New Mexico Bureau of Mines and Mineral Resources
Open File Report No. OF-348

# ORGANIC GEOCHEMICAL ANALYSES OF THE MERRION OIL AND GAS CORP. NO. 1 ARENA BLANCA WELL, McKINLEY COUNTY, NEW MEXICO

by
Ann Brooke Reaugh and
Douglas A. Muckelroy
GeoChem Laboratories, Inc.
Houston, Texas

September 10, 1985

Sidewall cores taken in Sec. 36-T20N-R5W
Ray



GEOCHEM LABORATORIES, INC.
GEOCHEMICAL ANALYSES
SOURCE ROCK EVALUATION
CRUDE OIL—SOURCE ROCK CORRELATION
CRUDE OIL CHARACTERIZATION
GEOCHEMICAL PROSPECTING
1143-C BRITTMOORE ROAD • HOUSTON, TEXAS 77043-5094 • 713/467-7011

September 10, 1985

Mr. Doug Endsley
MERRION OIL AND GAS CORP.
P.O.Box 840
Farmington, New Mexico 87499

RE: GeoChem Job No. 3190
Six Sidewall Cores from NM

36 - 20N - 5W McKinley
Arena Blanca No. 1 30-039-20883

Dear Mr. Endsley:

Enclosed please find the results of geochemical analyses performed on a suite of six (6) sidewall core samples from New Mexico.

These samples were submitted to the following geochemical analyses:

- Total organic carbon and brief lithological descriptions.....Table I
- Rock-Eval pyrolysis.....Table II
- Visual kerogen assessment.....Table III

## Comments on Environment of Deposition of Six Sidewall Cores Submitted for Analyses

Samples from 1644' and 2058', the Late Cretaceous Menefee mudstones are rich in amorphous sapropel (oil-prone) with secondary amounts of terrestrially-derived herbaceous, woody and reworked terrestrial kerogen. Although these mudstones were doubtless deposited in a transitional environment, the sediments are rich in marine-type kerogen. Transitional environments, in light of their location between marine and terrestrial environments, are prone to accumulate kerogen from both marine and terrestrial sources. In these two sidewall cores the "marine" component predominates volumetrically over the terrestrial component. This "marine" kerogen may have come from euryhline marine algae accumulating in transitional aqueous systems or may have accumulated from fresh water (lake or stream) algae. From these two sidewalls it appears that the organic material is predominantly amorphous in character and that the amorphous kerogen would have been the first to source oil in this section. The results of Rock-Eval pyrolysis indicate the first mudstone sampled (1644') had neither adsorbed hydrocarbons (low $S_1$) nor generative potential (low $S_2$). The second Menefee mudstone (2058') is considerably more prospective. With a large $S_1$ peak there is evidence of reservoired hydrocarbons in this sample. Because the kerogen in this sample is predominantly mature amorphous kerogen, it appears that the amorphous kerogen may have sourced the reservoired hydrocarbons associated with the mudstone.

The mudstone sample from 3554' is consistent with the kerogen that would be expected from a regressive marine sediment. The strong physical similarity of the kerogen with that from the Menefee (2058') strongly suggests that the Menefee mudstone is more marine than lacustrine in character. In this sample the amorphous kerogen would be expected to source liquid hydrocarbons before the lesser quantity of terrestrial kerogen could act as source.

[As you will see from the visual kerogen assessment worksheet, caved or drilling mud contaminants are associated with these mudstone sidewall cores. The 'caved' materials are distinctly less mature and have a definite Upper Cretaceous or Lower Tertiary pollen flora associated with the woody kerogen in them. The caved kerogen is not included in the interpretations here.]

The sample from 4077' was reported as Cretaceous Semilla formation - an offshore sand bar or a calcarenite. The mudstone from this interval was noncalcareous. The character of the kerogen in this sample limits the environments in which this mudstone may have been deposited. This interval contained only inertinite - kerogen which may have been oxidized from other kerogen. The "medium" size of this kerogen may indicate its transport as port of a sand bed load. Winnowing of a sand body could explain the lack of finer (typical amorphous) kerogen. A calcarenite or mudstone associated with a calcarenite would be expected to include amorphous kerogen. From the kerogen it appears that the mudstone from 4077' was more likely to have come from a temporarily emergent offshore sand bar than from an offshore calcarenite.

The two mudstones 5509' and 5518' from the Entrada have kerogen types that are consistent with their widely accepted origin as aeolian sand accumulations. The inertinitic character of their kerogen is consistent with the severe oxidizing environment of aeolian deposits.

Should we be of further assistance concerning this study or any other matter, please advise.

Yours truly,

Doug Muckelroy

Ann Brooke Reaugh by
Douglas A. Muckelroy
GEOCHEM LABORATORIES, INC.

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Enclosures

TABLE I

LITHOLOGICAL DESCRIPTIONS AND ORGANIC CARBON ANALYSES

MERRION OIL AND GAS CORP. - SIX SIDEWALL CORES FROM NEW MEXICO

| SAMPLE NUMBER | DEPTH (feet) | LITHO DESCRIPTION | GSA NO. | ORGANIC CARBON (wt.%) |
|---|---|---|---|---|
| 3190-001 | 1644 | 100% Mudstone, very light gray | | 0.23 |
| 3190-002 | 2058 | 100% Mudstone, very light gray | | 0.46 |
| 3190-003 | 3554 | 100% Mudstone, very light gray | | 0.59 |
| 3190-004 | 4077 | 100% Mudstone, light gray | | 0.30/0.28 |
| 3190-005 | 5509 | 100% Mudstone, light gray | | 0.69 |
| 3190-006 | 5518 | 100% Mudstone, light gray | | 0.68 |

TABLE II

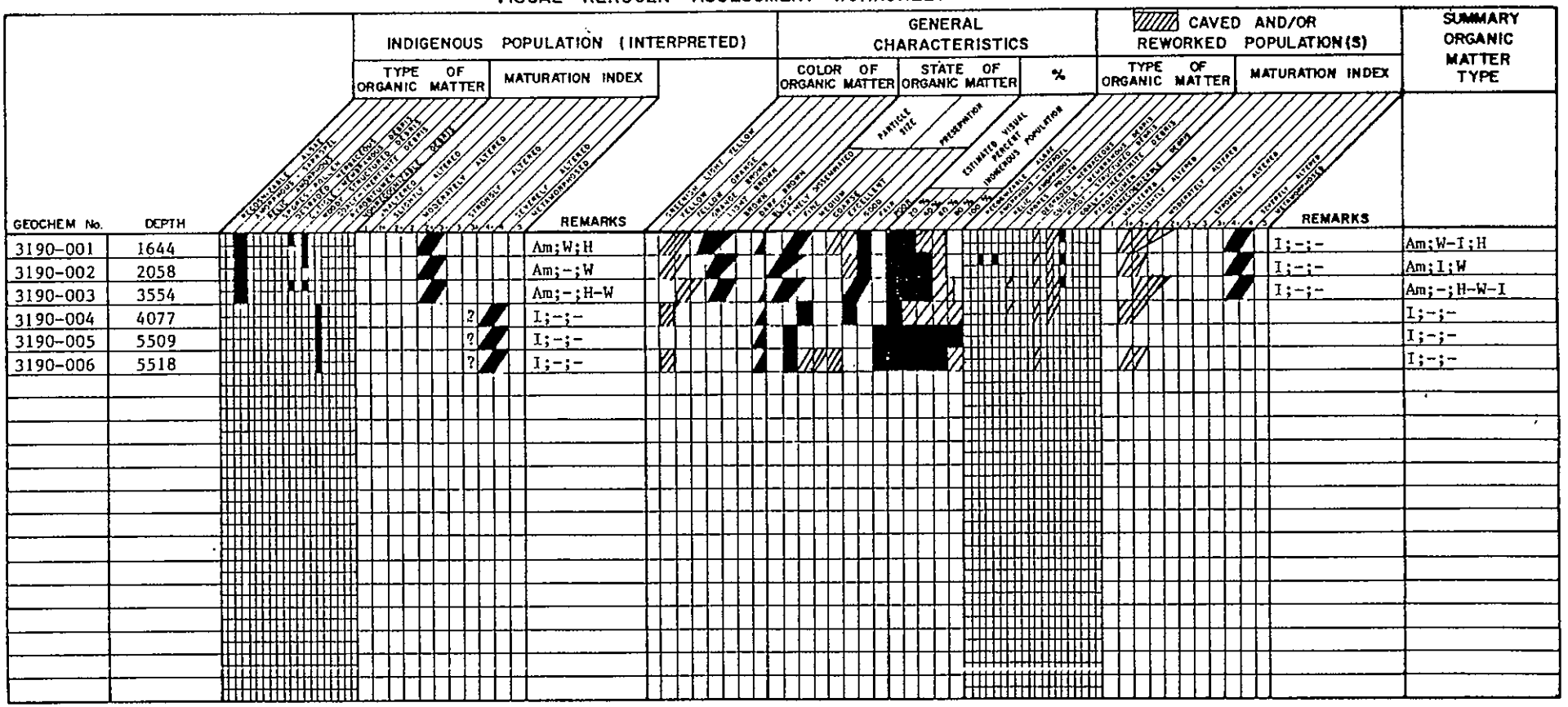
RESULTS OF ROCK-EVAL PYROLYSIS ANALYSIS

| GEOCHEM SAMPLE NUMBER | DEPTH INTERVAL (feet) | TMAX (c) | S1 (mg/g) | S2 (mg/g) | S3 (mg/g) | PI | PC* | T.O.C. (wt.%) | HYDROGEN INDEX | OXYGEN INDEX |
|---|---|---|---|---|---|---|---|---|---|---|
| 3190-001 | 1644 | 402 | 0.07 | 0.27 | 0.69 | 0.21 | 0.02 | 0.23 | 117 | 300 |
| 3190-002 | 2058 | 403 | 2.20 | 1.44 | 0.90 | 0.60 | 0.30 | 0.46 | 313 | 195 |
| 3190-002(Rinsed) | 2058 | 434 | 0.06 | 0.01 | 0.82 | 1.00 | 0.00 | 0.46 | 2 | 178 |
| 3190-003 | 3554 | 419 | 1.44 | 1.99 | 0.89 | 0.42 | 0.28 | 0.59 | 337 | 150 |
| 3190-003(Rinsed) | 3554 | 426 | 0.05 | 0.11 | 1.00 | 0.31 | 0.11 | 0.59 | 18 | 169 |
| 3190-004 | 4077 | 423 | 0.04 | 0.20 | 0.86 | 0.17 | 0.02 | 0.29 | 68 | 296 |
| 3190-005 | 5509 | 310 | 5.80 | 2.99 | 1.19 | 0.66 | 0.73 | 0.69 | 433 | 172 |
| 3190-005(Rinsed) | 5509 | 314 | 0.04 | 0.08 | 0.50 | 0.33 | 0.01 | 0.69 | 11 | 72 |
| 3190-006 | 5518 | 364 | 5.16 | 2.83 | 0.72 | 0.65 | 0.66 | 0.68 | 416 | 105 |
| 3190-006(Rinsed) | 5518 | 312 | 0.04 | 0.05 | 0.46 | 0.50 | 0.00 | 0.68 | 7 | 67 |

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

TABLE III

VISUAL KEROGEN ASSESSMENT WORKSHEET




| GEOCHEM No. | DEPTH | REMARKS | REMARKS | SUMMARY ORGANIC MATTER TYPE |
|---|---|---|---|---|
| 3190-001 | 1644 | Am;W;H | I;-;- | Am;W-I;H |
| 3190-002 | 2058 | Am;-;W | I;-;- | Am;I;W |
| 3190-003 | 3554 | Am;-;H-W | I;-;- | Am;-;H-W-I |
| 3190-004 | 4077 | I;-;- | | I;-;- |
| 3190-005 | 5509 | I;-;- | | I;-;- |
| 3190-006 | 5518 | I;-;- | | I;-;- |

NOTES:

In sample -003 the 2-/2 palynomorphs are Upper Cretaceous or Tertiary

In sample -004 the immature population is Tertiary

Of samples -004, -005, -006 maybe Entrada. If this is an eolian or transitional deposit, organic matter in it would probably have been oxidized as it was deposited and thus appear severely altered.

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ENERGY AND MINERALS DEPARTMENT

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30-031-20883

Form C-101
Revised 10-1-78

5A. Indicate Type of Lease STATE [X] FEE [ ]

5. State Oil & Gas Lease No. LG 7435

## APPLICATION FOR PERMIT TO DRILL, DEEPEN, OR PLUG BACK

1a. Type of Work
DRILL [X] DEEPEN [ ] PLUG BACK [ ]

b. Type of Well
OIL WELL [X] GAS WELL [ ] OTHER SINGLE ZONE [X] MULTIPLE ZONE [ ]

7. Unit Agreement Name

8. Farm or Lease Name: Arena Blanca

2. Name of Operator: Merrion Oil & Gas Corporation

9. Well No.: 1

3. Address of Operator: P. O. Box 1017, Farmington, New Mexico 87499

10. Field and Pool, or Wildcat: WC Entrada

4. Location of Well UNIT LETTER I LOCATED 2360 FEET FROM THE South LINE AND 1200 FEET FROM THE East LINE OF SEC. 36 TWP. 20N RGE. 5W NMPM

12. County: McKinley

| 19. Proposed Depth | 19A. Formation | 20. Rotary or C.T. |
|---|---|---|
| 5620 | Entrada | Rotary |

| 21. Elevations (Show whether DF, RT, etc.) | 21A. Kind & Status Plug. Bond | 21B. Drilling Contractor | 22. Approx. Date Work will start |
|---|---|---|---|
| 6634' GL | Nationwide | | Summer/1985 |

23.

PROPOSED CASING AND CEMENT PROGRAM

| SIZE OF HOLE | SIZE OF CASING | WEIGHT PER FOOT | SETTING DEPTH | SACKS OF CEMENT | EST. TOP |
|---|---|---|---|---|---|
| 12-1/4" | 9-5/8", J-55 | 32 #/ft. | 200 ft. | 75 sx | surface |
| 8-3/4" | 7", J-55 | 23 #/ft. | 5620 ft. | as below (970 | cu. ft.) |

Will drill 12-1/4" hole to 200 ft. and set 200 ft. of 9-5/8", 32 #/ft. J-55 casing with 75 sx Class B 2% CaCl2. Will pressure test to 600 PSI for 30 minutes. Drill 8-3/4" hole to 5520' KB. Will run drillstem test of Entrada Interval. If Entrada appears productive, will drill to 5620' KB. Will run open hole logs. Will run 7", 23 #/ft, J-55 casirg to 5620' and cement in two stages. First stage will pump 150 sx Class H 2% gel to cover from TD to top(183 of Morrison @ 4630'. Will set stage tool @ 4600' est. and cement with 350 sx Class B 2% (cu ft D-79 (726 cu. ft.) followed by 50 sx Class H (61 cu. ft.). Top of cement estimated at surface. Will perforate and stimulate as deemed necessary. Drilling mud will be low sclids, non-dispersed, low water loss mud using Bentonite, starch, CMC, and fresh water.
Minimum specifications for pressure control is 10" 900 series double ram blowcut preventer.

APPROVAL EXPIRES 10-25-85
UNLESS DRILLING IS COMMENCED.
SPUD NOTICE MUST BE SUBMITTED
WITHIN 10 DAYS.

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OIL CON. DIV.
DIST. 3

IN ABOVE SPACE DESCRIBE PROPOSED PROGRAM: IF PROPOSAL IS TO DEEPEN OR PLUG BACK, GIVE DATA ON PRESENT PRODUCTIVE ZONE AND PROPOSED NEW PRODUCTIVE ZONE. GIVE BLOWOUT PREVENTER PROGRAM, IF ANY.

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

Signed [signature] Title Operations Manager Date 4/24/85

(This space for State Use)

APPROVED BY [signature] TITLE SUPERVISOR DISTRICT # 3 DATE APR 25 1985

CONDITIONS OF APPROVAL, IF ANY:

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

GARREY CARRUTHERS
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

February 24, 1988

Mr. Doug Endsley
Merrion Oil and Gas Company
P. O. Box 840
Farmington, New Mexico 87499

RE: New Mexico Hydrocarbon Source Rock Data Base Geochemical Reports

Dear Mr. Endsley:

As we discussed on the phone today, I am enclosing a waiver of confidentiality for you to sign. This waiver will apply to the Core Lab and Geochem Lab reports for the Merrion Pot Mesa No. 1, CLU No. 321, and Arena Blanca Wells.

Thank you very much for your contribution to the Source Rock Data Base. If you have any questions concerning the waiver, please contact Roy Johnson or me at this office.

Sincerely,

Jami Bailey
Geologist

JB:sl

cc: Roy Johnson

# WAIVER OF CONFIDENTIALITY

I hereby release the information contained in the Core Laboratories, Inc. and the Geochem Laboratories, Inc. reports on the Merrion Pot Mesa No. 1, CLU No. 321, and Arena Blanca No. 1 Wells. I understand that the information in the reports will be incorporated in the New Mexico Bureau of Mines open file system.

Signed: Douglas Merrion

Title: PRESIDENT

Date: 2/29/88