New Mexico Bureau of Mines & Mineral Resources
Socorro, NM 87801

A DIVISION OF
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

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Publications: 505/835-5410

May 12, 1981

MEMO

TO: Frank E. Kottlowski, Director

FROM: Sam Thompson III, Petroleum Geologist

SUBJECT: Open-File Report No. OF-140

As we discussed, the following report from GeoChem Laboratories, Inc. is to be placed in the Bureau Open-File:

OF-140 Hydrocarbon source-rock evaluation study, Hachita Dome, Inc. No. 1 Tidball-Berry Federal well, Hidalgo County, New Mexico, by Paul Tybor, GeoChem Laboratories, Inc., 1981, 13 p. (including 2 p. text, 8 tables, 2 charts)

Readers should note that the T-Max (°C) shown on Summary Table I and on Table II is a laboratory determination made during pyrolysis, and is the temperature at which volatile components are cracked from the kerogen in the sample. This temperature usually ranges between 420°C and 550°C. Although it is an indication of thermal maturity, this laboratory measurement is not an estimate of the maximum paleotemperature.

ST:sn

xc: Robert W. Kelley, Editor
Mike R. Smith, GeoChem

GeoChem Laboratories, Inc.

GEOCHEMICAL ANALYSES
SOURCE ROCK EVALUATION

CRUDE OIL—SOURCE ROCK CORRELATION

CRUDE OIL CHARACTERIZATION
GEOCHEMICAL PROSPECTING

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

May 1, 1981

Mr. Sam Thompson III
New Mexico Bureau of Mines &
Mineral Resources
Socorro, New Mexico 87801

Dear Mr. Thompson:

Enclosed please find the results of the organic geochemical analyses performed on thirty-eight (38) well cuttings samples from the Hachita Dome Inc. No. 1 Tidball-Berry Federal well, located in Hidalgo County, New Mexico.

Upon arrival at GeoChem the samples were logged in under GeoChem Job Number 1971, followed by the sample sequential number -001 to -038, and submitted to the following geochemical analytical program:

Type of Analysis	Table
Total organic carbon determination + brief lithological description.....	I
Pyrolysis.....	II
C_{15+} soxhlet extraction, deasphaltening, + liquid chromatographic separation.....	III
C_{15+} paraffin-naphthene gas chromatography.....	IV; gas chromatograms
Visual kerogen assessment.....	V
Vitrinite reflectance.....	VI; histograms

DISCUSSION OF THE RESULTS

A. Thermal Maturity of Sediments

The Paleozoic sediments analyzed from this well range in thermal maturity from a mature Maturation Index Stage 3- at 640+ feet, within the Mississippian Escabrosa formation, to a very mature Maturation Index Stage 3+ at 2560+ feet, within the Ordovician El Paso formation.

The sediments within the Escabrosa formation are considered to be within the oil generating zone. Below the Escabrosa formation, within the Devonian Percha Shale, the maturation profile for this well, increases to a very mature level and remains at this level to total depth. At this very mature maturation level, these sediments are interpreted to be beyond the "oil window", in the wet gas-condensate generating zone.

These maturity interpretations were based on the variations in the coloration of the kerogen isolated from these samples (Table V). Vitrinite reflectance (Table VI; histogram) was performed on one sample (1971-019), however, we interpret that the results of this analysis represent reworked organic matter.

B. Hydrocarbon Source Characterization of Sediments)

With the exception of the lower portion of the Percha Shale, all of the Paleozoic sediments analyzed from this well are organic-lean, with poor hydrocarbon source characteristics.

The lower portion of the Percha Shale has a very mature, good wet gas-condensate source character.

This interpretation is based on the fair to good amounts of organic matter analyzed (Table I), which is comprised predominantly of the gas-prone woody organic matter type (Table V). This interval, represented by sample 1971-019, yielded fair amounts of C_{15+} total hydrocarbon (407 ppm; Table III-B). This data indicates that these lower Percha Shale sediments do contain liquid (condensate) hydrocarbon generating capability.

Should you have any questions concerning this study, or if we may be of further service, please feel free to contact me.

Sincerely,

Paul Tybor

Paul Tybor
Project Coordinator
GEOCHEM LABORATORIES, INC.

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Enclosures

SUMMARY TABLE I

AGE Stratigraphic Unit	(Feet)	Lithology	Organic Richness: Organic Carbon (%of rock)	Organic Richness: S1 Free H.C.'s (mg/g)	Organic Richness: S1 C_{15}^{+} Total H.C. (ppm)	Organic Richness: S2 Residual H.C. Yield (mg/g)	Organic Richness: S2 C_{15}^{+} Bitumen (ppm)	Predominant Kerogen Type Visual Assessment	Thermal Maturity: Kerogen Alteration (1-5 Scale)	Thermal Maturity: Vitrinite Reflectance (%Ro)	T-Max (°C)	Hydrocarbon Source Potential
			MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	
MISSISSIPPIAN												
Escabrosa	224'-790	Limestone, light brownish gray to medium gray to orange pink.	(10) 0.04	n/a	n/a	n/a	n/a	(1) Am;-;-	(1) 3-	n/a	n/a	Mature, poor hydrocarbon source.
DEVONIAN												
Percha	820'-1375	Shale, medium gray.	(9) 0.33	(2) 0.06	(1) 407	(2) 0.04	(1) 740	(3) W-I;-;Am-H	(3) 3 to 3+	(1) Reworked organic matter.	(2) 416	Very mature, overall poor hydrocarbon source. The lower portion of the formation may be a good wet-gas condensate source.
ORDOVICIAN												
Montoya	1400'-1465	Dolomite, medium gray to brownish gray.	(2) 0.04	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Very mature, poor hydrocarbon source.
El Paso	1505'-2560	Limestone, light to medium gray; Trace of Ddomite, Shale and Siltstone.	(17) 0.12	(4) 0.07	n/a	(4) 0.04	n/a	(5) Am(Al);-;-	(5) 3+	n/a	(4) 411	Very mature, poor hydrocarbon source.

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
1971-001	224 - 232	Limestone, light brownish gray and chert.	0.06
1971-002	265 - 286	Limestone, light gray to medium gray, cherty.	0.03
1971-003	305 - 325	Limestone, cherty, medium gray to grayish orange pink.	0.04
1971-004	380 - 385	Limestone, cherty, medium gray to grayish orange pink.	0.04
1971-005	435 - 450	Limestone, medium light gray to medium gray.	0.04;0.05
1971-006	495 - 500	Limestone, light gray to medium gray and moderately yellowish brown.	0.03
1971-007	560 - 570	Limestone, medium dark gray.	0.05
1971-008	610 - 640	Limestone, medium orange pink to brownish gray.	0.05
1971-009	680 - 700	Limestone, medium orange pink to brownish gray and white to medium gray.	0.04
1971-010	750 - 790	Limestone, light brownish gray to medium gray.	0.05
1971-011	820 - 840	Shale, calcareous, medium gray.	0.13
1971-012	910 - 950	Shale, calcareous, medium gray .	0.16
1971-013	970 - 980	Shale, calcareous, medium gray .	0.19
1971-014	1020 - 1050	Shale, calcareous, medium gray .	0.17
1971-015	1070 - 1090	Shale, calcareous, medium gray.	0.26
1971-016	1150 - 1160	Shale, calcareous, medium gray.	0.18;0.18
1971-017	1200 - 1210	Shale, calcareous, medium gray.	0.19
1971-018	1290 - 1300	Shale, calcareous, medium gray.	0.33
1971-019	1355 - 1375	Shale, grayish black.	1.38;0.60*
1971-020	1400 - 1405	Dolomite, medium light gray to light brownish gray.	0.05
1971-021	1460 - 1465	Dolomite, medium light gray to light brownish gray.	0.03

* Represents the T.O.C. value of the sample submitted to extraction.

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
1971-022	1505 - 1510	Dolomite, brownish gray.	0.09
1971-023	1645 - 1650	Limestone, white to medium gray.	0.12
1971-024	1680 - 1685	Limestone, white to medium gray.	0.06
1971-025	1750 - 1755	Limestone, white to medium gray.	0.09
1971-026	1800 - 1805	Limestone, white to medium gray.	0.07
1971-027	1860 - 1865	Limestone, medium light gray to medium gray.	0.08;0.07
1971-028	1920 - 1925	Limestone, medium light gray to medium gray.	0.08
1971-029	1980 - 1985	Limestone, medium light gray to medium gray.	0.10
1971-030	2040 - 2045	Limestone, medium light gray to medium gray.	0.07
1971-031	2095 - 2100	Limestone, medium light gray to medium gray.	0.11
1971-032	2150 - 2155	Limestone, medium light gray to medium gray.	0.12
1971-033	2220 - 2225	Limestone, medium light gray to medium gray.	0.08
1971-034	2280 - 2285	Limestone, medium light gray to medium gray.	0.07
1971-035	2340 - 2345	Limestone, medium light gray to medium gray.	0.15
1971-036	2410 - 2415	Limestone, light brownish gray to medium gray.	0.08
1971-037	2500 - 2505	Limestone, light brownish gray to medium gray.	0.06
1971-038	2558 - 2560	Composite: Shale and siltstone, grayish black.	0.62;0.63

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)
S1+S2 = Genetic hydrocarbon potential (mg HC/g of rock)
Hydrogen Index = mg HC/g organic carbon
Oxygen Index = mg CO2/g organic carbon
S1/S1+S2 = Transformation ratio
Tmax = Temperature Index, degrees C.

TABLE II

RESULTS OF ROCK-EVAL PYROLYSIS

GeoChem Sample No.	Depth Interval ( )	T.O.C. (wt.%)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	S1+S2 (mg/g)	Hydrogen Index	Oxygen Index	S1/S1+S2	Tmax (C)
1971-018	1290 - 1300	0.33	0.07	0.05	0.42	0.12	15	127	0.58	406
1971-019	1355 - 1375	0.60	0.04	0.03	0.67	0.07	5	112	0.57	427
1971-023	1645 - 1650	0.12	0.01	0.03	0.51	0.04	25	425	0.25	415
1971-032	2150 - 2155	0.12	0.03	0.04	0.36	0.07	33	300	0.43	431
1971-035	2340 - 2345	0.15	0.04	0.02	0.45	0.06	13	300	0.67	398
1971-038	2558 - 2560	0.63	0.20	0.08	1.08	0.28	13	171	0.71	401

Table III

Summary of C15+ Soxhlet Extraction, Deasphaltening 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)
1971-019	1355 -1375	74.5	0.0551	0.0163	0.0388	N.D.	0.0114	0.0189	0.0054	0.0031

B. Concentration of Extracted Materials in Rock

			Hydrocarbons				Nonhydrocarbons			
GeoChem Sample Number	Well Interval	Total Extract (ppm)	Paraffin-Naphthene (ppm)	Aromatic (ppm)	Total (ppm)	Sulfur (ppm)	Preciptd. Asphaltene (ppm)	Eluted NSO'S (ppm)	Noneluted NSO'S (ppm)	Total (ppm)
1971-019	1355 -1375	740	153	254	407	-	219	72	42	333

C. Composition of Extracts

		Hydrocarbons				Nonhydrocarbons					
GeoChem Sample Number	Well Interval	Paraffin-Naphthene %	Aromatic %	PN/Arom	Sulfur %	Eluted NSO'S %	Noneluted NSO'S %	Precipitd. Asphaltene %	Asph/NSO	HC'S %	HC/Non HC
1971-019	1355 -1375	20.7	34.3	0.60	-	9.8	5.6	29.6	1.92	55.0	1.22

Table IV-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
1971-019	1355 -1375	27.3	4.2	68.5	1.02	1.23	1.53

Table IV-B

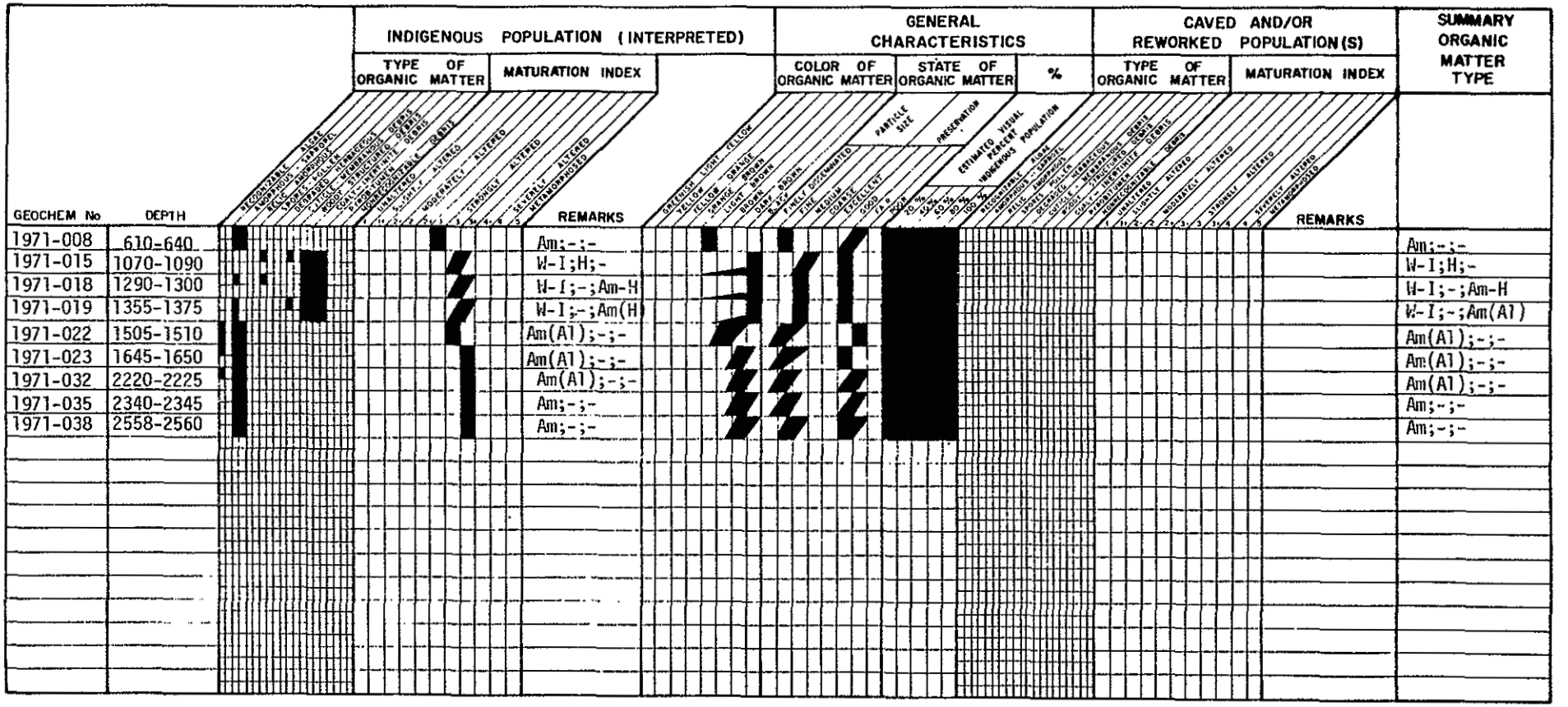
Saturate Hydrocarbon Analyses

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
1971-019	1355 -1375	4.0	10.6	12.4	8.1	9.5	5.3	7.9	6.7	7.1	7.5	6.8	5.4	3.4	2.0	1.2	0.7	0.6	0.3	0.3	0.1	0.1	0.0	0.0

TABLE V

VISUAL KEROGEN ASSESSMENT WORKSHEET



GEOCHEM No	DEPTH	REMARKS	REMARKS	SUMMARY ORGANIC MATTER TYPE
1971-008	610-640	Am;-;-		Am;-;-
1971-015	1070-1090	W-I;H;-		W-I;H;-
1971-018	1290-1300	W-I;-;Am-H		W-I;-;Am-H
1971-019	1355-1375	W-I;-;Am(H)		W-I;-;Am(Al)
1971-022	1505-1510	Am(Al);-;-		Am(Al);-;-
1971-023	1645-1650	Am(Al);-;-		Am(Al);-;-
1971-032	2220-2225	Am(Al);-;-		Am(Al);-;-
1971-035	2340-2345	Am;-;-		Am;-;-
1971-038	2558-2560	Am;-;-		Am;-;-

TABLE VI

VITRINITE REFLECTANCE SUMMARY

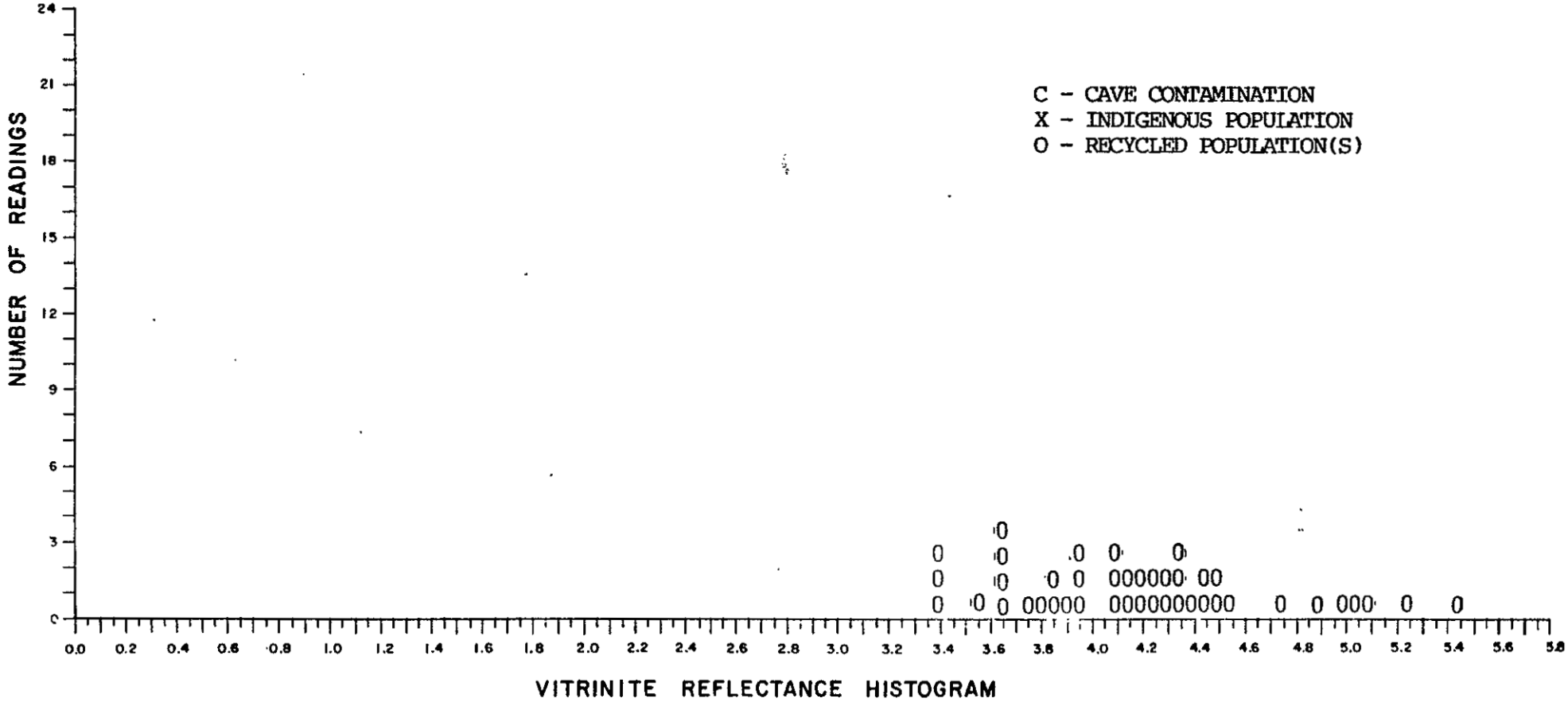
GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE (% Ro)	MAXIMUM REFLECTANCE (% Ro)	MEAN REFLECTANCE (% Ro)	STD. DEV. (% Ro)	REMARKS
1971-019	1375	CIG	(1)	16	3.35	3.93	3.68	0.200	
			(2)	27	4.06	5.43	4.47	0.382	

GEOCHEM NO. 1971-019 TYPE OF SAMPLE: CIG DEPTH/SAMPLE NO. 1375

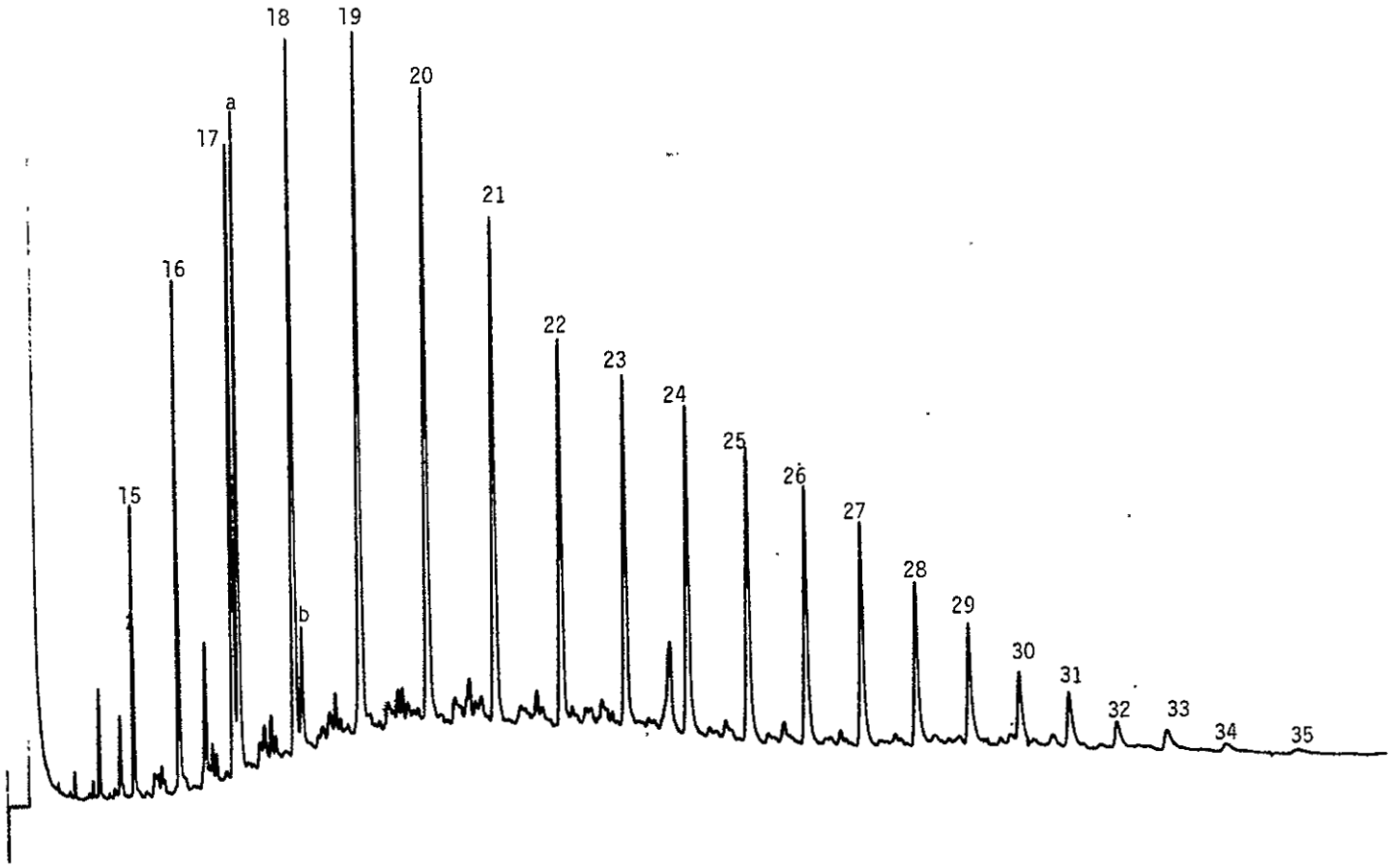
CLIENT'S NAME N. MEXICO BUREAU OF MINES WELL NAME HACHITA DOME #1

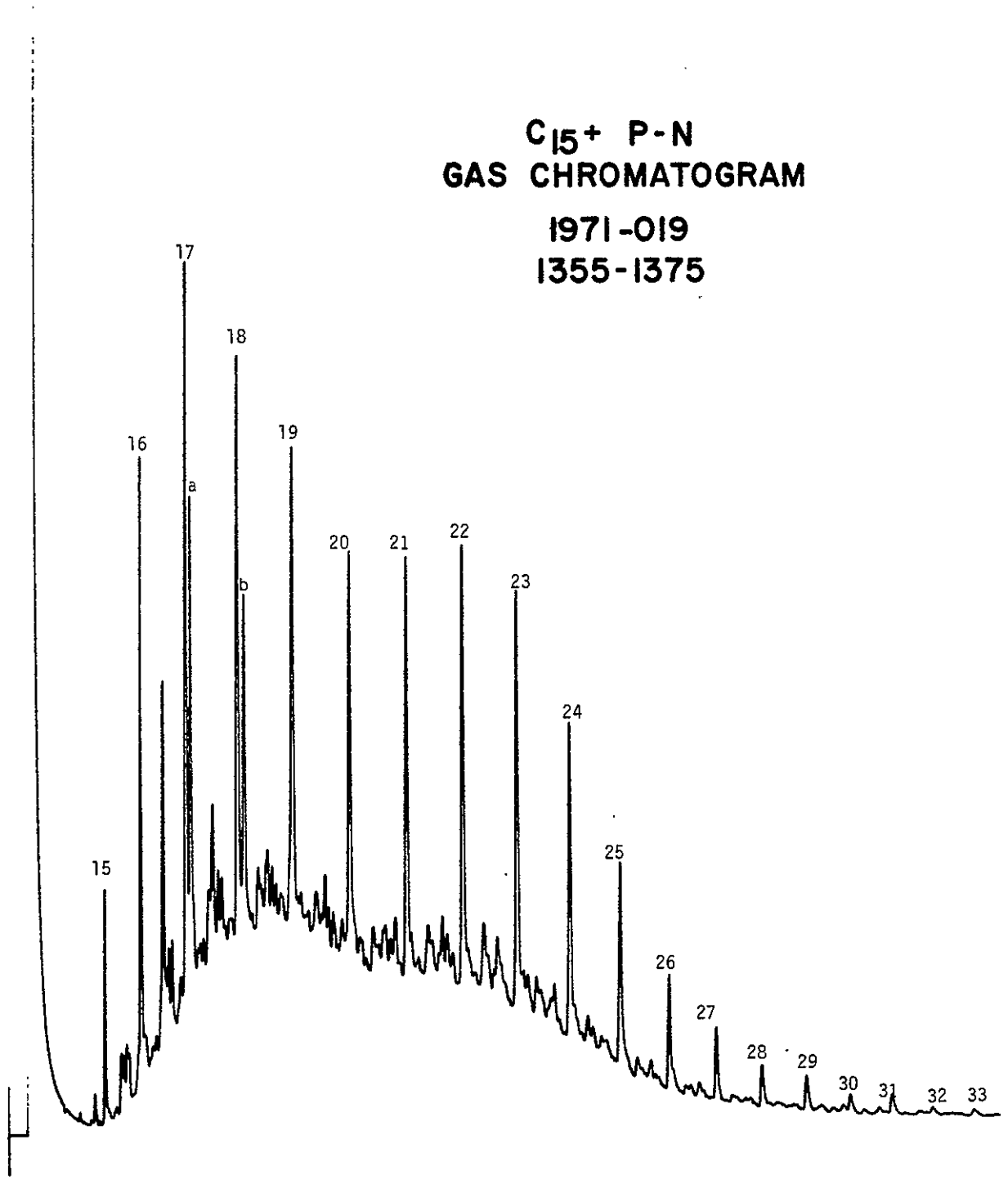
(NO. OF READINGS = 43) 3.35 3.35 3.39 3.52 3.60 3.60 3.63 3.63 3.71 3.77 3.82 3.82 3.88 3.90
3.92 3.93 4.06 4.08 4.09 4.10 4.12 4.16 4.19 4.22 4.23 4.28 4.28 4.31 4.31 4.31 4.39 4.40
4.43 4.46 4.47 4.52 4.70 4.87 4.96 5.00 5.09 5.23 5.43

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	16	3.35	3.93	3.68	0.200	
(2)	27	4.06	5.43	4.47	0.382	



C_{15}+ P-N
STANDARD




C15+ P-N
GAS CHROMATOGRAM
1971-019
1355-1375
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