Technical Service Report

ESSO PRODUCTION RESEARCH COMPANY

EPR69-ES19

GEOCHEMICAL ANALYSIS OF CANNED CUTTINGS SAMPLES FROM THE ESSO 25/11-1 WELL, NORWAY

R. E. Metter
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Stratigraphic Geology Division

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SUMMARY AND CONCLUSIONS

Canned cuttings samples from the interval 1250-8030 feet were analyzed for their yields of hydrocarbon gases. Chips of uniform lithology were picked from 34 of these samples and analyzed for total organic matter and light gasolines (C_4-C_7). Visual characteristics of the kerogen were also determined on 13 of the picked samples.

Several zones of high methane yields are indicated in the interval 1350-4000 feet, and reservoirs associated with these intervals might contain appreciable accumulations of dry gas. Cuttings from the intervals 5350-5850 and 6450-6750 feet gave high yields of wet gas, suggesting oil prone source strata. Oil shows such as were encountered below 5600 feet in this well might be expected, based on the cuttings gas patterns.

The cuttings gas becomes notably wetter below 5000 feet, the yields of C_4-C_7 gasolines become significant at about 5400 feet, and the kerogen alteration first becomes as high as 2+ at about 5400 feet. These three observations support the suggestion that thermal diagenesis first approaches the mature state at about 5400 feet. The high-methane gas yielded by samples above 5000 feet is thus likely to be due to organic immaturity of this section rather than to a strictly gas-prone nature of the organic matter.

Kerogen alteration ratings range no higher than 2+, suggesting that subsurface temperatures have not been high enough to destroy any liquid hydrocarbon accumulations that may have been present.

Kerogen types are variable, suggesting mixed oil-prone and gas-prone organic matter in the various strata that were sampled. A few scattered samples gave low cyclohexane/methylcyclopentane ratios, suggesting "non-oily" organic matter. Most of these samples apparently contain amorphous as well as woody and coaly kerogen. The woody and coaly material is commonly considered to represent gas-prone material, but amorphous kerogen has often been assumed to represent oil-prone material.

INTRODUCTION

Canned cuttings samples from the interval 1250-8030 feet in the Esso 25/11-1 well were analyzed for their yields of hydrocarbon gases. Selected samples of uniform lithology were further analyzed for total organic matter concentrations and yields of light gasoline (C_4-C_7) hydrocarbons, and some were also analyzed for visual characteristics of their kerogen.

The purpose of these analyses was to provide means for estimating the source character and the degree of diagenetic maturity of the organic matter in the sections penetrated by the well.

Results of cuttings gas analyses were plotted on 1:2000 vertical scale strip logs and transmitted to the North Sea Study Group with our letter of October 2, 1967. Cuttings samples that were selected for further analyses were chosen on the basis of results of the cuttings gas data.

The cuttings from the interval 5700-7400 feet were collected and shipped in glass rather than metal cans. The 5700-ft sample, which was in a glass container, yielded notably less total gas than the preceding 5600-ft sample which was stored in metal. This suggests that the "glass samples" may possibly have given lower gas yields than the metal samples, as will be discussed later.

The drilling mud used in the 25/11-1 well contained notable amounts of diesel oil, so that most of the samples had a strong diesel odor and fluoresced in ultra violet light. The diesel oil prevented us from making useful determinations of intermediate hydrocarbon (C_8-C_{14}) yields from these samples, but apparently did not seriously interfere with the light gasoline analysis.

This report includes complete tabulations of results of the cuttings gas, visual kerogen, total organic matter and gasoline analyses that were run, plus graphic plots of these data. Explanations of our criteria for interpreting the data, plus brief discussions of the results of the analyses are included.

A service report EPR67-ES99 on crude oil samples from the 25/11-1 well was sent to the North Sea Study Group in November, 1967. This earlier report concerned liquid hydrocarbons from various sand zones in the interval 5685-5829 feet.

Charges for this service work have been billed to the North Sea Study Group through our Job No. 9042.

PROCEDURE

Compositions and concentrations of hydrocarbon gases in the air spaces above the cuttings in the sample cans were determined by gas chromatography. Similar data were obtained on the gases released from a standard mixture of cuttings plus tap water after agitation for 2 minutes in a Waring blender. Combined results on air space gas plus cuttings gas were calculated for each sample. The data from the combined results were plotted graphically to show the vertical variations in total gas (C_1-C_4) and wet gas (C_2-C_4) and graphical plots were also made of the percent wet gas in total gas (Fig. 1).

Cuttings gas yields showed several vertical zonations which roughly correspond to different organic facies in the stratigraphic sections represented by the samples. Representative cuttings samples from the different distinctive zones defined by the cuttings gas were selected for further analyses. The selected samples were then picked by hand to provide materials of uniform lithologies for the additional work.

Some of the sample intervals that were chosen contained soft argillaceous cuttings dispersed in drilling mud, and they completely disaggregated when we attempted to wash the mud away. As a result, we were not able to obtain cuttings chips from all of the intervals of interest.

All of the "picked" cuttings were analyzed for light gasoline (C_4-C_7) compounds and total organic matter, and 13 of them were also analyzed for visual kerogen characteristics. Two core samples from approximately 3625 and 5714 feet were also analyzed for total organic matter and C_4-C_7 hydrocarbons.

Results of the cuttings gas analyses are given in Table I. Results of the additional chemical and visual kerogen analyses are given in Tables II and III.

BASES FOR INTERPRETING DATA

Cuttings Gas

Cuttings gas data give indications of the vertical variability in the source character of a section of interest. The ratio of wet gas (C_2-C_4) to total gas (C_1-C_4) may distinguish methane-prone from oil-and "wet" gas-prone sections. The critical value of this ratio varies from basin to basin. In Western Canada wet gas concentrations of about 45% or greater are considered to be indicative of sections that are likely to produce oil or gas with significant amounts of hydrocarbon liquids. In the Permian section of West Texas the significant ratio appears to be closer to 20% or greater of wet gas in total gas.

The significant values for total amounts of hydrocarbon gas yielded by the cuttings also appear to vary from basin to basin, and possibly must be established separately for each area of interest. Zones with the greatest yields of gas are considered to be of most interest as sources.

Oil in the drilling mud makes it nearly impossible to establish practical quantitative criteria that can be used in comparing different wells. The oil will tend to reduce the amount of cuttings gas released during agitation in the blender, and it will affect the composition of the hydrocarbon gas that is obtained for analysis. However, even with oil in the mud, significant vertical patterns in hydrocarbon gas concentrations and compositions can be established in each well. The patterns from different wells can be compared to establish regional trends or areal configurations of different organic facies within a section of interest.

Visual Kerogen

Kerogen data give two types of information. The color alteration (carbonization) provides a gross indication of the amount of thermal diagenesis that the organic matter has undergone. The types of materials comprising the kerogen help define different organic facies that are present in the sampled sections and they may indicate the source character of some of these facies.

Kerogen color alterations are rated on a 1 to 5 scale, from unaltered to almost completely carbonized, respectively. Ratings of 4 or 5 suggest that subsurface temperatures have been high enough to destroy most of the producible liquid hydrocarbons. Sections in which kerogen alteration is rated 4 and 5 are more likely to be characterized by dry gas production, if producible hydrocarbons are found in the associated reservoirs. Immobile pyrobitumens may also be found in these reservoir beds. Alteration ratings of 1 to 2 suggest that thermal diagenesis of the kerogen has barely begun, and reservoired hydrocarbons, if present, are likely to be gases, possibly associated with heavy, asphaltic oils. Ratings of 2+ to 3 suggest that maturation of the material has progressed to the point that gas, liquid hydrocarbons, or mixed oil and gas may be produced, depending on the nature of the original source materials. A rating of 2 may be associated with either immature or moderately mature sediments, based on other chemical evidence, and hence is not diagnostic. The interpretation of the significance of alteration ratings of 4 or 5 is the most reliable of the above tentative rules of thumb.

Types of kerogen materials that are commonly recognized include amorphous, finely disseminated, algal, herbaceous, woody and coaly. The source significance of these types is not established, but there have been suggestions in some areas, such as the offshore of southern Australia, that gas production is possibly associated with woody and coaly kerogen, whereas beds rated as oil sources may include rocks containing amorphous, finely disseminated and algal materials. These observations are speculative.

Total Organic Matter

The total organic matter concentration gives a rough indication of the richness of a rock in materials that can produce hydrocarbons. However, this measure alone does not indicate whether the organic material is oil-prone, gas-prone or mixed oil and gas prone. Rocks containing less than about 0.5% total organic matter are generally rated as poor sources, but this is modified by lithology. Carbonate sequences possibly include source rocks with still lower concentrations of total organic matter than 0.5%.

Sections that are notable for their production of dry gas (mainly methane) have commonly been found to be characterized by source rocks containing greater than about 1.1% total organic matter. However, a measure of the liquid hydrocarbons in these richer rocks is also necessary to determine whether they should be rated as oil prone or gas prone.

Light Gasoline (C_4-C_7) Hydrocarbons

Light gasolines apparently do not appear in source beds in concentrations above one or two parts per million until a fair degree of maturation occurs. Therefore, gasoline concentrations give one criterion of the degree of thermal maturation that the organic matter has attained

In addition, ratios of specific gasoline compounds may indicate the possible source character of the rocks. In particular, the ratio of cyclohexane to methylcyclopentane (CH/MCP) has been found to be useful in the U. S. Gulf Coast and the Alaskan areas for distinguishing "non oily" from "oily" facies. To date commerical oil has not been found associated with strata having a CH/MCP ratio of less than 0.25. However, dry gas has been found in strata characterized by lower ratio values as well as in sections with ratios greater than 0.25.

The CH/MCP ratio is also useful in helping distinguish different organic facies that may be present within an oil-like section. Ratios all above 0.25 in value may show groupings in vertical patterns that correlate with stratigraphic zones that have distinctive source characteristics. Definition of such zones may be quite useful for correlating reservoired oils with specific source intervals.

DISCUSSION AND INTERPRETATION OF RESULTS

The analytical results are summarized graphically in Figure 1 and are tabulated in Tables I, II and III.

In Tables I-III some of the sample depths are followed by a "-" and some are followed by a "+". The "-" indicates that the listed depth is the lower limit of the 50-ft interval represented by the sample, and the "+" indicates that the depth is the upper limit. This dual numbering system is used because the samples arrived in two different shipments, and the cuttings gas for each shipment was analyzed by two different operators. Each operator recorded the depths differently, as indicated. It was more economical to add the "+" and "-" symbols than to repunch all the data for a new machine printout.

Cuttings Gas

Several zones from 1350 to 4000 feet gave high yields of predominantly methane gas, suggesting that dry gas might be present in associated reservoirs in this interval (Fig. 1). The dry gas could be an early product generated by immature oil-prone organic matter, or it could represent hydrocarbon generation from gas-prone material. If it came from immature oil-prone matter, heavy asphaltic oils might also be encountered in porous beds in this interval, but probably not in commercial amounts at these depths. Some of the high methane yields, particularly at 2700 feet and 3000-3200 feet, are associated with coals, which generally generate large amounts of gas.

The interval from approximately 5350 to 5850 feet gave high total gas yields with high percentages of wet gas, suggesting an oil-prone source interval. This is consistent with the oil shows that were noted below 5600 feet. The interval 6450-6750 feet also gave moderately high yields of gas with high wet gas content and suggests another oil-prone interval. Crude oil or wet gas might be expected in appropriate traps in reservoir zones associated with these two intervals.

The profile of percent C_2-C_4 in total gas (Fig. 1) shows a notable increase below 5000 feet, suggesting that thermal maturation has caused significant generation of light hydrocarbon liquids below this depth. The very low wet gas concentration above 5000 feet is typical of diagenetically immature sections.

Total Organic Matter

The total organic contents of samples throughout the section are typical of strata that have been hydrocarbon sources. In general, the samples with higher than average total gas yields included lithologies that contained higher than average total organic matter (Fig. 1, Table II).

Light Gasoline (C_4-C_7) Hydrocarbons

The samples from 3000 and 3500 feet gave up above average amounts of C_4-C_7 hydrocarbons, but in view of their high organic content (the 3000-ft sample was a coal), the yields are less significant. They do suggest that these strata represent an immature oil-prone section rather than a strictly gas-prone interval, but these beds would need to be buried deeper before one could expect appreciable generation of medium gravity crude oils.

Consistent presence of appreciable gasoline in the samples begins at about 5400 feet. It appears that this is approximately the depth at which thermal diagenesis of oil-prone organic matter has approached a mature state.

Ratios of cyclohexane to methylcyclopentane (Table III) are mostly greater than 1. Ratio values below 0.25 were found in gasolines from samples at 3500, 4000, 6500 and 8000 feet. These low ratio values are believed to be indicative of "non-oily" but possibly gas-prone strata.

Kerogen

Kerogen alteration ratings (Table II) range from 1 (nonaltered) to 2+ (moderately altered). Evidently the subsurface temperatures encountered by this section have not been high enough to have destroyed accumulations of liquid hydrocarbons. The first alteration as high as 2+ was encountered in the 5400-ft sample, which is the approximate depth at which consistently appreciable amounts of gasolines began to be present.

This dual occurrence of higher kerogen alteration and higher gasoline yields supports the possibility that diagenesis of the oil-prone organic material first approaches maturity at about 5400 feet in the area of the 25/11-1 well.

Various types of kerogen were recognized (Table II, Fig. 1). A possible organic zonation based on kerogen types is suggested by horizontal dashed lines on the strip log at the right in Fig. 1. These kerogen assemblages do not suggest either an exclusively oil-prone or gas-prone section. The zones that gave cuttings with low values of cyclohexane/methylcyclopentane ratios appear to have kerogen consisting of amorphous, woody and coaly material. Woody and coaly debris is thought to be mainly indicative of gas-prone organic matter, but amorphous kerogen is commonly considered to indicate oil-prone material. This is a subject that requires further investigation.

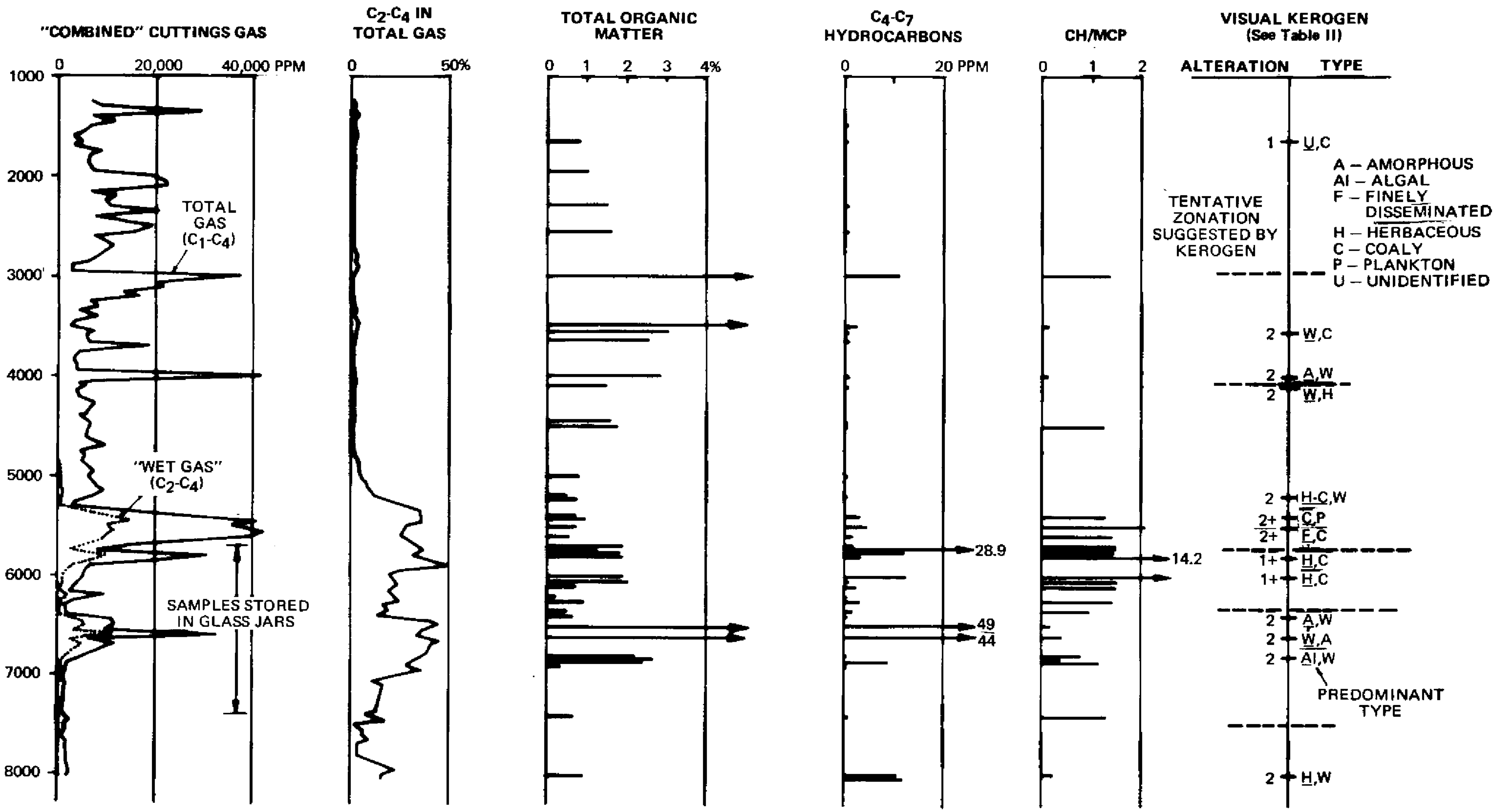

FIG. 1. GEOCHEMICAL PATTERNS, ESSO 25/11-1 WELL, NORWAY.

C_1-C_4 HYDROCARBON ANALYSES - AIR SPACE AT TOP OF CANS

SAMPLE NUMBER	R	DEPTH	METHANE (C_1)	ETHANE (C_2)	PROPANE (C_3)	ISO-BUTANE (iC_4)	NORMAL BUTANE (nC_4)	WET (C_2-C_4)	TOTAL (C_1-C_4)	TOTAL GAS C_2-C_4	TOTAL GAS C_1 C_2 C_3 iC_4 nC_4	WET GAS C_2 C_3 iC_4 nC_4	NOTES
53749A	4	1250-	7015.38	13.59	3.70	6.96	23.80	48.05	7063.43	0.6803	100. 0. 0. 0. 0.	28. 8.14.50.	
53749B	4	1300-	6466.67	6.80	1.95	3.44	10.40	22.59	6489.26	0.3481	100. 0. 0. 0. 0.	30. 9.15.46.	
53749C	4	1350-	25714.29	42.46	1.95	5.31	15.90	63.62	25777.91	0.2468	100. 0. 0. 0. 0.	64. 3. 8.25.	
53749D	4	1400-	6096.82	219.90	1.61	6.13	19.45	247.09	6345.91	3.8937	97. 3. 0. 0. 0.	89. 1. 2. 8.	
53749E	4	1450-	10713.24	106.73	2.49	4.52	17.01	130.75	10843.99	1.2057	99. 1. 0. 0. 0.	82. 2. 3.13.	
53749F	4	1500-	5394.23	34.56	1.49	2.27	6.93	45.25	5439.48	0.8319	99. 1. 0. 0. 0.	77. 3. 5.15.	
53749G	4	1550-	4022.73	37.07	0.99	2.71	9.25	50.02	4072.75	1.2282	99. 1. 0. 0. 0.	75. 2. 5.18.	
53749H	4	1600-	2302.63	19.87	1.50	3.59	12.83	37.79	2340.42	1.6147	98. 1. 0. 0. 1.	53. 4. 9.34.	
53749I	4	1650-	3925.33	6.55	1.95	3.70	12.89	25.09	3950.42	0.6351	100. 0. 0. 0. 0.	26. 8.15.51.	
53749J	4	1700-	3102.27	9.37	1.57	2.18	7.77	20.89	3123.16	0.6689	100. 0. 0. 0. 0.	45. 8.10.37.	
53749K	4	1750-	8100.00	27.19	2.19	3.17	10.52	43.07	8143.07	0.5289	100. 0. 0. 0. 0.	64. 5. 7.24.	
53749L	4	1800-	5500.00	4.55	1.79	3.29	11.12	20.75	5520.75	0.3759	100. 0. 0. 0. 0.	22. 9.16.53.	
53749M	4	1850-	4776.92	4.31	2.53	1.79	4.70	13.33	4790.25	0.2783	100. 0. 0. 0. 0.	32.19.13.36.	
53749N	4	1900-	4909.09	15.45	1.68	2.43	6.59	26.15	4935.24	0.5299	100. 0. 0. 0. 0.	60. 6. 9.25.	
53750A	4	1950-	6023.53	14.93	2.40	2.43	7.18	26.94	6050.47	0.4453	100. 0. 0. 0. 0.	55. 9. 9.27.	
53750B	4	2000-	17828.57	43.15	2.92	3.40	11.24	60.71	17889.28	0.3394	100. 0. 0. 0. 0.	70. 5. 6.19.	
53750C	4	2050-	19477.33	22.84	3.34	2.91	13.06	42.15	19519.48	0.2159	100. 0. 0. 0. 0.	54. 8. 7.31.	
53750D	4	2100-	21000.00	24.37	2.39	3.04	10.76	40.56	21040.56	0.1928	100. 0. 0. 0. 0.	60. 6. 7.27.	
53750E	4	2150-	5843.20	3.74	0.95	1.25	4.01	9.95	5853.15	0.1700	100. 0. 0. 0. 0.	38.10.13.39.	
53750F	4	2200-	9030.40	4.65	1.40	1.86	6.05	13.96	9044.36	0.1543	100. 0. 0. 0. 0.	33.10.13.44.	
53750G	4	2250-	7082.67	3.78	1.34	1.72	5.43	12.27	7094.94	0.1729	100. 0. 0. 0. 0.	31.11.14.44.	
53750H	4	2300-	9843.75	4.68	4.79	2.03	7.42	18.92	9862.67	0.1918	100. 0. 0. 0. 0.	25.25.11.39.	
53750I	4	2350-	18000.00	10.07	3.24	2.20	7.91	23.42	18023.42	0.1299	100. 0. 0. 0. 0.	43.14. 9.34.	
53750J	4	2400-	6947.92	8.14	4.81	2.38	7.31	22.64	6970.56	0.3248	100. 0. 0. 0. 0.	36.21.11.32.	
53750K	4	2450-	12239.58	12.78	5.22	3.62	12.37	33.99	12273.57	0.2769	100. 0. 0. 0. 0.	38.15.11.36.	
53750L	4	2500-	18083.33	18.90	7.07	5.77	18.62	50.36	18133.69	0.2777	100. 0. 0. 0. 0.	38.14.11.37.	
53750M	4	2550-	13800.00	10.86	9.09	3.42	11.05	34.42	13834.42	0.2488	100. 0. 0. 0. 0.	32.26.10.32.	
53750N	4	2600-	6300.00	10.20	5.75	2.38	7.12	25.45	6325.45	0.4023	100. 0. 0. 0. 0.	40.23. 9.28.	
53751A	4	2700-	10138.89	17.83	7.60	4.41	14.13	43.97	10182.86	0.4318	100. 0. 0. 0. 0.	41.17.10.32.	
53751B	4	2850-	5111.11	12.06	3.88	7.18	19.87	42.99	5154.10	0.8341	100. 0. 0. 0. 0.	28. 9.17.46.	
53751C	4	2900-	2261.90	11.46	2.39	5.67	16.15	35.67	2297.57	1.5525	99. 0. 0. 0. 1.	32. 7.16.45.	
53751D	4	2950-	2343.75	4.72	2.62	2.23	6.89	16.46	2360.21	0.6974	100. 0. 0. 0. 0.	29.16.14.41.	
53751E	4	3000-	35750.00	28.56	5.02	3.64	10.88	48.10	35798.10	0.1344	100. 0. 0. 0. 0.	59.10. 8.23.	
53751F	4	3050-	19166.67	23.60	8.36	4.13	13.43	49.52	19216.19	0.2577	100. 0. 0. 0. 0.	48.17. 8.27.	
53751G	4	3100-	20000.00	25.89	4.17	4.53	14.54	49.13	20049.13	0.2450	100. 0. 0. 0. 0.	53. 8. 9.30.	
53751H	4	3150-	11200.00	53.49	5.32	1.45	4.06	64.32	11264.32	0.5710	100. 0. 0. 0. 0.	84. 8. 2. 6.	
53751I	4	3200-	14608.00	13.50	14.04	4.36	13.99	45.89	14653.89	0.3132	100. 0. 0. 0. 0.	29.31.10.30.	
53751J	4	3250-	5853.17	13.49	4.16	4.33	14.47	36.45	5889.62	0.6189	100. 0. 0. 0. 0.	37.11.12.40.	
53751K	4	3300-	6888.89	11.75	4.46	2.42	7.54	26.17	6915.06	0.3784	100. 0. 0. 0. 0.	45.17. 9.29.	
53751L	4	3350-	3888.89	73.84	16.62	2.20	6.41	99.07	3987.96	2.4842	98. 2. 0. 0. 0.	75.17. 2. 6.	
53751M	4	3400-	6000.00	54.75	18.24	2.98	8.06	84.03	6084.03	1.3812	99. 1. 0. 0. 0.	64.22. 4.10.	
53751N	4	3450-	2406.25	24.54	13.22	0.99	2.54	41.29	2447.54	1.6870	98. 1. 1. 0. 0.	60.32. 2. 6.	
53752A	4	3500-	1402.50	11.55	4.65	0.67	1.59	18.46	1420.96	1.2991	99. 1. 0. 0. 0.	62.25. 4. 9.	
53752B	4	3550-	5248.00	61.93	19.33	2.18	5.43	88.87	5336.87	1.6652	99. 1. 0. 0. 0.	70.22. 2. 6.	
53752C	4	3600-	5402.30	27.78	11.74	1.14	2.73	43.39	5445.69	0.7968	99. 1. 0. 0. 0.	64.27. 3. 6.	
54067A		3600+	3955.60	15.55	4.42	1.73	5.32	27.02	3982.62	0.6784	100.0.00.00.00.0	58.16. 6.20.	
54067C		3650+	4205.83	24.67	1.77	0.64	2.44	29.51	4235.34	0.6968	99. 1.0.00.00.0	84. 6. 2. 8.	
54067D		3700+	14505.55	56.39	2.84	0.66	2.51	62.39	14567.94	0.4283	100.0.00.00.00.0	90. 5. 1. 4.	
54067E		3750+	3065.00	24.19	1.14	0.70	2.65	28.68	3093.68	0.9270	99. 1.0.00.00.0	85. 4. 2. 9.	
54067F		3800+	2376.00	12.78	1.02	0.19	0.77	14.76	2390.76	0.6173	99. 1.0.00.00.0	87. 7. 1. 5.	
54067G		3850+	1851.00	8.65	0.70	0.12	0.55	10.02	1861.02	0.5384	100.0.00.00.00.0	87. 7. 1. 5.	
54067H		3900+	2438.40	14.95	0.67	0.16	0.52	16.30	2454.70	0.6640	99. 1.0.00.00.0	92. 4. 1. 3.	
54067I		3950+	1897.41	11.99	0.78	0.13	0.41	13.31	1910.72	0.6966	99. 1.0.00.00.0	90. 6. 1. 3.	
54067J		4000+	39822.46	4.57	1.55	0.37	1.03	7.51	39829.96	0.0188	100.0.00.00.00.0	60.21. 5.14.	
54068A		4050+	5900.79	144.09	6.38	0.89	1.87	153.22	6054.01	2.5309	98. 2.0.00.00.0	94. 4. 1. 1.	
54068B		4080+	3628.89	22.00	2.70	0.44	1.41	26.55	3655.44	0.7263	99. 1.0.00.00.0	83.10. 2. 5.	
54068C		4100+	3283.74	3.91	1.30	0.26	0.38	5.85	3289.59	0.1778	100.0.00.00.00.0	68.22. 4. 6.	
54068D		4150+	2971.46	5.89	1.93	0.40	0.47	8.69	2980.15	0.2916	100.0.00.00.00.0	68.22. 5. 5.	
54068E		4200+	2693.64	3.62	1.67	0.18	0.17	5.64	2699.28	0.2089	100.0.00.00.00.0	64.30. 3. 3.	
54068F		4250+	5360.00	33.04	6.61	2.73	2.12	44.49	5404.49	0.8232	99. 1.0.00.00.0	74.15. 6. 5.	
54068G		4300+	5802.66	29.20	5.98	2.46	2.35	39.98	5842.64	0.6843	100.0.00.00.00.0	73.15. 6. 6.	
54068H		4350+	4132.26	19.64	3.71	1.96	2.01	27.31	4159.57	0.6565	100.0.00.00.00.0	72.14. 7. 7.	
54068I		4400+	3355.79	20.37	5.83	4.50	5.09	35.79	3391.58	1.0552	99. 1.0.00.00.0	57.16.13.14.	
54068J		4450+	3818.30	21.82	4.47	3.24	4.16	33.69	3851.99	0.8746	99. 1.0.00.00.0	65.13.10.12.	
54069A		4500+	4696.17	27.54	5.60	3.73	5.76	42.62	4738.79	0.8994	99. 1.0.00.00.0	64.13. 9.14.	
54069B		4550+	5430.51	30.52	4.41	2.66	3.55	41.53	5472.04	0.7589	99. 1.0.00.00.0	74.11. 6. 9.	
54069C		4600+	4992.00	35.59	7.41	5.37	6.45	54.81	5046.81	1.0861	99. 1.0.00.00.0	64.14.10.12.	
54069D		4650+	6870.85	49.81	10.15	7.30	9.31	76.56	6947.41	1.1020	99. 1.0.00.00.0	65.13.10.12.	
54069E		4700+	7987.19	53.86	8.60	5.34	6.52	74.32	8061.50	0.9219	99. 1.0.00.00.0	72.12. 7. 9.	
54069F		4750+	3469.96	26.43	5.97	3.36	4.59	40.35	3510.31	1.1495	99. 1.0.00.00.0	66.15. 8.11.	
54069G		4800+	4552.45	40.75	11.72	6.14	9.03	67.63	4620.08	1.4639	99. 1.0.00.00.0	61.17. 9.13.	
54069H		4850+	3453.95	45.03	30.67	19.81	27.77	123.28	3577.23	3.4462	96. 1. 1. 1. 1.	36.25.16.23.	
54069I		4950+	5334.10	78.54	39.00	21.21	30.34	169.09	5503.18	3.0725	97. 1. 1.0.0 1.	46.23.13.18.	
54069J		4950+	2413.71	41.54	16.09	9.42	13.08	80.13	2493.84	3.2131	96. 2. 1.0.0 1.	52.20.12.16.	
54070A		5000+	5217.87	88.26	53.41	36.43	52.40	230.49	5448.36	4.2305	95. 2. 1. 1. 1.	38.23.16.23.	
54070B		5050+	6113.03	114.83	112.13	70.27	95.03	392.25	6505.28	6.0298	94. 2. 2. 1. 1.	29.29.18.24.	
54070C		5100+	5641.41	139.93	99.46	64.07	92.93	396.38	6037.79	6.5650	93. 2. 2. 1. 2.	36.25.16.23.	
54070D		5150+	7179.42	256.09	207.55	133.92	172.54	770.09	7949.51	9.6873	90. 3. 3. 2. 2.	34.27.17.22.	
54070E		5200+	6194.00	199.09	163.75	89.53	114.80	567.16	6761.16	8.3886	92. 3. 2. 1. 2.	35.29.16.20.	
54070F		5250+	1809.00	89.74	113.89	104.90	121.79	430.32	2239.32	19.2165	81. 4. 5. 5. 5.	21.26.24.29.	
54070G		5300+	1722.67	110.55	142.12	110.18	133.27	496.12	2218.79	22.3599	78. 5. 6. 5. 6.	22.29.22.27.	
54070H		5350+	7769.59	1350.30	773.38	484.10	382.62	2990.39	10759.98	27.7918	72.13. 7. 4. 4.	45.26.16.13.	
54070I		5400+	13961.88	2971.35	1598.17	914.06	672.34	6155.91	20117.79	30.5993	69.15. 8. 5. 3.	48.26.15.11.	
54070J		5450+	22769.98	5503.52	1918.62	891.71	485.35	8799.19	31569.17	27.8727	72.17. 6. 3. 3.	62.22.10. 6.	
54071A		5500+	22802.03	4473.11	1460.13	676.59	304.41	6914.23	29716.26	23.2675	77.15. 5. 2. 1.	65.21.10. 4.	
54071B		5550+	29275.88	5561.37	1766.01	860.75	295.71	8483.83	37759.71	22.4679	77.15. 5. 2. 1.	66.21.10. 3.	
54071C		5600+	28210.51	5286.39	1641.60	738.78	263.33	7930.09	36140.60	21.9423	77.15. 5. 2. 1.	67.21. 9. 3.	
54161A	4	5700+	7717.48	1496.27	992.46	808.34	257.45	3554.52	11271.99	31.5340	69.13. 9. 7. 2.	42.28.23. 7.	
54161B	4	5750+	4073.36	1180.75	594.04	406.18	111.07	2292.03	6365.39	36.0077	64.19. 9. 6. 2.	51.26.18. 5.	
54161C	4	5800+	19265.89	4583.79	1771.36	1136.10	306.74	7797.98	27063.87	28.8132	71.17. 7. 4. 1.	58.23.15. 4.	
54161D	4	5850+	10835.30	3459.94	1656.71	1184.57	344.34	6645.55	17480.85	38.0162	62.20. 9. 7. 2.	52.25.18. 5.	
54161E	4	5900+	2582.14	1205.29	781.71	650.11	184.74	2821.84	5403.98	52.2178	49.22.14.12. 3.	42.28.23. 7.	
54161F	4	5950+	3274.66	584.02	231.04	137.89	37.45	990.40	4265.06	23.2212	77.14. 5. 3. 1.	59.23.14. 4.	
54161G	4	6000+	3345.40	448.54	184.32	109.31	31.91	774.08	4119.48	18.7906	81.11. 4. 3. 1.	58.24.14. 4.	
54161H	4	6050+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54161I	4	6100+	1902.06	327.70	192.99	148.80	69.96	739.45	2642.31	27.9850	72.12. 7. 6. 3.	45.26.20. 9.	
54161J	4	6150+	1222.58	161.82	71.71	47.96	18.02	299.51	1522.09	19.6775	80.11. 5. 3. 1.	54.24.16. 6.	
54161K	4	6200+	6765.71	917.03	404.41	224.48	135.68	1681.59	8447.30	19.9068	79.11. 5. 3. 2.	55.24.13. 8.	
54161L	4	6250+	1826.20	265.97	124.28	78.57	40.96	509.78	2335.98	21.8229	79.11. 5. 3. 2.	53.24.15. 8.	
54161M	4	6300+	522.74	73.31	48.44	40.51	18.35	180.61	703.35	25.6785	74.10. 7. 6. 3.	41.27.22.10.	
54161N	4	6350+	563.38	82.75	61.92	48.12	24.57	217.36	780.74	27.8402	72.11. 8. 6. 3.	39.28.22.11.	
54161O	4	6400+	294.17	36.61	28.00	20.45	9.46	94.52	388.69	24.3175	77. 9. 7. 5. 2.	38.30.22.10.	
54161P	4	6450+	5135.99	1366.91	1247.62	250.98	198.01	3063.51	8199.50	37.3621	63.17.15. 3. 2.	45.41. 8. 6.	
54161Q	4	6500+	5341.66	1455.33	1330.00	269.70	219.07	3274.09	8615.75	38.0013	62.17.15. 3. 3.	44.41. 8. 7.	
54162A	4	6550+	5623.25	1241.47	1158.03	247.42	175.45	2822.36	8445.61	33.4181	66.15.14. 3. 2.	44.41. 9. 6.	
54162B	4	6600+	19683.53	3598.11	3132.41	570.51	523.87	7824.89	27508.42	28.4454	72.13.11. 2. 2.	46.40. 7. 7.	
54162C	4	6650+	2630.22	719.96	936.32	178.23	189.67	2024.17	4654.39	43.4895	57.15.20. 4. 4.	36.46. 9. 9.	
54162D	4	6700+	6240.00	1480.19	1630.66	281.73	291.29	3683.86	9923.86	37.1212	63.15.16. 3. 3.	40.44. 8. 8.	
54162E	4	6750+	3978.95	849.60	827.28	149.78	143.10	1969.75	5948.70	33.1123	67.14.14. 3. 2.	43.42. 8. 7.	
54162F	4	6800+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162G	4	6850+	1128.00	231.28	306.43	58.28	58.72	654.71	1782.71	36.7255	64.13.17. 3. 3.	35.47. 9. 9.	
54162H	4	6900+	552.50	122.72	170.43	50.37	36.52	380.04	932.54	40.7532	60.13.18. 5. 4.	32.45.13.10.	
54162I	4	6950+	350.00	184.08	202.92	49.85	47.28	484.13	834.13	58.0431	42.22.24. 6. 6.	38.42.10.10.	
54162J	4	7000+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162K	4	7050+	15.03	3.42	7.47	3.19	2.89	16.97	32.00	53.0312	47.11.23.10. 9.	20.44.19.17.	
54162L	4	7100+	580.67	66.27	60.07	19.67	15.62	161.63	742.30	21.7741	78. 9. 8. 3. 2.	41.37.12.10.	
54162M	4	7250+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162N	4	7300+	184.00	14.10	13.98	4.84	4.32	37.24	221.24	16.8324	84. 6. 6. 2. 2.	38.37.13.12.	
54162O	4	7350+	137.14	12.64	14.25	7.40	6.44	40.73	177.87	22.8987	77. 7. 8. 4. 4.	31.35.18.16.	
54162P	4	7400+	109.30	12.79	15.80	7.90	6.01	42.50	151.80	27.9973	73. 8.10. 5. 4.	30.37.19.14.	
54052A		7450+	470.81	105.47	75.62	8.71	10.43	200.23	671.04	29.8387	70.16.11. 1. 2.	53.38. 4. 5.	
54052B		7500+	101.50	4.32	1.89	0.75	1.13	8.09	109.59	7.3820	92. 4. 2. 1. 1.	54.23. 9.14.	
54052C		7550+	235.30	23.08	10.36	2.40	2.63	38.47	273.77	14.0518	86. 8. 4. 1. 1.	60.27. 6. 7.	
54052D		7600+	217.14	9.27	4.07	1.49	2.68	17.51	234.65	7.4622	92. 4. 2. 1. 1.	53.23. 9.15.	
54052E		7650+	113.53	4.08	1.63	0.70	1.59	8.00	121.53	6.5827	94. 3. 1. 1. 1.	51.20. 9.20.	
54052F		7700+	168.29	7.76	3.71	1.05	1.68	14.20	182.49	7.7812	92. 4. 2. 1. 1.	55.26. 7.12.	
54052G		7750+	131.52	12.35	3.63	1.14	1.89	19.01	150.53	12.6287	88. 8. 2. 1. 1.	65.19. 6.10.	
54052H		7800+	67.37	6.13	4.07	2.19	4.63	17.02	84.39	20.1682	80. 7. 5. 3. 5.	36.24.13.27.	
54052I		7850+	96.56	23.75	15.04	5.23	6.14	50.16	146.72	34.1876	66.16.10. 4. 4.	48.30.10.12.	
54052J		7950+	173.69	64.65	38.89	8.34	7.52	119.40	293.09	40.7383	59.22.13. 3. 3.	54.33. 7. 6.	
54052K		8000+	338.29	82.94	53.87	14.53	13.57	164.91	503.20	32.7722	67.16.11. 3. 3.	50.33. 9. 8.	
54052L		8030+	81.54	44.59	38.37	8.01	7.60	98.57	180.11	54.7277	46.25.21. 4. 4.	45.39. 8. 8.	

B = CUTTINGS NOT ANALYZED *C* = AIR SPACE GAS NOT RUN *BC* = NO ANALYSES RUN

[illegible]

TABLE 2-F

C_1-C_4 HYDROCARBON ANALYSIS - CUTTINGS ONLY

SAMPLE NUMBER	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS) METHANE (C_1)	ETHANE (C_2)	PROPANE (C_3)	ISO-BUTANE (iC_4)	NORMAL BUTANE (nC_4)	WET (C_2-C_4)	TOTAL (C_1-C_4)	GAS COMPOSITION (PERCENT) TOTAL GAS C_2-C_4	TOTAL GAS C_1 C_2 C_3 iC_4 nC_4	WET GAS C_2 C_3 iC_4 nC_4	NOTES
53749A	4	1250-	450.00	19.12	0.85	3.72	18.44	42.13	492.13	8.5607	91. 4. 0. 1. 4.	45. 2. 9.44.	
53749B	4	1300-	3000.00	45.31	3.76	16.00	68.69	133.76	3133.76	4.2684	96. 1. 0. 1. 2.	34. 3.12.51.	
53749C	4	1350-	3668.20	13.69	1.95	10.88	48.46	74.78	3742.98	1.9979	99. 0. 0. 0. 1.	18. 3.15.64.	
53749D	4	1400-	930.00	5.31	2.14	9.30	44.52	61.27	991.27	6.1810	94. 1. 0. 1. 4.	9. 3.15.73.	
53749E	4	1450-	1080.00	19.47	0.85	4.65	23.06	48.03	1128.03	4.2579	96. 2. 0. 0. 2.	41. 2.10.47.	
53749F	4	1500-	1200.00	7.08	2.14	5.35	24.64	39.21	1239.21	3.1641	97. 1. 0. 0. 2.	18. 5.14.63.	
53749G	4	1550-	1020.00	12.39	1.50	5.58	26.63	46.10	1066.10	4.3242	96. 1. 0. 1. 2.	27. 3.12.58.	
53749H	4	1600-	798.75	3.45	1.39	6.65	32.20	43.69	842.44	5.1861	95. 0. 0. 1. 4.	8. 3.15.74.	
53749I	4	1650-	778.78	3.74	8.06	9.67	39.17	60.64	839.42	7.2240	93. 0. 1. 1. 5.	6.13.16.65.	
53749J	4	1700-	778.78	16.13	1.39	3.32	14.47	35.31	814.09	4.3374	96. 2. 0. 0. 2.	46. 4. 9.41.	
53749K	4	1750-	958.50	7.77	1.15	5.44	24.03	38.39	996.89	3.8510	96. 1. 0. 1. 2.	20. 3.14.63.	
53749L	4	1800-	858.66	4.03	1.39	4.84	21.70	31.96	890.62	3.5885	97. 0. 0. 1. 2.	13. 4.15.68.	
53749M	4	1850-	1497.66	15.53	3.33	3.93	12.92	35.71	1533.37	2.3289	98. 1. 0. 0. 1.	44. 9.11.36.	
53749N	4	1900-	1317.94	6.33	2.78	6.04	23.00	38.15	1356.09	2.8132	98. 0. 0. 0. 2.	17. 7.16.60.	
53750A	4	1950-	958.50	8.36	1.73	3.02	11.37	24.48	982.98	2.4904	98. 1. 0. 0. 1.	34. 7.12.47.	
53750B	4	2000-	1337.91	6.33	0.83	1.21	4.65	13.02	1350.93	0.9638	100. 0. 0. 0. 0.	49. 6. 9.36.	
53750C	4	2050-	2811.37	6.04	1.11	2.12	9.04	18.31	2829.68	0.6471	100. 0. 0. 0. 0.	33. 6.12.49.	
53750D	4	2100-	1288.55	4.03	0.75	0.65	4.03	9.46	1298.01	0.7288	100. 0. 0. 0. 0.	43. 8. 7.42.	
53750E	4	2150-	718.87	2.01	0.75	3.58	15.50	21.84	740.71	2.9485	98. 0. 0. 0. 2.	9. 3.16.72.	
53750F	4	2200-	2929.69	11.06	1.28	5.35	23.06	40.75	2970.44	1.3718	99. 0. 0. 0. 1.	27. 3.13.57.	
53750G	4	2250-	2655.19	5.46	1.11	3.93	17.83	28.33	2683.52	1.0557	99. 0. 0. 0. 1.	19. 4.14.63.	
53750H	4	2300-	937.12	4.31	4.45	2.12	6.98	17.86	954.98	1.8702	99. 0. 0. 0. 1.	24.25.12.39.	
53750I	4	2350-	2811.37	10.35	3.33	3.63	16.54	33.85	2845.22	1.1897	99. 0. 0. 0. 1.	31.10.11.48.	
53750J	4	2400-	819.98	6.62	4.72	3.02	12.40	26.76	846.74	3.1604	97. 1. 1. 0. 1.	25.18.11.46.	
53750K	4	2450-	1913.30	9.20	9.73	8.16	33.27	60.36	1973.66	3.0583	98. 0. 0. 0. 2.	15.16.14.55.	
53750L	4	2500-	1776.63	14.64	12.37	10.13	40.52	77.66	1854.29	4.1881	95. 1. 1. 1. 2.	19.16.13.52.	
53750M	4	2550-	2108.53	6.9C	10.00	6.35	26.29	49.54	2158.07	2.2956	99. 0. 0. 0. 1.	14.20.13.53.	
53750N	4	2600-	1140.00	5.31	4.45	3.16	13.04	25.96	1165.96	2.2265	99. 0. 0. 0. 1.	20.17.12.51.	
53751A	4	2700-	1327.59	6.90	4.45	4.23	17.05	32.63	1360.22	2.3989	98. 1. 0. 0. 1.	21.14.13.52.	
53751B	4	2850-	1098.28	3.74	4.72	16.32	61.10	85.88	1184.16	7.2524	94. 0. 0. 1. 5.	4. 5.19.72.	
53751C	4	2900-	708.89	9.78	2.78	11.79	47.22	71.57	780.46	9.1702	91. 1. 0. 2. 6.	14. 4.16.66.	
53751D	4	2950-	668.95	6.62	5.28	6.95	30.05	48.90	717.85	6.8120	93. 1. 1. 1. 4.	14.11.14.61.	
53751E	4	3000-	1837.12	9.78	2.22	2.42	10.85	25.27	1862.39	1.3569	98. 1. 0. 0. 1.	39. 9.10.42.	
53751F	4	3050-	1198.12	7.77	5.77	4.39	16.64	34.57	1232.69	2.8044	98. 1. 0. 0. 1.	22.17.13.48.	
53751G	4	3100-	1557.56	8.63	2.50	3.32	15.50	29.95	1587.51	1.8866	98. 1. 0. 0. 1.	29. 8.11.52.	
53751H	4	3150-	1956.94	9.49	4.72	2.12	8.78	25.11	1982.05	1.2669	100. 0. 0. 0. 0.	38.19. 8.35.	
53751I	4	3200-	2156.62	10.75	8.08	3.77	13.95	36.55	2193.17	1.6665	99. 0. 0. 0. 1.	29.22.10.39.	
53751J	4	3250-	639.00	3.16	2.22	3.93	16.54	25.85	664.85	3.8881	97. 0. 0. 1. 2.	12. 9.15.64.	
53751K	4	3300-	1138.22	5.46	3.89	2.42	10.33	22.10	1160.32	1.9046	99. 0. 0. 0. 1.	25.18.11.46.	
53751L	4	3350-	718.87	7.48	11.11	2.72	9.30	30.61	749.48	4.0842	97. 1. 1. 0. 1.	24.37. 9.30.	
53751M	4	3400-	1956.94	13.14	13.27	3.14	10.73	40.28	1997.22	2.0168	97. 1. 1. 0. 1.	33.32. 8.27.	
53751N	4	3450-	998.44	12.94	21.12	3.63	9.56	47.25	1045.69	4.5185	96. 1. 2. 0. 1.	27.45. 8.20.	
53752A	4	3500-	1118.25	19.27	25.01	5.44	16.79	66.51	1184.76	5.6138	95. 2. 2. 0. 1.	29.38. 8.25.	
53752B	4	3550-	1991.39	29.87	35.20	13.18	25.22	103.47	2094.86	4.9392	95. 1. 2. 1. 1.	29.34.13.24.	
53752C	4	3600-	1796.16	28.08	34.05	6.91	20.39	89.43	1885.59	4.7428	96. 1. 2. 0. 1.	31.38. 8.23.	
54067A		3600+	1968.75	8.50	7.32	4.09	14.95	34.86	2003.61	1.7398	99.0.00.00.0 1.	24.21.12.43.	
54067C		3650+	1804.69	12.39	3.08	1.44	6.02	22.93	1827.62	1.2546	99. 1.0.00.00.0	55.13. 6.26.	
54067D		3700+	3937.50	3.86	1.77	0.90	4.13	10.66	3948.16	0.2700	100.0.00.00.00.0	36.17. 8.39.	
54067E		3750+	1239.00	5.19	1.44	1.02	4.61	12.26	1251.26	0.9798	100.0.00.00.00.0	42.12. 8.38.	
54067F		3800+	1428.00	1.33	2.31	0.70	2.59	6.93	1434.93	0.4829	100.0.00.00.00.0	19.33.10.38.	
54067G		3850+	1551.00	3.76	2.99	0.86	3.12	10.73	1561.73	0.6870	100.0.00.00.00.0	35.28. 8.29.	
54067H		3900+	1492.50	3.54	1.33	1.10	2.69	8.66	1501.16	0.5768	100.0.00.00.00.0	41.15.13.31.	
54067I		3950+	1884.00	8.85	1.92	0.74	2.26	13.77	1897.77	0.7256	100.0.00.00.00.0	65.14. 5.16.	
54067J		4000+	1920.00	2.65	1.82	0.67	1.99	7.13	1927.13	0.3700	100.0.00.00.00.0	37.26. 9.28.	
54068A		4050+	1362.00	3.54	1.23	0.19	0.56	5.52	1367.52	0.4036	100.0.00.00.00.0	65.22. 3.10.	
54068B		4080+	648.00	1.77	1.53	0.77	2.41	6.48	654.48	0.9900	100.0.00.00.00.0	27.24.12.37.	
54068C		4100+	2412.00	6.19	1.43	1.30	0.99	9.91	2421.91	0.4092	100.0.00.00.00.0	63.14.13.10.	
54068D		4150+	774.00	4.35	1.14	0.59	0.68	6.76	780.76	0.8658	99. 1.0.00.00.0	64.17. 9.10.	
54068E		4200+	1446.00	3.41	1.05	0.58	0.72	5.76	1451.76	0.3967	100.0.00.00.00.0	59.18.10.13.	
54068F		4250+	1846.87	2.08	2.68	2.72	2.70	10.18	1857.05	0.5482	100.0.00.00.00.0	20.26.27.27.	
54068G		4300+	1282.03	1.77	2.99	2.60	2.86	10.22	1292.25	0.7908	100.0.00.00.00.0	17.30.25.28.	
54068H		4350+	1917.19	1.77	2.18	2.92	3.66	10.53	1927.72	0.5462	100.0.00.00.00.0	17.21.28.34.	
54068I		4400+	825.60	1.60	4.15	6.38	9.92	22.05	847.65	2.6013	98.0.00.0 1. 1.	7.19.29.45.	
54068J		4450+	2282.81	7.08	4.24	6.36	9.86	27.54	2310.35	1.1920	100.0.00.00.00.0	26.15.23.36.	
54069A		4500+	1729.69	3.54	3.73	5.88	9.48	22.63	1752.32	1.2914	99.0.00.00.0 1.	16.16.26.42.	
54069B		4550+	615.60	5.22	1.98	2.70	4.17	14.07	629.67	2.2345	98. 1.0.00.0 1.	37.14.19.30.	
54069C		4600+	780.00	4.25	2.99	4.46	7.39	19.09	799.09	2.3889	97. 1.0.0 1. 1.	22.16.23.39.	
54069D		4650+	621.60	2.65	6.98	4.34	6.97	20.94	642.54	3.2589	97.0.0 1. 1. 1.	13.33.21.33.	
54069E		4700+	1530.47	1.68	4.17	2.79	4.12	12.76	1543.23	0.8268	100.0.00.00.00.0	13.33.22.32.	
54069F		4750+	849.60	3.54	4.07	4.87	7.95	20.43	870.03	2.3481	98.0.00.0 1. 1.	17.20.24.39.	
54069G		4800+	900.00	4.34	5.32	6.42	5.85	21.93	921.93	2.3786	97.0.0 1. 1. 1.	20.24.29.27.	
54069H		4850+	1303.12	3.54	6.74	12.42	22.48	45.18	1348.30	3.3509	97.0.00.0 1. 2.	8.15.27.50.	
54069I		4950+	1490.62	10.62	21.99	29.13	51.58	113.32	1603.94	7.0651	93. 1. 1. 2. 3.	9.19.26.46.	
54069J		4950+	1586.72	12.46	19.36	25.82	46.81	104.45	1691.17	6.1762	93. 1. 1. 2. 3.	12.19.25.44.	
54070A		5000+	820.50	10.62	8.96	19.79	35.93	75.30	895.80	8.4058	92. 1. 1. 2. 4.	14.12.26.48.	
54070B		5050+	530.25	7.08	17.10	35.60	64.11	123.89	654.14	18.9393	81. 1. 3. 5.10.	6.14.29.51.	
54070C		5100+	1263.00	10.97	17.37	37.65	67.42	133.41	1396.41	9.5538	90. 1. 1. 3. 5.	8.13.28.51.	
54070D		5150+	1110.00	8.50	18.26	44.71	77.21	148.68	1258.68	11.8123	88. 1. 1. 4. 6.	6.12.30.52.	
54070E		5200+	648.00	28.04	61.22	99.10	154.42	342.78	990.78	34.5969	65. 3. 6.10.16.	8.18.29.45.	
54070F		5250+	954.00	10.62	32.93	95.23	143.48	282.26	1236.26	22.8317	76. 1. 3. 8.12.	4.12.34.50.	
54070G		5300+	339.00	14.16	35.98	55.35	95.65	201.14	540.14	37.2384	62. 3. 7.10.18.	7.18.28.47.	
54070H		5350+	1662.00	314.35	533.52	578.09	665.26	2091.22	3753.22	55.7180	45. 8.14.15.18.	15.26.28.31.	
54070I		5400+	2301.00	365.33	689.47	1011.84	852.24	2918.87	5219.87	55.9185	45. 7.13.19.16.	13.24.34.29.	
54070J		5450+	3791.99	1571.76	1647.07	1523.71	1048.13	5790.66	9582.65	60.4285	40.16.17.16.11.	27.29.26.18.	
54071A		5500+	2856.00	897.74	820.80	833.28	534.24	3086.05	5942.05	51.9358	48.15.14.14. 9.	29.27.27.17.	
54071B		5550+	2361.00	852.43	753.77	726.14	349.80	2682.13	5043.13	53.1839	47.17.15.14. 7.	32.28.27.13.	
54071C		5600+	1806.00	563.57	599.18	675.55	334.54	2172.84	3978.84	54.6099	46.14.15.17. 8.	26.28.31.15.	
54161A	4	5700+	1830.00	140.89	285.91	572.88	254.40	1254.08	3084.08	40.6630	59. 5. 9.19. 8.	11.23.46.20.	
54161B	4	5750+	892.50	83.54	136.80	258.54	114.48	593.36	1485.86	39.9337	60. 6. 9.17. 8.	14.23.44.19.	
54161C	4	5800+	1539.00	400.73	482.90	715.73	292.56	1891.92	3430.92	55.1432	44.12.14.21. 9.	21.26.38.15.	
54161D	4	5850+	924.00	122.48	198.38	349.68	146.28	816.80	1740.80	46.9239	54. 7.11.20. 8.	15.24.43.18.	
54161E	4	5900+	715.50	51.33	96.96	223.20	93.81	465.30	1180.80	39.4055	61. 4. 8.19. 8.	11.21.48.20.	
54161F	4	5950+	1029.00	95.58	116.28	166.66	63.60	442.12	1471.12	30.0533	71. 6. 8.11. 4.	22.26.38.14.	
54161G	4	6000+	930.00	50.98	69.08	111.60	42.93	274.59	1204.59	22.7953	77. 4. 6. 9. 4.	19.25.40.16.	
54161H	4	6050+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54161I	4	6100+	765.00	11.20	21.67	42.97	30.61	106.45	871.45	12.2152	88. 1. 2. 5. 4.	11.20.40.29.	
54161J	4	6150+	730.50	28.32	37.62	62.77	36.25	164.96	895.46	18.4218	82. 3. 4. 7. 4.	17.23.38.22.	
54161K	4	6200+	721.50	40.18	63.27	106.02	82.68	292.15	1013.65	28.8215	72. 4. 6.10. 8.	14.22.36.28.	
54161L	4	6250+	225.00	19.03	34.20	67.70	51.67	172.60	397.60	43.4104	56. 5. 9.17.13.	11.20.39.30.	
54161M	4	6300+	760.50	10.62	12.61	24.78	18.84	66.85	827.35	8.0799	92. 1. 2. 3. 2.	16.19.37.28.	
54161N	4	6350+	740.25	14.69	12.82	26.97	22.42	76.90	817.15	9.4107	90. 2. 2. 3. 3.	19.17.35.29.	
54161O	4	6400+	653.25	11.50	12.95	26.50	18.84	69.79	723.04	9.6523	89. 2. 2. 4. 3.	16.19.38.27.	
54161P	4	6450+	1317.00	203.90	613.55	290.16	331.36	1438.97	2755.97	52.2128	48. 7.22.11.12.	14.43.20.23.	
54161Q	4	6500+	996.00	297.36	841.32	357.12	394.32	1890.12	2886.12	65.4900	35.10.29.12.14.	16.44.19.21.	
54162A	4	6550+	519.00	55.40	273.94	122.76	147.55	599.65	1118.65	53.6048	47. 5.24.11.13.	9.46.20.25.	
54162B	4	6600+	1848.00	597.55	1387.15	458.30	658.90	3101.89	4949.89	62.6659	38.12.28. 9.13.	19.45.15.21.	
54162C	4	6650+	693.50	65.14	313.27	148.06	217.19	743.66	1436.66	51.7631	48. 5.22.10.15.	9.42.20.29.	
54162D	4	6700+	858.00	94.87	467.86	203.48	282.38	1048.59	1906.59	54.9982	44. 5.25.11.15.	9.45.19.27.	
54162E	4	6750+	783.00	115.40	469.22	217.99	269.03	1071.64	1854.64	57.7815	42. 6.25.12.15.	11.44.20.25.	
54162F	4	6800+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162G	4	6850+	705.00	26.55	83.45	47.99	67.10	225.09	930.09	24.2038	76. 3. 9. 5. 7.	12.37.21.30.	
54162H	4	6900+	695.25	7.96	35.57	24.92	36.05	104.50	799.75	13.0665	87. 1. 4. 3. 5.	8.34.24.34.	
54162I	4	6950+	708.00	9.73	38.22	27.16	32.87	107.98	815.98	13.2331	87. 1. 5. 3. 4.	9.36.25.30.	
54162J	4	7000+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162K	4	7050+	561.00	5.31	14.11	18.60	20.67	58.69	619.69	9.4708	91. 1. 2. 3. 3.	9.24.32.35.	
54162L	4	7100+	531.00	7.08	17.14	15.81	17.73	57.76	588.76	9.8134	90. 1. 3. 3. 3.	12.30.27.31.	
54162M	4	7250+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162N	4	7300+	545.25	6.19	8.42	37.71	24.13	76.45	621.70	12.2969	88. 1. 1. 6. 4.	8.11.49.32.	
54162O	4	7350+	194.40	1.84	2.33	3.56	2.17	9.90	204.30	4.8458	95. 1. 1. 2. 1.	19.24.35.22.	
54162P	4	7400+	680.40	2.39	6.50	9.67	9.86	28.42	708.82	4.0094	97.0.0 1. 1. 1.	8.23.34.35.	
54052A		7450+	1242.19	33.28	70.32	29.50	32.44	165.54	1407.73	11.7593	89. 2. 5. 2. 2.	20.42.18.20.	
54052B		7500+	1128.00	3.19	5.78	3.91	6.45	19.33	1147.33	1.6847	98.0.0 1.0.0 1.	17.30.20.33.	
54052C		7550+	1030.80	10.55	13.78	5.91	7.92	38.16	1068.96	3.5698	96. 1. 1. 1. 1.	28.36.15.21.	
54052D		7600+	621.60	6.94	7.49	4.58	9.73	28.74	650.34	4.4192	96. 1. 1. 1. 1.	24.26.16.34.	
54052E		7650+	231.90	7.96	5.65	3.79	9.54	26.94	258.84	10.4079	90. 3. 2. 1. 4.	30.21.14.35.	
54052F		7700+	1198.80	5.31	8.89	5.30	9.54	29.04	1227.84	2.3651	98.0.0 1.0.0 1.	18.31.18.33.	
54052G		7750+	1198.80	6.19	5.06	2.32	4.36	17.93	1216.73	1.4736	99. 1.0.00.00.0	35.28.13.24.	
54052H		7800+	1312.50	8.44	5.75	5.17	11.38	30.74	1343.24	2.2885	98. 1.0.00.0 1.	27.19.17.37.	
54052I		7850+	1183.20	4.42	32.15	17.97	23.53	78.07	1261.27	6.1898	94.0.0 3. 1. 2.	6.41.23.30.	
54052J		7950+	1406.25	72.92	143.91	57.14	57.24	331.21	1737.46	19.0629	82. 4. 8. 3. 3.	22.44.17.17.	
54052K		8000+	1406.25	17.70	75.24	33.33	33.71	159.98	1566.23	10.2143	90. 1. 5. 2. 2.	11.47.21.21.	
54052L		8030+	1284.37	23.79	69.36	26.34	28.49	147.98	1432.35	10.3312	89. 2. 5. 2. 2.	16.47.18.19.	

B = CUTTINGS NOT ANALYZED *C* = AIR SPACE GAS NOT RUN *BC* = NO ANALYSES RUN

TABLE 1-C

C_1-C_4 HYDROCARBON ANALYSES - CUTTINGS AND AIR SPACE

SAMPLE NUMBER	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)							GAS COMPOSITION (PERCENT)			NOTES
			METHANE (C_1)	ETHANE (C_2)	PROPANE (C_3)	ISO-BUTANE (iC_4)	NORMAL BUTANE (nC_4)	WET (C_2-C_4)	TOTAL (C_1-C_4)	TOTAL GAS C_2-C_4	TOTAL GAS C_1 C_2 C_3 iC_4 nC_4	WET GAS C_2 C_3 iC_4 nC_4	
53749A	4	1250-	7465.38	32.71	4.55	10.68	42.24	90.18	7555.56	1.1936	99. 0. 0. 0. 1.	36. 5.12.47.	
53749B	4	1300-	9466.67	52.11	5.71	19.44	79.09	156.35	9623.02	1.6247	98. 1. 0. 0. 1.	33. 4.12.51.	
53749C	4	1350-	29382.49	53.95	3.90	16.19	64.36	138.40	29520.89	0.4688	100. 0. 0. 0. 0.	39. 3.12.46.	
53749D	4	1400-	7028.82	225.21	3.75	15.43	63.97	308.36	7337.18	4.2027	96. 3. 0. 0. 1.	73. 1. 5.21.	
53749E	4	1450-	11793.24	126.20	3.34	9.17	40.07	178.78	11972.02	1.4933	99. 1. 0. 0. 0.	71. 2. 5.22.	
53749F	4	1500-	6594.23	41.64	3.63	7.62	31.57	84.46	6678.69	1.2646	99. 1. 0. 0. 0.	50. 4. 9.37.	
53749G	4	1550-	5042.73	49.46	2.49	8.29	35.88	96.12	5138.85	1.8705	98. 1. 0. 0. 1.	51. 3. 9.37.	
53749H	4	1600-	3101.38	23.32	2.89	10.24	45.03	81.48	3182.86	2.5600	98. 1. 0. 0. 1.	29. 4.13.54.	
53749I	4	1650-	4704.11	10.29	10.01	13.37	52.06	85.73	4789.84	1.7898	99. 0. 0. 0. 1.	12.12.16.60.	
53749J	4	1700-	3881.05	25.50	2.96	5.50	22.24	56.20	3937.25	1.4274	98. 1. 0. 0. 1.	45. 5.10.40.	
53749K	4	1750-	9058.50	34.96	3.34	8.61	34.55	81.46	9139.96	0.8912	100. 0. 0. 0. 0.	43. 4.11.42.	
53749L	4	1800-	6358.66	8.58	3.18	8.13	32.82	52.71	6411.37	0.8221	99. 0. 0. 0. 1.	16. 6.15.63.	
53749M	4	1850-	6274.58	19.84	5.86	5.72	17.62	49.04	6323.62	0.7755	100. 0. 0. 0. 0.	40.12.12.36.	
53749N	4	1900-	6227.03	21.78	4.46	8.47	29.59	64.30	6291.33	1.0220	100. 0. 0. 0. 0.	34. 7.13.46.	
53750A	4	1950-	6982.03	23.29	4.13	5.65	18.55	51.42	7033.45	0.7311	100. 0. 0. 0. 0.	45. 8.11.36.	
53750B	4	2000-	19166.48	49.48	3.75	4.61	15.89	73.73	19240.21	0.3832	100. 0. 0. 0. 0.	67. 5. 6.22.	
53750C	4	2050-	22288.70	28.88	4.45	5.03	22.10	60.46	22349.16	0.2705	100. 0. 0. 0. 0.	48. 7. 8.37.	
53750D	4	2100-	22288.55	28.40	3.14	3.69	14.79	50.02	22338.57	0.2239	100. 0. 0. 0. 0.	57. 6. 7.30.	
53750E	4	2150-	6562.07	5.75	1.70	4.83	19.51	31.79	6593.86	0.4821	100. 0. 0. 0. 0.	18. 5.15.62.	
53750F	4	2200-	11960.09	15.71	2.68	7.21	29.11	54.71	12014.80	0.4554	100. 0. 0. 0. 0.	29. 5.13.53.	
53750G	4	2250-	9737.86	9.24	2.45	5.65	23.26	40.60	9778.46	0.4152	100. 0. 0. 0. 0.	23. 6.14.57.	
53750H	4	2300-	10780.87	8.99	9.24	4.15	14.40	36.78	10817.65	0.3400	100. 0. 0. 0. 0.	24.25.11.40.	
53750I	4	2350-	20811.37	20.42	6.57	5.83	24.45	57.27	20868.64	0.2744	100. 0. 0. 0. 0.	36.11.10.43.	
53750J	4	2400-	7767.90	14.76	9.53	5.40	19.71	49.40	7817.30	0.6319	100. 0. 0. 0. 0.	30.19.11.40.	
53750K	4	2450-	14152.88	21.98	14.95	11.78	45.64	94.35	14247.23	0.6622	100. 0. 0. 0. 0.	23.16.12.49.	
53750L	4	2500-	19859.96	33.54	19.44	15.90	59.14	128.02	19987.98	0.6405	100. 0. 0. 0. 0.	26.15.12.47.	
53750M	4	2550-	15908.53	17.76	19.09	9.77	37.34	83.96	15992.49	0.5250	100. 0. 0. 0. 0.	21.23.12.44.	
53750N	4	2600-	7440.00	15.51	10.20	5.54	20.16	51.41	7491.41	0.6863	100. 0. 0. 0. 0.	30.20.11.39.	
53751A	4	2700-	11466.48	24.73	12.05	8.64	31.18	76.60	11543.08	0.6636	100. 0. 0. 0. 0.	32.16.11.41.	
53751B	4	2850-	6209.39	15.80	8.60	23.50	80.97	128.87	6338.26	2.0332	99. 0. 0. 0. 1.	12. 7.18.63.	
53751C	4	2900-	2970.79	21.24	5.17	17.46	63.37	107.24	3078.03	3.4840	96. 1. 0. 1. 2.	20. 5.16.59.	
53751D	4	2950-	3012.70	11.34	7.90	9.18	36.94	65.36	3078.06	2.1234	99. 0. 0. 0. 1.	17.12.14.57.	
53751E	4	3000-	37587.12	38.34	7.24	6.06	21.73	73.37	37660.49	0.1948	100. 0. 0. 0. 0.	52.10. 8.30.	
53751F	4	3050-	20364.79	31.37	14.13	8.52	30.07	84.09	20448.88	0.4112	100. 0. 0. 0. 0.	37.17.10.36.	
53751G	4	3100-	21557.56	34.52	6.67	7.85	30.04	79.08	21636.64	0.3655	100. 0. 0. 0. 0.	44. 8.10.38.	
53751H	4	3150-	13156.94	62.98	10.04	3.57	12.84	89.43	13246.37	0.6751	100. 0. 0. 0. 0.	71.11. 4.14.	
53751I	4	3200-	16764.62	24.25	22.12	8.13	27.94	82.44	16847.06	0.4893	100. 0. 0. 0. 0.	29.27.10.34.	
53751J	4	3250-	6492.17	16.65	6.38	8.26	31.01	62.30	6554.47	0.9505	100. 0. 0. 0. 0.	27.10.13.50.	
53751K	4	3300-	8027.11	17.21	8.35	4.84	17.87	48.27	8075.38	0.5977	100. 0. 0. 0. 0.	36.17.10.37.	
53751L	4	3350-	4607.76	81.32	27.73	4.92	15.71	129.68	4737.44	2.7373	97. 2. 1. 0. 0.	63.21. 4.12.	
53751M	4	3400-	7956.94	67.89	31.51	6.12	18.79	124.31	8081.25	1.5383	99. 1. 0. 0. 0.	55.25. 5.15.	
53751N	4	3450-	3404.69	37.48	34.34	4.62	12.10	88.54	3493.23	2.5346	98. 1. 1. 0. 0.	42.39. 5.14.	
53752A	4	3500-	2520.75	30.82	29.66	6.11	18.38	84.97	2605.72	3.2609	97. 1. 1. 0. 1.	36.35. 7.22.	
53752B	4	3550-	7239.39	91.80	54.53	15.36	30.65	192.34	7431.73	2.5881	98. 1. 1. 0. 0.	48.28. 8.16.	
53752C	4	3600-	7198.46	55.86	45.79	8.05	23.12	132.82	7331.28	1.8117	98. 1. 1. 0. 0.	42.34. 6.17.	
54067A		3600+	5924.35	24.05	11.74	5.82	20.27	61.88	5986.23	1.0337	100.0.00.00.00.0	39.19. 9.33.	
54067C		3650+	6010.52	37.06	4.85	2.08	8.46	52.44	6062.96	0.8649	99. 1.0.00.00.0	71. 9. 4.16.	
54067D		3700+	18443.05	60.25	4.61	1.56	6.64	73.05	18516.09	0.3945	100.0.00.00.00.0	83. 6. 2. 9.	
54067E		3750+	4304.00	29.38	2.58	1.72	7.26	40.94	4344.94	0.9422	99. 1.0.00.00.0	72. 6. 4.18.	
54067F		3800+	3804.00	14.11	3.33	0.89	3.36	21.69	3825.69	0.5669	100.0.00.00.00.0	66.15. 4.15.	
54067G		3850+	3402.00	12.41	3.69	0.98	3.67	20.75	3422.75	0.6062	100.0.00.00.00.0	59.18. 5.18.	
54067H		3900+	3930.90	18.49	2.00	1.26	3.21	24.96	3955.86	0.6309	100.0.00.00.00.0	74. 8. 5.13.	
54067I		3950+	3781.41	20.84	2.70	0.87	2.67	27.08	3808.49	0.7110	99. 1.0.00.00.0	77.10. 3.10.	
54067J		4000+	41742.46	7.22	3.37	1.04	3.02	14.64	41757.09	0.0351	100.0.00.00.00.0	49.23. 7.21.	
54068A		4050+	7262.79	147.63	7.61	1.08	2.43	158.74	7421.53	2.1389	98. 2.0.00.00.0	92. 5. 1. 2.	
54068B		4080+	4276.89	23.77	4.23	1.21	3.82	33.03	4309.92	0.7663	99. 1.0.00.00.0	71.13. 4.12.	
54068C		4100+	5695.74	10.10	2.73	1.56	1.37	15.76	5711.50	0.2759	100.0.00.00.00.0	64.17.10. 9.	
54068D		4150+	3745.46	10.24	3.07	0.99	1.15	15.45	3760.91	0.4108	100.0.00.00.00.0	67.20. 6. 7.	
54068E		4200+	4139.64	7.03	2.72	0.76	0.89	11.40	4151.04	0.2746	100.0.00.00.00.0	61.24. 7. 8.	
54068F		4250+	7206.87	35.12	9.29	5.45	4.82	54.67	7261.54	0.7529	100.0.00.00.00.0	64.17.10. 9.	
54068G		4300+	7084.68	30.97	8.97	5.06	5.21	50.20	7134.88	0.7036	100.0.00.00.00.0	62.18.10.10.	
54068H		4350+	6049.45	21.41	5.89	4.88	5.67	37.84	6087.29	0.6216	100.0.00.00.00.0	56.16.13.15.	
54068I		4400+	4181.39	21.97	9.98	10.88	15.01	57.84	4239.23	1.3644	99. 1.0.00.00.0	38.17.19.26.	
54068J		4450+	6101.11	28.50	8.71	9.60	14.02	61.23	6162.34	0.9936	100.0.00.00.00.0	47.14.16.23.	
54069A		4500+	6425.86	31.08	9.33	9.61	15.24	65.25	6491.11	1.0052	100.0.00.00.00.0	48.14.15.23.	
54069B		4550+	6046.11	36.14	6.39	5.36	7.72	55.60	6101.70	0.9112	99. 1.0.00.00.0	65.11.10.14.	
54069C		4600+	5772.00	39.84	10.40	9.83	13.84	73.90	5845.90	1.2642	99. 1.0.00.00.0	54.14.13.19.	
54069D		4650+	7492.45	52.46	17.13	11.64	16.28	97.50	7589.95	1.2846	99. 1.0.00.00.0	53.18.12.17.	
54069E		4700+	9517.66	55.54	12.77	8.13	10.64	87.08	9604.73	0.9066	99. 1.0.00.00.0	64.15. 9.12.	
54069F		4750+	4319.56	29.97	10.04	8.23	12.54	60.78	4380.34	1.3875	99. 1.0.00.00.0	48.17.14.21.	
54069G		4800+	5452.45	45.09	17.04	12.56	14.88	89.56	5542.01	1.6161	99. 1.0.00.00.0	50.19.14.17.	
54069H		4850+	4757.07	48.57	37.41	32.23	50.25	168.46	4925.53	3.4201	96. 1. 1. 1. 1.	29.22.19.30.	
54069I		4950+	6824.71	89.16	60.99	50.34	81.92	282.41	7107.12	3.9736	96. 1. 1. 1. 1.	31.22.18.29.	
54069J		4950+	4000.43	54.00	35.45	35.24	59.89	184.58	4185.01	4.4105	96. 1. 1. 1. 1.	29.19.19.33.	
54070A		5000+	6038.37	98.88	62.37	56.22	88.33	305.79	6344.16	4.8201	95. 2. 1. 1. 1.	33.20.18.29.	
54070B		5050+	6643.28	121.91	129.23	105.87	159.14	516.14	7159.42	7.2093	93. 2. 2. 1. 2.	24.25.21.30.	
54070C		5100+	6904.41	150.90	116.83	101.72	160.35	529.79	7434.20	7.1264	93. 2. 2. 1. 2.	28.22.19.31.	
54070D		5150+	8289.42	264.59	225.81	178.63	249.75	918.77	9208.19	9.9778	90. 3. 2. 2. 3.	29.25.19.27.	
54070E		5200+	6842.00	227.13	224.97	188.63	269.22	909.94	7751.94	11.7383	89. 3. 3. 2. 3.	25.25.21.29.	
54070F		5250+	2763.00	100.36	146.82	200.13	265.27	712.58	3475.58	20.5025	79. 3. 4. 6. 8.	14.21.28.37.	
54070G		5300+	2061.67	124.71	178.10	165.53	228.92	697.26	2758.93	25.2728	75. 5. 6. 6. 8.	18.26.24.32.	
54070H		5350+	9431.59	1664.65	1306.90	1062.19	1047.88	5081.61	14513.20	35.0137	66.11. 9. 7. 7.	32.26.21.21.	
54070I		5400+	16262.88	3336.68	2287.64	1925.90	1524.58	9074.79	25337.67	35.8154	64.13. 9. 8. 6.	37.25.21.17.	
54070J		5450+	26561.96	7075.28	3565.69	2415.42	1533.48	14589.85	41151.82	35.4537	64.17. 9. 6. 4.	48.24.17.11.	
54071A		5500+	25658.03	5370.25	2280.93	1509.87	838.65	10000.29	35658.32	28.0448	73.15. 6. 4. 2.	54.23.15. 8.	
54071B		5550+	31636.88	6413.80	2519.78	1586.89	645.51	11165.96	42802.84	26.0870	73.15. 6. 4. 2.	57.23.14. 6.	
54071C		5600+	30016.51	5849.95	2240.78	1414.33	597.87	10102.93	40119.43	25.1821	74.15. 6. 4. 1.	58.22.14. 6.	
54161A	4	5700+	9547.48	1637.16	1278.37	1381.22	511.85	4808.59	14356.07	33.4952	66.11. 9.10. 4.	33.27.29.11.	
54161B	4	5750+	4965.86	1264.29	730.84	664.72	225.55	2885.39	7851.25	36.7537	64.16. 9. 8. 3.	44.25.23. 8.	
54161C	4	5800+	20804.89	4984.52	2254.26	1851.83	599.30	9689.90	30494.79	31.7756	69.16. 7. 6. 2.	52.23.19. 6.	
54161D	4	5850+	11759.30	3582.42	1855.07	1534.25	490.62	7462.35	19221.64	38.8226	60.19.10. 8. 3.	47.25.21. 7.	
54161E	4	5900+	3297.64	1256.62	878.67	873.31	278.55	3287.14	6584.78	49.9203	51.19.13.13. 4.	38.27.27. 8.	
54161F	4	5950+	4303.66	679.60	347.32	304.55	101.05	1432.52	5736.18	24.9734	75.12. 6. 5. 2.	48.24.21. 7.	
54161G	4	6000+	4275.40	499.52	253.40	220.91	74.84	1048.67	5324.06	19.6967	81. 9. 5. 4. 1.	48.24.21. 7.	
54161H	4	6050+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54161I	4	6100+	2667.86	338.90	214.66	191.77	100.57	845.90	3513.76	24.0739	76.10. 6. 5. 3.	40.25.23.12.	
54161J	4	6150+	1953.08	190.14	109.33	110.73	54.27	464.47	2417.55	19.2124	80. 8. 5. 5. 2.	40.24.24.12.	
54161K	4	6200+	7487.21	957.21	467.68	330.50	218.36	1973.74	9460.95	20.8620	80.10. 5. 3. 2.	48.24.17.11.	
54161L	4	6250+	2051.20	285.00	158.48	146.27	92.63	682.38	2733.58	24.9628	76.10. 6. 5. 3.	42.23.21.14.	
54161M	4	6300+	1283.24	83.93	61.05	65.29	37.19	247.46	1530.70	16.1664	85. 5. 4. 4. 2.	34.25.26.15.	
54161N	4	6350+	1303.63	91.44	74.74	75.09	46.99	294.26	1597.89	18.4155	81. 6. 5. 5. 3.	33.25.26.16.	
54161O	4	6400+	947.42	48.11	40.95	46.95	28.30	164.31	1111.73	14.7796	85. 4. 4. 4. 3.	29.25.29.17.	
54161P	4	6450+	6452.99	1570.81	1861.17	541.14	529.37	4502.48	10955.46	41.0980	59.14.17. 5. 5.	35.41.12.12.	
54161Q	4	6500+	6337.66	1752.69	2171.32	626.82	613.39	5164.21	11501.87	44.8989	56.15.19. 5. 5.	34.42.12.12.	
54162A	4	6550+	6142.25	1296.87	1431.97	370.18	323.00	3422.01	9564.26	35.7792	64.14.15. 4. 3.	38.42.11. 9.	
54162B	4	6600+	21531.53	4195.66	4519.56	1028.81	1182.77	10926.79	32458.31	33.6640	66.13.14. 3. 4.	38.42. 9.11.	
54162C	4	6650+	3323.22	785.10	1249.59	326.29	406.86	2767.83	6091.05	45.4409	54.13.21. 5. 7.	28.45.12.15.	
54162D	4	6700+	7098.00	1575.06	2098.52	485.21	573.67	4732.45	11830.45	40.0022	60.13.18. 4. 5.	33.45.10.12.	
54162E	4	6750+	4761.95	965.00	1296.50	367.77	412.13	3041.39	7803.34	38.9755	61.12.17. 5. 5.	32.42.12.14.	
54162F	4	6800+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162G	4	6850+	1833.00	257.83	389.88	106.27	125.82	879.80	2712.80	32.4314	67.10.14. 4. 5.	29.45.12.14.	
54162H	4	6900+	1247.75	130.68	206.00	75.29	72.57	484.54	1732.29	27.9710	72. 8.12. 4. 4.	27.42.16.15.	
54162I	4	6950+	1058.00	193.81	241.14	77.01	80.15	592.11	1650.11	35.8830	63.12.15. 5. 5.	33.40.13.14.	
54162J	4	7000+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162K	4	7050+	576.03	8.73	21.58	21.79	23.56	75.66	651.69	11.6097	89. 1. 3. 3. 4.	12.29.29.30.	
54162L	4	7100+	1111.67	73.35	77.21	35.48	33.35	219.39	1331.06	16.4823	82. 6. 6. 3. 3.	33.36.16.15.	
54162M	4	7250+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.00.00.00.0	0.00.00.00.0	*BC*
54162N	4	7300+	729.25	20.29	22.40	42.55	28.45	113.69	842.94	13.4873	87. 2. 3. 5. 3.	18.20.37.25.	
54162O	4	7350+	331.54	14.48	16.58	10.96	8.61	50.63	382.17	13.2480	87. 4. 4. 3. 2.	29.32.22.17.	
54162P	4	7400+	789.70	15.18	22.30	17.57	15.87	70.92	860.62	8.2405	91. 2. 3. 2. 2.	21.32.25.22.	
54052A		7450+	1713.00	138.75	145.94	38.21	42.87	365.77	2078.77	17.5955	82. 7. 7. 2. 2.	38.40.10.12.	
54052B		7500+	1229.50	7.51	7.67	4.66	7.58	27.42	1256.92	2.1815	97. 1. 1.0.0 1.	27.28.17.28.	
54052C		7550+	1266.10	33.63	24.14	8.31	10.55	76.63	1342.73	5.7070	93. 3. 2. 1. 1.	43.32.11.14.	
54052D		7600+	838.74	16.21	11.56	6.07	12.41	46.25	884.99	5.2260	95. 2. 1. 1. 1.	35.25.13.27.	
54052E		7650+	345.43	12.04	7.28	4.49	11.13	34.94	380.37	9.1857	91. 3. 2. 1. 3.	34.21.13.32.	
54052F		7700+	1367.09	13.07	12.60	6.35	11.22	43.24	1410.33	3.0659	97. 1. 1.0.0 1.	30.29.15.26.	
54052G		7750+	1330.32	18.54	8.69	3.46	6.25	36.94	1367.26	2.7017	98. 1. 1.0.00.0	50.24. 9.17.	
54052H		7800+	1379.87	14.57	9.82	7.36	16.01	47.76	1427.63	3.3454	96. 1. 1. 1. 1.	31.21.15.33.	
54052I		7850+	1279.76	28.17	47.19	23.20	29.67	128.23	1407.99	9.1073	91. 2. 3. 2. 2.	22.37.18.23.	
54052J		7950+	1579.94	137.57	182.80	65.48	64.76	450.61	2030.55	22.1915	78. 7. 9. 3. 3.	31.40.15.14.	
54052K		8000+	1744.54	100.64	129.11	47.86	47.28	324.89	2069.43	15.6995	85. 5. 6. 2. 2.	31.39.15.15.	
54052L		8030+	1365.91	68.38	107.73	34.35	36.09	246.55	1612.46	15.2903	85. 4. 7. 2. 2.	28.43.14.15.	

B = CUTTINGS NOT ANALYZED   *C* = AIR SPACE GAS NOT RUN   *BC* = NO ANALYSES RUN

TABLE II

Sample Descriptions and Results of Total Organic and Visual Kerogen Analysis - Esso 25/11-1 Well, Norway
(Lithologic descriptions by R. E. Hukill except those from mud logs, designated *)
(Kerogen by J. L. Morgan)

Sample Depth (Feet)	EPR No.	Lithology of Analyzed Chips	GSA Color Code	Total Organic Matter-%	Kerogen Alteration Index	Types of Kerogen Materials** Predominant	Secondary	Other
1650-	53749-I	Claystone, silty, calcareous	5Y6/1	0.77	1	U	C	A
1950-	53750-A	*Claystone		1.04				
2300-	-H	Claystone, silty, fossiliferous		1.53				
2550-	-M	Claystone, silty, fossiliferous		1.61				
3000-	53751-E	Coal (lignite)		63.7				
3500-	53752-A	*Shale		5.77				
3550-	-B	*Claystone, silty, micaceous	5YR2/1	3.05	2	A	W	C
3625-40	54067-B (Core)	Shale, silty, sl. micaceous and fossiliferous	5YR3/1	2.56				
4000+	-J1	Claystone, silty, micaceous		2.82				
	-J2	Mudstone, silty, calcareous, micaceous, sl. sandy	5YR3/1	1.94	2	A	W	C
4100+	54068-C	Claystone, sl. silty	5Y4/1	1.50	2	W	H	F
4450+	-J	Shale, silty, micaceous, sl. calcareous		1.63				
4500+	54069-A	*Shale, silty		1.76				
5000+	54070-A	*Claystone, silty		.78				
5200+	-E1	*Claystone, silty, glauconitic		.44				
"	-E2	Claystone, trace of pyrite and microfossils	5Y6/1	0.71	2	C, H	W	P
5400+	-I1	Shale, tr. glauconite		0.70				
	-I2	Shale, trace of pyrite	5Y3/1	0.94	2+	C	P	F, W
5500+	54071-A	Shale, sl. silty and pyritic	5Y2/1	0.71	2+	F	C	H, W
5600+	-C	*Shale, sl. glauconitic		0.55				
5700+	54161-A	Shale, sl. silty, very hard	5Y3/1	1.87				
5714-28	54160 (Core)	Shale, hard, sandy zones	5Y3/1, N4	1.19				
5750-	54161-R	*Shale, sl. sandy		1.83				
5800+	-C	Shale, sl. silty and pyritic	5Y2/1	1.87	1+	H	C	A (Pollen very
6000+	-G	Shale, sl. silty, trace of pyrite	5Y2/1, N4	1.92	1+	H	C	F abundant)

** See footnote on next page.

TABLE II - Page 2

Sample Depth (Feet)	EPR No.	Lithology of Analyzed Chips	GSA Color Code	Total Organic Matter-%	Kerogen Alteration Index	Types of Kerogen Materials* Predominant	Secondary	Other
6050+	-H	Claystone, sl. silty	5Y3/1	2.05				
6100-	-S	*Claystone, sl. silty		.72				
6200+	54161-K	Limestone, foraminiferal	5YR8/1	0.16				
6250-	-T	*Shale, calcareous		0.88				
6350+	-N	Shale, minor silt and pyrite, very hard	5GY4/1	0.46				
6400+	-O	Shale, trace of pyrite and microfossils	5Y4/1	.59	2	A	W	H, C
6500+	-Q	Shale, minor silt and pyrite, abundant plant debris, splintery, very hard	5Y2/1	9.03				
6600+	54162-B	Shale, silty, trace of pyrite and mica	N2	16.7[illegible]	2	W	A	C
6800+	-F1	Shale, silty, micaceous, very hard	5Y3/1	2.22				
"	-F2	Mudstone, silty; sl. sandy, calcareous and micaceous; trace of pyrite	5Y3/1	2.70	2	Al	W	H, C
6850-	-Q	*Shale, silty		2.43				
6900+	-H	Limestone, soft, glauconitic, silty	5YR7/1	0.31				
7400+	-P	Clay	5YR4/4	0.62				
8000+	54052-K1	Shale ?						
	-K2	Shale ?						
	-K3	Claystone, sl. silty, trace of pyrite	5Y4/1	.87	2	H	W	A (Pollen very abundant)

* * Kerogen Types

A - Amorphous	W - Woody
Al- Algal debris	C - Coaly
H - Herbaceous	P - Plankton
F - Finely disseminated material	U - Unidentified

TABLE III

Results of Chemical Analyses of Selected Cuttings Chips - Esso 25/11-1 Well, Norway

(Hydrocarbon analyses by H. M. Fry)

Sample Depth (Feet)	EPR No.	Lithology (See Table II)	Total Organic Matter-%	Total C_4-C_7 Hydrocarbons ppm	Cyclohexane/ Methylcyclopentane
1500-	53749-F	Claystone	na*	trace	-
1650-	-I	Claystone	0.77	trace	-
1950-	53750-A	Claystone	1.04	na*	na*
2300-	-H	Claystone	1.53	trace	-
2550-	-M	Claystone	1.61	trace	-
3000-	53751-E	Coal	63.7	11.3	1.38
3500-	53752-A	Shale	5.77	2.3	0.08
3550-	-B	Claystone	3.05	trace	-
**3625-40	54067-B	Shale	2.56	trace	-
4000+	-J_1	Claystone	2.82	trace	-
4000+	-J_2	Mudstone	1.94	0.7	0.1 ?
4100+	54068-C	Mudstone	1.50	0.3	-
4450+	-J	Shale	1.63	trace	-
4500+	54069-A	Shale	1.76	0.04	1.25
5000+	54070-A	Claystone	.78	trace	-
5200+	-E_1	Claystone	.44	trace	-
5200+	-E_2	Claystone	.71	0.2	-
5400+	-I_1	Shale	.70	3.2	1.31
5400+	-I_2	Shale	.94	0.2	-
5500+	54071-A	Shale	.71	4.4	2.1
5600+	-C	Shale	.55	1.8	1.41
5700+	54161-A	Shale	1.87	1.7	1.53
**5714-28	54160	Shale	1.19	28.9	1.52
5750-	54161-R	Shale	1.83	12.0	1.45
5800+	-C	Shale	1.87	3.2	14.2
6000+	-G	Shale	1.92	12.3	3.2
6050+	-H	Claystone	2.05	0.7	1.50
6100-	-S	Claystone	.72	2.3	1.51
6200+	-K	Limestone	.16	0.2	-
6250-	-T	Shale	.88	3.0	1.45
6350+	-N	Shale	.46	1.5	.98
6400+	-O	Shale	.59	0.36	-
6500+	-Q	Shale	9.03	49.0	0.19
6600+	54162-B	Shale	16.7	44.4	0.4
6800+	-F_1	Shale	2.22	0.6	0.83
6800+	-F_2	Mudstone	2.70	0.3	0.4 ?
6850-	-Q	Shale	2.43	8.9	1.16
6900+	-H	Limestone	0.31	0.02	-
7400+	-P	Clay	0.62	0.7	1.30
8000+	54052-K_1	Shale ?	-	10.9	0.26
8000+	-K_2	Shale ?	-	12.2	0.25
8000+	-K_3	Claystone	0.87	trace	-

*na - not analyzed

**core sample