Western Atlas International
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**CORE LABORATORIES**

Ernie Bush
NMOCD

# Special Core Analysis Study

for

Meridian Oil, Incorporated
Pump Canyon Disposal Well No. 1
Morrison and Entrada Formations
Wildcat
San Juan County, New Mexico

Western Atlas International
A Dresser Company

# CORE LABORATORIES

November 15, 1988

Meridian Oil, Incorporated
3535 East 30th Street
Post Office Box 4289
Farmington, New Mexico 87499

Attention: Mr. Mark Manson

Subject:

Special Core Analysis Study
Pump Canyon Disposal Well No. 1
Morrison and Entrada Formations
Wildcat
San Juan County, New Mexico
File number: SCAL 203-88039

Gentlemen:

On October 31, in a conversation with a representative of Core Laboratories, Mr. Mark Manson of Meridian Oil, Incorporated, requested that a **Permeability to Liquid as a Function of Volume Throughput Determination** be performed on core material recovered from the subject well. Enclosed are the final results of the analysis.

**Sample Preparation:**

Sample M-2, from Core Laboratories' conventional core analysis file number 57121-8256, was submitted for use in the study. The sample was placed into a centrifuge solvent reflux apparatus and extracted of hydrocarbons and leached of salts using, respectively, warm toluene and warm methyl alcohol. Following cleaning, the sample was dried in a controlled-humidity oven at 140°F and 40 to 45 percent relative humidity until the sample weight stabilized. A lithological description of the sample, as well as the depth interval from which it was obtained, is provided on page 1.

Permeability to air and Boyle's Law porosity values (using helium as the gaseous phase) were measured for the sample, with data presented in tabular format on page 2.

**Permeability to Liquid as a Function of Volume Throughput Determination:**

The sample was evacuated, then pressure-saturated with a simulated formation brine, as requested by Mr. Manson; the brine analysis and resulting composition are presented on page 3. The sample was then placed into a hydrostatic core holder and flushed with the saturating brine. After a period of 6 hours, at a flow pressure of 3500 psi, no volume of brine had been displaced from the sample, and the test was suspended. A specific permeability to water value is reported on page 4.

A copy of the conventional core analysis data is presented at the conclusion of the report.

Thank you for the opportunity to perform this study for Meridian Oil, Incorporated. Should you have any questions regarding the test results, or if we may be of further assistance, please call us at (303) 751-9334.

Sincerely,

Stephen H. Leeds
Laboratory Manager
Special Core Analysis

SHL/TBB/tbb

## PROGRAM PARTICIPANTS

Thomas B. Beamish
Senior Scientist
Project Coordinator
Special Core Analysis

- Final Report Preparation

Victor M. Sunshine
Technical Analyst
Special Core Analysis

- Specific Permeability to Water Determination

## IDENTIFICATION AND LITHOLOGICAL DESCRIPTION OF SAMPLES

**Meridian Oil, Incorporated**
**Morrison and Entrada Formations**
**San Juan County, New Mexico**

**Pump Canyon Disposal Well No. 1**
**Wildcat**

| Sample Identification | Depth, feet | Lithological Description |
|---|---|---|
| M-2 | 8251.0 | Sst: lt gry, wl ind, v f gr, wl srt, calc |

## PERMEABILITY TO AIR, POROSITY, AND GRAIN DENSITY

**Meridian Oil, Incorporated**
**Morrison and Entrada Formations**
**San Juan County, New Mexico**

**Pump Canyon Disposal Well No. 1**
**Wildcat**

| Sample Identification | Depth, feet | Permeability to Air, millidarcies | Porosity, percent | Grain Density, gm/cc |
|---|---|---|---|---|
| M-2 | 8251.0 | 0.024 | 7.1 | 2.65 |

## SIMULATED BRINE COMPOSITION

| Constituents | Concentration, g/l |
|---|---|
| Sodium Chloride (NaCl) | 12.71 |
| Calcium Chloride ($CaCl_2 \cdot 2H2O$) | 0.09 |
| Magnesium Chloride ($MgCl_2 \cdot 6H_2O$) | 0.17 |
| Sodium Bicarbonate ($NaHCO_3$) | 0.55 |
| Sodium Carbonate ($Na_2CO_3 \cdot 2H_2O$) | 0.00 |
| Sodium Sulfate ($Na_2SO_4$) | 3.00 |
| Potassium Chloride (KCl) | 0.00 |

The brine composition was prepared from the following analysis:

Meridian Oil Company — WD No. 1 Well
Entrada Formation

| Constituent | Concentration, mg/l | Constituent | Concentration, mg/l |
|---|---|---|---|
| Sodium | 6091 | Chloride | 7810 |
| Calcium | 24 | Bicarbonate | 397 |
| Magnesium | 20 | Sulfate | 2030 |
| Potassium | 0 | Carbonate | 0 |

## SPECIFIC PERMEABILITY TO LIQUID

**Meridian Oil, Incorporated**
**Morrison and Entrada Formations**
**San Juan County, New Mexico**

**Pump Canyon Disposal Well No. 1**
**Wildcat**

Water Identification: Simulated Entrada Formation Brine

| Sample Identification | Depth, feet | Porosity, percent | Permeability to Air, millidarcies | Specific Permeability to Water, millidarcies | Permeability Ratio, water/air |
|---|---|---|---|---|---|
| M-2 | 8251.0 | 7.1 | 0.024 | <0.001 | ----- |

| | ft | Kair md | φ % | OIL % | WATER % | gm/cc | |
|---|---|---|---|---|---|---|---|
| | | | Morrison and Entrada Formations | | | | |
| 1 | 8241.0 | | 6.7 | 0.0 | 31.3 | 2.66 | Sst lt gry vf f gr calc |
| 2 | 8251.0 | 0.03 | 7.2 | 0.0 | 41.7 | 2.66 | Sst lt gry vf f gr calc |
| 3 | 8261.0 | 0.02 | 4.2 | 0.0 | 66.7 | 2.66 | Sst lt gry vf f gr calc |
| 4 | 8274.0 | <.01 | 3.6 | 0.0 | 45.5 | 2.65 | Sst lt gry vf f gr calc |
| 5 | 8280.0 | <.01 | 1.6 | 0.0 | 62.5 | 2.65 | Sst lt gry vf f gr sl calc |
| 6 | 8461.0 | <.01 | 4.3 | 0.0 | 41.7 | 2.66 | Sst tn lt rd vf f gr calc |

+ Denotes Sample Unsuitable for Permeability Measurement