

Multi-Chem Group, LLC

Multi-Chem Analytical Laboratory

349 PR 4473

Sonora, TX 76950



Water Analysis Report

Production Company: **ANTERO RESOURCES**

Sample ID: **WA-19064**

Well Name: **RIVER RANCH A-1**

Sample Point: **Separator**

Sample Date: **12/9 /2008**

Sales Rep: **Brian Bernatis**

Lab Tech: **Joseph Sadler**

Sample Specifics

Test Date:	1/7/2009
Temperature (°F):	58
Sample Pressure (psig):	0
Specific Gravity (g/cm³):	1.0270
pH:	7.8
Turbidity (NTU):	-
Calculated T.D.S. (mg/L)	36371
Molar Conductivity (µS/cm):	55108
Resitivity (Mohm):	0.1815

Analysis @ Properties in Sample Specifics

Cations	mg/L	Anions	mg/L
Calcium (Ca):	0.01	Chloride (Cl):	20308.00
Magnesium (Mg):	292.80	Sulfate (SO ₄):	8.00
Barium (Ba):	60.73	Dissolved CO ₂ :	99.00
Strontium (Sr):	-	Bicarbonate (HCO ₃):	2440.00
Sodium (Na):	13154.00	Carbonate (CO ₃):	-
Potassium (K):	-	H ₂ S:	0.01
Iron (Fe):	8.58	Phosphate (PO ₄):	-
Manganese (Mn):	0.17	Silica (SiO ₂):	-
Lithium (Li):	-	Fluoride (F):	-
Aluminum (Al):	-	Nitrate (NO ₃):	-
Ammonia NH ₃ :	-	Lead (Pb):	-
		Zinc (Zn):	-
		Bromine (Br):	-
		Boron (B):	-

Test Conditions		Scale Values @ Test Conditions - Potential Amount of Scale in lb/1000bbl										
		Calcium Carbonate CaCO ₃		Gypsum CaSO ₄ · 2H ₂ O		Calcium Sulfate CaSO ₄		Strontium Sulfate SrSO ₄		Barium Sulfate BaSO ₄		Calculated CO ₂
		Sat Index	Scale	Sat Index	Scale	Sat Index	Scale	Sat Index	Scale	Sat Index	Scale	psi
Temp °F	Gauge Press. psi											
58	0	0.00	-20.96	0.00	-3552.00	0.00	-4100.00	-	-	10.30	13.79	0.82
80	0	0.00	-16.62	0.00	23.18	0.00	-4050.40	-	-	6.08	12.18	0.42
100	0	0.00	-13.73	0.00	27.89	0.00	-3835.00	-	-	3.87	10.34	0.51
120	0	0.00	-11.67	0.00	31.47	0.00	-3505.40	-	-	2.52	8.03	0.57
140	0	0.00	-10.18	0.00	34.13	0.00	-3109.60	-	-	1.68	5.13	0.64
160	0	0.00	-9.20	0.00	35.53	0.00	-2689.20	-	-	1.14	1.49	0.72
180	0	0.00	-8.65	0.00	35.44	0.00	-2276.30	-	-	0.79	-3.07	0.78
200	0	0.00	-8.49	0.00	33.85	0.00	-1892.60	-	-	0.55	-8.73	0.79
220	2.51	0.00	-8.79	0.00	31.51	0.00	-1572.10	-	-	0.38	-16.29	0.79
240	10.3	0.00	-9.26	0.00	28.09	0.00	-1273.90	-	-	0.27	-25.02	0.80
260	20.76	0.00	-9.95	0.00	24.50	0.00	-1021.60	-	-	0.20	-35.54	0.81
280	34.54	0.00	-10.80	0.00	21.07	0.00	-812.48	-	-	0.14	-48.11	0.82
300	52.34	0.00	-11.77	0.00	18.04	0.00	-641.84	-	-	0.10	-63.02	0.82

Conclusions:

Calcium Carbonate Scaling Index is negative from 80°F to 300°F

Gypsum Scaling Index is negative from 80°F to 300°F

Calcium Sulfate Scaling Index is negative from 80°F to 300°F

Strontium Sulfate scaling was not evaluated

Barium Sulfate NO CONCLUSION

Notes:

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Scale Prediction Graphs

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