550	100% Rhyolite, pinkish gray. Trace of shale and limestone.	
721-007	2550-2600	100% Rhyolite, pinkish gray. Trace of shale and limestone.	
721-008	2600-2650	100% Dolomite, silty, slightly silicified, dusky brown.	0.04
721-009	2650-2700	60% Siltstone, calcareous, pale red. 40% Shale, blackish red.	
2721-010	2700-2750	60% Shale, medium gray to very dusky red. 20% Siltstone, calcareous, pale red. 20% Limestone, brownish gray.	0.09
721-011	2750-2800	80% Shale, medium gray to very dusky red. 20% Siltstone, calcareous, pale red.	
2721-012	2800-2850	100% Shale, medium gray to very dusky red.	0.05/0.04

Table III

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)		Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-013	2850-2900	100%	Shale, medium gray to very dusky red.	
2721-014	2900-2950	100%	Shale, slightly anhydritic, blackish red.	0.05
2721-015	2950-3000	60% 40%	Shale, slightly anhydritic, blackish red. Sandstone, calcareous, argillaceous, medium gray.	
2721-016	3000-3050	70% 30%	Dolomite, slightly anhydritic, olive gray. Shale, slightly anhydritic, blackish red.	0.06/0.05
2721-017	3050-3100	60% 40%	Shale, slightly anhydritic, blackish red. Dolomite, slightly anhydritic, olive gray.	
2721-018	3100-3150	60% 40%	Shale, slightly anhydritic, blackish red. Dolomite, slightly anhydritic, olive gray.	0.09
2721-025	3150-3200	60% 40%	Shale, slightly anhydritic, blackish red. Dolomite, slightly anhydritic, olive gray.	
2721-026	3200-3250	100%	Shale, blackish red.	0.09
2721-027	3250-3300	80% 20%	Shale, blackish red. Sandstone, medium gray.	
2721-028	3300-3350	100%	Shale, blackish red.	0.16
2721-029	3350-3400	80% 20%	Shale, blackish red. Sandstone, medium gray.	
2721-030	3400-3450	80% 20%	Shale, blackish red. Sandstone, slightly argillaceous, pale red.	0.12
2721-031	3450-3500	60% 40%	Shale, blackish red. Sandstone, medium gray.	
2721-032	3500-3550	100%	Shale, blackish red.	0.11/0.12
2721-033	3550-3600	60% 40%	Metasediments, greenish gray. Shale, blackish red.	

Table III

SCREEN ANALYSIS SUMMARY

eoChem ample Number	Well Interval (Feet)		Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-034	3600-3650		Igneous rock?	
721-035	3650-3700		Igneous rock?	
2721-036	3700-3750	60% 40%	Sandstone, slightly calcareous, pale red. Shale, dark gray to blackish red.	0.26
2721-037	3750-3800	60% 40%	Sandstone, slightly calcareous, pale red. Shale, dark gray to blackish red.	
2721-038	3800-3850	60% 40%	Shale, medium gray to blackish red. Sandstone, slightly calcareous, medium gray.	0.11
2721-039	3850-3900	60% 40%	Shale, medium gray to blackish red. Sandstone, slightly calcareous, medium gray.	
2721-040	3900-3950	60% 40%	Shale, medium gray to blackish red. Sandstone, slightly calcareous, medium gray.	0.09
721-041	3950-4000	60% 40%	Sandstone, slightly calcareous, medium gray. Shale, medium gray to blackish red.	
721-042	4000-4050	60% 40%	Shale, blackish red. Sandstone, slightly calcareous, medium gray to blackish red.	0.08
2721-043	4050-4100	60% 40%	Shale, blackish red. Sandstone, slightly calcareous, medium gray to blackish red.	
2721-044	4100-4150	100%	Shale, blackish red.	0.09
721-045	4150-4200	70% 30%	Shale, blackish red. Sandstone, medium gray.	
721-046	4200-4250	60% 40%	Shale, blackish red. Sandstone, medium gray.	0.11
721-047	4250-4300	60% 40%	Shale, blackish red. Igneous rock, greenish gray.	

Table III

SCREEN ANALYSIS SUMMARY

eoChem ample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-048	4300-4350	70% Shale, blackish red. 30% Sandstone, slightly calcareous, brownish gray.	0.10/0.11
2721-049	4350-4400	70% Igneous, rock. 30% Shale, blackish red.	
2721-050	4400-4450	60% Shale, blackish red. 30% Sandstone, slightly calcareous, brownish gray. 10% Limestone, light brownish gray.	0.18
721-051	4450-4500	50% Shale, blackish red. 20% Sandstone, slightly calcareous, brownish gray. 20% Igneous rock. 10% Limestone, light brownish gray.	
721-052	4500-4550	60% Shale, blackish red. 30% Sandstone, slightly calcareous, brownish gray. 10% Limestone, light brownish gray.	0.16
721-053	4550-4600	50% Shale, blackish red. 40% Sandstone, slightly calcareous, brownish gray. 10% Limestone, light brownish gray.	
2721-054	4600-4650	60% Shale, medium gray to blackish red. 40% Sandstone, slightly calcareous, brownish gray.	0.12
721-055	4650-4700	60% Shale, medium gray to blackish red. 40% Sandstone, slightly calcareous, brownish gray.	
721-056	4700-4750	60% Shale, blackish red. 40% Sandstone, calcareous, brownish gray.	0.23
721-057	4750-4800	60% Shale, greenish gray to blackish red. 40% Sandstone, calcareous, brownish gray.	
721-058	4800-4850	100% Shale, greenish gray to blackish red.	0.17

Table III

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)		Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-059	4850-4900	60% 40%	Shale, greenish gray to blackish red. Sandstone, calcareous, brownish gray.	
2721-060	4900-4947	100%	Dolomite, cherty, brownish gray.	0.07
2721-061	4947-5000	70% 30%	Dolomite, cherty, brownish gray. Shale, blackish red.	
2721-062	5000-5050	100%	Dolomite, cherty, brownish gray.	0.10
2721-063	5050-5100	100%	Dolomite, pinkish gray.	
2721-064	5100-5150	100%	Dolomite, pinkish gray.	0.07
2721-065	5150-5200	100%	Dolomite, pinkish gray.	
2721-066	5200-5250	100%	Dolomite, pinkish gray.	0.06
2721-067	5250-5300	100%	Dolomite, brownish gray.	
2721-068	5300-5350	100%	Dolomite, brownish gray.	0.06
2721-069	5350-5400	100%	Dolomite, light brownish gray.	
2721-070	5400-5450	100%	Dolomite, light brownish gray.	0.04
2721-071	5450-5500	100%	Dolomite, light brownish gray to brownish gray.	
2721-072	5500-5550	100%	Dolomite, brownish gray.	0.04
2721-073	5550-5600	100%	Dolomite, brownish gray.	
2721-074	5600-5650	100%	Dolomite, light brownish gray to brownish gray.	0.04
2721-075	5650-5700	100%	Dolomite, brownish gray.	
2721-076	5700-5750	100%	Dolomite, brownish gray.	0.06
2721-077	5750-5800	100%	Dolomite, light brownish gray to brownish gray.	

Table III

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)		Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-078	5800-5850	100%	Dolomite, light brownish gray to brownish gray.	0.04
2721-079	5850-5900	60%	Dolomite, light brownish gray to brownish gray.	
		40%	Chert, very light gray.	
2721-080	5900-5950	70%	Dolomite, light brownish gray to brownish gray.	0.06
		30%	Chert, very light gray.	
2721-081	5950-6000	100%	Dolomite, light brownish gray to brownish gray.	
2721-082	6000-6050	60%	Limestone, light brownish gray.	0.09/0.09
		40%	Dolomite, light brownish gray to brownish gray.	
2721-083	6050-6100	80%	Limestone, light brownish gray.	
		20%	Shale, dark gray.	
2721-084	6100-6150	100%	Limestone, light brownish gray.	0.09
2721-085	6150-6200	100%	Limestone, light brownish gray. Trace of shale.	
2721-086	6200-6250	100%	Limestone, light brownish gray. Trace of shale.	0.07
2721-087	6250-6300	100%	Limestone, light brownish gray. Trace of shale.	
2721-088	6300-6350	50%	Limestone, light brownish gray.	0.05
		50%	Dolomite, brownish gray.	
2721-089	6350-6400	80%	Limestone, light brownish gray.	
		20%	Dolomite, brownish gray.	
2721-090	6400-6450	80%	Limestone, light brownish gray.	0.09
		20%	Dolomite, brownish gray.	
2721-091	6450-6500	100%	Limestone, light brownish gray.	

Table III

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)		Brief Lithological Description	Total Organic Carbon (% of Rock)
2721-092	6500-6550	100%	Limestone, light brownish gray.	0.08
2721-093	6550-6600	100%	Limestone, light brownish gray.	
2721-094	6600-6650	70%	Limestone, light brownish gray.	0.07
		30%	Dolomite, brownish gray.	
2721-095	6650-6700	70%	Limestone, light brownish gray.	
		30%	Dolomite, brownish gray.	
2721-096	6700-6750	70%	Limestone, light brownish gray.	0.05
		30%	Dolomite, brownish gray.	
2721-097	6750-6800	70%	Limestone, light brownish gray.	
		30%	Dolomite, brownish gray.	
2721-098	6850-6900	70%	Limestone, light brownish gray.	0.06
		30%	Dolomite, brownish gray.	
2721-099	6850-6900	70%	Limestone, light brownish gray.	
		30%	Dolomite, brownish gray.	
2721-100	6900-6950	70%	Limestone, light brownish gray.	0.05
		30%	Dolomite, brownish gray.	
2721-101	6950-7000	60%	Siltstone, slightly silicified, light gray.	
		40%	Limestone, light brownish gray.	
2721-102	7000-7050		Igneous rock. No sample picked.	
2721-103	7050-7100		Igneous rock. No sample picked.	

T.O.C. = Total organic carbon, wt.%
S1 = Free hydrocarbons, mg HC/g of rock
S2 = Residual hydrocarbon potential potential(mg HC/g of rock)
S3 = CO2 produced from kerogen pyrolysis (mg CO2/g of rock)
PC* = 0.083 (S1 + S2)
Hydrogen Index = mg HC/g organic carbon
Oxygen Index = mg CO2/g organic carbon
PI = S1/S1 + S2
Tmax = Temperature Index, degrees C

Table IV

RESULTS OF ROCK-EVAL PYROLYSIS

GeoChem Sample No.	Depth Interval (Ft.)	Tmax (C)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PI	PC*	T.O.C. (wt.%)	Hydrogen Index	Oxygen Index
2721-001	2250-2300	417	0.02	0.05	0.14	0.33	0.00	0.12	41	116
2721-008	2600-2650	329	0.01	0.02	0.13	0.50	0.00	0.04	50	325
2721-028	3300-3350	350	0.00	0.05	0.11	0.00	0.00	0.16	31	68
2721-036	3700-3750	264	0.01	0.02	0.08	0.50	0.00	0.26	7	30
2721-050	4400-4450	277	0.02	0.05	0.12	0.33	0.00	0.18	27	66
2721-056	4700-4750	265	0.01	0.00	0.11	0.01	0.00	0.23	0	47
2721-062	5000-5050	256	0.00	0.00	0.22	0.00	0.00	0.10	0	220
2721-072	5500-5550	444	0.04	0.01	0.22	1.00	0.00	0.04	25	550
2721-078	5700-5750	353	0.02	0.02	0.31	0.50	0.00	0.06	33	516
2721-082	6000-6050	227	0.02	0.02	0.30	0.50	0.00	0.09	22	333
2721-084	6100-6150	346	0.04	0.03	0.35	0.67	0.00	0.09	33	388
2721-090	6400-6450	296	0.02	0.05	0.23	0.33	0.00	0.09	55	255
2721-094	6600-6650	444	0.01	0.00	0.30	0.01	0.00	0.07	0	428
2721-096	6700-6750	223	0.01	0.00	0.26	0.01	0.00	0.05	0	520
2721-100	6900-6950	272	0.02	0.01	0.22	1.00	0.00	0.05	20	440

Table V

VISUAL KEROGEN ASSESSMENT WORKSHEET

Bisbee Hills Unit #1

GEOCHEM No.	DEPTH	INDIGENOUS POPULATION (INTERPRETED) TYPE OF ORGANIC MATTER	INDIGENOUS POPULATION (INTERPRETED) MATURATION INDEX	REMARKS	GENERAL CHARACTERISTICS COLOR OF ORGANIC MATTER	GENERAL CHARACTERISTICS STATE OF ORGANIC MATTER	%	CAVED AND/OR REWORKED POPULATION(S) TYPE OF ORGANIC MATTER	CAVED AND/OR REWORKED POPULATION(S) MATURATION INDEX	REMARKS	SUMMARY ORGANIC MATTER TYPE	
2721-001	2300		?	W;-;H							W;-;H	
2721-003	2400			W;-;-							W;-;-	
2721-008	2650			indeterminate						No kerogen	float	
2721-014	2950		?	H;-;-							H;-;-	VLOM
2721-026	3250			W;H;-							W;H;-	
2721-032	3550			W;-;H							W;-;H	
2721-038	3850			W;H;-							W;H;-	
2721-044	4150			W;-;H							W;-;H	
2721-050	4450			W;H;-							W;H;-	
2721-056	4750			W;-;H							W;-;H	
2721-062	5050			Am;-;-							Am;-;-	
2721-068	5350			Am;-;-							Am;-;-	VLOM
2721-074	5650			Am;-;-							Am;-;-	
2721-080	5950			Am(Al);-;-							Am(Al);-;-	
2721-082	6050			Am;-;-							Am;-;-	pyrite
2721-088	6350			Am(Al);-;-							Am(Al);-;-	
2721-096	6750			Am;-;-							Am;-;-	
2721-100	6950		?	sparse inertinite							indeterminate	VLOM

In samples -001 to -056, the woody material (W) includes a mixture of dark brown to black wood and inertinite.

VLOM = very little organic material

= drilling mud sourced organic contaminants

VITRINITE REFLECTANCE SUMMARY

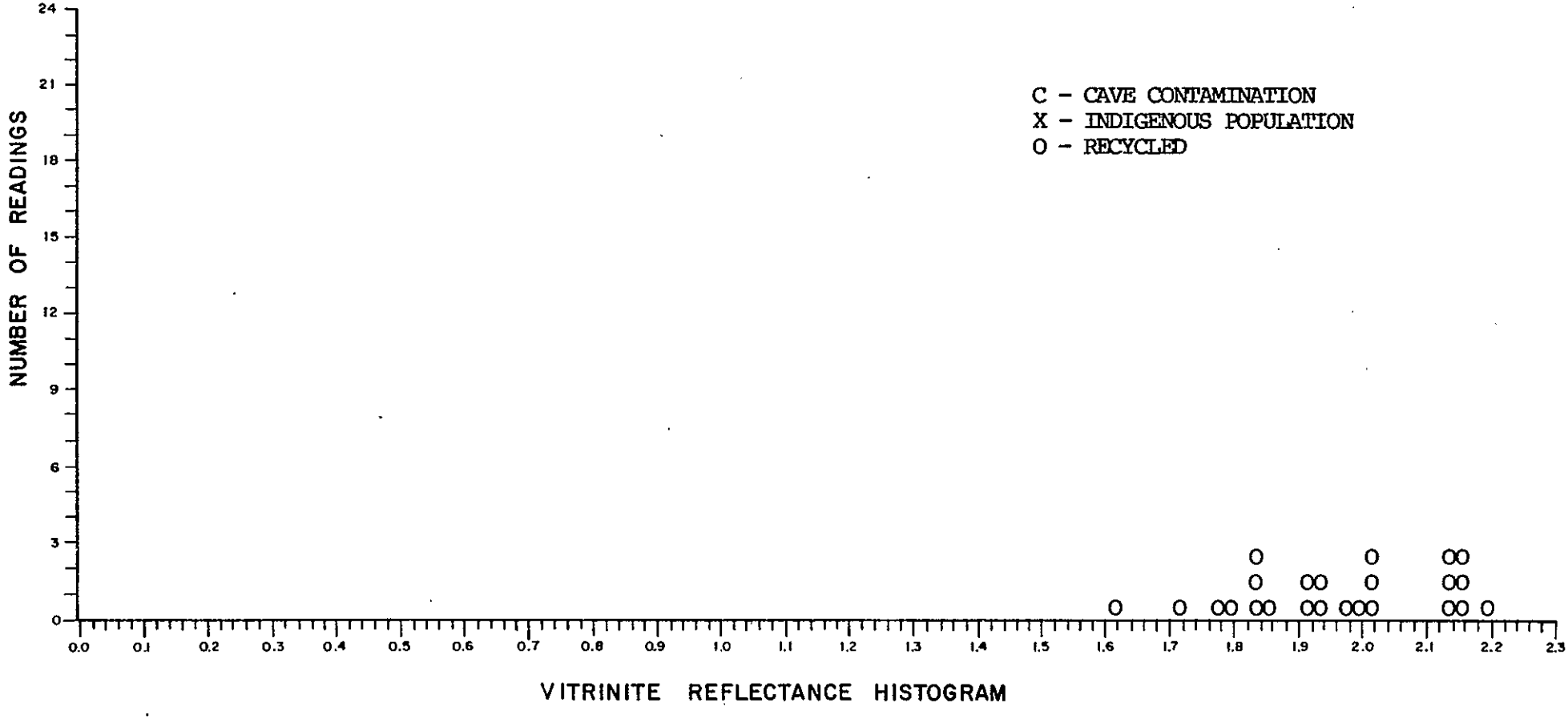
GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE (% Ro)	MAXIMUM REFLECTANCE (% Ro)	MEAN REFLECTANCE (% Ro)	STD. DEV. (% Ro)	REMARKS
2721-001	2300	CTG	(1)	24	1.63	2.20	1.97	0.159	REWORKED
2721-008	2650	CTG	NO VITRINITE						
2721-014	2950	CTG	INSUFFICIENT KEROGEN FLOAT						
2721-032	3550	CTG	INSUFFICIENT KEROGEN FLOAT						
2721-044	4150	CTG	(1)	1	1.17	1.17	1.17	-	INDIGENOUS
			(2)	8	1.82	2.22	2.00	0.133	REWORKED
2721-056	4750	CTG	(1)	3	1.99	2.09	2.04	0.050	REWORKED
2721-068	5350	CTG	NO VITRINITE						

GEOCHEM NO. 2721-001 TYPE OF SAMPLE: CTG DEPTH / SAMPLE NO. 2300

CLIENT'S NAME MARSHALL YOUNG OIL COMPANY WELL NAME BISBEE HILLS UNIT #1

(NO. OF READINGS = 24) 1.63 1.72 1.78 1.81 1.84 1.85 1.85 1.86 1.92 1.93 1.94 1.95 1.98 2.01
2.02 2.03 2.03 2.14 2.15 2.15 2.17 2.17 2.17 2.20

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	24	1.63	2.20	1.97	0.159	



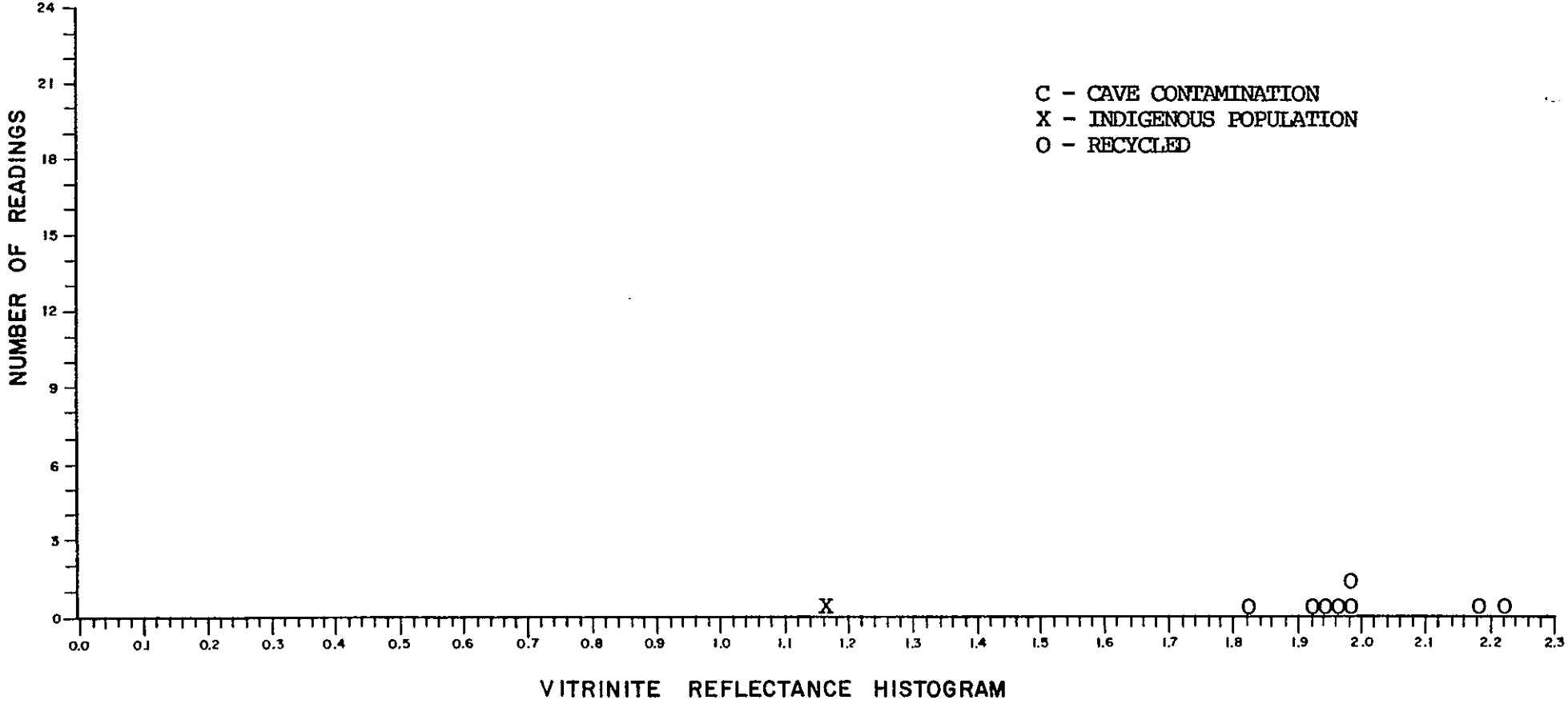
The material in this sample resembles inertinite in texture but was measured because there was no clearly definable vitrinite present.

GEOCHEM NO. 2721-044 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 4150

CLIENT'S NAME MARSHALL YOUNG OIL COMPANY WELL NAME BISBEE HILLS UNIT #1

(NO. OF READINGS = 9) 1.17 1.82 1.92 1.95 1.96 1.98 1.98 2.18 2.22

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	1	1.17	1.17	1.17	-	
(2)	8	1.82	2.22	2.00	0.133	



VITRINITE REFLECTANCE HISTOGRAM

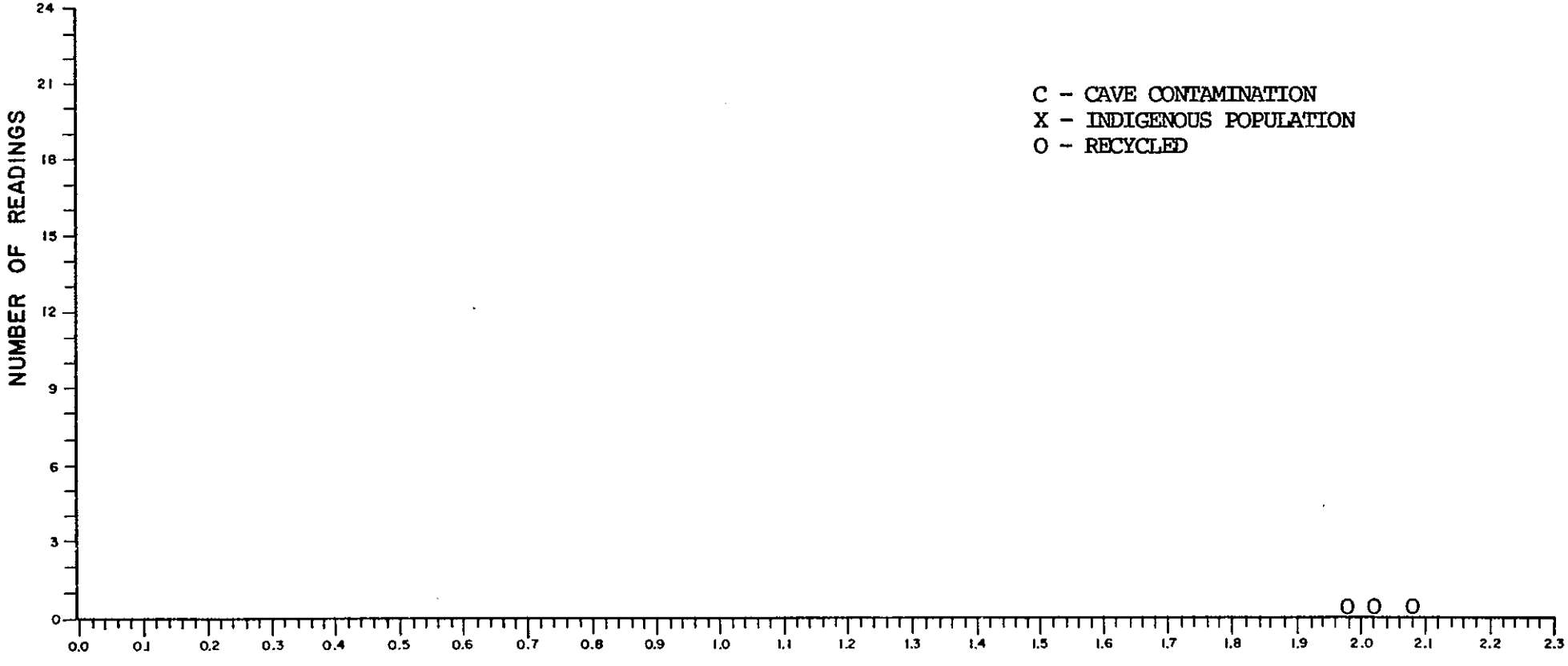
The material in the second population may be inertinite.

GEOCHEM NO. 2721-056 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 4750

CLIENT'S NAME MARSHALL YOUNG OIL COMPANY WELL NAME BISBEE HILLS UNIT #1

(NO. OF READINGS = 3) 1.99 2.03 2.09

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	3	1.99	2.09	2.04	0.050	



The material in this sample may be inertinite.

APPENDIX A

BISBEE HILLS UNIT NO. 1

Prepared

for

MARSHALL R. YOUNG OIL COMPANY

CONFIDENTIAL

October, 1983

MARSHALL R. YOUNG OIL COMPANY

BISBEE HILLS UNIT NO. 1

SYSTEMATIC COMPUTERIZED INTERPRETATION

Prepared

for

Clayton Valder

of

MARSHALL R. YOUNG OIL COMPANY

Fort Worth, Texas

by

GEOCHEM LABORATORIES, INC.
1143-C Brittmoore Road
Houston, Texas 77043

Job No.: 2721
Date: October 27, 1983
Reporting: Douglas A. Muckelroy

TABLE OF CONTENTS

APPENDIX A

INTRODUCTION

The systematic evaluative portion of this report on the Marshall R. Young Oil Company Bisbee Hills Unit No. 1 Well is composed of two sections as described below:

SECTION I - Computerized Geochemical Interpretations

A. A computerized formation-by-formation* interpretation is presented using selected geochemical data that are available on all samples. The geochemical interpretation of each formation uses the following geochemical information from samples within a given formation:

(1) sample lithology

(2) thermal maturity (TAI)

(3) total organic carbon content (TOC)

(4) volatile hydrocarbon (S_1 peak)

(5) kerogen type

The formation interpretations are computed for a shale source, a carbonate source, and a sand/silt nonsource when present. The formation interpretation section is comprised of three tables:

Table I Formation Interpretation

Table II Formation Summary Interpretation

Table III Formation Summary of Geochemical Data

B. A computerized sample-by-sample interpretation is presented using selected geochemical data that are available on all samples. The geochemical interpretation of each sample uses the same geochemical information as the formation interpretation.

The sample interpretation section is composed of three tables and two figures:

Table IV Sample Interpretation

Table V Sample Summary Interpretation

Table VI Sample Summary of Geochemical Data

Figure 1 Thermal Alteration Index (TAI) Maturity Profile

Figure 2 Vitrinite Reflectance (%Ro) Maturity Profile

SECTION II- Data Plots

A. A series of large computer generated diagrams of the geochemical data plotted in well profile format is provided; reduced copies are included in Appendix A. Sample lithology and formation tops are presented in every plot. Standard diagrams are labeled as follows:

Figure 1 Summary of Organic Analyses - C_1-C_7 Hydrocarbons

Figure 2 Summary of Organic Analyses - C_4-C_7 Hydrocarbons (no data)

Figure 3 Summary of Organic Analyses - Source Character

Figure 4 C_{15+} Paraffin-Naphthene Gas Chromatograms (no data)

Figure 5 Thermal Maturity Profiles (no data)

Figure 6 Summary of Pyrolysis Analyses (Inadequate data)

Figure 7B Tissot Diagram - Hydrogen Index vs. Oxygen Index (Inadequate data)

B. Other Computer-Generated Plots

1. GEOCHEM LOG (inadequate data)

TABLE OF FORMATION TOPS

Depth (feet)	Formation (M.R.Young Tops)
100	Rhyolite Tuffs and Volcanic arrenites
1150	Rubio Peak Formation
1800	Lobo Formation?
2060	U-Bar Formation?
2410	Probable rhyolite intrusive?
2670	Hell-to-Finish Formation
5035	Fusselman Dolomite Formation
5590	Montoya Formation
5985	El Paso Formation
6930	Bliss Formation
6980	Basement
7120	Total Depth

Simplified Flow Diagram for Systematic Evaluation

STEP I/DATA INPUT

1. Sample ID
2. Depth
3. Lithology
   a. % Sandstone (Ss)
   b. % Siltstone (St)
   c. % Shale (Sh)
   d. % Carbonate (Cb)
   e. % Evaporite (E)
   f. % Coal (C)
   g. % Other (Ot)
   h. % Metamorphic (M)
4. Geochemical parameters
   a. Pyrolysis data
      1. Volatile hydrocarbon (S1)
      2. Generated hydrocarbon (S2)
      3. Temperature (°C) of S2 peak (TMAX)
   b. Total organic carbon (TOC)
   c. Kerogen type
      1. % Amorphous (Am)
      2. % Herbaceous (H)
      3. % Woody (W)
      4. % Coaly (C)
   d. Thermal maturity indicators
      1. Thermal alteration index (TAI)
      2. Vitrinite reflectance (%Ro)

Output

Formations:
Table III
Samples:
Table VI
Fig. 1
Fig. 2

STEP II/LITHOLOGY CHECK

If the sample is uninterpretable because it contains coal, mud additives, or metamorphics, a statement is printed to that effect. If a significant portion of the sample is composed of "other" lithologies, the interpretation is referred to a footnote. If the sample is composed of 60% or more of either source rocks (shale and/or carbonate) or nonsource rocks (siltstones and/or sandstones) the sample is interpreted in Step III below.

STEP III/INTERPRETATION PROCEDURES

Interpretations are based on the following parameters:

1. Lithology
2. Thermal maturity using TAI
3. Total organic carbon (TOC)
4. Volatile hydrocarbon (S1)
5. Kerogen type

If a particular sample lacks only a TAI value, a TAI value is taken from a three term moving averge curve (Figure 1). The descriptive terminology used relative to the parameter values is given below.

Output

Formations
Table I
Table II
Samples
Table IV
Table V

INTERPRETIVE DESCRIPTIVE TERMINOLOGY

Thermal Alteration Index (TAI)

Value	Descriptive Terminology
1.0 - 1.7	Immature
1.8 - 2.1	Moderately Immature
2.2 - 2.5	Moderately Mature
2.6 - 3.5	Mature
3.6 - 4.1	Very Mature
4.2 - 4.9	Severely Altered
$\geq$ 5.0	Metamorphosed

Value	Associated Hydrocarbon Type
1.3 - 1.5	Biogenic Gas
1.5 - 2.2	Biogenic Gas and Immature Oil
2.2 - 2.5	Immature Heavy Oil
2.5 - 3.2	Mature Oil
3.2 - 3.4	Mature Oil, Condensate, and Wet Gas
3.4 - 3.8	Condensate and Wet Gas
$\geq$ 3.8	Petrogenic Methane Gas

Total Organic Carbon (TOC)

Value in %	Descriptive Terminology	
	Shale	Carbonate
$\leq$ 0.12	Poor	Poor
0.13 - 0.25	Poor	Fair
0.26 - 0.50	Poor	Good
0.51 - 1.00	Fair	Very Good
1.01 - 2.00	Good	Excellent
2.01 - 4.00	Very Good	Excellent
$\geq$ 4.00	Excellent	Excellent

Volatile Hydrocarbon (S1)

Value in ppm	Descriptive Terminology
< 200	Very Poor
201 - 400	Poor
401 - 800	Fair
801 - 1600	Good
1601 - 3200	Very Good
> 3200	Excellent

Kerogen Oil/Gas Factor

$$\% \text{ Oil} = (\% \text{ Am}) + 0.6\ (\% \text{ H}) + 0.3\ (\%\text{W}) + 0.1\ (\% \text{ C})$$

$$\% \text{ Gas} = 100 - \% \text{ Oil}$$

Vitrinite Reflectance (% Ro)

Value	Descriptive Terminology
0.0 - 0.42	Immature
0.43 - 0.55	Moderately Immature
0.56 - 0.80	Moderately Mature
0.81 - 1.62	Mature
1.63 - 2.37	Very Mature
2.38 - 4.50	Severely Altered
> 4.50	Metamorphosed

Value	Associated Hydrocarbon Type
0.30 - 0.35	Biogenic Gas
0.35 - 0.60	Biogenic Gas and Immature Oil
0.60 - 0.80	Immature Heavy Oil
0.80 - 1.20	Mature Oil
1.20 - 1.50	Mature Oil, Condensate and Wet Gas
1.50 - 2.00	Condensate and Wet Gas
$\geq$ 2.00	Petrogenic Methane Gas

TABLE I

FORMATION INTERPRETATION

This table gives a formation by formation interpretation based on the following parameters:

(1) Lithology
(2) Thermal alteration index (TAI)
(3) Total organic carbon (TOC)
(4) Volatile hydrocarbon (S1)
(5) Kerogen type

If a TAI value is lacking for an otherwise interpretable sample, a TAI value is taken from a three term moving average plot of all the TAI data for this well (see Figure 1).

The kerogen type oil/gas factor expressed as a percentage should be used as a modifier to the interpretation; i.e., a high oil factor will enhance the oil quality of the sample whereas correspondingly, a high gas factor will enhance the gas ratio of the sample and diminish the oil prospectiveness.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE I
FORMATION INTERPRETATION*

GEOCHEM SAMPLE NUMBER***	DEPTH	INTERPRETATION
	100	---------- TOP OF VOLCANICS ----------
	1150	---------- TOP OF RUBIO PEAK FORM ----------
	1800	---------- TOP OF LOBO FORMATION ----------
	2060	---------- TOP OF U-BAR FORMATION ----------
04SH	2060- 2410	SHALE , MATURE NONSOURCE FOR OIL AND ASSOCIATED GAS KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 32% GAS TYPE 68%
	2410	---------- TOP OF INTRUSIVE ----------
05CB	2410- 2670	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
	2670	---------- TOP OF HTF FORMATION ----------
06SH	2670- 4902	SHALE , MATURE NONSOURCE FOR OIL AND ASSOCIATED GAS KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 39% GAS TYPE 61%
06NS	2670- 4902	SAND NONSOURCE - NO EVIDENCE OF RESERVOIRED OIL KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
	4902	---------- TOP OF HTF FORM CONG ----------
07CB	4902- 5035	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 99% GAS TYPE 1%
	5035	---------- TOP OF FUSSELMAN DOLM FORM ----------
08CB	5035- 5590	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
	5590	---------- TOP OF MONTOYA FORM ----------
09CB	5590- 5985	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 99% GAS TYPE 1%
	5985	---------- TOP OF EL PASO FORM ----------
10CB	5985- 6930	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 69% GAS TYPE 31%
	6930	---------- TOP OF BLISS SANDSTONE ----------

* Rating parameters as defined in GeoChem's Source Rock Reference Manual.
** All footnotes typed on separate sheets.
*** Sample Type: CB-Carbonate Source, SH-Shale Source, NS-Sand/Silt Non-Source.

TABLE II

FORMATION SUMMARY INTERPRETATION

This table gives a formation by formation interpretation of each parameter used in Table I. The descriptive terminology used for each parameter is listed in the introduction.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE II
FORMATION SUMMARY INTERPRETATION*

GEOCHEM SAMPLE NUMBER****	DEPTH	LITHOLOGY	THERMAL*** TAI	THERMAL*** MATURITY %RO	TOC RICHNESS	HC RICHNESS	PRODUCTIVITY INDEX	% OIL FACTOR	% GAS FACTOR
	100	TOP OF VOLCANICS							
	1150	TOP OF RUBIO PEAK FORM							
	1800	TOP OF LOBO FORMATION							
	2060	TOP OF U-BAR FORMATION							
04SH	2060- 2410	SHALE	M		POOR	VERY POOR	0.29	32	68
	2410	TOP OF INTRUSIVE							
05CB	2410- 2670	CARB	M		POOR	VERY POOR	0.33	--	--
	2670	TOP OF HTF FORMATION							
06SH	2670- 4902	SHALE	M		POOR	VERY POOR	0.23	39	61
06NS	2670- 4902	SAND	M		POOR	VERY POOR	0.33	--	--
	4902	TOP OF HTF FORM CONG							
07CB	4902- 5035	CARB	M		POOR	VERY POOR	----	99	1
	5035	TOP OF FUSSELMAN DOLM FORM							
08CB	5035- 5590	CARB	M		POOR	VERY POOR	0.80	--	--
	5590	TOP OF MONTOYA FORM							
09CB	5590- 5985	CARB	M		POOR	VERY POOR	0.50	99	1
	5985	TOP OF EL PASO FORM							
10CB	5985- 6930	CARB	M		POOR	VERY POOR	0.53	69	31
	6930	TOP OF BLISS SANDSTONE							

*Rating parameters as defined in GeoChem's Source Rock Reference Manual.
** Value taken from a 3 term running average for all values of this parameter.
*** Thermal Maturity Abbreviations: I=Immature, MI=Moderately Immature, MM=Moderately Mature, M=Mature, VM=Very Mature, SA=Severly Altered, MT=Metamorphosed.
**** Sample Type: CB-Carbonate Source, SH-Shale Source, NS-Sand/Silt Non-Source.
***** All footnotes typed on separate sheets.

TABLE III

FORMATION SUMMARY OF GEOCHEMICAL DATA

This table gives a formation by formation listing of the data used in the computerized interpretations. The information given for each formation is as follows:

(1) Sample number
(2) Depth
(3) Lithology
(4) Volatile hydrocarbon (S1, ppm)
(5) Generated hydrocarbon (S2, ppm)
(6) Maximum temperature of S2 peak
(7) Total organic carbon (TOC, %)
(8) Kerogen composition (amorphous (Am), herbaceous (H), woody (W), and coaly (C))
(9) Thermal alteration index (TAI)
(10) Vitrinite reflectance (%Ro)

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE III
FORMATION SUMMARY OF GEOCHEMICAL DATA

FORMATION NAME: VOLCANICS (100- 1150)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	NOT PRESENT IN THIS FORMATION													
SAND-SILT NON-SOURCE	NOT PRESENT IN THIS FORMATION													

FORMATION NAME: RUBIO PEAK FORM (1150- 1800)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	NOT PRESENT IN THIS FORMATION													
SAND-SILT NON-SOURCE	NOT PRESENT IN THIS FORMATION													

FORMATION NAME: LOBO FORMATION (1800- 2060)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	NOT PRESENT IN THIS FORMATION													
SAND-SILT NON-SOURCE	NOT PRESENT IN THIS FORMATION													

* Number of samples and percent occurrence in this Formation.
** Value taken from a 3 term smoothing for all values for this parameter.
*** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE III
FORMATION SUMMARY OF GEOCHEMICAL DATA

FORMATION NAME: U-BAR FORMATION (2060- 2410)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	(2/ 67)													
AVG		20.	50.	140.	417	0.10	3.2	-----	0	5	95	0	32	68
MIN		20.	50.	140.	417	0.07	3.2	-----						
MAX		20.	50.	140.	417	0.12	3.2	-----						
CARBONATE SOURCE	(1/ 33)													
AVG		-------	-------	-------	---	-----	3.2	-----	---	---	---	---	---	---
MIN		-------	-------	-------	---	-----	3.2	-----						
MAX		-------	-------	-------	---	-----	3.2	-----						

SAND-SILT NON-SOURCE NOT PRESENT IN THIS FORMATION

FORMATION NAME: INTRUSIVE (2410- 2670)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	(1/ 50)													
AVG		10.	20.	130.	329	0.04	3.1	-----	---	---	---	---	---	---
MIN		10.	20.	130.	329	0.04	3.1	-----						
MAX		10.	20.	130.	329	0.04	3.1	-----						
SAND-SILT NON-SOURCE	(1/ 50)													
AVG		-------	-------	-------	---	-----	3.1	-----	---	---	---	---	---	---
MIN		-------	-------	-------	---	-----	3.1	-----						
MAX		-------	-------	-------	---	-----	3.1	-----						

* Number of samples and percent occurrence in this Formation.
** Value taken from a 3 term smoothing for all values for this parameter.
*** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE III
FORMATION SUMMARY OF GEOCHEMICAL DATA

FORMATION NAME: HTF FORMATION (2670- 4902)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	(35/ 88)													
AVG		10.	33.	113.	297	0.12	3.2	1.17	0	29	71	0	39	61
MIN		0.	0.	110.	265	0.05	3.0	1.17						
MAX		20.	50.	120.	350	0.23	3.3	1.17						
CARBONATE SOURCE	(2/ 5)													
AVG		-------	-------	-------	---	0.07	3.2	-----	---	---	---	---	---	---
MIN		-------	-------	-------	---	0.06	3.0	-----						
MAX		-------	-------	-------	---	0.07	3.3	-----						
SAND-SILT NON-SOURCE	(3/ 8)													
AVG		10.	20.	80.	264	0.26	3.3	-----	---	---	---	---	---	---
MIN		10.	20.	80.	264	0.26	3.3	-----						
MAX		10.	20.	80.	264	0.26	3.3	-----						

FORMATION NAME: HTF FORM CONG (4902- 5035)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	(2/100)													
AVG		0.	0.	220.	256	0.11	3.3	-----	99	0	0	0	99	1
MIN		0.	0.	220.	256	0.10	3.3	-----						
MAX		0.	0.	220.	256	0.10	3.3	-----						
SAND-SILT NON-SOURCE	NOT PRESENT IN THIS FORMATION													

* Number of samples and percent occurrence in this Formation.
** Value taken from a 3 term smoothing for all values for this parameter.
*** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE III
FORMATION SUMMARY OF GEOCHEMICAL DATA

FORMATION NAME: FUSSELMAN DOLM FORM (5035- 5590)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	(11/100)													
AVG		40.	10.	220.	444	0.06	3.3	----	---	---	---	---	---	---
MIN		40.	10.	220.	444	0.04	3.3	----						
MAX		40.	10.	220.	444	0.07	3.4	----						
SAND-SILT NON-SOURCE	NOT PRESENT IN THIS FORMATION													

FORMATION NAME: MONTOYA FORM (5590- 5985)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	(8/100)													
AVG		20.	20.	310.	353	0.05	3.4	----	99	0	0	0	99	1
MIN		20.	20.	310.	353	0.04	3.4	----						
MAX		20.	20.	310.	353	0.06	3.4	----						
SAND-SILT NON-SOURCE	NOT PRESENT IN THIS FORMATION													

FORMATION NAME: EL PASO FORM (5985- 6930)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													

* Number of samples and percent occurrence in this Formation.
** Value taken from a 3 term smoothing for all values for this parameter.
*** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE III
FORMATION SUMMARY OF GEOCHEMICAL DATA

FORMATION NAME: EL PASO FORM (5985- 6930)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
CARBONATE SOURCE	(19/100)													
AVG		20.	18.	277.	301	0.07	3.4	-----	66	0	0	33	69	31
MIN		10.	0.	220.	223	0.05	3.4	-----						
MAX		40.	50.	350.	444	0.09	3.4	-----						

SAND-SILT NON-SOURCE NOT PRESENT IN THIS FORMATION

FORMATION NAME: BLISS SANDSTONE (6930- 6980)

SEDIMENT FACIES	(NO/ %)*	PYROLYSIS DATA (PPM) S1	S2	S3	TMAX	TOC	MATURITY TAI**	%RO**	KEROGEN TYPE *** %A	%H	%W	%C	%OIL FACTOR	%GAS FACTOR
SHALE SOURCE	NOT PRESENT IN THIS FORMATION													
CARBONATE SOURCE	NOT PRESENT IN THIS FORMATION													
SAND-SILT NON-SOURCE	(1/100)													
AVG		-------	-------	-------	---	-----	---	----	---	---	---	---	---	---
MIN		-------	-------	-------	---	-----	---	----						
MAX		-------	-------	-------	---	-----	---	----						

* Number of samples and percent occurrence in this Formation.
** Value taken from a 3 term smoothing for all values for this parameter.
*** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite.

TABLE IV

SAMPLE INTERPRETATION

This table gives a sample by sample interpretation based on the following parameters:

(1) Lithology
(2) Thermal alteration index (TAI)
(3) Total organic carbon (TOC)
(4) Volatile hydrocarbon (S1)
(5) Kerogen type

If a TAI value is lacking for an otherwise interpretable sample, a TAI value is taken from a three term moving average plot of all the TAI data for this well (see Figure 1).

The kerogen type oil/gas factor expressed as a percentage should be used as a modifier to the interpretation; i.e., a high oil factor will enhance the oil quality of the sample whereas correspondingly, a high gas factor will enhance the gas ratio of the sample and diminish the oil prospectiveness.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE IV
SAMPLE INTERPRETATION*

GEOCHEM SAMPLE NUMBER***	DEPTH	INTERPRETATION
	100	---------- TOP OF VOLCANICS ----------
	1150	---------- TOP OF RUBIO PEAK FORM ----------
	1800	---------- TOP OF LOBO FORMATION ----------
	2060	---------- TOP OF U-BAR FORMATION ----------
001	2250- 2300	SHALE , MATURE NONSOURCE FOR OIL AND ASSOCIATED GAS KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 33% GAS TYPE 67%
	2410	---------- TOP OF INTRUSIVE ----------
008	2600- 2650	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
	2670	---------- TOP OF HTF FORMATION ----------
028	3300- 3350	SHALE , MATURE NONSOURCE FOR OIL AND ASSOCIATED GAS KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
036	3700- 3750	SAND NONSOURCE - NO EVIDENCE OF RESERVOIRED OIL KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
050	4400- 4450	SHALE , MATURE NONSOURCE FOR OIL AND ASSOCIATED GAS KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 38% GAS TYPE 62%
056	4700- 4750	SHALE , MATURE NONSOURCE FOR OIL AND ASSOCIATED GAS KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 33% GAS TYPE 67%
	4902	---------- TOP OF HTF FORM CONG ----------
062	5000- 5050	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 99% GAS TYPE 1%
	5035	---------- TOP OF FUSSELMAN DOLM FORM ----------
072	5500- 5550	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
	5590	---------- TOP OF MONTOYA FORM ----------
078	5800- 5850	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE

* Rating parameters as defined in GeoChem's Source Rock Reference Manual.
** All footnotes typed on separate sheets.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE IV
SAMPLE INTERPRETATION*

GEOCHEM SAMPLE NUMBER***	DEPTH	INTERPRETATION
	5985	---------- TOP OF EL PASO FORM ----------
082	6000- 6050	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
084	6100- 6150	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
090	6400- 6450	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
094	6600- 6650	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR NOT AVAILABLE
096	6700- 6750	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 99% GAS TYPE 1%
100	6900- 6950	CARB , MATURE VERY POOR TO POOR OIL AND ASSOCIATED GAS SOURCE KEROGEN TYPE OIL/GAS FACTOR: OIL TYPE 10% GAS TYPE 90%
	6930	---------- TOP OF BLISS SANDSTONE ----------

* Rating parameters as defined in GeoChem's Source Rock Reference Manual.
** All footnotes typed on separate sheets.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core.

TABLE V

SAMPLE SUMMARY INTERPRETATION

This table gives a sample by sample interpretation of each parameter used in Table IV. This descriptive terminology used for each parameter is listed in the introduction.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE V
SAMPLE SUMMARY INTERPRETATION*

GEOCHEM SAMPLE NUMBER****	DEPTH	LITHOLOGY	TAI	THERMAL*** MATURITY	%RO	TOC RICHNESS	HC RICHNESS	PRODUCTIVITY INDEX	% OIL FACTOR	% GAS FACTOR
	100	---------- TOP OF VOLCANICS ----------								
	1150	---------- TOP OF RUBIO PEAK FORM ----------								
	1800	---------- TOP OF LOBO FORMATION ----------								
	2060	---------- TOP OF U-BAR FORMATION ----------								
001	2250- 2300	SHALE	M			POOR	VERY POOR	0.29	33	67
	2410	---------- TOP OF INTRUSIVE ----------								
008	2600- 2650	CARB	M	**		POOR	VERY POOR	0.33	--	--
	2670	---------- TOP OF HTF FORMATION ----------								
028	3300- 3350	SHALE	M	**		POOR	VERY POOR	0.00	--	--
036	3700- 3750	SAND	M	**		POOR	VERY POOR	0.33	--	--
050	4400- 4450	SHALE	M		M **	POOR	VERY POOR	0.29	38	62
056	4700- 4750	SHALE	M			POOR	VERY POOR	1.00	33	67
	4902	---------- TOP OF HTF FORM CONG ----------								
062	5000- 5050	CARB	M			POOR	VERY POOR	----	99	1
	5035	---------- TOP OF FUSSELMAN DOLM FORM ----------								
072	5500- 5550	CARB	M	**		POOR	VERY POOR	0.80	--	--
	5590	---------- TOP OF MONTOYA FORM ----------								
078	5800- 5850	CARB	M	**		POOR	VERY POOR	0.50	--	--
	5985	---------- TOP OF EL PASO FORM ----------								
082	6000- 6050	CARB	M	**		POOR	VERY POOR	0.50	--	--

*Rating parameters as defined in GeoChem's Source Rock Reference Manual.
** Value taken from a 3 term running average for all values of this parameter.
*** Thermal Maturity Abbreviations: I=Immature, MI=Moderately Immature, MM=Moderately Mature, M=Mature, VM=Very Mature, SA=Severly Altered, MT=Metamorphosed.
**** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core.
***** All footnotes typed on separate sheets.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE V
SAMPLE SUMMARY INTERPRETATION*

GEOCHEM SAMPLE NUMBER****	DEPTH	LITHOLOGY	THERMAL*** TAI	THERMAL*** MATURITY	THERMAL*** %RO	TOC RICHNESS	HC RICHNESS	PRODUCTIVITY INDEX	% OIL FACTOR	% GAS FACTOR
084	6100- 6150	CARB	M **			POOR	VERY POOR	0.57	--	--
090	6400- 6450	CARB	M **			POOR	VERY POOR	0.29	--	--
094	6600- 6650	CARB	M **			POOR	VERY POOR	1.00	--	--
096	6700- 6750	CARB	M			POOR	VERY POOR	1.00	99	1
100	6900- 6950	CARB	M **			POOR	VERY POOR	0.67	10	90
	6930	---------- TOP OF BLISS SANDSTONE ----------								

*Rating parameters as defined in GeoChem's Source Rock Reference Manual.
** Value taken from a 3 term running average for all values of this parameter.
*** Thermal Maturity Abbreviations: I=Immature, MI=Moderately Immature, MM=Moderately Mature, M=Mature, VM=Very Mature, SA=Severly Altered, MT=Metamorphosed.
**** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core.
***** All footnotes typed on separate sheets.

TABLE VI

SAMPLE SUMMARY OF GEOCHEMICAL DATA

This table gives a sample by sample listing of the data used in the computerized interpretations. The information given for each formation is as follows:

(1) Sample number
(2) Depth
(3) Lithology
(4) Volatile hydrocarbon (S1, ppm)
(5) Generated hydrocarbon (S2, ppm)
(6) Maximum temperature of S2 peak
(7) Total organic carbon (TOC, %)
(8) Kerogen composition (amorphous (Am), herbaceous (H), woody (W), and coaly (C))
(9) Thermal alteration index (TAI)
(10) Vitrinite reflectance (%Ro)

The TAI and %Ro values are plotted on Figures 1 and 2 respectively; values of TAI or %Ro indicated with an asterisk (*) are taken from the three term moving average plot of the respective parameter. Sample types are indicated by "blank" (cuttings), "C" (conventional core) and "S" (sidewall core). Casing points and the tops of all formations penetrated by the well are displayed on all tables with associated depths.

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE VI: SAMPLE SUMMARY OF GEOCHEMICAL DATA

GEOCHEM SAMPLE NUMBER***	DEPTH	LITHOLOGY**	PYROLYSIS DATA (PPM) TMAX	S1	S2	S3	TOC	KEROGEN TYPE**** %Am	%H	%W	%C	THERMAL MATURITY TAI	%RO
	100	TOP OF VOLCANICS											
	1150	TOP OF RUBIO PEAK FORM											
	1800	TOP OF LOBO FORMATION											
	2060	TOP OF U-BAR FORMATION											
001	2250- 2300	60Sh 30Ss 10Cb	417	20.	50.	140.	0.12	0	10	90	0	3.2	----
002	2300- 2350	60Cb 30Sh 10Ss	---	-------	-------	-------	-----	--	--	--	--	---	----
003	2350- 2400	60Sh 30Ss 10Cb	---	-------	-------	-------	0.07	0	0	99	0	3.2	----
004	2400- 2450	70Ot 20Sh 10Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
	2410	TOP OF INTRUSIVE											
005	2450- 2500	100Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
006	2500- 2550	100Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
007	2550- 2600	100Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
008	2600- 2650	100Cb	329	10.	20.	130.	0.04	--	--	--	--	(3.1)*	----
009	2650- 2700	60St 40Sh	---	-------	-------	-------	-----	--	--	--	--	---	----
	2670	TOP OF HTF FORMATION											
010	2700- 2750	60Sh 20St 20Cb	---	-------	-------	-------	0.09	--	--	--	--	---	----
011	2750- 2800	80Sh 20St	---	-------	-------	-------	-----	--	--	--	--	---	----
012	2800- 2850	100Sh	---	-------	-------	-------	0.05	--	--	--	--	---	----
013	2850- 2900	100Sh	---	-------	-------	-------	-----	--	--	--	--	---	----
014	2900- 2950	100Sh	---	-------	-------	-------	0.05	0	99	0	0	3.0	----

* Value taken from a 3 term smoothing for this parameter.
** Lithologies: Ss-Sandstone, St-Siltstone, Sh-Shale, Cb-Carbonate, E-Evaporite, C-Coal, Ot-Other.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core
**** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE VI: SAMPLE SUMMARY OF GEOCHEMICAL DATA

GEOCHEM SAMPLE NUMBER***	DEPTH	LITHOLOGY**	PYROLYSIS DATA (PPM)					KEROGEN TYPE****				THERMAL MATURITY	
			TMAX	S1	S2	S3	TOC	%Am	%H	%W	%C	TAI	%RO
015	2950- 3000	60Sh 40Ss	---	-------	-------	-------	-----	--	--	--	--	---	----
016	3000- 3050	70Cb 30Sh	---	-------	-------	-------	0.06	--	--	--	--	---	----
017	3050- 3100	60Sh 40Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
018	3100- 3150	60Sh 40Cb	---	-------	-------	-------	0.09	--	--	--	--	---	----
025	3150- 3200	60Sh 40Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
026	3200- 3250	100Sh	---	-------	-------	-------	0.09	0	25	75	0	3.1	----
027	3250- 3300	80Sh 20Ss	---	-------	-------	-------	-----	--	--	--	--	---	----
028	3300- 3350	100Sh	350	0.	50.	110.	0.16	--	--	--	--	(3.1)*	----
029	3350- 3400	80Sh 20Ss	---	-------	-------	-------	-----	--	--	--	--	---	----
030	3400- 3450	80Sh 20Ss	---	-------	-------	-------	0.12	--	--	--	--	---	----
031	3450- 3500	60Sh 40Ss	---	-------	-------	-------	-----	--	--	--	--	---	----
032	3500- 3550	100Sh	---	-------	-------	-------	0.11	0	10	90	0	3.3	----
033	3550- 3600	60Ot 40Sh	---	-------	-------	-------	-----	--	--	--	--	---	----
034	3600- 3650	100Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
035	3650- 3700	100Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
036	3700- 3750	60Ss 40Sh	264	10.	20.	80.	0.26	--	--	--	--	(3.3)*	----
037	3750- 3800	60Ss 40Sh	---	-------	-------	-------	-----	--	--	--	--	---	----
038	3800- 3850	60Sh 40Ss	---	-------	-------	-------	0.11	0	25	75	0	3.3	----
039	3850- 3900	60Sh 40Ss	---	-------	-------	-------	-----	--	--	--	--	---	----
040	3900- 3950	60Sh 40Ss	---	-------	-------	-------	0.09	--	--	--	--	---	----

* Value taken from a 3 term smoothing for this parameter.
** Lithologies: Ss-Sandstone, St-Siltstone, Sh-Shale, Cb-Carbonate, E-Evaporite, C-Coal, Ot-Other.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core
**** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE VI: SAMPLE SUMMARY OF GEOCHEMICAL DATA

GEOCHEM SAMPLE NUMBER***	DEPTH	LITHOLOGY**			PYROLYSIS DATA (PPM) TMAX	S1	S2	S3	TOC	KEROGEN TYPE**** %Am	%H	%W	%C	THERMAL MATURITY TAI	%RO
041	3950- 4000	60Ss	40Sh		---	-------	-------	-------	-----	--	--	--	--	---	----
042	4000- 4050	60Sh	40Ss		---	-------	-------	-------	0.08	--	--	--	--	---	----
043	4050- 4100	60Sh	40Ss		---	-------	-------	-------	-----	--	--	--	--	---	----
044	4100- 4150	100Sh			---	-------	-------	-------	0.09	0	10	90	0	3.3	1.17
045	4150- 4200	70Sh	30Ss		---	-------	-------	-------	-----	--	--	--	--	---	----
046	4200- 4250	60Sh	40Ss		---	-------	-------	-------	0.11	--	--	--	--	---	----
047	4250- 4300	60Sh	40Ot		---	-------	-------	-------	-----	--	--	--	--	---	----
048	4300- 4350	70Sh	30Ss		---	-------	-------	-------	0.10	--	--	--	--	---	----
049	4350- 4400	70Ot	30Sh		---	-------	-------	-------	-----	--	--	--	--	---	----
050	4400- 4450	60Sh	30Ss	10Cb	277	20.	50.	120.	0.18	0	25	75	0	3.3	(1.17)*
051	4450- 4500	50Sh	20Ss	20Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
		10Cb													
052	4500- 4550	60Sh	30Ss	10Cb	---	-------	-------	-------	0.16	--	--	--	--	---	----
053	4550- 4600	50Sh	40Ss	10Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
054	4600- 4650	60Sh	40Ss		---	-------	-------	-------	0.12	--	--	--	--	---	----
055	4650- 4700	60Sh	40Ss		---	-------	-------	-------	-----	--	--	--	--	---	----
056	4700- 4750	60Sh	40Ss		265	10.	0.	110.	0.23	0	11	89	0	3.3	----
057	4750- 4800	60Sh	40Ss		---	-------	-------	-------	-----	--	--	--	--	---	----
058	4800- 4850	100Sh			---	-------	-------	-------	0.17	--	--	--	--	---	----
059	4850- 4900	60Sh	40Ss		---	-------	-------	-------	-----	--	--	--	--	---	----

* Value taken from a 3 term smoothing for this parameter.
** Lithologies: Ss-Sandstone, St-Siltstone, Sh-Shale, Cb-Carbonate, E-Evaporite, C-Coal, Ot-Other.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core
**** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE VI: SAMPLE SUMMARY OF GEOCHEMICAL DATA

GEOCHEM SAMPLE NUMBER***	DEPTH	LITHOLOGY**	PYROLYSIS DATA (PPM) TMAX	S1	S2	S3	TOC	KEROGEN TYPE**** %Am	%H	%W	%C	THERMAL MATURITY TAI	%RO
060	4900- 4947	100Cb	---	--------	--------	--------	0.07	--	--	--	--	---	----
	4902	---------- TOP OF HTF FORM CONG ----------											
061	4947- 5000	70Cb 30Sh	---	--------	--------	--------	-----	--	--	--	--	---	----
062	5000- 5050	100Cb	256	0.	0.	220.	0.10	99	0	0	0	3.3	----
	5035	---------- TOP OF FUSSELMAN DOLM FORM ----------											
063	5050- 5100	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
064	5100- 5150	100Cb	---	--------	--------	--------	0.07	--	--	--	--	---	----
065	5150- 5200	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
066	5200- 5250	100Cb	---	--------	--------	--------	0.06	--	--	--	--	---	----
067	5250- 5300	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
068	5300- 5350	100Cb	---	--------	--------	--------	0.06	--	--	--	--	---	----
069	5350- 5400	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
070	5400- 5450	100Cb	---	--------	--------	--------	0.04	--	--	--	--	---	----
071	5450- 5500	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
072	5500- 5550	100Cb	444	40.	10.	220.	0.04	--	--	--	--	(3.4)*	----
073	5550- 5600	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
	5590	---------- TOP OF MONTOYA FORM ----------											
074	5600- 5650	100Cb	---	--------	--------	--------	0.04	99	0	0	0	3.4	----
075	5650- 5700	100Cb	---	--------	--------	--------	-----	--	--	--	--	---	----
076	5700- 5750	100Cb	---	--------	--------	--------	0.06	--	--	--	--	---	----

* Value taken from a 3 term smoothing for this parameter.
** Lithologies: Ss-Sandstone, St-Siltstone, Sh-Shale, Cb-Carbonate, E-Evaporite, C-Coal, Ot-Other.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core
**** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE VI: SAMPLE SUMMARY OF GEOCHEMICAL DATA

GEOCHEM SAMPLE NUMBER***	DEPTH	LITHOLOGY**	PYROLYSIS DATA (PPM) TMAX	S1	S2	S3	TOC	KEROGEN TYPE**** %Am	%H	%W	%C	THERMAL MATURITY TAI	%RO
077	5750- 5800	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
078	5800- 5850	100Cb	353	20.	20.	310.	0.04	--	--	--	--	(3.4)*	----
079	5850- 5900	60Cb 40Ot	---	-------	-------	-------	-----	--	--	--	--	---	----
080	5900- 5950	70Cb 30Ot	---	-------	-------	-------	0.06	99	0	0	0	3.4	----
081	5950- 6000	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
	5985	---------- TOP OF EL PASO FORM ----------											
082	6000- 6050	100Cb	227	20.	20.	300.	0.09	--	--	--	--	(3.4)*	----
083	6050- 6100	80Cb 20Sh	---	-------	-------	-------	-----	--	--	--	--	---	----
084	6100- 6150	100Cb	346	40.	30.	350.	0.09	--	--	--	--	(3.4)*	----
085	6150- 6200	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
086	6200- 6250	100Cb	---	-------	-------	-------	0.07	--	--	--	--	---	----
087	6250- 6300	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
088	6300- 6350	100Cb	---	-------	-------	-------	0.05	99	0	0	0	3.4	----
089	6350- 6400	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
090	6400- 6450	100Cb	296	20.	50.	230.	0.09	--	--	--	--	(3.4)*	----
091	6450- 6500	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
092	6500- 6550	100Cb	---	-------	-------	-------	0.08	--	--	--	--	---	----
093	6550- 6600	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
094	6600- 6650	100Cb	444	10.	0.	300.	0.07	--	--	--	--	(3.4)*	----
095	6650- 6700	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----

* Value taken from a 3 term smoothing for this parameter.
** Lithologies: Ss-Sandstone, St-Siltstone, Sh-Shale, Cb-Carbonate, E-Evaporite, C-Coal, Ot-Other.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core
**** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

TABLE VI: SAMPLE SUMMARY OF GEOCHEMICAL DATA

GEOCHEM SAMPLE NUMBER***	DEPTH	LITHOLOGY**	PYROLYSIS DATA (PPM) TMAX	S1	S2	S3	TOC	KEROGEN TYPE**** %Am	%H	%W	%C	THERMAL MATURITY TAI	%RO
096	6700- 6750	100Cb	223	10.	0.	260.	0.05	99	0	0	0	3.4	----
097	6750- 6800	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
098	6800- 6850	100Cb	---	-------	-------	-------	0.06	--	--	--	--	---	----
099	6850- 6900	100Cb	---	-------	-------	-------	-----	--	--	--	--	---	----
100	6900- 6950	100Cb	272	20.	10.	220.	0.05	0	0	0	99	(3.4)*	----
	6930	---------- TOP OF BLISS SANDSTONE ----------											
101	6950- 7000	60St 40Cb	---	-------	-------	-------	-----	--	--	--	--	---	----

* Value taken from a 3 term smoothing for this parameter.
** Lithologies: Ss-Sandstone, St-Siltstone, Sh-Shale, Cb-Carbonate, E-Evaporite, C-Coal, Ot-Other.
*** Sample Type: Blank-Cuttings, C-Core, S-Sidewall Core
**** Kerogen Type: Am-Amorphous-Sapropel, H-Herbaceous, W-Woody, C-Coaly/Inertinite

FIGURE 1

THERMAL MATURITY PROFILE

USING THE THERMAL ALTERATION INDEX (TAI)

This figure displays a thermal maturity profile for the well using the thermal alteration index (TAI). The raw data plot displays the TAI values of individual samples plotted versus depth (150 foot intervals). Within a particular interval an "A" indicates one TAI values and a "B" indicates two TAI determinations of the same value, etc. The "AVG" gives the average TAI value for that interval.

The three term moving average plot displays a TAI profile smoothed by a three term moving average. The "AVG" gives the average for the particular interval. When a sample lacks a TAI value for interpretation, a TAI value is taken from this smoothed curve for that sample depth.

The descriptive terminology used to define thermal maturity, the associated hydrocarbon type, and the numerical values of TAI corresponding to this terminology is given below.

TAI Value	Descriptive Terminology
1.0 - 1.7	Immature (I)
1.8 - 2.1	Moderately Immature (MI)
2.2 - 2.5	Moderately Mature (MM)
2.6 - 3.5	Mature (M)
3.6 - 4.1	Very Mature (VM)
4.2 - 4.9	Severely Altered (SA)
$\geq$ 5.0	Metamorphosed

TAI Value	Associated Hydrocarbon Type
1.3 - 1.5	Biogenic Gas
1.5 - 2.2	Biogenic Gas and Immature Oil
2.2 - 2.5	Immature Heavy Oil
2.5 - 3.2	Mature Oil
3.2 - 3.4	Mature Oil, Condensate and Wet Gas
$\geq$ 3.8	Petrogenic Methane Gas

Tops are shown by a dashed line (---) and the names are indicated along the right hand margin. The exact depth of the tops are given in the Introduction. Total well depth is indicated and labeled with appropriate depth.

FIGURE 1: TAI MATURITY PROFILE

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

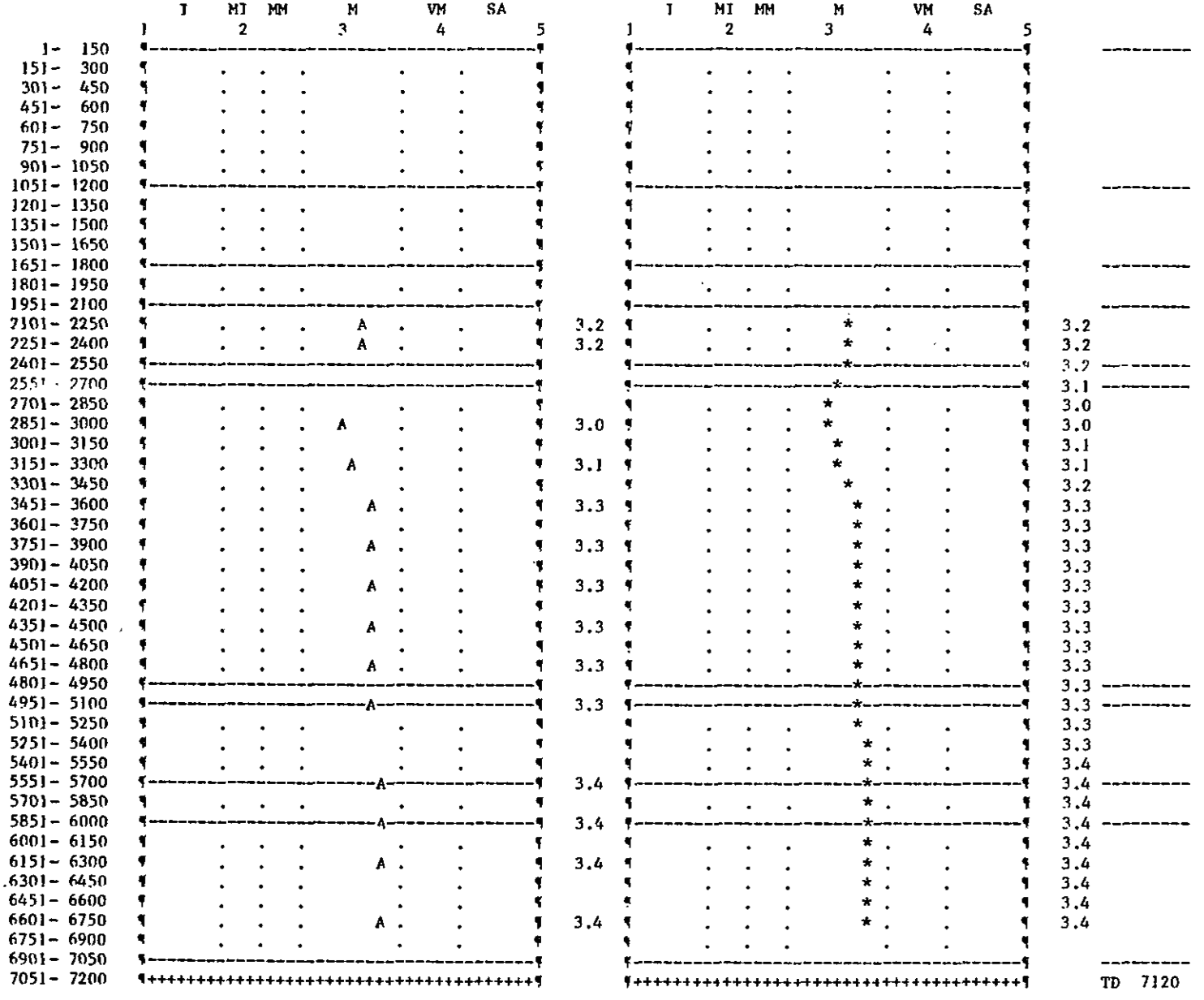


FIGURE 2

THERMAL MATURITY PROFILE

USING VITRINITE REFLECTANCE

This figure displays a thermal maturity profile for the well using vitrinite reflectance (%Ro). The raw data plot displays the %Ro values of individual samples plotted versus depth (150 foot intervals). Within a particular interval an "A" indicates one %Ro value, a "B" indicates two %Ro determinations of the same value, etc. The "AVG" gives the average %Ro value for that interval.

The three term moving average plot displays a %Ro profile smoothed by a three term moving average. The "AVG" gives the average for the particular interval.

The descriptive terminology used to define thermal maturity, the associated hydrocarbon type, and the numerical values of %Ro corresponding to this terminology is given below.

%Ro Value	Descriptive Terminology	%Ro Value	Associated Hydrocarbon Type
0.0 - 0.42	Immature (I)	0.30 - 0.35	Biogenic Gas
0.43 - 0.55	Moderately Immature (MI)	0.35 - 0.60	Biogenic Gas and Immature Oil
0.56 - 0.80	Moderately Mature (MM)		
0.81 - 1.62	Mature (M)	0.60 - 0.80	Immature Heavy Oil
1.63 - 2.37	Very Mature (VM)	0.80 - 1.20	Mature Oil
2.38 - 4.50	Severely Altered (SA)	1.20 - 1.50	Mature Oil, Condensate and Wet Gas
> 4.50	Metamorphosed	1.50 - 2.00	Condensate and Wet Gas
		≥ 2.00	Petrogenic Methane Gas

Moderately immature and moderately mature are plotted together on the profile under MM.

Tops are shown by a dashed line (---) with the names indicated. The exact depth of the tops are given in the Introduction. Total well depth is indicated and labeled with appropriate depth.

FIGURE 2: %RO MATURITY PROFILE

JOB NUMBER: 2721
WELL NAME: BISBEE HILLS #1

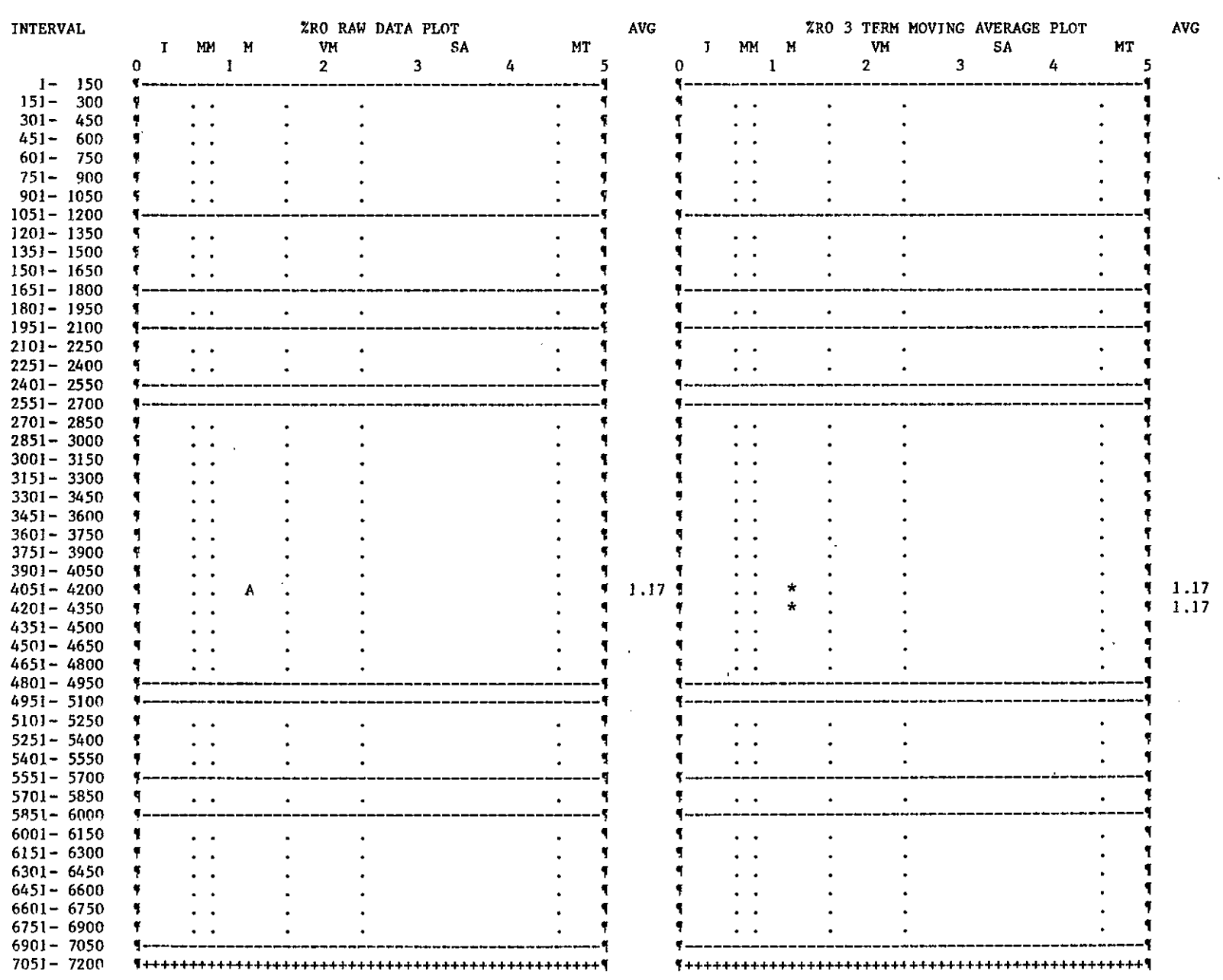


FIGURE 1

SUMMARY OF ORGANIC ANALYSES

C1-C7 HYDROCARBON

JOB NO:
2721
WELL NAME:
BISBEE HILLS #1

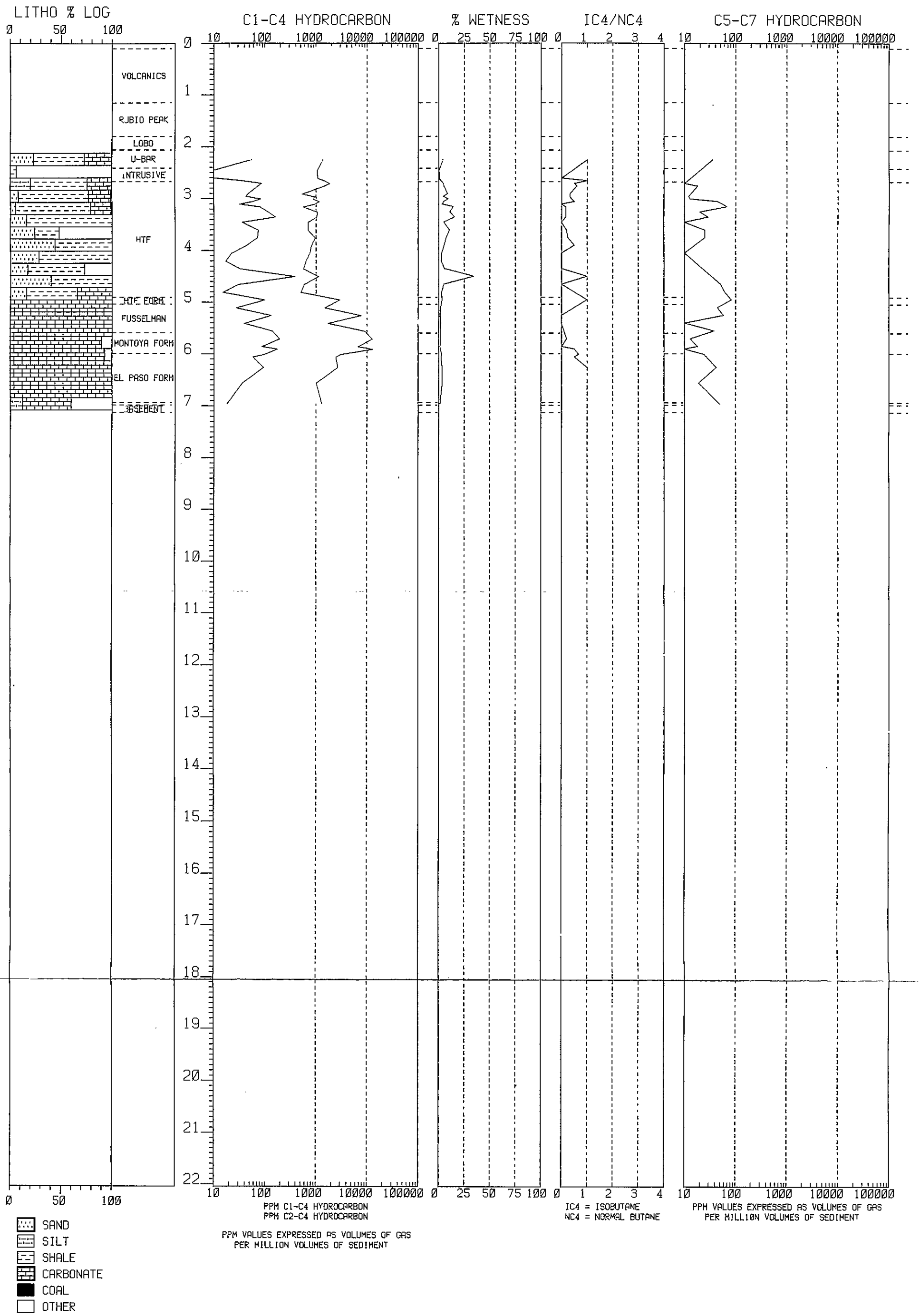


FIGURE 3
SUMMARY OF ORGANIC ANALYSES

JOB NO:
2721
WELL NAME:
BISBEE HILLS #1

SOURCE CHARACTER

VISUAL KEROGEN

LITHO % LOG

ORGANIC CARBON

C15+ EXTRACTION DATA

PN/AROM

ASPH/NSO

MATURATION
TAI INDEX

% KEROGEN

VOLCANICS
RUBIO PEAK
LOBO
U-BAR
INTRUSIVE
HTF
HTF FORM
FUSSELMAN
MONTOYA FORM
EL PASO FORM
BASEMENT

VALUES AS WT. PER CENT

PN AROM NON HC

TOTAL C15+ EXTRACT
PPM VALUES ON WEIGHT/WEIGHT BASIS

SAND
SILT
SHALE
CARBONATE
COAL
OTHER

KEROGEN KEY
AMORPHOUS
HERBACEOUS
WOODY
COALY

FIGURE 6

SUMMARY OF PYROLYSIS ANALYSES

JOB NO:
2721
WELL NAME:
BISBEE HILLS #1

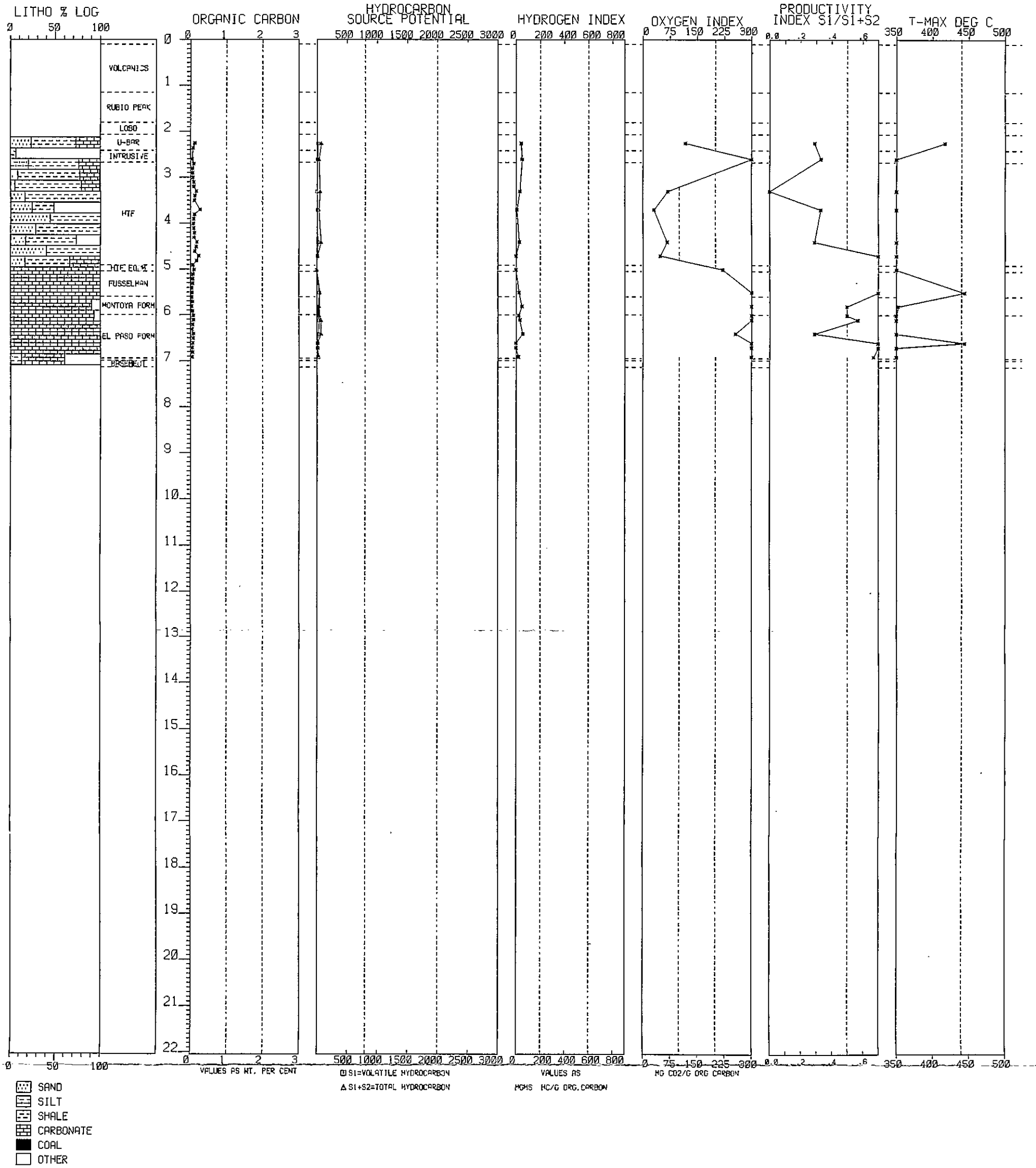
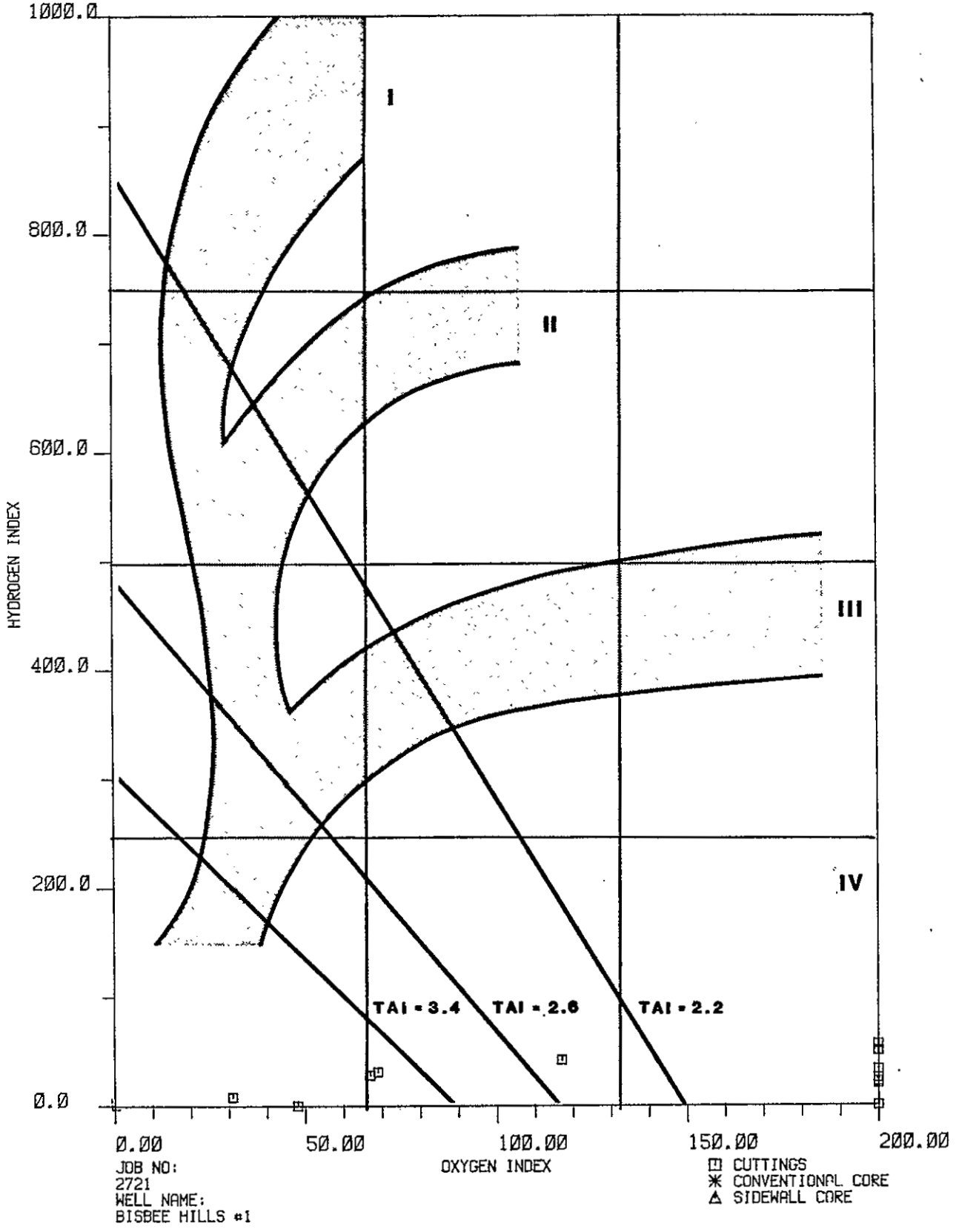


FIGURE 7B OXYGEN INDEX VS HYDROGEN INDEX

(TISSOT DIAGRAM)



APPENDIX

Brief Description of Organic Geochemical analyses Carried Out by GeoChem

C_1-C_7 Hydrocarbon

The C_1-C_7 hydrocarbon content and composition of sediments reflects source type, source quality and thermal maturity.

The C_1-C_7 hydrocarbon content of well cuttings is determined by analyzing both a sample of the cuttings and the air space at the top of the can. The results of the two analyses are summed to give an inventory of the C_1-C_7 hydrocarbon content of the well cuttings prior to any losses from the cuttings during the lapsed time period between collection at the wellsite and laboratory analysis.

The air space C_1-C_7 hydrocarbon analysis involves taking a measured volume of the air space gas out of the can with a syringe and injecting same into a gas chromatograph. GeoChem uses a Varian Aerograph Model 1400 instrument equipped with a Porapec Q column. The gas sample is taken through the column by a carrier gas and before reaching the detector is separated into its various C_1 (methane), C_2 (ethane), C_3 (propane), iC_4 (isobutane), nC_4 (normal butane), and C_5, C_6, C_7 hydrocarbon components.

This particular analysis gives a complete separation of the C_1-C_4 gas-range hydrocarbons and a partial separation of the C_5-C_7 gasoline-range hydrocarbons. (A detailed C_4-C_7 analysis, to be discussed later, involving a capillary column, effects a complete separation of this molecular range into its several individual molecular species.)

The electrical response of the various hydrocarbons as they reach the detector is recorded on a paper strip chart as a peak. This response is simultaneously fed to an integrator which computes the area of each peak. The concentration of C_1-C_7 hydrocarbons in the air space, expressed as volumes of gas per million volumes of cuttings, is determined by a calculation involving the volume of cuttings, volume of air space in the can, volume of sample injected, volume of standard gas sample used in the calibration, calibration factor for C_1, C_2, C_3, etc. determined by gc analysis of a standard gas sample, and the gc peak response.

The C_1-C_7 hydrocarbon content of the cuttings is determined by degasification of a measured volume of cuttings (in a medium of a measured volume of water) in a closed blender, sampling of the air space at the top of the blender, and injection of a measured volume of gas into the gas chromatograph.

The C_1-C_7 hydrocarbon data from the air space and cuttings gas analyses are summed to give a "restored" C_1-C_7 hydrocarbon content of the cuttings.

Sample Washing and Hand-Picking of Uncaved Lithology Samples

The cuttings samples are washed to remove all drilling mud from the cuttings. Care is taken in the washing procedure not to remove any soft clays, claystones, etc. and any loose fine sand and silt. The washed cuttings are usually kept under water cover until picked, to prevent loss of any gasoline-range hydrocarbons. Using the C_1-C_7 hydrocarbon data profile and the electrical well log supplied to us and our visual examination of the cuttings material under the binocular microscope, we carefully hand-pick and describe a suite of uncaved lithologies representative of the various stratigraphic zones penetrated by the well. The lithological data is used to compile a gross litho percentage log which is shown on all Figures. The 2-4 gram picked lithology samples are stored under water in small glass vials in those instances where we wish to run detailed C_4-C_7 hydrocarbon analyses. This sample set is used not only for the C_4-C_7 hydrocarbon analysis, but also for the visual kerogen and total organic carbon analyses. All remaining cuttings material is dried and packaged in labelled plastic bags for possible C_{15+} soxhlet extraction and/or eventual return to the client. Sample material from this study will be retained at GeoChem until advised of disposition.

Detailed C_4-C_7 Hydrocarbon

The C_4-C_7 gasoline-range hydrocarbon content of sediments reflects source quality, thermal maturation and organic facies. Compositional data can be used in crude oil-parent rock correlation work.

The C_4-C_7 hydrocarbon content and detailed molecular composition of hydrocarbon, in hand-picked lithologies, is determined by a gc analysis of the light hydrocarbon extracted from 1-2 gram cuttings samples macerated in a microblender. A measured volume of sample is placed in a sealed microblender along with a measured volume of hot water. The rock sample is pulverized by the blades of the blender. A sample of the liberated light hydrocarbons which collect in the air space at the top of the blender is injected into our Varian Aerograph 1400 gc unit which is equipped with a capillary column. Data recording, computations, etc. are comparable to those used for the C_1-C_7 analysis discussed previously in this report. Hydrocarbon concentration is expressed as volume gas per million volumes of cuttings.

Organic Carbon

The total organic carbon content of a rock is a measure of its total organic richness. This data is used, in conjunction with visual kerogen and C_1-C_4, C_4-C_7 and C_{15+} hydrocarbon content of a rock, to indicate the hydrocarbon source quality of rocks.

The procedure for determining the total organic carbon content of a rock involves drying the sample, grinding to a powder, weighing out 0.2729 gram sample into a crucible, acidizing with hot and cold hydrochloric acid to remove calcium and magnesium carbonate, and carbon analysis by combustion in a Leco carbon analyzer.

We run several blank crucibles, standards (iron rings of known carbon content) and duplicate rock samples in this analysis at no additional charge to the client for purposes of data quality control.

C_{15+} Soxhlet Extraction, Deasphaltening and Chromatographic Separation

The amount and composition of the organic matter which can be solvent-extracted from a rock reflects source quality and source type. C^{13}/C^{12} carbon isotopic, high mass spectrometric and gc analyses of the paraffin-naphthene and aromatic hydrocarbon fractions of the soluble extract gives data which is used in crude oil-parent rock correlations.
This analysis involves grinding of a dry rock sample to a powder and removal of the soluble organic matter by soxhlet extraction using a co-distilled toluene-methanol azeotrope solvent. Where the amount of available sample material permits, we like to use at least 100 grams of rock for this analysis.

The extracted bitumen is separated into an asphaltene (ASPH) and a pentane soluble fraction by normal pentane precipitation. The pentane soluble components are separated into a C_{15+} paraffin-naphthene (P-N) hydrocarbon, C_{15+} aromatic hydrocarbon (AROM) and C_{15+} nitrogen-sulfur-oxygen containing fraction (NSO) by adsorption chromatography on a silica gel-alumina column using pentane, toluene and toluene-methanol azeotrope eluants.

GC Analysis of C_{15+} Paraffin-Naphthene (P-N) Hydrocarbons

The content and molecular composition of the heavy C_{15+} paraffin-naphthene (P-N) hydrocarbons of rocks, as determined by gc analysis, reflects source quality, source type and degree of thermal maturation.

In this analysis, we subject a very small fraction of the total amount of the P-N fraction extracted from a rock sample to gc analysis. The gas chromatograph is a Varian Aerograph Model 1400 equipped with a solid rod injection system and a eutectic column.

The calculated C.P.I. (carbon preference index) values for the normal paraffin data is defined as the mean of two ratios which are determined by dividing the sum of concentrations of odd-carbon numbered n-paraffins by the sum of even-carbon numbered n-paraffins. The C.P. Indices A and B were obtained by the formulas:

$$\text{C.P. Index A} = \frac{\frac{C_{21}+C_{23}+C_{25}+C_{27}}{C_{22}+C_{24}+C_{26}+C_{28}} + \frac{C_{21}+C_{23}+C_{25}+C_{27}}{C_{20}+C_{22}+C_{24}+C_{26}}}{2}$$

$$\text{C.P. Index B} = \frac{\frac{C_{25}+C_{27}+C_{29}+C_{31}}{C_{26}+C_{28}+C_{30}+C_{32}} + \frac{C_{25}+C_{27}+C_{29}+C_{31}}{C_{24}+C_{26}+C_{28}+C_{30}}}{2}$$

Visual Kerogen

A visual study of kerogen, the insoluble organic matter in rocks, can indicate the relative abundance, size, and state of preservation of the various recognizable kerogen types and thereby indicate the hydrocarbon source character of a rock. The color of the kerogen can be used to indicate the state of thermal maturity of the sediments (i.e. their time-temperature history). Thermal maturation plays an important role in the generation of hydrocarbons from organic matter, and also affects the composition of reservoired hydrocarbons.

Our procedure for visual kerogen slide preparation involves isolation of the organic matter of a rock by removal of the rock material with hydrochloric and hydrofluoric acid treatment and heavy liquid separation. This procedure is comparable to that used by the palynologist except it does not include an oxidation stage. (The oxidation treatment is deleted from our procedure because it removes a great deal of kerogen and blanches any remaining kerogen to an extent whereby it is useless for our kerogen color observations.) The kerogen residue is mounted on a glass slide and is examined visually under a high power microscope.

Vitrinite Reflectance

Measurement of the reflectivity of vitrinite particles ($\%R_o$) present in the kerogen isolated from sedimentary rocks provides a method of determining the state of maturation, and the diagenetic (time-temperature) history of the organic matter present in the sediments.

The kerogen, obtained from a 25 gram aliquot of crushed rock by the acid procedure previously discussed, is dried and embedded in a Bioplastic plug. The surface of the plug is polished using 0.05 micron alumina and the reflectivity determined under oil using a Zeiss high resolution microscope. A minimum of 40 values are required to adequately determine the Maturation Rank.

Fluorescence Spectrophotometric Analysis

Fluorescence spectrophotometry can be used to characterize and fingerprint crude oils, establish crude oil-source rock relationships, and to measure the hydrocarbon source potential of fine-grained sediments.

A one (1) microliter aliquot of either (i) a crude oil or (ii) the solvent extractable rock bitumen, is passed through an alumina/silica gel micro column and the C_{10+} aromatic hydrocarbons isolated. The aromatic hydrocarbon is diluted and the emission and excitation spectra determined at 240 nm and 420 nm using a Perkin-Elmer Model 512 Double Beam Fluorescence Spectrophotometer.

GEOTHERMAL DIAGENETIC CRITERIA

(GEOCHEM LABORATORIES, INC.)