



Central Area Laboratory
12701 N. Santa Fe Ave, Suite 151
Oklahoma City, Oklahoma 73114

Upstream Chemicals

REPORT DATE: 8/10/2017

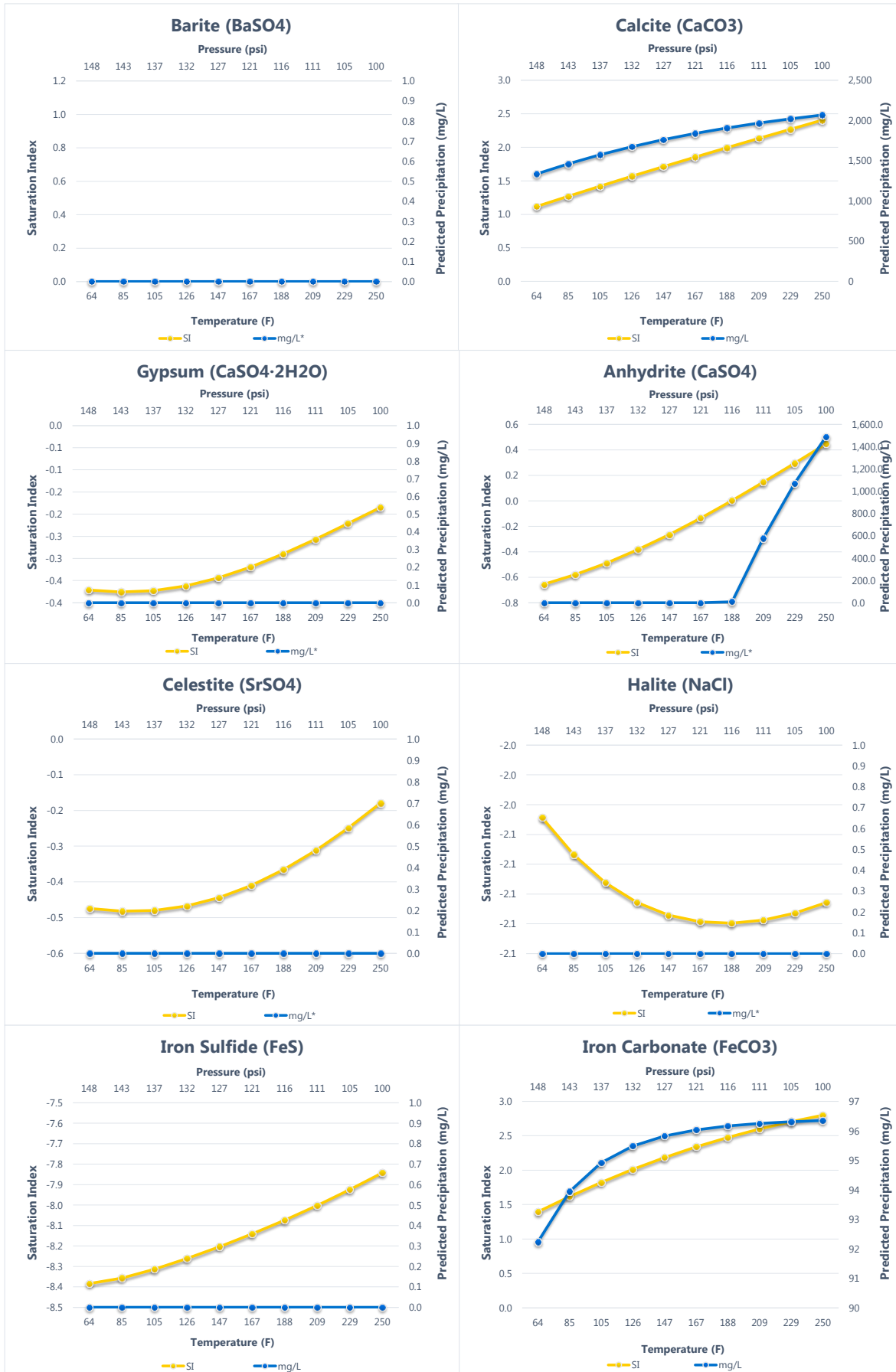
COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER: BREITBURN ENERGY CO LLC
DISTRICT: KANSAS
AREA/LEASE: LIBBY RANCH
SAMPLE POINT NAME: LIBBY RANCH 27-1-J
SITE TYPE: WELL SITES
SAMPLE POINT DESCRIPTION: NOT PROVIDED

ACCOUNT REP: KYLE MILLER
SAMPLE ID: 201710009444
SAMPLE DATE: 7/21/2017
ANALYSIS DATE: 8/10/2017
ANALYST: BS

BREITBURN ENERGY CO LLC, LIBBY RANCH, LIBBY RANCH 27-1-J

FIELD DATA			ANALYSIS OF SAMPLE							
			ANIONS:		mg/L	meq/L	CATIONS:		mg/L	meq/L
Initial Temperature (°F):	250		Chloride (Cl⁻):		35300.0		995.8	Sodium (Na⁺):	16971.0	738.5
Final Temperature (°F):	64		Sulfate (SO₄²⁻):		2261.0		47.1	Potassium (K⁺):	167.7	4.3
Initial Pressure (psi):	100		Borate (H₃BO₃):		39.1		0.6	Magnesium (Mg²⁺):	2343.9	192.9
Final Pressure (psi):	148		Fluoride (F⁻):		ND			Calcium (Ca²⁺):	1322.1	66.0
			Bromide (Br⁻):		ND			Strontium (Sr²⁺):	23.2	0.5
pH:			Nitrite (NO₂⁻):		ND			Barium (Ba²⁺):	0.0	0.0
pH at time of sampling:	6.8		Nitrate (NO₃⁻):		ND			Iron (Fe²⁺):	46.5	1.7
			Phosphate (PO₄³⁻):		0.0		0.0	Manganese (Mn²⁺):	1.1	0.0
			Silica (SiO₂):		ND			Lead (Pb²⁺):	ND	
								Zinc (Zn²⁺):	13.4	0.4
ALKALINITY BY TITRATION:			mg/L	meq/L						
Bicarbonate (HCO₃⁻):	2905.0	47.6						Aluminum (Al³⁺):	ND	
Carbonate (CO₃²⁻):	ND							Chromium (Cr³⁺):	ND	
Hydroxide (OH⁻):	ND							Cobalt (Co²⁺):	ND	
			ORGANIC ACIDS:		mg/L	meq/L	Copper (Cu²⁺):		ND	
aqueous CO₂ (ppm):	1638.0		Formic Acid:		ND			Molybdenum (Mo²⁺):	ND	
aqueous H₂S (ppm):	ND		Acetic Acid:		ND			Nickel (Ni²⁺):	ND	
aqueous O₂ (ppb):	ND		Propionic Acid:		ND			Tin (Sn²⁺):	ND	
			Butyric Acid:		ND			Titanium (Ti²⁺):	ND	
Calculated TDS (mg/L):	61355		Valeric Acid:		ND			Vanadium (V²⁺):	ND	
Density/Specific Gravity (g/cm³):	1.0397							Zirconium (Zr²⁺):	ND	
Measured Specific Gravity	ND							Lithium (Li):	ND	
Conductivity (mmhos):	ND									
Resistivity:	11.74 OHM/CM @ 25C							Total Hardness:	12988	N/A
MCF/D:	No Data									
BOPD:	No Data									
BWPD:	No Data		Anion/Cation Ratio:				1.09	ND = Not Determined		



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