



Rocky Mountain Area Laboratory
350 Cole Creek Road,
Evansville, WY 82636

Navajo Fm. Water
API: 103-08955

Upstream Chemicals

REPORT DATE: 7/25/2018

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	CHEVRON
DISTRICT:	WESTERN DIVIDE
AREA/LEASE:	RANGELY
SAMPLE POINT NAME	COLLECTION STATION 6 EMERALD 79X
SITE TYPE:	
SAMPLE POINT DESCRIPTION:	

ACCOUNT REP:	PRESTON M. STEWART
SAMPLE ID:	201812013920
SAMPLE DATE:	7/19/2018
ANALYSIS DATE:	7/25/2018
ANALYST:	BAS

CHEVRON, RANGELY, COLLECTION STATION 6 EMERALD 79X

FIELD DATA			ANALYSIS OF SAMPLE				
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	250	Chloride (Cl ⁻):	13245.0	373.6	Sodium (Na ⁺):	8170.1	355.5
Final Temperature (°F):	111	Sulfate (SO ₄ ²⁻):	303.0	6.3	Potassium (K ⁺):	155.9	4.0
Initial Pressure (psi):	100	Borate (H ₃ BO ₃):	65.3	1.1	Magnesium (Mg ²⁺):	60.4	5.0
Final Pressure (psi):	15	Fluoride (F ⁻):	ND		Calcium (Ca ²⁺):	415.8	20.7
		Bromide (Br ⁻):	ND		Strontium (Sr ²⁺):	43.0	1.0
pH:		Nitrite (NO ₂ ⁻):	ND		Barium (Ba ²⁺):	0.7	0.0
pH at time of sampling:	6.6	Nitrate (NO ₃ ⁻):	ND		Iron (Fe ²⁺):	128.5	4.6
		Phosphate (PO ₄ ³⁻):	3.3	0.1	Manganese (Mn ²⁺):	3.0	0.1
		Silica (SiO ₂):	78.9		Lead (Pb ²⁺):	ND	
					Zinc (Zn ²⁺):	0.1	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO ₃ ⁻):	805.2	13.2			Aluminum (Al ³⁺):	ND	
Carbonate (CO ₃ ²⁻):	ND				Chromium (Cr ³⁺):	ND	
Hydroxide (OH ⁻):	ND				Cobalt (Co ²⁺):	ND	
			ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu ²⁺):	ND
aqueous CO ₂ (ppm):	ND	Formic Acid:	ND		Molybdenum (Mo ²⁺):	ND	
aqueous H ₂ S (ppm):	2.5	Acetic Acid:	ND		Nickel (Ni ²⁺):	ND	
aqueous O ₂ (ppb):	ND	Propionic Acid:	ND		Tin (Sn ²⁺):	ND	
		Butyric Acid:	ND		Titanium (Ti ²⁺):	ND	
Calculated TDS (mg/L):	23410	Valeric Acid:	ND		Vanadium (V ²⁺):	ND	
Density/Specific Gravity (g/cm ³):	1.0136				Zirconium (Zr ²⁺):	ND	
Measured Specific Gravity	ND				Lithium (Li):	ND	
Conductivity (mmhos):	ND						
Resistivity:	ND				Total Hardness:	1338	N/A
MCF/D:	No Data						
BOPD:	No Data						
BWPD:	No Data	Anion/Cation Ratio:		1.01	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

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Conditions		Barite (BaSO ₄)		Calcite (CaCO ₃)		Gypsum (CaSO ₄ ·2H ₂ O)		Anhydrite (CaSO ₄)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
111°F	15 psi	0.39	0.260	0.43	67.707	-1.29	0.000	-1.40	0.000
126°F	24 psi	0.30	0.217	0.45	70.298	-1.28	0.000	-1.32	0.000
142°F	34 psi	0.22	0.173	0.52	78.656	-1.27	0.000	-1.23	0.000
157°F	43 psi	0.15	0.129	0.60	88.926	-1.26	0.000	-1.14	0.000
173°F	53 psi	0.10	0.088	0.69	99.757	-1.24	0.000	-1.04	0.000
188°F	62 psi	0.05	0.052	0.79	110.565	-1.21	0.000	-0.94	0.000
204°F	72 psi	0.02	0.020	0.90	121.064	-1.19	0.000	-0.83	0.000
219°F	81 psi	-0.01	0.000	1.02	132.214	-1.16	0.000	-0.72	0.000
235°F	91 psi	-0.02	0.000	1.14	142.613	-1.14	0.000	-0.61	0.000
250°F	100 psi	-0.04	0.000	1.26	152.226	-1.11	0.000	-0.49	0.000

Conditions		Celestite (SrSO ₄)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate (FeCO ₃)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
111°F	15 psi	-0.60	0.000	-2.81	0.000	2.45	4.774	1.78	89.413
126°F	24 psi	-0.58	0.000	-2.82	0.000	2.38	4.771	1.84	89.854
142°F	34 psi	-0.56	0.000	-2.82	0.000	2.38	4.771	1.93	90.486
157°F	43 psi	-0.54	0.000	-2.83	0.000	2.41	4.773	2.03	91.060
173°F	53 psi	-0.51	0.000	-2.82	0.000	2.46	4.775	2.13	91.528
188°F	62 psi	-0.47	0.000	-2.82	0.000	2.52	4.778	2.24	91.896
204°F	72 psi	-0.42	0.000	-2.82	0.000	2.59	4.780	2.34	92.181
219°F	81 psi	-0.37	0.000	-2.81	0.000	2.68	4.783	2.45	92.428
235°F	91 psi	-0.32	0.000	-2.80	0.000	2.78	4.785	2.55	92.612
250°F	100 psi	-0.26	0.000	-2.79	0.000	2.87	4.787	2.65	92.752

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered

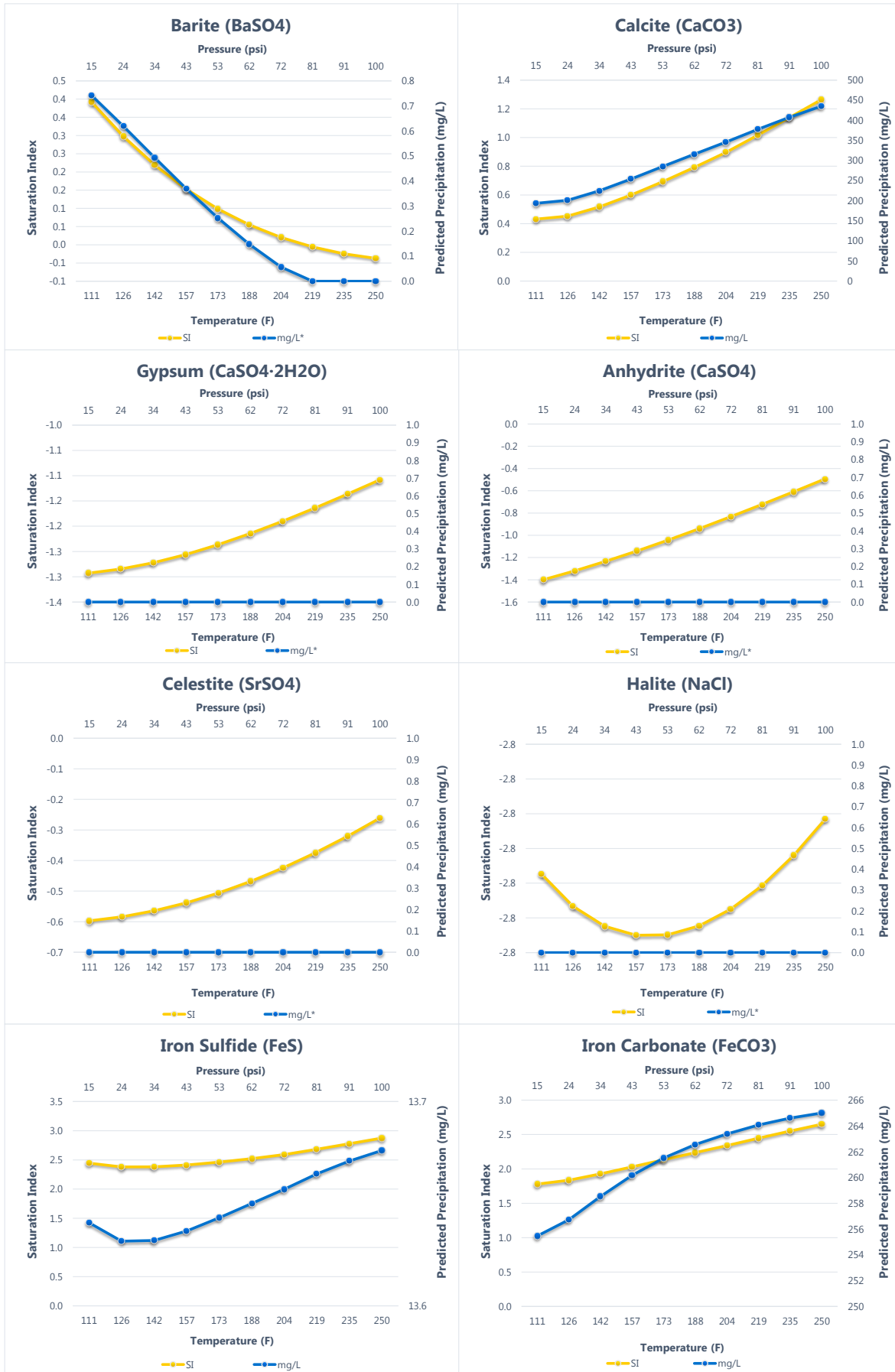
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.

Note 3: Saturation Index predictions on this sheet use pH and alkalinity; %CO₂ is not included in the calculations.

 **EESI**
Economic & Environmental Systems Institute
ScaleSoftPitzer™
SSP2010

Comments:

API 14 # 05103089550001, Navajo Formation, Perforated Interval 4678 to 5130, 5040 BBLS FLOWED, Sample Time 7:00am



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