

KELLAHIN AND KELLAHIN

ATTORNEYS AT LAW

EL PATIO BUILDING

117 NORTH GUADALUPE

POST OFFICE BOX 2265

SANTA FE, NEW MEXICO 87504-2265

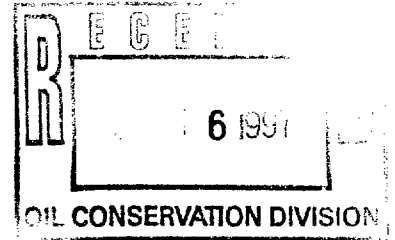
W. THOMAS KELLAHIN*

*NEW MEXICO BOARD OF LEGAL SPECIALIZATION
RECOGNIZED SPECIALIST IN THE AREA OF
NATURAL RESOURCES-OIL AND GAS LAW

JASON KELLAHIN (RETIRED 1991)

TELEPHONE (505) 982-4285
TELEFAX (505) 982-2047

September 16, 1997



HAND DELIVERED

Mr. David R. Catanach
Hearing Examiner
Oil Conservation Division
2040 South Pacheco
Santa Fe, New Mexico 87505

Re: NMOCD Case 11807
Application of Stevens & Tull, Inc.
for Salt Water Disposal
Lea County, New Mexico

Dear Mr. Catanach:

In accordance with your request at the hearing held on September 4, 1997 in the referenced case, please find attached a water analysis of produced water from each of the four wells which produced water to be disposed of in the subject well. Please call me if you have any questions about this case.

Very truly yours,

A handwritten signature in black ink, appearing to read "W. Thomas Kellahin". The signature is fluid and cursive, with a large initial "W" and a long, sweeping underline.

W. Thomas Kellahin

cc: Stevens & Tull, Inc.
Attn: Jerry Weant

Sep-10-97 09:20

P.02

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : Stevens & Tull
Lease : Concord St.
Well No. : # 2
Salesman:

Sample Loc. :
Date Analyzed: 09-September-1997
Date Sampled :

ANALYSIS

1. pH 8.730
2. Specific Gravity 50/60 F. 1.011
3. CaCO₃ Saturation Index @ 80 F. +0.844
@ 140 F. +1.544

Dissolved Gases

MG/L EQ. WT. *MEQ/L

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

Cations

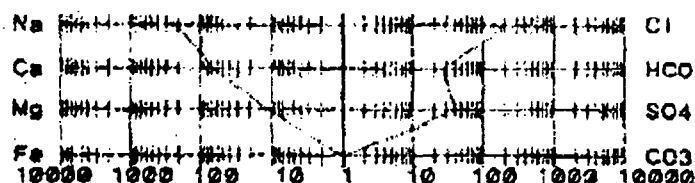
7. Calcium (Ca++) 1,308 / 20.1 = 65.07
8. Magnesium (Mg++) 132 / 12.2 = 10.82
9. Sodium (Na+) (Calculated) 4,938 / 23.0 = 214.70
10. Barium (Ba++) Not Determined

Anions

11. Hydroxyl (OH-) 0 / 17.0 = 0.00
12. Carbonate (CO₃--) 0 / 30.0 = 0.00
13. Bicarbonate (HCO₃--) 1,572 / 61.1 = 25.73
14. Sulfate (SO₄--) 1,930 / 48.8 = 39.03
15. Chloride (Cl-) 7,898 / 35.5 = 225.30
16. Total Dissolved Solids 17,848
17. Total Iron (Fe) 3 / 18.2 = 0.14
18. Total Hardness As CaCO₃ 3,811
19. Resistivity @ 75 F. (Calculated) 0.337 / cm.

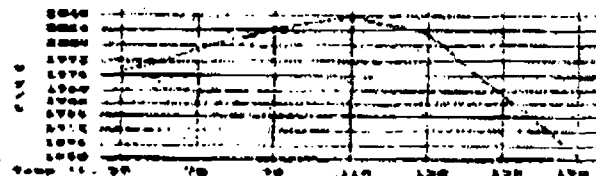
LOGARITHMIC WATER PATTERN

PROBABLE MINERAL COMPOSITION



COMPOUND	EQ. WT. X	*meq/L	= mg/L
Ca(HCO ₃) ₂	81.04	25.73	2,085
CaSO ₄	58.07	39.03	2,550
CaCl ₂	55.50	0.41	23
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	0.00	0
MgCl ₂	47.82	10.82	515
NaHCO ₃	84.00	0.00	0
NaSO ₄	71.00	0.00	0
NaCl	58.46	214.00	12,514

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, and the presence of H₂S in solution.

*Milli Equivalents per Liter

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : Stevens & Tyll
 Lease : State of
 Well No. : # 3
 Salesman :

Sample Loc. :
 Date Analyzed: 09-September-1997
 Date Sampled :

ANALYSIS

1. pH 7.870
2. Specific Gravity 60/60 F. 1.015
3. CaCO₃ Saturation Index @ 80 F. +1.485
 @ 140 F. +2.415

Dissolved Gases MG/L EQ. WT. *MEQ/L

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

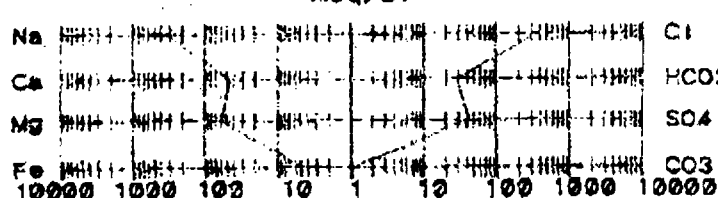
Cations

7. Calcium (Ca ⁺⁺)	872	/ 20.1 =	43.38
8. Magnesium (Mg ⁺⁺)	661	/ 12.2 =	54.18
9. Sodium (Na ⁺) (Calculated)	7,141	/ 23.0 =	310.48
10. Barium (Ba ⁺⁺)	Not Determined		

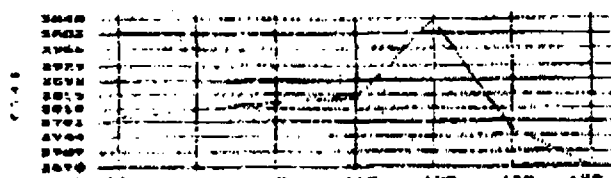
Anions

11. Hydroxyl (OH ⁻)	0	/ 17.0 =	0.00
12. Carbonate (CO ₃ ⁼)	0	/ 30.0 =	0.00
13. Bicarbonate (HCO ₃ ⁻)	1,674	/ 61.1 =	27.40
14. Sulfate (SO ₄ ⁼)	2,050	/ 48.8 =	42.01
15. Chloride (Cl ⁻)	11,997	/ 35.5 =	337.94
16. Total Dissolved Solids	24,395		
17. Total Iron (Fe)	78	/ 18.2 =	4.29
18. Total Hardness As CaCO ₃	4,900		
19. Resistivity @ 75 F. (Calculated)	0.288 /cm.		

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION			
COMPOUND	EQ. WT. X	*meq/L =	mg/L.
Ca(HCO ₃) ₂	81.04	27.40	2,220
CaSO ₄	58.07	15.99	1,028
CaCl ₂	55.50	0.00	0
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	26.02	1,568
MgCl ₂	47.62	28.16	1,341
NaHCO ₃	84.00	0.00	0
NaSC ₄	71.03	0.00	0
NaCl	58.46	300.79	18,110

*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, and the presence of H₂S in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : Stevens & Tull
 Lease : Corroco St.
 Well No. : # 1
 Salesman :

Sample Loc. :
 Date Analyzed : 09-September-1997
 Date Sampled :

ANALYSIS

1. pH 6.780
2. Specific Gravity 60/60 F. 1.013
3. CaCO₃ Saturation Index @ 80 F. +0.311
 @ 140 F. +1.221

Dissolved Gases

MG/L EQ. WT. *MEQ/L

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

Cations

7. Calcium (Ca++) 1,050 / 20.1 = 54.23
8. Magnesium (Mg++) 285 / 12.2 = 21.72
9. Sodium (Na+) (Calculated) 5,002 / 23.0 = 243.57
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-) 918 / 61.1 = 15.02
14. Sulfate (SO₄++) 2,450 / 49.9 = 50.20
15. Chloride (Cl-) 8,008 / 35.5 = 253.35

16. Total Dissolved Solids 19,323
17. Total Iron (Fe) 13 / 18.2 = 0.89
18. Total Hardness As CaCO₃ 3,811
19. Resistivity @ 75 F. (Calculated) 0.322 /cm.

LOGARITHMIC WATER PATTERN

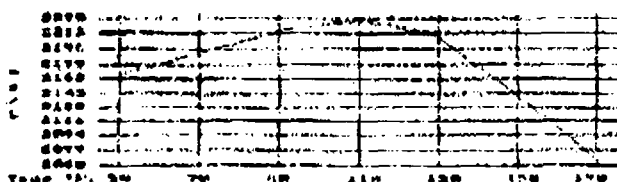
*meq/L.

PROBABLE MINERAL COMPOSITION

COMPOUND EQ. WT. X *meq/L = mg/L.

Na	1000	100	10	1	10	100	1000	10000	Cl	Ca(HCO ₃) ₂	81.04	15.02	1,218
Ca	1000	100	10	1	10	100	1000	10000	HCO ₃	CaSO ₄	68.07	39.20	2,669
Mg	1000	100	10	1	10	100	1000	10000	SO ₄	CaCl ₂	55.50	0.00	0
Fe	1000	100	10	1	10	100	1000	10000	CO ₃	Mg(HCO ₃) ₂	73.17	0.00	0
										MgSO ₄	60.19	11.00	662
										MgCl ₂	47.62	10.72	511
										NaHCO ₃	84.00	0.00	0
										NaSO ₄	71.03	0.00	0
										NaCl	58.46	242.74	14,181

Calcium Sulfate Solubility Profile



*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, and the presence of H₂S in solution.

Sep-10-97 08:07

P.03

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : Stevens & Tull
 Lease : State, BF
 Well No. : # 4
 Salesman :

Sample Loc. :
 Date Analyzed : 09-September-1997
 Date Sampled :

ANALYSIS

1. pH 6.840
 2. Specific Gravity 80/80 F. 1.020
 3. CaCO₃ Saturation Index @ 80 F. +0.073
 @ 140 F. +1.043

Dissolved Gases

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

Cations

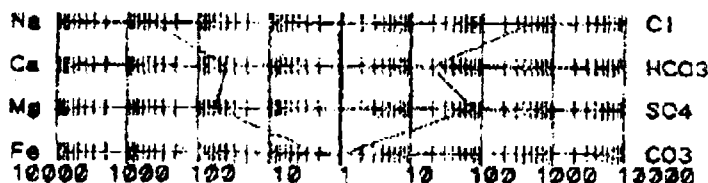
- | | | MG/L | EQ. WT. | *MEQ/L |
|--------------|---------------------|---------------------|---------|--------|
| 7. Calcium | (Ca ⁺⁺) | 763 | 20.1 | 37.98 |
| 8. Magnesium | (Mg ⁺⁺) | 861 | 12.2 | 54.18 |
| 9. Sodium | (Na ⁺) | (Calculated) 10,450 | 23.0 | 454.35 |
| 10. Barium | (Ba ⁺⁺) | Not Determined | | |

Anions

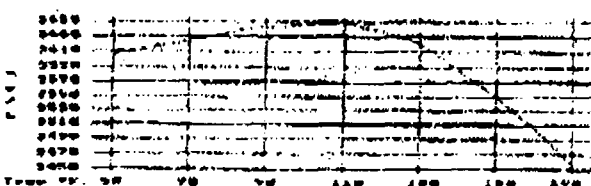
- | | | | | |
|---|----------------------------------|------------|------|--------|
| 11. Hydroxyl | (OH ⁻) | 0 | 17.0 | 0.00 |
| 12. Carbonate | (CO ₃ ⁼) | 0 | 30.0 | 0.00 |
| 13. Bicarbonate | (HCO ₃ ⁻) | 1,147 | 61.1 | 18.77 |
| 14. Sulfate | (SO ₄ ⁼) | 3,780 | 48.8 | 75.82 |
| 15. Chloride | (Cl ⁻) | 15,996 | 35.5 | 450.59 |
| 16. Total Dissolved Solids | | 32,717 | | |
| 17. Total Iron (Fe) | | 33 | 18.2 | 1.81 |
| 18. Total Hardness As CaCO ₃ | | 4,628 | | |
| 19. Resistivity @ 75 F. (Calculated) | | 0.240 /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	18.77	1,521	
CaSO ₄	60.07	19.19	1,306	
CaCl ₂	55.50	0.00	0	
Mg(HCO ₃) ₂	73.17	0.00	0	
MgSO ₄	60.10	54.18	3,291	
MgCl ₂	47.62	0.00	0	
NaHCO ₃	84.00	0.00	0	
NaSO ₄	71.03	2.45	174	
NaCl	58.46	450.59	26,342	

*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, and the presence of H₂S in solution.