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APPLICATION OF

ROBERT L. BAYLESS FOR DESIGNATION OF THE CABRESTO AREA OF THE PICTURED CLIFFS FORMATION AS A TIGHT FORMATION RIO ARRIBA COUNTY, NEW MEXICO

Case No. 10264

March 21, 1991

Prepared by: KEVIN H. McCORD, P.E. APPLICATION OF ROBERT L. BAYLESS FOR DESIGNATION OF THE CABRESTO AREA OF THE PICTURED CLIFFS FORMATION AS A TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO

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Robert L. Bayless is applying for portions of the East Blanco, Choza Mesa, and Gobernador Pictured Cliffs gas pools to be designated as a tight formation under Section 107 of the Natural Gas Policy Act of 1978. The proposed Cabresto Tight Gas Area is located in the northeastern portion of the San Juan Basin. The area is located in Rio Arriba County, approximately 45 miles northeast of the town of Bloomfield in northwestern New Mexico.

Exhibit No. 1 displays the proposed Cabresto Tight Gas Area on the map showing the Pictured Cliffs formation wells in the San Juan Basin. The Cabresto Tight Gas Area includes approximately 193,090 acres described as follows:

T29N R2W

All Sections	23,040	acres
<u>T29N_R3W</u>		
All Sections	22,210	acres
<u>T29N R4W</u>		
All Sections	23,040	acres
<u>T30N R2W</u>		
All Sections	23,040	acres
<u>T30N R3W</u>		
All Sections	22,260	acres
<u>T30N R4W</u>		
Sections 1-2; 11-14; 23-26; 35-36	7,680	acres
<u>T31N R2W</u>		
Sections 2-36	22,400	acres
<u>T31N R3W</u>		
All Sections	22,210	acres
<u>T32N R2W</u>		
Sections 7-10; 15-22; 27-35	11,880	acres
<u>T32N R3W</u>		
All Sections	15,330	acres
	193,090	acres

The Pictured Cliffs formation in the Cabresto Area meets the criteria established in Section 107 of the Natural Gas Policy Act of 1978 to be designated as a tight gas formation in that (1) the estimated average in situ gas permeability throughout the pay section in expected to be 0.10 millidarcy or less, (2) the stabilized gas production rates, without stimulation, at atmospheric pressure of these gas wells are not expected to exceed the maximum allowable production rate of 105 MCFD for an **average depth of 3715 feet to the top of the Pictured Cliffs** formation in this area, and (3) no well drilled into the Pictured Cliffs formation in this area is expected to produce more than five barrels of crude oil per day prior to stimulation.

Exhibit No. 2 is a Pictured Cliffs formation completion and production map of the proposed Cabresto Tight Gas Area. Shown on this map are all the wells that penetrated the Pictured Cliffs formation in this area. The production figures presented for each producing well are date of initial potential, initial gas potential in MCF per day, the current production capability of the Pictured Cliffs well in MCF per day, and cumulative production for the well in MCF as of November 1, 1990. If the Pictured Cliffs well produced any oil or condensate, this production data is presented also. Exhibit No. 2 also presents completion and production data from some Pictured Cliffs wells surrounding the proposed tight gas area.

The average depth to the top of the Pictured Cliffs formation in the Cabresto Tight Gas Area is 3715 feet. A list of well name, operator and production data for Pictured Cliffs wells within the Cabresto Tight Gas Area is presented as Exhibit No. 3. The Cabresto Tight Gas Area contains 124 wells which have penetrated and evaluated the Pictured Cliffs formation. At this time 53 wells are capable of production producing from the Pictured Cliffs formation.

GEOLOGY

The Pictured Cliffs Sandstone is a marine, clay filled, fine grained sandstone. This sandstone was deposited as a beach and as nearshore bars generally aligned northwest - southeast with a source generally to the southwest. These deposits represent the last marine strata in the northeasterly regression of the Cretaceous sea. There are two main zones within the Pictured Cliffs Sandstone. Each zone represents a regressive sequence separated by a marine tongue of Lewis Shale which represents a transgression. Production of gas in the Cabresto Tight Gas Area is from stratigraphic entrapment.

Sample examination indicates that the Pictured Cliffs formation in this area consists of very fine to fine grained, fairly well sorted, subrounded to subangular, slightly calcareous, salt and pepper sandstone. The dark grains are predominately glauconite, mica, and carbonaceous shale. Interbeds of the Lewis Shale are present in the lower part of each main zone, but become fewer and thinner upward. Microscopic examination of the Pictured Cliffs formation reveals that the sandstone grains are coated with mixed layer illite - smectite authigenic clay. These clay coatings are pervasive throughout the vertical extent of the Pictured Cliffs. The clay coatings of the sandstone grains reduce the effective permeability of the Pictured Cliffs sand in this area.

Exhibit No. 4 is a type log of the Pictured Cliffs formation in the Cabresto Tight Gas Area. This well is the Robert L. Bayless Jicarilla 464 No. 4 located in the NWSE of Section 31, T30N-R3W, Rio Arriba County, New Mexico. This type log is representative of potential pay in both the upper and lower zones of the Pictured Cliffs formation. The lower zone of the Pictured Cliffs is blanket - like in the southwest portion of the Cabresto Tight Gas Area but thins and pinches out a few miles northeast of the Jicarilla 464 No. 4 well. In contrast, the upper zone of the Pictured Cliffs is much more lenticular in nature.

Exhibit No. 5 is a cross section A-A' illustrating Pictured Cliffs sandstone development across the Cabresto Tight Gas Area. The datum for this cross section is the top of the Pictured Cliffs formation. The cross section shows that the Pictured Cliffs Sandstone is a continuous lithologic unit throughout the Cabresto Tight Gas Area.

STABILIZED UNSTIMULATED GAS PRODUCTION RATE

Obtaining stabilized unstimulated gas production rates for Pictured Cliffs wells is not a standard procedure used by operators when completing their wells in the San Juan Basin. Past experience has shown that these low permeability Pictured Cliffs wells must be stimulated to obtain commercial production. However, in preparation for this Cabresto Tight Gas Study, Robert L. Bayless performed a natural gas production test on a well before it was fracture stimulated. Exhibit No. 6 presents the data for this production test taken on the Robert L. Bayless Jicarilla 31-3-32 #1 well located in the NWSW of Section 32, T30N-R3W, Rio Arriba County, New Mexico. The average unstimulated natural gas production rate for this well is 22.0 MCF of gas per day. This rate is considered representative for the Cabresto Tight Gas Area and is well below the 105 MCFGPD allotted for tight formation gas wells having an average depth of 3715 feet.

It should be noted that this production test was taken after stimulation of the formation with acid. Acid was used to insure that the perforations in this well were open. Therefore, true unstimulated natural gas production, within its strict definition, would be less than this reported gas flowrate.

Not all of the natural production tests taken from this area were used to calculate the representative unstimulated natural production rate for the Cabresto Tight Gas Area. John E. Schalk conducted natural production tests on the Schalk 29-4 #6 and the Schalk 29-4 #10 wells in 1981 and 1982, respectfully. These wells are located in the SWSW of Section 25 and the SWSW of Section 23 of T29N-R4W, Rio Arriba County, New Mexico. Although both of these wells made some gas naturally, it was such a small amount that it was too small to measure. Rather than average in these two "zero values" the value of 22.0 MCF of gas per day from the Bayless well was used as the most representative natural unstimulated production rate for the Cabresto Tight Gas Area.

STABILIZED UNSTIMULATED OIL PRODUCTION RATE

The natural gas produced from the Pictured Cliffs formation in the Cabresto Tight Gas Area is virtually dry gas. There has been very little oil or condensate reported for the wells that have produced in the area. Some of these wells will have small amounts of oil or condensate production with the gas, but significant oil production is not common. Examination of the production data supplied in Exhibit #3 support these statements. These dry gas production figures indicate a well drilled in the Pictured Cliffs formation in the Cabresto Tight Gas Area is not expected to produce, without stimulation, more than 5 barrels of crude oil per day.

PERMEABILITY

The Pictured Cliffs formation in the San Juan Basin is dependent on stimulation techniques to be commercially productive due to the low permeability of the reservoir rock. Exhibit Nos. 7 through 10 present core analysis data used to determine the average laboratory permeability to air for the Pictured Cliffs formation in the Cabresto Tight Gas Area. The exhibits contain the actual core analysis reports plus selective analysis of the cores taken from only the productive portion of the Pictured Cliffs formation for each well. The cored intervals chosen for permeability averaging were determined by examination of the individual core analysis reports for each well. Only cored intervals of sand which had greater than 10% porosity from the core analysis were used for permeability averaging. The average permeability value determined for each well in Exhibit Nos. 7 through 10 are average laboratory determined permeability values. The actual in situ permeability of the formation is less than this laboratory determined value due to water saturation and net confining pressures found in the Pictured Cliffs reservoir.

Exhibit 11 **Constants of all laboratory constants** is results for the Cabresto Tight Gas Area. **The second constant** permanbility to air obtained for the Cabresto Tight Cos Area from the four wells shown is 0.66 millidarcy. Exhibit No. 12 presents a technical paper entitled "Effect of Overburden Pressure and Water Saturation on Gas Permeability of Tight Sandstone Cores" written by Thomas and Ward of the U.S. Bureau of Mines. This paper presents relationships between laboratory determined permeability in cores and actual in situ permeability found in reservoirs. Exhibit No. 13 explains how in situ permeability is calculated from the core analysis using the technical paper presented.

An average in situ permeability value of 0.035 millidarcy was calculated from the average laboratory permeability value of 0.66 millidarcy for the Cabresto Tight Gas Area. This 0.035 millidarcy permeability value calculated from core data is well below the 0.10 millidarcy cutoff for tight gas reservoirs.

Another method of determining reservoir permeability was performed as a check, making use of the representative unstimulated natural production test taken in the area. The average unstimulated gas flow rate of 20.0 MCF of gas per day, along with other Pictured Cliffs reservoir data for the Cabresto Tight Gas Area was used to calculate a reservoir permeability using Darcy's Law. This Darcy's Law calculation is presented as Exhibit No. 14. The use of Darcy's law calculates an average reservoir permeability value of 0.017 millidarcy for the Cabresto Tight Gas Area. This permeability value compares to the 0.035 millidarcy permeability value determined by core analysis methods. These two methods produce fairly similar permeability values both of which are well below the 0.10 millidarcy tight gas limitation.

From examination of the two sources of permeability data, the reservoir permeability value of 0.035 millidarcy determined by core analysis methods is thought to be the best estimate of reservoir permeability for the Cabresto Tight Gas Area because it uses actual core data from the Pictured Cliffs formation. Therefore, the estimated average is situ gas permeability throughout the Pictured Cliffs formation pay section is expected to be 0.10 millidarcy or less in the Cabresto Tight Gas Area.

FRESH WATER PROTECTION

Existing State and Federal regulations will assure that development of the Pictured Cliffs formation will not adversely affect or impair any fresh water acquifers that are being used or are expected to be used in the future for domestic or agricultural water supplies. Regulations require that casing programs be designed to seal off potential water bearing formations from oil and gas producing formations. These fresh water zones exist from the surface of the ground to the base of the Ojo Alamo Formation.

Most Pictured Cliffs wells drilled in the Cabresto Tight Gas Area are drilled with natural mud that will not contaminate fresh water zones. A normal casing design consists of 8 5/8" 0.D. surface casing being set from the surface to a depth of 150 to 250 feet. The production casing normally used is 4 1/2 or 5 1/2" 0.D. and is set from surface to total depth. The surface casing is cemented in place by circulating cement to the surface, protecting the near surface formations from downhole contamination. The production casing is cemented from total depth to the surface or to a depth sufficient to cover the Ojo Alamo formation in the older wells. The newer wells are required to circulate cement to the surface. This process protects the Pictured Cliffs and other hydrocarbon bearing formations from contaminating any fresh water acquifers. Therefore, productive and fresh water zones are protected by both casing and cement.

Stimulation of the Pictured Cliffs formation involves varied fracture treatments, depending on the operator. Fracture treatments usually consist of a one or two percent potassium chloride water base fluid with sand, or a nitrogen-water foam base fluid and sand. Either treatment will not harm a fresh water acquifer. Fresh water protection is assured during these fracture stimulation treatments due to zone isolation caused by cementation. A distance of well over 500 feet between the Pictured Cliffs formation and the closest fresh water acquifer in a wellbore is additional insurance that an existing fresh water zone will not be contaminated by stimulation of Pictured Cliffs wells in this area. Therefore, New Mexico and Federal regulations will protect fresh water aquifers from the drilling. completing, and producing the Pictured Cliffs formation in the Cabresto Tight Gas Area.

CONCLUSION

Evidence presented in this report substantiates the following for the Cabresto Tight Gas Area proposed by Robert L. Bayless:

(1) For an average Pictured Cliffs well depth of 3715 feet, the stabilized production rate at atmospheric pressure of wells completed in the Pictured Cliffs formation, without stimulation, is not expected to exceed the maximum allowable rate of 105 MCF of gas per day.

(2) No well drilled into the Pictured Cliffs formation in the Cabresto Area is expected to produce, without stimulation, more than five barrels of crude oil per day.

(3) The estimated average in situ gas permeability, throughout the Pictured Cliffs pay section, is expected to be 0.10 millidarcy or less.

The proposed Cabresto Tight Gas Area meets all the specifications required as stated above and should be designated a tight formation in the Pictured Cliffs formation under Section 107 of the Natural Gas Policy Act of 1978.

CABRESTO TIGHT GAS AREA

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LIST OF EXHIBITS

Exhibit Number	Exhibit Name	Exhibit Purpose
1.	Pictured Cliffs Reservoir Map	Show location of Cabresto Tight Gas Area with respect to San Juan Basin Pictured Cliffs Wells
2	Pictured Cliffs Formation Completion And Production Map	Show Pictured Cliffs formation well activity and production figures in and around the tight formation area
3.	Cabresto Tight Gas Area Wells	List Pictured Cliffs formation well production figures in and around the tight formation area
4.	Cabresto Tight Gas Area Type Log Robert L. Bayless Jicarilla 464 #4 NWSE Sec 31 T30N R3W	Show log characteristics of the Pictured Cliffs formation in the tight formation area
5.	Cross Section A-A'	Show that the Pictured Cliffs formation is present throughout the tight formation area
6.	Unstimulated Natural Production Test Robert L. Bayless Jicarilla 31-3-32 #1 NWSW Sec 32 T31N R3W	Show the results of the unstimulated natural production test taken on this well
7.	Core Analysis Data Robert L. Bayless Conoco 29-4 #7 SWNW Sec 20 T29N R4W	Show the selective analysis data and the actual core analysis data from this well
8.	Core Analysis Data John E. Schalk Schalk 29-4 #6 SWSW Sec 25 T29N R4W	Show the selective analysis data and the actual core analysis data from this well
9.	Core Analysis Data Robert L. Bayless Jicarilla 459 #5 SESE Sec 19 T30N R3W	Show the selective analysis data and the actual core analysis data from this well
10.	Core Analysis Data El Paso Natural Gas Gasbuggy #1 NESW Sec 36 T29N R4W	Show the selective analysis data and the actual core analysis data from this well
11.	Core Analysis Summary	Show the summary of the core analysis data used to determine the average laboratory core permeability for the tight formation area
12.	Technical Paper "Effect of Overburden Pressure and Water Saturation on Gas Permeability of Tight Sandstone Cores"	Show the relationship between laboratory and in situ permeability
13.	Determination of In Situ Permeability	Show the method of determining in situ permeability from laboratory core analysis
14.	Darcy's Law Permeability Calculation	Show the determination of permeability from an unstimulated gas production test using Darcy's Law

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			CABREST	o tight gas (area - I	EXHIBIT	#3		371.	ST	and of	il.	i I
		LIST O	F WELLS WITHIN THE TIG	ht gas area '	that ha	ve pene	TRATED TH	e pictured	CLIFFS FOR	ATION	diff	,#/L	
							azr=#2=51		31673137423		-		
	11.	~	- 53.	will	are		pro	fort					
1	124 incus	-		Chif	alle	<i>u j i</i>		CURRENT	CURRENT				
				MIRRENT	SD(17)	PC CMD	PC TD	GAS PROD	OIL PROD	11/1/91 Plik	11/1/91 CIN		DEPTH TO
WELL	LOCATION		OPERATOR	STATUS	DATE	DATE	(MCFD)	MCFD	BOPD	6AS PROD	OIL PROD	FIELD	P.C.
JIC H-9 #1	T29N R2W SEC 9 H	se ne	UNION OIL OF CALIF	D&A	6/86	8/87	8						3686
JIC #S-3	T29N R2W SEC 17 M	SW SW	SMITH DRILLING	D&A	6/56	5/57	8						3594
JIC #S-1	729N R2W SEC 19 N	se sw	SMITH DRILLING	DtA	12/55	3/56	800						3498
JIC 451 #1	t29n r3# sec 4 k	ne sh	ROBERT L. BAYLESS	PROD FRT	1/84								3762
JIC 451 #3	T29N R3W SEC 4 D		ROBERT L. BAYLESS	DIA	11/89	4 (00	1001			04 774			3782
JIU 452 #4	TOON DOW DEC 5 D	NW NW	RUBERT L. BRYLESS	FRUD FU	11785	1/89	1365	21	0.0	21,734	ø	E BLANCU PC	3/4/
JIG 402 #1-T INDION B-1	TOON BOTH OCC OF M	3C 3C CU CU	NUDERI L. DHILEDO	PRUV FRI Džo	0/00 5/57	7/60	0						2525
TIC 454 0-1	T29N R34 SEC 24 1	MAR SU	OWEED PROVETTON	DIA 1985	11/83	1100	v						3665
LA JARA #1	T29N R3W SEC 25 M	SU SU	JERDNE P. WCHIGH	PIA 1985	11/71								3515
INDIAN A #1	T29N R3K SEC 29 R	NENE	NORTHWEST PIPELINE	PIA 1962	11/52								3600
INDIAN A #3	T29N R3W SEC 29 L	NH SH	NORTHWEST PIPELINE	PROD PC	8/77	7/80	40						3750
INDIAN A #2	T29N R3N SEC 38 N	SE SH	NORTHWEST PIPELINE	prod PC	11/56	11/56	7984	59	6.0	876,842	17	Choza mesa	3646
BURKE #1	T29N R3W SEC 31 F	se nn	JEROME P. MCHUGH	P4A 1979	11/76	1/77	750			928	48	Choza Mesa	3713
INDIAN E #1	T29N R3W SEC 31 B	NK NE	PHILLIPS PETROLEUK	P&A 1985	4/54	5/54	6			357,932	0	Choza Mesa	3688
INDIAN 6 \$1	T29N R3W SEC 33 D	NH NH	NORTHMEST PIPELINE	D&A	6/55	7/55	6						3618
INDIAN 6 #2	t29n r3n sec 34 k	ne sh	NORTHWEST PIPELINE	D&A	10/55								3684
TRUJILLO FED #1	T29N R4W SEC 1 H	se ne	Southland Royalty	DLA	1/84								3615
BURNS RANCH 300	T29N R4W SEC 2 H	se ne	Southland Royalty	PROD FRT	5/98								3729
CONDCO 29-4 #9	T29N R4W SEC 2 D	SH SE	CONOCO DIL CO	DLA	4/78								3654
5J 29-4 UNIT #9	T29N R4W SEC 3 D		NORTHWEST PIPELINE	DER	9/55	7 /70	4330			40.757			4215
SJ 29-4 UNI: 421	TOON RAW SEC 5 K	NC SH	RERIDIAN GIL	PRED PC/NV	9/17	1/18	1332			19,605	Ϋ́	E BLANCO PC	4208
00 27-4 UNII #11	TOON DATE CC C D	25,25	NUKIMWESI PIPELINE		5/30	97.00	U						4263 4000
	TOON DAL OF 7 N		STONIO INT THE L GOS	PRUU DHL. DEG	11/04 A/57								4665 6665
SI 29-4 INIT #24	T29N R4U SEC A R	NUNF	MERIDIAN ATI	PROD PC/69	10/81	2/83	1649	50	1.2	86.354	1, 493	F BLONCH PC	4192
SJ 29-4 UNIT #7	T29N R4W SEC 8 D	NH NH	MERIDIAN OIL	P#A 1988	8/55	12/55	1186				***	2 001100 10	4002
SJ 29-4 UNIT #22	T29N R4K SEC 9 N	SE SK	MERIDIAN OIL	PROD PC	11/78	12/78	1320	9	8.1	37,788	217	e blanco pc	3535
VALDEZ #2	T29N R4W SEC 10 M	SH SH	STANDOLIND DIL & GAS	DLA	10/53								3685
CONOCO 29-4 #2	T29N R4W SEC 11 H	se ne	ROBERT L. BAYLESS	prod Gal	8/73								3694
CONOCO 29-4 #5	T29N R4W SEC 12 H	se ne	ROBERT L. BAYLESS	prod Gal	10/73								3774
BURNS RANCH #1	T29N R4W SEC 13 A	NE NE	Southland Royalty	Prod Gal	9/79								3595
CONOCO 29-4 #10	T29N R4W SEC 14 A	NE NE	ROBERT L. BAYLESS	prod pc	3/78	4/78	973	37	0.0	183, 317	9	UNDES PC	4075
5J 29-4 UNIT #23	T29N R4W SEC 15 J	NH SE	MERIDIAN OIL	PROD PC	11/78	12/78	663	13	0.0	46,320	144	Choza mesa	4874
SJ 29-4 UNIT #12	T29N R4W SEC 18 B	NH NE	MERIDIAN OIL	PROD AV	7/57	F 170			• •	75 664		ann callanas	4418
CONCLUS 29-4 #5	129N RAW SEC 19 H	SE NE	KUBERT L. BRYLESS	PRUD PC	4//8 17/17	5//8 مדום	/19	18	8.1 a a	50,881	119	GODEDNAROD	55/5 7879
CTMPLN 2774 #3	TOON DAY OF DA F	SW SE CUMU	JUTINE, JUTINE	DRUD PC	1110 1710	0/18 גרוך	bji ≂⊒a∧	12	10.10 0.1	10,130	517	COREDNOVO	30/0 7284
CINCOU 27-4 #/	TOON DAU GET DO V	una nana Ma⊂ q⊔	CONDERT LA DATLESS	PROD PC DIA	9/72	12/75	900 Q	13	0.1	UL 9770	510		3828
ST 29-4 INIT #7	TON RAU SEC 22 N	er qu	FI PASA NATURAL BAS	010	10/53	4/54	D D						3610
SCHALK 29-4 #16	T29N R4H SEC 22 P	SESE	JOHN E. SCHALK	PROD PC	4/78	16/78	1448	4	8.9	29, 269	ß	Choza nesa	4835
SCHALK 29-4 #11	T29N R4W SEC 23 P	SE SE	JDHN E. SCHALK	PROD PC	5/78	6/78	1019	6	0.9	44, 109	186	CHOZA MESA	3701
SCHRLK 29-4 #10	T29N R4W SEC 23 M	SH SH	M.R. SCHALK	PROD PC	2/82	11/82	812	12	8.6	31,887	8	Choza mesa	4841
CONOCO 29-4 #4	T29N R4W SEC 24 N	SE SH	ROBERT L. BAYLESS	PROD PC	12/73	4/78	5644	27	6.6	62,245	17	Choza mesa	3697
SJ 29-4 UNIT #15	T29N R4W SEC 25 6	Sh ne	el paso natural gas	DLA	7/58	10/58	0						3675

EKHIBIT #3 - PAGE 2

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MELL.				51H105	DHIE	UHIC.	(N GF 107	PIL-F U	DUPU		UIL PROD		Fe be
SCHALK 29-4 #6	T29N R4W SEC 25 M	SH SH	JOHN E. SCHALK	PROD PC	8/80	10/81	758	2	6.0	4,964	0	Choza nesa	4045
SCHHLK 29-4 \$17	TEAN NAM SEC 25 T	NE SE	JUHN E. SCHALK	PRUD PL	1/18	8/78	1.565	55	6.6	263,976	Ŭ (DG	CHUZA MESA	3644
50HHLK 29-4 #14	129N NAW SEL 20 B	NH NE	JUHN E. SUHHLK	PROD PL	4/ /ð	9//8	11/1	14	6.6	64,46/	462	CHUZA AESA	4646
SUNHLK 29-4 #/	TON NAM SEL OF N	NE SHI	JUHN E. SUHHLK	PRUD PU	צי וכ	6/19	1386	9/	1./	281,295	12,513	UNULA ALSA	3//4
5019615 2779 910 PONDOD 50-6 87	TOON NAW DEU CT P	25 25	JURN E. JURNEN	PROD PL	4//8	10/78	2610	5	0.0	41,014	e	UNUTH MEDH	5942
CT 20_4 18177 #12	TOON DALL COL	CC NC	RUDERI L. DRILEGO		11/13								4192
CI 00_4 UNIT #10	TOON BALL CEL 23 H	DE NE	LL PHOU RHIURHL OHO	NORT MIL	0/57								4071
57 29-A INTT #16	1271 RTH 32L 30 1	NE DE		PROD BY	0/33								4202
COUNT 20-1 47	TOON DALL CEP 70 D	NENE	TOLAL C COUNTY	0000 0C	1131	ארו ר	700	20	0 Q	104 271	a	COLEDNAVOO	4133
SCHOLK 29-4 #1	TOON DALL GET 72 M	CU CU	TOHALE SCHALK	DROD PL	1/75	<i>314</i> 0	100	E7	0.0	104,271	16	DUDERNHUUR	46.JK) 6760
FED #24-4-72 #1	TOON RAN GED 32 A	NENE	STRUCT SCIENCE		A/A9								4050 6050
SCHOLK 29-4 \$0	TPAN RAL GEC 32 D	SE SE	TOWN F SCHOLEUM	DRAN DR	12/75	2/76	1254	218	6 9	607 769	116		40.00
FFD #29-4-32 #2	T29N R4W SEC 32 M		RICHNOND DETROI FUN	OROD FRT	9/89	C) 10	1001	210	0.0	oorg 102	110	ODEMADU	4777
50'HO: K 29-4 #4	T29N RALL SEC 32 D	NUNU	TOHN F SCHOLK	DRAN DC	9/75	12/75	SØF,	197	0.0	299 221	ß	CORCONODAD	1001
SJ 29-4 INIT #18	T29N R4W SEC 33 H	SENE	NERIDIAN OTI	DRUD NU	9/59	26710	000	100	0.0	Englis	v	oopenmeren	4262
51 29-4 INIT #8	T29N RAW SEC 34 H	SENE	NORTHWEST DIDELINE	DRAD DC	6/57	7/57	376						7291
ST 29-4 INIT #4	T29N R4W SEC 35 B	NUNE	MERIDIAN OTI		9/55	11/55	ADI	10	8.8	104 075	0	runto mego	2022
51 29-4 INIT #2	T29N R4H SEC 35 K	NE SU	MERIDIAN OIL	PROD FRT	9/53	10/53	6928		010	1 035 500	9	CHOZA MEGO	2022
SH 29-4 UNIT #16	T29N R4W SEC 36 R	NENE	MERIDIAN OIL	PROD FRT	7/58	11/58	635			64.391	9	CHOTA MESA	3738
5J 29-4 UNIT #10	T29N R4N SEC 36 K	NE SW	EL PASO NATURAL GAS	P46 1985	7/56	9/56	1348			81,854	8	CHO7A MESA	3982
GASBUGGY #2	T29N R4W SEC 36 N	SE SH	EL PASO NATURAL GAS	DŁA	4/67					,	•		3910
GASBLIGGY #1	T29N R4W SEC 36 K	NE SW	EL PASO NATURAL BAS	DLA	2/67								3916
GASBUGGY #3	T29N R4W SEC 36 K	ne sw	el paso natural gas	D&A	8/69								3908
JIC S-4	T38N R2W SEC 6 E	sh nh	SWITH DRILLING	DLA	10/56								3775
JIC 516 #1	T309N R2W SEC 7 D	SH SE	ROBERT L. BAYLESS	PROD FRT/PC	11/87	1/88	368						3798
JIC 519 #1	T30N R2W SEC 18 0	SW SE	ROBERT L. BAYLESS	prod PC/GAL	11/85	7/87	754	9	6. 8	24.812	8	e blanco pc	3596
JIC 522 #1	T36N R2W SEC 33 C	NE NH	WALLON DIL CO	DAR	9/88			-			-		3814
JIC 458 #2	T340N R344 SEC 7 D	SH SE	ROBERT L. BAYLESS	prod pc	12/85	1/87	3221	148	6.6	238,656	0	e blanco pc	3633
JIC 458 #8	T36N R3W SEC 7 F	se nn	ROBERT L. BAYLESS	prod PC	9/88	11/88	3510	250	0.0	199, 103	8	E BLANCO PC	3710
JIC 458 #3	T320N R3W SEC 7 H	se ne	ROBERT L. BAYLESS	PROD PC	3/88	4/88	2633	198	8.8	181,533	8	e blanco pc	3713
JIC 457 #1	T30N R3W SEC 9 L	N# SH	ROBERT L. BAYLESS	prod da	12/86	1/87	384	29	0.0	17,577	6	e blanco pc	3702
JIC 456 #1	T30N R3W SEC 11 N	SE SW	ROBERT L. BAYLESS	PROD FRT	2/87					·			3730
JIC 461 #1	T36N R3W SEC 14 L	NH SH	ROBERT L. BAYLESS	prod PC	1/87	2/87	1055	31	0.6	43,766	0	e blanco pc	3651
JIC 459 #8	T369N R3W SEC 17 C	NE NW	ROBERT L. BAYLESS	prod pc	10/88	1/89	1586	33	6.8	24,486	8	e blanco pc	3663
JIC 459 #1	T36N R3W SEC 18 I	ne se	ROBERT L. BAYLESS	prod pc	11/86	1/67	2355	171	0.0	211,802	8	e blanco pc	3677
JIC 459 #3	T30N R3W SEC 18 6	sh ne	ROBERT L. BAYLESS	prod da/pc	10/88	1/89	2539	65	0.0	31,445	6	e blanco pc	3654
JIC 459 #4	T36N R3W SEC 19 B	NW NE	ROBERT L. BAYLESS	prod pc	10/88	1/89	4378	251	0.0	206,020	0	e blanco pc	3748
JIC 459 #5	T30N R3W SEC 19 P	se se	ROBERT L. BAYLESS	prod pc	12/88	4/90	1384	71	8.8	10,787	8	e blanco pc	3846
JIC 459 #2	T30N R3W SEC 20 E	SH NH	ROBERT L. BAYLESS	prod pc	11/87	12/87	3585	182	0.0	266,310	0	e blanco pc	3742
JIC 460 #2	T30N R3W SEC 21 M	SH SH	ROBERT L. BAYLESS	prod pc	12/86	1/87	408	11	0.8	26,041	8	e blanco pc	3687
JIC 462 #1	I JAIN RJA SEC 22 K	SW SW	KUBERT L. BAYLESS	PROD PC	1/87	1/87	404	24	0.0	25,882	0	e blancd pc	3689
JIC 463 #1	I JOHN ROW SEC 25 E	SH NH	NUBERT L. BAYLESS	prod da	3/87	4/87	443			9,071	8	e blanco pc	3680
JIC 464 #8	TJAAN RJW SEC 29 K	NE SW	KUBERT L. BAYLESS	PROD PC	10/88	12/88	2524	121	0.0	65,900	0	e blanco pc	3770
J10 464 #/	I SIGN KIGH SEC 29 D		KUBERT L. BAYLESS	prod pc	11/88	2/89	2428	164	0.0	93,069	6	e blanco pc	3814
J1C 464 #3	1340N K3W SEC 340 H	SE NE	RUBERT L. BRYLESS	PROD PC	11/88	12/88	4801	112	0.0	97, 391	8	E BLANCO PC	3808
J10 404 #1	THE REPORT OF THE	NE SE	NUBERT L. BRYLESS	PKUU PC	10/85	12/85	5923	262	6.8	483,271		E BLANCU PC	3/40
JIL 909 #3	TOOL DOLL OF DI	NW NE	NUBERI L. BHYLESS	PKUD PC	12/66	2/89	3010	50	0.0	43,8/9	U C	E BLANCO PC	5/20
JIL 909 89	ISION KSW SEL SI J	NW 5E	RUBERI L. BHYLESS	PKUD PC	C/66	3/66	1005	15	0.6	ci,505	6	E BLHNOU PC	3698

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EXHIBIT #3 - PAGE 3

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WELL	Location		operator .	clirrent Status	spud Date	pc Comp Date	PC IP (MCFD)	Current Gas prod Capability MCFD	CURRENT OIL PROD CAPABILITY BOPD	11/1/91 CUM GAS PROD	11/1/91 Cum OIL PROD	FIELD	Depth to Top of P.C.
JIC 464 #2	T30N R3W SEC 32 D	NH NH	ROBERT L. BAYLESS	prod pc	10/87	12/87	2481	89	6.0	315,095	8	e blanco pc	3734
JIC 464 #6	T3RN R3W SEC 32 M	SH SH	ROBERT L. BAYLESS	PROD PC	8/88	9/88	3882	142	0.0	178,427	0	e blanco pc	3 638
JIC TRIBAL #1	T30N R3N SEC 34 D	NH NH	SUNRAY DX DIL CO	D&A	3/64								3608
SINKS FED #3	T30N R4W SEC 11 E	SV NV	Southland Royalty	PROD PC	9/82	12/82	2002	10	6.6	35,818	0	e blanco pc	3650
SIMMS FED #2	T30N R4W SEC 11 0	S# SE	Southland Royalty	prod PC	10/81	12/81	1342						3666
SJ 30-4 UNIT #25	T30N R4W SEC 11 I	ne se	EL PASO NATURAL GRS	Pła	9/58	11/58	179						3650
SIMMS #7	T36N RAW SEC 12 P	se se	ROBERT L. BAYLESS	prod PC	7/90	8/90	3423	75	6.0	6,796	0	e blanco pc	3634
SIMMS FED #1	T30N R4W SEC 13 J	NW SE	Southland Royalty	prod Gal	6/81								3798
ALSUP BH1	T30N R4W SEC 14 P	se se	el paso natural gas	P&A 1959	11/51								
SJ 30-4 UNIT #31	T38N R4W SEC 14 D	NW NV	el paso natural gas	D&A	8/6€								3803
SCHALK 49 \$1	T30N R4K SEC 23 M	SW SW	SCHALK DEVELOPMENT	prod pc	3/73	7/73	1613	27	8.8	228, 785	8	e blanco pc	4144
SCHALK 49 \$2	T38N R4W SEC 23 0	SW SE	SCHALK DEVELOPMENT	prod PC	11/73	1/74	880	6	8.8	27,889	0	e Blanco PC	4833
SCHALK 49 \$3	T30N R4W SEC 23 A	NE NE	SCHALK DEVELOPMENT	prod PC	12/73	1/74	2236	7	0.0	129, 813	0	e blanco pc	3834
SCHALK 49 \$4	T39N R4N SEC 23 D	NW NW	SCHALK DEVELOPMENT	prod PC	1/74	5/74	713	7	6.6	25,936	8	e blanco pc	3872
SJ 30-4 UNIT #29	T30N R4W SEC 24 D	NU NU	el paso natural gas	DIA	9/58	10/58	6						4036
SCHALK 76 #1	130N R4W SEC 25 E	SW NW	CORSTLINE PETROLEUM	D&A	12/73								4885
BIXLER RANCH #1	T38N R4W SEC 26 E	SW NR	Southland Royalty	prod PC	9/81	11/81	449	15	0.0	74,951	0	e blanco pc	3986
SJ 30-4 UNIT #19	T30N R4W SEC 26 C	NE NW	el paso natural gas	DŁA	6/57	8/57	0						4871
BIXLER RANCH #2	T30N R4W SEC 26 M	SW SW	Southland Royalty	prod PC	8/83	3/84	712	35	0.0	75,402	8	e blanco pc	4130
RUBEN CANYON \$1	T3RN R4W SEC 35 E	SH NN	Southland Royalty	prod PC	10/81	12/81	1250	78	8.8	286,764	6	e blanco pc	3835
SINKS FED #4	T30N R4W SEC 36 P	se se	Southland Royalty	PROD FRT	8/83	10/84	6						3794
JIC TRIBAL 525 #1	T31N R2W SEC 15 I	NE SE	AMOCO PRODUCTION	prod Gal	11/85								969
JIC TRIBAL 29 #1	T31N R2W SEC 36 B	NW NE	HUMBLE OIL & REF	DLA	9/63								950
JIC TRIBAL 531 #1	T31N R3W SEC 5 K	ne sh	AMOCO PRODUCTION	prod Gal	11/83								3830
JIC 31-3-32 #1	T31N R3W SEC 32 L	NH SH	ROBERT L. BAYLESS	DRILLED	2/91	2/91	NONE YET	6 1	0.0	0	8	e blanco pc	3779
JIC TRIBAL #1	T32N R3W SEC 21 M	SM SM	The texas CC	D&A	5/52								1380
TRIBRL #1	T32N R3W SEC 22 H	se ne	STANOLIND	DSA	5/52								1105
PAGOSA JIC #1	T32N R3W SEC 23 D	NV NV	PAN AMERICAN PET	D&A	6/63								1054
TRIBAL #1	T32N R3W SEC 23 K	NE SH	FLORENCE DRILLING	D&A	6/47								
JIC NM 29 A #1	T32N R3W SEC 29 F	se nn	AUSTRA-TEX OIL CO	D&A	6/88								2764

CABRESTO TIGHT GAS AREA - EXHIBIT #6

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NATURAL UNSTIMULATED GAS PRODUCTION FLOWTEST

WELL: ROBERT L. BAYLESS JICARILLA 31-3-32 #1 NWSW SEC 32 T31N R3W

DATE	TIME		TUBING FLOW PRESS CHART (PSI)	ORIFICE SIZE	FLOW RATE (MCFD)	GAS FRODUCED (MCF)	TOT GAS PRODUCED (MCF)
02/27/91	10:05	==== am		.125 0.125	44.8	0.000	0.000
	10:10	an	86	0.125	43.1	0.153	0.153
	10:15	am	87	0.125	43.5	0.150	0.303
	10:20	am	85	Ø.125	42.7	0.150	0.453
	10:25	am	79	0.125	40.1	0.144	0.596
	10:30	am	73	0.125	37.5	0.135	0.731
	10:35	аm	67	0.125	34.9	0.126	0.857
:	10:40	am	65	0.125	34.0	0.120	0.976
	10:45	am	55	0.125	29.7	0.111	1.087
	10:50	am	60	0.125	31.9	Ø.107	1.194
•	10:55	am	53	0.125	28.9	0.106	1.299
- -	11:00	am	50	0.125	27.6	0.098	1.398
	11:05	an	44	0.125	25.0	0.091	1.489
	11:10	am	46	0.125	25.8	0.088	1.577
ļ	11:15	am	39	0.125	22.9	0.085	1.662
	11:20	зm	32	0.125	19.9	0.074	1.736
	11:25	am	37	0.125	22.1	0.073	1.809
- manual -	11:30	am	30	0.125	19.0	0.071	1.880
5 5	11:35	am	24	0.125	16.5	0.062	1.942
÷	11:40	am	33	0.125	20.3	0.064	2.006
5 5	11:45	am	28	0.125	18.2	0.067	2.073
	11:50	am	22	V.125	15.5	0.059	2.131
	11:55	an	19	0.125	14.0	0.001	2.182
	12:00	ря — —	27	0.120	17.8	0.000	C.C.0 0 007
	10.10	pa o	<u>-</u> 4	0.123 0.125	10.0	U.UGU 0.050	C.C7/ 0 7/0
	10.15	μm ο π	10	0.123	10.5	0.002	2 701
	10.00	9 m 6 m	0	0.123	16.0	0.07L	2 424
	10.05	- Pm	14	0.120 0.125	10.7	0.037	2 462
	10.70	Pa O	20A	0.125	14 5	0.007	2 509
	10.75	pm pm	14	0.123	19.0	0.047	2.507
i.	10.70	Pa Pa	10	0,12J 01195	15.0	0.047	2.000
	12:40	р и На	10	0.105	ניג ק	ענים. היות ה	0 405
	10.50	рж	0 1	0.105	0,0 6 A	0,031	6.06J 0.650
	12:00	р. Р.	с С	0.125	39	0.000	2,668
	1.00	– рия 19 м. –	ت 1	D. 125	2.4	0.012 0.012	2,680
	1.00	Рш	*	1. 8 X L. U	(VI VI VI L	2.000
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CALCULATED 24 HOUR FLOWRATE = 22.0 MCFD

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CABRESTO TIGHT GAS AREA - EXHIBIT #7

PICTURED CLIFFS CORE ANALYSIS

OPERATOR:ROBERT L. BAYLESSWELL:CONOCO 29-4 #7LOCATION:SWNW SEC 20 T29N R4W

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TOP OF PICTURED CLIFFS = 3284

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ALL DATA USED IN THIS ANALYSIS IS >10% POROSITY REPORTED FROM CORE ANALYSIS

SAMP NUM	TOP INTERVAL	BOTTOM	FOOTAGE INTERVAL	HORIZONTAL PERMEABILITY	POROSITY	WATER SATURATION
	TOTAL AVG		35	4.08 0.12	411.3 11.8	2069.0 59.1
6	3369	3370	i	0.12	10.7	49.5
7	3370	3371	1	0.33	11.6	50.0
10	3373	3374	1	Ø.44	11.5	52.1
11	3374	3375	1	0.15	12.8	49.3
12	3375	3376	1	0.28	13.8	49.3
13	3376	3377	1	0.14	12.6	38.1
14	3377	3378	1	0.28	11.3	38.9
15	3378	3379	1	0.10	12.8	39.1
18	3381	3382	1	0.10	11.2	56.1
19	3382	3383	1	0.32	13.5	45.9
20	3383	3384	1	0.18	13.8	47.1
21	3384	3385	1	Ø.11	12.4	55.6
22	3385	3386	1	0.21	11.8	58.5
23	3386	3387	1	Ø.11	12.8	52.4
24	3387	3388	1	0.15	10.3	65.0
26	3389	3390	1	0.07	11.6	69.9
28	3391	3392	1	0.05	11.8	65.2
31	3394	3395	i	0.05	11.8	61.9
32	3395	3396	1	0.08	11.3	62.8
37	3400	3401	1	0.04	11.i	70.3
41	3404	3405	1	0.08	10.4	70.2
42	3405	3406	1	Ø.14	10.9	65.1
51	3414	3415	1	0.04	11.0	72.7
52	3415	3416	1	0.04	10.3	73.8
87	3461	3462	1	0.02	10.5	76.1
89	3463	3464	1	0.01	10.9	78.9
100	3474	3475	1	0.01	10.7	64.5
101	3475	3476	1	0.02	11.4	64.9
102	3476	3477	1	0.05	12.8	61.0
103	3477	3478	1	0.08	12.0	57.5
104	3478	3479	1	0.05	11.7	62.4
105	3479	3480	1	0.07	11.5	61.7
106	3480	3481	1	0.05	11.9	61.4
107	3481	3482	1	0.04	12.3	66.7
108	3482	3483	1	0.07	12.5	55.1

EXHIBIT #7 PAGE 2

CORE LABORATORIES. INC. Petroleum Reservoir Engineering DALLAS, TEXAS

Page 1.

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CORE ANALYSIS RESULTS

Company,	CONTINENTAL	OIL COMPANY	Formation	PICTURED CLIFFS	File	<u>- RP-3-2620</u>
W'ell	NO. 7 SAN JU	AN 29-4	Core Type	DIA. CONV. 4"	Date Repor	n_2-18-74
Field	MILDCAT		Drilling Fluid	WEM	Analysts	<u>HN</u>
County	RIO ARRIBA	State N. MEX.	Elev. 6578 KB Location	NW 1/4 Sec. 20	T29N R4W	

Lithological Abbreviations

NumericDerive HIGEPrecision	SAND-8 BHALE- LIME-1	D DOLOMITE-DOL SH CHERT-CH M GYPSUM-GYP	ANHY CONG FOSEI	DRITE - ANHY LOMERATE - CONG LIFEROUS - FOSS	SANDY - SI Shaly - Bi Limy - Lmi	DY FI HY MI Y CO	NE+FN (DIUM+MED (ARSE+CSE		CRYSTALLINE - XLN GRAIN - GRN GRANULAR - GRNL	BROWN - BRN GRAY - GY VUSGY - VGY	PRACTURED - PRAC LAMINATION - LAM BTYLOLITIC - STY	SLIGHTLY-I VEPY-V/ WITH-W/
LUMBERF.C.THEGEL MARKEDInc. CarlonLUME13301-650.01-0.013.30.072.7Ss wh vfg cly s & p calc23365-660.01-0.018.22.4TALLVFSs wh vfg cly s & p calc3355-670.040.018.22.4TALLVFSs wh vfg cly s & p calc5355-690.050.029.82.050.1VFSs wh vfg cly s & p calc63359-700.120.011.76.419.5Ss wh vfg cly s & p calc73370-710.330.0711.67.8So.0Ss wh vfg cly s & p calc83371-720.020.013.315.175.8VFSs wh vfg cly s & p calc93372-730.01-0.012.30.082.6VFSs wh vfg cly s & p103373-740.140.0712.69.536.1VFSs wh vfg cly s & p133376-770.140.0712.69.536.1VFSs wh vfg cly s & p133376-780.280.0211.310.638.9VFSs wh vfg cly s & p143378-800.120.018.90.0073.0Ss wh vfg cly s & p153378-700.120.0211.310.615.9Ss wh vfg cly s & p1633378-800.120.018.90.073.0Ss wh vfg cly s & p1633378-800.120	SAMPLE	DEPTH	PER	MEABILITY	POROSITY	RESIDUAL PER C	BATURATIO	N		SAMPLE	DESCRIPTION	
1 3304-65 0.01 <0.01 3.3 0.0 72.7 Ss wh vfg cly s & p calc 2 3365-66 0.01 <0.01 4.0 0.0 82.5 VF Ss wh vfg cly s & p sli calc 3 3366-67 0.04 0.01 8.2 2.4 74.14 VF Ss wh vfg cly s & p sli calc 4 3307-68 0.05 0.02 9.8 2.0 56.1 VF Ss wh vfg cly s & p calc 5 3358-69 0.05 0.02 9.8 2.0 56.1 VF Ss wh vfg cly s & p calc 5 3358-69 0.02 0.01 10.7 8.4 μ 55 Ss wh vfg cly s & p calc 6 3359-70 0.12 0.04 10.7 8.4 μ 55 Ss wh vfg cly s & p calc 7 3370-71 0.33 0.07 11.6 7.8 50.0 Ss wh vfg cly s & p calc 8 3371-72 0.02 0.01 3.3 15.1 75.8 VF Ss wh vfg cly s & p calc 9 3372-73 0.01 <0.01 2.3 0.0 82.6 VF Ss wh vfg cly s & p calc 10 3373-74 0.44 0.11 11.5 6.1 52.1 Ss wh vfg cly s & p calc 10 3373-76 0.28 0.07 13.8 8.0 μ 9.3 Ss wh vfg cly s & p 11 3376-77 0.10 0.02 11.3 10.6 38.9 VF Ss wh vfg cly s & p 12 3376-77 0.10 0.02 11.3 10.6 38.9 VF Ss wh vfg cly s & p 13 3376-77 0.10 0.02 11.3 10.6 38.9 VF Ss wh vfg cly s & p 14 3377-8 0.16 0.02 11.3 10.6 38.9 VF Ss wh vfg cly s & p 15 3376-79 0.10 0.02 12.6 9.4 39.1 VF Ss wh vfg cly s & p 14 3377-8 0.12 0.01 8.2 0.0 67.1 Ss wh vfg cly s & p 15 3376-79 0.10 0.02 11.4 0.0 56.1 Ss wh vfg cly s & p 17 3350-81 0.05 0.01 8.9 0.0 73.0 Ss wh vfg cly s & p 18 3361-82 0.10 0.02 11.8 0.00 56.1 Ss wh vfg cly s & p 19 3362-63 0.32 0.07 13.5 9.6 μ 5.9 Ss wh vfg cly s & p sli calc 20 3363-64 0.18 0.00 13.8 10.9 μ 7.1 VF Ss wh vfg cly s & p 21 3362-65 0.11 0.02 12.4 0.0 55.6 Ss wh vfg cly s & p 23 3365-67 0.11 0.02 12.4 0.0 58.5 Ss wh vfg cly s & p 23 3365-67 0.11 0.02 12.4 0.0 58.5 Ss wh vfg cly s & p 24 3367-89 0.08 0.01 9.7 0.59.8 Ss wh vfg cly s & p 24 3367-89 0.08 0.01 9.7 0.59.8 Ss wh vfg cly s & p 25 3395-90 0.07 0.02 11.6 0.9 69.9 Ss wh vfg cly s & p 26 3392-90 0.07 0.02 11.6 0.9 69.9 Ss wh vfg cly s & p 26 3392-90 0.07 0.02 11.6 0.9 69.9 Ss wh vfg cly s & p 27 3390-91 0.02 0.01 3.1 0.0 77.4 VF Ss wh vfg cly s & p 26 3395-96 0.06 0.02 11.3 0.0 66.2 Ss wh vfg cly s & p 26 3395-96 0.06 0.02 11.3 0.0 68.9 Ss wh vfg cly s & p 27 3390-97 0.02 0.01 1.16 0.0 68.9 Ss w	NUMBER	FEET	HOR	K. VERT	PER CENT	OIL	TOTAL			AND	REMARKS	
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μα είας οματικάς του	50 20	2002-02	0.01		0.4 אר	0.0	80.2		Se th th	rg ery o d fo cly e f	- D - F	ć
	עכ הג	3102-05	0.04	<0.01	87	2 3	79.2		Ss wh vi	ני כאי פמ לה כאי פג	n sli calc	•

GERVICE NO. 5-A, 1-B. VF - VERTICAL FRACTURE. These analyses, opinous or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and considential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or productibleness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

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CORE LABORATORIES. INC. Petroleum Reservoir Engineering

EHHIBIT #7 PAGE 3

> Page No. 2

DALLAS, TEXAS

CORE ANALYSIS RESULTS

Company	OCUTINENTA	L OIL COMPANY	Formation	PICTURED CLIFFS	
W'cll	NO. 7 SAN	JUAN 29-4	Core Type	DIA. CONV. 4"	Date Report 2-18-74
Field	VILDOAT		Drilling Fluid	WEM	AnalystsRM
County	SAN JUAN	State N. MEX.	Elev. 6578 KB Locati	on NW 1/4 Sec. 20 T2	29N RÝM

Lithological Abbreviations

SAND - S Shale -	D DOLOMITE-DOL SN CHERT-CH	L ANHY CONG	DRITE - ANHY	SANDY-SD Shaly-Sh	Y 71 Y ME	NE . FN EDIUM - MED	CRYNTALLINE• XLI Grain•grn	N BROWN-BRN GRAY-GY	FRACTURED-FRAC Lamination-1am	\$LIGHTLY. VERY.V/
LIMEIL	M GYPSUM-BYP	F058	LIFEROUS-FOSS	LINY . LMY		ARBE-CSE	GRANULAR - GRNL	VUGGY - VGY	STYLOLITIC-STY	WITH W/
SAMPLE	DEPTH	PEF	MEABILITY	POROSITY	PER C	ENT PORE		BAMPLE	E DESCRIPTION	
NUMBER	FEET	HOR	K VERT.	PER CENT	DIL	TOTAL	1	AND	D REMARKS	
			-A	201						
41	3404-05	0.03	0.01	10.4	0.0	(0.2	Ss wn	vig cly s &	p sil calc	
42	3405-06	0.14	0.04	TO"À	0.0	05.L	Ss wn	vig cly s &	p sli calc	
43	3405-07	0.02	<0.01	7.1 	0.0	04.5	Ss wn	vig cly s &	p sli calc	
111	3407-05	0.04	<0.01	7.7	0.0	01.0	Ss wn	vig cly s &	p sli calc	
45	3405-09	0.04	<0.01	8.4	0.0	85.0	Ss wn	vig cly s &	p sli calc	
40	3409-10	0.01	<0.01	8.2	0.0	83.0	Ss wh	vig cly s &	p sin caic	
47	3410-11	0.01	<0.01	6.9	0.0	89.9	Ss wh	vfg cly s &	p shly	
48	3411-12	0.02	<0.01	8.1	0.0	86.5	Ss wh	vfg cly s &	p shly	
49	3412-13	0.02	<0.01	8.8	0.0	78.4	Ss wh	vig cly s &	p sli calc	
50	3413-14	0.02	0.01	8.1	0.0	91.3	Ss wh	vfg cly s &	p sli calc	
51	3414-15	0.04	0.02	11.0	0.0	72.7	Ss wh	vfg cly s &	p sli calc	
52	3415-16	0.04	0.02	10.3	0.0	73.8	Ss wh	vfg cly s &	p sli calc	
53	3416-17	0.04	0.02	9.8	0.0	77.5	Ss wh	vfg cly s &	p sli calc	
54	3417-18	0.04	0.01	9.5	0.0	84.1	Ss wh	vfg cly s &	p sli calc	
55	3418-19	0.04	0.04	9.8	0.0	71.4	Ss wh	vfg cly s &	p calc	
56	3419-20	0.04	0.04	9.4	0.0	71.2	Ss wh	vfg cly s &	p calc	
57	3420-21	0.04	0.02	9.7	0.0	71.1	Ss wh	vfg cly s &	p sli calc	
58	3421-22	0.02	0.01	7.6	0.0	81.6	Ss wh	vfg cly s &	p sli calc	
59	3423-24	0.02	0.02	5.6	8.9	78.5	Ss wh	vfg cly s &	p sli calc	
60	3424-25	0.01	0.01	6.4	0.0	86.0	Ss wh	vfg cly s &	p sli calc	
61	3425-26	0.01	0.01	4.5	40.0	49.0	VF Ss bri	n vfg cly		
62	3436-37	0.01	0.01	3.5	0.0	82.9	Ss wh	vfg cly s &	: p sli calc	
63	3437-38	0.01	0.01	5.2	0.0	82.6	Ss wh	vfg cly s &	2 p sli calc	
64	3438-39	⊲.01	0.01	4.5	0.0	84.4	Ss wh	vfg cly s &	k p sli calc	
65	3439-40	⊲.01	0.01	5.4	0.0	88.9	Ss wh	vfg cly s &	k p sli calc	
66	3440-41	0.01	0.01	5.7	0.0	85.9	Ss wh	vfg cly s &	k p sli calc	shly
67	3441-42	0.02	0.01	5.5	0.0	89.0	Ss wh	vfg cly s &	k p sli calc	
33	3442-43	0.01	0.01	4.6	0.0	80.5	Ss wh	vfg cly s &	k p sli calc	
69	3443-44	<0.01	0.01	5.4	0.0	79.6	Ss wh	vfg cly s &	k p sli calc	
70	3444-45	⊲.01	0.01	4.7	0.0	83.0	Ss wh	vfg cly s &	k p sli calc	
71	3445-46	<0.01	0.01	6.7	0.0	68.0	Ss wh	vfg cly s &	k p sli calc	
72	3446-47	0.01	<0.01	6.9	2.9	82.6	Ss wh	vfg cly s &	& p sli calc	
73	3447-48	0.01	⊲0.01	5.7	0.0	86.0	Ss wh	vfg cly s &	k p sli calc	
74	3448-49	0.04	0.01	6.2	0.0	83.9	Ss wh	vfg cly s &	k p sli calc	shly
75	3449-50	0.01	0.01	6.9	0.0	85.5	Ss wh	vfg cly s &	k p sli calc	

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CORE LABORATORIES, INC. Petroleum Reservoir Engineering DALLAS, TEXAS

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EXHIBIT #7

PAGE 4

CORE ANALYSIS RESULTS

Company_	CONTINENTAL OIL COMPANY	Formation	PICTURED CLIFFS	File <u>RP-3-2628</u>
Well	NO. 7 SAN JUAN 29-4	Core Type	DIA. CONV. 4"	Date Report 2-18-74
Field	VILDOAT	Drilling Fluid	WBM	Analysts <u>RP</u>
County	RIO ARRIBA State N. MEX. I	elev.6578 KB Location	NW 1/4 Sec. 20	T29N RLW

				Lith	ologica	l Abbrevia	ıti	ions			
SAND.S SHALE. LIME.L	D DOLOMITE-DOI BH CHERT-CH M GYPSUM-GYP	L ANHI CONG FOSS	DRITE-ANNY SLOMERATE-CONG ILIFEROUS-FOSS	SANDY-SD Shaly-Sh Limy-Lmy	*	FINE-FN MEDIUM-MED COARBE-CSE		CRYSTALLINK-XLN Grain-Grn Granular-Grnl	BROWN - BRN GRAY - GY VUGGY - VGY	FRACTURED - FRAC LAMINATION - LAM 67YLOLITIC - BTY	BLIGHTLY VERY-V/ WITH-W/
SAMPLE	DEPTH	PET	RMEABILITY	POROSITY	RESIDU. PER	CENT PORE			SAMPLE	DESCRIPTION	
NUMBER	FEET	HOR	K. VERT	PER CENT	OIL	TOTAL WATER			AND	REMARKS	
		0.07	AA	<i>(</i>))	~ ~	82.0					
70	5450-51	0.01	0.02	6.8	0.0	03.9		Ss wn vie	cth 2 %	p sin calc	
11	3451-52	0.02	0.01	7.2	0.0	04.1		SS wh Vie	g cly s &	p sin caic	
75	3452-53	0.02	0.02	7.4	0.0	05.1		Ss wh vi	cly s &	p sli calc	
19	3453-54	0.04	0.02	8.0	0.0	01.4		Ss wn vie	cly s &	p sin calc	
50	5454-55	0.02	0.02	9.0	0.0	80.0		Ss wn vig	cly s &	p sli calc	
51	3455-50	0.02	0.01	8.2	0.0	02.9		Ss wn vie	cih 2 %	p sli caic	
52	3450-57	0.02	0.02	8.3	0.0	77.1		Ss wh vig	cth 2 %	p sin caic	
83	3457-58	0.01	<0.01	<u>ل</u> ، ر	0.0	02.3		SS WN VI	g cly s &	p caic	
57	3458-59	0.01	<0.01	5.0	0.0	80.4	•	Ss wh vig	cià e a	p car	
65	3459-60	1.0 *	0.02	9.4	0.0	70.7 V	E.	Ss wh vi	cly s &	p calc	
56	3460-61	0.04	0.02	9.1	0.0	75.8		Ss wh vig	g ciy s &	p sli calc	
87	3461-62	0.02	0.02	10.5	0.0	76.1		Ss wh vig	g cly s &	p sli calc	
88	3462-63	0.02	0.04	9.7	0.0	76.2		Ss wh vi	g cly s &	p sli calc	
89	3463-64	0.01	0.02	10.9	0.0	78.9		Ss wh vig	g cly s &	p sli calc	
90	3464-65	0.01	0.02	9.9	0.0	80.8		· Ss wh vig	g cly s &	p sli calc	
91	3465-66	0.01	0.01	9.2	0.0	82.5		Ss wh vfg	g cly s &	p sli calc	
92	3466-67	0.01	0.01	9.9	0.0	78.8		Ss wh vf	g cly s &	p sli calc	
93	3467-68	0.01	0.01	8.5	0.0	80.0		Ss wh vf	g cly s &	p sli calc	
94	3463-69	0.01	<0.01	6.3	0.0	79.4 V	ΙF	Ss wh vf	g cly s &	p calc	
95	3469-70	0.01	<0.01	6.0	0.0	81.6		Ss wh vf	g cly s &	p calc	
96	3470-71	0.02	0.01	5.7	0.0	79.0		Ss wh vf	g cly s &	p sli calc	
97	3471-72	0.01	0.01	8.7	0.0	78.1		Ss wh vf	g cly s &	p calc	
98	3472-73	⊲.01	<0.01	7.5	0.0	85.3		Ss wh vf	g cly s &	p sli calc	
99	3473-74	<0.01	<0.01	4.3	0.0	72.1 V	VF	Ss wh vf	g cly s &	p calc	
100	3474-75	0.01	0.04	10.7	0.0	64.5 V	VF	' Ss wh vf	g cly s &	p calc	
101	3475 -7 6	0.02	0.04	11.4	0.0	64.9 V	VF	Ss wh vf	g cly s &	p calc	
102	3476-77	0.05	0.07	12.8	0.0	61.0 V	VF	Ss wh vf	g cly s &	p calc	
103	3477-78	0.08	0.08	12.0	0.0	57.5 V	VF	Ss wh vf	g cly s &	p sli calc	
104	3478-79	0.05	0.05	11.7	0.0	62.4		Ss wh vf	g cly s &	p sli calc	
105	3479-80	0.07	0.05	11.5	0.0	61.7		Ss wh vf	g cly s &	p sli calc	
106	3480-81	0.05	0.07	11.9	0.0	61.4		Ss wh vf	g cly s &	p sli calc	
107	3481-82	0.04	0.08	12.3	0.0	66.7 \	VF	Ss wh vf	g cly s &	p sli calc	
108	3482-83	0.07	0.07	12.5	0.8	55.1 V	VF	Ss wh vf	g cly s &	p sli calc	

* DENOTES FRACTURE PERMEABILITY. •

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CABRESTO TIGHT GAS AREA - EXHIBIT #8

PICTURED CLIFFS CORE ANALYSIS

OPERATOR: JOHN E. SCHALK WELL: SCHALK 29-4 #6 LOCATION: SWSW SEC 25 T29N R4W

TOP OF PICTURED CLIFFS = 4045

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ALL DATA USED IN THIS ANALYSIS IS >10% POROSITY REPORTED FROM CORE ANALYSIS

SAMP NUM	TOF INTERVAL	BOTTOM INTERVAL	FOOTAGE INTERVAL	HORIZONTAL PERMEABILITY	POROSITY	WATER SATURATION
	TOTAL AVG		59	92.39 1.57	682.2 11.6	2401.9 40.7
18	4057	4058	1	0.12	10.6	44.3
23	4062	4063	1	0.41	12.3	46.3
24	4063	4064	1	0.52	11.8	46.6
25	4064	4065	1	0.27	11.8	50.8
26	4065	4066	. 1	0.58	13.1	50.4
27	4066	4067	1	0.83	12.3	54.5
28	4067	4068	1	0.37	12.6	50.0
29	4068	4069	1	1.40	10.4	53.8
30	4069	4070	1	8.60	12.8	46.9
31	4070	4071	1	7.60	12.0	45.0
33	4072	4073	1	0.66	11.3	36.3
34	4073	4074	1	0.25	11.8	49.2
35	4074	4075	1	0.50	12.0	50.0
39	4078	4079	1	0.32	11.4	47.4
40	4079	4080	1	0.18	11.5	33.Ø
42	4081	4082	1	0.16	15.1	31.8
743	4082	4083	1	56.89	- 10.0	54.0
45	4084	4085	1	0.51	11.8	41.5
48	4087	4088	1	0.08	11.5	47.8
49	4088	4089	1	0.09	13.0	46.9
70	4119	4120	1	0.10	11.5	53.9
71	4120	4121	1	1.20	10.2	59.8
93	4146	4147	1	0.93	12.3	29.3
94	4147	4148	1	2.50	11.7	12.8
96	4149	4150	1	0.29	10.0	46.0
97	4150	4151	1	0.24	14.2	42.3
98	4151	4152	1	0.22	11.5	35.7
99	4152	4153	1	0.16	12.7	22.0
101	4154	4155	. 1	0.66	10.8	50.0
106	4159	4160	1	0.13	11.4	40.4
107	4161	4161	1	0.23	10.1	32.7
113	4166	4167	1	0.16	10.1	30.7
114	4167	4168	1	0.11	13.3	20.3
115	4168	4169	1	0.07	11.2	35.7
133	4186	4187	1	0.02	10.0	20.0
165	4223	4224	1	0.51	10.1	71.3
170	4228	4229	1	0.10	11.5	24.3
186	4244	4245	1	0.05	10.3	36.9
190	4248	4249	1	0.09	11.1	27.0

EXHIBIT #8 - PAGE 2

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SAMP	TOP	BOTTOM	FOOTAGE	HORIZONTAL		WATER
NUM	INTERVAL	INTERVAL	INTERVAL	PERMEABILITY	POROSITY	SATURATION
204	4262	4263	1	ø. 38	10.1	38.6
210	4268	4269	1	0.15	10.8	31.4
211	4269	4270	1	0.12	11.7	47.8
212	4270	4271	1	0.15	11.5	48.7
213	4271	4272	1	0.09	10.4	33.7
214	4272	4273	1	0.13	11.2	48.2
215	4273	4274	1	0.06	10.6	35.8
223	4281	4282	i	0.15	11.3	53.1
224	4282	4283	1	0.97	11.4	28.9
225	4283	4284	1	0.17	11.9	47.1
226	4284	4285	1	0.24	13.6	25.0
227	4285	4286	1	0.18	11.8	39.0
228	4286	4287	1	0.17	11.8	32.2
229	4287	4288	1	0.18	11.0	30.9
232	4290	4291	1	0.11	11.2	34,8
241	4299	4300	i	0.06	11.2	34.8
268	4326	4327	1	0.26	11.6	37.9
270	4328	4329	1	0.14	11.3	49.6
272	4330	4331	1	0.26	11.6	37.9
274	4332	4333	1	1.20	13.1	48.9

PRE	LIMINARY			COR! Peir	E LABORA coleum Reserve DALLAS.	TORIES. bir Engineeri TEXAS	INC ng	Ŀ	XHIBIT #8 PAGE 3
ípar	y_John	E. Shalk			_Formation_H	oicture	d Cliffs	Page1	of9
Well_		29-4 #6			CoresI	Dia. Co	nv. L"	FileRP-3-	-3016
Field	Basin	Dakota	·		_Drilling Fh	id Star	ch & Gel	Date Report 9.	-13-80
County	Rio A	rriba Stat	<u>N.M.</u>		_ Elevation	7347	GL	Analysts Go	etz
Locatio	n	Sec.25-	29N-4W	·	_ Remarks	- <u>.</u>	·	*	
	· .			COR (Figures i	E ANALY	SIS RESU er to footnote	JLTS remerks)	and the second state of th	
SAMPLE	DEPTH	PERMEAB MILLIDA		OROSITY	RESIDUAL	- N		REMARK	£
NUMBER	FEET	MAX	90 ⁰	REACENT	C	WATER	;		
				WHOI	LE CORE .	ANALYSI	S		-
1 23 45678 012345 67890123456789012	4020-21 4021-22 4022-23 4022-23 4022-23 4022-27 4022-27 4022-27 40227-28 40227-28 40227-28 40227-28 40227-28 40027-28 400233-33 400332-331 400333-335 4003335-378 4003355-578 90061-623 400657-68 400665-668 400665-668 400665-668 40072-72 40072-73	$\begin{array}{c} 0.03 \\ - & - \\ 0.01 \\ * \\ - & - \\ 0.01 \\ 0.52 \\ 0.28 \\ 0.08 \\ 0.21 \\ 0.52 \\ 0.28 \\ 0.08 \\ 0.10 \\ 0.52 \\ 0.13 \\ 0.12 \\ 0.31 \\ 0.12 \\ 1.7 \\ 0.12 \\ 0.14 \\ 0.26 \\ 0.41 \\ 0.52 \\ 0.58 \\ 0.37 \\ 1.4 \\ 8.6 \\ 0.66 \end{array}$	 0.46 0.25 0.08 0.19 0.08 0.10 0.08 0.10 0.68 0.07 1.2 0.08 0.10 0.25 0.08 0.10 0.25 0.08 0.10 0.25 0.08 0.10 0.25 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.08 0.10 0.08 0.10 0.08 0.10 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.25 0.08 0.10 0.08 0.10 0.25 0.08 0.10 0.25 0.08 0.10 0.25 0.10 0.25 0.10 0.25 0.10 0.25 0.10 0.25 0.10 0.25 0.10 0.25 0.12 0.25 0.27 0.14 0.19	9.7 11.8 14.3 5.6.4 13.35085471 9.2.6.4 19.2.6.6 10.921242219 10.571388813648093 11.1322048093 11.1322048093	52.6 888 3700017887003518254021177450000000000000000000000000000000000	4 . 2 1 . 2 1 . 38 9 9 8 7 7 7 4 2 0 3 5 5 4 2 3 7 2 6 6 8 4 1 0 8 5 8 0 7 4 8 5 5 4 2 3 7 2 6 6 0 0 4 0 3 6 5 8 6 1 5 5 4 4 5 5 5 5 4 4 5 5 5 5 5 4 4 3 6 1 5 5 4 4 5 5 5 5 5 4 4 3 6 1 5 5 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	COAL-BLK, RUBBLE - COAL-BLK, SD-BLK, vf RUBBLE - SD-BRN, vf SD-GRY, f SD-GRY, f	vf grn, VF NO ANALYSIS vf grn grn, w/coal NO ANALYSIS grn, w/coal grn, w/cly grn, w/cly	F oal, VF ly

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(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESU

NOTE: (*) REFER TO ATTACHED LETTER. (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED. (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED. INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED. These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc., and its officers and employees, assume no responsibility and make no warranty or representations, ar to the productivity, proper operation, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

		CORE	E LABORAT oleum Reservo. DALLAS.	FORIES, I ir Engineerin texas	NC		EXHIBIT #8 Page 4
C-pany John H	E. Shalk		Formation H	icture	d Cliffs	Page2	9
WeilShalk	29-4 #6		_ CoresI	Dia. Com	nv. 4"	FileR P= 1	3-3016
Field Basin	Dakota		Drilling Flui	id <u>Star</u>	ch & Gel	Date Report.	9-13-80
CountyRio_Ar	riba State N.	4.	Elevation	7347	GL	Analysts	Getz
Location	Sec.25-29N-4	N					
•		CORE (Figures in	ANALYS parentbeses reje	SIS RESUL	LTS .		
	PERMEABILITY MILLIDARCYS		RESIDUAL SATURATIO	N	· · · · · · · · · · · · · · · · · · ·		
SAMPLE DEPTH NUMBER FEET	00 XAM	PERCENT	DIL C' PORE	TOTAL WATER So PORE	.	REMAR	κ
34 $4073-74$ 35 $4075-76$ 37 $4076-77$ 38 $4077-78$ 39 $4078-79$ 40 4079-80 40 4079-80 40 4080-81 4081-82 4082-83 44 4082-83 44 4082-83 44 4082-83 44 4082-83 44 4085-86 47 4086-87 4086-87 4086-87 4086-87 4089-90 50 4099-90 51 4092-93 52 4093-94 53 4095-96 50 4097-99 56 4099-00 57 4100-01 58 4101-02 59 4109-10 62 4111-12 63 4112-13 61	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1.8066045010585650151154551327-433197		4565343535644744 67 76666 666 753366	SD-GRY, f SD-GRY, f	grn,w/cly grn,w/cly	w/coal w/coal ,w/coal ,VF IS IS IS IS IS IS VF ,VF ,VF ,VF ,VF ,VF

NOTE:

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4115-16

4116-17

(*) REFER TO ATTACHED LETTER. (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED.

0.01

0.64

0.04

(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF REBUL

SD-GRY,f grn,w/cly,VF SD-GRY,f grn,w/cly,VF SD-GRY,f grn,w/cly,VF

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			•	CORE Petro	LABORA oleum Reservo DALLAS.	TORIES, II ir Engineerin TEXAS	NC				EXH	IBIT #8 Page 5
Compin	<u>. John E</u>	. Shalk		<u></u>	Formation_I	^o ictured	<u>i Cli</u>	ffs	Page_	3	of	9
₩	Shalk	29-4 #6		<u></u>	CoresI	Dia. Cor	nv. L	11	File	RP	-3-30	016
Field	Basin	Dakota			_Drilling Flu	id Starch	<u>n & C</u>	Gel	Date	Report	9-1	3-80
County.	Rio Ar	riba Stat	N.1	í	Elevation	7347 (GL		Anal	ysts	Geta	2
Location		Sec.25-2	9N-4W	-	_ Remarks							
				CORE (Figures in	ANALYS	SIS RESUL	LTS (merks)					
BAMPLE	DEPTH	PERMEAB		POROSITY	RESIDUAL SATURATIO	N		ļ		REMA	RKS	
NUMBER	FEET	MAX	90 ⁰	PERCENT	OIL % PORE	WATER Se PORE						
66777777777777777777777777777777777777	4117-18 4118-19 4118-19 4120-21 4120-21 4120-22 4122-23 4122-23 4122-23 4122-23 4122-23 4122-23 4122-23 4122-23 4123-33 4133-33 4133-33 4133-33 4133-35 4133-35 4133-35 4133-36-37 4133-35 4133-35 4133-36-37 4133-35 4133-36-37 4133-36-55 4155-55 4155-55 4155-55	0.01 0.09 0.10 1.2 0.32 0.02 0.02 0.03 0.01 0.03 0.03 0.01 0.03 0.01 0.03 0.01 0.03 0.02 0.01 0.03 0.02 0.01 0.03 0.02 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.03 0.03 0.03 0.02 0.03 0.04 0.03 0.04 0.03 0.04 0.03 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.04 0.03 0.02 0.04 0.03 0.04 0.04 0.04 0.04 0.04 0.04 0.02 0.04 0.04 0.02 0.04 0.04 0.04 0.02 0.04 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0.02 0.04 0	0.40 0.20 0.02 	7.0 7.1 10.2 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0	2.9 1.4 0.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0	60.0989737 7545-62319791000001517938403700007 5663197910202001517938403700007	SD-C SD-C SD-C SD-C SD-C SD-C SD-C SD-C	GRY, f GRY, f G GRY, f G GRY, f G GRY, f G GRY, f G GRY, f G GRY, f G GRY, f G G G GRY, f G G G G G G G G G G G G G G G G G G G	grn,w grn,w grn,w grn,w grn,w grn,w grn,w grn,w grn,w Y,vf g grn,v	<pre>//cly //cly //cly //cly //cly //cly //cly //cly //cly //cly //cly //shl //sl //s</pre>	<pre>, shl , shl , shl /shl /shl /shl /shl /shl /shl /shl /</pre>	lam lam VF VF

NOTE:

(*) REFER TO ATTACHED LETTER.
 (1) INCOMPLETE CORE RECOVERY—INTERPRETATION RESERVED.

(2) OFF LOCATION ANALYSEB-NO INTERPRETATION OF RESULT

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•	•			CORI Petr	E LABORA oleum Reserv DALLAS,	ATORIES voir Engined TEXAS	5, INC. ering			EXI	IIBIT #8 Page 6
Стал	v John E	. Shalk			_ Formation.	Pictu	red Cl	iffs	Page	4of	9
Well	Shalk	29-4 #6				Dia. (Conv. 1	+"	File	RP-3-30	016
Field	Basin	Dakota			Drilling F	luid Star	rch & (Gel	Date R	eport 9-13	8-80
C	Rio Ar	riba c.			Elevation	734	7 GL		A nalvet	. Getz	3
County.		5 00 25-	20N-1W	· · · · ·							·····
Location	۰ <u> </u>		<u></u>	CORI (Figures in	E ANALY	SIS RES	SULTS				
		PERMEAE	RCYS		RESIDUA					· · · · · · · · · · · · · · · · · · ·	
SAMPLE Rumber	DEPTH FEET	MAX	<u>00</u> 0	POROSITY	OIL % POR	TOTAL I			RE	MARKE	·
			70	<u> </u>		- YO FORE		<u> </u>			
105	4158-59	1.3	0.30	9.8	0.0	45.9	S D-	GRY,f	grn,w/	cly	
106	4159-60	0.13		11.4	0.0	40.4	SD-	GRY,f CPV f	grn,W/	CTÀ CTÀ	
107	4100-01	0.23	0.04	- TO'T	0.0	35.5	SD-	GRY.f	grn.w/	cly	
100	<u>µ162-63</u>	0.04	0.02	8.9	0.0	28.1	SD-	GRY f	grn,w/	cly	
110	4163-64	0.08	0.03	9.2	0.0	20.7	SD-	GRY,f	grn,w/	cly	
111	4164-65	0.02		8.7	0.0	28.7	SD-	GRY, f	grn,w/	cly	
112	4165-66	0.26	0.21	9.1	0.0	20.9	SD-	GHY,I CPV f	grn,w/	710 710	
ל⊥⊥	4100-07		ົ່ດ	10.1 10.1	0.0	20.7	50- 50-	GRY f	grn, w/	CLY Cly	
115	μ_168-69	0.07	0.01	11.2	0.0	35.7	SD-	GRY.f	grn.w/	cly	
116	4169-70	0.09	0.01	9.5	0.0	18.9	SD-	GRY,f	grn,w/	cly	
<u>ר</u> ב	4170-71	0.03		7.6	0.0	28.9	SD-	GRY,f	grn,w/	cly	
118	4171-72	0. <u>0</u> 4	0.01	7.8	0.0	32.1	SD-	GRY, f	grn,w/	cly	
119	41(2-13)	3.5 7.0	0.02	6.9 8 á		ر •رز د دد	- 5D-	GRI,I GRV f	grn,w/	CIY Cly	
120	4175-74		0.05	5.8	0.0	23.0	SD-	GRY.f	grn.w/	clv	
122	4175-76	0.24	0.01	. 8.7	0.0	13.8	SD-	GRY, f	grn,w/	cly	
123	4176-77	0.04		7.2	0.0	36.1	SD-	GRY, f	grn,w/	cly,VF	
124	4177-78	0.04		6.9	0.0	8.7	SD-	GRY, f	grn,w/	cly,VF	
125	4178-79	0.71	,	3.2	6.3	59.4	SD-	DK GR	Y,vf gr	n,v/shl	, VF
126	4179-80	0.05)	3.7	5.4	31.0	SD-	DA GA GRV f	(1, VI gr	'ກ, W/SDL ໃດໄສ V ກ	, V.F.
128	h_{181-82}	0.03		1.9		83.7	SD-	DK GR	Y.vf cr	n.v/shl	. VF
129	4182-83	0.02		3.9	2.6	48.7	SD-	DK GR	Y,vf.gr	n,v/shl	, VF
130	4183-84	0.01		3.2	6.3	53.1	SD-	DK GR	Y, vf gr	n,v/shl	, VF
131	4184-85			3.8	(21.1)) SD-	DK GR	lY, vf gr	n,v/shl	,VF
132	4105-00)	2.0		20 0	. SD-	DK GR	V vf or	n, v/shi	, ४.४ . ४ म
	4187-88					- \-	- RUE	BBLE -	NO ANA	LYSIS	9 4 1.
134	4188-89	.<0.01	•	1.8	5.6	72.2	SD-	DK GR	RY, vf gr	'n,w/shl	,VF
135	4189-90	<0.01	-	5.3	\ 9.4	6'9.8	B SD-	DK GF	RY, vf gr	n,w/shl	,VF
136	4190-91	<0.01	-	3.9	<u>\5.1</u>		L SD-	DK GF	RY, vf gr	m,w/shl	,VF
לב⊥ אבר	4191-92	<0.01		2.3	0.0	73.9	y SD-	UK GF	11,VI gI	m,w/shl	• V F V 파
	4172-73	<0.01	L	ニシ・フ	2.9	88.6		DK GF	ligvi gi RV.vf my	n, w/sni m, w/ehl	, VF
īíó	4194-95	<0.01	• L•	3.05	0.0	82.9	SD-	DK GF	RY, vf gr	n,w/shl	VF
1	4195-96	< 0.0]	L ·	2.9	0.0	72.4	L SD-	DK GF	RY,vf gr	m,w/shl	, VF
142	4196 - 97	<0.0]	L	2.5	0.0	84 . C) SD-	DK GF	RY, vf gr	n,w/shl	,VF

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(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESUL

NOTE: (*) REFER TO ATTACHED LETTER. (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED. These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories. Inc. (all errors and omissions ex-cepted); but Core Laboratories, Inc., and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operation, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon. ----------

Company John E. Shelk
Shalk 29-4 #6
FieldBasin Dakota
County Rio Arriba State N.M.
Location Sec.25-29N-4W
FAMPLE DEPTH PERMEABILITY MILLIDARCYS
NUMBER FEET MAX 90 ⁰
$\begin{array}{cccccccccccccccccccccccccccccccccccc$

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· · ·			CORE Petro	LABORA cleum Reserve DALLAS.	TORIES, I oir Engineerin TEXAS	INC.		EXHIBII #6 Page 8
Compan	<u>, John E</u>	. Shalk		Formation_	Picture	d Cliffs	Page6	of9
¥	Shalk	29-4 #6		Cores	Die. Co	onv. 4"	FileR P	<u>-3-3016</u>
Field	Basin	Dakota		Drilling Flu	id Starc	ch & Gel	Date Report	9-13-80
County_	Rio Ar	riba State N.M.	•	Elevation	7347	GL	Analysts	Getz
Location	·	Sec.25-29N-4W				•		
			CORE (Figures in	ANALY parentbeses ref	SIS RESU er to footnote	LTS remerks)		·
BAMPLE	DEPTH	PERMEABILITY MILLIDARCYS	POROSITY	RESIDUAL SATURATIC	N		REMAI	R K S
NUMBER	FEET	MAX 90 ⁰	PERCENT	011 % PORE	WATER 90 PORE			
178 179 180 188 188 188 188 188 188 188 188 188	4236-37 4237-38 4237-38 4237-38 4237-38 4237-38 4237-38 4237-38 4237-38 4237-38 4237-38 4239-41 4234-43 42443-44 42443-44 42443-44 42445-46 422445-46 42245-46 422553-556 422557-558 422557-558 422557-558 422661-62 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 422663-66 42267-71 42772-73 42772-73	0.47 < 0.01 0.03 < 0.01 0.04 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.01 0.02 0.01 0.02 0.03 0.01 0.02 0.03 0.01 0.02 0.03 0.01 0.02 0.38 0.17 0.15 0.09 0.13 0.06	93191955305619409051436404115063875426	0.0000000000000000000000000000000000000	5167664992640337388411347561937848487728 51676649992640337388411347561937848487728	SD-GRY, f SD-GRY, f SD-GRY, f SD-GRY, f SD-GRY, f SD-GRY, f SD-GRY, f SD-DK GRY SD-DK GRY SD-GRY, f SD-GRY, f	grn, sl sh grn, w/cl; grn, w/cl; grn, w/cl;	hl, w/cly hl, w/cly hl, w/cly hl, w/cly hl, w/cly hl, w/cly hl, w/cly, VF hl, w/cly, VF hl, w/cly hl, w/cl

(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESUL

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Compan	v John E	. Shalk		<u> </u>		Pictur	ed Cliffs	Page7	of9
Wui		29-4 #6			_ Cores	Dia. C	onv. 4"	FileRP-	-3-3016
Field	Basin	Dakota			Drilling Fl	uid Star	ch & Gel	Date Report.	9-13-80
County.	Rio Ar	riba Stat	. N.	M	_ Elevation_	7347	GL	Analysts	Getz
Location)	Sec. 25-2	29N-4W		Remarks		·		
				COR (Figures ii	E ANALY n parentheses re	SIS RES	ULTS (c. remerka)	•	
GAMPLE	DEPTH	PERMEAE	RCYS	PORDSITY	RESIDUA SATURATI	NL ON	-		
NUMBER	FEET	MAX	90 ⁰	PERCENT	OIL % PORE	WATER So PORE	'		
22222222222222222222222222222222222222	4274-76 42775-778 42276-778-789 422778-789-881 422778-789-881 422789-881-883-8856-889 422883-8856-8899-991-923 422883-8856-8899-991-923 422883-8856-8899-991-923 422883-8856-8899-991-923 422883-8856-8899-991-923 422993-9956-9989-001-023 433002-003-0056-0089 433003-0056-0089 433005-0078-009 433005-0078-009 433005-008-009 433005-008-009 433005-008-009 433005-008-009 433005-008-009 433005-008-009 43308-009 43308-009	0.10 0.10 0.05 0.05 0.05 0.05 0.05 0.05	0.02 0.07 < 0.01 < 0.01 < 0.01 0.12	8876691134966801229171820326395786730281 111111891896642771453966864694	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	3058883191002918866679556181397898340731 7770036387592089499567580498848796855535	SD-GRY, SD-GRY	f grn,w/cly f grn,w/cly	<pre>VF VF VF VF VF VF VF VF VF VF VF VF VF V</pre>

NOTE:

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(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESULT

(*) REFER TO ATTACHED LETTER.
 (2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESU:
 (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED.
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i i i i i i i i i i i i i i i i i i i		C	ORE LABORA Petroleum Reserv DALLAS.	TORIES, IN oir Engineering TEXAS	NC		EXHIBIT #8 Page 10
John	E. Shalk		Formation_	Pictured	l Cliffs	Page8	of9
Shall	29-4 #6		Cores	Dia. Cor	n v. 4"		-3016
a Besir	Dakota	-	Drilling Fl	uid Starch	n & Gel	Date Report_9	-13-80
Bio	rribe source	N.M.	Elevation	7347 0	L.	Analysts G	e tz
ounty11101	Sec 25-2	9N-IIW	Remarks				
OC2110n		C (Fig	ORE ANALY wres in parentheses re	SIS RESUL	LTS emerks)	<u></u>	
	PERMEABIL		RESIDUA	L ON	·		,
AMPLE DEPTH	MAX	900 -ERCEN	01L % PORE	TOTAL WATER	-	REMARK	6
55 $4313-156$ $4314-157$ $4315-157$ $4315-158$ $4316-159$ $4316-159$ $4316-159$ $4316-159$ $4320-24320-261$ $4322-263$ $4322-264$ $4322-265$ $4323-2266$ $4323-2266$ $4322-2266$ $4322-2266$ $4322-2266$ $4322-2266$ $4322-2266$ $4322-2266$ $4322-2266$ $4322-224326-2277$ $4332-224330-32276$ $4334-32277$ $4335-32278$ $4334-32278$ $4334-32278$ $4334-32280$ $4343-12281$ $4342-12283$ $4344-12285$ $4344-12286$ $4344-12287$ $4345-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12288$ $4344-12289$ $4345-12289$ $4350-12293$ $4350-12293$ $4350-12$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c} 1 \\ 4 \\ 6 \\ 3 \\ 4 \\ 6 \\ 3 \\ 4 \\ 6 \\ 3 \\ 6 \\ 7 \\ 5 \\ 6 \\ 6 \\ 11 \\ 7 \\ 11 \\ 0.07 \\ 12 \\ 9 \\ 13 \\ 6 \\ 6 \\ 4 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 1 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 1 \\ 3 \\ 9 \\ 3 \\ 4 \\ 1 \\ 3 \\ 9 \\ 3 \\ 4 \\ 1 \\ 3 \\ 9 \\ 3 \\ 4 \\ 1 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 4 \\ 4 \\ 3 \\ 9 \\ 3 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4$	5 6.7 0.0 1 13.1 5 17.1 9 0.0 5 17.1 9 0.0 5 17.1 9 0.0 5 17.1 9 0.0 5 0.0 9 0.0	46.7 90.04 90.04 85.9 75.68.7 85.93.75.63.6269.769 975.68.77.860.75.663.75.69.99.19.4000.03.4000.026.46.46.78.86.8 774.69.89.75.60.00.3400.00.26.46.46.78.86.8 77.44.6.46.78.86.8 77.44.6.46.78.86.8 77.58.6.8 77.58.6.79.5.99.9.19.400.00.3400.00.26.46.46.78.86.8 77.58.6.79.5.81.6.75.81.6.8	SD-DK GRY SD-DK GRY SD-DK GRY SD-DK GRY SD-DK GRY SD-DK GRY SD-DK GRY SD-DK GRY SD-DK GRY SD-GRY,f SD-DK GRY SD-DK GRY	<pre>vf grn,v/s ,vf grn,v/s ,vf grn,v/s ,vf grn,v/s ,vf grn,v/s ,vf grn,v/s ,vf grn,v/s grn,w/shl grn,w/cly grn,w/cly grn,w/cly,V grn,w/cly,V grn,w/cly,V grn,w/cly,V grn,w/cly,V grn,w/cly,V grn,w/shl,V grn,w/shl,V grn,w/shl,V grn,v/shl,V grn,v/shl,V grn,v/shl,V grn,v/shl,V grn,v/shl,V grn,v/sly,V grn,v/sly,V grn,v/sly,V grn,v/sly,V grn,v/sly,V grn,v/sly,V grn,v/s ,vf grn,v/s</pre>	hl hl hl hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF hl,VF

NOTE:

(*) REFER TO ATTACHED LETTER. (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED.

(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF REBULT -

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) INCOMPLETE CORE RECOVERT-INTERFRETE for negeritors and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or onnions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc., and its officen and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operation, or profitableness of any cli, gas if other mineral well or and in connection with which such report is used or relied upon.

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Location_

CORE LABORATORIES, INC. Petroleum Reservoir Engineering

DALLAS. TEXAS

C Dany	John E. Shalk	_ Formation_	Pictured Cliffs	9	of9
Well	Shalk 29-4 #6	_ Cores	Dia. Conv. 4"		-3016
Field	Basin Dakota	Drilling Flu	uid Starch & Gel	Date Report	9-13-80
County	Rio Arriba State N.M.	_ Elevation	7347 GL	Analysts	Getz
Location_	Sec.25-29N-4W	_ Remarks	·	•	

_____ Remarks_

CORE ANALYSIS RESULTS (Figures in parentheses refer to footnote remarks)

			(11)	· · · · · · · · · · · · · · · · · · ·	,	
SAMPLE	DEPTH	PERMEABILITY MILLIDARCYS	POROSITY	RESIDUAL SATURATION	N	
NUMBER	FEET	MAX. 90°	PERCENT	OIL % PORE	WATER SO PORE	
001			1 0		RA 0	
294	4352-53	<0.01	4.2	11.9	13.0	SD-DK GRY, VI grn, V/sn1, VF
295	4353-54	0.07	1.1	0,0	36.4	SD-DK GRY,vf grn,v/shl,VF
296	4354-55	< 0.01	2.7	0.0	70.4	SD-DK GRY.vf grn.v/shl.VF
297	4355-56	< 0.01	2.3	8.7	65.2	SD-DK GRY.vf grn.v/shl.VF
298	4356-57	0.01	4.3	2.3	62.8	SD-DK GRY.vf grn.v/shl.VF
299	4357-58	< 0.01	3.5	2.9	77.1	SD-DK GRY.vf grn.v/shl
300	4358-59	0.04	2.4	4.2	87.5	SD-DK GRY.vf grn.v/shl
301	4359-60	0.01	1.5	6.7	66.7	SD-DK GRY, vf grn, v/shl
302	4360-61	0.18	4.1	21.9	61.0	SD-GRY f grn.w/shl
303	4361-62	<0.01	3.3	3.0	75.8	SD-GRY f grn.w/shl
304	4362-63	< 0.01	3.3	6.1	75.8	SD-GRY,f grn.w/shl
305	4363-64	< 0.01	1.2	0.0	33.3	SD-GRY f grn w/shl
3	4364-65	< 0.01	3.1	3.2	80.6	SD-GRY,f grn,w/shl
307	4365-66	0.01	2.8	3.6	82.1	SD-DK GRY, vf grn, v/shl, VF

Conventional plug used where whole core permeability was unsuitable for analysis.

Depths 4262-4293 may contain some induced vertical fractures. (VF).

NOTE:

(*) REFER TO ATTACHED LETTER. (1) INCOMPLETE CORE RECOVERY-INTERPRETATION RESERVED.

(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESU

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential: use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions ex-cepted); but Core Laboratories, Inc., and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity proper operation, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

CABRESTO TIGHT GAS AREA - EXHIBIT #9

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PICTURED CLIFFS CORE ANALYSIS

OPERATOR:	ROBERT L. BAYLESS
WELL:	JIC 459 #5
LOCATION:	SESE SEC 19 T30N R3W

TOP OF PICTURED CLIFFS = 3846

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ALL DATA USED IN THIS ANALYSIS IS >10% POROSITY REPORTED FROM CORE ANALYSIS

Samp Num	TOP INTERVAL	BOTTOM INTERVAL	FOOTAGE INTERVAL	HORIZONTAL PERMEABILITY	POROSITY	WATER SATURATION
	TOTAL AVG		1.8	1.05 0.06	215.5 12.0	633.3 35.2
1	3849	3850	1	Ø.03	10.9	66.5
ت 6	3850	3851	1	0.00 0.02	13.8	67.2 22.3
10	3877	3878	1	0.08	13.3	18.7
11	3878	3879	1	0.09	13.1	17.6
12	3879	3880	1	0.11	12.9	25.0
13	3881	3882	1	0.12	13.7	16.9
14	3883	3884	1	0.03	11.0	34.2
15	3885	3886	1	0.12	13.2	21.5
16	3887	3888	1	0.04	12.4	41.0
17	3892	3893	1	0.04	10.7	40.5
18	3894	3895	1	0.04	12.8	26.6
19	3897	3898	1	0.03	11.1	49.1
20	3903	3904	1	0.03	11.2	54.2
22	3911	3912	1	0.04	10.9	37.6
23	3913	3914	1	0.08	10.9	33.3
24	3915	3916	1	0.06	12.4	18.4
25	3923	3924	i	0.03	10.1	42.7

		PERMEABILITY		SATURATI	0N N		DESCOTOTION
NUMBER	DEPTH	(MAXIHUH) (90 DEG) (HELIUM)	(PORE VOL	UHE)	DENSITY	
	ft	Kair Kair md md	*	X 110	X	gm/cc	
	·	Core No.1 Frui	tland Formatio	on 3803.0-	3833.0	Cut 30.0	' Rec. 30.0'
	3803.0- 33.0						Coal No Analysis Requested
			itland Format	ion 3833.0	-3842.0	Cut 9.0	, Rec. 9.0,
	1011.0- 16.4						
		Core No.3 Frui	tland Formati	on 3842.0-	3872.0	Cut 30.0	' Rec. 30.0'
	3842.0-49.0	Core No.3 Frut	tland Formati	on 3842.0-	3872.0	Cut 30.0	'Rec. 30.0' No Analysis Requested
	3842.0-49.0 3849.0-50.0	Core No.3 Frui 0.03	tland Formatio	on 3842.0- 5.9	3872.0	Cut 30.0 2.69	' Rec. 30.0' No Analysis Requested Sst gry f gr arg sli sh sli calc sli
~ -	3842.0-49.0 3849.0-50.0 3850.0-51.0	Core No.3 Frui 0.03 0.06	tland Formatio 10.9 13.8	on 3842.0- 5.9 14.7	3872.0 66.5 67.2	Cut 30.0 2.69 2.67	· Rec. 30.0" No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli
2 1	3842.0-49.0 3849.0-49.0 3850.0-50.0 3851.0-57.0	Core No.3 Frut 0.03 0.06	tland Formati 10.9 13.8	on 3842.0- 5.9 14.7	3872.0 66.5 67.2	Cut 30.0 2.69 2.67	· Rec. 30.0" No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli No Analysis Requested
u ∾ −	3842.0-49.0 3849.0-49.0 3850.0-50.0 3851.0-51.0 3851.0-51.0	Core No.3 Frui 0.03 0.06 <.01	tland Formati 10.9 13.8 6.6	on 3842.0- 5.9 14.7 13.4	3872.0 66.5 67.2 76.9	Cut 30.0 2.69 2.67 2.70	• Rec. 30.0" No Analysis Requested Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli No Analysis Requested Sat gry f gr arg sli sh sli calc sli
ω N F	3842.0-49.0 3842.0-49.0 3850.0-50.0 3851.0-57.0 3857.0-58.0 3858.0-61.0	Core No.3 Frui 0.03 0.06 <.01	tland Formati 10.9 13.8 6.6	on 3842.0- 5.9 14.7 13.4	3872.0 66,5 67.2 76.9	Cut 30.0 2.69 2.67 2.70	<pre>* Rec. 30.0' No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli No Analysis Requested</pre>
↓ ₩ ₩ ₩	3842.0-49.0 3849.0-49.0 3850.0-50.0 3851.0-51.0 3857.0-58.0 3858.0-61.0 3861.0-62.0	Core No.3 Frui 0.03 0.06 <.01	tland Formatii 10.9 13.8 6.6	on 3842.0- 5.9 14.7 13.4 21.9	3872.0 66,5 67.2 76.9 76.9	Cut 30.0 2.69 2.67 2.70 2.70	<pre>* Rec. 30.0" * Rec. 30.0" No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli No Analysis Requested No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli </pre>
► W N H	3842.0-49.0 3849.0-50.0 3850.0-51.0 3851.0-57.0 3857.0-58.0 3857.0-58.0 3857.0-58.0 3858.0-58.0 3857.0-58.0 3857.0-58.0 3858.0-58.0 3857.0-58.0 3857.0-58.0 3857.0-58.0 3857.0-58.0	Core No.3 Frui 0.03 0.06 <.01 <.01	tland Formati 10.9 13.8 6.6 6.2	on 3842.0- 5.9 14.7 13.4 21.9	3872.0 66.5 67.2 76.9 60.2	Cut 30.0 2.69 2.67 2.70 2.70	<pre>* Rec. 30.0[°] No Analysis Requested Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli No Analysis Requested No Analysis Requested No Analysis Requested</pre>
υπ 👞 ω Ν 🚥	3842.0-49.0 3849.0-50.0 3851.0-51.0 3851.0-51.0 3852.0-51.0 3852.0-51.0 3852.0-52.0 3852.0-52.0 3852.0-55.0 3852.0-55.0 3852.0-55.0	Core No.3 Frui 0.03 <.01 <.01	tland Formati 10.9 13.8 6.6 8.9	on 3842.0- 5.9 14.7 13.4 21.9 0.4	3872.0 66.5 67.2 76.9 76.9 76.2	Cut 30.0 2.69 2.67 2.70 2.70 2.70 2.69	 Rec. 30.0[°] Requested Ro Analysis Requested Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli
σσισι 👞 ω Ν 🛏	3842.0-49.0 3849.0-50.0 3850.0-51.0 3851.0-51.0 3852.0-51.0 3852.0-51.0 3852.0-55.0 3852.0-55.0 3852.0-52.0 3852.0-57.0 3855.0-57.0 3855.0-57.0 3855.0-57.0 3855.0-57.0 3855.0-57.0 3855.0-57.0 3855.0-57.0 3855.0-57.0 58.0 3855.0-57.0 58.0	Core No.3 Frui 0.03 0.06 <.01 <.01 0.02 0.02	tland Formatii 10.9 13.8 6.6 8.9 11.1	on 3842.0- 5.9 14.7 13.4 21.9 0.4 3.7	3872.0 66.5 67.2 76.9 76.2 76.2 76.2 71.5	Cut 30.0 2.69 2.67 2.70 2.70 2.69 2.69	<pre>* Rec. 30.0' No Analysis Requested Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli No Analysis Requested Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli Sat gry f gr arg sli sh sli calc sli</pre>
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√ 65 5 & ₩ № ₩	3842.0-49.0 3849.0-50.0 3851.0-50.0 3851.0-51.0 3851.0-57.0 3857.0-58.0 3857.0-58.0 3857.0-58.0 3857.0-58.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 3857.0-57.0 57.0 3857.0-57.0 57.0 3857.0-57.0 57.0 3857.0-57.0 57.0 3857.0-57.0	Core No.3 Frui 0.03 4.01 4.01 0.02 0.02 0.02	tland Formati 10.9 13.8 6.6 8.9 11.1 11.1	on 3842.0- 5.9 14.7 21.9 2.1.9 0.4 3.7 0.0	3872.0 66.5 67.2 76.9 76.2 60.2 77.5 22.3	Cut 30.0 2.69 2.67 2.70 2.70 2.69 2.69 2.69	<pre>* Rec. 30.0' No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli No Analysis Requested No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli</pre>
~	3842.0-49.0 3849.0-50.0 3851.0-51.0 3857.0-51.0 3857.0-58.0 3858.0-51.0 3857.0-58.0 3857.0-58.0 3857.0-58.0 3857.0-58.0 3857.0-57.0 3857.0-58.0 3857.0-58.0 3857.0-57.0 3857.0-70.0 3857.0-70.0 3870.0-71.0	Core No.3 Frui 0.03 0.06 <.01 .02 0.02 0.02	tland Formatii 10.9 13.8 6.6 8.9 11.1 11.1	on 3842.0- 5.9 14.7 21.9 2.1.9 3.7 0.4 3.7	3872.0 66.5 67.2 76.9 76.9 77.5 22.3 35.3	Cut 30.0 2.69 2.67 2.70 2.70 2.69 2.69 2.69	<pre>* Rec. 30.0' * Rec. 30.0' No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli No Analysis Requested No Analysis Requested Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli Sst gry f gr arg sli sh sli calc sli No Analysis Requested No Analysis Requested No Analysis Requested No Analysis Requested</pre>

Data 1 - 1

CORE LABORATORIES

Field : Wildcat Formation : As Noted Coring Fluid : Water Base Mud Elevation : 7274 KB

ompany : Robert L. Bayless /ell : Jicarilla 459 No. 5 Well ocation : SE SE Sec. 19 T30N R3W o,State : Rio Arriba, New Mexico

CORE

A N A L Y S I S

RESULTS

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File No.: 57121-8279 Date : 27-Dec-1988 API No. : Analysts: FD MW

NO ANALYSIS Requested							3912.0-13.0	
Sst gry r gr arg sil calc sil glauc	2.72	37.6	0.0	10.9		0.04	3911.0-12.0	22
No Analysis Requested							3906.0-11.0	
Sst gry f gr arg sli calc sli glauc	2.72	57.7	0.0	9.1		0.03	3905.0- 06.0	21
No Analysis Requested							3904.0- 05.0	
Sst gry f gr arg sli calc sli glauc	2.72	54.2	0.0	11.2		0.03	3903.0- 04.0	20
No Analysis Requested							3898.0- 03.0	
Sst gry f gr arg sli calc sli glauc	2.71	49,1	0.0	11.1		0.03	3897.0- 98.0	19
No Analysis Requested							3895.0- 97.0	
Sst gry f gr arg sli calc sli glauc	2.70	25,6	0.0	12.8		0.04	3894.0-95.0	18
No Analysis Requested							3893.0- 94.0	
Sst gry f gr arg sli calc sli glauc	2.72	40.5	0.0	10.7		0.04	3892.0- 93.0	17
No Analysis Requested							3888.0- 92.0	
Sst gry f gr arg sli calc sli glauc	2.70	41.0	0.0	12.4		0.04	3887.0- 88.0	16
No Analysis Requested							3886.0- 87.0	
Sst gry f gr arg sli calc sli glauc	2.67	21.5	0.0	13.2	0.12	0.12	3885.0- 86.0	+ 15
No Analysis Requested							3884.0- 85.0	
Sst gry f gr arg sli sh sli calc sli glauc	2.69	34.2	0.0	11.0		0.03	3883.0- 84.0	14
No Analysis Requested							3882.0- 83.0	
Sst gry f gr arg sli calc sli glauc	2.69	16.9	0.0	13.7		0.12	3881.0- 82.0	13
No Analysis Requested							3880.0- 81.0	
Sst gry f gr arg sli calc sli glauc	2.69	25.0	0.0	12.9	0.10	0.11	3879.0- 80.0	+ 12
Sst gry f gr arg sli calc sli glauc	2.68	17.6	0.0	13.1		0.09	3878.0- 79.0	11
Sst gry f gr arg sli calc sli glauc	2.68	18.7	0.0	13.3		0.08	3877.0- 78.0	10
No Analysis Requested							3875.0-77.0	
Sst gry f gr arg sh sli calc sli glauc	2.70	28.9	0.2	8.7		0.02	3874.0-75.0	9
No Analysis Requested							3872.0- 74.0	
60.0' Rec. 60.0'	32.0 Cut	372.0-39	ition 38	Cliffs Forma	Pictured (Care No.4		
	gm/cc	×	X	×	md	md	ft	
	DENSITY	VATER	(PORE V	(HELIUN)	(90 DEG) Kair	(MAXIMUM) Kair	1	NUMBER
DESCRIPTION	GRAIN	ITION	SATUR	POROSITY	ILITY	PERMEA	DEPTH	SAMPLE

EXHIBII #9 Page 3

Company : Robert L. Bayless Well : Jicarilla 459 No. 5 Well

Field : Wildcat Formation : As Noted CORE LABORATORIES

File No.: 57121-8279 Date : 27-Dec-1988

Data 1 - 2

ALYSIS RESULTS

CORE

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-	EXHIBIT #9 Page 4	<u> </u>	······	Compan Well
		+ 25 4	S AMPLE NUMBER	y : Robe : Jica
•		3913.0-14.0 3914.0-15.0 3915.0-16.0 3916.0-23.0 3923.0-24.0 3924.0-32.0	DEPTH	rt L. Bayless rilla 459 No.
		0.08 0.06 0.03	PERHEA (MAXINUH) Kair md	5 Well
		0.08	BILITY (90 DEG) Kair md	C O R E
	+ Denotes	10.9 12.4 10.1	POROSITY (HELIUM) x	A
	Full Diameter	0.0 33. 0.0 18. 0.0 42.	SATURATION (PORE VOLUME OIL WATE	Field Formation A L Y S I
	. Sample	3 2.70 4 2.71 7 2.72	GRAIN DENSITY gm/cc	: Wildca : As Not S R E :
		Sst gry f gr arg sli calc No Analysis Requested Sst gry f gr arg sli calc No Analysis Requested Sst gry f gr arg sli sh sl No Analysis Requested	DESCRIPTIO	at Fil ted Dat SULTS
		sliglauc sliglauc icalc sliglauc	ž	e No.: 57121-827 ;e : 27-Dec-19

Data 1 - 3

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CORE LABORATORIES

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CABRESTO TIGHT GAS AREA - EXHIBIT #10

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PICTURED CLIFFS CORE ANALYSIS

OPERATOR:	EL PASO NATURAL GAS CO.	
WELL:	GASBUGGY #1	
LOCATION:	NESW SEC 36 T29N R4W	

0.66 milidense

TOP OF PICTURED CLIFFS = 3916

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ALL DATA USED IN THIS ANALYSIS IS >10% POROSITY REPORTED FROM CORE ANALYSIS

SAMP NUM	TOP INTERVAL	BOTTOM INTERVAL	FOOTAGE INTERVAL	HORIZONTAL PERMEABILITY	POROSITY	WATER SATURATION
	TOTAL AVG		49	8.40 0.17	600.0 12.2	2291.2 46.8
25	3916	3917	1	0.01	12.6	44.3
26	3918	3919	1	0.02	10.2	58.8
27	3920	3921	1	0.01	14.4	42.3
28	3922	3923	1	0.07	13.8	42.8
29	3924	3925	1	0.12	10.0	53.0
30	3926	3927	1	0.09	10.6	48.1
31	3928	3929	1	0.01	13.5	42.1
32	3930	3931	1	0.17	13.0	37.8
34	3934	3935	1	0.01	13.8	34.8
35	3936	3937	1	0.01	13.3	34.6
36	3938	3939	1	0.02	10.3	56.3
37	3940	3941	1	Ø. Øi	10.9	48.6
55	3977	3978	1	0.01	11.4	46.5
61	3989	3990	1	0.07	11.4	58.8
66	3999	4000	1	0.02	10.0	55.0
78	4023	4024	1	0.29	12.5	40.7
79	4025	4026	1	Ø.23	10.7	29.0
83	4033	4034	1	0.28	10.5	37.2
106	4082	4083	1	0.45	12.5	46.4
108	4086	4087	1	0.77	14.3	37.0
109	4088	4089	1	0.01	10.1	37.6
113	4096	4097	1	0.04	10.0	59.0
114	4098	40/99	1	0.08	12.1	56.2
119	4108	4109	1	0.01	10.6	67.0
122	4114	4115	1	0.14	11.9	53.0
123	4116	4117	1	0.12	11.3	51.4
125	4120	4121	1	0.01	11.2	63.4
126	4122	4123	1	0.01	11.0	64.5
129	4128	4129	1	0.01	11.8	58.5
130	4130	4131	1	0.19	10.6	50.0
131	4132	4133	1	0.29	12.0	55.8
132	4134	4135	1	0.14	12.1	52.1
133	4136	4137	1	0.44	12.7	46.4
134	4138	4139	1	0.10	11.5	57.4
135	4140	4141	1	0.15	11.1	54.0
136	4142	4143	1	0.14	12.1	39.7
137	4144	4145	i 1	0.70	13.0	42.3
138	4146	4147	1	0.37	12.5	43.2
139	4148	4149	1	0.84	14.3	51.1

EXHIBIT #10 - PAGE 2

SAMP NUM	TOF INTERVAL	BOTTOM INTERVAL	FODTAGE INTERVAL	HORIZONTAL PERMEABILITY	POROSITY	WATER SATURATION
 141	 4152	4153		 Ø. 43	12.3	35. 0
142	4154	4155	1	0.45	18.9	38.8
144	4158	4159	1	0.22	12.4	42.7
145	4160	4161	1	0.11	13.1	42.7
146	4162	4163	1	0.10	13.0	43.1
147	4164	4165	1	0.02	11.4	43.0
148	4166	4167	1	0.02	11.9	42.8
149	4168	4169	1	0.15	16.0	35.0
150	4170	4171	1	0.22	14.9	38.3
152	4174	4175	1	0.22	14.5	33.1

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CORE LABORATORIES. INC. Petroleum Reservoir Engineering DALLAS, TEXAS

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Page No.<u>5</u>

Comp	any BL PASO N	ATURAL C	HAS COMP	NY I	Formation			F	File	RP-3-2180
V Well	GAS BUGGY	#1		(Core Type	I	D/C	r	Date Report_	3-10-67
Field				1	Drilling 'F	Inid (JAS	A	Analysts	STRICKLIN
Count	TIO ARRIB	AState	N.M.	_Elev		Location	<u>, </u>			
1. 3. Jak				T :4L		Abbaario				
1			TE.ANHY		lological	AUDIEVIA	CRYSTALLINE-XL	N BROWN BRN	FRACTURED	.FRAC BLIGHTLY-SL
ANALE-	CHERT-CH	CONGLO	ERATE CONG	EHALY-SI	нт ие V .CO	DIUM-MED	GRAINÍGRN GRANULAR - GRNL	GRAY-GY VUGGY-VGY	LAMINATIO	N-LAM VERY-V/
K.		1		1	RESIDUAL	BATURATION	1	C 1 1 1		N
BUNNER	YEET	MILL	DARCYS	PER CENT	OIL	TOTAL	-	A	ND REMARKS	-
1 1000	and an	HORTZ	VERT			WATER		<u> </u>		
3						e.				
3 58	3790-91	⊲.01	· <0.01	3.8	0.0	94.8	SLTY SH	ARGILL, LT	GRY, CALC	IN PT.HD.TITE.
3 59	3796-97	⊲0.01	⊲.01	2.5	0.0	96.0	SLTY SH:	ARGILL, LT	GRY, CALC	IN PT, HD, TITE.
60	> 3798-99	⊲.01	⊲.01	3.2	0.0	90.7	SANDY SI	T:LT GRY,A	RGILL, V/C	ALC, HD.
≈ 61	3806-07	≪0.01	⊲.01	11.1	. 4.5	94.5	SS:LT BE	IN, FNGR, CAL	C, BANDED	W/CARB MTL.
r 62	3809-10	⊲.01	<0.01	11.2	6.2	90.7	SS:LT BF	IN, FNGR, CAL	C, BA NDED	W/CARB MTL.
à 63	3822-23	0.12	⊲0.01	3.2	. 6.3	. 90.7	SS:LT BF	IN, FNGR, CAL	C, BANDED	W/CARB MTL.
5.04	3020-21	A0.01	⊲0.01	0.7		90.0	SSILT B	IN, FNGR, CAL	C, BANDED	W/GARB MIL.
Y D2 -	2020-27		-0 01),),),),),),),),),),),),),)	2 7	66 O		IN FINGE CAL		W/CARD MILL.
+ 67	3837-38			30	17.0	71 8	SS ILI DI	EN FNGR CAL	C BANDED	W/CARE MTL.
۲ ۸8,	3838_39	<0.01 ·	<0.01	1.6	15.2	62.)	SSILT BE	IN. FNGR. CAL	C. BANDED	W/CARB WTL.
69=	3838-10	-√0.01	<0.01	1.1	12.2	68.2	SS ILT BE	IN. FNGR. CAL	C. BANDED	W/CARB MTL.
9.70	3840-11	<0.01	⊲0.01	<u> </u>	11.9	66.8	SS IT B	IN. FNGR. CAL	C.BANDED	W/CARB MTL.
71	3841-42.	⊲0₀01	<0.01	4.0	12.5	70.1	SS:LT BR	IN FNGR CAL	C. BAN DED	W/CARE MTL.
⁽⁰⁾ 72	3856-57	-0.01	⊲.01	2.9	.0.0	82.6	SS :LT GI	RY, FNGR, S&	P,SLI CAI	C, ARGILL IN PT
n 73	3857-58	⊲.01	≪,01	2.6	0.0	76.9	SS:LT GF	Y, FNGR, S&P	,SLI CALC	,ARGILL IN PT.
n.74	3859-60	⊲0.01	⊲.01	2.0	0,07.	90.0	SS:LT GF	RY, FNGR, S&P	,SLI CALC	,ARGILL IN PT.
175	3861-65	. <0.01	⊲0.01	:.3.9	0.0	74.4	SS:LT GE	RY, FNGR, S&P	,SLI CALC	, ARGILL IN PT.
1794	3000-07	<0.01	୍⊲0.01 ୁ	8-2-3-	. 0.0	87.0	SS:LT G	II, FNGR, S&P	SLI CALC	, ARGIEL IN PT.
1.14	2,300 (+00		 	ر ور		87 9	SSILL GE	LI FNGR SCP	SLL CALL	ADITI IN TT.
N 70	3873.71	0.01	່~0,01ິ ⊲0,01ິ	, , , , , , , , , , , , , , , , , , ,	× 0.0	52 6		II FNGR W/A	BNT CAR	SH PTNOS
SROW	3876 77	<0.01	0.01	2.7	7 1	89.0	SS IT OF	Y FNGE WA	BNT CARR	SH PTNOS
-61	3914-15	<0.01	0.01	h.h	13.6	59.0	SS ILT BE	IN FNGR. W/H	OTT CARB	WTL.SAP ARGIII
82	3916-17	-0.01	€.01	12.6	1.6	44.3	SS IT B	N, FNGR, W/M	OTT CARB	MTL, S&P, ARGILI
83	3918-19	0,02	-0.01	10.2	5. 0 .0	58.8	SS :LT BI	n, fngr, w/m	OTT CARB	MTL, S&P, ARGILL
. 84 1	13920-21	⊴.01	~ √.01.,	1.1.	1.4	42.3	SS ILT BI	IN, FNOR, W/M	OTT CARB	MTL, S&P, ARGILL
785支		0.07	⊲.01	-13,8	\$ 5.1	42.8	SS ILT OF	RI, FNGR, SLI	CALC, S&H	ARGILL, GLAU.
-86	3924-25	0.12	⊲.01.	10.0	_ 2.0		SS LT. GI	RY, FNGR, SLI	CALC, S&	ARGILL, GLAD.
₹0¥	-3926-27	0.09	0.01	10.6	4.07	48.1	SS:LT G	Y, FNOR, SLI	CALC, Se	P ARGILL OLAU.
	3920-29	<0.01		-13.5	201	42.1	SS II G	RY, FNGE, SLI	CALC, S&I	ARGILL GLAU.
07	2020-32	-0 01		い。 エン・U	0.7	5/.0 to 4	DS LL UI	IL FNUR, JLL	OP NON CI	ARULLU CLAU
01	2031-35	<0.01	-0.01	14.8	0.4	31.8	0 10 10 00 00	ANGE ARG	TLI SLD	
02	3936-37	` ₩.n`	a .n.	13.7	5.3	A. (1)	SS ITT O	RY. FNOR ARG	TTT. SAP	SLT CALC
393	3938-39	0.02	\$,01	10.3	0.0	56.3	SS ILT G	RY.FNGR.ARG	ILL.S&P.S	SLI CALC.
91	3940-61		<0.01	10.9	0.0	18.6	SSILT O	RY, FNGR, ARG	ILL,S&P.S	SLI CALC.
95.	3942-43	₹0.01	-0,01	9.0	0.0	62.3	SS:LT G	RY, FNOR, ARG	ILL,S&P,E	SLI CALC.
96.1	3961+15	₩.01	0.01	- 9.1	2 0.0	59.4	SS ILT OI	RY, FNGR, ARG	ILL,S&P,S	SLI CALC.
1.1.1.5	SERVICE #5-	X (1) (2)		م بر این طور و این م		Beer Stee	Car Sugar			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1

These sealence, to more a difference of the productivity and materials supplied by the client to whom, and for whose exclusive and confidential use. This senalence, to more the material and the productivity and make no warranty or the productivity, proper specations, but the productivity and use of the material well or sand in connection with which such report is used or relied upon.

CORE LABORATORIES, INC. Petroleum Reservoir Engineering

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Page No. 6

Company IL PASO NATURAL OAS COMPANY Formation File R2-2180 Well GAB EDGOT #1 Core Type D.G. Date Report 3-10-67 Field Contert Difficing Field Analysis STRUCKLYN Contert Field Lithological Abbreviations STRUCKLYN STRUCKLYN Contert Field Structure Structure Structure Structure Structure Structure Structure Structure Structure Structure Structure Structure Str			· · · · · · · · · · · · · · · · · · ·	(ANALY	SIS R	ESULTS	,		ć
World Ode Dde Date Report 3-10-67 Field - Drilling Fluid OdS Analysis STRUCKLTN Consign ATO ARRIBA State N.M. Elev Location Consign ATO ARRIBA State N.M. Elev Location Consign Construct State and State State and State State and State State and State State<	Compa	hy L PASO	NATURAL (GAS COMP	ANY	ormation_		· · ·	Fil	e	RP-3-2180
THIC Drilling Fluid GAS Analysta STRICKLTB Conting Luthological Abbreviations Lithological Abbreviations Lithological Abbreviations Martin Continuent of the state o	Well	GAS BUGG	Y #1		C	ore Type_	· D	/C	Da	te Report	3-10-67
Control NUM Flor Location Lithological Abbreviations Lithological Abbreviations Lithological Abbreviations Lithological Abbreviations Lithological Abbreviation Lithological Abbreviation Lithological Abbreviations Lithological Abbreviations Lithological Abbreviation Lithological Abbreviation Lithological Abbreviation Lithological Abbreviations Home Home Lithological Abbreviation Lithological Abbreviation Lithological Abbreviation 93 Syle-Li Old Old Syle Lithological Abbreviation Lithological Abbreviation 101 Syle-Lithological Abbreviation Lithological Abbreviation Lithological Abbreviation 102 Syle-Lithological Abbreviation Lithological Abbreviation Lithological Abbreviation 103	Field		r.		D	rilling Fl	uid G	AS	A_	alvsts	STRICKLIN
Internal Subscription Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Control Internal Contre Internal Contre	County	RIO ARRI	BA State	N.M.	Elev.		Location				
Introduction Introduction<											
Instruct Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruct Instruction Instruction Instruction Instruction Instruction Instruct Instruction Instruction Instruction Instruction Instruction 97 3946-b17 Cold O.O 7.5 Still ORT Fill Instruction 98 3946-b17 Cold O.O 7.1 O.O 7.2 Still ORT Fill Instruction 99 3950-51 O.O O.O 7.1 O.O 7.1 Still ORT Fill Still Still <th< td=""><td>SAND SD</td><td>DOI ORITE DOI</td><td></td><td></td><td>Litho</td><td>logical .</td><td>Abbrevia</td><td>tions</td><td></td><td></td><td></td></th<>	SAND SD	DOI ORITE DOI			Litho	logical .	Abbrevia	tions			
Antifie Other Hardweight Antifier and Antif	EMALE-SH	GHERT-CH GYPSUN-GYP	CONGLON	ERATE-CONG	CHALY-SH	MED	IUM - MED REE - CEE	GRAIN-GRN GRAIN-GRN GRANULAR-GRNL	GRAY - GY	LAMINATIO	-FRAC BLIGHTLY-SL/ N-LAM VERY-V/
BORIZ WERT OR WERT OR WERT 97 3946-47 <0.01						RESIDUAL	SATURATION	1			
HORLZ VERT. Construction 97 3946-47 0.01 5.5 0.0 72.9 SS & LT GRY, FNGR, ARGILL, S&P, SLI CALC. 98 3946-49 0.01 5.5 0.0 72.8 SS & LT GRY, FNGR, ARGILL, S&P, SLI CALC. 99 3950-51 0.01 0.01 7.3 0.0 77.3 SS & LT GRY, FNGR, ARGILL, S&P, SLI CALC. 100 3952-55 0.01 0.01 7.3 0.0 76.7 SS & LT GRY, FNGR, ARGILL, S&P, SLI CALC. 102 3956-57 0.01 0.01 5.5 0.0 83.6 SS LT GRY, FNGR, ARGILL, S&P, SLI CALC. 104 3950-61 0.01 0.01 5.0 0.0 66.6 SS LT GRY, FNGR, ARGILL, S&P, SLI CALC. 104 3950-65 0.01 0.01 8.0 0.6 SS LT GRY, FNGR, ARGILL, S&P, SLI CALC. 105 3950-65 0.01 0.01 8.0 0.6 SS LT GRY, FNGR, ARGILL, S&P, SLI CALC. 106 3950-66 0.01 0.01 1.0 0.0 8.51 GRY, FNGR, ARGILL	NUMBER	FIET	MILL	DARCYS	PER CENT	OIL	TOTAL	-	ANI	E DESCRIPTIO D REMARKS	N
97 3946-47 0.01 5.5 0.0 72.9 SS iLT GRY, FNGR, ARGILL, S&P, SLI CALC. 98 3946-49 0.01 0.01 5.3 0.0 71.8 SS iLT GRY, FNGR, ARGILL, S&P, SLI CALC. 100 3952-53 0.01 0.01 7.3 0.0 76.7 SS iLT GRY, FNGR, ARGILL, S&P, SLI CALC. 101 3954-57 0.01 0.01 7.3 0.0 76.7 SS iLT GRY, FNGR, ARGILL, S&P, SLI CALC. 102 3956-57 0.01 0.01 5.5 0.0 83.8 SS ILT GRY, FNGR, ARGILL, S&P, SLI CALC. 103 3956-57 0.01 0.01 5.5 0.0 83.8 SS ILT GRY, FNGR, ARGILL, S&P, SLI CALC. 1045 3960-61 0.01 0.01 5.6 SS ILT GRY, FNGR, ARGILL, S&P, SLI CALC. 1055 3966-67 0.01 0.01 8.3 0.0 61.5 SS ILT GRY, FNGR, ARGILL, S&P, SLI CALC. 106 3966-67 0.01 0.01 8.0 61.5 SS ILT GRY, FNGR, ARGILL, S&P, SLI CALC. 107 3977-76 0.01 0.01 7.0 0.6 SS ILT GRY, FNGR, ARGILL, S&P, SLI CAL			HORT7	A	1.		WATER	<u> </u>		····= · · · · · · · · · · · · · · · · ·	
98 394.6-b9 -0.01 -0.01 7.4 0.0 7.4 0.0 7.4 0.0 7.4 0.0 67.5 SS 117 OR1, NGR1, RG1LL, S&P, SLI CALC. 99 9950-51 -0.01 -0.01 7.3 0.0 7.4 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 100 3952-55 -0.01 -0.01 7.3 0.0 7.4 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 101 3952-57 -0.01 -0.01 1.8 0.0 66.6 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 103 3952-59 -0.01 -0.01 5.0 0.0 66.4 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 104 3954-56 -0.01 -0.01 8.0 0.6 65.1 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 1055 3954-56 -0.01 -0.01 8.0 65.4 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 106 3974-72 -0.01 -0.01 8.0 65.4 SS 117 OR1, PNOR, ARG1LL, S&P, SLI CALC. 107 3971-72 -0.01 -0.01 6.	97 -	3946-47		<0.01	5.5	0.0	72 9	SS IT CRY	ENCE ARCTI		T OITÓ
99 3950-51 -0.01 -0.01 7.4 0.0 67.5 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 100 3952-53 -0.01 -0.01 7.3 0.0 71.3 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 101 3951-55 -0.01 -0.01 1.8 0.0 76.7 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 102 3956-57 -0.01 -0.01 1.8 0.0 66.6 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 104 3960-61 -0.01 -0.01 5.0 0.0 66.0 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 1054 3962-63 -0.01 -0.01 5.0 0.0 65.6 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 1054 3964-67 -0.01 -0.01 6.8 0.0 61.5 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 107 3966-67 -0.01 -0.01 7.0 0.6 59.5 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 113 3971-77 -0.01 -0.01 1.4 0.0 SS LIT ORT, FNER, ARGILL, SAP, SLI CALC, 113 3971-76 -0.01 -0.0 <t< td=""><td>98</td><td>3948-49</td><td><0.01</td><td>⊲0.01</td><td>5.3</td><td>0.0</td><td>71.8</td><td>SS +LT GRY</td><td>FNGR ARGIL</td><td>LCCTRCCL</td><td>T CALC.</td></t<>	98	3948-49	<0.01	⊲0.01	5.3	0.0	71.8	SS +LT GRY	FNGR ARGIL	LCCTRCCL	T CALC.
100 3952-53 -0.01 7.3 0.0 71.3 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 101 3951-55 -0.01 -0.01 7.3 0.0 76.7 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 102 3956-57 -0.01 -0.01 1.8 0.0 66.6 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 103 3956-53 -0.01 -0.01 5.5 0.0 63.8 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 104 3960-61 -0.01 -0.01 5.0 0.0 66.4 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 105 3961-65 -0.01 -0.01 8.3 0.0 66.4 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 106 3961-65 -0.01 -0.01 8.3 0.0 65.5 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 106 3973-74 -0.01 -0.01 6.0 0.0 73.4 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 1112 3977-75 -0.01 -0.01 9.4 0.0 14.5 SSLIT GRI, FNGR, ARGILL, S&P, SLI CALC, 1112 3977-76 -0.01 -0.01 9.4 <td>99</td> <td>3950-51</td> <td>⊲0.01</td> <td><0.01</td> <td>7.1</td> <td>0.0</td> <td>67.5</td> <td>SS IT GRY</td> <td>FNGE ABGIL</td> <td>LISEP ST</td> <td>T CATC</td>	99	3950-51	⊲0.01	<0.01	7.1	0.0	67.5	SS IT GRY	FNGE ABGIL	LISEP ST	T CATC
101 395L-55 .0.01 .0.01 7.3 0.00 76.7 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 102 395D-55 .0.01 .0.01 La8 0.0 66.6 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 103 395D-50 .0.01 .0.01 5.5 0.0 66.6 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 104 .3960-61 .0.01 .0.01 5.0 0.0 66.4 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 105 .3960-61 .0.01 .0.0 8.3 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 106 .3961-65 .0.01 .0.01 8.3 0.0 61.5 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 106 .3962-67 .0.01 .0.01 6.0 0.0 73.4 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 110. .3973-76 .0.01 .0.0 0.0 73.4 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 111. .3977-76 .0.01 .0.01 .0.0 71.4 SS:LT GRY, FNGR, ARGILL, S&P, SLI CALC. 1113 .3977-76 .0.01 .0.0 1.6 SS:LT GRY, FNGR, ARGILL, S&P, SLI CA	100	3952-53	0,01	⊲.01	7.3	0.0	71.3	SSILT GRY	FNGR ARGIL	L.S&P.SI	T CALC.
102 3956-57 -0.01 -0.01 4.8 0.0 66.6 SS hIT GRY_PNGR_ARCHLL, SEP, SHI CALC. 103 3956-59 -0.01 -0.01 5.5 0.0 83.8 SS hIT GRY_PNGR_ARCHLL, SEP, SHI CALC. 104 1960-61 -0.01 -0.01 6.1 0.01 GALC. 1057 1960-63 -0.01 -0.01 8.3 0.0 66.4 SS hIT GRY_PNGR_ARCHLL, SEP, SHI CALC. 1067 3966-67 -0.01 -0.01 8.3 0.0 61.5 SS hIT GRY_PNGR_ARCHLL, SEP, SHI CALC. 107 3966-67 -0.01 -0.01 8.3 0.0 61.5 SS hIT GRY_PNGR, ARCHLL, SEP, SHI CALC. 108 3971-72 -0.01 -0.01 6.0 0.0 73.4 SS hIT GRY_PNGR, ARCHLL, SEP, SHI CALC. 110.4 .3973-76 -0.01 -0.01 9.4 0.0 50.0 SS HIT GRY_PNGR, ARCHLL, SEP, SHI CALC. 1112 .3977-76 -0.01 -0.01 5.4 50.0 SS HIT GRY_PNGR, ARCHLL, SEP, SHI CALC. 113 .3979-50 0.02 -0.01 5.9 SHI TGRY, PNGR, ARCHLL, SEP, SHI CALC	101 🤺	3954-55	⊲.01	0.01	7.3	0.0	76.7	SS :LT GRY	FNGR ARGIL	L.S&P.SI	J CALC.
103 3956-59 -0.01 -0.01 5.5 0.0 83.8 SSLIT GRY, FNGR, ARGILL, SEP, SLI CALC. 105 3960-61 -0.01 -0.01 5.0 0.0 66.0 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 105 3962-65 -0.01 -0.01 8.3 0.00 66.1 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 106 3964-67 -0.01 -0.01 1.0 0.0 62.5 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 108 3974-74 -0.01 -0.01 1.0 0.0 82.5 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 109 3971-72 -0.01 -0.01 9.0 73.4 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 1114 -3975-76 -0.01 -0.01 9.0 73.4 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 113 3970-76 -0.01 -0.01 5.9 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 113 3971-78 -0.01 -0.01 5.9 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. 114 -3983-84 -0.01 -0.01 5.9 SS LIT GRY, FNGR, ARGILL, SEP, SLI CALC. <	102	3956-57	⊲.01	⊲.01	4.8	0.0	66.6	SS:LT GRY	FNGR, ARGIL	L.S&P.SI	I CALC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	103 了 🤅	3958-59	<0.01	<0.01	5.5	0.0	83.8	SS:LT ORY	FNGR ARGIL	L,S&P,SI	LI CALC.
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	104	3960-61	- 0.01	<0.01	5.0	0.0	66.0	SS :LT ORY	FNGR, ARGIL	L,S&P,SI	I CALC.
L00 2901-03 40.01 9.0 0.0 56.8 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 108 3966-69 40.01 4.0 0.0 82.5 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 109 3971-72 40.01 4.0 0.0 82.5 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 109 3971-72 40.01 4.0 0.0 65.9 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 110. 3975-76 40.01 4.0 0.0 SIT GRT, FNOR, ARGILL, SEP, SLI CALC. 111. 3975-76 40.01 4.0 0.0 SIT GRT, FNOR, ARGILL, SEP, SLI CALC. 111. 3977-78 4.0 4.0 4.6.5 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 113 3977-78 4.0 4.0 4.6.5 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 114. 3981-82 4.0 4.0 4.6.5 SS IIT GRT, FNOR, ARGILL, SEP, SLI CALC. 115. 3983-84 4.0 4.0 6.1.7 71.9 SS IIT GRT, FNOR, SLTT, NON CALC, MICACEOUS. 115. 3982-86 4.0 4.0 7.1.9 SS IIT GRT, FNOR, SLI CALC, SAP, SLI CALC.	105 3	3962-63	0.01	⊲.01	8.3	0.0	66.4	SS:LT GRY	,FNGR,ARGIL	L,S&P,SI	I CALC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	100. 	0704-07	40,01	Q°01 . 	9.0	0.0	56.8	SS:LT GRY	FNGR, ARGIL	L,S&P,SI	I CALC.
109 3971-72 -0.01 -0.01 7.9 0.0 62.5 SS hIT GRI, FNGR, ARGILL, S&P, SLI CALC. 1109 3971-74 -0.01 -0.01 6.0 0.0 73.4 SS hIT GRI, FNGR, ARGILL, S&P, SLI CALC. 1111 3975-76 -0.01 -0.01 9.4 0.0 50.0 SS hIT GRI, FNGR, ARGILL, S&P, SLI CALC. 1112 3977-76 -0.01 -0.01 9.4 0.0 16.5 SS hIT GRI, FNGR, ARGILL, S&P, SLI CALC. 1113 3977-76 -0.01 -0.01 11.4 0.0 16.5 SS hIT GRI, FNGR, ARGILL, S&P, SLI CALC. 1113 3977-76 -0.01 -0.01 1.4 0.0 16.5 SS hIT GRI, FNGR, ARGILL, S&P, SLI CALC. 1114 3981-86 -0.01 -0.01 5.2 3.9 84.6 SS hIT GRI, FNGR, SLIT, MON CAL, MCACEOUS. 1155 3982-86 -0.01 -0.01 4.6 1.7 7.9 SS hIT GRI, FNGR, SLIT CALC, S&P, SLI CALC. 1165 3982-86 -0.01 -0.01 8.1 0.0 7.5 SS hIT GRI, FNGR, SLIT CALC, S&P, SLI CALC. 117 3991-92 0.01<	108	3900-01			6.3	0.0		SS:LT GRY	FNGR, ARGIL	L,S&P,SI	I CALC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	100	3071-72	· •0 01	-0.01	20	0.0	62.5	SSILT GRI	FNUR, ARGIL	L,S&P,SI	I CALC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	10	3072.71	-0.01 -0.01	<0.01	60	0.0	07.Y	SSIN GRI	FNUR, ARGLL	L,S&P,SI	I CALC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	111	3975-76	ັ⊲0.01	<0.01	0,0	0.0	50.0		FNUR, ARILL	6,562,51	AL GALIC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	112	-3977-78	√0,01	√0. 01	13.4	0.0	1.6 5	SS IT GRY	FNUR ARUIL	LCCTRCCL	L CALC.
111.3981-82 0.01 0.01 5.9 0.0 74.6 SS iffGRY, FNGR, AROILL, S&P, SLI CALC.115.3983-84 0.01 0.01 5.2 3.9 84.6 SS iffGRY, FNGR, SLTY, W/ABNTCALC116.3985-86 0.01 0.01 5.2 3.9 84.6 SS iffGRY, FNGR, SLITY, W/ABNTCALC116.3987-86 0.01 0.01 4.6 1.7 71.9 SS iffGRY, FNGR, SLITCALC, S&P, SLI117.3987-86 0.01 0.01 9.9 0.0 63.7 SS iffGRY, FNGR, SLICALC, S&P, SLI118.3689+ 50 0.07 0.01 9.9 0.0 63.7 SS iffGRY, FNGR, SLICALC, S&P, SLI120.3991-92 0.04 0.01 9.9 0.0 77.5 SS iffGRY, FNGR, SLICALC, S&P, SLICALC.121.3995-96 0.01 0.01 8.1 0.0 77.5 SS iffGRY, FNGR, SLICALC, S&P, SLICALC.122.3997-98 0.07 0.01 8.1 0.0 55.05 SS iffGRY, FNGR, SLICALC, S&P, SLICALC.123.3999-90 0.00^2 0.01^2 0.01 60.0 55.05 SS iffGRY, FNGR, SLICALC, S&P, SLICALC.124. $4001-02$ 0.05^2 0.07 9.4 0.0 62.7 SS iffGRY, FNGR, SLICALC, S&P, SLICALC.125.12 $4003-04$ 0.07 0.501 </td <td>U3 🔅</td> <td>3979-80,</td> <td>D.02</td> <td>⊲.01</td> <td>6.8</td> <td>0.0</td> <td>61.5</td> <td>SS IT GRY</td> <td>THOR ARGIN.</td> <td>בטניזצטנט דס מגס ז</td> <td>T CHIC</td>	U3 🔅	3979-80,	D.02	⊲.01	6.8	0.0	61.5	SS IT GRY	THOR ARGIN.	בטניזצטנט דס מגס ז	T CHIC
1153983-81 0.01 0.01 5.2 3.9 81.6 85 sitt BRN, FNGR, SLIT, NON GALC, MICACECOUS,1163985-86 0.01 0.01 1.6 1.7 71.9 85 sitt BRN, FNGR, SLIT, W/ABNT CARB SHALE,1173967-86 0.01 0.01 9.9 0.0 63.7 85 sitt BRN, FNGR, SLIT CALC, S&P, SLI CALC,1183869+39 0.07 0.01 11.4 0.0 58.6 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,1193991-92 0.01 0.01 9.4 2.1 69.2 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,120 $3993-94$ 0.01 0.01 8.4 0.0 77.5 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,121 $3995-96$ 0.01 0.01 8.1 0.0 59.3 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,122 $3997-98$ 0.01 0.01 8.1 0.0 59.3 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,123 $3999-900$ 0.022 0.01 9.0 0.0 55.0 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,124 4001402 0.08 0.07 9.4 0.0 62.7 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,125 $14003-04$ 0.07 0.014 9.0 0.0 47.0 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,125 $14003-04$ 0.07 0.014 8.3 0.0 47.0 85 sitt GRY, FNGR, SLI CALC, S&P, SLI CALC,125 $1003-04$ 0.01	114	3981-82	₹0.01	√0.01	5.9	0.0	71.6	SS IT GRY	FNGR, LEGIT.	LISLD ST	T CALC.
116 3985-66 -0.01 -0.01 h.6 1.7 71.9 SS:IT BRN, FNGR, SLIT, WABNT CARB SHALE. 117 3987-88 0.04 -0.01 9.9 0.0 63.7 SS:IT BRN, FNGR, SLI CALC, S&P, SLI CALC. 118 3889+90 0.07 0.01 11.4 0.0 58.6 SS:IT GRY, FNGR, SLI CALC, S&P, SLI CALC. 119 3991-92 0.04 -0.01 9.1 2.1 69.2 SS:IT GRY, FNGR, SLI CALC, S&P, SLI CALC. 120 3995-96 0.01 -0.01 8.1 0.0 77.5 SS:IT GRY, FNGR, SLI CALC, S&P, SLI CALC. 121 3995-96 0.01 -0.01 8.1 0.0 59.3 SS:IT GRY, FNGR, SLI CALC, S&P, SLI CALC. 122 3997-98 0107 -0.01 60.7 SS:IT GRY, FNGR, SLI CALC, S&P, SLI CALC. 123 3999-4000 0.02 -0.01 9.0 0.0 62.7 SS ILT GRY, FNGR, SLI CALC, S&P, SLI CALC. 124 4001-02 0.08 0.00 63.3 0.0 47.0 SS ILT GRY, FNGR, SLI CALC, S&P, SLI CALC.	115	3983-84	-0.01	0.01	5.2	3.9	84.6	SS IT BRN.	FNGR.SLTY	NON CATC	L UTCLOROUS
1173987-880.010.019.90.063.7SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1183889-900.070.0111.40.058.6SS:LTGRY, FNGR, SLICALC, S&P, SLIGALC,1193991-920.04 $< < 01$ 9.42.169.2SS:LTGRY, FNGR, SLICALC, S&P, SLIGALC,1203993-940.01 $< < 0.01$ < 0.01 8.10.077.5SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1213995-960.01 < 0.01 8.10.059.3SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1223997-980.07 < 0.01 9.70.060.9SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1244001-020.0680.079.40.062.7SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1254003-040.070.018.30.047.0SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1254003-060.001 < 0.01 8.30.047.0SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1264005-100.11 < 0.01 8.30.059.0SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1274007-08 < 0.01 < 0.01 8.30.035.8SS:LTGRY, FNGR, SLICALC, S&P, SLICALC,1284009-100.11 < 0.01 9.0	116	3985-86	-0.01	0.01	4.6	1.7	71.9	SS IT BRN.	FNGR SLTY	A/ABNT C	ARB SHALE
118 38694.90 0.07D.0111.40.058.8SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.119 $3991-92$ 0.04 0.01 9.4 2.1 69.2 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.120 $3993-94$ 0.01 0.01 8.4 0.077.5SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.121 $3995-96$ 0.01 0.01 8.1 0.0 59.3 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.121 $3997-96$ 0.07 -0.01 9.7 0.0 60.9 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.123 $3999-4000$ 0.02 40.01 0.0 62.7 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.124 $4001-02$ 0.08 0.07 9.4 0.0 62.7 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.125 124 $4003-04$ 0.07 0.01 9.0 6.0 61.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.125 124 $4005-06$ 0.08 0.01 8.3 0.0 47.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.126 $4005-06$ 0.08 0.01 8.3 0.0 59.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.127 $1007-08$ 0.01 0.01 8.3 0.0 59.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.128 $4009-10$ 0.11 0.01 9.8 0.0 55.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.129 $4011-12$ 0.08 40.01 9.8 0.0 55.8 </td <td>117</td> <td>3987-88</td> <td>0.04</td> <td>.0.01</td> <td>9.9</td> <td>0.0</td> <td>63.7</td> <td>SS ILT GRY.</td> <td>FNGR SLI C</td> <td>LC.SEP.</td> <td>SLI CALC.</td>	117	3987-88	0.04	.0.01	9.9	0.0	63.7	SS ILT GRY.	FNGR SLI C	LC.SEP.	SLI CALC.
119 3991-92 0.04 0.01 9.4 2.1 69.2 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 120 3993-94 0.01 0.01 8.4 0.0 77.5 SS:LT GRY, FNGR, SLI CALC, S&P, SLI OALC, 121 3995-96 0.01 0.01 8.1 0.0 59.3 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 122 3997-98 0107 0.01 9.7 0.0 60.9 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 123 3999-4000 0.02 0.01 10.0 0.0 55.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 124 4001-02 0.06 0.07 9.4 0.0 62.7 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 125 4003-04 0.07 0.01 8.3 0.0 47.0 BS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 126 4005-06 0.08 0.01 8.3 0.0 59.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 127 4007-08 0.01 8.3 0.0 59.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC, 128 4009-10 0.11 0.01 9.8 <td>118</td> <td>3889490</td> <td>0.07</td> <td>0.01</td> <td>11.4</td> <td>0.0 5</td> <td>58.8</td> <td>SS :LT GRY</td> <td>FNGR, SLI C</td> <td>IC,S&P,</td> <td>SLI CALC.</td>	118	3889490	0.07	0.01	11.4	0.0 5	58.8	SS :LT GRY	FNGR, SLI C	IC,S&P,	SLI CALC.
103993-940.01 0.01 8.4 0.0 77.5 SS:LT GRY, FNGR, SLI CALC, S&P, SLI OALC.1213995-960.01 0.01 8.1 0.059.3SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1223997-980.07 -0.01 9.7 0.0 60.9 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1233999-4000 0.02 -0.01 10.0 0.0 55.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.124 $4001-02$ 0.08 0.07 9.4 0.0 62.7 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.125 $4003-04$ 0.07 0.01 9.0 0.0 61.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.125 $4003-04$ 0.07 0.01 9.0 0.0 47.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.126 $4005-06$ 0.078 0.01 6.3 0.0 47.0 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.127 $4007-08$ 0.01 0.01 8.3 0.0 55.8 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.128 $4009-10$ 0.11 0.01 9.8 0.0 35.8 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.128 $4009-10$ 0.11 0.01 9.8 0.0 35.8 SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.129 $4011-12$ 0.08 0.01 9.8 0.0 35.8 SS:LT GRY, FNGR, SLI CALC, S&P.130 $4013-14$ 0.01 -0.01 7.8 0.0 54.0 SS:LT GR	119	3991+92	0.04	.0.01	9.4	2.1	69.2	SS:LT GRY,	FNGR, SLI C	LC,S&P,	SLI CALC.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		3793-94	0.01	0 .01	8.4	0.0	77.5	SS:LT GRY,	FNGR, SLI C	LC, S&P,	SLI OALC.
1233999-4000 $0_{\circ}02$ $0_{\circ}01$ $9_{\circ}7$ 0.0 60.9 SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1244001-02 $0_{\circ}08$ $0_{\circ}07$ $9_{\circ}4$ $0_{\circ}0$ 62.7 SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1251003-04 $0_{\circ}07$ $0_{\circ}04$ $9_{\circ}0$ $0_{\circ}0$ $61_{\circ}0$ SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1261005-06 $0_{\circ}08$ $0_{\circ}01$ 8.3 $0_{\circ}0$ 47.0 BS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1271007-08 $0_{\circ}01$ 8.3 $0_{\circ}0$ 59.0 SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1281007-08 $0_{\circ}01$ 8.3 $0_{\circ}0$ 59.0 SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1281007-08 $0_{\circ}01$ 8.3 $0_{\circ}0$ 59.0 SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1291011-12 $0_{\circ}08$ $0_{\circ}01$ 9.9 0.0 11.5 SS LT GRY, FNGR, SLI CALC, S&P, SLI CALC,1301011-12 $0_{\circ}08$ $0_{\circ}01$ 9.8 $0_{\circ}0$ 35.8 SS LT GRY, FNGR, SLI CALC, S&P,1311015-16 $0_{\circ}01$ $0_{\circ}01$ 5.9 0.0 56.0 SS LT GRY, FNGR, SLI CALC, S&P,1321037-18 $0_{\circ}01$ $0_{\circ}01$ 7.8 $0_{\circ}0$ 55.5 SS LT GRY, FNGR, SLI CALC, S&P,1331019-20 $0_{\circ}01$ 8.9 $0_{\circ}0$ 19.5 SS LT GRY, FNGR, SLI CALC, S&P,1341025-26 $0_{\circ}21$ $0_{\circ}21$ $0_{\circ}0$ 19.5 SS LT GRY, F	122	3007_08	0.01	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.1	0.0	59.3	SS:LT GRY,	FNGR, SLI CA	LC,S&P,	SLI CALC.
124 4001+02 0.08 0.07 9.1 0.0 62.7 SSILT GRI, FNGR, SLI CALC, S&P, SLI CALC. 125(1) 4003-04 0.07 0.01 9.0 0.0 61.0 SSILT GRI, FNGR, SLI CALC, S&P, SLI CALC. 126 4005-06 0.08 0.01 8.3 0.0 47.0 BSILT GRI, FNGR, SLI CALC, S&P, SLI CALC. 127 4007-08 0.01 0.01 8.3 0.0 59.0 SSILT GRI, FNGR, SLI CALC, S&P, SLI CALC. 128 4009-10 0.11 0.01 9.9 0.0 41.5 SSILT GRI, FNGR, SLI CALC, S&P, SLI CALC. 129 4011-12 0.08 0.01 9.8 0.0 35.8 SSILT GRI, FNGR, SLI CALC, S&P. 130 4013-14 0.01 9.8 0.0 35.8 SSILT GRY, FNGR, SLI CALC, S&P. 132 4017-16 0.01 8.3 0.0 42.2 SSILT GRY, FNGR, SLI CALC, S&P. 132 4017-18 0.01 59.0 0.56.0 SSILT GRY, FNGR, SLI CALC, S&P. 133 4019-20 0.01 3.0 0.0 55.1 GRY, FNGR, SLI CALC, S&P. 134<	121	3000-1000	0.01	-0.01	70 C			SSILT URI	FNGR, SLI C	LC,S&P,	SLI CALC.
1251003-040.070.019.00.061.0SS 11 GR1, FNGR, SLI CALC, S&P, SLI CALC.1261005-060.080.018.30.017.0BS 11 GRY, FNGR, SLI CALC, S&P, SLI CALC.1271007-080.010.018.30.059.0SS 111 GRY, FNGR, SLI CALC, S&P, SLI CALC.1281009-100.110.019.90.011.5SS 111 GRY, FNGR, SLI CALC, S&P, SLI CALC.1281009-100.110.019.90.011.5SS 111 GRY, FNGR, SLI CALC, S&P, SLI CALC.1291011-120.080.019.80.035.8SS 111 GRY, FNGR, SLI CALC, S&P.1301013-140.010.018.30.012.2SS 111 GRY, FNGR, SLI CALC, S&P.1311015-160.010.018.30.012.2SS 111 GRY, FNGR, SLI CALC, S&P.1311015-160.010.015.90.056.0SS 111 GRY, FNGR, SLI CALC, S&P.1321017-180.010.017.80.054.0SS 111 GRY, FNGR, SLI CALC, S&P.1331019-200.010.018.90.019.5SS 111 GRY, FNGR, SLI CALC, S&P.1341021-220.110.019.00.012.3SS 111 GRY, FNGR, SLI CALC, S&P.1351023-240.290.12:12.50.010.7SS 111 GRY, FNGR, SLI CALC, S&P.1361025-260.230.0110.70.029.0SS 111 GRY, FNGR, SLI CALC, S&P.1361	24	4001-02	0.08	0.07	10. h	-0-0 -0-0	ンフン・U ン イン・マート	SSILT URI,	FNOR, SLI CI	LU,S&P,	SLI CALC.
1261005-060.080.018.30.017.0BS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1271007-080.010.018.30.059.0SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1281009-100.110.019.90.011.5SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1291011-120.080.019.80.035.8SS:LT GRY, FNGR, SLI CALC, S&P.1301013-110.010.018.30.012.2SS:LT GRY, FNGR, SLI CALC, S&P.1311015-160.010.015.90.056.0SS:LT GRY, FNGR, SLI CALC, S&P.1321017-180.010.017.80.051.0SS:LT GRY, FNGR, SLI CALC, S&P.1331019-200.010.018.90.019.5SS:LT GRY, FNGR, SLI CALC, S&P.1341021-220.110.019.00.012.3SS:LT GRY, FNGR, SLI CALC, S&P.1351023-240.290.12 12.50.010.7SS:LT GRY, FNGR, SLI CALC, S&P.1361025-260.230.0110.70.029.0SS:LT GRY, FNGR, SLI CALC, S&P.	25	1003-01	0.07	0.01	80 n	0.0	61 0	CO ILL JURI	FNUR SLL U	والفلاد واللا	SLL CALO
1271007-08 \bigcirc 0.01 \bigcirc 0.01 \bigcirc 0.0 \bigcirc 59.0SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1281009-100.11 \bigcirc 0.019.90.011.5SS:LT GRY, FNGR, SLI CALC, S&P, SLI CALC.1291011-120.08 \bigcirc 0.019.80.035.8SS:LT GRY, FNGR, SLI CALC, S&P.1301013-140.01 \bigcirc 0.018.30.012.2SS:LT GRY, FNGR, SLI CALC, S&P.1311015-16 \bigcirc 0.01 \bigcirc 0.015.90.056.0SS:LT GRY, FNGR, SLI CALC, S&P.1321017-18 \bigcirc 0.01 \bigcirc 0.017.80.054.0SS:LT GRY, FNGR, SLI CALC, S&P.1331019-20 \bigcirc 0.01 \bigcirc 0.018.90.019.5SS:LT GRY, FNGR, SLI CALC, S&P.1341021-22 \bigcirc 0.11 \bigcirc 0.019.00.012.3SS:LT GRY, FNGR, SLI CALC, S&P.1351023-240.290.1212.50.010.7SS:LT GRY, FNGR, SLI CALC, S&P.1361025-260.230.0110.70.029.0SS:LT GRY, FNGR, SLI CALC, S&P.	126	4005-06	0.08	<0.07	8.3	0.0	1.7 0	BS ILL MAL	FNUR, DLL U	ILU, S&P	SLL UALG.
128 $1009-10$ 0.110.019.90.0 11.5 SS :LT GRY, FNGR, SLI CALC, S&P, SLI CALC.129 $1011-12$ 0.08 0.01 9.80.035.8SS :LT GRY, FNGR, SLI CALC, S&P.130 $1013-11$ 0.010.018.30.0 12.2 SS :LT GRY, FNGR, SLI CALC, S&P.131 $1015-16$ 0.01 0.01 5.90.056.0SS :LT GRY, FNGR, SLI CALC, S&P.132 $1017-18$ 0.01 0.01 7.80.054.0SS :LT GRY, FNGR, SLI CALC, S&P.133 $1019-20$ 0.01 0.01 8.90.0 19.5 SS :LT GRY, FNGR, SLI CALC, S&P.134 $1021-22$ 0.11 0.01 9.0 0.0 12.3 SS :LT GRY, FNGR, SLI CALC, S&P.135 $1023-21$ 0.29 0.12 12.5 0.0 10.7 SS :LT GRY, FNGR, SLI CALC, S&P.136 $1025-26$ 0.23 0.01 10.7 0.0 29.0 SS :LT GRY, FNGR, SLI CALC, S&P.136 $1025-26$ 0.23 0.01 10.7 0.0 29.0 SS :LT GRY, FNGR, SLI CALC, S&P.	127	4007-08	-0. 01	0.01	8.3	ີດູ້ດີ	59.0	SS IT ARY	FNOR SIT O	C SAD	STT CITC
129 1011-12 0.08 0.01 9.8 0.0 35.8 SS:LT GRY, FNGR, SLI CALC, S&P. 130 1013-14 0.01 0.01 8.3 0.0 12.2 SS:LT GRY, FNGR, SLI CALC, S&P. 131 1015-16 0.01 0.01 5.9 0.0 56.0 SS:LT GRY, FNGR, SLI CALC, S&P. 132 1017-18 0.01 0.01 7.8 0.0 51.0 SS:LT GRY, FNGR, SLI CALC, S&P. 132 1019-20 0.01 0.01 8.9 0.0 19.5 SS:LT GRY, FNGR, SLI CALC, S&P. 131 1019-20 0.01 0.01 8.9 0.0 19.5 SS:LT GRY, FNGR, SLI CALC, S&P. 134 1021-22 0.11 0.01 9.0 0.0 12.3 SS:LT GRY, FNGR, SLI CALC, S&P. 135 1023-24 0.29 0.12; 12.5 0.0 10.7 SS:LT GRY, FNGR, SLI CALC, S&P. 136: 1025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P.	L2 8	4009-10	0.11	<0.01	9.9	0.0	Ш.5	SS IT GRY	FNGB.SLT C	LC:S&P	SIT CITC
130 1013-14 0.01 8.3 0.0 12.2 SS:LT GRY, FNGR, SLI CALC, S&P. 131 1015-16 0.01 5.9 0.0 56.0 SS:LT GRY, FNGR, SLI CALC, S&P. 132 1017-18 0.01 7.8 0.0 54.0 SS:LT GRY, FNGR, SLI CALC, S&P. 133 1019-20 0.01 0.01 8.9 0.0 19.5 SS:LT GRY, FNGR, SLI CALC, S&P. 134 1021-22 0.11 0.01 9.0 0.0 12.3 SS:LT GRY, FNGR, SLI CALC, S&P. 135 1023-24 0.29 0.12; 12.5 0.0 10.7 SS:LT GRY, FNGR, SLI CALC, S&P. 136: 1025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P. 136: 1025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P.	129	1011-12	0.08	0.01	.9.8	0.0	35.8	SS :LT GRY	FNGR SLT C	LC.S&P	ATT NUTA
131 4015-16 <0.01	130 🦕	4013-14	0.01	<0.01	8.3	0.0	12.2	SS IT ORY.	FNOR SLI C	LC.SEP.	
132. 4017-18 -0.01 7.8 0.0 54.0 SS:LT GRY, FNGR, SLI CALC, S&P. 133 4019-20 -0.01 -0.01 8.9 0.0 49.5 SS:LT GRY, FNGR, SLI CALC, S&P. 134 4021-22 0.11 -0.01 9.0 0.0 42.3 SS:LT GRY, FNGR, SLI CALC, S&P. 135 4023-24 0.29 0.12; 12.5 0.0 40.7 SS:LT GRY, FNGR, SLI CALC, S&P. 136 4025-26 0.23 -0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P.	131	4015-16	40.01 ,	-⊲.,01	5.9	0.0	56.0	SS :LT. GRY.	FNGR, SLI C	LC.S&P.	
4019-20 0.01 0.01 8.9 0.0 49.5 SS:LT GRY, FNGR, SLI CALC, S&P. 134 4021-22 0.11 0.01 9.0 0.0 42.3 SS:LT GRY, FNGR, SLI CALC, S&P. 135 4023-24 0.29 0.12 12.5 0.0 40.7 SS:LT GRY, FNGR, SLI CALC, S&P. 136 4025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P. 136 4025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P.	LJZ	4017-18	⊲.01	<0.01	7.8	0.0	54.0	SS:LT GRI,	FNGR, SLI CI	LC,S&P.	
134 4021-22 0.11 0.01 9.0 0.0 42.3 SS:LT GRY, FNGR, SLI CALC, S&P. 135 4023-24 0.29 0.12;12.5 0.0 40.7 SS:LT GRY, FNGR, SLI CALC, S&P. 136 4025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P. 136 4025-26 0.23 0.01 10.7 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P.	1 55 - 1	4019-20	.≺0.01	<0.01	8.9	0.0	49.5	SS ILT GRY,	FNGR, SLI CA	LC,S&P.	
4025-24 0.29 0.12 12.5 0.0 40.7 SS:LT GRY, FNGR, SLI CALC, S&P. 136 4025-26 0.23 40.01 10.7 . 0.0 29.0 SS:LT GRY, FNGR, SLI CALC, S&P.	134	4021-22	0,11	<0.01	9.0	0.0	42.3	SS:LT GRY,	FNGR,SLI CA	LC,S&P.	
SERVICE TO ALC, S&P.	36!	1025-24	0.29	0.123	12.5	0.0	40.7	SS:LT GRY,	FNOR, SLI CA	LC,S&P.	۲۰ میں ایک
		SERVICE #C	Veca		1001	V •V	29.0	SS IL GRY,	FNUR, SLI CA	LC,S&P.	

DERVILLE John There shalyses, opinons or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, has report is made The interpretations or opinions excepted represent the best judgment of Core Laboratories. Inc. (all errors and omissions excepted) s but Core Jaboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, reprofitableness of any oil, gas of other mineral well or sand in connection with which such report is used or relied upon.

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Petroleum Reservoir Engineering DALLAS TEXAS

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CORE ANALYSIS RESULTS

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Comr	ANY EL PASO NA	TURAL GAS	COMPA	NY	Formation	· .			File	RP-3-2180
Well	GAS BUGIY	#1		(Core Type		D/C		Date Report	3-14-67
Field					Drilling F	Inid	GAS		Analysts	STRICKLIN
Com	RIO ARRIBA	State 1	I.M.	Flev		Location				
			2 2.4.4	Lith	ological	Abbreviat	lions			
BHALE.	SH SHERT CH	CONGLOWERAT FOSSILIFEROU	E-CONG	SHALY-SI LIMY-LM	ну ме У со	DIUM MED	GRAIN-GRN GRANULAR-I	GRAY-QY	GY STYLOLIT	ON-LAM VERY-V/
BANPLE	DEPTH	PERMEABL	LITY	POROSITY	RESIDUAL	SATURATION			SAMPLE DESCRIPTI	ON
NUMBER	FERT	MILLIDAR	CYS	PER CENT	OIL	TOTAL	-		AND REMARKS	
		HORIZ. A V	ERT						· · · · · · · · · · · · · · · · · · ·	······································
137	4027-28	0.28	0.05	9.0	0.0	43.3	SS:LT	GRY, FNGR, S	LI CALC,S&	P.
138	4029-30	0.12	0.01	8.5	0.0	56.5	SS:LT	GRY, FNGR, S	LI CALC,S&	P
139	4031-32	0.02	0.01	3.8	.0.0	65.9	SS:LT	GRY, FNGR, S	LI CALC,S&	P.
110	4033-34	0.28	0.01	10.5	0.0	37.2	SS:LT	GRY, FNGR, S	LI CALC,S&	P
111	ジュー <u>40</u> 35-36	0.12	10.C	8.7 0	0.0	1.1	SS:LT	GRI, FNGR, S	LI CALC,S&	P.
142	403/-30	0.02	J.01		0.0	51.0	SS:LT	GRI, FNGR, S	LI CALC,S&	r.
113	4039-40			5.4	0.0	76.0	SSILT	GRI, FNGR, S	LI CALC,S&	r.
1.04		<0.01			0.0	- ' YJ.O	. 22 TT	GRI, FWIR, S	LI UALC, Se	K.
147	- 1015-16				61	87 3	22 JN	CRY V/FNCB	VALO, OULAU LU	SU DANGG
172	1017-18	S.01	1.01 1.01	1.8	0.0	91,5	SS DK	GRY VIENCE	SLTY W/SM	SH PTNGS
718	1019-50	<0.01	ລິດ	2.7	55.6	10.8	SS DK	GRY. V/FNGR	SLTY. (CAR	B SHALE OTL)
11.9	1051-52	⊲.01	0.01	2.8	25.0	68.0	SS :DK	GRY. V/FNGR	SLTY CAR	B SH OIL).
150	SH-2053-54	₹0,01	0.01	7.1	16.9	79.0	SS:DK	GRY. V/FNGR	SLTY, (CAR	B SHALE OIL).
151	L055-56	⊲.01	0.01	7.5	17.3	65.2	SS:DK	GRY, V/FNGR	SLTY, (CAR	B SHALE OIL).
152	1057-58	<0.01 ·	0.01	3.2	28.1	65.5	SS:DK	GRY, V/FNGR	,SLTY, (CAR	B SHALE OIL).
753	4062-63	◆.01	0.01	5.9	0.0	89.8	SS :DK	GRY, FNGR, S	LTY THU OU	T,W/CARB PINGS
154	4064-65	0.05	⊲.01	7.4	0.0	81.2	SS:LT	GRY, FNGR, S	LTY,S&P,SL	I CALC.
155	4066-67	⊲.01	0.01	9.5	23.1	86.2	SS:LT	GRY, FNGR, S	LTY,S&P,SL	I CALC.
120	1000-09	0.01	0.01	0.4	.0.0	75.0	SS:LT	GRY, FNGR, S	&P,SLI CAL	C.
131	1072 72	40,01	0101	- う•0ぷ 1、イ	5 0. 0	· 91.0	SS:LT	GRI, FNUR, S	&P,SLI CAL	
150	1071-75			<u>ц</u> .о		88 1	TT. 50	CRV FNOR S	47901110410 110 110 110	
160	1076-77	⊲.01	0.01	5.2	0.0	90.1	55 •TT	GRY FNGR S	EP SLT.CAL	0. C
361	1078-79	0.01	<0.01 €	5.5	.0.0	89.2	SS IT	GRY. FNGR.S	&P.SLT CAL	С.
162	1080-81	⊲0.01	0.01-	7.7	0.0	76.6	SS:LT	GRY.FNGR.S	&P.SLI CAL	C.
163	24082-83	0.15	0.15	12.5	4.0	\$ 46.4	SS:LT	GRY, FNGR, S	&P,SLI CAL	C.
:16h-	1081-85	0.21	0.02	9.7	0.0 2	59.8	SSILT	GRY, FNGR, S	&P,SLI CAL	C.
165	.1086-87	0.77	0.45	14.3	6.3	.37.0	SS :LT	GRI, FNGR, S	&P,SLI CAL	C,W/OCC MED SI
166	4088-89	<0.01 ·	0.01	10.1	2.0	37.6	SS :LT	GRY, FNGR, S	&P,SLI CAL	C,W/OCC MED S
· 167	4090-91	0.07	0 °01	9.5	2.1	45.3	SS tLT	GRY, FNGR, S	&P,SLI CAL	C,W/OCC MED S
, 160	1072-73	0.00	0.0T	1.0	0.0	60.4	SS:LT	GRI, FNGR, S	W/SM CA	HE SH STGS.
170	1006 D7	-0.01	√ 01		4.9	DY.J	55:LT	GRI, FNGR, S	SLI CAL	U
771	1008-00	A 08	0.0)	10.0	E. U	57.U	111 CG - mr. 99	URL FNUND	LO GIT OLT	
172	1100-01	0.01	0.01 0.01	85	0.0	· 70 K	55 TT	CRY, FNUL 2	AU LLC, "DO	C.
173	4102-03	0.02	0.01	8.9	2.2	67_5	SS+IT	GRY FNGR 9	RP.STT CAL	С
171	110h-05	0.33	0.01	8.1	0.0	69.2	SS IT	GRY. FNOR S	KP_SLT CIT	C.
175	4106-07	0.11	0.01	9.1	0.0	J2.8	SS IT	GRY.FNGR.S	EP.SIT CAL	G.
176	1108-09	⊲0.01	0.01	10.6	0.0	67.0	SSILT	GRY FNGR S	&P.SLI CAL	C.
25.5	SERVICE #5-	-A								

SERVICE #5-A These analyses, opluons or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use. This report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all error and omissions excepted); but The core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitableness of any oil, gas or other mineral-well or sand in connection with which such report is used or relied upon.

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CORE LABORATORIES, INC.

Petroleum Reservoir Engineering DALLAS, TEXAS

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CORE ANALYSIS RESULTS

Company EL PASO NATURAL (AS COMPANY , Formation	File	RP-3-2180
Well GAS BUGGY #1	Core Type D/C	Date Report_	3-15-67
Field	Drilling Fluid GAS	Analysts	STRICKLIN
County RIO ARRIBA State	N.M. Elev. Location		

				Lith	ological	Abbrevia	tions 🖄		•	
84MD- Shale Ling-	SD; DOLOMITE - DOL SH CHERT - CH M GYPSUM GYP	ANNYORITE - ANI CONSLOMERATE SOSSIL (FEROUS	HY - CONG - 7035	SANDY-SC Shaly-Sh Limy-Lmy	Y FIN Y MEC CO/	E-FN DIUM-MED ARBE-CSE	CRYSTALLINE - XLN GRAIN - GRN GRANULAR - GRNL	BROWN - BRN GRAY - QY VUGGY - VGY	PRACTURED - FRAC LAMINATION - LAM BTYLOLITIC - STY	SLIGHTLY-SL/ VERY-V/ WITH-W/
SAMPLE	DEPTH	PERMEABIL	1TY	POROSITY	RESIDUAL PER CE	SATURATION		SAMPLE DESCRIPTION		
NUMBER		MILLIDARC K.	C Y 5	PER CENT	OIL	TOTAL		A.N.	ID REMARKS	· .
		HORIZ. VI	ERT.			·			-	· .
177	4110-11	0.11 (0.07	7.9	0.0	49.3	SS:LT GRY	FNGR .S&P .:	SLI CALC.	
178	4112-13	0.15 0	0.02	7.0	0.0	50.0	SS:LT GRY	FNGR, S&P,	SLI CALC.	
179	4114-15	0.14 🗸	10,0	11.9	0.0	53.0	SS:LT GRY	FNGR, S&P,	SLI CALC.	
180	4116-17	0.12 0	80.0	11.3	3.5	51.4	SS:LT GRY	FNGR, S&P,	SLI CALC.	`. :
181	4118-19	⊲.01 ∢	0.01	9.5	2.1	54.8	SS:LT GRY	FNGR, S&P,	SLI CALC.	:
182	4120-21	⊲.01 ∢	10.0	11.2	0.0	63.4	SS:LT GRY	FNGR, S&P,	SLI CALC.	
183	4122-23	⊲0.01 . ∢	0,01	11.0	0.0	64.5	SS:LT GRY	,FNGR,S&P,	SLI CALC.	
184	4124-25	0.01 🧹	0.01	9.2	0.0	.74.0	SS:LT GRY	,FNGR,S&P,	SLI CALC.	
185	4126-27	≪0.01 <	0.01	4.5	0.0	82.3	SS:LT GRY	FNGR, S&P,	SLI CALC.	
186	4128-29	-0. 01	0.01	11.8	0.0	58.5	SS :LT GRY	,FNGR,S&P,	SLI CALC.	
187	4130-31	0.19 0	0.07	10.6	0.0	<u>50.</u> σ	SS:LT GRY	, FNGR, S&P,	SLI CALC.	
188	4032-33	0.29 0	0.02	12.0	0.0	55.8	SS:LT GRY	,FNGR,S&P,	SLI CALC,	:
189	4134-35	્0.14 ∢	0.01	12.1	0.0	52.1	SS:LT GRY	FNGR, S&P,	SLI CALC.	
: 190	4136-37	0.44	0.01	12.7	0.0	46.4	SS:LT GRY	,FNGR,S&P,	SLI CALC.	
191	4138-39	0.10 🗸	0.01	11.5	0.0	57.4	SS:LT GRY	FNGR, S&P,	SLI CALC.	
192	4160-41	0.15 0	0.01	11.1	0.0	54.0	SS:LT GRI	, FNGR, S&P,	SLI CALC.	
193	4142-43	0.14 <	0.01	12.1	0.0	39.7	SS:LT GRY	, FNGR, S&P,	SLI CALC.	•
194	4144-45	0.70 0	0.02	13.0	0.0	42.3	SS:LT GRY	,FNGR,S&P,	SLI CALC.	:
-195	4146-47	0.37 <	0.01	12.5	0.0	43.2	SS:LT GRY	FNGR, S&P,	SLI CALC.	
195	4140-69	0,84 <	0.01	14,3	0.0	51.1	SS:LT GRY	FNGR, S&P,	SLI CALC.	
191	4150-51	<0.01 <	0.01	<u>4.2</u>	2.4	90.5	SLT:DKGRY	SNDY IN P	T, ABNT CARB N	TL.
190	4176-55	9.43 A	0.01	12.3	3.3	- 35.0	SS:LT GRY	FNGR, S&P,	SLI CALC.	
177	4154-55	0.45 <	POT	TR'A	0.2	30.0	SSILT GRI	FNGR, S&P	SLI CALC.	
200 9	4170-71	A).01 A	10. 01	3.4	0.0	4/.0	SS:LT GRI	FNGR, S&P,	ARGILL, W/CARE	S SH STGK.
201	41,20-39	<u> </u>) OT	12.4	3.2	42.7	SS (LT GRI	, FNGR, S&P,	ARGILL, W/CARE	SH STKS.
- 202 2017 -	100-01	0.11	1.01	13.1	ا جو ا	42.75	SSS LT GRI	FNGR, S&P,	ARGILL, W/GARE	SH STKS.
ິ20 <i>2</i> ິ ກໂ∕ິ	4102-0J	0.10	1.01	0.24	1.5	43.1	SS:LT GRY	FNGR, S&P,	ARGILL, W/CARE	SH STKS.
204	1104-02	0,02	1.01	11.4	0.0	43.0	SSILT GRY	FNOR, S&P,	AHGILL, W/CARE	SH STKS.
203	1768-60		J∉UL ∖_⊐1	14.0	0.0°	42.0	SS:LT GRY	, FNGR, S&P,	ARUILL.	•••
200		0.12	20 A C	TO 0	4.5	ט <u>הלכ</u> :	SSILT GRY	FNUR, S&P,	ARGILL.	
2018	1.179_73	0.22 .U.		711°A		<u>ל</u> סכ רופי	SSILT GRI	FNGR, S&P,	AKGILL, SLI GA	
200			ノ ₄ しエ ヽ ヿヿ	ט, ע ז, ער	0.0	04.5	SSILT GRI	FNGR, S&P	W/ABNT SH & S	LT LAMS.
207	4414-12	U.C.C.	بللوه	14.2	0.0	1.00	SSILT URI	FNUR, S&P,	ARGILL GA GLI CA	10. - UL

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CABRESTO TIGHT GAS AREA - EXHIBIT #11

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SUMMARY OF PICTURED CLIFFS CORE ANALYSIS DATA

NOTE:

ALL DATA USED IN AVERAGE IS >10% POROSITY FROM INDIVIDUAL PICTURED CLIFFS CORE ANALYSIS

WELL	FOOTAGE USED	PERMEABI TOTAL	LITY AVG	POROS: TOTAL	LTY AVG	WATER SATU TOTAL	RATION AVG
	35	4.08	0.12	411.3	11.8	2069.0	59.1
SCHALK 29-4 #6	59	92.39	1.57	682.2	11.6	2401.9	40.7
JIC 459 #5	18	1.05	0.06	215.5	12.0	633.3	35.2
GASBUGGY #1	49	8.40	0.17	600.0	12.2	2291.2	46.8
ALL WELLS	161	105.92	Ø.66	1909.0	11.9	7395.4	45.9
AVERAGES:							**

AVERAGE	LABORATORY PERMEABILITY:	0.66	n ci
AVERAGE	POROSITY:	11.9	%
AVERAGE	WATER SATURATION:	45.9	*

Effect of Overburden Pressure and Water Saturation on Gas Permeability of Tight Sandstone Cores

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Introduction

Research on the potential of nuclear explosions to stimulate gas production from low-permeability (tight) sandstone reservoirs is being conducted by the U. S. Bureau of Mines in cooperation with the Atomic Energy Commission. This report describes the part of that research that was conducted to establish correlation between permeability measured on dry cores at low external pressure (routine analysis) and permeability at reservoir conditions.

Cores used in this research were obtained from two Plowshare gas-stimulation projects. Project Gasbuggy cores from the Pictured Cliffs formation, Choza Mesa field, Rio Arriba County, N. M., can be described as very fine grained, slightly calcareous, well indurated sandstone. Project Wagon Wheel cores from the Fort Union formation, Pinedale field, Sublette County, Wyo., can be described as very fine grained, slightly calcareous, very well indurated sandstone.

Underground reservoirs are under considerable compressive stress as a result of the weight of overlying rocks (offset somewhat by internal-fluid pressure). The resultant net confining pressure or effective overburden pressure is referred to in this report simply as overburden pressure. The resulting effects on the physical properties of the reservoir rock have been studied.¹⁻² Overburden pressure causes only a small decrease in porosity, which can usually be ignored.⁵ This was confirmed for Project Gasbuggy and Project Wagon Wheel cores. A commercial laboratory found that the porosity of these cores is reduced by about 5 percent of the original porosity. The effect of overburden pressure on permeability, however, is appreciable and varies considerably for different reservoir rocks,^{3,2} causing greater reductions in permeability for low-permeability rocks.^{2,3} The effect of overburden pressure on relative permeability has been found to be small* or nonexistent.⁵

This report presents material that confirms and extends previous research findings on the effect that overburden pressure, has upon the permeability of dry cores. Also presented are the results of research on the relative gas permeability of low-permeability cores under overburden pressure.

Apparatus and Procedure

Cylindrical cores 2.0 to 7.5 cm long and 2.5 cm in diameter were cut parallel to the bedding plane. After the cores were dried overnight in a vacuum oven (4.5 psia, 70°C), the gas (N₂) permeability of each core was measured in a Hassler cell. An external pressure of 100 psi over the inlet pressure was used to maintain a good seal between the rubber sleeve and the core.⁴ Permeability was measured at inlet pressures of 45, 60, and 100 psia, with atmospheric pressure at the outlet. A bubble tube and timer were used to measure gas flow rate. Initial permeability (k₁) then was calculated by the Klinkenberg technique to correct for the effect of gas slippage. All other permeabilities reported here were calculated by this method.

In the same manner, permeability was measured at

Research conducted to determine the potential of nuclear explosions to stimulate gas production verifies that the gas permeability of tight sandstone cores is markedly decreased with increasing overburden pressure. Water saturation also reduces the gas permeability by a large amount. The relative permeability, however, does not change significantly with overburden pressure.

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increasing external pressures of about 500, 1,000, 2,000, 3,000, 4,000, 5,000, and 6,000 psi. External pressures actually were somewhat higher to compensate for internal pressure. The core and staniless steel end pieces were placed in a rubber sleeve (piece of bicycle innertube) 0.1 cm thick. Rubber cement was used to seal the stainless steel end pieces to the rubber sleeve. Shrinkable plastic tubing proved unsatisfactory because high pressure was required to seal the core. The jacketed core was mounted in a highpressure cell with distilled water as the external fluid.

Cores used in relative permeability studies were first subjected to high external pressure and then allowed to recover their initial permeability. Bulk volume, dry weight, and porosity were measured by conventional gas-expansion techniques. Cores then were subjected to a vacuum (0.3 psia) for 2 hours, immersed in water, and allowed to stand under a vacuum overnight. The cores were weighed and again subjected to vacuum overnight and weighed again to assure complete saturation. Most of the cores were completely saturated after one night. Porosity values calculated on the basis of water saturation are in good agreement with those measured by conventional gasexpansion techniques.

Water in the core was allowed to evaporate at atmospheric conditions to a saturation of about 70 percent and the core was placed in the holder for 2 hours under external pressure (100 psi above inlet) only so the water saturation was uniform. Gas permeability then was measured at three inlet pressures between 30 and 100 psia with atmospheric pressure at the outlet. This procedure was repeated for decreasing water saturations at the same external pressure. After the permeability was measured the core was weighed to determine if any water was lost. In all cases the amount lost was negligible. After the core was dried in a vacuum oven, the gas permeability at this external pressure was measured. The procedure was repeated for external pressures of 3,000 and 6,000 psi.

Results and Discussion

Effect of Overburden Pressure on Permeability

Core number, length, porosity, and initial permeability of the cores used in this research are shown in Table 1. The core number refers to the depth in feet at which the core was obtained. Typical plots of the effect of simulated overburden pressure on Gasbuggy cores are shown in Fig. 1. The permeability is decreased by about 75 percent at an overburden pressure of 3,000 psi and by 90 percent at 6,000 psi. The hydrostatic loading used in these experiments does not reproduce subsurface conditions exactly; in an actual reservoir the horizontal component of stress is usually less than the vertical component. Since the actual loading is not known, this method probably is as realtistic as any other. Cores that contain microfractures are affected to a greater extent, as shown in Fig. 2. In these cores the permeability is decreased by about 95 percent at a simulated overburden pressure of 3,000 psi, with most of the reduction occurring below 2,000 psi.

The data shown in Table 1 and Figs. 1 and 2 were obtained by subjecting the core to successive incre-







Fig. 2—Effect of overburden pressure on gas permeability of fractured Gasbuggy cores.





TABLE 1-EFFECT OF OVERBURDEN PRESSURE ON GAS PERMI	WEARIFILLA
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Effective Overburden Pressure (psi):			500	1,000	2,000	3,000	4,000	5,000	6,000			
Core Number®	Length (cm)	Porosity (percent)	k.†		Permeability (md)							
Gasbuggy												
3927	2.1	8.1	0.076	0.053	0.040	0.024	0.0175	0.0132	0.0105	0.0095		
3928	7.5	8.3	0.037	0.031	0.024	0.015	0.0093	0.0059	0.0046	0.0035		
3978	2.1	8.2	0.151	0.118	0.078	0.052	0.036	0.024	0.0175	0.0132		
4113**	2.1	10.1	1.75	1.16	0.602	0.252	0.113	0.068	0.042	0.029		
4134**	2.1	11.6	0.10	0.046	0.029	0.0153	0.0095	0.0065	0.0055	0.0047		
4146**	7.5	11.6	2.40	1.73	1.32	0.31	0.14	0.069	0.052	0.022		
4147**	7.5	11.3	0.60	0.247	0.181	0.071	0.034	0.0186	0.0118	0.0082		
4158	2.1	13.6	1.59	1.06	0.80	0.35	0.225	0.152	0.116	0.100		
Wagon Wheel												
8084	3.8	7.7	0.028	0.022	0.020	0.010	0.0070	0.0047	0.0035	0.0030		
8122	3.8	11.4	0.071	0.055	0.048	0.034	0.027	0.024	0.021	0.019		
8975**	3.8	8.7	0.039	0.029	0.024	0.0114	0.0073	0.0048	0.0032	0.0025		
10156	3.8	8.5	0.088	0.067	0.051	0.032	0.025	0.022	0.018	0.016		
10990**	3.8	9.0	0.048	0.020	0.0175	0.0080	0.0050	0.0040	0.0025	0.0019		

*Number denotes depth in feet,

**Slightly fractured.

tinitial permeability.

mental increases in external pressure. The core was assumed to be in equilibrium at each pressure when permeability measurements remained constant for 15 minutes, which required between 1 and 2 hours. A period of 30 minutes to an hour was required to attain equilibrium when the inlet pressure was changed. Consequently, each external pressure was maintained for a minimum of 2 hours.

The effect of decreasing external pressure was determined on a few cores, and typical results are shown in Fig. 3. Other researchers^{2,3} have observed and shown that this hysteresis is mainly dependent on the stress history of the core. Cores generally recover their original permeability after 3 to 6 weeks at atmospheric conditions. This time could be shortened by storing the core in an oven at 70°C.

The effect of overburden pressure on the permeability of cores from Project Wagon Wheel is similar to that on cores from Project Gasbuggy, and typical results are shown in Fig. 6. The permeability is decreased to about 30 percent of initial permeability at an overburden pressure of 3,000 psi and to 20 percent at 6,000.

A study of the data in Table 1 indicates that the original porosity of the core and the reduction in permeability caused by overburden pressure are not related. Pore structure (fractures to uniform pores) is probably the governing factor.

Water Saturation Effects

The data in Table 2 show that the permeability decreased with increasing water saturation. The values at 20-, 40-, and 60-percent water saturation were obtained from individual relative-permeability curves for Gasbuggy and Wagon Wheel cores. Relativepermeability curves for three cores from Project Gasbuggy are shown in Fig. 4 with the data points for Core 3978. Data points were omitted for the other cores to avoid confusion. This figure shows that although gas permeability is reduced, the relative gas permeability of Gasbuggy cores is not significantly affected by increased overburden pressure. This conclusion is in agreement with the results of others.

Extremely low values of permeability that resulted from water saturation and overburden pressure required that either long flow times or high inlet pressures (high differential across the core) be used. Since a high inlet pressure increases the end effects by changing the distribution of water in the core, long flow times were required. Although end-effect problems were encountered with the short cores (Cores 3978 and 4158), the permeability of these cores was

TABLE 2---EFFECT OF OVERBURDEN PRESSURE AND WATER SATURATION ON GAS PERMEABILITY

Water Satur	ation (percent)	0	20	40	60
Core Number	Pressure (psi)		Permeal	bility (md)	
Gasbuggy					
3927	100	0.115	0.099	0 041	0.0023
3927	3,000	0.026	0.023	0.009	0.0005
3927	6,000	0.012	0.010	0.003	0.0002
3978	100	0.112	0.080	0.034	0.011
3978	3,000	0.036	0.026	0.011	0.004
3978	6,000	0.013	0.009	0.004	0.0013
4158	100	0.447	0.335	0.156	0.045
4158	3,000	0.075	0.056	0.026	0.0074
4158	6,000	0.027	0.020	0.010	0.0026
Wagon Whee	1				
8084	100	0.038	0.030	0.014	0.0042
8084	3,000	0.012	0.0096	0.0043	0.0013
8084	6,000	0.0070	0.0056	0.0025	8000.0
8122	100	0.074	0.054	0.017	0.006
8122	3,000	0.027	0.020	0.008	0.002
8122	6,000	0.075	0.015	0.006	0.002
10156	100	0.100	0.074	0.029	0.003
10156	3,000	0.028	0.020	0 .008	8000.0
10156	6,000	0.017	0.013	0.005	0.0005

high enough to yield reasonable results. Permeability measurements for Core 4161 (7.5 cm long, 0.053 md) required more than 2 hours per reading. These extremely long flow times can cause errors.

End effects, long flow times, and changes in permeability due to water saturation tend to decrease the accuracy of permeability measurements, especially at the higher water saturations.

The initial permeability of many of the dry cores used in this research was not reproducible following saturation and drying. The changes probably were caused by solution of material in the pores and by particle movement. These caused both increases and decreases in permeability. The variation, although sometimes large, usually was less than 5 percent; however, we feel that the relative permeability curves are essentially correct. To eliminate the effects of solution and particle movement, the permeability of the dry core following saturation, rather than the permeability initially measured, was used in calculating relative permeability.

A composite of the relative permeability curves for Gasbuggy cores is shown in Fig. 5. These curves are representative of permeabilities encountered in this formation. At a water saturation of 50 percent, the relative permeability of the cores ranges from 15 to 20 percent and is not affected by overburden pressure.

Similar results were obtained on cores from Project Wagon Wheel, as shown in Table 2 and Fig. 6 with data points for Core 8122. These cores were cut to a length of 3.8 cm to alleviate some of the long flow time and end-effect difficulties encountered with Gasbuggy cores. These curves are representative of the permeabilities encountered in the formation. At a water saturation of 50 percent, the relative permeability of these cores ranges from 12 to 21 percent. The data in these figures show, as do the data from Gasbuggy cores, that relative gas permeability is not significantly affected by increased overburden pressure.

Correlation with Nuclear Stimulation Projects

Many of the basin areas of the Rocky Mountain region consist of thick, low-permeability sandstones containing large quantities of natural gas. This type of reservoir has been the object of the AEC's Plowshare Program experiments, Projects Gasbuggy and Rulison, and proposed Projects Wagon Wheel, WASP, and Rio Blanco. Because most wells in these reservoirs have not been commercial, only limited reservoir-analysis and production-test data are available. Reservoir analysis is most difficult because low permeability requires long-term testing. Also, it is difficult to determine permeability and net pay from these tests. Knowledge of the gas permeability is necessary in predicting gas recovery, and because it is not economical to define the characteristics of different strata by well test, it is desirable to be able to relate laboratory-measured permeability to the true insitu permeability.

Conventional analysis by a commercial laboratory (confirmed in our laboratory) of about 200 Gasbuggy cores gave an average initial gas permeability of 0.16 md on dry cores and an average water saturation of 48 percent. The effective overburden pressure of this







Fig. 5-Relative gas permeability of Gasbuggy cores.



Fig. 6—Relative gas permeability of Wagon Wheel cores.

reservoir is about 3,000 psi. From Fig. 1, the reduction factor resulting from the overburden pressure is 0.25, and the reduction factor for a water saturation of 48 percent (Fig. 5) is 0.20; thus the total reduction is 5 percent of the initial permeability, or 0.008 md. This value compares favorably with permeability determinations of about 0.01 md from both preshot and postshot flow testing at Gasbuggy. The gas reservoir at Project Rulison is similar to that at Gasbuggy, having an average initial dry permeability of 0.11 md and an average water saturation of 45 percent. Simulated in-situ permeability has not yet been measured in the laboratory on Rulison cores; however, using an effective overburden pressure of 5,000 psi and curves of Gasbuggy core data (Figs. 1 and 5), the reduction factor because of overburden pressure would be 0.12 and that for water saturation 0.24. This results in a combined reduction to 3 percent of the initial permeability, or 0.003 md. Postshot production testing at Rulison is not complete, and the only preshot determination of permeability was made from tests of a 32-ft isolated zone that gave an average value of 0.008 md. No cores are available from this zone. Rulison reservoir rock is said to be less compressible than that of Gasbuggy; therefore Gasbuggy pressureeffect data would be expected to indicate a greater reduction for Rulison than actually exists.

The average initial permeability of dry Wagon Wheel cores is 0.068 md, with an average water saturation of 50 percent. An estimated effective overburden pressure of 3.000 psi gives a reduction factor of 0.28 (Fig. 4). Water saturation further reduces permeability by a factor of 0.18 (Fig. 6). Therefore, the total reduction in permeability is to approximately 5 percent of the initial permeability, or 0.0034 md.

Original manuscript received in Society of Petroleum Engineers office June 16, 1971. Revised manuscript received Dec. 20, 1971. Paper (SPE 3634) was presented at SPE 46th Annual Fall Meeting, hold in New Orleans, Oct. 3-6, 1971. This value can be used to predict postshot gas recovery from the proposed Wagon Wheel experiment.

Cores are not yet available from Projects Rio Blanco and WASP.

Conclusions

The gas permeability of tight sandstone cores is markedly decreased with increasing overburden pressure. Most of the decrease takes place at pressures to 3,000 psi. At 3,000 psi, the permeability of unfractured samples ranges from 14 to 37 percent of the initial permeability. In fractured samples, permeability may be reduced to as low as 6 percent of initial permeability.

Water saturation also reduces the gas permeability greatly; however, the relative permeability does not change significantly with overburden pressure.

Permeability calculated from laboratory results are in good agreement with in-situ permeabilities determined from production test data. Although not confirmed, predictions for other projects appear to be reasonable.

References

- 1. Fatt, I. and Davis, T. H.: "The Reduction in Permeability with Overburden Pressure," Trans., AIME (1952) 195, 329.
- 2. McLatchie, L. S., Hemstock, R. A. and Young, J. W.: "Effective Compressibility of Reservoir Rocks and Its Effects on Permeability," *Trans.*, AIME (1958) 213, 386-388.
- Vairogs, Juris, Hearn, C. L., Dareing, D. W. and Rhoades, V. W.: "Effect of Rock Stress on Gas Production from Low-Permeability Reservoirs," J. Pet. Tech. (Sept., 1971) 1161-1167.
- 4. Wilson, J. W.: "Determination of Relative Permeability Under Simulated Reservoir Conditions," AIChE Jour. (1956) 2, 94.
- 5. Fatt, I.: "The Effect of Overburden Pressure on Relative Permeability," Trans., AIME (1953) 198, 325-326.
- 6. API Recommended Practice for Core-Analysis Procedure, API RP 40, Dallas (1960) 35. JPT

CABRESTO TIGHT GAS AREA - EXHIBIT NO. 13 DETERMINATION OF IN SITU FORMATION PERMEABILITY FROM LABORATORY CORE ANALYSIS DATA

The relationship needed to determine in situ permeability from laboratory core analysis data is published in a technical paper by Rex D. Thomas and Don C. Ward entitled "Effect of Overburden Pressure and Water Saturation on Gas Permeability of Tight Sandstone Cores", which is presented as Exhibit No. 12. The authors' studies involved taking routine laboratory air permeability measurements at the normal 100 psi or less external pressures. To simulate the effect of in situ conditions, these permeability measurements were then made at external pressures ranging from 500 to 6000 PSI. The results of these tests were then plotted on a graph of Percent of Initial Permeability (ratio of permeability at 100 psi to a permeability at a higher pressure) vs. Pressure.

Figure 1, on page 51 of Exhibit No. 12, is one such graph which presents results of tests run on cores taken from the Pictured Cliffs formation. These cores were taken from Project Gasbuggy, located in Choza Mesa Pictured Cliffs field, T28-29N, R3-4W, Rio Arriba County, New Mexico. These Gasbuggy cores are taken from wells within the Cabresto Tight Gas Area. In fact, one of the core analysis presented is from a well used in this study. Therefore, cores from the Pictured Cliffs formation from the Gasbuggy area used in this study should be representative of the cores from wells in the Cabresto Tight Gas Area.

The average laboratory air permeability for the Pictured Cliffs wells analyzed for the Cabresto Tight Gas Area is 0.66 millidarcy. This value most closely compares to the laboratory permeability value of 0.151 millidarcy for core 3978, as presented in Figure 1 of Exhibit No. 12. The characteristics of core 3978 are considered to best resemble the Pictured Cliffs formation in the Cabresto Tight Gas Area.

The net confining pressure due to overburden at a depth of 3715 feet in the Cabresto Tight Gas Area is approximately 2800 psi. Entering the graph in Figure 1 at 2800 psi results in a permeability reduction factor of 0.23 which is caused by the overburden pressure on the Pictured Cliffs formation. The water present in the reservoir also causes the in situ permeability to be less than the laboratory determined permeability as discussed in Exhibit No. 12. The 0.23 permeability reduction factor resulting from overburden pressure was determined from cores having 100% gas saturation. Figure 5 on page 53 of Exhibit No. 12 indicates relative permeability changes that occurred with changes in water saturation within the sample cores. For the Pictured Cliffs cored wells within the Cabresto Tight Gas Area, the average core water saturation was 46%. Entering Figure 5 at 46% water saturation results in a permeability reduction factor of 0.23 for in situ water saturation.

The total permeability reduction factor used on laboratory core data to approximate reservoir conditions is obtained by multiplying the overburden reduction factor by the water saturation reduction factor. This product is 0.05 for the Pictured Cliffs wells analyzed. Therefore, the in situ permeability for this well is 5% of the 0.66 millidarcy laboratory determined permeability or 0.035 millidarcy.

The resulting 0.035 millidarcy in situ permeability obtained for the Cabresto Tight Gas Area compares favorably with the overall results of the 200 Gasbuggy cores described by the U.S. Bureau of Mines study. The in situ permeability of the 200 cores in the Gasbuggy study was determined to be 0.008 md.

CABRESTO TIGHT GAS AREA - EXHIBIT #14

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CALCULATION OF FORMATION PERMEABILITY USING DARCY'S LAW

DARCY'S LAW:

$$Qg = 0.703 \text{ kh} (Pe^2 - Pwf^2)$$
(1000) Ug T Z ln(0.61 re/rw)

~

or

where

```
k = unstimulated in situ permeability of formation - millidarcies
Qg = gas flowrate - MCF/day
Ug = average gas viscosity - calculated to be 0.0125 centipoise
T = bottom hole temperature - 135 degrees F, 595 degrees R
Z = average gas compressibility factor - calculated to be 0.925
re = drainage radius for 160 acre spacing - 1489 feet
rw = wellbore radius - 0.17 feet
h = net pay height - feet
Pe = bottom hole pressure at drainage radius re - average of 1175 psi
Pwf = flowing bottom hole pressure - assumed equal to bottom hole atmospheric - 14 psi
```

Natural Production Test Well:

```
Robert L. BaylessCalculated flowrate Q = 22.0 MCFDJicarilla 31-3-32 #1Net pay height h = 78 perforated feetNWSW Sec 32 T31N R3W
```

 $k = (22.0) (0.0125) (595) (0.925) \ln (0.61*(1489/0.17)) (1000) \\ (0.703) (78) (1175^2 - 14^2)$

k = 0.017 md

note: This calculation assumes all 78 feet of pay is contributing gas.