

ILLEGIBLE**Enviro-Chem, Inc.
WATER ANALYSIS REPORT****SAMPLE**

Oil Co. : G.P.X Energy

Lease : Grier

Well No. : Sample # 2

25% Produced

Lab No. : 101690.001

75% Fresh

Sample Loc. : 25p/75% F

Date Analyzed: 16-October-1998

Date Sampled : 09-October-1998

ANALYSIS

1. pH 6.780
2. Specific Gravity 60/60 F. 1.018
3. CaCO₃ Saturation Index 0.80
0.140 P: -0.477
F: +0.453

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

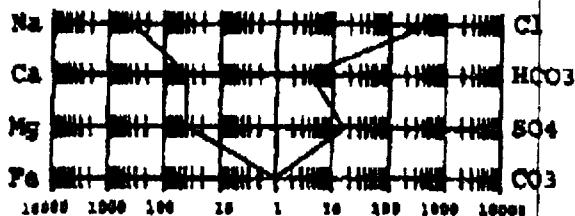
MG/L EQ. WT. MEQ/L

Not Present
Not Determined
Not Determined**Cations**

7. Calcium (Ca++) 834 / 20.1 = 41.49
8. Magnesium (Mg++) 441 / 12.2 = 36.23
9. Sodium (Na+) (Calculated) 339 / 23.0 = 14.74
10. Barium (Ba++) Not Determined

Anions

11. Hydroxyl (OH-) 0 / 17.0 = 0.00
12. Carbonate (CO₃--) 0 / 30.0 = 0.00
13. Bicarbonate (HCO₃-) 234 / 61.1 = 3.83
14. Sulfate (SO₄--) 750 / 48.8 = 15.37
15. Chloride (Cl-) 14,997 / 35.5 = 422.45
16. Total Dissolved Solids 25,636
17. Total Iron (Fe) 3
18. Total Hardness As CaCO₃ 3,903 / 18.2 = 0.11
19. Resistivity @ 75 F. (Calculated) 0.273 /cm.

LOGARITHMIC WATER PATTERN**Calcium Sulfate Solubility Profile**

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

PROBABLE MINERAL COMPOSITION			
COMPOUND	EQ. WT. %	MEQ/L	mg/L
Ca(HCO ₃) ₂	81.04	3.83	310
CaSO ₄	68.07	15.37	1,046
CaCl ₂	55.50	22.29	1,237
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	0.00	0
MgCl ₂	47.62	36.23	1,725
NaHCO ₃	84.00	0.00	0
NaSO ₄	71.03	0.00	0
NaCl	58.46	363.93	21,275

*Milli Equivalents per Liter

Enviro-Chem, Inc. WATER ANALYSIS REPORT

SAMPLE

Oil Co. : G.P.22 Energy

Lease : Grier

Well No. : Sample # 1

Lab No. : 101098.001

50% Produced
50% Fresh

Sample Loc. : 50/50 &

Date Analyzed: 16-October-1998

Date Sampled : 09-October-1998

ANALYSIS

1. pH 5.350
2. Specific Gravity 50/50 F. 1.038
3. CaCO₃ Saturation Index 0.140 F. -0.416
F. +0.289

Dissolved Gases

4. Hydrogen Sulfide Not Present
5. Carbon Dioxide Not Determined
6. Dissolved Oxygen Not Determined

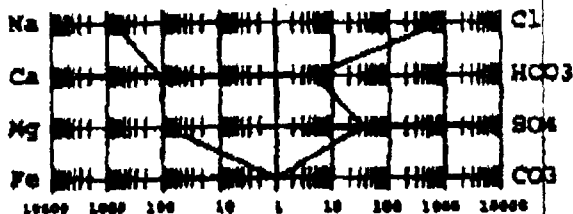
Cations

- | | | mg/L | EQ. WT. | *MEQ/L |
|--------------|--------------------|----------------|----------|--------|
| 7. Calcium | (Ca++) | 2.084 | / 20.1 = | 103.68 |
| 8. Magnesium | (Mg++) | 1.138 | / 12.3 = | 93.78 |
| 9. Sodium | (Na+) (Calculated) | 18.797 | / 23.0 = | 816.83 |
| 10. Barium | (Ba++) | Not Determined | | |

Anions

- | | | mg/L | EQ. WT. | *MEQ/L |
|---|----------------------|------------|----------|--------|
| 11. Hydroxyl | (OH-) | 0 | / 17.0 = | 0.00 |
| 12. Carbonate | (CO ₃ =) | 0 | / 30.0 = | 0.00 |
| 13. Bicarbonate | (HCO ₃ -) | 26.8 | / 61.1 = | 4.39 |
| 14. Sulfate | (SO ₄ =) | 1.650 | / 48.8 = | 33.81 |
| 15. Chloride | (Cl-) | 29.993 | / 35.5 = | 844.89 |
| 16. Total Dissolved Solids | | 50.930 | | |
| 17. Total Iron (Fe) | | 5 | / 18.2 = | 0.28 |
| 18. Total Hardness As CaCO ₃ | | 2.084 | | |
| 19. Resistivity @ 75 F. (Calculated) | | 0.161 /cm. | | |

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION			
COMPOUND	EQ. WT. %	*meq/L = mg/L.	
Ca(HCO ₃) ₂	81.04	4.39	355
CaSO ₄	66.07	33.81	2,302
CaCl ₂	55.50	65.48	3,634
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	0.00	0
MgCl ₂	47.62	93.28	4,442
NaHCO ₃	84.00	0.00	0
NaSO ₄	71.03	0.00	0
NaCl	58.48	586.11	40,110

*Milli Equivalents per Liter

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Enviro-Chem, Inc. ILLEGIBLE

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : U.P. II Energy

Lease : Grier

Well No. : Sample 6 3

Lab No. : 101028.001

75% Produced

25% Fresh

Sample Loc. : 251/72p 6

Date Analyzed: 15-October-1998

Date Sampled : 09-October-1998

ANALYSIS

1. pH
2. Specific Gravity 60/60 F.
3. CaCO_3 Saturation Index

6.580
1.053
-0.188
+0.750

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

Not Present
Not Determined
Not Determined

Cations

7. Calcium (Ca^{++})
8. Magnesium (Mg^{++})
9. Sodium (Na^{+})
10. Barium (Ba^{++})

(Calculated)

3.126 / 20.1 = 154.52
1.181 / 12.2 = 96.80
27.148 / 23.0 = 1,049.91

Anions

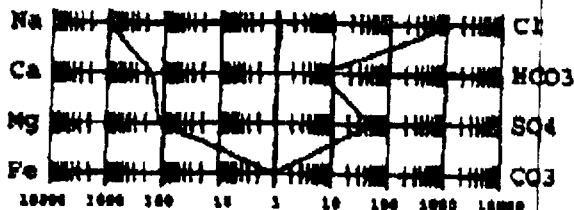
11. Hydroxyl (OH^{-})
12. Carbonate (CO_3^{-})
13. Bicarbonate (HCO_3^{-})
14. Sulfate (SO_4^{2-})
15. Chloride (Cl^{-})

0 / 17.0 = 0.00
366 / 30.0 = 12.20
2,200 / 46.1 = 47.72
44,990 / 58.5 = 769.57

16. Total Dissolved Solids
17. Total Iron (Fe)
18. Total Hardness As CaCO_3
19. Resistivity @ 75 F. (Calculated)

76.221 / 18.2 = 4.19
13.532 / 0.128 = 105.72

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT. X	*mg/L	mg/L
$\text{Ca}(\text{HCO}_3)_2$	81.04	5.99	485
CaSO_4	68.07	45.08	3,069
CaCl_2	55.50	104.45	5,797
$\text{Mg}(\text{HCO}_3)_2$	73.17	0.00	0
MgSO_4	60.19	0.00	0
MgCl_2	47.62	114.02	5,429
NaHCO_3	64.00	0.00	0
NaSO_4	71.03	0.00	0
NaCl	58.46	1,048.86	61,316

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

*Milli Equivalents per Liter

Enviro-Chem, Inc. **ILLEGIBLE**

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : G.P.II Energy
Lease : Griner
Well No. : Fresh Water
Lab No. : 101290.001

Sample Loc. :
Date Analyzed: 16-October-1998
Date Sampled : 09-October-1998

ANALYSIS

1. pH 8.460
2. Specific Gravity 60/60 F. 1.003
3. CaCO_3 Saturation Index 0.80 F. +0.280
0.140 F. -1.580

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

Not Present
Not Determined
Not Determined

Cations

7. Calcium (Ca^{++})
8. Magnesium (Mg^{++})
9. Sodium (Na^{+})
10. Barium (Ba^{++}) (Calculated)

MG/L EQ. WT. *MEQ/L

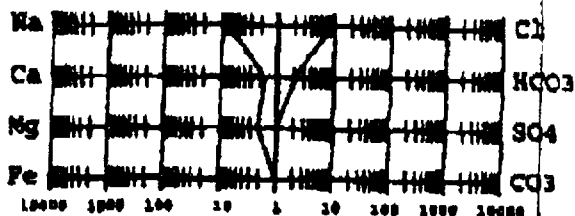
MG/L	EQ. WT.	*MEQ/L
31	20.1	1.54
177	12.1	14.6
0	55.5	0.00
0	68.7	0.00

Anions

11. Hydroxyl (OH^{-})
12. Carbonate (CO_3^{--})
13. Bicarbonate (HCO_3^{-})
14. Sulfate (SO_4^{--})
15. Chloride (Cl^{-})
16. Total Dissolved Solids
17. Total Iron (Fe)
18. Total Hardness as CaCO_3
19. Resistivity @ 75 F. (Calculated) 2.802 /cm.

MG/L	EQ. WT.	*MEQ/L
0	17.0	0.00
177	30.0	5.91
177	61.1	2.89
498	48.1	10.35
300	35.5	8.45

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

COMPOUND	EQ. WT. X	*MEQ/L = MG/L.	
$\text{Ca}(\text{HCO}_3)_2$	81.04	1.54	125
CaSO_4	68.07	0.00	0
CaCl_2	55.50	0.00	0
$\text{Mg}(\text{HCO}_3)_2$	73.17	0.37	27
MgSO_4	60.19	0.92	56
MgCl_2	47.62	0.75	36
NaHCO_3	84.00	0.00	0
Na_2SO_4	71.03	0.00	0
NaCl	58.46	7.70	450

*Milli Equivalents per Liter

Enviro-Chem, Inc. WATER ANALYSIS REPORT

SAMPLE

Oil Co. : S.P.II Energy
Lease : Grier
Well No. : Water Tank Pressure H₂O
Lab No. : 191688.681

Sample Loc. :
Date Analyzed: 16-October-1998
Date Sampled : 09-October-1998

ANALYSIS

ILLEGIBLE

1. pH 7.030
2. Specific Gravity 60/60 F. 1.068
3. CaCO₃ Saturation Index @ 60 F. +0.609
@ 140 F. +1.529

Dissolved Gases

4. Hydrogen Sulfide Not Present
5. Carbon Dioxide Not Determined
6. Dissolved Oxygen Not Determined

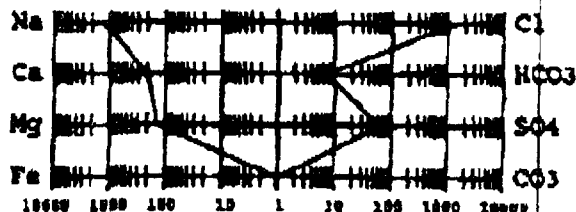
Cations

	ME/L	EQ. WT.	*MEQ/L
7. Calcium (Ca++)	4.158	20.1	207.26
8. Magnesium (Mg++)	1.580	12.2	139.51
9. Sodium (Na+) (Calculated)	29.433	23.0	1,275.83
10. Barium (Ba++)	Not Determined		

Anions

	ME/L	EQ. WT.	*MEQ/L
11. Hydroxyl (OH-)	0	17.0	0.00
12. Carbonate (CO ₃ =)	0	30.0	0.00
13. Bicarbonate (HCO ₃ -)	41.5	61.1	66.79
14. Sulfate (SO ₄ =)	2,800	48.0	59.43
15. Chloride (Cl-)	54,982	35.5	1,548.92
16. Total Dissolved Solids	93,483		
17. Total Iron (Fe)	16,912	18.2	0.08
18. Total Hardness As CaCO ₃			
19. Resistivity @ 75 F. (Calculated)	0.101 /cm.		

LOGARITHMIC WATER PATTERN *meq/L.



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION			
COMPOUND	EQ. WT. X	*meq/L	mg/L.
Ca(HCO ₃) ₂	81.04	6.79	550
CaSO ₄	68.07	59.43	4,045
CaCl ₂	55.50	141.14	7,834
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	0.00	0
MgCl ₂	47.62	129.51	6,167
NaHCO ₃	84.00	0.00	0
NaSO ₄	71.03	0.00	0
NaCl	58.46	1,275.30	74,730

*Milli Equivalents per Liter
This water is mildly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Sulfate is high.

ILLEGIBLE

EXHIBIT "A"
CASE NO. 12112 (REOPENED)
ORDER NO. R-11435-A

Vanco Oil & Gas Corporation
Approved Injection Wells
North Square Lake Unit Pressure Maintenance Project

<u>Well Name</u>	<u>Location</u>	<u>Section</u>	<u>Injection Interval</u>	<u>Pressure Limit (psig)</u>
NSLU No. 4	1650' FSL & 990' FEL	19	3,286' - 3,304' N/A	657 N/A
NSLU No. 8	1980' FSL & 660' FEL	20	3,424' - 3,475' N/A	684 N/A
NSLU No. 59	1880' FSL & 1980' FWL	29	3,258' - 3,340' N/A	651 N/A
Grier Well No. 11 (NSLU No. 101)	660' FNL & 1980' FEL	31	2,988' - 3,336'	598
Grier Well No. 17 (NSLU No. 102)	330' FNL & 660' FEL	31	3,132' - 3,338'	626
Grier Well No. 7X (NSLU No. 127)	1980' FNL & 660' FEL	31	3,055' - 3,367'	611
Grier Well No. 6 (NSLU No. 145)	1980' FSL & 1980' FEL	31	2,980' - 3,338' OH	596

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