

New Mexico Bureau of Mines and Mineral Resources  
Open File Report No. OF 199

HYDROCARBON SOURCE-ROCK EVALUATION STUDY,  
GRIMM ET AL NO. 1 MOBIL-32 WELL,  
DOÑA ANA COUNTY, NEW MEXICO

by Douglas A. Muckelroy  
GeoChem Laboratories, Inc.  
Houston, Texas  
September 10, 1982



GEOCHEMICAL ANALYSES  
SOURCE ROCK EVALUATION

CRUDE OIL—SOURCE ROCK CORRELATION

CRUDE OIL CHARACTERIZATION  
GEOCHEMICAL PROSPECTING

1143-C BRITTMORE ROAD • HOUSTON, TEXAS 77043-5094 • 713/467-7011

September 10, 1982

Marshall R. Young Oil Co.  
Clayton S. Valder  
750 West Fifth St.  
Ft. Worth, Texas 76102

Dear Mr. Valder:

Enclosed please find the results of the organic geochemical analyses performed on a suite of ninety-nine (99) dry well cuttings samples from the Grimm et al No.1 Mobil 32 Well located in Dona Ana County, New Mexico.

Upon arrival at GeoChem these samples were assigned the GeoChem Job Number 2326, and were submitted to the following organic geochemical analyses:

<u>Type of Analysis</u>	<u>Table</u>
Total organic carbon analysis and brief lithological description.....I	
Total organic carbon analysis and gross lithological description.....II	
Rock-Eval pyrolysis.....III	
Summary of C <sub>15</sub> + soxhlet extraction, deasphalting and liquid chroma- tography.....IV	
Saturate hydrocarbon analysis.....V; chromatograms	
Visual kerogen assessment.....VI	
Vitrinite reflectance analysis.....VII; histograms	

Also enclosed in this report is Summary Table I, which gives a quick reference characterization of each formation penetrated by this well.

## RESULTS AND INTERPRETATIONS

### A. Thermal Maturity

The sediments penetrated by this well can be divided into three (3) zones of thermal maturity.

#### Zone I (5880+ feet to 14100+ feet)

The sediments from the Tertiary, Lobo Formation down through the Lower Cretaceous, Sarten Formation are rated as thermally mature (mean Stage 3- to 3; Table VI). This state of thermal maturity is based on the light to dark brown coloration of the recognizable woody-structured and secondary amorphous-algal debris contained in the kerogen isolated from the cuttings samples (Table VI). This rating is supported by the mature ratings detected from the vitrinite reflectance analysis on samples 2326-006, -011 and -017 (1.50% Ro avg.; Table VII; chromatograms).

At this level of thermal maturity these sediments are located in the lower portion of the oil-generating window, wherein oil and associated gas could have been generated.

#### Zone II (14100+ feet to 20560+ feet)

The Jurassic, Permian and Pennsylvanian-aged sediments have a very mature (mean Stage 3+ to 4-; Table VI) thermal maturation rating. This rating is based on the dark brown to black coloration of the recognizable herbaceous and secondary amorphous and woody debris isolated in the visual kerogen analysis (Table VI). Supporting this interpretation are the very mature ratings detected from the vitrinite reflectance analyses on samples 2326-028, -034, -040, -049, -052, -058, -064, -071, -076, -082, and -088 (Table VII; chromatograms).

The thermal maturity of these sediments have progressed beyond the oil-generating window, thus only wet gas and condensate could be generated.

Zone III (20560+ feet to 21756 feet T.D.)

The remaining sediments, the Rancheria (Mississippian), Percha (Devonian), Fusselman (Silurian) and Montoya (Ordovician) Formations have undergone a high geothermal history and are rated as severely altered (mean STage 4-; Table VI). This high thermal maturity rating is based on the dark brown to black coloration of the recognizable relic amorphous matter type contained in the kerogen isolated from the cuttings samples (Table VI).

As in Zone II, the thermal maturity of these sediments have progressed beyond the oil-generating window, wherein only petrogenic methane ( $C_1$ ) gas could have been generated.

B. Hydrocarbon Source Characterization

The Lower Tertiary and Sarten (Lower Cretaceous) units have a mature fair oil and associated gas source character. This interpretation is based on the fair amounts of organic matter (0.79% avg. total organic carbon; Table I) which is comprised of the oil-prone amorphous and gas-prone woody matter types. This rating is supported by the fair amounts of hydrocarbon generating potential ( $S_2=0.64$  mg/g avg.; Table III) detected in the Rock-Eval pyrolysis analysis and the fair amounts of total bitumen (712 ppm avg.; Table IV) and good amounts of total hydrocarbon (277 ppm avg.; Table IV) detected in the  $C_{15+}$  soxhlet extraction, deasphalting and liquid chromatography analyses.

The sediments of the Hueco Formation (Permian; Zone II; see Summary Table I) and Magdalena Formation (Pennsylvanian) have a very mature possibly fair "wet" gas and condensate source character. This rating is based on the fair amounts of organic matter (0.60% avg. total organic carbon; Table I) analyzed which is comprised of the oil-gas-prone herbaceous, the gas-prone woody and the secondary oil-prone amorphous matter types (Table VI).

The Percha (Devonian) and Montoya (Ordovician) sediments have a severely altered, poor oil, fair to possibly good petrogenic methane ( $C_1$ ) gas source character. This interpretation is based on the fair to good amounts of organic matter (1.20% total organic carbon; Percha; 0.20% carbonate organic matter; Table I) analyzed which is comprised of the gas-prone relic amorphous and oil-gas-prone herbaceous matter types (Table VI).

Mr. Clayton S. Valder

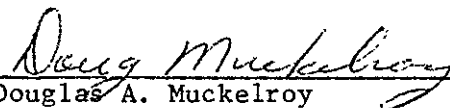
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The remaining sediments from this well contain poor amounts of organic matter (0.31% avg. total organic carbon; Table I) and also poor amounts of hydrocarbon generating potential ( $S_2=0.17$  mg/g avg.; Rock-Eval pyrolysis; Table III) thus, these sediments are considered to have a poor hydrocarbon source character.

Should we be of any further assistance concerning this study or any other matter, please do not hesitate to call upon us.

Yours truly,

  
Douglas A. Muckelroy  
GEOCHEM LABORATORIES, INC.

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Enclosures



SUMMARY TABLE 1  
GRIMM NO. 1 MOBIL 32  
DONA ANA COUNTY, NEW MEXICO  
SEC. 22 - T25S-R1E

Age Formation	Depth Interval (Feet)	Lithology	Organic Richness					Predominant Kerogen Type Visual Assessment	Thermal Maturity		Hydrocarbon Source Potential
			Organic Carbon (% rock)	Free H.C.'s Mg HC/g S <sub>1</sub>	Hydrocarbon Generating Potential Mg/ HC/g S <sub>2</sub>	C <sub>15</sub> <sup>+</sup> Bitumen (ppm)	C <sub>15</sub> <sup>+</sup> Total H.C. (ppm)		Kerogen Alteration (1-5 Scale)	Vitrinite Reflectance (% rock)	
			MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	
<u>TERTIARY</u>											
Lobo	5880-12100	Composite: shale, limestone, sandstone and dolomite.	(7) 0.18	n.a.	n.a.	n.a.	n.a.	(7) W;Am;H	(7) 3- to 3?	(1) 1.45?	Mature, poor oil and associated gas source character.
Lower Tertiary	12100-13300	60% Shale, light to medium gray. 40% Sandstone, light gray.	(10) 0.68	(2) 0.19	(2) 0.68	(1) 847	(1) 336	(3) W;H;Am	(3) 3	(2) 1.54?	Mature, fair oil and associated gas source character.
<u>LOWER CRETACEOUS</u>											
Sarten	13300-14100	75% Shale, medium dark gray. 25% Sandstone, light gray.	(8) 0.91	(2) 0.25	(2) 0.60	(2) 578	(2) 219	(2) Am(A1)-W;H;-	(2) 3	(1) 1.97?	Mature, fair oil and associated gas source character.
	14100-15550	Shale, medium dark gray. Sandstone and limestone.	(13) 0.48	(3) 0.10	(3) 0.26	n.a.	n.a.	(3) W;H;Am	(3) 3+	(3) 2.04?	Very mature, poor hydrocarbon source character.
<u>PERMIAN</u>											
Hueco Zone I	15550-16140	Limestone, brownish gray. Shale, medium dark gray.	(6) 0.38	n.a.	n.a.	n.a.	n.a.	(1) H;Am;W	(1) 3+ to 4-	n.a.	Very mature, poor hydrocarbon source character.
Hueco Zone II	16140-16820	Shale, medium dark gray.	(7) 0.65	(2) 0.18	(2) 0.14	n.a.	n.a.	(1) H;Am;W	(1) 3+ to 4-	(2) 1.88?	Very mature, possibly fair "wet" gas and condensate source character.

SUMMARY TABLE 1  
GRIMM NO. 1 MOBIL 32  
DONA ANA COUNTY, NEW MEXICO  
SEC. 22 - T25S-R1E

Age Formation	Depth Interval (Feet)	Lithology	Organic Richness					Predominant Kerogen Type Visual Assessment	Thermal Maturity		Hydrocarbon Source Potential
			Organic Carbon (% rock)	Free H.C.'s Mg HC/g S <sub>1</sub>	Hydrocarbon Generating Potential Mg/ HC/g S <sub>2</sub>	C <sub>15</sub> + Bitumen (ppm)	C <sub>15</sub> + Total H.C. (ppm)		Kerogen Alteration (1-5 Scale)	Vitrinite Reflectance (% rock)	
<u>PERMIAN (CONTD.)</u>			MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	
Hueco Zone III	16820-19080	Shale, medium dark gray. Limestone and dolomite, pinkish to brownish gray.	(22) 0.30	(3) 0.07	(3) 0.08	n.a.	n.a.	(4) H;W;Am	(4) 3+ to 4-	(4) 2.06	Very mature, poor hydrocarbon source character.
<u>PENNSYLVANIAN</u>											
Magdalena	19080-20560	Shale, dark gray. Sandstone, and dolomite.	(15) 0.56	(2) 0.43	(2) 0.32	n.a.	n.a.	(2) W;Am;H	(2) 3+ to 4-	(2) 2.01?	Very mature, possibly fair "wet" gas and condensate source character.
<u>MISSISSIPPIAN</u>											
Rancheria	20560-20710	Shale, medium dark gray.	(1) 0.44	(1) 0.24	(1) 0.24	n.a.	n.a.	(1) W-I;H;Am*	(1) 4-	(1) 2.13?	Severely altered, poor oil and associated gas source character.
<u>DEVONIAN</u>											
Percha	20710-20880	Shale, medium dark gray.	(2) 1.20	(1) 0.20	(1) 0.31	n.a.	n.a.	(1) H;Am*;W-I	(1) 4-	(1) 2.15?	Severely altered, poor oil, possible good petrogenic methane gas source character.
<u>SILURIAN</u>											
Fusselman	20880-21560	Dolomite, gray.	(7) 0.12	(1) 0.08	(1) 0.12	n.a.	n.a.	(2) Am*;H;W-I	(2) 4-	n.a.	Severely altered, poor oil and associated gas source character.
<u>ORDOVICIAN</u>											
Montoya	21560-21756 T.D.	Dolomite, brownish gray.	(1) 0.20	(1) 0.06	(1) 0.11	n.a.	n.a.	(1) Am*;H;W	(1) 4-	n.a.	Severely altered, poor oil, possibly fair petrogenic methane gas source character.

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2326-001	5940- 5950	Dolomite, argillaceous, grayish red.	0.16
2326-002	6930- 6940	Shale, dolomitic, grayish red.	0.21
2326-003	7930- 7940	Shale, dolomitic, grayish red.	0.15/0.16
2326-004	8930- 8940	Composite: Shale and sand.	0.25
2326-005	9910- 9920	50% Shale, grayish red. 50% Sandstone, medium dark gray.	0.18
2326-006	10940-10950	90% Shale, grayish red. 10% Sandstone, medium dark gray. Trace of limestone.	0.18
2326-007	11990-12000	Limestone, chert and red shale.	0.12/0.13
2326-008	12100-12110	Shale, grayish red. Trace of sandstone and limestone.	0.20
2326-009	12200-12210	Shale, grayish red. Trace of sandstone and limestone.	0.17
2326-010		No sample.	
2326-011	12570-12580	60% Sandstone, light gray. 40% Shale, medium gray.	1.94/1.97
2326-012	12640-12650	70% Sandstone, light gray. 30% Shale, medium gray.	1.07
2326-013	12730-12740	70% Sandstone, light gray. 30% Shale, medium gray.	1.05
2326-014	12850-12860	50% Shale, medium gray to medium dark gray. 50% Sandstone, light gray.	0.51
2326-015	12930-12940	50% Shale, medium gray to medium dark gray. 50% Sandstone, light gray.	0.56
2326-016	13030-13040	50% Shale, greenish gray and medium dark gray. 50% Sandstone. Trace of chert.	0.46



Table I

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GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2326-017	13130-13140	70% Shale, greenish gray and medium dark gray. 30% Sandstone, light gray.	0.44
2326-018	13220-13230	70% Shale, greenish gray and medium dark gray. 30% Sandstone, light gray.	0.41
2326-019	13320-13330	80% Shale, greenish gray and medium dark gray. 20% Sandstone, light gray.	0.75
2326-020	13430-13440	80% Shale, greenish gray and medium dark gray. 20% Sandstone, light gray.	1.39
2326-021	13530-13540	80% Shale, medium dark gray. 20% Sandstone, light gray.	0.78
2326-022	13620-13630	80% Shale, medium dark gray. 20% Sandstone, light gray.	0.85
2326-023	13740-13750	80% Shale, medium dark gray. 20% Sandstone, light gray.	1.31
2326-024	13820-13830	60% Shale, medium dark gray. 40% Sandstone, light gray.	0.63
2326-025	13920-13930	60% Shale, medium dark gray. 40% Sandstone, light gray.	0.83/0.84
2326-026	14020-14030	60% Shale, medium dark gray. 40% Sandstone, light gray.	0.74
2326-027	14130-14140	70% Shale, medium dark gray. 30% Sandstone, light gray.	0.60
2326-028	14230-14240	70% Shale, medium dark gray. 30% Sandstone, light gray.	0.83
2326-029	14320-14330	80% Shale, medium dark gray. 20% Sandstone, light gray. Trace of limestone.	0.41

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2326-030	14440-14450	60% Limestone, silty, pinkish gray. 40% Shale, medium dark gray.	0.24
2326-031	14530-14540	70% Chert, white. 30% Shale, medium dark gray.	0.39
2326-032	14630-14640	Chert, white. Trace of shale.	0.10
2326-033	14730-14740	Igneous rock, no sample picked.	
2326-034	14840-14850	Shale, medium dark gray.	0.77
2326-035	14930-14940	Igneous rock, no sample picked.	
2326-036	15030-15040	Shale, medium dark gray.	0.61
2326-037	15130-15140	Shale, slightly silicified, medium dark gray.	0.55
2326-038	15220-15240	Shale, medium dark gray.	0.44
2326-039	15330-15340	Shale, medium dark gray. Trace of sandstone and limestone.	0.48/0.49
2326-040	15420-15430	Shale, medium dark gray. Trace of sandstone and limestone.	0.46
2326-041	15540-15550	60% Limestone, pinkish gray. 40% Shale, medium dark gray.	0.34
2326-042	15640-15650	60% Limestone, argillaceous, pinkish gray. 40% Shale, medium dark gray.	0.41
2326-043	15720-15730	Limestone, brownish gray. Trace of shale.	0.32/0.35
2326-044	15820-15830	60% Limestone, brownish gray. 40% Shale, medium dark gray.	0.42
2326-045	15920-15930	70% Shale, medium dark gray. 30% Limestone, brownish gray.	0.45

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2326-046	16040-16050	Shale, medium dark gray.	0.40
2326-047	16130-16140	Composite: Shale and siltstone.	0.29
2326-048	16220-16230	Shale, medium dark gray. Trace of limestone.	0.55
2326-049	16330-16340	Shale, medium dark gray.	1.00
2326-050	16420-16430	Shale, medium dark gray.	0.70/0.71
2326-051	16520-16530	Shale, calcareous, silty, medium dark gray.	0.64
2326-052	16620-16630	Shale, calcareous, silty, medium dark gray.	0.53
2326-053	16740-16750	Shale, calcareous, silty, medium dark gray.	0.59
2326-054	16810-16820	Shale, calcareous, medium dark gray.	0.52
2326-055	16940-16950	60% Shale, calcareous, medium dark gray. 40% Limestone, brownish gray. Trace of siltstone.	0.34
2326-056	17020-17030	60% Shale, calcareous, medium dark gray. 40% Limestone, brownish gray.	0.30
2326-057	17130-17140	70% Dolomite, brownish gray. 30% Shale, calcareous, medium dark gray.	0.22
2326-058	17230-17240	80% Dolomite, brownish gray. 20% Shale, calcareous, medium dark gray.	0.24
2326-059	17320-17330	85% Limestone, pinkish gray. 15% Shale, calcareous, medium dark gray.	0.09
2326-060	17410-17420	60% Shale, calcareous, medium dark gray. 40% Limestone, silty, light brownish gray.	0.29
2326-061	17520-17530	70% Shale, calcareous, medium dark gray. 30% Limestone, silty, light brownish gray.	0.48

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2326-062	17620-17630	85% Chert, very light gray. 15% Shale, medium dark gray.	0.17
2326-063	17730-17740	60% Siltstone, light gray. 40% Shale, slightly silicified, medium dark gray.	0.17
2326-064	17820-17830	80% Shale, medium light gray. 20% Siltstone, light gray.	0.35/0.34
2326-065	17920-17930	60% Shale, medium light gray. 40% Limestone, light brownish gray.	0.33
2326-066	18020-18030	70% Shale, slightly silicified, medium dark gray. 30% Limestone and siltstone.	0.34
2326-067	18120-18130	60% Limestone, slightly silicified, light brownish gray. 40% Shale, slightly silicified, medium dark gray.	0.34
2326-068	18220-18230	70% Limestone, argillaceous, light brownish gray. 30% Shale, slightly silicified, medium dark gray.	0.32
2326-069	18320-18330	60% Shale, slightly silicified, medium dark gray. 40% Dolomite, pinkish gray.	0.26
2326-070	18430-18440	60% Dolomite, pinkish gray. 40% Shale, slightly silicified, medium dark gray.	0.12
2326-071	18520-18530	60% Dolomite, pinkish gray. 40% Shale, slightly silicified, medium dark gray.	0.39
2326-072	18620-18630	50% Dolomite, light brownish gray. 50% Shale, slightly silicified, medium dark gray.	0.46

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description		Total Organic Carbon (% of Rock)
2326-073	18730-18740	70%	Dolomite, brownish gray.	0.18
		30%	Shale, slightly silicified, medium dark gray.	
2326-074	18840-18850	60%	Shale, slightly silicified, medium dark gray.	0.43
		40%	Dolomite, brownish gray.	
2326-075	18920-18930	50%	Shale, slightly silicified, medium dark gray.	0.25/0.24
		50%	Dolomite, brownish gray.	
2326-076	19020-19030	80%	Shale, slightly silicified, medium dark gray.	0.63
		20%	Dolomite, brownish gray.	
2326-077	19120-19130	70%	Shale, slightly silicified, medium dark gray.	0.53
		30%	Dolomite, brownish gray.	
2326-078	19220-19230	80%	Shale, slightly silicified, medium dark gray.	0.54
		20%	Sandstone, light gray.	
2326-079	19320-19330		Shale, slightly silicified, medium dark gray. Trace of dolomite and sandstone.	0.54
2326-080	19420-19430	80%	Shale, medium dark gray.	0.50
		20%	Dolomite, pinkish gray.	
2326-081	19520-19530		Shale, medium dark gray.	0.48
2326-082	19620-19630		Dolomite, argillaceous, brownish gray.	0.31
2326-083	19730-19740		Shale, very calcareous, medium dark gray.	0.41
2326-084	19830-19840		Shale, very calcareous, medium dark gray.	0.43
2326-085	19920-19930		Shale, very calcareous, medium dark gray.	0.53

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2326-086	20020-20030	60% Limestone, brownish gray. 40% Shale, medium dark gray.	0.51
2326-087	20130-20140	60% Limestone, brownish gray. 40% Shale, medium dark gray.	0.69
2326-088	20230-20240	Shale, calcareous, medium dark gray.	1.25
2326-089	20330-20340	Composite: Siltstone and shale.	0.54
2326-090	20430-20440	Composite: Shale and siltstone.	0.54/0.56
2326-091	20530-20540	Composite: Shale and siltstone.	0.57
2326-092	20630-20640	Shale, silty, medium dark gray.	0.44
2326-093	20730-20740	Shale, medium dark gray. Trace of siltstone.	1.05
2326-094	20830-20840	Shale, medium dark gray.	1.35
2326-095	20930-20940	Dolomite, pinkish gray.	0.11
2326-096	21030-21040	Dolomite, brownish gray.	0.09
2326-097	21130-21140	Dolomite, brownish gray.	0.07
2326-098	21230-21240	Dolomite, brownish gray.	0.09
2326-099	21330-21340	Dolomite, brownish gray.	0.15
2326-100	21430-21440	Dolomite, brownish gray.	0.10/0.10
2326-101	21530-21540	Dolomite, brownish gray.	0.21
2326-102	21630-21640	Dolomite, brownish gray.	0.20

## ORGANIC CARBON ANALYSES AND GROSS LITHOLOGICAL DESCRIPTION

GeoChem Sample Number	Well Interval (Feet)	Gross Lithological Description		GSA Color Code	Total Organic Carbon (% of Rock)
2326-011					2.50
-A	12500-12770	60%	Sandstone, noncalcareous, medium fine, subangular and clear grains, quartzose, chunky, poor porosity, no show, light gray.	N7	
-B		40%	Shale, noncalcareous, chunky, splintery, medium gray to medium dark gray. Trace of coal.		
2326-020					2.39/2.42
-A	13230-13530	60%	Sandstone, noncalcareous, medium fine, subangular and clear grains, quartzose, chunky, poor porosity, no show, light gray.	N7	
-B		40%	Shale, noncalcareous, chunky, splintery, medium gray to medium dark gray. Trace of coal.		
2326-023					1.09
-A	13540-13700	80%	Shale, noncalcareous, chunky, splintery, medium gray to medium dark gray.	N7	
-B		20%	Sandstone, noncalcareous, medium fine, subangular and clear grains, quartzose, chunky, poor porosity, no show, light gray.		

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

Table III  
RESULTS OF ROCK-EVAL PYROLYSIS

GeoChem Sample No.	Depth Interval (Ft.)	Tmax (C)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PI	PC*	T.O.C. (wt. %)	Hydrogen Index	Oxygen
2326-011	12570-12580	471	0.29	1.15	0.23	0.20	0.12	1.96	58	11
2326-014	12850-12860	442	0.09	0.21	0.22	0.30	0.02	0.51	41	43
2326-020	13430-13440	472	0.14	0.70	0.13	0.17	0.07	1.39	50	9
2326-023	13740-13750	356	0.35	0.50	0.44	0.42	0.07	1.31	38	33
2326-028	14230-14240	378	0.08	0.23	0.28	0.27	0.02	0.83	27	33
2326-034	14840-14850	526	0.10	0.43	0.46	0.19	0.04	0.77	55	59
2326-040	15420-15430	347	0.13	0.13	0.24	0.50	0.02	0.46	28	52
2326-049	16330-16340	353	0.20	0.13	0.36	0.62	0.02	1.00	13	36
2326-052	16620-16630	362	0.16	0.15	0.39	0.53	0.02	0.53	28	73
2326-058	17230-17240	429	0.04	0.06	0.18	0.40	0.00	0.24	25	75
2326-067	18120-18130	393	0.04	0.03	0.62	0.67	0.00	0.34	8	182
2326-076	19020-19030	357	0.14	0.16	0.54	0.47	0.02	0.63	25	85
2326-082	19620-19630	384	0.40	0.10	0.60	0.80	0.04	0.31	32	193
2326-088	20230-20240	356	0.45	0.54	0.60	0.46	0.08	1.25	43	48
2326-092	20630-20640	366	0.24	0.24	0.35	0.50	0.04	0.44	54	79
2326-094	20830-20840	367	0.20	0.31	0.13	0.40	0.04	1.35	22	9
2326-101	21530-21540	417	0.08	0.12	0.19	0.40	0.01	0.21	57	90
2326-102	21630-21640	423	0.06	0.11	0.18	0.37	0.01	0.20	55	90



Table IV

Summary of C15+ Soxhlet Extraction, Deasphalting  
and Liquid Chromatography

## A. Weights of Extracts and Chromatographic Fractions

GeoChem Sample Number	Well Interval	Weight of Rock Extd. (grams)	Total Extract (grams)	Precipitated Asphaltenes (grams)	N-C5 Soluble (grams)	Sulfur (grams)	Paraffins- Naphthenes (grams)	Aromatics (grams)	Eluted NSO'S (grams)	Noneluted NSO'S (grams)
2326-011	12500-12770	45.0	0.0381	0.0100	0.0281	N.D.	0.0087	0.0064	0.0109	0.0021
2326-020	13230-13530	79.3	0.0460	0.0093	0.0367	N.D.	0.0114	0.0052	0.0149	0.0052
2326-023	13540-13700	100.0	0.0576	0.0098	0.0478	N.D.	0.0179	0.0050	0.0177	0.0072

## B. Concentration of Extracted Materials in Rock

GeoChem Sample Number	Well Interval	Total Extract (ppm)	-----Hydrocarbons-----				-----Nonhydrocarbons-----			
			Paraffin- Naphthene (ppm)	Aromatic (ppm)	Total (ppm)	Sulfur (ppm)	Precipitd. Asphaltene (ppm)	Eluted NSO'S (ppm)	Noneluted NSO'S (ppm)	Total (ppm)
2326-011	12500-12770	847	193	142	336	-	222	242	47	511
2326-020	13230-13530	580	144	66	209	-	117	188	66	371
2326-023	13540-13700	576	179	50	229	-	98	177	72	347

## C. Composition of Extracts

GeoChem Sample Number	Well Interval	-----Hydrocarbons-----				-----Nonhydrocarbons-----					
		Paraffin- Naphthene %	Aromatic %	PN/Arom	Sulfur %	Eluted NSO'S %	Noneluted NSO'S %	Precipitd. Asphaltene %	Asph/NSO	HC'S %	HC/Non HC
2326-011	12500-12770	22.8	16.8	1.36	-	28.6	5.5	26.2	0.77	39.6	0.66
2326-020	13230-13530	24.8	11.3	2.19	-	32.4	11.3	20.2	0.46	36.1	0.56
2326-023	13540-13700	31.1	8.7	3.58	-	30.7	12.5	17.0	0.39	39.8	0.66

Table V-A

## Saturate Hydrocarbon Analyses

## Summary of Paraffin-Naphthene Distribution

GeoChem Sample Number	Well Interval	% Paraffin	% Isoprenoid	% Naphthene	C-P Index A	C-P Index B	ip19/ip20
2326-011	12500-12770	25.8	4.5	69.7	0.99	1.12	1.43
2326-020	13320-13530	30.5	4.7	64.8	1.02	1.12	1.43
2326-023	13540-13700	25.0	4.2	70.8	1.03	1.11	1.60

Table V-B

## Saturate Hydrocarbon Analyses

## Normalized Paraffin Distribution

GeoChem Sample Number	Well Interval	% nC15	% nC16	% nC17	% ip19	% nC18	% ip20	% nC19	% nC20	% nC21	% nC22	% nC23	% nC24	% nC25	% nC26	% nC27	% nC28	% nC29	% nC30	% nC31	% nC32	% nC33	% nC34	% nC35
2326-011	12500-12770	2.1	9.7	14.0	8.7	10.4	6.1	7.3	5.8	5.8	6.6	5.6	4.9	3.7	2.7	2.3	1.5	1.1	0.7	0.5	0.2	0.2	0.1	0.0
2326-020	13320-13530	1.9	9.8	14.5	7.9	11.5	5.5	7.7	6.1	6.0	6.7	6.6	5.1	3.6	2.6	1.8	1.0	0.8	0.4	0.3	0.1	0.1	0.1	0.1
2326-023	13540-13700	3.6	11.9	14.6	8.8	10.1	5.5	7.3	5.7	5.8	6.0	5.5	4.4	3.2	2.4	1.7	1.1	0.9	0.5	0.4	0.2	0.2	0.1	0.0

Table VI

W

W = Walnut debris.

Table VI

GEOCHEM No.	DEPTH	INDIGENOUS POPULATION (INTERPRETED)										GENERAL CHARACTERISTICS										CAVED AND/OR REWORKED POPULATION(S)										SUMMARY ORGANIC MATTER TYPE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		TYPE OF ORGANIC MATTER					MATURATION INDEX					COLOR OF ORGANIC MATTER			STATE OF ORGANIC MATTER			%				TYPE OF ORGANIC MATTER			MATURATION INDEX																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		ALIPHATIC	AROMATIC	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED		CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED	CONDENSED

Table VII  
VITRINITE REFLECTANCE SUMMARY

GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE ( % Ro)	MAXIMUM REFLECTANCE ( % Ro)	MEAN REFLECTANCE ( % Ro)	STD. DEV. ( % Ro)	REMARKS
2326-001	5950	CTG	NO VITRINITE						
2326-006	10950	CTG	(1)	13	1.21	1.58	1.45	0.102	INDIGENOUS (?)
			(2)	33	1.71	3.00	2.16	0.383	REWORKED (?)
2326-011	12770	CTG	(1)	44	1.20	1.78	1.51	0.173	INDIGENOUS (?)
			(2)	16	1.82	2.58	2.07	0.236	REWORKED (?)
2326-017	13140	CTG	(1)	6	1.19	1.31	1.26	0.048	CAVED (?)
			(2)	32	1.37	1.77	1.57	0.108	INDIGENOUS (?)
			(3)	22	1.85	2.45	2.07	0.159	REWORKED (?)
2326-024	13830	CTG	(1)	3	1.32	1.48	1.41	0.083	CAVED (?)
			(2)	36	1.65	2.15	1.97	0.135	INDIGENOUS (?)
			(3)	21	2.19	2.73	2.37	0.139	REWORKED (?)
2326-028	14240	CTG	(1)	7	1.40	1.74	1.63	0.116	CAVED (?)
			(2)	38	1.86	2.55	2.23	0.217	INDIGENOUS (?)
			(3)	15	2.62	3.50	2.99	0.273	REWORKED (?)
2326-034	14850	CTG	(1)	19	1.20	1.69	1.46	0.163	CAVED (?)
			(2)	34	1.74	2.25	1.98	0.146	INDIGENOUS (?)
			(3)	7	2.35	2.54	2.44	0.067	REWORKED (?)
2326-040	15430	CTG	(1)	13	1.25	1.57	1.40	0.096	CAVED (?)
			(2)	44	1.61	2.28	1.92	0.174	INDIGENOUS (?)
			(3)	3	2.37	2.51	2.45	0.071	REWORKED (?)
2326-049	16340	CTG	(1)	1	1.31	1.31	1.31	-	CAVED (?)
			(2)	38	1.53	2.13	1.84	0.174	INDIGENOUS (?)
			(3)	17	2.20	3.03	2.43	0.238	REWORKED (?)

Table VII  
VITRINITE REFLECTANCE SUMMARY

GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE ( % Ro)	MAXIMUM REFLECTANCE ( % Ro)	MEAN REFLECTANCE ( % Ro)	STD. DEV. ( % Ro)	REMARKS
2326-052	16630	CTG	(1)	1	1.25	1.25	1.25	-	CAVED (?)
			(2)	11	1.63	2.19	1.92	0.177	INDIGENOUS (?)
			(3)	16	2.33	2.97	2.68	0.172	REWORKED (?)
2326-058	17240	CTG	(1)	3	1.33	1.39	1.36	0.031	CAVED (?)
			(2)	26	1.64	2.39	1.94	0.212	INDIGENOUS (?)
			(3)	17	2.55	3.46	3.00	0.300	REWORKED (?)
2326-064	17830	CTG	(1)	5	1.65	1.72	1.68	0.031	CAVED (?)
			(2)	36	1.78	2.52	2.13	0.184	INDIGENOUS (?)
			(3)	19	2.62	3.90	3.22	0.370	REWORKED (?)
2326-071	18530	CTG	(1)	7	1.41	1.69	1.60	0.097	CAVED (?)
			(2)	27	1.76	2.23	2.00	0.136	INDIGENOUS (?)
			(3)	20	2.49	3.93	3.19	0.426	REWORKED (?)
2326-076	19030	CTG	(1)	4	1.44	1.63	1.56	0.081	CAVED (?)
			(2)	11	1.87	2.45	2.17	0.199	INDIGENOUS (?)
			(3)	45	2.86	4.73	3.96	0.372	REWORKED (?)
2326-082	19630	CTG	(1)	10	1.19	1.69	1.47	0.160	CAVED (?)
			(2)	23	1.76	2.27	2.01	0.162	INDIGENOUS (?)
			(3)	27	2.42	4.63	3.38	0.812	REWORKED (?)
2326-088	20240	CTG	(1)	11	1.24	1.64	1.46	0.123	CAVED (?)
			(2)	22	1.72	2.35	2.02	0.208	INDIGENOUS (?)
			(3)	21	2.55	4.54	3.48	0.668	REWORKED (?)
2326-092	20640	CTG	(1)	12	1.30	1.79	1.51	0.181	CAVED (?)
			(2)	24	1.90	2.53	2.13	0.198	INDIGENOUS (?)
			(3)	24	2.66	4.47	3.52	0.622	REWORKED (?)

Table VII  
VITRINITE REFLECTANCE SUMMARY

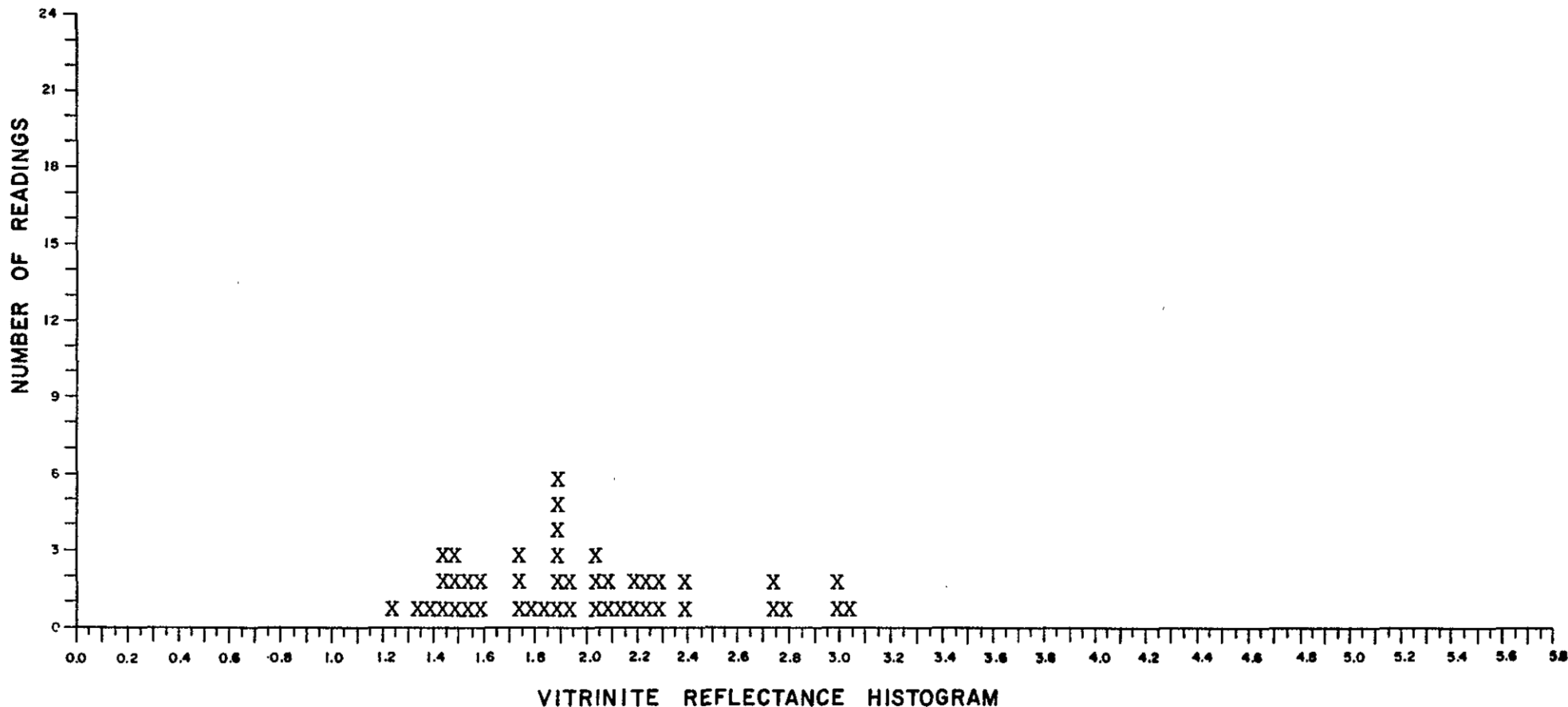
GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE ( % Ro)	MAXIMUM REFLECTANCE ( % Ro)	MEAN REFLECTANCE ( % Ro)	STD. DEV. ( % Ro)	REMARKS
2326-094	20840	CTG	(1)	4	1.35	1.69	1.57	0.152	CAVED (?)
			(2)	35	1.87	2.51	2.15	0.188	INDIGENOUS (?)
			(3)	21	2.63	4.56	3.52	0.652	REWORKED (?)

GEOCHEM NO. 2326-006 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 10950

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 46) 1.21 1.34 1.38 1.42 1.43 1.44 1.48 1.49 1.49 1.54 1.54 1.56 1.58 1.71  
 1.72 1.74 1.77 1.84 1.85 1.86 1.87 1.89 1.89 1.89 1.92 1.92 2.00 2.01 2.01 2.06 2.09 2.14  
 2.15 2.16 2.22 2.23 2.25 2.28 2.37 2.38 2.73 2.74 2.77 2.95 2.99 3.00

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	13	1.21	1.58	1.45	0.102	
(2)	33	1.71	3.00	2.16	0.383	



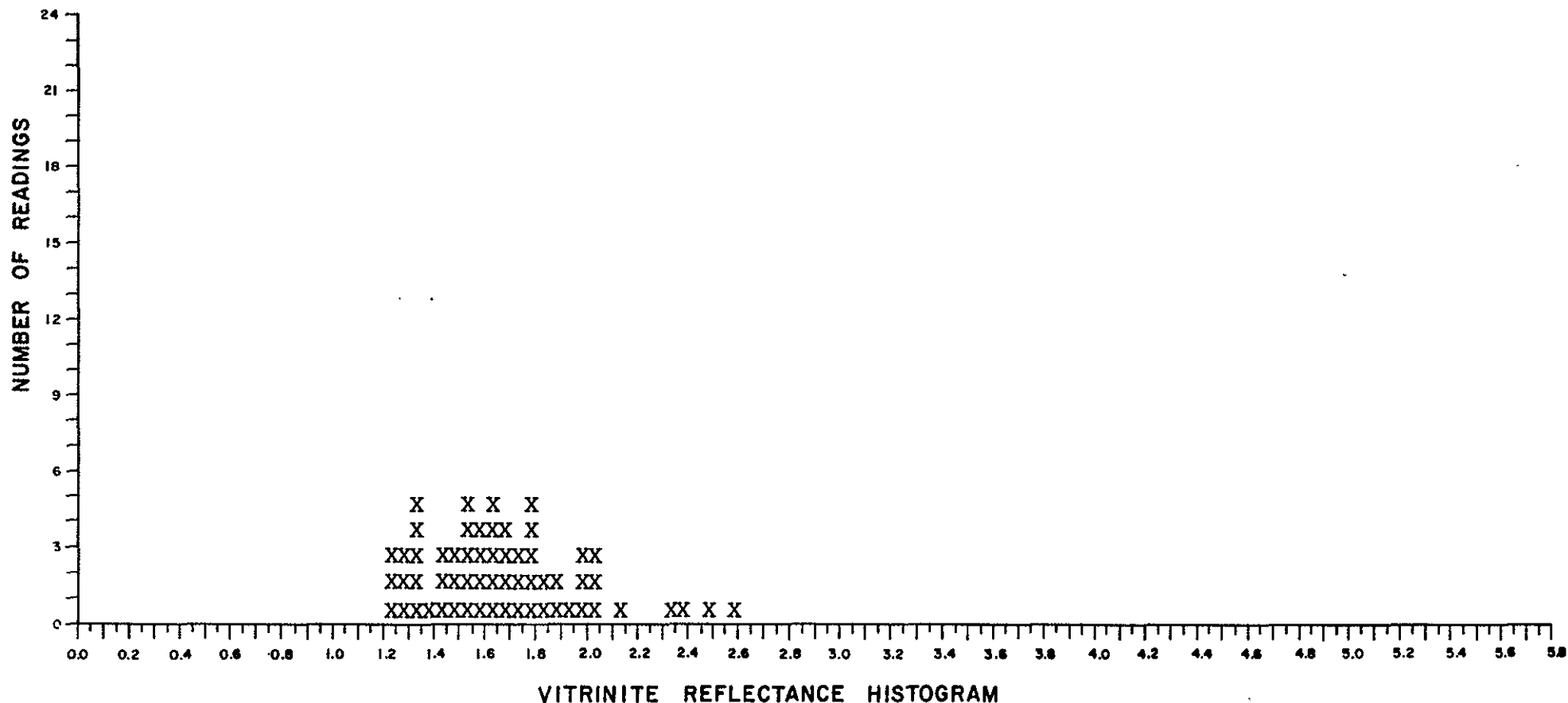


GEOCHEM NO. 2326-011 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 12770

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.20 1.22 1.22 1.26 1.26 1.29 1.30 1.30 1.33 1.33 1.33 1.35 1.40 1.41  
 1.42 1.47 1.47 1.47 1.51 1.52 1.53 1.54 1.54 1.56 1.57 1.58 1.59 1.60 1.61 1.61 1.63 1.64  
 1.65 1.65 1.65 1.68 1.70 1.70 1.71 1.75 1.75 1.77 1.78 1.78 1.82 1.83 1.87 1.88 1.92 1.95  
 1.95 1.98 2.01 2.03 2.04 2.13 2.33 2.38 2.45 2.58

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	44	1.20	1.78	1.51	0.173	
(2)	16	1.82	2.58	2.07	0.236	

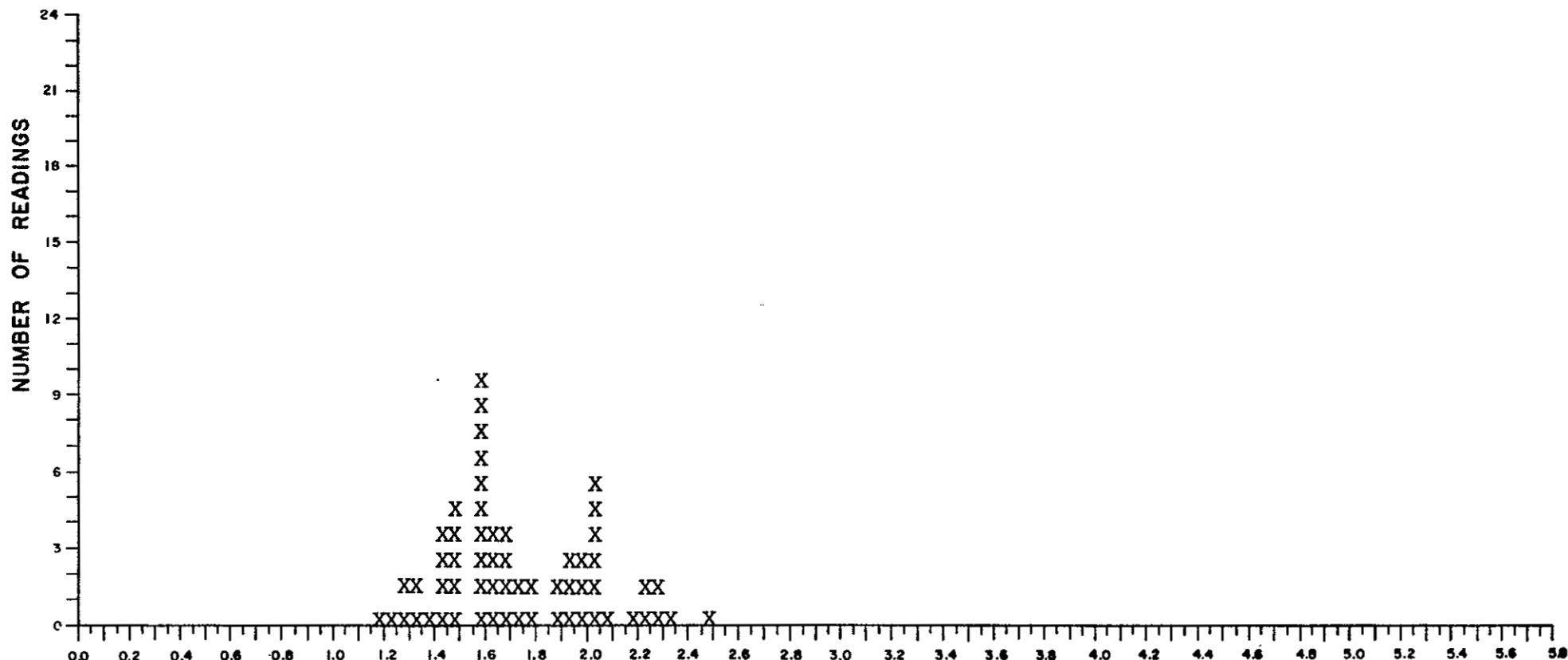


GEOCHEM NO. 2326-017 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 13140

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.19 1.22 1.27 1.29 1.30 1.31 1.37 1.40 1.41 1.42 1.44 1.45 1.46 1.47  
 1.48 1.49 1.55 1.57 1.57 1.57 1.58 1.58 1.58 1.59 1.59 1.59 1.60 1.62 1.62 1.64 1.65 1.67  
 1.68 1.69 1.71 1.73 1.76 1.77 1.85 1.89 1.94 1.94 1.94 1.95 1.97 1.98 2.00 2.00 2.02 2.03  
 2.04 2.04 2.07 2.18 2.21 2.23 2.26 2.27 2.34 2.45

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	6	1.19	1.31	1.26	0.048	
(2)	32	1.37	1.77	1.57	0.108	
(3)	22	1.85	2.45	2.07	0.159	



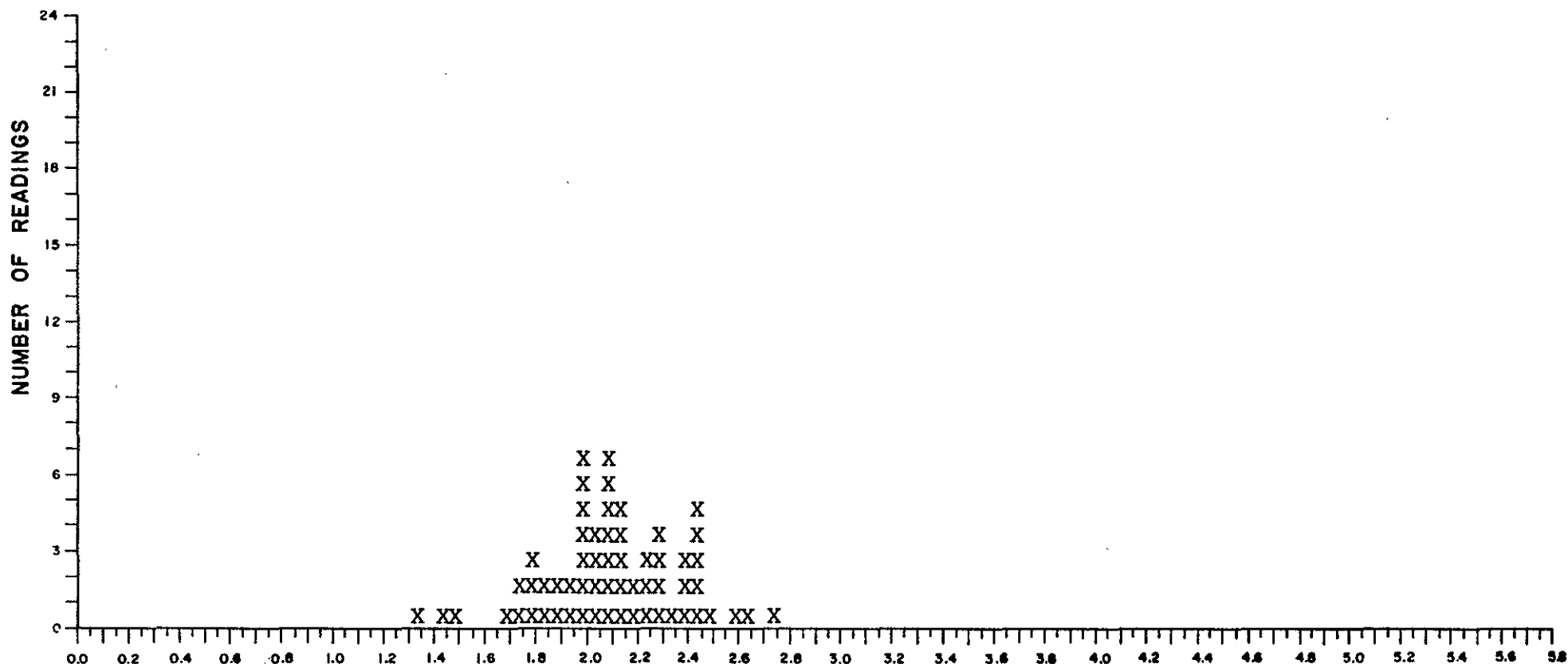
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2326-024 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 13830

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.32 1.44 1.48 1.65 1.71 1.72 1.76 1.78 1.79 1.84 1.84 1.85 1.86 1.90  
 1.94 1.95 1.95 1.96 1.97 1.99 1.99 1.99 2.00 2.02 2.03 2.04 2.06 2.07 2.07 2.07 2.07 2.08  
 2.09 2.10 2.11 2.12 2.12 2.14 2.15 2.19 2.20 2.21 2.23 2.25 2.26 2.27 2.28 2.33 2.36 2.37  
 2.38 2.40 2.40 2.40 2.41 2.44 2.45 2.56 2.60 2.73

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	3	1.32	1.48	1.41	0.083	
(2)	36	1.65	2.15	1.97	0.135	
(3)	21	2.19	2.73	2.37	0.139	



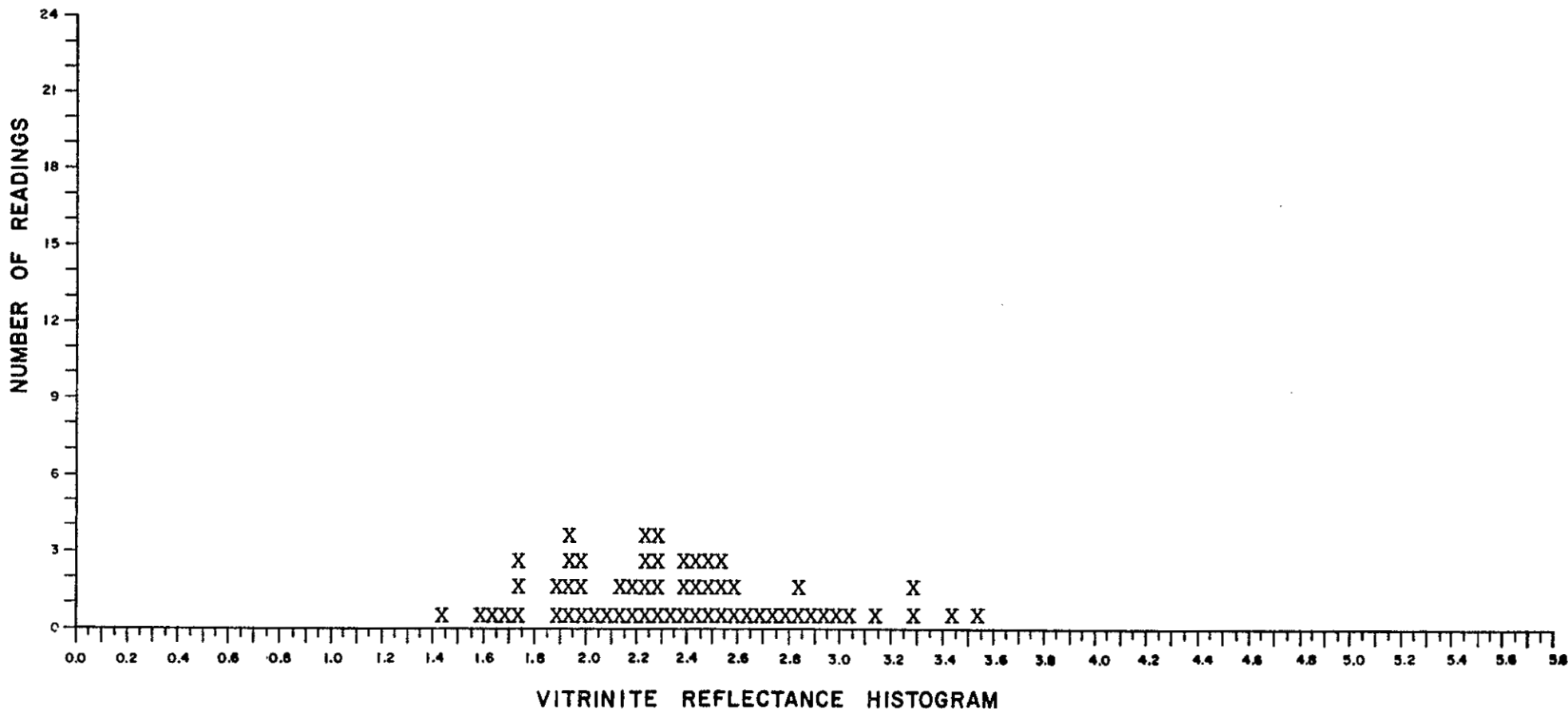
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2326-028 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 14240

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.40 1.59 1.62 1.68 1.70 1.71 1.74 1.86 1.88 1.92 1.92 1.93 1.93 1.95  
 1.96 1.98 2.04 2.05 2.13 2.14 2.18 2.18 2.20 2.22 2.22 2.23 2.26 2.27 2.27 2.28 2.31 2.35  
 2.37 2.38 2.40 2.41 2.42 2.46 2.47 2.48 2.50 2.54 2.54 2.55 2.55 2.62 2.68 2.74 2.77 2.80  
 2.82 2.87 2.91 2.98 3.04 3.12 3.26 3.27 3.42 3.50

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV (%)</u>	<u>REMARKS</u>
(1)	7	1.40	1.74	1.63	0.116	
(2)	38	1.86	2.55	2.23	0.217	
(3)	15	2.62	3.50	2.99	0.273	

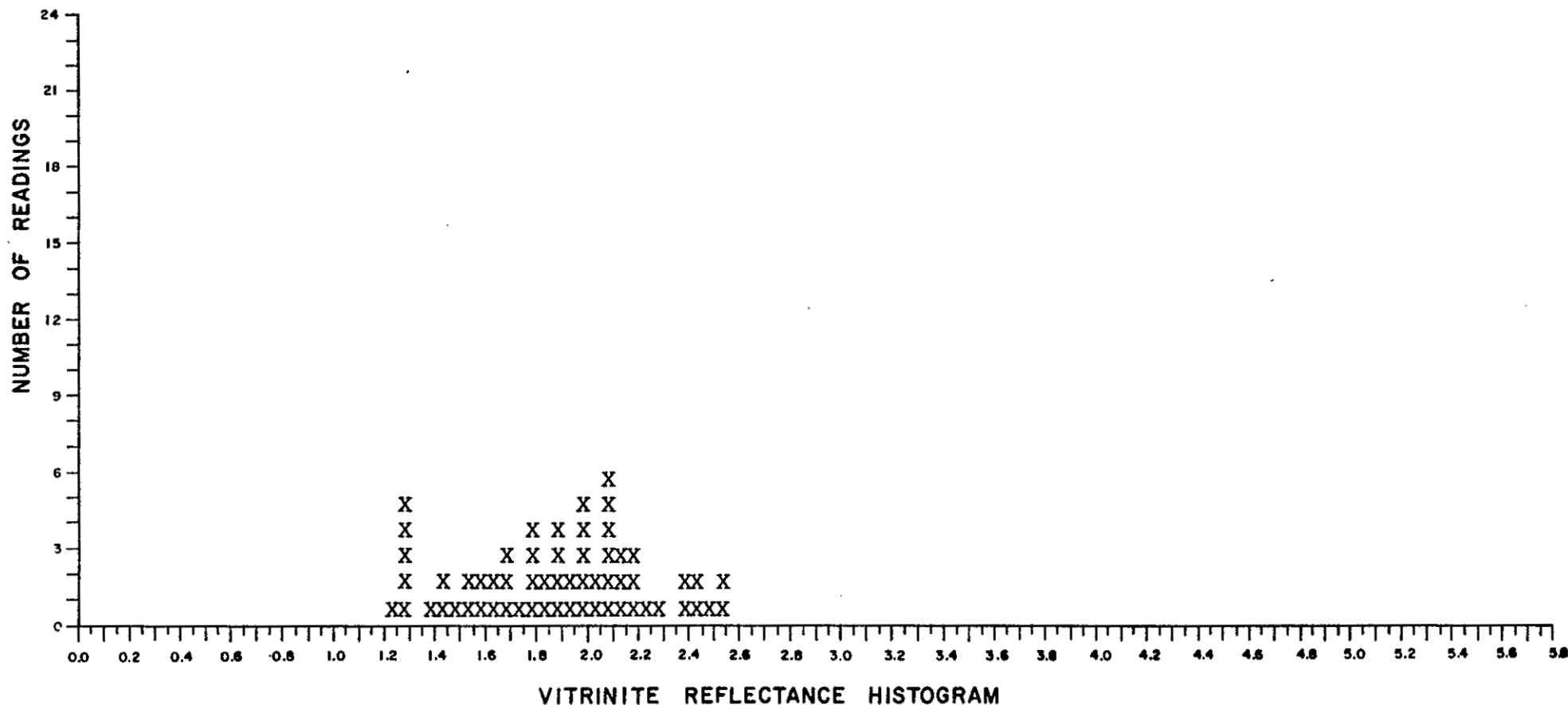


GEOCHEM NO. 2326-034 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 14850

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.20 1.25 1.26 1.28 1.29 1.29 1.39 1.41 1.43 1.48 1.52 1.53 1.56 1.57  
 1.62 1.63 1.67 1.68 1.69 1.74 1.76 1.76 1.77 1.78 1.83 1.84 1.85 1.86 1.87 1.88 1.90 1.91  
 1.97 1.97 1.98 1.98 1.99 2.01 2.04 2.06 2.06 2.07 2.07 2.07 2.10 2.11 2.13 2.18 2.19  
 2.19 2.20 2.25 2.35 2.39 2.40 2.41 2.46 2.50 2.54

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	19	1.20	1.69	1.46	0.163	
(2)	34	1.74	2.25	1.98	0.146	
(3)	7	2.35	2.54	2.44	0.067	

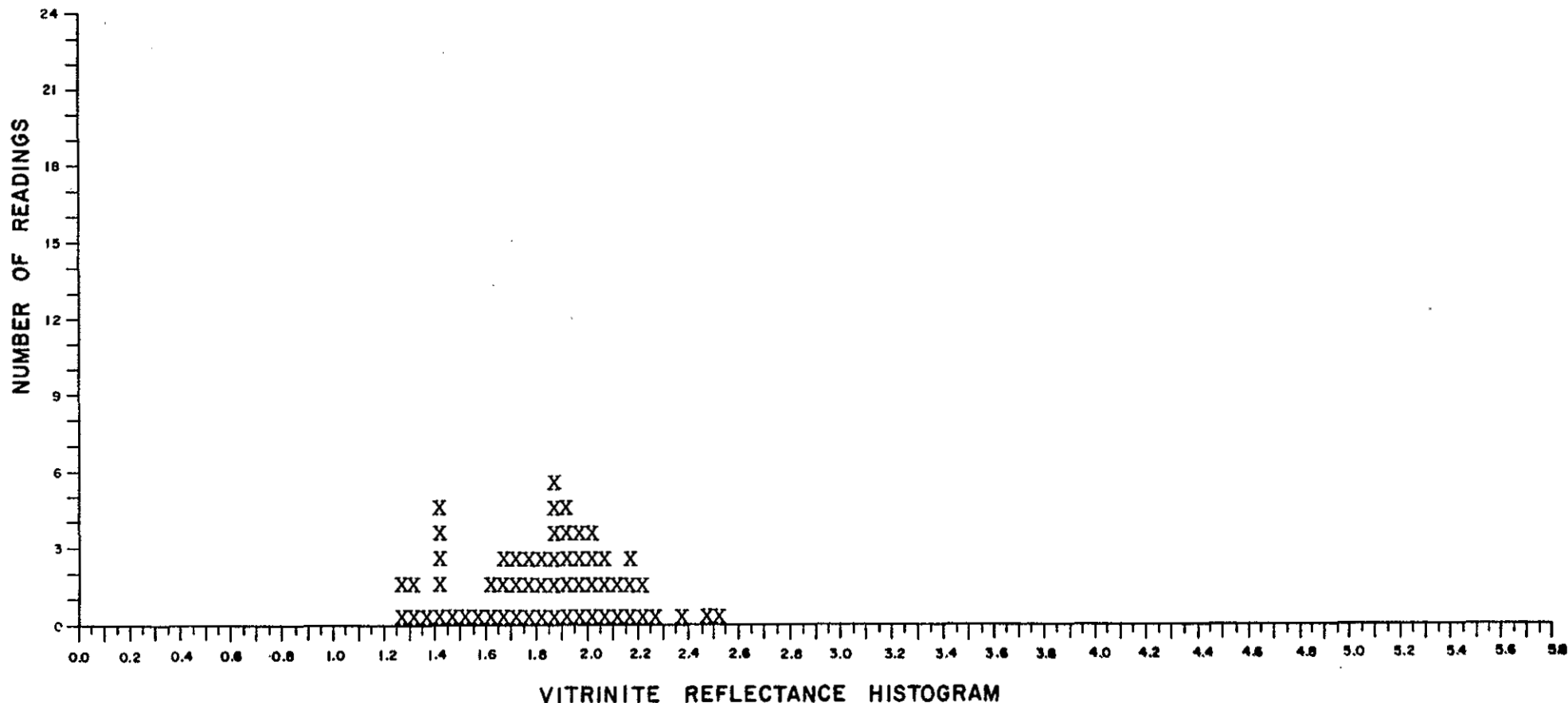


GEOCHEM NO. 2326-040 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 15430

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.25 1.26 1.32 1.32 1.37 1.40 1.41 1.43 1.44 1.44 1.45 1.54 1.57 1.61  
 1.64 1.68 1.68 1.69 1.71 1.71 1.72 1.76 1.76 1.79 1.80 1.83 1.84 1.85 1.85 1.86 1.87 1.88  
 1.89 1.90 1.90 1.91 1.92 1.92 1.95 1.97 1.97 1.97 2.00 2.03 2.03 2.04 2.05 2.05 2.08 2.11  
 2.13 2.16 2.19 2.19 2.22 2.24 2.28 2.37 2.46 2.51

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV (%)	REMARKS
(1)	13	1.25	1.57	1.40	0.096	
(2)	44	1.61	2.28	1.92	0.174	
(3)	3	2.37	2.51	2.45	0.071	

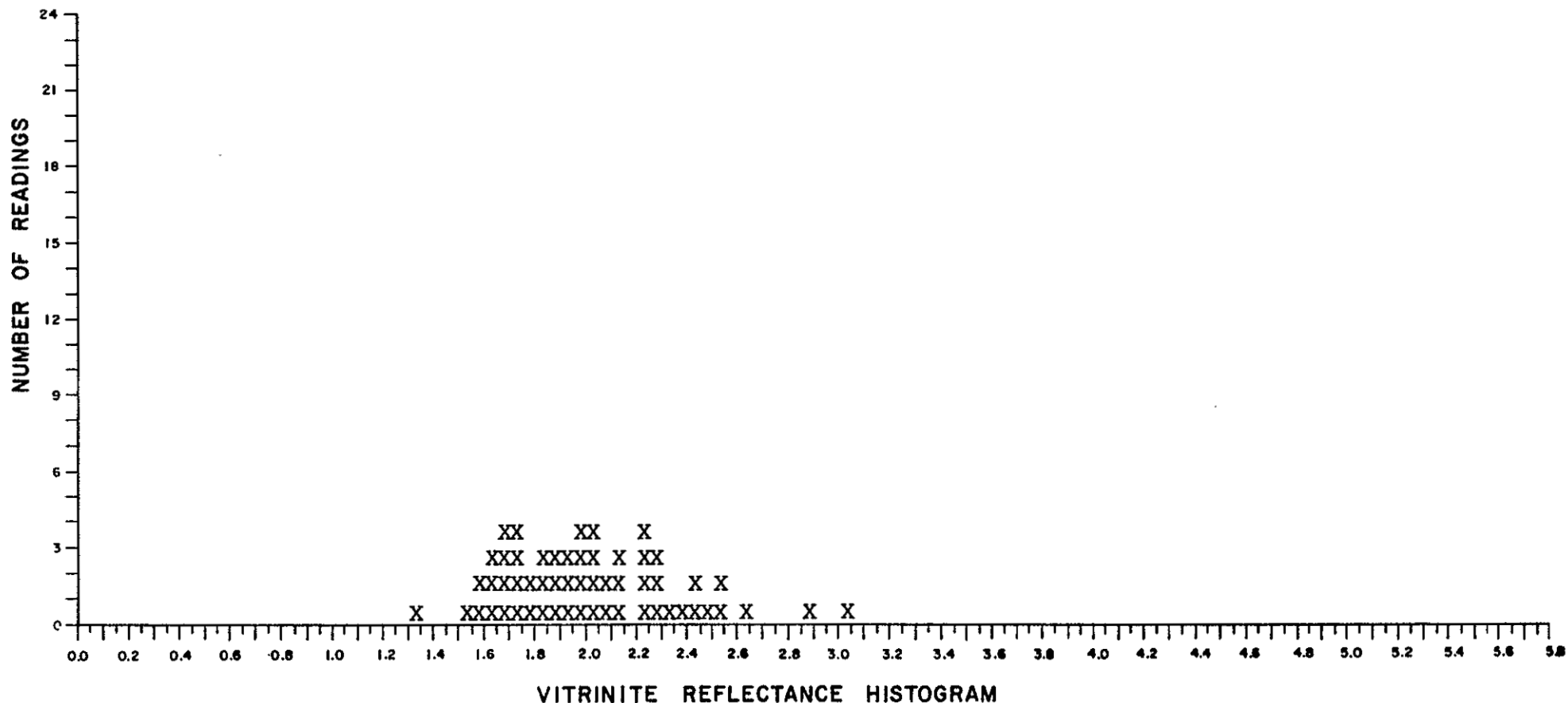


GEOCHEM NO. 2326-049 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 16340

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 56) 1.31 1.53 1.55 1.56 1.61 1.61 1.62 1.67 1.68 1.69 1.69 1.70 1.71 1.71  
 1.72 1.76 1.77 1.80 1.81 1.84 1.85 1.88 1.89 1.93 1.93 1.94 1.96 1.96 1.96 1.96 2.00 2.01  
 2.02 2.03 2.05 2.05 2.10 2.12 2.13 2.20 2.22 2.23 2.23 2.25 2.28 2.29 2.30 2.37 2.40 2.44  
 2.49 2.53 2.54 2.64 2.88 3.03

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	1	1.31	1.31	1.31	-	
(2)	38	1.53	2.13	1.84	0.174	
(3)	17	2.20	3.03	2.43	0.238	

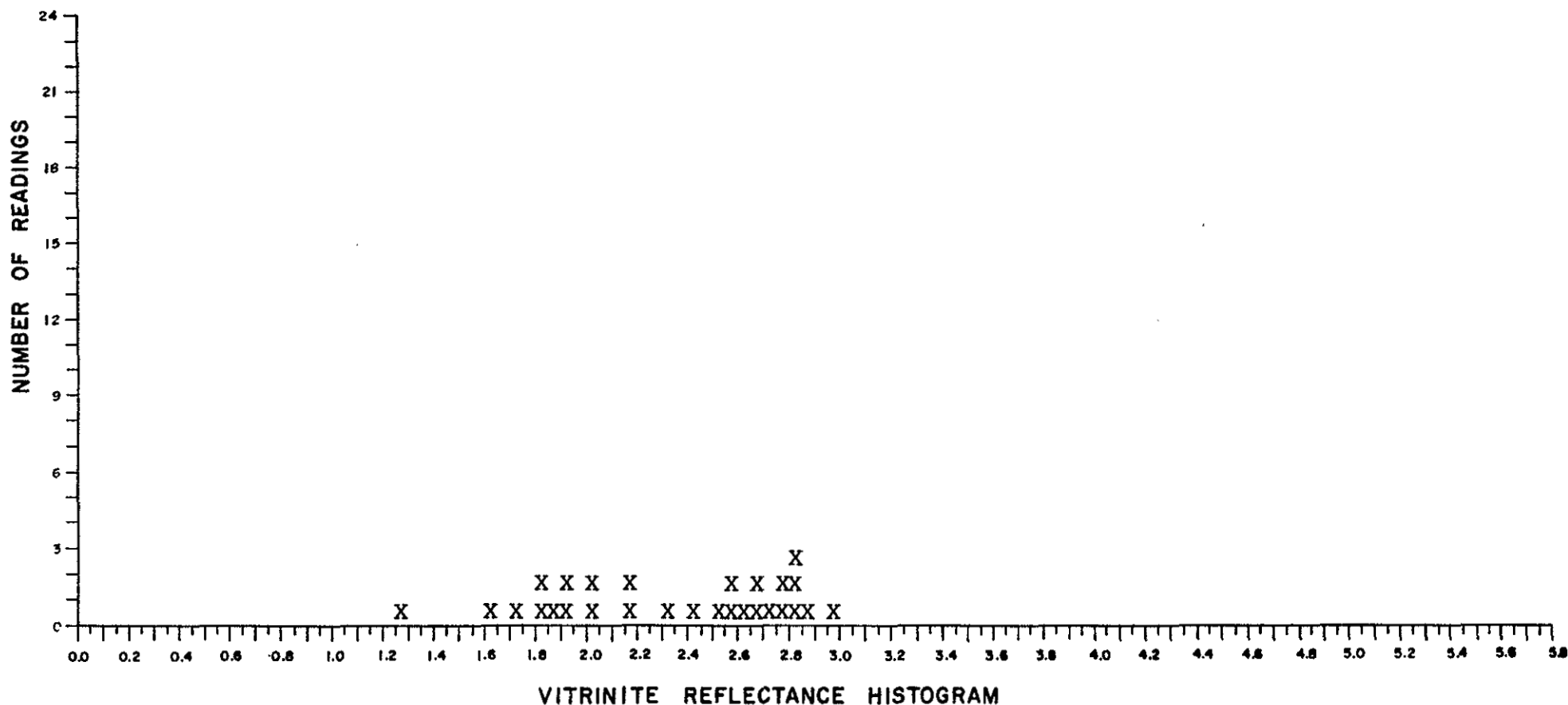


GEOCHEM NO. 2326-052 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 16630

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 28) 1.25 1.63 1.70 1.80 1.81 1.89 1.90 1.93 2.03 2.04 2.15 2.19 2.33 2.42  
2.51 2.55 2.56 2.64 2.65 2.67 2.74 2.75 2.79 2.80 2.81 2.84 2.85 2.97

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	1	1.25	1.25	1.25	-	
(2)	11	1.63	2.19	1.92	0.177	
(3)	16	2.33	2.97	2.68	0.172	



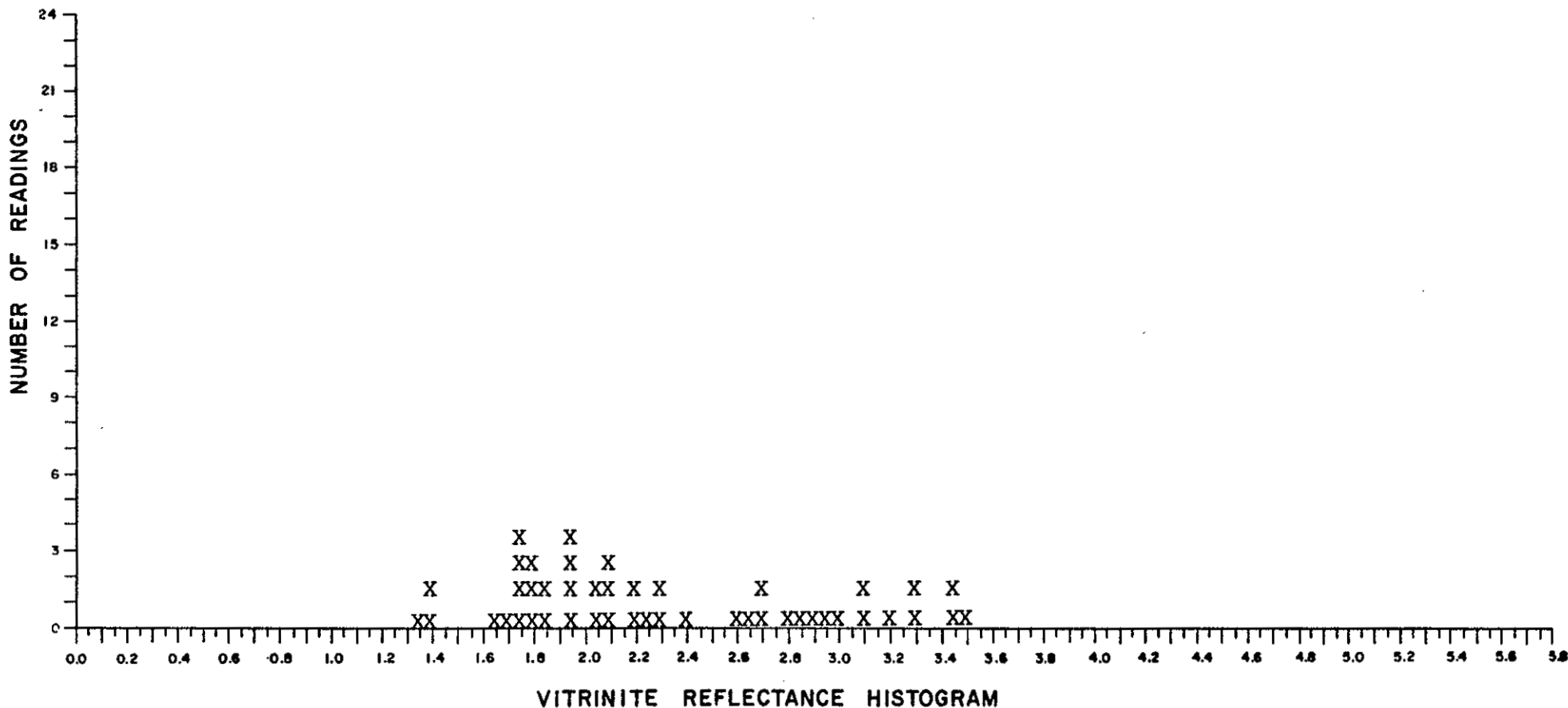


GEOCHEM NO. 2326-058 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 17240

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 46) 1.33 1.35 1.39 1.64 1.66 1.72 1.73 1.73 1.73 1.75 1.76 1.77 1.80 1.80  
 1.92 1.92 1.92 1.94 2.02 2.04 2.05 2.06 2.06 2.15 2.17 2.24 2.25 2.25 2.39 2.55 2.60 2.66  
 2.68 2.76 2.83 2.85 2.94 2.95 3.07 3.08 3.16 3.26 3.29 3.40 3.43 3.46

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	3	1.33	1.39	1.36	0.031	
(2)	26	1.64	2.39	1.94	0.212	
(3)	17	2.55	3.46	3.00	0.300	

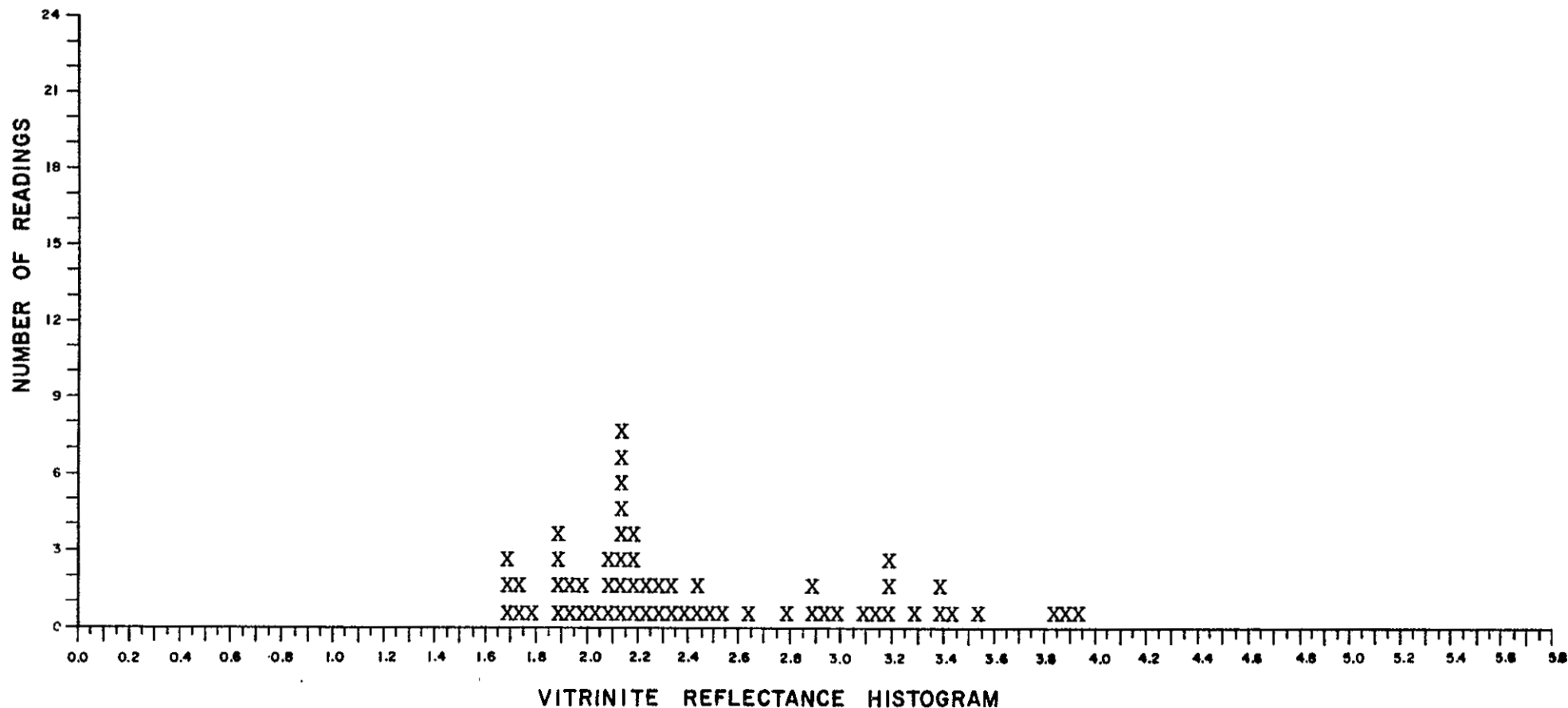


GEOCHEM NO. 2326-064 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 17830

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.65 1.65 1.69 1.70 1.72 1.78 1.85 1.87 1.88 1.89 1.91 1.92 1.95 1.97  
 2.04 2.05 2.08 2.08 2.10 2.10 2.11 2.11 2.11 2.12 2.12 2.13 2.16 2.17 2.17 2.19 2.20 2.24  
 2.26 2.28 2.31 2.34 2.36 2.40 2.42 2.48 2.52 2.62 2.77 2.86 2.86 2.91 2.96 3.06 3.12 3.15  
 3.16 3.19 3.28 3.35 3.39 3.43 3.50 3.81 3.89 3.90

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	5	1.65	1.72	1.68	0.031	
(2)	36	1.78	2.52	2.13	0.184	
(3)	19	2.62	3.90	3.22	0.370	

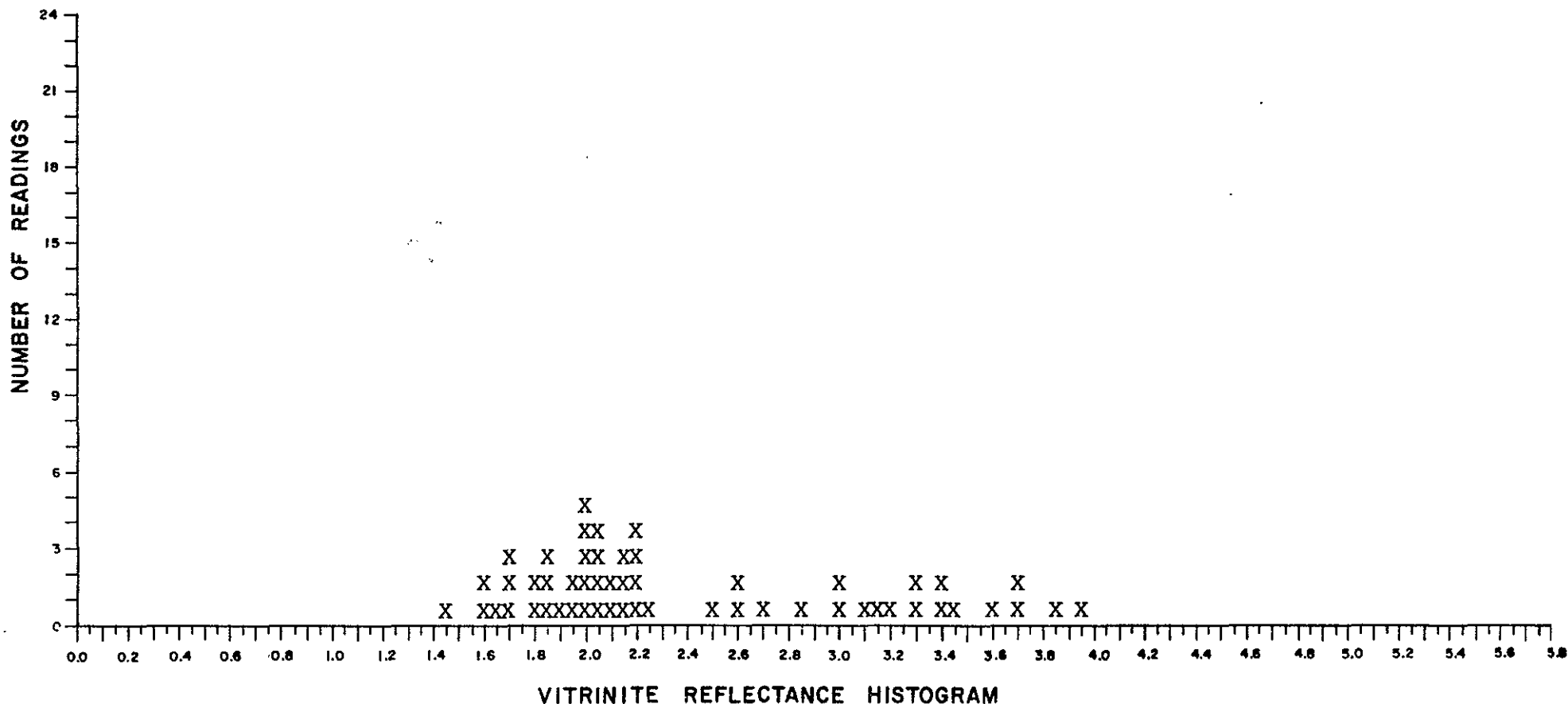


GEOCHEM NO. 2326-071 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 18530

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 54) 1.41 1.56 1.57 1.62 1.65 1.68 1.69 1.76 1.78 1.80 1.81 1.83 1.89 1.91  
 1.91 1.95 1.96 1.96 1.96 1.96 2.00 2.00 2.01 2.02 2.08 2.08 2.10 2.11 2.12 2.15 2.18 2.19  
 2.19 2.23 2.49 2.57 2.59 2.66 2.83 2.96 2.98 3.06 3.11 3.15 3.26 3.27 3.38 3.39 3.41 3.56  
 3.65 3.67 3.84 3.93

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	7	1.41	1.69	1.60	0.097	
(2)	27	1.76	2.23	2.00	0.136	
(3)	20	2.49	3.93	3.19	0.426	

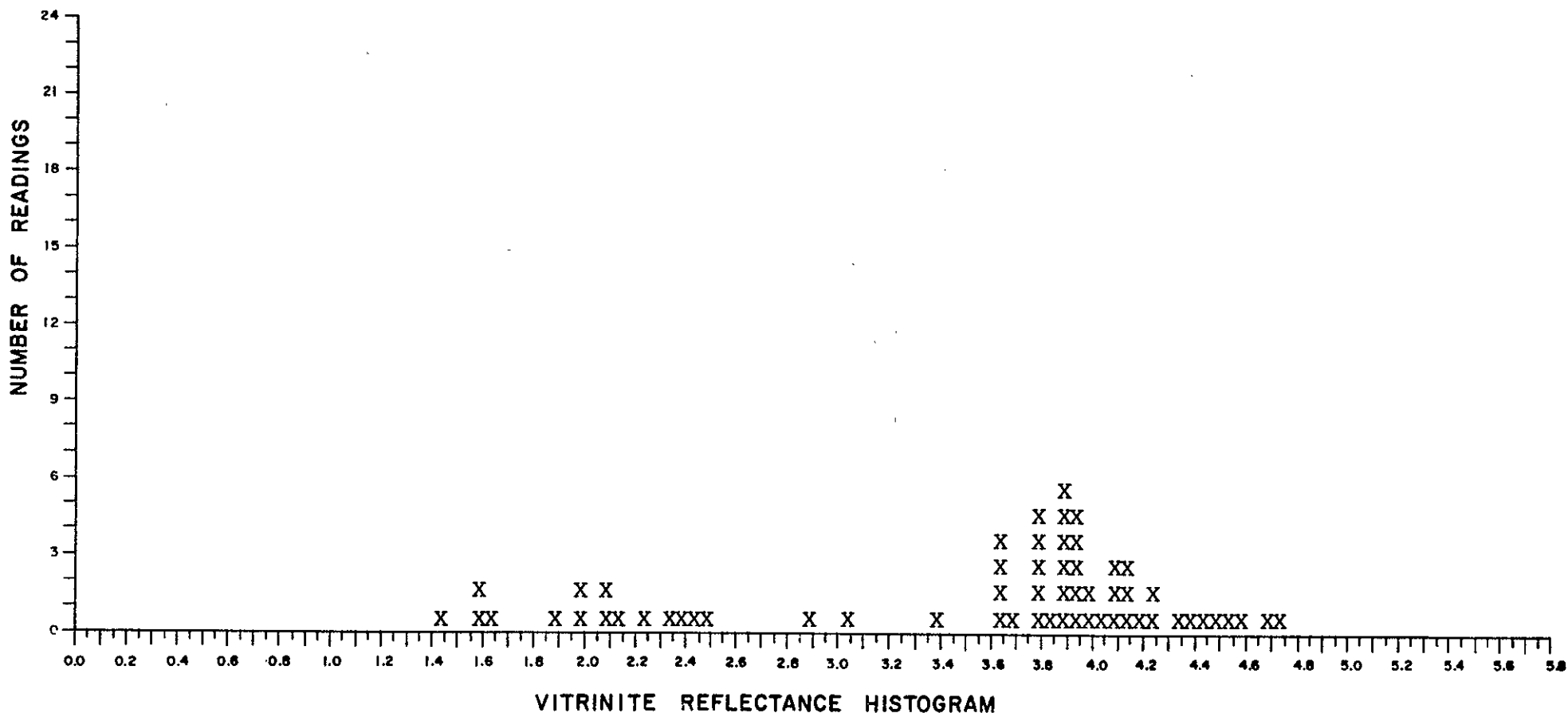


GEOCHEM NO. 2326-076 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 19030

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.44 1.57 1.58 1.63 1.87 1.96 1.99 2.05 2.09 2.14 2.20 2.33 2.37 2.42  
 2.45 2.86 3.03 3.37 3.61 3.62 3.63 3.63 3.68 3.75 3.77 3.77 3.77 3.79 3.84 3.85 3.85 3.85  
 3.86 3.86 3.87 3.90 3.90 3.91 3.92 3.93 3.95 3.97 4.00 4.06 4.06 4.06 4.10 4.13 4.13 4.16  
 4.23 4.24 4.32 4.37 4.41 4.48 4.54 4.58 4.66 4.73

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	4	1.44	1.63	1.56	0.081	
(2)	11	1.87	2.45	2.17	0.199	
(3)	45	2.86	4.73	3.96	0.372	

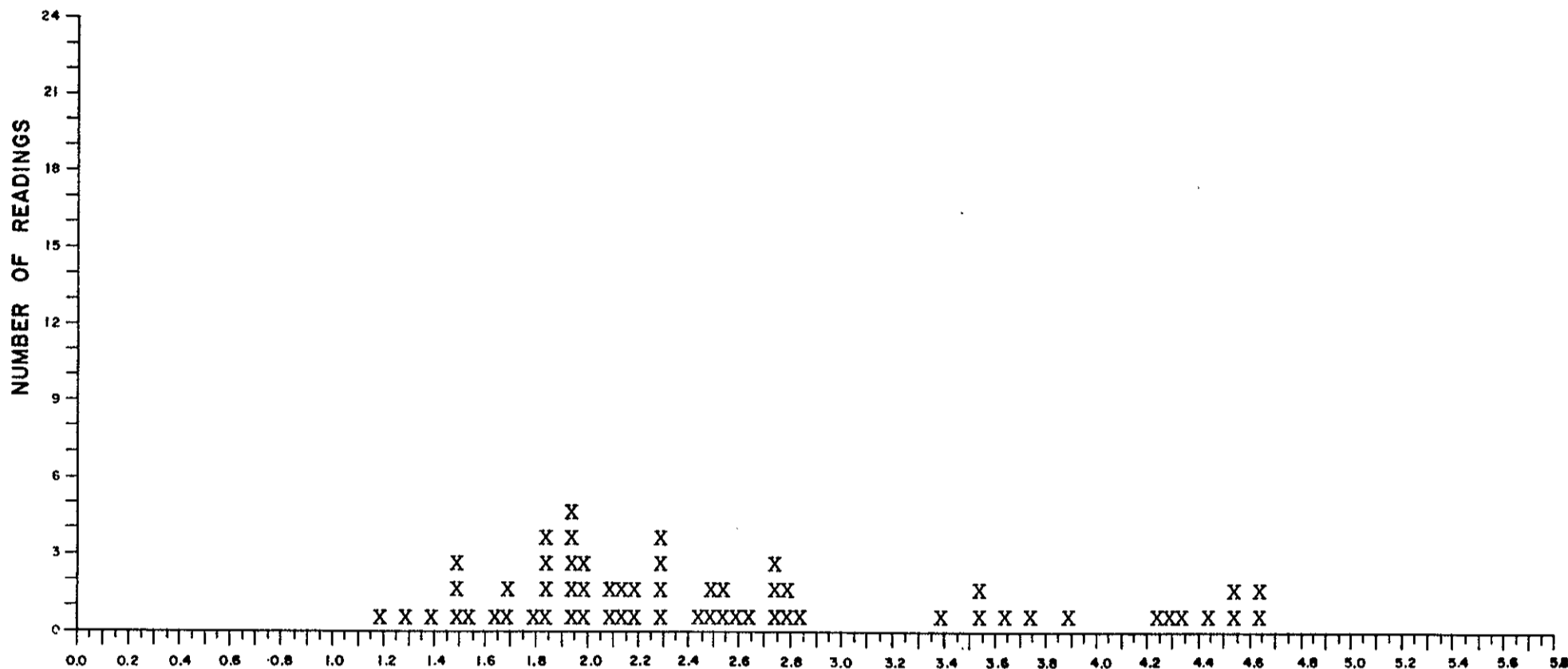


GEOCHEM NO. 2326-082 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 19630

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.19 1.27 1.37 1.45 1.46 1.47 1.52 1.60 1.65 1.69 1.76 1.80 1.81 1.82  
 1.84 1.90 1.91 1.91 1.94 1.94 1.97 1.98 1.99 2.05 2.07 2.10 2.13 2.15 2.16 2.25 2.26 2.26  
 2.27 2.42 2.45 2.49 2.53 2.54 2.59 2.61 2.70 2.71 2.73 2.76 2.77 2.81 3.39 3.53 3.53 3.61  
 3.72 3.87 4.22 4.26 4.31 4.42 4.51 4.52 4.60 4.63

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	10	1.19	1.69	1.47	0.160	
(2)	23	1.76	2.27	2.01	0.162	
(3)	27	2.42	4.63	3.38	0.812	



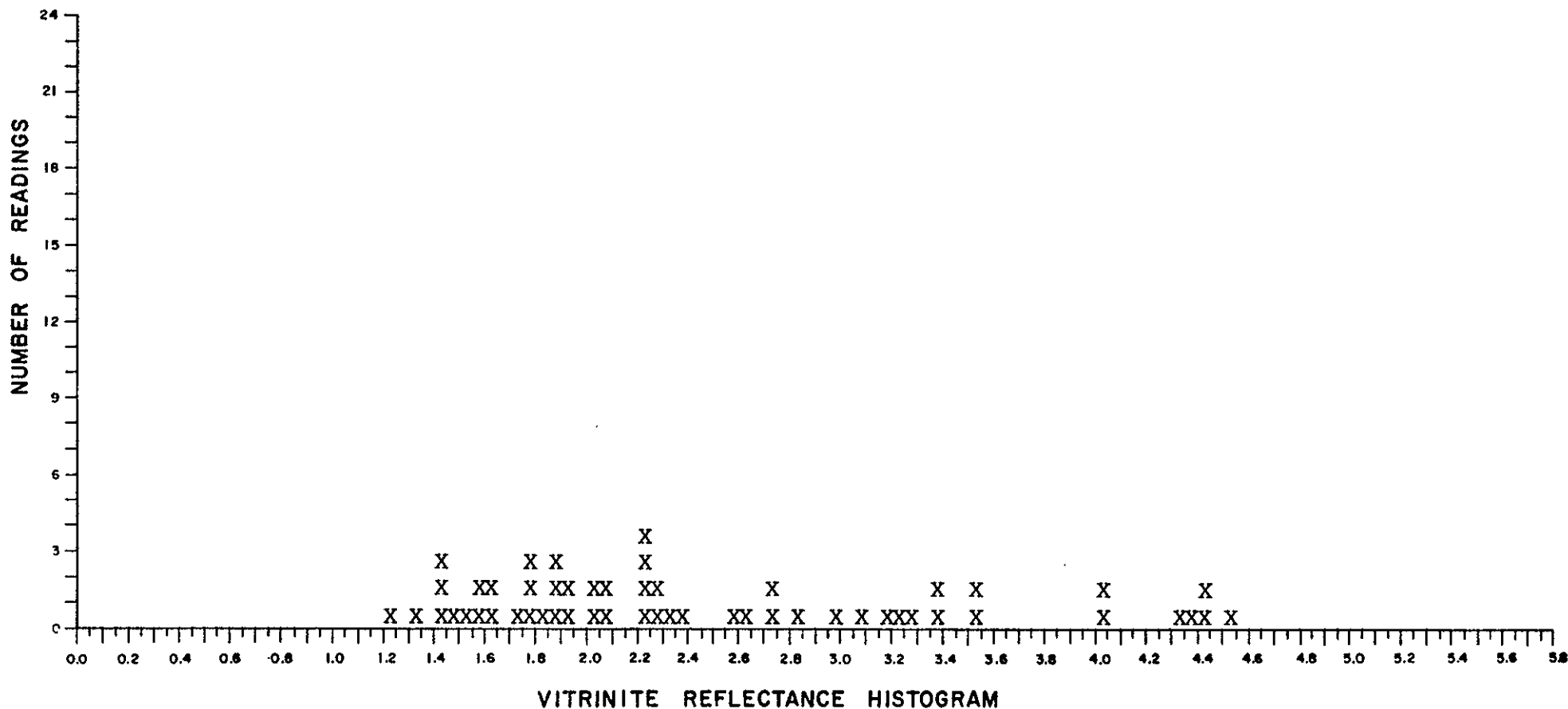
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2326-088 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 20240

CLIENT'S NAME MARSHALL YOUNG WELL NAME GRIMM # 1 MOBIL 32

(NO. OF READINGS = 54) 1.24 1.30 1.40 1.41 1.44 1.46 1.50 1.55 1.55 1.60 1.64 1.72 1.75 1.77  
 1.78 1.80 1.86 1.87 1.89 1.90 1.91 2.01 2.03 2.06 2.07 2.21 2.21 2.22 2.24 2.25 2.28 2.32  
 2.35 2.55 2.60 2.72 2.73 2.82 2.96 3.07 3.17 3.20 3.27 3.37 3.39 3.52 3.54 4.03 4.04 4.32  
 4.39 4.41 4.42 4.54

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV (%)	REMARKS
(1)	11	1.24	1.64	1.46	0.123	
(2)	22	1.72	2.35	2.02	0.208	
(3)	21	2.55	4.54	3.48	0.668	

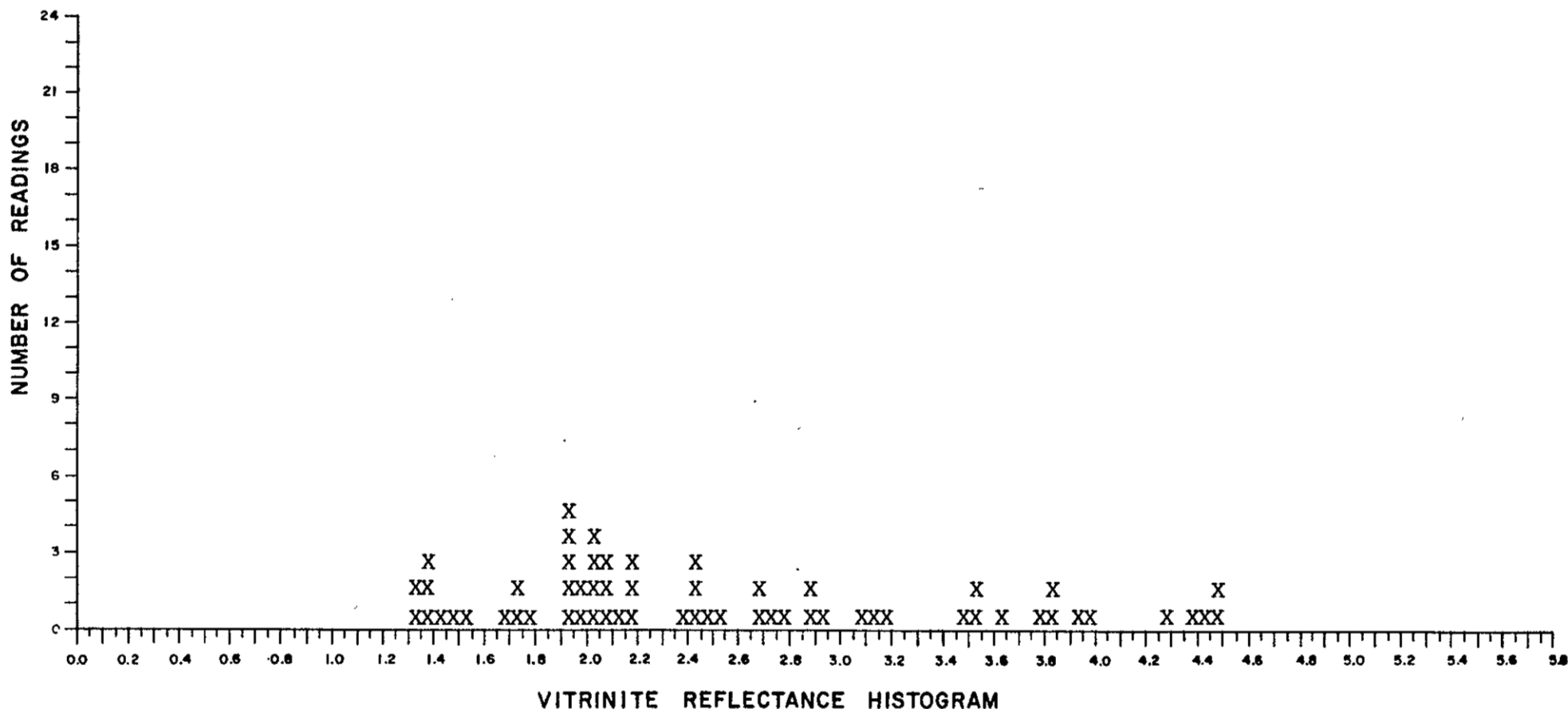


GEOCHEM NO. 2326-092 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 20640

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

(NO. OF READINGS = 60) 1.30 1.32 1.35 1.36 1.39 1.42 1.48 1.50 1.69 1.73 1.73 1.79 1.90 1.91  
 1.93 1.93 1.94 1.96 1.99 2.00 2.01 2.03 2.03 2.06 2.07 2.08 2.11 2.15 2.16 2.18 2.39 2.40  
 2.41 2.42 2.46 2.53 2.66 2.67 2.71 2.75 2.87 2.89 2.94 3.07 3.11 3.19 3.48 3.52 3.53 3.62  
 3.78 3.84 3.84 3.94 3.97 4.26 4.39 4.41 4.46 4.47

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	12	1.30	1.79	1.51	0.181	
(2)	24	1.90	2.53	2.13	0.198	
(3)	24	2.66	4.47	3.52	0.622	

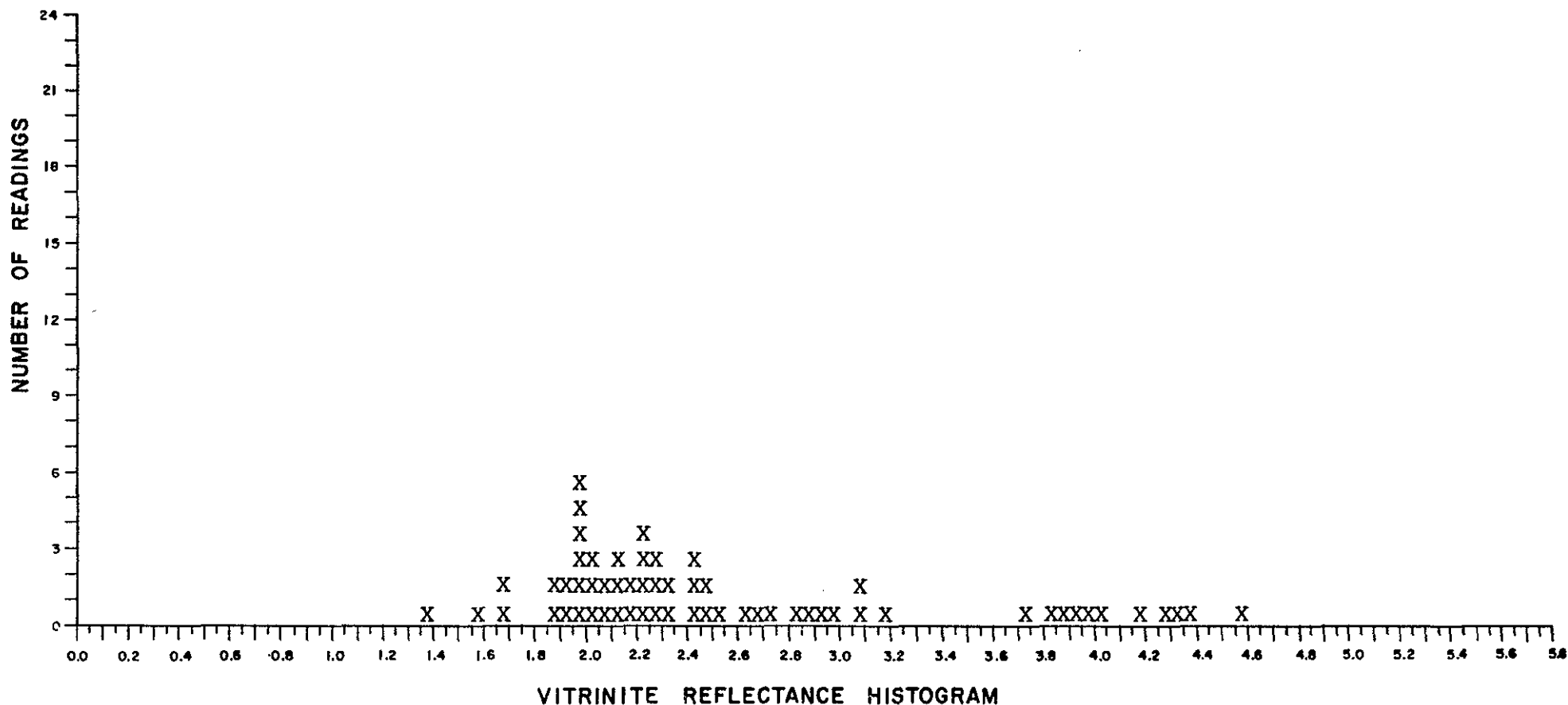


GEOCHEM NO. 2326-094 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 20840

CLIENT'S NAME MARSHALL YOUNG WELL NAME \_\_\_\_\_ GRIMM # 1 MOBIL 32

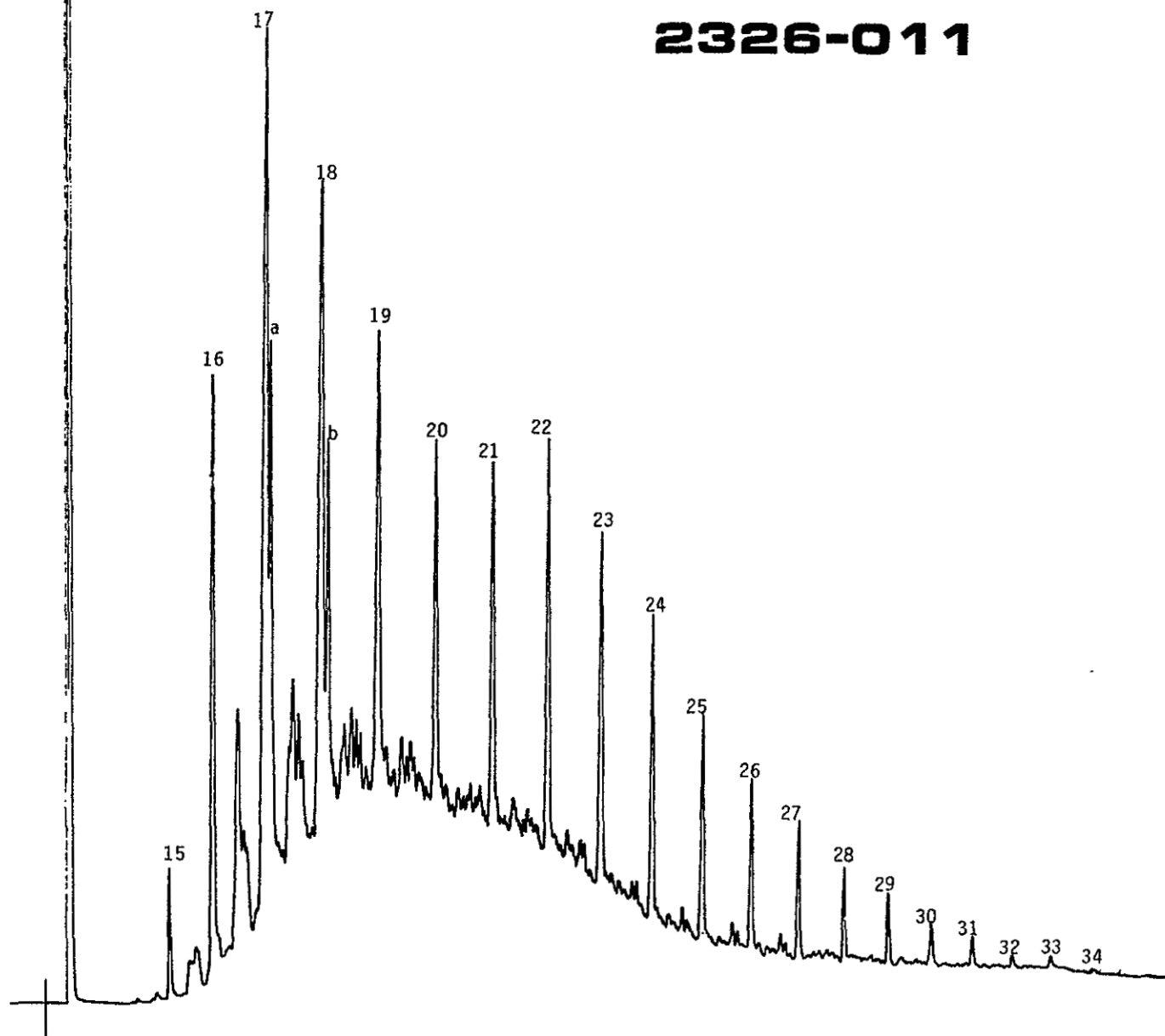
(NO. OF READINGS = 60) 1.35 1.59 1.65 1.69 1.87 1.88 1.90 1.92 1.96 1.96 1.96 1.98 1.98 1.99  
 2.01 2.03 2.04 2.06 2.06 2.11 2.12 2.12 2.17 2.19 2.21 2.22 2.23 2.24 2.25 2.28 2.29 2.32  
 2.34 2.40 2.42 2.43 2.45 2.47 2.51 2.63 2.65 2.72 2.84 2.87 2.93 2.99 3.06 3.08 3.18 3.72  
 3.84 3.87 3.90 3.95 4.04 4.18 4.26 4.32 4.36 4.56

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV (%)	REMARKS
(1)	4	1.35	1.69	1.57	0.152	
(2)	35	1.87	2.51	2.15	0.188	
(3)	21	2.63	4.56	3.52	0.652	





**2326-011**

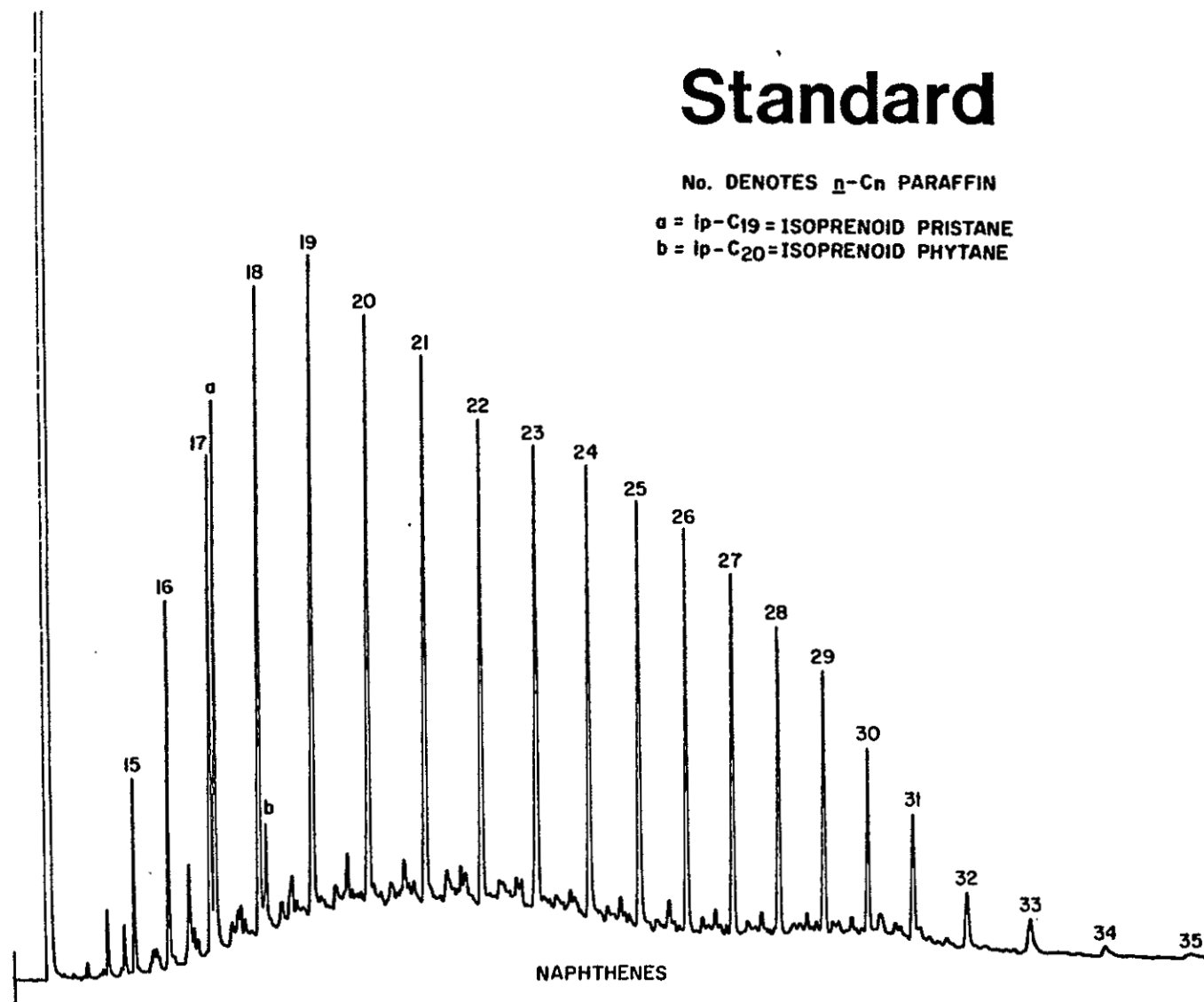


# Standard

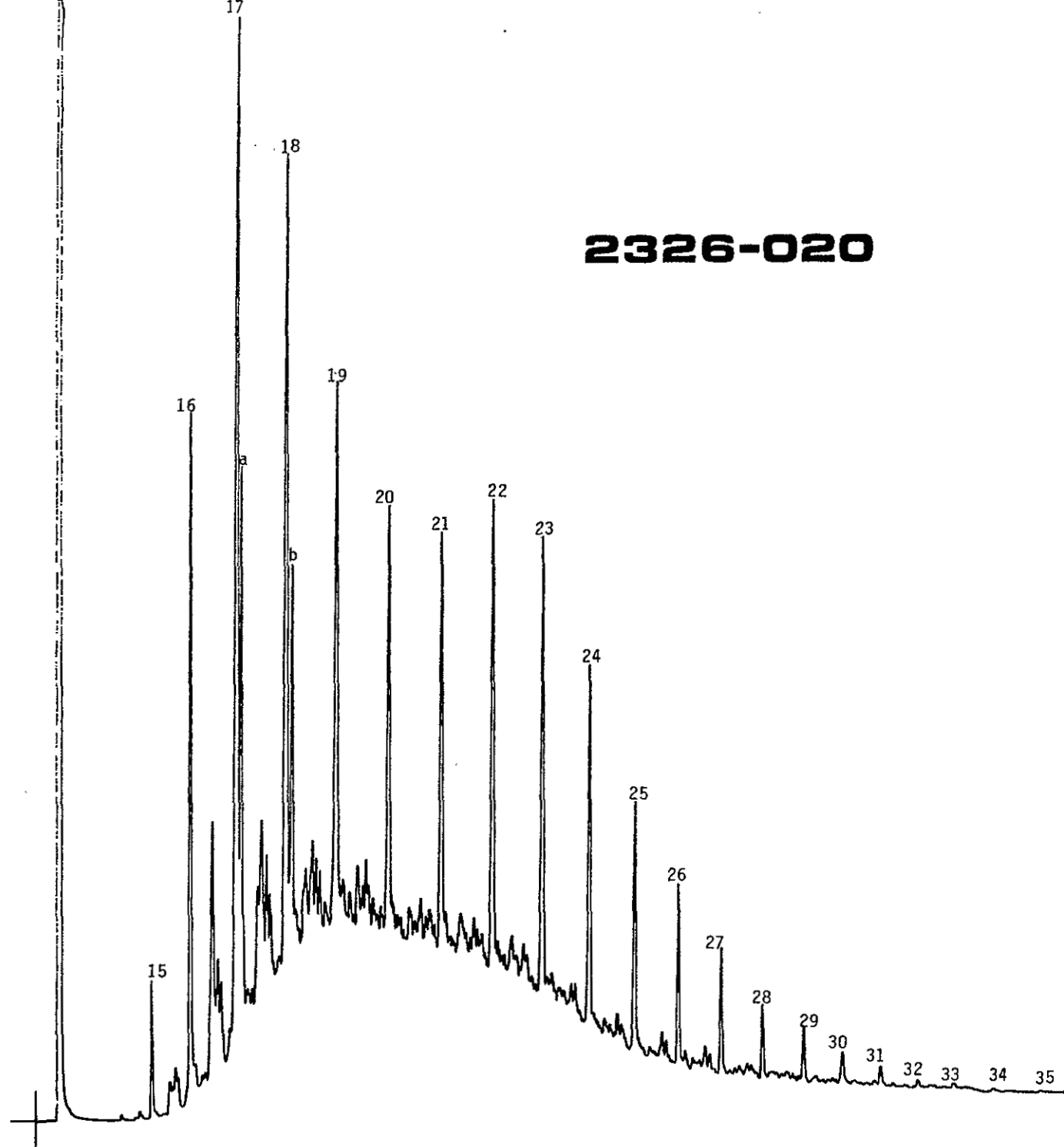
No. DENOTES  $n$ -C<sub>n</sub> PARAFFIN

a = Ip-C<sub>19</sub> = ISOPRENOID PRISTANE

b = Ip-C<sub>20</sub> = ISOPRENOID PHYTANE



**2326-020**



**2326-023**

