ORGANIC GEOCHEMICAL ANALYSIS, HOUSTON OIL AND MINERALS
NO. 2 LEWELLING WELL, OTERO COUNTY, NEW MEXICO

by Stephen R. Jacobson, James S. Rankin,
and James D. Saxton
Chevron, U.S.A., Inc.
Denver, Colorado

and Stephen W. Brown
Brown and Ruth Laboratories, Inc.
Houston, Texas

September 2, 1983
Mr. S. Thompson III  
New Mexico Bureau of Mines and Mineral Resources  
Socorro, NM 87801  

Dear Mr. Thompson:  

Enclosed please find the completed results of the organic geochemical analyses performed on samples from the Gulf #1 Sierra State "K", 35-12S-1W, Sierra Co., and the Plymouth #1 Federal, 15-20S-9E, Otero Co. Enclosed also is the corrected report for the Houston Oil and Minerals well. As you may recall there was a mix-up with the samples, and we actually analyzed the #2 Lewelling (10-12S-9E, Otero Co.), rather than the #1 Lewelling (12-12S-9E).  

Sincerely,  

[Signature]  

J. S. Vietti  
District Geologist  

Enclosures
Mr. Clayton S. Valder
Marshall R. Young Oil Co.
750 West Fifth Street
Fort Worth, TX 76102

Dear Mr. Valder:

Enclosed please find results of the organic geochemical analyses performed on samples from the Houston Oil & Minerals Lewelling well, located in Section 10, T12S-R9E, Otero Co., New Mexico.

The analyses include the following tests:

1. Total Organic Carbon (TOC)
2. Ro-k Eval (Pyrolysis)
3. Microscopic Organic Analysis (MOA)
4. Vitrinite Reflectance ($R_o$) and Thermal Alteration Index (TAI)

Sincerely,

M. I. Roberson

RHF

Enclosure
Discussion of Results:

A total of 23 shale samples were taken for analysis including: 7 from the Permian Abo Fm. (3750'-5400'), 11 from Permian Wolfcampian age rocks (5400'-6700'), 2 from the Mississippian (8670'-8730'), and 1 from the Devonian Woodford Formation (8800'-8850').

I. Thermal Maturity

Based on vitrinite reflectance and TAI data the Permian section is in the condensate and dry gas to dry gas zone. Several values reflect a higher thermal maturity ranging into the dry gas zone (P4080-23, P4080-24). This is attributed to intrusive activity as noted in the description of the cuttings. Lower thermal maturity is indicated by Tmax values, however, these Tmax data are considered less reliable due to very small S-2 peaks.

The Mississippian and Devonian sections are of somewhat higher thermal maturity than the Permian, and are in the dry gas zone.

II. Organic Richness and Type

Organic richness of samples from the Permian section range from poor to very good (0.19 to 6.63 wt. % TOC). The majority, 18 of 20 data values, fall in the good (1-2 wt. %) to very good (2+) range. Organic type, as indicated by MOA, tends to be more inert or gas prone (up to 70% type III kerogen type).

Mississippian and Devonian samples have fair to good organic richness, and are somewhat more oil prone as indicated by MOA (50% oil prone type).
HYDROCARBON GENERATION ZONES

BIOSKETCH NO. 1172

% KEROGEN TYPES

<table>
<thead>
<tr>
<th>LCG TOS</th>
<th>SAMPLE NUMBER</th>
<th>VERTICLE REFLECTION AND MAX DETERMINATIONS</th>
<th>TAI</th>
<th>%R0</th>
<th>IMMATURE ZONE</th>
<th>OIL ZONE</th>
<th>CONDENSATE AND GAS ZONE</th>
<th>DRY GAS ZONE</th>
<th>OIL PRONE</th>
<th>GAS-CONDENSATE</th>
<th>NERIT</th>
<th>HY (HOCR/GC ORG)</th>
<th>THICK</th>
<th>KELDIGH TIE</th>
<th>OBC YIELD/ID CTS</th>
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</table>

I | II | III | IV
GEOCHEMICAL REPORT

T.O.C./Pyrolysis Results

Houston Oil & Minerals Inc.
Lewelling Well, Otero County, N.M.
10-12S-9E

BROWN & RUTH LABORATORIES, INC.
10690 Shadow Wood, Suite 130
Houston, Texas 77043
713/464-3284
Chevron U.S.A., Inc.
P. O. Box 599
Denver, Colorado 80201

Attention: Dr. S. R. Jacobson

Gentlemen:

Attached are the results of our analysis of four (4) samples from the well Houston Oil & Minerals #2 J.M. Lewelling, Otero County, New Mexico. The work was authorized by your Requisition No. CMEN2100 of April 27, 1983.

All unused sample material is being returned under separate cover.

We appreciate the opportunity to be of service to Chevron. If you have any questions regarding the data, then please contact me.

Very truly yours,

BROWN & RUTH LABORATORIES, INC.

Gary W. Ruth

GWR/kr
Enclosures
SAMPLE DESCRIPTIONS:

A total of four (4) samples were received from the well interval 3750 - 5000 feet. The samples were clean cuttings in good condition, and no evidence of contamination was apparent.

SAMPLE PREPARATION:

Each sample was examined using a binocular microscope in order to ascertain if contaminants were present. The samples were then ground to a fine powder and analyzed on a Leco Carbon Analyzer and a Geocom Rock-Eval II.

DATA EVALUATION:

The results of the analyses are tabulated in Tables 1. The pyrograms have been included as requested. The following criteria are suggested for interpreting the data:

<table>
<thead>
<tr>
<th>SOURCE POTENTIAL</th>
<th>PETROLEUM TYPE</th>
<th>THERMAL MATURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&lt;sub&gt;2&lt;/sub&gt;</td>
<td>HYDROGEN INDEX</td>
<td>S&lt;sub&gt;2&lt;/sub&gt;/S&lt;sub&gt;3&lt;/sub&gt;</td>
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<tr>
<td>&lt;2.0 POOR</td>
<td>&lt;200 GAS PRONE</td>
<td>&lt;2.5 DRY GAS</td>
</tr>
<tr>
<td>2.0-5.0 MARGINAL</td>
<td>200-300 MIXED</td>
<td>2.5-5.0 WET GAS</td>
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<tr>
<td>&gt;5.0 GOOD</td>
<td>&gt;300 OIL PRONE</td>
<td>&gt;5.0 OIL</td>
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ROCK-EVAL PYROGRAMS

Sample 633-002
4000' - 4500'

Sample 633-003
4500' - 4750'

Sample 633-004
4750' - 5000'

[Graphs showing pyrograms for different samples]
Addendum # 1172
GEOCHEMICAL REPORT

T.O.C./Pyrolysis Results

Houston Oil & Minerals No. 2
J. M. Lewelling, Otero Co., N.M.
Sec. 10, T12S, R9E

BROWN & RUTHI LABORATORIES, INC.
10690 Shadow Wood, Suite 130
Houston, Texas 77043
713/464-3384
June 23, 1983

Chevron U.S.A. Inc.
P. O. Box 599
Denver, Colorado 80201

Attention: S. R. Jacobson

Gentlemen:

Attached are the results of our analysis of nineteen (19) samples from the well Houston Oil & Minerals No. J. M. Lewelling, Otero County, New Mexico. The work was authorized under your Work No. CMEN 2100 of June 7, 1983.

All unused sample material is being returned under separate cover.

We appreciate the opportunity to be of service to Chevron. If you have any questions regarding the data, then please contact us.

Very truly yours,

BROWN & RUTH LABORATORIES, INC.

Gary W. Ruth

GWR/kr/4
Enclosures
SAMPLE MATERIAL:

A total of nineteen (19) samples were received from the well interval 5140-8860 feet. Each appeared in reasonably good condition, and no evidence of major contamination was apparent.

SAMPLE PREPARATION:

Each sample was visually examined for contaminants (paint, walnut shells, metal, etc.) and the contaminants were removed when present. Splits of the samples were taken, ground to a fine powder, and then analyzed.

DATA EVALUATION:

The results of the analyses are presented in the attached Table. The following criteria are suggested for interpreting the data:

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<td>&lt;2.5 DRY GAS</td>
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<td>2.0-5.0 MARGINAL</td>
<td>200-300 MIXED</td>
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<td>&gt;470 GAS</td>
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**TABLE I**

Chevron U.S.A. Inc.
Houston Oil & Minerals #2 J.M.
Lewelling, Otero County, N.M.

Results of Organic Carbon Analysis and Rock-Eval Pyrolysis

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Depth (ft.)</th>
<th>T.O.C. (% Wt.)</th>
<th>S1 (mg/g)</th>
<th>S2 (mg/g)</th>
<th>S3 (mg/g)</th>
<th>Tmax (°C)</th>
<th>Production Index</th>
<th>S2 Index</th>
<th>S3 Index</th>
<th>Hydrogen Index</th>
<th>Oxygen Index</th>
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<td>633-001</td>
<td>3750-4000</td>
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<tr>
<td>Sample Number &amp; Client ID</td>
<td>Depth (ft)</td>
<td>T.O.C. (% Wt.)</td>
<td>S1 (mg/g)</td>
<td>S2 (mg/g)</td>
<td>S3 (mg/g)</td>
<td>Tmax (°C)</td>
<td>Production Index</td>
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<td>Sample Number &amp; Client ID</td>
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<td>S1 (mg/g)</td>
<td>S2 (mg/g)</td>
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**Unable to determine due to insufficient S2 yield, multiple peaks, etc.