

FULCRUM ENERGY
 NATE HYLE
 JACKSON CO

PATRIOT 0880 13-32H5
 SEPARATOR

Report Date: 06-05-2023 Sampled: 05-16-2023 at 0000
 Sample #: 6661 Sample ID: 332786

CATIONS

Calcium (as Ca)	293.21
Magnesium (as Mg)	28.80
Barium (as Ba)	34.67
Strontium (as Sr)	40.08
Sodium (as Na)	13350
Potassium (as K)	32.22
Lithium (as Li)	2.26
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	14.31
Manganese (as Mn)	0.200
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	21200
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	310.00
Bicarbonate (as HCO ₃)	170.80
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	21.35

PARAMETERS

Calculated T.D.S.	35864
Molar Conductivity	44245
Resistivity	22.60
Sp.Gr.(g/mL)	1.021
Pressure(atm)	1.00
pCO ₂ (atm)	0.0300
pH ₂ S(atm)	0.00
Temperature (°F)	70.00
pH	6.48

BOUND IONS

	TOTAL	FREE
Calcium	299.37	297.20
Barium	35.40	35.40
Carbonate	0.312	0.0598
Phosphate	0.00	0.00
Sulfate	0.00	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.0555
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COMMENTS

JACKSON CO

JACAM LABORATORIES

205 S. Broadway · P.O. Box 96 · Sterling, KS 67579-0096

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SATURATION RATIO as IAP/Ksp

Calcite (CaCO ₃)	0.09
Aragonite (CaCO ₃)	0.08
Witherite (BaCO ₃)	0.00
Strontianite (SrCO ₃)	0.04
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.01
Anhydrite (CaSO ₄)	0.00
Gypsum (CaSO ₄ *2H ₂ O)	0.00
Barite (BaSO ₄)	0.00
Celestite (SrSO ₄)	0.00
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	19.35
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	6.60
Halite (NaCl)	0.00
Thenardite (Na ₂ SO ₄)	0.00
Iron sulfide (FeS)	0.00

FREE ION MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.350
Aragonite (CaCO ₃)	-0.374
Witherite (BaCO ₃)	-10.23
Strontianite (SrCO ₃)	-1.19
Calcium oxalate (CaC ₂ O ₄)	-0.183
Magnesite (MgCO ₃)	-3.67
Anhydrite (CaSO ₄)	-1268
Gypsum (CaSO ₄ *2H ₂ O)	-1083
Barite (BaSO ₄)	-0.727
Celestite (SrSO ₄)	-141.37
Fluorite (CaF ₂)	-14.13
Calcium phosphate	>-0.001
Hydroxyapatite	-317.35
Silica (SiO ₂)	-35.92
Brucite (Mg(OH) ₂)	-2.06
Magnesium silicate	-99.15
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.0341
Halite (NaCl)	-171282
Thenardite (Na ₂ SO ₄)	-63801
Iron sulfide (FeS)	-0.127

SIMPLE INDICES

Langelier	-0.968
Ryznar	8.42
Puckorius	7.21
Larson-Skold Index	213.74
Stiff Davis Index	-1.48
Oddo-Tomson	-1.61

CARBONATE PRECIPITATION POTENTIAL (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-25.19
Aragonite (CaCO ₃)	-25.86
Witherite (BaCO ₃)	-37.69
Strontianite (SrCO ₃)	-25.18
Magnesite (MgCO ₃)	-40.08
Siderite (FeCO ₃)	7.89

OPERATING CONDITIONS

Temperature (°F)	70.00
Time(secs)	0.00



SYSTEM IDENTIFICATION

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 PATRIOT 0880 13-32H5
 NATE HYLE
 SEPARATOR
 JACKSON CO

Sample ID#: 6661
 ID 332786

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WATER CHEMISTRY

CATIONS

Calcium(as Ca)	293.21
Magnesium(as Mg)	28.80
Barium(as Ba)	34.67
Strontium(as Sr)	40.08
Sodium(as Na)	13350
Potassium(as K)	32.22
Lithium(as Li)	2.26
Iron(as Fe)	14.31
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.200
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	21200
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	310.00
Bicarbonate(as HCO ₃)	170.80
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	21.35

PARAMETERS

Temperature(°F)	70.00	Sample pH	6.48
Conductivity	44245	Sp.Gr.(g/mL)	1.021
Resistivity	22.60	T.D.S.	35864

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃	Anhydrite CaSO ₄	Gypsum CaSO ₄ *2H ₂ O	Barite BaSO ₄	Celestite SrSO ₄	Siderite FeCO ₃	Mackinawite FeS	CO ₂ (mpy)	pCO ₂ (atm)								
50.00	1.000	0.0407	-0.435	0.00	-1254	0.00	-1039	0.00	-0.432	0.00	-136.62	2.56	0.0131	0.00	-0.122	0.0568	0.0300	
65.45	1.000	0.0617	-0.373	0.00	-1271	0.00	-1075	0.00	-0.652	0.00	-141.04	4.36	0.0220	0.00	-0.126	0.109	0.0300	
80.91	1.000	0.0878	-0.322	0.00	-1249	0.00	-1099	0.00	-0.925	0.00	-140.96	6.91	0.0308	0.00	-0.131	0.0710	0.0300	
96.36	1.000	0.118	-0.280	0.00	-1194	0.00	-1113	0.00	-1.24	0.00	-138.49	10.29	0.0393	0.00	-0.136	0.0930	0.0300	
111.82	1.000	0.151	-0.244	0.00	-1115	0.00	-1072	0.00	-1.59	0.00	-135.12	14.55	0.0472	0.00	-0.142	0.0975	0.0300	
127.27	1.000	0.191	-0.214	0.00	-1017	0.00	-999.88	0.00	-2.02	0.00	-132.26	20.05	0.0556	0.00	-0.149	0.0818	0.0300	
142.73	1.000	0.236	-0.187	0.00	-909.64	0.00	-938.94	0.00	-2.53	0.00	-129.99	27.06	0.0647	0.00	-0.156	0.0663	0.0300	
158.18	1.000	0.288	-0.163	0.00	-798.36	0.00	-887.11	0.00	-3.13	0.00	-128.27	35.81	0.0746	0.00	-0.165	0.0685	0.0300	
173.64	1.000	0.347	-0.141	0.00	-688.44	0.00	-843.16	0.00	-3.85	0.00	-127.07	46.47	0.0854	0.00	-0.174	0.0704	0.0300	
189.09	1.000	0.413	-0.121	0.00	-583.74	0.00	-806.08	0.00	-4.68	0.00	-126.36	59.21	0.0971	0.00	-0.185	0.0354	0.0300	
204.55	1.000	0.485	-0.102	0.00	-486.93	0.00	-775.10	0.00	-5.65	0.00	-126.14	74.17	0.110	0.00	-0.198	0.0295	0.0300	
220.00	18.207	0.538	-0.0941	0.00	-415.41	0.00	-774.76	0.00	-7.09	0.00	-130.55	88.91	0.126	0.00	-0.218	0.180	0.547	
		xSAT	Lbs per 1000 Barrels	xSAT	Lbs per 1000 Barrels	xSAT	Lbs per 1000 Barrels	xSAT	Lbs per 1000 Barrels	xSAT	Lbs per 1000 Barrels	xSAT	Lbs per 1000 Barrels	xSAT	Lbs per 1000 Barrels			

Saturation Ratios (xSAT) are the ratio of ion activity to solubility, e.g. {Ca}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase. Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.

