369 Marshall Avenue • St. Louis, Missouri 63119
314 961-3500 • TWX 910-760-1660 • Telex 44-2417

# WATER ANALYSIS REPORT

Company: CIBOLA ENERGY CORP.

Sampling Date: 09/06/84
Analysis Date: 09/28/84
Sample ID: F13214

Sample Source
Lease: C.X. PLAINS
Well: #6
Sample Pt:

Submitted by: HOLLINGER, S.B.
Sampled by: S.B. HOLLINGER
Chem. Treatment:
Sample Condition: SLIGHT TURBIDITY

## ANALYTICAL RESULTS

CaCO3 & BARITE Scale

pH at the time of sampling: 5.45
pH at the time of analysis: 7.00
Density: 1.135
Hydrogen Sulfide (H2S):
TDS: Calculated 204814.2 mg/L

| CONSTITUENT | | mg/L | meq/L | method | comments |
|---|---|---|---|---|---|
| ANIONS | | | | | |
| *Bicarbonate | HCO3- | 383.0 | 6.28 | FIA | |
| Boron | B(OH)4- | 99.1 | 1.26 | ICP | |
| *Carbonate | CO3-- | .0 | .00 | N.A. | |
| *Chloride | Cl- | 125000.0 | 3525.79 | FIA | |
| Phosphate | PO4--- | 17.0 | .54 | ICP | |
| *Sulfate | SO4-- | 1770.0 | 36.85 | FIA | |
| | SUM OF ANIONS= | | 3570.72 | | |
| CATIONS | | | | | |
| Aluminum | Al+++ | 7.4 | .83 | ICP | |
| *Barium | Ba++ | 14.1 | .21 | ICP | |
| *Calcium | Ca++ | 2253.0 | 112.43 | ICP | |
| Chromium | Cr+++ | 0.0 | 0.00 | ICP | DL= 2.020 |
| Copper | Cu++ | 0.0 | 0.00 | ICP | DL= 2.020 |
| *Iron | Fe++ | 0.0 | 0.00 | ICP | DL= 2.020 |
| Lead | Pb++ | 0.0 | 0.00 | ICP | DL=10.100 |
| Lithium | Li+ | 0.0 | 0.00 | N.A. | |
| *Magnesium | Mg++ | 833.0 | 68.55 | ICP | |
| Manganese | Mn++ | 0.0 | 0.00 | ICP | DL= 1.010 |
| Nickel | Ni++ | 5.4 | .19 | ICP | |
| Potassium | K+ | 658.0 | 16.83 | ICP | |
| Silica | SiO2 | 0.0 | 0.00 | ICP | DL= 2.020 |
| *Sodium | Na+ | 73620.0 | 3202.26 | ICP | |
| *Strontium | Sr++ | 154.0 | 3.52 | ICP | |
| Vanadium | V++ | 0.0 | 0.00 | N.A. | |
| | SUM OF CATIONS= | | 3404.80 | | |

Ratio of ANIONS:CATIONS 1.05

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# SATURATION INDEX TABLE

Sample ID: F13214
pH (at 25.0 deg C): 7.00

| Temperature | | Scale Component | | | | |
|---|---|---|---|---|---|---|
| deg F | deg C | CaCO3 (Calcite) | CaSO4 (Anhydrite) | CaSO4*2H2O (Gypsum) | SrSO4 (Celestite) | BaSO4 (Barite) |
| 32.00 | .00 | .756 | -1.035 | -.320 | -.266 | 2.330 |
| 68.00 | 20.00 | .827 | -.828 | -.438 | -.335 | 1.945 |
| 77.00 | 25.00 | .846 | -.780 | -.458 | -.343 | 1.853 |
| 104.00 | 40.00 | .902 | -.640 | -.499 | -.356 | 1.589 |
| 140.00 | 60.00 | .987 | -.458 | -.519 | -.328 | 1.259 |
| 176.00 | 80.00 | 1.094 | -.272 | -.513 | -.283 | .950 |
| 212.00 | 100.00 | 1.228 | -.076 | -.491 | -.224 | .660 |

S.I.=SATURATION INDEX
S.I.=log(Product of activities of component ions/Ksp)

| | |
|---|---|
| S.I. less than 0 | The water is undersaturated and indicates a non-scaling situation. |
| S.I. near or equal to 0 | The water is saturated and scale formation is likely. |
| S.I. greater than 0 | The water is supersaturated and favors scale formation. |

# POSSIBLE SCALE FORMATION

| Temperature | | Scale Component (mg/1000 g H2O) | | | | |
|---|---|---|---|---|---|---|
| deg F | deg C | CaCO3 (Calcite) | CaSO4 (Anhydrite) | CaSO4*2H2O (Gypsum) | SrSO4 (Celestite) | BaSO4 (Barite) |
| 32.00 | .00 | 64. | 0. | 0. | 0. | 26. |
| 68.00 | 20.00 | 82. | 0. | 0. | 0. | 26. |
| 77.00 | 25.00 | 87. | 0. | 0. | 0. | 26. |
| 104.00 | 40.00 | 106. | 0. | 0. | 0. | 26. |
| 140.00 | 60.00 | 137. | 0. | 0. | 0. | 25. |
| 176.00 | 80.00 | 172. | 0. | 0. | 0. | 24. |
| 212.00 | 100.00 | 208. | 0. | 0. | 0. | 21. |

The POSSIBLE SCALE FORMATION predicts the maximum amount of any one scale component that could precipitate from the water as analyzed. As precipitation progresses, these predictions become less accurate.

To estimate the POSSIBLE SCALE FORMATION in lbs/1000 barrels (US 42 gal) use the following:
APPROXIMATE lbs/1000 barrels = (mg/1000g H2O) x 0.35