VISUAL KEROGEN AND VITRINITE REFLECTANCE ANALYSES OF THE PLEASANT BAYOU NO. 1 WELL, BRAZORIA CO., TEXAS

Prepared
for

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SUMMARY

- Based on the visual kerogen analyses, the Pleasant Bayou No. 1 Well can be subdivided into six (6) zones and nine (9) sub-zones.

- The stratigraphic section ranges from Immature at 2,894 feet to Marginally Mature at 16,500 feet.

- From 2,894 to 5,360 feet the organic matter suite is primarily an amorphous, spore-pollen assemblage with secondary amounts of vitrinite. Below 6,080 feet, the kerogenaceous debris is generally of a vitrinite, plant tissue, spore-pollen mixture with very little amorphous debris.

- Loss-of-circulation material, indicating drilling problems, is particularly abundant in cutting samples from 9,740 to 10,820 feet.

- There is a significant "jump" in the thermal maturation index, T.A.I., at the T-3 seismic horizon between 11,180 and 11,600 feet.

- As a result of the overall thermal immaturity and due to only fair quality organic matter, one can expect non-commercial accumulations of biogenic methane and/or wet gas.

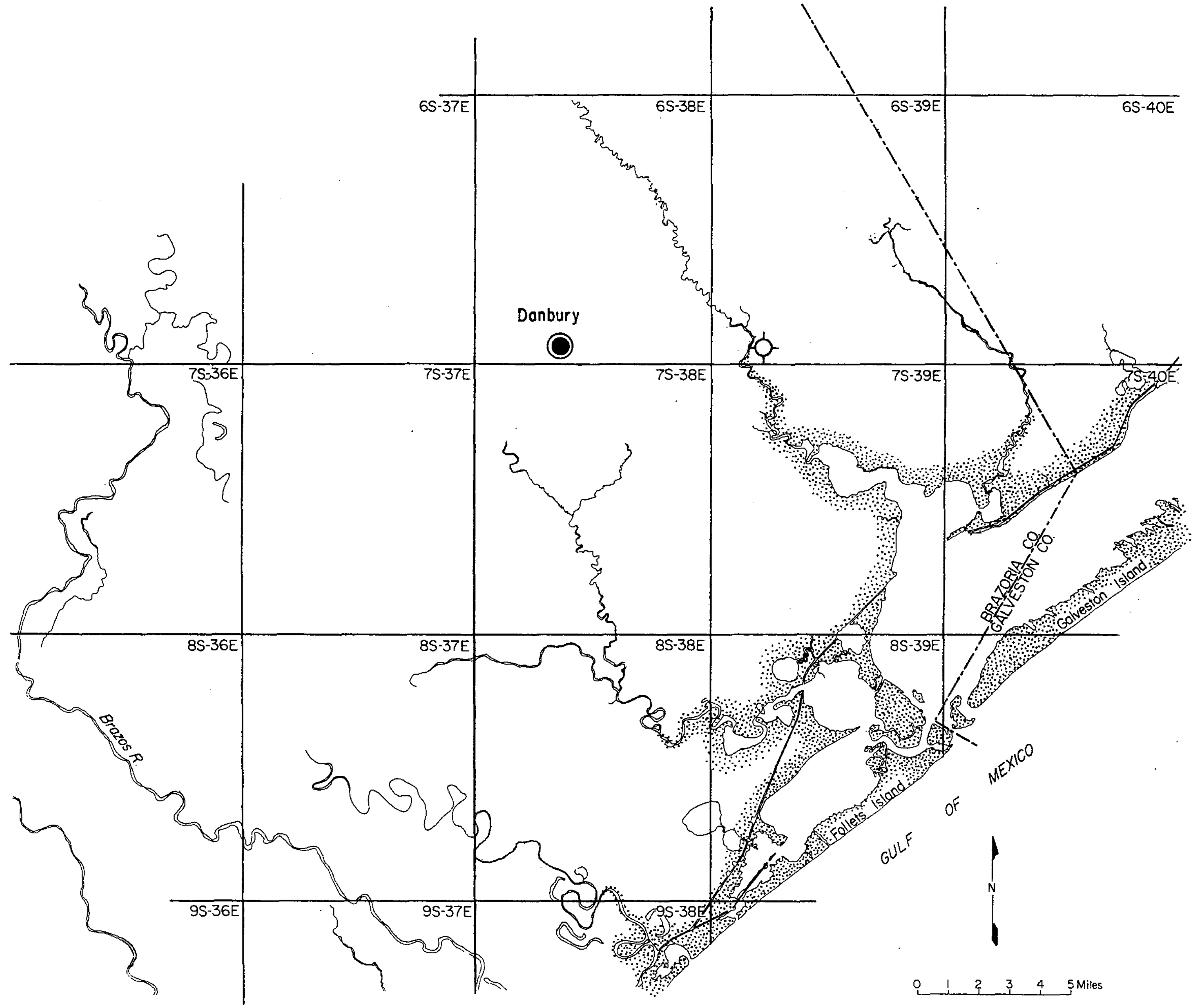


Figure 1. Location map of the Pleasant Bayou No. 1 well.

SAMPLE MATERIAL

Geo-Strat, Inc., received all its cuttings material, i.e., visual kerogen slides and organic matter residue, from Geo-Chem Laboratories, Inc., of Houston, Texas. The two (2) cored specimens which Geo-Strat, Inc., examined were sampled and processed by the writer. For clarity, Geo-Strat's Job Number prefix, 1136, and each subsequent sample number, -086, are the same as those used by Geo-Chem Laboratories, Inc.

GENERAL INFORMATION

Twenty-five (25) copies of this report have been sent to Dr. Robert A. Morton, Bureau of Economic Geology, The University of Texas, Austin, Texas. Geo-Strat, Inc., retains three (3) copies of this report for future reference in answering any questions which may arise concerning this study.

All the visual kerogen slides and vitrinite reflectance plugs will be retained by Geo-Strat, Inc. The data presented in this report is considered the sole property of the Gas Research Institute. Reprinting of the enclosed text-figures by any other institution is prohibited without the expressed written consent of Geo-Strat, Inc.

INTRODUCTION

The Pleasant Bayou No. 1, located approximately six (6) miles east of the town of Danbury along Chocolate Bayou in Brazoria Co., Texas, is the United States' first geopressure-geothermal well (Figure 1). It is this nation's first organized attempt to tap geopressured methane gas. The target, a geothermal reservoir in the Oligocene Frio Formation, lies at a depth of between 15,000 and 16,500 feet. The well is expected to recover about 40 cubic feet of methane gas per barrel of water. Bottom hole pressures are expected to be in the order of 10,000 to 12,500 pounds per square inch. Geopressured methane gas reserves in Texas and Louisiana have been estimated at between 3,000 and 100,000 trillion cubic feet with about 50 trillion cubic feet being recoverable.

In order to have a viable geopressure-geothermal well, four (4) basic conditions must be met:

1. There should be a good source of biogenic or thermally derived methane gas.

2. High fluid temperatures, in excess of 300°F, should be present.

3. Good geopressures, hopefully above 10,000 pounds per square inch, should exist in the subsurface.

4. Reservoir quality sands must be present.

Current knowledge, based on surrounding well information, indicates that at least two (2) of the conditions listed above, 2 and 4, are present.

Geo-Strat's task will be to determine if sediments having good source rock capabilities exist in the stratigraphic section penetrated by the Pleasant Bayou No. 1 Well. Of particular interest is the lower Frio interval between 15,000 and 16,500 feet. The results and interpretations made by this writer will be based exclusively on Geo-Strat's visual kerogen and vitrinite reflectance analyses of forty (40) well cuttings samples and two (2) core specimens. Through these analyses we can:

1. Accurately define the state of thermal maturity attained by the sediments penetrated in the Pleasant Bayou No. 1 Well.

2. Describe the character, type and quality of the extracted organic matter.

3. Gain a fairly good understanding as to the hydrocarbon source potential of the stratigraphic section.

RESULTS AND INTERPRETATIONS

Organic Geochemical Zonation

A. VISUAL KEROGEN

Visual kerogen analyses allow one to sub-divide the stratigraphic section between 2,894 and 16,500 feet in the Pleasant Bayou No. 1 Well into six (6) zones and nine (9) sub-zones (Table 1).

ZONE I

Pleistocene-Pliocene Undifferentiated
2,894-3,693 ft.

This zone is characterized by a predominance in amorphous sapropelic kerogen. Spore-pollen and plant tissue, also abundant, is of secondary importance. The average organic matter index, O.M.I., for this interval is 2.67 (Figures 3-4; Table 1). It is of a good quality insofar as its oil-generating potential is concerned. The average thermal alteration index, T.A.I., is 3.54 and indicates that this portion of the stratigraphic section is Immature (Figures 2, 3, 5-7, 13-14; Table 1, 2a).

The kerogen particle size index, P.S.I., has an average value of 1.70 and is considered to be finely disseminated. Preservation of the extracted organic matter is fair and has an average preservation index, P.I., of 4.14 (Figures 3-5; Table 1).

Geochemically, this interval of the Pleasant Bayou No. 1 Well would be considered as a Poor source rock. Only minor amounts of biogenic methane can be anticipated.

ZONE II

Miocene Undifferentiated
3,974-7,580 ft.

In comparison with the overlying unit, one can't help but notice a substantial increase in the amount of vitrinite and coaly material extracted from Miocene-age sediments. The increase, reflected by an overall organic matter index, O.M.I., of 4.72, is sharply defined on the kerogen worksheet and enclosed well profile (Figures 3-4). This decrease in quality, "oil-generating potential," coupled by a somewhat lower thermal alteration index, T.A.I., of 2.60, forces Geo-Strat, Inc., to regard this portion of the stratigraphic section as Immature (Figures 2-6, 8, 12-15; Tables 1-2b).

Within the undifferentiated Miocene section, a transition in the kerogen particle size, from finely disseminated in Sub-Zone A to fine in Sub-Zone B, is clearly evident. A substantial improvement in the state of palynomorph preservation can also be seen (Figures 3-5; Table 1).

Sub-Zone A (3,974-5,360 ft.)

Sub-Zone A is distinguished from Sub-Zone B by its greater concentration of amorphous kerogen, i.e., its lower O.M.I. value of 4.36, its finer particle size, P.S.I. of 1.50, and its poorer preservation of the extractable kerogen debris, P.I. of 3.67 (Figures 3-5; Table 1).

Sub-Zone B (6,080-7,580 ft.)

Sub-Zone B is identified by a sudden decrease in the quality of the organic matter type, O.M.I. of 5.08, by an increase in the particle size, P.S.I. of 2.71, by a steady improvement in the state of palynomorph preservation, P.I. of 3.00, and by the first major occurrence of marine algal cysts (Figures 3-5; Table 1).

Based on the above data, the Miocene section between 3,974 and 7,580 feet would be considered by this writer as a poor source potential for the generation of commercial quantities of liquid hydrocarbons. Only minor amounts of biogenic methane and/or wet gas are expected to occur in this horizon.

ZONE III

Anahuac Shale-Oligocene
7,940-9,020 ft.

From the kerogen parameters, it is very difficult to distinguish the Anahuac from the overlying Miocene sediments of Sub-Zone B. The only significant changes are a decrease in the particle size of the organic matter, P.S.I. of 2.13, a slight increase in the thermal alteration index, T.A.I. of 2.74, and an increasing marine influence during sediment deposition (Figures 3-5, 9, 15-16; Table 1).

Geochemically, the Anahuac is not much better than the overlying Miocene section. Sediments are considered to be Immature and have a poor potential for the generation of liquid hydrocarbons. Only minor accumulations of biogenic methane and/or wet gas should be expected.

ZONE IV

"Upper" Frio-Oligocene
9,440-12,680 ft.

The "upper" Frio is very much like the Anahuac insofar as the quality of its organic matter is concerned. The extractable kerogen can be regarded as fair, having an O.M.I. of 5.17. There is a significant increase in the overall state of thermal maturation, i.e., an average T.A.I., of 3.07 for Zone IV versus an average of 2.74 for the Anahuac. This "jump" is especially evident in Sub-Zones B and C, the latter of which approximates the T-3 seismic horizon. Compared with Zone III, the dispersed organic matter shows a rapid deterioration in its overall state of preservation, i.e., a P.I. of 3.44 in Zone IV compared with a P.I. of 3.20 in Zone III. Again, this is most noticeable in Sub-Zones B and C. The particle size, P.S.I., has an average value of 2.35 and shows no significant change from what was observed in the overlying Anahuac Shale. Common occurrences of fresh to brackish water dinoflagellates, algal cysts, indicate a shallow marine environment of deposition for "upper" Frio sediments (Figures 3-6, 10, 13, 17-20; Tables 1, 2b-d).

Sub-Zone A (9,440-10,460 ft.)

Sub-Zone A is differentiated from the overlying Anahuac Shale by the influx of fresh to brackish water algal cysts, i.e., Pediastrum sp. No significant changes in the organic matter type, thermal alteration index, particle size, and preservation can be observed when compared with the same parameters of Zone III. The average values of these parameters in Sub-Zone A are as follows: O.M.I., 2.80; T.A.I., 5.25; P.S.I., 2.29; and P.I., 3.10.

Sub-Zone B (10,820-11,180 ft.)

Sub-Zone B is separated from Sub-Zone A by its increase in thermal maturity and its rapid deterioration in palynomorph preservation, i.e., a T.A.I. of 3.00 and a P.I. of 3.67 in Sub-Zone B versus a T.A.I. of 2.80 and a P.I. of 3.10 in Sub-Zone A. The organic matter continues to be of fair quality, O.M.I. of 5.39, while the particle size remains fine, P.S.I. of 2.33. In addition, there is a noticeable absence in the occurrence, ?recovery, of fresh to brackish water algal cysts.

Sub-Zone C (11,600-12,680 ft.)

Sub-Zone C, when compared to Sub-Zones A and B, shows a significant "jump" in its thermal maturity, i.e., a T.A.I. of 3.37 in Sub-Zone C compared with T.A.I. values of 2.80 and 3.00 in Sub-Zones A and B. The organic matter is fair in quality, O.M.I. of 4.98, but considerably better than that of Sub-Zones A and B. Good thermal maturity, coupled with fairly good organic constituents, allows one to characterize this zone as being within the Immature to Mature transition (Figure 10).

NOTE: It is important to mention that cuttings samples from Sub-Zones A and B contain an abundance of mud additives and/or loss-of-circulation material, i.e., walnut hulls. This indicates that the well was experiencing drilling problems, a situation which undoubtedly affected the quality of the sample material. It may also be one of the reasons as to why Sub-Zones A and B are so different from Sub-Zone C.

Collectively, Sub-Zones A and B of the "upper" Oligocene continue to be Immature and should not be expected to contain any significant accumulations of liquid hydrocarbons. Sediments of Sub-Zone C, however, are within the Immature-Mature transition and could show a substantial increase in the amount of biogenic methane and/or wet gas being generated in situ. As a principal source rock, the "upper" Frio is considered to be poor in the Pleasant Bayou No. 1 Well. Only minor accumulations of biogenic methane and/or wet gas can be expected in this portion of the stratigraphic section.

ZONE V

"Middle" Frio-Oligocene
13,340-14,800 ft.

The stratigraphic section that this writer has designated as "middle" Frio in the Pleasant Bayou No. 1 Well, can be distinguished from "upper" Frio sediments by its overall higher thermal maturity, a T.A.I. of 3.43 versus 3.07 in Zone IV, its continued deterioration in palynomorph preservation, a P.I. of 3.91 compared to 3.44 in Zone IV, and the more marine nature of its sediments. The quality of the organic matter remains fair, but it is not as good as that observed in the "upper" Frio, i.e., an O.M.I. of 5.40 in Zone V as compared to 5.17 in Zone IV. Although the average particle size of the kerogen, P.S.I. of 2.28, tends to indicate little change from that of "upper" Miocene sediments, a noticeable shift between Sub-Zones A and B of Zone V is quite noticeable, i.e., a P.S.I. of 2.70 for Sub-Zone A and a P.S.I. of 2.07 for Sub-Zone B. This may reflect significant changes in the depositional environment (Figures 2-6, 11, 20-21, 24; Tables 1, 2a-e).

Sub-Zone A (13,340-13,760 ft.)

Sub-Zone A differs from Sub-Zone C of the "upper" Frio by its poorer quality of the extractable organic matter, i.e., an O.M.I. of 5.36 in Sub-Zone A compared with an O.M.I. of 4.98 for Sub-Zone C of Zone IV. There is an increase in the particle size of the kerogen from a P.S.I. of 2.42 in Sub-Zone C of the "upper" frio to 2.70 in Sub-Zone A of the "middle" Frio. In addition, there continues to be a deterioration in palynomorph preservation, i.e., a P.I. of 3.86 for Sub-Zone A versus a P.I. of 3.67 for Sub-Zone C, and an increase in thermal maturation, a T.A.I. of 3.51 versus a T.A.I. of 3.37. The poor quality of the extractable organic matter, coupled with only moderate paleotemperatures, forces this writer to regard the overall state of maturity as being slightly Immature.

Sub-Zone B (14,060-14,800 ft.)

Kerogenaceous debris in Sub-Zone B of Zone V shows a slight increase in its thermal alteration index over that observed in Sub-Zone A, i.e., a T.A.I. of 3.50 versus a T.A.I. of 3.29. There is continued deterioration in the quality of the organic matter type as well as in palynomorph preservation, i.e., an O.M.I. of 5.42 and a P.I. of 3.96 in Sub-Zone B as compared to an O.M.I. of 5.36 and a P.I. of 3.86 in Sub-Zone A. The most noticeable parameter which distinguishes Sub-Zone B from Sub-Zone A is the particle size index. The mean particle size of the kerogen debris in Sub-Zone B is significantly less than that recorded for Sub-Zone A, i.e., a P.S.I. of 2.07 versus a P.S.I. of 2.70.

Zone V shows a slight improvement in its hydrocarbon-generating potential as compared with Zone IV. Kerogenaceous debris from this portion of the stratigraphic section is just entering the transition phase between Immaturity and Maturity. As a result, sediments in Zone V of the Pleasant Bayou No. 1 Well are considered as being marginally Mature. Compared with the upper portion of the well, one should be seeing larger accumulations of biogenic methane and/or wet gas. It is still unlikely, however, that they will be of major commercial value.

Zone VI

"Lower" Frio-Oligocene
15,100-16,500 ft.

Kerogenaceous debris in Zone VI, when compared to values obtained from Zone V, continues to show an overall increase in thermal maturity and a decrease in palynomorph preservation, i.e., a T.A.I. of 3.56 and a P.I. of 4.33 in Zone VI as compared to a T.A.I. of 3.42 and a P.I. of 3.91 in Zone V. The mean particle size of the kerogen is decreasing, a P.S.I. of 2.07 versus a P.S.I. of 2.28, and the extractable organic matter is improving in its overall hydrocarbon potential, i.e., an O.M.I. of 5.18 versus an O.M.I. of 5.40. The marked decrease in marine algal cysts and amorphous type kerogen, suggests that the stratigraphic section has experienced a major change in its depositional environment. Based on the algal content of the conventional core sample taken at 15,556 feet, I would interpret this portion of the well as being of a shallow marine and/or brackish water facies (Figures 2-6, 12, 13, 21-24; Tables 1, 2e-g).

Sub-Zone A (15,100-15,680 ft.)

Sub-Zone A is very much like Sub-Zone B of Zone V. The state of thermal maturity and the degree of palynomorph preservation is almost identical, i.e., a T.A.I. of 3.51 and a P.I. of 4.04 in Sub-Zone A versus a T.A.I. of 3.50 and a P.I. of 3.93 in Sub-Zone B of Zone V. There is a minor increase in the mean particle size of the kerogen in Sub-Zone B coupled with a slight improvement in the quality of the extractable organic matter, i.e., a P.S.I. of 2.25 and an O.M.I. of 5.18 in Sub-Zone A compared with a P.S.I. of 2.07 and an O.M.I. of 5.18 in Sub-Zone B of the "middle" Frio. Marine algal cysts are conspicuously absent. A noticeable influx of amorphous type kerogen is present at the base of this zone.

Sub-Zone B (15,700-16,500 ft.)

Sub-Zone B differs from Sub-Zone A by its general absence of dinoflagellates (algal cysts) and the almost total lack of amorphous type kerogen. There is an increase in the thermal alteration index, a T.A.I. of 3.62 in Sub-Zone B compared to a T.A.I. of 3.51 in Sub-Zone A, coupled with a significant deterioration in palynomorph preservation, i.e., a P.I. of 4.69 in Sub-Zone B versus a P.I. of 4.04 in Sub-Zone A. Measurements of the particulate kerogen debris shows a considerable decrease in particle size when compared to the same parameters for Sub-Zone A, i.e., a P.S.I. of 1.84 versus a P.S.I. of 2.24. The quality of the organic matter remains essentially the same as that of Sub-Zone A and is considered to be fair, i.e., an O.M.I. of 5.19 in Sub-Zone B versus an O.M.I. of 5.18 in Sub-Zone A.

From the standpoint of hydrocarbon generation, Zone VI would appear to be the most favorable of all those analyzed. One could expect to find moderate accumulations of biogenic methane and/or wet gas. The commercial value of such hydrocarbons, i.e., potential value of in situ hydrocarbons, is questionable.

B. VITRINITE REFLECTANCE

Vitrinite, one of the many petrographic constituents of coal, has been used by the coal mining industry for many years as a means of determining coal rank. In petroleum exploration, the technique has been slightly modified and is used as a method of determining a sediment's state of thermal maturity (Figure 2).

In the vitrinite reflectance analyses, vitrinite particles and associated kerogen types are extracted from the sediment using a series of acids. The process is essentially the same as that used in palynology except that the oxidation step has been omitted. Extractable organic matter, kerogen, is dried in a vacuum chamber and then embedded in a bioplastic or epoxy plug. After being finely polished, a high resolution microscope, calibrated with a known optical standard, is used to measure the reflectivity of the vitrinite particles.

Vitrinite reflectance measurements, expressed as % R_o, are taken in oil and then summarized on individual histograms (Figures 13-24). In samples having a history of low paleotemperatures, 40 to 50 observations are usually adequate. Sediments which have undergone complex structural deformations, contain significant amounts of older re-worked debris, and/or have been subjected to high paleotemperatures, may require as many as 100 to 150 observations. The latter usually has a wide scatter in its reflectance values and subsequently makes it very difficult to determine the correct % R_o value. Without the aid of visual kerogen data, samples having a wide scattering of % R_o values are almost impossible to interpret.

A good example of this problem can be seen in Figure 13. Here four (4) individual histograms are presented showing both situations. The upper two show a good tight histogram profile while the bottom two reflect histograms having a poor quality due to the excessive wide scatter in the % R_o values.

In the upper half of the Pleasant Bayou No. 1 Well, vitrinite reflectance data is essentially very good (Figures 13-16). Below 8,000 feet vitrinite reflectance % R_o values become widely scattered making accurate thermal maturation estimates very difficult (Figures 17-24). Even the core samples from 14,078 and 15,556 feet contain more than one vitrinite population. However, with core material, assuming that it has been thoroughly washed and contains no drilling mud, we have the advantage of knowing that the lowest % R_o value (mean) for the vitrinite must be *in situ*.

CONCLUSIONS AND RECOMMENDATIONS

It is Geo-Strat's conclusion that the sediments at 16,500 feet in the Pleasant Bayou No. 1 Well are *Marginally Mature*. Due to the rather low state of thermal maturation, combined with the *fair* quality of the extractable organic matter, we do not expect that this well will produce commercial quantities of biogenic methane and/or wet gas. Assuming an *improvement* in the quality of the organic matter at depth, coupled with *high paleotemperatures*, one could expect *major* sources and accumulations of liquid hydrocarbons in deeper stratigraphic horizons.

Geo-Strat, Inc., recommends that the Gas Research Institute examine the Frio, "Vicksburg" and ?Jackson sections of at least two (2) deep wells in the surrounding fields, i.e., *Humble No. 1 Skrabanek* and the *Sun Oil Company No. 1 Houston Farms*. The primary purpose would be to construct a series of isopachous maps which will *illustrate* and *predict* the more *favorable fairways* insofar as *paleotemperature*, *total organic carbon*, and *organic matter* is concerned. If samples of the two previously mentioned wells can be attained, it would be a relatively inexpensive means of gathering additional critical well data.

Figure 2

COMPARISON OF GEOTHERMAL DIAGENETIC CRITERIA

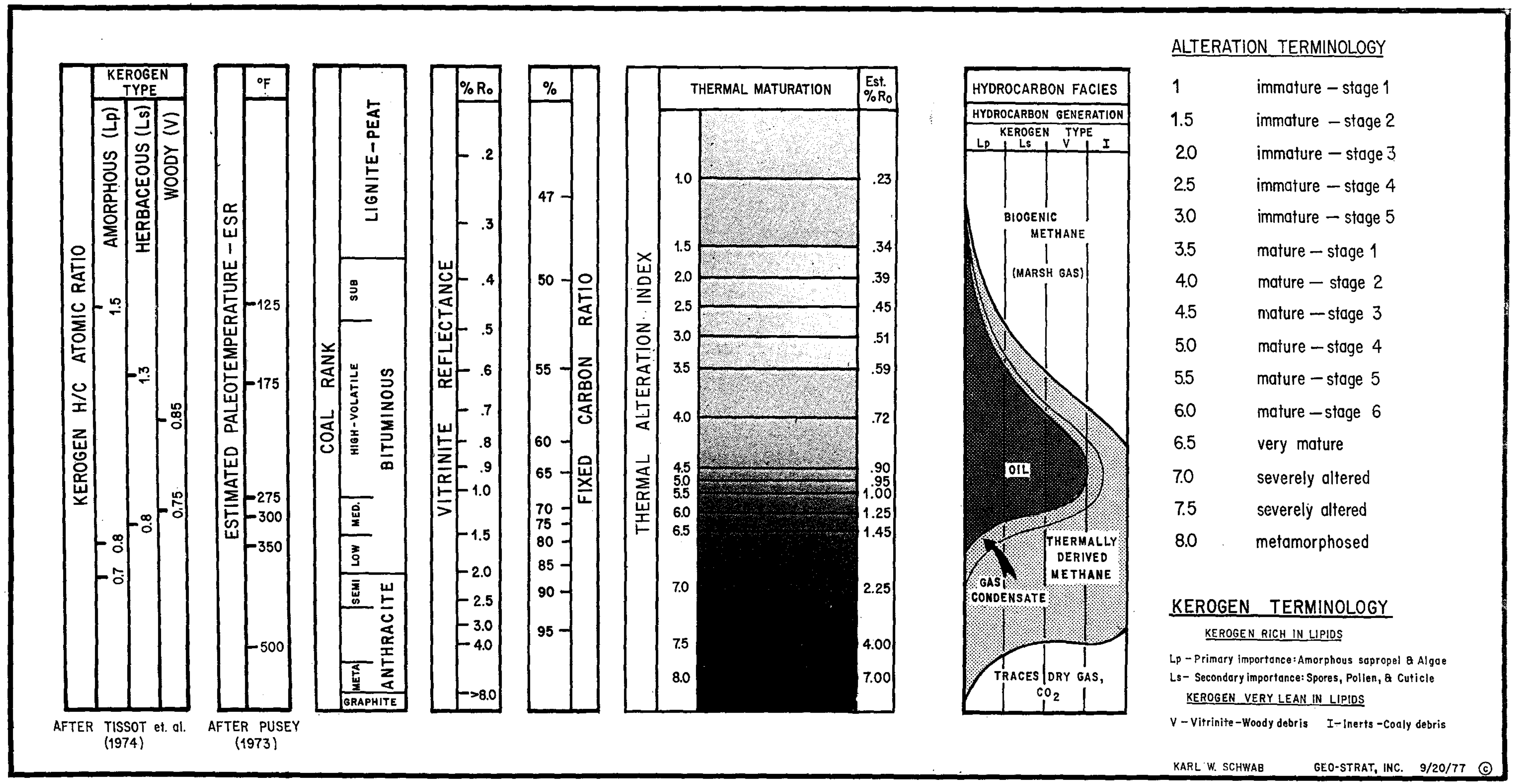


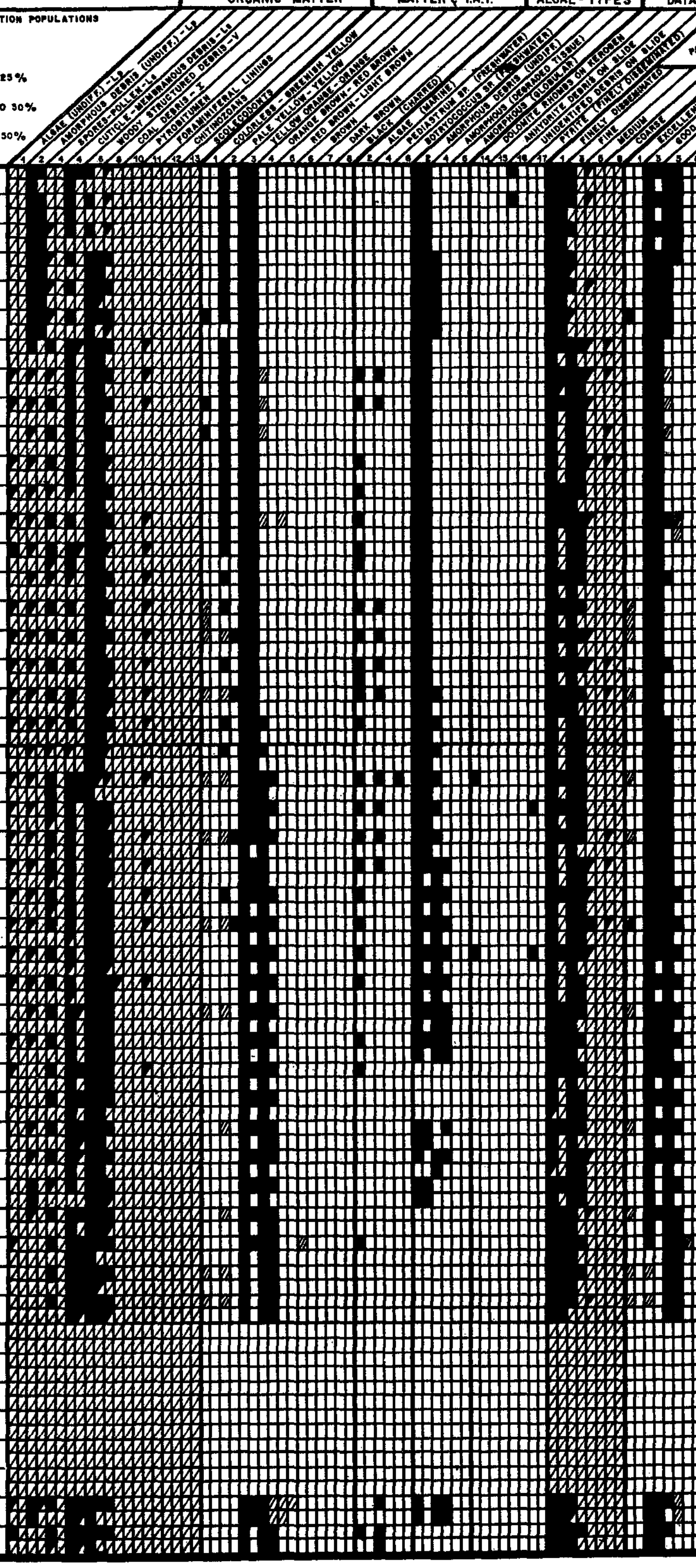
Figure 3

G.R.I.   PLEASANT BAYOU NO. 1

KEROGEN SUMMARY CHART

+ 2 OR MORE MATURATION POPULATIONS
TRACE < 5%
COMMON – 5% TO 25%
ABUNDANT – 25% TO 50%
VERY ABUNDANT > 50%

TYPE OF ORGANIC MATTER | COLOR OF ORGANIC MATTER & T.A.I. | AMORPHOUS-ALGAL-TYPES & MISC. DATA | STATE OF ORGANIC MATTER | TYPE ORGANIC MATTER, MATURATION, PRESERVATION, AND PARTICLE SIZE INDICES



	GEO-STRAT NO.	DEPTH	ORGANIC MATTER INDEX (O.M.I.)	MATURATION INDEX (T.A.I.) "PRIMARY POPULATION"	MATURATION INDEX (T.A.I.) "SECONDARY POPULATION"	PRESERVATION INDEX (P.I.) "PRIMARY POPULATION"	PRESERVATION INDEX (P.I.) "SECONDARY POPULATION"	PARTICLE SIZE INDEX (P.S.I.)	REMARKS
	1136-010	2894'	3.73	2.67		4.14		1.92	Lp-Ls;V;I
	1136-016	3386'	3.47	2.67		4.14		1.73	Lp;Ls;V(I)
	1136-021	3693'	3.43	2.67		4.14		1.40	Lp;Ls;V(I)
	1136-025	3974'	4.38	2.67		3.86		1.55	Lp-V;Ls;I
	1136-029	4160'	4.30	2.67		3.86		1.73	Lp;V;Ls(I)
	1136-032	5360'	4.40	2.50		3.29		1.22	Lp;V;Ls-I
	1136-044	6080'	5.05	2.67		3.00		2.64	V;Ls;Lp-I
	1136-049	6380'	5.12	2.67	4.00	3.00	5.00	2.59	V;Ls;Lp(Al)-I
	1136-056	6800'	5.05	2.43	4.00	3.00	5.00	2.33	V;Ls;Lp(Al)-I
	1136-064	7280'	5.29	2.47	4.00	3.00	5.00	2.77	V;Ls;I(Lp)
	1136-069	7580'	4.88	2.67		3.00		3.21	V;Ls;Lp(Al)(I)
	1136-075	7940'	5.36	2.67		3.00		1.86	V;Lp(Al)-Ls-I;-
	1136-080	8240'	5.19	2.67	4.50	3.40	5.00	2.33	V;Ls;Lp(Al)-I
	1136-086	8600'	4.60	2.80		3.00		2.33	Ls-V;Lp(Al);I
	1136-093	9020'	5.69	2.80		3.40		2.00	V;Ls-I;Lp
	1136-100	9440'	5.19	2.80	1.00	3.00	1.00	2.00	V;Ls;Lp(Al)-I
*	1136-105	9740'	5.19	2.80	1.50	3.00	1.00	2.23	V;Ls;Lp(Al)-I
	1136-112	10160'	5.35	2.80		3.40		2.64	V;Ls;I(Lp(Al))
*	1136-118	10460'	5.28	2.80	1.50	3.00	1.00	2.27	V;Ls;I(Lp(Al))
*	1136-124	10820'	5.27	3.00		3.67		2.33	V;Ls;Lp(Al)-I
	1136-130	11180'	5.50	3.00		3.67		2.33	V;Ls;Lp-I
	1136-137	11600'	4.45	3.43	1.50	3.67	1.00	2.14	Ls;V;Lp(Al)(I)
	1136-142	11900'	5.15	3.43		3.67		2.14	V;Ls;I(Lp(Al))
	1136-148	12260'	5.15	3.29	1.50	3.67	1.00	2.46	V;Ls;I(Lp(Al))
	1136-156	12680'	5.15	3.33		3.67		2.93	V;Ls;I(Lp(Al))
	1136-167	13340'	5.29	3.29		3.86		2.33	V;Ls;I(Lp(Al))
	1136-174	13760'	5.42	3.29	1.50	3.86	1.00	3.07	V;Ls;I(Lp(Al))
	1136-179	14060'	5.28	3.50		4.00		2.23	V;Ls;I(Lp(Al))
	1136-186	14480'	5.55	3.50		4.00		2.33	V;Ls-I;Lp(Al)
	1136-186A	14500'	5.50	3.50	1.50	3.86	1.00	1.86	V;Ls;I(Lp)
	1136-191A	14800'	5.35	3.50		3.86		1.86	V;Ls;I(Lp(Al))
	1136-196A	15100'	5.38	3.50		4.00		2.00	Ls-V;I;Lp(Al)
	1136-197	15140'	5.33	3.50		4.00		2.45	Ls-V;I;-
	1136-201A	15400'	5.10	3.57	2.00	4.00	1.00	2.00	Ls;V;I(Lp)
	1136-202	15440'	5.22	3.50		4.00		2.67	V;Ls;I(Lp)
	1136-207	15680'	4.89	3.50		4.20		2.14	V;Lp;Ls-I
	1136-206A	15700'	5.30	3.57	2.00	4.14	1.00	1.92	Ls-V;I;Lp
	1136-211A	16000'	4.89	3.57	6.00	4.60	8.00	1.86	Ls;V;I(Lp(Al))
	1136-216A	16300'	5.16	3.67	1.50	5.00	2.00	1.86	Ls;V;I
	1136-220A	16500'	5.40	3.67	1.50	5.00	2.00	1.73	Ls;V;I
	1136 Core	14078'	4.30	3.33	4.50	3.40	5.00	1.55	Ls;Lp(Al)-V;I
	1136 Core	15556'	4.70	3.67		3.40		1.86	Ls;V;Lp(Al)-I

KARL W. SCHWAB

* Indicates an abundance in the loss-of-circulation material.

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Figure 4

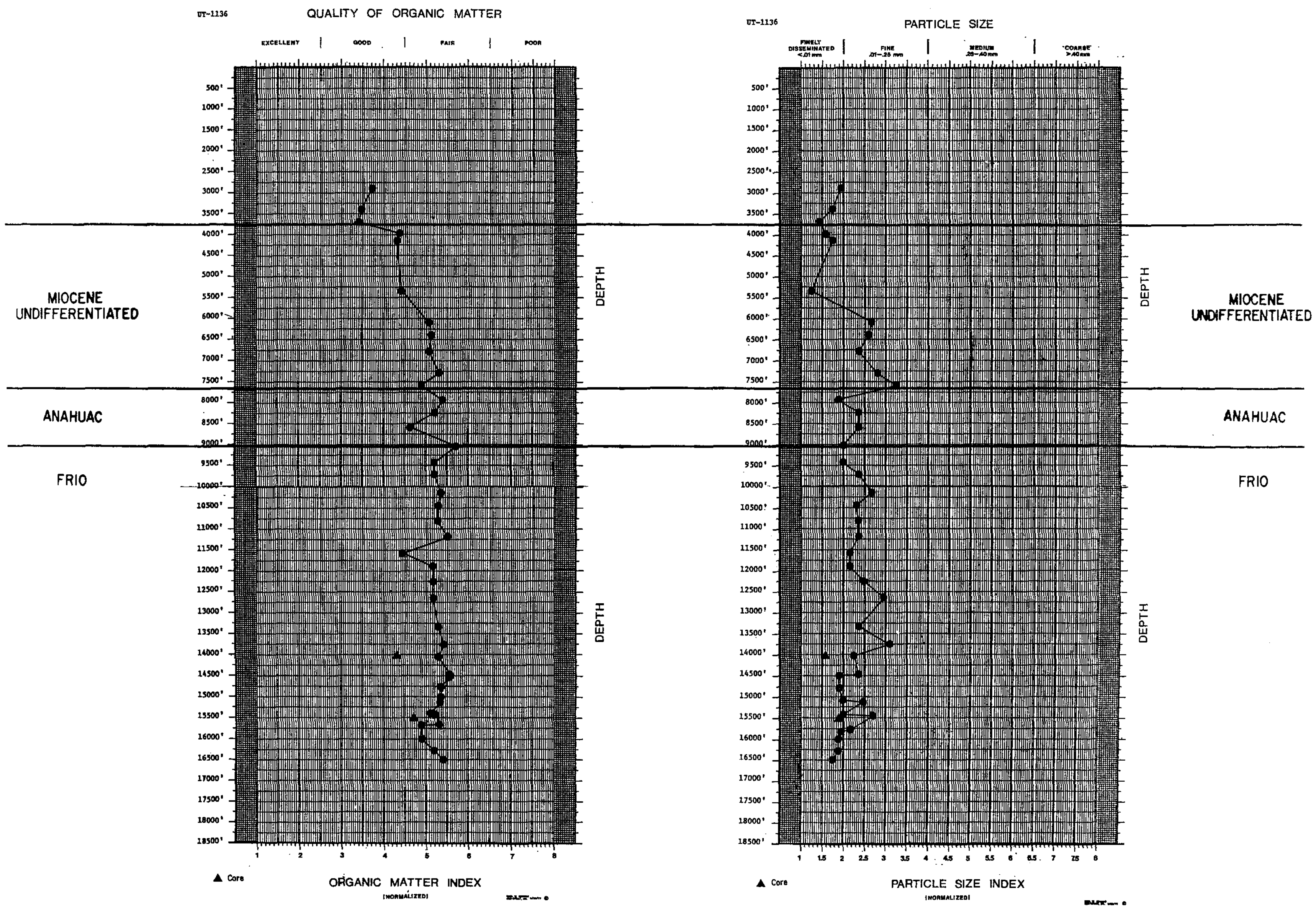

UT-1136
QUALITY OF ORGANIC MATTER
EXCELLENT
GOOD
FAIR
POOR
ORGANIC MATTER INDEX
(NORMALIZED)
▲ Core
PARTICLE SIZE
FINELY DISSEMINATED <.01 mm
FINE .01–.25 mm
MEDIUM .25–.40 mm
COARSE >.40 mm
PARTICLE SIZE INDEX
(NORMALIZED)
DEPTH
MIOCENE UNDIFFERENTIATED
ANAHUAC
FRIO

Figure 5

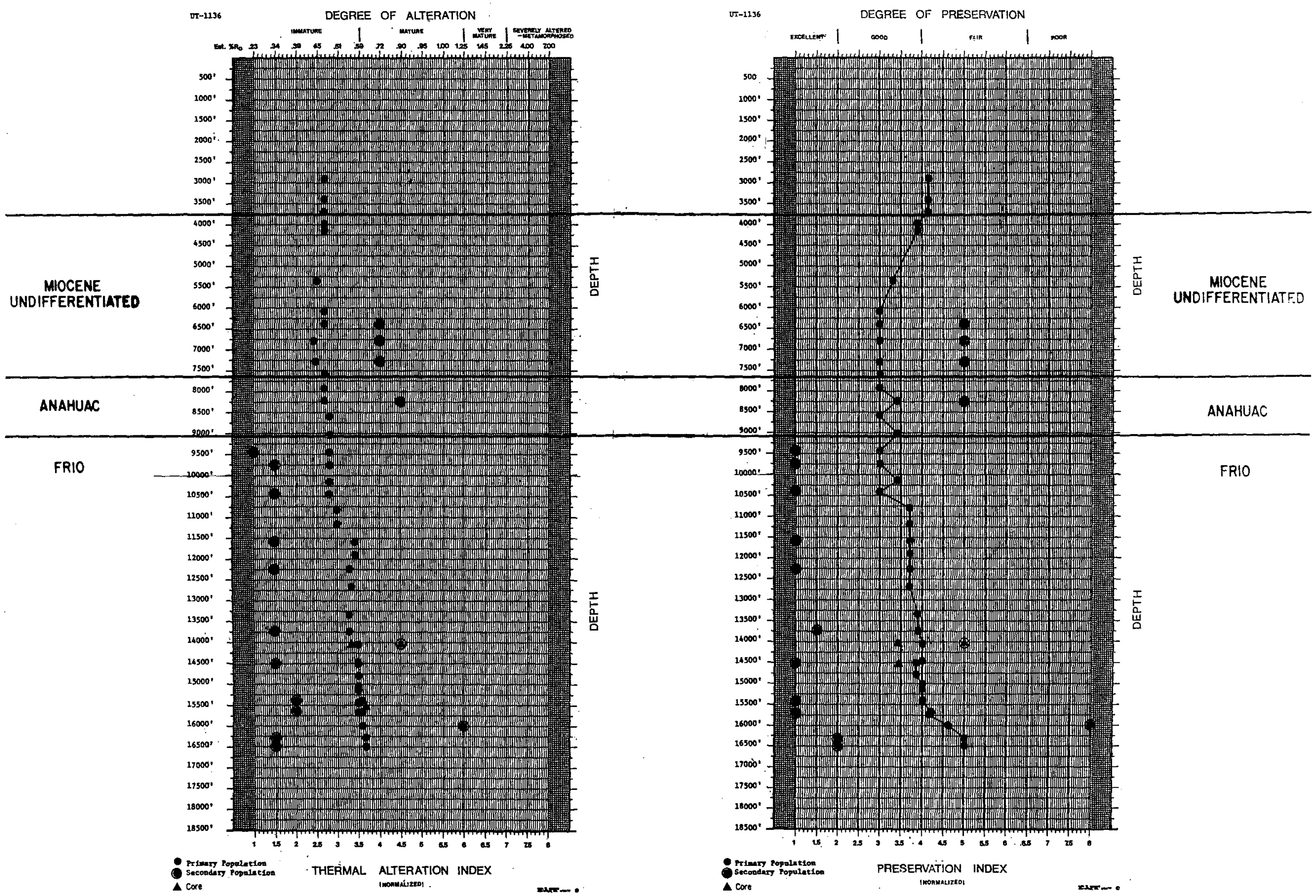

UT-1136
DEGREE OF ALTERATION
IMMATURE
MATURE
VERY MATURE
SEVERELY ALTERED —METAMORPHOSED
Est. %Ro .23 .34 .39 .45 .51 .59 .72 .90 .95 1.00 1.25 1.45 2.26 4.00 7.00
MIOCENE UNDIFFERENTIATED
ANAHUAC
FRIO
DEPTH
Primary Population
Secondary Population
Core
THERMAL ALTERATION INDEX
(NORMALIZED)
UT-1136
DEGREE OF PRESERVATION
EXCELLENT
GOOD
FAIR
POOR
PRESERVATION INDEX
(NORMALIZED)

Figure 6

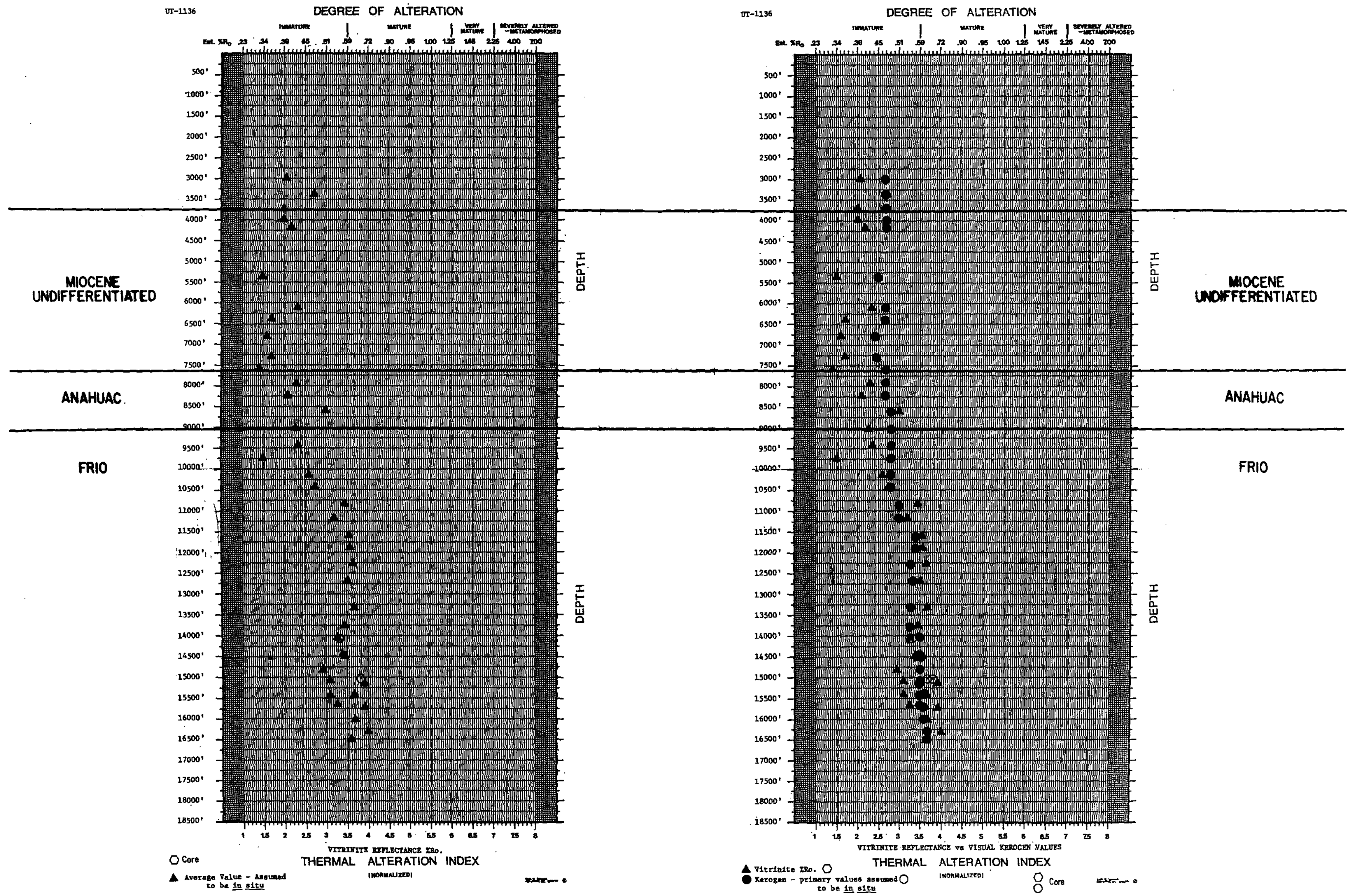
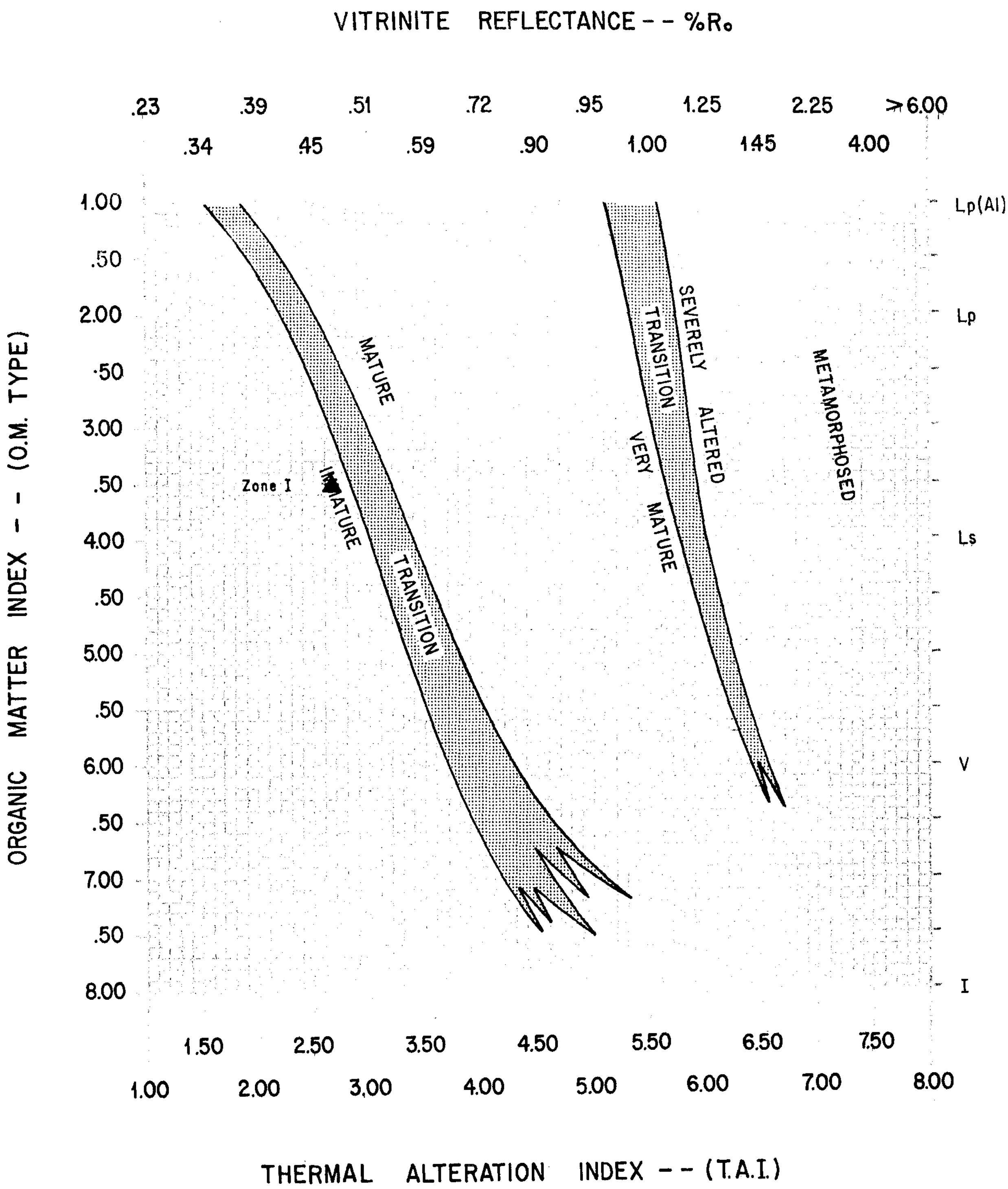

UT-1136
DEGREE OF ALTERATION
IMMATURE
MATURE
VERY MATURE
SEVERELY ALTERED —METAMORPHOSED
DEPTH
MIOCENE UNDIFFERENTIATED
ANAHUAC
FRIO
VITRINITE REFLECTANCE %Ro.
THERMAL ALTERATION INDEX
(NORMALIZED)
Core
Average Value - Assumed to be in situ
UT-1136
DEGREE OF ALTERATION
DEPTH
MIOCENE UNDIFFERENTIATED
ANAHUAC
FRIO
VITRINITE REFLECTANCE vs VISUAL KEROGEN VALUES
THERMAL ALTERATION INDEX
(NORMALIZED)
Vitrinite %Ro.
Kerogen - primary values assumed to be in situ
Core

Figure 7

LEVEL OF MATURITY vs KEROGEN TYPE*

(APPROXIMATE)



* NORMALIZED VALUE

Pleistocene-Pliocene
Undifferentiated

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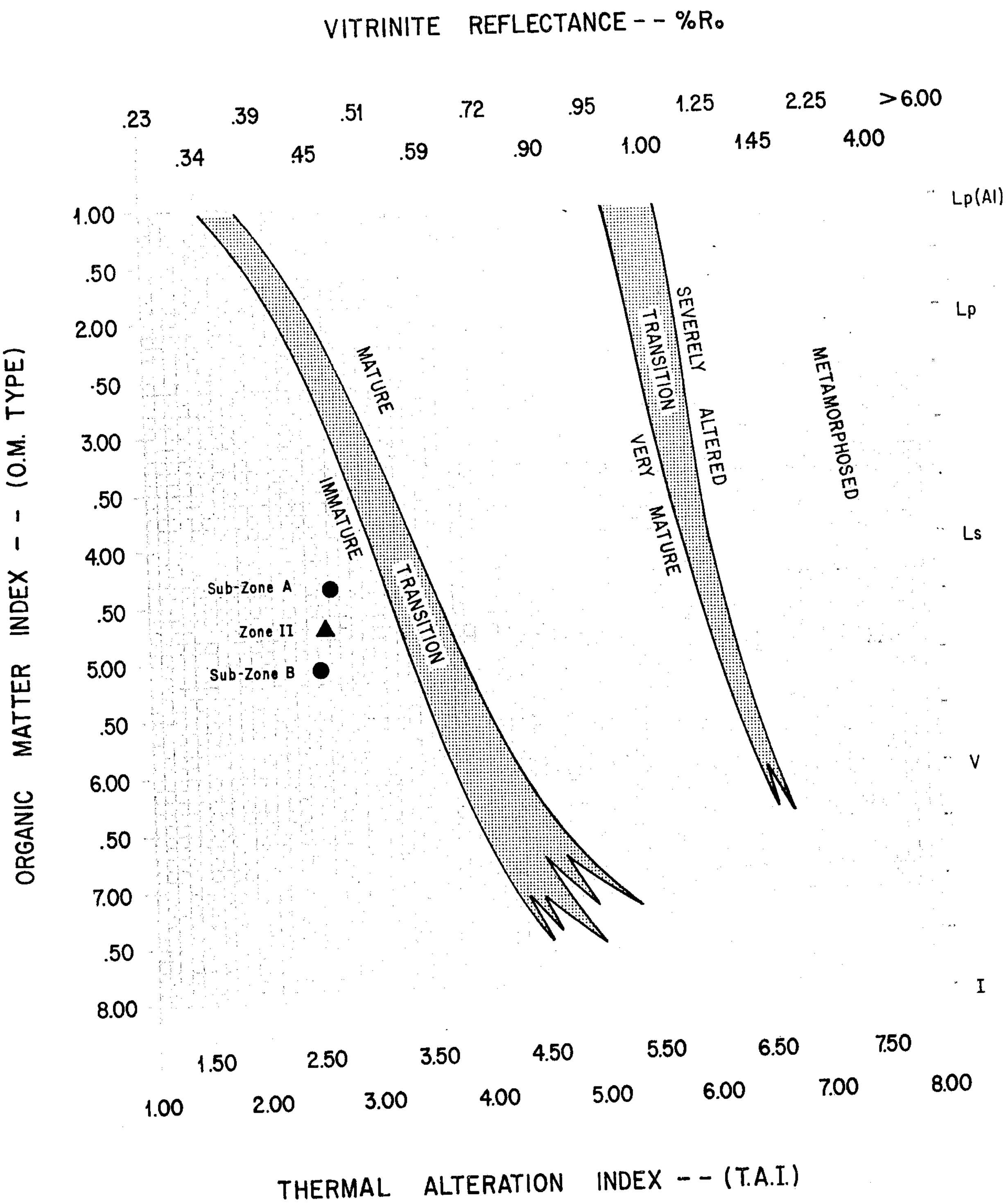
Figure 8

LEVEL OF MATURITY vs KEROGEN TYPE*

(APPROXIMATE)



* NORMALIZED VALUE

Miocene
Undifferentiated

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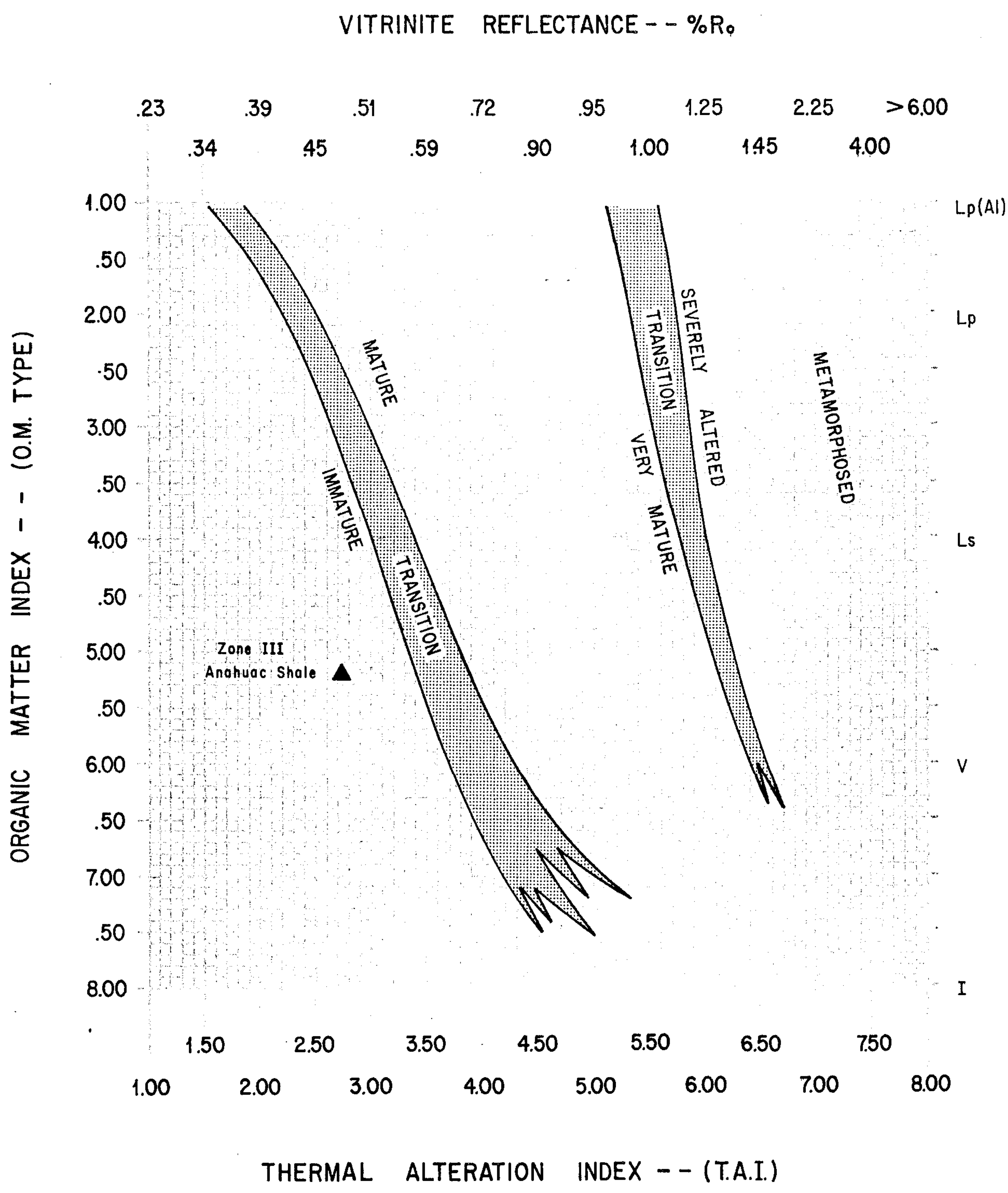
Figure 9

LEVEL OF MATURITY vs KEROGEN TYPE*

(APPROXIMATE)



* NORMALIZED VALUE

Anahuac-Oligocene

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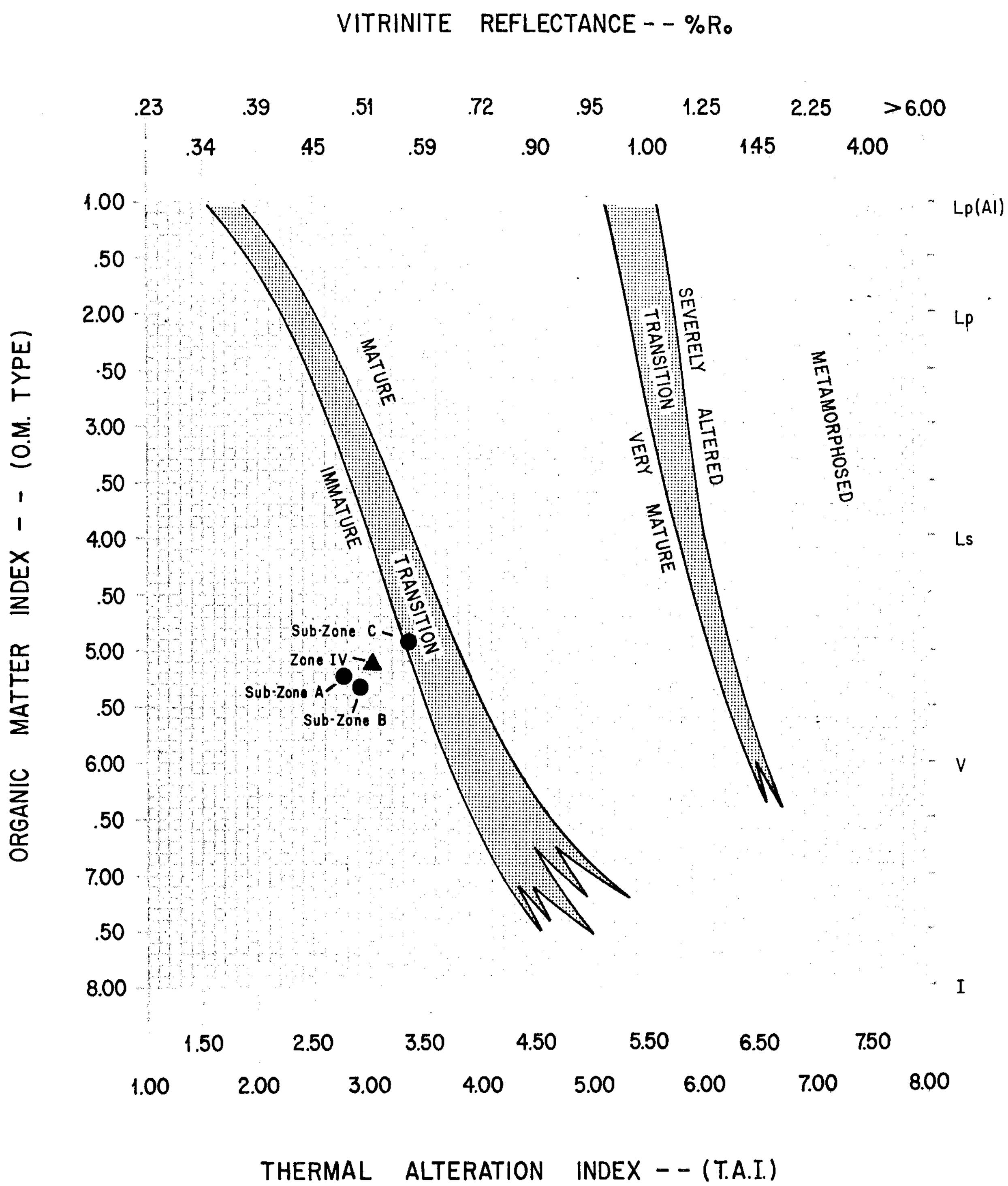
Figure 10

LEVEL OF MATURITY vs KEROGEN TYPE*

(APPROXIMATE)



* NORMALIZED VALUE

"upper" Frio-Oligocene

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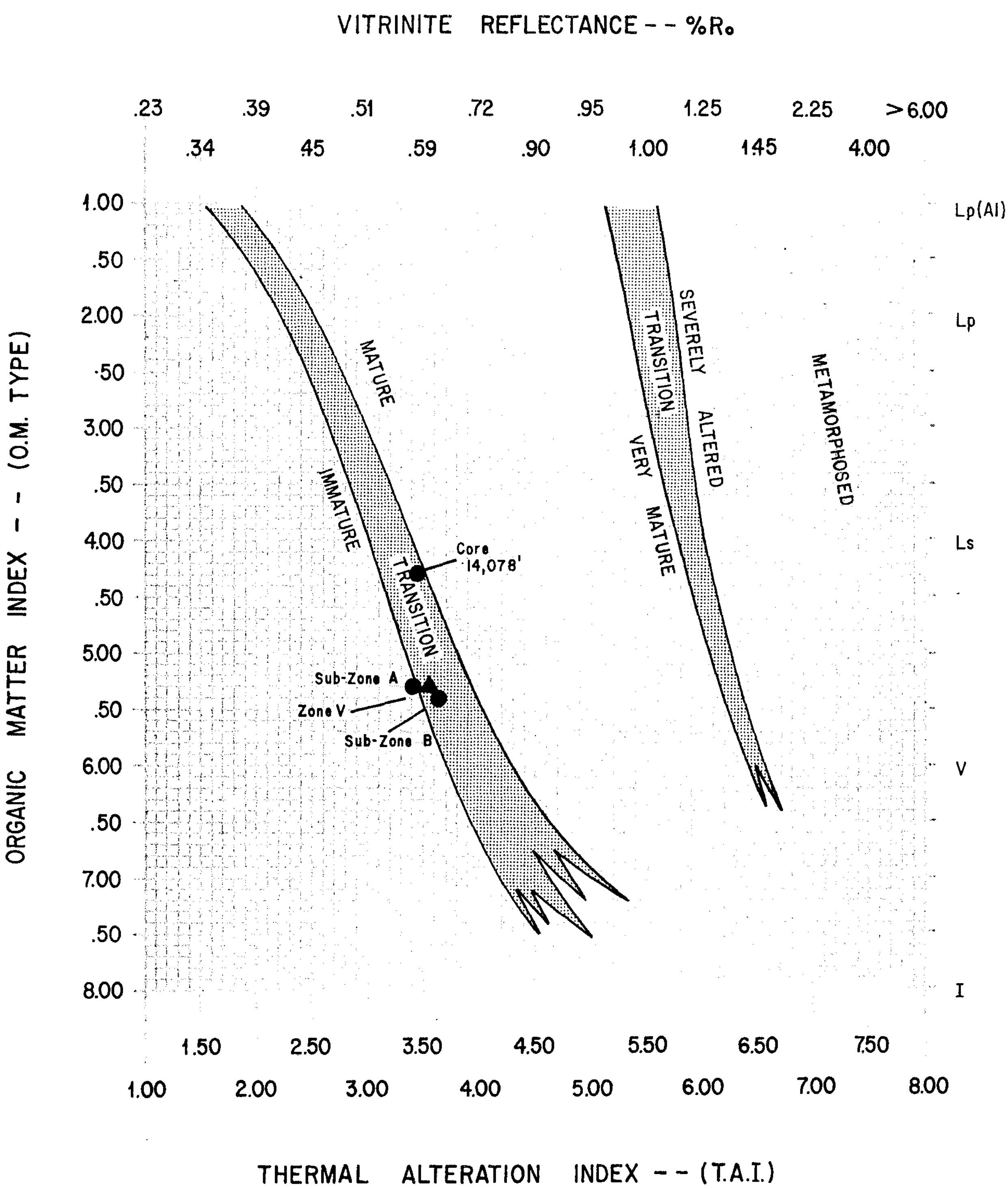
Figure 11

LEVEL OF MATURITY vs KEROGEN TYPE*

(APPROXIMATE)



* NORMALIZED VALUE

"middle" Frio-Oligocene

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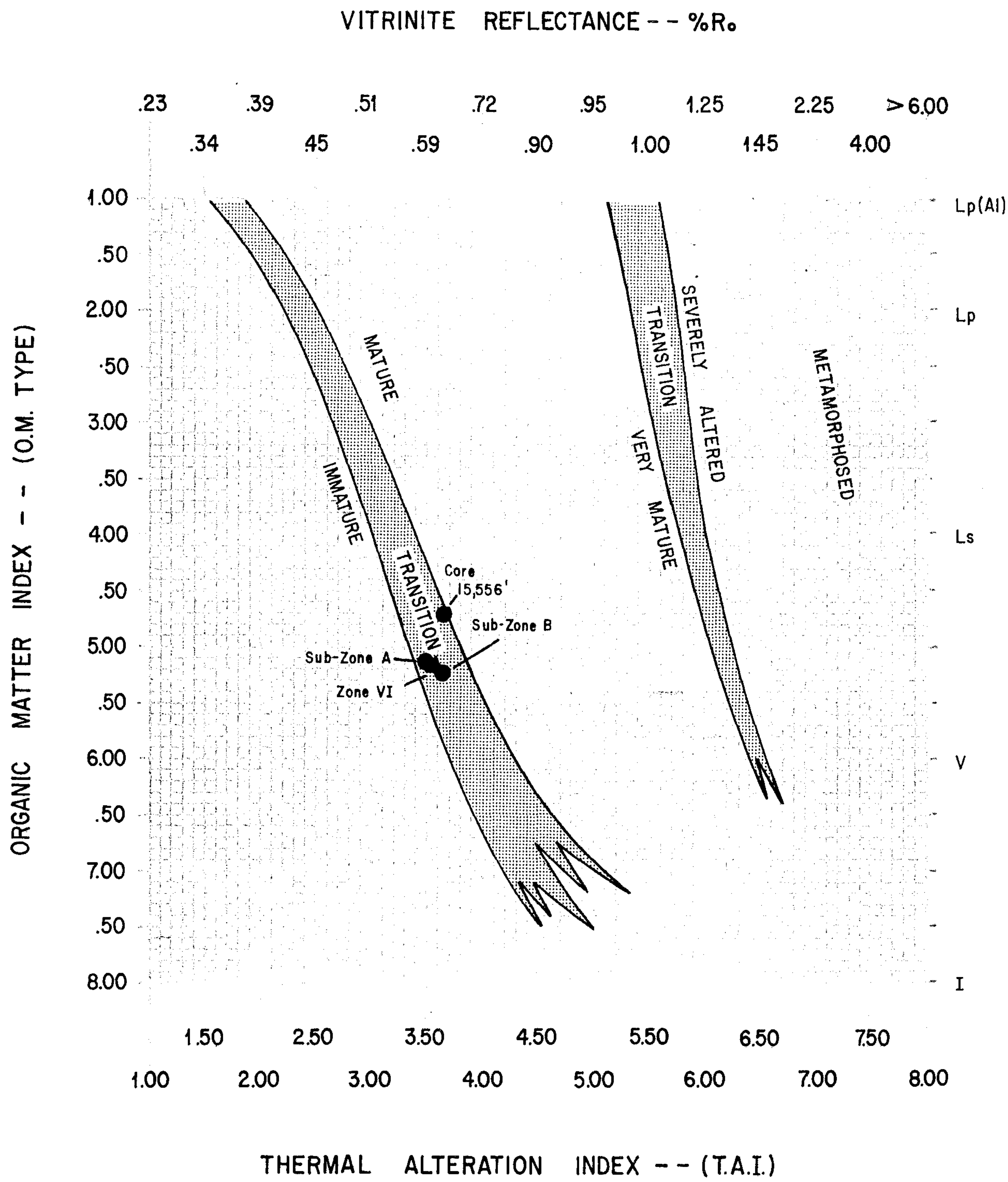
Figure 12

LEVEL OF MATURITY vs KEROGEN TYPE*

(APPROXIMATE)



* NORMALIZED VALUE

"lower" Frio-Oligocene

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Figure 13

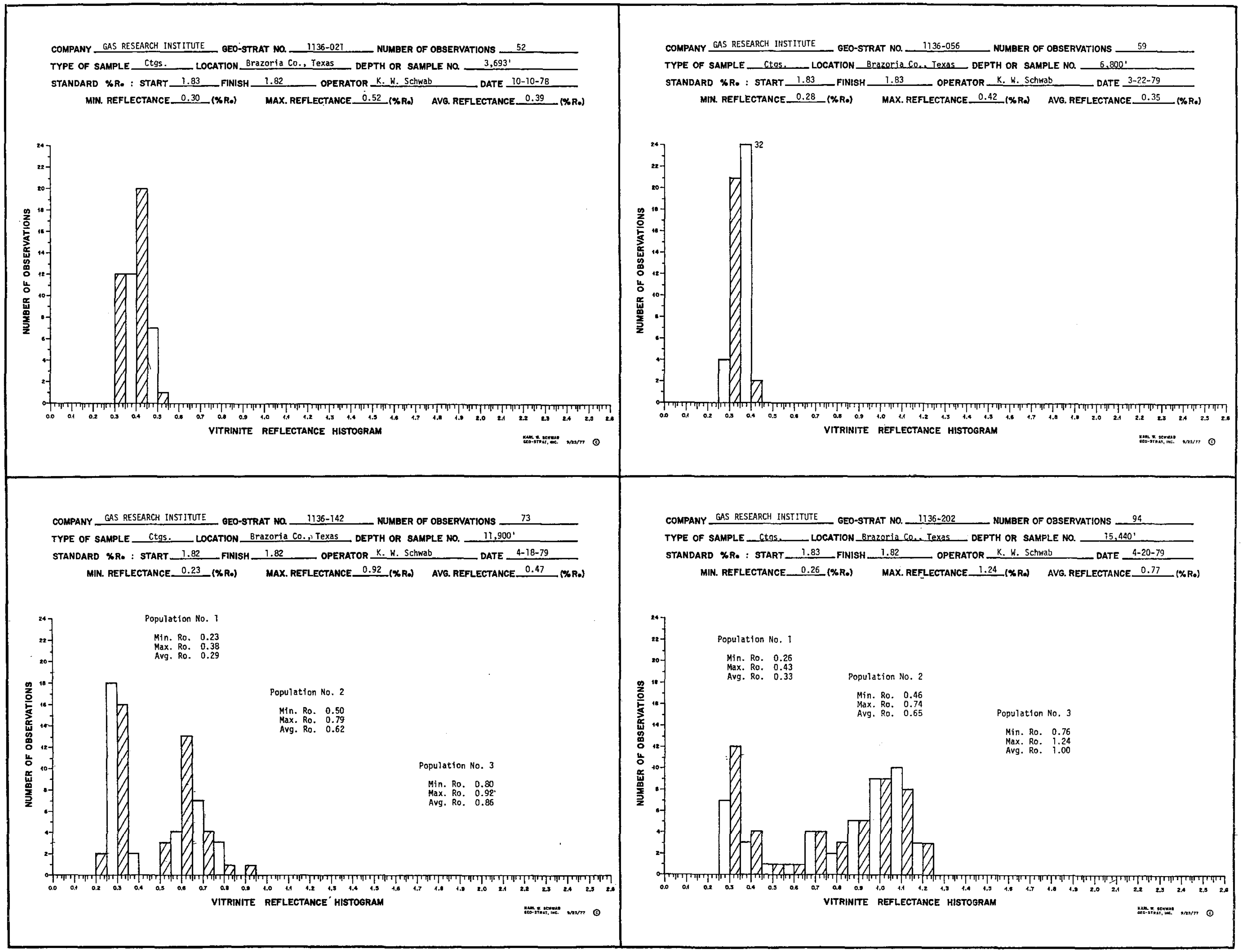

COMPANY GAS RESEARCH INSTITUTE GEO-STRAT NO. 1136-021 NUMBER OF OBSERVATIONS 52
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 3,693'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 10-10-78
MIN. REFLECTANCE 0.30 (%Ro) MAX. REFLECTANCE 0.52 (%Ro) AVG. REFLECTANCE 0.39 (%Ro)
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY GAS RESEARCH INSTITUTE GEO-STRAT NO. 1136-056 NUMBER OF OBSERVATIONS 59
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 6,800'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.28 (%Ro) MAX. REFLECTANCE 0.42 (%Ro) AVG. REFLECTANCE 0.35 (%Ro)
32
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY GAS RESEARCH INSTITUTE GEO-STRAT NO. 1136-142 NUMBER OF OBSERVATIONS 73
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 11,900'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-18-79
MIN. REFLECTANCE 0.23 (%Ro) MAX. REFLECTANCE 0.92 (%Ro) AVG. REFLECTANCE 0.47 (%Ro)
Population No. 1
Min. Ro. 0.23
Max. Ro. 0.38
Avg. Ro. 0.29
Population No. 2
Min. Ro. 0.50
Max. Ro. 0.79
Avg. Ro. 0.62
Population No. 3
Min. Ro. 0.80
Max. Ro. 0.92
Avg. Ro. 0.86
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY GAS RESEARCH INSTITUTE GEO-STRAT NO. 1136-202 NUMBER OF OBSERVATIONS 94
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15,440'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.26 (%Ro) MAX. REFLECTANCE 1.24 (%Ro) AVG. REFLECTANCE 0.77 (%Ro)
Population No. 1
Min. Ro. 0.26
Max. Ro. 0.43
Avg. Ro. 0.33
Population No. 2
Min. Ro. 0.46
Max. Ro. 0.74
Avg. Ro. 0.65
Population No. 3
Min. Ro. 0.76
Max. Ro. 1.24
Avg. Ro. 1.00
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Figure 14

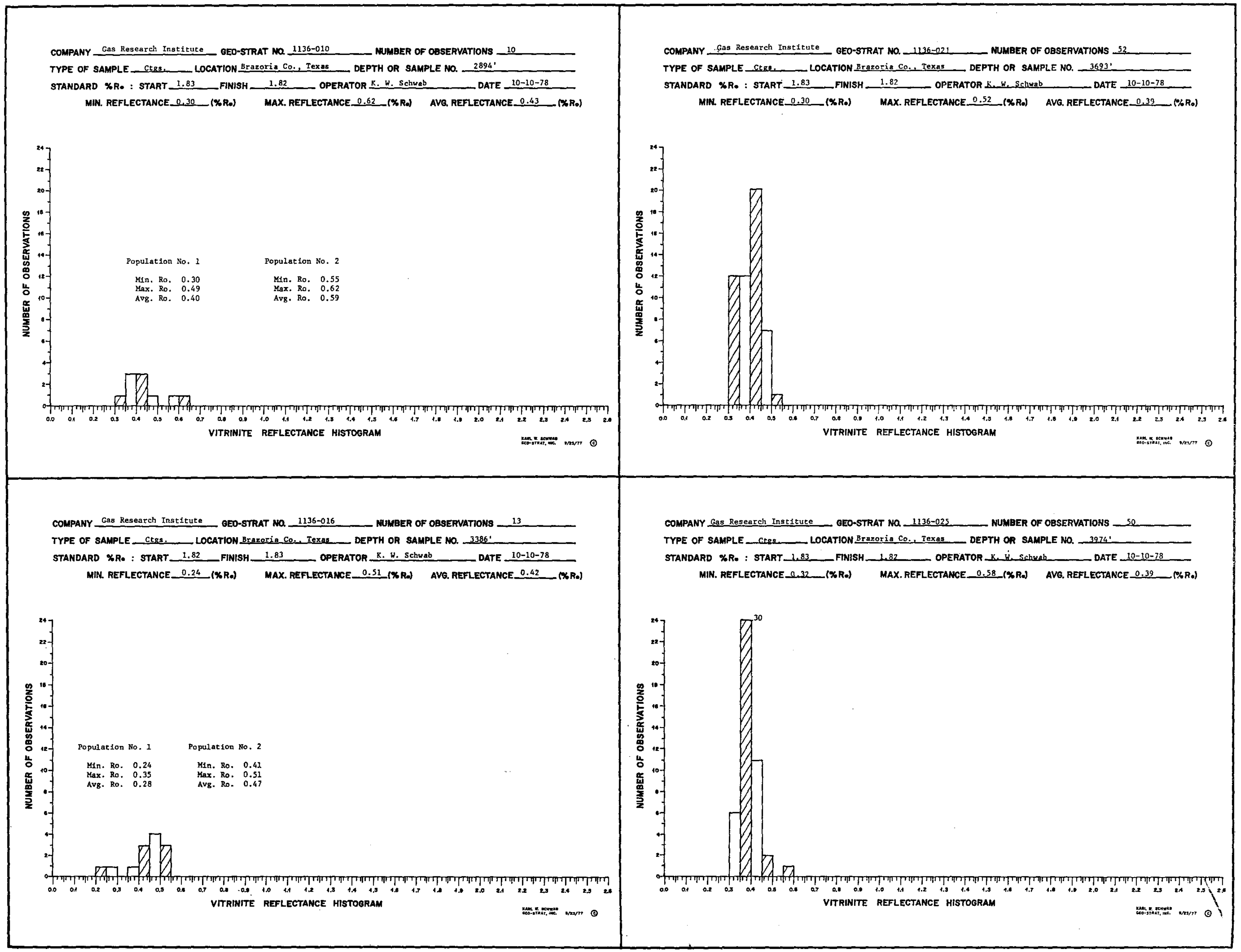

COMPANY Gas Research Institute GEO-STRAT NO. 1136-010 NUMBER OF OBSERVATIONS 10
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 2894'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 10-10-78
MIN. REFLECTANCE 0.30 (%Ro) MAX. REFLECTANCE 0.62 (%Ro) AVG. REFLECTANCE 0.43 (%Ro)
Population No. 1
Min. Ro. 0.30
Max. Ro. 0.49
Avg. Ro. 0.40
Population No. 2
Min. Ro. 0.55
Max. Ro. 0.62
Avg. Ro. 0.59
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-021 NUMBER OF OBSERVATIONS 52
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 3693'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 10-10-78
MIN. REFLECTANCE 0.30 (%Ro) MAX. REFLECTANCE 0.52 (%Ro) AVG. REFLECTANCE 0.39 (%Ro)
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-016 NUMBER OF OBSERVATIONS 13
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 3386'
STANDARD %Ro : START 1.82 FINISH 1.83 OPERATOR K. W. Schwab DATE 10-10-78
MIN. REFLECTANCE 0.24 (%Ro) MAX. REFLECTANCE 0.51 (%Ro) AVG. REFLECTANCE 0.42 (%Ro)
Population No. 1
Min. Ro. 0.24
Max. Ro. 0.35
Avg. Ro. 0.28
Population No. 2
Min. Ro. 0.41
Max. Ro. 0.51
Avg. Ro. 0.47
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-025 NUMBER OF OBSERVATIONS 50
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 3974'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 10-10-78
MIN. REFLECTANCE 0.32 (%Ro) MAX. REFLECTANCE 0.58 (%Ro) AVG. REFLECTANCE 0.39 (%Ro)
30
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Figure 15

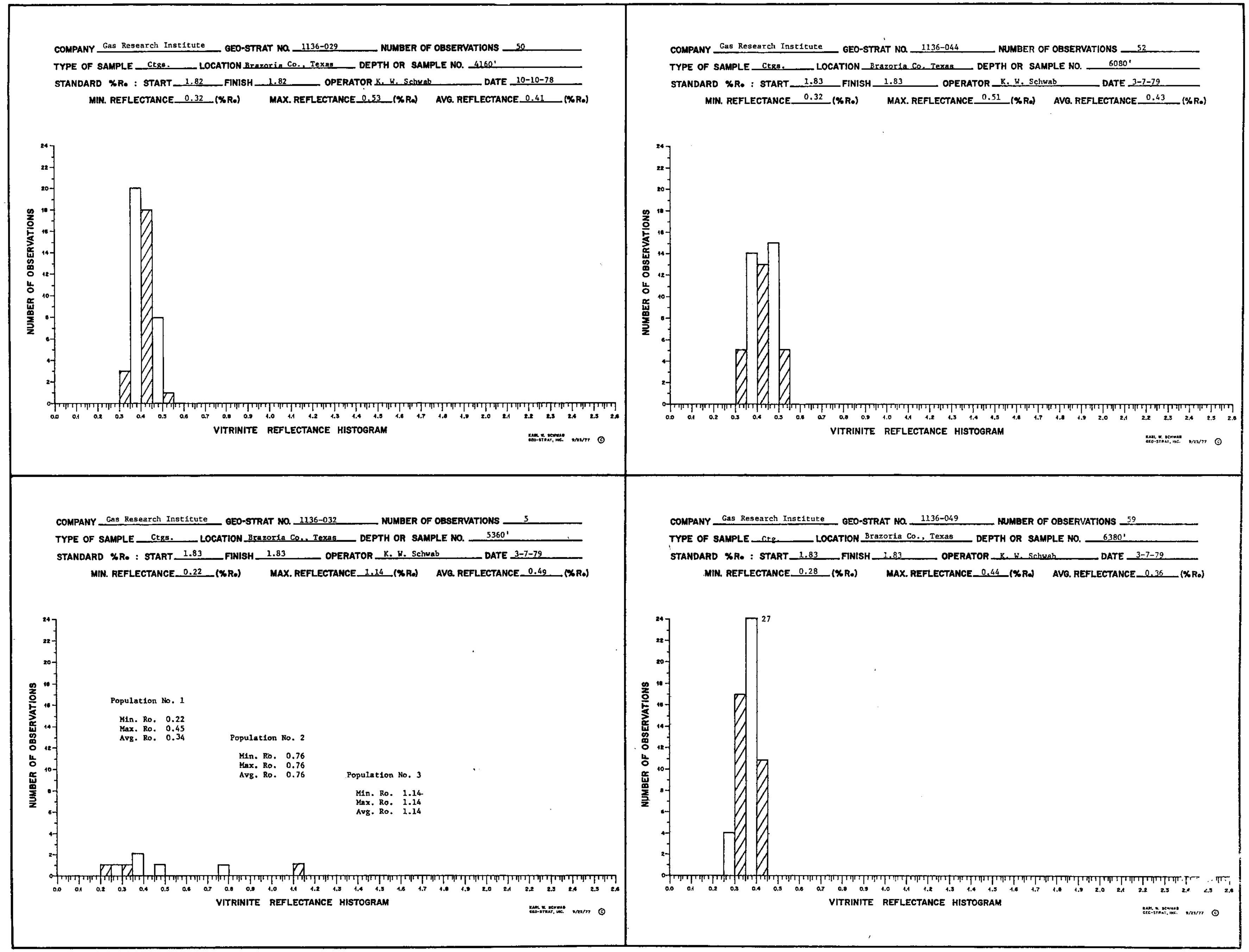

COMPANY Gas Research Institute GEO-STRAT NO. 1136-029 NUMBER OF OBSERVATIONS 50
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 4160'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 10-10-78
MIN. REFLECTANCE 0.32 (%Ro) MAX. REFLECTANCE 0.53 (%Ro) AVG. REFLECTANCE 0.41 (%Ro)
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-044 NUMBER OF OBSERVATIONS 52
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co. Texas DEPTH OR SAMPLE NO. 6080'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-7-79
MIN. REFLECTANCE 0.32 (%Ro) MAX. REFLECTANCE 0.51 (%Ro) AVG. REFLECTANCE 0.43 (%Ro)
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-032 NUMBER OF OBSERVATIONS 5
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 5360'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-7-79
MIN. REFLECTANCE 0.22 (%Ro) MAX. REFLECTANCE 1.14 (%Ro) AVG. REFLECTANCE 0.49 (%Ro)
Population No. 1
Min. Ro. 0.22
Max. Ro. 0.45
Avg. Ro. 0.34
Population No. 2
Min. Ro. 0.76
Max. Ro. 0.76
Avg. Ro. 0.76
Population No. 3
Min. Ro. 1.14
Max. Ro. 1.14
Avg. Ro. 1.14
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-049 NUMBER OF OBSERVATIONS 59
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 6380'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-7-79
MIN. REFLECTANCE 0.28 (%Ro) MAX. REFLECTANCE 0.44 (%Ro) AVG. REFLECTANCE 0.36 (%Ro)
27
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Figure 16

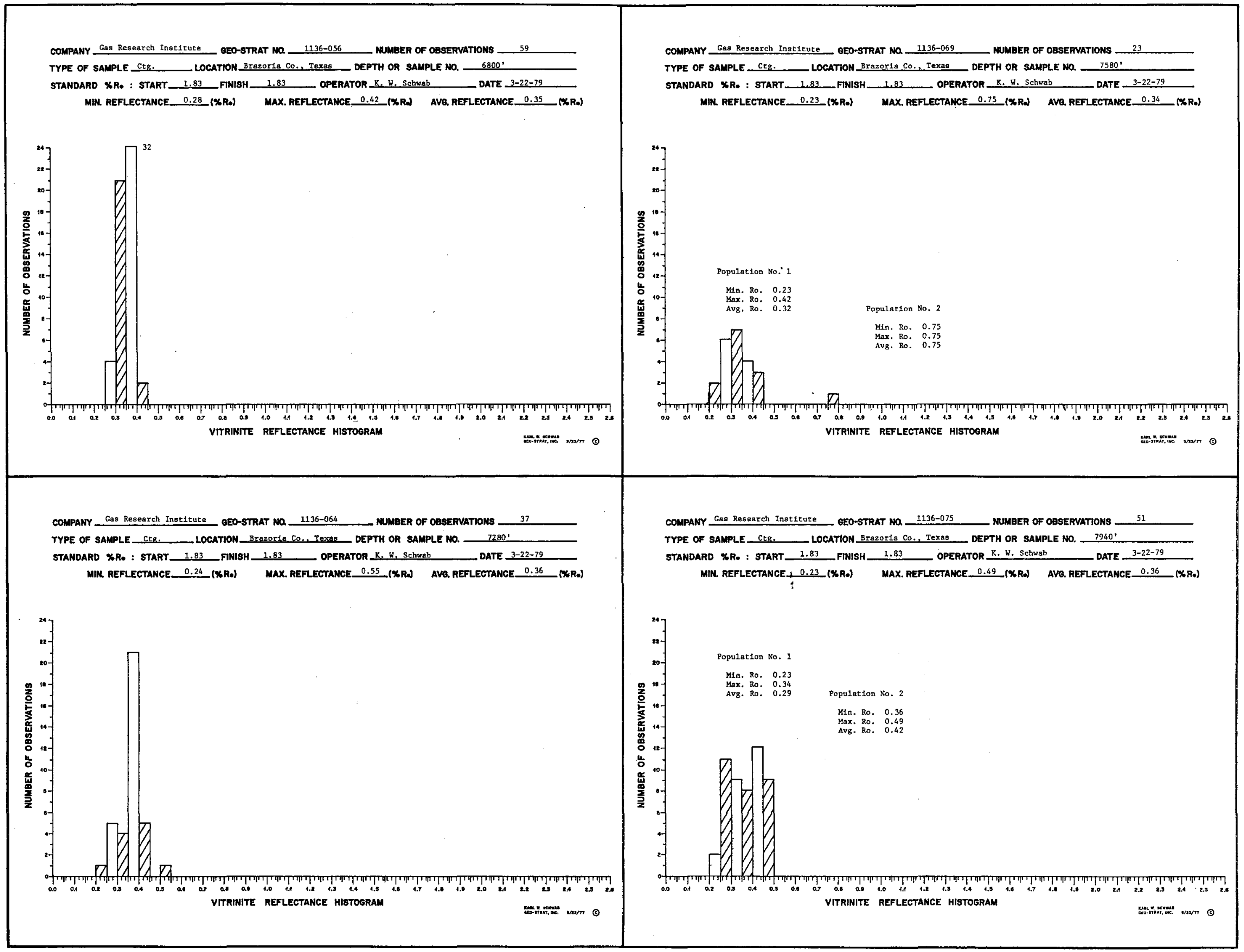
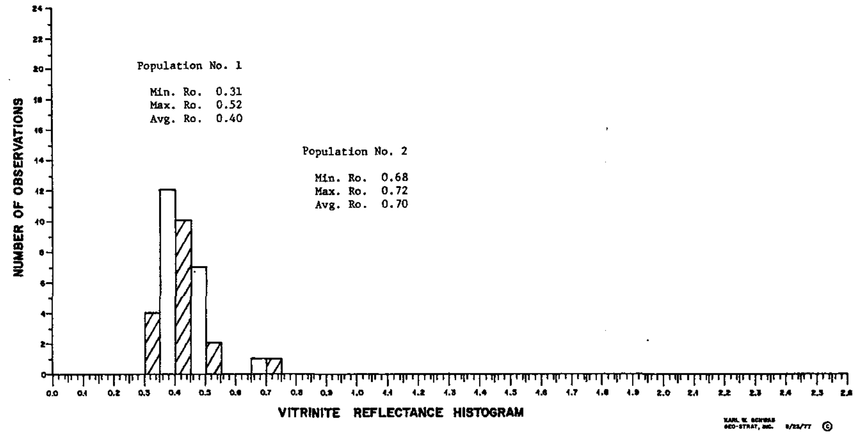
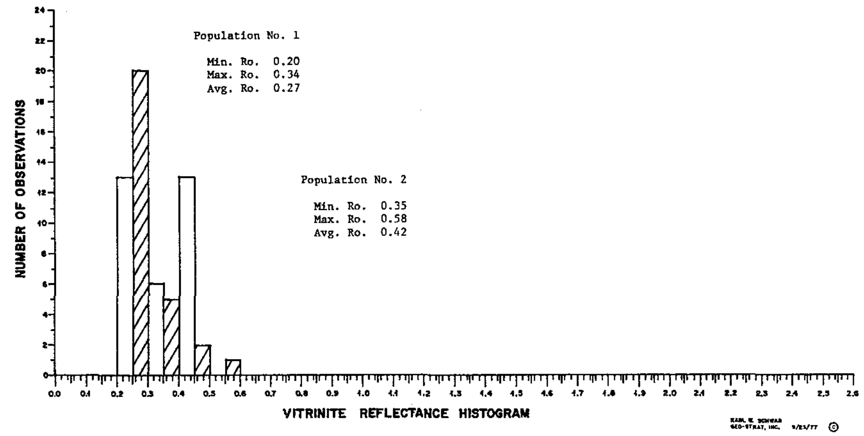

COMPANY Gas Research Institute GEO-STRAT NO. 1136-056 NUMBER OF OBSERVATIONS 59
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 6800'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.28 (%Ro) MAX. REFLECTANCE 0.42 (%Ro) AVG. REFLECTANCE 0.35 (%Ro)
32
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-069 NUMBER OF OBSERVATIONS 23
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 7580'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.23 (%Ro) MAX. REFLECTANCE 0.75 (%Ro) AVG. REFLECTANCE 0.34 (%Ro)
Population No. 1
Min. Ro. 0.23
Max. Ro. 0.42
Avg. Ro. 0.32
Population No. 2
Min. Ro. 0.75
Max. Ro. 0.75
Avg. Ro. 0.75
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-064 NUMBER OF OBSERVATIONS 37
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 7280'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.24 (%Ro) MAX. REFLECTANCE 0.55 (%Ro) AVG. REFLECTANCE 0.36 (%Ro)
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-075 NUMBER OF OBSERVATIONS 51
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 7940'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.23 (%Ro) MAX. REFLECTANCE 0.49 (%Ro) AVG. REFLECTANCE 0.36 (%Ro)
Population No. 1
Min. Ro. 0.23
Max. Ro. 0.34
Avg. Ro. 0.29
Population No. 2
Min. Ro. 0.36
Max. Ro. 0.49
Avg. Ro. 0.42
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Figure 17

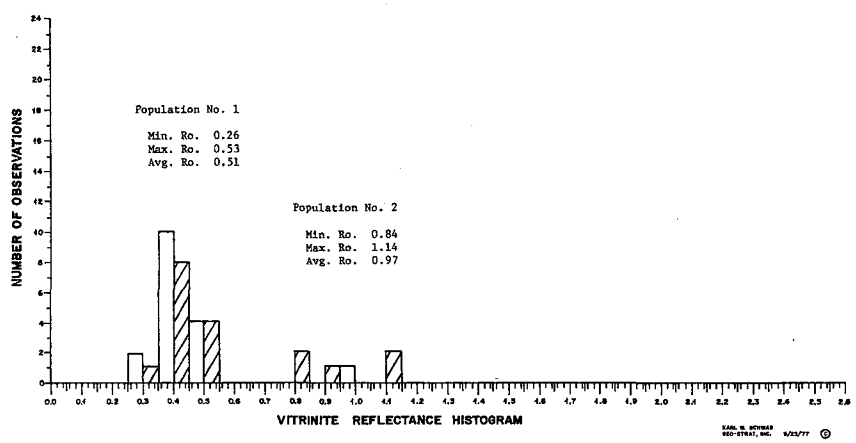
COMPANY Gas Research Institute GEO-STRAT NO. 1136-080 NUMBER OF OBSERVATIONS 37
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 8240'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.31 (%Ro) MAX. REFLECTANCE 0.72 (%Ro) AVG. REFLECTANCE 0.42 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-093 NUMBER OF OBSERVATIONS 60
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 9020'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.20 (%Ro) MAX. REFLECTANCE 0.58 (%Ro) AVG. REFLECTANCE 0.32 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-086 NUMBER OF OBSERVATIONS 35
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 8600'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.26 (%Ro) MAX. REFLECTANCE 1.14 (%Ro) AVG. REFLECTANCE 0.51 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-100 NUMBER OF OBSERVATIONS 39
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 9440'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.15 (%Ro) MAX. REFLECTANCE 0.87 (%Ro) AVG. REFLECTANCE 0.34 (%Ro)

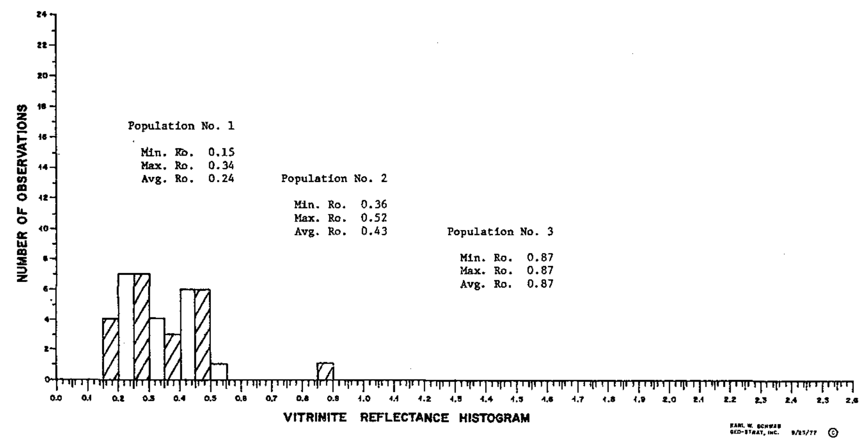
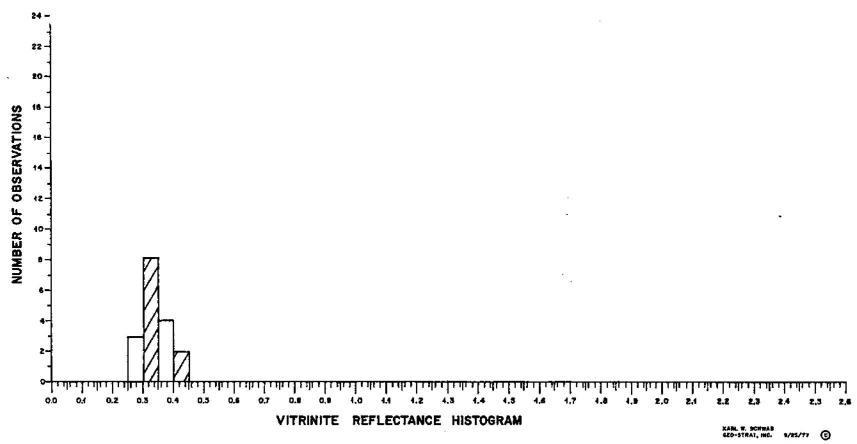
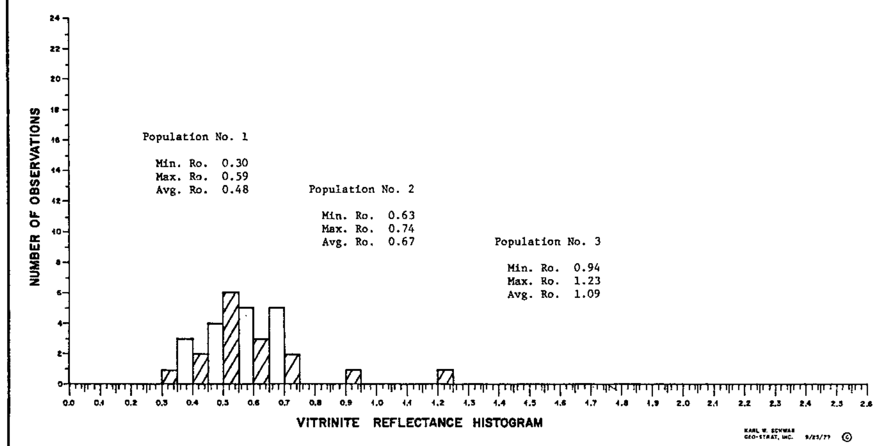


Figure 18

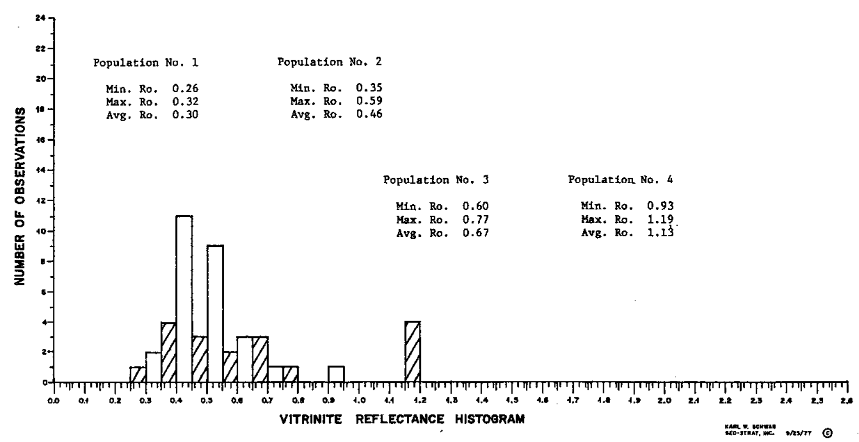
COMPANY Gas Research Institute GEO-STRAT NO. 1136-105 NUMBER OF OBSERVATIONS 17
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 9740'
STANDARD %Rₒ : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.28 (%Rₒ) MAX. REFLECTANCE 0.41 (%Rₒ) AVG. REFLECTANCE 0.34 (%Rₒ)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-118 NUMBER OF OBSERVATIONS 33
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 10460'
STANDARD %Rₒ : START 1.82 FINISH 1.81 OPERATOR K. W. Schwab DATE 3-24-79
MIN. REFLECTANCE 0.30 (%Rₒ) MAX. REFLECTANCE 1.23 (%Rₒ) AVG. REFLECTANCE 0.58 (%Rₒ)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-112 NUMBER OF OBSERVATIONS 45
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 10160'
STANDARD %Rₒ : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 3-22-79
MIN. REFLECTANCE 0.26 (%Rₒ) MAX. REFLECTANCE 1.19 (%Rₒ) AVG. REFLECTANCE 0.56 (%Rₒ)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-124 NUMBER OF OBSERVATIONS 76
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 10820'
STANDARD %Rₒ : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-24-79
MIN. REFLECTANCE 0.20 (%Rₒ) MAX. REFLECTANCE 1.02 (%Rₒ) AVG. REFLECTANCE 0.39 (%Rₒ)

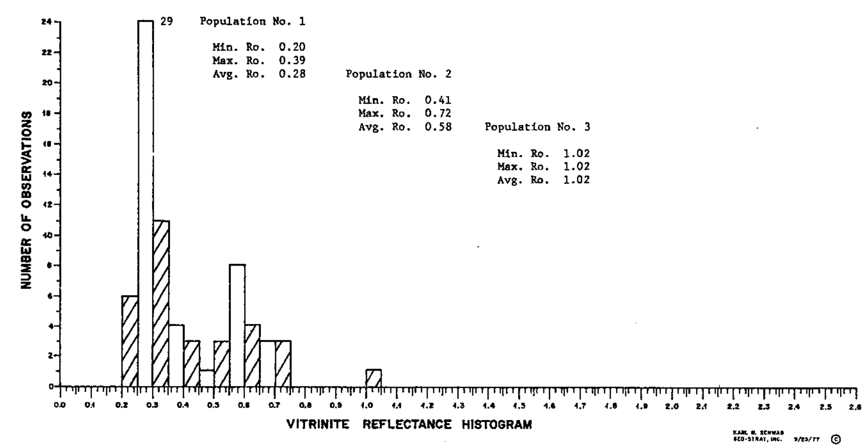


Figure 19

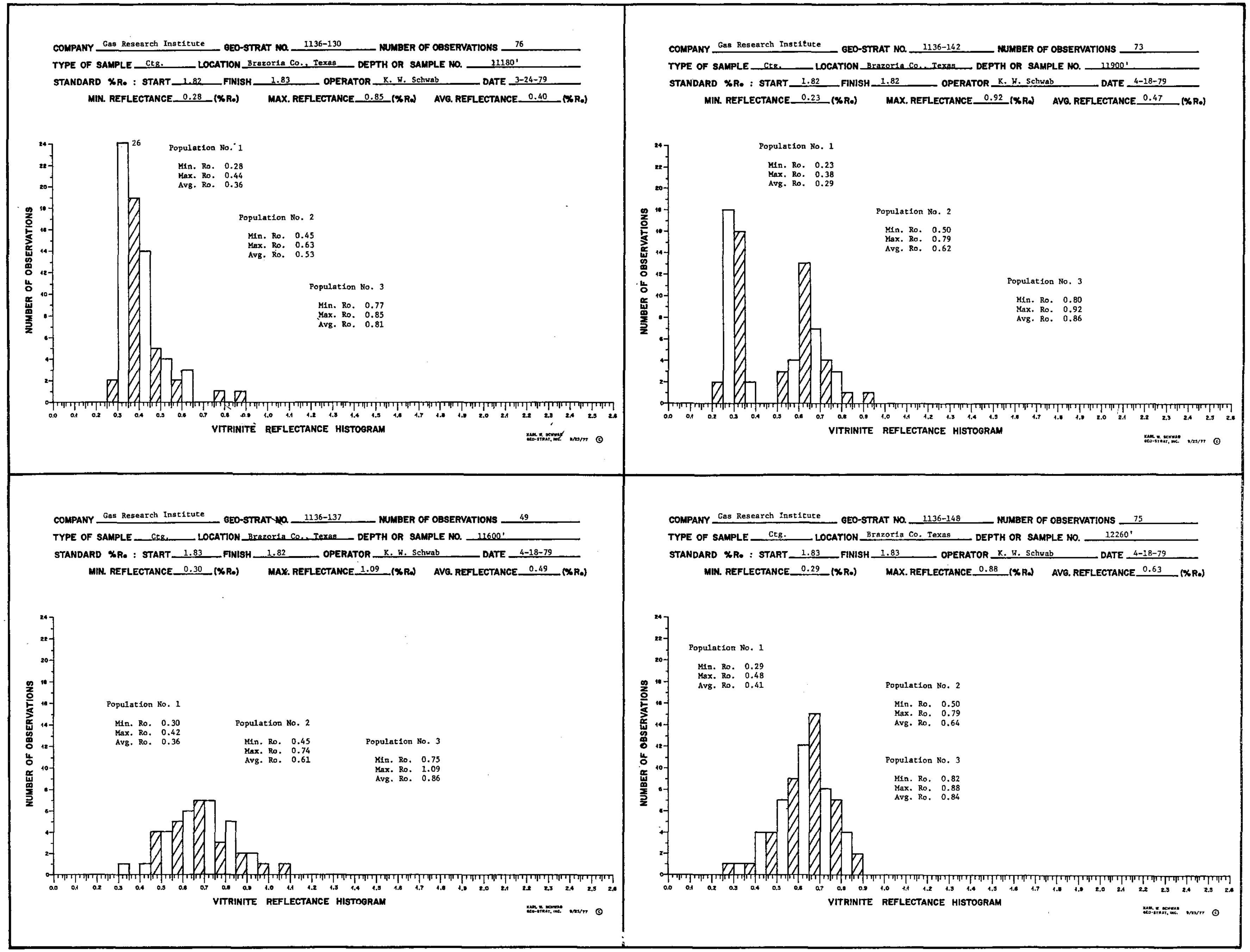
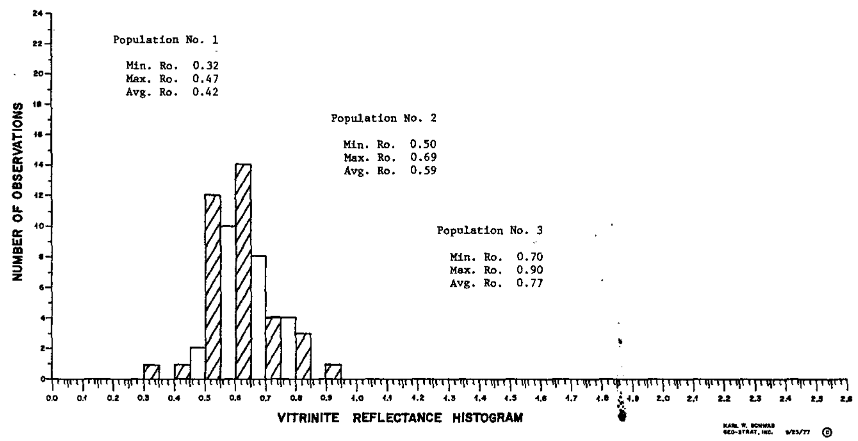
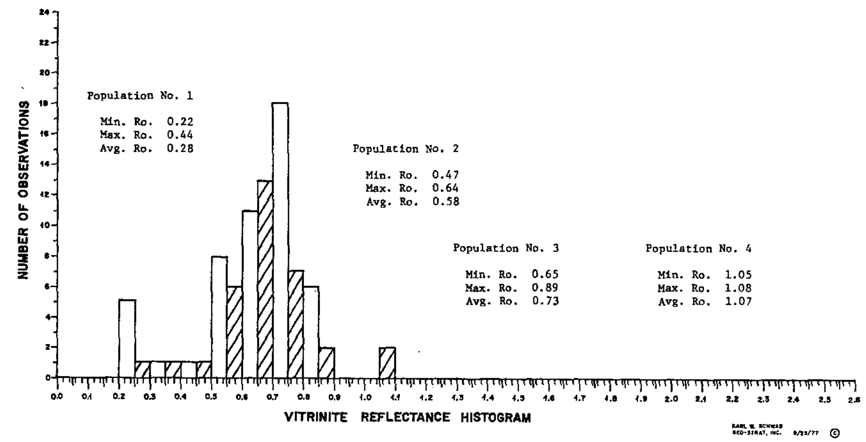

COMPANY Gas Research Institute GEO-STRAT NO. 1136-130 NUMBER OF OBSERVATIONS 76
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 11180'
STANDARD %Ro : START 1.82 FINISH 1.83 OPERATOR K. W. Schwab DATE 3-24-79
MIN. REFLECTANCE 0.28 (%Ro) MAX. REFLECTANCE 0.85 (%Ro) AVG. REFLECTANCE 0.40 (%Ro)
26
Population No. 1
Min. Ro. 0.28
Max. Ro. 0.44
Avg. Ro. 0.36
Population No. 2
Min. Ro. 0.45
Max. Ro. 0.63
Avg. Ro. 0.53
Population No. 3
Min. Ro. 0.77
Max. Ro. 0.85
Avg. Ro. 0.81
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-142 NUMBER OF OBSERVATIONS 73
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 11900'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-18-79
MIN. REFLECTANCE 0.23 (%Ro) MAX. REFLECTANCE 0.92 (%Ro) AVG. REFLECTANCE 0.47 (%Ro)
Population No. 1
Min. Ro. 0.23
Max. Ro. 0.38
Avg. Ro. 0.29
Population No. 2
Min. Ro. 0.50
Max. Ro. 0.79
Avg. Ro. 0.62
Population No. 3
Min. Ro. 0.80
Max. Ro. 0.92
Avg. Ro. 0.86
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-137 NUMBER OF OBSERVATIONS 49
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 11600'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-18-79
MIN. REFLECTANCE 0.30 (%Ro) MAX. REFLECTANCE 1.09 (%Ro) AVG. REFLECTANCE 0.49 (%Ro)
Population No. 1
Min. Ro. 0.30
Max. Ro. 0.42
Avg. Ro. 0.36
Population No. 2
Min. Ro. 0.45
Max. Ro. 0.74
Avg. Ro. 0.61
Population No. 3
Min. Ro. 0.75
Max. Ro. 1.09
Avg. Ro. 0.86
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM
COMPANY Gas Research Institute GEO-STRAT NO. 1136-148 NUMBER OF OBSERVATIONS 75
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co. Texas DEPTH OR SAMPLE NO. 12260'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 4-18-79
MIN. REFLECTANCE 0.29 (%Ro) MAX. REFLECTANCE 0.88 (%Ro) AVG. REFLECTANCE 0.63 (%Ro)
Population No. 1
Min. Ro. 0.29
Max. Ro. 0.48
Avg. Ro. 0.41
Population No. 2
Min. Ro. 0.50
Max. Ro. 0.79
Avg. Ro. 0.64
Population No. 3
Min. Ro. 0.82
Max. Ro. 0.88
Avg. Ro. 0.84
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Figure 20

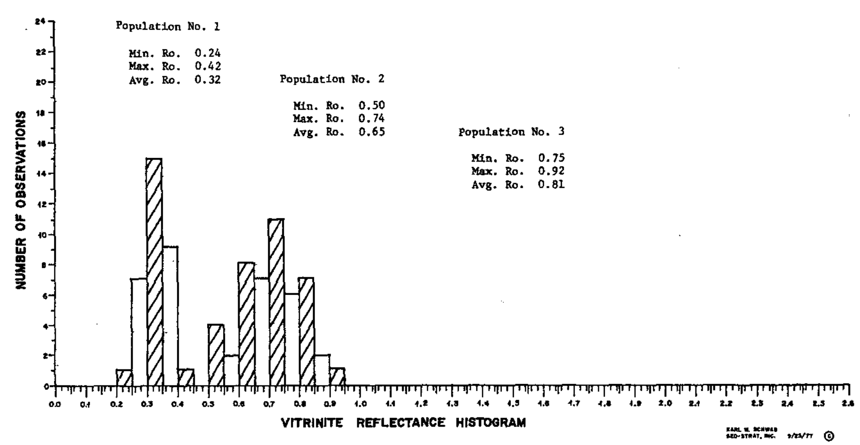
COMPANY Gas Research Institute GEO-STRAT NO. 1136-156 NUMBER OF OBSERVATIONS 60
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 12680'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.32 (%Ro) MAX. REFLECTANCE 0.90 (%Ro) AVG. REFLECTANCE 0.61 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-174 NUMBER OF OBSERVATIONS 83
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 13760'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.22 (%Ro) MAX. REFLECTANCE 1.08 (%Ro) AVG. REFLECTANCE 0.64 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-167 NUMBER OF OBSERVATIONS 81
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 13340'
STANDARD %Ro : START 1.82 FINISH 1.83 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.24 (%Ro) MAX. REFLECTANCE 0.92 (%Ro) AVG. REFLECTANCE 0.55 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-179 NUMBER OF OBSERVATIONS 102
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 14060'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.28 (%Ro) MAX. REFLECTANCE 1.01 (%Ro) AVG. REFLECTANCE 0.70 (%Ro)

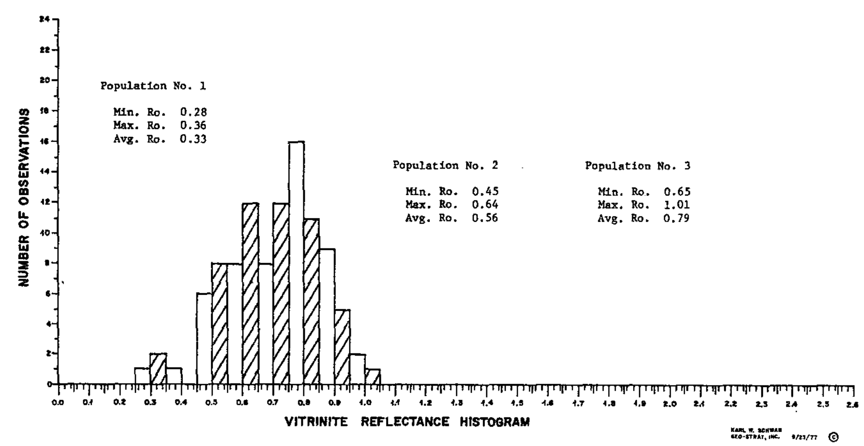
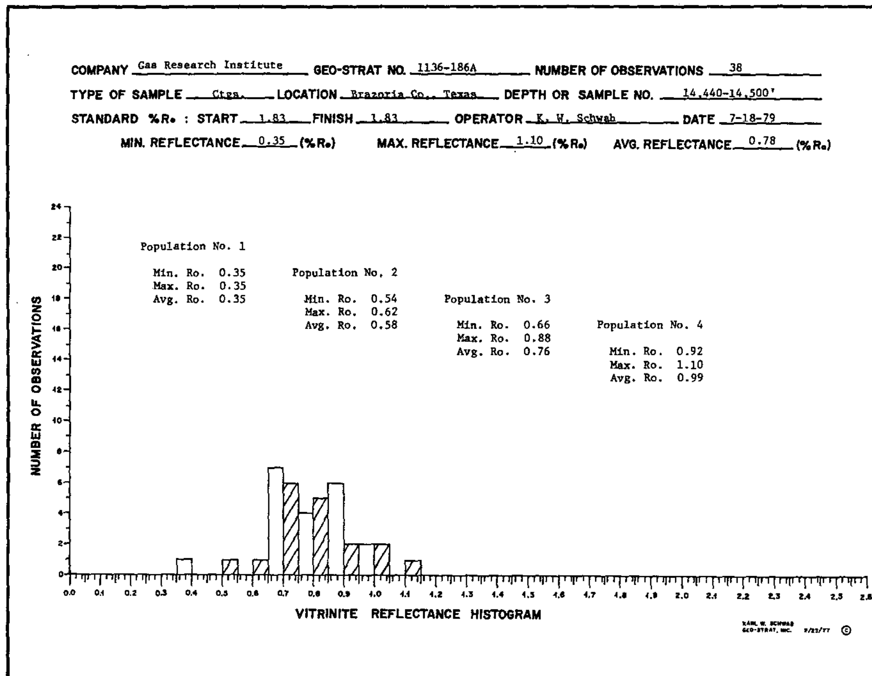
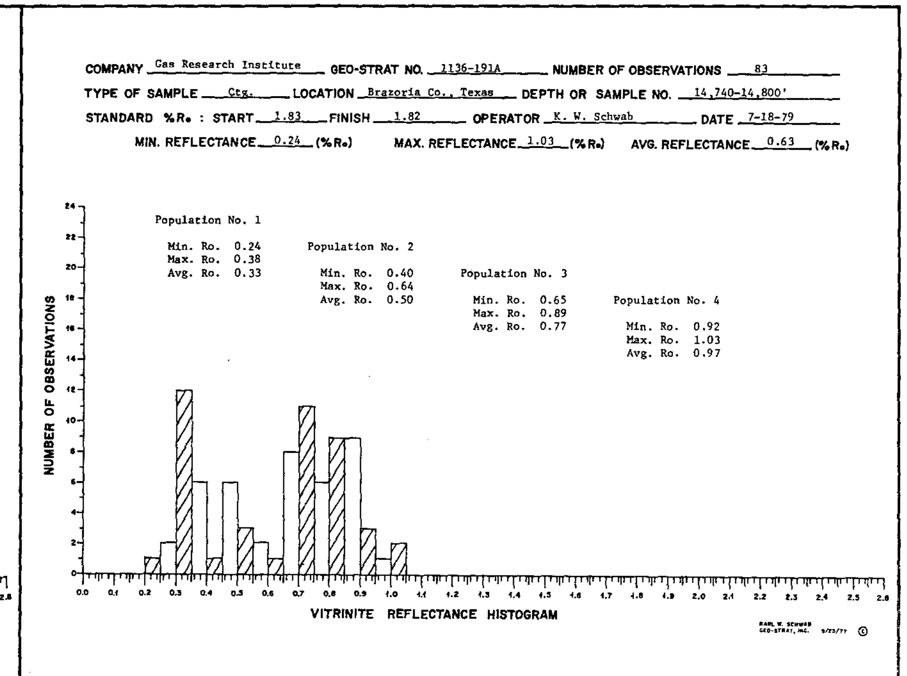
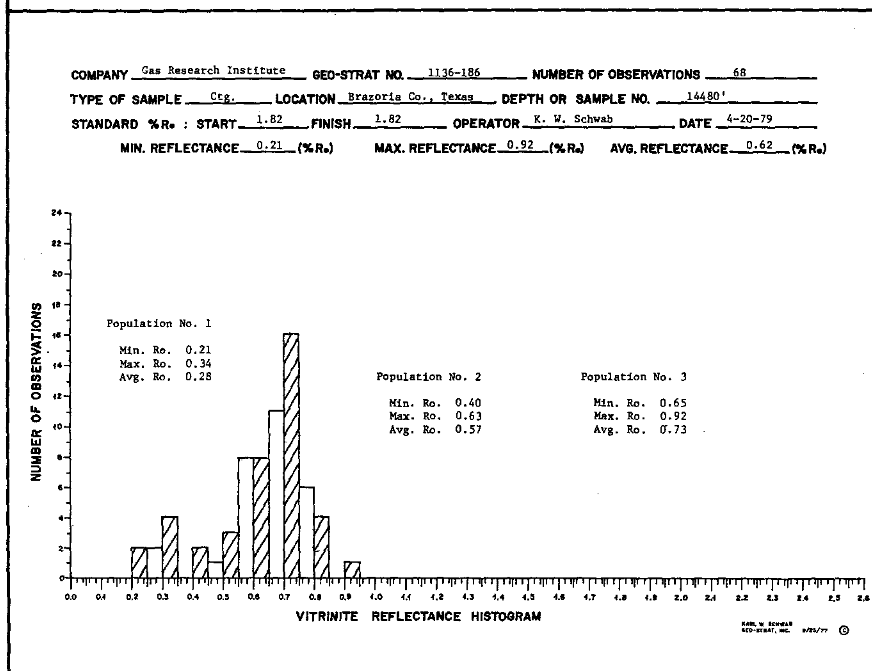


Figure 21


COMPANY Gas Research Institute GEO-STRAT NO. 1136-186A NUMBER OF OBSERVATIONS 38
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 14,440-14,500'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.35 (%Ro) MAX. REFLECTANCE 1.10 (%Ro) AVG. REFLECTANCE 0.78 (%Ro)
Population No. 1
Min. Ro. 0.35
Max. Ro. 0.35
Avg. Ro. 0.35
Population No. 2
Min. Ro. 0.54
Max. Ro. 0.62
Avg. Ro. 0.58
Population No. 3
Min. Ro. 0.66
Max. Ro. 0.88
Avg. Ro. 0.76
Population No. 4
Min. Ro. 0.92
Max. Ro. 1.10
Avg. Ro. 0.99
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM


COMPANY Gas Research Institute GEO-STRAT NO. 1136-191A NUMBER OF OBSERVATIONS 83
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 14,740-14,800'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.24 (%Ro) MAX. REFLECTANCE 1.03 (%Ro) AVG. REFLECTANCE 0.63 (%Ro)
Population No. 1
Min. Ro. 0.24
Max. Ro. 0.38
Avg. Ro. 0.33
Population No. 2
Min. Ro. 0.40
Max. Ro. 0.64
Avg. Ro. 0.50
Population No. 3
Min. Ro. 0.65
Max. Ro. 0.89
Avg. Ro. 0.77
Population No. 4
Min. Ro. 0.92
Max. Ro. 1.03
Avg. Ro. 0.97
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM


COMPANY Gas Research Institute GEO-STRAT NO. 1136-186 NUMBER OF OBSERVATIONS 68
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 14480'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.21 (%Ro) MAX. REFLECTANCE 0.92 (%Ro) AVG. REFLECTANCE 0.62 (%Ro)
Population No. 1
Min. Ro. 0.21
Max. Ro. 0.34
Avg. Ro. 0.28
Population No. 2
Min. Ro. 0.40
Max. Ro. 0.63
Avg. Ro. 0.57
Population No. 3
Min. Ro. 0.65
Max. Ro. 0.92
Avg. Ro. 0.73
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

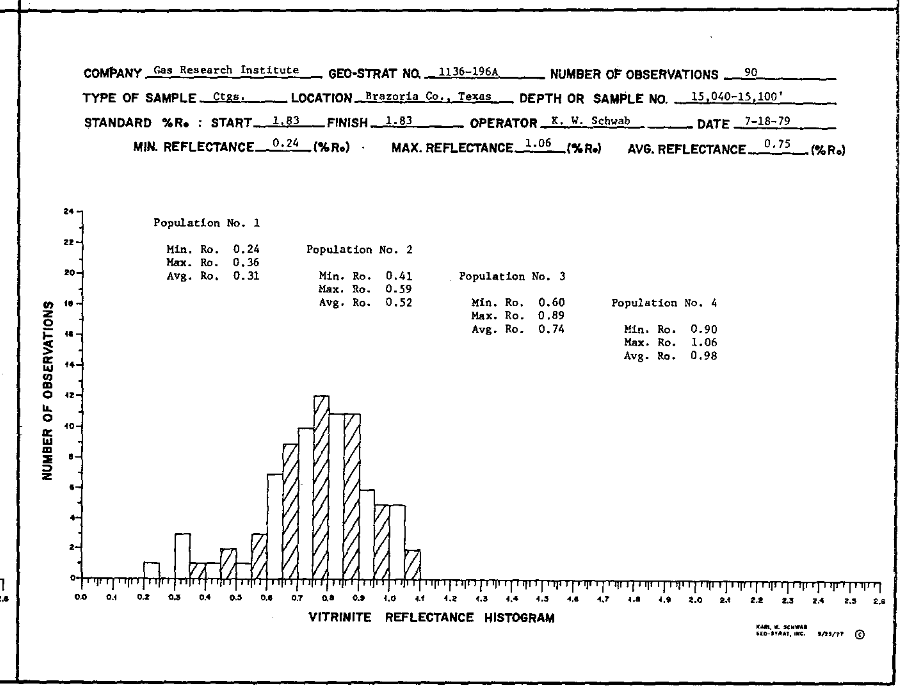
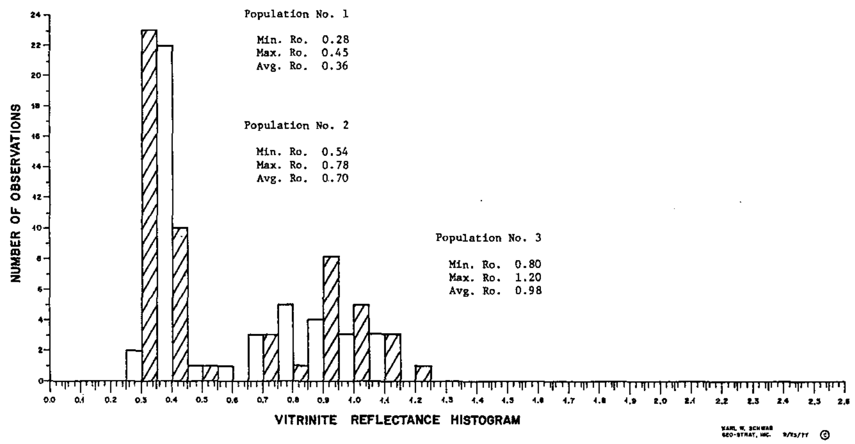
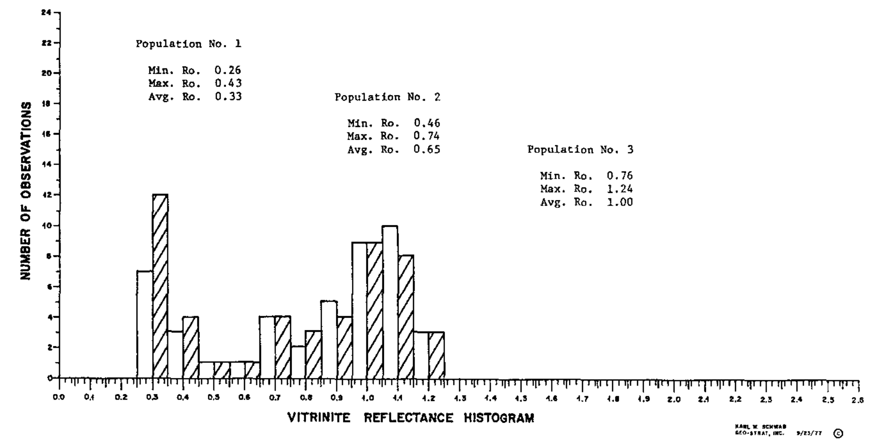

COMPANY Gas Research Institute GEO-STRAT NO. 1136-196A NUMBER OF OBSERVATIONS 90
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15,040-15,100'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.24 (%Ro) MAX. REFLECTANCE 1.06 (%Ro) AVG. REFLECTANCE 0.75 (%Ro)
Population No. 1
Min. Ro. 0.24
Max. Ro. 0.36
Avg. Ro. 0.31
Population No. 2
Min. Ro. 0.41
Max. Ro. 0.59
Avg. Ro. 0.52
Population No. 3
Min. Ro. 0.60
Max. Ro. 0.89
Avg. Ro. 0.74
Population No. 4
Min. Ro. 0.90
Max. Ro. 1.06
Avg. Ro. 0.98
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Figure 22

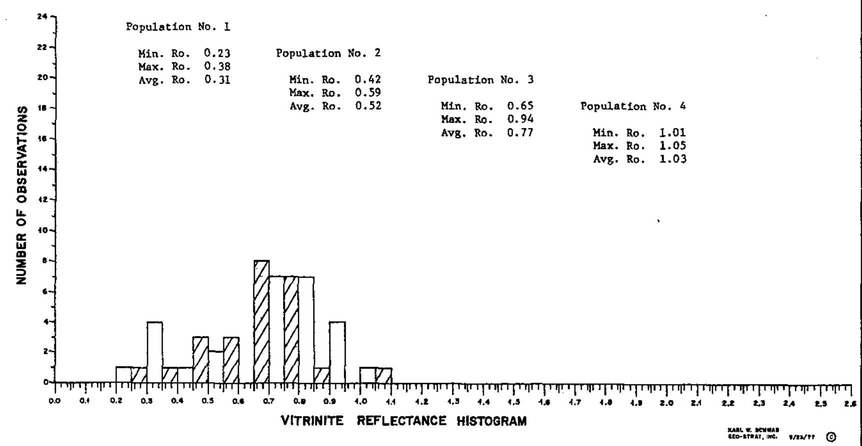
COMPANY Gas Research Institute GEO-STRAT NO. 1136-197 NUMBER OF OBSERVATIONS 99
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15140'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-18-79
MIN. REFLECTANCE 0.28 (%Ro) MAX. REFLECTANCE 1.20 (%Ro) AVG. REFLECTANCE 0.58 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-202 NUMBER OF OBSERVATIONS 94
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15440'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.26 (%Ro) MAX. REFLECTANCE 1.24 (%Ro) AVG. REFLECTANCE 0.77 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-201A NUMBER OF OBSERVATIONS 52
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15,340-15,400'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.23 (%Ro) MAX. REFLECTANCE 1.05 (%Ro) AVG. REFLECTANCE 0.67 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-206A NUMBER OF OBSERVATIONS 75
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15,640-15,700'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.30 (%Ro) MAX. REFLECTANCE 1.20 (%Ro) AVG. REFLECTANCE 0.83 (%Ro)

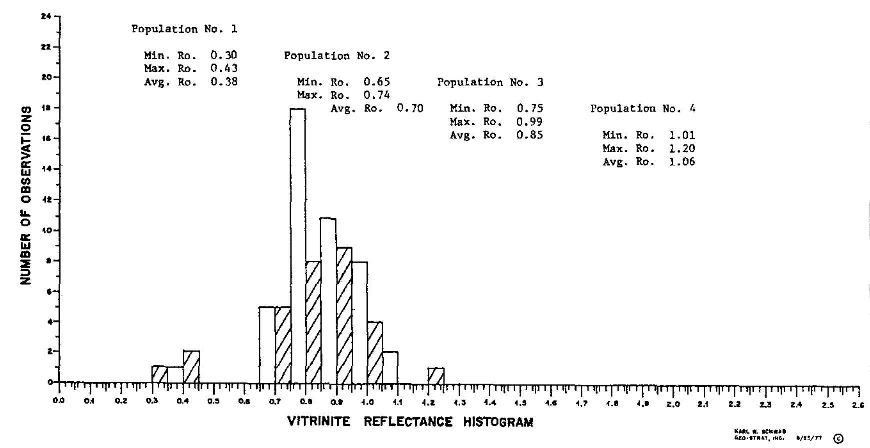
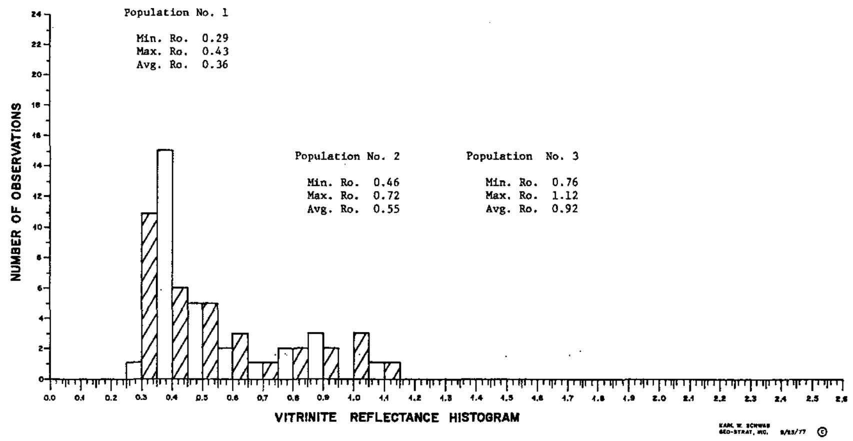
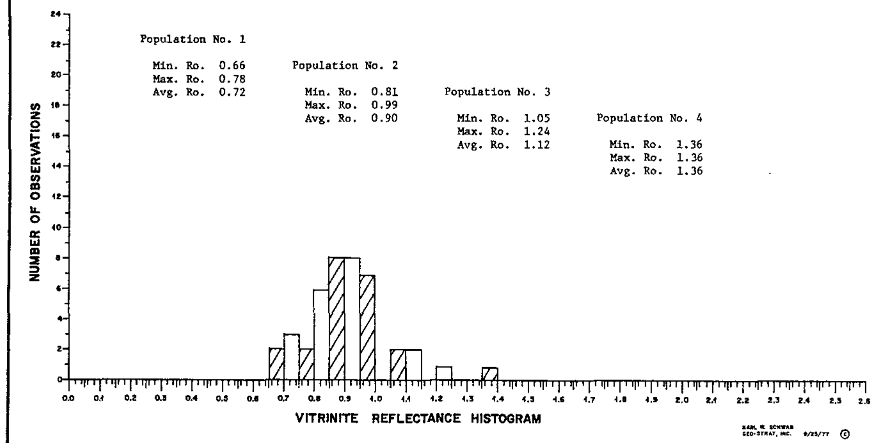


Figure 23

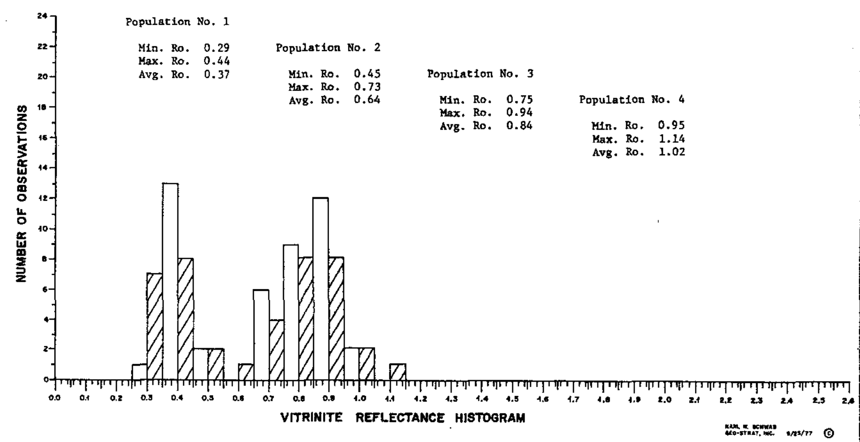
COMPANY Gas Research Institute GEO-STRAT NO. 1136-207 NUMBER OF OBSERVATIONS 64
TYPE OF SAMPLE Ctg. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15680'
STANDARD %Ro : START 1.82 FINISH 1.82 OPERATOR K. W. Schwab DATE 4-20-79
MIN. REFLECTANCE 0.29 (%Ro) MAX. REFLECTANCE 1.12 (%Ro) AVG. REFLECTANCE 0.53 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-216A NUMBER OF OBSERVATIONS 42
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 16,240-16,300'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.66 (%Ro) MAX. REFLECTANCE 1.36 (%Ro) AVG. REFLECTANCE 0.91 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-211A NUMBER OF OBSERVATIONS 86
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15,940-16,000'
STANDARD %Ro : START 1.83 FINISH 1.82 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.29 (%Ro) MAX. REFLECTANCE 1.14 (%Ro) AVG. REFLECTANCE 0.66 (%Ro)



COMPANY Gas Research Institute GEO-STRAT NO. 1136-220A NUMBER OF OBSERVATIONS 73
TYPE OF SAMPLE Ctgs. LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 16,480-16,500'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-18-79
MIN. REFLECTANCE 0.30 (%Ro) MAX. REFLECTANCE 1.07 (%Ro) AVG. REFLECTANCE 0.81 (%Ro)

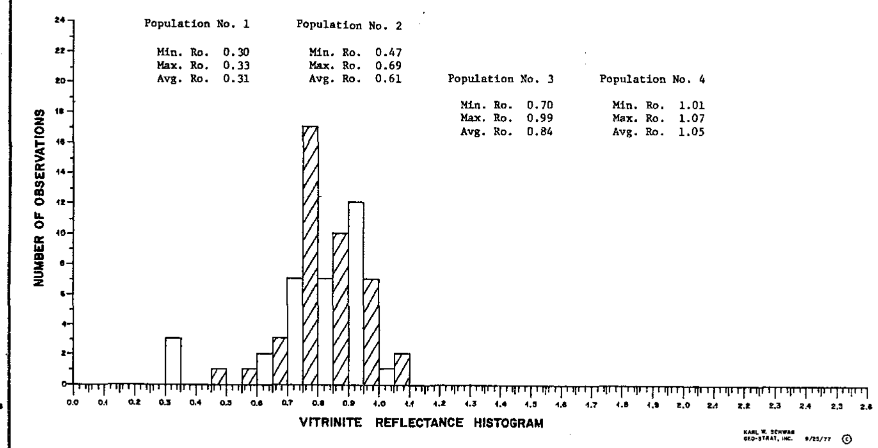
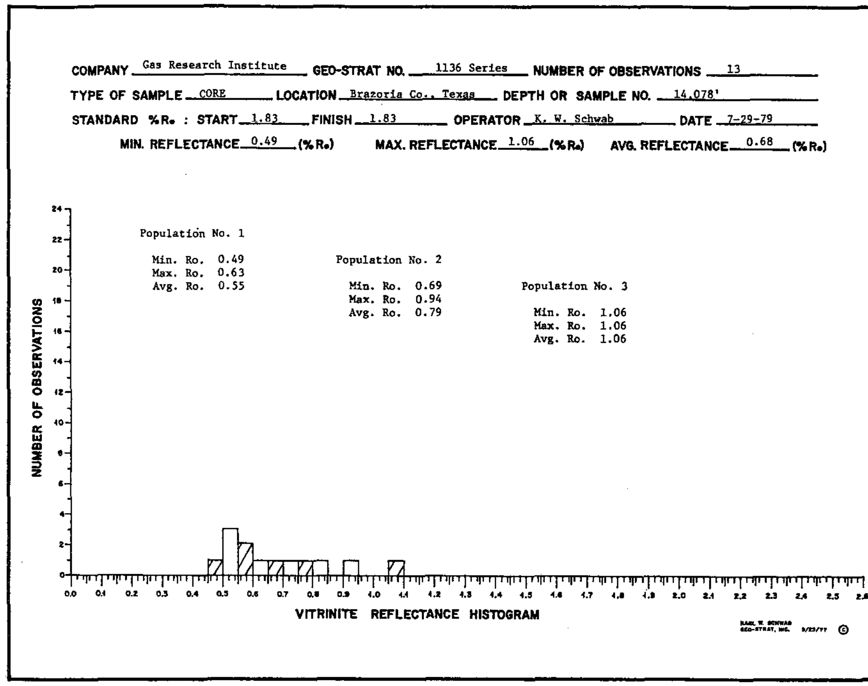


Figure 24


COMPANY Gas Research Institute GEO-STRAT NO. 1136 Series NUMBER OF OBSERVATIONS 13
TYPE OF SAMPLE CORE LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 14,078'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 7-29-79
MIN. REFLECTANCE 0.49 (%Ro) MAX. REFLECTANCE 1.06 (%Ro) AVG. REFLECTANCE 0.68 (%Ro)
Population No. 1
Min. Ro. 0.49
Max. Ro. 0.63
Avg. Ro. 0.55
Population No. 2
Min. Ro. 0.69
Max. Ro. 0.94
Avg. Ro. 0.79
Population No. 3
Min. Ro. 1.06
Max. Ro. 1.06
Avg. Ro. 1.06
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

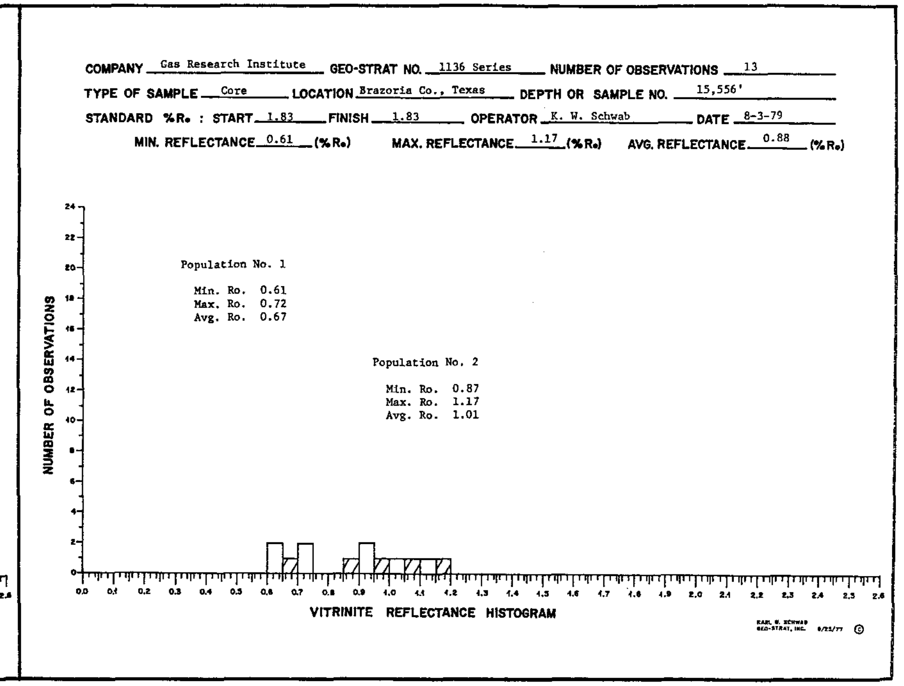

COMPANY Gas Research Institute GEO-STRAT NO. 1136 Series NUMBER OF OBSERVATIONS 13
TYPE OF SAMPLE Core LOCATION Brazoria Co., Texas DEPTH OR SAMPLE NO. 15,556'
STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 8-3-79
MIN. REFLECTANCE 0.61 (%Ro) MAX. REFLECTANCE 1.17 (%Ro) AVG. REFLECTANCE 0.88 (%Ro)
Population No. 1
Min. Ro. 0.61
Max. Ro. 0.72
Avg. Ro. 0.67
Population No. 2
Min. Ro. 0.87
Max. Ro. 1.17
Avg. Ro. 1.01
NUMBER OF OBSERVATIONS
VITRINITE REFLECTANCE HISTOGRAM

Table 1

Kerogen Zone	Depth Interval	Formation/Age	Avg. O.M.I.	Avg. T.A.I.	Avg. P.S.I.	Avg. P.I.
Zone I	2,894-3,693	Pleistocene-Pliocene Undifferentiated	3.54	2.67	1.70	4.14
Zone II	3,974-7,580'	Miocene Undifferentiated	4.72	2.60	2.23	3.34
Sub-Zone A	3,974-5,360'		4.36	2.61	1.50	3.67
Sub-Zone B	6,080-7,580'		5.08	2.58	2.71	3.00
Zone III	7,940-9,020'	Anahuac Shale	5.21	2.74	2.13	3.20
Zone IV	9,440-12,680'	"upper" Frio Oligocene	5.17	3.07	2.35	3.44
Sub-Zone A	9,440-10,460'		5.25	2.80	2.29	3.10
Sub-Zone B	10,820-11,180'		5.39	3.00	2.33	3.67
Sub-Zone C	11,600-12,680'		4.98	3.37	2.42	3.67
Zone V	13,340-14,800'	"middle" Frio Oligocene	5.40	3.43	2.28	3.91
Sub-Zone A	13,340-13,760'		5.36	3.29	2.70	3.86
Sub-Zone B	14,060-14,800'		5.42	3.50	2.07	3.93
Zone VI	15,100-16,500'	"lower" Frio Oligocene	5.18	3.56	2.07	4.33
Sub-Zone A	15,100-15,680'		5.18	3.51	2.25	4.04
Sub-Zone B	15,700-16,500'		5.19	3.62	1.84	4.69

Table 2a

VITRINITE SUMMARY CHART

Geo-Strat, No.	Sample Depth	ASTM Coal Classification	Min. Reflectance	Max. Reflectance	Avg. Reflectance
1136-010	2894'	Sub-Bituminous	0.30	0.62	0.43
Population No. 1		Sub-Bituminous	0.30	0.49	0.40
Population No. 2		High-Vol. Bituminous	0.55	0.62	0.59
1136-016	3386'	Sub-Bituminous	0.24	0.51	0.42
Population No. 1		Lignite	0.24	0.35	0.28
Population No. 2		Sub-Bituminous	0.41	0.51	0.47
1136-021	3693'	Sub-Bituminous	0.30	0.52	0.39
1136-025	3974'	Sub-Bituminous	0.32	0.58	0.39
1136-029	4160'	Sub-Bituminous	0.32	0.53	0.41
1136-032	5360'	High-Vol. Bituminous	0.22	1.14	0.49
Population No. 1		Lignite	0.22	0.45	0.34
Population No. 2		High-Vol. Bituminous	0.76	0.76	0.76
Population No. 3		Med-Vol. Bituminous	1.14	1.14	1.14
1136-044	6080'	Sub-Bituminous	0.32	0.51	0.43
1136-049	6380'	Lignite	0.28	0.44	0.36
1136-056	6800'	Lignite	0.28	0.42	0.35
1136-064	7280'	Lignite	0.24	0.55	0.36

Table 2b

VITRINITE SUMMARY CHART

Geo-Strat, No.	Sample Depth	ASTM Coal Classification	Min. Reflectance	Max. Reflectance	Avg. Reflectance
1136-069	7580'	Lignite	0.23	0.75	0.34
Population No. 1		Lignite	0.23	0.42	0.32
Population No. 2		High-Vol. Bituminous	0.75	0.75	0.75
1136-075	7940'	Lignite	0.23	0.49	0.36
Population No. 1		Lignite	0.23	0.34	0.29
Population No. 2		Sub-Bituminous	0.36	0.49	0.42
1136-080	8240'	Sub-Bituminous	0.31	0.72	0.42
Population No. 1		Sub-Bituminous	0.31	0.52	0.40
Population No. 2		High-Vol. Bituminous	0.68	0.72	0.70
1136-086	8600'	High-Vol. Bituminous	0.26	1.14	0.51
Population No. 1		High-Vol. Bituminous	0.26	0.53	0.51
Population No. 2		High-Vol. Bituminous	0.84	1.14	0.97
1136-093	9020'	Lignite	0.20	0.58	0.32
Population No. 1		Lignite	0.20	0.34	0.27
Population No. 2		Sub-Bituminous	0.35	0.58	0.42
1136-100	9440'	Lignite	0.15	0.87	0.34
Population No. 1		Lignite	0.15	0.34	0.24
Population No. 2		Sub-Bituminous	0.36	0.52	0.43
Population No. 3		High-Vol. Bituminous	0.87	0.87	0.87
1136-105	9740'	Lignite	0.28	0.41	0.34

Table 2c

VITRINITE SUMMARY CHART

Geo-Strat, No.	Sample Depth	ASTM Coal Classification	Min. Reflectance	Max. Reflectance	Avg. Reflectance
1136-112	10160'	High-Vol. Bituminous	0.26	1.19	0.56
Population No. 1		Lignite	0.26	0.32	0.30
Population No. 2		Sub-Bituminous	0.35	0.59	0.46
Population No. 3		High-Vol. Bituminous	0.60	0.77	0.67
Population No. 4		Med-Vol. Bituminous	0.93	1.19	1.13
1136-118	10460'	High-Vol. Bituminous	0.30	1.23	0.58
Population No. 1		Sub-Bituminous	0.30	0.59	0.48
Population No. 2		High-Vol. Bituminous	0.63	0.74	0.67
Population No. 3		Med-Vol. Bituminous	0.94	1.23	1.09
1136-124	10820'	Sub-Bituminous	0.20	1.02	0.39
Population No. 1		Lignite	0.20	0.39	0.28
Population No. 2		High-Vol. Bituminous	0.41	0.72	0.58
Population No. 3		High-Vol. Bituminous	1.02	1.02	1.02
1136-130	11180'	Sub-Bituminous	0.28	0.85	0.40
Population No. 1		Lignite	0.28	0.44	0.36
Population No. 2		High-Vol. Bituminous	0.45	0.63	0.53
Population No. 3		High-Vol. Bituminous	0.77	0.85	0.81
1136-137	11600'	High-Vol. Bituminous	0.30	1.09	0.49
Population No. 1		Lignite	0.30	0.42	0.36
Population No. 2		High-Vol. Bituminous	0.45	0.74	0.61
Population No. 3		High-Vol. Bituminous	0.75	1.09	0.86

Table 2d

VITRINITE SUMMARY CHART

Geo-Strat, No.	Sample Depth	ASTM Coal Classification	Min. Reflectance	Max. Reflectance	Avg. Reflectance
1136-142	11900'	Sub-Bituminous	0.23	0.92	0.47
Population No. 1		Lignite	0.23	0.38	0.29
Population No. 2		High-Vol. Bituminous	0.50	0.79	0.62
Population No. 3		High-Vol. Bituminous	0.80	0.92	0.86
1136-148	12260'	High-Vol. Bituminous	0.29	0.88	0.63
Population No. 1		Sub-Bituminous	0.29	0.48	0.41
Population No. 2		High-Vol. Bituminous	0.50	0.79	0.64
Population No. 3		High-Vol. Bituminous	0.82	0.88	0.84
1136-156	12680'	High-Vol. Bituminous	0.32	0.90	0.61
Population No. 1		Sub-Bituminous	0.32	0.47	0.42
Population No. 2		High-Vol. Bituminous	0.50	0.69	0.59
Population No. 3		High-Vol. Bituminous	0.70	0.90	0.77
1136-167	13340'	High-Vol. Bituminous	0.24	0.92	0.55
Population No. 1		Lignite	0.24	0.42	0.32
Population No. 2		High-Vol. Bituminous	0.50	0.74	0.65
Population No. 3		High-Vol. Bituminous	0.75	0.92	0.81
1136-174	13760'	High-Vol. Bituminous	0.22	1.08	0.64
Population No. 1		Lignite	0.22	0.44	0.28
Population No. 2		High-Vol. Bituminous	0.47	0.64	0.58
Population No. 3		High-Vol. Bituminous	0.65	0.89	0.73
Population No. 4		Med-Vol. Bituminous	1.05	1.08	1.07

Table 2e

VITRINITE SUMMARY CHART

Geo-Strat, No.	Sample Depth	ASTM Coal Classification	Min. Reflectance	Max. Reflectance	Avg. Reflectance
1136-179	14060'	High-Vol. Bituminous	0.28	1.01	0.70
Population No. 1		Lignite	0.28	0.36	0.33
Population No. 2		High-Vol. Bituminous	0.45	0.64	0.56
Population No. 3		High-Vol. Bituminous	0.65	1.01	0.79
1136-186	14480'	High-Vol. Bituminous	0.21	0.92	0.62
Population No. 1		Lignite	0.21	0.34	0.28
Population No. 2		High-Vol. Bituminous	0.40	0.63	0.57
Population No. 3		High-Vol. Bituminous	0.65	0.92	0.73
1136-186A	14440-14500'	High-Vol. Bituminous	0.35	1.10	0.78
Population No. 1		Lignite	0.35	0.35	0.35
Population No. 2		High-Vol. Bituminous	0.54	0.62	0.58
Population No. 3		High-Vol. Bituminous	0.66	0.88	0.76
Population No. 4		High-Vol. Bituminous	0.92	1.10	0.99
1136-191A	14740-14800'	High-Vol. Bituminous	0.24	1.03	0.63
Population No. 1		Lignite	0.24	0.38	0.33
Population No. 2		High-Vol. Bituminous	0.40	0.64	0.50
Population No. 3		High-Vol. Bituminous	0.65	0.89	0.77
Population No. 4		High-Vol. Bituminous	0.92	1.03	0.97
1136-196A	15040-15100'	High-Vol. Bituminous	0.24	1.06	0.75
Population No. 1		Lignite	0.24	0.36	0.31
Population No. 2		High-Vol. Bituminous	0.41	0.59	0.52
Population No. 3		High-Vol. Bituminous	0.60	0.89	0.74
Population No. 4		High-Vol. Bituminous	0.90	1.06	0.98

Table 29

VITRINITE SUMMARY CHART

Geo-Strat, No.	Sample Depth	ASTM Coal Classification	Min. Reflectance	Max. Reflectance	Avg. Reflectance
1136-211A	15940-16000'	High-Vol. Bituminous	0.29	1.14	0.66
Population No. 1		Lignite	0.29	0.44	0.37
Population No. 2		High-Vol. Bituminous	0.45	0.73	0.64
Population No. 3		High-Vol. Bituminous	0.75	0.94	0.84
Population No. 4		High-Vol. Bituminous	0.95	1.14	1.02
1136-216A	16240-16300'	High-Vol. Bituminous	0.66	1.36	0.91
Population No. 1		High-Vol. Bituminous	0.66	0.78	0.72
Population No. 2		High-Vol. Bituminous	0.81	0.99	0.90
Population No. 3		Med-Vol. Bituminous	1.05	1.24	1.12
Population No. 4		Med-Vol. Bituminous	1.36	1.36	1.36
1136-220A	16480-16500'	High-Vol. Bituminous	0.30	1.07	0.81
Population No. 1		Lignite	0.30	0.33	0.31
Population No. 2		High-Vol. Bituminous	0.47	0.69	0.61
Population No. 3		High-Vol. Bituminous	0.70	0.99	0.84
Population No. 4		Med-Vol. Bituminous	1.01	1.07	1.05
1136 Series (Core)	14078'	High-Vol. Bituminous	0.49	1.06	0.68
Population No. 1		High-Vol. Bituminous	0.49	0.63	0.55
Population No. 2		High-Vol. Bituminous	0.69	0.94	0.79
Population No. 3		Med-Vol. Bituminous	1.06	1.06	1.06
1136 Series (Core)	15556'	High-Vol. Bituminous	0.61	1.17	0.88
Population No. 1		High-Vol. Bituminous	0.61	0.72	0.67
Population No. 2		High-Vol. Bituminous	0.87	1.17	1.01