GEOCHEMICAL ANALYSIS PROCEDURES

Source Rock Richness Study

To evaluate the organic richness of the ditch samples, we determined both their organic carbon (Corg or non-carbonate carbon, NCC), and the effective carbon (Ceff) contents. Organic carbon, or acid-insoluble carbon, represents the total amount of organic matter in the rock, and it is determined by measuring the total amount of carbon dioxide evolved during combustion of an acid-treated sample.

On the other hand, effective carbon reflects the fraction of organic carbon which is thermally convertible to petroleum. As estimates of effective carbon, we used two laboratory pyrolysis procedures. One method, pyrolysis-fluorescence (PF) is a rapid means of evaluating the petroleum generating potential, by measuring (in arbitrary PF units) the amount of fluorescing bitumen generated on heating. PF values in rocks can range from zero to several thousand units. For additional data, refer to Heacock and Hood (1970). The second method, pyrolysis-FID (P-FID) provides a measure of the amount of organic matter which can be converted thermally to hydrocarbons. A small amount of sample (less than 200 milligrams) is heated in a flowing stream of pure nitrogen at temperatures increasing from room temperature to 750°C at a rate of 25°C per minute. The volatile organic compounds are distilled at temperatures less than about 300°C. At higher temperatures nonvolatile organic matter is pyrolyzed for form volatile hydrocarbons. The distillation (D) and pyrolysis (P) products are carried (by nitrogen) to a hydrogen flame ionization detector (FID). The FID signal can be converted to percent hydrocarbons or percent carbon by calibration with a petroleum wax. For further data on the method and instrumentation see Eggertsen and Stross (1972).

Thermal History

Some of the methods used to determine the burial metamorphic history are summarized in the attached table taken from a publication by Hood and Castano. These methods are related through the use of the LOM (Level of Organic Metamorphism) scale reported by Hood et al in the AAPG Bulletin. The techniques for measuring the level of organic metamorphism reflect the irreversible effects of temperature and time, hence, of thermal history. Therefore, the reflectance data can be tied reaidly into the LOM or coal rank scales.

Vitrinite Reflectance Study

A number of ditch samples were prepared for vitrinite reflectance study. For the shale samples, the vitrinite was concentrated by non-oxidative acid solution of the inorganic matrix. Standard A.S.T.M. procedures are followed for polishing and examining the specimens. For coals, the samples were prepared with acid maceration.

The results of the study are summarized on the individual histograms and on the depth-reflectance plot. On the histograms, each vitrinite reflectance reading is shown to the nearest 0.01% reflectance in oil (%Ro), and the values are summed up for each 0.1% Ro group. In the tables, the (arithmetic) mean Ro is given with the limits of uncertainty calculated for 95% confidence limits. All of the measurements are random Ro readings.

Visual Kerogen Analysis (VKA)

Visual kerogen analysis (an abbreviated form of maceral analysis) is run in conjunction with the vitrinite reflectance study. VKA consists of estimating the percentage of the major kinds of organic matter that are present in a sample. The percentages refer only to the relative proportions of the several kerogen types, and do not carry any implications as to organic richness.

Visual kerogen analysis is especially valuable in relating optical methods of describing organic matter to organic geochemical analyses. VKA is also useful in identifying solid hydrocarbons, and high LOM "burned-out" source rocks. And, as lipid rich macerals can be identified readily up to LOM 11.5 or so, optical analysis can be used as a supplement to chemical typing methods. VKA affords a means of classifying organic rich rocks, and should enable us to map particular source rock facies.

Five major subdivisions are used; they are:

Amorphous. Many palynologists prefer to call amorphous kerogen structureless organic matter (SOM). Amorphous kerogen is lipid-rich, and it is the dominant component of most oil source rocks.

Liptinite. In this category we have included all of the structured, lipid-rich macerals. The main ones are: exinite (spores and pollen), algae, plant cuticles, and resins. At LOM's of 11.5-12 liptinite loses its fluorescence, and attains a reflectance similar to that of vitrinite. As a result, liptinite cannot be distinguished from vitrinite at LOM's above 11.5-12.

Bitumens. Often called solid hydrocarbons. At low LOM's bitumens fluoresce and have reflectivities lower than that of vitrinite. At LOM's of about 11, the solid hydrocarbons lose their fluorescence and attain a reflectance similar to that of vitrinite. At high LOM's, morphology and the typical grainy texture help the identification.

Vitrinite. We have also used the term humic (reactive) for the vitrinite group, as vitrinite is the principal component of reactive humic matter. Vitrinite can be subdivided into sub-macerals such as ulminite, corpohumite, telinite, etc., but these refinements are not normally of importance to us.

Inertinite. In this category are included all of the macerals which are essentially inert or non-reactive. The inert category includes fusinite, semi-fusinite, altered vitrinite, reworked vitrinite, pseudo-vitrinite, sclerotinite and micrinite.

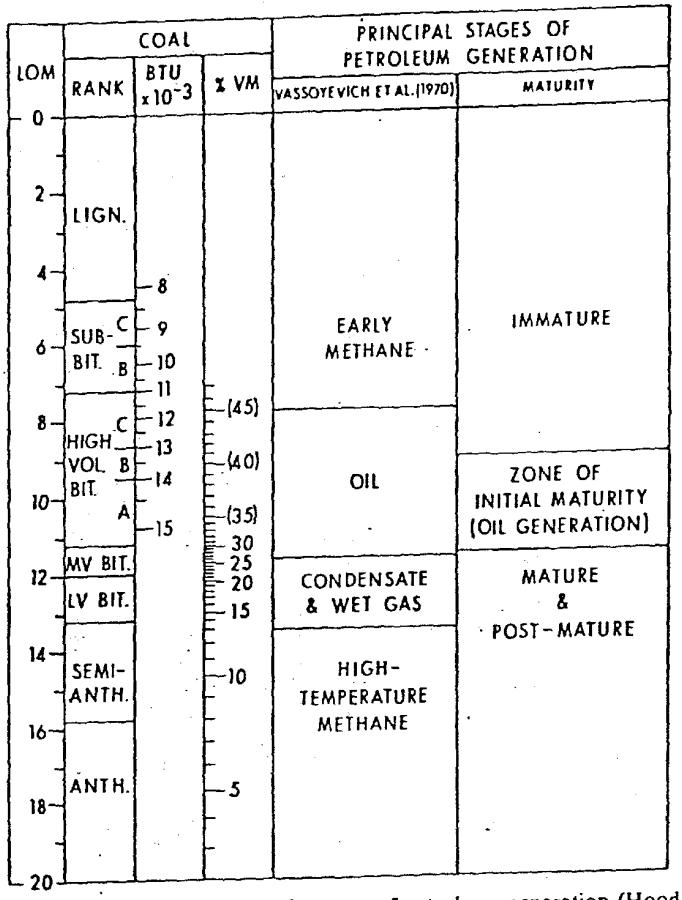


Figure VII–12. Principal organic-metamorphic stages of petroleum generation (Hood *et al.*, in press).

BRC-4
7/78

Shell Development Company

DATE: JULY 14, 1982

FROM: GEOCHEMICAL SERVICES

TO: PACIFIC DIVISION EXPLORATION

ATTN: G. B. ROSS

SUBJECT: SOURCE ROCK EVALUATION
PHILLIPS, BIG RIVER NO. A-1,
API #50-251-20001-00,
SEC. 15, T49S, R68W,
ALEUTIAN BASIN,
SEWARD B&M, ALASKA

			REFLECTANCE ANALYSIS					VISUAL KEROGEN ANALYSIS									
								Kerogen									
Depth or Sample No.	Lab No. V-	Sample Type Lithology	Formation, Age	Maceral Type Ro	Mean ± 95% Conf. Lmts.	LOM	Solid Hydrocarbon B	Amorphous KA	Massive KM	Micrinized KI	Alginite A	Liptodetrinite L	Resinite R	Coked Vitrinite VK	Vitrinite V	Inertinite I	REMARKS:
600-720	30037	Ditch	Stepovak, Oligocene-Eocene	V	0.46 ± 0.04	6.8-8.0		95				2			2	<1	
990-1050	30038	"	"	V	0.45 ± 0.03	6.8-7.7		96				<1			2	1	
1980-2160	30039	" , Sink Fraction	Tolstoi, Eocene	V VK	0.78 ± 0.03 2.03 ± 0.16	9.6-9.9 ND			39					5	55	1	
1980-2160	30040	", Float Fraction	"	V VK	0.83 ± 0.02 2.28 ± 0.22	9.9-10.1 ND							2	40	56	2	
4480-4530	30041	Ditch	"	V	1.05 ± 0.04	10.8-11.2			25						75		
4860-4890	30042	" ,Sink Fraction	"	V	1.21 ± 0.04	11.4-11.6			10						88	2	
4860-4890	30043	", Float Fraction	"	V	1.32 ± 0.03	11.8-11.9			1						97	2	
4960-4980	30044	", Float Fraction	"	V	1.50 ± 0.04	12.1-12.3									98	2	
5320-5340	30045	" "	"	V	1.33 ± 0.03	11.8-11.9									99	<1	
5580-5600	30046	" "	"	V	1.39 ± 0.04	11.9-12.1									100		
5930-5980	30047	" "	"	V VK	1.48 ± 0.04 2.31 ± 0.11	12.1-12.3 ND								25	74	1	
6470-6510	30048	", Sink Fraction	"	V	1.60 ± 0.04	12.4-12.6			20						80	<1	
6470-6510	30049	", Float Fraction	"	V	1.64 ± 0.04	12.4-12.7									99	<1	

Depth or Sample No.	Lab No. V-	Sample Type Lithology	Formation, Age	Maceral Type Ro	Mean ± 95% Conf. Lmts.	LOM	Solid Hydrocarbon Bi	VISUAL KEROGEN ANALYSIS: Kerogen Amorphous KA	Kerogen Massive KM	Kerogen Micrinized KI	Alginite A	Liptodetrinite L	Coked Vitrinite VI	Vitrinite V	Inertinite I	REMARKS:
		REFLECTANCE ANALYSIS														
6900-6940	30050	Ditch, Sink Fraction	Tolstoi, Eocene	V	1.78 ± 0.05	12.8-13.2			70					30	<1	
6900-6940	30051	" , Float Fraction	"	V	1.83 ± 0.04	13.1-13.4								99	<1	
7310-7330	30052	" "	Chignik, U. Cretaceous	V	2.10 ± 0.05	14.2-14.7								99	<1	
7710-7720	30053	" "	"	V	2.02 ± 0.06	13.8-14.3								99	<1	
8290-8300	30054	" , Picked coal	"	V	2.44 ± 0.06	15.8-16.3								99	<1	
8360-8370	30055	", Float Fraction	"	V	2.43 ± 0.06	15.7-16.3								99	<1	
8900-8950	30056	", Picked Coal	Herendeen, L. Cretaceous	V	2.40 ± 0.06	15.6-16.2								99	<1	
9360-9420	30057	", Sink Fraction	"	V	2.27 ± 0.04	15.1-15.5				45				55	<1	
9360-9420	30058	", Float Fraction	Staniokovich, Naknek, Jurassic	V	2.40 ± 0.07	15.5-16.2								99	<1	
9680-9720	30059	", Sink Fraction	"	V	2.35 ± 0.04	15.4-15.8				45				55	<1	
9680-9720	30060	", Float Fraction	"	V	2.45 ± 0.06	15.8-16.4								99	<1	
10000-10050	30061	", Sink Fraction	"	V	2.26 ± 0.04	15.0-15.4				35				65		

Depth or Sample No.	Lab No. V-	Sample Type Lithology	Formation, Age	Maceral Type Ro	Mean ± 95% Conf. Lmts.	LOM	Solid Hydrocarbons	VISUAL KEROGEN ANALYSIS: Kerogen Amorphous KA	Kerogen Massive KM	Micrinized KI	Alginite A	Liptodetrinite L	Coked Vitrinite VI	Vitrinite V	Inertinite I	REMARKS:
10000-10050	30062	Ditch, Float Fraction	Staniokovich-Naknek, Jurassic	V	2.44 ± 0.05	15.8-16.3								100		
10500-10550	30063	" , Sink Fraction	"	V	2.20 ± 0.06	14.6-15.2				35				65		
10500-10550	30064	", Float Fraction	"	V	2.30 ± 0.04	15.2-15.6								100		
11000-11050	30065	", Sink Fraction	"	V	2.14 ± 0.07	14.3-14.9				50				50	<1	
11000-11050	30066	", Float Fraction	"	V	2.42 ± 0.06	15.7-16.3								100		
11320-11370	30067	", Sink Fraction	"	V	2.17 ± 0.10	14.3-15.3				90				10		
11320-11370	30068	", Float Fraction	"	V	2.14 ± 0.07	ND								100		

REFLECTANCE ANALYSIS

Liptinite attains a reflectance similar to that of vitrinite at around LOM 11.5-12 and can no longer be distinguished from vitrinite.

Visual kerogen analysis refers to the relative amounts of each type of kerogen to the total kerogen. It does not indicate quantitatively the amount of kerogen in the sample.

Where two or more values are presented, the A mean is preferred and the X group refers to the entire spread of vitrinite values seen in the sample.

Four different types of sample preparation were analysed for this study. They include:

Float fraction	-	light material (predominantly coal) separated from the bulk cuttings by heavy liquid separation (ρ <2.0).
Sink fraction	-	heavy material (shales, etc.) which was separated from the bulk cuttings by heavy liquid separation (ρ >2.0) and acid macerated to obtain a kerogen concentrate.
Ditch	-	a bulk cuttings sample, acid macerated.
Picked coal	-	hand picked to obtain the in situ material.

The samples at 1980-2160 and 5930-5980 contained coked vitrinite. This implies that they have been altered (naturally coked) by a thermal anomaly, such as an igneous intrusion. Furthermore, the reflectance of the sample at 1980-2160 is anomalously high, relative to the overall reflectance-depth trend.

There is a significant change in the reflectance-depth gradient, changing from a rather high gradient above ~8250' (Tertiary and Upper Cretaceous) to virtually no gradient below ~ 8250' (Lower Cretaceous and Jurassic).

J. R. CASTAÑO

JRC/AKK/PRJ:pv
Attachments

cc: J. R. Castaño (w/attachments)
Well File (w/attachments)
Regional Geochemistry File (w/attachments)
P. Herr (w/attachments)

COUNTY _____ STATE/PROV Alaska COUNTRY USA

COMPANY/WELL Phillips Big River No. A-1

SEC. 15 TWS. 49S RGE. 68W OTHER: _____

BASIN: ALEUTIAN API NO. 50-251-20001-00

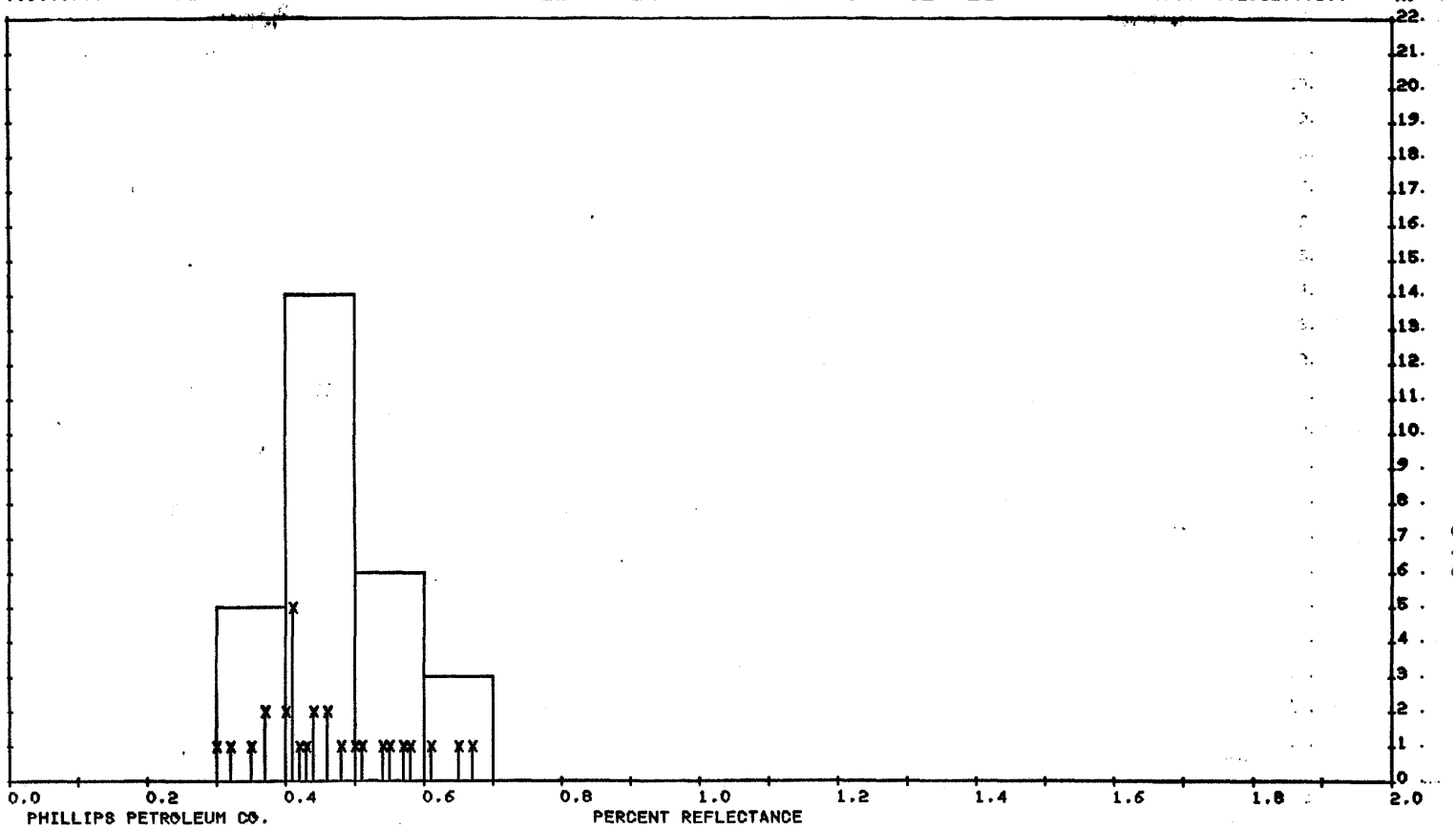
D = Ditch HLS = Heavy Liquid Seperation
Coal is float fraction of HLS
Rock is sink fraction of HLS
HCL - HF = sample treated with acid to obtain an organic concentrate

Heavy liquid has specific gravity of 2.0
Picked coal - coal physically concentrated by hand
Pellet = coal was crushed to <250 micrometer

VR NO.	DEPTH	SAMPLE TYPE	HCL	HF	PELLET		REMARKS
30037	600-720	D	X	X	X		Rock
30038	990-1050	D	X	X			Rock
30039	1980-2160	D	X	X		HLS	Rock
30040	1980-2160	D			X	HLS	Coal
30041	4480-4530	D	X	X			Rock
30042	4860-4890	D	X	X		HLS	Rock
30043	4860-4890	D			X	HLS	Coal
30044	4960-4980	D			X	HLS	Coal
30045	5320-5340	D			X	HLS	Coal
30046	5580-5600	D			X	HLS	Coal
30047	5930-5980	D			X	HLS	Coal
30048	6470-6510	D	X	X		HLS	Rock
30049	6470-6510	D			X	HLS	Coal
30050	6900-6940	D	X	X		HLS	Rock
30051	6900-6940	D			X	HLS	Coal
30052	7310-7330	D			X	HLS	Coal
30053	7710-7720	D			X	HLS	Coal
30054	8290-8300	D			X	picked coal	
30055	8360-8370	D			X	HLS	Coal
30056	8900-8950	D			X	picked coal	
30057	9360-9420	D	X	X		HLS	Rock
30058	9360-9420	D			X	HLS	Coal
30059	9680-9720	D	X	X		HLS	Rock
30060	9680-9720	D			X	HLS	Coal
30061	10000-10050	D	X	X		HLS	Rock
30062	10000-10050	D			X	HLS	Coal
30063	10500-10550	D	X	X		HLS	Rock
30064	10500-10550	D			X	HLS	Coal
30065	11000-11050	D	X	X		HLS	Rock
30066	11000-11050	D			X	HLS	Coal
30067	11320-11370	D	X	X		HLS	Rock
30068	11320-11370	D			X	HLS	Coal

RECEIVED
JUL 28 1982
Alaska Oil & Gas Cons. Commission
Anchorage

V030097001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 00600.00 BOT 00720.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
28	0.67	0.30	0.37	0.46	± 0.037	0.09	7.40

OTHER MACERALS

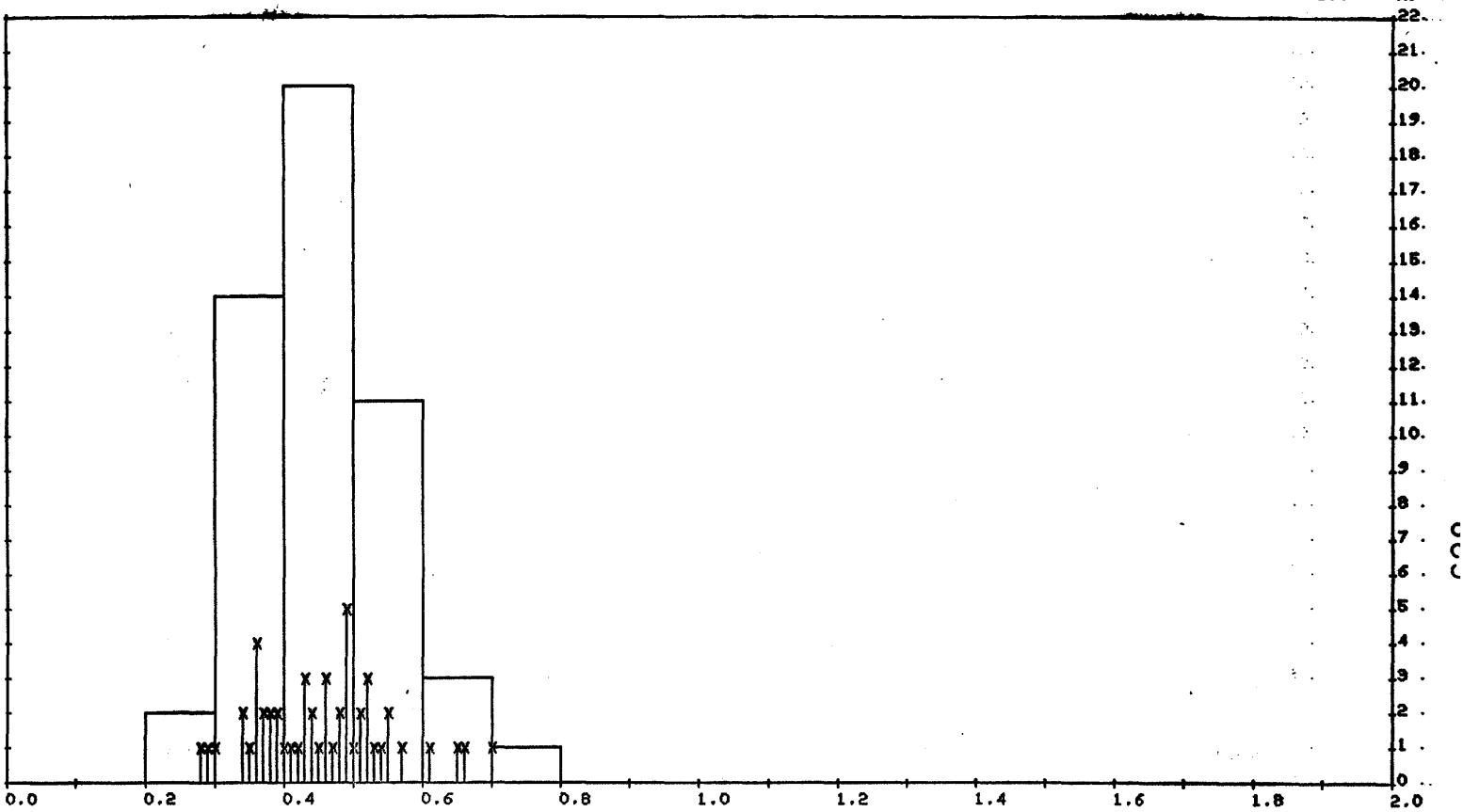
	N	MIN	MAX
FUSINITE	1	1.78	1.78
REWORKED VIT	1	0.84	0.84
SAPROVITRIN	3	0.16	0.33

1AK071282V015 VITAL VERSION 1.11

V030098001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502612000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 00990.00 BOT 01050.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
51	0.70	0.28	0.42	0.45	± 0.027	0.09	7.34

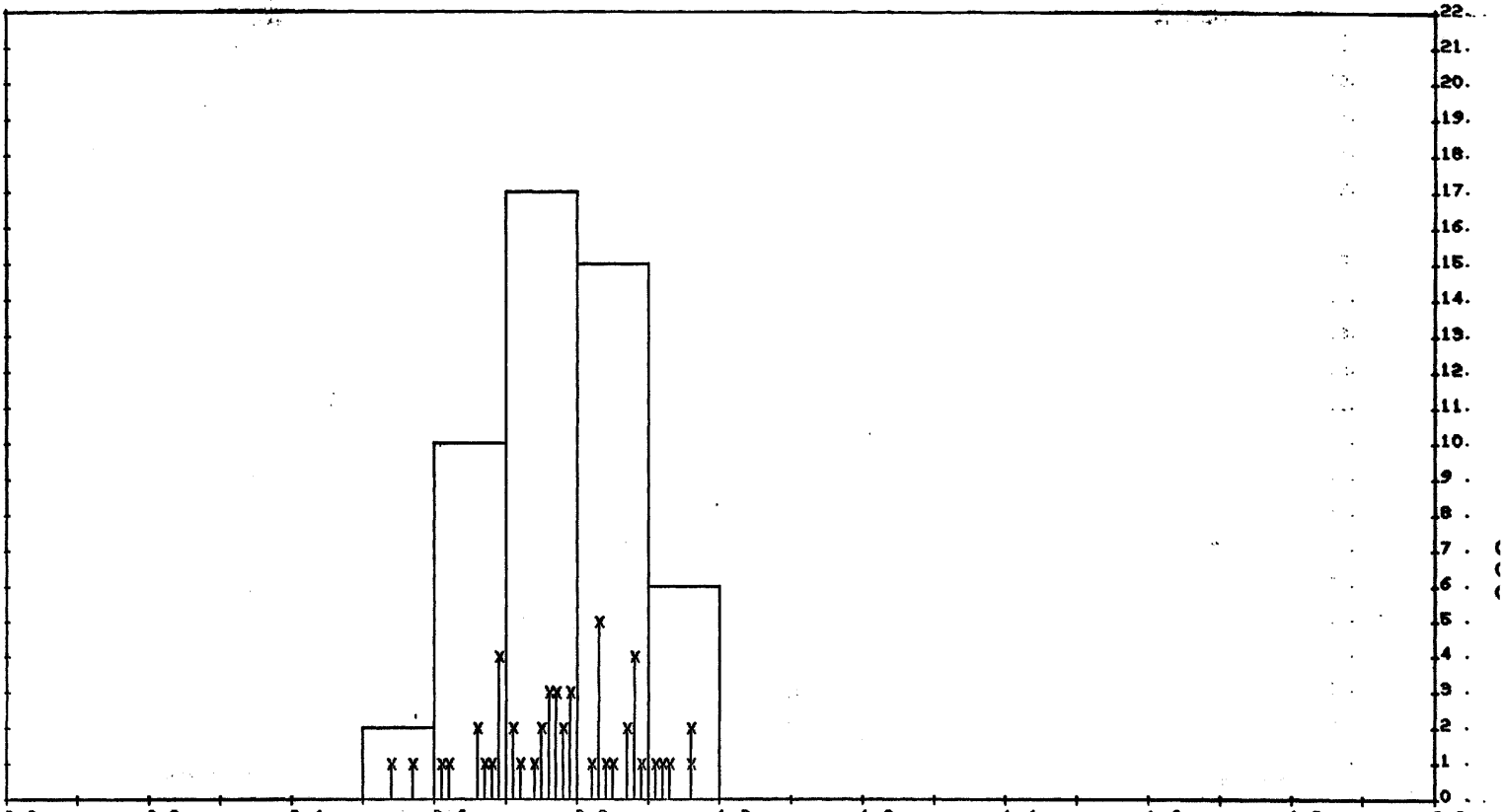
OTHER MACERALS

	N	MIN	MAX
SCLEROTINITE	1	0.75	0.75

V090099001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502612000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 8 68 W 7 TOP 01980.00 BOT 02160.00 FT

PLOT TYPE = VITRINITE

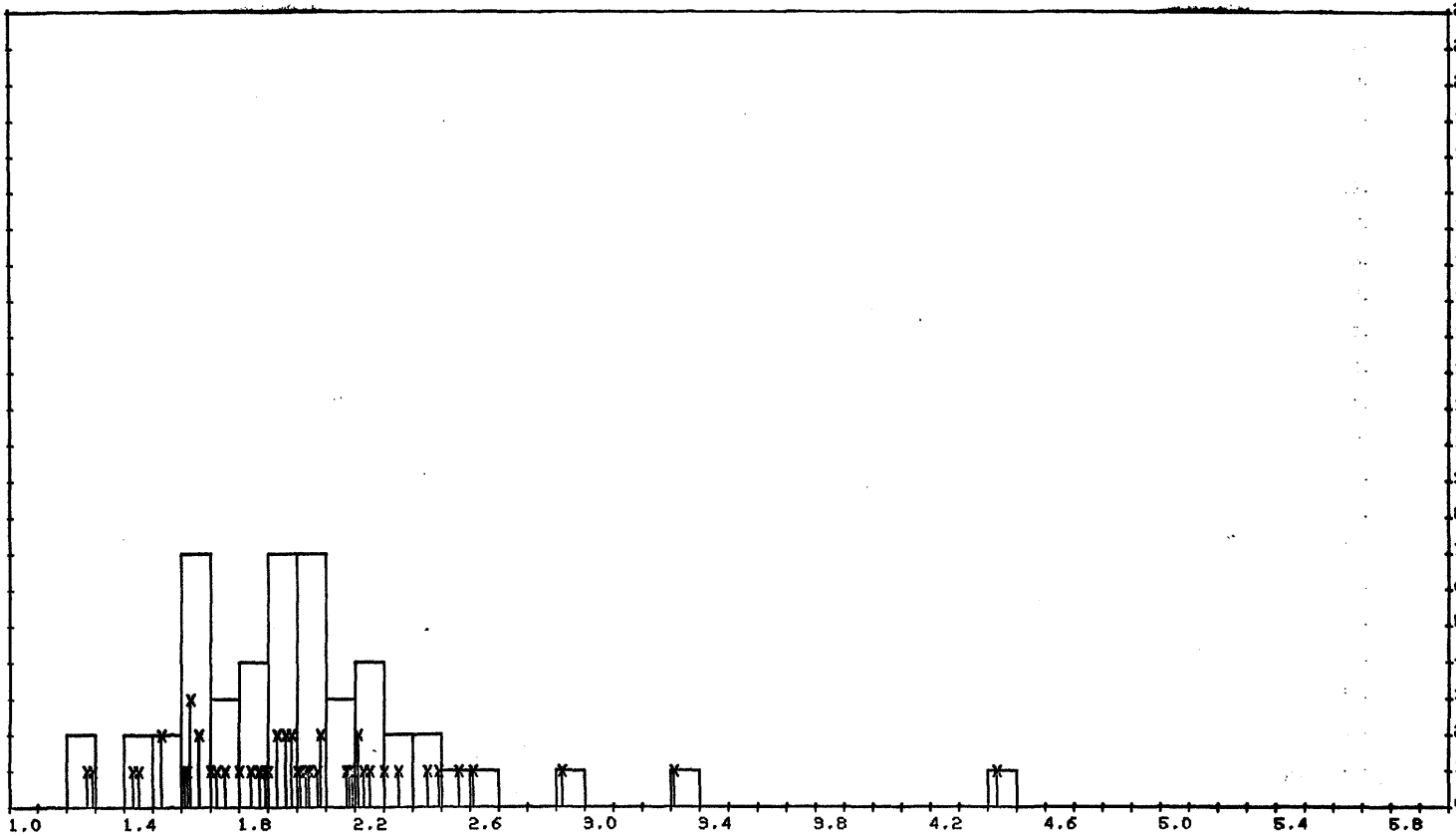
N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
50	0.96	0.54	0.42	0.78	± 0.030	0.10	9.76

OTHER MACERALS

	N	MIN	MAX
COKED VITRIN	50	1.27	4.43

1AK071282V017 VITAL VERSION 1.11

V030039001 PLOT TYPE = COKED VITRIN **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 01980.00 BOT 02160.00 FT

PLOT TYPE = COKED VITRIN

N	MAX	MIN	RANG	MEAN	CONF	STDV
50	4.43	1.27	3.16	2.03	±0.155	0.52

OTHER MACERALS

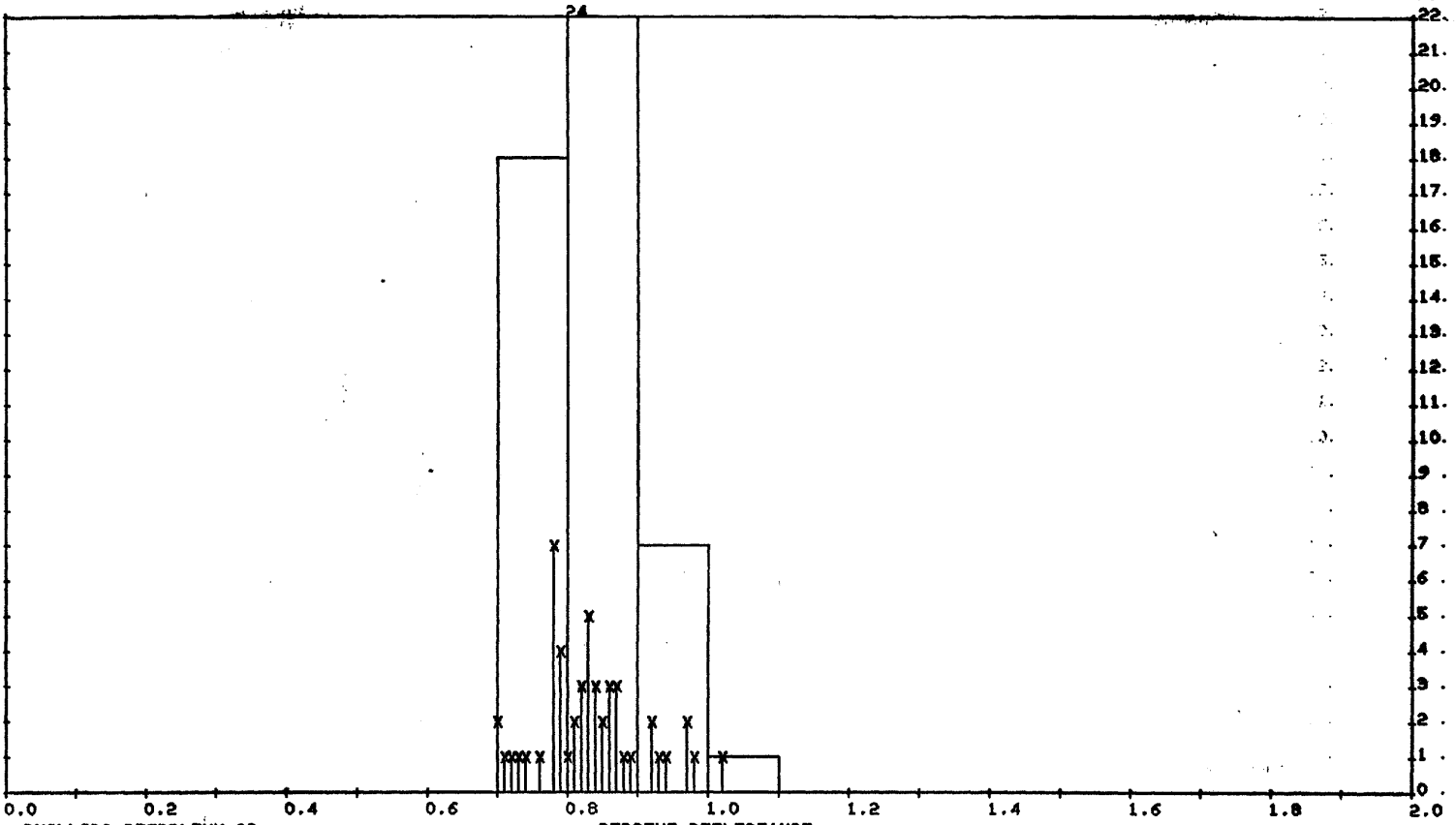
	N	MIN	MAX
VITRINITE	50	0.54	0.96

1AK071282V017 VITAL VERSION 1.11

V030040002 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 8 68 W 7 TOP 01980.00 BOT 02160.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
50	1.02	0.70	0.32	0.83	± 0.022	0.07	10.00

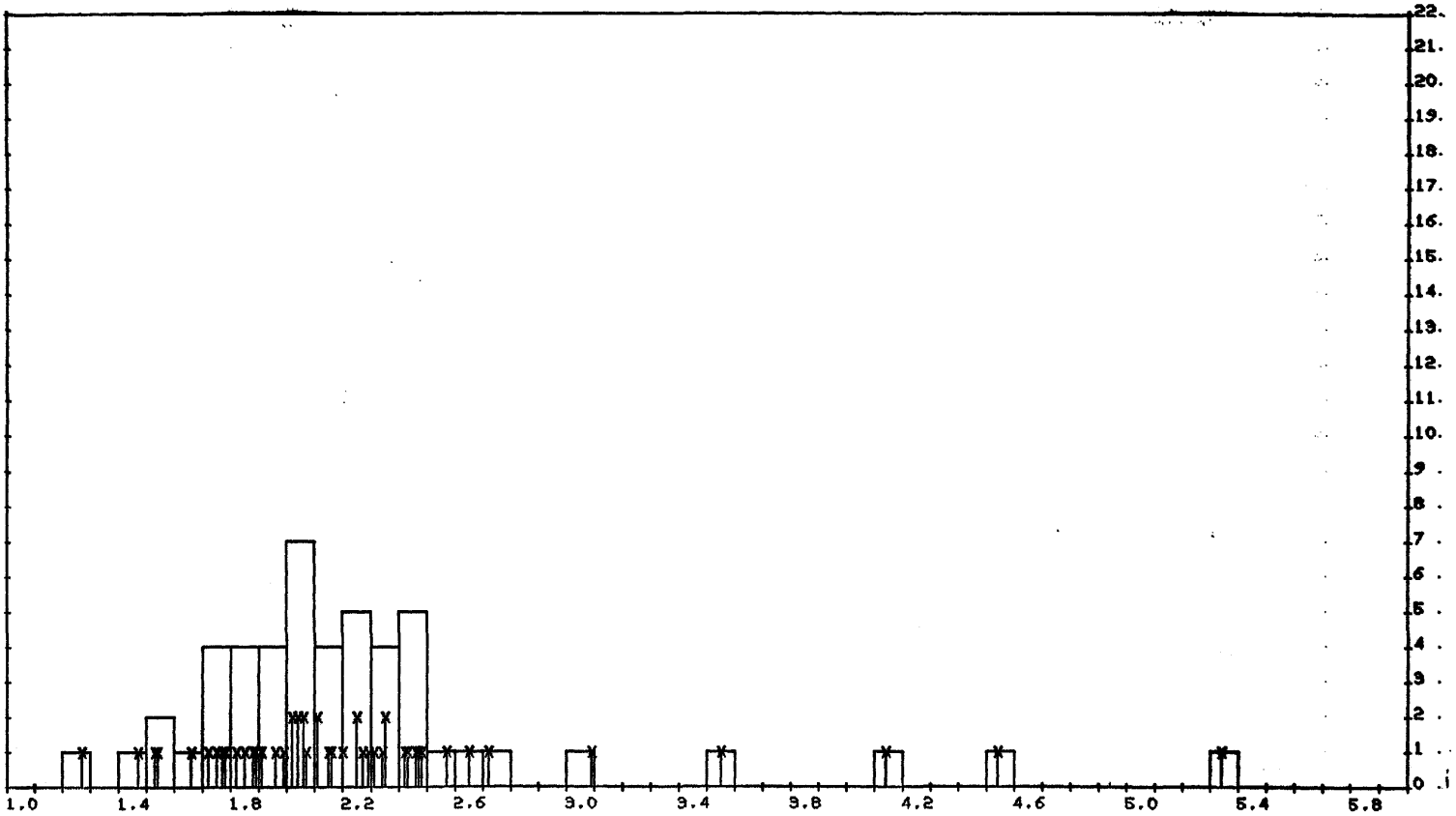
OTHER MACERALS

	N	MIN	MAX
COKED VITRIN	50	1.27	5.94

1AK071282V001 VITAL VERSION 1.11

519

V090040002 PLOT TYPE = COKED VITRIN **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO :



PERCENT REFLECTANCE

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 01980.00 BOT 02160.00 FT
PLOT TYPE = COKED VITRIN

	N	MAX	MIN	RANG	MEAN	CONF	STDV
	50	5.34	1.27	4.07	2.28	±0.219	0.73

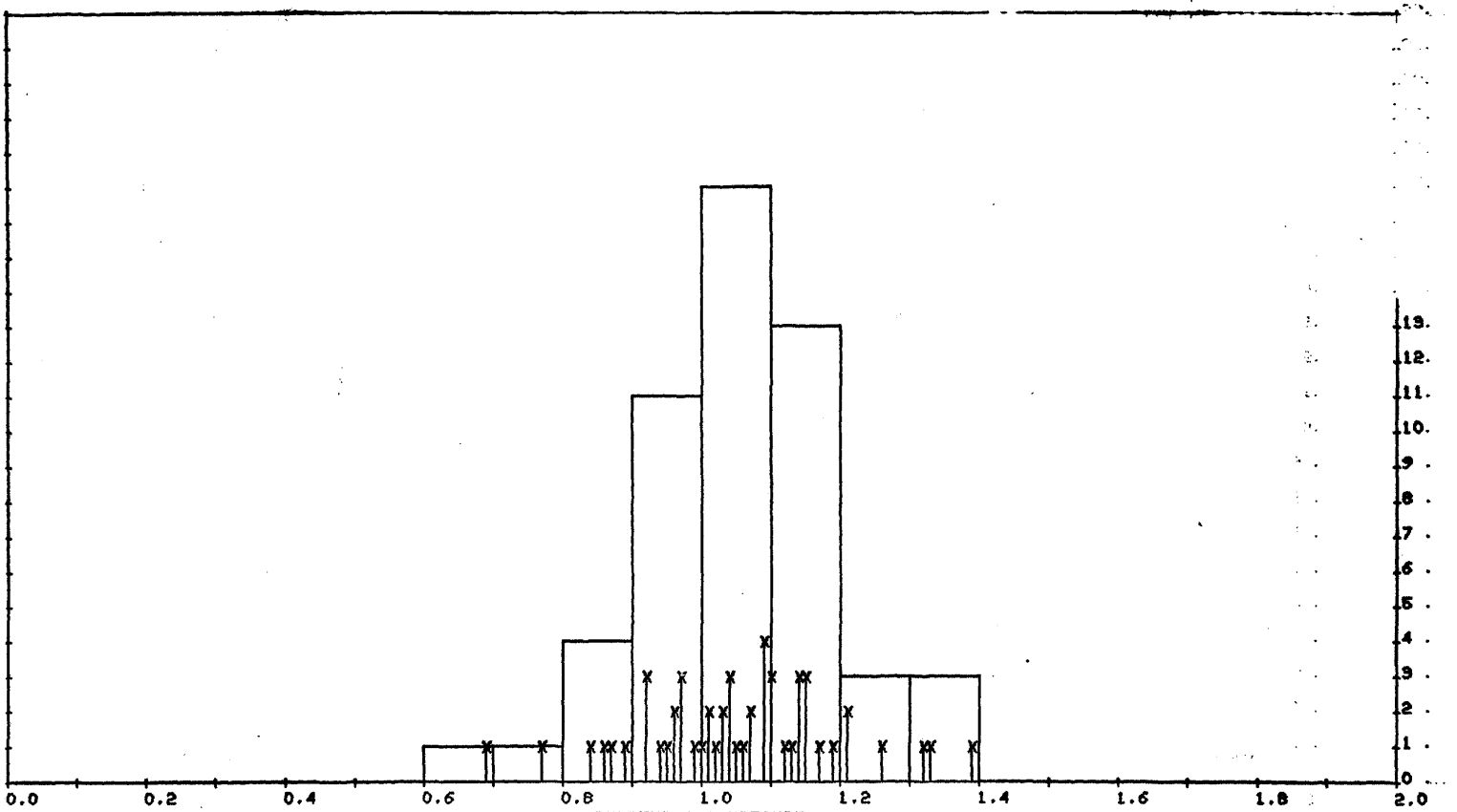
OTHER MACERALS

	N	MIN	MAX
VITRINITE	50	0.70	1.02

1AK071282V001 VITAL VERSION 1.11

521

V030041001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 5025120001 00 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 04480.00 BOT 04590.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
59	1.39	0.69	0.70	1.05	±0.039	0.13	11.00

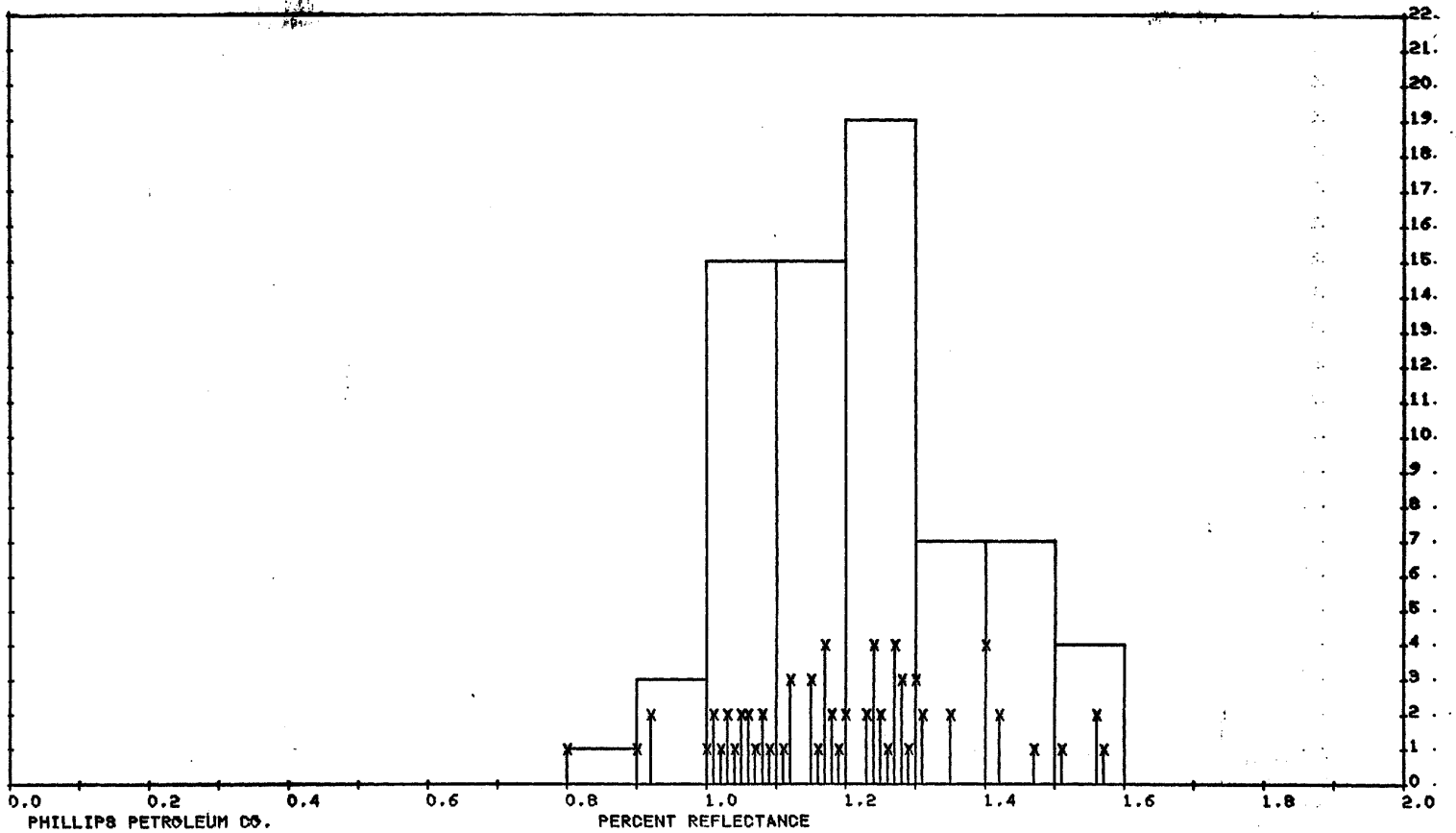
OTHER MACERALS

	N	MIN	MAX
OXIDIZED VIT	1	9.18	9.18

630

3MB071282V009 VITAL VERSION 1.11

V090042001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 04860.00 BOT 04890.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
71	1.57	0.80	0.77	1.21	± 0.038	0.16	11.52

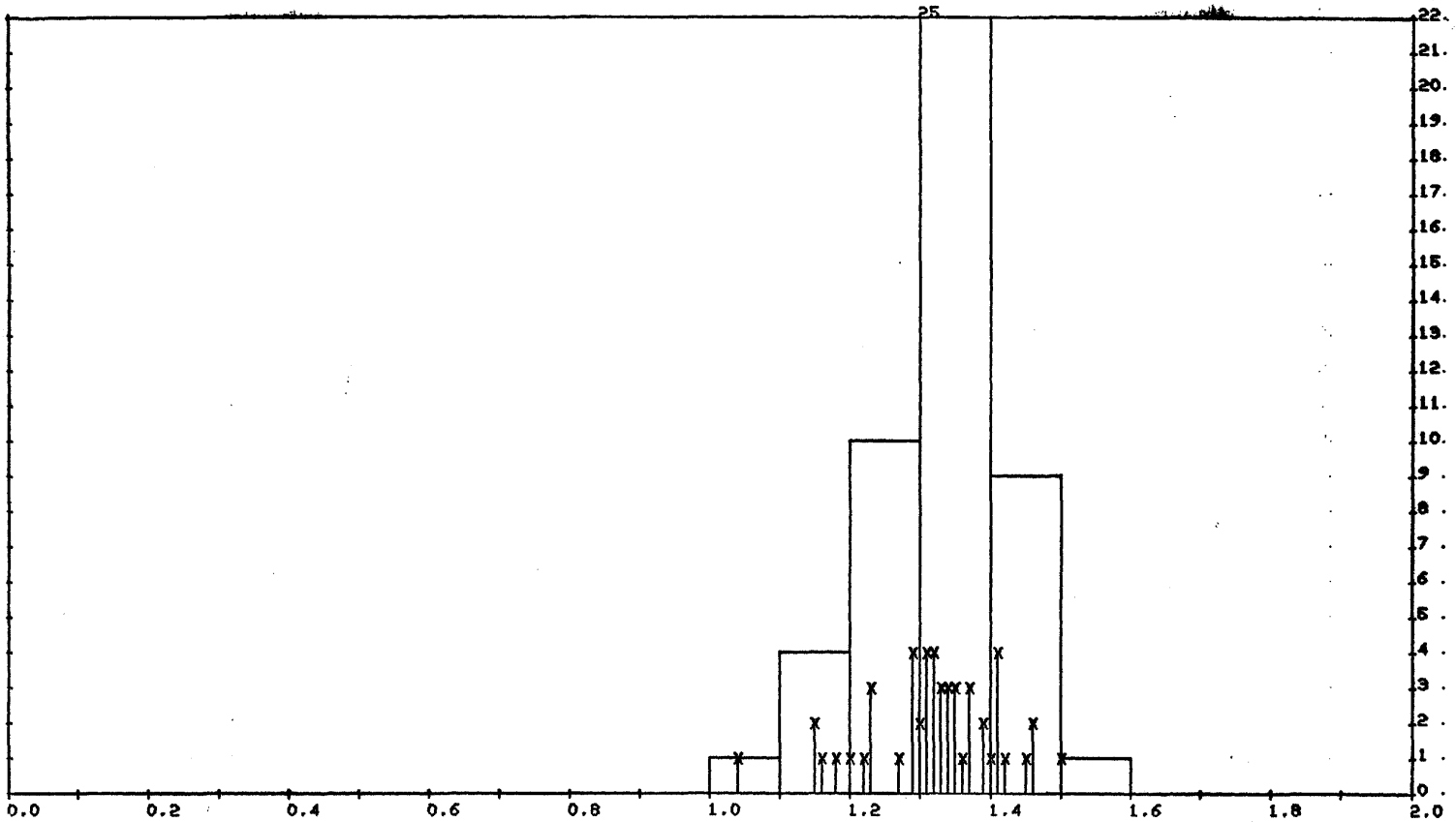
1AK071282V018 VITAL VERSION 1.11

636

Y090049002 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100 NO



PERCENT REFLECTANCE

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 04860.00 BOT 04890.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
50	1.50	1.04	0.46	1.32	±0.027	0.09	11.84

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	1.94	1.94

523

1AK071282V002 VITAL VERSION 1.11

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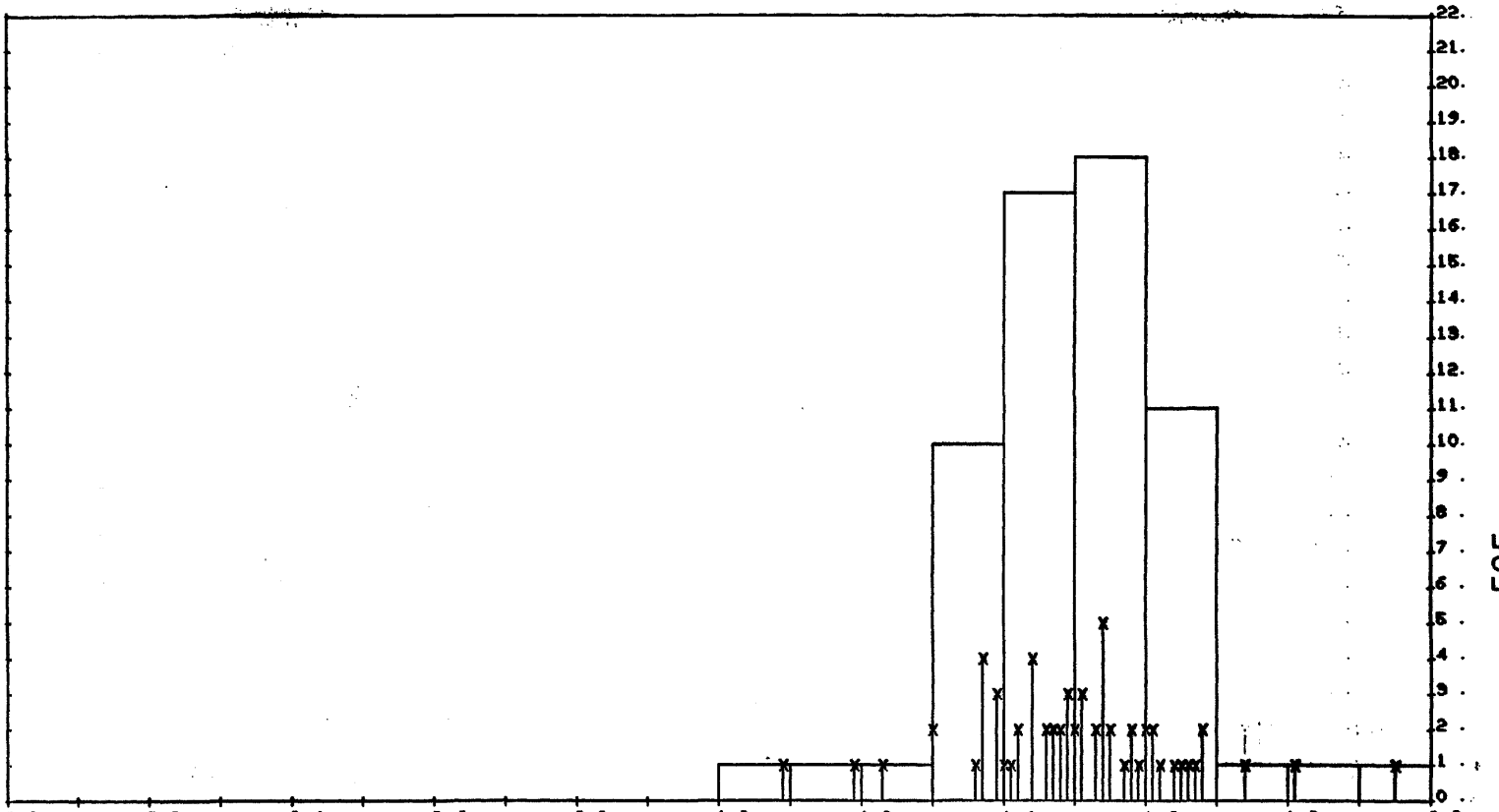


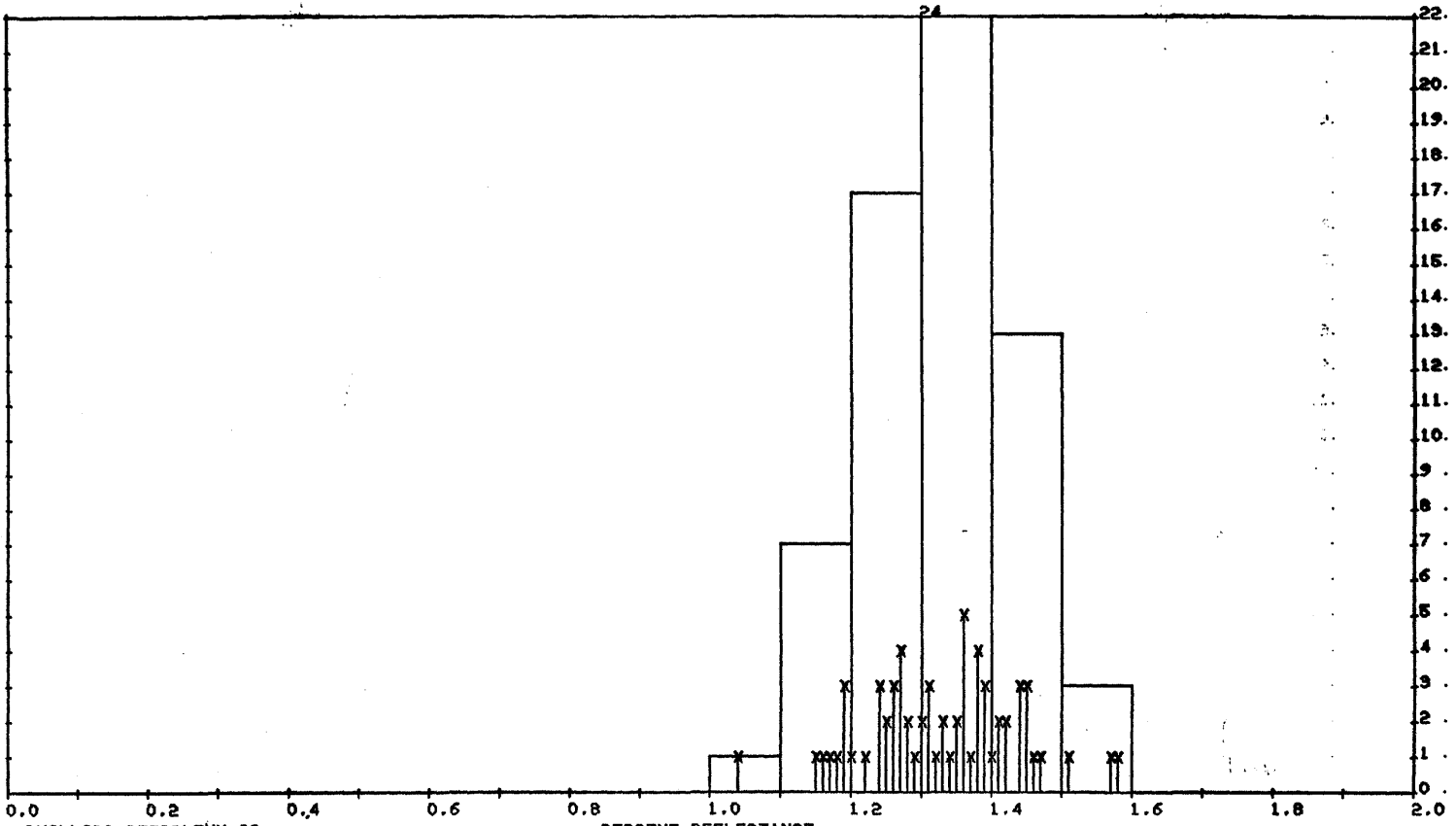
PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 04960.00 BOT 04980.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
62	1.95	1.09	0.86	1.50	±0.035	0.14	12.24

525

1AK071282V009 VITAL VERSION 1.11

V030045001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



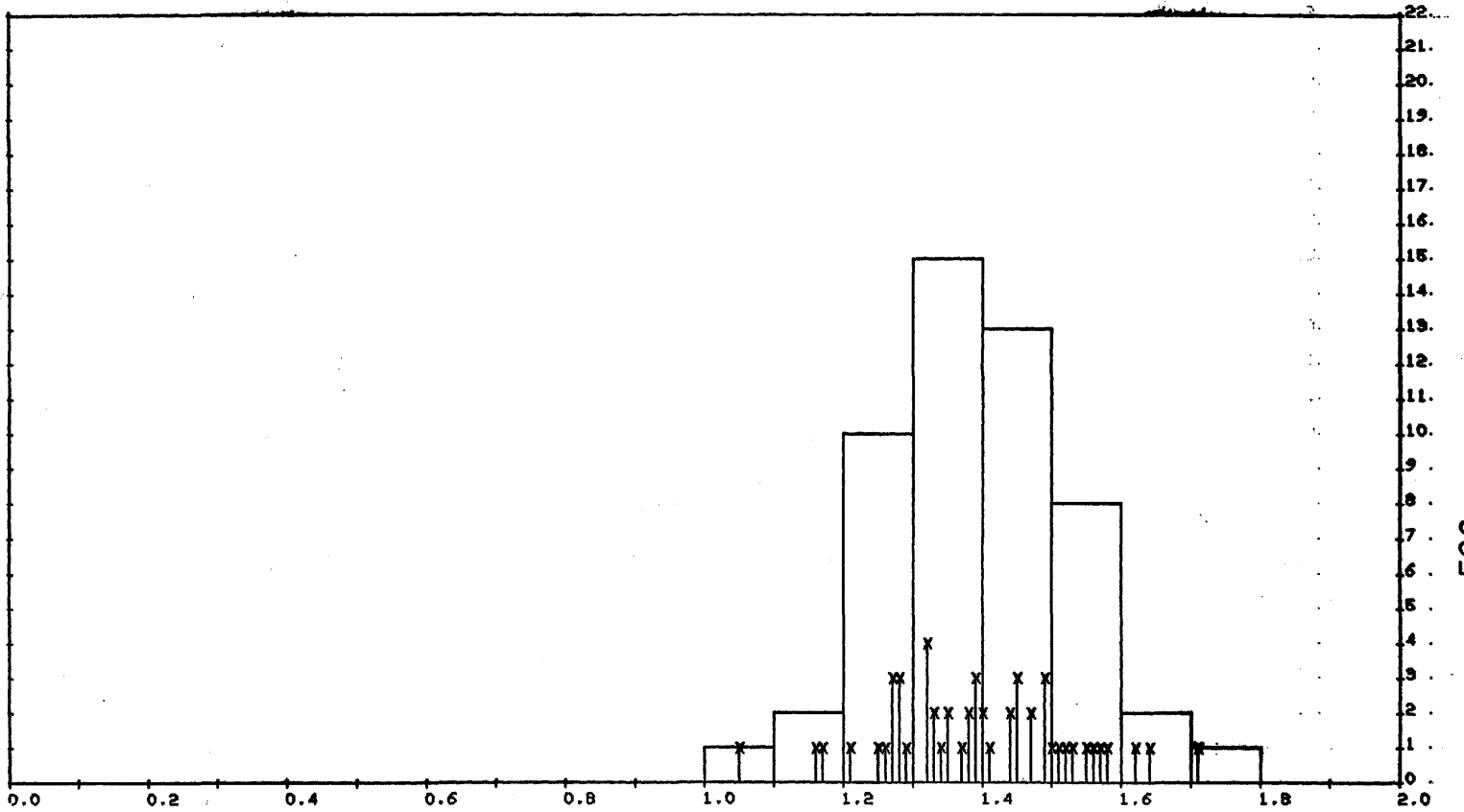
527

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 05320.00 BOT 05340.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
65	1.58	1.04	0.54	1.33	±0.025	0.10	11.86

1AK071282V004 VITAL VERSION 1.11

V090046001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502612000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 05580.00 BOT 05600.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
52	1.71	1.05	0.66	1.39	±0.038	0.13	12.01

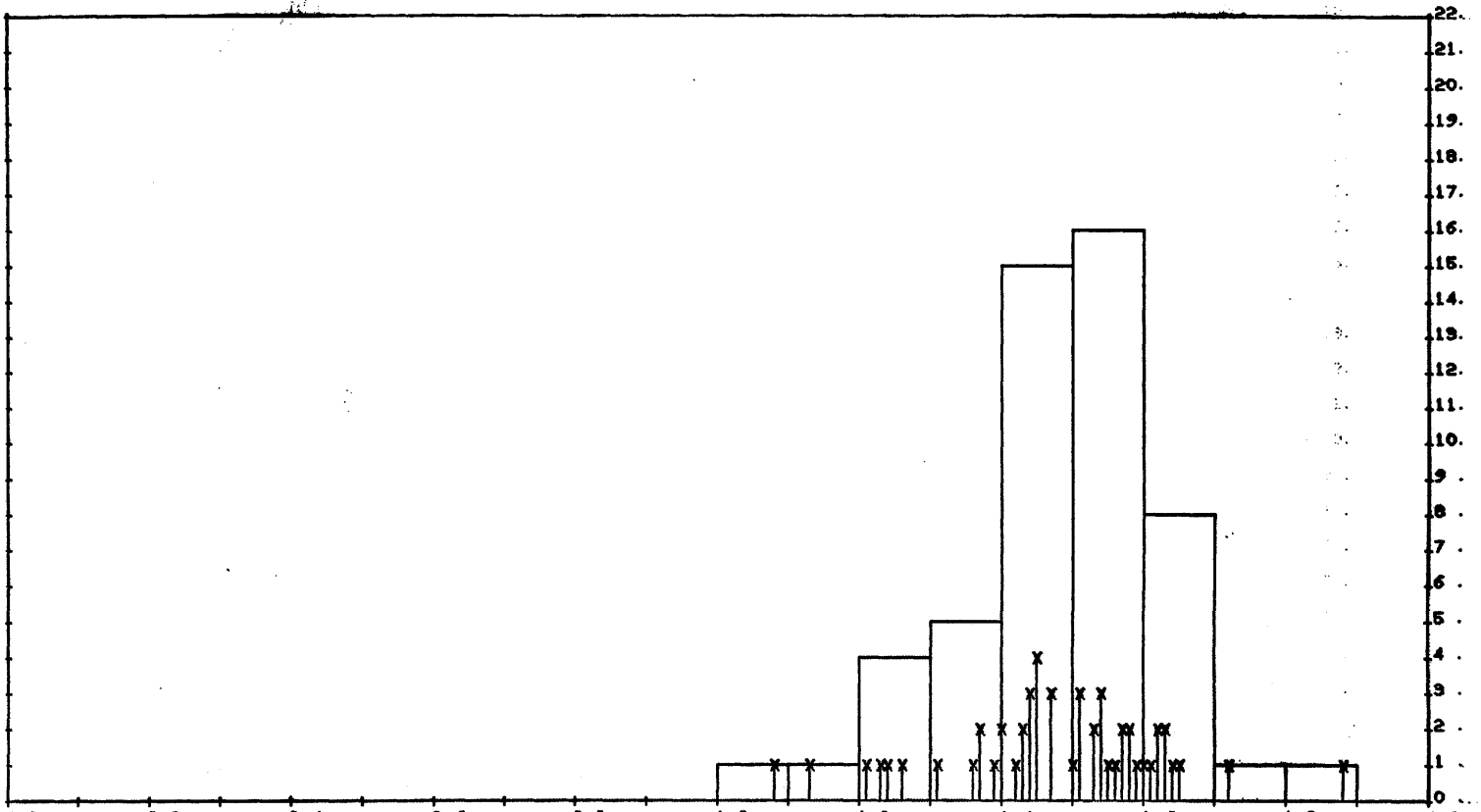
1AK071282V005 VITAL VERSION 1.11

529

V090047002 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 05930.00 BOT 05980.00 FT

PLOT TYPE = VITRINITE

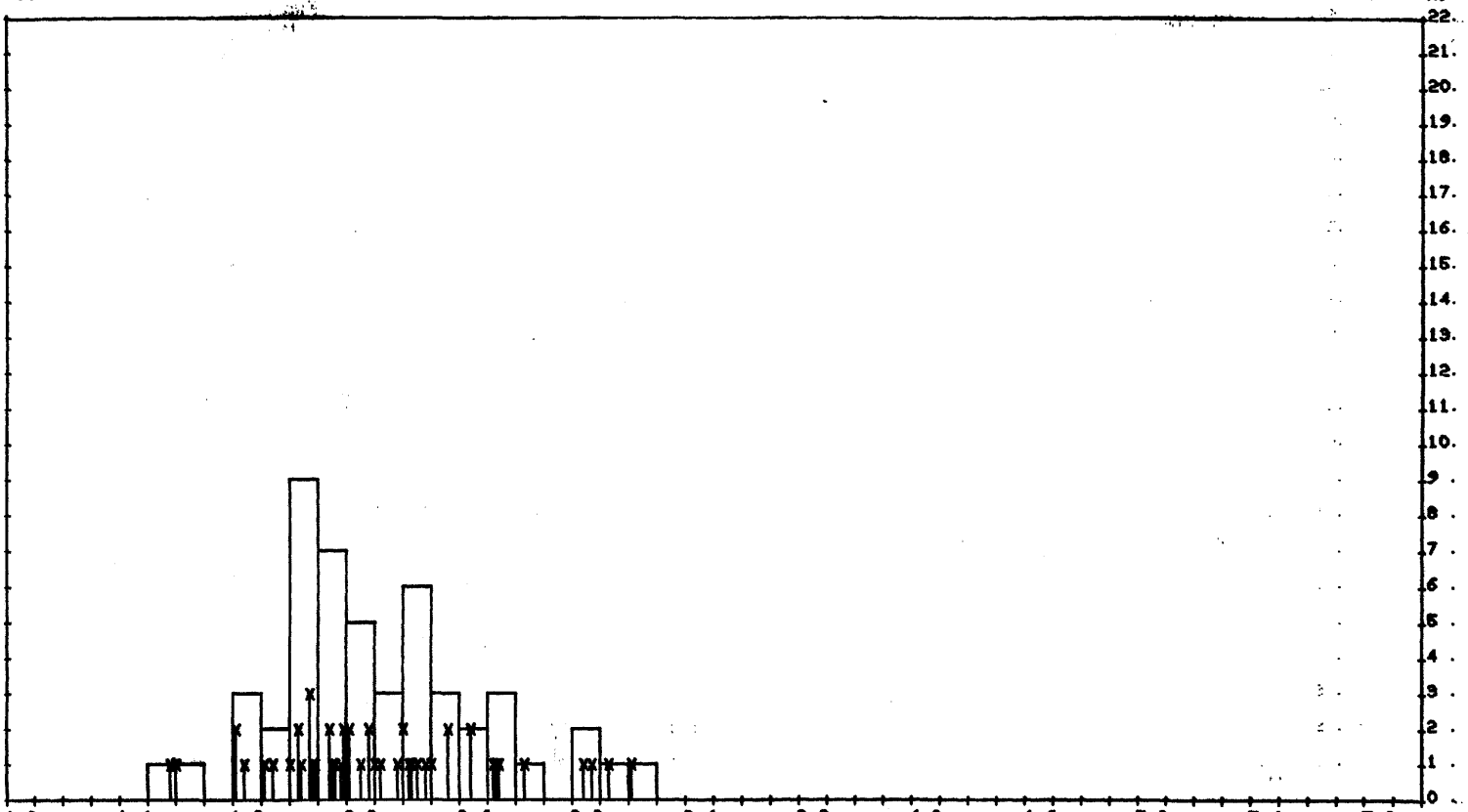
N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
52	1.88	1.08	0.80	1.48	±0.043	0.15	12.19

OTHER MACERALS	N	MIN	MAX
COKED VITRIN	50	1.58	3.21

1AK071282V006 VITAL VERSION 1.11

531

V090047002 PLOT TYPE = COKED VITRIN **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 1502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 05930.00 BOT 05980.00 FT

PLOT TYPE = COKED VITRIN

N	MAX	MIN	RANG	MEAN	CONF	STDV
50	3.21	1.58	1.63	2.31	±0.110	0.37

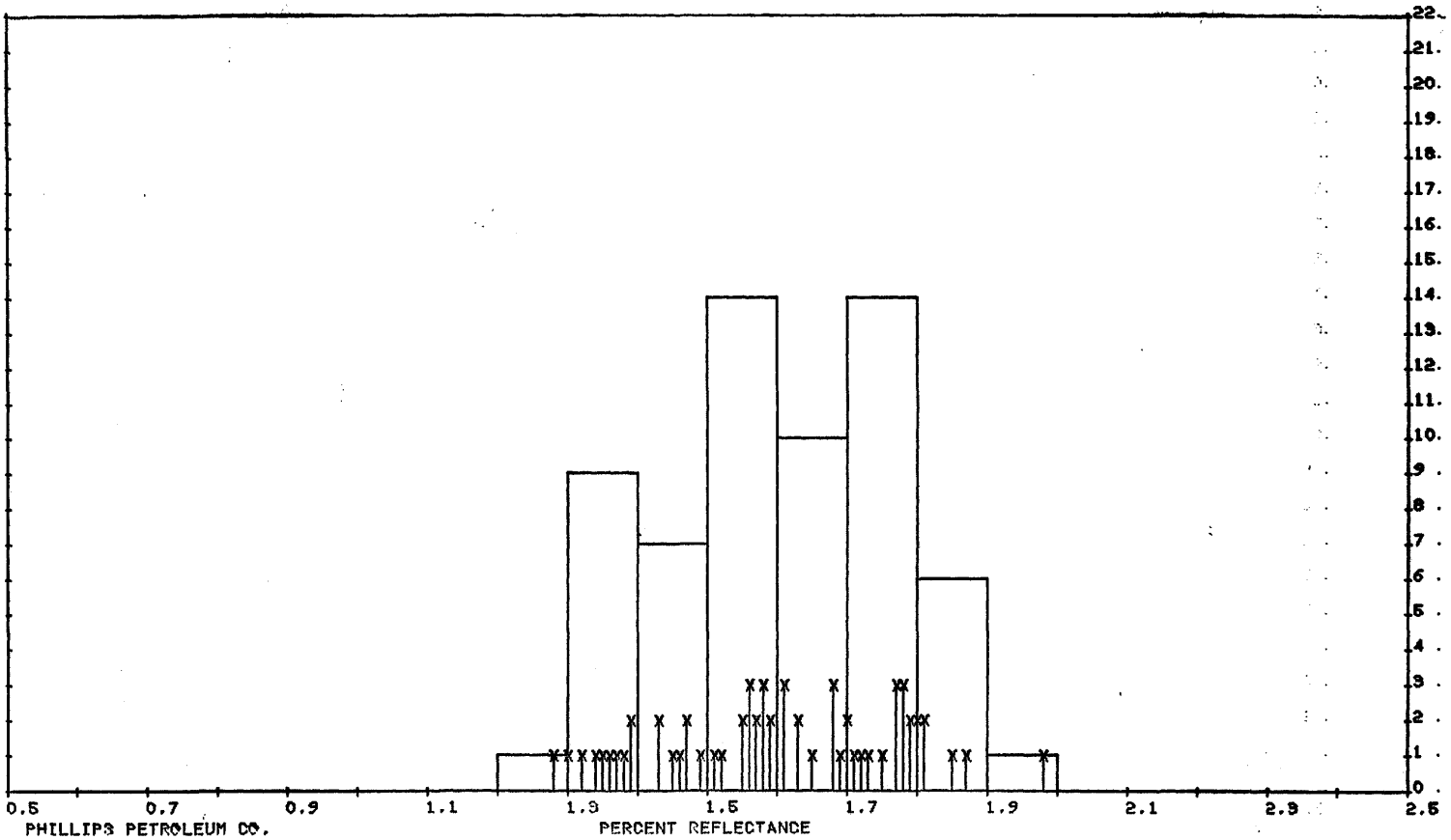
OTHER MACERALS

	N	MIN	MAX
VITRINITE	52	1.08	1.88

1AK071282V006 VITAL VERSION 1.11

533

3D0048001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 06470.00 BOT 06610.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
62	1.98	1.28	0.70	1.60	±0.041	0.16	12.47

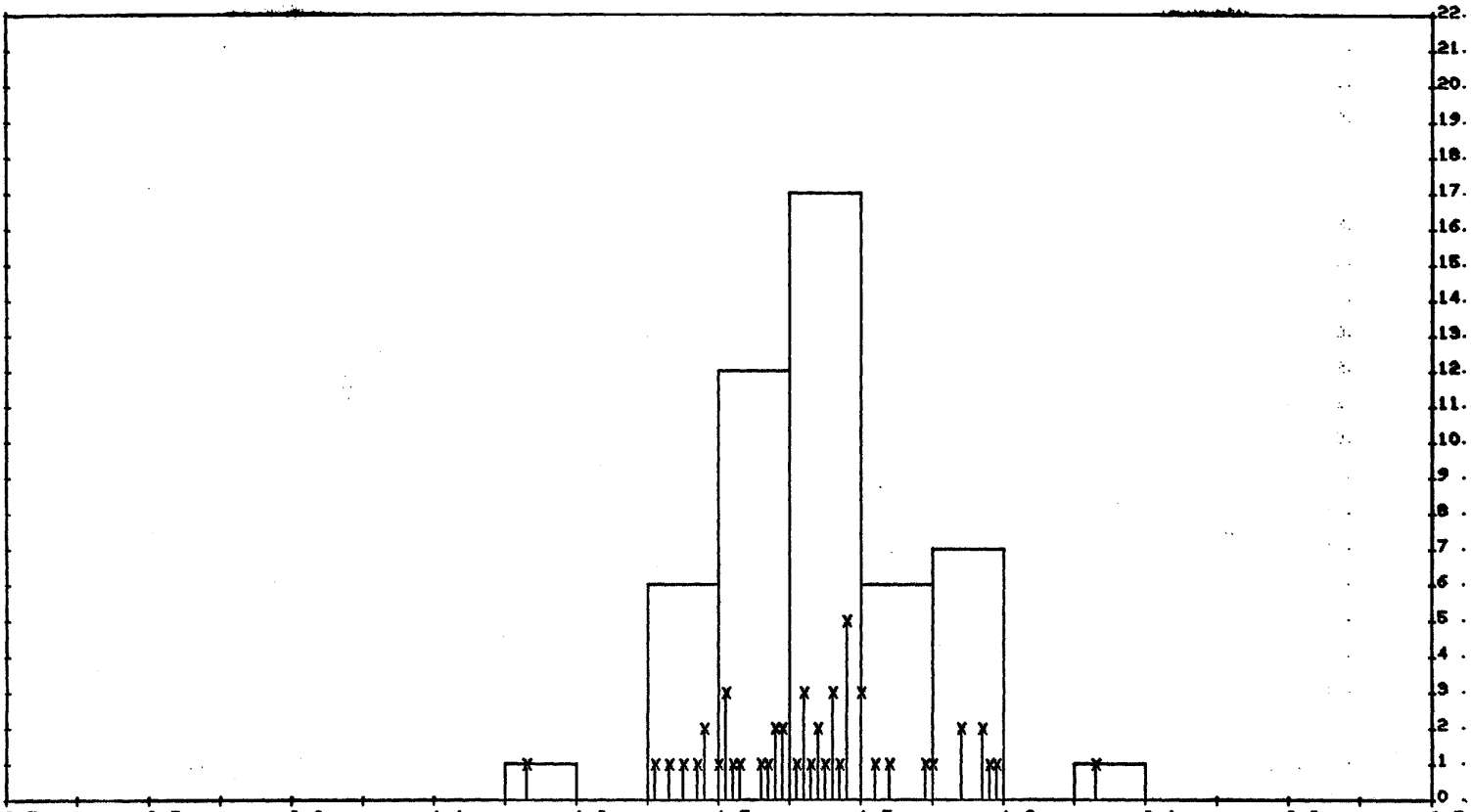
1AK071282V019 VITAL VERS

638

V090049001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100 NO



PERCENT REFLECTANCE

535

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 06470.00 BOT 06510.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
50	2.03	1.23	0.80	1.64	±0.043	0.14	12.55

OTHER MACERALS

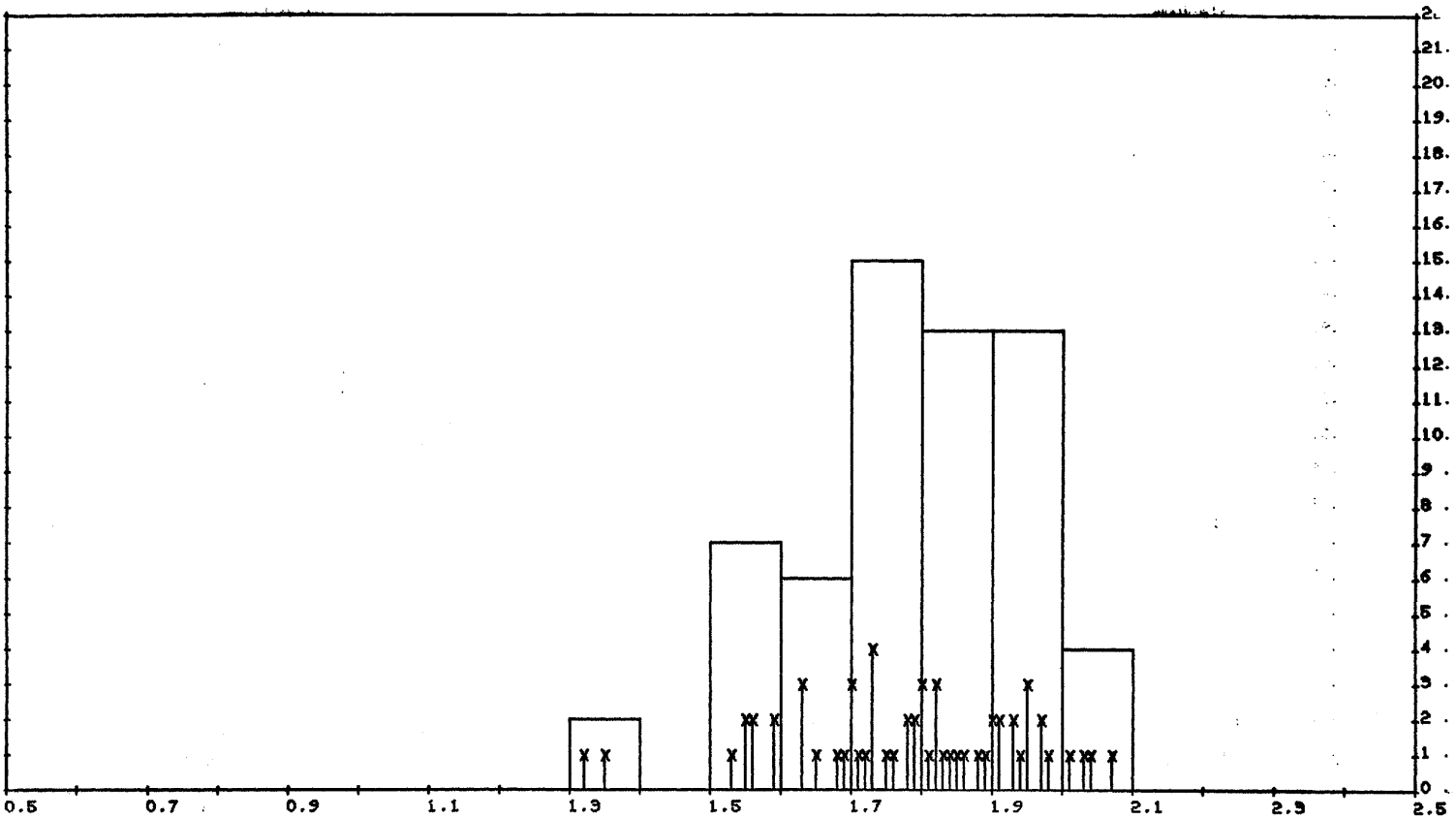
	N	MIN	MAX
FUSINITE	1	4.01	4.01

1AK071282V007 VITAL VERSION 1.11

V090050001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 06900 BOT 06940 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
60	2.07	1.92	0.15	1.78	±0.046	0.16	13.03

OTHER MACERALS

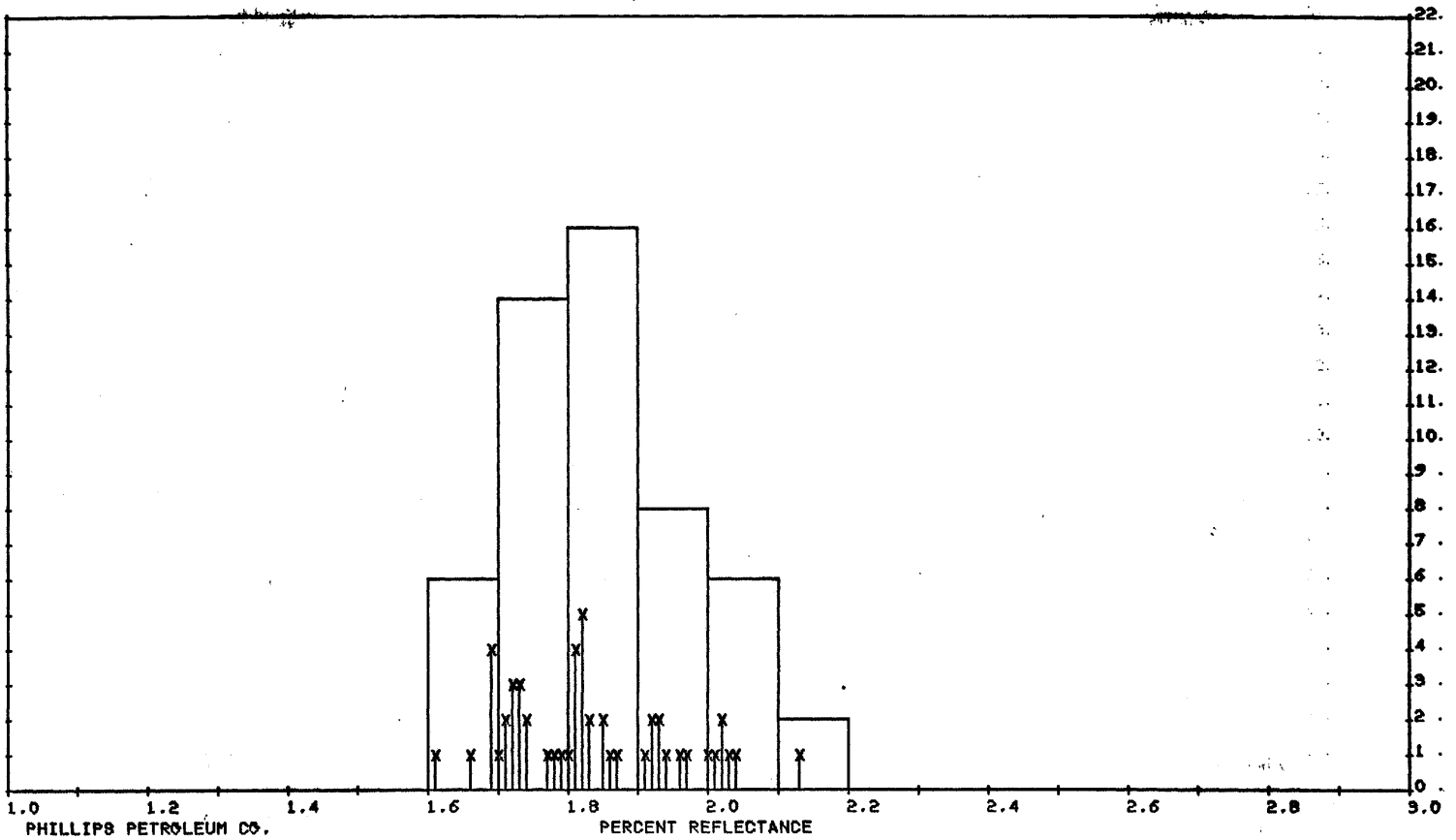
	N	MIN	MAX
FUSINITE	1	2.48	2.48

1AK071282V020 VITAL VERSION 1.11

V030061001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502612000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 8 68 W 7 TOP 06900.00 BOT 06940.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
52	2.13	1.61	0.52	1.83	±0.036	0.12	13.22

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	2.39	2.39

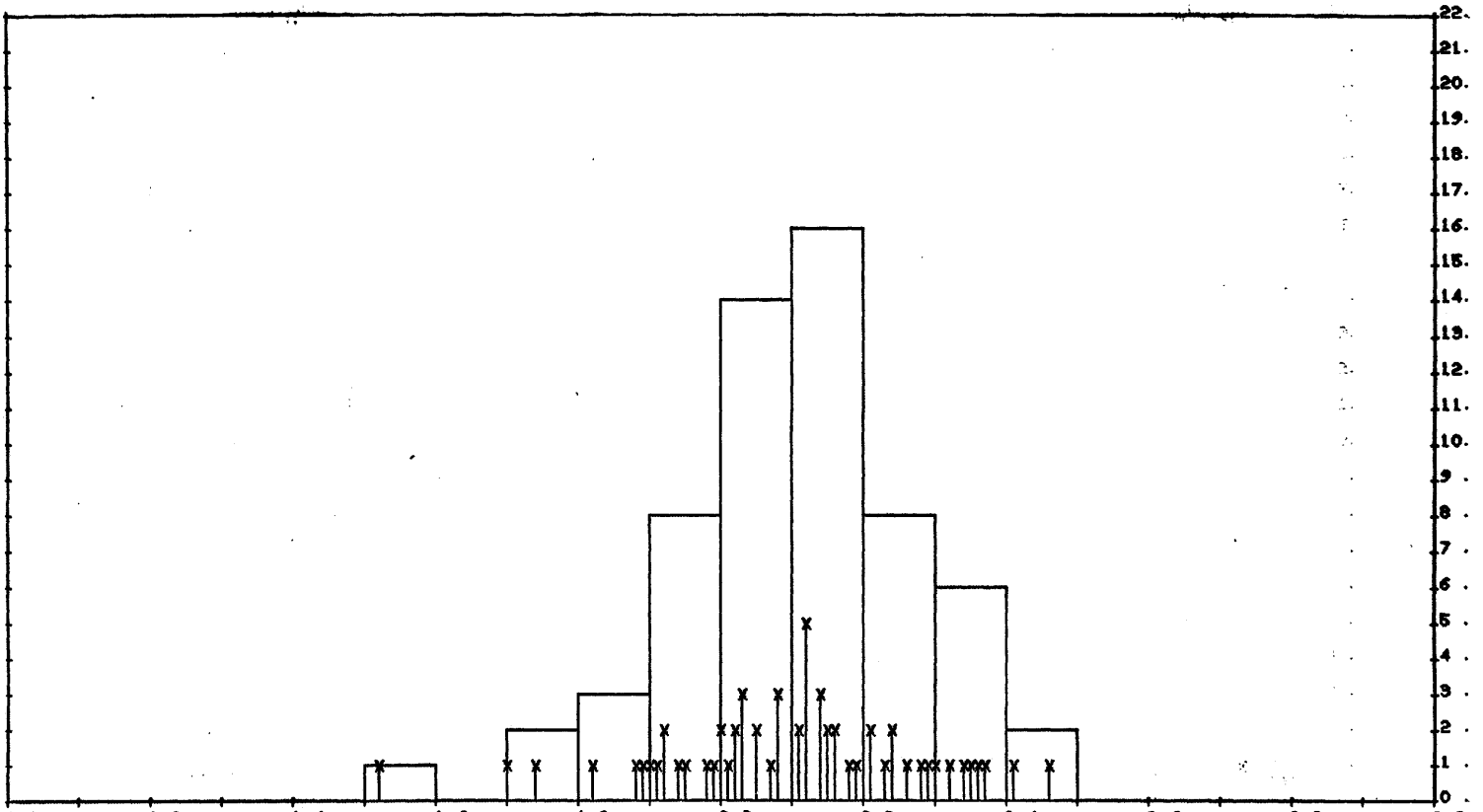
1AK071282V008 VITAL VERSION 1.11

711

V030052001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 8 68 W 7 TOP 07910.00 BOT 07990.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
60	2.46	1.52	0.94	2.10	± 0.050	0.18	14.38

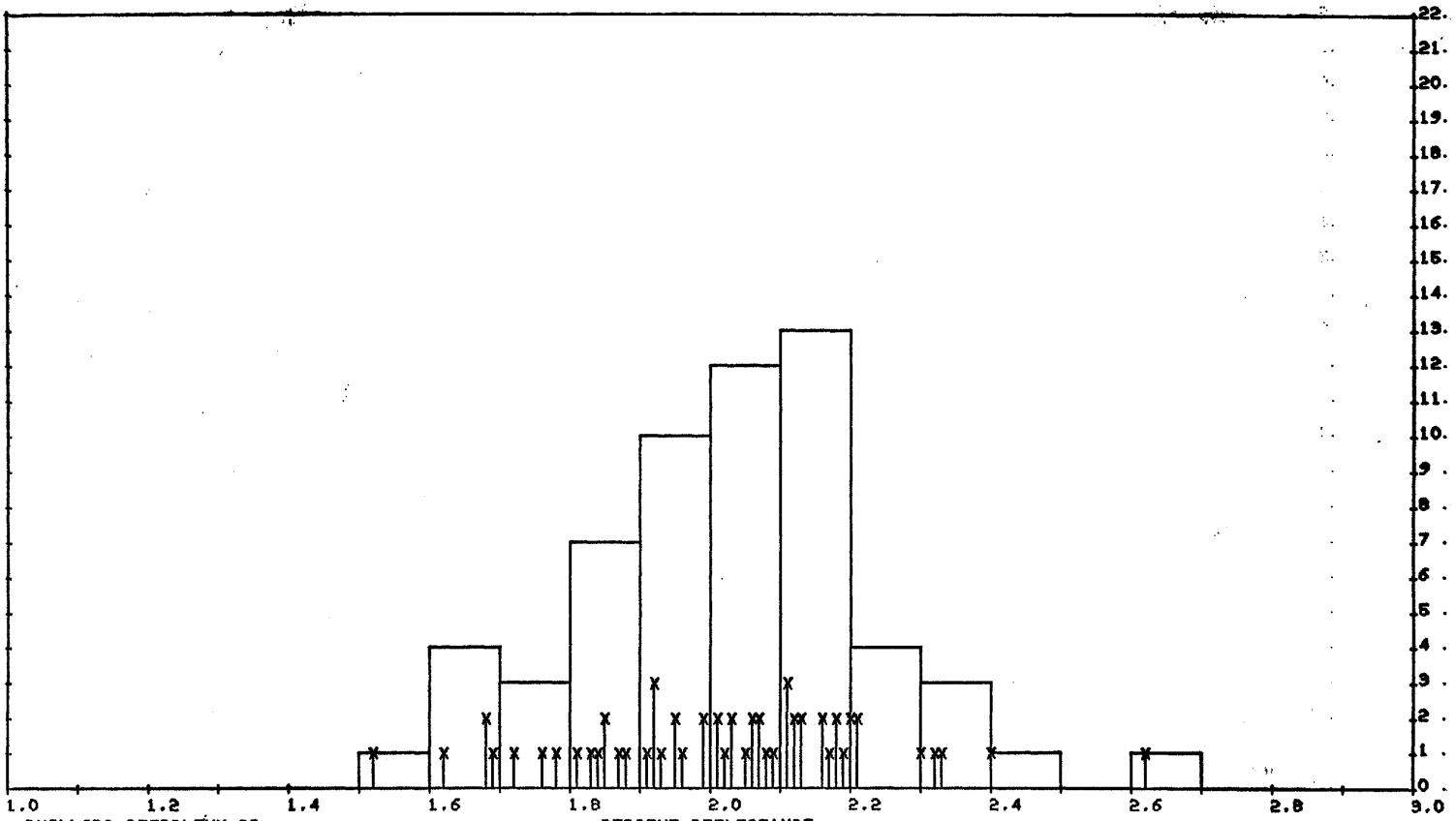
OTHER MACERALS

	N	MIN	MAX
FUSINITE	2	2.29	9.57

1AK071282V009 VITAL VERSION 1.11

705

V090063001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



PERCENT REFLECTANCE

590

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 07710.00 BOT 07720.00 FT

PLOT TYPE = VITRINITE

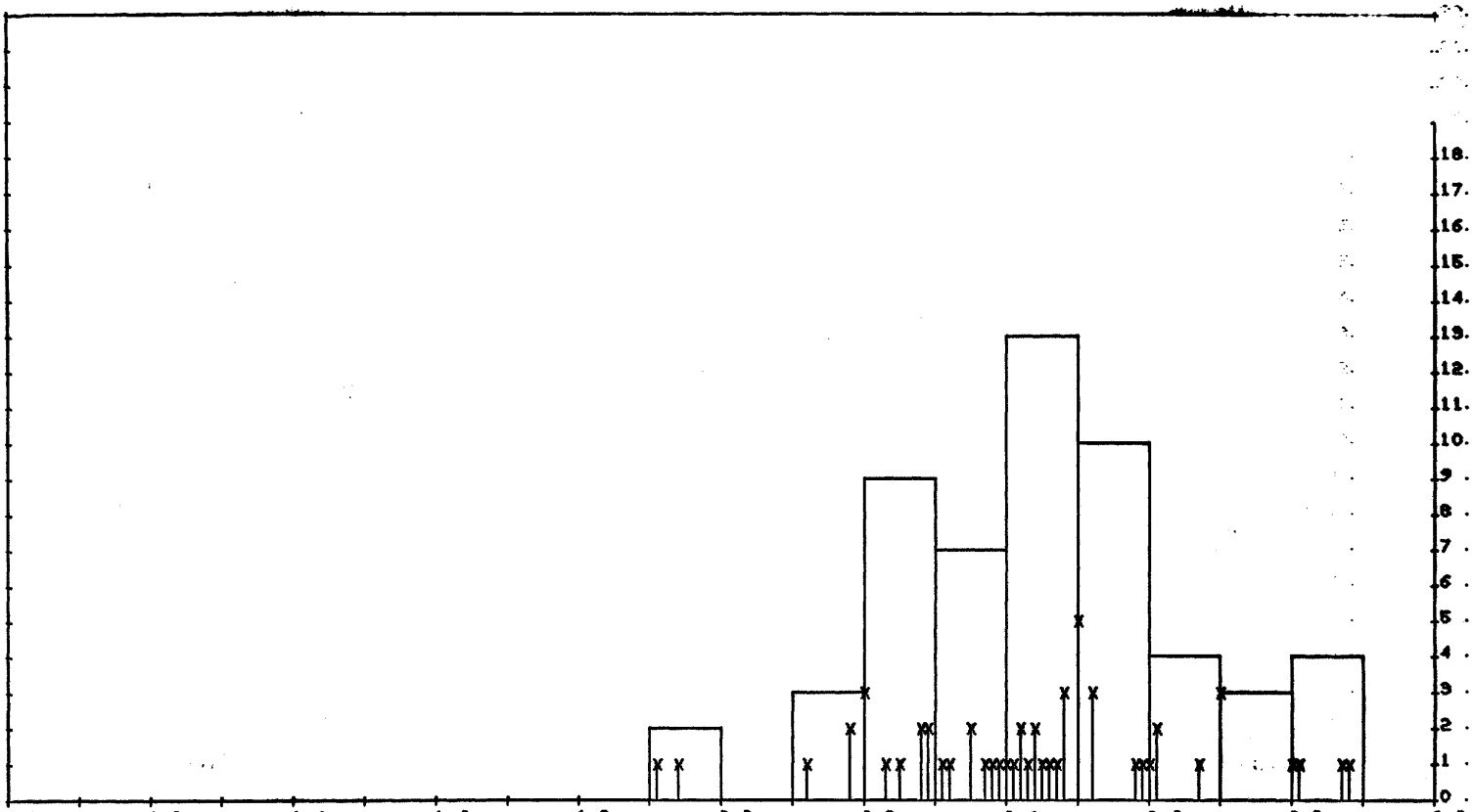
N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
59	2.62	1.52	1.10	2.02	± 0.058	0.20	13.99

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	4.49	4.49

1AK071282V010 VITAL VERSION 1.11

V090054001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 08290.00 BOT 08900.00 FT

PLOT TYPE = VITRINITE

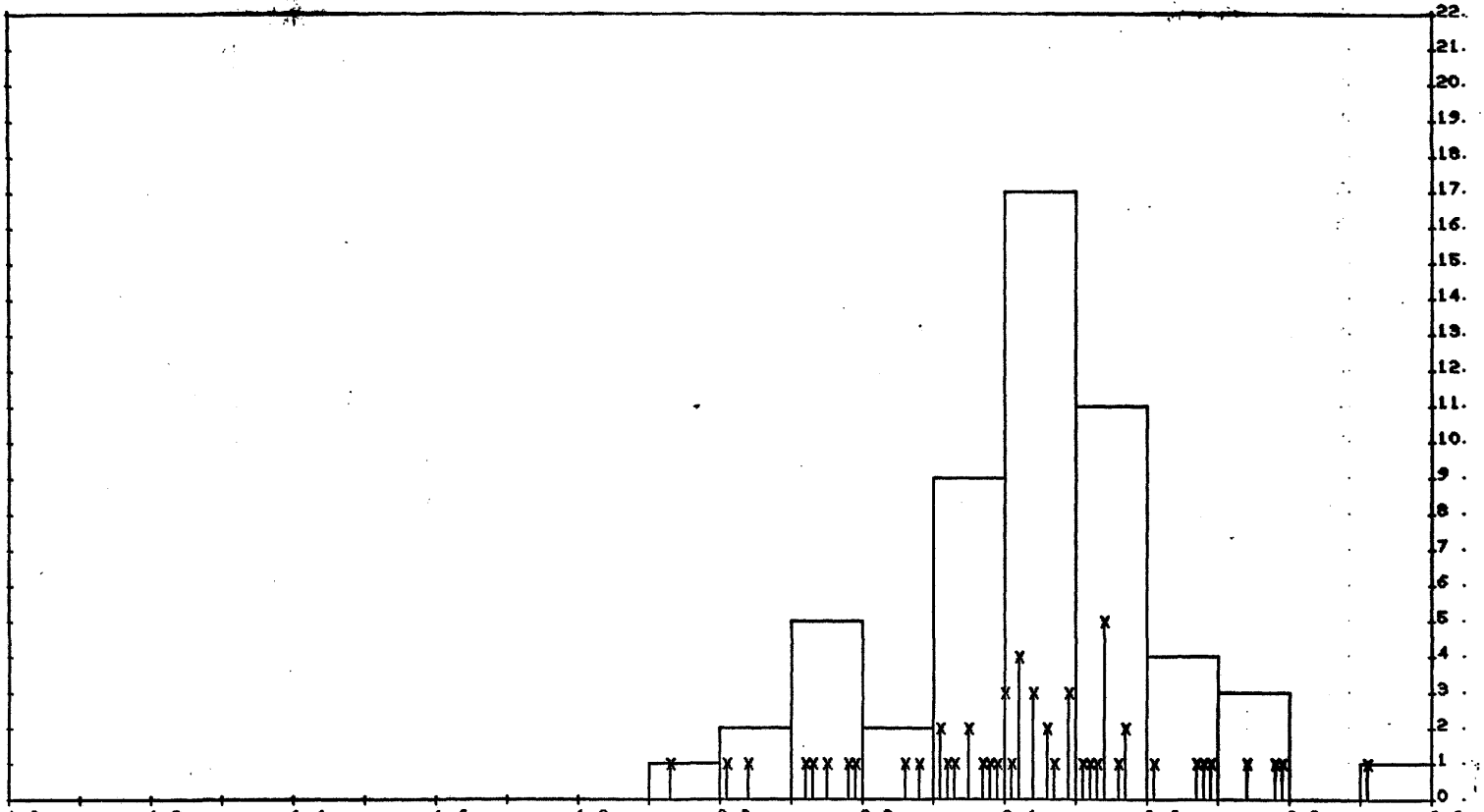
N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
55	2.88	1.91	0.97	2.44	± 0.059	0.20	16.09

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	3.48	3.48

1AK071282V011 VITAL VERSION 1.11

V090055001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100



PERCENT REFLECTANCE

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 08960.00 BOT 08970.00 FT

PLOT TYPE = VITRINITE

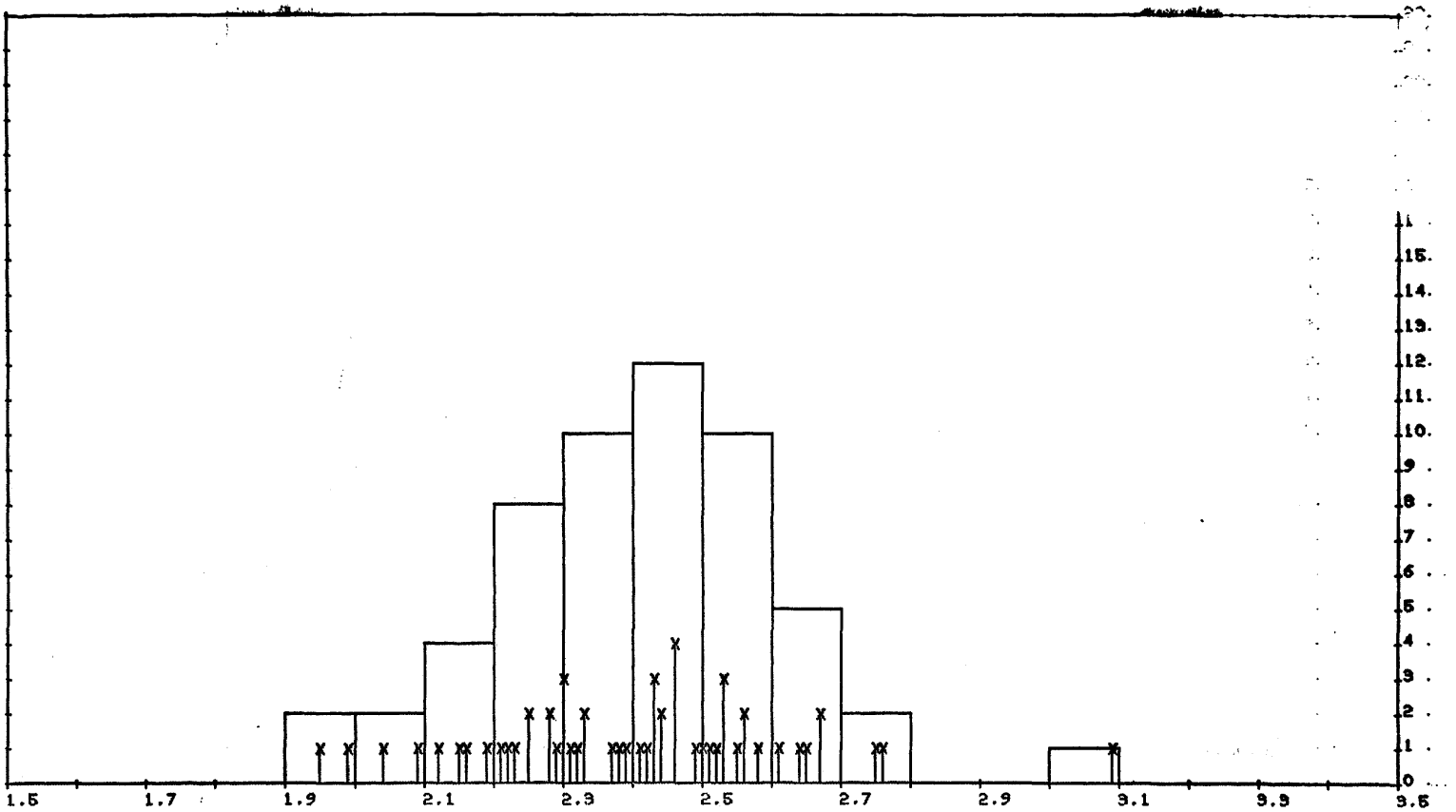
N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
55	2.91	1.93	0.98	2.43	± 0.056	0.19	16.00

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	3.17	3.17

1AK071282V012 VITAL VERSION 1.11

V090056001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 50251200010[illegible] NO



PERCENT REFLECTANCE

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 6B W 7 TOP 08900.00 BOT 08950.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
56	3.09	1.95	1.14	2.40	±0.059	0.20	15.91

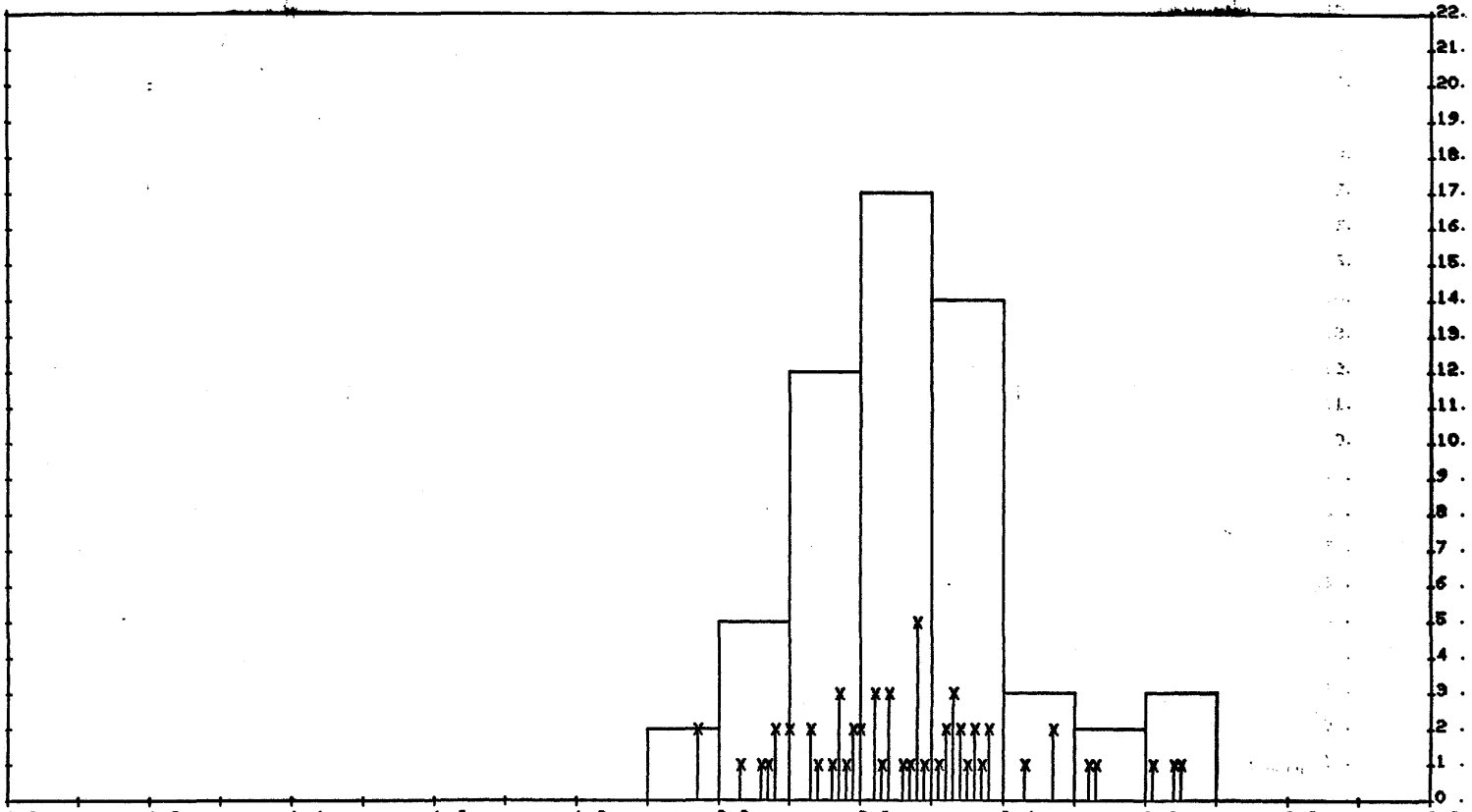
OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	4.48	4.48

1AK071282V013 VITAL VERSION 1.11

598

V090057001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



PERCENT REFLECTANCE

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 9360 BOT 9420 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
58	2.65	1.97	0.68	2.27	±0.043	0.15	15.23

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	4.14	4.14

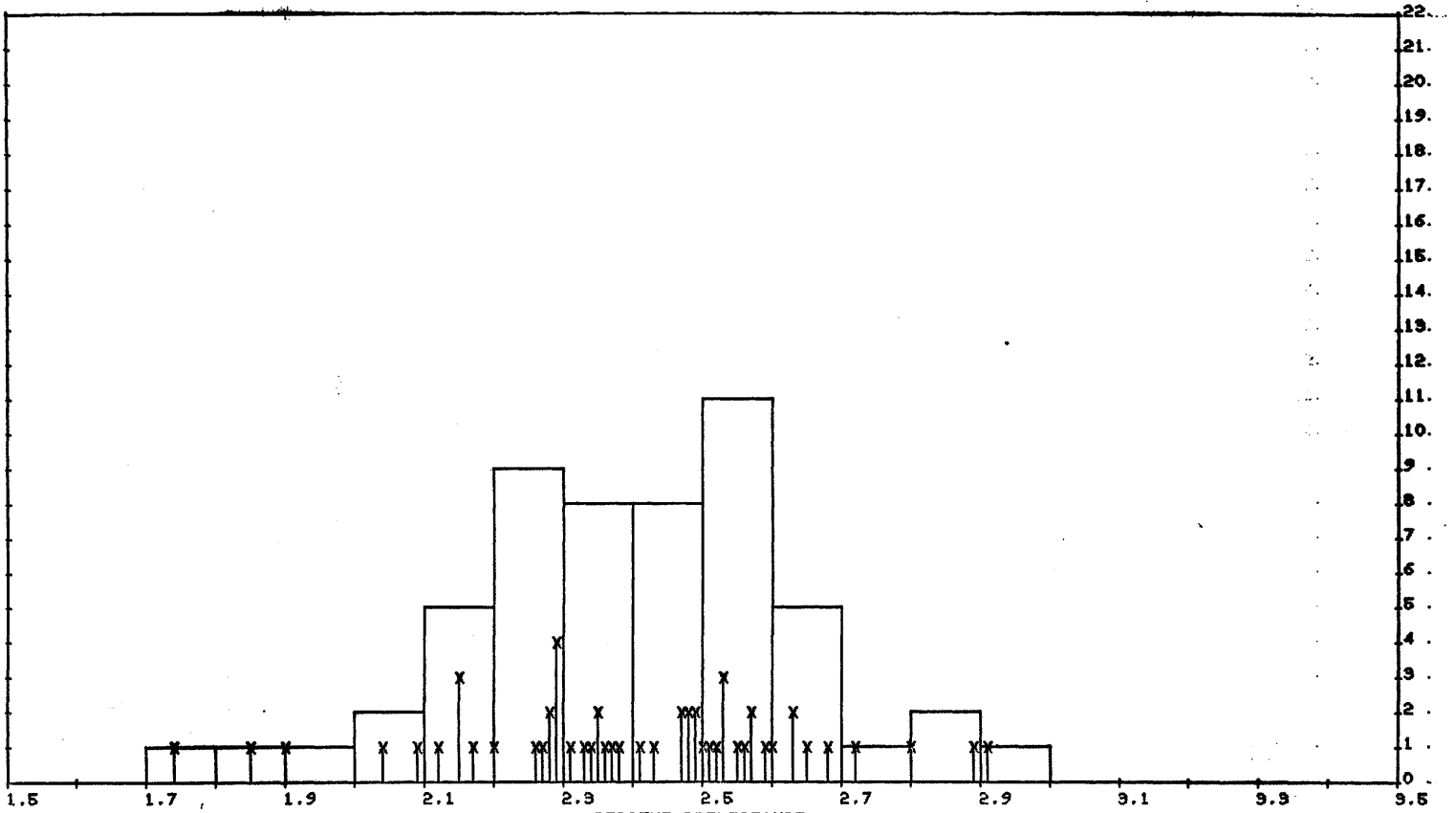
9MB071282V010 VITAL VERSION 1.11

199

V090058001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 09360.00 BOT 09420.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
55	2.91	1.74	1.17	2.40	± 0.069	0.23	15.86

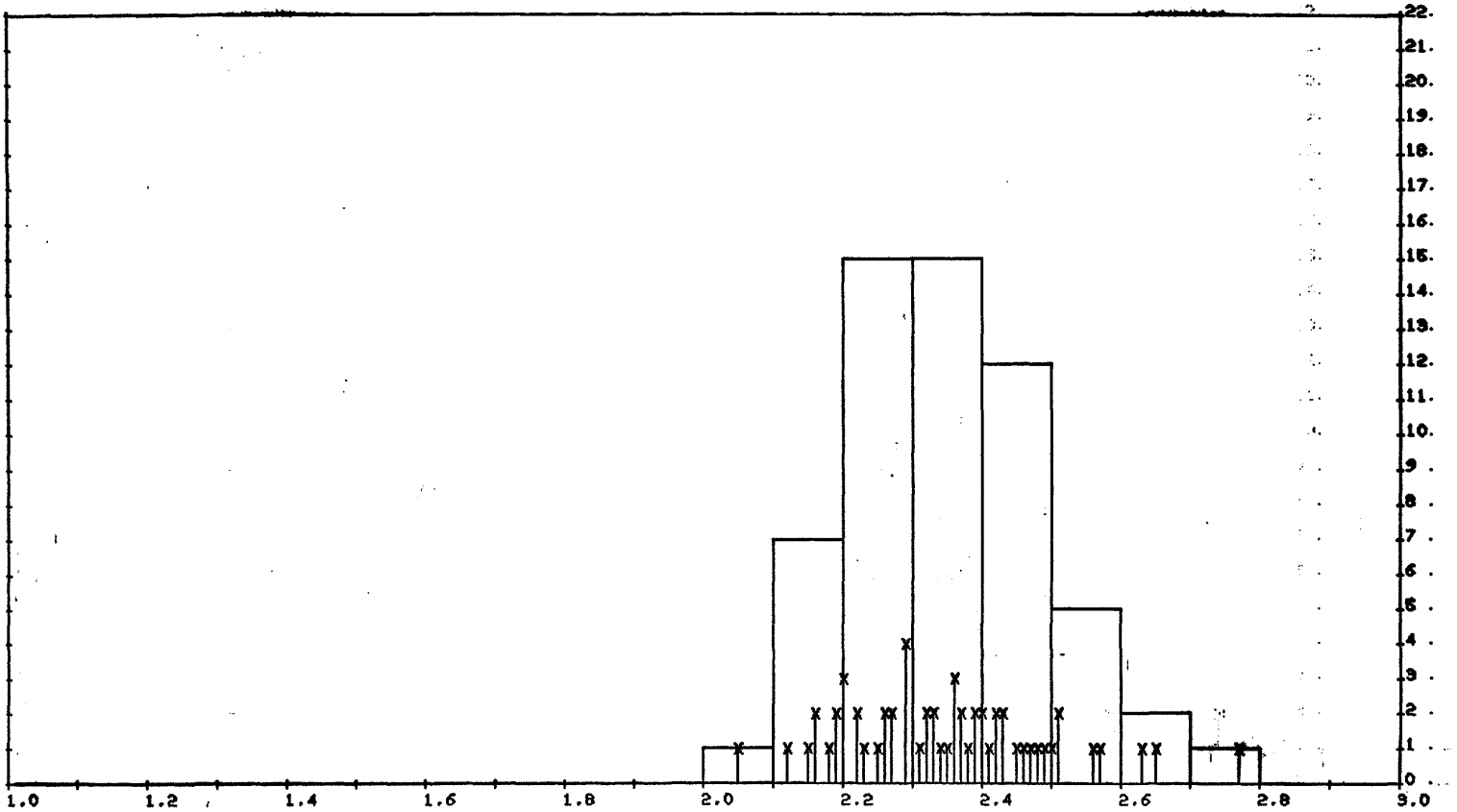
1AK071282V014 VITAL VERSION 1.11

009

V090059001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 302612000100



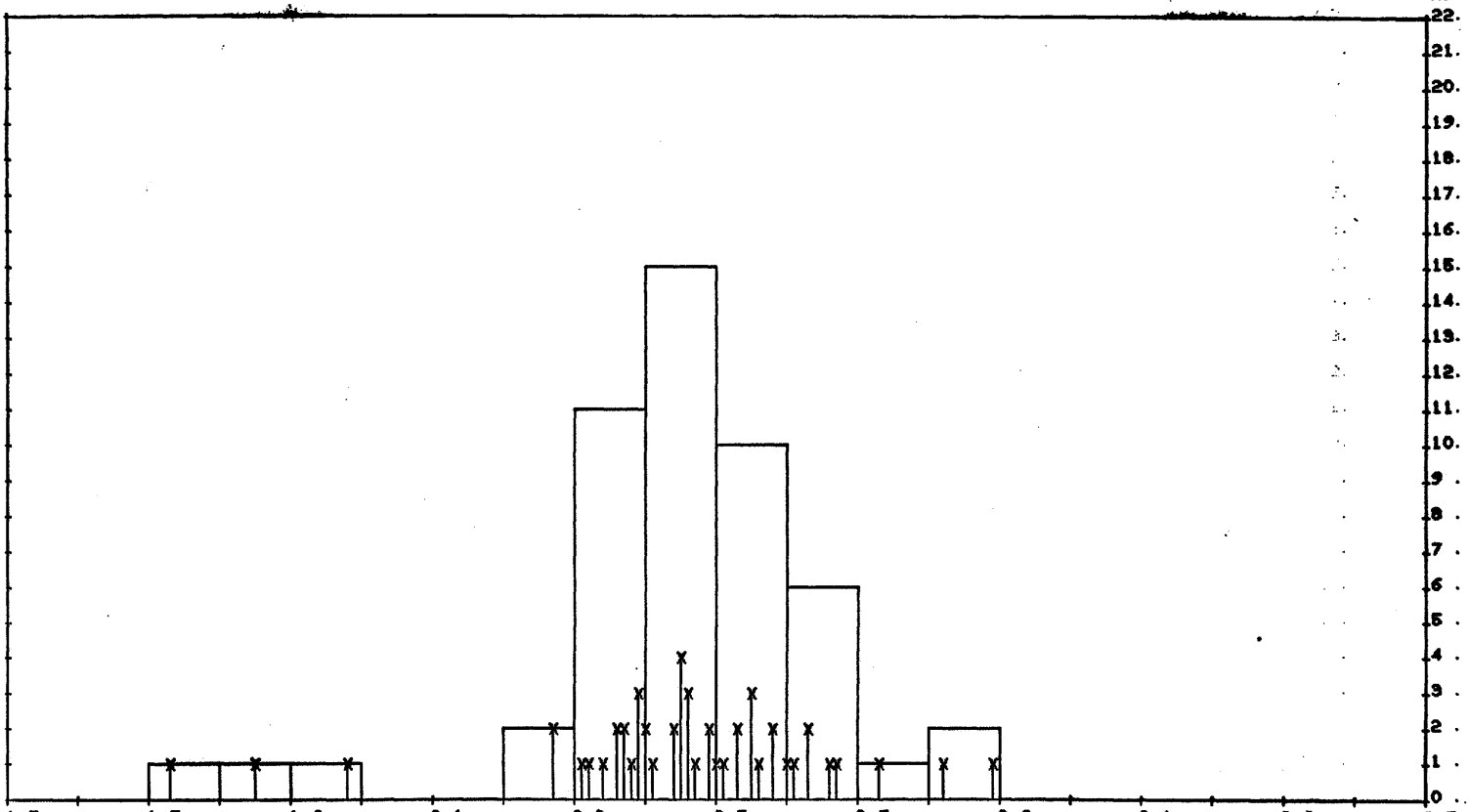
652

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 09680.00 BOT 09720.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
58	2.77	2.05	0.72	2.35	±0.040	0.14	15.64

3MB071282V011 VITAL VERSION 1.11

V030060001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 08680.00 BOT 09720.00 FT
PLOT TYPE = VITRINITE

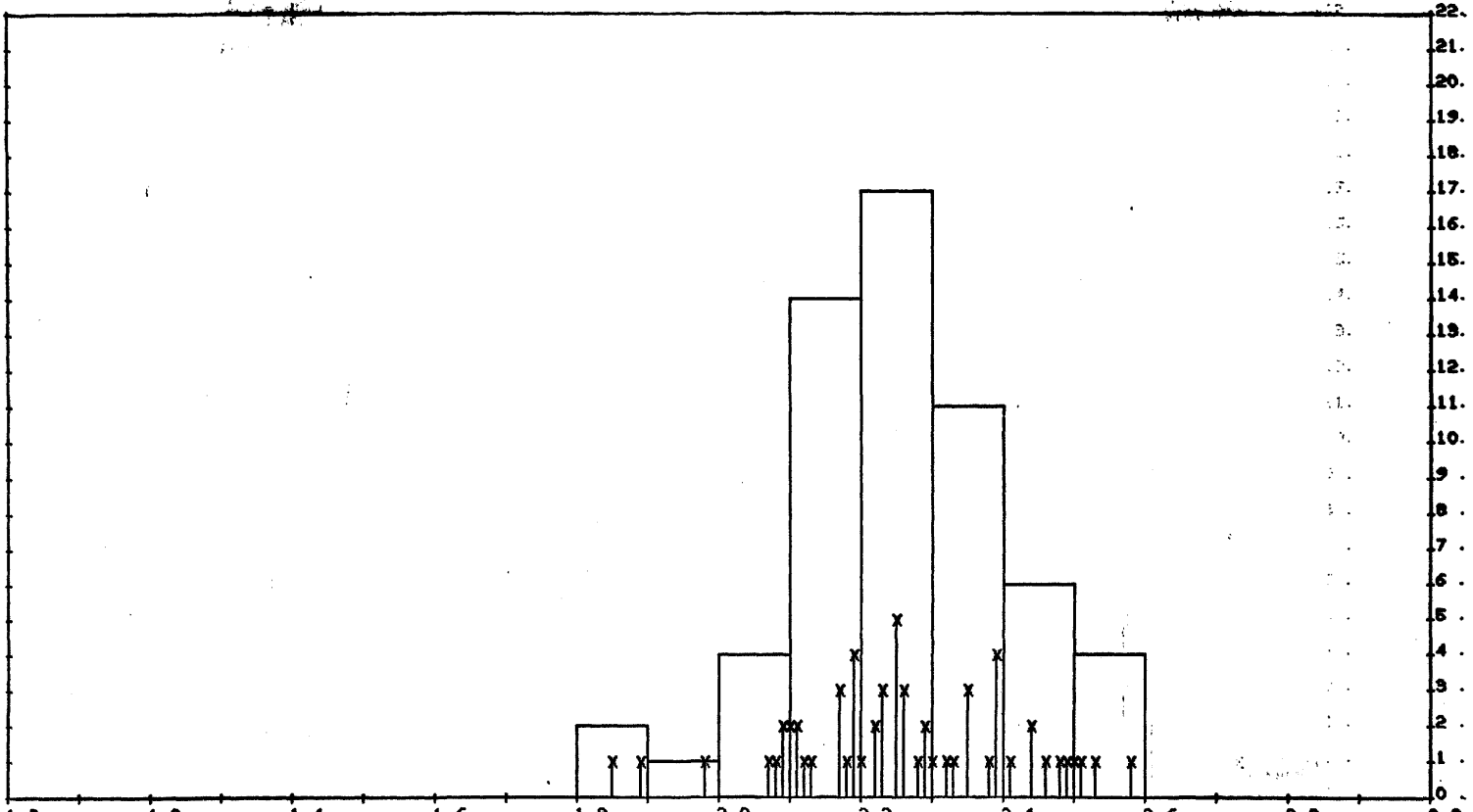
N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
50	2.89	1.73	1.16	2.45	± 0.060	0.20	16.10

STANIUKORICH-NAKNEK/JURASSIC 3MB071282V004 VITAL VERSION 1.11

V090061001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 10000 BOT 10050 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
59	2.58	1.85	0.73	2.26	±0.043	0.15	15.19

OTHER MACERALS

	N	MIN	MAX
BITUMEN. SHD	1	2.22	2.22

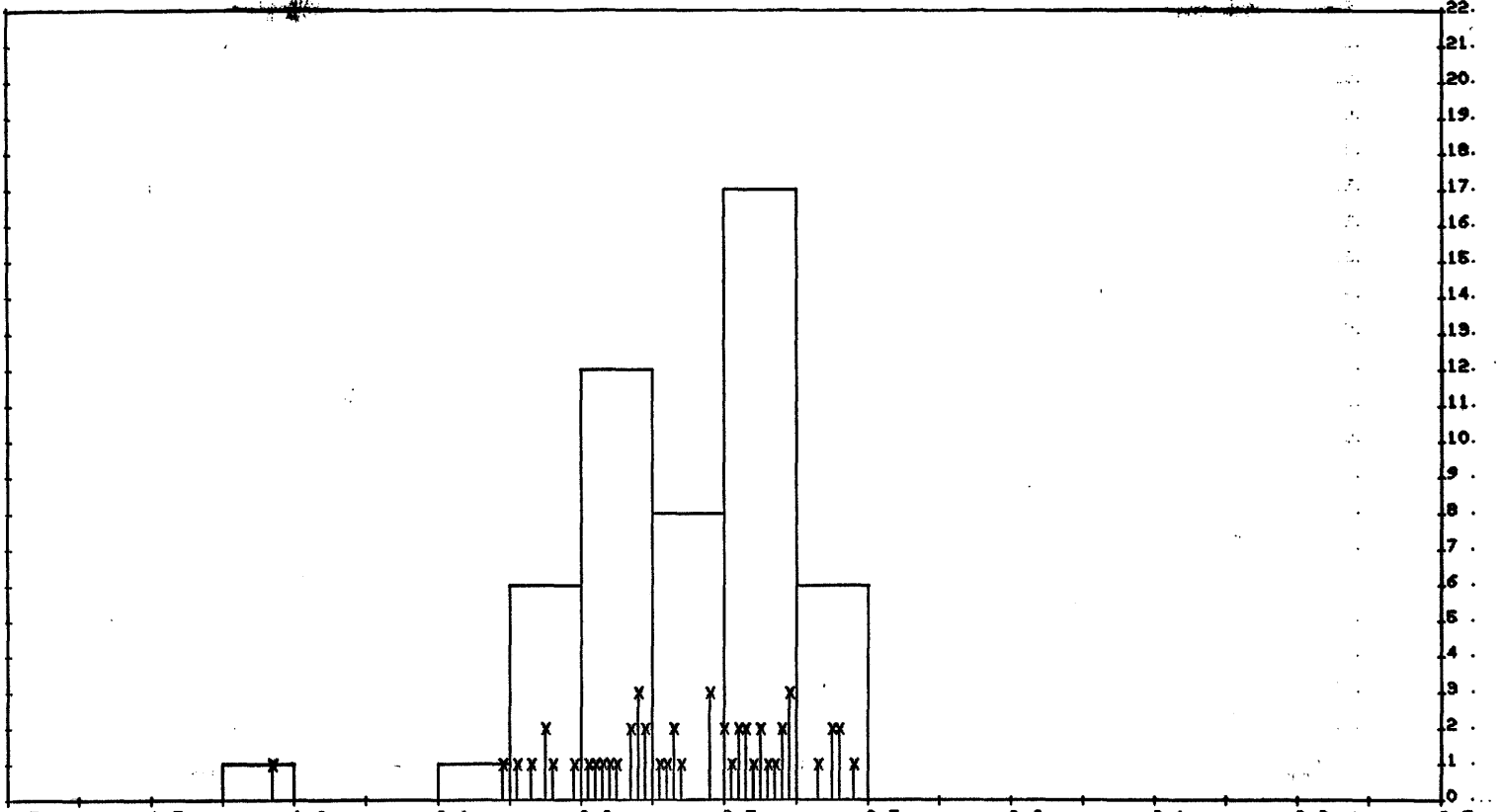
STANIUKORICH-NAKNEK/JURASSIC

3 MB071282V012 VITAL VERSION 1.11

030062001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 10000.00 BOT 10050.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
51	2.68	1.87	0.81	2.44	± 0.046	0.15	16.07

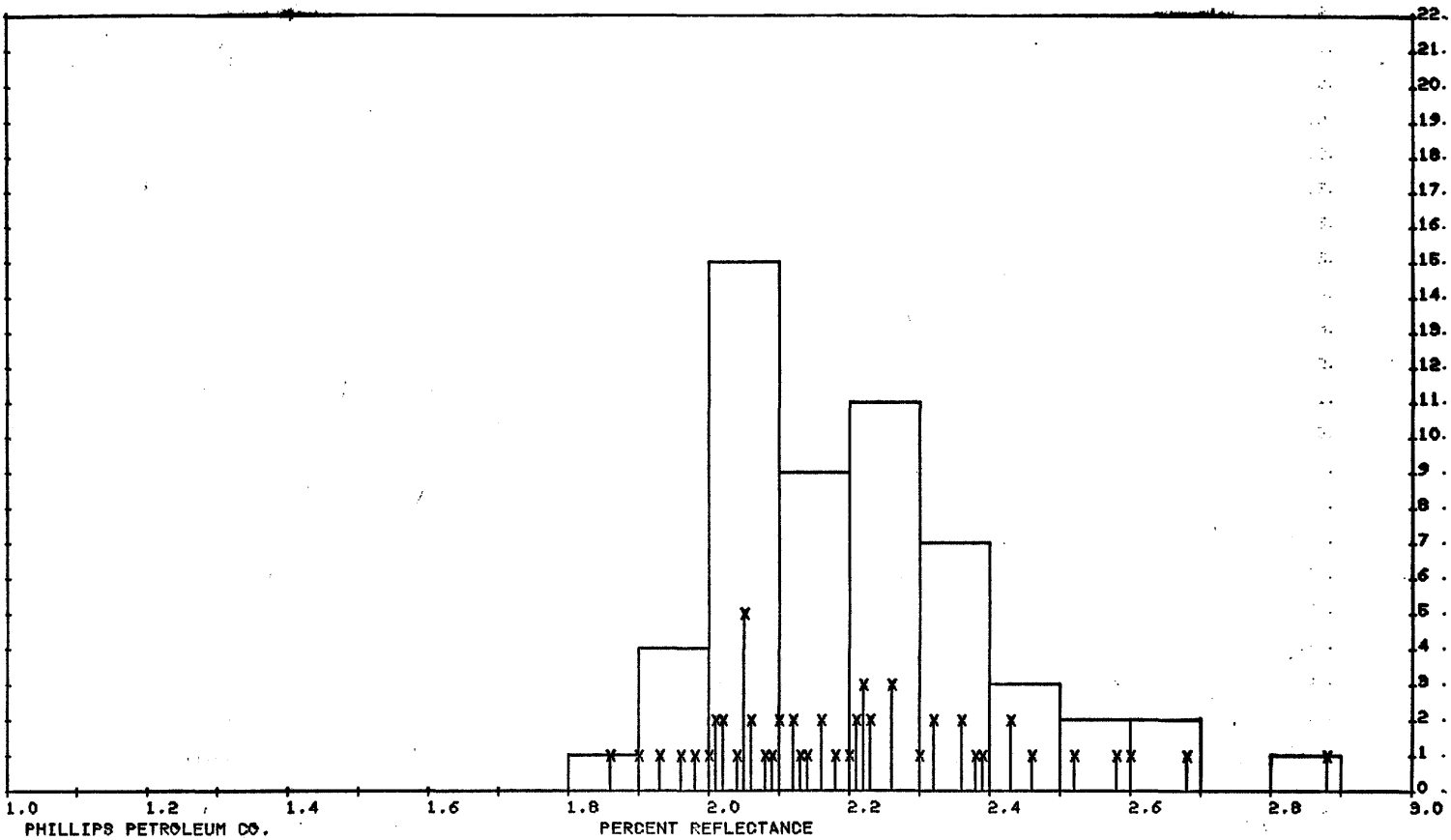
STANILEORICH-NAKNEK/JURASSIC

3MB071282V005 VITAL VERSION 1.11

V090069001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502512000100



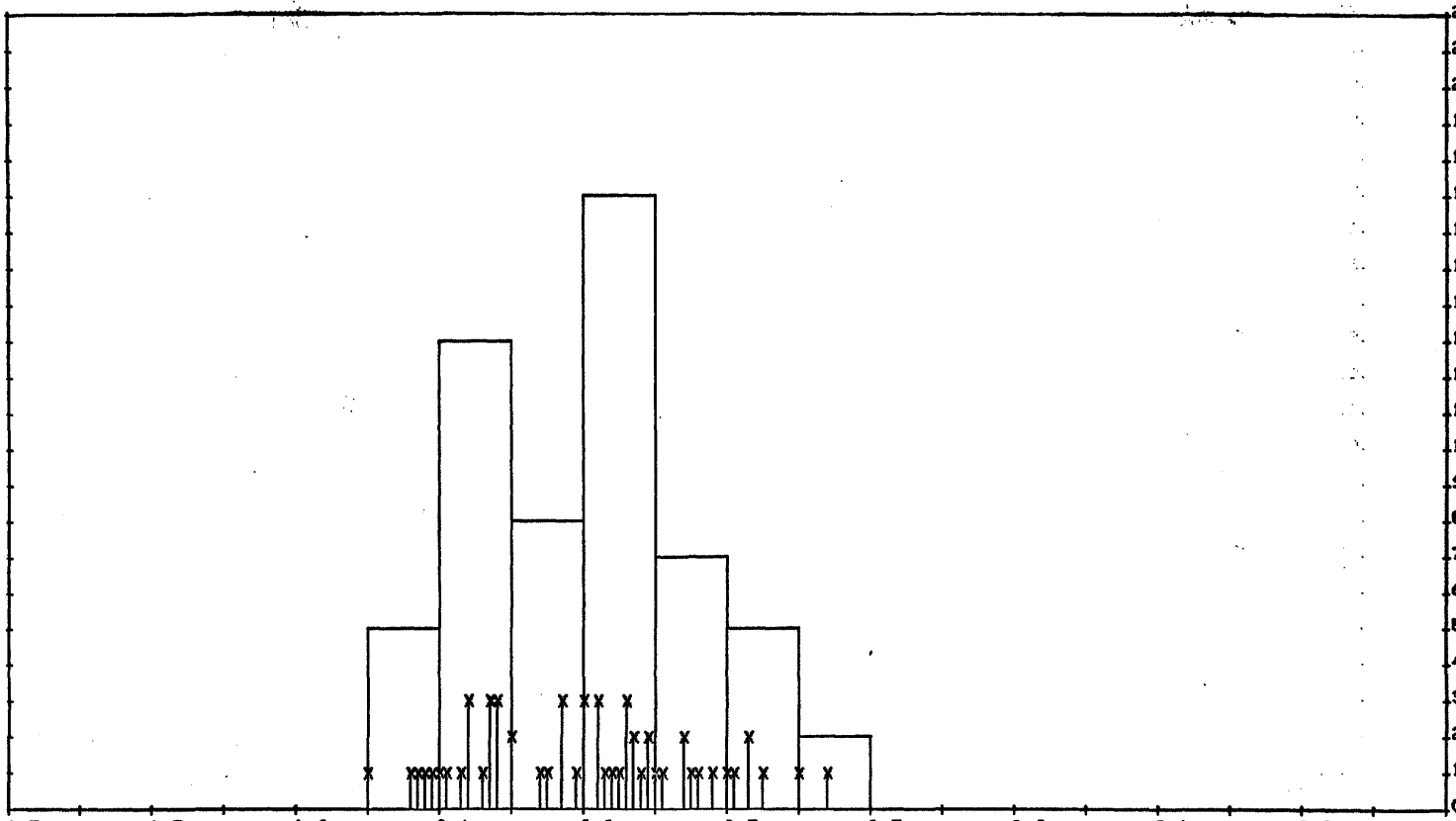
PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 10500 BOT 10550 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
55	2.88	1.86	1.02	2.20	± 0.059	0.20	14.87

STANIUKORICH-NAKNEK/JURASSIC

3 MB071282V019 VITAL VERSION 1.11

V090064001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO 5

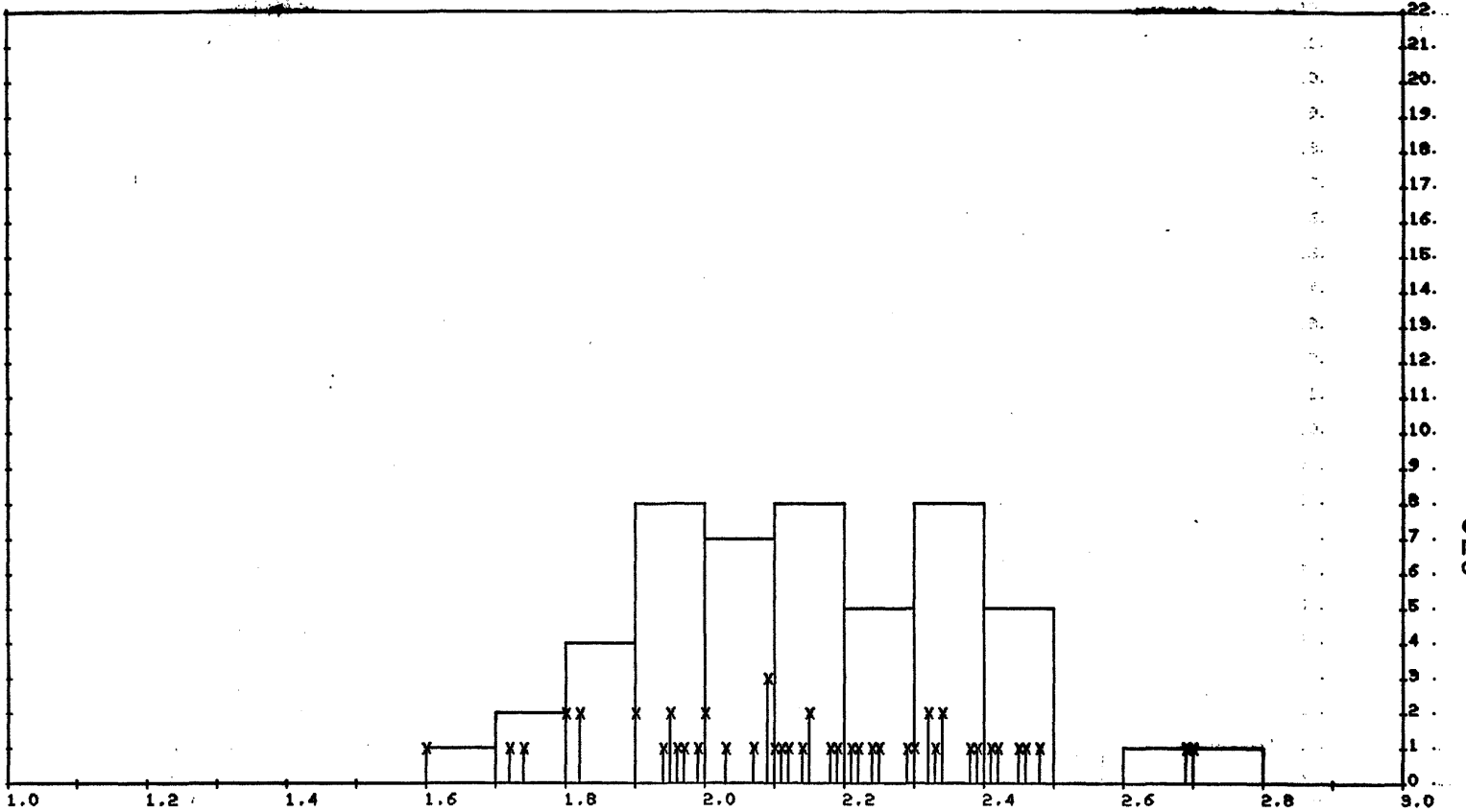


PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 10500.00 BOT 10550.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
57	2.64	2.00	0.64	2.30	± 0.049	0.15	15.40

STANIUKORICH-NAKNEK/JURASSIC 3MB071282V006 VITAL VERSION 1.11

V030065001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 11000.00 BOT 11050.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
50	2.70	1.60	1.10	2.14	± 0.072	0.24	14.59

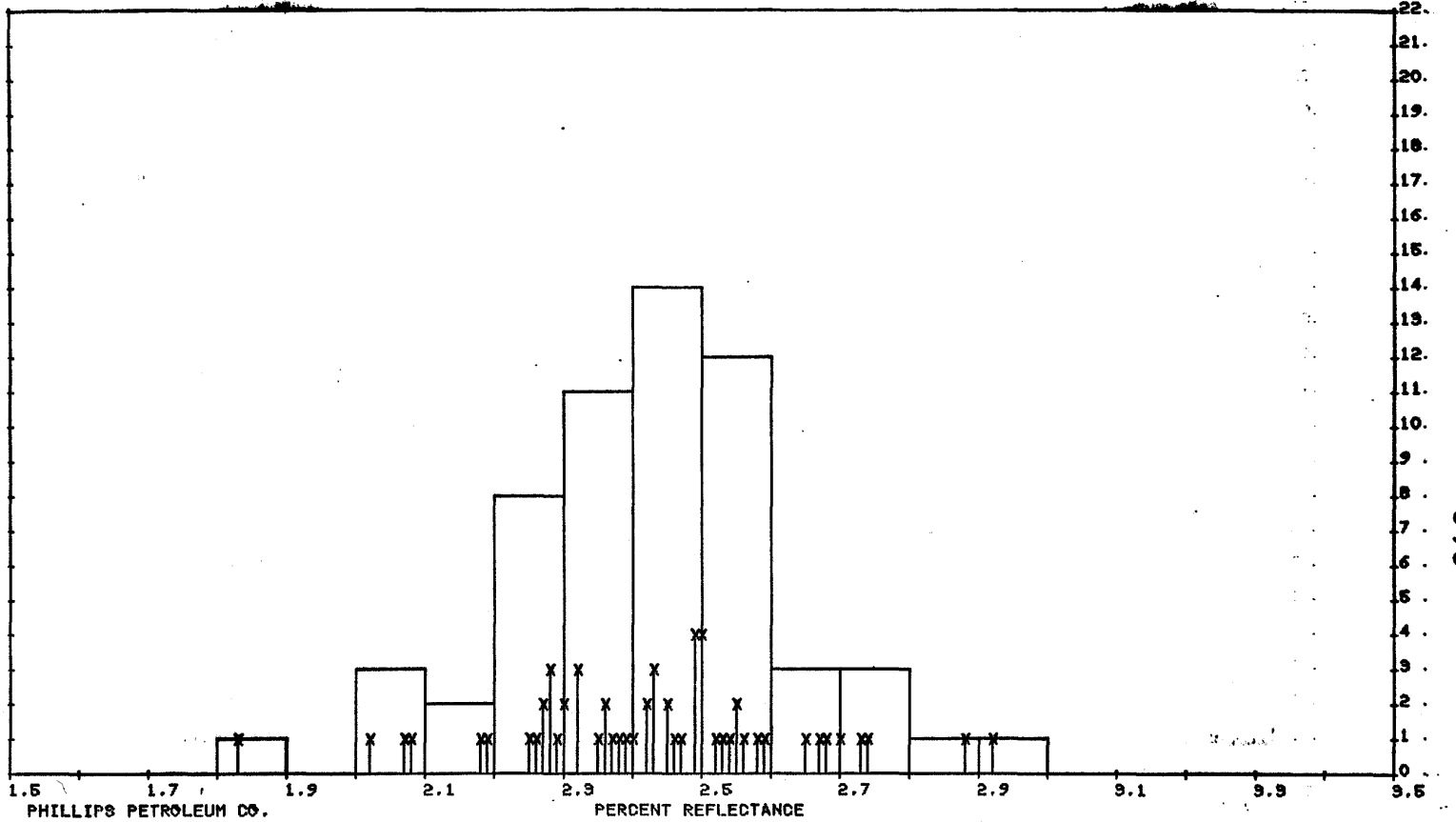
1AK071282V021 VITAL VERSION 1.11

U79

V030066001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 502612000100



610

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 11000.00 BOT 11050.00 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
59	2.92	1.83	1.09	2.42	± 0.056	0.19	15.98

OTHER MACERALS

	N	MIN	MAX
FUSINITE	1	2.27	2.27
SAPROVITRIN	1	0.71	0.71

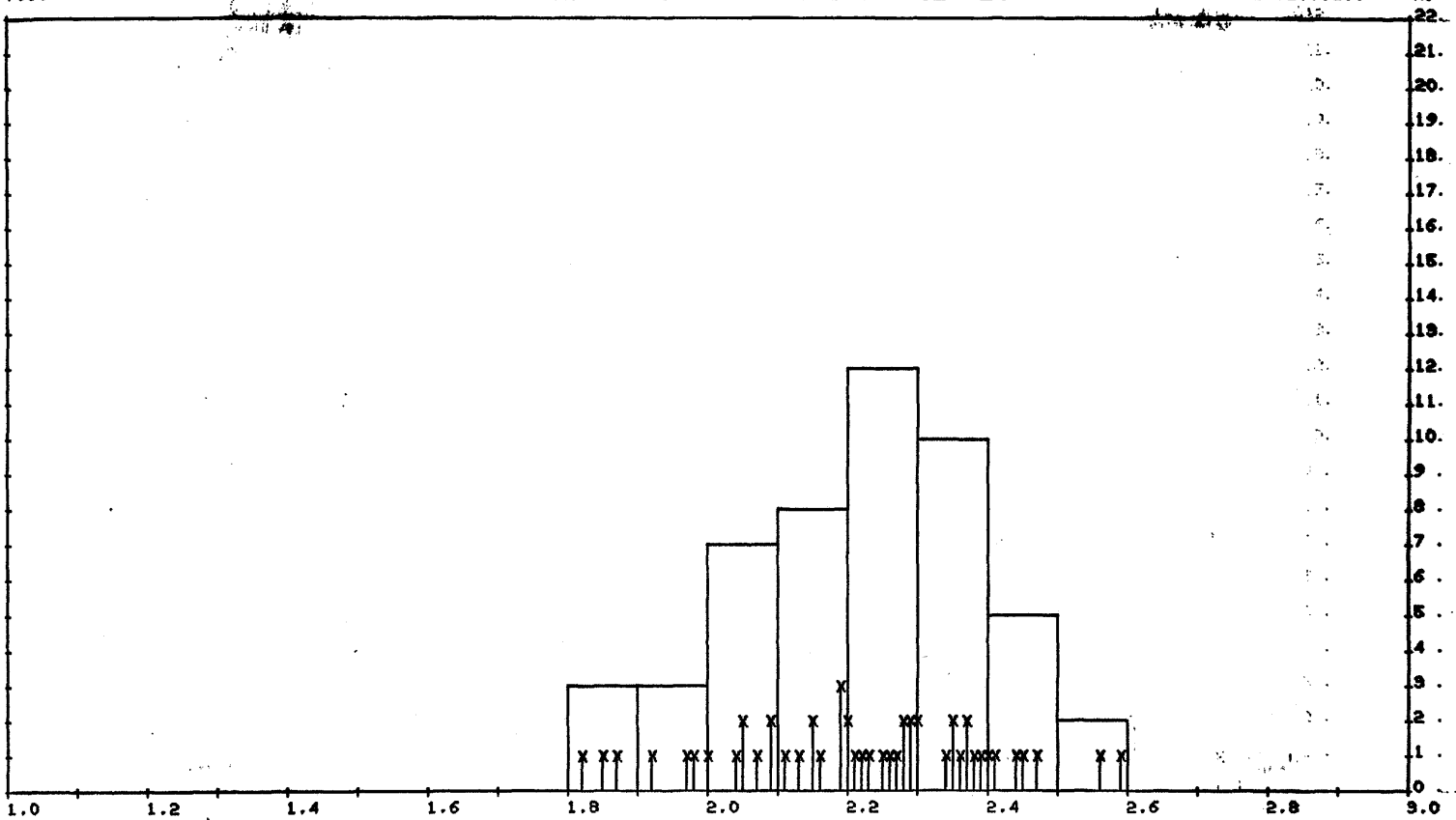
STANIUKOVICH-NAKNEK/JURASSIC

3MB071282V007 VITAL VERSION 1.11

V090067001 PLOT TYPE = VITRINITE

SHELL DEVELOPMENT REFLECTANCE PLOT

ID.NO. 5026512000100 NO 1



659

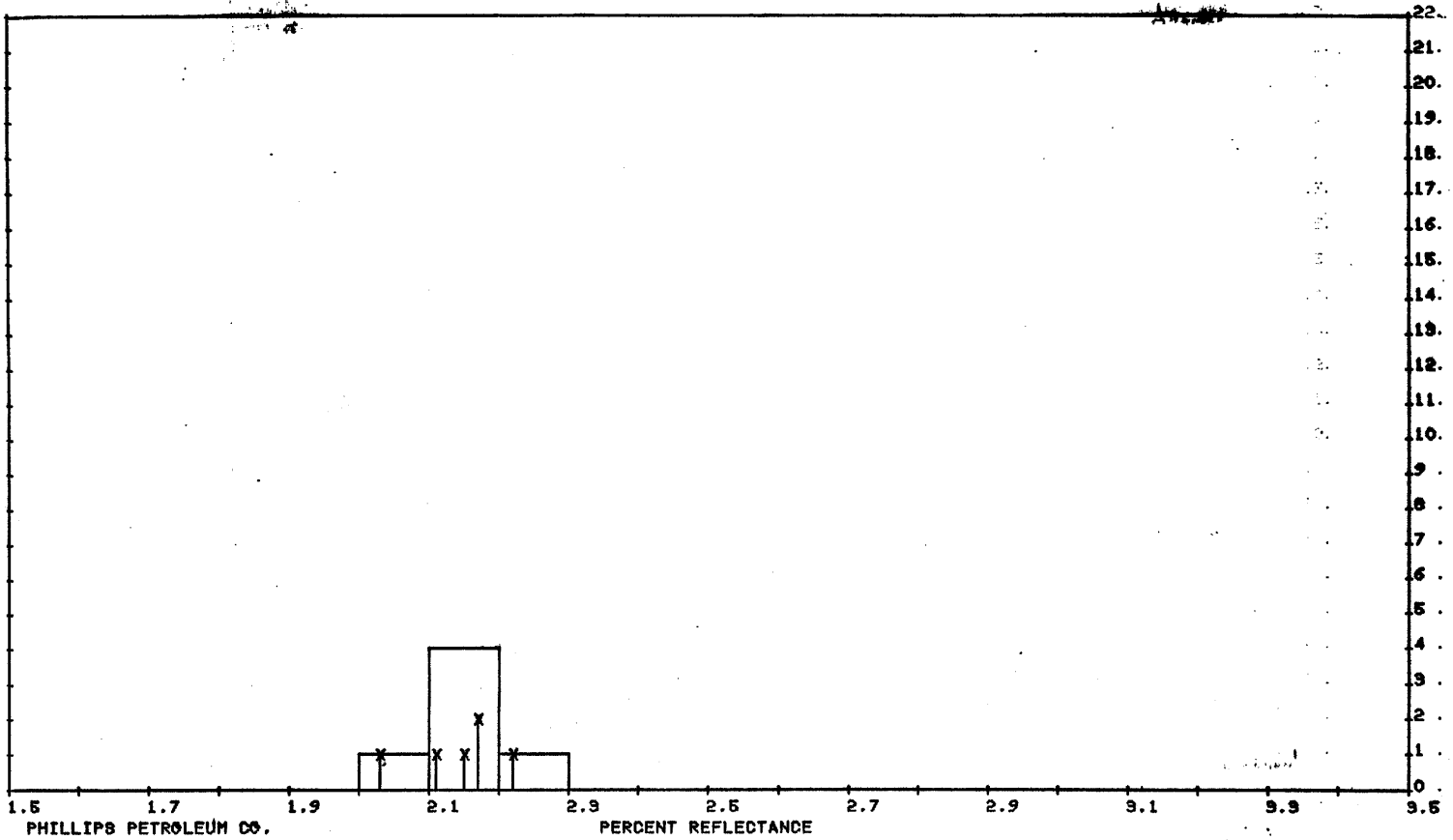
PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 S 68 W 7 TOP 11320 BOT 11370 FT

PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
51	2.59	0.04	2.55	2.17	±0.104	0.35	14.77

1 AK071282V022 VITAL VERSION 1.11

/090068001 PLOT TYPE = VITRINITE **SHELL DEVELOPMENT REFLECTANCE PLOT** ID.NO. 502512000100 NO



612

PHILLIPS PETROLEUM CO.
BIG RIVER A-1
AKA LOCATION 15 49 8 68 W 7 TOP 11920.00 BOT 11970.00 FT
PLOT TYPE = VITRINITE

N	MAX	MIN	RANG	MEAN	CONF	STDV	LOM
6	2.22	2.03	0.19	2.14	±0.068	0.06	14.61

STANIUKORICH-NAKNEK/JURASSIC 3MB071282V008 VITAL VERSION 1.11

BRC-4
7/78

Shell Development Company

DATE: JULY 14, 1982

FROM: GEOCHEMICAL SERVICES

TO: PACIFIC DIVISION EXPLORATION
ATTN: G. B. ROSS

SUBJECT: SOURCE ROCK STUDY
PHILLIPS, BIG RIVER #A-1,
API #50-251-20001,
SEC. 15, T49S, R68W,
SBM, ALEUTIAN BASIN, ALASKA

Depth Ft.	Lab No.	Sample Type, Lithology	Formation, Age	D/P Ratio	PYROLYSIS FID Analysis: Total HC Yield wt %	LOM	VRE	ORGANIC CARBON: NCC wt %
390-420	AKA-S-1944 F20888	D, gry mudstone	Oligocene	0.029	0.045	<11	<1.05	0.92
420-450	AKA-S-1945 F20889	" " "	Stepovak, Olig-Eoc.	0.287	0.010	ND	ND	*0.4 0.4
1020-50	AKA-S-1946 F20890	" " shale	"	0.092	0.041	<11	<1.05	0.76
1980-2040	AKA-S-1947 F20891	" coal	Tolstoi, Eocene	0.032	10.010	<11	<1.05	44.7
2040-70	AKA-S-1948 F20892	" brn-gry shale	"	0.056	0.258	<11	<1.05	3.84
5930-80	AKA-S-1949 F20897	" coal from HLS	"	0.016	6.063	12.6	1.66	60.4
6470-6510	AKA-S-1950 F20898	" " "	"	0.025	0.966	13.2	1.83	25.6
6470-6510	AKA-S-1951 F20899	" brn-gry shale	"	0.070	0.023	13.9	2.00	1.27
6900-40	AKA-S-1952 F20900	" coal	"	0.004	1.119	13.7	1.94	37.0
7310-30	AKA-S-1953 F20901	" "	Chignik, UK	0.029	1.089	15.2	2.25	46.3
7710-20	AKA-S-1954 F20902	" "	"	0.023	0.811	14.9	2.20	33.3
8290-8300	AKA-S-1955 F20903	" "	"	0.009	0.944	16.9	2.67	71.8
8360-70	AKA-S-1956 F20904	" " from HLS	"	0.014	0.690	16.6	2.58	54.0
9370-90	AKA-S-1957 F20905	" gry shale	Staniukovich Naknek, Jur.	0.970	0.010	ND	ND	0.48

Depth Ft.	Lab No.	Sample Type, Lithology	Formation, Age	PYROLYSIS FID Analysis D/P Ratio	Total HC Yield wt %	LOM	VRE	ORGANIC CARBON NCC wt %
9690-9720	AKA-S-1958 F20906	D, coaly shale	Staniukovich Naknek, Jur.	0.291	0.087	17.1	2.76	6.23
9690-9720	AKA-S-1959 F20907	" coal	"	0.019	0.358	17.0	2.71	*34.1 35.4
10010-50	AKA-S-1960 F20908	" gry-blk siltstone	"	0.849	0.021	ND	ND	1.01
10520-40	AKA-S-1961 F20909	" "	" "	1.006	0.005	ND	ND	0.32
11020-50	AKA-S-1962 F20910	" "	" "	0.620	0.021	ND	ND	1.03
11350-60	AKA-S-1963 F20911	" blk shale	"	1.821	0.013	ND	ND	0.39

* The samples was limited so that elemental carbon analysis was run rather than NCC. The analysis was run on the leached sample of AKA-S-1945 but the data is reported on the basis of the original sample. The leaching factor is 0.8148. The anlaysis was run on the leached coal AKA-S-1959.

Pyrolysis-fluorescence was run on the bulk ditch samples from the interval 34-11370 ft; the source rock log is attached.

Refer to BRC Request Nos. 23604 & 23605.

J. R. CASTAÑO

JRC/MLW:pv
Attachments

cc: J. R. Castaño (w/attachments)
Well File (w/attachments)
Regional Geochemistry File (w/attachments)
P. Herr (w/attachments)

SAMPLE TYPE	KEROGEN TYPE	SOURCE ROCK QUAL.
C= Core	I, Lipid	E= Excellent
D= Picked Ditch	II, Lipid	F= Fair
M= Mine	III, Humic	G= Good
O= Outcrop	IV, Inert	M= Marginal
S= Sidewall core		N= Non Source
UD= Unpicked ditch		
X= Extracted		NA= Not applicable
HLS = heavy liquid separation		ND= No determination

RM-100 (4-71)

SHELL OIL COMPANY
SOURCE ROCK LOG

STATE OR PROV. Alaska
COUNTY

Phillips — COMPANY

Big River — NO. A-1

T. | R.

Aleutian
FIELD OR AREA

SURVEY — BLK.

ELEV. | COMM. — COMP.

T.D.

ELEC. LOG
RADIOACTIVE
MICROLOG
LATEROLOG

~~PRODUCTION~~ Blank spaces represent a skip in intervals.

REMARKS Std. 36 ± 2 units. Scale is 1" = 100'. Zero to five is plotted as five by plotter.

SAMPLED BY:
DATE

ANALYZED BY: F. Della-Rose, R. Rios;
DATE 5/20/82 L. Mellon & K. Meaux

PLOTTED BY: P. Valentine & N. West
DATE 7/82

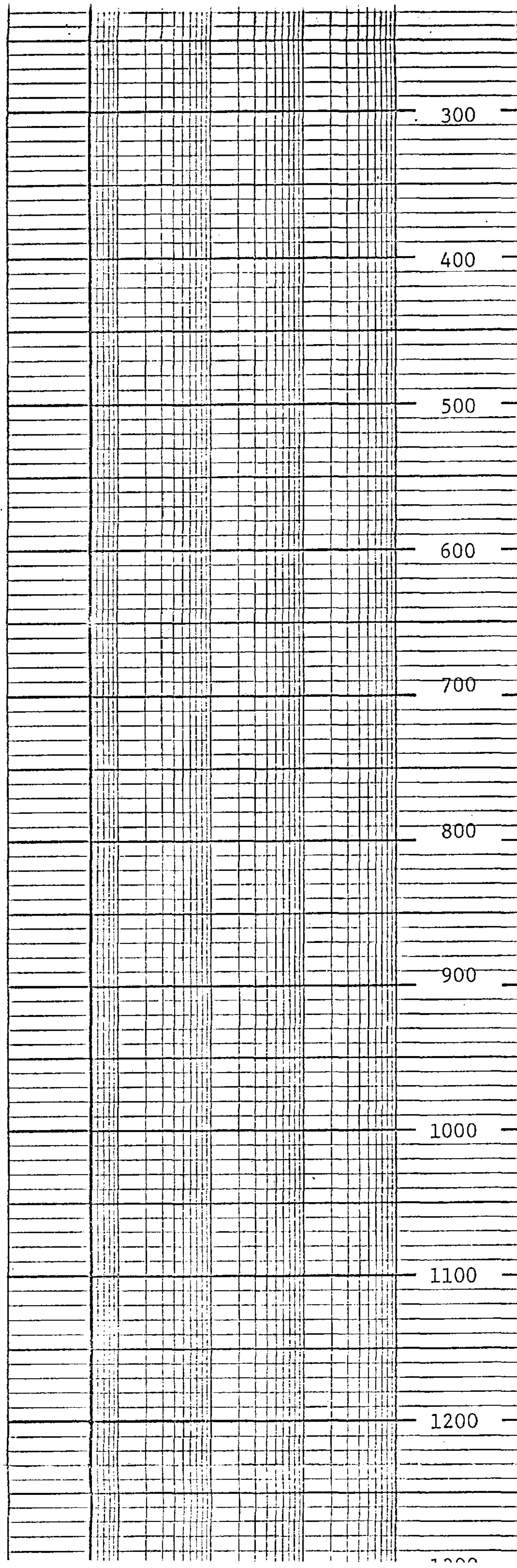
SEC. 15 TWP. 49S RGE. 68W

SEC. | BLK. | TWP. | SURVEY RGE.

LITHOLOGY	TOTAL FLUORESCENT UNITS SCALE 10 20 50 100 500 1000 5000	DEPTH AND REMARKS
		0
		100
		200

GRAPHIC CONT

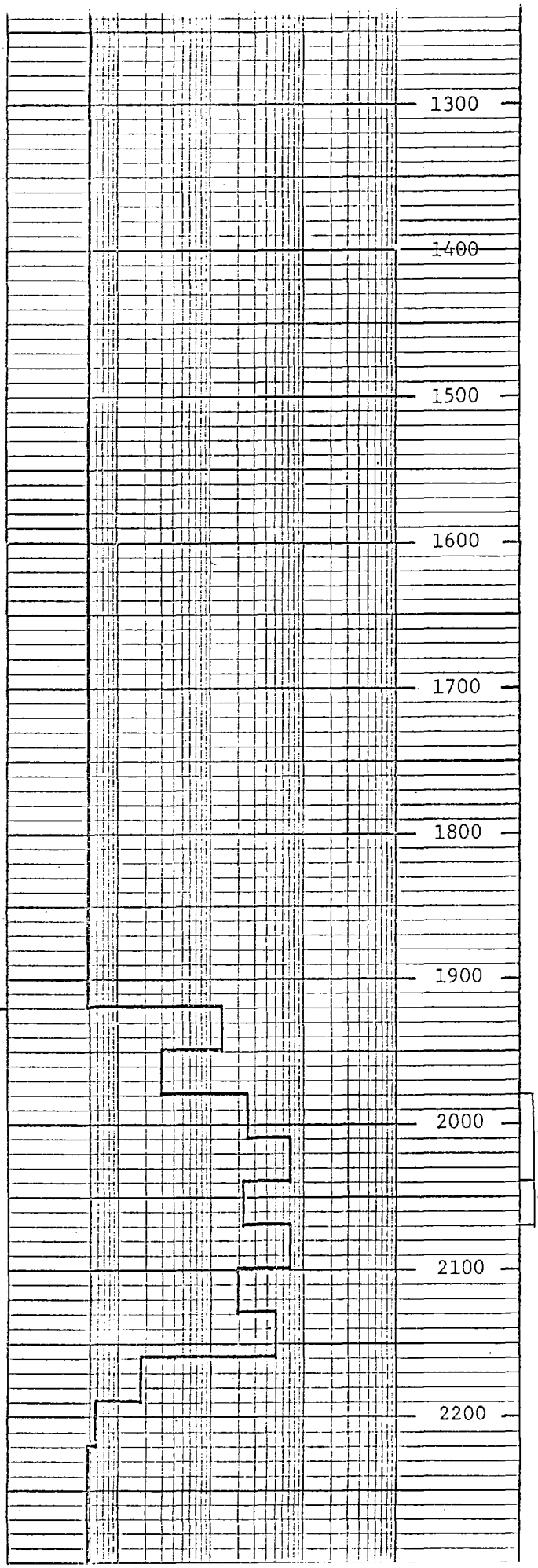
RECORDING CHARTS



HC YIELD
0.045%
NCC% 0.92

HC YIELD
0.010%
NCC% 0.4

HC YIELD
0.041%
NCC% 0.76



2300

2400

2500

2600

2700

2800

2900

3000

3100

3200

3300

3300

3400

3500

3600

3700

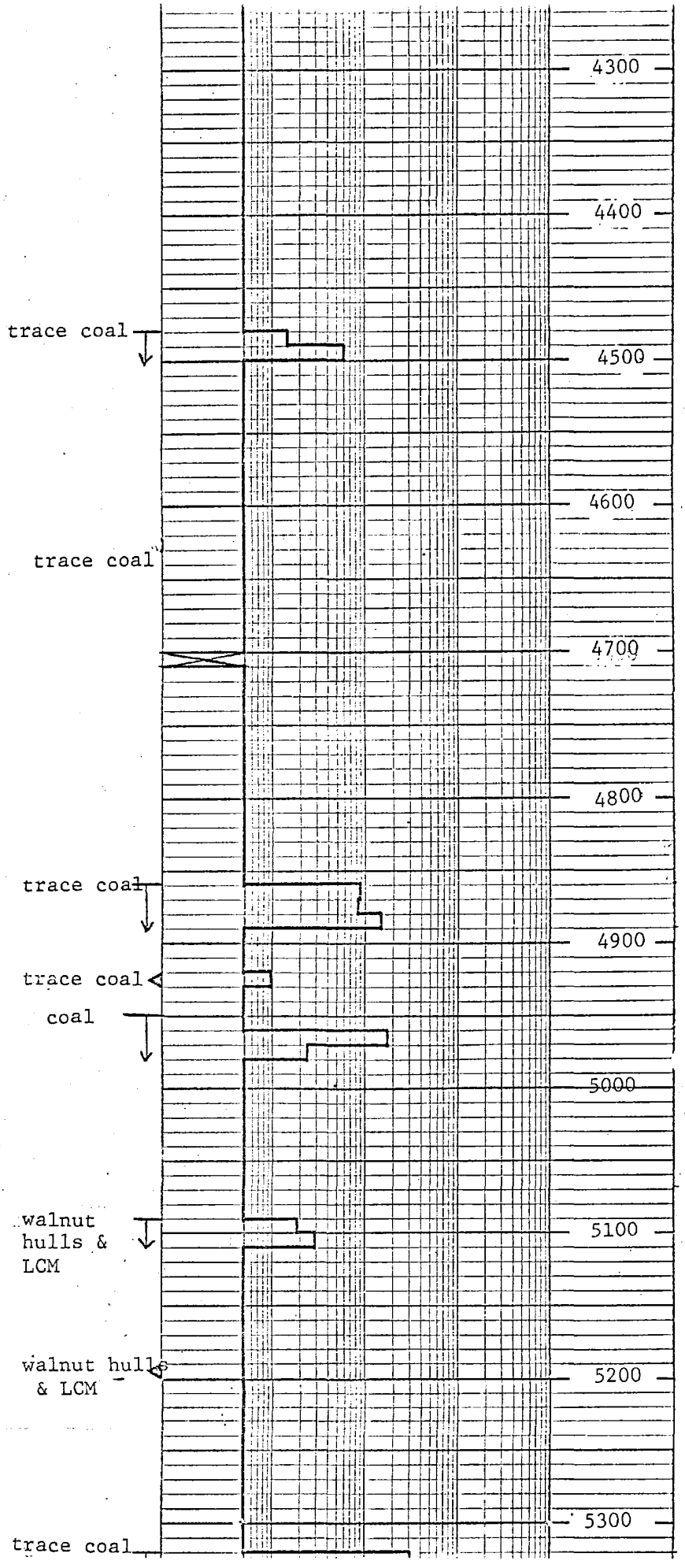
3800

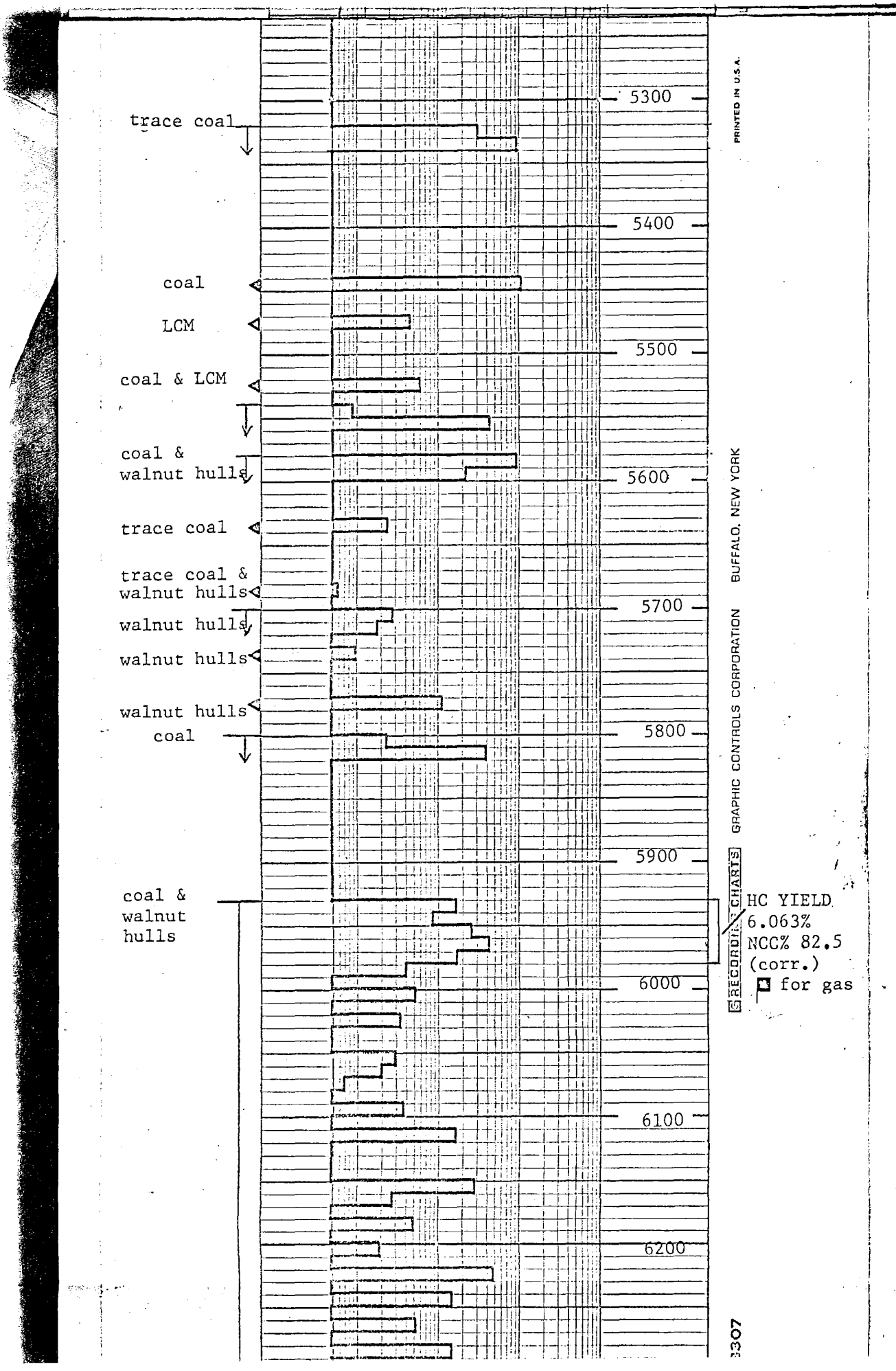
3900

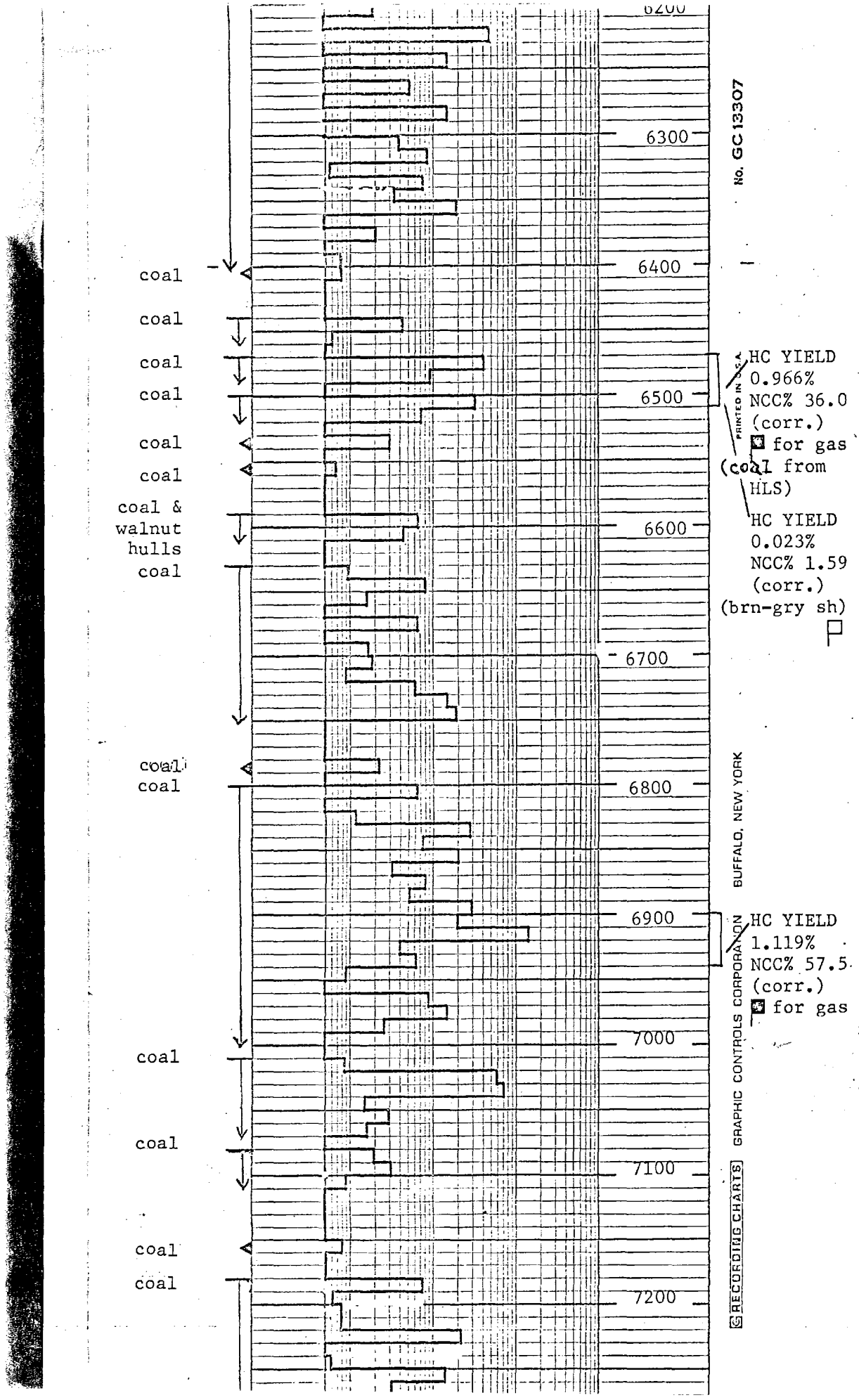
4000

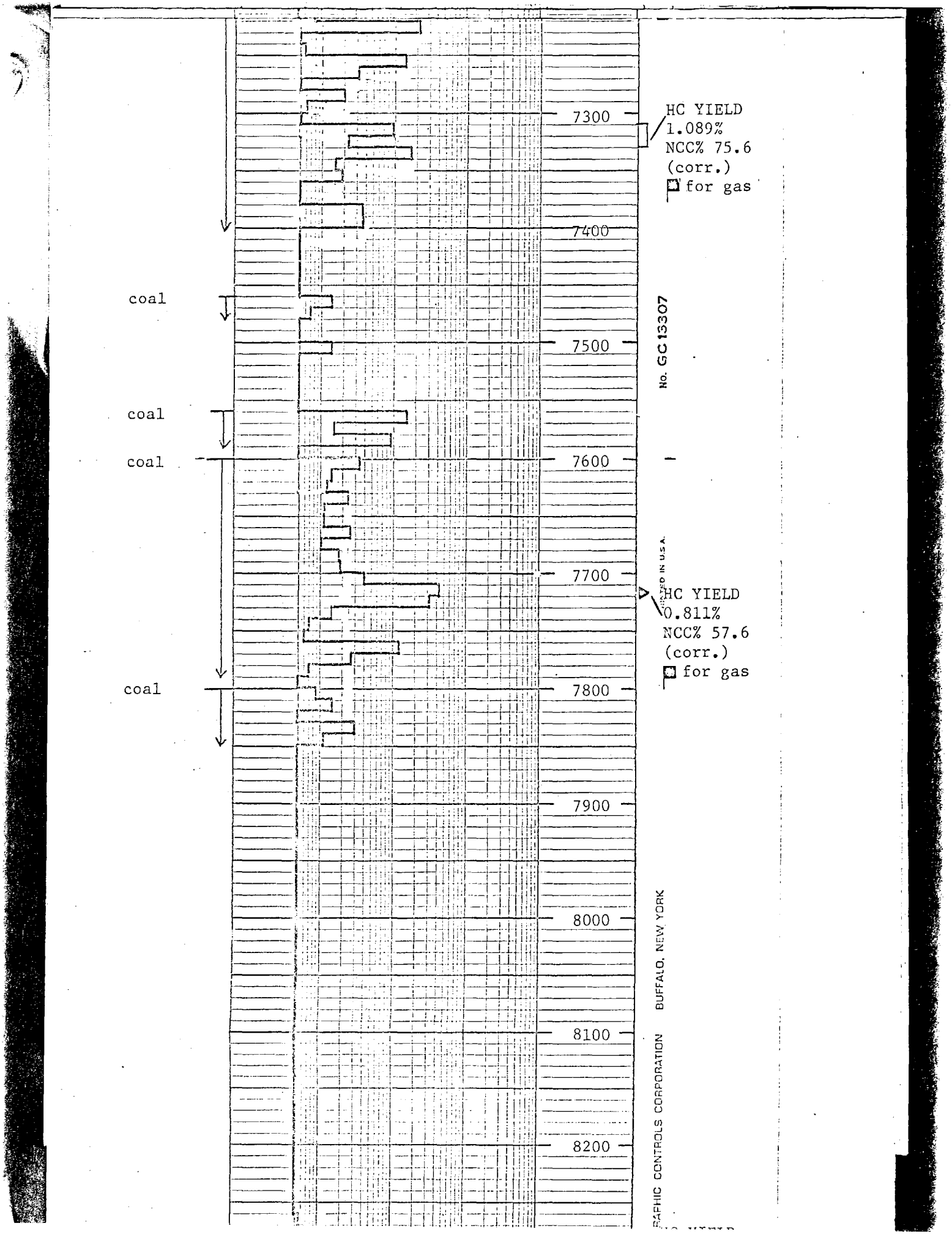
4100

4200




trace coal
coal
LCM
coal & LCM
coal & walnut hulls
trace coal
trace coal & walnut hulls
walnut hulls
walnut hulls
walnut hulls
coal
coal & walnut hulls
5300
5400
5500
5600
5700
5800
5900
6000
6100
6200
HC YIELD
6.063%
NCC% 82.5
(corr.)
for gas
RECORDING CHARTS
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
PRINTED IN U.S.A.
2307


6200
6300
6400
6500
6600
6700
6800
6900
7000
7100
7200
coal
coal
coal
coal
coal
coal
coal &
walnut
hulls
coal
coal
coal
coal
coal
coal
HC YIELD
0.966%
NCC% 36.0
(corr.)
for gas
(coal from
HLS)
HC YIELD
0.023%
NCC% 1.59
(corr.)
(brn-gry sh)
HC YIELD
1.119%
NCC% 57.5
(corr.)
for gas
No. GC13307
PRINTED IN U.S.A.
BUFFALO, NEW YORK
GRAPHIC CONTROLS CORPORATION
RECORDING CHARTS


7300
7400
7500
7600
7700
7800
7900
8000
8100
8200
coal
coal
coal
coal
HC YIELD
1.089%
NCC% 75.6
(corr.)
for gas
HC YIELD
0.811%
NCC% 57.6
(corr.)
for gas
No. GC 13307
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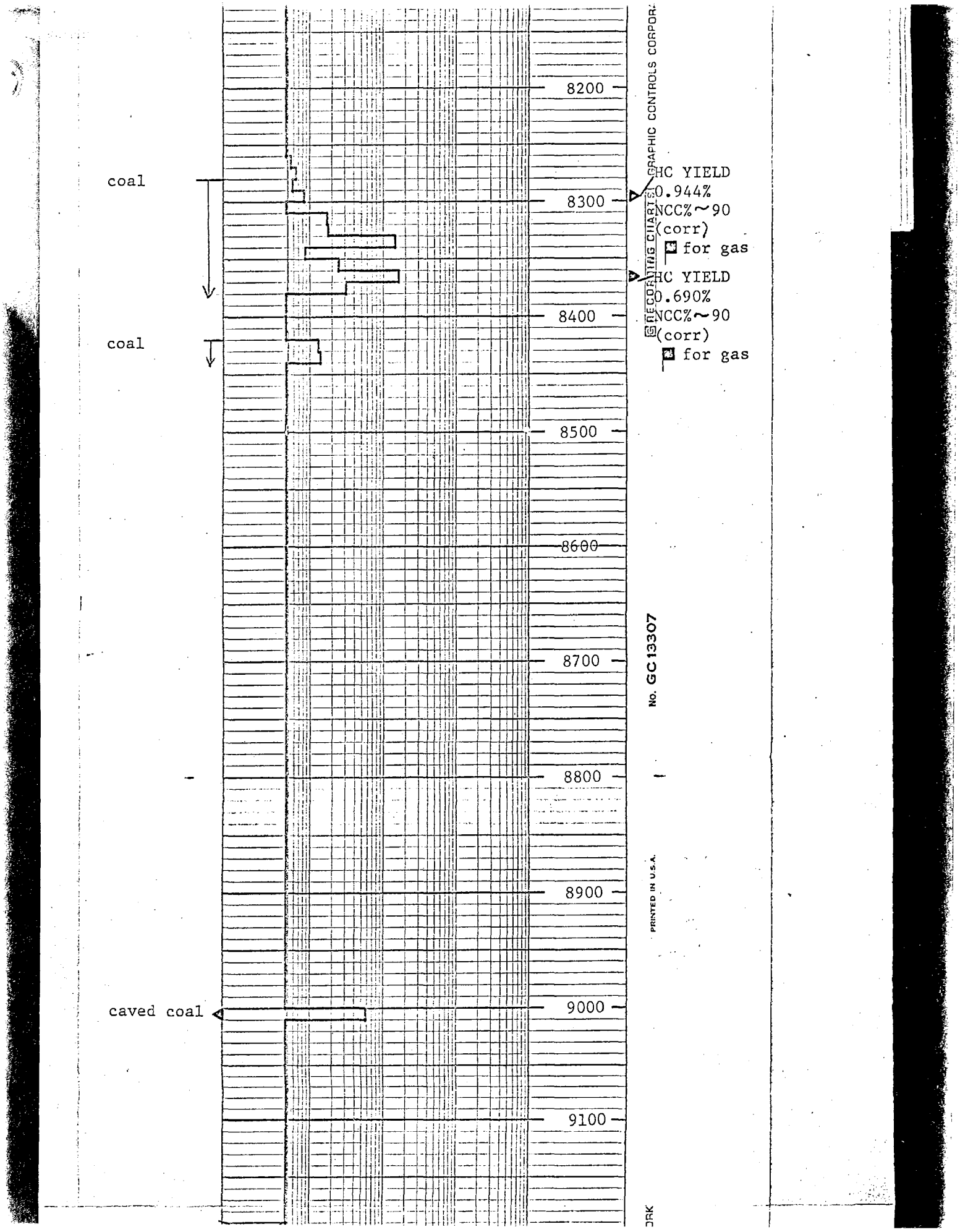
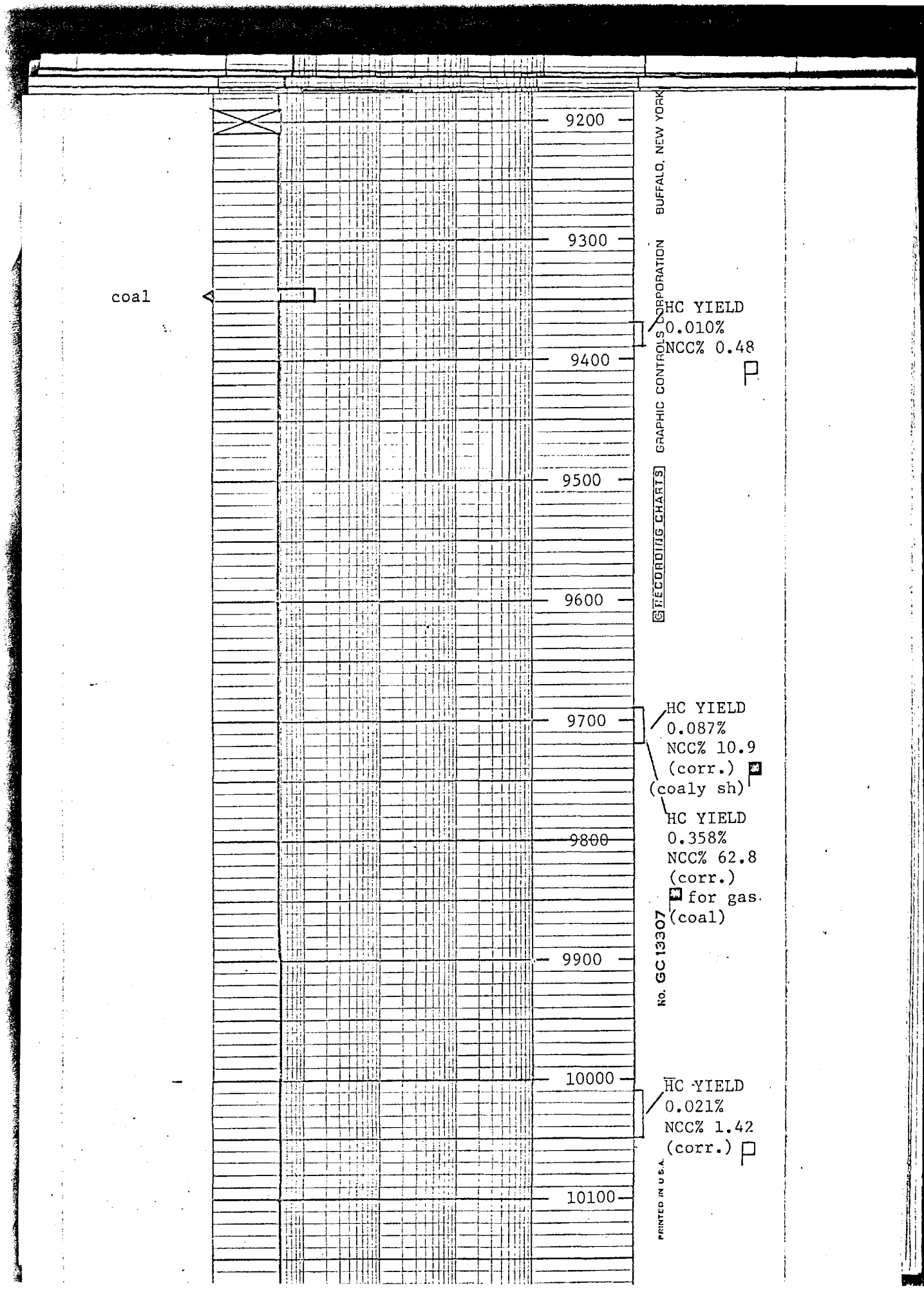
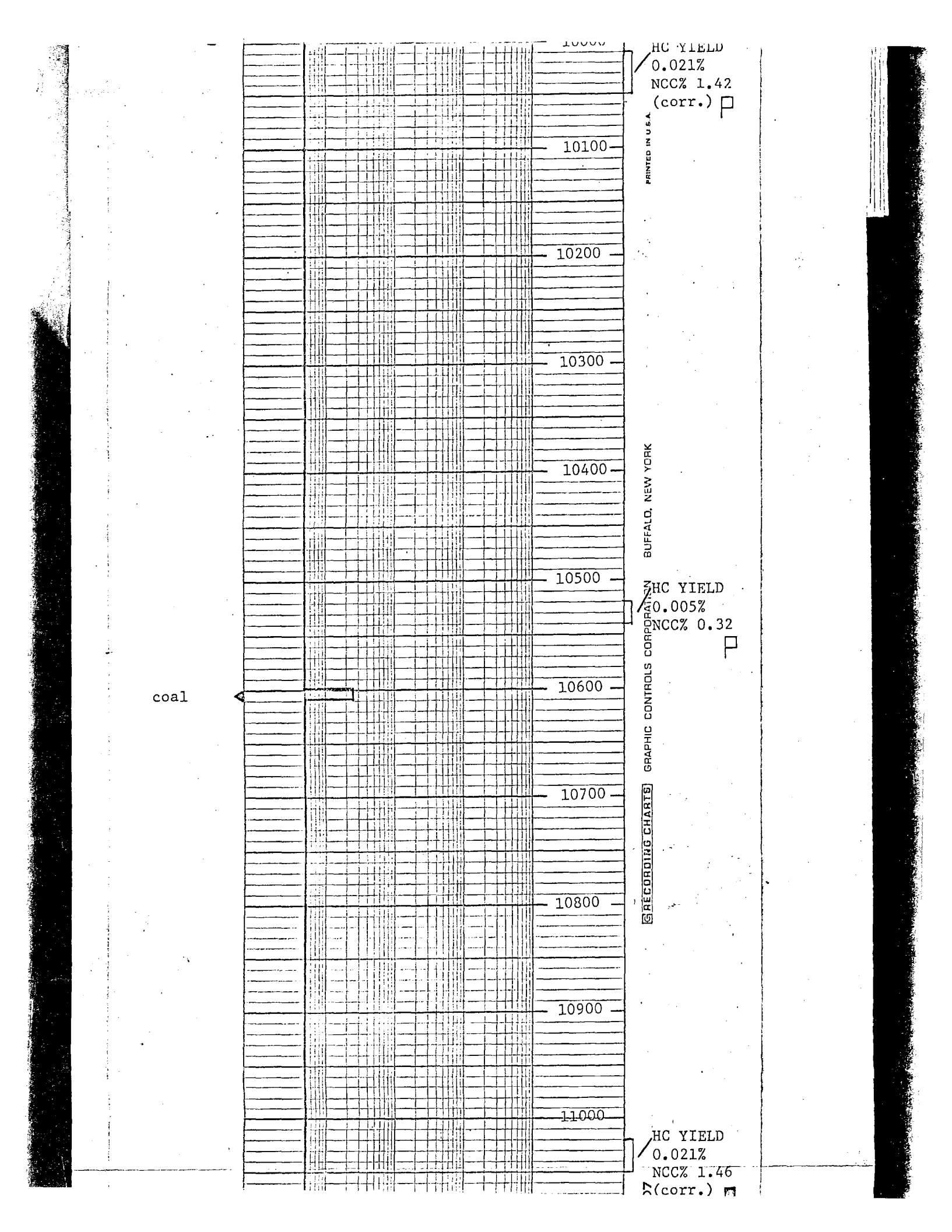
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK


8200
8300
8400
8500
8600
8700
8800
8900
9000
9100
coal
coal
caved coal
HC YIELD
0.944%
NCC%~90
(corr)
for gas
HC YIELD
0.690%
NCC%~90
(corr)
for gas
RECORDING CHARTS
GRAPHIC CONTROLS CORPOR
No. GC13307
PRINTED IN U.S.A.


9200
9300
coal
HC YIELD
0.010%
NCC% 0.48
9400
9500
9600
9700
HC YIELD
0.087%
NCC% 10.9
(corr.)
(coaly sh)
HC YIELD
0.358%
NCC% 62.8
(corr.)
for gas
(coal)
9800
9900
10000
HC YIELD
0.021%
NCC% 1.42
(corr.)
10100
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
RECORDING CHARTS
No. GC 13307
PRINTED IN U.S.A.


HC YIELD
0.021%
NCC% 1.42
(corr.)
10100
10200
10300
10400
10500
HC YIELD
0.005%
NCC% 0.32
10600
coal
10700
10800
10900
11000
HC YIELD
0.021%
NCC% 1.46
(corr.)
PRINTED IN U.S.A.
BUFFALO, NEW YORK
GRAPHIC CONTROLS CORPORATION
RECORDING CHARTS

9200

NCC% 1.46
(corr.)

No. GC 13307

11100

11200

11300

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HC YIELD
0.013%
NCC% 0.39

11400

GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

SHELL DEV. DEPTH-REFLECTANCE PLOT

PRODUCED BY DEPTH PROGRAM VERSION 2.01

API NO.	502512000100	AKA	
	PHILLIPS PETROLEUM CO.	BIG RIVER	A-1
LOCATION	15 49 S 68 W 7	LAT.	LONG.
AREA	ALEUTIAN BASIN	DATE	7 /13/82
ELEV.	281 KB	T.D.	11870

REMARKS

O-Eo=OLIGOCENE-EOCENE STEPOVAK Et=EOCENE TOLSTOI UKc=U.CRETACEOUS CHIGNIK

LKh=L.CRETACEOUS HERENDEEN Je-n=JURASSIC STANIUKOVICH-NAKNEK

PLOTTING SYMBOLS

	MEAN	VIT	FID
BAR = BARREN	-CONF +CONF	CORE ⊞	◊
ND = NO DETERMINATION		DITCH △	⧖

DEPTH IN FEET